WOODS HOLE OCEANOGRAPHIC INSTITUTION
Woods Hole, Massachusetts

REFERENCE NO. 71-68

HUDSON '70
GRAVITY OBSERVATIONS
62.9°S - 57.5°N
ALONG 150°W

by

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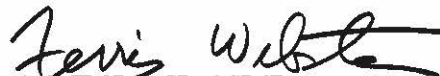
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TECHNICAL REPORT

Approved for Distribution _____

Ferris Webster, Chairman
Department of Physical Oceanography

ABSTRACT

To provide geoidal topography over the world oceans, a radar altimeter carried by earth satellite is planned. Ground truth calibration will be provided by a grid comprised of the equatorial belt and meridional traverses along the 30^OW and 150^OW meridians. Ground truth topography is derived from gravity values measured along these traverses. This report presents the free air gravity values and the computed free air anomalies obtained from 62.9^OS to 57.5^ON along the 150^OW meridian.

INTRODUCTION

Given sufficiently widespread observations of the geo-potential topography of the sea surface and knowing the internal distribution of water density, it should then be possible to compute for all depths the geopotential slopes of interior isobaric surfaces and the corresponding values of the global geostrophic transport of mass and heat by the horizontal pressure gradient fields in the ocean.

The necessary measurements of sea-surface slopes can be made with the GEON (Gyro Erected Optical Navigation) system, but it seems possible and more efficient to use an orbiting altimeter.

A satellite altimeter in near-earth polar orbit would provide a coarse-grained topographic map of the sea surface every 12 hours and examine every square degree of the ocean surface about once a week. A time series of such maps would provide evidence of change in the oceans and may reveal unexpected phenomena in the sea for intensive scientific observation.

For purposes of planning and testing, the NASA has altered the payload of the GEOS-C geodetic satellite to accommodate the first oceanographic experiment, i.e., permitting one bay of that satellite to contain a radar altimeter for operation over selected ocean areas where ground truth is available. Direct measurements of ground truth gravity and subsequent determination of geoidal topography has been the concern of a W.H.O.I./ONR project.

Figure 1. Hudson '70, Phase V & VI
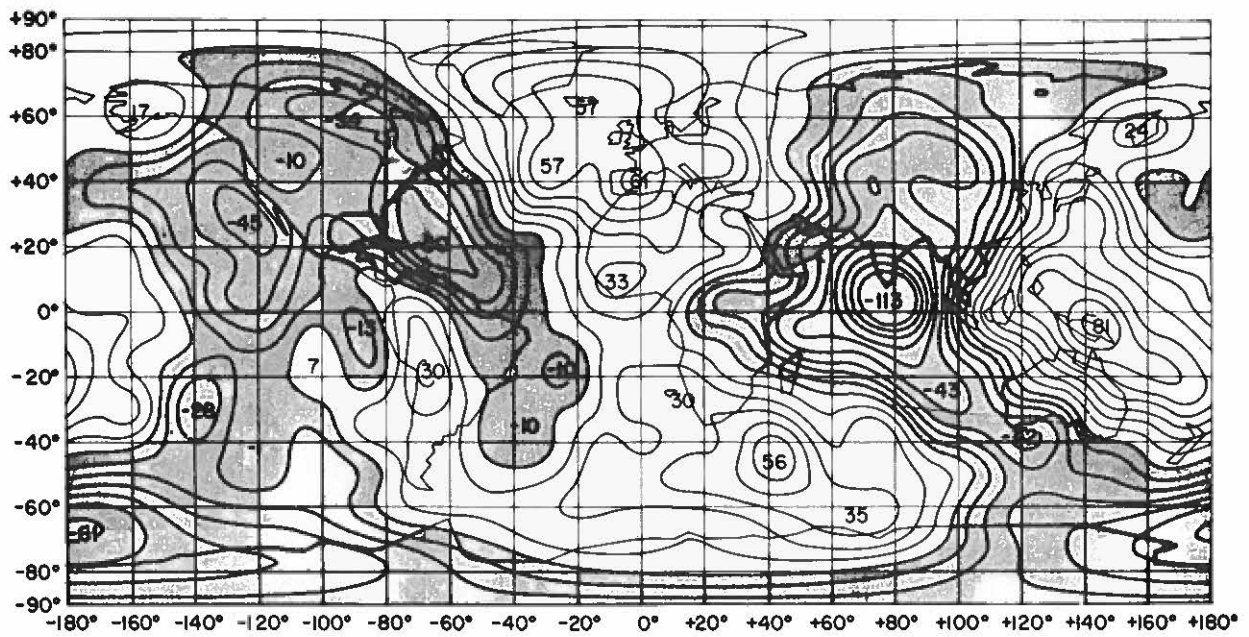
Figure 2. Geoid heights in meters of the new combination solution
corresponding to a reference ellipsoid of flattening
f = 1/298.255.
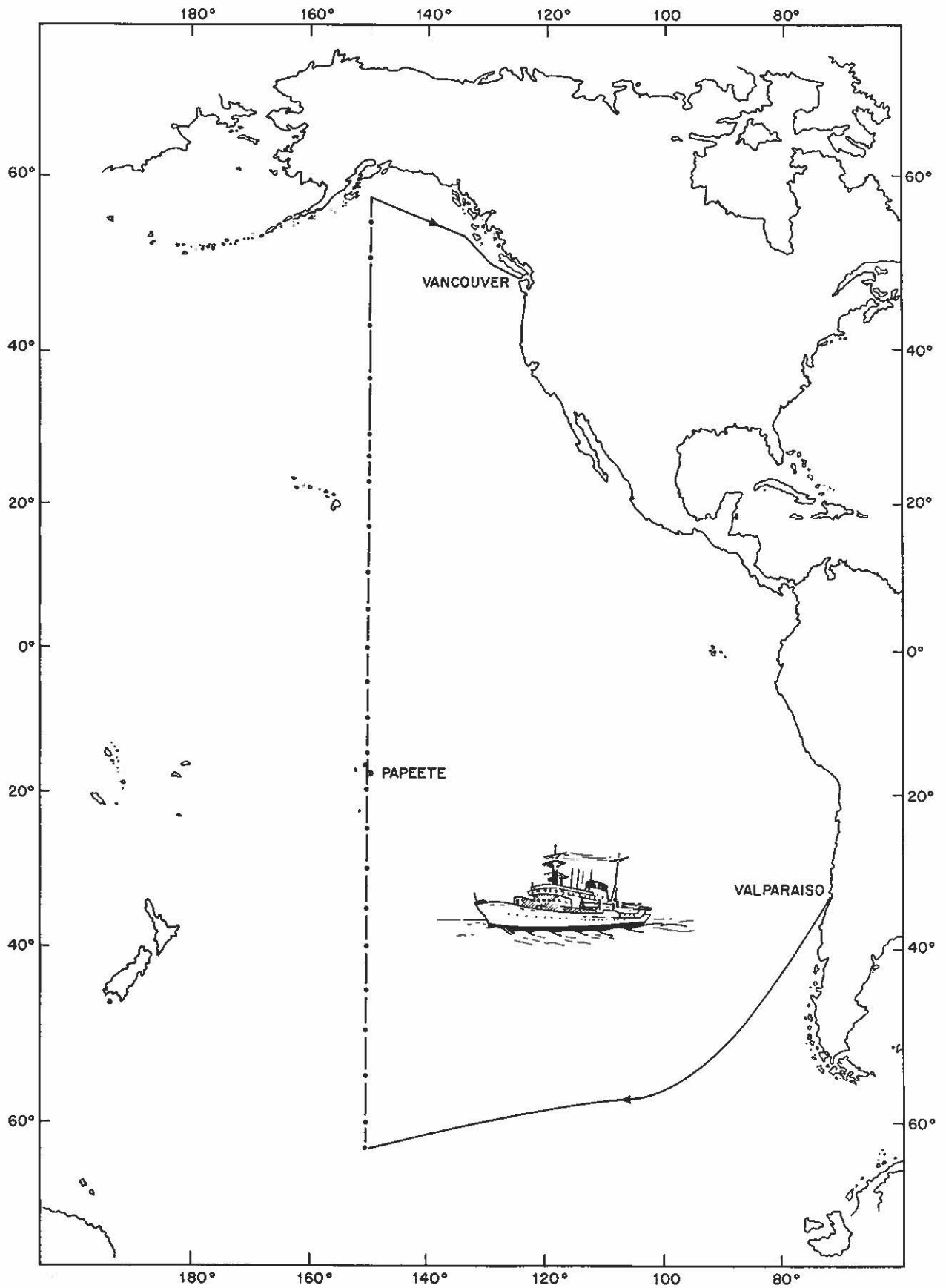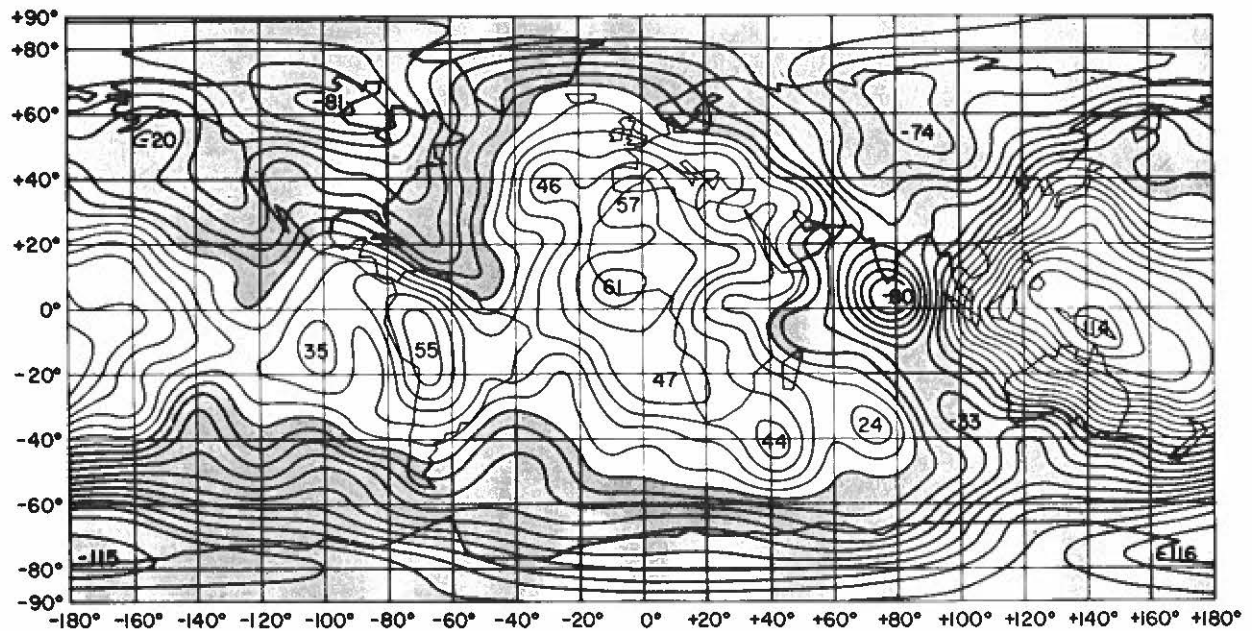

