

Supporting Information for

Solar-cycle, seasonal, and asymmetric dependencies of thermospheric mass density disturbances due to magnetospheric forcing

5 Andres Calabia¹, and Shuanggen Jin^{1*}

¹ School of Remote Sensing and Geomatics Engineering, Nanjing University of Information Science and Technology, Nanjing 210044, China

Contents of this file

Table S1

10 **Additional Supporting Information (DOI:10.5281/zenodo.3234582) can be downloaded from <https://zenodo.org>:**

The following files are compressed in the *ds02.zip* file:

- *DN_3min* (csv format): Modified Julian Date, Latitude, longitude, and density estimates (Kg/m^3) along orbit 3 min interval, normalized to 475 Km altitude.
- *model* (folder): MATLAB scripts corresponding to TMDM model (example in RUN.m file).

15

Table S1. Fitting parameters in Equation (4) and (5) for the best correlation given in Figure 5. Goodness of fits is given in Table 4.

		North		Equator		South	
1 day < ρ < 10 day	Dst	p00	1.97E-15 (8.676e-16, 3.063e-15)	-4.39E-15 (-5.627e-15, -3.145e-15)	1.15E-14 (1.06e-14, 1.233e-14)		
		p10	-1.11E-14 (-1.118e-14, -1.097e-14)	-5.59E-15 (-5.712e-15, -5.465e-15)	-2.263 (-2.283, -2.243)		
		p01	-6.01E-17 (-8.324e-17, -3.704e-17)	9.42E-17 (6.805e-17, 1.203e-16)	-2.31E-14 (-2.498e-14, -2.125e-14)		
	Am	p20	7.87E-17 (7.813e-17, 7.935e-17)	5.77E-17 (5.698e-17, 5.836e-17)	4.74E+11 (4.503e+11, 4.976e+11)		
		p11	2.36E-16 (2.333e-16, 2.376e-16)	1.27E-16 (1.243e-16, 1.292e-16)	5.798 (5.753, 5.842)		
		p02	2.91E-19 (1.749e-19, 4.066e-19)	-4.02E-19 (-5.325e-19, -2.705e-19)	1.07E-14 (9.79e-15, 1.164e-14)		
		p30	2.72E-19 (2.71e-19, 2.738e-19)	3.69E-19 (3.678e-19, 3.711e-19)	-1.27E+22 (-1.81e+22, -7.303e+21)		
		p21	-7.36E-19 (-7.415e-19, -7.306e-19)	-6.18E-19 (-6.244e-19, -6.121e-19)	-4.52E+11 (-4.755e+11, -4.294e+11)		
		p12	-8.95E-19 (-9.048e-19, -8.841e-19)	-4.98E-19 (-5.098e-19, -4.863e-19)	-2.273 (-2.296, -2.249)		
		p00	-7.25E-15 (-8.377e-15, -6.131e-15)	-5.23E-15 (-5.784e-15, -4.678e-15)	1.08E-14 (9.865e-15, 1.171e-14)		
		p10	-1.23E-14 (-1.243e-14, -1.224e-14)	-7.68E-15 (-7.731e-15, -7.637e-15)	-3.197 (-3.219, -3.175)		
		p01	1.58E-16 (1.343e-16, 1.816e-16)	1.10E-16 (9.805e-17, 1.213e-16)	-2.23E-14 (-2.427e-14, -2.03e-14)		
ρ < 1 day	Dst	p20	2.90E-17 (2.864e-17, 2.939e-17)	5.12E-17 (5.098e-17, 5.135e-17)	1.39E+12 (1.362e+12, 1.408e+12)		
		p11	2.52E-16 (2.502e-16, 2.54e-16)	1.54E-16 (1.531e-16, 1.549e-16)	7.582 (7.535, 7.63)		
		p02	-7.86E-19 (-9.038e-19, -6.671e-19)	-5.12E-19 (-5.698e-19, -4.532e-19)	9.83E-15 (8.839e-15, 1.082e-14)		
	Em	p30	1.62E-20 (1.546e-20, 1.689e-20)	1.20E-19 (1.194e-19, 1.201e-19)	-5.09E+23 (-5.198e+23, -4.973e+23)		
		p21	-2.44E-19 (-2.47e-19, -2.407e-19)	-4.76E-19 (-4.773e-19, -4.742e-19)	-8.95E+11 (-9.152e+11, -8.746e+11)		
		p12	-9.43E-19 (-9.522e-19, -9.34e-19)	-6.30E-19 (-6.341e-19, -6.251e-19)	-3.079 (-3.103, -3.054)		
		p00	-7.94E-15 (-8.506e-15, -7.373e-15)	-5.70E-15 (-6.212e-15, -5.182e-15)	1.05E-14 (9.672e-15, 1.13e-14)		
		p10	-2.16E-16 (-2.17e-16, -2.147e-16)	-1.27E-16 (-1.285e-16, -1.264e-16)	-3.571 (-3.592, -3.55)		
		p01	1.67E-16 (1.554e-16, 1.793e-16)	1.24E-16 (1.132e-16, 1.349e-16)	-2.03E-14 (-2.205e-14, -1.855e-14)		
		p20	2.01E-20 (1.999e-20, 2.018e-20)	2.59E-20 (2.584e-20, 2.601e-20)	1.19E+12 (1.168e+12, 1.206e+12)		
