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Shape optimization of a sandy coast with the wave refraction-diffraction REFDIF model coupled to the BMO optimizer (Gulf of Aigues-Mortes, NW Mediterranean sea, France)

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The REFDIF program developed by Kirby \& Dalrymple (1984) at CACR describes well the propagation of water waves over a weakly irregular seabottom, taking into account shoaling, refraction, diffraction and energy dissipation. REFDIF may correctly model the global wave-induced hydrodynamics along a mild-slope sandy coast like that of the Gulf of Aigues-Mortes (NW Mediterranean sea, France).

The global semi-deterministic algorithm BMO is a shape optimizer program developed at University Montpellier II (reference). Shape optimization belongs to inverse problem category in numerical analysis. It means that once satisfactory simulation tools are developed enough, they may be used in an inverse way like a help tool for the design of structures: given, for instance, a modelled flow around a plane wing, a shape optimizer program determines the best possible wing shape with respect to a given set of physical criteria.

The REFDIF program was coupled to the BMO optimizer to determine the better shape of a sandy coast (from 30m water depth to the surf zone) at different scales with respect to several sets of physical criteria. Preliminary results are presented and show that the coupled BMO/REFDIF model may be used to determine seabottom shape that 1) minimize the wave amplitude over the domain, 2) minimize the Stokes drift over the domain, 3) optimize a specific wave angle over the domain. The detailed methodology (cost functions choice, ...) that the coupled model uses for these different

cases is described.