NATIONAL & KAPODISTRIAN UNIVERSITY OF ATHENS

ASTRONOMICAL OBSERVATORY BELGRADE

Studding the origin of SACs and DACs in the spectra of hot emission stars

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Ways of creation of SACs and DACs in the plasma around quasars

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In order to reproduce theoretically the spectral lines that present DACs or SACs in hot emission stars and quasars we calculated the line function of the complex line profile. This line function is the following .

$$I_\lambda = \left[I_{\lambda 0} \prod_i \exp\{-L_i \xi_i\} + \sum_j S_{\lambda ej} \left(1 - \exp\{-L_{ej} \xi_{ej}\}\right) \right] \prod_g \exp\{-L_g \xi_g\}$$

where:

$I_{\lambda 0}$: is the initial radiation intensity,

L_i, L_{ej}, L_g: are the distribution functions of the absorption coefficients $k_{\lambda i}$, $k_{\lambda ej}$, $k_{\lambda g}$,

ξ: is the optical depth in the centre of the spectral line,

$S_{\lambda ej}$: is the source function, that is constant during one observation.

The main hypothesis of this model is that the stellar envelope is composed of a number of successive and independent absorbing density layers of matter, a number of emission regions and some external absorption region.

This period our scientific group examines the form of line function, in the case that the density regions of matter that produce the absorption or emission satellite components are Independent but Not Successive.

In this case the line function has the following form:

$$I_\lambda = I_{\lambda 0}\sum_i \exp\{-L_i\xi_i\} + \sum_j S_{\lambda ej}\left(1-\exp\{-L_{ej}\xi_{ej}\}\right)$$

The spectral line profile that results from the addition of a group of functions is exactly the same with the profile that results from a graphical composition of the same functions, but it is completely different than the multiplication of functions.

$$I_\lambda = \left[I_{\lambda 0}\prod_i \exp\{-L_i\xi_i\} + \sum_j S_{\lambda ej}\left(1-\exp\{-L_{ej}\xi_{ej}\}\right)\right]\prod_g \exp\{-L_g\xi_g\}$$

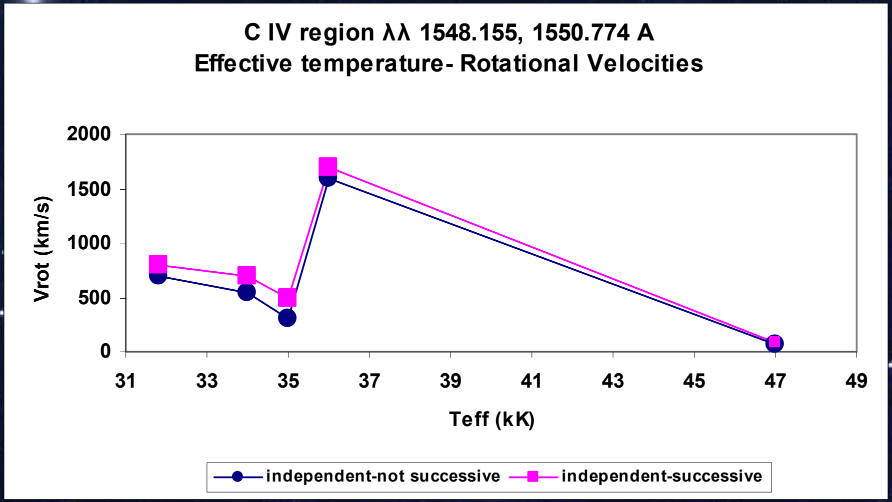
The idea of this study is to calculate the new values of the parameters in the case that the independent density regions of matter which produce the absorption or emission satellite components **are successive or not.**

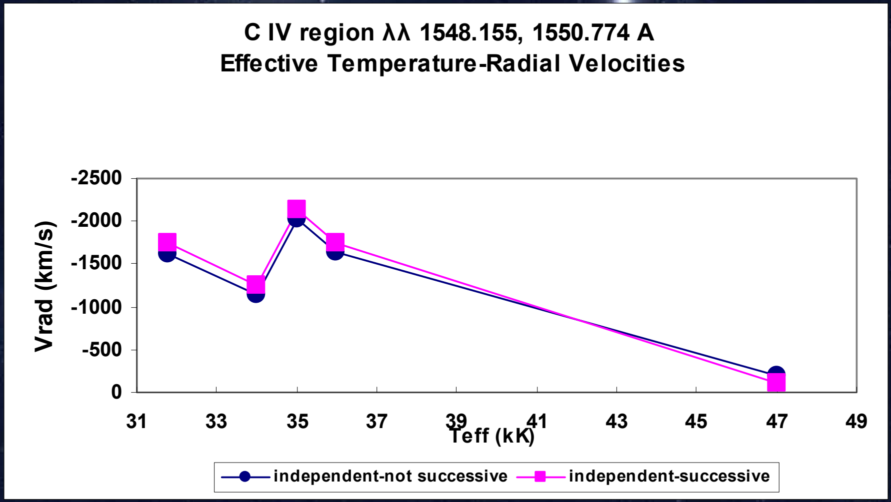
The results of our study in the case of hot emission stars

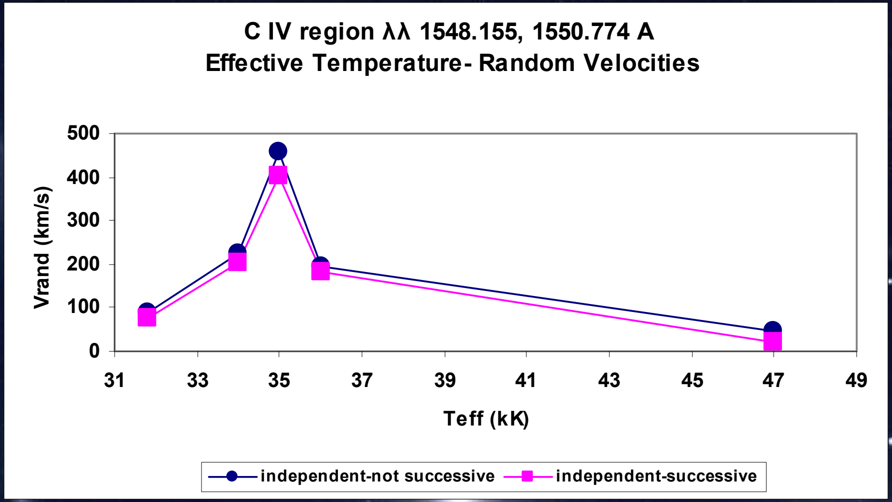
In the first poster paper we study the density regions that produce the C IV (λλ 1548.155, 1550.774 Å) and the N V (λλ 1238.821, 1242.804 Å) resonance lines in the HD 57061, HD 93521, HD 47129, HD 24911 and HD 49798 Oe stars, as well as the Mg II (λλ 2795.523, 2802.698 Å) resonance lines and the Fe II (λ 2585.876 Å) spectral line in the HD 30386, HD 42335, HD 53367, HD 45910 and HD 200120 Be stars

