GLAST Solar Capabilities

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Solar activity expected to rise ~2008 and peak as early as 2011

GLAST is the only satellite capable of making solar observations >30 MeV

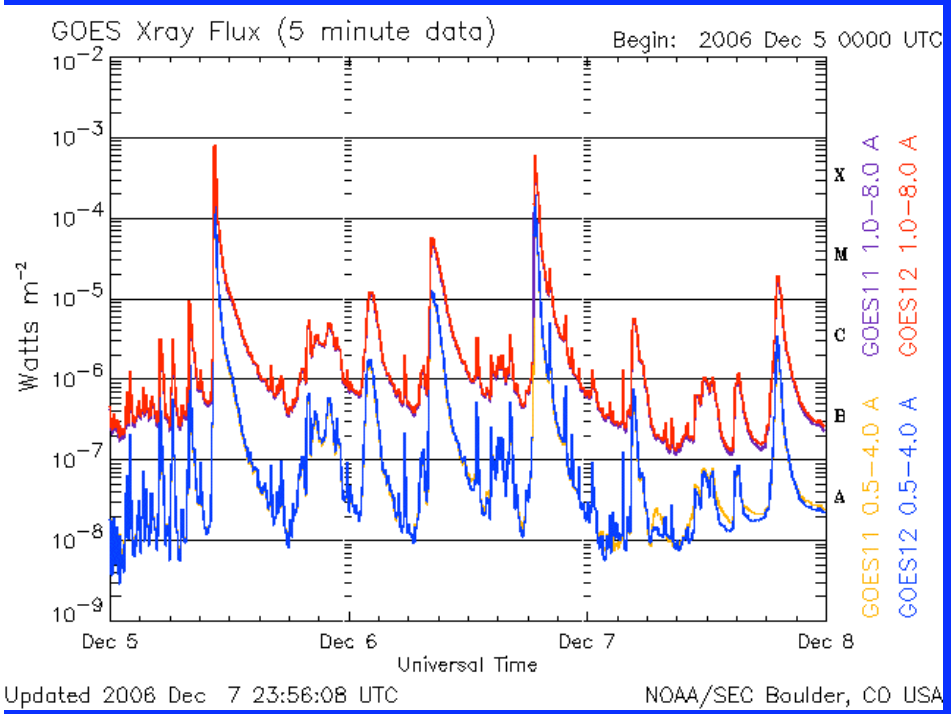
Coordinated gamma-ray measurements with GBM (10 keV-25 MeV) and RHESSI (1 keV – 20 MeV; anneal in the next half year); comparison with solar energetic particle measurements on ACE, STEREO, SOHO, WIND and ground based neutron monitors, muon telescopes, Milagro

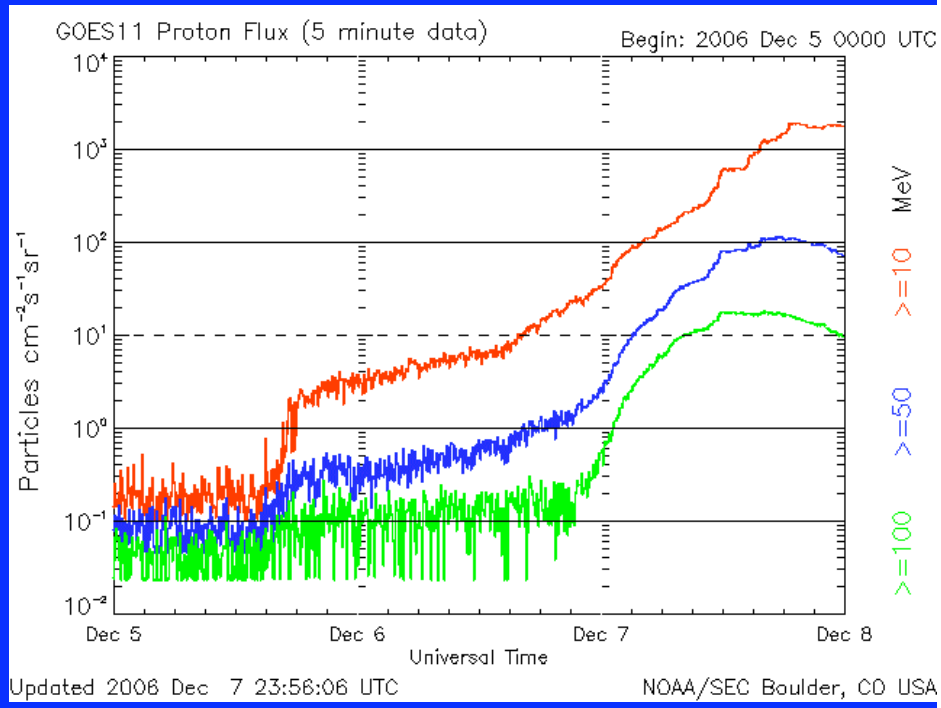
Ten's of high-energy flares will be observed.

