The evolution of a thrust belt within a continental indenter: Investigating the internal deformation of the Dolomites Indenter (Southern European Alps) using low-temperature thermochronology

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DOI: http://dx.doi.org/10.17169/refubium-41073

The Dolomites Indenter represents the front of the Neogene to ongoing N(W)-directed continental indentation of the Adriatic microplate into Europe. Concomitant shortening within the indenter is accommodated within a dominantly WSW – ENE striking and S-vergent thrust belt.

In this contribution, we present a new low-temperature thermochronological dataset (apatite U-Th/He (AHe) and apatite fission track (AFT)) over the Dolomites Indenter, with a north to south extent from the Periadriatic fault system (Pustertal-Gailtal fault) to the footwall of the Bassano thrust. In west-east direction, the AFT data cover the area from Lake Garda to San Martino di Castrozza. The AHe dataset, on the other hand, extents further east to Bled in Slovenia. The extensive dataset covers several major fault systems (from north to south): west of Lozzo di Cadore the Villnöß-, Truden-, Valsugana-, Belluno-, and Bassano-Valdobbiadene faults; east of Lozzo di Cadore the Fella-Sava-, Sauris-, Ampezzo-Tolmezzo-, Dof-Auda-, Pinedo-Uccea- and Barcis-Staro Selo faults. It includes several elevation profiles and aims to capture the cooling and exhumation history of the Dolomites Indenter.

The AFT data obtained range from Jurassic to Miocene age. The vast majority of modelled cooling paths show a plateau and a long residence time of the samples within the Apatite partial annealing zone (APAZ), often from the beginning of the Jurassic to the Miocene. The location of the plateau within the APAZ during the long residence time can be responsible for whether a sample gives a Mesozoic or Cenozoic AFT age without major faults being involved. The basement and Permian intrusive rocks in the northern part of the Dolomites Indenter show cooling below ZFT between ~140 and 110 Ma and Eocene AFT data (~50-40 Ma). The modelled cooling paths based on apatite confined length distributions indicate a flat plateau in the upper APAZ delimited by two phases of accelerated cooling, one predating the AFT data and one in the middle Miocene. The latter is present in nearly all modelled cooling paths of our dataset besides the southernmost samples located in the footwall of the Bassano fault. The bend point varies between 20 and 12 Ma, tending to be earlier in the north and later in the south. We assign this middle Miocene change in cooling rate to the Valsugana deformation phase. For the older accelerated cooling phase, a tectonic interpretation is still in elaboration.

Within the AHe dataset the most striking pattern is a significant trend towards younger ages in the direction east (lower Miocene in the west to upper Miocene to Pliocene in the east).