ABSTRACT

TC Camille (1969) and TC Danny (1997) both interacted with the equatorward entrance region of an upper-tropospheric jet as they traversed the Appalachian Mountains; however, their societal impacts differed. During the 12-h period starting 0000 UTC 20 August 1969, 690 mm of rain fell over Massies Mill, Virginia, as TC Camille traversed the central Appalachian Mountains. On 24 July 1997, TC Danny underwent inland reintensification while moving across the Carolinas. TC Danny's minimum central mean sea level pressure decreased from 1012 hPa to 1000 hPa and its maximum sustained wind speed increased from 20 kt to 40 kt during the 18-h period starting 0000 UTC 24 July. The main objectives of this thesis are to document the synoptic-scale environments and underlying mesoscale processes responsible for each TC–jet interaction, and to document important mechanisms and processes that lead to inland flooding associated with TC–jet interactions and inland reintensifying TCs that interact with midlatitude jets.

Multiscale analyses are conducted using ERA-40 and the NCEP CFSR (Climate Forecast System Reanalysis) global gridded datasets, available at 1.125° and 0.5° resolution, for the TC Camille and TC Danny cases. Surface analyses are employed to identify and document the surface environment and significant mesoscale features associated with both storms. Radar data are used to supplement the mesoscale analysis of each case, and a potential vorticity (PV) perspective is employed to facilitate the interpretation of the multiscale analyses.

The multiscale analyses reveal that unlike the TC Camille case, synoptic-scale ascent arising from implied positive PV advection and minimized effects of vertical wind

shear associated with an upper-tropospheric positive PV anomaly enabled TC Danny to intensify inland. Frontogenetically forced ascent along a lower-tropospheric baroclinic zone and orographic enhancement of rainfall, induced by moist, upslope flow across the Blue Ridge Mountains, were the main contributors to the inland flooding associated with TC Camille. Convection that induced diabatically driven cyclonic relative vorticity and PV increases below the level of maximum diabatic heating at midlevels near the center of TC Danny strengthened the TC's circulation and led to its inland reintensification. The tropospheric features and processes for each case are graphically represented in conceptual models that forecasters can utilize when predicting the impacts associated with inland TC–jet interactions.