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Neogene subsidence pattern in the multi-episodic extension systems: insights from backstripping modelling of the Okinawa Trough

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Extensional systems of back-arc basins have been extensively recognized and studied especially in SE Asia. The Okinawa Trough (OT) represents a typical back-arc basin along the Western Pacific Margin, which experienced multi-episodic rifting events during the Cenozoic. This contribution aims to investigate the interactions between extension-related tectonics and spatial-temporal distributions of subsidence in this active back-arc basin. The OT is characterized by three segments (southern, middle and northern) exhibiting different geological characteristics emphasized by distinct crustal thickness, gravity anomaly, structural style, convergent rates and slap depths in the subduction zone. From its structural location, the OT provides an opportunity to study the initiation of rifting and subsequent back-arc spreading dominated by interaction between the Philippine Sea Plate and the Eurasian Plate. Meanwhile, its sedimentary history is complicated by southward propagating continental rifting, initial seafloor spreading in the southern segment, the Taiwan Orogeny, and widespread volcanic additions. All these elements resulted in the OT of remarkable differences in sedimentary facies, depositional environments and sedimentary processes in different areas. As result, we explored and compared the tectonic subsidence of its different segments, investigating the tectono-sedimentary processes and mechanisms controlling its evolution during different geological stages.

In this presentation we use the one-dimensional backstripping method to investigate the temporal-spatial distribution of tectonic subsidence and sedimentary processes in the OT. Based on more than 30 multi-channel seismic profiles, we present a seismo-stratigraphic analysis and a precise framework with detailed geological interpretations. This study enables us to 1) reconstruct the tectonic subsidence during different geological stages, 2) replace the subsidence evolution in a tectonic context, 3) investigate the key factors controlling the sedimentary processes and the infill of different segments, and 4) provide the first detailed maps of decompacted sedimentary thickness and tectonic subsidence for the entire OT. Eventually, we will also explore the style of continental extension and the corresponding rapid subsidence patterns in the multi-episodic extension systems.