Volume estimation of small to medium size lakes and water reservoirs: a max-depth based approach applied to tuscany region (Italy).

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The succession of flood events and cloudbursts alternated with long drought periods increased the interest on water reservoirs such as basins and lakes. The detailed evaluation of the water resource is a fundamental tool for understanding the evolution of territorial resilience in response to climate changes. Volume is the key-parameter that can be used to quantify and monitor the capacity of a water reservoir. Through this work we developed a method for the volume estimation of small- to medium-sized water bodies, combining surface data with the lake depth. Remote imaging surveys provide the estimation of the surface of the lake, whilst direct measurements, performed using sonar sensors, provide reliable estimations of the water resources reducing times and costs for detection. We validated this method on a regional scale, on the water reservoirs, lakes and water basins of the Tuscany region (Central Italy).

The results indicate that the more accurate is the detection of the depth profile, the more precise are the estimations of the water body volume. The obtained correlation between calculated and real volume is $R2 = 0.94$.

The creation of a database using this max-depth based approach may encourage future studies on the dynamics of the water resource in relation to climate change and also promote the comparisons with data obtained from satellite and LiDAR surveys.