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Despite the climate change: Baltic Sea could return to a good environmental status

In the largest model comparison ever carried out for the Baltic Sea region, an international team of authors led by Markus Meier, oceanographer from Warnemünde, came to the conclusion that a good status of the Baltic Sea environment can be achieved if the measures planned in the Baltic Sea Action Plan to reduce nutrient discharges are stringently implemented. They thus contradicted the view that climate change in general makes it impossible to achieve this goal. At the same time, however, they confirmed that climate change would lead to an increase in eutrophication if the nutrient load remains high.

Eutrophication is one of the biggest environmental problems in the Baltic Sea. It promotes the development of toxic algal blooms and leads to oxygen deficiency regions, in which no higher life can exist. The Baltic Sea Action Plan therefore explicitly aims to reduce nutrient loads to the Baltic Sea. All countries around the Baltic Sea have agreed on this goal, but implementation is only slowly going on. In recent years there has been an increase in the number of voices calling for a higher reduction rate, as climate change is expected to exacerbate the problem of eutrophication.

Against this background, an international team of modellers from Germany, Sweden, Finland, Russia and Portugal carried out an analysis of 58 so-called multi model ensemble simulations for the Baltic Sea region in the 21st century. Taking into account climate scenarios developed by the Intergovernmental Panel on Climate Change (IPCC) for the period in question, all models examined the effects of a stringent implementation of the Baltic Sea Action Plan. In parallel, the development was calculated with unchanged input quantities. The years 1980 to 2005, for which observation values are available, served as the control years. The closer the model results for this period matched the values measured in reality, the higher the reliability of the models was rated. To assess the state, the variables oxygen, salt content and temperature as well as the nutrients nitrogen and phosphorus were used.

Never before so many complex physical-biogeochemical models have been used to calculate the development of the Baltic Sea continuously from the past, starting in 1960, through to the present and into a future scenario in 2100. “Among the models, we find those that reflect the reference values of the years 1980 to 2005 quite well,” says Markus Meier, Head of the Physical Oceanography and Instrumentation Department at the IOW, summarising the results. “We therefore consider these results to be robust with regard to projections into the future, too.” Surprisingly, however, it turned out that even the models that individually deviate strongly from the reference values have a mean value in their totality that corresponds to the results of the reliable models. Apparently, the individual weaknesses of the different models compensate each other in the end. “We still have a lot of uncertainty to deal with. But overall, the model results show that if the measures to reduce nutrient inputs detailed by the Baltic Sea Action Plan are rigorously applied, a good condition for the Baltic Sea can be achieved even under changed climatic conditions.”

However, it will take a few decades longer than originally intended before success is achieved. Markus Meier, for his part, leaves no doubt that climate change cannot be met with half-heartedness. “If we do not consistently pursue the reduction targets, climate change will exacerbate eutrophication and all associated environmental problems.”

The model comparison has been carried out under the umbrella of the Baltic Earth Programme (www.baltic-earth.eu) and with the financial support of the BONUS project Baltic App (Well-being from the Baltic Sea – applications combing natural sciences and economics) and the Swedish Research Council for Environmental, Agricultural and Spatial Planning.

More information:

Meier, H. E. M., Edman, M. K., Eilola, K. J., Placke, M., Neumann, T., Andersson, H. C., Brunnabend, S. E., Dieterich, C., Frauen, C., Friedland, R., Gröger, M., Gustafsson, B. G., Gustafsson, E., Isaev, A., Kniebusch, M., Kuznetsov, I., Müller-Karulis, B., Omstedt, A., Ryabchenko, V., Saraiva, S. and Savchuk, O. P. (2018) Assessment of Eutrophication Abatement Scenarios for the Baltic Sea by Multi-Model Ensemble Simulations. Front. Mar. Sci. 5:440. doi: 10.3389/fmars.2018.00440

Scientific Contact:

Prof. Dr. Markus Meier | +49 381 5197 150 | markus.meier@io-warnemuende.de
Head of the Department of Physical Oceanography and Instrumentation
Leibniz Institute for Baltic Sea Research Warnemünde

Press and public relation:

Dr. Kristin Beck | +49 (0)381 5197-135 | kristin.beck@io-warnemuende.de
Dr. Barbara Hentzsch | +49 (0)381 5197-102 | barbara.hentzsch@io-warnemuende.de

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