A Summary of the State University of New York at Albany (SUNY) Collaborative Science, Technology and Applied Research (CSTAR) Program's Efforts Toward Improving the Prediction of the Timing and Intensity of Heavy Precipitation Associated with Landfalling Tropical Cyclones, as Modulated by the Complex Terrain and Physiography of the Northeastern United States

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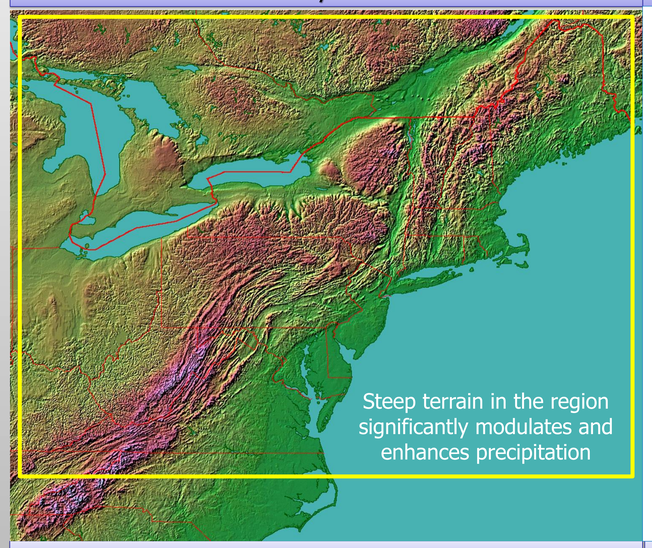
Part I : Identify various types of rainfall distributions and synoptic scale mechanisms

- Study area encompassed the Northeast United States – steep terrain in this region significantly modulates precipitation amounts
- High resolution rainfall reanalyses were produced in GIS using >3700 individual precipitation stations
- Deluca (2004) found 67% of tropical cyclones affecting the Northeast produced the heaviest rainfall to the left (west) of track (LOT) and 16% along or to the right (east) of track (ROT)
- Mechanisms driving heavy rainfall production were related to diabatically-induced upper-level ridging, which intensified and reconfigured the jet maximum
- Reconfiguration of the jet maximum resulted in a stationary area of upper-level divergence and an implied thermally-direct circulation

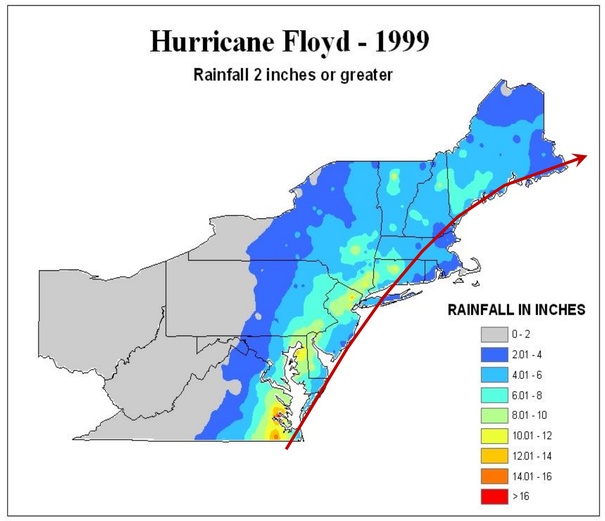
Part II : Identify mesocale mechanisms & behavior of Predecessor Rainfall Events (PREs)

- Most landfalling tropical cyclones interacted with a pre-existing mesoscale boundary
- Klein (2007) identified that jet reconfiguration induced an amplified low-level jet and positive θ_e advection with heaviest precipitation occurring in the region of strong surface frontogenesis and beneath an equatorward jet entrance region
- Cote (2007) identified the presence of localized intense rainfall events (PREs), which arrive well in advance of the main tropical cyclone rain shield
- Events were located within a mid-level confluence zone, on the west edge of a low-level θ_e ridge, on the northwest edge of a tropical moisture plume, and within the right entrance region of a jet streak
- 55% of PREs occurred to the left of track of approaching tropical cyclones, 26% occurred along-track, and 19% occurred to the right of track

