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A Demonstration of the Effect of Vertical Wind Shear and the Perturbation Pressure Fields on Simulated Thunderstorms

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While vertical wind shear is not a requirement to produce deep convection, and in many operational forecasting settings is not explicitly considered, vertical shear nonetheless has a huge impact on the structure and longevity of a thunderstorm. Aside from the separation of up- and downdrafts, this impact results from the perturbation pressure field, whose gradients affect the structure and propagation of the thunderstorm cells. The associated vertical acceleration often matches, or even exceeds that due to thermal buoyancy. The purpose of the poster is to demonstrate the impact of shear and perturbation pressure on thunderstorms. To this end, three simulations with different vertical shear profiles were performed using the 19th version of the Bryan Cloud Model 1 (CM1). In the first simulation shear was excluded. The two others simulations include shear. While the total length of the hodographs between zero and six km is constant in these simulations, the shapes of the hodographs vary: One is a quarter circle in the first three kilometres and the other one is purely straight. In all the three simulations the Weisman-Klemp analytic thermodynamic profile was used. Results are presented for the mature stage of the storms and a detailed look at the perturbation pressure field is offered, using a decomposition of the pressure field into various dynamic and static contributions.