Master's thesis project in Space, earth and environment

Zooming in on Stellar Surfaces

Background
Sun-like stars at the end of their life are the main source of chemical enrichment of the interstellar medium as they produce and expel elements such as Carbon, Nitrogen and even for example Tin that were formed in their interior. However, the exact processes involved in expelling these elements from these so-called evolved stars into space are still unknown. Recent breakthrough observations with instruments such as ALMA and the VLT now show that it has become possible to directly image the extended atmospheres of these evolved stars that can reach sizes of several astronomical units (see e.g. Vlemmings et al. 2017, https://arxiv.org/abs/1711.01153). These observations have revealed several surprises, such as hotspots and fast rotation. This MSc thesis project focuses on investigating the irregularity of the extended atmospheres in comparison to ALMA observations in order to investigate the origin of the observed structures. In particular if the structures can be related to large convection cells or smaller scale shock motions.

Task description
The student will construct simple models of extended atmospheres focusing in particular on inhomogeneous structures of varying size and contrast. Observations of these models as would be made with ALMA will then be simulated and analyzed in order to obtain a qualitative comparison with a large number of ALMA data sets. Results will be used to optimize planned ALMA observational projects.

Required education and potential course requirements
The courses "Stellar Physics" (RRY145) and "Radio Astronomical techniques and interferometry" (RRY131) are highly recommended for this Master's research project. Programing skills, specifically in Python, are helpful, but may also be developed as part of this thesis.

Credits
30 or 60 credits

Starting time
The starting date can be any time from January 2019

Contact information to supervisor
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