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Air–sea interaction in a coastal zone: The results of the CAPMOS'05 experiment on an oceanographic platform in the Black Sea

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ABSTRACT

The paper presents the results of the experiment CAPMOS'05 performed at an offshore oceanographic platform in the Black Sea during June, 2–20, 2005. The experiment was aimed at air–sea coupling investigations by means of direct and remote measurements with radiometers and microwave radar. A specialized research platform managed by the Marine Hydrophysical Institute is located on the shelf slope approximately 600 m to the south of Crimea coast, Ukraine. The sea depth at the site is about 30 m, so the deep water and long fetch conditions were ensured for prevailing winds from the south, south-east and south-west. The mean wind speed during the experiment ranged from 0 to 13 m/s; two episodes of high wind speeds were observed, with gusts well above 20 m/s. Spectral parameters of wind and waves were estimated from direct and remote measurements. The peak frequency of the wind retrieved from radar measurements varied from 0.002 to 0.007 Hz, corresponding to wavelengths between 500 and 7000 m. The spectral peak frequency of gravity waves varied in the range from 0.2 to 0.7 Hz that corresponded to dominating wave lengths from 50 down to several meters. Comparison of two different techniques of wave spectrum retrieval from radar data, and also comparison of radar and radiometric data shows satisfactory agreement. A novel approach of gravity–capillary spectrum parameters retrieval from angular radiometric measurements was tested. Comparison with several spectrum models published previously by various researchers shows certain disagreement. The retrieved curvature of high-frequency part of spectrum exceeds that of the models whereas the spectral density of long waves is below the one predicted by any other model.

1. Introduction

Satellite-based measurements are broadly used in modern oceanographic research. Remote sensing satellites provide data for global operational monitoring of ocean and atmosphere. Accuracy and consistency of remote sensing data depend on the quality of models, which relate geophysical parameters to the parameters of electromagnetic waves emitted/scattered by natural environment. Detailed and highly accurate measurements are necessary for developing and testing of these models.

Offshore platforms provide a unique opportunity to perform long-term measurements of oceanic and atmospheric parameters in a fixed position using various kinds of remote and contact sensors (Keller and Plant, 1990; Camps et al., 2002).

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