SeaLevel Newsletter

Issue 1 | December 2017

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Welcome to the quarterly SPP-1889 SeaLevel Newsletter!

This is the first edition which comes after the ***SPP-1889 "Regional Sea Level Change and Society" (SeaLevel)*** has been underway already for over a year now.

This means that while we still have lot of work to do in pursuing the overall aim to perform an integrated analysis of regional sea-level change in the North and Baltic Seas, and in South-East Asia, while accounting for their distinct socio-politico-economic and cultural aspects, still lots of progress has been made.

This newsletter aims to share information, news and insights into the wide range of research activities of the SeaLevel program, the goals and achievements of the different SPP projects during the first year, past and future SPP SeaLevel events, and more!

We hope that you will find it useful and we encourage you to get in touch with any questions or comments you may have about what SeaLevel is doing.

Thanks for your interest in the SeaLevel program!

INSIDE THIS ISSUE

Bringing the SeaLevel community together!

SeaLevel had a well-attended and successful kick-off meeting earlier this year in Hamburg. Members from the different SPP projects from 23 German universities and research institutes gathered together, interacted and energized the SPP program.

Over 75 scientists of the SeaLevel community from various disciplines from the natural and social sciences, overviewed the SeaLevel objectives, and discussed the terminology, challenges and ways for a successful interdisciplinary coordination, efficient communication and exchange of information among the projects. Focus was also put on the needs and desires of our early career researchers, and how SeaLevel can support them best.

Among the guest speakers, Prof. R. Nicholls (University of Southampton, UK) talked about the impact and adaptation to coastal sea level rise, Dr. A. Cazenave (LEGOS/CNES, France) on the latest sea level research from altimetry observations, while Dr. I. Sofian (GIA, Indonesia) overviewed the ocean climate research in Indonesia. Other aspects of the program, such as gender equality, and scientific communication of the urgent topic of sea level with the Media were also presented, offering a comprehensive view of what the SPP SeaLevel actually involves!

Fig.1: The participants of the SeaLevel kick-off meeting (June 2017, Institute of Oceanography, University of Hamburg).

We are now getting ready for the 2nd Annual SeaLevel Meeting scheduled in March 2018!

Focusgroup Cryosphere and SeaLevel (FCS)

Involved projects: Labsea Melt, OGreen79, OMCG, PARSL-Glac, RASLyBoCa, SATELLITE

The interaction between cryosphere and ocean is one of the main drivers for sea level rise on local to global scales.

A number of projects inside the *SPP1889: Regional Sea Level Change and Society* focusing on the interaction between the Arctic Ocean, sea ice and Greenland ice sheets and glaciers joined their efforts within the *Focusgroup Cryosphere and SeaLevel* (FCS). Topics addressed by the six projects inside the FCS include sea level changes induced by glacier mass losses, basal glacial melt estimation from Greenland ice sheets, global ice volume changes, influence of river runoff variations on Arctic sea level and sea ice, ocean mass changes due to steric sea level changes and glacial isostatic adjustment and heat transfer from the ocean to the inner Northeast Greenland shelf and the 79N glacier. The focusgroup consists of partners from the Universities of Bonn, Bremen, Dresden, Stuttgart and Erlangen-Nürnberg (FAU), and the Helmholtz Centres AWI (Bremerhaven) and GEOMAR (Kiel).

The main aims of the FCS are an intensified cooperation and exchange between the projects, regular communication on the progress and discussion of scientific results, a coherent scientific plan and joint publications and an interchange of observational data and modelling results. The PhD students and early career scientists working in the projects of the FCS have the opportunity to visit other FCS groups to broaden their skills and scientific knowledge, and they - together with the FCS members - meet during the SPP meetings and annual workshops.

The following six articles describe the projects involved in the FCS in detail, report on field trips and measurement excursions conducted by members of the FCS and illustrate first results achieved by the projects.

SATELLITE: Estimating the contribution of mountain glaciers to sea level rise

Philipp Malz, Christian Sommer, Matthias Braun; *FAU Erlangen-Nürnberg*

The SATELLITE project aims at an improved estimate of the contribution of mountain glaciers and ice caps outside the large ice sheets to sea level rise. We use acquisitions since 2010 of the German TanDEM-X satellite mission and the Shuttle Radar Topography Mission (Feb. 2000) as baseline to compute geodetic glacier mass balances – which means comparison of digital elevation models from different dates (Fig. 2). The method is based on differential SAR interferometry and enables glacier-wide and glacier specific measurements over large regions. A statistical approach shall enable the upscaling from measured regions to the global scale. This enables a consistent dataset that can be used as reference for respective modelling approaches. Within the SPP we have considerably refined our processing chains in order to facilitate processing of large data amounts. We integrated existing

