Geophysical Research Abstracts
Vol. 18, EGU2016-16229, 2016
EGU General Assembly 2016

How rifting and spreading center interaction created the architecture of the South China Sea

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Recent advances in understanding the formation of rifted continental margins suggest a wider range of structural evolution that challenges the classical extensional models. State-of-the-art of processing techniques – including multiple attenuation by both radon filtering and wave-equation-based surface-related multiple elimination and time migration – have been used to reprocess regional multichannel seismic profiles from the NW, SW and E subbasins of the South China Sea.

The resulting seismic images show the geometry and crustal architecture of the rifted margin. A range of features including post-rift and syn-rift sediments, the structure of fault-bounded basement blocks, intra-basement fault reflections, and crust-mantle boundary reflections are visible in the images. Differences in crustal thickness and its lateral variations, internal basement reflectivity, morphology of the top of the basement, faulting style, fault-block geometry, and geometry of overlying sediments permit to distinguish the continental and oceanic domains.

The improved resolution of the images allows interpreting the relationship between the changes in tectonic structure and crustal thickness as deformation focused across the ocean continent boundary (COB). The structure, extension and location of the COB has been used to study the role of strain localization throughout the rift history.

The clear definition of the COB and high-quality images of the crustal structure support that rifting was largely a-magmatic, but that seafloor spreading occurred abruptly after break up.

The regional character of the seismic lines – crossing over the entire basin – permits to study the symmetry/asymmetry of conjugated margins, and to study the processes controlling their contrasting geometry and crustal architecture. The COB can be interpreted in seismic profiles in both conjugated margins of the subbasins. The several transects along the strike of the margins provide the variation of crustal structure needed to understand the temporal and spatial evolution of rifting as a 3D process.