

RT Crucis: A look into the X-ray emission of a peculiar symbiotic star

Ducci L., Doroshenko V., Suleimanov V., Nikołajuk M., Santangelo A., Ferrigno C.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016 ESO. Symbiotic stars are a heterogeneous class of interacting binaries. Among them, RT Cru has been classified as prototype of a subclass that is characterised by hard X-ray spectra that extend past ~ 20 keV. We analyse ~ 8.6 Ms of archival INTEGRAL data collected during the period 2003-2014, ~ 140 ks of Swift/XRT data, and a Suzaku observation of 39 ks, to study the spectral X-ray emission and investigate the nature of the compact object. Based on the 2MASS photometry, we estimate the distance to the source of 1.2-2.4 kpc. The X-ray spectrum obtained with Swift/XRT, JEM-X, IBIS/ISGRI, and Suzaku data is well fitted by a cooling flow model modified by an absorber that fully covers the source and two partially covering absorbers. Assuming that the hard X-ray emission of RT Cru originates from an optically thin boundary layer around a non-magnetic white dwarf, we estimated a mass of the white dwarf of $M_{WD} \approx 1.2 M_{\odot}$. The mass accretion rate obtained for this source might be too high for the optically thin boundary layer scenario. Therefore we investigate other plausible scenarios to model its hard X-ray emission. We show that, alternatively, the observed X-ray spectrum can be explained with the X-ray emission from the post-shock region above the polar caps of a magnetised white dwarf with mass $M_{WD} \approx 0.9-1.1 M_{\odot}$.

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Keywords

Stars: individual: IGR J12349-6434, Stars: individual: RT Cru, White dwarfs, X-rays: binaries