SeaLevel Newsletter

Issue 10 | December 2021

www.spp-sealevel.de

Welcome to the SPP-1889 SeaLevel Newsletter!

We are pleased to present the latest news and research outcomes of the SPP SeaLevel program.
In this newsletter, find out about the new findings from the successful measurement campaign and recovering oceanographic moorings in Northeast Greenland of the A2Green project that took place in September 2021,
also the methodology developed by the OMCG-2 project about separating long-term and short-term mass changes of Antarctic ice sheet from satellite observations + model products, and other new publications of the program.
Also in this newsletter issue, read about the annual SPP SeaLevel Meeting 2021 of the SeaLevel members that occurred in September 2021, the presentation of the program at the Nautical Association of Hamburg as well as about and other activities of the program over the last months, rewards of SPP members as well as future sea level events for the entire community.

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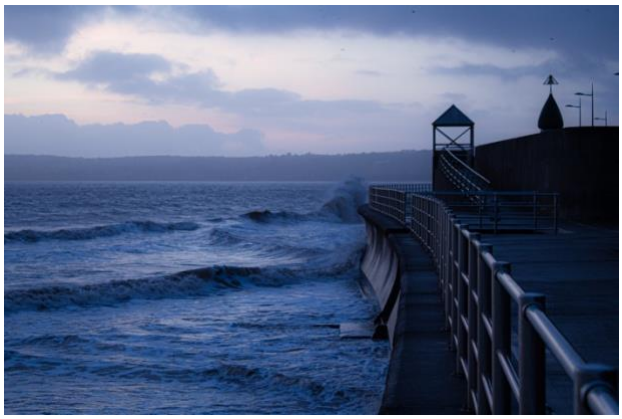

OMCG-2: Separating long-term and short-term ice mass changes of the Antarctic Ice Sheet

Matthias Willen and Martin Horwath, TU Dresden

The Antarctic Ice Sheet is constantly changing in volume and mass. Overall, the ice sheet is shrinking, but there are regions with large losses and regions with small mass gains. Mass loss means that more ice is transported into the ocean than new ice is added due to snowfall. The reason can be that the flow of the ice has increased (ice-dynamical change). Furthermore, mass changes occur because the amount of snowfall varies from year to year. In the recently published study "Separating long-term and short-term mass changes of Antarctic ice drainage basins: a coupled state space analysis of satellite observations and model products" (Willen et al., 2021), we were able to separate these two processes in several regions of the Antarctic Ice Sheet.

We used data from the GRACE satellite mission from 2002 to 2016. Those satellites measure the

changes in the gravity field of the Earth caused by mass changes. Moreover, we used data from altimetry satellites during the same time period. Altimeters can measure the volume changes of the ice sheet by recording changes in ice surface elevation. Changes of snowfall can be calculated using a regional climate model for Antarctica. We combined these sources of information and analysed them with statistical state space methods. We were able to find long-term changes which are due to changes of the ice flow. As an advantage over earlier methods, we allow those changes to vary in speed over time. The results show that there is an accelerated mass loss in West Antarctica caused by an increased ice flow (Figure 2). In contrast, we identified a long-term steady increase in East Antarctica. We want to examine this increase in East Antarctica in further investigations.

Reference

Willen, M. O., T. Broerse, A. Groh, B. Wouters, P. Kuipers Munneke, M. Horwath, M. R. van den Broeke, and L. Schröder (2021). Separating long-term and short-term mass changes of Antarctic ice drainage basins: a coupled state space analysis of satellite observations and model products. Journal of Geophysical Research: Earth Surface. https://doi.org/10.1029/2020JF005966.

