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Volumetric changes of glaciers in the Bolivian Andes between 1986 and 2017

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Glaciers represent an important water resource for Andean cities and mountain communities. However, a recent study has shown that Bolivian glaciers have shrunk by ∼43% in area over the last ∼30 years. If current rates of glacier recession are sustained then there could be potentially important consequences for downstream water supply, especially during the dry season. A first step in assessing the severity of this problem is to estimate the current volume of glacier ice in Bolivia, and how this has changed over recent decades. Here, we use VOLTA (created by James and Carrivick, 2016 – Computers & Geosciences), an ArcGIS tool requiring only a Digital Elevation Model (DEM) and glacier outlines to give a first-order ice thickness estimate and therefore derive volume changes for the entire Bolivian Andes between 1986 and 2017. The VOLTA tool also models bed topography, which we use to make a preliminary assessment of the locations of subglacial overdeepennings, which will become loci for future proglacial lakes capable of generating glacial lake outburst floods (GLOFs) and storing meltwater.