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ONLINE ISSN : 1881-1760

PRINT ISSN : 1880-3717

Journal of the Japan Society of Naval Architects and Ocean Engineers

Vol. 6 (2007) pp.65-73

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Water Surface Wave Observation by using Microwave Doppler Radar in Experimental Basin

[Chang-Kyu Rheem](#)

(Accepted October 15, 2007)

Summary: A water surface wave observation method to use Doppler velocity of the microwave backscattering from water surface has been proposed. Water surface waves were observed by using a X-band CW microwave Doppler radar in an experimental basin. The observed waves by the radar were compared with the waves measured by an electric capacitance type wave gauge. There was very high correlation between the wave shapes measured by the wave gauge and observed by the radar. The results verified that the water surface wave observation method to use Doppler velocity of the microwave backscattering from water surface is useful for observation of a water surface wave. The ratio of a microwave irradiation width on water surface and a wavelength of water surface wave, and the orbital velocity of a water surface wave are important parameters to determine the wave height accuracy on water surface wave observation by a radar. The orbital velocity of a water surface wave becomes faster, and the wavelength becomes larger than the microwave irradiation width on water surface, the observation accuracy of wave height by a radar is improved. When an angle of direction that is an angle between the direction of microwave radiation and the direction of wave propagation changes, the phase difference between the waves observed by radar with disregarding the angle of direction and measured by wave gauge changes. By use the relation between an angle of direction and a phase difference of waves observed by a radar and measured by a wave gauge, wave direction can be determined.

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To cite this article:

Chang-Kyu Rheem: Water Surface Wave Observation by using Microwave Doppler Radar in Experimental Basin , Journal of the Japan Society of Naval Architects and Ocean Engineers, (2007), Vol. 6, pp.65-73 .

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