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Probabilistic Climate Change Projections of Nearshore Wave Climate

M. Menendez, J. Perez, F.J. Mendez, and I.J. Losada
Environmental Hydraulics Institute "IH-Cantabria". Universidad de Cantabria, Santander (Spain).

The characterization of local wave climate in a particular location is of paramount importance for the estimation of coastal flooding. Downscaling is the method to obtain wave climate information at high spatial resolution from relatively coarse resolution. 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.
The main advantages of the statistical against the dynamical approach are the ease of implementation and the low computational requirements. Moreover, the statistical downscaling allows the reconstruction of local wave climates from multiple runs of several Climate Models. Therefore, the estimation of a multi-model local wave climate for a probabilistic climate change projection is possible.
We propose a statistical downscaling method, Y=f(x), based on the local wave characteristics (predictand) which are conditioned to a particular synoptic-scale weather type (predictor). The selected predictor is the n-days-averaged sea level pressure anomaly (SLP). The downscaling relies on the correspondence between local sea-state parameters and weather types (Menendez et al., 2011).
The method has been validated by using a high-resolution near-shore wave reanalysis in the Spanish Coast. The near-shore reanalysis is achieved by means of a hybrid approach based on statistical (calibration procedures, selection algorithms and multidimensional interpolation schemes) and dynamic downscaling (SWAN propagations), following Camus et al (2011) methodology.
Finally, multivariate wave climate parameters (significant wave height, mean period, mean direction and energy flux) for a specific location under several scenarios have been projected by using an ensemble approach.

References

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