Geophysical Research Abstracts
Vol. 14, EGU2012-3720, 2012
EGU General Assembly 2012

Wind wave climate in the Western Mediterranean under climate change scenarios

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In this contribution we investigate the expected changes in the wind wave climate of the western Mediterranean under different scenarios of greenhouse gases (GHG) emissions. The wave fields are modelled with the WAM model at 1/6º of spatial resolution in a domain covering the western Mediterranean basin. The model is forced with the winds obtained from the ARPEGE climate model, which provides 6h wind fields with a spatial resolution of ∼50km. Two simulations are run for the 1960-2000 period in order to assess the quality of model results. The first one is a hindcast, obtained by forcing the wave model with a dynamic downscalling of the ERA40 reanalysis. The comparison between the hindcast and buoy observations shows a good agreement, with averaged correlations larger than 0.85 for significant wave height and mean period. The second simulation is a control run, obtained by forcing the wave model with the outputs of the atmospheric model forced with observed GHG concentrations. A statistical comparison between the control simulation and the hindcast indicates a good performance of the control run in reproducing the wave field variability at different frequency bands.

Once the reliability of the simulations is assessed, three more simulations are run for the 2000-2100 period following the B1, A1B and A2 SRES scenarios. The results obtained for the XXI century indicate an overall decrease in both the significant wave height and the mean period of the wave fields. Those changes are expected to be larger with larger GHGs emissions (A2 scenario) and would be especially marked in winter. Consequently, there would be an overall decrease in the energy flux. Changes in the extreme events are also expected, both in the intensity and in the frequency of the episodes. Changes in 50-years return levels computed for the period 2060-2100 with respect to the control run are highly heterogeneous, with some regions showing an increase in the return levels and others showing a decrease. On average, changes in the 50-years return levels were found to vary by -0.5 m, -0.3 m and 0.1 m under A1B, A2 and B1 scenarios, respectively.