

# Variability of the trapped proton environment

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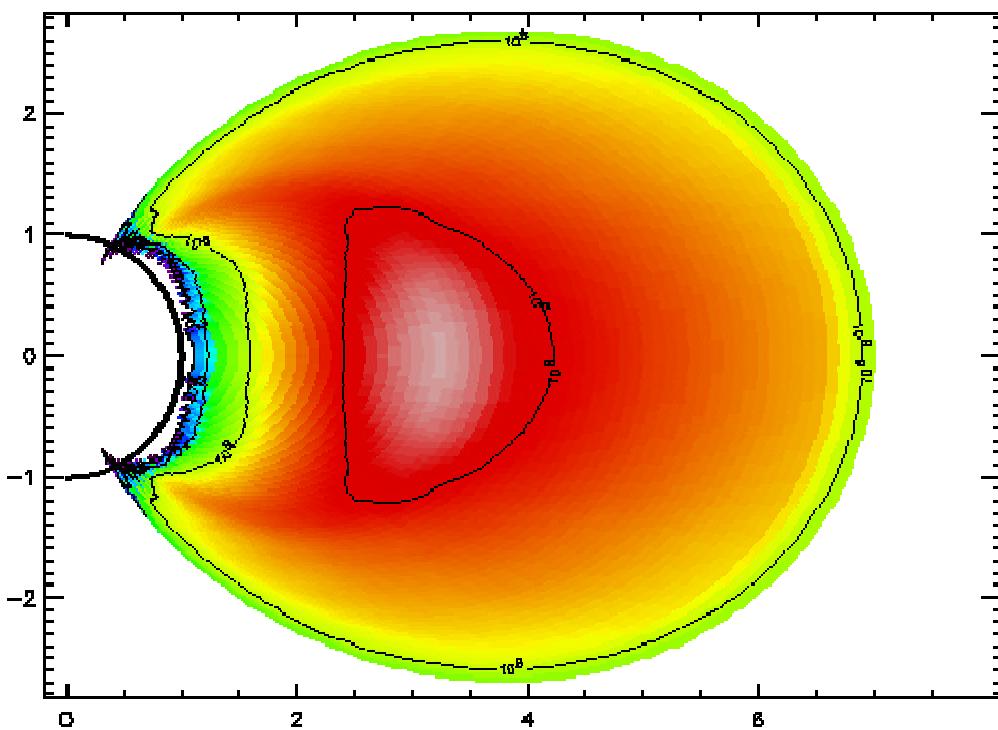
Belgisch Instituut voor Ruimte-Aéronomie

# Overview

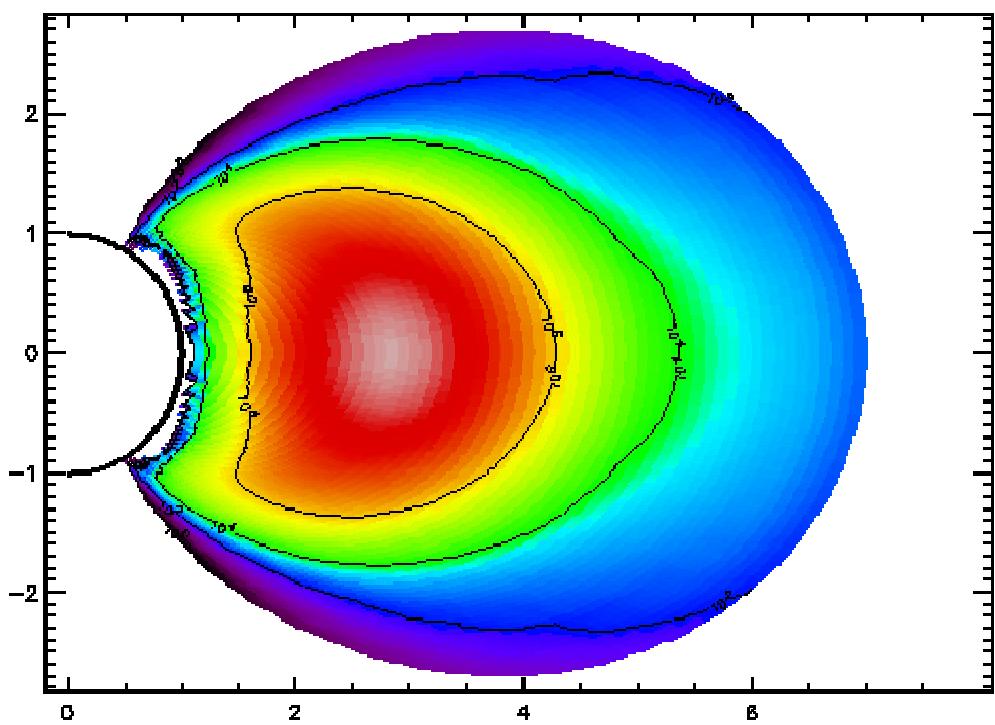
- General description of the proton environment
- Time dependencies
- Case study: SAMPEX/PET observations and model
- Coordinate systems
- Model and data issues

