Seismic Reflection Moho Structure of Southwest Sub-basin of South China Sea Implications for Continental Break-up and Seafloor Spreading Mechanisms

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Background

- The South China Sea (SCS) is one of the largest marginal seas on Earth, formed by continental break-up started in the early Paleogene (40 Ma), then by seafloor spreading between the late Oligocene and the middle Miocene (33-15 Ma)
- The Southwest sub-basin (SWB) opened the most lately among the three sub-basins of SCS, so it has the narrowest conjugate margins
- Study of SWB helps answer two important questions about marginal sea formation:
  - ~Where do marginal seas come from? (i.e. non volcanic or volcanic origin)
  - ~How do continental break-up and seafloor spreading occur?
- One signature multichannel seismic lines (NH973-1) collected across SWB (Fig. 1), showing the crustal structure and its geological implications

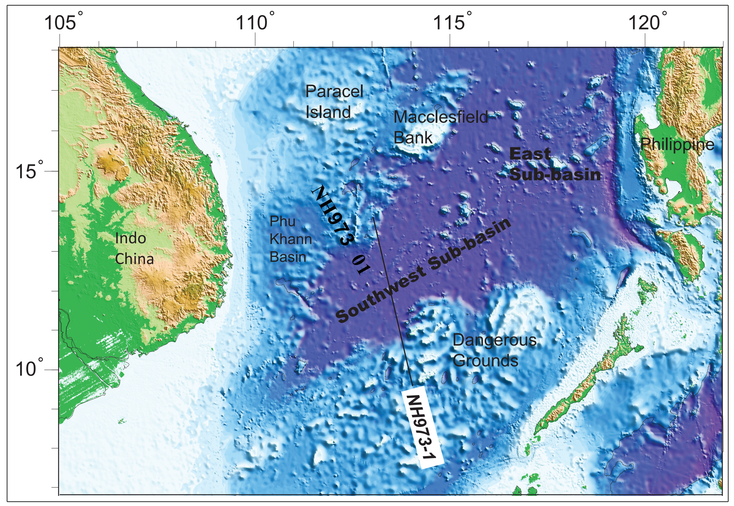


Figure 1. South China Sea bathymetry map. Black line denotes multichannel seismic line.

Constant Velocity Stacks

- NH973-1 data were reprocessed by constant velocity stacks (CVS) to image Moho more clearly (Fig. 2), instead of normal CDP stacks with standard velocity analysis
- CVS highlights reflectivity of a particular horizon (i.e. Moho) when coherency or semblance do not work well due to low signal-noise ratio or lack of layered structures

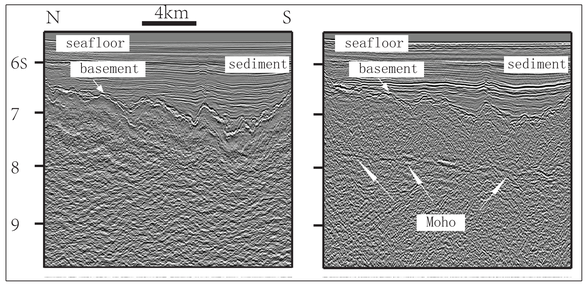
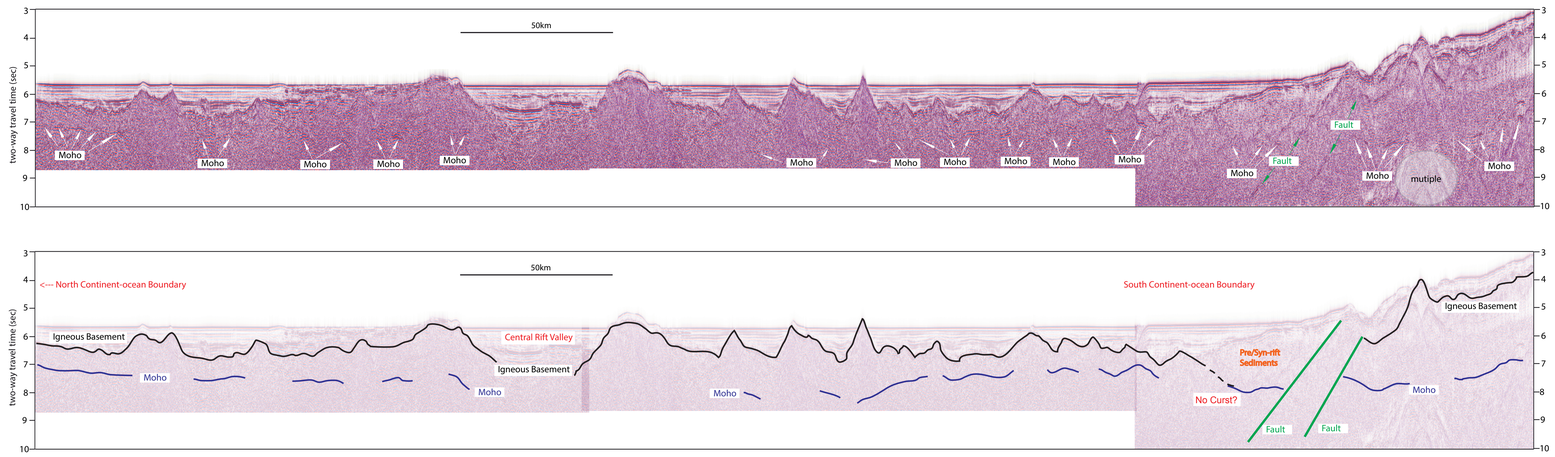