Figure 3. Geoid heights in meters of the new combination solution
corresponding to a reference ellipsoid of flattening
f = 1/299.67.
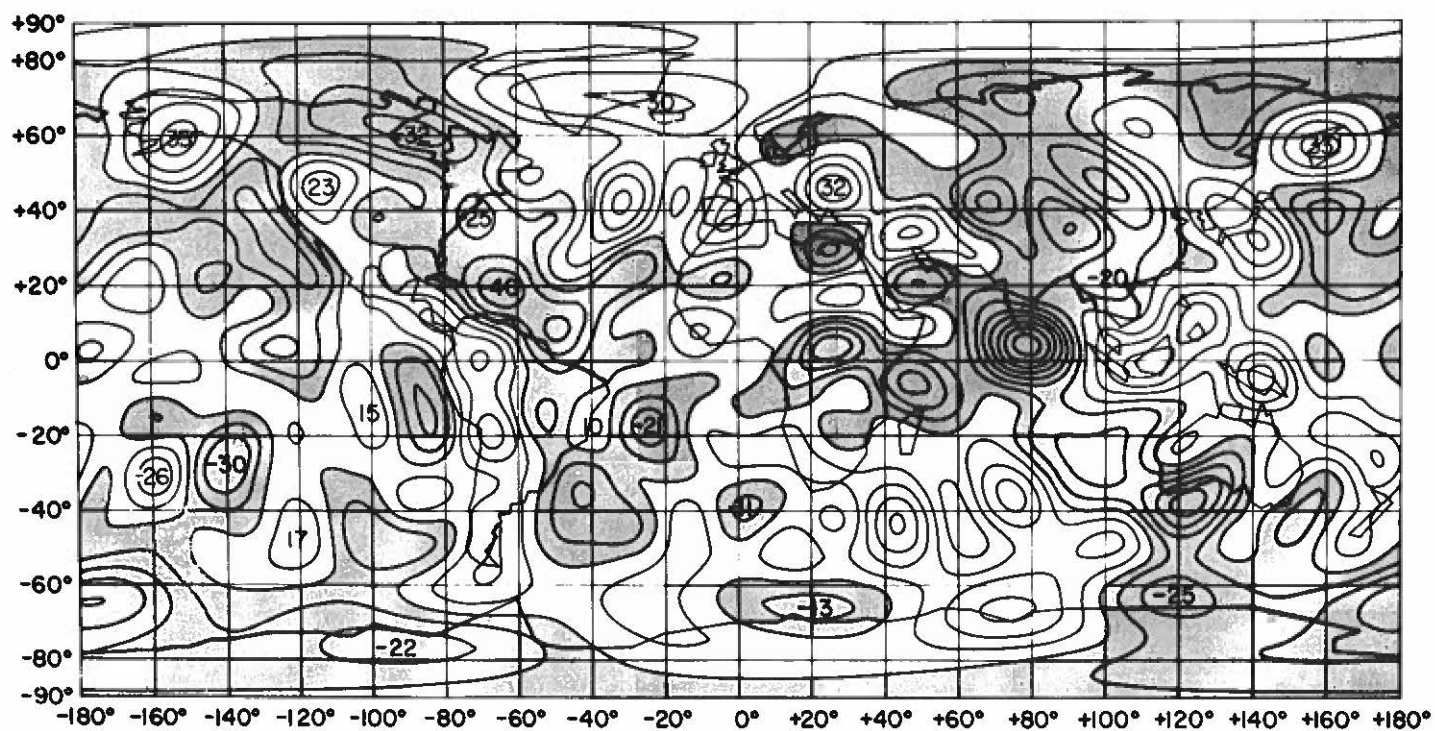
Figure 4.   Gravity anomalies with respect to the best fitting ellipsoid
f = 1/298.255 from the adopted solution (10-mgal contours).

Through the cooperation of the Canadian Bureau of Energy, Mines and Resources, it was possible in the spring of 1970 to run the CSS Hudson on a gravimetric arc along the 150°W meridian from 62.9°S to 57.5°N latitude. A circumnavigation of the earth on the equator is underway by RV Chain and Atlantis II, and it is planned to run a section along the 30° west meridian from the Weddell Sea to Greenland to complete the ground truth grid.

This report is to present the data obtained during the Hudson '70 cruise of the CSS Hudson, cruise #69-050, phases V and VI. See Figure 1.

These data were obtained with an Ambac Vibrating String Accelerometer (VSA) Gravimeter installed on an Anshultz stable platform.

Drift of the meter was corrected at the rate of -0.1 mgl per day as averaged linearly over the 60-day cruise and shown to be linear from base gravity values measured at three points on the cruise. The Eötvös correction was determined by satellite navigation methods.

Figures 2, 3, and 4 are charts made from satellite track observations providing the low order harmonics of the geoid. These charts are shown for reference through the courtesy of the Smithsonian Astrophysical Observatory.

Table I is the free air gravity values derived from observed values on which Eötvös and gravimeter drift corrections have been made.

Table II is the free air anomaly values with reference to the 1930 International Formula gravity values. (Negative numbers in italics.)

Table III is the free air anomaly values with reference to the 1964 formula adopted by the IAU. (Negative values in italics.)

NOTE 1: Certain values marked (†) were derived from the analog backup record or are interpolations made from the best data available other than the digital data acquisition system.

NOTE 2: One section between 22°N and 43°N has been corrected for a VSA offset. The correction was determined using data taken simultaneously with an Askania gravimeter.

