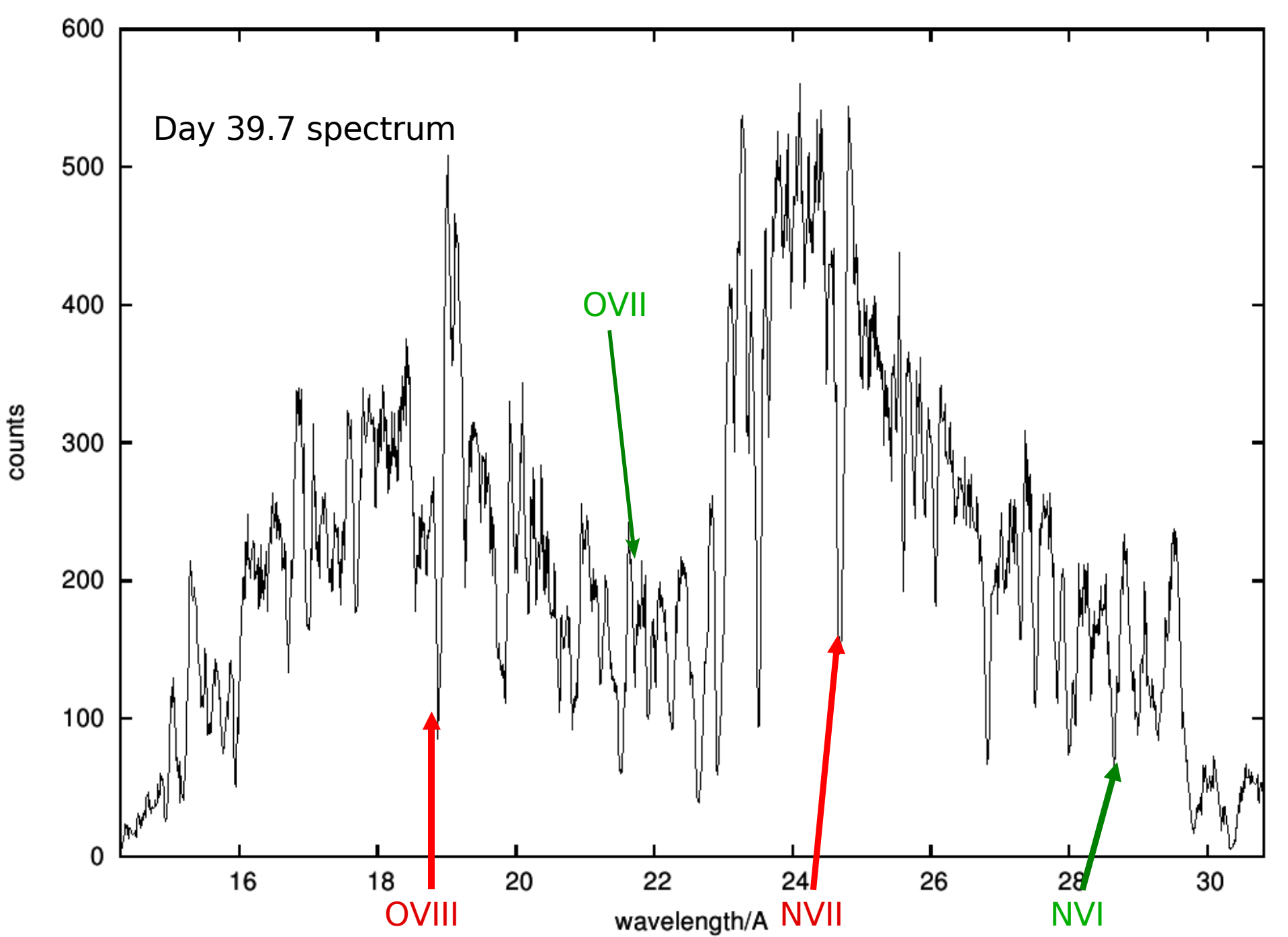
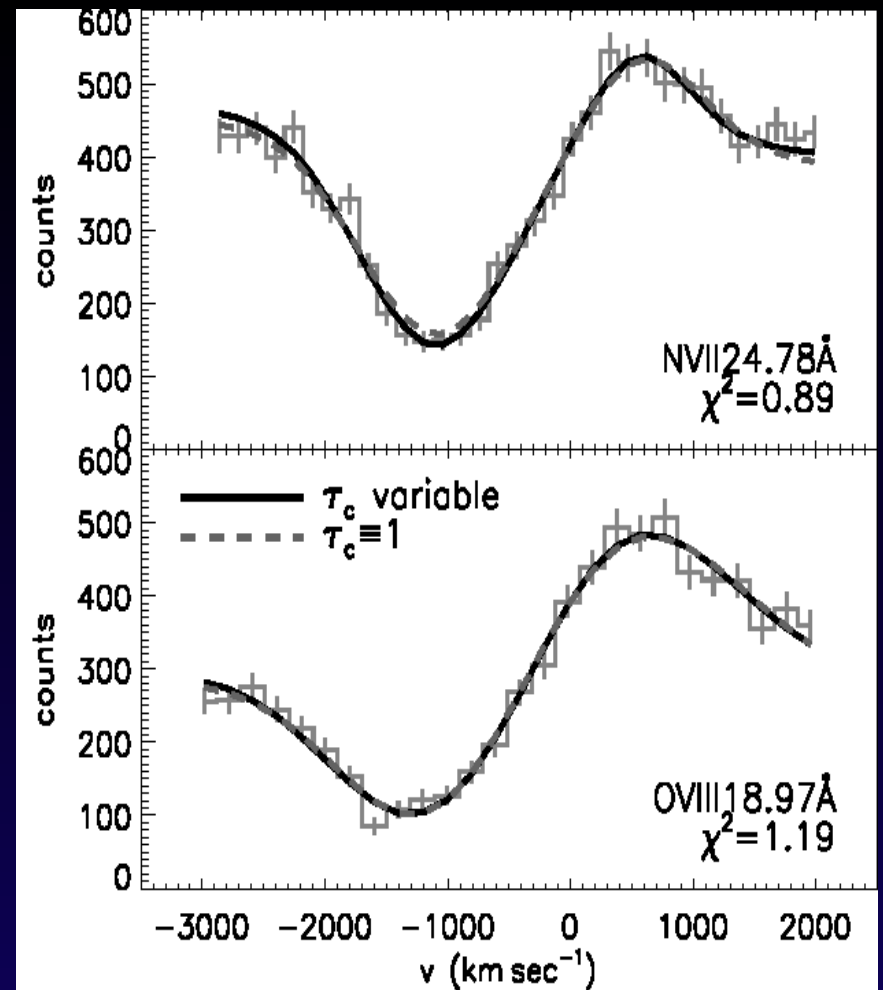
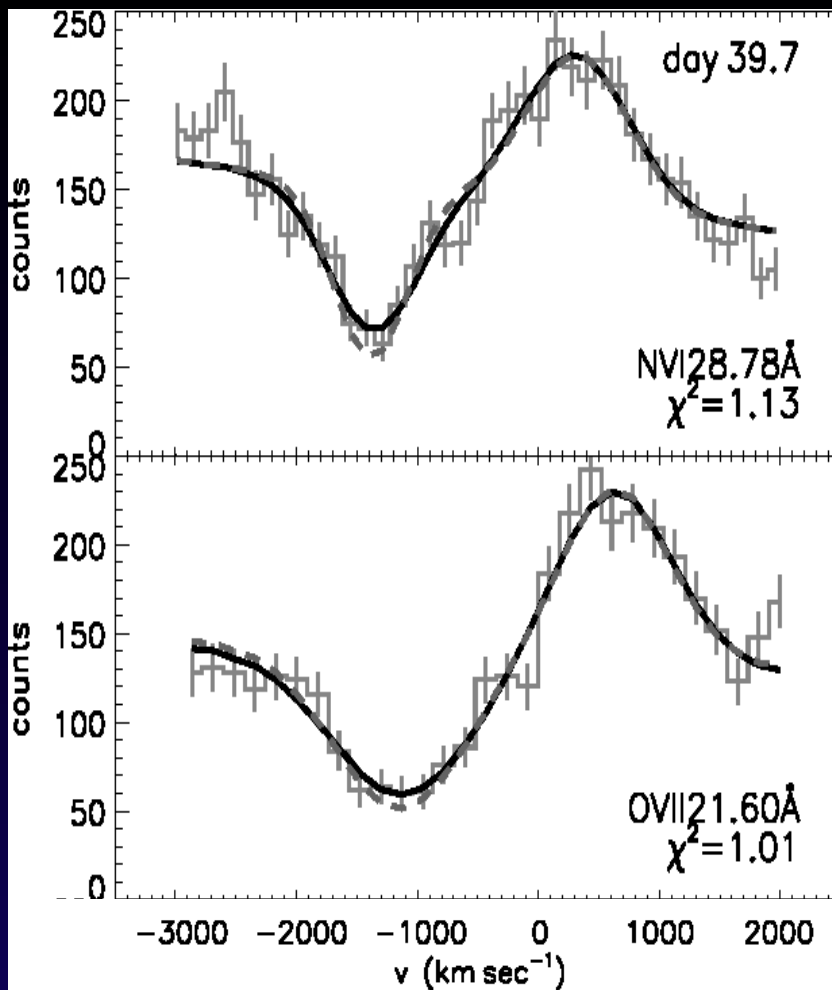


The background image shows a bright, multi-colored star (RS Oph) with a prominent blue-white core and a surrounding orange-red envelope. The star is set against a dark, star-filled space. The text is overlaid on the image in white.

