

Seismic evidence for velocity variation in Changbaishan volcanism in northeastern China

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Although located far west from the Pacific plate, northeastern China (NE China) is characterized by extensive volcanic activity. Changbaishan (CBS) is the largest active volcano in this area. Two end member models for CBS volcanism are significantly different in their detailed structure in the mantle transition zone (MTZ). The origin of the CBS volcano is still debatable. Most of the available waveform data recorded by temporary and permanent stations, recently deployed in and around NE China, were used to measure relative traveltimes residuals. Diagrams of P and S velocity variations down to 800 km depth using joint inversion were made. A broad slow velocity zone in the upper mantle was highlighted right beneath the CBS. Two prominent low-V branches connected to this broad slow velocity zone were also observed. One is to the east of the CBS down to the top of the MTZ. Another is to the west of the CBS down to the base of the MTZ. This could indicate that there are two deep sources feeding the CBS volcano. A weak high-V zone in the MTZ was also highlighted right beneath the CBS volcano, possibly the ponding of slab fragments. On the basis of previous studies, the eastern low-V branch could be related to slab dehydration whereas the western low-V branch outlines an upwelling conduit in the MTZ. Our intent is to propose a dynamic model for CBS volcanism. It appears that there are two deep sources feeding the CBS volcano. One from dehydration of the flat-lying Pacific slab and another from the upwelling likely rooted from the top of the lower mantle. In conclusion, these two sources make the CBS the largest and most active intraplate volcano in NE China.