RBSP Coordinates "CooCoo" Committee

SWG In Person Meeting

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Recommendations

- Each Science Data Provider (SOCs, Science Data Portal) will provide the following coordinate systems with all “final” science data products (Level 2 and higher where appropriate):
  - GSE, GSM, GEI, GEO, SM and GDZ (alt/lat/lon geodetic)
  - APL will develop SPICE kernels to support rotations between them
- Magnetic coordinates:
  - Each SOC will use magnetic coordinates derived from two active magnetic field models: T89 and TS04.
  - Each SOC will use magnetic coordinates derived from two quiet magnetic field models: T89 with Kp=2 and Olson-Pfitzer Quiet.
  - The ECT SOC will prepare the magnetic coordinates for us (details follow)
  - The science data portal will host the ECT SOC coordinates files and the TS04 input files for SOC use
- Magnetic field measurements:
  - EMFISIS/MAG will provide B vectors in GSE, GSM, GEI, GEO, and SM in at least one "low" time resolution product (<~1/spin). (UVW, too, per mission requirements docs)
  - For the 64 Hz product, it's up to EMFISIS, but we're pleased with the SM, GSE, and GSM set they've proposed. (UVW, too, per mission requirements docs)

RBSP Magnetic Coordinates

The ECT/SOC will compute the following quantities and make them available via the ECT/SOC website. These will be computed for; OP77 Quiet, T89 (Kp=2 predictive), T89 (Real Kp definitive), TS04 (dynamic, historical only). These will be produced as ASCII, HDF5, and CDF files at 1 minute cadence. All pitch angles are local (not equatorial).

1) IsoDateTime
2) Date
3) DOY
4) UTC
5) JulianDate
6) GpsTime
7) Geodipole Tilt Angle
8) Rgeo
9) Geodetic (WGS84)
10) Rgsm
11) Rsm
12) Rgei
13) Rgse

RBSP Magnetic Coordinates, continued

14) CDIP MLT/MLAT
15) EDIP MLT/MLAT
16) Invariant Latitude
17) Internal model used (CDIP, EDIP, IGRF)
18) External Model used (whatever you want, e.g. OPQ, T89, T04s, etc...)
19) Kp
20) Dst
21) Bsc_gsm. Components and magnitude of the local B-field.
22) FieldLineType ("LGM_CLOSED", "LGM_OPEN_N_LOBE", "LGM_OPEN_S_LOBE“, "LGM_OPEN_IMF“)
23) Location of Northern Footpoint at 100km (in GEO coords)
24) Location of Northern Footpoint at 100km (in GSM coords)
25) Geodetic Latitude and Longitude of Northern Footpoint at 100km.
26) Geodetic Height of Northern Footpoint (should be 100km.)
27) MLAT100N , MLON100N , MLTN . Magnetic lat/lon/mlt of Northern Footpoint at 100km.
28) Magnetic field vector at Northern Footpoint at 100km (in GEO coords)
29) Magnetic field vector at Northern Footpoint at 100km (in GSM coords)
30) Value of Northern Loss Cone angle. asin(sqrt(Bsc/Bfn))
31-38) Southern Footpoint counterparts to 23-30

RBSP Magnetic Coordinates, continued

39) Location of minimum-|B| point (in GSM coords).
40) B-field at minimum-|B| point (in GSM coords). Components and magnitude.
41) The magnetic dipole moment that was used to convert magnetic flux to L*. In units of nT.
42) The fixed reference magnetic dipole moment for converting magnetic flux to L*.
43) Time-dependant magnetic dipole moment
44) Generalized Roederer L-shell value (also known as L*) - nominally 18 different pitch angles (but whatever you what).
45) McIlwain L-shell value - 18 PAs
46) Magnetic field strength at mirror points for each pitch angle. -18 PAs
47) Integral invariant for each pitch angle - 18 Pas
48) K invariant for each pitch angle - 18 Pas
49) Lmeq. McIlwain L of an equatorially mirroring particle on the same field line as the vehicle . This will have a local pitch angle that is not necessarily the same as any of the L's listed in line 43.
50) INVLAT eq. Invariant latitude computed from Lmeq .
51) MAGLAT . Magnetic latitude computed from BoverBeq (see note) .
52) BoverBeq . B/Bmin.