

# Regional Assessments of Glacier Mass Change (RAGMAC), (2020 – 2023)

## Annual Report for 2020 to IACS

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## Objectives and work packages

The overall goal of this working group (WG) is bringing together the research community that is assessing regional glacier mass changes from various observation technologies and to come up with a new consensus estimate of global glacier mass changes and related uncertainties. The WG is organized in three work packages (WPs), two related to different remote sensing technologies and a third that aims at regional comparisons of corresponding results.

## Key achievements of the first year

After acceptance of the RAGMAC WG proposal by IACS in 2019, the co-chairs jointly started to bring the WG to life and action.

Information about RAGMAC have been made are available online:

- RAGMAC webpage: <https://cryosphericsscience.org/activities/wg-ragmac/>
- RAGMAC proposal: [https://cryosphericsscience.org/wp-content/uploads/2020/01/IACS\\_WG\\_RAGMAC\\_Proposal\\_2019.pdf](https://cryosphericsscience.org/wp-content/uploads/2020/01/IACS_WG_RAGMAC_Proposal_2019.pdf)
- RAGMAC kickoff presentation, including updates and videos of meetings and webinars: <https://prezi.com/view/hZHOtiJ6MGsBnCSr8hyO/>

The WG was announced on Cryolist (<https://cryolist.org/>), within the WGMS and GLIMS network, and in the IACS newsletter ([https://cryosphericsscience.org/wp-content/uploads/2020/01/2020\\_January\\_IACS\\_newsletter.pdf](https://cryosphericsscience.org/wp-content/uploads/2020/01/2020_January_IACS_newsletter.pdf)), as well as with various sessions and workshops at international conferences, e.g. EGU General Assembly 2020 (<http://egu2020.eu/>), EC/ESA European Polar Science Week 2020 (<https://eo4polar.esa.int/>), AGU Fall Meeting (<https://www.agu.org/fall-meeting>).

The WG co-chairs started to tackle the proposed tasks (cf. proposal) and have been coordinating the work in about bi-monthly co-chair meetings.

At present, RAGMAC counts 42 members (willing to actively contribute to WG) and 49 friends (interested in news and events).

In the following, we briefly summarize the main activities of the RAGMAC WG in 2020, followed by short statements on funding and outlook.

## **WP 1, Glacier mass changes based on glaciological and geodetic (DEM differencing) methods**

The main goals of WP1 are to (i) develop best practises for geodetic estimates of glacier mass changes and related uncertainties and to (ii) improve the global coverage of geodetic glacier change assessments.

Main activities in the current year include:

- Refine working concept within co-leads meetings.
- Active call-for-data for glaciological and geodetic mass changes through the World Glacier Monitoring Service (WGMS; <https://wgms.ch/>).
- Coordination of geodetic data integration with groups working on major regional mass change assessments within the Copernicus Climate Change Service (C3S; <https://climate.copernicus.eu/>) run by the WGMS.
- Co-lead workshop to define the concept, data, and announcement of the “Glacier volume change intercomparison experiment” to be announced early 2021.

## **WP 2, Glacier mass changes based on altimetry and gravimetry**

The main goals of WP2 is to develop best practices for the propagation of errors in glacier mass-change estimates derived from satellite altimetry and gravimetry.

Main activities in the current year include:

- Refine working concept within co-leads meetings.
- Co-lead workshop to define the concept and outline of a white paper on assessing glacier mass changes and related uncertainties from GRACE/GRACE-FO, ICESat, ICESat-2, and CryoSat-2; writing draft of white paper to be distributed to the wider community for feedback and input.

## **WP 3, Regional comparisons of glacier mass changes from different methods**

The main goals of WP3 are to (i) encourage regional assessments of glacier mass changes, (ii) foster open and free access to glacier data, (iii) define a common framework for regional-scale mass change estimates and identify best method(s) for each large-scale glacier region, and to (iv) develop a consensus estimate of regional and global mass changes from glaciological, geodetic, altimetric, and gravimetric methods.

