

NO. 10 TOPOCENTRIC LIBRATIONS OF THE YERKES LUNAR PHOTOGRAPHS

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THE topocentric librations (l' , b') of the moon, which are more simply described as the selenographic longitude and latitude of the observer, are required for the reduction of differential measures on the lunar disk.

The present table gives the topocentric librations of 423 plates taken by Elliott Moore with the Yerkes 40-inch refractor. These plates were selected from the over 1000 taken so far in the selenodetic program of the Lunar and Planetary Laboratory (cf. p. 8).

The data were computed using an IBM 650 program written by Mr. Huzzen. Formerly these computations were carried out by desk machine using a computing form devised by Mr. Arthur. This form is based on the method set out by R. d'E Atkinson (1951), and the program merely duplicates the steps in the form. The Atkinson method corrects the geocentric values to topocentric values. The program could have been written to calculate the topocentric values *ab initio*, but when the problem was examined in detail it was found that this would have required a more extensive input than for the method actually used. The high-speed computation requires 5 seconds as compared with the 30 minutes of the desk calculation and is more reliable.

The geocentric librations and the necessary corrections were taken from The American Ephemeris and Nautical Almanac. Time-dependent quantities were interpolated for the instant of exposure with the simple formula

$$u = u_0 + f\Delta + \frac{1}{2} f(f-1)\Delta',$$

where Δ , Δ' are the first and second differences, while f is the fraction of the time interval of the tables of the ephemeris.

The quantities taken from the ephemeris and the accuracy to which they were read, are listed as follows:

- a = geocentric R. A. of moon, 0.01s;
- δ = geocentric declination of moon, 0''.01;
- π = tabular parallax, 0''.01;
- l = geocentric libration in longitude, 0°.01;
- b = geocentric libration in latitude, 0°.01;
- C = geocentric position-angle of moon's axis, 0°.01;

GST_0 = mean sidereal time at 0^h of date, 0.01s.

The quantities given in our tables are the following:

- The identity number of the plate;
- the date (year, month, day);
- Universal Time of exposure;
- l' = topocentric libration in longitude;
- b' = topocentric libration in latitude;
- C' = topocentric position-angle of moon's axis;
- s' = approximate topocentric semidiameter of moon.

For convenience in certain calculations the values of the sine and cosine of $Q - C$ are given, Q being the geocentric value of the parallactic angle. The table also gives the value of the sine of the geocentric zenith-distance.

The position-angle and the librations are stated in degrees and minutes. Decimals of a minute could have been obtained by the program, but would not have been significant because of certain approxima-

tions in the method of calculation. The accuracy of the results is, however, sufficient for cartographic purposes and for the reduction of relative height measures.

The computation scheme is outlined as follows: The values a , δ , l , b , C , π are interpolated for the instant of exposure and the geocentric hour-angle is found from

$$H = GST_0 + \text{sidereal interval} - \text{W. longitude of observatory} - a,$$

in which the sidereal interval is the U. T. converted into sidereal units. The geocentric zenith-distance ζ is computed from

$$\cos \zeta = \sin \delta \sin \phi + \cos \delta \cos \phi \cos H,$$

and the selenocentric arc σ is found from the approximate relation

$$\sigma = \pi \sin \zeta (1 + 0.0168 \cos \zeta).$$

The sine and cosine of the parallactic angle Q are computed from

$$\begin{aligned} \sin Q &= \sin H \cos \phi / \sin \zeta, \\ \cos Q &= (\sin \phi - \cos \zeta \sin \delta) / \sin \zeta \cos \delta. \end{aligned}$$

The corrections (Δl , Δb) to the geocentric librations (l , b) to pass to the topocentric values (l' , b')

are next computed; i.e.,

$$\begin{aligned} \Delta l &= -\sigma \sin(Q - C) / \cos b, \\ \Delta b &= +\sigma \cos(Q - C). \end{aligned}$$

The declination is corrected with

$$\bar{\delta} = \delta - \frac{1}{2} \sigma \cos Q$$

and the topocentric position-angle C' found from

$$C' = C + \Delta l \sin b' - \sigma \sin Q \tan \bar{\delta}.$$

The approximate topocentric semidiameter s' is computed from the tabular value interpolated for the instance of exposure by

$$s' = s (1 + \sin \pi \cos \zeta).$$

The tabular results will be used for the determination of selenographic statistics and cartography. However, because of the approximations in the calculations and because the lunar rotation constants of the standard Ephemeris may require revision, the tabular data will not be used for selenodetic purposes.

REFERENCE

Atkinson, R. d'E., 1951, *M. N.*, 111, 448.

