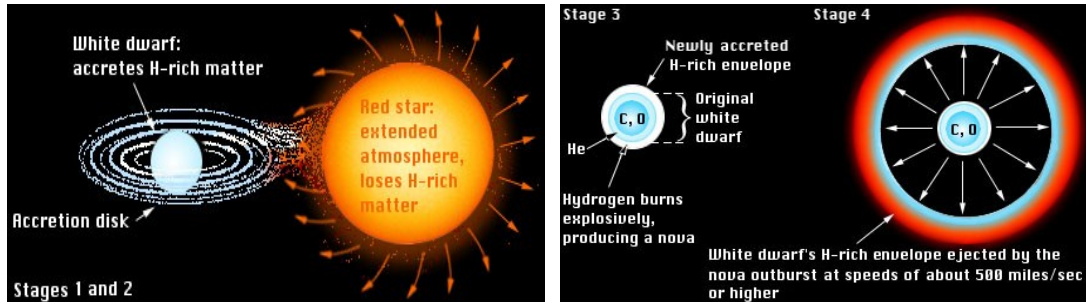


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Novae

Close binary systems where explosion occurs due to TNR on the WD which accretes matter from the companion star.



Significance of Novae :

- Used to measure distance in space, using MMRD relations.
- RNe are probable progenitor of type Ia supernovae.
- Probable source of significant isotopes, e.g. ^{22}Na , ^{26}Al .
- Form varieties of astrophysical dust (grain size 0.1 - 5 μm) and molecules (e.g. CO, CN, PAH)

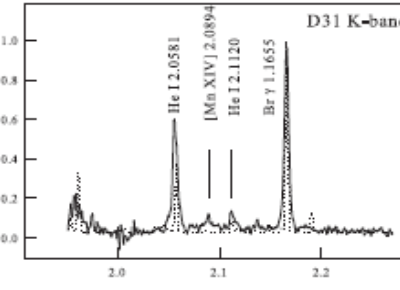
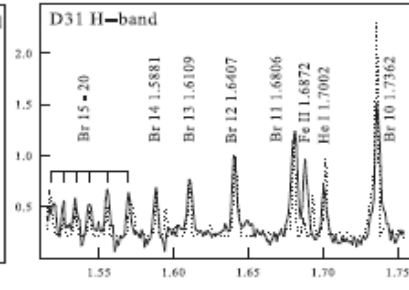
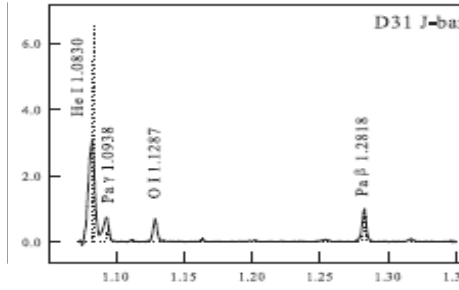
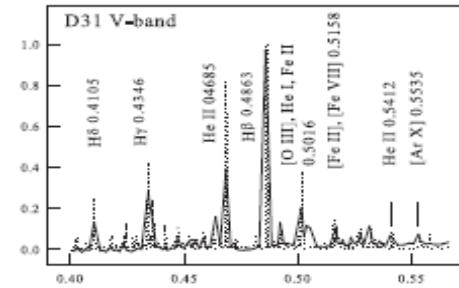
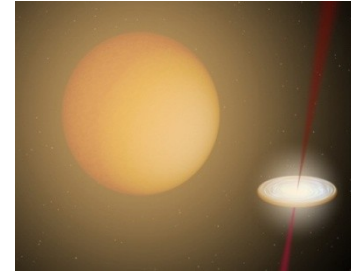
Few questions

- Formation of molecules and dust in 'unfriendly' environment.
- Photoionization process inside ejecta and evolution of spectra.
- Type of WD and progenitors of RNe.

Abundance analysis of the recurrent nova RS Oph (2006 outburst)

[Das & Mondal, 2015, *New Astronomy*, 39, 19-24]

Red Giant + White Dwarf,
Recurrence period ~ 22 y,
WD mass $\sim 1.35 M_{\odot}$,
Strong candidate for progenitor of Type Ia SNe.



Best-fit CLOUDY model parameters.

Parameters	D31	D49	Predicted abundances	N/N_{\odot}	O/O_{\odot}	Ne/Ne_{\odot}	Si/Si_{\odot}	Fe/Fe_{\odot}	Ar/Ar_{\odot}	Al/Al_{\odot}	Ejected mass ($\times 10^{-6} M_{\odot}$)	Number of observed lines (n)	Number of free parameters (n_p)	Degrees of freedom (ν)	Total χ^2	χ^2_{nd}
T_{eff} ($\times 10^5$ K)	5.8	5.5	...	...	12.0 (2)	...	...	...	...	...	3.4	42	11	31	38.0	1.2
Source luminosity ($\times 10^{36}$ erg s^{-1})	6.3	8.0	...	...	1.0 (1)	1.5 (1)	0.3 (1)	3.0 (12)	4.9 (1)	0.9 (1)	4.9	51	13	38	69.1	1.8
Clump hydrogen density ($\times 10^9$ cm $^{-3}$)	10.0	6.3	...	...	1.0 (1)	1.5 (1)	0.5 (1)	3.5 (11)	5.2 (2)	1.1 (1)	...	...	...	...	...	...
Diffuse hydrogen density ($\times 10^8$ cm $^{-3}$)	1.6	1.0	...	...	1.5 \pm 0.1	1.5 \pm 0.1	0.4 \pm 0.1	5.1 \pm 0.1	5.1 \pm 0.1	1.0 \pm 0.1	...	...	...	...	...	...
α^a	-3	-3	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Inner radius ($\times 10^{14}$ cm)	2.1	2.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Outer radius ($\times 10^{14}$ cm)	4.8	6.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Clump to diffuse covering factor	90/10	85/15	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Filling factor	0.1	0.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
β^b	0.0	0.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
He/He $_{\odot}^c$	1.8 (11)	1.9 (16)	1.8 \pm 0.1	...	...	...	...	...	...	...	...	...	...	...	...	...

The model could not produce a few lines e.g. Si II (0.5041, 0.5056 μm), O I (1.1287, 1.1364 μm), [Mn IV] (2.0894 μm)

Future plan: In-depth analysis of remaining spectra using Cloudy.