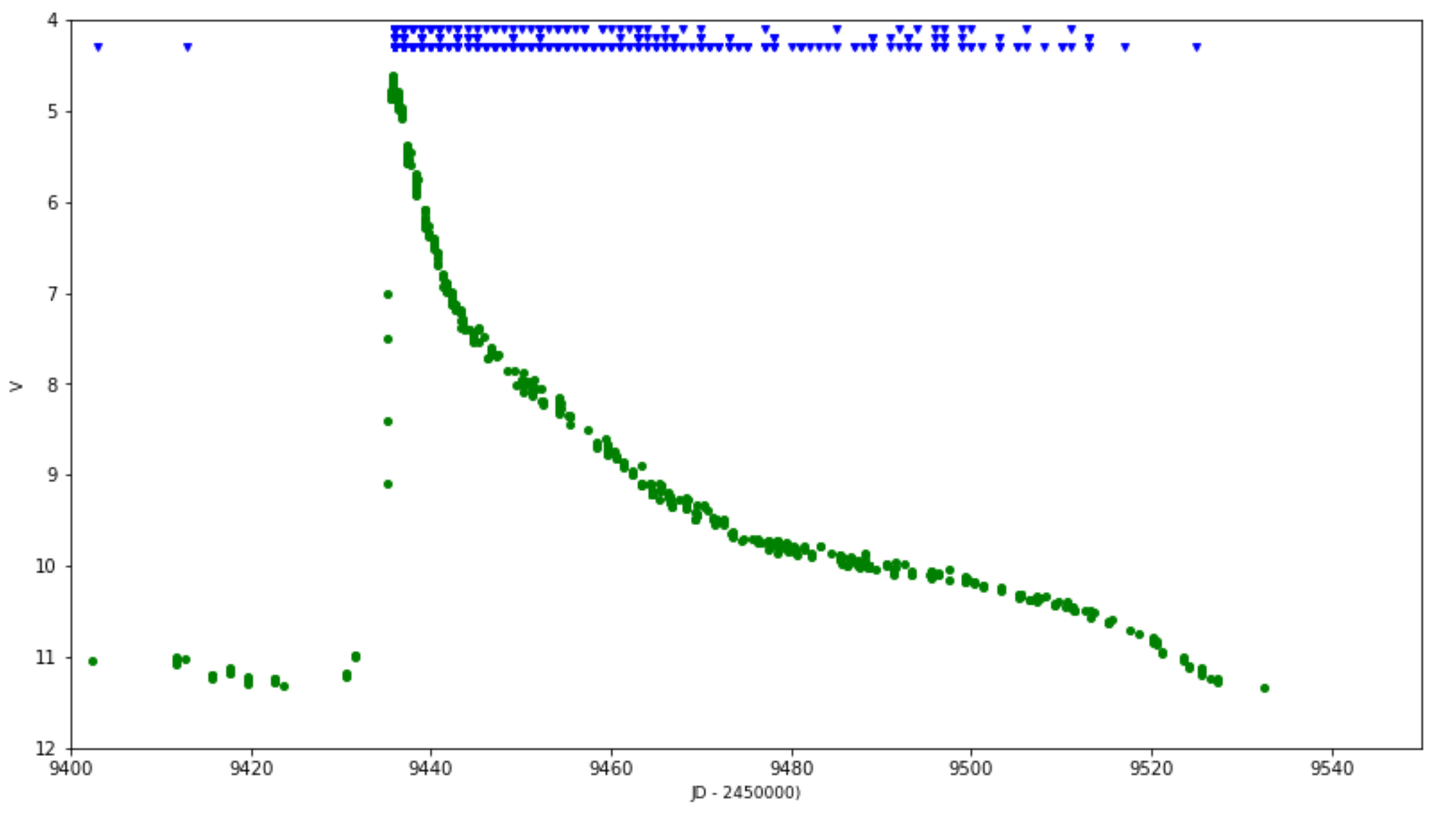
RS Oph 2021
High cadency
Optical spectroscopic monitoring

F. Teyssier, J. Guarro Flo

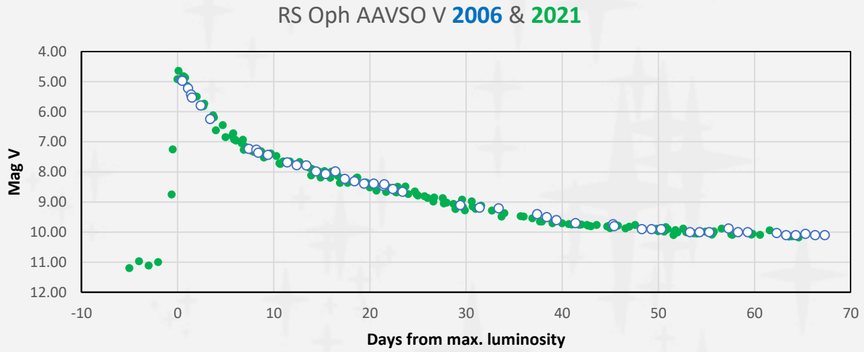
EUROPEAN ASTRONOMICAL SOCIETY ANNUAL MEETING

