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Ice cap melting and low viscosity crustal root explain narrow geodetic uplift of the Western Alps

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More than 10 years of geodetic measurements demonstrate an uplift rate of 1-3 mm/yr of the high topography region of the Western Alps. By contrast, no significant horizontal motion has been detected. Three uplift mechanisms have been proposed so far:
(1) the isostatic response to denudation. However this process is responsible for only a fraction of the observed uplift and
(2) the rebound induced by the Wurmian ice cap melting. This process leads to a broader uplifting region than the one evidenced by geodetic observations.
(3) a deep source motion associated with slab motion or some deep isostatic unbalance.
Using a numerical model accounting for crustal and mantle rheology of the Alps and its foreland, we model the response to Wurmian ice cap melting. We show that a crustal viscosity contrast between the foreland and the central part of the Alps, the later being weaker with a viscosity of 1021 Pa.s, is needed to produce a narrow uplift. The vertical rates are enhanced if the strong uppermost mantle beneath the Moho is interrupted across the Alps, therefore allowing a weak vertical rheological anomaly thanks to the continuity between the low viscosity parts of the crust and mantle.

References:
Champagnac, J.-D., F. Schlunegger, K. Norton, F. von Blanckenburg, L. M. Abbühl, and M. Schwab (2009), Erosion-driven uplift of the modern Central Alps, Tectonophysics, 474(1-2), 236–249.
Vernant, P., F. Hivert, J. Chéry, P. Steer, R. Cattin, and A. Rigo (2013), Erosion-induced isostatic rebound triggers extension in low convergent mountain ranges, geology, 41(4), 467–470.