Geophysical Research Abstracts
Vol. 13, EGU2011-4472-1, 2011
EGU General Assembly 2011

Sea state modelling from the global ocean to the beach and coupling with coastal circulations

Fabrice Ardhuin (1), Aron Roland (2), Jean-François Filipot (1), and Fabien Leckler (1)

(1) Laboratoire d'Océanographie Spatiale, IFREMER, Plouzané, France (ardhuin@shom.fr), (2) Institute for Hydraulic Engineering and Water Resources Management, T. U. Darmstadt, Germany (aaronroland@gmx.de)

Today's numerical wave models are least accurate in swell-dominated contitions and in coastal environments, in particular in enclosed basins. Recent development have brought considerable improvements in swell-dominated conditions thanks to a better understanding of swell energy dissipation (Ardhuin et al. Geophys. Res. Lett. 2009) and work is ongoing to also correct biases on the spatial distribution of swell fields (Delpey et al., J. Geophys. Res. 2010). The coastal areas present several challenges in terms of forcing fields (winds and currents), numerical constraints (high resolution needed at the shoreline) and still poorly represented physical processes (wave breaking, bottom friction). We present here ongoing work based on unstructured grid modelling of coastal environments on the French coasts using the future version (4.xx) of the WAVEWATCH III code to be released in 2011 or 2012 by NCEP, and jointly developed at Ifremer and T.U. Darmstadt as particular as part of a large U.S. National Ocean Partnership Program and E.U. FP7-ERC project "IOWAGA" (http://wwz.ifremer.fr/iowaga). The model results are particularly investigated in terms of important variables for wave-current coupling. These include the surface Stokes drift which is found to be very sensitive on the shape of the wave spectrum at high frequencies (Ardhuin et al., J. Phys. Oceanogr. 2009), and which can be estimated from wave spectra measured by ocean buoys. We also investigate in details the quality of modelled wave spectra in intermediate water depths such as the English Channel, Southern North Sea and U.S. East Coast where details of both bottom friction and wave breaking paramaterizations can have a strong influence on the model solutions. It is found that a movable-bed bottom friction that uses known sediment characteristics can provide accurate results when combined with physically-based parameterizations of wave breaking. Other parameters needed for wave-current coupling are still uncertain, such as the underwater roughness length (e.g. Gemmrich et al., J. Phys. Oceanogr. 2009; Rascle and Ardhuin J. Geophys. Res. 2009) which points to future investigations of processes at the air-sea and water-sediment interfaces.