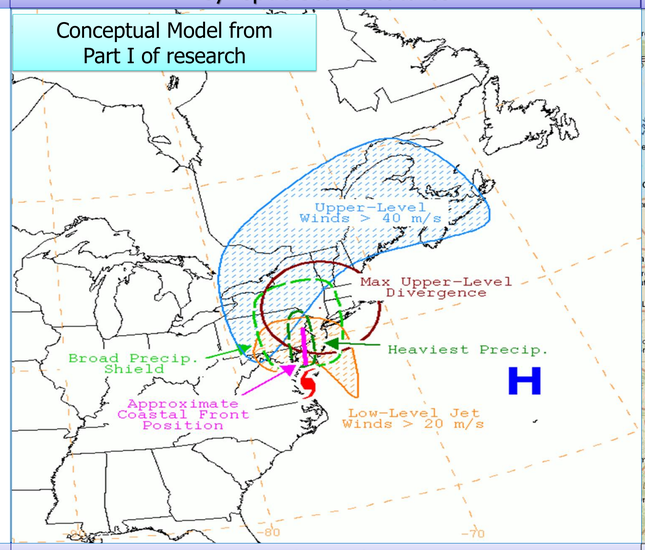
Study Area



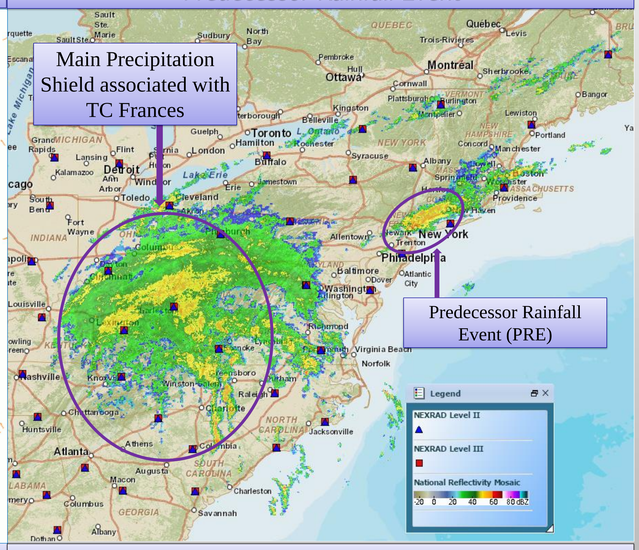
Example of a Left of Track Rainfall Event



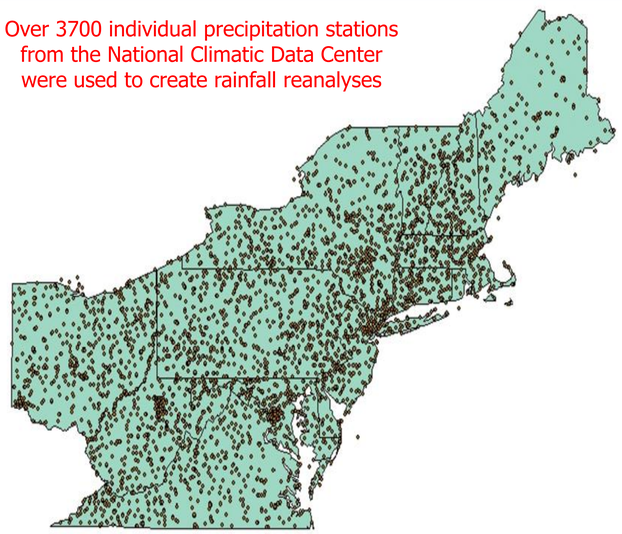
Synoptic Scale Features



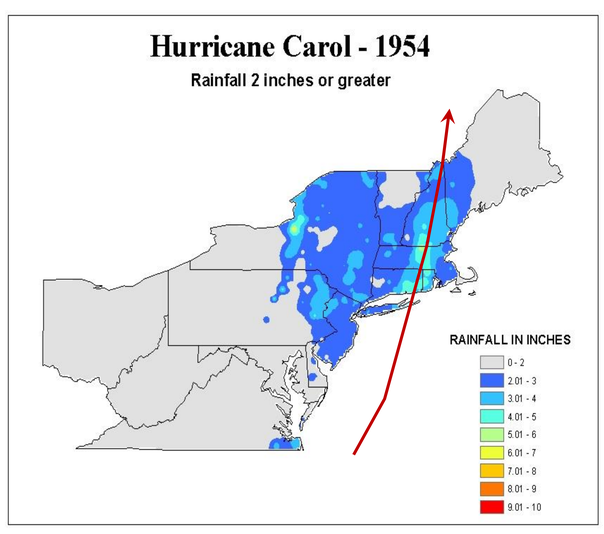
Predecessor Rainfall Event



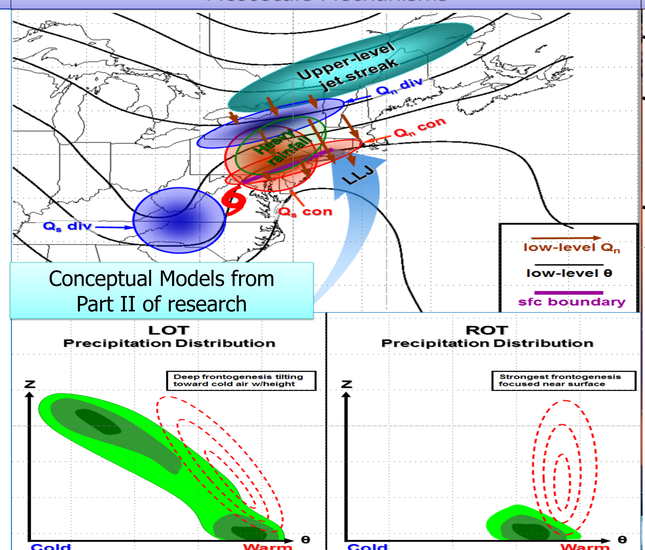
Rain gage network utilized for rainfall reanalyses



Example of an Along/Right of Track Rainfall Event



Mesoscale Mechanisms



PRE Synoptic Scale Features