G228-015 **Room: 201A** **Time: May 18 14:15-14:30**

Preliminary Imaging of Methane Hydrate using Marine DC Resistivity Sounding

Ryo Takagi[1]; Tada-nori Goto[2]; Takafumi Kasaya[2]; Toshiki Watanabe[3]; Taku Okamoto[4]; Yoshinori Sanada[5]; Hitoshi Mikada[6]; Nobukazu Seama[7]

[1] CMCR, Graduate School Sci., Kochi Univ.; [2] JAMSTEC; [3] RCSV, Nagoya Univ.; [4] Dept. of Civil and Earth Resources Eng., Kyoto; [5] Dept. of Civil and Earth Resources Eng., Kyoto Univ.; [6] Kyoto Univ.; [7] Research Center for Inland Seas, Kobe Univ.

Accurate imaging of the methane hydrate, a new marine energy resource, will allow us to estimate its amount. Seismic methods are used for the methane hydrate survey on the basis of the same technology as finding the oil and gas reservoirs. Especially, the bottom Simulating Reflectors (BSR) correspond the bottom boundary of the methane hydrate layer. However, the top reflectors of the methane hydrate layers are not found clearly. In order to obtain more accurate information of methane hydrate reservoirs, not only advanced seismic methods but also new geophysical exploration methods are demanded.

We try a preliminary imaging of the methane hydrate using marine electrical survey as a new exploration method. In the case of methane hydrate in sediment pore spaces, this resistivity is approximately 2-5 times higher than normal sediments (1-2 Ohm-m). In the case of massive hydrate, this resistivity is approximately 100 times higher than general sediment, on the basis of the electrical log data. Therefore, we have preliminary images of methane hydrate using Marine DC Resistivity Sounding, with towing electrode cable above the seafloor. As checking its feasibility, we study on numerical calculations with 3D modeling of the marine DC resistivity sounding to demonstrate possibility of methane hydrate detection. Next, we analyze resistivity structure using a marine DC resistivity sounding data in the real ocean environment off Sado area, in Japan sea. The main purpose of the real-field test is for discussion whether accurate imaging of the methane hydrate is achieved or not.

In the forward modeling to test sensitivity of marine DC resistivity sounding, we assume a high resistivity block (50 Ohm-m) as imitation of the methane hydrate layer below the seafloor. If the towed cable height above the seafloor is lower than 100 m, the apparent resistivity is higher than the sea water's value. Therefore, apparent resistivity acquired near the seafloor is affected by not only sea water, but also the sediment below the seafloor. Next, as the top boundary of the high resistivity layer becomes shallower, the apparent resistivity becomes higher and higher. This correlation implies that the top boundary of the methane hydrate layer can be imaged well. The side boundary of the high resistivity layer below the seafloor makes anomalous apparent resistivity near the boundary higher than one on the 1D structure. Therefore, the 2D or 3D imaging of the methane hydrate layer using marine DC resistivity sounding will be possible.

Then, real-field experiments of the marine DC resistivity sounding are carried out. We acquired time series of the source electrical current and the received potential field off Sado area, Japan Sea. This area is so nice for the field test because the massive hydrate is recognized by the piston core sampler and the deep-tow camera. The best-fitting 1D resistivity models are estimated from comparison between observed and calculated data by an inversion procedures. As a result, columnar resistivity anomalies higher than 100 Ohm-m are recognized. Resistivity of the surrounding area around the columnar anomalies is approximately 1-2 Ohm-m in the shallow depth, and is approximately 10 Ohm-m in the deeper part. The anomalous area in the resistivity model corresponds with the massive hydrate site. We conclude that these columnar resistivity anomalies are related to the massive hydrate. On the basis of these results from numerical and field tests, the marine DC resistivity sounding is a reliable method for detecting methane hydrate distribution.