

Sprite Balloon X-ray Event

This x-ray event was seen during the Brazil Sprite campaign in December 2002. It was unusual for several reasons: there was no nearby thunderstorm activity. Local thunderstorm activity had died off about a half hour earlier. More distant storms were still active, but they were out of range for x-rays. The source of x-rays is from above. A solar source is excluded as the event occurred on the night side. There were no cosmic γ -ray bursts at this time. Low L-shell precipitation is not excluded, nor is a magnetically conjugate source.

An x-ray event was seen in the upward viewing x-ray spectrometer (downgoing x-ray flux) near 1:06:52 UTC on 7Dec2002, while the balloon payload was located at latitude -22.58, longitude -45.68, and altitude 32.66 km. The downward viewing spectrometer detected no increase over background fluxes (see Figure 1). A downviewing flash sensor shows no IC or CG flashes for several seconds prior to the event; the optical signal is at its noise floor. The extremal values of 3 components of electric field amplitude (VLF frequency range) over 100 ms intervals are also shown. There are some weak sferic signals from distant sources, but nothing local. Table 1 shows the bracketing ground-based events seen by the Brazil network (BIN). These CG events can also be identified in the electric field data.

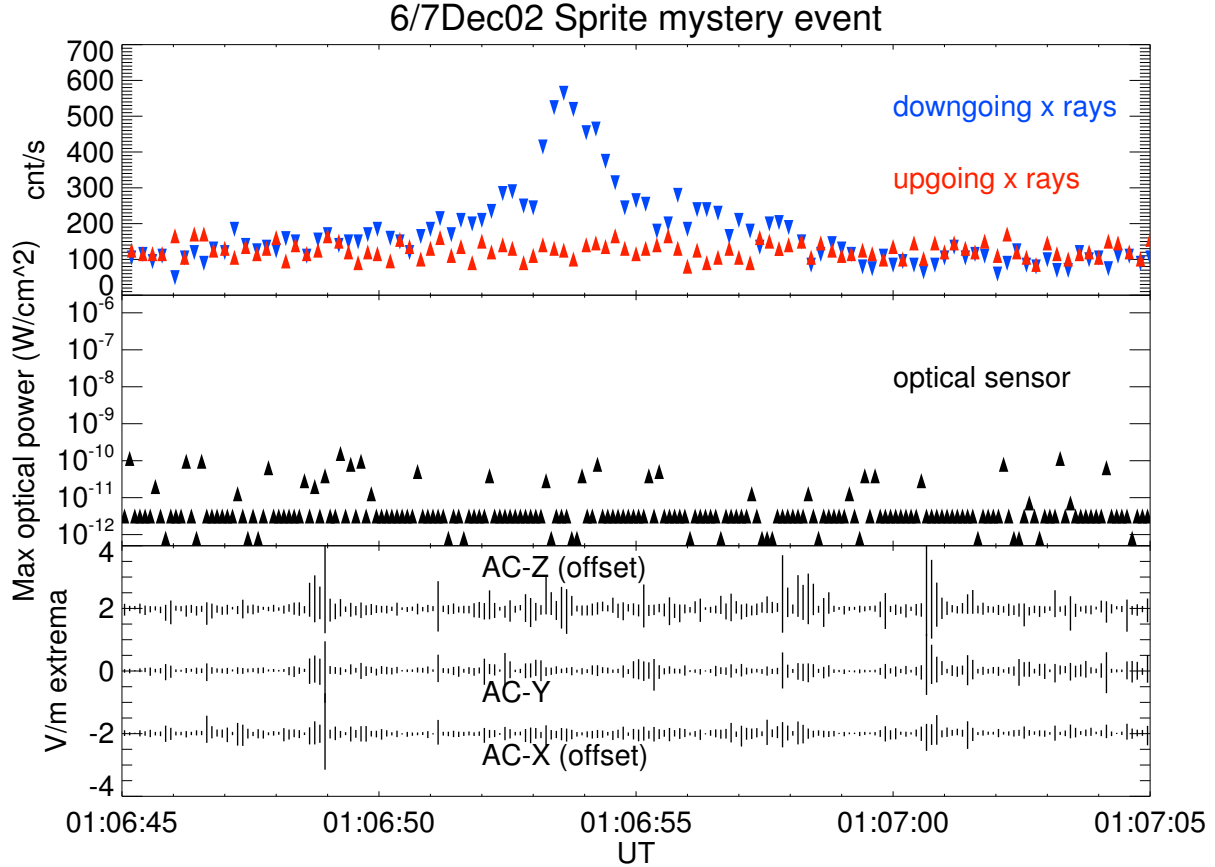


Figure 1 X-ray event showing absence of sferics, flashes

In order to study the x-ray event spectrum, a 3 second interval centered on the time of maximum flux was examined. This spectrum is plotted as light blue points in Figure 2. A background spectrum was accumulated for 10 minutes shortly before the x-ray event. This

spectrum is plotted as the dark blue points in Figure 2. The background feature on the far right is the 511 keV annihilation line. The difference between background and event is plotted as the black points, with 1-sigma error bars for the flux. The spectrum is not corrected for instrument or atmospheric absorption. The excess x-rays are below 100 keV energy.

