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Shear enhanced compaction-solution bands in quartz-rich calcarenites of the Cotiella Massif (Spanish Pyrennes)

Stefano Tavani (1), Pablo Granado (2,3), Irene Cantanero (4), Fabrizio Balsamo (5), Amerigo Corradetti (1), Josep Muñoz (2,3)

(1) Dipartimento di Scienze della Terra, Uniersità Federico II, Napoli, Italy (stefano.tavani@unina.it), (2) Departament de Dinàmica de la Terra i de l'Oceà, Facultat de Geologia, Universitat de Barcelona, Barcelona, Spain, (3) Institut de Recerca Geomodels, Universitat de Barcelona, Barcelona, Spain, (4) Departament de Mineralogia, Petrologia i Geologia Aplicada, Facultat de Geologia, Universitat de Barcelona, Barcelona, Spain, (5) Natural and Experimental Tectonics Research Group, Department of Physics and Earth Sciences, Parma University, Parma, Italy

In this contribution we describe deformation bands developed due to the interplay between shearing and mechanical and chemical compaction in Paleocene quartz-rich calcarenites. The studied structures are located in the footwall of the Cotiella Thrust (Spanish Pyrennes) and form anastomosed, mm-thick tabular bands, composed of high concentration of quartz grains. The bands strike perpendicular to the local transport direction of the regional thrust sheet, thus indicating a tectonic origin, and are organized in three sets. One set is perpendicular to the shallow-dipping bedding surface, while the other two are roughly perpendicular to each other and form an angle of 45°, in opposite directions, with the bedding. No macroscopic evidence of shearing is found along these bands. Optical microscope and SEM investigations on both undeformed and deformed rocks indicate that the high concentration of quartz within the deformation bands was caused by the localized pressure-enhanced dissolution of calcite grains, which determined the enrichment of the less soluble quartz grains. Quartz grains fracturing, fragmentation and crushing was observed along in all deformation bands, whereas cataclasis and shear occurs only along oblique oblique-to-bedding sets. All these features indicate that studied deformation bands are hybrid structures most likely developed during layer-parallel shortening. In detail, bedding perpendicular and bedding oblique structures can be interpreted as pure compaction and shear-enhanced compaction bands, respectively.