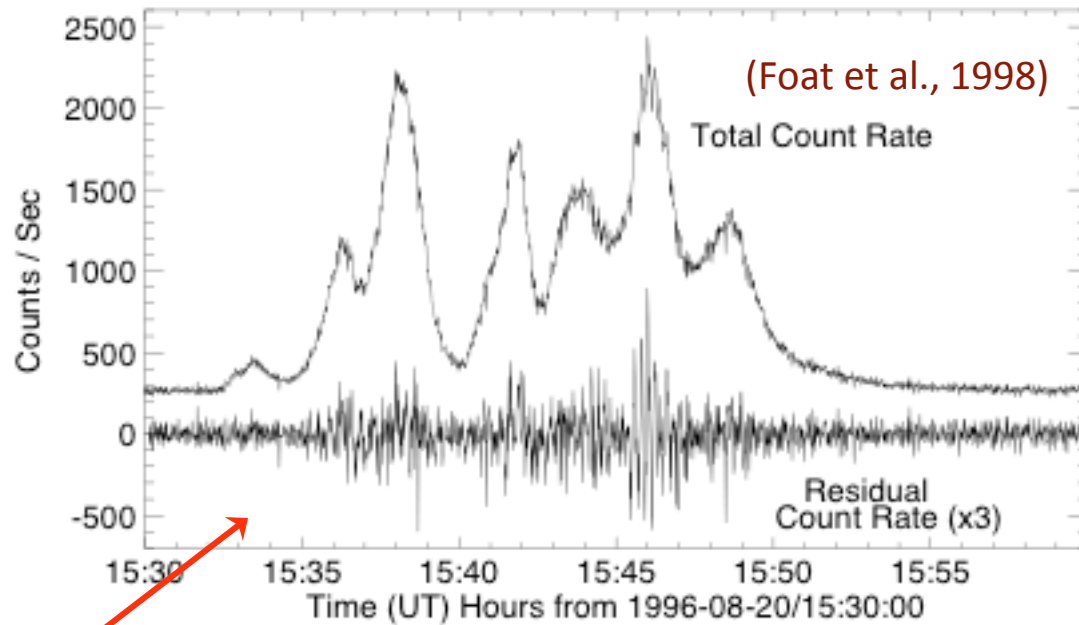
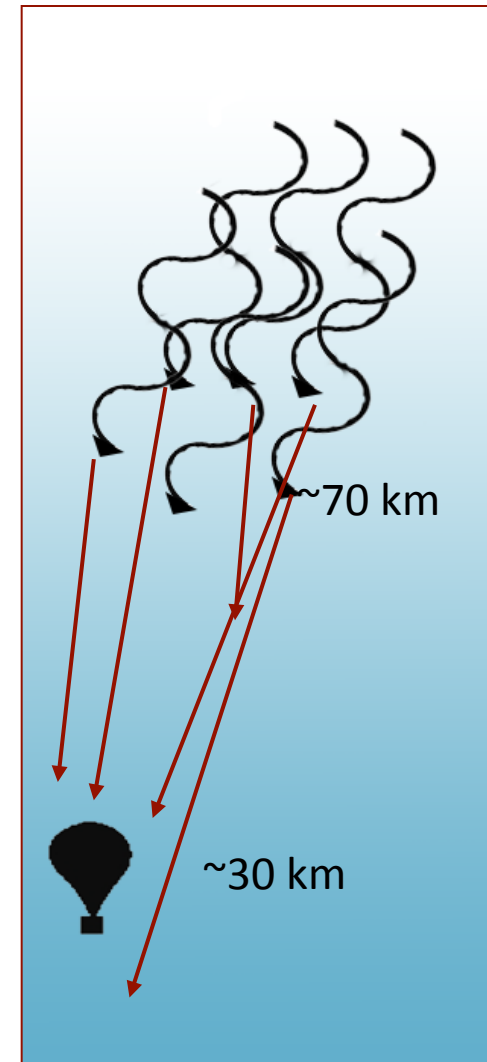


BARREL Observing Method

- Bremsstrahlung X-rays are produced as precipitating electrons collide with atmospheric neutrals



