Geophysical Research Abstracts, Vol. 8, 00469, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00469

Short wave/long wave interaction and amplification of decimeter-scale wind waves in film slicks

S. Ermakov

Institute of Applied Physics, Russian Academy of Sciences, Nizhny Novgorod, Russia

An effect of amplification of decimeter-scale wind waves in marine slicks was revealed in field experiments, where it was shown that the spectrum intensity of wind waves with wavelengths from about 40 cm to 1 m was larger in the presence of organic films than on a clean water surface (see, Ermakov et.al., 1986, 1987).

Interaction between long and short gravity wind waves is analysed to explain this effect. It is shown that in the equations for long waves an additional term appears which is proportional to a temporal derivative of the energy of short waves. Variations of the short wave energy are described by the kinetic equation for the spectrum of short waves on the long wave orbital velocity currents. Relaxation of short wind waves results in damping of long waves, and an expression for the damping coefficient of long waves is obtained. The damping of long waves is analysed for the cases of short wind waves on clean water surface and in the presence of elastic organic films. It is shown that strong depression of centimeter-scale wind ripples in organic slicks leads to reduction of the damping coefficient of decimeter-scale waves, and, therefore, to larger intensities of these waves compared to the case of clean water surface. The effect of amplification of the spectrum intensity of decimeter-scale waves in slicks is estimated using a simple model of local energy balance of wind waves (see, e.g., Donelan&Pierson, 1987), and the obtained spectrum contrasts are shown to be in reasonable agreement with experimental results. The work has been supported by RFBR (Projects 05-05-64137, 04-05-64763) and INTAS (Project 03-51-4987 “SIMP”).