Search for time-dependent fluctuations in cosmic rays spectra with the AMS01 detector

Flux fluctuations:

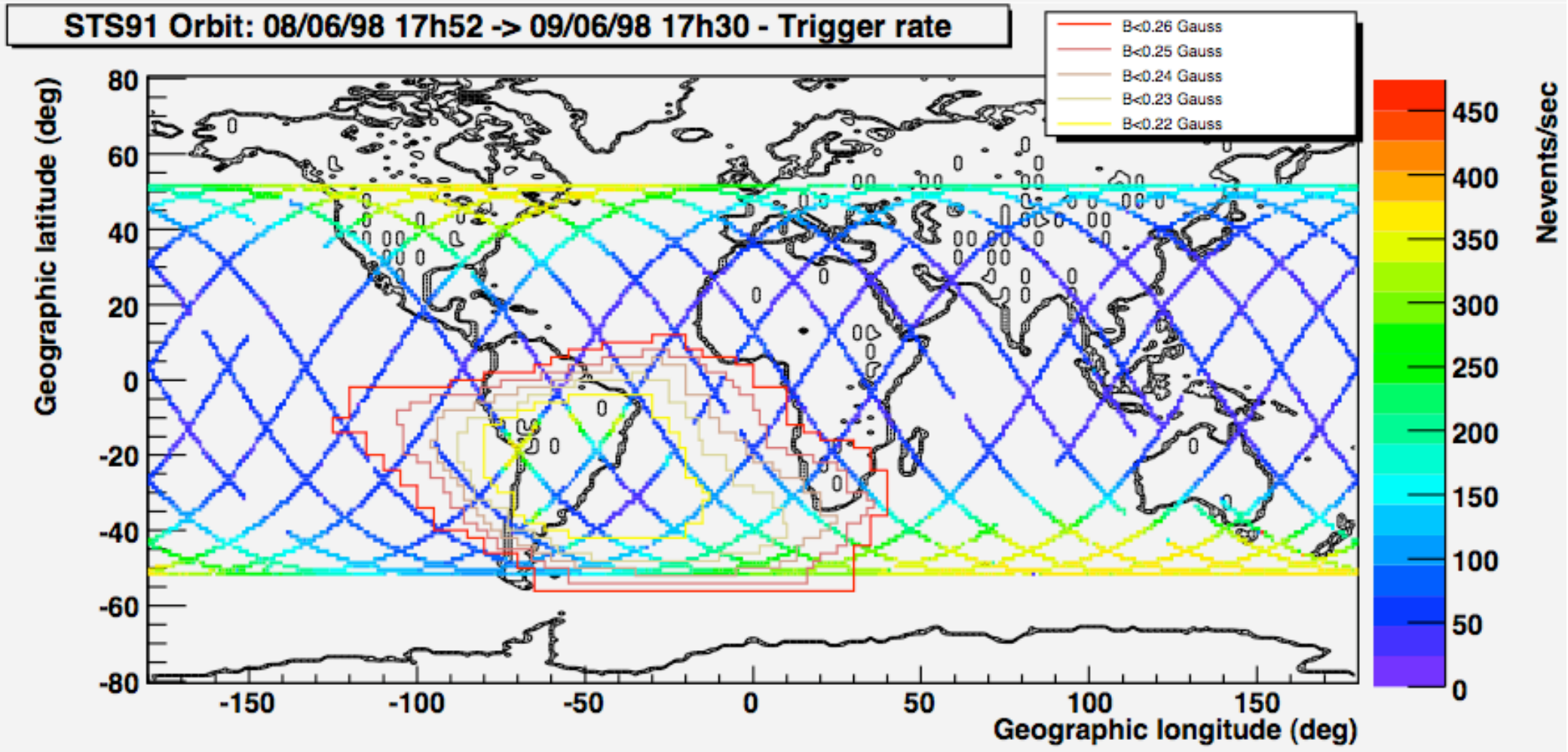
Data taking period: 8/06/98 18h00-> 9/06/98 17h30
AMS Z-axis pointing 1º within Zenith

~1 min sampling

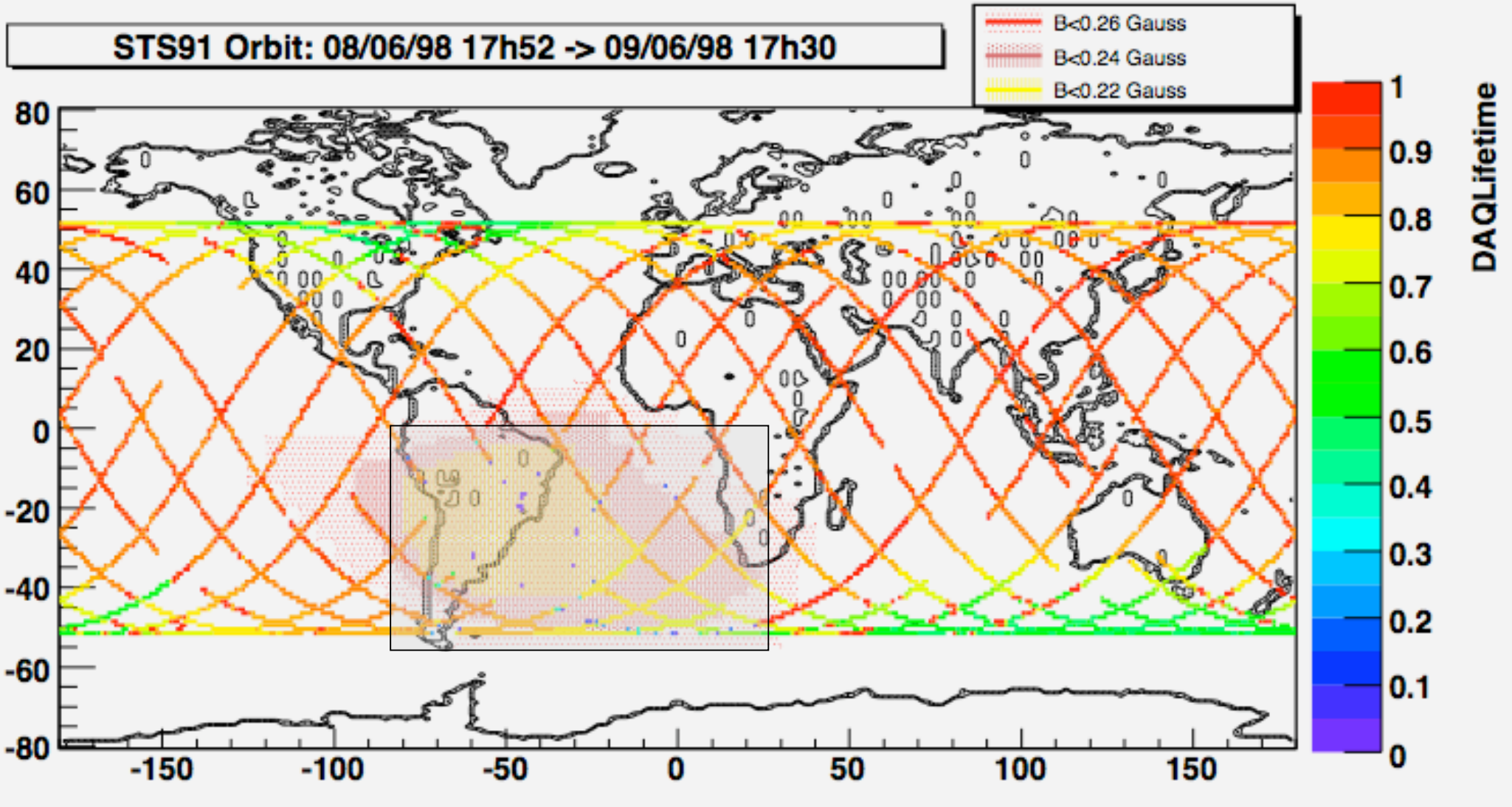
Outline

- SAA exclusion
- Actual vs mean rate
- Flux fluctuations
- Space weather

SAA Local Magnetic Field



SAA excluding region: 85W-25E; 0S-55S



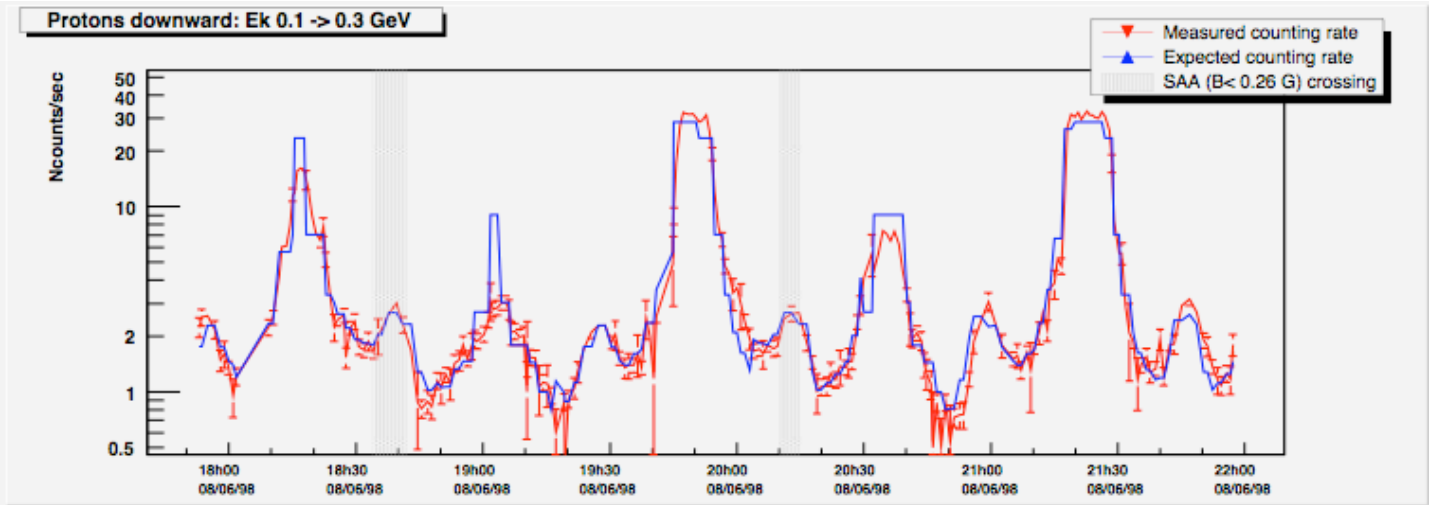
SAA exclusion

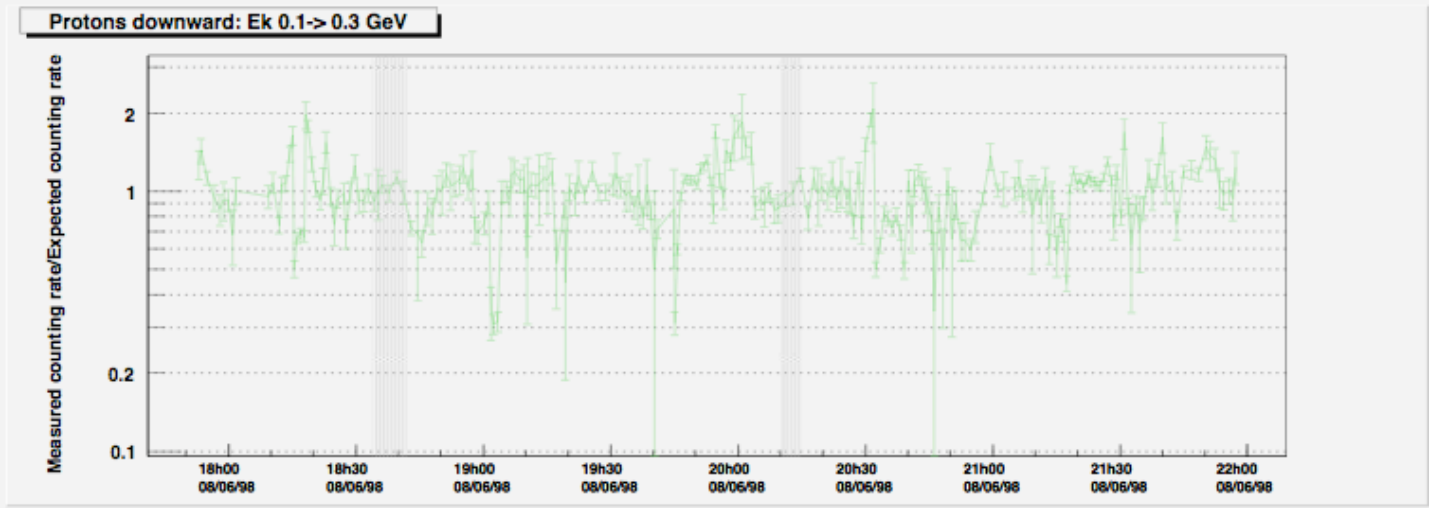
- SAA excluded region:

  85W-25E; 0S-55S As in previous analysis (ref. Choutko)

