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The added value of convection-permitting ensemble forecasts of sea breeze compared to a Bayesian forecast driven by the global ensemble

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Dynamical downscaling of ensemble forecasts to convection permitting resolutions aims to improve forecast skill by explicitly resolving mesoscale dynamical features. The success of this approach is dependent on the ability of the model to spin up smaller features embedded in the larger scale flow and provide more local information than could be inferred from knowledge of the climatological response to the large scale flow alone. Here we test whether such additional information is obtained from the Met Office Global and Regional Ensemble Prediction Systems for the sea-breeze phenomena which is resolved properly only at convection permitting resolutions but is driven by large-sale conditions that are well represented in the global driving model. The sea-breeze is detected using a new automatic tracking algorithm suitable for use in convective scale forecast data. The skill of probabilistic forecasts of sea-breeze occurrence from the high resolution ensemble is compared to that of a Bayesian forecast trained on paired high/low resolution ensemble members. This creates a statistical forecast of the high-resolution ensemble member given knowledge of the global forecast ensemble alone. The aim of this paper is twofold: -firstly to assess whether the information about sea breeze occurrence is encoded in a few large-scale parameters and can be forecast by a statistical method; secondly to estimate what information is gained by running the high resolution forecast beyond that which is contained in these large-scale flow parameters. Comparison of the two forecasting methods using a variety of verification methods all lead to the same conclusion: although both the Bayesian forecast and convection permitting ensemble provide information about sea-breeze occurrence, the convection-permitting ensemble has significantly greater resolution and therefore provides more information at all forecast lead times.