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Tectonics and sedimentation in the Northern South China Sea

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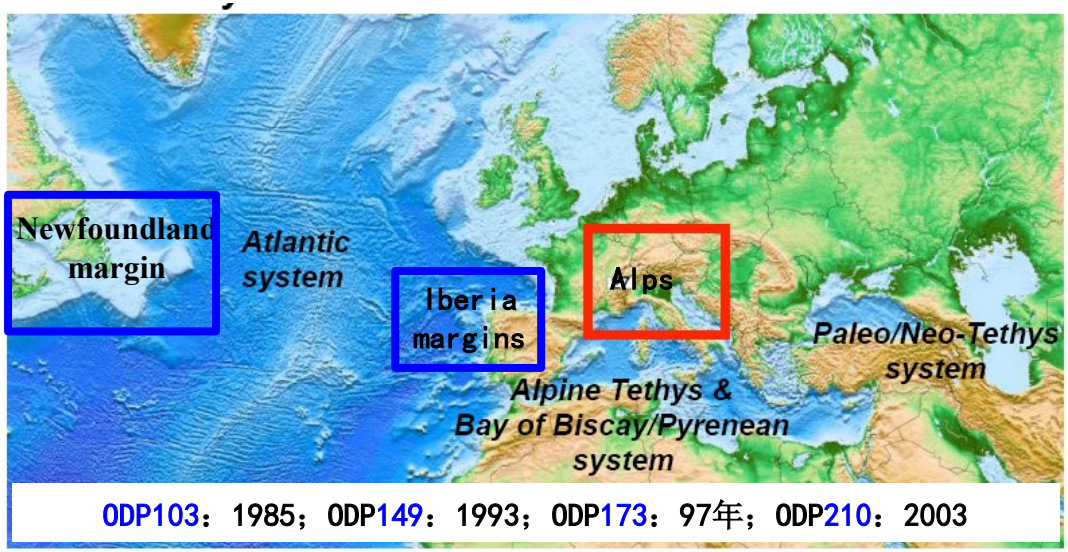
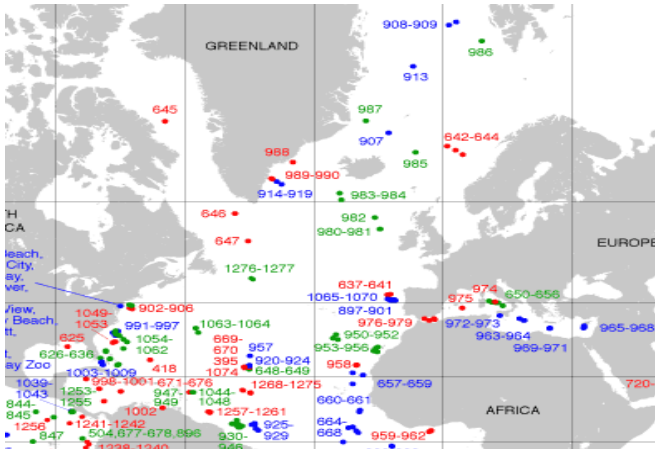
Discovery of the OCT

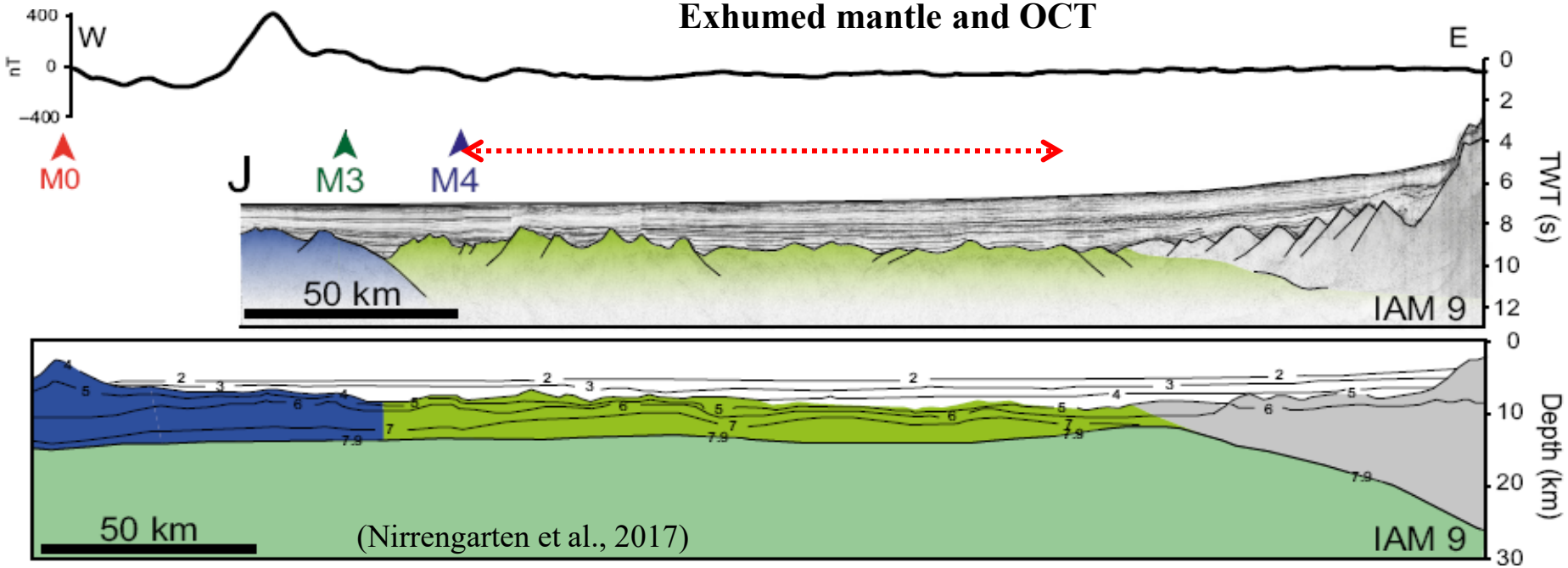


ODP103：1985；ODP149：1993；ODP173：97年；ODP210：2003



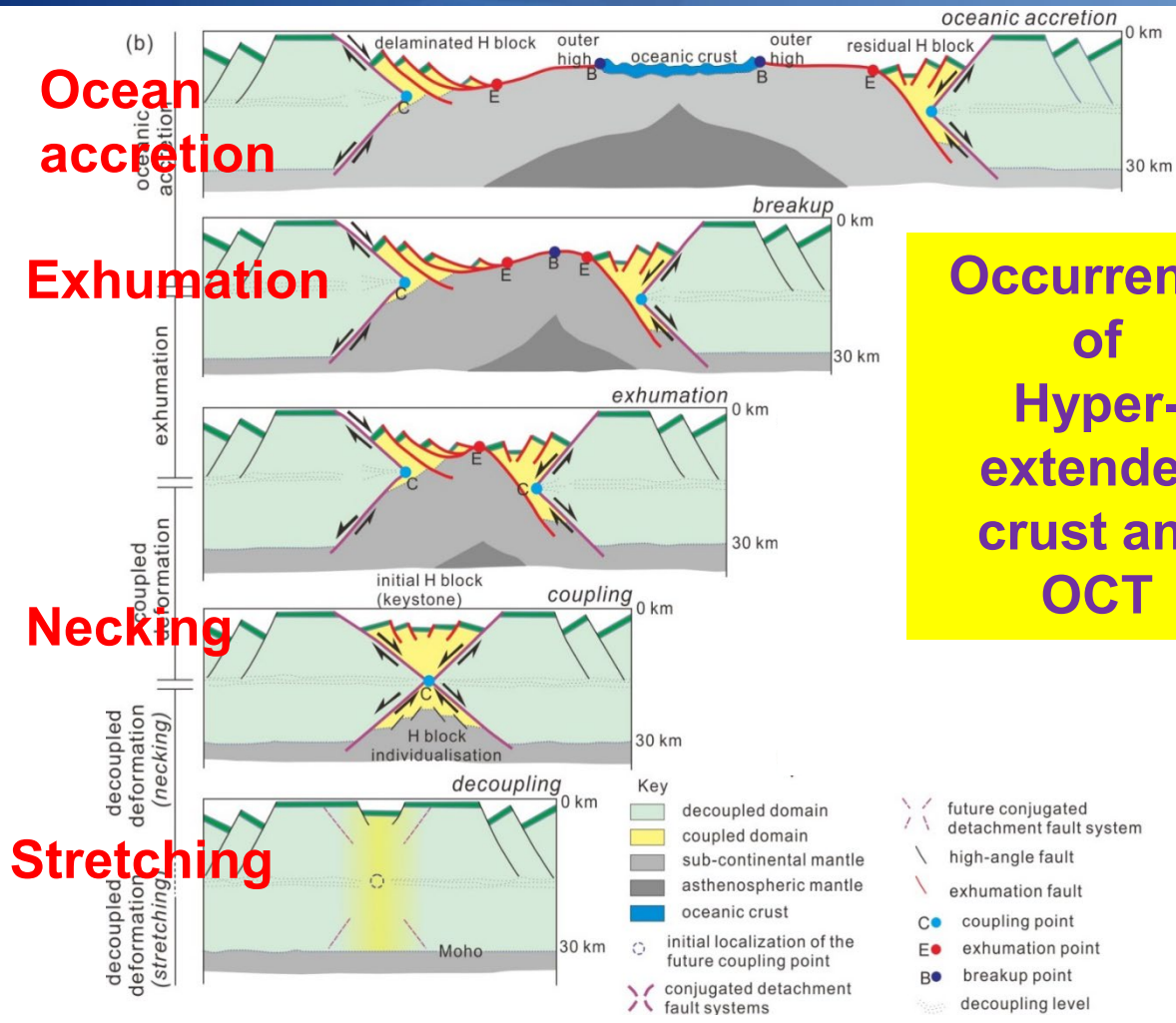
http://www-odp.tamu.edu/sitemap/odpmap.gif

