Structural Controls on the Formation of BSR Over a Buried Anticline From a 2.5-D Seismic Reflection Survey Offshore Southwestern Taiwan

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Offshore southwestern Taiwan, a well developed accretionary prism encroaches onto the China Continental slope. In this area, BSRs are highly concentrated and geochemical signals for the presence of methane seep and gas hydrates are strong. The dominant structures east of the deformation front are N-S trending trust-bounded folds, 10 to 12 Km wide and separated by NE-SW oblique ramps, that culminates to the east with the "Good Weather Ridge", a prominent high on the bathymetric data. In the wake of this ridge, an NW-SE elongated slope basin, characterized by rapid sedimentation, is burying the accretionary units. This structure provides a peculiar setting for the deformation of the accretionary unit, dewatering and fluid+gas migration paths, and gas hydrate emplacements. Thus in 2006, we have conducted a 2.5-D seismic reflection survey over a 14 x 14 km portion of the buried anticline: 29 E-W profiles with 500-m line spacing and 18 N-S profiles with up to 250 m line spacing in the center where collected. This survey is part of a 4-year gas hydrate investigation program supported by the Central Geological Survey of Taiwan. We have mapped the BSR distribution, computed the BSR sub-bottom depths, and associated heat flow values. On one hand, the concentric/convergent patterns of the stratigraphic dips constitute favorable migration paths for the upward fluid and gas transport across the BSR into the gas hydrate stability zone. On the other hand, the rapid sedimentation opposes this fluid flux, and results in upward migration of the BSR. Finally when nearing the sub-surface, the fluid channels are forced into more narrow conduits: several mud-volcanoes are observed in the slope basin, where seismic coverage is the most concentrated. We then investigate simple scenarios for the methane seep and gas hydrate accumulation though numerical modeling. Hence, the initial results from this dense 2.5-D seismic experiment illustrate numerous features in the mechanisms leading to gas hydrate emplacements.