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BSR occurrences in a continental-slope ridge with widespread cold-seep carbonates, northern South China Sea margin

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A field of cold seep carbonates named “Jiulong methane reef” was previously discovered on the upper part of a slope ridge, northern South China Sea margin. This slope ridge is herein coined “Kaohsiung Ridge”. We use densely spaced (4.75 km in line spacing) multichannel seismic data, covering a water depth of 200 m to 2400 m, to characterize the bottom simulating reflectors (BSRs) occurrences and sedimentary features for gas hydrate-bearing sediments beneath the Kaohsiung Ridge. Abundant BSRs are found beneath a water depth of around 700 to 1800 m, clustering beneath bathymetric highs. No BSRs are found for water depth shallower than around 700 m, indicating that the base of gas hydrate stability zone approaches to seafloor around a water depth of 700 m.
Seismic data show that a series of hundreds-meter thick sediment waves covers the Kaohsiung Rigde. A typical sediment wave shows asymmetrical downslope profile with upslope facing leeside. There is a common occurrence for strong reflections concentrating around the leeside of sediment waves and beneath BSRs. This feature suggests that leesides of sediment waves may have accumulated more coarse materials than the stoss side; as such, leeside sediments beneath the BSRs may have trapped more gas, resulting in strong reflections. Part of the sediment wave field is affected by deep-cutting, listric normal fault systems due to gravitation. Strong reflections, interpreted as gas-charged sediments, are commonly found to cluster around normal faults, indicating that these fault zones may serve as fluid conduits that tap deeper seated gas. Our results indicate that the Kaohsiung Ridge may have hosted a large amount of gas hydrates in sediment wave fields.

Keywords: gas hydrate, northern South China Sea margin.