EGU21-12884, updated on 02 Dec 2022
https://doi.org/10.5194/egusphere-egu21-12884
EGU General Assembly 2021

Insights into a dextral transtensional shear zone in NW Anatolia, Turkey: Preliminary results from the three dimensional strain and kinematic analyses of the Marmara Granitoid.

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Marmara Granitoid (MG) is an E-W trending sill-like magmatic body exposed in the center of the Marmara Island, NW Anatolia, Turkey. MG is lower Eocene in age and was concordantly emplaced into metamorphic basement rocks of Saraylar Marble and Erdek Complex. It is represented by a deformed granodiorite which widely displays protomylonitic-mylonitic textures with prominent foliation and lineation. Foliation planes display a mean dip direction-angle of 335/29 and mineral stretching lineations show mean trend-plunge of 286/34. Mica-fishes, rotated porphyroclasts and micro-faults are commonly observed and serve as shear gauges pointing out to a dextral movement. Mineral deformation thermometers such as myrmekite development, chessboard extinction, grain boundary migration (GBM), sub-grain rotation recrystallization (SGR), and bulging recrystallization (BLG) in quartz crystals indicate that solid-state deformation of the MG has experienced a high-temperature ductile deformation and superimposed ductile to brittle deformation.

Three-dimensional strain ellipsoid measurements are investigated on the MG in order to determine the relative amounts of pure shear and simple shear deformation and the mean kinematic vorticity number (W_m). The image processing of quartz grains is used as strain markers to obtain the three-dimensional best-fit ellipsoids. The results show that, Lode's ratio (ν) of the samples change between -0.010 and -0.650 and Flinn's k-values range from 1.026 to 11.157 indicating to a general constrictional (prolate) deformation. The calculated kinematic vorticity numbers change between 0.429 and 0.958 which show that shear deformation of MG is mostly dominated by simple shear. All of these micro and meso structural properties and three-dimensional strain and kinematic analyses collectively suggest that MG has experienced a dextral transtensional deformation.