COMPTEL Team Meeting, SRON Utrecht, Feb.27 – March 1, 1996

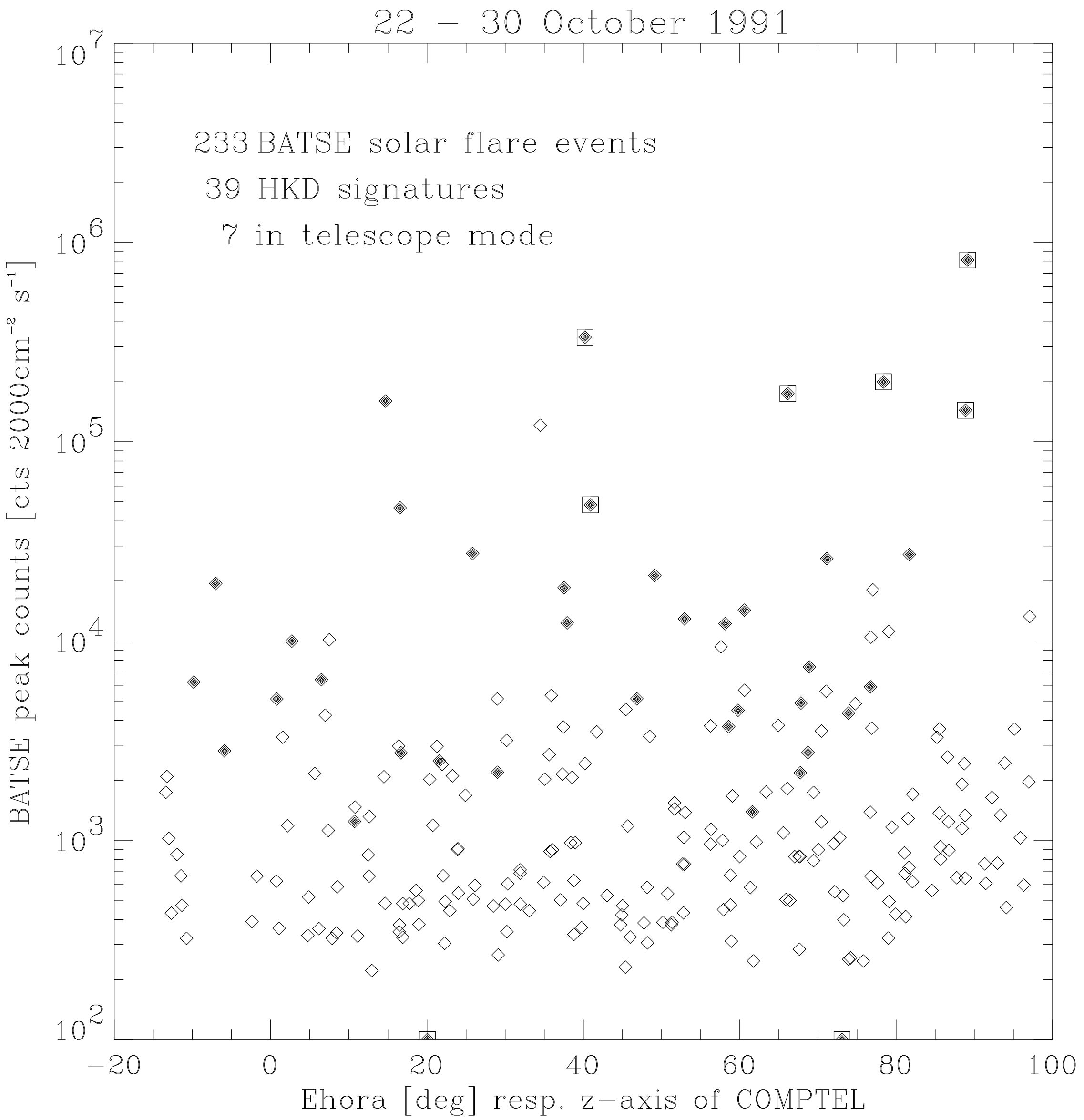
Solar Flares in October 1991
(CGRO Observation Period 12)

• CGRO Observation Period 12 lasts from October 17 to 30, 1991. The Sun was within the FOV of COMPTEL.

• Very quiet conditions for October 17 – 22 (according to GOES-7 monitoring data). On Oct 20 the very active group AR-6891 rotates on the visible disc. This causes high activity for Oct 22 – 30.

• Three of the October 1991 flares were analyzed by Raid Suleiman using the burst mode. The telescope mode data of October 1991 were previously examined by Martin Varendorff.

• Search for Solar flares during Oct 22 – 30:
— We begin with lists of GOES events and BATSE Solar flare triggers.
— The HKD data sets were scanned for flare signatures. The most sensitive scalers by far are combined D1 rate and Veto-1 rate. 39 signatures are found.
—Some events are strong enough to be seen in the telescope data: 7 flares show a $> 3\sigma$ signal, 3 out of these allow further spectral analysis ($> 20\sigma$).

