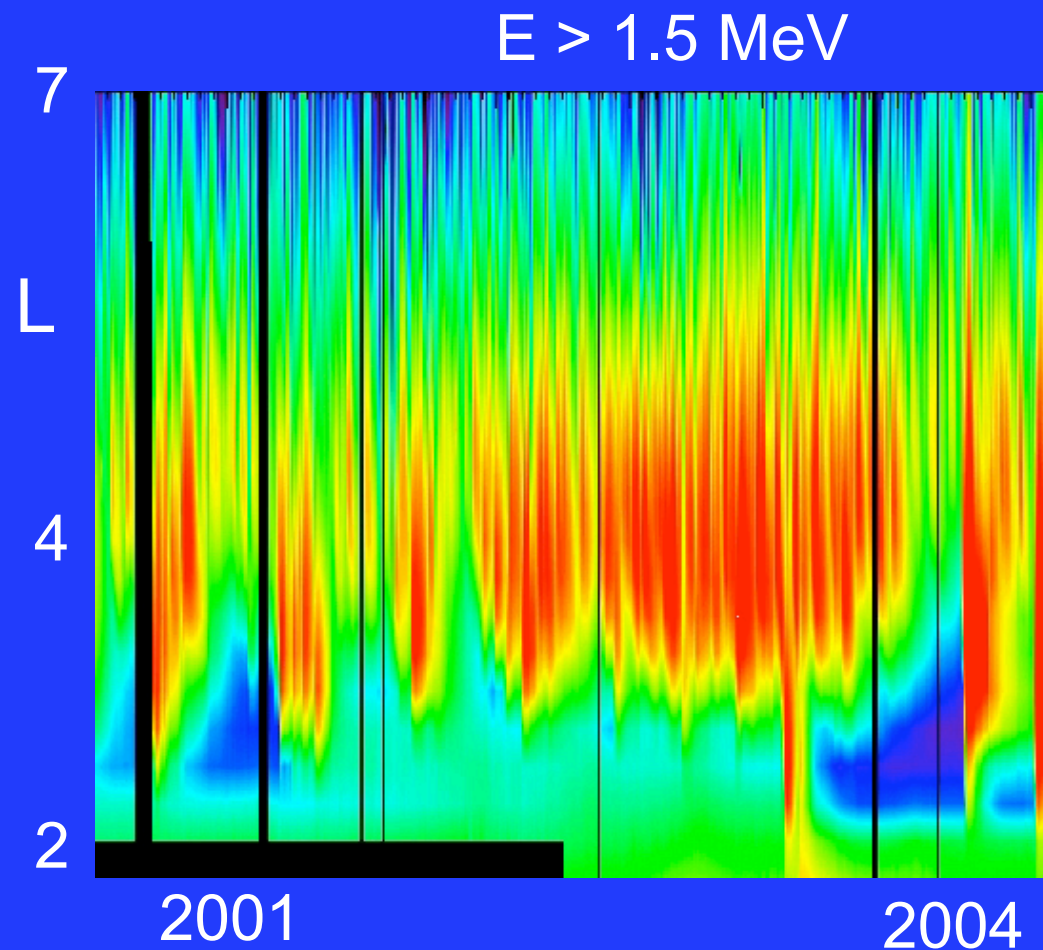


# A Look at Recent Events

J. B. Blake

Space Sciences Department  
The Aerospace Corporation

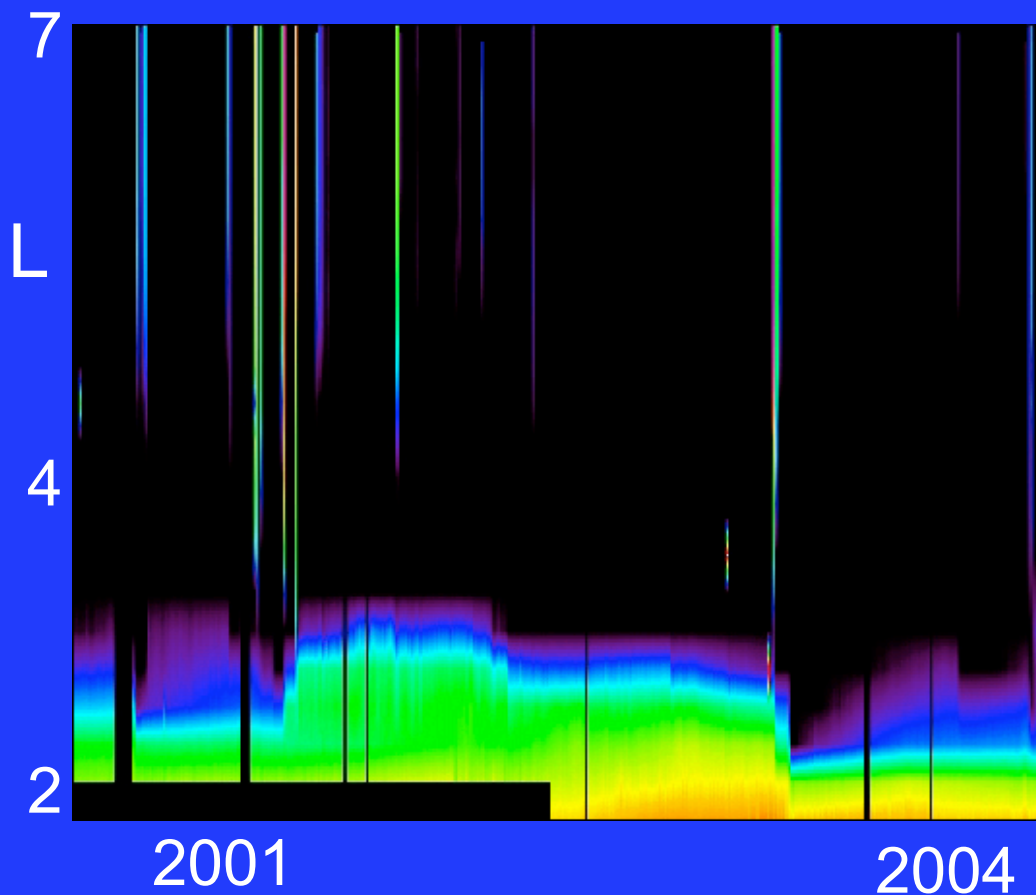
# Four Years of Energetic Electrons



- Oct-Nov 2003 was very unusual
  - Depth of injection
  - Few electrons outside slot
  - However not largest event in terms of intensity and spectral hardness

# Four Years of Energetic Protons

$E > 15 \text{ MeV}$



- In Nov 2001 there were two large shock injections of ions into slot
- Ion population changed only modestly over next two years
- Substantial removal in Nov 2003

