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New thermo-baric data from the (meta-)sedimentary units of northern Calabria (Italy): implications for tectonic burial and exhumation in the southern Apennines

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The orogenic wedge evolution is a topic of great importance in tectonic studies. Acquisition of thermo-baric data, widely used in basin analysis, is now a strong support to unravel times and modes of burial/exhumation history in mountain belts. A multidisciplinary approach for thermo-baric data acquisition is here proposed along the Calabria-Lucanian border (Southern Appennines, Italy), a crucial area to understand the geodynamics of western-central Mediterranean.

Different stratigraphic, structural and geodynamics models have been proposed for this area though time. Recently Iannace et al. (2005) suggested a new structural-stratigraphic synthesis, grouping the outcropping Meso-Cenozoic succession into two tectonic units: the Lungro-Verbicaro Unit (LVU) and the tectonically underlying Pollino-Ciagola Unit (PCU). These units comprise respectively HP-LT and non-metamorphic rocks of the paleo-African continental marging. They are overlain by ophiolite bearing units.

Our study is focussed on the thermo-baric characterization of the different lithological units belonging to the LVU and PCU. Preliminary available data come from fluid inclusion micro-thermometry (on syn-tectonic quartz/calcite veins), organic matter maturity, clay mineralogy and apatite fission tracks analysis.

Consistent results have been obtained from the base and top parts of the LVU metasedimentary succession (Middle Triassic phillites and Lower Miocene metapelites of the Scisti del Fiume Lao Fm, respectively). They record similar values of organic vitrinite reflectance (Ro 3-4%), fluid inclusion micro-thermometry on primary inclusions from the oldest set of extension veins reach extrapolated trapping temperatures of 350-400˚C. Clay mineralogy thermal indicators are slight different for the two metasediments. The Triassic phyllite samples show high KI 0.3 ˚$\Delta 2\theta$ (experienced maximum temperature in the range of 250-270 ˚C), the white mica polytype is the $2M_1$ with an average b_0 value of about 9.060 Å, and a relevant amount of paragonite is also observed. The samples from the Scisti del Fiume Lao Fm exhibit KI values in the range of 0.43-0.55 ˚$\Delta 2\theta$ (200-180˚C), the presence of only the $2M_1$ white mica polytype with an average b_0 value of about 9.020 Å.

Data from the Bifurto Formation, constituting the stratigraphic top of the unmetamorphosed footwall unit (PCU), record the presence of illite-smectite mixed layer with a percentage of illitic layers in the range of 80 -90%, KI between 0.7-0.8 ˚$\Delta 2\theta$, indicating maximum temperature in the range of 110-120˚C and vitrinite reflectance of 1.1%. Fluid inclusion microthermometry indicate T around 100˚C, while annealing of fission tracks in apatite suggest temperatures slightly higher than 120˚C.

These data confirm that the tectonic superposition of the LVU onto the PCU followed a stage of significant exhumation of the previously metamorphosed hanging-wall unit. In fact, the footwall rocks (PCU) record maximum T not exceeding *ca.* 120 ˚C and significantly lower burial conditions with respect to those characterising the LVU. Final exhumation of both units occurred in late Miocene to Pliocene times, as indicated by an apatite fission track cooling age of 6.0 ± 1.1 My recorded from Miocene siliciclastic rocks (Bifurto Formation) of the PCU.