Intensification of an asymmetric, sheared tropical cyclone in a WRF simulation

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Tropical Storm Gabrielle (2001) experienced a rapid pressure fall of 22 hPa in less than 3 hours while undergoing 13 m s^{-1} of ambient vertical wind shear. A 1-km resolution Weather Research and Forecasting model simulation of this event was performed to assess the physical processes associated with asymmetric rapid intensification. The simulation intensified Gabrielle while under a high shear environment, although the amplitude and rate of the pressure fall were underestimated. The vortex tilted in the vertical in response to the shear, with the direction of tilt and the associated convective maxima ranging from downshear to left of shear. During the period of deepening, the storm evolved from a broad weak vortex with intense downshear convective cells to a strong vortex with central subsidence. The processes by which asymmetric convection contributed to vortex organization and deepening will be evaluated.

In addition, a measure of mid level ventilation of the TC will be developed and applied to this simulation. The impact of downdraft activity associated with shear-induced convective asymmetries will also be evaluated. These negative influences on TC intensity change will be discussed in the context of an intensifying, sheared TC.