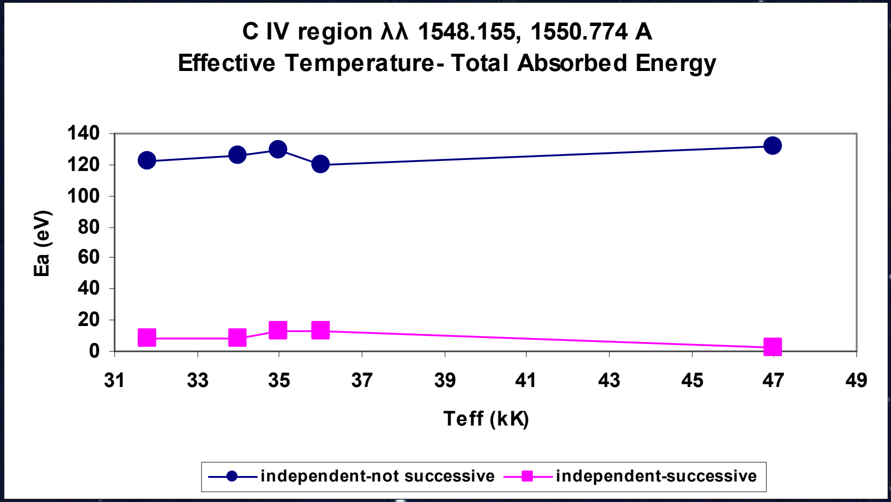
Oe Stars

C IV resonance lines

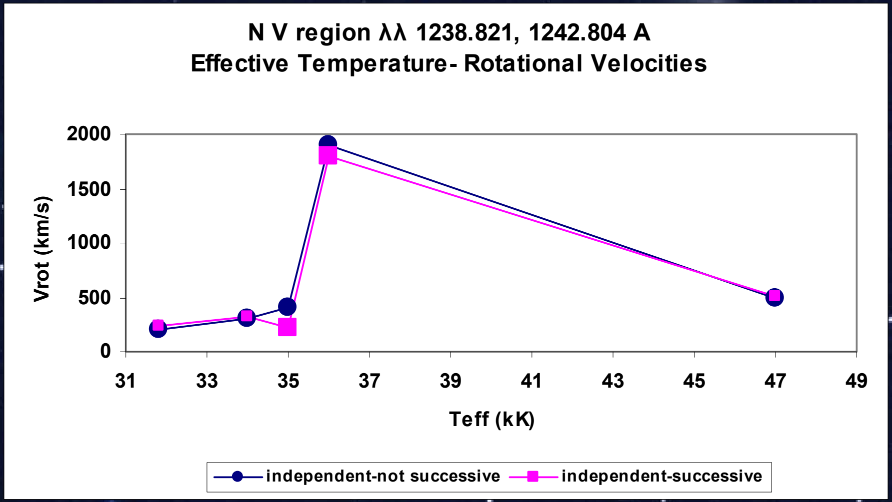


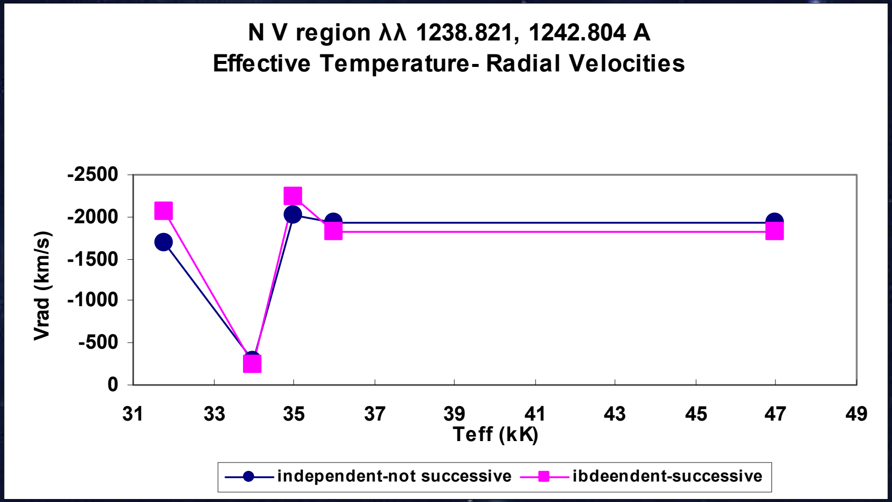


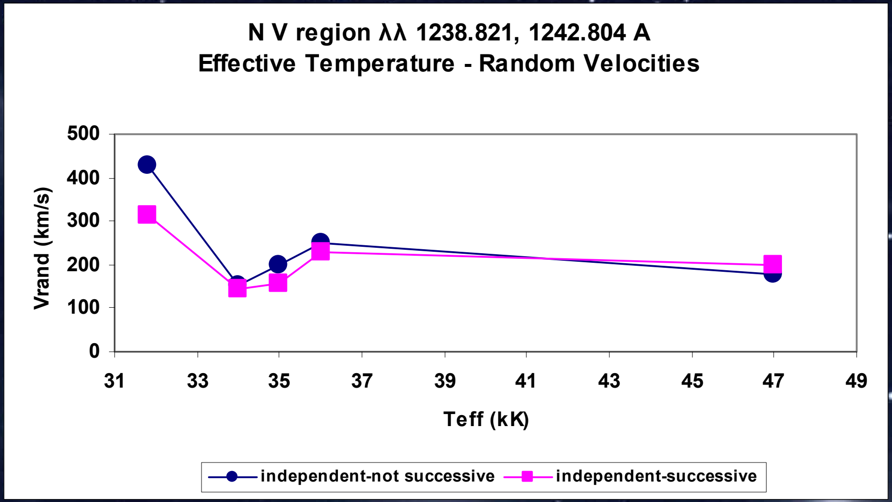


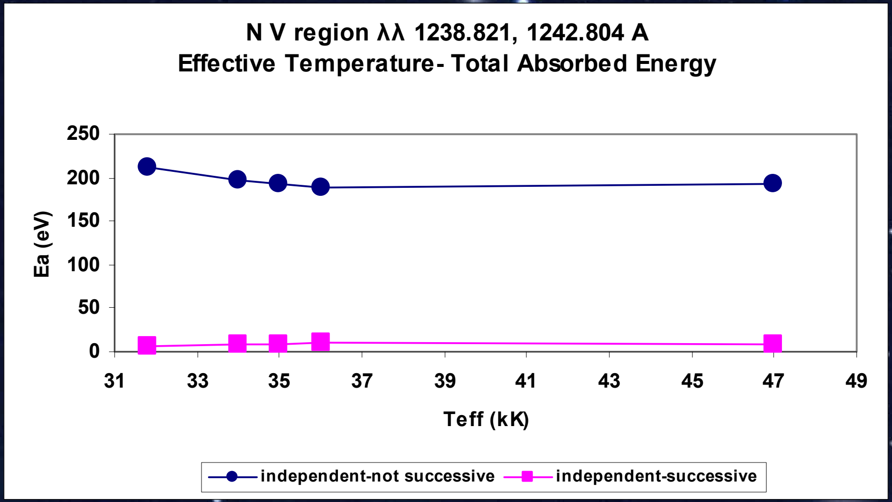


N V resonance lines