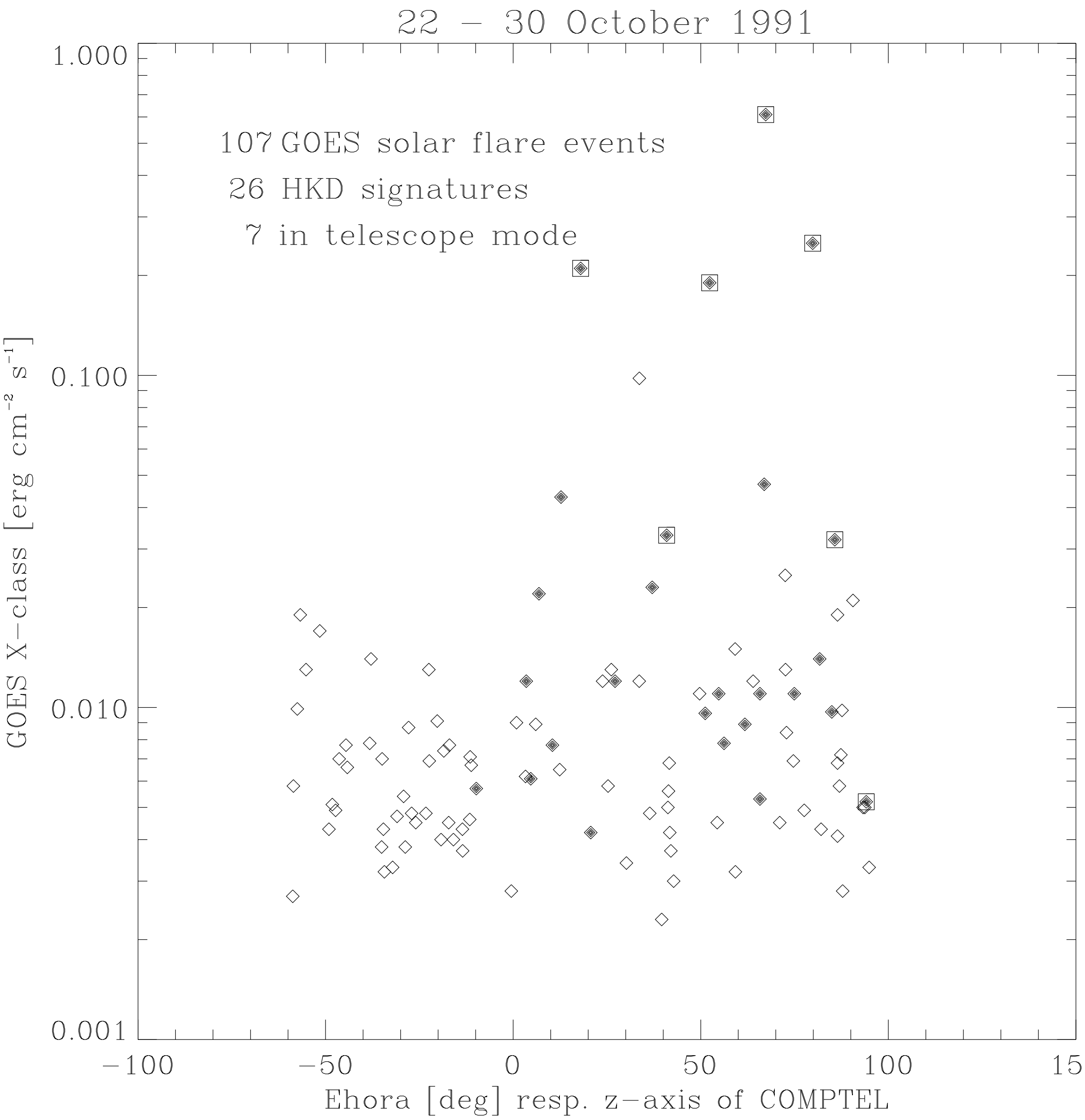


COMPTEL flare detections compared with the BATSE solar flare trigger events during October 22 – 30 :

BATSE flare trigger

COMPTEL HKD signature (combined D1 rate or Veto-1 rate)

COMPTEL telescope event ($> 3\sigma$)



COMPTEL flare detections compared with the GOES-7 SXR events during October 22 – 30 :

GOES event

COMPTEL HKD signature (combined D1 rate or Veto-1 rate)

COMPTEL telescope event ($> 3\sigma$)

conclusions, so far

• Due to the large geometrical area of the COMPTEL detectors and vetos, the HKD scalers prove to be a sensitive tool for studying overall flare features.

• COMPTEL flare signals tend to correlate well with HXR (=BATSE) but less with SXR (=GOES).

• The obtained count rate spectra for the larger flares show narrow line emission.

work to do in the future . . .

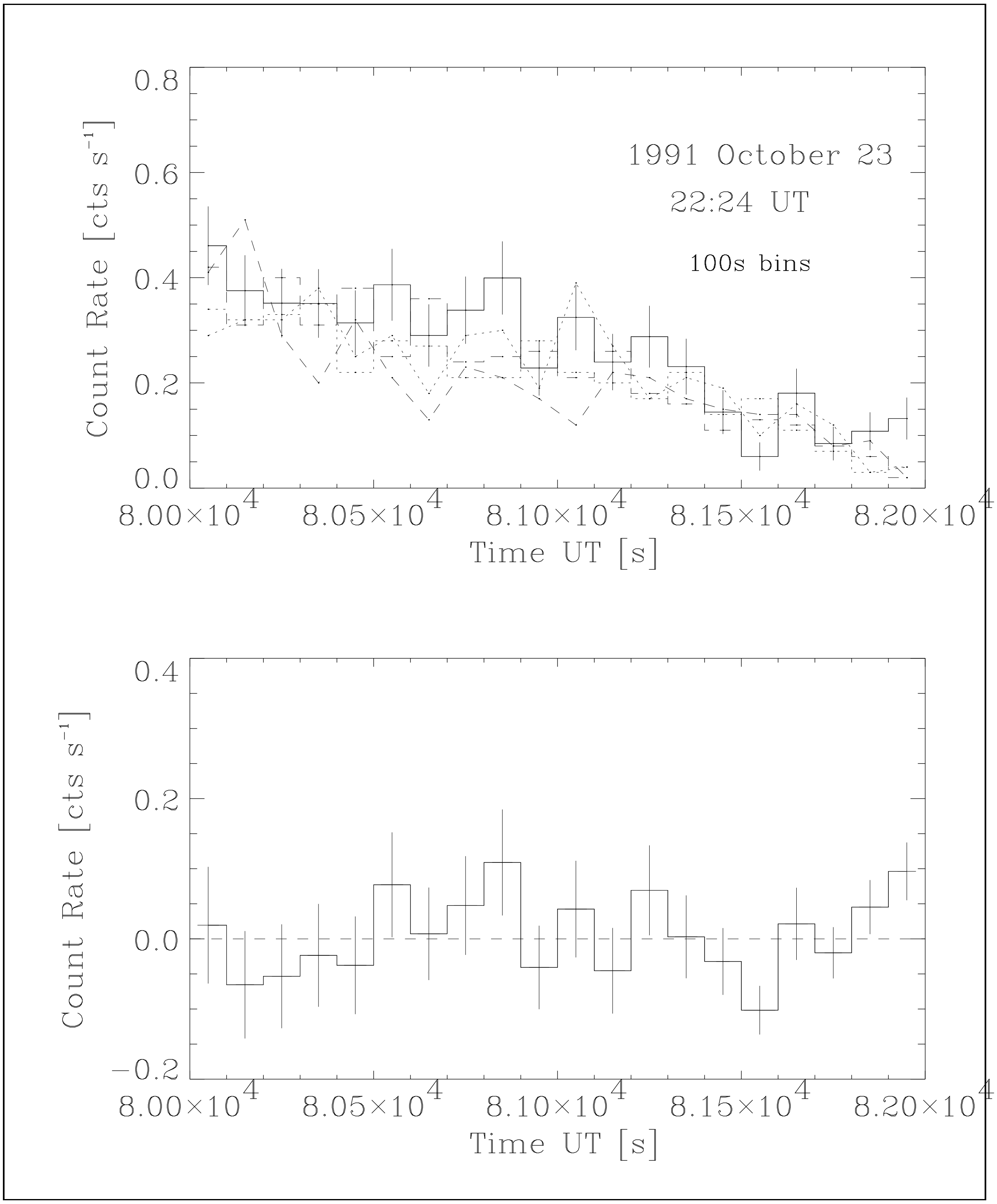
• Plot the statistics with respect to the rigidity to learn about the threshold sensitivity of telescope and HKD scalers.

