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# High resolution numerical wave propagation in coastal area : benefits in assessment of the marine submersion

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Many numerical models based on equation of action conservation ($N = E/\sigma$) enables the simulation of sea states (WAM, WW3,...). They allow through parametric equations to define sources and sinks of wave energy ($E(f, \sigma)$) in spectral form. Statistics of the sea states can be predicted at medium or long term as the significant wave height, the wave pic direction, mean wave period, etc. Those predictions are better if initials and boundaries conditions together with 10m wind field are well defined. Basically the more homogeneous the marine area bathymetry is the more accurate the prediction will be.

Météo-France for French West Indies and French Guiana (MF-DIRAG) is in charge of the safety of persons and goods tries to improve knowledge and capacity to evaluate the sea state at the coast and the marine submersion height using among other statistical methods (as return periods) and numerical simulations. The area of responsibility is large and includes different territory, type of coast and sea wave climate.

Up today most part of the daily simulations were done for large areas and with large meshes ($10\,km$). The needs of more accurate values in the assessment of the marine submersion pushed to develop new strategies to estimate the level of the sea water on the coast line and therefore characterize the marine submersion hazard.

Since 2013 new data are available to enhance the capacity to simulate the mechanical process at the coast. High resolution DEM **Litto 3D** for Guadeloupe and Martinique coasts with grid-spacing of $5\,m$ up to $5\,km$ of the coast are free of use.

The study presents the methodology applied at MF-DIRAG in study mode to evaluate effects of wave breaking on coastline. The method is based on wave simulation downscaling form the Atlantic basin to the coastal area using MF-WAM to an sub kilometric unstructured WW3 or SWAN depending to the domain studied. At the final step a non-hydrostatic wave flow as SWASH is used on the coast completed by an analytical method based on Stockdon *et al.* 2006 to validate the water level estimation. The water circulation due to storm surge and tide is at this point computed separately with an oceanic model including a coastal configuration and only used as an input in the wave models.

The method is testing on two documented hurricane events (Dean 2007 and Omar 2008), results, accuracy and computation cost are presented. A special attention is brought to wave breaking simulation on coast of small to medium slope.