



Transport of RFID tracers in a glacierized Andean stream (Estero Morales, Chile)

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A proper quantification of bedload transport is crucial in order to improve the knowledge on the morphology and dynamics of river systems. Unfortunately, bedload surveys in mountain streams are notoriously difficult. Also, equations for predicting the transport capacity often overestimate the actual bedload rates, and field measurement are still rare. An alternative to direct bedload sampling during floods is the use of tracers, which allow to obtain precious data on sediment dynamic and transport due to different conditions of hydraulic forcing, especially in mountain streams. In this work, the results obtained by the employment of passive RFID tracers in a steep Andean channel are presented. The study site is the Estero Morales, a high-gradient stream located in the Metropolitan Region (central Chile). The channel bed exhibits boulder-cascade, step-pool and plane bed morphologies while the average slope is of about 9.5%. The basin (27 km²) hosts the San Francisco glacier (1.8 km²) that strongly affects the hydrological regime. In particular during the melt period (December-March) the glacier ensures daily discharge fluctuations with highly variable associated bedload transport rates. Overall, 429 RFID tracers were installed in the Estero Morales and the displacements over a reach of approximately 700 m were monitored through 15 surveys, performed between January and March 2014. The recovery rate ranges between 19% and 97%. Tracers travel distance were paired to the peaks of stream power per unit area (ω , in W/m²) that occurred during the study period. Due to the wide range of flow magnitude observed, the values of stream power were grouped in three classes: low (650-750 W/m²), moderate (750-800 W/m²), and high (800-900 W/m²). Despite the different conditions of hydraulic forcing, moderate and low classes show mean displacement very similar, equal to 33 m and 24 m, respectively. In either cases a size selective transport was observed. On the other hand, the high class of stream power exhibits a mean displacement equal to 201 m, or rather one order of magnitude larger respect to the values that characterized moderate and low classes. In this case also the dynamic of transport is different, showing an equal mobility condition. This research was supported by the project Fondecyt 1130378.