

WCRP Grand Challenge: Regional Sea Level Change and Coastal Impacts

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GC overview

The “Regional Sea Level Change and Coastal Impacts” (SL for short hereafter) is one of the WCRP Grand Challenges, managed by CLIVAR. The decision to develop this GC occurred during the 19th session of CLIVAR SSG in 2012, in line with one of the WCRP grand challenge topics “Regional Sea Level Change” agreed by WCRP JSC. During a 10-year period (Jan 2015 - Dec 2024), the program is to address the following imperatives, which are being approached via six parallel, but strongly interconnected, working groups:

- An integrated approach to historic sea level estimates (paleo time scale)
- Quantifying the contribution of land ice to near-future sea level rise
- Contemporary regional sea level variability and change
- Predictability of regional sea level
- Sea level science for coastal zone management
- Global sea level change

Activities in 2019-2020:

#In September 2019, the IPCC Special Report on Ocean and Cryosphere in a Changing Climate was launched, where the RF made a substantial contribution. Over the period 2019-2020 members of the RF contributed through authorship of the SROCC report as well as supporting ISMIP activities leading up to the IPCC AR6 report.

#In October 2019, the fourth Steering Team Meeting of the SL GC was held in Orleans, France and involved participation of about 40 scientists .

Discussions of the restructuring of the membership of the GC meeting commenced at this meeting and took place in the period November 2019 – February 2020. These involved a change in the co-leads as well as the membership of the different working groups.

#The workshop in Orleans furthermore focused on coastal climate services. A major outcome of the workshop was the decision to include, where possible decision makers to the planned SL conference foreseen in Singapore in 2022. Leading up to the conference and, as outcome of the workshop an initiative was launched to publish a special issue of *Frontiers in Marine Sciences* on climate services for adaptation to sea-level rise. Currently three papers are submitted with the deadline extended to early 2021.

#In November 2019 a special issue into the relation between coastal sea level and large scale ocean circulation, edited by members of the GC has been published in *Surveys in Geophysics* with 16 review papers.

#The SL GC also contributed to the WMO statement on the state of Global Climate 2019.

#GC co-leads participated in the CLIVAR SSG-25 meeting in San Diego and the JSC-41 virtual meeting.

#A very successful session on sea level was organized at the AGU-Fall in San Francisco in December 2019, with three oral sessions and a poster session.

#Negotiations started for the SL conference in Singapore. A local organizing committee is in place and a scientific steering committee will be installed at the next steering committee meeting in November 2020.

#In September 2020 an online workshop was organized on high-end sea-level rise. A major outcome of the workshop will be a publication on the topic. The writing process has been initialized.

Plans for 2021 and beyond

#5th Session of SL GC will be organized online from 17-18 November 2020.

#The 2nd Sea Level Conference is foreseen to be organised in Singapore in 2022. A preparatory meeting in Singapore is foreseen in 2021.

#Plans were made to organise a special sea-level scenario user workshop, which will now take place in 2021 reflecting delays due to C-19.

#Publication on high-end sea-level rise.

Articles published since 2018 as part of RF GC activities

Cazenave, A., M Ablain, J Bamber, V Barletta, B Beckley, J Benveniste, E Berthier, A Blazquez, T Boyer, D Caceres, D Chambers, N Champollion, B Chao, J Chen, L Cheng, J A Church, J G Cogley, S Dangendorf, D Desbruyères, P Döll, C Domingues, U Falk, J Famiglietti, L Fenoglio-Marc, R Forsberg, G Galassi, A Gardner, A Groh, A Hogg, M Horwath, V Humphrey, L Husson, M Ishii, A Jaeggi, S Jevrejeva, G Johnson, N Kolodziejczyk, Ju Kusche, K Lambeck, F Landerer, P Leclercq, B Legresy, E Leuliette, W Llovel, L Longuevergne, B D Loomis, S B Luthcke, M Marcos, B Marzeion, C Merchant, M Merrifield, B Meyssignac, G Milne, G Mitchum, Y Mohajerani, M Monier, S Nerem, H Palanisamy, F Paul, B Perez, C G Piecuch, R M Ponte, S G Purkey, J T Reager, R Rietbroek, E Rignot, R Riva, D H Roemmich, L Sandberg Sørensen, I Sasgen, E J O Schrama, S I Seneviratne, C K Shum, G Spada, D Stammer, R S W van de Wal, I Velicogna, K von Schuckmann, Y Wada, Y Wang, C Watson, D Wiese, S Wijffels, R Westaway, G Woppelmann, B Wouters. Global Sea Level Budget 1993-present. Earth System Science Data, 2018-53.

