MMM SEMINAR SERIES

Composite Synoptic-Scale Environments Conducive to North American Polar/Subtropical Jet Superposition Events

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The atmosphere often exhibits a three-step pole-to-equator tropopause structure, with each break in the tropopause associated with a jet stream. The polar jet stream (PJ) typically resides in the break between the polar and subtropical tropopause and is positioned atop the strongly baroclinic, tropospheric-deep polar front at ~50°N. The subtropical jet stream (SJ) resides in the break between the subtropical and the tropical tropopause and is situated on the poleward edge of the Hadley cell at ~30°N. On occasion, the latitudinal separation between the PJ and the SJ vanishes, resulting in a vertical jet superposition. Prior case study work indicates that jet superpositions are often attended by a dynamical and thermodynamic environment that is particularly favorable for the development of high-impact weather. Furthermore, this prior work suggests that there is considerable variability among antecedent environments conducive to jet superpositions. These considerations motivate a comprehensive examination of the relative importance of dynamical processes that operate within the double-jet environment to produce jet superpositions.

This study focuses on the identification of North American jet superposition events in the Climate Forecast System Reanalysis dataset during November–March 1979–2010. Jet superposition events are classified into three characteristic types: "Polar Dominant" events consist of events during which only the PJ is characterized by a substantial excursion from its climatological latitude band; "Subtropical Dominant" events consist of events during which only the SJ is characterized by a substantial excursion from its climatological latitude band; and "Hybrid" events consist of events characterized by an excursion of both the PJ and SJ from their climatological latitude bands. Following their classification, frequency distributions are constructed to highlight the geographical locations most often associated with jet superpositions within each event type. Composite analyses are also constructed in an effort to illuminate the dominant dynamical processes that support the production of jet superpositions for each event type. Predicated on the results from the preceding analyses, the relevance of jet superpositions to the development of high-impact weather within a changing climate is discussed.

Thursday, 5 March 2020, 3:30pm

Refreshments 3:15pm

NCAR-Foothills Laboratory, 3450 Mitchell Lane, FL2-1022 Large Auditorium

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