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Numerical and experimental results on the spectral wave transfer in finite depth

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Determination of the form of the one-dimensional surface gravity wave spectrum in water of finite depth is important for many scientific and engineering applications. Spectral parameters of deep water and intermediate depth waves serve as input data for the design of all coastal structures and for the description of many coastal processes. Moreover, the wave spectra are given as an input for the response and seakeeping calculations of high speed vessels in extreme sea conditions and for reliable calculations of the amount of energy to be extracted by wave energy converters (WEC).
Available data on finite depth spectral form is generally extrapolated from parametric forms applicable in deep water (e.g., JONSWAP) [Hasselmann et al., 1973; Mitsuyasu et al., 1980; Kahma, 1981; Donelan et al., 1992; Zakharov, 2005).
The present paper gives a contribution in this field through the validation of the offshore energy spectra transfer from given spectral forms through the measurement of inshore wave heights and spectra. The wave spectra on deep water were recorded offshore Ponza by the Wave Measurement Network (Piscopia et al.,2002). The field regressions between the spectral parameters, fp and the nondimensional energy with the fetch length were evaluated for fetch-limited sea conditions. These regressions gave the values of the spectral parameters for the site of interest. The offshore wave spectra were transfered from the measurement station offshore Ponza to a site located offshore the Gulf of Salerno. The offshore local wave spectra so obtained were transfered on the coastline with the TMA model (Bouws et al., 1985).
Finally the numerical results, in terms of significant wave heights, were compared with the wave data recorded by a meteo-oceanographic station owned by Naples Hydrographic Office on the coastline of Salerno in 9m depth. Some considerations about the wave energy to be potentially extracted by Wave Energy Converters were done and the results were discussed.