Table I

05	00	.087	.088	.088	.089	.090	.090	.090	.089	.089	.089
	10	.089	.089	.089	.088	.088	.087	.087	.086	.085	.085
	20	.085	.086	.085	.086	.086	.086	.087	.087	.087	.087
	30	.087	.087	.085	.086	.087	.087	.088	.088	.089	.090
	40	.091	.091	.092	.093	.093	.095	.096	.097	.098	.099
	50	.100	.102	.100	.100	.101	.099	.100	.100	.100	.100
06	00	.100	.100	.101	.101	.101	.101	.101	.101	.101	.101
	10	.100	.100	.100	.100	.101	.101	.101	.100	.100	.100
	20	.100	.099	.099	.100	.100	.101	.102	.103	.106	.109
	30	.111	.111	.110	.109	.109	.109	.109	.109	.110	.112
	40	.112	.113	.114	.114	.116	.116	.117	.118	.119	.119
	50	.120	.121	.122	.123	.123	.123	.123	.123	.123	.116
07	00	.117	.117	.116	.117	.117	.115	.115	.115	.114	.112
	10	.113	.111	.114	.115	.118	.120	.124	.128	.132	.136
	20	.138	.138	.137	.135	.133	.131	.129	.134	.134	.134
	30	.135	.133	.133	.135	.136	.138	.139	.140	.141	.142
	40	.142	.143	.142	.142	.144	.144	.145	.146	.145	.146
	50	.147	.146	.146	.148	.150	.152	.156	.158	.159	.158
08	00	.156	.154	.155	.154	.154	.154	.154	.155	.153	.153
	10	.152	.150	.149	.149	.149	.148	.148	.148	.149	.149
	20	.149	.149	.148	.149	.148	.148	.148	.148	.147	.148
	30	.148	.149	.149	.151	.151	.152	.154	.156	.159	.160
	40	.162	.162	.158	.157	.156	.155	.153	.151	.150	.149
	50	.148	.150	.150	.150	.150	.152	.152	.152	.154	.155
09	00	.157	.157	.159	.160	.161	.161	.162	.163	.164	.164
	10	.165	.166	.167	.169	.171	.173	.176	.179	.183	.184
	20	.186	.187	.188	.189	.188	.188	.188	.188	.188	.187
	30	.187	.188	.188	.188	.189	.189	.189	.187	.187	.187
	40	.188	.188	.188	.189	.189	.190	.190	.190	.190	.189
	50	.187	.186	.186	.186	.186	.187	.188	.189	.190	.190
10	00	.191	.192	.192	.191	.191	.190	.190	.189	.189	.191

15	00	.382	.383	.382	.383	.384	.384	.384	.385	.386	.388
	10	.388	.389	.391	.392	.393	.395	.396	.396	.397	.397
	20	.398	.399	.399	.399	.399	.400	.401	.401	.402	.403
	30	.404	.405	.406	.406	.408	.409	.409	.411	.412	.413
	40	.414	.415	.416	.417	,419	.418	.421	.422	.424	.425
	50	.425	.428	.429	.430	.431	.432	.433	.434	.432	.432
16	00	.433	.434	.434	.435	.436	.436	.436	.437	.437	.437
	10	.436	.436	.435	.435	.435	.433	.432	.431	.432	.431
	20	.438	.439	.441	.442	.445	.448	.450	.453	.458	.462
	30	.465	.466	.466	.467	.467	.466	.466	.467	.466	.465
	40	.465	.465	.465	.465	.465	.465	.469	.469	.471	.470
	50	.471	.471	.471	.472	.473	.473	.474	.474	.476	.476
17	00	.477	.477	.478	.477	.479	.480	.481	.482	.482	.481
	10	.482	.482	.483	.485	.486	.489	.490	.491	.493	.495
	20	.496	.498	.500	.501	.502	.502	.504	.505	.505	.506
	30	.508	.510	.511	.511	.512	.515	.515	.517	.518	.518
	40	.518	.518	.517	.517	.515	.514	.515	.516	.517	.520
	50	.522	.524	.524	.525	.527	.527	.527	.530	.531	.532
13	00	.534	.534	.535	.537	.537	.538	.538	.539	.540	.540
	10	.542	.543	.544	.544	.546	.546	.547	.548	.549	.550
	20	.552	.553	.554	.556	.554	.557	.557	.558	.555	.557
	30	.556	.557	.558	.559	.561	.561	.563	.563	.564	.564
	40	.565	.567	.567	.567	.569	.569	.569	.570	.571	.572
	50	.572	.573	.568	.568	.569	.569	.570	.571	.572	.573
19	00	.573	.574	.574	.576	.577	.578	.579	.581	.582	.583
	10	.585	.586	.587	.588	.589	.592	.594	.599	.600	.602
	20	.603	.604	.605	.606	.608	.608	.609	.611	.613	.614
	30	.614	.611	.614	.614	.614	.616	.617	.617	.618	.620
	40	.620	.624	.625	.626	.628	.629	.630	.632	.633	.636
	50	.637	.638	.639	.641	.641	.643	.644	.645	.646	.647
20	00	.648	.649	.649	.650	.651	.652	.651	.651	.652	.653

25 00	.949	.947	.948	.949	.952	.954	.955	.955	.957	.959
10	.959	.960	.960	.962	.964	.968	.972	.975	.978	.980
20	.981	.980	.979	.979	.980	.982	.926	.991	.996	.998
30	.999	.997	.993	.990	.988	.988	.988	.987	.988	.988
40	978.988	.989	.991	.992	.991	.992	.993	.994	.997	***
50	979.001	.002	.004	.007	.009	.010	.012	.012	.014	.015
26 00	.016	.017	.018	.019	.021	.022	.023	.023	.025	.026
10	.028	.029	.030	.031	.033	.035	.037	.037	.038	.039
20	.039	.042	.044	.045	.045	.047	.048	.050	.052	.054
30	.055	.057	.058	.060	.061	.062	.062	.064	.065	.066
40	.069	.069	.070	.071	.072	.073	.075	.077	.078	.081
50	.081	.082	.085	.086	.089	.090	.090	.092	.093	.093
27 00	.096	.097	.098	.100	.101	.103	.104	.104	.104	.106
10	.105	.106	.107	.108	.108	.110	.112	.112	.112	.112
20	.113	.115	.116	.117	.118	.120	.121	.121	.122	.124
30	.125	.125	.126	.128	.133	.134	.134	.135	.136	.138
40	.139	.140	.142	.143	.144	.146	.148	.150	.151	.151
50	.152	.154	.155	.157	.160	.161	.162	.162	.165	.166
28 00	.168	.168	.169	.169	.170	.173	.173	.174	.175	.177
10	.177	.178	.179	.180	.181	.180	.181	.182	.183	.184
20	.185	.187	.189	.194	.194	.194	.195	.196	.196	.198
30	.200	.202	.204	.206	.206	.208	.209	.211	.213	.214
40	.215	.217	.217	.219	.220	.221	.223	.224	.226	.227
50	.230†	.233†	.236†	.238	.240	.242	.242	.243	.243	.244
29 00	.244	.245	.247	.248	.250	.251	.254	.256	.258	.260
10	.262	.262	.266	.268	.270	.271	.271	.274	.276	.278
20	.279	.281	.282	.283	.284	.286	.289	.292	.294	.296
30	.298	.300	.303	.305	.309	.312	.316	.318	.321	.321
40	.320	.319	.315	.314	.314	.312	.311	.311	.311	.312
50	.315	.317	.318	.318	.314	.312	.307	.304	.301	.301
30 00	.299	.299	.303	.306	.314	.320	.328	.334	.342	.345

35	00	.719	.719	.722	.723	.725	.726	.727	.728	.729	.732
	10	.734	.736	.738	.740	.741	.742	.742	.745	.747	.748
	20	.750	.752	.754	.755	.757	.758	.758	.760	.761	.762
	30	.762	.763	.765	.766	.768	.775	.776	.778	.780	.780
	40	.782	.784	.784	.785	.787	.788	.790	.792	.795	.797
	50	.799	.800	.802	.803	.804	.806	.808	.811	.812	.813
36	00	.813	.815	.815	.816	.817	.819	.820	.821	.823	.824
	10	.831	.832	.835	.837	.837	.839	.839	.839	.839	.839
	20	.840	.842	.843	.845	.846	.846	.846	.850	.849	.848
	30	.847	.847	.844	.848	.851	.854	.854	.854	.854	.853
	40	.854	.856	.858	.860	.862	.864	.865	.866	.868	.869
	50	.871	.872	.873	.874	.875	.877	.880	.884	.889	.893
37	00	.898	.901	.908	.911	.905	.905	.905	.907	.908	.908
	10	.910	.911	.913	.917	.918	.917	.919	.920	.920	.921
	20	.923	.923	.919	.918	.920	.920	.922	.922	.924	.926
	30	.929	.930	.932	.935	.938	.939	.940	.941	.942	.945
	40	.948	.949	.952	.954	.956	.958	.960	.960	.959	.960
	50	.961	.961	.964	.965	.965	.966	.965	.967	.966	.967
38	00	.972	.973	.973	.972	.973	.972	.970	.970	.969	.969
	10	979.971	.971	.971	.970	.974	.978	.983	.988	.992	.998
	20	980.003	.009	.014	.017	.017	.020	.023	.025	.026	.027
	30	.029	.030	.031	.033	.035	.038	.038	.039	.041	.042
	40	.041	.043	.044	.044	.041	.037	.036	.034	.034	.033
	50	.037	.040	.045	.046	.049	.053	.057	.060	.062	.066
39	00	.068	.074	.077	.079	.082	.084	.083	.083	.080	.079
	10	.077	.074	.069	.069	.070	.071	.074	.075	.077	.081
	20	.085	.088	.094	.095	.098	.099	.100	.104	.106	.108
	30	.110	.113	.116	.119	.120	.119	.118	.117	.115	.116
	40	.116	.119	.122	.124	.127	.128	.129	.130	.132	.132
	50	.132	.132	.132	.134	.134	.133	.132	.132	.132	.132
40	00	.132	.134	.136	.138	.140	.142	.144	.147	.149	.150

