Architecture of the Luoyang basin from a short-period dense array

Yunhao Wei[1,2], Xiaobo Tian[2], Yonghong Duan[1]

[1]Geophysical Exploration Center, China Earthquake Administration, Zhengzhou, 450002, China, wweiyunhao@163.com
[2]Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, 100049, China

Dense arrays have facilitated much interest in seismological research. Here, we offer a new application example in which a dense array was used to image the details of a basin architecture. A structural model including basement and Moho topography was derived for the Luoyang basin, central China, based on receiver-function (RF) analysis, using data from a dense array including 110 short-period three-component seismometers deployed over the basin. The RF technique is an effective method that utilizes seismic P to S conversion waves to map out subsurface interfaces beneath a seismic receiver. There is an obvious delayed converted phase around 1 s from the basin basement as the waves pass through seismically slow sediment, which were used to estimate the sediment depth distribution. There is a solid and continuous Ps-converted phase appearing around the 6 s time from the Moho, as a first-order discontinuity, is characterized by the maximum amplitude of the conversion phase. The structure of the model shows that the basin has a maximum depth of 6 km and that the Moho declines to a depth of 38 km below the central basin. The short-period geophone array opens up new applications and advantages in passive seismological research. It has superior performance for imaging the high-resolution basin architecture to other seismic methods.

References

Liu, Z., X. Tian, R. Gao, G. Wang, Z. Wu, B. Zhou, P. Tan, S. Nie, G. Yu, G. Zhu (2017). New images of the crustal structure beneath eastern Tibet from a high-density seismic array, Earth Planet. Sci. Lett. 480, 33–41, doi: 10.1016/j.epsl.2017.09.048.

Wei, Y., X. Tian, Y. Duan., X. Tian (2018). Imaging the topography of crust-mantle boundary from a high-density seismic array beneath the middle-lower Yangtze River, Eastern China. Seismol. Res. Lett. doi: 10.1785/ 0220180045.