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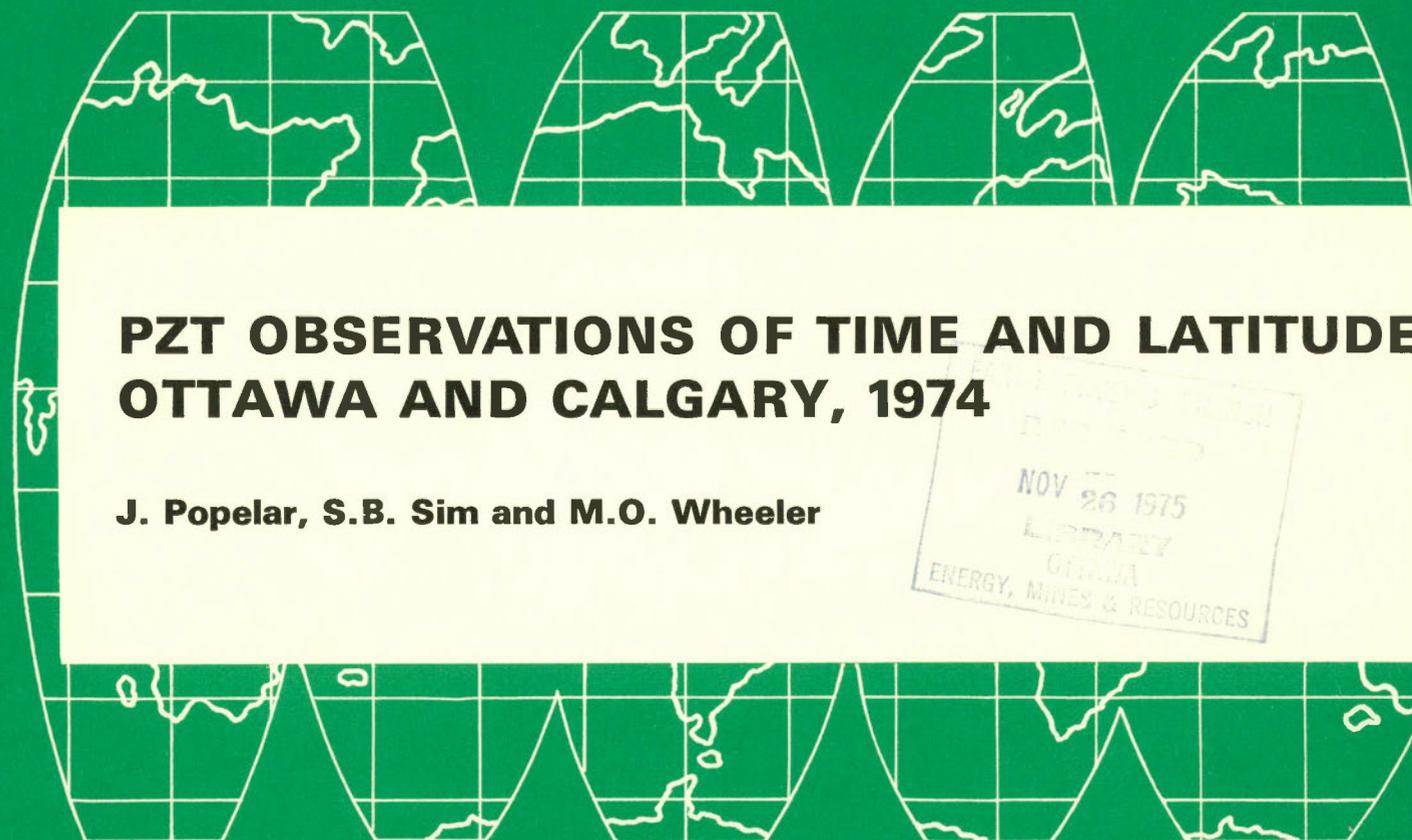
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PZT OBSERVATIONS OF TIME AND LATITUDE OTTAWA AND CALGARY, 1974

J. Popelar, S.B. Sim and M.O. Wheeler

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FOREWORD

This bulletin presents in summary form the results of time and latitude observations made with two Photographic Zenith Tubes (PZT) located near Ottawa, Ontario and Calgary, Alberta. As such it is a continuation of the previous Time and Latitude Bulletins issued by the Positional Astronomy Group of the now defunct Dominion Observatory. On April 1, 1970 the PZT observatories became part of the Earth Physics Branch of the Department of Energy, Mines and Resources. Since July 1, 1973 the Gravity and Geodynamics Division has had the responsibility for the PZT program.

J.G. Tanner, Director
Gravity and Geodynamics Division

PZT OBSERVATIONS OF TIME AND LATITUDE OTTAWA AND CALGARY, 1974

J. Popelar, S.B. Sim and M.O. Wheeler

This bulletin presents the results of time and latitude observations made with the Ottawa and Calgary photographic zenith tubes (PZT) during 1974, in continuation of Bulletin No. 65. The data from both PZT instruments have been contributed regularly during the year to the international programs of the BIH and IPMS.

Ottawa PZT has been located at Shirleys Bay near Ottawa since December 30, 1970. The adopted BIH co-ordinates for the instrument are:

5^h 03^m 40^s.8500 W 45° 24' 0".800 N.

The observational program is based on the 1972 star catalogue which was published in Bulletin No. 63. Nightly operations of the PZT are pre-programmed and fully automated. The instrument provided consistent data of high quality throughout the year. Altogether 207 photographic plates were obtained from which 4,232 transits of program stars were processed. For time comparisons the CHU time signals were used regularly.

Calgary PZT at Priddis near Calgary is located approximately on the same parallel as the Herstmonceux PZT of the Royal Greenwich Observatory. The adopted BIH co-ordinates for the instrument are:

7^h 37^m 9^s.5000 W 50° 52' 22".500 N.

The observational program in 1974 was based on the Herstmonceux PZT star catalogue published in Royal Observatory Bulletin No. 113 and revised in April 1971 (Greenwich Time Report, 1971, April-June). Nightly operation of the new PZT installed at the beginning of 1973 are also pre-programmed and fully automated. During the year 216 photographic plates were obtained from which 5,240 transits of program stars were evaluated. For time comparisons the WWV time signals were used regularly.

The time and latitude observations are presented in the same form as in the previous two Bulletins Nos. 64 and 65. The smoothing was performed on plate means using the technique suggested by Vondrak (Bull. Astr. Inst. of Czechoslovakia, Vol. 20, No. 6, 1969) with weights proportional to the number of observed stars for each plate. UTC step adjustments were removed before smoothing and the value of 10^{-7} was used as the coefficient of roughness. The smoothed time and latitude curves, with individual plate means for the Ottawa PZT and the Calgary PZT, are shown in Figures 1 and 2 respectively.