eas 2022 Valencia



V peak luminosity reached on JD 2459435.6
D = 0 in this presentation

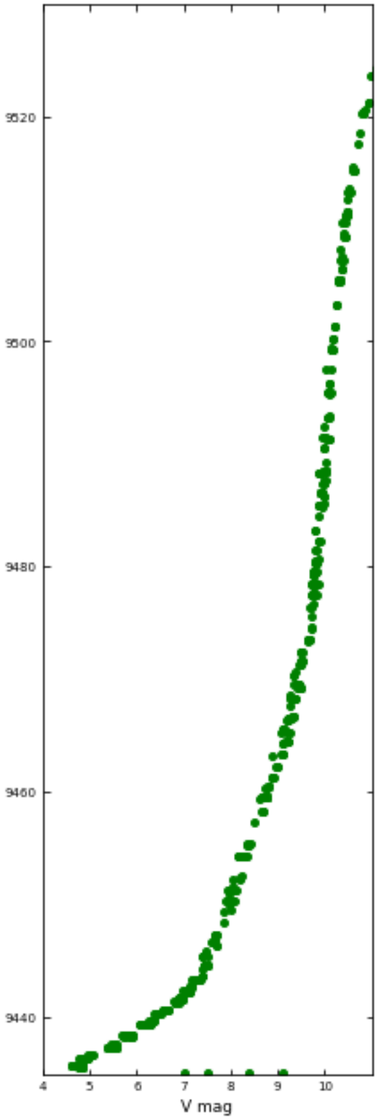
Comparison with 2006 outburst

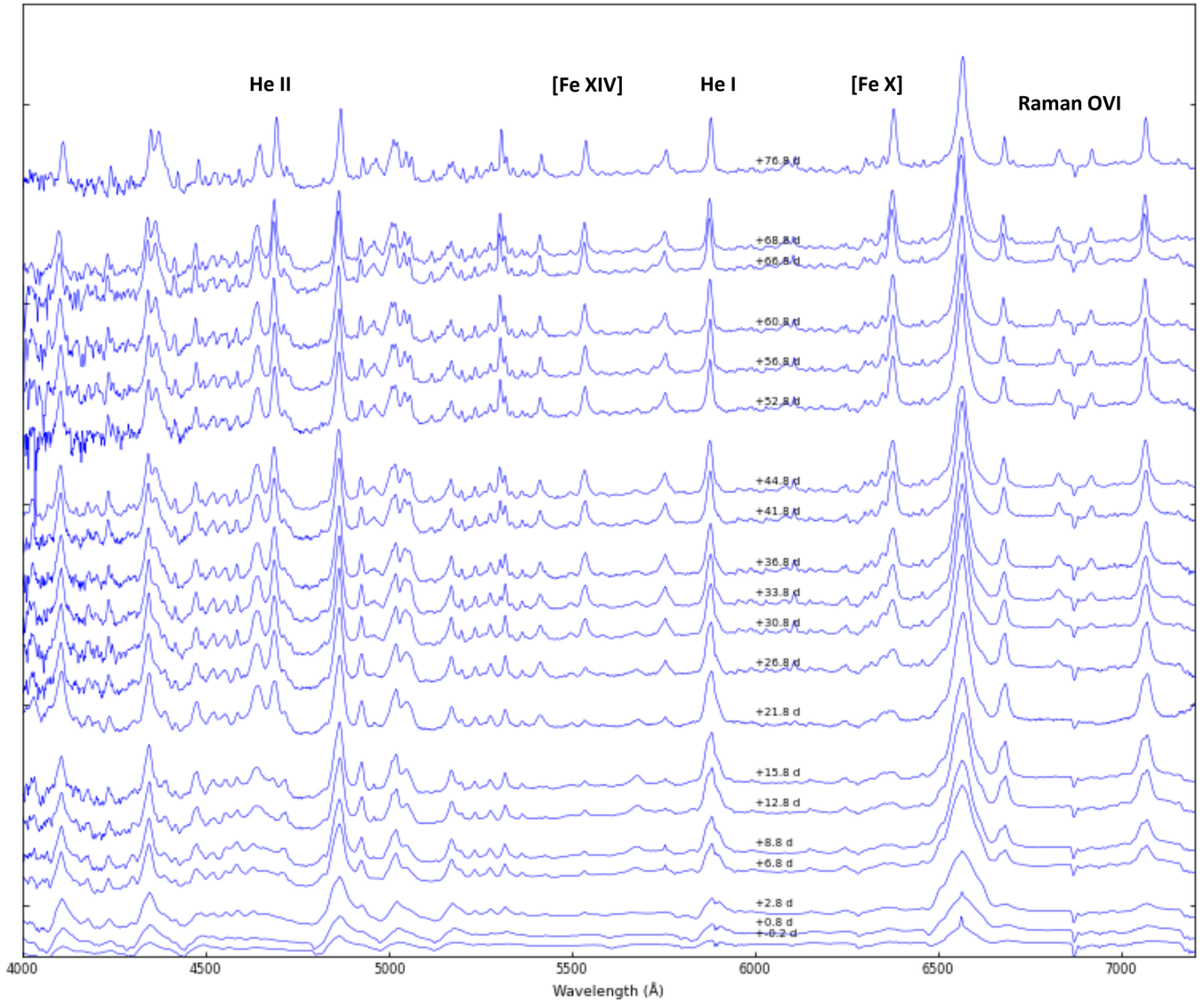


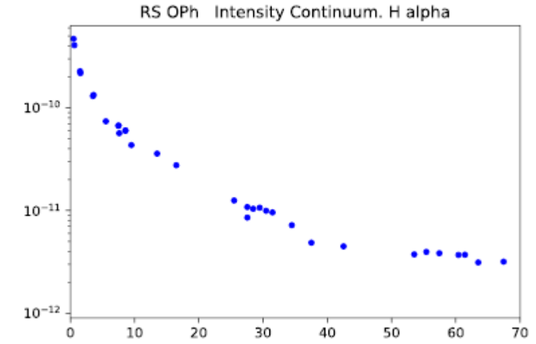
Luminosity Peak at orbital phase = 0.376
ϕ = 2444 999.9 + 460 * E
(Dobrzycha & Kenyon, 1994)

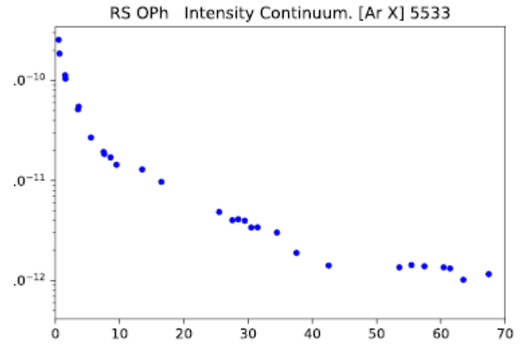
RS Oph 2021 outburst
o : AAVSO V band lightcurve (selected data)
v : ARAS spectra

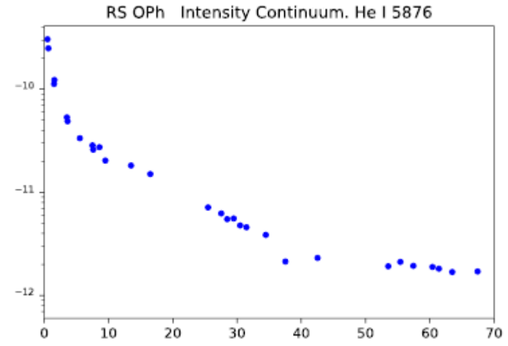
echelle (86) – 37 used in this presentation – Resolution 9000 to 11000
flux calibrated (54) – Resolution
full dataset (308)