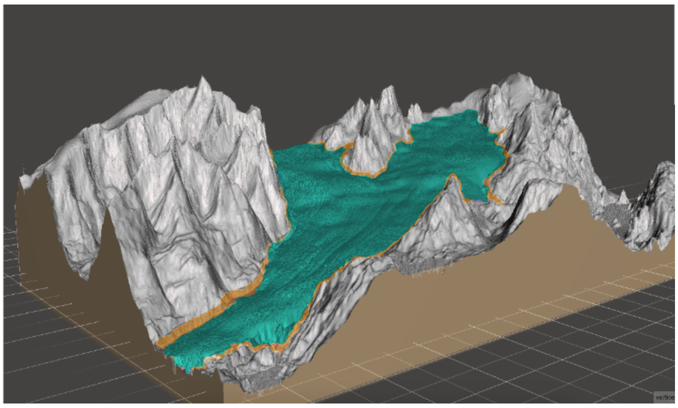

Fig. 2: Principle of geodetic mass balance method explained by a 3D-visualisation: semi-opaque overlay is elevation in 2000, below elevation 2012. The difference in glacier volume (appearing in orange) is calculated to mass changes that contribute to sea level rise. The figure shows Tyndall Glacier in Patagonia

measurements from other projects in the Karakoram and Indian Himalaya and expanded those with new measurements in Nepal and the Hindukush. The full coverage of High Mountain Asian is soon to be accomplished with the improved processing environment. For the glaciers and icefields of South America we currently work on a complete coverage. A paper to elevation and mass changes of the Southern Patagonian Icefield has been submitted, a second paper for the Northern Patagonian Icefield is to be submitted in the next days. Both data sets with complete coverage now enable the development of a stochastic sampling approach and to quantify errors resulting from this. The Andean glaciers show a vast latitudinal spreading and a broad range of elevation zones and climate conditions which is eminent for testing the sampling approach.

PARSL-Glac: The Reconstruction of Glacier Geometries in 1850

Julia Eis, Ben Marzeion; *Universität Bremen*

Glaciers respond to climate variability and change with time lags between a few years and many centuries. At a given time, the glaciers' mass change therefore not only reflects the current state of the climate system, but additionally is influenced by the ongoing adjustment to past climate change.
To quantify the spatial pattern of this ongoing adjustment, we need to initialize the glaciers using a reconstructed state in 1850, and model forward using the historical runs from the CMIP5 ensemble.

To initialize the model (Open Global Glacier Model, www.oggm.org), information about the surface elevation, the bed topography and the widths along the flowline at a given time are necessary. Under the assumption that the bed topography will not change and can be calculated using the ice thickness inversion method of the model, we are mostly interested in the surface elevation of the glaciers in 1850.

We utilize an optimization approach to find a glacier state that minimizes the difference between the forward modeled glacier geometry and today's geometry. To this end, surface elevation, length, area and volume of the glacier's geometries are taken into account. Additional constraints are needed to find a realistic glacier shape: e.g., the surface elevation always needs to be higher than or equal to the bed topography. We started to develop the method based on an idealized and simplified glacier (black line in figures 3 & 4) and with a linear mass balance gradient. Depending on the number of grid points and the estimated starting values, we obtain a number of possible glacier states, shown in figure 3.

Further steps will be to test the method on realistic glacier geometries and compare the results with observations from a glacier length fluctuations database.

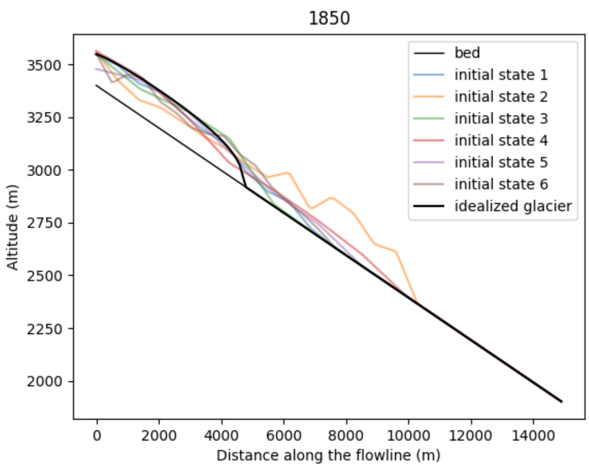

Fig. 3: Multiple optimized initial surface elevations.

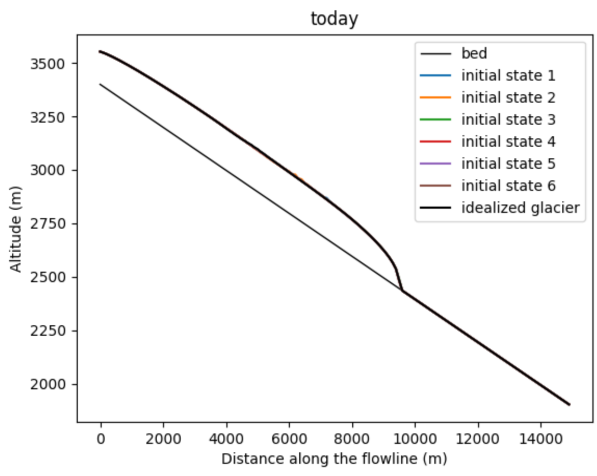

Fig 4: All initial states from the left panel lead to identical surface elevations.