UTC	Latitude	Longitude	I_{peak} (kA)
01:06:34.490657	-22.87	-50.23	-24
01:06:48.688561	-19.93	-48.20	-18
01:06:48.715132	-19.90	-48.20	-18
01:06:48.834189	-19.91	-48.20	-10
01:06:48.936459	-19.91	-48.20	-49
01:06:51.139573	-22.23	-51.14	23
01:06:57.861790	-16.60	-41.45	-26
01:06:57.873495	-24.09	-58.48	-79
01:07:00.877508	-23.74	-51.69	-27

Table 1 CG flashes in Brazil preceding the x-ray event

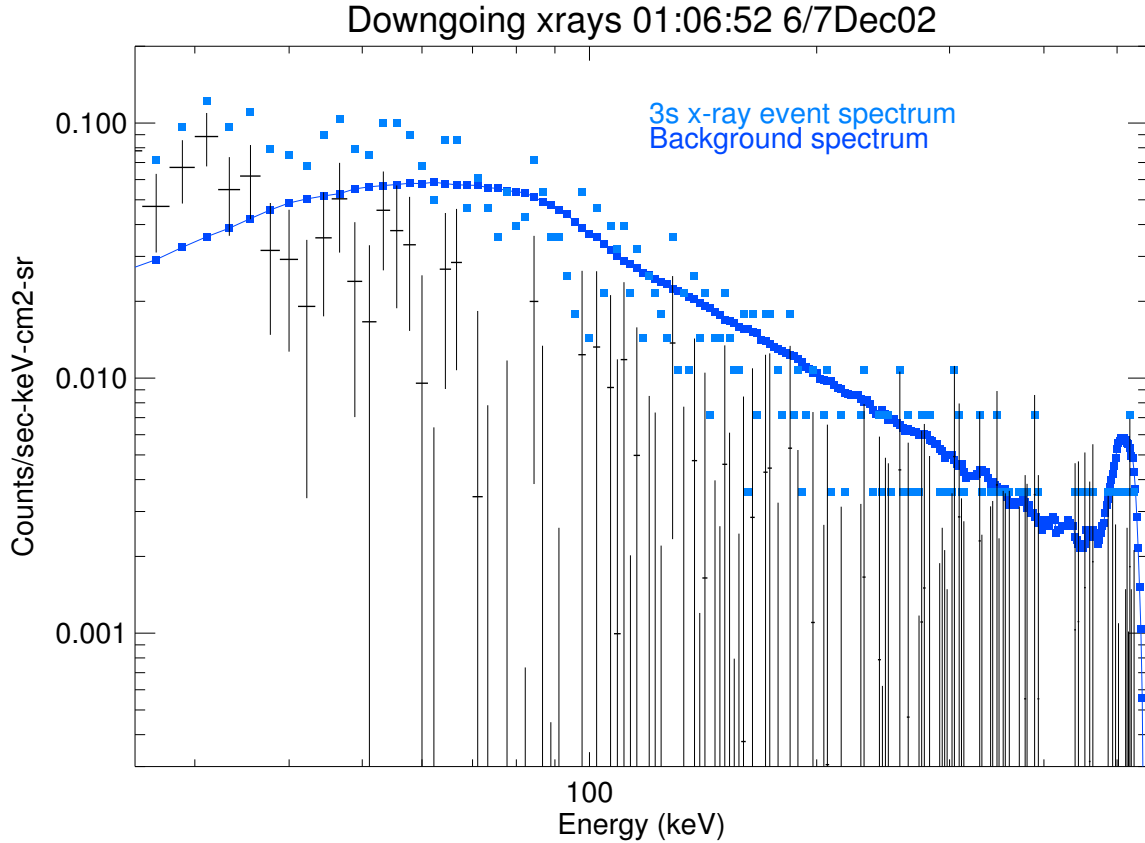


Figure 2 X-ray event spectrum