45	00	.610	.612	.613	.615	.616	.618	.619	.621	.622	.623
	10	.624	.626	.628	.629	.631	.633	.634	.638	.639	.640
	20	.642	.643	.644	.646	.647	.649	.650	.652	.653	.654
	30	.655	.656	.656	.658	.658	.661	.662	.663	.664	.666
	40	.667	.670	.669	.671	.673	.674	.676	.678	.679	.682
	50	.682	.685	.686	.688	.690	.691	.693	.697	.699	.701
46	00	.702	.705	.706	.709	.711	.708	.711	.713	.715	.717
	10	.718	.720	.721	.723	.724	.726	.728	.729	.731	.732
	20	.733	.734	.740	.741	.742	.743	.744	.746	.747	.749
	30	.750	.752	.753	.756	.758	.760	.762	.759	.762	.764
	40	.765	.768	.770	.773	.774	.776	.777	.778	.779	.780
	50	.782	.783	.784	.786	.786	.787	.788	.790	.791	.793
47	00	.793	.794	.798	.800	.802	.803	.805	.808	.809	.810
	10	.813	.815	.819	.822	.825	.828	.829	.827	.827	.829
	20	.826	.827	.830	.831	.837	.842	.846	.849	.850	.849
	30	.848	.847	.847	.847	.847	.848	.848	.849	.850	.852
	40	.859	.861	.862	.866	.869	.872	.875	.874	.873	.871
	50	.870	.872	.875	.879	.884	.887	.890	.895	.898	.900
48	00	.904	.906	.909	.911	.913	.912	.913	.912	.912	.911
	10	.911	.911	.910	.909	.911	.913	.916	.916	.918	.918
	20	.919	.920	.922	.923	.926	.927	.930	.931	.933	.936
	30	.939	.942	.944	.945	.947	.949	.950	.951	.952	.953
	40	.954	.956	.958	.959	.961	.963	.965	.967	.968	.969
	50	.970	.974	.975	.977	.978	.980	.982	.984	.986	.987
49	00	980.990	.993	.994	.994	.998	.999	.**1	.**3	.**4	.**6
	10	981.000	.001	.002	.004	.004	.006	.008	.011	.013	.014
	20	.017	.019	.020	.022	.024	.025	.025	.027	.032	.033
	30	.034	.037	.038	.040	.041	.043	.045	.046	.048	.049
	40	.051	.052	.053	.053	.054	.054	.055	.057	.057	.058
	50	.057	.060	.061	.063	.066	.067	.068	.069	.071	.072
50	00	.074	.077	.078	.080	.084	.087	.089	.091	.093	.096

55	00	.540	.544	.549	.555	.565	.566	.564	.560	.556	.552
	10	.551	.551	.551	.551	.551	.553	.553	.554	.555	.557
	20	.558	.559	.560	.561	.562	.564	.564	.568	.569	.570
	30	.570	.572	.572	.573	.572	.571	.570	.568	.567	.565
	40	.563	.562	.562	.562	.562	.562	.563	.563	.563	.564
	50	.564	.565	.566	.567	.569	.570	.571	.572	.573	.573
56	00	.574	.574	.573	.572	.570	.568	.567	.566	.565	.566
	10	.568	.569	.572	.575	.577	.578	.579	.579	.576	.576
	20	.575	.574	.574	.573	.573	.573	.572	.572	.572	.573
	30	.573	.574	.575	.575	.576	.578	.580	.582	.584	.587
	40	.590	.593	.597	.603	.608	.613	.619	.624	.632	.637
	50	.645	.651	.660	.666	.675	.680	.687	.690	.695	.699
57	00	.703	.709	.715	.719	.724	.727	.736	.738	.744	.748
	10	.750	.750	.751	.752	.754	.757	.761	.765	.769	.774
	20	.780	.782	.784	.789	.794	.795	.794	.796	.798	.801
	30	.806									

	.084	.083	.083	.082	.082	.082	.078	.078	.079	.080
05 00	.084	.083	.083	.082	.082	.082	.078	.078	.079	.080
10	.081	.083	.084	.086	.088	.090	.093	.095	.097	.099
20	.102	.103	.105	.106	.108	.111	.114	.117	.120	.123
30	.125	.126	.123	.119	.115	.109	.103	.096	.089	.083
40	.079	.075	.073	.072	.070	.072	.075	.080	.083	.087
50	.092	.094	.097	.099	.101	.102	.104	.105	.107	.108
06 00	.109	.110	.111	.112	.114	.115	.116	.116	.115	.113
10	.111	.109	.109	.110	.110	.112	.115	.118	.120	.121
20	.122	.121	.120	.119	.117	.116	.114	.112	.111	.112
30	.110	.110	.110	.110	.112	.114	.116	.118	.120	.122
40	.123	.123	.124	.123	.123	.122	.121	.119	.119	.118
50	.117	.115	.115	.116	.117	.117	.117	.117	.116	.116
07 00	.116	.116	.116	.115	.116	.115	.115	.114	.113	.113
10	.114	.113	.113	.114	.113	.113	.114	.114	.114	.115
20	.116	.117	.118	.121	.123	.125	.126	.127	.127	.127
30	.126	.125	.127	.127	.127	.127	.128	.128	.129	.129
40	.130	.130	.130	.130	.131	.131	.132	.131	.131	.131
50	.131	.131	.131	.132	.132	.133	.133	.133	.133	.134
08 00	.134	.135	.135	.135	.134	.134	.134	.134	.139	.140
10	.141	.142	.141	.141	.141	.141	.142	.146	.147	.147
20	.149	.150	.151	.151	.152	.152	.153	.153	.154	.155
30	.155	.157	.158	.158	.158	.158	.159	.160	.160	.166
40	.167	.168	.168	.169	.169	.169	.169	.168	.168	.168
50	.168	.168	.168	.167	.167	.167	.165	.165	.165	.165
09 00	.164	.163	.163	.163	.163	.162	.161	.161	.161	.161
10	.161	.160	.160	.160	.160	.161	.162	.162	.163	.165
20	.165	.164	.164	.166	.166	.169	.176	.185	.196	.210
30	.231	.243	.255	.265	.270	.267	.258	.242	.225	.217
40	.208	.203	.199	.199	.204	.211	.218	.215†	.212	.209
50	.208	.207	.207	.209	.209	.208	.206	.204	.202	.201
10 00	.199	.197	.195	.194	.192	.192	.192	.191	.191	.191

15	00	.371	.372	.372	.373	.374	.375	.378	.380	.382	.383
	10	.383	.386	.388	.389	.391	.393	.395	.396	.397	.399
	20	.401	.401	.401	.401	.403	.404	.404	.404	.406	.407
	30	.409	.412	.417	.422	.429	.433	.432	.429	.425	.419
	40	.417	.415	.415	.416	.417	.420	.421	.420	.420	.420
	50	.420	.420	.420	.421	.421	.421	.421	.422	.423	.424
16	00	.425	.426	.428	.429	.429	.430	.431	.432	.433	.431
	10	.432	.433	.433	.432	.432	.433	.434	.436	.435	.436
	20	.437	.437	.436	.443	.443	.443	.443	.443	.444	.444
	30	.443	.443	.444	.444	.446	.449	.451	.452	.453	.455
	40	.458	.461	.462	.462	.464	.463	.461	.460	.460	.461
	50	.461	.462	.463	.464	.465	.466	.468	.469	.471	.471
17	00	.472	.472	.473	.472	.472	.472	.473	.476	.479	.483
	10	.494	.501	.508	.509	.506	.504	.503	.505	.507	.509
	20	.513	.516	.519	.523	.528	.533	.540	.548	.554	.558
	30	.560	.561	.561	.560	.560	.551	.550	.547	.545	.542
	40	.540	.538	.536	.533	.531	.531	.531	.532	.531	.530
	50	.530	.528	.527	.525	.523	.523	.522	.523	.523	.536
18	00	.538	.539	.542	.557	.550	.557	.562	.558	.550	.537
	10	.527	.520	.517	.516	.517	.518	.520	.521	.523	.525
	20	.527	.529	.531	.532	.533	.538	.538	.540	.542	.544
	30	.546	.549	.551	.555	.558	.560	.560	.559	.559	.559
	40	.559	.561	.566	.567	.569	.569	.570	.565	.565	.565
	50	.567	.572	.576	.577	.574	.570	.568	.568	.568	.568
19	00	.570	.573	.577	.580	.583	.590	.591	.591	.588	.587
	10	.584	.583	.583	.584	.585	.586	.588	.591	.596	.604
	20	.609	.614	.617	.618	.615	.611	.608	.605	.605	.604
	30	.605	.604	.606	.607	.607	.609	.611	.615	.618	.622
	40	.625	.626	.625	.625	.624	.622	.622	.620	.620	.620
	50	.620	.620	.620	.621	.621	.622	.623	.625	.626	.627
20	00	.628	.629	.629	.625	.625	.626	.628	.627	.627	.627

