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Ground penetrating radar imaging of active faults across the offshore-onshore boundary of the northern Gulf of Aqaba, Jordan

AbdEl-Rahman Abueladas (1), ABDALLAH AL-zoubi (1), Tina Niemi (2), Emad Akawi (1), Rami AlRuzouq (1), Zvi Ben-Avraham (3), Gal Hartman (3), Gideon Tiber (4), and the A, ABUELADAS Team

(1) Al-Balqa' Applied University, Geomatics Engineering, Al-Salt, Jordan (aabueladas@yahoo.com), (2) Department of Geosciences, University of Missouri-Kansas City, (UMKC), 5100 Rockhill Road, RHFH 42, Kansas City, MO U.S.A., (3) Department of Geophysical and Planetary Science, Tel Aviv University (TAU), Faculty of Exact Sciences, Ramat Aviv 69978, ISRAEL, (4) Israel Oceanographic and Limnological Research, Haifa, Israel

The city of Aqaba is situated at the northern end of Gulf of Aqaba along the southern part of the Dead Sea Transform (DST) which is the main source of seismic activity in the region. A ground penetrating radar (GPR) survey was carried out Aqaba under the MERC M25-004 Project that seeks to map the active faults submerged in the northern gulf that lie immediately offshore and the faults that lie onshore beneath the rapidly developing cities of Aqaba and Eilat. Approximately 3000 m of GPR lines were collected in Aqaba with a 400 MHz and 100 MHz monostatic antennas. The maximum depth of penetration was with approximately 10 meter. The GPR survey conducted in Aqaba reveals several different kinds of anomalies and discontinuities. In order to enhance our interpration of the GPR anomalies, we collected several GPR lines across several locations in the city where faults, fractures, and channels have been mapped in trench exposures. Analysis of the anomalies and discontinuities in GPR cross section (radagram) can be interpreted as a set of shallow fractures and faults within various lithologic changes. All the detected faults located by GPR survey are shallow less than 10 m depth and have vertical small displacement within late Quaternary sediments. The GPR anomalies appear to align along three NE-trending fault zones in the city of Aqaba. These zones, that we call the Ayla fault, the West Aqaba fault, and the Aqaba fault zone, appear to be on land extensions of faults that have been imaged offshore in the Gulf of Aqaba as part of our recent marine geophysical survey. This study indicates that there are more active faults within the region than previously mapped. Studying the late Quaternary sediments would provide a way to characterize the seismic hazard potential of faults.
The GPR inferred faults seem to be an extension of the marine seismic inferred fault.