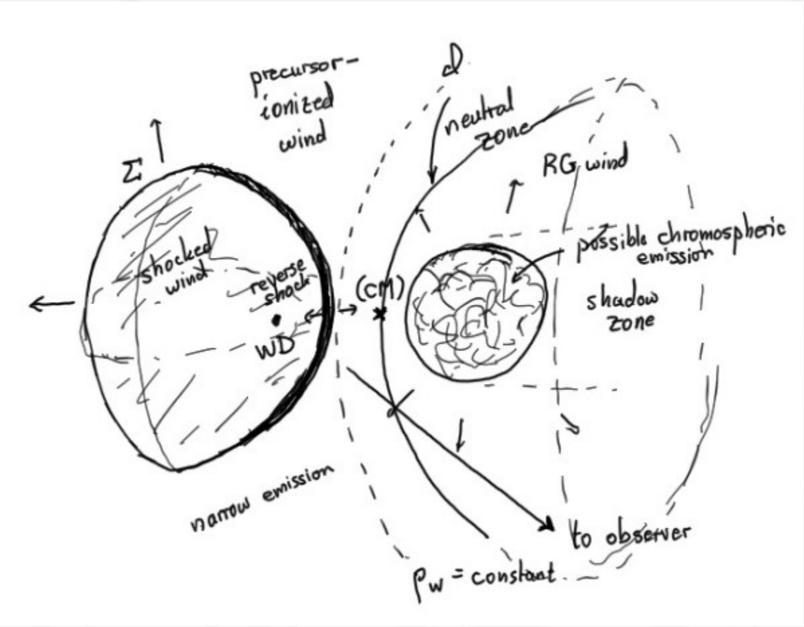






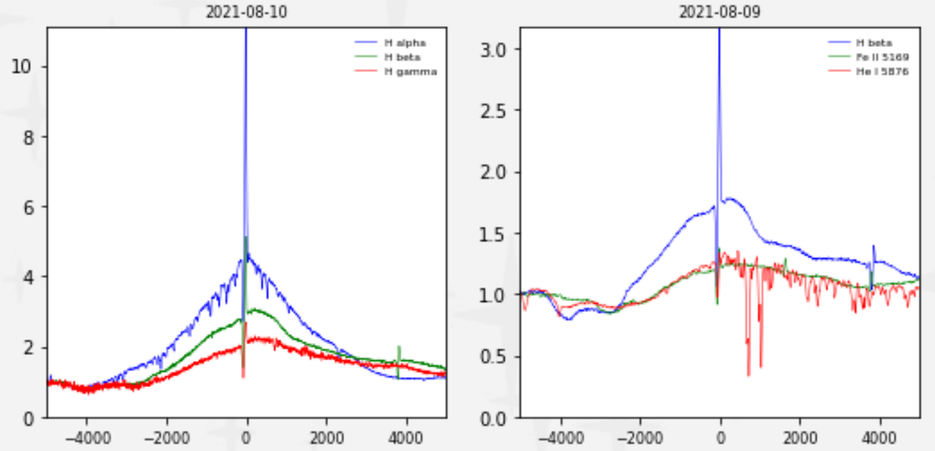


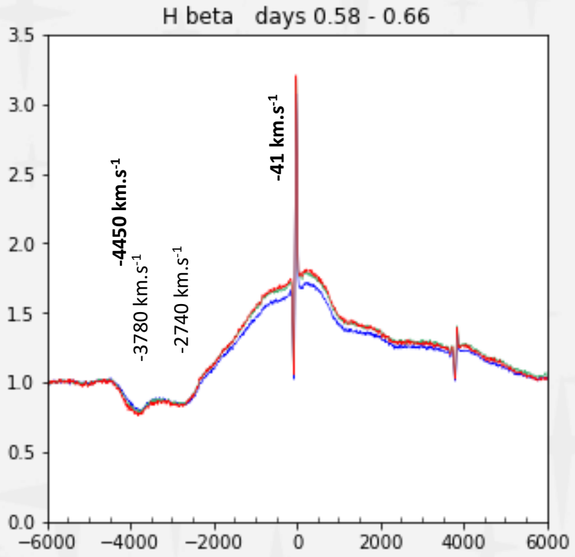
Low resolution flux calibrated spectra (R = 1000)
Secured by F. Sims, P. Dubovky, D. Boyd
V band light curve: AAVSO

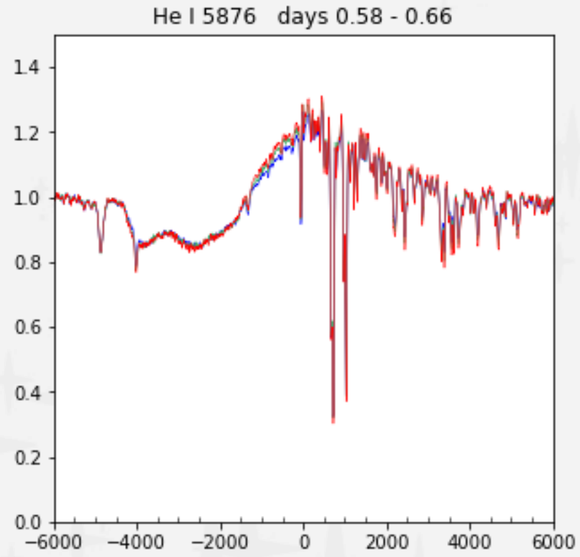


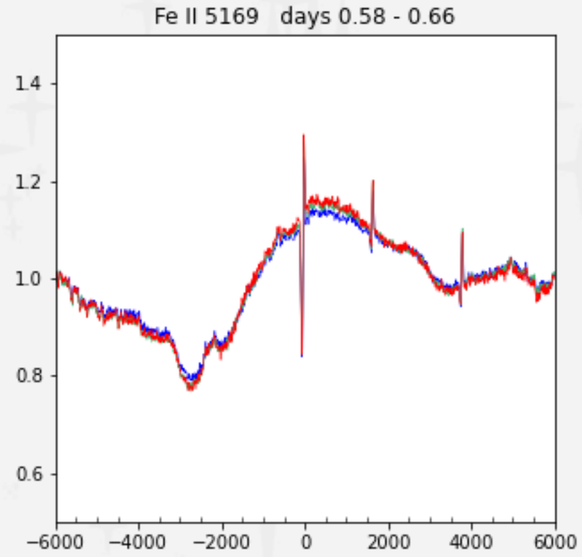
Simplified model of the 2021 outburst
Courtesy: Steve Shore

System radial velocity = 39 km.s^{-1}



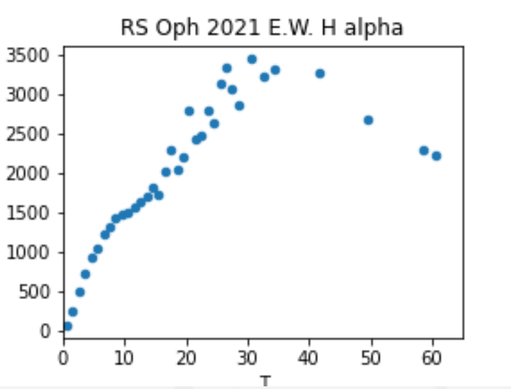


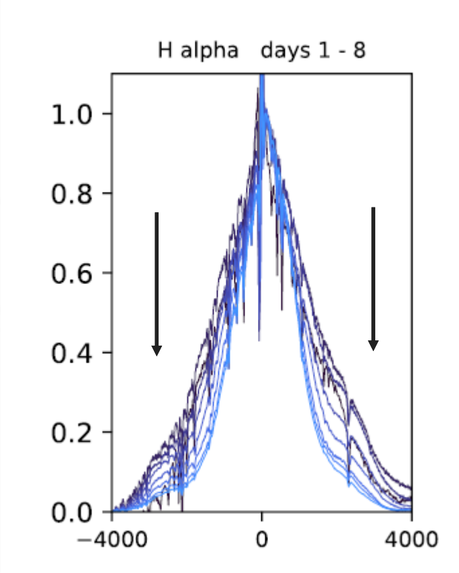




D = 0.58
D = 0.63
D = 0.66

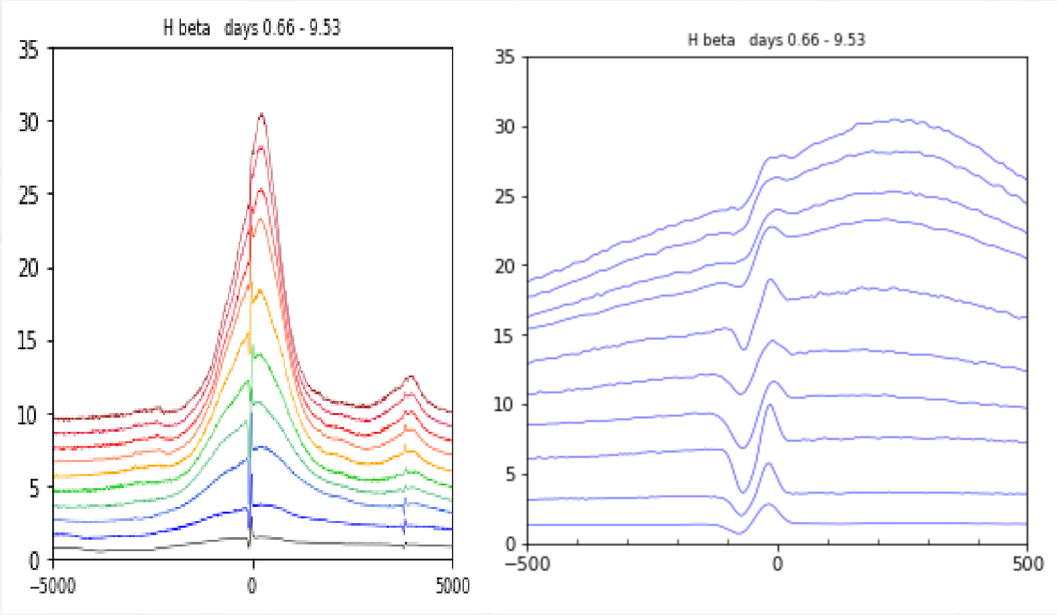
FWHM Narrow Line = 85 km.s^{-1}
Absorption 39.5 km.s^{-1}
Emission 45.8 km.s^{-1}



