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200 years of geomorphic history of the Arveyron of the Mer de Glace

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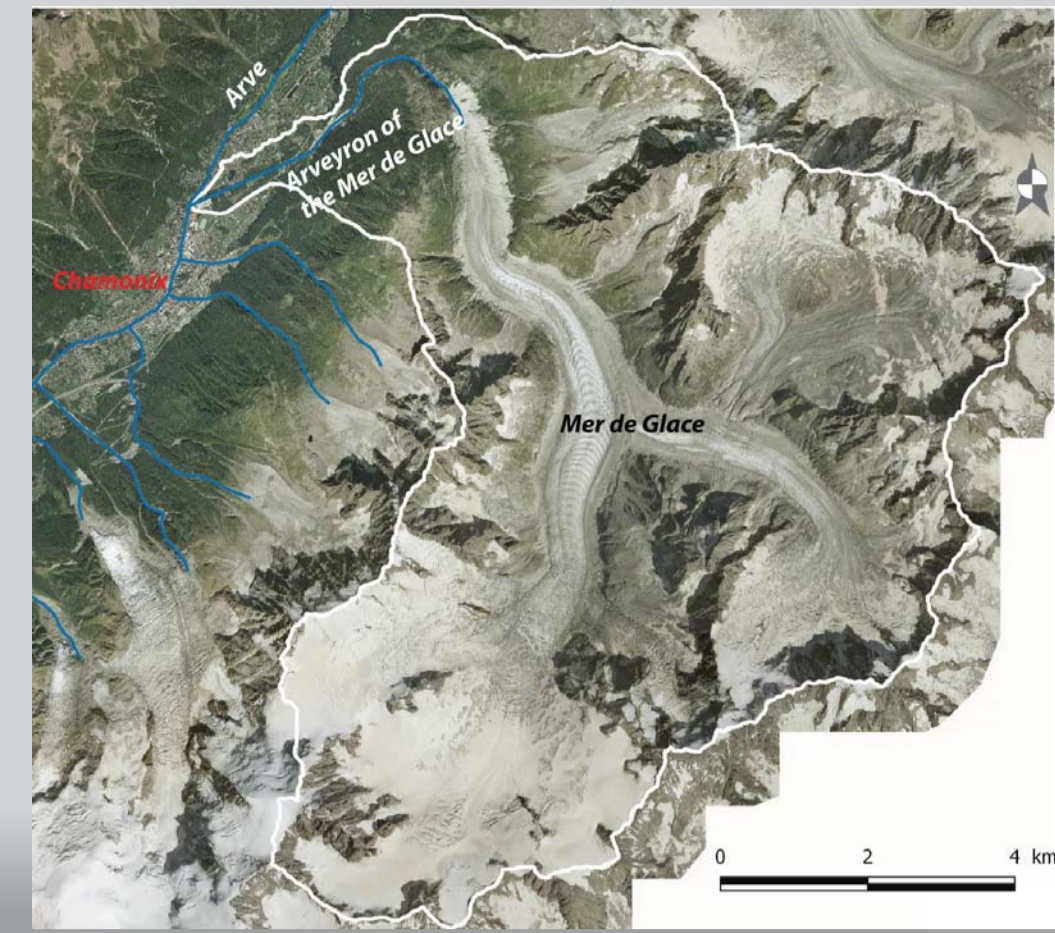
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Introduction

The Arveyron of the Mer de Glace is the only emissary of the largest French glacier. Even if it represents a direct link between the Mer de Glace and Chamonix Downtown, its history since the end of the Little Ice Age (LIA), is not very known by the *chamoniards*. This poster summarizes our research on this river, completed with a geo-historic approach, geomorphological mapping and LiDAR survey.