- Crossing inside B<0.26 Gauss region highlited

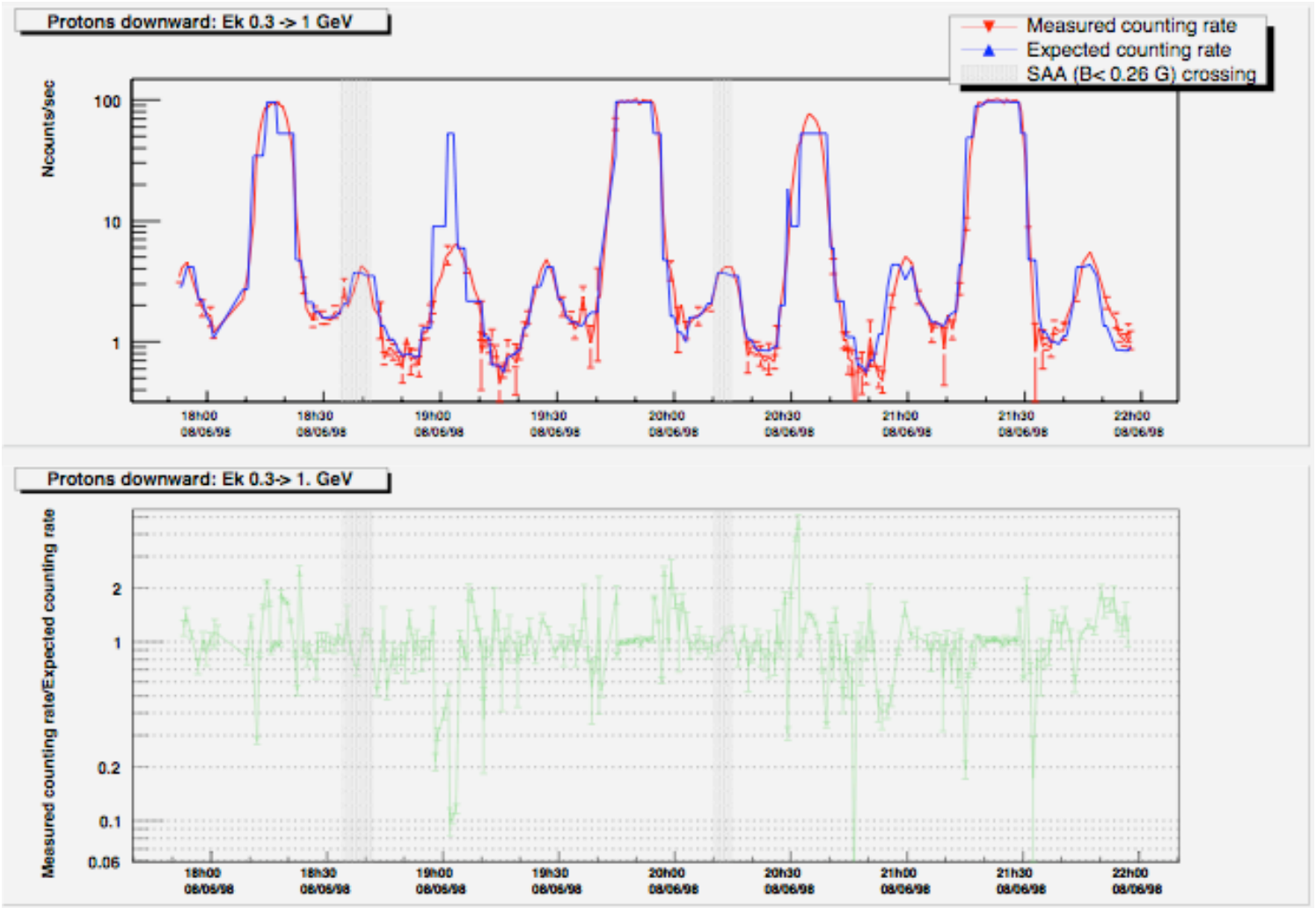
Protons actual rate vs mean rate
Ek: 0.1 -> 0.3 GeV





