



Review

East Asia: Seismotectonics, magmatism and mantle dynamics

Dapeng Zhao^{a,*}, Sheng Yu^b, Eiji Ohtani^c^a Department of Geophysics, Tohoku University, Sendai 980-8578, Japan^b Department of Earth Sciences, National Natural Science Foundation of China, Beijing 100085, China^c Department of Mineralogy, Petrology and Economic Geology, Tohoku University, Sendai 980-8578, Japan

ARTICLE INFO

Article history:

Received 1 July 2010

Received in revised form 9 November 2010

Accepted 26 November 2010

Available online 1 December 2010

Keywords:

Intraplate volcanoes
Subducting slabs
Mantle transition zone
Big mantle wedge
Deep earthquakes
Hotspots
Mantle plumes
Mantle dynamics

ABSTRACT

In this article, we review the significant recent results of geophysical studies and discuss their implications on seismotectonics, magmatism, and mantle dynamics in East Asia. High-resolution geophysical imaging revealed structural heterogeneities in the source areas of large crustal earthquakes, which may reflect magma and fluids that affected the rupture nucleation of large earthquakes. In subduction zone regions, the crustal fluids originate from the dehydration of the subducting slab. Magmatism in arc and back-arc areas is caused by the corner flow in the mantle wedge and dehydration of the subducting slab. The intraplate magmatism has different origins. The continental volcanoes in Northeast Asia (such as Changbai and Wudalianchi) seem to be caused by the corner flow in the big mantle wedge (BMW) above the stagnant slab in the mantle transition zone and the deep dehydration of the stagnant slab as well. The Tengchong volcano in Southwest China is possibly caused by a similar process in BMW above the subducting Burma microplate (or Indian plate). The Hainan volcano in southernmost China seems to be a hotspot fed by a lower-mantle plume associated with the Pacific and Philippine Sea slabs' deep subduction in the east and the Indian slab's deep subduction in the west down to the lower mantle. The occurrence of deep earthquakes under the Japan Sea and the East Asia margin may be related to a metastable olivine wedge in the subducting Pacific slab. The stagnant slab finally collapses down to the bottom of the mantle, which may trigger upwelling of hot mantle materials from the lower mantle to the shallow mantle beneath the subducting slabs and cause the slab–plume interactions. Some of these issues, such as the origin of intraplate magmatism, are still controversial, and so further detailed studies are needed from now.

© 2010 Elsevier Ltd. All rights reserved.

Contents

1. Introduction	691
2. Seismotectonics	692
2.1. Seismogenesis in the Japan Islands	692
2.2. Large earthquakes in the Asian continent	694
3. Magmatism	696
3.1. Intraplate volcanism in Northeast Asia	696
3.2. Tengchong volcano in Southwest China	696
3.3. The Hainan hotspot	696
3.4. A mantle plume under the Baikal rift zone	697
4. Mantle structure and dynamics	697
4.1. The stagnant slab and tectonics in Eastern China	697
4.2. Whole-mantle tomography	702
4.3. Metastable olivine wedge and deep earthquakes	704
5. Discussion	704
6. Conclusions	707
Acknowledgements	707
References	707

* Corresponding author. Tel.: +81 22 225 1950; fax: 81 22 264 3292

E-mail address: zhao@aob.gp.tohoku.ac.jp (D. Zhao).

