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Seismic Analysis across the Deformation Front: implications for channel migration in the upper reach of the Penghu Submarine Canyon, Offshore Southwestern Taiwan

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This study analyzes both 2D and 3D seismic images in the upper reach of the Penghu Submarine Canyon to investigate sedimentary and structural processes in this tectonically active zone. The study area lies across the deformation front which separates the rifted South China Sea (SCS) continental slope to the west from the submarine Taiwan accretionary wedge to the east. Using 3D seismic images, several structural and sedimentary features have been identified: in the rifted SCS slope domain, besides the paleo-slope surface, buried submarine channels and mass transport deposits (MTDs), a reverse reactivated normal fault system is recognized, while in the accretionary wedge domain, the fold and thrust structures are dominate. The reverse fault system we interpreted in the rifted SCS slope domain was a normal fault in the past, and then reactivated to become a reverse fault through the arc-continent collision processes. Since the deformation front is defined as the location of the most frontal contractional structures along a convergent plate boundary, no contractional structures should appear west of it. We thus suggest to move the location of the previously mapped deformation front further west to where the reactivated fault lies. High resolution 2D seismic and bathymetry data reveal that the directions of the paleo-submarine channels ran in an across-slope direction, while the present submarine channels head down slope in the study area. The channel migration model we proposed suggests that this might be the result of the fault reactivation. The interactions of down-slope processes and active structural controls affect the channel paths in our study area.