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Application of Perpendicular Drought Indices as a Dynamic Drought Monitoring Method

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Drought monitoring is one of essential component of drought risk management and it has become a recurrent phenomenon in Iran in the last few decades. Significant drought conditions were observed during 1998 t0 2001.The country's agricultural sector and water resources have been under sever constrains from the recurrent droughts. The Iranian Emergency Agency reported that 278 cities and 1050 villages had been affected. Also, the crops from a rainfed area of 4 million ha as well as those from an irrigated area of 2.7 million ha were completely destroyed. The total agricultural and livestock losses by the year 2001 were estimated to be US$2.6 billion and according to reports of Iranian Meteorological Organization another dry period have been started since winter 2009.
This paper aims at finding, evaluating and refining an appropriate drought estimation method in Iran using remote sensing. Recently developed methods Perpendicular Drought Index (PDI) and Modified Perpendicular Drought Index (MPDI) are selected as a satellite based drought indices. First, time series of MODIS satellite images (MOD13A3) have been collected over the region spanning the time interval between February 2000 to December 2005, and the perpendicular drought index (PDI) and modified perpendicular drought index (MPDI) were calculated. Then, the indices were evaluated against meteorological drought indices including Zscore, China-Z index and modified China-Z index over 180 meteorological observing stations in Iran. Results indicate that the PDI and MPDI are significantly correlated with the regional surface dryness and drought status. It is further confirmed that the PDI is effective for bare soil applications or early stages of vegetation growth, while the MPDI is optimal for vegetated surfaces yet effective for bare soils. The paper also presents surface drought maps over Iran using the indices.
Key words: drought monitoring, drought indices, drought classes, remote sensing.