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## Dynamic Controls on the Formation of Mantle Plume Beneath the South China Sea Region

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The South China Sea (SCS) has attracted intensive structural and geophysical research over the past decades, with a focus on its extensional history and relevant dynamic tectonic models. Seismic tomographic images obtained from the mantle under the southeast Asia region indicate there may exist a mantle plume beneath and around the Hainan island. Some scholars believe that the low-velocity zone (LVZ) is a mantle plume formed by the subduction material under the Sunda Plate. However, the deep seismic tomography indicates the lower mantle also exists a small area of LVZ, which means the mantle plume in the SCS has the feature of both core-mantle boundary and mantle transition zone (MTZ). Therefore, the origin as well as the evolution model of mantle plume beneath the SCS is still controversy. To identify the lower mantle flow pattern, we conduct a numerical simulation of temperature and fluid flow associated with slab subduction in a 3-D box model (Fig. 1a). Our results indicate that the subduction of Australian-Indian plate and Pacific plate toward the Sunda

block will spontaneously form mantle upwelling beneath the SCS (Fig. 1b). When the viscosity difference is small on the two sides of the phase transformation zone in 660km underground, the mantle convection expands to the whole mantle; while the viscosity difference is large, the upwelling is confined to the upper mantle, and it vanishes or die out in the lower mantle. The vertical sections of calculated deep mantle structure confirm that the LVZ exist beneath the southeast Asia region (Fig. 1c). The material source of mantle plume includes not only the mantle convection cell generated by the subduction of Pacific plate and Australian-Indian plate, but also a weak supply from the lower mantle and the north mantle flow.

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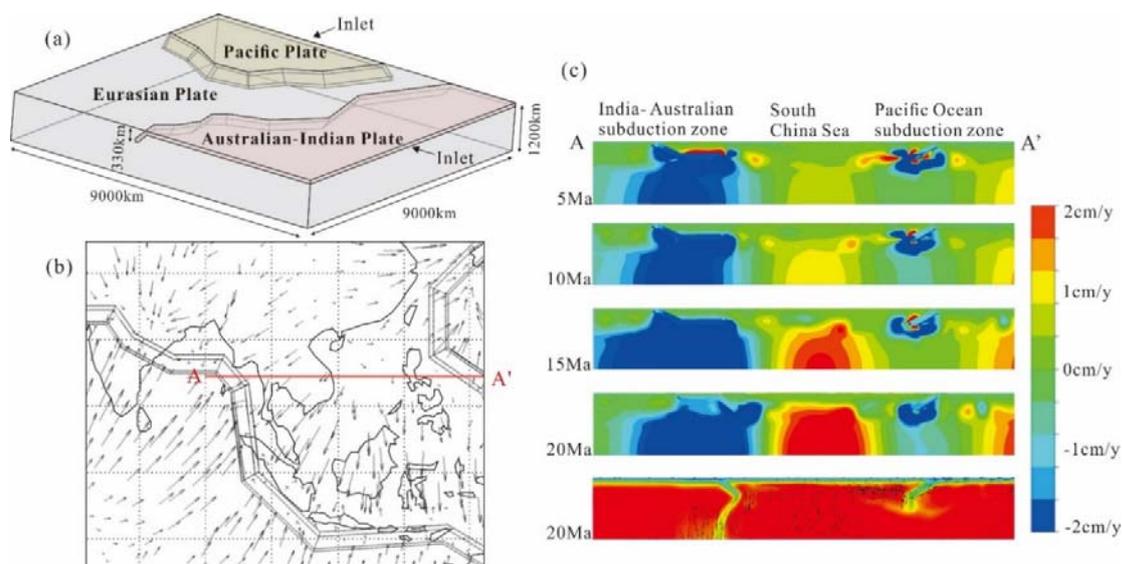


Fig. 1. (a) Boundary conditions of the 3-D Finite element viscous flow model; (b) The mantle flow velocity field in 600 km beneath the SCS; (c) Vertical sections of calculated deep mantle structure beneath the southeast Asia region.

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