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Magmatism in geodynamical models of continental collision zones

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Magmatism in continental collision zones still is poorly understood due to the diversity of possible subduction dynamics and petrological processes. Particularly in continental collision zones, where small amounts of magma with a diverse composition are produced, magmatism might provide unique insight in the underlying dynamical and chemical processes. The thickness, thermal structure, and rheology of the colliding continent are key parameters influencing subduction dynamics. Changes in these parameters can determine whether delamination or slab break-off occur, and, therefore, affect the resulting magmatism. This setting may be applied to the central Mediterranean subduction zone where the subducting plate seems to be delaminating beneath the younger and thinner Apennines but not beneath the old and thick Nubian plate.

In this study, we develop numerical models that can provide new insight in this topic, by combining previously developed 2D geodynamical models with thermodynamical databases and software. With this approach, we are able to trace the temporal and spatial evolution of the dehydration pattern and melting production during subduction and the subsequent continental collision. We vary the rheology and thickness of the continental indentor to study the effect on position and degree of melting. Preliminary results suggest small amounts of melting are produced after slab break-off, whereas more melting is expected in the models where delamination occurs.