X-ray emission and absorption lines during the SSS-phase of RS Oph

13 June 2007
Ralph Schönrich
USM Munich





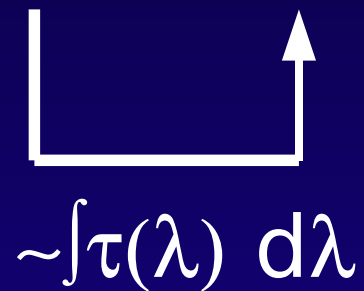
$$M(\lambda) = \left(C \cdot B_\lambda(T) + E \cdot G_e(\lambda, \lambda_e, \sigma_e) \right) \times \left\{ 1 - A \cdot G_a(\lambda, \lambda_a, \sigma_a) \right\} \times T_{st}(\lambda) T_{ism}(\lambda)$$

Results

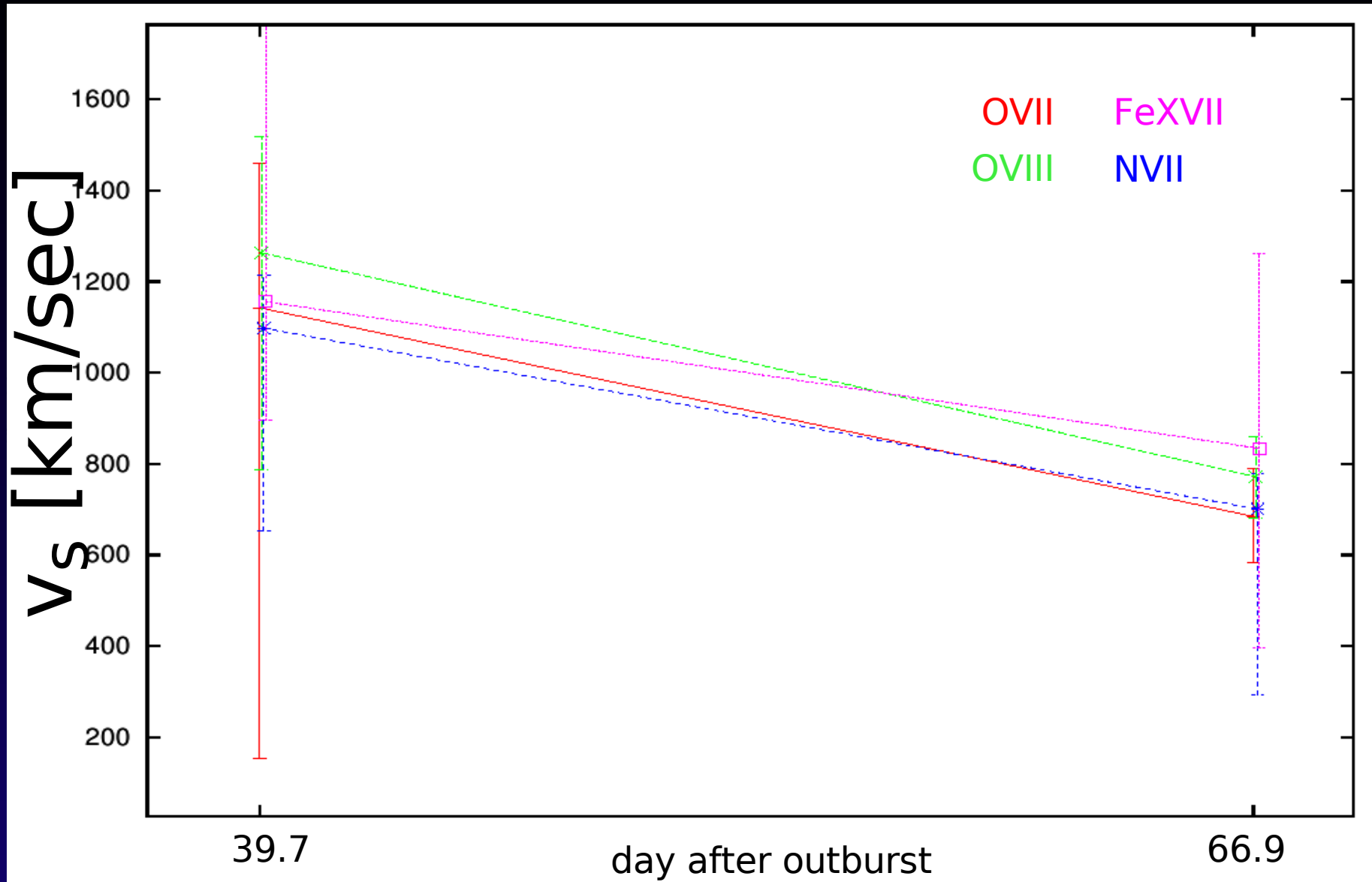
$$M(\lambda) = \left\{ C \cdot B_{\lambda}(T) + E \cdot G_e(\lambda, \lambda_e, \sigma_e) \right\} \times \left\{ 1 - A \cdot G_a(\lambda, \lambda_a, \sigma_a) \right\} \\ \times T_{st}(\lambda) T_{ism}(\lambda)$$

