



HAL
open science

Ephémérides des satellites de Jupiter, Saturne et Uranus pour 1989

Th. Derouazi, Ch. Ruatti, W. Thuillot, D.T. Vu

► **To cite this version:**

Th. Derouazi, Ch. Ruatti, W. Thuillot, D.T. Vu. Ephémérides des satellites de Jupiter, Saturne et Uranus pour 1989. [Rapport de recherche] Institut de mécanique céleste et de calcul des éphémérides(IMCCE). 1988, 93 p., figures, tableaux. hal-01467145

HAL Id: hal-01467145

<https://hal-lara.archives-ouvertes.fr/hal-01467145v1>

Submitted on 14 Feb 2017

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

ÉPHÉMÉRIDES DES SATELLITES DE JUPITER, SATURNE ET URANUS POUR 1989

EPHEMERIDES OF THE SATELLITES OF JUPITER, SATURN AND URANUS FOR 1989

les éditions



de physique

SUPPLÉMENT A LA CONNAISSANCE DES TEMPS - PARIS 1988
BUREAU DES LONGITUDES

**ÉPHÉMÉRIDES DES
SATELLITES DE JUPITER,
SATURNE ET URANUS
POUR 1989**

***EPHEMERIDES OF THE
SATELLITES OF JUPITER,
SATURN AND URANUS
FOR 1989***

les éditions

de physique

Avenue du Hoggar
Zone Industrielle de Courtabœuf,
B.P. 112,
F-91944 Les Ulis Cedex, France

PUBLICATIONS DU
BUREAU DES LONGITUDES

PUBLICATIONS OF
THE BUREAU DES LONGITUDES

- La *Connaissance des Temps* (Ephémérides Astronomiques de la Lune et des planètes pour 1989). Editée par l'EPSHOM, BP426, F-29275 Brest Cedex, France

- *The Connaissance des Temps* (Astronomical Ephemerides of the Moon and the Planets for 1989). Published by EPSHOM, BP426, F-29275 Brest Cedex, France

Autres suppléments à la *Connaissance des Temps* :

Other supplements to the *Connaissance des Temps* :

- Ephémérides des satellites faibles de Jupiter (VI, VII, VIII, IX) et de Saturne (IX) pour 1989
- Phénomènes et configurations des satellites Galiléens de Jupiter pour 1989
- Configurations des huit premiers satellites de Saturne pour 1989

- *Ephemerides of the Faint Satellites of Jupiter (VI, VII, VIII, IX) and of Saturn (IX) for 1989*
- *Phenomena and configurations of the Galilean Satellites of Jupiter for 1989*
- *Configurations of the First Eight Satellites of Saturn for 1989*

Autres publications du Bureau des Longitudes :

Other publications of the Bureau des Longitudes (in French) :

- Annuaire du Bureau des Longitudes, Ephémérides pour 1989 (Masson, Paris)
- Ephémérides nautiques pour l'an 1989 (Bordas, Paris)
- Encyclopédie Scientifique de l'Univers (Bordas, Paris) :
 - La physique (1981)
 - La terre, les eaux, l'atmosphère (réédition, 1984)
 - Les étoiles, le système solaire (réédition, 1985)
 - La galaxie, l'univers extra-galactique (réédition, 1988)

AVERTISSEMENT

Depuis 1980, la *Connaissance des Temps* publie les éphémérides du Soleil, de la Lune, des planètes et des satellites Galiléens de Jupiter sous forme de coefficients de Tchébycheff. A partir de 1981, des éphémérides des huit premiers satellites de Saturne ont été publiées sous la même forme dans un supplément à la *Connaissance des Temps*. Ces éphémérides ayant été appréciées par les utilisateurs, nous avons décidé d'étendre ces publications à d'autres satellites naturels du Système Solaire.

Depuis 1985, nous publions dans un même recueil des éphémérides des satellites Galiléens de Jupiter, des huit premiers satellites de Saturne et des cinq satellites d'Uranus. Les éphémérides ne sont plus représentées à l'aide de coefficients de Tchébycheff, mais à l'aide de fonctions mixtes du paramètre « temps » comprenant des termes séculaires et des termes périodiques. Cette représentation permet de garder une bonne précision tout en diminuant notablement le nombre de valeurs numériques à publier et en autorisant une plus grande facilité d'emploi.

La liste des satellites dont nous publions les éphémérides n'est pas limitative et nous envisageons de l'étendre en fonction des données dont nous disposerons.

En dehors des éphémérides proprement dites cet ouvrage contient des données diverses sur les satellites de Jupiter, Saturne et Uranus et présente un formulaire permettant de calculer les phénomènes des satellites Galiléens de Jupiter

J. CHAPRONT

Directeur du Service des Calculs et de Mécanique Céleste du Bureau des Longitudes, Unité Associée au CNRS

Collaboration scientifique et technique : Th. DEROUAZI, Ch. RUATTI, W. THUILLOT, D. T. VU

Bureau des Longitudes, 77, avenue Denfert-Rochereau, 75014 Paris, FRANCE

FOREWORD

Since 1980, *Connaissance des Temps* has published ephemerides of the Sun, the Moon, the Planets and the Galilean Satellites of Jupiter as tables of Chebychev polynomials. From 1981, ephemerides of the First Eight Satellites of Saturn have been published under the same form in a supplement to the *Connaissance des Temps*. These ephemerides have been well received by the users ; hence, we now intend to enlarge the publication to incorporate other natural satellites of the planets.

Starting from 1985, we have gathered in this booklet, the ephemerides of the Galilean Satellites of Jupiter, the First Eight Satellites of Saturn and the Five Satellites of Uranus. The representation does not use Chebychev polynomials. It appears that a mixed form of representation, involving secular and periodic terms and depending directly on time, allows sufficient accuracy and reduces the amount of numerical data to be published. Furthermore, it is very easy to use these tables.

The list of the satellites, the ephemerides of which are published, is not limited and will be extended as soon as it is possible.

Beside the tables, the present publication contains various data concerning the satellites of Jupiter, Saturn and Uranus. We will also present, a formula which permits the calculation of the phenomena of the Galilean Satellites.

TABLE DES MATIERES

	page :
PRÉSENTATION DES ÉPHÉMÉRIDES	7
Contenu	8
Représentation des coordonnées	8
Description des éphémérides	9
Echelles de temps	9
Exemple de calcul d'une position	10
Précision des éphémérides	11
Phénomènes des satellites Galiléens de Jupiter	11
Références bibliographiques	11
LES SATELLITES DE JUPITER	13
Données sur les satellites Galiléens	14
Données sur l'ensemble des satellites de Jupiter	16
Ephémérides des satellites Galiléens	17
Io (I)	18
Europe (II)	26
Ganymède (III)	34
Callisto (IV)	38
Phénomènes des satellites Galiléens	42
LES SATELLITES DE SATURNE	47
Données sur les satellites de Saturne	48
Ephémérides des huit premiers satellites de Saturne	49
Mimas (I)	50
Encelade (II)	65
Téthys (III)	67
Dioné (IV)	69
Rhéa (V)	71
Titan (VI)	73
Hypérion (VII)	76
Japet (VIII)	80
LES SATELLITES D'URANUS	83
Données sur les satellites d'Uranus	84
Ephémérides des cinq satellites d'Uranus	85
Miranda (V)	86
Ariel (I)	90
Umbriel (II)	91
Titania (III)	92
Obéron (IV)	93

TABLE OF CONTENTS

	page :
PRESENTATION OF THE EPHEMERIDES	7
<i>Contents</i>	8
<i>Representation of the coordinates</i>	8
<i>Description of the ephemerides</i>	9
<i>Time-scales</i>	9
<i>Example of a position calculation</i>	10
<i>Accuracy of the ephemerides</i>	11
<i>Phenomena of the Galilean satellites of Jupiter</i>	11
<i>References</i>	11
SATELLITES OF JUPITER	13
<i>Data on the Galilean satellites</i>	14
<i>Data on the Galilean and other satellites of Jupiter</i>	16
<i>Ephemerides of the Galilean satellites</i>	17
<i>Io (I)</i>	18
<i>Europa (II)</i>	26
<i>Ganymede (III)</i>	34
<i>Callisto (IV)</i>	38
<i>Phenomena of the Galilean satellites</i>	42
SATELLITES OF SATURN	47
<i>Data on the satellites of Saturn</i>	48
<i>Ephemerides of the First Eight satellites of Saturn</i>	49
<i>Mimas (I)</i>	50
<i>Enceladus (II)</i>	65
<i>Tethys (III)</i>	67
<i>Dione (IV)</i>	69
<i>Rhea (V)</i>	71
<i>Titan (VI)</i>	73
<i>Hyperion (VII)</i>	76
<i>Iapetus (VIII)</i>	80
SATELLITES OF URANUS	83
<i>Data on the satellites of Uranus</i>	84
<i>Ephemerides of the five satellites of Uranus</i>	85
<i>Miranda (V)</i>	86
<i>Ariel (I)</i>	90
<i>Umbriel (II)</i>	91
<i>Titania (III)</i>	92
<i>Oberon (IV)</i>	93

PRÉSENTATION DES ÉPHÉMÉRIDES
PRESENTATION OF THE EPHEMERIDES

CONTENU

On trouve dans cette publication :

— des données sur les satellites Galiléens de Jupiter rassemblant les résultats d'un certain nombre de travaux théoriques ou d'observation effectués sur ces satellites, ainsi que des données (en général recommandées par l'UAI) sur l'ensemble des satellites de Jupiter, Saturne et Uranus, extraites de l'*Encyclopédie du Bureau des Longitudes* ;

— des tables permettant de calculer les positions des satellites Galiléens de Jupiter, des huit premiers satellites de Saturne et des cinq satellites d'Uranus ;

— des tables permettant de calculer les prédictions des phénomènes des satellites Galiléens de Jupiter.

Les éphémérides des satellites donnent les coordonnées différentielles tangentielles des satellites par rapport au centre de la planète :

$$X = \Delta\alpha \cos \delta \text{ et } Y = \Delta\delta$$

où δ est la déclinaison de la planète et où $\Delta\alpha$ et $\Delta\delta$ sont les différences en ascension droite et en déclinaison entre le satellite et la planète.

Ces coordonnées sont des coordonnées moyennes rapportées à l'équateur de la date pour les satellites Galiléens de Jupiter et à l'équateur 1950.0 pour les satellites de Saturne et Uranus. L'axe des Y est dirigé vers le pôle de l'équateur moyen des coordonnées (nord) et l'axe des X est orienté dans le sens des ascensions droites croissantes (est).

Les théories utilisées pour la construction des éphémérides sont les suivantes :

— satellites Galiléens : la théorie de Sampson (1921) améliorée par Lieske (1977) ; les constantes introduites ont été déterminées par Arlot (1982) ;

— huit premiers satellites de Saturne : les théories issues des travaux de Rapaport (1977), de Kozai (1959) et de Struve (1930) ;

— satellites d'Uranus : la théorie issue du travail de Veillet (1983).

**REPRÉSENTATION
DES COORDONNÉES**

Soit T une date Julienne appartenant à l'intervalle de temps $T_0, T_0 + \Delta t$, les coordonnées des satellites pour la date T sont données par la formule :

$$\left. \begin{matrix} X \\ Y \end{matrix} \right\} = A_0 + A_1 \cdot t + B_0 \sin(Nt + F_0) + B_1 \cdot t \sin(Nt + F_1) + B_2 \cdot t^2 \sin(Nt + F_2) + C_0 \sin(2Nt + P_0) \quad (1)$$

CONTENTS

This publication contains the following :

— data on the Galilean satellites of Jupiter which sum the results of theoretical or observational studies in addition to various data (most of which are recommended by the IAU) concerning all known satellites of Jupiter, Saturn and Uranus. These data are found in the *Encyclopédie du Bureau des Longitudes* ;

— tables which allow the computation of the positions of the Galilean satellites of Jupiter, the first eight satellites of Saturn and the five satellites of Uranus ;

— tables to calculate the phenomena of the Galilean satellites of Jupiter.

These ephemerides of the satellites give the differential tangential coordinates of the satellites with respect to the centre of mass of the planet :

$$X = \Delta\alpha \cos \delta \text{ and } Y = \Delta\delta$$

where δ is the declination of the planet, $\Delta\alpha$ and $\Delta\delta$ the separations in right ascension and declination between the satellite and the planet.

These coordinates are mean coordinates (equator of the date for the Galilean satellites and equator of 1950.0 for the satellites of Saturn and Uranus). The Y -axis is set towards the pole of the equator (North) and the X -axis towards the increasing right ascensions (East).

The theories which have been used for the construction of the ephemerides are :

— Galilean satellites : Sampson's theory (1921) improved by Lieske (1977) ; the constants introduced have been determined by Arlot (1982) ;

— first eight satellites of Saturn : theories from the studies of Rapaport (1977), Kozai (1959) and Struve (1930) ;

— satellites of Uranus : theory from Veillet's thesis (1983).

**REPRESENTATION
OF THE COORDINATES**

Let T be a Julian date belonging to the interval of time $T_0, T_0 + \Delta t$. The coordinates of the satellites for the date T are given by the formula :

où :

- $t = T - T_0$
- $A_0, A_1, B_0, F_0, B_1, F_1, B_2, F_2, C_0, P_0$ sont les coefficients numériques valables pour l'intervalle de temps $T_0, T_0 + \Delta t$ contenant T
- N est la fréquence associée au satellite considéré. Cette fréquence est en général proche de celle du satellite lui-même, sauf dans le cas d'Hypérior pour lequel on prend une fréquence proche de celle de Titan du fait de l'existence d'un très gros terme perturbateur de fréquence plus grande que celle du satellite lui-même.

Cette représentation sous forme de fonctions mixtes (termes séculaires et sinusoïdaux) utilise le caractère quasi périodique des variations des positions des satellites naturels des planètes. On trouvera des explications détaillées sur cette représentation dans Chapront et Vu (1984).

DESCRIPTION DES ÉPHÉMÉRIDES

Pour chaque satellite et pour chaque intervalle de temps, on donne :

- les dates de début et de fin de l'intervalle de validité ainsi que la date Julienne du début de l'intervalle ; cet intervalle peut varier de 2 jours pour Mimas à 32 jours pour les gros satellites d'Uranus ;
- deux jeux de coefficients $A_0, A_1, B_0, F_0, B_1, F_1, B_2, F_2, C_0, P_0$: l'un pour la coordonnée X , l'autre pour la coordonnée Y . Notons que pour quelques satellites (Titan, par exemple), certains coefficients ne sont pas donnés car ils sont nuls ;
- la valeur de la fréquence N associée au satellite est indiquée en haut de chaque page.

Les unités sont : la seconde de degré pour les coefficients A_0, B_0, C_0 , la seconde de degré par jour pour A_1, B_1 , la seconde de degré par (jour)² pour B_2 ; les phases F_0, F_1, F_2, P_0 sont mesurées en radian. N est en radian par jour et le paramètre « temps » t est compté en jours à partir du début de l'intervalle (époque T_0).

ÉCHELLES DE TEMPS

L'argument « temps » des éphémérides publiées ici est le TDB (temps dynamique barycentrique) que l'on peut confondre, à la précision des éphémérides, avec le TDT (temps dynamique terrestre), proche du TE (temps des éphémérides) et réalisé physiquement par la mesure du TAI (temps atomique international). On a :

$$\text{TDT} = \text{TAI} + 32,184 \text{ s}$$

where :

- $t = T - T_0$
- $A_0, A_1, B_0, F_0, B_1, F_1, B_2, F_2, C_0, P_0$ are numerical coefficients valid for the time interval $T_0, T_0 + \Delta t$
- N is the frequency associated with the chosen satellite. Generally, N is close to the natural frequency of the satellite itself. Nevertheless, in the case of Hyperion, N is close to the frequency of Titan because of the appearance of a large disturbing term which frequency is larger than the proper frequency of the satellite.

This representation with mixed functions (secular and sinusoidal terms) of time, makes use of the quasi-periodic character of the variations of the differential coordinates of the satellites. Detailed explanations about this representation are given in Chapront and Vu (1984).

DESCRIPTION OF THE EPHEMERIDES

The following is given for each satellite and for each time interval :

- the dates of the beginning and end of the interval and the Julian date of the beginning. The duration of the time interval may cover from 2 days (in the case of Mimas) to 32 days (in the case of the larger satellites of Uranus) ;
- two sets of coefficients $A_0, A_1, B_0, F_0, B_1, F_1, B_2, F_2, C_0, P_0$: the first set for the X -coordinate and the second set for the Y -coordinate. Let us note that for some satellites (Titan for example) some coefficients, with zero value, are not listed ;
- the value of frequency N , associated with the satellite indicated at the top of each page.

Units of the data : A_0, B_0, C_0 in arcsecond ; A_1 and B_1 in arcsecond per day and B_2 in arcsecond per (day)². For phases F_0, F_1, F_2, P_0 the unit is the radian. N is expressed in radian per day and t in days from the beginning of the interval (epoch T_0).

TIME-SCALES

The time argument of the ephemerides is TDB (barycentric dynamical time) which can be identified with TDT (terrestrial dynamical time) close to the former definition of ET (ephemeris time) and physically made by measuring TAI (international atomic time), so that :

$$\text{TDT} = \text{TAI} + 32.184 \text{ s}$$

Les événements astronomiques étant mesurés dans l'échelle UTC (temps universel coordonné), le tableau ci-dessous donne la relation (entre le 1 janvier 1980 et le 1 juillet 1988) entre TDT et UTC (d'après la relation entre TAI et UTC publiée par le BIH).

Astronomical events are measured in the time-scale UTC (coordinate universal time). The table below gives the correspondence (from 1980 January 1 to 1988 July 1) between TDT and UTC (using the relationship between TAI and UTC published by BIH).

		TDT-UTC
1980 Jan. 1 - 1981 Juil.	1	51.184 s
1981 Juil. 1 - 1982 Juil.	1	52.184 s
1982 Juil. 1 - 1983 Juil.	1	53.184 s
1983 Juil. 1 - 1985 Juil.	1	54.184 s
1985 Juil. 1 - 1988 Juil.	1	55.184 s
1988 Juil. 1 -		56.184 s

Pour 1989, on ne sait pas encore quelle en sera la valeur ; on peut cependant prendre 56 secondes, l'erreur commise n'ayant que peu d'influence sur la valeur des positions calculées des satellites.

For 1989 the value of TDT-UTC is not yet known ; one may take 56 seconds : the error made will have little effect on the values of the calculated positions of the satellites.

EXEMPLE DE CALCUL D'UNE POSITION

Pour calculer les coordonnées X et Y d'un satellite pour une date T exprimée en UTC :

- on effectue une correction déduite du tableau du paragraphe précédent pour se ramener à l'échelle TDT (identifiée à TDB) ;
- on cherche parmi les tableaux représentant X et Y celui qui correspond à l'intervalle $T_0, T_0 + \Delta t$ dans lequel se trouve T ;
- on applique la formule (1) avec $t = T - T_0$.

Il faut insister sur le fait que la représentation n'est valable que sur son intervalle de validité : T doit être compris entre T_0 et $T_0 + \Delta t$.

EXEMPLE : Calculer les coordonnées tangentielles de Téthys (3^e satellite de Saturne) par rapport à la planète, le 5 janvier 1989 à 23 h 30 min UTC.

On effectue d'abord une correction pour se ramener à l'échelle TDB. Pour 1989 nous avons choisi 56 secondes ; la date T est donc le 5 janvier 1989 à 23 h 30 min 56 s TDB.

Les coefficients nécessaires au calcul de X et Y sont ceux de la page 67 correspondant à l'intervalle du 1^{er} janvier à 0 h au 17 janvier à 0 h. On a, pour X :

$$A_0 = 0., A_1 = 0., B_0 = 36.640\ 3, B_1 = 0.070\ 38, B_2 = 0.000\ 406, C_0 = 0.002\ 9$$

$$F_0 = 5.932\ 759, F_1 = 4.422\ 0, F_2 = 0.045\ 7, P_0 = 2.374\ 9$$

et pour Y :

$$A_0' = -0.001\ 2, A_1' = 0., B_0' = 16.831\ 6, B_1' = 0.025\ 29, B_2' = 0.000\ 172, C_0' = 0.001\ 4$$

$$F_0' = 1.443\ 536, F_1' = 5.794\ 9, F_2' = 1.944\ 2, P_0' = 4.162\ 2$$

On applique ensuite la formule (1) :

$$\left. \begin{matrix} X \\ Y \end{matrix} \right\} = A_0 + A_1 \cdot t + B_0 \sin(Nt + F_0) + B_1 \cdot t \sin(Nt + F_1) + B_2 \cdot t^2 \sin(Nt + F_2) + C_0 \sin(2Nt + P_0)$$

EXAMPLE OF A POSITION CALCULATION

To compute the X and Y coordinates of a satellite for a date T (expressed in UTC), one has to :

- apply the correction deduced from the preceding table to express the date T in TDT (identified with TDB) ;
- select from the tables of coefficients, the one which corresponds to the time interval $T_0, T_0 + \Delta t$ where T is found ;
- apply formula (1) with $t = T - T_0$.

It is important to state that the representation is valid only for its time interval : T must belong to the interval $T_0, T_0 + \Delta t$.

EXAMPLE : Let us compute the tangential coordinates of Tethys (third satellite of Saturn) with respect to the planet for 1989 January 5, 23 h 30 min UTC.

First, the date must be corrected in order to fit with the TDB time-scale. For 1989, we choose 56 seconds ; so, the date T is 1989 January 5, 23 h 30 min 56 s TDB.

The coefficients necessary to compute X and Y are given on page 67 (interval from January 1, 0 h to January 17, 0 h). We read for X :

and for Y :

On a ici :

$$N = 3,328 \text{ radian/jour}$$

t est le nombre de jours écoulés entre le 1 janvier à 0 h (début de l'intervalle) et le 5 janvier à 23 h 30 min 56 s, soit 4,979 826 jours.

On obtient finalement :

$$X = -17,75''$$

$$Y = -12,51''$$

Where :

$$N = 3.328 \text{ radian/day}$$

t is the number of days elapsed between January 1, 0 h (beginning of the interval) and January 5, 23 h 30 min 56 s. Hence $t = 4.979 826$ days.

Finally, we get :

$$X = -17.75''$$

$$Y = -12.51''$$

PRÉCISION DES ÉPHÉMÉRIDES

Les théories dont sont issues les éphémérides sont construites pour la plupart avec une précision meilleure que 0,01" géocentrique.

Les observations utilisées pour l'ajustement des constantes et aussi certains défauts de la théorie ne permettent d'obtenir en réalité qu'une précision de 0,05" ; cette précision peut n'être que de 1" pour certains satellites de Saturne.

La représentation en fonctions mixtes publiée ici a été déterminée de façon à ce que l'écart avec la théorie-source soit toujours inférieur à 0,01".

ACCURACY OF THE EPHEMERIDES

The theories from which are built the ephemerides have an internal precision better than 0.01" (in a geocentric reference frame).

In reality, the observations used to fit the constants and shortcomings in the theories, allow a precision of only 0.05" which may reach 1" for some satellites of Saturn.

The representation in mixed functions, as published here, has been determined in such a way that the difference between the representation and the source always remains below 0.01".

PHÉNOMÈNES DES SATELLITES GALILÉENS DE JUPITER

Les prédictions des phénomènes des satellites Galiléens sont données suivant une représentation polynômiale en fonction d'une variable temporelle. La méthode (Thuillot, 1983) permet une représentation compacte puisque 14 coefficients suffisent à représenter chaque type de phénomène (passages, occultations, éclipses, passages d'ombre, débuts ou fins) de chaque satellite pour une année entière avec une précision de l'ordre de la minute de temps.

Des explications sur cette méthode, le formulaire et les tables de coefficients sont donnés pages 42 à 45.

PHENOMENA OF THE GALILEAN SATELLITES OF JUPITER

The predictions of the phenomena of the Galilean Satellites are given as a polynomial representation which depends directly on time. The method (Thuillot, 1983) allows a compact representation as only 14 coefficients are sufficient to represent each type of phenomenon (transits, occultations, eclipses, shadow transits, beginnings or ends) for each satellite for a complete year with an accuracy of about one minute of time.

Some explanations about the method, the formulae and the tables of coefficients are given on pages 42 to 45.

REFERENCES

- ARLOT, J.-E. : 1982, *Astron. Astrophys.* **107**, 305.
 CHAPRONT, J., VU, D.T. : 1984, *Astron. Astrophys.* **141**, 131.
 KOZAI, Y. : 1959, *Astron. J.* **64**, 367.
 LIESKE, J.H. : 1977, *Astron. Astrophys.* **56**, 333.
 RAPAPORT, M. : 1977, Thèse d'Etat, Université de Bordeaux I.
 SAMPSON, R.A. : 1921, *Mem. Roy. Astron. Soc.* **63**.
 STRUVE, G. : 1930, *Veröff. Univ. Sternw. Berlin Babelsberg* **6**.
 THUILLOT, W. : 1983, *Astron. Astrophys.* **127**, 63.
 VEILLET, Ch. : 1983, Thèse d'Etat, Université de Paris VI.

Note : Les calculs nécessaires à l'élaboration de cet ouvrage ont été effectués sur l'ordinateur NAS 9080 du Centre Inter-Régional de Calcul Electronique du CNRS, F-91405 ORSAY (France).

Note : The calculations performed in order to build these tables have been made on the NAS 9080 computer of the Centre Inter-Régional de Calcul Electronique of the CNRS, F-91405 ORSAY (France).

SATELLITES DE JUPITER
SATELLITES OF JUPITER

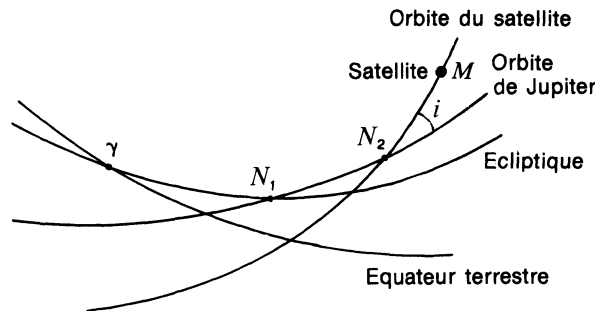
DONNÉES SUR LES SATELLITES GALILÉENS

DATA ON THE GALILEAN SATELLITES

	IO (I)	EUROPE (II)	GANYMÈDE (III)	CALLISTO (IV)
<i>Masses</i> (10^{-5} masse de Jupiter)				
Sampson (1921) :	4.50	2.54	7.99	4.50
De Sitter (1931) :	3.81	2.48	8.17	5.09
Pionner 11 (1976) :	4.68	2.52	7.80	5.66
<i>Rayons</i> (km)				
Danjon (1954) :	1650	1400	2450	2300
Dollfus (1961) :	1775	1550	2800	2525
Pionner 11 (1976) :	1840	1552	2650	2420
Voyager (1983) :	1816	1563	2638	2410
<i>Magnitudes visuelles</i> à l'opposition de Jupiter :				
Harris (1961) :	4.8	5.2	4.5	5.5
<i>Albedos géométriques</i> (Harris, 1961)				
<i>U</i> : 353 nm	0.19	0.47	0.29	0.14
<i>B</i> : 448 nm	0.56	0.67	0.41	0.21
<i>V</i> : 554 nm	0.92	0.83	0.49	0.26
<i>R</i> : 690 nm	1.12	0.93	0.56	0.30
<i>I</i> : 820 nm	1.15	0.95	0.57	0.31
<i>Albédo de Bond</i> (visuel)				
	0.54	0.49	0.29	0.15
<i>Demi-grand axe</i> (Sampson, 1921)				
en UA :	0.002820	0.004486	0.007155	0.012586
en rayons de Jupiter :	5.87	9.34	14.91	26.22
en kilomètres :	421810	671140	1070500	1882900
<i>Plus grande élongation</i> à l'opposition de Jupiter (minutes et secondes de degré)				
Sampson (1921) :	2' 17"	3' 40"	5' 48"	10' 13"
<i>Période synodique</i> (jours)				
Sampson (1921) :	1.7698604883	3.5540941742	7.1663872292	16.7535523007
<i>Inclinaison moyenne</i> sur l'équateur de Jupiter pour 1989.5 (minutes et secondes de degré)				
Sampson (1921) :	2'02"	26'20"	10'59"	21'00"
<i>Valeur moyenne de l'excentricité</i> pour 1989.5				
Sampson (1921) :	0.004	0.009	0.001	0.007
<i>Partie séculaire du mouvement</i> (degrés par an)				
nœud :	- 48.5	- 11.9	- 2.6	- 0.6
périjove :	57.0	14.6	2.7	0.7
Sampson (1921)				

**Théorie du mouvement
des satellites Galiléens**

**Theory of the motion of
the Galilean satellites**



(repère moyen de la date)
(mean frame of the date)

Du fait de la complexité du mouvement des satellites Galiléens, il est difficile de donner des valeurs précises sur les nœuds et les périodes. En effet, les excentricités et les inclinaisons sont faibles (cf. tableau précédent) et tous ces éléments sont soumis à de grandes variations.

On donne ci-après les longitudes moyennes (d'après Sampson, 1921) dans le plan des orbites, ce plan étant confondu avec l'équateur de Jupiter.

Si τ est le temps en jours moyens compté à partir de 1900,0 on a :

Because of the complexity of the motion of the Galilean satellites of Jupiter it is difficult to provide precise values for nodes and perijoves. Indeed, eccentricities and inclinations are small (see the preceding table) and all these elements undergo large variations.

The mean longitudes (Sampson, 1921) in the orbital planes identified with Jupiter's equator are given below.

If τ is the time in days which has elapsed from 1900.0, one gets :

$$\gamma N_1 N_2 = 316.051^\circ + 0.00003559 \tau, \quad i = 3.10350^\circ$$

	$\gamma N_1 + N_1 N_2 + N_2 M$	Période sidérale en jours Sidereal period in days
Io	$142.59987^\circ + 203.488992435 \tau$	1.7691374639
Europe	$99.55081^\circ + 101.374761672 \tau$	3.5511797420
Ganymède	$168.02628^\circ + 50.317646290 \tau$	7.1545476894
Callisto	$234.40790^\circ + 21.571109630 \tau$	16.6889884746

DONNÉES SUR L'ENSEMBLE DES SATELLITES DE JUPITER

DATA ON THE GALILEAN AND OTHER SATELLITES OF JUPITER

NOM	masse	rayon	période rotation sidérale	albédo géométrique	magnitude visuelle	période orbitale	élongation maximale	1/2 grand axe	excentricité	inclinaison sur l'équateur de Jupiter
unité →	masse de Jupiter	km	jour			jour	(°) (') (")	10 ³ km		degré
I Io	4.70×10^{-5}	1 815	(S)	0.61	5.02	1.769 137	2 18	422	0.004	0.04
II Europa	2.56×10^{-5}	1 569	(S)	0.64	5.29	3.551 181	3 40	671	0.009	0.47
III Ganymède	7.84×10^{-5}	2 631	(S)	0.42	4.61	7.154 552	5 51	1 070	0.002	0.21
IV Callisto	5.6×10^{-5}	2 400	(S)	0.20	5.65	16.689 018	10 18	1 883	0.007	0.51
V Amalthea	$38. \times 10^{-10}$	135 × 85 × 75	(S)	0.05	14.1	0.498 179	59	181	0.003	0.40
VI Himalia	$50. \times 10^{-10}$	90	0.4	0.03	14.84	250.566 2	1 02 46	11 480	0.158	27.63 (1) (2)
VII Elara	$4. \times 10^{-10}$	40	0.5	0.03	16.77	259.652 8	1 04 10	11 737	0.207	24.77 (1) (2)
VIII Pasiphae	$1. \times 10^{-10}$				17.0	735. (R)	2 08 26	23 500	0.378	145. (1) (2)
IX Sinope	0.4×10^{-10}	15			18.3	758. (R)	2 09 31	23 700	0.275	153. (1) (2)
X Lysithea	0.4×10^{-10}	10			18.4	259.22	1 04 04	11 720	0.107	29.02 (2)
XI Carme	0.5×10^{-10}	15			18.0	692. (R)	2 03 31	22 600	0.207	164. (2)
XII Ananke	0.2×10^{-10}	10			18.9	631. (R)	1 55 52	21 200	0.169	147. (2)
XIII Leda	0.03×10^{-10}	8			20.	238.72	1 00 39	11 094	0.148	26.07 (2)
XIV Thebe	$4. \times 10^{-10}$	40		0.05	16.0	0.674 55	1 13	221		
XV Adrastea	0.1×10^{-10}	10		0.05	18.9	0.298	42	129		
XVI Metis	0.5×10^{-10}	20		0.05	17.5	0.294 79	42	128		

NAME	mass	radius	sidereal rotation	geometrical albedo	visual magnitude	orbital period	greatest elongation	semi major axis	eccentricity	inclination on Jupiter's equator
unit →	Jupiter's mass	km	day			day	(°) (') (")	10 ³ km		degree

NOTES

(S) : révolution synchrone

(R) : révolution rétrograde

(1) : les éphémérides des satellites VI, VII, VIII et IX sont données sous forme de coefficients de Tchébycheff dans le supplément à la Connaissance des Temps « Satellites faibles... »

(2) : inclinaison sur l'orbite de Jupiter

(S) : synchronous revolution

(R) : retrograde revolution

(1) : the ephemerides for satellites VI, VII, VIII and IX are given as Chebychev coefficients in the *Supplément à la Connaissance des Temps « Faint Satellites... »*

(2) : inclination on Jupiter's orbit

Données extraites de l'*Encyclopédie du Bureau des Longitudes*.

Data from the *Encyclopédie du Bureau des Longitudes*.

ÉPHÉMÉRIDES DES SATELLITES GALILÉENS

EPHEMERIDES OF THE GALILEAN SATELLITES

Coordonnées différentielles tangentielles données en secondes de degré dans le repère équatorial moyen de la date. *Differential tangential coordinates given in arcsecond in the mean equatorial frame of the date.*

$$\begin{aligned} \Delta\alpha \cos\delta &= X \\ \Delta\delta &= Y \end{aligned}$$

$$\left. \begin{array}{l} X \\ Y \end{array} \right\} = A0 + A1 \cdot t + B0 \sin(Nt + F0) + B1 \cdot t \sin(Nt + F1) + B2 \cdot t^2 \sin(Nt + F2) + C0 \sin(2Nt + P0)$$

où $t = T - T0$ avec $T0$ date du début de l'intervalle et T date du calcul *where $t = T - T0$ with $T0$ date of beginning of the interval and T the date for the calculation*

satellite	intervalle Δt (jours)	N (rad/j)	page
Io	4	3.551 6	18
Europe	4	1.769 3	26
Ganymède	8	0.878 2	34
Callisto	8	0.376 5	38
	(days)	(rad/d)	

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE JUPITER: IO				N=3.5516	
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
JAN. 1 (OH)	X:	-0.8017	+0.00302	+132.0899 6.259186	+0.38480 2.8261	+0.002590 4.3821	+0.2649 4.6881
(2447527.5)							
A JAN. 5 (OH)	Y:	-0.2065	+0.00004	+ 33.1446 0.204943	+0.04267 3.2609		+0.0662 4.9111
JAN. 5 (OH)	X:	-0.7936	+0.00598	+130.6059 1.618851	+0.39896 4.5006	+0.008848 0.0561	+0.2619 1.7434
(2447531.5)							
A JAN. 9 (OH)	Y:	-0.2067	+0.00082	+ 32.9753 1.845311	+0.05838 5.0354		+0.0651 1.9730
JAN. 9 (OH)	X:	-0.7722	+0.00638	+129.0599 3.260969	+0.39357 6.2510	+0.007286 1.5927	+0.2547 5.0761
(2447535.5)							
A JAN. 13 (OH)	Y:	-0.2037	+0.00095	+ 32.7411 3.484969	+0.07348 0.4526		+0.0648 5.3090
JAN. 13 (OH)	X:	-0.7573	+0.00921	+127.4832 4.902027	+0.39334 1.7064	+0.005943 3.2045	+0.2503 2.1236
(2447539.5)							
A JAN. 17 (OH)	Y:	-0.2039	+0.00194	+ 32.4472 5.124058	+0.08765 2.1520		+0.0645 2.3343
JAN. 17 (OH)	X:	-0.7269	+0.00613	+125.8905 0.258844	+0.39373 3.4239	+0.006213 4.6334	+0.2448 5.4662
(2447543.5)							
A JAN. 21 (OH)	Y:	-0.1986	+0.00085	+ 32.0994 0.479103	+0.10166 3.8020		+0.0621 5.6772
JAN. 21 (OH)	X:	-0.7029	+0.00674	+124.2950 1.898048	+0.40867 5.1999	+0.000370 3.8291	+0.2395 2.5095
(2447547.5)							
A JAN. 25 (OH)	Y:	-0.1936	+0.00112	+ 31.7009 2.116880	+0.11450 5.4748		+0.0610 2.7383
JAN. 25 (OH)	X:	-0.6725	+0.00385	+122.6890 3.536069	+0.41363 0.6236	+0.001275 4.3583	+0.2356 5.8466
(2447551.5)							
A JAN. 29 (OH)	Y:	-0.1872	+0.00061	+ 31.2551 3.753818	+0.12531 0.8384		+0.0603 6.0586
JAN. 29 (OH)	X:	-0.6466	+0.00581	+121.0899 5.173012	+0.40868 2.2950	+0.001602 3.8813	+0.2302 2.8912
(2447555.5)							
A FEV. 2 (OH)	Y:	-0.1824	+0.00131	+ 30.7670 5.390154	+0.13434 2.4871		+0.0583 3.0977
FEV. 1 (OH)	X:	-0.6229	+0.00459	+119.9140 3.258760	+0.42033 0.4620	+0.001882 4.0361	+0.2270 5.3953
(2447558.5)							
A FEV. 5 (OH)	Y:	-0.1768	+0.00087	+ 30.3794 3.475491	+0.14220 0.5864		+0.0578 5.6066
FEV. 5 (OH)	X:	-0.5953	+0.00649	+118.3537 4.894056	+0.41361 2.1288	+0.001636 3.9885	+0.2222 2.4384
(2447562.5)							
A FEV. 9 (OH)	Y:	-0.1707	+0.00155	+ 29.8290 5.110727	+0.14910 2.2277		+0.0559 2.6475
FEV. 9 (OH)	X:	-0.5647	+0.00568	+116.8382 0.245386	+0.42109 3.8081	+0.003552 6.0359	+0.2191 5.7662
(2447566.5)							
A FEV. 13 (OH)	Y:	-0.1643	+0.00156	+ 29.2521 0.462235	+0.15639 3.8667		+0.0546 5.9825
FEV. 13 (OH)	X:	-0.5361	+0.00972	+115.3488 1.879003	+0.40937 5.4778	+0.005872 0.5459	+0.2142 2.8136
(2447570.5)							
A FEV. 17 (OH)	Y:	-0.1564	+0.00236	+ 28.6487 2.096489	+0.16293 5.5137		+0.0527 3.0389
FEV. 17 (OH)	X:	-0.5055	+0.01017	+113.8978 3.511876	+0.40140 0.8958	+0.006322 1.9259	+0.2102 6.1392
(2447574.5)							
A FEV. 21 (OH)	Y:	-0.1491	+0.00270	+ 28.0211 3.730190	+0.16704 0.8711		+0.0518 0.0826

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE JUPITER:				IO	N=3.5516
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
FEV. 21 (OH) (2447578.5)	X:	-0.4670	+0.01097	+112.5078 5.143984	+0.41051 2.5956	+0.004066 3.9124	+0.2063 3.1910
A FEV. 25 (OH)	Y:	-0.1399	+0.00268	+ 27.3784 5.363469	+0.17169 2.5097		+0.0499 3.4048
FEV. 25 (OH) (2447582.5)	X:	-0.4342	+0.01151	+111.1656 0.492174	+0.41618 4.3069	+0.000396 4.7174	+0.2032 0.2317
A FEV. 29 (OH)	Y:	-0.1316	+0.00279	+ 26.7204 0.713091	+0.17584 4.1393		+0.0484 0.4590
MAR. 1 (OH) (2447586.5)	X:	-0.3859	+0.00762	+109.8783 2.122862	+0.43057 6.0002	+0.003344 3.2573	+0.1997 3.5694
A MAR. 5 (OH)	Y:	-0.1199	+0.00179	+ 26.0474 2.345604	+0.17845 5.7740		+0.0473 3.7914
MAR. 5 (OH) (2447590.5)	X:	-0.3530	+0.00958	+108.6379 3.752674	+0.42593 1.3730	+0.003008 4.2639	+0.1966 0.6085
A MAR. 9 (OH)	Y:	-0.1110	+0.00222	+ 25.3641 3.977676	+0.18047 1.1159		+0.0452 0.8293
MAR. 9 (OH) (2447594.5)	X:	-0.3072	+0.00580	+107.4487 5.381851	+0.41413 3.0422	+0.001120 5.4613	+0.1953 3.9392
A MAR. 13 (OH)	Y:	-0.1003	+0.00156	+ 24.6711 5.609540	+0.18163 2.7412		+0.0442 4.1693
MAR. 13 (OH) (2447598.5)	X:	-0.2748	+0.00970	+106.3269 0.727324	+0.41143 4.6913	+0.003499 0.0276	+0.1910 0.9824
A MAR. 17 (OH)	Y:	-0.0923	+0.00238	+ 23.9724 0.958090	+0.18298 4.3699		+0.0426 1.2150
MAR. 17 (OH) (2447602.5)	X:	-0.2375	+0.00982	+105.2488 2.355399	+0.39550 0.0743	+0.006041 0.9833	+0.1894 4.3035
A MAR. 21 (OH)	Y:	-0.0834	+0.00242	+ 23.2670 2.589677	+0.18333 5.9975		+0.0414 4.5454
MAR. 21 (OH) (2447606.5)	X:	-0.1975	+0.01176	+104.2355 3.983124	+0.40143 1.7685	+0.003316 2.5328	+0.1860 1.3545
A MAR. 25 (OH)	Y:	-0.0738	+0.00265	+ 22.5588 4.221184	+0.18344 1.3380		+0.0399 1.5940
MAR. 25 (OH) (2447610.5)	X:	-0.1619	+0.01310	+103.2891 5.610383	+0.41469 3.4412	+0.001481 5.4613	+0.1844 4.6770
A MAR. 29 (OH)	Y:	-0.0658	+0.00289	+ 21.8500 5.852703	+0.18421 2.9605		+0.0385 4.9268
MAR. 29 (OH) (2447614.5)	X:	-0.1126	+0.01036	+102.3833 0.953971	+0.41646 5.1349	+0.002326 2.9058	+0.1830 1.7240
A AVR. 2 (OH)	Y:	-0.0552	+0.00212	+ 21.1376 1.201030	+0.18398 4.5787		+0.0378 1.9756
AVR. 1 (OH) (2447617.5)	X:	-0.0906	+0.01296	+101.7507 5.315299	+0.41330 3.2173	+0.001335 5.5372	+0.1816 4.2108
A AVR. 5 (OH)	Y:	-0.0501	+0.00273	+ 20.6025 5.566371	+0.18329 2.6529		+0.0362 4.4706
AVR. 5 (OH) (2447621.5)	X:	-0.0431	+0.01099	+100.9444 0.658154	+0.41121 4.9003	+0.001702 2.8769	+0.1806 1.2602
A AVR. 9 (OH)	Y:	-0.0404	+0.00210	+ 19.8895 0.914963	+0.18299 4.2685		+0.0355 1.5254

