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Proglacial sediment supply and channel evolution of the Arveyron of the Mer de Glace since the early 20th c.

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The Arveyron of the Mer de Glace is the emissary of the most famous and largest French glacier. The latter has dramatically shrunk since the end of the Little Ice Age (LIA), such as every alpine glacier: the front has registered a retreat of 2.7 km since 1820 and a recent modelling showed a likely decrease of an extra km by 2040. The Arveyron and its surroundings are deeply impacted by the retreat. Then, dynamics of proglacial streams and of lateral moraines have been studied at different time and space scales through various methods: airborne and terrestrial Lidar DEM comparisons, mapping from orthophotos, 2D and 3D monoplotting to quantify past events from old terrestrial pictures, etc. By coupling studies on moraines and on stream morphology we wanted to better understand the influence of glacier retreat on sediment supply and transport downstream.
Results show the evolution of the stream sediment sources linked to the glacier retreat. Before the middle of the 20th century, till was the main sediment source and was released by major flood events such as GLOFs. Now, geomorphic activity is especially important on the right lateral moraine into the recently deglaciated hanging valley of the Mer de Glace but also in the moraine flanks of the current glacier tongue (many landslides occurred during the Summer 2014). The recent glacier retreat has also formed sediments sinks such as two proglacial lakes which are progressively filling. These lakes work as big sediment traps until they will disappear (around 2017).
Fluvial dynamics of the Arveyron depends on the connectivity with potential sediments sources. This is why we crossed upstream studies with the channel evolution on its fan. Arveyron channel has got narrower and incised for at least a century. Such evolution should mean a decreasing sediment yield, but anthropic factors play also an important role on stream morphology.
The main anthorpic impact is the complex subglacial harnessing of the Mer de Glace. The Arveyron discharge is totally by passed up to the restitution channel, even during flood events. Evolution of the paraglacial area, but also downstream, is thus largely influenced by that facility.
Finally we used recent modelling of the Mer de Glace retreat for the next decades to comprehend the future paraglacial landscapes and what the Arveyron dynamics should become. Excepted small threshold effects, no major evolution should occur.