

Det Kongelige Danske Videnskabernes Selskab

Matematisk-fysiske Meddelelser, bind **28**, nr. 10

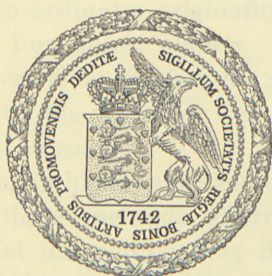
Dan. Mat. Fys. Medd. **28**, no. 10 (1954)

AN APPROPRIATE METHOD FOR
INTEGRATION OF THE MOTION
OF PERIODIC COMETS

BY

H. Q. RASMUSEN AND O. K. HESSELBERG

With an Auxiliary Table



København

i kommission hos Ejnar Munksgaard

1954

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Den 1ste Jule-Nr. 28, nr. 10 (1944)

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Forlaget for Videnskabs Selskabet

Printed in Denmark.

Bianco Lunos Bogtrykkeri A-S.

When the method of numerical integration is used to calculate the perturbed motion of a planet or comet, a certain difficulty arises if it is desired to take the effect of the four inner planets into account.

First of all, the mass of Mercury is so small that, except for very rare cases, it can safely be included in that of the Sun. We shall assume that this procedure is adopted throughout this paper. Thus, no distinction is made between heliocentric co-ordinates and co-ordinates referred to the centre of mass of the Sun and Mercury. However, even the planets Venus, the Earth, and Mars cause difficulties. These planets revolve so rapidly around the Sun that the use of an interval exceeding 10 or 20 days is impossible if the differences are going to remain manageable.

When the objects are more than four or five astronomical units from the Sun this problem is solved by including the masses of the four inner planets into that of the Sun, and neglecting the attractions of the inner planets on the Sun. Though this does seem to be generally recognized, such a procedure assumes the use of a system of co-ordinates originating in the gravity centre of the Sun and the four inner planets.

At smaller distances from the Sun the attractions from Venus, the Earth and Mars on the object as well as on the Sun must be taken rigorously into account.

For objects moving in highly elliptical orbits the usual practice is to use both of these methods alternately. This, however, requires some care at the point where the transition from one method to the other is made, if discontinuities are not to be introduced in the co-ordinates.

The method proposed in this paper is designed to avoid this difficulty. The point of the method is to use a co-ordinate system with its origin in the centre of mass of the Sun + Mercury, Venus,

the Earth, and Mars in the summation schemes at all times, and to omit the attractions on the Sun from these planets. The particular advantages of this choice are the following two:

1. The differences in the summation schemes must always remain smooth, even at the point of changing over from one procedure to the other.
2. The distance of the Sun from the origin of the co-ordinate system will never exceed $5 \cdot 10^{-6}$ astronomical units. Thus, the correction necessary to reduce the co-ordinates, and the attractions on the Sun from the outer planets, to the chosen system from the heliocentric system, in which they generally are tabulated, are sufficiently small to be neglected in nearly all cases. This would not be the case if a system with its origin in the centre of mass of the whole planetary system had been chosen.

The use of a co-ordinate system such as the one proposed here requires the co-ordinates of the Sun in this system to be available. This paper gives the co-ordinates of the Sun with opposite signs for every 10 days during the years 1920—1960. The tabular values are denoted $-\bar{x}_0$, $-\bar{y}_0$, $-\bar{z}_0$ and computed by the equations:

$$-\bar{x}_0 = \frac{\sum_{i=2}^4 m_i x_i}{1 + \sum_{i=1}^4 m_i} \quad -\bar{y}_0 = \frac{\sum_{i=2}^4 m_i y_i}{1 + \sum_{i=1}^4 m_i} \quad -\bar{z}_0 = \frac{\sum_{i=2}^4 m_i z_i}{1 + \sum_{i=1}^4 m_i}$$

The masses of the inner planets, which are used in the equations, are in accordance with *Astronomical Journal* 1170 (G. M. CLEMENCE):

1 = Mercury	1:6 000 000
2 = Venus	1: 408 000
3 = Earth + Moon	1: 329 406
4 = Mars	1:3 093 500

The co-ordinates of Venus, the Earth and Mars used in the computation are those given in the "Planetary Co-ordinates 1920—1960", published by H. M. Nautical Almanac Office.

Then the numerical integration of the perturbed rectangular co-ordinates of a body can be done, either by means of the equation:

$$\left. \begin{aligned}
 w^2 \frac{d^2 \bar{x}}{dt^2} &= -w^2 k^2 (1 + m_1) \frac{\bar{x} - \bar{x}_0}{r^3} \\
 &- \sum_{i=2}^8 w^2 k^2 m_i \frac{x - x_i}{\Delta_i^3} \\
 &- \sum_{i=5}^8 w^2 k^2 m_i \frac{\bar{x}_i}{r_i^3}.
 \end{aligned} \right\} 1.$$

Or, if the distance of the body from the Sun is more than 4-5 units, by means of the equation:

$$\left. \begin{aligned}
 w^2 \frac{d^2 \bar{x}}{dt^2} &= -w^2 k^2 \left(1 + \sum_{i=1}^4 m_i \right) \frac{\bar{x}}{r^3} \\
 &- \sum_{i=5}^8 w^2 k^2 m_i \frac{\bar{x} - \bar{x}_i}{\Delta_i^3} \\
 &- \sum_{i=5}^8 w^2 k^2 m_i \frac{\bar{x}_i}{r_i^3}.
 \end{aligned} \right\} 2.$$

In which:

$$\begin{aligned}
 x &= \bar{x} - \bar{x}_0 & r^2 &= (\bar{x} - \bar{x}_0)^2 + (\bar{y} - \bar{y}_0)^2 + (\bar{z} - \bar{z}_0)^2 \\
 y &= \bar{y} - \bar{y}_0 & \Delta_i^2 &= (x - x_i)^2 + (y - y_i)^2 + (z - z_i)^2 \\
 z &= \bar{z} - \bar{z}_0 & \Delta_i^2 &= (\bar{x} - \bar{x}_i)^2 + (\bar{z} - \bar{z}_i)^2 + (\bar{z} - \bar{z}_i)^2 \\
 & & \bar{r}_i^2 &= \bar{x}_i^2 + \bar{y}_i^2 + \bar{z}_i^2
 \end{aligned}$$

x, y, z are co-ordinates referred to the centre of mass of the Sun + Mercury.

$\bar{x}, \bar{y}, \bar{z}$ are co-ordinates referred to the centre of mass of the Sun + the four inner planets.

Instructions for the use of the method.

Given are the osculating elements: M , e , a , P_x , P_y , P_z , Q_x , Q_y , Q_z , $k\sqrt{1+m_1}$. We adopt the elements to be referred to the barycentre Sun + Mercury. With these elements we compute the rectangular co-ordinates and velocities for the osculating date: x , y , z , $w \frac{dx}{dt}$, $w \frac{dy}{dt}$, $w \frac{dz}{dt}$.

From these we then have to subtract: $-\bar{x}_0$, $-\bar{y}_0$, $-\bar{z}_0$, $-w \frac{dx_0}{dt}$, $-w \frac{dy_0}{dt}$, $-w \frac{dz_0}{dt}$ where the negative velocities of the Sun are deduced from the table by:

$$10 \frac{df}{dt} = \frac{1}{60} (-f_{-3} + 9f_{-2} - 45f_{-1} + 45f_{+1} - 9f_{+2} + f_{+3}).$$

We then get \bar{x} , \bar{y} , \bar{z} , $w \frac{d\bar{x}}{dt}$, $w \frac{d\bar{y}}{dt}$, $w \frac{d\bar{z}}{dt}$ and from these values the integration schemes can be built up.

If the radius vector of the body is less than 4—5 units we use equation 1; if it is greater, equation 2.

If the interval is greater than 80 days, the heliocentric co-ordinates for Jupiter and Saturn given in "Planetary Co-ordinates 1920—1960" will not be sufficient for computing the third terms in the two equations accurately by 9 decimals.

In the rare cases when a comet passes very close to one of the outer planets, the second terms must also be computed by means of six or more decimals. So the co-ordinates for the five outer planets given in the "Astronomical Papers" Vol. XII will be well suited.

These co-ordinates are integrated by means of an equation similar to equation 2, thus they are also referred to the origin in the centre of mass of the Sun and the four inner planets. Consequently the co-ordinates of the comet in the second term of equation 1 must not be made heliocentric by adding the tabular values $-\bar{x}_0$, $-\bar{y}_0$, $-\bar{z}_0$.

If equation 2 is used both the co-ordinates of the outer planets and those of the comet are referred to the same origin.

When computing an accurate geocentric ephemeris, the tabular values $-\bar{x}_0$, $-\bar{y}_0$, $-\bar{z}_0$ must always be added to the

barycentric co-ordinates of the body \bar{x} , \bar{y} , \bar{z} . The resulting co-ordinates x , y , z cannot in any case be distinguished from true heliocentric co-ordinates by observation.

If osculating elements are to be derived for some date, the barycentric co-ordinates and velocities derived from the schemes have of course to be changed to the heliocentric system by adding

$$-\bar{x}_0, -\bar{y}_0, -\bar{z}_0, -w \frac{d\bar{x}_0}{dt}, -w \frac{d\bar{y}_0}{dt}, -w \frac{d\bar{z}_0}{dt}.$$

As an illustration of the use of the two equations, we compute the acceleration of the periodic comet Schwassmann-Wachmann (2) for 1940 June 20.0 (Interval 20 days).

This date is chosen because Venus and the Earth have then almost the same heliocentric longitude. Thus the disagreement between the results obtained will be particularly great, but all the same only a few units in the 9th decimal.

Numerical examples.

EQUATION 1.

${}''\bar{F}$	+ 3.95361694	5	— 0.39710974	7	— 0.37222441	1	r^2	15.92613559
$\bar{F} : 12$	—	61366	+	6249	+	5895		
$-\bar{F}'' : 240$	+	4	+	9	+	3	r	3.99075627
$-\bar{x}_0, -\bar{y}_0, -\bar{z}_0$	—	56	—	406	—	176	$\frac{w^2 k^2 (1 + m_1)}{r^3}$	0.00186233298
x, y, z	+ 3.95300276		— 0.39705123		— 0.37716719			

Planet No.	2	3	4	5	6	7	8		
$x - x_i$	+ 4.025	+ 3.977	+ 4.908	— 0.40914	— 3.4668	— 7.95	+ 34.05		
$y - y_i$	+ 0.264	+ 0.535	— 1.603	— 2.59555	— 5.5935	— 14.70	— 2.63		
$z - z_i$	+ 0.084	+ 0.027	— 0.956	— 1.21364	— 2.2054	— 6.48	— 2.05		
Δ_i^2	16.277	16.103	27.572	8.37720	48.1697	321.28	1170.52		
$10^8 w^2 k^2 m_i$	29.011	35.933	3.826	11301.31	3380.31	517.6	612.8		
$10^8 w^2 k^2 m_i : \Delta_i^3$	0.442	0.556	0.026	466.102	10.111	0.0899	0.0153		
1. Term	— 0.00736180	74		+ 0.00073944	16		+ 0.00070241	09	
2. Term	+	221	83	+	1267	34	+	588	57
3. Term	—	436	94	—	227	42	—	85	96
Acceleration	— 0.00736395	8		+ 0.00074984	1		+ 0.00070743	7	
${}''\bar{F}$ (May 31.0)	— 3.98820410	0		+ 0.53999358	2		+ 0.43472291	1	
$2''\bar{F}$ (June 20.0)	+ 7.90723389	0		— 0.79421949	4		— 0.75444882	2	
${}''\bar{F}$ (July 10.0)	+ 3.91166583	2		— 0.25347607	1		— 0.31901847	4	

EQUATION 2.

${}''\bar{F}$	+ 3.95361694	5	— 0.39710974	7	— 0.37722441	1	\bar{r}^2	15.92613546
$\bar{F} : 12$	—	61366	+	6249	+	5895	\bar{r}	3.99075625
$\bar{F}'' : 240$	+	4	+	9	+	3	$\frac{w^2 k^2 (1 + \sum_{i=1}^4 m_i)}{\bar{r}^3}$	0.00186234382
$\bar{x}, \bar{y}, \bar{z}$	+ 3.95300332		— 0.39704717		— 0.37716543			

Planet No.		5	6	7	8				
$\bar{x} - \bar{x}_i$		— 0.40914	— 3.4668	— 7.95	+ 34.05				
$\bar{y} - \bar{y}_i$		— 2.59555	— 5.5935	— 14.70	— 2.63				
$\bar{z} - \bar{z}_i$		— 1.21364	— 2.2054	— 6.48	— 2.05				
Δ_i^2		8.37720	48.1697	321.28	1170.52				
$10^8 w^2 k^2 m_i$		11301.31	3380.31	517.6	612.8				
$10^8 w^2 k^2 m_i : \Delta_i^3$		466.102	10.111	0.0899	0.0153				
1. Term	— 0.00736185	13		+ 0.00073943	83		+ 0.00070241	17	
2. Term	+	225	95	+	1267	71	+	588	59
3. Term	—	436	94	—	227	42	—	85	96
Acceleration	— 0.00736396	1		+ 0.00074984	1		+ 0.00070743	8	
${}''\bar{F}$ (May 31.0)	— 3.98820410	0		+ 0.53999358	2		+ 0.43472291	1	
$2''\bar{F}$ (June 20.0)	+ 7.90723389	0		— 0.79421949	4		— 0.75444882	2	
${}''\bar{F}$ (July 10.0)	+ 3.91166582	9		— 0.25347607	1		— 0.31901847	3	

