

Meeting Minutes

Global Synthesis and Observations Panel



Date: 2024-06-11 **Start date:** 9 pm China ST (UTC+8)
Venue: GoTo Meeting **ICPO Staff Host** Agus Santoso

Attendees (9)

Peter Oke, Shuhei Masuda, Lijing Chen, Yonghong Yin, Nathalie Zilberman, Aneesh Subramanian, François Counillon, Matthieu Belbeoch, Agus Santoso (ICPO).

Apologies: Hindumathi Palanisamy, Pablo Canziani, Aida Alvera Azcárate, Matt Mazloff, Soline Bielli, Louis Clement.

Co-Chairs: Peter Oke, Nathalie Zilberman.



Peter started the meeting by showing Terms of Reference.

1. Membership

The SSG provided feedback on the membership including their two suggested members for a co-chair (in replacement of Nathalie): Aida, if not Shuhei. Action: Peter, Nathalie, and Agus meet with Aida and Shuhei to discuss. Three proposed new members were approved, along with only one of the two SIO postdocs to avoid overrepresentation from a particular institution and improve gender balance (also ensuring that the postdoc will have the experience, time, position longevity, and motivation to help drive the panel forward).

The SSG suggests that Magdalena Balmaseda be formally invited to join the panel as Ex Officio. GSOP is requested to review the list of Ex-Officio to ensure that they are still contributing.

Action: Nathalie will ask Uwe and Dean regarding Ex Officio membership. Nathalie will also inform Matt about the SSG suggestion on the nominated SIO postdoc. Agus mentioned that



there will be an open call for new CLIVAR membership nomination in the coming months, so there will be another opportunity to nominate the other postdoc.

Peter mentioned that the panel should also be proactive in nominating.

Francois underscored the need to consider expertise. Peter will provide an overview of panel members' expertise in the next meeting.

2. Cross-panel responsibilities

Shuhei, Yonghong, Aneesh would like to liaise with IORP on the IndOOS task team. The purpose is to engage the group by joining and contributing to their meetings and report back to GSOP (to identify synergy and potential joint activities).

Action: Peter to contact Janet Sprintall on the GSOP engagement in IndOOS activities.

Peter gave an update on the WMO NWP impact workshop, highlighting relevant talks. <https://community.wmo.int/en/meetings/8th-wmo-impact-workshop-home>

SynObs special issue in Frontiers, 7 papers published (2 papers in review).

3. Science talk

3.1 Peter gave a science talk on: "What causes the subsurface velocity maximum of the East Australian Current".

First described evidence of subsurface velocity maximum, then verified by ADCP measurements, deep water mooring arrays, Refs: Sloyan et al. (2016), Roughan and Middleton (2003), Cresswell et al. (2016), Mata et al. (2000).

Three features of interest: subsurface velocity maximum, leaning of the jet towards the coast, deep seaward bulge (turns out they are all closely related). Showed time series of EAC Deep Water Array. EAC flows as a narrow tongue of light warm water from the light Coral Sea to the dense Tasman Sea. The horizontal density gradient changes sign on the seaward and onshore sides. The three features are seen in a model.

Thermal wind relation shows that when the zonal density gradient is less (greater) than zero, the southward flowing current in the southern hemisphere is surface (subsurface) intensified. These variations are linked to the wind-stress curl which is downwelling favorable over the shelf. Idealized calculations: prescribing a Gaussian jet with idealized depth-averaged profile, the subsurface velocity maximum can be produced by varying zonal density gradient.

One possible implication is the influence on baroclinic instability (stronger transport of heat below the surface may initiate instabilities, leading to eddy formation, EAC separation).

Paper published in J. Phys. Oceanogr. (Oke et al., "What causes the subsurface velocity maximum of the East Australian Current?").



Q&A:

- Shuhei: what is the radius of the EAC / what sets the narrowness? Peter: Not a clear answer. Out of boundary currents, the EAC is the weakest and shallowest, while other boundary currents are stronger and wider; so the width/radius might be related to the strength.
- Nathalie: the core can affect transport weighted temperature – having an impact on heat transport.
- Francois: internal variability of the depth of velocity maximum – is there an influence from variability of the wind. Peter: it might be dependent on the climatological depth which is meridionally varying. Nathalie has a student who is looking at the issue in other regions.
- Agus: it might be interesting to look at how different reanalysis products capture the subsurface velocity maximum.

