The relationship between evolution of Frontal Ridge growth and sediment-routing system in the developing marine accretionary prism in offshore Southwest Taiwan

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Sediment-routing system in a developing marine accretionary prism is highly related to the thrusting and the accompanied fold structures. The main purpose of this study is to investigate how the thrust fault growth had spatially and temporally affected sediment transport paths in the frontal part of the developing accretionary prism in offshore Southwest Taiwan. This study attempts to reveal the lateral change in dipping angle of and displacement along thrust fault and the accompanied variation in trend of the submarine channels by interpreting a grid of seismic section.

The Frontal Ridge is the outmost topographic high in the frontal part of the accretionary prism in offshore Southwest Taiwan and has been regarded as the resultant anticlinal fold caused by westward thrusting. The major structural trend of the ridge is NW-SE and the fold tightness with the displacement along the fold-forming thrust decreases southeastward. Beneath the backlimb of the fold, basal boundary of the growth strata can be defined by a major unconformity and the overlying strata wedging westward to the ridge. The backlimb dipping angle is smaller than that of the thrust ramp. While narrow channels appear in the growth strata and parallel to the strike of fault, a wide submarine fan can be observed in the pre-growth strata. In the lower part of the growth strata, upstream of the channels is characterized by several narrow, concentrated and deep-cutting channels younging toward the east. On the other hand, downstream of the narrow channels appears as the distributed channels, which are overlain by the younger narrow and concentrated channels that are running along a synclinal axis in the upper part of the growth strata.

We propose that the Frontal Ridge is a manifestation of a shear fault-bend fold in the subsurface and the ridge uplifted first from its northwestern end and propagated toward the southeast. The southeastward propagating fold had strongly affected sediment-routing path and deposition. At each stage, the active thrusting and accompanied piggy-back structure offered the loci for narrow
and deep-cutting channels in the upstream areas. On the other hand, in the downstream areas, the channels ran far from pre-existing thrust front and spread out into distributed channels. When the frontal thrust continued to propagate to the southeastern end, the younger channels developed and migrated gradually to be restricted in the synclinal axial area. Meantime, the distributed channels in the original downstream areas would become a part of the folded pre-growth strata underneath the ridge.

Key words: Sediment-routing system, accretionary prism, syn-tectonic deposition, Southwest Taiwan