

## **The past, present, and future of Laguna del Maule volcanic field, southern Andes: insights from high-resolution topographic data**

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We present the first high-resolution topographic model of the Laguna del Maule (LdM) volcanic field. Post-glacial volcanism comprises >50 km<sup>3</sup> of lava flows, domes, monogenetic and composite cones and voluminous rhyolitic pyroclastic flow and fall deposits. The ~400 km<sup>2</sup> central lake basin straddles the Chile-Argentina border. In January 2016, an oblique photogrammetry survey of the LdM lake basin, upper Maule Valley, and Troncoso Valley was conducted via helicopter. A network of ~50 ground control points was deployed using campaign GPS and photo targets. Approximately 7,400 digital photos were acquired during the helicopter survey and were processed using a USGS super cluster network to create a 0.5 m resolution digital elevation model (DEM) and 0.2 m resolution orthophoto of the lake basin. We supplemented the 0.5 m DEM with additional high-resolution (1 m) DEMs derived from along-track stereo satellite imagery collected in-sync with our oblique photogrammetry survey. The new high-resolution DEM allows us to improve estimates of erupted volumes of flows and domes, precisely define and map an early Holocene lake high-stand paleo-shoreline, calculate the volume of the paleo-lake and model potential lahar inundation down the Maule and Barrancas river valleys using improved estimates of the current lake volume. The unprecedented resolution of the DEM facilitates identification of pre-and-post glacial units as well as those erupted following the paleo-lake outburst flood and can guide future instrument deployments, hazardous flow modeling, and the mapping of geologic structures and Holocene deformation. In addition, we investigated the use of multi-temporal DEMs and sub-pixel correlation routines using additional optical satellite imagery (along-track stereo and single scenes) collected between 2007-2016 to study the uplift signal of >20 cm/year that has been centered in the southwestern portion of the lake basin since 2007.