TOPOCENTRIC LIBRATIONS

Plate Ident.	Date	Time (U.T.)	l'	b'	c'	a'	sin (Q-C)	cos (Q-C)	sin ζ
Y-37	1959-2-25	07.24	-1° 50'	+2° 02'	024° 56'	16' 30.0"	-.492 136	.870 519	.699 831
Y-38	1959-2-25	07.22	-1 50	+2 02	024 56	16 30.0	-.499 786	.866 149	.700 256
Y-44	1959-2-25	07.45	-1 53	+2 02	024 56	16 30.0	-.409 128	.912 477	.698 566
Y-45	1959-3-18	01.06	-6 04	+7 04	000 09	15 15.0	+.326 151	.945 318	.440 708
Y-46	1959-3-18	01.14	-6 05	+7 05	000 10	15 15.0	+.372 153	.928 171	.450 872
Y-51	1959-3-19	00.48	-6 31	+7 13	005 39	15 25.8	-.244 963	.969 533	.429 483
Y-54	1959-3-23	04.59	-5 14	+4 22	023 17	16 25.2	-.277 772	.960 647	.611 827
Y-55	1959-3-24	04.47	-3 46	+2 49	024 46	16 36.0	-.579 000	.815 327	.678 415
Y-56	1959-3-25	07.12	-2 19	+1 06	024 38	16 43.2	-.219 881	.975 527	.744 891
Y-57	1959-3-28	08.56	+2 53	-3 49	014 26	16 34.8	-.308 554	.951 207	.852 016
Y-65	1959-4-14	00.43	-5 48	+7 01	358 20	15 04.2	+.710 076	.704 125	.630 754
Y-66	1959-4-14	01.02	-5 52	+7 02	358 23	15 04.2	+.735 257	.677 788	.671 523
Y-67	1959-4-14	01.04	-5 52	+7 02	358 23	15 03.0	+.737 508	.675 339	.675 786
Y-72	1959-4-14	01.29	-5 56	+7 03	358 28	15 03.0	+.760 195	.649 695	.728 110
Y-82	1959-4-16	00.27	-7 09	+7 11	009 05	15 24.0	+.091 887	.995 769	.456 099
Y-93	1959-4-17	00.59	-7 31	+6 48	014 08	15 37.2	-.121 567	.992 583	.478 099
Y-96	1959-4-19	02.36	-7 05	+5 00	021 59	16 07.8	-.294 797	.955 560	.578 103
Y-100	1959-4-21	04.17	-4 52	+1 59	024 56	16 37.8	-.371 981	.928 240	.698 625
Y-101	1959-4-22	03.36	-3 01	+0 13	024 04	16 46.8	-.680 425	.732 818	.788 174
Y-104	1959-4-22	03.50	-3 02	+0 13	024 04	16 46.8	-.642 109	.766 613	.777 789
Y-106	1959-4-22	03.57	-3 03	+0 13	024 03	16 46.8	-.621 682	.783 270	.773 210
Y-108	1959-4-22	04.00	-3 04	+0 13	024 03	16 46.8	-.612 679	.790 332	.771 378
Y-109	1959-4-22	04.01	-3 04	+0 13	024 03	16 46.8	-.609 638	.792 680	.770 785
Y-110	1959-4-22	04.10	-3 04	+0 13	024 02	16 46.8	-.581 586	.813 485	.765 884
Y-111	1959-4-22	05.25	-3 12	+0 13	023 59	16 48.0	-.310 125	.950 696	.758 455
Y-112	1959-4-22	05.26	-3 12	+0 13	023 59	16 48.0	-.306 272	.951 944	.758 775
Y-123	1959-4-23	05.24	-1 09	-1 32	021 22	16 52.8	-.478 594	.878 037	.806 255
Y-148	1959-5-16	02.13	-7 44	+5 22	020 55	15 48.0	+.196 582	.980 488	.673 233
Y-149	1959-5-16	02.14	-7 44	+5 22	020 55	15 48.0	+.199 662	.979 865	.674 912
Y-150	1959-5-16	02.15	-7 44	+5 22	020 55	15 48.0	+.202 716	.979 238	.676 595
Y-152	1959-5-16	02.53	-7 49	+5 22	020 58	15 46.8	+.300 287	.953 849	.742 679
Y-158	1959-5-17	03.18	-7 29	+4 08	023 33	16 03.0	+.160 168	.987 090	.740 847
Y-159	1959-5-18	01.41	-6 29	+2 38	024 48	16 18.0	-.464 047	.885 810	.667 673
Y-160	1959-5-18	01.42	-6 30	+2 38	024 48	16 18.0	-.459 935	.887 952	.667 563
Y-161	1959-5-18	01.43	-6 30	+2 38	024 48	16 18.0	-.455 821	.890 071	.667 468
Y-162	1959-5-18	01.43	-6 30	+2 38	024 48	16 18.0	-.455 821	.890 071	.667 468
Y-163	1959-5-18	01.44	-6 30	+2 38	024 48	16 18.0	-.451 686	.892 177	.667 387
Y-164	1959-5-18	01.45	-6 30	+2 38	024 48	16 18.0	-.447 550	.894 259	.667 321
Y-165	1959-5-18	01.46	-6 30	+2 38	024 48	16 18.0	-.443 393	.896 327	.667 270
Y-168	1959-5-18	01.50	-6 31	+2 38	024 48	16 18.0	-.426 667	.904 409	.667 209
Y-169	1959-5-18	03.29	-6 43	+2 39	024 50	16 18.0	-.021 579	.999 767	.732 870
Y-177	1959-5-24	07.09	+4 05	-5 32	001 22	16 40.2	-.132 452	.991 189	.878 050
Y-178	1959-5-24	07.44	+4 02	-5 33	001 15	16 40.2	-.007 191	.999 974	.874 901
Y-180	1959-5-25	07.42	+5 44	-5 45	354 40	16 28.2	-.111 071	.993 812	.880 366
Y-184	1959-5-28	08.57	+7 52	-3 58	339 36	15 40.2	-.145 860	.989 305	.876 883
Y-192	1959-5-28	09.20	+7 48	-3 58	339 34	15 40.8	-.079 908	.996 802	.854 832
Y-224	1959-6-18	03.03	-2 16	-3 15	017 04	16 42.0	-.347 107	.937 826	.837 572
Y-225	1959-6-19	04.49	-0 31	-4 26	011 19	16 46.2	-.086 719	.996 233	.865 324
Y-229	1959-6-19	04.53	-0 32	-4 26	011 19	16 46.2	-.072 402	.997 376	.866 311
Y-232	1959-6-19	05.30	-0 36	-4 27	011 12	16 45.0	+.056 787	.998 386	.880 226
Y-236	1959-6-19	05.36	-0 37	-4 27	011 11	16 45.0	+.076 921	.997 037	.883 213
Y-237	1959-6-19	06.34	-0 42	-4 29	011 00	16 43.8	+.254 316	.967 121	.919 108
Y-238	1959-6-19	06.35	-0 42	-4 29	011 00	16 43.8	+.257 069	.966 393	.919 798
Y-242	1959-6-19	06.42	-0 43	-4 29	010 59	16 43.8	+.275 989	.961 161	.924 649

TOPOCENTRIC LIBRATIONS

Plate Ident.	Date	Time (U.T.)	l'	b'	c'	s'	sin (Q-C)	cos (Q-C)	sin ζ
Y-248	1959-6-20	05.05	+1° 29'	-5° 15'	004° 53'	16' 45.0"	-.136 449	.990 647	.874 413
Y-250	1959-6-21	06.50	+3 15	-5 38	357 48	16 37.8	+.139 837	.990 175	.876 537
Y-260	1959-6-23	08.56	+6 00	-5 03	345 24	16 13.8	+.384 121	.923 282	.844 600
Y-268	1959-6-24	08.17	+6 56	-4 10	341 01	16 00.0	+.124 922	.992 167	.821 730
Y-291	1959-7-12	01.48	-5 28	+1 37	024 57	15 58.2	+.231 190	.972 909	.871 304
Y-304	1959-7-14	01.40	-4 02	-1 31	022 14	16 16.2	-.064 787	.997 899	.819 977
Y-308	1959-7-14	01.44	-4 02	-1 31	022 14	16 16.2	-.051 111	.998 693	.823 144
Y-335	1959-7-16	02.58	-1 41	-4 11	013 46	16 30.0	-.049 441	.998 777	.862 475
Y-345	1959-7-17	05.07	-0 23	-5 07	007 28	16 31.2	+.276 797	.960 929	.915 511
Y-347	1959-7-20	03.49	+4 33	-5 16	348 33	16 19.8	-.243 457	.969 912	.911 496
Y-353	1959-7-20	05.32	+4 20	-5 15	348 16	16 21.0	+.094 860	.995 490	.856 623
Y-359	1959-7-21	06.23	+5 23	-4 29	343 02	16 10.2	+.164 897	.986 311	.831 173
Y-364	1959-7-22	09.14	+5 44	-3 27	338 53	15 55.8	+.633 020	.774 136	.818 836
Y-369	1959-7-22	09.23	+5 42	-3 28	338 52	15 55.8	+.656 727	.754 129	.825 542
Y-370	1959-7-22	09.59	+5 38	-3 28	338 49	15 55.2	+.738 655	.674 084	.856 549
Y-386	1959-7-27	10.24	+3 22	+3 26	338 34	15 03.0	-.033 400	.999 442	.593 309
Y-389	1959-7-27	10.26	+3 21	+3 26	338 34	15 03.0	-.024 551	.999 699	.590 613
Y-427	1959-9-13	00.52	+4 38	-5 13	347 17	15 58.8	-.144 446	.989 513	.888 134
Y-445	1959-9-14	02.01	+5 03	-4 20	342 22	15 52.8	-.017 161	.999 853	.854 528
Y-453	1959-9-14	04.52	+4 37	-4 22	342 01	15 52.2	+.574 270	.818 668	.845 564
Y-465	1959-9-15	04.24	+5 02	-3 10	338 31	15 46.8	+.375 545	.926 804	.782 706
Y-466	1959-9-15	05.49	+4 49	-3 11	338 24	15 45.0	+.651 217	.758 891	.817 180
Y-467	1959-9-15	05.50	+4 48	-3 11	338 24	15 45.0	+.653 838	.756 634	.817 941
Y-468	1959-9-15	05.51	+4 48	-3 11	338 24	15 45.0	+.656 446	.754 373	.818 708
Y-469	1959-9-15	05.53	+4 48	-3 11	338 24	15 45.0	+.661 604	.749 853	.820 257
Y-471	1959-9-16	05.43	+4 55	-1 48	336 08	15 37.8	+.526 466	.850 196	.743 441
Y-473	1959-9-17	05.41	+4 46	-0 19	335 05	15 30.0	+.354 172	.935 180	.690 100
Y-482	1959-9-18	08.12	+3 55	+1 11	335 20	15 19.8	+.740 402	.672 164	.689 677
Y-486	1959-9-18	08.28	+3 52	+1 11	335 20	15 19.2	+.778 575	.627 551	.709 468
Y-490	1959-9-21	07.18	+1 35	+5 09	342 29	15 01.2	-.232 330	.972 637	.588 831
Y-498	1959-10-9	23.53	+5 33	-5 25	348 44	16 01.2	+.048 019	.998 846	.860 343
Y-506	1959-10-12	00.55	+6 08	-3 33	339 41	15 43.2	+.044 872	.998 993	.828 976
Y-510	1959-10-18	05.45	+2 05	+4 43	341 08	15 01.8	-.059 199	.998 246	.552 374
Y-526	1959-10-19	06.33	+0 52	+5 44	345 05	14 58.2	-.143 610	.989 634	.513 726
Y-528	1959-10-20	06.22	-0 13	+6 31	349 38	14 55.2	-.466 108	.884 727	.591 202
Y-538	1959-10-22	09.51	-3 13	+7 11	000 30	15 00.0	-.071 051	.997 472	.413 448
Y-556	1959-11-9	02.00	+6 53	-2 32	337 26	15 37.8	+.576 860	.816 843	.783 307
Y-558	1959-11-10	01.38	+6 41	-1 08	335 38	15 28.2	+.359 635	.933 093	.724 195
Y-560	1959-11-10	01.42	+6 40	-1 08	335 38	15 28.2	+.375 650	.926 761	.723 497
Y-563	1959-11-10	01.49	+6 38	-1 08	335 38	15 28.2	+.403 472	.914 992	.722 753
Y-564	1959-11-10	01.51	+6 38	-1 08	335 38	15 28.2	+.411 366	.911 470	.722 656
Y-568	1959-11-12	01.40	+5 25	+1 46	335 34	15 10.8	-.026 593	.999 646	.698 027
Y-576	1959-11-15	06.47	+1 26	+5 22	343 54	14 57.0	+.650 146	.759 810	.529 656
Y-588	1959-11-17	07.08	-0 52	+6 44	353 16	14 55.2	+.116 783	.993 157	.419 686
Y-616	1959-12-8	22.58	+6 53	+1 33	335 16	15 15.0	-.138 185	.990 407	.771 311
Y-618	1959-12-9	23.13	+5 58	+2 56	336 32	15 06.0	-.260 366	.965 510	.782 771
Y-621	1959-12-9	23.20	+5 58	+2 55	336 33	15 06.0	-.245 666	.969 354	.771 158
Y-623	1959-12-9	23.41	+5 54	+2 55	336 34	15 07.2	-.195 589	.980 686	.736 330
Y-624	1959-12-9	23.42	+5 53	+2 55	336 34	15 07.2	-.192 970	.981 205	.734 682
Y-627	1959-12-10	03.35	+5 08	+2 52	336 46	15 07.2	+.746 624	.665 246	.650 028
Y-630	1959-12-10	03.41	+5 07	+2 52	336 46	15 07.2	+.761 828	.647 779	.658 151
Y-632	1959-12-10	03.45	+5 06	+2 52	336 47	15 07.2	+.771 428	.636 316	.663 738
Y-639	1959-12-15	10.07	-1 40	+7 00	357 34	14 51.0	+.796 584	.604 527	.838 403
Y-640	1959-12-15	10.33	-1 43	+7 01	357 39	14 49.8	+.798 334	.602 215	.879 612

