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深海 1000m における TDR 法を用いたガスハイドレート含有堆積物中のガス量の見積り
Estimate gas mass in sea floor with gas hydrate by Time Domain Reflectometry(TDR) method

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As for the carbon dioxide generated from the natural gas, 20-30% of the carbon dioxide generated from coal and the oil that burns to obtain the same calorie is also few, and the carbon dioxide reduction is expected. The gas hydrate is an ice solid material that consists of the natural gas (methane) and the water molecule. It is paid attention as new natural gas resources in recent years. In many cases, it is thought that the deposit consists of the deposit particle and interstitial water. However, the methane flux from the depth that by the way of the gas chimney and the fracture is large, and there is a possibility including a free gas in the deposit that accumulates the gas hydrate in the superficial deposit though the marine sediment. As for Matsumoto and others (2009), it thought the cause to be free gas distribution that existed in the deposit by finding P wave propagation speed of 100m under bottom of the sea to be an abnormally small (1.0-1.3km/sec) from depth of the time of gas hydrate BSR and the heat flow of the sea area. The existence of a free gas in the deposit leads to understanding the mechanism of the gas hydrate accumulation in the superficial deposit. However, it is difficult to estimate the amount of the gas only from the velocity anomaly accurately because it is thought that there is no linear relationship between the speed and the amount of the gas, and the speed decreases remarkably by very small amount gas. Then, it was tried to apply TDR (Time Domain Reflectometry) method, which is used by measuring the water content of the farmland, to estimate the amount of the gas in the present study.In the experiment, the estimate of the amount of the gas in the bottom of the sea deposit is done by using the Time Domain Reflectometry (TDR) method. The TDR method presumes the dielectric constant of the soil by using the wave velocity of the electromagnetic radiation, and obtains the soil water content(=liquid phase rate) there. The dielectric constant is different in each material, about water is 80 and the soil are 3-9 and air is 1, and ice is 4.2. The sediment core of a constant amount is taken from bottom of the sea, the dry density and the particle density of the soil are measured in a laboratory. Then the amount of solid phase rate is estimated. The liquid phase rate can be estimated according to the value of the dielectric constant by the TDR method measured at the bottom of the sea. The volume of the gas can be requested from these measurements by the calculation. The TDR probe is used 2 stainless rods of 300mm long, 10mm across, and 100 mm apart. The measurement of the dielectric constant by the TDR method attenuates in the probe terminal reflection strength of the electromagnetic radiation, and becomes impossible to measure in measuring the solution that the electrical conductivity is very high like seawater it. For this case, the measurement of the dielectric constant by the TDR method becomes impossible. Then, the rod was covered with the heat-shrinkable tubing and the electromagnetic radiation was prevented being attenuated in the TDR probe by film in the present study as shown by Moret-Fernandez (2007). As a result, it succeeded in the suppression of the attenuation of reflection strength of the electromagnetic radiation, and the measurement of the relative permittivity in seawater became possible.

キーワード: TDR 法, 比誘電率, 気相率, 乾燥密度, 土粒子密度
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