UT2-UTC +2.7MS/DAY

OTTAWA SB TIME OBSERVATIONS

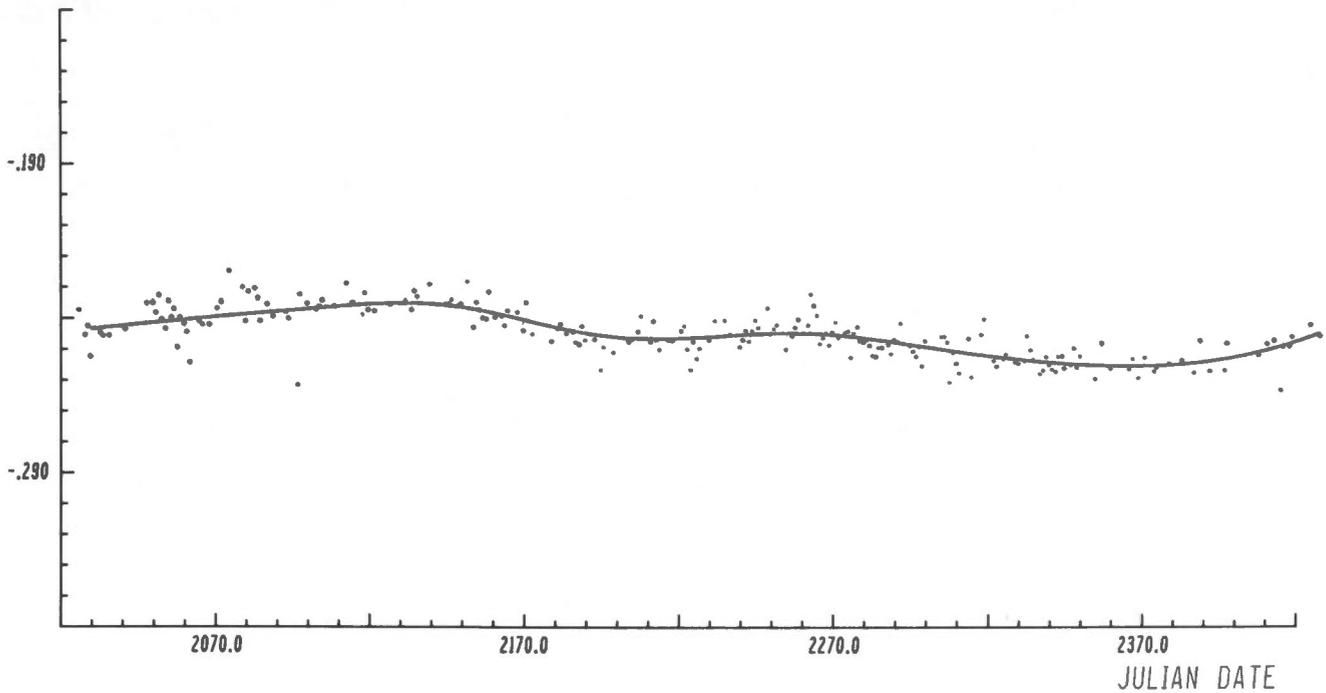


Figure 1a. Individual night observations of time with the Ottawa PZT and the smoothed curve for UT2-UTC + 2.7 ms/day* (STD 4.1 ms).

PHI 1

OTTAWA SB LATITUDE OBSERVATIONS

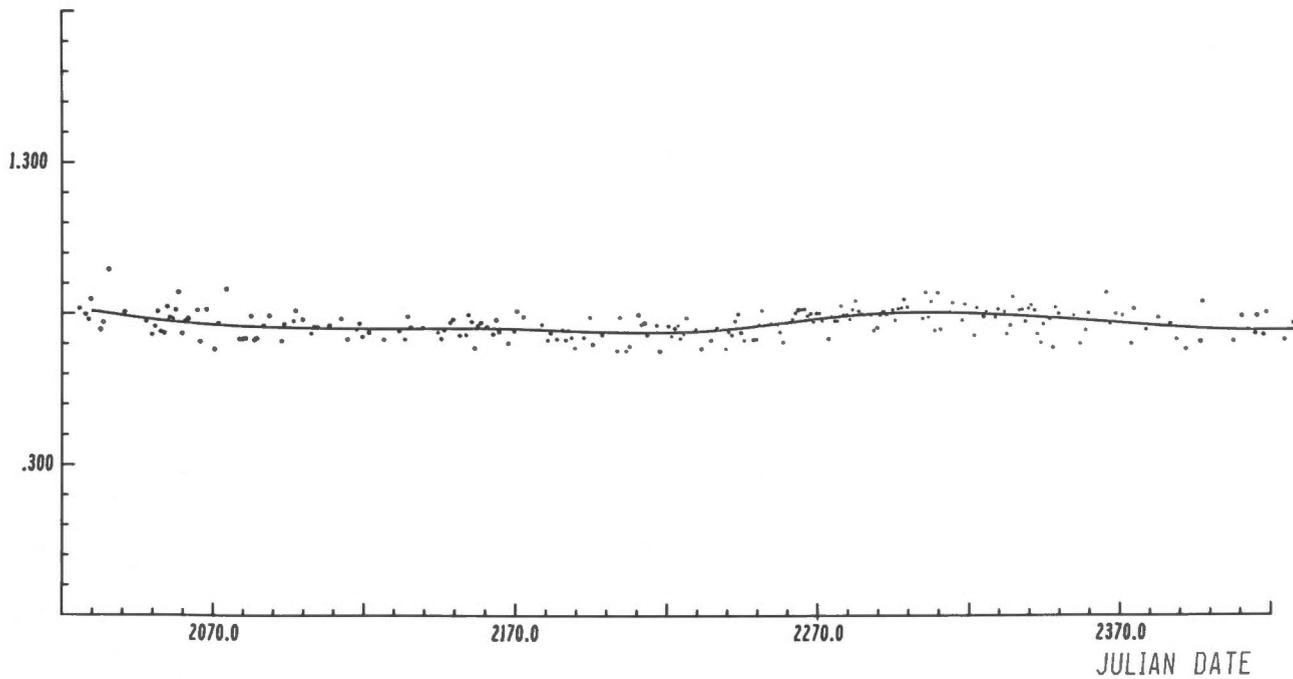


Figure 1b. Individual night observations of latitude with the Ottawa PZT and the smoothed curve for PHI 1 (STD 0".035).

*The UTC step adjustments have been removed.

UT2-UTC +2.7MS/DAY

CALGARY TIME OBSERVATIONS

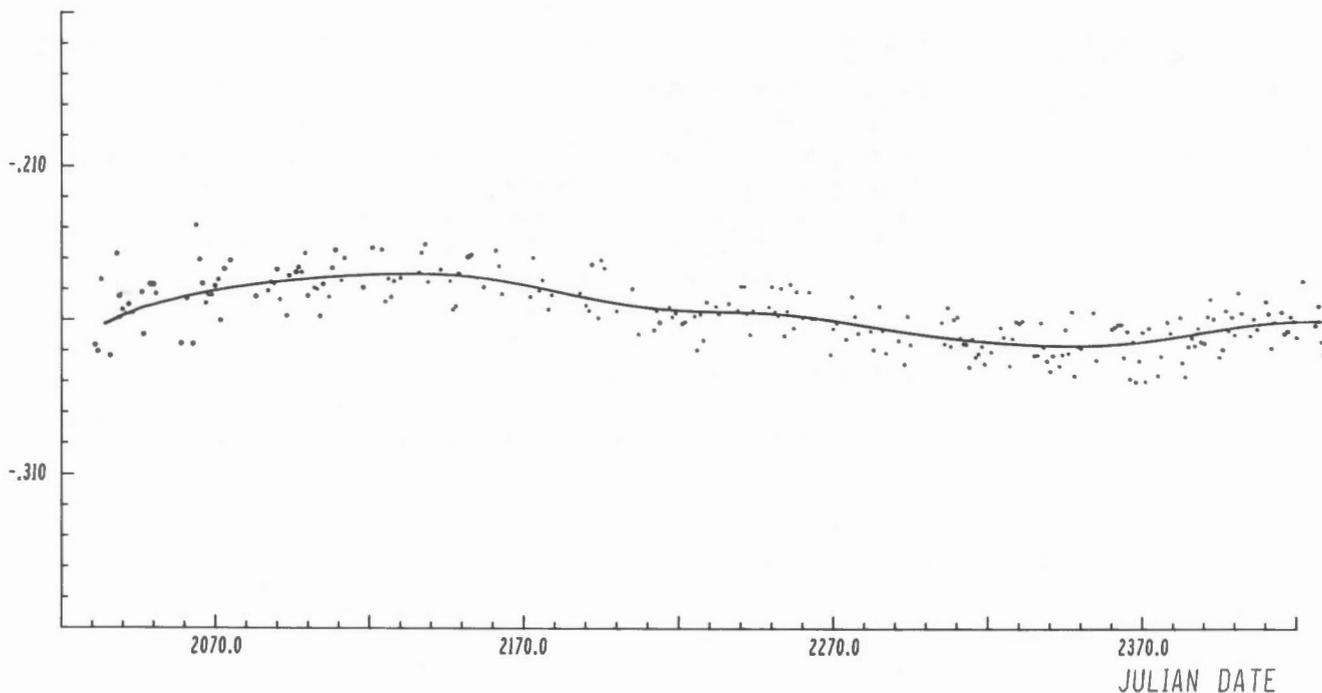


Figure 2a. Individual night observations of time with the Calgary PZT and the smoothed curve for UT2-UTC + 2.7 ms/day* (STD 6.1 ms).

