

Global Synthesis and Observations Panel (GSOP)

Co-chairs, Email addresses

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Panel overview

GSOP is responsible for the definition and promotion of CLIVAR's overall global needs for sustained ocean observations, and the evaluation of model-based synthesis of ocean observations and statistical mapping of the observations. GSOP aims to promote methodological advances in the development of coupled and ocean-only re-analyses, and the statistical mapping of observations, enhanced way to assess their performance and fit-for-purpose, and identifying practices for the best exploitation of key climate observing networks.

During the last year, the pandemic hampered organizing workshops/meetings, and the Panel activities mostly consisted of virtual meetings. Despite this, we have still managed to achieve some modest outcomes that address our terms of reference. It is desirable that in the future the Panel be able to meet in and jointly other panel meetings.

Achievements for 2022

- GSOP did not meet face-to-face in 2022. Many panel members (including the Co-Chairs) are still reluctant to travel. We made progress in meeting that was to be co-located with the 7th Argo Science Workshop, in Brussels - but too few members were planning to attend, and so we chose not to go ahead with that meeting.
- GSOP members met virtually during the year on four occasions (February, March, August, October 2022), and the GSOP Co-Chairs met in between most virtual meetings to discuss ongoing and planned activities.
- During face-to-face meetings, GSOP discussed several issues that panel members worked on together out of session. These activities includes:
 - Promotion of best practice use of observations for ocean reanalysis and forecasting.
 - Refinement of Deep Argo missions for ocean forecasting.
 - Improved Argo trajectory data products.
- During GSOP discussions, we agreed on some areas in which we can undertake joint activities. Planning for these activities is still being formulated, and commitment to contribute is still being negotiated. We hoped that a face-to-face meeting would help stimulate this, but the planned meeting didn't occur.

Best practice use of observations

The panel discussed various issues relating to best practice use of ocean observations for ocean forecasting and reanalysis. Panel members gave presentations at various meetings to promote best practice in the broader community (e.g., EuroSea/OceanPredict Workshop, June 2022; 7th Argo Science Meeting, October 2022). One paper – focussed on describing best practice use of Argo observations (led by Peter Oke) – is in preparation.

Deep Argo mission

The panel discussed the suitability of Deep Argo missions for ocean reanalysis and ocean forecasting. The panel provided feedback to leaders of the Deep Argo program (including Nathalie Zilberman), leading to non-trivial changes in Deep Argo missions. Specifically, Deep Argo floats of the Deep SOLO model capable of collecting profiles from the surface to 6000m depth, have now the ability to sample on ascent (to inform operational users), as well as descent (to return highest quality data). This change to the Deep Argo mission required a significant re-work of the sampling firmware that has been implemented on all Deep SOLO floats built at Scripps Institution of Oceanography, and will soon be available on the Deep SOLO floats manufactured by MRV-Systems.

Argo trajectories

The panel discussed how to exploit Argo trajectory information. This identified several opportunities for development and discussion of how to better exploit this aspect of Argo data. Panel members subsequently published two papers (one with joint authorship). Published papers include:

Oke, P.R., Rykova, T., Pilo, G.S. and Lovell, J.L., 2022. Estimating Argo float trajectories under ice. *Earth and Space Science*, 9(7), p.e2022EA002312.

Zilberman, N.V., Scanderbeg, M., Gray, A.R. and Oke, P.R., 2023. Scripps Argo Trajectory-Based Velocity Product: Global Estimates of Absolute Velocity Derived from Core, Biogeochemical, and Deep Argo Float Trajectories at Parking Depth. *Journal of Atmospheric and Oceanic Technology*, in press.

A new Argo trajectory-based velocity dataset has been developed. This product is freely available (<https://library.ucsd.edu/dc/collection/bb6630688j>), and will be updated every 6 month.

Zilberman, Nathalie V.; Scanderbeg, Megan C.; Gray, Alison R.; Oke, Peter R. (2022). Scripps Argo trajectory-based velocity product 2001-01 to 2020-12. In Scripps Argo Trajectory-Based Velocity Product. UC San Diego Library Digital Collections. <https://doi.org/10.6075/J0KD1Z35>.