Date		J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1919 Oct.	8.5.....	2422240.5	+ 415.20	+ 198.59	+ 79.78
	18.5.....	250.5	+ 361.81	+ 275.41	+ 115.68
	28.5.....	260.5	+ 291.05	+ 339.08	+ 146.30
Nov.	7.5.....	270.5	+ 206.80	+ 386.35	+ 170.02
	17.5.....	280.5	+ 113.73	+ 415.00	+ 185.59
Dec.	27.5.....	290.5	+ 16.94	+ 423.96	+ 192.32
	7.5.....	300.5	- 78.34	+ 413.36	+ 190.04
	17.5.....	310.5	- 167.14	+ 384.56	+ 179.14
1920 Jan.	27.5.....	320.5	- 245.10	+ 339.94	+ 160.54
	6.5.....	330.5	- 308.75	+ 282.76	+ 135.59
Feb.	16.5.....	340.5	- 355.68	+ 216.83	+ 105.94
	26.5.....	350.5	- 384.72	+ 146.27	+ 73.48
	5.5.....	360.5	- 395.84	+ 75.14	+ 40.10
Mar.	15.5.....	370.5	- 390.18	+ 7.20	+ 7.62
	25.5.....	380.5	- 369.80	- 54.33	- 22.32
Apr.	6.5.....	390.5	- 337.51	- 106.97	- 48.41
	16.5.....	400.5	- 296.60	- 149.08	- 69.70
	26.5.....	410.5	- 250.57	- 179.94	- 85.66
May	5.5.....	420.5	- 202.86	- 199.67	- 96.14
	15.5.....	430.5	- 156.60	- 209.22	- 101.43
June	25.5.....	440.5	- 114.42	- 210.20	- 102.14
	5.5.....	450.5	- 78.21	- 204.73	- 99.18
	15.5.....	460.5	- 49.07	- 195.21	- 93.64
July	25.5.....	470.5	- 27.22	- 184.09	- 86.71
	4.5.....	480.5	- 12.03	- 173.67	- 79.54
Aug.	14.5.....	490.5	- 2.09	- 165.81	- 73.17
	24.5.....	500.5	+ 4.58	- 161.80	- 68.38
	4.5.....	510.5	+ 10.34	- 162.20	- 65.68
Sept.	14.5.....	520.5	+ 17.62	- 166.74	- 65.19
	24.5.....	530.5	+ 28.66	- 174.39	- 66.66
Oct.	3.5.....	540.5	+ 45.23	- 183.45	- 69.52
	13.5.....	550.5	+ 68.39	- 191.72	- 72.90
	23.5.....	560.5	+ 98.35	- 196.71	- 75.74
Nov.	2.5.....	570.5	+ 134.40	- 195.96	- 76.93
	12.5.....	580.5	+ 174.92	- 187.29	- 75.40
Dec.	22.5.....	590.5	+ 217.52	- 168.99	- 70.25
	2.5.....	600.5	+ 259.25	- 140.10	- 60.83
	12.5.....	610.5	+ 296.79	- 100.48	- 46.86
1921 Jan.	22.5.....	620.5	+ 326.75	- 50.87	- 28.40
	1.5.....	630.5	+ 345.95	+ 7.06	- 5.96
Feb.	11.5.....	640.5	+ 351.67	+ 70.89	+ 19.63
	21.5.....	650.5	+ 341.91	+ 137.48	+ 47.16
	1.5.....	660.5	+ 315.54	+ 203.24	+ 75.19
Mar.	11.5.....	670.5	+ 272.46	+ 264.31	+ 102.07
	21.5.....	680.5	+ 213.67	+ 316.81	+ 126.11
Apr.	31.5.....	690.5	+ 141.28	+ 357.16	+ 145.66
	10.5.....	700.5	+ 58.43	+ 382.27	+ 159.23
	20.5.....	710.5	- 30.90	+ 389.84	+ 165.64

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$	
1921 Jan.	20.5.....	2422710.5	- 30.90	+ 389.84	+ 165.64
	30.5.....	720.5	-122.03	+ 378.57	+ 164.07
Feb.	9.5.....	730.5	-209.96	+ 348.24	+ 154.19
	19.5.....	740.5	-289.66	+ 299.86	+ 136.19
Mar.	1.5.....	750.5	-356.42	+ 235.60	+ 110.77
	11.5.....	760.5	-406.22	+ 158.69	+ 79.15
	21.5.....	770.5	-435.99	+ 73.21	+ 42.98
	31.5.....	780.5	-443.90	- 16.18	+ 4.21
Apr.	10.5.....	790.5	-429.42	-104.57	- 34.99
	20.5.....	800.5	-393.38	-187.09	- 72.45
	30.5.....	810.5	-337.93	-259.30	-106.09
May	10.5.....	820.5	-266.31	-317.43	-134.07
	20.5.....	830.5	-182.67	-358.57	-154.93
	30.5.....	840.5	- 91.77	-380.90	-167.61
June	9.5.....	850.5	+ 1.36	-383.73	-171.58
	19.5.....	860.5	+ 91.68	-367.47	-166.81
	29.5.....	870.5	+174.45	-333.65	-153.76
July	9.5.....	880.5	+245.54	-284.70	-133.38
	19.5.....	890.5	+301.62	-223.88	-106.99
	29.5.....	900.5	+340.35	-154.98	- 76.23
Aug.	8.5.....	910.5	+360.52	- 82.12	- 42.95
	18.5.....	920.5	+362.06	- 9.48	- 9.07
	28.5.....	930.5	+346.06	+ 59.03	+ 23.52
Sept.	7.5.....	940.5	+314.61	+119.95	+ 53.11
	17.5.....	950.5	+270.68	+170.54	+ 78.27
	27.5.....	960.5	+217.81	+208.93	+ 97.94
Oct.	7.5.....	970.5	+159.86	+234.24	+111.49
	17.5.....	980.5	+100.69	+246.56	+118.75
	27.5.....	2422990.5	+ 43.83	+246.89	+120.03
Nov.	6.5.....	2423000.5	- 7.76	+236.99	+115.97
	16.5.....	010.5	- 51.87	+219.16	+107.57
	26.5.....	020.5	- 87.20	+196.01	+ 96.00
Dec.	6.5.....	030.5	-113.34	+170.18	+ 82.53
	16.5.....	040.5	-130.73	+144.13	+ 68.41
	26.5.....	050.5	-140.56	+119.92	+ 54.74
1922 Jan.	5.5.....	060.5	-144.54	+ 99.08	+ 42.42
	15.5.....	070.5	-144.75	+ 82.48	+ 32.09
	25.5.....	080.5	-143.40	+ 70.35	+ 24.05
Feb.	4.5.....	090.5	-142.60	+ 62.23	+18.33
	14.5.....	100.5	-144.17	+ 57.10	+14.64
	24.5.....	110.5	-149.46	+ 53.44	+12.42
Mar.	6.5.....	120.5	-159.19	+ 49.41	+10.90
	16.5.....	130.5	-173.41	+ 43.01	+ 9.21
	26.5.....	140.5	-191.38	+ 32.32	+ 6.42
Apr.	5.5.....	150.5	-211.64	+ 15.65	+ 1.64
	15.5.....	160.5	-232.09	- 8.21	- 5.85
	25.5.....	170.5	-250.12	-39.85	-16.53
May	5.5.....	180.5	-262.88	-79.04	-30.56

Date		J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$	
1922	May 5.5.....	2423180.5	-262.88	- 79.04	- 30.56	
	15.5.....	190.5	-267.46	-124.75	- 47.74	
	25.5.....	200.5	-261.28	-175.08	- 67.46	
	June	4.5.....	210.5	-242.28	-227.41	- 88.76
		14.5.....	220.5	-209.24	-278.55	-110.38
	24.5.....	230.5	-161.91	-324.96	-130.84	
	July	4.5.....	240.5	-101.14	-363.07	-148.57
		14.5.....	250.5	- 28.90	-389.52	-162.02
		24.5.....	260.5	+ 51.88	-401.52	-169.82
	Aug.	3.5.....	270.5	+137.42	-396.98	-170.88
		13.5.....	280.5	+223.37	-374.80	-164.48
	Sept.	23.5.....	290.5	+305.05	-334.90	-150.34
2.5.....		300.5	+377.81	-278.30	-128.68	
12.5.....		310.5	+437.30	-207.06	-100.16	
22.5.....		320.5	+479.76	-124.25	- 65.94	
Oct.	2.5.....	330.5	+502.26	- 33.68	- 27.54	
	12.5.....	340.5	+502.93	+ 60.22	+ 13.20	
	22.5.....	350.5	+481.13	+152.67	+ 54.19	
Nov.	1.5.....	360.5	+437.48	+238.88	+ 93.31	
	11.5.....	370.5	+373.90	+314.27	+128.44	
Dec.	21.5.....	380.5	+293.51	+374.82	+157.66	
	1.5.....	390.5	+200.49	+417.34	+179.36	
	11.5.....	400.5	+ 99.79	+439.67	+192.36	
	21.5.....	410.5	- 3.15	+440.88	+196.00	
	31.5.....	420.5	-102.80	+421.31	+190.20	
1923	Jan. 10.5.....	430.5	-193.89	+382.58	+175.44	
	20.5.....	440.5	-271.80	+327.42	+152.77	
	30.5.....	450.5	-332.84	+259.51	+123.69	
	Feb.	9.5.....	460.5	-374.53	+183.15	+ 90.06
		19.5.....	470.5	-395.65	+102.97	+ 53.93
	Mar.	1.5.....	480.5	-396.33	+ 23.58	+ 17.43
		11.5.....	490.5	-377.93	- 50.74	-17.42
		21.5.....	500.5	-342.91	-116.30	- 48.79
		31.5.....	510.5	-294.55	-170.21	- 75.20
	Apr.	10.5.....	520.5	-236.74	-210.53	- 95.55
		20.5.....	530.5	-173.62	-236.30	-109.21
	May	30.5.....	540.5	-109.37	-247.60	-116.02
10.5.....		550.5	- 47.84	-245.41	-116.23	
20.5.....		560.5	+ 7.63	-231.53	-110.55	
30.5.....		570.5	+ 54.42	-208.39	- 99.98	
June	9.5.....	580.5	+ 90.83	-178.85	- 85.78	
	19.5.....	590.5	+116.05	-145.93	- 69.39	
	29.5.....	600.5	+130.30	-112.58	- 52.22	
July	9.5.....	610.5	+134.68	- 81.46	- 35.63	
	19.5.....	620.5	+131.04	- 54.66	- 20.76	
Aug.	29.5.....	630.5	+121.78	- 33.59	- 8.48	
	8.5.....	640.5	+109.61	- 18.84	+ 0.72	
	18.5.....	650.5	+ 97.18	- 10.18	+ 6.70	

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1923 Aug. 18.5.....	2423650.5	+ 97.18	- 10.18	+ 6.70
28.5.....	660.5	+ 86.90	- 6.59	+ 9.74
Sept. 7.5.....	670.5	+ 80.59	- 6.46	+ 10.42
17.5.....	680.5	+ 79.37	- 7.74	+ 9.58
27.5.....	690.5	+ 83.48	- 8.20	+ 8.22
Oct. 7.5.....	700.5	+ 92.34	- 5.70	+ 7.33
17.5.....	710.5	+ 104.58	+ 1.55	+ 7.87
27.5.....	720.5	+ 118.18	+ 14.82	+ 10.59
Nov. 6.5.....	730.5	+ 130.69	+ 34.72	+ 15.98
16.5.....	740.5	+ 139.49	+ 61.10	+ 24.20
26.5.....	750.5	+ 142.00	+ 93.01	+ 35.11
Dec. 6.5.....	760.5	+ 135.96	+ 128.80	+ 48.19
16.5.....	770.5	+ 119.62	+ 166.21	+ 62.64
26.5.....	780.5	+ 91.92	+ 202.50	+ 77.41
1924 Jan. 5.5.....	790.5	+ 52.66	+ 234.67	+ 91.24
15.5.....	800.5	+ 2.54	+ 259.64	+ 102.82
25.5.....	810.5	- 56.76	+ 274.51	+ 110.83
Feb. 4.5.....	820.5	- 122.73	+ 276.82	+ 114.05
14.5.....	830.5	- 192.03	+ 264.69	+ 111.52
24.5.....	840.5	- 260.72	+ 237.13	+ 102.56
Mar. 5.5.....	850.5	- 324.56	+ 194.06	+ 86.91
15.5.....	860.5	- 379.20	+ 136.52	+ 64.76
25.5.....	870.5	- 420.57	+ 66.56	+ 36.76
Apr. 4.5.....	880.5	- 445.19	- 12.78	+ 4.05
14.5.....	890.5	- 450.47	- 97.66	- 31.86
24.5.....	900.5	- 434.90	- 183.68	- 69.15
May 4.5.....	910.5	- 398.24	- 266.18	- 105.79
14.5.....	920.5	- 341.53	- 340.57	- 139.74
24.5.....	930.5	- 267.07	- 402.61	- 169.04
June 3.5.....	940.5	- 178.27	- 448.72	- 191.93
13.5.....	950.5	- 79.41	- 476.21	- 207.04
23.5.....	960.5	+ 24.62	- 483.43	- 213.42
July 3.5.....	970.5	+ 128.58	- 469.85	- 210.58
13.5.....	980.5	+ 227.30	- 436.14	- 198.59
23.5.....	2423990.5	+ 315.85	- 384.03	- 178.01
Aug. 2.5.....	2424000.5	+ 389.94	- 316.28	- 149.87
12.5.....	010.5	+ 446.10	- 236.47	- 115.64
22.5.....	020.5	+ 481.88	- 148.78	- 77.09
Sept. 1.5.....	030.5	+ 496.02	- 57.78	- 36.25
11.5.....	040.5	+ 488.49	+ 31.89	+ 4.79
21.5.....	050.5	+ 460.50	+ 115.80	+ 43.92
Oct. 1.5.....	060.5	+ 414.40	+ 189.97	+ 79.24
11.5.....	070.5	+ 353.51	+ 251.16	+ 109.09
21.5.....	080.5	+ 281.90	+ 297.07	+ 132.21
31.5.....	090.5	+ 204.09	+ 326.43	+ 147.82
Nov. 10.5.....	100.5	+ 124.66	+ 339.11	+ 155.64
20.5.....	110.5	+ 48.01	+ 336.04	+ 155.90
30.5.....	120.5	- 22.04	+ 319.08	+ 149.28

