



HYPER PROJECT

ANNUAL REPORT 2010

HYPER	WP1 - Trends of hypoxia
Reporting period	Months 13 – 24
Gained scientific results during the reporting period	<p>We have participated in two successful research cruises collecting additional sediment cores for our research (RV Heinke 27 June-10 July 2010; RV Meriam 26 July-21 August 2010). Our intensive laboratory work continues analyzing the numerous cores and the partners are working well together producing interesting results.</p> <p>Our research on the effect of hypoxia on phosphorus burial demonstrates that the lack of The absence of “sink-switching” from organic and Fe bound P to authigenic Ca-P makes the Baltic Sea extremely sensitive to sustained anoxia, since any P released from the labile P phases will return to the overlying water where it ultimately may fuel primary production.</p>
Comparison with the original research and financial plan	WP1 has met all of the outcomes identified in the original research plan for the reporting period.
Statement if the research plan and schedule of deliverables had to be adapted (if yes please mention the consequences)	The research plan and schedule of deliverables has not been adapted and continues as planned.
Do results of third parties will have influence on the working programme?	No
Are there any changes in the future working plan expected?	No
Are there any changes expected for the deliverables?	No

HYPER	WP2 - Biogeochemical processes
Reporting period	Months 13 – 24
Gained scientific results during the reporting period	<p>A manuscript has been prepared describing results of batch experiments performed to assess P release mechanisms under anoxia.</p> <p>A manuscript describing P and N regeneration and P burial at 17 locations in the Baltic over the past century was submitted to Biogeosciences (Jilbert et al. 2011).</p> <p>A manuscript has been prepared describing the results from 2009 cruises nitrogen cycling.</p> <p>Two manuscripts on nitrogen processes from cruise 2010 are in prep. During the Heincke cruise samples of the redoxcline in the central Baltic Sea were collected to do isotopic analysis of nitrate. Moreover sediment porewater was collected for the same purpose.</p>
Comparison with the original research and financial plan	<p>No reductions to the original plan have been necessary. Instead more has been done than originally planned (two manuscripts on P regeneration and burial so far)</p> <p>Participated in a cruise on R/V Heincke (10 HYPER participants) and in a cruise with R/V Skagerak (1 HYPER participant). There is some delay in isotopic analyses, but these do not delay the original plan.</p>
Statement if the research plan and schedule of deliverables had to be adapted (if yes please mention the consequences)	No reductions to the original plan or deliverables
Do results of third parties will have influence on the working programme?	No
Are there any changes in the future working plan expected?	We will carry out an additional cruise in May 2011 to elucidate how P is buried in the deep basins and to study nitrogen cycling in sediments and in water column. There is a possibility that another cruise will take place in July 2011 (IOW).
Are there any changes expected for the deliverables?	No

HYPER	WP3 - Physical and biogeochemical modelling
Reporting period	Months 13 – 24
Gained scientific results during the reporting period	<p>Task 3.1: An investigation of the physical causes of variations in hypoxia during the past 2000 years has been submitted to Est. Coastal & Shelf Res.</p> <p>Task 3.2: A physiological fauna model with special emphasis on a mechanistic formulation of hypoxia induced mortality. The model is applied for a number of sites in the Baltic Sea. First results and validation is described in a report.</p> <p>Task 3.3: The reactive transport model is ready and validated. A manuscript of the simulated effects from seasonal hypoxia on biogeochemical cycles is accepted for publication in Limnology and Oceanography. The work continuous to use the reactive transport model to improve parameterizations for large scale coupled physical-biogeochemical models.</p> <p>Task 3.4: Intensive work on this task will start soon.</p>
Comparison with the original research and financial plan	On schedule
Statement if the research plan and schedule of deliverables had to be adapted (if yes please mention the consequences)	No
Do results of third parties will have influence on the working programme?	No
Are there any changes in the future working plan expected?	No
Are there any changes expected for the deliverables?	No

HYPER	WP4 - Hypoxia and benthic fauna
Reporting period	Months 13 – 24
Gained scientific results during the reporting period	This year has mainly involved working through material and data obtained from the field-surveys and experiments conducted in year one. The field data required for the completion of all deliverables of WP4 has already been secured. All has gone according to plan; two papers have been published, one manuscript has been submitted and is now in awaiting an editorial decision in its revised form and several other manuscripts are being prepared for submission.
Comparison with the original research and financial plan	The research has progressed in line with the original research and financial plans.
Statement if the research plan and schedule of deliverables had to be adapted (if yes please mention the consequences)	No.
Do results of third parties will have influence on the working programme?	No
Are there any changes in the future working plan expected?	No
Are there any changes expected for the deliverables?	No