Exhumed mantle and OCT



(Nirrengarten et al., 2017)

From rifting to oceanic spreading stage



Ocean accretion

Exhumation

Necking

Stretching

Occurrence of Hyper-extended crust and OCT

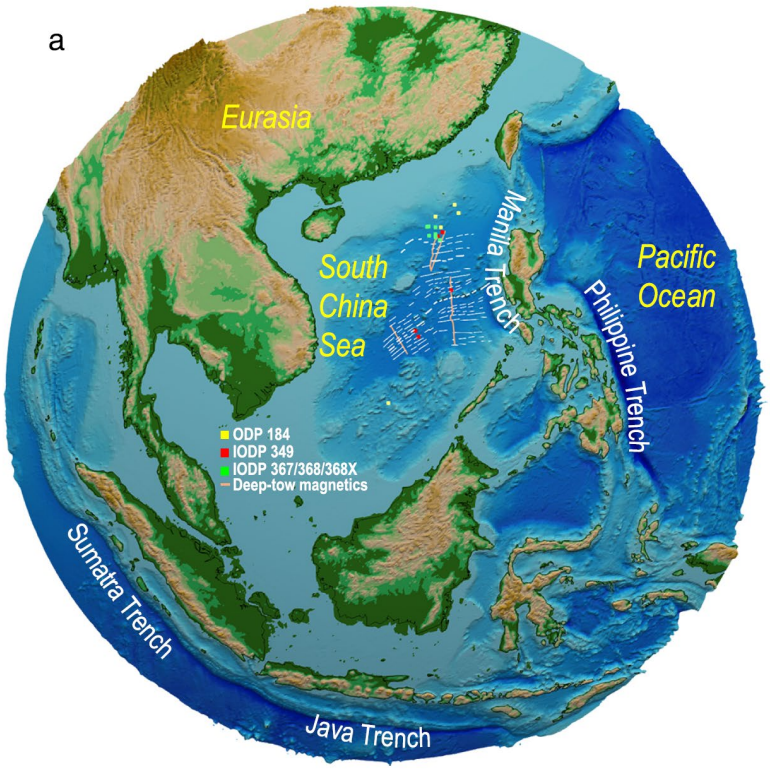
Final Breakup

Extremely thinning

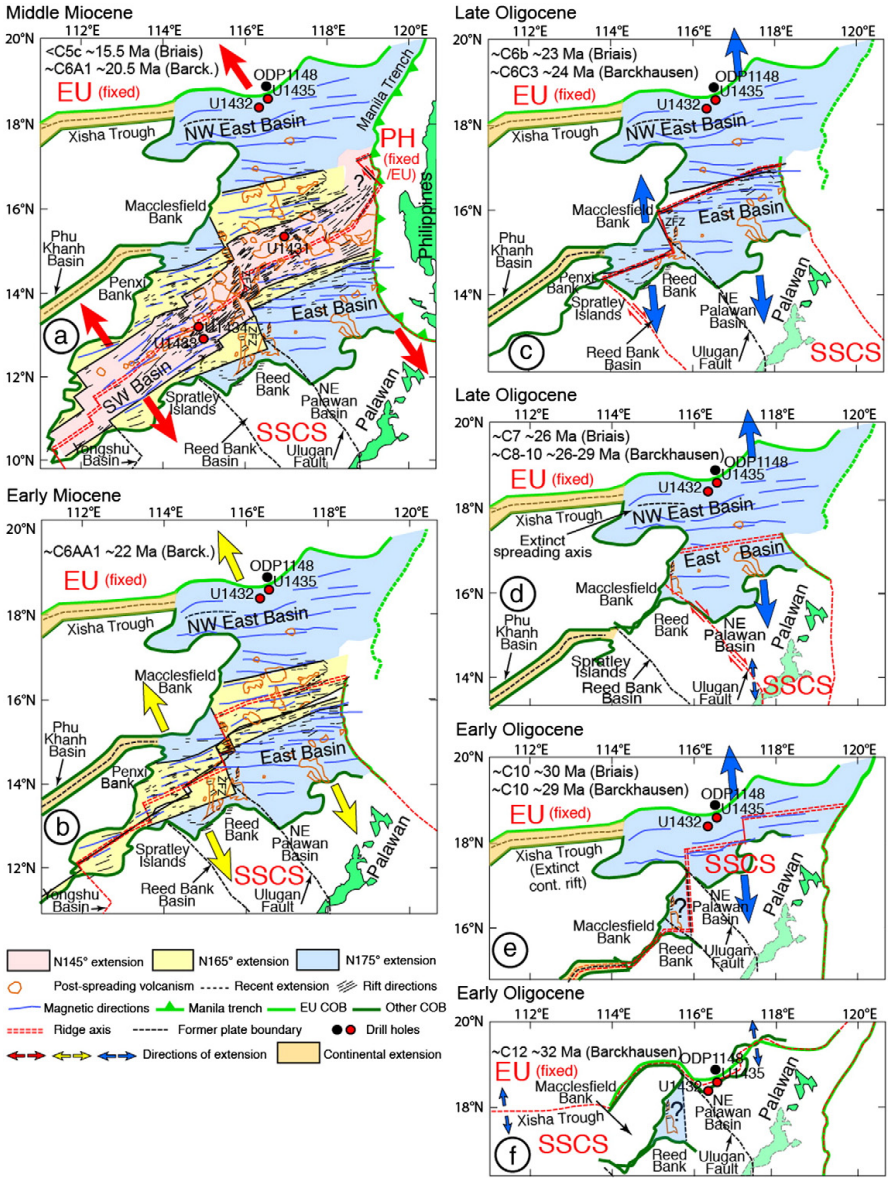
Sutra et al., 2013

Hyper-extended crust: less than 10 km continental crust
OCT: limited continental crust

