Geophysical Research Abstracts
Vol. 19, EGU2017-6285, 2017
EGU General Assembly 2017

Rayleigh-Wave Group-Velocity Tomography of Saudi Arabia

Zheng Tang (1), P. Martin Mai (1), Sung-Joon Chang (2), and Hani Zahran (3)

(1) King Abdullah University of Science and Technology, Thuwal, Saudi Arabia (Zheng.Tang@kaust.edu.sa), (2) Kangwon National University, Chuncheon, South Korea, (3) Saudi Geological Survey, Jeddah, Saudi Arabia

We use surface-wave tomography to investigate the lithospheric structure of the Arabian plate, which is traditionally divided into the Arabian shield in the west and the Arabian platform in the east. The Arabian shield is a complicated mélange of crustal material, composed of several Proterozoic terrains separated by ophiolite-bearing suture zones and dotted by outcropping Cenozoic volcanic rocks. The Arabian platform is primarily covered by very thick Paleozoic, Mesozoic and Cenozoic sediments.

We develop high-resolution tomographic images from fundamental-mode Rayleigh-wave group-velocities across Saudi Arabia, utilizing the teleseismic data recorded by the permanent Saudi National Seismic Network (SNSN). Our study extends previous efforts on surface wave work by increasing ray path density and improving spatial resolution. Good quality dispersion measurements for roughly 3000 Rayleigh-wave paths have been obtained and utilized for the group-velocity tomography. We have applied the Fast Marching Surface Tomography (FMST) scheme of Rawlinson (2005) to obtain Rayleigh-wave group-velocity images for periods from 8 s to 40 s on a 0.8° 0.8° grid and at resolutions approaching 2.5° based on the checkerboard tests.

Our results indicate that short-period group-velocity maps (8-15 s) correlate well with surface geology, with slow velocities delineating the main sedimentary features including the Arabian platform, the Persian Gulf and Mesopotamia. For longer periods (20-40 s), the velocity contrast is due to the differences in crustal thickness and subduction/collision zones. The lower velocities are sensitive to the thicker continental crust beneath the eastern Arabia and the subduction/collision zones between the Arabian and Eurasian plate, while the higher velocities in the west infer mantle velocity.