



New insights in thrust mechanics within carbonatic rocks: cataclastic flow, veining and localised sliding deformation inside the Belluno Thrust, eastern Southern Alps, Italy

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We present the preliminary results of a multiscalar structural study of an outstanding exposure of the Belluno Thrust of the Italian Southern Alps (Monte Coppolo area, Feltre region). The Belluno Thrust is one of the main structures forming the orogen-scale WSW-ENE-trending thrust system that contributed to the building of the Southern Alps in the context of the Neogene Alpine evolution. Thrust tectonics, expressed by generally SSE-verging low-angle thrusts, started in the upper Oligocene and continues to present times, as documented by active faults considered to be the seismogenic sources affecting the eastern Southern Alps.

In the Monte Coppolo area, the Belluno Thrust marks the tectonic juxtaposition of Early Jurassic oolitic and micritic limestones (the Calcarei Grigi Group) on top of Late Jurassic-Early Cretaceous pelagic limestones (the Maiolica Fm). At the outcrop-scale, the thrust corresponds to an up to 2 m-thick complex deformation zone striking WSW-ENE and dipping NNW at less than 40°. Kinematic indicators confirm top-to-the-SSE tectonic transport. The fault consists of blandly anastomosed slip surfaces wrapping around lenses of massive cataclasites and less deformed, dm-to-half metre-thick strained lithons that sample both the hanging wall and the footwall blocks. At the top, the deformation zone is bounded by a sharp principal slip surface over which the Calcarei Grigi Group is stacked. Microstructural investigations on samples that are representative of the identified fault facies denote that: (i) cataclasites consist of a fine-to-very fine-grained matrix (in the order of the clay-size fraction) hosting poorly-sorted and variably rounded fragments of limestone derived from both the hanging wall and footwall limestones as well as early cataclased fragments; (ii) the strained lithons display evidence of a long and complex deformation history documented by multiple arrays of shear and dilatant fractures filled by calcite, SC-like structures within foliated microdomains, and pervasive pressure-solution; (iii) the principal slip surface is a mm-thick surface that abruptly cuts at an angle $< 10^\circ$ an underlying foliated cataclasite; and (iv) the hanging wall Calcarei Grigi Group limestone is deformed by a complex system of cross-cutting shear veins and diffuse evidence of pressure-solution. These preliminary observations constrain a thrusting faulting mechanism aided by major cataclastic flow and localised sliding within a seismic scenario, wherein strain localised into a progressively narrower fault core, likely assisted by fluid circulation and synkinematic clay authigenesis along individual slip surfaces. The principal slip surface likely represents the last increment of strain at the outcrop. These deformation processes are considered to be representative of the mechanical behaviour of the Belluno Thrust in response to the stress accumulation during its seismic cycle and provide further insights on strain localisation in carbonatic rocks.