# Low energy environment

$>0.1 \text{ MeV}$

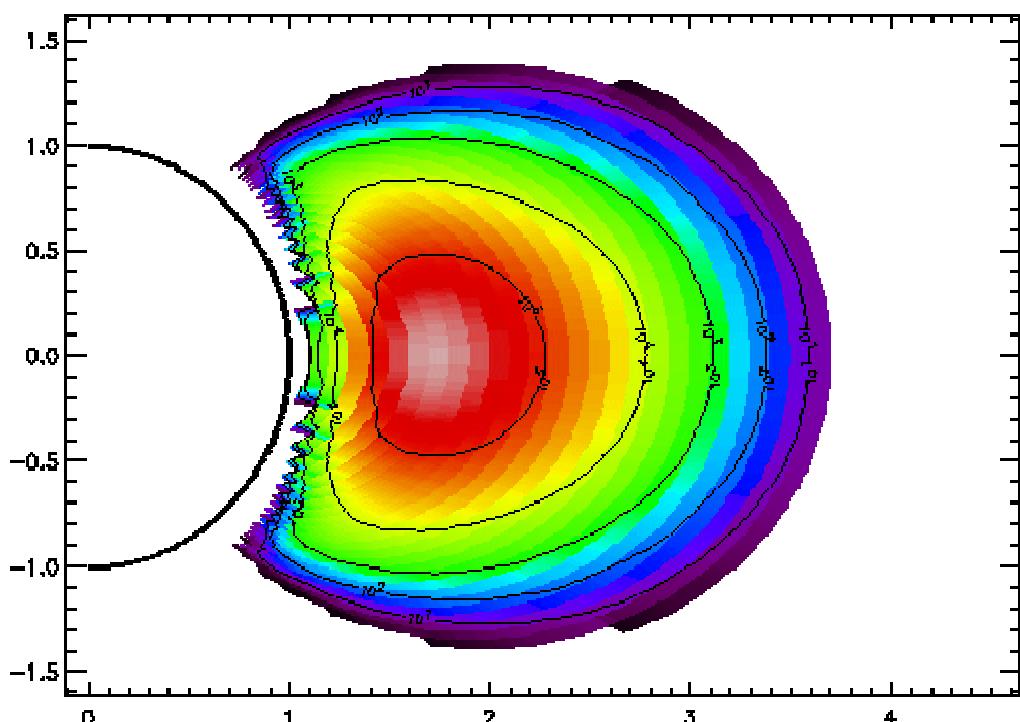


$>1.0 \text{ MeV}$

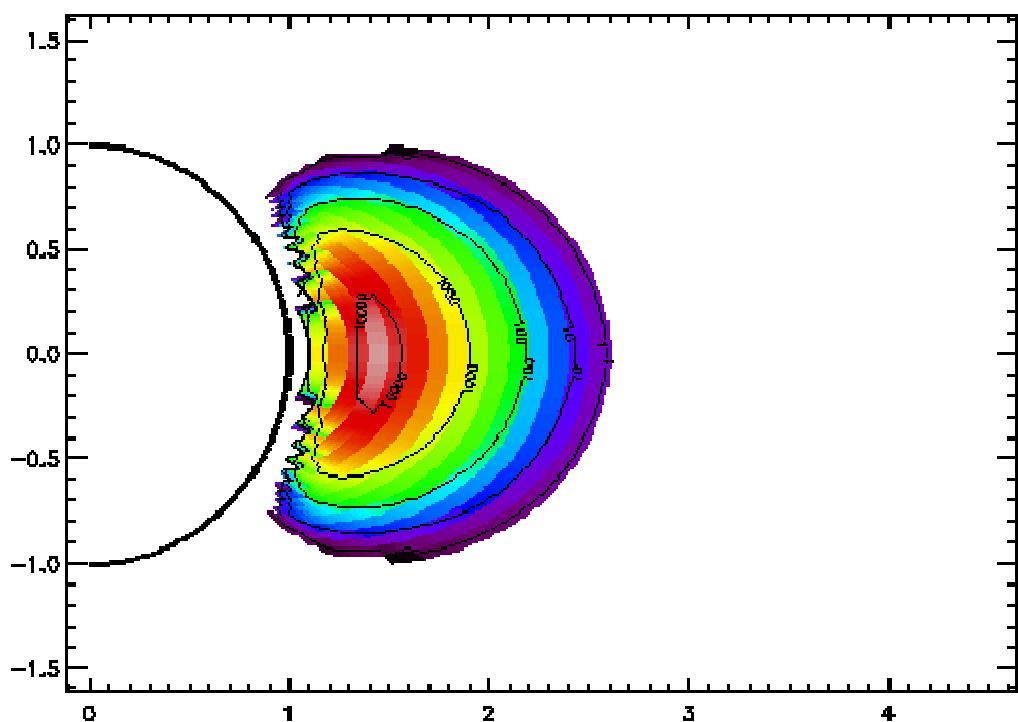