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1924 Nov. 30.5.....	2424120.5	— 22.04	+ 319.08	+ 149.28
Dec. 10.5.....	130.5	— 82.44	+ 290.83	+ 136.87
20.5.....	140.5	— 131.07	+ 254.38	+ 120.04
30.5.....	150.5	— 166.89	+ 213.01	+ 100.31
1925 Jan. 10.0.....	160.5	— 189.85	+ 169.98	+ 79.24
20.....	170.5	— 200.86	+ 128.22	+ 58.30
30.....	180.5	— 201.58	+ 90.17	+ 38.78
Feb. 9.....	190.5	— 194.26	+ 57.61	+ 21.71
19.....	200.5	— 181.48	+ 31.59	+ 7.76
Mar. 1.....	210.5	— 165.96	+ 12.40	— 2.72
11.....	220.5	— 150.24	— 0.39	— 9.74
21.....	230.5	— 136.53	— 7.86	— 13.65
31.....	240.5	— 126.52	— 11.60	— 15.08
Apr. 10.....	250.5	— 121.20	— 13.56	— 14.88
20.....	260.5	— 120.83	— 15.81	— 14.01
30.....	270.5	— 124.85	— 20.35	— 13.48
May 10.....	280.5	— 131.96	— 28.88	— 14.21
20.....	290.5	— 140.22	— 42.62	— 16.94
30.....	300.5	— 147.29	— 62.10	— 22.16
June 9.....	310.5	— 150.58	— 87.09	— 30.02
19.....	320.5	— 147.60	— 116.53	— 40.28
29.....	330.5	— 136.23	— 148.61	— 52.38
July 9.....	340.5	— 114.96	— 180.90	— 65.38
19.....	350.5	— 83.15	— 210.56	— 78.14
29.....	360.5	— 41.10	— 234.53	— 89.34
Aug. 8.....	370.5	+ 9.85	— 249.93	— 97.65
18.....	380.5	+ 67.45	— 254.22	— 101.86
28.....	390.5	+ 128.59	— 245.54	— 100.97
Sept. 7.....	400.5	+ 189.61	— 222.80	— 94.29
17.....	410.5	+ 246.49	— 185.91	— 81.53
27.....	420.5	+ 295.18	— 135.77	— 62.85
Oct. 7.....	430.5	+ 331.90	— 74.25	— 38.82
17.....	440.5	+ 353.36	— 4.12	— 10.46
27.....	450.5	+ 357.10	+ 71.07	+ 20.85
Nov. 6.....	460.5	+ 341.61	+ 147.27	+ 53.44
16.....	470.5	+ 306.55	+ 220.09	+ 85.44
26.....	480.5	+ 252.77	+ 285.13	+ 114.89
Dec. 6.....	490.5	+ 182.35	+ 338.23	+ 139.90
16.....	500.5	+ 98.51	+ 375.80	+ 158.74
26.....	510.5	+ 5.45	+ 395.03	+ 170.00
1926 Jan. 5.....	520.5	— 91.88	+ 394.18	+ 172.68
15.....	530.5	— 188.11	+ 372.71	+ 166.30
25.....	540.5	— 277.80	+ 331.32	+ 150.90
Feb. 4.....	550.5	— 355.82	+ 271.99	+ 127.16
14.....	560.5	— 417.71	+ 197.83	+ 96.23
24.....	570.5	— 459.98	+ 112.85	+ 59.76
Mar. 6.....	580.5	— 480.38	+ 21.72	+ 19.72
16.....	590.5	— 478.01	— 70.60	— 21.70

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1926 Mar. 16	2424590.5	-478.01	-70.60	-21.70
26	600.5	-453.34	-159.19	-62.24
Apr. 5	610.5	-408.17	-239.46	-99.79
15	620.5	-345.43	-307.49	-132.41
25	630.5	-268.94	-360.22	-158.55
May 5	640.5	-183.19	-395.61	-177.08
15	650.5	-92.96	-412.68	-187.33
25	660.5	-3.05	-411.57	-189.17
June 4	670.5	+82.04	-393.48	-182.92
14	680.5	+158.32	-360.47	-169.38
24	690.5	+222.58	-315.39	-149.70
July 4	700.5	+272.56	-261.58	-125.35
14	710.5	+307.03	-202.68	-97.99
24	720.5	+325.84	-142.34	-69.32
Aug. 3	730.5	+329.87	-83.97	-41.01
13	740.5	+320.94	-30.50	-14.57
23	750.5	+301.57	+15.83	+8.79
Sept. 2	760.5	+274.76	+53.60	+28.20
12	770.5	+243.70	+82.28	+43.20
22	780.5	+211.47	+102.20	+53.73
Oct. 2	790.5	+180.73	+114.49	+60.15
12	800.5	+153.55	+120.84	+63.11
22	810.5	+131.21	+123.30	+63.51
Nov. 1	820.5	+114.15	+124.08	+62.35
11	830.5	+102.01	+125.23	+60.66
21	840.5	+93.69	+128.46	+59.39
Dec. 1	850.5	+87.54	+134.99	+59.26
11	860.5	+81.56	+145.38	+60.76
21	870.5	+73.61	+159.56	+64.12
31	880.5	+61.64	+176.77	+69.20
1927 Jan. 10	890.5	+43.92	+195.63	+75.63
20	900.5	+19.19	+214.30	+82.72
30	910.5	-13.18	+230.54	+89.61
Feb. 9	920.5	-53.04	+241.98	+95.28
19	930.5	-99.48	+246.24	+98.68
Mar. 1	940.5	-150.77	+241.21	+98.76
11	950.5	-204.45	+225.21	+94.64
21	960.5	-257.45	+197.19	+85.65
31	970.5	-306.31	+156.92	+71.46
Apr. 10	980.5	-347.40	+105.08	+52.10
20	2424990.5	-377.20	+43.29	+28.04
30	2425000.5	-392.67	-25.94	+0.15
May 10	010.5	-391.44	-99.32	-30.31
20	020.5	-372.14	-172.99	-61.77
30	030.5	-334.50	-242.78	-92.46
June 9	040.5	-279.44	-304.54	-120.54
19	050.5	-209.09	-354.41	-144.24
29	060.5	-126.62	-389.10	-161.95

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1927 June 29	2425060.5	-126.62	-389.10	-161.95
July 9	070.5	-36.09	-406.15	-172.42
19	080.5	+57.85	-404.10	-174.76
29	090.5	+150.19	-382.58	-168.57
Aug. 8	100.5	+235.94	-342.34	-153.96
18	110.5	+310.39	-285.27	-131.51
28	120.5	+369.41	-214.21	-102.30
Sept. 7	130.5	+409.68	-132.86	-67.83
17	140.5	+428.96	-45.54	-29.89
27	150.5	+426.16	+43.05	+9.45
Oct. 7	160.5	+401.50	+128.12	+48.06
17	170.5	+356.47	+205.08	+83.78
27	180.5	+293.74	+269.82	+114.66
Nov. 6	190.5	+217.07	+319.00	+139.02
16	200.5	+130.98	+350.27	+155.59
26	210.5	+40.50	+362.40	+163.59
Dec. 6	220.5	-49.17	+355.41	+162.81
16	230.5	-133.08	+330.47	+153.55
26	240.5	-206.83	+289.86	+136.68
1928 Jan. 5	250.5	-266.87	+236.70	+113.47
15	260.5	-310.71	+174.77	+85.57
25	270.5	-337.05	+108.10	+54.82
Feb. 4	280.5	-345.79	+40.77	+23.10
14	290.5	-337.96	-23.45	-7.75
24	300.5	-315.56	-81.30	-36.09
Mar. 5	310.5	-281.33	-130.25	-60.58
15	320.5	-238.56	-168.59	-80.24
25	330.5	-190.75	-195.51	-94.50
Apr. 4	340.5	-141.38	-211.10	-103.19
14	350.5	-93.65	-216.23	-106.56
24	360.5	-50.26	-212.50	-105.21
May 4	370.5	-13.21	-202.02	-100.04
14	380.5	+16.29	-187.19	-92.13
24	390.5	+37.92	-170.55	-82.69
June 3	400.5	+52.22	-154.44	-72.92
13	410.5	+60.52	-140.86	-63.87
23	420.5	+64.75	-131.19	-56.41
July 3	430.5	+67.26	-126.14	-51.09
13	440.5	+70.51	-125.58	-48.09
23	450.5	+76.80	-128.63	-47.24
Aug. 2	460.5	+88.01	-133.68	-48.01
12	470.5	+105.33	-138.62	-49.59
22	480.5	+129.10	-141.01	-50.95
Sept. 1	490.5	+158.78	-138.42	-51.01
11	500.5	+192.91	-128.62	-48.69
21	510.5	+229.23	-109.90	-43.06
Oct. 1	520.5	+264.90	-81.18	-33.48
11	530.5	+296.67	-42.25	-19.61

Date		J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1928 Oct.	11	2425530.5	+ 296.67	- 42.25	- 19.61
	21	540.5	+ 321.23	+ 6.24	- 1.48
	31	550.5	+ 335.41	+ 62.77	+ 20.46
Nov.	10	560.5	+ 336.48	+ 124.96	+ 45.41
	20	570.5	+ 322.40	+ 189.78	+ 72.21
	30	580.5	+ 291.98	+ 253.70	+ 99.44
Dec.	10	590.5	+ 245.07	+ 312.89	+ 125.48
	20	600.5	+ 182.57	+ 363.50	+ 148.66
	30	610.5	+ 106.52	+ 401.92	+ 167.32
1929 Jan.	9	620.5	+ 19.96	+ 425.02	+ 179.96
	19	630.5	- 73.14	+ 430.45	+ 185.38
	29	640.5	- 168.15	+ 416.80	+ 182.74
Feb.	8	650.5	- 260.08	+ 383.77	+ 171.65
	18	660.5	- 343.84	+ 332.28	+ 152.26
	28	670.5	- 414.65	+ 264.41	+ 125.24
Mar.	10	680.5	- 468.37	+ 183.31	+ 91.78
	20	690.5	- 501.83	+ 93.02	+ 53.49
	30	700.5	- 513.00	- 1.80	+ 12.34
Apr.	9	710.5	- 501.23	- 96.19	+ 29.54
	19	720.5	- 467.19	- 185.25	- 69.92
	29	730.5	- 412.88	- 264.42	- 106.68
May	9	740.5	- 341.44	- 329.79	- 137.95
	19	750.5	- 256.95	- 378.31	- 162.17
	29	760.5	- 164.12	- 408.00	- 178.25
June	8	770.5	- 67.98	- 417.98	- 185.56
	18	780.5	+ 26.36	- 408.52	- 183.99
	28	790.5	+ 114.13	- 380.98	- 173.95
July	8	800.5	+ 191.07	- 337.68	- 156.31
	18	810.5	+ 253.73	- 281.75	- 132.33
	28	820.5	+ 299.62	- 216.90	- 103.62
Aug.	7	830.5	+ 327.35	- 147.21	- 71.99
	17	840.5	+ 336.70	- 76.80	- 39.34
	27	850.5	+ 328.57	- 9.64	- 7.57
Sept.	6	860.5	+ 304.93	+ 50.78	+ 21.61
	16	870.5	+ 268.60	+ 101.65	+ 46.73
	26	880.5	+ 223.01	+ 141.03	+ 66.70
Oct.	6	890.5	+ 171.96	+ 167.92	+ 80.84
	16	900.5	+ 119.26	+ 182.32	+ 88.94
	26	910.5	+ 68.43	+ 185.13	+ 91.25
Nov.	5	920.5	+ 22.45	+ 178.03	+ 88.39
	15	930.5	- 16.44	+ 163.27	+ 81.31
	25	940.5	- 46.89	+ 143.41	+ 71.16
Dec.	5	950.5	- 68.45	+ 121.08	+ 59.21
	15	960.5	- 81.52	+ 98.74	+ 46.69
	25	970.5	- 87.28	+ 78.49	+ 34.72
1930 Jan.	4	980.5	- 87.42	+ 61.86	+ 24.21
	14	2425990.5	- 84.05	+ 49.77	+ 15.80
	24	2426000.5	- 79.41	+ 42.47	+ 9.82

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1930 Jan. 24	2426000.5	- 79.41	+ 42.47	+ 9.82
Feb. 3	010.5	- 75.64	+ 39.54	+ 6.32
13	020.5	- 74.65	+ 39.95	+ 5.00
23	030.5	- 77.88	+ 42.18	+ 5.31
Mar. 5	040.5	- 86.12	+ 44.38	+ 6.50
15	050.5	- 99.52	+ 44.49	+ 7.67
25	060.5	- 117.43	+ 40.50	+ 7.85
Apr. 4	070.5	- 138.48	+ 30.65	+ 6.13
14	080.5	- 160.61	+ 13.61	+ 1.74
24	090.5	- 181.27	- 11.35	- 5.85
May 4	100.5	- 197.58	- 44.16	- 16.88
14	110.5	- 206.62	- 83.92	- 31.20
24	120.5	- 205.70	- 128.88	- 48.29
June 3	130.5	- 192.68	- 176.57	- 67.24
13	140.5	- 166.16	- 223.86	- 86.85
23	150.5	- 125.75	- 267.29	- 105.67
July 3	160.5	- 72.12	- 303.32	- 122.15
13	170.5	- 7.04	- 328.60	- 134.75
23	180.5	+ 66.72	- 340.25	- 142.10
Aug. 2	190.5	+ 145.54	- 336.14	- 143.07
12	200.5	+ 225.17	- 315.03	- 136.90
22	210.5	+ 301.04	- 276.73	- 123.27
Sept. 1	220.5	+ 368.54	- 222.13	- 102.32
11	230.5	+ 423.34	- 153.18	- 74.68
21	240.5	+ 461.65	- 72.78	- 41.43
Oct. 1	250.5	+ 480.49	+ 15.32	- 4.05
11	260.5	+ 477.93	+ 106.81	+ 35.65
21	270.5	+ 453.22	+ 196.96	+ 75.64
31	280.5	+ 406.86	+ 281.02	+ 113.81
Nov. 10	290.5	+ 340.67	+ 354.39	+ 148.04
20	300.5	+ 257.65	+ 413.04	+ 176.40
30	310.5	+ 161.90	+ 453.69	+ 197.26
Dec. 10	320.5	+ 58.30	+ 474.10	+ 209.41
20	330.5	- 47.74	+ 473.23	+ 212.13
30	340.5	- 150.68	+ 451.31	+ 205.30
1931 Jan. 9	350.5	- 245.19	+ 409.84	+ 189.36
19	360.5	- 326.56	+ 351.48	+ 165.29
29	370.5	- 390.99	+ 279.83	+ 134.57
Feb. 8	380.5	- 435.84	+ 199.16	+ 99.04
18	390.5	- 459.75	+ 114.11	+ 60.74
28	400.5	- 462.70	+ 29.33	+ 21.81
Mar. 10	410.5	- 445.92	- 50.83	- 15.68
20	420.5	- 411.74	- 122.57	- 49.88
30	430.5	- 363.38	- 182.87	- 79.25
Apr. 9	440.5	- 304.66	- 229.65	- 102.62
19	450.5	- 239.72	- 261.83	- 119.31
29	460.5	- 172.75	- 279.32	- 129.06
May 9	470.5	- 107.66	- 282.98	- 132.10

