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Linking orogen and peripheral foreland basin: conceptual model and application to the Southalpine-Dinaric (Friuli) orocline

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Surface uplift and rock exhumation within an orogen are generally a consequence of convergence, and can often be linked with subsidence in a peripheral foreland. Since vertical loads act on the entire lithosphere, these processes can, therefore, be considered as plate-scale processes. Here, we propose a conceptual model for this linkage for the Friuli orocline and its surrounding units. The Friuli orocline stretches from the ENE-trending Southern Alps to the SE-trending Dinarides.
There, two Neogene stages of convergence and associated deformation can be differentiated: (1) a Mid-Late Miocene phase of increased surface uplift and intra-orogenic subsidence of sedimentary basins reflecting intra-orogenic crustal-scale folding. Depocentres are e.g. the flexural Belluno, Ljubljana and Klagenfurt basins. (2) A second stage of convergence during Late Pliocene-Pleistocene times led to overall surface uplift in the orogen and contemporaneous pronounced subsidence in the peripheral foreland basin (Venetian platform and the northern Adriatic Sea). We propose, that the spatially variable extent of subsidence originates in variably strong orogen-basin coupling, i.e. weak coupling during stage 1 vs. strong coupling during stage 2.
This interpretation is based on the apatite fission track age pattern, the distribution of intra-orogenic Neogene sediment basins and subsidence analyses in the foreland basin (Barbieri et al., 2007). Available low-temperature thermochronological data for the Southern Alps and the NW Dinarides are sparse, in contrast to a dense network of primarily apatite fission track ages north of the Periadriatic lineament (e.g. summarized by Luth & Willingshofer, 2008). AFT ages adjacent to the eastern Periadriatic Lineament mainly range from 15 to 25 Ma (Hejl, 1997; Fodor et al., 2008). Detrital studies on Oligocene to Miocene sediments from the Venetian foreland basin yielded dominant age groups clustering roughly around 20 and 30 Ma (Stefani et al., 2008). Bedrock ages from the vicinity of the Valsugana thrust indicate an important exhumational event at about 10 Ma (Zattin et al., 2006).
The existing data already hint at decreasing rates of thermal overprint towards the foreland. Basement uplifts partly display AFT ages contemporaneous to subsidence in intra-orogenic basins. Consequently, existing AFT data and their relationships to intervening Neogene basins suggest a Neogene large-wavelength crustal-scale fold structure between the Klagenfurt basin and the Adriatic Sea. The main stage of subsidence in the Venetian-Adriatic foreland is younger and of Late Pliocene-Pleistocene age reflecting the final, still ongoing stage of shortening (Barbieri et al., 2007).
In order to further test these observations, we aim at collecting more structural and low-T thermochronological data from the region. First results from the recently started project “AlDi-Adria” will be presented.

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