EMS Annual Meeting Abstracts
Vol. 11, EMS2014-646, 2014
14th EMS / 10th ECAC

A Framework for Regional Wind-Wave Climate Scenarios

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In recent years, the impact of climate change on sea surface waves has received more attention by the climate community (Hemer et al., 2013). Indeed, ocean waves reaching the coast play an important role in several processes concerning coastal communities, such as inundation or erosion. However, regional downscalings of these oceanic waves at rather high spatial resolution have received less attention. This work presents a general framework for regional wave climate scenarios focused in the European region.

The presented work takes into account considerations to define the spatial domain, the development of statistical downscaling methods, the multivariate wave climate and the skill of statistical versus dynamical approaches. The selection of the spatial domain to achieve a regional wave downscaling can be complex due to local coastal waves are the integrated result of the dynamics of the ocean surface over a region of influence. A new technique to estimate the spatial domain is presented (Perez et al., 2014). Dynamic downscaling, based on the use of numerical wave generation and propagation models, is perhaps the most widely used methodology. An alternative approach is statistical downscaling that can be conducted by means of regression methods or weather pattern-based approaches. Here, a weather-type statistical downscaling for ocean wave climate is presented (Menendez et al. 2012). Wave downscalings are usually limited to climate projections of significant wave height parameter of the sea-state, nevertheless, wave height is not the only variable of concern to deal with wave climate processes. Other sea state parameters (e.g. peak period, mean wave direction) are required to analyze climate change effects. Finally, the application of this framework is shown through the resulting regional wave climate projections on the European Atlantic region.