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GEOLOGICAL SURVEY,

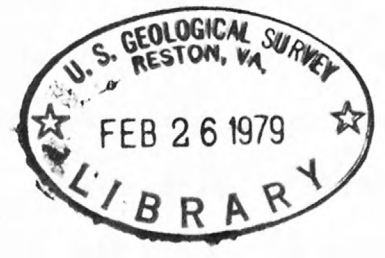
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MAGNETOMETER TRAVERSE ON PLUM ISLAND NEAR
NEWBURYPORT, MASSACHUSETTS

By

Robert W. Simpson and Wallace A. Bothner



Open-File Report 79-435

1979

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MAGNETOMETER TRAVERSE ON PLUM ISLAND NEAR

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Several large faults of regional tectonic significance circle around Boston and disappear offshore at Plum Island south of Newburyport, Massachusetts (Castle and others, 1976; Barosh and others, 1977). The traces of these faults are, in places, well defined by aeromagnetic anomalies (Harwood and Zietz, 1977). The purpose of this traverse was to get a close look at the magnetic signatures of these faults on the ground before attempting to trace them offshore using ship-towed magnetometer.

Figure 1 shows the location of an 8-mile (12-km)-long, north-south magnetometer traverse along the shore of Plum Island, Massachusetts. The faults shown in figure 1 were taken from Barosh and others (1977) and from Shride (1976), who located them from mapped geology and aeromagnetic anomalies.

Plum Island lies in the Newburyport East and Ipswich, Massachusetts, 7.5-minute quadrangles. The profile was made on Monday, September 18, 1978, between 12:00 p.m. and 5:30 p.m.; it followed the shoreline from the jetty at the north end of the Island to the southern boundary of the Parker River National Wildlife refuge, staying within 50 ft (15 m) of the high water line for that day. Distances were taped and paced for the first mile; they were paced thereafter with an accuracy of 2 percent or better, estimated by comparing paced distances with landmarks on the topographic maps.

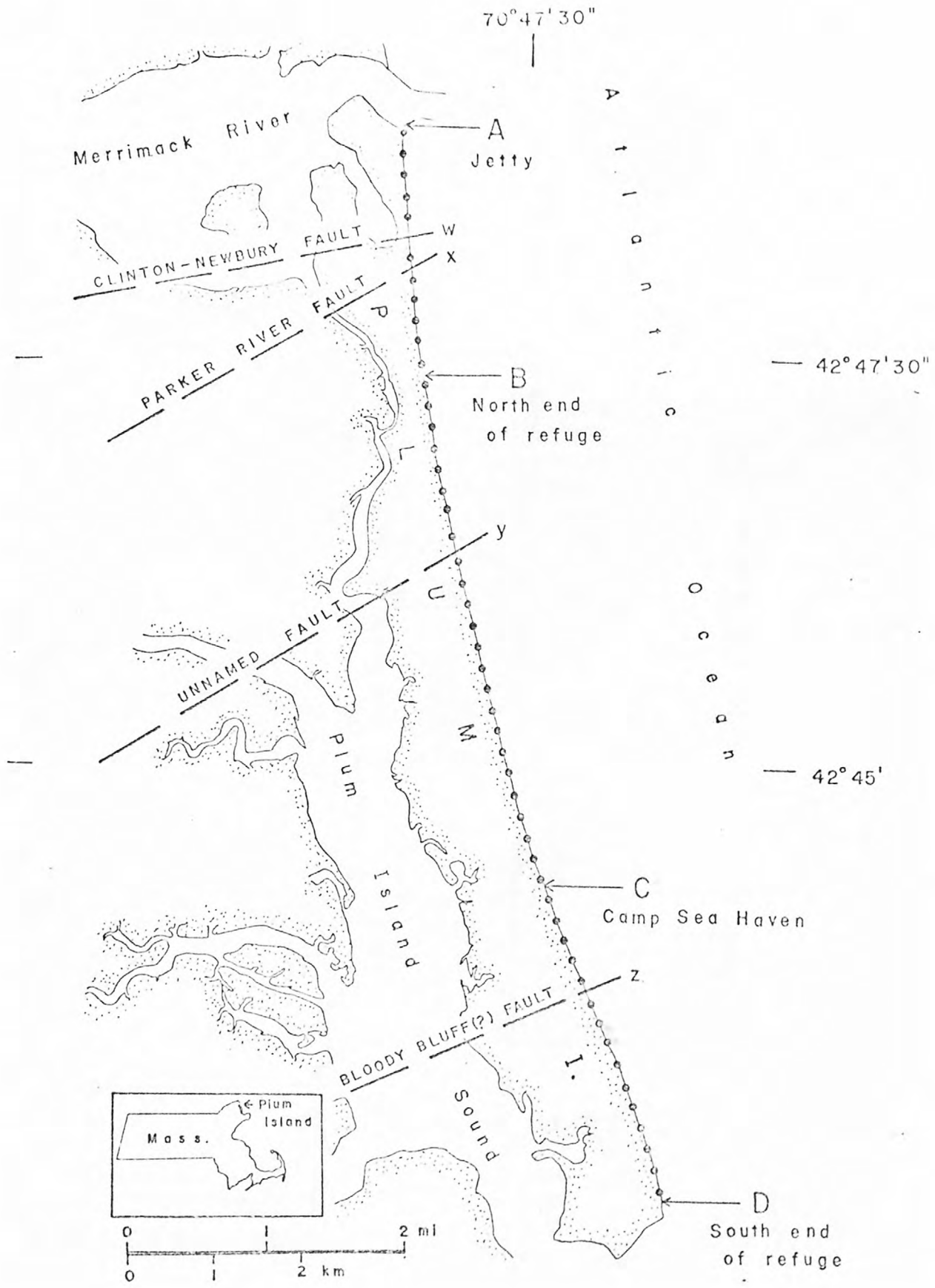
A portable proton precession Geometrics^{1/} magnetometer (model G816, serial number 605) belonging to the University of New Hampshire Geology Department was used. Values of the field recorded in figure 2 are the total field intensity values read from the instrument every 100 feet (30.5 m) (50 feet (15.2 m) where values changed rapidly). Initial stations near the jetty were reoccupied at the end of the traverse, and drift was observed to be less than 20 gammas. Values recorded are listed in table 1.

