Geophysical Research Abstracts
Vol. 19, EGU2017-5986, 2017
EGU General Assembly 2017


# Passive Seismic Experiment to understand the basement and crustal structure, Northern Red Sea

Cvetan Sinadinovski (1), Khalid Aldamegh (2), Philip Ball (3), Emad Janoubi (4), AbdulKader Afifi (5), Dumitru Ion (6), Goutam Nayak (7), and Ron Borsato (8)

(1) EXPEC Advanced Research Center, Saudi Aramco, Dhahran, Saudi Arabia (cvetan.sinadinovski@aramco.com), (2) National Oil and Gas Technology Center, King Abdulaziz City for Science & Technology, Riyadh, Saudi Arabia (kdamegh@kacst.edu.sa), (3) Red Sea Exploration, Saudi Aramco, Dhahran, Saudi Arabia (philip.ball@aramco.com), (4) Red Sea Exploration, Saudi Aramco, Dhahran, Saudi Arabia (emad.janoubi@aramco.com), (5) Red Sea Exploration, Saudi Aramco, Dhahran, Saudi Arabia (abdulkader.afifi@aramco.com), (6) Geophysical Technical Services Division, Saudi Aramco, Dhahran, Saudi Arabia (dumitru.ion@aramco.com), (7) Geophysical Technical Services Division, Saudi Aramco, Dhahran, Saudi Arabia (goutam.nayak.1@aramco.com), (8) Red Sea Exploration, Saudi Aramco, Dhahran, Saudi Arabia (ronald.borsato@aramco.com)

In 2011, air gun seismic surveys were performed in the Red Sea in conjunction with an offshore survey where portable seismic stations were deployed onshore up to 250 km inland from the shoreline. In total, 30 temporary broadband stations were deployed in the northern Red Sea. The recorded shot data were analyzed in conjunction with earthquake records that occurred during the three-month deployment period. The receiver function data were modeled using an advanced 3D modeling software. Gravity data were modeled as well on five regional profiles to provide additional constraints for the depth-to-basement and depth-to-Moho discontinuity.

The passive (earthquakes) and active (air gun) data for both areas were modeled separately and then in a joint scheme. This experiment was unique, where no previous deployment at this scale had been attempted before in Saudi Arabia. The tomography results provide for the first time a detailed insight of the deeper crustal structure in the Red Sea margin.

The results reveal a complex geology with a heterogeneous crust and upper mantle. The crustal-mantle discontinuity was picked assuming a Vp velocity of around 8.0 km/s. The Moho discontinuity offshore appears to vary in depth from 17 km to 27 km, increasing to 22 km to 35 km onshore. The average crustal thickness inland is 28 km, whereas the average thickness offshore is 22 km. These 3D images of the Moho show that thinning of the crust was not just coast-parallel as proposed from previous 2D or 1D studies. Such findings can help in better understanding of the rift related processes in the Red Sea