

**Risk assessment of drought using crop model**

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Droughts caused by a lack of precipitation are one of the major factors limiting agricultural crop production. It is thus important to assess the risk of agricultural droughts to reduce their impact on agriculture. In this study, the drought risk for crop production was assessed through an integrated approach that analyzed the relationship between crop yield and drought in Henan Province, China. We used the calibrated CERES-Wheat model to simulate two levels of wheat yield, the yield potential and the water-limited yield potential, at 94 weather stations. The yield gap between the yield potential and the water-limited yield potential was used as an indicator of the effects of a precipitation deficit on crop production under rainfed conditions. A strong linear relationship between the yield gap and the amount of precipitation in the growing season was observed for each station during the period 1962-2009. A uniform criterion for drought severity thresholds for the entire Henan Province was constructed based on the yield gap. For each station, the growing season precipitation thresholds associated with different drought severities were then calculated based on the linear relationship between the yield gap and the amount of precipitation in the growing season. Drought frequencies derived from changes in the amount of precipitation in the growing season were also examined for all stations and spatially interpolated over the province. The results showed diverse spatial patterns of frequency with respect to different drought types.