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Hydrological drought risk recurrence under climate change in the karst area of Northwestern Algeria

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Abstract:

This study aims to estimate hydrological drought risk using probabilistic analysis of bivariate drought characteristics to assess both past and future drought severity and duration in three basins located in the widest karst massif of northern Algeria. The procedures entail: (1) identification of extent of meteorological drought that could trigger corresponding hydrological drought through their characteristics; (2) assessment of future risk of extreme drought according to two emission scenarios of the representative concentration pathway (RCP 4.5 and 8.5); and (3) estimation of drought return periods using bivariate frequency analysis and investigation of their future change rates under climate change. Hydrological droughts were computed by using the bias-corrected future climate projections from nine global climate models downscaled using the Rossby Centre Regional Climate model (RCA4), and GR2M hydrological model. The analysis revealed a connection between meteorological and hydrological drought occurrences and the response time depended on the memory effect of the considered basin. We also found strong consensus between past drought event return periods, determined by bivariate frequency analysis, and those determined by climate models under RCP8.5 scenario. Finally, in regards to drought return periods (10, 50 and 100 years), the risk of extreme drought recurrence in the future has been projected to be larger than the reference period.

Key words: Climate change ; Drought propagation ; Drought risk assessment ; Darst-Dystems ; Deturn periods

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