Parameters: E A $(\sigma, \lambda)_{e,a}$

Derived quantities: f_{ℓ} $v_{s,w}$ $\tau(\lambda_c)$ N_{χ}


$$\sim \int \tau(\lambda) d\lambda$$

absorption line velocities

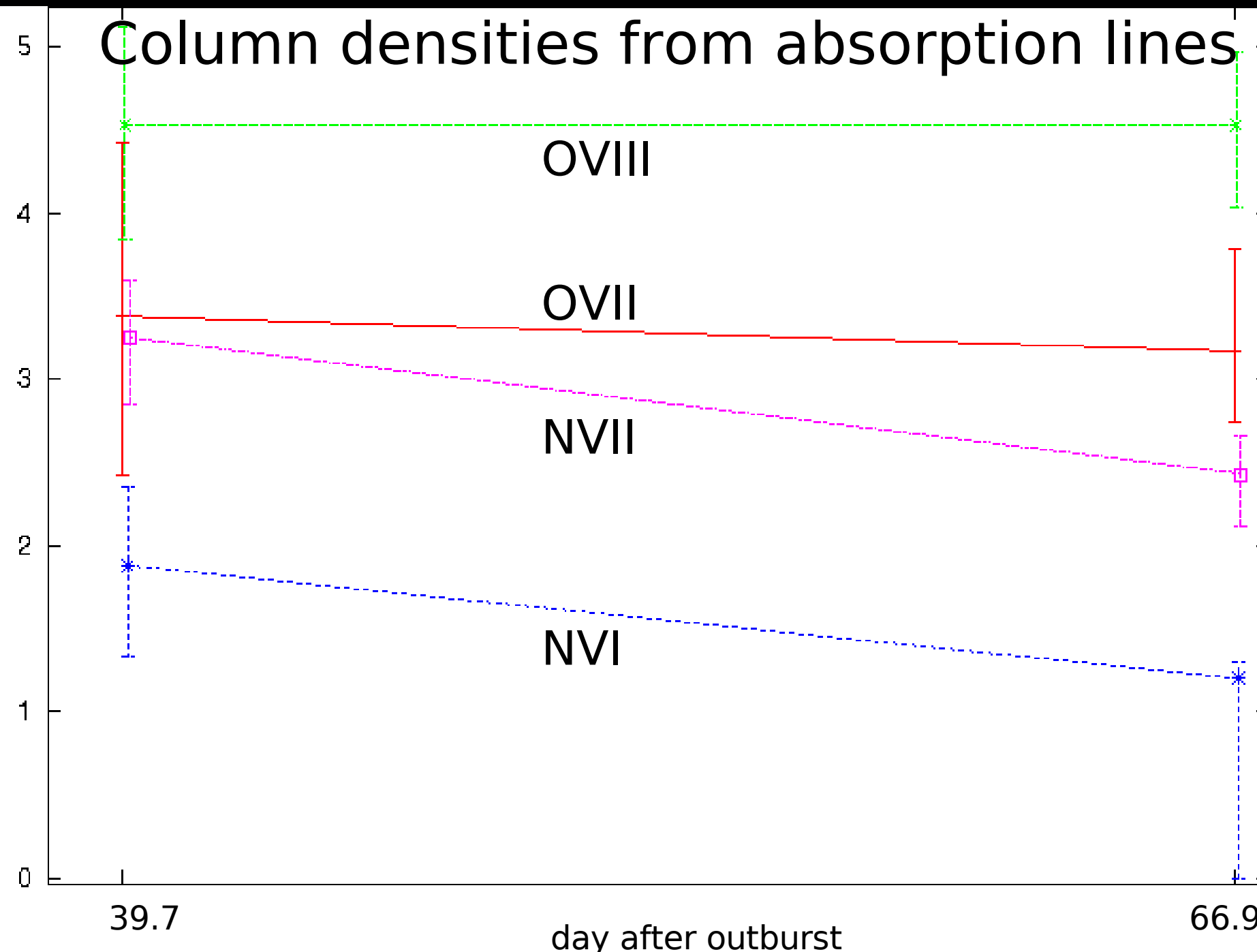


weighted averages: -1286 +/- 267 km/s on day 39.7

-771 +/- 65 km/s on day 66.9

Column densities from absorption lines

(column number density) * cm² / 10¹⁶ (-16)



OVIII

OVII

NVII

NVI

39.7

day after outburst

66.9

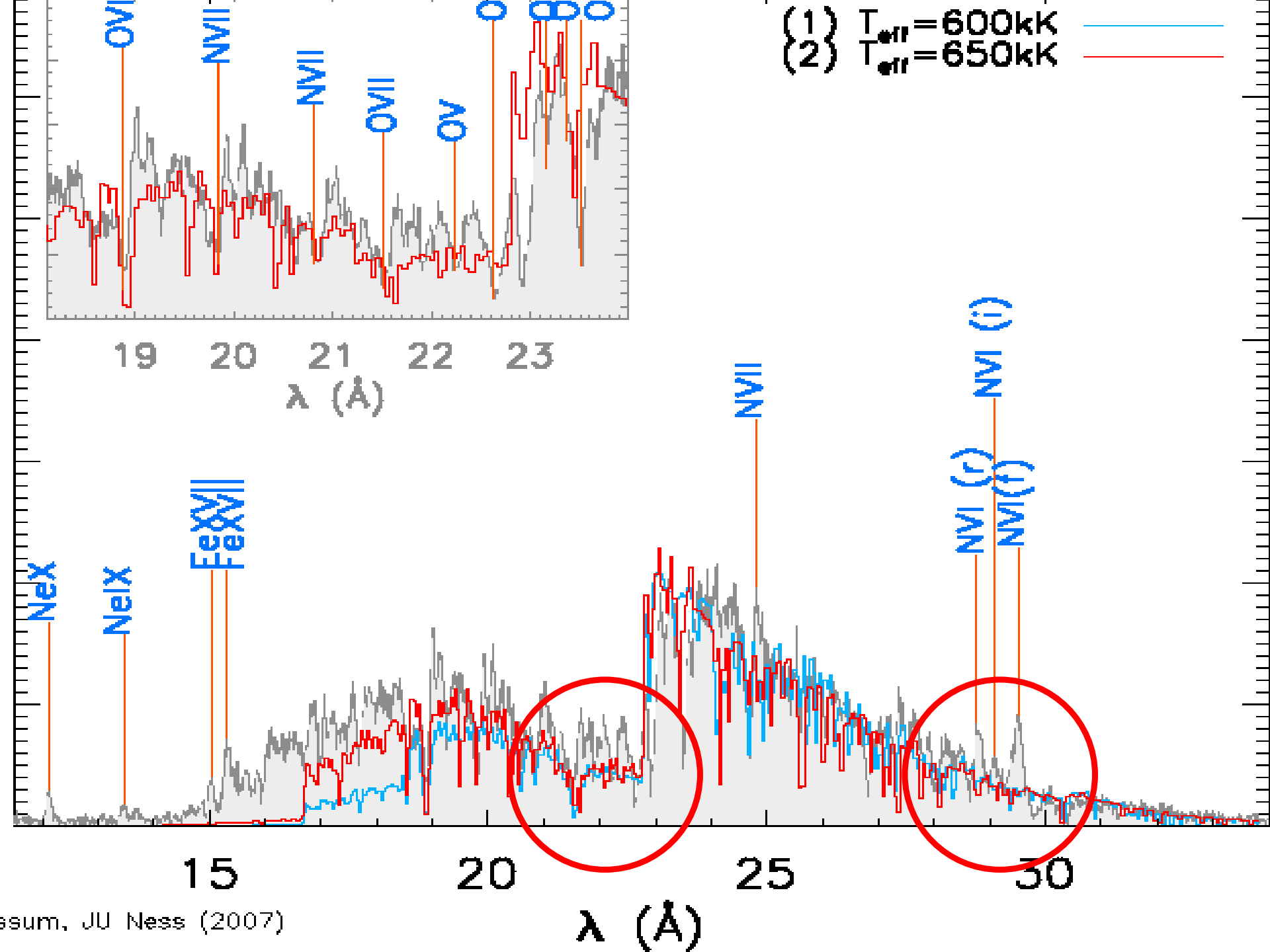
Column densities from absorption lines

Ratio of N_X of O to N lines yields elemental abundance:

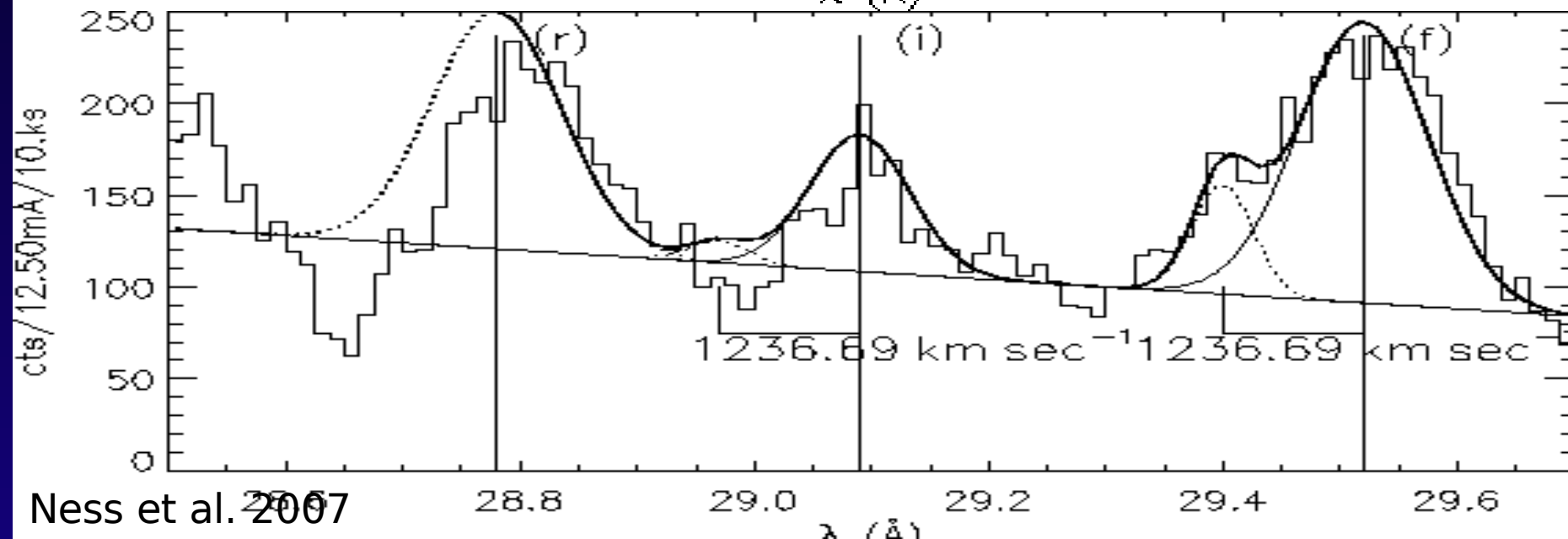
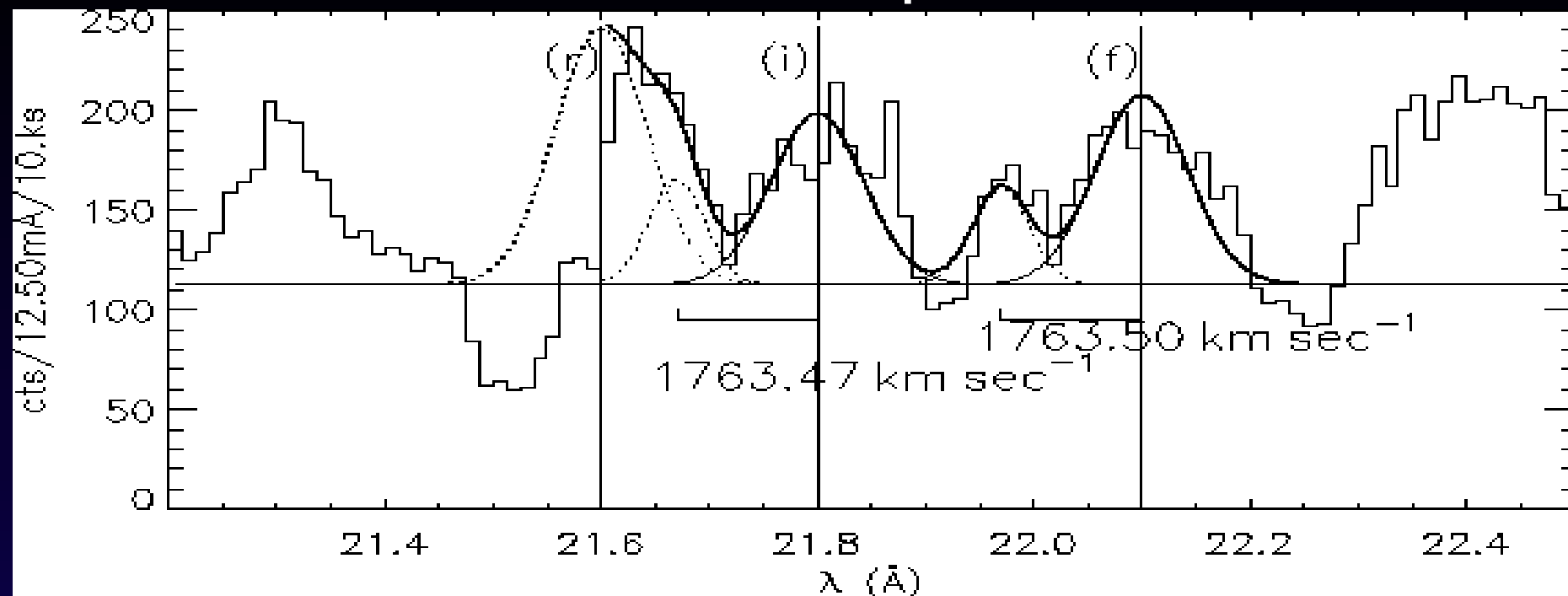
$$[O/N] \sim 0.2 \pm 0.3$$

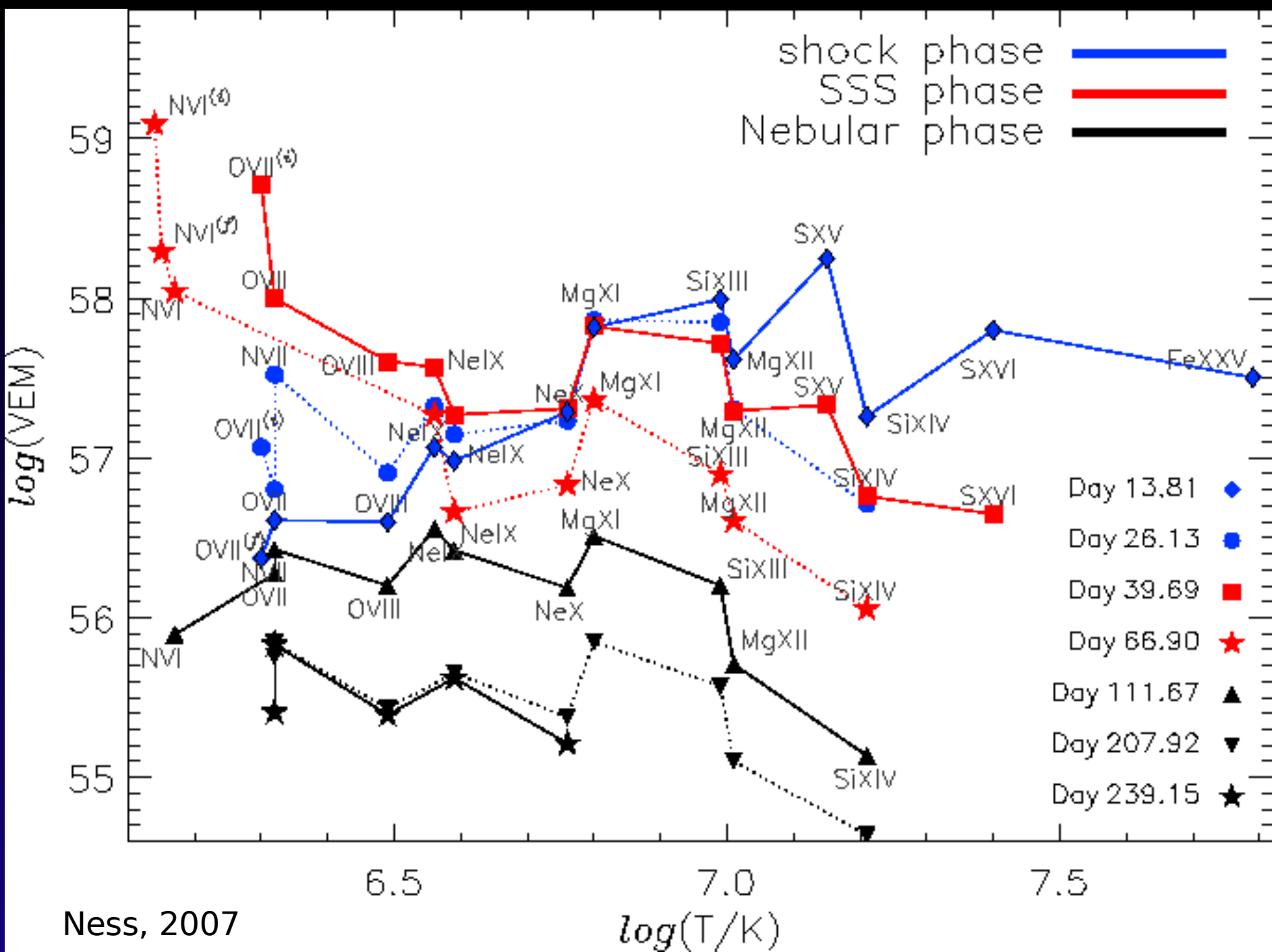
solar: $[O/N] = 0.90$ (Grevesse et al. 1996)

V1500 Cygni: $[O/N] \sim 0.18 \pm 0.2$
(Ferland & Shields 1978)

