



Evolutionary Model and Tectonic Subsidence History of the foreland basin in NW Taiwan

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During the Early Pliocene, the Eurasian and Philippine Sea plates obliquely converged and produced an orogenic loading, which flexed a rift-type continental margin and formed the foreland basins in western Taiwan. According to the previous studies, the foreland basin was formed at 3 to 6.5Ma. However, the detailed time and processes still remain in debate.

In this study, wellbore and biostratigraphic data were used to delineate the stratigraphic boundaries and calculate the regional subsidence curves, which can reveal the morphology of foreland basin based on decompaction and backstripping. We can divide the study area into three terranes, the outer foothill, coastal plain, and offshore, from orogenic belts to outer sea, respectively. Compare the distributions of the uplift and subsidence rate in different terranes at the same age can provides us the basis to reconstruct an evolutionary model and tectonic subsidence history of the foreland basin in northwestern Taiwan.

Subsidence curves indicate the timing of uplift and subsidence in the foreland basin, which may correspond to forebulge in northwestern Taiwan near 4.4Ma (NN12). The uplift rate decreases from outer foothill to offshore. The rapid subsidence began at 4Ma (NN13~NN14) in the outer foothill and coastal plain and corresponded to the initiation of Taiwan orogeny, which created the foreland basin by loading. In contrast to the uplift rate, the subsidence rate decreases from outer offshore to outer foothill. After the rapid subsidence, the whole study area subside in a similar rate at 3Ma (NN15). At 1.8Ma (NN16~NN18), the outer foothill and coastal plain kept subsiding in a lower rate; however, the offshore region was uplifted.

From the aforementioned results, we can construct an episodic evolutionary model of the foreland basin in northwestern Taiwan. At 4.4Ma, the whole study area was uplifted, which could be interpreted as the distal part of the foreland basin. At 4Ma, the outer foothill and the coastal plain began to subside rapidly, which represented the proximal part of the foreland basin and revealed a typical asymmetric basin-shape. Afterwards, at 3Ma the foreland basin started to be filled steadily with the sediments eroded from the orogenic belt and revealed a relatively symmetric basin-shape, which corresponded to the basin evolution from underfilled to overfilled stage. Finally, the orogeny re-acted at 1.8Ma, the outer foothill and the coastal continue to subside, while the forebulge migrated back to the offshore again.