Probing the fast dynamics of disc-jet connection in GX 339-4 with the internal shock model.

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Abstract

The emission of compact jets in the hard state of X-ray binaries (XRBs) could be powered by internal shocks caused by fluctuations of the outflow velocity. Those fluctuations are likely to originate in the accretion flow. Indeed, accretion flows in XRBs are strongly variable and this variability can be traced by their X-ray light curves. The response of the synchrotron jet can be observed with radio and IR measurements. Under the assumption that the power-spectrum of the jet fluctuations is identical to that of the observed X-ray light curve, we use the internal shock model ishem to calculate the predictions of the model and compare to spectral and timing data from GX339-4. The model provides a good description of the observed radio optical SEDs. We also show that the quenching of the jet in the soft state might be related to the drop in X-ray variability: the jet could be present but undetected due to a very low radiative efficiency associated to very weak velocity fluctuations. The model also predicts a strong, wavelength dependent jet variability that resembles the observed one. In particular, strong sub-second variability is predicted in the infrared and optical bands. Complex timing correlations are observed between the IR and the X-rays. We use it to probe the fast dynamics of the accretion/ejection connection. In this source also low frequency QPOs have been detected simultaneously in X-ray and IR. The IR QPO could be caused by jet precession driven by Lense-Thirring precession of the X-ray accretion flow.

Keywords: jets, shocks, timing, synchrotron, non, thermal radiation

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