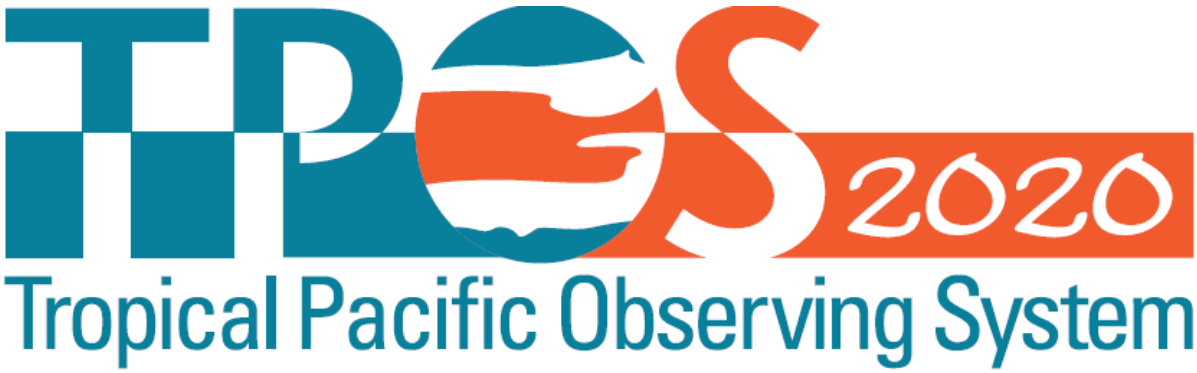

Report of the 3rd Meeting of the TPOS 2020 Steering Committee

25-28 October, 2016
DHN, Lima, Peru

20 December 2016
Version 01 – Consultative Draft
Project Website: www.tpos2020.org

Table of Contents

1. Opening and Welcome

The third meeting of the TPOS 2020 Steering Committee (SC) opened at 0900 Tuesday 25 October. The sessions opened with a presentation led by the local host Dirección de Hidrografía y Navegación (DHN). A welcome was extended from:

- Rodolfo SABLICH (Rear admiral) - Director of Hidrography and Navigation, Peruvian Navy
- Javier FERNANDEZ (Commander) - Head of Oceanography Department, Peruvian Navy
- César VALDIVIEZO (Second Lieutenant) - Deputy Head of Oceanography Department, Peruvian Navy

The presentation included a briefing on the new 97m-long polar research vessel, BAP Carrasco, that was launched on 7 May 2016. The vessel provides capability for Peru to fulfill its obligations under the Antarctic Treaty as we will to provide open ocean/coastal capabilities. The vessel was constructed at the Freire shipyard in Spain and will be fully commissioned by the end of 2016. It has advanced environmental capabilities and can support research cruises more than 50 days with around 60 scientists on board.

The Steering Committee welcomed this development and thanked the Peruvian Navy for their presentation and looked forward to the BAP Carrasco contributing to TPOS.

The Co-Chairs opened the formal part of the SC-3 meeting and began by thanking Ken Takahashi of the Instituto Geofísico del Perú (IGP), and other members of IGP and DHN for their assistance in hosting the meeting. The Co-Chairs drew attention to the very successful Workshop "Tropical Pacific Observing System 2020 Eastern Pacific Task Team Workshop" (see Appendix 3) convened by Ken Takahashi on Monday 24 October, with contributions from DHN, IGP and IMARPE, as well as the TPOS 2020 SC Co-Chairs. Enthusiastic engagement reflected strong local interest in eastern Pacific observations and research.

The co-Chairs noted that all SC and extended SC members (Task Team co-Chairs) were in attendance with the exception of Harry Hendon, Weidong Yu and Eric Guilyardi (who joined some of the proceedings remotely). The co-Chairs extended a welcome to TPOS 2020 First Report Lead Authors, Tony Lee, and to Andrew Wittenberg who joined for modeling discussions (Special Issue 2).

The meeting Agenda is included as Appendix 1 and Appendix 2 contains a full list of participants.

2. Agenda and Review of Actions

SC co-Chair Neville Smith introduced the Agenda (Appendix 1) for the meeting and asked the SC to consider the desired outcomes for each session. It was noted that some of the agenda items may require rescheduling to accommodate the needs of remote participants. Appendix 2 contains a list of all participants.

Major outcomes of the meeting were reviewed. A key outcome of the SC-3 will be responding to the review of the Second Order Draft (SOD) of the TPOS 2020 First Report, including detailed consideration of the SOD comments and responses, a revision and approval of the Executive Summary, and next steps toward finalization and publication.

The Agenda covered Task Team (TT) progress and relevant SC activities including those conducted related to the Resource Forum. The SC was also asked to consider and agree to early plans for Transition arrangements. National and agency activities are included with a focus on the needs and potential activities within the Eastern Pacific community.

Previous SC Actions were reviewed and it was reported that with the exception of three Actions all were completed or closed. The following three Actions were carried through:

> ACTION **SC-2.12**: Consider requirements relevant to, and the adequacy of, the proposed Deep Argo Array for meeting TPOS objectives (BB TT)

ACTION **SC-2.13**: Develop guidance on requirements for deep ocean sampling, utilizing tropical Pacific moorings as appropriate (BB TT)

ACTION **SC-2.18**: The draft TPOS 2020 performance metrics to be further elaborated to include specific milestones and targets (A. McCurdy, N. Smith)

It was noted that an Action that called for a plan for improved data delivery was closed but that the issue would be partly taken up via the transition and implementation discussions. The actions associated with determining deep-ocean observing needs (SC-2.12, 13) will also be considered during the upcoming December 2016 Deep Ocean Observing Strategy workshop (to be picked up under the Backbone TT Item). As part of this effort the Co-Chair of the PBL TT offered to provide an update on the use of microcat devises under the OceanSITES project. Project performance metrics will also be considered and further articulated during the first few months of 2017.

3. Status

The SC Co-Chairs Neville provided an overview of milestone activities for the Project since SC-2. Highlights included:

Distributed Project Office:
- Qingdao DPO node open
- TPOS 2020 First Report support provided by PMEL and others

Two Drafts of the First Report of TPOS 2020:
- First Order Draft (FOD) of First Report primarily through the efforts of Sophie Cravatte and Susan Wijffels
- Strawman ideas were further developed and now make up Chapter 6 content of the First Report
- Multiple drafts and reviews of the First Report were conducted which led to the Second Order Draft (SOD)
- Transition plan outlined in Chapter 7 with additional details to come

National briefings and agency presentations included:
- Report to GODAE OceanView SC Dec 2015
- Report to GSC Jun 2016, GOOS webinar
- Input provided to Ocean Vector Wind Science Team Report
- CLIVAR Open Science Meeting
- SOA-NOAA high-level Summit
- G7 Document

4. General Overview and Discussion of the Report

The Co-Chairs noted that the aim was to finalize the TPOS 2020 First Report based on the 2nd draft (SOD) and the reviews of that draft; the SC was not providing a review. The Executive Summary was the main priority, including the Recommendations and Actions therein, with changes likely to result in trickle-back changes to the underlying chapters. The Executive Summary must be finalized by the end of the meeting; guidance will be agreed and provided to the Lead Authors for the revision of the Report itself.

Prior to the session, the Co-Chairs had identified seven Issues that warranted SC comment and discussion (leaders of the discussion are identified in brackets):

Special Issue 1	Wind and wind stress (TF, TL)
Special Issue 2	Raising visibility of analysis/assimilation activities (AK, EG)
Special Issue 3	Biogeochemistry (PS, AS)
Special Issue 4	How to handle costs in the report (NS, BK)
Special Issue 5	The case for a meridional line at 170W (MC, KT); also discuss practicalities of 95W and the ITCZ/SPCZ extensions in general
Special Issue 6	Is 2x Argo too general? Is the evidence for such an enhancement adequate? (SW, DR)

Special Issue 7 Should moorings be added to enhance the meridional resolution of the TMA around the equator? (BK)

The discussions were spread over the first three days of the meeting but the results/outcomes are gathered under Agenda Item 5 in this meeting Report.

