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Progress report

SPECTRAL SYNTHESIS AS A TOOL FOR STELLAR AND GALACTIC ASTRONOMY CHALLENGES AND PERSPECTIVES

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Atmosphere models and theoretical spectra are an essential instrument in the analysis of stellar atmospheres, and by extension, provide a fundament for a variety of fields such as stellar evolution, studies of planetary systems and galactic chemical abundances. Wide field surveys including future space missions and the rapidly evolving power of multi-object and integral field spectroscopy are going to provide an unprecedented wealth of observational data. The are creating an increased demand for extensive spectral databases that can presently only be satisfied by classical tools of 1D stellar atmospheres and spectral synthesis. At the same time, obtaining high precision spectral models requires an accurate treatment of convection effects, both due to the impact of convective energy transport on the atmospheric temperature structure and of the turbulent velocity field on line broadening. Both affect line formation and limb darkening, and are inferred from 3D radiative hydrodynamic (RHD) simulations, which can only be performed for a select set of model parameters with today's computational resources. I will discuss the benefits 1D spectral models can gain from RHD simulations and their limits, as well as the status of the treatment of NLTE effects, and outline perspectives for an improved parameterised convection treatment.