Variability of the extension of the South China Sea

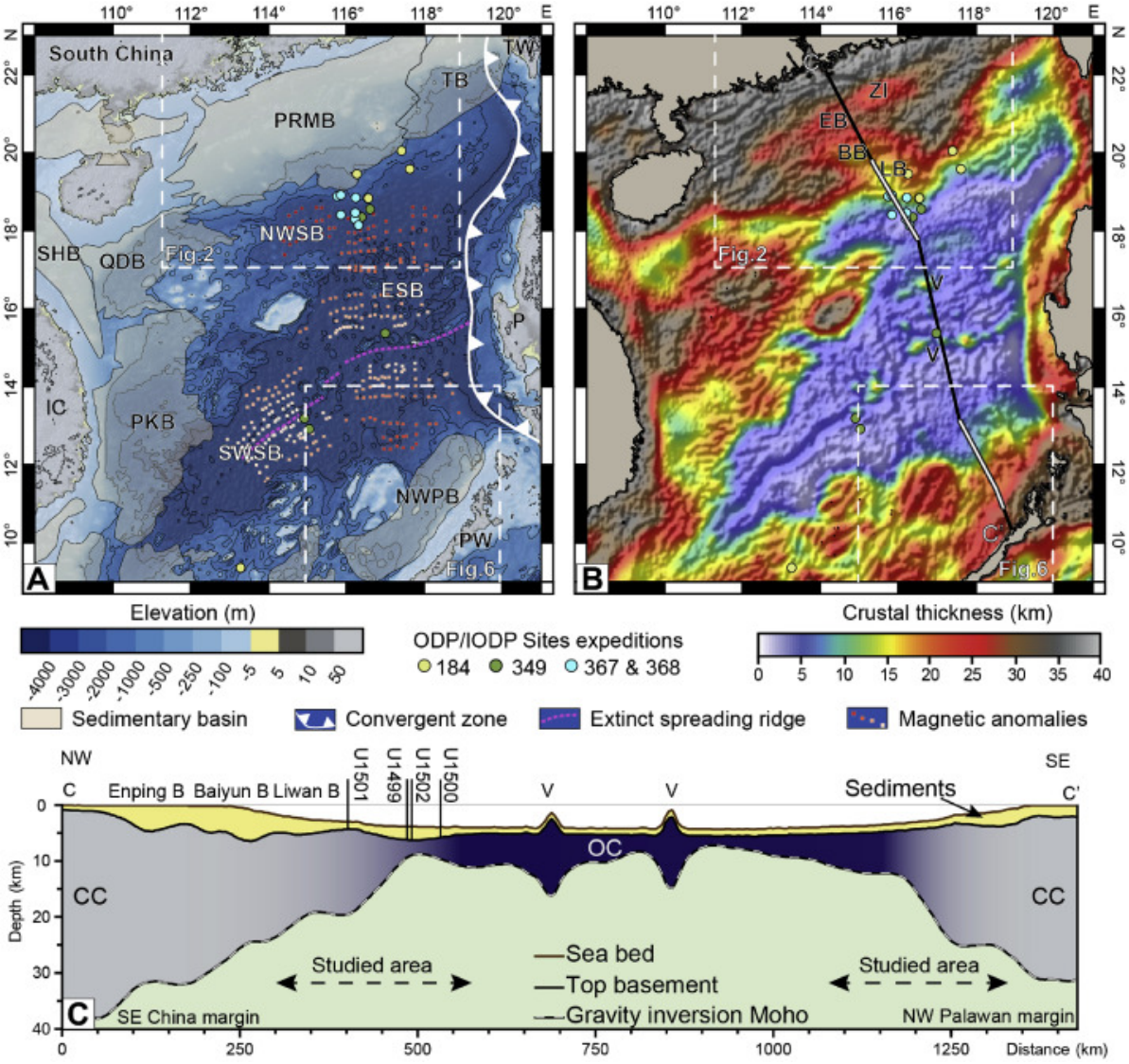


Lin et al., 2019, NSR



Sibuet et al., 2016, Tectonphysics

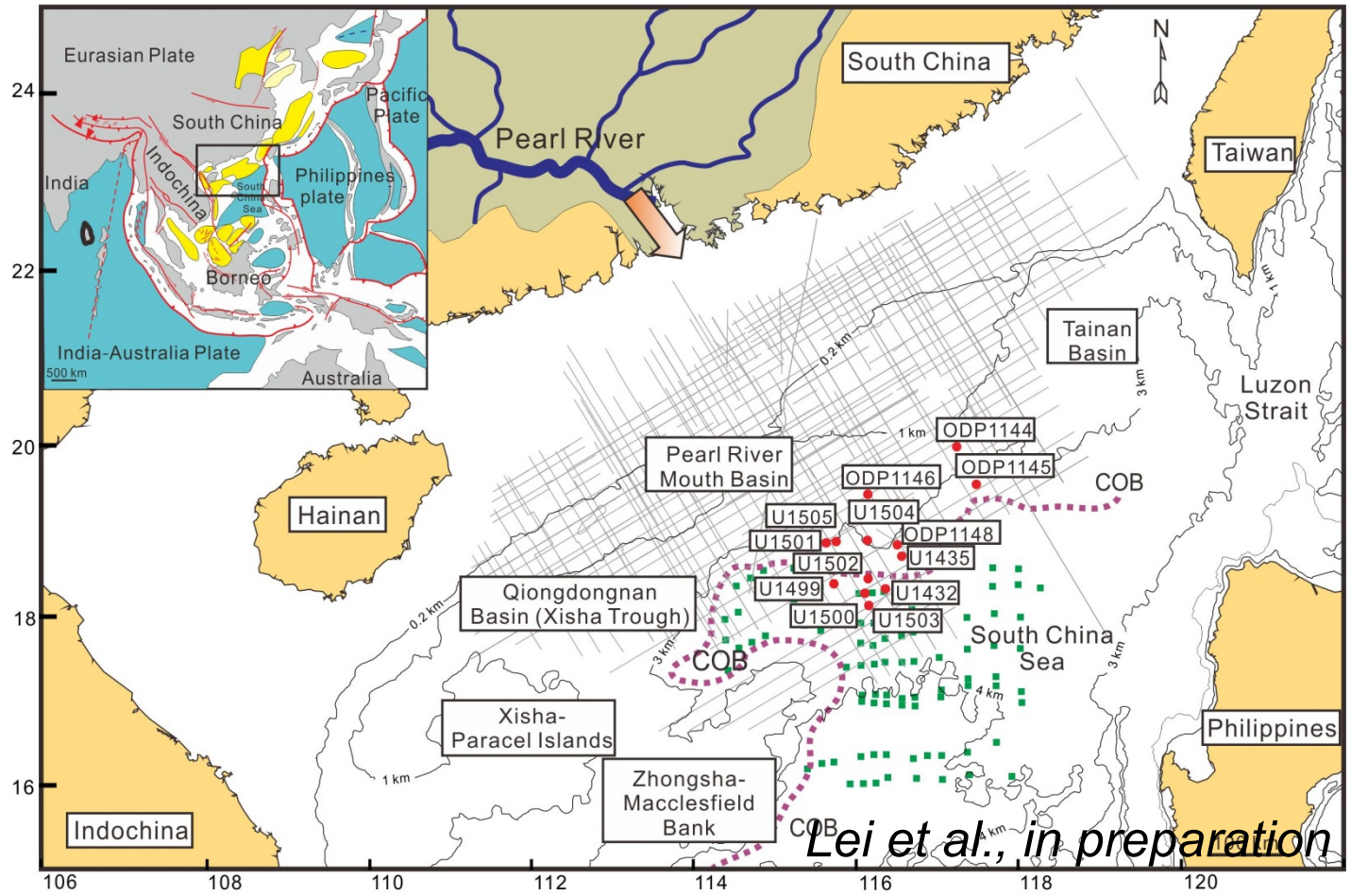
Variability of the extension of the South China Sea



Nirrengarten et al., 2019, MPG

Northern South China Sea

- Covered by dense seismic surveys and petroleum drillings
- ODP184, IODP349, IODP367, 368 and 368X



Lei et al., in preparation

What we have done

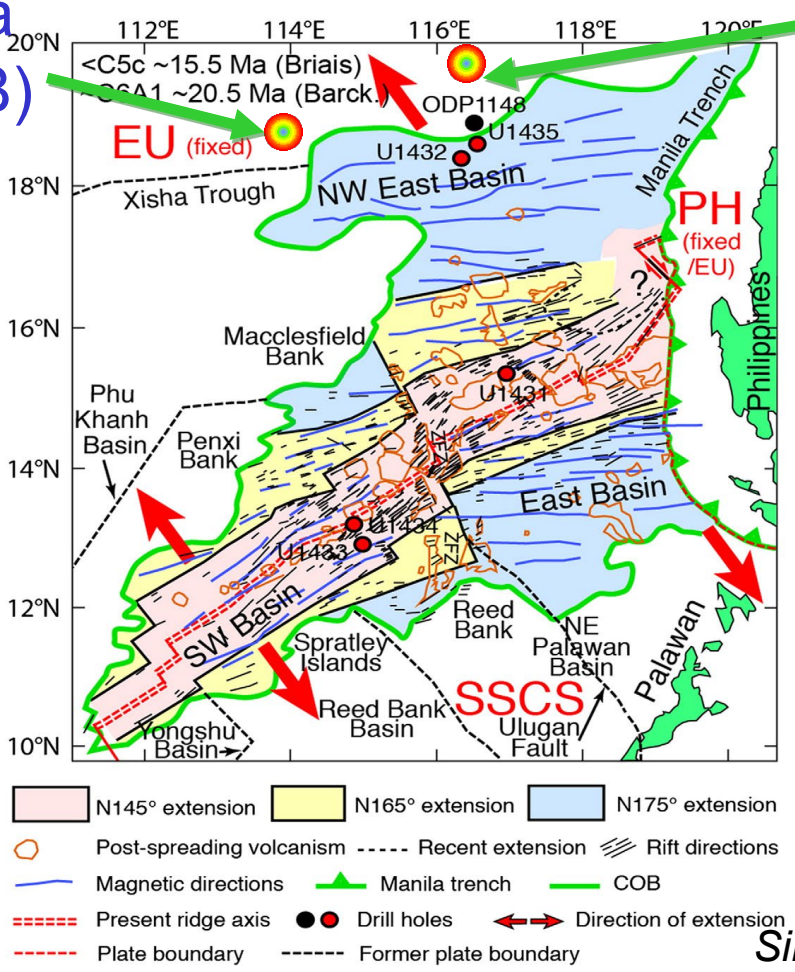
Basins on distal margin

- Failed continental breakup: Xisha Trough (QDNB)

