Geophysical Research Abstracts
Vol. 13, EGU2011-4955, 2011
EGU General Assembly 2011

Validation of numerical waves models in strong currents, a tribute to Owen Phillips.

Fabrice Ardhuin (1) and Aron Roland (2)

(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). Here we analyse in detail the behaviour of waves over strongly varying current from the laboratory scale (Lai et al., J. Geophys. Res. 1989) to the coastal ocean, using the best possible numerical schemes and
field observations from the French Atlantic coast with incoming significant wave heights up to 12∼m and tidal currents exceeding 3 m/s in some places. It is found that both the conservative (refraction and 'bunching') and dissipative effects play an important role. As ancitipated by Phillips (J. Phys. Oceanogr. 1984), a non-linear dissipation term can provide a good reproduction of observed tidal-induced modulations of wave heights and periods, where more traditional forms (e.g. Bidlot et al., Tech. Rep. 2005) suffer from unphysical steepness definitions.
We also find that the directional spreading of waves is systematically and strongly underestimated in the presence of strong currents. We attribute this effect to a non-modeled scattering of waves.