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Winter Wheat Drought Monitoring based on TVDI Index in Xingtai District in North China

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In North China[U+FF0C]agricultural drought is the biggest challenge for food production and ecological sustainability. Drought resisting in recent decades due to over development of water resources has destructed the hydro-ecological environment, caused dramatic lowering of groundwater table, formed numbers of shallow and deep groundwater funnels, lead to large area ground subsidence. The wetland, rivers and ecological environment are drying. As a feedback, the worsening water scarcity amplifies agricultural drought risk in return which restrict regional sustainable development.
Winter wheat is the staple food of local people. It is a kind of high water consumption crop. The precipitation in its growing season can only meet 1/3 of its water demand, making winter wheat production heavily dependent on irrigation. The over pumping of groundwater for irrigation strengthens the water scarcity which makes drought response and coping much more difficult. Monitoring winter wheat drought, find its' temporal and spatial rules, analysis its root causes of vulnerability to drought and seek the adapting strategy for different agricultural ecological zones can provide useful information for agricultural drought disaster reduction.
Xingtai is located in middle part of Hebei Province in North China. The western part of it is mountains, the central part is hilly and middle and eastern part is piedmont plain and low plain areas. Both rain-fed and irrigation agriculture exist and drought occurs almost every year during winter wheat growing season. We take the key growing period from March to May in four typical years: 2006 and 2008(normal)[U+FF0C]2010(severe drought) and 2012(slight drought) as an example and use MODIS images to combine the normalized difference vegetation index and land surface temperature data to establish temperature vegetation drought index (TVDI) in remote sensing monitoring model to monitor the drought situations and classified drought degree. Furthermore, we established integrated winter wheat drought risk assessment model, carried out assessment and put forward adapting strategy. The main results are as follows:
(1) According to the study, from March to May in 2006[U+FF0C]2008[U+FF0C]2010 and 2012, the drought intensity was severe in March[U+FF0C]significantly reduced in April, and further alleviated in May with interference of irrigation.
(2) Xingtai district can be divided into three winter wheat drought risk zones: western mountain and hilly high drought risk zone where rain-fed farming is popular; the central piedmont plain low drought risk zone where water resources is relatively rich and irrigation is well developed; and eastern low plain medium risk zone where over pump of deep groundwater has been last for decades.
(3) The available water resources and affording capacity for irrigation are the key impacting factors drought winter wheat drought intensity distribution under the present condition that local people do not consider the threshold of water resources development.
Key words[U+FF1A]Xingtai in North China[U+FF1B]Winter Wheat[U+FF1B]Drought Monitoring by TVDI[U+FF1B]Integrated Drought risk Assessment, Drought Adapting