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Fluid Flow Processes Study: from a 3D seismic data set in the Pointer Ridge offshore SW Taiwan

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This study analyzes a 3D seismic cube in the Pointer Ridge for understanding the fluid flow processes in subsurface. Pointer Ridge is a ridge situated on the passive China continental margin and is suggested as a potential prospect for future gas hydrate development. High methane flux rate, active gas venting and seismic chimneys have been observed in this area, which are direct evidences for active ongoing fluid migration processes. To find the possible fluid conduits and to understand how the fluids have migrated along those conduits, we firstly identify the structural and sedimentary features from this 3D seismic cube in our study area. Secondly, seismic attribute analyses are carried out for detecting fluid conduits and evaluating the contribution of recognized faults/fractures for fluid flow, respectively. Finally, we propose conceptual models to illustrate how fluids have migrated along those conduits to the seafloor and how those conduits have developed. The results show: 1) a major NE-SW striking normal fault (PR Fault) separates a depositional field on the hanging wall and a erosional field on the footwall; 2) the PR Fault zone itself and the chimneys in its footwall act as main conduits for focused fluid flow migrating to the seafloor; 3) the development of the chimneys in the Pointer Ridge area are highly controlled by the erosion and deposition processes. Since the ongoing fluid flow processes will increase the seafloor instabilities and the Pointer Ridge is a gas hydrate leaking site, our results could provide useful information for further risk evaluation.