• Correlations between the following measurements might allow a simple 'two-band spectroscopy' for flares:
— COMPTEL HKD scaler for Veto-1 rate: $E > 10keV$
— COMPTEL HKD scaler for combined D1 rate: $E > 70keV$
— COMPTEL HKD scaler for combined D2 rate: $E > 650keV$
— GOES total flux: $E > 1 - 12keV$
— BATSE total flux: $E > 25keV$

• Include other observation periods where the Sun is located within the FOV (June 1991, March1992 ...).

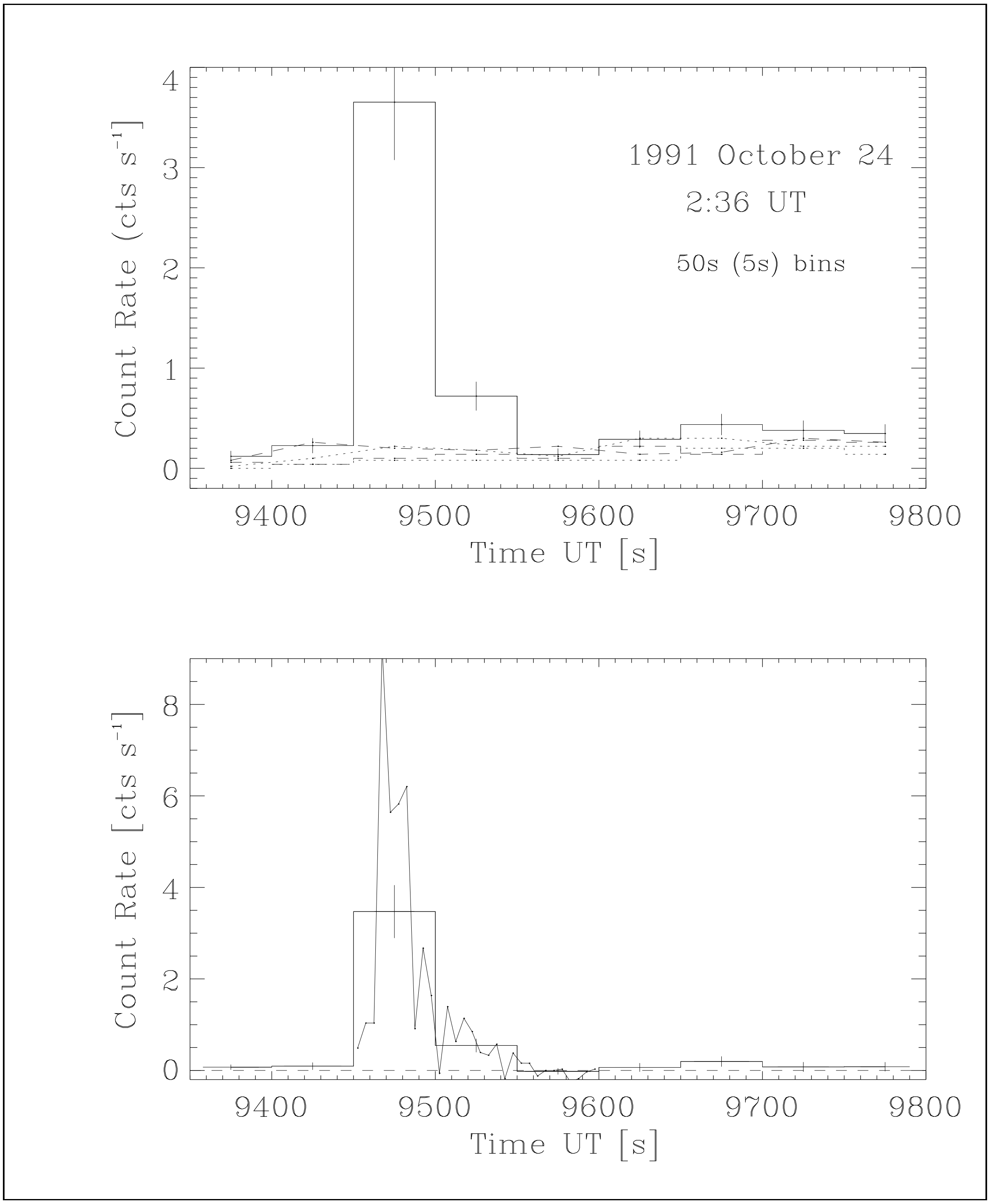
• For telescope events with sufficient significance: perform spectral and temporal analysis. Combine results of burst and telescope mode.

•All observed flares originate from the same AR and hence from a similar magnetic configuration. The study of variations in spectral hardness and temporal structure (short 1s bursts vs. 25min smoothly variing emission) is important for understanding of flare geometry.

