

Introducing cloud horizontal overlap at NWP scales (1-10 km) in a fast 3D radiative transfer model

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Interactions between radiation and clouds are a source of significant uncertainty in both numerical weather prediction (NWP) and climate models. Here we present a hybrid radiative transfer model that combines a traditional twostream maximum random overlap (twomaxrnd) radiative solver (Črnivec and Mayer, 2019) with a Neighbouring Column Approximation (NCA) model (Klinger and Mayer, 2019), which parametrizes horizontal photon transport between adjacent grid-cells. Thereby the hybrid includes both subgrid-scale effects and grid-scale horizontal transport. In addition we introduced a horizontal cloud overlap scheme to the hybrid model. Further we assess the performance of the model at the NWP scale (1-10 km) for various realistic cloud configurations using results from the benchmark Monte-Carlo model MYSTIC (Mayer, 2009).