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Satellite Observation of Large Scale Changes in Climate and Land Use in the Caspian Sea Basin

S. Saatchi, A. Nouri, S. Asefi, A. Shiklomanov, D. Entekhabi, S. Mohammadi, and B. Hedjazi
CALTECH, Jet Propulsion Laboratory, Pasadena, United States (saatchi@jpl.nasa.gov, 818-393-5184)

The Caspian Sea Basin (catchments) area occupies the vast European and Asian territory between approx. 330-580 N latitude and 300-620 E longitude. In comparison with other world great natural lakes, the Caspian Sea ranks first in watershed area (3660,000 km2) and also in a total annual rivers runoff (340 km3/year - long-term average value). The Caspian is a closed basin with the largest landlocked water body in the world in its center. As a result, the water and biogeochemical cycles over the sea and surrounding lands are intimately linked. Any changes in the hydrologic regime over land and any major shifts in land use and land ecosystem health will directly impact the overall water and energy cycle of the basin, as well as the water quality and aquatic biology of the Sea. The basin being a closed system, it can also exhibit feedback processes that reinforce excursions from normal and lead to large impacts on the surrounding regions.
In this paper, we present results of the analysis of climate and vegetation observations over the past 30 years over the Caspian Sea Basin to document the changes of climate, and land use, the regional vegetation response. We focus our analysis using data from AVHRR, MODIS, QSCAT, and TRMM. The results indicate that the region has gone through major changes in land use accompanied by anomalies of temperature and rainfall that in turn has suppressed the vegetation cover and phenology. The results are corroborated by data from socio-economic changes in the region and ground observation of climate and vegetation.