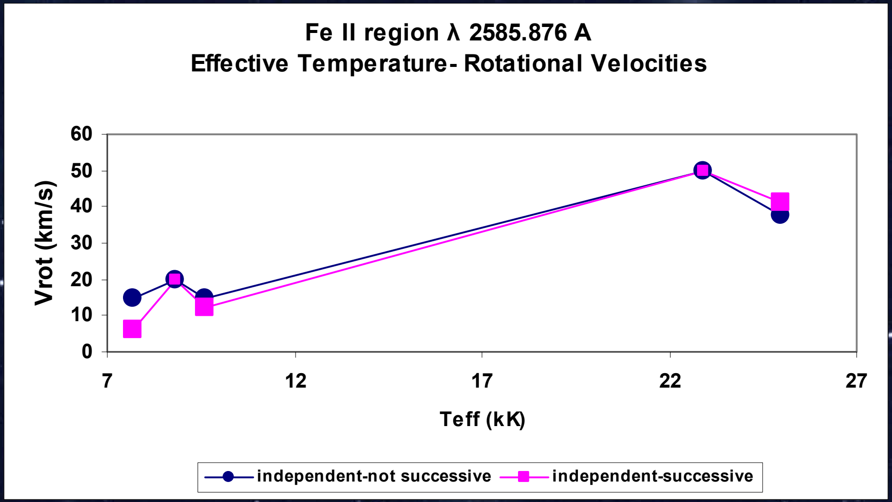


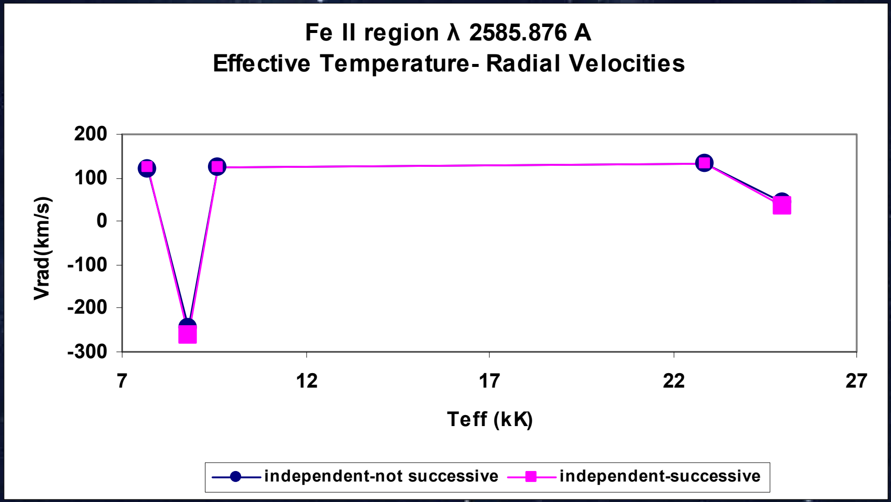


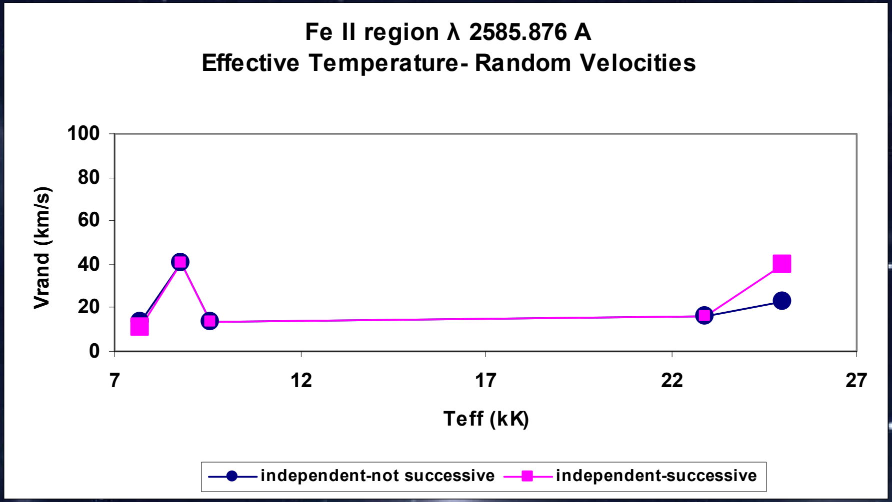


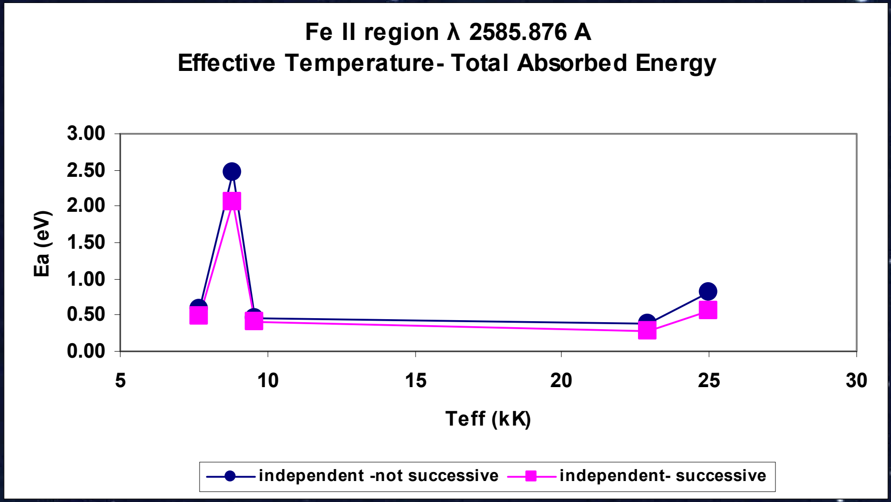
Be Stars

Fe II spectral lines

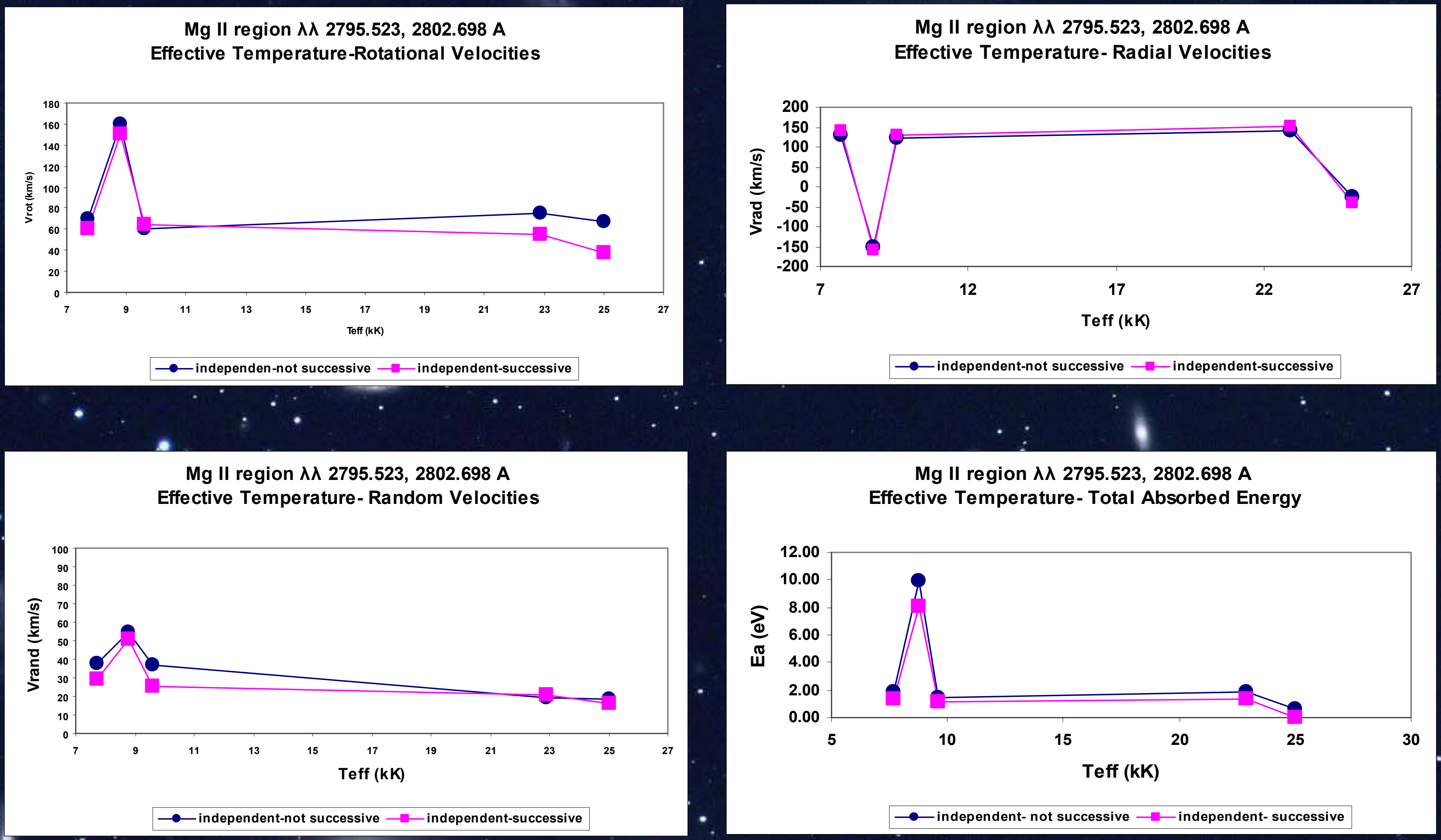








Mg II resonance lines