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE JUPITER: IO				N=3.5516	
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
AVR. 9 (OH)	X:	-0.0043	+0.01098	+100.2038 2.283867	+0.41885 0.2679	+0.003436 3.5747	+0.1792 4.5855
(2447625.5)							
A AVR. 13 (OH)	Y:	-0.0331	+0.00203	+ 19.1750 2.547031	+0.18125 5.8848		+0.0338 4.8431
AVR. 13 (OH)	X:	+0.0430	+0.00760	+ 99.5176 3.909164	+0.41386 1.9053	+0.003584 4.5831	+0.1797 1.6249
(2447629.5)							
A AVR. 17 (OH)	Y:	-0.0234	+0.00119	+ 18.4646 4.179346	+0.18064 1.2106		+0.0323 1.9068
AVR. 17 (OH)	X:	+0.0789	+0.00857	+ 98.8748 5.534171	+0.39811 3.5683	+0.001082 5.1744	+0.1781 4.9500
(2447633.5)							
A AVR. 21 (OH)	Y:	-0.0170	+0.00148	+ 17.7539 5.812249	+0.17916 2.8245		+0.0315 5.2381
AVR. 21 (OH)	X:	+0.1196	+0.00734	+ 98.2931 0.875819	+0.38951 5.2076	+0.004029 6.2001	+0.1785 1.9906
(2447637.5)							
A AVR. 25 (OH)	Y:	-0.0104	+0.00127	+ 17.0462 1.162566	+0.17799 4.4400		+0.0304 2.2784
AVR. 25 (OH)	X:	+0.1520	+0.01020	+ 97.7532 2.500503	+0.38624 0.6019	+0.003575 1.1209	+0.1768 5.3157
(2447641.5)							
A AVR. 29 (OH)	Y:	-0.0052	+0.00155	+ 16.3401 2.796730	+0.17627 6.0526		+0.0290 5.6161
AVR. 29 (OH)	X:	+0.1868	+0.00972	+ 97.2674 4.125055	+0.39384 2.2846	+0.001434 1.5184	+0.1775 2.3533
(2447645.5)							
A MAI 3 (OH)	Y:	+0.0003	+0.00145	+ 15.6384 4.431653	+0.17524 1.3776		+0.0278 2.6704
MAI 1 (OH)	X:	+0.2117	+0.00792	+ 97.0542 4.937119	+0.39254 3.0838	+0.001229 4.6469	+0.1771 4.0160
(2447647.5)							
A MAI 5 (OH)	Y:	+0.0039	+0.00098	+ 15.2888 5.249391	+0.17469 2.1784		+0.0274 4.3423
MAI 5 (OH)	X:	+0.2514	+0.00569	+ 96.6471 0.278151	+0.38690 4.7341	+0.002447 5.7027	+0.1777 1.0543
(2447651.5)							
A MAI 9 (OH)	Y:	+0.0088	+0.00068	+ 14.5919 0.602764	+0.17342 3.7908		+0.0264 1.3843
MAI 9 (OH)	X:	+0.2788	+0.00891	+ 96.2875 1.902242	+0.38082 0.1107	+0.003538 0.6229	+0.1769 4.3773
(2447655.5)							
A MAI 13 (OH)	Y:	+0.0117	+0.00101	+ 13.8980 2.240476	+0.17164 5.3983		+0.0248 4.7227
MAI 13 (OH)	X:	+0.3137	+0.00733	+ 95.9730 3.526295	+0.38292 1.7892	+0.002632 1.5595	+0.1776 1.4152
(2447659.5)							
A MAI 17 (OH)	Y:	+0.0155	+0.00074	+ 13.2107 3.879668	+0.17066 0.7220		+0.0237 1.7807
MAI 17 (OH)	X:	+0.3408	+0.01054	+ 95.7197 5.150324	+0.39486 3.4272	+0.000988 5.6865	+0.1780 4.7402
(2447663.5)							
A MAI 21 (OH)	Y:	+0.0182	+0.00092	+ 12.5283 5.520638	+0.16936 2.3297		+0.0229 5.1282
MAI 21 (OH)	X:	+0.3727	+0.00852	+ 95.5057 0.491053	+0.40029 5.0840	+0.002542 1.9546	+0.1785 1.7750
(2447667.5)							
A MAI 25 (OH)	Y:	+0.0203	+0.00069	+ 11.8524 0.880411	+0.16855 3.9358		+0.0220 2.1617
MAI 25 (OH)	X:	+0.4061	+0.00757	+ 95.3370 2.114924	+0.40517 0.4540	+0.004583 3.6214	+0.1807 5.1010
(2447671.5)							
A MAI 29 (OH)	Y:	+0.0224	+0.00027	+ 11.1810 2.525727	+0.16657 5.5382		+0.0204 5.5143

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

		DU SATELLITE 1 DE JUPITER: IO						N=3.5516
		AO	A1	B0 FO	B1 F1	B2 F2	CO PO	
MAI 29 (OH) (2447675.5)	X:	+0.4323	+0.00639	+ 95.2164 3.738603	+0.38841 2.0905	+0.002267 4.3218	+0.1810 2.1325	
A JUN. 2 (OH)	Y:	+0.0241	+0.00006	+ 10.5203 4.173793	+0.16621 0.8568		+0.0193 2.6031	
JUN. 1 (OH) (2447678.5)	X:	+0.4521	+0.00698	+ 95.1516 1.815054	+0.40250 0.2044	+0.004399 3.3581	+0.1827 4.6265	
A JUN. 5 (OH)	Y:	+0.0241	+0.00009	+ 10.0283 2.270645	+0.16472 5.2030		+0.0184 5.0882	
JUN. 5 (OH) (2447682.5)	X:	+0.4746	+0.00586	+ 95.1097 3.438787	+0.38833 1.8442	+0.002525 4.2668	+0.1831 1.6569	
A JUN. 9 (OH)	Y:	+0.0247	-0.00011	+ 9.3846 3.925140	+0.16433 0.5232		+0.0172 2.1823	
JUN. 9 (OH) (2447686.5)	X:	+0.5047	+0.00235	+ 95.1097 5.062559	+0.36950 3.5046	+0.002338 3.9043	+0.1859 4.9789	
A JUN.13 (OH)	Y:	+0.0255	-0.00048	+ 8.7513 5.584372	+0.16312 2.1262		+0.0167 5.5198	
JUN.13 (OH) (2447690.5)	X:	+0.5189	+0.00385	+ 95.1562 0.403450	+0.37226 5.1567	+0.002164 5.7225	+0.1862 2.0158	
A JUN.17 (OH)	Y:	+0.0240	-0.00021	+ 8.1342 0.966142	+0.16212 3.7334		+0.0154 2.5834	
JUN.17 (OH) (2447694.5)	X:	+0.5405	+0.00139	+ 95.2440 2.027549	+0.36965 0.5346	+0.002812 0.8018	+0.1882 5.3277	
A JUN.21 (OH)	Y:	+0.0228	-0.00044	+ 7.5337 2.637735	+0.16076 5.3348		+0.0142 5.9710	
JUN.21 (OH) (2447698.5)	X:	+0.5495	+0.00432	+ 95.3760 3.651774	+0.37336 2.2036	+0.001751 1.5981	+0.1897 2.3716	
A JUN.25 (OH)	Y:	+0.0213	-0.00031	+ 6.9579 4.317529	+0.16057 0.6558		+0.0133 3.0892	
JUN.25 (OH) (2447702.5)	X:	+0.5622	+0.00360	+ 95.5643 5.276250	+0.38888 3.8304	+0.002845 0.3166	+0.1911 5.6853	
A JUN.29 (OH)	Y:	+0.0198	-0.00038	+ 6.4088 6.007469	+0.15964 2.2612		+0.0125 0.1616	
JUN.29 (OH) (2447706.5)	X:	+0.5735	+0.00445	+ 95.7841 0.617522	+0.38894 5.4921	+0.003283 2.1790	+0.1939 2.7242	
A JUL. 3 (OH)	Y:	+0.0177	-0.00043	+ 5.8950 1.426017	+0.15924 3.8649		+0.0113 3.5415	
JUL. 1 (OH) (2447708.5)	X:	+0.5868	-0.00055	+ 95.9094 1.429654	+0.36589 0.0477	+0.002513 0.1114	+0.1949 4.3740	
A JUL. 5 (OH)	Y:	+0.0166	-0.00061	+ 5.6529 2.282070	+0.15854 4.6640		+0.0108 5.2875	
JUL. 5 (OH) (2447712.5)	X:	+0.5883	+0.00136	+ 96.1993 3.054404	+0.36659 1.7090	+0.002354 1.5304	+0.1963 1.4139	
A JUL. 9 (OH)	Y:	+0.0142	-0.00053	+ 5.2108 4.005997	+0.15807 6.2707		+0.0103 2.4456	
JUL. 9 (OH) (2447716.5)	X:	+0.5936	+0.00081	+ 96.5386 4.679500	+0.38521 3.3497	+0.002921 6.2513	+0.1984 4.7258	
A JUL.13 (OH)	Y:	+0.0120	-0.00056	+ 4.8312 5.746859	+0.15748 1.5930		+0.0098 5.8431	
JUL.13 (OH) (2447720.5)	X:	+0.5927	+0.00283	+ 96.9235 0.021443	+0.38178 4.9980	+0.002943 1.3729	+0.2017 1.7661	
A JUL.17 (OH)	Y:	+0.0097	-0.00056	+ 4.5297 1.222032	+0.15662 3.2011		+0.0091 3.0090	

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE JUPITER:				IO	N=3.5516
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
JUL. 17 (OH) (2447724.5)	X:	+0.5960	+0.00069	+ 97.3474 1.646781	+0.37636 0.3774	+0.002413 2.8719	+0.2038 5.0793
A JUL. 21 (OH)	Y:	+0.0066	-0.00056	+ 4.3195 2.995752	+0.15599 4.8029		+0.0089 0.2478
JUL. 21 (OH) (2447728.5)	X:	+0.5962	+0.00042	+ 97.8233 3.272417	+0.37208 2.0226	+0.003587 4.0582	+0.2075 2.1097
A JUL. 25 (OH)	Y:	+0.0047	-0.00078	+ 4.2168 4.780005	+0.15587 0.1298		+0.0092 3.7129
JUL. 25 (OH) (2447732.5)	X:	+0.5941	-0.00254	+ 98.3393 4.898255	+0.35734 3.7109	+0.002120 3.9455	+0.2095 5.4301
A JUL. 29 (OH)	Y:	+0.0023	-0.00063	+ 4.2243 0.284531	+0.15502 1.7370		+0.0089 0.8652
JUL. 29 (OH) (2447736.5)	X:	+0.5919	-0.00396	+ 98.8986 0.241338	+0.35608 5.3926	+0.003286 5.0303	+0.2125 2.4588
A AOU. 2 (OH)	Y:	+0.0000	-0.00053	+ 4.3416 2.066789	+0.15401 3.3475		+0.0093 4.3647
AOU. 1 (OH) (2447739.5)	X:	+0.5809	-0.00323	+ 99.3616 4.602817	+0.35606 3.4766	+0.002229 3.9299	+0.2145 4.9516
A AOU. 5 (OH)	Y:	-0.0016	-0.00056	+ 4.4944 0.253997	+0.15376 1.4124		+0.0098 0.6398
AOU. 5 (OH) (2447743.5)	X:	+0.5750	-0.00477	+100.0039 6.229659	+0.35377 5.1681	+0.003528 4.7523	+0.2178 1.9787
A AOU. 9 (OH)	Y:	-0.0035	-0.00045	+ 4.7747 2.012209	+0.15223 3.0242		+0.0105 4.1104
AOU. 9 (OH) (2447747.5)	X:	+0.5577	-0.00489	+100.7037 1.573767	+0.35940 0.5365	+0.002025 0.4827	+0.2198 5.3007
A AOU. 13 (OH)	Y:	-0.0059	-0.00023	+ 5.1237 3.753345	+0.15137 4.6319		+0.0118 1.2548
AOU. 13 (OH) (2447751.5)	X:	+0.5475	-0.00695	+101.4542 3.201432	+0.36537 2.1948	+0.000294 3.4137	+0.2234 2.3334
A AOU. 17 (OH)	Y:	-0.0075	-0.00012	+ 5.5294 5.477880	+0.15011 6.2480		+0.0127 4.6390
AOU. 17 (OH) (2447755.5)	X:	+0.5192	-0.00278	+102.2523 4.829599	+0.37797 3.8355	+0.004242 6.2687	+0.2266 5.6546
A AOU. 21 (OH)	Y:	-0.0080	-0.00021	+ 5.9752 0.904784	+0.14864 1.5794		+0.0135 1.7640
AOU. 21 (OH) (2447759.5)	X:	+0.5049	-0.00538	+103.1002 0.174851	+0.37317 5.4977	+0.004704 1.3213	+0.2301 2.6848
A AOU. 25 (OH)	Y:	-0.0090	-0.00003	+ 6.4508 2.602426	+0.14688 3.1957		+0.0148 5.1479
AOU. 25 (OH) (2447763.5)	X:	+0.4776	-0.00235	+103.9921 1.803700	+0.36872 0.9098	+0.003309 3.0603	+0.2345 6.0027
A AOU. 29 (OH)	Y:	-0.0090	-0.00019	+ 6.9461 4.269754	+0.14522 4.8117		+0.0163 2.2254
AOU. 29 (OH) (2447767.5)	X:	+0.4590	-0.00571	+104.9431 3.433078	+0.35853 2.5926	+0.002621 3.9307	+0.2369 3.0356
A SEP. 2 (OH)	Y:	-0.0094	+0.00002	+ 7.4554 5.968515	+0.14301 0.1503		+0.0173 5.5858
SEP. 1 (OH) (2447770.5)	X:	+0.4350	-0.00312	+105.6856 1.513999	+0.36728 0.6957	+0.003659 2.6523	+0.2405 5.5256
A SEP. 5 (OH)	Y:	-0.0087	-0.00001	+ 7.8416 4.081596	+0.14095 4.5034		+0.0185 1.8238

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE JUPITER:				IO	N=3.5516
		AO	A1	B0 FO	B1 F1	B2 F2	CO PO
SEP. 5 (OH)	X:	+0.4130	-0.00619	+106.7223 3.144328	+0.36042 2.3893	+0.002738 3.8630	+0.2435 2.5582
(2447774.5)							
A SEP. 9 (OH)	Y:	-0.0084	+0.00020	+ 8.3593 5.749142	+0.13800 6.1274		+0.0194 5.1751
SEP. 9 (OH)	X:	+0.3881	-0.00725	+107.8093 4.775204	+0.34771 4.1119	+0.004171 3.7918	+0.2486 5.8743
(2447778.5)							
A SEP. 13 (OH)	Y:	-0.0069	+0.00018	+ 8.8746 1.128853	+0.13468 1.4643		+0.0206 2.2547
SEP. 13 (OH)	X:	+0.3587	-0.00930	+108.9381 0.123732	+0.36076 5.7849	+0.001873 5.3337	+0.2506 2.9131
(2447782.5)							
A SEP. 17 (OH)	Y:	-0.0055	+0.00062	+ 9.3848 2.787765	+0.13048 3.0878		+0.0222 5.5941
SEP. 17 (OH)	X:	+0.3314	-0.01118	+110.1214 1.756057	+0.37092 1.1591	+0.001887 2.9746	+0.2554 6.2287
(2447786.5)							
A SEP. 21 (OH)	Y:	-0.0041	+0.00082	+ 9.8842 4.443483	+0.12664 4.7111		+0.0234 2.6306
SEP. 21 (OH)	X:	+0.2927	-0.00982	+111.3561 3.388906	+0.37199 2.8555	+0.001672 5.3697	+0.2597 3.2717
(2447790.5)							
A SEP. 25 (OH)	Y:	-0.0020	+0.00095	+ 10.3737 6.096459	+0.12090 0.0578		+0.0244 5.9947
SEP. 25 (OH)	X:	+0.2587	-0.00997	+112.6413 5.022614	+0.37475 4.4947	+0.006076 0.1585	+0.2624 0.3055
(2447794.5)							
A SEP. 29 (OH)	Y:	+0.0010	+0.00087	+ 10.8445 1.464175	+0.11543 1.6854		+0.0258 3.0480
SEP. 29 (OH)	X:	+0.2160	-0.00688	+113.9647 0.373722	+0.37068 6.1803	+0.007338 1.5797	+0.2682 3.6290
(2447798.5)							
A OCT. 3 (OH)	Y:	+0.0052	+0.00069	+ 11.2964 3.113207	+0.10883 3.3171		+0.0270 0.0805
OCT. 1 (OH)	X:	+0.2088	-0.01132	+114.6264 1.191074	+0.37782 0.8110	+0.001599 3.3584	+0.2691 5.2870
(2447800.5)							
A OCT. 5 (OH)	Y:	+0.0063	+0.00102	+ 11.5121 3.937148	+0.10592 4.1324		+0.0275 1.7428
OCT. 5 (OH)	X:	+0.1693	-0.01202	+116.0196 2.826525	+0.37078 2.5023	+0.001287 4.0013	+0.2730 2.3322
(2447804.5)							
A OCT. 9 (OH)	Y:	+0.0090	+0.00137	+ 11.9281 5.584148	+0.09775 5.7613		+0.0278 5.0965
OCT. 9 (OH)	X:	+0.1308	-0.01115	+117.4380 4.462916	+0.37751 4.1508	+0.006443 6.0312	+0.2766 5.6495
(2447808.5)							
A OCT. 13 (OH)	Y:	+0.0128	+0.00117	+ 12.3135 0.946669	+0.08941 1.1199		+0.0294 2.1466
OCT. 13 (OH)	X:	+0.0840	-0.00825	+118.8877 6.099998	+0.37328 5.8355	+0.008646 1.2035	+0.2821 2.6937
(2447812.5)							
A OCT. 17 (OH)	Y:	+0.0183	+0.00090	+ 12.6671 2.591597	+0.07998 2.7509		+0.0306 5.4566
OCT. 17 (OH)	X:	+0.0467	-0.00890	+120.3550 1.454528	+0.37182 1.3228	+0.003825 2.7136	+0.2852 6.0151
(2447816.5)							
A OCT. 21 (OH)	Y:	+0.0225	+0.00105	+ 12.9832 4.235476	+0.07059 4.4007		+0.0308 2.5028
OCT. 21 (OH)	X:	+0.0017	-0.00579	+121.8466 3.093277	+0.37213 3.0443	+0.002983 4.3108	+0.2906 3.0548
(2447820.5)							
A OCT. 25 (OH)	Y:	+0.0268	+0.00067	+ 13.2622 5.878853	+0.05883 6.0389		+0.0313 5.8567

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE JUPITER: IO				N=3.5516	
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
OCT. 25 (OH)	X:	-0.0295	-0.01085	+123.3501 4.732904	+0.37322 4.7848	+0.001175 3.8636	+0.2937 0.0972
A OCT. 29 (OH)	Y:	+0.0304	+0.00101	+ 13.4947 1.238428	+0.04754 1.3904		+0.0323 2.9078
OCT. 29 (OH)	X:	-0.0693	-0.00972	+124.8418 0.090289	+0.38724 0.2076	+0.002373 3.7983	+0.2970 3.4206
A NOV. 2 (OH)	Y:	+0.0359	+0.00081	+ 13.6826 2.880572	+0.03395 3.0236		+0.0330 6.1951
NOV. 1 (OH)	X:	-0.1010	-0.01065	+125.9796 4.462824	+0.37427 4.6434	+0.000667 3.8395	+0.3003 5.9213
A NOV. 5 (OH)	Y:	+0.0378	+0.00096	+ 13.7880 0.970113	+0.02447 1.1378		+0.0328 2.4472
NOV. 5 (OH)	X:	-0.1417	-0.00904	+127.4501 6.104922	+0.38714 0.0761	+0.002676 3.6493	+0.3039 2.9619
A NOV. 9 (OH)	Y:	+0.0433	+0.00064	+ 13.8846 2.611325	+0.00969 2.7137		+0.0336 5.7354
NOV. 9 (OH)	X:	-0.1784	-0.01308	+128.9058 1.464763	+0.38236 1.7552	+0.003752 3.7585	+0.3077 0.0125
A NOV. 13 (OH)	Y:	+0.0464	+0.00128	+ 13.9220 4.251729	+0.00400 1.2498		+0.0327 2.7786
NOV. 13 (OH)	X:	-0.2152	-0.01246	+130.3332 3.108612	+0.37019 3.4579	+0.006255 5.1227	+0.3106 3.3391
A NOV. 17 (OH)	Y:	+0.0485	+0.00118	+ 13.9067 5.891642	+0.02068 2.9460		+0.0326 6.1452
NOV. 17 (OH)	X:	-0.2653	-0.00993	+131.6930 4.753331	+0.36150 5.1444	+0.010118 0.3948	+0.3138 0.3931
A NOV. 21 (OH)	Y:	+0.0525	+0.00081	+ 13.8263 1.247424	+0.03494 4.5730		+0.0331 3.1782
NOV. 21 (OH)	X:	-0.2991	-0.01029	+132.9864 0.115441	+0.35726 0.6324	+0.007610 1.9167	+0.3168 3.7193
A NOV. 25 (OH)	Y:	+0.0564	+0.00063	+ 13.6894 2.885553	+0.05109 6.2226		+0.0323 0.1778
NOV. 25 (OH)	X:	-0.3503	-0.00463	+134.1990 1.761403	+0.36860 2.4281	+0.003471 4.2558	+0.3204 0.7701
A NOV. 29 (OH)	Y:	+0.0596	+0.00026	+ 13.4888 4.522582	+0.06548 1.5855		+0.0312 3.5086
NOV. 29 (OH)	X:	-0.3778	-0.00793	+135.3175 3.408285	+0.36264 4.1732	+0.003241 6.1316	+0.3203 4.1016
A DEC. 3 (OH)	Y:	+0.0599	+0.00028	+ 13.2323 6.158452	+0.08118 3.2380		+0.0307 0.5812
DEC. 1 (OH)	X:	-0.3951	-0.01013	+135.8301 4.232164	+0.34459 4.9615	+0.009792 0.2032	+0.3214 5.7729
A DEC. 5 (OH)	Y:	+0.0602	+0.00054	+ 13.0808 0.692696	+0.08789 4.0672		+0.0308 2.2386
DEC. 5 (OH)	X:	-0.4265	-0.01002	+136.7721 5.879822	+0.33674 0.4548	+0.008210 1.7402	+0.3234 2.8212
A DEC. 9 (OH)	Y:	+0.0623	+0.00020	+ 12.7393 2.326359	+0.10108 5.7253		+0.0301 5.5241
DEC. 9 (OH)	X:	-0.4743	-0.00460	+137.5909 1.244675	+0.34458 2.2772	+0.003214 3.8529	+0.3255 6.1553
A DEC. 13 (OH)	Y:	+0.0639	-0.00008	+ 12.3480 3.957975	+0.11268 1.0866		+0.0285 2.5619

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE JUPITER: IO				N=3.5516	
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
DEC. 13 (OH)	X:	-0.4995	-0.00617	+138.2539	+0.34495	+0.005192	+0.3250
(2447873.5)				2.893295	4.0251	6.0124	3.2040
A DEC. 17 (OH)	Y:	+0.0628	-0.00018	+ 11.9144	+0.12377		+0.0270
				5.587759	2.7452		5.9030
DEC. 17 (OH)	X:	-0.5340	-0.00442	+138.7663	+0.35010	+0.006585	+0.3258
(2447877.5)				4.542185	5.8070	2.2250	0.2527
A DEC. 21 (OH)	Y:	+0.0631	-0.00057	+ 11.4415	+0.13154		+0.0263
				0.931841	4.4001		2.9341
DEC. 21 (OH)	X:	-0.5550	-0.00831	+139.1085	+0.34017	+0.007723	+0.3237
(2447881.5)				6.191343	1.2604	3.6250	3.5924
A DEC. 25 (OH)	Y:	+0.0619	-0.00039	+ 10.9431	+0.13879		+0.0251
				2.556436	6.0528		6.2190
DEC. 25 (OH)	X:	-0.5822	-0.00814	+139.2961	+0.30892	+0.007424	+0.3237
(2447885.5)				1.557475	3.0282	4.4248	0.6397
A DEC. 29 (OH)	Y:	+0.0603	-0.00050	+ 10.4236	+0.14306		+0.0235
				4.178027	1.4208		3.2397
DEC. 29 (OH)	X:	-0.6076	-0.00945	+139.3139	+0.30749	+0.007237	+0.3224
(2447889.5)				3.206600	4.8303	6.2613	3.9816
A DEC. 33 (OH)	Y:	+0.0576	-0.00028	+ 9.8951	+0.14534		+0.0223
				5.796407	3.0722		0.2732

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 2 DE JUPITER: EUROPE					N=1.7693
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
JAN. 1 (OH) (2447527.5)	X:	+4.2169	-0.68985	+209.4866 0.686570	+1.77177 2.7700	+0.320835 6.1134	+1.0640 3.2444
A JAN. 5 (OH)	Y:	+0.7273	+0.00606	+ 52.6846 0.952404	+0.07535 3.9439		+0.2568 3.5215
JAN. 5 (OH) (2447531.5)	X:	+0.3387	+1.24268	+210.5644 1.488657	+3.10159 5.1899	+0.583105 2.6937	+1.0918 4.9453
A JAN. 9 (OH)	Y:	+0.7755	-0.02019	+ 52.3660 1.748193	+0.07385 5.0581		+0.2591 5.1661
JAN. 9 (OH) (2447535.5)	X:	+4.2285	-0.67540	+204.5780 2.291880	+0.83190 2.0198	+0.306066 5.6761	+1.0000 0.3026
A JAN.13 (OH)	Y:	+0.7072	+0.01257	+ 52.0168 2.540961	+0.11744 5.5733		+0.2537 0.5139
JAN.13 (OH) (2447539.5)	X:	+2.5952	+0.00556	+202.6520 3.080732	+0.53819 5.5061	+0.084287 1.1121	+0.9882 1.9260
A JAN.17 (OH)	Y:	+0.7048	+0.01014	+ 51.5363 3.334807	+0.13223 0.1869		+0.2531 2.1526
JAN.17 (OH) (2447543.5)	X:	+2.3057	+0.19863	+200.2212 3.874761	+0.91705 0.2133	+0.113440 3.1232	+0.9655 3.5284
A JAN.21 (OH)	Y:	+0.7326	-0.00781	+ 51.0128 4.128164	+0.16601 1.0664		+0.2493 3.7726
JAN.21 (OH) (2447547.5)	X:	+3.7538	-0.63289	+199.0597 4.670086	+1.71330 2.0819	+0.264738 6.0281	+0.9454 5.1427
A JAN.25 (OH)	Y:	+0.7130	-0.00778	+ 50.3660 4.920498	+0.18311 1.8870		+0.2475 5.4198
JAN.25 (OH) (2447551.5)	X:	+0.5887	+0.94720	+194.0253 5.470916	+1.32952 5.3924	+0.447159 2.8480	+0.9990 0.4465
A JAN.29 (OH)	Y:	+0.7096	-0.01812	+ 49.6576 5.712404	+0.20655 2.6907		+0.2453 0.7512
JAN.29 (OH) (2447555.5)	X:	+3.7866	-0.68967	+192.5067 6.247564	+1.81176 2.4449	+0.317023 5.7126	+1.0107 2.1387
A FEV. 2 (OH)	Y:	+0.6471	+0.00488	+ 48.8861 0.220991	+0.22117 3.5698		+0.2452 2.3959
FEV. 1 (OH) (2447558.5)	X:	+0.5222	+0.86662	+189.4848 5.284304	+1.22095 5.3043	+0.414304 2.7569	+0.9865 0.1642
A FEV. 5 (OH)	Y:	+0.6794	-0.02105	+ 48.2566 5.525938	+0.23418 2.5335		+0.2403 0.4610
FEV. 5 (OH) (2447562.5)	X:	+3.1116	-0.43844	+188.3326 6.062747	+1.33799 2.4428	+0.211083 5.5280	+0.9813 1.8505
A FEV. 9 (OH)	Y:	+0.6094	+0.00252	+ 47.3780 0.033667	+0.24260 3.4051		+0.2381 2.1088
FEV. 9 (OH) (2447566.5)	X:	+2.5892	-0.35707	+185.9742 0.571714	+1.19732 3.5265	+0.202109 0.3067	+0.9815 3.4783
A FEV.13 (OH)	Y:	+0.6057	-0.00838	+ 46.4311 0.823608	+0.24747 4.2179		+0.2327 3.7342
FEV.13 (OH) (2447570.5)	X:	+0.6972	+0.63948	+184.8808 1.364270	+1.90455 5.3422	+0.304378 2.8948	+0.9638 5.1413
A FEV.17 (OH)	Y:	+0.5857	-0.01322	+ 45.4511 1.612649	+0.24739 4.9809		+0.2297 5.3615
FEV.17 (OH) (2447574.5)	X:	+3.6071	-0.88745	+179.9855 2.157965	+1.31436 1.8692	+0.383519 5.7536	+0.9165 0.5218
A FEV.21 (OH)	Y:	+0.5144	+0.00524	+ 44.4540 2.400570	+0.26197 5.7175		+0.2231 0.7222

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 2 DE JUPITER: EUROPE					N=1.7693
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
FEV.21 (OH) (2447578.5)	X:	+0.6104	+0.50082	+179.0607 2.931061	+1.38064 5.6704	+0.239342 2.5385	+0.8709 2.0776
A FEV.25 (OH)	Y:	+0.5186	-0.00796	+ 43.4391 3.189801	+0.27360 0.2689		+0.2173 2.3271
FEV.25 (OH) (2447582.5)	X:	+1.7399	-0.08404	+177.2132 3.724000	+0.88656 1.2116	+0.053825 4.7105	+0.8833 3.7041
A FEV.29 (OH)	Y:	+0.4819	-0.00851	+ 42.3791 3.977652	+0.27973 1.0549		+0.2131 3.9703
MAR. 1 (OH) (2447586.5)	X:	+1.7904	-0.24678	+175.2011 4.510661	+0.93773 2.3918	+0.106140 0.3837	+0.8863 5.2941
A MAR. 5 (OH)	Y:	+0.4700	-0.01807	+ 41.3148 4.765578	+0.29244 1.8475		+0.2093 5.5829
MAR. 5 (OH) (2447590.5)	X:	+0.1230	+0.58068	+171.9796 5.298200	+0.71580 5.0723	+0.272918 2.8949	+0.8979 0.6281
A MAR. 9 (OH)	Y:	+0.4128	-0.00732	+ 40.1969 5.553059	+0.28620 2.6384		+0.2032 0.9325
MAR. 9 (OH) (2447594.5)	X:	+3.1363	-1.00735	+171.2284 6.066822	+2.19334 2.5220	+0.450644 5.8489	+0.9435 2.2894
A MAR.13 (OH)	Y:	+0.3571	+0.00461	+ 39.1069 0.058139	+0.29822 3.4920		+0.2004 2.5544
MAR.13 (OH) (2447598.5)	X:	+0.1402	+0.37142	+169.9906 0.582308	+1.49349 4.8682	+0.190445 2.3838	+0.8858 3.9441
A MAR.17 (OH)	Y:	+0.3672	-0.01743	+ 37.9345 0.844312	+0.27643 4.2029		+0.1926 4.1926
MAR.17 (OH) (2447602.5)	X:	+0.5640	+0.17164	+167.8223 1.363525	+1.09810 5.7273	+0.139248 3.4040	+0.8782 5.5705
A MAR.21 (OH)	Y:	+0.3247	-0.01629	+ 36.8174 1.631413	+0.28230 5.0009		+0.1868 5.8153
MAR.21 (OH) (2447606.5)	X:	+1.6372	-0.50186	+165.1659 2.147255	+0.59338 1.7321	+0.217892 6.0615	+0.8420 0.9085
A MAR.25 (OH)	Y:	+0.2634	+0.00134	+ 35.6946 2.417705	+0.29125 5.7280		+0.1810 1.1567
MAR.25 (OH) (2447610.5)	X:	-0.6507	+0.57430	+164.5194 2.918268	+1.34229 5.8278	+0.268879 2.7207	+0.8035 2.5107
A MAR.29 (OH)	Y:	+0.2471	-0.00898	+ 34.5641 3.205115	+0.29469 0.2558		+0.1738 2.7906
MAR.29 (OH) (2447614.5)	X:	+1.6742	-0.64002	+163.8406 3.713580	+1.75154 1.9871	+0.262408 5.8632	+0.8241 4.0647
A AVR. 2 (OH)	Y:	+0.2213	-0.00964	+ 33.4205 3.992593	+0.29430 1.0393		+0.1685 4.4013
AVR. 1 (OH) (2447617.5)	X:	-0.7948	+0.50319	+162.2407 2.715582	+1.26296 5.7836	+0.237806 2.6335	+0.7946 2.2006
A AVR. 5 (OH)	Y:	+0.1881	-0.00717	+ 32.5602 3.011827	+0.29274 0.0387		+0.1638 2.4962
AVR. 5 (OH) (2447621.5)	X:	+1.1062	-0.47009	+161.2394 3.508654	+1.44291 1.8300	+0.192175 5.7423	+0.8156 3.7666
A AVR. 9 (OH)	Y:	+0.1668	-0.00846	+ 31.4170 3.799736	+0.29230 0.8218		+0.1583 4.1065

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 2 DE JUPITER: EUROPE					N=1.7693
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
AVR. 9 (OH) (2447625.5)	X:	+0.0018	-0.05291	+159.4444 4.284557	+0.62616 2.5290	+0.048374 1.0357	+0.8153 5.4124
A AVR. 13 (OH)	Y:	+0.1285	-0.00604	+ 30.2692 4.587318	+0.29039 1.5907		+0.1528 5.7437
AVR. 13 (OH) (2447629.5)	X:	-0.9988	+0.46243	+157.5479 5.065886	+0.52868 5.1409	+0.243742 3.1132	+0.8360 0.7231
A AVR. 17 (OH)	Y:	+0.0965	-0.00226	+ 29.1279 5.376435	+0.28695 2.3982		+0.1468 1.0860
AVR. 17 (OH) (2447633.5)	X:	+0.9524	-0.64302	+157.8199 5.836326	+1.40237 2.7233	+0.283548 5.9226	+0.8439 2.3871
A AVR. 21 (OH)	Y:	+0.0696	+0.00003	+ 27.9844 6.164683	+0.28234 3.1448		+0.1411 2.7130
AVR. 21 (OH) (2447637.5)	X:	-1.7492	+0.60015	+157.2908 0.348416	+2.02667 5.0395	+0.302027 2.4943	+0.8242 4.0582
A AVR. 25 (OH)	Y:	+0.0886	-0.02184	+ 26.8187 0.670724	+0.26644 3.8891		+0.1352 4.3628
AVR. 25 (OH) (2447641.5)	X:	-0.1868	-0.16520	+155.1859 1.119711	+0.39816 6.2504	+0.082266 5.1313	+0.7833 5.6427
A AVR. 29 (OH)	Y:	+0.0310	-0.00394	+ 25.7229 1.460621	+0.27934 4.6458		+0.1278 5.9753
AVR. 29 (OH) (2447645.5)	X:	+0.0176	-0.40512	+154.1835 1.899961	+0.50254 1.5030	+0.172298 6.1006	+0.7753 1.0023
A MAI 3 (OH)	Y:	-0.0021	+0.00114	+ 24.6078 2.251343	+0.28244 5.4029		+0.1223 1.3438
MAI 1 (OH) (2447647.5)	X:	+0.2063	-0.47722	+155.1022 5.424328	+1.21141 2.5969	+0.213318 5.6862	+0.8134 1.7763
A MAI 5 (OH)	Y:	-0.0133	+0.00510	+ 24.0414 5.790369	+0.27443 2.6964		+0.1204 2.1429
MAI 5 (OH) (2447651.5)	X:	-1.1066	+0.03091	+154.1228 6.210866	+1.09215 4.3789	+0.103815 1.4325	+0.8008 3.4140
A MAI 9 (OH)	Y:	+0.0070	-0.01292	+ 22.9087 0.299491	+0.26617 3.4255		+0.1131 3.7893
MAI 9 (OH) (2447655.5)	X:	-1.6393	+0.32725	+153.6587 0.707411	+1.27309 5.4447	+0.166928 3.0184	+0.7849 5.0336
A MAI 13 (OH)	Y:	-0.0180	-0.00824	+ 21.8116 1.093760	+0.26723 4.1778		+0.1079 5.4123
MAI 13 (OH) (2447659.5)	X:	+0.1860	-0.67867	+151.4389 1.482982	+0.92807 1.8033	+0.287035 5.8643	+0.7473 0.4012
A MAI 17 (OH)	Y:	-0.0538	+0.00187	+ 20.7365 1.889202	+0.27599 4.9374		+0.1011 0.7892
MAI 17 (OH) (2447663.5)	X:	-2.3031	+0.50921	+153.1029 2.255387	+1.28079 5.8000	+0.234068 2.6889	+0.7264 1.9431
A MAI 21 (OH)	Y:	-0.0514	-0.00180	+ 19.6490 2.688124	+0.27177 5.7144		+0.0957 2.4070
MAI 21 (OH) (2447667.5)	X:	-0.7049	-0.32106	+152.1718 3.043709	+1.20576 1.6813	+0.140218 5.5811	+0.7484 3.5556
A MAI 25 (OH)	Y:	-0.0609	-0.00284	+ 18.5785 3.488585	+0.27066 0.2028		+0.0905 4.0613
MAI 25 (OH) (2447671.5)	X:	-1.6273	+0.02761	+151.4647 3.817433	+0.42903 2.7588	+0.082685 1.6552	+0.7638 5.1701
A MAI 29 (OH)	Y:	-0.0601	-0.00528	+ 17.5218 4.292227	+0.26982 0.9760		+0.0855 5.6916

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 2 DE JUPITER: EUROPE N=1.7693

		AO	A1	BO FO	B1 F1	B2 F2	CO PO
MAI 29 (OH) (2447675.5)	X:	-2.3251	+0.39718	+150.7896 4.594983	+0.39934 4.8715	+0.191894 3.0109	+0.7664 0.5079
A JUN. 2 (OH)	Y:	-0.0893	+0.00764	+ 16.4596 5.099150	+0.25772 1.7319		+0.0793 1.0734
JUN. 1 (OH) (2447678.5)	X:	-1.2427	-0.24727	+151.4965 3.611257	+0.93061 2.3842	+0.116905 0.3258	+0.7459 4.8543
A JUN. 5 (OH)	Y:	-0.0660	-0.00501	+ 15.7074 4.135369	+0.26676 0.7355		+0.0759 5.4435
JUN. 5 (OH) (2447682.5)	X:	-2.7683	+0.52950	+150.3451 4.384952	+0.62240 5.0541	+0.246883 2.8653	+0.7646 0.1978
A JUN. 9 (OH)	Y:	-0.0912	+0.00710	+ 14.6789 4.949515	+0.25562 1.4835		+0.0699 0.8313
JUN. 9 (OH) (2447686.5)	X:	-0.0913	-0.84129	+152.8243 5.158821	+1.94376 2.4951	+0.382402 5.7985	+0.7912 1.8763
A JUN. 13 (OH)	Y:	-0.0893	+0.00852	+ 13.6987* 5.769458	+0.25138 2.2619		+0.0659 2.4861
JUN.13 (OH) (2447690.5)	X:	-2.5712	+0.31300	+151.4234 5.948579	+1.26852 4.7997	+0.154478 2.3890	+0.7357 3.5047
A JUN.17 (OH)	Y:	-0.0595	-0.00504	+ 12.7296 0.309591	+0.25471 2.9573		+0.0599 4.1777
JUN.17 (OH) (2447694.5)	X:	-2.2096	+0.17200	+151.5585 0.440982	+0.98317 5.5752	+0.114807 3.3086	+0.7340 5.1342
A JUN.21 (OH)	Y:	-0.0609	-0.00420	+ 11.8206 1.143162	+0.25348 3.7289		+0.0555 5.8551
JUN.21 (OH) (2447698.5)	X:	-1.3493	-0.34377	+151.2030 1.215509	+0.29898 1.3663	+0.152918 6.0997	+0.7065 0.4488
A JUN.25 (OH)	Y:	-0.0710	+0.00407	+ 10.9616 1.984732	+0.26010 4.4957		+0.0515 1.2602
JUN.25 (OH) (2447702.5)	X:	-3.1365	+0.54779	+153.0631 1.991567	+1.33520 5.8470	+0.248426 2.7703	+0.6858 2.0431
A JUN.29 (OH)	Y:	-0.0597	+0.00101	+ 10.1493 2.838382	+0.25679 5.2682		+0.0474 2.9655
JUN.29 (OH) (2447706.5)	X:	-0.7745	-0.65029	+152.1352 2.782764	+1.74416 1.9860	+0.289659 5.9091	+0.7309 3.6126
A JUL. 3 (OH)	Y:	-0.0431	-0.00346	+ 9.4115 3.704691	+0.25474 6.0475		+0.0442 4.6689
JUL. 1 (OH) (2447708.5)	X:	-3.2440	+0.59239	+152.7083 0.029980	+1.79421 5.2929	+0.278671 2.8191	+0.7333 4.5487
A JUL. 5 (OH)	Y:	-0.0359	-0.00503	+ 9.0417 1.000386	+0.24984 3.2303		+0.0426 5.5468
JUL. 5 (OH) (2447712.5)	X:	-1.0772	-0.52153	+152.2232 0.796647	+0.55434 1.8435	+0.229765 5.8822	+0.6877 6.1328
A JUL. 9 (OH)	Y:	-0.0448	+0.00344	+ 8.4500 1.886489	+0.25552 4.0118		+0.0395 0.9966
JUL. 9 (OH) (2447716.5)	X:	-3.0474	+0.43874	+154.5614 1.578395	+1.23845 5.7364	+0.199836 2.6222	+0.6874 1.4339
A JUL.13 (OH)	Y:	-0.0366	+0.00318	+ 7.9626 2.788433	+0.25434 4.7782		+0.0375 2.7444
JUL.13 (OH) (2447720.5)	X:	-1.4153	-0.33722	+153.8383 2.363561	+1.18986 1.6292	+0.163584 5.6621	+0.7222 3.0333
A JUL.17 (OH)	Y:	-0.0161	-0.00239	+ 7.6206 3.704866	+0.24975 5.5585		+0.0360 4.4963

