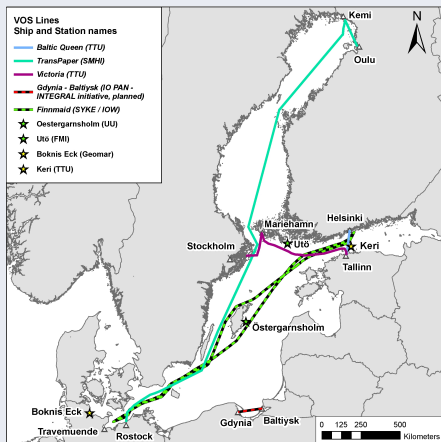


BONUS INTEGRAL

Integrated carbon and Trace Gas monitoring for the bALTic sea



Project coordinator:

Prof. Dr. Gregor Rehder, IOW, Germany

Project applicants:

Prof. Dr. Anna Rutgersson, UU, Sweden

Prof (ext.ord). Lauri Laakso, FMI, Finland

Dr. Karol Kuliński, IO PAN, Poland

Prof. Dr. Urmas Lips, TTU, Estonia

Prof. Dr. Hermann Bange, GEOMAR, Germany

Dr. Mikael Krysell, SMHI, Sweden

Dr. Jamie Shutler, UoE, United Kingdom

Key theme addressed:

5.1 Developing and improving scientific basis for integrated monitoring programmes for continuous assessment of ecological status and human pressures

Subthemes:

1.1 Ecosystem resilience and dynamics of the biogeochemical processes, including cumulative impacts of human pressures

5.2 Developing and testing innovative in situ, remote sensing and laboratory techniques

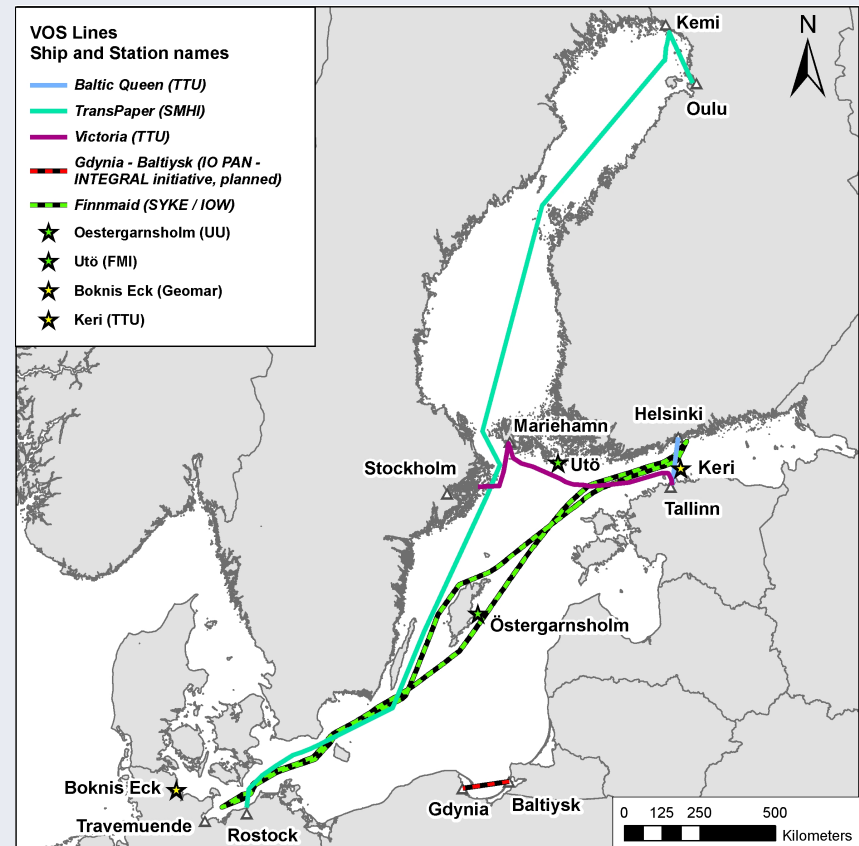
2.2 The role of coastal systems in the dynamics of the Baltic Sea

