https://doi.org/10.3301/ABSGI.2022.02

Torino 19-21 September 2022

ABSTRACT BOOK

a cura della Società Geologica Italiana

GEOSCIENCES FOR
A SUSTAINABLE FUTURE

UNIVERSITÀ DI TORINO

PRESIDENTS OF THE CONGRESS

Rodolfo Carosi and Daniele Castelli.

SCIENTIFIC COMMITTEE

Germana Barone, Fabrizio Berra, Matteo Berti, Fernando Camara, Piergulio Cappelletti, Claudio Chiarabba, Rita Chirico, Renato Colucci, Chiara D'Ambrogi, Rosanna De Rosa, Laura De Santis, Daniela Ducci, Patrizia Fumagalli, Biagio Giaccio, Fausto Guzzetti, Giulia Innamorati, Ilaria Mazzini, Mimmo Palano, Claudia Piromallo, Mario Soldati, Stefania Venturi, Andrea Zanchi.

ORGANISING COMMITTEE

Donato Belmonte, Sabrina Bonetto, Bernardo Carmina, Francesco Dela Pierre, Evdokia Tema, Lorenza Fascio, Salvatore Iaccarino, Andrea Maffeis, Nadia Malaspina, Chiara Montomoli, Marcello Natalicchio, Alessandro Petroccia, Fabio Massimo Petti, Fabrizio Piana, Franco Rolfo, Licia Santoro, Mario Tribaudino, Alessandro Zuccari.

ABSTRACT BOOK EDITORS

Bernardo Carmina, Lorenza Fascio, Giulia Innamorati, Marco Pasero & Fabio Massimo Petti.

COVER IMAGE:

Aerial cityscape image of Turin during sunset.

Slip surfaces associated with seismic faults and gravitational slope deformations in carbonate rocks

Del Rio L.*[1], Moro M.[2], Fondriest M.[3], Saroli M.[4], Masoch S.[1], Doumaz F.[2], Gori S.[2], Falcucci E.[2], Cavallo A.[5], Lutterotti L.[6], Artioli G.[1], Borovin E.[6] & Di Toro G.[1]

[1] Dipartimento di Geoscienze, Università di Padova. [2] INGV, Roma. [3] Institut des Sciences de la Terre ISTerre, Universitè Grenoble Alpes, Grenoble (France). [4] Dipartimento di Ingegneria Civile e Meccanica, Università di Cassino e del Lazio Meridionale. [5] Laboratorio tecnologico multidisciplinare CERTEMA, Grosseto. [6] Dipartimento di Ingegneria industriale, Università di Trento.

Corresponding author e-mail: luca.delrio@studenti.unipd.it

Keywords: DGSD, active faults, microstructures.

Active Normal Faulting (NF) affects the carbonate rocks of the Italian Central Apennines since Late Pliocene causing destructive earthquakes and controlling the development of Deep-Seated Gravitational Slope Deformations (DGSDs; Galadini, 2006). Recent paleo-seismological, geological and geomorphological observations pointed out that, in the Central Apennines, some sharp slip surfaces located in the footwall of large seismogenic normal faults accommodate Deep-Seated Gravitational Slope Deformations (Moro et al., 2012).

The principal slip surfaces and associated slip zones of DGSD and NF exhume from different depths (100-500 m for DGSDs, 1-3 km for NFs), and are formed and active over a different range of temperatures (<30°C for DGSDs vs. 0-100°C for NFs), pressures (<15 MPa for DGSDs, 0-80 MPa for NFs) and slip rates (usually $<10^{-3}$ m/s for DGSDs, up to ~1 m/s for NFs). Such large differences in loading conditions should result in the formation of distinctive secondary fault/fracture networks in the damage zones that host the DGSDs, possibly recognizable at the outcrop scale, or in the slip zones microstructures. The individuation of the deformation mechanisms and the discrimination between DGSDs and NFs structures could bring outstanding improvements in geological hazard studies.

To achieve these goals, we investigated four DGSDs located in the footwall of active seismogenic NFs and three normal faults bordering large and small depressions in the central Apennines. we investigated the fracture distribution around DGSDs' and NFs scarps and the microstructures of the associated slip zones. Then, we performed Crystallographic Texture Analyses (CTA) on natural and experimental slip zones in carbonate rocks to identify the Crystallographic Preferred Orientations (CPOs) of microcrystalline aggregates and interpret the deformation mechanisms active during slip.

Based on these studies, we conclude that most DGSDs in the central Apennines re-use pre-existing minor faults or shear fractures located in the footwall of large normal seismogenic faults and that no microstructural indicators can allow to uniquely distinguish between DGSDs and normal faults. Indeed, slip zones associated with both NFs and DGSDs in carbonate rocks have similar cataclastic fabrics and are produced by similar deformation mechanisms (i.e., cataclasis and pressure-solution). This interpretation is further supported by the weak lattice preferred orientation measured with Crystallographic Texture Analyses.

Galadini F. (2006) - Quaternary tectonics and large-scale gravitational deformations with evidence of rock-slide displacements in the Central Apennines (central Italy). Geomorphology, 82, 201-228.

Moro M., Saroli M., Gori S., Falcucci E., Galadini F. & Messina P. (2012) - The interaction between active normal faulting and large-scale gravitational mass movements revealed by paleoseismological techniques: a case study from central Italy. Geomorphology, 151-152, 164-174.

SPONSOR

PLATINUM PLUS

GOLD

SILVER

BRONZE

PATROCINI