



## Lake pushed out by 200 m<sup>3</sup> rock avalanche (Zugspitze / Lake Eibsee, D) - New geophysical and sedimentological insights into interactive processes

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Rock avalanches destroy and reshape landscapes within only few minutes and are among the most hazardous processes on earth. Water in the travel path may accelerate the rock avalanche, with longer runouts as a result. So far no study has aimed at proving the existence of a paleolake pushed out by a rock avalanche and further analysing the interaction of the moving mass with the former lake. Especially for ancient long-runout mass movements this could be the key to explain exceptional runout lengths.

In this study at the Zugspitze / Eibsee rock avalanche we prove the existence of, and the impact onto a paleolake inside the rock-avalanche trajectories. We assume that there has been a paleo-Lake Eibsee which was displaced by the ~200 mio. m<sup>3</sup> rock avalanche. Our approach shows a complementary application of geomorphological mapping (over ~5 km<sup>2</sup>) and Electrical Resistivity Tomography (ERT) measurements (8 profiles with in total ~9.5 km length), combined with sedimentological analysis in outcrops and drillings. The geoelectrical profiles give us up to ~120 m deep insights into the structure, thickness and distribution of the rock-avalanche deposits, the interactive processes with the lake water and sediments, and the paleotopography. Sediments exposed in outcrops show water-escape structures at the front of the rock avalanche. The data further allow for ERT-calibration at 7 different sites, where it is possible to distinguish materials (rock avalanche, bedrock, lake clay, mixed sediments) and interactive processes of the rock avalanche with the lake and substrate (bulldozing, bulging, overriding of secondary lobes). Here we show how complementary geophysical, geomorphological and sedimentological applications on terrestrial deposits provide detailed insights into multiple effects of impacting of a rock avalanche onto a lake.

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