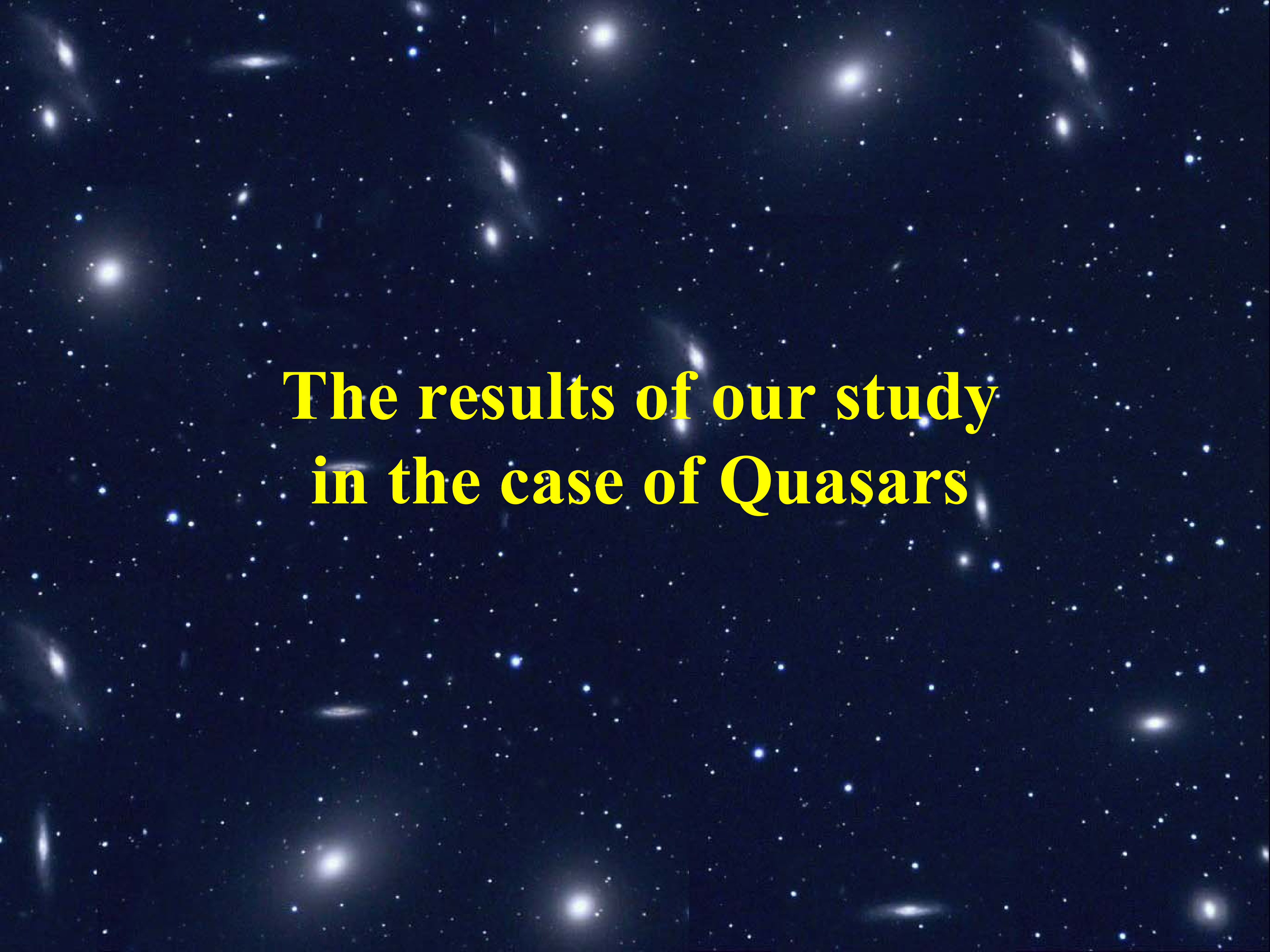


Conclusions

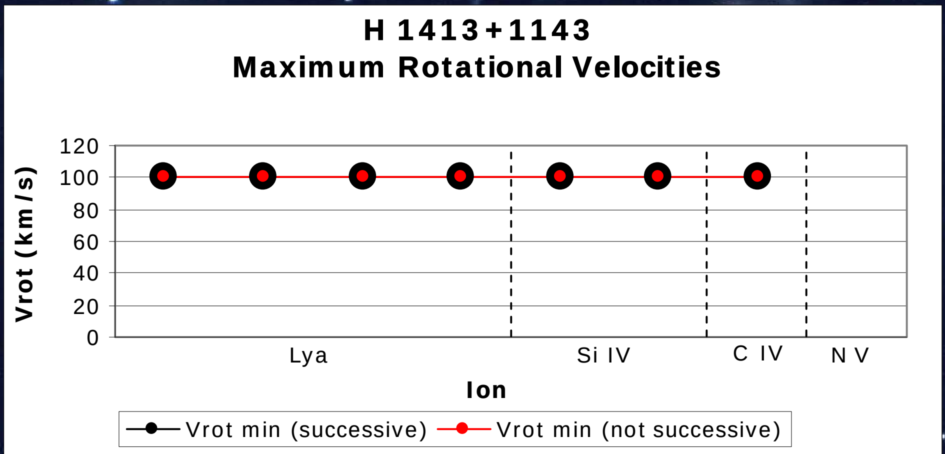
In all cases, comparing the results, we observe that the mean values of all the kinematic parameters **do not change depending on the applied method**.

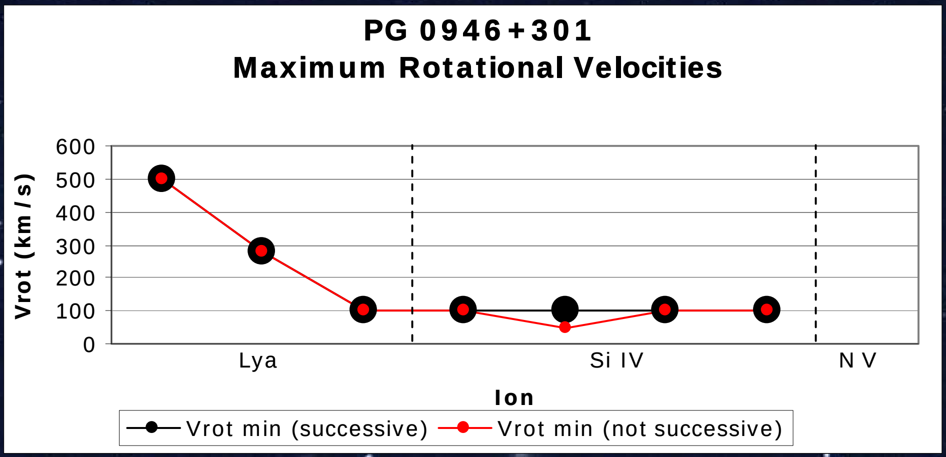
However

