Geophysical Research Abstracts,
Vol. 11, EGU2009-647-1, 2009
EGU General Assembly 2009

A field study of "lambda distribution" for breaking wave crests

V. Dulov and A. Mironov

Marine Hydrophysical Institute, Sevastopol, Ukraine (dulov1952@gmail.com)

"Lambda distribution" concept introduced by Phillips (1985) provides a way to link wind wave spectra and numerous important measures of the air-sea interface processes related to wave breaking. Production of sea drops in the near water atmospheric layer (Kudryavtsev, 2006), radar backscattering due to wave breaking (Phillips, 1988, Kudryavtsev et al., 2003), turbulent mixing in the uppermost sea layer (Kudryavtsev et al., 2008) and other phenomena were recently studied on the basis of this approach. In this connection experimental investigations of the key theoretical quantity, $\Lambda(c)dc$, the average length of breaking crests per unit area propagating with speeds in the range (c, $c + dc$), and its dependence on wave spectra are of obvious importance.

An experimental study of $\Lambda(c)$ was performed during three field campaigns (2003, 2005 and 2008) on the Black Sea research platform of Marine Hydrophysical Institute (National Academy of Sciences of Ukraine). Simultaneous recordings of wave breaking measures (with video camera) and wave 2D-spectra (with an array of resistance wave staffs) were obtained under variety of wave conditions at wind speed 4-20m/s. A special method was developed to evaluate geometrical and kinematical whitecap parameters including their vectors of advance velocity. Individual whitecaps corresponding to active phase of wave breaking (phase A) were extracted from video recordings of the sea surface practically without human influence on the process of data processing because the method is based on physical considerations of sea surface brightness and empirical information on whitecap dynamics. Estimations of $\Lambda(c)$ were derived from data obtained.

Spectral energy dissipation rates were evaluated from the wave spectra and from the $\Lambda(c)$ in accordance with Phillips approach (1985). Their comparison for every experimental run exhibits poor agreement, but a good agreement was found for integral dissipation rates for all data. Value of Phillips theory constant, "b", estimated from our data is in disagreement with other authors' estimates on the orders of value, but our estimate are in a good agreement with value proposed by Phillips (1985).

This work was supported by the EU under the projects INTAS 05-1000008-8014, INTAS/ESA 06-1000025-9264 and Contract # SST5-CT-2006-031001 (MONRUK) of FP6.