Long term variability of the coronal and post - coronal regions of the Oe star HD 149757 (ζ Oph)
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Introduction
HD 149757 (ζ Oph) is a bright (06V) star (Guiasu 1973), rapidly rotating and a strong non-polar radiar (Kameik, Aoki & Hiras 1995, Reid et al. 1995) that, on occasions, shows distinct the emission (Buchler & Brown 1974). It is a favorite source for UV absorption-line studies because in line of sight intercept a nearby region of dense gas which is probably located in space (e.g. Lambert et al. 1974). Hrivnak et al. (1991) and Hrivnak et al. (1991) consider it as a binary star from the integrated 6052 Å (O VI) supercontinuum. They propose that this neutron star is the remnant of a supernova that occurred in a binary system that also contains (ζ Oph) and the proposed neutron star. The neutron star received a kick velocity of about 35 km/s in the explosion.

In this paper we apply the model proposed by Denezis et al. (2006), Nikolaidis et al. (2006) and Denezis et al. (2007) for the outer atmosphere of Oe and the stars, to the star HD 149757 and we present some first results deriving from this application. This model allows the existence of many absorption shells and many independent density regions, considers that the expanding outer atmosphere consists of some absorbing shell and an outer emitting shell and concludes to a function for the spectral line shape to reproduce the profiles of all the spectral lines with great accuracy. We calculate the apparent rotational, random and radial velocities as well as the density of the independent regions of matter which produce the main spectral lines of C IV-N IV and N V and their satellite component. Finally, we present the time-scale changes for all the calculated parameters.

Observational data
This project is based on eleven different spectra of HD 149757 taken with the IUE- Data satellite. We study the structure of the spectral lines of V I, C IV, N IV and N V and the N V spectral line of HD 149767 we use the so-called G/D/G(Gaussian/Rotation) - Model proposed by Denezis et al. (2005, 2007).

It is already known that two dominant reasons for line broadening are the rotational velocity of the spherical region, which creates the line broadening, and the random velocities of the two terms, confirms the results of broaderling Denezis et al. (2005, 2007) proposed a new approach, which reduces the weight of these factors in the calculation of the final line function. We consider that the area of gas, where a specific spectral line is created, consists of independent absorbing shells followed by independent shells that both absorb and emit an outer absorbing shell. Such a structure produces DACs or SACs (Denezis et al. 2003). We apply the method proposed by Denezis et al. (2003, 2005), Nikolaidis et al. (2006). Denezis et al. (2007) on spectra of the star HD 149757 and we examine the timescale variation of the physical parameters stated below.

The study of the coronal and post - coronal regions of the moving atmosphere of the Oe star HD 149757
In Figs. 1 and 2 we present a spectral line from each of C IV, N IV and N V regions and their best fit. In the graph below each profile we present the difference between the fit and the real spectral line. Below fit we present the analysis of the observed profile to its SACs.

A. The study of the C IV density region
In Figs. 3 G and 7 we present the time-scale changes of the apparent rotational, radial and random velocities, as well as the column density of the C IV region in 10^24 cm^-3 of the density region where the spectral line of N V region in 10^18 cm^-3 is created.

B. The study of the N V density region
In Figs. 8 G and 11 we present the time-scale changes of the apparent rotational, radial (V rad) and random velocities (V rand) in limit (km/s) and the column density (CD) in 10^24 cm^-3 of the density region where the spectral line of N V region in 10^18 cm^-3 is created.

C. The study of the N V density region
In Figs. 1a – 1b we present the time-scale variations of the column density (CD) in 10^24 cm^-3 of the absorbing component of the N V resonance line ζ 1328.821 and 1242.804 Å respectively. In Figures 11 and 14 we present the mean values of the apparent radial velocities (V rad) and random velocities (V rand) respectively.

Conclusions
The models
Applying the GB – Model (Denezis et al. 2005, Nikolaidis et al. 2006 and Denezis et al. 2007), we can fit accurately all the studied spectral lines.

Radial velocities
The important differences in the radial velocities in the three studied regions are remarkable. Specifically, in the C IV region we calculate apparent radial velocities about -800 to 100 km/s for each satellite absorption component. However, in the N V region the apparent radial velocities are about -50 km/s and in the N V region we measure apparent radial velocities about -1100 ± 200 km/s for each satellite absorption component (see Figures 5, 8 and 11).

Rotational velocities
We present timescale variation of the rotational velocities only in the C IV region, where the best fit of the spectral lines has been obtained in 7 of the 11 cases with the rotational way with Gaussian correction (see Figure 4). The values about 200 km/s correspond to the spectra that we fitted with the Gaussian way. Apart from these spectra, we see a constant behavior of the apparent rotational velocities, with values about 1400 km/s for the first component and about 950 km/s for the second one.

Random velocities
In the C IV region we detected two groups of random velocities. The first group has values about 1000 km/s The second group has values between 100 and 350 km/s and correspond to the spectra where we used the rotational way with Gaussian correction (see Figure 6). In the N V region the values of random velocities are about 100 km/s and correspond to the spectra fitted with the rotational way. The values between 500 and 4000 km/s correspond to the spectra fitted with the Gaussian way (see Figure 9). In the N V region we calculated values about 1000 km/s for one satellite component and values about 200 km/s for the other (see Figures 12). In each region and for each fitting way, the timescale variation of the values of the random velocities are almost constant.

Column density
Until now the Column Density was measured considering that the observed feature represents only one component. As our hypothesis is that the observed complex profile of the studied lines consists of a number of satellite components, we calculate lower values for the Column Density. Specifically, we calculated Column Density in each region with values between 0.5 x 10^15 and 2.5 x 10^15 cm^-2. These values are lower than the typical values which are around 10^17 cm^-2 (Pavlov & van der Poell 1980) or 10^16 – 10^17 cm^-2 (Hawthorn & Pinjia, 1986). Besides, it is generally accepted that the calculation of the Column Density values depends on the method one uses. (Hawthorn & Pinjia, 1986).

References
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