FINNISH METEOROLOGICAL INSTITUTE

Analysis of Marine Seasonal Ensemble Forecasts for the Baltic Sea

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Making of an Ensemble Forecast

An ensemble forecast consists of several slightly differing model runs for the same time period and usually one unperturbed member as a control run.

The differentiation of the ensemble can be done in several ways. In this work we produced ensemble forecasts with FMI's operational three dimensional biogeochemical model, Baleco, which was forced with ECMWF's mathematically perturbed monthly weather parameter ensemble.

The variables of interest are scalars but the method is also viable for predicting vector variables like the flow field.

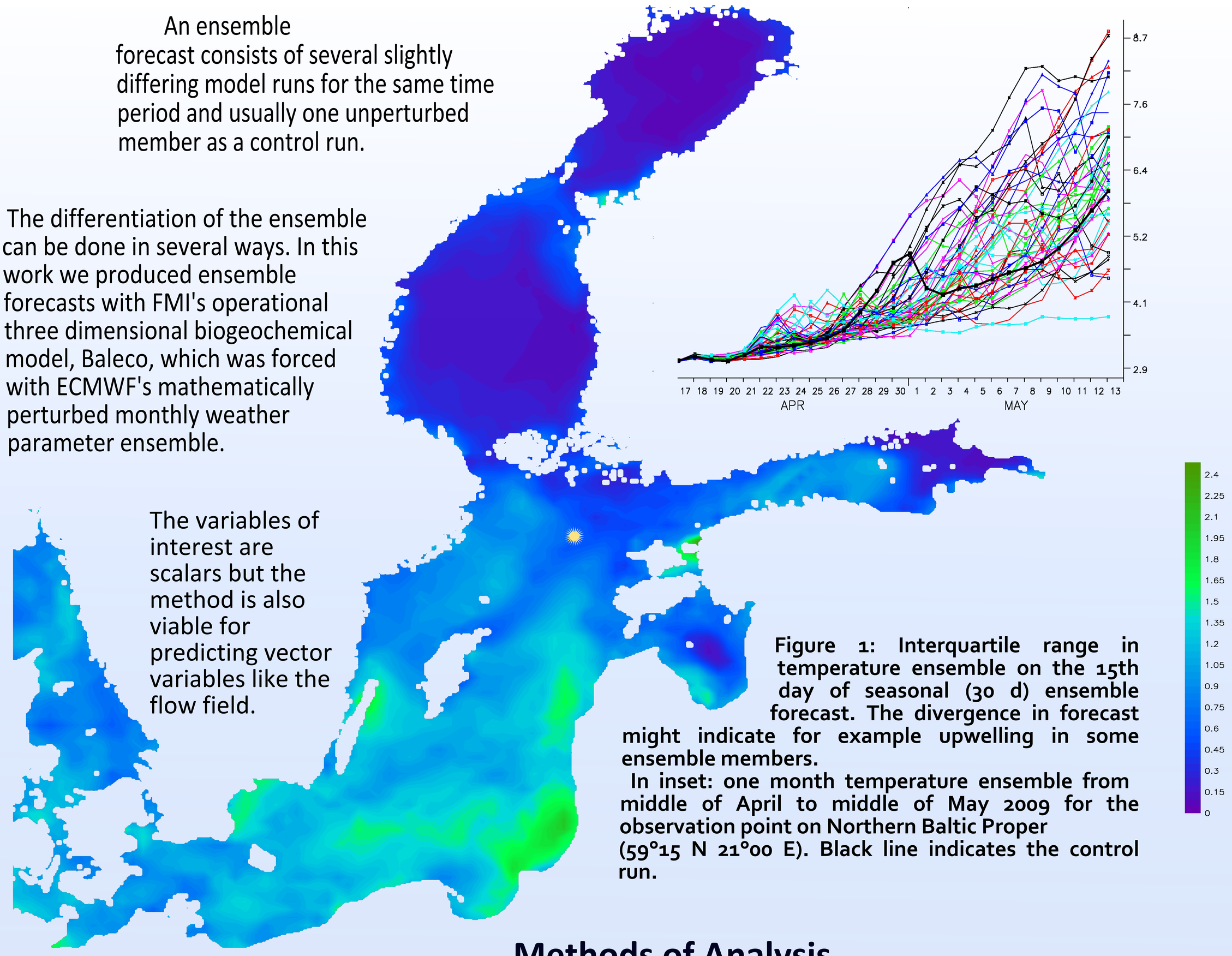
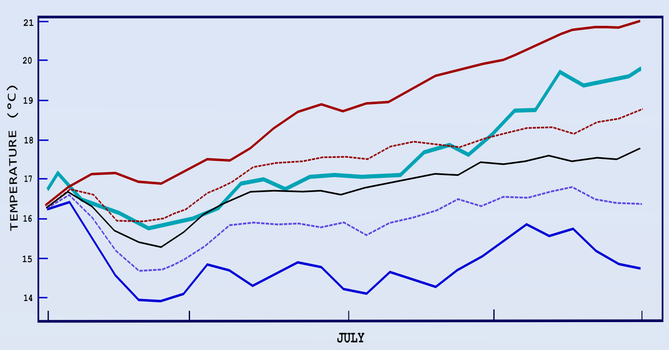


