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Assessing sediment dynamics in small alpine watersheds: Linking short-term processes study to dynamic geomorphological mapping

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Assessing sediment volumes and transfer processes is necessary to understand the hydro-geomorphological functioning of small alpine watersheds prone to channelised debris flow triggering because their occurrence often depends on the amount of debris available in the gully ("weathering/supply limited system") (Sterling and Slaymaker 2007). Torrential systems should therefore be studied through the thematic of sediment budgets studies (Warburton 2007). According to Reid and Dunne (1996), the development of a sediment budget necessitates the identification of processes of erosion, transportation and deposition within a catchment, and their rates and controls. This kind of study may be complex because if sediment transfer starts generally from the hill slopes – where physical weathering followed by gravitational processes are predominant – the time of residence of sediments is very variable depending on the topographic setting and the intensity of processes. Moreover in drainage catchments sediments may often have a second repository when they reach the main active gully where the time of residence depends on water runoff.

Transfer processes were investigated in two small catchments by field measurements and more specifically through geomorphological mapping (Theler et al. 2008). A dynamic geomorphological mapping methodology based on data directly derived from GIS analysis using high resolution DEM, field measurements and aerial photographs observations was developed for estimating the importance of the global sediment transfer dynamics of the drainage catchment. It highlights the role of different sediment stores. This approach is quite innovative in geomorphological mapping research because most available mapping legend systems are not sufficient for mapping alpine environments with high geomorphological activity and complexity as debris flows catchments. Furthermore downscaling to small catchment scale increases the difficulties: distinction and mapping erosion and accumulation processes is complex because both of them are sometimes combined.

A the Bruchi torrent, qualitative information were also derived from field measurements. Methods used to estimate intensity of processes (sediment fluxes and denudation rates) in the field included reference coloured lines, painted stones and wooden markers. They provide a simple view of surface processes directly supplying the Bruchi torrent and acting on the different sediment stores. LiDar scanning of the drainage basin and of a landslide and a natural levee supplying the main channel realised during summer and autumn 2008 should provide more quantitative information. This combined approach allows us to consider the catchment as a succession of connected reservoir subsystems (tanks) varying in storage period and emptying velocity.

References

Reid L.M. and Dunne T. (1996). Rapid evaluation of sediment budgets. Catena Verlag.
Sterling S., Slaymaker O. (2007). Lithologic control of debris torrent occurrence. Geomorphology 86, 307-319.
Theler D, Reynard E., Bardou E. (2008). Assessing sediment dynamics from geomorphological maps: Bruchi torrential system, Swiss Alps. Journal of Maps v2008, 277-289.
Warburton J. (2007). Sediment budgets and rates of sediment transfer across cold environments in Europe: a commentary. Geogr. Ann. 89, 95-100.