Some numbers about the Arveyron of the Mer de Glace evolution since the end of the LIA

	Stream Length (from the glacier tongue to the Arve confluence)	Ice Cover rate (watershed surface = 80 km ²)
Late LIA (1850)	2660 m	61 %
Now (2008)	5020 m (2016 : 5270 m)	51 %



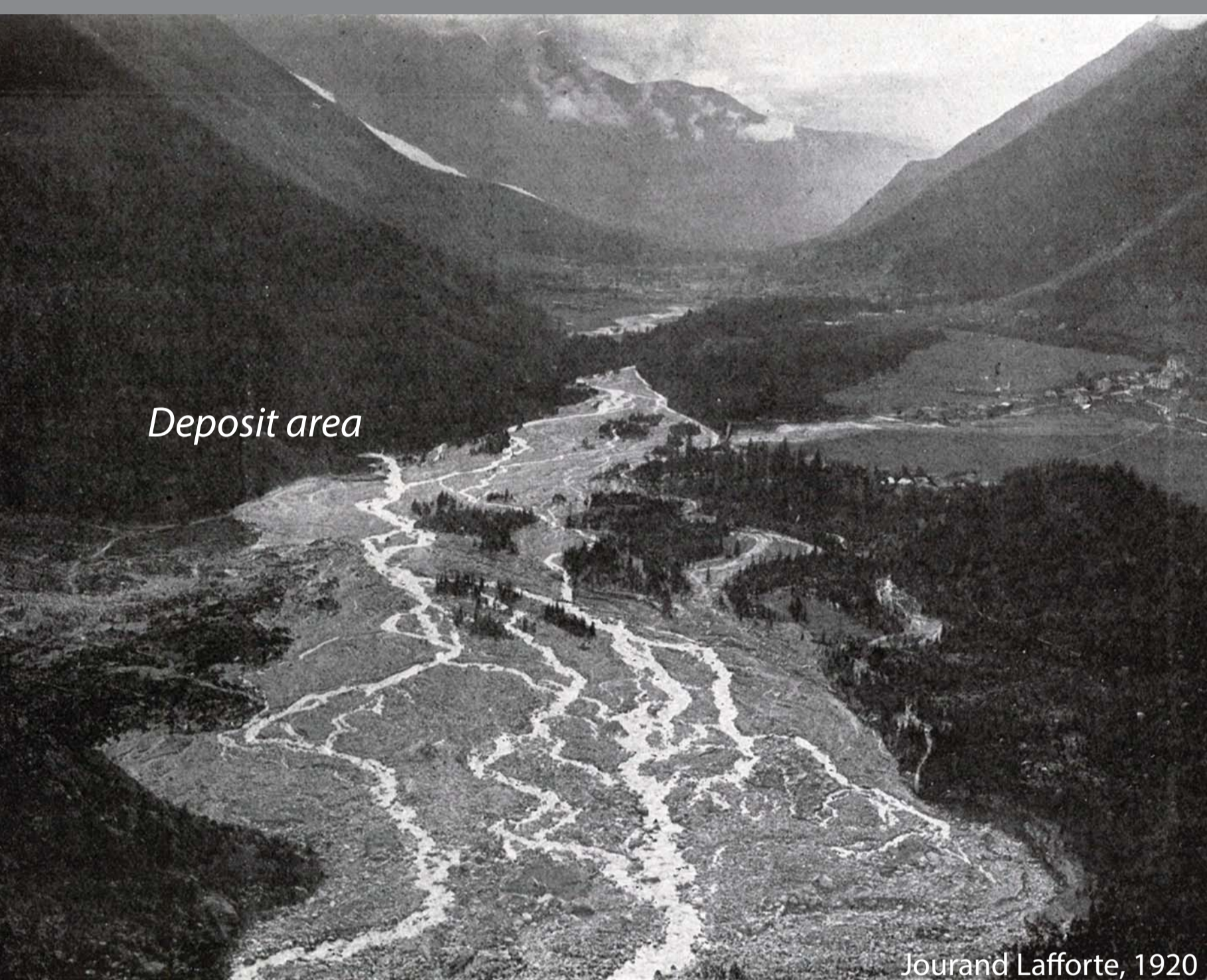
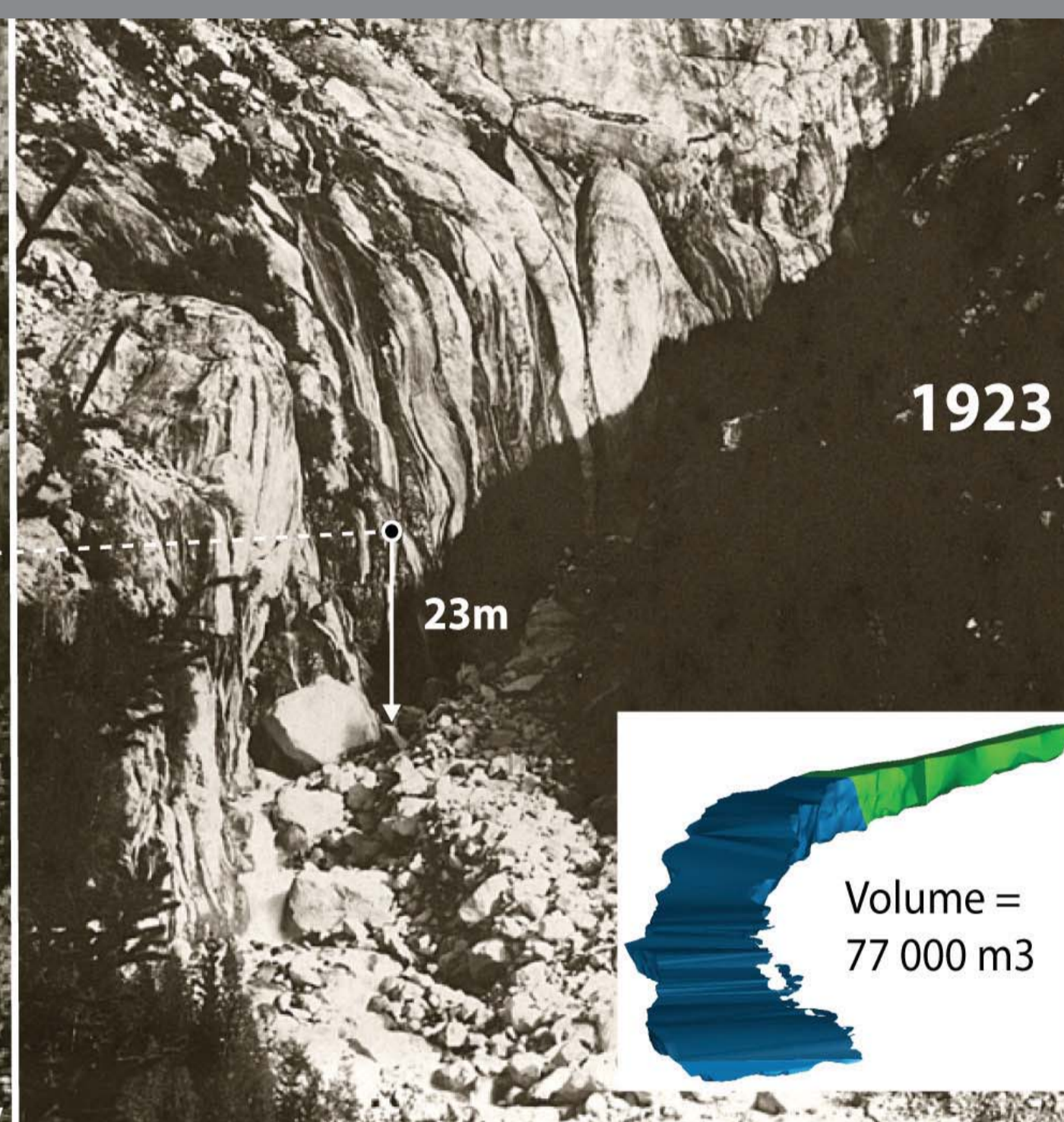
The LIA, the peak of geomorphic activity

