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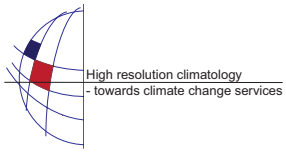

Momentum Transport in the Convective Boundary Layer

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The sub-grid scale transport of momentum in the boundary layer is generally treated as a diffusive process in atmospheric models. However, results for the mean wind are frequently poor in test cases, and it is not clear how important are those fluxes in the performance of the models. Nevertheless, it is clear that convective momentum transport in a key issue in the atmospheric circulation, and in the interactions across multiple space and time scales.

In the case of scalar fluxes, such as potential temperature and water vapour, it has been shown that “non-local” transport plays an important role in the turbulent transport, implying that a purely diffusive representation is insufficient. Counter-gradient, mass-flux theories and the combined eddy-diffusivity/mass-flux (EDMF) scheme were built to overcome that problem. The role of non-local effects in momentum is still largely an opened question.

In the present study we use a extensive set of results from LES simulations to diagnose vertical profiles of momentum related quantities in different convective boundary layers: the nieuwstadt clear boundary layer, the trade wind cumulus BOMEX case, the shallow cumulus diurnal cycle from the ARM experiment and a LBA deep convection case. In many situations these results show that the momentum transport made by organized structures, as clouds, updraughts and downdraughts contribute significantly to the total turbulent flux, suggesting that they should be included in convective parameterizations.