Geophysical Research Abstracts
Vol. 14, EGU2012-14265, 2012
EGU General Assembly 2012

XXI century projections of wind-wave conditions and sea-level rise in the Black sea

A. Polonsky (1), A. Garmashov (1), V. Fomin (1), N. Valchev (2), and E. Trifonova (2)

(1) Marine Hydrophysical Institute, Kapitanskaya, 2, 99011, Sevastopol, Ukraine, (2) Institute of Oceanology (Coastal Zone Dynamics Dep.), Bulgarian Academy of Sciences, 40 Parvi May Str., 9000, Varna, Bulgaria

Projection of regional climate changes for XXI century is one of the priorities of EC environmental programme. Potential worsening of the waves' statistics, sea level rise and extreme surges are the principal negative consequences of the climate change for marine environment. That is why the main purpose of this presentation is to discuss the above issue for the Black sea region (with a strong focus to the south-west subregion because the maximum heights of waves exceeding 10 m occur just here) using output of several global coupled models (GCM) for XXI century, wave simulation, long-term observations of sea level and statistical techniques.
First of all we tried to choose the best coupled model (s) simulated the Black sea climate change and variability using the control experiments for 20 century (203). The principal result is as follows. There is not one model which is simulating adequately even one atmospheric parameter for all seasons. Therefore we considered (for the climate projection) different outputs form various models. When it was possible we calculated also the ensemble mean projection for the selected model (s) and emission scenarios. To calculate the wave projection we used the output of SWAN model forced by the GCM wind projection for 2010 to 2100. To estimate the sea level rise in XXI century and future surges statistics we extrapolate the observed sea level rise tendencies, statistical relation between wave heights and sea level and wave scenarios.
Results show that in general, the climate change in XXI century doesn't lead to the catastrophic change of the Black sea wind-wave statistics including the extreme waves in the S-W Black sea. The typical atmospheric pattern leading to the intense storm in the S-W Black sea is characterized by the persistent anticyclonic area to the North of the Black sea and cyclonic conditions in the Southern Black sea region. Such pressure pattern causes persistent and strong eastern or north-eastern wind which generates the high waves in the S-E Black sea. The climate projections show that the frequency of such atmospheric pattern will not principally increase. The recent probability of the extreme wave height (exceeding 8 to10 m) in the S-W Black sea ($\sim$1 occurrence per 10 years) will not be much worse in XXI century. Similar conclusion is true for the storm surges along the Bulgarian coastline. Expected sea level rise in the Black sea basin for XXI century due to regional climate changes is about 2 mm per year ($\pm$50%). However, some Black sea subregions (such as Odessa and Varna bay) are characterized by fivefold sea level rise because of the local land subsidence. So, this geomorphologic effect is the most dangerous local consequence for the sustainable development and management of the coastal zone in such subregions.

This study was supported by EC project "THESEUS".