25	00	.952	.953	.955	.956	.958	.960	.962	.965	.966	.969
	10	.970	.971	.971	.971	.971	.971	.971	.972	.973	.975
	20	.976	.978	.980	.982	.983	.986	.988	.989	.990	.993
	30	978.994	.996	.998	.**1	.**4	.**5	.**7	.*10	.*11	.*13
	40	979.015	.017	.019	.020	.019	.018	.016	.015	.014	.015
	50	.016	.017	.018	.019	.020	.022	.023	.025	.027	.029
26	00	.031	.033	.035	.036	.038	.041	.042	.044	.045	.047
	10	.049	.049	.050	.052	.052	.054	.055	.057	.058	.059
	20	.060	.062	.063	.064	.065	.066	.066	.067	.068	.068
	30	.070	.071	.072	.073	.074	.074	.075	.077	.077	.079
	40	.080	.080	.082	.082	.082	.084	.083	.083	.084	.084
	50	.084	.085	.086	.087	.089	.090	.091	.093	.094	.096
27	00	.098	.098	.098	.101	.102	.103	.103	.105	.110	.113
	10	.116	.118	.120	.123	.125	.127	.134	.135	.137	.137
	20	.138	.140	.140	.141	.142	.143	.145	.146	.147	.148
	30	.150	.151	.151	.151	.153	.155	.156	.158	.158	.162
	40	.164	.166	.169	.170	.172	.173	.176	.177	.177	.175
	50	.174	.172	.174	.177	.180	.184	.189	.196	.202	.208
28	00	.215	.220	.224	.226	.225	.221	.215	.209	.203	.192
	10	.188	.183	.182	.179	.178	.178	.179	.180	.181	.183
	20	.185	.188	.194	.198	.203	.207	.212	.216	.220	.225
	30	.229	.233	.239	.242	.245	.246	.248	.249	.249	.249
	40	.247	.246	.244	.243	.245	.246	.248	.248	.250	.251
	50	.253	.253	.254	.256	.258	.259	.261	.265	.267	.268
29	00	.269	.269	.270	.271	.271	.272	.274	.276	.278	.280
	10	.281	.282	.281	.279	.279	.278	.277	.276	.276	.276
	20	.277	.280	.284	.288	.294	.300	.305	.312	.316	.320
	30	.325	.327	.328	.327	.326	.325	.323	.322	.320	.318
	40	.316	.316	.316	.318	.321	.322	.323	.324	.324	.326
	50	.329	.332	.334	.338	.339	.341	.343	.344	.345	.346
30	00	.348	.348	.349	.351	.353	.356	.358	.361	.362	.364

35	00	.743	.745	.746	.747	.750	.752	.753	.754	.756	.761
	10	.759	.762	.763	.764	.765	.767	.767	.769	.771	.771
	20	.773	.775	.775	.777	.779	.779	.780	.782	.783	.784
	30	.786	.787	.792	.793	.795	.796	.799	.800	.805	.809
	40	.811	.813	.813	.813	.812	.811	.810	.812	.812	.813
	50	.816	.816	.818	.819	.820	.823	.825	.826	.826	.827
36	00	.830	.830	.834	.836	.837	.839	.841	.842	.843	.843
	10	.844	.846	.849	.850	.852	.853	.857	.858	.860	.860
	20	.862	.863	.865	.866	.866	.856	.862	.871	.873	.875
	30	.876	.878	.876	.877	.878	.879	.879	.881	.883	.883
	40	.885	.887	.889	.889	.890	.892	.893	.894	.894	.896
	50	.898	.898	.899	.901	.902	.902	.905	.905	.906	.907
37	00	.906	.907	.910	.911	.911	.913	.919	.919	.919	.920
	10	.922	.924	.924	.926	.929	.930	.931	.931	.934	.935
	20	.937	.938	.939	.940	.942	.942	.944	.941	.942	.943
	30	.945	.946	.946	.950	.949	.950	.952	.953	.954	.954
	40	.958	.962	.963	.966	.966	.969	.972	.975	.978	.980
	50	.982	.981	.984	.984	.986	.989	.994	.995	.997	.998
38	00	979.999	.**1	.**2	.**4	.**5	.**7	.**9	.*10	.*13	.*15
	10	980.016	.017	.018	.020	.021	.022	.023	.024	.026	.029
	20	.029	.031	.032	.034	.036	.038	.040	.042	.044	.044
	30	.046	.046	.047	.048	.050	.051	.052	.055	.057	.057
	40	.058	.060	.060	.061	.064	.067	.069	.072	.073	.075
	50	.076	.076	.078	.076	.076	.076	.077	.078	.080	.084†
39	00	.087	.087	.087	.089	.091	.091	.092	.092	.094	.095
	10	.097	.097	.098	.099	.100	.102	.104	.105	.107	.111
	20	.113	.115	.116	.117	.120	.121	.123	.125	.126	.128
	30	.130	.133	.136	.137	.138	.139	.141	.142	.143	.145
	40	.146	.148	.150	.151	.153	.155	.156	.158	.160	.162
	50	.162	.163	.165	.166	.168	.171	.172	.175	.177	.180
40	00	.181	.183	.185	.185	.187	.188	.189	.190	.191	.193

45	00	.623	.626	.628	.629	.631	.632	.634	.636	.639	.641
	10	.644	.648	.646	.647	.646	.649	.650	.651	.651	.653
	20	.654	.655	.656	.659	.662	.661	.662	.663	.666	.666
	30	.668	.669	.673	.673	.673	.677	.677	.677	.679	.682
	40	.683	.684	.687	.689	.691	.694	.695	.697	.698	.696
	50	.697	.697	.698	.701	.702	.704	.703	.704	.704	.706
46	00	.711	.711	.713	.715	.716	.717	.719	.723	.725	.731
	10	.733	.735	.738	.741	.740	.740	.741	.742	.743	.746
	20	.748	.749	.753	.755	.756	.758	.759	.760	.762	.763
	30	.765	.767	.768	.770	.771	.774	.776	.778	.779	.780
	40	.781	.782	.783	.783	.783	.784	.784	.782	.780	.780
	50	.779	.779	.781	.782	.784	.785	.789	.790	.793	.794
47	00	.799	.803	.806	.810	.812	.816	.818	.821	.826	.828
	10	.831	.835	.836	.836	.837	.836	.836	.837	.837	.837
	20	.839	.841	.843	.843	.845	.846	.848	.850	.851	.853
	30	.854	.857	.860	.860	.862	.864	.864	.865	.867	.868
	40	.870	.873	.874	.875	.877	.878	.881†	.883†	.888†	.893†
	50	.899†	.903†	.906†	.906†	.905†	.903†	.901†	.900†	.900†	.899†
48	00	.900†	.900†	.900†	.902†	.903†	.903†	.904†	.904†	.904†	.905
	10	.906	.907	.908	.909	.911	.911	.913	.914	.915	.915
	20	.916	.917	.918	.919	.920	.921	.921	.923	.925	.928
	30	.929	.930	.931	.933	.934	.934	.936	.938	.939	.941
	40	.943	.944	.945	.946	.948	.950	.952	.953	.952	.957
	50	.958	.960	.962	.962	.962	.962	.962†	.963†	.963	.963
49	00	980.962	.963	.964	.965	.970	.977	.984	.992	.997	**3
	10	981.008	.011	.015	.019	.023	.027	.029	.031	.033	.035
	20	.038	.041	.043	.046	.050	.052	.052	.052	.054	.055
	30	.055	.054	.053	.054	.053	.052	.050	.051	.053	.051
	40	.050	.049	.047	.048	.048	.049	.050	.051	.050	.050
	50	.052	.054	.056	.057	.060	.065	.070	.077	.082	.089
50	00	.093	.096	.097	.098	.099	.102	.099	.096	.094	.093