		p11	4.41E-18 (4.39e-18, 4.436e-18)	2.53E-18 (2.509e-18, 2.551e-18)	8.642 (8.595, 8.689)		
		p02	-7.82E-19 (-8.417e-19, -7.22e-19)	-5.89E-19 (-6.433e-19, -5.344e-19)	8.45E-15 (7.576e-15, 9.318e-15)		
Am	Dst	p30	5.65E-25 (5.624e-25, 5.667e-25)	6.38E-25 (6.355e-25, 6.394e-25)	-5.62E+21 (-9.77e+21, -1.467e+21)		
		p21	-2.12E-22 (-2.126e-22, -2.109e-22)	-2.42E-22 (-2.425e-22, -2.408e-22)	-1.13E+12 (-1.153e+12, -1.116e+12)		
		p12	-1.57E-20 (-1.581e-20, -1.559e-20)	-9.36E-21 (-9.459e-21, -9.253e-21)	-3.65 (-3.674, -3.625)		
	Em	p00	6.69E-15 (5.587e-15, 7.783e-15)	5.49E-15 (4.631e-15, 6.35e-15)	-1.84E-16 (-1.129e-16, 7.62e-16)		
		p10	-2.46E-15 (-2.621e-15, -2.304e-15)	-3.05E-16 (-4.303e-16, -1.802e-16)	-2.952 (-3.004, -2.901)		
		p01	-1.40E-16 (-1.626e-16, -1.166e-16)	-1.18E-16 (-1.36e-16, -9.993e-17)	-5.74E-16 (-2.617e-15, 1.47e-15)		
		p20	2.47E-18 (1.761e-18, 3.183e-18)	-2.55E-18 (-3.117e-18, -1.99e-18)	1.15E+12 (1.101e+12, 1.203e+12)		
		p11	3.12E-17 (2.808e-17, 3.438e-17)	-7.68E-18 (-1.017e-17, -5.192e-18)	7.435 (7.323, 7.547)		
		p02	5.51E-19 (4.36e-19, 6.665e-19)	5.52E-19 (4.619e-19, 6.423e-19)	2.42E-17 (-9.932e-16, 1.042e-15)		
		p30	9.53E-20 (9.411e-20, 9.644e-20)	2.04E-19 (2.035e-19, 2.054e-19)	4.29E+23 (4.199e+23, 4.383e+23)		
		p21	-4.04E-21 (-1.02e-20, 2.126e-21)	3.65E-20 (3.161e-20, 4.145e-20)	-1.57E+12 (-1.612e+12, -1.521e+12)		
		p12	1.30E-19 (1.151e-19, 1.453e-19)	2.22E-19 (2.105e-19, 2.343e-19)	-3.276 (-3.333, -3.218)		
Em	Dst	p00	5.59E-15 (4.533e-15, 6.654e-15)	3.07E-15 (2.782e-15, 3.351e-15)	-4.44E-16 (-1.251e-15, 3.628e-16)		
		p10	-4.94E-15 (-5.066e-15, -4.817e-15)	-1.90E-15 (-1.935e-15, -1.868e-15)	-2.368 (-2.404, -2.333)		
		p01	-1.17E-16 (-1.394e-16, -9.493e-17)	-6.54E-17 (-7.134e-17, -5.943e-17)	3.21E-16 (-1.423e-15, 2.065e-15)		
	Em	p20	-8.46E-18 (-8.806e-18, -8.115e-18)	-3.26E-18 (-3.352e-18, -3.166e-18)	7.55E+11 (7.312e+11, 7.783e+11)		
		p11	9.70E-17 (9.46e-17, 9.949e-17)	3.17E-17 (3.107e-17, 3.238e-17)	6.415 (6.338, 6.492)		
		p02	4.89E-19 (3.78e-19, 6.005e-19)	3.07E-19 (2.774e-19, 3.37e-19)	-4.19E-17 (-9.101e-16, 8.262e-16)		
		p30	4.35E-20 (4.317e-20, 4.388e-20)	6.99E-20 (6.977e-20, 6.996e-20)	-1.51E+23 (-1.537e+23, -1.483e+23)		
		p21	4.91E-20 (4.647e-20, 5.175e-20)	7.21E-21 (6.493e-21, 7.92e-21)	-8.99E+11 (-9.202e+11, -8.776e+11)		
		p12	-2.77E-19 (-2.883e-19, -2.651e-19)	-3.68E-21 (-6.796e-21, -5.601e-22)	-2.432 (-2.471, -2.393)		
		p00	5.44E-15 (4.493e-15, 6.384e-15)	5.17E-15 (4.261e-15, 6.068e-15)	-1.41E-15 (-2.245e-15, -5.77e-16)		
		p10	-5.84E-17 (-6.001e-17, -5.676e-17)	-3.24E-17 (-3.394e-17, -3.084e-17)	-3.915 (-3.961, -3.869)		
		p01	-1.05E-16 (-1.244e-16, -8.456e-17)	-1.07E-16 (-1.265e-16, -8.842e-17)	1.99E-15 (1.822e-16, 3.787e-15)		
p20	-2.93E-21 (-3.021e-21, -2.845e-21)	-1.85E-21 (-1.93e-21, -1.762e-21)	4.73E+11 (4.267e+11, 5.196e+11)				
Em	Em	p11	1.13E-18 (1.094e-18, 1.159e-18)	6.07E-19 (5.759e-19, 6.382e-19)	9.77 (9.667, 9.873)		
		p02	3.41E-19 (2.409e-19, 4.408e-19)	4.71E-19 (3.756e-19, 5.666e-19)	-9.57E-16 (-1.854e-15, -5.999e-17)		
		p30	1.31E-26 (1.194e-26, 1.424e-26)	1.28E-25 (1.272e-25, 1.294e-25)	-1.52E+24 (-1.551e+24, -1.488e+24)		
		p21	3.20E-23 (3.121e-23, 3.27e-23)	2.41E-23 (2.339e-23, 2.482e-23)	3.38E+11 (2.92e+11, 3.836e+11)		