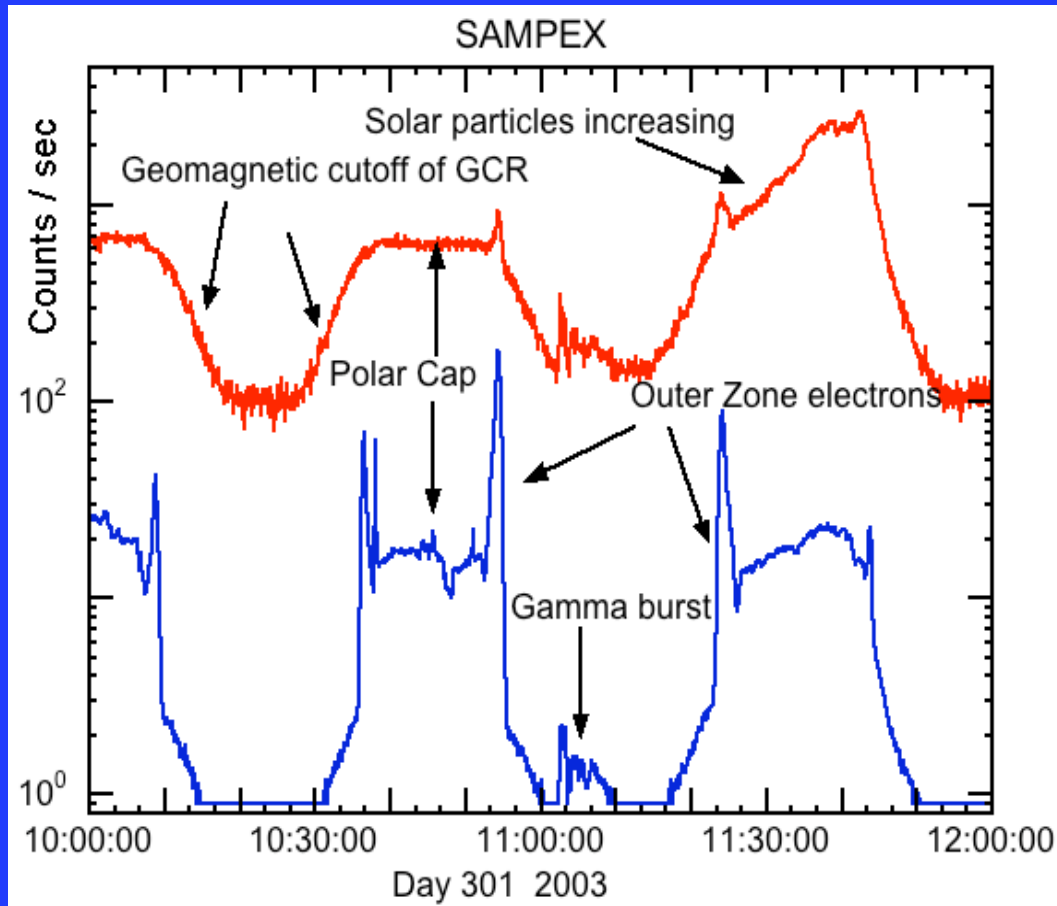
# Energetic Solar Particle Event of 28 October 2003

- Large fluxes of energetic particles
- A Ground Level Event including solar neutrons
- Intense photon fluxes including MeV gammas

# Relativistic Solar Neutrons and Protons on 28 October 2003

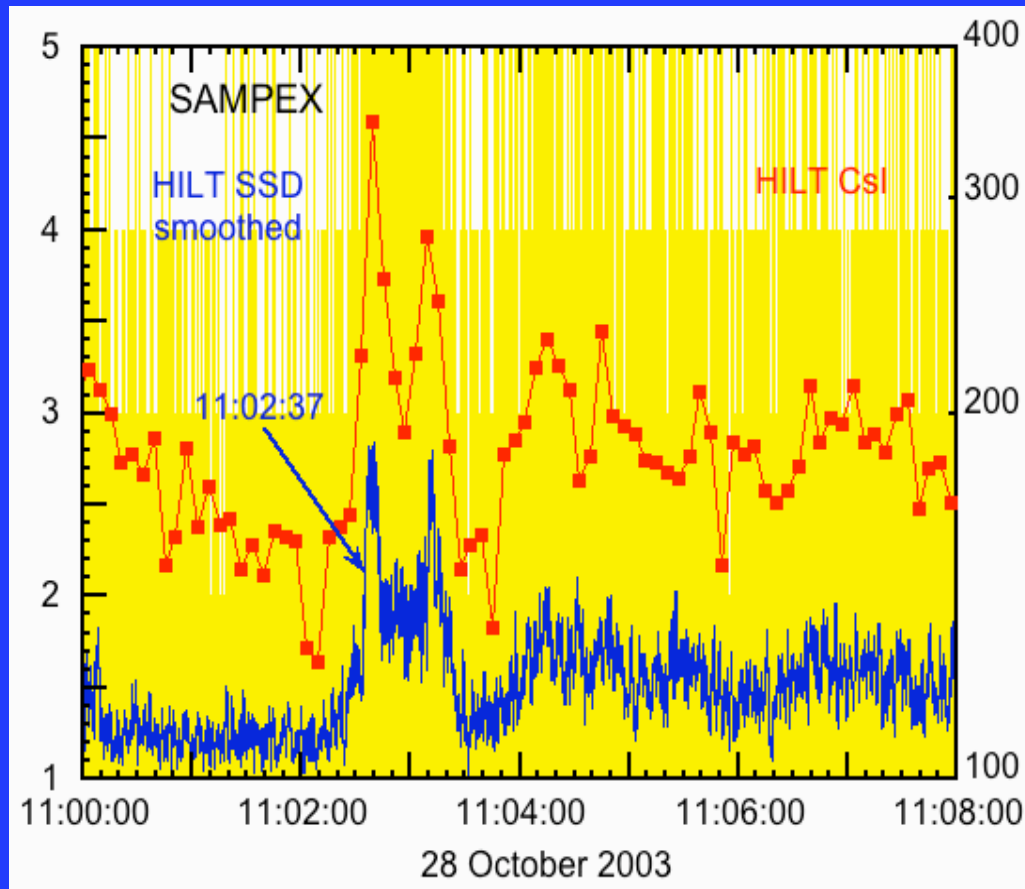
- Solar particle event associated with the X17.2 class flare on 28 October
  - Some high-latitude neutron monitors observed a highly anisotropic “spike” at event onset
  - Earliest onset observed by neutron monitor stations viewing anti-sunward
  - GLE unusually long and slow rise
  - Near-equatorial neutron monitor in Namibia observed increase consistent with a solar neutron event - nine minutes long
  - Nuclear processes responsible for energetic neutrons also generate high-energy gamma rays - no data available to authors of Letter cited below
  - **Bieber et al. GRL 32, L03S02, 2005**