General discussion

Neville Smith provided an overview of the changes made to the FOD in producing the SOD, based on the comments provided from the initial expert review. Generally, the resulting SOD provided a clearer focus on priorities and actions along with a tighter alignment between the requirements, responses (recommendations) and proposed solutions (actions).

The SOD provides a better articulation of requirements in terms of Essential Ocean Variables or EOVs and the climate record, as well as observations required for increased understanding of critical processes and phenomena. It also provides an improved articulation of planetary boundary layer and biogeochemistry challenges.

The report contains improvements within the chapters. Chapter Two contains an improved discussion of socioeconomic benefits of TPOS given the proposed design changes. Chapter Three was revised to have a tighter alignment with requirements that deliver services and that detect climate changes; and thus lead to an improved climate record. It better captures observational needs for research on critical processes. Chapter 4 'Design Principles' was restructured to better align with GCOS, GOOS and WIGOS principles. Chapter 5 focused on the Backbone response to the requirements (sustained observing) while Chapter 6 described pilot and process studies need to guide the evolution of the Backbone. Chapter 7 had a greater focus on Implementation and Transition.

Traceability from requirements to recommendations and actions, and from the Executive Summary to the main Report, has been greatly improved. The SOD also lifted the visibility and priority attached to Pilot Projects and Process Studies.

Dr Smith further emphasized the importance of coming to agreement on the contents of the Executive Summary at this meeting. Ideally it should be shortened but, realistically, is will likely remain at or near the current length. There did not appear to be a need for major structural change but refinement by the SC was absolutely called for.

Both the FOD and SOD underwent substantial internal and external review

- FOD: Scientific expert review > 1000 comments
- SOD: Stakeholder review ~ 150 comments

These review comments were the primary factor for the SC to consider.

In the ensuing discussion, the importance of traceability was emphasised. The potential value of a TPOS 2020 science capability matrix was also raised – these are now in common use in the satellite community and in some science agencies.

Such a matrix would provide a logical flow from high level objectives through project objectives, science objectives, measurement objectives (EOV requirements), Backbone observing system requirements, and finally network and platform requirements; these in turn would be related to data products and/or research publications. Such matrix approaches are like the GOOS FOO approach.

While the SC did not see an easy way to do this for the First Report, it was agreed that something similar might be developed in the future, perhaps for the TPOS 2020 Resources Forum. Table 1 provides an outline based on the First Report structure[1].

[1] The Table was prepared after the meeting.

Table 1. Outline of a possible science capability matrix for TPOS 2020

TPOS Aims **(from Ch 1, 2)**	• To develop and maintain an observing system for the tropical Pacific Ocean to support monitoring and prediction.			
TPOS 2020 Objectives **(from 1.2)**	● To redesign and refine the TPOS to observe ENSO and advance scientific understanding of its causes, ● To determine the most efficient and effective observational solutions to support prediction systems for ocean, weather and climate services, and ● To advance understanding of tropical Pacific physical and biogeochemical/ecosystem variability and predictability.			
Science Objective	**Requirements (EOVs)**	**Backbone observations**	**Implementation Networks/ Platforms**	**Outputs Products**
(1) Provide data in support of, and to evaluate, validate and initialize, ENSO prediction and other forecasting systems and to foster their advancement; (2) Provide observations to quantify the evolving state of the surface and subsurface ocean; (3) Support integration of satellite and in situ approaches including calibration and validation; (4) Advance understanding and modelling of the climate system in the tropical Pacific, including through the provision of observing system infrastructure for process studies; and (5) Maintain and extend the tropical Pacific climate record.				

Action SC-3.1 Consider the development of a science capability matrix (or similar device) to summarise the links from high-level objectives through to recommendations and actions (TPOS 2020 SC Co-Chairs, DPO and Kathy Tedesco; April 2017).

Scientific overview

An initial overview of this scientific issues was provided by SC co-Chair William "Billy" Kessler (also see the Special Issues identified above).

He noted that there are several phenomena that the observing system will need to capture, as well enhancing understanding of the boundary layers, and that firm agreement is needed on the required scales. The boundary layer considerations included:

- Surface boundary layer (connection surface to thermocline)
- Western Boundary Layer
- Eastern Boundary Layer
- Equatorial Boundary Layer

An envisioned increase in the use of gridded products (including for research) drives consideration of the complementary strength of diverse platforms and of assimilation which results in improved system performance. He suggested that the current Report recommendation 14 (now 18) is weak on how this could be achieved; where there will be progress in the next 5 years; and what investments will make the most difference.

He also challenged the SC to consider why the Report proposes changes in the design of the observing system when there is general agreement that the tropical Pacific is not currently oversampled; the redesign appears not be driven by redundancies and a need to reduce/remove them. He emphasized the justification that the redesigned TPOS will focus on a credible climate record not just long-term time series data.

The presentation also challenged the SC to consider the phenomenon that need to be sampled that are vital to understanding Pacific climate and whether they can be observed by sustained, broadscale sampling; whether models can capture them with assimilation; and any systematic failings of models that might prevent effective representation of such phenomena. The SC needs to consider what role there is for limited term process studies.

Dr Kessler then discussed the complementary strengths of diverse platforms such as satellites, moorings, and Argo floats, and how the strengths of each addresses weaknesses of the others. He emphasized that integration of these diverse sources is fundamental to the vision of the redesign and that a user base taking advantage of a functioning assimilation system will prove most valuable to TPOS maturation over time.

In relation to the 'value added' by models Billy prompted: models are achieving impact for prediction (we do not observe the future!) but the presence of systematic errors in the models and assimilation parameterisations limit their ability as integrators of ocean and climate observations, and thus reduce the potential impact of TPOS.

Much of the discussion focused on the 'value add' of models/modeling and whether TPOS may be imparting too dark a picture. Several members highlighted areas where models, and coupled models in particular, were contributing to products that would otherwise not be possible. The SC agreed to revisit this under Special Issue 2 and within the Modeling and Data Assimilation Task Team Report.

Discussion and Feedback

- General expression of satisfaction with the Report content, structure, recommendations and actions.
- It is important to be able to recognize and align regional/local interests with the report Recommendations and Actions, and the projects described in Chapter 6. This is also true for specific sectors such as model development.
- Comments on the SOD mean we should revisit the conclusion around wind/wind stress (see Special Issue 1).

- Some view the Report as a proposal to cut the TMA rather than a reconfiguration; the Final version needs to address this perception.
- Few operational agencies see this as an opportunity to strengthen investment in TPOS; however, the Report is critical for sustaining the current investment.
- Several research agencies see significant opportunity, both for developing the Backbone and for pilot/process studies. The Steering Committee should provide encouragement and advice as appropriate.
- Data accessibility and exchange continues to be an issue in some areas.
- Need to give attention to the initial messages in the ES and build a sense of excitement and anticipation.
- In an ideal world, ENSO prediction would be much better than it is now, so the impact of observations is compromised.
- BGC issues need to be elevated generally.
- Constructive and positive feedback from several groups, e.g. Satellite CGMS Precipitation working group and US CLIVAR POS; air-sea flux variables highlighted.
- Some groups like NPOCE seeking to engage on pilots and projects.
- Traceability is a significant plus for the SOD.
- Need guidance on the way research and operational groups can work together on TPOS.
- Language barriers continue to inhibit engagement for some potential participants.
- Some positive signs with respect to (new) ship time (e.g. KIOST and new Peru R/V)
- The recommendations and actions need to be defendable – evidence based – decisive and actionable.
- TPOS 2020 needs to consider its legacy the governance and observing networks post-2020.
- Focus on phenomena that add to predictability.
- There are opportunities to contribute to model improvements but partnerships with observational experts will be needed.
- What key messages are, and how they could be communicated more widely?