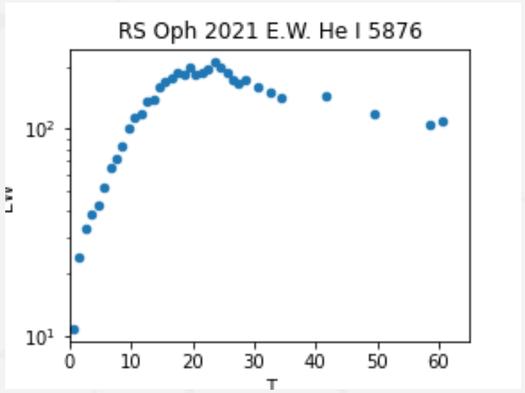


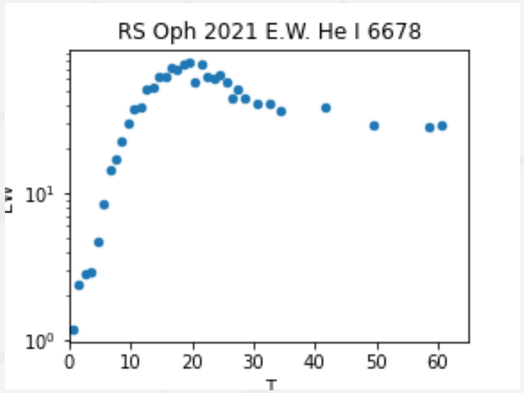
Maximum intensity
of the broad component normalized

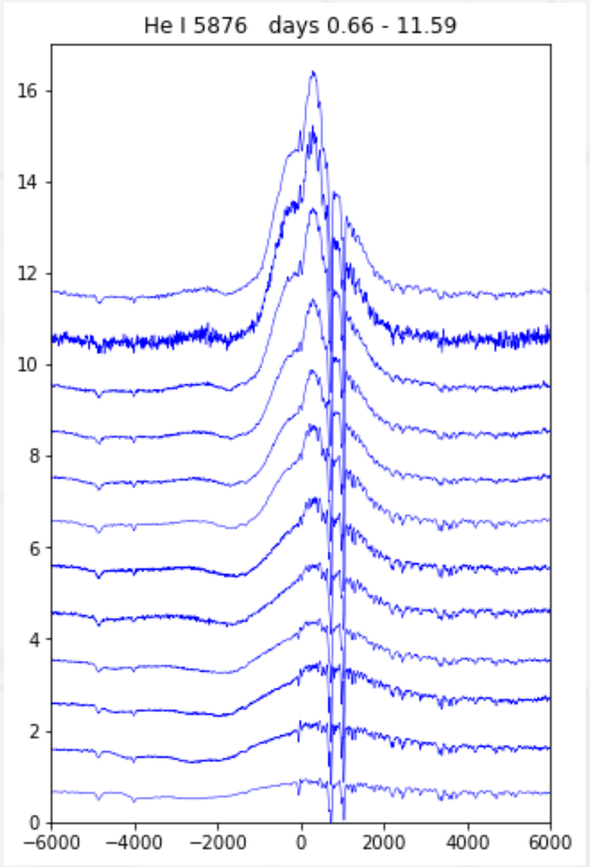
Color map: dark to light blue

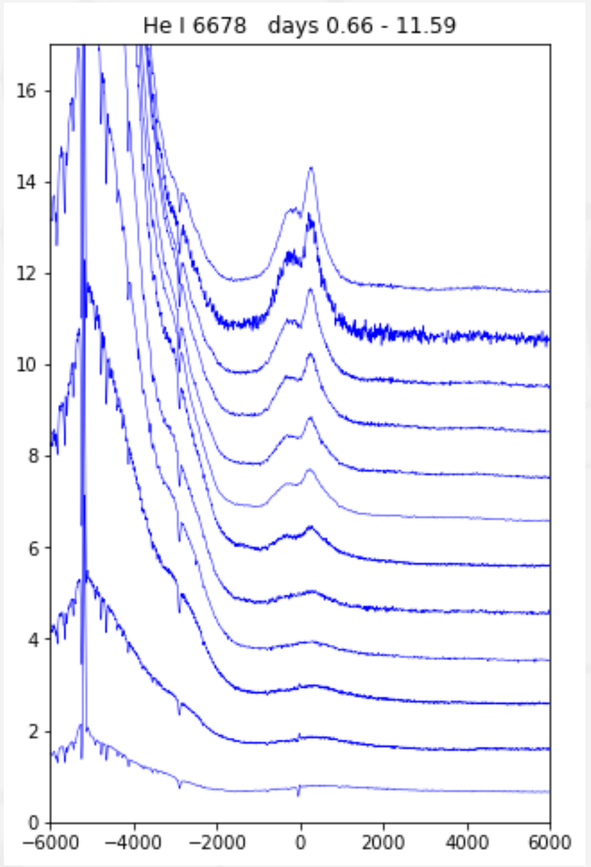


Narrow absorption decreases
as a result of the ionization of RG wind
(or decrease of the column density of the H^0 region







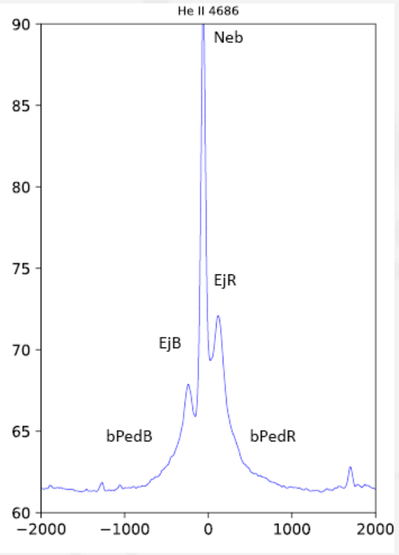


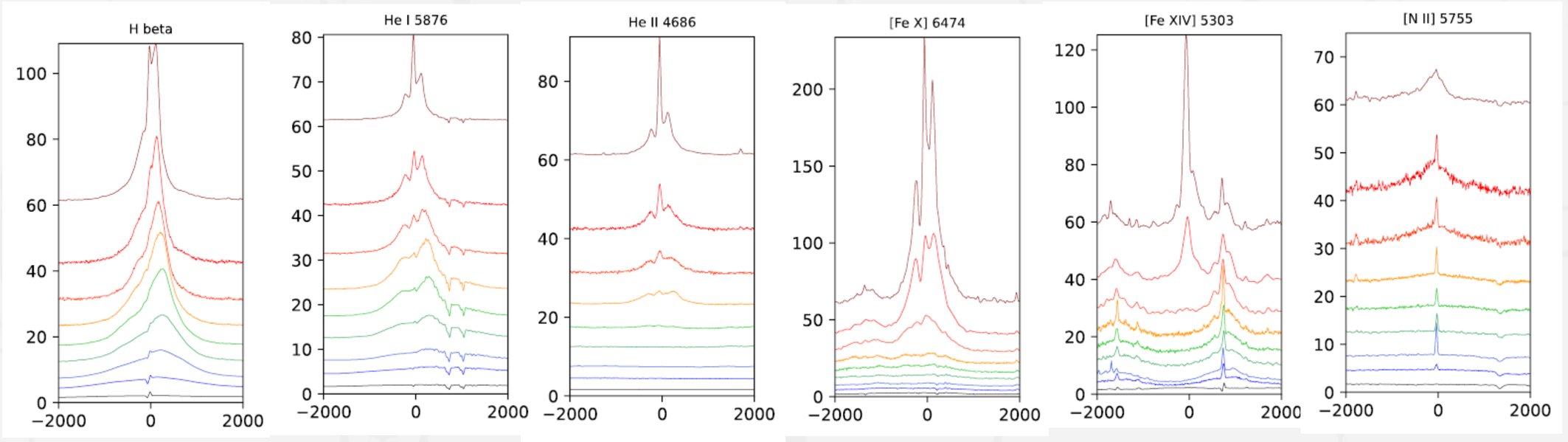
No Helium « flash » (Iijima, 2006)
Smooth increase relative to continuum until D = 20