Figure 2. Moho imaging effect comparison between the normal CDP stack and the constant velocity stack by using a velocity of 3500 m/s. This portion of section of line NH973-1 is located in the northern continent -ocean boundary (COB) of the southwest sub-basin of South China Sea.

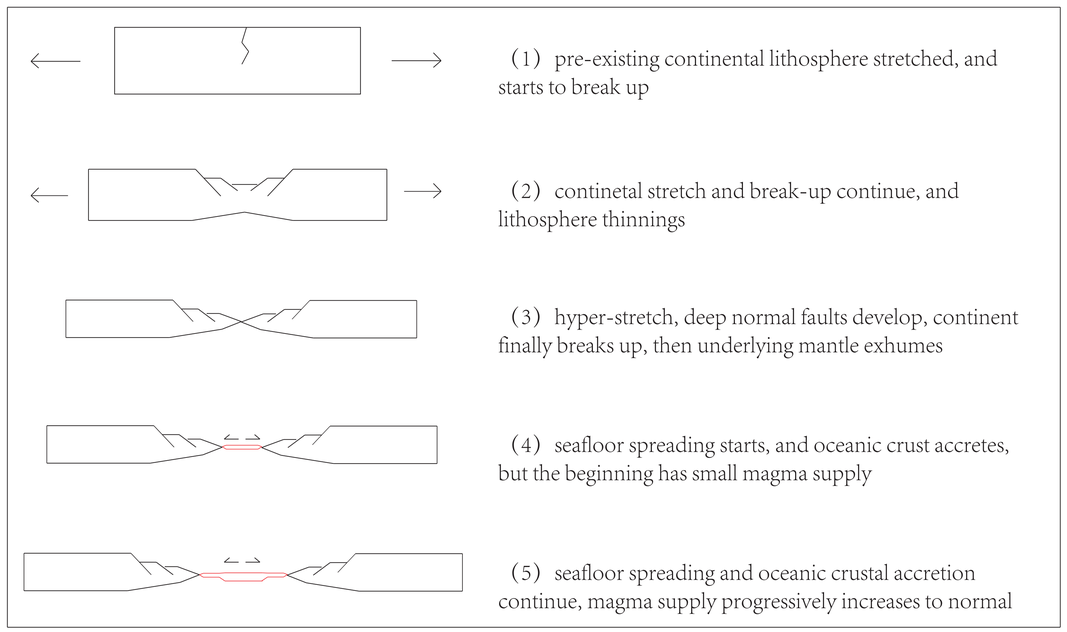
Seismic Profiles and Interpretation

- Symmetric Moho structure to the central rift valley
- In the middle, Moho is ~2 seconds depth below basement (~7 km), getting shallower towards COB
- At south COB, there is probably no crust (i.e. mantle exhumation), and there are two low-angle dipping, deep normal faults penetrating into the mantle



Geological Implications

- A model proposed as below to demostrate the evolution of the southwest sub-basin of South China Sea
- Hyper-stretch of continent causing deep normal faults
- Initial seafloor spreading with thin crustal accretion



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Acknowledgments

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