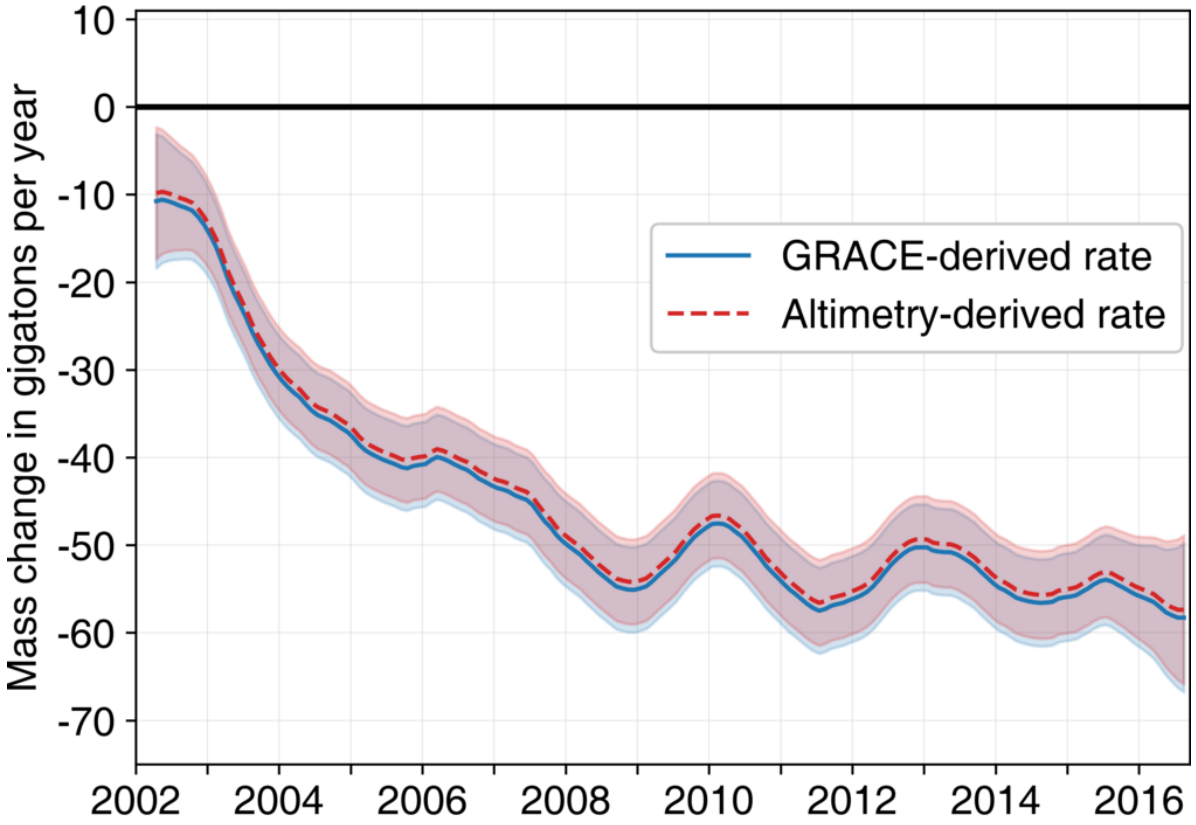

Fig. 2: The figure shows, how fast the long-term changes (mass changes per year) evolved in a West Antarctic region (Pine Island Glacier). In the last years the mass loss was 50 to 60 gigatons per year.

A2Green: Successful Northeast Greenland field campaign

R. McPherson, T. Kanzow, AWI

A team of AWI physical oceanographers, Rebecca McPherson and Torsten Kanzow, and technician Carina Engicht have recently returned from conducting a successful measurement campaign and recovering oceanographic moorings in Northeast Greenland. They joined a Danish Navy ship, HDMS TRITON, on their patrol of the region from 30 August to 20 September 2021.

Near Nioghalvfjerdsbræ (79 North Glacier (79NG)), two moorings were successfully recovered; one at the calving front of 79NG and the other approximately 50 nm offshore, which have been collecting hydrographic data since 2017 and 2018, respectively. Preliminary results show a prolonged cooling of the warm subsurface Atlantic water that drives the basal melting of 79NG. Further analysis is required to determine the extent of this cooling, its drivers, and the implications for the basal melt rate. Hydrographic measurements were also conducted near 79NG and in other more southern fjord systems such a Young Sund and Kong Oscar Fjord.