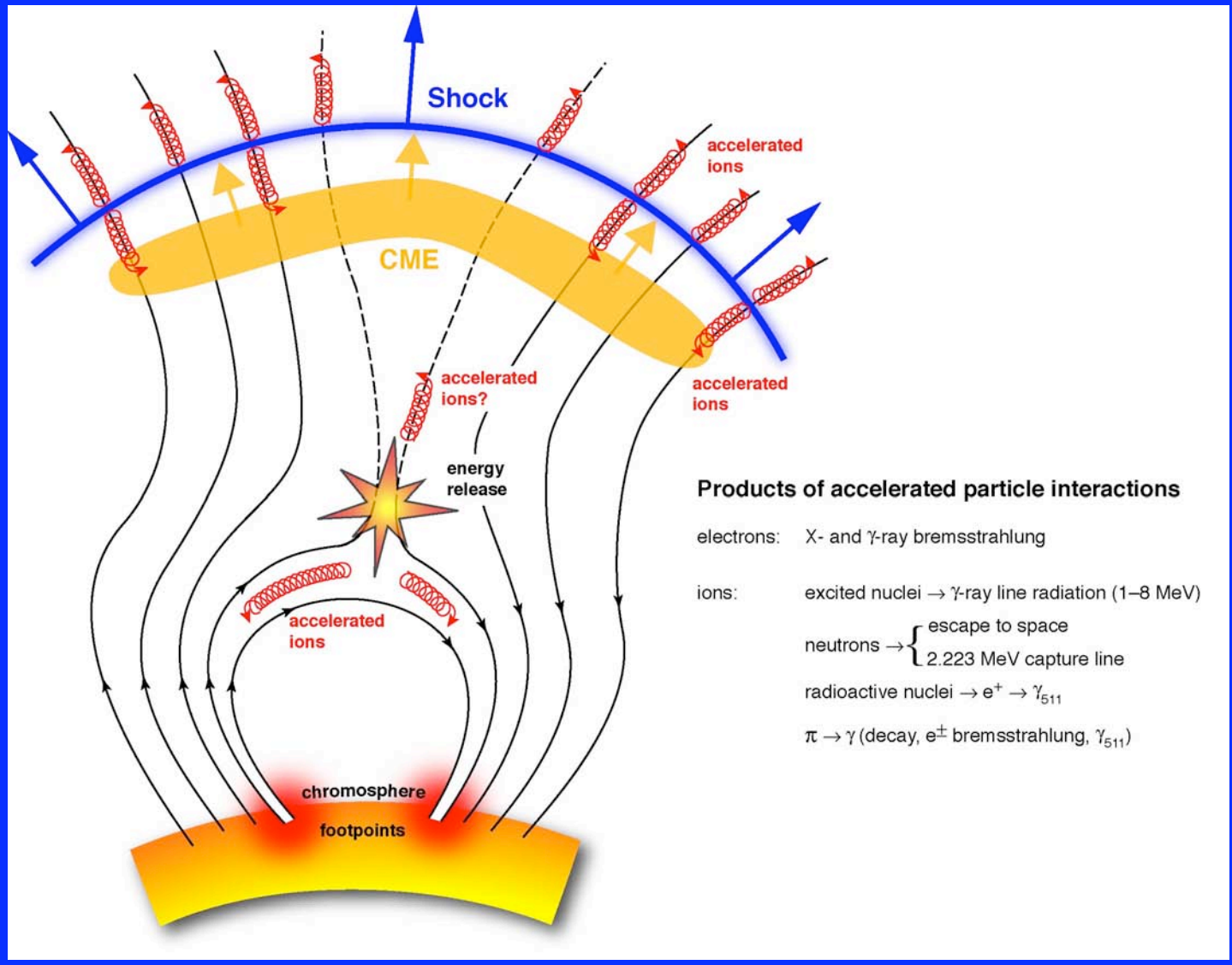
~25% solar coverage (~60% with ToO)

