



Unified Parametrization of the moist Boundary Layer using an Eddy Diffusivity/Dual Mass-Flux Framework

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A combined moist eddy diffusivity/mass-flux (EDMF) boundary layer (BL) parametrization aimed at improving stratocumulus has been developed and implemented in the ECMWF operational model. To achieve that goal and pave the way for a unification of the separate BL and shallow convection schemes the following ingredients were deemed necessary: (i) moist conserved variables, (ii) a combined eddy diffusion/mass-flux solver, (iii) a treatment of cloud variability and (iv) a treatment of the transition between stratocumulus and shallow convection with typically high and low cloud cover respectively. The resulting parametrization drastically improved the marine stratocumulus representation. Continental winter stratus and SSTs (even NINO4 - central/western Pacific) were also improved.

The second development stage aimed at the further unification with shallow convection. A statistical mass-flux framework is used featuring an ensemble of explicitly modeled updrafts. Currently, two degrees of freedom are allowed with mass-flux components representing the two most vigorous updraft fractions (i) and (ii) in the PDF of vertical velocity. The most vigorous updraft (i), condenses and reaches cloud top, while updraft (ii) stops at cloud base. The updraft fractions are determined from the mixed layer variance budget.

Challenges will be highlighted that include the momentum transport, regime transitions and the cloud variance budget.