Labsea Melt: Estimates of submarine melt water from Greenland: a driver for sea level changes

Monika Rhein, Oliver Huhn; *IUP – MARUM, University of Bremen*

Greenland Ice Sheet (GrIS) submarine melting is one of the major contributors to GrIS ice mass loss and thus sea level rise. The accelerating melt rates in the last 20 years are mainly caused by intrusions of warm Atlantic water into the glacier terminating fjords. However, estimates of submarine melt rates are still highly uncertain. Large uncertainties also still exist in how much and where the glacial melt is released into the Greenland boundary current and subsequently into the interior of the adjacent ocean basins. So far, there are not sufficient data available that might allow to trace and quantify the glacial melt water in the ocean outside the fjords. Increasing melt water flow into key regions of the Atlantic Meridional Overturning Circulation (AMOC) as for instance the Labrador Sea, are able to change local and basin wide circulation, thereby modifying dynamic topography and thus sea level.

One of the aims of this project is to measure and use the distributions of helium and neon isotopes in ocean water in the vicinity of one of the major outlet glaciers in northeastern Greenland (79N Glacier), and in the Greenland boundary current around and in the Labrador Sea to estimate how much of the glacial melt water of the GrIS is transferred from the Greenland boundary current into the Labrador Sea and the LSW formation region and quantify – if possible - whether the fractions of glacial melt has increased.

The first 160 noble gas samples were already taken in a pre-study in summer 2015 (MERIAN cruise MSM 43) at two sections from the Greenland shelf to the interior of the Labrador Sea, and analysed in the Bremen Mass Spectrometer Lab HELIS. First results show that submarine melt water is found in both sections in the Greenland boundary current. In summer 2016, about 700 samples were collected at and near the 79N Glacier, one of the main outlet glaciers of northeast Greenland (POLARSTERN cruise PS 100). Furthermore, samples from the Scoresby Sund in southeast Greenland have been collected during cruise MSM 56. In the sund, high amounts of submarine melt water have been found. In June 2017, the Greenland boundary current near Nuuk and further north have been covered with 170 He and Ne samples during cruise MSM 65.

Fig. 5: The Greenland Boundary current (M. Rhein)

OMCG: Reconciling ocean mass change and GIA from satellite gravity and altimetry

Willen, M.[1], B. Uebbing[2], M. Horwath[1], J. Kusche[2]; [1]*TU Dresden*, [2]*Universität Bonn*

Knowledge of ocean mass variability in space and time is important for addressing the global and regional sea level budget. However, recent studies have provided ocean mass change (OMC) estimates that differ beyond the error margins. Therefore, in this project, we are working on the improvement of methods to determine OMC from geodetic satellite data. In Bonn, we use gravity data from the GRACE mission in combination with radar altimetry over the ocean in a joint inversion approach to determine OMC (effects from hydrology, melting of ice sheets and land glaciers) simultaneously with steric sea level changes. In Dresden, we want to improve the information on glacial isostatic adjustment (GIA) by separating the GIA and the ice mass change effect in a joint analysis of GRACE and altimetry over ice sheets. Together we aim at evolving a unified framework for reconciling OMC and GIA, which integrates approaches and data sets in a globally consistent way.

So far, we have examined the differences in OMC results between the joint inversion approach and the widely used direct method, which is based solely on GRACE data. We investigated the OMC change on global scales as well as for the Atlantic, Pacific and Indian Ocean basins (Fig. 6). Our preliminary results suggest that the main difference is due to the application of the GIA correction. While the direct method is limited to a static linear trend correction, the joint inversion is able to adjust the trends for the major GIA regions. The inversion results suggest a significantly smaller GIA trend in Antarctica compared to the standard model (A et al., 2013) employed in the direct method. This is in agreement with recently published studies and will be the basis for further investigations within the OMCG project.

To resolve empirically GIA we further develop the approach by Gunter et al. (2014). Satellite gravimetry observes the superposition of ice mass change and GIA, which, for Antarctica as a whole, have the same order of magnitude. The fundamental starting point is the big difference in the average density of the ice sheet and the asthenosphere, where GIA-related mass transport takes place. We are able to separate both effects, by the additional use of volume change observations (altimetry) and various models regarding surface processes (Fig. 7). For a later integration of our GIA results into the global inversion approach, it is crucial to characterize the uncertainties. Therefore, we are currently conducting a simulation study to quantify the error budget.

References

- A, G. et al. (2013). Computations of the viscoelastic response of a 3-D compressible Earth to surface loading: an application to Glacial Isostatic Adjustment in Antarctica and Canada. GJI.
- Gunter, B.C. et al. (2014). Empirical estimation of present-day Antarctic glacial isostatic adjustment and ice mass change. TC.