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 2 DE JUPITER: EUROPE					
		N=1.7693					
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
JUL.17 (OH)	X:	-1.9124	-0.15103	+154.7763 3.139853	+0.78124 2.2690	+0.086987 0.3396	+0.7156 4.6763
(2447724.5)							
A JUL.21 (OH)	Y:	-0.0133	-0.00090	+ 7.4226 4.629401	+0.24924 0.0353		+0.0351 6.2529
JUL.21 (OH)	X:	-3.3714	+0.65898	+154.7804 3.912580	+0.75892 5.4042	+0.310289 2.9591	+0.7541 0.0145
(2447728.5)							
A JUL.25 (OH)	Y:	-0.0243	+0.00918	+ 7.3883 5.561489	+0.23893 0.7700		+0.0354 1.7700
JUL.25 (OH)	X:	-0.9602	-0.57351	+157.6594 4.697128	+1.47652 2.5980	+0.263564 5.8435	+0.7408 1.6997
(2447732.5)							
A JUL.29 (OH)	Y:	-0.0095	+0.00724	+ 7.5250 0.203032	+0.24221 1.5357		+0.0356 3.5152
JUL.29 (OH)	X:	-2.9910	+0.41132	+156.8825 5.484063	+1.44788 4.7631	+0.187882 2.3239	+0.7125 3.3484
(2447736.5)							
A ADU. 2 (OH)	Y:	+0.0187	-0.00333	+ 7.7998 1.120421	+0.24711 2.2723		+0.0377 5.2924
ADU. 1 (OH)	X:	-1.0349	-0.49687	+159.1682 4.493059	+1.38802 2.5363	+0.231671 5.7485	+0.7339 1.4066
(2447739.5)							
A ADU. 5 (OH)	Y:	+0.0012	+0.00785	+ 8.1286 0.229983	+0.23933 1.2986		+0.0384 3.4352
ADU. 5 (OH)	X:	-2.4668	+0.17878	+158.8493 5.276853	+1.09757 4.3962	+0.103624 1.7980	+0.7171 3.0449
(2447743.5)							
A ADU. 9 (OH)	Y:	+0.0291	-0.00304	+ 8.6237 1.123835	+0.24527 2.0414		+0.0412 5.1928
ADU. 9 (OH)	X:	-2.1245	+0.09797	+160.0673 6.055391	+0.69421 5.3057	+0.054952 3.4946	+0.7030 4.6468
(2447747.5)							
A ADU.13 (OH)	Y:	+0.0288	-0.00032	+ 9.2377 2.002980	+0.24390 2.8202		+0.0433 0.6041
ADU.13 (OH)	X:	-1.1211	-0.40234	+160.8699 0.548705	+0.36109 1.6387	+0.180555 5.9799	+0.6860 0.0107
(2447751.5)							
A ADU.17 (OH)	Y:	+0.0242	+0.00311	+ 9.9215 2.867914	+0.24365 3.6061		+0.0461 2.3268
ADU.17 (OH)	X:	-2.8778	+0.53311	+163.6317 1.336025	+1.34294 5.9070	+0.224017 2.9031	+0.6952 1.5626
(2447755.5)							
A ADU.21 (OH)	Y:	+0.0331	+0.00158	+ 10.6615 3.722614	+0.24071 4.3752		+0.0486 3.9998
ADU.21 (OH)	X:	-0.8598	-0.44148	+163.2428 2.121008	+1.37624 1.8108	+0.207273 5.7900	+0.7250 3.2092
(2447759.5)							
A ADU.25 (OH)	Y:	+0.0449	-0.00509	+ 11.4528 4.566008	+0.23233 5.1632		+0.0522 5.7107
ADU.25 (OH)	X:	-2.5666	+0.38917	+165.3525 2.894577	+0.33517 4.9425	+0.193674 2.3223	+0.7524 4.8699
(2447763.5)							
A ADU.29 (OH)	Y:	+0.0393	-0.00314	+ 12.2565 5.402575	+0.22862 5.9128		+0.0548 1.1068
ADU.29 (OH)	X:	-2.0142	+0.23402	+166.7917 3.680872	+0.12106 3.2027	+0.118355 3.2545	+0.7397 0.2204
(2447767.5)							
A SEP. 2 (OH)	Y:	+0.0207	+0.00599	+ 13.0835 6.231582	+0.22408 0.3801		+0.0590 2.7832
SEP. 1 (OH)	X:	-1.9076	+0.13096	+168.0209 2.697782	+0.24279 2.7771	+0.107059 1.7264	+0.7475 4.5787
(2447770.5)							
A SEP. 5 (OH)	Y:	+0.0424	-0.00622	+ 13.7087 5.277211	+0.22152 5.7009		+0.0604 0.8895

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 2 DE JUPITER: EUROPE					
		N=1.7693					
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
SEP. 5 (OH)	X:	-2.1927	+0.40244	+169.5031	+0.26695	+0.186096	+0.7512
(2447774.5)				3.480078	5.0700	3.0008	6.2195
A SEP. 9 (OH)	Y:	+0.0169	+0.00453	+ 14.5445	+0.21743		+0.0646
				6.096831	0.1625		2.5678
SEP. 9 (OH)	X:	+0.0635	-0.68610	+172.8949	+1.79513	+0.338897	+0.7675
(2447778.5)				4.271852	2.5374	5.8233	1.6294
A SEP. 13 (OH)	Y:	+0.0275	-0.00312	+ 15.3655	+0.21739		+0.0672
				0.628000	0.9377		4.2403
SEP. 13 (OH)	X:	-2.0744	+0.40339	+172.5051	+1.28275	+0.165983	+0.7224
(2447782.5)				5.056907	4.8866	2.5755	3.2500
A SEP. 17 (OH)	Y:	+0.0195	-0.00228	+ 16.1876	+0.21326		+0.0703
				1.438830	1.7291		5.8868
SEP. 17 (OH)	X:	-0.9358	-0.06057	+175.0741	+0.40932	+0.040099	+0.7265
(2447786.5)				5.838573	5.4831	5.2817	4.8755
A SEP. 21 (OH)	Y:	+0.0032	-0.00009	+ 17.0001	+0.20558		+0.0727
				2.246444	2.5237		1.2787
SEP. 21 (OH)	X:	-1.2185	+0.08857	+177.2101	+0.67375	+0.045606	+0.7341
(2447790.5)				0.344346	5.7994	1.9813	0.1933
A SEP. 25 (OH)	Y:	-0.0078	+0.00293	+ 17.7859	+0.19961		+0.0758
				3.052325	3.3215		2.9154
SEP. 25 (OH)	X:	-1.4228	+0.31000	+179.5606	+0.90276	+0.131963	+0.7364
(2447794.5)				1.131963	0.0330	3.0457	1.8374
A SEP. 29 (OH)	Y:	-0.0143	-0.00051	+ 18.5561	+0.18805		+0.0781
				3.856248	4.0992		4.5923
SEP. 29 (OH)	X:	+0.6053	-0.69699	+179.8803	+1.92213	+0.341865	+0.7885
(2447798.5)				1.922153	2.1222	6.0191	3.4399
A OCT. 3 (OH)	Y:	+0.0029	-0.01520	+ 19.3114	+0.16612		+0.0824
				4.658527	4.8851		6.2301
OCT. 1 (OH)	X:	-1.2500	+0.30967	+181.8605	+1.14550	+0.124291	+0.7588
(2447800.5)				5.456707	5.2562	2.8029	4.3538
A OCT. 5 (OH)	Y:	-0.0368	-0.00136	+ 19.6411	+0.17260		+0.0821
				1.917600	2.1247		0.7939
OCT. 5 (OH)	X:	-0.1822	-0.20319	+184.4674	+0.22867	+0.100088	+0.7468
(2447804.5)				6.241583	0.2368	6.2206	5.9482
A OCT. 9 (OH)	Y:	-0.0534	+0.00267	+ 20.3118	+0.16194		+0.0847
				2.717827	2.9394		2.4284
OCT. 9 (OH)	X:	-1.3034	+0.47027	+187.3831	+1.17298	+0.201080	+0.7584
(2447808.5)				0.753505	5.9513	2.8188	1.2948
A OCT. 13 (OH)	Y:	-0.0691	+0.00217	+ 20.9418	+0.14862		+0.0865
				3.517033	3.7305		4.0966
OCT. 13 (OH)	X:	+1.1112	-0.67723	+187.5201	+1.96289	+0.339390	+0.8214
(2447812.5)				1.542427	1.9846	5.8497	2.9216
A OCT. 17 (OH)	Y:	-0.0486	-0.01470	+ 21.5476	+0.12081		+0.0905
				4.315847	4.4918		5.7441
OCT. 17 (OH)	X:	-0.5310	+0.17065	+191.4997	+0.30313	+0.096869	+0.8083
(2447816.5)				2.330639	3.1030	2.0284	4.6086
A OCT. 21 (OH)	Y:	-0.0831	-0.00731	+ 22.0510	+0.11236		+0.0913
				5.113333	5.3027		1.1137
OCT. 21 (OH)	X:	-0.8129	+0.47732	+193.9101	+0.39185	+0.229770	+0.8392
(2447820.5)				3.121930	5.3552	3.1913	6.2589
A OCT. 25 (OH)	Y:	-0.1109	-0.00185	+ 22.5066	+0.09821		+0.0940
				5.911500	5.9779		2.7618

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 2 DE JUPITER: EUROPE					
		N=1.7693					
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
OCT. 25 (OH)	X:	+1.0784	-0.45606	+196.8641 3.922061	+1.12750 2.8011	+0.227178 5.8627	+0.8285 1.6498
(2447824.5)							
A OCT. 29 (OH)	Y:	-0.1140	-0.00919	+ 22.8803 0.423722	+0.08460 0.6273		+0.0944 4.4139
OCT. 29 (OH)	X:	-0.7784	+0.52905	+197.4157 4.714617	+1.61515 5.0075	+0.206110 2.4752	+0.8089 3.3206
(2447828.5)							
A NOV. 2 (OH)	Y:	-0.1389	-0.00717	+ 23.2005 1.219744	+0.06283 1.3922		+0.0945 6.0661
NOV. 1 (OH)	X:	+1.4738	-0.51652	+201.0569 3.742796	+1.23687 2.6826	+0.253247 5.7958	+0.8459 1.3997
(2447831.5)							
A NOV. 5 (OH)	Y:	-0.1411	-0.00989	+ 23.3762 0.245281	+0.04812 0.5267		+0.0961 4.1606
NOV. 5 (OH)	X:	-0.3117	+0.41191	+201.7447 4.535269	+1.40832 4.8847	+0.156067 2.2964	+0.8276 3.0583
(2447835.5)							
A NOV. 9 (OH)	Y:	-0.1619	-0.00926	+ 23.5472 1.040525	+0.02601 1.2783		+0.0959 5.8082
NOV. 9 (OH)	X:	+1.1051	-0.18992	+205.2339 5.329297	+0.27627 0.0766	+0.092824 5.7989	+0.8262 4.6577
(2447839.5)							
A NOV. 13 (OH)	Y:	-0.1989	+0.00365	+ 23.6399 1.834464	+0.00983 4.1149		+0.0952 1.1713
NOV. 13 (OH)	X:	+0.8244	+0.00737	+207.2832 6.128596	+0.51045 0.1205	+0.035859 1.3341	+0.8449 0.0387
(2447843.5)							
A NOV. 17 (OH)	Y:	-0.2166	+0.00576	+ 23.6239 2.628088	+0.03016 5.6108		+0.0956 2.8350
NOV. 17 (OH)	X:	+0.2884	+0.40401	+209.6505 0.646812	+0.94293 0.2949	+0.182273 3.3118	+0.8633 1.6460
(2447847.5)							
A NOV. 21 (OH)	Y:	-0.2109	+0.00043	+ 23.5167 3.421977	+0.05360 0.3709		+0.0946 4.4701
NOV. 21 (OH)	X:	+2.3258	-0.60587	+210.1999 1.442820	+1.84613 2.2374	+0.286707 5.9716	+0.9013 3.3116
(2447851.5)							
A NOV. 25 (OH)	Y:	-0.2121	-0.00595	+ 23.3199 4.214138	+0.08228 1.2212		+0.0955 6.1241
NOV. 25 (OH)	X:	-0.6359	+0.90687	+214.6374 2.236742	+1.59051 4.9915	+0.411888 2.5595	+0.9487 5.0076
(2447855.5)							
A NOV. 29 (OH)	Y:	-0.2297	-0.00206	+ 23.0036 5.006406	+0.10679 2.1082		+0.0945 1.4866
NOV. 29 (OH)	X:	+1.7264	-0.11699	+215.3562 3.046106	+0.44173 2.8653	+0.101262 4.9741	+0.9069 0.3853
(2447859.5)							
A DEC. 3 (OH)	Y:	-0.2292	-0.00662	+ 22.6024 5.795693	+0.12352 2.8182		+0.0920 3.1193
DEC. 1 (OH)	X:	+0.0556	+0.73967	+216.4050 0.309180	+1.34998 6.0053	+0.326154 2.9815	+0.8966 1.1347
(2447861.5)							
A DEC. 5 (OH)	Y:	-0.2511	+0.00511	+ 22.3733 3.048998	+0.13759 0.0819		+0.0900 3.9344
DEC. 5 (OH)	X:	+2.7892	-0.57924	+216.2775 1.103052	+1.84120 2.1409	+0.276563 5.7898	+0.9373 2.8249
(2447865.5)							
A DEC. 9 (OH)	Y:	-0.2434	-0.00209	+ 21.8476 3.837577	+0.16127 0.9287		+0.0892 5.5941
DEC. 9 (OH)	X:	+0.6745	+0.43976	+219.6254 1.904145	+1.02956 4.4286	+0.228820 2.1386	+0.9629 4.5076
(2447869.5)							
A DEC. 13 (OH)	Y:	-0.2465	-0.00181	+ 21.2263 4.624833	+0.17835 1.7597		+0.0868 0.9433

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 3 DE JUPITER: GANYMEDE					
		N=0.8782					
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
JAN. 1 (OH)	X:	+0.3163	-0.09558	+335.2560	+1.18475	+0.017228	+0.4745
(2447527.5)				5.762258	2.2856	5.5410	2.1591
A JAN. 9 (OH)	Y:	+0.0796	-0.02177	+ 84.6879	+0.13891		+0.1202
				5.976888	2.5504		2.3736
JAN. 9 (OH)	X:	-0.2534	+0.04328	+327.3855	+0.93238	+0.013357	+0.4506
(2447535.5)				0.229683	3.2350	3.7476	3.6966
A JAN. 17 (OH)	Y:	+0.0174	-0.01152	+ 83.6371	+0.20344		+0.1217
				0.438322	3.5350		3.8864
JAN. 17 (OH)	X:	-0.5545	+0.10708	+319.6827	+1.04873	+0.020963	+0.4313
(2447543.5)				0.975506	4.3068	3.1340	5.2552
A JAN. 25 (OH)	Y:	-0.0471	+0.00026	+ 82.0158	+0.27197		+0.1088
				1.180246	4.4014		5.3907
JAN. 25 (OH)	X:	+0.7809	-0.21438	+310.2612	+0.55140	+0.061930	+0.3697
(2447551.5)				1.717451	4.6726	5.8076	0.5331
A FEV. 2 (OH)	Y:	-0.1310	+0.02451	+ 79.8963	+0.34084		+0.0926
				1.918852	5.1698		0.6408
FEV. 1 (OH)	X:	+0.5588	-0.14647	+303.4680	+0.68334	+0.043563	+0.3181
(2447558.5)				1.577303	4.7875	5.7994	0.1784
A FEV. 9 (OH)	Y:	-0.0930	+0.01754	+ 77.6506	+0.37564		+0.0807
				1.778470	5.0800		0.2932
FEV. 9 (OH)	X:	-0.8202	+0.18176	+296.7905	+1.36887	+0.048204	+0.2766
(2447566.5)				2.309184	5.5956	2.1892	1.4504
A FEV. 17 (OH)	Y:	-0.0206	+0.00674	+ 74.7532	+0.40323		+0.0762
				2.513940	5.8762		1.6539
FEV. 17 (OH)	X:	+0.0383	+0.01895	+289.0623	+1.11239	+0.012560	+0.3001
(2447574.5)				3.042916	0.3887	3.4825	2.8380
A FEV. 25 (OH)	Y:	+0.0063	+0.00402	+ 71.6131	+0.42520		+0.0748
				3.246188	0.3340		3.0787
FEV. 25 (OH)	X:	-0.1021	+0.01629	+281.8053	+0.91206	+0.013849	+0.3264
(2447582.5)				3.770714	1.1914	2.1190	4.3833
A MAR. 5 (OH)	Y:	+0.0212	-0.00171	+ 68.3128	+0.44550		+0.0749
				3.976748	1.0780		4.6155
MAR. 1 (OH)	X:	-0.0172	+0.01710	+278.6395	+0.96967	+0.008434	+0.3073
(2447586.5)				0.992683	4.8652	4.1752	5.1714
A MAR. 9 (OH)	Y:	+0.0140	-0.00302	+ 66.5884	+0.44729		+0.0732
				1.199780	4.5813		5.3293
MAR. 9 (OH)	X:	+0.4726	-0.13666	+272.0395	+0.70639	+0.035625	+0.2573
(2447594.5)				1.716284	5.5917	6.2217	0.4099
A MAR. 17 (OH)	Y:	-0.0263	+0.00451	+ 63.1188	+0.46189		+0.0615
				1.927837	5.3014		0.5885
MAR. 17 (OH)	X:	-0.2037	+0.04490	+267.1016	+1.02826	+0.014404	+0.2353
(2447602.5)				2.437115	0.0398	2.1645	1.7511
A MAR. 25 (OH)	Y:	-0.0030	+0.00039	+ 59.5536	+0.46487		+0.0527
				2.655858	6.0372		1.9921
MAR. 25 (OH)	X:	+0.0263	+0.00130	+261.9474	+0.95544	+0.005923	+0.2247
(2447610.5)				3.156946	0.9493	1.8828	3.0974
A AVR. 2 (OH)	Y:	-0.0030	+0.00262	+ 55.9402	+0.46172		+0.0467
				3.382605	0.4627		3.3425

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 3 DE JUPITER: GANYMEDE					
		N=0.8782					
		A0	A1	B0 F0	B1 F1	B2 F2	C0 P0
AVR. 1 (OH)	X:	+0.2127	-0.02068	+258.1132 3.000109	+1.02681 0.9252	+0.003320 5.0670	+0.2335 2.6411
A AVR. 9 (OH)	Y:	+0.0029	+0.00396	+ 52.7723 3.233280	+0.45861 0.2980		+0.0467 2.9383
AVR. 9 (OH)	X:	+0.1304	+0.01507	+254.2248 3.715164	+0.99410 1.5985	+0.011368 3.7159	+0.2348 4.0732
A AVR. 17 (OH)	Y:	+0.0134	+0.00383	+ 49.1534 3.960555	+0.45361 0.9958		+0.0469 4.3378
AVR. 17 (OH)	X:	+0.3817	-0.07406	+251.0502 4.430343	+1.11802 2.4644	+0.016861 6.0513	+0.2431 5.5334
A AVR. 25 (OH)	Y:	-0.0033	+0.00748	+ 45.5391 4.689192	+0.44500 1.6955		+0.0453 5.8486
AVR. 25 (OH)	X:	+0.2772	-0.04027	+248.1119 5.142935	+0.98906 3.1336	+0.013288 5.2372	+0.2501 0.7652
A MAI 3 (OH)	Y:	+0.0012	+0.00608	+ 41.9681 5.419795	+0.44058 2.3932		+0.0413 1.0406
MAI 1 (OH)	X:	+0.4725	-0.09680	+246.5877 4.107960	+1.18956 2.2366	+0.023942 5.6767	+0.2121 4.9277
A MAI 9 (OH)	Y:	-0.0247	+0.00935	+ 39.2807 4.398243	+0.43259 1.3266		+0.0355 5.2731
MAI 9 (OH)	X:	+0.1479	-0.01251	+244.3145 4.819427	+1.03533 3.0495	+0.008988 0.2531	+0.2080 6.2703
A MAI 17 (OH)	Y:	-0.0122	+0.00938	+ 35.7643 5.134471	+0.42686 2.0154		+0.0317 0.3562
MAI 17 (OH)	X:	-0.0739	+0.05607	+242.7182 5.531443	+0.99706 3.9305	+0.012289 2.3728	+0.2148 1.3305
A MAI 25 (OH)	Y:	+0.0218	+0.00293	+ 32.2948 5.875191	+0.42430 2.6860		+0.0296 1.6737
MAI 25 (OH)	X:	+0.3188	-0.01424	+241.7886 6.240997	+0.88003 4.5894	+0.007877 4.8225	+0.2522 2.7005
A JUN. 2 (OH)	Y:	+0.0549	-0.00377	+ 28.8591 0.340146	+0.41733 3.3548		+0.0278 3.1069
JUN. 1 (OH)	X:	+0.5853	-0.08881	+241.3945 6.076537	+0.81965 4.3258	+0.020415 5.5901	+0.2801 2.4273
A JUN. 9 (OH)	Y:	+0.0452	-0.00189	+ 25.9271 0.218307	+0.41301 3.1653		+0.0268 2.8622
JUN. 9 (OH)	X:	+0.1716	-0.01122	+241.3673 0.505422	+0.94141 5.1939	+0.006466 0.5467	+0.2856 3.9467
A JUN. 17 (OH)	Y:	+0.0632	-0.00866	+ 22.6392 0.989779	+0.40379 3.8289		+0.0236 4.5298
JUN. 17 (OH)	X:	+0.2198	-0.01521	+241.5442 1.216770	+0.96936 6.0978	+0.008395 4.5688	+0.2659 5.4725
A JUN. 25 (OH)	Y:	+0.0510	-0.00885	+ 19.5208 1.782166	+0.39950 4.5070		+0.0196 6.0993
JUN. 25 (OH)	X:	+0.6032	-0.13355	+242.0087 1.928012	+0.83143 0.7872	+0.035188 0.0426	+0.2424 0.6167
A JUL. 3 (OH)	Y:	+0.0294	-0.00494	+ 16.6066 2.604106	+0.39896 5.1825		+0.0166 1.4262

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 3 DE JUPITER: GANYMEDE					
		N=0.8782					
		AO	A1	B0 FO	B1 F1	B2 F2	CO PO
JUL. 1 (OH)	X:	+0.0549	+0.03021	+243.4808	+0.99449	+0.005018	+0.2676
(2447708.5)				0.890471	5.7731	2.7226	4.7093
A JUL. 9 (OH)	Y:	+0.0531	-0.00877	+ 14.5865	+0.39198		+0.0149
				1.679059	4.1071		5.6588
JUL. 9 (OH)	X:	+0.3549	-0.05311	+244.8346	+0.83895	+0.017681	+0.2789
(2447716.5)				1.601982	0.3288	0.4430	6.0809
A JUL. 17 (OH)	Y:	+0.0412	-0.00708	+ 12.3502	+0.38946		+0.0141
				2.591725	4.7872		1.0321
JUL. 17 (OH)	X:	-0.1476	+0.08330	+247.3127	+0.90603	+0.024853	+0.3179
(2447724.5)				2.313742	0.8402	2.7365	1.2216
A JUL. 25 (OH)	Y:	+0.0204	-0.00260	+ 10.8133	+0.39013		+0.0160
				3.573725	5.4597		2.7806
JUL. 25 (OH)	X:	+0.1461	-0.01162	+249.5593	+0.96968	+0.002431	+0.3489
(2447732.5)				3.028301	1.8438	4.6983	2.7916
A AOU. 2 (OH)	Y:	+0.0107	-0.00021	+ 10.2897	+0.38730		+0.0171
				4.611155	6.1378		4.4898
AOU. 1 (OH)	X:	+0.1602	-0.02769	+252.1587	+0.98882	+0.003631	+0.3545
(2447739.5)				2.868432	1.7625	5.7930	2.5298
A AOU. 9 (OH)	Y:	+0.0183	-0.00207	+ 10.7627	+0.38291		+0.0181
				4.731367	5.9505		4.4599
AOU. 9 (OH)	X:	+0.1490	-0.02838	+255.7553	+0.99881	+0.009693	+0.3322
(2447747.5)				3.584041	2.4561	4.8003	3.9951
A AOU. 17 (OH)	Y:	+0.0047	+0.00108	+ 12.1889	+0.37676		+0.0178
				5.713251	0.3497		6.1104
AOU. 17 (OH)	X:	+0.5321	-0.13178	+260.0139	+1.19058	+0.037196	+0.3187
(2447755.5)				4.301878	3.1261	6.0341	5.3574
A AOU. 25 (OH)	Y:	-0.0035	+0.00324	+ 14.2498	+0.36772		+0.0197
				0.342218	1.0384		1.4654
AOU. 25 (OH)	X:	-0.4298	+0.11994	+263.5024	+1.05585	+0.027111	+0.3697
(2447763.5)				5.020179	4.3705	2.7526	0.4762
A SEP. 2 (OH)	Y:	-0.0231	+0.00896	+ 16.6676	+0.35380		+0.0253
				1.197917	1.7425		3.0271
SEP. 1 (OH)	X:	-0.6346	+0.16965	+267.5779	+1.09351	+0.037554	+0.4213
(2447770.5)				4.865093	4.3827	2.7595	0.1762
A SEP. 9 (OH)	Y:	-0.0207	+0.00852	+ 18.8974	+0.34223		+0.0313
				1.130103	1.5677		2.8202
SEP. 9 (OH)	X:	+0.6851	-0.16723	+274.0418	+0.63377	+0.040592	+0.4609
(2447778.5)				5.584784	4.6487	5.7107	1.7550
A SEP. 17 (OH)	Y:	-0.0086	+0.00862	+ 21.4680	+0.32661		+0.0364
				1.925829	2.2727		4.3958
SEP. 17 (OH)	X:	-0.3668	+0.05745	+279.6311	+1.08639	+0.014843	+0.4476
(2447786.5)				0.029641	5.6361	2.3590	3.2947
A SEP. 25 (OH)	Y:	+0.0124	+0.00658	+ 23.9818	+0.30796		+0.0419
				2.704002	2.9845		5.9706
SEP. 25 (OH)	X:	+0.0813	-0.06470	+285.7472	+0.92800	+0.010261	+0.4368
(2447794.5)				0.755579	0.3577	6.1603	4.7704
A OCT. 3 (OH)	Y:	+0.0315	+0.00363	+ 26.3804	+0.28048		+0.0443
				3.470749	3.6964		1.1779

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 3 DE JUPITER: GANYMEDE					
		N=0.8782					
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
OCT. 1 (OH)	X:	-0.4829	+0.06222	+291.0387 6.016985	+1.10138 5.5223	+0.017864 2.0788	+0.4398 2.7677
A OCT. 9 (OH)	Y:	-0.0091	+0.01201	+ 28.0573 2.468374	+0.25156 2.6975		+0.0455 5.4831
OCT. 9 (OH)	X:	+0.1834	-0.08050	+297.9596 0.464309	+0.89068 0.3491	+0.017544 6.0182	+0.4496 4.1344
A OCT. 17 (OH)	Y:	+0.0096	+0.00850	+ 30.0486 3.223334	+0.21153 3.4176		+0.0494 0.6170
OCT. 17 (OH)	X:	-0.2440	+0.00091	+305.7379 1.201185	+0.83175 0.9817	+0.019896 1.7448	+0.4994 5.5987
A OCT. 25 (OH)	Y:	+0.0380	+0.00399	+ 31.7209 3.974046	+0.16060 4.1393		+0.0529 2.0539
OCT. 25 (OH)	X:	-0.2143	+0.00517	+313.2026 1.940727	+0.94394 1.8635	+0.013637 3.4660	+0.5440 0.8482
A NOV. 2 (OH)	Y:	+0.0929	-0.00778	+ 33.0081 4.720362	+0.09532 4.9427		+0.0532 3.5913
NOV. 1 (OH)	X:	+0.0017	-0.06461	+319.6092 1.805968	+1.10913 1.8351	+0.020428 4.4723	+0.5832 0.6627
A NOV. 9 (OH)	Y:	+0.0990	-0.00555	+ 33.7255 4.586789	+0.03614 4.9158		+0.0556 3.3735
NOV. 9 (OH)	X:	-0.2336	-0.03853	+327.2479 2.551850	+1.00654 2.7683	+0.014583 5.1296	+0.5859 2.1914
A NOV. 17 (OH)	Y:	+0.1552	-0.02132	+ 34.0345 5.328230	+0.04448 1.9815		+0.0563 4.9857
NOV. 17 (OH)	X:	-0.1790	-0.06383	+334.3983 3.301978	+0.97162 3.5866	+0.027154 5.7825	+0.5736 3.7002
A NOV. 25 (OH)	Y:	+0.1377	-0.02182	+ 33.7223 6.068343	+0.11154 2.9636		+0.0527 0.2189
NOV. 25 (OH)	X:	-0.0623	-0.07597	+341.0645 4.054919	+0.76531 4.5282	+0.029852 6.0414	+0.5542 5.2001
A DEC. 3 (OH)	Y:	+0.0673	-0.00907	+ 32.8495 0.522679	+0.18704 3.8488		+0.0498 1.7651
DEC. 1 (OH)	X:	-0.1953	-0.02784	+344.9047 3.050898	+0.85355 3.7085	+0.025308 5.4416	+0.5696 3.1461
A DEC. 9 (OH)	Y:	+0.1189	-0.01910	+ 31.7951 5.782602	+0.24330 2.8233		+0.0476 5.8937
DEC. 9 (OH)	X:	-0.2411	-0.03873	+349.2502 3.808699	+0.89083 4.6708	+0.029723 0.4628	+0.6187 4.6438
A DEC. 17 (OH)	Y:	+0.0604	-0.00688	+ 29.9129 0.226564	+0.30067 3.6365		+0.0461 1.1218
DEC. 17 (OH)	X:	-0.8769	+0.12052	+351.7466 4.568153	+1.11778 5.6994	+0.038312 2.3222	+0.6452 6.1838
A DEC. 25 (OH)	Y:	+0.0208	+0.00431	+ 27.6214 0.943968	+0.34814 4.4198		+0.0460 2.6303
DEC. 25 (OH)	X:	-0.4861	+0.01557	+353.5586 5.228703	+0.93021 0.5468	+0.017832 3.0645	+0.6493 1.4836
A DEC. 33 (OH)	Y:	+0.0422	+0.00179	+ 25.0154 1.649163	+0.36605 5.1892		+0.0418 4.1167

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES				
		DU SATELLITE 4 DE JUPITER: CALLISTO				
		N=0.3765				
		AO	A1	BO FO	B1 F1	CO PO
JAN. 1 (OH) (2447527.5)	X:	+ 1.5188	+ 0.58192	+594.1773 2.078673	+ 2.44638 5.0840	+2.3062 5.7951
A JAN. 9 (OH)	Y:	+ 0.0365	+ 0.14951	+148.1065 2.292464	+ 0.43469 5.2797	+0.5994 6.0010
JAN. 9 (OH) (2447535.5)	X:	- 7.5944	+ 3.75719	+558.9318 5.088019	+ 3.28433 0.7735	+2.6551 5.8937
A JAN. 17 (OH)	Y:	- 2.4934	+ 1.08383	+140.0225 5.304687	+ 0.77643 0.6633	+0.6933 6.0519
JAN. 17 (OH) (2447543.5)	X:	+ 8.0175	- 0.40913	+559.6024 1.832878	+ 1.55374 4.8579	+1.6304 5.3363
A JAN. 25 (OH)	Y:	+ 2.9606	- 0.39147	+140.4071 2.038849	+ 0.37621 4.5989	+0.3906 5.4966
JAN. 25 (OH) (2447551.5)	X:	+15.1661	- 2.05528	+557.9892 4.852636	+ 2.84181 2.3870	+1.7098 4.7748
A FEV. 2 (OH)	Y:	+ 2.9066	- 0.34494	+140.5808 5.052281	+ 0.75568 2.3287	+0.4196 5.0324
FEV. 1 (OH) (2447558.5)	X:	+15.6698	- 2.41429	+528.7201 1.173010	+ 2.62894 3.8604	+2.1521 3.7363
A FEV. 9 (OH)	Y:	+ 3.8849	- 0.62821	+132.6018 1.379367	+ 0.78261 4.0705	+0.5186 3.9502
FEV. 9 (OH) (2447566.5)	X:	+ 7.1155	- 0.70314	+521.2984 4.203825	+ 1.41123 1.7540	+2.0802 3.8393
A FEV. 17 (OH)	Y:	+ 0.7921	- 0.00331	+129.3149 4.402204	+ 0.58677 1.4094	+0.4991 4.0672
FEV. 17 (OH) (2447574.5)	X:	- 8.6810	+ 3.42982	+513.0613 0.949137	+ 2.84028 5.6720	+0.9318 3.5350
A FEV. 25 (OH)	Y:	- 2.2379	+ 0.87137	+126.2201 1.153241	+ 0.81737 5.3499	+0.2285 3.9660
FEV. 25 (OH) (2447582.5)	X:	+ 9.0258	- 0.68051	+498.1140 3.920816	+ 1.99104 1.6678	+1.8799 3.1321
A MAR. 5 (OH)	Y:	+ 2.4493	- 0.31124	+119.2694 4.133336	+ 0.74673 1.5092	+0.4754 3.3362
MAR. 1 (OH) (2447586.5)	X:	+18.9409	- 3.03042	+506.8864 5.406781	+ 4.07960 2.9773	+0.9855 0.0509
A MAR. 9 (OH)	Y:	+ 4.4237	- 0.73932	+119.3782 5.609210	+ 1.33280 2.8374	+0.2263 0.4425
MAR. 9 (OH) (2447594.5)	X:	+ 9.6875	- 1.36817	+473.2848 2.117185	+ 0.98304 5.4546	+1.4033 5.6248
A MAR. 17 (OH)	Y:	+ 1.9502	- 0.28385	+108.1177 2.333549	+ 0.68200 5.4605	+0.3195 5.9306
MAR. 17 (OH) (2447602.5)	X:	+ 4.4577	+ 0.05927	+469.3428 5.113660	+ 1.65338 2.8796	+1.7236 5.5880
A MAR. 25 (OH)	Y:	+ 0.1701	+ 0.18933	+102.2649 5.332152	+ 0.70346 2.2743	+0.3902 5.9039
MAR. 25 (OH) (2447610.5)	X:	- 4.7852	+ 2.47400	+472.4817 1.830384	+ 3.46182 6.1562	+1.8451 5.5319
A AVR. 2 (OH)	Y:	- 0.4753	+ 0.38166	+ 98.8246 2.051383	+ 0.98291 5.6662	+0.3901 5.7311

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES				
		DU SATELLITE 4 DE JUPITER: CALLISTO				N=0.3765
		AO	A1	B0 FO	B1 F1	CO PO
AVR. 1 (OH) (2447617.5)	X:	- 7.2505	+ 3.12046	+445.7486 4.402901	+ 1.88272 0.9215	+1.3230 4.7176
A AVR. 9 (OH)	Y:	- 1.4100	+ 0.56496	+ 89.2944 4.645442	+ 0.88343 1.2164	+0.2904 4.9786
AVR. 9 (OH) (2447625.5)	X:	+13.3356	- 1.82350	+441.4998 1.116856	+ 1.09536 4.4613	+1.8110 3.6902
A AVR. 17 (OH)	Y:	+ 2.7248	- 0.40501	+ 83.4187 1.364828	+ 0.80189 4.3220	+0.3337 3.9523
AVR. 17 (OH) (2447633.5)	X:	+10.4487	- 1.59992	+442.6783 4.137299	+ 2.41947 2.6640	+2.0371 3.6841
A AVR. 25 (OH)	Y:	+ 1.3934	- 0.24343	+ 79.0054 4.393550	+ 0.67735 1.5997	+0.3450 3.9892
AVR. 25 (OH) (2447641.5)	X:	+ 3.3732	+ 0.13888	+437.4377 0.821800	+ 1.98440 5.2380	+1.4955 3.4589
A MAI 3 (OH)	Y:	+ 0.0389	+ 0.15584	+ 72.8661 1.107141	+ 0.75127 4.5089	+0.2327 3.8724
MAI 1 (OH) (2447647.5)	X:	+ 9.5021	- 1.12852	+429.2575 3.066085	+ 1.60507 1.7507	+1.5697 1.7791
A MAI 9 (OH)	Y:	+ 1.6905	- 0.27133	+ 67.0693 3.364850	+ 0.55992 0.3289	+0.2537 2.1797
MAI 9 (OH) (2447655.5)	X:	+10.6003	- 1.75773	+437.4308 6.028877	+ 2.80005 3.9116	+1.2435 1.4788
A MAI 17 (OH)	Y:	+ 0.6905	- 0.06225	+ 61.8591 0.068950	+ 0.80004 3.2712	+0.1962 1.7823
MAI 17 (OH) (2447663.5)	X:	- 9.3505	+ 3.50985	+443.3517 2.716390	+ 3.83862 0.4296	+2.2091 0.6826
A MAI 25 (OH)	Y:	- 0.6341	+ 0.31631	+ 56.6341 3.061162	+ 0.97260 6.2439	+0.2501 1.0881
MAI 25 (OH) (2447671.5)	X:	+10.3176	- 1.16917	+431.2376 5.708314	+ 2.22042 3.6742	+1.5145 0.8859
A JUN. 2 (OH)	Y:	+ 1.2727	- 0.18360	+ 50.1105 6.084663	+ 0.87219 2.8538	+0.1912 1.5105
JUN. 1 (OH) (2447678.5)	X:	+ 7.7571	- 0.52320	+421.4807 2.042011	+ 1.50656 0.7021	+1.4545 5.9923
A JUN. 9 (OH)	Y:	+ 1.1376	- 0.11784	+ 43.7024 2.475793	+ 0.62847 5.3737	+0.1549 0.3411
JUN. 9 (OH) (2447686.5)	X:	+ 9.7128	- 1.10135	+430.4841 5.024403	+ 2.52535 3.3123	+1.2987 5.5633
A JUN. 17 (OH)	Y:	+ 0.7228	- 0.11901	+ 39.1288 5.507450	+ 0.74930 2.1729	+0.1105 0.0754
JUN. 17 (OH) (2447694.5)	X:	+13.3542	- 2.35700	+415.6870 1.700831	+ 0.11178 2.5154	+1.5897 4.9694
A JUN. 25 (OH)	Y:	+ 0.3326	+ 0.00871	+ 33.1112 2.290730	+ 0.70118 5.0409	+0.1395 6.0056
JUN. 25 (OH) (2447702.5)	X:	- 7.4074	+ 2.94876	+414.7557 4.675364	+ 0.51687 5.9716	+1.9392 5.3892
A JUL. 3 (OH)	Y:	- 0.4946	+ 0.15573	+ 27.0549 5.384962	+ 0.70293 1.4848	+0.1441 6.1465