# High energy environment

$>10.0 \text{ MeV}$



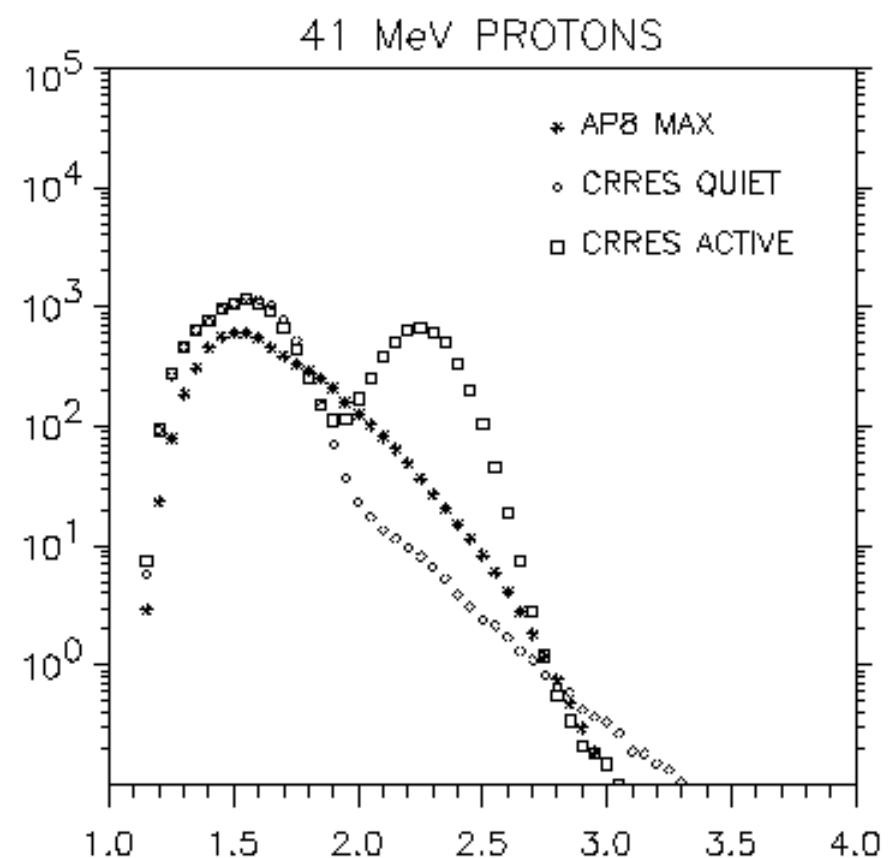
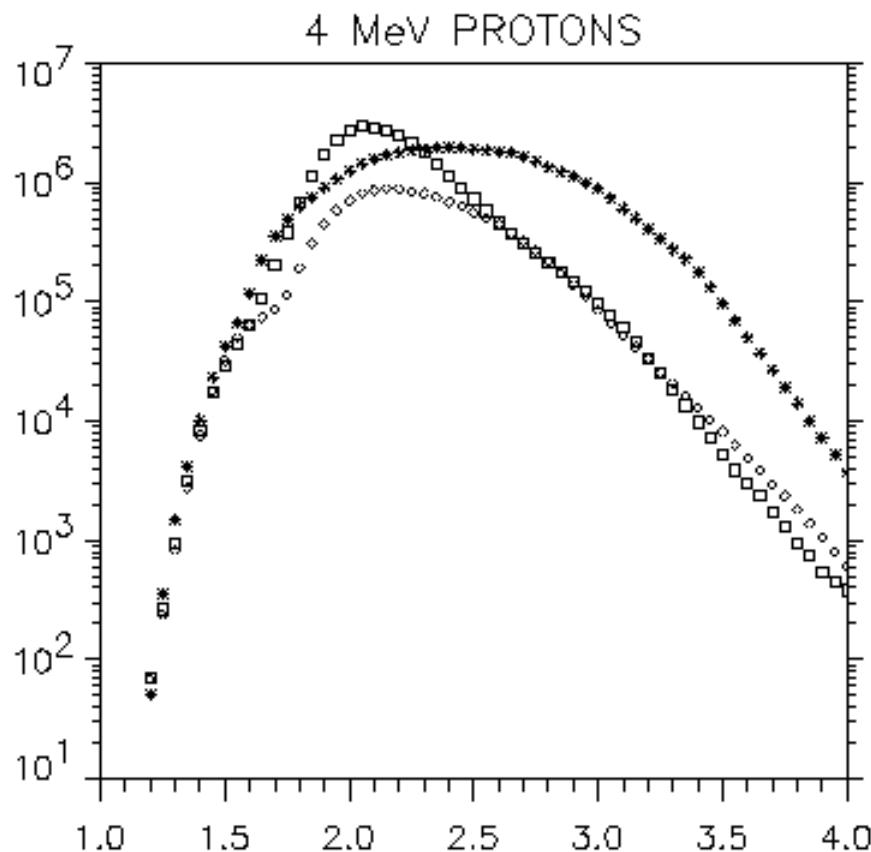
$>100.0 \text{ MeV}$