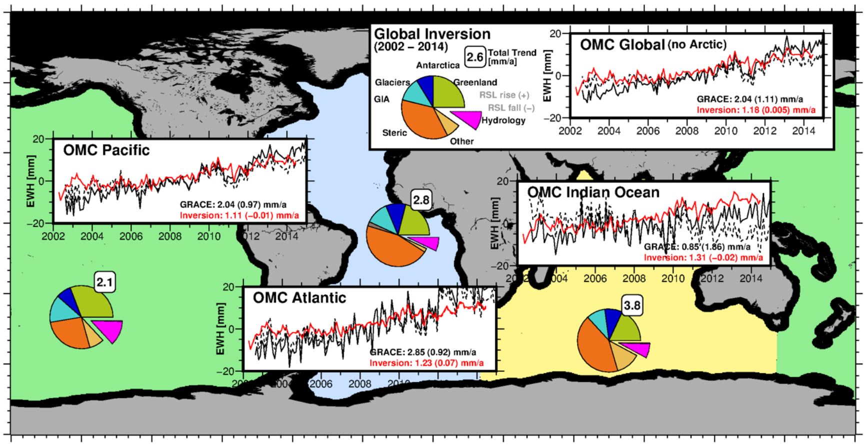

Fig. 6: Inversion results and comparison to the direct method globally and for the Pacific, Atlantic and Indian Ocean for 2002-2014. Pie charts: contributions of individual trend components to the total trend. The sub-figures compare the ocean mass change (OMC) of the inversion (red) to the direct method (black) with (solid lines) and without (dashed lines) applying the GIA correction. Trends of OMC are provided with corresponding trends of the GIA correction in parentheses.

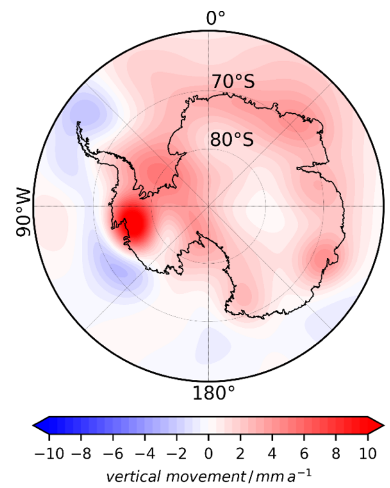

Fig. 7: Empirical estimated GIA induced vertical movement for Antarctica following the approach of Gunter et al. (2014).

RASLyBoCa: Influence of Arctic river runoff variations on Arctic sea level, sea ice and circulation

Elena Gerwing[1], Elisabeth Woisetschläger[2], Martin Losch[1], Nico Sneeuw[2], Benjamin Rabe[1];
[1]Alfred Wegener Institute Bremerhaven, [2]Institute of Geodesy, University of Stuttgart

The main objective of this project is to assess and quantify the response of Arctic sea ice and Arctic and North Atlantic sea level and hydrography to changes in river discharge into the Arctic Ocean.

However, as the availability of in situ observations of river runoff is on the decline since the late 1980s, the observational record of discharge into the Arctic Ocean is still too sparse to address important scientific questions relating to long-term behaviour. Therefore, at the Institute of Geodesy in Stuttgart (GIS), we are improving the observational record of hydrological parameters over boreal catchments by geodetic spaceborne methods such as satellite altimetry and GRACE gravimetry. The goal is to achieve long time series (several decades) of runoff with a temporal resolution up to 5 days for all major catchments draining into the Arctic Ocean. Hereby, we are facing challenges including the correct interpretation of snow and ice reflected waveforms with appropriate altimetric retracking algorithms, the estimation of non-stationary runoff using multi-mission altimetric water level time series along each river as well as the combination of GRACE and altimetry based runoff estimates.

For ice-ocean models, the scarcity of runoff information in the Arctic generally requires that the seasonal cycle of runoff is assumed to be a climatological mean. At the AWI Bremerhaven, we use the sea ice-ocean model MITgcm to determine the influence of using a high resolution time series of river discharge provided by GIS in comparison to runoff climatologies. Further, we will assess the influence of an increased river runoff and an increased freshwater content in the Arctic on the Arctic sea level, the Arctic sea ice and the North Atlantic sea level and overturning circulation. In addition to that, we will perform adjoint model simulations in order to assess the sensitivity of sea level and other important net quantities to river discharge relative to other freshwater sources. The adjoint model will be used to identify river catchments that are hotspots of sensitivity for the Arctic sea level to inform GIS where to focus their investigations.

First results suggest a measurable influence of using inter-annually varying runoff forcing in the model simulations on the freshwater content and the sea level in the Arctic (Fig. 8). The difference in sea surface elevation for a simulation with the CORE II (Danabasoglu et al. 2014) runoff climatology and a simulation with CORE II interannual runoff (monthly resolution) for August 2010 after 30 years of simulation imply systematic changes in the Arctic sea level of up to ± 5 cm. This can be quantified by current satellite altimetry missions.