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES				
		DU SATELLITE 4 DE JUPITER: CALLISTO				
		N=0.3765				
		AO	A1	BO FO	B1 F1	CO PO
JUL. 1 (OH) (2447708.5)	X:	+13.3053	- 2.27331	+429.0215 0.623857	+ 1.39089 4.4648	+2.1221 3.2645
A JUL. 9 (OH)	Y:	+ 0.1252	+ 0.00981	+ 24.5094 1.457829	+ 0.69178 3.9004	+0.1149 4.2662
JUL. 9 (OH) (2447716.5)	X:	- 7.1334	+ 2.81578	+433.1926 3.597997	+ 1.52958 0.9215	+1.0918 2.8802
A JUL. 17 (OH)	Y:	- 0.3358	+ 0.08528	+ 20.0567 4.636213	+ 0.73912 0.4609	+0.0851 4.5746
JUL. 17 (OH) (2447724.5)	X:	+ 2.0276	+ 0.83434	+431.9919 0.338053	+ 2.03516 5.7098	+1.6226 2.4820
A JUL. 25 (OH)	Y:	+ 0.2583	- 0.04540	+ 17.8283 1.634015	+ 0.71322 3.4575	+0.1007 3.9563
JUL. 25 (OH) (2447732.5)	X:	+ 9.8282	- 1.01140	+437.1909 3.325757	+ 2.40528 2.3700	+2.1102 2.4490
A AOU. 2 (OH)	Y:	+ 0.4934	- 0.15006	+ 17.9560 4.986524	+ 0.56312 0.1049	+0.1192 4.1066
AOU. 1 (OH) (2447739.5)	X:	+ 4.5287	+ 0.16460	+442.8178 5.923243	+ 1.58820 4.8447	+1.8655 1.3832
A AOU. 9 (OH)	Y:	+ 0.0912	- 0.06773	+ 18.3992 1.560392	+ 0.70571 2.7803	+0.1169 3.3695
AOU. 9 (OH) (2447747.5)	X:	+16.9807	- 3.10778	+434.9084 2.637515	+ 2.69742 2.5722	+1.4344 1.3909
A AOU. 17 (OH)	Y:	- 0.4157	+ 0.09947	+ 20.9958 4.805255	+ 0.70493 5.7639	+0.0816 3.2215
AOU. 17 (OH) (2447755.5)	X:	- 4.4512	+ 1.99831	+446.3712 5.620366	+ 2.37143 5.3043	+2.1132 0.5706
A AOU. 25 (OH)	Y:	- 0.1585	- 0.00726	+ 25.1645 1.709620	+ 0.65739 2.3392	+0.1252 2.9780
AOU. 25 (OH) (2447763.5)	X:	+ 0.3425	+ 1.32955	+471.0204 2.317651	+ 2.33444 0.9897	+2.3616 0.4415
A SEP. 2 (OH)	Y:	+ 0.4349	- 0.12394	+ 30.2485 4.834822	+ 0.55158 5.2064	+0.1803 2.9396
SEP. 1 (OH) (2447770.5)	X:	+ 2.0922	+ 0.81766	+468.5952 4.926552	+ 1.26843 4.4457	+2.1314 5.8687
A SEP. 9 (OH)	Y:	+ 0.1421	- 0.11100	+ 33.3107 1.226530	+ 0.61731 1.7567	+0.1727 2.1113
SEP. 9 (OH) (2447778.5)	X:	+ 5.5438	+ 0.13291	+480.6838 1.642260	+ 1.94615 1.0116	+1.9178 5.4531
A SEP. 17 (OH)	Y:	- 0.2830	- 0.01916	+ 38.2069 4.301663	+ 0.59386 4.6142	+0.1662 1.8115
SEP. 17 (OH) (2447786.5)	X:	+19.8224	- 3.73848	+505.5583 4.660513	+ 4.15270 3.5195	+1.9394 4.8146
A SEP. 25 (OH)	Y:	- 1.6024	+ 0.30848	+ 43.3259 1.095352	+ 0.65612 0.9615	+0.2175 1.2151
SEP. 25 (OH) (2447794.5)	X:	- 1.6064	+ 1.46504	+508.9088 1.357483	+ 2.40940 0.4592	+2.4372 4.9841
A OCT. 3 (OH)	Y:	- 0.4909	+ 0.03743	+ 47.0735 4.088745	+ 0.45128 4.3621	+0.2375 1.3435

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES				
		DU SATELLITE 4 DE JUPITER: CALLISTO				
		N=0.3765				
		AO	A1	BO FO	B1 F1	CO PO
OCT. 1 (OH) (2447800.5)	X:	+22.4753	- 4.34447	+506.9724 3.639389	+ 4.95313 3.2067	+3.1675 3.1908
A OCT. 9 (OH)	Y:	- 1.7858	+ 0.36696	+ 48.8217 0.111836	+ 0.71657 0.1965	+0.3147 5.9864
OCT. 9 (OH) (2447808.5)	X:	- 5.2883	+ 2.46058	+520.5683 0.336783	+ 3.58265 6.2775	+1.7778 2.8040
A OCT. 17 (OH)	Y:	- 0.1187	- 0.11860	+ 53.0181 3.109238	+ 0.46030 3.2887	+0.2059 5.6058
OCT. 17 (OH) (2447816.5)	X:	+ 1.6264	+ 1.01333	+540.0429 3.312411	+ 0.95978 3.0635	+2.2119 2.4955
A OCT. 25 (OH)	Y:	+ 0.1484	- 0.09681	+ 56.6908 6.112154	+ 0.20608 0.1485	+0.2574 5.2777
OCT. 25 (OH) (2447824.5)	X:	- 2.7715	+ 2.44124	+542.1006 0.060608	+ 3.54395 0.1764	+2.4643 2.1341
A NOV. 2 (OH)	Y:	+ 0.4945	- 0.35091	+ 57.0473 2.863698	+ 0.43598 3.3348	+0.2644 4.8925
NOV. 1 (OH) (2447831.5)	X:	- 2.2427	+ 2.53750	+574.2288 2.676780	+ 1.27590 1.4102	+3.2008 1.2088
A NOV. 9 (OH)	Y:	+ 0.7407	- 0.30888	+ 61.4415 5.489624	+ 0.17937 3.5630	+0.3795 4.0633
NOV. 9 (OH) (2447839.5)	X:	+22.9293	- 4.32626	+596.5913 5.685333	+ 1.72200 3.5634	+2.1760 1.5471
A NOV. 17 (OH)	Y:	- 2.2965	+ 0.37952	+ 62.4985 2.216396	+ 0.32689 6.0218	+0.1871 4.3412
NOV. 17 (OH) (2447847.5)	X:	- 0.8275	+ 1.45688	+595.2560 2.427125	+ 0.53448 2.9628	+2.8961 0.7132
A NOV. 25 (OH)	Y:	- 0.3913	+ 0.04207	+ 59.9133 5.223872	+ 0.23297 1.9225	+0.2837 3.6532
NOV. 25 (OH) (2447855.5)	X:	+ 0.5017	+ 1.40061	+591.7169 5.454324	+ 2.68770 6.2406	+2.9372 0.5867
A DEC. 3 (OH)	Y:	- 0.1286	- 0.12749	+ 57.8945 1.946988	+ 0.32852 4.9157	+0.2526 3.3968
DEC. 1 (OH) (2447861.5)	X:	+ 8.9339	- 0.96312	+604.7917 1.431759	+ 1.99715 2.7927	+3.1012 5.0275
A DEC. 9 (OH)	Y:	- 1.5555	+ 0.27788	+ 56.1817 4.181544	+ 0.55254 0.8947	+0.2697 1.5284
DEC. 9 (OH) (2447869.5)	X:	- 5.6054	+ 2.63285	+604.8103 4.449007	+ 3.45809 5.9365	+3.0427 5.1427
A DEC. 17 (OH)	Y:	+ 0.9072	- 0.28515	+ 52.8070 0.891421	+ 0.64075 3.9323	+0.2431 1.6746
DEC. 17 (OH) (2447877.5)	X:	- 1.8708	+ 2.48039	+624.1052 1.230476	+ 1.36800 1.2470	+2.6399 4.9064
A DEC. 25 (OH)	Y:	+ 0.5283	- 0.25844	+ 49.1883 3.936968	+ 0.49754 1.3668	+0.1622 1.5248
DEC. 25 (OH) (2447885.5)	X:	+20.6644	- 3.62410	+629.6039 4.269371	+ 1.46267 3.7248	+3.1652 4.2266
A DEC. 33 (OH)	Y:	- 0.9534	+ 0.15214	+ 44.6274 0.622957	+ 0.58742 4.2340	+0.2115 0.8077

PHÉNOMÈNES DES SATELLITES GALILÉENS

DESCRIPTION :

Les satellites Galiléens, dont les orbites sont faiblement inclinées sur l'équateur et sur l'écliptique, présentent de nombreux phénomènes. Au cours de chaque révolution, les trois premiers satellites, et en général le quatrième satellite, traversent le cône de visibilité et le cône d'ombre qui s'appuient sur la planète. On peut alors observer les passages des satellites devant Jupiter et les occultations par Jupiter lors de la traversée du cône de visibilité, ou les éclipses ou les passages d'ombre sur la planète lors de la traversée du cône d'ombre. Au cours d'une année, environ 3 000 tels événements (passages début ou fin, éclipses début ou fin, occultations début ou fin, passages d'ombres début ou fin) sont calculables (mais environ 2 200 seulement sont observables). Nous donnons ici une représentation compacte de ces prédictions utilisant un développement polynômial.

MÉTHODE DE CALCUL :

Les tables des pages 44 et 45 permettent de calculer les dates en TDT des phénomènes des satellites Galiléens de la manière suivante.

Soit P la période synodique moyenne d'un satellite ; la date approchée TI du phénomène proche de la date T est donnée par la relation :

$$TI = K \times P + \tau/24 + T_0 \quad (2)$$

où K représente la partie entière de la quantité $(T - T_0)/P$ et où τ est donné, sur l'intervalle $T_0, T_0 + DT$ par un polynôme de la forme :

$$\tau = C_0 + C_1 x + C_2 x^2 + \dots + C_n x^n \quad (3)$$

$$\text{avec } x = \{2(T - T_0)/DT\} - 1 \quad (4)$$

TI ayant été obtenu par la relation (2), on peut réitérer le calcul en substituant TI à T dans la formule (4) pour obtenir une date T_2 plus proche du phénomène recherché que TI . La précision de ce type de prédiction est meilleure que 60 secondes de temps.

Les tables donnent les coefficients C_i de la formule (3), numérotés de C_0 à C_7 pour les quatre satellites et pour les phénomènes :

- débuts et fins des éclipses des satellites par Jupiter (notées respectivement EC.D et EC.F),
- débuts et fins des occultations des satellites par Jupiter (notées OC.D et OC.F),
- débuts et fins des passages de l'ombre des satellites sur le disque de Jupiter (OM.D et OM.F),
- débuts et fins des passages des satellites devant la planète (PA.D et PA.F).

EXEMPLE D'UTILISATION :

Déterminons les dates des phénomènes du satellite I (Io) au voisinage du 30 juin 1989.

PHENOMENA OF THE GALILEAN SATELLITES

DESCRIPTION :

The Galilean satellites which orbits have low inclinations over the equator and the ecliptic, display many phenomena. During each revolution, the first three satellites and, often the fourth one, pass through the visibility and shadow cones which are tangent to the planet. It is then possible to observe the transits of the satellites across Jupiter and their occultations by Jupiter when they pass through the visibility cone, or the eclipses and the shadow transits when the shadow cone is involved. In the course of a year 3 000 such events may be computed (transits ingress and egress, eclipses disappearance and reappearance, occultations disappearance and reappearance, transits of the shadow ingress and egress). Only about 2 200 are observable. A compact representation of these predictions using a polynomial approximation is given here.

COMPUTATIONAL METHOD :

The tables on p. 44 and 45 permit the computation of the dates in TDT of phenomena of the satellites of Jupiter in the following way.

Let P be the mean synodic period of a satellite ; the approximate date TI of a phenomenon close to a date T is given by :

$$TI = K \times P + \tau/24 + T_0 \quad (2)$$

where K is the integer part of $(T - T_0)/P$ and where τ is given (on the interval $T_0, T_0 + DT$) by a polynomial :

$$\tau = C_0 + C_1 x + C_2 x^2 + \dots + C_n x^n \quad (3)$$

$$\text{with } x = \{2(T - T_0)/DT\} - 1 \quad (4)$$

The value TI deduced from equation (2) is then substituted in place of T in equation (4). The new iteration yields a date T_2 closer to the date of the phenomenon than TI . The precision of this type of prediction is better than 60 seconds of time. The tables give the coefficients C_i in formula (3), numbered from C_0 to C_7 , for the four satellites and for the following phenomena :

- disappearance and reappearance of the satellites eclipsed by Jupiter (denoted respectively by EC.D and EC.F),
- disappearance and reappearance of the satellites occulted by Jupiter (denoted OC.D and OC.F),
- ingress and egress of the transits of the satellites shadow across the disc of Jupiter (OM.D and OM.F),
- ingress and egress of the satellites transits across the planet (PA.D and PA.F).

EXAMPLE :

Let us find the dates of the phenomena of satellite I (Io) which takes place near the 30 th of June 1989.

Voyons tout d'abord le calcul pour le début d'occultation pour lequel les tables donnent :

$$T0 = 0 ; P = 1,769\ 860\ 5 ; DT = 366$$

Du 0 janvier au 30 juin 1989, 181 jours se sont écoulés, on a donc :

$T = 181$ et la formule (4) donne alors :

$$x = 2(181 - 0)/366 - 1 = - 0.010\ 928\ 962$$

La formule (3) donne ensuite :

$$\tau = 24.184\ 356 - 0.079\ 854 x - 0.287\ 005 x^2 + 0.131\ 596 x^3 + 0.084\ 215 x^4 + 0.017\ 211 x^5 + 0.025\ 817 x^6 - 0.018\ 574 x^7$$

d'où : $\tau = 24.185\ 194\ 27$

On a d'autre part :

$$K = \text{partie entière de } (181 - 0)/1,769\ 860\ 5 = 102$$

La formule (2) donne alors :

$TI = 102 \times 1,769\ 860\ 5 + 24.185\ 194\ 27/24 + 0$
 $TI = 181,533\ 487\ 4$ jours depuis le 0 janvier (début de l'intervalle pour les occultations) soit EC.D le 30 juin 1989 à 12 h 48 min 13 s TDT. Le calcul réitéré donne $T2 = 181,533\ 478\ 4$ jours soit le 30 juin 1989 à 12 h 48 min 13 s TDT.

On trouverait de même pour les autres phénomènes :

- EC.F : le 30 juin à 15 h 00 min 18 s
- OC.D : le 30 juin à 13 h 09 min 20 s
- OC.F : le 30 juin à 15 h 23 min 46 s
- PA.D : le 29 juin à 16 h 00 min 33 s
- PA.F : le 29 juin à 18 h 13 min 09 s
- OM.D : le 29 juin à 15 h 40 min 27 s
- OM.F : le 29 juin à 17 h 52 min 32 s

IMPORTANT : Conditions d'existence des phénomènes

Le recouvrement des cônes d'ombre et de visibilité, rend inexistants certains phénomènes. Ainsi, avant (ou après) l'opposition de Jupiter, les fins (respectivement débuts) d'éclipses et les débuts (respectivement fins) d'occultations sont inobservables. Ceci ne pouvant être pris en compte dans la représentation, il est nécessaire que l'utilisateur vérifie les conditions d'existence pour les éclipses et les occultations en calculant les quatre phases EC.D, EC.F, OC.D et OC.F. Ainsi, dans l'exemple précédent, on a dans l'ordre chronologique :

- EC.D : le 30 juin à 12 h 48 min 13 s observable
- OC.D : le 30 juin à 13 h 09 min 20 s inobservable car déjà éclipsé
- EC.F : le 30 juin à 15 h 00 min 18 s inobservable car encore occulté
- OC.F : le 30 juin à 15 h 23 min 46 s observable

D'autre part, les caractéristiques de l'orbite du satellite IV (Callisto) font qu'il n'existe pas toujours de phénomènes. Les coefficients relatifs à ce satellite ne sont donc donnés que sur l'intervalle où ils existent.

Let us start with the computation of the disappearance for the occultation of the satellite for which the tables give :

$$T0 = 0 ; P = 1.769\ 860\ 5 ; DT = 366$$

Between January 0 to June the 30th 1989, 181 days have elapsed

T = 181 and formula (4) gives :

$$x = 2(181 - 0)/366 - 1 = - 0.010\ 928\ 962$$

Formula (3) then gives :

therefore $\tau = 24.185\ 194\ 27$

On the other hand,

$$K = \text{integer part of } (181 - 0)/1.769\ 860\ 5 = 102$$

Formula (2) then gives :

*$TI = 102 \times 1.769\ 860\ 5 + 24.185\ 194\ 27/24 + 0$
 $TI = 181.533\ 487\ 4$ days from January 0 (beginning of the interval for the occultations) that is June the 30th 1989 at 12 h 48 min 13 s TDT. Another iteration gives $T2 = 181.533\ 478\ 4$ days that is June the 30th 1989 at 12 h 48 min 13 s TDT.*

One would find as well for the other phenomena :

- EC.F : June the 30th at 15 h 00 min 18 s
- OC.D : June the 30th at 13 h 09 min 20 s
- OC.F : June the 30th at 15 h 23 min 46 s
- PA.D : June the 29th at 16 h 00 min 33 s
- PA.F : June the 29th at 18 h 13 min 09 s
- OM.D : June the 29th at 15 h 40 min 27 s
- OM.F : June the 29th at 17 h 52 min 32 s

IMPORTANT : Conditions for the existence of the phenomena

As the visibility and shadow cones may sometimes overlap, some of the computed phenomena may not exist. Thus, before (or after) the opposition of Jupiter, the reappearances (respectively the disappearances) for the eclipses, and the disappearances (respectively reappearances) for the occultations are not observable. This could not be taken into account in the representation ; so the user will have to check the existence conditions of the eclipses and occultations by computing the four steps EC.D, EC.F, OC.D and OC.F. For instance, in the example above one has, in chronological order :

- EC.D : June the 30th at 12 h 48 min 13 s observable
- OC.D : June the 30th at 13 h 09 min 20 s unobservable as already eclipsed
- EC.F : June the 30th at 15 h 00 min 18 s unobservable as yet occulted
- OC.F : June the 30th at 15 h 23 min 46 s observable

Moreover, the orbit of satellite IV (Callisto) is such that phenomena are not always present. The coefficients for this satellite are given on the interval for which they exist.

AN 1989 SATELLITE 1 P = 1.7698605 JOURS TO = 0.0 DT = 366.JOURS

EC.D		EC.F		OM.D		OM.F	
0	24.184356	0	26.386295	0	3.056122	0	5.257286
1	-0.079854	1	-0.024313	1	0.037007	1	0.021066
2	-0.287005	2	-0.275419	2	-0.590718	2	-0.697530
3	0.131596	3	0.105604	3	0.005475	3	0.134501
4	0.084215	4	0.080691	4	0.134429	4	0.326664
5	0.017211	5	0.026066	5	0.002336	5	-0.084468
6	0.025817	6	0.025703	6	0.077129	6	-0.011105
7	-0.018574	7	-0.020389	7	0.021756	7	0.028886

OC.D		OC.F		PA.D		PA.F	
0	24.560387	0	26.769945	0	3.429291	0	5.637586
1	2.926435	1	2.999191	1	3.011458	1	3.003358
2	-1.071981	2	-1.044571	2	-1.533205	2	-1.626745
3	-2.118752	3	-2.193585	3	-2.306950	3	-2.186546
4	-0.673308	4	-0.722419	4	-0.254946	4	-0.104475
5	-1.110426	5	-1.053466	5	-0.920774	5	-1.006226
6	0.688605	6	0.706021	6	0.535243	6	0.462229
7	0.744057	7	0.728422	7	0.670183	7	0.680241

TO = 0 CORRESPOND AU 0 JANVIER 1989 à 0 H SOIT LA DATE JULIENNE 2447526.5

AN 1989 SATELLITE 2 P = 3.5540942 JOURS TO = 0.0 DT = 366.JOURS

EC.D		EC.F		OM.D		OM.F	
0	15.731624	0	18.224795	0	57.904689	0	60.381077
1	0.158830	1	0.292559	1	-0.158151	1	0.024550
2	-1.373927	2	-1.395390	2	0.367534	2	0.284035
3	-0.139015	3	-0.072557	3	0.268894	3	0.323016
4	0.676083	4	0.707712	4	-0.419588	4	-0.220970
5	0.148661	5	0.072720	5	-0.123863	5	-0.178702
6	-0.082854	6	-0.091370	6	0.179893	6	0.081769
7	-0.057053	7	-0.023540	7	0.057037	7	0.053652

OC.D		OC.F		PA.D		PA.F	
0	16.483446	0	19.007159	0	58.643837	0	61.155843
1	6.140914	1	6.364498	1	5.822786	1	6.101931
2	-3.414463	2	-3.375714	2	-1.086498	2	-1.122940
3	-4.496591	3	-4.623666	3	-4.289505	3	-4.441413
4	0.047184	4	-0.107685	4	-2.064944	4	-2.038787
5	-2.287741	5	-2.180328	5	-2.191329	5	-2.079438
6	0.827288	6	0.887044	6	1.542942	6	1.507675
7	1.541603	7	1.513016	7	1.473465	7	1.428994

TO = 0 CORRESPOND AU 0 JANVIER 1989 à 0 H SOIT LA DATE JULIENNE 2447526.5

AN 1989 SATELLITE 3 P = 7.1663872 JOURS TO = 0.0 DT = 366. JOURS

EC.D		EC.F		OM.D		OM.F	
0	40.942661	0	43.541697	0	127.003234	0	129.585625
1	-0.000948	1	0.411372	1	0.057783	1	0.437017
2	-0.445001	2	-0.416097	2	-0.584763	2	-0.683570
3	0.231967	3	0.220206	3	-0.027863	3	0.049654
4	0.159462	4	0.160412	4	0.060101	4	0.293028
5	-0.229331	5	-0.250971	5	0.199181	5	0.148251
6	-0.012071	6	-0.012256	6	0.110322	6	0.001620
7	0.145529	7	0.155797	7	-0.125171	7	-0.138763

OC.D		OC.F		PA.D		PA.F	
0	42.442666	0	45.127865	0	128.490255	0	131.160572
1	12.187586	1	12.670558	1	12.148452	1	12.590580
2	-3.933646	2	-3.690278	2	-4.160268	2	-4.065178
3	-8.811294	3	-9.131645	3	-9.085323	3	-9.292853
4	-2.315097	4	-2.850624	4	-2.123810	4	-2.395193
5	-4.913223	5	-4.571248	5	-4.244658	5	-3.957588
6	2.427962	6	2.598470	6	2.373315	6	2.419728
7	3.259193	7	3.184611	7	2.849179	7	2.759897

TO = 0 CORRESPOND AU 0 JANVIER 1989 à 0 H SOIT LA DATE JULIENNE 2447526.5

AN 1989 SATELLITE 4 P = 16.7535520 JOURS TO =328.0 DT = 180. JOURS

EC.D		EC.F		OM.D		OM.F	
0	67.874484	0	70.452769	0	270.637901	0	273.175651
1	-0.287241	1	0.933081	1	-0.380819	1	0.784678
2	0.191580	2	-0.200255	2	0.213136	2	-0.111830
3	-0.139614	3	0.037220	3	-0.172055	3	0.028339
4	0.021032	4	0.161363	4	-0.073688	4	-0.170972
5	-0.018223	5	-0.126718	5	0.076102	5	0.150354
6	0.102866	6	-0.243330	6	0.164595	6	0.046221
7	-0.076142	7	0.200780	7	-0.141093	7	-0.083403

AN 1989 SATELLITE 4 P = 16.7535520 JOURS TO =271.0 DT = 180. JOURS

OC.D		OC.F		PA.D		PA.F	
0	230.163805	0	231.608020	0	30.904030	0	32.319908
1	-22.115001	1	-21.999482	1	-21.956374	1	-21.887785
2	-0.273994	2	0.264312	2	-0.315766	2	0.171558
3	13.527297	3	14.479397	3	13.428961	3	14.529174
4	0.487078	4	-0.213913	4	0.598641	4	0.038659
5	-5.528585	5	-5.918966	5	-5.574160	5	-6.253955
6	-0.139377	6	-0.099888	6	-0.243360	6	-0.262494
7	1.337141	7	1.601914	7	1.410323	7	1.814630

TO = 0 CORRESPOND AU 0 JANVIER 1989 à 0 H SOIT LA DATE JULIENNE 2447526.5

SATELLITES DE SATURNE
SATELLITES OF SATURN

DONNÉES SUR LES SATELLITES DE SATURNE

DATA ON THE SATELLITES OF SATURN

NOM	masse	rayon	période rotation sidérale	albédo géométrique	magnitude visuelle	période orbitale	élongation maximale	1/2 grand axe	excentricité	inclinaison sur l'équateur de Saturne
unité →	masse de Saturne	km	jour			jour	(') (")	10 ³ km		degré
I Mimas	8.0×10^{-8}	196	(S)	0.53	12.9	0.942 421	30	185.52	0.020 2	1.53
II Enceladus	1.3×10^{-7}	250	(S)	0.99	11.7	1.370 217	38	238.02	0.004 5	0.
III Tethys	1.3×10^{-6}	530	(S)	0.88	10.2	1.887 802	48	294.66	0.	1.86
IV Dione	1.85×10^{-6}	560	(S)	0.65	10.4	2.736 914	1 01	377.40	0.002 2	0.02
V Rhea	4.4×10^{-6}	765	(S)	0.67	9.7	4.517 500	1 25	527.04	0.001 0	0.35
VI Titan	2.41×10^{-4}	2 575	(S)	0.21	8.28	15.945 420	3 17	1 221.83	0.029 1	0.33
VII Hyperion	$3. \times 10^{-8}$	205 × 130 × 110		0.3	14.19	21.276 608	3 59	1 481.1	0.104	0.43
VIII Iapetus	3.3×10^{-6}	730	(S)	0.5-0.05	11.2	79.330 182	9 35	3 561.3	0.028 2	14.72
IX Phoebe	$7. \times 10^{-10}$	110	0.4	0.06	16.45	(R)550.48	34 51	12 952.	0.163 2	177. (1)
X Janus (5)		110 × 100 × 80	(S)	0.4	14.	0.694 5	24	151.472	0.007	0.14
XI Epimetheus (5)		70 × 60 × 50	(S)	0.4	15.	0.694 2	24	151.422	0.009	0.34
XII Hélène (2)		18 × 16 × 15		0.5	17.	2.736 9	1 01	377.40	0.005	0.2
XIII Telesto (3)		17 × 14 × 13		0.6	18.	1.887 8	48	294.66		
XIV Calypso (3)		17 × 11 × 11		0.8	18.5	1.887 8	48	294.66		
XV Atlas		20 × 10		0.4	18.	0.601 9	22	137.670		0.3
XVI Prometheus (4)		70 × 50 × 40		0.6	15.	0.613 0	23	139.353		0.
XVII Pandora (4)		55 × 45 × 35		0.6	15.5	0.628 5	23	141.700	0.004	0.1

NAME	mass	radius	sidereal period	geometrical albedo	visual magnitude	orbital period	greatest elongation	semi major axis	eccentricity	inclination on Saturn's equator
unit →	Saturn's mass	km	day			day	(') (")	10 ³ km		degree

NOTES

(S) : révolution synchrone

(R) : révolution rétrograde

(1) : inclinaison par rapport à l'écliptique.

Les éphémérides de Phœbé sont données sous la forme de coefficients de Tchébycheff dans le supplément à la Connaissance des Temps « Satellites faibles... »

(2) : Hélène : même orbite que Dioné

(3) : Telesto et Calypso : même orbite que Téthys

(4) : satellites coorbitaux « gardiens » de l'anneau F

(5) : Janus et Epimetheus : même orbite

(S) : *synchronous revolution*

(R) : *retrograde revolution*

(1) : *inclination on the ecliptic*

The ephemerides of Phœbe are given as Chebychev coefficients in the supplément à la Connaissance des Temps « Faint Satellites... »

(2) : *Helene : same orbit as Dione*

(3) : *Telesto and Calypso : same orbit as Tethys*

(4) : *satellites on the same orbit « shepherding » F ring*

(5) : *Janus and Epimetheus : same orbit*

Données extraites de l'*Encyclopédie du Bureau des Longitudes*

Data from the Encyclopédie du Bureau des Longitudes

ÉPHÉMÉRIDES DES HUIT PREMIERS SATELLITES DE SATURNE

EPHEMERIDES OF THE FIRST EIGHT SATELLITES OF SATURN

Coordonnées différentielles tangentiellles données en secondes de degré dans le repère équatorial moyen 1950.0 *Differential tangential coordinates given in arcseconds in the mean equatorial frame 1950.0*

$$\begin{aligned}\Delta\alpha \cos\delta &= X \\ \Delta\delta &= Y\end{aligned}$$

$$\left. \begin{matrix} X \\ Y \end{matrix} \right\} = A0 + A1 \cdot t + B0 \sin(Nt + F0) + B1 \cdot t \sin(Nt + F1) + B2 \cdot t^2 \sin(Nt + F2) + C0 \sin(2Nt + P0)$$

où $t = T - T0$ avec $T0$ date du début de l'intervalle et T date du calcul *where $t = T - T0$ with $T0$ date of the beginning of the interval and T the date for the calculation*

satellite	intervalle Δt (jours)	N (rad/j)	page
Mimas	2	6.667 0	50
Encelade	16	4.586 0	65
Téthys	16	3.328 0	67
Dioné	16	2.296 0	69
Rhée	16	1.391 0	71
Titan	11	0.394 0	73
Hypérion	8	0.394 0	76
Japet	16	0.079 0	80
	(days)	(rad/d)	

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE: MIMAS				N=6.667	
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
JAN. 1 (OH)	X: +0.6214	-0.00385	+23.1121	+0.04087	+0.004291	+0.2330	
(2447527.5)			0.865677	5.6353	5.8570	2.8111	
A JAN. 3 (OH)	Y: -0.1878	-0.00333	+ 9.9050	+0.02781	+0.000327	+0.0996	
			2.633927	0.9074	2.4990	4.5813	
JAN. 3 (OH)	X: +0.6126	-0.00553	+23.1203	+0.04983	+0.001683	+0.2324	
(2447529.5)			1.629109	0.1480	2.6153	4.3082	
A JAN. 5 (OH)	Y: -0.1937	-0.00364	+ 9.8982	+0.02623	+0.001897	+0.0996	
			3.395811	1.5358	2.8359	6.0726	
JAN. 5 (OH)	X: +0.6034	-0.00627	+23.1354	+0.05194	+0.003645	+0.2331	
(2447531.5)			2.392581	0.7971	2.8881	5.8014	
A JAN. 7 (OH)	Y: -0.2009	-0.00277	+ 9.8890	+0.02981	+0.001572	+0.0994	
			4.158004	2.4844	5.8303	1.2863	
JAN. 7 (OH)	X: +0.5909	-0.00487	+23.1441	+0.05109	+0.003371	+0.2330	
(2447533.5)			3.155954	1.8170	5.9140	1.0162	
A JAN. 9 (OH)	Y: -0.2072	-0.00296	+ 9.8836	+0.02867	+0.000498	+0.0995	
			4.920107	3.2301	6.0732	2.7781	
JAN. 9 (OH)	X: +0.5799	-0.00599	+23.1606	+0.04845	+0.000418	+0.2336	
(2447535.5)			3.919460	2.5067	2.7467	2.5109	
A JAN. 11 (OH)	Y: -0.2129	-0.00325	+ 9.8783	+0.02632	+0.000935	+0.0995	
			5.682134	4.0887	3.0431	4.2753	
JAN. 11 (OH)	X: +0.5681	-0.00640	+23.1785	+0.04711	+0.001252	+0.2337	
(2447537.5)			4.682990	3.2728	3.8376	4.0091	
A JAN. 13 (OH)	Y: -0.2192	-0.00278	+ 9.8761	+0.02689	+0.000827	+0.0996	
			0.161164	4.7888	6.1617	5.7700	
JAN. 13 (OH)	X: +0.5554	-0.00621	+23.1977	+0.04969	+0.001650	+0.2340	
(2447539.5)			5.446629	4.0477	6.0346	5.5066	
A JAN. 15 (OH)	Y: -0.2247	-0.00299	+ 9.8742	+0.02872	+0.000900	+0.0995	
			0.923488	5.6307	2.0966	0.9831	
JAN. 15 (OH)	X: +0.5437	-0.00738	+23.2151	+0.05226	+0.002873	+0.2338	
(2447541.5)			6.210291	5.0075	2.4826	0.7198	
A JAN. 17 (OH)	Y: -0.2307	-0.00267	+ 9.8744	+0.02622	+0.000156	+0.0995	
			1.685667	0.1791	5.1426	2.4797	
JAN. 17 (OH)	X: +0.5290	-0.00641	+23.2427	+0.04276	+0.002034	+0.2342	
(2447543.5)			0.690724	5.7078	5.7665	2.2183	
A JAN. 19 (OH)	Y: -0.2366	-0.00241	+ 9.8753	+0.02511	+0.001049	+0.0993	
			2.447951	1.0750	5.8089	3.9742	
JAN. 19 (OH)	X: +0.5144	-0.00662	+23.2686	+0.03975	+0.002183	+0.2338	
(2447545.5)			1.454420	0.2898	5.9629	3.7127	
A JAN. 21 (OH)	Y: -0.2412	-0.00306	+ 9.8822	+0.02324	+0.001934	+0.0995	
			3.210392	1.6167	2.7744	5.4701	
JAN. 21 (OH)	X: +0.5020	-0.00858	+23.3012	+0.04752	+0.004948	+0.2346	
(2447547.5)			2.218572	0.7969	2.7984	5.2106	
A JAN. 23 (OH)	Y: -0.2467	-0.00252	+ 9.8871	+0.02402	+0.000279	+0.0993	
			3.972936	2.5161	4.7742	0.6811	
JAN. 23 (OH)	X: +0.4862	-0.00742	+23.3301	+0.04468	+0.001174	+0.2344	
(2447549.5)			2.982486	1.7677	5.5029	0.4226	
A JAN. 25 (OH)	Y: -0.2523	-0.00205	+ 9.8944	+0.02757	+0.001808	+0.0997	
			4.735816	3.2649	5.9530	2.1764	
JAN. 25 (OH)	X: +0.4701	-0.00731	+23.3603	+0.04862	+0.002483	+0.2355	
(2447551.5)			3.746650	2.5874	6.0088	1.9204	
A JAN. 27 (OH)	Y: -0.2567	-0.00264	+ 9.9026	+0.02377	+0.000969	+0.0996	
			5.498423	4.1761	2.8093	3.6723	

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 1 DE SATURNE: MIMAS

N=6.667

		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
JAN.27 (OH) (2447553.5)	X:	+0.4551	-0.00866	+23.3964 4.510730	+0.04056 3.3584	+0.002171 3.1062	+0.2356 3.4179
A JAN.29 (OH)	Y:	-0.2616	-0.00231	+ 9.9130 6.261315	+0.02399 4.9181	+0.000165 5.6593	+0.0999 5.1686
JAN.29 (OH) (2447555.5)	X:	+0.4381	-0.00812	+23.4331 5.275048	+0.04418 4.0691	+0.001806 5.6282	+0.2362 4.9166
A JAN.31 (OH)	Y:	-0.2662	-0.00216	+ 9.9250 0.741130	+0.02411 5.6885	+0.000641 0.8189	+0.1000 0.3824
JAN.31 (OH) (2447557.5)	X:	+0.4221	-0.00893	+23.4685 6.039370	+0.04678 4.9867	+0.001424 1.9464	+0.2365 0.1312
A FEV. 2 (OH)	Y:	-0.2705	-0.00226	+ 9.9383 1.504252	+0.02530 0.2148	+0.000925 2.5835	+0.1001 1.8805
FEV. 2 (OH) (2447559.5)	X:	+0.4050	-0.00908	+23.5088 0.520616	+0.04659 5.7895	+0.001281 2.6620	+0.2365 1.6308
A FEV. 4 (OH)	Y:	-0.2754	-0.00169	+ 9.9519 2.267273	+0.02356 1.2051	+0.001226 5.6615	+0.1002 3.3758
FEV. 4 (OH) (2447561.5)	X:	+0.3855	-0.00805	+23.5531 1.284876	+0.03549 0.4598	+0.003944 5.8449	+0.2370 3.1264
A FEV. 6 (OH)	Y:	-0.2790	-0.00209	+ 9.9702 3.030628	+0.02214 1.8657	+0.000687 2.7859	+0.1003 4.8747
FEV. 6 (OH) (2447563.5)	X:	+0.3688	-0.00992	+23.5994 2.049696	+0.04126 0.9889	+0.002884 2.7270	+0.2370 4.6265
A FEV. 8 (OH)	Y:	-0.2824	-0.00221	+ 9.9901 3.793945	+0.01873 2.6538	+0.001450 2.9150	+0.1004 0.0847
FEV. 8 (OH) (2447565.5)	X:	+0.3509	-0.01013	+23.6497 2.814436	+0.03733 1.7146	+0.002757 2.9943	+0.2377 6.1208
A FEV.10 (OH)	Y:	-0.2870	-0.00132	+10.0096 4.557818	+0.02460 3.3931	+0.002009 5.8702	+0.1007 1.5839
FEV.10 (OH) (2447567.5)	X:	+0.3302	-0.00877	+23.6933 3.579349	+0.04691 2.6834	+0.004031 5.9017	+0.2383 1.3382
A FEV.12 (OH)	Y:	-0.2903	-0.00166	+10.0317 5.321526	+0.02212 4.2473	+0.000234 0.4870	+0.1009 3.0780
FEV.12 (OH) (2447569.5)	X:	+0.3114	-0.01017	+23.7456 4.344270	+0.03909 3.4635	+0.000981 2.8720	+0.2389 2.8346
A FEV.14 (OH)	Y:	-0.2933	-0.00182	+10.0536 6.085397	+0.02282 5.1526	+0.000927 2.8544	+0.1013 4.5774
FEV.14 (OH) (2447571.5)	X:	+0.2916	-0.01031	+23.7978 5.109318	+0.03872 4.2586	+0.000906 4.0131	+0.2396 4.3352
A FEV.16 (OH)	Y:	-0.2967	-0.00128	+10.0792 0.566272	+0.02067 5.8661	+0.000891 0.0892	+0.1016 6.0746
FEV.16 (OH) (2447573.5)	X:	+0.2711	-0.01012	+23.8516 5.874520	+0.04006 5.0017	+0.001576 0.0809	+0.2403 5.8345
A FEV.18 (OH)	Y:	-0.2993	-0.00148	+10.1050 1.330561	+0.02287 0.3587	+0.000997 2.2738	+0.1018 1.2906
FEV.18 (OH) (2447575.5)	X:	+0.2514	-0.01113	+23.9041 0.356658	+0.04703 5.8722	+0.002882 2.4861	+0.2404 1.0508
A FEV.20 (OH)	Y:	-0.3024	-0.00110	+10.1319 2.094806	+0.02256 1.2953	+0.000374 4.9263	+0.1021 2.7891
FEV.20 (OH) (2447577.5)	X:	+0.2288	-0.01002	+23.9642 1.121840	+0.03725 0.5404	+0.002495 5.7289	+0.2412 2.5504
A FEV.22 (OH)	Y:	-0.3051	-0.00092	+10.1602 2.859308	+0.02353 2.1497	+0.000768 5.6650	+0.1021 4.2877

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE: MIMAS				N=6.667	
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
FEV.22 (OH)	X:	+0.2073	-0.01061	+24.0230	+0.03905	+0.000925	+0.2410
(2447579.5)				1.887319	1.3383	5.9420	4.0489
A FEV.24 (OH)	Y:	-0.3065	-0.00146	+10.1936	+0.01746	+0.001884	+0.1026
				3.623849	2.9394	2.8051	5.7849
FEV.24 (OH)	X:	+0.1874	-0.01222	+24.0907	+0.03210	+0.004958	+0.2423
(2447581.5)				2.653076	1.8090	2.8424	5.5472
A FEV.26 (OH)	Y:	-0.3090	-0.00072	+10.2250	+0.02134	+0.000868	+0.1027
				4.388811	3.6841	5.6721	1.0007
FEV.26 (OH)	X:	+0.1639	-0.01067	+24.1498	+0.04108	+0.002581	+0.2423
(2447583.5)				3.418811	2.8112	5.7187	0.7635
A FEV.28 (OH)	Y:	-0.3112	-0.00040	+10.2597	+0.02117	+0.001664	+0.1033
				5.154000	4.3586	6.0465	2.4971
FEV.28 (OH)	X:	+0.1410	-0.01095	+24.2141	+0.04144	+0.002051	+0.2437
(2447585.5)				4.184777	3.5507	6.0367	2.2619
A MAR. 2 (OH)	Y:	-0.3121	-0.00096	+10.2931	+0.02308	+0.001337	+0.1035
				5.919098	5.3839	2.6967	3.9975
MAR. 2 (OH)	X:	+0.1191	-0.01216	+24.2805	+0.03742	+0.002309	+0.2442
(2447587.5)				4.950649	4.5222	3.0426	3.7630
A MAR. 4 (OH)	Y:	-0.3135	-0.00043	+10.3299	+0.02116	+0.000327	+0.1041
				0.401330	6.1337	0.0806	5.4957
MAR. 4 (OH)	X:	+0.0952	-0.01137	+24.3490	+0.03629	+0.001961	+0.2452
(2447589.5)				5.716827	5.1627	5.9196	5.2634
A MAR. 6 (OH)	Y:	-0.3145	-0.00029	+10.3676	+0.02113	+0.000591	+0.1045
				1.166904	0.6436	1.1591	0.7134
MAR. 6 (OH)	X:	+0.0727	-0.01220	+24.4152	+0.04301	+0.001953	+0.2457
(2447591.5)				0.199906	5.9909	2.0841	0.4808
A MAR. 8 (OH)	Y:	-0.3151	-0.00031	+10.4062	+0.02218	+0.000885	+0.1049
				1.932665	1.4222	2.8699	2.2142
MAR. 8 (OH)	X:	+0.0487	-0.01201	+24.4864	+0.04143	+0.000736	+0.2463
(2447593.5)				0.966214	0.5603	2.9829	1.9830
A MAR. 10 (OH)	Y:	-0.3161	+0.00027	+10.4446	+0.02561	+0.001292	+0.1052
				2.698496	2.3573	5.5757	3.7133
MAR. 10 (OH)	X:	+0.0232	-0.01118	+24.5575	+0.04251	+0.003492	+0.2467
(2447595.5)				1.732473	1.6102	5.7985	3.4810
A MAR. 12 (OH)	Y:	-0.3156	-0.00015	+10.4881	+0.02130	+0.000955	+0.1056
				3.464537	3.1866	2.7746	5.2150
MAR. 12 (OH)	X:	+0.0009	-0.01311	+24.6360	+0.03347	+0.003887	+0.2475
(2447597.5)				2.499248	2.1264	2.7817	4.9835
A MAR. 14 (OH)	Y:	-0.3151	+0.00001	+10.5312	+0.02167	+0.000826	+0.1058
				4.230710	4.0732	2.9621	0.4292
MAR. 14 (OH)	X:	-0.0234	-0.01262	+24.7121	+0.03430	+0.001343	+0.2479
(2447599.5)				3.265932	3.0314	3.3057	0.1976
A MAR. 16 (OH)	Y:	-0.3155	+0.00091	+10.5759	+0.02163	+0.002315	+0.1065
				4.997465	4.5907	5.9590	1.9308
MAR. 16 (OH)	X:	-0.0497	-0.01140	+24.7846	+0.04374	+0.004479	+0.2493
(2447601.5)				4.032972	3.6672	5.9444	1.7000
A MAR. 18 (OH)	Y:	-0.3142	+0.00044	+10.6205	+0.02351	+0.000599	+0.1067
				5.764030	5.5666	2.1959	3.4294
MAR. 18 (OH)	X:	-0.0734	-0.01297	+24.8632	+0.03944	+0.001858	+0.2499
(2447603.5)				4.799857	4.6866	2.7724	3.1996
A MAR. 20 (OH)	Y:	-0.3128	+0.00052	+10.6657	+0.02516	+0.000925	+0.1075
				0.247733	0.0669	2.7368	4.9310