During the first phase of research in ocean-glacier interactions, 79NG was the primary focus: it is the largest marine-terminating outlet glacier of the Northeast Greenland Ice Stream. The work examined the pathways of oceanic heat from the continental shelf towards the glacier, which contributes to the melting of its large floating ice tounge. The moorings recovered at 79NG by the AWI team will contribute to the understanding of how the subsurface warm water inflow to the glacier changes over time, and the processes that drive the circulation of warm water near the calving front.

The hydrographic measurements taken on board the TRITON in fjords further south of 79NG contributes to the current work which extends the research focus to the whole East Greenland continental shelf. The ocean-glacier interactions examined at 79NG are thought to be applicable to other glacier systems as far south as Scoresby Sund (69° N). Thus, the drivers of ocean-driven melt rate of the marine-terminating glaciers in Northeast Greenland can be better quantified and understood.

The field work is supported by the Joint Arctic Command who facilitated the coordination between the Danish Navy and the participating scientists at AWI. The scientific collaboration between institutes was organised by ISAAFFIK, the support of whom we are greatly appreciative. We are very grateful to the dedicated and capable support of our work by the captain and crew of HDMS TRITON.

Fig. 3: Impression from the embayment near the calving front of the 79N Glacier in Northeast Greenland on 08 September, 2021 (Photo: T. Kanzow).

The SPP SeaLevel annual program gathered for its annual meeting 2021 virtually

The members of the SPP SeaLevel program gathered virtually this year for its annual meeting due to COVID regulations to discuss the program's status and future aspects of the program as it enters this period its final year. The successful and fruitful annual SPP SeaLevel meeting occurred on 20-22 September 2021 online and the agenda included both the report of the current state of all active projects as well as future plans until the completion of the program.

The coordinator of the SPP SeaLevel, Prof. Detlef stammer/University Hamburg, opened the annual meeting with a summary of the SPP Sealevel purpose and an overall view of the sea level science status currently.

During the first 2 days of the annual meeting, all projects had the opportunity to present in detail their newest results and progress as well as future planned actions and to lead also fruitful discussions with the rest of the projects about their outcomes and opportunities for potential collaborations and exchange of information among them for a more interdisciplinary approach to their research aims and prospects.

Among others, the TRANSOCAP II project partners presented their current survey on the adaptive capacities of people and communities in Indonesia who are affected by environmental hazards and invited all members to circulate their survey to Indonesian partners that live in Germany and in the Netherlands. More specifically, the survey will explore how Indonesian households and communities use their personal social contacts to deal with these hazards and changes as well as the role that Indonesians living in Germany and the Netherlands play for affected Indonesians. They survey can be filled in here.

Moreover, the meeting agenda included discussions on the preparation of a collaborative paper on the results and outcomes of the entire SPP SeaLevel program throughout its life span where all SPP SeaLevel projects will have the opportunity to contribute with their research work and outcomes, and also coming sea level events, conferences and workshops to be held both by the SPP SeaLevel program itself, e.g. its last annual meeting in 2022, as well as by the global sea level community the time ahead, such as the World Climate Research Programme (WCRP) Regional Sea Level Change and Coastal Impacts conference in Singapore on 11-15 July 2022, where all SPP projects were encouraged to submit their contributions.

Representative of the DFG, Dr. Daniel Weymann also joined the annual SPP SeaLevel meeting to discuss the potential funding COVID extensions offered by the DFG to all SPP SeaLevel projects that were impacted by the pandemic to apply for an extension until end of November 2021 (final date to be determined and circulated to all projects soon).

In addition, members shared information about future opportunities for research funds for coming projects on oceanography and all participants were invited to contribute with their proposals and contributions for new collaborations.

Overall, the annual meeting was fruitful and successful and the SPP SeaLevel program with the participation of most of the members of its active projects currently was fueled with fresh ideas and plans for the future and its final year and more.