The anomalies beginning at 39,600 feet appear to be caused in part by highly magnetic boulders lying on the beach and enclosed in glacial drift at the top of the beach.

References Cited

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- Castle, R. O., Dixon, H. R., Grew, E. S., Griscom, Andrew, and Zietz, Isidore, 1976, Structure dislocations in eastern Massachusetts: U.S. Geological Survey Bulletin 1410, 39 p.
- Harwood, D. S., and Zietz, Isidore, 1977, Geologic interpretation of an aeromagnetic map of southern New England: U.S. Geological Survey Geophysical Investigations Map GP-906, scale 1:250,000.
- Shride, A. F., 1976, Stratigraphy and correlation of the Newbury Volcanic Complex, northeastern Massachusetts, in Page, L. R., ed., Contributions to the stratigraphy of New England: Geological Society of America Memoir, p. 148.

^{1/} The use of brand names in this paper are for descriptive purposes only and do not necessarily constitute endorsement by the U.S. Geological Survey.



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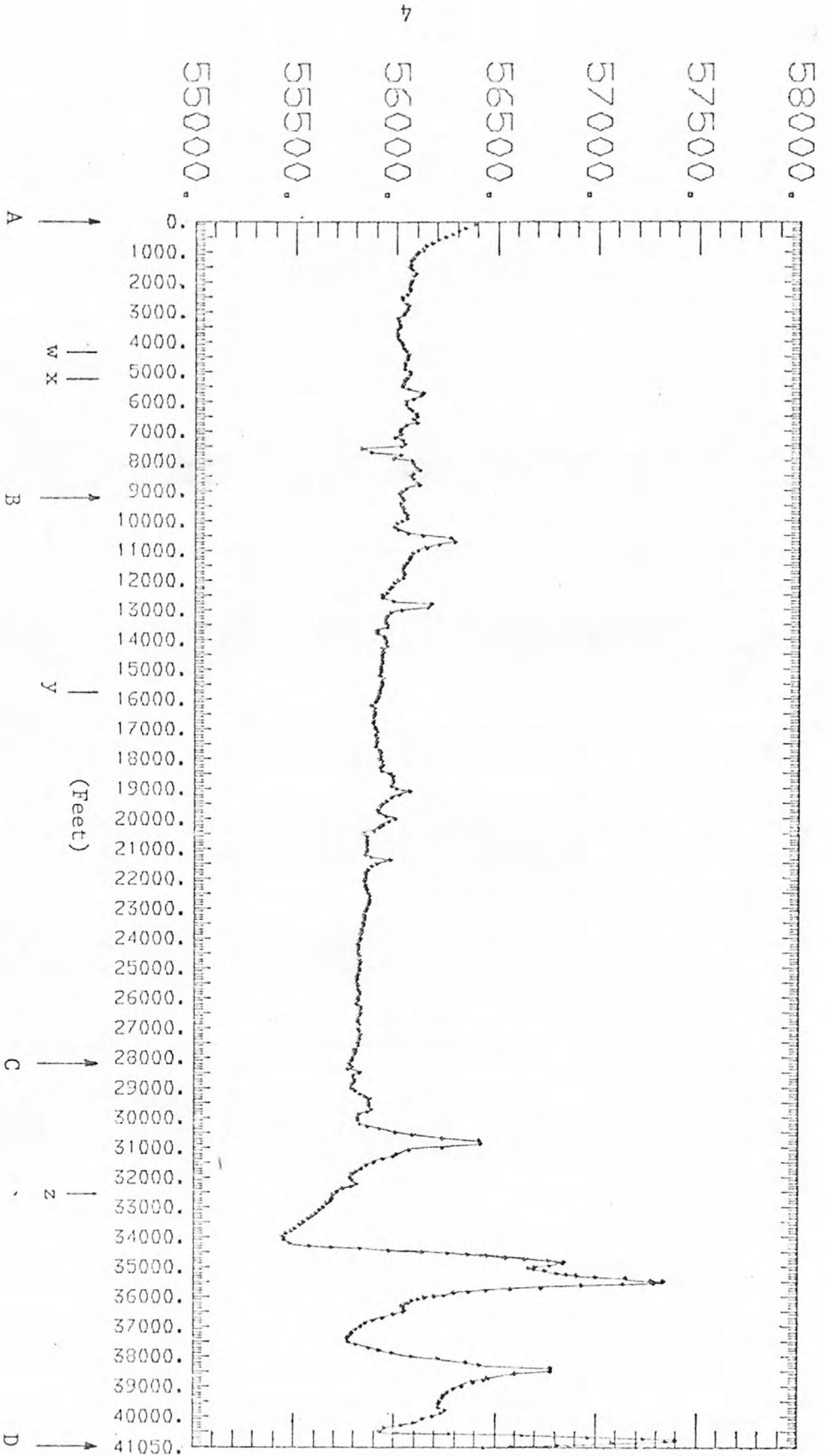


Figure 2.--Total magnetic field intensity.

