

# Geomorphologic impacts of the glacial lake outburst flood from Lake No. 513 (Peru)

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## Abstract

This article deals with the 2010 glacial lake outburst flood (GLOF) which happened in the Chucchún Valley in the Cordillera Blanca (Peru). The volume of the ice and rock fall from Mt. Hualcán was estimated to be about 500,000 m<sup>3</sup> and the detachment zone was identified between 5,450 and 5,600 m a.s.l. Basic landforms and processes (e.g. stream erosion, accumulation) were characterized by field investigation (2010 and 2011) as well as the rate of deglaciation using remotely sensed data (1948, 1962, 1970 and 2010). Two relatively independent parts of the Chucchún Valley were identified from the point of view of sediment flux: uppermost part of the catchment (4,192–3,575 m a.s.l.), where even fine-grained sediments were laid down, and the lower reaches up to the confluence (3,191–2,640 m a.s.l.), where valley bottom sediments were mobilised by the increased discharge. The comparison of field data and potential for erosion or sedimentation derived from the HEC-RAS model mostly showed conformity and discrepancy occurred in the valley segments where an extreme discharge during the 2010 GLOF laid down sediments after the gradient of the flow diminished. The rate of deglaciation is also described using historical remotely sensed data and unpublished reports and was set as 1,040 m in the last 62 years. We focused our attention also on the uppermost part of the catchment and applied a modified quantitative method for GLOF hazard evaluation—high topographical susceptibility for an icefall into the lake was calculated (0.92).