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Overarching ideas:

- Use of the (extended) ICOS network for biogeochemical monitoring of the Baltic Sea, in combination to existing monitoring programs
- Enhanced ASE-parameterizations for the Baltic Sea
- Provide best experimentally based seasonal concentration charts for carbon dioxide, methane, and nitrous oxide
- Full integration of carbon system into high resolution physical biogeochemical model
- Advice for countries with upcoming ICOS infrastructure



Currently running and proposed VOS lines and field stations for the measurement of trace gases and carbon system parameters

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Work package Structure

Work package	WP title	Type of activity	Lead appl. #	Lead appl.	Person months (Bonus)	Start months	End months
WP1	Coordination and Management	MGM/RTD	1	IOW	13.0	1	36 (38)
WP2	Data mining, assimilation, integration	RTD	4	IO PAN	18.1	1	24
WP3	Infrastructure and observation amendments	RTD	1	IOW	63.9	1	36
WP4	Greenhouse Gas data integration	RTD	6	GEOMAR	45.6	1	36
WP5	Flux parameterization and estimates	RTD	3	FMI	37.1	1	30
WP6	Carbon-based ecosystem assessment	RTD	1	IOW	33.5	1	36
WP7	Dissemination and Outreach	Other	2	UU	14.5	1	36

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WP2: Data mining, assimilation and integration

Objectives

The overall objective of WP2, led by Karol Kuliński (IOPAN), is to identify and evaluate the quality of existing data on greenhouse gases (CO_2 , CH_4 and N_2O) as well as on carbonate system (A_T , C_T , pH) in the Baltic Sea. All the identified and quality controlled data will be published in the form of meta-data on the BOOS data platform, with easy-access links to the repositories of the real data.

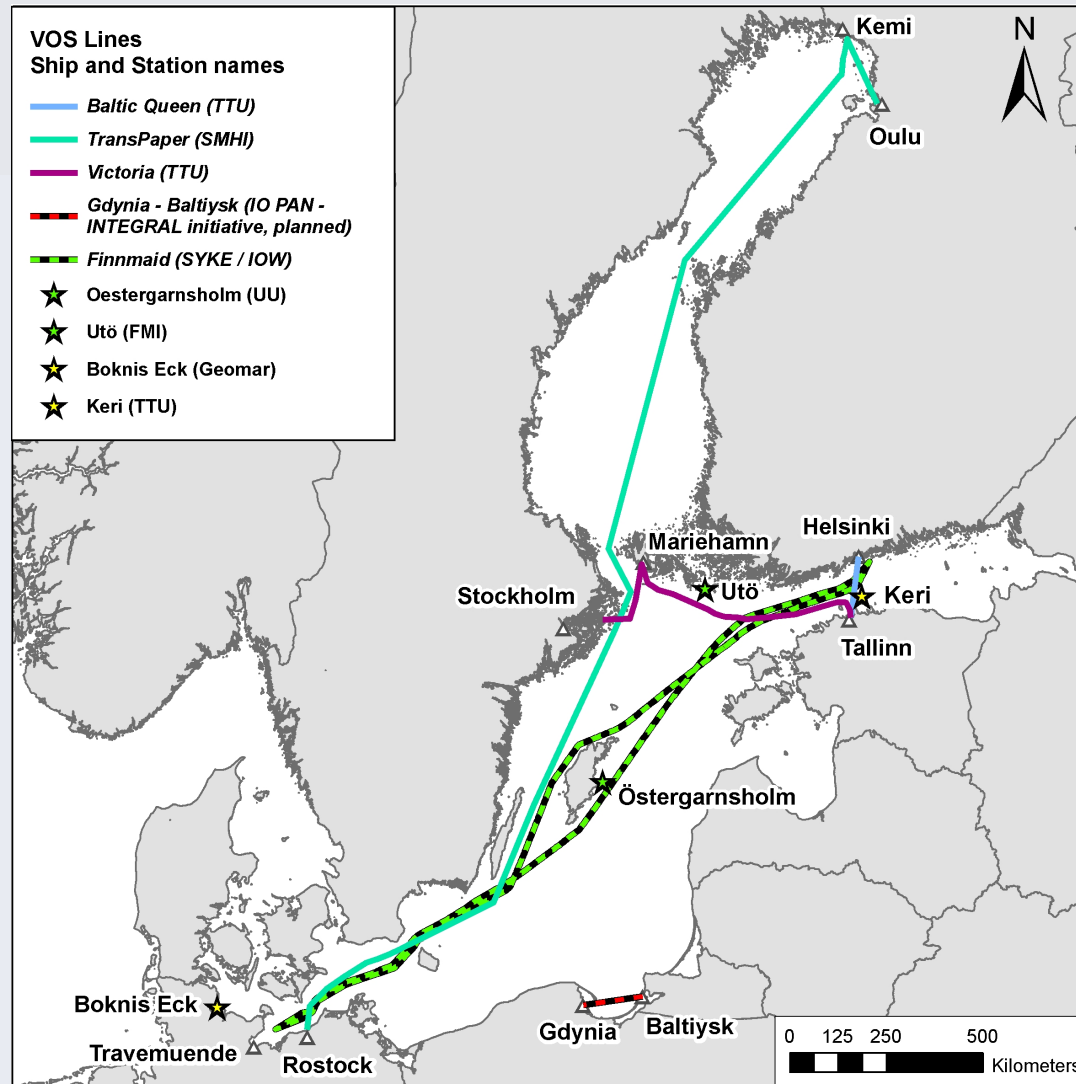
WP3: Infrastructure and observation amendments