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1931 May 9	2426470.5	-107.66	-282.98	-132.10
19	480.5	-47.86	-274.49	-129.05
29	490.5	+3.93	-256.20	-120.87
June 8	500.5	+45.85	-230.88	-108.80
18	510.5	+77.01	-201.53	-94.22
28	520.5	+97.48	-171.08	-78.56
July 8	530.5	+108.23	-142.20	-63.16
18	540.5	+111.01	-117.02	-49.18
28	550.5	+108.15	-97.01	-37.51
Aug. 7	560.5	+102.28	-82.83	-28.68
17	570.5	+96.03	-74.30	-22.84
27	580.5	+91.81	-70.48	-19.76
Sept. 6	590.5	+91.47	-69.78	-18.88
16	600.5	+96.14	-70.18	-19.36
26	610.5	+106.14	-69.44	-20.23
Oct. 6	620.5	+120.89	-65.42	-20.48
16	630.5	+139.03	-56.25	-19.13
26	640.5	+158.56	-40.61	-15.42
Nov. 5	650.5	+176.99	-17.83	-8.84
15	660.5	+191.65	+12.00	+0.84
25	670.5	+199.86	+48.00	+13.46
Dec. 5	680.5	+199.27	+88.57	+28.55
15	690.5	+187.98	+131.44	+45.30
25	700.5	+164.82	+173.86	+62.68
1932 Jan. 4	710.5	+129.42	+212.81	+79.42
14	720.5	+82.37	+245.13	+94.18
24	730.5	+25.16	+267.83	+105.60
Feb. 3	740.5	-39.76	+278.30	+112.44
13	750.5	-109.18	+274.54	+113.63
23	760.5	-179.20	+255.35	+108.45
Mar. 4	770.5	-245.60	+220.49	+96.55
14	780.5	-304.00	+170.77	+78.03
24	790.5	-350.26	+108.08	+53.47
Apr. 3	800.5	-380.80	+35.28	+23.90
13	810.5	-392.84	-43.92	-9.21
23	820.5	-384.71	-125.25	-44.12
May 3	830.5	-355.95	-204.10	-78.83
13	840.5	-307.40	-275.90	-111.31
23	850.5	-241.16	-336.40	-139.61
June 2	860.5	-160.42	-381.96	-161.97
12	870.5	-69.32	-409.80	-176.97
22	880.5	+27.38	-418.15	-183.61
July 2	890.5	+124.59	-406.38	-181.36
12	900.5	+217.15	-374.98	-170.23
22	910.5	+300.20	-325.58	-150.70
Aug. 1	920.5	+369.42	-260.79	-123.77
11	930.5	+421.31	-184.08	-90.83
21	940.5	+453.36	-99.52	-53.61

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1932 Aug. 21	2426940.5	+ 453.36	— 99.52	— 53.61
31	950.5	+ 464.23	— 11.61	— 14.09
Sept. 10	960.5	+ 453.80	+ 75.06	+ 25.65
20	970.5	+ 423.16	+ 156.08	+ 63.54
30	980.5	+ 374.57	+ 227.46	+ 97.64
Oct. 10	2426990.5	+ 311.28	+ 285.92	+ 126.31
20	2427000.5	+ 237.30	+ 329.10	+ 148.27
30	010.5	+ 157.09	+ 355.67	+ 162.68
Nov. 9	020.5	+ 75.25	+ 365.42	+ 169.25
19	030.5	— 3.81	+ 359.20	+ 168.16
29	040.5	— 76.21	+ 338.82	+ 160.06
Dec. 9	050.5	— 138.80	+ 306.83	+ 146.02
19	060.5	— 189.40	+ 266.29	+ 127.39
29	070.5	— 226.86	+ 220.53	+ 105.69
1933 Jan. 8	080.5	— 251.05	+ 172.81	+ 82.49
18	090.5	— 262.76	+ 126.13	+ 59.29
28	100.5	— 263.63	+ 82.98	+ 37.41
Feb. 7	110.5	— 255.83	+ 45.25	+ 17.90
17	120.5	— 241.94	+ 14.09	+ 1.49
27	130.5	— 224.67	— 10.13	— 11.42
Mar. 9	140.5	— 206.59	— 27.75	— 20.81
19	150.5	— 189.96	— 39.76	— 26.98
29	160.5	— 176.53	— 47.69	— 30.52
Apr. 8	170.5	— 167.40	— 53.43	— 32.25
18	180.5	— 162.88	— 59.03	— 33.12
28	190.5	— 162.52	— 66.49	— 34.11
May 8	200.5	— 165.11	— 77.52	— 36.16
18	210.5	— 168.79	— 93.38	— 40.01
28	220.5	— 171.25	— 114.64	— 46.18
June 7	230.5	— 169.94	— 141.14	— 54.83
17	240.5	— 162.38	— 171.87	— 65.78
27	250.5	— 146.40	— 205.10	— 78.44
July 7	260.5	— 120.46	— 238.40	— 91.95
17	270.5	— 83.84	— 268.93	— 105.14
27	280.5	— 36.77	— 293.65	— 116.70
Aug. 6	290.5	+ 19.48	— 309.60	— 125.29
16	300.5	+ 82.68	— 314.18	— 129.67
26	310.5	+ 149.80	— 305.41	— 128.79
Sept. 5	320.5	+ 217.12	— 282.13	— 121.93
15	330.5	+ 280.63	— 244.10	— 108.75
25	340.5	+ 336.18	— 192.11	— 89.35
Oct. 5	350.5	+ 379.86	— 127.94	— 64.26
15	360.5	+ 408.28	— 54.30	— 34.46
25	370.5	+ 418.79	+ 25.36	— 1.30
Nov. 4	380.5	+ 409.69	+ 106.96	+ 33.57
14	390.5	+ 380.44	+ 186.12	+ 68.26
24	400.5	+ 331.69	+ 258.36	+ 100.82
Dec. 4	410.5	+ 265.33	+ 319.42	+ 129.30

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1933 Dec. 4	2427410.5	+ 265.33	+ 319.42	+ 129.30
14	420.5	+ 184.41	+ 365.56	+ 151.92
24	430.5	+ 92.99	+ 393.83	+ 167.20
1934 Jan. 3	440.5	- 4.08	+ 402.25	+ 174.05
13	450.5	- 101.49	+ 390.04	+ 171.88
23	460.5	- 193.78	+ 357.70	+ 160.66
Feb. 2	470.5	- 275.76	+ 306.98	+ 140.92
12	480.5	- 342.86	+ 240.77	+ 113.75
22	490.5	- 391.45	+ 162.91	+ 80.70
Mar. 4	500.5	- 419.06	+ 77.93	+ 43.67
14	510.5	- 424.58	- 9.31	+ 4.80
24	520.5	- 408.28	- 93.90	- 33.69
Apr. 3	530.5	- 371.72	- 171.30	- 69.67
13	540.5	- 317.62	- 237.53	- 101.22
23	550.5	- 249.66	- 289.45	- 126.76
May 3	560.5	- 172.14	- 324.93	- 145.11
13	570.5	- 89.73	- 342.90	- 155.57
23	580.5	- 7.15	- 343.38	- 157.93
June 2	590.5	+ 71.14	- 327.41	- 152.49
12	600.5	+ 141.18	- 296.97	- 139.97
22	610.5	+ 199.76	- 254.79	- 121.48
July 2	620.5	+ 244.57	- 204.12	- 98.45
12	630.5	+ 274.34	- 148.54	- 72.48
22	640.5	+ 288.86	- 91.65	- 45.28
Aug. 1	650.5	+ 288.97	- 36.83	- 18.48
11	660.5	+ 276.42	+ 12.97	+ 6.41
21	670.5	+ 253.69	+ 55.52	+ 28.17
31	680.5	+ 223.77	+ 89.36	+ 45.92
Sept. 10	690.5	+ 189.86	+ 113.93	+ 59.17
20	700.5	+ 155.03	+ 129.54	+ 67.88
30	710.5	+ 122.02	+ 137.29	+ 72.37
Oct. 10	720.5	+ 92.93	+ 138.88	+ 73.28
20	730.5	+ 69.13	+ 136.39	+ 71.52
30	740.5	+ 51.12	+ 132.04	+ 68.11
Nov. 9	750.5	+ 38.57	+ 127.97	+ 64.11
19	760.5	+ 30.43	+ 125.96	+ 60.46
29	770.5	+ 25.08	+ 127.30	+ 57.94
Dec. 9	780.5	+ 20.49	+ 132.67	+ 57.10
19	790.5	+ 14.50	+ 142.05	+ 58.16
29	800.5	+ 5.02	+ 154.76	+ 61.07
1935 Jan. 8	810.5	- 9.77	+ 169.51	+ 65.44
18	820.5	- 31.19	+ 184.48	+ 70.66
28	830.5	- 59.97	+ 197.48	+ 75.85
Feb. 7	840.5	- 96.06	+ 206.13	+ 80.02
17	850.5	- 138.65	+ 208.06	+ 82.12
27	860.5	- 186.09	+ 201.10	+ 81.10
Mar. 9	870.5	- 236.00	+ 183.53	+ 76.04
19	880.5	- 285.39	+ 154.23	+ 66.28

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1935 Mar. 19	2427880.5	- 285.39	+ 154.23	+ 66.28
29	890.5	- 330.79	+ 112.88	+ 51.43
Apr. 8	900.5	- 368.61	+ 60.07	+ 31.49
18	910.5	- 395.30	- 2.66	+ 6.89
28	920.5	- 407.76	- 72.88	- 21.53
May 8	930.5	- 403.53	- 147.34	- 52.54
18	940.5	- 381.14	- 222.22	- 84.59
28	950.5	- 340.22	- 293.35	- 115.92
June 7	960.5	- 281.56	- 356.52	- 144.66
17	970.5	- 207.20	- 407.81	- 169.02
27	980.5	- 120.24	- 443.82	- 187.37
July 7	2427990.5	- 24.67	- 461.98	- 198.39
17	2428000.5	+ 74.84	- 460.68	- 201.15
27	010.5	+ 173.30	- 439.41	- 195.17
Aug. 6	020.5	+ 265.62	- 398.79	- 180.50
16	030.5	+ 346.99	- 340.57	- 157.67
26	040.5	+ 413.14	- 267.48	- 127.69
Sept. 5	050.5	+ 460.60	- 183.16	- 92.02
15	060.5	+ 486.92	- 91.86	- 52.45
25	070.5	+ 490.83	+ 1.72	- 11.00
Oct. 5	080.5	+ 472.30	+ 92.76	+ 30.16
15	090.5	+ 432.63	+ 176.60	+ 68.88
25	100.5	+ 374.30	+ 249.00	+ 103.15
Nov. 4	110.5	+ 300.89	+ 306.50	+ 131.22
14	120.5	+ 216.81	+ 346.53	+ 151.74
24	130.5	+ 126.99	+ 367.69	+ 163.86
Dec. 4	140.5	+ 36.60	+ 369.74	+ 167.24
14	150.5	- 49.41	+ 353.66	+ 162.10
24	160.5	- 126.54	+ 321.52	+ 149.20
1936 Jan. 3	170.5	- 191.14	+ 276.26	+ 129.75
13	180.5	- 240.59	+ 221.50	+ 105.30
23	190.5	- 273.40	+ 161.18	+ 77.62
Feb. 2	200.5	- 289.31	+ 99.28	+ 48.58
12	210.5	- 289.13	+ 39.55	+ 19.97
22	220.5	- 274.71	- 14.77	- 6.57
Mar. 3	230.5	- 248.64	- 61.10	- 29.68
13	240.5	- 214.04	- 97.71	- 48.38
23	250.5	- 174.31	- 123.72	- 62.06
Apr. 2	260.5	- 132.85	- 139.12	- 70.52
12	270.5	- 92.77	- 144.74	- 73.98
22	280.5	- 56.74	- 142.09	- 72.99
May 2	290.5	- 26.75	- 133.21	- 68.43
12	300.5	- 3.99	- 120.46	- 61.35
22	310.5	+ 11.20	- 106.32	- 52.94
June 1	320.5	+ 19.37	- 93.12	- 44.36
11	330.5	+ 21.82	- 82.84	- 36.69
21	340.5	+ 20.50	- 76.89	- 30.77
July 1	350.5	+ 17.77	- 75.98	- 27.17

