

Bjerknes Center for Climate Research - Strategic Project 2022-2025

“Sea Level Prediction and Reconstruction (SeaPR)”

Progress Meeting

Bjerknes Center, 21st April 2022

Minutes

Welcome and Introduction

Antonio Bonaduce (NERSC) opens the day by welcoming all the participants. He goes through the agenda of the meeting and emphasizes the importance of having an interactive discussion during the meeting for each workgroup. He continues introducing outreach activities linked to SeaPR. He describes the outcomes of a scoping workshop organized by the JPI Knowledge Hub on Sea Level Rise focused on the topics and requirements to obtain a regional assessment of the North Sea, Nordic Seas, and the Arctic Ocean.

Work Group 1: Sea-level governing processes during present times and predictability (WP1)

Kjell Arne Mork (IMR)

Kjell Arne opens the session with a presentation about “Ocean heat content and transport in relation to sea level variability”. He shows the variations of ocean heat and freshwater content in the Norwegian Sea, as well as the volume and heat transport at the Svinøy, Grimsøy, and Bjørøya sections obtained by combining altimetry-derived geostrophic currents and hydrographic data from a previous study (Mork and Skagseth, 2008). As part of SeaPR, the study will be extended for the recent time-period using the latest altimeter data, updated Mean Dynamic Topography and including NorArgo data. The research activities are relevant to the sea-level budget analysis in SeaPR (Task 1.2).

Roshin P. Raj (NERSC)

Roshin gives a talk about Arctic sea-level variability during the last decade. He underlines the halosteric contribution to sea-level rise observed in the area of the Beaufort Gyre (BG), induced by ocean freshening, and the role of atmospheric drivers on the discrepancies/similarities observed between the sea-level signals in the Nordic Seas and in the BG. He continues showing



the agreement between enhanced altimetry data in the Arctic (ESA Cryotempo) and sea-level outputs from TOPAZ ocean reanalysis. The research activities are relevant to the sea-level budget analysis in SeaPR (Task 1.2).

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Roshin continues with a second presentation focused on ocean freshening driven by mesoscale activity in the Lofoten Basin (LB). The results are obtained by detecting eddies from satellite altimetry maps and co-locating the mesoscale features with Argo profiling floats to assess the eddy-driven anomalies and quasi-3D structure of the eddy population in the LB. The research activities are relevant to the mesoscale contribution to sea-level variability (Task 1.3)

Antonio Bonaduce (NERSC)

Antonio`s talk focused on the potential of enhanced altimetry datasets for investigating ocean mesoscale variability. He emphasizes the improved observing capabilities offered by retracked altimetry data in sea ice-covered areas to obtain a full picture of sea-level variability and constrain the mesoscale in the Nordic Sea and in the Arctic. The research activities are relevant to the mesoscale contribution to sea-level variability (Task 1.3).

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Øystein Skagseth asks about the differences between conventional and enhanced satellite altimetry concepts and about the policy for data distribution.

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Antonio replies that the conventional and enhanced altimetry data are available through CMEMS and AVISO web portals, respectively.

Work Group 2: Reconstruct and attribute sea-level changes during the 20th century (WP2)

Kristin Richter (NORCE)

Kristin opens the session with a presentation on the processes that connect the sea-level variability in the open ocean with the patterns observed over the continental shelf areas. She emphasizes that steric sea-level in the open ocean and shelf mass loading are very well-known processes but their relative importance has not been quantified yet. She shows the difference between the sea-level signal obtained from altimetry and steric sea-level from hydrographic



data at the Svinøy section, as an estimate of the mass component of sea-level variability across the shelf. The results are connected to the reconstruction of the regional sea level (Task 2.1).

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Kjell Arne argues that the latter makes a good link with IMR activities in WP1 and could be extended to the other cross-shelf sections shown in his presentation.

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Antonio says that the GRACE satellite mission provides estimates of the sea-level manometric components and can be included in the sea-level signal decomposition at each section.

