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# Validation of the broadband HLRADIA radiation scheme in the ALADIN-HIRLAM NWP system

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It is common to use multi-band radiative transfer schemes in numerical weather prediction (NWP). However, due to their computational cost they are often used at reduced temporal and/or spatial resolution, which compromises the overall model accuracy because of strong feedback between highly variable cloud cover and radiative forcing. An alternative approach is use a computationally cheaper broadband scheme which can be used at every time-step and grid-point. Here an overview of the broadband HLRADIA scheme implemented in the ALADIN-HIRLAM NWP system is presented. This simple and computationally very fast scheme was originally developed for the HIRLAM NWP model. The shortwave (SW) and longwave (LW) components of the scheme were validated using a range of clear-sky, cloud liquid and cloud ice experiments. In the clear-sky cases, further testing was carried out for a range of aerosol forcings.

Compared to benchmark radiative transfer calculations done using DISORT, the SW fluxes from the HLRADIA scheme were shown to be of comparable quality to those from the more detailed IFS (cycle 25r1) scheme and the broadband ACRANEB2 scheme for both clear-sky and cloudy cases. In a forest fire case study where aerosol loads were high, the differences between the SW fluxes from HLRADIA, IFS and ACRANEB2 were found to be significantly smaller than differences due to the input aerosol optical properties. In this case, when the aerosol input was based on observations, SW fluxes from both schemes agreed well with observations. Preliminary experiments indicate that there are larger differences in LW fluxes between the HLRADIA and IFS and ACRANEB2 schemes when aerosol and cloud condensate loads are high.