Geophysical Research Abstracts,
Vol. 10, EGU2008-A-12205, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-12205
EGU General Assembly 2008

Effect of surface waves on the determination of momentum fluxes

L. Grare(1), J.P. Giovanangeli (1), H. Branger (1)
(1) IRPHE, CNRS, Marseilles, France

The Inertial-Dissipation method (IDM) and the Eddy Correlation Method (ECM) are usually used in laboratory or open field experiments to estimate the momentum fluxes at the air-sea interface. Effects of surface waves on the kinetic energy balance equation and its consequence on the estimation of momentum fluxes have been pointed on by different authors (Donelan et al (1997), Janssen (1999), Drennan et al (1999)). The analytical model of Janssen is based on the concept of potential wave induced motions and suggests that, in the presence of surface growing waves, the IDM can underestimate the momentum flux. In situ experiments show that IDM and ECM do not agree in presence of swell or close to the surface for pure wind waves.

We present here the results of a series of experiments conducted in the large wind-wave tank at IRPHE (Marseille). A complete experimental set-up was used in order to measure the downstream and the vertical velocities in air flow, the air-flow pressure fluctuations and the instantaneous deflections of the air-water interface. Momentum fluxes and kinetic transport terms were determined for different wind and wave conditions.

The results show that close to the surface in presence of waves, the two methods do not agree i.e. the IDM underestimates the momentum flux. This is due to the non-zero value of the kinetic transport term. Above the Wavy Boundary Layer the two methods collapse. Moreover, in absence of waves (experimental run with a floating coat located at the interface) the IDM and the ECM agree because the transport term is equal to zero. Effects of background waves on fluxes are quantified.