

Guest Editorial

Marcus Reckermann

Climate change is a big challenge, not only for society but also for science itself. The modelling communities of atmospheric scientists, doing regional climate models, and biologists, building biogeochemical and ecosystem models, have for long lived in different worlds. But the research on climate change and its effects on the environment have forced the two communities to learn from each other and work closer together. In the Baltic Sea region, the conditions for a fruitful marriage are very good. Here, both communities are very mature and competent with a worldwide reputation in their respective fields. Moreover, the Baltic Sea is well suited for a joint modelling effort, as it is among the most intensely investigated seas in the world with a good data coverage going back to the early days of instrumental measurements. In many characteristics it can be regarded as a mini-version of the large ocean although the Baltic Sea is particularly vulnerable towards pollution and eutrophication. This Special Issue of *AMBIO* presents selected results from the BONUS¹ project ECOSUPPORT, an ambitious attempt for an integration of the two modelling worlds.

In ECOSUPPORT, a consortium of 11 research groups from seven countries in the Baltic Sea region have collaborated for the first time to combine different types of sophisticated models across scientific disciplines, ranging from physical regional climate models to biogeochemical and ecosystem models as well as socioeconomic impacts, taking into account different climate and nutrient emission scenarios. An interdisciplinary modelling system was built to demonstrate how ecosystems may respond to the combined future impacts of possible climate change and continued eutrophication. Thus, a sound scientific basis for a revised HELCOM Baltic Sea Action Plan² was intended, aiming to incorporate climate change effects in the future and, based on that, assist decision makers to find the best

options for managing the environmental health of the Baltic Sea.

The project provides the best glimpse into the possible future of Baltic Sea environmental conditions to date, based on the best currently available coupled modelling techniques. Despite the high uncertainties involved, which are due to the nature and the novelty of the work, a basic conclusion seems to be that climate change does matter and should be taken into account when developing remedies against the advancing deterioration of the Baltic Sea environment. In particular, the connection between warmer temperatures, increased oxygen depletion in the deep basins, and the phosphorus cycle—which is crucial for the development of the typical cyanobacteria blooms—can be expected to be even more important in the future, and may lead to the measures of the Baltic Sea Action Plan taking effect much later than expected.

While looking at the results presented here, we should be aware that this type of research, i.e. the coupling of models from different disciplines, is still in its infancy and needs to be continued and expanded. We can hope that in 10–20 years we look back and say—it was with ECOSUPPORT and similar projects when it all really started.

¹ BONUS is a novel EU funding scheme for environmental research for the Baltic Sea and its catchment basin, providing a unique opportunity for international and interdisciplinary research to be carried out in a coordinated manner under a common goal (Andrusaitis et al. 2011).

² The Baltic Sea Action Plan by the Helsinki Commission (HELCOM) is an ambitious plan to considerably improve the environmental conditions in the Baltic Sea (Backer et al. 2010).

REFERENCES

- Andrusaitis, A., B. von Bodungen, D. Conley, M. Durkin, J. Elken, E. Fellenius, V. Forbes, Z. Gasiūnaitė et al. 2011. BONUS Strategic Research Agenda 2011–2017—the joint Baltic Sea research and development programme. BONUS Publication No. 12, 40 pp.
- Backer, H., J.-M. Leppänen, A.C. Brusendorff, K. Forsius, M. Stankiewicz, J. Mehtonen, M. Pyhälä, M. Laamanen, et al. 2010. HELCOM Baltic Sea action plan—a regional programme of measures for the marine environment based on the ecosystem approach. *Marine Pollution Bulletin* 60: 642–649.

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