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Ocean-Continent Transition Structure of the Northern South China Sea

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Sea-floor spreading ridge jumps and spreading direction re-orientation during the Oligocene-Miocene formation of the South China Sea (SCS) has led to the present complex distribution of oceanic crust, thinned continental crust, micro-continents and volcanic ridges. As a consequence, the ocean-continent transition (OCT) structure of the SCS margins is complex and highly variable.

We use 3D gravity anomaly inversion to map Moho depth, crustal basement thickness and continental lithosphere thinning for the SCS in order to determine COB location, OCT structure and the distribution of oceanic lithosphere. Because of the young formation age of the SCS it is essential that the gravity inversion method incorporates a lithosphere thermal gravity anomaly which for much of the SCS exceeds -100 mgal in magnitude. The gravity inversion method provides a prediction of OCT structure and COB location which is independent of ocean isochron information. Gravity inversion using public domain data shows that SCS conjugate margins are highly asymmetric and have several striking features such as the Macclesfield Bank, Xisha Trough, Reed Bank and Dangerous Grounds.

We focus our investigation of OCT structure on the northern margin of the SCS which has recently been drilled by IODP expeditions 367-368. Thin continental crust is predicted by gravity inversion extending westwards from thin oceanic crust north of Macclesfield Bank into the Quiondongnan (QDN) basin and is interpreted as being generated ahead of westward propagating sea-floor spreading in the Oligocene.

The Pearl River Mouth Basin shows a broad region of hyper-extended continental crust. Using sediment thickness determined from high quality deep seismic reflection data we investigate the detailed OCT structure of this segment of the northern SCS continental margin.