Links to NASA Living with a Star and Sentinels programs

Surprises though!
Active Regions in January 2005 and December 2006 produced
Intense X-Class Flares

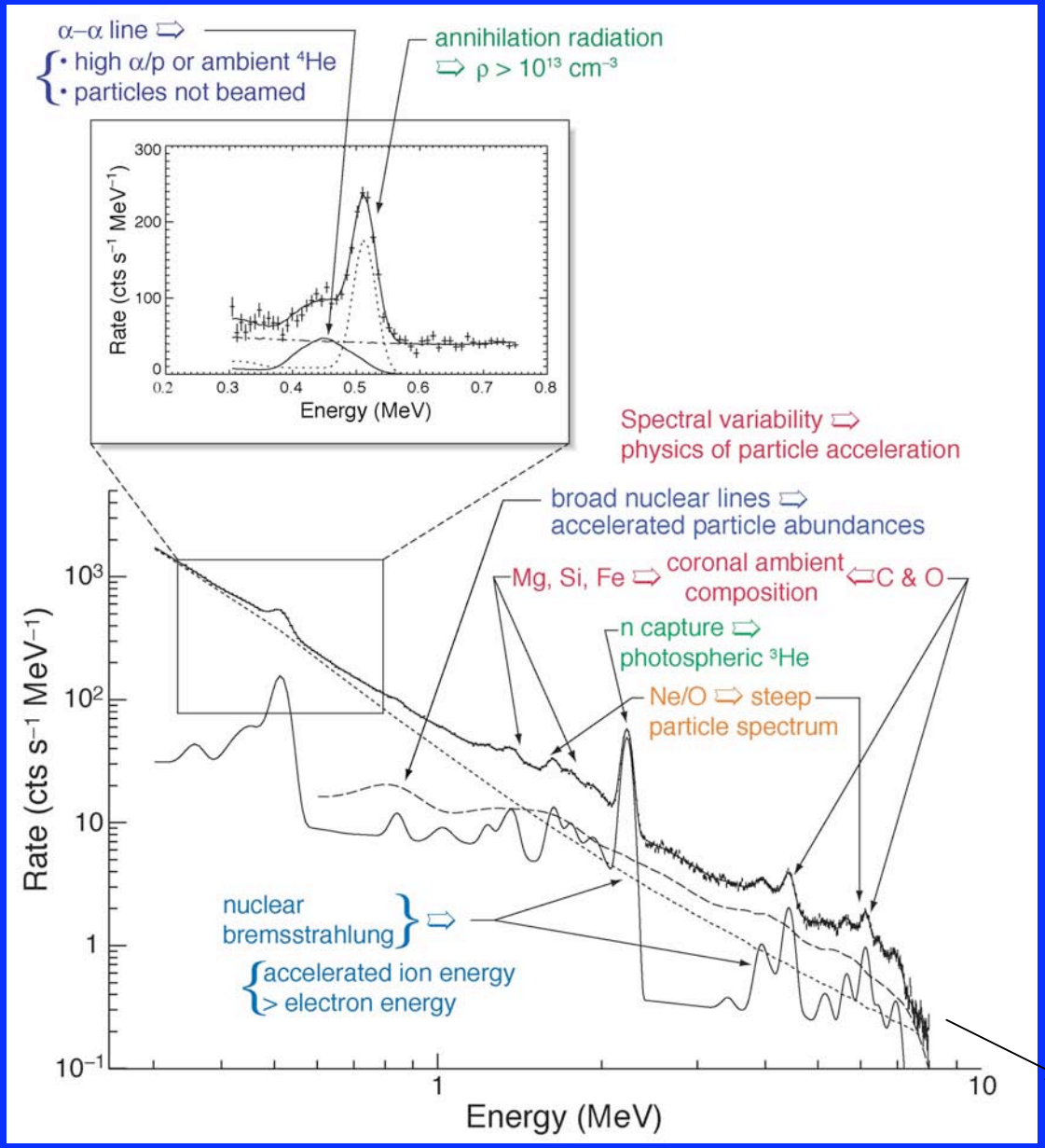






