Aalto University
School of Engineering

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Autonomous measuring devices and probability based forecasts advance Baltic Sea research

Title of the dissertation	Advancements of operational oceanography in the Baltic Sea
Contents of the dissertation	Understanding environmental issues in the Baltic Sea requires that the marine processes are well understood in different temporal and spatial scales. In this work the usability of new autonomous measuring device and achieved data was studied. Also, new probability based monthly scale forecasts were developed. Such new methods are needed to better prepare for future conditions and to understand changes at sea. In the Baltic Sea, autonomous Argo buoys have been used since 2012. The buoys provide data from the water column more often than traditional observation methods, and they can measure even under very difficult conditions. In this study, the suitability of buoys for the Baltic Sea, along with salinity, temperature and GPS data was analysed. The collected data can be utilised in the study of small-scale phenomena as well as to supplement long-term monitoring. Monthly ensemble forecasts were developed using the three-dimensional hydrodynamic model of the Baltic Sea, which was coupled with a biogeochemical model of the marine environment. The suitability and length of these forecasts was assessed for forecasting of upwelling events and cyanobacterial blooms in the Bothnian Sea and the Baltic Sea Proper. Observations and modelling complement our understanding of marine phenomena. Observations can be used to improve models and forecasts. Computational models and forecasts can indicate environmental risks and also, in return, help to design better and more effective measurement campaigns.
Field of the dissertation	Water and Environmental Engineering
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