P 49

NLTE line formation in "unified" model atmospheres of hot stars: Improved line transfer and wind contamination of H, He profiles

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The treatment of NLTE multilevel radiative transfer in the presence of sub- and supersonic velocity fields of unified model atmospheres is discussed. An iterative method is presented, which uses a new Approximated Lambda Operator for the line transfer in the comoving frame (CMF). This method yields excellent convergence also in cases of very complex model atoms, where many strong, intermediate and weak lines have to be treated simultaneously and where other algorithms failed to converge. Especially the radiation transfer through the sonic region is investigated and the exact solution in the CMF is compared with the Sobolev approximation, which is frequently applied.

The new algorithm is used to investigate the contamination of photospheric hydrogen and helium absorption lines by emission of the stellar wind. It is found that in the case of early O-supergiants close to the Eddington-limit wind contamination is significant and leads to systematic errors in the determination of stellar parameters, if purely hydrostatic, plane parallel NLTE models are used for the spectral analysis. This is shown for ζ Puppis and Melnick 42.