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## Variable Sources Summary

### **4u1822-37:**

Light curve is generally sinusoidal (because of the accretion disk) with an eclipse (from the companion star). Comparing colors between the high state and the low state doesn't show a significant difference. Calculated luminosities for the object are on the order of a solar luminosity, though this is questionable. Inclusion of the spectral "arms" in the energy spectrum seems to introduce an anomalous peak at  $\sim 2$  keV. Fitting a blackbody model to the higher energy part of the spectrum yields a "good" fit, but with a questionable temperature (144 keV). Difference in flux between high and low state is clear.

In this case, no color change indicates that the x-ray source is never completely blocked out by clouds, etc, as it might show absorption at lower energies.

### **Cyg X-1:**

Light curve is more random (not periodic, or observation shorter than one period?). Still, a general dimming, from accretion disk material blocking the source. Spectrum from zeroth order image in high or low state shows strange peaks at low energies. Fitting blackbody models to higher energies ( $>3.5$  keV) yields a temperature of 4.0 keV in the low state and 3.7 keV in the high state (bluer when dimmer). This is confirmed with the color analysis counts-in-region. Flux is  $\sim 50\%$  higher in the high state, and calculated luminosities are  $\sim 10$  solar luminosities, as a low estimate.

The two large dips are shown most easily in 500 second bins of the light curve. The sinusoidal variation seen at 10 seconds is due to the dithering of Chandra, to avoid having data always fall on a particular bad pixel. It is an instrumental effect and not something the source is intrinsically doing.

Color differences show the following:

Low flux state: 45% low energy, 38% medium, 14% high (percentage of total counts)

High flux state: 54% low energy, 32% medium, 11% high

Harder when dimmer, because large clouds which orbit CygX-1 absorb or scatter the low energy photons.

### **Burster GS 1826-238:**

Light curve is very periodic – relatively low background with a five-fold increase in flux for  $\sim 100$  seconds every 15000 seconds. During bursts, a blackbody model fits well to the zeroth order image with a temperature of 9.16 keV. Between bursts, the fit temperature drops to 5.65 keV. Comparing colors show that the object is clearly bluer during a burst and redder between bursts.

Color differences show the following:

Low state: 37% low energy, 39% medium, 15% high

High flux state: 26% low, 52% medium, 20% high (from combined times of ALL bursts, in order to include lots of counts)

In this case, the thermonuclear explosion during the bursts is hotter, so the blackbody spectrum shifts to higher energy.