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Sensitivity/Comparison Study Between the Jacchia 1970, 1971, and 1977 Upper Atmospheric Density Models

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SENSITIVITY/COMPARISON STUDY BETWEEN THE JACCHIA 1970, 1971, AND 1977 UPPER ATMOSPHERIC DENSITY MODELS

I. INTRODUCTION

The thermospheric model currently used by NASA-MSFC in orbital dynamics and lifetime estimates is the 1970 Jacchia (J70) model [1] as reported on in 1973 [2]. It was slightly modified in 1974, and has been used as the MSFC standard. Two additional Jacchia models have become available and have been computerized for possible use. These are the 1971 Jacchia (J71) model [3] and the 1977 Jacchia (J77) model [4]. It was determined that a parametric study was needed involving the computation and comparison of total density from each of the three models. Also the establishment of each models sensitivity to the differing solar input conditions is desirable.

Total atmospheric density computations were made using all three models, over a wide range of solar and geomagnetic conditions. Comparisons were then made based on these results to determine the sensitivity of each model to differing solar/geomagnetic input. Twelve different cases of solar/geomagnetic input were used in the study and are summarized in Table 1. The average, daily solar flux parameter $F_{10.7}$, along with the 162-day centered average solar flux parameter $\overline{F_{10.7}}$ and three hourly average geomagnetic index A_p (or K_p) were the three solar/geomagnetic inputs to each model tested.* Values representing solar conditions close to low, medium, and high were used. This included $\overline{F_{10.7}}$ values of 100, 150, and 250. Daily $F_{10.7}$ values of 100, 150, 200, 250, and 300 were used, along with A_p values of 0, 15, and 400 (Kp = 0, 3, and 9). The altitude level of 400 km was chosen because it is close to the orbital levels of many NASA spacecraft. June 20 at 12 UT was selected so the models could run near the Summer Solstice when the diurnal bulge maximum is located north of the equator in the northern hemisphere. All computations were computed over an 81-point latitude/longitude Earth matrix consisting of nine latitudes from 80°N to 80°S, along with nine longitudes from 40°E to 360°, with spacing of 20° for latitude and 40° for longitude.

TABLE 1. SOLAR FLUX AND GEOMAGNETIC INDEX INPUT VALUES USED IN STUDY

Case No.	$\overline{F_{10.7}}$	$F_{10.7}$	A_p/K_p
1	100	100	0/0
2	100	100	15/3
3	100	100	400/9
4	100	150	15/3
5	150	150	0/0
6	150	150	15/3
7	150	150	400/9
8	150	200	15/3
9	250	250	0/0
10	250	250	15/3
11	250	250	400/9
12	250	300	15/3

Date: June 20; Time: 12 UT; Altitude: 400 km

*In this idealized exercise, the 3-hourly predicted a_p values were substituted by the daily A_p values.

The currently used J70 modified model atmosphere is considered the standard throughout the study, and most computations involved here are expressed as a percentage difference in density (ρ) from the J70, i.e.,

$$\frac{\rho \text{ J71} - \rho \text{ J70}}{\rho \text{ J70}} \times 100 = \% \text{ diff.} \tag{1}$$

Other times, percent differences in density were computed for two different input cases involving the same Jacchia model. In this instance the percent difference equation can be expressed as

$$\frac{\rho \text{ J71 (case 2)} - \rho \text{ J71 (case 1)}}{\rho \text{ J71 (case 1)}} \times 100 = \% \text{ diff.} \quad , \tag{2}$$

where J71 case 2 is expressed as a percent difference from J71 case 1. Table 2 lists 24 different combinations or categories of percent deviations that were calculated, involving a case difference with respect to the same Jacchia model.

TABLE 2. 24 CATEGORIES USED IN STUDY

Category	Case Difference
A	2-1
B	3-2
C	3-1
D	4-2
E	6-5
F	7-6
G	7-5
H	8-6
I	10-9
J	11-10
K	11-9
L	12-10

Category	Case Difference
M	5-1
N	9-5
O	9-1
P	6-2
Q	10-6
R	10-2
S	7-3
T	11-7
U	11-3
V	8-4
W	12-8
X	12-4

II. PRESENTATION OF DATA/RESULTS

The total density values computed using the J70, J71, and J77 models for the 12 different input cases are presented in Tables 3, 4, and 5, respectively. The units of density are in kg/m^3 and were computed over an Earth-matrix (81 point grid) with increment spacing of every 20 deg latitude and 40 deg longitude. The maximum density bulge is noticed in most cases to be located at the 20°N latitude and 40°E longitude location. The bulge maximum is located at 40°E only because of the matrix used. Actual bulge maximum is at 23½° during Summer Solstice.

TABLE 3. TOTAL DENSITY VALUES GENERATED USING THE JACCHIA 1970 MODEL

Case 1.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 100
F10.7B = 100
Ap = 0 (Kp = 0)

Output:

J70 Density ($x10^{-12}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.831	1.090	1.400	1.720	1.970	2.090	2.030	1.830	1.530
80	.785	.937	1.140	1.350	1.520	1.620	1.640	1.580	1.450
120	.710	.732	.789	.870	.951	1.040	1.140	1.240	1.330
160	.674	.594	.573	.586	.627	.691	.818	1.000	1.240
200	.660	.545	.496	.493	.512	.577	.709	.920	1.200
240	.659	.544	.498	.491	.509	.575	.707	.918	1.200
280	.680	.594	.580	.595	.638	.702	.828	1.010	1.240
320	.746	.784	.874	.985	1.090	1.180	1.260	1.320	1.360
360	.871	1.070	1.280	1.550	1.770	1.880	1.860	1.720	1.490

Case 2.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 100
F10.7B = 100
Ap = 15 (Kp = 3)

Output:

J70 Density ($x10^{-12}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	1.450	1.800	2.220	2.620	2.930	3.070	3.010	2.750	2.380
80	1.380	1.600	1.860	2.140	2.360	2.500	2.520	2.440	2.270
120	1.290	1.310	1.390	1.500	1.610	1.740	1.870	2.000	2.120
160	1.210	1.110	1.080	1.090	1.140	1.250	1.430	1.690	2.000
200	1.190	1.030	.964	.954	.982	1.080	1.280	1.570	1.950
240	1.190	1.030	.961	.951	.979	1.080	1.270	1.570	1.950
280	1.220	1.110	1.090	1.110	1.160	1.260	1.440	1.700	2.000
320	1.310	1.380	1.510	1.660	1.800	1.930	2.030	2.110	2.160
360	1.470	1.710	2.060	2.410	2.680	2.820	2.790	2.620	2.330

TABLE 3. (Continued)

Case 3.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 100
F10.7B = 100
Ap = 400 (Kp = 9)

Output:

J70 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.721	.794	.872	.943	.994	1.020	1.010	.965	.900
80	.707	.753	.806	.858	.898	.922	.926	.912	.882
120	.686	.690	.708	.733	.757	.781	.807	.832	.854
160	.670	.643	.636	.641	.652	.677	.717	.771	.832
200	.663	.625	.608	.605	.612	.637	.683	.748	.824
240	.663	.625	.607	.604	.612	.636	.682	.747	.824
280	.670	.645	.638	.644	.656	.681	.721	.773	.833
320	.692	.707	.734	.766	.794	.818	.838	.853	.861
360	.715	.776	.844	.906	.953	.976	.972	.942	.892

Case 4.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 100
Ap = 15 (Kp = 3)

Output:

J70 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.242	.294	.354	.412	.455	.474	.466	.430	.377
80	.233	.264	.304	.343	.375	.394	.398	.386	.362
120	.218	.221	.233	.250	.267	.285	.304	.323	.340
160	.207	.190	.185	.189	.196	.212	.239	.278	.323
200	.203	.179	.168	.167	.171	.187	.216	.261	.317
240	.203	.179	.168	.166	.171	.186	.216	.260	.317
280	.208	.191	.187	.191	.198	.215	.242	.279	.324
320	.222	.232	.251	.274	.294	.313	.328	.339	.346
360	.238	.281	.332	.382	.420	.439	.436	.411	.371

TABLE 3. (Continued)

Case 5.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 150
Ap = 0 (Kp = 0)

Output:

J70 Density ($x10^{-11}$ Kg/M^3)

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	.221	.276	.340	.402	.449	.470	.460	.422	.364
80	.211	.244	.285	.328	.362	.383	.387	.374	.348
120	.196	.199	.212	.229	.247	.266	.286	.306	.324
160	.185	.167	.162	.166	.173	.190	.218	.258	.307
200	.180	.156	.145	.143	.148	.164	.194	.240	.300
240	.180	.156	.145	.143	.147	.163	.193	.240	.299
280	.185	.169	.164	.168	.176	.192	.220	.260	.307
320	.200	.211	.230	.254	.276	.295	.311	.324	.331
360	.217	.262	.316	.369	.410	.431	.428	.401	.357

Case 6.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 150
Ap = 15 (Kp = 3)

Output:

J70 Density ($x10^{-11}$ Kg/M^3)

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	.322	.388	.466	.533	.585	.609	.598	.555	.490
80	.314	.350	.399	.449	.488	.511	.516	.501	.472
120	.292	.295	.311	.332	.353	.376	.399	.423	.444
160	.278	.256	.250	.254	.263	.284	.319	.367	.424
200	.272	.241	.228	.226	.231	.251	.289	.345	.416
240	.272	.241	.227	.225	.231	.250	.288	.345	.415
280	.278	.257	.252	.256	.266	.287	.321	.369	.424
320	.296	.309	.333	.362	.388	.410	.429	.444	.452
360	.317	.371	.435	.496	.543	.566	.562	.532	.482

TABLE 3. (Continued)

Case 7.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 150
Ap = 400 (Kp = 9)

Output:

J70 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	1.040	1.140	1.240	1.340	1.400	1.430	1.420	1.370	1.280
80	1.020	1.080	1.150	1.220	1.280	1.310	1.320	1.300	1.260
120	.991	.997	1.020	1.060	1.090	1.120	1.160	1.190	1.220
160	.969	.932	.922	.928	.945	.979	1.030	1.110	1.190
200	.960	.907	.883	.879	.889	.924	.987	1.080	1.180
240	.960	.906	.882	.878	.888	.923	.986	1.070	1.180
280	.970	.935	.925	.933	.950	.984	1.040	1.110	1.190
320	.999	1.020	1.060	1.100	1.140	1.170	1.200	1.220	1.230
360	1.030	1.110	1.210	1.290	1.350	1.380	1.380	1.340	1.270

Case 8.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 200
F10.7B = 150
Ap = 15 (Kp = 3)

Output:

J70 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.462	.547	.641	.729	.794	.823	.810	.757	.676
80	.446	.498	.562	.624	.674	.703	.708	.690	.654
120	.422	.427	.448	.476	.503	.532	.562	.592	.619
160	.404	.376	.367	.372	.385	.413	.458	.520	.593
200	.397	.356	.337	.335	.342	.369	.419	.493	.583
240	.397	.355	.337	.334	.341	.368	.418	.492	.582
280	.405	.377	.370	.376	.389	.417	.461	.523	.594
320	.429	.446	.477	.514	.547	.576	.600	.618	.628
360	.455	.526	.607	.684	.742	.771	.766	.728	.667

TABLE 3. (Continued)

Case 9.

Input:
Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 250
F10.7B = 250
Ap = 0 (Kp = 0)

Output:
J70 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.706	.830	.965	1.090	1.180	1.220	1.200	1.130	1.010
80	.687	.759	.851	.941	1.010	1.050	1.060	1.030	.983
120	.647	.655	.685	.726	.766	.808	.852	.895	.934
160	.620	.577	.565	.573	.592	.633	.700	.791	.896
200	.610	.548	.520	.516	.527	.567	.642	.751	.881
240	.609	.547	.518	.514	.526	.566	.641	.750	.881
280	.621	.580	.569	.578	.598	.639	.705	.795	.898
320	.657	.682	.728	.782	.830	.872	.906	.932	.947
360	.696	.799	.916	1.030	1.110	1.150	1.140	1.090	1.000

Case 10.

Input:
Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 250
F10.7B = 250
Ap = 15 (Kp = 3)

Output:
J70 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.866	.997	1.140	1.270	1.360	1.400	1.380	1.310	1.190
80	.841	.922	1.020	1.110	1.190	1.230	1.240	1.210	1.160
120	.803	.811	.843	.887	.929	.974	1.020	1.070	1.110
160	.774	.727	.713	.722	.743	.787	.859	.956	1.070
200	.762	.695	.664	.660	.672	.716	.798	.913	1.050
240	.762	.694	.663	.658	.671	.715	.796	.912	1.050
280	.775	.730	.718	.728	.749	.793	.865	.960	1.070
320	.813	.840	.889	.947	.997	1.040	1.080	1.100	1.120
360	.855	.965	1.090	1.200	1.280	1.330	1.320	1.260	1.180

TABLE 3. (Concluded)

Case 11.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 250
F10.7B = 250
Ap = 400 (Kp = 9)

Output:

J70 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	1.740	1.880	2.030	2.160	2.250	2.290	2.270	2.200	2.080
80	1.710	1.800	1.900	2.000	2.080	2.120	2.130	2.100	2.050
120	1.660	1.670	1.710	1.760	1.810	1.850	1.900	1.950	1.990
160	1.630	1.580	1.560	1.570	1.600	1.650	1.730	1.830	1.950
200	1.620	1.540	1.500	1.500	1.510	1.560	1.660	1.790	1.940
240	1.620	1.540	1.500	1.490	1.510	1.560	1.660	1.790	1.940
280	1.630	1.580	1.570	1.580	1.600	1.650	1.730	1.840	1.950
320	1.680	1.710	1.760	1.820	1.880	1.930	1.960	1.990	2.010
360	1.720	1.840	1.970	2.090	2.180	2.220	2.210	2.160	2.070

Case 12.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 300
F10.7B = 250
Ap = 15 (Kp = 3)

Output:

J70 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	1.060	1.210	1.370	1.510	1.610	1.650	1.630	1.550	1.420
80	1.030	1.130	1.280	1.340	1.420	1.470	1.470	1.450	1.390
120	.991	.999	1.040	1.090	1.130	1.180	1.240	1.290	1.330
160	.957	.904	.888	.898	.922	.972	1.050	1.160	1.290
200	.944	.867	.831	.826	.841	.892	.985	1.120	1.270
240	.944	.866	.830	.824	.839	.890	.983	1.110	1.270
280	.959	.907	.893	.905	.929	.980	1.060	1.170	1.290
320	1.000	1.030	1.090	1.150	1.210	1.260	1.300	1.330	1.350
360	1.050	1.170	1.310	1.430	1.530	1.570	1.560	1.510	1.410

TABLE 4. TOTAL DENSITY VALUES GENERATED USING THE JACCHIA 1971 MODEL

Case 1.

Input:
Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 100
F10.7B = 100
Ap = 0 (Kp = 0)

Output:
J71 Density ($x10^{-12}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.946	1.200	1.490	1.760	1.970	2.060	2.020	1.859	1.600
80	.897	1.040	1.220	1.400	1.550	1.650	1.680	1.630	1.520
120	.826	.826	.865	.932	1.010	1.110	1.220	1.330	1.420
160	.773	.680	.641	.647	.689	.778	.921	1.110	1.340
200	.753	.627	.564	.552	.581	.667	.817	1.040	1.310
240	.752	.626	.562	.550	.579	.664	.815	1.030	1.310
280	.775	.685	.648	.656	.699	.789	.931	1.120	1.340
320	.845	.881	.952	1.050	1.140	1.240	1.330	1.400	1.450
360	.925	1.130	1.370	1.600	1.780	1.880	1.870	1.750	1.560

Case 2.

Input:
Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 100
F10.7B = 100
Ap = 15 (Kp = 3)

Output:
J71 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.159	.192	.229	.264	.289	.300	.295	.275	.243
80	.152	.172	.195	.218	.237	.250	.253	.248	.234
120	.142	.142	.148	.157	.168	.181	.195	.209	.221
160	.135	.122	.116	.117	.123	.136	.155	.181	.210
200	.132	.114	.105	.103	.107	.120	.141	.171	.206
240	.132	.114	.105	.103	.107	.119	.141	.171	.206
280	.135	.122	.117	.118	.124	.137	.157	.182	.211
320	.145	.150	.160	.172	.185	.198	.210	.219	.224
360	.156	.183	.214	.243	.266	.278	.277	.263	.239

TABLE 4. (Continued)

Case 3.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 100
F10.7B = 100
Ap = 400 (Kp = 9)

Output:

J71 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.723	.788	.855	.914	.956	.974	.966	.932	.879
80	.709	.748	.793	.835	.869	.890	.896	.887	.864
120	.689	.689	.700	.719	.741	.766	.793	.819	.840
160	.673	.644	.631	.633	.647	.675	.716	.767	.821
200	.667	.626	.605	.600	.611	.640	.686	.747	.814
240	.667	.626	.604	.599	.610	.639	.686	.746	.814
280	.674	.645	.634	.636	.650	.678	.719	.769	.822
320	.694	.705	.725	.750	.775	.799	.820	.837	.846
360	.717	.771	.828	.880	.918	.938	.936	.913	.872

Case 4.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 100
Ap = 15 (Kp = 3)

Output:

J71 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.228	.272	.320	.364	.397	.411	.405	.379	.338
80	.219	.245	.275	.306	.330	.346	.351	.344	.327
120	.206	.206	.213	.225	.240	.257	.276	.294	.309
160	.196	.178	.171	.172	.180	.197	.224	.258	.296
200	.192	.168	.155	.153	.159	.176	.204	.244	.291
240	.192	.168	.155	.152	.158	.175	.204	.244	.291
280	.197	.179	.172	.174	.182	.199	.225	.259	.296
320	.210	.216	.229	.246	.263	.280	.295	.307	.314
360	.224	.260	.301	.339	.368	.383	.381	.364	.333

TABLE 4. (Continued)

Case 5.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 150
Ap = 0 (Kp = 0)

Output:
J71 Density ($x10^{-11}$ Kg/M^3)

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	.252	.305	.362	.415	.453	.471	.463	.432	.383
80	.242	.272	.309	.345	.374	.393	.399	.390	.369
120	.226	.226	.235	.249	.266	.287	.309	.330	.349
160	.214	.193	.185	.186	.195	.216	.247	.287	.333
200	.210	.181	.166	.164	.171	.190	.224	.271	.327
240	.210	.181	.166	.163	.170	.190	.224	.271	.327
280	.215	.195	.186	.188	.198	.218	.249	.289	.333
320	.230	.238	.254	.273	.294	.314	.332	.346	.354
360	.248	.291	.339	.384	.418	.437	.435	.414	.377

Case 6.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 150
Ap = 15 (Kp = 3)

Output:
J71 Density ($x10^{-11}$ Kg/M^3)

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	.355	.417	.482	.542	.585	.604	.595	.561	.507
80	.343	.379	.421	.463	.496	.518	.524	.514	.491
120	.325	.325	.335	.352	.372	.396	.422	.447	.467
160	.311	.285	.274	.276	.287	.312	.349	.397	.449
200	.305	.270	.252	.248	.257	.281	.322	.378	.442
240	.305	.270	.251	.247	.256	.281	.322	.377	.442
280	.311	.286	.276	.278	.290	.315	.352	.399	.450
320	.330	.339	.357	.380	.404	.427	.448	.464	.474
360	.350	.401	.456	.507	.546	.566	.564	.541	.500

TABLE 4. (Continued)

Case 7.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 150
Ap = 400 (Kp = 9)

Output:

J71 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	1.060	1.150	1.240	1.320	1.380	1.400	1.390	1.350	1.270
80	1.040	1.090	1.160	1.210	1.260	1.290	1.300	1.280	1.250
120	1.010	1.010	1.030	1.050	1.080	1.120	1.160	1.190	1.220
160	.990	.949	.931	.934	.953	.992	1.050	1.120	1.190
200	.981	.925	.894	.888	.902	.943	1.010	1.090	1.190
240	.981	.924	.893	.887	.901	.942	1.010	1.090	1.180
280	.991	.951	.935	.938	.958	.997	1.050	1.120	1.200
320	1.020	1.030	1.060	1.100	1.130	1.160	1.190	1.220	1.230
360	1.050	1.130	1.200	1.270	1.330	1.350	1.350	1.320	1.260

Case 8.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 200
F10.7B = 150
Ap = 15 (Kp = 3)

Output:

J71 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.456	.529	.607	.676	.727	.749	.739	.699	.635
80	.441	.484	.534	.583	.623	.648	.655	.644	.617
120	.418	.419	.431	.451	.476	.504	.535	.564	.589
160	.401	.371	.357	.359	.373	.403	.448	.505	.567
200	.395	.352	.330	.325	.336	.366	.416	.482	.559
240	.395	.352	.329	.325	.335	.365	.415	.482	.559
280	.402	.372	.360	.362	.377	.407	.451	.507	.568
320	.424	.436	.458	.486	.514	.542	.566	.585	.596
360	.449	.510	.575	.636	.681	.705	.703	.675	.627

TABLE 4. (Continued)

Case 9

Input:
Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 250
F10.7B = 250
Ap = 0 (Kp = 0)

Output:
J71 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.788	.903	1.020	1.130	1.200	1.230	1.220	1.160	1.060
80	.765	.833	.911	.986	1.050	1.080	1.100	1.080	1.040
120	.729	.729	.749	.781	.820	.864	.912	.957	.994
160	.702	.652	.631	.634	.657	.705	.777	.866	.962
200	.692	.623	.586	.579	.596	.645	.725	.830	.949
240	.691	.622	.585	.577	.595	.644	.724	.829	.949
280	.703	.655	.635	.639	.663	.710	.781	.869	.963
320	.739	.757	.791	.835	.879	.922	.960	.989	1.010
360	.778	.873	.974	1.070	1.130	1.170	1.170	1.120	1.050

Case 10.