# SAMPEX Observations



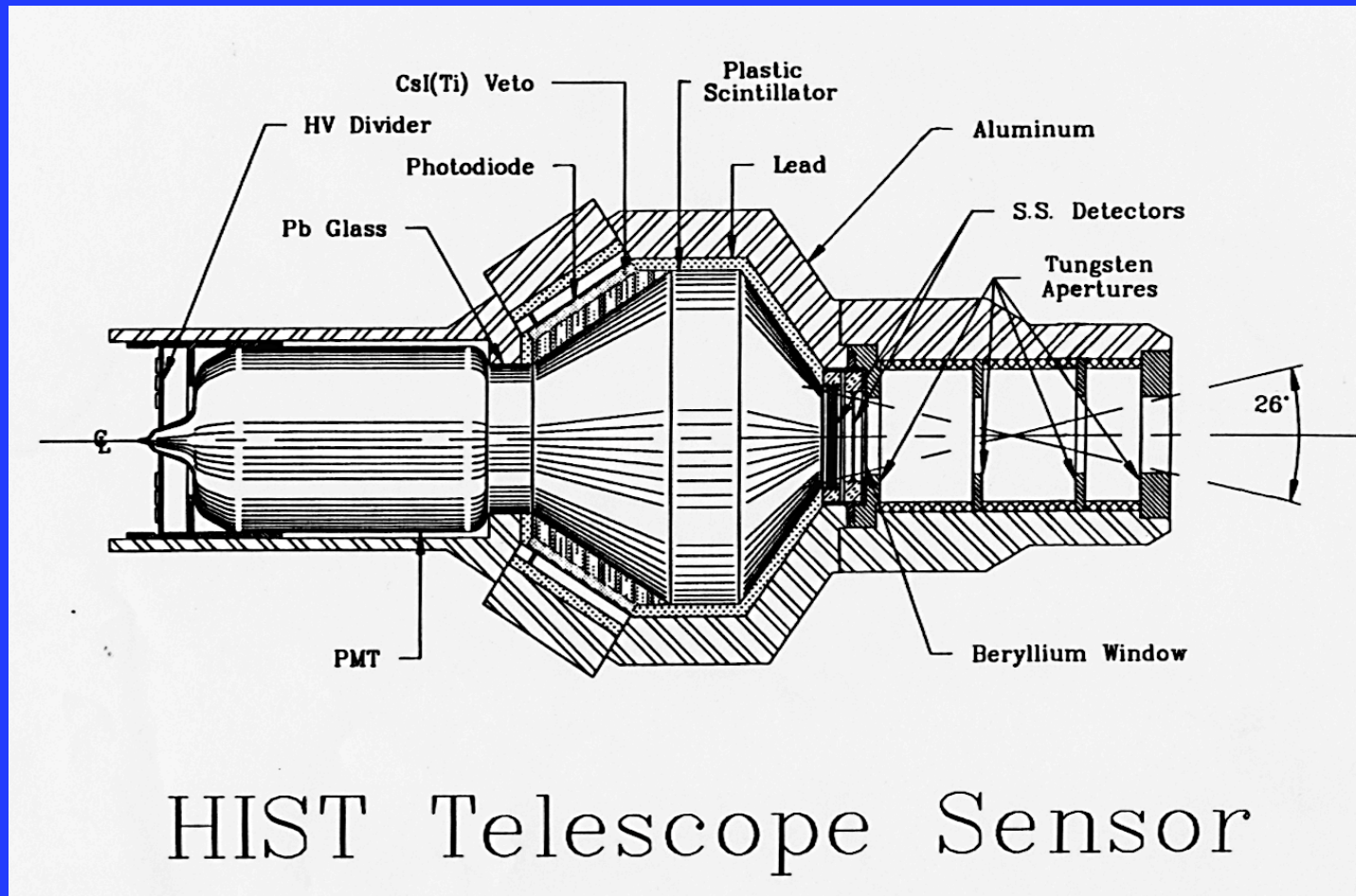
- Blue - Si detectors
  - 16 detectors, each 10 cm<sup>2</sup>, 2 mm thick
  - Threshold 1 MeV
- Red - CsI detectors
  - Scintillator behind each Si detector
  - Threshold ~ 3 MeV

# High Rate SAMPEX Data



- Si detectors
  - Sampled 50 times/sec
    - Yellow, each sample
    - Blue, 1 sec smooth
  - Threshold 1 MeV
- Csl detectors
  - Sampled every six seconds

