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Grid-Based Comprehensive Risk Assessment of Drought Disasters in Qinghai Province (Post-print)

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Abstract

Drought disaster risk assessment constitutes a crucial measure for implementing regional drought disaster risk management and represents a non-engineering technical approach for effectively conducting meteorological disaster prevention and mitigation. With the progressive implementation of meteorological modernization, the significance of drought disaster risk assessment techniques and their precision has become increasingly prominent. Therefore, to scientifically and accurately evaluate the monitoring precision of regional drought and drought disaster risk levels in Qinghai Province, this study employs Qinghai Province as a case study. Utilizing potential evapotranspiration and precipitation data from 50 meteorological stations in Qinghai Province spanning 1961–2010, based on the theoretical framework and methodologies of meteorological disaster risk assessment, and in accordance with the "Qinghai Province Local Drought Grade Classification Standard" , the spatiotemporal distribution characteristics of drought disaster risk and corresponding risk levels in Qinghai Province were systematically analyzed through an integrated approach combining drought disaster risk modeling with ArcGIS spatial analysis. The results indicate that over the past 50 years, varying degrees of winter-spring drought have predominantly occurred within Qinghai. From a spatiotemporal distribution perspective, the distribution patterns and evolutionary trends of light, moderate, and severe drought disasters exhibit fundamental consistency, with drought-prone and high-incidence areas primarily located in the northwestern Qaidam Basin. The Qinghai Lake basin, Gonghe Basin, and localized areas within the eastern agricultural region demonstrate moderate risk levels, while other areas exhibit relatively low drought disaster risk. At the municipal, county, and township levels, Mangya, Huatugou Town, Lenghu, and Golmud City exhibit relatively high drought disaster risk, followed by Tianjun, Dulan, Wulan, Gonghe, Xinghai, Tongde, Guinan, Tongren, Hualong, Xunhua, and Tanggula, with remaining areas showing relatively low risk. This demonstrates that drought disaster occurrence in Qinghai

is influenced not only by precipitation but also closely correlated with different underlying surface types.

Full Text

Grid-Based Estimation of Drought Disaster Risk in Qinghai Province

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Abstract

With the gradual implementation of meteorological modernization, the importance of risk assessment techniques and their precision regarding drought disaster has become increasingly prominent. Drought is one of the major global meteorological disasters that severely restricts agricultural and pastoral production, ecological environment improvement, and socio-economic development. The risk assessment of drought disaster represents an important measure for implementing regional drought disaster risk management and serves as a non-engineering technical approach for effectively conducting meteorological disaster prevention and reduction work. While some scholars have studied the risk assessment of drought disaster in Qinghai Province, China, these studies were based on vector data using county-level administrative units as the domain, which exaggerated the risk degree and spatial distribution of drought disaster and reduced the accuracy of disaster risk assessment.

To scientifically and accurately assess regional drought monitoring accuracy and the risk levels of drought disaster in Qinghai Province, this paper systematically

analyzed the spatial and temporal distribution characteristics and risk levels using potential evapotranspiration and precipitation data from 50 meteorological stations in Qinghai Province during the period from 1961 to 2010. This analysis employed the theories and methods of meteorological disaster risk estimation, combined with a drought disaster risk degree model and ArcGIS spatial analysis, according to the regional drought grading standard of Qinghai Province. The results showed that winter and spring drought occurred in Qinghai Province with varying degrees during the study period. From the perspective of spatial and temporal distribution, the distribution and evolution trends of light, medium, and heavy drought were basically identical. Areas prone to drought disaster or with high incidence of drought disaster were mainly located in the northwestern part of the Qaidam Basin, while regions around Qinghai Lake, the Gonghe Basin, and the eastern agricultural areas were at medium risk level. The remaining areas shared low levels of drought disaster risk. From the viewpoint of administrative units, higher drought disaster risks were found in Mangya, Lenghu, Huatugou Town, and Golmud City. Medium risk levels were observed in Tianjun, Dulan, Wulan, Gonghe, Xinghai, Tongde, Guinan, Tongren, Hualong, Xunhua, and Tanggula. The rest of the regions exhibited low risk levels. Additionally, influenced by topography and geomorphology, the Mangya and Lenghu areas remained in a dry state throughout the entire year, which is more consistent with reality. Thus, it can be seen that the occurrence of drought disaster in Qinghai Province is not only related to precipitation but also to the underlying surface characteristics of different types.

Keywords: Qinghai Province; drought disaster; risk model; risk estimation

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Figures

Fig. 3 Spatial-temporal distribution of light drought in Qinghai Province

Fig. 4 Spatial-temporal distribution of medium drought in Qinghai Province

Fig. 5 Spatial-temporal distribution of heavy drought in Qinghai Province

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