Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01293, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01293
EGU General Assembly 2008

Effect of wind-wave-current interaction on air-sea momentum and TKE fluxes and ocean response to hurricanes

T. Hara (1), Y. Fan (1) and I. Ginis (1)
(1) University of Rhode Island, USA

The momentum and turbulent kinetic energy (TKE) fluxes into subsurface currents are important boundary conditions for oceanic modeling. Traditionally, ocean models parameterize these fluxes in terms of the 10-meter wind speed using a bulk formula based on the following two assumptions: (1) The momentum and TKE fluxes are independent of the sea state; (2) The momentum and TKE fluxes from wind are identical to those into subsurface currents, that is, no net momentum (or energy) is gained (or lost) by surface waves. However, these assumptions are not valid when the surface wave field is not fully developed. The main objective of this paper is to investigate the effect of surface gravity waves on the energy and momentum transfer budget across the air-sea interface under medium to high wind conditions. Specifically, we focus on the difference between the TKE/momentum fluxes from wind and those into currents. By using a coupled wind-wave-current model we examine time dependent and fetch dependent conditions under steady uniform wind forcing, as well as more complex wind conditions in tropical cyclones where the surface wave field is fast varying is space and time. The wave-current interaction significantly reduces momentum flux into the currents in the rear-right quadrant of the hurricane and consequently weakens the ocean response to the hurricane.