TOPOCENTRIC LIBRATIONS

Plate Ident.	Date	Time (U.T.)	l'	b'	c'	s'	sin (Q-C)	cos (Q-C)	sin ζ
Y-642	1959-12-16	06.04	-1 58	+6 55	002 18	14 58.2	-.297 756	.954 642	.427 111
Y-646	1959-12-16	06.33	-2 04	+6 55	002 22	14 58.2	-.092 899	.995 675	.410 521
Y-647	1959-12-16	06.54	-2 08	+6 55	002 25	14 58.2	+.064 250	.997 933	.412 718
Y-648	1959-12-16	07.12	-2 13	+6 55	002 28	14 58.2	+.192 462	.981 304	.424 047
Y-651	1959-12-17	09.23	-3 40	+6 40	008 03	15 01.2	+.489 412	.872 053	.567 100
Y-654	1959-12-17	09.52	-3 45	+6 41	008 07	15 00.0	+.558 833	.829 280	.627 553
Y-656	1959-12-17	10.14	-3 49	+6 41	008 11	14 58.8	+.595 912	.803 050	.674 174
Y-658	1959-12-18	07.08	-4 07	+6 04	012 39	15 04.8	-.600 005	.799 996	.499 535
Y-660	1959-12-18	07.11	-4 07	+6 04	012 40	15 04.8	-.587 277	.809 385	.495 317
Y-672	1959-12-18	09.20	-4 34	+6 05	012 56	15 06.0	+.183 951	.982 935	.499 293
Y-680	1959-12-19	10.07	-5 32	+5 14	017 18	15 12.0	+.081 579	.996 667	.533 161
Y-703	1960-1-7	23.03	+4 41	+5 08	341 04	15 00.0	-.334 577	.942 368	.690 905
Y-704	1960-1-7	23.12	+4 40	+5 08	341 05	15 00.0	-.312 679	.949 859	.673 974
Y-706	1960-1-11	02.29	+0 35	+6 56	354 54	14 55.2	-.411 607	.911 362	.493 023
Y-707	1960-1-11	02.30	+0 34	+6 56	354 54	14 55.2	-.407 217	.913 332	.491 303
Y-711	1960-1-11	02.36	+0 33	+6 56	354 55	14 55.2	-.379 740	.925 093	.481 244
Y-712	1960-1-11	02.35	+0 34	+6 56	354 55	14 55.2	-.384 438	.923 151	.482 886
Y-718	1960-1-16	05.58	-4 25	+4 18	019 37	15 16.8	-.780 828	.624 746	.620 158
Y-720	1960-1-16	06.14	-4 28	+4 17	019 38	15 19.2	-.741 373	.671 093	.594 210
Y-731	1960-2-3	01.38	+5 02	+3 46	337 26	15 18.0	+.886 761	.462 228	.782 340
Y-732	1960-2-3	01.39	+5 02	+3 46	337 26	15 18.0	+.887 676	.460 469	.783 998
Y-733	1960-2-3	01.41	+5 02	+3 46	337 26	15 18.0	+.889 469	.456 995	.787 305
Y-734	1960-2-3	01.42	+5 02	+3 46	337 26	15 18.0	+.890 347	.455 282	.788 956
Y-735	1960-2-3	02.07	+4 58	+3 47	337 28	15 16.8	+.908 888	.417 041	.829 421
Y-737	1960-2-3	02.11	+4 57	+3 47	337 28	15 16.8	+.911 309	.411 724	.835 697
Y-738	1960-2-3	02.13	+4 57	+3 47	337 28	15 16.8	+.912 470	.409 144	.838 807
Y-739	1960-2-3	23.24	+4 43	+4 57	340 01	15 12.0	+.332 214	.943 204	.528 687
Y-740	1960-2-3	23.26	+4 42	+4 57	340 01	15 12.0	+.343 240	.939 248	.528 596
Y-741	1960-2-3	23.28	+4 42	+4 57	340 01	15 12.0	+.345 219	.935 162	.528 584
Y-742	1960-2-3	23.30	+4 41	+4 57	340 01	15 12.0	+.365 142	.930 952	.528 655
Y-743	1960-2-3	23.31	+4 41	+4 57	340 01	15 12.0	+.370 586	.928 798	.528 722
Y-744	1960-2-3	23.33	+4 41	+4 57	340 01	15 12.0	+.381 422	.924 401	.528 922
Y-745	1960-2-3	23.35	+4 40	+4 56	340 01	15 12.0	+.392 191	.919 884	.529 201
Y-746	1960-2-3	23.36	+4 40	+4 56	340 02	15 12.0	+.397 553	.917 580	.529 371
Y-753	1960-2-9	00.04	-0 46	+7 02	003 31	14 58.8	-.779 690	.626 166	.725 422
Y-754	1960-2-9	00.11	-0 47	+7 02	003 32	14 58.8	-.774 239	.632 894	.710 991
Y-761	1960-2-12	06.12	-4 08	+4 40	018 34	15 22.2	-.141 963	.989 872	.508 197
Y-762	1960-2-12	06.34	-4 13	+4 40	018 37	15 22.8	-.018 589	.999 827	.527 654
Y-769	1960-2-13	09.06	-4 58	+3 26	022 01	15 28.2	+.274 573	.961 566	.731 715
Y-770	1960-2-13	09.34	-5 02	+3 26	022 03	15 28.2	+.329 464	.944 168	.781 129
Y-773	1960-2-15	06.43	-4 42	+0 24	024 56	15 45.0	-.717 602	.696 454	.702 229
Y-774	1960-2-15	06.50	-4 43	+0 24	024 56	15 45.0	-.698 080	.716 020	.695 182
Y-781	1960-3-1	00.11	+4 21	+3 18	336 31	15 28.2	+.917 853	.396 920	.861 838
Y-784	1960-3-2	00.04	+3 56	+4 36	338 54	15 19.2	+.871 282	.490 782	.746 970
Y-786	1960-3-2	00.09	+3 55	+4 36	338 54	15 19.2	+.876 393	.481 598	.755 697
Y-788	1960-3-2	00.12	+3 55	+4 36	338 55	15 19.2	+.879 299	.476 271	.760 925
Y-789	1960-3-2	00.14	+3 54	+4 36	338 55	15 18.0	+.881 171	.472 797	.764 403
Y-790	1960-3-2	00.16	+3 53	+4 36	338 55	15 18.0	+.882 992	.469 389	.767 875
Y-791	1960-3-2	00.18	+3 53	+4 36	338 55	15 18.0	+.884 766	.466 035	.771 342
Y-792	1960-3-2	00.23	+3 53	+4 36	338 56	15 18.0	+.888 994	.457 919	.779 972
Y-798	1960-3-4	02.14	+1 56	+6 31	346 41	15 01.2	+.864 287	.503 000	.768 363
Y-817	1960-3-8	00.33	-1 58	+6 47	007 01	15 04.2	-.612 294	.790 630	.507 740
Y-821	1960-3-8	00.39	-1 59	+6 47	007 01	15 04.2	-.589 950	.807 440	.497 335
Y-822	1960-3-8	00.49	-2 01	+6 47	007 03	15 04.2	-.548 719	.836 006	.481 059