PHI 1

CALGARY LATITUDE OBSERVATIONS

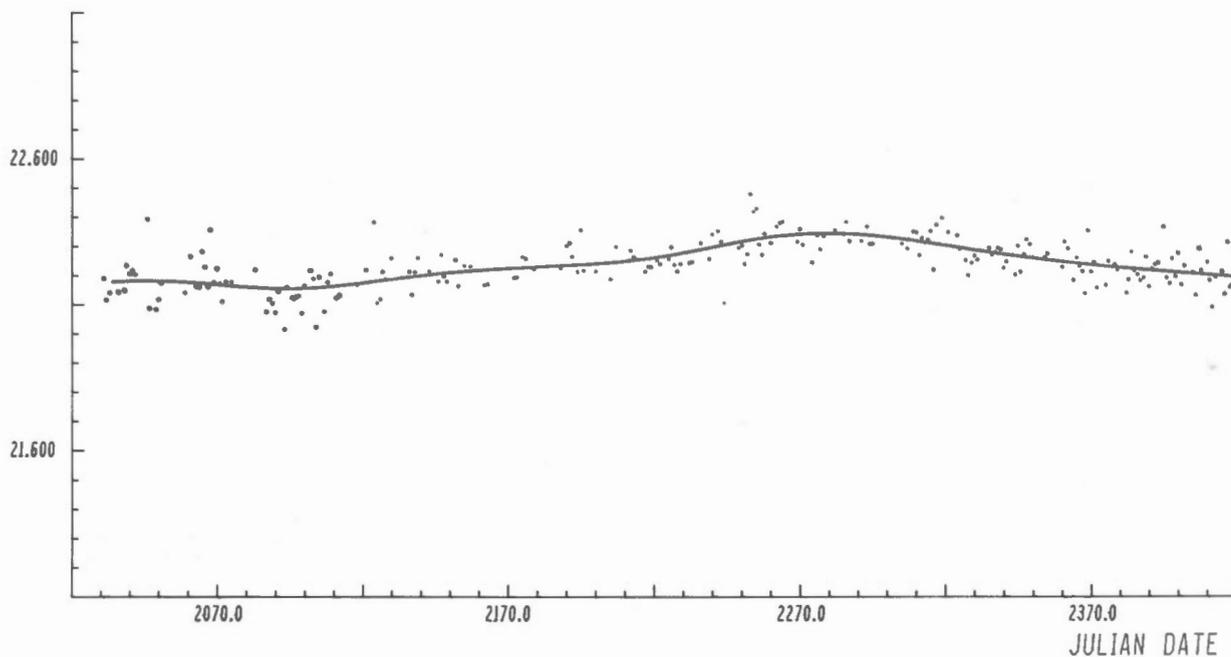


Figure 2b. Individual night observations of latitude with the Calgary PZT and the smoothed curve for PHI 1 (STD 0".047).

*The UTC step adjustments have been removed.

Table 1 presents the results of time and latitude observations arranged by nights (plates) separately for the Ottawa and Calgary stations.

<u>Column</u>	<u>Description</u>
1	<u>Date (UT)</u> of mid-observation.
2	<u>Julian Date</u> of mid-observation.
3	<u>N</u> – number of observed stars.
4	<u>UTO-UTC observed</u> – raw time observations.
5	<u>UT2-UTC smoothed</u> – smoothed values of time after reduction for the longitude variation and the seasonal change in the rate of rotation as given in the BIH Circulars for 1974.
6	<u>UT Res.</u> – difference between the smoothed and raw values of UT2-UTC.
7	<u>PHI 0 observed</u> – raw latitude observations.
8	<u>PHI 1 smoothed</u> – smoothed values of latitude after reduction for the latitude variation as given in the BIH Circulars for 1974.
9	<u>PHI Res.</u> – difference between the smoothed and raw values of PHI 1.

Table 2 gives the smoothed values of UT2-UTC and PHI 1 at standard five (5) days interval for the Ottawa and Calgary stations.

Table 1A. Ottawa PZT Time and Latitude Observations

Date (UT)	Julian Date 2440000 +	N	UTO-UTC Observed \$0001	UT2-UTC Smoothed \$0001	UT Res. \$0001	PHI 0 Observed 45°24'	PHI 1 Smoothed 45°24'	PHI Res.
1	2	3	4	5	6	7	8	9
74 Jan. 2	2049.671	35	7006	6938	65	1.003	.777	-.048
74 Jan. 3	2050.706	18	6944	6911	32	1.028	.776	-.020
74 Jan. 4	2051.692	9	6971	6886	86	1.074	.775	.030
74 Jan. 5	2052.639	28	6867	6861	8	1.006	.774	-.035
74 Jan. 6	2053.748	17	6806	6832	-21	.998	.772	-.039
74 Jan. 7	2054.842	10	6864	6804	65	1.083	.771	.050
74 Jan. 8	2055.703	39	6787	6781	12	1.044	.770	.014
74 Jan. 9	2056.576	14	6790	6758	39	1.038	.769	.011
74 Jan. 10	2057.644	25	6636	6731	-86	1.066	.768	.042
74 Jan. 11	2058.540	6	6707	6707	9	1.122	.767	.101
74 Jan. 12	2059.727	33	6654	6676	-11	.983	.766	-.033
74 Jan. 13	2060.696	33	6601	6651	-39	1.022	.765	.008
74 Jan. 14	2061.710	16	6474	6625	-138	1.028	.765	.017
74 Jan. 17	2064.724	28	6524	6546	-8	1.048	.762	.047
74 Jan. 18	2065.681	35	6486	6521	-20	.942	.761	-.056
74 Jan. 20	2067.803	22	6428	6466	-21	1.044	.760	.052
74 Jan. 22	2070.490	5	6406	6395	28	.906	.758	-.078
74 Jan. 24	2071.790	18	6390	6361	46	.990	.757	.009
74 Jan. 26	2074.490	7	6414	6291	143	1.097	.755	.123
74 Jan. 31	2078.749	18	6245	6180	87	.926	.753	-.040
74 Feb. 1	2079.724	39	6109	6154	-21	.925	.752	-.039
74 Feb. 2	2080.737	35	6176	6127	71	.926	.752	-.037
74 Feb. 4	2082.685	32	6132	6076	80	.997	.751	.037
74 Feb. 5	2083.762	12	6070	6048	47	.918	.751	-.041
74 Feb. 6	2084.550	15	5976	6028	-24	.923	.750	-.035
74 Feb. 8	2086.795	23	5968	5969	27	.963	.749	.007
74 Feb. 10	2088.723	32	5876	5918	-12	.994	.749	.041
74 Feb. 14	2092.832	20	5775	5811	-1	.908	.748	-.042
74 Feb. 15	2093.724	35	5727	5787	-24	.963	.747	.014
74 Feb. 18	2096.759	31	5426	5708	-241	.973	.746	.027
74 Feb. 19	2097.540	9	5695	5687	48	1.006	.746	.061
74 Feb. 21	2099.796	22	5603	5628	18	.975	.746	.031
74 Feb. 24	2102.713	37	5500	5552	-3	.927	.745	-.014
74 Feb. 25	2103.709	32	5480	5526	5	.948	.745	.007
74 Feb. 26	2104.776	28	5469	5498	23	.945	.745	.006
74 Mar. 2	2108.721	15	5336	5395	1	.950	.744	.013
74 Mar. 6	2112.597	15	5296	5294	71	.970	.744	.036
74 Mar. 8	2114.710	32	5175	5238	9	.901	.743	-.032
74 Mar. 11	2117.731	32	5047	5159	-31	.933	.743	.001
74 Mar. 12	2118.715	24	5087	5133	35	.952	.743	.021
74 Mar. 13	2119.699	28	5005	5107	-17	.907	.743	-.023
74 Mar. 15	2121.717	32	4942	5053	-22	.921	.743	-.009
74 Mar. 20	2126.717	30	4817	4920	-2	.896	.743	-.033
74 Mar. 25	2131.753	22	4677	4784	7	.925	.744	-.004
74 Mar. 27	2133.708	29	4591	4731	-19	.897	.744	-.032
74 Mar. 28	2134.700	16	4620	4704	39	.973	.744	.043
74 Mar. 29	2135.693	30	4573	4676	21	.936	.744	.006
74 Apr. 2	2139.631	14	4495	4568	64	.935	.744	.004
74 Apr. 7	2144.650	17	4280	4428	4	.921	.745	-.011
74 Apr. 8	2145.724	29	4249	4397	7	.901	.745	-.032
74 Apr. 9	2146.713	26	4234	4370	22	.930	.745	-.003
74 Apr. 11	2148.702	27	4153	4313	4	.956	.745	.022
74 Apr. 12	2149.654	17	4132	4286	13	.966	.745	.033
74 Apr. 14	2151.833	12	4136	4224	86	.914	.745	-.021
74 Apr. 16	2153.807	15	3931	4167	-55	.916	.745	-.019
74 Apr. 17	2154.734	31	3984	4140	27	.983	.745	.047
74 Apr. 18	2155.712	27	3930	4112	4	.960	.745	.024

