

Man-made oasis change and its effects on the hydrological regime of the Aksu River basin

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Abstract By carefully classifying the NDVI spatial information retrieved from MODIS 13 over the Aksu Basin (China) into seven categories based on fractional vegetation cover, with a careful division of the whole study region (WS) into man-made sub-region (MMS) and natural sub-region (NS), and with special consideration of the seasonal difference between summer and winter, a new index, called the man-made oasis index (MMOI), to describe the extent of man-made oasis (EMMO), is proposed. It is expressed as the linear weighted combination of the area ratio of each class from III to VI to the total area, with the higher the class number the higher the weight. The reason to choose classes from III to VI is that in winter they can be only found in MMS. MMOI in winter in MMS shows an increasing trend over the last 10 years, which matches well with the increase of EMMO found from the documented study. A transfer function between MMOI in winter in MMS and EMMO is then proposed to calculate EMMO based on MMOI. As paddy field was only found located in MMS, evapotranspiration over the paddy field (ET_p) simulated by the VIP distributed eco-hydrological dynamic model was chosen as the rate representative of water consumption by man-made oasis (WCMMO) per unit of EMMO. WCMMO is then calculated yearly based on the ET_p information multiplied with EMMO based on the index MMOI. The simulated results of yearly WCMMO are useful in exploring the effects of the oasis on the hydrological regime of the Aksu River.

Key words index; man-made oasis; VIP distributed eco-hydrological model; water consumption; the Aksu River, China