Geophysical Research Abstracts
Vol. 12, EGU2010-209, 2010
EGU General Assembly 2010

Vegetation Control in the Long-term Self-stabilisation of the Liangzhou Oasis of the Upper Shiyang River Watershed of West-central Gansu, NW China

Charles Bourque (1) and Quazi Hassan ()

(1) Faculty of Forestry and Environmental Management, University of New Brunswick, Fredericton, New Brunswick, E3B 6C2, Canada (cbourque@unb.ca), (2) Department of Geomatics Engineering, University of Calgary, 2500 University Dr. NW, Calgary, Alberta, T2N 1N4, Canada (qhassan@ucalgary.ca)

Oases are special ecological systems that naturally oppose the encroachment of deserts by staying moist. Oases provide important habitat refugia for plants, animals, and humans alike. Oases in NW China account for only about 5% of the total land area of the region, but give shelter and feed about 95% of the area's growing population. It has been proposed by many scientists and observers of desertification in NW China that rapid economic development in the area is largely unsustainable and is occurring at the very detriment of the oases. This presentation explores the relationship between vegetation in the Liangzhou Oasis in the Upper Shiyang River Watershed (USRW) of west-central Gansu, China, and within-watershed precipitation, soil water storage, and oasis self-support. Oases along the base of the Qilian Mountains receive a significant portion of their water supply (> 90%) from surface and subsurface flow originating from the Qilian Mountains. Investigation of vegetation control on oasis-water conditions in the USRW is based on an application of a process model of soil-water hydrology. The model is used to simulate long-term soil water content in the Liangzhou Oasis as a function of (i) monthly composites of MODIS images of land surface and mean air temperature, (ii) spatiotemporal calculations of monthly precipitation and relative humidity generated with the assistance of genetic algorithms, and (iii) an 80-m resolution digital elevation model of the area. Modelled removal of vegetation is shown to affect within-watershed precipitation and soil water storage by reducing the exchange of water vapour from the land surface to the air, increasing the air's lifting condensation level by promoting drier air conditions, and causing the high-intensity precipitation band in the Qilian Mountains to weaken and to be displaced upward in the watershed, leading to an overall reduction in soil water in the Liangzhou Oasis. Feedback mechanisms of oasis self-support introduced in this presentation are most likely the same mechanisms that promote self-support and long-term stabilisation of the chain of oases along the base of the Qilian Mountains.