References:
Danabasoglu et al. (2014). North Atlantic simulations in Coordinated Ocean-ice Reference Experiments phase II (CORE-II). Part I: Mean states Ocean Modelling, 2014, 73, 76-107

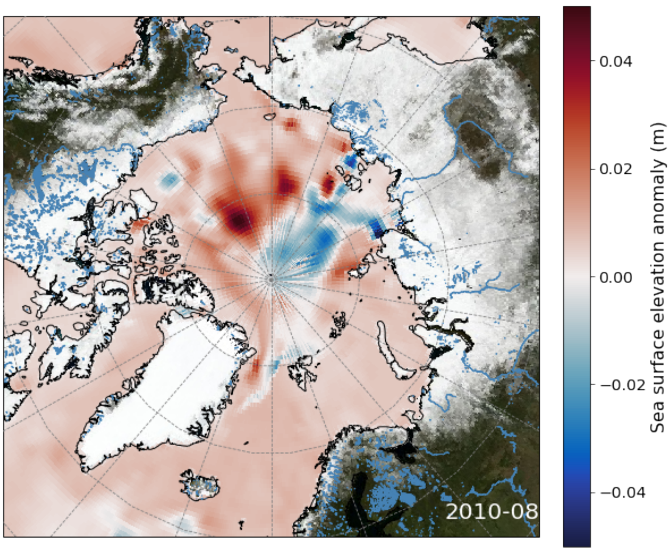

Fig. 8: Sea surface elevation anomaly of simulations with CORE II runoff climatology and CORE II interannual runoff for August 2010. Red colours indicate higher sea level simulated with the runoff climatology and blue indicates where the sea level is lower compared to the interannual runoff.

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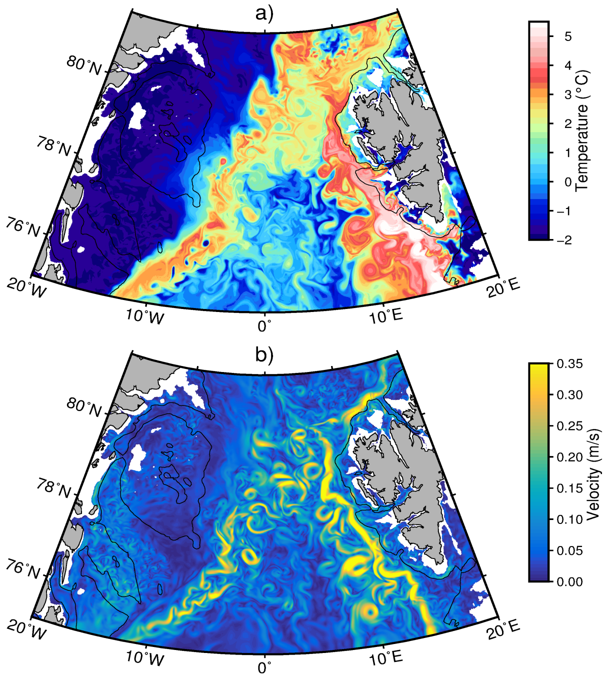
You can also forward us your papers!

OGreen79: Ocean impact on Greenlands 79°N-Glacier

Torsten Kanzow[1], Ursula Schauer[1], Ralph Timmermann[1], Janin Schaffer[1], [1]*Alfred-Wegener-Institute*

The Fram Strait between Greenland and Spitsbergen is the only deep passage connecting the Arctic with the world oceans. Here, two strong ocean currents meet: At the eastern side, relatively warm Atlantic waters (AW) from the Gulf Stream enter the Arctic Ocean. Along the western side of the strait, cold waters from the Arctic Ocean flow southward to the Atlantic Ocean. Eddy driven recirculation of AW in the Fram Strait modifies the amount of heat that reaches the Arctic Ocean and drives some of the warm water to the Northeast Greenland glaciers. However, it is difficult to constrain this bifurcation in ocean models due to the very small Rossby radius (an indication for the size of eddies) in this region.

In a study recently published in JGR Oceans (*Wekerle et al.*, 2017), we explored the effect of resolved eddies on the AW circulation in a simulation using the global Finite-Element-Sea ice-Ocean Model (FESOM) with a high resolution in the Fram Strait. Our results suggest that resolving local eddy dynamics is critical to realistically simulate ocean dynamics in the Fram Strait. Strong eddy activity simulated by the model, as shown in Fig. 9, is comparable in magnitude and seasonal cycle to observations from a long-term mooring array. Given the good agreement between the eddy-resolving model and measurements, it can help filling gaps that point-wise observations inevitably leave.



Simulations planned for OGreen79 will be based on this model setup. Additionally, ice shelves will be incorporated, and the resolution will be increased from 1 km to around 500 m in the vicinity of the 79ºN Glacier.