Lei et al., online, JGR-Solide Earth
Lei et al., 2019, MPG

- Extremely continental thinning: Liwan Subbasin

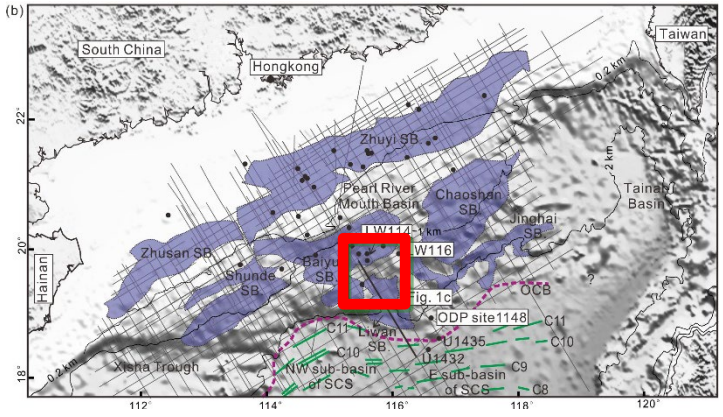
Lei et al., 2019, GSA Bulletin

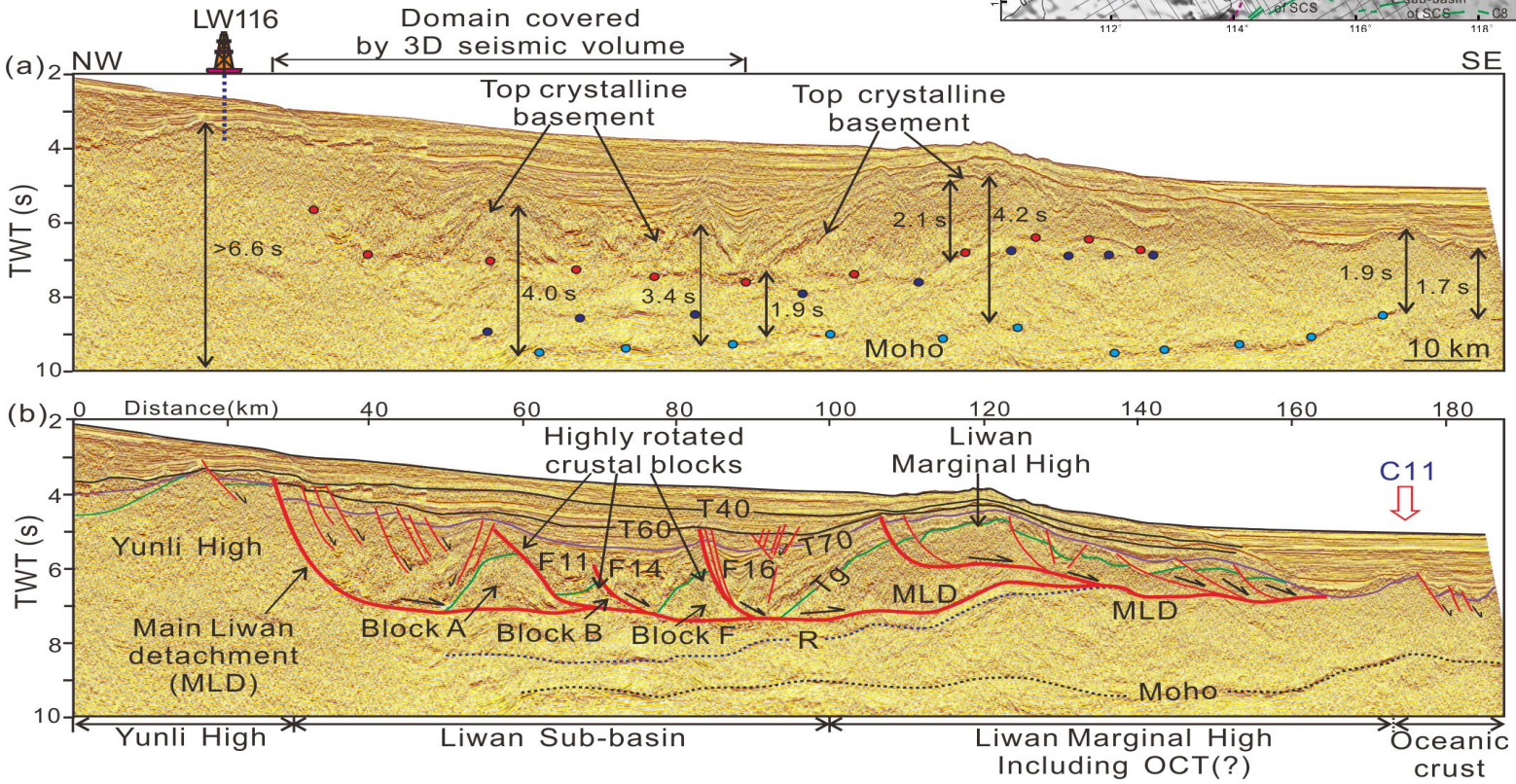


Sibuet et al., 2016, Tectonophysics

Liwan Subbasin

- Thick sediments deposited on the hyperextended crust.
- Highly rotated continental blocks overlying the detachment faults.

