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LES diagnostics of momentum fluxes in the convective boundary layer

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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. 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 inappropriate. 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 results from LES simulations to diagnose vertical profiles of momentum fluxes in different convective boundary layers: a well known dry case, a cumulus BOMEX case and a shallow cumulus diurnal cycle from the ARM experiment. In many situations these results show that the momentum transport made by organized updraughts contribute significantly to the total turbulent flux, suggesting that they may be included in convective parametrizations.