Geophysical Research Abstracts
Vol. 14, EGU2012-3278, 2012
EGU General Assembly 2012

Swell-Dissipation Function for Wave Models

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In the paper, we will investigate swell attenuation due to production of turbulence by the wave orbital motion.

Theoreticaly, potential waves cannot generate the vortex motion, but the scale considerations indicate that if the steepness of waves is not too small, the Reynolds number can exceed the critical values. This means that in presence of initial non-potential disturbances the orbital velocities can generate the vortex motion and turbulence. This problem was investigated by laboratory means, numerical simulations and field observations.

As a sink of wave energy, such dissipation is small in presence of wave breaking, but is essential for swell. Swell prediction by spectral wave models is often poor, but is important for offshore and maritime industry, and across a broad range of oceanographic and air-sea interaction applications. Based on the research of wave-induced turbulence, new swell-dissipation function is proposed. It agrees well with satellite observations of long-distance swell propagation and has been employed and tested in spectral wave models.