Four actions were agreed:

Action SC-3.2 The TPOS 2020 SC agreed to translation of the Executive Summary into French, Spanish, Chinese, Japanese and Korean (Dake Chen offered assistance for Chinese; Ken Ando for Japanese; Dongchull Jean for Korean; Katy can help with UN Languages) (DPO, Dec 2016)

Action SC-3.3 Develop high-level messages around the First Report of TPOS 2020 (target: senior managers; objective: effective communication; form: around 10 bullet points) (TPOS 2020 SC Co-Chairs, 31 Dec 2016)

Action SC-3.4 Provide guidance on the way that research and operational groups can work together (sustained and experimental observations) (develop as part of preparations for TRF -2; NS, March 2017)

Action SC-3.5 TPOS 2020 SC to provide input to Sophie Cravatte for Coriolis Steering Committee briefing (comité directeur de Coriolis) on 20 Dec (TPOS 2020 SC Co-Chairs, Sophie C; Dec 2016).

5. Consideration of Comments/Reviews

The aim of this Agenda Item was to move through the review comments on the SOD chapter by chapter, including those directed at the Executive Summary. The latter was revisited under Item 6 when the ES was considered in detail. The seven issues identified at the start of Item 4 were discussed separately to develop an understanding of the issues and, as appropriate to provide advice to the Lead Authors.

We will not cover the detail of the Chapter-by-Chapter discussions since that advice was provided directly to the Lead Authors, most of whom participated in the meeting. The PowerPoint slides that were shown at the meeting contain much of that detail. We report here only those aspects that may have relevance beyond the finalisation of the First Report.

General points

- Several of the points covered under Item 4 “Discussion and feedback” were also touched on here; they are not repeated.
- Ship time was a general issue, despite the commissioning of new vessels in Peru and the Republic of Korea in recent times. The western parts of the TMA could be stronger if more ship time was available. Furthermore, where vessels are used for service cruises, there are missed opportunities for gathering ancillary data – such data are particularly important for the biogeochemistry climate record.
- While surface waves (sea state) is considered within the requirements (Chapter 3), little work has been done developing this theme in terms of requirements and actions; this may need to be addressed in following Reports.
- Sea level pressure was touched on in the requirements and in later chapters but not developed in detail. A “business as usual” stance was taken in terms of SOD recommendations – that is to provide support for recommendations of other bodies like the DBCP but no additional action from TPOS. Exchanges with the NWP began to test the assumption that SLP had reduced impact in the tropics; experiments with TRITON MSLP data did reveal a positive impact. Further reflection encouraged TPOS to be more proactive and at least support the addition of SLP on the TMA wherever practical.
- Agreed to strengthen Chapters 3 and 5 with respect to surface fluxes and rainfall; refinement to make sure we are conveying the key messages.
- It is important to highlight the potential role of technology development, particularly those that are close to being ready for Backbone deployment. For areas where the reconfiguration of the TMA may impact the availability of air-sea flux variables (air temperature, humidity), it is important to encourage new technology.
- Surface ocean currents are a requirement but broadscale observations are not yet available (other than through indirect estimates such as from OSCAR).
- Chapter 6 (Evolution: Pilot Projects, Process Studies) has emerged as a key Chapter of the Report; need to ensure there is clarity on priorities and a clear set of actionable objectives within each. We also need to develop a roadmap for developing these expressions of interest into strategic implementation (actionable) plans

Action SC-3.6 Further develop Pilot/Process studies into “implementation strategy” style documents, with guidance on who may contribute, when, and in what form (Study authors, Task Teams, SC, by mid-March 2017)

- Various projects and/or new developments and technology will arise as part of the implementation strategy for Actions and will exists alongside those of Chapter 6 and its Annex (Chapter 10).
- The concept of a “bow-tie” TMA has evolved based on SOD comments and further discussion among the Lead Authors. A new figure will be developed that will capture the evolution in thinking but that will remain “fuzzy” where the details are subject to further dialogue with stakeholders (scientists, implementation agencies).

Action SC-3.7 Develop a ~ 15 pp draft roadmap for implementation of TPOS 2020 actions, including the Projects and Pilot studies as part of the preparation for the TPOS 20202 Resources Forum (NS 15 March 2017).

Special Issue 1: Winds and Wind Stress

- Considerable discussion on the needed scatterometer coverage, sampling errors, and on rain-flag metadata generated for scatterometers.

- The design is aiming to reduce sampling errors for key applications. The SC noted that the SOA scatterometer could potentially fill part of the sampling gap.
- Also, discussed the impact of currents on SCAT measurements at low wind speed. Spurious effects may arise If the relative measurements of scatterometers are treated as absolute winds (e.g., in NWP or specialised analyses) or if absolute winds from fixed points are used to estimate stress without taking account of currents.
- The SC agreed that further impact/sensitivity studies are needed, particularly for rain flags and the importance of TMA winds for validation and model improvement.

Action SC-3.8 Develop a note on the risks around satellite scatterometer data and the importance of the Chinese HY-2B/CFOSAT contribution for informal communications with WMO, Chinese agencies, the OVWST and CEOS (NS, TL, JTF, DC; Feb 2017)

Action SC-3.9 Follow-up on importance of wind and surface flux sensitivity studies with John Eyre ahead of the CBS Meeting in China next month (Guangzhou, 21-29 November) (NS, KH, 7 Nov 2016)

Special Issue 2: Raising the visibility of analysis/assimilation activities

- Agreement that we should strengthen the modeling aspects of the Report and the Executive Summary.
- Agreement that the project "Comparison of analyses and utilization of TPOS observations" should be given higher priority and greater visibility as a Pilot Project.
- Develop specific activities on gathering diagnostics from some of the more advanced analysis and assimilation systems on increments and innovations. It is important that this be extended to some of the simpler analysis systems, e.g. ALT and wind that are not complicated by model bias.
- Agreed that a specific activity on the sensitivity of specialised wind analyses and NWP products should be included (see previous special issue).
- Agreed that modeling and data assimilation must be a priority area for the Steering Committee and for the 2nd Report.

Special Issue 3: Biogeochemistry

- The FOD and SOD attracted many comments on biogeochemical aspects. Need to extend/expand relevant recommendations and actions.
- The discussion highlighted the importance of ancillary data collected systematically on service vessels.
- Oxygen minimum zone should be in requirements and response.
- Where practical, extend instrumentation on TPOS platforms to include BGC EOVs.

Special Issue 4: How to handle costs in the report

- Overall, costs are very difficult to estimate for a lot of reasons:
  - Many agencies do not state or know their full costs;
  - Costs for similar observations can vary, in time and geographically, sometimes by a factor of 5 or more;
  - There is no standard methodology around the elements that must be included, e.g. granted ship time, in-kind contributions, depreciation, etc.;
  - In some special cases, we know all-up costs for supporting a network and these represent our best guide. For example, TRITON costed around $2M per annum excluding ship time.
- Issues include:
  - How to apportion costs for TPOS for global systems?
  - Early missions cost more than later.

    - Big variations across nations/agencies.
    - No simple way to quantify cost-effectiveness.
    - Costs are typically not fungible.
- Agreed to include guidance for areas that are expected to change and where they are known and might be helpful.

Special Issue 5: The case for a meridional line at 170W

This discussion also covered the practicalities of a line at 95W and the location of the ITCZ/SPCZ extensions in general.

Since vandalism is an issue in general, and particularly for 95W, the discussion began with techniques to mitigate that risk:

- Avoid detection
    - Be stealthy, e.g. underwater!
    - Avoid heavily fished areas outside of EEZ
- Be robust to abuse – engineering solutions
- Telemeter high resolution data – you may lose stored data
- Make it cheap – you may lose it
- Plan for repairs – this is where you put your money

The case for a central Pacific line (nominally at 170W) involved:

- the variability of humidity is space and time - big patches, more meridional lines;
- Rainfall: need the 5,8 and 10N moorings for rainfall – high satellite uncertainty in the tropics
- ENSO diversity - Advocacy for 170W/155 or 155W/140W
- SPCZ – add either 140, 155 or 170 to capture SPCZ
- Zonal winds (as argued by Shayne MacGregor)

170W was originally in the plan that came out of Noumea but SC-2 pushed for the bowtie configuration with fewer central extensions.

The SC agreed to include a central Pacific line, at a longitude to be determined (refer to the First Report for further details).

Special Issue 6: Is 2x Argo too general? Is the evidence for such an enhancement adequate?

