Convective momentum transport through the subtropical shallow convection in LES simulations

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Does atmospheric moist convection transport horizontal momentum upwards to significantly impact surrounding flows? This has remained an enigma in spite of considerable efforts. We utilize unique multi-day large eddy simulations run over the tropical Atlantic under German HDCP2 project to evaluate the convective momentum transport (CMT) effects by shallow convection.For typical trade wind profiles during boreal winter, the convection acts as an effective “cumulus friction” to decelerate the north-easterlies. This effect is maximum near the cloud base while in the cloud layer, the effects are weak but are distributed over relatively a deeper layer. In the cloud layer, the zonal component of the momentum flux is counter-gradient and penetrates deeper than reported previously. The transport through convective updrafts and downdrafts captures the right sign of the counter-gradient momentum transport but underestimates it severely.