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Historical Changes in Australian temperature extremes as inferred from extreme value distribution analysis

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This study develops a generalized extreme value (GEV) distribution analysis approach, namely, a GEV-tree approach that allows for both stationary and non-stationary cases. This approach is applied a century-long homogenized daily temperature data set for Australia to assess changes in temperature extremes from 1910 to 2010. Changes in 20-year return values are estimated from the most suitable GEV distribution chosen from a GEV-tree that consists of both stationary and non-stationary distributions. 20-year return values of extreme low minimum temperature are found to have warmed strongly over the century in most parts of the continent. There is also a tendency towards warming of extreme high maximum temperatures, but it is weaker than that for minimum temperatures, with the majority of stations not showing significant trends. The observed changes in extreme temperatures are broadly consistent with observed changes in mean temperatures, and in the frequency of temperatures above the 90th and below the 10th percentile. The GEV-tree analysis provides insight into behavior of extremes with re-occurrence times of several years to decades that are of importance to engineering design/applications, while extreme indices represent moderately extreme events with re-occurrence times of a year or shorter.