Deep Imaging of large scale extensional structures in the SW South China Sea

Yao Liang (1), Matthias Delescluse (1), Jun Wang (2), Manuel Pubellier (1), Nicolas Chamot-Rooke (1), Yan Qiu (2), Dimitri Savva (1), and Florian Meresse (1)

(1) Laboratoire de Géologie de l'ENS-PSL Research University-CNRS UMR 8538, Paris, France, (2) Guangzhou Marine Geological Survey, Guangzhou, P.R. China

The South China Sea (SCS) is the largest marginal basin in SE Asia and exhibits hundreds of kilometres of extended continental crust on both conjugate margins. The structures and processes leading to the formation of the SCS are still debated at various levels (timing, mechanisms). A joint collaboration between French and Chinese scientists led to the acquisition of coincident refraction and reflection seismic data over the SW sub-basin. In 2011, a 1000-km-long refraction line was first shot using R/V Tan Bao and 50 Ocean Bottom Seismometers (OBS). Among the results was the homogeneous thickness (∼12 km) of the thinned continental crust over hundreds of kilometres and the possible large scale normal faults rooting in a ductile lower crust which could explain the relatively flat Moho.

The coincident multichannel seismic (MCS) profile is now available to us. The 1000-km-long MCS line was acquired using a ∼7000 cu.in. tuned airgun array and 6 to 8 km long streamers. Here we focus on a 230-km-long section of the profile to the south of the V-shaped SW oceanic basin across Spratley Islands. Multiples attenuation and high density velocity analysis are performed to obtain a detailed imaging of the sediments and crust at depth. We apply pre-stack Kirchhoff time migration and superimpose the obtained reflectivity on the refraction velocity model. The processed section includes a basin bound by a large crustal normal fault already imaged in the refraction velocity model, although no information on the basement was used to model the refraction velocities. The results validate the interpretation of the refraction velocity lateral variations and emphasize the significant vertical offsets of the large scale normal faults. Deep crustal reflectivity may give additional hints at a lower crustal ductile flow.

Future work will consist in using the geometry of the MCS profiles in the refraction velocity modelling and an attempt to use more advanced migration methods with the help of the refraction velocities.