8th International Conference on Seismology & Earthquake Engineering
11-13 Nov. 2019, Tehran, Iran

IMAGING STRUCTURE OF THE WESTERN MAKRAN SUBDUCTION ZONE BY RECEIVER FUNCTIONS ANALYSIS

Rahil MOKHTARZADEH
Ph.D. Student, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran
mokhtarzadeh@iasbs.ac.ir
Farhad SOBOUTI
Associate Professor, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran
farhads@iasbs.ac.ir
Keith PRIESTLEY
Professor, University of Cambridge, Cambridge, United Kingdom
kfp10@hermes.cam.ac.uk
Abdolreza GHODS
Associate Professor, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran
aghods@iasbs.ac.ir
Khalil MOTAGHI
Assistant Professor, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran
kmotaghi@iasbs.ac.ir

Keywords: Subduction, Receiver function, Makran, Moho, Slab

We applied the P and S receiver functions methods to new data from a temporary seismic network of IASBS deployed in the western Makran region to image the geometry of the subducting and overriding plates the subduction zone. IASBS temporary seismic network, consisting of 29 braodband stations, has been deployed in the western Makran in the past three years (Figure 1). For each station, receiver functions were computed from teleseismic events with epicentral distance between 30˚ and 90˚, and magnitude larger than 5.5. Additionally, we computed receiver functions for two permanent broadband stations CHBR and ZHDN belonging to the Iranian National Seismic Network (INSN).

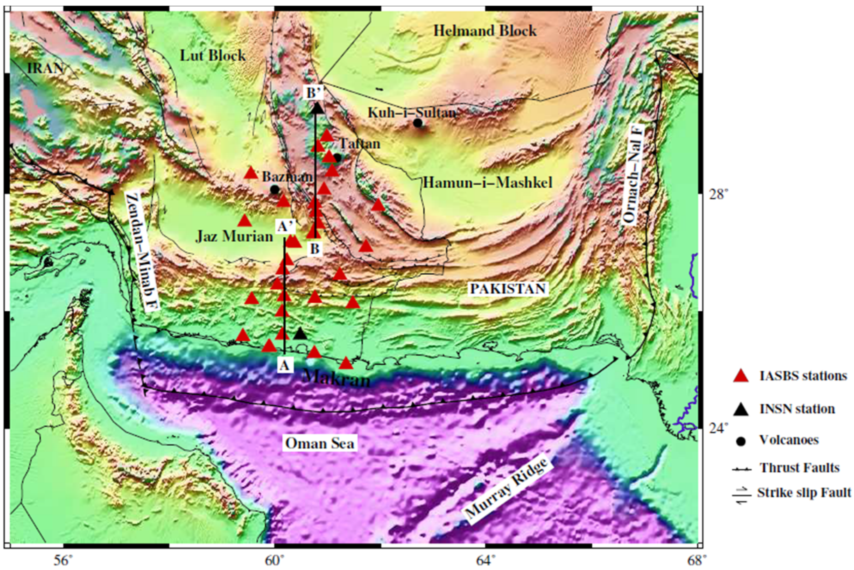

Figure 1. Topography and bathymetry of Makran region showing significant features. The location of seismic stations are denoted by triangles. Black lines AA' and BB' show the locations of profiles plotted in Figure 2.

The iterative deconvolution method (Ligorria & Ammon, 1999) was used for constructing the P receiver functions. For the deconvolution process, a time window of 90 s and Gaussian filter width of 5 Hz were selected. For constructing S receiver function, a time-domain maximum entropy deconvolution of the vertical component by the radial method (Chen et al., 2008) were applied. To provide an image of the slab geometry, we selected two profiles, AA' and BB', perpendicular to the slab strike (Figure 1). We stacked the receiver functions using the Common Conversion Point technique (Zhu, 2000) along the two profiles (Figure 2). Our receiver function profiles delineate the geometry of the subducting slab (the subduction interface marked as black dashed line that follows the converted Ps phase amplitudes in Figure 2). The slab has a shallow dip. From the coast to the Jaz Murian margin it is relatively flat (6˚). The dip angle increases to 12.5˚ from Jaz Murian to near Bazman volcano, and to 27˚ from Bazman volcano to the north of Taftan volcano at the end of BB' profile. We projected the seismicity on the profiles. Brown circles show the earthquakes along the subduction zone (Figure 2). There is a very close correlation between the top of the slab and the loci of the earthquakes. The depth to the oceanic Moho is 30 km in the coast region. It increases to 60 km beneath the Jaz Murian depression in profile AA' and to 120 km beneath Taftan volcano in BB' profile. At stations near the coast, a clear interface can be observed at 10 km depth which indicates base of the sedimentary wedge. The continental Moho of the overriding plate has a clear signal along profile BB' (marked red dashed line in Figure 2). The thickness of the continental crust in profile BB' is between 40 to 50 km and it gradually decreases southward in profile AA'. These interfaces are also obvious in the S receiver functions depth section.

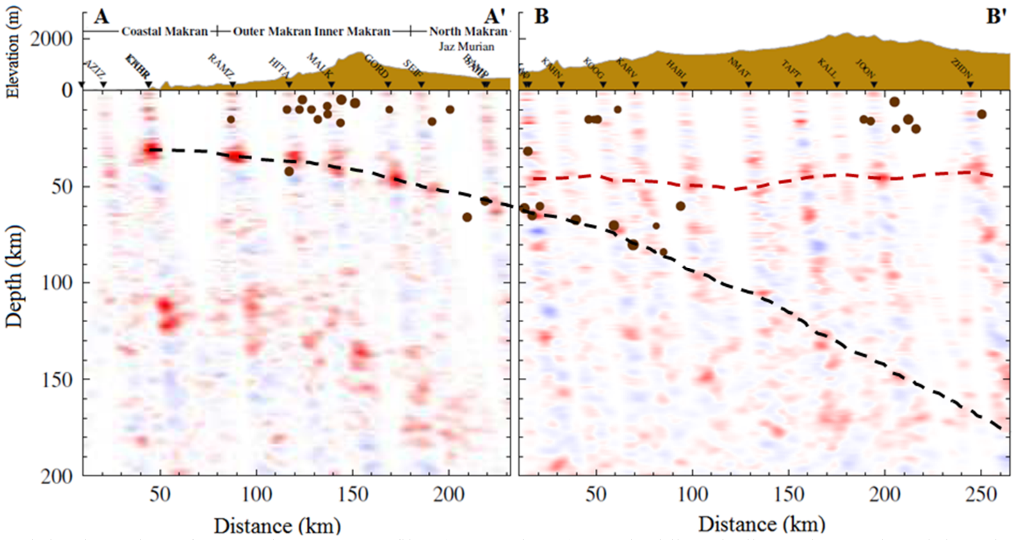

Figure 2. Migrated depth section of PRFs along two profiles (AA' and BB'). Dashed lines indicate downgoing slab and continental Moho.

REFERENCES

Chen, L., Tao, W., Zhao, L., and Zheng, T. (2008). Distinct lateral variation of lithospheric thickness in the Northeastern North China Craton. *Earth and Planetary Sci. Lett., 267*, 56-68.

Ligorria, J.P. and Ammon, C.J. (1999). Iterative deconvolution and receiver function estimation, *Bull. Seism. Soc. Am., 89*, 1395-1400.

Zhu, L.P. (2000). Crustal structure across the San Andreas Fault, southern California from teleseismic converted waves. *Earth Planet Sci. Lett. 179*, 183-190.