- Cozannet G Le, R J Nicholls, J Hinkel, W v Sweet, K L McInnes, R S W van de Wal, A B A Slangen, J Lowe and K White (2017). Sea-level projections and coastal climate services: the way forward. *J of Marine Science and Engineering*, 5,49,doi;10.3390/jmse5040049.
- Gregory, J.M., Griffies, S.M., Hughes, C.W., Lowe, J.A., Church, J.A., Fukimori, I., Gomez, N, Kopp, R.E., Landerer, F., Le Cozannet, G., Ponte, R.M., Stammer, D., Tamisiea, M.E., van de Wal, R. (2019) Concepts and Terminology for Sea Level: Mean, Variability and Change, Both Local and Global, *Surveys in Geophysics* <https://doi.org/10.1007/s10712-019-09525-z>
- Hinkel, J., Church, J. A., Gregory, J. M., Lambert, E., Le Cozannet, G., Lowe, J., McInnes, K.L., Nicholls, R.J., van der Pol, T.D, van de Wal, R. (2019). Meeting user needs for sea level rise information: A decision analysis perspective. *Earth's Future*, 7(3), 320-337. doi:10.1029/2018EF001071.
- Jevrejeva S, T Frederikse, R Kopp, G Le Cozannet, L Jackson, R S W van de Wal (2019). Probabilistic sea level projections at the coast by 2100, *Surveys of Geophysics*, doi.org/10.1007/s10712-019-09550-y.
- Ponte R M, M Carson, M Cirano, C Domingues, S Jevrejeva, M Marcos, G Mitchum, R S W van de Wal, P L Woodworth, M Ablain, F Arduin, V Ballu, M Becker, J Benveniste, F Birol, E Bradshaw, A Cazenave, P De Mey-Frémaux, F Durand, T Ezer, L-L Fu, I Fukumori, K Gordon, M Gravelle, S M Griffies, W Han, A Hibbert, C W Hughes, D Idier, V H Kourafalou, C M Little, A Matthews, A Melet, M Merrifield, B Meyssignac, S Minobe, T Penduff, N Picot, C Piecuch, R D Ray, L Rickards, A Santamaría-Gómez, D Stammer, J Staneva, L Testut, K Thompson, P Thompson, S Vignudelli, J Williams, S D P Williams, G Wöppelmann, L Zanna, X Zhang (2019). Towards comprehensive observing and modeling systems for monitoring and predicting regional to coastal sea level, *Frontiers of Marine Sciences*, doi.org/10.3389/fmars.2019.00437.
- Stammer, D., van de Wal, R. S. W., Nicholls, R. J., Church, J. A., Le Cozannet, G., Lowe, J. A., Horton, B.P., White, K., Behar, D., Hinkel, J. (2019). Framework for high-end estimates of sea-level rise for stakeholder applications. *Earth's Future*. doi:10.1029/2019EF001163
- Van de Wal R S W, X Zhang, S Minobe, S Jevrejeva, R E M Riva, C Little, K. Richter, M Palmer (2019). Uncertainties in long-term process-based coastal sea-level projections. *Surv. of Geophysics*.

Budget Needs

For the time being as long as workshops are on-line there are no costs foreseen. However, a preparatory meeting in Singapore is foreseen in 2021 requiring travel costs for 2 GC members.

Annex A

Proforma for CLIVAR Research Focus requests for SSG approval for meetings

1. **RF name:** WCRP Grand Challenge: Regional Sea Level Change and Coastal Impacts
2. **Title of meeting or workshop:** Preparatory meeting for the 2nd Sea Level Conference
3. **Proposed venue:** Singapore
4. **Proposed dates:** 2021
5. **Proposed attendees, including likely number:**
6. **Rationale, motivation and justification, including: relevance to CLIVAR science & WCRP Grand Challenges, and any cross-panel/research foci links and interactions involved:**
7. **Specific objectives and key agenda items:**
8. **Anticipated outcomes (deliverables):**
9. **Format:**
10. **Science Organizing Committee (if relevant)**
11. **Local Organizing Committee (if relevant)**
12. **Proposed funding sources and anticipated funding requested from WCRP:**

Travel costs for 2 GC members, 10,000 CHF.