



Sediment tracing and use of terrestrial laser scanning (TLS) for monitoring and modelling hydrological and sedimentary processes in the Upper Guil Catchment (Queyras, French Alps)

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In the frame of SAMCO (ANR 12 SENV-0004) project designed for mountain hazard mitigation in a context of Climate Change, one of our purposes is to understand the hydro-geomorphological specificities of French Alpine catchments. Part of our study deals with a better assessment of the sediment transfers, and adjacent sediment supply (i.e. from hillslope to channel, and from tributaries to the trunk river) during seasonal meteorological events, and major event inducing floods and/or avalanches. Our research focuses on the Guil River catchment (Queyras, Southern French Alps), prone to catastrophic floods (June 1957 (> R.I. 100 yr), June 2000 (R.I. 30 yr)...) with serious damages to infrastructure and buildings located in the valley bottoms. Such floods are characterized by considerable sediment transport from debris flow prone tributaries to downvalley, together with strong hillslope-channel connectivity. The “schistes lustrés” bedrock is an aggravating factor that explains the mobilization of huge volumes during floods ($\approx 12,000$ m³ aggraded during the June 2000 flood event). Confluences with debris flow prone tributaries are particularly sensitive areas..

For monitoring and modelling hydrological and sedimentary processes our approach is twofold: (i) assessment of slopes contribution to sediment supply using terrestrial laser scanning (TLS), (ii) assessment of two sub-catchment contribution to the global sediment budget of the Guil river catchment using passive integrated transponder (PIT) technique. To assess coarse sediment fluxes and delivery into the main channel network, we implemented 560 tracers in 4 selected sub-catchments. To assess small sediment delivery, 1 Airborne LiDAR and 2 TLS campaigns have been performed using Optech station over 3 specific hotspots highly affected by slope erosion and largely contributing to the Guil river sediment budget. The first location corresponds to a gorge section with direct connection of hillslope to the main channel network (Guil River). The second site is located in a sub-catchment, at the confluence of two productive torrents, and the third one is located along a torrent, in a small upstream sub-catchment. Based on the use of multi resolution data, erosion rates and sedimentary dynamics are presented as preliminary results. Four other TLS campaigns (2 per years) are planned and aimed at associating erosion rates to seasonal hydro-climatic conditions to characterize transfers of sediments at the river catchment scale associated to specific hydro-meteorological conditions.