For the FOD, several options for thinning and/or reconfiguring the TMA were being considered. Florent Gasparin conducted several additional experiments to supplement the work published in Gasparin et al (2014), including analyses of the error change (percentage of the variance explained) for doubled Argo density in the tropics and for a so-called thinned TMA. Subsequently, arguments were mounted for doubling Argo as a distinct action, and for the TMA to be refocused and not necessarily reduced (a grid arrangement to a regime focus).

The tropical T/S sampling requirements is taken from Fujii et al: 200 km x 1000 km by 5 days. If we assume we want a signal to noise of 4:1 (~20-25% error) the current TPOS only achieves this error level near the equator and right on the TMA lines, with large errors in between. Gasparin's calculations indicate 2 x Argo achieves this to ~6N/S^{o} at 5 days, ~10^{o} at 10 days. This error reduction is achieved for all levels of the upper ocean because of the finer vertical sampling. Altimetry (synthetic profiles) may provide an additional 10% error reduction. The TMA provides complementary information: it provides fine temporal sampling, currents, and collocated surface sampling.

Other points included:

- 2x Argo is the broad recommendation (roughly an extra 70-80 floats per year); further studies will help refine this guidance.
- High-bandwidth and two-way communication (and reduced time at the surface) mean the dispersion of equatorial floats can be reduced/partially managed.
- High vertical resolution in the upper 100 m is needed.
- The change should be introduced in a staged way to enable further study of deployment strategies
- Doubling Argo does mitigate some risks associated with a refocused TMA (particularly in the west) but is not a replacement for the TMA.
- Doubling the Argo platform numbers is more effective than doubling the profiling frequency.

Special Issue 7: Should moorings be added to enhance the meridional resolution of the TMA around the equator?

The rationale is built around several factors:

- Upwelling area
- Important to TP Climate
- Circulation not captured by broadscale sampling
- Models do not presently capture this circulation well (model errors/biases)
- The effectiveness of the strategy could be addressed through a process study

The SC concluded TPOS should aim to measure this circulation to a very fine scale through an ENSO cycle and challenge high resolution models. Initially on a pilot/experimental basis (single line first, then refine/extend as appropriate).

6. Executive Summary

The SC considered the SOD Executive Summary paragraph-by-paragraph in the light of reviewer comments and the decisions made under the previous two Agenda Items.

Additional recommendations were added in for BGC and the existing TPOS and several others were modified, in line with the Chapter-by-Chapter discussion.

Changes were agreed to the first paragraphs to better highlight the significance and impact of the Report, and to the end to capture some of the next steps. Pilot projects and process studies are now included in the Summary.

7. National and Agency Updates

7 (i) Peru: IMARPE AND ENFEN

Dimitri Gutiérrez, Director of Oceanography and Climate Change, from the Peruvian Instituto del Mar del Perú (IMARPE) discussed the importance of TPOS to the region given its role in the development of their index for predicting the strength of El Nino and La Nina. He provided an overview of the socio/economic impacts realized from improved physical and biogeochemical observations and the impact on regional forecasts and scientific research to better understand anomalies especially from 100W. He discussed the relationship among improved observations and a better understanding of ENSO and the importance of regional cooperation through GO2Ne (Global and Oxygen Network), the collaboration with KIOST, new glider lines and the improved capability, and opportunities presented under CPPS, specifically at the 95W line.

A second presentation was given by Ivonne Montes, Head of Oceanography from Instituto Geofísico del Perú (IGP). The very informative talk focused on three important research topics of climate, ecosystems, and human impacts, generally focused on loss of oxygen in the ocean.

7 (ii) USA: NOAA Climate Observation Division

Kathy Tedesco, Program Manager in NOAA Climate Program Office provided an overview of FY2016 Federal Funding Opportunity for "*In Situ* Technologies to Contribute to the Tropical Pacific Observing System (TPOS 2020) Project". The projects listed below began 1 July 2016 and represent a total investment by NOAA/COD of $4.6 M over the next 4 years:

- "Autonomous Surface Vessels as Low-Cost TPOS Platforms for Observing the Planetary Boundary Layer and Surface Biogeochemistry" -Meghan Cronin and Chris Meinig (NOAA/PMEL), Dongxiao Zhang & Adrienne Sutton (JISAO-UW)
- "Profiling Floats Equipped with Rainfall, Wind Speed, and Biogeochemical Sensors for Use in the Tropical Pacific Observing System" -Stephen Riser (UW) & Jie Yang (APL-UW)
- "Enhanced Ocean Boundary Layer Observations on NDBC TAO Moorings" -Karen Grissom (NOAA/NWS/NDBC) & William Kessler (NOAA/PMEL)
- "Development and Testing of Direct Covariance Turbulent Flux Measurements for NDBC TAO Buoys" -J. Thomas Farrar (WHOI), James Edson (U Conn) & Meghan Cronin (NOAA/PMEL)

Kathy then provided an overview of two activities within NOAA. First, the TPOS 2020 Internal Working Group (IWG) which meets via conference call monthly with representatives from PMEL, NWS (NDBC, NCEP-CPC), OAR (CPO, IA), OER and invited speakers. Second, under development, is a 5-10-page strategy document which will provide a 5-year strategic vision and phasing of needed TPOS activities within NOAA (OAR, NWS, PMEL, GFDL). This document will be developed over the next 3-4 months in preparation for the TRF discussions and TRF-2 meeting in May 2017.

She then provided insight into the importance to TPOS 2020 of creating and maintaining an understanding of the goals of NOAA and other US agencies. She discussed the five-year vision now being generated internally at NOAA and that similar efforts are also taking place at both NASA and the NSF. This can most effectively be accomplished by reaching out to these agencies, which she encouraged as part of the TRF efforts and considering the upcoming TRF-2.

> ***Action SC-3.10*** COD Pilot Project progress updates should be provided to the community (as part of MSR updates). (DPO, Kathy T, ongoing)

7 (iii) China: SOA

Dake Chen provided an update on the status of activities in China. The country is supporting several satellite launches which will result in 12 ocean missions out of 34 total missions. He emphasized that TPOS provides a platform for a possible NOAA collaboration. The Chinese Argo Programme will also support 200 of its own floats (as part of a proposed fleet of 1,000 floats); it is not yet clear how many will be in the tropical Pacific.

The NPOCE Programme is supported by the Cabinet of Science and will deploy 50 moorings for a several year research project. Additionally, the 'Big Cross' Project in the western Pacific along 137W will monitor circulation, typhoon, east Asian monsoons, and ENSO. This may be expanded if approved at the 147W line, however the timeline is uncertain. He stated that the current primary focus is on the larger Argo effort rather than the smaller ones.

He stated that there is consensus among the Chinese scientists that China should play a significant role in TPOS and encouraged TPOS 2020 to consider and articulate what is needed from SOA, including detail on functionality and location for deployment. Some consideration also needs to be given to modeling and data assimilation development. To

take maximum advantage of TPOS 2020, Dake also encouraged the translation of the Executive Summary (see Action SC-3.2) and that TPOS work through the JCOMM Observation Coordination Group and an expression of interest prior to the proposed upcoming TRF-2 would be of great advantage.

Current projects are mostly research oriented, but sustained ocean observing systems have been proposed. Considerable efforts are still needed to persuade the government for support. Dake suggested a possible side meeting at one of the international meetings may be a good opportunity to help persuade the government for support.

> ***Action SC-3.11*** Katy/David to work with Dake/Weidong to consider opportunities JCOMM OCG Meeting in Qingdao next May to raise TPOS 2020 Opportunities with SOA/CMA, and Other Chinese organisations (KH, DC, DL, Feb 2017).
>
> ***Action SC-3.12*** Liaise with SOA through DC to scope out how TPOS 2020 may be interfaced with Chinese planning (expand to other agencies as appropriate) (TPOS 2020 SC Co-Chairs, DC, March 2017)

7 (iv) Korea: KIOST

Dongchull Jeon presented an overview of Korean efforts, primarily for research. A good deal of attention is targeted at the increased intensity of typhoons in the North Pacific. At present, there is not a lot of TPOS related activity although he will be looking for a special TPOS session in the spring of 2017. More generally, they are working on a plan with NOAA, and KMA is engaged in some domestic university discussions; they are doing some work on gliders with Rutgers, and have an Indian Ocean study approved for next year. KIOST is still planning its move to the south next year.

