

The strong impact of weak horizontal convergence on continental shallow convection

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Large-scale horizontal convergence/divergence perturbations are omnipresent in the atmosphere. However, they are often too subtle to detect them by state of the art remote and in situ measurements. We examine their impact on continental shallow convection using large-eddy simulation (LES). The results show a strong sensitivity of liquid water path and cloud-top height to the perturbations. In contrast, cloud-base area coverage and mass flux are weakly affected. Those impacts are comparable to microphysical sensitivity from cloud droplet number concentration perturbations. The simulation results provide a stringent test for convection parameterizations, especially important for large-scale models progressing toward resolving some nonhydrostatic effects. One such test is performed using the multi-plume Eddy-Diffusivity/Mass-Flux parameterization. Its results show a general agreement with the LES, although some discrepancy for decreasing convection is also documented.