Different from classical novae (Mac Laughlin, 1964)

Triplet

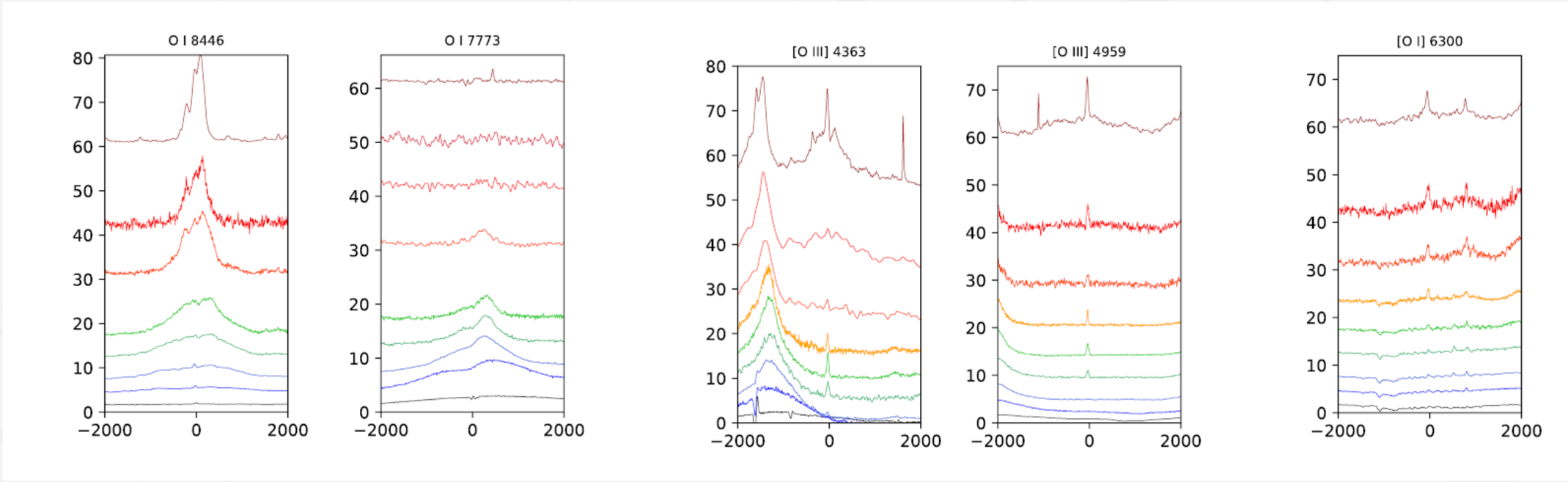
Doublet

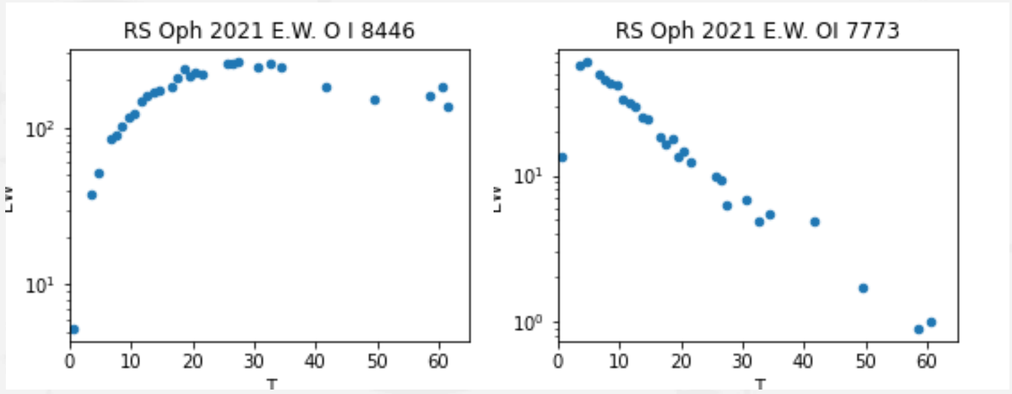




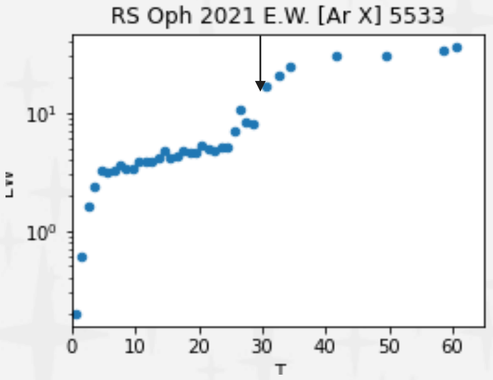
Continuum normalized at -2000 km.s^{-1} and shifted by D - 1

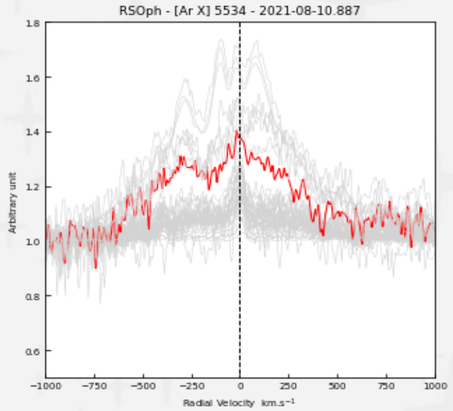
D = [0.66, 3.54, 6.53, 11.59, 16.52, 22.52, 30.50,41.52, 60.51]