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1936 July 1	2428350.5	+ 17.77	— 75.98	— 27.17
11	360.5	+ 16.14	— 80.01	— 26.08
21	370.5	+ 17.98	— 88.09	— 27.34
31	380.5	+ 25.21	— 98.61	— 30.42
Aug. 10	390.5	+ 39.14	— 109.43	— 34.50
20	400.5	+ 60.21	— 118.08	— 38.55
30	410.5	+ 87.95	— 122.03	— 41.43
Sept. 9	420.5	+ 120.97	— 118.96	— 42.05
19	430.5	+ 157.08	— 107.02	— 39.44
29	440.5	+ 193.43	— 85.02	— 32.88
Oct. 9	450.5	+ 226.80	— 52.59	— 21.96
19	460.5	+ 253.80	— 10.26	— 6.69
29	470.5	+ 271.19	+ 40.57	+ 12.57
Nov. 8	480.5	+ 276.14	+ 97.65	+ 35.06
18	490.5	+ 266.47	+ 158.02	+ 59.66
28	500.5	+ 240.85	+ 218.19	+ 84.98
Dec. 8	510.5	+ 198.95	+ 274.37	+ 109.42
18	520.5	+ 141.55	+ 322.68	+ 131.32
28	530.5	+ 70.50	+ 359.48	+ 149.00
1937 Jan. 7	540.5	— 11.28	+ 381.57	+ 160.95
17	550.5	— 99.92	+ 386.47	+ 165.91
27	560.5	— 190.89	+ 372.67	+ 162.99
Feb. 6	570.5	— 279.22	+ 339.73	+ 151.76
16	580.5	— 359.82	+ 288.41	+ 132.29
26	590.5	— 427.86	+ 220.68	+ 105.22
Mar. 8	600.5	— 479.14	+ 139.57	+ 71.66
18	610.5	— 510.33	+ 49.05	+ 33.19
28	620.5	— 519.30	— 46.27	— 8.25
Apr. 7	630.5	— 505.23	— 141.45	— 50.53
17	640.5	— 468.66	— 231.53	— 91.41
27	650.5	— 411.46	— 311.88	— 128.77
May 7	660.5	— 336.67	— 378.50	— 160.66
17	670.5	— 248.29	— 428.22	— 185.51
27	680.5	— 151.00	— 458.91	— 202.13
June 6	690.5	— 49.86	— 469.55	— 209.85
16	700.5	+ 50.02	— 460.26	— 208.48
26	710.5	+ 143.75	— 432.26	— 198.38
July 6	720.5	+ 226.96	— 387.78	— 180.35
16	730.5	+ 296.06	— 329.85	— 155.63
26	740.5	+ 348.39	— 262.13	— 125.76
Aug. 5	750.5	+ 382.37	— 188.66	— 92.56
15	760.5	+ 397.60	— 113.62	— 57.93
25	770.5	+ 394.80	— 40.98	— 23.77
Sept. 4	780.5	+ 375.76	+ 25.67	+ 8.16
14	790.5	+ 343.14	+ 83.39	+ 36.36
24	800.5	+ 300.29	+ 130.09	+ 59.65
Oct. 4	810.5	+ 250.91	+ 164.63	+ 77.31
14	820.5	+ 198.78	+ 186.82	+ 89.03

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1937 Oct. 14	2428820.5	+ 198.78	+ 186.82	+ 89.03
24	830.5	+ 147.41	+ 197.41	+ 94.99
Nov. 3	840.5	+ 99.84	+ 197.93	+ 95.73
13	850.5	+ 58.37	+ 190.49	+ 92.13
23	860.5	+ 24.43	+ 177.54	+ 85.30
Dec. 3	870.5	— 1.42	+ 161.63	+ 76.45
13	880.5	— 19.48	+ 145.16	+ 66.77
23	890.5	— 30.79	+ 130.18	+ 57.37
1938 Jan. 2	900.5	— 36.98	+ 118.21	+ 49.13
12	910.5	— 40.05	+ 110.15	+ 42.70
22	920.5	— 42.15	+ 106.27	+ 38.41
Feb. 1	930.5	— 45.38	+ 106.14	+ 36.29
11	940.5	— 51.56	+ 108.75	+ 36.08
21	950.5	— 62.08	+ 112.60	+ 37.22
Mar. 3	960.5	— 77.75	+ 115.82	+ 38.98
13	970.5	— 98.64	+ 116.40	+ 40.44
23	980.5	— 124.09	+ 112.29	+ 40.66
Apr. 2	2428990.5	— 152.71	+ 101.71	+ 38.72
12	2429000.5	— 182.40	+ 83.31	+ 33.84
22	010.5	— 210.58	+ 56.34	+ 25.47
May 2	020.5	— 234.29	+ 20.81	+ 13.36
12	030.5	— 250.53	— 22.40	— 2.35
22	040.5	— 256.53	— 71.57	— 21.16
June 1	050.5	— 249.99	— 124.21	— 42.17
11	060.5	— 229.41	— 177.21	— 64.16
21	070.5	— 194.24	— 227.04	— 85.69
July 1	080.5	— 145.02	— 270.08	— 105.16
11	090.5	— 83.37	— 302.85	— 121.01
21	100.5	— 11.98	— 322.37	— 131.79
31	110.5	+ 65.59	— 326.32	— 136.32
Aug. 10	120.5	+ 145.14	— 313.29	— 133.77
20	130.5	+ 222.10	— 282.92	— 123.73
30	140.5	+ 291.80	— 235.93	— 106.26
Sept. 9	150.5	+ 349.83	— 174.09	— 81.93
19	160.5	+ 392.28	— 100.17	— 51.74
29	170.5	+ 416.04	— 17.79	— 17.11
Oct. 9	180.5	+ 419.00	+ 68.80	+ 20.19
19	190.5	+ 400.19	+ 154.96	+ 58.17
29	200.5	+ 359.96	+ 235.92	+ 94.70
Nov. 8	210.5	+ 299.92	+ 307.07	+ 127.70
18	220.5	+ 222.89	+ 364.30	+ 155.20
28	230.5	+ 132.82	+ 404.23	+ 175.53
Dec. 8	240.5	+ 34.47	+ 424.50	+ 187.43
18	250.5	— 66.82	+ 423.92	+ 190.12
28	260.5	— 165.53	+ 402.56	+ 183.39
1939 Jan. 7	270.5	— 256.34	+ 361.78	+ 167.63
17	280.5	— 334.45	+ 304.09	+ 143.76
27	290.5	— 395.99	+ 232.98	+ 113.20

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1939 Jan. 27	2429290.5	-395.99	+232.98	+113.20
Feb. 6	300.5	-438.17	+152.67	+77.74
16	310.5	-459.51	+67.76	+39.43
26	320.5	-459.84	+17.11	+0.38
Mar. 8	330.5	-440.26	-97.52	-37.32
18	340.5	-403.01	-169.60	-71.78
28	350.5	-351.21	-230.24	-101.41
Apr. 7	360.5	-288.66	-277.25	-125.02
17	370.5	-219.49	-309.41	-141.84
27	380.5	-147.90	-326.53	-151.59
May 7	390.5	-77.87	-329.35	-154.42
17	400.5	-12.92	-319.46	-150.90
27	410.5	+44.13	-299.13	-141.97
June 6	420.5	+91.28	-271.10	-128.82
16	430.5	+127.48	-238.34	-112.84
26	440.5	+152.66	-203.83	-95.44
July 6	450.5	+167.66	-170.26	-78.00
16	460.5	+174.09	-139.86	-61.70
26	470.5	+174.18	-114.20	-47.47
Aug. 5	480.5	+170.48	-94.04	-35.90
15	490.5	+165.62	-79.36	-27.19
25	500.5	+161.98	-69.32	-21.18
Sept. 4	510.5	+161.44	-62.44	-17.35
14	520.5	+165.19	-56.80	-14.93
24	530.5	+173.60	-50.23	-12.98
Oct. 4	540.5	+186.20	-40.63	-10.50
14	550.5	+201.67	-26.15	-6.56
24	560.5	+218.08	-5.49	-0.40
Nov. 3	570.5	+232.99	+22.03	+8.51
13	580.5	+243.75	+56.32	+20.36
23	590.5	+247.73	+96.54	+35.02
Dec. 3	600.5	+242.54	+141.04	+52.00
13	610.5	+226.30	+187.60	+70.53
23	620.5	+197.81	+233.45	+89.54
1940 Jan. 2	630.5	+156.68	+275.50	+107.77
12	640.5	+103.48	+310.58	+123.85
22	650.5	+39.69	+335.64	+136.41
Feb. 1	660.5	-32.24	+347.98	+144.18
11	670.5	-109.07	+345.52	+146.06
21	680.5	-186.89	+326.96	+141.27
Mar. 2	690.5	-261.38	+291.97	+129.45
12	700.5	-328.07	+241.28	+110.64
22	710.5	-382.71	+176.69	+85.38
Apr. 1	720.5	-421.54	+101.01	+54.70
11	730.5	-441.63	+17.92	+20.03
21	740.5	-441.10	-68.28	-16.89
May 1	750.5	-419.30	-152.95	-54.04
11	760.5	-376.90	-231.42	-89.36

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1940 Apr. 1	2429720.5	-421.54	+ 101.01	+ 54.70
11	730.5	-441.63	+ 17.92	+ 20.03
21	740.5	-441.10	- 68.28	- 16.89
May 1	750.5	-419.30	-152.95	- 54.04
11	760.5	-376.90	-231.42	- 89.36
21	770.5	-315.83	-299.31	-120.86
31	780.5	-239.17	-352.84	-146.70
June 10	790.5	-150.93	-389.04	-165.40
20	800.5	- 55.83	-405.97	-175.86
30	810.5	+ 41.04	-402.78	-177.50
July 10	820.5	+ 134.50	-379.80	-170.21
20	830.5	+ 219.62	-338.46	-154.40
30	840.5	+ 291.99	-281.22	-130.99
Aug. 9	850.5	+ 347.97	-211.40	-101.31
19	860.5	+ 384.89	-133.00	- 67.03
29	870.5	+ 401.24	- 50.42	- 30.10
Sept. 8	880.5	+ 396.70	+ 31.79	+ 7.43
18	890.5	+ 372.20	+ 109.18	+ 43.50
28	900.5	+ 329.82	+ 177.76	+ 76.16
Oct. 8	910.5	+ 272.67	+ 234.18	+ 103.73
18	920.5	+ 204.62	+ 275.96	+ 124.91
28	930.5	+ 130.05	+ 301.69	+ 138.81
Nov. 7	940.5	+ 53.51	+ 311.03	+ 145.07
17	950.5	- 20.60	+ 304.70	+ 143.82
27	960.5	- 88.36	+ 284.41	+ 135.67
Dec. 7	970.5	-146.59	+ 252.64	+ 121.64
17	980.5	-193.03	+ 212.40	+ 103.05
27	2429990.5	-226.44	+ 166.97	+ 81.41
1941 Jan. 6	2430000.5	-246.60	+ 119.62	+ 58.27
16	010.5	-254.26	+ 73.36	+ 35.14
26	020.5	-250.97	+ 30.76	+ 13.36
Feb. 5	030.5	-238.89	- 6.26	- 6.00
15	040.5	-220.57	- 36.49	- 22.16
25	050.5	-198.73	- 59.45	- 34.69
Mar. 7	060.5	-175.97	- 75.44	- 43.55
17	070.5	-154.63	- 85.38	- 48.99
27	080.5	-136.53	- 90.77	- 51.58
Apr. 6	090.5	-122.86	- 93.45	- 52.12
16	100.5	-114.04	- 95.47	- 51.54
26	110.5	-109.74	- 98.85	- 50.85
May 6	120.5	-108.85	-105.37	- 50.96
16	130.5	-109.60	-116.32	- 52.68
26	140.5	-109.76	-132.41	- 56.54
June 5	150.5	-106.82	-153.55	- 62.76
15	160.5	- 98.32	-178.86	- 71.20
25	170.5	- 82.07	-206.70	- 81.33
July 5	180.5	- 56.50	-234.75	- 92.33
15	190.5	- 20.80	-260.24	-103.08

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1941 July 15	2430190.5	- 20.80	- 260.24	- 103.08
25	200.5	+ 24.86	- 280.19	- 112.30
Aug. 4	210.5	+ 79.32	- 291.65	- 118.67
14	220.5	+ 140.44	- 292.04	- 120.95
24	230.5	+ 205.25	- 279.34	- 118.09
Sept. 3	240.5	+ 270.10	- 252.35	- 109.37
13	250.5	+ 331.00	- 210.78	- 94.42
23	260.5	+ 383.81	- 155.38	- 73.31
Oct. 3	270.5	+ 424.61	- 87.87	- 46.57
13	280.5	+ 449.98	- 10.90	- 15.16
23	290.5	+ 457.19	+ 72.06	+ 19.61
Nov. 2	300.5	+ 444.48	+ 156.96	+ 56.05
12	310.5	+ 411.25	+ 239.39	+ 92.31
22	320.5	+ 358.05	+ 314.84	+ 126.39
Dec. 2	330.5	+ 286.71	+ 378.96	+ 156.33
12	340.5	+ 200.23	+ 427.93	+ 180.32
22	350.5	+ 102.65	+ 458.64	+ 196.82
1942 Jan. 1	360.5	- 1.20	+ 469.03	+ 204.67
11	370.5	- 105.93	+ 458.16	+ 203.24
21	380.5	- 206.03	+ 426.38	+ 192.43
31	390.5	- 296.17	+ 375.33	+ 172.72
Feb. 10	400.5	- 371.62	+ 307.81	+ 145.13
20	410.5	- 428.54	+ 227.60	+ 111.20
Mar. 2	420.5	- 464.28	+ 139.20	+ 72.81
12	430.5	- 477.52	+ 47.52	+ 32.11
22	440.5	- 468.29	- 42.50	- 8.67
Apr. 1	450.5	- 438.00	- 126.18	- 47.36
11	460.5	- 389.21	- 199.41	- 81.98
21	470.5	- 325.47	- 258.89	- 110.86
May 1	480.5	- 251.01	- 302.30	- 132.77
11	490.5	- 170.47	- 328.39	- 146.91
21	500.5	- 88.58	- 337.00	- 153.00
31	510.5	- 9.84	- 329.00	- 151.24
June 10	520.5	+ 61.71	- 306.23	- 142.28
20	530.5	+ 122.74	- 271.26	- 127.19
30	540.5	+ 170.83	- 227.28	- 107.32
July 10	550.5	+ 204.55	- 177.75	- 84.24
20	560.5	+ 223.56	- 126.28	- 59.64
30	570.5	+ 228.54	- 76.22	- 35.14
Aug. 9	580.5	+ 221.09	- 30.53	- 12.26
19	590.5	+ 203.62	+ 8.48	+ 7.78
29	600.5	+ 179.02	+ 39.30	+ 24.06
Sept. 8	610.5	+ 150.41	+ 61.30	+ 36.07
18	620.5	+ 120.88	+ 74.73	+ 43.70
28	630.5	+ 93.14	+ 80.61	+ 47.27
Oct. 8	640.5	+ 69.35	+ 80.60	+ 47.41
18	650.5	+ 50.89	+ 76.78	+ 44.98
28	660.5	+ 38.31	+ 71.36	+ 41.01

