

**Third BALTIC GAS workshop
Askö Field Station Laboratory, Sweden
June 7 – 9, 2010**

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Tuesday June 7 – start 9:00

Welcome

*... to the BALTIC GAS workshop by our host: Volker Brüchert
and
... by BALTIC GAS coordinator: Bo Barker Jørgensen*

Updating of action list (Henrik Fossing)

The (attached) action list is updated and supplied with deadlines for 'actions' not met. Please check you 'duties'. The action list will be adjusted during the workshop and 'by the end' consensus is taken about TASKs added to the list.

Consortium Agreement (Bo Barker Jørgensen)

No need to discuss this unless the CA has not been signed by all partners prior to the workshop

Work package progress during first half (18 months) of BALTIC GAS – how to proceed to achieve all tasks of the project and fulfil the WPs.

Half the project is accomplished – it's time to look back and ahead - are we up to date? Are any challenges (i.e. problems) to be foreseen? Any divergences from the Gantt chart or list of deliverables?

It's also about time to think of 'names' (i.e. responsibly scientists) for the deliveries (not necessary the WP-leaders) and we should start caring about the 2nd annual report that should at least refer to 'hard core results' and not just report BALTIC GAS progressing as scheduled. To let's discuss how these 'hard core results' should be presented and where e.g. the home page. Being a little ahead of time might even facilitate the writing of the final report (due month 36).

Thus a full day is dedicated to a detailed and thorough discussion of all 17 tasks (hold in 5 work packages) that 'make' BALTIC GAS. The work package (WP) leaders are asked to chair the presentations and report to the minutes of the tasks in their WP. The task responsible (TR) are asked to coordinate the presentation (the Gantt-chart lists the principal scientists (PS) expected to contribute to each task). Each presentation is followed by a discussion.

NOTE

- some TRs are expected to present more than one task – thus, please keep the presentations separated instead of giving just one summarizing presentation,
- each task is presented by a short synopsis. You may use this as guidance. For the detailed content of your task please refer to the BALTIC GAS full research plan.

ATTACHMENTS:

- Gantt-chart
- Deliverables
- Full proposal

WP 1: Project management, coordination and dissemination (chaired and reported by Henrik Fossing)

WP1 deliverables

- BALTIC GAS web-page – month 8 (*web-based source*)
- Scientific reports (Y1, Y2, final) – months 13,25, 37 (*scientific report*)
- BALTIC GAS Workshops and meetings (reports) – months 2, 8, 20, 26, 32, 36 (*technical report*)
- Submission of data to a common database – month 36 (*data base*)
- Research cruises – months tbd (*event*)

T 1.1: Management and dissemination (Bo Barker Jørgensen)

The overall status of BALTIC GAS as seen from the chair of the (scientific) coordinator. Also the homepage will be presented and its potential use as web-site for communication, presentation of results, and data exchange by the participants are explained and discussed. BALTIC GAS scientists are encouraged to express their expectations to the future use of the BALTIC GAS homepage.

T 1.2: Submission of data to common database (Henrik Fossing)

This task will be initiated during the 2nd half of 2010. The BONUS EEIG has given a positive answer to our inquiry about using PANGAEA as our preferred data base. Thus a presentation of PANGAEA will be given and we'll discuss how to handle data submission to this data base.

T 1.3: Research Cruises (Henrik Fossing)

An overview of cruises performed and cruises to come incl. a status on cruise reports will be given.

T 1.4: Ph.D-training program (Volkard Spiess)

A presentation of the programme for the training course in *Seismo-acoustic Imaging of Sedimentary and Gas-related Features in the Baltic Sea* onboard RV Navigator XXI from July 19 to July 25, 2010 following a 3-4 days preparatory course on land.

