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Observation of wave propagation in ice using stereo imaging in the Sea of Okhostk

Alberto Alberello[1], Takehiko Nose[1], Tsubasa Kodaira[1], Keita Nishizawa[1], Filippo Nelli[2], Takenobu Toyota[3], and Takuji Waseda[1]

[1]Graduate School of Frontier Science, The University of Tokyo
[2]Department of Infrastructure Engineering, The University of Melbourne
[3]Institute of Low Temperature Science, Hokkaido University

Sea ice seasonally covers the Sea of Okhotsk, a marginal Arctic basin nested between Russia and Japan, but its extent is predicted to decrease by 40% by 2050 leaving larger ice free areas over which waves can form. In the highly dynamical seasonal ice zone, i.e. where waves and ice interact, ice formation and breakup, and wave attenuation mutually affect each other via complex feedback mechanisms. To shed light into these interactions, wave measurements were conducted in the winter seasonal ice zone in the Southern Okhotsk Sea, North of Hokkaido, from onboard the P/V Soya using a stereo camera system. Data show that wave energy penetrates even in high ice concentration (>85%), where contemporary wave models predict complete attenuation of wind waves. Consistently with physical experiments and field observations of waves in the Arctic and Antarctic marginal ice zones, the measurements also show that the ice cover is more effective in attenuating short wave components and, consequently, the dominant wave period in ice is significantly increased compared to corresponding open ocean waves. The present data can inform calibration of wave models in the rapidly evolving seasonal ice zone in the Sea of Okhotsk.