

Impact of Quaternary glacial cycles on denudation in Western Mediterranean mountains

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It is important to understand how climate changes impact denudation, notably during the large amplitude Quaternary glacial cycles, not only because denudation is thought to be a long-term climate pacer, but also because available denudation records are contradictory and sometimes underconstrained. We present here new ¹⁰Be-derived denudation rates from 6 cores drilled in offshore sediments from two Mediterranean alpine ranges: Southern Alps (Var River) and Corsica (Golo River). This dataset of 60 ¹⁰Be samples from well-dated sedimentary archives documents at high resolution (1 kyr in some sections) the denudation variability over the last 3 million years of the alpine reliefs, with a special focus on the last five 100 kyr glacial cycles. Our new record brings two main results:

i) At the million years timescale, the appearance of the Quaternary glaciations (2.6 Ma) had a negligible impact on the denudation rates of these Alpine reliefs. This observation is in good agreement with other ¹⁰Be-denudation rates records from Asia (Tianshan and Himalaya) that report a limited impact of the Pleistocene climatic transition [1-3], but at odds with other regions of the American Cordilleras, where tectonic may have played a role [4-5].

ii) At the glacial-interglacial cycles timescale, our high resolution ¹⁰Be data over the last 500 kys reveal that glacial maxima enhanced denudation compared to interglacial periods. However, this impact is variable in space and time, different denudation responses being observed between Southern Alps and Corsica. This contrasted behavior appears to be controlled by the velocity of paleoglaciers, that itself result from the combination between paleoclimate and basin reliefs. This mechanism is responsible for a non-linear response of denudation to glacier fluctuations, explaining why glaciations had regionally variable impacts on denudation [6].

References

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