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Mapping Geological Features in a 3D Seismic Volume for Gas Hydrate Investigation Offshore Southwestern Taiwan

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Yung-An Ridge is a structural high located in the accretionary complex of the Luzon subduction-collision system offshore southwestern Taiwan. Bottom simulating reflectors (BSRs) are widespread in the region, and combined geophysical and geochemical investigations have revealed that large amount of gas hydrates and free gases are accumulated beneath the anticlines and adjacent slope basins on both sides of the Yung-An Ridge where high priority drilling sites for gas hydrate investigation are proposed. It is thus important to have a good understanding of the potential gas hydrate reservoir characters. In this study, we analyze a 3D seismic volume over the Yung-An Ridge area to map the geological features, such as buried channels, faults, gas migration paths and free gas bearing sediment strata, etc. which are associated with local gas hydrate system. Seismic attribute analyses of the 3D data help us to better constrain the geological features identified in the 3D seismic volume. The reflection strength analysis shows that in addition to the high amplitude character of BSRs, we have also observed some very strong reflection signals below BSRs in the slope basins on both sides of the Yung-An Ridge. Instantaneous frequency images show that there are low frequency patches beneath BSRs which may reflect gas-bearing strata. The analyses of instantaneous phase images help to identify faults easily. Those images also show that the characters of gas hydrate presence are approximately terminated in the west side of Penghu Canyon, the west flank of the Yung-An Ridge and the chimney structure located in the slope basin of the east part of Yung-An Ridge.