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The handling of radiation transport in 3D simulations of cool giants

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Recent 3D simulations of cool giants and supergiants, specifically the asymptotic giant branch (AGB) and red supergiant (RSG) stars, with the CO5BOLD radiation-hydrodynamics code cover a wider range of stellar parameters and with greater temporal and spatial resolution than before. In these simulations, the hydrodynamical steps were handled straightforwardly with the Roe solver with 1D directional splitting, while particular considerations were needed for the radiation transport scheme. As all the boundaries on the grid are fully open for matter and radiation, and conditions in AGB and RSG stars give rise to turbulent and violent flows, resulting in large fluctuations in local temperature, heat capacity and opacity, radiation transport is handled with a modified short-characteristics scheme. The size of a radiative time step was calculated in relation to the thermal relaxation time of the grids, with an equation adapted from Spiegel (1957). Other simplifications exist to allow for efficient, yet accurate and reliable, radiative transfer in the 3D simulations. The aim of the talk, or poster, would be to highlight the radiation transport scheme being utilised in the CO5BOLD simulations, and present recent analyses on the pulsation properties of the simulated stars and how they relate to their stellar parameters.

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