Figure 1: Interquartile range in temperature ensemble on the 15th day of seasonal (30 d) ensemble forecast. The divergence in forecast might indicate for example upwelling in some ensemble members.
In inset: one month temperature ensemble from middle of April to middle of May 2009 for the observation point on Northern Baltic Proper (59°15 N 21°00 E). Black line indicates the control run.

Methods of Analysis

The first tool for analysis is the calculation of the minimum, maximum, median and 1st and 3rd quartile. In some cases it is also beneficial to know the difference between upper and lower quartile for it is robust key value against large variations in ensemble distribution. These aforementioned key values are essential tool among other methods in so called "eye ball" validation.

The somewhat more sophisticated method for determining the reliability of the ensemble forecasts and diagnosing the errors in its mean and spread is the rank histogram. The basic idea is that if the ensemble is an accurate description of the phenomenon then the probability distribution function should be equal for both. Therefore the rank histogram formed by these results should be even. This method has also some limitations and it should be used with other methods of analysis.



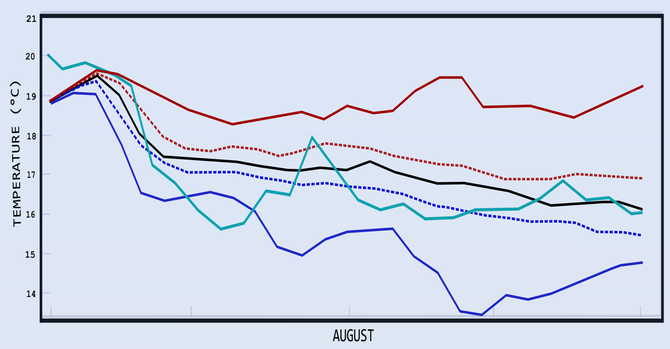


Figure 2 & 3: Characteristic values of monthly temperature ensemble forecasts for the Northern Baltic Proper wave buoy during summer 2008. Maximum, minimum, median, 25 % and 75 % quartils. The green line shows the in-situ observations from the same location.

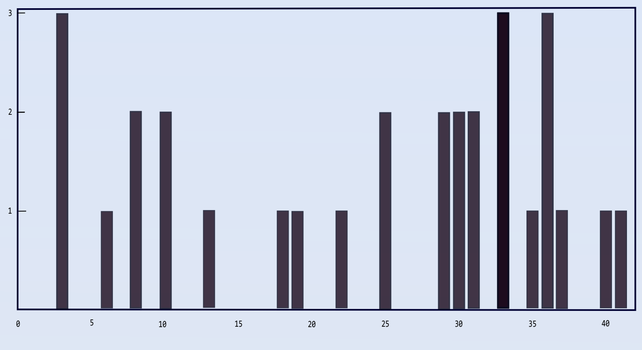


Figure 4: The rank histogram of the ensemble around 20th forecast day. Fairly even spread indicates that ensembles are formed correctly.

Acknowledgements

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