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The long outburst of the black hole transient GRS 1716-249

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The spectral states of the Black Hole Binaries (BHBs) are characterised by different X/γ-ray luminosities, spectral shapes and timing properties over their outburst. The dominant hard X-ray component observed in the hard state spectrum is usually described by a cut-off power law and it is interpreted as thermal Comptonization.
We present the the spectral and timing analysis of X/γ-ray observations of the black hole transient GRS 1716-249 performed during the 2016-2017 outburst.
GRS 1716-249 increases the number of black hole transients showing outbursts with "failed" state transition. The XRT and BAT broad band spectra modeling with a thermal Comptonization plus a multi-color disk blackbody, showed spectral parameters characteristic of the HS-HIMS in agreement with the evolution of the root mean square amplitude of the flux variability. We find that, coherently with a scenario in which the disc moves closer to the compact object, the accretion disc could have reached the ISCO during the HIMS or the hot accretion flow might have re-condensated in an inner mini-disc.
The advent of γ-ray telescopes allowed to observe an additional high energy excess above 200 keV, during either hard (HS) or hard/intermediate states (HIMS). This component is usually explained as a Comptonization process due to a non-thermal electron populations in the corona, but there is not a unique theory to explain it, yet.
We observed that the X/γ-ray broad band spectrum of GRS 1716-249 showed a high energy excess in addition to the thermal Comptonization model adopted when using XRT and BAT data only.
The parameters obtained by the X/γ-ray broad band modeling, with the physical hybrid thermal/non-thermal model, are typical of hard state spectra. Moreover, we fitted our data with the magnetized hybrid Comptonization model BELM. This provided us with an upper limit on the magnetic field intensity of about 10^6 G.
Finally, we present our study with the aim to possibly explain the high energy excess observed during the hard state as due to jets. We computed a Spectral Energy Distribution with Swift, INTEGRAL, ATCA and REM observations during the hard spectral state of the source. We modeled the accretion flow with an irradiated disc plus Comptonization model and the jet emission with the compact jet internal shock emission model (ISHEM). This model assumes that the fluctuations of the jet velocity are driven by the X-ray timing proprieties of the source. Our results show that a jet with an electron distribution of p=2.1 can explain the high energy tail observed.

Topic

Compact and diffuse sources in galaxies and in the Galactic Center

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