

POST-COLLISIONAL EXHUMATION HISTORY AND SURFACE EVOLUTION OF THE CENTRAL ALPS

Cornelia Spiegel, Joachim Kuhlemann, István Dunkl & Wolfgang Frisch

The Oligo-Miocene is an important period for the geomorphological evolution of the Alps. After the Eocene-Oligocene collision and nappe stacking, the Central Alps started to develop a significant relief in Oligocene times. Miocene lateral extrusion caused an east-west stretching of more than 300 km and led to the collapse of the relief. This collapse is reflected by a drastic decrease of sediment accumulation rates in the foreland basins of the Central Alps at 21 Ma. The aim of this study was a detailed reconstruction of the exhumation history and the surface evolution of the Central Alps in Oligo-Miocene times. Geochronological, geochemical and isotope studies on the foreland basin sediments give evidence for the first exposures of certain tectonic units and their cooling rates. Moreover, the paleodrainage system of the Central Alps in Oligo-Miocene times can be reconstructed. To summarize, the following can be concluded: During Oligocene times only sedimentary cover nappes (flysch and carbonates) and basement nappes of the Austroalpine mega-unit were exposed on the northern flank of the Central Alps. The eroded part of the Austroalpine basement in the Central Alps consisted of large areas, which experienced only weak or even no Eo-Alpine metamorphic overprint. It was the direct western continuation of the Ötztal and Silvretta block of the western Eastern Alps. Austroalpine basement exposed on the southern flank of the Central Alps experienced slightly higher temperatures (~240–300°C)

during Cretaceous metamorphism. The main drainage divide was situated north of a volcanic chain which was positioned in the area of the Periadriatic lineament. Contemporaneous with the collapse of the relief units of the Penninic lower plate became exposed over large areas of the Central Alps (21 Ma). While in the hinterland of the Kronberg-Gäbris and Hörnli fan only upper parts of the Penninic nappe pile were eroded, the Honegg-Napf and Pfänder system rooted in deeper levels of the Penninic sequence. Geochronological data reveal an average cooling rate of ~20°C/Ma in Late-Oligocene to Early Miocene times for these Penninic units. The Pfänder river system rooted in the Lepontine area of the Central Alps. The Pfänder fan itself was situated in the area of the recent Lake Constance. Therefore, the catchment area was similar to the present-day Rhine river and the Pfänder system might be called 'Paleo-Rhine'. In Middle Miocene times Lower Penninic units of the Lepontine Dome were exhumed to the surface, contemporaneously with the opening of the Tauern window in the Eastern Alps.

Authors' address:

Dr. Cornelia Spiegel, Dr. Joachim Kuhlemann, Dr. István Dunkl, Prof. Dr. Wolfgang Frisch, Institut für Geowissenschaften, Universität Tübingen, Sigwartstr. 10, 72076 Tübingen, Germany