At this time, the glacier tongue reached the Chamonix valley bottom. The river is much wider than today. This peak of torrential activity is highlighted by the presence of a second emissary, the *Lavoussé stream* which has disappeared around 1850. At the end of the LIA, because of the increasing distance between sediment sources at the proglacial margin, and the valley bottom, the torrential activity begins to decrease.



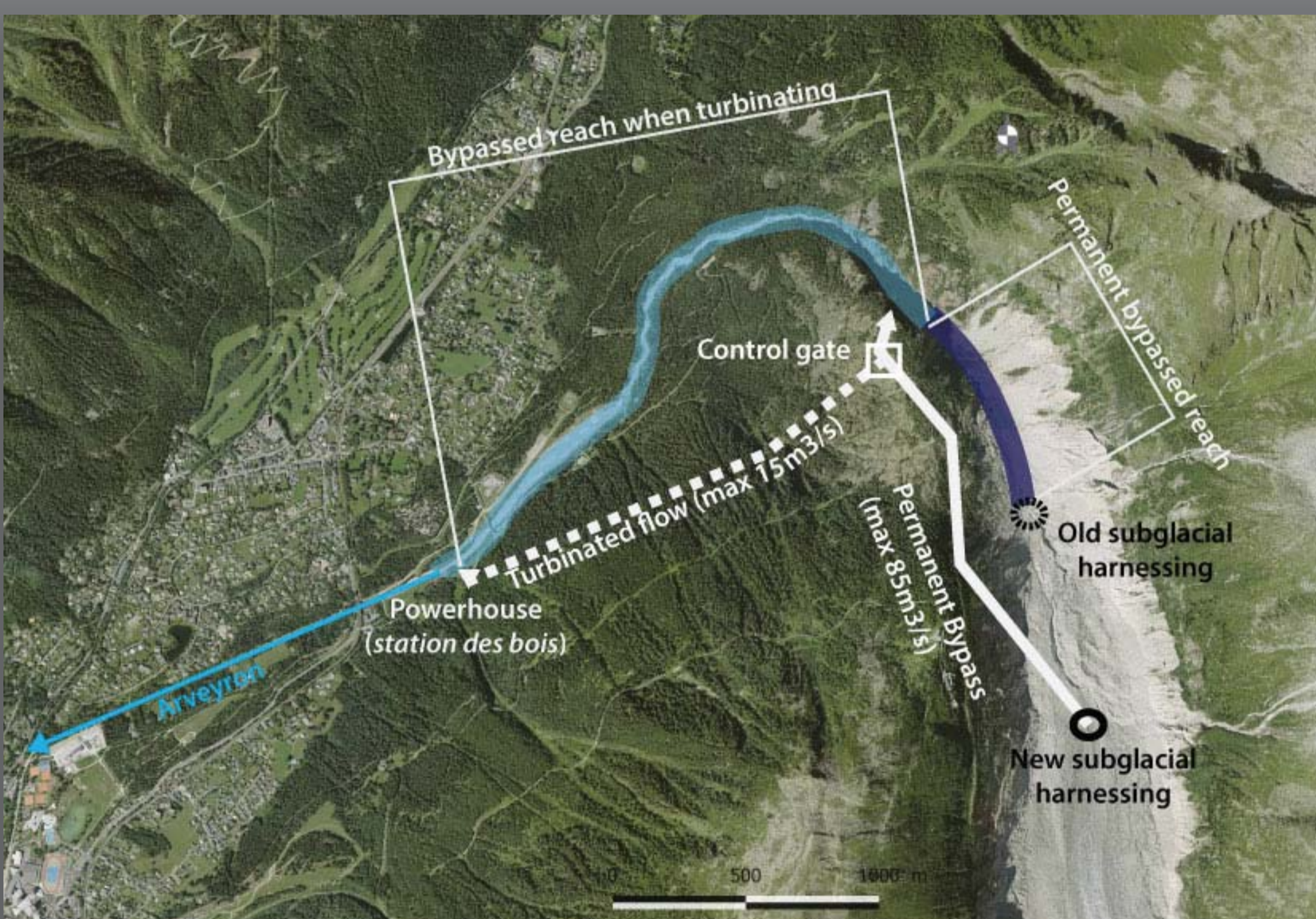
1920 : an (almost) catastrophic flood

September 24th, 1920, the most powerful flood of the 20th century happened. It is a glacial lake outburst flood (GLOF), more precisely from an inner water pocket. 150 000m³ of sediment were redrafted. The channel river incision reached 23m at the end of the Gorges du Mauvais pas. Even if only few damages were reported in Chamonix downtown, this flood has durably changed the river bed morphology.