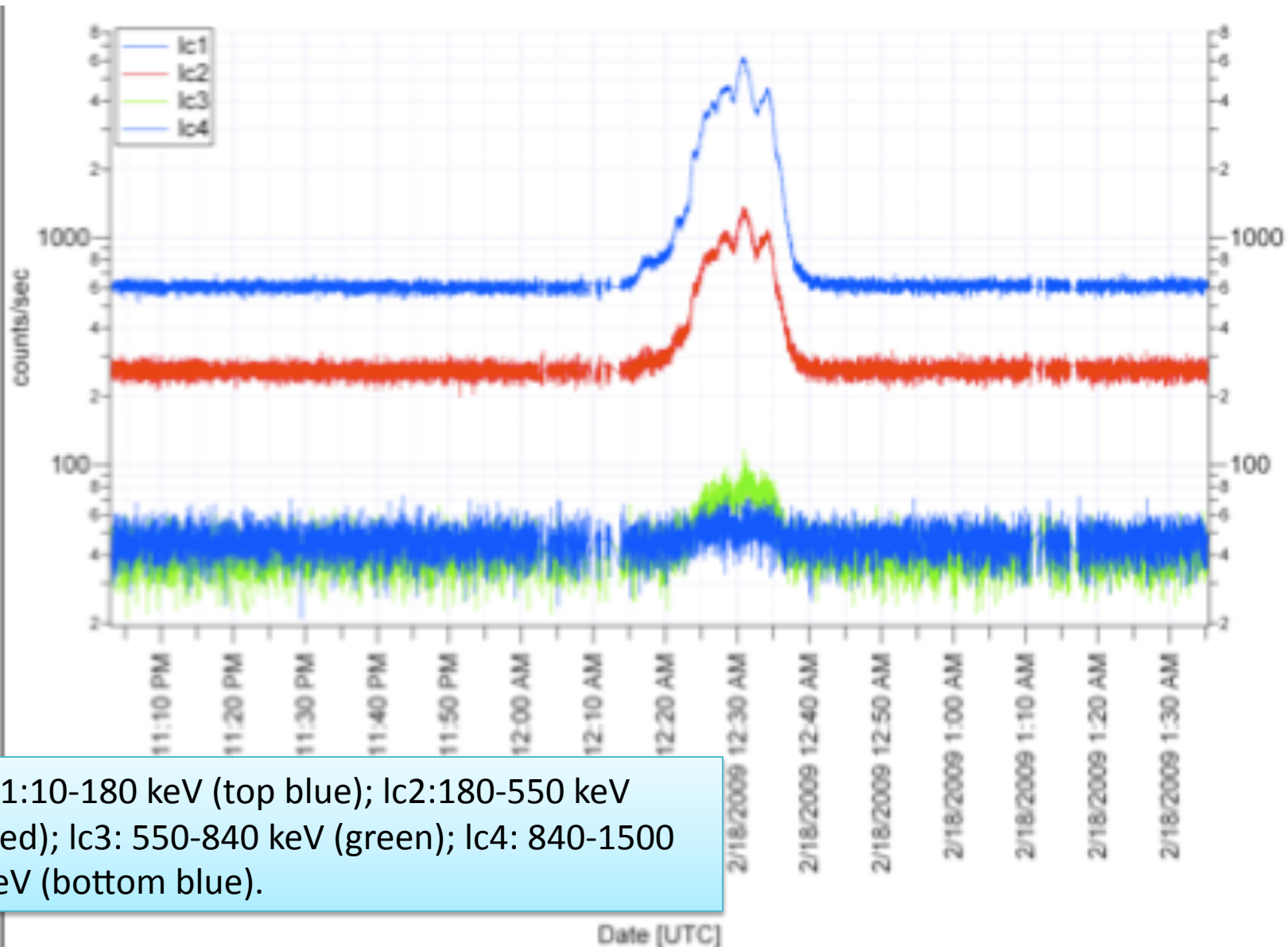
- First observation of X-rays to MeV energies made in 1996 over Kiruna, Sweden.



