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A method to evaluate the generation area of local wave climate

Jorge Perez, Fernando Mendez, and Melisa Menendez
Environmental Hydraulics Institute "IH-Cantabria", Marine climate and climate change, Santander, Spain (perezgj@unican.es)

The description of wave conditions at a local scale is of paramount importance for off-shore and coastal engineering applications (maritime works, ship design and route definition, offshore structures design, harbours operability). However, wave characteristics at a specific location cannot be fully understood studying only information of such location. They are the integrated result of the dynamics of the ocean surface over an area of influence. The goal of this work is to provide a methodology to easily characterize the area of influence of any particular ocean location in the world.
The method is based on a global scale analysis using both geographic and oceanographic criteria. The geographic criterion relies on the realistic assumption that deep water waves travel along great circle paths, taking into account the spherical shape of the Earth. This allows limiting the study area by neglecting energy that cannot reach a target point, as its path is blocked by land. The oceanographic criterion is applied to global wave reanalysis data (Reguero et al., 2012), considering different spectral parameters such as mean direction, directional spread, wave energy period and energy flux, and taking into account in its specific location, the fraction of energy of the directional sector that travels towards the target point. A better understanding of the spatial generation and propagation area and an estimation of the time span the waves take to arrive to the target point is obtained.
We have applied the methodology worldwide to obtain detailed maps of the relative importance of different oceanic areas to the climate of any location. Results show important spatial patterns that cannot be inferred from local parameters and validation with different climate analysis of other authors (Izaguirre et al., 2012; Alves et al., 2006) confirm the robustness of the method. This methodology facilitates enormously the study of wave generation area that induces local wave climate.