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Investigating thermal and non-thermal emission in novae

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A nova eruption occurs on the surface of a white dwarf following extensive accretion of material from a less evolved companion star. Their study provides an opportunity to understand the emission processes of expelled material and high-energy emitting shocks among others. Modelling radio observations as an expanding gas emitting free-free emission give insights to ejected mass, the velocity of the remnant and kinetic energy of the outburst. The environments surrounding novae in these models are assumed to be of low densities allowing the envelope to expand freely. However, novae surrounded by dense 'embedded' environments similar to recurrent novae, interaction with the ejecta gives rise to synchrotron emission which in some cases is the dominant emission. We present the case of nova V445 Puppis where the radio light curve is multi-peaked and dominated by synchrotron emission. We model the emission as arising from the interaction of nova ejecta with regions of enhanced densities (shells) in the circumstellar material to determine the amount of mass ejected and energy of the explosion. Most radio models assume the material to be spherical. However, imaging shows evidence of polar and equatorial flows in novae. We apply bipolar models to estimate the ejected mass of V339 Del outburst and compare with theoretical predictions.

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yes

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PhD

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