Plans for 2022 and beyond

We recruited two new members last year (denoted below by **). We plan to continue to refresh and broaden the panel. The newest members have expertise in atmospheric

modelling (and tropical cyclone prediction), and seasonal prediction. The current membership is:

- Chairs:
 - Nathalie Zilberman – Scripps Institution of Oceanography, USA
 - Peter Oke – CSIRO, Australia
- Members:
 - Aida Alvera Azcárate – University of Liège, Belgium
 - Isabella Ansorg – University of Cape Town, South Africa
 - Mathieu Belbeoch – OceanOPS, France
 - **Soline Bielli, Laboratoire de l'Atmosphère et des Cyclones (LACy), La Réunion, France
 - Pablo Canziani, Consejo Nacional de Investigaciones Científicas y Tecnológicas(CONICET) , Argentina
 - Lijing Cheng – Institute of Atmospheric Physics, China
 - Louis Clement, National Oceanographic Centre, UK
 - François Counillon – NERSC, Norway
 - Shuhei Masuda – JAMSTEC, Japan
 - Matt Mazloff – Scripps Institution of Oceanography, USA
 - Hindumathi Palanisamy – WCRP Secretariat, Switzerland
 - Aneesh Subramanian – University of Colorado, Boulder
 - **Yonghong Yin, BoN, Australia
- Ex officio:
 - Ken Ando – Tropical Moored Buoy Implementation Panel vice-chair
 - Uwe Send – OceanSITES co-chair

We acknowledge that main achievements of GSOP in 2022 relate to the Argo Program. This is largely because both Co-Chairs are part of the Argo community (Peter Oke leads the Australian Argo effort; and Nathalie Zilberman is one of the leaders of the Deep Argo Program). We played to our strength in 2022. But we recognize the need for the panel to broaden our area of impact.

During the recent meetings, members have discussed the activities for the panel during 2022 and 2023. These include:

- Impacts of data assimilation on dynamic balance. This is an area of reanalysis and forecasting that is rarely considered. We plan to address this using different systems and different data assimilation approaches. We intend to undertake a joint activity to inter-compare “increments” (changes introduced during the data assimilation process) from a series of single observation, and to inter-compare how these introduced changes “corrupt” the dynamic balance of each model. We are still working through the details of this planned activity – including the metrics by which we will assess dynamic balance (e.g., magnitude of ageostrophic velocities, Rossby number, etc), and working on how to best coordinate our efforts.
- What metrics are most suitable for assessing data assimilating systems (e.g., reanalyses and forecasts). Most assessments report a standard set of statistical metrics: mean, standard deviation, root-mean-squared differences, mean absolute

differences, correlations, etc. Our goal is to define metrics that will provide users of data-assimilating products with a more meaningful assessment of the suitability of each product for various applications.

Articles published in 2022/23 as part of panel activities (if any)

We have set up a Google Scholar page to capture the recent and past publications of GSOP members that are relevant to our terms of reference. The Google Scholar page can be found at: <https://scholar.google.com.au/citations?hl=en&user=CaQHAcAAAAJ>.

Budget and other needs for 2023 (in CHF)

Noting the ongoing reluctance of Panel members to travel to meet face-to-face, we are reluctant to request that funds are committed to support any face-to-face event. We welcome advice from the SSG on this. But we describe a possible meeting, along with a proposed theme below.

Annex A

Proforma for CLIVAR Panel requests for SSG approval for meetings

Note: If your group has approved funds in 2021 that were not used because of Covid19 and other unexpected issues, and you propose to use them in 2022, they should be included again in this request, in addition to any new request.

1. **Panel name:** GSOP
2. **Title of meeting or workshop:** Panel Meeting
3. **Proposed venue (Or indicate if online):**
4. **Proposed dates:**
5. **Proposed attendees, including likely number:** All panel members, plus 2 guests (TBD)
6. **Rationale, motivation and justification, including: relevance to CLIVAR science & WCRP Strategic Plan and Lighthouse Activities, and any cross-panel/research foci links and interactions involved:**
7. **Specific objectives and key agenda items:** Discussion on the Panel activities, especially those planned for 2023 (impacts of data assimilation on dynamic balance; metrics)
8. **Anticipated outcomes (deliverables):** Meeting report
9. **Format:** 2-3 days of presentation and discussion
10. **Science Organizing Committee (if relevant)**
11. **Local Organizing Committee (if relevant)**
12. **Proposed funding sources and anticipated funding requested from WCRP:** \$15-20K