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A FUNDAMENTAL EXPERIMENT ON DETECTION OF SEA ICE THICKNESS BY UHF WAVES (ABSTRACT)

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The authors are endeavoring to study radar for detecting sea ice thickness which will help icebreakers transit ice-covered waters, and which makes use of ice thickness observations near the coasts of Arctic and Antarctic regions.

It has been reported by K. IIZUKA and A.P. FREUNDOLFER (J. Appl. Phys., **56**, 2572, 1984) that the most useful type of radar to detect sea ice thickness is a step frequency one that sweeps over a wide bandwidth of UHF waves. We constructed a step frequency radar for detecting sea ice thickness and verified its capabilities.

The radar transmitting signal is composed of 256 step signals that sweep in the frequency range from 200 MHz to 956 MHz in 3 MHz steps. The measurement device detects the amplitudes and phases of the reflected signals of each step returned from targets in the sensing direction. The data measured at 256 steps are combined amplitude and phase to make a set of complex values on each step and are transformed by FFT to obtain the reflected power spectra in relation to radar range. The obtained spectral peak shows the position of a target such as the bottom of the detected ice.

We did experiments to verify the capability of the radar in a cold room and in an ordinary laboratory and obtained the following results.

1) An experiment in which the model sea ice (1 m×2 m×thickness 0.5 m) was measured by the radar in a cold room revealed that observing from the resultant spectra simply transformed by FFT it is difficult to distinguish the ice bottom spectrum from many other reflection spectra caused by metal walls, floor and ceiling.

2) An experiment in which the model sea ice (0.6 m×0.9 m×thickness 0.3 m)was floated in a wooden tank was done with the radar in an ordinary laboratory. The obtained spectral peak of the ice bottom was not so large but could be distinguished from other reflections.

We intend to produce a more effective radar by upgrading the measuring and processing devices and hope to measure the thickness of real sea ice.

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