Main activities in the current year include:

- Assignment of co-leads for WP 3.
- Refine working concept within co-leads meetings.
- Coordination with the IACS WG on the Randolph Glacier Inventory (RGI , <https://cryosphericsscience.org/activities/working-groups/rgi-working-group/>)
- Research topic in Frontiers in Earth Sciences: <https://frontiersin.org/research-topics/9957/observational-assessments-of-glacier-mass-changes-at-regional-and-global-level>

## Events

In 2020, RAGMAC reached out to the community with the following events:

- RAGMAC virtual kickoff meetings for eastern and western time zones.
- EGU General Assembly 2020:
  - Glacier monitoring session: <https://meetingorganizer.copernicus.org/EGU2020/displays/34941>
  - RAGMAC splinter meeting, in line with the splinter meetings of the RGI WG and the Global Terrestrial Network for Glaciers (GTN-G) meeting.
- Glacier session at EC/ESA European Polar Science Week 2020 (<https://eo4polar.esa.int/>) with the following key notes:
  - Frank Paul (Univ. Zurich, CH) and the Glacier CCI group: “Global monitoring of glacier distribution and changes: Where we are and where we (would like to) go”.
  - Fabien Maussion (Univ. Innsbruck, AT) and the RGI working Group: “Towards a multi-temporal global glacier inventory: challenges and potential applications”.
  - Matthias Braun (Univ. Erlangen-Nürnberg, DE): “Global glacier mass-change assessments from synthetic aperture radar interferometry”
  - Livia Jakob (Earthwave Ltd., UK): “Global glacier mass-change assessments from Radar Altimetry”.
  - Fanny Brun (Univ. Grenoble, FR): “Challenges and outcomes of global glacier mass balance monitoring from optical images”.
  - Inès Otosaka (Univ. Leeds, UK): “Perspectives from two Ice sheet Mass Balance Intercomparison Exercises”.
  - Regine Hock (Univ. Alaska, US; Univ. Oslo, NO): “Global glacier mass-change assessments – lessons learned from IPCC SROCC”.
- AGU Fall Meeting, glacier monitoring session: <https://agu.confex.com/agu/fm20/prelim.cgi/Session/102154>
- RAGMAC webinar I, with the following key-note speakers:
  - Inés Dussaillant (Univ. Toulouse, Fr; Univ. Zurich, CH): “Glacier mass changes in South America from ASTER stereo images”.
  - Thorsten Seehaus (Univ. Erlangen-Nürnberg, DE): “Glacier mass changes in South America from synthetic aperture radar interferometry”.
  - Regine Hock (Univ. Alaska, US; Univ. Oslo, NO): “The importance of a common framework for regional glacier mass-change assessments - lessons learned from IPCC SROCC”.

- RAGMAC webinar II, with the following key-note speakers:
  - Alex Gardner (NASA's Jet Propulsion Laboratory, US): "An introduction to ICESat-2 for glacier studies and a showcasing of early results".
  - Bert Wouters (Utrecht Univ. & Delft Univ. of Technology, NL): "Glacier mass change from GRACE and GRACE-FO".
  - Ashley Morris (Norwegian Polar Institute, NO) & Livia Jakob (Earthwave Ltd, UK): "CryoSat-2 for estimating glacier change".

## **Funding**

In the first year, the RAGMAC WG was run without funding. Due to the COVID-19 situation and the related difficulties in organizing (physical) workshops, it is not yet clear if funding will be required in 2021. We will get in contact with IACS in due time as soon as the release of the assigned budget becomes possible and needed. In addition, we are currently evaluating options to raise additional funding for scaling RAGMAC activities into a larger project.

## **Outlook**

Besides the continuation of the planned work in the three WPs, we have submitted RAGMAC-related sessions and workshops for EGU General Assembly 2021 (<https://egu21.eu/>) and the IGS "International Symposium on Ice, Snow and Water in a Warming World" to be held in Iceland (<https://cryosphere2021.is>).