Evaluating Potential Impact of Significant East Coast Winter Storms (ECWS) by Analysis of Upper and Low-Level Wind Anomalies

Research by: Neil A. Stuart

Definitions

Historical East Coast Winter Storm

(based on analysis of snowfall amounts and wind anomalies in 85 winter storms from 1948-2002)

– >12” of snow in the Carolinas & points south

– >18” of snow in Virginia and points north

Definitions

- Anomaly = Departure from normal based on a 30 year climatology (1961-1990), in units of Standard Deviations from Normal (SD)
- U and V wind anomalies = Departures from normal for Westerly and Southerly winds
- -U and –V wind anomalies = Departures below normal for Easterly and Northerly winds

Why 850 Mb and 300/250 Mb?

- 850 Mb winds represent low level wind flow above the friction layer

- Easterly winds at 850 hPa –
  - moisture advection off the Atlantic Ocean
  - low-level convergence
  - enhancement of low-level frontogenesis
  - increased precipitation production

- 300 to 250 Mb winds represent upper-level wind flow affecting the movement of the upper-level vorticity center

- Below normal upper-level winds can signal a storm cut off from the steering flow, resulting in slower movement

What to look for…

- 850 Mb U wind anomalies <-4 SD for potential extreme snowfall
- 250 Mb U wind anomalies <-2.5 SD for unusually slow-moving storm
- Heaviest snowfall generally within the nose of the 850 Mb –3 SD contour
- Rain/Snow conversion ratios not considered

and remember...

- Do NOT discount 850 Mb -3 to -4 SD and 250 Mb -1.5 to -2.5 SD
- Strong frontogenesis & favorable liquid/snow ratios can contribute to potentially historical snowfall when wind anomalies are just below threshold
- This is just one tool for evaluating the potential for a significant storm
- MREF & SREF anomalies based on different blends of operational models