WP 2: Data mining and GIS-mapping (chaired and reported by Jørn Bo Jensen)

WP2 deliverables

- GIS-map of mined data – month 36 (*scientific report/ technical report*)
- GIS-map of methane flux and distribution in sediments – month 36 (*scientific/ technical report*)
- GIS-map of hot-spots of present and future – month 36 (*scientific/ technical report*)

T 2.1: Data mining (Jørn Bo Jensen)

The progress of compiling paper prints from acoustic surveys and comparing these to recent investigations is presented incl. a status on compilation of data reg. CH₄ distribution and production, pore water and sediment composition. Archived and new data on shallow gas are expected to provide information on the persistency of gassy sediments in different regional settings. Which regions have been addressed and how is the task progressing? And are any significant regions still missing? Last but not least a strategy for submitting these data to PANGAEA and transferring data to *T 2.2: GIS-mapping* will be discussed.

T 2.2: GIS-mapping (Michael Schlüter)

This task will be initiated during the 2nd half of 2010. The out come of GIS-mapping is thematic maps based on e.g. methane gas distribution in the seafloor, water column data, pore water data, information about sediments and bathymetry, morphological features of the seafloor etc. These data are expected to be acquired during the research cruises, as well as by data mining and thus depends on the outcome of *T 2.1: Data mining*. Hence, the presentation should describe the cooperation with and expectations to *T 2.1* and how the Geo-Information-System ArcGIS and a BALTIC GAS geodatabase are expected to serve as data library for a) numerical modelling, b) calculation of spatial budgets, and c) comparison of new with archived data. Also to be discussed is how these data are made publicly available.

WP 3: Gas and seismo-acoustic mapping (chaired and reported by Gregor Rehder)

WP3 deliverables

- Mapping of shallow gas and physical characterisation of gas-bearing sediments (i.e. [Identification of] zones of potential weakness under the external forcing of climate change and eutrophication for future political and hazard prevention measures) - month 36 (*scientific/ technical report*)

AND (to be published in the same report):

- [Identification of] zones of potential weakness under the external forcing of climate change and eutrophication for future political and hazard prevention measures –
- Detection and monitoring of methane ebullition – month 36 (*scientific/ technical report*)

T 3.1: Mapping and quantification of shallow gas by seismo-acoustic techniques (Jørn Bo Jensen)

An overview of data covering spatial distribution of free gas accumulations in sediments incl. seep/pockmark structures and underlying sediment structures is given. Determination of bubble size based on various seismo-acoustic techniques and geoacoustic models is discussed and the schism verifying this by data on total gas content from pressure-retaining coring is discussed.

T 3.2: Physical characterization of gas-bearing sediments (Gregor Rehder)

Geophysical parameters of the sediments and thicknesses of gas containing layers are obtained from sediment coring and used to interpret/ calibrate multi-sensor core logging (i.e. acoustic data). The geophysical parameters essential for or helping to calculate gas content or sediment resistance for fracturing by gas include wet bulk density, p-wave velocity and attenuation, vane shear strength, consolidation parameters, pore pressure, consolidation parameters, full wave form p- and s-wave velocity, and hydrodynamic permeability. An updatet on this task is given and 'what's missing', 'what to do' etc. are discussed.

T 3.3: Assessment of sites of sediment weakness for recent and future gas ebullition using multidisciplinary seismo-acoustic and sediment property data (Gregor Rehder)

This task will be initiated during the 2nd half of 2010 and comprise high resolution bathymetry, shallow seismic, and measurements of sediment physical properties. With these observations in hand the goal is (combined with modelling results on future changes of the gas burden) to identify future weak zones of gaseous sediments, and thus potential hot-spots of gas ebullition. The presentation will discuss the prerequisites to achieve this goal and how to report the outcome (a delivery) of this task for future political and hazard prevention measures as a tool to indentify identify zones of potential weakness under the external forcing of climate change and eutrophication.

T 3.4: Detection and monitoring of gas bubble propagation through the water column and into the atmosphere in key regions of the Baltic (Gregor Rehder)

The progress of this task is presented and discussed focusing on

- determination of exact position of gas bubbles and their rising height up through the water column,
- fate of CH₄ in the water column investigated by
 - CH₄ concentration and stable isotope measurements,
 - new gas-water equilibration based system using IR-spectroscopic CH₄ detection to quantify sea-air fluxes.

