Mesozoic-Cenozoic Rifting and Origins of the North Yellow Sea Basin

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Yellow Sea is a semi-closed continental shelf basin which is bounded by Tanlu fault to the west and by Korea peninsula to the east. The Yellow Sea basin can be tectonically divided by two subbasins by Qianliyan rise, named north Yellow Sea basin (NYSB) and south Yellow Sea basin based on the acoustic basement and tectonic evolution. Here we discuss the tectonic evolution and regional kinematics of the NYSB by using seismic data and field survey.

NYSB was developed on the Proterozoic metamorphic basement and Paleozoic basement of the North China Block in the west and east respectively. Two rifting stage can be revealed from the seismic data and well data at central depression. The first rifting happened from Late Jurassic to Early and Middle Cretaceous and thickness of 1000 to 4000m terrigenous deposits and volcanic rocks were deposited in half-graben basins. The deposit sequences were revealed in onshore Jiaolai Basin of Shandong Peninsula. During early Cretaceous probably between 140-120Ma, the Tanlu fault zone was activated as a dextral fault. Transitional tectonics caused pull-apart opening of the early Cretaceous Jiaolai Basin. The period of middle Cretaceous possibly between 120-100Ma was marked by widespread occurrence of volcanic eruption in the Jiaolai Basin. This stage was dominated by extensional tectonics and normal faulting. During late Cretaceous, the direction of compression changed from NW-SE to NE-SW. The Tanlu fault zone was a dextral strike-slip fault. Second rifting was from early Paleocene to Oligocene and was not well-developed rifting basin because it accepted very thin early Tertiary deposits and distributed in isolated local depressions. The evolution of early Tertiary rifting and crust extension of the NYSB was originated from back-roll mantle convection induced by northwestward subduction of the Pacific plate beneath Asian plate. During Pliocene to Quaternary NYSB became thermal subsidence with 300-600m marine sediments developed on the anticlines and controlled by some NEE striking faults.

Tectonic evolution of the continental shelf basin has three features as follow: (1) it has two levels of structures. Upper structure of the basin was developed a break unconformity; (2) thermal subsidence rate must be correspond to the rifting rate, which is <50m/Ma; and (3) Gentle detachment faults were formed along the margin of the depression and
disappeared at plasticity layer. NYSB could be interpreted by Flexural-Cantilevers simple-shear model (Kuszmir, 1992). At the early stage occurred thinning of the lithosphere, of which the upper crust decrease by simple shear and lower crust and lithosphere are pure shear.