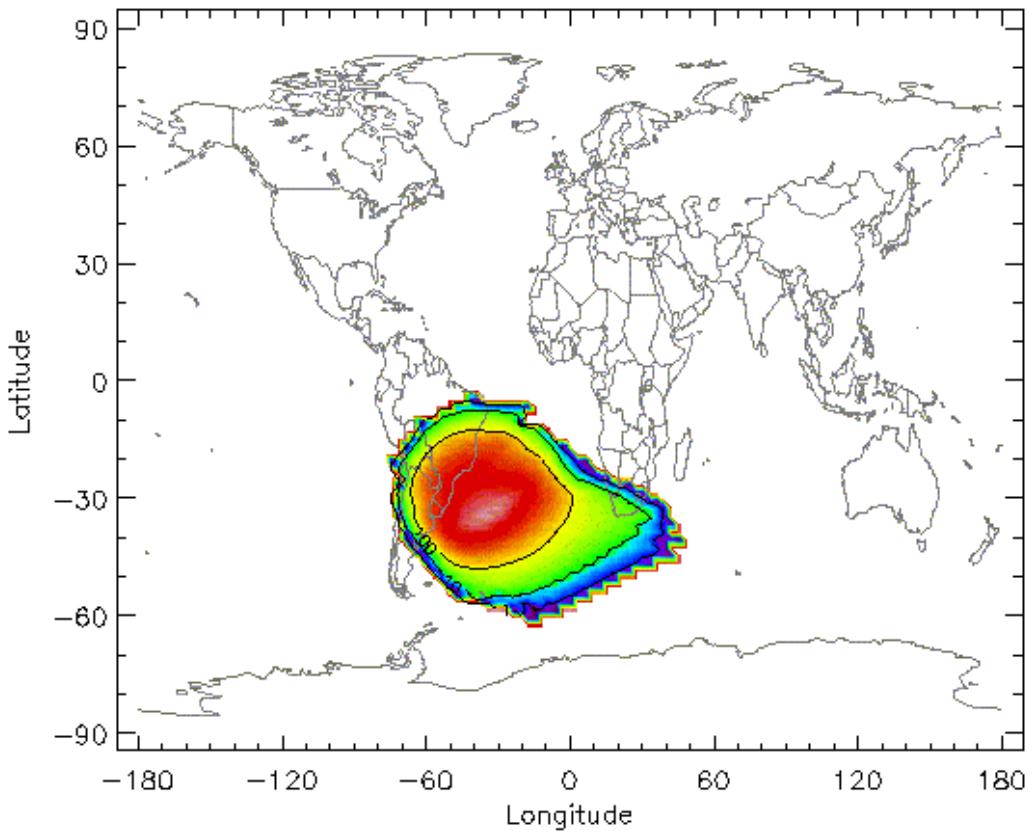
# Time dependencies

- Injections
- Secular variation of the geomagnetic field:
  - Drift of dipole centre (2.5 km/yr)
  - Change of dipole axis tilt ( $0.1^\circ/\text{yr}$ )
- Solar cycle variation of atmospheric density
- Seasonal variation of atmospheric density