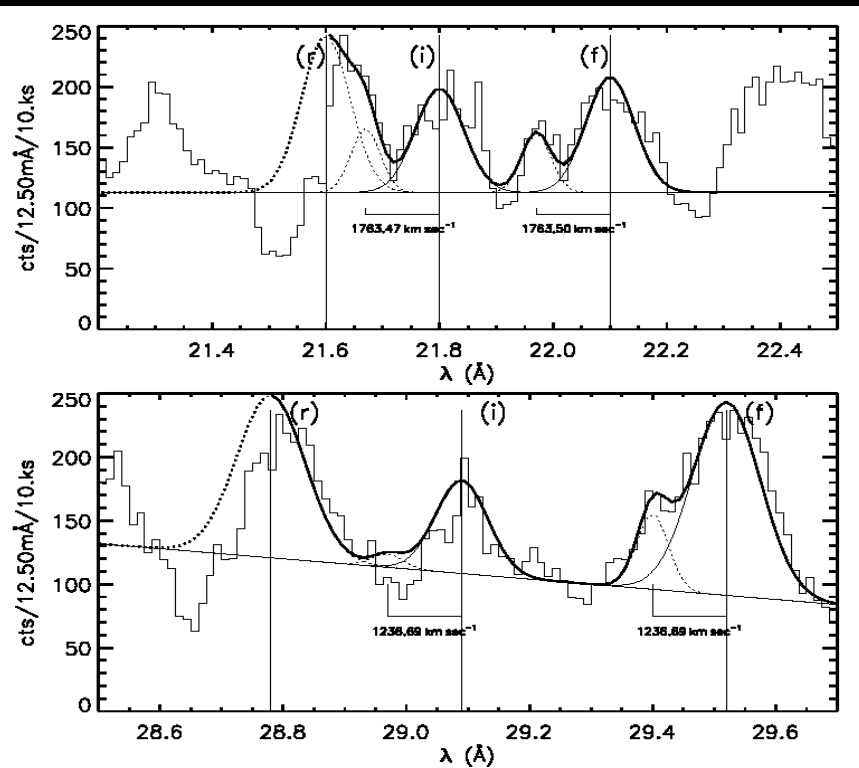


He-like triplets





He-like triplets



from Ness et al. 2007

f/i ratio (cf. Gabriel & Jordan 1969):