Table 1A. Ottawa PZT Time and Latitude Observations — Continued

Date (UT)	Julian Date		UTO-UTC Observed ‰0001	UT2-UTC Smoothed ‰0001	UT Res. ‰0001	PHI 0 Observed 45°24'	PHI 1 Smoothed 45°24'	PHI Res.
	2440000 +	N						
1	2	3	4	5	6	7	8	9
74 Apr. 19	2156.729	31	3873	4083	-19	.873	.745	-.063
74 Apr. 20	2157.745	28	3839	4053	-21	.947	.745	.010
74 Apr. 21	2158.722	30	3896	4025	66	.958	.745	.022
74 Apr. 23	2160.700	9	3757	3967	-8	.943	.745	.007
74 Apr. 25	2162.732	28	3700	3908	-0	.920	.745	-.016
74 Apr. 26	2163.765	23	3638	3878	-29	.968	.744	.031
74 Apr. 27	2164.729	29	3657	3850	20	.929	.744	-.008
74 Apr. 30	2167.712	15	3563	3762	22	.891	.743	-.045
74 May 2	2169.719	29	3445	3703	-31	.932	.743	-.004
74 May 3	2170.704	26	3506	3674	60	.998	.743	.062
74 May 5	2172.753	21	3346	3614	-35	.980	.742	.044
74 May 11	2178.765	20	3148	3438	-45	.954	.740	.021
74 May 13	2180.777	6	3133	3379	1	.903	.739	-.030
74 May 14	2181.722	25	3120	3351	16	.927	.738	-.006
74 May 16	2183.730	22	3033	3293	-9	.907	.738	-.026
74 May 18	2185.729	20	2982	3235	-0	.938	.737	.006
74 May 19	2186.748	17	2920	3205	-32	.904	.736	-.027
74 May 20	2187.735	20	2887	3177	-37	.937	.736	.006
74 May 21	2188.670	8	2920	3150	23	.912	.736	-.019
74 May 22	2189.726	13	2846	3120	-19	.879	.735	-.052
74 May 25	2192.640	5	2770	3036	-12	.914	.734	-.017
74 May 27	2194.734	7	2615	2977	-108	.981	.733	.051
74 May 28	2195.687	12	2664	2950	-33	.892	.733	-.038
74 May 31	2198.750	8	2567	2864	-46	.924	.732	-.006
74 June 5	2203.695	20	2474	2726	-8	.872	.731	-.058
74 June 6	2204.712	16	2458	2698	1	.983	.731	.053
74 June 8	2206.730	17	2429	2643	24	.874	.731	-.057
74 June 9	2207.750	5	2454	2615	75	.888	.731	-.043
74 June 12	2210.708	13	2299	2535	-6	.993	.731	.062
74 June 13	2211.737	13	2340	2507	59	.962	.731	.030
74 June 14	2212.728	17	2256	2480	-0	.967	.731	.035
74 June 15	2213.670	12	2202	2455	-32	.927	.731	-.006
74 June 18	2216.729	23	2160	2373	-1	.961	.731	.027
74 June 19	2217.820	8	2133	2343	-3	.875	.731	-.060
74 June 22	2220.702	13	2097	2267	25	.960	.732	.024
74 June 23	2221.687	12	2090	2241	41	.926	.732	-.011
74 June 24	2222.774	5	1990	2212	-33	.952	.733	.015
74 June 25	2223.800	7	1901	2185	-100	.963	.733	.025
74 June 26	2224.636	7	1972	2163	-10	.920	.733	-.019
74 June 27	2225.711	23	1893	2134	-65	.935	.734	-.005
74 June 28	2226.711	23	1903	2108	-33	.988	.734	.047
74 July 1	2229.740	20	1864	2028	-8	.952	.736	.009
74 July 3	2231.660	6	1883	1978	51	.888	.737	-.057
74 July 6	2234.720	20	1820	1897	52	.917	.739	-.031
74 July 8	2236.717	19	1732	1844	5	.957	.741	.007
74 July 11	2239.710	20	1629	1766	-36	.890	.743	-.063
74 July 12	2240.695	17	1630	1740	-15	.947	.744	-.008
74 July 13	2241.700	20	1638	1713	12	.936	.745	-.020
74 July 14	2242.700	20	1584	1687	-21	.982	.746	.025
74 July 15	2243.689	17	1596	1660	11	1.006	.747	.048
74 July 16	2244.694	15	1611	1634	46	.945	.748	-.015
74 July 17	2245.683	18	1566	1608	21	.920	.749	-.041
74 July 20	2248.683	19	1568	1528	82	.923	.753	-.042
74 July 21	2249.673	18	1466	1501	-0	.925	.754	-.041
74 July 22	2250.707	22	1461	1474	16	.973	.755	.004
74 July 23	2251.640	9	1454	1449	27	1.020	.756	.050
74 July 26	2254.676	20	1316	1367	-50	.979	.760	.004