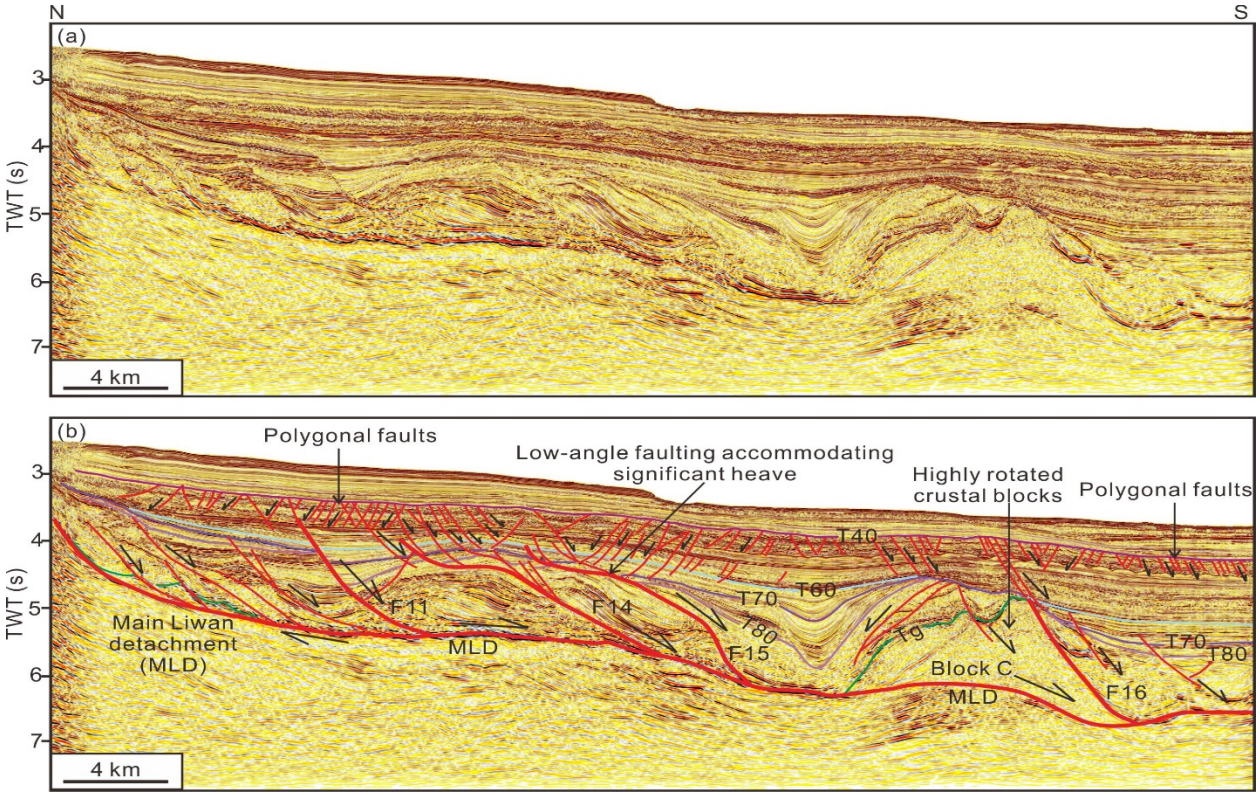




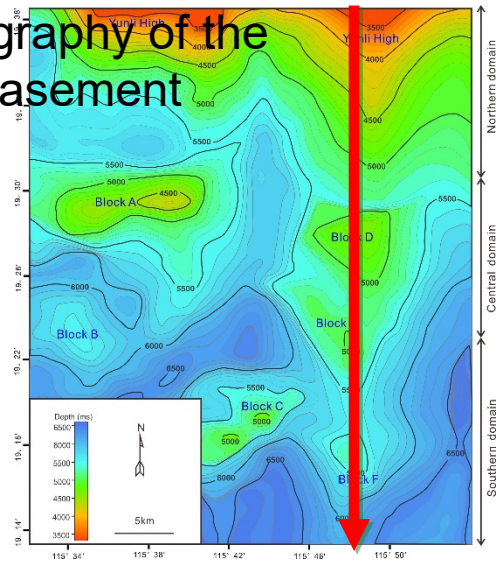
Lei et al., 2019, GSA Bulletin

Liwan Subbasin

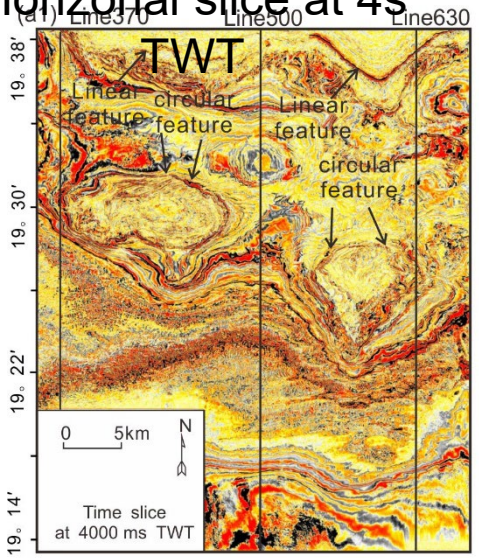
- 3D seismic data indicate the occurrence of the detachment faulting and associated titled crustal blocks.



Topography of the basement



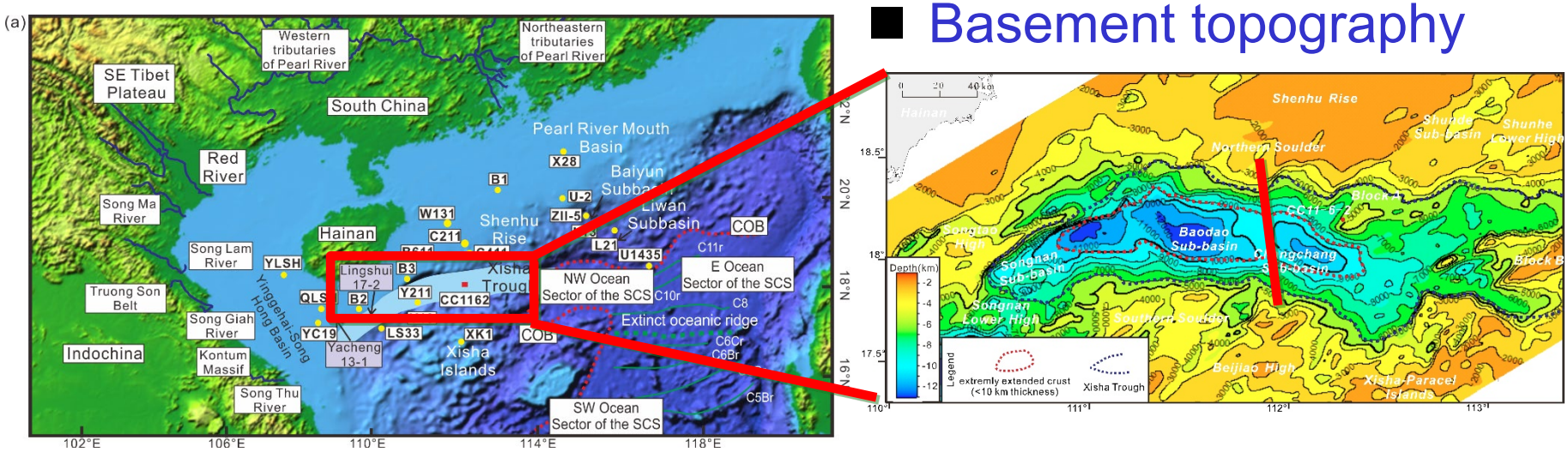
Horizonal slice at 4s



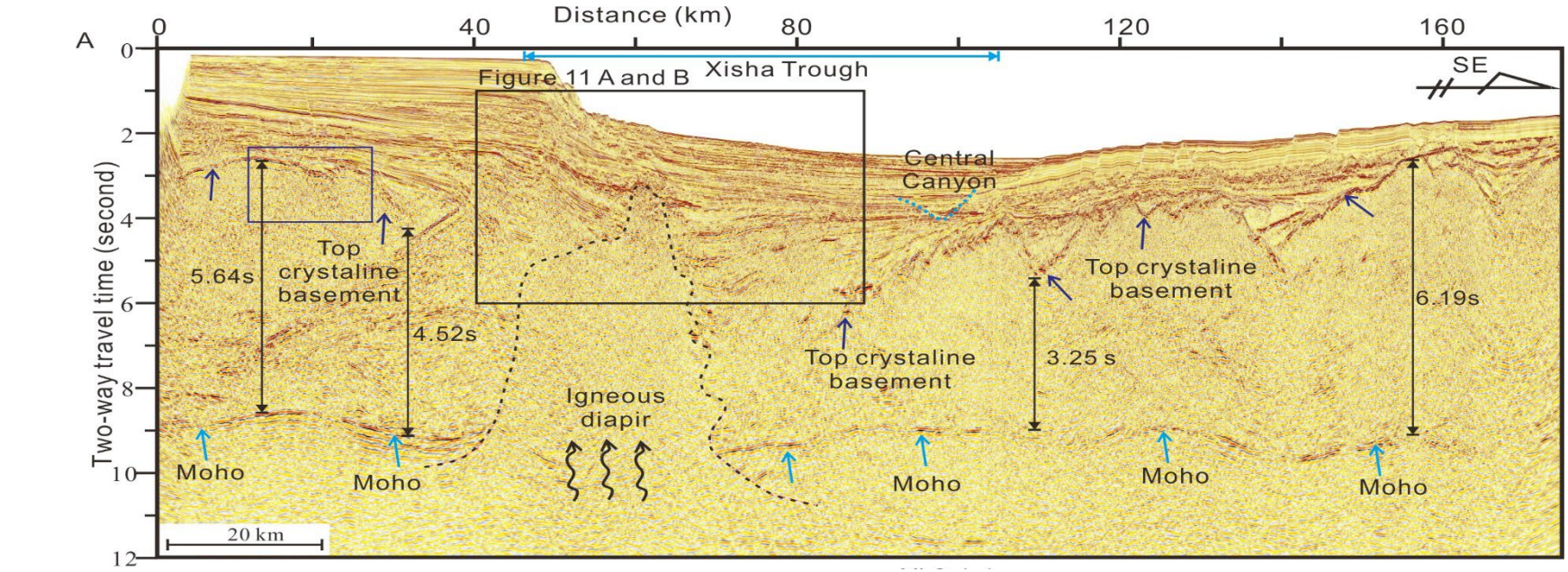
- Continental blocks and faults on the horizonal slice