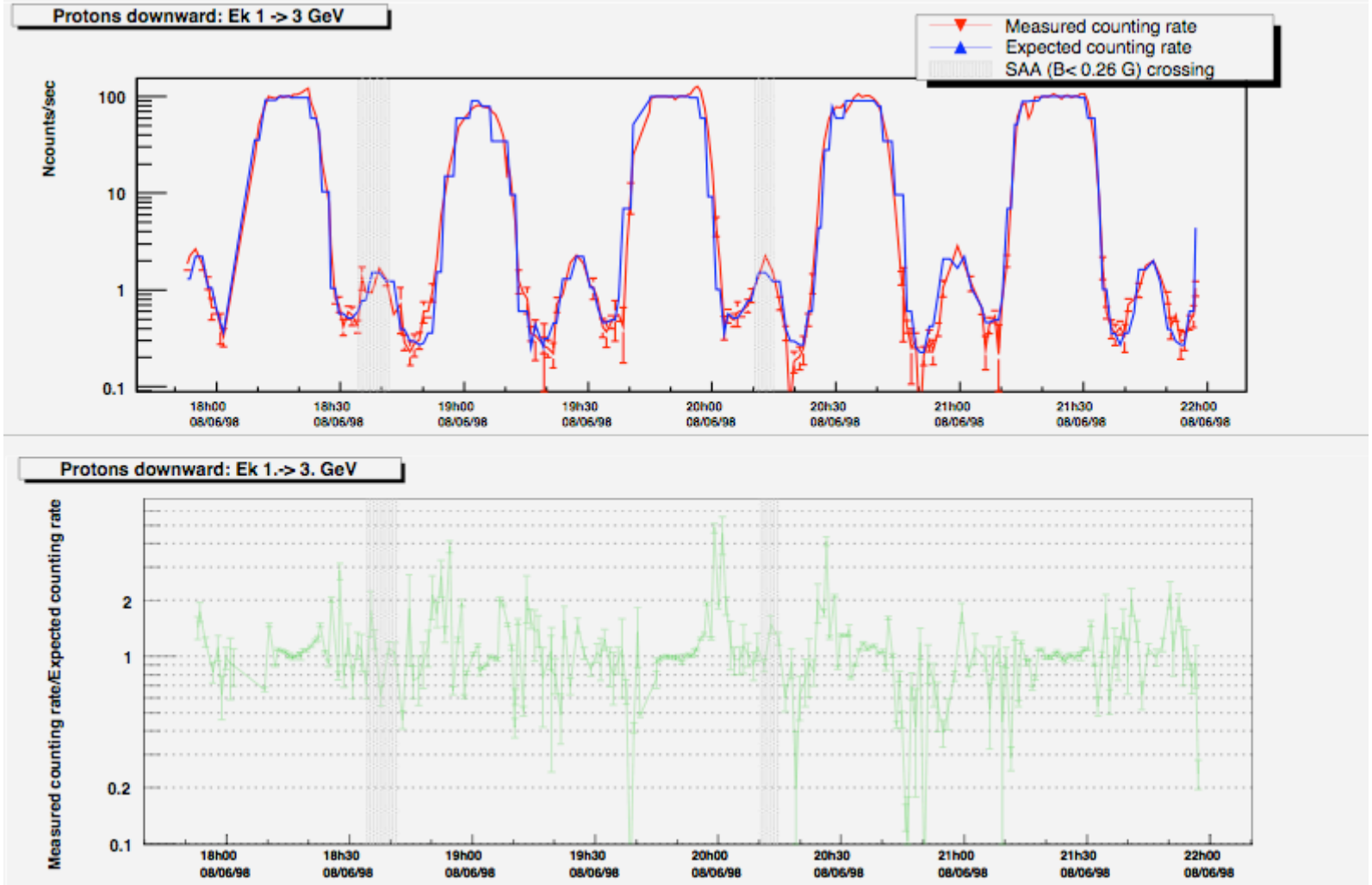
Protons actual rate vs mean rate

Ek: 0.3 -> 1 GeV



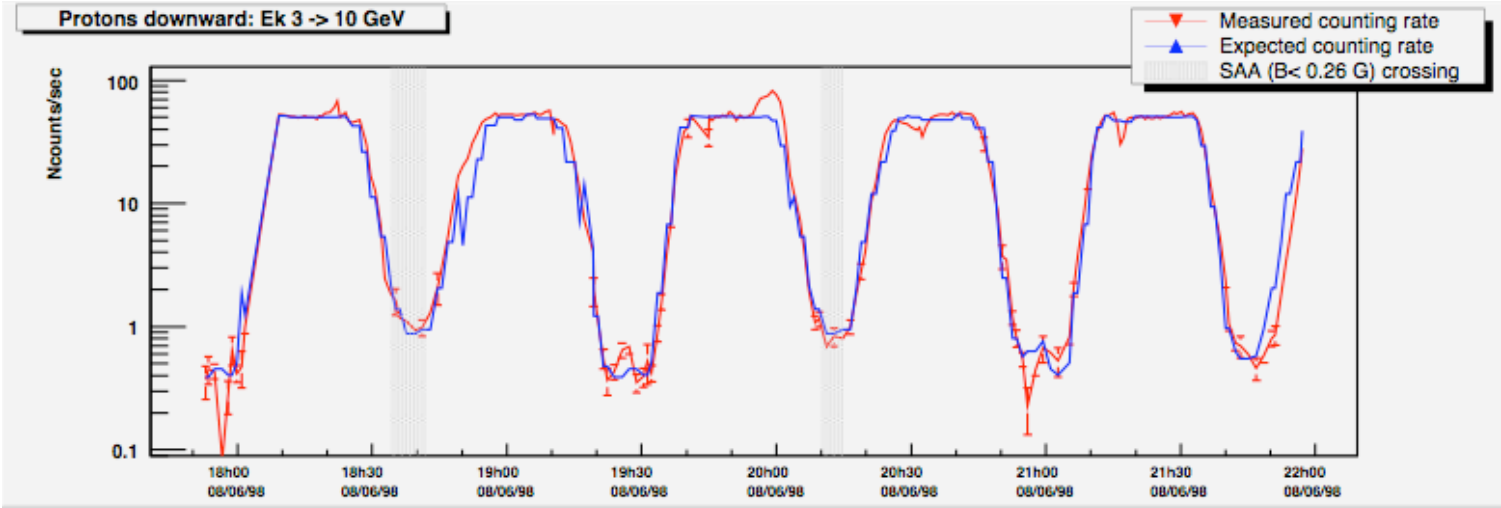
Protons actual rate vs mean rate

Ek: 1 -> 3 GeV



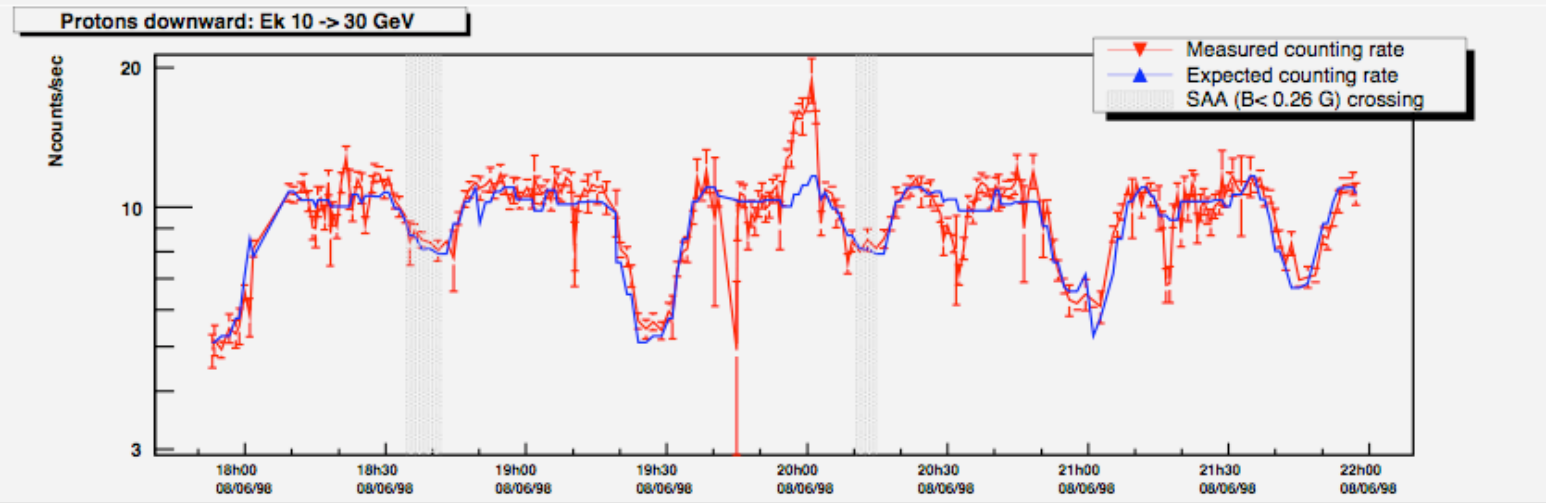
Protons actual rate vs mean rate

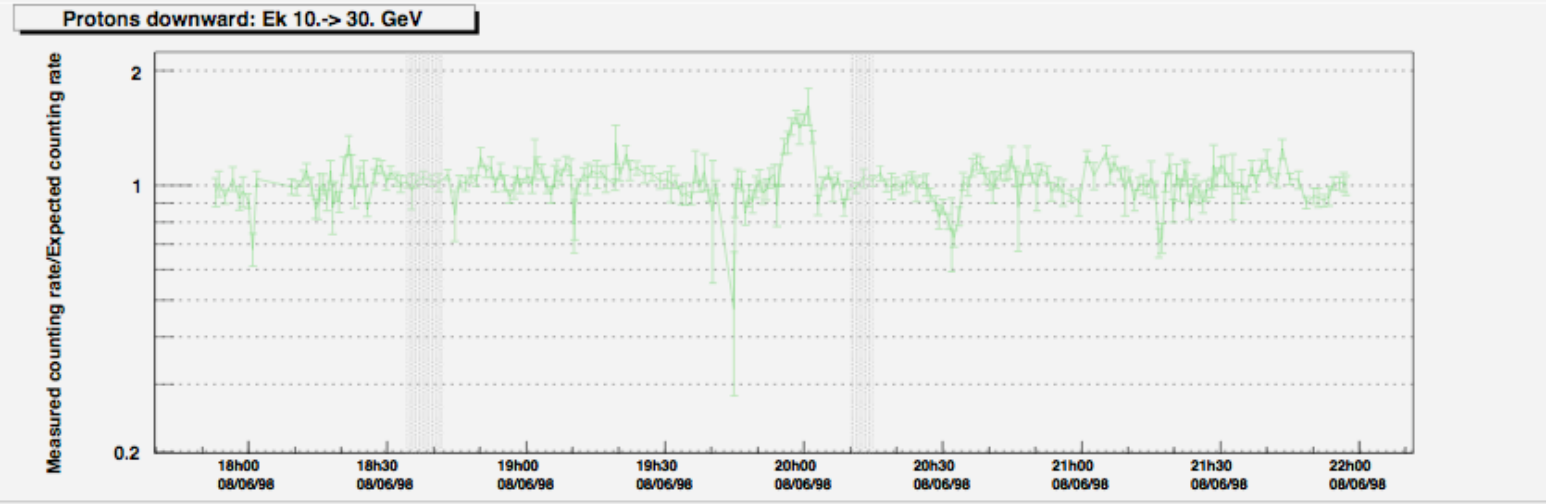
Ek: 3 -> 10 GeV



Protons actual rate vs mean rate

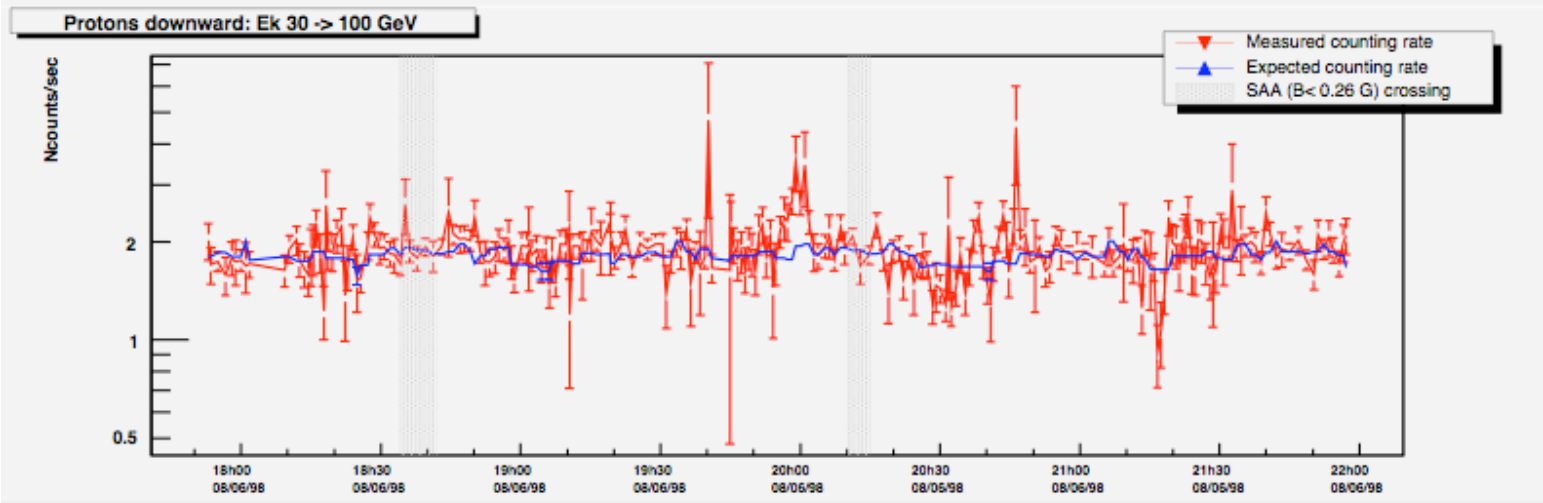
Ek: 10 -> 30 GeV

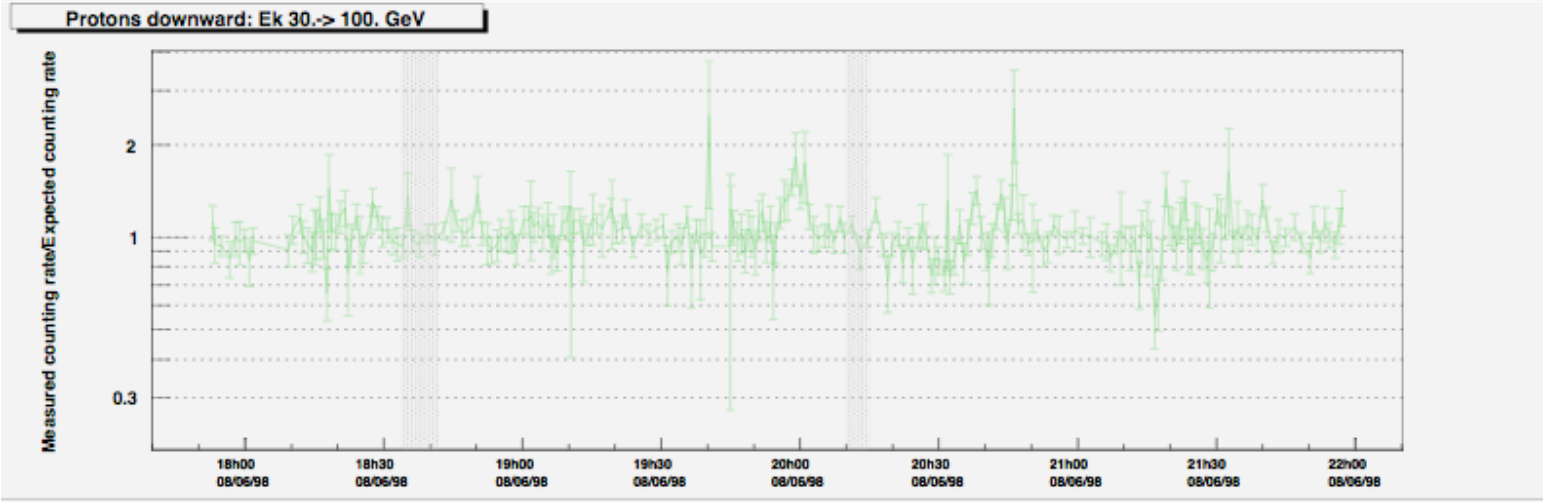




Protons actual rate vs mean rate

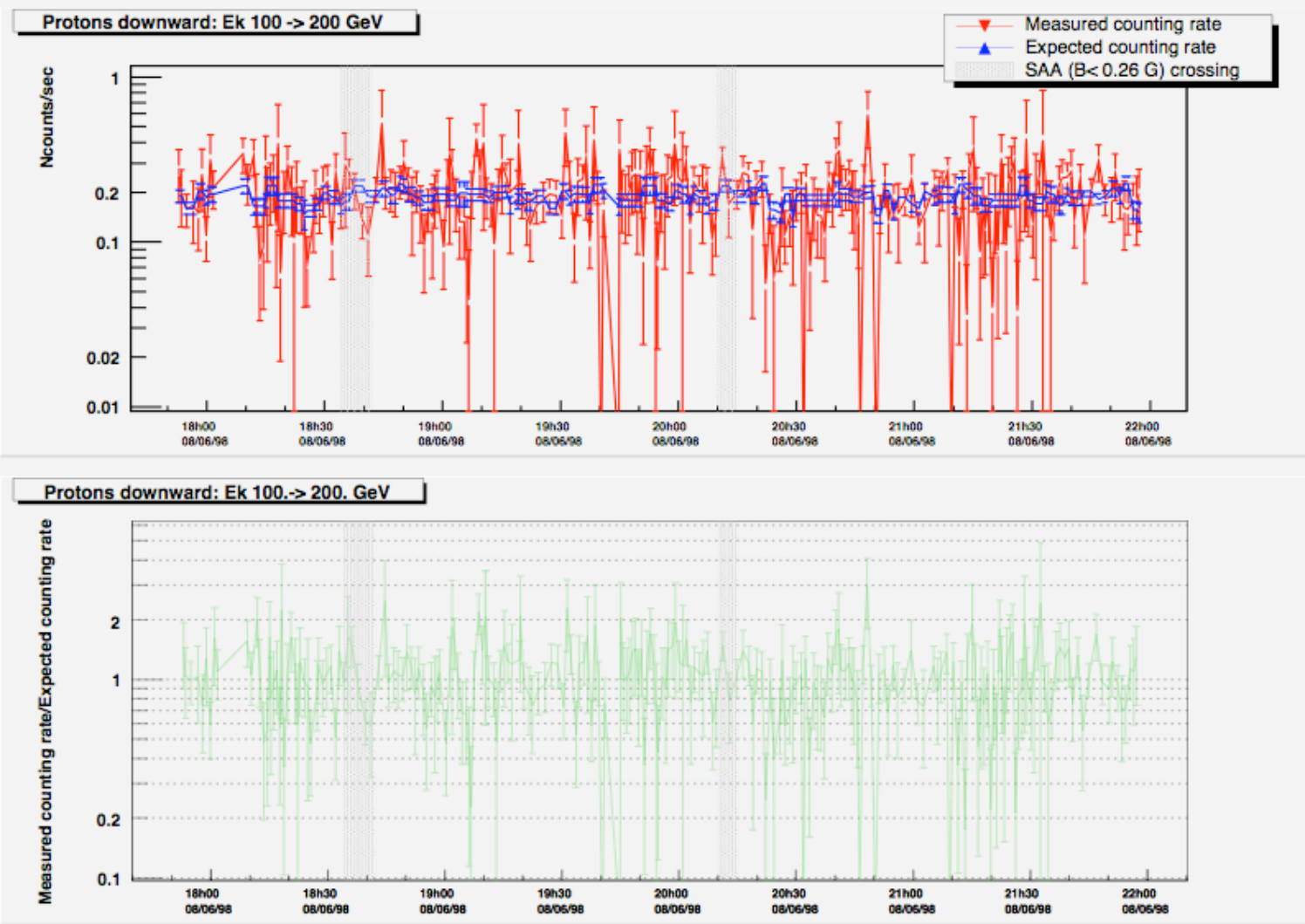
Ek: 30 -> 100 GeV





Protons actual rate vs mean rate

Ek: 100 -> 200 GeV



Flux fluctuation probability I

For each kinetic energy bin, calculate fluctuation probability according to a Poisson distribution:

$$Prob(N \geq N_{counts}) = \sum_{k \geq N_{counts}}^{\infty} e^{-\mu} \frac{\mu^k}{k!}$$

Positive fluctuations

$$Prob(N \leq N_{counts}) = \sum_{k \leq N_{counts}}^{\infty} e^{-\mu} \frac{\mu^k}{k!}$$

Negative fluctuations

where μ is the number of expected counts estimated from the mean counting rate and N_{counts} is the measured number of counts.

