High-Resolution XMM-Newton X-ray spectra of V2491 Cyg probing different stages of evolution

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Exponential decline in optical not due to reduction of energy budget but owing to a shift of the spectral energy distribution from optical to UV and ultimately X-ray.
Constant Bolometric Luminosity phase

\[ L_{\text{bol}} = 10^{38} \text{ erg/s} \]

\( \gamma \), if any, only during early fireball phase

IR and radio from outer, thin plasma and companion, but not from the WD

optical \hspace{1cm} UV \hspace{1cm} X-ray

shrinking opacity of outer layers

\( T_{\text{eff}} = 6000 \text{ K} \)
\( R = 1.0 \times 10^8 \text{ km} \)

\( T_{\text{eff}} = 30000 \text{ K} \)
\( R = 4.2 \times 10^6 \text{ km} \)

\( T_{\text{eff}} = 300000 \text{ K} \)
\( R = 4.2 \times 10^4 \text{ km} \)
X-ray

Nova V2491 Cyg

XRT (Swift)

UV

$\lambda_0 = 1928 \, \text{Å}$

$\text{FWHM} = 657 \, \text{Å}$

Amateurs

optical

mag

log (count rate)

days after outburst (2008, Apr 10.70)

AAVSO
**XMM/RGS** (13.2 cps)

**XMM/RGS** (2.5 cps)

**SSS phase**

**Nova V2491 Cyg**

**Days after outburst (2008, Apr 10.70)**
High-amplitude variations in early light curve
What can we learn?
RS Oph:
Blackbody fit with IS absorption model by J. Wilms

But: Blackbodies are not physical models and can only be considered as parameterizations of the spectra

\[ T_{\text{eff}} = 5.8 \times 10^5 \text{K} \ (= 49.64 \text{ eV}) \]
\[ N_H = 3.48 \times 10^{21} \text{cm}^{-2} \]
\[ R_{\text{eff}} = 4.5 \times 10^4 \text{km} \]
\[ \log(L_{\text{bol}}) = 39.20 \]
\[ d = 1.6 \text{kpc} \]
Atmosphere models are physical models but the assumptions in this model (plane parallel and static) are quite far from the truth.
A good fit does not necessarily mean anything. Examples: Gaussian fit.
Or even: Blackbody to the light curve! Seems to fit, but doesn't mean anything!
dynamic atmosphere
- more realistic, but needs more work
Summary I

- Swift monitoring allows accurate scheduling of deeper exposures with Chandra/XMM-Newton
- The X-ray light curves show a surprisingly high degree of variability on long and short timescales
- The SSS spectra of V2491 Cyg and other novae in outburst contain complex details that will be difficult to model
- Atmosphere models must account for the expansion. Static hot WD models are not adequate, even if they fit the spectra