Presentation of SPP at the Nautical Association of Hamburg

B. Ratter, University Hamburg

On invitation by the chairman Captain Suhr and on behalf of the SPP SeaLevel B. Ratter presented the SPP SeaLevel program at the Nautical Association of Hamburg on 16 November 2021.
Since its foundation in 1868, the Nautical Association of Hamburg has pursued the goal of representing the national interests of the German maritime industry in a world-oriented context and to provide impulses for the maritime economy (https://nvhh.de/). Under the title "Crisis on the coasts - sea level rise as a social challenge at the transition between land and sea", around 40 members and guests of this traditional association attended the event.
Already during the presentation of the research foci of the SPP SeaLevel, recent results of the IPCC, determination and composition of the global and impact factors of regional sea levels as well as especially the societal challenges that climate change poses to coastal and island societies, there were exciting discussions with the audience. The example of the project "DICES - Dealing with change: societal action and political reaction in sea level change adaptation in Small Island Developing States" was used to illustrate that future climate change impacts will present coastal societies with new challenges. Using the examples of the Maldives and East Frisia, it was shown that natural dynamics are essential for coastal protection as well as coastal conservation and that compound events in particular will increase in the future.

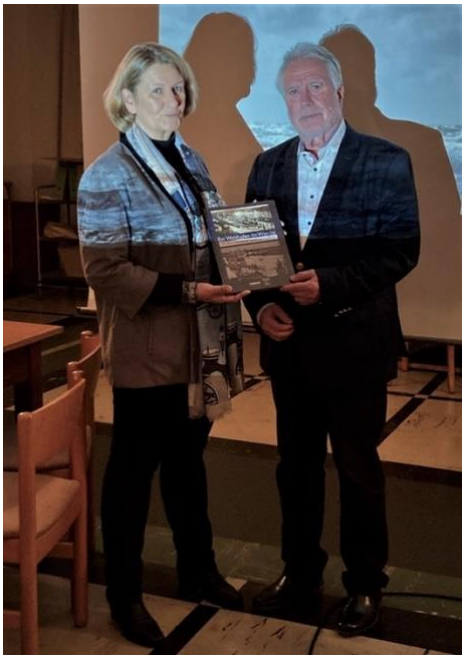

Fig. 3: B. Ratter, PI of the DICES project at the Nautical Association of Hamburg.

The embedding of the Maldivians ("people of the sea") and the East Frisians ("God created the sea, the Frisians the coast") in their socio-cultural traditions and resilience in the coastal space stimulated numerous comments, queries and additions by the audience. What is true for the Maldives could also be applied to the Frisians. People are not rational, they are embedded in socio-cultural traditions and routines and have to deal with powerful political interests. For any form of socially supported climate adaptation, trust in the government is an important basis, but at the same time, exclusively ascribing responsibility to state institutions can become a handicap.
The question of whether societies will be able to deal with the new challenges in the future was hotly debated. The bottom line: it is worth taking a closer look - at the specific, local case and the specific socio-cultural and political situation. Coasts are not (only) in crisis due to rising sea levels. The responsibility for climate adaptation action does not lie with governments alone. Climate change adaptation is a task for society as a whole.

Recent SPP SeaLevel Publications:

PLOS ONE

RESEARCH ARTICLE

The 'wickedness' of governing land subsidence: Policy perspectives from urban Southeast Asia

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OPEN ACCESS

Citation: Siriwardane-de Zoysa R, Schöne T, Herbeck J, Illigner J, Haghighi M, Simarmata H, et al. (2021) The 'wickedness' of governing land subsidence: Policy perspectives from urban Southeast Asia. PLoS ONE 16(6): e0250208. https://doi.org/10.1371/journal.pone.0250208

Editor: Vanesa Magar, Centro de Investigacion Cientifica y de Educacion Superior de Ensenada Division de Fisica Aplicada, MEXICO

Received: March 1, 2020

Accepted: April 3, 2021

Published: June 9, 2021

Peer Review History: PLOS recognizes the benefits of transparency in the peer review process; therefore, we enable the publication of all of the content of peer review and author responses alongside final, published articles. The editorial history of this article is available here: https://doi.org/10.1371/journal.pone.0250208

Data Availability Statement: Due to ethical and legal restrictions, anonymized aggregated

