AN IMPROVED TWO-DIMENSIONAL SPECTRAL SPACE BASED MODEL FOR DROUGHT MONITORING AND ITS APPLICATIONS

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ABSTRACT

Remote sensing is an effective tool to achieve surface information with its macro-observation, objectiveness, promptness and low-cost. It plays an important part in the real-time monitoring of temporal and spatial variation of crop moisture content, soil moisture, pests and diseases and can provide the farmland drought information in a large and worldwide scale [1-8]. As a result, research on monitoring of agricultural drought by remote sensing has great practical significance on the promotion of agricultural production and regional sustainable development.

Based on the analysis of the features of two-dimensional spectral space, we promote an improved model named DDI (Distance Drought Index) against Perpendicular Drought Index (PDI) method [9,10]. The main points are as follows: The humid areas are generally found in the lower left corner of the moisture triangle scatter diagram in the Red-NIR spectral space. For pure water body, it can be taken as blackbody and its reflectance should be zero in Red-NIR band. The distribution of points in the scatter diagram varies with different water conditions and vegetation conditions in the two-dimensional spectral space. If appropriate coefficient is employed to eliminate the vegetation influence, the surface water condition indicator is available. Therefore, the distance between each point and the extreme point in the left bottom corner can be used as a drought monitoring indicator. As shown in figure 1, line CO represents the distance between point C and the moisture saturated area. $1 + NDVI$ stands for the influence of vegetation. And the DDI of point C is calculated by the following equation:

$$DDI_c = \frac{|CO|}{1 + NDVI} \quad (1)$$

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Generally speaking, the moisture condition is better in the vegetation flourished area with higher NDVI value, which will reduce the value of DDI and shows a sign of less severe drought. The added 1 is to avoid the zero vale of NDVI. Thus, the smaller the distance is, the less arid it represents; the greater the distance is, the more severe the drought is. The model not only takes the vegetation impact into account and at the same time simplifies the model processing.

The validation is taken on the remote sensing images of experimental area in Ningxia Hui Autonomous Region on April 18th, 2004. Combined with the analysis of the soil moisture data, we come to the conclusion that DDI achieves a better result on drought monitoring with $R^2$ equals to 0.5598 than that of PDI with $R^2$ equals to 0.4632.

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**REFERENCES**


