



Spatiotemporal Changes in Lake Water Extents in the Lakes Region (Türkiye) and the Role of Climate and Land Cover Parameters

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The impacts of global climate change extend to population dynamics, food security, agricultural activities, and water demand, thus presenting complex and urgent challenges associated particularly with the water resources. Türkiye's Lakes Region is situated in the Mediterranean region, which is recognized as a climate change hotspot and further stressed by ever-increasing water demand arising from rapid population growth. Due to the convergence of these factors, the lakes in the Lakes Region face significant challenges with the phenomenon of shrinking lakes.

This study examines the spatio-temporal changes in lake waters in Türkiye's Lakes Region, consisting of sixteen lakes. Using Landsat 5, 8, 9, and Sentinel-2 satellite images, the surface area changes were analyzed via NDWI in the Google Earth Engine environment from April 1984 to April 2023. To assess hydrological/hydrogeological conditions accurately, water volume calculations were performed in lakes having in-situ bathymetry and water level measurements. We analyzed MODIS Terra Land Cover dataset and climatic variables such as precipitation, and evaporation-transpiration to understand the degree of anthropogenic and climatic drivers effecting the study lakes.

Our results indicated that, for large lakes such as Burdur, Beyşehir and Eğirdir, the period of influence of climatic parameters is close to two years. The effect period varies based on lake bathymetry, size, and hydrodynamic characteristics of the recharge basin. Lake water losses were primarily attributed to climatic factors, with clear links to climatic parameters until 2016. After 2016, a shift of precipitation to the summer season significantly impacted the hydrological system, intensifying the shrinking in the lakes. We conclude that the dominant driver for the shrinking lakes is the climatic effects and the anthropogenic effects for the whole-time interval has been found negligible. Of the lakes considered in this study, only Lake Akşehir should be excluded from this assessment. Lake Akşehir was found to be the only lake where human impact was clearly predominant.