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Geological evidences and thermo-mechanical simulation of P-T variations in rheologically heterogeneous materials during subduction (Cima Lunga unit, Central Alps)

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Geodynamics of subduction zones is commonly constrained by pressure and temperature (P-T) estimates deriving from petrological investigations on metamorphic rocks. In the last years, remarkable advances in numerical modelling show that significant deviations from the lithostatic pressure (and/or a thermal anomaly) can occur at micro- and plate-scale due heterogeneous rheology and strength of the rocks under tectonic stress. However, there is not consensus if these deviations can be maintained enough to substantially modify the metamorphic reactions in the rocks. Quite a lot physical-chemical processes concur, in fact, to define the recorded P-T condition of the deforming rocks, resulting in large uncertainties about the effectiveness of the tectonic over/under-pressure and shear heating in the geological systems.
In this contribution, we show some preliminary results from petrological investigation on structurally constrained domains from ultra-high-pressure rocks of the Cima Lunga unit (Central Alps, Switzerland). We investigate the spatial variations of P-T estimates associated with the structural setting of folded ultramafic and metapelite layers. The analytical results validate numerical simulations derived from a visco-elasto-plastic 2D finite difference code.