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Missing hard states and regular outbursts: the puzzling case of the BHC 4U 1630–472

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4U 1630–472 is a recurrent X-ray transient classified as a black hole candidate from its spectral and timing properties. One of the peculiarities of this source is the presence of regular outbursts with a recurrence period between 600 and 730 d that has been observed since the discovery of the source in 1969. We report on a comparative study, performed with INTEGRAL and RXTE, of the spectral and timing behaviour of four consecutive outbursts that occurred in 2006, 2008, 2010 and 2012.

We show that, in spite of having a very similar accretion disc evolution, these four outbursts exhibit totally different characteristics of the Compton electron corona, showing a softening in their evolution rarely observed before in a low-mass X-ray binary hosting a black hole.

We argue the possibility that the unknown perturbation that causes the outbursts to be equally spaced in time could be at the origin of this particular behaviour. We describe several possible scenarios that could explain the regularity of the outbursts, identifying the most plausible, such as a third body orbiting around the binary system.

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