O I 8446
O I 7773
[O III] 4363
[O III] 4959
[O I] 6300

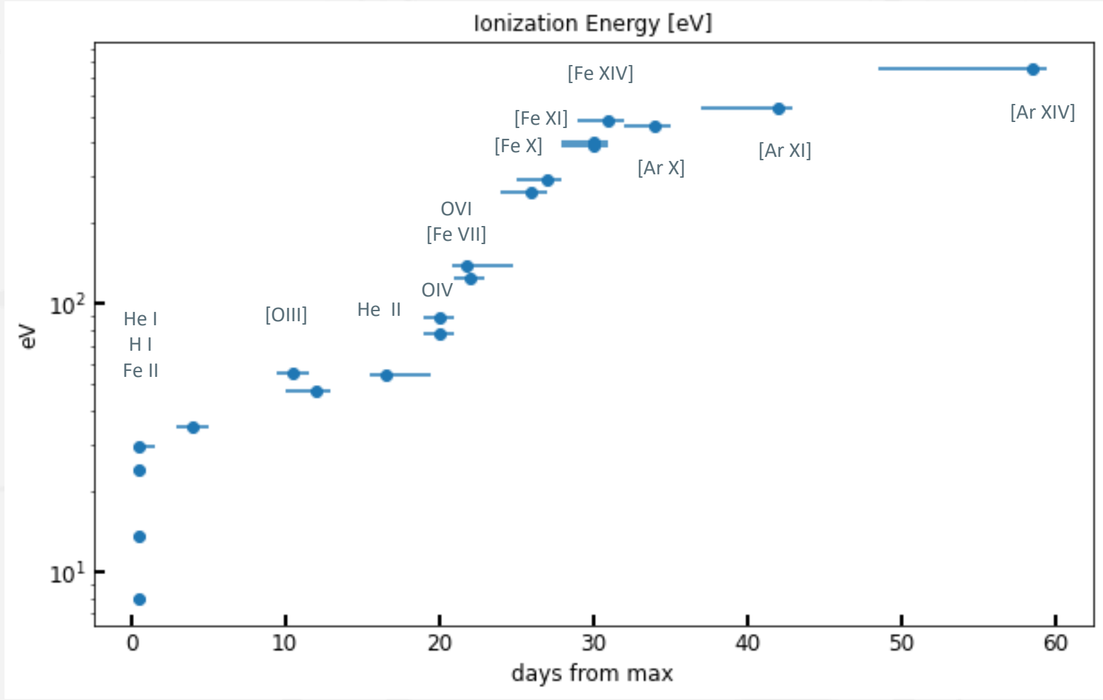

RS Oph 2021 E.W. O I 8446
RS Oph 2021 E.W. OI 7773
LVV
T

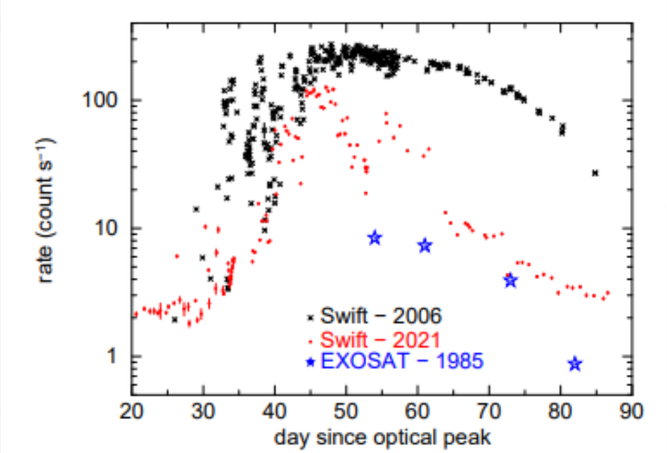
Method

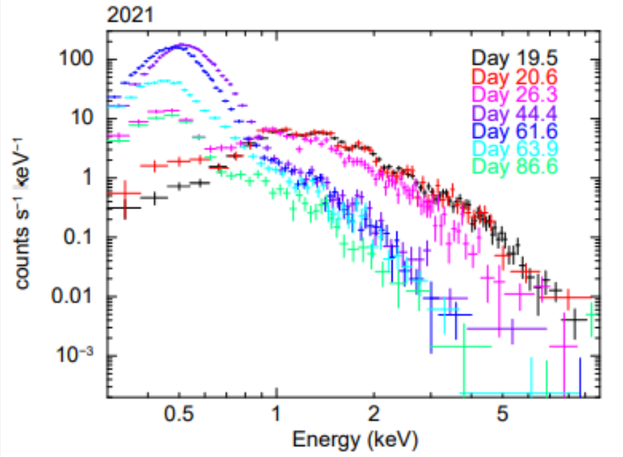




[Ar X] blended with NII





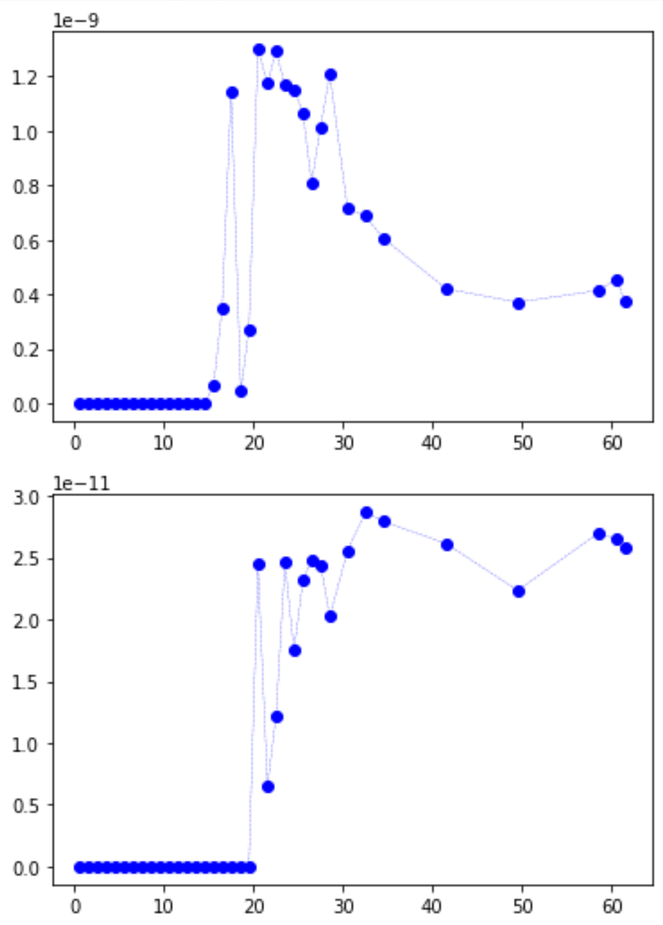


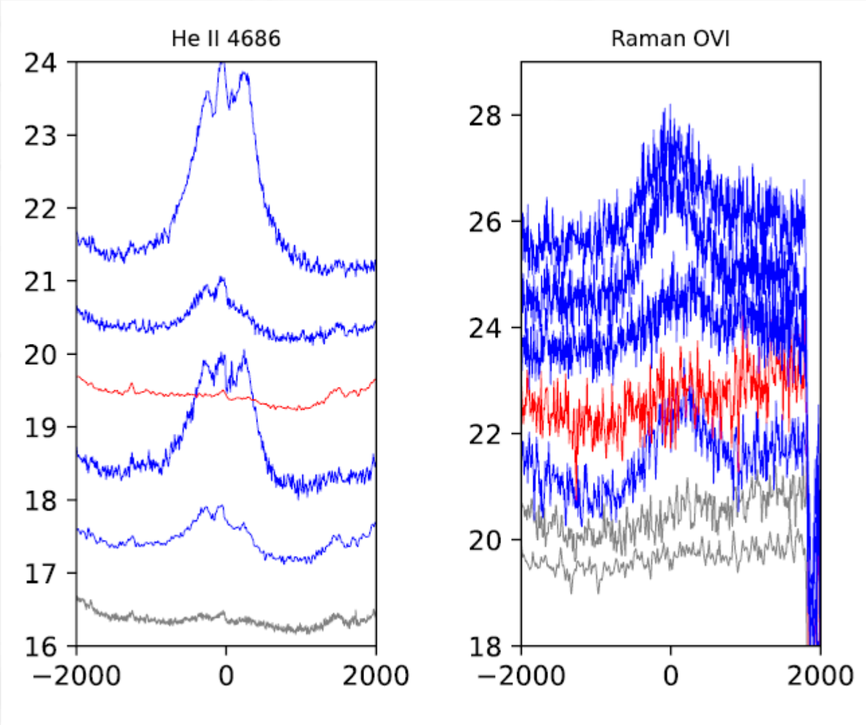
Soft X-rays
Page+, 2022

He II 4686 Å

Raman OVI 6825 Å

Flux (erg.cm^2.s^{-1})



