Geophysical Research Abstracts
Vol. 13, EGU2011-4389, 2011
EGU General Assembly 2011

A Field Study of 2D-Wavenumber Spectra of Short Wind Waves

Vladimir Dulov and Maria Kosnik
Marine Hydrophysical Institute, Sevastopol, Ukraine

A new approach to evaluation of the spectra of short wind waves in field conditions was developed on the basis of stereo photography. Spectra extracted from stereo pairs of the sea surface were used for the absolute calibration of the slope spectra obtained with Fourier-processing of the same high resolution photo images. This procedure extends significantly the range of scales of stereo-retrieved waves toward shortest ones which principally cannot be resolved using traditional stereo method.

Experimental studies were performed in 2009 and 2010 at the Research Platform of Marine Hydrophysical Institute in the Black Sea coastal zone. Dozens of image series of the sea surface consisting of 50-80 stereo photographs were obtained and processed using new procedure. As a result, a set of two-dimensional spectra in the range of 6 mm - 30 cm wave lengths for wind speeds from 4 to 15 m/s was derived.

Saturation spectra $B = k^4 E$ were considered, where E is the surface elevation spectrum, and their wind dependence was evaluated in the form of AU^a. In the range of short gravity waves the omnidirectional B is practically independent of wind speed. The wind exponent a gradually increases in approaching to the area of phase velocity minimum. The strongest wind dependence is observed for waves of 1-2 cm wavelengths, where the spectrum level is proportional to $U^{1.5}$. For shorter waves the wind exponent is smaller.

A presence of a “dip” on the saturation spectrum in the area of phase velocity minimum was clearly confirmed. This dip was observed in laboratory conditions (Cox, 1958, Zhang, 1995) and explained as a result of three-wave interactions in numerical modeling of spectra (Dulov, Kosnik, 2009). In the field conditions, the dip is explicitly presented at low winds and filled out at higher winds.

A way to improve spectral modeling on the basis of data obtained will be also discussed.