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10Be-derived paleo-denudation rates over the last 500 ka in the Golo River catchment (Corsica, Mediterranean Sea)

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The existence of a large worldwide increase in denudation rates during the Late Cenozoic resulting from the global Pleistocene cooling has recently been questioned and is now under debate. An efficient way to independently estimate the impact of climate on paleo-denudation rates consists in measuring in-situ produced 10Be in buried sedimentary series. Although marine basins are theoretically one of the most suitable locations to preserve continuous sediment series and thus to perform this kind of work, no studies have been completed yet at the scale of several glacial/interglacial cycles. Here, we measure 10Be concentration on 25 samples of quartz from cored sediments located in the East-Corsica margin, off the outlet of the Golo River, paying a special attention to the methodological specificities of this setting.

The Golo is a steep mountainous catchment that drains a 1000 km^2 area of crystalline and metamorphic rocks, with a mean elevation of 926 m and summits around 2700 m. Today this mountainous area is dominated by a Mediterranean climate with a strong precipitation increase with elevation. During the Last Glacial Maximum, ice covered the uppermost areas, about 7 % of the watershed surface. This ice cover probably grows up during all major glacial stages of the Quaternary. Fast sediment transfer from the slopes to the deep-subsiding basin ensured a good preservation of sediments during both glacial and interglacial stages. However, sands needed for cosmogenic nuclide studies stand either on the shelf, where sedimentation is discontinue or in the deep-basin where they are possibly remobilized from the shelf. To meet these contradictory constraints, we analyzed 10Be in sands collected from three boreholes located along a profile from the littoral to the shelf break (0 to 116 m bsf), that ensured that our sampling cover both glacial and interglacial wedges over the last five glacial/interglacial cycles (500 ka). Age model is constrained from stratigraphic correlations based both on several dating methods and seismic profiles correlations.

Obtained denudation rates range between 0.05 and 0.1 mm/yr. Results suggest that glacial paleo-denudation rates are 20 to 40 % higher than interglacial ones. They also reveal a relative long-term stability of the mean denudation rate over the different climatic cycles of the last 500 ka. Differences of denudation processes between glacial and interglacial stages are also discussed. While physical erosion is enhanced by glacial and peri-glacial processes during cold stages, chemical weathering plays a major role in denudation during warm stages.