Flux fluctuation probability

Ek: 0.1-> 0.3 GeV

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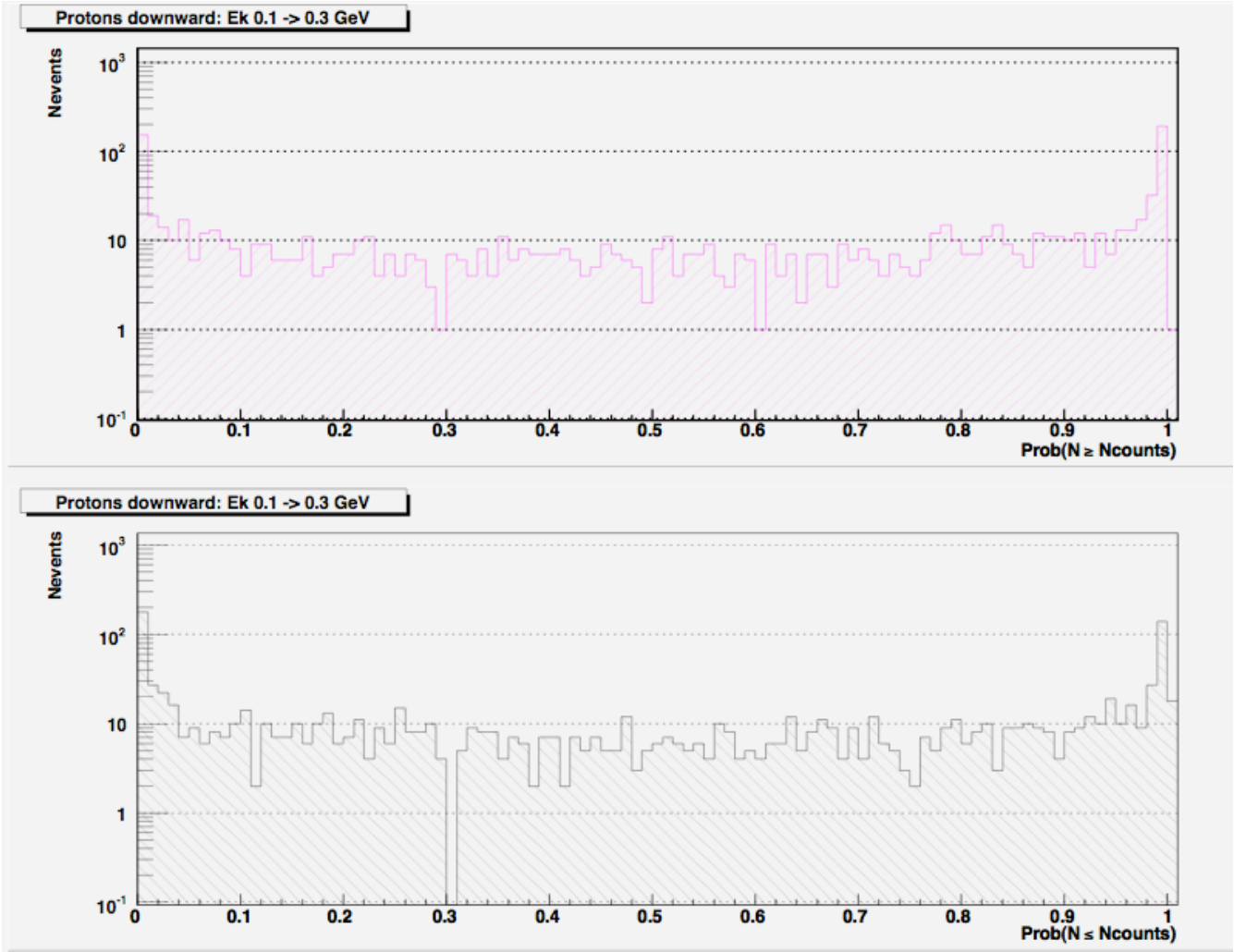
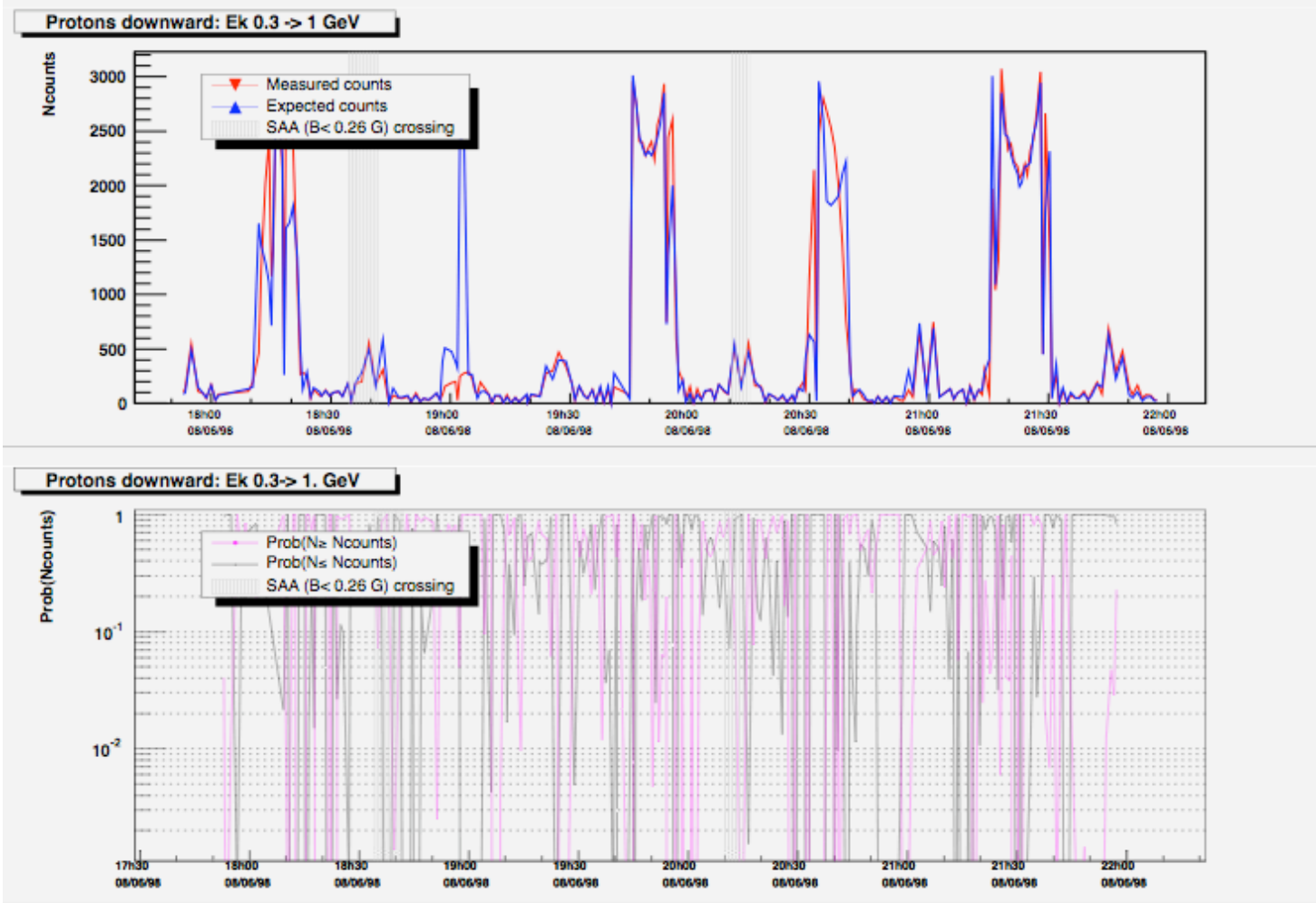


