



Analysis of Present-day Crustal 3D Movement and Geodynamic Mechanisms in the Hainan Island

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Citation: Hu et al., 2019. Analysis of Present-day Crustal 3D Movement and Geodynamic Mechanisms in the Hainan Island. *Acta Geologica Sinica* (English Edition), 93(supp.2): 25.

Abstract: Analyzing the characteristic of the present-day crustal three-dimensional (3D) movement with GNSS data since 1999 and the precise leveling data since 1970 s observed in the Hainan island and its adjacent area. These data combined with the horizontal movement field in the region of Southeast Asia, we discuss how the horizontal velocities in Hainan and the continental margin of the South China block (SCB) are influenced by the Eurasian plate, the India-Australia plate and the Philippine Sea plate. The results show the movement of Hainan is the same as SCB. The horizontal velocities of the continental margin in South China are different in the east and west sides with the boundary of the Northeastern Coast block and Yangtze Block. The E-component velocities (ITRF2014) of the stations in the eastern continental margin (<32 mm/a) is smaller than that in the western (>32 mm/a). The S-component of the velocities (<11 mm/a) on the western are smaller than that in the East (>11 mm/a). In the Hainan Island, the difference of the 3D movement between the two sides of Baisha fault in the margin of Baisha Basin, which is another important tectonic belt for dividing Hainan tectonic units. The basin formed in Mesozoic and Cenozoic under the action of the Pacific Plate when the island was in tension. The E-component of horizontal velocities in the east of Baisha fault (<32 mm/a) is smaller than that in the west (>32 mm/a). The vertical movement in long period is

consistent with the topography. The uplifting velocity is about 1 mm/a in the northwest of Baisha fault bigger than that in the southeast. The movement of SCB affected by Indo-European collision and extrusion and the continental margin affected by the movement of the Pacific Ocean and the Philippine Sea plate, the expansion of the South China Sea (SCS) and the hot materials underplating and subsequent lithospheric extension in the region. It has smaller effect on the regional movement by the Australia plate, but it can cause co-seismic step to SCB when there has a giant earthquake in Sumatra caused by the convergence of the Australia with the Sunda Plate in the NE direction.

Keywords: 3D movement, Geodynamic mechanisms, India-Australia plate, Philippine Sea plate, Hainan

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