Long-Term Variability of Galactic Black Holes

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We present the results of several year-long monitoring campaigns of the galactic black holes Cyg X-1, GX 339−4, and LMC X-3 with the Rossi X-ray Timing Explorer, focusing on the correlated changes of the spectral and temporal properties of these sources.

The study of the changes in the X-ray spectrum during state transitions between the canonical hard and soft states using several Comptonization models reveals the presence of a hysteretic region where the source spectrum is different depending on its previous history. During the hard state itself, a possible anticorrelation between the covering factor of cold material and the compactness of the putative Compton corona is observed.

During state transitions, the timing behavior of the sources changes dramatically. While the power spectral density during the hard state can be well described as the sum of four broad Lorentzian components, two of these components dominate during the spectral transitions. Increased time lags in the frequency band of these Lorentzians are indicative of an increase of the size of the region producing the observed radiation. Since state changes are also associated with ejection events observed in the radio, we speculate on a possible relationship between the mechanisms responsible for the production of the X-rays and the radio emission.