Lei et al., 2019, GSA Bulletin

Xisha Trough

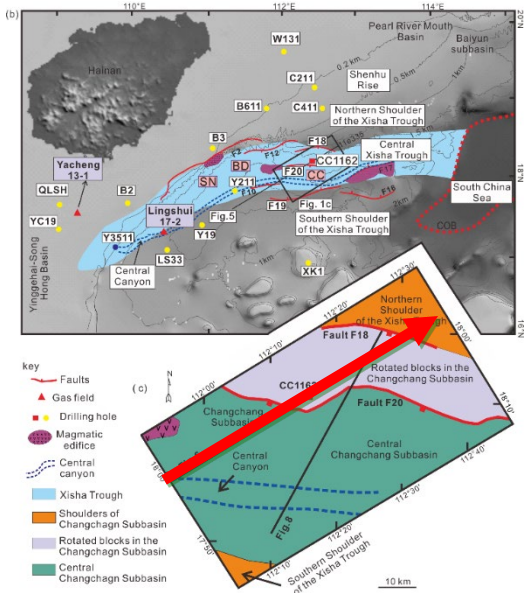


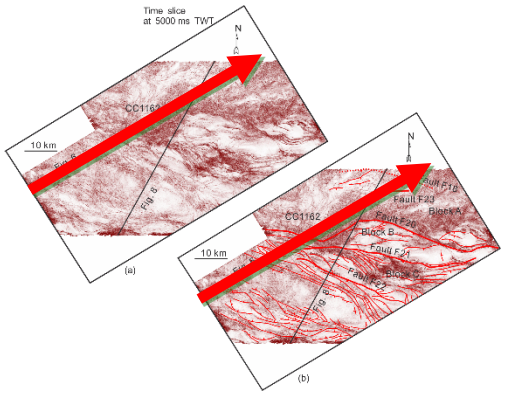
Basement topography



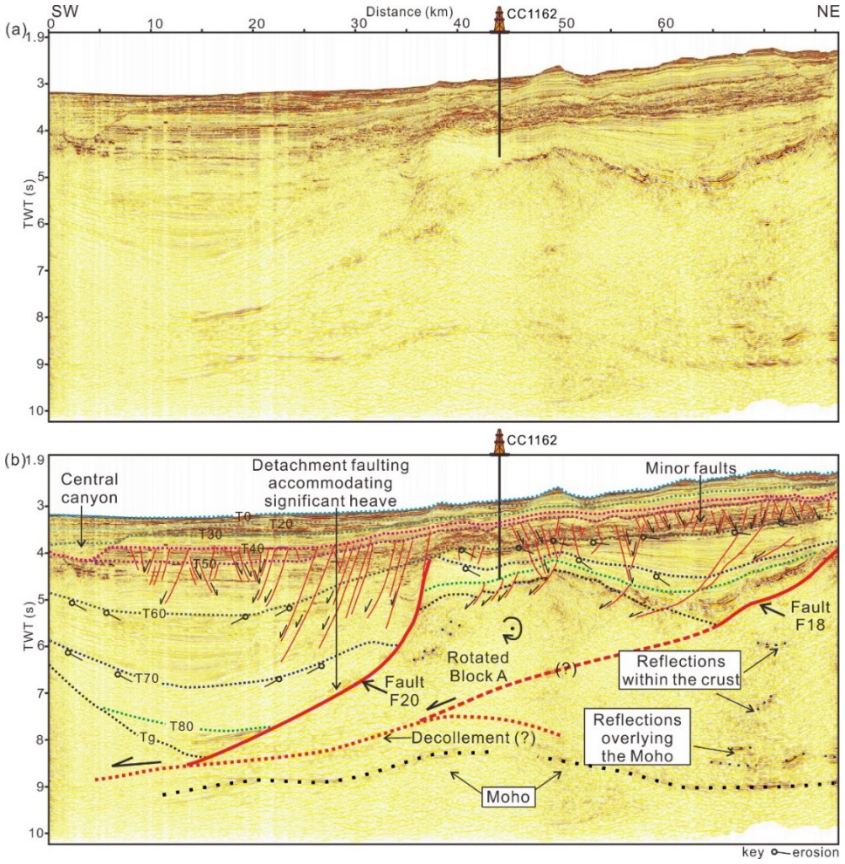
Lei et al., 2016, MPG

Xisha Trough



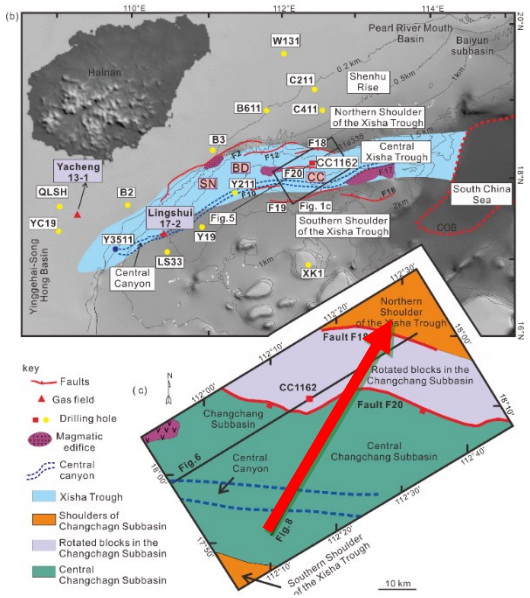


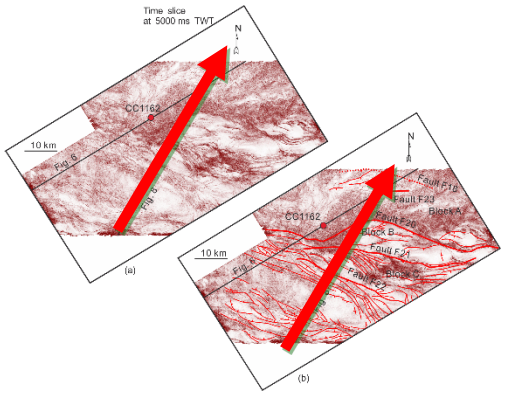
- The lowest Cenozoic sediments was deposited on the ~3 km crust.
- The cored rock samples in the axial trough were used to explore the source-to-sink system there.



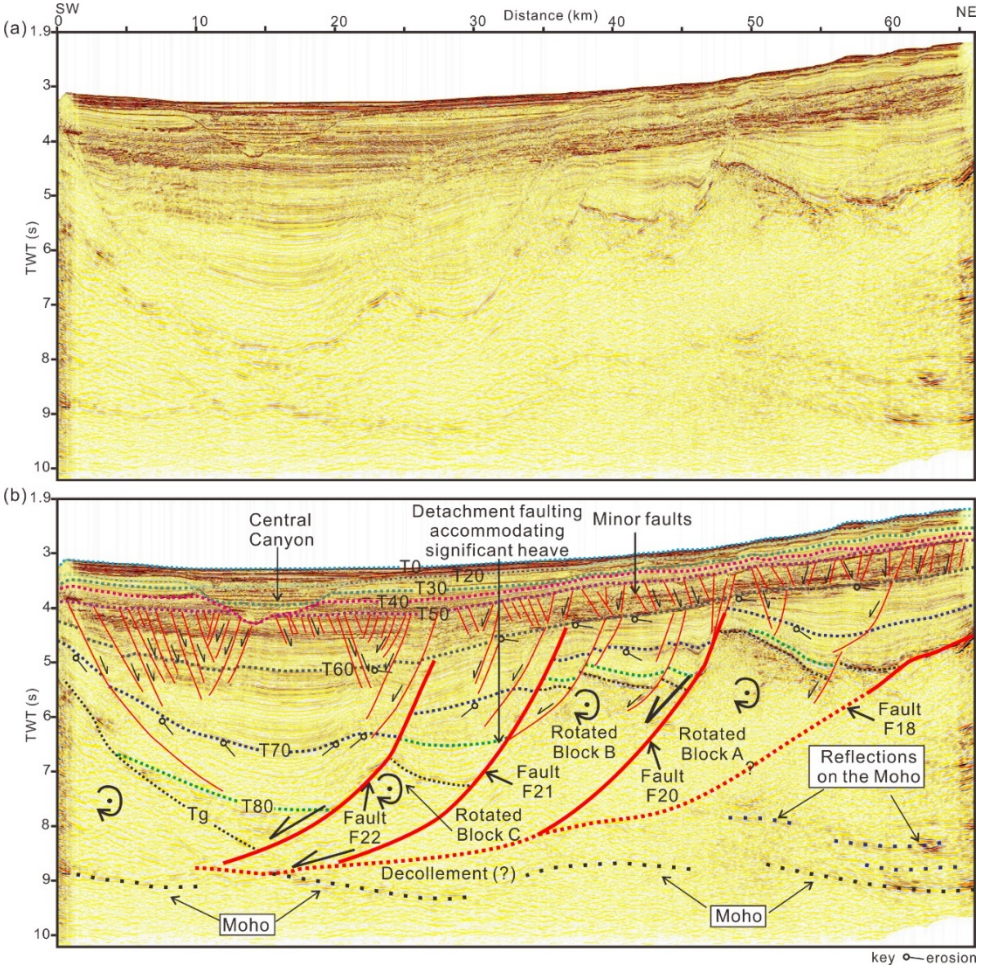
Lei et al., online, JGR-Solid Earth

Xisha Trough



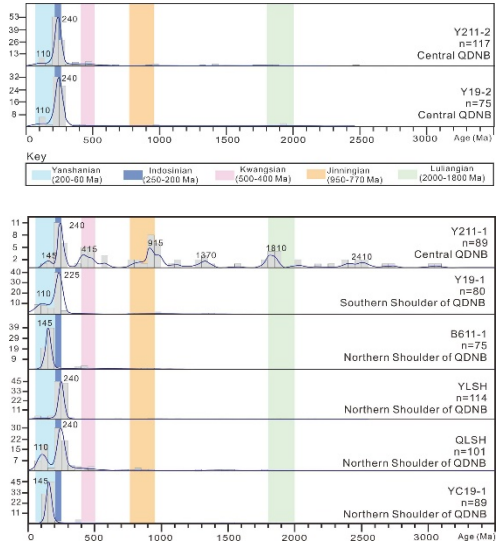


- Extremely thinned crust located in the axial trough;
- Detachment faults thinned the crust