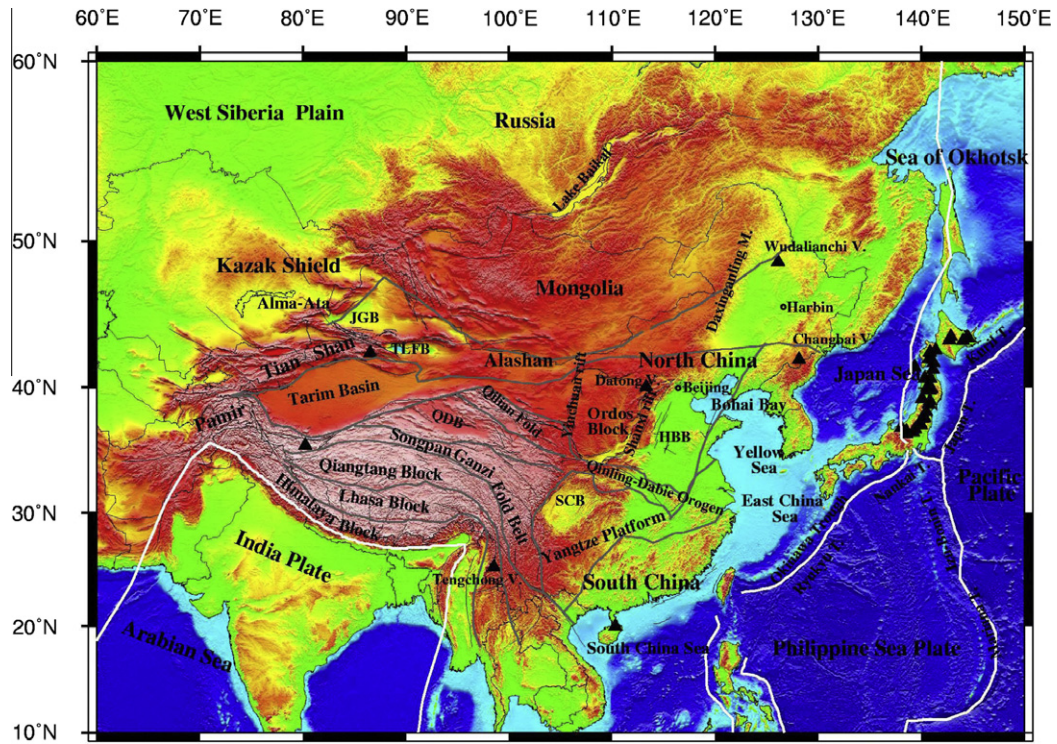


Fig. 1. Map showing the major geological features of East Asia (Huang and Zhao, 2006). The color shows the surface topography. White curved lines show the plate boundaries. Thin grey lines show the large fault zones and/or boundaries of major tectonic blocks. Black triangles denote volcanoes.

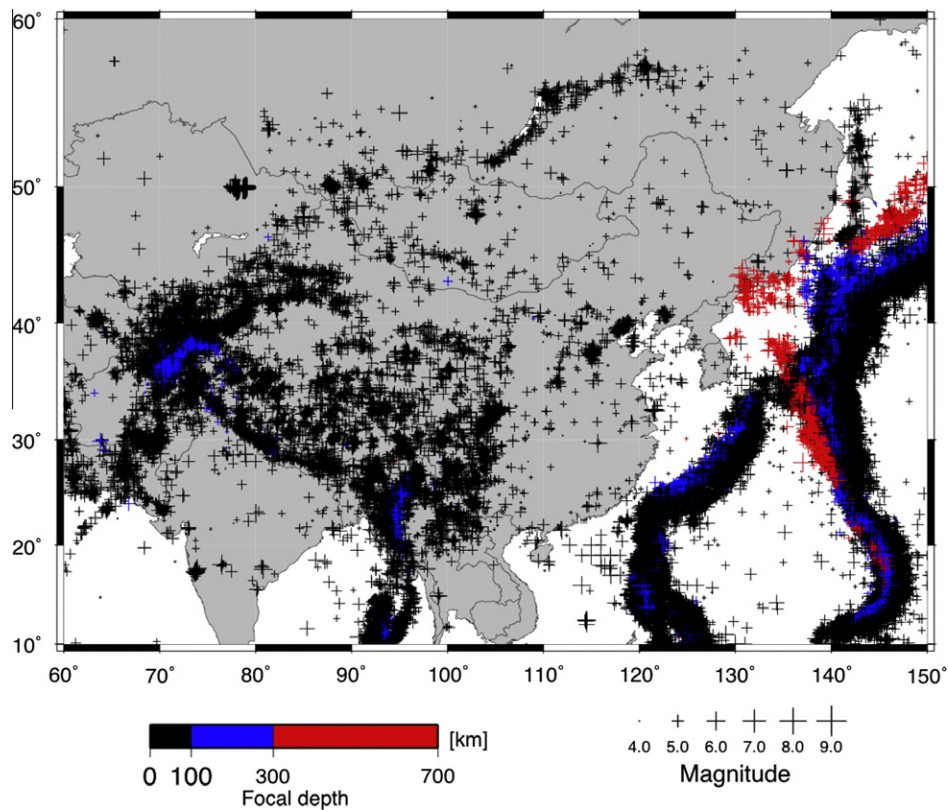


Fig. 2. Distribution of earthquakes ($M > 4.0$) in the East Asian region compiled by the International Seismological Center during 1964–2006 and by the National Earthquake Information Center, USGS during 2007–2009. Black, blue and red crosses denote earthquakes with focal depths of 0–100 km, 100–300 km, and 300–700 km, respectively. The magnitude scale is shown at the bottom.

Download English Version:

<https://daneshyari.com/en/article/4731766>

Download Persian Version:

<https://daneshyari.com/article/4731766>

[Daneshyari.com](https://daneshyari.com)