



## **Magmatic plumbing system from lower mantle of Hainan plume**

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Intraplate volcanism during Late Cenozoic in the Leiqiong area of southernmost South China, with basaltic lava flows covering a total of more than 7000 km<sup>2</sup>, has been attributed to an underlying Hainan plume. However, detailed features of Hainan plume, such as morphology of magmatic conduits, depth of magmatic pool in the upper mantle and pattern of mantle upwelling, are still enigmatic. Here we present seismic tomographic images of the upper 1100 km of the mantle beneath the southern South China. Our results show a mushroom-like continuous low-velocity anomaly characterized by a columnar tail with diameter of about 200-300 km that tilts downward to lower mantle beneath north of Hainan hotspot and a head that spreads laterally near the mantle transition zone, indicating a magmatic pool in the upper mantle. Further upward, this head is decomposed into small patches, but when encountering the base of the lithosphere, a pancake-like anomaly is shaped again to feed the Hainan volcanism. Our results challenge the classical model of a fixed thermal plume that rises vertically to the surface, and propose the new layering-style pattern of magmatic upwelling of Hainan plume. This work indicates the spatial complexities and differences of global mantle plumes probably due to heterogeneous compositions and changefully thermochemical structures of deep mantle.