Geophysical Research Abstracts
Vol. 20, EGU2018-18233, 2018
EGU General Assembly 2018

The Dolomites Indenter: Deformation from Neoalpine indentation until today

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The ongoing north-directed indentation of Adria into Europe is a key feature of the Alpine orogenesis. The Southalpine Adriatic Indenter is subdivided by the NNE-SSW trending Giudicarie fault system into a western and an eastern sector, the Insubric and the Dolomites Indenter, respectively. Internal deformation and deformation along the rim of the indenter are documented by important fault zones as, e.g., the Periadriatic fault system (PFS), the Giudicarie belt, the Valsugana fault, and the Fella-Sava line. At present, there are only a few studies providing a small thermochronological data set that can be used to unravel the tectonic evolution of the Dolomites Indenter. Nevertheless, already this incomplete dataset indicates some characteristics with mostly Miocene Apatite fission track (AFT) ages along the PFS and the Valsugana fault and two clusters of Mesozoic AFT data. The first cluster represents the triangle-shaped area of the Monti Lessini east of Riva del Garda bounded by the transpressive Schio-Vicenza fault system to the East and the Giudicarie belt to the West. The second cluster of Mesozoic AFT ages is located SE of Bozen, in the footwall of the SE-dipping Truden line that probably terminates it to the South, but age constraints for the hangingwall are unknown and also the western and southern continuation of the cluster. An explanation for the transition to Cenozoic AFT ages towards the east is also missing. Thus already this small thermochronological dataset indicates the presence of relative vertical motions within the Dolomites indenter after the onset of indentation.

Adriatic indentation is ongoing today. Earthquake slip-vector solutions and satellite-based geodetic studies indicate that the Adriatic and European plates are converging in the eastern Southern Alps at an average rate of 2 mm/yr (Weber et al., 2010). Southern Alpine deformation phases partly describe the internal deformation of the Dolomites indenter during indentation as do the few available thermochronological data. There is not, however, important present-day seismicity within the northern and central part of the indenter. The significant present-day seismotectonic activity concentrates in the Friuli area in the southeast. Due to the scarcity of earthquakes in the northern parts of the indenter and also in the northerly adjacent Austroalpine basement and the Tauern Window further to the north the northern subsurface extension of the Dolomites Indenter cannot be depicted from earthquake data (Reiter, 2017).

The transition from important Miocene deformation in the northern and central part of the Dolomites Indenter to the absence of present-day seismotectonic activity in these areas indicates an important change in style and localisation of deformation. On the basis of the few existing and new thermochronological and field data we propose to investigate the 4D evolution of the Dolomites Indenter, its significance for the overall deformation of the surrounding Alpine tectonic units, and its importance for the deeper lithospheric structure. Here, we present a compilation of all the existing data and results of a pilot study.

Weber et al. 2010; Tectonophysics 483, 214-222
Reiter 2017; PhD Thesis; University of Innsbruck, p. 256