

M31N 2008-12a - The REMARKABLE RECURRENT NOVA in M31: PANCHROMATIC OBSERVATIONS of the 2015 ERUPTION

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Abstract

© 2016. The American Astronomical Society. All rights reserved. The Andromeda Galaxy recurrent nova M31N 2008-12a had been observed in eruption 10 times, including yearly eruptions from 2008 to 2014. With a measured recurrence period of $P_{rec} = 351 \pm 13$ days (we believe the true value to be half of this) and a white dwarf very close to the Chandrasekhar limit, M31N 2008-12a has become the leading pre-explosion supernova type Ia progenitor candidate. Following multi-wavelength follow-up observations of the 2013 and 2014 eruptions, we initiated a campaign to ensure early detection of the predicted 2015 eruption, which triggered ambitious ground- and space-based follow-up programs. In this paper we present the 2015 detection, visible to near-infrared photometry and visible spectroscopy, and ultraviolet and X-ray observations from the Swift observatory. The LCOGT 2 m (Hawaii) discovered the 2015 eruption, estimated to have commenced at August 28.28 \pm 0.12 UT. The 2013-2015 eruptions are remarkably similar at all wavelengths. New early spectroscopic observations reveal short-lived emission from material with velocities $\sim 13,000$ km s⁻¹, possibly collimated outflows. Photometric and spectroscopic observations of the eruption provide strong evidence supporting a red giant donor. An apparently stochastic variability during the early supersoft X-ray phase was comparable in amplitude and duration to past eruptions, but the 2013 and 2015 eruptions show evidence of a brief flux dip during this phase. The multi-eruption Swift/XRT spectra show tentative evidence of high-ionization emission lines above a high-temperature continuum. Following Henze et al. (2015a), the updated recurrence period based on all known eruptions is $P_{rec} = 174 \pm 10$ days, and we expect the next eruption of M31N 2008-12a to occur around 2016 mid-September.

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Keywords

galaxies: individual (M31), novae, cataclysmic variables, stars: individual (M31N 2008-12a),

ultraviolet: stars, X-rays: binaries