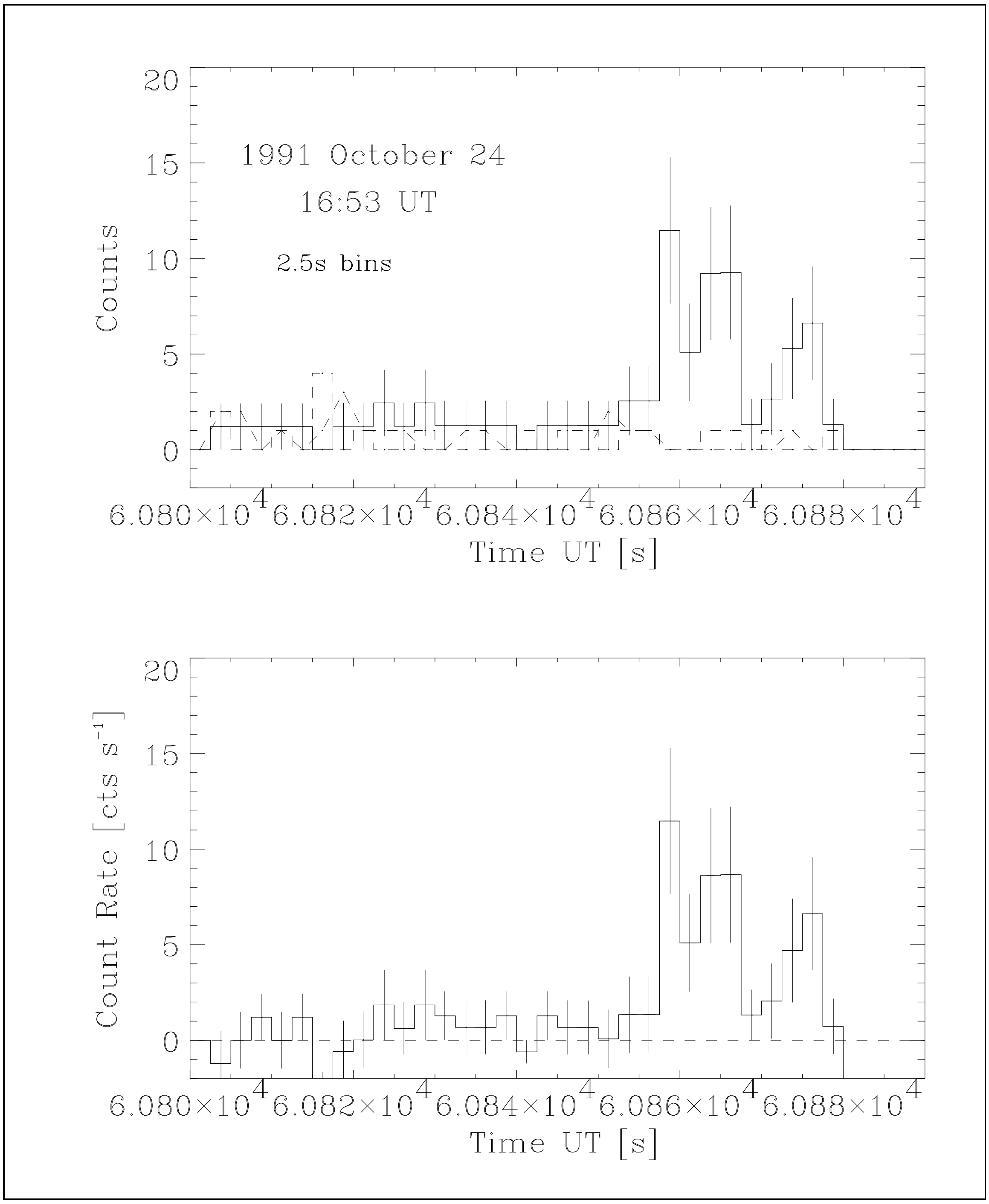


COMPTEL tel.: $\sim 2\sigma$

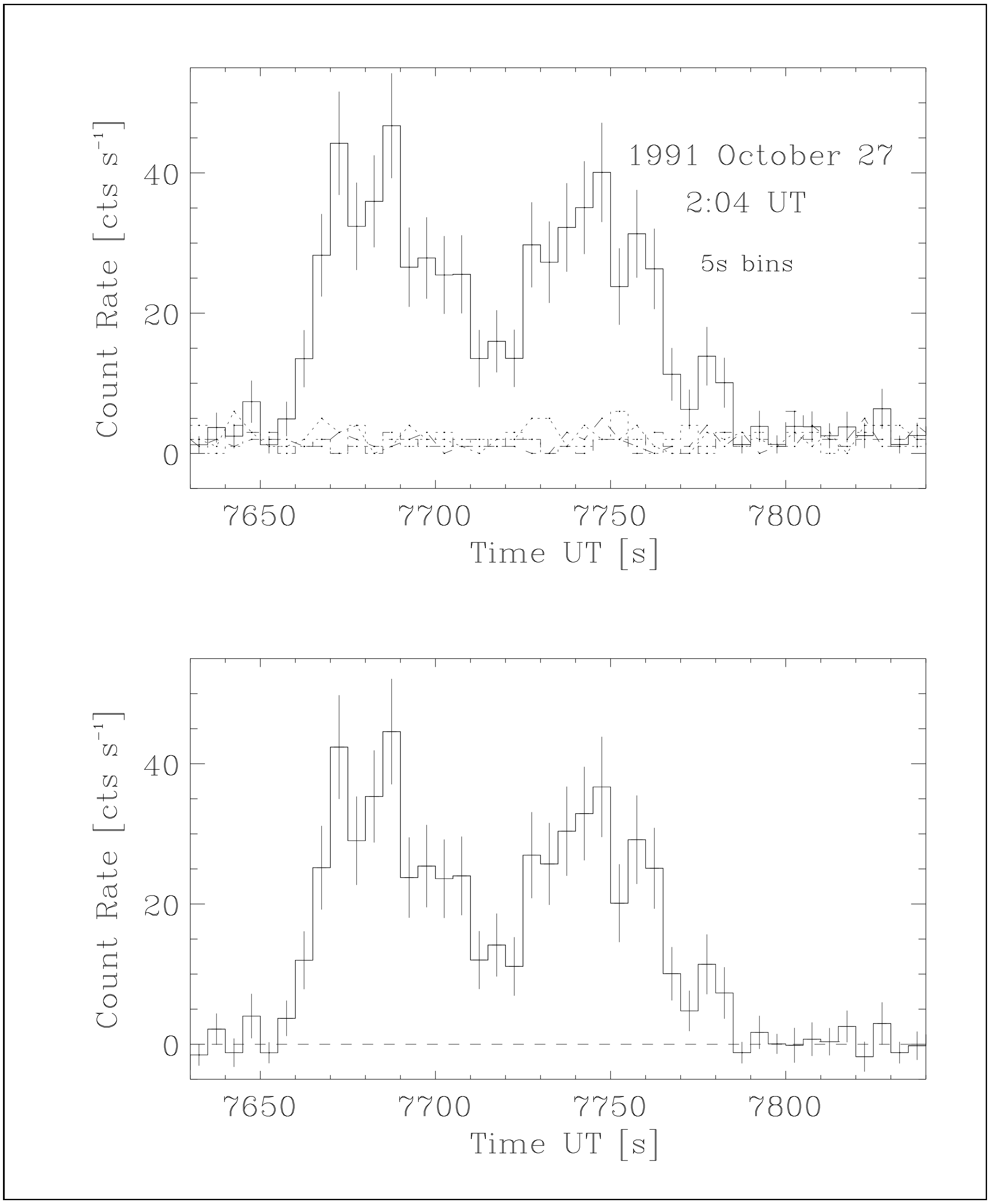
GOES C-flare; If COMPTEL signal is real, very hard spectrum required (resonable, as also large BATSE peak count rate measured).