TOPOCENTRIC LIBRATIONS

Plate Ident.	Date	Time (U.T.)	l'	b'	c'	s'	sin (Q-C)	cos (Q-C)	sin ζ
Y-830	1960-3-11	02.50	-4° 23'	+3° 57'	020° 26'	15' 28.8"	-.743 562	.668 667	.601 947
Y-832	1960-3-12	05.53	-5 03	+2 33	023 18	15 40.8	-.182 403	.983 224	.596 332
Y-844	1960-3-13	05.19	-4 48	+0 59	024 43	15 51.0	-.583 060	.812 429	.646 074
Y-863	1960-3-14	06.06	-4 30	-0 37	024 51	15 58.8	-.580 351	.814 367	.702 292
Y-864	1960-3-14	06.31	-4 34	-0 37	024 50	16 00.0	-.487 563	.873 088	.693 364
Y-865	1960-4-5	00.33	-3 16	+6 23	010 13	15 04.8	-.213 498	.976 944	.433 593
Y-866	1960-4-5	00.34	-3 16	+6 23	010 13	15 04.8	-.206 539	.978 438	.433 484
Y-867	1960-4-5	00.36	-3 17	+6 23	010 13	15 04.8	-.192 593	.981 278	.433 354
Y-868	1960-4-5	00.37	-3 17	+6 23	010 14	15 04.8	-.185 595	.982 626	.433 323
Y-869	1960-4-5	00.39	-3 17	+6 23	010 14	15 04.8	-.171 592	.985 168	.433 345
Y-870	1960-4-5	00.40	-3 18	+6 23	010 14	15 04.8	-.164 569	.986 366	.433 397
Y-871	1960-4-5	00.44	-3 19	+6 23	010 14	15 04.8	-.136 463	.990 645	.433 864
Y-833	1960-4-6	01.02	-4 16	+5 33	014 56	15 13.2	-.404 050	.914 737	.468 966
Y-886	1960-4-6	01.07	-4 17	+5 33	014 56	15 13.2	-.374 033	.927 415	.466 569
Y-890	1960-4-7	00.45	-4 53	+4 28	018 53	15 21.0	-.723 312	.690 522	.577 008
Y-891	1960-4-9	02.02	-5 34	+1 40	024 09	15 45.0	-.784 461	.620 179	.689 407
Y-892	1960-4-9	02.03	-5 35	+1 40	024 09	15 45.0	-.782 264	.622 948	.688 033
Y-893	1960-4-9	02.05	-5 35	+1 40	024 09	15 45.0	-.777 799	.628 514	.685 305
Y-894	1960-4-9	02.07	-5 35	+1 40	024 09	15 45.0	-.773 235	.634 120	.682 608
Y-895	1960-4-9	02.08	-5 35	+1 40	024 09	15 45.0	-.770 922	.636 930	.681 269
Y-896	1960-4-9	02.09	-5 35	+1 40	024 09	15 45.0	-.768 580	.639 754	.679 940
Y-898	1960-4-9	02.14	-5 36	+1 40	024 09	15 45.0	-.756 500	.653 994	.673 420
Y-903	1960-4-10	04.26	-5 36	+0 05	024 58	16 01.2	-.468 308	.883 566	.666 492
Y-905	1960-4-10	04.30	-5 37	+0 05	024 58	16 01.2	-.451 774	.892 133	.666 115
Y-906	1960-4-10	04.31	-5 37	+0 05	024 58	16 01.2	-.447 610	.894 229	.666 058
Y-908	1960-4-10	04.34	-5 37	+0 05	024 58	16 01.2	-.435 066	.900 399	.665 973
Y-909	1960-4-10	04.35	-5 37	+0 05	024 58	16 01.2	-.430 857	.902 420	.665 971
Y-910	1960-4-10	04.37	-5 38	+0 05	024 58	16 01.2	-.422 420	.906 400	.666 019
Y-914	1960-4-12	04.35	-3 50	-3 01	022 13	16 19.8	-.704 101	.710 100	.822 224
Y-933	1960-5-2	01.09	-3 22	+6 30	008 37	14 58.2	+5.575 590	.817 738	.654 698
Y-934	1960-5-2	01.11	-3 23	+6 30	008 37	14 58.2	+5.578 839	.815 442	.658 942
Y-935	1960-5-2	01.12	-3 23	+6 30	008 37	14 58.2	+5.580 423	.814 315	.661 057
Y-936	1960-5-2	01.13	-3 23	+6 30	008 37	14 57.0	+5.581 989	.813 197	.663 177
Y-937	1960-5-2	01.15	-3 23	+6 30	008 38	14 57.0	+5.585 055	.810 993	.667 411
Y-938	1960-5-2	01.16	-3 23	+6 30	008 38	14 57.0	+5.586 561	.809 905	.669 530
Y-939	1960-5-2	01.19	-3 24	+6 31	008 38	14 57.0	+5.590 932	.806 721	.675 865
Y-940	1960-5-2	01.20	-3 24	+6 31	008 38	14 57.0	+5.592 345	.805 684	.677 973
Y-942	1960-5-4	01.45	-5 32	+4 47	017 38	15 12.0	+2.231 310	.972 880	.584 677
Y-946	1960-5-5	01.35	-6 14	+3 35	021 00	15 22.2	-.118 503	.992 954	.548 690
Y-957	1960-5-12	06.05	-1 13	-5 28	010 08	16 43.2	-.348 447	.937 328	.866 768
Y-958	1960-5-12	06.20	-1 14	-5 27	010 05	16 43.2	-.297 728	.954 651	.862 395
Y-959	1960-5-12	06.34	-1 16	-5 26	010 03	16 43.2	-.248 891	.968 532	.859 715
Y-962	1960-5-13	08.56	+0 29	-5 41	003 07	16 42.0	+1.154 278	.988 027	.884 294
Y-963	1960-5-13	08.58	+0 29	-5 41	003 07	16 42.0	+1.161 052	.986 946	.885 080
Y-964	1960-5-13	08.59	+0 28	-5 41	003 07	16 42.0	+1.164 432	.986 388	.885 482
Y-967	1960-5-13	09.05	+0 28	-5 41	003 05	16 42.0	+1.184 547	.982 824	.888 001
Y-968	1960-5-13	09.06	+0 28	-5 41	003 05	16 42.0	+1.187 870	.982 194	.888 440
Y-970	1960-5-14	08.54	+2 23	-5 27	356 25	16 37.8	+0.050 534	.998 722	.873 840
Y-971	1960-5-14	08.56	+2 22	-5 27	356 25	16 37.8	+0.057 742	.998 332	.873 800
Y-972	1960-5-14	08.57	+2 22	-5 27	356 25	16 37.8	+0.061 341	.998 117	.873 792
Y-976	1960-5-14	09.04	+2 22	-5 27	356 23	16 37.8	+0.086 529	.996 249	.873 921
Y-980	1960-5-15	09.42	+3 55	-4 48	349 56	16 30.0	+1.120 702	.992 689	.864 849
Y-983	1960-5-31	02.24	-5 11	+4 57	016 32	14 58.2	+5.534 199	.845 359	.875 334
Y-984	1960-5-31	02.25	-5 11	+4 57	016 32	14 58.2	+5.534 506	.845 165	.876 831

