

Characterizing the Energy-dependent Temporal Variability of MAXI J1803-298 with AstroSat and NICER

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Abstract

Using the excellent temporal resolution of AstroSat/LAXPC and NICER, we performed a detailed temporal and spectral analysis of the whole month observation of MAXI J1803-298 during its May 2021 outburst. The source evolves through the hard, intermediate, and soft spectral states during these observations. The spectra in all states can be well described by a combination of soft thermal emission from the accretion disk and hard Comptonized emission from the corona. Variations in the inner disk temperature and disk normalization suggest the movement of the truncated disk across these spectral states. We detect broad aperiodic features and identify both Type-C and Type-B quasi-periodic oscillations (QPOs) in the power density spectra corresponding to different states. Further, we employed a fluctuation propagation model to interpret the observed variability. Our study of the fractional rms and time lags reveals that the lags transition between positive and negative values as the outburst evolves. By modeling these features within a simplified framework that incorporates variations in accretion rate, heating rate, and inner disk radius, along with time delays between them, we find evidence for a dynamic reversal in the origin of variability between the corona and the disk.

Keywords: MAXI J1803-298, X-ray binaries, Accretion disks, Quasi-periodic oscillations (QPOs)