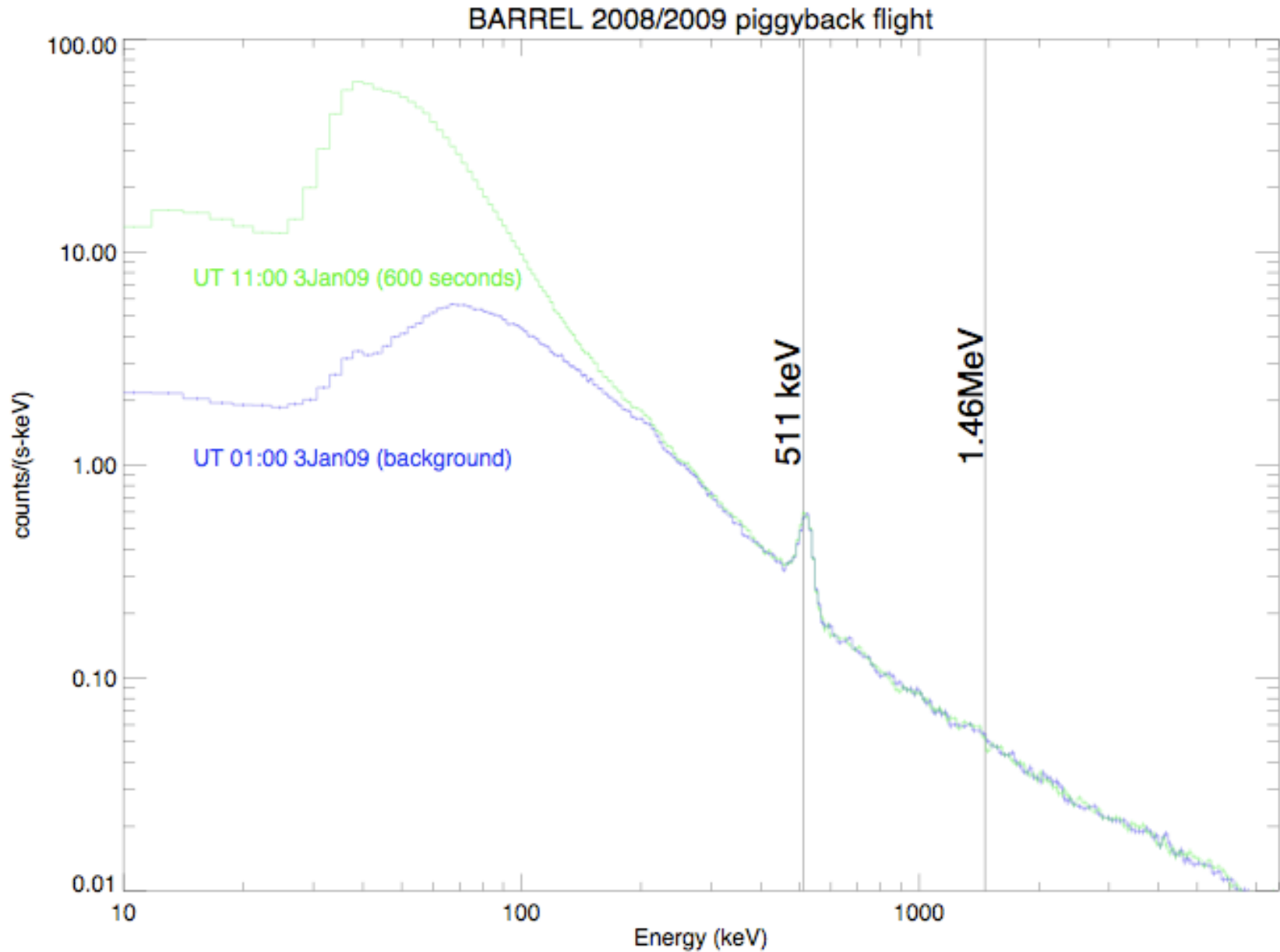
What Information will BARREL Provide?

