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Sedimentary Cycles in Foreland Basin and Their Tectonic Implications of SW Taiwan

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In southwestern Taiwan, depositional system of Coastal plain and outer part of Foothills belt has been influenced by loading of the orogenic belt to the east from Pliocene to present and developed into a typical foreland basin system. In the study area, which is located at the distal and central parts of the foreland basin, the well bore data and outcropped sections record the changes of sedimentary facies within the foreland basin sequences. The changes were caused by the mixed variations of eustasy and activity of the orogenic belt during thrusting/quiescence episodes. Previous studies concerning the foreland basin in southwestern Taiwan mainly focus on the model of basin framework, and the accompanied orogenic morphology as well. The aim of this study is to analyze the sedimentary cycles and establish the tectonostratigraphy in foreland basin.

The Plio-Pleistocene sequences show the sedimentary cycles of submarine deposits can be recognized and grouped into the system tracts, including the transgressive (TST), highstand (HST), and forced regressive (FRST) systems tracts. The assemblage of systems tracts commonly forms a stacking pattern, in descending, of TST/FRST/HST. Stratigraphic columns were correlated and compared by analyzing the stratigraphic sequences, and a stratigraphic profile extending from the distal to central parts of the basin was then constructed. On the profile, because the oblique arc-continent collision has resulted in the progressive migration of foreland basin development from north to south, the time-spatial distribution of FRST and the accompanied widespread unconformities appear together as shift from east to west and from north to south. And there are 2 cycles of foreland basin sequence in the stratigraphic records.

We interpret the FRST as results from and relative sea-level fall caused by the approaching forebulge uplift. In each period of foreland basin development, TST was deposited at the higher rate of tectonic subsidence, which was followed by FRST representing the hinterlandward approaching forebulge. When tectonic activity in the orogenic belt gradually diminished, HST was deposited at the lower rate of tectonic subsidence and by the progradation toward the distal part of the basin till the end of the period. The assemblage of the foreland basin sequences (TST/FRST/HST) demonstrates that tectonics has been dominant during thrusting episode (TST/FRST) and eustasy has been dominant during quiescence episode (HST).