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1942 Oct. 28	2430660.5	+ 38.31	+ 71.36	+ 41.01
Nov. 7	670.5	+ 31.32	+ 66.49	+ 36.55
17	680.5	+ 28.90	+ 64.01	+ 32.58
27	690.5	+ 29.41	+ 65.26	+ 29.88
Dec. 7	700.5	+ 30.84	+ 70.97	+ 29.03
17	710.5	+ 30.98	+ 81.19	+ 30.29
27	720.5	+ 27.67	+ 95.30	+ 33.61
1943 Jan. 6	730.5	+ 19.03	+ 112.03	+ 38.66
16	740.5	+ 3.63	+ 129.60	+ 44.81
26	750.5	- 19.35	+ 145.83	+ 51.22
Feb. 5	760.5	- 49.99	+ 158.33	+ 56.90
15	770.5	- 87.56	+ 164.68	+ 60.77
25	780.5	- 130.55	+ 162.68	+ 61.78
Mar. 7	790.5	- 176.66	+ 150.50	+ 58.99
17	800.5	- 222.98	+ 126.94	+ 51.68
27	810.5	- 266.12	+ 91.56	+ 39.44
Apr. 6	820.5	- 302.48	+ 44.83	+ 22.20
16	830.5	- 328.54	- 11.86	+ 0.33
26	840.5	- 341.15	- 76.19	- 25.39
May 6	850.5	- 337.78	- 145.03	- 53.77
16	860.5	- 316.87	- 214.63	- 83.31
26	870.5	- 277.92	- 280.89	- 112.28
June 5	880.5	- 221.64	- 339.63	- 138.84
15	890.5	- 149.92	- 386.93	- 161.22
25	900.5	- 65.75	- 419.36	- 177.76
July 5	910.5	+ 26.94	- 434.30	- 187.14
15	920.5	+ 123.58	- 430.07	- 188.39
25	930.5	+ 219.17	- 406.10	- 181.02
Aug. 4	940.5	+ 308.68	- 362.93	- 165.04
14	950.5	+ 387.26	- 302.23	- 140.95
24	960.5	+ 450.59	- 226.69	- 109.74
Sept. 3	970.5	+ 495.16	- 139.88	- 72.83
13	980.5	+ 518.44	- 46.05	- 32.00
23	2430990.5	+ 519.06	+ 50.12	+ 10.72
Oct. 3	2431000.5	+ 496.92	+ 143.77	+ 53.16
13	010.5	+ 453.22	+ 230.19	+ 93.16
23	020.5	+ 390.39	+ 305.07	+ 128.66
Nov. 2	030.5	+ 311.95	+ 364.83	+ 157.89
12	040.5	+ 222.28	+ 406.80	+ 179.44
22	050.5	+ 126.34	+ 429.43	+ 192.38
Dec. 2	060.5	+ 29.35	+ 432.37	+ 196.34
12	070.5	- 63.64	+ 416.49	+ 191.49
22	080.5	- 148.01	+ 383.74	+ 178.50
1944 Jan. 1	090.5	- 219.97	+ 337.02	+ 158.58
11	100.5	- 276.69	+ 279.89	+ 133.23
21	110.5	- 316.54	+ 216.31	+ 104.24
31	120.5	- 339.04	+ 150.30	+ 73.48
Feb. 10	130.5	- 344.89	+ 85.70	+ 42.78

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1944 Feb. 10	2431130.5	-344.89	+ 85.70	+ 42.78
20	140.5	-335.77	+ 25.84	+ 13.81
Mar. 1	150.5	-314.17	- 26.58	- 12.02
11	160.5	-283.14	- 69.67	- 33.65
21	170.5	-246.05	-102.41	- 50.41
31	180.5	-206.27	-124.67	- 62.04
Apr. 10	190.5	-166.98	-137.12	- 68.68
20	200.5	-130.87	-141.15	- 70.84
30	210.5	-100.02	-138.70	- 69.31
May 10	220.5	- 75.74	-132.07	- 65.15
20	230.5	- 58.44	-123.68	- 59.48
30	240.5	- 47.70	-115.86	- 53.47
June 9	250.5	- 42.30	-110.58	- 48.18
19	260.5	- 40.39	-109.28	- 44.47
29	270.5	- 39.66	-112.71	- 42.92
July 9	280.5	- 37.63	-120.82	- 43.75
19	290.5	- 31.94	-132.78	- 46.82
29	300.5	- 20.61	-147.00	- 51.62
Aug. 8	310.5	- 2.33	-161.38	- 57.34
18	320.5	+ 23.41	-173.43	- 62.96
28	330.5	+ 56.22	-180.59	- 67.34
Sept. 7	340.5	+ 94.74	-180.48	- 69.35
17	350.5	+ 136.82	-171.18	- 68.00
27	360.5	+ 179.65	-151.38	- 62.54
Oct. 7	370.5	+ 219.94	-120.63	- 52.51
17	380.5	+ 254.28	- 79.32	- 37.86
27	390.5	+ 279.33	- 28.78	- 18.91
Nov. 6	400.5	+ 292.16	+ 28.84	+ 3.60
16	410.5	+ 290.44	+ 90.64	+ 28.62
26	420.5	+ 272.68	+ 153.17	+ 54.75
Dec. 6	430.5	+ 238.39	+ 212.63	+ 80.43
16	440.5	+ 188.16	+ 265.14	+ 103.96
26	450.5	+ 123.70	+ 306.95	+ 123.67
1945 Jan. 5	460.5	+ 47.76	+ 334.79	+ 138.00
15	470.5	- 35.94	+ 346.06	+ 145.64
25	480.5	-122.96	+ 339.08	+ 145.65
Feb. 4	490.5	-208.37	+ 313.26	+ 137.52
14	500.5	-287.13	+ 269.19	+ 121.26
24	510.5	-354.38	+ 208.64	+ 97.41
Mar. 6	520.5	-405.85	+ 134.50	+ 67.02
16	530.5	-438.13	+ 50.61	+ 31.61
26	540.5	-448.94	- 38.54	- 6.94
Apr. 5	550.5	-437.34	-128.06	- 46.54
15	560.5	-403.71	-213.04	- 84.98
25	570.5	-349.78	-288.85	-120.12
May 5	580.5	-278.48	-351.44	-150.04
15	590.5	-193.70	-397.61	-173.12
25	600.5	-100.03	-425.14	-188.16

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1945 May 25	2431600.5	-100.03	-425.14	-188.16
June 4	610.5	- 2.50	-432.95	-194.46
14	620.5	+ 93.81	-421.10	-191.80
24	630.5	+ 184.00	-390.72	-180.50
July 4	640.5	+ 263.69	-343.97	-161.32
14	650.5	+ 329.22	-283.86	-135.49
24	660.5	+ 377.88	-214.03	-104.55
Aug. 3	670.5	+ 408.03	-138.50	- 70.30
13	680.5	+ 419.19	- 61.46	- 34.64
23	690.5	+ 412.03	+ 13.03	+ 0.51
Sept. 2	700.5	+ 388.29	+ 81.35	+ 33.36
12	710.5	+ 350.62	+ 140.47	+ 62.36
22	720.5	+ 302.36	+ 188.22	+ 86.33
Oct. 2	730.5	+ 247.24	+ 223.34	+ 104.46
12	740.5	+ 189.09	+ 245.59	+ 116.43
22	750.5	+ 131.55	+ 255.63	+ 122.36
Nov. 1	760.5	+ 77.74	+ 254.93	+ 122.77
11	770.5	+ 30.09	+ 245.59	+ 118.52
21	780.5	- 9.81	+ 230.07	+ 110.72
Dec. 1	790.5	- 41.30	+ 210.95	+ 100.58
11	800.5	- 64.56	+ 190.68	+ 89.33
21	810.5	- 80.54	+ 171.41	+ 78.08
31	820.5	- 90.79	+ 154.75	+ 67.78
1946 Jan. 10	830.5	- 97.26	+ 141.70	+ 59.10
20	840.5	-102.08	+ 132.63	+ 52.44
30	850.5	-107.36	+ 127.22	+ 47.87
Feb. 9	860.5	-114.96	+ 124.54	+ 45.17
19	870.5	-126.31	+ 123.18	+ 43.84
Mar. 1	880.5	-142.26	+ 121.34	+ 43.15
11	890.5	-162.98	+ 117.01	+ 42.25
21	900.5	-187.90	+ 108.20	+ 40.20
31	910.5	-215.67	+ 93.12	+ 36.07
Apr. 10	920.5	-244.29	+ 70.39	+ 29.10
20	930.5	-271.20	+ 39.22	+ 18.71
30	940.5	-293.50	- 0.42	+ 4.64
May 10	950.5	-308.18	- 47.74	- 13.01
20	960.5	-312.42	-101.05	- 33.74
30	970.5	-303.91	-157.91	- 56.69
June 9	980.5	-281.04	-215.22	- 80.66
19	2431990.5	-243.17	-269.48	-104.20
29	2432000.5	-190.74	-317.00	-125.72
July 9	010.5	-125.29	-354.26	-143.62
19	020.5	- 49.43	-378.16	-156.43
29	030.5	+ 33.34	-386.27	-162.91
Aug. 8	040.5	+ 118.84	-377.06	-162.17
18	050.5	+ 202.48	-350.02	-153.76
28	060.5	+ 279.56	-305.70	-137.65
Sept. 7	070.5	+ 345.54	-245.77	-114.36

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1946 Sept. 7	2432070.5	+ 345.54	- 245.77	- 114.36
17	080.5	+ 396.42	- 172.86	- 84.83
27	090.5	+ 428.92	- 90.50	- 50.43
Oct. 7	100.5	+ 440.75	- 2.86	- 12.90
17	110.5	+ 430.76	+ 85.44	+ 25.80
27	120.5	+ 399.07	+ 169.62	+ 63.56
Nov. 6	130.5	+ 347.08	+ 245.03	+ 98.25
16	140.5	+ 277.46	+ 307.48	+ 127.90
26	150.5	+ 193.94	+ 353.47	+ 150.79
Dec. 6	160.5	+ 101.17	+ 380.48	+ 165.57
16	170.5	+ 4.38	+ 387.15	+ 171.43
26	180.5	- 90.98	+ 373.37	+ 168.05
1947 Jan. 5	190.5	- 179.57	+ 340.29	+ 155.74
15	200.5	- 256.58	+ 290.27	+ 135.34
25	210.5	- 318.04	+ 226.65	+ 108.20
Feb. 4	220.5	- 361.08	+ 153.50	+ 76.03
14	230.5	- 384.06	+ 75.32	+ 40.85
24	240.5	- 386.71	- 3.27	+ 4.73
Mar. 6	250.5	- 369.97	- 77.91	- 30.26
16	260.5	- 335.98	- 144.72	- 62.22
26	270.5	- 287.76	- 200.56	- 89.58
Apr. 5	280.5	- 229.00	- 243.20	- 111.10
15	290.5	- 163.82	- 271.37	- 126.02
25	300.5	- 96.36	- 284.82	- 134.02
May 5	310.5	- 30.60	- 284.27	- 135.22
15	320.5	+ 29.93	- 271.27	- 130.20
25	330.5	+ 82.38	- 248.06	- 119.86
June 4	340.5	+ 124.72	- 217.38	- 105.41
14	350.5	+ 155.87	- 182.23	- 88.21
24	360.5	+ 175.72	- 145.60	- 69.71
July 4	370.5	+ 185.07	- 110.26	- 51.30
14	380.5	+ 185.56	- 78.50	- 34.19
24	390.5	+ 179.43	- 51.97	- 19.36
Aug. 3	400.5	+ 169.28	- 31.52	- 7.41
13	410.5	+ 157.83	- 17.16	+ 1.40
23	420.5	+ 147.54	- 8.14	+ 7.22
Sept. 2	430.5	+ 140.44	- 3.00	+ 10.52
12	440.5	+ 137.86	+ .19	+ 12.10
22	450.5	+ 140.31	+ 3.63	+ 12.88
Oct. 2	460.5	+ 147.42	+ 9.48	+ 13.89
12	470.5	+ 158.02	+ 19.68	+ 16.08
22	480.5	+ 170.24	+ 35.67	+ 20.29
Nov. 1	490.5	+ 181.70	+ 58.24	+ 27.06
11	500.5	+ 189.78	+ 87.43	+ 36.66
21	510.5	+ 191.80	+ 122.51	+ 49.02
Dec. 1	520.5	+ 185.35	+ 162.00	+ 63.70
11	530.5	+ 168.47	+ 203.72	+ 79.98
21	540.5	+ 139.86	+ 245.01	+ 96.82

