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Tectono-magmatic and thermal evolution of the SE China margin-NW Palawan breakup

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Continent Ocean Transitions (COTs) record the processes leading to continental breakup and localized oceanic accretion initiation. The recent IODP Expeditions 367-368 and 368X at the SE China margins combined with high quality multi-channel seismic profiles provide a unique dataset to explore the tectono-magmatic and thermal evolution from final rifting to early seafloor spreading. To investigate these issues, we developed a multi-disciplinary approach combining reflection seismic interpretations with geophysical quantitative analysis calibrated thanks to drilling results, from which we measured and modelled the thermal maturity in pre-/syn- to post-rift sediments.

Drilling results show that the transition from the most thinned continental crust to new, largely igneous crust is narrow (~20 km). During final rifting, decompression melting forming Mid-Ocean Ridge type magmatism emplaced within thinned continental crust as deep intrusions and shallow extrusive rocks concomitant with continued deformation by extensional faults. The initial igneous crust of the conjugate margins is asymmetric in width and morphology. The wider and faulted newly accreted domain on the SE China side indicates that magmatic accretion was associated with tectonic faulting during the formation of initial oceanic lithosphere, a feature not observed on the conjugate Palawan side. We suggest that deformation and magmatism were not symmetrically distributed between the conjugate margins during the initiation of seafloor spreading but evolved asymmetrically prior to the spreading ridge stabilising.

Organic matter from post-rift sediments has low thermal maturities due to limited burial and the absence of late post-rift magmatism. In contrast, pre to syn-rift sediments show significant variability in thermal maturities across the COT. Localised high thermal maturities for the pre- to syn-rift sediments requires that significant additional heat be imparted at shallow depths during

breakup, likely related to magmatic intrusion or subsurface expressions of volcanism. The heterogeneous variation in thermal maturity observed across the COT reflects localised thermal perturbations caused by magmatic additions.