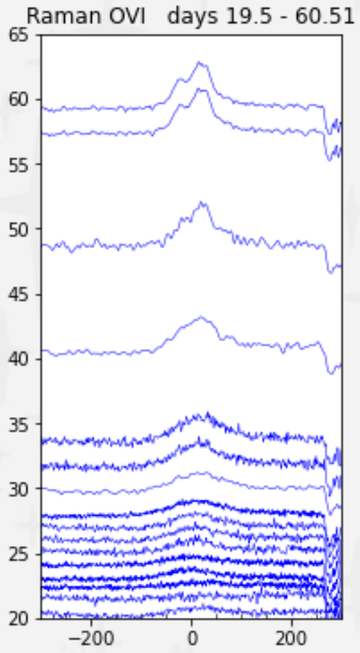


Uncertainty ~ 10-20%

Raman VI 6825 Å
Scattering of OVI 1032 Å
on Lyβ
(Schmid, 1989)

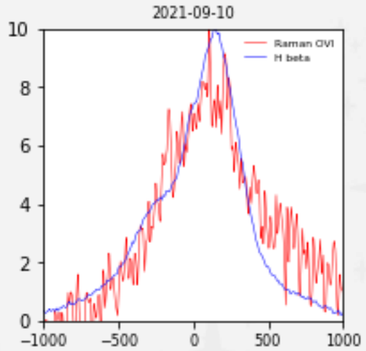
Typical of SySt (50%)
Absent in RS Oph in quiescence

The other Raman band 7088 Å
produced by OVI 1038 Å
Not detected



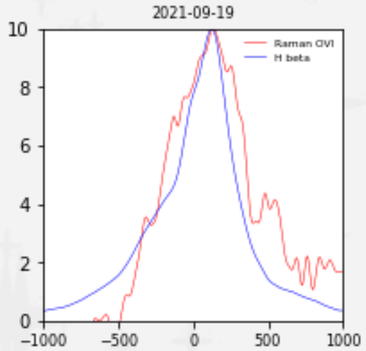
D = 58.8
JD 9496.3

D = 30.7

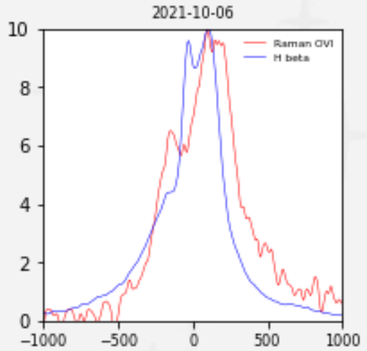


One peak
Red Skewness

D = 41.7



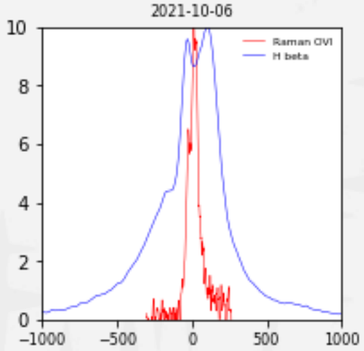
D = 58.8



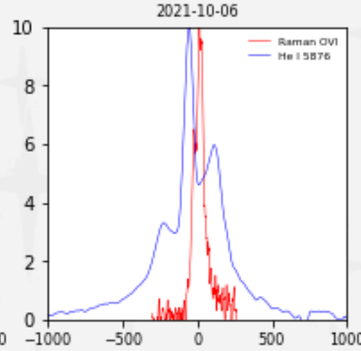
2 peaks
(pollution ?)

Comparison with Hβ
In their own velocity space
At various times

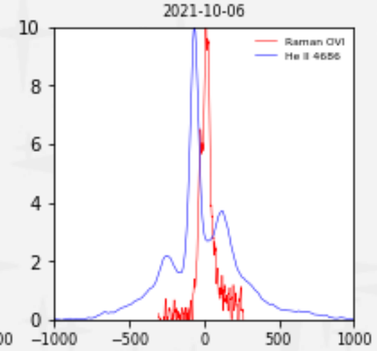
Hβ



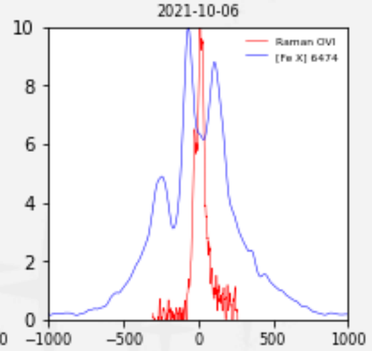
He I 5886 Å



He II 4686 Å



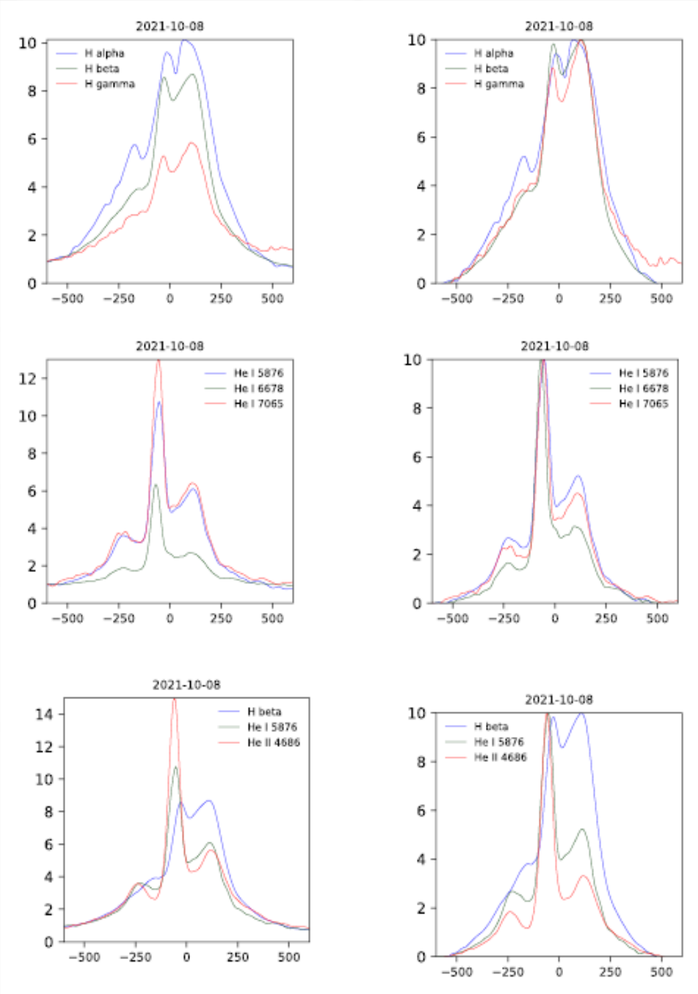
[Fe X] 6374 Å



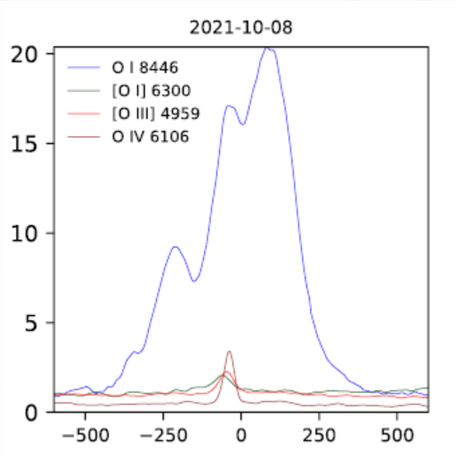
FWHM = 74 km.s^{-1}
(velocity space of 1032 Å)
Typical of the RG wind

