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The Tornado Climatology of Australia 1795-2014

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A new climatology for the occurrence of tornadoes in Australia has been developed for the period 1795 to 2014, the second largest single country record. Like many places outside of the United States, the historical records for tornadoes are poorly documented. Existing data from the Australian Bureau of Meteorology National Severe Storms Archive also suffer from observer-driven spatial limitations, and biases related to institutional policy of event documentation. Recently, extensive library archives of scanned newspapers, and digitization of the original severe thunderstorm reports material have become available for Australia that can offer insight into historical events and extend the existing climatology.

Keyword optimization has been used to identify tornadoes from the scanned data while reflecting changes to terms used in the historical vernacular. Additional metadata relating to intensity, time of occurrence, path characteristics, injuries, fatalities and damage is inferred from newspaper accounts. Further, tornadoes from the existing Severe Storms Archive are cross-validated and additional metadata determined for inclusion in the new climatology. Based on documentary evidence, tornadoes are rated via the Fujita scale using three categorizations to reflect uncertainty in historical strength determination (Weak F0-F1, Strong F2-F3 and Violent F4-F5). The quality of record for each identified event is categorized into three levels (Possible, Likely or Definite) and is based on the reliability of observations, as well as documentation of characteristics indicating the presence of a tornadic event.

For the period 1795 to 1905, this reanalysis doubled the existing record. Based on the full record for which observations appear consistent the annual frequency of tornadoes in Australia ranges between 30 and 80 observed tornado events per year. However, this likely underestimates the total frequency given underreporting due to population density. Numerous tornado outbreak cases have also been identified, including an event producing at least 40 tornadoes in a nine-hour period in 1897. Seasonally, Australian tornado occurrence peaks in the spring and earlier summer, with near-coastal low instability tornadoes recorded each winter in the southern states. These insights into the nature of the historical climatology allow a greater understanding of risks in the present and future relating to damage and fatalities from tornadoes. While reviewing historical accounts is painstaking, the climatology has demonstrated the importance of considering documentary evidence for understanding the frequency of severe phenomena such as tornadoes in data-poor countries outside of the United States. Going forward, this climatology will be used to explore tornado formative environments.