

A trial of the delineation of gas hydrate-bearing zones using multi seismic attributes analysis by 3D seismic survey

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METI, Ministry of Economy, Trade and Industry of JAPAN (formerly MITI), started Japan's Methane Hydrate Exploitation Program since the fall of 2001. To undertake the research in accordance with this program, the MH21 Research Consortium was established.

Bottom Simulating Reflectors (BSRs) were widely recognized on the marine seismic survey data acquired offshore Japan, especially in the shelf slope near the Nankai Trough. METI conducted three-dimension seismic survey in 2002. BSRs are considered to a base of gas hydrate-stability zone, we are not able to estimate the amount of gas hydrate as the reservoir parameters only from BSRs' information.

In order to estimate the amount of gas hydrate accurately, we have to get the more detailed reservoir parameters such as the gas hydrate saturation, the concentration (gas hydrate saturation multiplied by porosity) or the thickness of the gas hydrate reservoir layer. The velocity of the pure gas hydrate is over 3,000 m/s. It is well known that the compressional velocity of sediments increases, as gas hydrate composes in sediments. We had found the relationship between the gas hydrate and P-wave interval velocity from the NMO velocity analysis, P-wave impedance, S-wave impedance, pseudo Poisson's ratio and attenuation of seismic wave from seismic attributes analysis using the 3D seismic survey data.

We compared P-wave velocity, P-impedance, S-impedance, pseudo Poisson's ratio, and attenuation by seismic attributes analysis with logging data at METI exploratory wells. We found good correlations between these attributes, and the estimated range of hydrate-bearing sediments.

We presumed gas hydrate reservoirs are sand layers accumulated by turbidite using the sequence analysis. We inferred the horizontal extension of gas hydrate-bearing sediments by three-dimensional time slice.