Quantitative spectroscopy of the exoplanet host star μ^2 Scorpii

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Field of work: Quantitative spectroscopy

The discovery of exoplanets was one of the greatest scientific achievements in astrophysics of the last three decades, and was awarded with the Nobel Prize in Physics 2019 to Michel Mayor and Didier Queloz. An overview of the current status of the search for exoplanets can be found at exoplanet.eu. Initially, only indirect methods of searching for exoplanets - e.g. the radial velocity and transit method - were successful. From 2008 onwards, direct imaging of exoplanets was realised, in particular with the aid of adaptive optics and coronography. One of the unusual findings of recent times was a planetary system around the massive supernova progenitor star μ^2 Scorpii (see the figure, Squicciarini et al. 2022, *Astronomy & Astrophysics*, 664, A9 doi:10.1051/0004-6361/202243675).

The proposed bachelor thesis focuses on the host star μ^2 Scorpii, of spectral type B2 IV. A spectral analysis on the basis of an existing high-resolution spectrum is to be carried out. In particular, the chemical composition is of interest. Modern line-formation calculation codes together with analysis codes are to be applied in order to analyse the chemical composition, taking into account deviations from the standard assumption of thermodynamic equilibrium (so-called non-LTE effects) to determine abundances for the astrophysically most important elements.

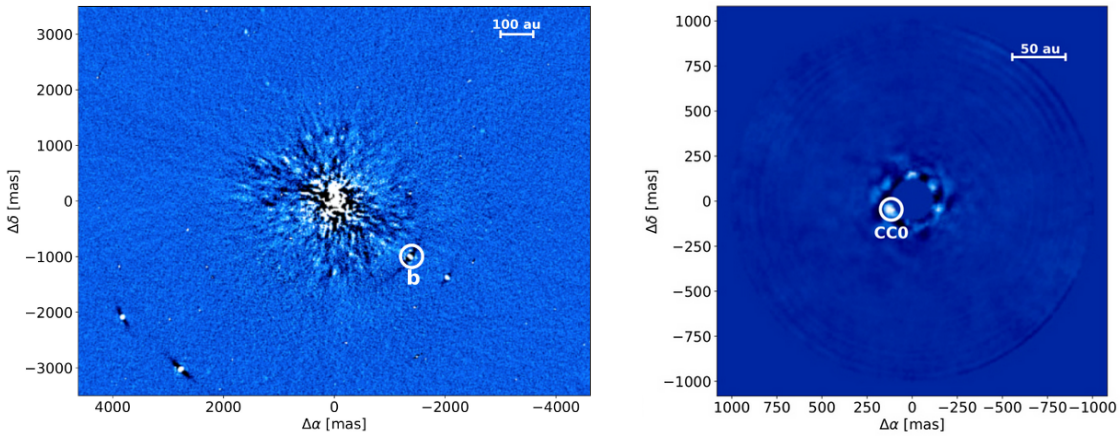

Figure: Detection of the substellar companions μ^2 Sco b and c via adaptive optics. The light from the bright host star was suppressed via a coronograph (Squicciarini et al. 2022).

Keywords: high-resolution spectroscopy – elemental abundances – stellar atmospheres – non-LTE radiative transfer – host stars of exoplanets

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