Workshop

Stellar End Products: The Low Mass - High Mass Connection

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Susanne Höfner *(invited)*
Uppsala University, Sweden

Title:
Dynamical Atmospheres and Winds of AGB stars: A Theorist's View

Abstract:
The massive cool outflows observed around AGB stars are usually attributed to a combination of stellar pulsation and radiation pressure on dust. Atmospheric shock waves, triggered by pulsation and giant convection cells, intermittently lift gas to distances above the stellar photosphere where temperatures are low enough for dust condensation. The dust grains which are formed in the dense wakes of the shocks are accelerated outwards by absorption and scattering of stellar photons, and they drag along the surrounding gas by collisions. This scenario is supported by various observations, e.g. high-resolution spectra probing gas velocities in the atmospheres and winds, or interferometry and imaging of nearby objects, showing evidence of atmospheric dynamics and constraining dust condensation distances. In recent years, considerable progress has been made regarding time-dependent dynamical models which follow the flow of matter from the atmosphere into the circumstellar envelope, taking non-equilibrium dust formation and detailed radiative transfer into account in a self-consistent way. Such models, based on first principles, predict mass-loss rates, wind velocities, spectra and photometric variations in good agreement with observations for both M- and C-type AGB stars. In this talk I will focus on recent developments and insights concerning dust species that are wind-driving candidates or prominent in mid-IR spectra, effects of pulsation and convection on atmospheres and winds, as well as the latest generation of 3D star-in-a-box models.