

GOES Data Use in the FAA Solar Radiation Alert System

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**Federal Aviation
Administration**



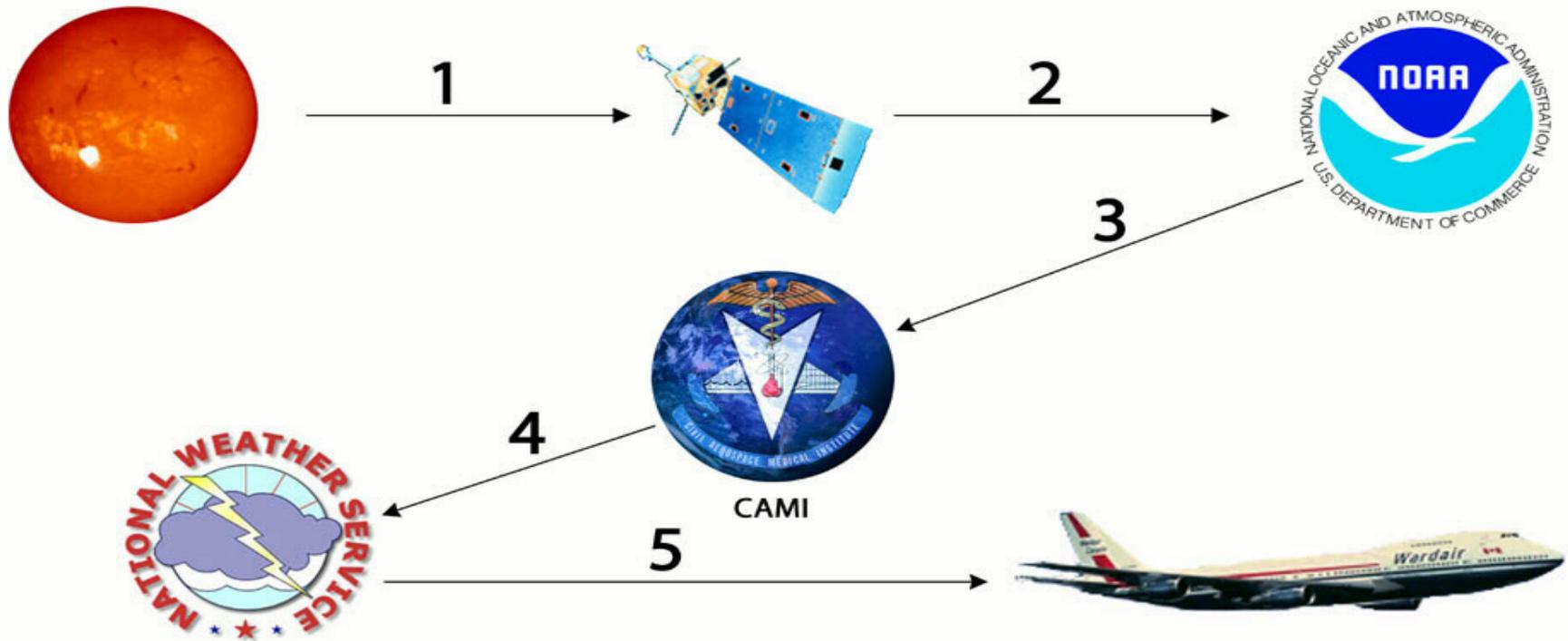
FAA Models of Solar Cosmic Radiation Exposure

Solar Cosmic Radiation:

- **Solar Radiation Alert System (SRAS) for real-time evaluation (based solely on GOES proton flux data from MEPAD and HEPAD). (OAM report DOT/FAA/AM-9/06)**
- ***Ad hoc* codes for more precise after-the-fact evaluations that include global neutron monitor data. (Adv. Space Res. 2008, 42:1008-1029)**



SOLAR RADIATION ALERT SYSTEM



1. An eruption on the sun raises radiation levels in the Earth's environment.
2. A GOES satellite measures the radiation and transmits the data to NOAA.
3. A CAMI computer obtains and analyzes the data from NOAA.
4. CAMI issues any needed alert or update to the National Weather Service.
5. The National Weather Service informs the aviation community.

