The Lives and Death-Throes of Massive Stars
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The circumstellar environments of B[e] Supergiants

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Abstract. The evolution of massive stars encompasses short-lived transition phases in which mass-loss is more enhanced and usually eruptive. A complex environment, combining atomic, molecular and dust regions, is formed around these stars. In particular, the circumstellar environment of B[e] Supergiants is not well understood. To address that, we have initiated a campaign to investigate their environments for a sample of Galactic and Magellanic Cloud sources. Using high-resolution optical and near-infrared spectra (MPG-ESO/FEROS, GEMINI/Phoenix and VLT/CRIRES, respectively), we examine a set of emission features ([OI], [CaII], CO bandheads) to trace the physical conditions and kinematics in their formation regions. We find that the B[e] Supergiants are surrounded by a series of rings of different temperatures and densities, a probable result of previous mass-loss events. In many cases the CO forms very close to the star, while we notice also an alternate mixing of densities and temperatures (which give rise to the different emission features) along the equatorial plane.

Keywords. stars: circumstellar matter, stars: emission-line, Be, stars: mass loss, line: profiles

1. Analysis and Results

By using a simple kinematical model of a rotating ring as emitting region of each optically thin forbidden emission line and each molecular band, we probe the structure of B[e] Supergiants' disks (for details see [1]). For all studied cases we find a series of rings, and each object displays a unique distribution of these rings in terms of density and temperature. We identify two groups based on: i. the presence of [CaII]/[OI] emitting regions closer to the star than CO, consisting of CPD-529243, HD62623, Hen 3-298 (the only system displaying the [OI]5577 emission line), CPD-572874 (multiple rings, most probably a disk), HD87643, and LHA120-S73 (from [2]), and ii. those without, consisting of HD 327083 and GG Car (circumbinary structures), MWC137 (without any [CaII] emission), and LHA115-S6. Such series of equatorial rings may be the result of a common formation mechanism from mass loss triggered by (non-)radial pulsations and/or other instabilities. A close companion, as seen in two objects, is suitable to clear the innermost atomic gas regions. Minor bodies might be present in the gaps around the single stars as well that help stabilize the ring systems [2].

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References

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