feet	miles	meters	gammas	feet	miles	meters	gammas	feet	miles	meters	gammas
100.	0.017	30.	56361.	6100.	1.155	1854.	56043.	12100.	2.292	3686.	55965.
200.	0.036	61.	56352.	6200.	1.174	1890.	56050.	12200.	2.311	3719.	55972.
300.	0.057	91.	56304.	6300.	1.193	1920.	56072.	12300.	2.330	3749.	55961.
400.	0.076	122.	56270.	6400.	1.212	1951.	56091.	12400.	2.348	3780.	55948.
500.	0.095	152.	56238.	6500.	1.231	1981.	56097.	12500.	2.367	3810.	55934.
600.	0.114	183.	56197.	6600.	1.250	2012.	56080.	12600.	2.386	3840.	55924.
700.	0.133	213.	56166.	6700.	1.269	2042.	56095.	12700.	2.405	3871.	55919.
800.	0.152	244.	56140.	6800.	1.288	2073.	56059.	12800.	2.424	3901.	56168.
900.	0.170	274.	56123.	6900.	1.307	2103.	56018.	12900.	2.443	3932.	56151.
1000.	0.189	305.	56102.	7000.	1.326	2134.	56008.	13000.	2.462	3962.	56025.
1100.	0.208	335.	56069.	7100.	1.345	2164.	56017.	13100.	2.481	3993.	55969.
1200.	0.227	366.	56075.	7200.	1.364	2195.	55988.	13200.	2.500	4023.	55949.
1300.	0.246	396.	56066.	7300.	1.383	2225.	56024.	13300.	2.519	4054.	55944.
1400.	0.265	427.	56065.	7400.	1.402	2256.	56035.	13400.	2.538	4084.	55945.
1500.	0.284	457.	56056.	7500.	1.420	2286.	56014.	13500.	2.557	4115.	55948.
1600.	0.303	488.	56072.	7600.	1.439	2316.	55923.	13600.	2.576	4145.	55950.
1700.	0.322	518.	56091.	7700.	1.458	2347.	55970.	13700.	2.595	4176.	55963.
1800.	0.341	549.	56078.	7800.	1.477	2377.	56016.	13800.	2.614	4206.	55969.
1900.	0.360	579.	56069.	7900.	1.496	2406.	55979.	13900.	2.633	4237.	55937.
2000.	0.379	610.	56064.	8000.	1.515	2438.	56072.	14000.	2.652	4267.	55942.
2100.	0.398	640.	56056.	8100.	1.534	2469.	56079.	14100.	2.670	4298.	55941.
2200.	0.417	671.	56057.	8200.	1.553	2499.	56087.	14200.	2.689	4328.	55952.
2300.	0.436	701.	56056.	8300.	1.572	2530.	56106.	14300.	2.708	4359.	55929.
2400.	0.455	732.	56044.	8400.	1.591	2560.	56076.	14400.	2.727	4389.	55929.
2500.	0.473	762.	56025.	8500.	1.610	2591.	56064.	14500.	2.746	4420.	55920.
2600.	0.492	792.	56023.	8600.	1.629	2621.	56079.	14600.	2.765	4450.	55923.
2700.	0.511	823.	56041.	8700.	1.648	2652.	56094.	14700.	2.784	4481.	55922.
2800.	0.530	853.	56050.	8800.	1.667	2682.	56106.	14800.	2.803	4511.	55922.
2900.	0.549	884.	56046.	8900.	1.686	2713.	56043.	14900.	2.822	4542.	55920.
3000.	0.568	914.	56033.	9000.	1.705	2743.	56022.	15000.	2.841	4572.	55921.
