Increased outburst flood hazard from Lake Palcacocha due to human-induced glacier retreat

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Human-induced warming is responsible for the retreat of Palcaraju glacier and the associated increase in glacial lake outburst flood hazard, according to an analysis of observations and numerical models.

A potential glacial lake outburst flood from Lake Palcacocha (Cordillera Blanca, Peru) threatens Huaraz, a city of 120,000 people. In 1941, an outburst flood destroyed one-third of the city and caused at least 1,800 fatalities. Since pre-industrial times, Lake Palcacocha has expanded due to the retreat of Palcaraju glacier. Here we used observations and numerical models to evaluate the anthropogenic contribution to the glacier's retreat and glacial lake outburst flood hazard. We found that the magnitude of human-induced warming equals between 85 and 105% (5-95% confidence interval) of the observed 1 degrees C warming since 1880 in this region. We conclude

that it is virtually certain (>99% probability) that the retreat of Palcaraju glacier to the present day cannot be explained by natural variability alone, and that the retreat by 1941 represented an early impact of anthropogenic greenhouse gas emissions. Our central estimate is that the overall retreat is entirely attributable to the observed temperature trend, and that the resulting change in the geometry of the lake and valley has substantially increased the outburst flood hazard.

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