

River basin affected by rare perturbation events: the Chaiten volcanic eruption.

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Natural disasters can strongly and rapidly affect a wide array of environments. Among these, volcanic eruptions can exert severe impacts on the dynamic equilibrium of riverine environment. The production and subsequent mobilization of large amounts of sediment all over the river basin, can strongly affect both hydrology and sediment and large wood transport dynamics. The aim of this research is to quantify the impact of a volcanic eruption along the Blanco River basin (Southern Chile), considering the geomorphic settings, the sediment dynamics and wood transport. Moreover, an overview on the possible management strategies to reduce the risks will be proposed. The research was carried out mainly along a 2.2 km-long reach of the fourth-order Blanco stream. Almost the entire river basin was affected by the volcanic eruption, several meters of tephra (up to 8 m) were deposited, affecting the evergreen forest and the fluvial corridor. Field surveys and remote sense analysis were carried out to investigate the effect of such extreme event. A Terrestrial Laser Scanner (TLS) was used to detect the morphological changes by computing Difference of Dems (DoDs), while field surveys were carried out to detect the amount of in-channel wood; moreover aerial photos have been analyzed to detect the extension of the impact of volcanic eruption over the river basin. As expected, the DoDs analysis permitted to detect predominant erosional processes along the channel network. In fact, over 190569 m² there was erosion that produced about 362999 m³ of sediment mobilized, while the deposition happened just over 58715 m² for a total amount of 23957 m³. Looking then to the LW recruited and transported downstream, was possible to detect as along the active channel corridor a total amount of 113 m³/ha of wood was present. Moreover, analyzing aerial photographs taken before and after the volcanic eruption was possible to define as a total area of about 2.19 km² was affected by tephra deposition, 0.87 km² has already been eroded by floods, while 1.32 km² is still there. Considering an average depth of 5 m, the potential amount of sediment erodible and potentially transported downstream during the next near future is around 6.5 x 10⁶ m³. Finally, from the same area can be recruited other 7.3 x 10⁴ m³ of LW that can be transported towards the mouth. These results may help to better define management strategies to reduce the potential risks to the sensitive structures and cross section downstream. In fact, the management of sediment and LW transport through the lower Chaiten village appear of fundamental importance to guarantee a safer condition. This research is funded by the Chilean research Project FONDECYT 1141064 "Effects of vegetation on channel morphodynamics: a multiscale investigation in Chilean gravel-bed rivers".