## 1. Research activity (max 1.000 words)

My research activity focuses on the architecture and the mechanics of carbonate-hosted seismogenic faults. During the first year of my Ph.D. I performed rock mechanics experiments with a biaxial apparatus (BRAVA in INGV) to investigate the mechanics of simulated carbonate-bearing faults. In detail, I studied the evolution of both the frictional strength and the fault structure in response to variations of the applied normal stress (within a range 5-120 MPa) and slip velocity (comprised between 0.3 µm/s and 100 µm/s). The results show a strain weakening behaviour at high normal stresses and slow slip velocities; this promotes relatively low values of frictional strength (e.g. ~ 0.5 µm/s). Microstructural analysis show that the fault weakening is driven by deformation accommodated by cataclasis and “ductile” deformation processes (pressure-solution and granular plasticity) that become more efficient at slow slip velocities. Since the coexistence of cataclastic and “ductile” deformation is a typical feature of carbonate fault rocks exhumed from seismogenic depths, the observed shear strength weakening may be relevant for the mechanics of faults hosted in carbonate sequences.

Moreover, I began to conduct a field study on the architecture of the Tremonti fault, an exhumed carbonate-hosted fault in the central Apennines. Such a fault crops out in an abandoned quarry near the town of Celano (AQ), providing perfect conditions for the analysis of the damage zone structure. This was accomplished through the integration of traditional fieldwork (e.g. scanlines) with the interpretation of a virtual outcrop resulting from a laser scanner survey. Preliminary results show that (1) the local fracture density within the damage zone (number of fractures per unit length) is strongly controlled by the presence of secondary faults and (2) that both the attitudes of the fractures and the kinematics of the slip on the main fault are compatible with the same stress field.

## 2. Research products

a) Publications (ISI journals)

1) Mercuri, M., Scuderi, M., Tesei, T., Carminati, E., Collettini, C., 2018. Strength evolution of simulated carbonate-bearing faults: The role of normal stress and slip velocity. Journal of Structural Geology 109, 1–9. https://doi.org/10.1016/j.jsg.2017.12.017

b) Publications (NON ISI journals)

c) Manuscripts (submitted, in press)

d) Abstracts
1) Mercuri, M., Scuderi, M., Tesei, T., Collettini, C. The semi brittle behavior of simulated calcite fault gouge. EUROconference on Rock Physics and Geomechanics, 5-10 November 2017, Yearim Hotel, Jerusalem, Israel (oral presentation)

**N.B. I dottorandi del primo anno al punto 1 possono inserire il riassunto del progetto di ricerca (max 1.000 parole)**