Geophysical Research Abstracts
Vol. 17, EGU2015-2870, 2015
EGU General Assembly 2015

Magnetic fabrics induced by dynamic faulting reveal damage zone sizes in soft rocks, Dead Sea basin

Tsafrir Levi (1), Rami Weinberger (1,2), and Shmulik Marco (3)

(1) Geological Survey of Israel, 30 Malkhe Yisrael Street, Jerusalem 95501, Israel, (2) Department of Geological and Environmental Sciences, Ben-Gurion University of the Negev, Beer-Sheva 84105, Israel, (3) Department of Geosciences, Tel Aviv University, Tel Aviv 69978, Israel

Distinguishing between the effect of remote versus local strain fields, determining the size of the related inelastic damage zone, and resolving the fault-plane solutions of past earthquakes are of fundamental importance to neotectonic reconstructions and paleoseismic studies. In order to shad lights on these issues, we measured the anisotropy of magnetic susceptibility (AMS) of soft rocks within a seismically active region. The AMS fabrics were explored next to late Pleistocene syndepositional normal faults (total displacement up to $\sim$3.5 m) that cross soft lacustrine rocks in the Dead Sea basin. 'Deposition fabrics' prevail meters away from the fault planes and are characterized by scattered maximum and intermediate principal AMS axes. 'Deformation fabrics' are detected up to tens of centimeters from the fault planes and are characterized by well-grouped AMS axes, in which one of the principal axes is parallel to the strike of the nearby fault. Variations in the AMS fabrics and magnetic lineations define the size of the inelastic damage zone around the faults. The results demonstrate that the deformation-driven magnetic fabrics and the associated inelastic deformation zones are compatible with coseismic dynamic faulting and the effects of the local strain field during earthquakes. Most of the AMS fabrics show a conspicuous similarity to that of the fault-plane solutions, i.e. the principal AMS axes and instantaneous strain ellipsoids are coaxial. These results suggest a novel application of the AMS method for defining the shape and size of the damage zones surrounding the paleo- dynamic faults and determining the principal axes of the local strain field.