3100.	0.587	945.	56031.	9100.	1.723	2774.	56012.	15100.	2.860	4602.	55918.
3200.	0.606	975.	56000.	9200.	1.742	2804.	56021.	15200.	2.879	4633.	55913.
3300.	0.625	1006.	56005.	9300.	1.761	2835.	56027.	15300.	2.898	4663.	55930.
3400.	0.644	1036.	56009.	9400.	1.780	2865.	56014.	15400.	2.917	4694.	55927.
3500.	0.663	1067.	56010.	9500.	1.799	2896.	56024.	15500.	2.936	4724.	55925.
3600.	0.682	1097.	56001.	9600.	1.818	2926.	56027.	15600.	2.955	4755.	55918.
3700.	0.701	1128.	55999.	9700.	1.837	2957.	56032.	15700.	2.973	4785.	55913.
3800.	0.720	1158.	56000.	9800.	1.856	2987.	56046.	15800.	2.992	4816.	55911.
3900.	0.739	1189.	56002.	9900.	1.875	3018.	56045.	15900.	3.011	4846.	55907.
4000.	0.758	1219.	56014.	10000.	1.894	3048.	56024.	16000.	3.030	4877.	55898.
4100.	0.777	1250.	56021.	10100.	1.913	3078.	55945.	16100.	3.049	4907.	55892.
4200.	0.795	1280.	56029.	10200.	1.932	3109.	55965.	16200.	3.068	4938.	55868.
4300.	0.814	1311.	56043.	10300.	1.951	3139.	56003.	16300.	3.087	4968.	55890.
4400.	0.833	1341.	56054.	10400.	1.970	3170.	56059.	16400.	3.106	4999.	55869.
4500.	0.852	1372.	56048.	10500.	1.989	3200.	56128.	16500.	3.125	5029.	55888.
4600.	0.871	1402.	56044.	10600.	2.008	3231.	56264.	16600.	3.144	5060.	55865.
4700.	0.890	1433.	56036.	10700.	2.027	3261.	56262.	16700.	3.163	5090.	55864.
4800.	0.909	1463.	56035.	10800.	2.045	3292.	56262.	16800.	3.182	5121.	55864.
4900.	0.928	1494.	56037.	10900.	2.064	3322.	56145.	16900.	3.201	5151.	55866.
5000.	0.947	1524.	56060.	11000.	2.083	3353.	56100.	17000.	3.220	5182.	55843.
5100.	0.966	1554.	56061.	11100.	2.102	3383.	56075.	17100.	3.239	5212.	55848.
5200.	0.985	1585.	56046.	11200.	2.121	3414.	56064.	17200.	3.258	5243.	55847.
5300.	1.004	1615.	56035.	11300.	2.140	3444.	56057.	17300.	3.277	5273.	55848.
5400.	1.023	1646.	56031.	11400.	2.159	3475.	56046.	17400.	3.295	5304.	55848.
5500.	1.042	1676.	56025.	11500.	2.178	3505.	56035.	17500.	3.314	5334.	55844.
5600.	1.061	1707.	56055.	11600.	2.197	3536.	56029.	17600.	3.333	5364.	55846.
5700.	1.080	1737.	56124.	11700.	2.216	3566.	56030.	17700.	3.352	5395.	55911.
5800.	1.098	1768.	56116.	11800.	2.235	3597.	56035.	17800.	3.371	5425.	55917.
5900.	1.117	1798.	56080.	11900.	2.254	3627.	56026.	17900.	3.390	5456.	55916.
6000.	1.136	1829.	56040.	12000.	2.273	3658.	56005.	18000.	3.409	5486.	55912.