Objectives

This WP is led by Gregor Rehder (IOW), but will have major contributions from nearly all partners. In order to get vital additional information on surface greenhouse gas concentrations and fluxes as well as carbon system data to support WPs 4-6, INTEGRAL will provide several amendments to existing infrastructure, will use its close relation/involvement in the HELCOM monitoring to effectively gain carbon system and trace gas data from selected monitoring stations, execute two field campaigns on research vessels, and install a basic underway $p\text{CO}_2$ system on a coastal-near ferry line traversing the plume of the river Vistula. The “base case” year for this additional efforts will be the 2nd year of the project, though installations for continuous measurements on the VOS-lines and permanent stations will continue to be operational until the end of the project and in most cases beyond. For individual platforms and locations, please refer to Fig.1, Page 1).

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WP4: Greenhouse Gas Data Integration

Objectives

The overall objective of WP4 is to provide GHG (CO₂, N₂O and CH₄) concentration fields for the Baltic Sea and make them available to WP5, other scientists and the public/stakeholders.

Specific objectives are: i) to merge historical data provided by WP2 as well as actual data from the Baltic Sea GHG monitoring network under the INTEGRAL; ii) to perform quality check and harmonize the data; iii) to compute GHG concentrations fields; and iv) to publish the Baltic Sea GHG concentration fields.

WP5: Flux Parameterization and Estimates

Objectives

Derive improved gas exchange parameterization and provide basin wide GHG-flux estimates

Deliverables

D 5.1 A manuscript presenting the new turbulence-based gas exchange coefficients is submitted and a report filed. (M18) (FMI)

D5.2 The new parameterization is coded into the WAM model. Based on existing sea surface water gas concentration fields, we will calculate spatially and temporally compartmentalized fluxes for the Baltic Sea. The results are compared with Results from FluxEngine (D5.3) (M24) (FMI)

D5.3 FluxEngine is run with different gas exchange parameterizations and gas concentration fields for the Baltic Sea. Resulting fluxes are compared with results from WAM-based estimates (D5.2). (M30) (UU)

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WP6: Carbon-based ecosystem assessment

Objectives

The overall objective of WP6, led by Markus Meier (IOW), is to improve carbon cycle models by using the improved process understanding from measurements compiled in WP 2 and 3, and implement carbon as central variable for the assessment of the Baltic Sea eutrophication. We will calculate the carbon budget and its changes in time for the entire Baltic Sea and for the coastal zone and the Baltic Sea sub-basins separately, using a high-resolution carbon system model and INTEGRAL observations. The model will also be used to develop strategies for optimized carbon monitoring taking temporal and spatial variability of the system with as little as possible data into account.

