Specifying the Solar Energetic Particle Hazard Inside Geosynchronous

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SEP Hazard/Present Capability

“L” Mapping Method

SEP Hazards: Solar panel degradation and electronic anomalies from bit-flips to system latch-up.

Issue: Current operational capability measures GEO flux for GEO specification only.

Objective: Extend specification and new forecast to all orbits.

Liouville Method

- SEPs penetrate to energy dependent cutoff surfaces.
- Smart and Shea, 1967 (AFGL) – L-shells approximate cutoff surfaces at low altitudes.
- Our study suggests this is valid at higher altitudes.
- Method may bypass need for modelling time dependent fields.

1. Numerical Study
- Cutoff energies corresponded well with meridional L curves.
- Cutoff energies are reasonably constant over the L surface.

Global Mapping

- Meridional Mapping

2. Data Study
- Map observations at POES satellite to Van Allen Probes using relation determined by a least squares fit: $f_{err}(L) = 0.619f_{POES}(L) + 1.85$
- Compared mapped to locally observed data and found that 90% of mapped observations were within the necessary factor of 4.

Results: Use “L” Mapping for specification and Liouville Method for high altitude forecast