55	00	.519	.519	.520	.521	.523	.525	.526	.526	.528	.531
	10	.533	.536	.538	.538	.539	.540	.540	.541	.541	.542
	20	.542	.544	.547	.549	.552	.555	.555	.556	.557	.557
	30	.558	.559	.561	.562	.563	.564	.565	.567	.568	.570
	40	.571	.572	.573	.575	.577	.580	.583	.587	.590	.590
	50	.590	.591	.592	.594	.596	.598	.599	.601	.603	.604
56	00	.606	.607	.608	.610	.611	.612	.615	.616	.618	.619
	10	.624	.623	.624	.625	.627	.628	.629	.629	.630	.632
	20	.633	.634	.635	.636	.637	.639	.640	.642	.643	.647
	30	.648	.647	.647	.645	.644	.644	.645	.645	.646	.648
	40	.649	.648	.647	.647	.646	.649	.652	.656	.662	.668
	50	.672	.673	.671	.673	.673	.674	.674	.674	.676	.679
57	00	.679	.680	.682	.684	.685	.687	.689	.691	.694	.695
	10	.696	.697	.699	.698	.700	.702	.704	.706	.708	.710
	20	.712	.714	.717	.718	.720	.721	.722	.725	.726	.727
	30	.728	.729	.731	.733	.732	.733	.733	.732	.734	.734
	40	.736	.737	.739	.740	.741	.745	.746	.748	.749	.750
	50	.749	.752	.754	.756	.757	.759	.762	.762	.764	.765
58	00	.766	.767	.768	.775	.775	.776	.778	.778	.778	.779
	10	.781	.781	.783	.785	.787	.789	.790	.793	.794	.795
	20	.796	.797	.797	.799	.801	.802	.802	.803	.803	.804
	30	.805	.806	.808	.809	.811	.812	.813	.815	.816	.817
	40	.821	.823	.823	.824	.825	.825	.825	.826	.827	.829
	50	.830	.831	.833	.836	.837	.842	.847	.849	.847	.847
59	00	.847	.847	.847	.849	.850	.849	.851	.853	.857	.861
	10	.863	.866	.867	.868	.868	.870	.871	.875	.876	.873
	20	.874	.877	.879	.881	.883	.885	.889	.889	.889	.888
	30	.889	.889	.890	.896	.897	.898	.900	.902	.900	.898
	40	.897	.899	.898	.901	.900	.899	.900	.900	.904	.907
	50	.911	.915	.919	.921	.922	.921	.920	.921	.921	.924
60	00	.919	.920	.917	.920	.926	.935	.938	.940	.940	.937

Table II

05	00	01	00	01	00	01	01	00	01	01	02
	10	02	02	02	04	04	05	05	07	08	08
	20	09	08	09	08	09	09	08	09	09	09
	30	09	10	12	11	11	11	10	10	10	09
	40	08	09	08	07	03	06	05	04	04	03
	50	02	01	03	03	02	05	04	04	05	05
06	00	05	06	05	05	06	06	06	07	07	07
	10	08	09	09	09	09	09	09	11	11	11
	20	12	13	13	13	13	12	12	11	08	06
	30	04	04	06	07	07	08	08	08	08	06
	40	06	06	05	05	04	04	04	03	02	03
	50	02	01	01	00	00	01	01	01	02	09
07	00	09	09	10	10	10	12	13	13	14	17
	10	17	19	16	15	13	11	07	04	00	03
	20	05	05	03	01	01	04	06	02	02	02
	30	02	04	05	03	02	01	00	00	01	02
	40	01	02	01	01	02	01	02	03	01	02
	50	02	01	00	02	04	05	09	10	11	10
08	00	07	05	05	04	04	03	03	03	01	00
	10	01	03	05	05	06	07	08	08	07	08
	20	08	09	10	10	11	11	12	12	14	13
	30	14	13	13	12	12	12	10	09	06	06
	40	04	04	09	10	12	13	16	18	20	21
	50	22	21	21	22	22	21	21	22	20	20
09	00	18	19	17	16	16	16	16	15	15	15
	10	15	14	14	12	11	09	07	04	01	00
	20	01	02	03	03	02	01	01	00	00	02
	30	02	02	02	03	02	03	03	06	06	07
	40	06	07	07	07	07	07	07	08	08	10
	50	12	14	14	15	15	15	14	14	13	14
10	00	13	13	13	15	15	17	17	19	19	18

15	00	12	12	14	13	13	14	15	14	14	13
	10	14	13	12	12	12	10	10	11	11	11
	20	11	11	12	13	13	13	13	14	13	13
	30	13	13	12	13	12	12	13	11	11	11
	40	11	10	10	10	09	11	08	08	07	07
	50	08	05	05	05	05	04	04	04	07	08
16	00	07	07	08	08	08	08	09	09	10	11
	10	12	13	15	16	17	19	21	23	23	25
	20	18	18	17	17	15	12	11	09	05	02
	30	00	01	00	00	01	03	03	03	05	07
	40	08	09	09	10	11	12	09	10	08	10
	50	10	11	12	12	11	12	12	13	12	13
17	00	12	13	13	15	14	14	13	13	14	16
	10	16	17	16	15	15	13	13	13	12	10
	20	10	09	08	08	08	09	07	07	08	08
	30	07	06	06	06	06	04	05	04	04	05
	40	05	06	08	09	12	14	14	14	13	11
	50	10	09	10	10	09	10	10	08	08	08
18	00	07	08	08	07	08	07	08	08	08	09
	10	08	08	08	08	07	08	08	08	08	08
	20	07	07	07	05	08	06	07	07	11	10
	30	12	12	12	11	10	11	10	11	11	12
	40	12	11	12	13	11	12	13	13	13	13
	50	14	14	20	21	21	22	21	21	21	21
19	00	22	22	23	22	22	22	22	21	21	20
	10	19	19	19	19	19	17	16	12	12	11
	20	11	11	11	11	09	10	10	09	08	08
	30	09	14	11	12	13	12	12	13	13	12
	40	13	10	09	09	08	08	08	07	07	05
	50	05	05	05	04	05	04	04	04	04	04
20	00	04	04	05	05	05	05	07	07	07	07

25	00	20	24	24	24	22	21	21	23	22	21
	10	22	22	23	22	22	19	16	14	12	11
	20	12	14	16	17	17	16	14	10	06	05
	30	05	08	14	18	21	22	23	25	26	27
	40	28	28	27	27	30	30	30	30	28	26
	50	27	27	26	24	23	24	23	24	23	23
26	00	23	24	24	24	23	23	24	25	24	24
	10	23	23	24	24	23	22	21	23	23	23
	20	24	22	22	22	23	22	22	22	21	20
	30	20	19	20	19	19	19	20	20	20	20
	40	18	19	20	20	20	20	19	19	19	17
	50	18	18	17	17	15	15	16	16	16	17
27	00	15	16	16	15	15	14	15	16	17	16
	10	18	19	19	19	20	20	19	20	21	22
	20	23	22	22	22	23	22	22	23	24	23
	30	23	24	24	24	20	20	21	22	22	21
	40	21	22	21	21	21	20	20	19	19	20
	50	21	20	20	19	18	18	18	19	18	18
28	00	17	18	19	20	20	18	20	20	20	19
	10	21	21	21	21	22	24	24	24	25	25
	20	25	24	24	20	21	22	23	23	24	23
	30	23	22	21	20	22	21	21	20	20	20
	40	20	20	21	20	20	21	20	20	19	20
	50	19†	17†	15†	14	13	12	14	14	15	15
29	00	17	17	16	16	16	16	14	14	13	12
	10	11	13	10	09	08	09	10	08	08	08
	20	07	06	07	07	07	07	05	03	02	02
	30	01	00	01	02	05	07	09	10	12	10
	40	08	06	01	02	03	06	09	10	11	12
	50	10	09	09	11	16	19	26	30	34	36
30	00	39	40	37	36	29	24	18	13	06	05

35	00	27	28	26	27	26	27	27	27	28	26
	10	26	25	25	24	24	25	26	25	24	24
	20	24	23	23	23	23	23	24	24	24	25
	30	26	27	26	26	26	20	21	20	19	21
	40	20	20	22	21	21	21	21	20	19	18
	50	18	18	17	18	18	18	17	17	16	16
36	00	18	17	19	19	20	19	19	20	19	20
	10	14	15	13	12	14	13	15	16	18	19
	20	19	19	19	19	19	21	22	20	22	24
	30	27	28	33	30	29	27	28	30	31	34
	40	34	34	33	33	31	31	32	32	32	32
	50	32	32	32	33	33	33	31	29	25	23
37	00	19	17	12	10	18	19	21	20	21	22
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	20	23	24	30	32	32	33	33	34	34	33
	30	31	32	31	30	28	29	30	29	30	29
	40	27	27	26	25	25	24	24	25	28	28
	50	29	30	28	29	30	31	33	33	35	36
38	00	32	33	34	37	37	39	43	44	47	48
	10	48	49	51	53	51	48	44	41	38	34
	20	30	26	22	21	22	21	19	19	19	20
	30	19	19	20	19	19	17	19	19	19	19
	40	22	21	22	23	28	33	35	39	40	43
	50	40	39	35	36	34	32	29	28	27	25
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	10	30	34	41	42	43	43	42	42	41	39
	20	36	35	30	31	29	30	30	28	27	27
	30	26	25	23	22	22	25	27	30	33	33
	40	35	33	32	31	30	30	31	31	31	32
	50	34	35	37	36	38	40	43	44	46	47
40	00	49	48	48	47	46	46	45	44	43	44