TOPOCENTRIC LIBRATIONS

Plate Ident.	Date	Time (U.T.)	l'	b'	c'	s'	sin (Q-C)	cos (Q-C)	sin ζ
Y-987	1960-5-31	02.27	-5° 11'	+4° 57'	016° 32'	14' 58.2"	+0.535 094	.844 792	.879 807
Y-988	1960-5-31	02.28	-5 11	+4 57	016 32	14 58.2	+0.535 374	.844 615	.881 284
Y-990	1960-5-31	02.30	-5 12	+4 57	016 32	14 58.2	+0.535 904	.844 279	.884 209
Y-991	1960-5-31	02.33	-5 12	+4 58	016 33	14 58.2	+0.536 630	.843 818	.888 542
Y-992	1960-5-31	02.34	-5 12	+4 58	016 33	14 58.2	+0.536 862	.843 670	.889 968
Y-997	1960-6-4	01.48	-7 38	-0 24	024 58	15 46.2	-0.235 284	.971 927	.680 998
Y-999	1960-6-4	01.49	-7 38	-0 24	024 58	15 46.2	-0.231 015	.972 950	.681 648
Y-1000	1960-6-4	01.50	-7 38	-0 24	024 58	15 46.2	-0.226 755	.973 952	.682 315
Y-1001	1960-6-4	01.51	-7 38	-0 24	024 58	15 46.2	-0.222 507	.974 931	.682 989
Y-1002	1960-6-4	01.52	-7 39	-0 24	024 58	15 46.2	-0.218 262	.975 890	.683 681
Y-1004	1960-6-4	01.54	-7 39	-0 24	024 58	15 46.2	-0.209 805	.977 743	.685 093
Y-1006	1960-6-4	01.56	-7 40	-0 24	024 58	15 46.2	-0.201 375	.979 514	.686 559
Y-1007	1960-6-4	01.56	-7 40	-0 24	024 58	15 46.2	-0.201 375	.979 514	.686 559
Y-1008	1960-6-4	01.57	-7 40	-0 24	024 58	15 46.2	-0.197 184	.980 367	.687 310
Y-1028	1960-6-7	05.32	-5 43	-4 22	018 02	16 31.8	+0.087 395	.996 174	.867 939
Y-1039	1960-6-8	05.09	-3 53	-5 11	013 01	16 43.2	-0.106 654	.994 296	.851 030
Y-1040	1960-6-8	05.17	-3 55	-5 10	012 59	16 43.2	-0.077 735	.996 974	.853 430
Y-1041	1960-6-8	05.23	-3 55	-5 10	012 58	16 43.2	-0.056 188	.998 420	.855 526
Y-1051	1960-6-9	04.54	-1 46	-5 35	006 53	16 49.8	-0.268 575	.963 259	.872 864
Y-1052	1960-6-9	05.15	-1 48	-5 35	006 49	16 49.8	-0.195 453	.980 713	.868 388
Y-1053	1960-6-9	05.35	-1 50	-5 35	006 46	16 49.8	-0.123 897	.992 295	.866 936
Y-1054	1960-6-9	05.56	-1 52	-5 34	006 41	16 49.8	-0.048 030	.998 846	.868 439
Y-1065	1960-6-10	06.45	+0 18	-5 30	359 43	16 52.2	+0.024 861	.999 691	.875 392
Y-1066	1960-6-10	07.01	+0 16	-5 30	359 40	16 52.2	+0.082 217	.996 614	.876 879
Y-1085	1960-7-2	02.07	-7 49	-1 35	024 35	15 42.0	+0.104 491	.994 526	.809 883
Y-1086	1960-7-2	02.08	-7 49	-1 35	024 35	15 42.0	+0.107 240	.994 233	.811 166
Y-1087	1960-7-2	02.09	-7 49	-1 35	024 35	15 42.0	+0.109 973	.993 934	.812 454
Y-1088	1960-7-2	02.09	-7 49	-1 35	024 35	15 42.0	+0.109 973	.993 934	.812 454
Y-1089	1960-7-2	02.11	-7 50	-1 35	024 35	15 42.0	+0.115 386	.993 321	.815 034
Y-1090	1960-7-2	02.11	-7 50	-1 35	024 35	15 42.0	+0.115 386	.993 321	.815 034
Y-1091	1960-7-2	02.12	-7 50	-1 35	024 35	15 42.0	+0.118 069	.993 005	.816 326
Y-1092	1960-7-2	02.13	-7 50	-1 35	024 35	15 42.0	+0.120 731	.992 685	.817 620
Y-1093	1960-7-2	02.14	-7 50	-1 35	024 35	15 42.0	+0.123 380	.992 359	.818 915
Y-1094	1960-7-2	02.18	-7 50	-1 35	024 35	15 42.0	+0.133 814	.991 007	.824 110
Y-1095	1960-7-2	02.19	-7 51	-1 35	024 35	15 42.0	+0.136 372	.990 658	.825 410
Y-1096	1960-7-2	02.20	-7 51	-1 35	024 35	15 42.0	+0.138 921	.990 304	.826 711
Y-1097	1960-7-2	02.52	-7 55	-1 35	024 34	15 40.8	+0.212 017	.977 266	.868 177
Y-1098	1960-7-2	02.53	-7 55	-1 35	024 34	15 40.8	+0.214 041	.976 825	.869 448
Y-1099	1960-7-2	02.54	-7 55	-1 35	024 34	15 40.8	+0.216 058	.976 380	.870 721
Y-1101	1960-7-2	02.56	-7 56	-1 35	024 34	15 40.8	+0.220 046	.975 490	.873 254
Y-1102	1960-7-2	02.56	-7 56	-1 35	024 34	15 40.8	+0.220 046	.975 490	.873 254
Y-1103	1960-7-2	02.57	-7 56	-1 35	024 34	15 40.8	+0.222 012	.975 044	.874 518
Y-1104	1960-7-2	02.58	-7 56	-1 35	024 34	15 40.2	+0.223 968	.974 597	.875 775
Y-1105	1960-7-2	03.00	-7 56	-1 35	024 34	15 40.2	+0.227 839	.973 699	.878 290
Y-1106	1960-7-2	03.01	-7 56	-1 35	024 34	15 40.2	+0.229 754	.973 249	.879 541
Y-1107	1960-7-2	03.02	-7 56	-1 35	024 34	15 40.2	+0.231 652	.972 799	.880 790
Y-1119	1960-7-4	02.13	-6 59	-4 07	020 02	16 12.0	-0.166 099	.986 109	.805 537
Y-1132	1960-7-5	02.16	-5 50	-5 01	015 45	16 25.8	-0.284 870	.958 566	.830 329
Y-1140	1960-7-6	05.26	-4 34	-5 33	009 40	16 37.8	+0.258 356	.966 050	.910 977
Y-1143	1960-7-6	05.35	-4 35	-5 33	009 38	16 37.8	+0.283 283	.959 036	.917 303
Y-1148	1960-7-7	02.12	-2 15	-5 43	003 50	16 46.2	-0.467 177	.884 164	.918 579
Y-1149	1960-7-7	02.13	-2 15	-5 43	003 50	16 46.2	-0.464 572	.885 535	.917 951
Y-1153	1960-7-7	04.11	-2 26	-5 40	003 26	16 48.0	-0.085 965	.996 298	.872 236
Y-1154	1960-7-7	04.12	-2 26	-5 40	003 26	16 48.0	-0.082 364	.996 602	.872 193

