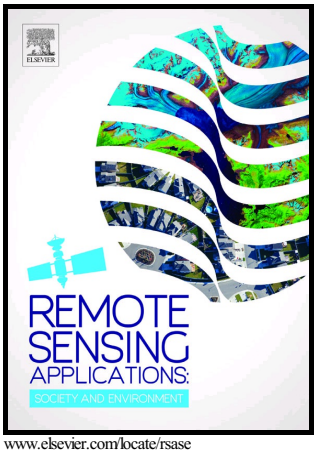

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Inferring elevation variation of lakes and reservoirs from areal extents: Calibrating with altimeter and *in situ* data

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Abstract

Water security is a major national security issue that can impact food and energy production and sometimes political stability in countries all over the globe. Monitoring water supplies is critical for identifying potential crises before they begin. As a means to estimate lake and reservoir storage for sites without reliable *in situ* water stage data, this study defines correlations between satellite-based reservoir elevation and aerial extents. Water body levels from or altimeter data (i.e. TOPEX/Poseidon, Jason series) were correlated with areal extents observed in historic multispectral (i.e. MODIS and Landsat TM/ETM+/OLI) imagery for 18 sites globally. Water levels measured using *in situ* observations were used to validate the relationships between water level, altimetry data, and surface area for six of the sites. Altimeters were generally more accurate (RMSE: 0.40 – 0.49 m) for estimating lake elevations in Iraq and Afghanistan than the modeled elevation data using multispectral sensor areal extents: Landsat (RMSE: 0.25 – 1.5 m) and MODIS (RMSE 0.53 – 3.0 m). Correlations between altimeter data