Geological Evolution of Tri Ton High: Implications for the Interaction between Indochinese Escape and Slab-pull Tectonics in the Central Vietnam Margin

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ABSTRACT

The study area is a transition zone from the continental margin to the seafloor-spreading zone, which makes the key area for understanding the complex geological development of Cenozoic basins in the Central Vietnam Margin. The southern part of the study area is floored by the Phu Khanh Basin adjacent to the seafloor-spreading zone. Previous publications concentrate on shallow water parts of this area due to limitations of seismic reflection data constrained in a certain basin, therefore, existing Cenozoic tectonic models of this area is recently in debate. In regional scale, recent researchers propose two main alternative tectonic models for basins distributed along the Vietnam Margin, including the extrusion model and the slab-pull one. The first model considers the seaward extrusion of the Indochina block, linked to the collision of India and Eurasia plates, caused the left-lateral displacement along the Ailao Shan – Red River Shear Zone followed by the Paleogene rifting and the sea-floor spreading. On the other hand, the second model suggests rifting and seafloor spreading is a consequence of the slab-pull force related to the southward subduction of the proto oceanic crust beneath the northwest Borneo during Paleogene to Middle Miocene time. The most significant difference between such models is the direction of lateral displacement along shear zones. While the extrusion model implies the left-lateral motion along the Red River Shear Zone (RRSZ), the slab-pull hypothesis implies the right-lateral motion along the Red River Shear Zone and East Vietnamese Boundary Fault (EVBF). In order to resolve the arguments, this paper presents key results of an integrated geology-geophysical study of the Tri Ton High and adjacent areas. The study seeks to cover Red River basin (north), ultra-deep-water areas of Phu Khanh basin (southeast), Hoang Sa Basin (east), in which we can either observe the strike-slip motion and rifting/seafloor spreading. There are at least five unconformities aged Late Oligocene to Late Miocene can be identified clearly from seismic sections, and the formation of the unconformities are interpreted as the response to the strike-slip movement, rifting commencement, halt of drifting phases over the East Vietnam Margin. Particularly, we interpret that the major rifting in the study area would had been finished at the end of Oligocene time. The Early Miocene unconformity (EMU), widely observed in the southernmost part of Quang Ngai graben and the outer Phu Khanh Basin marks the regional compression in response to the right- lateral movement along the Red River Shear Zone and the end of seafloor spreading phase. The study infers that Tri Ton High was persisted between Red River Shear Zone (west) and extensional basins such as Qiongdongnan, Hoang Sa and Phu Khanh basins (East). The study results are supportive for a hybrid tectonic model in which the left strike-slip mostly occurred within the Song Hong Basin and the rifting in the Phu Khanh Basin interconnected to the subduction along the west Borneo zone taken up the left strike-slip motion along East Vietnam Boundary Fault.