Title: An Apparent Eastward Shift in United States Tornadic Activity

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"Tornados in the United States incur millions of dollars in damage every year and are among the costliest natural disasters nationwide, both financially and physically. With this cost comes a need to understand variability and changes in tornado frequency and where they are expected to occur. Past research has identified a robust, eastward shift of tornadic activity in the central and Eastern United States from 1979 to 2017, and attributing this shift to the convective environments that foster tornado formation, particularly the significant tornado parameter (STP). To explore this further, 3-hourly data from the North American Regional Reanalysis product from 1979-2022 was utilized to compute annual accumulated STP. Spatial trends of STP are in agreement with past literature. However, time series analysis suggests the linear trend might be better described by a near step-change occurring around 2008, with an abrupt increase in STP over the eastern U.S. and an accompanying decrease over the southern Great Plains. This step change was then analyzed as an epoch difference, including the separate terms that comprise the STP parameter. Also, global sea surface temperatures were differenced between the 1979-2007 and 2008-2022 periods. The resulting pattern strongly projects on the negative phase of the Pacific Decadal Oscillation (PDO). Statistically, this phase of the PDO corresponds to La Niña events, and previous literature has documented an increase in eastern U.S. tornado activity during La Nina, suggesting the epoch change in tornadic activity could be linked to the decadal variability of the PDO. Further research will examine this mechanism in more detail, as well as the role of other leading modes of climate variability, as well as anthropogenic climate change, in affecting STP. This primary tool for this ongoing analysis will be a 100-member large ensemble of historical and future climate simulations performed with version 2 of the Community Earth System Model (CESM2)."