Table 1.--Distances and magnetic field intensity for traverse.

feet	miles	meters	gammas	feet	miles	meters	gammas	feet	miles	meters	gammas
18100.	3.420	5517.	55926.	24100.	4.564	7346.	55814.	30100.	5.701	9174.	55810.
18200.	3.447	5547.	55934.	24200.	4.583	7376.	55811.	30200.	5.720	9205.	55821.
18300.	3.466	5578.	55917.	24300.	4.602	7407.	55811.	30300.	5.739	9235.	55859.
18400.	3.485	5608.	55927.	24400.	4.621	7437.	55811.	30400.	5.758	9266.	55910.
18500.	3.504	5634.	55962.	24500.	4.640	7468.	55807.	30500.	5.777	9296.	55949.
18600.	3.523	5669.	55977.	24600.	4.659	7498.	55814.	30600.	5.795	9327.	56083.
18700.	3.542	5700.	55981.	24700.	4.678	7529.	55818.	30700.	5.814	9357.	56231.
18800.	3.561	5730.	55977.	24800.	4.697	7554.	55819.	30800.	5.833	9388.	56412.
18900.	3.580	5761.	55971.	24900.	4.716	7590.	55817.	30900.	5.852	9418.	56440.
19000.	3.599	5791.	55946.	25000.	4.735	7620.	55813.	31000.	5.871	9449.	56232.
19100.	3.617	5822.	56067.	25100.	4.754	7650.	55813.	31100.	5.890	9479.	56005.
19200.	3.636	5852.	56009.	25200.	4.773	7681.	55807.	31200.	5.909	9510.	56002.
19300.	3.655	5883.	55972.	25300.	4.792	7711.	55802.	31300.	5.928	9540.	55934.
19400.	3.674	5913.	55948.	25400.	4.811	7742.	55804.	31400.	5.947	9571.	55740.
19500.	3.693	5944.	55932.	25500.	4.830	7772.	55805.	31500.	5.966	9601.	55847.
19600.	3.712	5974.	55916.	25600.	4.848	7803.	55809.	31600.	5.985	9632.	55854.
19700.	3.731	6005.	55908.	25700.	4.867	7833.	55812.	31700.	6.004	9662.	56021.
19800.	3.750	6035.	55913.	25800.	4.886	7864.	55814.	31800.	6.023	9693.	55801.
19900.	3.769	6066.	55951.	25900.	4.905	7894.	55815.	31900.	6.042	9723.	55785.
20000.	3.788	6096.	55969.	26000.	4.924	7925.	55811.	32000.	6.061	9754.	55772.
20100.	3.807	6126.	55964.	26100.	4.943	7955.	55812.	32100.	6.080	9784.	55770.
20200.	3.826	6157.	55929.	26200.	4.962	7986.	55804.	32200.	6.099	9815.	55855.
20300.	3.845	6187.	55913.	26300.	4.981	8016.	55821.	32300.	6.117	9845.	55781.
20400.	3.864	6218.	55891.	26400.	5.000	8047.	55824.	32400.	6.136	9876.	55736.
20500.	3.883	6248.	55851.	26500.	5.019	8077.	55820.	32500.	6.155	9906.	55704.
20600.	3.902	6279.	55849.	26600.	5.038	8108.	55815.	32600.	6.174	9936.	55889.
20700.	3.920	6309.	55849.	26700.	5.057	8138.	55810.	32700.	6.193	9967.	55879.
20800.	3.939	6340.	55852.	26800.	5.076	8169.	55808.	32800.	6.212	9997.	55873.
20900.	3.958	6370.	55854.	26900.	5.095	8199.	55814.	32900.	6.231	10028.	55857.
