Basic ALI in Moving Atmospheres

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The non-LTE radiative transfer problem requieres the consistent solution of two sets of equations: the radiative transfer equations, which couple the spatial points, and the equations of the statistical equilibrium, which couple the frequencies. The ALI method allows for an iterative scheme, in which both sets of equations are solved in turn.

For moving atmospheres, the radiative transfer is preferably formulated in the comoving frame and thereby becomes a partial differential equation. "Clasical" numerical solution methods are based on differencing schemes. For better numerical stability, we prefer "short characteristics" integration methods. For angle-dependent "ray-by-ray" integration the formulation is straightforward, while for the angle-integrated "moment equations" a more sophisticated formalism based on "Riemann invariants" is being developed.

Iron line blanketing is accounted for by means of the "superlevel" concept. In contrast to static atmospheres, the frequencies can not be re-ordered in the moving case because of the frequency coupling from Doppler shifts.

One of our future aims is the coupling of elaborated radiative transfer calculations with the hydrodynamical equations in order to understand the driving of strong stellar winds, especially from Wolf-Rayet stars.