Monthly Ensembles in Algal Bloom Predictions on the Baltic Sea

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In this work we explore the statistical features of monthly ensembles and their capability to predict biogeochemical conditions in the Baltic Sea. Operational marine environmental modelling has been considered hard, and consequently there are very few operational ecological models. Operational modelling of harmful algal blooms is harder still, since it is difficult to separate the algal species in models, and in general, very little is known of HAB properties.

We present results of an ensemble approach to HAB forecasting in the Baltic, and discuss the applicability of the forecasting method to biochemical modelling. It turns out that HABs are indeed possible to forecast with useful accuracy.

For modelling the algal blooms in Baltic Sea we used FMI operational 3-dimensional biogeochemical model to produce seasonal ensemble forecasts for different physical, chemical and biological variables. The modelled variables were temperature, salinity, velocity, silicate, phosphate, nitrate, diatoms, flagellates and two species of potentially toxic filamentous cyanobacteria nodularia spumigena and aphanizomenon flos-aquae.

In this work we concentrate to the latter two. Ensembles were produced by running the biogeochemical model several times and forcing it on every run with different set of seasonal weather parameters from ECMWF's mathematically perturbed ensemble prediction forecasts. The ensembles were then analysed by statistical methods and the median, quartiles, minimum and maximum values were calculated for estimating the probable amounts of algae. Validation for the forecast method was made by comparing the final results against available and valid in-situ HAB data.