Geophysical Research Abstracts
Vol. 18, EGU2016-10356-1, 2016
EGU General Assembly 2016

Investigation of the foam influence on the wind-wave momentum exchange and cross-polarization microwave radar return within laboratory modeling of atmosphere-ocean boundary layer

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The effect of foam presence on the transfer processes and the parameters of the surface roughness within the laboratory simulation of wind-wave interaction was carried out on the Thermostratified Wind-Wave Tank (TSWiWaT) IAP, using a specially designed foam generator. The parameters of air flow profiles and waves elevation were measured with scanning Pitot gauge and wire wave gauges respectively in the range of equivalent wind speed U10 from 12 to 38 m/s (covering strong winds) on the clean water and with foam. It was shown that the foam reduces the amplitudes and slopes of the waves in comparison with the clean water in the hole range of wind speeds investigated, and the peak frequency and wave numbers remain almost constant. The drag coefficient calculating by profiling method demonstrated similar behavior (almost independent on U10) for case of foam and increased compared with clear water, particularly noticeable for low wind speeds. Simultaneously the investigations of influence of the foam on the peculiarity of the microwave radio back scattering of X-diapason was investigated. These measurements were carried for different sensing angles (30, 40 50 degrees from vertical) and for four polarizations: co-polarized HH and VV, and de-polarized HV and VH. It was shown that foam leads to decrease of specific radar cross section of the wavy surface in comparison with clean water.
The work was supported by the Russian Foundation for Basic Research (grants No. 15-35-20953, 14-05-00367, 16-55-52022) and project ASIST of FP7. The experiment is supported by Russian Science Foundation (Agreement No. 15-17-20009), radilocation measurments are partially supported by Russian Science Foundation (Agreement No. 14-17-00667).