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 1 DE SATURNE: MIMAS

N=6.667

	A0	A1	B0 F0	B1 F1	B2 F2	C0 P0
MAR.20 (OH) (2447605.5)	X: -0.0986	-0.01263	+24.9412 5.566994	+0.03901 5.4376	+0.000474 4.5276	+0.2511 4.7022
A MAR.22 (OH)	Y: -0.3117	+0.00115	+10.7139 1.014714	+0.02285 0.9442	+0.000915 0.1358	+0.1079 0.1492
MAR.22 (OH) (2447607.5)	X: -0.1238	-0.01242	+25.0204 0.051087	+0.03869 6.1873	+0.001432 0.4887	+0.2519 6.2040
A MAR.24 (OH)	Y: -0.3095	+0.00095	+10.7620 1.782009	+0.02350 1.6373	+0.001083 2.5613	+0.1085 1.6516
MAR.24 (OH) (2447609.5)	X: -0.1482	-0.01318	+25.0986 0.818524	+0.04413 0.6250	+0.002845 2.5917	+0.2524 1.4234
A MAR.26 (OH)	Y: -0.3077	+0.00146	+10.8098 2.549328	+0.02692 2.5045	+0.000728 5.1037	+0.1090 3.1532
MAR.26 (OH) (2447611.5)	X: -0.1752	-0.01185	+25.1798 1.585780	+0.04594 1.7051	+0.003054 5.6631	+0.2534 2.9244
A MAR.28 (OH)	Y: -0.3051	+0.00157	+10.8600 3.316902	+0.02728 3.3104	+0.000544 5.6798	+0.1093 4.6563
MAR.28 (OH) (2447613.5)	X: -0.2000	-0.01275	+25.2627 2.353459	+0.04306 2.4166	+0.000345 2.9047	+0.2535 4.4272
A MAR.30 (OH)	Y: -0.3014	+0.00121	+10.9127 4.084440	+0.02585 4.3076	+0.001714 2.7514	+0.1098 6.1558
MAR.30 (OH) (2447615.5)	X: -0.2238	-0.01375	+25.3521 3.121198	+0.03303 3.3136	+0.004318 2.8743	+0.2548 5.9262
A MAR.32 (OH)	Y: -0.2988	+0.00218	+10.9648 4.852589	+0.02520 4.8889	+0.001552 5.9041	+0.1102 1.3764
AVR. 1 (OH) (2447617.5)	X: -0.2510	-0.01178	+25.4311 3.889199	+0.04425 3.8722	+0.004099 5.8571	+0.2554 1.1466
A AVR. 3 (OH)	Y: -0.2953	+0.00230	+11.0189 5.620746	+0.02419 5.7168	+0.001159 0.0003	+0.1109 2.8750
AVR. 3 (OH) (2447619.5)	X: -0.2763	-0.01245	+25.5167 4.657242	+0.04157 4.7333	+0.001121 0.1121	+0.2567 2.6460
A AVR. 5 (OH)	Y: -0.2904	+0.00185	+11.0703 0.105858	+0.02970 0.2091	+0.001793 2.6981	+0.1115 4.3796
AVR. 5 (OH) (2447621.5)	X: -0.3007	-0.01323	+25.6000 5.425279	+0.04629 5.6464	+0.002450 2.9295	+0.2577 4.1504
A AVR. 7 (OH)	Y: -0.2863	+0.00263	+11.1256 0.874312	+0.02724 1.0936	+0.000581 6.1855	+0.1121 5.8806
AVR. 7 (OH) (2447623.5)	X: -0.3267	-0.01211	+25.6869 6.193590	+0.03977 0.1274	+0.002080 6.1414	+0.2587 5.6526
A AVR. 9 (OH)	Y: -0.2813	+0.00270	+11.1805 1.642977	+0.02749 1.8646	+0.000452 1.6702	+0.1127 1.1020
AVR. 9 (OH) (2447625.5)	X: -0.3509	-0.01287	+25.7699 0.678857	+0.04468 0.7922	+0.002461 2.3182	+0.2595 0.8729
A AVR.11 (OH)	Y: -0.2759	+0.00280	+11.2357 2.411809	+0.02817 2.6306	+0.000736 3.3247	+0.1133 2.6058
AVR.11 (OH) (2447627.5)	X: -0.3765	-0.01216	+25.8558 1.447252	+0.04688 1.7102	+0.000690 4.5444	+0.2604 2.3769
A AVR.13 (OH)	Y: -0.2706	+0.00340	+11.2901 3.180792	+0.03221 3.3909	+0.001438 5.6535	+0.1137 4.1090
AVR.13 (OH) (2447629.5)	X: -0.4022	-0.01150	+25.9392 2.215754	+0.05377 2.5646	+0.003016 5.7626	+0.2606 3.8783
A AVR.15 (OH)	Y: -0.2636	+0.00295	+11.3486 3.949772	+0.03077 4.3557	+0.001244 2.6075	+0.1144 5.6127

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE: MIMAS				N=6.667	
		A0	A1	B0 F0	B1 F1	B2 F2	CO PO
AVR. 15 (OH) (2447631.5)	X:	-0.4246	-0.01321	+26.0326 2.984544	+0.03939 3.4729	+0.004458 2.7732	+0.2620 5.3817
A AVR. 17 (OH)	Y:	-0.2571	+0.00344	+11.4054 4.719079	+0.03156 5.1078	+0.000142 2.5912	+0.1146 0.8321
AVR. 17 (OH) (2447633.5)	X:	-0.4495	-0.01183	+26.1169 3.753392	+0.04552 4.1653	+0.000914 5.4570	+0.2621 0.5998
A AVR. 19 (OH)	Y:	-0.2508	+0.00425	+11.4651 5.488737	+0.02642 5.8466	+0.002248 6.0574	+0.1155 2.3346
AVR. 19 (OH) (2447635.5)	X:	-0.4747	-0.01082	+26.2021 4.522564	+0.04307 4.7721	+0.004250 6.0618	+0.2639 2.1025
A AVR. 21 (OH)	Y:	-0.2427	+0.00364	+11.5209 6.258310	+0.03247 0.3325	+0.001463 2.5544	+0.1159 3.8384
AVR. 21 (OH) (2447637.5)	X:	-0.4968	-0.01229	+26.2866 5.291497	+0.05113 5.7598	+0.003077 2.7164	+0.2645 3.6058
A AVR. 23 (OH)	Y:	-0.2347	+0.00403	+11.5787 0.744967	+0.03178 1.1245	+0.000688 2.8853	+0.1168 5.3412
AVR. 23 (OH) (2447639.5)	X:	-0.5204	-0.01125	+26.3723 6.060736	+0.04635 0.2610	+0.000543 5.6111	+0.2659 5.1093
A AVR. 25 (OH)	Y:	-0.2267	+0.00463	+11.6372 1.514803	+0.03257 2.0083	+0.000922 6.2543	+0.1173 0.5635
AVR. 25 (OH) (2447641.5)	X:	-0.5430	-0.01099	+26.4566 0.546883	+0.04568 1.0280	+0.001142 1.0184	+0.2667 0.3305
A AVR. 27 (OH)	Y:	-0.2176	+0.00440	+11.6956 2.284954	+0.03061 2.7413	+0.001068 2.8485	+0.1180 2.0683
AVR. 27 (OH) (2447643.5)	X:	-0.5647	-0.01126	+26.5396 1.316338	+0.04632 1.7359	+0.002444 2.8174	+0.2674 1.8354
A AVR. 29 (OH)	Y:	-0.2089	+0.00508	+11.7521 3.055148	+0.03449 3.4788	+0.001166 5.4268	+0.1185 3.5728
AVR. 29 (OH) (2447645.5)	X:	-0.5881	-0.00965	+26.6198 2.085644	+0.05817 2.6383	+0.003789 5.6622	+0.2682 3.3378
A AVR. 31 (OH)	Y:	-0.1991	+0.00498	+11.8109 3.825442	+0.03440 4.3243	+0.000273 0.3887	+0.1190 5.0790
MAI 1 (OH) (2447647.5)	X:	-0.6080	-0.01069	+26.7060 2.855309	+0.04925 3.4872	+0.001512 2.6446	+0.2687 4.8433
A MAI 3 (OH)	Y:	-0.1884	+0.00480	+11.8691 4.595714	+0.03730 5.2117	+0.001567 2.6165	+0.1195 0.2978
MAI 3 (OH) (2447649.5)	X:	-0.6275	-0.01075	+26.7913 3.624919	+0.04981 4.4215	+0.003052 2.8149	+0.2695 0.0603
A MAI 5 (OH)	Y:	-0.1789	+0.00588	+11.9288 5.366536	+0.03082 5.9395	+0.001994 5.9916	+0.1202 1.8041
MAI 5 (OH) (2447651.5)	X:	-0.6495	-0.00844	+26.8690 4.394967	+0.04520 4.9008	+0.005103 5.9914	+0.2706 1.5660
A MAI 7 (OH)	Y:	-0.1680	+0.00566	+11.9867 6.137212	+0.03322 0.4651	+0.000403 1.0156	+0.1206 3.3058
MAI 7 (OH) (2447653.5)	X:	-0.6679	-0.00938	+26.9492 5.164803	+0.04985 5.8357	+0.001153 2.0179	+0.2714 3.0672
A MAI 9 (OH)	Y:	-0.1561	+0.00536	+12.0421 0.624979	+0.03484 1.1357	+0.001992 2.8384	+0.1215 4.8119
MAI 9 (OH) (2447655.5)	X:	-0.6857	-0.00937	+27.0247 5.934763	+0.05353 0.3208	+0.002472 2.9201	+0.2727 4.5728
A MAI 11 (OH)	Y:	-0.1451	+0.00625	+12.0998 1.395822	+0.03575 2.0656	+0.001086 5.9015	+0.1220 0.0328

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE: MIMAS				N=6.667	
		AO	A1	B0 FO	B1 F1	B2 F2	CO PO
MAI 11 (OH) (2447657.5)	X:	-0.7042	-0.00791	+27.1034 0.421661	+0.04849 1.2207	+0.002063 6.1868	+0.2735 6.0768
A MAI 13 (OH)	Y:	-0.1329	+0.00610	+12.1561 2.166924	+0.03418 2.8260	+0.000368 2.2753	+0.1228 1.5391
MAI 13 (OH) (2447659.5)	X:	-0.7200	-0.00847	+27.1765 1.191908	+0.04623 1.8620	+0.002645 2.5624	+0.2742 1.2988
A MAI 15 (OH)	Y:	-0.1207	+0.00628	+12.2113 2.938093	+0.03454 3.5869	+0.000489 4.1636	+0.1233 3.0449
MAI 15 (OH) (2447661.5)	X:	-0.7370	-0.00710	+27.2477 1.961996	+0.05460 2.7068	+0.001877 5.3157	+0.2751 2.8035
A MAI 17 (OH)	Y:	-0.1084	+0.00673	+12.2651 3.709382	+0.03575 4.3084	+0.001403 5.9048	+0.1237 4.5510
MAI 17 (OH) (2447663.5)	X:	-0.7525	-0.00659	+27.3172 2.732271	+0.05668 3.4738	+0.002360 5.8960	+0.2751 4.3079
A MAI 19 (OH)	Y:	-0.0946	+0.00618	+12.3201 4.480475	+0.03920 5.2428	+0.001758 2.4881	+0.1244 6.0553
MAI 19 (OH) (2447665.5)	X:	-0.7644	-0.00777	+27.3937 3.502533	+0.05358 4.5435	+0.004679 2.6751	+0.2763 5.8106
A MAI 21 (OH)	Y:	-0.0818	+0.00688	+12.3738 5.251991	+0.03582 5.9955	+0.000418 6.1413	+0.1246 1.2784
MAI 21 (OH) (2447667.5)	X:	-0.7790	-0.00548	+27.4582 4.273080	+0.04947 5.1162	+0.002574 5.9903	+0.2764 1.0321
A MAI 23 (OH)	Y:	-0.0689	+0.00735	+12.4288 6.023521	+0.03286 0.5948	+0.001694 6.0658	+0.1253 2.7807
MAI 23 (OH) (2447669.5)	X:	-0.7919	-0.00479	+27.5253 5.043692	+0.04408 5.9313	+0.002995 6.2626	+0.2778 2.5339
A MAI 25 (OH)	Y:	-0.0542	+0.00655	+12.4776 0.511983	+0.03538 1.2006	+0.002197 2.7958	+0.1258 4.2877
MAI 25 (OH) (2447671.5)	X:	-0.8013	-0.00586	+27.5843 5.814126	+0.05542 0.3867	+0.004204 2.7839	+0.2784 4.0397
A MAI 27 (OH)	Y:	-0.0404	+0.00714	+12.5285 1.283618	+0.03512 2.0749	+0.000363 4.4778	+0.1265 5.7908
MAI 27 (OH) (2447673.5)	X:	-0.8121	-0.00409	+27.6466 0.301562	+0.05009 1.3048	+0.001231 5.7079	+0.2794 5.5431
A MAI 29 (OH)	Y:	-0.0264	+0.00744	+12.5772 2.055247	+0.03669 2.8886	+0.001037 6.1011	+0.1271 1.0150
MAI 29 (OH) (2447675.5)	X:	-0.8205	-0.00384	+27.7038 1.072241	+0.04774 2.0630	+0.000873 1.5767	+0.2800 0.7656
A MAI 31 (OH)	Y:	-0.0116	+0.00708	+12.6255 2.827058	+0.03348 3.6968	+0.000867 2.9779	+0.1276 2.5208
MAI 31 (OH) (2447677.5)	X:	-0.8280	-0.00348	+27.7581 1.842927	+0.04692 2.8228	+0.001425 3.2060	+0.2806 2.2712
A JUN. 2 (OH)	Y:	+0.0023	+0.00764	+12.6702 3.598912	+0.03433 4.3673	+0.001465 5.7470	+0.1280 4.0268
JUN. 2 (OH) (2447679.5)	X:	-0.8360	-0.00171	+27.8054 2.613535	+0.05659 3.5101	+0.004296 5.7904	+0.2808 3.7745
A JUN. 4 (OH)	Y:	+0.0175	+0.00724	+12.7156 4.370618	+0.03633 5.2484	+0.000786 1.9680	+0.1285 5.5335
JUN. 4 (OH) (2447681.5)	X:	-0.8395	-0.00280	+27.8607 3.384235	+0.05283 4.5482	+0.002930 2.4616	+0.2814 5.2802
A JUN. 6 (OH)	Y:	+0.0327	+0.00715	+12.7582 5.142389	+0.03839 6.0388	+0.001461 2.6157	+0.1286 0.7543

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE :				MIMAS	N=6.667
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
JUN. 6 (OH) (2447683.5)	X:	-0.8432	-0.00184	+27.9074 4.154926	+0.05484 5.3277	+0.001822 2.5640	+0.2813 0.4987
A JUN. 8 (OH)	Y:	+0.0466	+0.00805	+12.8034 5.914401	+0.03210 0.6870	+0.002110 5.9017	+0.1294 2.2598
JUN. 8 (OH) (2447685.5)	X:	-0.8481	+0.00050	+27.9522 4.925976	+0.03925 6.0873	+0.005015 6.0712	+0.2825 2.0035
A JUN.10 (OH)	Y:	+0.0621	+0.00732	+12.8420 0.403136	+0.03373 1.3570	+0.000912 2.7874	+0.1295 3.7640
JUN.10 (OH) (2447687.5)	X:	-0.8482	-0.00064	+27.9905 5.696665	+0.04983 0.5387	+0.002909 2.6193	+0.2825 3.5063
A JUN.12 (OH)	Y:	+0.0775	+0.00711	+12.8798 1.175225	+0.03114 2.0937	+0.001617 3.1121	+0.1303 5.2687
JUN.12 (OH) (2447689.5)	X:	-0.8482	+0.00018	+28.0261 0.184319	+0.04780 1.3297	+0.001929 3.2022	+0.2837 5.0108
A JUN.14 (OH)	Y:	+0.0918	+0.00781	+12.9160 1.947031	+0.03539 2.9587	+0.001764 5.8849	+0.1305 0.4915
JUN.14 (OH) (2447691.5)	X:	-0.8478	+0.00168	+28.0614 0.955096	+0.04858 2.2606	+0.002208 6.1049	+0.2840 0.2324
A JUN.16 (OH)	Y:	+0.1070	+0.00727	+12.9509 2.719048	+0.03174 3.7899	+0.000459 2.3373	+0.1311 1.9971
JUN.16 (OH) (2447693.5)	X:	-0.8444	+0.00132	+28.0910 1.725996	+0.04078 3.0215	+0.002238 2.6854	+0.2843 1.7376
A JUN.18 (OH)	Y:	+0.1216	+0.00739	+12.9824 3.491034	+0.03085 4.5293	+0.000474 5.2758	+0.1314 3.5032
JUN.18 (OH) (2447695.5)	X:	-0.8421	+0.00313	+28.1133 2.496680	+0.04816 3.6614	+0.003106 5.6589	+0.2847 3.2415
A JUN.20 (OH)	Y:	+0.1361	+0.00744	+13.0123 4.262995	+0.03006 5.2936	+0.000933 0.0393	+0.1316 5.0099
JUN.20 (OH) (2447697.5)	X:	-0.8369	+0.00325	+28.1371 3.267456	+0.04651 4.5165	+0.001322 0.2956	+0.2844 4.7470
A JUN.22 (OH)	Y:	+0.1515	+0.00669	+13.0394 5.034691	+0.03575 6.1077	+0.002291 2.5754	+0.1319 0.2302
JUN.22 (OH) (2447699.5)	X:	-0.8287	+0.00263	+28.1608 4.038007	+0.05554 5.4897	+0.004906 2.5921	+0.2847 6.2480
A JUN.24 (OH)	Y:	+0.1651	+0.00738	+13.0674 5.806695	+0.03042 0.7341	+0.000966 5.6645	+0.1321 1.7371
JUN.24 (OH) (2447701.5)	X:	-0.8231	+0.00538	+28.1766 4.808963	+0.03890 6.2699	+0.003587 6.0189	+0.2847 1.4705
A JUN.26 (OH)	Y:	+0.1790	+0.00726	+13.0926 0.295319	+0.03118 1.5929	+0.001073 5.7748	+0.1322 3.2385
JUN.26 (OH) (2447703.5)	X:	-0.8143	+0.00546	+28.1913 5.579668	+0.04097 0.8500	+0.001135 0.2413	+0.2850 2.9707
A JUN.28 (OH)	Y:	+0.1938	+0.00626	+13.1122 1.067371	+0.02596 2.2088	+0.002348 2.9839	+0.1327 4.7451
JUN.28 (OH) (2447705.5)	X:	-0.8027	+0.00476	+28.1951 0.067134	+0.04141 1.4101	+0.004414 2.9530	+0.2855 4.4763
A JUN.30 (OH)	Y:	+0.2070	+0.00682	+13.1318 1.839087	+0.02939 3.0901	+0.001141 5.5727	+0.1328 6.2478
JUN.30 (OH) (2447707.5)	X:	-0.7923	+0.00681	+28.2029 0.837721	+0.04446 2.4327	+0.002373 5.7461	+0.2857 5.9788
A JUL. 2 (OH)	Y:	+0.2202	+0.00664	+13.1479 2.610835	+0.02879 3.8861	+0.001029 0.0115	+0.1333 1.4708

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE :				MIMAS	N=6.667
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
JUL. 2 (OH) (2447709.5)	X:	-0.7791	+0.00676	+28.2038 1.608347	+0.03897 3.2608	+0.000866 1.7061	+0.2859 1.2005
A JUL. 4 (OH)	Y:	+0.2334	+0.00610	+13.1628 3.382569	+0.02699 4.7797	+0.000733 2.8290	+0.1334 2.9759
JUL. 4 (OH) (2447711.5)	X:	-0.7655	+0.00747	+28.1997 2.378838	+0.03799 4.0051	+0.000468 4.4687	+0.2859 2.7048
A JUL. 6 (OH)	Y:	+0.2454	+0.00639	+13.1735 4.154316	+0.02351 5.4817	+0.001299 5.9407	+0.1335 4.4813
JUL. 6 (OH) (2447713.5)	X:	-0.7516	+0.00887	+28.1890 3.149282	+0.03639 4.5899	+0.003806 5.9865	+0.2853 4.2080
A JUL. 8 (OH)	Y:	+0.2583	+0.00557	+13.1821 4.925708	+0.02824 6.2718	+0.001600 2.4317	+0.1337 5.9860
JUL. 8 (OH) (2447715.5)	X:	-0.7333	+0.00759	+28.1845 3.919478	+0.04756 5.6453	+0.004553 2.4818	+0.2856 5.7112
A JUL.10 (OH)	Y:	+0.2701	+0.00551	+13.1884 5.697216	+0.02703 0.7917	+0.001059 2.9806	+0.1334 1.2074
JUL.10 (OH) (2447717.5)	X:	-0.7165	+0.00915	+28.1699 4.689811	+0.04118 0.1452	+0.000696 2.4404	+0.2846 0.9304
A JUL.12 (OH)	Y:	+0.2804	+0.00601	+13.1962 0.185412	+0.02829 1.8539	+0.002288 5.7250	+0.1337 2.7096
JUL.12 (OH) (2447719.5)	X:	-0.6999	+0.01090	+28.1576 5.460212	+0.03662 1.2826	+0.004305 5.9944	+0.2852 2.4317
A JUL.14 (OH)	Y:	+0.2921	+0.00481	+13.1961 0.956891	+0.02275 2.5018	+0.001445 3.0264	+0.1334 4.2144
JUL.14 (OH) (2447721.5)	X:	-0.6787	+0.00938	+28.1321 6.230299	+0.03439 1.7224	+0.003950 2.8746	+0.2846 3.9349
A JUL.16 (OH)	Y:	+0.3026	+0.00465	+13.1959 1.728255	+0.02162 3.3966	+0.000848 3.4808	+0.1337 5.7158
JUL.16 (OH) (2447723.5)	X:	-0.6585	+0.01054	+28.1081 0.717216	+0.03488 2.6607	+0.001104 4.0895	+0.2851 5.4364
A JUL.18 (OH)	Y:	+0.3118	+0.00501	+13.1913 2.499329	+0.02426 4.0780	+0.002049 6.0515	+0.1337 0.9380
JUL.18 (OH) (2447725.5)	X:	-0.6376	+0.01156	+28.0810 1.487143	+0.03850 3.5037	+0.002453 6.1984	+0.2848 0.6571
A JUL.20 (OH)	Y:	+0.3214	+0.00415	+13.1864 3.270456	+0.02347 5.0748	+0.000831 2.3485	+0.1338 2.4412
JUL.20 (OH) (2447727.5)	X:	-0.6145	+0.01110	+28.0499 2.257090	+0.03431 4.4742	+0.001764 -2.5905	+0.2846 2.1604
A JUL.22 (OH)	Y:	+0.3298	+0.00418	+13.1772 4.041516	+0.02043 5.8778	+0.000482 5.5120	+0.1337 3.9457
JUL.22 (OH) (2447729.5)	X:	-0.5929	+0.01271	+28.0097 3.026842	+0.02788 4.9977	+0.003413 5.8334	+0.2840 3.6623
A JUL.24 (OH)	Y:	+0.3380	+0.00380	+13.1659 4.812361	+0.02064 0.3863	+0.000337 1.1948	+0.1336 5.4505
JUL.24 (OH) (2447731.5)	X:	-0.5680	+0.01209	+27.9740 3.796445	+0.03408 5.9219	+0.001528 1.8886	+0.2835 5.1663
A JUL.26 (OH)	Y:	+0.3462	+0.00300	+13.1503 5.583005	+0.02199 0.9885	+0.002294 2.7716	+0.1332 0.6691
JUL.26 (OH) (2447733.5)	X:	-0.5419	+0.01172	+27.9330 4.565806	+0.04095 0.3222	+0.004619 2.6661	+0.2827 0.3821
A JUL.28 (OH)	Y:	+0.3521	+0.00361	+13.1376 0.070475	+0.02448 2.1116	+0.001810 5.5545	+0.1332 2.1733

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE: MIMAS				N=6.667	
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
JUL.28 (OH) (2447735.5)	X:	-0.5188	+0.01421	+27.8927 5.335492	+0.03667 1.5963	+0.004349 5.8702	+0.2825 1.8855
A JUL.30 (OH)	Y:	+0.3584	+0.00297	+13.1192 0.840967	+0.02364 2.8770	+0.000746 5.4485	+0.1327 3.6737
JUL.30 (OH) (2447737.5)	X:	-0.4923	+0.01335	+27.8452 6.104770	+0.03582 2.2539	+0.000321 3.0840	+0.2817 3.3841
A JUL.32 (OH)	Y:	+0.3650	+0.00196	+13.0986 1.611640	+0.01865 3.9161	+0.002022 3.0008	+0.1329 5.1767
AOU. 1 (OH) (2447739.5)	X:	-0.4644	+0.01270	+27.7909 0.590892	+0.02746 3.0885	+0.003646 3.1005	+0.2819 4.8867
A AOU. 3 (OH)	Y:	+0.3694	+0.00248	+13.0749 2.381816	+0.02084 4.5033	+0.001662 5.9191	+0.1324 0.3950
AOU. 3 (OH) (2447741.5)	X:	-0.4383	+0.01441	+27.7395 1.359903	+0.03681 3.8177	+0.003220 5.9265	+0.2812 0.1042
A AOU. 5 (OH)	Y:	+0.3738	+0.00196	+13.0493 3.152015	+0.02081 5.4024	+0.000742 0.5895	+0.1325 1.8977
AOU. 5 (OH) (2447743.5)	X:	-0.4100	+0.01380	+27.6837 2.128938	+0.03606 4.8109	+0.001249 1.7902	+0.2810 1.6065
A AOU. 7 (OH)	Y:	+0.3777	+0.00141	+13.0220 3.922064	+0.02214 0.0122	+0.000820 2.9042	+0.1322 3.4005
AOU. 7 (OH) (2447745.5)	X:	-0.3825	+0.01436	+27.6221 2.897775	+0.03161 5.6140	+0.000686 5.4552	+0.2804 3.1080
A AOU. 9 (OH)	Y:	+0.3804	+0.00149	+12.9917 4.692058	+0.02006 0.9480	+0.000880 5.8465	+0.1319 4.9038
AOU. 9 (OH) (2447747.5)	X:	-0.3547	+0.01492	+27.5585 3.666520	+0.02743 0.2067	+0.002397 6.1139	+0.2792 4.6099
A AOU.11 (OH)	Y:	+0.3837	+0.00053	+12.9575 5.461657	+0.01917 1.4814	+0.001941 2.6761	+0.1315 0.1218
AOU.11 (OH) (2447749.5)	X:	-0.3238	+0.01335	+27.4967 4.434815	+0.03713 0.6484	+0.005333 2.6151	+0.2789 6.1091
A AOU.13 (OH)	Y:	+0.3852	+0.00064	+12.9241 6.231295	+0.02079 2.4201	+0.000586 4.1388	+0.1309 1.6252
AOU.13 (OH) (2447751.5)	X:	-0.2959	+0.01496	+27.4313 5.203369	+0.03580 1.7490	+0.000979 5.4157	+0.2775 1.3276
A AOU.15 (OH)	Y:	+0.3856	+0.00083	+12.8901 0.717413	+0.02633 3.1885	+0.002381 5.7220	+0.1306 3.1233
AOU.15 (OH) (2447753.5)	X:	-0.2681	+0.01569	+27.3688 5.971709	+0.04515 2.6278	+0.003863 5.8618	+0.2773 2.8246
A AOU.17 (OH)	Y:	+0.3872	-0.00047	+12.8512 1.486981	+0.02180 4.2645	+0.001673 2.9042	+0.1302 4.6265
AOU.17 (OH) (2447755.5)	X:	-0.2368	+0.01373	+27.2928 0.456746	+0.03128 3.5244	+0.004135 2.9530	+0.2764 4.3264
A AOU.19 (OH)	Y:	+0.3871	-0.00042	+12.8121 2.256169	+0.02353 5.0258	+0.000199 3.9529	+0.1298 6.1242
AOU.19 (OH) (2447757.5)	X:	-0.2078	+0.01479	+27.2221 1.224785	+0.03721 4.2520	+0.001130 5.3015	+0.2761 5.8242
A AOU.21 (OH)	Y:	+0.3859	-0.00023	+12.7685 3.025173	+0.02088 5.7551	+0.001779 6.2374	+0.1296 1.3438
AOU.21 (OH) (2447759.5)	X:	-0.1786	+0.01510	+27.1480 1.992641	+0.03829 5.0121	+0.002276 0.1601	+0.2755 1.0426
A AOU.23 (OH)	Y:	+0.3851	-0.00110	+12.7259 3.794058	+0.02528 0.3112	+0.001162 2.5968	+0.1292 2.8438

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE: MIMAS				N=6.667	
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
ADU.23 (OH) (2447761.5)	X:	-0.1486	+0.01437	+27.0726 2.760443	+0.04201 5.9302	+0.001688 2.6244	+0.2748 2.5428
A ADU.25 (OH)	Y:	+0.3829	-0.00102	+12.6803 4.562885	+0.02478 1.2399	+0.000558 5.1709	+0.1287 4.3456
ADU.25 (OH) (2447763.5)	X:	-0.1205	+0.01539	+26.9908 3.528118	+0.03477 0.6169	+0.002904 5.7979	+0.2737 4.0424
A ADU.27 (OH)	Y:	+0.3808	-0.00152	+12.6324 5.331393	+0.02356 1.9841	+0.000477 2.5137	+0.1283 5.8470
ADU.27 (OH) (2447765.5)	X:	-0.0898	+0.01407	+26.9139 4.295421	+0.03760 1.1496	+0.002569 2.4617	+0.2731 5.5431
A ADU.29 (OH)	Y:	+0.3784	-0.00207	+12.5820 6.099790	+0.02067 2.7727	+0.001679 2.9257	+0.1274 1.0637
ADU.29 (OH) (2447767.5)	X:	-0.0598	+0.01382	+26.8320 5.062632	+0.03459 1.8700	+0.003387 2.8383	+0.2714 0.7572
A ADU.31 (OH)	Y:	+0.3739	-0.00144	+12.5351 0.584707	+0.02806 3.4548	+0.002379 5.6711	+0.1272 2.5635
ADU.31 (OH) (2447769.5)	X:	-0.0331	+0.01568	+26.7581 5.829957	+0.05132 2.8182	+0.005157 5.7998	+0.2712 2.2564
A SEP. 2 (OH)	Y:	+0.3702	-0.00225	+12.4831 1.352845	+0.02612 4.3524	+0.000177 5.4515	+0.1262 4.0627
SEP. 2 (OH) (2447771.5)	X:	-0.0034	+0.01398	+26.6733 0.313788	+0.04248 3.6506	+0.001111 3.0194	+0.2697 3.7537
A SEP. 4 (OH)	Y:	+0.3665	-0.00297	+12.4322 2.120981	+0.02995 5.3020	+0.001787 2.8499	+0.1261 5.5608
SEP. 4 (OH) (2447773.5)	X:	+0.0260	+0.01332	+26.5887 1.080842	+0.04379 4.6045	+0.002800 3.0824	+0.2697 5.2520
A SEP. 6 (OH)	Y:	+0.3608	-0.00234	+12.3767 2.888673	+0.02532 6.0092	+0.001695 6.0890	+0.1253 0.7775
SEP. 6 (OH) (2447775.5)	X:	+0.0531	+0.01456	+26.5052 1.847495	+0.04225 5.1937	+0.003317 6.0972	+0.2686 0.4676
A SEP. 8 (OH)	Y:	+0.3556	-0.00289	+12.3220 3.656333	+0.02789 0.5348	+0.000499 1.4681	+0.1250 2.2760
SEP. 8 (OH) (2447777.5)	X:	+0.0816	+0.01348	+26.4213 2.614186	+0.04834 6.0676	+0.001541 2.1189	+0.2681 1.9666
A SEP. 10 (OH)	Y:	+0.3498	-0.00323	+12.2662 4.423804	+0.02947 1.3262	+0.000836 3.2558	+0.1244 3.7762
SEP. 10 (OH) (2447779.5)	X:	+0.1084	+0.01377	+26.3333 3.380723	+0.04614 0.6851	+0.000925 5.1286	+0.2672 3.4651
A SEP. 12 (OH)	Y:	+0.3432	-0.00314	+12.2092 5.191163	+0.03050 2.1937	+0.000704 5.6504	+0.1239 5.2765
SEP. 12 (OH) (2447781.5)	X:	+0.1352	+0.01360	+26.2470 4.147090	+0.04648 1.5053	+0.001155 6.0472	+0.2660 4.9651
A SEP. 14 (OH)	Y:	+0.3373	-0.00390	+12.1486 5.958236	+0.02542 2.9901	+0.001713 2.7296	+0.1232 0.4911
SEP. 14 (OH) (2447783.5)	X:	+0.1638	+0.01197	+26.1592 4.913042	+0.03754 2.0617	+0.004938 2.7183	+0.2651 0.1775
A SEP. 16 (OH)	Y:	+0.3297	-0.00352	+12.0914 0.441976	+0.02931 3.7036	+0.000874 5.3389	+0.1225 1.9920
SEP. 16 (OH) (2447785.5)	X:	+0.1883	+0.01347	+26.0768 5.679261	+0.05026 2.9492	+0.002578 5.6111	+0.2639 1.6775
A SEP. 18 (OH)	Y:	+0.3218	-0.00343	+12.0326 1.208598	+0.02955 4.3729	+0.001998 5.8460	+0.1217 3.4870

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE: MIMAS				N=6.667	
		AO	A1	B0 FO	B1 F1	B2 F2	CO PO
SEP.18 (OH)	X:	+0.2131	+0.01333	+25.9944 0.161974	+0.05325 3.6457	+0.003264 5.8591	+0.2630 3.1711
(2447787.5)							
A SEP.20 (OH)	Y:	+0.3150	-0.00454	+11.9736 1.975526	+0.03394 5.3771	+0.001987 2.7439	+0.1212 4.9871
SEP.20 (OH)	X:	+0.2402	+0.01120	+25.9038 0.927992	+0.05104 4.7161	+0.004235 2.8933	+0.2623 4.6707
(2447789.5)							
A SEP.22 (OH)	Y:	+0.3068	-0.00416	+11.9132 2.741969	+0.03225 6.1073	+0.000156 6.1932	+0.1205 0.1989
SEP.22 (OH)	X:	+0.2640	+0.01220	+25.8191 1.693658	+0.05007 5.3580	+0.001408 5.8175	+0.2615 6.1655
(2447791.5)							
A SEP.24 (OH)	Y:	+0.2980	-0.00396	+11.8505 3.508362	+0.03035 0.6763	+0.001355 0.0087	+0.1201 1.6983
SEP.24 (OH)	X:	+0.2878	+0.01203	+25.7324 2.459226	+0.04974 6.1436	+0.001753 0.3585	+0.2610 1.3814
(2447793.5)							
A SEP.26 (OH)	Y:	+0.2897	-0.00463	+11.7899 4.274510	+0.03277 1.3706	+0.001221 2.8626	+0.1194 3.1954
SEP.26 (OH)	X:	+0.3116	+0.01114	+25.6470 3.224735	+0.05461 0.6569	+0.001690 2.9252	+0.2602 2.8787
(2447795.5)							
A SEP.28 (OH)	Y:	+0.2805	-0.00439	+11.7280 5.040625	+0.03463 2.2303	+0.000712 5.1640	+0.1188 4.6944
SEP.28 (OH)	X:	+0.3333	+0.01170	+25.5590 3.990182	+0.05526 1.5916	+0.002478 5.6431	+0.2590 4.3766
(2447797.5)							
A SEP.30 (OH)	Y:	+0.2718	-0.00477	+11.6642 5.806453	+0.03205 3.0388	+0.000523 2.4904	+0.1183 6.1922
SEP.30 (OH)	X:	+0.3571	+0.01011	+25.4737 4.755189	+0.04688 2.2358	+0.002902 2.6197	+0.2583 5.8738
(2447799.5)							
A OCT. 2 (OH)	Y:	+0.2628	-0.00495	+11.6008 0.289008	+0.03144 3.8686	+0.000949 2.9293	+0.1173 1.4075
OCT. 2 (OH)	X:	+0.3788	+0.01008	+25.3880 5.520277	+0.04667 3.0629	+0.001841 3.0268	+0.2566 1.0873
(2447801.5)							
A OCT. 4 (OH)	Y:	+0.2524	-0.00428	+11.5400 1.054296	+0.03212 4.4353	+0.002377 5.8029	+0.1168 2.9030
OCT. 4 (OH)	X:	+0.3976	+0.01140	+25.3123 0.002087	+0.05867 3.6588	+0.005358 5.8313	+0.2564 2.5824
(2447803.5)							
A OCT. 6 (OH)	Y:	+0.2432	-0.00505	+11.4773 1.819829	+0.03406 5.3524	+0.000544 2.4380	+0.1158 4.4011
OCT. 6 (OH)	X:	+0.4193	+0.00928	+25.2261 0.767045	+0.05439 4.6426	+0.002001 2.7910	+0.2548 4.0792
(2447805.5)							
A OCT. 8 (OH)	Y:	+0.2340	-0.00537	+11.4169 2.585170	+0.03803 6.1208	+0.001656 2.7706	+0.1155 5.8948
OCT. 8 (OH)	X:	+0.4396	+0.00882	+25.1450 1.531979	+0.05933 5.4509	+0.002329 2.9794	+0.2548 5.5737
(2447807.5)							
A OCT.10 (OH)	Y:	+0.2233	-0.00461	+11.3521 3.350275	+0.03313 0.7006	+0.001609 6.0825	+0.1147 1.1100
OCT.10 (OH)	X:	+0.4574	+0.00981	+25.0628 2.296550	+0.05112 6.1808	+0.003093 6.1568	+0.2537 0.7881
(2447809.5)							
A OCT.12 (OH)	Y:	+0.2135	-0.00507	+11.2903 4.115263	+0.03498 1.4297	+0.000419 2.2821	+0.1143 2.6049
OCT.12 (OH)	X:	+0.4762	+0.00853	+24.9839 3.061195	+0.05756 0.6520	+0.001611 2.4953	+0.2533 2.2844
(2447811.5)							
A OCT.14 (OH)	Y:	+0.2034	-0.00518	+11.2282 4.880082	+0.03561 2.1995	+0.000729 3.5930	+0.1136 4.1029

SATELLITES DE SATURNE

61

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE: MIMAS				N=6.667	
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
OCT. 14 (OH) (2447813.5)	X:	+0.4931	+0.00868	+24.9030 3.825772	+0.05910 1.5264	+0.001294 4.9504	+0.2524 3.7812
A OCT. 16 (OH)	Y:	+0.1931	-0.00500	+11.1662 5.644797	+0.03683 3.0143	+0.000645 5.8016	+0.1131 5.6003
OCT. 16 (OH) (2447815.5)	X:	+0.5101	+0.00819	+24.8249 4.590140	+0.05761 2.3059	+0.000547 5.9506	+0.2515 5.2792
A OCT. 18 (OH)	Y:	+0.1834	-0.00548	+11.1023 0.126176	+0.03401 3.8945	+0.001361 2.6195	+0.1122 0.8129
OCT. 18 (OH) (2447817.5)	X:	+0.5279	+0.00678	+24.7444 5.354268	+0.04658 3.1211	+0.004038 2.7393	+0.2503 0.4901
A OCT. 20 (OH)	Y:	+0.1725	-0.00490	+11.0425 0.890416	+0.03432 4.5356	+0.001147 5.7047	+0.1117 2.3108
OCT. 20 (OH) (2447819.5)	X:	+0.5415	+0.00822	+24.6750 6.118554	+0.05768 3.7361	+0.003550 5.7372	+0.2496 1.9881
A OCT. 22 (OH)	Y:	+0.1618	-0.00487	+10.9812 1.654537	+0.03248 5.2934	+0.001342 5.9879	+0.1107 3.8044
OCT. 22 (OH) (2447821.5)	X:	+0.5560	+0.00754	+24.6024 0.599426	+0.05497 4.4920	+0.002226 5.9522	+0.2484 3.4805
A OCT. 24 (OH)	Y:	+0.1525	-0.00570	+10.9234 2.418873	+0.03960 6.1063	+0.002208 2.7126	+0.1104 5.3010
OCT. 24 (OH) (2447823.5)	X:	+0.5719	+0.00557	+24.5282 1.363758	+0.06374 5.4574	+0.004454 2.8341	+0.2482 4.9778
A OCT. 26 (OH)	Y:	+0.1417	-0.00506	+10.8630 3.182809	+0.03590 0.6261	+0.000380 5.9704	+0.1095 0.5116
OCT. 26 (OH) (2447825.5)	X:	+0.5843	+0.00669	+24.4575 2.127657	+0.05583 6.1683	+0.001689 5.9464	+0.2472 0.1884
A OCT. 28 (OH)	Y:	+0.1310	-0.00485	+10.8029 3.946792	+0.03621 1.4737	+0.001081 6.1854	+0.1092 2.0076
OCT. 28 (OH) (2447827.5)	X:	+0.5968	+0.00627	+24.3867 2.891588	+0.05621 0.6810	+0.001195 0.4012	+0.2471 1.6855
A OCT. 30 (OH)	Y:	+0.1211	-0.00535	+10.7450 4.710458	+0.03549 2.1633	+0.001120 3.0440	+0.1085 3.5031
OCT. 30 (OH) (2447829.5)	X:	+0.6091	+0.00539	+24.3191 3.655478	+0.05937 1.4236	+0.001688 3.2364	+0.2463 3.1813
A OCT. 32 (OH)	Y:	+0.1105	-0.00499	+10.6875 5.474146	+0.03776 2.9709	+0.000740 5.3923	+0.1081 4.9997
NOV. 1 (OH) (2447831.5)	X:	+0.6195	+0.00577	+24.2513 4.419361	+0.06300 2.2866	+0.002261 5.5862	+0.2454 4.6784
A NOV. 3 (OH)	Y:	+0.1006	-0.00523	+10.6289 6.237659	+0.03608 3.8185	+0.000557 2.1368	+0.1075 0.2119
NOV. 3 (OH) (2447833.5)	X:	+0.6316	+0.00423	+24.1834 5.182881	+0.05163 3.0900	+0.002824 2.6064	+0.2449 6.1735
A NOV. 5 (OH)	Y:	+0.0905	-0.00517	+10.5724 0.717865	+0.03607 4.6056	+0.000485 2.7353	+0.1067 1.7092
NOV. 5 (OH) (2447835.5)	X:	+0.6412	+0.00448	+24.1204 5.946567	+0.05432 3.8541	+0.000604 3.4077	+0.2435 1.3873
A NOV. 7 (OH)	Y:	+0.0796	-0.00454	+10.5172 1.480834	+0.03184 5.2601	+0.002028 5.8780	+0.1062 3.2019
NOV. 7 (OH) (2447837.5)	X:	+0.6486	+0.00541	+24.0652 0.426857	+0.05458 4.3964	+0.004920 5.8801	+0.2433 2.8799
A NOV. 9 (OH)	Y:	+0.0702	-0.00523	+10.4637 2.244158	+0.03674 6.0890	+0.001105 2.5690	+0.1054 4.6992