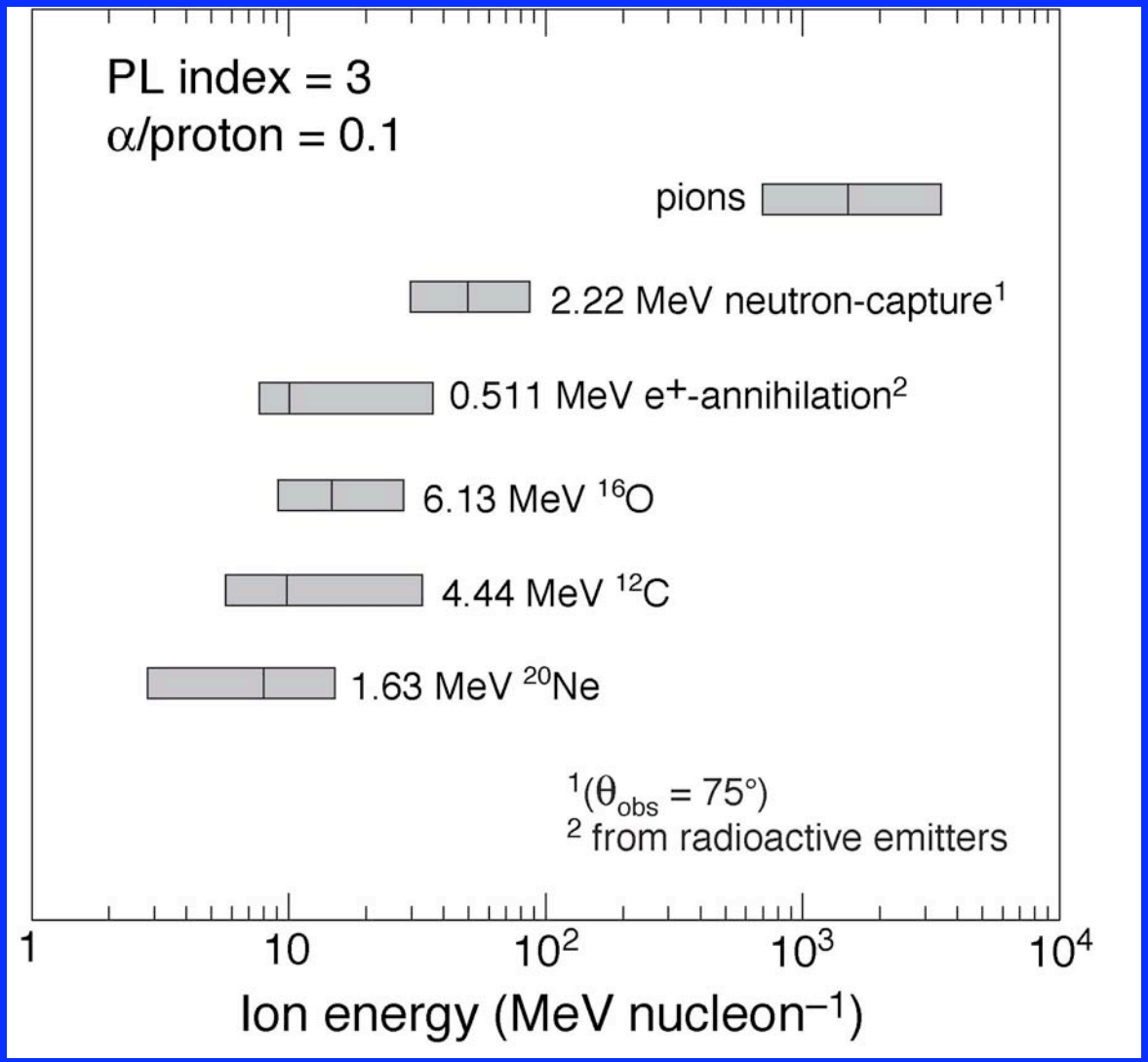
Study how particles are accelerated at the Sun and their relationship to Solar Energetic Particles (SEP) and Ground Level Events (GLE).

