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3_D modeling using TLS and GPR techniques to characterize above and below-ground wood distribution in pyroclastic deposits along the Blanco River (Chilean Patagonia)

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To date, the study of in-stream wood in rivers has been focused mainly on quantifying wood pieces deposited above the ground. However, in some particular river systems, the presence of buried dead wood can also represent an important component of wood recruitment and budgeting dynamics. This is the case of the Blanco River (Southern Chile) severely affected by the eruption of Chaitén Volcano occurred between 2008 and 2009. The high pyroclastic sediment deposition and transport affected the channel and the adjacent forest, burying wood logs and standing trees. The aim of this contribution is to assess the presence and distribution of wood in two study areas (483 m2 and 1989 m2, respectively) located along the lower streambank of the Blanco River, and covered by thick pyroclastic deposition up to 5 m. The study areas were surveyed using two different devices, a Terrestrial Laser Scanner (TLS) and a Ground Penetrating Radar (GPR). The first was used to scan the above surface achieving a high point cloud density (≈ 2000 points m-2) which allowed us to identify and measure the wood volume. The second, was used to characterize the internal morphology of the volcanic deposits and to detect the presence and spatial distribution of buried wood up to a depth of 4 m. Preliminary results have demonstrated differences in the numerousness and volume of above wood between the two study areas. In the first one, there were 43 wood elements, 33 standing trees and 10 logs, with a total volume of 2.96 m3 (109.47 m3 km-1), whereas the second one was characterized by the presence of just 7 standing trees and 11 wood pieces, for a total amount of 0.77 m3 (7.73 m3 km-1). The dimensions of the wood elements vary greatly according to the typology, standing trees show the higher median values in diameter and length (0.15 m and 2.91 m, respectively), whereas the wood logs were smaller (0.06 m and 1.12 m, respectively). The low dimensions of deposited wood can be probably connected to their origin, suggesting that these elements were generated by toppling and breaking of surrounding dead trees. Results obtained with the GPR confirm the ability of this instrument to localize the presence and distribution of buried wood. From the 3-D analysis it was possible to assess the spatial distribution and to estimate, as first approach, the volume of the buried wood which represents approximately 0.04% of the entire volcanic deposit. Further analysis will focus on additional GPR calibration with different wood sizes for a more accurate estimation of the volume. The knowledge of the overall wood amount stored in a fluvial system that can be remobilized over time, represent an essential factor to ensure better forest and river management actions.