Expeditions:

The Polarstern expedition "Greenland ice sheet/ocean interaction" (PS109) aimed at investigating the complex physical interactions between the ocean and the ice sheet in Northeast Greenland, as well as their implications for the regional marine ecosystem (see Fig. 10 for cruise track). On 12 September *Polarstern* left the port of Tromsø. The shelf and coast of Northeast Greenland represented our main work area, where we investigated the interaction between the ocean and the marine terminating glaciers in Northeast Greenland (79N Glacier and Zachariæ Isstrøm). For this, the disciplines on board covered the range of climate-, geo- and biosciences. A major emphasis was put on observations of the hydrography, circulation and tracer distribution relying both on vessel-based methods (CTD, ADCP, microstructure) and on autonomous platforms (moorings, AUV). Based on these we targeted both the pathways of subsurface warm Atlantic Water inflow from Fram Strait to the glaciers at the coast and the outflow of glacier meltwaters and their distribution on the shelf. Fig. 11 shows AUV-based velocity observations of the Atlantic Water inflow in the central part of Norske Trough toward the coast of Northeast Greenland. On the outer shelf, central shelf and also close the 79N Glacier at the coast of Greenland, moorings deployed in 2016 were recovered successfully, such that for the first time coherent time series of the subsurface circulation of Atlantic Water in the Norske Trough – Westwind Trough system have become available. Glaciological measurements of the thickness of the floating ice tongue of the 79N Glacier of were carried out in order to calculate basal melt rates. On 13 October *Polarstern* arrived in the port of Bremerhaven.

References: Wekerle, C., Q. Wang, W.-J. von Appen, S. Danilov, V. Schourup-Kristensen, and T. Jung (2017), Eddy-Resolving Simulation of the Atlantic Water Circulation in the Fram Strait With Focus on the Seasonal Cycle, J. Geophys. Res. Oceans, doi: 10.1002/2017JC012974.

Fig. 9: Snapshots of simulated a) temperature and b) velocity in 75 m depth on 31 March 2004 in the eddy-resolving FESOM setup. Mesh resolution is 1 km in the wider Fram Strait and on the Northeast Greenland continental shelf.

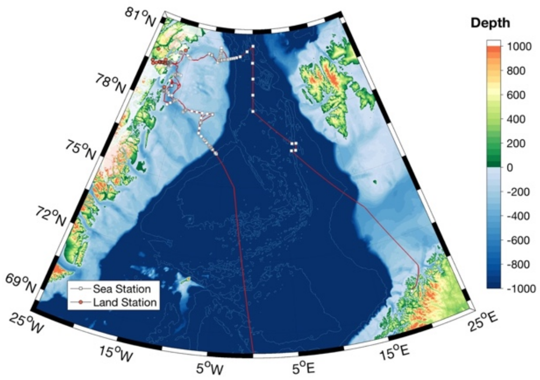


Fig. 10: Cruise track (red lines) and stations of Polarstern (white dots) as well as helicopter stations during the expedition PS109.

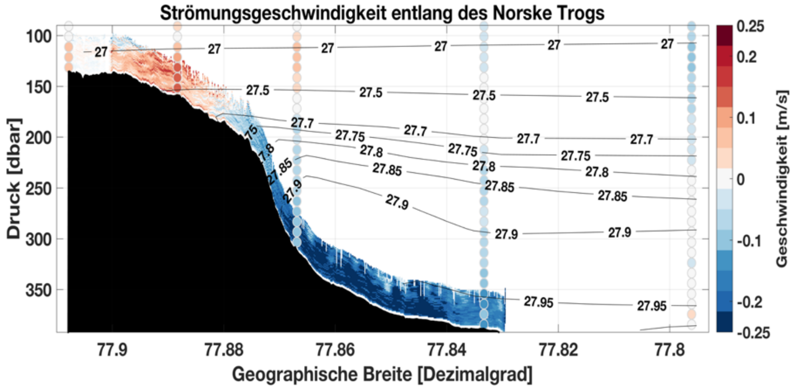


Fig. 11: The colored shading represents velocity observations obtained during an AUV dive in Norske Trough off Belgica Bank in the central part of the shelf of Northeast Greenland (blue shading represents flow to the inner shelf, red shading to the outer shelf). The colored dots show velocities based on LADCP measurement aboard Polarstern. Potential density is given by the black contour lines.

Recent SPP SeaLevel Publications:

OMCG project: Karegar, M.A., T.H. Dixon, R. Malservisi, **J. Kusche**, and S.E. Engelhart (2017), Nuisance Flooding and Relative Sea-Level Rise: the Importance of Present-Day Land Motion, *Nature Scientific Reports*, 7(11197), doi:10.1038/s41598-017-11544-y.)

OGreen79 project: **Schaffer, J.**, W.-J. von Appen, P.A. Dodd, C. Hofstede, C. Mayer, L. de Steur, and **T. Kanzow** (2017), Warm water pathways toward Nioghalvfjerdsfjorden Glacier, Northeast Greenland, *J. Geophys. Res. Oceans*, 122, 4004-4020, doi:10.1002/ 2016JC012462.

SEASTORM: Natural and anthropogenic forcing of past North Frisian salt marshes

A. Cordua[1], D. Bunzel[1], A. Lang[2], G. Schmiedl[1], S. Lindhorst[1], U. Mikolajewicz[2], K. Müller-Navarra[1], C. Betzler[1], J. Jungclaus[2], Y. Milker[1]; [1]CEN Institute of Geology Uni HH, [2]*MPI Meteorology Hamburg*

The joined project SEASTORM (*Unraveling the signals of sea level and storminess of the past millennium; southern North Sea*) tests the hypothesis that existing proxy-based sea-level reconstructions bear a climate component, which in the past has been underestimated. We therefore follow an integrated approach combining proxy data with results from climate-model experiments. In the first project phase we have successfully cored different recent salt marshes and fossil polder deposits and generated the first geophysical, sedimentological, micropaleontological and geochemical data sets. In addition, a full simulation of the last millennium has been performed using a regionally coupled atmosphere-ocean model with a high enough spatial and temporal resolution to realistically represent tides and storm surges.

