

GOES-16 SEISS MPS-HI Level 1b (L1b) Data Release  
Provisional Data Quality  
December 19, 2017  
Read-Me for Data Users

The GOES-R Peer Stakeholder - Product Validation Review (PS-PVR) for Space Environment In-Situ Suite (SEISS) Magnetospheric Particle Sensor – High Energy (MPS-HI) L1b Provisional Maturity was held on December 8, 2017. As a result of this review, following closure of some open issues, NOAA has confirmed that the MPS-HI L1b data are at Provisional Validation Maturity as of December 19, 2017.

The MPS-HI L1b data product consists of 50 keV – 4 MeV electron fluxes and 80 keV – 12 MeV proton fluxes. MPS-HI consists of 5 electron solid-state (silicon detector) telescopes and 5 proton solid-state (silicon detector) telescopes with 30-degree full-width conical fields-of-view, arranged in a north-to-south fan with field-of-view centers separated by 35 degrees.

Each electron telescope reports 10 differential channels plus a >2 MeV integral channel. Each proton telescope reports 7 channels in the 80 keV – 1 MeV range and 4 channels in the 1-12 MeV range. In the latter energy range, the channels generally register counts above backgrounds only during solar energetic particle events.

In addition, there are two dosimeters that distinguish dose from particles depositing < 1 MeV and > 1 MeV under domes of 250 and 100 mil aluminum shielding.

Provisional validation means:

- Validation activities are ongoing and the general research community is now encouraged to participate.
- Severe algorithm anomalies are identified and under analysis. Solutions to anomalies are in development and testing.
- Incremental product improvements may still be occurring.
- Product performance has been demonstrated through analysis of a small number of independent measurements obtained from GOES-East (GOES-13), separated from GOES-16 one hour in local time.
- Product analysis is sufficient to establish product performance relative to expectations (Performance Baseline).
- Documentation of product performance exists that includes recommended remediation strategies for all anomalies and weaknesses. Any algorithm changes associated with severe anomalies have been documented, implemented, and tested.
- Testing has been fully documented.
- Product is ready for operational use and for use in comprehensive cal/val activities and product optimization.

Users of the GOES-16 MPS-HI L1b data bear responsibility for inspecting the data and understanding the known caveats prior to use. Below is the list of caveats that have been identified and are under analysis. Solutions are in development and testing:

1. No MPS-HI L1b data prior to declaration of Provisional Maturity should be used. NCEI will reprocess and release the early mission data using the Provisional Maturity algorithm and look-up tables.
2. Pitch angles are not yet available since the GOES-16 Magnetometer data have not yet reached Provisional Maturity.

3. Electron telescope 2 exhibited unusually high levels of noise through early April. Since then, its behavior has been stable and consistent with the other telescopes, but this is a watch item.
4. Preliminary cross-comparisons among the MPS-HI telescopes using one month of data indicate scale factors ranging from <1% to >50% depending on the energy, species and telescope. These scale factors have not been applied to the data and will be revised following the application of an improved cross-comparison method to a longer period of data.
5. Preliminary comparisons between >2 MeV electron fluxes observed by GOES-16 MPS-HI and GOES-13 EPEAD indicate reasonable agreement. Remaining differences may be due to the much larger field-of-view on GOES-13; a quantitative evaluation of this effect is planned.
6. Preliminary comparisons between GOES-16 MPS-HI electrons and GOES-13 MAGED electrons generally indicate good agreement, with some discrepancies, particularly between the lowest energy channels. The reasons for these discrepancies are being investigated.
7. Preliminary comparisons between GOES-16 MPS-HI protons and GOES-13 MAGPD protons indicate that MAGPD fluxes are a factor of 2-3 too low. The reasons for these discrepancies are being investigated. GOES-13 has been on-orbit since June 2006, i.e. over eleven years, so radiation damage may be a factor.
8. Solar proton observations above 3.2 MeV (channels P10 and P11) are at least a factor of 2 lower than GOES-13 and -15 EPEAD observations. The reasons for these discrepancies are being investigated.
9. Comparisons between particle detectors with different energy channels must carefully estimate the effective energies of the channels. The broader the channels, the more sensitive such estimates are to assumptions.

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NCEI website for GOES-R Space Weather data (provides daily aggregations of MPS-HI L1b data):

<https://www.ngdc.gov/stp/satellite/goes-r.html>