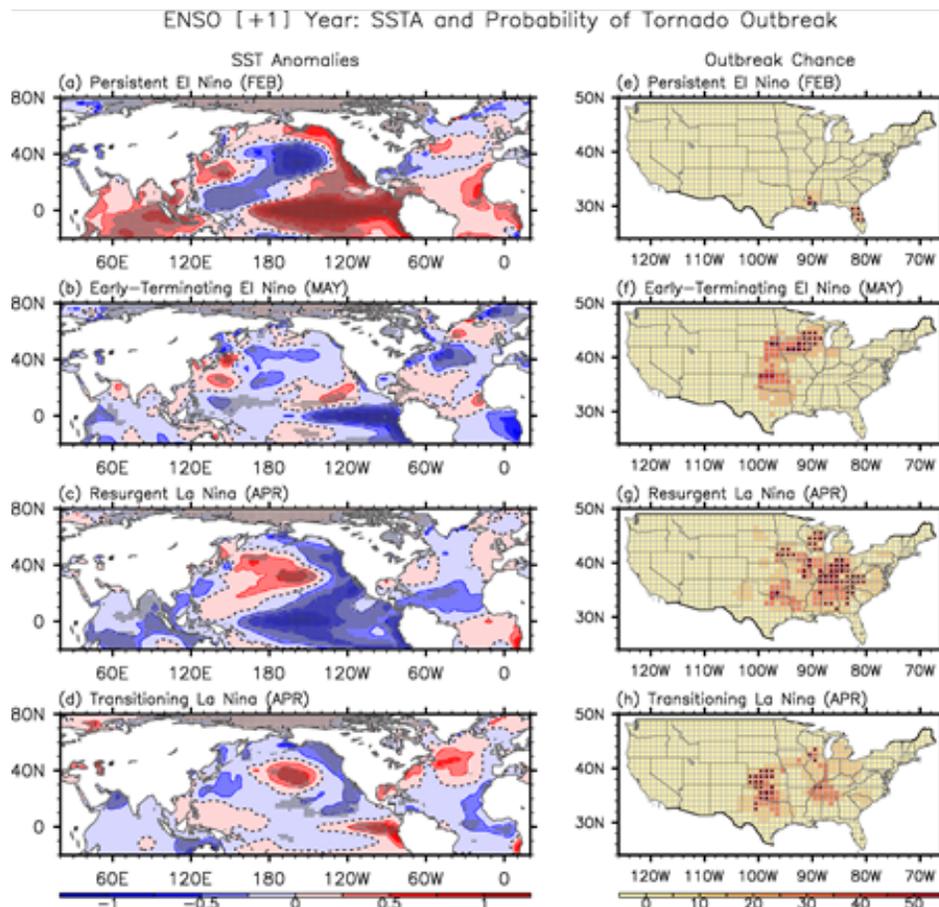


# Toward Developing a Seasonal Outlook for the Occurrence of Major U.S. Tornado Outbreaks

Sang-Ki Lee and Robert Atlas

Recent violent and widespread tornado outbreaks in the U.S., such as occurred in the spring of 2011, have caused devastating societal impact with significant loss of life and property. At present, our capacity to predict U.S. tornado and other severe weather risk does not extend beyond seven days. In an effort to advance our capability for developing a skillful long-range outlook for U.S. tornado outbreaks, this project aims to investigate the spring risk patterns of U.S. regional tornado outbreaks during 1950-2014. We show that the dominant springtime El Niño-Southern Oscillation (ENSO) phases and the North Atlantic sea surface temperature tripole variability are linked to distinct and significant U.S. regional patterns of outbreak risk (figure). These changes in outbreak risk are shown to be largely consistent with remotely forced regional changes in the large-scale atmospheric processes conducive to tornado outbreaks. An implication of these findings is that the springtime ENSO phases and the North Atlantic SST tripole variability may provide seasonal predictability of U.S. regional tornado outbreaks.



*SSTA and the probability of U.S. regional tornado outbreaks linked to the four dominant springtime ENSO phases. Composite (a-d) SSTAs for the four dominant phases of springtime ENSO evolution and (e-h) the corresponding probability of U.S. regional tornado outbreaks for the month in which each of the four springtime ENSO phases has the strongest influence. The gray dots in panels a-d indicate that the SSTAs are statistically significant at 90% based on a student-t test. The black dots in panels e-h indicate that the probability of tornado outbreaks is statistically significant at 90% based on a binomial test. The units are in °C for the SSTAs and in % for the probability of tornado outbreaks.*