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## Effects of multi-time scales drought on vegetation dynamics in Qaidam River Basin, Qinghai-Tibet Plateau from 1998 to 2015

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Quantifying drought variations at multi-time scales is important to assess the potential impacts of climate change on terrestrial ecosystems, especially vulnerable desert grassland. Based on the Normalized Difference Vegetation Index (NDVI) and Standardized Precipitation Evapotranspiration Index (SPEI), we assessed the influences of different time-scales drought (SPEI-3, SPEI-6, SPEI-12, SPEI-24, and SPEI-48 with 3, 6, 12, 24 and 48 months, respectively) on vegetation dynamics in the Qaidam River Basin, Qinghai-Tibet Plateau. Results showed that: (1) Temporally, annual and summer NDVI increased, while spring and autumn NDVI decreased from 1998 to 2015. Annual, spring and summer SPEI increased and autumn SPEI decreased. (2) Spatially, annual, spring, summer, and autumn NDVI increased in the periphery of the Basin, with 45.98%, 22.68%, 43.90% and 30.80% of the study area, respectively. SPEI showed a reverse variation pattern with NDVI, with an obvious decreasing trend from southeast to northwest. (3) Annual vegetation growth in most areas (69.53%, 77.33%, 86.36%, 90.19% and 85.44%) was correlated with drought at all time-scales during 1998-2015. However, high spatial and seasonal differences occurred among different time-scales, with the maximum influence in summer under SPEI24. (4) From month to annual scales, NDVI of all land cover types showed higher correlation to long-term drought of SPEI24 or SPEI48. Vegetation condition index (VCI) and SPEI were positively correlated at all time-scales and had a more obvious response in summer. The highest correlation was VCI of grassland (June-July) or forest (April-May, August-October) and SPEI48. This study contributes to exploring the effect of drought on vegetation dynamics at different time scales, further providing credible guidance for regional water resources management.