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE: MIMAS				N=6.667	
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
NOV. 9 (OH) (2447839.5)	X:	+0.6587	+0.00318	+24.0027 1.190594	+0.06021 5.3921	+0.003003 2.7298	+0.2422 4.3771
A NOV. 11 (OH)	Y:	+0.0605	-0.00525	+10.4121 3.007194	+0.03766 0.5270	+0.001384 2.8103	+0.1050 6.1901
NOV. 11 (OH) (2447841.5)	X:	+0.6669	+0.00310	+23.9468 1.954193	+0.06190 6.1262	+0.001881 2.9587	+0.2421 5.8694
A NOV. 13 (OH)	Y:	+0.0499	-0.00447	+10.3575 3.770256	+0.03598 1.4538	+0.001629 5.9950	+0.1045 1.4042
NOV. 13 (OH) (2447843.5)	X:	+0.6729	+0.00396	+23.8878 2.717578	+0.05405 0.6936	+0.002967 6.1198	+0.2415 1.0838
A NOV. 15 (OH)	Y:	+0.0404	-0.00490	+10.3067 4.533100	+0.03561 2.1541	+0.000426 2.7653	+0.1040 2.8968
NOV. 15 (OH) (2447845.5)	X:	+0.6801	+0.00263	+23.8350 3.481047	+0.05765 1.3754	+0.001671 2.7977	+0.2412 2.5785
A NOV. 17 (OH)	Y:	+0.0307	-0.00487	+10.2562 5.295854	+0.03548 2.9267	+0.000554 3.8126	+0.1036 4.3935
NOV. 17 (OH) (2447847.5)	X:	+0.6852	+0.00279	+23.7816 4.244525	+0.06103 2.2110	+0.001493 4.9882	+0.2406 4.0751
A NOV. 19 (OH)	Y:	+0.0211	-0.00465	+10.2066 6.058567	+0.03654 3.7207	+0.000617 6.1629	+0.1031 5.8887
NOV. 19 (OH) (2447849.5)	X:	+0.6907	+0.00221	+23.7300 5.007818	+0.05779 3.0135	+0.000301 0.3127	+0.2402 5.5720
A NOV. 21 (OH)	Y:	+0.0120	-0.00494	+10.1569 0.538051	+0.03620 4.5959	+0.001141 2.4692	+0.1024 1.1007
NOV. 21 (OH) (2447851.5)	X:	+0.6964	+0.00114	+23.6771 5.771055	+0.05227 3.9180	+0.003185 2.7014	+0.2390 0.7832
A NOV. 23 (OH)	Y:	+0.0020	-0.00432	+10.1104 1.300323	+0.03267 5.2689	+0.001175 5.8108	+0.1021 2.5961
NOV. 23 (OH) (2447853.5)	X:	+0.6983	+0.00254	+23.6370 0.251100	+0.05337 4.4279	+0.003977 5.8095	+0.2389 2.2797
A NOV. 25 (OH)	Y:	-0.0072	-0.00438	+10.0640 2.062698	+0.03196 6.0749	+0.000693 6.1164	+0.1012 4.0899
NOV. 25 (OH) (2447855.5)	X:	+0.7016	+0.00150	+23.5919 1.014323	+0.05197 5.2763	+0.001001 6.1719	+0.2377 3.7730
A NOV. 27 (OH)	Y:	-0.0155	-0.00500	+10.0224 2.825145	+0.03683 0.4667	+0.002202 2.7510	+0.1011 5.5836
NOV. 27 (OH) (2447857.5)	X:	+0.7059	-0.00012	+23.5507 1.777840	+0.06395 6.0823	+0.004523 2.8224	+0.2380 5.2686
A NOV. 29 (OH)	Y:	-0.0250	-0.00424	+ 9.9776 3.587432	+0.03422 1.3556	+0.000725 5.7960	+0.1003 0.7946
NOV. 29 (OH) (2447859.5)	X:	+0.7066	+0.00116	+23.5086 2.540954	+0.05372 0.6313	+0.002158 5.9298	+0.2371 0.4800
A NOV. 31 (OH)	Y:	-0.0342	-0.00412	+ 9.9354 4.349795	+0.03555 2.1595	+0.000951 6.0544	+0.1002 2.2880
DEC. 1 (OH) (2447861.5)	X:	+0.7078	+0.00056	+23.4692 3.304211	+0.05517 1.4035	+0.000737 0.3240	+0.2374 1.9759
A DEC. 3 (OH)	Y:	-0.0425	-0.00453	+ 9.8947 5.111855	+0.03254 2.8890	+0.001005 3.1000	+0.0997 3.7833
DEC. 3 (OH) (2447863.5)	X:	+0.7088	-0.00023	+23.4336 4.067431	+0.05552 2.1237	+0.001657 3.4366	+0.2369 3.4719
A DEC. 5 (OH)	Y:	-0.0514	-0.00413	+ 9.8555 5.874029	+0.03453 3.6586	+0.000712 5.7046	+0.0995 5.2784

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE :				MIMAS	N=6.667
		AO	A1	B0 FO	B1 F1	B2 F2	CO PO
DEC. 5 (OH) (2447865.5)	X:	+0.7082	+0.00009	+23.3986 4.830700	+0.05961 2.9409	+0.002063 5.6629	+0.2365 4.9691
A DEC. 7 (OH)	Y:	-0.0595	-0.00431	+ 9.8162 0.352973	+0.03440 4.5160	+0.000661 1.9326	+0.0990 0.4898
DEC. 7 (OH) (2447867.5)	X:	+0.7090	-0.00128	+23.3619 5.593754	+0.05202 3.8644	+0.002726 2.5322	+0.2361 0.1806
A DEC. 9 (OH)	Y:	-0.0680	-0.00414	+ 9.7796 1.114960	+0.03346 5.2850	+0.000274 2.5306	+0.0986 1.9865
DEC. 9 (OH) (2447869.5)	X:	+0.7072	-0.00077	+23.3336 0.073760	+0.05258 4.5480	+0.000508 5.4021	+0.2354 1.6784
A DEC. 11 (OH)	Y:	-0.0768	-0.00363	+ 9.7434 1.876698	+0.02835 6.0626	+0.001598 5.8813	+0.0981 3.4784
DEC. 11 (OH) (2447871.5)	X:	+0.7039	-0.00018	+23.3091 0.836743	+0.04495 5.1796	+0.004156 5.9133	+0.2351 3.1705
A DEC. 13 (OH)	Y:	-0.0842	-0.00429	+ 9.7115 2.638788	+0.03291 0.4750	+0.001452 2.6783	+0.0978 4.9752
DEC. 13 (OH) (2447873.5)	X:	+0.7034	-0.00238	+23.2827 1.600195	+0.05830 6.0553	+0.003871 2.7373	+0.2347 4.6685
A DEC. 15 (OH)	Y:	-0.0920	-0.00411	+ 9.6801 3.400643	+0.03151 1.2246	+0.000968 2.9420	+0.0973 0.1825
DEC. 15 (OH) (2447875.5)	X:	+0.7004	-0.00204	+23.2607 2.363397	+0.05496 0.5169	+0.001196 3.0823	+0.2345 6.1605
A DEC. 17 (OH)	Y:	-0.1005	-0.00341	+ 9.6478 4.162762	+0.03362 2.1484	+0.001733 5.9323	+0.0972 1.6790
DEC. 17 (OH) (2447877.5)	X:	+0.6957	-0.00131	+23.2352 3.126591	+0.05244 1.4444	+0.002961 6.0590	+0.2346 1.3753
A DEC. 19 (OH)	Y:	-0.1079	-0.00388	+ 9.6189 4.924588	+0.03068 2.8646	+0.000499 2.8924	+0.0969 3.1713
DEC. 19 (OH) (2447879.5)	X:	+0.6923	-0.00269	+23.2176 3.889816	+0.05099 2.0882	+0.001833 2.9783	+0.2345 2.8701
A DEC. 21 (OH)	Y:	-0.1154	-0.00378	+ 9.5907 5.686473	+0.03043 3.6496	+0.000349 3.9131	+0.0967 4.6676
DEC. 21 (OH) (2447881.5)	X:	+0.6870	-0.00244	+23.1997 4.653126	+0.05496 2.8894	+0.001535 5.1282	+0.2343 4.3675
A DEC. 23 (OH)	Y:	-0.1229	-0.00356	+ 9.5642 0.165217	+0.03124 4.4237	+0.000635 0.2386	+0.0965 6.1623
DEC. 23 (OH) (2447883.5)	X:	+0.6823	-0.00304	+23.1824 5.416319	+0.05244 3.7417	+0.000495 1.2505	+0.2342 5.8642
A DEC. 25 (OH)	Y:	-0.1298	-0.00377	+ 9.5385 0.927193	+0.03219 5.2765	+0.001036 2.4083	+0.0961 1.3750
DEC. 25 (OH) (2447885.5)	X:	+0.6772	-0.00379	+23.1660 6.179578	+0.05230 4.6389	+0.002502 2.6512	+0.2334 1.0771
A DEC. 27 (OH)	Y:	-0.1376	-0.00319	+ 9.5147 1.688839	+0.02699 6.0492	+0.001097 5.7796	+0.0959 2.8693
DEC. 27 (OH) (2447887.5)	X:	+0.6689	-0.00247	+23.1605 0.659499	+0.04275 5.1943	+0.004102 5.8393	+0.2337 2.5728
A DEC. 29 (OH)	Y:	-0.1445	-0.00337	+ 9.4927 2.450764	+0.02771 0.5516	+0.000161 0.0707	+0.0954 4.3647
DEC. 29 (OH) (2447889.5)	X:	+0.6625	-0.00380	+23.1506 1.422861	+0.04733 6.0601	+0.000446 2.0552	+0.2328 4.0685
A DEC. 31 (OH)	Y:	-0.1506	-0.00382	+ 9.4753 3.212655	+0.02817 1.1494	+0.002014 2.8117	+0.0954 5.8570

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 DE SATURNE: MIMAS				N=6.667	
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
DEC.30 (OH)	X:	+0.6600	-0.00486	+23.1487	+0.05493	+0.004241	+0.2332
(2447890.5)				1.804694	0.1017	2.7487	4.8173
A DEC.32 (OH)	Y:	-0.1542	-0.00349	+ 9.4651	+0.02732	+0.000726	+0.0951
				3.593616	1.6127	3.0693	0.3204
DEC.32 (OH)	X:	+0.6520	-0.00430	+23.1445	+0.04997	+0.000784	+0.2330
(2447892.5)				2.568025	0.8910	3.3091	0.0268
A DEC.34 (OH)	Y:	-0.1615	-0.00284	+ 9.4463	+0.03080	+0.001791	+0.0951
				4.355829	2.5046	5.9217	1.8168

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 2 DE SATURNE: ENCELADE					N=4.586
		A0	A1	B0 F0	B1 F1	B2 F2	CO PO
JAN. 1 (OH) (2447527.5)	X:	-0.1911	+0.00001	+29.6537 0.261398	+0.07935 5.0115	+0.000341 0.8419	+0.0672 4.8590
A JAN. 17 (OH)	Y:	+0.0399	+0.00031	+13.4164 2.020417	+0.03032 0.2982	+0.000114 2.6778	+0.0303 0.3387
JAN. 17 (OH) (2447543.5)	X:	-0.1899	+0.00020	+29.8000 4.481361	+0.07530 3.1022	+0.000368 5.1589	+0.0678 0.6765
A FEV. 2 (OH)	Y:	+0.0443	+0.00039	+13.3742 6.246877	+0.02741 4.6673	+0.000131 0.6858	+0.0303 2.4454
FEV. 1 (OH) (2447558.5)	X:	-0.1868	+0.00009	+30.0958 4.121235	+0.07184 2.9097	+0.000379 5.0097	+0.0688 6.1849
A FEV. 17 (OH)	Y:	+0.0492	+0.00041	+13.3986 5.892589	+0.02451 4.4707	+0.000159 0.2604	+0.0305 1.6769
FEV. 17 (OH) (2447574.5)	X:	-0.1863	+0.00034	+30.5779 2.066325	+0.06786 1.0421	+0.000424 3.0835	+0.0703 2.0144
A MAR. 5 (OH)	Y:	+0.0553	+0.00035	+13.4937 3.843479	+0.02198 2.6551	+0.000174 4.5569	+0.0309 3.7950
MAR. 1 (OH) (2447586.5)	X:	-0.1817	+0.00010	+31.0425 0.528926	+0.06410 5.9403	+0.000459 1.5165	+0.0715 5.1753
A MAR. 17 (OH)	Y:	+0.0594	+0.00041	+13.6123 2.310063	+0.02108 1.3389	+0.000187 3.1888	+0.0313 0.6754
MAR. 17 (OH) (2447602.5)	X:	-0.1798	+0.00046	+31.7740 4.768240	+0.06079 4.1346	+0.000461 5.9305	+0.0735 1.0189
A AVR. 2 (OH)	Y:	+0.0655	+0.00045	+13.8353 0.270396	+0.02076 5.9002	+0.000189 1.2261	+0.0319 2.8048
AVR. 1 (OH) (2447617.5)	X:	-0.1739	+0.00051	+32.5512 4.429593	+0.05893 4.0287	+0.000498 5.8771	+0.0755 0.2702
A AVR. 17 (OH)	Y:	+0.0716	+0.00049	+14.1074 6.217545	+0.02170 5.8596	+0.000171 0.9657	+0.0327 2.0587
AVR. 17 (OH) (2447633.5)	X:	-0.1669	+0.00081	+33.4355 2.400168	+0.05631 2.2618	+0.000513 4.1049	+0.0777 2.4118
A MAI 3 (OH)	Y:	+0.0794	+0.00040	+14.4547 4.189533	+0.02369 4.0859	+0.000153 5.5157	+0.0337 4.2010
MAI 1 (OH) (2447647.5)	X:	-0.1553	+0.00081	+34.2002 3.772027	+0.05508 3.8891	+0.000502 5.9008	+0.0797 5.0758
A MAI 17 (OH)	Y:	+0.0852	+0.00046	+14.7927 5.561341	+0.02481 5.6406	+0.000139 0.8416	+0.0345 0.5831
MAI 17 (OH) (2447663.5)	X:	-0.1419	+0.00127	+35.0070 1.755882	+0.05135 2.1567	+0.000543 4.2260	+0.0816 0.9467
A JUN. 2 (OH)	Y:	+0.0920	+0.00042	+15.1883 3.543502	+0.02521 3.8043	+0.000133 5.7936	+0.0355 2.7346
JUN. 1 (OH) (2447678.5)	X:	-0.1233	+0.00142	+35.6232 1.441372	+0.04684 2.1508	+0.000559 4.3152	+0.0830 0.2196
A JUN. 17 (OH)	Y:	+0.0978	+0.00037	+15.5352 3.226253	+0.02356 3.6392	+0.000183 6.0089	+0.0363 2.0048
JUN. 17 (OH) (2447694.5)	X:	-0.1015	+0.00174	+36.0570 5.716877	+0.04071 0.5166	+0.000616 2.6883	+0.0838 2.3762
A JUL. 3 (OH)	Y:	+0.1036	+0.00016	+15.8371 1.214566	+0.01929 1.8253	+0.000241 4.4100	+0.0369 4.1573

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 2 DE SATURNE: ENCELADE					
		N=4.586					
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
JUL. 1 (OH)	X:	-0.0767	+0.00159	+36.2093 0.819379	+0.03463 2.3394	+0.000613 4.3357	+0.0840 5.0493
(2447708.5)							
A JUL. 17 (OH)	Y:	+0.1062	+0.00008	+16.0109 2.596207	+0.01408 3.4540	+0.000312 6.0222	+0.0372 0.5407
JUL. 17 (OH)	X:	-0.0503	+0.00177	+36.0955 5.094041	+0.03220 0.9485	+0.000637 2.6423	+0.0835 0.9164
(2447724.5)							
A AOU. 2 (OH)	Y:	+0.1070	-0.00001	+16.0821 0.583163	+0.00771 2.1345	+0.000334 4.2090	+0.0373 2.6871
AOU. 1 (OH)	X:	-0.0233	+0.00158	+35.7267 4.777899	+0.03578 1.2211	+0.000626 2.5259	+0.0823 0.1774
(2447739.5)							
A AOU. 17 (OH)	Y:	+0.1060	-0.00011	+16.0179 0.263132	+0.00901 3.0292	+0.000329 4.1097	+0.0370 1.9447
AOU. 17 (OH)	X:	+0.0009	+0.00164	+35.1039 2.758713	+0.04566 5.9534	+0.000566 0.7509	+0.0806 2.3116
(2447755.5)							
A SEP. 2 (OH)	Y:	+0.1035	-0.00030	+15.8201 4.524018	+0.01637 1.5721	+0.000288 2.2468	+0.0363 4.0768
SEP. 1 (OH)	X:	+0.0236	+0.00143	+34.3658 2.429275	+0.05585 5.9249	+0.000513 0.5808	+0.0787 1.5552
(2447770.5)							
A SEP. 17 (OH)	Y:	+0.0987	-0.00031	+15.5385 4.192800	+0.02367 1.4617	+0.000232 2.1664	+0.0356 3.3181
SEP. 17 (OH)	X:	+0.0448	+0.00112	+33.4958 0.394063	+0.06643 4.1242	+0.000419 5.0528	+0.0766 3.6704
(2447786.5)							
A OCT. 3 (OH)	Y:	+0.0940	-0.00045	+15.1666 2.157079	+0.02957 5.8650	+0.000188 0.3337	+0.0346 5.4344
OCT. 1 (OH)	X:	+0.0616	+0.00083	+32.7237 1.747818	+0.07365 5.6233	+0.000416 0.3912	+0.0747 0.0170
(2447800.5)							
A OCT. 17 (OH)	Y:	+0.0875	-0.00032	+14.8106 3.511912	+0.03402 1.0562	+0.000100 1.9153	+0.0338 1.7810
OCT. 17 (OH)	X:	+0.0742	+0.00096	+31.8828 5.980783	+0.07971 3.7342	+0.000338 4.8225	+0.0728 2.1183
(2447816.5)							
A NOV. 2 (OH)	Y:	+0.0815	-0.00039	+14.3939 1.463958	+0.03682 5.3904	+0.000065 0.3321	+0.0328 3.8852
NOV. 1 (OH)	X:	+0.0866	+0.00080	+31.1825 5.623633	+0.08407 3.5031	+0.000293 4.9016	+0.0711 1.3338
(2447831.5)							
A NOV. 17 (OH)	Y:	+0.0751	-0.00032	+14.0140 1.110169	+0.03791 5.1250	+0.000032 0.5543	+0.0319 3.1046
NOV. 17 (OH)	X:	+0.0976	+0.00065	+30.5591 3.562280	+0.08581 1.5696	+0.000265 3.1655	+0.0698 3.4253
(2447847.5)							
A DEC. 3 (OH)	Y:	+0.0700	-0.00044	+13.6398 5.336781	+0.03803 3.1452	+0.000051 5.8301	+0.0310 5.2022
DEC. 1 (OH)	X:	+0.1078	+0.00044	+30.1351 4.897517	+0.08664 3.0269	+0.000220 5.0740	+0.0689 6.0398
(2447861.5)							
A DEC. 17 (OH)	Y:	+0.0638	-0.00028	+13.3458 0.393574	+0.03658 4.5413	+0.000062 0.6338	+0.0304 1.5406
DEC. 17 (OH)	X:	+0.1144	+0.00073	+29.8115 2.831219	+0.08511 1.0825	+0.000264 3.2429	+0.0683 1.8483
(2447877.5)							
A DEC. 33 (OH)	Y:	+0.0585	-0.00032	+13.0573 4.616984	+0.03455 2.5541	+0.000087 5.1289	+0.0297 3.6385

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 3 DE SATURNE: TETHYS					N=3.328
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
JAN. 1 (OH)	X:	+0.0000	+0.00000	+36.6403 5.932759	+0.07038 4.4220	+0.000406 0.0457	+0.0029 2.3749
(2447527.5)							
A JAN. 17 (OH)	Y:	-0.0012	+0.00000	+16.8376 1.443536	+0.02529 5.7949	+0.000172 1.9442	+0.0014 4.1622
JAN. 17 (OH)	X:	+0.0000	+0.00000	+36.8198 2.602662	+0.06720 1.3049	+0.000441 3.1680	+0.0030 1.9909
(2447543.5)							
A FEV. 2 (OH)	Y:	-0.0012	+0.00000	+16.7371 4.404705	+0.02142 2.6615	+0.000193 5.0014	+0.0014 3.7858
FEV. 1 (OH)	X:	+0.0000	+0.00000	+37.1866 2.232516	+0.06475 1.1567	+0.000484 2.9596	+0.0031 1.2555
(2447558.5)							
A FEV. 17 (OH)	Y:	-0.0012	+0.00000	+16.7205 4.041762	+0.01791 2.5517	+0.000217 4.7041	+0.0014 3.0597
FEV. 17 (OH)	X:	-0.0001	+0.00000	+37.7803 5.193096	+0.06302 4.3810	+0.000523 6.0846	+0.0032 0.8881
(2447574.5)							
A MAR. 5 (OH)	Y:	-0.0012	+0.00000	+16.7894 0.726129	+0.01525 5.9246	+0.000235 1.4477	+0.0014 2.7224
MAR. 1 (OH)	X:	-0.0001	+0.00000	+38.3508 1.134017	+0.06294 0.5330	+0.000560 2.1701	+0.0033 5.3559
(2447586.5)							
A MAR. 17 (OH)	Y:	-0.0013	+0.00000	+16.9008 2.954768	+0.01503 2.2504	+0.000247 3.7314	+0.0015 0.8929
MAR. 17 (OH)	X:	-0.0001	+0.00000	+39.2563 4.105188	+0.06432 3.7975	+0.000595 5.3451	+0.0035 5.0190
(2447602.5)							
A AVR. 2 (OH)	Y:	-0.0013	+0.00000	+17.1293 5.930787	+0.01762 5.6970	+0.000249 0.5224	+0.0015 0.5511
AVR. 1 (OH)	X:	-0.0001	+0.00000	+40.2189 3.755597	+0.06741 3.7214	+0.000631 5.2272	+0.0037 4.3287
(2447617.5)							
A AVR. 17 (OH)	Y:	-0.0014	+0.00000	+17.4221 5.584255	+0.02212 5.6608	+0.000241 0.3229	+0.0016 6.1397
AVR. 17 (OH)	X:	-0.0001	+0.00000	+41.3116 0.457930	+0.07167 0.7066	+0.000656 2.2039	+0.0038 4.0161
(2447633.5)							
A MAI 3 (OH)	Y:	-0.0014	+0.00000	+17.8070 2.288063	+0.02743 2.5908	+0.000219 3.5633	+0.0017 5.8598
MAI 1 (OH)	X:	-0.0001	+0.00000	+42.2627 3.076468	+0.07581 3.5624	+0.000684 5.1148	+0.0041 2.9827
(2447647.5)							
A MAI 17 (OH)	Y:	-0.0015	+0.00000	+18.1864 4.906306	+0.03154 5.3627	+0.000197 0.2797	+0.0018 4.8155
MAI 17 (OH)	X:	-0.0001	+0.00000	+43.2607 6.075674	+0.07934 0.5431	+0.000709 2.1806	+0.0043 2.6876
(2447663.5)							
A JUN. 2 (OH)	Y:	-0.0016	+0.00000	+18.6363 1.620250	+0.03440 2.2359	+0.000202 3.8603	+0.0018 4.5222
JUN. 1 (OH)	X:	-0.0001	+0.00000	+44.0234 5.751090	+0.08108 0.4667	+0.000747 2.2228	+0.0044 2.0491
(2447678.5)							
A JUN. 17 (OH)	Y:	-0.0017	+0.00000	+19.0320 1.292276	+0.03481 2.0681	+0.000251 4.0574	+0.0018 3.8551
JUN. 17 (OH)	X:	-0.0001	+0.00000	+44.5627 2.476473	+0.08014 3.7497	+0.000789 5.6062	+0.0043 1.7954
(2447694.5)							
A JUL. 3 (OH)	Y:	-0.0017	+0.00000	+19.3738 4.296111	+0.03241 5.2832	+0.000320 1.1506	+0.0019 3.6353

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 3 DE SATURNE: TETHYS					N=3.328
		AO	A1	B0 FO	B1 F1	B2 F2	CO PO
JUL. 1 (OH)	X:	-0.0001	+0.00000	+44.7500	+0.07736	+0.000827	+0.0044
(2447708.5)				5.110174	0.3593	2.2757	0.7915
A JUL. 17 (OH)	Y:	-0.0017	+0.00000	+19.5649	+0.02871	+0.000372	+0.0020
				0.641979	1.8800	4.0299	2.5686
JUL. 17 (OH)	X:	-0.0001	+0.00000	+44.6119	+0.07260	+0.000843	+0.0043
(2447724.5)				1.835756	3.6942	5.6039	0.4930
A AOU. 2 (OH)	Y:	-0.0018	+0.00000	+19.6271	+0.02432	+0.000395	+0.0019
				3.645405	5.2903	0.9766	2.3176
AOU. 1 (OH)	X:	-0.0001	+0.00000	+44.1599	+0.06856	+0.000830	+0.0042
(2447739.5)				1.511390	3.7096	5.5588	6.1165
A AOU. 17 (OH)	Y:	-0.0017	+0.00000	+19.5241	+0.02262	+0.000384	+0.0019
				3.316472	5.4568	0.8517	1.6510
AOU. 17 (OH)	X:	-0.0001	+0.00000	+43.3920	+0.06617	+0.000777	+0.0040
(2447755.5)				4.510509	0.8070	2.5321	5.8616
A SEP. 2 (OH)	Y:	-0.0017	+0.00000	+19.2546	+0.02454	+0.000342	+0.0018
				0.028429	2.6794	4.0560	1.3611
SEP. 1 (OH)	X:	-0.0001	+0.00000	+42.4851	+0.06672	+0.000701	+0.0038
(2447770.5)				4.173701	0.8190	2.4364	5.1653
A SEP. 17 (OH)	Y:	-0.0016	+0.00000	+18.8820	+0.02846	+0.000288	+0.0017
				5.972167	2.7003	3.9264	0.6816
SEP. 17 (OH)	X:	-0.0001	+0.00000	+41.4130	+0.06926	+0.000610	+0.0037
(2447786.5)				0.874221	4.1323	5.6594	4.8343
A OCT. 3 (OH)	Y:	-0.0015	+0.00001	+18.3974	+0.03269	+0.000229	+0.0016
				2.671168	5.9515	0.8516	0.3550
OCT. 1 (OH)	X:	+0.0000	+0.00000	+40.4595	+0.07225	+0.000528	+0.0035
(2447800.5)				3.478197	0.7013	2.2102	3.7404
A OCT. 17 (OH)	Y:	-0.0014	+0.00000	+17.9335	+0.03573	+0.000177	+0.0015
				5.274926	2.4481	3.7043	5.5568
OCT. 17 (OH)	X:	-0.0001	+0.00000	+39.4241	+0.07511	+0.000450	+0.0033
(2447816.5)				0.163817	3.9104	5.4377	3.4225
A NOV. 2 (OH)	Y:	-0.0014	+0.00000	+17.3916	+0.03785	+0.000133	+0.0015
				1.961493	5.5737	0.7148	5.2004
NOV. 1 (OH)	X:	-0.0001	+0.00000	+38.5584	+0.07688	+0.000393	+0.0032
(2447831.5)				6.082688	3.7431	5.3555	2.6859
A NOV. 17 (OH)	Y:	-0.0013	+0.00000	+16.8976	+0.03866	+0.000104	+0.0014
				1.599113	5.3312	0.7997	4.4695
NOV. 17 (OH)	X:	+0.0000	+0.00000	+37.7907	+0.07735	+0.000364	+0.0031
(2447847.5)				2.756870	0.6055	2.3228	2.2943
A DEC. 3 (OH)	Y:	-0.0012	+0.00000	+16.4065	+0.03821	+0.000097	+0.0013
				4.559493	2.1163	4.2629	4.0901
DEC. 1 (OH)	X:	+0.0000	+0.00000	+37.2733	+0.07663	+0.000354	+0.0030
(2447861.5)				5.341475	3.3483	5.1644	1.1741
A DEC. 17 (OH)	Y:	-0.0012	+0.00000	+16.0188	+0.03685	+0.000108	+0.0013
				0.864199	4.7890	0.9505	3.0042
DEC. 17 (OH)	X:	+0.0000	+0.00000	+36.8774	+0.07470	+0.000366	+0.0030
(2447877.5)				2.010065	0.1948	2.0807	0.7970
A DEC. 33 (OH)	Y:	-0.0011	+0.00000	+15.6341	+0.03429	+0.000130	+0.0013
				3.820268	1.5528	4.1546	2.6088

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 4 DE SATURNE: DIONE				N=2.296	
		A0	A1	B0 F0	B1 F1	B2 F2	C0 P0
JAN. 1 (OH)	X:	-0.1560	-0.00006	+47.0129	+0.11798	+0.000450	+0.0539
(2447527.5)				1.074925	5.8347	1.4447	0.3616
A JAN. 17 (OH)	Y:	+0.0176	-0.00002	+21.2798	+0.04530	+0.000193	+0.0243
				2.833578	1.0959	3.3594	2.1226
JAN. 17 (OH)	X:	-0.1572	-0.00009	+47.2465	+0.11437	+0.000491	+0.0543
(2447543.5)				0.072780	4.9910	0.6218	4.6519
A FEV. 2 (OH)	Y:	+0.0172	-0.00001	+21.2137	+0.04171	+0.000225	+0.0242
				1.837936	0.2463	2.4352	0.1380
FEV. 1 (OH)	X:	-0.1588	-0.00015	+47.7185	+0.11050	+0.000537	+0.0549
(2447558.5)				3.062854	1.8583	3.7631	4.3591
A FEV. 17 (OH)	Y:	+0.0170	+0.00000	+21.2508	+0.03821	+0.000250	+0.0243
				4.833903	3.4155	5.4978	6.1342
FEV. 17 (OH)	X:	-0.1614	-0.00020	+48.4814	+0.10613	+0.000587	+0.0559
(2447574.5)				2.067530	1.0504	2.9602	2.3761
A MAR. 5 (OH)	Y:	+0.0170	+0.00003	+21.4015	+0.03499	+0.000277	+0.0246
				3.844404	2.6550	4.5656	4.1553
MAR. 1 (OH)	X:	-0.1637	-0.00025	+49.2143	+0.10271	+0.000645	+0.0569
(2447586.5)				4.466106	3.5996	5.4830	0.8918
A MAR. 17 (OH)	Y:	+0.0172	+0.00005	+21.5911	+0.03337	+0.000297	+0.0248 *
				6.246825	5.2628	0.7286	2.6764
MAR. 17 (OH)	X:	-0.1676	-0.00027	+50.3757	+0.09811	+0.000687	+0.0583
(2447602.5)				3.480931	2.8382	4.7107	5.2049
A AVR. 2 (OH)	Y:	+0.0180	+0.00007	+21.9449	+0.03302	+0.000304	+0.0253
				5.265849	4.5883	6.1337	0.7069
AVR. 1 (OH)	X:	-0.1718	-0.00026	+51.6097	+0.09437	+0.000759	+0.0599
(2447617.5)				0.207558	6.0746	1.6792	4.9313
A AVR. 17 (OH)	Y:	+0.0192	+0.00010	+22.3763	+0.03457	+0.000301	+0.0260
				1.995202	1.5985	3.0185	0.4390
AVR. 17 (OH)	X:	-0.1764	-0.00022	+53.0106	+0.08988	+0.000798	+0.0617
(2447633.5)				5.519758	5.3707	0.9717	2.9774
A MAI 3 (OH)	Y:	+0.0208	+0.00014	+22.9267	+0.03731	+0.000279	+0.0266
				1.025630	0.8925	2.2957	4.7639
MAI 1 (OH)	X:	-0.1799	-0.00020	+54.2286	+0.08626	+0.000846	+0.0631
(2447647.5)				6.247216	0.0675	1.9839	4.4088
A MAI 17 (OH)	Y:	+0.0229	+0.00016	+23.4604	+0.03961	+0.000255	+0.0274
				1.752970	1.8181	3.4003	6.2014
MAI 17 (OH)	X:	-0.1836	-0.00011	+55.5069	+0.08117	+0.000877	+0.0648
(2447663.5)				5.290157	5.7081	1.3651	2.4689
A JUN. 2 (OH)	Y:	+0.0256	+0.00020	+24.0873	+0.04037	+0.000263	+0.0281
				0.794256	1.0591	2.9932	4.2512
JUN. 1 (OH)	X:	-0.1856	-0.00004	+56.4824	+0.07618	+0.000925	+0.0659
(2447678.5)				2.042224	2.7841	4.7613	2.2185
A JUN. 17 (OH)	Y:	+0.0285	+0.00023	+24.6371	+0.03847	+0.000322	+0.0289
				3.826681	4.2800	0.2677	4.0037
JUN. 17 (OH)	X:	-0.1861	+0.00005	+57.1717	+0.06993	+0.000967	+0.0670
(2447694.5)				1.095167	2.2237	4.1774	0.2857
A JUL. 3 (OH)	Y:	+0.0321	+0.00022	+25.1160	+0.03279	+0.000405	+0.0294
				2.875596	3.5627	5.9606	2.0624

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 4 DE SATURNE: DIONE				N=2.296	
		AO	A1	B0 FO	B1 F1	B2 F2	CO PO
JUL. 1 (OH) (2447708.5)	X:	-0.1852	+0.00019	+57.4091 1.838824	+0.06552 3.3542	+0.001003 5.2450	+0.0671 1.7318
A JUL. 17 (OH)	Y:	+0.0351	+0.00022	+25.3933 3.615297	+0.02580 4.6004	+0.000466 0.6710	+0.0299 3.5086
JUL. 17 (OH) (2447724.5)	X:	-0.1820	+0.00028	+57.2289 0.892782	+0.06309 2.8994	+0.001011 4.6207	+0.0670 6.0798
A AOU. 2 (OH)	Y:	+0.0384	+0.00017	+25.5066 2.664717	+0.01850 4.2493	+0.000488 6.2322	+0.0299 1.5658
AOU. 1 (OH) (2447739.5)	X:	-0.1777	+0.00036	+56.6459 3.929754	+0.06604 0.1188	+0.001000 1.6659	+0.0661 5.8290
A AOU. 17 (OH)	Y:	+0.0411	+0.00012	+25.4041 5.697906	+0.01854 1.8135	+0.000471 3.1943	+0.0298 1.3118
AOU. 17 (OH) (2447755.5)	X:	-0.1721	+0.00040	+55.6574 2.974869	+0.07384 5.8884	+0.000932 0.9684	+0.0652 3.8804
A SEP. 2 (OH)	Y:	+0.0431	+0.00008	+25.0897 4.739912	+0.02600 1.4587	+0.000418 2.4425	+0.0294 5.6458
SEP. 1 (OH) (2447770.5)	X:	-0.1662	+0.00038	+54.4915 6.000048	+0.08443 2.9631	+0.000846 4.2531	+0.0636 3.6180
A SEP. 17 (OH)	Y:	+0.0442	+0.00005	+24.6416 1.480139	+0.03468 4.7925	+0.000347 5.6864	+0.0288 5.3779
SEP. 17 (OH) (2447786.5)	X:	-0.1599	+0.00031	+53.1122 5.030264	+0.09549 2.2753	+0.000739 3.5139	+0.0621 1.6501
A OCT. 3 (OH)	Y:	+0.0448	+0.00000	+24.0528 0.509868	+0.04251 4.0339	+0.000280 4.9448	+0.0281 3.4166
OCT. 1 (OH) (2447800.5)	X:	-0.1553	+0.00030	+51.8863 5.745840	+0.10450 3.1920	+0.000643 4.4638	+0.0606 3.0676
A OCT. 17 (OH)	Y:	+0.0448	+0.00000	+23.4874 1.226235	+0.04784 4.8920	+0.000213 5.9063	+0.0275 4.8299
OCT. 17 (OH) (2447816.5)	X:	-0.1503	+0.00021	+50.5535 4.761270	+0.11217 2.4032	+0.000544 3.7094	+0.0592 1.0860
A NOV. 2 (OH)	Y:	+0.0444	-0.00004	+22.8273 0.243953	+0.05173 4.0395	+0.000161 5.2299	+0.0266 2.8552
NOV. 1 (OH) (2447831.5)	X:	-0.1468	+0.00016	+49.4392 1.476008	+0.11767 5.5626	+0.000463 0.7116	+0.0579 0.7958
A NOV. 17 (OH)	Y:	+0.0437	-0.00006	+22.2271 3.245236	+0.05374 0.8647	+0.000115 2.4241	+0.0259 2.5654
NOV. 17 (OH) (2447847.5)	X:	-0.1443	+0.00013	+48.4493 0.479709	+0.12076 4.7212	+0.000421 6.2831	+0.0568 5.0859
A DEC. 3 (OH)	Y:	+0.0427	-0.00006	+21.6337 2.253718	+0.05401 6.2530	+0.000112 1.9624	+0.0252 0.5819
DEC. 1 (OH) (2447861.5)	X:	-0.1425	+0.00005	+47.7803 1.175452	+0.12188 5.5471	+0.000402 0.9590	+0.0560 0.2013
A DEC. 17 (OH)	Y:	+0.0418	-0.00006	+21.1681 2.954472	+0.05293 0.7527	+0.000122 3.0885	+0.0247 1.9822
DEC. 17 (OH) (2447877.5)	X:	-0.1419	+0.00002	+47.2663 0.172976	+0.12115 4.6886	+0.000410 0.1924	+0.0556 4.4882
A DEC. 33 (OH)	Y:	+0.0407	-0.00005	+20.7109 1.958535	+0.05042 6.1281	+0.000155 2.3227	+0.0242 6.2779