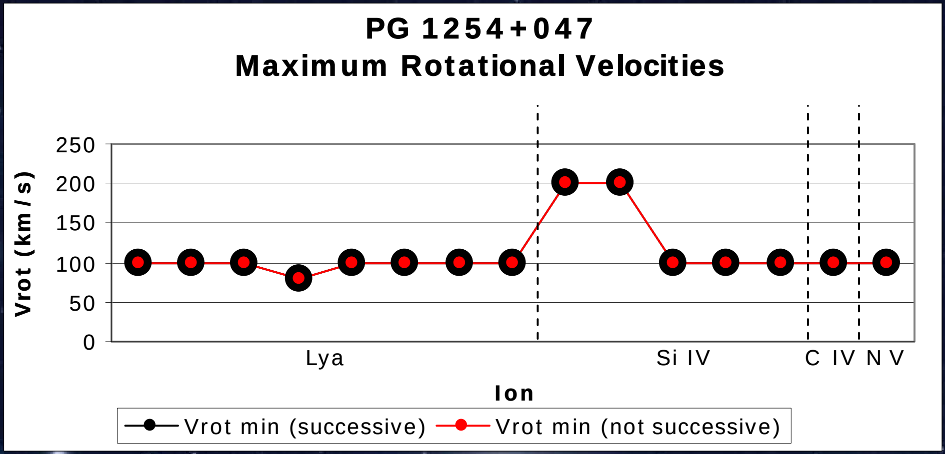
In the case of the absorbed energy, the method of the independent but not successive layers of matter gives **higher values than the method** of the independent and successive layers of matter. This is what we theoretically expected.