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1947 Dec. 21	2432540.5	+ 139.86	+ 245.01	+ 96.82
31	550.5	+ 99.02	+ 282.82	+ 112.99
1948 Jan. 10	560.5	+ 46.42	+ 314.00	+ 127.16
20	570.5	+ 16.59	+ 335.48	+ 137.95
30	580.5	- 87.67	+ 344.54	+ 144.06
Feb. 9	590.5	- 163.66	+ 339.03	+ 144.40
19	600.5	- 240.70	+ 317.58	+ 138.17
29	610.5	- 314.53	+ 279.74	+ 124.94
Mar. 10	620.5	- 380.67	+ 226.16	+ 104.72
20	630.5	- 434.83	+ 158.53	+ 78.02
30	640.5	- 473.18	+ 79.59	+ 45.80
Apr. 9	650.5	- 492.68	- 7.06	+ 9.47
19	660.5	- 491.34	- 97.15	- 29.22
29	670.5	- 468.36	- 186.02	- 68.30
May 9	680.5	- 424.29	- 268.97	- 105.67
19	690.5	- 360.90	- 341.54	- 139.32
29	700.5	- 281.20	- 399.84	- 167.37
June 8	710.5	- 189.12	- 440.77	- 188.28
18	720.5	- 89.32	- 462.24	- 200.89
28	730.5	+ 13.08	- 463.24	- 204.55
July 8	740.5	+ 112.90	- 443.95	- 199.07
18	750.5	+ 205.12	- 405.64	- 184.81
28	760.5	+ 285.22	- 350.65	- 162.61
Aug. 7	770.5	+ 349.40	- 282.18	- 133.75
17	780.5	+ 394.86	- 204.14	- 99.86
27	790.5	+ 419.88	- 120.88	- 62.84
Sept. 6	800.5	+ 423.96	- 36.96	- 24.75
16	810.5	+ 407.84	+ 43.20	+ 12.36
26	820.5	+ 373.42	+ 115.52	+ 46.53
Oct. 6	830.5	+ 323.61	+ 176.56	+ 76.04
16	840.5	+ 262.17	+ 223.76	+ 99.54
26	850.5	+ 193.36	+ 255.53	+ 116.08
Nov. 5	860.5	+ 121.66	+ 271.40	+ 125.24
15	870.5	+ 51.44	+ 271.96	+ 127.07
25	880.5	- 13.40	+ 258.76	+ 122.14
Dec. 5	890.5	- 69.63	+ 234.15	+ 111.37
15	900.5	- 114.94	+ 201.04	+ 96.05
25	910.5	- 148.04	+ 162.64	+ 77.63
1949 Jan. 4	920.5	- 168.61	+ 122.13	+ 57.64
14	930.5	- 177.35	+ 82.51	+ 37.57
24	940.5	- 175.72	+ 46.30	+ 18.74
Feb. 3	950.5	- 165.85	+ 15.44	+ 2.22
13	960.5	- 150.25	- 8.89	- 11.21
23	970.5	- 131.59	- 26.20	- 21.15
Mar. 5	980.5	- 112.48	- 36.79	- 27.52
15	2432990.5	- 95.26	- 41.60	- 30.58
25	2433000.5	- 81.76	- 42.12	- 30.92
Apr. 4	010.5	- 73.16	- 40.26	- 29.33

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1949 Apr. 4	2433010.5	- 73.16	- 40.26	- 29.33
14	020.5	- 69.92	- 38.09	- 26.77
24	030.5	- 71.70	- 37.70	- 24.25
May 4	040.5	- 77.40	- 40.93	- 22.74
14	050.5	- 85.22	- 49.19	- 23.07
24	060.5	- 92.88	- 63.24	- 25.80
June 3	070.5	- 97.81	- 83.11	- 31.21
13	080.5	- 97.40	-108.00	- 39.19
23	090.5	- 89.37	-136.32	- 49.27
July 3	100.5	- 71.96	-165.80	- 60.62
13	110.5	- 44.20	-193.68	- 72.15
23	120.5	+ 6.06	-216.93	- 82.57
Aug. 2	130.5	+ 41.45	-232.54	- 90.54
12	140.5	+ 96.37	-237.80	- 94.77
22	150.5	+ 155.83	-230.58	- 94.18
Sept. 1	160.5	+ 216.30	-209.50	- 87.95
11	170.5	+ 273.81	-174.12	- 75.67
21	180.5	+ 324.26	-124.98	- 57.31
Oct. 1	190.5	+ 363.68	- 63.66	- 33.34
11	200.5	+ 388.56	+ 7.36	- 4.62
21	210.5	+ 396.07	+ 84.74	+ 27.56
31	220.5	+ 384.35	+ 164.54	+ 61.62
Nov. 10	230.5	+ 352.58	+ 242.41	+ 95.70
20	240.5	+ 301.19	+ 313.86	+ 127.84
30	250.5	+ 231.82	+ 374.55	+ 156.08
Dec. 10	260.5	+ 147.32	+ 420.60	+ 178.60
20	270.5	+ 51.59	+ 448.83	+ 193.82
30	280.5	- 50.64	+ 457.05	+ 200.56
1950 Jan. 9	290.5	-154.04	+ 444.19	+ 198.11
19	300.5	-253.11	+ 410.49	+ 186.33
29	310.5	-342.51	+ 357.42	+ 165.62
Feb. 8	320.5	-417.42	+ 287.67	+ 136.97
18	330.5	-473.90	+ 204.93	+ 101.84
28	340.5	-509.16	+ 113.65	+ 62.10
Mar. 10	350.5	-521.73	+ 18.70	+ 19.88
20	360.5	-511.49	- 74.94	- 22.59
30	370.5	-479.70	-162.54	- 63.11
Apr. 9	380.5	-428.81	- 239.89	- 99.67
19	390.5	-362.27	-303.58	-130.55
29	400.5	-284.27	-351.14	-154.46
May 9	410.5	-199.42	-381.18	-170.53
19	420.5	-112.45	-393.39	-178.42
29	430.5	- 27.94	-388.52	-178.26
June 8	440.5	+ 49.99	-368.25	-170.64
18	450.5	+ 117.92	-335.09	-156.58
28	460.5	+ 173.26	-292.12	-137.38
July 8	470.5	+ 214.45	-242.77	-114.60
18	480.5	+ 240.98	-190.61	- 89.88

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1950 July 18	2433480.5	+ 240.98	- 190.61	- 89.88
28	490.5	+ 253.37	- 139.02	- 64.86
Aug. 7	500.5	+ 253.11	- 91.01	- 41.07
17	510.5	+ 242.44	- 48.93	- 19.77
27	520.5	+ 224.17	- 14.39	- 1.90
Sept. 6	530.5	+ 201.34	+ 11.89	+ 11.99
16	540.5	+ 176.99	+ 30.06	+ 21.74
26	550.5	+ 153.84	+ 41.04	+ 27.62
Oct. 6	560.5	+ 134.01	+ 46.43	+ 30.21
16	570.5	+ 118.93	+ 48.23	+ 30.36
26	580.5	+ 109.16	+ 48.62	+ 29.06
Nov. 5	590.5	+ 104.45	+ 49.72	+ 27.35
15	600.5	+ 103.77	+ 53.35	+ 26.18
25	610.5	+ 105.50	+ 60.86	+ 26.35
Dec. 5	620.5	+ 107.61	+ 72.96	+ 28.42
15	630.5	+ 107.86	+ 89.71	+ 32.65
25	640.5	+ 104.05	+ 110.46	+ 38.98
1951 Jan. 4	650.5	+ 94.26	+ 133.92	+ 47.08
14	660.5	+ 76.99	+ 158.27	+ 56.29
24	670.5	+ 51.38	+ 181.26	+ 65.77
Feb. 3	680.5	+ 17.33	+ 200.42	+ 74.48
13	690.5	- 24.58	+ 213.26	+ 81.32
23	700.5	- 72.75	+ 217.43	+ 85.19
Mar. 5	710.5	- 124.93	+ 211.00	+ 85.09
15	720.5	- 178.18	+ 192.62	+ 80.25
25	730.5	- 229.06	+ 161.71	+ 70.19
Apr. 4	740.5	- 273.88	+ 118.61	+ 54.79
14	750.5	- 309.00	+ 64.57	+ 34.34
24	760.5	- 331.08	+ 1.81	+ 9.61
May 4	770.5	- 337.44	- 66.62	- 18.30
14	780.5	- 326.29	- 137.01	- 47.90
24	790.5	- 296.90	- 205.27	- 77.47
June 3	800.5	- 249.75	- 267.16	- 105.16
13	810.5	- 186.53	- 318.68	- 129.16
23	820.5	- 110.06	- 356.28	- 147.78
July 3	830.5	- 24.08	- 377.17	- 159.62
13	840.5	+ 66.94	- 379.50	- 163.64
23	850.5	+ 158.07	- 362.49	- 159.28
Aug. 2	860.5	+ 244.29	- 326.48	- 146.44
12	870.5	+ 320.74	- 272.96	- 125.53
22	880.5	+ 383.06	- 204.43	- 97.48
Sept. 1	890.5	+ 427.60	- 124.30	- 63.62
11	900.5	+ 451.71	- 36.69	- 25.66
21	910.5	+ 453.86	+ 53.80	+ 14.42
Oct. 1	920.5	+ 433.80	+ 142.40	+ 54.48
11	930.5	+ 392.52	+ 224.38	+ 92.36
21	940.5	+ 332.30	+ 295.46	+ 126.03
31	950.5	+ 256.49	+ 351.96	+ 153.67

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1951 Oct. 31	2433950.5	+ 256.49	+ 351.96	+ 153.67
Nov. 10	960.5	+ 169.36	+ 391.15	+ 173.86
20	970.5	+ 75.79	+ 411.35	+ 185.62
30	980.5	- 19.09	+ 412.10	+ 188.51
Dec. 10	2433990.5	- 110.21	+ 394.14	+ 182.64
20	2434000.5	- 192.92	+ 359.30	+ 168.66
30	010.5	- 263.36	+ 310.39	+ 147.69
1952 Jan. 9	020.5	- 318.62	+ 250.91	+ 121.22
19	030.5	- 356.93	+ 184.77	+ 91.02
29	040.5	- 377.72	+ 116.01	+ 58.93
Feb. 8	050.5	- 381.56	+ 48.47	+ 26.81
18	060.5	- 370.04	- 14.43	- 3.65
28	070.5	- 345.58	- 69.92	- 31.01
Mar. 9	080.5	- 311.19	- 116.01	- 54.16
19	090.5	- 270.19	- 151.59	- 72.38
29	100.5	- 225.99	- 176.40	- 85.37
Apr. 8	110.5	- 181.80	- 191.03	- 93.21
18	120.5	- 140.37	- 196.78	- 96.37
28	130.5	- 103.89	- 195.51	- 95.62
May 8	140.5	- 73.73	- 189.47	- 91.94
18	150.5	- 50.46	- 181.07	- 86.47
28	160.5	- 33.75	- 172.62	- 80.37
June 7	170.5	- 22.50	- 166.13	- 74.70
17	180.5	- 14.95	- 163.09	- 70.33
27	190.5	- 8.86	- 164.29	- 67.88
July 7	200.5	- 1.80	- 169.79	- 67.59
17	210.5	+ 8.56	- 178.80	- 69.36
27	220.5	+ 24.21	- 189.82	- 72.71
Aug. 6	230.5	+ 46.50	- 200.79	- 76.87
16	240.5	+ 75.97	- 209.24	- 80.82
26	250.5	+ 112.26	- 212.63	- 83.44
Sept. 5	260.5	+ 154.07	- 208.55	- 83.60
15	270.5	+ 199.26	- 195.04	- 80.31
25	280.5	+ 245.00	- 170.77	- 72.77
Oct. 5	290.5	+ 287.99	- 135.20	- 60.54
15	300.5	+ 324.76	- 88.70	- 43.52
25	310.5	+ 351.90	- 32.54	- 22.03
Nov. 4	320.5	+ 366.37	+ 31.13	+ 3.22
14	330.5	+ 365.72	+ 99.41	+ 31.15
24	340.5	+ 348.34	+ 168.82	+ 60.38
Dec. 4	350.5	+ 313.62	+ 235.50	+ 89.31
14	360.5	+ 262.01	+ 295.46	+ 116.22
24	370.5	+ 195.12	+ 344.84	+ 139.36
1953 Jan. 3	380.5	+ 115.63	+ 380.21	+ 157.14
13	390.5	+ 27.21	+ 398.79	+ 168.17
23	400.5	- 65.71	+ 398.71	+ 171.41
Feb. 2	410.5	- 158.17	+ 379.17	+ 166.26
12	420.5	- 245.04	+ 340.56	+ 152.66

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1953 Feb. 12	2434420.5	-245.04	+340.56	+152.66
22	430.5	-321.31	+284.48	+131.05
Mar. 4	440.5	-382.52	+213.67	+102.42
14	450.5	-425.06	+131.84	+68.21
24	460.5	-446.40	+43.41	+30.27
Apr. 3	470.5	-445.32	-46.74	-9.32
13	480.5	-421.96	-133.69	-48.36
23	490.5	-377.81	-212.70	-84.68
May 3	500.5	-315.57	-279.63	-116.31
13	510.5	-238.96	-331.10	-141.57
23	520.5	-152.42	-364.73	-159.20
June 2	530.5	-60.89	-379.23	-168.38
12	540.5	+30.59	-374.47	-168.82
22	550.5	+117.12	-351.39	-160.75
July 2	560.5	+194.29	-311.97	-144.86
12	570.5	+258.36	-259.04	-122.28
22	580.5	+306.50	-196.11	-94.50
Aug. 1	590.5	+336.97	-127.12	-63.24
11	600.5	+349.14	-56.17	-30.39
21	610.5	+343.51	+12.73	+2.16
31	620.5	+321.70	+75.93	+32.63
Sept. 10	630.5	+286.23	+130.41	+59.48
20	640.5	+240.33	+173.92	+81.47
30	650.5	+187.67	+205.16	+97.80
Oct. 10	660.5	+132.03	+223.78	+108.10
20	670.5	+77.03	+230.40	+112.45
30	680.5	+25.82	+226.42	+111.35
Nov. 9	690.5	-19.13	+213.89	+105.63
19	700.5	-56.21	+195.26	+96.38
29	710.5	-84.67	+173.10	+84.80
Dec. 9	720.5	-104.64	+149.90	+72.13
19	730.5	-117.05	+127.82	+59.50
29	740.5	-123.41	+108.53	+47.87
1954 Jan. 8	750.5	-125.67	+93.10	+37.95
18	760.5	-125.97	+81.96	+30.15
28	770.5	-126.44	+74.84	+24.60
Feb. 7	780.5	-128.99	+70.87	+21.07
17	790.5	-135.12	+68.69	+19.11
27	800.5	-145.76	+66.50	+18.01
Mar. 9	810.5	-161.15	+62.34	+16.93
19	820.5	-180.82	+54.20	+14.92
29	830.5	-203.49	+40.24	+11.08
Apr. 8	840.5	-227.27	+19.06	+4.61
18	850.5	-249.63	-10.20	-5.08
28	860.5	-267.72	-47.65	-18.30
May 8	870.5	-278.57	-92.56	-34.95
18	880.5	-279.32	-143.35	-54.60
28	890.5	-267.64	-197.64	-76.42

