la connectivité sédimentaire et la connectivité des environnements proglaciaires : relation spatio-temporelle de la livraison en sédiments depuis les pentes

Sediment connectivity and connectivity of proglacial environments: Spatio-temporal pattern of sediment deliver from hillslopes coupling to proglacial margins

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1. Sediment connectivity and connectivity of proglacial environments: Spatio-temporal pattern of sediment deliver from hillslopes coupling to proglacial margins

In a context of climate change, water yield, sediment supply and transport capacity have been increasing since the early 1980s in Alpine catchments experiencing rapid glacier recession (Micheletti and Lane, 2016;Lane et al., 2017). Over the next few decades the increasing extent of deglaciated terrain will interact with changing magnitude and frequency of sediment mobilizing extreme events (e.g. debris flows) (Rebetez et al., 1997; Ravanel and Deline, 2011; Fischer et al., 2012; Stoffel and Huggel, 2012; Hirschberg et al., 2021).

In permafrost-dominated regions rising temperatures are also changing the response of slope stability to extreme precipitation events (Rebetez et al., 1997). It is not only the frequency of the events that is likely to change but also the seasonality as climate warming reduces winter snow accumulation and leads to an earlier onset of snow-free conditions (IPCC, 2021). In the same way, even if the overall frequency of debris flows events remains low, magnitude may increase if larger volumes of sediment are mobilized (Stoffel et al., 2014; Hirschberg et al., 2021). There is emerging evidence that these changes can be seen in increasing sediment yield from mountain basins.

What is perhaps less frequently considered in periglacial environments especially is the role played by connectivity as an influence upon the ways in which the signals of changing climate propagate through river catchments. Through erosion and deposition, sediment transport leads to modification of the landscape and thus the ease with which sediment can move though the landscape, that is the degree of connectivity. For instance, glacier recession leads to sidewall debuttressing and fall in local base level leading to intense erosional processes on sidewalls (e.g. gully development) which increase potential connectivity from upstream to downstream (Lane et al., 2017; Mancini et Lane, 2020).

Following these processes, my PhD project focus on the relative importance of the sources, sinks and pathways of sediments in the hillslopes that form after deglaciation as compared with other drivers of sediment flux (e.g. rivers) in proglacial margins. This is being achieved by combining passive environmental seismometry to qualify (and quantify) sediment transport events, and static and dynamic connectivity analyses (Cavalli et al., 2013) to understand where sources are and the role played by connectivity in modifying source-to-sink sediment transfers.

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