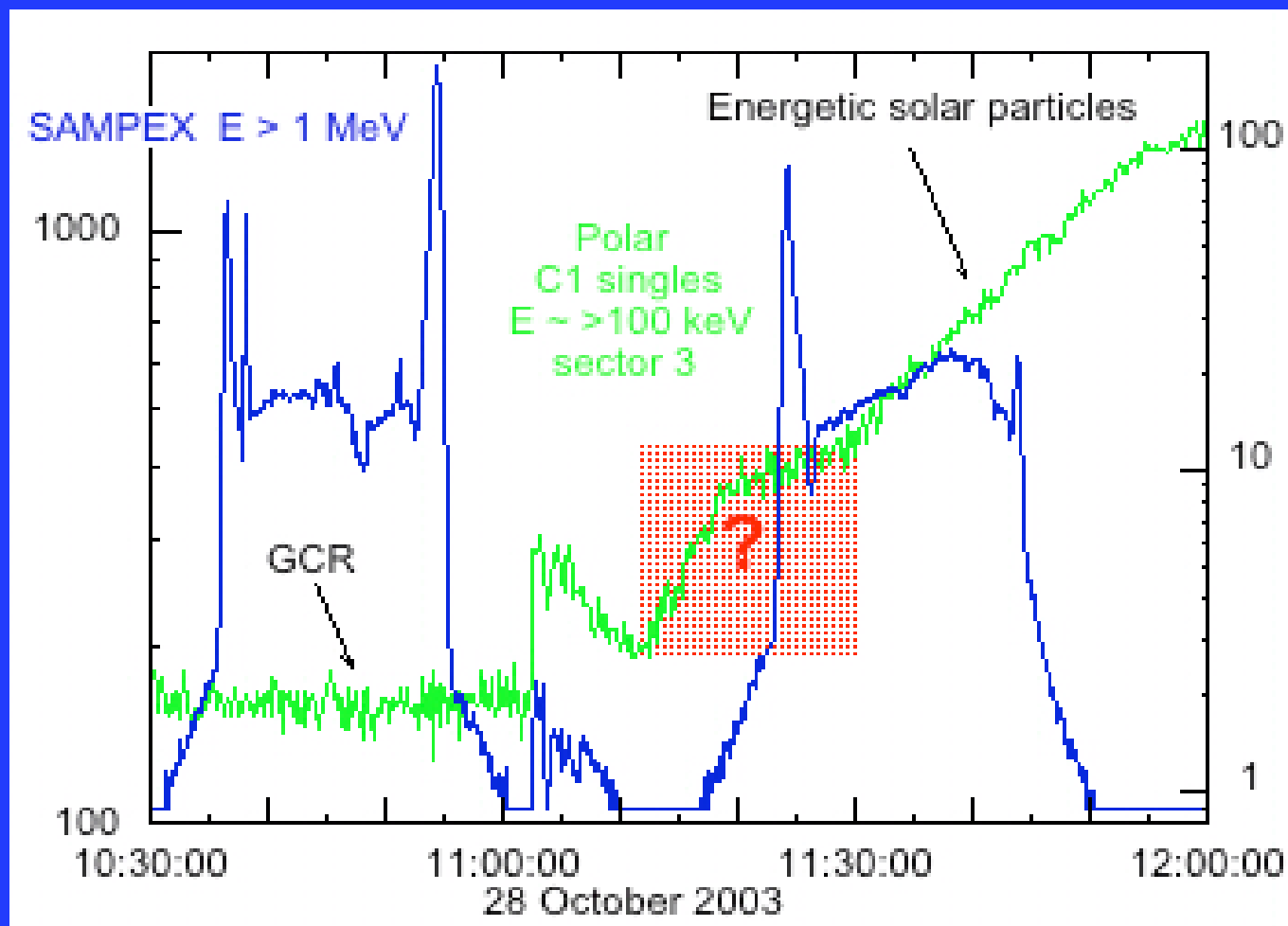
# Polar CEPPAD



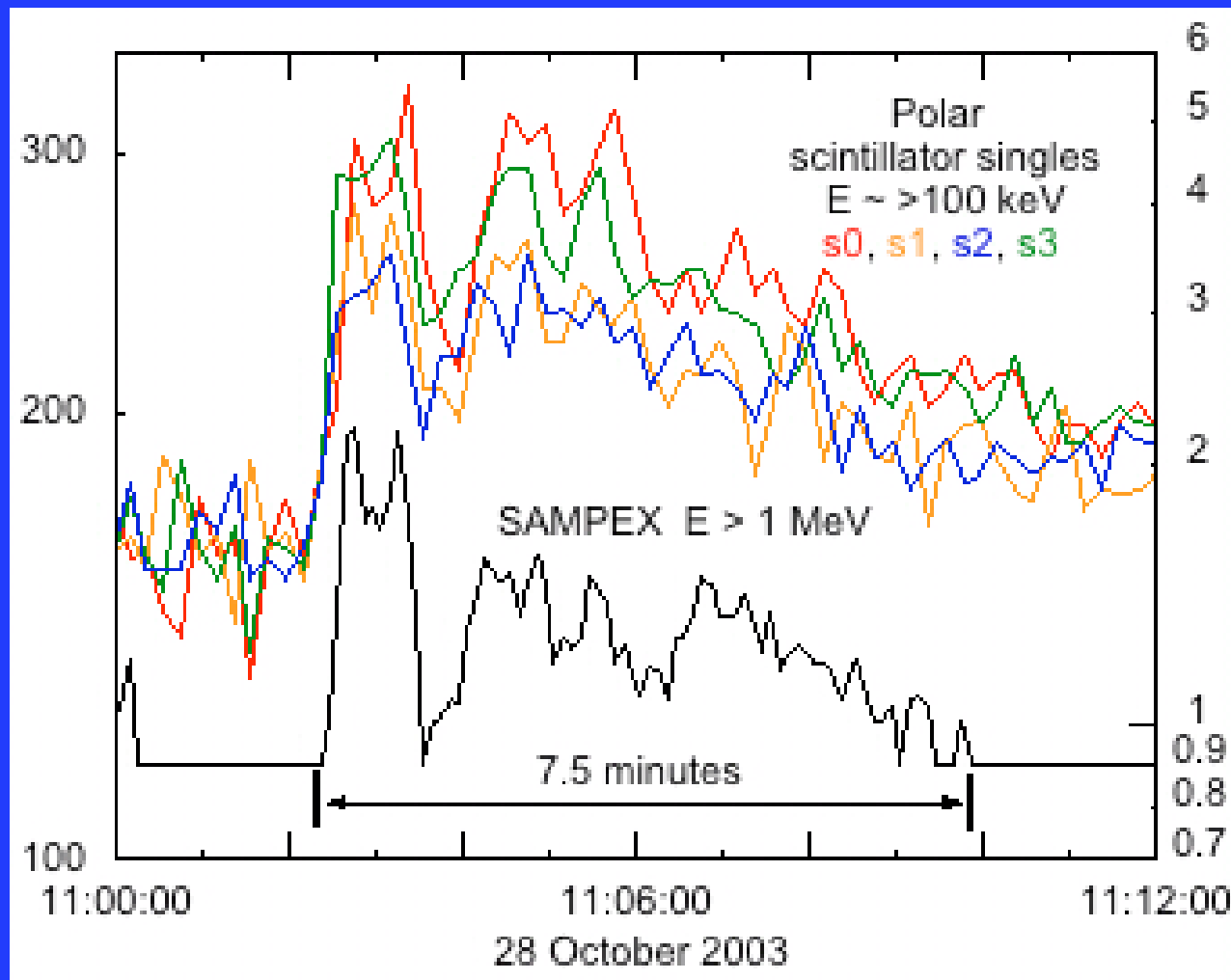
## HIST Telescope Sensor



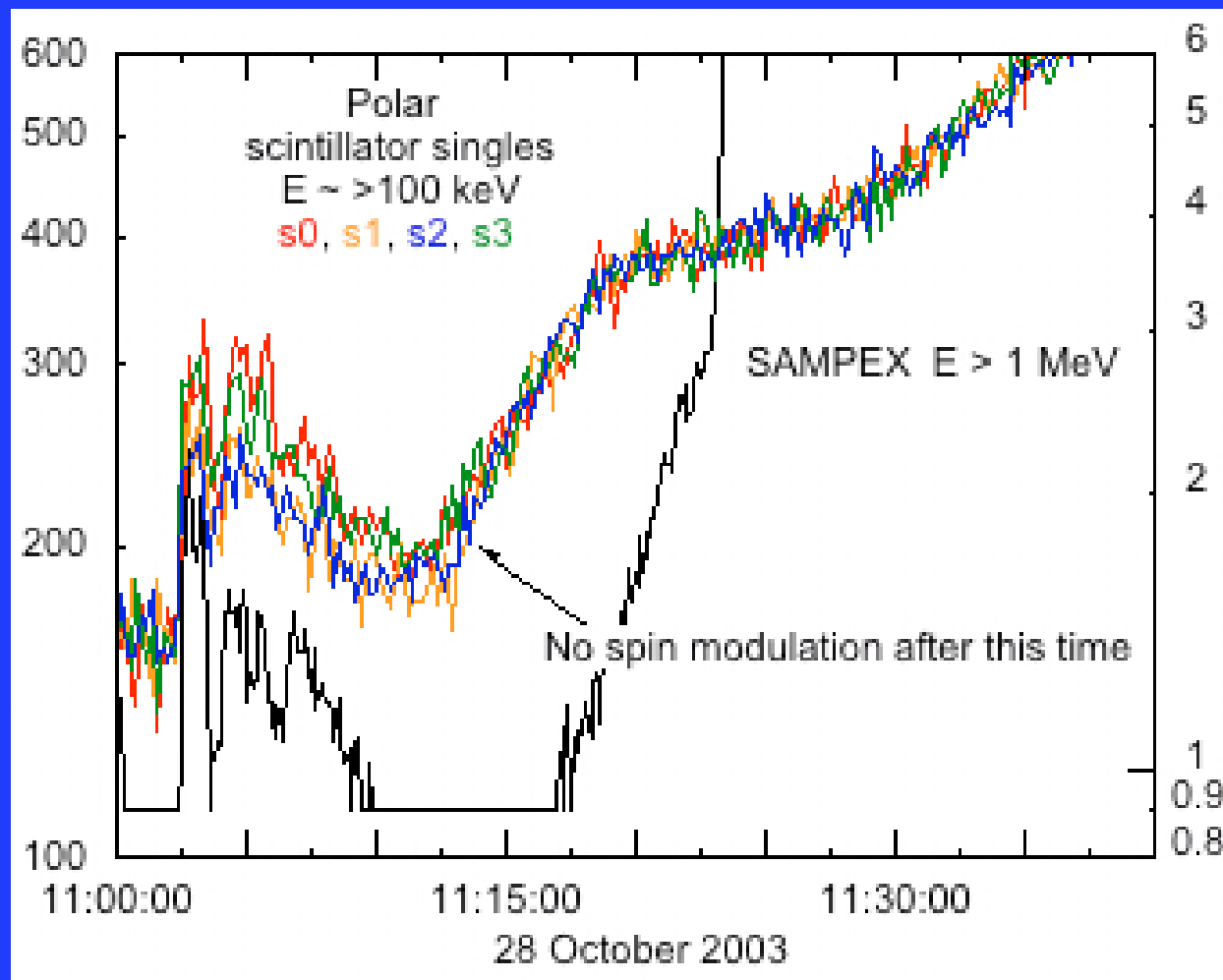
# Polar SAMPEX Comparison



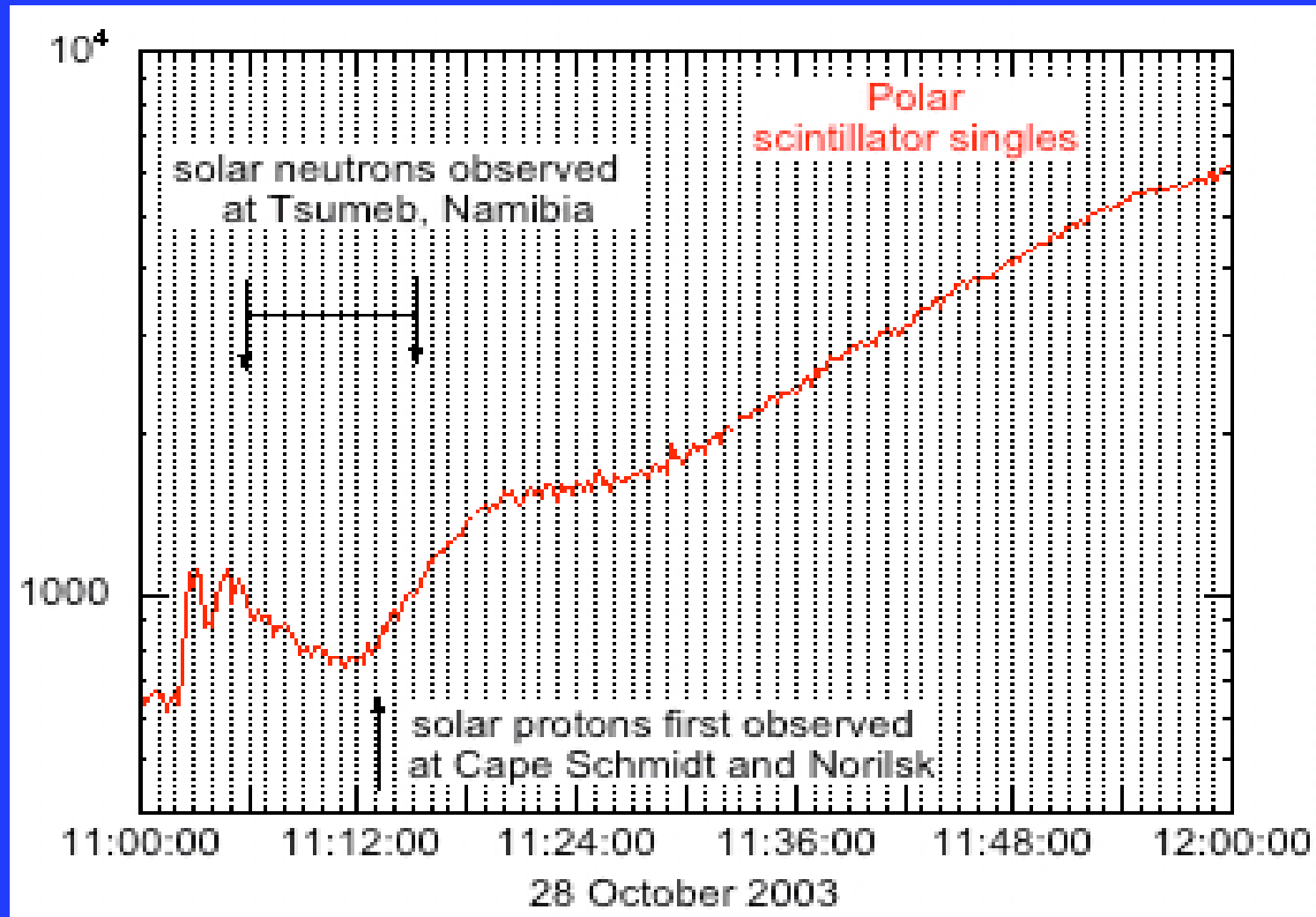
# Polar SAMPEX Comparison



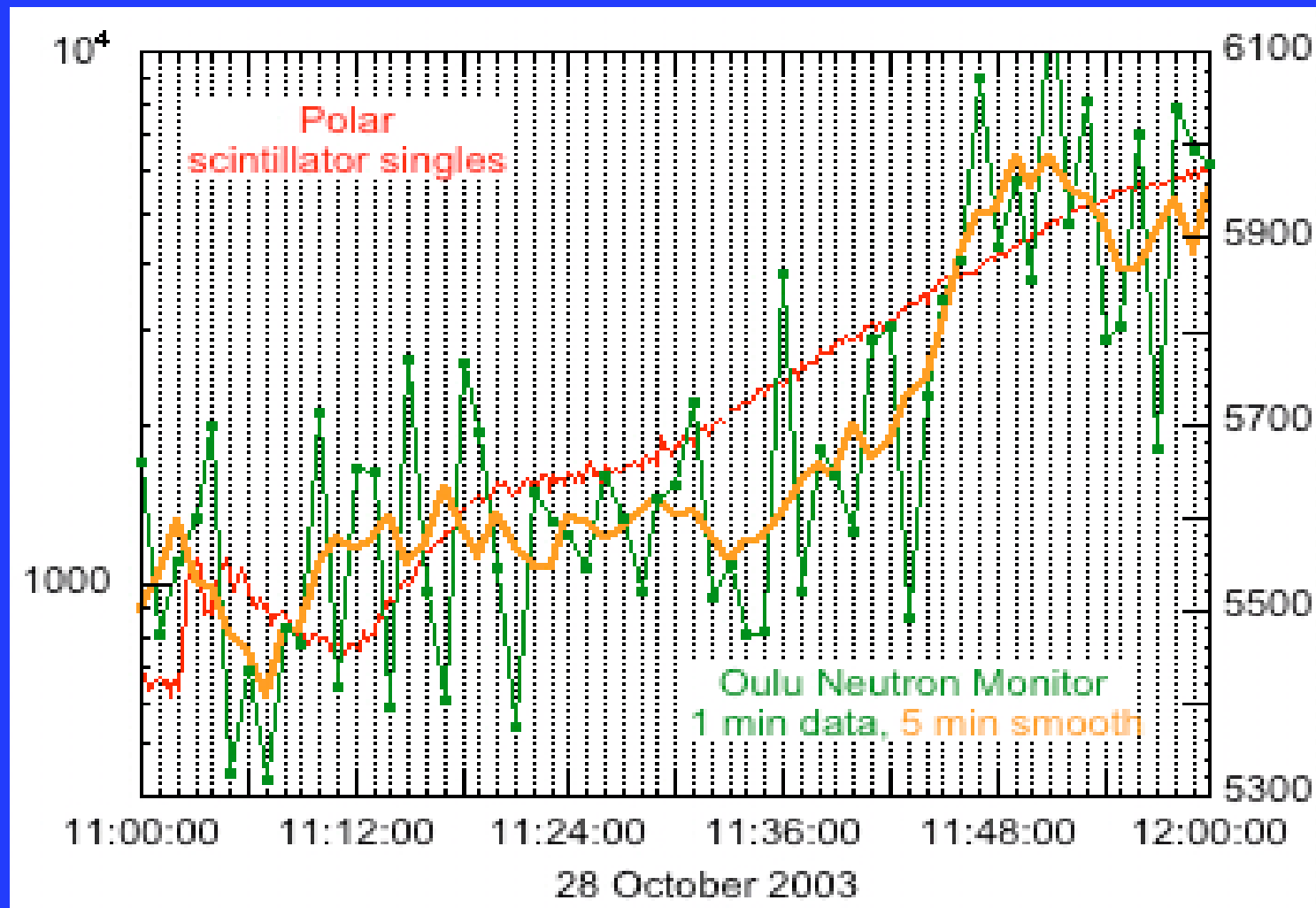