TOPOCENTRIC LIBRATIONS

Plate Ident.	Date	Time (U.T.)	l'	b'	c'	s'	sin (Q-C)	cos (Q-C)	sin ξ
Y-1157	1960-7-7	06.28	-2° 40'	-5° 40'	002° 58'	16' 46.8"	+0.367 324	.930 093	.921 806
Y-1158	1960-7-7	06.31	-2 40	-5 40	002 58	16 46.8	+0.375 394	.926 865	.923 728
Y-1159	1960-7-8	05.33	-0 22	-5 16	356 18	16 52.8	+0.106 520	.994 311	.875 467
Y-1160	1960-7-8	05.34	-0 22	-5 16	356 18	16 52.8	+0.110 080	.993 923	.875 548
Y-1162	1960-7-8	05.38	-0 23	-5 16	356 17	16 52.8	+0.124 342	.992 240	.875 939
Y-1163	1960-7-8	05.39	-0 23	-5 16	356 17	16 52.8	+0.127 907	.991 786	.876 054
Y-1164	1960-7-8	05.41	-0 23	-5 16	356 16	16 52.8	+0.135 006	.990 845	.876 302
Y-1166	1960-7-8	05.43	-0 23	-5 16	356 16	16 52.8	+0.142 097	.989 853	.876 579
Y-1167	1960-7-8	05.45	-0 23	-5 16	356 16	16 52.8	+0.149 178	.988 810	.876 881
Y-1168	1960-7-8	05.46	-0 23	-5 16	356 16	16 52.8	+0.152 704	.988 272	.877 041
Y-1169	1960-7-8	05.48	-0 23	-5 16	356 15	16 52.8	+0.159 759	.987 156	.877 382
Y-1170	1960-7-8	05.50	-0 24	-5 16	356 14	16 52.8	+0.166 792	.985 992	.877 748
Y-1173	1960-7-9	07.16	+1 41	-4 26	349 24	16 51.0	+0.361 435	.932 397	.874 366
Y-1174	1960-7-9	07.30	+1 40	-4 26	349 22	16 51.0	+0.406 187	.913 790	.879 751
Y-1179	1960-7-11	07.44	+5 24	-1 46	339 21	16 33.0	+0.214 040	.976 825	.817 156
Y-1180	1960-7-11	07.45	+5 24	-1 46	339 21	16 33.0	+0.217 711	.976 013	.816 794
Y-1181	1960-7-11	07.46	+5 24	-1 46	339 21	16 33.0	+0.221 385	.975 186	.816 440
Y-1182	1960-7-11	07.47	+5 24	-1 46	339 21	16 33.0	+0.225 061	.974 345	.816 096
Y-1183	1960-7-11	07.47	+5 24	-1 46	339 21	16 33.0	+0.225 061	.974 345	.816 096
Y-1184	1960-7-11	07.48	+5 24	-1 46	339 21	16 33.0	+0.228 733	.973 489	.815 759
Y-1185	1960-7-11	07.49	+5 23	-1 46	339 21	16 33.0	+0.232 403	.972 620	.815 429
Y-1186	1960-7-11	07.49	+5 23	-1 46	339 21	16 33.0	+0.232 403	.972 620	.815 429
Y-1187	1960-7-11	07.50	+5 23	-1 46	339 20	16 33.0	+0.236 083	.971 733	.815 109
Y-1188	1960-7-11	07.51	+5 23	-1 46	339 20	16 33.0	+0.239 764	.970 831	.814 799
Y-1189	1960-7-11	07.52	+5 23	-1 46	339 20	16 33.0	+0.243 437	.969 917	.814 497
Y-1190	1960-7-11	07.55	+5 23	-1 46	339 20	16 33.0	+0.254 478	.967 078	.813 640
Y-1191	1960-7-11	08.41	+5 17	-1 46	339 16	16 33.0	+0.420 838	.907 136	.810 704
Y-1192	1960-7-11	08.42	+5 17	-1 46	339 16	16 33.0	+0.424 319	.905 513	.810 857
Y-1193	1960-7-11	08.42	+5 17	-1 46	339 16	16 33.0	+0.424 319	.905 513	.810 857
Y-1194	1960-7-11	08.43	+5 17	-1 46	339 15	16 33.0	+0.427 792	.903 878	.811 018
Y-1195	1960-7-11	08.43	+5 17	-1 46	339 15	16 33.0	+0.427 792	.903 878	.811 018
Y-1196	1960-7-11	08.44	+5 17	-1 46	339 15	16 33.0	+0.431 259	.902 228	.811 189
Y-1197	1960-7-11	08.45	+5 17	-1 46	339 15	16 33.0	+0.434 711	.900 570	.811 368
Y-1198	1960-7-11	08.46	+5 17	-1 46	339 15	16 33.0	+0.438 156	.898 899	.811 554
Y-1199	1960-7-11	08.47	+5 17	-1 46	339 15	16 33.0	+0.441 597	.897 213	.811 751
Y-1200	1960-7-11	08.47	+5 17	-1 46	339 15	16 33.0	+0.441 597	.897 213	.811 751
Y-1203	1960-7-11	09.31	+5 11	-1 47	339 10	16 31.8	+0.581 663	.813 430	.828 806
Y-1204	1960-7-11	09.31	+5 11	-1 47	339 10	16 31.8	+0.581 663	.813 430	.828 806
Y-1205	1960-7-11	09.32	+5 11	-1 47	339 10	16 31.8	+0.584 557	.811 352	.829 370
Y-1206	1960-7-11	09.33	+5 11	-1 47	339 10	16 31.8	+0.587 434	.809 272	.829 941
Y-1207	1960-7-11	09.35	+5 11	-1 47	339 10	16 31.8	+0.593 148	.805 094	.831 102
Y-1208	1960-7-11	09.35	+5 11	-1 47	339 10	16 31.8	+0.593 148	.805 094	.831 102
Y-1209	1960-7-11	09.36	+5 11	-1 47	339 10	16 31.8	+0.595 979	.803 000	.831 692
Y-1210	1960-7-11	09.37	+5 11	-1 47	339 10	16 31.8	+0.598 802	.800 897	.832 288
Y-1211	1960-7-11	09.38	+5 11	-1 47	339 10	16 31.8	+0.601 606	.798 793	.832 894
Y-1212	1960-7-11	09.39	+5 11	-1 47	339 10	16 31.8	+0.604 396	.796 684	.833 505
Y-1213	1960-7-11	09.39	+5 11	-1 47	339 10	16 31.8	+0.604 396	.796 684	.833 505
Y-1214	1960-7-11	09.40	+5 11	-1 47	339 10	16 31.8	+0.607 175	.794 568	.834 124
Y-1222	1960-7-14	09.13	+7 37	-2 57	335 17	15 48.0	-0.005 619	.999 984	.732 661
Y-1226	1960-7-15	09.34	+7 29	+4 18	336 41	15 31.8	-0.145 890	.989 301	.725 192
Y-1234	1960-7-16	09.29	+7 04	+5 26	339 09	15 19.2	-0.341 488	.939 886	.775 363
Y-1235	1960-7-16	09.30	+7 04	+5 26	339 09	15 19.2	-0.339 732	.940 522	.773 619
Y-1236	1960-7-16	09.30	+7 04	+5 26	339 09	15 19.2	-0.339 732	.940 522	.773 619
Y-1237	1960-7-16	09.31	+7 04	+5 26	339 09	15 19.2	-0.337 958	.941 161	.771 866