- Available near real-time (within 1 hour)
 - Balloon locations – where are measurements available? Times of conjunctions with RBSP.
 - Summary plots (e.g. count rates, raw spectra)
 - Is there precipitation at a given location and time?
 - Is the precipitation energetic?
 - Possibly quantify this: e.g. estimate of precipitating flux above 500 keV
- Requiring more processing (bkgnd subtraction; modeling response, etc.)
 - Flux and energy spectrum of precipitating electrons for specific events.
 - Spatial distribution of precipitation (maps?)
- Data and software tools publicly available:
 - Ascii, CDF, IDL save files – uncalibrated data extracted from binary files
 - Fast Spectra: X-ray count rate in 4 energy channels at 50ms
 - Higher resolution 48 channel energy spectra every 4 sec.
 - Highest resolution 256 channel spectra accumulated over 32 s (for calibration)
 - IDL software tools
 - For plotting data and balloon locations
 - Spectral analysis and inversion of X-ray spectrum, instrument response

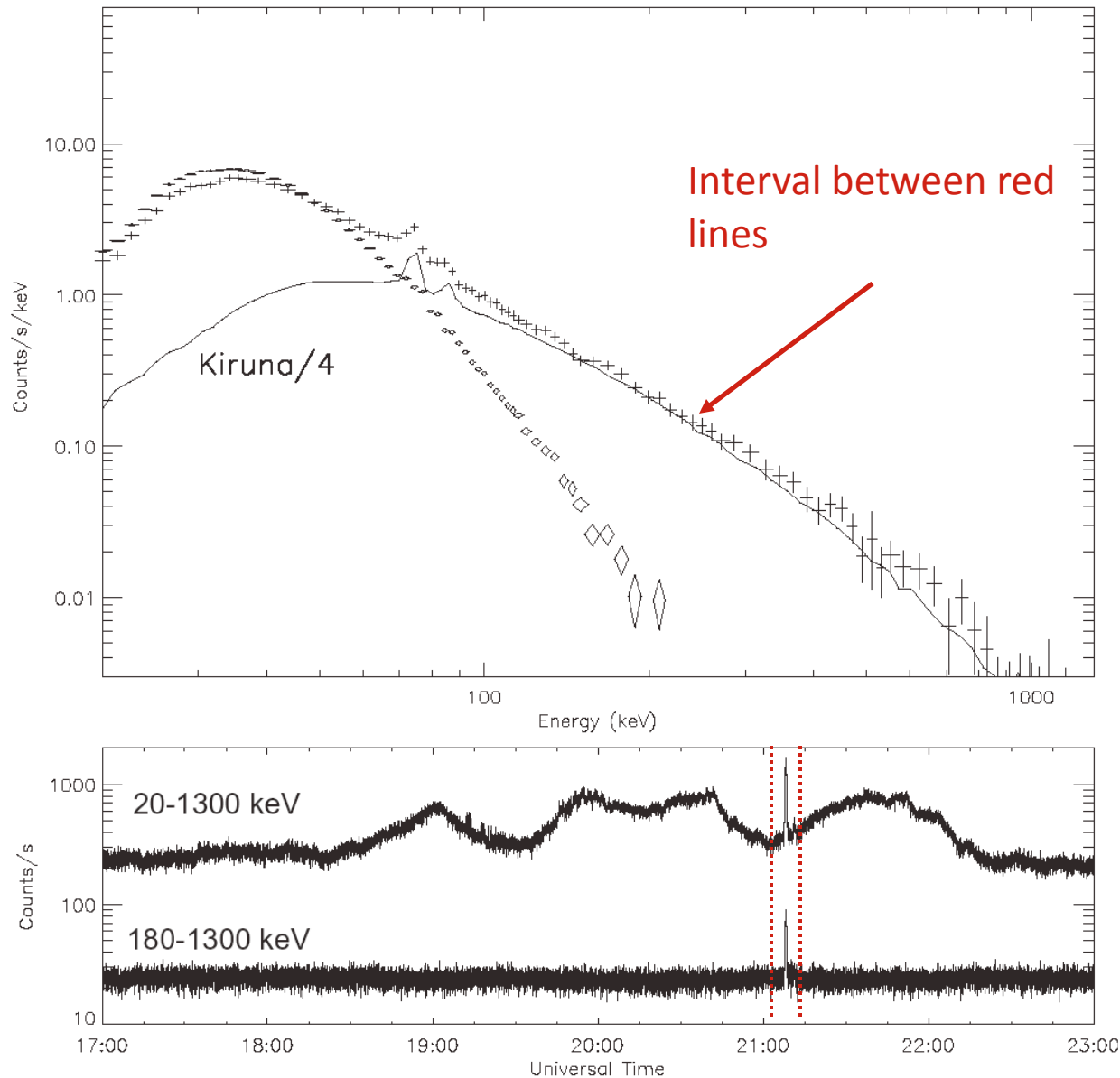
Example: Fast X-ray Spectra



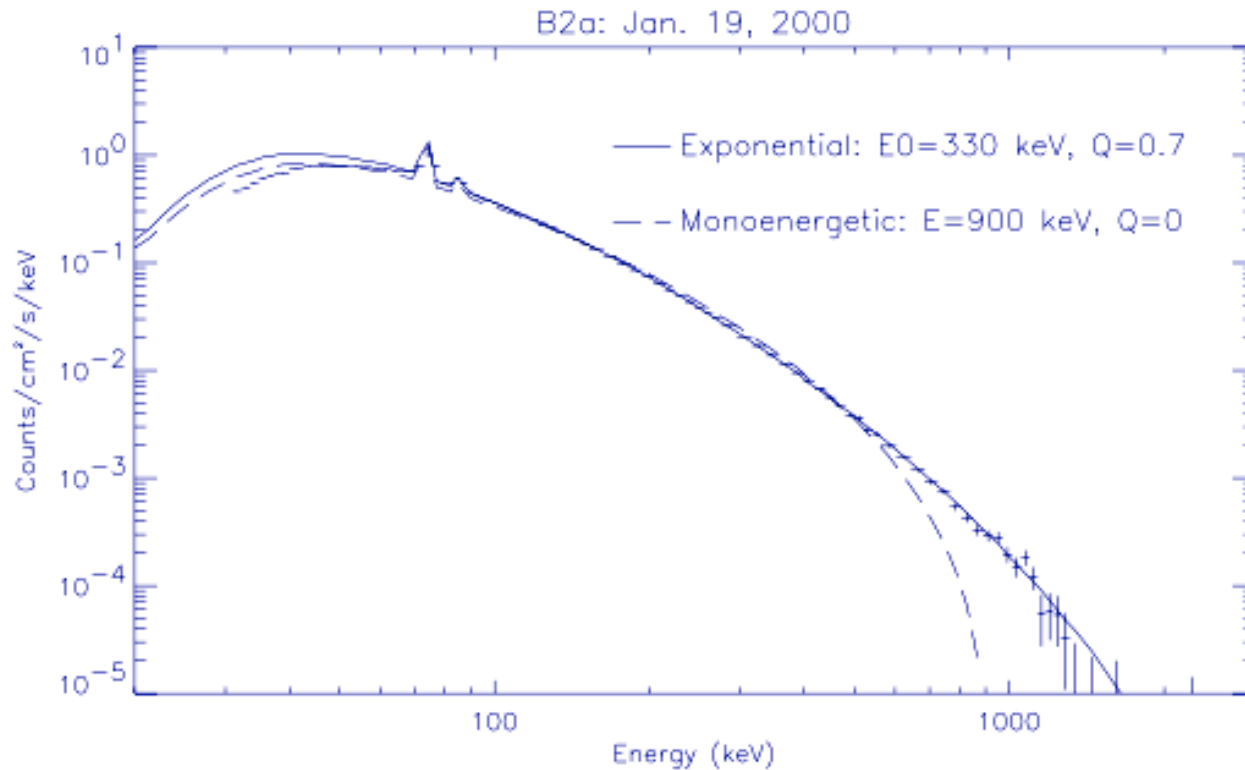
Example: 256 Channel Spectra



Identifying Relativistic Electron Precipitation



Energy Spectrum

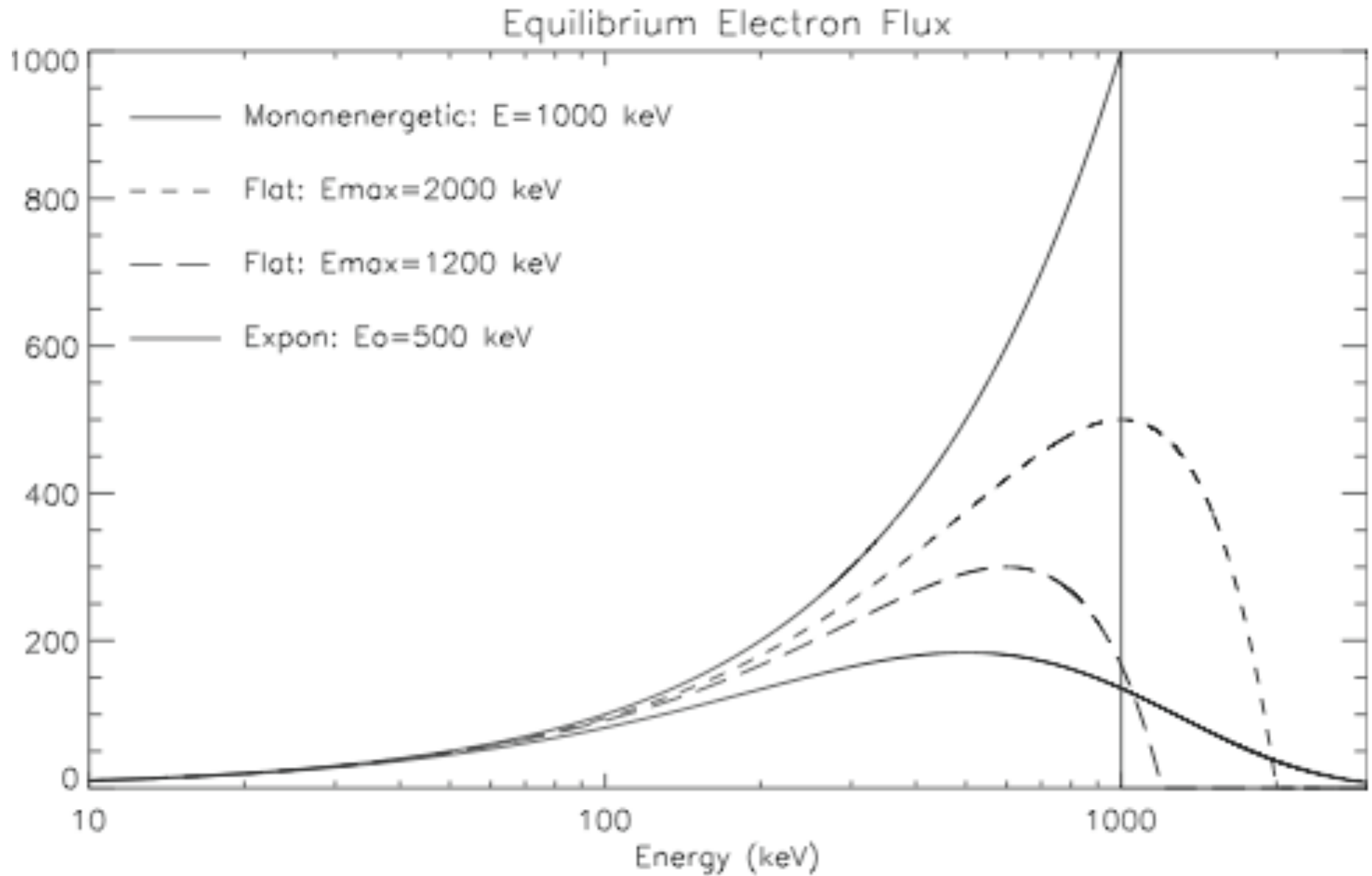


- Assume a precipitating electron distribution and model the observed spectrum
 - Model ionization losses, bremsstrahlung production and scattering of photons