# Polar SAMPEX Comparison



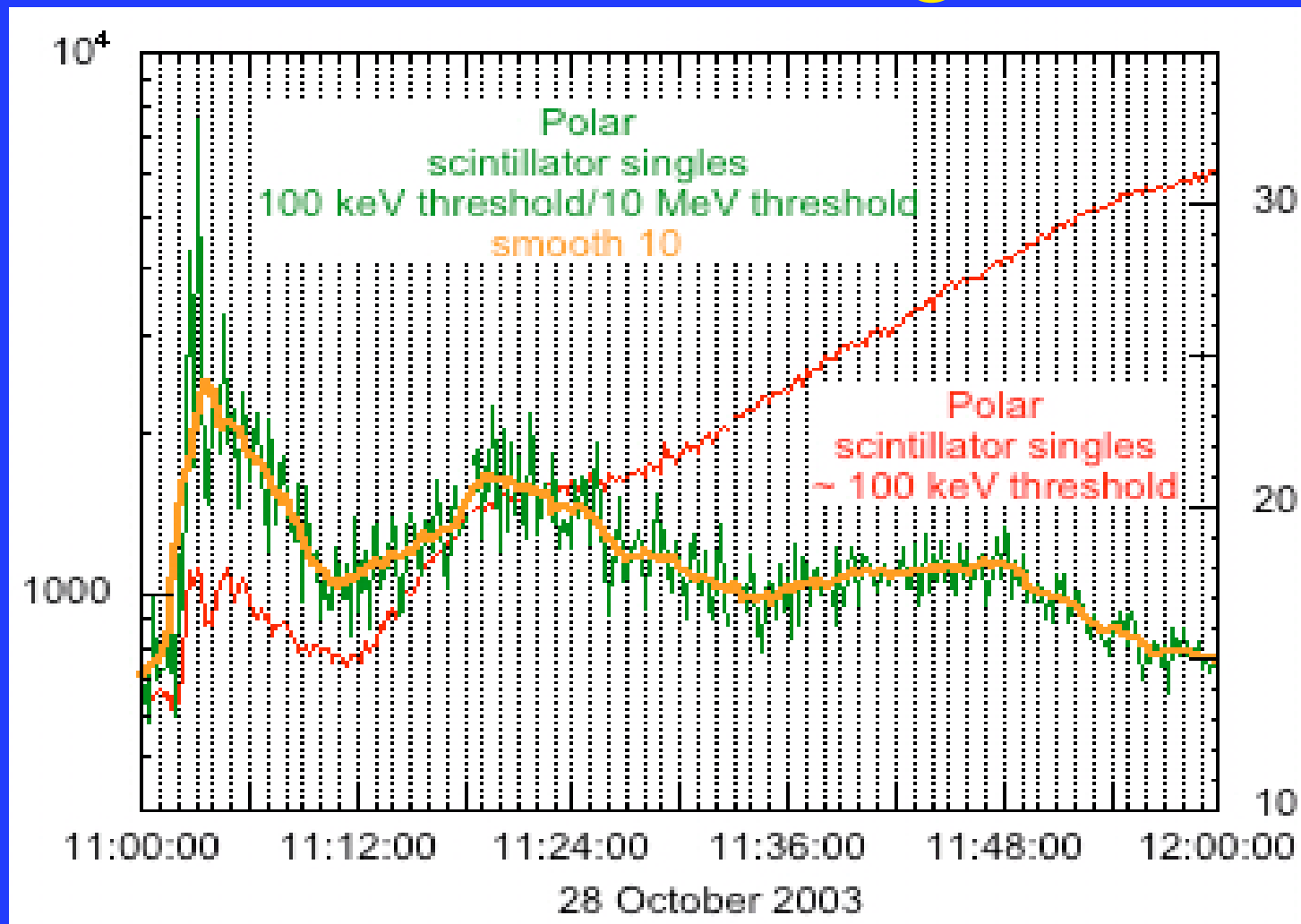
# Polar - Neutron Monitors



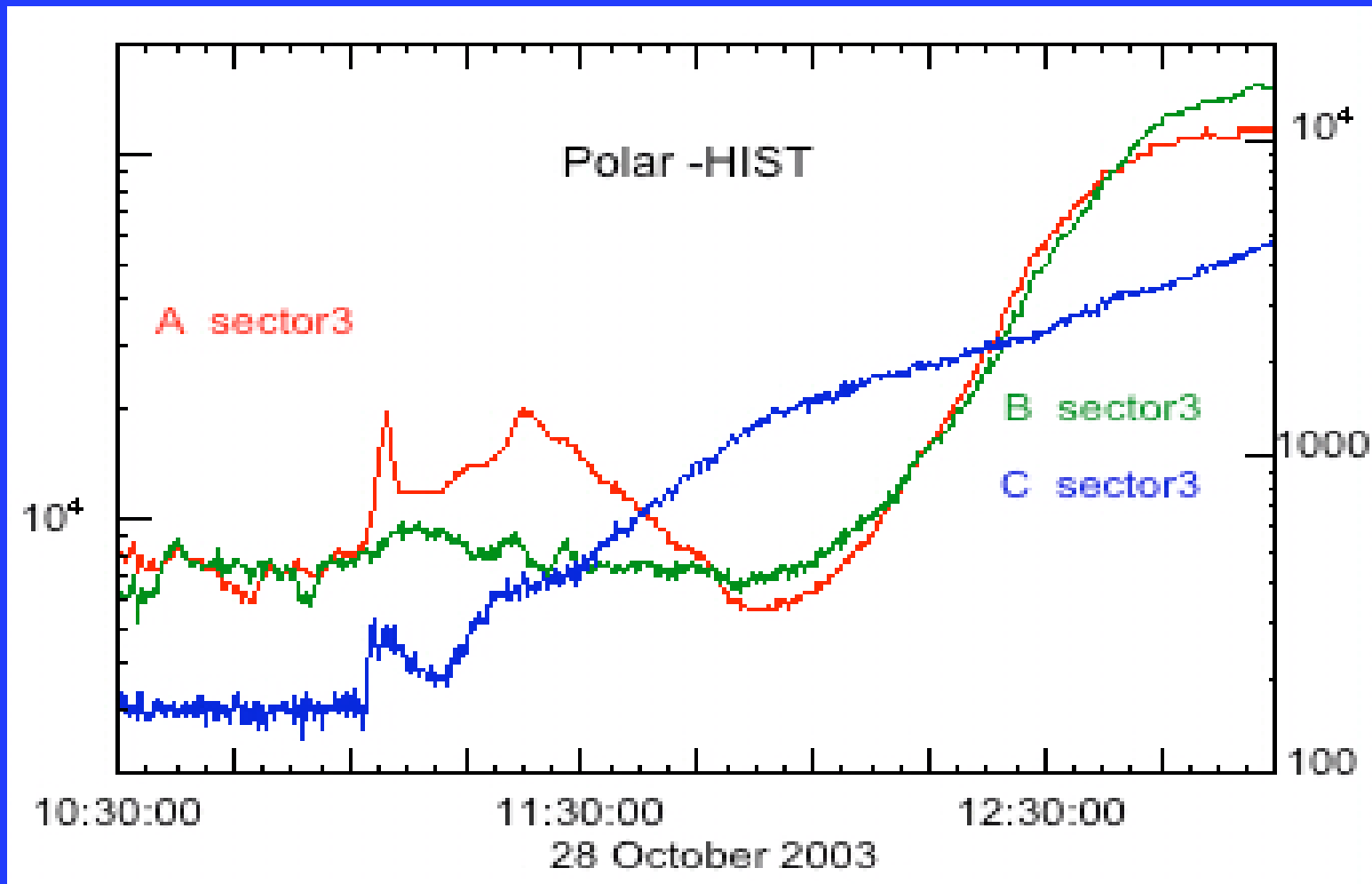
# Polar - Oulu Neutron Monitor



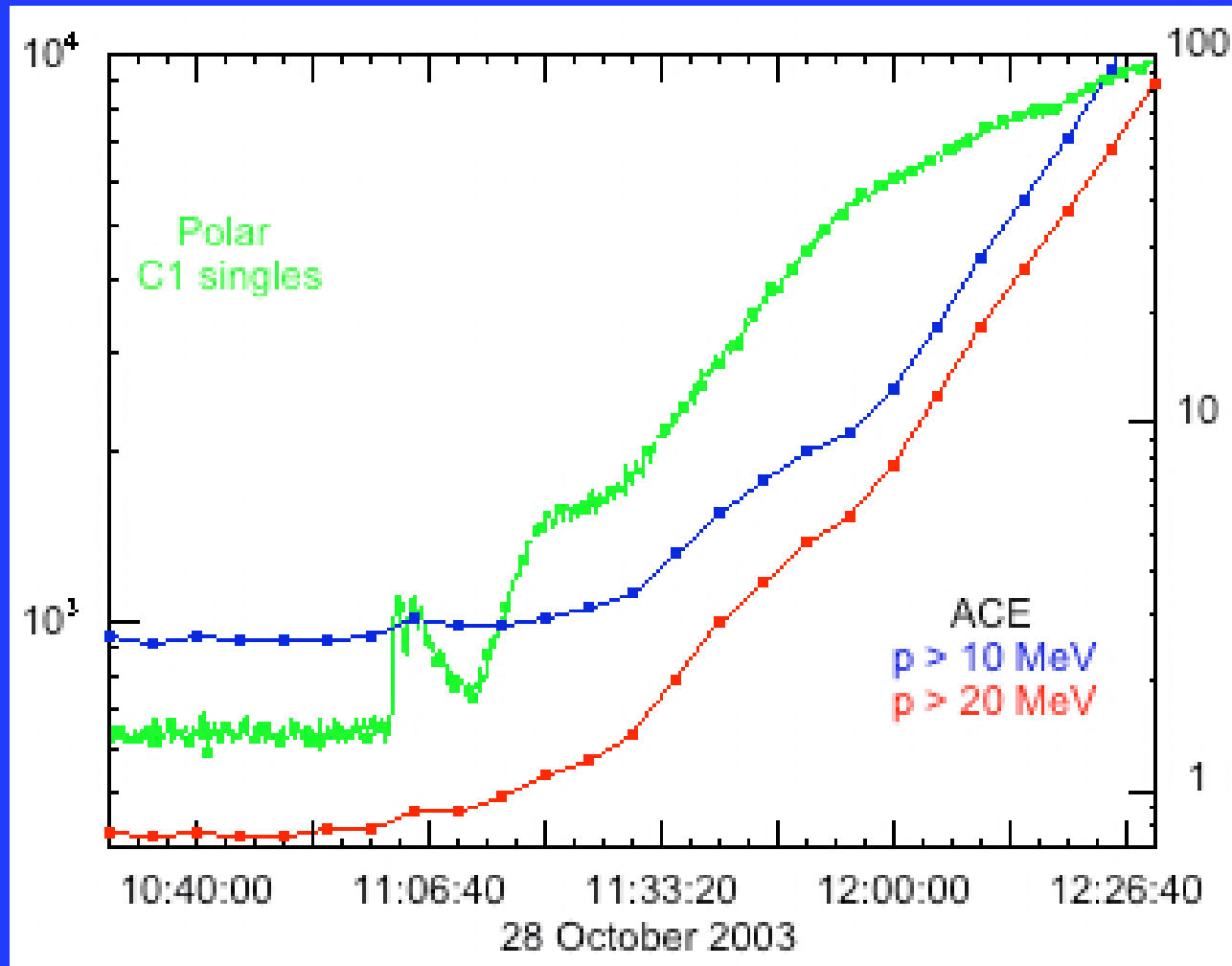
# Polar HIST Singles



# Polar HIST Singles



# Polar ACE Comparison





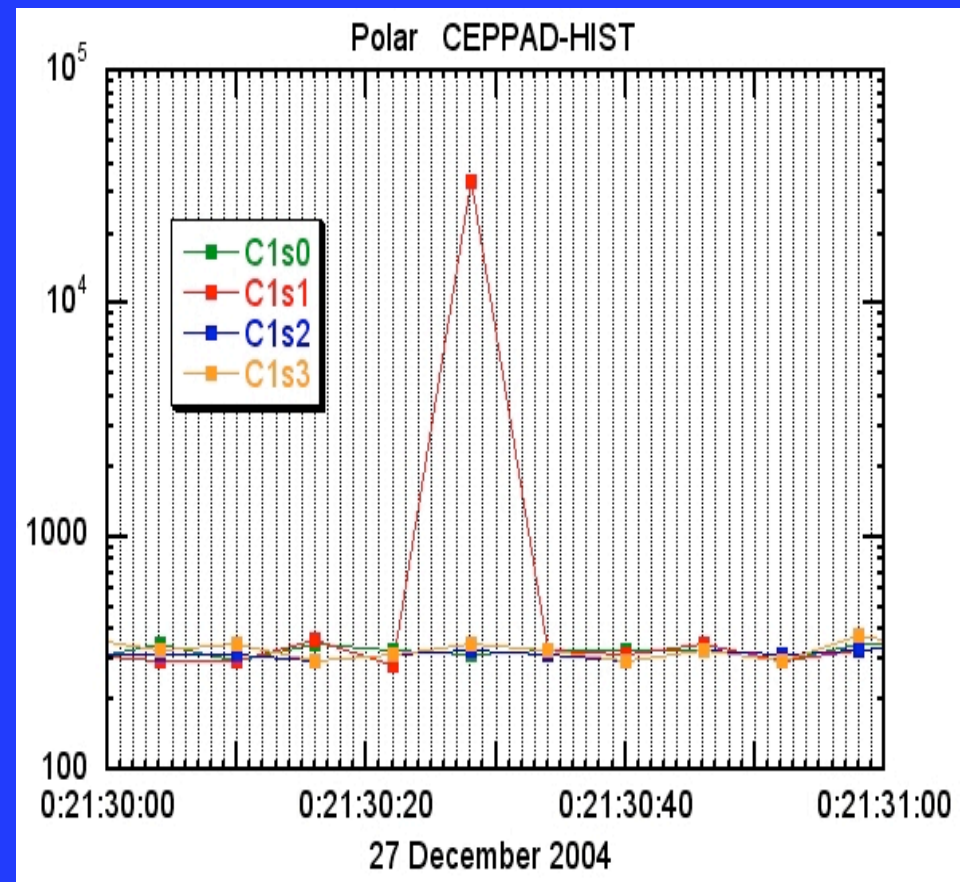
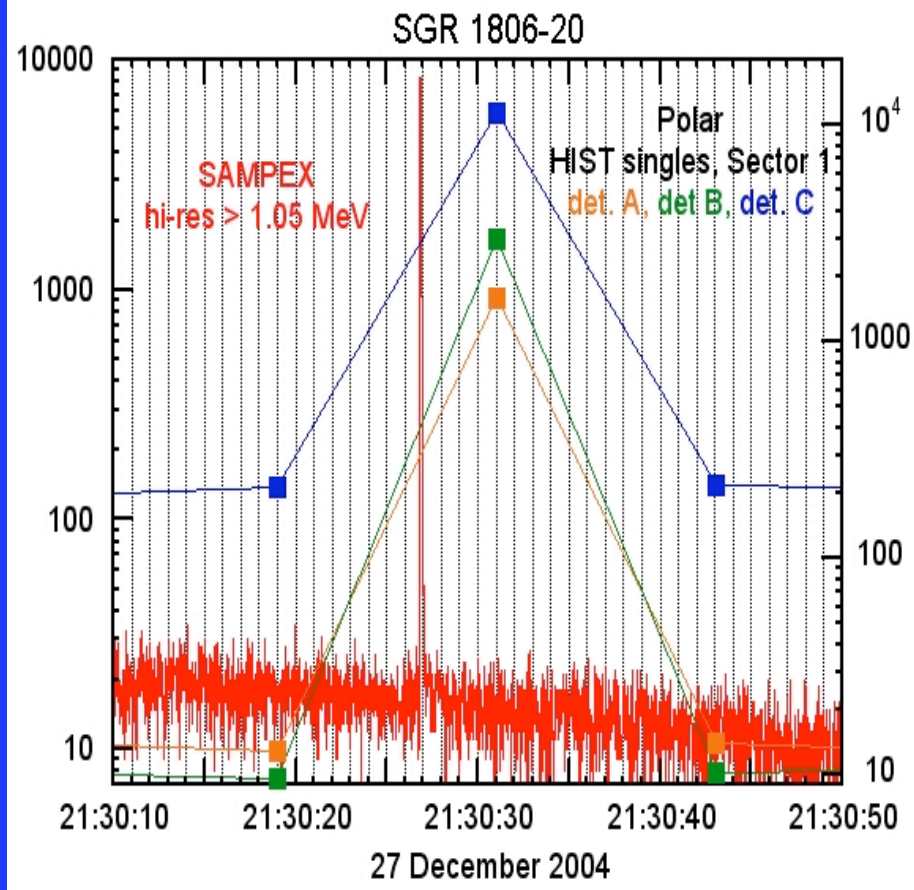