Input:
Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 250
F10.7B = 250
Ap = 15 (Kp = 3)

Output:
J71 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.947	1.070	1.190	1.300	1.380	1.410	1.400	1.340	1.240
80	.922	.994	1.080	1.150	1.220	1.260	1.270	1.250	1.210
120	.884	.884	.905	.940	.980	1.030	1.080	1.120	1.160
160	.855	.802	.779	.782	.807	.858	.934	1.030	1.130
200	.844	.770	.730	.722	.741	.794	.880	.991	1.120
240	.844	.769	.729	.721	.740	.792	.878	.990	1.120
280	.856	.805	.783	.788	.813	.864	.939	1.030	1.130
320	.894	.914	.950	.996	1.040	1.090	1.130	1.160	1.180
360	.936	1.040	1.140	1.240	1.310	1.350	1.340	1.300	1.220

TABLE 4. (Concluded)

Case 11.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 250
F10.7B = 250
Ap = 400 (Kp = 9)

Output:

J71 Density ($x10^{-11}$ Kg/M^3)

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	1.820	1.960	2.170	2.220	2.300	2.340	2.320	2.260	2.150
80	1.790	1.870	1.970	2.130	2.130	2.170	2.180	2.160	2.190
120	1.720	1.750	1.770	1.810	1.860	1.910	1.970	2.020	2.140
160	1.710	1.650	1.620	1.620	1.650	1.720	1.800	1.910	2.030
200	1.700	1.610	1.560	1.550	1.570	1.640	1.740	1.870	2.010
240	1.700	1.610	1.560	1.550	1.570	1.640	1.740	1.870	2.010
280	1.710	1.650	1.630	1.630	1.660	1.720	1.810	1.920	2.030
320	1.760	1.780	1.820	1.880	1.930	1.980	2.030	2.130	2.150
360	1.810	1.920	2.040	2.150	2.230	2.270	2.260	2.220	2.130

Case 12.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 300
F10.7B = 250
Ap = 15 (Kp = 3)

Output:

J71 Density ($x10^{-11}$ Kg/M^3)

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	1.090	1.220	1.360	1.470	1.560	1.590	1.580	1.510	1.400
80	1.060	1.140	1.230	1.310	1.380	1.430	1.440	1.420	1.370
120	1.020	1.020	1.040	1.080	1.120	1.180	1.230	1.280	1.320
160	.987	.928	.902	.906	.934	.990	1.070	1.180	1.290
200	.974	.893	.849	.840	.861	.919	1.010	1.140	1.270
240	.974	.892	.848	.839	.859	.918	1.010	1.140	1.270
280	.988	.931	.907	.912	.940	.997	1.080	1.180	1.290
320	1.030	1.050	1.090	1.140	1.190	1.240	1.290	1.320	1.340
360	1.080	1.190	1.300	1.410	1.480	1.520	1.520	1.470	1.390

TABLE 5. TOTAL DENSITY VALUES GENERATED USING THE JACCHIA 1977 MODEL

Case 1.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 100
F10.7B = 100
Ap = 0 (Kp = 0)

Output:

J77 Density ($x10^{-12}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.943	1.240	1.570	1.880	2.090	2.180	2.140	1.980	1.760
80	.910	1.110	1.330	1.560	1.760	1.890	1.920	1.870	1.730
120	.816	.793	.800	.873	1.000	1.160	1.330	1.500	1.610
160	.773	.680	.639	.675	.777	.932	1.130	1.350	1.560
200	.740	.619	.569	.591	.682	.835	1.040	1.270	1.510
240	.723	.572	.497	.499	.576	.723	.934	1.200	1.490
280	.790	.719	.687	.726	.829	.979	1.170	1.380	1.570
320	.862	.927	1.000	1.120	1.270	1.410	1.530	1.630	1.660
360	.898	1.070	1.260	1.470	1.650	1.760	1.810	1.790	1.700

Case 2.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 100
F10.7B = 100
Ap = 15 (Kp = 3)

Output:

J77 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	1.210	1.360	1.660	2.200	2.620	2.640	2.320	2.020	1.990
80	1.200	1.260	1.370	1.760	2.180	2.330	2.160	1.900	1.900
120	1.100	.950	.839	.978	1.230	1.440	1.510	1.540	1.770
160	1.040	.816	.693	.777	.966	1.140	1.260	1.400	1.750
200	.955	.699	.626	.705	.854	.997	1.120	1.330	1.760
240	.902	.628	.562	.613	.716	.833	.986	1.320	1.800
280	.968	.789	.791	.901	1.020	1.100	1.230	1.600	1.940
320	1.040	.998	1.140	1.390	1.560	1.590	1.580	1.820	2.030
360	1.110	1.150	1.390	1.780	2.060	2.060	1.890	1.890	2.000

TABLE 5. (Continued)

Case 3.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 100
F10.7B = 100
Ap = 400 (Kp = 9)

Output:
J77 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	1.790	.748	.305	.444	.710	.623	.378	.611	1.450
80	2.090	1.030	.323	.307	.561	.601	.376	.440	1.210
120	2.130	.996	.238	.169	.311	.377	.273	.346	1.120
160	1.930	.759	.175	.148	.255	.287	.217	.381	1.240
200	1.450	.387	.120	.156	.234	.221	.195	.545	1.480
240	1.120	.223	.103	.153	.190	.159	.225	.876	1.800
280	1.060	.230	.151	.236	.258	.197	.367	1.370	2.110
320	1.110	.282	.210	.359	.402	.282	.405	1.310	2.040
360	1.330	.408	.338	.424	.557	.412	.346	.885	1.730

Case 4.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 100
Ap = 15 (Kp = 3)

Output:
J77 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.198	.224	.279	.367	.429	.427	.372	.321	.312
80	.196	.209	.233	.301	.367	.387	.354	.307	.301
120	.181	.161	.150	.179	.222	.252	.258	.255	.283
160	.172	.141	.127	.146	.178	.204	.217	.231	.278
200	.160	.124	.118	.135	.160	.180	.193	.220	.279
240	.152	.114	.108	.119	.136	.152	.170	.216	.284
280	.163	.141	.147	.167	.185	.193	.204	.254	.304
320	.174	.174	.204	.245	.271	.268	.258	.288	.316
360	.183	.195	.242	.306	.346	.340	.306	.299	.314

TABLE 5. (Continued)

Case 5.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 150
Ap = 0 (Kp = 0)

Output:
J77 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.247	.309	.374	.428	.462	.472	.461	.431	.389
80	.240	.282	.326	.368	.402	.420	.423	.411	.384
120	.218	.213	.214	.229	.253	.282	.313	.344	.363
160	.209	.188	.179	.185	.205	.235	.272	.314	.352
200	.201	.173	.161	.166	.184	.214	.253	.298	.344
240	.197	.161	.144	.144	.161	.191	.233	.284	.338
280	.212	.197	.190	.197	.217	.245	.279	.318	.353
320	.229	.243	.258	.281	.306	.329	.349	.366	.370
360	.237	.274	.313	.350	.379	.396	.402	.396	.379

Case 6.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 150
Ap = 15 (Kp = 3)

Output:
J77 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.[illegible]	.304	.381	.449	.507	.526	.496	.456	.413
80	.264	.262	.318	.411	.497	.520	.474	.410	.400
120	.245	.220	.210	.253	.311	.349	.353	.344	.377
160	.233	.195	.182	.212	.255	.289	.301	.313	.370
200	.218	.175	.171	.197	.231	.256	.268	.298	.371
240	.210	.164	.160	.177	.200	.218	.236	.292	.377
280	.224	.202	.216	.245	.267	.272	.279	.339	.401
320	.239	.245	.291	.347	.378	.368	.348	.383	.417
360	.250	.270	.338	.425	.474	.461	.411	.397	.414

TABLE 5. (Continued)

Case 7.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 150
F10.7B = 150
Ap = 400 (Kp = 9)

Output:

J77 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	1.930	1.070	.605	.992	1.[illegible]0	1.350	.[illegible]78	1.[illegible]30	1.860
80	2.150	1.330	.603	.692	1.280	1.340	.810	.809	1.630
120	2.140	1.250	.454	.414	.785	.916	.624	.663	1.530
160	1.990	1.010	.358	.387	.674	.723	.498	.698	1.640
200	1.620	.618	.282	.431	.631	.562	.430	.892	1.860
240	1.340	.413	.271	.442	.529	.402	.455	1.240	2.140
280	1.300	.437	.390	.641	.675	.459	.661	1.740	2.410
320	1.360	.521	.506	.898	.970	.629	.736	1.710	2.370
360	1.560	.[illegible]85	.530	1.010	1.280	.911	.682	1.310	2.110

Case 8.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 200
F10.7B = 150
Ap = 15 (Kp = 3)

Output:

J77 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.356	.407	.513	.666	.764	.753	.[illegible]63	.561	.541
80	.352	.379	.432	.559	.669	.695	.630	.543	.526
120	.328	.301	.[illegible]14	.356	.434	.481	.[illegible]61	.461	.497
160	.[illegible]14	.269	.250	.302	.360	.401	.411	.421	.489
200	.296	.245	.246	.284	.329	.358	.368	.400	.490
240	.286	.242	.238	.258	.287	.307	.324	.391	.496
280	.304	.280	.307	.347	.373	.374	.376	.448	.525
320	.323	.[illegible]37	.404	.479	.515	.496	.463	.503	.545
360	.356	.367	.463	.576	.636	.614	.544	.523	.542

TABLE 5. (Continued)

Case 9

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 250
F10.7B = 250
Ap = 0 (Kp = 0)

Output:

J77 Density ($x10^{-11}$ Kg/M^3)

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	.674	.798	.915	1.000	1.050	1.060	1.040	.984	.906
80	.658	.742	.824	.898	.951	.977	.976	.950	.897
120	.612	.599	.596	.620	.663	.714	.769	.824	.858
160	.591	.543	.518	.526	.561	.616	.686	.766	.837
200	.573	.508	.477	.481	.515	.573	.649	.735	.821
240	.564	.481	.437	.433	.464	.524	.606	.705	.811
280	.599	.562	.542	.551	.583	.632	.695	.770	.838
320	.634	.661	.687	.723	.762	.798	.832	.862	.870
360	.653	.727	.790	.859	.903	.936	.931	.920	.886

Case 10.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 250
F10.7B = 250
Ap = 15 (Kp = 3)

Output:

J77 Density ($x10^{-11}$ Kg/M^3)

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	.632	.723	.911	1.170	1.320	1.290	1.120	.962	.924
80	.624	.674	.778	.997	1.180	1.210	1.090	.941	.903
120	.586	.550	.558	.680	.815	.886	.868	.818	.861
160	.564	.502	.504	.596	.698	.756	.755	.752	.847
200	.540	.471	.493	.572	.646	.683	.680	.717	.847
240	.526	.457	.479	.531	.577	.596	.603	.699	.854
280	.556	.543	.610	.683	.717	.697	.679	.782	.896
320	.585	.631	.766	.894	.941	.889	.817	.867	.925
360	.604	.672	.850	1.040	1.130	1.080	.946	.900	.923

TABLE 5. (Concluded)

Case 11.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 250
F10.7B = 250
Ap = 400 (Kp = 9)

Output:

J77 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.[illegible]	.170	.1[illegible]	.2[illegible]	.3[illegible]	.303	.1[illegible]	.183	.260
80	.256	.19[illegible]	.1[illegible]	.164	.303	.311	.186	.159	.239
120	.252	.1[illegible]	.095	.108	.206	.232	.152	.1[illegible]	.228
160	.239	.15[illegible]	.080	.106	.184	.189	.123	.138	.237
200	.208	.111	.072	.124	.177	.149	.103	.158	.256
240	.184	.085	.07[illegible]	.132	.153	.108	.101	.192	.280
280	.182	.092	.106	.179	.181	.114	.130	.243	.305
320	.139	.106	.128	.231	.242	.149	.145	.245	.303
360	.207	.13[illegible]	.105	.246	.306	.211	.145	.209	.282

Case 12.

Input:

Date: June 20, 1968
Time: 12 UT
Altitude: 400 Km
F10.7 = 300
F10.7B = 250
Ap = 15 (Kp = 3)

Output:

J77 Density ($x10^{-11}$ Kg/M^3)

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.[illegible]	.[illegible]4	1.050	1.340	1.500	1.470	1.270	1.100	1.050
80	.[illegible]	.779	.901	1.150	1.350	1.390	1.250	1.080	1.030
120	.6[illegible]	.641	.656	.800	.954	1.030	1.010	.944	.987
160	.654	.587	.594	.704	.820	.884	.878	.870	.971
200	.627	.554	.586	.679	.762	.801	.792	.829	.970
240	.612	.540	.571	.633	.684	.701	.704	.807	.977
280	.645	.637	.719	.803	.839	.811	.786	.897	1.020
320	.67[illegible]	.7[illegible]5	.894	1.040	1.090	1.030	.940	.991	1.050
360	.648	.774	.985	1.200	1.300	1.230	1.080	1.030	1.050

Tables 6, 7, and 8 give the percent difference of inter-model density change for the respective J70, J71, and J77 models, given a change in flux and/or geomagnetic index. Besides the standard 81 point matrix output of density change given in percent, the tables give the mean and standard deviation of all 81 matrix computations, along with the lowest and highest matrix value (both used to compute range). Also, the 81 absolute density matrix values for each case have been processed and mean, with standard deviation results, have been computed and are listed on each table.

TABLE 6. PERCENT DEVIATION OF JACCHIA 1970 DENSITY DURING A CHANGE OF $F_{10.7}$ AND/OR A_p

A

J70 ρ (Case 2) as % of J70 ρ (Case 1)

Case 2		Case 1	
F10.7	= 100	F10.7	= 100
F10.7B	= 100	F10.7B	= 100
Ap	= 15	Ap	= 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	74.5	65.1	58.6	52.3	48.1	46.9	48.3	50.3	55.6
80	75.8	70.8	63.2	58.5	55.3	54.3	53.7	54.4	56.6
120	77.1	79.0	74.2	72.4	69.3	67.3	64.0	61.3	59.4
160	79.7	86.9	88.5	86.0	81.8	80.9	74.8	69.0	61.3
200	80.3	89.0	93.1	93.5	91.8	87.2	80.5	70.7	62.5
240	80.6	89.3	93.0	93.7	92.3	87.8	79.6	71.0	62.5
280	79.4	85.3	87.9	86.6	81.8	79.5	73.9	68.3	61.8
320	78.0	76.0	72.8	68.5	65.1	63.6	61.1	59.8	58.8
360	76.1	67.6	60.9	55.5	51.4	50.0	50.0	52.3	56.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.104, SD 1 = 0.044
* Mean 2 = 0.172, SD 2 = 0.059

Density Differences (%)

High = 93.7 %
Mean = 70.4 %, SD = 13.4 %
Low = 46.9 %

Range = 46.8 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

B

J70 ρ (Case 3)		J70 ρ (Case 2)	
F10.7	= 100	F10.7	= 100
F10.7B	= 100	F10.7B	= 100
Ap	= 400	Ap	= 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	397.2	341.1	292.8	259.9	239.2	232.2	235.5	250.9	278.2
80	412.3	370.6	333.3	300.9	280.5	268.8	267.5	273.8	288.5
120	431.8	426.7	409.4	388.7	370.2	348.9	331.6	316.0	302.8
160	449.2	479.3	488.9	488.1	471.9	441.6	401.4	356.2	316.0
200	457.1	506.8	530.7	534.2	523.2	489.8	33.6	376.4	322.6
240	457.1	506.8	531.6	535.1	525.1	488.9	437.0	375.8	322.6
280	449.2	481.1	485.3	480.2	465.5	440.5	400.7	354.7	316.5
320	428.2	412.3	386.1	361.4	341.1	323.8	312.8	304.3	298.6
360	403.5	353.8	309.7	275.9	255.6	246.1	248.4	221.4	282.8

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.172 , SD 1 = 0.059
* Mean 2 = 0.768 , SD 2 = 0.115

Density Differences (%)

High = 535.1 %
Mean = 377.0 %, SD = 89.9 %
Low = 221.4 %

Range = 313.7 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

C

J70 ρ (Case 3) as % of J70 ρ (Case 1)

F10.7 = 100 F10.7 = 100
F10.7B = 100 F10.7B = 100
Ap = 400 Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	767.6	628.4	522.9	448.3	404.6	388.0	397.5	427.3	488.2
80	800.6	703.6	607.0	535.6	490.8	469.1	464.6	477.2	508.3
120	855.4	742.6	797.3	742.5	696.0	651.0	607.9	571.0	542.1
160	886.7	982.5	1009.9	993.9	939.9	879.7	776.5	671.0	571.0
200	904.5	1046.8	1118.4	1127.2	1095.3	1004.0	863.3	713.0	586.7
240	906.1	1048.9	1118.9	1130.1	1102.4	1006.1	864.6	713.7	586.7
280	885.3	976.8	1000.0	982.4	928.2	870.1	770.8	665.3	571.8
320	840.2	801.8	739.8	677.7	628.4	593.2	565.1	546.2	533.1
360	781.6	660.8	559.4	484.5	438.4	419.1	422.6	389.5	498.7

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($\times 10^{-11}$ Kg/M^3)

* Mean 1 = 0.104, SD 1 = 0.044
* Mean 2 = 0.768, SD 2 = 0.115

Density Differences (%)

High = 1130.1 %
Mean = 724.9 %, SD = 218.5%
Low = 388.0 %

Range = 742.1 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

D

J70 ρ (Case 4) as % of J70 ρ (Case 2)

F10.7 = 150	F10.7 = 100
F10.7B = 100	F10.7B = 100
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	66.9	63.3	59.5	57.3	55.3	54.4	54.8	56.4	58.4
80	68.8	65.0	63.4	60.3	58.9	57.6	57.9	58.2	59.5
120	69.0	68.7	67.6	66.7	65.8	63.8	62.6	61.5	60.4
160	69.7	71.2	71.3	73.4	71.9	69.6	67.1	64.5	61.5
200	70.6	73.8	74.3	75.1	74.1	73.1	68.8	66.2	62.6
240	70.6	73.8	74.8	74.6	74.7	72.2	70.1	65.6	62.6
280	70.5	72.1	71.6	72.1	70.7	70.6	68.1	64.1	62.0
320	69.5	68.1	66.2	65.1	63.3	62.2	61.6	60.7	60.2
360	67.6	64.3	61.2	58.5	56.7	55.7	56.3	56.9	59.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.172 , SD 1 = 0.059
* Mean 2 = 0.280 , SD 2 = 0.086

Density Differences (%)

High = 75.1 %
Mean = 65.4 %, SD = 5.9 %
Low = 54.4 %

Range = 20.7 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

E

J70 ρ (Case 6) as % of J70 ρ (Case 5)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 15	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	45.7	40.6	35.9	32.6	30.3	29.6	30.0	31.5	34.6
80	46.9	43.4	40.0	36.9	34.8	33.4	33.3	34.0	35.6
120	49.0	48.2	46.7	45.0	42.9	41.4	39.5	38.2	37.0
160	50.3	53.3	54.3	53.0	52.0	49.5	46.3	42.2	38.1
200	51.1	54.5	57.2	58.0	56.1	53.0	49.0	43.8	38.7
240	51.1	54.5	56.6	57.3	57.1	53.4	49.2	43.8	38.8
280	50.3	52.1	53.7	52.4	51.1	49.5	45.9	41.9	38.1
320	48.0	46.4	44.8	42.5	40.6	39.0	37.9	37.0	36.6
360	46.1	41.6	37.7	34.4	32.4	31.3	31.3	32.7	35.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.262, SD 1 = 0.091
* Mean 2 = 0.369, SD 2 = 0.107

Density Differences (%)

High = 58.0 %
Mean = 43.6 %, SD = 8.1 %
Low = 29.6 %

Range = 28.4 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

F

J70 ρ (Case 7) as % of J70 ρ (Case 6)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 400	Ap = 15

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	223.0	193.8	168.4	151.4	139.3	134.8	137.5	146.8	161.2
80	229.0	208.6	188.2	171.7	162.3	156.4	155.8	159.5	166.9
120	239.4	238.0	228.0	219.3	208.8	197.9	190.7	181.3	174.8
160	248.6	264.1	268.8	265.4	259.3	244.7	222.9	202.5	180.7
200	252.9	276.3	287.3	288.9	284.8	268.1	241.5	213.0	183.7
240	252.9	275.9	288.5	290.2	284.4	269.2	242.4	210.1	184.3
280	248.9	263.8	267.1	264.5	257.1	242.9	224.0	200.8	180.7
320	237.5	230.1	218.3	203.9	193.8	185.4	179.7	174.8	172.1
360	224.9	199.2	178.2	160.1	148.6	143.8	145.6	151.9	163.5

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.369 , SD 1 = 0.107
* Mean 2 = 1.103 , SD 2 = 0.158

Density Differences (%)

High = 290.2%
Mean = 211.7 %, SD = 45.3 %
Low = 134.8 %

Range = 155.4 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

G

J70 ρ (Case 7) as % of J70 ρ (Case 5)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 400	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	379.6	313.0	264.7	233.3	211.8	204.5	208.7	224.6	251.6
80	383.4	342.6	303.5	272.0	253.6	242.0	241.1	247.	262.1
120	405.6	401.0	381.1	362.9	341.3	321.1	305.6	288.9	276.5
160	423.8	458.1	469.1	459.0	446.2	415.3	372.5	330.2	287.6
200	433.3	481.4	509.0	514.7	500.7	463.4	408.8	350.0	293.3
240	433.3	480.8	508.3	514.0	504.1	466.3	410.9	345.8	294.6
280	424.3	453.3	464.0	455.4	439.8	412.5	373.7	326.9	287.6
320	399.5	383.4	360.9	333.1	313.0	296.6	285.9	276.5	271.6
360	374.7	323.7	282.9	249.6	229.3	220.2	222.4	234.2	255.7

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.262, SD 1 = 0.091
* Mean 2 = 1.103, SD 2 = 0.158

Density Differences (%)

High = 514.7 %
Mean = 351.1 %, SD = 90.5 %
Low = 204.3 %

Range = 310.4 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

H

J70 ρ (Case 8) as % of J70 ρ (Case 6)

F10.7 = 200	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	43.5	41.0	38.7	36.8	35.7	35.1	35.5	36.4	38.0
80	43.9	42.3	40.9	39.0	38.1	37.6	37.2	37.7	38.6
120	44.5	44.1	44.1	43.4	42.5	41.5	40.9	40.0	39.4
160	45.3	46.9	46.8	46.5	46.4	45.4	43.6	41.7	39.9
200	46.0	47.1	47.8	48.2	48.1	47.0	45.0	42.9	40.1
240	46.0	47.3	48.5	48.4	47.6	47.2	45.1	42.6	40.2
280	45.7	46.7	46.8	46.9	46.2	45.3	43.6	41.7	40.1
320	44.9	44.3	43.2	42.0	41.0	40.5	39.9	39.2	38.9
360	43.5	41.8	39.5	37.9	36.6	36.2	36.3	36.8	38.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.369 , SD 1 = 0.107
* Mean 2 = 0.521 , SD 2 = 0.137

Density Differences (%)

High = 48.5 %
Mean = 42.3 %, SD = 3.8 %
Low = 35.1 %

Range = 13.4 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

J70 ρ (Case 10) as % of J70 ρ (Case 9)

F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 15	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	22.7	20.1	18.1	16.5	15.3	14.8	15.0	15.9	17.8
80	23.1	21.5	19.9	18.0	17.8	17.1	17.0	17.5	18.0
120	24.1	23.8	23.1	22.2	21.3	20.5	19.7	19.6	18.8
160	24.8	26.0	26.2	26.0	25.5	24.3	22.7	20.9	19.4
200	24.9	26.8	27.7	27.9	27.5	26.3	24.3	21.6	19.2
240	25.1	26.9	28.0	28.0	27.6	26.3	24.2	21.6	19.2
280	24.8	25.9	26.2	26.0	25.3	24.1	22.7	20.8	19.2
320	23.7	23.2	22.1	21.1	20.1	19.3	19.2	18.0	18.3
360	22.8	20.8	19.0	16.5	15.3	15.7	15.8	15.6	18.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.790 , SD 1 = 0.199
* Mean 2 = 0.953 , SD 2 = 0.210

Density Differences (%)

High = 28.0 %
Mean = 21.6 %, SD = 3.8 %
Low = 14.8 %

Range = 13.2 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

J

J70 ρ (Case 11) as % of J70 ρ (Case 10)

F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 400	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	100.9	88.6	78.1	70.1	65.4	63.6	64.5	67.9	74.8
80	103.3	95.2	86.3	80.2	74.8	72.4	71.8	73.6	76.7
120	106.7	105.9	102.8	98.4	94.8	89.9	86.3	82.2	79.3
160	110.6	117.3	118.8	117.5	115.3	109.7	101.4	91.4	82.2
200	112.6	121.6	125.9	127.3	124.7	117.9	108.0	96.1	84.8
240	112.6	121.9	126.2	126.4	125.0	118.2	108.5	96.3	84.8
280	110.3	116.4	118.7	117.0	113.6	108.1	100.0	91.7	82.2
320	106.6	103.6	98.0	92.2	88.6	85.6	81.5	80.9	79.5
360	101.2	90.7	80.7	74.2	70.3	66.9	67.4	71.4	75.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11}$ Kg/M^3)

* Mean 1 = 0.953 , SD 1 = 0.210
* Mean 2 = 1.824 , SD 2 = 0.227

Density Differences (%)

High = 127.3%
Mean = 95.4%, SD = 18.6%
Low = 63.6%

Range = 63.7%

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

K

J70 ρ (Case 11) as % of J70 ρ (Case 9)

F10.7 = 250 F10.7 = 250
F10.7B = 250 F10.7B = 250
Ap = 400 Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	146.5	126.5	110.4	98.2	90.7	87.7	89.2	94.7	105.9
80	150.4	137.2	123.3	112.5	105.9	101.9	100.9	103.9	108.5
120	156.6	155.0	149.6	142.4	136.3	129.0	123.0	117.9	113.1
160	162.9	173.8	176.1	174.0	170.3	160.7	147.1	131.4	117.6
200	165.6	181.0	188.5	190.7	186.5	175.1	158.6	138.3	120.2
240	166.0	181.5	189.6	189.9	187.1	175.6	159.0	138.7	120.2
280	162.5	172.4	175.9	173.4	167.6	158.2	145.4	131.4	117.1
320	155.7	150.7	141.8	132.7	126.5	121.3	116.3	113.5	112.2
360	147.1	130.3	115.1	102.9	96.4	93.0	93.9	98.2	107.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.790, SD 1 = 0.199
* Mean 2 = 1.824, SD 2 = 0.227

Density Differences (%)

High = 190.7 %
Mean = 138.3 %, SD = 30.1 %
Low = 87.7 %

Range = 103.0 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

L

J70 ρ (Case 12) as % of J70 ρ (Case 10)