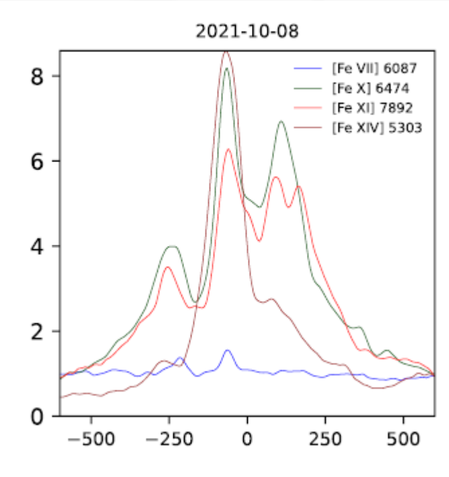
Peak shifted by ~ + 40 km.s^{-1}
According to the rv of the system

R.V. Raman OVI (theorical value 6825.4 Å) in the velocity space of OVI 1032 (λ / 6.7)
Max. intensity normalized to 10

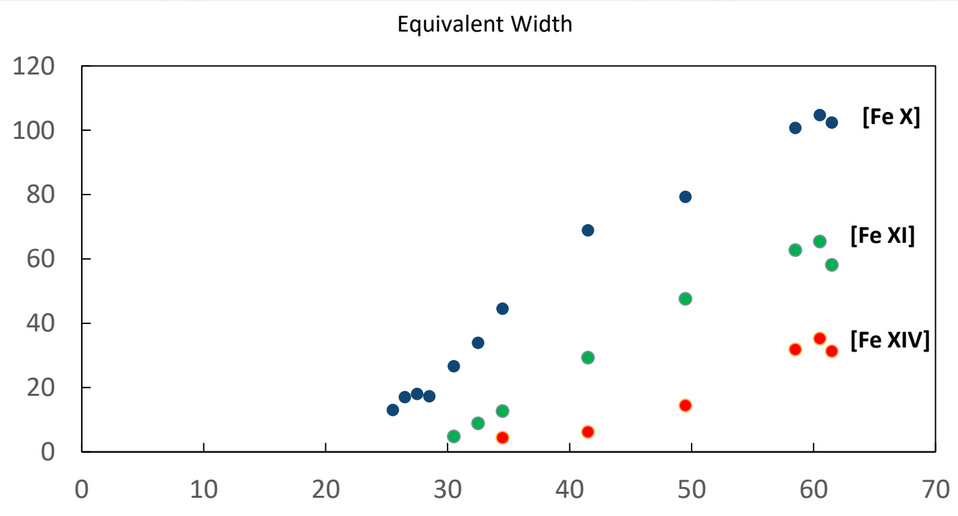


Proga+, 1994
Ne -> 6678/5876 ratio

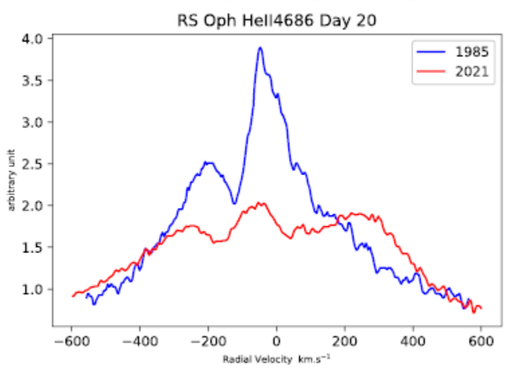


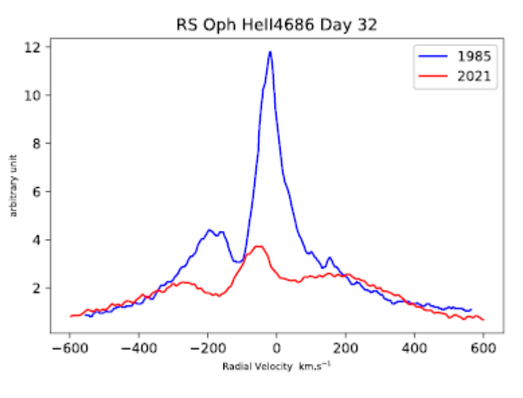


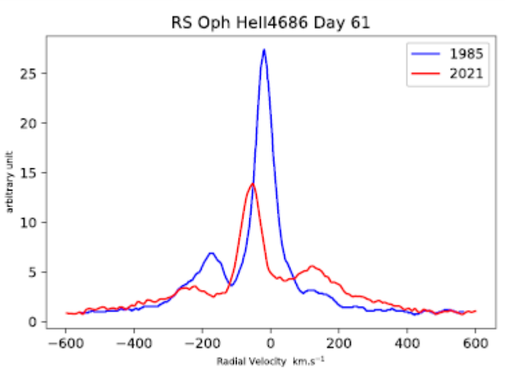
Ejecta components max at E ~ 300 eV

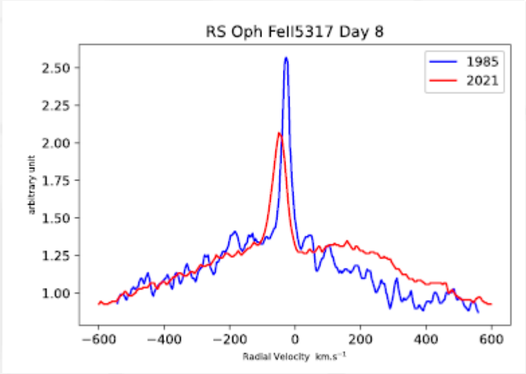


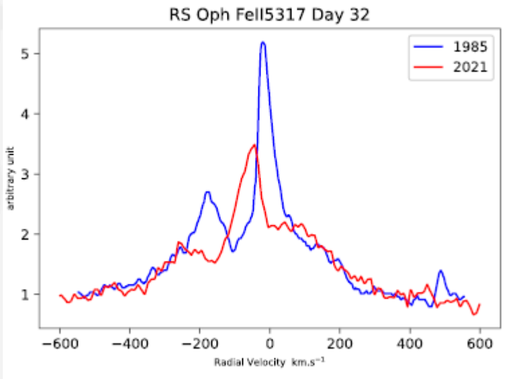
1985 JD 2446093 ϕ = 0.122
2006 JD 2453779 ϕ = 0.086
2021 JD 2459435 ϕ = 0.382

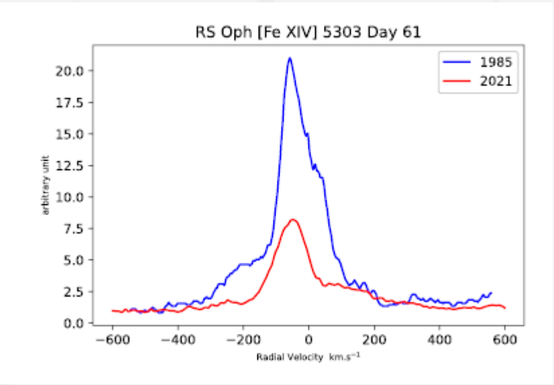












1985: with material kindly provided by Steve Shore

Spectra used in this presentation:
Echelle spectra: J. Guarro Flo (16), F. Teyssier (13), S. Charbonnel (6), O. Thizy (2), C. Elridge (3)
Low resolution flux calibrated spectra: F. Sims, P. Dubovsky, D. Boyd

Many thanks to Steve Shore for his tireless support for more than 10 years
And his fruitfull comments about this presentation

ASDB (7500 SySt – 3900 Novae spectra)
Free access
https://aras-database.github.io/database/rsoph.html
Thanks to Jaroslav Merc (Charles University, Praga)

Information Letter:
http://www.astrosurf.com/aras/novae/InformationLetter/InformationLetter.html
With the support of Woody Sims and David Boyd

Contact: francoismathieu.teyssier@gmail.com