Shannon Entropy-Based Evaluation of Meteorological Droughts over China

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Evaluation of drought is essential to develop mitigation measures. Here we employed the entropy index to investigate spatiotemporal variability of meteorological droughts over China. Entropy values, with reliable hydrogeographical basis, can be classified as <0.3, 0.3~0.8, 0.8~1.5 and >1.5, reflecting a very high, high, mid and low occurrence probability of droughts. The occurrence frequency and average magnitude of droughts, based on the standard precipitation index, consistently decrease with entropy increase. Therefore, southwest China with smaller entropy values has higher occurrence probability of droughts than northwest China, with a break at 38°N latitude. The aggravating drought in China is represented by the increase in occurrence frequency but not magnitude. The entropy, determined by skew variation of precipitation and easily calculated, can be an effective index for evaluating drought. We therefore identified dominant thresholds for entropy values and statistical characteristics of precipitation, which would help evaluate the occurrence probability of meteorological droughts worldwide.