$$(f/i)_{\text{OVII}} = 1.1 \pm 0.1 \blacktriangleright \log(n_e) = 11.0$$

$$(f/i)_{\text{NVI}} = 2.8 \pm 0.2 \blacktriangleright \log(n_e) = 10.8$$

$$((f+i)/r)_{\text{OVII}} = 2.2 \pm 1.2 > 1$$

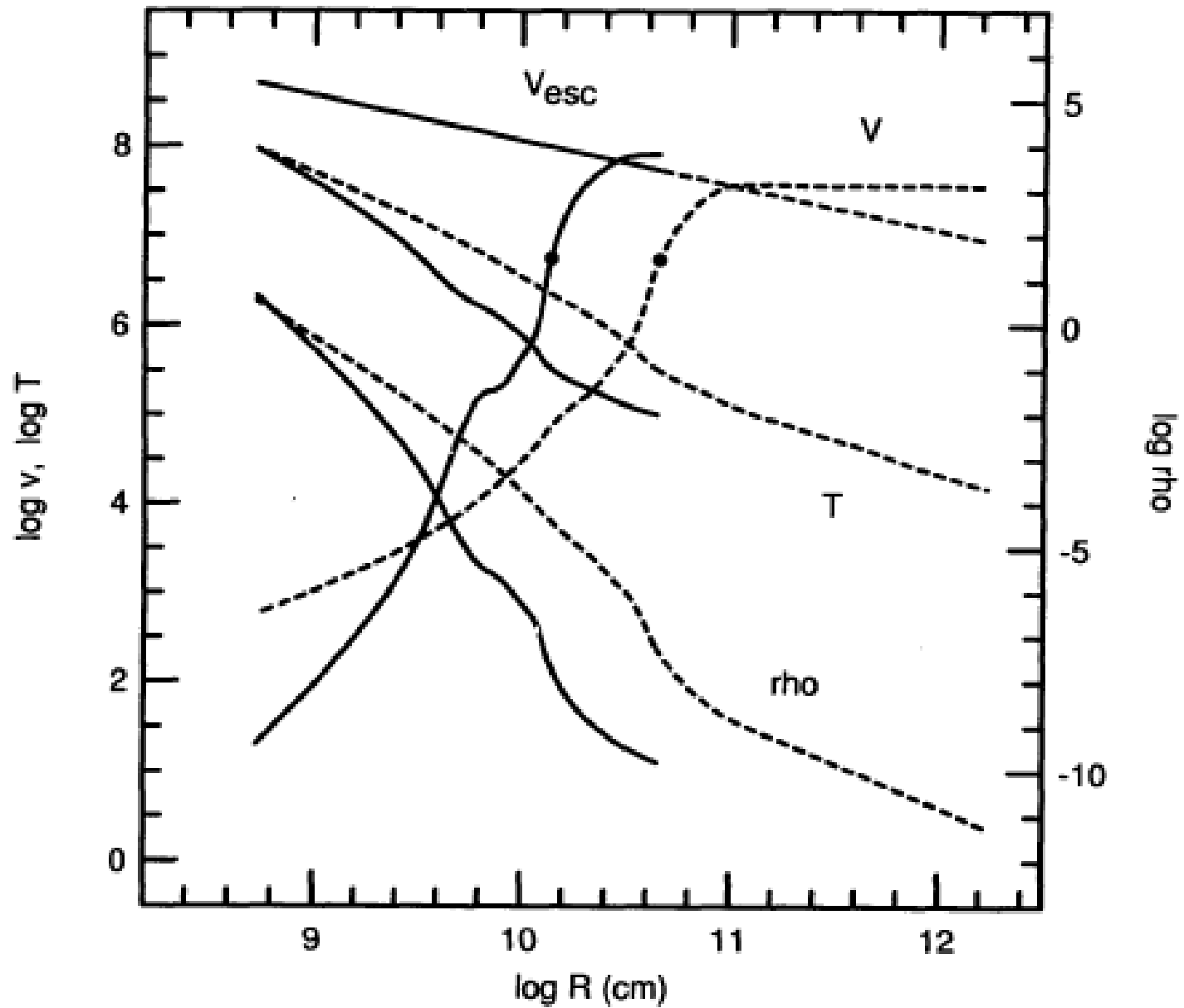


**Photoionization and/or
Recombination**

$$((f+i)/r)_{\text{NVI}} = 3.3 \pm 2.0 > 1$$

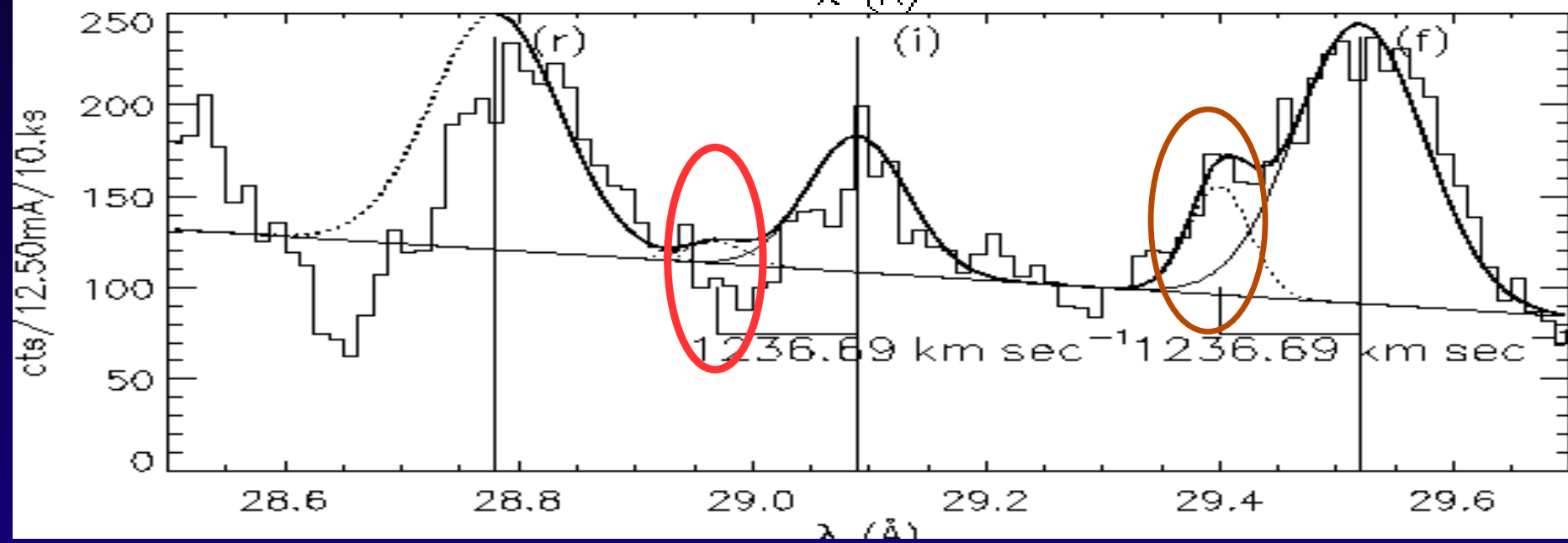
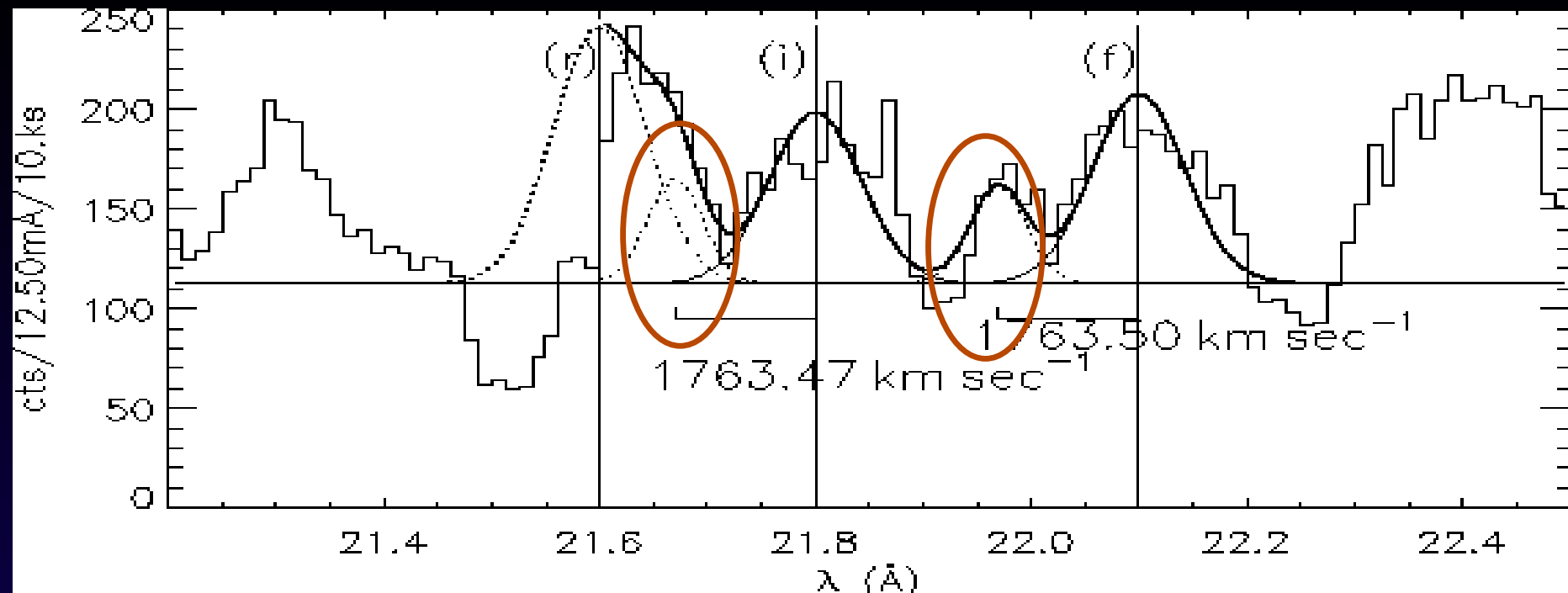
(Coupé et al. 2004, Godet et al. 2004)

