Readme File for Data Included in the KU Repository

April 2022

Small scale magnetic structure in the induced Martian ionosphere and lower magnetic pile-up region

Hamil, O., Cravens, T. E., Renzaglia, A., & Andersson, L. (2022). Small scale magnetic structure in the induced Martian ionosphere and lower magnetic pile-up region. *Journal of Geophysical Research: Space Physics*, 127, e2021JA030139. hlllps://doi.org/10.1029/2021JA030139

The KU archive contains the excel data file used for the statistical discussion and figures of the magnetic field characteristics discussed in this paper.

The columns of the file (Hamil22MarsMagnetic) are as follows:

A) ***Structure.*** Just a number label for a magnetic structure in the overall database used.
B) ***Lat.*** The latitude (in degrees) of the center of the structure.
C) ***Lon.*** The longitude (in degrees) of the center of the structure.
D) ***SZA.*** Solar Zenith Angle (in degrees).
E) ***Alt (km).*** Altitude in kilometers.
F) ***B_ave.*** The average magnetic field in the structure in nanotesla (nT).
G) ***B_crust.*** The average crustal field (in nT) in the structure from the M14 model (see paper).
H) ***B_rad.*** The average radial magnetic field (in nT) of the structure.
I) ***SpceW.*** The width of the structure (in km) along the spacecraft path.
J) ***SpceH.*** The vertical width of the structure in km.
K) ***dPB.*** The variation of the magnetic pressure (in nPa – nanoPascals) across the structure.
L) ***PB.*** The average magnetic pressure (in nPa) of the structure.
M) ***dPth.*** The variation of the thermal pressure (in nPa – nanoPascals) across the structure.
N) ***Pthrm.*** The average thermal pressure (in nPa) of the structure.
O) ***B_0(nT)***. The background magnetic field (nT) of the structure.
P) ***dB(nT).*** The variation of the magnetic field (nT) across the structure.
Q) ***MSO x.*** The x-position of the spacecraft in MSO coordinates (km).
R) ***MSO y.*** The y-position of the spacecraft in MSO coordinates (km).
S) ***MSO z.*** The z-position of the spacecraft in MSO coordinates (km).
T) ***Eig1.*** Maximum eigenvalue from the Minimum Variance Analysis.
U) ***Eig2.*** Minimum eigenvalue from the Minimum Variance Analysis.
V) ***Eig3.*** Intermediate eigenvalue from the Minimum Variance Analysis.
W) ***Ellip.*** Ellipticity of magnetic structure. Ratio of maximum to intermediate eigenvalue.
X) ***MinRad***. Cosine of the angle between the minimum variance direction and radial.
Y) ***MaxRad.*** Cosine of the angle between the maxiumum variance direction and radial.
Z) ***MinSpce.*** Cosine of the angle between minimum variance direction and spacecraft velocity.
AA) ***StructW***. Structure width along the minimum variance direction.

BB) ***FFPar***. Force-Free parameter.
CC) ***Beta***. Plasma beta of structure. Thermal pressure divided by magnetic pressure.
DD)***Type***. Structure type as defined in paper. Also see below.b

Some Definitions.

MSO Coordinates. Mars Solar Orbital coordinates. X towards Sun and z towards Ecliptic north

Force-Free Parameter. FFparam = (ΔB/B) /ellipticity = dB / ellip. Higher FFparam indicated the structure is more force-free.

Structure Types.

1. Waves
2. Slab
3. Rotation
4. Tube
5. Rope