

## Deep structure and origin of the active volcanoes in East Asia continent

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There are at least three active volcanoes in the East Asia continent. Among them, the Wudalianchi volcano is located in North-east China close to Russia, the Changbai volcano exists at the border between China and North Korea, while the Tengchong volcano is located close to the border between China and Burma. The three volcanoes have erupted several times in the last 1000 years, and their most recent eruptions took place 300-400 years ago. In addition, there is a Quaternary volcano located in Hainan Province in southernmost China, which is potentially an active volcano. The origins of these intraplate volcanoes are still not clear. Recently we have used multiscale (local, regional and global) seismic tomography to investigate the 3-D crust and mantle structure under these volcanoes for understanding their origins (Zhao, 2004; Zhao et al., 2004, 2007; Huang and Zhao, 2006).

Our regional and global tomography shows that the subducting Pacific slab becomes stagnant under NE Asia and strong low-velocity (low-V) anomalies exist in the upper mantle under the Changbai and Wudalianchi volcanoes. Our local tomography shows a columnar low-V anomaly extending down to 400 km depth and high-velocity (high-V) anomalies in the mantle transition zone with deep-focus earthquakes of about 600 km depth. These results indicate that the Changbai and Wudalianchi volcanoes are not hotspot like Hawaii but a kind of back-arc volcano related to the deep subduction and stagnancy of the Pacific slab under NE Asia.

Under the Tengchong volcano, a prominent low-V anomaly is clearly visible down to about 300 km depth. A dipping high-V zone exists under the low-V anomaly, and earthquakes occur within the high-V zone down to about 200 km depth, which represent the subducting Burma microplate. These results indicate that the formation of the Tengchong volcano is related to the deep subduction of the Burma microplate. Under the Hainan volcano, a significant low-V zone is visible from the crust down to the lower mantle, which may represent a plume (Hainan plume) ascending from the CMB. Significant high-V anomalies are visible to the east and west of the Hainan plume, which correspond to the deeply subducted Philippine Sea slab and the Indian slab, respectively. Thus the Hainan plume may represent a mantle upwelling associated with the downwellings of the Indian and Philippine Sea slabs.

In conclusion, the three active volcanoes (Changbai, Wudalianchi and Tengchong) in the East Asia continent are all subduction-related volcanoes, while Hainan could be a hotspot volcano caused by a deep mantle plume.

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