F10.7 = 300	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	22.4	21.4	20.2	18.9	18.4	17.9	18.1	18.3	19.3
80	22.5	22.6	20.6	20.7	19.3	19.5	18.5	19.8	19.8
120	23.4	23.2	23.4	22.9	21.6	21.1	21.6	20.6	19.8
160	23.6	24.3	24.5	24.4	24.1	23.5	22.2	21.3	20.6
200	23.9	24.7	25.2	25.2	25.1	24.6	23.4	22.7	21.0
240	23.9	24.8	25.2	25.2	25.0	24.5	23.5	21.7	21.0
280	23.7	24.2	24.4	24.3	24.0	23.6	22.5	21.9	20.6
320	23.0	22.6	22.6	21.4	21.4	21.2	20.4	20.9	20.5
360	22.8	21.2	20.2	19.2	19.5	18.0	18.2	19.8	19.5

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.953 , SD 1 = 0.210
* Mean 2 = 1.157 , SD 2 = 0.235

Density Differences (%)

High = 25.2 %
Mean = 21.9 %, SD = 2.1 %
Low = 17.9 %

Range = 7.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

M

J70 ρ (Case 5) as % of J70 ρ (Case 1)

F10.7 = 150	F10.7 = 100
F10.7B = 150	F10.7B = 100
Ap = 0	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	165.9	153.2	142.9	133.7	127.9	124.9	126.6	130.6	137.9
80	168.8	160.4	150.0	143.0	138.2	136.4	136.0	136.7	140.0
120	173.0	171.9	168.7	163.2	159.7	155.8	150.9	146.8	143.6
160	172.5	181.1	182.7	183.3	175.9	175.0	166.5	158.0	147.6
200	172.7	186.2	190.6	190.1	189.1	184.2	173.6	160.9	150.0
240	173.1	186.8	191.2	191.2	188.8	183.5	173.0	161.4	149.2
280	172.1	182.1	182.8	182.4	175.9	173.5	165.7	157.4	147.6
320	171.7	169.1	163.2	157.9	153.2	150.0	146.8	145.5	143.4
360	167.6	156.9	146.9	138.1	131.6	129.3	130.1	133.1	139.6

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.104 , SD 1 = 0.044
* Mean 2 = 0.262 , SD 2 = 0.091

Density Differences (%)

High = 191.2 %
Mean = 159.7 %, SD = 19.0 %
Low = 124.9 %

Range = 66.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

N

J70 ρ (Case 9) as % of J70 ρ (Case 5)

F10.7 = 250	F10.7 = 150
F10.7B = 250	F10.7B = 150
Ap = 0	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	219.5	200.7	183.8	171.1	162.8	159.6	160.9	167.8	177.5
80	223.7	211.1	198.6	186.9	179.0	174.2	173.9	175.4	182.5
120	230.1	229.1	223.1	217.0	210.1	203.8	197.9	192.5	188.3
160	235.1	245.5	248.8	245.2	242.2	233.2	221.1	206.6	191.9
200	238.9	251.3	258.6	260.8	256.1	245.7	230.9	212.9	193.7
240	238.3	250.6	257.2	259.4	257.8	247.2	232.1	212.5	194.6
280	235.7	243.2	247.0	244.0	239.8	232.8	220.5	205.8	192.5
320	228.5	223.2	216.5	207.9	200.7	195.6	191.3	187.7	186.1
360	220.7	205.0	189.9	179.1	170.7	166.8	166.4	171.8	180.1

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.262 , SD 1 = 0.091
* Mean 2 = 0.790 , SD 2 = 0.199

Density Differences (%)

High = 260.8 %
Mean = 211.3 %, SD = 29.1 %
Low = 159.6 %

Range = 101.2 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

O

J70 ρ (Case 9) as % of J70 ρ (Case 1)

F10.7 = 250	F10.7 =
F10.7B = 250	F10.7B = 100
Ap = 0	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	749.6	661.5	589.3	533.7	499.0	483.7	491.1	517.5	560.1
80	770.1	710.0	646.5	597.0	564.5	548.1	546.3	551.9	577.9
120	801.1	794.8	768.2	734.5	705.5	676.9	647.4	621.8	602.3
160	813.1	871.4	886.0	877.8	844.2	816.1	755.7	691.0	622.6
200	824.2	905.5	942.1	946.7	929.3	882.7	805.5	716.3	634.2
240	824.1	905.5	940.2	946.8	933.4	884.3	806.6	717.0	634.2
280	813.2	868.3	881.0	871.4	837.3	810.3	751.4	687.1	624.2
320	792.7	769.9	733.0	693.9	661.5	639.0	619.0	606.1	596.3
360	758.2	683.3	615.6	564.5	527.1	511.7	512.9	533.7	571.1

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.104, SD 1 = 0.044
* Mean 2 = 0.790, SD 2 = 0.199

Density Differences (%)

High = 946.8 %
Mean = 714.1 %, SD = 134.6 %
Low = 483.7 %

Range = 463.1 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

P

J70 ρ (Case 6) as % of J70 ρ (Case 2)

F10.7 = 150 F10.7 = 100
F10.7B = 150 F10.7B = 100
Ap = 15 Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	122.1	115.6	108.1	103.4	99.7	98.4	98.7	101.8	105.9
80	124.6	118.8	114.5	109.8	106.8	104.4	104.8	105.3	107.9
120	126.4	125.2	123.7	121.3	119.3	116.1	113.4	111.5	109.4
160	127.9	130.6	131.5	133.0	130.7	127.2	123.1	117.2	112.0
200	128.6	134.0	136.5	136.9	135.2	132.4	125.8	119.7	113.3
240	128.6	134.0	136.2	136.6	136.0	131.5	126.8	119.7	112.8
280	127.9	131.5	131.2	130.6	129.3	127.8	122.9	117.1	112.0
320	126.0	123.9	120.5	118.1	115.6	112.4	111.3	110.4	109.3
360	123.2	117.0	111.2	105.8	102.6	100.7	101.4	103.1	106.9

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.172 , SD 1 = 0.059
* Mean 2 = 0.369 , SD 2 = 0.107

Density Differences (%)

High = 136.9 %
Mean = 118.8 %, SD = 11.1 %
Low = 98.4 %

Range = 38.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

Q

J70 ρ (Case 10) as % of J70 ρ (Case 6)

F10.7 = 250	F10.7 = 150
F10.7B = 250	F10.7B = 150
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	168.9	157.0	146.8	138.3	132.5	129.9	130.8	136.0	142.9
80	171.3	163.4	155.6	147.2	143.9	140.7	140.3	141.5	145.8
120	175.0	174.9	171.1	167.2	163.2	159.0	155.6	153.0	150.0
160	178.4	184.0	185.2	184.3	182.5	177.1	169.3	160.5	152.4
200	180.1	188.4	191.2	192.0	190.9	185.3	176.1	164.6	152.4
240	180.1	188.0	192.1	192.4	190.5	186.0	176.4	164.3	153.0
280	178.8	184.0	184.9	184.4	181.6	176.3	169.5	160.2	152.4
320	174.7	171.8	167.0	161.6	157.0	153.7	151.7	147.7	147.8
360	169.7	160.1	150.6	141.9	135.7	135.0	134.9	136.8	144.8

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.369 , SD 1 = 0.107
* Mean 2 = 0.953 , SD 2 = 0.210

Density Differences (%)

High = 192.4 %
Mean = 163.4 %, SD = 18.1 %
Low = 129.9 %

Range = 62.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

R

J70 ρ (Case 10) as % of J70 ρ (Case 2)

F10.7 = 250	F10.7 = 100
F10.7B = 250	F10.7B = 100
Ap = 15	Ap = 15

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	497.2	453.9	413.5	384.7	364.2	356.0	358.5	376.4	400.0
80	509.4	476.3	448.4	418.7	404.2	392.0	392.1	395.9	411.0
120	522.5	519.1	506.5	491.3	477.0	459.8	445.5	435.0	423.6
160	534.4	555.0	560.2	562.4	551.8	529.6	500.7	465.7	435.0
200	540.3	574.8	588.8	591.8	584.3	563.0	523.4	481.5	438.5
240	540.3	573.8	589.9	591.9	585.4	562.0	526.8	480.9	438.5
280	535.2	557.7	558.7	555.9	545.7	529.4	500.7	464.7	435.0
320	520.6	508.7	488.7	470.5	453.9	438.9	432.0	421.3	418.5
360	502.1	464.3	429.1	397.9	377.6	371.6	373.1	380.9	406.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.172 , SD 1 = 0.059
* Mean 2 = 0.953 , SD 2 = 0.210

Density Differences (%)

High = 591.9 %
Mean = 478.3 %, SD = 67.7 %
Low = 356.0 %

Range = 235.9 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE . (Continued)

S

J70 ρ (Case 7) as % of J70 ρ (Case 3)

F10.7 = 150	F10.7 = 100
F10.7B = 150	F10.7B = 100
Ap = 400	Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	44.2	43.6	42.2	42.1	40.8	40.2	40.6	42.0	42.2
80	44.3	43.4	42.7	42.2	42.5	42.1	42.5	42.5	42.9
120	44.5	44.5	44.1	44.6	44.0	43.4	43.7	43.0	42.9
160	44.6	44.9	45.0	44.8	44.9	44.6	43.7	44.0	43.0
200	44.8	45.1	45.2	45.3	45.3	45.1	44.5	44.4	43.2
240	44.8	45.0	45.3	45.4	45.1	45.1	44.6	43.2	43.2
280	44.8	45.0	45.0	44.9	44.8	44.5	44.2	43.6	42.9
320	44.4	44.3	44.4	43.6	43.6	43.0	43.2	43.0	42.9
360	44.1	43.0	43.4	42.4	41.7	41.4	42.0	59.1	42.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($\times 10^{-11}$ Kg/M^3)

* Mean 1 = 0.768 , SD 1 = 0.115
* Mean 2 = 1.103 , SD 2 = 0.158

Density Differences (%)

High = 45.4 %
Mean = 43.9 %, SD = 2.1 %
Low = 40.2 %

Range = 5.2 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

T

J70 ρ (Case //) as % of J70 ρ (Case 7)

F10.7 = 250	F10.7 = 150
F10.7B = 250	F10.7B = 150
Ap = 400	Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	67.3	64.9	63.7	61.2	60.7	60.1	59.9	60.6	62.5
80	67.6	66.7	65.2	63.9	62.5	61.8	61.4	61.5	62.7
120	67.5	67.5	67.6	66.0	66.1	65.2	63.8	63.9	63.1
160	68.2	69.5	69.2	69.2	69.3	68.5	68.0	64.9	63.9
200	68.8	69.8	69.9	70.6	69.9	68.8	68.2	65.7	64.4
240	68.8	70.0	70.1	69.7	70.0	69.0	68.4	67.3	64.4
280	68.0	69.0	69.7	69.3	68.4	67.7	66.3	65.8	63.9
320	68.2	67.6	66.0	65.5	64.9	65.0	63.3	63.1	63.4
360	67.0	65.8	62.8	62.0	61.5	60.9	60.1	61.2	63.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 1.103 , SD 1 = 0.158
* Mean 2 = 1.824 , SD 2 = 0.227

Density Differences (%)

High = 70.6 %
Mean = 65.8 %, SD = 3.1 %
Low = 59.9 %

Range = 10.7 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

U

J70 ρ (Case 11) as % of J70 ρ (Case 3)

F10.7 = 250	F10.7 = 100
F10.7B = 250	F10.7B = 100
Ap = 400	Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	141.3	136.8	132.8	129.1	126.4	124.5	124.8	128.0	131.1
80	141.9	139.0	135.7	133.1	131.6	129.9	130.0	130.3	132.4
120	142.0	142.0	141.5	140.1	139.1	136.9	135.4	134.4	133.0
160	143.3	145.7	145.3	144.9	145.4	143.7	141.3	137.4	134.4
200	144.3	146.4	146.7	147.9	146.7	144.9	143.0	139.3	135.4
240	144.3	146.4	147.1	146.7	146.7	145.3	143.4	139.6	135.4
280	143.3	145.0	146.1	145.3	143.9	142.3	139.9	138.0	134.1
320	142.8	141.9	139.8	137.6	136.8	135.9	133.9	133.3	133.4
360	140.6	137.1	133.4	130.7	128.8	127.5	127.4	156.5	132.1

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.768 , SD 1 = 0.115
* Mean 2 = 1.824 , SD 2 = 0.227

Density Differences (%)

High = 147.9 %
Mean = 138.5 %, SD = 6.6 %
Low = 124.5 %

Range = 23.4 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

V

J70 ρ (Case 8) as % of J70 ρ (Case 4)

F10.7 = 200	F10.7 = 150
F10.7B = 150	F10.7B = 100
Ap = 15	Ap = 15

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	90.9	86.1	81.1	76.9	74.5	73.6	73.8	76.0	79.3
80	91.4	88.6	84.9	81.9	79.7	78.4	77.9	78.8	80.7
120	93.6	93.2	92.3	90.4	88.4	86.7	84.9	83.3	82.1
160	95.2	97.9	98.4	96.8	96.4	94.8	91.6	87.1	83.6
200	95.6	98.9	100.6	100.6	100.0	97.3	94.0	88.9	83.9
240	95.6	98.3	100.6	101.2	99.4	97.8	93.5	89.2	83.6
280	94.7	97.4	97.9	96.9	96.5	94.0	90.5	87.5	83.3
320	93.2	92.2	90.0	87.6	86.1	84.0	82.9	82.3	81.5
360	91.2	87.2	82.8	79.1	76.7	75.6	75.7	77.1	79.8

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.280, SD 1 = 0.086
* Mean 2 = 0.521, SD 2 = 0.137

Density Differences (%)

High = 101.2 %
Mean = 88.3 %, SD = 7.9 %
Low = 73.6 %

Range = 27.6 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Continued)

W

J70 ρ (Case 12) as % of J70 ρ (Case 8)

F10.7 = 300	F10.7 = 200
F10.7B = 250	F10.7B = 150
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	129.4	121.2	113.7	107.1	102.8	100.5	101.2	104.8	110.1
80	130.9	126.9	118.9	114.7	110.7	109.1	107.6	110.1	112.5
120	134.8	134.0	132.1	129.0	124.7	121.8	120.6	117.9	114.9
160	136.9	140.4	142.0	141.4	139.5	135.4	129.3	123.1	117.5
200	137.8	143.5	146.6	146.6	145.9	141.7	135.1	127.2	117.8
240	137.8	143.9	146.3	146.7	146.0	141.8	135.2	125.6	116.2
280	136.8	140.6	141.4	140.7	138.6	135.0	129.9	123.7	117.2
320	133.1	130.9	128.5	123.7	121.2	118.8	116.7	115.2	115.0
360	130.8	122.4	115.8	109.1	106.2	103.6	103.7	107.4	111.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

- Mean 1 = 0.521 , SD 1 = 0.137
- Mean 2 = 1.157 , SD 2 = 0.235

Density Differences (%)

High = 146.7 %
Mean = 125.5 %, SD = 13.4 %
Low = 100.5 %

Range = 46.2 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 6. (Concluded)

X

J70 ρ (Case 2) as % of J70 ρ (Case 4)

F10.7 = 300	F10.7 = 150
F10.7B = 250	F10.7B = 100
Ap = 15	Ap = 15

Degrees Longitude (+E)	Degrees Latitude (+N) -80	-60	-40	-20	0	20	40	60	80
40	338.0	311.6	287.0	266.5	253.8	248.1	249.8	260.5	276.7
80	342.1	328.0	304.6	290.7	278.7	273.1	269.3	275.6	284.0
120	354.6	352.0	346.4	336.0	323.2	314.0	307.9	299.4	291.2
160	362.3	375.8	380.0	375.1	370.4	358.5	339.3	317.3	299.4
200	365.0	384.4	394.6	394.6	391.8	377.0	356.0	329.1	300.6
240	365.0	383.8	394.0	396.4	390.6	378.5	355.1	326.9	300.6
280	361.1	374.9	377.5	373.8	369.2	355.8	338.0	319.4	298.1
320	350.5	344.0	334.3	319.7	311.6	302.6	296.3	292.3	290.2
360	341.2	316.4	294.6	274.3	264.3	257.6	257.8	267.4	280.1

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.280 , SD 1 = 0.086
* Mean 2 = 1.157 , SD 2 = 0.235

Density Differences (%)

High = 396.4 %
Mean = 325.8 %, SD = 42.9 %
Low = 248.1 %

Range = 148.3%

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. PERCENT DEVIATION OF JACCHIA 1971 DENSITY DURING A CHANGE OF $F_{10.7}$ AND/OR A_p

A

J71 ρ (Case 2)		J71 ρ (Case 1)	
F10.7	= 100	F10.7	= 100
F10.7B	= 100	F10.7B	= 100
Ap	= 15	Ap	= 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	68.1	60.0	53.7	50.0	46.7	45.6	46.0	48.6	51.9
80	69.5	65.4	59.8	55.7	52.9	51.5	50.6	52.1	53.9
120	71.9	71.9	71.1	68.5	66.3	63.1	59.8	57.1	55.6
160	74.6	79.4	81.0	80.8	78.5	74.8	68.3	63.1	56.7
200	75.2	81.8	86.2	86.6	84.2	79.9	72.6	64.4	57.3
240	75.5	82.1	86.8	87.3	84.8	79.2	73.0	66.0	57.3
280	74.3	78.1	80.6	79.9	77.4	73.6	68.6	62.5	57.5
320	71.6	70.3	68.1	63.8	62.3	59.7	57.9	56.4	54.5
360	68.1	61.9	56.2	51.9	49.4	47.9	48.1	50.3	53.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.111 , SD 1 = 0.042
* Mean 2 = 0.180 , SD 2 = 0.055

Density Differences (%)

High = 83.7 %
Mean = 65.6 %, SD = 11.9 %
Low = 45.6 %

Range = 41.7 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

B

J71 ρ (Case 3) as % of J71 ρ (Case 2)

F10.7 = 100	F10.7 = 100
F10.7B = 100	F10.7B = 100
Ap = 400	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	354.7	310.4	273.4	246.2	230.8	224.7	227.5	238.9	261.7
80	366.4	334.9	306.7	283.0	266.7	256.0	254.2	257.7	269.2
120	385.2	385.2	373.0	358.0	341.1	323.2	306.7	291.9	280.1
160	398.5	427.9	444.0	441.0	426.0	396.3	361.9	323.8	291.0
200	405.3	449.1	476.2	482.5	471.0	433.3	386.5	336.8	295.1
240	405.3	449.1	475.2	481.6	470.1	437.0	386.5	336.3	295.1
280	399.3	428.7	441.9	439.0	424.2	394.9	358.0	322.5	289.6
320	378.6	370.0	353.1	336.0	318.9	303.5	290.5	282.2	277.7
360	359.6	321.3	286.9	262.1	245.1	237.4	237.9	247.1	264.9

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.180 , SD 1 = 0.055
* Mean 2 = 0.758 , SD 2 = 0.105

Density Differences (%)

High = 482.5 %
Mean = 344.0 %, SD = 74.6 %
Low = 224.7 %

Range = 257.8 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

C

J71 ρ (Case 3) as % of J71 ρ (Case 1)

F10.7 = 100	F10.7 = 100
F10.7B = 100	F10.7B = 100
Ap = 400	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	664.3	556.7	473.8	419.3	385.3	372.8	378.2	403.8	449.4
80	690.4	619.2	550.0	496.4	460.6	439.4	433.3	444.2	468.4
120	734.1	734.1	709.2	671.5	633.7	590.1	550.0	515.8	491.5
160	770.6	847.1	884.4	878.4	839.0	767.6	677.4	591.0	512.7
200	785.8	898.4	972.7	987.0	951.6	859.5	739.7	618.3	521.4
240	787.0	900.0	974.7	989.1	953.5	862.3	741.7	624.3	521.4
280	769.7	841.6	878.4	869.5	829.9	759.3	672.3	586.6	513.4
320	721.3	700.2	661.6	614.3	579.8	544.4	516.5	497.9	483.4
360	675.1	582.3	504.4	450.0	415.7	398.9	400.5	421.7	459.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($\times 10^{-11}$ Kg/M^3)

* Mean 1 = 0.111 , SD 1 = 0.042
* Mean 2 = 0.758 , SD 2 = 0.105

Density Differences (%)

High = 989.1 %
Mean = 643.7 %, SD = 177.8%
Low = 372.9 %

Range = 616.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

D

J71 ρ (Case 4) as % of J71 ρ (Case 2)

F10.7 = 150	F10.7 = 100
F10.7B = 100	F10.7B = 100
Ap = 15	Ap = 15

Degrees Longitude (+E)	Degrees Latitude (+N) -80	-60	-40	-20	0	20	40	60	80
40	43.4	41.7	39.7	37.9	37.4	37.0	37.3	37.8	39.1
80	44.1	42.4	41.0	40.4	39.2	38.4	38.7	38.7	39.7
120	45.1	45.1	43.9	43.3	42.9	42.0	41.5	40.7	39.8
160	45.2	45.9	47.4	47.0	46.3	44.9	44.5	42.5	41.0
200	45.5	47.4	47.6	48.5	46.6	46.7	44.7	42.7	41.3
240	45.5	47.4	47.6	47.6	47.7	47.1	44.7	42.7	41.3
280	45.9	46.7	47.0	47.5	46.8	45.3	43.3	42.3	40.3
320	44.8	44.0	43.1	43.0	42.2	41.4	40.5	40.2	40.2
360	43.6	42.1	40.7	39.5	38.3	37.8	37.5	38.4	39.3

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.180, SD 1 = 0.055
* Mean 2 = 0.255, SD 2 = 0.072

Density Differences (%)

High = 48.6 %
Mean = 42.8 %, SD = 3.3 %
Low = 37.0 %

Range = 11.6 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

E

J71 ρ (Case 6) as % of J71 ρ (Case 5)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 15	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	40.9	36.7	33.1	30.6	29.1	28.2	28.5	29.9	32.4
80	41.7	39.3	36.2	34.2	32.6	31.8	31.3	31.8	33.1
120	43.8	43.8	42.6	41.4	39.8	38.0	36.6	35.5	33.8
160	45.3	47.7	48.1	48.4	47.2	44.4	41.3	38.3	34.8
200	45.2	49.2	51.8	51.2	50.3	47.9	43.8	39.5	35.2
240	45.2	49.2	51.2	51.5	50.6	47.9	43.8	39.1	35.2
280	44.7	46.7	48.4	47.9	46.5	44.5	41.4	38.1	35.1
320	43.5	42.4	40.6	39.2	37.4	36.0	34.9	34.1	33.9
360	41.1	37.8	34.5	32.0	30.6	29.5	29.7	30.7	32.6

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.284, SD 1 = 0.086
* Mean 2 = 0.391, SD 2 = 0.100

Density Differences (%)

High = 51.8 %
Mean = 39.7 %, SD = 6.7 %
Low = 28.2 %

Range = 23.6 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

F

J71 ρ (Case 7) as % of J71 ρ (Case 6)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 400	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	198.6	175.8	157.3	143.5	135.9	131.8	133.6	140.6	150.5
80	203.2	187.6	175.5	161.3	154.0	149.0	148.1	149.0	154.6
120	210.8	210.8	207.5	198.3	190.3	182.8	174.9	166.2	161.2
160	218.3	233.0	239.8	238.4	232.1	217.9	200.9	182.1	165.0
200	221.6	242.6	254.8	258.1	251.0	235.6	213.7	188.4	169.2
240	221.6	242.2	255.8	259.1	252.0	235.2	213.7	189.1	167.0
280	218.6	232.5	238.8	237.4	230.3	216.5	198.3	180.7	166.7
320	209.1	203.8	196.9	189.5	179.7	171.7	165.6	162.9	159.5
360	200.0	181.8	163.2	150.5	143.6	138.5	139.4	144.0	152.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($\times 10^{-11}$ Kg/M^3)

* Mean 1 = 0.391 , SD 1 = 0.100
* Mean 2 = 1.106 , SD 2 = 0.145

Density Differences (%)