21000.	3.977	6401.	55851.	27000.	5.114	8230.	55811.	33000.	6.250	10058.	55859.
21100.	3.996	6431.	55851.	27100.	5.133	8260.	55813.	33100.	6.269	10089.	55820.
21200.	4.015	6462.	55847.	27200.	5.152	8291.	55823.	33200.	6.288	10119.	55802.
21300.	4.034	6492.	55874.	27300.	5.170	8321.	55817.	33300.	6.307	10150.	55807.
21400.	4.053	6523.	55906.	27400.	5.189	8352.	55815.	33400.	6.326	10180.	55863.
21500.	4.072	6553.	55961.	27500.	5.208	8382.	55809.	33500.	6.345	10211.	55844.
21600.	4.091	6584.	55876.	27600.	5.227	8412.	55812.	33600.	6.364	10241.	55821.
21700.	4.110	6614.	55858.	27700.	5.246	8443.	55748.	33700.	6.383	10272.	55800.
21800.	4.129	6645.	55848.	27800.	5.265	8473.	55748.	33800.	6.402	10302.	55878.
21900.	4.148	6675.	55845.	27900.	5.284	8504.	55742.	33900.	6.420	10333.	55859.
22000.	4.167	6706.	55843.	28000.	5.303	8534.	55766.	34000.	6.439	10363.	55847.
22100.	4.186	6736.	55842.	28100.	5.322	8565.	55780.	34100.	6.458	10394.	55847.
22200.	4.205	6767.	55845.	28200.	5.341	8595.	55767.	34200.	6.477	10424.	55873.
22300.	4.223	6797.	55846.	28300.	5.360	8626.	55776.	34300.	6.496	10455.	55873.
22400.	4.242	6828.	55853.	28400.	5.379	8656.	55759.	34400.	6.515	10485.	55819.
22500.	4.261	6858.	55856.	28500.	5.398	8687.	55813.	34500.	6.534	10516.	55819.
22600.	4.280	6888.	55864.	28600.	5.417	8717.	55787.	34600.	6.553	10546.	56038.
22700.	4.299	6919.	55867.	28700.	5.436	8748.	55744.	34700.	6.572	10577.	56046.
22800.	4.318	6949.	55863.	28800.	5.455	8778.	55743.	34800.	6.591	10607.	56043.
22900.	4.337	6980.	55857.	28900.	5.473	8809.	55760.	34900.	6.610	10638.	56049.
23000.	4.356	7010.	55851.	29000.	5.492	8839.	55761.	35000.	6.629	10668.	56061.
23100.	4.375	7041.	55844.	29100.	5.511	8870.	55747.	35100.	6.648	10698.	56067.
23200.	4.394	7071.	55849.	29200.	5.530	8900.	55822.	35200.	6.667	10729.	56072.
23300.	4.413	7102.	55838.	29300.	5.549	8931.	55843.	35300.	6.686	10759.	56072.
23400.	4.432	7132.	55838.	29400.	5.568	8961.	55864.	35400.	6.705	10790.	56072.
23500.	4.451	7163.	55836.	29500.	5.587	8992.	55865.	35500.	6.724	10820.	56072.
23600.	4.470	7193.	55835.	29600.	5.606	9022.	55865.	35600.	6.743	10851.	56072.
23700.	4.489	7224.	55839.	29700.	5.625	9053.	55875.	35700.	6.762	10881.	56072.
23800.	4.508	7254.	55828.	29800.	5.644	9083.	55858.	35800.	6.781	10912.	56072.
23900.	4.527	7285.	55824.	29900.	5.663	9114.	55815.	35900.	6.800	10942.	56072.
24000.	4.545	7315.	55819.	30000.	5.682	9144.	55807.	36000.	6.819	10973.	56072.

