

Application of the geophysical prospecting for methane hydrates exploration

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METI/MH21 have conducted the research of various geophysical prospecting methods for methane hydrate exploration.

It is well known the Bottom Simulating Reflector (hereafter, BSR) indicates the occurrence of methane hydrate. However, the BSR is not given the other important information of methane hydrate reservoir such as their thickness or saturation. To detect the methane hydrate reservoirs, we are developing the new seismic exploration tools to pay the attention of the properties of methane hydrate-bearing sediments. On the other hand, other new exploration methods are developing. They are included the OBS/OBC seismic survey which gets the information of S-wave, and deep-towed seismic survey which is towed the streamer and the source in deep ocean at the a few hundred meters above the sea floor, and the ocean electromagnetic survey because the sediments with gas hydrates has high resistivity.

The P-wave velocity of sediments with methane hydrate is grater than that without methane hydrate. Dvorkin et al. (2003) proposed the relationship between the P-impedance and Poisson's ratio and the concentration of methane hydrate from the methane hydrate micro rock model. Our goal is to delineate the P-velocity or P-impedance, S-impedance, Poisson's ratio, Attenuation section as seismic attributes from the seismic data. The comparison between the seismic data and the well logging data is executed at the drilling sites of METI exploratory well of the Nankai Trough and the Tokai-oki to Kumano-nada well sites. It is the good correlation between the methane hydrate bearing zones estimated from the well logging data and the high P-velocity and high P-impedance and low Poisson's ratio intervals calculated from seismic data.

The methane hydrate-bearing zones above the BSR and the free gas-bearing zones below the BSR are inhomogeneous and are composed from the turbidite sand layers. The conventional one dimensional methane hydrate reservoir model is not able to delineate the occurrence of the methane hydrate and free gas. The result of the ocean electromagnetic method is delineated the inhomogeneous methane hydrate bearing layers, similar to the result of the seismic data.

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