SATELLITES DE SATURNE

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 5 DE SATURNE :				RHEA	N=1.391
		A0	A1	B0 FO	B1 F1	B2 F2	C0 PO
JAN. 1 (OH) (2447527.5)	X:	-0.1001	+0.00009	+65.6738 2.564903	+0.15615 1.0445	+0.000627 2.8552	+0.0335 3.7623
A JAN. 17 (OH)	Y:	-0.0187	-0.00007	+29.9344 4.315157	+0.05940 2.5767	+0.000266 4.7409	+0.0152 5.5162
JAN. 17 (OH) (2447543.5)	X:	-0.0988	+0.00005	+65.9993 5.934236	+0.15265 4.5782	+0.000680 0.1280	+0.0335 4.2526
A FEV. 2 (OH)	Y:	-0.0199	-0.00008	+29.8519 1.407970	+0.05508 6.1113	+0.000306 1.9402	+0.0151 6.0120
FEV. 1 (OH) (2447558.5)	X:	-0.0979	+0.00001	+66.6581 1.633993	+0.14898 0.4433	+0.000745 2.3114	+0.0335 1.9637
A FEV. 17 (OH)	Y:	-0.0211	-0.00007	+29.9143 3.396969	+0.05100 1.9982	+0.000350 4.0224	+0.0150 3.7310
FEV. 17 (OH) (2447574.5)	X:	-0.0978	+0.00000	+67.7236 5.009521	+0.14394 4.0082	+0.000818 5.8628	+0.0338 2.4630
A MAR. 5 (OH)	Y:	-0.0225	-0.00007	+30.1361 0.495286	+0.04718 5.6189	+0.000386 1.1847	+0.0150 4.2334
MAR. 1 (OH) (2447586.5)	X:	-0.0979	-0.00005	+68.7457 2.832093	+0.14027 1.9857	+0.000885 3.8469	+0.0340 4.4055
A MAR. 17 (OH)	Y:	-0.0234	-0.00007	+30.4090 4.605012	+0.04561 3.6575	+0.000411 5.3695	+0.0150 6.1820
MAR. 17 (OH) (2447602.5)	X:	-0.0988	-0.00011	+70.3673 6.217399	+0.13497 5.5951	+0.000971 1.1632	+0.0347 4.9114
A AVR. 2 (OH)	Y:	-0.0246	-0.00006	+30.9153 1.711467	+0.04573 1.0701	+0.000428 2.5854	+0.0152 0.4069
AVR. 1 (OH) (2447617.5)	X:	-0.1003	-0.00012	+72.0906 1.936148	+0.13033 1.5455	+0.001062 3.4051	+0.0352 2.6370
A AVR. 17 (OH)	Y:	-0.0257	-0.00005	+31.5280 3.716236	+0.04839 3.3561	+0.000421 4.7530	+0.0154 4.4187
AVR. 17 (OH) (2447633.5)	X:	-0.1026	-0.00018	+74.0466 5.335518	+0.12503 5.2160	+0.001139 0.7809	+0.0359 3.1597
A MAI 3 (OH)	Y:	-0.0265	-0.00004	+32.3073 0.833932	+0.05257 0.7358	+0.000398 2.1288	+0.0157 4.9409
MAI 1 (OH) (2447647.5)	X:	-0.1047	-0.00021	+75.7477 5.960105	+0.12104 6.1006	+0.001206 1.6858	+0.0366 4.4032
A MAI 17 (OH)	Y:	-0.0272	-0.00001	+33.0605 1.458462	+0.05601 1.5589	+0.000379 3.1165	+0.0160 6.1848
MAI 17 (OH) (2447663.5)	X:	-0.1083	-0.00016	+77.5327 3.090446	+0.11591 3.5519	+0.001265 5.4301	+0.0375 4.9236
A JUN. 2 (OH)	Y:	-0.0277	+0.00000	+33.9431 4.870372	+0.05746 5.1785	+0.000389 0.7677	+0.0164 0.4185
JUN. 1 (OH) (2447678.5)	X:	-0.1107	-0.00020	+78.8964 5.118268	+0.11117 5.9069	+0.001318 1.5111	+0.0379 2.6804
A JUN. 17 (OH)	Y:	-0.0276	+0.00002	+34.7149 0.612213	+0.05536 1.1162	+0.000473 3.2781	+0.0167 4.4576
JUN. 17 (OH) (2447694.5)	X:	-0.1141	-0.00009	+79.8590 2.259166	+0.10598 3.4239	+0.001364 5.3045	+0.0388 3.2234
A JUL. 3 (OH)	Y:	-0.0275	+0.00004	+35.3852 4.032276	+0.04850 4.7869	+0.000577 0.7837	+0.0173 4.9921

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 5 DE SATURNE:				RHEA	N=1.391
		AO	A1	BO FO	B1 F1	B2 F2	CO PO
JUL. 1 (OH) (2447708.5)	X:	-0.1158	-0.00006	+80.1910 2.900911	+0.10212 4.4209	+0.001405 6.2646	+0.0391 4.4834
A JUL.17 (OH)	Y:	-0.0267	+0.00005	+35.7708 4.670036	+0.04018 5.7298	+0.000651 1.6850	+0.0175 6.2489
JUL.17 (OH) (2447724.5)	X:	-0.1167	+0.00003	+79.9398 0.043554	+0.09965 1.9958	+0.001405 3.7380	+0.0387 5.0269
A ADU. 2 (OH)	Y:	-0.0259	+0.00008	+35.9246 1.808137	+0.03179 3.4010	+0.000680 5.3490	+0.0175 0.5067
ADU. 1 (OH) (2447739.5)	X:	-0.1168	+0.00007	+79.1256 2.074414	+0.10163 4.4373	+0.001378 6.0757	+0.0386 2.7912
A ADU.17 (OH)	Y:	-0.0246	+0.00006	+35.7763 3.835225	+0.03102 6.0888	+0.000649 1.3125	+0.0175 4.5499
ADU.17 (OH) (2447755.5)	X:	-0.1154	+0.00015	+77.7453 5.492099	+0.10777 1.9819	+0.001298 3.4832	+0.0380 3.3210
A SEP. 2 (OH)	Y:	-0.0236	+0.00007	+35.3301 0.966630	+0.03845 3.7855	+0.000578 4.9552	+0.0173 5.0782
SEP. 1 (OH) (2447770.5)	X:	-0.1135	+0.00018	+76.1160 1.228538	+0.11729 4.3379	+0.001188 5.7669	+0.0371 1.0741
A SEP.17 (OH)	Y:	-0.0224	+0.00004	+34.6981 2.984538	+0.04817 6.1442	+0.000485 0.9185	+0.0169 2.8298
SEP.17 (OH) (2447786.5)	X:	-0.1104	+0.00022	+74.1894 4.631772	+0.12808 1.7585	+0.001054 3.1199	+0.0364 1.6009
A OCT. 3 (OH)	Y:	-0.0218	+0.00004	+33.8698 0.104166	+0.05736 3.5066	+0.000393 4.5620	+0.0166 3.3568
OCT. 1 (OH) (2447800.5)	X:	-0.1077	+0.00024	+72.4763 5.246820	+0.13756 2.5967	+0.000925 3.9595	+0.0355 2.8383
A OCT.17 (OH)	Y:	-0.0213	+0.00002	+33.0761 0.720088	+0.06368 4.2839	+0.000317 5.4323	+0.0162 4.5959
OCT.17 (OH) (2447816.5)	X:	-0.1038	+0.00022	+70.6148 2.352174	+0.14640 6.2030	+0.000795 1.3110	+0.0343 3.3497
A NOV. 2 (OH)	Y:	-0.0210	+0.00000	+32.1510 4.111043	+0.06839 1.5428	+0.000241 2.8472	+0.0156 5.1105
NOV. 1 (OH) (2447831.5)	X:	-0.1005	+0.00023	+69.0569 4.344675	+0.15250 2.0914	+0.000703 3.5385	+0.0335 1.0757
A NOV.17 (OH)	Y:	-0.0211	+0.00000	+31.3117 6.107066	+0.07067 3.6583	+0.000193 5.2272	+0.0151 2.8404
NOV.17 (OH) (2447847.5)	X:	-0.0969	+0.00020	+67.6732 1.438054	+0.15682 5.6409	+0.000634 0.8994	+0.0326 1.5711
A DEC. 3 (OH)	Y:	-0.0213	-0.00002	+30.4831 3.205397	+0.07097 0.8687	+0.000175 2.7950	+0.0146 3.3416
DEC. 1 (OH) (2447861.5)	X:	-0.0940	+0.00019	+66.7381 2.032829	+0.15863 0.0956	+0.000594 1.7345	+0.0319 2.7908
A DEC.17 (OH)	Y:	-0.0218	-0.00002	+29.8347 3.805382	+0.06955 1.5603	+0.000183 3.7719	+0.0142 4.5672
DEC.17 (OH) (2447877.5)	X:	-0.0911	+0.00018	+66.0188 5.402699	+0.15862 3.6215	+0.000596 5.3288	+0.0315 3.2853
A DEC.33 (OH)	Y:	-0.0224	-0.00004	+29.1998 0.898816	+0.06623 5.0366	+0.000213 1.1250	+0.0138 5.0675

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES				
		DU SATELLITE 6 DE SATURNE:			TITAN	N=0.394
		AO	A1	BO FO	B1 F1	CO PO
JAN. 1 (OH) (2447527.5)	X:	- 5.8059	+ 0.22978	+152.3921 4.138330	+ 0.22471 1.6079	+2.2933 0.9540
A JAN. 12 (OH)	Y:	+ 1.1275	- 0.45224	+ 69.7092 5.878990	+ 0.39609 2.8518	+1.0989 2.6797
JAN. 12 (OH) (2447538.5)	X:	- 3.0963	- 0.21988	+151.0847 2.189033	+ 0.62477 1.2169	+1.8813 3.3575
A JAN. 23 (OH)	Y:	+ 0.9835	- 0.45947	+ 68.9598 3.978322	+ 0.51220 2.5901	+0.7467 5.1579
JAN. 23 (OH) (2447549.5)	X:	- 1.1874	- 0.60706	+152.7280 0.175533	+ 0.24068 2.3317	+2.1160 5.9599
A FEV. 3 (OH)	Y:	+ 0.0219	- 0.30937	+ 66.0231 1.970576	+ 0.21380 2.4634	+1.0203 1.4400
FEV. 1 (OH) (2447558.5)	X:	-10.5504	+ 1.02738	+152.8012 3.691619	+ 0.56784 5.7131	+2.3336 0.0899
A FEV. 12 (OH)	Y:	- 0.1610	- 0.19361	+ 68.8091 5.488779	+ 0.15562 2.5919	+1.0411 1.9514
FEV. 12 (OH) (2447569.5)	X:	- 9.2014	+ 0.86980	+160.8084 1.771095	+ 0.95655 6.2439	+1.7903 2.7285
A FEV. 23 (OH)	Y:	+ 0.8309	- 0.39415	+ 68.8750 3.576129	+ 0.44911 2.3459	+0.7774 4.3917
FEV. 23 (OH) (2447580.5)	X:	- 7.1831	+ 0.51287	+155.6597 6.089517	+ 0.72829 5.7988	+2.4639 5.1380
A MAR. 6 (OH)	Y:	+ 0.9635	- 0.44613	+ 65.8805 1.566961	+ 0.37030 2.2024	+1.0519 0.7207
MAR. 1 (OH) (2447586.5)	X:	- 2.0094	- 0.39053	+156.7598 2.163985	+ 0.73297 1.6789	+1.9936 3.3723
A MAR. 12 (OH)	Y:	+ 0.5877	- 0.43754	+ 69.8865 3.967197	+ 0.47534 2.7986	+0.7767 5.2048
MAR. 12 (OH) (2447597.5)	X:	- 0.5179	- 0.71356	+161.2165 0.156096	+ 0.40178 1.8866	+2.2256 6.0140
A MAR. 23 (OH)	Y:	- 0.3848	- 0.27606	+ 68.1189 1.968256	+ 0.27242 2.5208	+1.0425 1.4946
MAR. 23 (OH) (2447608.5)	X:	+ 0.8959	- 1.02586	+170.5953 4.523924	+ 0.90588 2.7527	+2.8254 1.8847
A AVR. 3 (OH)	Y:	- 1.5089	- 0.09694	+ 71.2669 0.012005	+ 0.09237 4.3303	+1.1227 3.6531
AVR. 1 (OH) (2447617.5)	X:	- 8.5976	+ 0.76465	+171.1011 1.774702	+ 0.70375 0.1584	+1.9628 2.7835
A AVR. 12 (OH)	Y:	+ 0.9051	- 0.45476	+ 72.1368 3.594703	+ 0.47174 2.5979	+0.8141 4.4608
AVR. 12 (OH) (2447628.5)	X:	- 6.7446	+ 0.42679	+167.8066 6.102440	+ 0.73720 6.1871	+2.6319 5.2236
A AVR. 23 (OH)	Y:	+ 0.9888	- 0.49052	+ 69.6177 1.593484	+ 0.50068 2.3021	+1.1248 0.8142
AVR. 23 (OH) (2447639.5)	X:	- 3.9184	- 0.09997	+175.1182 4.143522	+ 0.02393 2.2681	+2.7471 1.1395
A MAI 4 (OH)	Y:	+ 0.7876	- 0.49233	+ 75.8487 5.905913	+ 0.31020 2.5114	+1.2210 2.8585

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES				
		DU SATELLITE 6 DE SATURNE :			TITAN	N=0.394
		A0	A1	BO FO	B1 F1	CO PO
MAI 1 (OH) (2447647.5)	X:	- 6.8619	+ 0.15142	+177.4712 1.016005	+ 0.04545 5.8820	+2.2447 1.3293
A MAI 12 (OH)	Y:	- 4.2453	+ 0.46046	+ 76.7003 2.778474	+ 0.28392 5.6251	+0.9382 3.2147
MAI 12 (OH) (2447658.5)	X:	- 9.8225	+ 0.66494	+174.4592 5.371143	+ 0.87668 5.4597	+2.8835 3.7262
A MAI 23 (OH)	Y:	- 3.6827	+ 0.38179	+ 77.0800 0.888831	+ 0.36963 0.0348	+1.2909 5.4480
MAI 23 (OH) (2447669.5)	X:	-12.2563	+ 1.11780	+180.2652 3.372834	+ 1.10158 5.2700	+2.8083 5.8491
A JUN. 3 (OH)	Y:	- 2.4843	+ 0.18192	+ 76.6494 5.195340	+ 0.32221 6.1357	+1.1110 1.3875
JUN. 1 (OH) (2447678.5)	X:	- 0.4677	- 1.02398	+181.2926 0.653663	+ 1.05116 2.4938	+2.5382 0.7607
A JUN. 12 (OH)	Y:	- 4.3297	+ 0.40175	+ 80.5658 2.448817	+ 0.28483 5.1107	+0.9961 2.5079
JUN. 12 (OH) (2447689.5)	X:	- 3.5055	- 0.55519	+187.2945 5.040636	+ 0.27981 3.0259	+3.0520 2.9503
A JUN. 23 (OH)	Y:	- 4.8895	+ 0.53738	+ 80.8427 0.574454	+ 0.42566 5.8718	+1.3945 4.7827
JUN. 23 (OH) (2447700.5)	X:	- 7.3203	+ 0.08216	+184.2046 3.089641	+ 0.60107 4.4633	+2.6009 5.2455
A JUL. 4 (OH)	Y:	- 4.8100	+ 0.56496	+ 77.3214 4.872221	+ 0.59746 5.8083	+1.0934 0.6446
JUL. 1 (OH) (2447708.5)	X:	- 4.6427	- 0.05995	+184.2943 6.254352	+ 0.58156 1.3387	+2.7631 5.5251
A JUL. 12 (OH)	Y:	+ 1.1572	- 0.56220	+ 77.7149 1.751669	+ 0.58463 2.6837	+1.2759 1.0810
JUL. 12 (OH) (2447719.5)	X:	- 1.6908	- 0.63605	+189.9859 4.337323	+ 0.53361 1.6321	+3.0476 1.4779
A JUL. 23 (OH)	Y:	+ 0.3876	- 0.43678	+ 83.0317 6.080331	+ 0.42115 2.5579	+1.3176 3.1675
JUL. 23 (OH) (2447730.5)	X:	- 0.1496	- 1.00407	+179.4668 2.417149	+ 0.75409 2.6731	+2.2802 3.7680
A AOU. 3 (OH)	Y:	- 1.0120	- 0.19170	+ 81.6530 4.181926	+ 0.11845 3.2480	+0.9968 5.6364
AOU. 1 (OH) (2447739.5)	X:	-11.2038	+ 1.04026	+178.9535 5.975771	+ 0.74343 6.1325	+3.0215 4.8617
A AOU. 12 (OH)	Y:	+ 0.8320	- 0.41912	+ 78.4110 1.430759	+ 0.40215 2.5242	+1.2486 0.3917
AOU. 12 (OH) (2447750.5)	X:	- 8.4306	+ 0.58841	+180.7691 3.994920	+ 0.82555 0.0500	+2.7209 0.7243
A AOU. 23 (OH)	Y:	+ 1.4135	- 0.53720	+ 82.8474 5.751543	+ 0.56175 2.4029	+1.3161 2.4841
AOU. 23 (OH) (2447761.5)	X:	- 6.0241	+ 0.14656	+179.2915 2.080322	+ 0.33785 5.9268	+2.1905 3.2314
A SEP. 3 (OH)	Y:	+ 1.2353	- 0.52317	+ 80.9887 3.876800	+ 0.41000 2.3324	+0.8760 4.9721

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 6 DE SATURNE : TITAN N=0.394

		A0	A1	B0 FO	B1 F1	C0 PO
SEP. 1 (OH) (2447770.5)	X:	-12.3002	+ 1.11006	+170.9647 5.649467	+ 0.68618 5.5991	+2.8947 4.1951
A SEP. 12 (OH)	Y:	- 1.8692	+ 0.11012	+ 78.5798 1.115729	+ 0.09780 5.7824	+1.2502 5.8850
SEP. 12 (OH) (2447781.5)	X:	-12.1149	+ 1.16691	+171.7230 3.634990	+ 1.13042 5.9517	+2.6003 6.2476
A SEP. 23 (OH)	Y:	- 0.5423	- 0.12425	+ 78.1129 5.428134	+ 0.27223 2.0164	+1.1504 1.8128
SEP. 23 (OH) (2447792.5)	X:	-11.6222	+ 1.12983	+176.7238 1.732137	+ 1.23438 5.6458	+1.9097 2.6354
A OCT. 4 (OH)	Y:	+ 0.3923	- 0.29524	+ 76.8705 3.516491	+ 0.31454 1.6840	+0.8864 4.2901
OCT. 1 (OH) (2447800.5)	X:	- 0.4680	- 0.99127	+173.6472 4.880143	+ 1.14743 2.5572	+2.8138 2.5119
A OCT. 12 (OH)	Y:	- 3.5930	+ 0.32143	+ 75.7306 0.383765	+ 0.33095 4.9287	+1.2318 4.3520
OCT. 12 (OH) (2447811.5)	X:	- 2.1875	- 0.68287	+162.0407 2.932764	+ 0.43536 2.3734	+2.0364 4.7981
A OCT. 23 (OH)	Y:	- 4.0354	+ 0.42582	+ 70.8830 4.674999	+ 0.24140 5.7727	+0.9766 0.2167
OCT. 23 (OH) (2447822.5)	X:	- 4.6993	- 0.26059	+162.5905 0.942158	+ 0.52975 4.0643	+2.1326 1.1584
A NOV. 3 (OH)	Y:	- 4.4331	+ 0.52363	+ 74.2862 2.689963	+ 0.57710 5.8518	+0.8782 3.0045
NOV. 1 (OH) (2447831.5)	X:	- 0.0047	- 0.86058	+165.2695 4.500027	+ 1.08870 2.3161	+2.6528 1.7783
A NOV. 12 (OH)	Y:	- 0.8607	- 0.17968	+ 71.8039 6.250088	+ 0.31995 3.4120	+1.1043 3.5100
NOV. 12 (OH) (2447842.5)	X:	+ 0.9317	- 1.03546	+152.7286 2.550537	+ 0.80692 2.0900	+1.8815 4.0004
A NOV. 23 (OH)	Y:	- 1.7507	- 0.02275	+ 69.1948 4.302659	+ 0.14194 2.6764	+0.8741 5.8728
NOV. 23 (OH) (2447853.5)	X:	+ 0.6575	- 1.04704	+154.5730 0.511923	+ 0.78363 2.9860	+2.1154 0.4971
A DEC. 4 (OH)	Y:	- 3.0242	+ 0.21003	+ 69.5451 2.313955	+ 0.31139 5.6085	+0.8831 2.1929
DEC. 1 (OH) (2447861.5)	X:	-10.1115	+ 1.00120	+153.3206 3.650843	+ 0.67760 6.1123	+2.3107 0.0701
A DEC. 12 (OH)	Y:	- 0.2945	- 0.18710	+ 68.5380 5.455292	+ 0.27536 2.5309	+1.0238 1.9385
DEC. 12 (OH) (2447872.5)	X:	- 9.2028	+ 0.92105	+158.4467 1.728123	+ 1.13665 5.9789	+1.7274 2.7028
A DEC. 23 (OH)	Y:	+ 0.6100	- 0.35968	+ 67.2110 3.538320	+ 0.41586 1.9983	+0.7517 4.3753
DEC. 23 (OH) (2447883.5)	X:	- 6.6221	+ 0.49587	+150.2450 6.038976	+ 0.50074 5.4558	+2.3517 5.1072
A DEC. 34 (OH)	Y:	+ 0.8330	- 0.43281	+ 63.0173 1.523871	+ 0.24166 2.4393	+0.9928 0.7020

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES				
		DU SATELLITE 7 DE SATURNE: HYPERION				
		N=0.394				
		AO	A1	BO FO	B1 F1	CO PO
JAN. 1 (OH) (2447527.5)	X:	-13.6071	+ 0.33586	+156.6490 3.428357	+ 8.97910 1.7314	+2.6284 1.0192
A JAN. 9 (OH)	Y:	-22.0098	+ 4.31039	+ 58.1032 5.211169	+ 2.69115 3.7051	+0.9210 2.7244
JAN. 9 (OH) (2447535.5)	X:	+32.7646	+ 3.38373	+163.4929 5.864268	+10.40414 3.8085	+0.7424 0.2313
A JAN. 17 (OH)	Y:	+13.2907	- 4.32823	+ 65.7786 1.217000	+ 3.81836 5.2745	+0.5175 2.6265
JAN. 17 (OH) (2447543.5)	X:	+56.7803	- 8.30459	+128.2502 1.927654	+ 9.36936 0.3854	+0.8746 2.9342
A JAN. 25 (OH)	Y:	-17.7666	- 0.59589	+ 65.2371 3.790529	+ 5.39448 2.1651	+0.2166 3.9764
JAN. 25 (OH) (2447551.5)	X:	-32.4455	+ 8.31606	+153.9254 4.108092	+ 7.14261 2.1215	+2.3236 2.6866
A FEV. 2 (OH)	Y:	- 2.6478	+ 1.89862	+ 68.3448 6.071090	+ 3.61045 4.3124	+1.2039 4.6489
FEV. 1 (OH) (2447558.5)	X:	+56.5175	- 2.13689	+175.8067 0.039319	+13.37141 4.2343	+0.8332 3.2025
A FEV. 9 (OH)	Y:	+ 1.0090	- 2.71538	+ 68.2820 1.866922	+ 4.84960 6.0978	+0.2446 4.4922
FEV. 9 (OH) (2447566.5)	X:	+48.9642	-10.30123	+124.0611 2.458214	+ 8.27764 1.1403	+1.2796 4.3502
A FEV. 17 (OH)	Y:	-28.6862	+ 2.63508	+ 62.4139 4.093680	+ 3.73325 2.4794	+0.6715 0.3541
FEV. 17 (OH) (2447574.5)	X:	-24.1983	+10.63630	+146.8769 4.650901	+ 6.27042 2.6195	+1.9436 4.1510
A FEV. 25 (OH)	Y:	+ 8.2929	- 0.39208	+ 73.4312 0.247351	+ 4.09047 4.5734	+0.9951 5.7221
FEV. 25 (OH) (2447582.5)	X:	+51.4874	- 2.18842	+165.7347 0.907389	+14.02546 5.3093	+1.0000 5.4753
A MAR. 5 (OH)	Y:	- 8.4603	- 1.48312	+ 69.1867 2.748744	+ 5.82964 0.8854	+0.4098 1.0403
MAR. 1 (OH) (2447586.5)	X:	+62.7021	-10.19235	+127.2580 2.025772	+ 8.57102 0.6132	+1.2724 3.4702
A MAR. 9 (OH)	Y:	-20.9927	+ 0.28761	+ 65.9695 3.851048	+ 4.99273 2.2543	+0.2469 5.5336
MAR. 9 (OH) (2447594.5)	X:	-30.9371	+ 9.41397	+160.1201 4.233176	+ 7.32155 2.2123	+2.2350 3.1485
A MAR. 17 (OH)	Y:	+ 1.6331	+ 1.25635	+ 72.1852 6.192278	+ 3.88929 4.3640	+1.2024 5.0132
MAR. 17 (OH) (2447602.5)	X:	+57.6247	- 2.49902	+176.9563 0.494318	+14.40438 4.8035	+1.0107 4.4742
A MAR. 25 (OH)	Y:	- 6.0403	- 1.57695	+ 72.6792 2.350332	+ 5.92550 0.4029	+0.4111 0.1230
MAR. 25 (OH) (2447610.5)	X:	+22.1610	- 6.44155	+154.3597 2.853160	+ 9.48070 1.3683	+1.9400 6.1014
A AVR. 2 (OH)	Y:	-30.0755	+ 4.44719	+ 61.4441 4.472272	+ 2.75883 2.8648	+0.9811 1.3656

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 7 DE SATURNE: HYPERION

N=0.394

		AO	A1	BO FO	B1 F1	CO PO
AVR. 1 (OH) (2447617.5)	X:	-20.4429	+11.75461	+154.0883 4.803545	+ 6.48275 2.7582	+2.0053 4.6975
A AVR. 9 (OH)	Y:	+12.4679	- 1.31745	+ 77.4675 0.359825	+ 4.38455 4.6143	+0.8332 6.1522
AVR. 9 (OH) (2447625.5)	X:	+54.3592	- 2.12531	+174.6929 1.054694	+14.97587 5.5201	+1.0418 5.9764
A AVR.17 (OH)	Y:	- 7.9557	- 1.82773	+ 70.7602 2.909364	+ 6.03217 1.1246	+0.4204 1.6607
AVR.17 (OH) (2447633.5)	X:	- 6.2432	- 0.87324	+178.2759 3.312269	+10.05262 1.6388	+3.0432 1.0596
A AVR.25 (OH)	Y:	-22.8069	+ 4.68003	+ 63.3049 5.081629	+ 2.76001 3.5488	+1.0242 2.7710
AVR.25 (OH) (2447641.5)	X:	+37.2255	+ 4.15549	+187.7929 5.745903	+12.22133 3.6926	+0.6732 0.4212
A MAI 3 (OH)	Y:	+16.1301	- 4.54244	+ 73.7833 1.120700	+ 4.49996 5.2025	+0.5181 2.8025
MAI 1 (OH) (2447647.5)	X:	+58.6284	- 3.19695	+175.7109 1.270302	+14.84831 5.8019	+0.8498 0.3463
A MAI 9 (OH)	Y:	- 8.4849	- 2.17209	+ 71.4993 3.160952	+ 6.18328 1.4650	+0.4583 2.4116
MAI 9 (OH) (2447655.5)	X:	-17.2960	+ 2.02215	+188.6404 3.505539	+10.09361 1.7357	+3.3263 1.5198
A MAI 17 (OH)	Y:	-18.7553	+ 4.58817	+ 67.0315 5.355959	+ 3.00262 3.8212	+1.1186 3.4122
MAI 17 (OH) (2447663.5)	X:	+54.3192	+ 0.78824	+203.7620 5.968578	+14.64179 3.8906	+0.5349 2.2748
A MAI 25 (OH)	Y:	+10.9080	- 4.09534	+ 76.1958 1.420635	+ 4.95180 5.5828	+0.4206 3.4476
MAI 25 (OH) (2447671.5)	X:	+74.5161	-12.15226	+143.7471 2.026843	+ 9.08992 0.6697	+1.6414 3.6980
A JUN. 2 (OH)	Y:	-24.2301	+ 0.67436	+ 74.6943 3.836907	+ 5.34746 2.2541	+0.4171 5.9260
JUN. 1 (OH) (2447678.5)	X:	-33.6631	+ 8.56134	+190.0171 3.964954	+ 9.05936 1.9729	+2.8704 2.5948
A JUN. 9 (OH)	Y:	- 4.3110	+ 2.67924	+ 78.4507 5.931144	+ 4.01292 4.1949	+1.3889 4.5868
JUN. 9 (OH) (2447686.5)	X:	+66.1199	- 2.43213	+205.7182 0.221682	+16.31971 4.4780	+1.1705 3.8680
A JUN.17 (OH)	Y:	- 2.2159	- 2.26048	+ 82.4053 2.066269	+ 6.43646 0.0804	+0.3936 5.7756
JUN.17 (OH) (2447694.5)	X:	+46.4725	-10.33862	+159.9909 2.612300	+ 9.81797 1.2336	+1.7696 5.3614
A JUN.25 (OH)	Y:	-34.7063	+ 4.29256	+ 72.4404 4.206587	+ 3.56490 2.5644	+1.0955 0.8723
JUN.25 (OH) (2447702.5)	X:	-20.0315	+12.93365	+171.1502 4.865850	+ 7.18663 2.7936	+2.2267 4.9143
A JUL. 3 (OH)	Y:	+15.4242	- 1.79185	+ 87.9754 0.389827	+ 4.99899 4.6073	+0.8463 0.0575

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES				
		DU SATELLITE 7 DE SATURNE: HYPERION				
		N=0.394				
		A0	A1	B0 FO	B1 F1	C0 PO
JUL. 1 (OH) (2447708.5)	X:	+63.8332	- 2.16901	+201.5604 0.487250	+16.42787 4.8013	+1.1699 4.5139
A JUL. 9 (OH)	Y:	- 5.3711	- 1.90879	+ 83.9241 2.319999	+ 6.84456 0.3767	+0.4885 0.1272
JUL. 9 (OH) (2447716.5)	X:	+28.4634	- 7.57796	+173.4494 2.838469	+10.41151 1.3452	+2.2639 6.1269
A JUL.17 (OH)	Y:	-34.3552	+ 4.98692	+ 71.4794 4.441962	+ 3.19559 2.8069	+1.1605 1.3840
JUL.17 (OH) (2447724.5)	X:	- 7.1951	+12.03199	+171.7723 5.156367	+ 7.80116 3.1156	+2.1382 5.4573
A JUL.25 (OH)	Y:	+19.7677	- 3.32735	+ 87.6763 0.571350	+ 5.11713 4.6834	+0.5678 0.8720
JUL.25 (OH) (2447732.5)	X:	+64.0144	- 3.76491	+182.0113 1.324560	+15.21247 5.8538	+0.7990 0.4602
A AOU. 2 (OH)	Y:	- 8.6994	- 2.56247	+ 77.0036 3.209854	+ 6.65952 1.5188	+0.4997 2.5093
AOU. 1 (OH) (2447739.5)	X:	- 3.3061	- 1.67373	+188.9830 3.310785	+10.64624 1.6311	+3.2268 1.0525
A AOU. 9 (OH)	Y:	-26.6663	+ 5.27040	+ 69.9025 5.044236	+ 2.99213 3.4815	+1.1388 2.7202
AOU. 9 (OH) (2447747.5)	X:	+35.5953	+ 4.88026	+194.1984 5.736323	+12.52498 3.6629	+0.7741 0.4415
A AOU.17 (OH)	Y:	+18.5025	- 4.82197	+ 80.6653 1.084217	+ 4.98001 5.1420	+0.5763 2.7894
AOU.17 (OH) (2447755.5)	X:	+76.1169	- 9.79455	+151.7341 1.766248	+10.58056 0.2165	+1.0817 3.0695
A AOU.25 (OH)	Y:	-17.0837	- 1.33937	+ 76.3951 3.665760	+ 6.26958 2.0626	+0.2658 4.0762
AOU.25 (OH) (2447763.5)	X:	-33.9672	+ 8.34370	+183.3030 3.986790	+ 8.82704 1.9682	+2.7164 2.6239
A SEP. 2 (OH)	Y:	- 5.3248	+ 2.93227	+ 78.4286 5.940335	+ 4.00973 4.1836	+1.3757 4.6064
SEP. 1 (OH) (2447770.5)	X:	+60.0137	- 0.85689	+199.2125 6.217391	+15.29308 4.1315	+0.9798 3.1560
A SEP. 9 (OH)	Y:	+ 5.9400	- 3.30122	+ 78.7957 1.715143	+ 5.65813 5.9281	+0.3404 4.4857
SEP. 9 (OH) (2447778.5)	X:	+66.5164	-12.36141	+135.5903 2.290095	+ 8.47056 0.9675	+1.5398 4.2751
A SEP.17 (OH)	Y:	-30.2467	+ 2.25904	+ 72.8530 3.962729	+ 4.53750 2.3250	+0.7357 0.2838
SEP.17 (OH) (2447786.5)	X:	-29.4435	+11.15768	+164.1959 4.488947	+ 7.37988 2.3828	+2.0193 3.9719
A SEP.25 (OH)	Y:	+ 7.1316	+ 0.54999	+ 81.5758 0.114090	+ 4.54409 4.4546	+1.1420 5.5886
SEP.25 (OH) (2447794.5)	X:	+57.4121	- 1.47893	+177.2796 0.760415	+15.09214 5.1370	+1.1328 5.2233
A OCT. 3 (OH)	Y:	- 4.4853	- 2.09145	+ 74.8645 2.576367	+ 6.29204 0.6912	+0.4611 0.7749

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES				
		DU SATELLITE 7 DE SATURNE: HYPERION				
		N=0.394				
		AO	A1	BO FO	B1 F1	CO PO
OCT. 1 (OH)	X:	+53.6079	-10.99790	+136.6393 2.481441	+ 8.51343 1.1229	+1.4524 4.9412
(2447800.5)						
A OCT. 9 (OH)	Y:	-32.1602	+ 3.37430	+ 68.5702 4.083230	+ 3.75803 2.4098	+0.9273 0.6654
OCT. 9 (OH)	X:	-25.1424	+11.62548	+153.2713 4.678366	+ 6.76479 2.5555	+1.8397 4.5524
(2447808.5)						
A OCT.17 (OH)	Y:	+11.2329	- 0.43526	+ 79.4915 0.260174	+ 4.56501 4.5247	+0.8962 5.9920
OCT.17 (OH)	X:	+56.0878	- 1.57300	+167.6424 0.929345	+14.51083 5.3579	+1.0686 5.6865
(2447816.5)						
A OCT.25 (OH)	Y:	- 4.1425	- 2.26839	+ 69.7604 2.760612	+ 5.94261 0.9405	+0.4254 1.3486
OCT.25 (OH)	X:	+ 4.5870	- 3.26183	+162.0176 3.185099	+ 9.45879 1.5410	+2.6578 0.8662
(2447824.5)						
A NOV. 2 (OH)	Y:	-25.9286	+ 4.82108	+ 61.2761 4.868737	+ 2.63675 3.2468	+0.9903 2.4567
NOV. 1 (OH)	X:	- 2.2405	+10.05831	+148.9698 5.228191	+ 7.57295 3.1659	+1.5482 5.7158
(2447831.5)						
A NOV. 9 (OH)	Y:	+19.5002	- 3.16526	+ 75.3387 0.616394	+ 4.65443 4.6927	+0.3801 1.4722
NOV. 9 (OH)	X:	+62.1339	- 4.27131	+150.4961 1.321480	+12.41859 5.8775	+0.4964 0.8238
(2447839.5)						
A NOV.17 (OH)	Y:	- 5.9722	- 2.51055	+ 64.2757 3.244278	+ 5.60972 1.5843	+0.4163 2.7436
NOV.17 (OH)	X:	-17.8806	+ 2.18165	+165.5647 3.542023	+ 8.94893 1.6984	+2.8257 1.7381
(2447847.5)						
A NOV.25 (OH)	Y:	-16.5329	+ 4.42821	+ 60.1111 5.399970	+ 2.68079 3.7952	+0.9988 3.6997
NOV.25 (OH)	X:	+45.7337	+ 1.27313	+172.1075 5.998413	+13.10300 3.9264	+0.6636 2.8698
(2447855.5)						
A DEC. 3 (OH)	Y:	+11.1707	- 3.25734	+ 67.1865 1.451249	+ 4.74667 5.6304	+0.3325 4.0459
DEC. 1 (OH)	X:	+65.7855	- 5.92886	+140.3144 1.422212	+10.86813 6.0408	+0.4362 2.1637
(2447861.5)						
A DEC. 9 (OH)	Y:	- 7.2325	- 2.25527	+ 62.0350 3.379652	+ 5.35577 1.7643	+0.3454 3.2137
DEC. 9 (OH)	X:	-23.4087	+ 4.00371	+163.0862 3.648620	+ 8.63607 1.7246	+2.6179 2.0474
(2447869.5)						
A DEC.17 (OH)	Y:	-11.5898	+ 3.85112	+ 60.2734 5.566807	+ 2.83761 3.9025	+1.0282 4.0995
DEC.17 (OH)	X:	+48.6493	+ 0.42683	+169.1946 6.134736	+13.42338 4.0876	+0.8736 3.3629
(2447877.5)						
A DEC.25 (OH)	Y:	+ 8.2877	- 2.72364	+ 65.4330 1.633543	+ 4.89533 5.8695	+0.2993 4.8193
DEC.25 (OH)	X:	+62.9942	-11.13329	+118.5812 2.118657	+ 6.91657 0.7827	+1.3979 4.4154
(2447885.5)						
A DEC.33 (OH)	Y:	-23.4060	+ 1.74454	+ 61.8811 3.856082	+ 3.83520 2.1965	+0.6757 0.4003

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES			
		DU SATELLITE 8 DE SATURNE :		JAPET	N=0.079
		AO	A1	BO FO	CO PO
JAN. 1 (OH) (2447527.5)	X:	-12.5197	+ 1.40795	+432.0017 1.287508	+ 5.3108 5.9780
A JAN. 17 (OH)	Y:	+ 8.8440	- 0.86732	+106.1530 3.624485	+ 1.6855 2.6389
JAN. 17 (OH) (2447543.5)	X:	-23.7878	+ 0.20565	+446.9350 2.452332	+ 6.4730 4.2661
A FEV. 2 (OH)	Y:	+ 2.9427	- 0.50099	+115.4894 4.813727	+ 2.0966 0.4412
FEV. 1 (OH) (2447558.5)	X:	-62.2212	+ 3.76303	+474.6295 3.481236	+15.1483 5.4977
A FEV. 17 (OH)	Y:	+ 5.0785	- 0.43019	+116.0654 5.884499	+ 3.7066 1.7019
FEV. 17 (OH) (2447574.5)	X:	-54.6454	+ 4.57504	+406.7023 4.707116	+ 1.0622 6.1683
A MAR. 5 (OH)	Y:	+10.7170	- 0.58979	+105.3749 0.753281	+ 1.5698 2.8338
MAR. 1 (OH) (2447586.5)	X:	- 2.4370	- 1.02566	+483.1340 5.774745	+11.2232 3.1459
A MAR. 17 (OH)	Y:	- 0.1086	+ 0.63394	+114.3879 1.866915	+ 3.4697 5.3678
MAR. 17 (OH) (2447602.5)	X:	+ 7.8484	- 2.93646	+488.9746 0.653458	+ 3.3349 0.2735
A AVR. 2 (OH)	Y:	- 1.4593	+ 0.50179	+115.4089 2.999706	+ 0.5855 6.0451
AVR. 1 (OH) (2447617.5)	X:	- 6.7131	- 3.39636	+449.8672 1.839522	+11.1463 2.0394
A AVR. 17 (OH)	Y:	- 6.9988	+ 1.19140	+107.8044 4.016010	+ 3.5472 4.9561
AVR. 17 (OH) (2447633.5)	X:	-10.6151	- 3.03087	+455.2245 3.247962	+ 4.6027 2.0963
A MAI 3 (OH)	Y:	- 5.8793	+ 1.53369	+ 85.7082 5.378693	+ 2.7827 5.3280
MAI 1 (OH) (2447647.5)	X:	-24.5292	+ 1.43975	+515.7041 4.260363	+ 5.4946 1.0866
A MAI 17 (OH)	Y:	- 0.5525	+ 0.43453	+109.9272 0.356002	+ 2.8959 4.0985
MAI 17 (OH) (2447663.5)	X:	+14.1221	- 3.31987	+584.5617 5.585035	+12.0749 2.9075
A JUN. 2 (OH)	Y:	- 7.0087	+ 0.43117	+127.4534 1.601854	+ 3.8186 5.2826
JUN. 1 (OH) (2447678.5)	X:	-25.5898	- 0.37572	+538.5463 0.503706	+12.2403 5.7005
A JUN. 17 (OH)	Y:	- 8.3018	+ 0.71999	+133.5211 2.722002	+ 1.3885 1.4318
JUN. 17 (OH) (2447694.5)	X:	-44.8124	+ 1.44123	+560.4842 1.813241	+ 8.7698 1.7381
A JUL. 3 (OH)	Y:	+ 1.1047	+ 0.42127	+127.0408 4.008401	+ 2.9172 3.8411

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 8 DE SATURNE: JAPET

N=0.079

		A0	A1	BO FO	CO PO
JUL. 1 (OH) (2447708.5)	X:	-36.8455	+ 3.16108	+590.6799 2.904478	+ 9.7810 4.3913
A JUL.17 (OH)	Y:	+14.1777	- 1.07504	+147.0227 5.249642	+ 1.6274 1.8681
JUL.17 (OH) (2447724.5)	X:	-10.2530	- 0.37106	+538.8230 4.226071	+ 3.3866 0.2097
A ADU. 2 (OH)	Y:	+ 8.0553	- 0.85130	+144.5188 0.135626	+ 2.3857 2.5053
ADU. 1 (OH) (2447739.5)	X:	-11.7605	- 1.92429	+558.1383 5.436795	+ 5.5855 2.5414
A ADU.17 (OH)	Y:	+ 1.5974	- 0.20719	+134.6290 1.364871	+ 0.6061 5.4914
ADU.17 (OH) (2447755.5)	X:	-47.1642	+ 1.71667	+508.4454 0.472206	+ 9.5536 5.6674
A SEP. 2 (OH)	Y:	+ 9.9292	- 0.72229	+119.4177 2.700906	+ 4.3325 1.9310
SEP. 1 (OH) (2447770.5)	X:	- 3.0053	- 1.34705	+482.8454 1.572833	+15.1705 1.8244
A SEP.17. (OH)	Y:	+ 6.1576	- 0.33692	+128.7271 3.917793	+ 2.7984 3.8184
SEP.17 (OH) (2447786.5)	X:	+ 0.0574	- 0.68434	+483.1731 2.905693	+ 8.3646 4.1026
A OCT. 3 (OH)	Y:	+ 6.1071	- 1.01614	+140.3776 5.229977	+ 2.4883 0.9493
OCT. 1 (OH) (2447800.5)	X:	+15.5339	- 4.38026	+478.9468 4.132582	+ 9.6020 0.7493
A OCT.17 (OH)	Y:	- 4.8397	+ 0.48230	+117.6201 0.022209	+ 1.6054 1.9876
OCT.17 (OH) (2447816.5)	X:	-25.2606	- 0.60184	+473.5342 5.241351	+ 7.2704 1.8007
A NOV. 2 (OH)	Y:	+ 4.6804	+ 0.24603	+116.1938 1.247264	+ 1.0161 3.8414
NOV. 1 (OH) (2447831.5)	X:	-12.7538	- 0.31271	+457.4414 0.088840	+ 1.0932 5.4849
A NOV.17 (OH)	Y:	+11.2478	- 0.19666	+107.9294 2.415988	+ 1.1163 1.4557
NOV.17 (OH) (2447847.5)	X:	- 2.3523	+ 0.26134	+436.1740 1.367080	+ 5.3289 1.3031
A DEC. 3 (OH)	Y:	+ 6.8039	- 0.59549	+101.8368 3.700731	+ 1.6183 3.7000
DEC. 1 (OH) (2447861.5)	X:	-23.8982	+ 1.54020	+470.9196 2.442119	+10.3667 4.3180
A DEC.17 (OH)	Y:	+ 3.0649	- 0.74778	+107.7608 4.805959	+ 2.3352 0.3135
DEC.17 (OH) (2447877.5)	X:	-51.2243	+ 2.69541	+455.6545 3.557707	+14.8770 5.5214
A DEC.33 (OH)	Y:	- 0.6002	- 0.21428	+100.2303 5.940381	+ 3.2797 1.6109

SATELLITES D'URANUS
SATELLITES OF URANUS

DONNÉES SUR LES SATELLITES D'URANUS

DATA ON THE SATELLITES OF URANUS

NOM	masse	rayon	période rotation sidérale	albédo géométrique	magnitude visuelle	période orbitale	élongation maximale	1/2 grand axe	excentricité	inclinaison sur l'équateur d'Uranus
unité →	masse d'Uranus	km	jour			jour	(")	10 ³ km		degré
I Ariel	1.8×10^{-5}	665		0.2	14.4	2.520 379 35	14	191.02	0.003 4	0.31
II Umbriel	1.2×10^{-5}	555		0.1	15.3	4.144 177 2	20	266.30	0.005 0	0.36
III Titania	6.8×10^{-5}	800		0.21	14.0	8.705 871 7	33	435.91	0.002 2	0.142
IV Oberon	6.9×10^{-5}	815	(S)	0.16	14.2	13.463 238 9	44	583.52	0.000 8	0.101
V Miranda	0.2×10^{-5}	150?			16.5	1.413 479 25	10	129.39	0.002 7	4.22
NAME	mass	radius	sidereal rotation	geometrical albedo	visual magnitude	orbital period	greatest elongation	semi major axis	eccentricity	inclination on Uranus' equator
unit →	Uranus' mass	km	day			day	(")	10 ³ km		degree

NOTES

(S) : rotation synchrone

(S) : synchronous rotation

Données extraites de l'*Encyclopédie du Bureau des Longitudes*.

