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# Plio-Pleistocene denudation history of the Central European Alps revealed through detrital thermochronology

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For the European Alps, strongly enhanced sedimentation discharge rates into the circum-Alpine main depocentres since the Pliocene indicating enhanced hinterland erosion has been suggested (Kuhlemann et al., 2002). In this study we are focussing on the driving forces of increasing hinterland erosion in response to climatic and/or tectonic processes. On the basis of apatite fission track and apatite (U-Th-Sm)/He analyses we are investigating the provenance of the detrital sediments from the circum-Alpine area, namely the Sundgau gravel (France), the Upper Rhine Graben (boreholes of Parkinsel and Viernheim, Germany), and the Swiss foreland (Höhere Deckenschotter, Irchel). Additionally the analyses yield paleoexhumation rates of the different Alpine source areas, and especially changes of denudation rates through time.

Our apatite fission track (AFT) data show that the source areas of the Sundgau gravels (deposited between 2.9 and 4.2 Ma) are most likely the Aar massif and the Lepontine Dome. Liniger (1967) assumed the Aar massif as one of the main source areas of the Sundgau gravel but the catchment area also seems to comprise parts of the Lepontine Dome. The amalgamation of the Palaeo-Aare and the Rhine river in the lowermost Pleistocene stopped the deposition of the Sundgau gravel, and from this time on the Alpine signal is traceable through all Pleistocene sediments of the Parkinsel and Viernheim drillings in the Upper Rhine Graben. The lack of an AFT age signal from the Lepontine Dome after the reorganisation of the drainage network implies a northward shift of the drainage divide away from the Lepontine Dome towards the Aar massif. The western Swiss foreland, by contrast, was fed by East Alpine sources around 2 Ma.

The lag time evolution (thermochronological age minus age of deposition) of the youngest AFT age population show an interesting pattern: i) between 4 and 2 Ma the lag time is $\sim$6 Ma, and ii) after 2 Ma the lag time has decreased to $\sim$4 Ma. The lag time of the older period agrees with lag times reported from the Western Alps (Glotzbach et al., 2010), whereas after 2 Ma, the Central Alps seem to show a more rapid exhumation than the Western Alps. Accelerated exhumation after 2 Ma is most likely related to valley erosion and relief formation due to glacial processes.

References

Glotzbach, C., Reinecker, J., Danišík, M., Rahn, M., Frisch, W., Spiegel., C. (2010). Thermal history of the central Gotthard and Aar massifs, European Alps: Evidence for steady state, long-term exhumation. J Geophys Res. 115. F03017. doi:10.1029/2009JF001304.

Kuhlemann, J., Frisch., W., Székely, B., Dunkl, I., Kázmér, M. (2002). Post-collisional sediment budget of the Alps: tectonic versus climatic control. Int J Earth Sci. 91. 818-837.

Liniger H. (1967). Pliozän und Tektonik des Juragebirges. Eclogae Geologicae Helvetiae. 60. 407-490.