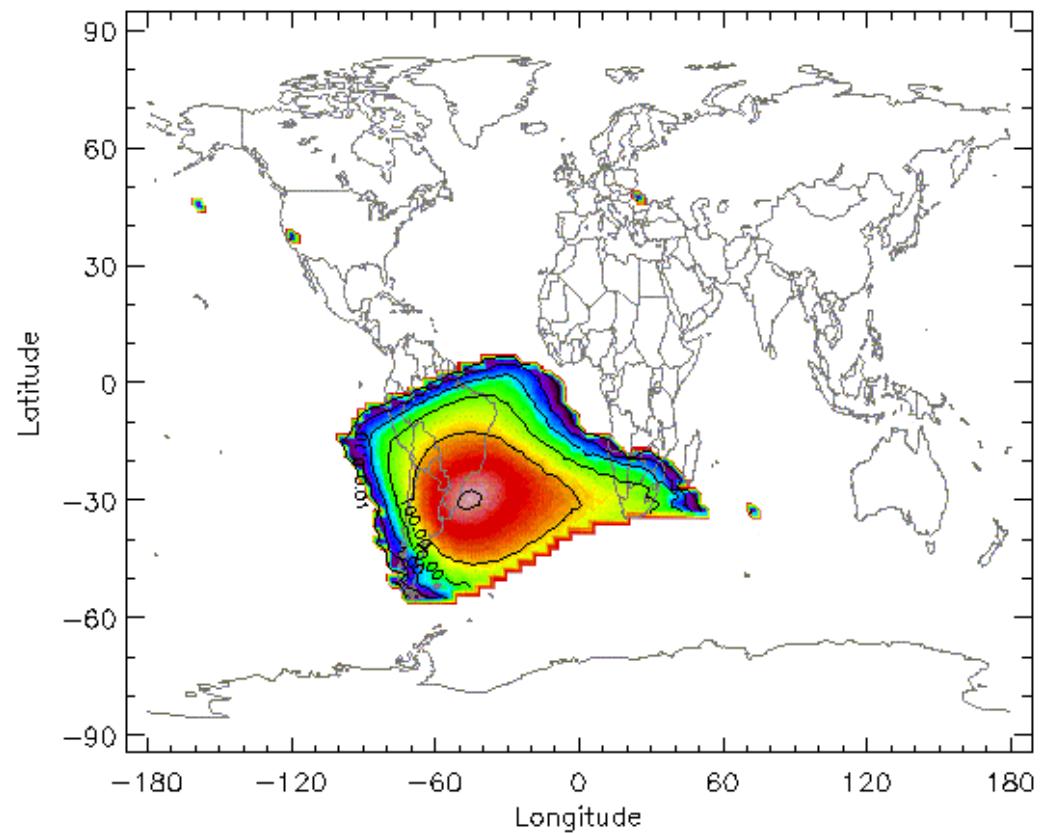
# CRRESPRO quiet and active models