3. 2 Lijing's presentation on International Quality-controlled Ocean Database (IQuOD).

Motivation (Today's big challenge: 'climate quality' ocean database): Several instruments of temperature and salinity and the data have different qualities, requiring homogenisation in the database to support various applications. Lijing gave an example of two quality control systems: "world ocean database (WOD)-QC" and "CODC-QC" developed in China, on ocean heat content (0-2000 m) time series. The differences are quite huge, i.e., QC is important. The difference in OHC (0-700 m): No XBT correction vs after correction shows significant difference (Domingues et al. 2008).

The mission of IQuOD is to maximize the quality, consistency, and completeness of the long-term global subsurface ocean temperature (and salinity) database. IQuOD brings research community together (producers and users) to produce a single 'best' dataset. Meetings in Hobart 2013 (inaugural meeting), Potsdam 2023, 5 workshops.

Structure: Co-Chairs: Lijing Cheng, Gui Castelao, coordinator: Rebeca Cowley, steering team, task teams (uncertainties, automated quality control, intelligent metadata, duplicates, expert quality control, global data acquisition center, education and outreach). IQuOD's operational structure comprises 17 nation members and a dynamic workforce of 30-50 international members, organized into specialized task teams.

Achievements:

- 1) Best-practice to benchmark temperature profiles AutoQC, IQuOD AutoQC flag, uncertainty specification to check assignment for individual temperature measurement (e.g., Argo). Ref: Good et al. (2023, Ocean Observation, Frontiers in Marine Science).
- 2) Assigning instrumental uncertainty to each individual temperature measurement (Cowley et al. 2021: IQuOD v0.1: The Temperature Uncertainty Specification). E.g., CTD has smaller uncertainty than XBT. Consistent set of observation uncertainties will provide a more complete understanding of historical ocean observations used to examine the changing



environment. Ongoing efforts: Definition of representativeness error – error/uncertainty in using a single measurement to represent gridded averages (more relevant to IQuOD and reanalysis community as they are working on individual measurements); accuracy of grid average calculated from a limited number of observations to represent the true grid average (more relevant to objective analysis community who are concerned with spatial interpolation from gridded average field).

3) Assigning XBT probe type using a machine learning approach (Haddad *et al.* 2022).

4) IQuOD-v1 online, publicly available through NOAA/NCEI service.

IQuOD activities in 1-2 years: 1) develop new data processing and data QC techniques, 2) improve uncertainty definition/quantification, 3) increase outreach and international collaboration, 4) pilot activity for salinity. www.iquod.org.

Q&A:

- Peter: On reducing the estimate of representation error would depend on what model or what grid. Lijing: plan for two resolutions: 1 degree – 1 month, .25 degree – 1 week
- Francois: so the work is based on profiles not reanalysis, and that there is no salinity. Lijing; no salinity for now, but have started work in terms of biases.
- Francois asked about EN4 vs IQuOD. Lijing: IQuOD v1 would be much improved.
- Peter asked about Argo QC. Lijing answered in broad terms, how IQuOD QC performs different checks, comparing different choices from different groups for each check, and combining to have a new IQuOD system, and evaluate to check if the QC system is good or not.
- Yonghong commented that there are different corrections (depth-corrected, pressure corrected), e.g., in CMEMS (Copernicus), and EN4 also has 4-5 corrected products. Lijing: EN4 provides several versions of uncertainty quantification, to check how large the impact of the correction schemes on the applications.
- Mathieu: What does intelligent metadata mean? Lijing: many XBT data do not have probe type information (i.e., XBT going to 400-500 m, or 700 m, etc) which have different biases and need to be corrected differently. Missing probe type information is important – and thus some use machine learning to make a best guess for the probe type information to correct the XBT bias.
- Mathieu: AI can help rescue metadata, how, and what's the basis for the machine learning, and progress should be made (e.g., via IQuOD) on the instrumentation.

4. Other topics

Aneesh's two presentations will be made at the next meeting.

Discussions on when the next meetings will be (planning for the next one in 2 week time – hopefully the new members can join).



Action: ICPO to invite the new members to join the panel.

Agus: the new members can have their first 3-year membership ending in December 2027, considering it is now already midyear.

End of Meeting