Vandhna Kumar (UiB)

Vandhna gives a talk about her contribution to the Ocean States Project - an interdisciplinary project bringing together anthropologists, lawyers, and climate scientists to investigate the effect of sea-level rise on the Ocean States, which could be exposed to an unprecedented risk: the loss of their sovereignty on their Exclusive Economic Zone. She continues presenting her planned activities that aim to the partitioning of sea-level contributions in CMIP6 projections for the Pacific islands region. The research developed in the Ocean State Project linked with SeaPR activities focused on attributing the contributions to sea-level variability (Task 2.1).

Roshin R. Raj (NERSC)

Roshin gives another presentation, focusing this time on initial results obtained comparing 11 CMIP6 models with observation and with CMIP6 dynamical downscaling (NEMO-NAA10km). The preliminary results are relevant to the impact of model resolution for sea-level projections (Task 2.3).

Work Group 3: Project sea level with increased confidence (WP3)

Heiko Goelzer (NORCE)

Heiko starts the 3rd session with a presentation on Greenland ice sheet (GrIS) sea-level projections. He describes the activities planned in the Protect H20220 Project, which aim to enlarge the ensemble considered in ISMIP6 for GrIS simulations and extend the forcing beyond 2100. He shows results on the sensitivity of the ice-sheet model to grid resolution, underlining that the results in terms of sea-level equivalent are independent of the spatial resolution, hence good results can be obtained considering “coarse” (and computationally cheap) numerical



simulations. The results and model development aim to obtain Process-based sea-level projections (Task 3.1). He continues presenting the WCRP Safe Landing Climate Lighthouse Activity on Sea Level Rise.

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Antonio asks about coupled ice-sheet simulation.

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Heiko replies that he is actively involved in the development of the ice-sheet coupling with NorESM.

[William Helland-Hansen \(UiB\)](#)

William presents an approach for vulnerability assessment based on shoreline types, sea-level changes (based on CMIP5), and coastal population (World Bank projections). Shoreline types are defined through an in-depth analysis of satellite images, which will set the basis for a training data set to develop machine learning methods for automated shoreline classification. The results and model development aim to obtain Process-based sea-level projections (Task 3.1).

[Bjorn Nyberg \(UiB\)](#)

Bjorn shows a Google Earth application showing projections of population density as a function of coastal elevation and slope.

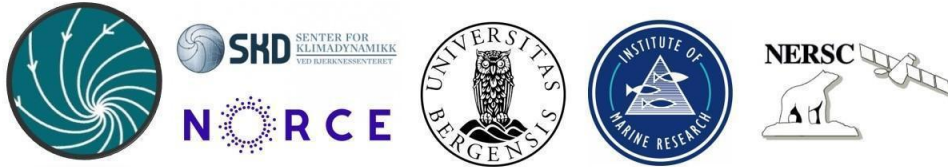
[Wrap-up of the meeting and next steps](#)

Kjell Arne starts the discussion asking if something is still missing to ensure the exchange among the WPs and the optimal development of the project.

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Antonio replies that work done so far while assessing new sources for sea-level estimates, based on observations and models, in WP1 will be propaedeutic for hybrid sea-level reconstructions in WP2, which will be used to assess the sea-level projections. The latter will then inform WP3 on the skill of the climate models considered in the ensemble used for ice-sheet sea-level projections.

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Heiko replies that the connection with WP3 could be not straightforward, in particular when it comes to the ice sheet-climate models coupling that in the current implementation includes exclusively NorESM. He continues saying that we should continue this kind of discussion to find the best way of interaction with the other WPs.

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Kjell Arne and Kristin ask about the recruitment of the Postdoc position.

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Antonio replies that the recruitment is still ongoing: the position was reopened before Easter with a deadline for application on the 30th of April. Interviews will start as soon as possible in May.

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Øystein Skaghset suggests sharing common data sources.

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Antonio replies that he will start a shared document to collect the data sources relevant to SeaPR activities.

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Antonio says that the SeaPR web-site is still under construction, due to technical issues. All the presentations given during the meeting will be available there once it is setted up.

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Antonio closes the meeting thanking the participants.