

World Climate Research Programme JOINT SCIENTIFIC COMMITTEE (JSC) 41st online session

WCRP Sea Level Grand Challenge Report (draft 1)

1. Highlights for JSC

- The SL GC has made a great contribution to the IPCC [Special Report on Ocean and Cryosphere in a Changing Climate \(SROCC\)](#). Meanwhile, SL GC also contributed to IPCC AR6 by submitting 10-15 papers related to ISMIP.
- The [Workshop on WCRP Grand Challenge and Climate Services](#) was organised on 12-13 November 2019 at Orléans, France, in conjunction to the [SL GC-4 \(Report\)](#). Around 40 scientists attended the workshop, including members of the SL GC (in particular WP5), and invited participants with experience in projects on coastal climate services. It was agreed during the meeting to bring more decision makers to the planned SL conference (see below) and preparatory workshops. A research topic on '[Climate Services for Adaption to Sea-Level Rise](#)' has been accepted by *Frontiers in Marine Science*, with 15 confirmed submissions.
- To strengthen the link with end users, David Behar and Kathy McInnes have been approved as new co-chairs for SL GC. Also, the leadership of the six Work Packages (WP) has been updated with consideration of the expertise, gender, age and regional spread.
- Building on the success of the New York Sea Level Conference in 2017, the SL GC agreed to organise the Second Sea Level Conference in Asia (Singapore) tentatively in July 2022. The conference aims to have 300-500 participants, with a large representation from vulnerable Asian coastal areas, and including top world stakeholders, city planners, coastal developers and managers and other relevant stakeholders to focus on the flow of knowledge from sea-level science to strengthen climate change adaptation and disaster resilience in coastal zones. The SL GC will be completed after the conference, at least in its current form.
- A preparatory workshop on user interaction will be organised in Victoria, Canada in Autumn 2020 (subject to the COVID-19 situation), while another preparatory workshop on sea-level and subsidence will be organised in 2021 at a location to be determined, feeding into the 2022 Sea Level Conference.
- Three oral sessions and one poster session on 'Sea Level Change, Coastal Impacts, and Adaptation' were successfully organised by SL GC at the 2019 AGU Fall Meeting.
- A special issue on [Relationships Between Coastal Sea Level and Large Scale Ocean Circulation](#) has been published in *Surveys in Geophysics* in November 2019. 16 review papers from the ISSI workshop in 2018 are included in this issue.
- SL GC also contributed to the WMO Statement on the State of the Global Climate 2019 (WP6).

2. Primary science issues (looking ahead, 3 to 5 years)

- *High End estimate of Sea Level Rise for Stakeholder Application*

Because of the existing confusion about multiple perspectives on high-end scenarios, there needs to be a reconciliation of those perspectives by integrating the best scientific information and guidance to provide consensus on actionable science. A [conceptual framework](#) for high-end sea-level rise as a function of time scale has been developed, as a contribution of the SL GC community paper (Stammer et al., 2019). The proposed framework infers the required information from explicit conditional statements (lines of evidence) in combination with upper (plausible) physical bounds. This approach

acknowledges the growing uncertainty in respective estimates with increasing time scale. It also allows consideration of the various levels of risk aversion of the diverse stakeholders who make coastal policy and adaptation decisions, whilst maintaining scientific rigor. International and interdisciplinary co-operation and co-production are essential to achieve future success in this direction. GC leaders are planning a follow up paper that uses the conceptual approach in Stammer et al 2019 to develop consensus projections of SLR to meet user needs before the 2022 Conference.

- *Coastal Climate Services (CCS)*

Climate services provide the scientific information relevant for adaptation to and mitigation of climate change. Coastal zones are especially in need of climate services for adaptation, in particular due to committed sea level rise, as re-emphasised in IPCC SROCC in 2019. Though some coastal climate services already exist, such as observations, models, case studies, training and user support, the information and climate services supporting adaptation to sea-level rise remain fragmented and sometimes cause confusion, e.g. the probabilistic projections of SLR may not be well understood by decision makers or assist in planning. The SL GC recognise that the following issues on coastal climate services need to be further addressed: 1) assessment of the current status of coastal climate services and planned activities; 2) identification and mapping of users and their needs; 3) review of existing practices and how they can be improved; 4) translating science to application and communicating uncertainties; and 5) frameworks to develop coastal climate services. The special issue of *Frontiers in Marine Sciences* will address this in more detail.

- *Sea Level Budget*

In order to understand and reduce the uncertainty in the mass and steric contribution to contemporary sea level budget at both global (WP6) and regional to local (WP3) spatial scales, the SL GC will start in 2020 a new assessment of the sea level budget (update of the WCRP, ESSD, 2018 paper) with updated values for the components over an extended time period. Ocean reanalyses will be also considered for the steric component.

- *Sea Level Rise Risk and Responses*

In the IPCC SROCC, the importance of cross-cutting measures such as information measures (e.g. warnings, emergency preparedness) and community measures are highlighted. Also, the integrated uses of adaptive options, including protection, accommodation, ecosystem-based adaptation (multiple benefits), coastal advance and planned relocation, if alternative localities are available, can be more effective in responding to SLR than applying single options. Meanwhile, the sea level rise range that needs to be considered for planning and implementing coastal responses depends in part on the risk tolerance of stakeholders.

- *Other science issues*

The translation of global climate information for coastal hazard assessment such as coastal flooding and erosion requires appropriate regionalisation. To understand the coastal impacts of sea level rise, extreme sea levels and relative sea levels must be modelled at the local scale, especially where waves are the dominant mechanism. Local information (e.g. vertical land motion including subsidence, storms, waves and bathymetry, topography, geomorphology and catchment inputs) is needed in coastal modelling to provide regionally useful assessments. Translation of open ocean climatological signals towards coastal extreme sea level events require further attention.

3. Issues and challenges, for example:

- How you work with other WCRP activities

The SL GC collaborates closely with CMIP6, e.g. to quantify the contribution of land ice to future sea level rise through ISMIP-6 (linking the CMIP with ice sheet modelling communities) and CliC; and the CESM2-CISM2 simulations focusing on Greenland Ice mass

loss. Meanwhile, several joint papers have been published together with CLIVAR OMDP, which demonstrated a good inter-panel cooperation.

- How you see your community evolving

The SL GC started as a science initiative and has evolved by improving understanding and integration between the science areas and an improving appreciation of user needs. This move to application is expected to continue as increasing engagement with users helps to shape the resulting science needs.

Climate services dedicated to sea level problems will gain more and more attraction thereby including attention for the incorporation of non-climate driven components related to relative sea level like human caused subsidence. High-end, extremes and the Antarctic contribution to SLC are topics attracting attention of the community because of their imminent importance for the impacts of sea level change on society

- How you work with partners outside of WCRP

Scientists involved in the GC are also partners in other international bodies coordinating model intercomparisons and international observing programs.

- WP1 of SL GC partners with SCAR on SERCE & ASIDSL.
- To enhance the future cooperation with GLOSS on global sea level observations.
- Enhanced interface with decision community and its science needs
- How the current funding affects your community, your activities, your service

Funding is under pressure at the international level, this is reflected in our community.