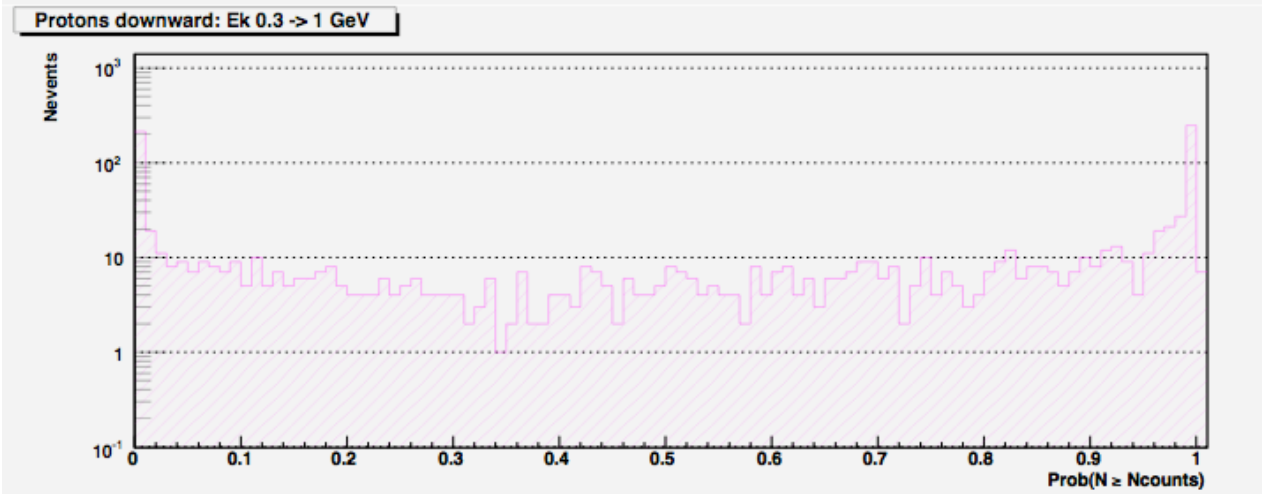
Flux fluctuation probability

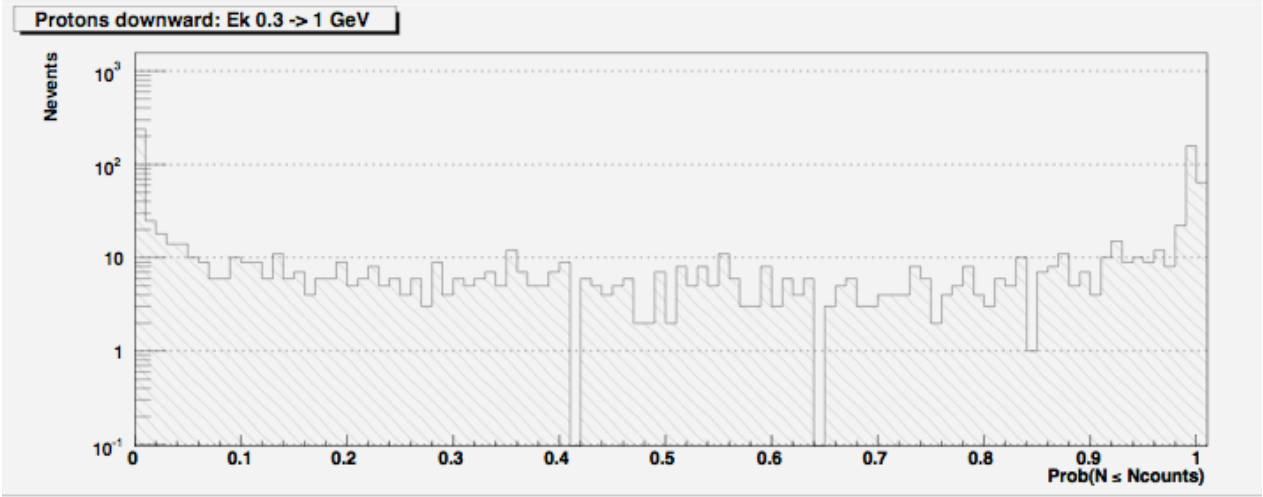
Ek: 0.3 -> 1 GeV



Flux fluctuation probability

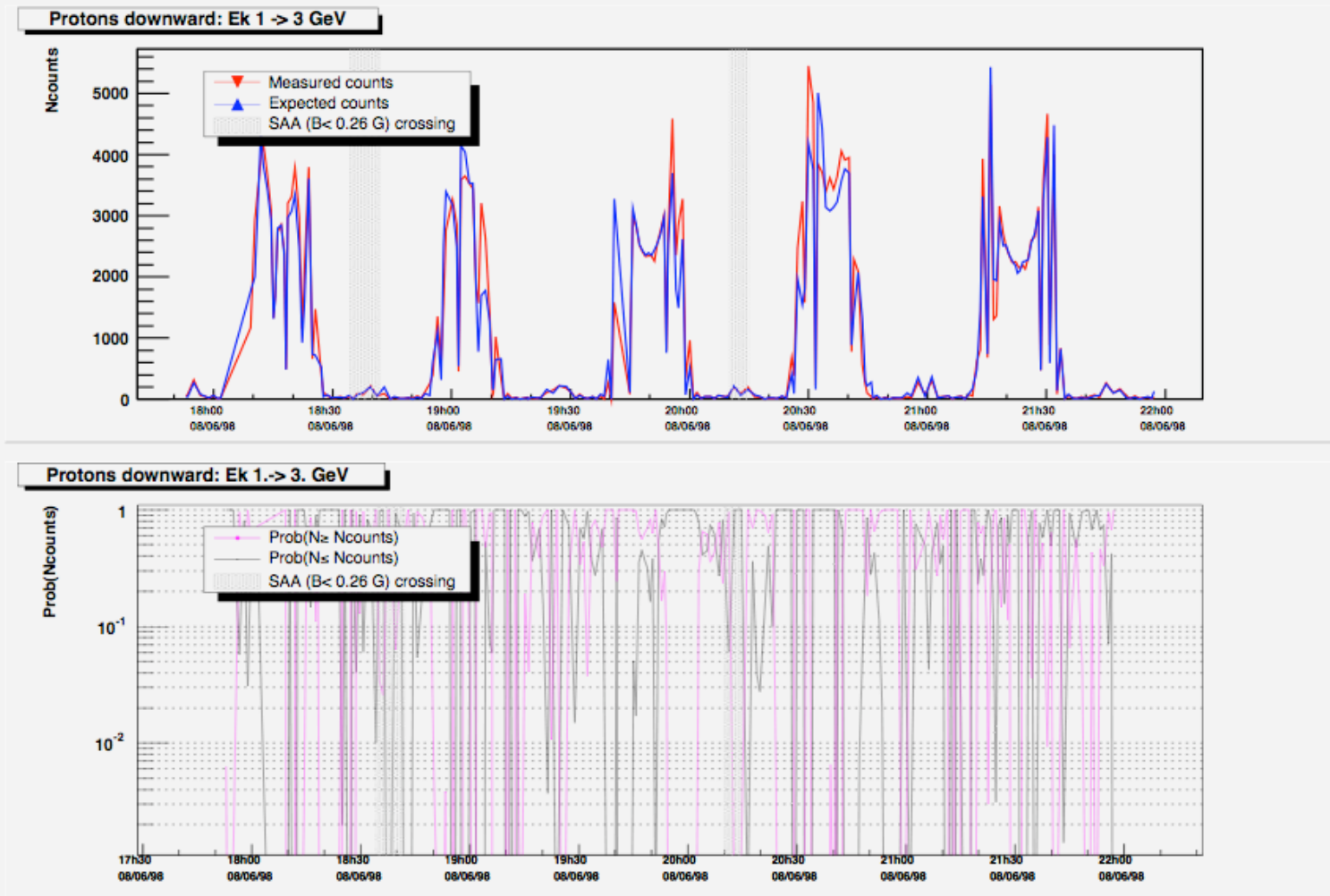
Ek: 0.3 -> 1 GeV





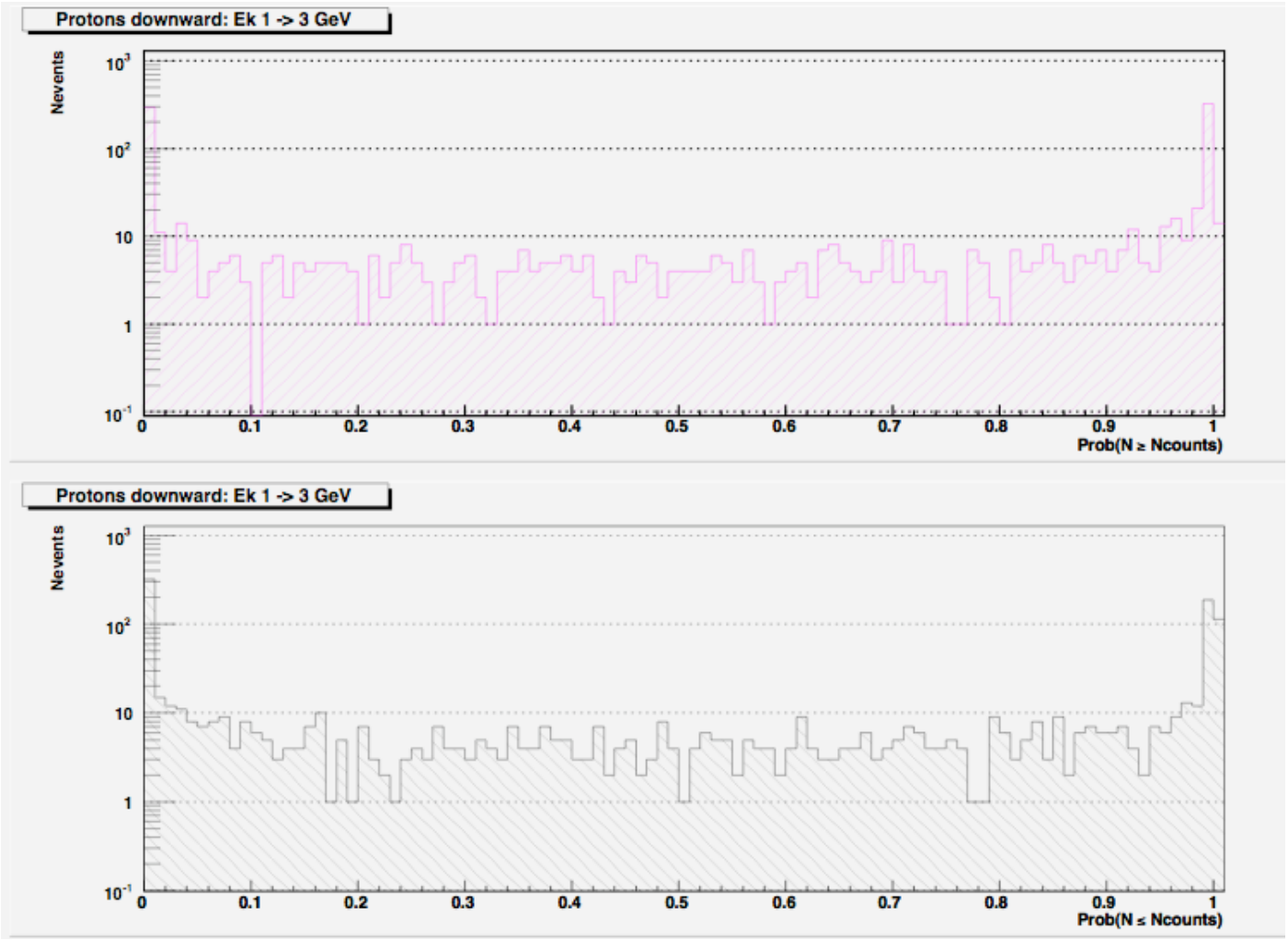
Flux fluctuation probability

Ek: 1 -> 3 GeV



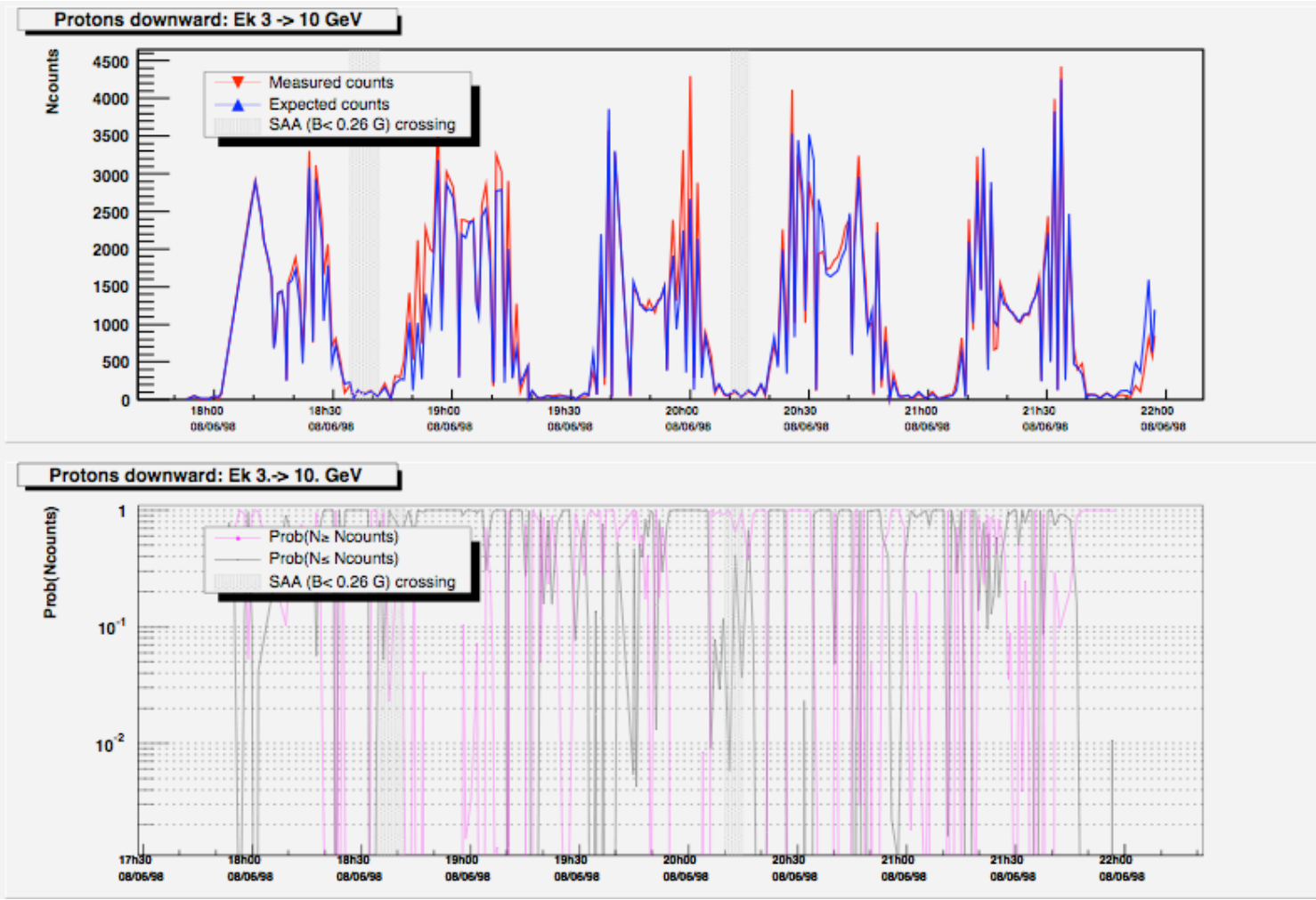
Flux fluctuation probability

Ek: 1 -> 3 GeV



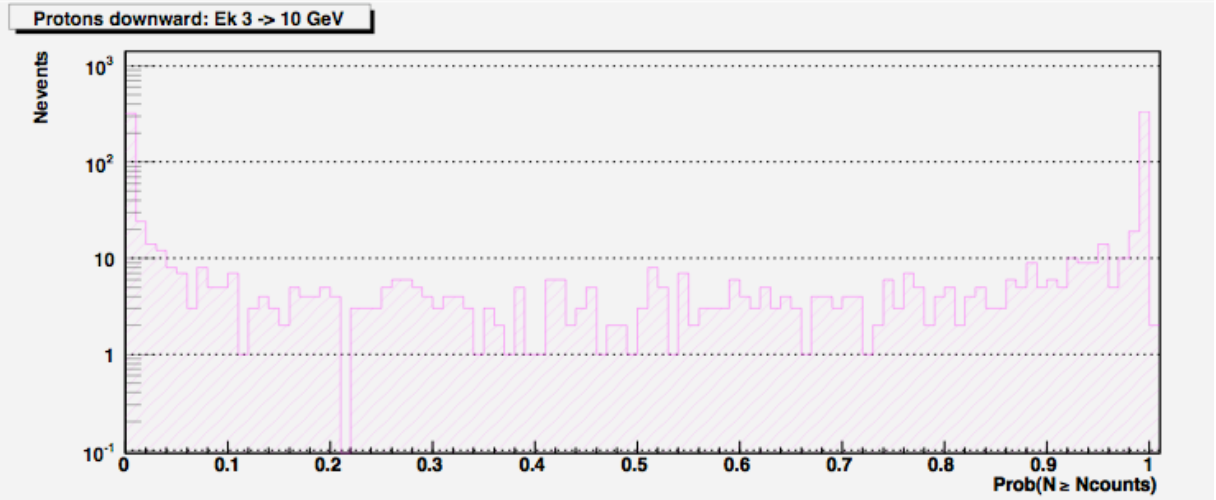