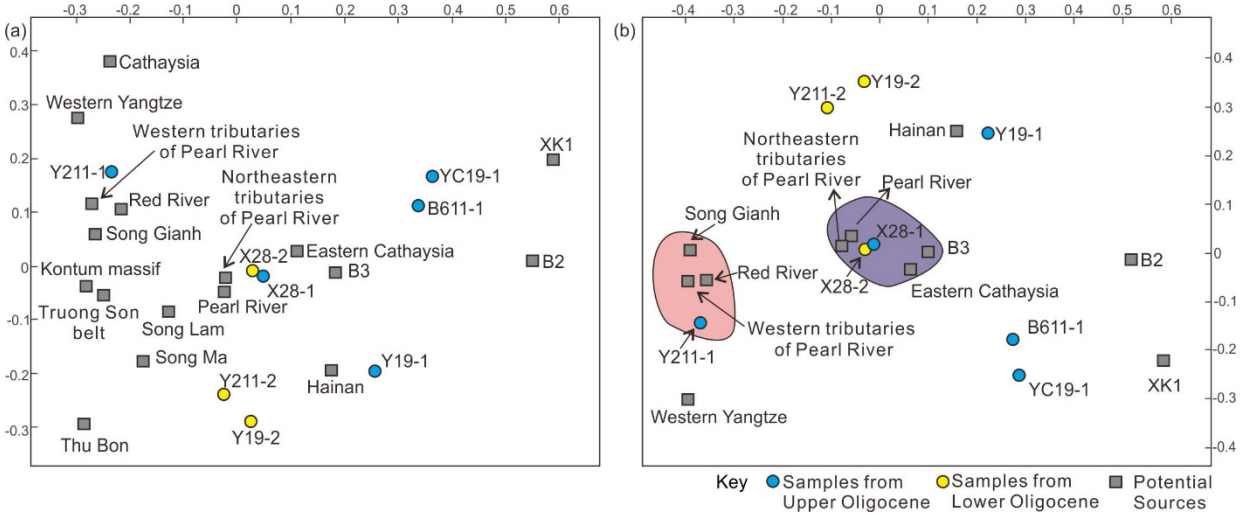


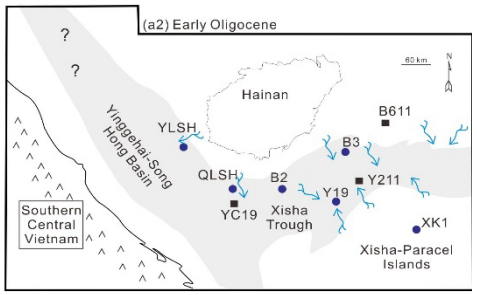
Lei et al., online, JGR-Solid Earth

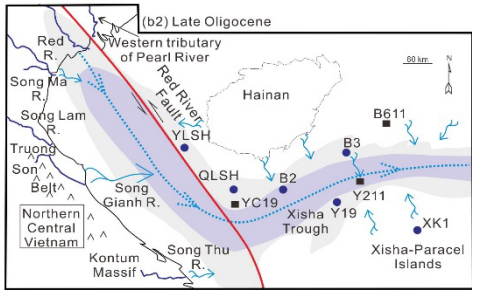
Source-to-Sink system on the hyperextended crust in Xisha Trough



Detrital zircon U-Pb analysis





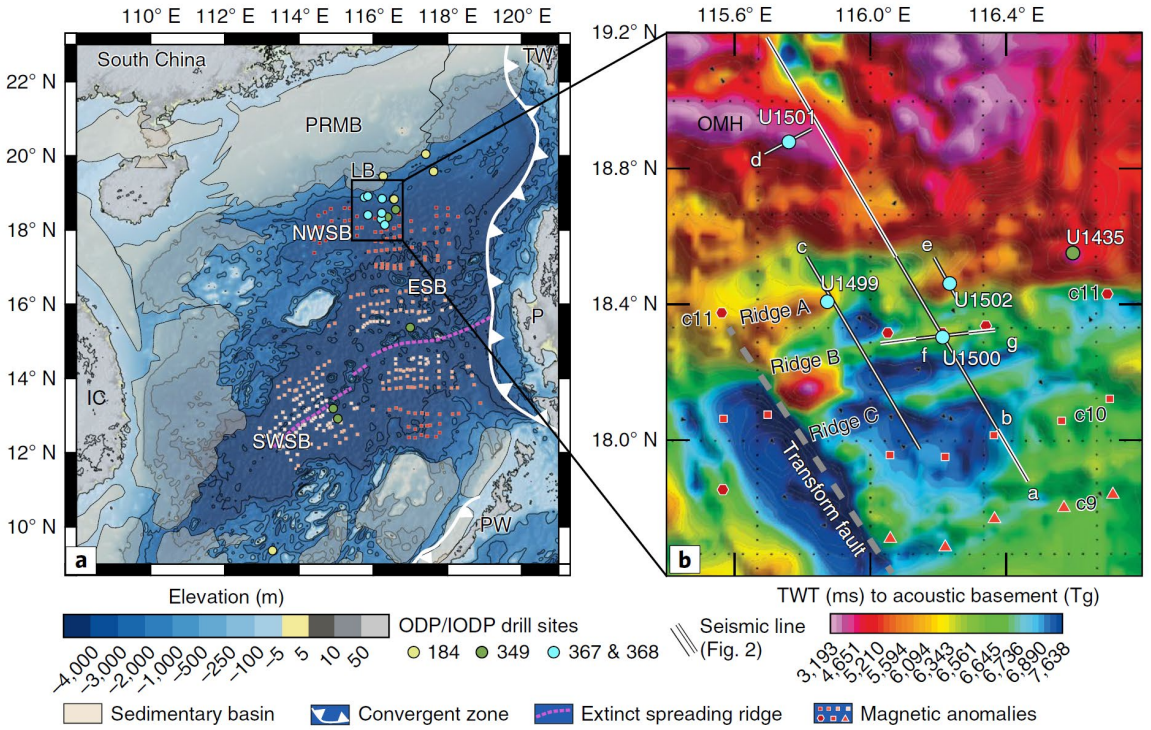


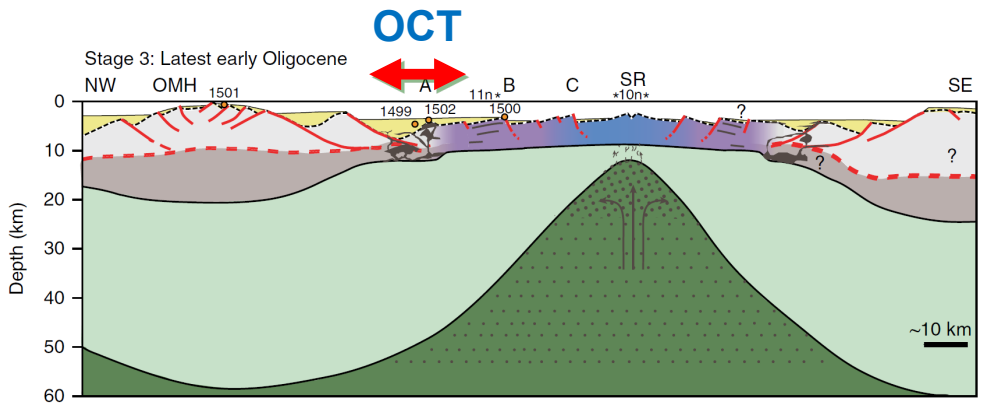
- Lower Oligocene: Proximal sediment sources
- Upper Oligocene: sediment delivery from distal sediment sources is prominent, e.g. Red River

- Sediment were mainly delivered along the axial of the Xisha Trough of the western SCS;
- Hyperextension facilitated the axial sedimentation there.

