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Wave Energy assessment in the NW Adriatic Sea

M. Sclavo (1), F. Barbariol (2), A. Benetazzo (1), and S. Carniel (1)
(1) Institute of Marine Science, National Research Council, Italy, (2) Civil Engineering Department, University of Padua, Italy

The work aims at evaluating the wave energy resources in the Adriatic Sea (NE region of the Mediterranean Sea), focusing more specifically on the northern-western sector of the basin. In this portion of this shallow semi-enclosed basin, the dominant winds blowing are Bora and Scirocco, both causing high and energetic waves. Bora is a cold and katabatic wind blowing from NE, generally fetch-limited, while Sirocco is warm and wet wind and is coming from SE. The waves climate is reproduced by means of the SWAN model, using the meteorological forcings provided by the operational meteorological model COSMO-I7 (the Italian version of the COSMO Model), a mesoscale model developed in the framework of the COSMO Consortium. The adopted grid size has a 2 km resolution and covers the whole basin.

Local comparisons are carried out considering the acquired data at the CNR-ISMAR Acqua Alta tower, located at 10 km off Venice, and by means of remote sensed data (Jason and ENVISAT altimeters), during the years 2010-2011. Comparisons against measurements evidenced that the wave prediction system provides reliable results in terms of significant wave heights, periods and directions.

Starting from these considerations, the fields of wave energy are analyzed for the wave conditions typical of three winter months of 2011, during which relevant storms with winds up to 20 m/s and significant wave heights close to 4 m occurred and were registered.

The two components of the wave energy transport were then computed using the SWAN model fully coupled with the ocean model ROMS, as implemented in the Coupled Ocean–Atmosphere–Wave–Sediment Transport (COAWST) modeling system. The 2-way data transfer between circulation and wave models was synchronous with ROMS providing current field, free surface elevation, and bathymetry to SWAN. We also considered the influence of current on wave energy running the SWAN model alone.

Preliminary results represent a useful step for further investigations that will be spanning longer time periods and/or with increased resolution in the direction of a better understanding of the nearshore dynamics and in the definition of good practices in the field of littoral protection.