High = 259.1 %
Mean = 191.6 %, SD = 36.3 %
Low = 131.8 %

Range = 127.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

G

J71 ρ (Case 7) as % of J71 ρ (Case 5)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 400	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	320.6	277.0	242.5	218.1	204.6	197.2	200.2	212.5	231.6
80	329.8	300.7	275.4	250.7	236.9	228.2	225.8	228.2	238.8
120	346.9	346.9	338.3	321.7	306.0	290.2	275.4	260.6	249.6
160	362.6	391.7	403.2	402.2	388.7	359.3	325.1	290.2	257.4
200	367.1	411.0	439.6	441.5	427.5	396.3	350.9	302.2	263.9
240	367.1	410.5	436.0	444.2	430.0	395.8	350.9	302.2	260.9
280	360.9	387.7	402.7	398.9	383.8	357.3	321.7	287.5	260.4
320	343.5	332.8	317.3	302.9	284.4	269.4	258.4	252.6	247.5
360	323.4	288.3	254.0	230.7	218.2	208.9	210.3	218.8	234.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.284 , SD 1 = 0.086
* Mean 2 = 1.106 , SD 2 = 0.145

Density Differences (%)

High = 444.2 %
Mean = 309.9 %, SD = 70.7 %
Low = 197.2 %

Range = 247.0 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

H

J71 ρ (Case 8) as % of J71 ρ (Case 6)

F10.7 = 200	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	28.5	26.9	25.9	24.7	24.3	24.0	24.2	24.6	25.2
80	28.6	27.7	26.8	25.9	25.6	25.1	25.0	25.3	25.7
120	28.6	28.9	28.7	28.1	28.0	27.3	26.8	26.2	26.1
160	28.9	30.2	30.3	30.1	30.0	29.2	28.4	27.2	26.3
200	29.5	30.4	31.0	31.0	30.7	30.2	29.2	27.5	26.5
240	29.5	30.4	31.1	31.6	30.9	29.9	28.9	27.9	26.5
280	29.3	30.1	30.4	30.2	30.0	29.2	28.1	27.1	26.2
320	28.5	28.6	28.3	27.9	27.2	26.9	26.3	26.1	25.7
360	28.3	27.2	26.1	25.4	24.7	24.6	24.6	24.8	25.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.391 , SD 1 = 0.100
* Mean 2 = 0.498 , SD 2 = 0.119

Density Differences (%)

High = 31.6 %
Mean = 27.7 %, SD = 2.1 %
Low = 24.0 %

Range = 7.6 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

J71 ρ (Case 10) as % of J71 ρ (Case 9)

F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 15	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	20.2	18.5	16.7	15.0	15.0	14.6	14.8	15.5	17.0
80	20.5	19.3	18.6	16.6	16.2	16.7	15.5	15.7	16.3
120	21.3	21.3	20.8	20.4	19.5	19.2	18.4	17.0	16.7
160	21.8	23.0	23.5	23.3	22.8	21.7	20.2	18.9	17.5
200	22.0	23.6	24.6	24.7	24.3	23.1	21.4	19.4	18.0
240	22.1	23.6	24.6	25.0	24.4	23.0	21.3	19.4	18.0
280	21.8	22.9	23.3	23.3	22.6	21.7	20.2	18.5	17.3
320	21.0	20.7	20.1	19.3	18.3	18.2	17.7	17.3	16.8
360	20.3	19.1	17.0	15.9	15.9	15.4	14.5	16.1	16.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.851 , SD 1 = 0.185
* Mean 2 = 1.012 , SD 2 = 0.195

Density Differences (%)

High = 25.0 %
Mean = 19.6 %, SD = 3.0 %
Low = 14.5 %

Range = 10.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

J

J71 ρ (Case 11) as % of J71 ρ (Case 10)

F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 400	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	92.2	83.2	82.4	70.8	66.7	66.0	65.7	68.7	73.4
80	94.1	88.1	82.4	85.2	74.6	72.2	71.7	72.8	81.0
120	94.6	98.0	95.6	92.6	89.8	85.4	82.4	80.4	84.5
160	100.0	105.7	108.0	107.2	104.5	100.5	92.7	85.4	79.6
200	101.4	109.1	113.7	114.7	111.9	106.5	97.7	88.7	79.5
240	101.4	109.4	114.0	115.0	112.2	107.1	98.2	88.9	79.5
280	99.8	105.0	108.2	106.9	104.2	99.1	92.8	86.4	79.6
320	96.9	94.7	91.6	88.8	85.6	81.7	79.6	83.6	82.2
360	93.4	84.6	78.9	73.4	70.2	68.1	68.7	70.8	74.6

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 1.012 , SD 1 = 0.195
* Mean 2 = 1.896 , SD 2 = 0.229

Density Differences (%)

High = 115.0 %
Mean = 89.8 %, SD = 13.9 %
Low = 65.7 %

Range = 49.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

K

J71 ρ (Case 11) as % of J71 ρ (Case 9)

F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 400	Ap = 0

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	131.0	117.1	112.7	96.5	91.7	90.2	90.2	94.8	102.8
80	134.0	124.5	116.2	116.0	102.9	100.9	98.2	100.0	110.6
120	135.9	140.1	136.3	131.8	126.8	121.1	116.0	111.1	115.3
160	143.6	153.1	156.7	155.5	151.1	144.0	131.7	120.6	111.0
200	145.7	158.4	166.2	167.7	163.4	154.3	140.0	125.3	111.8
240	146.0	158.8	166.7	168.6	163.9	154.7	140.3	125.6	111.8
280	143.2	151.9	156.7	155.1	150.4	142.3	131.8	120.9	110.8
320	138.2	135.1	130.1	125.1	119.6	114.8	111.5	115.4	112.9
360	132.6	119.9	109.4	100.9	97.3	94.0	93.2	98.2	102.9

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.851 , SD 1 = 0.185
* Mean 2 = 1.896 , SD 2 = 0.229

Density Differences (%)

High = 168.6 %
Mean = 127.3 %, SD = 22.2%
Low = 90.2 %

Range = 78.4 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

J71 ρ (Case 12) as % of J71 ρ (Case 10)

F10.7 = 300	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	15.1	14.0	14.3	13.1	13.0	12.8	12.9	12.7	12.9
80	15.0	14.7	13.9	13.9	13.1	13.5	13.4	13.6	13.2
120	15.4	15.4	14.9	14.9	14.3	14.6	13.9	14.3	13.8
160	15.4	15.7	15.8	15.9	15.7	15.4	14.6	14.6	14.2
200	15.4	16.0	16.3	16.3	16.2	15.7	14.8	15.0	13.4
240	15.4	16.0	16.3	16.4	16.1	15.9	15.0	15.2	13.4
280	15.4	15.7	15.8	15.7	15.6	15.4	15.0	14.6	14.2
320	15.2	14.9	14.7	14.5	14.4	13.8	14.2	13.8	13.6
360	15.4	14.4	14.0	13.7	13.0	12.6	13.4	13.1	13.9

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 1.012 , SD 1 = 0.195
* Mean 2 = 1.158 , SD 2 = 0.213

Density Differences (%)

High = 16.4 %
Mean = 14.6 %, SD = 1.0 %
Low = 12.6 %

Range = 3.8 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

M

J71 ρ (Case 5)		J71 ρ (Case 1)	
F10.7	= 150	F10.7	= 100
F10.7B	= 150	F10.7B	= 100
Ap	= 0	Ap	= 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	166.4	154.2	143.0	135.8	129.9	128.6	129.2	133.5	139.4
80	169.8	161.5	153.3	146.4	141.3	138.2	137.5	139.3	142.8
120	173.6	173.6	171.7	167.2	163.4	158.6	153.3	148.1	145.8
160	176.8	183.8	188.6	187.5	183.0	177.6	168.2	158.6	148.5
200	178.9	188.7	194.3	197.1	194.3	184.9	174.2	160.6	149.6
240	179.3	189.1	195.4	196.4	193.6	186.1	174.8	163.1	149.6
280	177.4	184.7	187.0	186.6	183.3	176.3	167.5	158.0	148.5
320	172.2	170.1	166.8	160.0	157.9	153.2	149.6	147.1	144.1
360	168.1	157.5	147.4	140.0	134.8	132.4	132.6	136.6	141.7

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($\times 10^{-11}$ Kg/M^3)

* Mean 1 = 0.111 , SD 1 = 0.042
* Mean 2 = 0.284 , SD 2 = 0.086

Density Differences (%)

High = 197.1 %
Mean = 162.8 %, SD = 19.7 %
Low = 128.6 %

Range = 68.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

N

J71 ρ (Case 9) as % of J71 ρ (Case 5)

F10.7 = 250	F10.7 = 150
F10.7B = 250	F10.7B = 150
Ap = 0	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	212.7	196.1	181.8	172.3	164.9	161.1	163.5	168.5	176.8
80	216.1	206.3	194.8	185.8	180.7	174.8	175.7	176.9	181.8
120	222.6	222.6	218.7	213.7	208.3	201.0	195.1	190.0	184.8
160	228.0	237.8	241.1	240.9	236.9	226.4	214.6	201.7	188.9
200	229.5	244.2	253.0	253.0	248.5	239.5	223.7	206.3	190.2
240	229.0	243.6	252.4	254.0	250.0	238.9	223.2	205.9	190.2
280	227.0	235.9	241.4	239.9	234.8	225.7	213.7	200.7	189.2
320	221.3	218.1	211.4	205.9	199.0	193.6	189.2	185.8	185.3
360	213.7	200.0	187.3	178.6	170.3	167.7	169.0	170.5	178.5

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.284, SD 1 = 0.086
* Mean 2 = 0.851, SD 2 = 0.185

Density Differences (%)

High = 254.0 %
Mean = 207.3 %, SD = 26.4 %
Low = 161.1 %

Range = 92.9 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

O

J71 ρ (Case 9) as % of J71 ρ (Case 1)

F10.7 = 250	F10.7 = 100
F10.7B = 250	F10.7B = 100
Ap = 0	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	733.0	652.5	584.6	542.0	509.1	497.1	504.0	527.0	562.5
80	752.8	701.0	646.7	604.3	577.4	554.5	554.8	562.6	584.2
120	782.6	782.6	765.9	738.0	711.9	678.4	647.5	619.5	600.0
160	808.2	858.8	884.4	879.9	853.6	806.2	743.6	680.2	617.9
200	819.0	893.6	939.0	948.9	925.8	867.0	787.4	698.1	624.4
240	818.9	893.6	940.9	949.1	927.6	869.9	788.3	704.9	624.4
280	807.1	856.2	879.9	874.1	848.5	799.9	738.9	675.9	618.7
320	774.6	759.3	730.9	695.2	671.1	643.5	621.8	606.4	596.6
360	741.1	672.6	610.9	568.8	534.8	522.3	525.7	540.0	573.1

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.111 , SD 1 = 0.042
* Mean 2 = 0.851 , SD 2 = 0.185

Density Differences (%)

High = 949.1 %
Mean = 711.3 %, SD = 130.1 %
Low = 497.1 %

Range = 452.0%

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

P

J71 ρ (Case 6) as % of J71 ρ (Case 2)

F10.7 = 150	F10.7 = 100
F10.7B = 150	F10.7B = 100
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	123.3	117.2	110.5	105.3	102.4	101.3	101.7	104.0	108.6
80	125.7	120.3	115.9	112.4	109.3	107.2	107.1	107.3	109.8
120	128.9	128.9	126.4	124.2	121.4	118.8	116.4	113.9	111.3
160	130.4	133.6	136.2	135.9	133.3	129.4	125.2	119.3	113.8
200	131.1	136.8	140.0	140.8	140.2	134.2	128.4	121.1	114.6
240	131.1	136.8	139.0	139.8	139.3	136.1	128.4	120.5	114.6
280	130.4	134.4	135.9	135.6	133.9	129.9	124.2	119.2	113.3
320	127.6	126.0	123.1	120.9	118.4	115.7	113.3	111.9	111.6
360	124.4	119.1	113.1	108.6	105.3	103.6	103.6	105.7	109.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.180 , SD 1 = 0.055
* Mean 2 = 0.391 , SD 2 = 0.100

Density Differences (%)

High = 140.8 %
Mean = 121.3 %, SD = 11.4 %
Low = 101.3 %

Range = 39.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

Q

J71 ρ (Case 10)		as % of	J71 ρ (Case 6)	
F10.7	= 250		F10.7	= 150
F10.7B	= 250		F10.7B	= 150
Ap	= 15		Ap	= 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	166.8	156.6	146.9	139.9	135.9	133.4	135.3	138.9	144.6
80	168.8	162.3	156.5	148.4	146.0	143.2	142.4	143.2	146.4
120	172.0	172.0	170.1	167.0	163.4	160.1	155.9	150.6	148.4
160	174.9	181.4	184.3	183.3	181.2	175.0	167.6	159.4	151.7
200	176.7	185.2	189.7	191.1	188.3	182.6	173.3	162.2	153.4
240	176.7	184.8	190.4	191.9	189.1	181.9	172.7	162.6	153.4
280	175.2	181.5	183.7	183.5	180.3	174.3	166.8	158.1	151.1
320	170.9	169.6	166.1	162.1	157.4	155.3	152.2	150.0	148.9
360	167.4	159.4	150.0	144.6	139.9	138.5	137.6	140.3	144.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.391 , SD 1 = 0.100
* Mean 2 = 1.012 , SD 2 = 0.195

Density Differences (%)

High = 191.9 %
Mean = 162.8 %, SD = 16.4 %
Low = 133.4 %

Range = 58.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

R

J71 ρ (Case 10) as % of J71 ρ (Case 2)

F10.7 = 250	F10.7 = 100
F10.7B = 250	F10.7B = 100
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	495.6	457.3	419.7	392.4	377.5	370.0	374.6	387.3	410.3
80	506.6	477.9	453.8	427.5	414.8	404.0	402.0	404.0	417.1
120	522.5	522.5	511.5	498.7	483.3	469.1	453.8	435.9	424.9
160	533.3	557.4	571.6	568.4	556.1	530.9	502.6	469.1	438.1
200	539.4	575.4	595.2	601.0	592.5	561.7	524.1	479.5	443.7
240	539.4	574.6	594.3	600.0	591.6	565.5	522.7	478.9	443.7
280	534.1	559.8	569.2	567.8	555.6	530.7	498.1	465.9	435.5
320	516.6	509.3	493.8	479.1	462.2	450.5	433.1	429.7	426.8
360	500.0	468.3	432.7	410.3	392.5	385.6	383.8	394.3	410.5

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.180 , SD 1 = 0.055
* Mean 2 = 1.012 , SD 2 = 0.195

Density Differences (%)

High = 601.0 %
Mean = 493.5 %, SD = 66.4%
Low = 370.0 %

Range = 231.0 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

S

J71 ρ (Case 1)		J71 ρ (Case 2)	
F10.7	= 150	F10.7	= 100
F10.7B	= 150	F10.7B	= 100
Ap	= 400	Ap	= 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	46.6	45.9	45.0	44.4	44.4	43.7	43.9	44.8	44.5
80	46.7	45.7	46.3	44.9	45.0	44.9	45.1	44.3	44.7
120	46.6	46.6	47.1	46.0	45.7	46.2	46.3	45.3	45.2
160	47.1	47.4	47.5	47.6	47.3	47.0	46.6	46.0	44.9
200	47.1	47.8	47.8	48.0	47.6	47.3	47.2	45.9	46.2
240	47.1	47.6	47.8	48.1	47.7	47.4	47.2	46.1	45.0
280	47.0	47.4	47.5	47.5	47.4	47.1	46.0	45.6	46.0
320	47.0	46.1	46.2	46.7	45.6	45.2	45.1	45.8	45.4
360	46.4	46.6	44.9	44.3	44.9	43.9	44.2	44.6	44.5

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.756 , SD 1 = 0.105
* Mean 2 = 1.106 , SD 2 = 0.145

Density Differences (%)

High = 48.1 %
Mean = 46.1 %, SD = 1.2 %
Low = 43.7 %

Range = 4.4 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

T

J71 ρ (Case //) as % of J71 ρ (Case 7)

F10.7 = 250	F10.7 = 150
F10.7B = 250	F10.7B = 150
Ap = 400	Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	71.7	70.4	75.0	68.2	66.7	67.1	66.9	67.4	69.3
80	72.1	71.6	69.8	76.0	69.0	68.2	67.7	68.8	75.2
120	70.3	73.3	71.3	72.4	72.2	70.5	69.8	69.7	75.4
160	72.7	73.9	74.0	73.4	73.1	73.4	71.4	70.5	70.6
200	73.3	74.1	74.5	74.5	74.1	73.9	72.3	71.6	68.9
240	73.3	74.2	74.7	74.7	74.3	74.1	72.3	71.6	70.3
280	72.6	73.5	74.3	73.8	73.3	72.5	72.4	71.4	69.2
320	72.5	72.8	71.7	70.9	70.8	70.7	70.6	74.6	74.8
360	72.4	69.9	70.0	69.3	67.7	68.1	67.4	68.2	69.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 1.106 , SD 1 = 0.145
* Mean 2 = 1.896 , SD 2 = 0.229

Density Differences (%)

High = 74.7 %
Mean = 71.6 %, SD = 2.4 %
Low = 66.7 %

Range = 8.0 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

U

J71 ρ (Case 1) as % of J71 ρ (Case 3)

F10.7 = 250	F10.7 = 100
F10.7B = 250	F10.7B = 100
Ap = 400	Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	151.7	148.7	153.8	142.9	140.6	140.2	140.2	142.5	144.6
80	152.5	150.0	148.4	155.1	145.1	143.8	143.3	143.5	153.5
120	149.6	154.0	152.9	151.7	151.0	149.3	148.4	146.6	154.8
160	154.1	156.2	156.7	155.9	155.0	154.8	151.4	149.0	147.3
200	154.9	157.2	157.9	158.3	157.0	156.3	153.6	150.3	146.9
240	154.9	157.2	158.3	158.8	157.4	156.7	153.6	150.7	146.9
280	153.7	155.8	157.1	156.3	155.4	153.7	151.7	149.7	147.0
320	153.6	152.5	151.0	150.7	149.0	147.8	147.6	154.5	154.1
360	152.4	149.0	146.4	144.3	142.9	142.0	141.5	143.2	144.3

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.758 , SD 1 = 0.105
* Mean 2 = 1.896 , SD 2 = 0.229

Density Differences (%)

High = 158.8 %
Mean = 150.8 %, SD = 5.1 %
Low = 140.2 %

Range = 18.6 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

V

J71 ρ (Case 8) as % of J71 ρ (Case 4)

F10.7 = 200	F10.7 = 150
F10.7B = 150	F10.7B = 100
Ap = 15	Ap = 15

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	100.0	94.5	89.7	85.7	83.1	82.2	82.5	84.4	87.9
80	101.4	97.6	94.2	90.5	88.8	87.3	86.6	87.2	88.7
120	102.9	103.4	102.3	100.4	98.3	96.1	93.8	91.8	90.6
160	104.6	108.4	108.8	108.7	107.2	104.6	100.0	95.7	91.6
200	105.7	109.5	112.9	112.4	111.3	108.0	103.9	97.5	92.1
240	105.7	109.5	112.3	113.8	112.0	108.6	103.4	97.5	92.1
280	104.1	107.8	109.3	108.0	107.1	104.5	100.4	95.8	91.9
320	101.9	101.9	100.0	97.6	95.4	93.6	91.9	90.6	89.8
360	100.4	96.2	91.0	87.6	85.1	84.1	84.5	85.4	88.3

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.255, SD 1 = 0.072
* Mean 2 = 0.498, SD 2 = 0.119

Density Differences (%)

High = 113.8 %
Mean = 97.8 %, SD = 8.9 %
Low = 82.2 %

Range = 31.6 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Continued)

W

J71 ρ (Case 12) as % of J71 ρ (Case 8)

F10.7 = 300	F10.7 = 200
F10.7B = 250	F10.7B = 150
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	139.0	130.6	124.1	117.5	114.6	112.3	113.8	116.0	120.5
80	140.4	135.5	130.3	124.7	121.5	120.7	119.8	120.5	122.8
120	144.0	143.4	141.3	139.5	135.3	134.1	129.9	127.0	124.1
160	146.1	150.1	152.7	152.4	150.4	145.7	138.8	133.7	127.5
200	146.6	153.7	157.3	158.5	156.3	151.1	142.8	136.5	127.2
240	146.6	153.4	157.8	158.2	156.4	151.5	143.4	136.5	127.2
280	145.8	150.3	151.9	151.9	149.3	145.0	139.5	132.7	127.1
320	142.9	140.8	138.0	134.6	131.5	128.8	127.9	125.6	124.8
360	140.5	133.3	126.1	121.7	117.3	115.6	116.2	117.8	121.7

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.498 , SD 1 = 0.119
* Mean 2 = 1.158 , SD 2 = 0.213

Density Differences (%)

High = 158.5 %
Mean = 135.8 %, SD = 13.0 %
Low = 112.3 %

Range = 46.2 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 7. (Concluded)

X

J71 ρ (Case 12) as % of J71 ρ (Case 4)

F10.7	= 300	F10.7	= 150
F10.7B	= 250	F10.7B	= 100
Ap	= 15	Ap	= 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	378.1	348.5	325.0	303.8	292.9	286.9	290.1	298.4	314.2
80	384.0	365.3	347.3	328.1	318.2	313.3	310.3	312.8	319.0
120	395.1	395.1	388.3	380.0	366.7	359.1	345.7	335.4	327.2
160	403.6	421.3	427.5	426.7	418.9	402.5	377.7	357.4	335.8
200	407.3	431.5	447.7	449.0	441.5	422.2	395.1	367.2	336.4
240	407.3	431.0	447.1	452.0	443.7	424.6	395.1	367.2	336.4
280	401.5	420.1	427.3	424.1	416.5	401.0	380.0	355.6	335.8
320	390.5	386.1	376.0	363.4	352.5	342.9	337.3	330.0	326.8
360	382.1	357.7	331.9	315.9	302.2	296.9	299.0	303.8	317.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.255, SD 1 = 0.072
* Mean 2 = 1.158, SD 2 = 0.213

Density Differences (%)

High = 452.0 %
Mean = 367.6 %, SD = 46.7 %
Low = 286.9 %

Range = 165.1 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. PERCENT DEVIATION OF JACCHIA 1977 DENSITY DURING A CHANGE OF $F_{10.7}$ AND/OR A_p

A

J77 ρ (Case 2) as % of	J77 ρ (Case 1)
F10.7 = 100	F10.7 = 100
F10.7B = 100	F10.7B = 100
Ap = 15	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	28.3	9.7	5.7	17.0	25.4	21.1	8.4	2.0	13.1
80	31.9	13.5	3.0	12.8	23.9	23.3	12.5	1.6	9.8
120	34.8	19.8	4.9	12.0	23.0	24.1	13.5	2.7	9.9
160	34.5	20.0	8.5	15.1	24.3	22.3	11.5	3.7	12.2
200	29.1	12.9	10.0	19.3	25.2	19.4	7.7	4.7	16.6
240	24.8	9.8	13.1	22.8	24.3	15.2	5.6	10.0	20.8
280	22.5	9.7	15.1	24.1	23.0	12.4	5.1	15.9	23.6
320	20.[illegible]	7.7	14.0	24.1	22.8	12.8	3.3	11.7	22.3
360	23.6	[illegible].5	10.3	21.1	24.8	17.0	4.4	5.6	17.6

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.120, SD 1 = 0.046
* Mean 2 = 0.138, SD 2 = 0.052

Density Differences (%)

High = 34.8 %
Mean = 15.7 %, SD = 8.1 %
Low = 1.6 %

Range = 33.2 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

B

J77 ρ (Case 3) as % of J77 ρ (Case 2)

F10.7 = 100	F10.7 = 100
F10.7B = 100	F10.7B = 100
Ap = 400	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	1379.3	450.0	83.7	101.8	171.0	136.0	62.9	202.5	628.6
80	1641.7	717.5	135.8	74.4	157.3	157.9	74.1	131.6	536.8
120	1836.4	948.4	183.7	72.8	152.8	161.8	80.8	124.7	532.8
160	1755.8	830.1	152.5	90.5	164.0	151.8	72.2	172.1	608.6
200	1418.3	453.6	91.7	121.3	174.0	121.7	74.1	309.8	740.9
240	1141.7	255.1	83.3	149.6	165.4	90.9	128.2	563.6	900.0
280	995.0	191.5	90.9	161.9	152.9	79.1	198.4	756.3	987.6
320	967.3	182.6	84.2	158.3	157.7	77.4	156.3	619.8	904.9
360	1098.2	254.8	71.2	138.2	170.4	100.0	83.1	368.3	765.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.138 , SD 1 = 0.052
* Mean 2 = 0.663 , SD 2 = 0.571

