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Frequency of thermal extremes in arid and semiarid regions of Pakistan

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Annual trends of temperature extremes in different zones spatially distributed over Pakistan were studied using homogenized daily minimum and maximum temperatures data for the period of 1981–2010. Extreme temperature indices calculated on annual timescale were chosen from the list of core climate extreme indices recommended by the World Meteorological Organization – Commission for Climatology (WMO – CCL) and the research project on Climate Variability and Predictability (CLIVAR) of the World Climate Research Programme (WCRP). Furthermore, a nonparametric Mann-Kendall test and Sen's slope estimator method were applied to compute magnitude and significance level of annually averaged trends of temperature extremes. Analysis revealed a decreasing trend of DTR (Diurnal temperature range) and CSDI (cold spell duration index) over the Country, with the regional averages of –0.15 (oC decade–1) and –1.83 (days decade–1). The spatial averaged regional trend of WSDI (Warm spell duration index) is 1.05 (days decade–1) which were found statistically significant for the zones of Northern Dry Mountains (1.75 days decade–1), Western Dry Mountains (5.15 days decade–1) and Dry Western Plateau (3.95 days decade–1) respectively. The positive trends of SU25 (4.58 days decade–1) and TR20 (3.51 nights decade–1) were calculated in the region. The zones of Western Dry Mountains (7.56 days decade–1) and Barani/Rainfall (7.24 nights decade–1) experienced the most frequent numbers of SU25 and TR20. The indices of thermal extremes depicted trend of significant warming in the region of Pakistan.