TOPOCENTRIC LIBRATIONS

Plate Ident.	Date	Time (U.T.)	l'	b'	c'	s'	$\sin(Q-C)$	$\cos(Q-C)$	$\sin \zeta$
Y-1238	1960-7-16	09.32	+7° 04'	+5° 26'	339° 09'	15' 19.2"	-.336 161	.941 805	.770 111
Y-1242	1960-7-17	09.45	+6 20	+6 19	342 35	15 09.0	-.466 598	.884 470	.802 088
Y-1246	1960-7-17	09.49	+6 19	+6 19	342 35	15 09.0	-.462 207	.886 772	.794 961
Y-1247	1960-7-17	09.49	+6 19	+6 19	342 35	15 09.0	-.462 207	.886 772	.794 961
Y-1248	1960-7-17	09.50	+6 19	+6 19	342 35	15 09.0	-.461 073	.887 362	.793 166
Y-1249	1960-7-17	09.51	+6 19	+6 19	342 35	15 09.0	-.459 925	.887 958	.791 370
Y-1254	1960-7-31	01.40	-6 59	-3 58	021 06	15 52.8	+.127 660	.991 818	.864 865
Y-1255	1960-7-31	01.41	-6 59	-3 58	021 06	15 52.8	+.130 423	.991 458	.865 879
Y-1257	1960-7-31	01.42	-6 59	-3 58	021 05	15 52.8	+.133 175	.991 093	.866 898
Y-1258	1960-7-31	01.43	-6 59	-3 58	021 05	15 52.8	+.135 908	.990 721	.867 914
Y-1259	1960-7-31	01.45	-6 59	-3 58	021 05	15 52.8	+.141 335	.989 962	.869 953
Y-1260	1960-7-31	01.46	-6 59	-3 58	021 05	15 52.8	+.144 028	.989 574	.870 976
Y-1261	1960-7-31	01.46	-6 59	-3 58	021 05	15 52.8	+.144 028	.989 574	.870 976
Y-1262	1960-7-31	01.47	-7 00	-3 58	021 05	15 52.8	+.146 704	.989 180	.871 997
Y-1263	1960-8-1	01.48	-6 26	-4 55	017 22	16 04.8	+.047 450	.998 874	.856 366
Y-1264	1960-8-1	01.49	-6 26	-4 55	017 22	16 04.8	+.050 715	.998 713	.857 115
Y-1265	1960-8-1	01.50	-6 26	-4 55	017 22	16 04.8	+.053 968	.998 543	.857 868
Y-1266	1960-8-1	01.50	-6 26	-4 55	017 22	16 04.8	+.053 968	.998 543	.857 868
Y-1268	1960-8-1	01.52	-6 26	-4 55	017 21	16 04.8	+.060 430	.998 172	.859 387
Y-1269	1960-8-1	01.53	-6 26	-4 55	017 21	16 04.8	+.063 650	.997 972	.860 154
Y-1270	1960-8-1	01.53	-6 26	-4 55	017 21	16 04.8	+.063 650	.997 972	.860 154
Y-1271	1960-8-1	01.54	-6 26	-4 55	017 21	16 04.8	+.066 851	.997 763	.860 925
Y-1272	1960-8-1	01.54	-6 26	-4 55	017 21	16 04.8	+.066 851	.997 763	.860 925
Y-1273	1960-8-1	01.56	-6 27	-4 55	017 21	16 04.8	+.073 236	.997 315	.862 478
Y-1274	1960-8-1	01.56	-6 27	-4 55	017 21	16 04.8	+.073 236	.997 315	.862 478
Y-1284	1960-8-2	02.08	-5 30	-5 34	012 24	16 19.2	+.010 127	.999 949	.861 704
Y-1288	1960-8-3	01.50	-4 06	-5 49	006 32	16 30.0	-.158 016	.987 437	.865 954
Y-1296	1960-8-5	03.39	-0 41	-4 58	352 58	16 45.0	+.034 255	.999 413	.879 748
Y-1308	1960-8-8	06.47	+4 33	-0 52	337 41	16 34.2	+.327 264	.944 933	.791 308
Y-1309	1960-8-10	09.27	+6 25	+2 26	335 05	16 06.0	+.578 253	.815 857	.695 938
Y-1310	1960-8-10	09.27	+6 25	+2 26	335 05	16 06.0	+.578 253	.815 857	.695 938
Y-1311	1960-8-10	09.28	+6 25	+2 26	335 05	16 06.0	+.581 781	.813 345	.696 459
Y-1312	1960-8-10	09.29	+6 25	+2 26	335 05	16 06.0	+.585 287	.810 826	.696 989
Y-1314	1960-8-10	09.30	+6 25	+2 26	335 05	16 06.0	+.588 773	.808 298	.697 531
Y-1315	1960-8-10	09.31	+6 25	+2 26	335 05	16 06.0	+.592 241	.805 761	.698 085
Y-1318	1960-8-10	09.46	+6 23	+2 26	335 06	16 04.8	+.641 886	.766 800	.707 847
Y-1321	1960-8-11	07.58	+7 06	+3 57	335 59	15 51.0	-.013 739	.999 905	.700 420
Y-1322	1960-8-11	07.59	+7 06	+3 57	335 59	15 51.0	-.010 118	.999 949	.699 129
Y-1323	1960-8-11	08.00	+7 06	+3 57	335 59	15 51.0	-.006 474	.999 979	.697 842
Y-1324	1960-8-11	08.01	+7 05	+3 57	335 59	15 51.0	-.002 821	.999 996	.696 569
Y-1325	1960-8-11	08.05	+7 05	+3 57	335 59	15 51.0	+.012 032	.999 927	.691 543
Y-1326	1960-8-11	08.06	+7 05	+3 57	335 59	15 51.0	+.015 787	.999 875	.690 311
Y-1333	1960-8-11	10.04	+6 46	+3 55	336 04	15 49.8	+.529 542	.848 284	.633 846
Y-1334	1960-8-11	10.05	+6 46	+3 55	336 04	15 49.8	+.533 614	.845 728	.634 271
Y-1335	1960-8-11	10.06	+6 46	+3 55	336 04	15 49.8	+.537 660	.843 162	.634 715
Y-1336	1960-8-11	10.06	+6 46	+3 55	336 04	15 49.8	+.537 660	.843 162	.634 715
Y-1337	1960-8-11	10.09	+6 46	+3 55	336 05	15 49.8	+.549 666	.835 384	.636 133
Y-1338	1960-8-11	10.10	+6 46	+3 55	336 05	15 49.8	+.553 634	.832 761	.636 638
Y-1339	1960-8-11	10.11	+6 45	+3 55	336 05	15 49.8	+.557 571	.830 129	.637 157
Y-1340	1960-8-11	10.11	+6 45	+3 55	336 05	15 49.8	+.557 571	.830 129	.637 157
Y-1341	1960-8-11	10.12	+6 45	+3 55	336 05	15 49.8	+.561 491	.827 483	.637 687
Y-1342	1960-8-11	10.13	+6 45	+3 55	336 05	15 49.8	+.565 388	.824 825	.638 237
Y-1343	1960-8-11	10.14	+6 45	+3 55	336 05	15 49.8	+.569 264	.822 155	.638 801
Y-1344	1960-8-11	10.15	+6 44	+3 55	336 05	15 49.8	+.573 109	.819 480	.639 375