Density Differences (%)

High = 1836.4 %
Mean = 393.7 %, SD = 434.3%
Low = 72.8 %

Range = 1763.6%

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

C

J77 ρ (Case 3) as % of J77 ρ (Case 1)

F10.7 = 100	F10.7 = 100
F10.7B = 100	F10.7B = 100
Ap = 400	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	1798.2	503.2	94.3	136.2	239.7	185.8	76.6	208.6	723.9
80	2196.7	827.9	142.9	96.8	218.8	218.0	95.8	135.3	599.4
120	2510.3	1156.0	197.5	93.6	211.0	225.0	105.3	130.7	595.7
160	2396.8	1016.2	173.9	119.3	228.2	207.9	92.0	182.2	694.9
200	1859.5	525.2	110.9	164.0	243.1	164.7	87.5	329.1	880.1
240	1449.1	289.9	107.2	206.6	229.9	119.9	140.9	630.0	1108.1
280	1241.8	219.9	119.8	225.1	211.2	101.2	213.7	892.8	1243.9
320	1187.7	204.2	110.0	220.5	216.5	100.0	164.7	703.7	1128.9
360	1381.1	281.3	88.9	188.4	237.6	134.1	91.2	394.4	917.6

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.120 , SD 1 = 0.046
* Mean 2 = 0.663 , SD 2 = 0.571

Density Differences (%)

High = 2510.3 %
Mean = 490.1 %, SD = 566.0%
Low = 76.6 %

Range = 2433.7%

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

D

J77 ρ (Case 4) as % of J77 ρ (Case 2)

F10.7 = 150	F10.7 = 100
F10.7B = 100	F10.7B = 100
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	63.6	64.7	68.1	66.8	63.7	61.7	60.3	58.9	56.8
80	63.3	65.9	70.1	71.0	68.3	66.1	63.9	61.6	58.4
120	64.5	69.5	78.8	83.0	80.5	75.0	70.9	65.6	59.9
160	65.4	72.8	83.3	87.9	84.3	78.9	72.2	65.0	58.9
200	67.5	77.4	88.5	91.5	87.4	80.5	72.3	65.4	58.5
240	68.5	81.5	92.2	94.1	89.9	82.5	72.4	63.6	57.8
280	68.4	78.7	85.8	85.3	81.4	75.5	65.9	58.8	56.7
320	67.3	74.3	78.9	76.3	73.7	68.6	63.3	58.2	55.7
360	64.9	69.6	74.1	71.9	68.0	65.0	61.9	58.2	57.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.138 , SD 1 = 0.052
* Mean 2 = 0.231 , SD 2 = 0.078

Density Differences (%)

High = 94.1 %
Mean = 70.7 %, SD = 9.9 %
Low = 55.7 %

Range = 38.4 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

E

J77 ρ (Case 6) as % of J77 ρ (Case 5)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 15	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	8.1	-1.6	1.9	16.6	24.9	21.2	7.6	-1.2	6.2
80	10.0	0.0	-2.5	11.7	23.6	23.8	12.1	-.2	4.2
120	12.4	3.3	-1.9	10.5	22.9	23.8	12.8	0.0	3.9
160	11.5	3.7	1.7	14.6	24.4	23.0	10.7	-.3	5.1
200	8.5	1.2	6.2	18.7	25.5	19.6	5.9	0.0	7.8
240	6.6	1.9	11.1	22.9	24.2	14.1	1.3	2.8	11.5
280	5.7	2.5	13.7	24.4	23.0	11.0	0.0	6.6	13.6
320	4.4	.8	12.8	23.5	23.5	11.9	-.3	4.6	12.7
360	5.5	-1.5	8.0	21.4	25.1	16.4	2.2	.3	9.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.288 , SD 1 = 0.088
* Mean 2 = 0.317 , SD 2 = 0.101

Density Differences (%)

High = 25.5 %
Mean = 10.1 %, SD = 8.7 %
Low = -2.5 %

Range = 28.0 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

F

J77 ρ (Case 7) as % of J77 ρ (Case 6)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 400	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	622.8	252.0	58.8	98.8	172.1	136.0	56.9	139.4	350.4
80	714.4	371.6	89.6	68.4	157.5	157.7	70.9	97.3	307.5
120	773.5	468.2	116.2	63.6	152.4	162.5	76.8	92.7	305.8
160	754.1	417.9	96.7	82.5	164.3	150.2	65.4	123.0	343.2
200	643.1	253.1	64.9	118.8	173.2	119.5	60.4	199.3	401.3
240	538.1	151.8	69.4	149.7	164.5	84.4	92.8	324.7	467.6
280	480.4	116.3	80.6	161.6	152.8	68.8	136.9	413.3	501.0
320	469.6	112.7	73.9	158.8	156.6	70.9	111.5	346.5	468.3
360	524.0	153.7	56.8	137.6	170.0	97.6	65.9	230.0	409.7

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.317 , SD 1 = 0.101
* Mean 2 = 1.008 , SD 2 = 0.565

Density Differences (%)

High = 773.5 %
Mean = 226.3 %, SD = 183.5 %
Low = 56.8 %

Range = 716.7 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

G

J77 ρ (Case 7) as % of J77 ρ (Case 5)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 400	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	681.4	246.3	61.8	131.8	239.8	186.0	68.8	136.7	378.1
80	795.8	371.6	85.0	88.0	218.4	219.0	91.5	96.8	324.5
120	881.7	486.9	112.1	80.8	210.3	224.8	99.4	92.7	321.5
160	852.2	437.2	100.0	109.2	228.8	207.7	83.1	122.3	365.9
200	706.0	257.2	75.2	159.6	242.9	162.6	70.0	199.3	440.7
240	580.2	156.5	88.2	206.9	228.6	110.5	95.3	336.6	533.1
280	513.2	121.8	105.3	225.4	211.1	87.3	136.9	447.2	582.7
320	493.9	114.4	96.1	219.6	217.0	91.2	110.9	367.2	540.5
360	558.2	150.0	69.3	188.6	237.7	130.1	69.7	230.8	456.7

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.288 , SD 1 = 0.088
* Mean 2 = 1.008 , SD 2 = 0.565

Density Differences (%)

High = 881.7 %
Mean = 257.5 %, SD = 198.6 %
Low = 61.8 %

Range = 819.9 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

H

J77 ρ (Case 8) as % of J77 ρ (Case 6)

F10.7 =	F10.7 =
F10.7B =	F10.7B =
Ap =	Ap =

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	33.3	33.9	34.6	33.5	32.4	31.6	31.7	31.7	31.0
80	33.3	34.4	35.8	36.0	34.6	33.7	32.9	32.4	31.5
120	33.9	36.8	40.0	40.7	39.5	37.8	36.3	34.0	31.8
160	34.8	37.9	41.8	42.5	41.2	38.8	36.5	34.5	32.2
200	35.8	40.0	43.9	44.2	42.4	39.8	37.3	34.2	32.1
240	36.2	41.5	45.6	45.8	43.5	40.8	37.3	33.9	31.6
280	35.7	39.6	42.1	41.6	39.7	37.5	34.8	32.2	30.9
320	35.1	37.6	38.8	38.0	36.2	34.8	33.0	31.3	30.7
360	34.4	35.9	37.0	35.5	34.2	33.2	32.4	31.7	30.9

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations*

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.317, SD 1 = 0.101
* Mean 2 = 0.428, SD 2 = 0.129

Density Differences (%)

High = 45.8 %
Mean = 36.2 %, SD = 3.9 %
Low = 30.7 %

Range = 15.1 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

J77 ρ (Case 10) as % of J77 ρ (Case 9)

F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 15	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	-6.2	-9.4	-.4	17.0	25.7	21.7	7.7	-2.2	2.0
80	-5.2	-9.2	-5.6	11.0	24.1	23.8	11.7	-.9	.7
120	-4.2	-8.2	-6.4	9.7	22.9	24.1	12.9	-.7	.3
160	-4.6	-7.6	-2.7	13.3	24.4	22.7	10.1	-1.8	1.2
200	-5.8	-7.3	3.4	18.9	25.4	19.2	4.8	-2.4	3.2
240	-6.7	-5.0	9.6	22.6	24.4	13.7	-.5	-.9	5.3
280	-7.2	-3.4	12.5	24.0	23.0	10.3	-2.3	1.6	6.9
320	-7.7	-4.5	11.5	23.7	23.5	11.4	-1.3	.6	6.3
360	-7.4	-7.6	6.5	21.1	25.1	16.6	1.6	-2.2	4.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.725, SD 1 = 0.166
* Mean 2 = 0.773, SD 2 = 0.205

Density Differences (%)

High = 25.7 %
Mean = 6.4 %, SD = 11.4 %
Low = -9.4 %

Range = 35.1 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

J

J77 ρ (Case 11) as % of J77 ρ (Case 10)

F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 400	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	279.7	135.1	42.7	96.6	170.5	134.9	52.7	90.2	181.4
80	310.3	186.4	58.1	64.5	156.8	157.0	70.6	69.0	164.7
120	330.0	221.8	70.3	58.8	152.8	161.9	75.1	67.5	164.8
160	323.8	204.8	58.7	77.9	163.6	150.0	62.9	83.5	179.8
200	285.2	135.7	46.0	116.8	174.0	118.2	51.5	120.4	202.2
240	249.8	86.2	58.7	148.6	165.2	81.2	67.5	174.7	227.9
280	227.3	68.7	73.8	162.1	152.4	63.6	91.5	210.7	240.4
320	223.1	68.0	67.1	158.4	157.2	67.6	77.5	182.6	227.6
360	242.7	89.0	47.1	136.5	170.8	95.4	53.3	132.2	205.5

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.773 , SD 1 = 0.205
* Mean 2 = 1.828 , SD 2 = 0.666

Density Differences (%)

High = 330.0 %
Mean = 138.6 %, SD = 72.6 %
Low = 42.7 %

Range = 287.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

K

J77 ρ (Case 11) as % of J77 ρ (Case 9)

F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 400	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	256.1	113.0	42.1	130.0	240.0	185.8	64.4	86.0	187.0
80	289.1	160.1	49.3	82.6	218.6	218.3	90.6	67.4	166.4
120	311.8	195.5	59.4	74.2	210.7	224.9	97.7	66.3	165.7
160	304.4	181.8	54.4	101.5	228.0	206.8	79.3	80.2	183.2
200	263.0	118.5	50.9	157.8	243.7	160.0	58.7	115.0	211.8
240	226.2	76.9	73.9	204.8	229.7	106.1	66.7	172.3	245.3
280	203.8	63.0	95.6	224.9	210.5	80.4	87.1	215.6	264.0
320	198.1	60.4	86.3	219.5	217.6	86.7	74.3	184.2	248.3
360	217.5	74.7	56.6	186.4	238.9	127.9	55.7	127.2	218.3

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.725, SD 1 = 0.166
* Mean 2 = 1.828, SD 2 = 0.666

Density Differences (%)

High = 311.8 %
Mean = 152.8 %, SD = 74.6 %
Low = 42.1 %

Range = 269.7 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

L

J77 ρ (Case 12) as % of J77 ρ (Case 10)

F10.7 = 300	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	15.3	15.4	15.3	14.5	13.6	14.0	13.4	14.3	13.6
80	15.5	15.6	15.8	15.3	14.4	14.9	14.7	14.8	14.1
120	15.7	16.5	17.6	17.6	17.1	16.3	16.4	15.4	14.6
160	16.0	16.9	17.9	18.1	17.5	16.9	16.3	15.7	14.6
200	16.1	17.6	18.9	18.7	18.0	17.3	16.5	15.6	14.5
240	16.3	18.2	19.2	19.2	18.5	17.6	16.7	15.5	14.4
280	16.0	17.3	17.9	17.6	17.0	16.4	15.8	14.7	13.8
320	16.1	16.5	16.7	16.3	15.8	15.9	15.1	14.3	13.5
360	15.6	15.9	15.9	15.4	15.0	13.9	14.2	14.4	13.8

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.773 , SD 1 = 0.205
* Mean 2 = 0.894 , SD 2 = 0.229

Density Differences (%)

High = 19.2 %
Mean = 15.9 %, SD = 1.5 %
Low = 13.4 %

Range = 5.8 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

M

J77 ρ (Case 5)		J77 ρ (Case 1)	
F10.7	= 150	F10.7	= 100
F10.7B	= 150	F10.7B	= 100
Ap	= 0	Ap	= 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	161.9	149.2	138.2	127.7	121.1	116.5	115.4	117.7	121.0
80	163.7	154.1	145.1	135.9	128.4	122.2	120.3	119.8	122.0
120	167.2	168.6	167.5	162.3	153.0	143.1	135.3	129.3	125.5
160	170.4	176.5	180.1	174.1	163.8	152.1	140.7	132.6	125.6
200	171.6	179.5	183.0	180.9	169.8	156.3	143.3	134.6	127.8
240	172.5	181.5	189.7	188.6	179.5	164.2	149.5	136.7	126.8
280	168.4	174.0	176.6	171.3	161.8	150.3	138.5	130.4	124.8
320	165.7	162.1	158.0	150.9	140.9	133.3	128.1	124.5	122.9
360	163.9	156.1	148.4	138.1	129.7	125.0	122.1	121.2	122.9

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.120 , SD 1 = 0.046
* Mean 2 = 0.288 , SD 2 = 0.088

Density Differences (%)

High = 189.7 %
Mean = 148.1 %, SD = 21.4 %
Low = 115.4 %

Range = 74.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

N

J77 ρ (Case 9) as % of J77 ρ (Case 5)

F10.7	= 250	F10.7	= 150
F10.7B	= 250	F10.7B	= 150
Ap	= 0	Ap	= 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	172.9	158.3	144.7	133.6	127.3	124.6	125.6	128.3	132.9
80	174.2	163.1	152.8	144.0	136.6	132.6	130.7	131.1	133.6
120	180.7	181.2	178.5	170.7	162.1	153.2	145.7	139.5	136.4
160	182.8	188.8	189.4	184.3	173.7	162.1	152.2	143.9	137.8
200	185.1	193.6	196.3	189.8	179.9	167.8	156.5	146.6	138.7
240	186.3	198.8	203.5	200.7	188.2	174.3	160.1	148.2	139.9
280	182.5	185.3	185.3	179.7	168.7	158.0	149.1	142.1	137.4
320	176.9	172.0	166.3	157.3	149.0	142.6	138.4	135.5	135.1
360	175.1	165.3	155.0	145.4	138.3	133.8	131.6	132.3	133.8

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11}$ Kg/M^3)

* Mean 1 = 0.288 , SD 1 = 0.088
* Mean 2 = 0.725 , SD 2 = 0.166

Density Differences (%)

High = 203.5 %
Mean = 158.5 %, SD = 22.0 %
Low = 124.6 %

Range = 78.9 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

O

J77 ρ (Case 9) as % of J77 ρ (Case 1)

F10.7 = 250	F10.7 = 100
F10.7B = 260	F10.7B = 100
Ap = 0	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	614.7	543.5	482.8	431.9	402.4	386.2	386.0	397.0	414.8
80	623.1	568.5	519.5	475.6	440.3	416.9	408.3	408.0	418.5
120	650.0	655.4	645.0	610.2	563.0	515.5	478.2	449.3	432.9
160	664.6	698.5	710.6	679.3	622.0	560.9	507.1	467.4	436.5
200	674.3	720.7	738.3	713.9	655.1	586.2	524.0	478.7	443.7
240	680.1	740.9	779.3	767.7	705.6	624.8	548.8	487.5	444.3
280	658.2	681.6	688.9	659.0	603.3	545.6	494.0	458.0	433.8
320	635.5	613.1	587.0	545.5	500.0	466.0	443.8	428.8	424.1
360	626.1	579.4	533.3	484.4	447.3	426.1	414.4	414.0	421.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.120 , SD 1 = 0.046
* Mean 2 = 0.725 , SD 2 = 0.166

Density Differences (%)

High = 779.3 %
Mean = 545.8 %, SD = 110.9 %
Low = 386.0 %

Range = 393.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

P

J77 ρ (Case 6) as % of J77 ρ (Case 2)

F10.7 = 150	F10.7 = 100
F10.7B = 150	F10.7B = 100
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	120.7	123.5	129.5	126.8	120.2	116.7	113.8	110.9	107.5
80	120.0	123.8	132.1	133.5	128.0	123.2	119.4	115.8	110.5
120	122.7	131.6	150.3	158.7	152.8	142.4	133.8	123.4	113.0
160	124.0	139.0	162.6	172.8	164.0	153.5	138.9	123.6	111.4
200	128.3	150.4	173.2	179.4	170.5	156.8	139.3	124.1	110.8
240	132.8	161.1	184.7	188.7	179.3	161.7	139.4	121.2	109.4
280	131.4	156.0	173.1	171.9	161.8	147.3	126.8	111.9	106.7
320	129.8	145.5	155.3	149.6	142.3	131.4	120.3	110.4	105.4
360	125.2	134.8	143.2	138.8	130.1	123.8	117.5	110.1	107.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.138 , SD 1 = 0.052
* Mean 2 = 0.317 , SD 2 = 0.101

Density Differences (%)

High = 188.7 %
Mean = 136.0 %, SD = 21.4 %
Low = 105.4 %

Range = 83.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

Q

J77 ρ (Case 10)		J77 ρ (Case 6)	
F10.7	= 250	F10.7	= 150
F10.7B	= 250	F10.7B	= 150
Ap	= 15	Ap	= 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	136.7	137.8	139.1	134.5	128.8	125.5	125.8	125.8	123.7
80	136.4	139.0	144.7	142.6	137.4	132.7	130.0	129.5	125.8
120	139.2	150.0	165.7	168.8	162.1	153.9	145.9	137.8	128.4
160	142.1	157.4	176.9	181.1	173.7	161.6	150.8	140.3	128.9
200	147.7	169.1	188.3	190.4	179.7	166.8	153.7	140.6	128.3
240	150.5	178.7	199.4	200.0	188.5	173.4	155.5	139.4	126.5
280	148.2	168.8	182.4	178.8	168.5	156.3	143.4	130.7	123.4
320	144.8	157.6	163.2	157.6	148.9	141.6	134.8	126.4	121.8
360	141.6	148.9	151.5	144.7	138.4	134.3	130.2	126.7	122.9

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} K-/M^3$)

* Mean 1 = 0.317 , SD 1 = 0.101
* Mean 2 = 0.773 , SD 2 = 0.205

Density Differences (%)

High = 200.0 %
Mean = 149.0 %, SD = 20.0 %
Low = 121.8 %

Range = 78.2 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

R

J77 ρ (Case 10) as % of J77 ρ (Case 2)

F10.7 = 250	F10.7 = 100
F10.7B = 250	F10.7B = 100
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	422.3	431.6	448.8	431.8	403.8	388.6	382.8	376.2	364.3
80	420.0	434.9	467.9	466.5	441.3	419.3	404.6	395.3	375.3
120	432.7	478.9	565.1	595.3	562.6	515.3	474.8	431.2	386.4
160	442.3	515.2	627.3	667.1	622.6	563.2	499.2	437.1	384.0
200	465.4	573.8	687.5	711.3	656.4	585.1	507.1	439.1	381.3
240	483.1	627.7	752.3	766.2	705.9	615.5	511.6	429.5	374.4
280	474.4	588.2	671.2	658.0	602.9	533.6	432.0	388.8	361.9
320	462.5	532.3	571.9	543.2	503.2	459.1	417.1	376.4	355.7
360	444.1	484.3	511.5	484.3	448.5	424.3	400.5	376.2	361.5

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.138 , SD 1 = 0.052
* Mean 2 = 0.773 , SD 2 = 0.205

Density Differences (%)

High = 766.2 %
Mean = 491.8 %, SD = 102.9 %
Low = 355.7 %

Range = 410.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

S

J77 ρ (Case 7) as % of J77 ρ (Case 3)

F10.7	= 150	F10.7	= 100
F10.7B	= 150	F10.7B	= 100
Ap	= 400	Ap	= 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	7.8	43.0	98.4	123.4	121.1	116.7	105.8	66.9	28.3
80	2.9	29.1	86.7	125.4	128.2	123.0	115.4	83.9	34.7
120	.5	25.5	90.8	145.0	152.4	143.0	128.6	91.6	36.6
160	3.1	33.1	104.6	161.5	164.3	151.9	129.5	83.2	32.3
200	11.7	59.7	135.0	176.3	169.7	154.3	120.5	63.7	25.7
240	19.6	85.2	163.1	188.9	178.4	152.8	102.2	41.6	18.9
280	22.6	90.0	158.3	171.6	161.6	133.0	80.1	27.0	14.2
320	22.5	84.8	141.0	150.1	141.3	123.0	81.7	30.5	16.2
360	17.3	67.9	122.7	138.2	129.8	121.1	97.1	48.0	22.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($\times 10^{-11}$ Kg/M^3)

* Mean 1 = 0.663 , SD 1 = 0.571
* Mean 2 = 1.008 , SD 2 = 0.565

Density Differences (%)

High = 188.9 %
Mean = 91.3 %, SD = 54.6 %
Low = 0.5 %

Range = 188.4 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

T

J77 ρ (Case 11) as % of J77 ρ (Case 7)

F10.7 = 250	F10.7 = 150
F10.7B = 250	F10.7B = 150
Ap = 400	Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	24.4	58.9	114.9	131.9	127.4	124.4	119.8	79.4	39.8
80	19.1	45.1	104.0	137.0	136.7	132.1	129.6	96.5	46.6
120	17.8	41.6	109.3	160.9	162.4	153.3	143.6	106.6	49.0
160	20.1	51.5	123.5	173.9	173.0	161.4	147.0	97.7	44.5
200	28.4	79.6	155.3	187.7	180.5	165.1	139.5	77.1	37.6
240	37.3	106.1	180.4	198.6	189.2	168.7	122.0	54.8	30.8
280	40.0	109.6	171.8	179.3	168.1	148.4	96.7	39.7	26.6
320	39.0	103.5	153.0	157.2	149.5	136.9	97.0	43.3	27.8
360	32.7	85.4	135.8	143.6	139.1	131.6	112.6	59.5	33.6

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 1.008 , SD 1 = 0.565
* Mean 2 = 1.928 , SD 2 = 0.666

Density Differences (%)

High = 198.6 %
Mean = 105.0 %, SD = 53.3 %
Low = 17.8 %

Range = 180.8 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

U

J77 ρ (Case 1) as % of J77 ρ (Case 3)

F10.7 = 250	F10.7 = 100
F10.7B = 250	F10.7B = 100
Ap = 400	Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	34.1	127.3	326.2	418.0	402.8	386.4	352.4	195.5	79.3
80	22.5	87.4	280.8	434.2	440.1	417.5	394.7	261.4	97.5
120	18.3	77.7	299.2	539.1	562.4	515.4	456.8	296.0	103.6
160	23.8	101.6	357.1	616.2	621.6	558.5	466.8	262.2	91.1
200	43.4	186.8	500.0	694.9	656.4	574.2	428.2	189.9	73.0
240	64.3	281.6	637.9	762.7	705.3	579.2	348.9	119.2	55.6
280	71.7	298.3	602.0	658.5	601.0	478.7	254.2	77.4	44.5
320	70.3	275.9	509.5	543.5	502.0	428.4	258.0	87.0	48.5
360	55.6	211.3	425.2	480.2	449.4	412.1	319.1	136.2	63.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.663 , SD 1 = 0.571
* Mean 2 = 1.828 , SD 2 = 0.666

Density Differences (%)

High = 762.7 %
Mean = 320.9 %, SD = 219.9 %
Low = 18.3 %

Range = 744.4 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

V

J77 ρ (Case 8) as % of J77 ρ (Case 4)

F10.7 = 200	F10.7 = 150
F10.7B = 150	F10 7B = 100
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	79.8	81.7	83.9	81.5	78.1	76.3	75.5	74.8	73.4
80	79.6	81.3	85.4	85.7	82.3	79.6	78.0	76.9	74.8
120	81.2	87.0	96.0	98.9	95.5	90.9	86.4	80.8	75.6
160	82.6	90.8	103.1	106.8	102.2	96.6	89.4	82.3	75.9
200	85.0	97.6	108.5	110.4	105.6	98.9	90.7	81.8	75.6
240	88.2	103.5	115.7	116.8	111.0	102.0	90.6	81.0	74.6
280	86.5	100.0	108.8	107.8	101.6	93.8	84.3	76.4	72.7
320	85.6	93.7	98.0	[illegible]	90.0	85.1	79.5	74.7	72.5
360	83.6	88.2	91.3	88.2	83.8	80.6	77.8	74.9	72.6

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.231 , SD 1 = 0.078
* Mean 2 = 0.428 , SD 2 = 0.129

Density Differences (%)

High = 116.8 %
Mean = 88.1 %, SD = 11.5 %
Low = 72.5 %

Range = 44.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Continued)

W

J77 ρ (Case 12) as % of J77 ρ (Case 8)

F10.7 = 300	F10.7 = 200
F10.7B = 250	F10.7B = 150
Ap = 15	Ap = 15

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	104.8	104.9	104.7	101.2	96.3	95.2	94.5	96.1	94.1
80	104.8	105.5	108.6	105.7	101.8	100.0	98.4	98.9	95.8
120	106.7	113.0	123.1	124.7	119.8	114.1	110.0	104.8	98.6
160	108.3	118.2	130.2	133.1	127.8	120.4	113.6	106.7	98.6
200	111.8	126.1	138.2	139.1	131.6	123.7	115.2	107.3	98.0
240	114.0	132.8	145.1	145.3	138.3	128.3	117.3	106.4	97.0
280	112.2	125.9	134.2	131.4	124.9	116.8	109.0	100.2	94.3
320	110.2	118.1	121.3	117.1	111.7	107.7	103.0	97.0	92.7
360	107.7	112.3	112.7	108.3	104.4	100.3	98.5	96.9	93.7

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.428, SD 1 = 0.129
* Mean 2 = 0.894, SD 2 = 0.229

Density Differences (%)

High = 145.3 %
Mean = 111.9 %, SD = 13.4 %
Low = 92.7 %

Range = 52.6 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 8. (Concluded)

X

J77 ρ (Case 12) as % of J77 ρ (Case 4)

F10.7 = 300	F10.7 = 150
F10.7B = 250	F10.7B = 100
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	268.2	272.3	276.3	265.1	249.7	244.3	241.4	242.7	236.5
80	267.9	272.7	286.7	282.1	267.8	259.2	253.1	251.8	242.2
120	274.6	298.1	337.3	346.9	329.7	308.7	291.5	270.2	248.8
160	280.2	316.3	367.7	382.2	360.7	333.3	304.6	276.6	249.3
200	291.9	346.8	396.6	403.0	376.3	345.0	310.4	276.8	247.7
240	302.6	373.7	428.7	431.9	402.9	361.2	314.1	273.6	244.8
280	295.7	351.8	389.1	380.8	353.5	320.2	285.3	253.1	235.5
320	290.2	322.4	338.2	324.5	302.2	284.3	264.3	244.1	232.3
360	281.4	299.5	307.0	292.2	275.7	261.8	252.9	244.5	234.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.231 SD 1 = 0.078
* Mean 2 = 0.894, SD 2 = 0.229

Density Differences (%)

High = 431.9 %
Mean = 300.0 %, SD = 50.5 %
Low = 232.3 %

Range = 179.6 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

Finally, Table 9 presents percent density differences for the 12 cases, between the J71 and the standard J70. Likewise, Table 10 gives density percentages of the J77 with respect to the J70 for the same 12 cases. A discussion of the results given in Tables 6 through 10 will be presented in the next section.