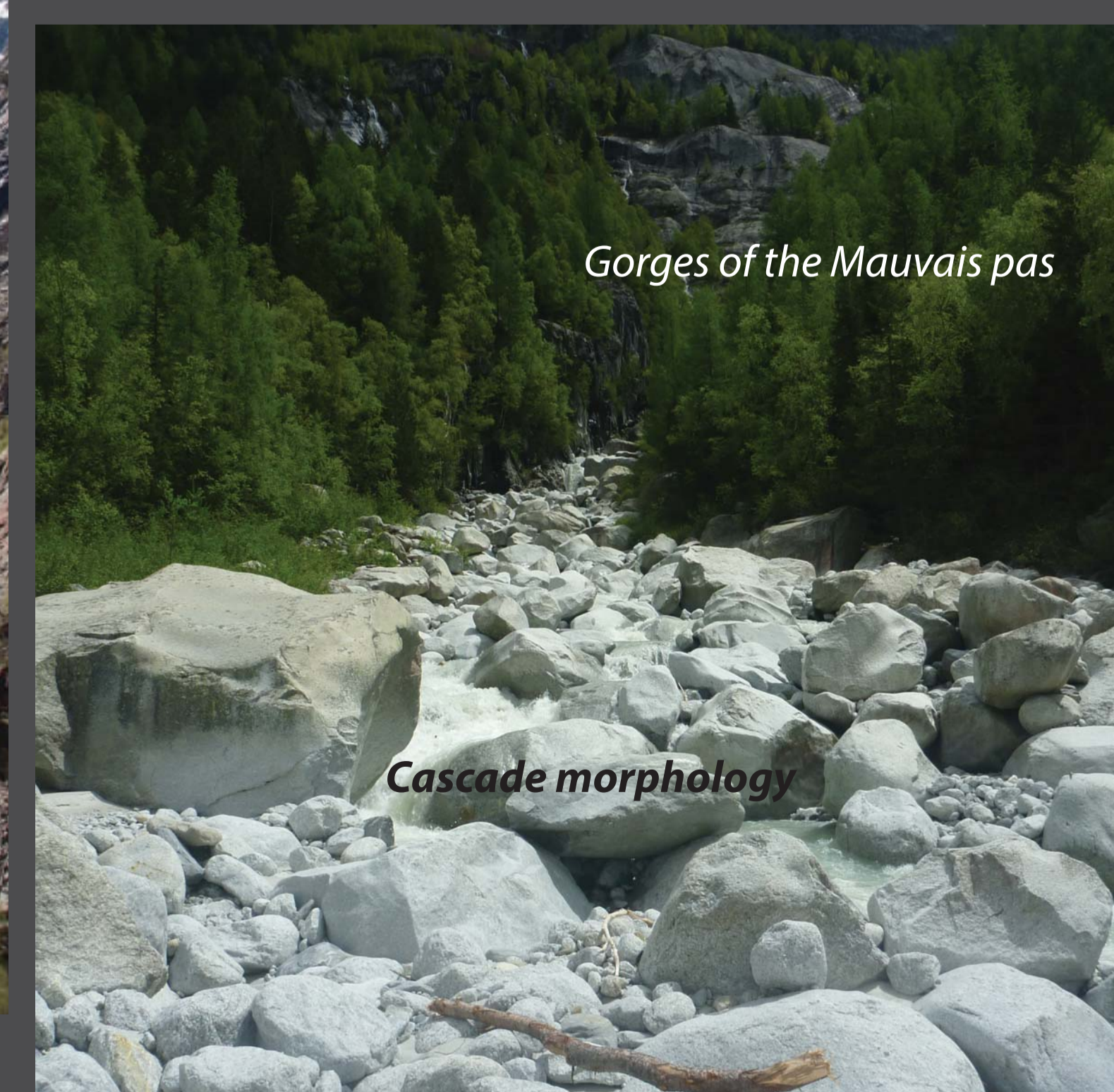
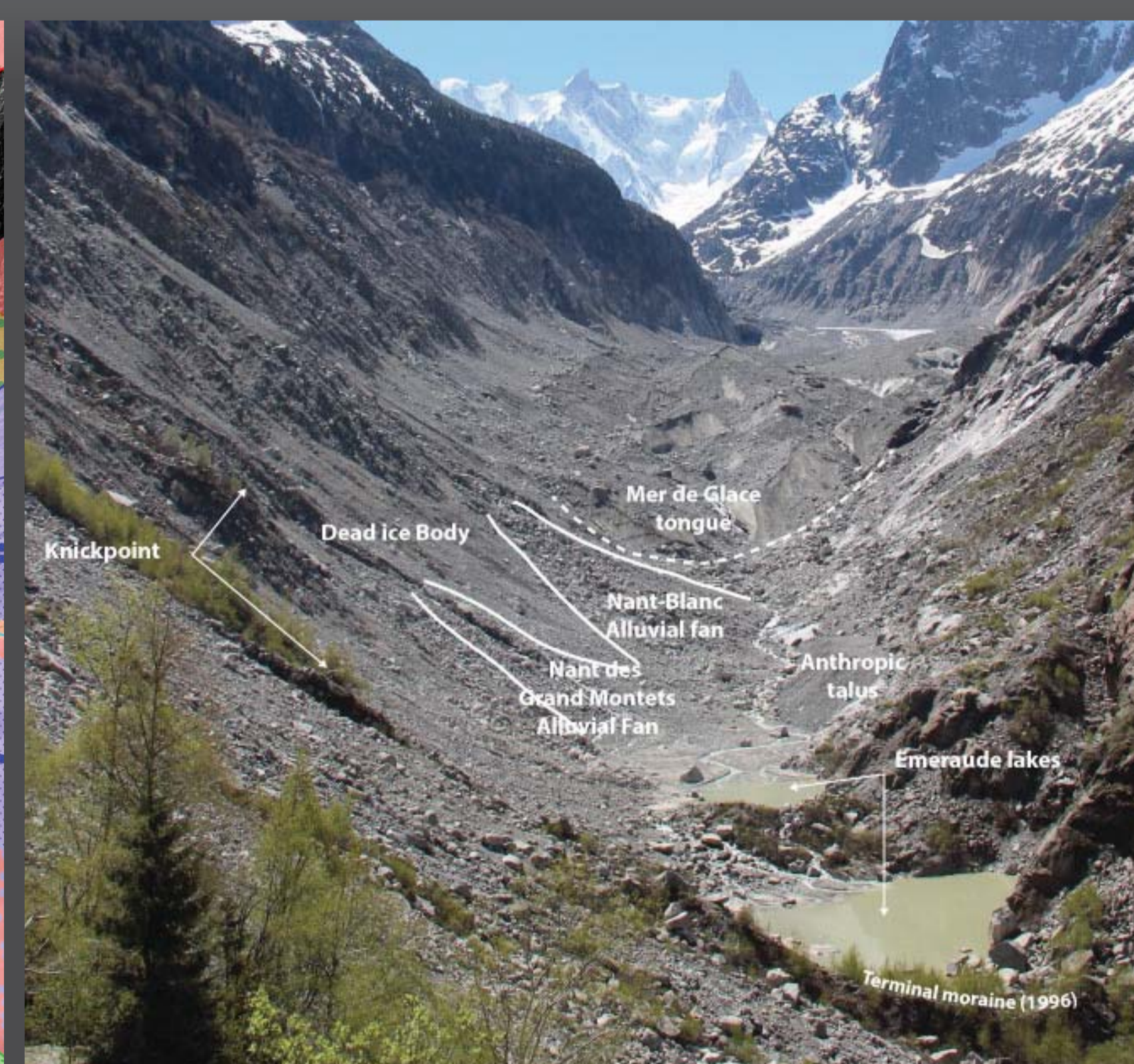
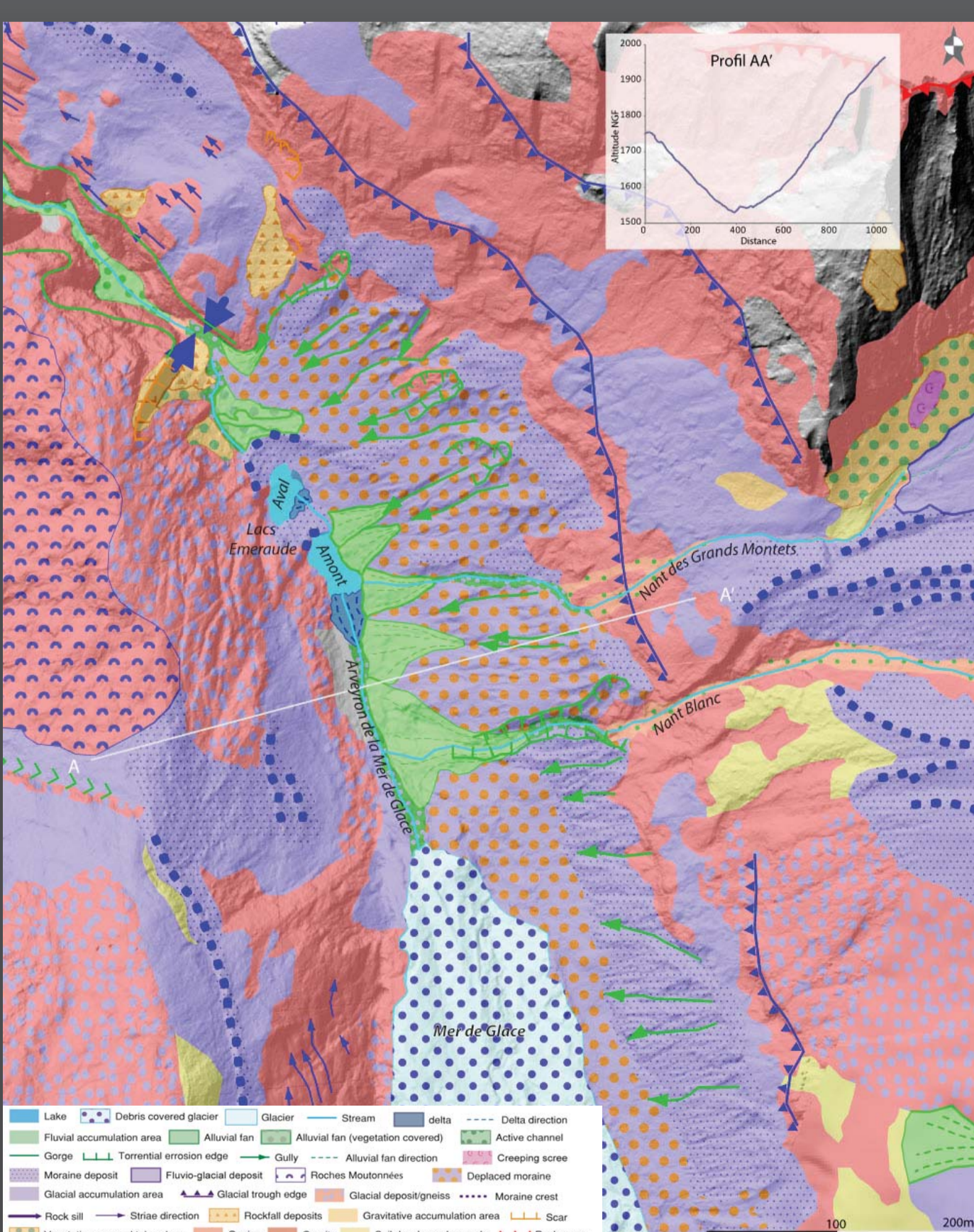
Since the 50' : the major impact of human activities

In 1973, a unique hydropower plant is built, with a subglacial harnessing. The waterflow is totally derived from the glacier front to the Gorges du Mauvais Pas, even during flood events. It means that no flood has passed through the proglacial margin for 45 years. That is why the geomorphic transition between the by passed section and the «connected» section is outstanding. Human activities concern also the channel damming and the sediment extraction. All those impacts have participated to decrease the torrential activity.



Present geomorphic activity

Now, the Mer de Glace tongue is retreating into a hanging valley. The proglacial margin has typical paraglacial process and landforms such as lakes or developing alluvial fans at the foot of the right lateral moraine. However, the full flow abstraction due to the hydropower plant has modified the paraglacial evolution and disconnected the Arveyron to its potential sediment sources. Thus, the river is now sediment supply limited as shows the *cascade* river bed morphology.



References

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Conclusions

- From the end of the LIA to the middle of the 20th century, Mer de Glace retreat has caused the decrease of the geomorphic activity of the Arveyron of the Mer de Glace

- Since the middle of the 20th century, this trend is enhanced and mainly led by human activities, especially the hydropower plant.