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Paleodenudation rates variations in the Southern French Alps (Var river) during the last 70 ka.

Apolline Mariotti (1), Pierre-Henri Blard (1), Julien Charreau (1), Samuel Toucanne (2), Stephan Jorry (2), Stéphane Molliex (3,1), Carole Petit (4), and Aster ASTER Team (5)

(1) Université de Lorraine, CRPG, Vandœuvre les Nancy, France (mariotti@crpg.cnrs-nancy.fr), (2) IFREMER, Unité Géosciences Marines, Plouzané, France, (3) Laboratoire Géosciences Océan, Institut Universitaire Européen de la Mer, Brest, France, (4) Géoazur, Université de Nice, Valbonne Sophia Antipolis, France , (5) CEREGE, Laboratoire LN2C, CNRS Université Aix Marseille, Aix-en-Provence, France

Reconstruction of denudation rates through time is an important task to quantify and understand the impact of climate on landscape evolution. Cosmogenic nuclides have been widely used to infer denudation rates at the watershed scale from both present day sediments and past stratigraphic records. Here, we analyze the in situ ^{10}Be cosmogenic concentration in sediments of two long-piston cores that were collected offshore the Var River (Western Mediterranean Sea), precisely along the Var sedimentary ridge. These sedimentary archives have been well dated at a high resolution and analyzed for sediment provenance (Bonneau et al., 2017-EPSL) thus providing a unique record to reconstruct the denudation history of the Var catchment in the Southern French Alps over the last 70 ka. This period covers the majority of the last glacial period and the associated Dansgaard-Oeschger events, the last glacial maximum (LGM, 26-19 ka) and the subsequent deglaciation (19-11 ka), and the Holocene, with all these events being precisely defined in the studied cores. Therefore, this setting offers the rare opportunity to study the impact of rapid climate fluctuations on denudation rates in a mountainous glaciated catchment over a time scale that is not impacted by tectonics.

We present 21 ^{10}Be paleo concentrations ranging from 1.24±0.51 x 10^4 atoms/g_{quartz} to 5.99±1.90 x 10^4 atoms/g_{quartz}. The ^{10}Be paleo concentrations overall are very similar to present day ^{10}Be concentrations (average of 4.20±0.67 x 10^4 atoms/g_{quartz} at the watershed's outlet in 2016, or a denudation rate of 0.20 ±0.03 mm/year). This suggests similar paleo denudation rates between today, the 0-17 ka period and the 27-70 ka period.

Only the LGM shows a clear change in ^{10}Be concentrations with much lower concentrations (average of 1.68±0.48 x 10^4 atoms/g_{quartz}) suggesting high denudation rates during this period of maximum glacial extent in the French Alps.

These results suggest that climatic settings have a limited impact on overall denudation rates and that glaciers in the Mediterranean Alps either weren't strong agents of erosion during the MIS 3 (70-25 ka) or were smaller than previously thought. These results also suggest that only strong climatic fluctuations (such as the LGM) can induce meaningful changes in denudation rates.