TABLE 9. PERCENT DEVIATION OF JACCHIA 1971 DENSITY AS A FUNCTION OF CORRESPONDING JACCHIA 1970 DENSITY

CASE: 1

J71 ρ (Case /) as % of J70 ρ (Case /)

J71 ρ (Case /)		J70 ρ (Case /)	
F10.7	= 100	F10.7	= 100
F10.7B	= 100	F10.7B	= 100
Ap	= 0	Ap	= 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	13.8	10.1	6.4	2.3	0.0	-1.4	-.5	1.1	4.6
80	14.3	11.0	7.0	3.7	2.0	1.9	2.4	3.2	4.8
120	15.0	12.8	9.6	7.1	6.2	6.7	7.0	7.3	6.8
160	13.8	14.5	11.9	10.4	9.9	12.6	12.6	11.0	9.1
200	14.1	15.0	13.0	12.0	13.5	15.6	15.2	13.0	9.2
240	14.1	15.1	12.9	12.0	13.8	15.5	15.3	12.2	9.2
280	14.0	14.4	11.7	10.3	9.6	12.4	12.4	10.9	8.1
320	14.8	12.4	8.9	6.6	4.6	5.1	5.6	6.1	6.6
360	14.1	10.8	7.0	3.2	.6	0.0	.5	1.7	4.7

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.104 , SD 1 = 0.044
* Mean 2 = 0.111 , SD 2 = 0.042

Density Differences (%)

High = 15.6 %
Mean = 9.0 %, SD = 4.8 %
Low = -1.4 %

Range = 17.0 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

C-2

TABLE 9. (Continued)

CASE: 2

J71 ρ (Case 2) as % of J70 ρ (Case 2)

F10.7 = 100 F10.7 = 100
F10.7B = 100 F10.7B = 100
Ap = 15 Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	9.7	6.7	3.2	.8	-1.4	-2.3	-2.0	0.0	2.1
80	10.1	7.5	4.8	1.9	.4	0.0	.4	1.6	3.1
120	10.1	8.4	6.5	4.7	4.3	4.0	4.3	4.5	4.2
160	10.7	9.9	7.4	7.3	7.9	8.8	8.4	7.1	5.0
200	10.9	10.7	8.9	8.0	9.0	11.1	10.2	8.9	5.6
240	10.9	10.7	9.3	8.3	9.3	10.2	11.0	8.9	5.6
280	10.7	9.9	7.3	6.3	6.9	8.7	9.0	7.1	5.5
320	10.7	8.7	6.0	3.6	2.8	2.6	3.4	3.8	3.7
360	9.9	7.0	3.9	.8	-.7	-1.4	-.7	.4	2.6

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.172 , SD 1 = 0.059
* Mean 2 = 0.180 , SD 2 = 0.055

Density Differences (%)

High = 11.1 %
Mean = 5.9 %, SD = 3.8 %
Low = -2.3 %

Range = 13.4 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 9. (Continued)

CASE: 3

J71 ρ (Case 3) as % of J70 ρ (Case 3)

F10.7 = 100	F10.7 = 100
F10.7B = 100	F10.7B = 100
Ap = 400	Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	.3	-.8	-1.9	-3.1	-3.8	-4.5	-4.4	-3.4	-2.3
80	.3	-.7	-1.6	-2.7	-3.2	-3.5	-3.2	-2.7	-2.0
120	.4	-.1	-1.1	-1.9	-2.1	-1.9	-1.7	-1.6	-1.6
160	.4	.2	-.8	-1.2	-.8	-.3	-.1	-.5	-1.3
200	.6	.2	-.5	-.8	-.2	.5	.4	-.1	-1.2
240	.6	.2	-.5	-.8	-.3	.5	.6	-.1	-1.2
280	.6	0.0	-.6	-1.2	-.9	-.4	-.3	-.5	-1.3
320	.3	-.3	-1.2	-2.1	-2.4	-2.3	-2.1	-1.9	-1.7
360	.3	-.6	-1.9	-2.9	-3.7	-3.9	-3.7	-3.1	-2.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.768 , SD 1 = 0.115
* Mean 2 = 0.758 , SD 2 = 0.105

Density Differences (%)

High = 0.6 %
Mean = -1.1 %, SD = 1.7 %
Low = -4.5 %

Range = 5.1 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 9. (Continued)

CASE: 4

J71 ρ (Case 4) as % of J70 ρ (Case 4)

F10.7 = 150
F10.7B = 100
Ap = 15

F10.7 = 150
F10.7B = 100
Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	-5.8	-7.5	-9.6	-11.7	-12.7	-13.3	-13.1	-11.9	-10.3
80	-6.0	-7.2	-9.5	-10.8	-12.0	-12.2	-11.8	-10.9	-9.7
120	-5.5	-6.8	-8.6	-10.0	-10.1	-9.8	-9.2	-9.0	-9.1
160	-5.3	-6.3	-7.6	-9.0	-8.2	-7.1	-6.3	-7.2	-8.4
200	-5.4	-6.1	-7.7	-8.4	-7.0	-5.9	-5.6	-6.5	-8.2
240	-5.4	-6.1	-7.7	-8.4	-7.6	-5.9	-5.6	-6.2	-8.2
280	-5.3	-6.3	-8.0	-8.9	-8.1	-7.4	-7.0	-7.2	-8.6
320	-5.4	-6.9	-8.8	-10.2	-10.5	-10.5	-10.1	-9.4	-9.2
360	-5.9	-7.5	-9.3	-11.3	-12.4	-12.8	-12.6	-11.4	-10.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.280 , SD 1 = 0.086
* Mean 2 = 0.255 , SD 2 = 0.072

Density Differences (%)

High = -5.3 %
Mean = -8.6 %, SD = 2.2 %
Low = -13.3 %

Range = 8.0 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 9. (Continued)

CASE: 5

J71 ρ (Case 5) as % of J70 ρ (Case 5)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 0	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	14.0	10.5	6.5	3.2	.9	.2	.7	2.4	5.2
80	14.7	11.5	8.4	5.2	3.3	2.6	3.1	4.3	6.0
120	15.3	13.6	10.8	8.7	7.7	7.9	8.0	7.8	7.7
160	15.7	15.6	14.2	12.0	12.7	13.7	13.3	11.2	8.5
200	16.7	16.0	14.5	14.7	15.5	15.9	15.5	12.9	9.0
240	16.7	16.0	14.5	14.0	15.6	16.6	16.1	12.9	9.4
280	16.2	15.4	13.4	11.9	12.5	13.5	13.2	11.2	8.5
320	15.0	12.8	10.4	7.5	6.5	6.4	6.8	6.8	6.9
360	14.3	11.1	7.3	4.1	2.0	1.4	1.6	3.2	5.6

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.262, SD 1 = 0.091
* Mean 2 = 0.284, SD 2 = 0.086

Density Differences (%)

High = 16.7 %
Mean = 10.1 %, SD = 4.8 %
Low = 0.2 %

Range = 16.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 9. (Continued)

CASE: 6

J71 ρ (Case 6) as % of J70 ρ (Case 6)

J71 ρ (Case 6)	J70 ρ (Case 6)
F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 15	Ap = 15

Degrees Longitude (+E)	Degrees Latitude (+N) -80	-60	-40	-20	0	20	40	60	80
40	10.2	7.5	4.3	1.7	0.0	-.8	-.5	1.1	3.5
80	10.6	8.3	5.5	3.1	1.6	1.4	1.6	2.6	4.0
120	11.3	10.2	7.7	6.0	5.4	5.3	5.8	5.7	5.2
160	11.9	11.3	9.6	8.7	9.1	9.9	9.4	7.2	5.9
200	12.1	12.0	10.5	9.7	11.3	12.0	11.4	9.6	6.3
240	12.1	12.0	10.6	9.8	10.8	12.4	11.8	9.3	6.5
280	11.9	11.3	9.5	8.6	9.0	9.8	9.7	8.1	6.1
320	11.5	9.7	7.2	5.0	4.1	4.1	4.4	4.5	4.9
360	10.4	8.1	4.8	2.2	.6	0.0	.4	1.7	3.7

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.369 , SD 1 = 0.107
* Mean 2 = 0.391 , SD 2 = 0.100

Density Differences (%)

High = 12.4 %
Mean = 7.1 %, SD = 3.8 %
Low = -0.8 %

Range = 13.2 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 9. (Continued)

CASE: 7

J71 ρ (Case 7) as % of J70 ρ (Case 7)

J71 ρ (Case 7)	J70 ρ (Case 7)
F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 400	Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	1.9	.9	0.0	-1.5	-1.4	-2.1	-2.1	-1.5	-.8
80	2.0	.9	.9	-.8	-1.6	-1.5	-1.5	-1.5	-.8
120	1.9	1.3	1.0	-.9	-.9	0.0	0.0	0.0	0.0
160	2.2	1.8	1.0	.6	.8	1.3	1.9	.9	0.0
200	2.2	2.0	1.2	1.0	1.5	2.1	2.3	.9	.8
240	2.2	2.0	1.2	1.0	1.5	2.1	2.4	1.9	0.0
280	2.2	1.7	-1.1	.5	.8	1.3	1.0	.9	.8
320	2.1	1.0	0.0	0.0	-.9	-.9	-.8	0.0	0.0
360	1.9	1.8	-.8	-1.6	-1.5	-2.2	-2.2	-1.5	-.8

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 1.103 , SD 1 = 0.158
* Mean 2 = 1.106 , SD 2 = 0.145

Density Differences (%)

High = 2.4 %
Mean = 0.4 %, SD = 1.3 %
Low = -2.2 %

Range = 4.6 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 9. (Continued)

CASE: 8

J71 ρ (Case 8) as % of J70 ρ (Case 8)

F10.7 = 200	F10.7 = 200
F10.7B = 150	F10.7B = 150
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	-1.3	-3.3	-5.3	-7.3	-8.4	-9.0	-8.8	-7.7	-6.1
80	-1.1	-2.8	-5.0	-6.6	-7.6	-7.8	-7.5	-6.7	-5.7
120	-.9	-1.9	-3.8	-5.3	-5.4	-5.3	-4.8	-4.7	-4.8
160	-.7	-1.3	-2.7	-3.5	-3.1	-2.4	-2.2	-2.9	-4.4
200	-.5	-1.1	-2.1	-3.0	-1.8	-.8	-.7	-2.2	-4.1
240	-.5	-.8	-2.4	-2.7	-1.8	-.8	-.7	-2.0	-4.0
280	-.7	-1.3	-2.7	-3.7	-3.1	-2.4	-2.2	-3.1	-4.4
320	-1.2	-2.2	-4.0	-5.4	-6.0	-5.9	-5.7	-5.3	-5.1
360	-1.3	-3.0	-5.3	-7.0	-8.2	-8.6	-8.2	-7.3	-6.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.521 , SD 1 = 0.137
* Mean 2 = 0.498 , SD 2 = 0.119

Density Differences (%)

High = -0.5 %
Mean = -3.9 %, SD = 2.4 %
Low = -9.0 %

Range = 8.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 9. (Continued)

CASE: 9

J71 ρ (Case 9) as % of J70 ρ (Case 9)

F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 0	Ap = 0

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	11.6	8.8	5.7	3.7	1.7	.8	1.7	2.7	5.0
80	12.0	9.7	7.1	4.8	4.0	2.9	3.8	4.9	5.8
120	12.7	11.3	9.3	7.6	7.0	6.9	7.0	6.9	6.4
160	13.2	13.0	11.7	10.6	11.0	11.4	11.0	9.5	7.4
200	13.4	13.7	12.7	12.2	13.1	13.8	12.9	10.5	7.7
240	13.5	13.7	12.9	12.3	13.1	13.8	12.9	10.5	7.7
280	13.2	12.9	11.6	10.6	10.9	11.1	10.8	9.3	7.2
320	12.5	11.0	8.7	6.8	5.9	5.7	6.0	6.1	6.7
360	11.8	9.3	6.3	3.9	1.8	1.7	2.6	2.8	5.0

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.790 , SD 1 = 0.199
* Mean 2 = 0.851 , SD 2 = 0.185

Density Differences (%)

High = 13.8 %
Mean = 8.7 %, SD = 3.8 %
Low = 0.8 %

Range = 13.0 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 9. (Continued)

CASE: 10

J71 ρ (Case 10)		J70 ρ (Case 10)	
F10.7	= 250	F10.7	= 250
F10.7B	= 250	F10.7B	= 250
Ap	= 15	Ap	= 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	9.4	7.3	4.4	2.4	1.5	.7	1.4	2.3	4.2
80	9.6	7.8	5.9	3.6	2.5	2.4	2.4	3.3	4.3
120	10.1	9.0	7.4	6.0	5.5	5.7	5.9	4.7	4.5
160	10.5	10.3	9.3	8.3	8.6	9.0	8.7	7.7	5.6
200	10.8	10.8	9.9	9.4	10.3	10.9	10.3	8.5	6.7
240	10.8	10.8	10.0	9.6	10.3	10.8	10.3	8.6	6.7
280	10.5	10.3	9.1	8.2	8.5	9.0	8.6	7.3	5.6
320	10.0	8.8	6.9	5.2	4.3	4.8	4.6	5.5	5.4
360	9.5	7.8	4.6	3.3	2.3	1.5	1.5	3.2	3.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = *0.953* , SD 1 = *0.210*
* Mean 2 = *1.012* , SD 2 = *0.195*

Density Differences (%)

High = *10.9* %
Mean = *6.9* %, SD = *3.0* %
Low = *0.7* %

Range = *10.2* %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 9. (Continued)

CASE: 11

J71 ρ (Case //) as % of J70 ρ (Case //)

J71 ρ (Case //)		J70 ρ (Case //)	
F10.7	= 250	F10.7	= 250
F10.7B	= 250	F10.7B	= 250
Ap	= 400	Ap	= 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	4.6	4.3	6.9	2.8	2.2	2.2	2.2	2.7	3.4
80	4.7	3.9	3.7	6.5	2.4	2.4	2.3	2.9	6.8
120	3.6	4.8	3.5	2.8	2.8	3.2	3.7	3.6	7.5
160	4.9	4.4	3.8	3.2	3.1	4.2	4.0	4.4	4.1
200	4.9	4.5	4.0	3.3	4.0	5.1	4.8	4.5	3.6
240	4.9	4.5	4.0	4.0	4.0	5.1	4.8	4.5	3.6
280	4.9	4.4	3.8	3.2	3.8	4.2	4.6	4.3	4.1
320	4.8	4.1	3.4	3.3	2.7	2.6	3.6	7.0	7.0
360	5.2	4.3	3.6	2.9	2.3	2.3	2.3	2.8	2.9

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 1.824 , SD 1 = 0.227
* Mean 2 = 1.896 , SD 2 = 0.229

Density Differences (%)

High = 7.5 %
Mean = 4.0 %, SD = 1.2 %
Low = 2.2 %

Range = 5.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 9. (Concluded)

CASE: 12

J71 ρ (Case 12) as % of J70 ρ (Case 12)

F10.7 = 300	F10.7 = 300
F10.7B = 250	F10.7B = 250
Ap = 15	Ap = 15

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	2.8	.8	-.7	-2.6	-3.1	-3.6	-3.1	-2.6	-1.4
80	2.9	.9	0.0	-2.2	-2.8	-2.7	-2.0	-2.1	-1.4
120	2.9	2.1	0.0	-.9	-.9	0.0	-.8	-.8	-.8
160	3.1	2.7	1.6	.9	1.3	1.9	1.9	1.7	0.0
200	3.2	3.0	2.2	1.7	2.4	3.0	2.5	1.8	0.0
240	3.2	3.0	2.2	1.8	2.4	3.1	2.7	2.7	0.0
280	3.0	2.6	1.6	.8	1.2	1.7	1.9	.9	0.0
320	3.0	1.9	0.0	-.9	-1.7	-1.6	-.8	-.8	-.7
360	2.9	1.7	-.8	-1.4	-3.3	-3.2	-2.6	-2.6	-1.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($\times 10^{-11}$ Kg/M^3)

* Mean 1 = 1.157 , SD 1 = 0.235
* Mean 2 = 1.158 , SD 2 = 0.213

Density Differences (%)

High = 3.2 %
Mean = 0.4 %, SD = 2.1 %
Low = -3.6 %

Range = 6.8 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. PERCENT DEVIATION OF JACCHIA 1977 DENSITY AS A FUNCTION OF CORRESPONDING JACCHIA 1970 DENSITY

CASE: 1

J77 ρ (Case /) as % of J70 ρ (Case /)

J77 ρ (Case /)		J70 ρ (Case /)	
F10.7	= 100	F10.7	= 100
F10.7B	= 100	F10.7B	= 100
Ap	= 0	Ap	= 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	13.5	13.8	12.1	9.3	6.1	4.3	5.4	8.2	15.0
80	15.9	18.5	16.7	15.6	15.8	16.7	17.1	18.4	19.3
120	13.6	8.3	1.4	.3	5.2	11.5	16.7	21.0	21.1
160	13.8	14.5	11.5	15.2	23.9	34.9	38.1	35.0	25.8
200	12.1	13.6	14.0	19.9	33.2	44.7	46.7	38.0	25.8
240	9.7	5.1	-.2	1.6	13.2	25.7	32.1	30.7	24.2
280	16.2	20.0	18.4	22.0	29.9	39.5	41.3	36.6	26.6
320	17.1	18.2	14.4	13.7	16.5	19.5	21.4	23.5	22.1
360	10.7	4.9	-1.6	-5.2	-6.8	-6.4	-2.7	4.1	14.1

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.104, SD 1 = 0.044
* Mean 2 = 0.120, SD 2 = 0.046

Density Differences (%)

High = 46.7 %
Mean = 16.9 %, SD = 11.8 %
Low = -6.8 %

Range = 53.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. (Continued)

CASE: 2

J77 ρ (Case 2)		J70 ρ (Case 2)	
F10.7	= 100	F10.7	= 100
F10.7B	= 100	F10.7B	= 100
Ap	= 15	Ap	= 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	-16.6	-24.4	-25.2	-16.0	-10.6	-14.0	-22.9	-26.5	-16.4
80	-13.0	-21.3	-26.3	-17.8	-7.6	-6.8	-14.3	-22.1	-16.3
120	-14.7	-27.5	-39.6	-34.8	-23.6	-17.2	-19.3	-23.0	-16.5
160	-14.8	-26.5	-35.8	-28.7	-15.3	-8.8	-11.9	-17.2	-12.5
200	-19.7	-32.1	-35.1	-26.1	-13.0	-7.7	-12.5	-15.3	-9.7
240	-24.2	-39.0	-41.5	-35.5	-26.9	-22.9	-22.4	-15.9	-7.7
280	-20.7	-28.9	-27.4	-18.8	-12.1	-12.7	-14.6	-5.9	-3.0
320	-20.6	-27.7	-24.5	-16.3	-13.3	-17.6	-22.2	-13.7	-6.0
360	-21.8	-32.7	-32.5	-26.1	-23.1	-27.0	-32.3	-27.9	-14.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.172 , SD 1 = 0.059
* Mean 2 = 0.138 , SD 2 = 0.052

Density Differences (%)

High = -3.0 %
Mean = -20.5 %, SD = 8.7 %
Low = -41.5 %

Range = 38.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. (Continued)

CASE: 3

J77 ρ (Case 3) as % of J70 ρ (Case 3)

F10.7 = 100
F10.7B = 100
Ap = 400

F10.7 = 100
F10.7B = 100
Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	148.3	-5.8	-65.0	-52.9	-28.6	-38.9	-62.6	-36.7	61.1
80	195.6	36.8	-59.9	-64.2	-37.5	-34.8	-59.4	-51.8	37.2
120	210.5	44.3	-66.4	-76.9	-58.9	-51.7	-66.2	-58.4	31.1
160	188.1	18.0	-72.5	-76.9	-60.9	-57.6	-69.7	-50.6	49.0
200	118.7	-38.1	-80.3	-74.2	-61.8	-65.3	-71.4	-27.1	79.6
240	68.9	-64.3	-83.0	-74.7	-69.0	-75.0	-67.0	17.3	118.4
280	58.2	-64.3	-76.3	-63.4	-60.7	-71.1	-49.1	77.2	153.3
320	60.4	-60.1	-71.4	-53.1	-49.4	-65.5	-51.7	53.6	136.9
360	86.0	-47.4	-71.8	-53.2	-41.6	-57.8	-64.4	5.1	93.9

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.768 , SD 1 = 0.115
* Mean 2 = 0.663 , SD 2 = 0.571

Density Differences (%)

High = 210.5 %
Mean = -14.1 %, SD = 75.4 %
Low = -83.0 %

Range = 293.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. (Continued)

CASE: 4

J77 ρ (Case 4) as % of J70 ρ (Case 4)