Recent salt-marsh deposits of the past century reveal a long-term coarsening trend, likely reflecting a close linkage between the regional sea-level rise and associated changes in availability and export of tidal-flat sediments to the adjacent salt marshes. Alternations in the dominance of agglutinated and calcareous benthic foraminiferal taxa reveal quasi-periodic decadal-scale changes in the frequency of storm surges, but also reflect sediment relocation through ditching. The protection of salt-marsh ecosystems with foundation of the Wadden Sea

National Park in AD 1985 led to a gradual return to natural vegetation and sedimentation dynamics. This process is associated with enhanced accretion rates, which likely strengthened the resilience of regional salt marshes to further sea-level rise.

The sedimentary succession preserved in the polders documents the complex evolution of the area comprising multiple phases of salt-marsh growth, re-flooding and erosion. Our first results indicate a sedimentary architecture that vary markedly from polder to polder and open up for an investigation of different depositional time intervals in the Wadden Sea coastal evolution. The current focus is on establishing age models, and in combination with the compiled dataset from three main study sites, to establish a thorough understanding of the depositional processes, stratigraphy, and sedimentary architecture. The three study sites are located in polders embanked in the years AD 1100, 1445 and 1862 in different past depositional environments. Correlation of sedimentary successions in the different polders will make it possible to overcome local-scale effects related to lateral variability and thereby reconstruct changes in sea level and climate oscillations.

Simulations using coupled climate models help to unravel the variability of storm surges along the southern North Sea and the role of their associated climatic forcing mechanisms. First results from a downscaling of a last millennium simulation using the regionally coupled atmosphere-ocean model configuration MPIOM-REMO show that the most extreme storm surges (with return periods > 5 years) likewise exhibit a prominent multi-decadal variability. Comparison with mean sea level suggests that the decadal variability of extreme storm surges is decoupled from mean sea-level variability on these timescales. While the latter is significantly linked to the North Atlantic Oscillation, attribution of extreme storm surges to climate variability on (multi-)decadal timescales proves more difficult and builds the focus of the project's next phase.

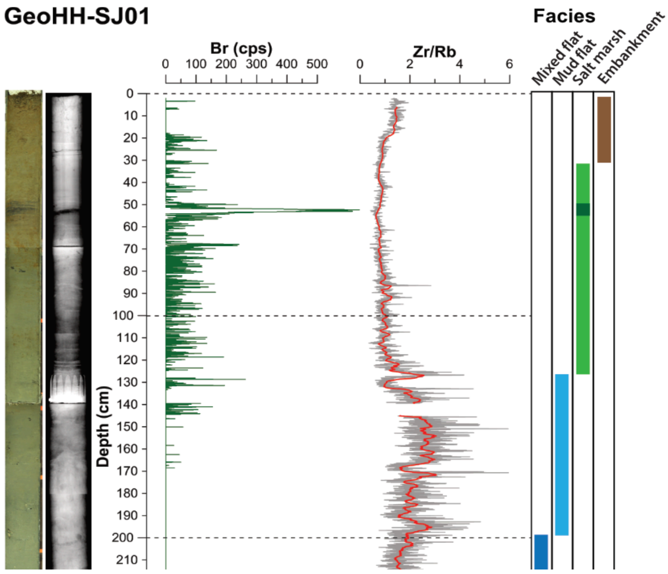


Fig. 12: Sediment core GeoHH-SJ01 from polder embanked c. AD 1100. Geochemical data based on X-ray flourescence scanning reflects changing depositional conditions: Br is a proxy for organic content and Zr/Rb for variations in grain size. The cored interval documents a relative sea level fall reflected by the landward shift in facies.

Future Events:

IBS Conference on Climate Change and Human Migration, 27 November-1 December 2017, Busan, South Korea
SPP-1889 Social Sciences Postdoc Networking Day, 1 December 2017, Bremen, Germany
SPP-1889 Indonesian Networking Day, 1 February 2018, Bremen, Germany
Cities and Climate Change Science Conference, 5-7 March 2018, Edmonton, Canada
*2nd Annual SPP-1889 SeaLevel Meetin*g, 19-21 March 2018, Hamburg, Germany
1st Early Career Scientists (ECS) SPP-1889 SeaLevel Meeting, 22-23 March 2018, Hamburg
European Geosciences Union (EGU) General Assembly, 8-13 April 2018, Vienna, Austria
8th GEWEX Science Conference on Extremes and Water on the Edge, 6-11 May 2018, Canmore, Canada
ESA Cryosphere Remote Sensing Training Course, Svalbard, Norway
SCAR & IASC POLAR2018 Conference: Where the Poles come together, Davos, Switzerland

Traveling Practices of Urban Coastal Protection in Island Southeast Asia

Rapti Siriwardane[1] & Johannes Herbeck[2], [1]*Leibniz-Centre for Tropical Marine Research (ZMT),* [2]*Sustainability Research Centre*, [2]*University of Bremen* (EMERSA project)

With its distinct megacity focus on Island Southeast Asia (Jakarta, Manila and Singapore), the EMERSA project completed its first phase of ethnographic fieldwork between February and June 2017.

