



Erosion of the French Alpine foreland controlled by crustal thickening

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In alpine-type collision belts, deformation of the foreland may occur as a result of forward propagation of thrusting and is generally associated with thin-skinned deformation mobilizing the sedimentary cover in fold-and-thrust belts. Locally, foreland deformation can involve crustal-scale thrusting and produce large-scale exhumation of crystalline basement resulting in significant relief generation. In this study, we investigate the burial and exhumation history of Tertiary flexural basins located in the western Alpine foreland, at the front of the Digne thrust-sheet (SE France), using low-temperature apatite fission-track (AFT) and (U-Th)/He (AHe) thermochronology. Based on the occurrence of partially to totally reset apatite grain ages, we document 3.3 to 4.0 km burial of these basins remnants between ~ 12 -6 Ma, related to thin-skinned thrust-sheet emplacement without major relief generation. The onset of exhumation is dated at ~ 6 Ma and is linked to erosion associated with subsequent relief development. This evolution does not appear controlled by major climate changes (Messinian crisis) or by European slab breakoff. Rather, we propose that the erosional history of the Digne thrust-sheet corresponds to basement involvement in foreland deformation, leading to crustal thickening and the incipient formation of a new external crystalline massif. Our study highlights the control of deep-crustal tectonic processes on foreland relief development and its erosional response at mountain fronts.