Table 1A. Ottawa PZT Time and Latitude Observations - Continued

Date (UT)	Julian Date 244000 +	N	UTO-UTC Observed %0001	UT2-UTC Smoothed %0001	UT Res. %0001	PHI 0 Observed 45°24'	PHI 1 Smoothed 45°24'	PHI Res.
1	2	3	4	5	6	7	8	0
74 July 28	2256.712	20	1318	1312	-7	.976	.762	-.002
74 July 29	2257.644	12	1327	1286	19	.951	.763	-.028
74 July 30	2258.610	6	1334	1260	46	.918	.765	-.063
74 Aug. 2	2261.733	13	1254	1175	29	.994	.768	.009
74 Aug. 3	2262.760	7	1331	1146	127	1.016	.770	.029
74 Aug. 4	2263.702	8	1278	1120	92	1.026	.771	.039
74 Aug. 5	2264.744	12	1226	1092	61	1.028	.772	.039
74 Aug. 6	2265.711	16	1115	1065	-29	1.029	.773	.039
74 Aug. 7	2266.716	24	1115	1037	-8	1.006	.774	.015
74 Aug. 8	2267.713	23	1110	1010	7	1.013	.776	.021
74 Aug. 9	2268.727	12	1050	981	-31	.987	.777	-.007
74 Aug. 10	2269.706	24	1072	954	10	1.014	.778	.019
74 Aug. 11	2270.706	25	1085	926	44	1.016	.779	.019
74 Aug. 12	2271.688	22	1014	899	-5	.990	.780	-.007
74 Aug. 14	2273.728	19	990	842	13	.930	.782	-.069
74 Aug. 15	2274.712	24	975	814	19	1.005	.783	.004
74 Aug. 16	2275.705	26	869	786	-64	.989	.784	-.012
74 Aug. 17	2276.617	14	928	760	14	.990	.785	-.012
74 Aug. 18	2277.810	7	924	727	36	1.039	.786	.036
74 Aug. 19	2278.606	8	863	704	-7	1.009	.787	.005
74 Aug. 20	2279.695	24	836	674	-10	1.008	.788	.003
74 Aug. 21	2280.692	20	825	645	0	.994	.789	-.011
74 Aug. 22	2281.685	26	784	617	-18	1.026	.790	.020
74 Aug. 23	2282.622	8	732	591	-49	1.055	.791	.048
74 Aug. 24	2283.739	8	705	559	-51	1.021	.791	.013
74 Aug. 25	2284.678	26	715	532	-20	1.011	.792	.003
74 Aug. 26	2285.715	20	692	503	-19	1.009	.793	-.000
74 Aug. 28	2287.710	20	659	446	-7	1.007	.794	-.003
74 Aug. 29	2288.715	6	608	418	-35	.957	.795	-.054
74 Aug. 30	2289.681	14	631	390	10	.966	.795	-.045
74 Aug. 31	2290.705	20	602	361	5	1.008	.796	-.004
74 Sep. 1	2291.700	20	641	333	67	1.018	.796	.006
74 Sep. 2	2292.723	12	553	304	3	1.010	.797	-.002
74 Sep. 4	2294.724	25	500	247	-0	1.025	.797	.011
74 Sep. 5	2295.722	25	459	218	-17	.990	.798	-.024
74 Sep. 6	2296.718	25	420	190	-32	1.028	.798	.014
74 Sep. 7	2297.742	16	428	160	0	1.031	.798	.017
74 Sep. 8	2298.659	17	345	134	-59	1.059	.799	.044
74 Sep. 9	2299.744	22	400	103	21	1.033	.799	.019
74 Sep. 14	2304.742	24	295	-39	44	.996	.799	-.019
74 Sep. 15	2305.774	9	270	-68	46	1.082	.799	.067
74 Sep. 16	2306.746	24	227	-96	28	1.002	.799	-.014
74 Sep. 17	2307.580	7	77	-120	-99	1.053	.799	.037
74 Sep. 18	2308.720	29	144	-152	-1	.958	.799	-.058
74 Sep. 19	2309.718	28	84	-181	-35	1.082	.799	.066
74 Sep. 20	2310.590	6	32	-205	-64	.962	.799	-.054
74 Sep. 23	2313.653	6	66	-292	50	1.020	.798	.003
74 Sep. 24	2314.611	11	-83	-320	-72	1.052	.798	.035
74 Sep. 27	2317.790	15	-29	-410	68	.995	.797	-.023
74 Sep. 28	2318.680	5	-2	-435	119	1.048	.796	.031
74 Oct. 1	2321.706	30	-216	-520	-10	.947	.795	-.071
74 Oct. 2	2322.628	18	-258	-546	-27	1.039	.795	.021
74 Oct. 4	2324.710	30	-292	-605	-1	1.011	.794	-.007
74 Oct. 5	2325.642	24	-302	-631	13	1.028	.793	.010
74 Oct. 8	2328.706	37	-409	-718	-6	1.013	.792	-.007
74 Oct. 9	2329.670	8	-441	-745	-10	1.040	.791	.020
74 Oct. 11	2331.709	36	-487	-802	1	1.034	.790	.014

Table 1A. Ottawa PZT Time and Latitude Observations – Continued

Date (UT)	Julian Date 2440000 +	N	UTO-UTC	UT2-UTC	UT	PHI 0	PHI 1	PHI Res.
			Observed ‰0001	Smoothed ‰0001	Res. ‰0001	Observed 45°24'	Smoothed 45°24'	
1	2	3	4	5	6	7	8	9
74 Oct. 12	2332.555	11	-431	-825	81	.962	.789	-.059
74 Oct. 13	2333.684	28	-507	-857	37	.991	.789	-.031
74 Oct. 14	2334.593	20	-564	-883	7	1.086	.788	.064
74 Oct. 16	2336.679	25	-668	-941	-36	1.044	.787	.021
74 Oct. 17	2337.613	23	-684	-967	-25	1.047	.786	.024
74 Oct. 18	2338.776	24	-673	-999	19	1.008	.786	-.015
74 Oct. 19	2339.705	38	-724	-1025	-4	1.052	.785	.029
74 Oct. 20	2340.611	23	-765	-1050	-19	1.064	.785	.041
74 Oct. 21	2341.757	28	-805	-1082	-25	1.047	.784	.023
74 Oct. 22	2342.687	33	-783	-1108	23	.969	.783	-.054
74 Oct. 23	2343.838	14	-814	-1140	26	.942	.782	-.081
74 Oct. 24	2344.693	38	-878	-1164	-11	1.004	.782	-.020
74 Oct. 26	2346.729	18	-928	-1220	-1	1.023	.781	-.001
74 Oct. 27	2347.834	14	-905	-1250	53	.929	.780	-.095
74 Oct. 28	2348.671	32	-991	-1274	-6	1.062	.779	.038
74 Oct. 29	2349.735	16	-986	-1303	29	1.042	.779	.018
74 Nov. 3	2354.618	26	-1203	-1437	-41	1.039	.775	.016
74 Nov. 5	2356.882	10	-1155	-1499	74	.947	.774	-.076
74 Nov. 7	2358.706	42	-1284	-1549	0	.992	.772	-.030
74 Nov. 8	2359.694	39	-1321	-1576	-6	1.049	.772	.027
74 Nov. 14	2365.544	5	-1499	-1734	-8	1.118	.767	.099
74 Nov. 15	2366.818	16	-1504	-1769	25	1.016	.766	-.002
74 Nov. 17	2368.615	19	-1620	-1817	-36	1.048	.765	.031
74 Nov. 19	2370.731	39	-1618	-1874	28	1.044	.763	.028
74 Nov. 22	2373.790	26	-1754	-1955	-15	.951	.761	-.063
74 Nov. 23	2374.666	23	-1770	-1979	-5	1.067	.760	.053
74 Nov. 27	2378.691	35	-1877	-2085	5	.999	.757	-.013
74 Dec. 1	2382.705	40	-1985	-2191	14	1.040	.754	.030
74 Dec. 5	2386.668	36	-2143	-2294	-29	1.019	.752	.012
74 Dec. 7	2388.794	17	-2103	-2349	71	.969	.750	-.038
74 Dec. 10	2391.817	9	-2291	-2427	-30	.938	.748	-.068
74 Dec. 15	2396.661	39	-2432	-2550	-35	.964	.745	-.040
74 Dec. 15	2397.450	5	-2368	-2570	49	1.096	.745	.092
74 Dec. 26	2407.723	43	-2704	-2827	-7	.969	.741	-.034
74 Dec. 29	2410.519	7	-2748	-2896	21	1.052	.740	.049
74 Dec. 31	2412.697	44	-2800	-2949	26	1.008	.740	.005