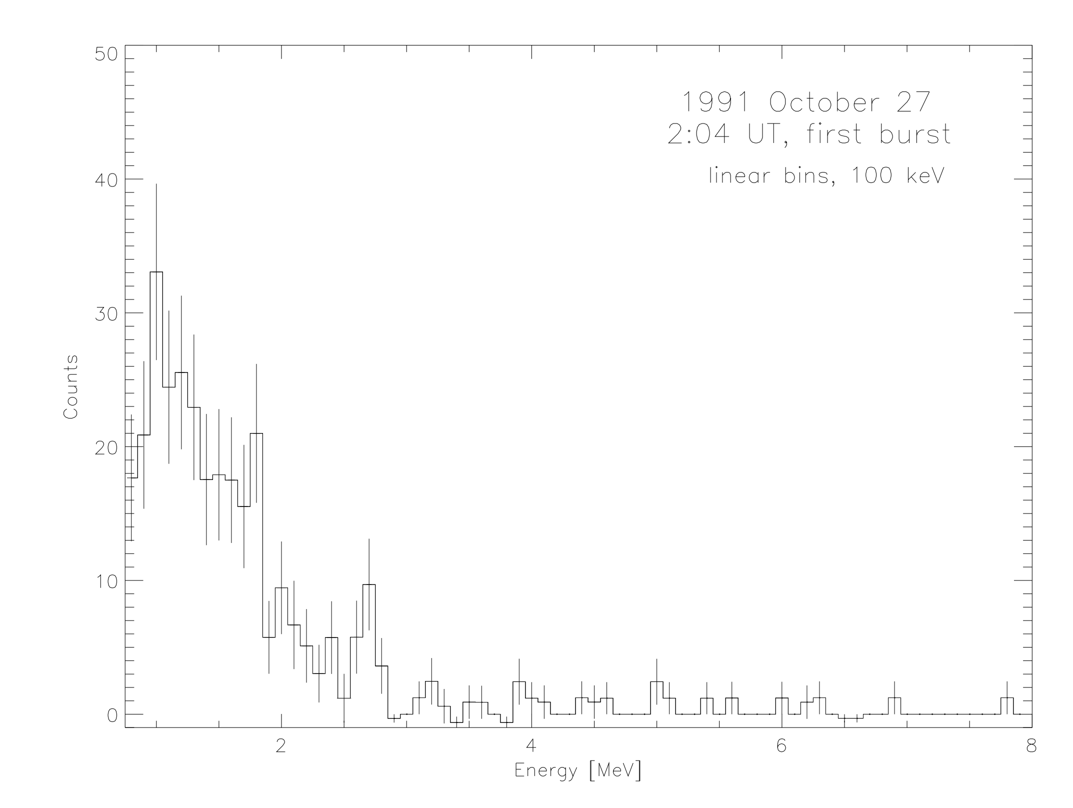
COMPTEL tel.: $\sim 7\sigma$ ($\sim$225$\pm$33 photons), average live time corr. = 3.3
GOES X2.1; also seen in COMPTEL burst mode.

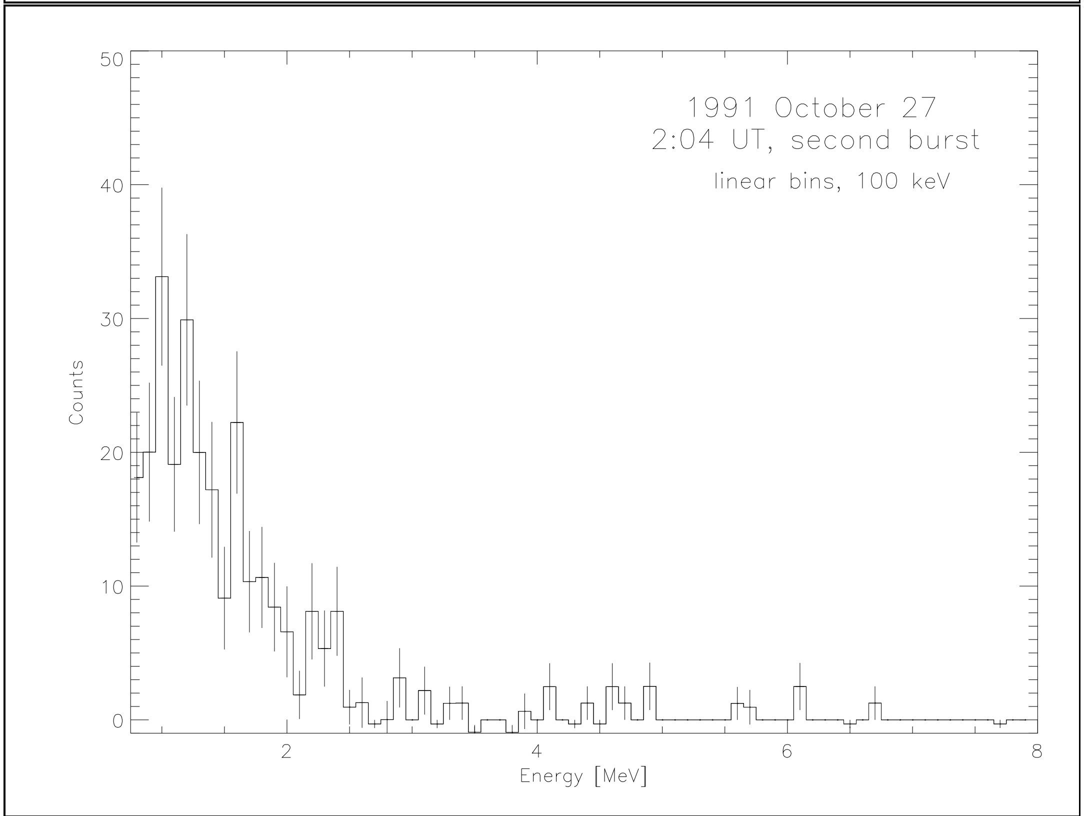


COMPTEL tel.: $\sim 6\sigma$ ($\sim$51$\pm$9 photons), average live time corr. = 1.3
GOES M3.2; end of COMPTEL event defined by SAA.



