A Space Weather Testbed for the Geosynchronous Environment

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Goals

Produce a comprehensive, unified, & validated testbed database for rapid prototyping

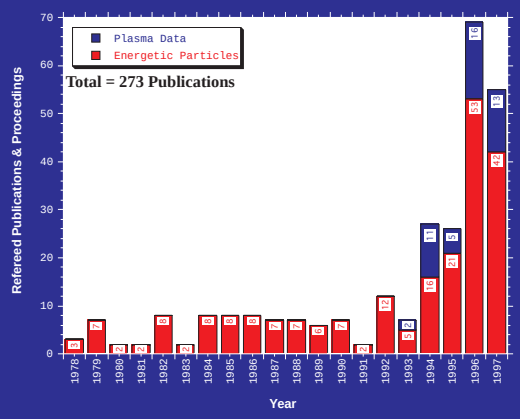
- Satellite Design
- Event Analysis
- Model Development
- Model Testing/Evaluation
- Statistics/“Climate” Studies
- Quatitative Studies

Combines MPA, SOPA, & ESP data

- proton & electron fluxes, fluences
- ≈1ev–20 MeV, ≈60 energies
- continuous coverage 1989-pres.

Value Added

The current database is extremely useful & well used

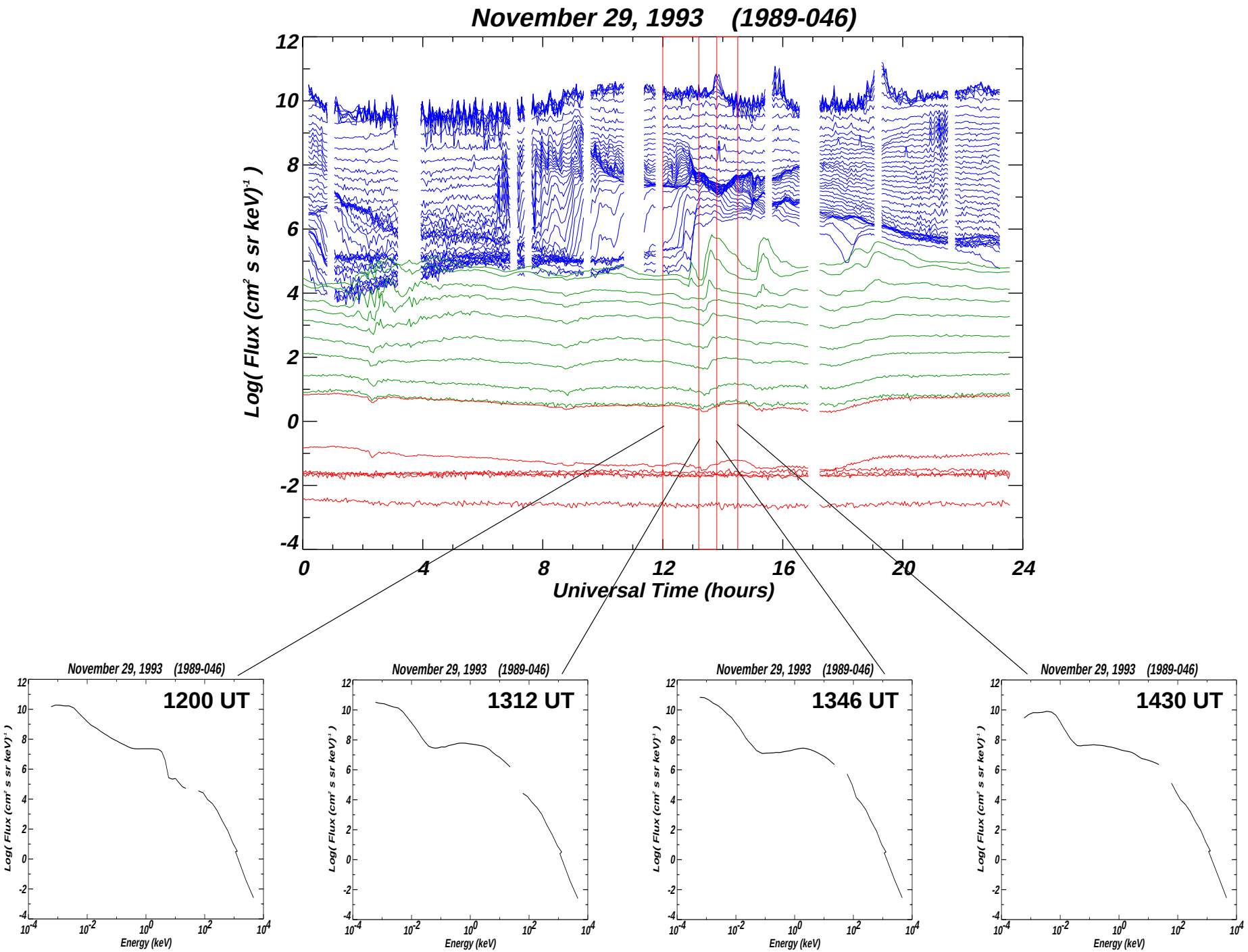


For the NSWP several improvements should be made

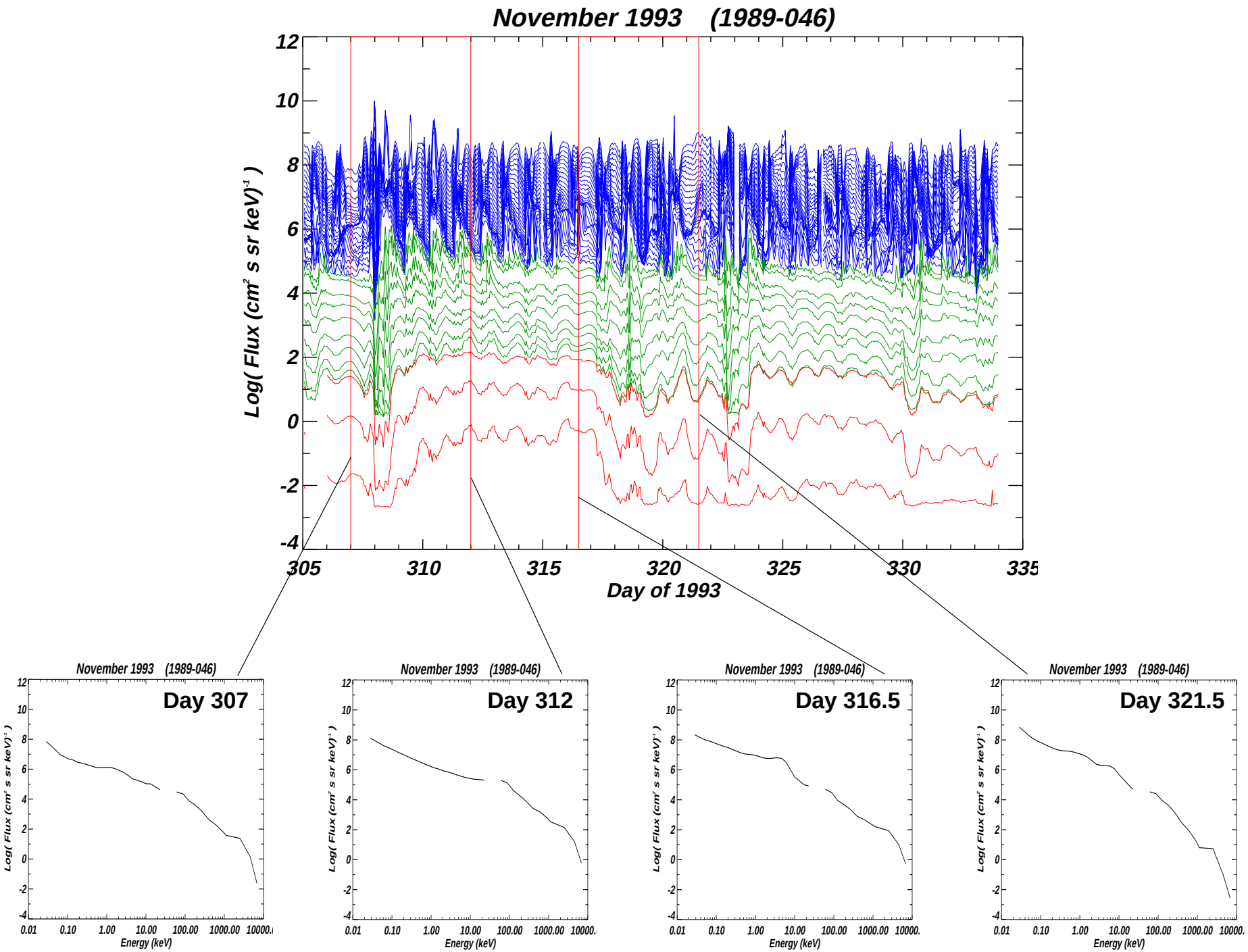
- unified database for all 3 sensors
- complete spectra and moments
- continuous coverage 1989-pres.
- removing telemetry glitches
- better energy response functions
- real-time web access
- data analysis & data synthesis

Henderson et al, Space Weather Workshop, Boulder, CO, Feb. 1998

Substorm Example


November 29, 1993 (1989-046)
Log(Flux (cm² s sr keV)⁻¹)
Universal Time (hours)
1200 UT
1312 UT
1346 UT
1430 UT
Energy (keV)

“Killer Electrons”


November 1993 (1989-046)
Log(Flux (cm² s sr keV)⁻¹)
Day of 1993
Day 307
Day 312
Day 316.5
Day 321.5
Energy (keV)

Applications

Event Studies

- GEM Campaigns esp.substorm & radiation belts
- National Space Weather Storm
- January 1997 Magnetic Cloud

Climatology

- Long-term database (soon 1 solar cycle)
- Research e.g. solar max vs solar min storm responses
- Applications e.g.averages, worst case, histograms

Models & Forecasting

- Input and boundary conditions
- Model development esp.data assimilation
- Model evaluation with uniform testbed

Rapid Prototyping

- Routine comparison with MSFM beginning
- Real-time data delivered to 55th SWX

Future Work

Rapid Prototyping Application

- joint daily LANL/NOAA-SEC evaluation of MSFM & geosynchronous fluxes

Robust De-Glitching

- automatically test for and remove bad data points

Long-Term Statistics

- complete statistical study of geosync. environment fluxes, fluences, and spectra as a function of solar cycle, activity, etc.

Multiple Satellite Studies

- cross-calibration, local time differences
- geosynchronous/GPS synthesis

Spectral Inversion

- true deconvolution of spectrum independent of assumed form using response functions