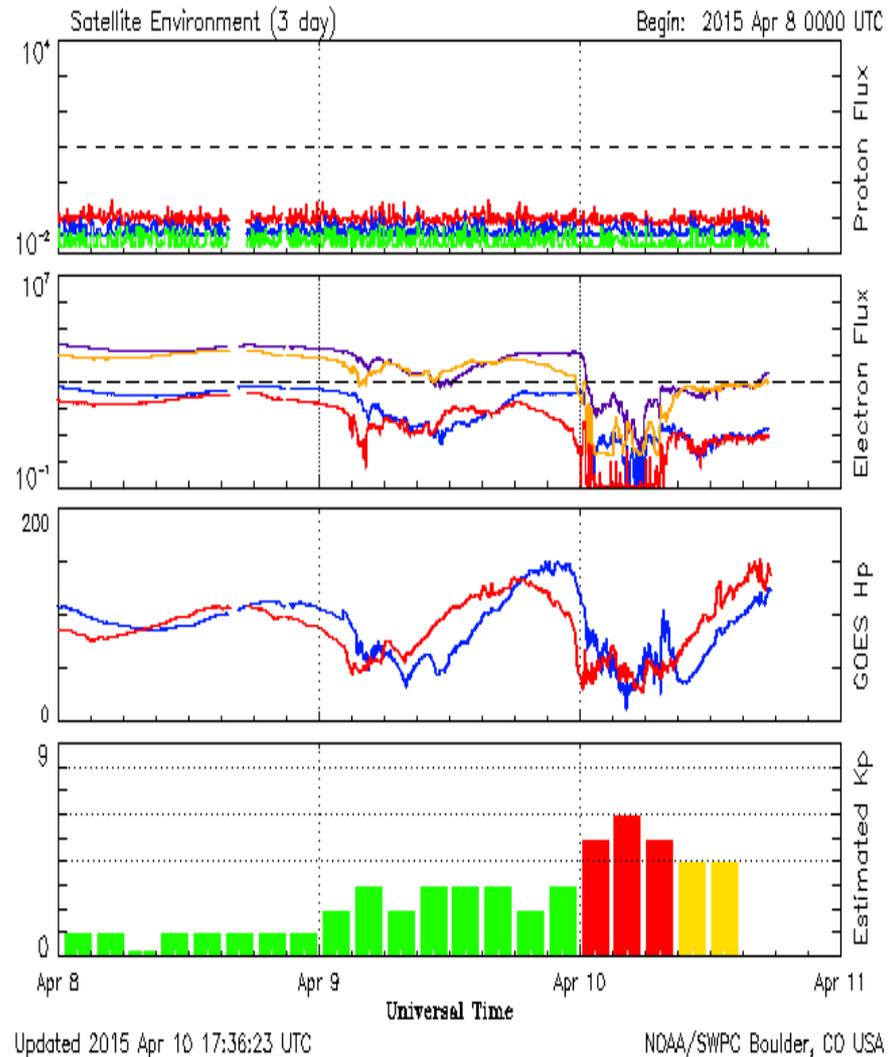


Calculations Based on MCNPX and GOES

Atmospheric response functions for dose rate were pre-calculated for proton showers using MCNPX.

Primary proton spectra at the top of the atmosphere are estimated based on GOES data from 10 MeV to > 700 MeV (P4-P11).

The spectra are used to guide integration of doses at each altitude.



Areas for Improvement

Current dose rates estimates are within about a factor of 2, neglecting highly anisotropic events. One key is to improve estimates of the spectral shape.

- Improve real-time knowledge of spectral anisotropy (NM data, solar Bz) and high E particle flux (NM data)
- Incorporate geomagnetic disturbances in addition to current quiet time estimates (add an index input)
- Improve atmospheric transport model to include magnetic effects (Next version of MCNP6)
- Include solar energetic alphas (estimated 5-10% of dose) (not currently planned to be available).

Danger is that each input source reduces reliability