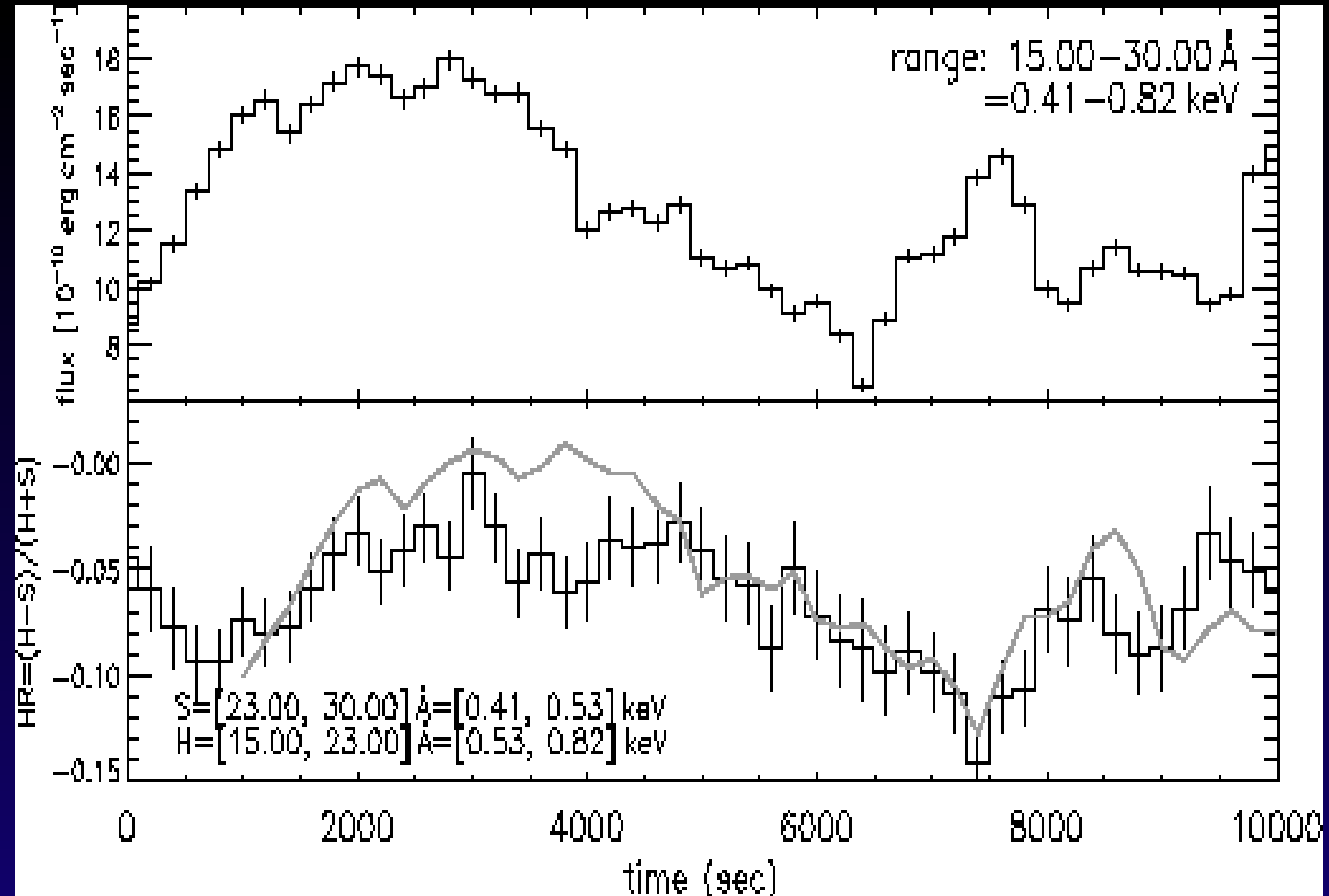
He-like triplets

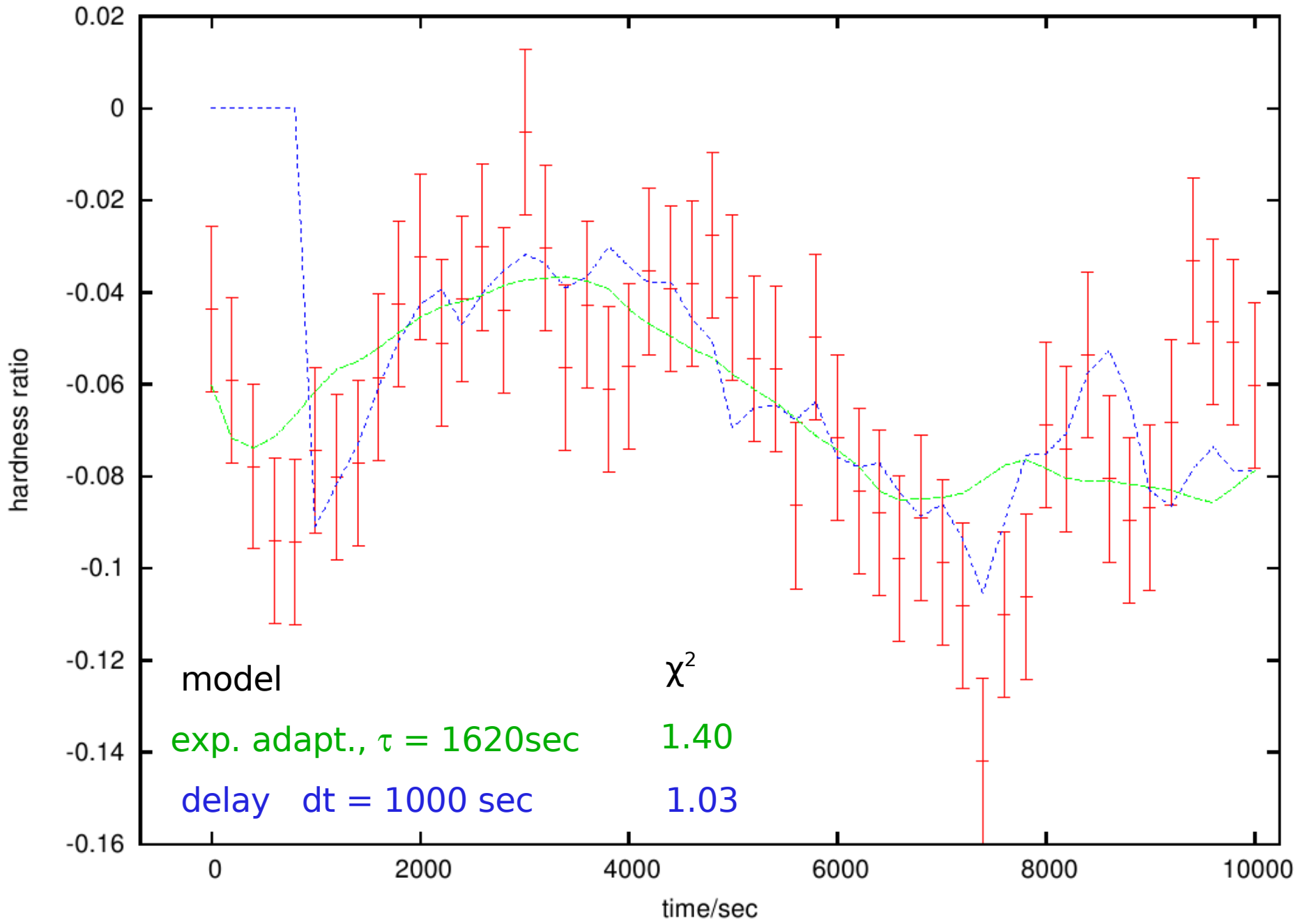


from Kato & Hachisu 1994

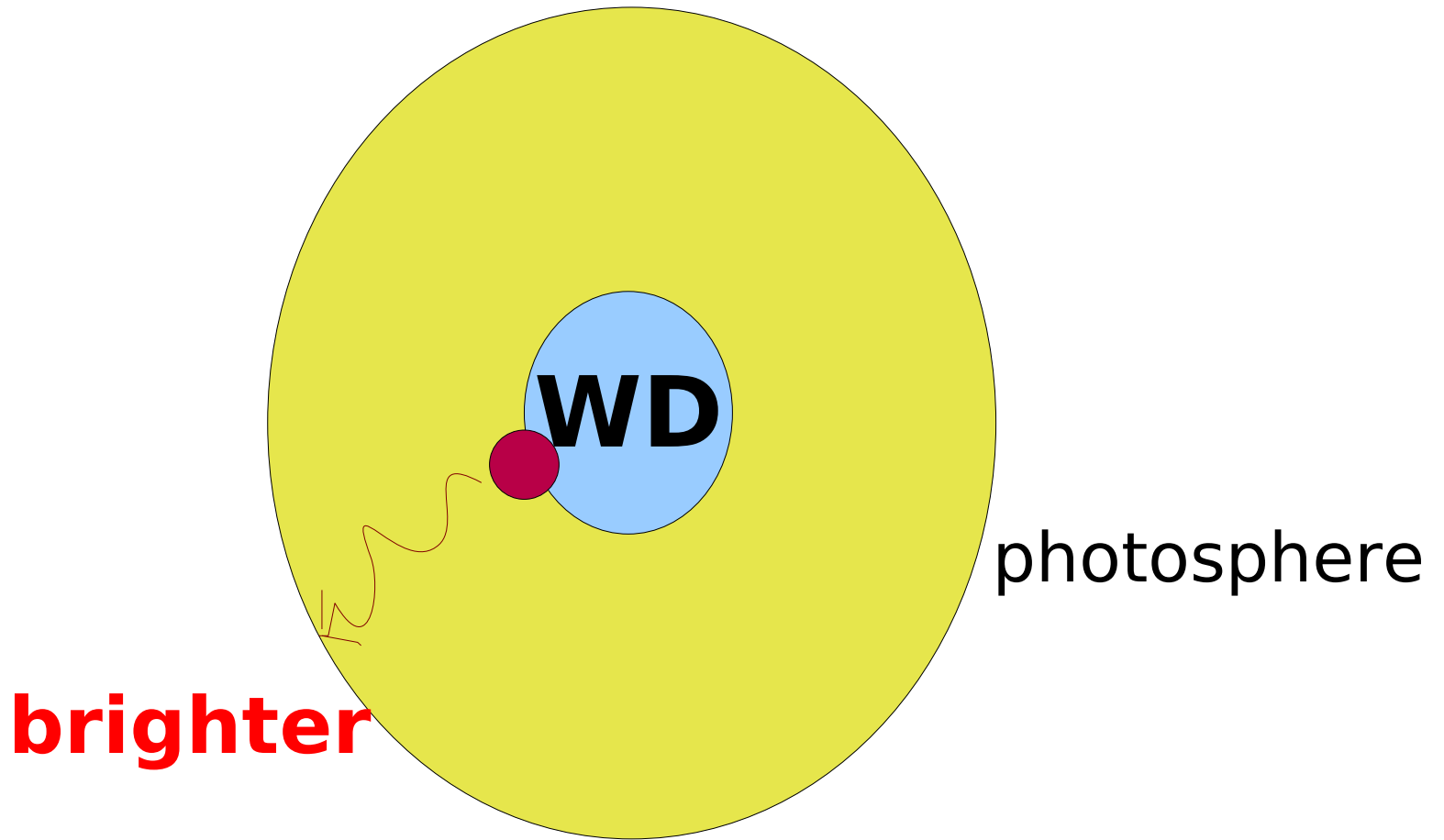
He-like triplets

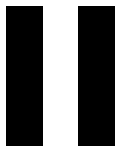




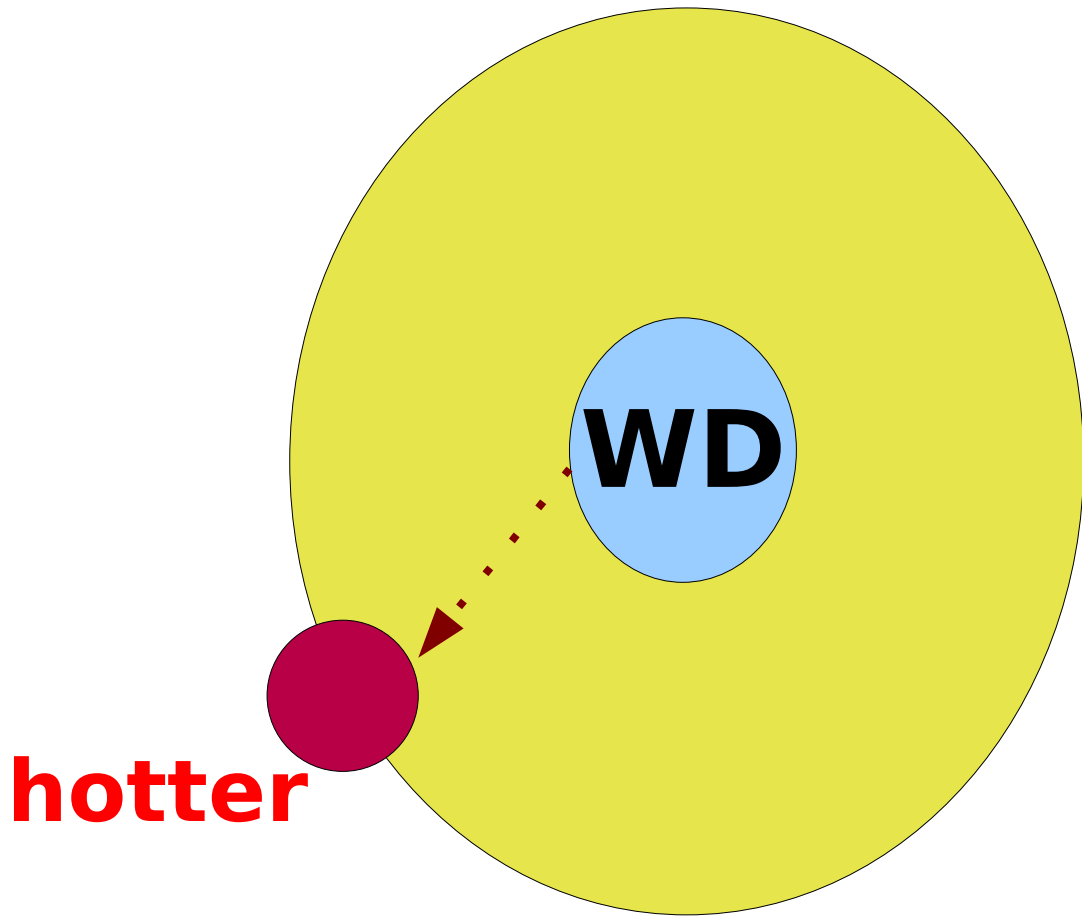


increase in nuclear burning





1000 sec later



Summary

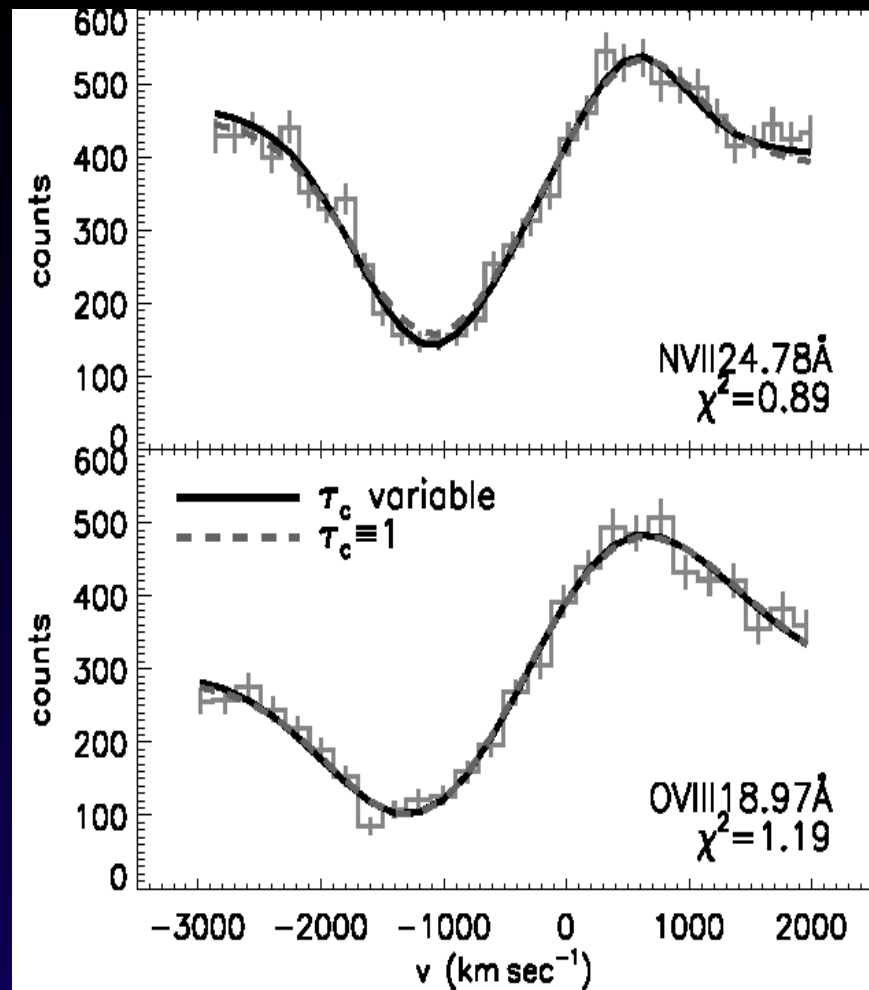
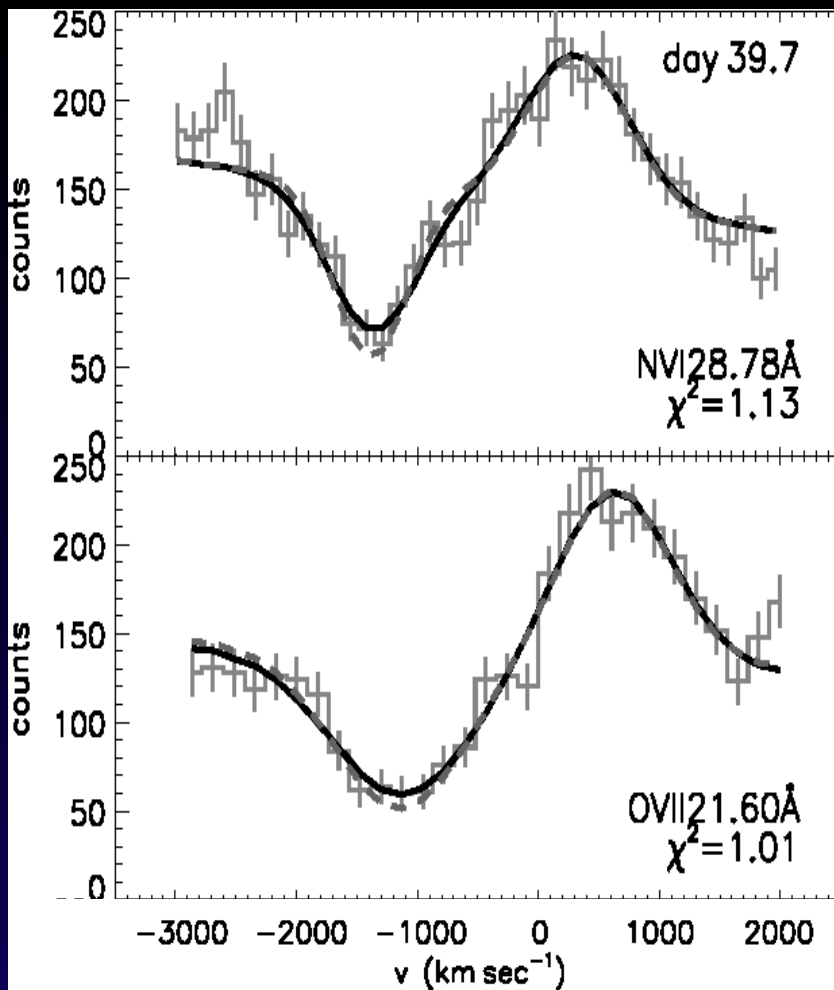
well-defined absorption lines show a decrease of the expansion velocity and of the linewidth from ~ 1300 (day 39.7) to 780 km/s (day 66.9)

$\tau \sim 1$ for the most important absorption lines

strong decrease in the strength of emission lines from day 39.7 to day 66.9

He-like triplet emissions of OVII and NVI are likely to be formed in proximity to the supersoft source

strong correlation of luminosity and hardness ratio with a delay of about 1000 sec



$$M(\lambda) = \left\{ C \cdot B_\lambda(T) + E \cdot G_e(\lambda, \lambda_e, \sigma_e) \right\} \times \left\{ 1 - A \cdot G_a(\lambda, \lambda_a, \sigma_a) \right\} \times T_{st}(\lambda) T_{ism}(\lambda)$$

$$M(\lambda) = \left\{ C \cdot B_\lambda(T) + E \cdot G_e(\lambda, \lambda_e, \sigma_e) \right\} \times \exp(-G_a(\lambda, \lambda_a, \sigma_a)) \times T_{st}(\lambda) T_{ism}(\lambda) * G_{spec}(\lambda)$$