Table 1B. Calgary PZT Time and Latitude Observations

Date (UT)	Julian Date 2440000 +	N	UTO-UTC	UT2-UTC	UT	PHI 0	PHI 1	PHI Res.
			Observed ‰0001	Smoothed ‰0001	Res. ‰0001	Observed 50°52'	Smoothed 50°52'	
1	2	3	4	5	6	7	8	9
74 Jan. 1	2048.829	17	6896	6957	73	22.259	22.179	-.095
74 Jan. 2	2049.854	25	6867	6933	69	22.291	22.179	-.061
74 Jan. 3	2050.650	9	6816	6914	37	22.348	22.179	-.002
74 Jan. 11	2058.800	45	6432	6715	-147	22.299	22.174	-.034
74 Jan. 13	2060.723	11	6527	6668	-6	22.421	22.173	.092
74 Jan. 15	2062.640	9	6329	6621	-157	22.318	22.172	-.007
74 Jan. 16	2063.700	5	6688	6594	227	22.312	22.171	-.011
74 Jan. 17	2064.840	7	6546	6566	113	22.433	22.170	.113
74 Jan. 18	2065.735	31	6443	6543	32	22.378	22.169	.060
74 Jan. 19	2066.787	23	6352	6517	-32	22.310	22.168	-.006
74 Jan. 20	2067.600	8	6359	6497	-5	22.504	22.168	.190
74 Jan. 21	2068.770	42	6324	6467	-11	22.321	22.167	.009
74 Jan. 22	2069.786	43	6328	6442	17	22.368	22.166	.058
74 Jan. 23	2070.791	24	6322	6417	36	22.317	22.165	.009
74 Jan. 24	2071.640	16	6167	6395	-97	22.252	22.164	-.054
74 Jan. 25	2072.877	13	6301	6364	67	22.318	22.163	.015
74 Jan. 27	2074.740	41	6278	6317	91	22.317	22.161	.016
74 Feb. 4	2082.923	21	5941	6108	-36	22.356	22.156	.065
74 Feb. 8	2086.827	34	5852	6007	-23	22.211	22.154	-.078
74 Feb. 9	2087.806	31	5853	5982	3	22.255	22.153	-.034
74 Feb. 10	2088.818	39	5819	5955	-3	22.238	22.153	-.050
74 Feb. 11	2089.831	19	5837	5929	41	22.209	22.153	-.079
74 Feb. 12	2090.857	35	5712	5903	-56	22.281	22.153	-.007
74 Feb. 14	2093.010	5	5599	5847	-111	22.150	22.152	-.137
74 Feb. 15	2093.829	40	5706	5825	17	22.295	22.152	.008
74 Feb. 17	2095.892	21	5659	5772	26	22.259	22.153	-.028
74 Feb. 18	2096.844	37	5649	5747	42	22.262	22.153	-.026
74 Feb. 19	2097.789	20	5606	5722	25	22.266	22.153	-.022
74 Feb. 20	2098.941	7	5636	5692	86	22.206	22.153	-.083
74 Feb. 21	2099.829	33	5472	5669	-53	22.300	22.154	.011
74 Feb. 23	2101.895	22	5440	5615	-28	22.352	22.155	.062
74 Feb. 24	2102.847	31	5407	5590	-34	22.323	22.155	.033
74 Feb. 25	2103.844	14	5291	5564	-122	22.157	22.156	-.133
74 Feb. 26	2104.821	29	5367	5538	-19	22.329	22.157	.038
74 Feb. 28	2106.692	13	5273	5489	-61	22.211	22.158	-.082
74 Mar. 1	2107.824	32	5334	5459	30	22.311	22.159	.018
74 Mar. 2	2108.819	27	5363	5433	87	22.340	22.160	.045
74 Mar. 4	2110.797	37	5209	5381	-11	22.259	22.162	-.039
74 Mar. 5	2111.761	29	5253	5356	59	22.268	22.163	-.031
74 Mar. 11	2117.836	20	4981	5195	-38	22.307	22.170	-.001
74 Mar. 14	2120.915	11	5020	5113	88	22.359	22.174	.045
74 Mar. 17	2123.779	19	4930	5037	81	22.525	22.178	.205
74 Mar. 18	2124.925	22	4729	5006	-86	22.248	22.179	-.074
74 Mar. 19	2125.974	14	4772	4978	-12	22.263	22.180	-.062
74 Mar. 20	2126.803	27	4687	4956	-72	22.357	22.181	.031
74 Mar. 21	2127.803	18	4709	4929	-21	22.331	22.183	.003
74 Mar. 23	2129.822	34	4659	4874	-11	22.407	22.185	.073
74 Mar. 29	2135.897	18	4494	4710	5	22.366	22.193	.019
74 Mar. 30	2136.827	30	4532	4685	70	22.288	22.194	-.061
74 Mar. 31	2137.890	7	4528	4656	99	22.367	22.195	.015
74 Apr. 1	2138.922	15	4374	4628	-23	22.417	22.196	.063
74 Apr. 5	2142.859	25	4295	4519	18	22.376	22.201	.012
74 Apr. 8	2145.900	18	4167	4435	-15	22.346	22.204	-.025
74 Apr. 9	2146.950	6	4042	4406	-108	22.437	22.205	.064
74 Apr. 10	2147.865	20	4025	4381	-96	22.365	22.206	-.010
74 Apr. 11	2148.842	26	4100	4354	8	22.349	22.207	-.028
74 Apr. 14	2151.758	15	4066	4272	66	22.426	22.209	.043

Table 1B. Calgary PZT Time and Latitude Observations — Continued

Date (UT)	Julian Date 2440000 +	N	UTO-UTC	UT2-UTC	UT	PHI 0	PHI 1	PHI Res.
			Observed °0001	Smoothed °0001	Res. °0001	Observed 50°52'	Smoothed 50°52'	
1	2	3	4	5	6	7	8	9
74 Apr. 15	2152.830	24	4040	4242	73	22.338	22.210	-.047
74 Apr. 17	2154.876	18	3905	4184	2	22.409	22.212	.021
74 Apr. 19	2156.875	14	3814	4128	-25	22.407	22.213	.015
74 Apr. 23	2160.820	8	3813	4015	98	22.399	22.216	.000
74 Apr. 24	2161.820	6	3733	3987	50	22.350	22.217	-.050
74 Apr. 25	2162.853	17	3611	3957	-38	22.353	22.218	-.049
74 May 4	2171.833	17	3335	3698	-31	22.382	22.223	-.032
74 May 5	2172.835	12	3433	3669	97	22.384	22.224	-.031
74 May 7	2174.830	10	3269	3611	-4	22.455	22.225	.037
74 May 8	2175.828	13	3273	3582	30	22.450	22.225	.031
74 May 10	2177.816	18	3121	3524	-60	22.419	22.227	-.001
74 May 11	2178.800	5	3139	3495	-11	22.416	22.227	-.006
74 May 20	2187.870	12	2891	3232	14	22.422	22.231	-.008
74 May 22	2189.867	18	2796	3174	-21	22.500	22.232	.067
74 May 23	2190.852	17	2751	3145	-37	22.510	22.233	.076
74 May 24	2191.835	13	2874	3117	114	22.464	22.233	.030
74 May 26	2193.853	18	2647	3058	-55	22.413	22.235	-.023
74 May 27	2194.846	9	2808	3030	134	22.556	22.235	.118
74 May 28	2195.825	10	2756	3001	110	22.418	22.236	-.020
74 June 1	2199.835	19	2512	2886	-22	22.417	22.238	-.025
74 June 6	2204.827	16	2456	2744	57	22.391	22.242	-.055
74 June 8	2206.850	8	2258	2686	-86	22.501	22.244	.053
74 June 13	2211.805	19	2149	2547	-66	22.487	22.248	.035
74 June 14	2212.777	14	2188	2520	-3	22.466	22.249	.012
74 June 15	2213.797	18	2125	2491	-40	22.458	22.251	.003
74 June 18	2216.785	19	2104	2408	12	22.416	22.254	-.042
74 June 19	2217.787	18	2047	2380	-19	22.433	22.255	-.026
74 June 20	2218.775	16	2037	2353	-5	22.431	22.257	-.030
74 June 22	2220.840	22	1955	2296	-39	22.453	22.260	-.010
74 June 23	2221.851	18	1937	2268	-32	22.440	22.261	-.024
74 June 26	2224.833	18	1888	2186	-12	22.456	22.266	-.011
74 June 27	2225.790	10	1756	2160	-121	22.496	22.268	.027
74 June 28	2226.860	12	1847	2130	-6	22.436	22.269	-.035
74 June 29	2227.838	19	1741	2103	-89	22.413	22.271	-.059
74 June 30	2228.880	5	1842	2075	34	22.438	22.273	-.036
74 July 3	2231.803	19	1763	1995	21	22.441	22.278	-.037
74 July 4	2232.805	22	1718	1968	-1	22.444	22.280	-.035
74 July 7	2235.802	23	1686	1886	31	22.507	22.286	.023
74 July 10	2238.750	11	1602	1806	10	22.451	22.292	-.037
74 July 11	2239.795	6	1658	1777	88	22.535	22.294	.045
74 July 12	2240.830	12	1636	1749	89	22.492	22.296	.000
74 July 13	2241.810	10	1527	1722	1	22.545	22.298	.052
74 July 14	2242.852	20	1437	1694	-67	22.507	22.300	.012
74 July 15	2243.890	9	1493	1665	11	22.298	22.302	-.198
74 July 20	2248.827	18	1405	1529	26	22.486	22.312	-.019
74 July 21	2249.834	21	1450	1502	92	22.494	22.314	-.012
74 July 22	2250.846	15	1348	1474	12	22.431	22.315	-.078
74 July 23	2251.800	9	1316	1447	-0	22.464	22.317	-.046
74 July 24	2252.820	16	1384	1419	89	22.670	22.319	.159
74 July 25	2253.822	17	1210	1391	-63	22.610	22.320	.097
74 July 26	2254.823	19	1270	1363	16	22.621	22.322	.106
74 July 27	2255.814	19	1337	1336	104	22.498	22.324	-.019
74 July 28	2256.860	9	1174	1306	-36	22.462	22.325	-.056
74 July 29	2257.806	16	1273	1280	82	22.534	22.327	.014
74 July 31	2259.797	12	1149	1224	0	22.502	22.329	-.020
74 Aug. 2	2261.843	21	1192	1166	86	22.559	22.332	.035
74 Aug. 3	2262.836	33	1086	1138	1	22.571	22.333	.046