WP7: Flux Parameterization and Estimates

Objectives

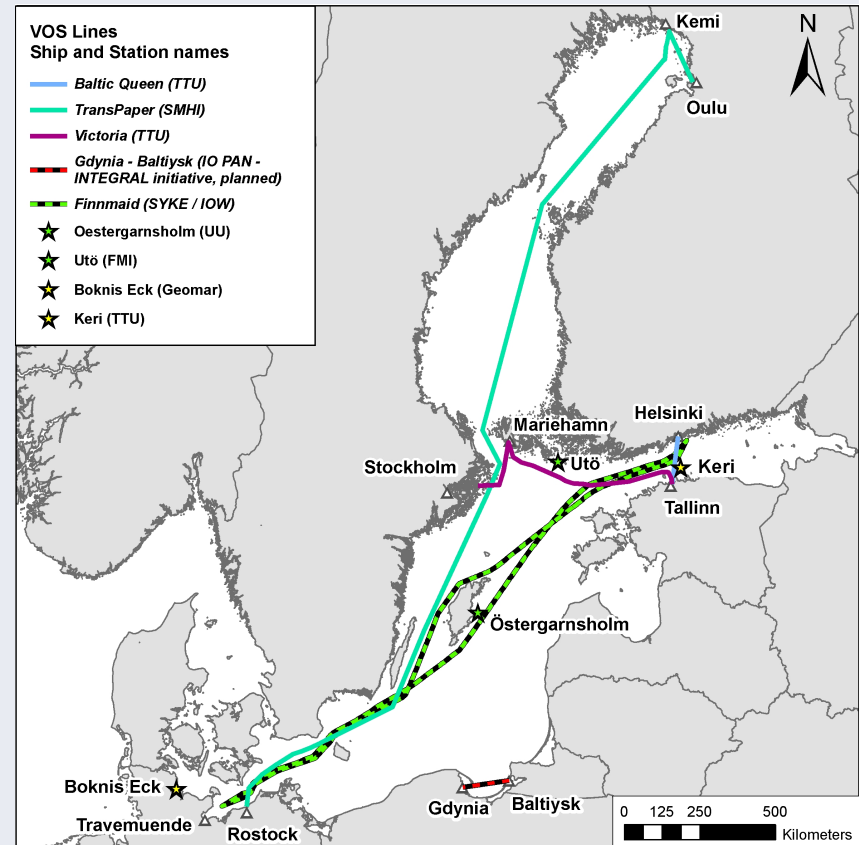
WP7 is led by Anna Rutgersson (UU). Dissemination of knowledge from INTEGRAL at various levels is an essential part of the project's concept. This includes knowledge transfer within the group and between countries, training of modern carbon and greenhouse gas analytics, flux assessment and modelling of the next generation of enthusiastic scientists in the framework of a summer school and training workshops, the promotion of the use of VOS lines and carbon data for a cost effective monitoring of the Baltic Sea via workshops and a stakeholder conference, and a Report/White Paper and Brochure demonstrating and road-mapping the better integration of VOS-based sampling strategies and ICOS-related infrastructure for Baltic Sea monitoring. Dissemination will be supported by the expertise of the Baltic Earth Consortium and secretariat with long track of successful organization of summer schools, conferences, and dissemination products, and long-term strategic work of some of the PIs within the HELCOM community.

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The BASICS

- 8 partners from 6 nations, 5 involved in ICOS, 4 in the Baltic Sea HelCom monitoring
- Total funding requested is ~2 Mio Euro
- Funding success rate is in the order of 10%



Currently running and proposed VOS lines and field stations for the measurement of trace gases and carbon system parameters