

# A modern study of HD166734: a massive supergiant system

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**Aims.** HD166734 is an eccentric eclipsing binary system composed of two supergiant O-type stars, orbiting with a 34.5-day period. In this rare configuration for such stars, the two objects mainly evolve independently, following single-star evolution so far. This system provides a chance to study the individual parameters of two supergiant massive stars and to derive their real masses.

**Methods.** An intensive monitoring was dedicated to HD166734. We analyzed mid- and high-resolution optical spectra to constrain the orbital parameters of this system. We also studied its light curve for the first time, obtained in the VRI filters. Finally, we disentangled the spectra of the two stars and modeled them with the CMFGEN atmosphere code in order to determine the individual physical parameters.

**Results.** HD166734 is a O7.5I<sub>f</sub>+O9I(f) binary. We confirm its orbital period but we revise the other orbital parameters. In comparison to what we found in the literature, the system is more eccentric and, now, the hottest and the most luminous component is also the most massive one. The light curve exhibits only one eclipse and its analysis indicates an inclination of  $63.0^\circ \pm 2.7^\circ$ . The photometric analysis provides us with a good estimation of the luminosities of the stars, and therefore their exact positions in the Hertzsprung-Russell diagram. The evolutionary and the spectroscopic masses show good agreement with the dynamical masses of  $39.5 M_\odot$  for the primary and  $33.5 M_\odot$  for the secondary, within the uncertainties. The two components are both enriched in helium and nitrogen and depleted in carbon. In addition, the primary also shows a depletion in oxygen. Their surface abundances are however not different from those derived from single supergiant stars, yielding, for both components, an evolution similar to that of single stars.

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