# Development of a fully coupled wave-current interaction model. The POLCOMS-WAM system.

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Momentum transfer due to wind on the ocean surface not only generates surface waves, it also generates ocean currents. Due to the spatial and time scales of ocean and shelf sea applications and due to the randomness of the turbulent and the wave induced motions involved, only integrated (in time and space) effects of turbulence and waves on the mean motion can be taken into account. [Mellor, 2003; 2005], [Rascle et al., 2006], a.o. have worked on a consistent physical framework to describe the dynamics of the system. A more consistent treatment of the interaction between waves and currents may improve our ability to deal with dispersion and transport of particles such as pollutants, larvae, etc. and would therefore also be of particular interest in ROFI (Regions Of Fresh water Influence) environments.

From a practical point of view, such a framework can be brought into practice if it can be filled largely with existing codes. Therefore after presenting briefly this physical framework, the approach for the practical implementation using a fully coupled spectral wave model (WAM) and a 3D circulation model (POLCOMS) will be outlined and some of the practical difficulties will be highlighted. Finally an illustration will be given for the microtidal environment of the Catalan Coast, where due to oceanographic properties currents are typically less than 20 cm/s and modification of waves due to the effect of currents is expected to be small. However, the wave induced currents, due to Stokes' drift processes and enhanced wind drag due to waves, may produce a current of about the same order of magnitude as the ambient one and thus become an important source of mass transport.

## REFERENCES

Mellor, G., 2003. The three-dimensional current and surface wave equations. Journal of Physical Oceanography, 33, 1978-1989

Mellor, G., 2005. Some consequences of the three-dimensional current and surface wave equations. Journal of Physical Oceanography, 35, 2291-2298.

Rascle, N., F. Ardhuin and E. A. Terray, 2006. Drift and mixing under the ocean surface: A coherent one-dimensional description with application to unstratified conditions, Journal of Geophysical Research-Oceans, 111(C03016).