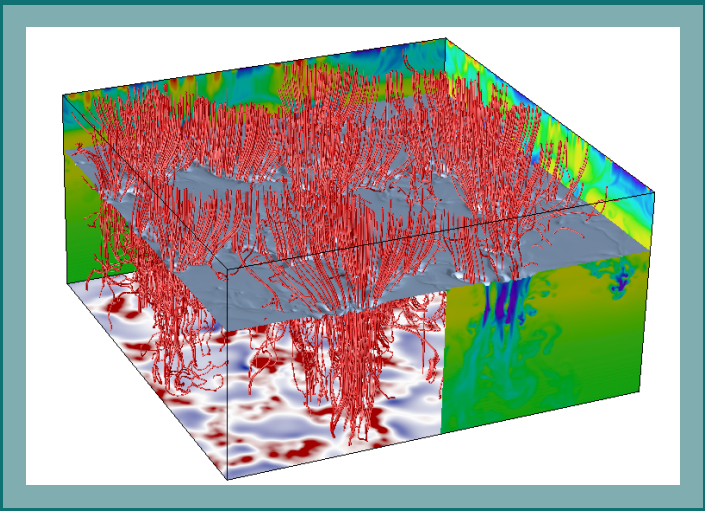
Simulations of magnetoconvection in cool main-sequence stars



Benjamin Beeck

International Max Planck Research School
for Solar System Science
at the University of Göttingen

Benjamin Beeck: Simulations of magnetoconvection in cool main-sequence stars

In this thesis, the magnetoconvective processes in the near-surface layers of cool main-sequence stars were studied in 24 three-dimensional local "box-in-a-star" simulations. For each of six sets of stellar parameters corresponding to spectral types F3V – M2V including the solar case (G2V), one non-magnetic and three magnetic simulations with an initially vertical and homogeneous field of 20, 100, and 500 G were performed.
A granule segmentation and tracking algorithm was developed and the granulation was analysed for the non-magnetic and some magnetic runs. For a few wavelength passbands, the centre-to-limb variation of the intensity and its rms contrast were calculated on the basis of snapshots from the simulations. Synthetic spectral line profiles were calculated for the simulated stars. A disc-integration including differential rotation was carried out in order to study the effects of the three-dimensional atmospheric structure on spectral line profiles.
The simulations presented in this thesis are an essential step towards a physically comprehensive description of magnetoconvective processes in stars, which is needed, e. g. for the improvement of inversion methods and the correct interpretation of spectroscopic observations.

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