7 (v) Peru

Ken Takahashi provided an overview of the Eastern Pacific Task Team Workshop held the morning of Monday 24 October prior to the SC-3 (Appendix 3). Ken articulated that a US Embassy based project on real-time data focused on climate change could provide benefits. He stated that coordinated work through TPOS 2020 may help toward a more relaxed data policy and demonstrate the value of this type of effort. Beyond this additional coordination on SST satellite calibration, Argo deployment at 80W, and greater engagement from regional fisheries, IMARPE, IGP, Met Services, and the Department of Finance can also be coordinated through strengthened connections to CPPS. It is hoped that TPOS expertise could be added to the May 2017 meeting as a follow-on to meetings scheduled for December 2016 during which TPOS will be discussed. Carmen Grado was identified as the contact person within CPPS. Most critical for TPOS 2020 will be to work through these key regional groups to accomplish goals set forth thus far by the SC and the EP TT as this type of coordination is well received in proposals to the government.

> ***Action SC-3.13*** DPO to keep track of regional planning activities e.g. in China and Peru/South America and any input needed from TPOS 2020 SC (as part of engagement plans) (DPO, ongoing).
>
> ***Action SC-3.14*** Explore options for a small project demonstrating the utility and benefits of data exchange (Ken T, NS; May 2017)
>
> ***Action SC-3.15*** Note plans for a meeting in CPPS May 2017 and consider representation. Carmen to provide details and be contact point for CPPS (DPO, Carmen G, March 2017).

7 (vi) France: IRD

Sophie Cravatte referred to the feedback provided under Item 4 and noted that there has been consultation with several French groups. She emphasized that IRD is primarily focused on local impact and articulated her willingness to help with coordinating an optimal path forward to both TPOS and IRD. She noted again her plans to present to the Coriolis Steering Committee in the coming weeks (20 Dec) and the need for clear focused messages. She emphasized that working through these coordinated groups is the most effective way to communicate to French stakeholders.

Sophie will continue to monitor and work with TPOS 2020 to ensure that proper representation is provided through the TRF and even most likely throughout the transition process.

> ***Action SC-3.16*** Provide guidance on how TPOS 2020 may take advantage of offers for cooperation with Mercator/AtlantOS (TPOS 2020 SC through Sophie C, immediately).

7 (vii) Australia: IMOS and CSIRO

Susan Wijffels provided an overview from Australia with a discussion of both IMOS and CSIRO activities and perspectives.

She emphasized the very strong contribution provided by Tim Moltmann, Director of IMOS. Tim has supported Dr. Ana Lara-Lopez and the DPO node in Hobart since the project's inception; he is an active member of the TRF (and newly created *ad hoc* Transition and Implementation Group), and supports Project related activities as the lead of the GOOS Regional Alliances. She reminded the SC that while IMOS has received a 5-year approval of funding, it is expected that they face funding cuts in the future. Currently IMOS support of XBT lines, moorings, ship time, and Argo funds seem secure; an additional GO-SHIP line at 170W was conducted this year, and there may be additional support for BGC Argo in the future.

She emphasized that an optimal path forward for TPOS may be to incorporate mature requirements or needs into the IMOS Strategic Plan and the National Marine Science Strategic Plan to be reviewed over the next few years.

Susan's home institution, CSIRO is presently exploring a research center with China. Some discussions have examined a WP focus, maybe some work on the Wyrtki Challenge, and some pilot floats. Another large effort of 15 FTE has been assigned to a decadal prediction project that will launch with a 5-10-year horizon and concentrate longer timescales. There are also YMC and RAMA moorings proposals under consideration.

General:

> ***Action SC-3.17*** Develop guidance for TPOS 2020 SC on modalities for working with NMHSs and the atmospheric community more generally, taking account of Transition Group and TRF activities (NS, KH, Jan 2017)

8. Task Team Activities

The Co-Chairs introduced this item. TT co-Chairs were asked to provide a brief on:

- Activities during 2016-17
- Updates on projects/studies (as captured in TPOS 2020 First Report, Chapter 6 and Annex 10)
- Plans for 2017-2020
- Membership and Terms of Reference Review

The Co-Chairs suggested that the coming 12 to 20 months of TPOS 2020 should have increased focus on 1) biogeochemistry and ecosystems and 2) modeling and data assimilation as well as further design and planning for implementation of the projects.

The second resources forum also provides an opportunity to revisit the terms of reference of the TPOS 2020 Project; gaps related to typhoons, impacts, atmospheric observations, and paleo elements warrant some consideration. A final note was made on the need to generate and maintain a focus on technology development as the TPOS 2020 proceeds into the next phase.

8 (i) Backbone TT

Susan Wijffels reported that nearly all the TT's Actions were completed this year apart from the Wyrtki Challenge. She also discussed the role that she and Sophie played along with the TT in drafting and redrafting the First Report. This was a major focus for the group this year resulting in a significant achievement!

With respect to the Wyrtki Challenge, Tong "Tony" Lee stated that he is ready to work on the feasibility study but will need a post-doc or similar to make progress. Ken Ando suggested Yukio Masumoto may have a grad student that could assist with this work.

> ***Action SC-3.18*** Wyrtki challenge: SC to consider whether they know bright post doc who could take this on and perform the necessary calculations (TPOS 2020 SC, TL; Dec 2016)

> ***Action SC-3.19*** Tony Lee to contact Yukio Masumoto about engaging in the Wyrtki Calculation (TL, YM; Nov 2016).

The BBTT Co-Chairs noted they have developing a model design project between AltantOS (CLS intern, Gasparin, PY LeTraon) and CSIRO/CAS involving multiple models to simulate platform impacts through an OSSE. Given this may also involve biogeochemistry, the TT Co-Chairs suggested they will reach out to BGC TT as appropriate.

In looking at immediate needs for the TT, and noting the fact that the First Report had consumed a great deal of the TT's energy this past year and that, to re-energize the group dynamic, it would be desirable to have a clear set of issues and agenda to pursue. In revisiting the group dynamic, it may even be desirable to divide the focus of activities within the group to maximize their impact. This may have implications for the commitment of TT resources to Transition and Implementation activities.

Several possible future activities were identified:

- Community engagement – observing networks, science meetings, agencies – should we have a concerted and coordinated effort – feedback, design, pilot activities?
- Wind/flux issue – special project on intercomparisons and issues; Is this a PBL/MDA TT job or for the BB? Who will lead?
- Deep Ocean - DOOS interaction with TPOS.
- Funded pilots: getting updates from and assessing progress and implications for the Backbone design.
- New pilots: what else is needed/possible? e.g. fast and shallow profiling float array? Other?
- The next report/design update - being specific on TMA/other technologies.
- Adequacy – monitoring performance of TPOS?

The Co-Chairs also reported that Alex Ganachaud has stepped down due to other commitments and that a replacement of someone from the modeling community may be in order.

The SC Co-Chairs noted that further clarity on some of these future activities will emerge from the road-mapping exercise in early 2017. The TPOS 2020 SC also agreed that a slide pack should be prepared summarising the key conclusions of the First Report for community engagement.

The BB TT should be directly engaged on any Pilot that has a direct implication for the Backbone (e.g., the LLWBC Pilot). Most of the Actions in the First Report, including Action 7 on wind sensitivity (also see Action SC-3.9), will require BB TT engagement. In some, such as the Argo studies (Action 4) the BB TT is explicitly identified as the Lead.

Planning for the next Report will begin with preparations for SC-4.