COMPTEL tel.: 20.5σ (584.6$\pm$28.4 photons), average live time corr. = 1.23
GOES X1.9; also seen in COMPTEL burst mode.


1991 October 27
2:04 UT, first burst
linear bins, 100 keV
Counts
Energy [MeV]
0
10
20
30
40
50
2
4
6
8


1991 October 27
2:04 UT, second burst
linear bins, 100 keV
Counts
Energy [MeV]
0
10
20
30
40
50
2
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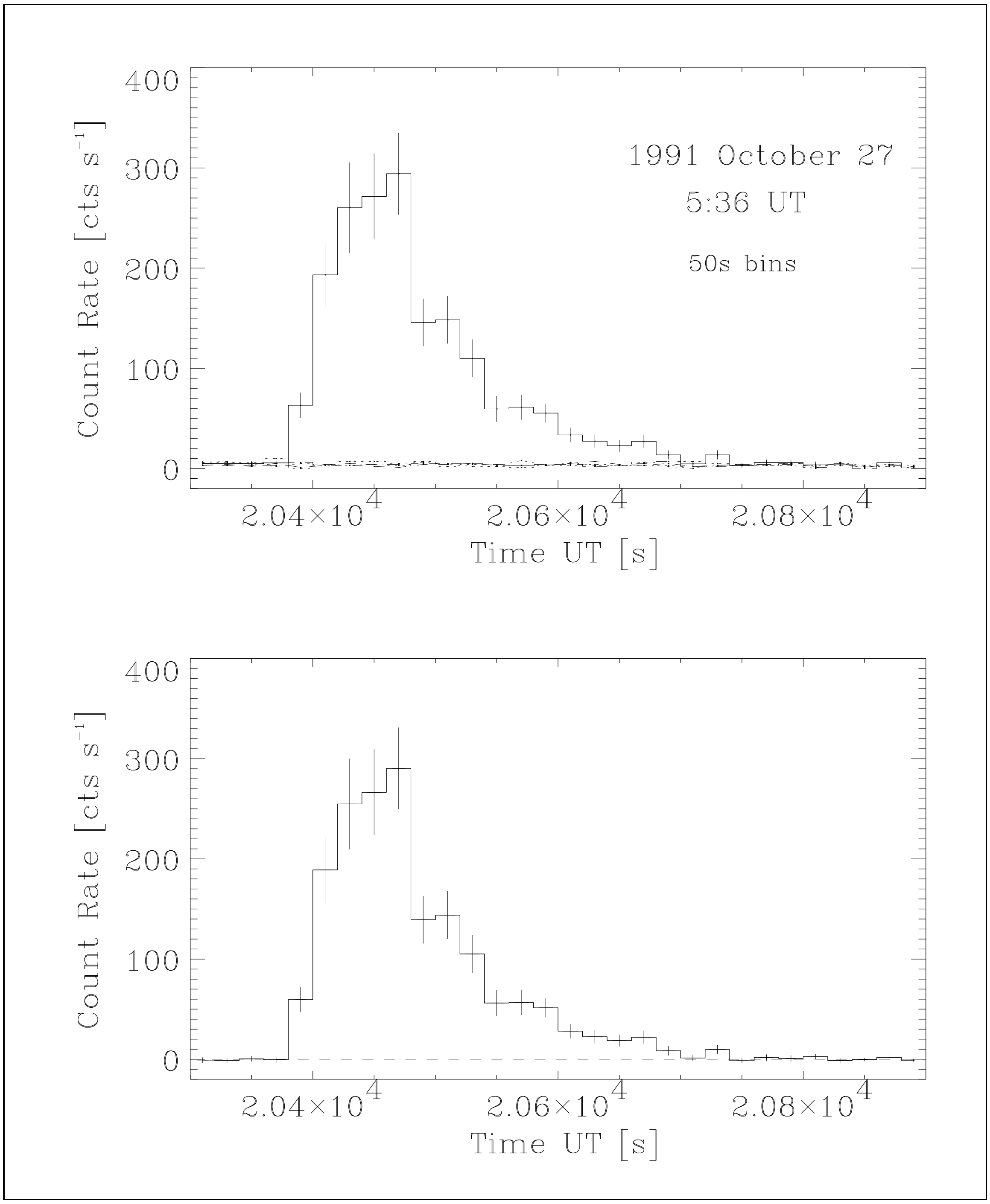
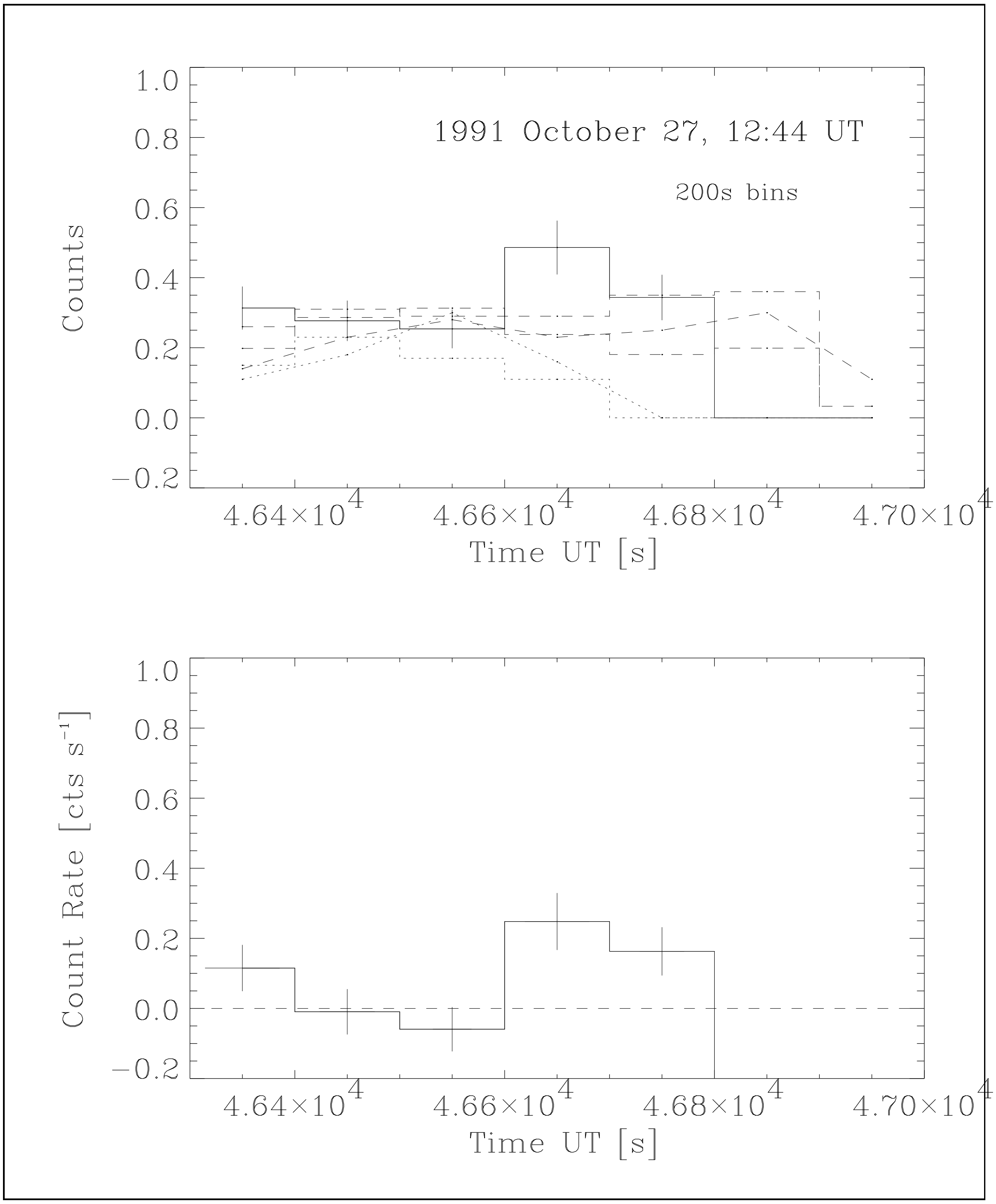
6
8