HYPER	WP5 - Nutrient management
Reporting period	Months 13 – 24
Gained scientific results during the reporting period	<p>WP5 focuses on synthesising the results from WP1-4 and project management. The synthesis activities will mostly take place in the third year of the project, and therefore management activities are reported here. Two synthesis manuscripts are being planned for at the upcoming HYPER meeting in February 2011.</p> <p>Project management activities have included organising a consortium meeting for all scientists involved in HYPER that took place in Utrecht in March 2010. There has been a steering group meeting in Stockholm in September 2010 with the aim of following up on existing activities and planning for new activities. The next steering group meeting will be held in connection with the upcoming consortium meeting taking place in Gdynia, 7-10 February 2011.</p> <p>Member of the consortium have been active in organising scientific sessions at various conferences: EUTRO2010 (Nyborg, June 2010), ASLO meeting (San Juan, February 2011), EGU meeting (Vienna, April 2011), Baltic Sea Science Congress (St. Peterburg, August 2011), CERF meeting (Daytona Beach, November 2011).</p> <p>The HYPER consortium has actively disseminated Baltic Sea science to school classes and media. Additionally, HYPER has participated in the scientific and political discussions about engineering approaches to remediate hypoxia in Sweden and Finland by attending public meeting on these issues and contributing to newspaper articles.</p>
Comparison with the original research and financial plan	<p>WP5 concerns the overall project management and the upscaling of the results from the other WPs to the entire Baltic Sea. Therefore, most of the scientific work is in the last period of the project and most efforts in WP5 have been towards managing the project as such.</p> <p>There have been no deliverables for WP5 in the second reporting period.</p>
Statement if the research plan and schedule of deliverables had to be adapted (if yes please mention the consequences)	There has been no adaptation of the research plan.
Do results of third parties will have influence on the working programme?	Yes, the continuous development of the NEST system will facilitate integration with the HYPER results, particularly the transition from the coarse box-model SanBalts to a

	model with a fine vertical resolution (BALTSEM) allowing a much better spatial description of the pelagic-benthic interactions.
Are there any changes in the future working plan expected?	No.
Are there any changes expected for the deliverables?	No.

NB! Metadata for models, observations, and monitoring data produced in HYPER can be found here:

<http://hyper.dmu.dk/metadata/>

Top 3 highlights of 2010 for HYPER

Three publications that offer a scientific basis for better management of the Baltic Sea Ecosystem

1. Publication:

Tom Jilbert, Caroline P. Slomp, Bo G. Gustafsson & Wim Boer (2011): Beyond the Fe-P-redox connection: Preferential regeneration of phosphorus from organic matter as a key control on Baltic Sea nutrient cycles. *Biogeosciences Discussions* (under review for BG), Vol. 8, pp 655-706

Short excerpt from paper:

“Alongside the well-documented link between iron oxyhydroxide dissolution and release of P from Baltic Sea sediments, we show that preferential remineralization of P with respect to carbon (C) and nitrogen (N) during degradation of organic matter plays a key role in determining the surplus of bioavailable P in the water column.”

See more: http://www.biogeosciences-discuss.net/papers_in_open_discussion.html

2. Publication:

A. Villnäs & A. Norkko (in press) (2010): Benthic diversity gradients and shifting baselines: implications for assessing environmental status. *Ecological Applications*

Short excerpt from paper:

“The increasing pressure on marine biodiversity emphasizes the importance of finding benchmarks against which to assess change... In this study, we provide a comprehensive analysis of regional benthic diversity, encompassing the open sea areas of the large, brackish-water Baltic Sea. By taking advantage of long-term monitoring data, spanning hundreds of stations in time and space over the past 40 years, and using a basic measure, regional species richness, we define quantitative gradients in benthic diversity and area-specific reference conditions and acceptable deviations against which to gauge prevailing conditions in benthic macrofaunal diversity. We demonstrate distinct gradients in benthic diversity across the Baltic Sea, and a severely impaired status of the benthic community throughout large areas of the Baltic. In such variable ecosystems establishing good quantitative baselines is imperative for reliable future assessments of changes in diversity.”

3. Publication:

Daniel J. Conley et al. (2010): Dead zones are increasing in the coastal zone of the Baltic Sea. Will be submitted to Environmental Science & Technology soon.

Short description:

Hypoxia is a well-described phenomenon in the offshore waters of the Baltic Sea with both the spatial extent and intensity of hypoxia known to have increased due to anthropogenic eutrophication, however, an unknown amount of hypoxia is present in the coastal zone. The article reports on the widespread unprecedented occurrence of hypoxia across the coastal zone of the Baltic Sea.

The analysis of the global occurrence of hypoxia has been hampered by the lack of systematic data collection in the marine environment with inadequate data available to establish historical trends. Hypoxia in the off-shore deep waters of the Baltic Sea is well-described, but our knowledge of hypoxia in the coastal zone is lacking, despite that the Baltic is one of the most data rich regions in the world. To fill this knowledge gap, we compiled coastal monitoring and research data from the coastal countries to identify areas where hypoxia occurs and its frequency of occurrence.

Currently, there are 416 areas in the world with reported coastal hypoxia with about 30 previously reported sites in the Baltic Sea region, which includes both coastal zone hypoxia and deep water sites in the Baltic Sea. We have identified an additional 96 sites that have experienced hypoxia increasing the global total to nearly 500 sites. Of all the known sites around the world, around 20% of the sites are found in the Baltic Sea region

Record of the HYPER project's stakeholder events:

1. Professor Daniel Conley (Lund University) participated in the HELCOM Ministers Meeting on August 25 2010, where had the opportunity to talk directly to the Environmental Ministers around the Baltic Sea. He also gave a talk on: *How to evaluate nutrient reduction through ecological engineering.*
2. Workshop held in Lund on August 23 2010 on Knowledge for saving the Baltic Sea (Kunskap för att rädda Östersjön) with participation of an EU PM, who helps shepherd the BONUS legislation through the EU Parliament. At the workshop the HYPER, BALTIC GAS and INFLOW projects were all discussed. Professor Daniel Conley from the HYPER project gave a talk on: *Knowledge building through the BONUS Program.*