F10.7 = 150	F10.7 = 150
F10.7B = 100	F10.7B = 100
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	-18.2	-23.8	-21.2	-10.9	-5.7	-9.9	-20.2	-25.3	-17.2
80	-15.9	-20.8	-23.4	-12.2	-2.1	-1.8	-11.1	-20.5	-16.9
120	-17.0	-27.1	-35.6	-28.4	-16.9	-11.6	-15.1	-21.1	-16.8
160	-16.9	-25.8	-31.4	-22.8	-9.2	-3.8	-9.2	-16.9	-13.9
200	-21.2	-30.7	-29.8	-19.2	-6.4	-3.7	-10.6	-15.7	-12.0
240	-25.1	-36.3	-35.7	-28.3	-20.5	-18.3	-21.3	-16.9	10.4
280	-21.6	-26.2	-21.4	-12.6	-6.6	-10.2	-15.7	-9.0	-6.2
320	-21.6	-25.0	-18.7	-10.6	-7.8	-14.4	-21.3	-15.0	-8.7
360	-23.1	-30.6	-27.1	-19.9	-17.6	-22.6	-29.8	-27.3	-15.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.280 , SD 1 = 0.086
* Mean 2 = 0.231 , SD 2 = 0.078

Density Differences (%)

High = -1.8 %
Mean = -18.1 %, SD = 8.1 %
Low = -36.3 %

Range = 34.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. (Continued)

CASE: 5

J77 ρ (Case 5) as % of J70 ρ (Case 5)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 0	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	11.8	12.0	10.0	6.5	2.9	.4	.2	2.1	6.9
80	13.7	15.6	14.4	12.2	11.0	9.7	9.3	9.9	10.3
120	11.2	7.0	.9	0.0	2.4	6.0	9.4	12.4	12.0
160	13.0	12.6	10.5	11.4	18.5	23.7	24.8	21.7	14.7
200	11.7	10.9	11.0	16.1	24.3	30.5	30.4	24.2	14.7
240	9.4	3.2	-.7	.7	9.5	17.2	20.7	18.3	13.0
280	14.6	16.6	15.9	17.3	23.3	27.6	26.8	22.3	15.0
320	14.5	15.2	12.2	10.6	10.9	11.5	12.2	13.0	11.8
360	9.2	4.6	-.9	-5.1	-7.6	-8.1	-6.1	-1.2	6.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.262 , SD 1 = 0.091
* Mean 2 = 0.288 , SD 2 = 0.088

Density Differences (%)

High = 30.5 %
Mean = 11.3 %, SD = 8.3 %
Low = -8.1 %

Range = 38.6 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. (Continued)

CASE: 6

J77 ρ (Case 6) as % of J70 ρ (Case 6)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	-17.1	-21.6	-17.5	-6.4	-1.4	-6.1	-17.1	-23.2	-15.7
80	-14.8	-19.4	-20.3	-8.5	1.8	1.8	-8.1	-18.2	-15.3
120	-16.1	-25.4	-32.5	-23.8	-11.9	-7.2	-11.5	-18.7	-15.1
160	-16.2	-23.8	-27.2	-16.5	-3.0	1.8	-5.6	-14.7	-12.7
200	-19.9	-27.4	-25.0	-12.8	0.0	2.0	-7.3	-13.6	-10.8
240	-22.8	-32.0	-29.5	-21.3	-13.4	-12.8	-18.1	-15.4	-9.2
280	-19.4	-21.4	-14.3	-4.3	.4	-5.2	-13.1	-8.1	-5.4
320	-19.3	-20.7	-17.6	-4.1	-2.6	-10.2	-10.9	-13.7	-7.7
360	-21.1	-27.2	-21.3	-14.3	-13.7	-18.6	-26.9	-25.4	-14.1

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Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.369 , SD 1 = 0.107
* Mean 2 = 0.317 , SD 2 = 0.101

Density Differences (%)

High = 2.0 %
Mean = -14.6 %, SD = 8.4 %
Low = -32.5 %

Range = 34.5 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. (Continued)

CASE: 7

J77 ρ (Case 7) as % of J70 ρ (Case 7)

F10.7 = 150	F10.7 = 150
F10.7B = 150	F10.7B = 150
Ap = 400	Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	85.6	-6.1	-51.2	-26.0	12.1	-5.6	-45.2	-25.5	45.3
80	110.8	23.1	-47.6	-43.3	0.0	2.3	-38.6	-37.8	29.4
120	115.9	25.4	-55.5	-60.9	-28.0	-18.2	-46.2	-44.3	25.4
160	105.4	8.4	-61.2	-58.3	-28.7	-26.1	-51.7	-37.1	37.8
200	68.8	-31.9	-68.1	-51.0	-29.0	-39.2	-56.4	-17.4	57.6
240	39.6	-54.4	-69.3	-49.7	-40.4	-56.4	-53.9	15.9	81.4
280	34.0	-53.3	-57.8	-31.3	-28.9	-53.4	-36.4	56.8	102.5
320	36.1	-48.9	-52.3	-18.4	-14.9	-46.2	-38.7	40.2	92.7
360	51.5	-38.3	-56.2	-21.7	-5.2	-34.0	-50.6	-2.2	66.1

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 1.103 , SD 1 = 0.158
* Mean 2 = 1.008 , SD 2 = 0.565

Density Differences (%)

High = 115.9 %
Mean = -9.6 %, SD = 49.1 %
Low = -69.3 %

Range = 185.2 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. (Continued)

CASE: 8

J77 ρ (Case 8) as % of J70 ρ (Case 8)

J77		J70	
F10.7	= 200	F10.7	= 200
F10.7B	= 150	F10.7B	= 150
Ap	= 15	Ap	= 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	-22.9	-25.6	-20.0	-8.6	-3.8	-8.5	-19.4	-25.9	-20.0
80	-21.1	-23.9	-23.1	-10.4	-.7	-1.1	-11.0	-21.3	-19.6
120	-22.3	-29.5	-34.4	-25.2	-13.7	-9.6	-14.4	-22.1	-19.7
160	-22.3	-28.5	-29.7	-18.8	-6.5	-2.9	-10.3	-19.0	-17.5
200	-25.4	-31.2	-27.0	-15.2	-3.8	-3.0	-12.2	-18.9	-16.0
240	-28.0	-34.6	-30.9	-22.8	-15.8	-16.6	-22.5	-20.5	-14.8
280	-24.9	-25.2	-17.0	-7.7	-4.1	-10.3	-18.4	-14.3	-11.6
320	-24.7	-24.4	-15.3	-6.8	-5.9	-13.9	-22.8	-18.6	-13.2
360	-26.2	-30.2	-23.7	-15.8	-14.3	-20.4	-29.0	-28.2	-18.7

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.521 , SD 1 = 0.137
* Mean 2 = 0.428 , SD 2 = 0.129

Density Differences (%)

High = -0.7 %
Mean = -18.2 %, SD = 8.2 %
Low = -34.6 %

Range = 33.9 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. (Continued)

CASE: 9

J77 ρ (Case 9) as % of J70 ρ (Case 9)

J77	J70
F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 0	Ap = 0

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	-4.5	-3.9	-5.2	-8.3	-11.0	-13.1	-13.3	-12.9	-10.3
80	-3.7	-2.2	-3.2	-4.6	-5.8	-7.0	-7.9	-7.8	-8.7
120	-5.4	-8.5	-13.0	-14.6	-13.4	-11.6	-9.7	-7.9	-8.1
160	-4.7	-5.9	-8.3	-8.2	-5.2	-2.7	-2.0	-3.2	-6.6
200	-6.1	-7.3	-8.3	-6.8	-2.3	1.1	1.1	-2.1	-6.8
240	-7.4	-12.1	-15.6	-15.8	-11.8	-7.4	-5.5	-6.0	-7.9
280	-3.5	-3.1	-4.7	-4.7	-2.5	-1.1	-1.4	-3.1	-6.7
320	-3.5	-3.1	-5.6	-7.5	-8.2	-8.5	-8.2	-7.5	-8.1
360	-6.3	-9.0	-12.9	-16.6	-18.6	-19.5	-18.3	-15.6	-11.4

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.790 , SD 1 = 0.199
* Mean 2 = 0.725 , SD 2 = 0.166

Density Differences (%)

High = 1.1 %
Mean = -7.6 %, SD = 4.5 %
Low = -19.5 %

Range = 20.6 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. (Continued)

CASE: 10

J77 ρ (Case 10) as % of J70 ρ (Case 10)

J77 ρ (Case 10)	J70 ρ (Case 10)
F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 15	Ap = 15

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	-27.0	-27.5	-20.1	-7.9	-2.9	-7.9	-18.8	-26.6	-22.4
80	-25.8	-26.9	-23.7	-10.2	-.8	-1.6	-12.1	-22.2	-22.2
120	-27.0	-32.2	-33.8	-23.3	-12.3	-9.0	-14.9	-23.6	-22.4
160	-27.1	-30.9	-29.3	-17.5	-6.1	-3.9	-12.1	-21.3	-20.8
200	-29.1	-32.2	-25.8	-13.3	-3.9	-4.6	-14.8	-21.5	-19.3
240	-31.0	-34.1	-27.8	-19.3	-14.0	-16.6	-24.2	-23.4	-18.7
280	-28.3	-25.6	-15.0	-6.2	-4.3	-12.1	-21.5	-16.5	-16.3
320	-26.0	-24.9	-13.8	-5.6	-5.6	-14.5	-24.4	-21.2	-17.4
360	-29.4	-30.4	-22.0	-13.3	-11.7	-18.8	-28.3	-28.6	-21.8

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 0.953 , SD 1 = 0.210
* Mean 2 = 0.773 , SD 2 = 0.205

Density Differences (%)

High = -0.8 %
Mean = -19.2 %, SD = 8.7 %
Low = -34.1 %

Range = 33.3 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. (Continued)

CASE: 11

J77 ρ (Case //) as % of J70 ρ (Case //)

F10.7 = 250	F10.7 = 250
F10.7B = 250	F10.7B = 250
Ap = 400	Ap = 400

Degrees Latitude (+N)

Degrees Longitude (+E)	-80	-60	-40	-20	0	20	40	60	80
40	37.9	-9.6	-36.0	6.5	58.7	32.3	-24.7	-16.8	25.0
80	49.7	7.2	-35.3	-18.0	45.7	46.7	-12.7	-24.3	16.6
120	51.8	6.0	-44.4	-38.6	13.8	25.4	-20.0	-29.7	14.6
160	46.6	-3.2	-48.7	-32.5	15.0	14.5	-28.9	-24.6	21.5
200	28.4	-27.9	-52.0	-17.3	17.2	-4.5	-38.0	-11.7	32.0
240	13.6	-44.7	-49.3	-11.4	1.3	-30.8	-39.2	7.3	44.3
280	11.7	-42.0	-32.5	13.3	13.1	-30.9	-24.9	32.1	56.4
320	12.5	-38.0	-27.3	26.9	28.7	-22.8	-26.0	23.1	50.7
360	20.3	-31.0	-36.5	17.7	40.4	-5.0	-34.4	-3.2	36.2

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 1.824 , SD 1 = 0.227
* Mean 2 = 1.828 , SD 2 = 0.666

Density Differences (%)

High = 58.7 %
Mean = -0.8 %, SD = 30.8 %
Low = -52.0 %

Range = 110.7 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

TABLE 10. (Concluded)

CASE: 12

J77 ρ (Case 12) as % of J70 ρ (Case 12)

J77 ρ (Case 12)	J70 ρ (Case 12)
F10.7 = 300	F10.7 = 300
F10.7B = 250	F10.7B = 250
Ap = 15	Ap = 15

Degrees Longitude (+E)	Degrees Latitude (+N)								
	-80	-60	-40	-20	0	20	40	60	80
40	-31.2	-31.1	-23.4	-11.3	-6.8	-10.9	-22.1	-29.0	-26.1
80	-30.0	-31.1	-26.7	-14.2	-4.9	-5.4	-15.0	-25.5	-25.9
120	-31.6	-35.8	-36.9	-26.6	-15.6	-12.7	-18.5	-26.8	-25.8
160	-31.7	-35.1	-33.1	-21.6	-11.1	-9.1	-16.4	-25.0	-24.7
200	-33.6	-36.1	-29.5	-17.8	-9.4	-10.2	-19.6	-26.0	-23.6
240	-35.2	-37.6	-31.2	-23.2	-18.5	-21.2	-28.4	-27.3	-23.1
280	-32.7	-29.8	-19.5	-11.3	-9.7	-17.2	-25.8	-23.3	-20.9
320	-32.1	-28.6	-18.0	-9.6	-9.9	-18.3	-27.7	-25.5	-22.2
360	-33.5	-33.4	-24.8	-16.1	-15.0	-21.7	-30.8	-31.8	-25.5

Given Input: June 20, 1968, 12 UT; 400 Km Altitude.

Matrix Computations:

Absolute Density ($x10^{-11} Kg/M^3$)

* Mean 1 = 1.157 , SD 1 = 0.235
* Mean 2 = 0.894 , SD 2 = 0.229

Density Differences (%)

High = -4.9 %
Mean = -23.1 %, SD = 8.5 %
Low = -37.6 %

Range = 32.7 %

* 1 indicates reference model. 2 indicates model used as a percent of the reference

The analysis presented in this section deals with the two percent differencing schemes mentioned in the Introduction. That of percent density differences within each model (for differing solar conditions), and that of percent differences between one model and another. The analysis will further be broken down into two conditions. One examines density changes under a constant A_p (allowing flux to vary); the other assumes a constant $F_{10.7}$ flux (allowing A_p to vary). Many of Tables 6 through 10 results will also be expressed in figure form.

A. Intra-Model Testing Under Constant Flux

Each of the three Jacchia density models will be compared separately according to its own percent density change when the geomagnetic index varies under constant flux. Results from Tables 6, 7, and 8 are presented in Figures 1 (categories A, E, and I) and 2 (categories B, F, and J). Both mean and standard deviation density percent difference values for the three models are presented in Figure 1 versus constant F (and $\bar{F}$) values of 100, 150, and 250 given a ΔA_p change equal to 15 (A_p from 0 to 15). Figure 2 presents similar results but over a ΔA_p change of 385 (i.e., A_p from 15 to 400).

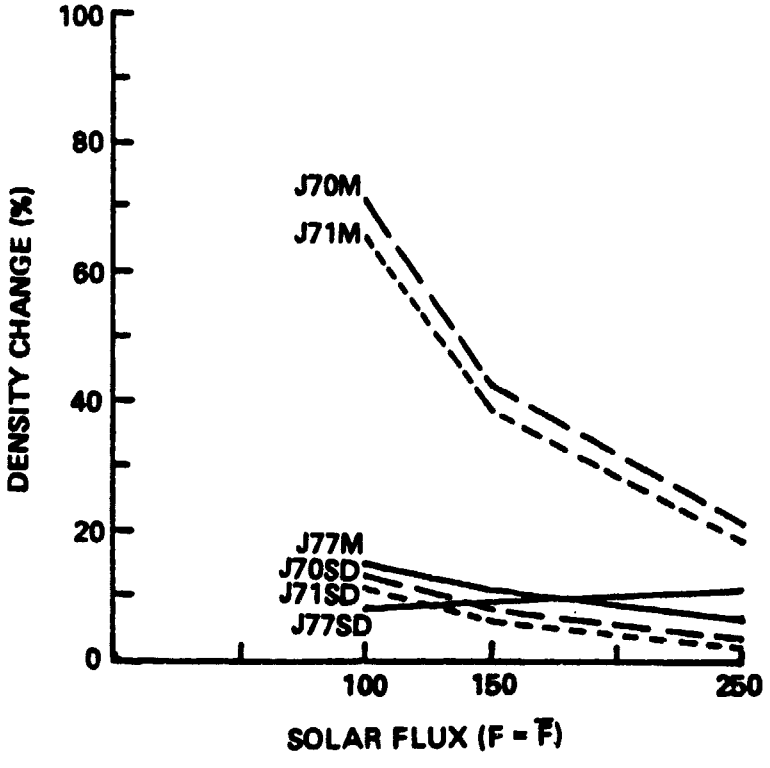

Figure 1. Percent model density change at selected $F_{10.7}$ values given a $\Delta A_p = 15$.

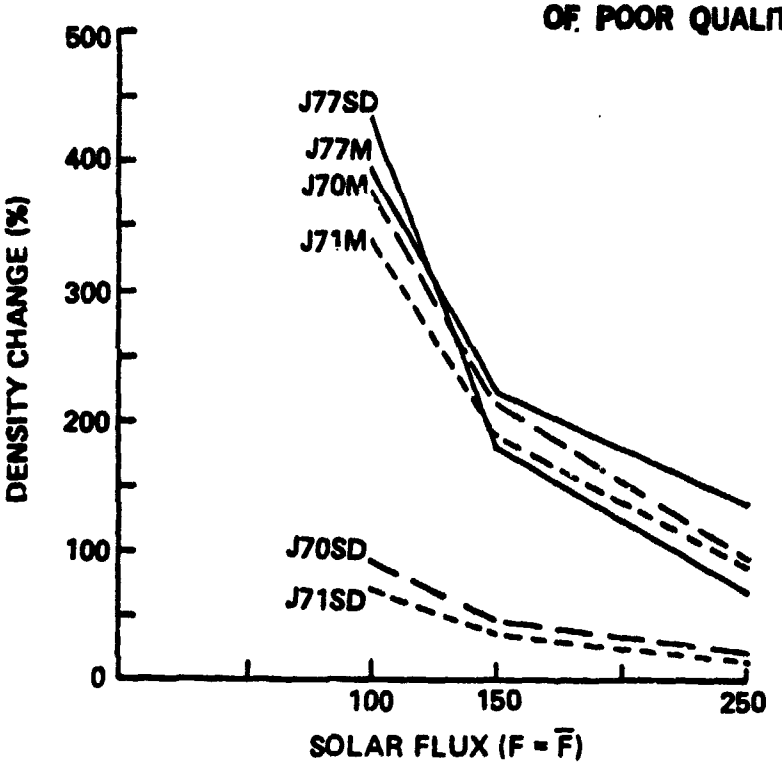

Figure 2. Percent model density change at selected $F_{10.7}$ values given a ΔA_p = 385.

Figure 1 shows that the J70 and J71 mean (M) percent differences change by more than 50 percent than does the J77 at F = 100, when ΔA_p = 15. This difference is smaller whenever the flux is 150 or 250. The standard deviation (SD) for all three models is small (less than 16 percent) at F = 100, with J70 and J71 variability decreasing at higher flux. The J77 SD increases 8 percent more than the other two models at F = 250.

As A_p increases 385 units from 15 to 400, all three models are very sensitive to a density change at a low flux (F = 100) (Fig. 2). The J77 matrix percent difference values are much more variable over latitude (Table 8B) than the J70 or J71 as expressed by the large J77 SD value of 434 percent at F = 100. A larger F flux of 150 or 250 produces significantly lower density increases as shown by the M and SD percent difference values of Figure 2.

These two figures suggest that J77 is less sensitive at small magnitude A_p changes than the J70 and J71. When A_p levels jump to extremes (A_p = 400) the J77 is just a little more sensitive in the mean change than J70 and J71, but it is also much more variable in its percentage change of density around the globe.

B. Intra-Model Testing Under Constant A_p

Tables 6, 7, and 8, representing J70, J71, and J77 density changes, are used to calculate density increases when F values change under constant A_p conditions. Mean and standard deviation values of percent density increase are plotted in Figures 3 and 4.

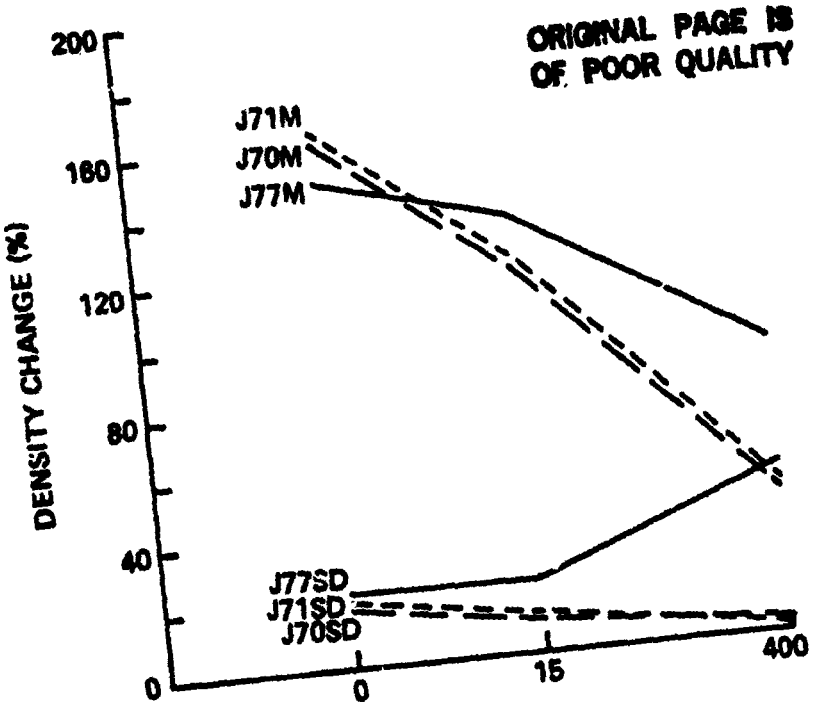

Figure 3. Percent model density change at selected A_p values given a $\Delta F = 50$, $\overline{\Delta F} = 50$.

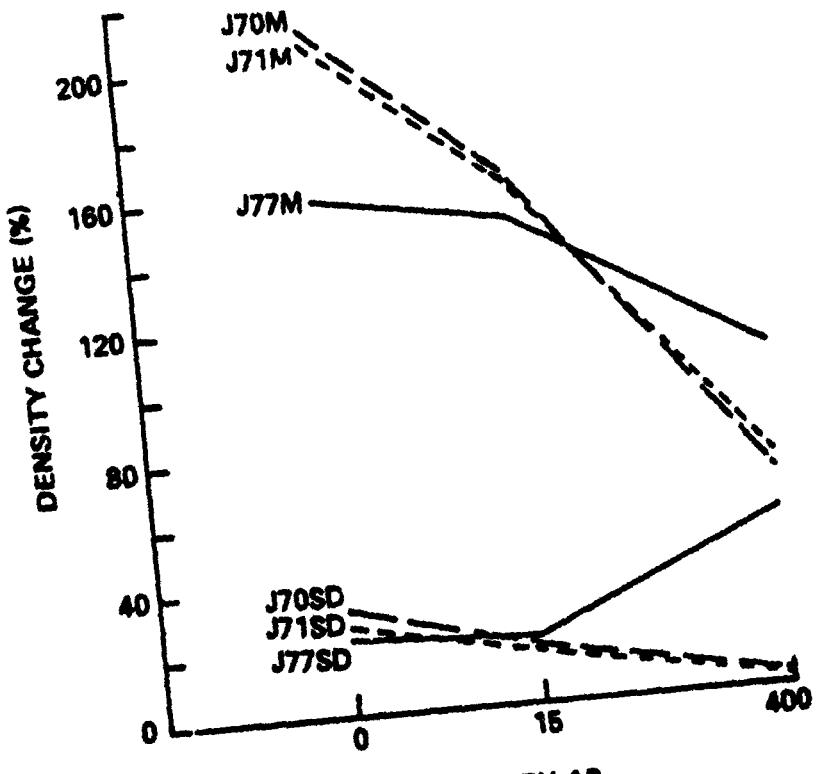

Figure 4. Percent model density change at selected A_p values given a $\Delta F = 100$, $\overline{\Delta F} = 100$.

Figure 3 presents conditions (categories M, P, and S) applicable to an increase in F (and $\bar{F}$) of 50, using data when F increases from 100 to 150. Percent density increase values are plotted for constant A_p of 0, 15, and 400. Only at $A_p = 0$ conditions do J77 density percent increases appear equal to or lower than those of J70 and J71. If A_p is 15 or 400, a ΔF of 50 creates a larger percent density increase, with the J77 almost doubling that of the J70 or J71 at $A_p = 400$. Also at $A_p = 400$, the variability (in terms of SD) of J77 is large (more than 50 percent) as compared to J70 or J71 (less than 4 percent).

Figure 4 differs from Figure 3 only in that it deals with a flux change of 100 (where F goes from 150 to 250). Indicated in Figure 4 is the same general trend as in Figure 3, except amplitudes of density change percentage are magnified for the J70 and J71 cases, with little increase shown for the J77 M or SD percentages. Figure 4 represents categories N, Q, and T.

