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Fault rock texture and porosity type in Triassic dolostones

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Preliminary results of an ongoing project aimed at deciphering the micromechanics and porosity evolution associated to brittle deformation of Triassic dolostones are presented. Samples collected from high-angle, oblique-slip, 10's to 100's m-throw normal faults crosscutting Mesozoic carbonates of the Neo Tethys (Campanian-Lucanian Platform) are investigated by mean of field geological mapping, optical microscopy, SEM and image analyses. The goal is to characterize in detail composition, texture and porosity of cataclastic rocks in order to assess the structural architecture of dolomitic fault cores. Moreover, the present study addresses the time-space control exerted by several micro-mechanisms such as intragranular extensional fracturing, chipping and shear fracturing, which took place during grain rolling and crushing within the evolving faults, on type, amount, dimensions and distribution of micropores present within the cataclastic fault cores. Study samples are representative of well-exposed dolomitic fault cores of oblique-slip normal faults trending either NW-SE or NE-SW. The high-angle normal faults crosscut the Mesozoic carbonates of the Campanian-Lucanian Platform, which overrode the Lagonegro succession by mean of low-angle thrust faults. Fault throws are measured by considering the displaced thrust faults as key markers after large scale field mapping (1:10,000 scale) of the study areas. In the field, hand samples were selected according to their distance from main slip surfaces and, in some case, along secondary slip surfaces. Microscopy analysis of about 100 oriented fault rock samples shows that, mostly, the study cataclastic rocks are made up of dolomite and sparse, minute survivor silicate grains deriving from the Lagonegro succession.
In order to quantitatively assess the main textural classes, a great attention is paid to the grain-matrix ratio, grain sphericity, grain roundness, and grain sorting. By employing an automatic box-counting technique, the fractal dimension of representative samples is also computed. Results of such a work shows that five main textural types are present: 1) fractured and fragmented dolomites; 2) protocataclasites characterized by intense intragranular extensional fracturing; 3) cataclasites due to a chipping-dominated mechanism; 4) cataclasites and ultracataclasites with pronounced shear fracturing; 5) cemented fault rocks, which localize along the main slip surfaces. The first four textural types are therefore indicative to the fault rock maturity within individual cataclastic fault cores. A negative correlation among grain-matrix ratio and grain sphericity, roundness and sorting is computed, which implies that ultracataclasites are made up of more spherical and rounded smaller grains relative to cataclasites and protocataclasites. Each textural type shows distinct D0-values (box-counting dimension). As expected, a good correlation between the D0-value and fault rock maturity is computed. Ongoing analysis of selected images obtained from representative samples of the five textural classes will shed lights on the relative role played by the aforementioned micro-mechanisms on the porosity evolution within the cataclastic fault cores.