

Clumping in Hot Star Winds

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Moving absorption bumps in the spectra of Be stars

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Several Be binaries exhibit an absorption bump moving across the blue wing of hydrogen emission lines towards the line center. This bump is demonstrated for the case of two bright Be stars, κ Dra and 4 Her. It is not clear what is the reason for this travelling bump.

4 Her (HR 5938, HD 142926) is a bright ($V=5.75$) rapidly rotating Be star and a single-line spectroscopic binary (Harmanec et al. 1973). Koubský et al. (1997) found an absorption bump moving across the blue wing of the $H\alpha$ profile. This bump follows the orbital period and appears twice during the orbital period (see Fig. 2). Very interesting is the fact that the radial velocity of this absorption bump is *always* negative.

κ Dra (HR 4787, HD 109387) is a variable ($V=3.75-3.95$) Be star, which was proved to be a binary by Juza et al. (1991). Similarly to the case of 4 Her, Saad et al. (2005) found an absorption bump moving in the blue part of the $H\alpha$ and $H\beta$ line profiles (Figure 1). The bumps are indicated by an arrow. Comparing available profiles of $H\alpha$ and $H\beta$ lines observed at the same time we can see that the bump velocity in the $H\beta$ lines is always slightly smaller. The radial velocities of these bumps are plotted in the Figure 2.

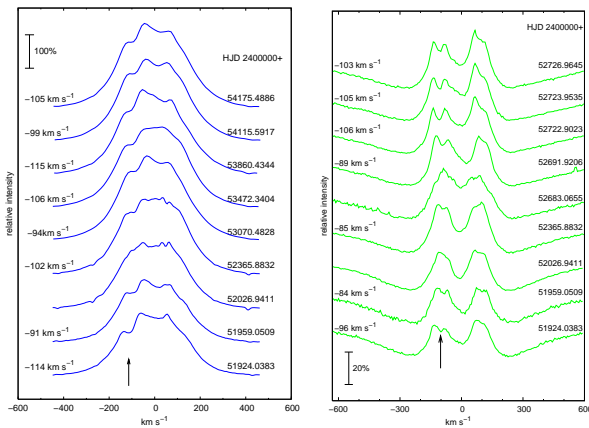


Figure 1: The $H\alpha$ (left panel) and $H\beta$ (right panel) line profiles of κ Dra with the moving absorption bump (denoted by an arrow) in the blue wing of the profile.

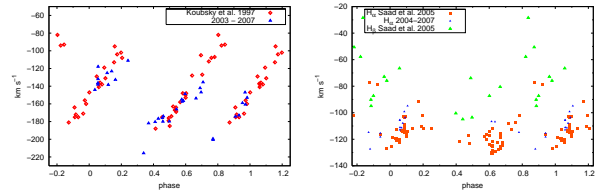


Figure 2: Radial velocities of the moving absorption bump in the $H\alpha$ line of 4 Her (left panel) and in the $H\alpha$ and $H\beta$ lines of κ Dra (right panel), both folded with orbital periods.

Discussion: Both binary systems display a lot of similarities. They are both systems with a rapidly rotating late Be star primary and a low-mass secondary. Their orbital period is of the order of tens of days. Both stars display also V/R variations locked with the orbital period. All these similarities suggest that also the reason for the appearance of the moving absorption bumps could be similar. However, the explanation of the absorption feature is not clear. Possible polar jets connected with the Be star are not able to explain orbital variations of the bumps. On the other hand, corotating structure does not explain the exclusively negative radial velocities of these bumps.

There are indications that similar features may be present in other systems with Be stars as well, like in V743 Mon (Pogodin 1997).

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References

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