Flux fluctuation probability

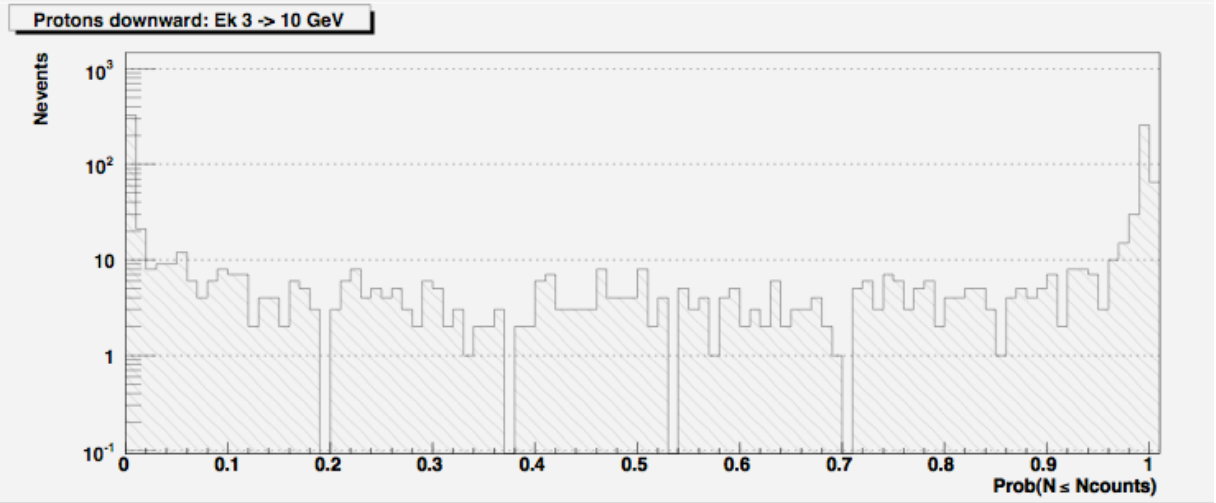
Ek: 3 -> 10 GeV



Flux fluctuation probability

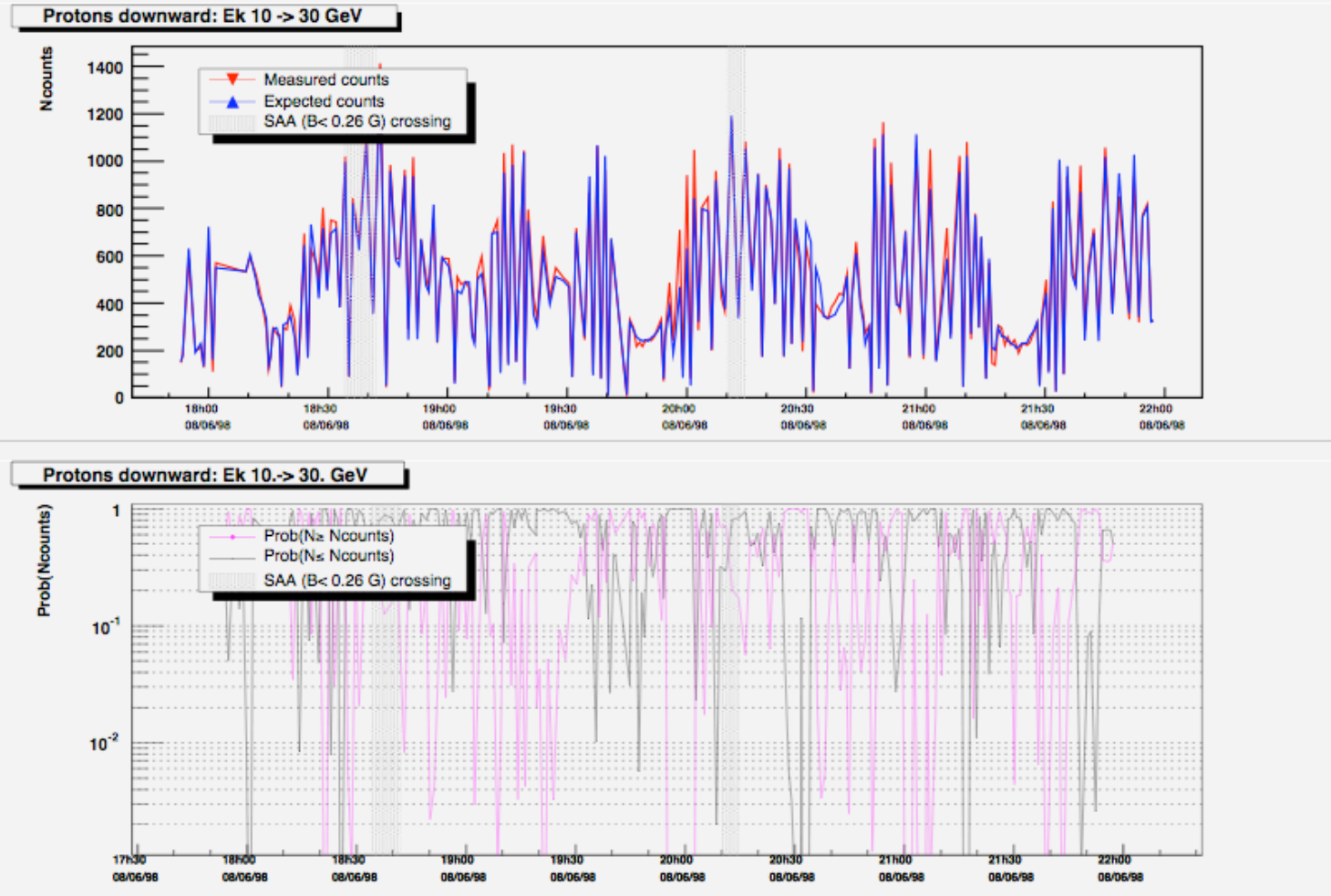
Ek: 3 -> 10 GeV





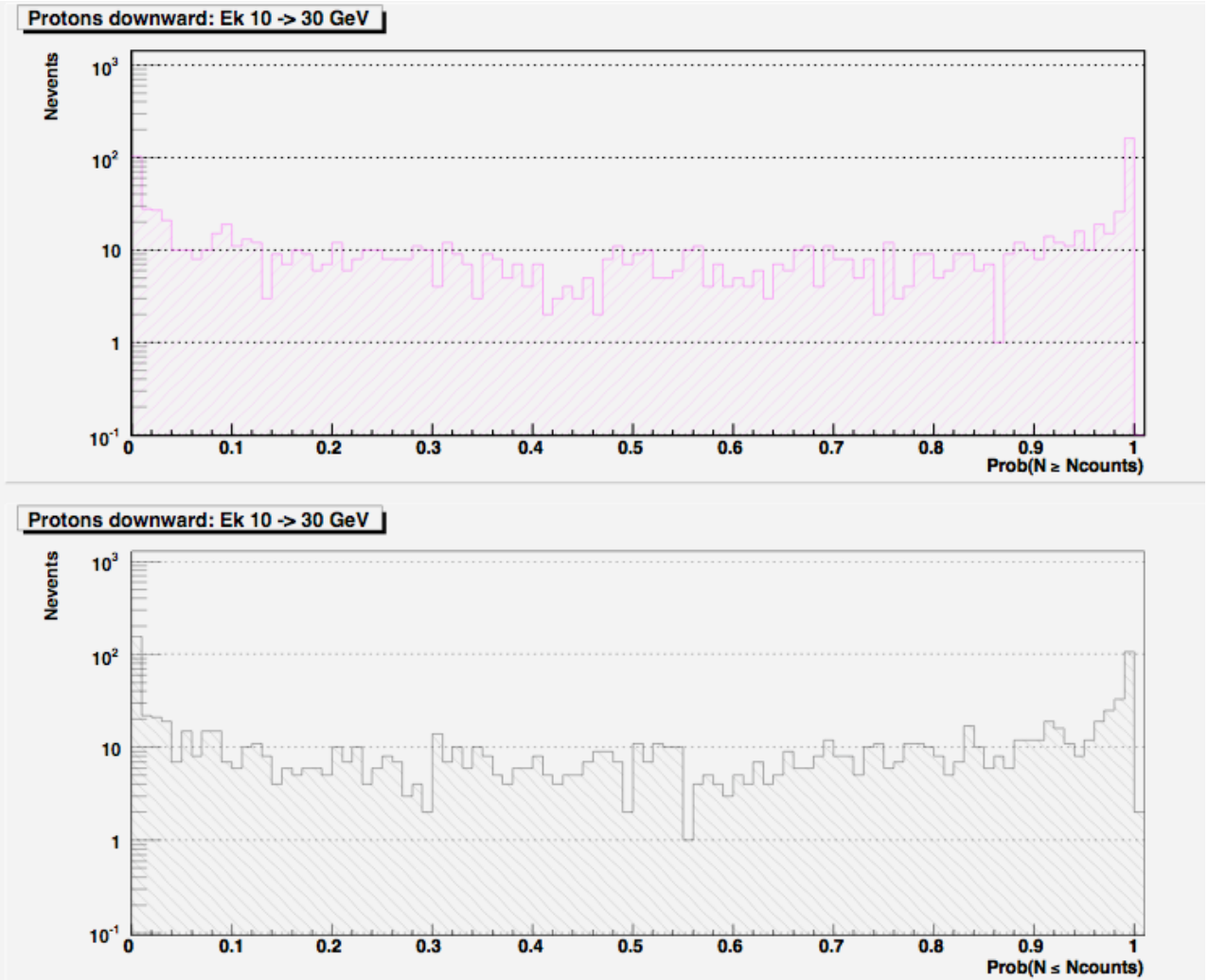
Flux fluctuation probability

Ek: 10 -> 30 GeV



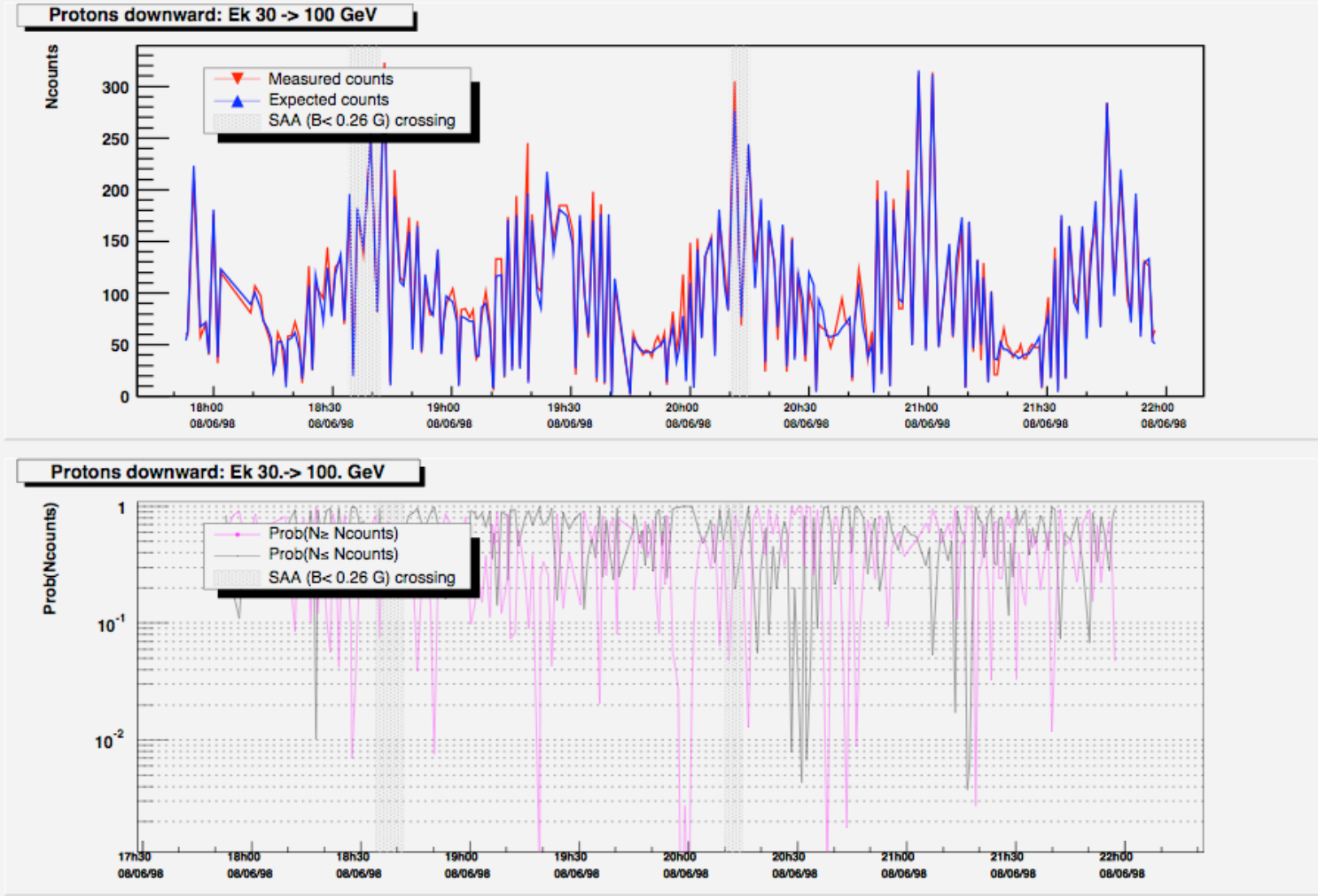
Flux fluctuation probability

Ek: 10 -> 30 GeV



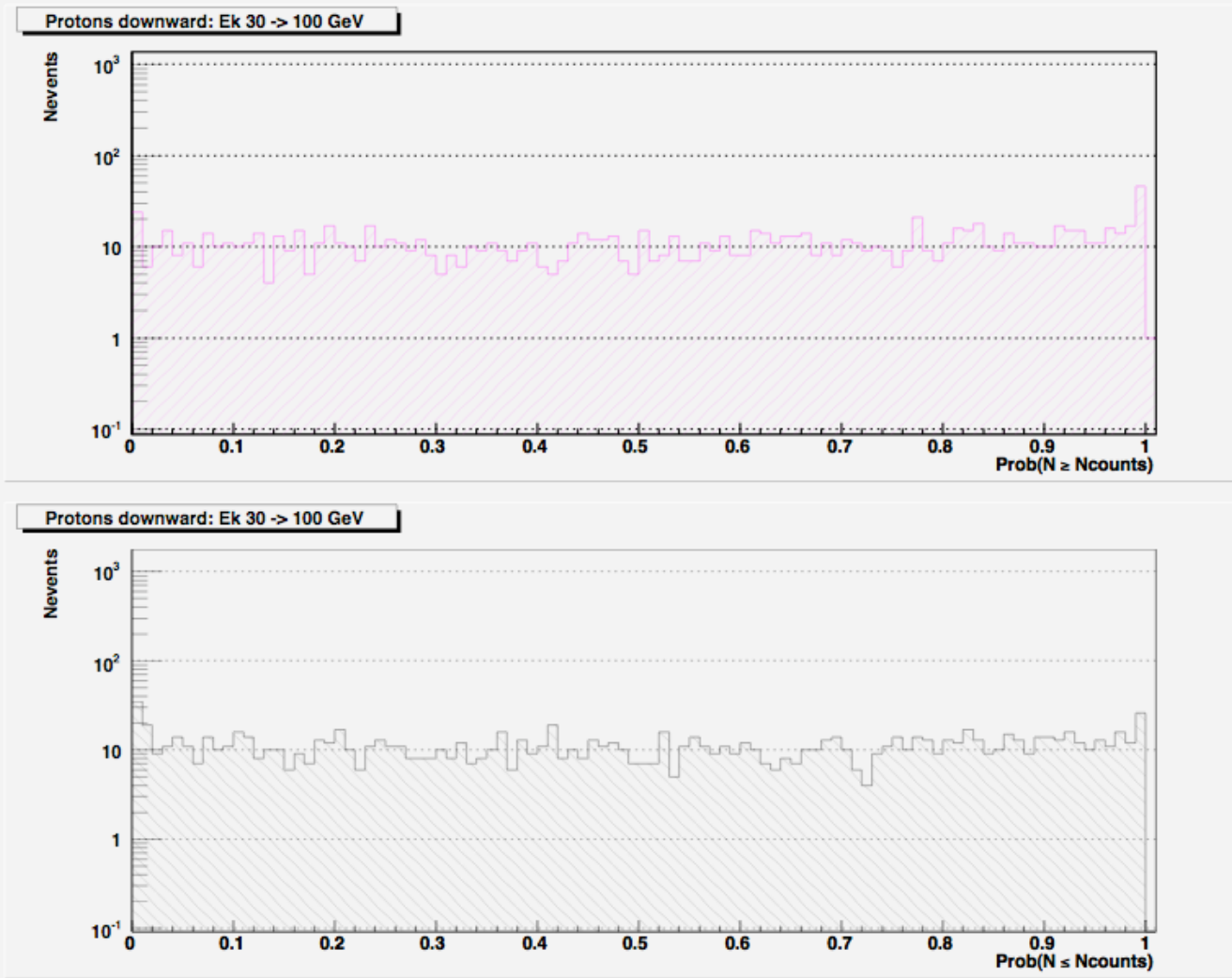
Flux fluctuation probability

