EXOSAT OBSERVATIONS OF X-RAYS FROM CLASSICAL NOVAE DURING OUTBURST STAGE

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ABSTRACT

The initial discovery of soft X-rays from Nova Muscae 1983 was followed by eight additional observations of the three brightest novae whose outburst stage coincided with the lifetime of *EXOSAT* satellite; namely three more observations of Nova Muscae 1983 , three observations of Nova Vulpeculae 1984 # 1 (PW Vul), and two observations of Nova Vulpeculae 1984 # 2 . Through these observations we sampled the soft X-ray light curve of classical novae from optical maximum to $\sim$ 900 days after. The observations seem best explained by the constant bolometric luminosity model of a hot white dwarf remnant. Although the measurements suffer from limited statistics, very broad energy bandpass, and incomplete sampling of any single nova, their constraints on the theories of nova outburst are significant. One constraint is that the lifetime of the white dwarf remnant in Nova Muscae 1983 is $\sim$ 2 to 3 years, which leads to the conclusion that the burned envelope mass M_{burn} should be of the order of $10^{-6}(\frac{10^{38}\mathrm{erg\ s}^{-1}}{L_{burn}})M_{\odot}$. The second constraint is that the maximum temperature, of the white dwarf remnant should approximately be within 200 000 K to 400 000 K. We estimate that a white dwarf remnant evolving like the central star of a planetary nebula, with core mass of 0.8 to 0.9 $M_{\odot}$, core luminosity of $\sim 2 \times 10^4$ $L_{\odot}$, and envelope mass of 10^{-6} $M_{\odot}$, can explain the general characteristics of the X-ray measurements for Nova Muscae 1983 . In order to have ≥ 1.1 $M_{\odot}$ core mass, estimated from the early observations of bolometric luminosity in the UV to infrared range, a wind with $\dot{M} \leq 5 \times 10^{-7}$ $M_{\odot}$ yr^{-1} appears to be necessary. The few observations of Nova Vulpeculae 1984 # 1 and Nova Vulpeculae 1984 # 2 , during the first year after outburst, give a risetime and intensity that is consistent with a constant bolometric luminosity model.

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