Geophysical Research Abstracts
Vol. 16, EGU2014-13312, 2014
EGU General Assembly 2014

Long and short-term spatial processes analysis of an acacia tree population using a single aerial photograph with near infra-red band

Sivan Isaacson (1), Dan G. Blumberg (1), Shimon Rachmilevitch (2), and Jhonathan E. Ephrath (2)

(1) Geography and Environmental development, Ben-Gurion University of the Negev, Beer Sheva, Israel (sivanisa@post.bgu.ac.il), (2) French Associates Institute for Agriculture and Biotechnology of Drylands. Jacob Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Sede Boker, Israel

Hyper-arid zones are characterized by highly sparse vegetation cover. Monitoring vegetation dynamics in hyper-arid zones is important because any reduction in the vegetation cover in these areas can lead to a considerable reduction in the carrying capacity of the ecological system. Remote sensing expands the spatial and temporal database and is thus a powerful tool for long-term monitoring in arid zones, where access is limited and long-term ground data are rarely available.

The main goal of this research was to study both the long-term and short-term spatial processes affecting the acacia population, by using information from a single, three bands color infrared (CIR) aerial photograph (green, red and near infrared). CIR images enable us to obtain information about photosynthetically active biomass by using vegetation indices such as NDVI.

A map of individual acacia trees that was extracted from a CIR aerial photograph of Wadi Ktora allowed us to examine the distribution pattern of the trees size and foliage health status (NDVI). Tree size distribution was used as an indicator of long-term (decades) geo-hydrologic spatial processes effecting the acacia population. The tree health status distribution was used as an indicator for short-term (months to a few years) geo-hydrologic spatial processes, such as the paths of recent flashfloods events. Comparison of the tree size distribution and NDVI values distribution enabled us to differentiate between long-term and short-term processes that brought the population to its present state.

The spatial analysis revealed that both the tree size and NDVI distribution patterns were significantly clustered, suggesting that the processes responsible for tree size and tree health status do have a spatial expression. Furthermore, each of the attributes has a different distribution and unique clustering location. We suggest that the lack of spatial correlation between tree size and health status is a result of spatial-temporal changes in the water supply. The distribution of the trees in the wadi was divided into three distinct parts: large trees with high NDVI values, large trees with low NDVI values and small trees with medium NDVI values. Using these results, we divided the Wadi into three sections, each representing a unique combination of long and short-term geo-hydrologic processes (i.e. flashfloods spatial spreading) affecting the acacia trees. Further investigation including field survey is needed to find additional evidence for changes in the flow route.