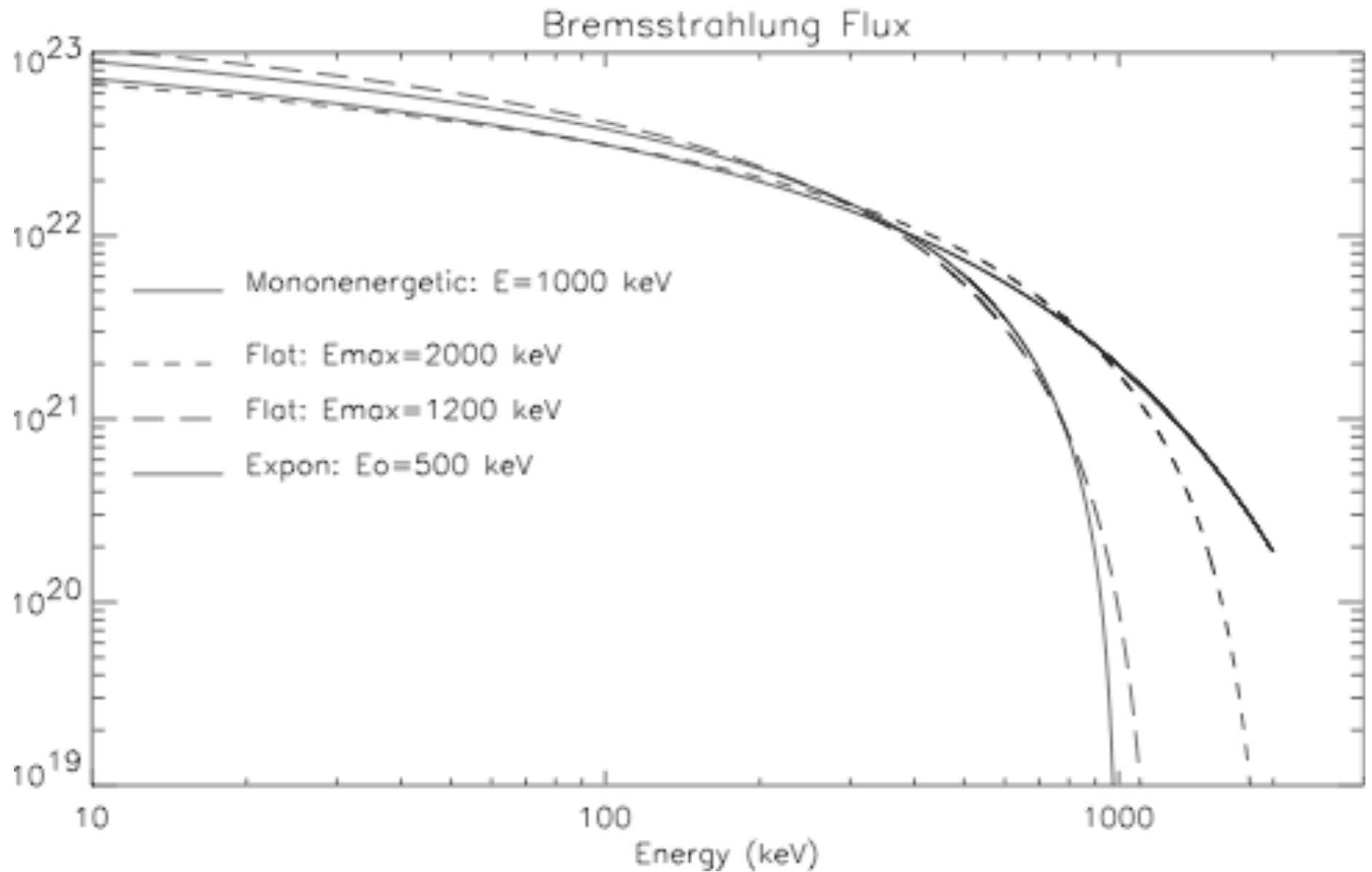
What do we need from RBSP?

- In order to identify and/or predict conjunctions
 - Requires mapping s/c to ionosphere or mapping balloons to equator
 - Spacecraft ephemeris data
 - Best magnetic field model to use (RBSP mag data?)
 - Would like to do this as quickly as possible
- To validate and improve instrument response
 - Loss cone electron fluxes for specific events
 - These can be forward folded into model to predict X-ray spectrum and compare with observed.
- To address science questions

Ionization Losses



Bremsstrahlung Production



Spectral Modeling

