

CHIPS: The Carina High-contrast Imaging Project of massive Stars

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Abstract. The formation of massive stars remains one of the most intriguing questions in astrophysics today. The main limitations result from the difficulty to obtain direct observational constraints on the formation process itself. In this context, the Carina High-contrast Imaging Project of massive Stars (CHIPS) aims to observe all 80+ O stars in the Carina nebula using the new VLT 2nd-generation extreme-AO instrument SPHERE. This instrument offers unprecedented imaging contrast allowing us to detect the faintest companions around massive stars. These novel observational constraints will help to discriminate between the different formation scenarios by comparing their predictions for companion statistics and properties.

Keywords. binaries: general, binaries (including multiple): close, binaries: general, stars: imaging, techniques: interferometric, methods: data analysis

Description of the Project

CHIPS builds on the foundations of the Southern Massive Stars at High angular resolutions survey (SMaSH+, Sana *et al.* 2014), which found a larger number of faint companions at separations roughly corresponding to expectations of the outer edge of the accretion disk. CHIPS will investigate whether low-mass companions exist at closer separations or whether there is a characteristic length at which the flux versus separation distribution changes. In this project we use the second VLT generation extreme-AO instrument SPHERE which allows us to reach objects 100 times fainter than achieved by SMaSH+ and other high contrast imaging campaigns (Turner *et al.* 2008, Maíz Apellániz 2010; see comparison in Sana & Evans 2010). CHIPS will observe 84 O and WR stars reaching a flux contrast of $\Delta mag = 10$ at separations as close as $0.15''$. The data analysis is performed using a state-of-the-art code named VIP, the Vortex Image Processing package (Gomez Gonzalez *et al.* 2016).

References

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