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High-frequency Sequence stratigraphy and facies architecture in Cholan Formation (Pleistocene), northwestern Taiwan: the evolution of a foreland basin

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In northwestern Taiwan, Cholan Formation in Dahan river is about 1400 m thick that contains high-frequency sequence stratigraphy (6^{th}-order) and detail of facies architecture which indicates evolution of the foreland basin. In late Miocene (6 Ma), the Taiwan orogeny belt is formed by the arc-continental collision (the Luzon Volcanic Arc and the Eurasian plate). During Pliocene-Pleistocene, uplift of the Hsueshan Range and the Western Foothill created by a series of the fold-thrust belt formed the foreland basin. Most importantly, high subsidence rate and high sedimentation rate are critical that glacio-eustasy (6^{th}-order) could be correlated to parasequences in Cholan Formation. It provides a precise age model to discuss different stages of foreland basin.

Parasequences in Cholan Formation could be divided into three types of depositional systems including siliciclastic shallow marine (Type 1), margin marine (Type 2) and nonmarine (Type 3) that are a typical sequence of foreland basins. Type 1, which is tidal-dominated open coast, shows 10-30 m coarsening-upward succession. Type 2, which is tidal-dominated delta, shows two different parts. The lower part is 10-50 m coarsening-upward succession which unconformity contact with Type 1. The upper part changes to 20-50 m fining-upward succession. Type 3, which is alluvial system, shows 30-70 m fining-upward succession that is conformable with Type 2. From shallow marine to nonmarine, the thickness of parasequence is growing thicker that indicates long-term tectonic subsidence rate is getting higher with more sediment deposits in the basin. In more detail, in marine setting, sea level change is the main considered factor to identify sequence boundary (SB) and maximum flooding surface (MFS), while in nonmarine setting, precipitation change in glacial and inter-glacial may be a critical factor to impact the formation of SB. However, MFS is complicated to define because some parasequences show tidal signal, but some don't. It could be influenced by degree of sea level uplift or paleotopography. In Cholan Formation, the signal of sea level, tectonic and climate is sensitive to reflect in stratigraphy architecture.

Keywords: Foreland basin, High-order sequence stratigraphy, Marine to nonmarine facies architecture