



Comparison of Energy- and Flux-Budget turbulence closure with Large Eddy Simulation

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Recently a new theoretical derivation of for a new turbulence closure has been presented by Zilitinkevich et al. (2013). This Energy- and Flux-Budget (EFB) closure is based on the budget equations for the basic second moments: the two energies, the TKE E_K and the turbulent potential energy (TPE) E_P , and the vertical turbulent fluxes of momentum and potential temperature, τ_i ($i = 1, 2$) and F_z . Instead of the traditional postulation of the down-gradient turbulent transport, it uses the flux-profile relationships and determines the eddy viscosity and eddy conductivity from the steady-state version of the budget equations for τ_i and F_z . In that closure authors further advance the physical background of the EFB closure, introduce a new prognostic equation for the turbulent dissipation time scale t_T , and extend the theory to non-steady turbulence regimes accounting for non-gradient and non-local turbulent transports (when the traditional concepts of eddy viscosity and eddy conductivity become generally inconsistent).

In the present study we implement a new turbulence closure in one-column RANS model and in HARMONIE/AROME weather prediction system (HIRLAM-B, 2013). We test the closure in various idealized cases, varying stratification from stable (GABLS1 case) to neutral (Truly Neutral and Conventionally Neutral cases) running HARMONIE/AROME model in single-column mode. Results are compared with LES runs and different numerical weather prediction models.

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