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Comparing ED(MF)^n in the gray zone to observations

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A new scale-adaptive shallow cumulus parameterization scheme is confronted with measurements made during the High Definition Clouds and Precipitation for advancing Climate Prediction Observational Prototype Experiment (HOPE) at the Jülich Observatory for Cloud Evolution (JOYCE). The Eddy-Diffusivity Multiple Mass-Flux (or ED(MF)^n) scheme is a bin-macrophysics scheme, in which subgrid transport and clouds are formulated in terms of discretized size densities. It is implemented into a large-eddy simulation (LES) model, replacing the original subgrid transport scheme. This way the ED(MF)^n can be tested in an idealized setting, covering the boundary layer gray zone. The LES is driven with large-scale forcings derived from analyses of the weather prediction model COSMO-DE, resulting in a reasonably accurate simulation of the measured conditions. During the HOPE campaign the boundary layer was measured extensively, supplying a wealth of data that can be used to evaluate parameterizations. Both long-term averages and individual shallow cumulus days are investigated. The LES is run with and without ED(MF)^n for various resolutions, and the modeled boundary layer is compared to the observations from HOPE. This allows investigating the question how well the scale-adaptive scheme reproduces simulated and observed meteorology across the gray zone.