A landslide-generated tsunami and outburst flood at Elliot Creek, coastal British Columbia

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On 28 November 2020, about 18 Mm$^3$ of quartz diorite detached from a steep rock face at the head of Elliot Creek in the southern Coast Mountains of British Columbia. The rock mass fragmented as it descended 1000 m and flowed across a debris-covered glacier. The rock avalanche was recorded on local and distant seismometers, with long-period amplitudes equivalent to a M 4.9 earthquake. Local seismic stations detected several earthquakes of magnitude <2.4 over the minutes and hours preceding the slide, though no causative relationship is yet suggested. More than half of the rock debris entered a 0.6 km$^2$ lake, where it generated a huge displacement wave that overtopped the moraine at the far end of the lake. Water that left the lake was channelized along Elliot Creek, deeply scouring the valley fill over a distance of 10 km before depositing debris on a 2 km$^2$ fan in the Southgate River valley. Debris temporarily dammed the river, and turbid water continued down the Southgate River to Bute Inlet, where it produced a 70 km turbidity current and altered turbidity and water chemistry in the inlet for weeks. The landslide followed a century of rapid glacier retreat and thinning that exposed a growing lake basin. The outburst flood extended the damage of the landslide far beyond the limit of the landslide, destroying forest and impacting salmon spawning and rearing habitat. We expect more cascading impacts from landslides in the glacierized mountains of British Columbia as glaciers continue to retreat, exposing water bodies below steep slopes while simultaneously removing
buttressing support.