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1954 May 28	2434890.5	-267.64	-197.64	-76.42
June 7	900.5	-241.84	-252.37	-99.22
17	910.5	-201.23	-304.06	-121.57
27	920.5	-146.15	-349.04	-141.90
July 7	930.5	-78.08	-383.75	-158.59
17	940.5	+0.46	-405.03	-170.16
27	950.5	+85.95	-410.39	-175.35
Aug. 6	960.5	+174.28	-398.19	-173.22
16	970.5	+260.80	-367.83	-163.27
26	980.5	+340.76	-319.79	-145.46
Sept. 5	2434990.5	+409.55	-255.64	-120.26
15	2435000.5	+463.04	-177.98	-88.58
25	010.5	+497.81	-90.28	-51.79
Oct. 5	020.5	+511.42	+3.27	-11.59
15	030.5	+502.56	+98.02	+30.02
25	040.5	+471.19	+189.12	+70.91
Nov. 4	050.5	+418.57	+271.82	+108.93
14	060.5	+347.22	+341.78	+141.98
24	070.5	+260.79	+395.31	+168.40
Dec. 4	080.5	+163.87	+429.72	+186.64
14	090.5	+61.68	+443.40	+195.82
24	100.5	-40.26	+436.05	+195.54
1955 Jan. 3	110.5	-136.53	+408.61	+185.99
13	120.5	-222.16	+363.24	+167.93
23	130.5	-292.98	+303.15	+142.64
Feb. 2	140.5	-345.88	+232.30	+111.79
12	150.5	-379.00	+155.14	+77.33
22	160.5	-391.78	+76.26	+41.35
Mar. 4	170.5	-384.96	+0.11	+5.92
14	180.5	-360.43	-69.38	-27.04
24	190.5	-321.02	-128.94	-55.88
Apr. 3	200.5	-270.30	-176.18	-79.34
13	210.5	-212.24	-209.69	-96.55
23	220.5	-150.93	-229.05	-107.13
May 3	230.5	-90.34	-234.78	-111.12
13	240.5	-33.98	-228.30	-109.02
23	250.5	+15.24	-211.71	-101.68
June 2	260.5	+55.22	-187.61	-90.22
12	270.5	+84.78	-158.93	-75.97
22	280.5	+103.73	-128.59	-60.35
July 2	290.5	+112.76	-99.32	-44.71
12	300.5	+113.42	-73.42	-30.28
22	310.5	+107.87	-52.53	-18.01
Aug. 1	320.5	+98.67	-37.55	-8.55
11	330.5	+88.48	-28.53	-2.14
21	340.5	+79.81	-24.74	+1.32
31	350.5	+74.68	-24.75	+2.32
Sept. 10	360.5	+74.47	-26.62	+1.61

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1955 Sept. 10	2435360.5	+ 74.47	— 26.62	+ 1.61
20	370.5	+ 79.73	— 28.16	+ 0.15
30	380.5	+ 90.15	— 27.12	— 1.05
Oct. 10	390.5	+ 104.59	— 21.54	— 0.99
20	400.5	+ 121.19	— 9.90	+ 1.18
30	410.5	+ 137.58	+ 8.70	+ 6.05
Nov. 9	420.5	+ 151.09	+ 34.39	+ 13.93
19	430.5	+ 159.00	+ 66.52	+ 24.78
29	440.5	+ 158.81	+ 103.69	+ 38.20
Dec. 9	450.5	+ 148.44	+ 143.78	+ 53.50
19	460.5	+ 126.49	+ 184.15	+ 69.67
29	470.5	+ 92.34	+ 221.80	+ 85.49
1956 Jan. 8	480.5	+ 46.28	+ 253.52	+ 99.63
18	490.5	— 10.42	+ 276.25	+ 110.70
28	500.5	— 75.55	+ 287.17	+ 117.39
Feb. 7	510.5	— 146.06	+ 284.06	+ 118.57
17	520.5	— 218.18	+ 265.42	+ 113.40
27	530.5	— 287.67	+ 230.72	+ 101.39
Mar. 8	540.5	— 350.08	+ 180.44	+ 82.52
18	550.5	— 401.08	+ 116.17	+ 57.23
28	560.5	— 436.81	+ 40.54	+ 26.44
Apr. 7	570.5	— 454.12	— 42.94	— 8.49
17	580.5	— 450.93	— 130.04	— 45.85
27	590.5	— 426.32	— 216.16	— 83.67
May 7	600.5	— 380.70	— 296.56	— 119.87
17	610.5	— 315.76	— 366.76	— 152.40
27	620.5	— 234.40	— 422.78	— 179.39
June 6	630.5	— 140.49	— 461.44	— 199.24
16	640.5	— 38.69	— 480.52	— 210.76
26	650.5	+ 65.91	— 478.94	— 213.23
July 6	660.5	+ 168.06	— 456.74	— 206.44
16	670.5	+ 262.67	— 415.12	— 190.69
26	680.5	+ 345.11	— 356.34	— 166.78
Aug. 5	690.5	+ 411.46	— 283.56	— 135.98
15	700.5	+ 458.77	— 200.65	— 99.89
25	710.5	+ 485.16	— 112.00	— 60.42
Sept. 4	720.5	+ 489.99	— 22.19	— 19.65
14	730.5	+ 473.84	+ 64.23	+ 20.34
24	740.5	+ 438.49	+ 143.09	+ 57.55
Oct. 4	750.5	+ 386.75	+ 210.81	+ 90.19
14	760.5	+ 322.32	+ 264.64	+ 116.82
24	770.5	+ 249.44	+ 302.83	+ 136.44
Nov. 3	780.5	+ 172.63	+ 324.70	+ 148.52
13	790.5	+ 96.31	+ 330.68	+ 153.04
23	800.5	+ 24.52	+ 322.16	+ 150.47
Dec. 3	810.5	— 39.37	+ 301.37	+ 141.70
13	820.5	— 92.88	+ 271.13	+ 127.93
23	830.5	— 134.51	+ 234.57	+ 110.60

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1956 Dec. 23	2435830.5	-134.51	+234.57	+110.60
1957 Jan. 2	5840.5	-163.77	+194.88	+91.23
12	850.5	-181.09	+155.08	+71.30
22	860.5	-187.96	+117.73	+52.14
Feb. 1	870.5	-186.17	+84.85	+34.87
11	880.5	-178.17	+57.73	+20.29
21	890.5	-166.55	+36.95	+8.88
Mar. 3	900.5	-153.86	+22.35	+0.75
13	910.5	-142.38	+13.08	-4.30
23	920.5	-133.95	+7.75	-6.80
Apr. 2	930.5	-129.80	+4.58	-7.50
12	940.5	-130.40	+1.53	-7.32
22	950.5	-135.46	-3.41	-7.24
May 2	960.5	-143.94	-12.06	-8.20
12	970.5	-154.09	-25.80	-11.02
22	980.5	-163.66	-45.43	-16.28
June 1	2435990.5	-170.11	-70.98	-24.25
11	2436000.5	-170.82	-101.69	-34.84
21	010.5	-163.48	-135.99	-47.58
July 1	020.5	-146.25	-171.63	-61.67
11	030.5	-118.12	-205.82	-76.00
21	040.5	-78.97	-235.50	-89.29
31	050.5	-29.72	-257.60	-100.18
Aug. 10	060.5	+27.72	-269.34	-107.33
20	070.5	+90.56	-268.45	-109.62
30	080.5	+155.26	-253.43	-106.19
Sept. 9	090.5	+217.85	-223.71	-96.56
19	100.5	+274.18	-179.68	-80.64
29	110.5	+320.21	-122.80	-58.84
Oct. 9	120.5	+352.31	-55.43	-31.97
19	130.5	+367.52	+19.19	-1.26
29	140.5	+363.78	+97.18	+31.72
Nov. 8	150.5	+340.13	+174.22	+65.16
18	160.5	+296.80	+245.81	+97.09
28	170.5	+235.24	+307.59	+125.56
Dec. 8	180.5	+158.14	+355.59	+148.69
18	190.5	+69.23	+386.53	+164.89
28	200.5	-26.83	+398.08	+172.92
1958 Jan. 7	210.5	-124.84	+389.02	+172.00
17	220.5	-219.32	+359.41	+161.92
27	230.5	-304.89	+310.58	+143.00
Feb. 6	240.5	-376.71	+245.06	+116.17
16	250.5	-430.73	+166.44	+82.84
26	260.5	-464.05	+79.06	+44.83
Mar. 8	270.5	-475.05	-12.25	+4.24
18	280.5	-463.50	-102.51	-36.72
28	290.5	-430.51	-186.97	-75.82
Apr. 7	300.5	-378.44	-261.36	-111.05

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1958 Apr. 7	2436300.5	-378.44	-261.36	-111.05
17	310.5	-310.66	-322.19	-140.65
27	320.5	-231.32	-366.90	-163.28
May 7	330.5	-145.01	-393.99	-178.05
17	340.5	-56.51	-403.06	-184.54
27	350.5	+29.56	-394.76	-182.86
June 6	360.5	+108.99	-370.74	-173.58
16	370.5	+178.23	-333.42	-157.65
26	380.5	+234.59	-285.89	-136.40
July 6	390.5	+276.37	-231.61	-111.37
16	400.5	+302.94	-174.17	-84.24
26	410.5	+314.70	-117.06	-56.66
Aug. 5	420.5	+313.03	-63.38	-30.20
15	430.5	+300.12	-15.62	-6.19
25	440.5	+278.75	+24.48	+14.36
Sept. 4	450.5	+251.98	+56.03	+30.84
14	460.5	+222.88	+79.04	+43.03
24	470.5	+194.27	+94.32	+51.11
Oct. 4	480.5	+168.39	+103.35	+55.63
14	490.5	+146.80	+108.06	+57.38
24	500.5	+130.22	+110.59	+57.33
Nov. 3	510.5	+118.53	+113.07	+56.50
13	520.5	+110.86	+117.32	+55.86
23	530.5	+105.71	+124.75	+56.21
Dec. 3	540.5	+101.14	+136.14	+58.13
13	550.5	+94.99	+151.60	+61.92
23	560.5	+85.12	+170.59	+67.56
1959 Jan. 2	570.5	+69.62	+191.89	+74.75
12	580.5	+47.01	+213.74	+82.88
22	590.5	+16.42	+233.96	+91.11
Feb. 1	600.5	-22.34	+250.14	+98.46
11	610.5	-68.59	+259.79	+103.83
21	620.5	-120.90	+260.60	+106.14
Mar. 3	630.5	-177.01	+250.61	+104.41
13	640.5	-234.02	+228.45	+97.84
23	650.5	-288.48	+193.50	+85.94
Apr. 2	660.5	-336.72	+146.04	+68.57
12	670.5	-375.03	+87.29	+46.02
22	680.5	-400.04	+19.41	+19.00
May 2	690.5	-408.96	-54.58	-11.38
12	700.5	-399.89	-130.98	-43.64
22	710.5	-371.98	-205.67	-76.06
June 1	720.5	-325.60	-274.37	-106.78
11	730.5	-262.32	-332.98	-133.94
21	740.5	-184.84	-377.84	-155.84
July 1	750.5	-96.86	-406.02	-170.99
11	760.5	-2.80	-415.52	-178.30
21	770.5	+92.42	-405.38	-177.13

Date	J. D.	$-10^8 \bar{x}_0$	$-10^8 \bar{y}_0$	$-10^8 \bar{z}_0$
1959 July 21	2436770.5	+ 92.42	-405.38	-177.13
31	780.5	+ 183.74	-375.81	-167.32
Aug. 10	790.5	+ 266.22	-328.12	-149.20
20	800.5	+ 335.39	-264.67	-123.63
30	810.5	+ 387.48	-188.77	- 91.89
Sept. 9	820.5	+ 419.65	-104.43	- 55.64
19	830.5	+ 430.23	- 16.19	- 16.82
29	840.5	+ 418.72	+ 71.19	+ 22.44
Oct. 9	850.5	+ 385.98	+ 153.00	+ 60.00
19	860.5	+ 334.05	+ 224.87	+ 93.79
29	870.5	+ 266.14	+ 283.07	+ 121.99
Nov. 8	880.5	+ 186.38	+ 324.72	+ 143.10
18	890.5	+ 99.52	+ 348.05	+ 156.10
28	900.5	+ 10.66	+ 352.42	+ 160.49
Dec. 8	910.5	- 75.17	+ 338.43	+ 156.30
18	920.5	-153.31	+ 307.78	+ 144.11
28	930.5	-219.84	+ 263.16	+ 125.01
1960 Jan. 7	940.5	-271.75	+ 207.96	+ 100.43
17	950.5	-307.21	+ 146.06	+ 72.08
27	960.5	-325.54	+ 81.45	+ 41.82
Feb. 6	970.5	-327.22	+ 17.98	+ 11.49
16	980.5	-313.74	- 40.92	- 17.21
26	2436990.5	-287.48	- 92.41	- 42.82
Mar. 7	2437000.5	-251.41	-134.47	- 64.21
17	010.5	-208.86	-165.89	- 80.63
27	020.5	-163.26	-186.39	- 91.74
Apr. 6	030.5	-117.86	-196.48	- 97.61
16	040.5	- 75.50	-197.44	- 98.68
26	050.5	- 38.44	-191.13	- 95.68
May 6	060.5	- 8.16	-179.80	- 89.64
16	070.5	+ 14.68	-165.90	- 81.69
26	080.5	+ 30.30	-151.81	- 73.01
June 5	090.5	+ 39.74	-139.64	- 64.70
15	100.5	+ 44.71	-130.99	- 57.69
25	110.5	+ 47.42	-126.80	- 52.64
July 5	120.5	+ 50.31	-127.25	- 49.87
15	130.5	+ 55.79	-131.69	- 49.34
25	140.5	+ 65.93	-138.74	- 50.63
Aug. 4	150.5	+ 82.20	-146.43	- 53.02
14	160.5	+ 105.31	-152.36	- 55.53
24	170.5	+ 135.04	-154.00	- 57.05
Sept. 3	180.5	+ 170.26	-148.95	- 56.48
13	190.5	+ 208.96	-135.20	- 52.78
23	200.5	+ 248.45	-111.34	- 45.18
Oct. 3	210.5	+ 285.54	- 76.73	- 33.15
13	220.5	+ 316.82	- 31.65	- 16.59
23	230.5	+ 338.90	+ 22.74	+ 4.25
Nov. 2	240.5	+ 348.75	+ 84.41	+ 28.71