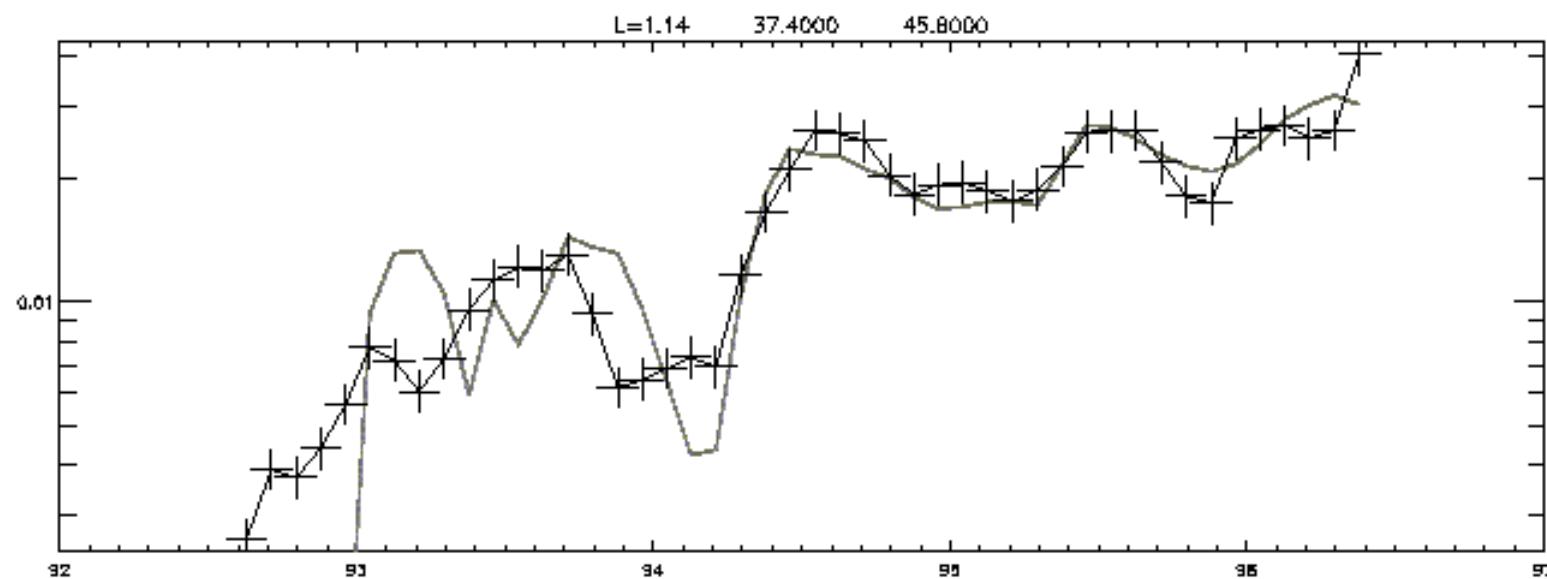
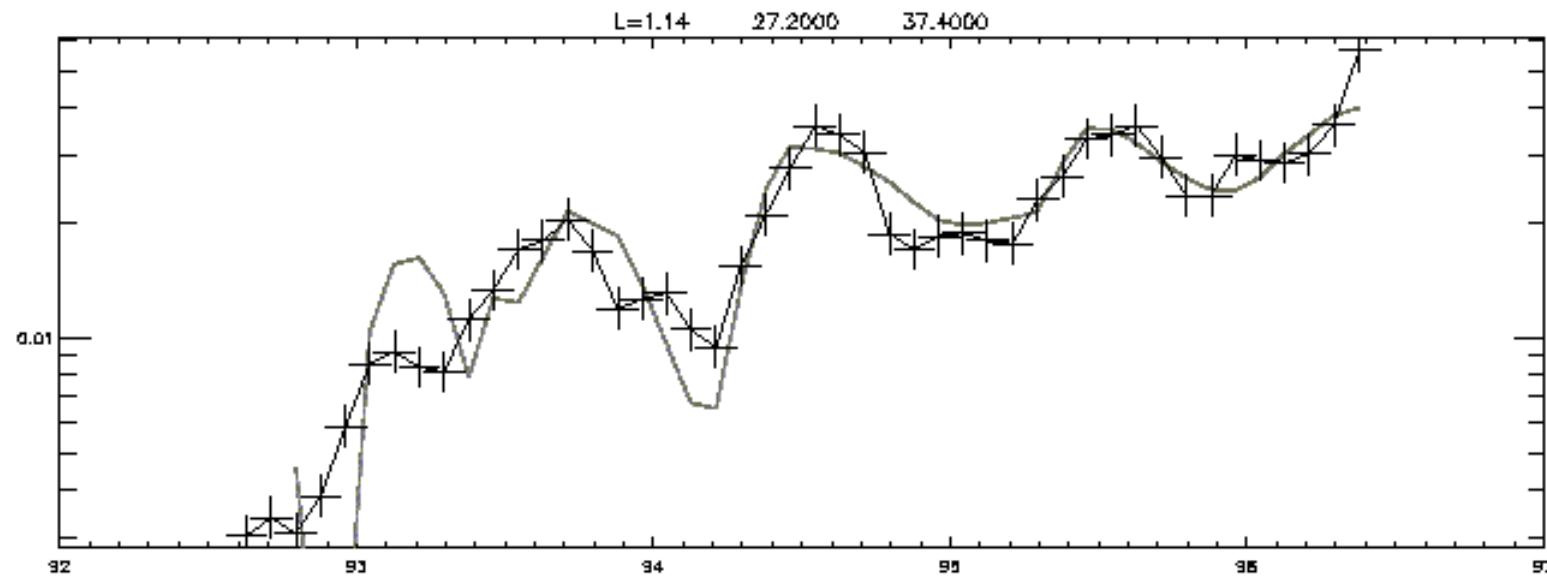
AP-8 MIN