45	00	19	19	19	19	19	19	19	19	19	20
	10	20	20	19	20	20	19	20	17	18	18
	20	18	18	19	18	19	18	19	18	19	19
	30	20	20	22	21	23	21	22	22	23	22
	40	23	21	24	23	23	23	23	22	23	21
	50	23	21	22	21	21	21	21	18	18	17
46	00	18	16	17	15	15	19	18	17	17	16
	10	17	16	17	16	17	16	16	16	16	16
	20	17	17	13	13	14	14	15	14	15	14
	30	15	14	15	13	13	12	12	16	15	14
	40	15	13	13	11	12	11	12	12	13	13
	50	13	13	14	13	15	15	16	15	16	15
47	00	17	17	15	14	14	14	14	12	13	13
	10	12	11	09	07	06	04	05	08	10	09
	20	14	14	13	13	09	05	03	01	02	04
	30	07	09	11	12	14	14	16	16	17	16
	40	11	10	11	08	07	05	04	06	09	12
	50	15	14	13	10	07	05	04	00	01	02
48	00	04	05	06	07	07	05	04	02	00	02
	10	04	05	08	10	10	09	08	09	09	10
	20	11	11	11	11	10	10	09	09	09	07
	30	06	04	04	04	04	03	04	04	05	05
	40	06	05	05	05	05	04	04	03	04	04
	50	05	02	03	02	03	02	02	01	00	01
49	00	01	02	02	00	03	02	03	04	03	03
	10	04	05	05	05	06	06	05	04	03	04
	20	02	02	02	02	01	02	03	03	01	00
	30	00	01	01	01	01	01	02	01	02	01
	40	02	02	01	00	01	02	03	02	04	04
	50	07	05	06	05	04	04	05	05	05	05
50	00	05	03	04	03	01	01	01	02	02	04

55	00	25	28	32	36	45	44	41	35	30	25
	10	22	21	19	18	17	17	16	15	15	16
	20	15	15	14	14	13	14	13	15	15	16
	30	13	14	12	12	09	07	05	01	01	05
	40	08	10	12	13	15	16	16	18	19	20
	50	21	21	23	22	22	22	22	23	23	25
56	00	25	26	29	31	35	38	40	43	45	46
	10	45	45	44	42	42	42	42	44	48	50
	20	52	54	56	58	59	61	63	65	66	66
	30	68	68	69	70	70	70	69	69	68	66
	40	65	63	60	56	52	49	44	40	34	30
	50	23	19	11	07	01	05	10	12	15	18
57	00	21	25	30	33	36	38	45	46	51	53
	10	54	53	52	52	52	54	57	59	62	66
	20	70	71	72	75	79	78	76	77	77	79
	30	83									

05	00	04	05	06	07	07	08	12	12	11	11
	10	10	08	07	06	04	02	01	02	04	06
	20	08	09	11	12	13	16	19	21	24	27
	30	29	29	26	22	17	11	05	02	10	16
	40	20	25	27	28	30	29	26	21	19	15
	50	10	09	06	04	03	02	00	01	02	03
06	00	04	04	05	06	07	08	09	08	07	05
	10	03	00	00	01	00	02	05	07	09	10
	20	10	09	08	06	04	03	00	02	03	03
	30	05	05	06	06	04	03	01	01	02	04
	40	05	04	05	04	03	02	00	02	02	04
	50	05	07	08	07	06	07	07	07	09	09
07	00	10	10	10	12	11	12	13	14	15	16
	10	15	17	17	16	18	18	17	18	18	18
	20	17	16	16	13	11	10	09	09	09	09
	30	11	12	11	11	11	12	11	12	11	11
	40	11	11	11	12	11	12	11	12	13	13
	50	14	14	15	14	14	14	14	15	15	14
08	00	15	14	15	15	16	17	17	18	13	13
	10	12	11	13	13	14	14	14	10	09	10
	20	08	08	07	08	07	07	07	07	07	06
	30	07	05	04	05	05	06	06	05	05	00
	40	01	02	01	02	01	01	00	01	02	02
	50	02	03	03	05	05	06	08	09	09	10
09	00	11	13	13	13	14	15	17	17	18	18
	10	19	20	21	21	22	21	21	21	21	19
	20	20	21	21	20	20	18	11	03	08	21
	30	42	53	65	74	79	75	64	49	32	23
	40	14	08	04	03	08	14	21	17	14	10
	50	09	07	07	08	08	06	04	01	01	03
10	00	05	08	10	12	14	15	15	17	17	18

15	00	23	23	24	23	23	23	21	19	18	18
	10	19	16	15	15	14	12	11	11	11	09
	20	08	09	10	11	09	09	10	11	09	09
	30	08	06	01	03	09	12	10	07	02	05
	40	08	10	11	11	11	09	08	10	11	12
	50	13	13	14	14	15	15	16	16	16	16
16	00	15	15	14	14	15	14	14	14	14	17
	10	16	16	17	19	20	19	19	18	20	20
	20	19	20	22	16	17	17	18	19	19	20
	30	22	22	22	23	22	20	18	18	18	17
	40	15	13	12	13	12	14	17	19	19	19
	50	20	20	20	20	19	19	18	18	17	18
17	00	17	18	18	20	21	22	21	19	18	14
	10	04	02	09	09	05	02	00	01	02	04
	20	07	09	11	14	18	22	29	36	41	44
	30	45	45	44	43	42	32	30	26	23	19
	40	17	14	11	07	04	03	02	02	01	01
	50	02	05	07	10	13	14	15	15	16	04
18	00	03	03	01	13	05	12	16	11	02	12
	10	23	31	35	36	36	36	35	35	34	33
	20	32	31	30	29	29	25	26	25	24	23
	30	22	20	19	15	13	12	13	15	16	17
	40	18	17	13	13	11	12	12	18	19	20
	50	19	15	12	12	16	21	23	24	25	26
19	00	25	23	20	18	16	10	10	11	15	16
	10	20	22	23	23	23	23	22	20	16	09
	20	05	01	01	01	02	07	11	15	16	18
	30	18	20	19	19	20	19	18	15	13	20
	40	08	08	09	10	12	15	16	19	20	21
	50	22	23	24	24	25	25	25	24	24	24
20	00	24	24	26	30	31	31	30	31	32	33

25	00	17	18	17	17	16	15	14	13	13	11
	10	11	11	12	13	15	16	17	17	17	16
	20	17	16	15	14	14	12	12	12	12	10
	30	10	09	09	07	05	05	04	02	03	02
	40	01	00	01	01	02	04	07	09	11	11
	50	12	12	12	12	12	12	12	11	10	09
26	00	08	08	07	07	06	04	05	04	04	03
	10	02	03	04	03	04	03	03	03	03	03
	20	03	02	03	03	03	03	04	05	05	06
	30	05	05	06	06	06	07	07	07	08	07
	40	07	08	08	09	10	09	11	13	13	14
	50	15	15	16	16	15	15	15	15	15	14
27	00	13	15	16	14	14	14	16	15	11	09
	10	07	07	06	04	03	03	03	03	04	03
	20	02	03	02	02	01	01	02	02	01	01
	30	02	02	01	01	00	01	01	01	00	03
	40	04	04	06	06	07	07	08	08	07	04
	50	01	02	01	01	02	05	09	15	19	24
28	00	30	34	36	37	35	30	22	15	08	04
	10	10	16	18	22	25	26	26	26	27	26
	20	25	23	19	16	12	09	06	03	00	04
	30	06	09	14	16	17	17	18	18	16	15
	40	12	09	06	04	05	04	05	04	05	04
	50	05	04	04	04	05	05	05	08	09	09
29	00	08	07	07	07	05	05	06	06	07	08
	10	08	07	05	02	01	02	04	06	08	09
	20	09	07	05	02	03	07	11	17	20	22
	30	26	27	26	24	22	20	16	14	11	07
	40	04	03	02	02	04	04	03	03	02	02
	50	04	06	07	09	09	10	10	10	10	09
30	00	10	09	09	09	10	12	12	14	14	14

35	00	03	02	02	03	01	01	01	01	01	03
	10	01	01	00	00	00	00	01	01	00	01
	20	01	00	02	01	01	02	02	02	02	03
	30	02	03	01	01	01	01	02	02	06	08
	40	09	09	08	06	04	02	01	00	02	02
	50	01	02	01	02	02	01	00	01	02	02
36	00	01	02	00	01	00	01	02	01	01	01
	10	01	01	01	01	01	01	03	03	03	02
	20	03	02	03	02	01	11	06	01	02	03
	30	02	03	01	01	02	02	03	03	02	04
	40	03	03	02	04	04	03	04	04	06	05
	50	05	06	06	06	06	08	06	08	08	09
37	00	11	11	10	10	12	11	07	08	10	10
	10	09	09	10	10	08	09	09	11	09	10
	20	09	09	10	10	10	11	11	15	16	16
	30	15	16	17	15	17	18	17	18	18	20
	40	17	14	15	13	15	13	12	10	09	08
	50	08	10	08	10	09	08	04	05	04	05
38	00	05	05	05	05	05	04	04	04	03	02
	10	03	03	04	03	04	04	04	05	04	03
	20	04	04	04	04	03	03	02	02	01	03
	30	02	03	04	04	04	04	05	03	03	04
	40	05	04	06	06	05	03	02	01	01	01
	50	01	03	02	06	07	09	09	10	09	07
39	00	05	06	08	07	07	08	09	10	10	10
	10	10	11	12	12	13	12	12	12	11	09
	20	08	08	08	09	07	08	07	07	07	07
	30	06	05	03	04	04	05	04	05	05	04
	40	05	04	04	04	04	03	04	03	03	02
	50	04	04	04	04	04	02	03	01	01	01
40	00	00	01	01	00	01	00	00	01	01	01