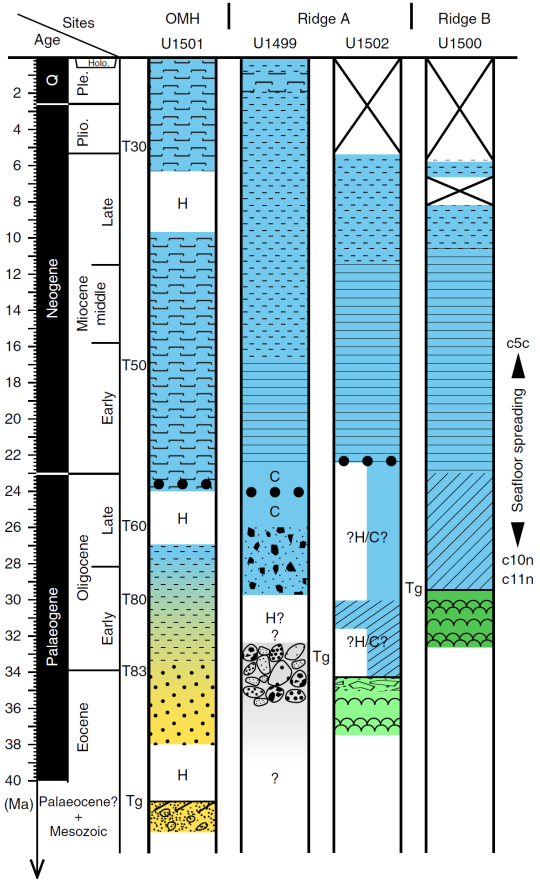
Lei et al., 2019, MPG

OCT





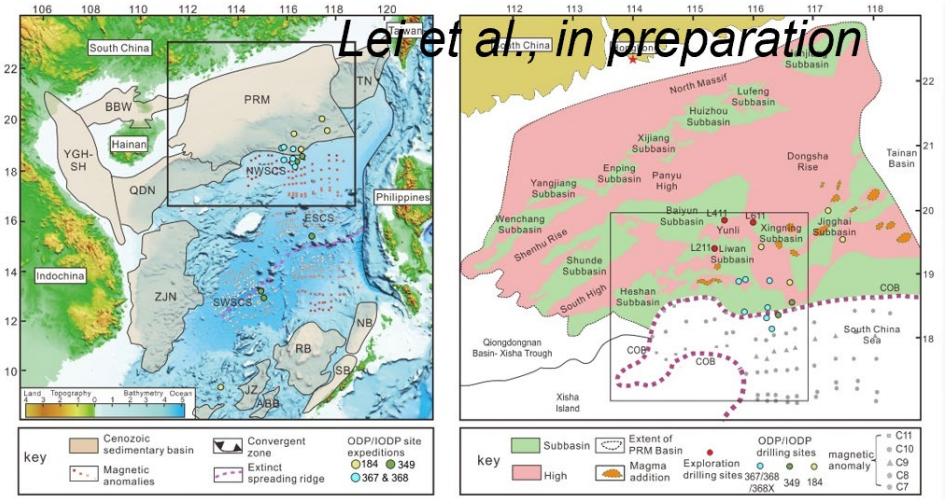
IODP drilling result



Narrow OCT with magmatism

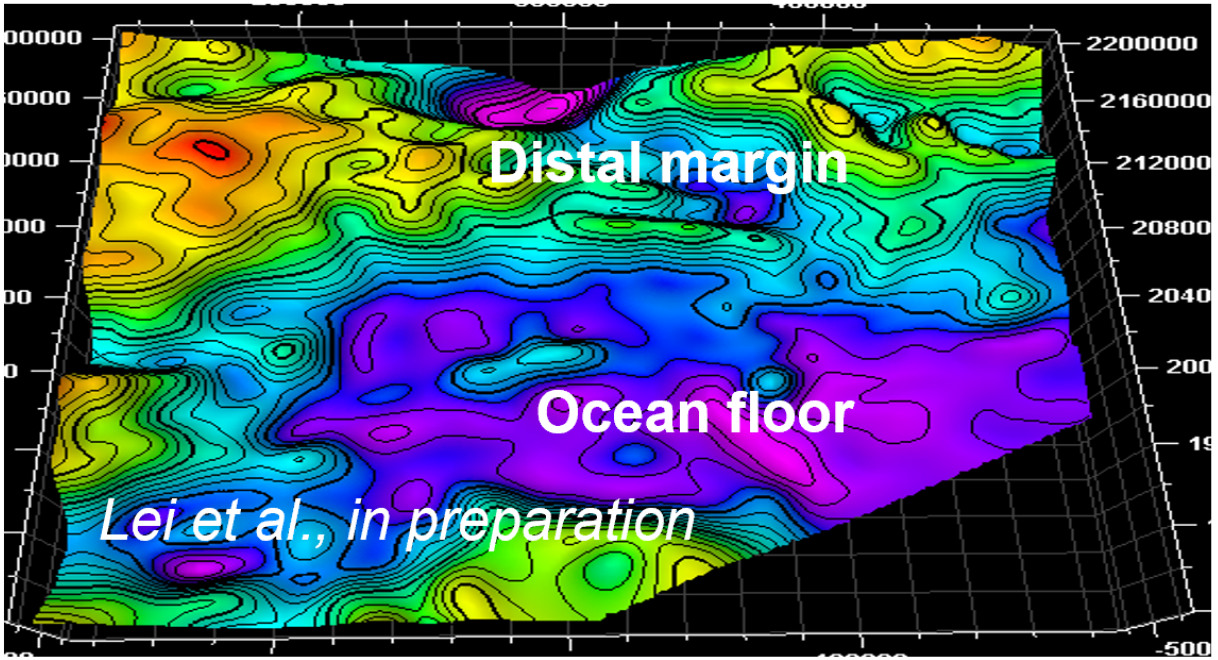
Larsen et al., 2018, Nature Geosciences

What we are doing

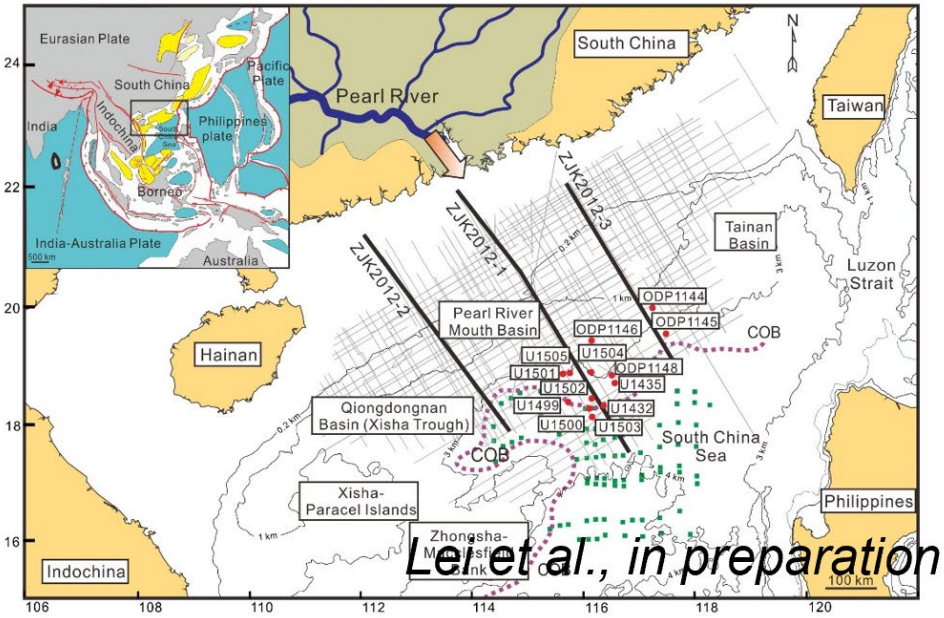


Task 1

- Build the 3D structure and sedimentation infill along the OCT.
- Exploring the links between tectonic and magmatism

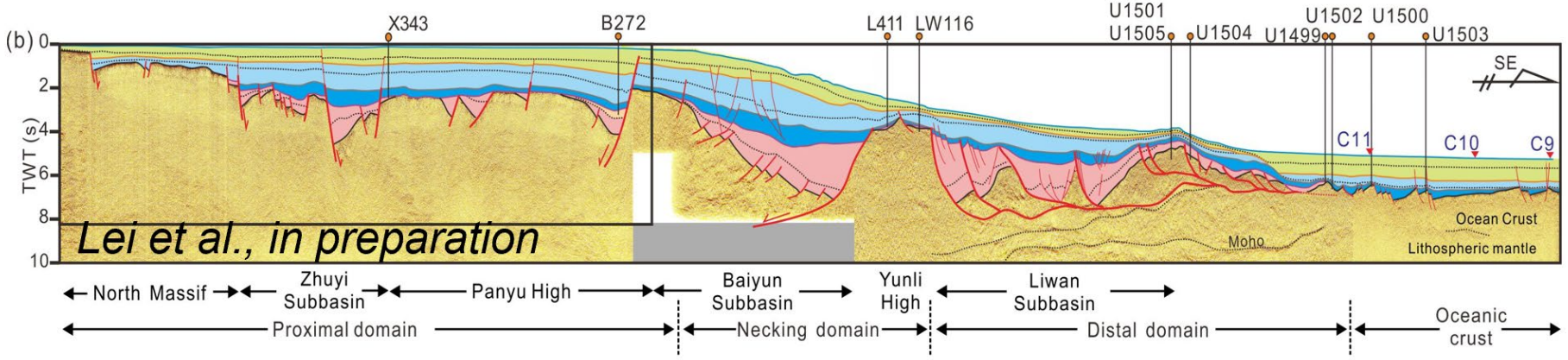


What we are doing



Task 2

- Study and review the structures and sediments infill on the northern SCS;
- imaging the variability across and along the margin.




Thanks for your
attention