Probabilistic Forecasting of the Wave Energy Flux

Wave energy will certainly have a significant role to play in the deployment of renewable energy generation capacities. As with wind and solar, probabilistic forecasts of wave power over horizons of a few hours to a few days are required for power system operation as well as trading in electricity markets. A methodology for the probabilistic forecasting of the wave energy flux is introduced, based on a log-Normal assumption for the shape of predictive densities. It uses meteorological forecasts (from the European Centre for Medium-range Weather Forecasts – ECMWF) and local wave measurements as input. The parameters of the models involved are adaptively and recursively estimated. The methodology is evaluated for 13 locations around North-America over a period of 15months. The issued probabilistic forecasts substantially outperform the various benchmarks considered, with improvements between 6% and 70% in terms of Continuous Rank Probability Score (CRPS), depending upon the test case and the lead time. It is finally shown that the log-Normal assumption can be seen as acceptable, even though it may be refined in the future.

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