Table 1.--(Continued)

feet	miles	meters	gammas	feet	miles	meters	gammas
35200.	6.067	10729.	56802.	39900.	7.557	12162.	56231.
35250.	6.070	10744.	56848.	40000.	7.576	12192.	56186.
35300.	6.080	10759.	56900.	40100.	7.595	12222.	56137.
35350.	6.095	10775.	56946.	40200.	7.614	12253.	56097.
35400.	6.705	10790.	57143.	40300.	7.633	12283.	56052.
35450.	6.714	10805.	57268.	40400.	7.652	12314.	55947.
35500.	6.723	10820.	57324.	40500.	7.670	12344.	55924.
35550.	6.733	10836.	57281.	40550.	7.689	12360.	56012.
35600.	6.742	10851.	57132.	40600.	7.689	12375.	56271.
35650.	6.752	10866.	56925.	40650.	7.699	12390.	56632.
35700.	6.761	10881.	56724.	40700.	7.708	12405.	56959.
35750.	6.771	10897.	56508.	40750.	7.718	12421.	57236.
35800.	6.780	10912.	56449.	40800.	7.727	12436.	57391.
35850.	6.790	10927.	56361.	40850.	7.737	12451.	57340.
35900.	6.799	10942.	56293.	40900.	7.746	12466.	57081.
35950.	6.809	10958.	56244.	40950.	7.756	12482.	56809.
36000.	6.818	10973.	56192.	41000.	7.765	12497.	56581.
36050.	6.828	10988.	56147.	41050.	7.775	12512.	56441.
36100.	6.837	11003.	56113.				
36150.	6.847	11019.	56086.				
36200.	6.856	11034.	56065.				
36250.	6.866	11049.	56046.				
36300.	6.875	11064.	56037.				
36350.	6.884	11079.	56036.				
36400.	6.894	11095.	56042.				
36450.	6.903	11110.	56047.				
36500.	6.913	11125.	56039.				
36600.	6.932	11156.	55990.				
36700.	6.951	11186.	55938.				
36800.	6.970	11217.	55891.				
36900.	6.989	11247.	55853.				
37000.	7.008	11278.	55825.				
37100.	7.027	11308.	55804.				
37200.	7.045	11339.	55787.				
37300.	7.064	11369.	55771.				
37400.	7.083	11400.	55761.				
37500.	7.102	11430.	55765.				
37600.	7.121	11460.	55806.				
37700.	7.140	11491.	55871.				
37800.	7.159	11521.	55921.				
37900.	7.178	11552.	55983.				
38000.	7.197	11582.	56042.				
38100.	7.216	11613.	56208.				
38200.	7.235	11643.	56349.				
38300.	7.254	11674.	56418.				
38400.	7.273	11704.	56771.				
38500.	7.292	11735.	56773.				
38600.	7.311	11765.	56595.				
38700.	7.330	11796.	56460.				
38800.	7.348	11826.	56441.				
38900.	7.367	11857.	56387.				
39000.	7.386	11887.	56333.				
39100.	7.405	11918.	56290.				
39200.	7.424	11948.	56257.				
39300.	7.443	11979.	56242.				
39400.	7.462	12009.	56234.				
39500.	7.481	12040.	56225.				
39600.	7.500	12070.	56216.				
39700.	7.519	12101.	56216.				
39800.	7.538	12131.	56247.				

Table 1.--(Continued)

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