Abstract

Drawing on Jakarta, Metro Manila and Singapore as case studies, we explore the paradox of slow political action in addressing subsiding land, particularly along high-density urban coastlines with empirical insights from coastal geography, geodesy analysis, geology, and urban planning. In framing land subsidence as a classic 'wicked' policy problem, and also as a hybrid geological and anthropogenic phenomenon that is unevenly experienced across urban contexts, the paper uses a three-step analysis. First, satellite-derived InSAR maps are integrated with Sentinel-1A data in order to reveal the socio-temporal variability of subsidence rates which in turn pose challenges in uniformly applying regulatory action. Second, a multi-sectoral mapping of diverse policies and practices spanning urban water supply, groundwater extraction, land use zoning, building codes, tenurial security, and land reclamation reveal the extent to which the broader coastal governance landscape remains fragmented and incongruous, particularly in arresting a multi-dimensional phenomenon such as subsidence. Finally, in reference to distinct coastal identities of each city–the 'Sinking Capital' (Jakarta), 'Fortress Singapore', and the 'Disaster Capital' (Manila) the paper illustrates how land subsidence is portrayed across the three metropolises in markedly similar ways: as a reversible, quasi-natural, and/or a highly individualized problem.

1. Introduction

Global sea level rise is one of the most direct consequences of the changing climate and is the result of two main processes [1]. First, eustatic changes are driven by ice melting, steric effects

A collaboration paper of the EMERSA, CoRSEA and SEASchange projects:

Siriwardane-de Zoysa, R., Schöne T, Herbeck, J., Illigner, J., Haghighi, M., Simarmata, H., Porio, E., Rovere, A., and Hornidge, A-K., 2021, The 'wickedness' of governing land subsidence: Policy perspectives from urban Southeast Asia. *PLOS ONE*, https://doi.org/10.1371/journal.pone.0250208.

Recent SPP SeaLevel Publications:

OMCG-2: Nitzke, A., B. Niedermann, L. Fenoglio-Marc, J. Küsche, and J.-H. Haunert (2020), Reconstructing the dynamic sea surface from tide gauge records using optimal data-dependent triangulations, Computers and Geosciences, doi: arXviv:2009.01012.

DICES: David, C.G., Hennig, A., Ratter, B.M.W. et al., 2021, Considering socio-political framings when analyzing coastal climate change effects can prevent maldevelopment on small islands, Nat Commun 12, 5882, doi.org/10.1038/s41467-021-26082-5.

Find the full list of the SPP SeaLevel published papers at *www.spp-sealevel.de* → *"Resources"* → *"Publications"*

Future Events related to sea-level research:

AGU Fall Meeting, 13-17 December 2021, New Orleans, LA and online.

EGU General Assemply 2022, 3-8 April 2022, Vienna, Austria and online.

ESA Living Planet Symposium 2022, 23-27 May 2022, Bonn, Germany.

WCRP Regional sea level change and coastal impacts, 11-15 July 2022, Singapore.

MISCELLANEOUS ANNOUNCEMENTS:

Fridtjof Nansen-Medal for Monika Rhein, PI of the Labsea Melt II project

The European Geosciences Union (EGU) has named the recipients of next year's Medals and Awards. SPP Project Leader Monika Rhein, professor at the Institute of Environmental Physics, Bremen University receives the Fridtjof Nansen Medal, which recognises her scientific achievements and outstanding research in the field of oceanography. The prices will be awarded during the EGU General Assembly 2022, which will be held from April 3 to 8.

Seminars + online talks by the BlueUrban project

"The Sea is Rising and So Are We' Seminar Series (organised by the University of Bremen), register online.

Talk – Tidal Cities: Contested Speculative Futures of Urban Shorelines (J Herbeck/R. Siriwardane) December 7, 18.00 (CST), together with the introduction of **'Tidal Cities – Visualising Coastal Futures'** a pedagogical tool on the politics of shore urban placemaking and design, co-developed with two landscape architects Jose Antonio Bimbao (Chaoyang University of Technology, Taiwan) in and Divya Rathod (Anhalt University of Applied Sciences, Germany).

Geographic visualization of the different SPP SeaLevel research locations + the work done there by all projects, Check the www.spp-sealevel.de

We welcome all spp projects to contribute with images and descriptions of their research work at your different research locations for the interactive map of the www.spp-sealevel.de.

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