Table 1B. Calgary PZT Time and Latitude Observations — Continued

Date (UT)	Julian Date 2440000 +	N	UTO-UTC	UT2-UTC	UT	PHI 0	PHI 1	PHI
			Observed ‰0001	Smoothed ‰0001	Res. ‰0001	Observed 50°52'	Smoothed 50°52'	Res.
1	2	3	4	5	6	7	8	9
74 Aug. 4	2263.836	33	1067	1110	3	22.576	22.334	.049
74 Aug. 9	2268.813	30	851	969	-107	22.505	22.338	-.025
74 Aug. 10	2269.773	14	915	941	-22	22.549	22.339	.018
74 Aug. 11	2270.810	7	912	912	-3	22.496	22.340	-.035
74 Aug. 14	2273.890	8	798	824	-49	22.435	22.341	-.097
74 Aug. 16	2275.765	14	898	770	91	22.526	22.341	-.006
74 Aug. 17	2276.800	33	812	741	28	22.479	22.342	-.053
74 Aug. 18	2277.844	9	736	711	-24	22.524	22.342	-.008
74 Aug. 22	2281.768	26	662	598	-10	22.544	22.341	.012
74 Aug. 23	2282.783	33	581	569	-69	22.532	22.341	.000
74 Aug. 25	2284.732	8	679	514	73	22.531	22.341	.000
74 Aug. 26	2285.710	7	581	486	-2	22.573	22.340	.042
74 Aug. 27	2286.841	11	483	453	-73	22.507	22.340	-.023
74 Aug. 31	2290.808	19	438	340	-26	22.509	22.337	-.019
74 Sep. 2	2292.841	30	316	282	-100	22.558	22.336	.031
74 Sep. 3	2293.842	26	449	254	56	22.498	22.335	-.028
74 Sep. 4	2294.792	20	336	227	-34	22.499	22.334	-.026
74 Sep. 14	2304.804	29	173	-57	51	22.500	22.323	-.014
74 Sep. 15	2305.801	32	78	-85	-17	22.515	22.321	.002
74 Sep. 16	2306.801	32	172	-113	102	22.482	22.320	-.029
74 Sep. 17	2307.798	32	22	-141	-21	22.512	22.319	.003
74 Sep. 18	2308.827	38	83	-170	65	22.541	22.317	.032
74 Sep. 19	2309.875	13	64	-200	75	22.539	22.316	.032
74 Sep. 20	2310.930	7	-31	-229	7	22.461	22.314	-.045
74 Sep. 21	2311.818	39	-72	-254	-9	22.520	22.313	.015
74 Sep. 22	2312.817	38	-99	-282	-10	22.505	22.311	.001
74 Sep. 23	2313.818	37	-198	-310	-82	22.515	22.310	.012
74 Sep. 24	2314.814	38	-133	-338	8	22.545	22.308	.043
74 Sep. 25	2315.833	32	-218	-367	-48	22.413	22.307	-.088
74 Sep. 26	2316.745	19	-231	-392	-37	22.569	22.305	.068
74 Sep. 27	2317.822	29	-236	-422	-12	22.503	22.304	.004
74 Sep. 28	2318.718	17	-316	-447	-68	22.593	22.302	.095
74 Sep. 30	2320.718	19	-331	-503	-28	22.546	22.299	.049
74 Oct. 3	2323.786	39	-335	-588	53	22.536	22.294	.043
74 Oct. 4	2324.851	8	-395	-618	22	22.491	22.293	-.001
74 Oct. 6	2326.813	48	-541	-672	-68	22.454	22.290	-.038
74 Oct. 7	2327.729	14	-479	-697	20	22.404	22.288	-.087
74 Oct. 8	2328.844	41	-454	-728	76	22.447	22.286	-.044
74 Oct. 9	2329.810	51	-487	-755	71	22.473	22.285	-.018
74 Oct. 10	2330.803	47	-507	-782	79	22.461	22.283	-.030
74 Oct. 14	2334.748	35	-729	-891	-29	22.507	22.278	.016
74 Oct. 15	2335.702	12	-756	-917	-28	22.485	22.276	-.006
74 Oct. 16	2336.812	31	-682	-947	77	22.497	22.275	.006
74 Oct. 17	2337.794	49	-789	-974	-1	22.512	22.273	.021
74 Oct. 18	2338.784	51	-863	-1001	-46	22.509	22.272	.018
74 Oct. 19	2339.792	49	-926	-1028	-80	22.447	22.270	-.045
74 Oct. 20	2340.717	12	-901	-1054	-28	22.469	22.269	-.022
74 Oct. 22	2342.771	50	-994	-1109	-61	22.495	22.266	.004
74 Oct. 23	2343.774	51	-987	-1136	-25	22.428	22.265	-.063
74 Oct. 24	2344.770	51	-935	-1163	55	22.529	22.264	.037
74 Oct. 25	2345.764	51	-1041	-1190	-20	22.440	22.263	-.051
74 Oct. 26	2346.799	36	-937	-1218	113	22.503	22.261	.012
74 Oct. 27	2347.658	21	-1170	-1241	-94	22.555	22.260	.063
74 Oct. 28	2348.751	48	-1106	-1270	1	22.539	22.259	.048
74 Oct. 29	2349.754	38	-1142	-1297	-4	22.496	22.258	.004
74 Nov. 2	2353.845	12	-1147	-1406	109	22.502	22.253	.011
74 Nov. 3	2354.814	48	-1331	-1432	-45	22.515	22.251	.024

