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## Thermo-kinematic evolution of the Eastern Alps along TRANSALP: Exploring the transient tectonic state towards slab reversal

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The Eastern Alps are shaped by the indentation of Adria into Europe and exhibit a doubly-vergent lithospheric wedge geometry. Immediately after the subduction of the Penninic ocean, pro- and retro-wedges have been established in the European and Adriatic plates, respectively. Recent tomographic studies, depicting several detached slab fragments beneath the Alps, have been interpreted as evidence of continuous southward subduction, contrary to an often-invoked subduction polarity reversal. Systematic changes in orogen-scale exhumation, driven by rock displacement along active faults, should reflect such change in subduction polarity. Low temperature thermochronology can evaluate upper lithospheric cooling as a response to changes in tectonic and/or erosional boundary conditions. This study investigates whether a potential change in locations of the pro- and retro-wedges is reconcilable with observed crustal re-organisations, exhumation patterns and mantle tomography. A suite of thermo-kinematic forward models driven by a new 2D structural-kinematic reconstruction of continental collision along the TRANSALP profile in the Eastern Alps has been subject to systematic sensitivity analyses encompassing variations in shortening rates, thermophysical parameters and topographic evolution, supplemented by new apatite and zircon fission-track data. Results from the thermo-kinematic modelling reproduce: (i) the orogen-scale structural geometry, (ii) the distribution of low-temperature thermochronometer ages, (iii) independently determined time-temperature paths, and (vi) the present-day surface heat flux. We suggest that the observed thermochronologic record along the TRANSALP profile is primarily driven by cooling through rock displacement along active faults. Our thermo-kinematic reconstruction emphasises a systematic southward shift of deformation, in particular in the Southern Alps, since onset of motion along the Tauern Ramp. Interpreting both, the Tauern Ramp as a mega retro-thrust and the southward shift of deformation in the Southern Alps, as a response to new Coulomb-wedge criterions, then our results are consistent with a Mid-Miocene reversal of continental subduction polarity. This time frame is compatible with a detachment of the European slab and a tectonic re-organisation of the Eastern Alps since ~10-25 Ma.