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3D structures and sedimentary infill across the continent-ocean transition of the northern South China Sea: constraint by the drilling results from IODP Expeditions 367, 368 and 368X

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Apart from the Iberia-Newfoundland margins, the South China Sea (SCS) represents another passive margin where continent-ocean transition basement was sampled by deep drilling. Drilling data from IODP Expedition 367-368 and 368X combined with seismic profiles revealed a narrow continent-ocean transition (COT) between the Distal High sampled at Site U1501 and the Ridge B sampled at Site U1500. Results suggested that major Eocene lithospheric thinning triggered Mid-Ocean Ridge type melt production which emplaced within hyperextended continental crust leading eventually to continental breakup.

Because of available dense seismic survey consisting of deep-penetrated seismic data imaging as deep as 12 s TWT, as well as drilling results from IODP Expeditions 367-368 and 368X, the COT in the northern SCS enables us to investigate the 3D propagation of continental breakup and the interactions between tectonic extension and magmatism. The top of acoustic basement can be consistently interpreted through all of our seismic survey and reveal various types of reliefs and nature from hyperextended continental crust to oceanic crust. In the basement, deep-penetrated seismic profiles present series of densely sub-parallel high-amplitude reflections that occurred within the lower crust. The lower boundary of these reflections is often characterized by double continual and high reflections interpreted as the Moho. Across the COT, the basement structure is characterized by: 1) Series of tilted blocks bounded by high angle faults on the Distal High and filled by syn-tectonic sedimentary wedges, 2) Rounded mounds of the basement with chaotic seismic reflection and sedimentary onlaps on these structures, 3) Series of ridges delimited by high-angle normal faults with no sedimentary wedge on the first oceanic crust.

Based on the detail stratigraphic framework constraint by drilling results from IODP Expeditions, the nature and timing of formation of these basement highs can be investigated. Some of these highs are limited by extensional faults while the nature of mounded structures located on the thinnest continental crust remain mysterious. Our detailed analyses emphasize the occurrence and local control of syn-rift magmatism in order to build such structures. At larger scale, the hyperextended continental crust is characterized by significant 3D morphological variations both

observed on dip and strike profiles. In contrast, the initial oceanic crust is characterized by a more homogenous structure and consistently juxtaposed to continental crust over a sharp and narrow zone.