Solar Gamma-Ray Spectrum

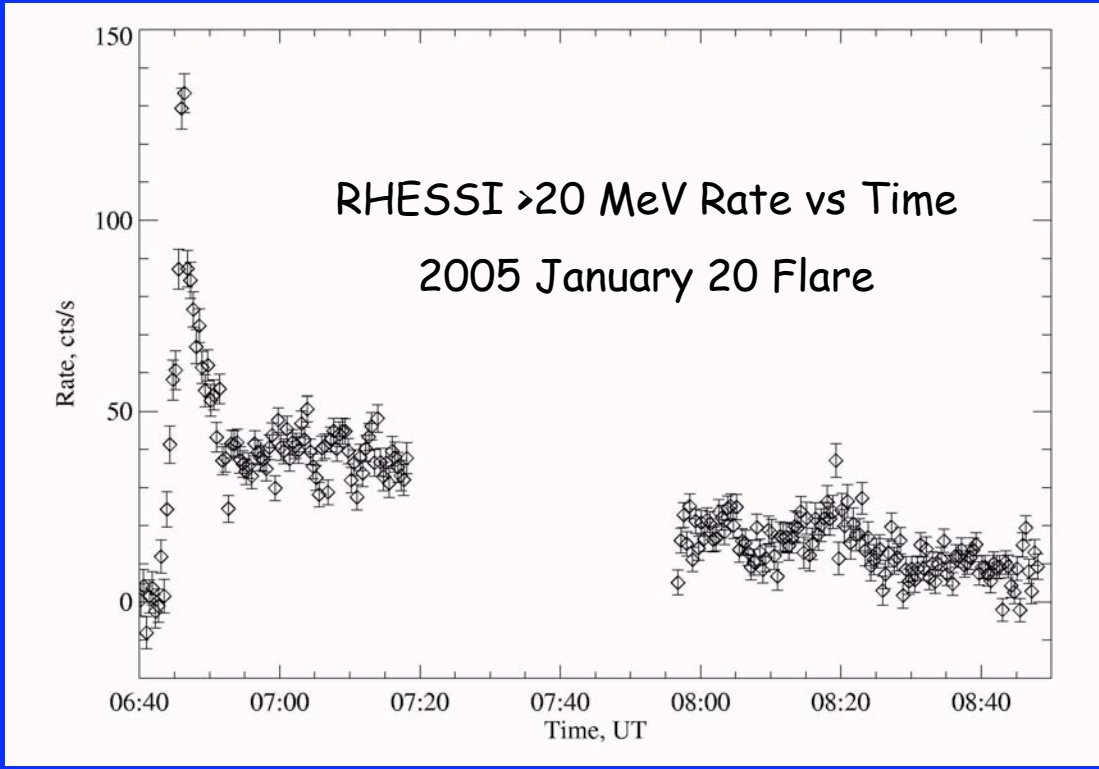


Pion Contribution

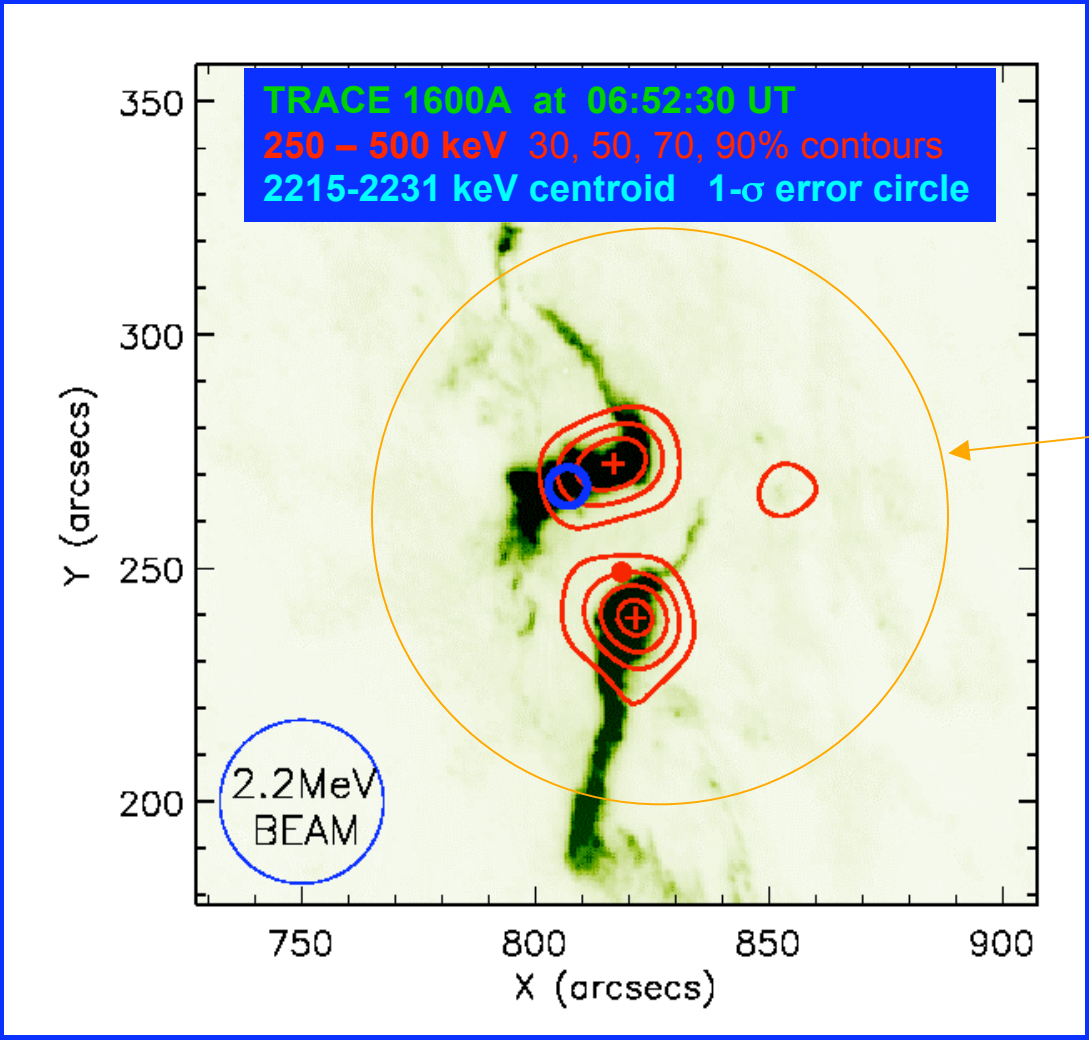
Measure the spectrum of flare-accelerated ions and electrons to energies > 1 GeV/nuc



Study continued particle acceleration and magnetic trapping of high-energy ions from minutes to hours after flares



20 January 2005 06:44-06:56



GLAST Location

Localize the source of >1 GeV photons to ~30 arc sec

Additional Capabilities

Understanding the newly discovered submm radio component in flares.

Potential to study >50 MeV solar neutrons.

Potential to study partially-ionized heavy SEPs.

Non-Flaring Objectives

Observe pion-decay photons from cosmic-ray interactions in the photosphere to study solar modulation near the Sun.

Observe Compton-scattered gamma rays from interactions of cosmic-ray electrons and sunlight to study solar modulation in the inner heliosphere (Moskalenko et al. 2006).

Studies of lunar and terrestrial albedo gamma rays

Using GLAST to Study Solar Flares

Hiro Tajima studied saturation effects in the upper Si layers due to intense 20-150 keV X-rays. For a flare with peak hard X-ray intensity ~10% of the largest expected

Expect ~1.2 × 10^6 photons s^{-1}; 0.1 mm of W reduces flux to ~2.2 × 10^5 photons s^{-1}; taking into account energy deposition in Si (>30 keV) ➔ 5 × 10^3 counts s^{-1}

→ ~1% deadtime

At the peak of the most intense flare expect

→ ~10% deadtime

ACD tile + threshhold >0.3MeV → OK

Effect of +-35 deg offsets each orbit on GBM background evaluation for flares (we use +-15 orbit subtractions)?