45	00	06	05	04	05	04	05	04	04	02	02
	10	00	02	01	02	05	03	04	04	06	05
	20	06	06	07	05	04	06	07	07	06	07
	30	07	07	05	06	08	05	07	08	08	06
	40	07	07	06	05	05	03	04	03	04	07
	50	08	09	10	08	09	08	11	11	13	12
46	00	09	10	10	09	10	10	10	07	07	02
	10	02	01	00	02	01	02	03	03	04	02
	20	02	02	00	01	00	01	00	00	00	00
	30	00	01	00	01	00	02	02	03	02	02
	40	01	01	00	01	03	03	05	08	12	13
	50	16	17	17	17	17	17	15	15	14	14
47	00	11	08	07	04	04	01	01	01	04	05
	10	06	09	08	07	06	04	02	02	00	01
	20	01	00	00	01	01	01	01	00	01	00
	30	01	01	02	01	01	02	00	00	00	00
	40	00	02	01	01	01	01	02†	03†	06†	10†
	50	14†	17†	18†	17†	14†	11†	07†	05†	03†	01†
48	00	00†	01†	03†	02†	03†	04†	05†	06†	08†	08
	10	09	09	10	10	10	11	11	11	12	13
	20	14	14	15	15	16	16	18	17	17	15
	30	16	16	17	16	17	18	18	17	18	17
	40	17	17	18	18	18	17	17	17	20	16
	50	17	16	16	17	19	20	22†	22†	23	25
49	00	27	28	28	29	25	20	14	08	04	00
	10	04	05	08	10	13	15	16	16	17	17
	20	19	20	21	22	25	25	24	22	23	22
	30	21	18	16	15	13	10	07	06	07	03
	40	01	01	05	05	07	07	08	08	11	12
	50	12	11	11	11	10	06	03	03	06	12
50	00	14	16	15	15	14	16	11	07	03	01

55	00	04	03	03	02	03	03	03	01	02	04
	10	04	06	06	05	05	04	03	02	01	01
	20	01	00	01	02	03	05	04	03	03	01
	30	01	01	01	01	00	00	00	00	00	00
	40	00	00	01	00	00	02	04	06	08	06
	50	05	05	04	05	05	06	06	06	07	06
56	00	07	07	06	07	06	06	08	07	08	07
	10	11	09	08	08	08	08	08	06	06	06
	20	06	06	05	05	05	05	05	05	05	08
	30	07	05	03	00	02	04	04	06	06	05
	40	06	08	10	12	14	13	11	08	04	01
	50	04	03	00	00	01	01	03	04	04	02
57	00	03	04	03	02	03	02	02	01	01	00
	10	00	00	00	02	02	01	00	00	01	02
	20	02	03	05	04	05	04	04	06	05	05
	30	05	04	05	05	03	03	01	01	00	02
	40	01	01	01	01	02	01	01	01	01	01
	50	02	00	01	01	01	02	03	02	02	02
58	00	02	01	01	07	05	05	06	04	03	03
	10	03	02	03	03	04	04	04	06	05	05
	20	05	04	03	04	04	04	03	02	01	01
	30	00	00	01	00	01	01	00	01	01	00
	40	03	04	02	02	02	00	01	01	02	01
	50	01	02	01	00	00	04	07	08	05	04
59	00	02	01	00	00	00	02	02	01	02	04
	10	05	07	06	06	05	05	05	08	07	03
	20	03	04	05	06	06	07	10	08	07	05
	30	04	03	03	07	07	07	08	08	05	02
	40	01	00	02	01	03	05	06	07	04	03
	50	00	03	06	06	06	04	01	01	00	01
60	00	05	05	09	08	03	05	06	07	06	01

TABLE III

Free Air Gravity Anomaly at Sea Level along 150°W Longitude
for each Minute of Latitude with reference to
the IAU Formula (1964) (Negative values in italics)

φ N									
0°	19	6°	12	12°	03	18°	09	24°	09
	18		11		03		08		*05*
	20		08		03		08		*05*
	21		06		06		08		*02*
	29		04		06		07		*02*
	25		13		05		04		*04*
	20		09		09		06		*07*
	18		12		09		04		*07*
	24		15		08		03		*02*
	20		17		04		*05*		*01*
1°	19	7°	08	13°	03	19°	*06*	25°	06
	17		04		00		*06*		07
	19		01		*04*		*04*		09
	13		17		*04*		04		02
	16		15		*01*		06		03
	17		15		01		07		09
	21		17		09		04		09
	19		17		11		06		*13*
	17		18		12		08		*14*
	17		21		04		11		*09*
2°	20	8°	24	14°	*15*	20°	12	26°	09
	20		20		*03*		09		09
	26		12		03		07		09
	16		10		00		05		08
	15		06		09		04		09
	13		03		09		18		06
	12		07		11		08		06
	14		08		16		08		05
	25		*03*		11		07		04
	33		*05*		06		*11*		01
3°	08	9°	*01*	15°	04	21°	01	27°	*01*
	01		01		02		*05*		00
	00		03		04		05		*05*
	03		16		06		08		*07*
	05		18		03		06		*08*
	09		14		03		05		*09*
	20		14		04		09		*07*
	32		10		06		06		*07*
	30		09		09		05		*05*
	24		01		11		02		*03*
4°	17	10°	03	16°	09	22°	01	28°	*03*
	18		*01*		07		08		*05*
	21		*02*		01		*07*		*07*
	30		*03*		*07*		*02*		*10*
	16		01		01		09		*07*
	11		01		16		06		*09*
	19		02		13		*05*		*07*
	23		03		07		*11*		*07*
	22		*04*		08		05		*05*
	17		*02*		05		04		01
5°	16	11°	*03*	17°	04	23°	03	29°	03
	17		*04*		03		03		00
	15		*02*		*01*		03		04
	09		*01*		04		04		06
	08		*02*		08		*02*		07
	08		*04*		09		03		13
	07		*04*		11		00		23
	09		*02*		08		00		14
	13		00		02		*02*		*03*
	15		06		07		*11*		*02*

60

TABLE III (Continued)

φ S

φ	S	φ	S	φ	S	φ	S	φ	S
0°	19	6°	21	12°	14	18°	13	24°	10
	81		26		11		32		19
	18		17		06		19		30
	25		26		14		18		26
	23		21		18		14		03
	18		12		25		06		05
	25		16		09		03		31
	17		22		01		03		28
	17		15		07		03		05
	14		11		06		00		02
1°	19	7°	07	13°	21	19°	09	25°	03
	14		04		09		06		00
	18		00		22		08		02
	18		01		03		00		03
	18		05		10		13		00
	17		06		26		02		04
	18		06		52		02		10
	22		05		70		06		15
	22		04		99		05		03
	18		03		68		09		02
2°	17	8°	02	14°	39	20°	08	26°	06
	19		00		66		14		10
	18		04		94		17		11
	19		08		99		04		12
	21		10		101		27		11
	20		10		84		04		09
	20		12		11†		04		07
	20		18		15		09		07
	20		15		17		11		02
	22		12		09		00		01
3°	30	9°	06	15°	07	21°	06	27°	01
	28		00		04		01		01
	24		04		01		09		08
	25		04		06		07		18
	24		04		07		06		16
	26		58		08		04		16
	29		83		27		02		15
	29		21		05		01		20
	27		31		05		03		21
	26		24		01		04		17
4°	27	10°	11	16°	01	22°	04	28°	44
	29		01		02		06		37
	29		08		01		05		04
	27		17		04		14		12
	22		11		01		10		02
	19		03		06		01		20
	18		04		02		03		32
	13		04		04		05		20
	16		12		03		14		19
	15		10		03		15		19
5°	13	11°	11	17°	01	23°	17	29°	22
	05		09		05		12		20
	10		06		24		45		19
	21		06		18		72		06
	30		12		34		01		17
	46		15		61		02		40
	22		15		46		07		30
	10		15		27		09		15
	02		14		16		05		16
	15		15		03		05		23

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ALONG 150°W by W. S. von Arx, D. C. Bowen, J. P. Dean,
R. T. Haworth. 3 pages, 4 figures and tables I,II & III.
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Ground truth calibration will be provided by a grid com-
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the 30°W and 150°W meridians. Ground truth topography is
derived from gravity values measured along these traverses.
This report presents the free air gravity values and the
computed free air anomalies obtained from 62.9°S to 57.5°N
along the 150°W meridian.

1. HUDSON '70

2. 150°W Meridian

3. Gravity
4. Marine Geodesy

I. von Arx, W. S.

II. Bowen, D. C.

III. Dean, J. P.

IV. Haworth, R. T.

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