Data from the *Encyclopédie du Bureau des Longitudes*.

ÉPHÉMÉRIDES DES CINQ SATELLITES D'URANUS

EPHEMERIDES OF THE FIVE SATELLITES OF URANUS

Coordonnées différentielles tangentielles données en secondes de degré dans le repère équatorial moyen 1950.0. *Differential tangential coordinates given in arcseconds in the mean equatorial frame 1950.0.*

$$\begin{aligned}\Delta\alpha \cos\delta &= X \\ \Delta\delta &= Y\end{aligned}$$

$$\left. \begin{matrix} X \\ Y \end{matrix} \right\} = A0 + A1 \cdot t + B0 \sin(Nt + F0) + B1 \cdot t \sin(Nt + F1) + B2 \cdot t^2 \sin(Nt + F2) + C0 \sin(2Nt + P0)$$

où $t = T - T0$ avec $T0$ date du début de l'intervalle et T date du calcul *Where $t = T - T0$ with $T0$ date of the beginning of the interval and T the date for the calculation*

satellite	intervalle Δt (jours)	N (rad/j)	page
Miranda	8	4.488 0	86
Ariel	32	2.493 0	90
Umbriel	32	1.516 2	91
Titania	32	0.721 7	92
Obéron	32	0.466 7	93
	(days)	(rad/d)	

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 5 D'URANUS: MIRANDA

N=4.4880

	AO	A1	B0 F0	B1 F1	B2 F2	C0 P0

JANVIER						

JAN. 1 (OH) (2447527.5)	X: -0.0316	-0.00001	+ 8.4376 1.860887	+0.36688 0.2844	+0.007780 4.8140	+0.0104 2.2351
A JAN. 9 (OH)	Y: -0.0144	+0.00003	+ 8.6225 3.373008	+0.37695 1.8068	+0.008079 0.0571	+0.0120 3.6249

JAN. 9 (OH) (2447535.5)	X: -0.0320	+0.00000	+ 8.4287 6.005484	+0.36534 4.4267	+0.007511 2.6852	+0.0112 4.1136
A JAN. 17 (OH)	Y: -0.0142	+0.00000	+ 8.6392 1.233030	+0.37742 5.9490	+0.007923 4.1966	+0.0117 5.7273

JAN. 17 (OH) (2447543.5)	X: -0.0317	+0.00001	+ 8.4226 3.867231	+0.36340 2.2950	+0.007643 0.5757	+0.0117 6.2446
A JAN. 25 (OH)	Y: -0.0143	+0.00001	+ 8.6612 5.376435	+0.37638 3.8131	+0.007953 2.0830	+0.0111 1.3554

JAN. 25 (OH) (2447551.5)	X: -0.0318	-0.00002	+ 8.4250 1.730014	+0.36494 0.1608	+0.007694 4.6954	+0.0101 1.9148
A FEV. 2 (OH)	Y: -0.0141	+0.00002	+ 8.6890 3.237660	+0.37794 1.6790	+0.008077 6.2194	+0.0123 3.3787

FEVRIER						

FEV. 1 (OH) (2447558.5)	X: -0.0318	-0.00003	+ 8.4336 1.430950	+0.36534 6.1466	+0.007670 4.3932	+0.0105 1.2163
A FEV. 9 (OH)	Y: -0.0140	+0.00001	+ 8.7210 2.937386	+0.37860 1.3800	+0.008054 5.9240	+0.0120 2.8489

FEV. 9 (OH) (2447566.5)	X: -0.0324	-0.00001	+ 8.4531 5.577375	+0.36469 4.0074	+0.007422 2.2717	+0.0119 3.2988
A FEV. 17 (OH)	Y: -0.0139	+0.00000	+ 8.7645 0.799539	+0.37911 5.5250	+0.007955 3.8000	+0.0113 4.7882

FEV. 17 (OH) (2447574.5)	X: -0.0322	+0.00000	+ 8.4742 3.440994	+0.36413 1.8786	+0.007631 0.1621	+0.0104 5.3579
A FEV. 25 (OH)	Y: -0.0139	+0.00002	+ 8.8110 4.945446	+0.38009 3.3923	+0.008107 1.6741	+0.0125 0.5074

FEV. 25 (OH) (2447582.5)	X: -0.0323	-0.00003	+ 8.5043 1.305648	+0.36714 6.0286	+0.007691 4.2802	+0.0110 0.9323
A MAR. 5 (OH)	Y: -0.0136	+0.00001	+ 8.8641 2.809030	+0.38278 1.2564	+0.008102 5.8070	+0.0118 2.5899

MARS						

MAR. 1 (OH) (2447586.5)	X: -0.0327	-0.00002	+ 8.5227 0.237760	+0.36667 4.9612	+0.007646 3.2300	+0.0109 5.1954
A MAR. 9 (OH)	Y: -0.0134	+0.00000	+ 8.8941 1.741152	+0.38469 0.1852	+0.007956 4.7237	+0.0125 0.3433

MAR. 9 (OH) (2447594.5)	X: -0.0328	-0.00001	+ 8.5625 4.385634	+0.36690 2.8291	+0.007716 1.1180	+0.0118 0.8529
A MAR. 17 (OH)	Y: -0.0138	+0.00001	+ 8.9536 5.888211	+0.38455 4.3336	+0.007959 2.6223	+0.0116 2.4594

MAR. 17 (OH) (2447602.5)	X: -0.0330	-0.00003	+ 8.6070 2.250984	+0.36945 0.6979	+0.007843 5.2553	+0.0119 2.9601
A MAR. 25 (OH)	Y: -0.0135	+0.00004	+ 9.0126 3.753101	+0.38776 2.2039	+0.008249 0.4757	+0.0113 4.3203

MAR. 25 (OH) (2447610.5)	X: -0.0335	-0.00003	+ 8.6593 0.116530	+0.37130 4.8446	+0.007719 3.1231	+0.0110 4.9038
A AVR. 2 (OH)	Y: -0.0130	+0.00001	+ 9.0791 1.618498	+0.39112 0.0649	+0.008100 4.6056	+0.0129 0.1096

SATELLITES D'URANUS

87

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 5 D'URANUS: MIRANDA

N=4.4880

		AO	A1	BO FO	B1 F1	B2 F2	CO PO

AVRIL							

AVR. 1 (OH)	X:	-0.0338	-0.00003	+ 8.7079	+0.37291	+0.007671	+0.0115
(2447617.5)				6.103015	4.5470	2.8316	4.2503
A AVR. 9 (OH)	Y:	-0.0130	+0.00001	+ 9.1352	+0.39291	+0.008190	+0.0126
				1.321602	6.0523	4.3140	5.8464

AVR. 9 (OH)	X:	-0.0338	-0.00001	+ 8.7637	+0.37408	+0.007886	+0.0123
(2447625.5)				3.968736	2.4173	0.7200	0.0836
A AVR. 17 (OH)	Y:	-0.0131	+0.00002	+ 9.1993	+0.39372	+0.008273	+0.0116
				5.470378	3.9187	2.2028	1.4969

AVR. 17 (OH)	X:	-0.0341	-0.00005	+ 8.8226	+0.37842	+0.007997	+0.0108
(2447633.5)				1.835075	0.2843	4.8403	2.0789
A AVR. 25 (OH)	Y:	-0.0128	+0.00004	+ 9.2600	+0.39719	+0.008475	+0.0131
				3.336682	1.7869	0.0540	3.4950

AVR. 25 (OH)	X:	-0.0348	-0.00003	+ 8.8857	+0.38027	+0.007818	+0.0120
(2447641.5)				5.984265	4.4287	2.7151	3.9880
A MAI 3 (OH)	Y:	-0.0124	+0.00002	+ 9.3220	+0.39984	+0.008368	+0.0125
				1.203109	5.9317	4.1960	5.5895

MAI							

MAI 1 (OH)	X:	-0.0346	-0.00005	+ 8.9280	+0.38392	+0.008090	+0.0120
(2447647.5)				1.242484	5.9737	4.2330	0.7475
A MAI 9 (OH)	Y:	-0.0123	+0.00003	+ 9.3635	+0.40106	+0.008479	+0.0122
				2.744448	1.1903	5.7426	2.3992

MAI 9 (OH)	X:	-0.0354	-0.00003	+ 8.9895	+0.38544	+0.007928	+0.0124
(2447655.5)				5.391523	3.8343	2.1112	2.8888
A MAI 17 (OH)	Y:	-0.0123	+0.00003	+ 9.4167	+0.40201	+0.008428	+0.0125
				0.610795	5.3363	3.6243	4.3030

MAI 17 (OH)	X:	-0.0353	-0.00001	+ 9.0421	+0.38714	+0.008221	+0.0110
(2447663.5)				3.257217	1.7038	6.2740	4.8336
A MAI 25 (OH)	Y:	-0.0119	+0.00005	+ 9.4604	+0.40413	+0.008662	+0.0133
				4.760452	3.2041	1.4867	0.1154

MAI 25 (OH)	X:	-0.0355	-0.00004	+ 9.0931	+0.39175	+0.008302	+0.0126
(2447671.5)				1.123243	5.8505	4.1048	0.4991
A JUN. 2 (OH)	Y:	-0.0114	+0.00003	+ 9.4999	+0.40712	+0.008587	+0.0119
				2.627022	1.0654	5.6125	2.1159

JUN							

JUN. 1 (OH)	X:	-0.0358	-0.00003	+ 9.1329	+0.39360	+0.008371	+0.0130
(2447678.5)				0.826230	5.5520	3.8069	6.2523
A JUN. 9 (OH)	Y:	-0.0110	+0.00003	+ 9.5278	+0.40878	+0.008540	+0.0118
				2.330817	0.7650	5.3072	1.4309

JUN. 9 (OH)	X:	-0.0363	-0.00001	+ 9.1738	+0.39453	+0.008297	+0.0117
(2447686.5)				4.974315	3.4119	1.6823	1.9923
A JUN. 17 (OH)	Y:	-0.0112	+0.00003	+ 9.5508	+0.40801	+0.008502	+0.0135
				0.196480	4.9104	3.1985	3.4867

JUN. 17 (OH)	X:	-0.0363	+0.00000	+ 9.2022	+0.39607	+0.008525	+0.0125
(2447694.5)				2.838919	1.2775	5.8302	3.9068
A JUN. 25 (OH)	Y:	-0.0106	+0.00007	+ 9.5608	+0.40995	+0.008793	+0.0119
				4.345419	2.7779	1.0482	5.5664

JUN. 25 (OH)	X:	-0.0364	-0.00002	+ 9.2245	+0.39879	+0.008518	+0.0129
(2447702.5)				0.703394	5.4206	3.6707	6.0074
A JUL. 3 (OH)	Y:	-0.0099	+0.00004	+ 9.5667	+0.41199	+0.008599	+0.0122
				2.210872	0.6354	5.1676	1.1320

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 5 D'URANUS: MIRANDA

N=4.4880

	AO	A1	B0 FO	B1 F1	B2 F2	CO PO

JUILLET						

JUL. 1 (OH) (2447708.5)	X: -0.0365	-0.00001	+ 9.2341 2.242683	+0.39866 0.6756	+0.008602 5.2196	+0.0125 2.8405
A JUL. 9 (OH)	Y: -0.0100	+0.00007	+ 9.5597 3.750979	+0.41187 2.1781	+0.008840 0.4301	+0.0122 4.1871

JUL. 9 (OH) (2447716.5)	X: -0.0368	+0.00000	+ 9.2405 0.106042	+0.39920 4.8151	+0.008432 3.0786	+0.0117 4.7492
A JUL. 17 (OH)	Y: -0.0092	+0.00004	+ 9.5488 1.615522	+0.41293 0.0350	+0.008642 4.5549	+0.0135 6.2778

JUL. 17 (OH) (2447724.5)	X: -0.0366	+0.00002	+ 9.2334 4.251878	+0.39845 2.6771	+0.008562 0.9537	+0.0131 0.4846
A JUL. 25 (OH)	Y: -0.0093	+0.00004	+ 9.5256 5.762157	+0.41061 4.1797	+0.008638 2.4422	+0.0118 2.0196

JUL. 25 (OH) (2447732.5)	X: -0.0365	+0.00000	+ 9.2167 2.114389	+0.39995 0.5369	+0.008628 5.0699	+0.0119 2.5636
A AOU. 2 (OH)	Y: -0.0086	+0.00007	+ 9.4912 3.625524	+0.41120 2.0443	+0.008851 0.2868	+0.0127 3.9056

AOUT						

AOU. 1 (OH) (2447739.5)	X: -0.0364	+0.00000	+ 9.1950 1.814322	+0.39999 0.2331	+0.008582 4.7579	+0.0110 1.8887
A AOU. 9 (OH)	Y: -0.0084	+0.00006	+ 9.4570 3.326089	+0.41044 1.7428	+0.008842 6.2655	+0.0134 3.3634

AOU. 9 (OH) (2447747.5)	X: -0.0369	+0.00002	+ 9.1640 5.958635	+0.39820 4.3696	+0.008300 2.6234	+0.0126 3.8205
A AOU. 17 (OH)	Y: -0.0079	+0.00004	+ 9.4133 1.186111	+0.40924 5.8827	+0.008667 4.1217	+0.0123 5.4205

AOU. 17 (OH) (2447755.5)	X: -0.0363	+0.00004	+ 9.1191 3.819186	+0.39584 2.2324	+0.008488 0.4991	+0.0121 5.9572
A AOU. 25 (OH)	Y: -0.0077	+0.00005	+ 9.3608 5.332429	+0.40665 3.7440	+0.008716 1.9955	+0.0124 1.0387

AOU. 25 (OH) (2447763.5)	X: -0.0361	+0.00000	+ 9.0693 1.679807	+0.39655 0.0903	+0.008493 4.6036	+0.0109 1.5395
A SEP. 2 (OH)	Y: -0.0072	+0.00005	+ 9.3033 3.193304	+0.40598 1.6045	+0.008747 6.1225	+0.0131 3.1103

SEPTEMBRE						

SEP. 1 (OH) (2447770.5)	X: -0.0359	+0.00001	+ 9.0205 1.378019	+0.39532 6.0697	+0.008453 4.2916	+0.0117 0.8720
A SEP. 9 (OH)	Y: -0.0068	+0.00004	+ 9.2517 2.891707	+0.40414 1.3007	+0.008651 5.8199	+0.0121 2.5449

SEP. 9 (OH) (2447778.5)	X: -0.0362	+0.00003	+ 8.9627 5.520450	+0.39193 3.9229	+0.008159 2.1604	+0.0124 2.9976
A SEP. 17 (OH)	Y: -0.0067	+0.00003	+ 9.1906 0.751150	+0.40092 5.4410	+0.008505 3.6943	+0.0120 4.4352

SEP. 17 (OH) (2447786.5)	X: -0.0356	+0.00005	+ 8.8950 3.379357	+0.38859 1.7858	+0.008332 0.0339	+0.0107 4.9547
A SEP. 25 (OH)	Y: -0.0063	+0.00005	+ 9.1255 4.893392	+0.39878 3.3030	+0.008631 1.5534	+0.0129 0.2179

SEP. 25 (OH) (2447794.5)	X: -0.0352	+0.00001	+ 8.8276 1.238511	+0.38809 5.9265	+0.008292 4.1421	+0.0120 0.5822
A OCT. 3 (OH)	Y: -0.0058	+0.00003	+ 9.0632 2.752174	+0.39757 1.1593	+0.008473 5.6769	+0.0114 2.2282

SATELLITES D'URANUS

89

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 5 D'URANUS: MIRANDA

N=4.4880

	A0	A1	B0 F0	B1 F1	B2 F2	C0 P0
OCTOBRE						
OCT. 1 (OH) (2447800.5)	X: -0.0352	+0.00004	+ 8.7749 2.773733	+0.38449 1.1804	+0.008314 5.6986	+0.0122 3.6845
A OCT. 9 (OH)	Y: -0.0058	+0.00006	+ 9.0151 4.287367	+0.39521 2.6968	+0.008524 0.9412	+0.0108 5.2979
OCT. 9 (OH) (2447808.5)	X: -0.0350	+0.00002	+ 8.7059 0.632307	+0.38239 5.3199	+0.008169 3.5438	+0.0117 5.7685
A OCT. 17 (OH)	Y: -0.0051	+0.00002	+ 8.9573 2.145534	+0.39411 0.5505	+0.008253 5.0604	+0.0118 0.8715
OCT. 17 (OH) (2447816.5)	X: -0.0348	+0.00004	+ 8.6371 4.773591	+0.37831 3.1776	+0.008064 1.4182	+0.0112 1.3965
A OCT. 25 (OH)	Y: -0.0054	+0.00002	+ 8.8998 0.002862	+0.38962 4.6924	+0.008160 2.9530	+0.0122 3.0073
OCT. 25 (OH) (2447824.5)	X: -0.0344	+0.00003	+ 8.5672 2.631863	+0.37568 1.0388	+0.008112 5.5554	+0.0121 3.4216
A NOV. 2 (OH)	Y: -0.0050	+0.00005	+ 8.8432 4.143753	+0.38863 2.5562	+0.008369 0.7983	+0.0105 4.9364
NOVEMBRE						
NOV. 1 (OH) (2447831.5)	X: -0.0342	+0.00002	+ 8.5093 2.328665	+0.37317 0.7357	+0.008035 5.2514	+0.0115 2.8859
A NOV. 9 (OH)	Y: -0.0048	+0.00005	+ 8.7999 3.839854	+0.38723 2.2539	+0.008338 0.4899	+0.0111 4.2364
NOV. 9 (OH) (2447839.5)	X: -0.0342	+0.00003	+ 8.4475 0.186974	+0.36995 4.8746	+0.007787 3.1136	+0.0106 4.7935
A NOV. 17 (OH)	Y: -0.0043	+0.00001	+ 8.7586 1.697434	+0.38608 0.1085	+0.008090 4.6171	+0.0124 0.0307
NOV. 17 (OH) (2447847.5)	X: -0.0337	+0.00004	+ 8.3863 4.328458	+0.36611 2.7367	+0.007823 0.9928	+0.0118 0.5159
A NOV. 25 (OH)	Y: -0.0045	+0.00002	+ 8.7204 5.837756	+0.38235 4.2521	+0.008051 2.5074	+0.0108 2.0579
NOV. 25 (OH) (2447855.5)	X: -0.0335	+0.00001	+ 8.3299 2.187360	+0.36479 0.5976	+0.007808 5.1149	+0.0108 2.5961
A DEC. 3 (OH)	Y: -0.0042	+0.00004	+ 8.6866 3.695599	+0.38197 2.1159	+0.008212 0.3541	+0.0115 3.9313
DECEMBRE						
DEC. 1 (OH) (2447861.5)	X: -0.0333	+0.00004	+ 8.2916 3.722915	+0.36153 2.1334	+0.007678 0.3912	+0.0105 5.6677
A DEC. 9 (OH)	Y: -0.0041	+0.00003	+ 8.6686 5.230378	+0.37979 3.6521	+0.008150 1.9078	+0.0119 0.7597
DEC. 9 (OH) (2447869.5)	X: -0.0330	+0.00000	+ 8.2448 1.582475	+0.36126 6.2772	+0.007638 4.5022	+0.0102 1.2181
A DEC. 17 (OH)	Y: -0.0038	+0.00002	+ 8.6495 3.088655	+0.37956 1.5127	+0.008121 6.0389	+0.0119 2.8488
DEC. 17 (OH) (2447877.5)	X: -0.0334	+0.00002	+ 8.2062 5.724995	+0.35792 4.1340	+0.007349 2.3798	+0.0115 3.2980
A DEC. 25 (OH)	Y: -0.0037	+0.00001	+ 8.6398 0.947042	+0.37792 5.6548	+0.007984 3.9126	+0.0111 4.7822
DEC. 25 (OH) (2447885.5)	X: -0.0329	+0.00003	+ 8.1683 3.584749	+0.35516 2.0015	+0.007516 0.2617	+0.0100 5.3461
A DEC. 33 (OH)	Y: -0.0036	+0.00003	+ 8.6349 5.089039	+0.37694 3.5190	+0.008089 1.7824	+0.0122 0.4955

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 1 D'URANUS: ARIEL				N=2.4930	
		A0	A1	B0 F0	B1 F1	B2 F2	C0 P0
JAN. 1 (OH) (2447527.5)	X:	+0.0603	+0.00000	+12.5928 1.579246	+0.00452 5.8456	+0.000090 1.9467	+0.0214 4.3762
A FEV. 2 (OH)	Y:	-0.0199	+0.00000	+12.8511 3.113988	+0.00623 1.8470	+0.000092 3.5421	+0.0219 5.9082
FEV. 1 (OH) (2447558.5)	X:	+0.0604	+0.00002	+12.6129 3.456473	+0.00393 2.9106	+0.000084 3.8985	+0.0216 1.8478
A MAR. 5 (OH)	Y:	-0.0199	+0.00000	+12.9894 4.987388	+0.00798 4.5393	+0.000076 5.6374	+0.0223 3.3838
MAR. 1 (OH) (2447586.5)	X:	+0.0611	+0.00004	+12.7661 4.143162	+0.00779 4.1470	+0.000062 4.7127	+0.0219 3.2259
A AVR. 2 (OH)	Y:	-0.0203	-0.00002	+13.2373 5.671747	+0.01083 5.5986	+0.000049 0.4955	+0.0230 4.7510
AVR. 1 (OH) (2447617.5)	X:	+0.0626	+0.00004	+13.0571 6.030448	+0.01144 6.2197	+0.000021 1.1657	+0.0225 0.7052
A MAI 3 (OH)	Y:	-0.0213	-0.00003	+13.5920 1.274626	+0.01243 1.4389	+0.000046 3.6272	+0.0235 2.2361
MAI 1 (OH) (2447647.5)	X:	+0.0640	+0.00003	+13.3960 5.428417	+0.01211 5.7184	+0.000058 2.2903	+0.0232 5.7725
A JUN. 2 (OH)	Y:	-0.0225	-0.00004	+13.9303 0.672826	+0.01113 1.0415	+0.000085 3.7055	+0.0240 1.0258
JUN. 1 (OH) (2447678.5)	X:	+0.0649	+0.00001	+13.6997 1.037786	+0.00865 1.4463	+0.000110 4.3993	+0.0235 3.2604
A JUL. 3 (OH)	Y:	-0.0240	-0.00003	+14.1714 2.566954	+0.00683 3.3016	+0.000115 5.9009	+0.0241 4.7948
JUL. 1 (OH) (2447708.5)	X:	+0.0652	-0.00002	+13.8418 0.435429	+0.00236 1.4109	+0.000122 3.9117	+0.0236 2.0381
A AOU. 2 (OH)	Y:	-0.0254	-0.00002	+14.2228 1.966978	+0.00376 4.0556	+0.000111 5.5359	+0.0241 3.5725
AOU. 1 (OH) (2447739.5)	X:	+0.0644	-0.00004	+13.7729 2.321792	+0.00609 5.5688	+0.000091 5.9285	+0.0234 5.7840
A SEP. 2 (OH)	Y:	-0.0263	+0.00000	+14.0688 3.855787	+0.00829 0.6697	+0.000078 1.4814	+0.0236 1.0435
SEP. 1 (OH) (2447770.5)	X:	+0.0628	-0.00006	+13.5086 4.202229	+0.01163 1.3487	+0.000041 1.8477	+0.0227 3.2447
A OCT. 3 (OH)	Y:	-0.0269	+0.00001	+13.7591 5.737609	+0.01226 2.8538	+0.000042 4.1337	+0.0229 4.7868
OCT. 1 (OH) (2447800.5)	X:	+0.0609	-0.00006	+13.1495 3.584535	+0.01385 0.8256	+0.000021 3.0518	+0.0221 2.0068
A NOV. 2 (OH)	Y:	-0.0265	+0.00002	+13.4039 5.119576	+0.01330 2.4355	+0.000048 4.6655	+0.0224 3.5307
NOV. 1 (OH) (2447831.5)	X:	+0.0587	-0.00003	+12.7703 5.455975	+0.01309 2.7914	+0.000053 5.6086	+0.0214 5.7434
A DEC. 3 (OH)	Y:	-0.0259	+0.00001	+13.0779 0.705727	+0.01169 4.5293	+0.000074 0.7360	+0.0220 0.9902
DEC. 1 (OH) (2447861.5)	X:	+0.0573	-0.00001	+12.4700 4.833884	+0.01014 2.2853	+0.000076 5.1206	+0.0210 4.4985
A DEC.33 (OH)	Y:	-0.0256	+0.00001	+12.8742 0.080532	+0.00858 4.2458	+0.000090 0.3303	+0.0218 6.0246

SATELLITES D'URANUS

91

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 2 D'URANUS: UMBRIEL

N=1.5162

		AO	A1	B0 F0	B1 F1	B2 F2	C0 PO
JAN. 1 (OH) (2447527.5)	X:	+0.1124	+0.00000	+17.5763 6.136286	+0.00674 4.1700	+0.000121 0.1237	+0.0439 1.8180
A FEV. 2 (OH)	Y:	+0.0738	+0.00005	+17.9396 1.391006	+0.00902 0.1088	+0.000123 1.7210	+0.0451 3.3518
FEV. 1 (OH) (2447558.5)	X:	+0.1123	+0.00005	+17.6080 2.863837	+0.00636 2.1517	+0.000113 3.2460	+0.0445 1.5616
A MAR. 5 (OH)	Y:	+0.0754	+0.00007	+18.1316 4.398265	+0.01170 3.8540	+0.000101 4.9834	+0.0456 3.0972
MAR. 1 (OH) (2447586.5)	X:	+0.1136	+0.00009	+17.8247 1.330468	+0.01110 1.1724	+0.000086 1.8826	+0.0450 4.7817
A AVR. 2 (OH)	Y:	+0.0773	+0.00007	+18.4773 2.862745	+0.01529 2.6750	+0.000067 3.9359	+0.0468 0.0359
AVR. 1 (OH) (2447617.5)	X:	+0.1165	+0.00011	+18.2329 4.349756	+0.01575 4.4212	+0.000035 5.8044	+0.0463 4.5407
A MAI 3 (OH)	Y:	+0.0796	+0.00003	+18.9713 5.880925	+0.01718 5.9344	+0.000067 1.9152	+0.0481 6.0668
MAI 1 (OH) (2447647.5)	X:	+0.1200	+0.00011	+18.7061 5.856912	+0.01651 6.0590	+0.000082 2.5584	+0.0470 1.2631
A JUN. 2 (OH)	Y:	+0.0807	+0.00000	+19.4441 1.105125	+0.01502 1.3719	+0.000119 4.0318	+0.0493 2.7951
JUN. 1 (OH) (2447678.5)	X:	+0.1236	+0.00007	+19.1284 2.599616	+0.01180 2.9563	+0.000152 5.8598	+0.0484 1.0246
A JUL. 3 (OH)	Y:	+0.0806	-0.00004	+19.7811 4.132414	+0.00898 4.7967	+0.000157 1.0787	+0.0494 2.5574
JUL. 1 (OH) (2447708.5)	X:	+0.1257	+0.00000	+19.3249 4.108852	+0.00352 5.1553	+0.000167 1.2280	+0.0484 4.0269
A AOU. 2 (OH)	Y:	+0.0792	-0.00008	+19.8533 5.643834	+0.00538 1.4336	+0.000150 2.8370	+0.0492 5.5651
AOU. 1 (OH) (2447739.5)	X:	+0.1258	-0.00005	+19.2260 0.848323	+0.00850 3.9459	+0.000124 4.4232	+0.0474 3.7749
A SEP. 2 (OH)	Y:	+0.0765	-0.00008	+19.6390 2.385565	+0.01164 5.3897	+0.000104 6.2214	+0.0489 5.3104
SEP. 1 (OH) (2447770.5)	X:	+0.1239	-0.00009	+18.8565 3.866199	+0.01586 0.9101	+0.000056 1.5512	+0.0466 3.5150
A OCT. 3 (OH)	Y:	+0.0735	-0.00007	+19.2066 5.404746	+0.01677 2.4249	+0.000058 3.8048	+0.0471 5.0539
OCT. 1 (OH) (2447800.5)	X:	+0.1208	-0.00010	+18.3561 5.363145	+0.01873 2.5242	+0.000034 4.6578	+0.0452 0.2229
A NOV. 2 (OH)	Y:	+0.0710	-0.00003	+18.7100 0.618142	+0.01783 4.1286	+0.000070 0.0697	+0.0461 1.7555
NOV. 1 (OH) (2447831.5)	X:	+0.1174	-0.00009	+17.8290 2.088970	+0.01767 5.6475	+0.000074 2.0643	+0.0439 6.2317
A DEC. 3 (OH)	Y:	+0.0697	-0.00001	+18.2551 3.625231	+0.01549 1.0929	+0.000104 3.5324	+0.0453 1.4911
DEC. 1 (OH) (2447861.5)	X:	+0.1143	-0.00005	+17.4133 3.580276	+0.01379 1.0090	+0.000103 3.7388	+0.0432 2.9406
A DEC.33 (OH)	Y:	+0.0691	+0.00002	+17.9698 5.113684	+0.01144 2.9628	+0.000123 5.2545	+0.0448 4.4709

ÉPHÉMÉRIDES DES SATELLITES NATURELS

1989		COORDONNEES EQUATORIALES DIFFERENTIELLES					
		DU SATELLITE 3 D'URANUS: TITANIA					N=0.7217
		AO	A1	B0 FO	B1 F1	B2 F2	C0 PO
JAN. 1 (OH) (2447527.5)	X:	-0.0708	-0.00001	+28.7264 0.236528	+0.00957 4.4631	+0.000194 0.4171	+0.0316 4.4554
A FEV. 2 (OH)	Y:	+0.0616	+0.00000	+29.3557 1.772868	+0.01321 0.5270	+0.000197 2.0208	+0.0325 5.9922
FEV. 1 (OH) (2447558.5)	X:	-0.0714	-0.00003	+28.7719 3.751739	+0.00986 3.0692	+0.000182 4.0637	+0.0318 5.2099
A MAR. 5 (OH)	Y:	+0.0615	+0.00002	+29.6704 5.284507	+0.01885 4.7687	+0.000157 5.7891	+0.0329 0.4573
MAR. 1 (OH) (2447586.5)	X:	-0.0725	-0.00005	+29.1214 5.105315	+0.01801 4.9396	+0.000140 5.6190	+0.0323 1.6424
A AVR. 2 (OH)	Y:	+0.0625	+0.00004	+30.2361 0.352744	+0.02511 0.1570	+0.000106 1.4189	+0.0335 3.1725
AVR. 1 (OH) (2447617.5)	X:	-0.0745	-0.00003	+29.7852 2.344373	+0.02571 2.4031	+0.000064 3.7821	+0.0334 2.4031
A MAI 3 (OH)	Y:	+0.0636	+0.00007	+31.0456 3.873898	+0.02810 3.9119	+0.000118 6.1340	+0.0348 3.9326
MAI 1 (OH) (2447647.5)	X:	-0.0758	-0.00005	+30.5595 5.149143	+0.02702 5.3545	+0.000135 1.7138	+0.0338 1.7294
A JUN. 2 (OH)	Y:	+0.0660	+0.00006	+31.8186 0.395719	+0.02466 0.6656	+0.000202 3.2330	+0.0352 3.2593
JUN. 1 (OH) (2447678.5)	X:	-0.0774	+0.00001	+31.2523 2.395709	+0.01989 2.8085	+0.000246 5.5697	+0.0347 2.4985
A JUL. 3 (OH)	Y:	+0.0678	+0.00003	+32.3709 3.926905	+0.01554 4.6592	+0.000257 0.7865	+0.0358 4.0327
JUL. 1 (OH) (2447708.5)	X:	-0.0773	+0.00004	+31.5781 5.204486	+0.00814 0.1067	+0.000270 2.2496	+0.0347 1.8198
A AOU. 2 (OH)	Y:	+0.0687	+0.00002	+32.4892 0.454699	+0.01131 2.4136	+0.000239 3.8567	+0.0357 3.3545
AOU. 1 (OH) (2447739.5)	X:	-0.0761	+0.00005	+31.4217 2.450354	+0.01447 5.2873	+0.000199 5.9603	+0.0341 2.5891
A SEP. 2 (OH)	Y:	+0.0693	-0.00002	+32.1384 3.986049	+0.02011 0.5086	+0.000163 1.5127	+0.0348 4.1266
SEP. 1 (OH) (2447770.5)	X:	-0.0747	+0.00009	+30.8197 5.975628	+0.02550 2.8430	+0.000094 3.6679	+0.0335 3.3410
A OCT. 3 (OH)	Y:	+0.0680	-0.00005	+31.4299 1.229454	+0.02704 4.3587	+0.000102 5.9073	+0.0342 4.8766
OCT. 1 (OH) (2447800.5)	X:	-0.0720	+0.00005	+30.0012 2.491605	+0.02973 5.7902	+0.000064 1.6720	+0.0324 2.6573
A NOV. 2 (OH)	Y:	+0.0665	-0.00005	+30.6177 4.028273	+0.02790 1.1014	+0.000124 3.4106	+0.0331 4.1929
NOV. 1 (OH) (2447831.5)	X:	-0.0704	+0.00005	+29.1359 6.008263	+0.02767 3.1529	+0.000123 5.8378	+0.0317 3.4049
A DEC. 3 (OH)	Y:	+0.0645	-0.00005	+29.8728 1.259783	+0.02330 4.8751	+0.000173 1.0732	+0.0326 4.9379
DEC. 1 (OH) (2447861.5)	X:	-0.0688	+0.00002	+28.4507 2.517652	+0.02132 6.1112	+0.000167 2.5693	+0.0310 2.7137
A DEC.33 (OH)	Y:	+0.0628	-0.00002	+29.4066 4.049445	+0.01630 1.8030	+0.000200 4.1008	+0.0322 4.2429

SATELLITES D'URANUS

1989

COORDONNEES EQUATORIALES DIFFERENTIELLES

DU SATELLITE 4 D'URANUS: OBERON

N=0.4667

		AO	A1	B0 FO	B1 F1	B2 F2	CO PO
JAN. 1 (OH) (2447527.5)	X:	-0.0047	-0.00001	+38.4817 1.917755	+0.01383 6.1896	+0.000259 2.0639	+0.0154 0.7974
A FEV. 2 (OH)	Y:	+0.0463	+0.00003	+39.2929 3.454400	+0.01891 2.1921	+0.000258 3.6710	+0.0159 2.3308
FEV. 1 (OH) (2447558.5)	X:	-0.0057	+0.00002	+38.5456 3.810006	+0.01449 3.0352	+0.000243 4.1082	+0.0155 4.5908
A MAR. 5 (OH)	Y:	+0.0470	+0.00003	+39.7143 5.343014	+0.02621 4.7688	+0.000205 5.8176	+0.0162 6.1166
MAR. 1 (OH) (2447586.5)	X:	-0.0063	+0.00003	+39.0165 4.305407	+0.02460 4.0546	+0.000187 4.8091	+0.0159 5.5902
A AVR. 2 (OH)	Y:	+0.0485	+0.00000	+40.4706 5.836206	+0.03424 5.5812	+0.000137 0.6383	+0.0164 0.8230
AVR. 1 (OH) (2447617.5)	X:	-0.0046	-0.00007	+39.9055 6.204183	+0.03455 6.1927	+0.000095 1.4213	+0.0162 3.1140
A MAI 3 (OH)	Y:	+0.0498	+0.00001	+41.5561 1.450691	+0.03742 1.4308	+0.000153 3.6793	+0.0167 4.6233
MAI 1 (OH) (2447647.5)	X:	-0.0052	-0.00002	+40.9443 1.357370	+0.03573 1.5104	+0.000180 4.1765	+0.0163 5.9852
A JUN. 2 (OH)	Y:	+0.0495	+0.00010	+42.5886 2.887351	+0.03271 3.0955	+0.000276 5.6919	+0.0173 1.2262
JUN. 1 (OH) (2447678.5)	X:	-0.0064	+0.00006	+41.8698 3.264036	+0.02596 3.6197	+0.000329 0.1061	+0.0168 3.5040
A JUL. 3 (OH)	Y:	+0.0520	-0.00002	+43.3289 4.795438	+0.02001 5.4733	+0.000347 1.6332	+0.0175 5.0350
JUL. 1 (OH) (2447708.5)	X:	-0.0048	+0.00000	+42.3038 4.705129	+0.01015 5.8651	+0.000361 1.7253	+0.0168 0.0923
A AOU. 2 (OH)	Y:	+0.0514	+0.00001	+43.4891 6.238829	+0.01444 1.9423	+0.000315 3.3368	+0.0175 1.6321
AOU. 1 (OH) (2447739.5)	X:	-0.0058	+0.00008	+42.0929 0.328742	+0.01950 3.1684	+0.000266 3.8514	+0.0166 3.8931
A SEP. 2 (OH)	Y:	+0.0508	+0.00000	+43.0183 1.864809	+0.02667 4.6847	+0.000215 5.6236	+0.0173 5.4340
SEP. 1 (OH) (2447770.5)	X:	-0.0040	-0.00001	+41.2849 2.232181	+0.03425 5.3865	+0.000121 6.2138	+0.0161 1.4001
A OCT. 3 (OH)	Y:	+0.0512	-0.00010	+42.0710 3.769447	+0.03623 0.6125	+0.000140 2.1536	+0.0167 2.9488
OCT. 1 (OH) (2447800.5)	X:	-0.0033	-0.00004	+40.1883 3.664457	+0.03970 0.6757	+0.000093 2.7439	+0.0159 4.2671
A NOV. 2 (OH)	Y:	+0.0484	+0.00000	+40.9836 5.201480	+0.03749 2.2789	+0.000169 4.5848	+0.0160 5.8133
NOV. 1 (OH) (2447831.5)	X:	-0.0047	+0.00003	+39.0315 5.559217	+0.03716 2.7141	+0.000168 5.3586	+0.0155 1.7812
A DEC. 3 (OH)	Y:	+0.0472	+0.00000	+39.9852 0.810978	+0.03133 4.4380	+0.000231 0.5974	+0.0158 3.3189
DEC. 1 (OH) (2447861.5)	X:	-0.0047	+0.00001	+38.1158 0.701346	+0.02870 4.3182	+0.000221 0.7132	+0.0151 4.6409
A DEC.33 (OH)	Y:	+0.0471	-0.00002	+39.3620 2.233378	+0.02249 0.0048	+0.000270 2.2520	+0.0157 6.1653

Ces éphémérides donnent les positions des satellites Galiléens de Jupiter, des huit premiers satellites de Saturne et des cinq satellites d'Uranus pour 1989 avec une précision de 0.01 seconde de degré ("). Elles sont ainsi très utiles aux astronomes pour préparer ou réduire des observations de haute précision ainsi que pour étudier les mouvements des satellites naturels des planètes.

Les positions sont données sous forme de coefficients de fonctions élémentaires dépendant directement du temps. Les calculs sont faciles à programmer sur une calculatrice de poche ou sur un micro-ordinateur.

Cet ouvrage donne aussi une méthode pour effectuer les prédictions des phénomènes des satellites de Jupiter en 1989.

De telles éphémérides, uniques par leur contenu, méritent de figurer dans les bibliothèques des Universités et des Observatoires.

These ephemerides give the positions of the Galilean satellites of Jupiter, of the first eight satellites of Saturn and of the five satellites of Uranus for 1989 with an accuracy of 0.01 arcsecond (").

Thus, they are very useful to astronomers in order to prepare or reduce precise observations and to study the motions of the natural satellites of the planets.

The positions are given as coefficients of elementary functions depending directly on time. The calculations are easy to program on a pocket calculator or on a micro-computer.

This booklet also contains a method of calculation to predict the phenomena of the satellites of Jupiter in 1989.

Such ephemerides of unique nature, have their place in the libraries of Universities and Observatories.

ISBN : 2-86883-098-6

France : 160 FF
Etranger : 200 FF