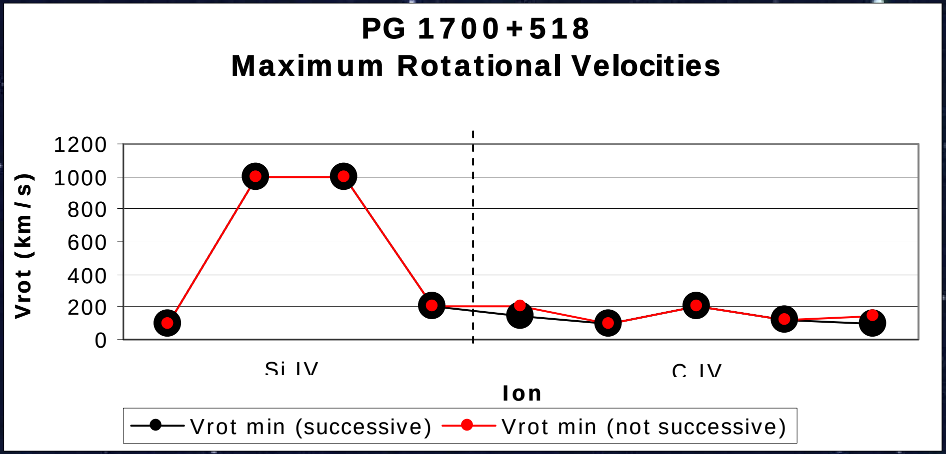

The results of our study
in the case of Quasars

Rotational Velocities (GR)



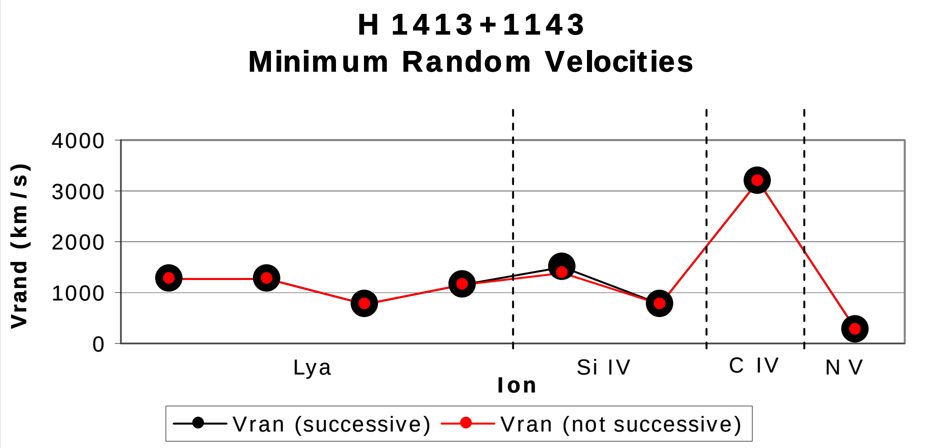


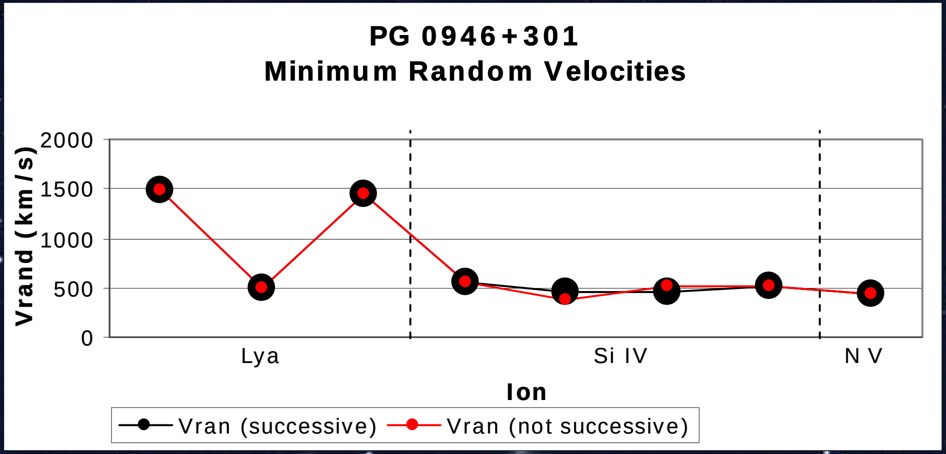


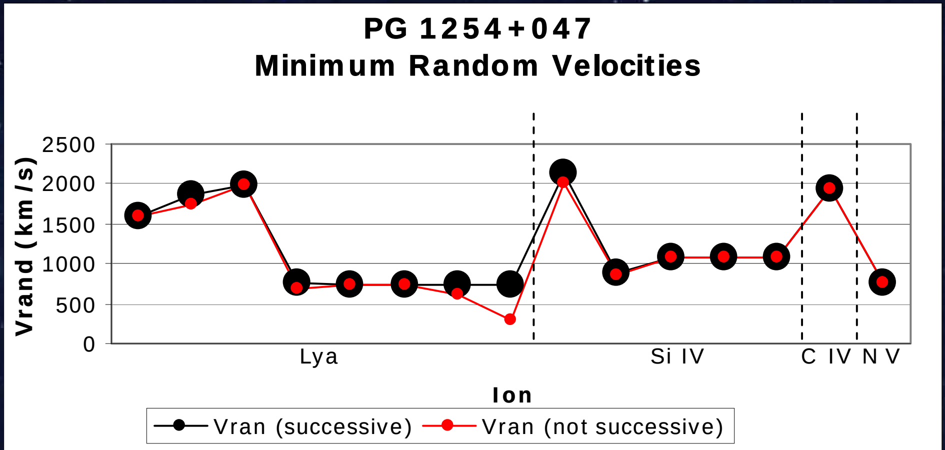


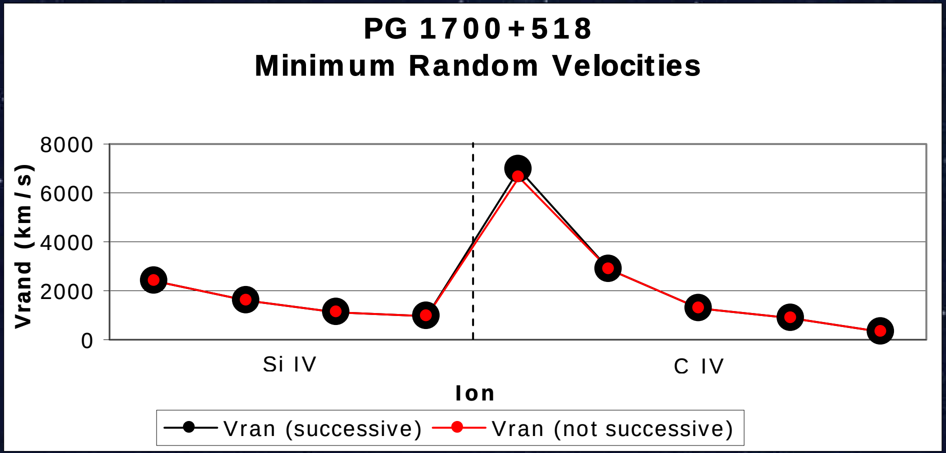
Almost no change between successive and not successive cases

