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X-ray detection of a nova in the fireball phase

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Novae are caused by runaway thermonuclear burning in the hydrogen-rich envelopes of accreting white dwarfs, which leads to a rapid expansion of the envelope and the ejection of most of its mass. Theory has predicted the existence of a ‘fireball’ phase following directly on from the runaway fusion, which should be observable as a short, bright and soft X-ray flash before the nova becomes visible in the optical. I report of the discovery of this X-ray flash in the classical Galactic nova YZ Reticuli. The fireball phase happened 11 hours before the source’s 9mag optical brightening. No X-ray source was detected 4h before and after the event, constraining the duration of the flash to shorter than 8h. In agreement with theoretical predictions, the source’s spectral shape is consistent with a black-body of 3.27×10^5 K (28.2 eV), or a white dwarf atmosphere, radiating at the Eddington luminosity, with a photosphere that is only slightly larger than a typical white dwarf. I discuss connections of novae to gamma and cosmic rays.

Summary

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