> ***Action SC-3.20*** Develop a slide deck highlighting the scientific background, rationale, Recommendations, Actions, and key technological/scientific challenges of the First Report (DPO with TPOS 2020 SC, Jan 2017)

> ***Action SC-3.21*** The BB TT to work with the BGC TT in the development of model sensitivity

experiments (BB and BGC TTs; April 2017)

Action SC-3.22 Develop a 2-page project plan around wind/flux inter-comparisons (NS, TL, JTF; Jan 2016)

Action SC-3.23 Contact John Eyre re cooperation with WMO community on sensitivity experiments relevant to wind and surface flux estimates (NS; 7 Nov 2016)

Action SC-3.24 Provide guidance on deep observations for TPOS 2020 (see Roemmich presentation SC-2 and actions SC-2:12, 13) (TPOS 2020 SC through SW; Dec 2016)

8 (ii) Biogeochemistry TT

The BGC TT Co-Chairs, Adrienne Sutton and Pete Strutton provided an overview of the BGC TT activities. During 2016-17 the BGC TT is focused on:

- Organize TPOS BGC sessions at the Fall AGU and ASLO in February
- Push coordinating groups (Ocean Carbon and Biogeochemistry coordinating office/OCB et al.) for further input.
- Send proposal to OCB for postdoc to interrogate existing data (obs and models) to define the temporal/spatial scales for TPOS BGC measurements – activity #1 in the BGC pilot, 6.1.3.
- Seek input on the status of emerging sensors: iron.

Adrienne also provided an overview of relevant NOAA funded studies (Saildrone and BGC floats) which are generally proceeding as planned. She also provided an overview of plans to add BGC sensors on floats and Prawler (a wave-powered CTD profiler) moorings.

Plans for 2017-2020 include:

- Seek OCB funding to hold a workshop to engage a broader group outside of BGC TT to assess BGC in the tropical Pacific. This would include the recent data synthesis and pilot projects.
- Develop recommendations on BGC TPOS Backbone array design to inform second and Final TPOS Reports.

In terms of BGC TT membership, the Co-Chairs suggested adding a modeler to sit on both the BGC and MDA TTs. Such expertise would cover BGC data assimilation in models and Ecosystem forecasting. TPOS 2020 SC also drew attention to ***Action SC-3.21***.

In response to a SC Co-Chair comment about raising the profile and priority of BGC work over the coming year(s), the BGC TT Co-Chairs confirmed that they were completely comfortable with such an action, but noted they would need to re-energize and motivate the TT is order to accelerate progress.

Action SC-3.25 The TPOS 2020 SC and BGC TT agree to place priority on BGC activities for the next inter-sessional period, including activities identified in the Pilot Project 6.1.3 of the First Report (TPOS 2020 SC and BGC TT; ongoing 2017).

8 (iii) Eastern Pacific TT

The Co-Chairs of the Eastern Pacific Task Team, Yolande Sera and Ken Takahashi provided an overview of activities and reported on the status of EP TT pilot and process studies:

- Contributions to a GCOS Science Day organized by CIIFEN
- Contributions to the International Precipitation Working Group
    - OceanRAIN, disdrometers: could TPOS 2020 find funding to have this on service cruises, Christian Klepp (UNI Hamburg)

- US CLIVAR POS Panel, including helpful comments on the First Report
- The EP TT workshop in Lima, Peru (see Item 7 (v), Appendix 3).
- A minor format change is required for 6.1.2: Eastern Pacific equatorial-coastal waveguide and upwelling system;
- The future is uncertain for 6.1.5 "Pilot Climate Observing Station at Clipperton Island for the Study of East Pacific ITCZ" based on initial feedback from France but the EP TT remains interested.
- 6.2.5 "Eastern Pacific ITCZ/warm pool/cold tongue/stratus system" is a priority process study for the TT.

During the upcoming period the EP TT will continue to engage partners and activities to improve impact in the eastern Pacific including the satellite rainfall community. Another major thrust will be to continue to develop the Double ITCZ Process Study and pursue next steps.

The TT has taken on new members Kris Karnauskas from the US, and Gustavo Laos from Peru. It was noted that TPOS 2020 SC member Dr Dongchull Jeon will be in Lima during 2017-18 and that he may move to be a member of the EP TT. It was noted that lack of modeling expertise is viewed as an obstacle to moving forward.

The TPOS 2020 SC discussed a small project on real time data sharing that may prove helpful as a proof-of-concept activity. It was also generally agreed that the collaboration with KIOST may prove helpful along with CPPS coordination assistance.

> ***Action SC-3.26*** TPOS 2020 SC Chairs to discuss with Ken, Carmen, Dongchull how to take forward and support activities in the Eastern Pacific Task Team (including improving regional data availability; see *Action SC-3.14*) (April 2017)

8 (iv) Modeling and Data Assimilation TT

The Co-Chairs of the Modeling and Data Assimilation Task Team, Arun Kumar and Eric Guilyardi provided an update on activities and plans (Eric was unable to join; Andrew Wittenberg was present via videoconference.)

Arun emphasized the need to conduct additional studies to more fully engage sponsors. Other key issues include:

- discrepancies within analysis products,
- models biases and data assimilation practices that lead to a poor use of observations,
- the difficulty associated with understanding what observational data is being ingested into models, and
- the difficulty in understanding what observational data is required for coupled data assimilation systems.

Arun provided an overview of the several M&DA TT meetings held in the previous Project year which focused on the scope of the TT, activities for the coming year, and what input was required for the First Report. It was also noted that Eric presented to the US CLIVAR and the fall CLIVAR Open Science Conference in September, an outcome of which was a campaign to engage the ENSO Research Focus Group and OMDP.

Dake Chen drew attention to the fact that no Chinese scientists are engaged in the Task Team's work and the M&DA TT Co-Chairs undertook to follow this up.

The TPOS 2020 SC Co-Chairs noted the previous discussion under the Items introducing the scientific background of the First Report (Billy Kessler) and *Special Issue 2: Raising the visibility of analysis/assimilation activities,* and the agreement to lift the profile and priority attached to modeling and data assimilation over the coming intersessional period.

> ***Action SC-3.27*** The TPOS 2020 SC agreed that modeling and data assimilation must a priority area for the Steering Committee and for the 2nd Report (M&DA TT, ongoing 2017).

The TPOS 2020 SC further noted ***Action SC-3.9*** (wind sensitivity) and ***Action SC-3.21*** (BGC OSSEs) above as well as Actions 7 and 8 of the First Report which specifically target wind and flux variable sensitivity studies, respectively, and Action 13 which encourages efforts to improve the realism of reanalysis and possibly real-time NWP flux products; the M&DA TTshould be engaged in all of these activities.

Further discussion revolved around the need to articulate the timeline of community activities and the need to focus modeling activity on TPOS; noting that the timeline for some subsequent activities may go well beyond 2020. It should be possible now to get an idea of what observational data are being assimilated into models and otherwise and why certain data are not being taken up. It was also suggested the group launch a campaign to understand what key four things are needed to constrain models in the tropical Pacific and to get feedback on what presently works well.

For assimilation, it would be beneficial to understand what data are most relevant to the improvement of models. The upcoming 5th WGNE workshop on systematic errors in weather and climate models provides an opportunity to explore this. Andrew Wittenberg suggested a targeted workshop that brings observational experts and model developers together might also be useful. Such a workshop would provide an opportunity for TPOS 2020 to discuss its new design and the opportunities therein. The TPOS 2020 SC welcomed this suggestion and undertook to explore options.

> ***Action SC-3.28*** Stronger engagement from M&DA TT is needed with broader community activities. The TPOS 2020 SC to assist in the organization of a regular schedule of telecons with key groups. i.e. GOV Coupled assimilation group, GOV OSEval Group. (M&DA TT Co-Chairs, NS; ongoing 2017).
>
> ***Action SC-3.29*** Scope and organise a workshop on the take up and needs for observations (sustained and experimental) for model development and field programme (SC Co-Chairs, Bill Large, PBL TT, M&DA TT (Andrew W), by Jan 2016)

8 (v) Planetary Boundary Layer TT

The Co-Chairs of the Planetary Boundary Layer Task Team, Meghan Cronin and Tom Farrar, provided an update on current and future activities of the PBL TT. Meghan reiterated the lingering concern over the 'fuzzy map' as it exists in the current version of the First Report and the need for continued discussion of trade-off as the Report is redrafted[2].