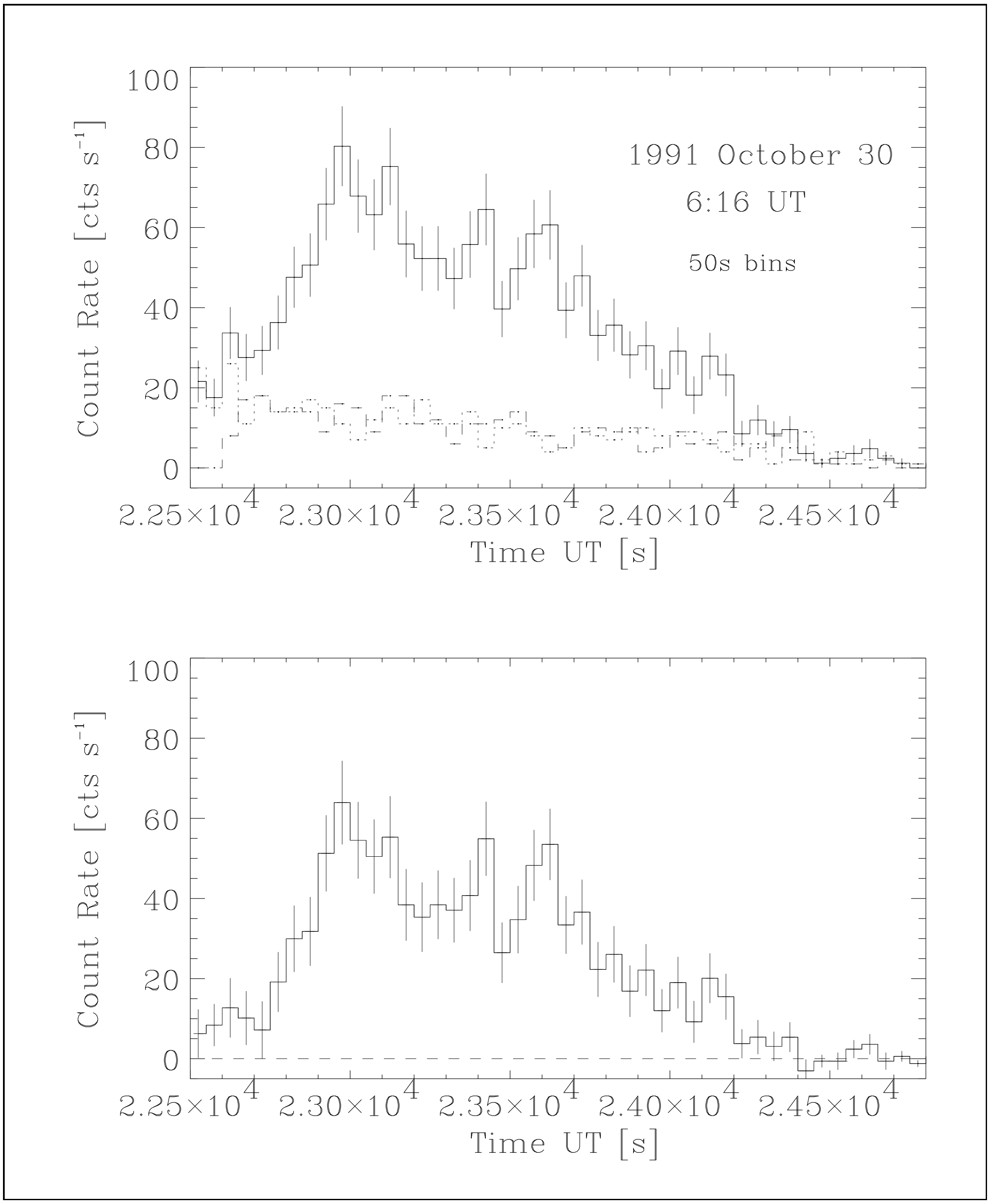


COMPTEL tel.: 20.3σ (1724.7$\pm$85.0 photons), average live time corr. = 3.84
GOES X6.1; also seen in COMPTEL burst mode.