Table 1B. Calgary PZT Time and Latitude Observations — Continued

Date (UT)	Julian Date		UTO-UTC Observed \$0001	UT2-UTC Smoothed \$0001	UT Res. \$0001	PHI 0 Observed 50°52'	PHI 1 Smoothed 50°52'	PHI Res.
	2440000 +	N						
1	2	3	4	5	6	7	8	9
74 Nov. 8	2359.836	20	-1380	-1565	53	22.473	22.246	-.017
74 Nov. 9	2360.743	22	-1401	-1589	59	22.561	22.245	.071
74 Nov. 10	2361.770	42	-1424	-1616	66	22.538	22.244	.050
74 Nov. 11	2362.799	48	-1455	-1642	66	22.491	22.242	.003
74 Nov. 12	2363.721	11	-1590	-1667	-42	22.431	22.241	-.057
74 Nov. 13	2364.808	43	-1539	-1695	41	22.508	22.240	.021
74 Nov. 14	2365.739	32	-1721	-1719	-113	22.480	22.239	-.006
74 Nov. 15	2366.787	45	-1632	-1746	5	22.463	22.238	-.023
74 Nov. 16	2367.677	12	-1789	-1769	-125	22.387	22.237	-.099
74 Nov. 17	2368.678	17	-1752	-1795	-58	22.604	22.236	.118
74 Nov. 18	2369.777	41	-1692	-1824	33	22.463	22.235	-.022
74 Nov. 19	2370.719	29	-1880	-1848	-127	22.497	22.234	.012
74 Nov. 20	2371.826	32	-1741	-1876	43	22.410	22.233	-.074
74 Nov. 23	2374.749	28	-1983	-1951	-113	22.420	22.230	-.063
74 Nov. 24	2375.764	25	-1951	-1977	-53	22.504	22.229	.021
74 Nov. 26	2377.795	57	-1901	-2029	55	22.493	22.227	.010
74 Nov. 27	2378.808	37	-1967	-2055	17	22.476	22.226	-.006
74 Nov. 30	2381.964	18	-2011	-2135	63	22.399	22.224	-.082
74 Dec. 1	2382.689	28	-2178	-2154	-83	22.445	22.223	-.036
74 Dec. 2	2383.654	22	-2252	-2178	-130	22.542	22.222	.060
74 Dec. 3	2384.683	29	-2186	-2204	-35	22.477	22.221	-.004
74 Dec. 4	2385.763	30	-2190	-2231	-8	22.465	22.220	-.016
74 Dec. 5	2386.731	39	-2244	-2256	-35	22.445	22.220	-.035
74 Dec. 6	2387.850	23	-2221	-2284	19	22.456	22.219	-.025
74 Dec. 7	2388.755	53	-2293	-2307	-26	22.527	22.218	.047
74 Dec. 8	2389.801	41	-2328	-2334	-32	22.425	22.217	-.054
74 Dec. 9	2390.870	34	-2273	-2361	52	22.488	22.216	.009
74 Dec. 10	2391.835	54	-2246	-2385	106	22.503	22.216	.024
74 Dec. 11	2392.867	14	-2341	-2411	40	22.509	22.215	.031
74 Dec. 13	2394.718	19	-2519	-2458	-85	22.633	22.213	.155
74 Dec. 14	2395.827	52	-2528	-2486	-63	22.458	22.212	-.020
74 Dec. 15	2396.846	48	-2432	-2512	61	22.441	22.212	-.037
74 Dec. 16	2397.712	29	-2522	-2534	-4	22.526	22.211	.049
74 Dec. 17	2398.820	53	-2511	-2562	37	22.465	22.210	-.012
74 Dec. 18	2399.764	43	-2597	-2587	-21	22.545	22.209	.068
74 Dec. 19	2400.932	24	-2494	-2616	113	22.438	22.208	-.039
74 Dec. 20	2401.914	10	-2589	-2641	46	22.503	22.208	.027
74 Dec. 23	2404.824	49	-2748	-2716	-31	22.479	22.205	.004
74 Dec. 24	2405.878	14	-2724	-2743	21	22.404	22.205	-.070
74 Dec. 25	2407.010	5	-2790	-2773	-12	22.564	22.204	.090
74 Dec. 26	2407.739	42	-2796	-2791	1	22.489	22.203	.016
74 Dec. 28	2409.847	32	-2783	-2846	73	22.518	22.201	.045
74 Dec. 29	2410.689	18	-2846	-2868	33	22.456	22.201	-.016
74 Dec. 30	2411.621	18	-2984	-2892	-78	22.363	22.200	-.108
74 Dec. 31	2412.661	29	-2930	-2920	4	22.469	22.199	-.002

Table 2. Interpolated Smoothed Time and Latitude Observations

Date 0 ^h UT	Julian Date 2440000 +	Ottawa PZT		Calgary PZT	
		UT2-UTC s0001	PHI 1 45°24'	UT2-UTC s0001	PHI 1 50°52'
1	2	3	4	5	6
74 Jan. 1	2049.0	6954	.778	6952	22.179
74 Jan. 6	2054.0	6824	.772	6831	22.177
74 Jan. 11	2059.0	6694	.767	6709	22.174
74 Jan. 16	2064.0	6563	.763	6585	22.170
74 Jan. 21	2069.0	6433	.759	6460	22.166
74 Jan. 26	2074.0	6302	.755	6334	22.162
74 Jan. 31	2079.0	6171	.753	6207	22.158
74 Feb. 5	2084.0	6041	.750	6078	22.155
74 Feb. 10	2089.0	5910	.749	5949	22.153
74 Feb. 15	2094.0	5779	.747	5819	22.152
74 Feb. 20	2099.0	5648	.746	5689	22.153
74 Feb. 25	2104.0	5517	.745	5558	22.156
74 Mar. 2	2109.0	5386	.744	5427	22.160
74 Mar. 7	2114.0	5255	.744	5295	22.166
74 Mar. 12	2119.0	5124	.743	5163	22.172
74 Mar. 17	2124.0	4991	.743	5029	22.178
74 Mar. 22	2129.0	4857	.743	4895	22.184
74 Mar. 27	2134.0	4721	.744	4760	22.191
74 Apr. 1	2139.0	4584	.744	4624	22.196
74 Apr. 6	2144.0	4444	.745	4486	22.202
74 Apr. 11	2149.0	4303	.745	4348	22.207
74 Apr. 16	2154.0	4160	.745	4207	22.211
74 Apr. 21	2159.0	4015	.745	4066	22.215
74 Apr. 26	2164.0	3869	.744	3923	22.219
74 May 1	2169.0	3723	.743	3779	22.222
74 May 6	2174.0	3576	.741	3634	22.225
74 May 11	2179.0	3429	.740	3488	22.227
74 May 16	2184.0	3283	.737	3343	22.230
74 May 21	2189.0	3139	.735	3197	22.232
74 May 26	2194.0	2996	.734	3053	22.235
74 May 31	2199.0	2855	.732	2909	22.238
74 June 5	2204.0	2717	.731	2766	22.241
74 June 10	2209.0	2580	.731	2624	22.245
74 June 15	2214.0	2444	.731	2484	22.251
74 June 20	2219.0	2310	.732	2345	22.257
74 June 25	2224.0	2178	.733	2207	22.265
74 June 30	2229.0	2046	.735	2070	22.273
74 July 5	2234.0	1914	.739	1934	22.283
74 July 10	2239.0	1783	.743	1797	22.292
74 July 15	2244.0	1651	.747	1661	22.302
74 July 20	2249.0	1518	.753	1523	22.312
74 July 25	2254.0	1383	.759	1385	22.321
74 July 30	2259.0	1248	.765	1245	22.328
74 Aug. 4	2264.0	1111	.771	1104	22.334
74 Aug. 9	2269.0	972	.777	962	22.338
74 Aug. 14	2274.0	833	.783	819	22.341
74 Aug. 19	2279.0	692	.787	676	22.342
74 Aug. 24	2284.0	550	.792	533	22.341
74 Aug. 29	2289.0	408	.795	390	22.339
74 Sep. 3	2294.0	266	.797	248	22.335
74 Sep. 8	2299.0	123	.799	106	22.330
74 Sep. 13	2304.0	-18	.799	-35	22.324
74 Sep. 18	2309.0	-161	.799	-176	22.317
74 Sep. 23	2314.0	-303	.798	-316	22.309
74 Sep. 28	2319.0	-444	.796	-456	22.302

Table 2. Interpolated Smoothed Time and Latitude Observations—Continued

Date 0 ^h UT	Julian Date 2440000 +	Ottawa PZT		Calgary PZT	
		UT2-UTC s0001	PHI 1 45° 24'	UT2-UTC s0001	PHI 1 50° 52'
1	2	3	4	5	6
74 Oct. 3	2324.0	-586	.794	-595	22.294
74 Oct. 8	2329.0	-726	.791	-733	22.286
74 Oct. 13	2334.0	-866	.789	-871	22.279
74 Oct. 18	2339.0	-1006	.786	-1007	22.272
74 Oct. 23	2344.0	-1145	.782	-1143	22.265
74 Oct. 28	2349.0	-1283	.779	-1278	22.258
74 Nov. 2	2354.0	-1421	.776	-1411	22.252
74 Nov. 7	2359.0	-1557	.772	-1543	22.247
74 Nov. 12	2364.0	-1693	.768	-1674	22.241
74 Nov. 17	2369.0	-1828	.765	-1804	22.236
74 Nov. 22	2374.0	-1961	.761	-1933	22.231
74 Nov. 27	2379.0	-2094	.757	-2060	22.226
74 Dec. 2	2384.0	-2225	.754	-2187	22.222
74 Dec. 7	2389.0	-2355	.750	-2314	22.218
74 Dec. 12	2394.0	-2483	.747	-2440	22.214
74 Dec. 17	2399.0	-2610	.744	-2568	22.210
74 Dec. 22	2404.0	-2735	.742	-2695	22.206
74 Dec. 27	2409.0	-2859	.741	-2825	22.202