Random Velocities (GR)



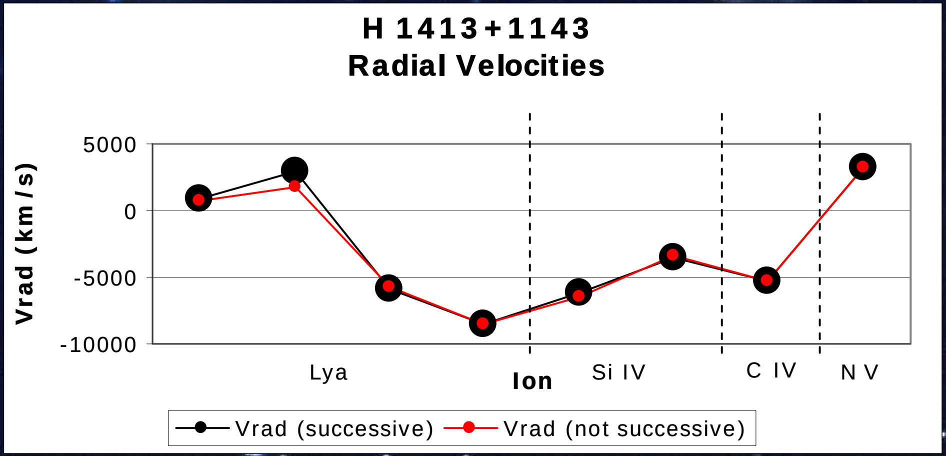


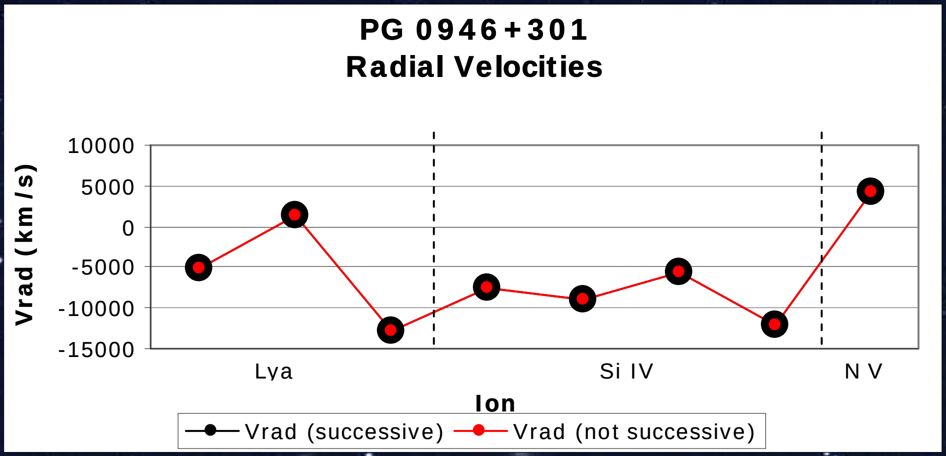


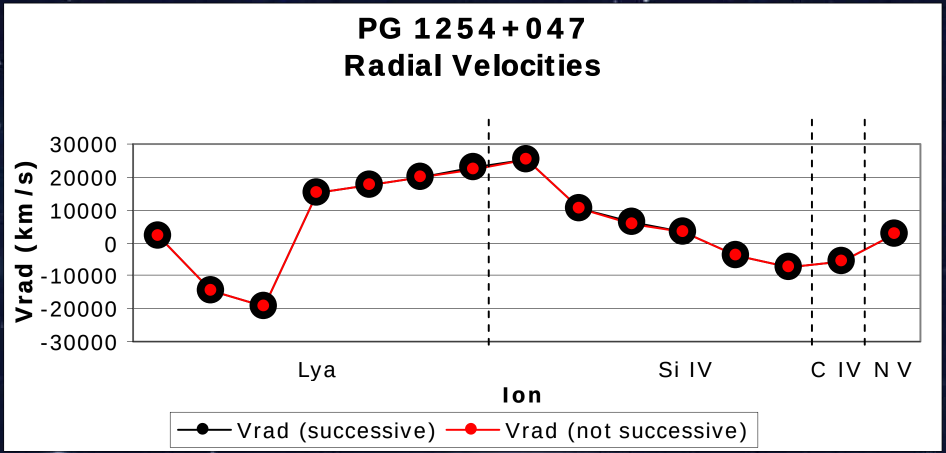


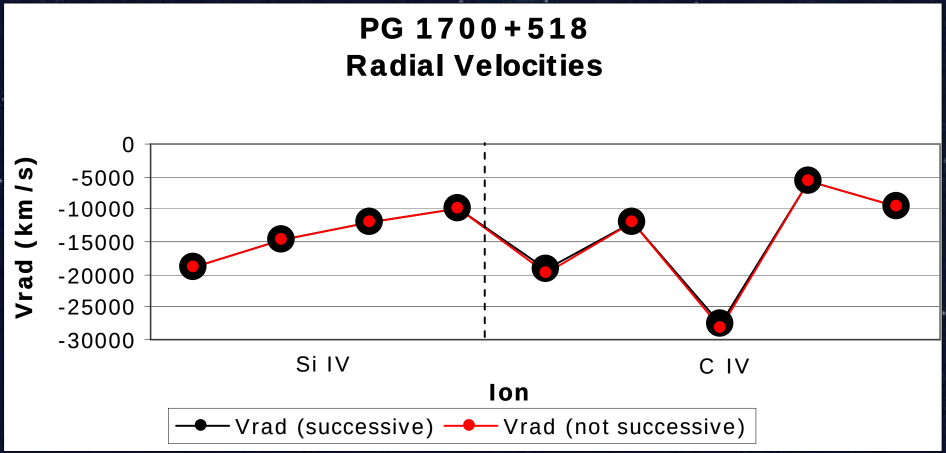
Almost no change between successive and not successive cases

Radial Velocities (GR)