The percent density increases on each model for a 50 unit change in the daily flux, during a constant $\bar{F}$ and constant $A_p = 15$ condition, are presented in Figure 5. This would probably represent a more typical condition actually experienced on a day-to-day basis when $\bar{F}$ would remain approximately constant. Three different categories of $\Delta F = 50$ are presented in Figure 5: when the daily flux changes from 100 to 150, from 150 to 200, and from 250 to 300. Density percent changes, in terms of M and SD, decrease as the $\Delta F = 50$ category occurs for a greater F value. From the figure it appears as if the J71 is less sensitive to a ΔF change than the other two models. Figure 5 represents categories D, H, and L.

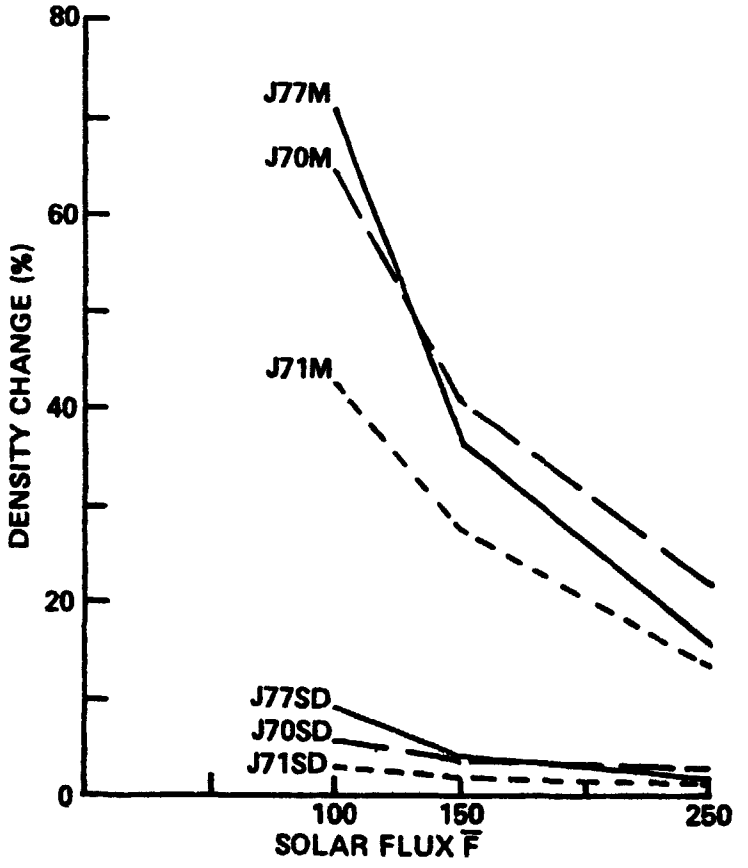

Figure 5. Percent model density change at $A_p = 15$ given $\Delta F = 50$ with constant $\bar{F}$.

Table 11 summarizes the results presented in Figures 1 and 2, when A_p is allowed to vary under constant F and $\overline{F}$. Table 12 presents results from Figures 3, 4, and 5, when F (and at times $\overline{F}$) is allowed to vary, while A_p is kept constant.

TABLE 11. PERCENT GLOBAL DENSITY CHANGE WHEN A_p VARIES UNDER CONSTANT F AND $\overline{F}$

ΔA_p = 15 (A_p = 0 to 15)			J70		J71		J77	
Cat.	F10	F10B	M	SD	M	SD	M	SD
A	100	100	70	13	66	12	16	8
E	150	150	44	8	40	7	10	9
I	250	250	22	4	20	3	6	11
ΔA_p = 385 (A_p = 15 to 400)			J70		J71		J77	
Cat.	F10	F10B	M	SD	M	SD	M	SD
B	100	100	377	90	344	75	394	434
F	150	150	212	45	192	36	226	183
J	250	250	95	19	90	14	139	73

TABLE 12. PERCENT GLOBAL DENSITY CHANGE WHEN F VARIES UNDER CONSTANT A_p

ΔF = 50 *			J70		J71		J77	
Cat.	A_p	F Range	M	SD	M	SD	M	SD
D	15	F = 100 to 150	65	6	43	3	71	10
H	15	F = 150 to 200	42	4	28	2	36	4
L	15	F = 250 to 300	22	2	15	1	16	1
ΔF = 50 (F = 100 to 150)**			J70		J71		J77	
Cat.	A_p		M	SD	M	SD	M	SD
M	0		160	19	162	20	148	21
P	15		119	11	121	11	136	21
S	400		44	2	46	1	91	55
ΔF = 100 (F = 150 to 250)**			J70		J71		J77	
Cat.	A_p		M	SD	M	SD	M	SD
N	0		211	29	207	26	158	22
Q	15		163	18	163	16	149	20
T	400		66	3	72	2	105	53

* Only F changes. $\overline{F}$ remains constant.

** Both F and $\overline{F}$ change the same.

C. Inter-Model Testing Under Constant Flux

This section is included so that percent density differences between one model and another (the standard) can be computed for a given case. It indicates exactly how much one model's calculated densities differ percentwise from another model's values. Tables 9 and 10 data were used in this analysis.

Calculated J71 density values expressed as a percentage of the standard J70 densities are plotted in Figures 6, 7, and 8 as a function of A_p (0, 15, and 400), for a constant F (and $\overline{F}$) being 100, 150, and 250, respectively. The J77 density percent differences from the J70 are also presented on these figures. Figure 6 shows the J77 and J71 mean density being greater than J70 density at $A_p = 0$ conditions. At A_p equaling 15 and 400, the J70 mean has exceeded the J77 by 15 to 20 percent. When A_p equals 400, the J70 density only exceeds by approximately 1 percent the J71 mean. The variability decreases between the two models for both the J71/J70 and J77/J70, except for the J77 SD at A_p = 400 where it exceeds 75 percent.

Figures 7 and 8 represent similar conditions at F = 150 and 250, respectively. However, as flux increases, the departure of J71 and J77 density from the J70 density generally decreases in terms of M and SD. Now when F and $\overline{F}$ both equal 250 (Fig. 8), the J71 average density is at all times greater than the average J70 value; while J77 densities are less than J70 over all A_p. Tabular values of Figures 6, 7, and 8 means and standard deviations are given in Table 13.

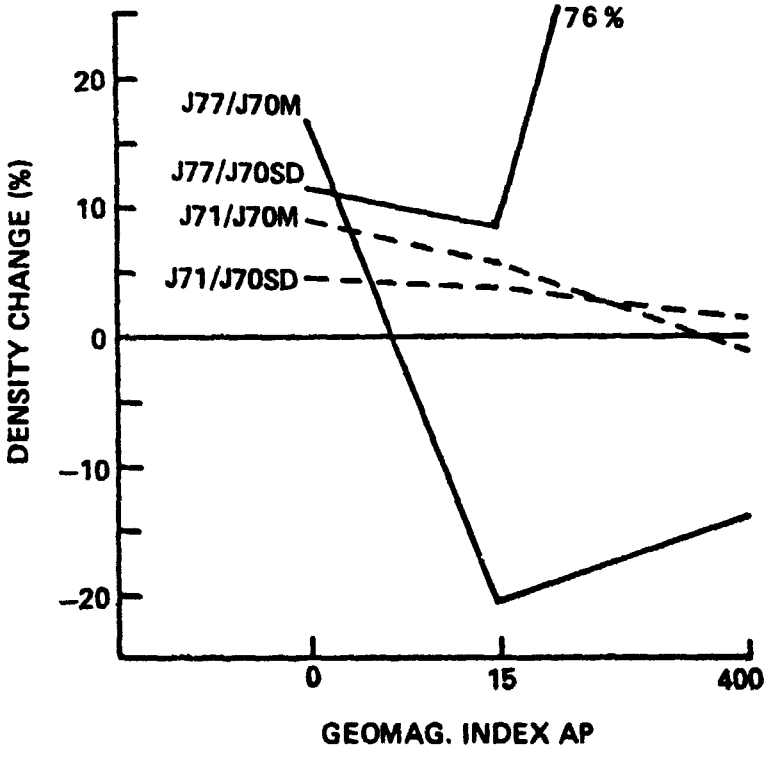

Figure 6. Percent density changes of the J77 and the J71 as a function of the J70 density, given F and $\overline{F}$ = 100.

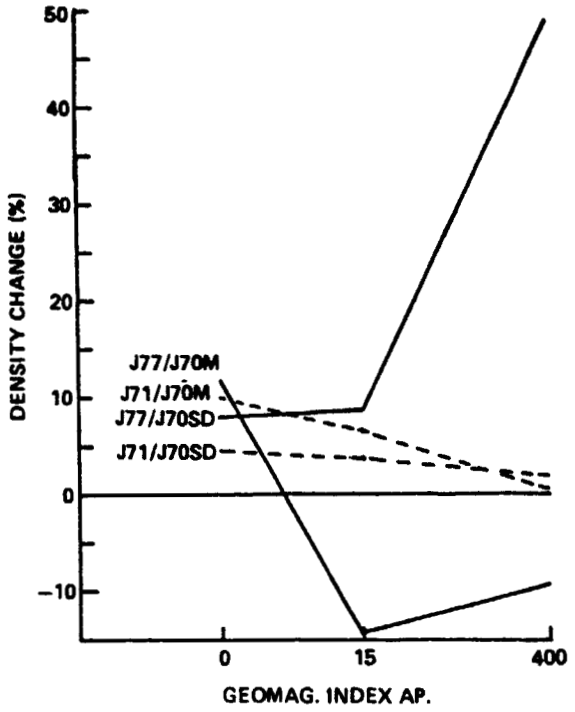

Figure 7. Percent density changes of the J77 and the J71 as a function of the J70 density, given F and $\overline{F}$ = 150.

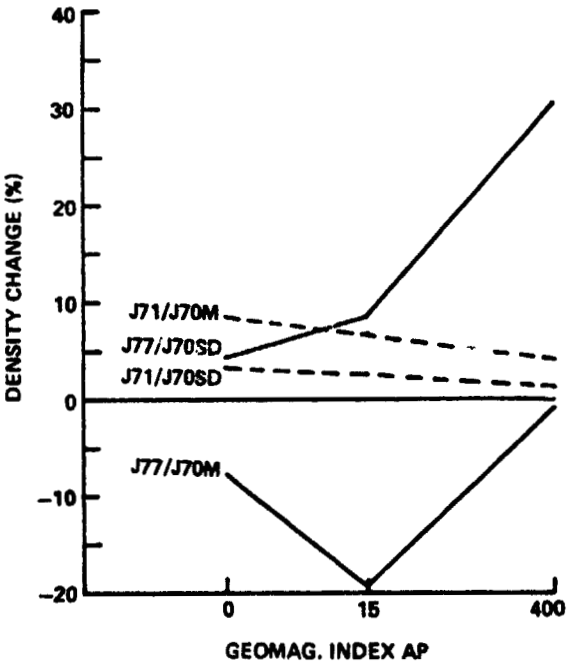

Figure 8. Percent density changes of the J77 and the J71 as a function of the J70 density, given F and $\overline{F}$ = 250.

TABLE 13. PERCENT DENSITY DIFFERENCES BETWEEN THE J71 AND J77 WITH RESPECT TO J70, AT CONSTANT F AND $\overline{F}$

F Held Constant (A_p Varies)	J71 ρ as f (J70 ρ) [%]		J77 ρ as f (J70 ρ) [%]	
Case Number	Mean $\rho\%\Delta$	SD $\rho\%\Delta$	Mean $\rho\%\Delta$	SD $\rho\%\Delta$
(F_{10} and $\overline{F}_{10}$ = 100)				
1. $A_p = 0$	9	5	17	12
2. $A_p = 15$	6	4	-20	9
3. $A_p = 400$	-1	2	-14	75
(F_{10} and $\overline{F}_{10}$ = 150)				
5. $A_p = 0$	10	5	11	8
6. $A_p = 15$	7	4	-15	8
7. $A_p = 400$	0	1	-10	49
(F_{10} and $\overline{F}_{10}$ = 250)				
9. $A_p = 0$	9	4	- 8	5
10. $A_p = 15$	7	3	-19	9
11. $A_p = 400$	4	1	- 1	31

D. Inter-Model Testing Under Constant A_p

Both the J77 and J71 density values from Tables 9 and 10 are expressed as percent differences, at constant A_p, with respect to the J70 density in Figures 9, 10, and 11. Figure 9 presents the models mean and standard deviation percent difference values from standard, for F and $\overline{F}$ conditions of 100, 150, and 250 at constant $A_p = 0$. Figures 10 and 11 represent similar conditions for $A_p = 15$ and 400, respectively.

Figure 9 indicates that the J77 density at $A_p = 0$ is greater than the J70 by 11 to 16 percent, at F (and $\overline{F}$) of 100 and 150. However, J77 densities are less than J70 by 7 percent at an F (and $\overline{F}$) of 250. The SD of the J77 percent density difference decreases slightly from 11 percent at F = 100 to 4 percent at F = 250. The M and SD of J71 density as a percent from the J70 is from 4 to 10 percent greater than the J70 at all three flux values.

Incidently, the J71 relationship to J70 is approximately uniform for all three A_p conditions. This is probably due to the fact that the J71 and J70 Jacchia models are both derived with similar data/equations, resulting in similar construction.

When $A_p = 15$, the J77 mean density is 15 to 20 percent lower than the J70 at all three flux conditions. The J71 density is again greater than the J70 by 6 to 7 percent, with small variability observed over the globe (Fig. 10).

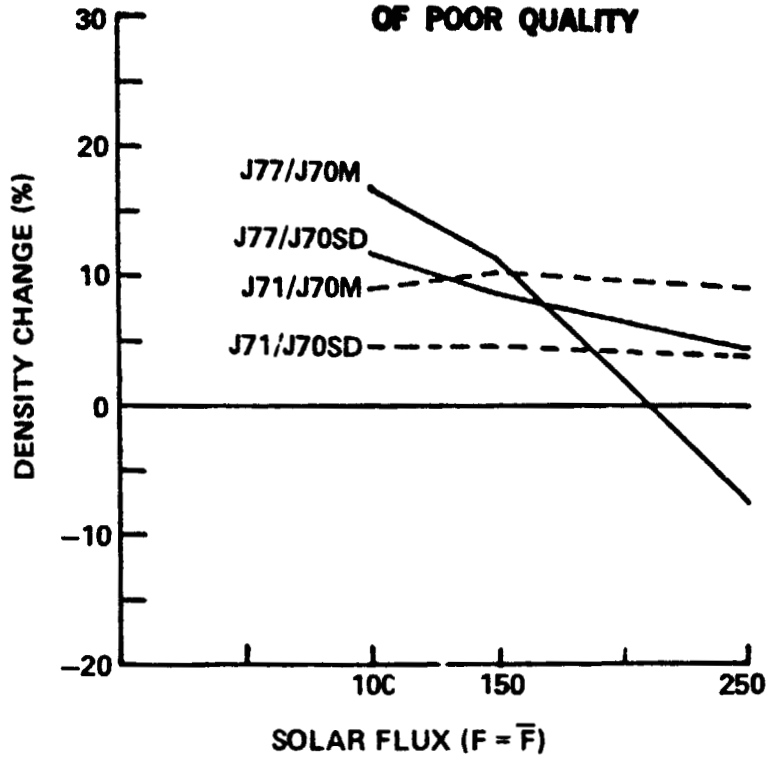

Figure 9. Percent density changes of the J77 and the J71 as a function of the J70 density, given $A_p = 0$.

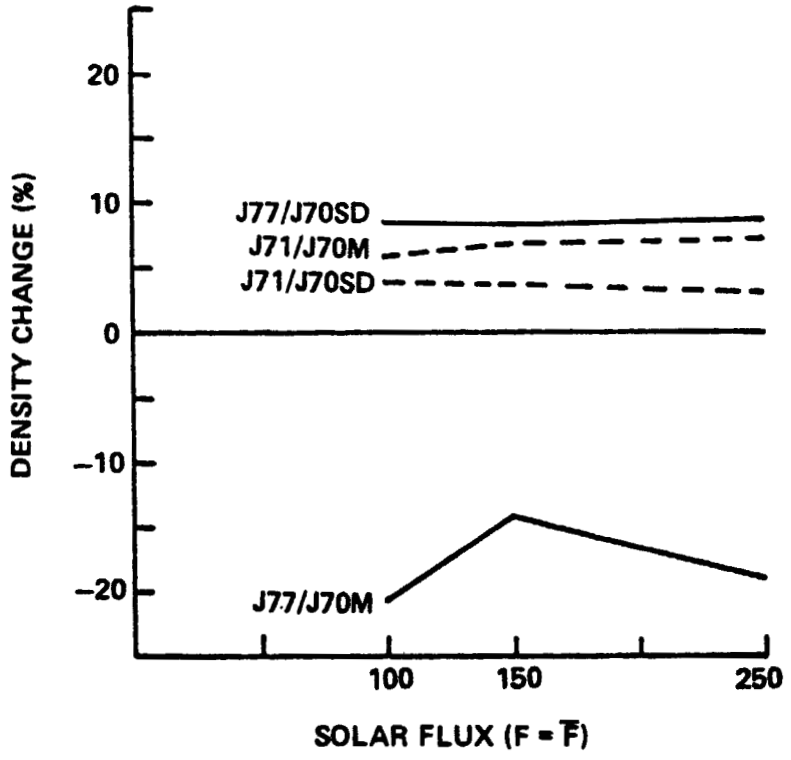

Figure 10. Percent density changes of the J77 and the J71 as a function of the J70 density, given $A_p = 15$.

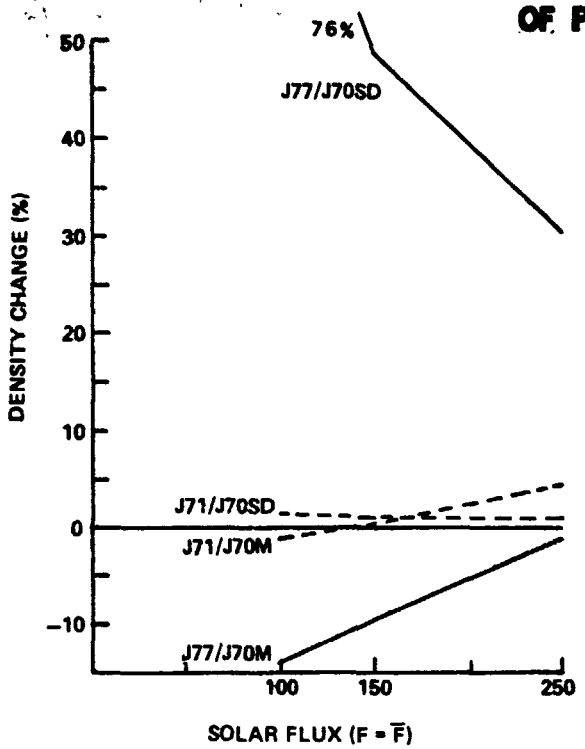

Figure 11. Percent density changes of the J77 and the J71 as a function of the J70 density, given A_p = 400.

Figure 11 presents A_p = 400 conditions. The J71 is very close to J70 in the mean and standard deviation of density differences. Again, the J77 mean density difference is lower than the J70. The J77 SD ranges between 30 and 75 percent, over all flux, indicating a large variability of J77 density with respect to the way J70 density changes over the globe, under extreme A_p = 400 conditions.

Table 14 summarizes the percent changes for the J71 and J77 from the J70 reference, as A_p is held constant. Tables 13 and 14 have been further broken down into Table 15 so that the magnitudes of percentage differences over all A_p and all F $\bar{F}$ can be presented for the J71 and J77 models. This table indicates that the magnitude of the J77 mean percent difference of density ranges more than the J71 (both expressed as a percent of J70). The table also shows a general trend for the percent magnitude change, for both models, to become more positive (or less negative) than the J70, as either A_p or F increase.

TABLE 14. PERCENT DENSITY DIFFERENCES BETWEEN THE J71 AND J77 WITH RESPECT TO J70, AT CONSTANT A_p

A_p Held Constant (F Varies)			J71 ρ as f (J70 ρ) [%]		J77 ρ as f (J70 ρ) [%]	
Case No.	(A_p = 0) F10	F10B	Mean $\rho\%\Delta$	SD $\rho\%\Delta$	Mean $\rho\%\Delta$	SD $\rho\%\Delta$
1.	100	100	9	5	17	12
5.	150	150	10	5	11	8
9.	250	250	9	4	- 8	5
	(A_p = 15) F10	F10B				
2.	100	100	6	4	-20	9
6.	150	150	7	4	-15	8
10.	250	250	7	3	-19	9
4.	150	100	-9	2	-18	8
8.	200	150	-4	2	-18	8
12.	300	250	0	2	-23	8
	(A_p = 400) F10	F10B				
3.	100	100	-1	2	-14	75
7.	150	150	0	1	-10	49
11.	250	250	4	1	- 1	31

TABLE 15. J71/J77 AS PERCENT DENSITY MAGNITUDE CHANGE OF J70 OVER VARIOUS RANGES OF A_p AND F

J71 ρ as f (70 ρ)			
(Increasing A_p) F $\bar{F}$ Const. (Table 13) A_p	F $\bar{F}$ 100-100	F $\bar{F}$ 150-150	F $\bar{F}$ 250-250
0 to 15 15 to 400 0 to 400	- 3 - 7 -10%	- 3 - 7 -10	-2 -3 -5
(Increasing F and $\bar{F}$) A_p Const. (Table 14) (F $\bar{F}$)	$A_p = 0$	$A_p = 15$	$A_p = 400$
100-100 to 150-150 150-150 to 250-250 100-100 to 250-250	+1 -1 0	+1 0 +1	+1 +4 +5
J77 ρ as f (70 ρ)			
(Increasing A_p) F $\bar{F}$ Const. (Table 13) A_p	F $\bar{F}$ 100-100	F $\bar{F}$ 150-150	F $\bar{F}$ 250-250
0 to 15 15 to 400 0 to 400	-37 + 6 -31%	-26 + 5 -21	-11 +18 + 7
(Increasing F and $\bar{F}$) A_p Const. (Table 14) (F $\bar{F}$)	$A_p = 0$	$A_p = 15$	$A_p = 400$
100-100 to 150-150 150-150 to 250-250 100-100 to 250-250	- 6 -19 -25	+5 -4 +1	+ 4 + 9 +13

IV. SUMMARY/CONCLUSIONS

For the 12 different cases of solar/geomagnetic input used in the 400 km density analysis of three thermospheric models (i.e., J70, J71, and J77), the following has been accomplished under this study:

1) 12 cases of 400 km density data have been generated for 81 worldwide latitude/longitude locations, for the three separate Jacchia models of 1970, 1971, and 1977 (Tables 3, 4, and 5).

2) A small A_p change from low values (A_p = 0 to 15), over all F = $\overline{F}$ (F's = 100 to 250), indicates the J77 computed density is less sensitive to these changes than the J70 or J71. The variability of J77 is smaller or equal to that of J70 or J71 at F's = 100 and 150; while larger in variability when F's = 250 (Fig. 1 and Table 11).

3) A large A_p change from low to high (A_p = 15 to 400), over all F = $\overline{F}$, indicates J71 as being less sensitive to density change in terms of global mean density and its variability. The J77 indicates a very high variability of global density as compared with the J70 and J71 (Fig. 2 and Table 11).

4) During an F and $\overline{F}$ change = 50 or = 100, the J77 does not show a density change as much as the J70 or J71 at A_p = 0. However, at A_p = 400 the exact reverse is true, with J77 density change being higher and much more variable than either the J70 or J71 over the globe (Figs. 3, and 4 and Table 12).

5) When a change in F daily alone occurs (i.e., $\Delta F = 50$, $\Delta\overline{F} = 0$, $\Delta A_p = 0$), the J71 is the less sensitive to density change and it also exhibits less variability of change over the globe (Fig. 5 and Table 12).

6) Inter-model testing over varying A_p and flux indicates the J71 density to be slightly more dense than the J70. The J77 density is generally less than J70 over all conditions, except when A_p = 0. The variability of J77 density over the globe is also very high whenever A_p = 400 (Figs. 6 through 11 and Tables 13 through 15).

7) This study has also indicated the J71 density being closer, in most all categories, to the J70. This is reasonable due to similar data and modeling methods in both.

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