SAMPEX/PET

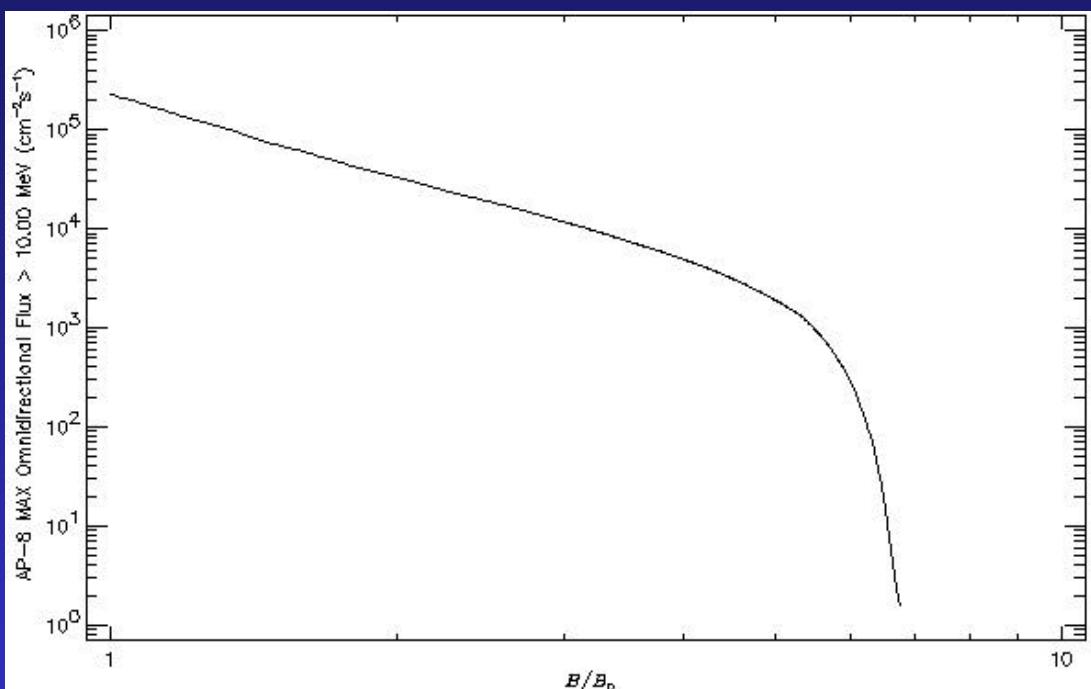


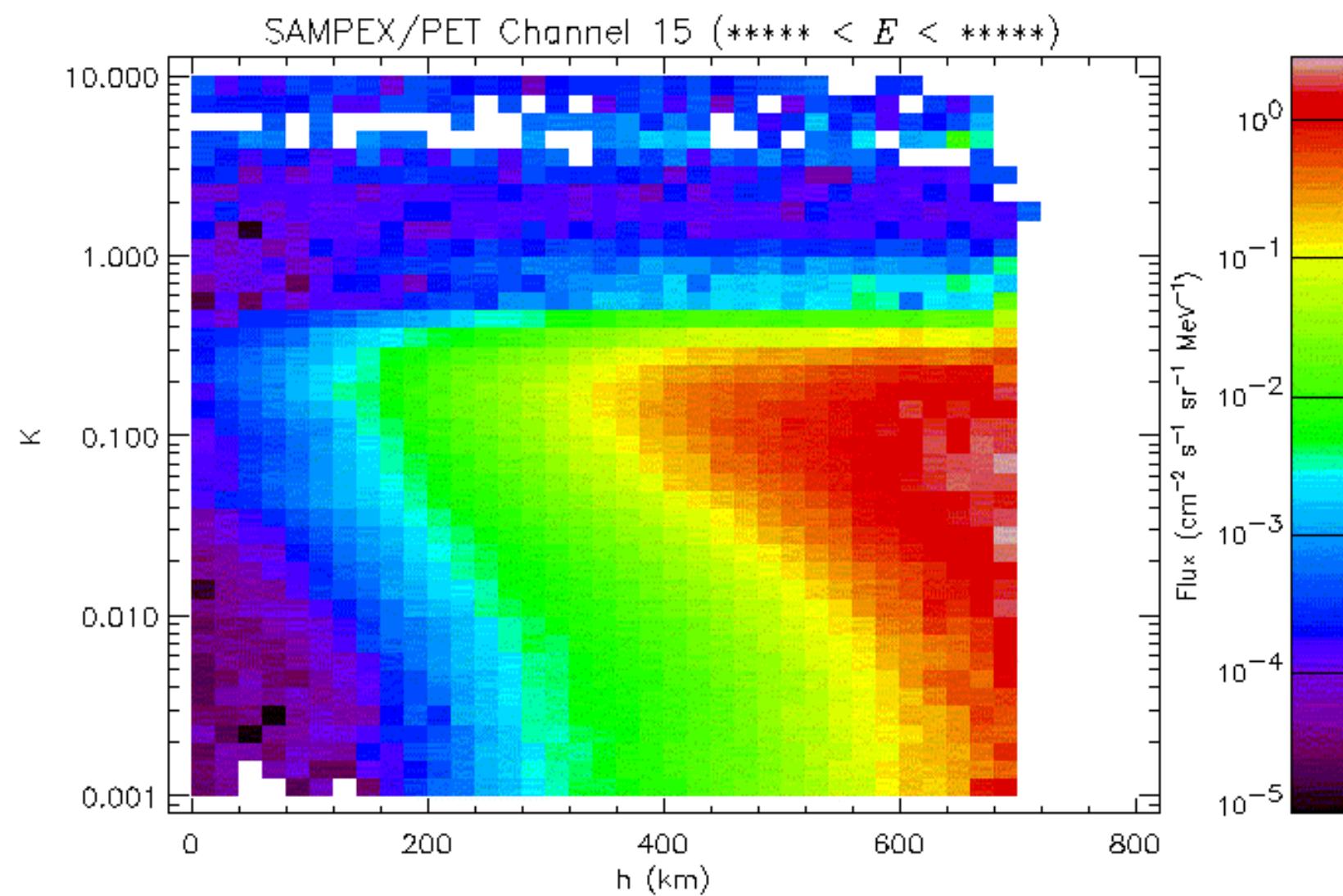
Directional proton flux >18 MeV at 500 km



# Coordinate systems

- McIlwain's ( $B, L$ ) coordinates:
  - Not well suited for strong gradients
  - Poor coverage at low altitudes
  - $L$  is not conserved for secular variation
- Alternative for  $L$ : Kauffman  $K = I \sqrt{B}$
- Alternative for  $B$ :  $\langle n \rangle_{ds}$  or  $\langle n \rangle_{h_{\min}}$





# Model and data issues

- Model unification
- Concurrent missions in different orbits
- Standard instruments
- Radiation monitors vs. scientific instruments
- Instrument calibration and data reduction