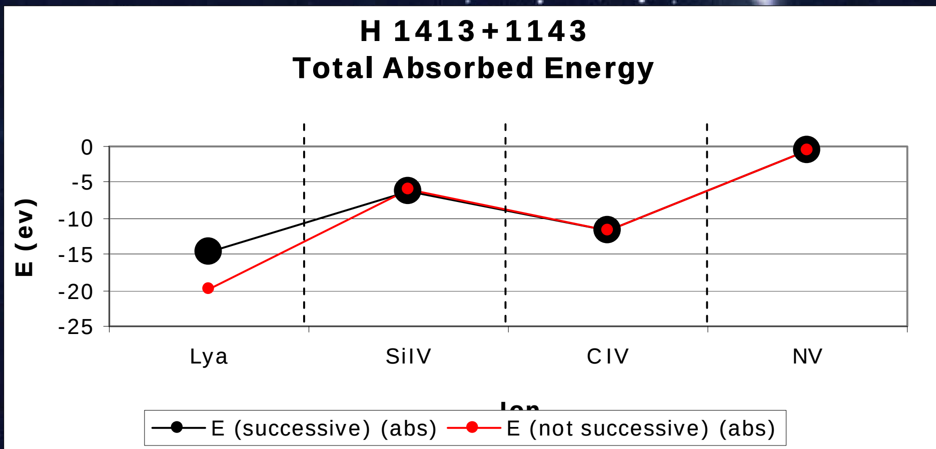


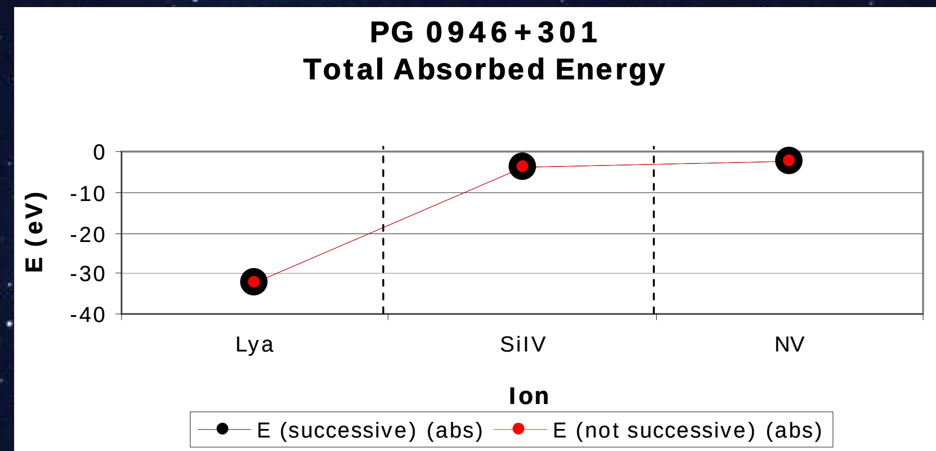


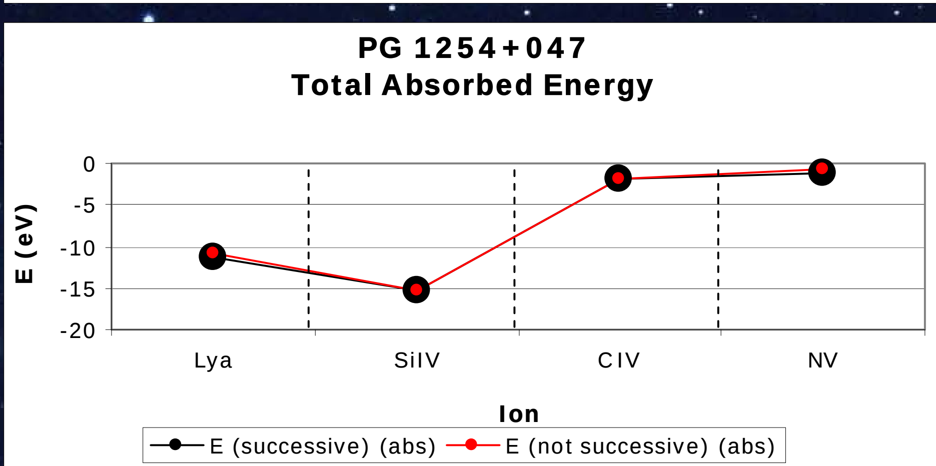


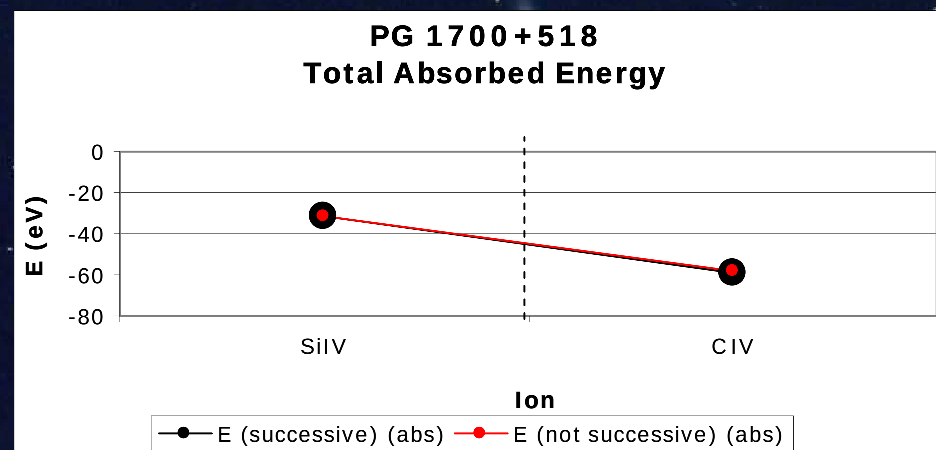
Almost no change between successive and not successive cases

Total Absorbed Energy (GR)









Almost no change between successive and not successive cases.

These results are opposed to what we theoretically expected, i.e. differentiation in the absorbed energy.

Conclusions

In all the studied quasars, comparing the results, we observe that the mean values of all the kinematic parameters do not change depending on the applied method.

However
In the case of the absorbed energy the method of the independent but not successive layers of matter gives the same values as the method of the independent and successive layers of matter.

Some general remarks

1. From our study in hot emission stars (Oe and Be stars), we see that the cooler the studied objects and the studied regions are, the smaller are the differences in the absorbed energy. This means that in order to study the problem of energies, we should take into account the temperature of the studied objects, as well as of the studied regions which create the observed spectral lines.
2. We should also take into account that hot emission stars present their **maximal energy in UV**, while quasars in **X-rays**. This means that we should study the behavior of energies in many spectral ranges (UV, optical X-rays, e.t.c.)
3. In general, in the case of stars, the density regions lie in a much smaller area than in the case of quasars. This means that it is more probable that the density regions in the case of stars are successive, while in the case of quasars, the BLR (Broad Line Regions) are not successive. The two extreme cases of total or not at all covering give the minimum and maximum values of the total absorbed energy, respectively.


Thank you!