CLIMATIC ROLE OF NORTH AMERICAN LOW-LEVEL JETS ON UNITED STATES REGIONAL TORNADIC ACTIVITY

Scott Weaver [•1], Stephen Baxter[2], and Arun Kumar[2]

[1]National Institute of Standards and Technology, Gaithersburg, MD 20899, USA; [2]NOAA, Climate Prediction Center, College Park, MD, 20740, USA

[•]scott.weaver@nist.gov

Variability of springtime tornadic activity over the United States is assessed through the connectivity of preferred modes of North American low-level jet (NALLJ) variability to the local thermodynamic environment, large-scale atmospheric circulation, and remote sea surface temperature (SST) variations. The link between regional tornado activity and NALLJ variability as diagnosed from a consistent reanalysis system (i.e., NCEP–NCAR) serves as dynamical corroboration in light of the inhomogeneous tornado database. The analysis reveals a multidecadal variation in the strength of the NALLJ–tornado connection, highlighted by tornado activity in the southern Great Plains region nearly doubling its correlation with NALLJ principal component 1 (PC 1) in recent decades. Locally, this is a result of a southward shift of NALLJ variability modes during the recent period. Motivated by these epochal shifts in NALLJ activity, a comparison of the early (1950–78) and late (1979–2010) tornado and NALLJ SST linkages indicates an Atlantic decadal SST variability influence during the early epoch, with Pacific decadal variability thereafter, highlighting the remote SST influence on the shifts in geographic placement and strength of NALLJ variability. The remote SST variability linkages further reveal that the observed global-scale SST trend pattern over the last 61 years may be contributing to a shift toward weaker tornadoes during spring in the northern Great Plains region. Tornado activity over the southeast region of the United States shows no such relationship to the SST trend pattern during spring, an immunity that is unexpected if spurious trends in the tornado database were influencing the SST linkage.