Teleseismic Traveltime Tomography of the Upper Mantle Structure Beneath Southeastern China

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Southeastern China is often called “a big barn” of mineral resources in China where tungsten, tin, antimony and bismuth reserves rank first in the world, copper, uranium, vanadium, titanium, mercury, and niobium, tantalum and other rare metal reserves rank first in the country, and lead, zinc, gold, silver and platinum group elements are also at the top of the reserve list of our country. Southeastern China plays an important role in the exploration and utilization of mineral resources as well as in the social and economic activities of China. An “explosive” mineralization oocurred there during Mesozoic in an intra-continetal setting, which is thought to be unique and therefore an ideal place to address continental evolution and intra-continental metallogensis. However, restricted by knowledge of the deep, especially mantle, structure of southeastern China, we do not know what tectonic process was responsible for this Mesozoic “explosive” mineralization. One class of models associate the mineralization to subduction of the paleo-Pacific plate (eg., Zhou XM et al., 2006；Li ZX & Li XH, 2007)，but other models attribute it to asthenosphere upwelling and anatexis in an intra-continental setting (Sh LS，2012；Wang YJ，2013；Li SZ et al., 2011； Zhang GW et al, 2013).

Teleseismic tomography is thought to be a very effective way to reveal the upper mantle structure and to address mantle tectonic and dynamic processes. Previous global P-wave tomographic results shows that the paleo-Pacific plate may have been subducted beneath southeastern China to a depth of ~1500 km, and a large scale of low velocity anomaly shown between ~200 to ~700 km depths may have resulted from an upwelling of lower mantle material (Van der Voo et al., 1999). In order to obtain a more detailed tomographic image of the upper mantle structure and to address the deep tectonic processes for the Mesozoic intracontinental mineralization in southeastern China, we deployed several seismic stations in both linear seismic profiles and areal seismic networks in southeastern China, supported by the National Key Research and Development Program of China. In a new approach of teleseismic tomography, we have also used other data available to us, including those from the China Seismic Array at the Institute of Geophysics and data from CDSN and WDSN stations around our study region.

Our preliminary results show that the different blocks in southeastern China are characterized by different crustal and upper mantle veloctities. A very interesting finding from our new results is that the coastal volcanic belt in southeastern China and the Jiangnan orogenic belt are characterized by relatively high velocity in the mantle transition zone (410-660 km), but the Nanlin and the middle-to-lower Yangtze metellogenic belts are characterized by relatively low velocities in the mantle transition zone. Based on our preliminary results, we tend to attribute the Mesozoic intracontinental mineralization in southeastern China to upwelling of lower mantle material trigged by the subduction of the paleo-Pacific plate in the Mesozoic.

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