



Active tectonics within the southwestern edge of the Fars Arc, SW Iran

Aram Fathian^{1,2,3}, Hemin Koyi⁴, Stefan Back⁵, Hamid Nazari³, Dan H. Shugar¹, Mohammad Ali Shokri⁶, and Klaus Reicherter²

¹Water, Sediment, Hazards, and Earth-surface Dynamics (waterSHED) Lab, University of Calgary, Calgary, Canada (aram.fathianbaneh@ucalgary.ca)

²Neotectonics and Natural Hazards Institute, RWTH Aachen University, Aachen, Germany

³UNESCO Chair on Coastal Geo-Hazards Analysis, Research Institute for Earth Sciences (RIES), Tehran, Iran

⁴Hans Ramberg Tectonic Laboratory, Department of Earth Sciences, Uppsala University, Uppsala, Sweden. Currently at the Department of Earth Sciences, Khalifa University, Abu Dhabi, UAE

⁵Geological Institute, RWTH Aachen University, Aachen, Germany

⁶Geological Survey of Iran (GSI), Rasht, Iran

The Fars Arc constitutes the southeastern segment of a tectonic recessions and salients array that characterizes the Zagros orogen. The delineation of the Fars Arc's western boundary is attributed to the prominent Kazerun fault system. However, further to the west, the southwestern periphery of the Arc (i.e., the Bushehr area) remains relatively unexplored, lacking documented evidence of tectonically active structures, as well as significant historical and instrumental seismic events. We combined tectonic geomorphology, remote sensing, and Quaternary geochronology to comprehensively study and identify tectonically active structures within the onshore area. Investigating the offshore area, we utilized 2D seismic-reflection data to interpret and image active subsurface structures in the Persian Gulf. We mapped and introduced several active faults in the Bushehr area, some of which are closely associated with active Quaternary anticlines, e.g., the Bushehr and Abtavil anticlines. Two generations of uplifted marine terraces, Terrace-I and Terrace-II across the Bushehr anticline, reveal a local uplift rate of approximately 0.8 mm/yr across the Bushehr Peninsula. The offshore 2D seismic-reflection data indicate ongoing deformation in the study area and show evidence of a recent sedimentary depocenter offshore of the Bushehr Peninsula. These observations define the present-day active deforming structures along the Zagros orogenic front in the Persian Gulf. The 2D seismic-reflection interpretations have characterized the active folding of the Bushehr anticline, indicating a minimum age of approximately 600 ka BP. The integration of on- and offshore geological analysis has revealed contemporaneous incipient deformation and syn-kinematic sedimentation, which significantly contributes to our understanding of geodynamics of the Zagros deformation front.