# Interpretation of Complex Onset?

- Multiple source populations
  - Different intensities, energy spectra and upper energy cutoffs
  - Length of path taken to Earth significantly different
  - But why no anisotropy seen in Polar measurements?
  - Any neutron signal in Polar measurements?

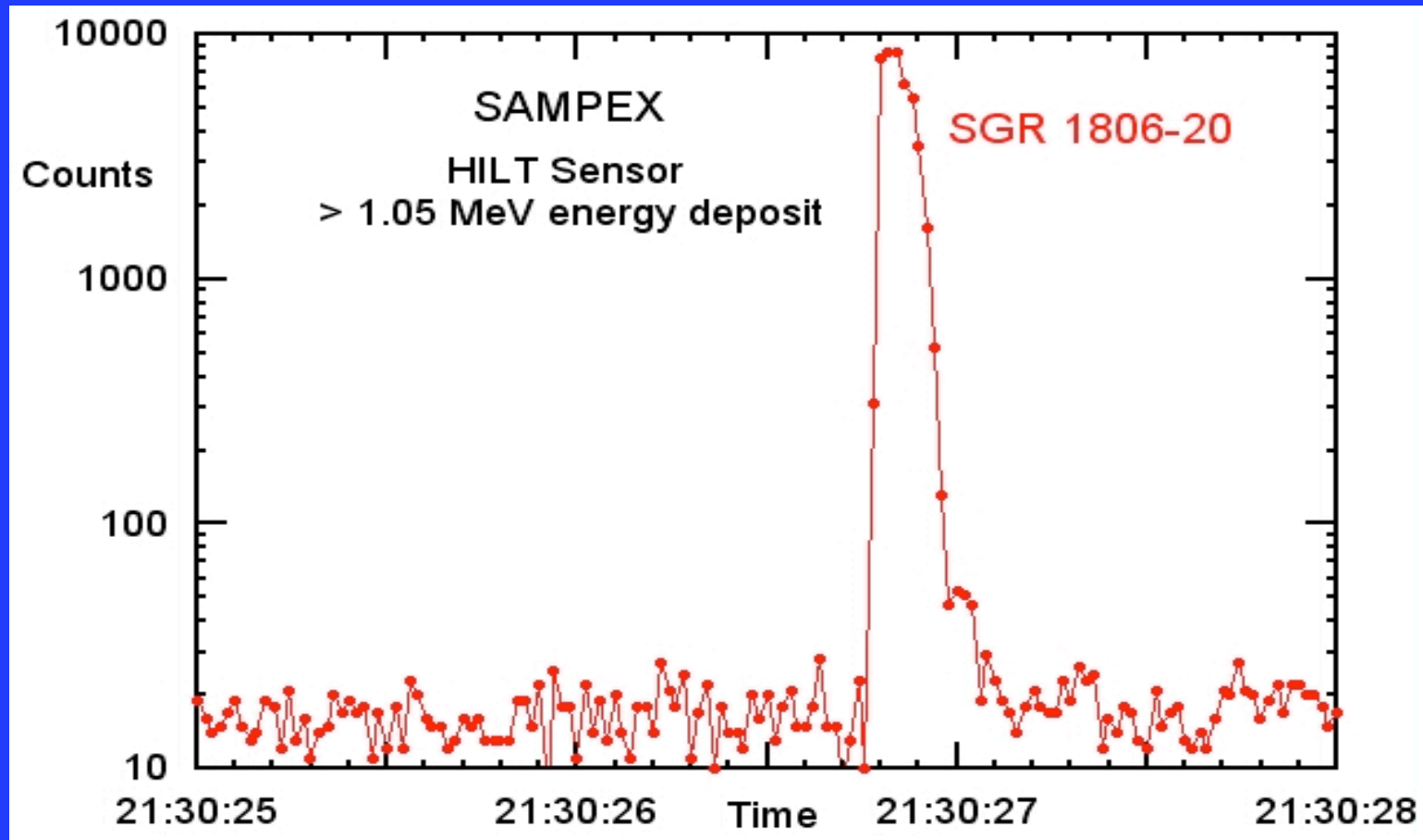
# SGR1806-20 Observations

- An intense x-ray signal was observed from the Soft Gamma Repeater SGR1806-20 on 27 December 2004
  - Signal saturated most (all) gamma-ray sensors
  - SAMPEX and Polar (and many other s/c) responded to event

# Polar Observations of SGR



# SAMPEX - High Time Resolution



- Talk gives examples of how continued, long-term observations have enabled observations of rare events
- SAMPEX, since official mission termination on 30 June 2004, has observed:
  - Two of the largest relativistic electron injections ever seen - July and November 2004
  - SGR event on 27 December 2004
  - Largest GLE in 50 years on 20 January 2005