

Acoustical Surveys of Methane Plumes by Using the Quantitative Echo Sounder in the Sea of Japan

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Research and Training Vessel Umitaka-maru sailed to the methane seep area on a small ridge in the eastern margin of the Sea of Japan on July to August 2004 to survey the ocean floor gas hydrate and related acoustic signatures of methane plumes by using a quantitative echo sounder. Detailed bathymetric profiles have revealed a number of mounds, pockmarks and collapse structures within 3km x 4km on the ridge at the water depth of 910m to 980m.

We mapped minutely methane plumes by using a quantitative echo sounder with positioning data from GPS. We also measured averaged echo intensity from the methane plumes both in every 100m range and every one minute by the echo integrator.

We obtained the following results from the present echo-sounder survey.

1) We checked 36 plumes on echogram, ranging 100m to 200m in diameter and 600m to 700m in height, reaching up to 200m to 300m below sea level.

2) We measured the averaged volume backscattering strength (SV) of each methane plume. The strongest SV, -45dB, of the plumes was stronger than SV of fish school.

3) Averaged SV tend to show the highest values around the middle of plumes, whereas the SVs are relatively low at the bottom and the top of plumes.

4) Some of the plumes were observed to show daily fluctuation in height and width.

5) We recovered several fist-sized chunks of methane hydrate by piston coring at the area where we observed methane plumes.

As a following up project, we are planning to measure SV of methane bubbles and methane hydrate floating in water columns through an experimental study in a large water tanks.