

A 2-D Single Channel Seismic Interpretation on the Umitaka Spur Gas Hydrate Area, Joetsu Basin, Eastern Margin of Japan Sea

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Umitaka Spur is a gas hydrate site in the Joetsu Basin, off Joetsu, eastern margin of Japan Sea. Vents, plumes, hydrates outcrops, bacterial mats and carbonate crusts are direct evidence of gas hydrates in the study area. Mounds and pockmarks are also observed over these gas hydrate sites in a strict relation with methane hydrate plumes. A 2D Single Channel Seismic (SCS) survey was conducted in 2007 and 2008 cruises using R/V Natsushima of JAMSTEC, and shows indirect evidences of gas hydrate deposits, confirmed by the surface and near surface studies. Gas chimneys, BSRs, amplitude anomalies and pull up structures are observed. In one hand, the BSRs occurs at around 0.12 to 0.18 ms below sea floor on both sides west and east of Umitaka Spur. On the other hand, the BSR occurrence at the center part of the spur is not clear because layers parallelism and the disturbance caused by gas chimney activities. Heat flow measurements by piston cores and push cores indicate a gradient around 10 deg C/100m in average, giving a very good indication about the base of gas hydrate stability zone (BGHSZ) at around 140mbsf. Coupled SCS and heat flow data infer the seismic velocity on the shallow sediments as 1000 to 1300m/s. Low velocities in both west and east sides of the spur, where clear BSRs are observed, indicates that those sediments are enriched in dissolved gas. Double BSRs appear on the eastern part of the Umitaka Spur. It may represent a seismic signal of sea level changes, indicating that that the BGHSZ was shallower in the past because sea-level dropping and/or tectonic uplifting of the spur. In this study we identified deep and shallow faults and fractures, which are pathways for gas migration from deep reservoirs. Structural maps of the sea floor show at least two different directions (N-S and NE-SW). This pattern is likely to control gas migration, gas hydrate distribution, and also the occurrence of plumes, mounds and pockmarks on the spur.