EMERSA (Epistemic Mobilities and the Governance of Environmental Risks in Island Southeast Asia) explores how and why particular stocks of traveling knowledge - primarily model policy blueprints, 'best practices', standardized recipes and experimental solutions for living with sea-level change gain traction, are politically legitimized, contextually translated, and are further re-circulated by a host of actors such as states, donor organizations, international consultancies, and civil society groups.

The fieldwork placed emphasis on the everyday communal and institutional practices of coastal protection that implicated a host of broader urban transformations, which not only featured distinct land-sea dynamics (e.g. subsidence, salinization, backflow etc.) but also a interrelated socio-political aspects such as disaster risk reduction, the privatization of coastal land and security of tenure, forced displacement, and on-going land/island reclamation projects - all of which complicate urban realities of living with (or *without*) water along densely populated shorelines.

Based on in-depth interviews, mobile methods such as community transect walks, focus groups and participatory workshops, the EMERSA team comprising their partner universities identified several crosscutting thematic tangents for future publications which include:

a) Discourses underpinning how the notion of sea level change both as a techno-scientific concept and as a materially ‘measurable’ reality is diversely framed between the three megacities, and what these interpretations implicate for adaptive learning;

b) Traveling imaginaries and contradictory solutions on the uses and design of ‘coastal defence’ systems which in turn embody a range of international donor-driven, policy-related, and community-level negotiations between hard and soft engineering principles, hybrid infrastructures, and how their underpinning visions come to be locally translated into practice in ways that may at times exacerbate or create new coastal and hinterland vulnerabilities;

c) Changing discursive patterns illustrating how sea level change has been perceived not only as an emergent riskscape, but also as a new profit frontier in legitimizing megaprojects that serve particular vested economic and socio-political interests.

d) Conceptual advances in the study of multiple mobilities/immobilities that go beyond mere spatial and temporal understandings, thereby integrating epistemic boundaries and knowledge translations - for example between ‘dry’ and amphibious adaptive strategies, the ways in which coastal and freshwater flooding is addressed, or how divergent futures for dwelling along shorelines and their hinterlands are produced and contested.

Fig. 13: A dike in the making: the materialization of a coastal boundary in the face of older ‘amphibious’ modes of informal dwelling in Metro Manila (© Rapti Siriwardane).

Acknowledgement:
Project ‘Epistemic Mobilities and the Governance of Environmental Risks in Island Southeast Asia (EMERSA)’, PIs: Prof. Dr. Anna-Katharina Hornidge (Uni Bremen & ZMT) & Prof. Dr. Michael Flitner (Uni Bremen).

Past Events: "High-End Sea Level Rise" Workshop by the WCRP Grand Challenge & the SPP SeaLevel

Our knowledge on how fast sea level rise (SLR) can develop under a given emission scenario over the 21st century, still remains highly uncertain, primarily due to considerable uncertainties in Antarctic ice sheet mass loss and associated processes. An improved understanding of the evolution of future SLR and low-probability, high-risk events, is of crucial importance for both mitigation and adaptation in coastal impact studies and management strategies.

To this end, on 18 -19 September, leading research experts on climate modeling/projections, cryosphere, glaciology/ ice sheet dynamics, oceanography, meteorology, but also human-environment interactions, coastal engineering, geography, risk communication and mitigation advice, met at CEN Institute, Hamburg to discuss concepts of future "High-end Sea Level Rise", including the different aspects of high-end (emission-dependent) scenarios of SL change and change rates used in the literature and IPCC reports, to improve the understanding on their different perspectives, to discuss ways of estimating high-end SL projections and how such information can be "translated" to best meet the range of users' needs.

SLR will continue for several centuries after a global temperature rise comes to a halt. The likely range of SLR at the end of 21st century stated in the IPCC AR5 is still consistent with current knowledge (within a few dm). However, the meeting also emphasized no upper-end SLR is specified by the IPC reports, and doing so remains a challenge. Several different suggestions are floated in the literature, but concerns were raised regarding some of those, as their likelihood to occur is considered very low.

The workshop was organized by the WCRP Grand Challenge and the SPP SeaLevel. Its outcome will be a scientific paper on high-end SL change scenarios, which will likely help further to the IPCC AR6 and SROCC preparations, but also allow the SL community to provide less ambiguous messages to the science and stakeholder community alike.

You can also follow us at:

Twitter: **SPP1889_SeaLevel**

Instagram: **SPP-1889 SeaLevel** to find more on our diverse fieldwork research!

We wish you all Merry Christmas

& A Happy & Productive 2018!

The SPP SeaLevel Members

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