Meghan provided an overview of the activities over the past few years and the need to re-engage the TT. She emphasized that there are multiple proposals being submitted around flux buoys and a better understanding of TPOS goals would be of benefit to these groups. In the next 12 months, there will also be an emphasis on plans for the 95W line, taking maximum advantage of the NOAA Climate Observation Division Projects. Meghan also noted that ownership of the related YMC activities has drifted into the WP TT (next Item).

Meghan suggested that working toward deadlines is helpful in moving things forward.

The TPOS 2020 SC drew attention to the extensive discussion of PBL issues under *Special Issue 1: Winds and Wind Stress* and *Special Issue 5: The case for a meridional line at 170W*, which also included discussion of other ITCZ/SPCZ extensions. The SC also noted that Actions 6, 7, 8, 10, 11 and 13 of the First Report will involve PBL TT leadership, as will several Projects listed in Chapter 6. In each of these cases, an initial implementation plan needs to be developed with sufficient detail to indicate who will be engaged, and when and where activities might take place.

> ***Action SC-3.30*** The PBL TT to continue to lead discussions focused on refining the location of meridional regime mooring lines (PBL TT, June 2017).
>
> ***Action SC-3.31*** PBL TT to engage with groups planning to put flux moorings in the tropical Pacific region to ensure they align with TPOS goals (PBL TT, ongoing 2017).

8 (vi) Western Pacific TT

The Co-Chairs of the Western Pacific Task Team, Ken Ando and Janet Sprintall summarised key activities of the WP TT during its inaugural year. These included their first face-to-face meeting during Ocean Sciences in February 2016 in New Orleans, which also included a TPOS presentation. In addition to their teleconference meetings they have launched an

[2] The PBL TT has since led discussions on this figure and it has been finalised for publication in the Report.

effort to collect and publish cruise plans to facilitate maximum use of ship-time in the WP and ITF region. Additional engagement occurred with the CLIVAR Pacific Regional Panel and the NPOCE-SSE. Strengthened coordination with NPOCE is under discussion, including membership and the possibility of future meetings in early 2017 and 2018.

Ken then provided an overview of contributions to the First Report including observation of the Western Boundary Currents (6.1.1), and Air-Sea interactions on the eastern and western edge of the warm pool (6.2.3 and 6.2.4). He also described 2017-2020 plans for the YMC, ITF programs, SPICE, and the western Pacific. This was followed by an overview of Japan's plans for the western Pacific as related to TRITON and the use of wave gliders to replace flux measurements of TRITON.

He concluded by noting that the WP TT will launch a data inventory project to understand data availability and management issues. The TT will also explore the role and use of new technologies such a gliders and wave gliders. They will also be pulling together a timeline and plan for the international meetings discussed earlier.

> ***Action SC-3.32*** Consider governance arrangements with research using the NPOCE/SPICE/TPOS 2020 cooperation in the LLWBC pilot as an example, with focus on data exchange which is essential (WP TT Co-Chairs, SC Co-Chairs; June 2017)
>
> ***Action SC-3.33*** WP TT to Develop an inventory of observations/data in the western Pacific. Consider a technical workshop to facilitate data delivery (WP TT, August 2017).

9. Future Work of Report Lead Authors

9 (i) Transition arrangements

Co-Chair Neville Smith provided an update on transition and implementation activities.

Following the outline developed at SC-2 in Hobart, a brief paper on transition and implementation arrangements was developed with the assistance of Katy Hill and David Legler; that paper formed the basis for Section 7.7 of the First Report. Subsequently, a meeting was convened on 24 September 2016 with participants from IOC, WMO, GOOS and JCOMM to discuss the proposed arrangements in more detail. The participants were provided with:

- A brief on the First Report of TPOS 2020
- An outline of the next steps and engagement strategy
- A description of some aspects of implementation and transition:
  - Proposed process
    - TPOS SC agreement at SC-3
    - Decision presented to TPOS Resources Forum
    - Pilot regional mechanism → ICG WIGOS (12-14 Jan 2017)
    - Pre-operational phase - Seek endorsement at JCOMM management committee
    - A TPOS 2020 Transition and Implementation Project
    - Supported through DPO (resource implication)
    - Formal initiation: Prior to or at TRF-2
    - Informal initiation: Dec 2016
  - Proposed Governance
    - Delay consideration of 'research transition'
    - Group of implementation "experts"
    - Retain TRF as agency representation
    - Include 2 or 3 key agency stakeholders
    - Size of Group ~ 10
    - One Co-Chair from TPOS 2020 SC, one from implementation community
    - *Ad hoc* Group, and evolving
- A draft schedule for initiation of the process:

- Initiation late 2016; initial implementation 2017-28; handover 2020

Much of the work of the proposed Transition & Implementation Group would overlap with the envisaged work program for TRF-2 (for example, ***Action SC-3.7*** on developing a Roadmap). The next meeting is scheduled for early December.

Action SC-3.34 Further develop a background note on the Transition and Implementation Group structure, form and key engagement points; also, develop an explanation around implementation mechanisms (NS, KH; Nov 2016)

Action SC-3.35 Update the organisation chart and output schedule figures to reflect development of a transition group alongside TRF (DPO, Co-Chairs, Dec 2016)

Action SC-3.36 Clarify input requirements for JCOMM MAN (form, deadline) (Katy Hill; Dec 2016)).

Action SC-3.37 Clarify input requirements for ICG WIGOS (Katy Hill, Dec 2016)

9 (ii) Finalization of 2016 First Report

The TPOS 2020 SC discussed the schedule for final drafting and the dates and process for publication.

- Finalise content Oct-Nov 2016 (deadline 5 Dec)
  - LA meeting afternoon 28 October
    - Clarify Executive Summary trickle-downs for Report
    - Clarify editorial actions agreed at SC-3
      - E.g., use of trade-winds, triaged, …
    - Chapter by Chapter: discuss key changes, figures
    - Agree schedule of work, responsibility
  - Several further LA meetings will be scheduled during November (3?)
- Publish on or before 31 December 2016
  - Executive Summary should be final by first week of December
  - PMEL has agreed to assist with publication
  - Translation of ES will occur in parallel with final editing/publishing (grateful for offers from SC members and IOC/WMO to assist)

Action SC-3.38 Dongchull Jeon and Ken Ando to make enquiries at home institutes regarding potential to translate the Exec Summary into Korean and Japanese (DJ, KA, KH; Nov 2016).

The TPOS 2020 SC Co-Chairs concluded discussion of the Report by thanking all Lead Authors and other contributors for their effort, and thanked members of the SC who contributed review. The Co-Chairs also recognized the effort of the DPO, particularly Lucia, Ana and Andrea, without which this First report would not have been possible.

They also recognized the immense value of the reviewers for both the First and Second Order Drafts: these comments were pivotal to the development of the report.

10. Steering Committee Business

10 (i) Report from the DPO

The first business item was presented by DPO, Project Manager McCurdy. It was reported that based on feedback from SC-2 that the TPOS 2020 web site was revised to provide a more direct communication tool for Project members and stakeholders. Additionally items such as the slide set, Executive Summary, and the Monthly Status Report (MSR) will be revised to enhance scientific and stakeholder engagement. A key new feature for enhanced communication this year will be the addition of an Integrated Master Schedule (IMS) designed to track and communicate the status of key

Project activities and cross-project dependencies. A second primary activity will be the Western Pacific Cruise and Observation Inventory. The details and plans for presenting the findings were presented and discussed.

10 (ii) Resource Forum: TRF-2

McCurdy also presented the early plans for a face-to-face meeting of the TPOS 2020 Resource Forum (TRF-2). The TRF co-Chair Craig McLean will convene a session of this forum on 16 and 17 May 2017 at the East-West Center at the University of Hawaii in Honolulu. The presentation then turned toward projected meeting goals and outcomes, most specifically on an improved understanding of sponsor national interests, relevant guidance for the SC, and response to perceived resource needs for 2017-2018. The group will also be asked to provide advice on a governance strategy for TPOS and objectives for the next convening of the TRF.