TOPOCENTRIC LIBRATIONS

Plate Ident.	Date	Time (U.T.)	l'	b'	c'	s'	$\sin(Q-C)$	$\cos(Q-C)$	$\sin \zeta$
Y-1348	1960-8-12	07.54	+7 10	+5 13	338 05	15 34.8	-.243 377	.969 932	.736 343
Y-1350	1960-8-13	09.27	+6 36	+6 10	341 23	15 22.8	-.197 321	.980 339	.619 610
Y-1352	1960-8-13	09.34	+6 35	+6 10	341 23	15 22.8	-.171 340	.985 212	.608 203
Y-1450	1960-9-6	08.45	+4 34	+1 43	335 07	16 13.2	+.806 786	.590 843	.804 677
Y-1462	1960-12-31	02.44	+4 00	+6 56	355 54	15 01.8	-.540 276	.841 488	.549 666
Y-1474	1961-1-3	08.11	-0 20	+4 45	012 16	14 54.0	+.259 295	.965 798	.490 440
Y-1494	1961-1-4	05.45	-1 02	+3 38	016 18	14 54.0	-.797 388	.603 467	.592 772
Y-1495	1961-1-4	06.03	-1 06	+3 37	016 20	14 54.0	-.757 020	.653 393	.558 848
Y-1502	1961-3-30	02.49	-2 58	-0 40	024 17	15 10.2	-.790 481	.612 486	.672 364
Y-1503	1961-3-30	03.08	-3 01	-0 40	024 18	15 10.2	-.743 900	.668 291	.646 713
Y-1506	1961-3-30	03.30	-3 06	-0 40	024 19	15 10.2	-.677 407	.735 609	.621 678
Y-1507	1961-3-30	03.45	-3 08	-0 40	024 19	15 10.2	-.623 987	.781 434	.608 201
Y-1518	1961-3-30	06.43	-3 43	-0 37	024 24	15 10.2	+.137 704	.990 473	.716 896
Y-1519	1961-3-30	06.56	-3 44	-0 37	024 25	15 10.2	+.174 021	.984 742	.737 913
Y-1522	1961-3-31	03.50	-3 53	-2 04	024 52	15 16.8	-.737 553	.675 289	.697 154
Y-1523	1961-3-31	04.17	-3 58	-2 04	024 52	15 18.0	-.658 861	.752 265	.670 197
Y-1526	1961-3-31	04.50	-4 04	-2 04	024 52	15 18.0	-.539 169	.842 198	.649 399
Y-1527	1961-3-31	05.16	-4 09	-2 03	024 52	15 18.0	-.430 152	.902 757	.644 235
Y-1530	1961-3-31	05.54	-4 16	-2 02	024 52	15 18.0	-.260 564	.965 457	.655 457
Y-1531	1961-3-31	06.19	-4 20	-2 02	024 52	15 18.0	-.151 679	.988 430	.674 094
Y-1538	1961-4-1	03.43	-4 22	-3 22	024 16	15 24.0	-.820 678	.571 391	.804 163
Y-1539	1961-4-1	04.12	-4 26	-3 22	024 16	15 25.2	-.766 858	.641 817	.769 008
Y-1542	1961-4-1	04.43	-4 31	-3 22	024 14	15 25.2	-.691 630	.722 253	.736 678
Y-1543	1961-4-1	05.14	-4 37	-3 21	024 13	15 25.2	-.596 673	.802 484	.712 834
Y-1546	1961-4-1	06.27	-4 49	-3 19	024 11	15 27.0	-.312 441	.949 937	.702 999
Y-1547	1961-4-1	06.53	-4 54	-3 19	024 10	15 25.8	-.204 722	.978 820	.716 257
Y-1554	1961-4-1	07.29	-5 01	-3 18	024 08	15 25.8	-.064 575	.997 913	.746 809
Y-1555	1961-4-1	07.53	-5 04	-3 17	024 07	15 25.2	+.018 942	.999 821	.773 108
Y-1563	1961-4-2	04.36	-4 43	-4 29	022 27	15 31.2	-.775 217	.631 696	.832 983
Y-1566	1961-4-2	05.26	-4 50	-4 28	022 23	15 33.0	-.662 247	.749 286	.784 487
Y-1579	1961-4-3	05.38	-4 50	-5 19	019 22	15 40.2	-.697 860	.716 235	.852 850
Y-1588	1961-4-3	06.48	-5 00	-5 16	019 14	15 40.8	-.505 841	.862 727	.803 889
Y-1589	1961-4-3	08.01	-5 13	-5 13	019 07	15 42.0	-.241 982	.970 281	.796 242
Y-1611	1961-5-30	04.18	-4 00	-5 43	008 30	16 13.8	-.473 101	.881 008	.893 714
Y-1612	1961-5-30	04.31	-4 02	-5 41	008 28	16 15.0	-.435 554	.900 163	.886 345
Y-1613	1961-5-30	04.44	-4 04	-5 41	008 25	16 16.2	-.396 024	.918 240	.879 743
Y-1614	1961-5-30	04.56	-4 05	-5 40	008 23	16 16.2	-.357 903	.933 759	.874 434
Y-1615	1961-5-30	05.16	-4 08	-5 39	008 20	16 16.2	-.291 295	.956 633	.867 492
Y-1616	1961-5-30	05.27	-4 09	-5 39	008 18	16 16.2	-.253 274	.967 395	.864 787
Y-1617	1961-5-30	05.39	-4 11	-5 38	008 16	16 16.2	-.210 929	.977 502	.862 795
Y-1618	1961-5-30	05.49	-4 12	-5 38	008 14	16 16.2	-.175 116	.984 548	.861 923
Y-1621	1961-5-31	06.06	-2 54	-5 10	001 56	16 24.0	-.207 692	.978 194	.884 968
Y-1622	1961-5-31	06.18	-2 56	-5 09	001 53	16 24.0	-.166 380	.986 062	.881 622
Y-1627	1961-5-31	06.47	-2 59	-5 08	001 48	16 24.0	-.063 658	.997 972	.877 280