

Changbai intraplate volcanism and deep earthquakes in Northeast Asia

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The origin of the intraplate volcanoes in Northeast Asia is considered to be associated with upwelling of hot and wet asthenospheric materials in the big mantle wedge above the stagnant Pacific slab in the mantle transition zone. Among these intraplate volcanoes, Changbai is the largest and most active one, and very deep earthquakes (500-600 km depths) in the Pacific slab under East Asia occur ~300 km to the east of the Changbai volcano. Integrating the findings of geophysical, geochemical and petrologic studies so far, we suggest a link between the Changbai volcanism and the deep earthquakes in the Pacific slab. Many large shallow earthquakes occurred in the Pacific plate in the outer-rise areas close to the oceanic trench, and seawater may enter down to the deep portion of the oceanic lithosphere through the active normal faults which generated the large outer-rise earthquakes. The seawater or fluids may be preserved in the active faults even after the Pacific plate subducts into the mantle. Many large deep earthquakes are observed that took place in the subducting Pacific slab under the Japan Sea and the East Asian margin. At least some of the large deep earthquakes are caused by the reactivation of the faults preserved in the subducting slab, and the fluids preserved in the faults within the slab may cause the observed non-double-couple components in the deep earthquake faulting. The fluids preserved in the slab may be released to the overlying mantle wedge through the large deep earthquakes. Because large deep earthquakes occur frequently in the vicinity of the Changbai volcano, much more fluids could be supplied to this volcano than other areas in Northeast Asia, making Changbai the largest and most active intraplate volcano in the region.

Reference

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