Ek: 30 -> 100 GeV



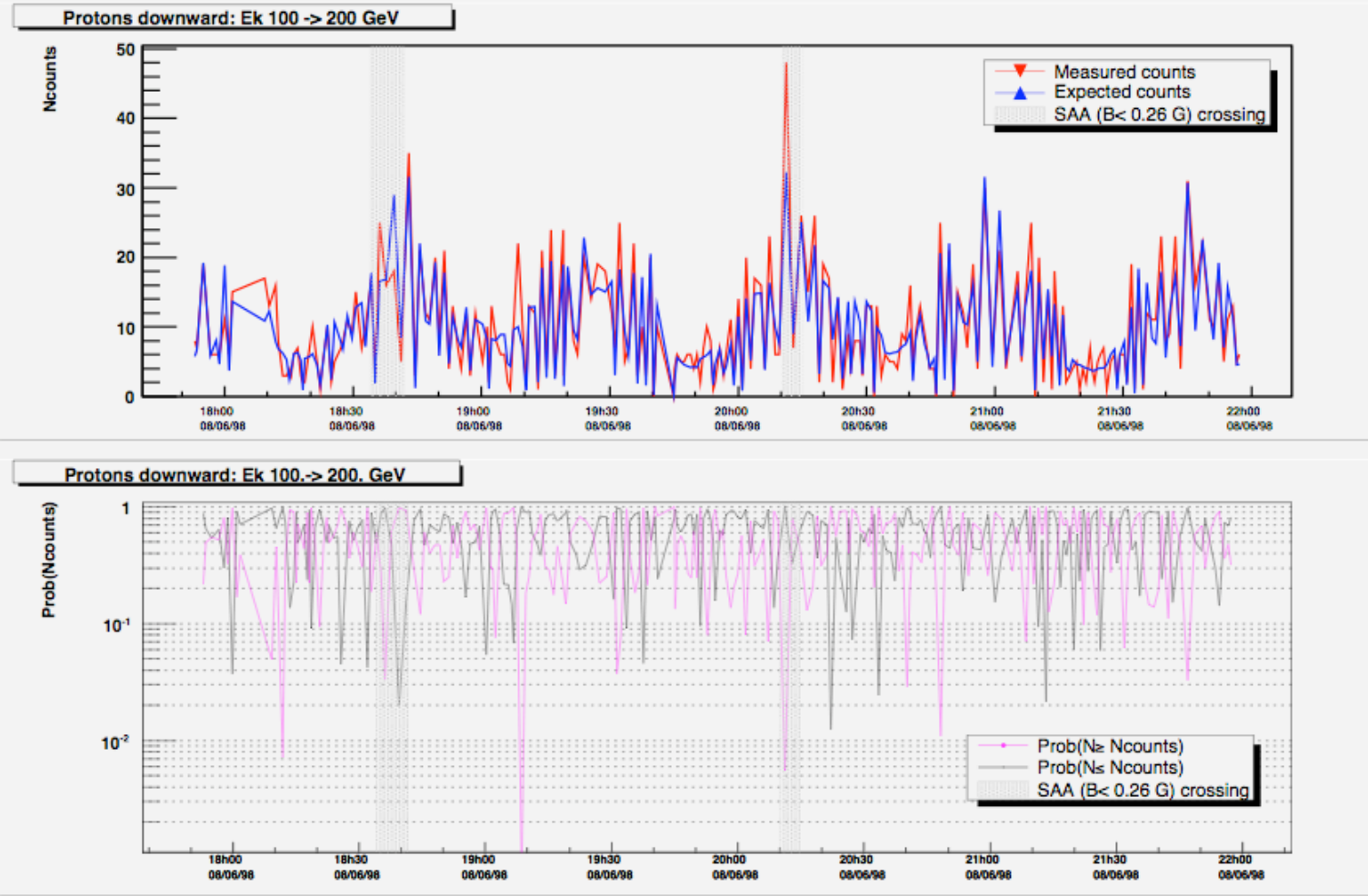
Flux fluctuation probability

Ek: 30 -> 100 GeV



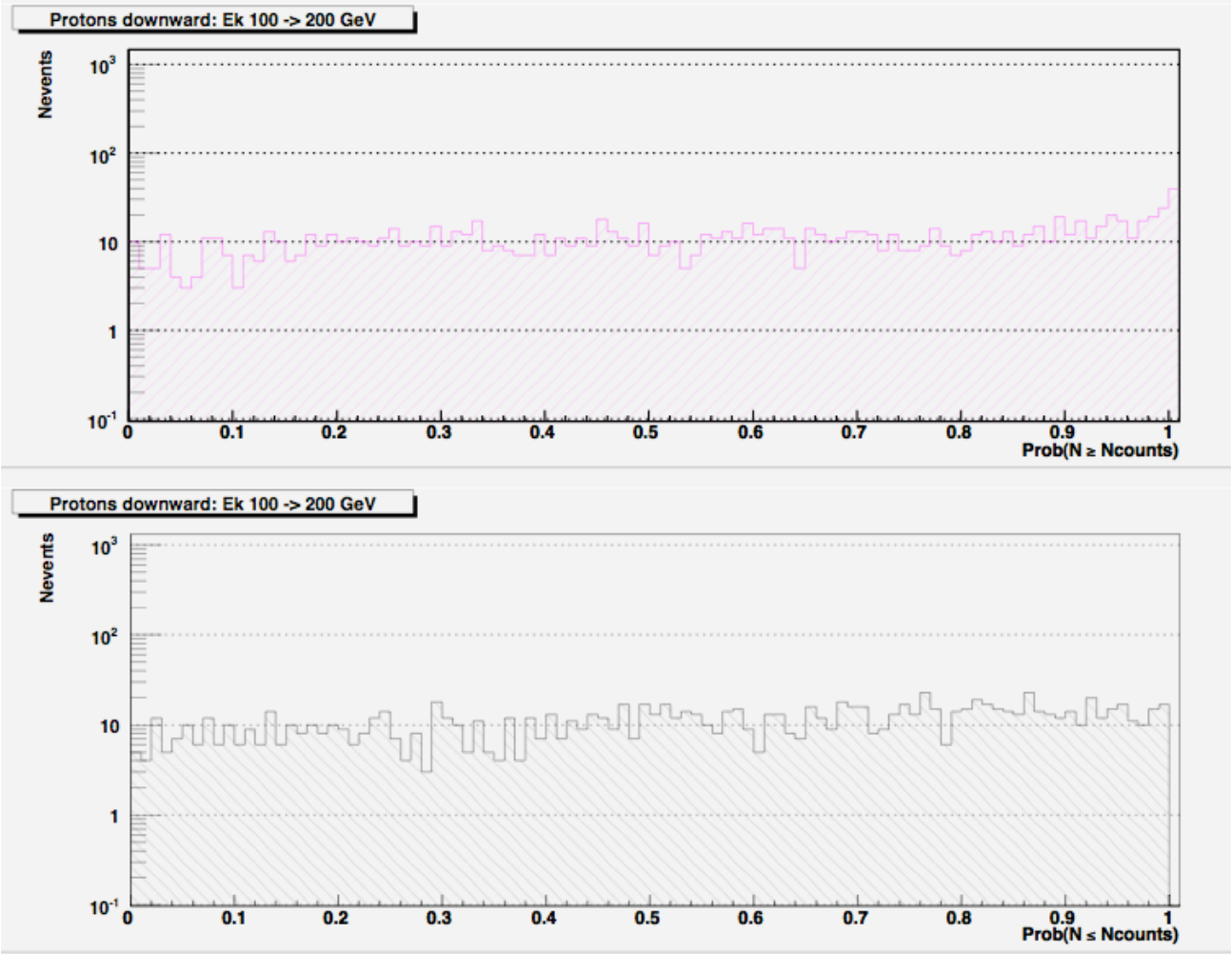
Flux fluctuation probability

Ek: 100 -> 200 GeV



Flux fluctuation probability

Ek: 100 -> 200 GeV

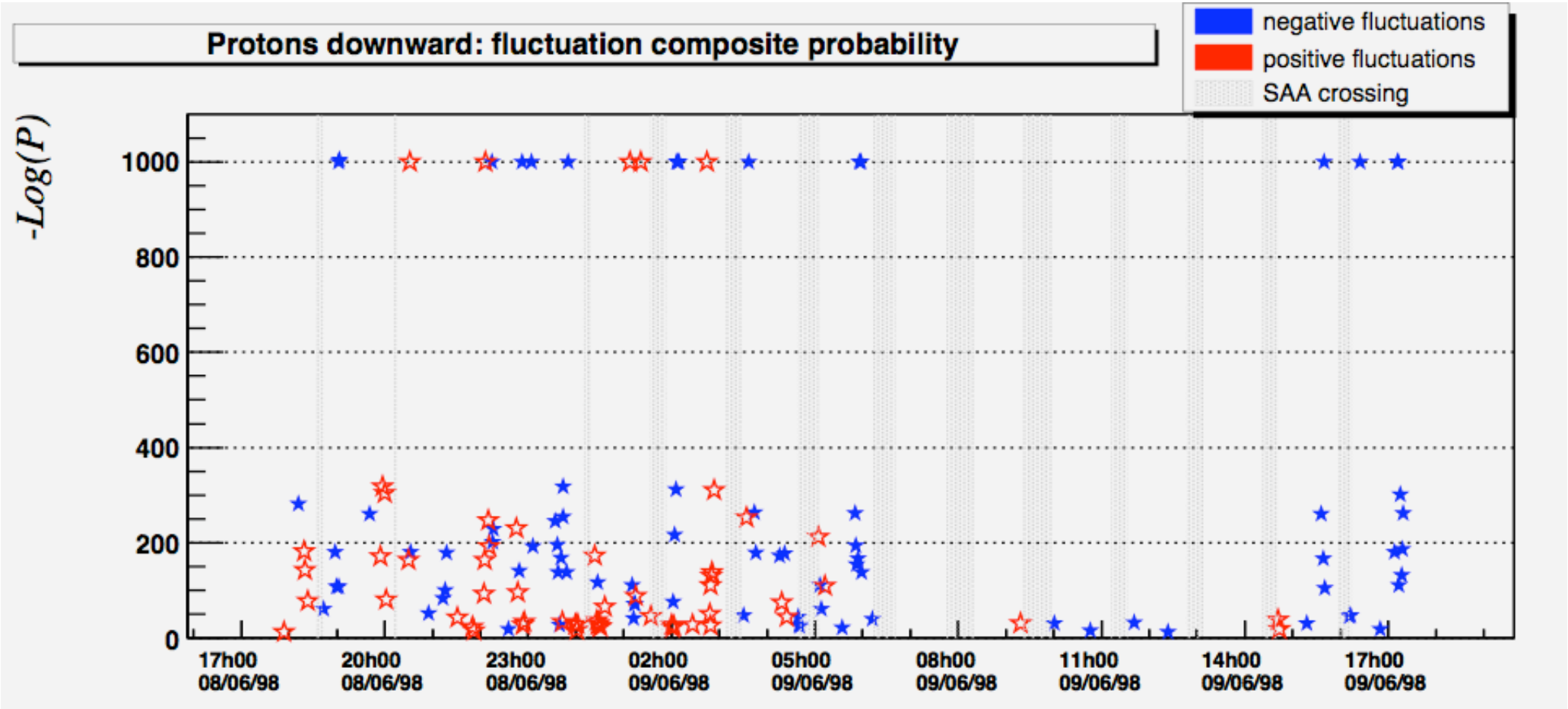


Flux fluctuation probability II

- Evidence of proton flux fluctuations in the Kinetic energy region: 0.1 GeV to 30 GeV
  (first 5 bins of kinetic energy)

