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Interdisciplinary Earthquake Hazard Research in Gulf of Aqaba

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The highest earthquake hazard in Egypt and Saudi Arabia is close to Gulf of Aqaba and Strait of Tiran (at the gulf's southern end), an area we refer to as GAST. The hazard is due to the left-lateral Dead Sea transform fault system, which at this location is trans-tensional with three major basins within the gulf and one more immediately south of the strait. While the fault system has produced many devastating earthquakes to the north of Aqaba in the past 2000 years, less is known about historical earthquakes in the GAST area. The last major earthquake occurred in 1995 (Mw=7.3) in the central part of the gulf and it caused several fatalities and considerable damage both in Egypt and in Saudi Arabia. The 1995 earthquake only ruptured a part of fault system within the gulf, leaving other segments undisturbed that have not ruptured for several centuries. Saudi Arabia and Egypt have decided to build a bridge across Strait of Tiran, linking the two countries, and construction of an entirely new high-tech city (NEOM) has started on the Saudi side of the gulf. These major infrastructure projects have greatly increased the need for better knowledge about the earthquake hazard in the GAST area. To address this challenge, we have started an international and interdisciplinary project aimed at locating the active faults in the gulf and constraining better its overall tectonics, as well as obtaining new information about how frequent and how large major earthquakes in the area likely are. The project title is "Interdisciplinary earthquake hazard research in Gulf of Aqaba and Strait of Tiran (GAST)". During a research cruise in May-June 2018 we mapped the bathymetry of large parts of the gulf with high-resolution multibeam sounder and collected 23 sediment cores in search for evidence of past major earthquakes. The multibeam data show well the locations of the active fault strands leading to a new fault map of the GAST area. In addition, to learn more about the structure and activity of normal faults bounding the basins in the gulf, we carried out a seismic survey along a 7 km long profile, crossing one of the onshore faults, as well as collected and dated samples from uplifted coral terraces along the gulf's coastline. Furthermore, we installed a new GPS network in the area and the results of the first remeasurements show well the relative motion across the gulf, which helps to constrain better the moment accumulation rate in the area. The collected sediment cores show clear evidence of the 1995 earthquake and two older earthquakes, of which one is likely the 1588 earthquake. Finally, using earthquake scenario calculations, we are estimating expected shaking levels of possible future major earthquakes occurring on faults in the GAST area. Together the results will significantly improve knowledge of the active tectonics in the Gulf of Aqaba area and provide valuable information for future seismic hazard assessments.