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Ways of creation of DACs and SACs in the spectra of PG 0946+301 and PG 1254+047

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1. Introduction

Assuming that the Broad Line Regions - BLR (originated in a disk wind) are composed of a number of successive independent absorbing density layers, which have the random, rotational and radial velocity, we used the GR model (Danezis et al. 2007) in order to fit broad spectral lines. By fitting the observed absorption lines with the model we take the basic parameters of BLRs (random, rotation and radial velocities and column density). This model supposes that the density regions of matter that construct the BLRs are independent and successive.

Here we investigate the physical properties of Broad Absorption Line Regions (BALRs) of the BALQSOs PG 0946+301 (Z=1.216) and PG 1254+047 (Z=1.024) by applying the GR model on their spectra. Specifically, we study the C IV $\lambda\lambda$ 1548.187, 1550.772 Å, Si IV $\lambda\lambda$ 1393.755, 1402.77 Å, N V $\lambda\lambda$ 1238.821, 1242.804 Å UV resonance lines and the Lya λ 1215.68 Å spectral line.

2. The method

In order to study the BALs and the BELs we use the GR model (Danezis et al. 2007), which can be used successfully, for both hot emission stars and AGNs. By solving the radiation transfer equations through a complex structure of successive and independent layers of matter, we conclude to the function

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

for the line profile, which is able to give the best fit for the main spectral line and its Satellite Components at the same time.

In the GR line function, in the case of a number of independent and successive absorbing or emitting density layers of matter the final profile that is produced by a group of absorption lines is given by the product of the line functions of each component.

An idea of our scientific group is to examine the form of GR line function if the density regions of matter that produce the satellite absorption or emission components are independent but not successive. In this case the GR line Function has the fowling form $I_\lambda = I_{\lambda 0} \sum\limits_i \exp\{-L_i \xi_i\} + \sum\limits_j S_{\lambda ej} \left(1 - \exp\{-L_{ej} \xi_{ej}\}\right)$

3. Results - Conclusions

We found that the peculiar profiles of the studies lines are created by a number of Satellite Absorption Components (SACs). An exceptional phenomenon is that the C IV doublet of PG 0946+301 is one of the very few lines presenting clearly Discrete Absorption Components (DACs), in the case of quasars. Finally, we calculated some kinematical parameters such as the apparent radial and rotational velocities of the regions that create the studied lines, the random velocities of the ions and the total absorbed energy of the same regions.

In both cases of PG 0946+301 and PG 1254+047 we observe that the mean values of all the kinematic parameters and the absorbed energy do not change depending on the applied method (successive and not successive layers of matter). In Fig. 1 we present, as an example, the values of the rotational and radial velocities of the regions which create the Lya, Si IV, C IV and N V spectral lines of PG 0946+301 and the random velocities of the ions and the values of the total absorbed energy of the same regions, calculated in the cases that the independent density regions of matter producing the absorption or emission satellite components are successive (black circles) or not (white circles).

References

Danezis, E., Nikolaidis, D., Lyratzi, E., Popović, L. Č., Dimitrijević, M. S., Antoniou, A. & Theodossiou, E. 2007, PASJ, 59, 827

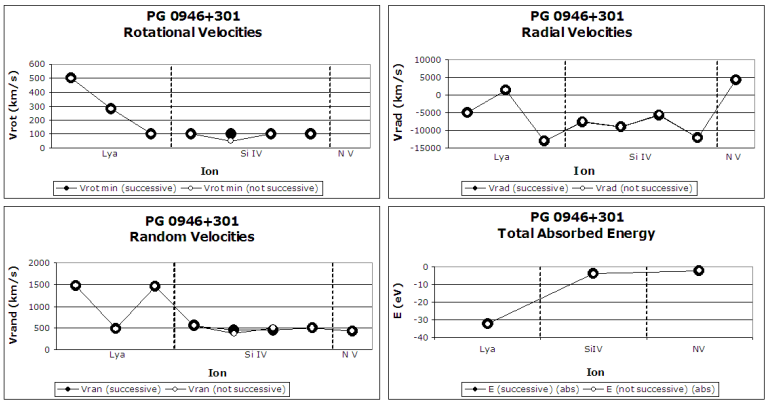

Figure 1.: Rotational Velocities (up-left), radial velocities (up-right), random velocities (down-left) and total absorbed energy (down-right) taken from the analysis of the Lya, Si IV, C IV and N V spectral lines in the case of successive (black circles) or not successive (white circles) density regions. One can see that there is almost no difference between the two cases.