ATMO-WAVE-OCEAN interactions NEMO WORKING GROUP

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Abstract

Understanding the relevance of Atmosphere-Wave-Ocean exchanges processes and their roles in driving the ocean circulation at both coastal and global scales, the NEMO consortium has decided to dedicate specific effort to address this issue, creating a Working Group with the specific goal to identify required actions and models developments.

There are many processes occurring at the interface between the Atmosphere and the Ocean. We focus our attention on the Wave-Atmosphere-Ocean coupling. In particular the working group will explore the way in which surface gravity waves can influence the ocean circulation. Waves influence the ocean circulation at least through several different mechanisms. During the first WG meeting these mechanisms have been discussed and prioritized. The resulting list follows:

1. Computation of the Stokes drift currents to be coupled with the ocean hydrodynamics;
2. Enhancement of upper ocean mixing through the wave-induced mixing by breaking and non-breaking waves;
3. Modification of the wind stress due to surface roughness;
4. Modification of the ocean hydrodynamics through large scale wave-current interaction introducing sorce and sink terms deriving from wave induced motion;
5. Modification of the bottom roughness and thus the bottom shear stress
6. Radiation stresses effects in shallow waters;
7. Sea-Ice – Wave interactions.

The first point is concerned with the different approximations to the full Stokes drift currents due to a given wave spectrum. The second point involves the parameterizations of the wave-induced vertical mixing. The third point is usually addressed considering parameterizations of the surface drag coefficient that can consider the sea surface roughness provided by a wave model. The fourth point is handled by re-defining the primitive equations to contain also Stokes drift effects. The

fifth point addresses the parameterization of the interaction between the orbital velocity of the waves and the bottom velocities from the OGCM. The sixth point studies the radiation stresses in shallow water and their coupling with the hydrodynamics crucial in the setup of the coastal sea level. Finally, the seventh point is concerned with the eave effect on the sea ice.