EP 6: Astrophysics I: Astrospheres

Zeit: Donnerstag 12:00–13:00 Raum: HS 19

Hauptvortrag EP 6.1 Do 12:00 HS 19

Interactions of multiple stellar winds inside stellar clusters — •Alexander Noack[1], Klaus Scherer[1], Jens Kleimann[1], Horst Fichtner[1], and Kerstin Weis[2] — [1]Institut für Theoretische Physik IV, Ruhr-Universität Bochum, 44780 Bochum, Germany — [2]Astronomisches Institut, Ruhr-Universität Bochum, 44780 Bochum, Germany

This talk deals with the interaction of stellar winds inside stellar clusters. We have investigated the principal flow structure of combined multiple stellar winds, including stagnation points and boundary regions of asymmetrical cluster configurations using hydrodynamical methods. We have, first, applied the theory of complex potentials to analyze planar cases analytically. Second, this model was expanded to fully three-dimensional, asymmetric configurations with the aid of numerics.

We found (i) that one can distinguish regions in the large-scale cluster wind that are determined by the individual stellar winds, (ii) that there are comparatively narrow outflow channels, and (iii) that the large-scale cluster wind asymptotically approaches spherical symmetry at large distances. Consequently, one must conclude that the combined flow inside a stellar cluster resulting from the interaction of multiple stellar winds is highly structured.

More information can be found in the related paper: K. Scherer, A. Noack, J. Kleimann, H. Fichtner and K. Weis, 2018, A&A, 616, A115.

EP 6.2 Do 12:30 HS 19

Skymaps of observables of three-dimensional MHD astrosphere models — •Lennart Robin Baalmann — Ruhr-Universität Bochum

Sky maps of three-dimensional MHD single-fluid models of astrospheres are created by projecting the modeled cells on the surface of a sphere. By choosing different physical parameters to be integrated, sky maps of different observables can be created, e.g. the Hα flux, the bremsstrahlung flux, the cyclotron flux, the Faraday rotation measure or the column density. The method is applied to the astrospheres of different stars, including λ Cephei and the Sun (heliosphere). Compared to current observational limits, only the fluxes of the λ Cephei astrosphere may be observed.

EP 6.3 Do 12:45 HS 19

MHD-shock structures of astrospheres — •Klaus Scherer[1], Lennart Baalmann[1], Horst Fichtner[1], Jens Kleimann[1], Dominik Bomans[2], Kerstin Weis[2], and Stefan Ferreira[3] — [1]Institut für theoretische Physik IV, Ruhr-Universität Bochum, 44780 Bochum, Germany — [2]Astronomisches Institut, Ruhr-Universität Bochum, 44780 Bochum, Germany — [3]Centre for Space Research, North-West University, 2520 Potchefstroom, South Africa

The interpretation of recent observations of bow shocks around O stars and the creation of corresponding models require a detailed understanding of the associated (magneto-)hydrodynamic structures, which will be discussed here. We discuss in detail the magnetohydrodynamic structures associated with stellar bow shocks, which are of high relevance for further studies of turbulence and cosmic-ray modulation. We describe in detail the fast- and slow-magnetosonic regions using the corresponding Mach numbers. We show that in O star astrospheres, distinct regions exist in which the fast, slow, Alfvénic, and sonic Mach numbers become lower than one, implying sub-slow magnetosonic, as well as sub-fast and sub-sonic flows.