4–8 November 2019, Kraków, Poland
ECSS2019-189

The relevance of vertical-vorticity rivers in simulated storms that produce tornado-like vortices

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Recent attention has focused on the role of so-called vertical vorticity rivers in thunderstorm outflow on tornadogenesis. Vorticity rivers have been implicated to act like an umbilical cord for a tornado, continuously providing an influx of vertical vorticity practically at the surface. This vorticity has been demonstrated to originate in descending air that has its horizontal vorticity augmented baroclinically. This horizontal vorticity is subsequently tilted into the vertical while the air is descending. However, recent trajectory analyses suggest that those parcels that enter the tornado-like vortex (TLV) at the lowest levels in simulations have not spent much, if any, time in vorticity rivers. In some cases, these rivers are absent altogether while TLVs are present, which is the case especially in quasi-linear convective systems. Moreover, if vorticity rivers are present, parcels within these rivers do not seem to stream into the TLV. This is a surprising finding because the Eulerian depiction at the lowest model level seems to suggest that vorticity patches within vorticity rivers directly feed into the TLV in many of the simulations.
Idealized simulations will be presented to address this discrepancy and to elucidate the role of parcels within and outside of vorticity rivers in producing and maintaining tornado-like vortices. This analysis will include vorticity budgets along the trajectories to identify the ultimate source, and the mechanisms for the rapid increase, of vertical vorticity before the parcels enter the vortex.