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Prognosis of Future Regime Shifts of the Ecosystem of the Central Baltic Sea (PRORES)

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The Baltic Sea as a brackish water is a sensitive ecosystem. It represents a marginal habitat for many of the its species. The physical environment has a limiting influence on many of the important fish species via several direct and indirect effects, mainly induced by changes in salinity, temperature and oxygen concentrations. These factors are sensitive to climatic changes. The salinity is determined by two drivers: the freshwater fluxes from the rivers and influxes of high-saline water from the Northern Sea. The freshwater fluxes are directly determined by the hydrological cycle. The inflows from the Northern Sea are mainly wind driven and thus sensitive to changes of the local atmospheric circulation patterns. Significant transport of salt into the Baltic Sea only occurs during long-lasting inflow events, the so called major inflows. During the last century a decrease of these events has been observed. Together with overfishing this caused a regime shift in the important fish species.
Due to the strong stratification of the Baltic Sea these major inflows are also the only mechanism to refresh the deeper waters where many fish species have their main reproduction area and rely on sufficient oxygen concentrations.
The aim of the project PRORES is to identify connections between the physical system of the Baltic Sea and the population of the key fish species. Subsequently we will try to conditionally predict the future development of this species under different greenhouse gas emission and fishery scenarios. Additionally an socio-economical analysis of the adaptability of the local fishery we be performed considering the expected changes of climate and political regulations.
We will perform coupled regional climate simulations using the atmospheric model REMO and the Baltic Sea ice ocean model BSIOM. The results will be used to predict the reproduction success of the key fish species. The resulting reproduction rates will be used to drive a stochastic multi-species model for the key fish species.
In this contribution, the project and some firsts results of the physical modeling will be presented.