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Air–sea interaction under low and moderate winds in the Black Sea coastal zone

Irina Repina[a,b,c], Arseny Artamonov[a], Alexander Chukharev[d], Igor Esau[e,f], Yury Goryachkin[d], Alexey Kuzmin[b], Michael Pospelov[b], Ilya Sadovsky[b,g] and Mikhail Smirnov[h]

[a] A. M. Obukhov Institute of Atmospheric Physics RAS, Pyzhevski per. 3, 119017 Moscow, Russia; repina@ifaran.ru
[b] Space Research Institute, Profsoyuznaya Str. 84/32, 117997 Moscow, Russia
[c] Russian State Hydrometeorological University, Malookhtinsky prospect 98, 195196 Saint-Petersburg, Russia
[d] Marine Hydrophysical Institute NASU, Kapitanskaya St. 2, 99011 Sevastopol, Ukraine
[e] Nansen Environmental and Remote Sensing Centre, G. C. Rieber Climate Institute, Thormøhlens gate 47, N-5006 Bergen, Norway
[f] Centre for Climate Dynamics (SKD), Allegaten 70, N-5007 Bergen, Norway
[g] Vladimir State University, Gorkogo 87, 600000 Vladimir, Russia
[h] A. V. Kotelnikov Institute of Radioengineering and Electronics RAS, Vvedensky Sq. 1, 141120 Fryazino, Moscow region, Russia

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Abstract. This paper reports the results of field experiments performed at an offshore oceanographic platform in the Black Sea during spring and fall seasons 2005–2011. Observations of the air-sea interaction were made using direct and remote sensing methods in the coastal zone where the interaction is complex and still poorly understood. A specialized research platform, managed by the Marine Hydrophysical Institute (MHI), is placed on the shelf slope approximately 600 m offshore the Crimea coast, Ukraine. The water depth at the site is about 30 m. The experiment program included conventional turbulence measurements with the eddy-covariance method as well as remote radio-polarimetric measurements with a newly developed instrument. The study was concentrated on the air-sea interaction during episodes of weak wind in the atmosphere and upwelling events in the ocean. Analysis of the collected data confirmed significant dependence of the surface drag coefficient on the air-sea temperature difference under weak wind conditions. However, this analysis also demonstrated a new air–sea interaction regime, which is characterized by large quasi-periodic (periods about 3.5 h) turbulence oscillations developing initially in the atmosphere and later (after about 10–12 h) in the sub-surface water layer. The analysis of radio-polarimetric measurements provided the characteristics of the gravity-capillary wave field during these events.

Key words: coastal zone, atmospheric boundary layer, sea drag coefficient, gravity-capillary wave, radio-polarimetric measurements.