Geophysical Research Abstracts,
Vol. 11, EGU2009-10243, 2009
EGU General Assembly 2009

Statistical Downscaling in Multi-dimensional Wave Climate Forecast

P. Camus (1), F.J. Méndez (1), R. Medina (1), I.J. Losada (1), A.S. Cofiño (2), and J.M. Gutiérrez (2)

(1) Environmental Hydraulics Institute "IH Cantabria", Universidad de Cantabria, Santander, Spain (camusp@unican.es/+34-942201860), (2) Meteorology & Data Mining Group, Universidad de Cantabria, Santander, Spain

Wave climate at a particular site is defined by the statistical distribution of sea state parameters, such as significant wave height, mean wave period, mean wave direction, wind velocity, wind direction and storm surge. Nowadays, long-term time series of these parameters are available from reanalysis databases obtained by numerical models. The Self-Organizing Map (SOM) technique is applied to characterize multi-dimensional wave climate, obtaining the relevant "wave types" spanning the historical variability. This technique summarizes multi-dimension of wave climate in terms of a set of clusters projected in low-dimensional lattice with a spatial organization, providing Probability Density Functions (PDFs) on the lattice. On the other hand, wind and storm surge depend on instantaneous local large-scale sea level pressure (SLP) fields while waves depend on the recent history of these fields (say, 1 to 5 days). Thus, these variables are associated with large-scale atmospheric circulation patterns.

In this work, a nearest-neighbors analog method is used to predict monthly multi-dimensional wave climate. This method establishes relationships between the large-scale atmospheric circulation patterns from numerical models (SLP fields as predictors) with local wave databases of observations (monthly wave climate SOM PDFs as predictand) to set up statistical models. A wave reanalysis database, developed by Puertos del Estado (Ministerio de Fomento), is considered as historical time series of local variables. The simultaneous SLP fields calculated by NCEP atmospheric reanalysis are used as predictors. Several applications with different size of sea level pressure grid and with different temporal domain resolution are compared to obtain the optimal statistical model that better represents the monthly wave climate at a particular site.

In this work we examine the potential skill of this downscaling approach considering perfect-model conditions, but we will also analyze the suitability of this methodology to be used for seasonal forecast and for long-term climate change scenario projection of wave climate.