Past changes in erosion in antipodal active orogens – unsurprisingly, French and New Zealanders disagree

Carney, S.,[1,2] Wilcox, P.,[1,2] Ryan, M.T.,[3] Toucanne, S.,[4] Bayon, G.,[4] Francke, A.,[1,2] Dosseto, A.,[1,2]

[1] *Wollongong Isotope Geochronology Laboratory, School of Earth and Environmental Sciences, University of Wollongong. Wollongong, NSW 2522, Australia*

[2] *GeoQuEST Research Centre, School of Earth and Environmental Sciences, University of Wollongong. Wollongong, NSW 2522, Australia*

[3] *School of Geography, Environment and Earth Sciences, Victoria University of Wellington. Wellington, New Zealand*

[4] *IFREMER, Unité de Recherche Géosciences Marines, F-29280 Plouzané, France*

Mountains erode. A lot. And fast. But what happens in the context of Quaternary climate change is much less understood. This is mostly because of the lack of proxies for reconstructing past changes in catchment erosion. Uranium isotopes (^{234}U and ^{238}U) are sensitive to the mechanisms of hillslope erosion (shallow sheet wash vs mass wasting) and the rate of sediment transport. Thus, a high $^{234}U/^{238}U$ denotes deep hillslope erosion and rapid sediment transport. Applying this tool to sediment records could help us understand how catchment erosion responds to climate variability. We have applied this approach to two marine cores collecting sediment from two antipodal active orogens: the French and New Zealand Alps.

In the Mediterranean Sea, turbidite sequences record 75 kyr of erosion in the Var River catchment, which drains a portion of the southern French Alps. Uranium isotope ratios of these sediments show higher values during the Last Glacial Maximum, followed by a decrease in the Holocene. This suggests that glacial erosion was resulting in the production and rapid export of sediments, while during pluvial conditions shallower erosion and slower sediment transport were taking place.

A marine core of the west coast of New Zealand's South Island shows contrasting results. Here, the record spans the last 200 kyr, and the lowest uranium isotope ratios correspond to glacial stadials. In this case, this suggests that erosion was shallower and/or slower, compared to interstadials. While glacial cover was more extensive during these periods, it is possible that the sediment produced was not exported, only to be delivered to the Tasman Sea during the following interstadial.

Taken together, these results show that rugby is not the only source of disagreement between French and New Zealanders. The response of mountainous catchments to Quaternary climate variability is complex, and the application of novel isotopic proxies, combined to other approaches, should shed the light on this complexity.