WP 4: Biogeochemistry (chaired and reported by Tim Ferdelman)

WP4 deliverables

- Methane distributions and breakdown – month 36 (*scientific/ technical report*)
- Methane emission through sediment-water and sea-air interfaces – month 36 (*scientific/ technical report*)
- Holocene evolution of the Baltic Sea ecosystem – month 36 (*scientific/ technical report*)
- Submitted MS on: Sulphur and methane biogeochemistry – > 36 month (*scientific publication*)

T 4.1: Methane distribution and geochemical in situ gradient (Tim Ferdelman)

An overview of obtained sulfur and methane biogeochemistry data in gassy and non-gassy sediments is presented followed by a discussion of questions comprising (but not necessary limited to)

- what is the status on data of natural carbon isotopic composition of methane, dissolved inorganic carbon, and total organic carbon to determine the biogeochemical origin and history of methane in specific target areas?
- how far are we in determining the carbon-14 age of methane?
- are pore water data sufficient to sustain transport-reaction modelling, GIS-mapping, and for refining the algorithm to calculate methane fluxes from gas bubble depths?
- how do we do about non-decompressed piston cores to analyze 3D-imaging of gas and other structures?

T 4.2: Gas emission across sediment-water and sea-air interface (Volker Brüchert)

An update on this task will be given comprising CH₄ flux and ebullition measurements, H₂S flux as well as water column methane and ferry box surface CH₄ measurements. Focus and discussion is expected on

- diffusive and advective fluxes of CH₄ and H₂S at selected sites e.g. in presence of shallow gas, pockmarks, crater structures, or bubble tracks,
- membrane inlet mass spectrometry and underwater mass spectrometry (UWMS) to analyze the distribution of methane at high resolution in time and space,
- coupling the UWMS to benthic chambers as well as to *in situ* pore water samplers,
- mapping of methane in surface and bottom waters,
- GC measurements of CH₄ concentration patterns in the water column comprising i.a. calculations of CH₄ dissolution and aerobic oxidation
- flux of CH₄ through the sea-air interface performed on BALTIC GAS cruises and by ferry boxes (i.e. IR spectroscopy)

T 4.3: Methane and key biogeochemical processes (Bo Barker Jørgensen)

This task will be initiated during the 2nd half of 2010 and covers quantification of CH₄ production and consumption, determination of controls on relevant key geochemical processes as well as CH₄ and H₂S oxidation coupled to water column oxygen consumption. A presentation and discussion of localities, data, experiments and models necessary to perform this task is given comprising but not necessary limited to

- understanding the mechanisms of methane cycling in the Baltic seabed,
- selection of sites and experiments to study these mechanisms:
 - rate and pathways (H₂-dependent or acetoclastic) of methane production studied by radio-labelled CH₄ as a tracer during onboard incubations,
 - budgets of carbon cycling in the sediment and determination of the controls on which fraction of organic C that is converted to CH₄,
 - breakdown of CH₄ to CO₂ within the sediment using 14C-labeled CH₄ as a tracer.
- analyzing conditions for penetration of the methane barrier either by pore water advection and bubble escape or by a diffusive flux. Selection of sites based on e.g. bottom water sulphate or oxygen concentration, organic carbon loading, shallow gas occurrence, or visible escape structures.
- calculation of oxygen consumption by the oxidation of methane and hydrogen sulphide released from the sediment as
 - ebullition of methane gas driving also H₂S into the lower water column

- reactivity of CH₄ and H₂S in the lower water column and their control on oxygen depletion.

T 4.4: Holocene evolution of the Baltic Sea ecosystem (Daniel Conley)

The target sites visited and sediment studies performed are presented and discussed with special emphasis on how these results will be used to characterize past salinity, temperature, precipitation, river run-off, productivity, plankton communities, and anoxia. Are data sufficient to run predictive models describing future scenarios of ecosystem development?