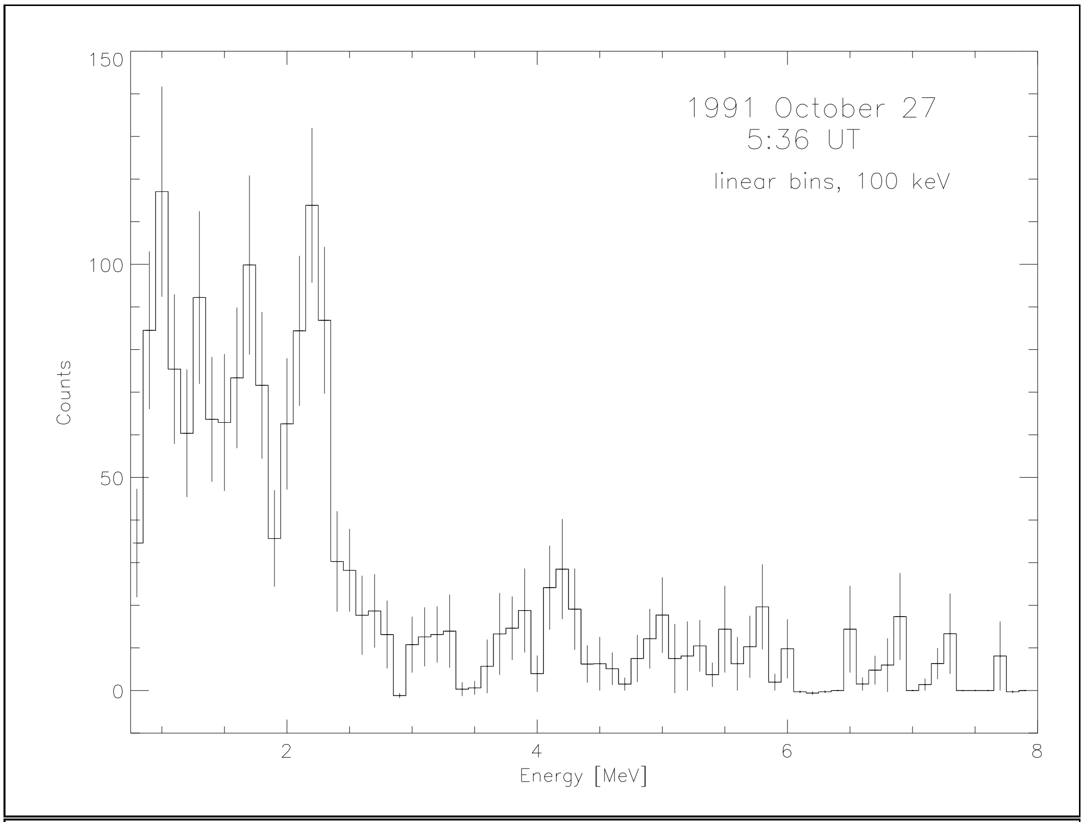


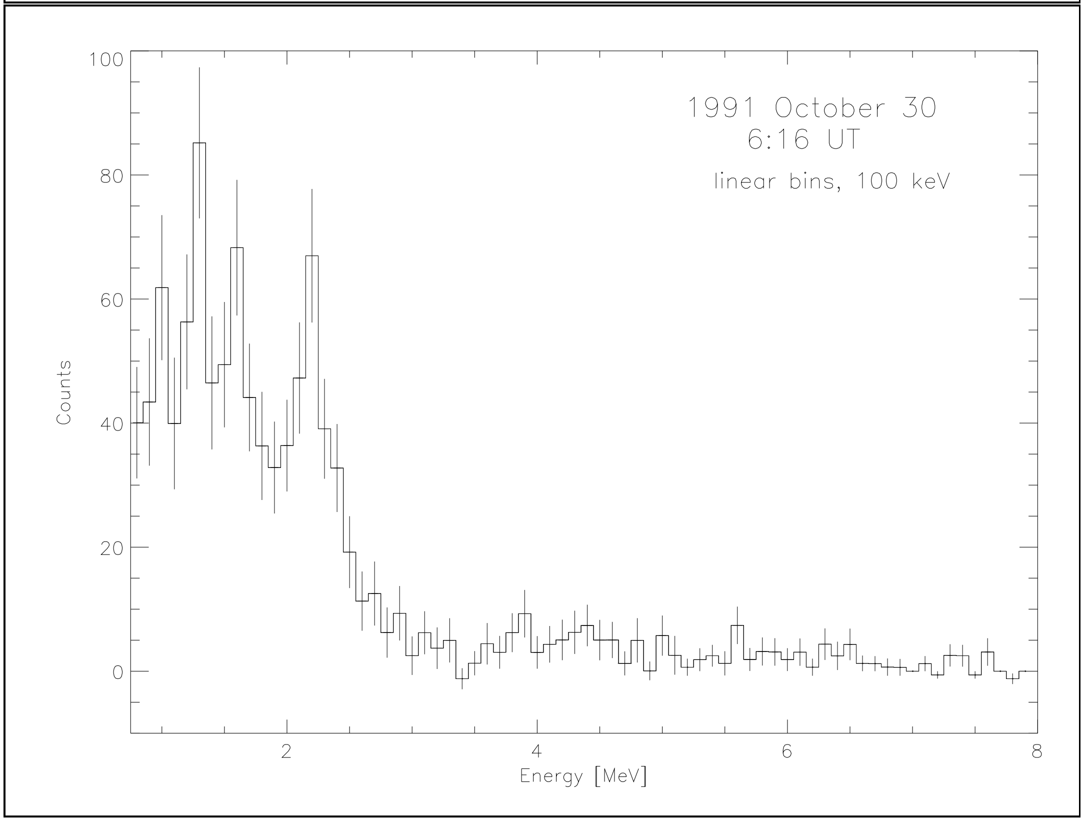
COMPTEL tel.: $\sim 3\sigma$

GOES M3.3; end of COMPTEL event defined by SAA.



COMPTEL tel.: 22.7σ (1021.4±45.0 photons), average live time corr. = 1.23
GOES X2.5.


1991 October 27
5:36 UT
linear bins, 100 keV
Counts
Energy [MeV]
150
100
50
0
2
4
6
8


1991 October 30
6:16 UT
linear bins, 100 keV
Counts
Energy [MeV]
100
80
60
40
20
0
2
4
6
8