

Imaging crustal architecture of the South China Block by SinoProbe seismic profiling

Yueqiao Zhang^{1,2}, Shuwen Dong^{1,2}, Jianhua Li³

¹School of Earth Science and Engineering, Nanjing University, Nanjing 210023, China

²State Key Laboratory for Mineral Deposits Research, Nanjing University, Nanjing 210023, China

³Institute of Geomechanics, Chinese Academy of Geological Sciences, Beijing 100081, China

A seismic-reflection profile traversing east-westerly the South China Block clearly image the crustal architecture of the Yangtze and the Cathaysia blocks. Interpretations of this seismic profile lead to the following first-order observations. (1) The Yangtze Fold zone bounded to east by the Xuefengshan orogenic belt, is characterized by highly folded and truncated reflectors in the upper crust, which correspond to thin- and thick-skinned thrust systems associated with large-scale intraplate structural imbrication and shortening in northwest Yangtze. It constitute a retro-arc foreland system developing far away (>800 km) from the convergent margin. The Sichuan Basin itself is characterized by flat-lying reflectors of Late Proterozoic to Jurassic sedimentary sequences, indicating a stable cratonic basement. (2) A prominent character revealed by this profiling is a strong reflector zone buried beneath the late Proterozoic sequence across the wide area of Wuling Shan and Xuefeng Shan. This buried zone has been interpreted as an orogen that welded the Yangtze and Cathaysia blocks in late Paleoproterozoic. (3) Deep structure beneath the Cathaysia block is largely complicated by voluminously exposed magmatic rocks in this region. The Moho seems flat but extends discontinuously, interrupted by oblique reflectors. Two distinct terranes separated by the Zhenghe-Dapu fault zone can be distinguished in SE China. The Wuyishan terrane is highly reflective and shows truncated and folded reflectors that document extensive crustal shortening and high-strain deformation; the coastal terrane is low-reflective with the exception of several strong bands of layered reflectors, possibly related to an extension-related crustal architecture dominated by voluminous magmatism. Overall, the above-stated deep seismic profiling observations show that a wide retro-arc foreland system developed in South China during the westward subduction of paleo-Pacific oceanic plate in Jurassic and the Cathaysia block underwent significant extensional overprinting in Cretaceous. As a consequence, the crustal thickness varies progressively from 40~45 km below the Sichuan basin and the Yangtze Folded zone, to ~33 km below the Cathaysia block and less than 30 km in the Coastal zone. Rough estimate suggests ~7 km crustal thinning of the Cathaysia block, which is much lower than those for typical crustal extensional areas. It is likely the large volume of magma underplating to the crust, due to asthenospheric upwelling, may have compensated for some of the expected crustal thinning during crustal extension.