WP 5: Modelling and data integration (chaired and reported by Pierre Regnier)

WP5 deliverables

- Transport/ reaction models reg. methane and sulphur dynamics – month 26 (*model*)
- Predictive model and climate change scenarios – month 36 (*model/ scientific report*)
- Submitted MS on: Integration gas, acoustics and biogeochemistry – month > 36 (*scientific publication*)

T 5.1: Modelling methane and sulfur dynamics (Pierre Regnier)

An update of this task comprising transport-reaction models and predictive models (i.e. climate change scenarios) is given and discussed. The goal is to develop a reactive transport model (RTM) with full GIS functionality, which is able to simulate the transformations and fluxes of methane in sediments of the Baltic Sea, and their response to water column eutrophication and climate change. How far is this goal ahead? The modelling depends on process-based (WP 4) interpretation of existing (WP 2) and newly acquired geochemical and seismo-acoustic data (WP 3) and flux measurements (WP 4). How does the TA obtain data from WP2, 3 and 4?

T 5.2: GIS-modelling (Michael Schlüter)

This task will be initiated during the 2nd half of 2010 and depends on archived (i.e. mined) and new data and focuses on spatial modelling to identify biogeochemical provinces for the Baltic Sea. The goal is to refine the budgets on inventories and fluxes of CH₄ and other biogeochemical fluxes in the Baltic Sea. A plan for this task and the prerequisites to obtain this goal will be presented and discussed.

T 5.2: Integrating gas, acoustics and biogeochemistry (Bo Barker Jørgensen)

This task will be initiated during the 2nd half of 2010. The value and novelty of BALTIC GAS lie in particular in the synthesis of the very diverse data which is the challenge and responsibility of the project coordinator, in cooperation with the work-package leaders and the task leaders! The goal is to ensure that the multidisciplinary data obtained during BALTIC GAS will be compiled and integrated for in-depth analysis and synthesis. These goals will be defined in order to focus all participants on the superior project objectives.

COFFEE and LUNCH BREAK

to be served during breaks in the task presentations when appropriate or needed.

Wednesday June 8 – start 9:00

BALTIC GAS cruises – 2nd half of 2009

Four cruises have been performed in the second half of 2009. At least one participant from each cruise is encouraged to give an overview of the cruise including

- *research purpose*
- *results*
- *research challenges arising from cruise results*
- *etc.*

- *OCEANIA (November 5 – 16: Thang Manh Nguyen)*
- *POSEIDON (November 27 – December 21: Rudolf Endler)*
- *Russian cruise in Finland Gulf – methane distribution data (pending data delivered) (Nikolay Pimenov)*
- *Susanne A in Aarhus Bay (October 2009 and May 2010: Henrik Fossing)*

Each presentation will be followed by a short discussion.

Planned BALTIC GAS cruises – 2010

Two cruises are planned for 2010 and the chief scientists give a presentation of research aims and plans

- *Cruise to the Russian sector of the the Gdansk basin pock mark region (Nikolay Pimenov)*
- *Merian cruise (August 2010) – Tour de Baltic (Gregor Rehder)*

The BONUS+ Scientific reporting guideline and the second annual report (Henrik Fossing)

BALTIC GAS is divided into three reporting periods: months 1 –12, months 13 – 24, and months 25 – 36. No later than 30 days after ending of each of the reporting periods, the annual report must be submitted to the BONUS Electronic Proposal Submission System (EPSS) i.e. deadline of January 31.

Henrik gives an overview of the procedure and emphasizes the responsibility of the coordinator, the work package leaders, and task responsible and sets up a time schedule for the process.

COFFEE BREAK about 10:30

Announcement of next BALTIC GAS work-shop (Henrik Fossing/ Nikolay Pimenov)

The next two days work-shop will be hosted by Nikolay Pimenov and co-workers in Kaliningrad (Russia) tentatively in the fall 2010. The dates are discussed. Nikolay gives a short intro to the location and inputs to the agenda are briefly discussed.

Action list (Henrik Fossing)

An action list based on the minutes from the BALTIC GAS workshop is presented and consensus is (hopefully) reached about tasks and dead-lines.

Miscellaneous (Henrik Fossing)

Any important issues forgotten – then it's about time to cry it out loud!

LUNCH about 12:00

End of workshop