Invited Lecture

IMPROVEMENTS TO THE SHORT-CHARACTERISTICS METHOD IN 3D-RHD SIMULATIONS AND SOME UNSOLVED PROBLEMS IN SPECTRAL LINE SHAPES OF A-TYPE STARS

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Radiative transfer is the most important physical process taking place at the surface of a star, the stellar atmosphere. For a wide range of stars their atmospheres feature also convective energy transport which nowadays is often investigated theoretically by numerical radiation hydrodynamical simulations (RHDs), in two and also in three spatial dimensions (2D and 3D). Numerical efficiency is very important in this context, since the radiative transfer equation has to be solved for each grid point and each time step and each spatial direction chosen in those simulations. To accelerate such RHDs of stellar atmospheres with the ANTARES code a modified Bézier interpolation has recently been proposed, implemented, and tested. A report on the advantages of this approach will be given. This is followed by a discussion of unsolved problems concerning the shape of spectral lines in A-type main sequence stars and supergiants where existing RHDs yet fail to reproduce observed data, contrary to the success this approach has had for stars of lower effective temperature such as our Sun.