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Investigating the Changes in Bathymetry and Water Level-Area Relationship of the Lake Urmia using Satellite Imagery

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The significant shrinkage of Lake Urmia between 1995 and 2016 has brought about a vast number of restoration plans with the aim of reviving the lake to its ecologically desirable state. The volume of water stored in the lake plays a key role in assessing the success of the restoration plans, while its quantification is typically challenging due to limited information about the lake bathymetry. The goal of this study is to estimate the Lake Urmia water volume via mapping the lake bathymetry using both satellite imagery and in-situ measurements. To this end, the lake surface area is extracted at multiple dates between 1984 and 2019 using Landsat Imagery. Water surface elevation at the corresponding dates, measured at Golmankhaneh station, is then used to obtain the relationship between water surface elevation and area. Moreover, several in-situ measurements of the lake bed elevation from September 2017 to March 2019 are used to develop a relationship between water depth and surface reflectance, enabling us to map the lake bathymetry over its whole extent. The results suggest different types of relationship between the lake water level and its surface area depending on the magnitude of lake water volume. Also, the highly dynamic behavior of the lake bathymetry with respect to the rate of inflows from the rivers feeding the lake over different seasons highlights the strong influence of salt dissolution and precipitation on the lake bed elevation fluctuations.

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