Introduction

- The interaction of transverse circulations associated with two separate upper-level (UL) jet streams, along with its effects on mesoscale weather, have been documented in several studies:
  - East Coast cyclogenesis (e.g., Uccellini and Kocin 1987).
  - Heavy/flash flooding precipitation (e.g., Anctil and Stewart 1985; Johnson et al. 1990; Heslin and Uccellini 1992; Fank and Hane 1995; Medina 1996).
  - Organized severe thunderstorms complex (e.g., Hamilton et al. 1990; Ashley et al. 2000; Janowiak et al. 2000).

- The term “coupled jet streams” refers to the presence of two separate jet streams juxtaposed in such a fashion that the leading or rear boundaries of the transverse circulations are collocated with one another, resulting in an enhanced area of upper-level vertical motion (e.g., Uccellini and Kocin 1987).

- This study will investigate coupled UL jet streak occurrences during the main season (October to 31 March) in the northeastern U.S. over 19 seasons (1993-2003).

Preliminary examination of the UL flow regime using the North American Regional Reanalysis (NARR) dataset revealed 79 possible coupled jet streak occurrences during the period.

Methodology

- Preliminary examination of the UL flow regime using the North American Regional Reanalysis (NARR) dataset revealed 79 possible coupled jet streak occurrences during the period.

- Using the General Meteorological Package (GMPAC) with the NARR dataset, plan-view and cross-sectional analyses of the possible occurrences were analyzed to ensure the interaction of the jet streak circulations.

- The identified 25 coupled jet streak cases, which were then subdivided into weak dynamic (n=15) and strong dynamic (n=10) categories.

- The strong dynamic cases (covered in this presentation) were characterized by strong surface circulations (MSL = 1800 hPa) and closed mid-tropospheric waves.

Strong Dynamic Case Study

- 4 March 1994
  - Regions of 6+ inches of snow
  - Wind reports of 60-80 kts
  - Avalanches reported in PA, NY, and NJ
  - Significant deepening followed jet stream coupling (6 MP, 65 kts)

- No monthly preference for strong dynamic episodes (16 weak dynamic episodes occurred in March vs. 28 strong dynamic episodes)

- No tendency for strong jet region to have maximum in UL jet core (n=6 strong, n=9 weak)

- Northern jet stream and strong jet stream stronger during coupling period but maintain convergence, while southern jet stream [seen in ahs from 2 week time frames] show significant coupling; jet stream coupling is associated with increased vertical motion.

- Significant deepening occurs as jet stream coupling occurs.

- Conclusions
  - Northern jet stream: evenness over coupling period while maintaining position
  - Southern jet stream: strong jet region moves to 890 hPa level (600 mb) and southern (negative) circulation becomes better defined over coupling period.
  - Strong jet region (southern jet stream) strengthens over coupling period (29 days)

- Strong jet region strengthens in southern jet over coupling period

- Low-level jet strengthens over coupling period

- High jet in jet stream coupling region weaker and more diffuse

- Conclusions of basic parameters generally better than those of derived parameters, but essential differences between weak and strong coupling episodes indicate similar properties for both types of interaction.

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