- Selection of fluctuation occurrences:
  - $Prob(N \geq N_{counts}) \leq 10^{-3}$ *OR* $Prob(N \leq N_{counts}) \leq 10^{-3}$
  - simultaneous fluctuations of the same kind in at least three adjacent bins of kinetic energy
  - $\prod_i Prob(N^i \geq N^i counts) \leq 10^{-200} \quad i=1,...,5$

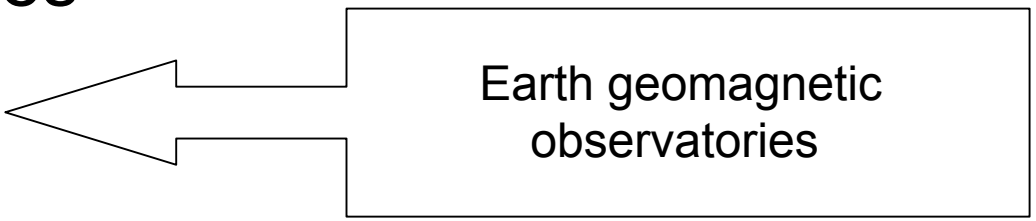
Flux fluctuation composite probability



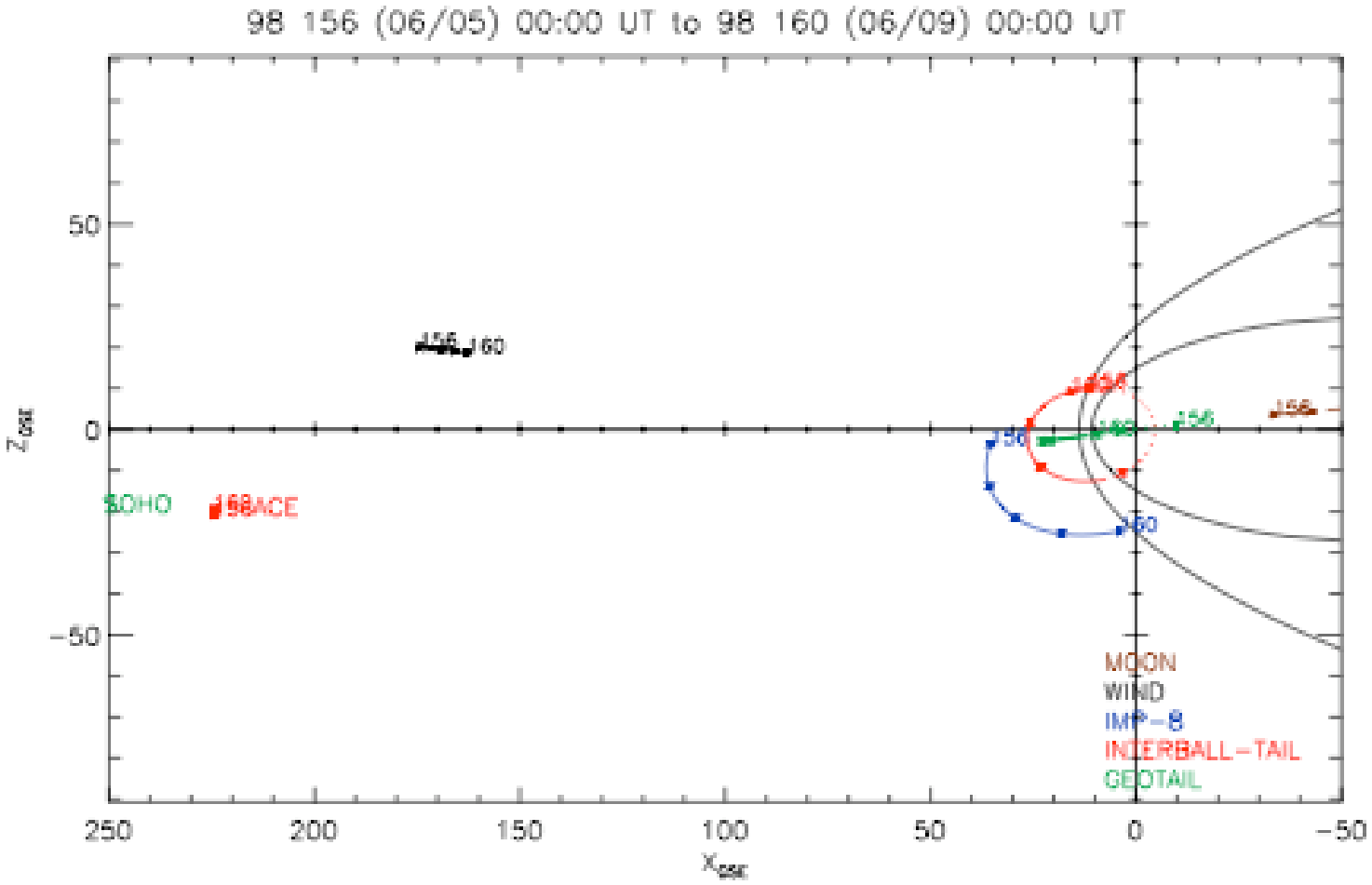
Space Weather

- Interplanetary Magnetic Field
- Solar Wind

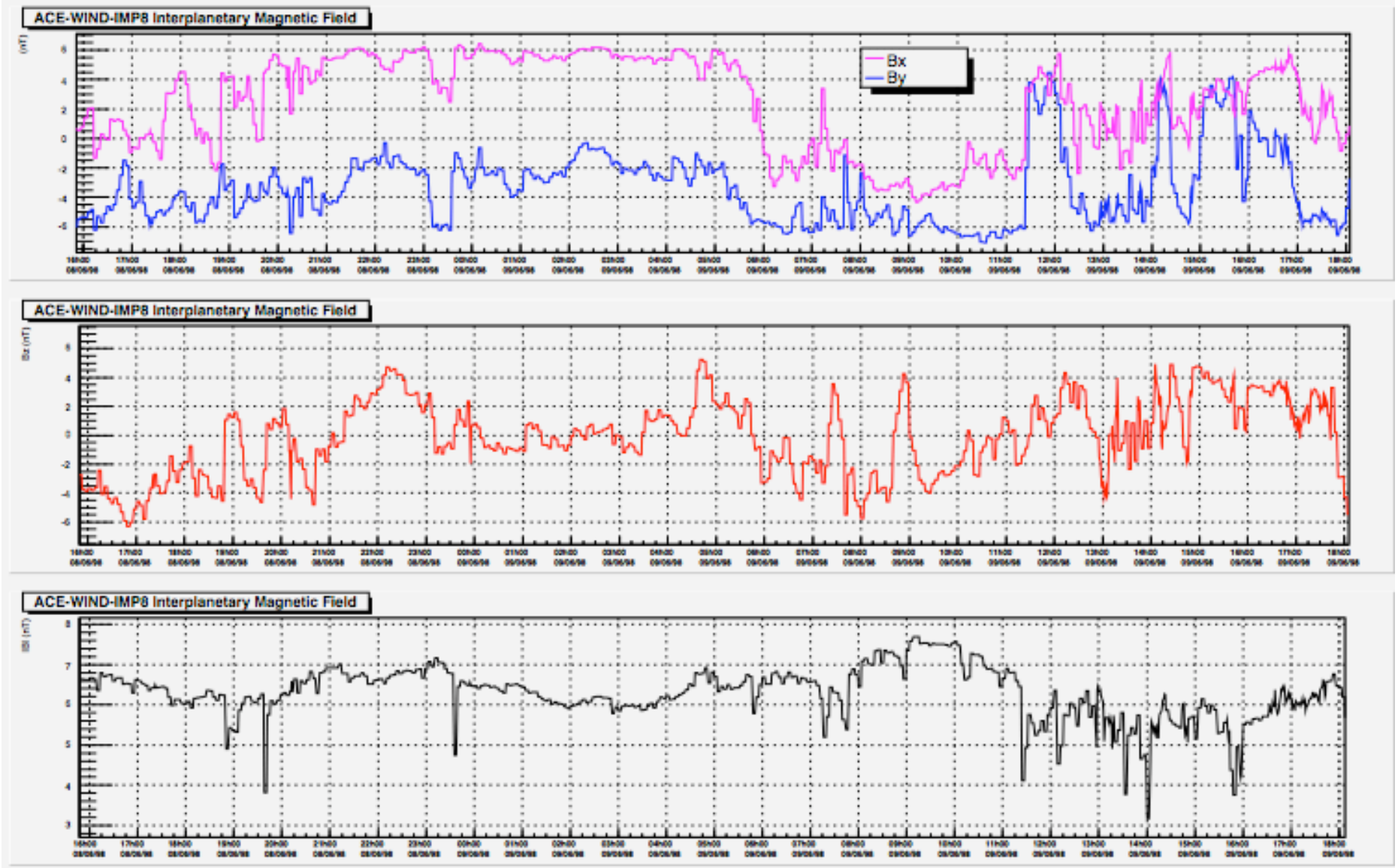
- Geomagnetic indexes
  - Kp, Dst
  - ASYH, SYMH



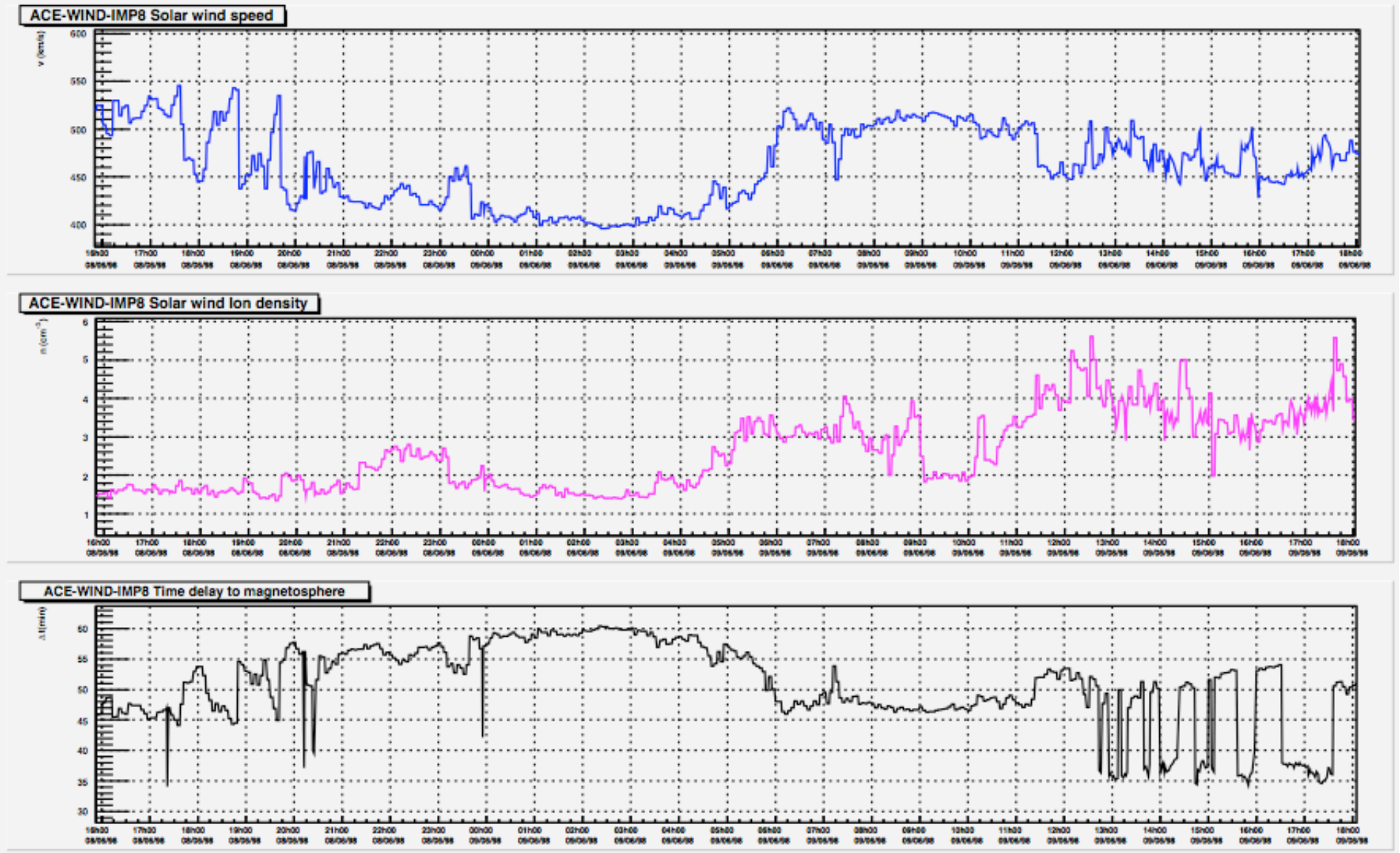
ACE-WIND-IMP8 position



Interplanetary Magnetic Field



Solar wind parameters



Geomagnetic activity indices