



Exhumation of the Mont Blanc and Gotthard massifs, forced by tectonics or climate?

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We present new zircon and apatite fission track and apatite (U-Th)/He data from two tunnel transects crossing the Gotthard and Mont Blanc massifs. Horizontal and vertical profiles along these transects allow to draw conclusions about the spatial and temporal exhumation history of the massifs.

Exhumation of the Mont Blanc massif was episodic with fast exhumation before ~ 6 Ma (~ 3 km/Myr), followed by slow exhumation and again fast exhumation after ~ 3 Ma (> 1 km/Myr). In contrast, exhumation in the Gotthard massif was constant (~ 0.5 km/Myr) after ~ 15 Ma. Fault activity and block tilting within the massifs were not significant during the last ~ 15 Ma.

We suggest that the Mont Blanc massif was thrust northward before ~ 6 Ma causing the observed fast exhumation event. The acceleration in exhumation after ~ 3 Ma is also reported for other external massifs, except the Gotthard massif. This argues against a climate triggered exhumation event. During the Pliocene the Western and Central Alps are characterized by a general change in the orientation of extension: from orogen-parallel to orogen-perpendicular. This led to normal faulting along orogen-parallel faults accompanied by exhumation of the external massifs. A reconstruction of the Mont Blanc palaeorelief, however, indicates that a great amount of post ~ 3 Ma exhumation was caused by rapid valley incision related to glaciation. We therefore propose that fast exhumation after ~ 3 Ma of the external massifs was

triggered by tectonics and amplified by climate.