The SC then provided valuable insight and ideas designed to assist in the planning efforts and maximize meeting outcomes and needs leading up to the meeting as they pertain to SC member needs and engagement. It was suggested that planning focus on what can be known from partner groups such as JCOMM OPS and others, and what will still be required through focused engagement with national and Met agency representatives. It was suggested that the aforementioned roadmap document, and articulated focused questions for the TRF could be helpful in focusing discussions, outcomes, and TPOS TT next steps. It was also concluded that the further articulation of Transition and Implementation plans are critical to this group's understanding of how TPOS will evolve beyond the TRF-2 and TPOS 2020 in general.

Action SC-3.39 Communicate to convenors of the TRF through the interim Co-Chair on the SC perspective of objectives and desired outcomes (Co-Chairs, DPO; Nov 2016)

Action SC-3.40 Maintain communication with SC on the plans for the TRF (DPO; ongoing)

Action SC-3.41 Develop a schedule of activities leading up to the TRF meeting in May 2017, including the initial response to TPOS 2020 recommendations and actions (NS, DPO; Dec 2016)

Action SC-3.42 Ahead of TRF-2, DPO to work through JCOMMOPS and other mechanisms to pre-populate a view of existing activities, capability in the Tropical Pacific. (DPO, KH; Jan 2016)

11. OTHER BUSINESS

Membership and commitment

The TPOS 2020 SC Co-Chairs noted this is the 3rd meeting for members and that ordinarily this would be an appropriate time to consider some rotation. Noting that none of the present Co-Chairs of the Task Teams indicated a desire to step aside (even though some are tired), this means we will likely seek some rotation/supplementation outside that group.

The Resources Forum provides a convenient point to get any such changes endorsed (though we would expect that to be a formality). The Forum also provides an opportunity to reset our Terms of Reference or seek clarity around scope; the PBL and EP TTs see wisdom in extending our scope with respect to atmospheric observations, particularly for the projects. Paleo data and typhoons/tropical cyclones/hurricanes are other areas we might wish to work more deeply.

Action SC-3.43 SC Co-Chairs to liaise offline with respect to SC membership and membership/terms of reference for TTs (Feb 2017, SC Co-Chairs)

Action SC-3.44 Develop small paper on SC Terms of Reference for the TRF, taking note of the interest in atmospheric observations (EP TT) and perhaps paleo data (SC Co-Chairs, April 2017)

Venue, date for SC-4

Action SC-3.45 Agree to convene the Fourth Session of the TPOS 2020 SC in Seattle, during the last week of October, 2017.

Meeting close

The SC Co-Chairs closed the meeting by, first, thanking the hosts DHN and IGP (and Ken Takahashi) for providing such excellent facilities and such a wonderful location and environment for the meeting. Second, they thanked the many people who assisted with local logistics at the two venues. Finally, the Co-Chairs thanked the extended Steering Committee, Lead Authors and other observers who participated throughout this full agenda; the Steering Committee has achieved its main objectives of finalising the Executive Summary and agreeing on a set of instructions for the Lead Authors to finalise the First Report.

Action SC-3.46 Send note of thanks to DHN, IMARPE for hosting the SC-3 meeting (KH, DPO, NS; Nov 2016)

The Co-Chairs closed the meeting at 1200 on Friday 28 October.

Appendix 1 SC-3 Agenda

0900 Tue 25 Oct

Session 1: ***Opening and Overview***

ITEM 1: OPENING AND WELCOME

- Introduction (Co-Chairs)
- Local welcome
- Presentation by hosts

ITEM 2: AGENDA AND REVIEW OF ACTIONS (NS)

- Agree agenda and consider desired meeting outcomes
- Review past actions

ITEM 3: STATUS

- Overview of TPOS 2020 activities since SC-2 (Co-Chairs)

1030 Coffee Break

1100 Tue 25 Oct

Session 2: ***First TPOS 2020 Report: SOD***

Desired Outcomes:

- Overview of the 2nd order draft, including its main recommendations and action
- Overview of the SOD Review
- Agree guidance on revision
- Revise and agree the Executive Summary (top priority)
- Agree next steps and publication schedule

ITEM 4: GENERAL OVERVIEW AND DISCUSSION OF REPORT

Note: The aim here is to finalize the Report based on the 2nd draft and the reviews of that draft. The SC is not providing a review. The Executive Summary is the main priority, including the Recommendations and Actions therein. Any changes to the ES may result in trickle-back changes to the underlying chapters. The Executive Summary must be finalized by the end of the meeting; guidance will be agreed and provided to the Lead Authors for the revision of the Report itself.

Documents:

- TPOS 2020 First Report (2nd draft July 2016)
- Reviewer comments on the SOD and initial responses by SC Co-Chairs

1100 Overview of the TPOS 2020 Report (approach, structure, content) – NS

- General discussion

1145 Scientific overview: Requirements, integrated OS, implementation (BK)

Note: Based on a preliminary consideration of the Review comments the Co-Chairs have identified several special issues for detailed discussion ITEM 5)

- Discussion and feedback

Note for extended SC including those not attending:

- *We are keen to get feedback on how well the Report has been received at an agency level and by the scientific community. Some of this is captured in the review comments but this is an opportunity to get an initial reading on how the Report recommendations and actions resonated with agency plans. We will give all members an opportunity to provide such feedback.*

[3]1230-1330 Lunch Break

1330 Chapters 1 and 2 (NS, BK)

- Little comment so expect little change

ITEM 5: CONSIDERATION OF COMMENTS/REVIEWS

Note: The aim here is to move through the comments relevant to each chapter; in many cases the comments will have been directed at the ES but with direct implications for a Chapter; these will be touched on first here and then revisited when the ES is considered in detail. In some cases we will pick up issues by topic, eg wind and wind stress; BGC and related issues; modeling activities; cost. The SC needs to understand the issues and, as appropriate provide advice to the Lead Authors.

1345 Chapter Three: Needs for the TPOS Backbone (SCra)

- SC: Please give special attention to 3.4 since this is the underlying basis for the ES

1420 Chapter Four: Design Principles (TF, NS, BK)

- SC: generally well received so probably only fine tuning

[3] **Note:** We will actually break for lunch 1200-1215 to avoid a crush at 1230

- SC: Should some of these be included in the ES? At present they are not.

1435 Special Issues 1: Wind and wind stress (TF, TL)

1515 Coffee Break

1545 Special Issues 2: Raising visibility of analysis/assimilation activities (AK, EG)
NB: ideally we would like Andrew W (+1h) and Eric G (+5) to join for this item so we may adjust timing

1615 Chapter Five: Integrating Satellite and In Situ Observations (TL, BK, NS)

- SC: This is a key Chapter of the Report and contains 17 recommendations (an 18th is in Chapter 7)
- SC: The recommendations will be reviewed one by one later. This item gives an opportunity to examine the final form of Chapter 5; test whether it has responded appropriately to the FOD comments (big issues only!); and to consider responses to appropriate comments

1700 Special Issue 3: Biogeochemistry (PS, AS)

- SC: the FOD and SOD included many comments on biogeochemical aspects of this Report. There have also been comments on aspects which fall in between (e.g., paleo data).
- SC: Some of the changes may have implications for the SC and our future work program

1730 Special Issue 4: How to handle costs in the report (NS, BK)

- SC: Some background on discussions and a possible way forward

1750 Close for day

0900 Wed 26

ITEM 5 (CONTINUED)

0900 Chapter Six: Evolution of the Observing System (NS, BK)

- This has emerged as a key Chapter of the Report but has received only minimal review. We will begin the discussion but may return to this topic later to ensure we have clarity on priorities and a clear set of actionable objectives.
- SC: Please consider Projects/Studies in your area of expertise and be prepared to offer comment.
- SC: Is the list too long/comprehensive? Should we be more specific concerning priority?
- TT Chairs: Next steps for these projects will be consider under the TT items

0930 Chapter Seven: Implementation and Transition (NS, BK, SCra, SW)

- SC: Transition (7.7) will be considered in more detail later
- Many reviewers focused on Chapter 7, and 7.4 in particular
- We will begin by considering some particular issues and conclude with consideration of the more general issues
- *Around 2 hours is allocated in all; we may need to be flexible given the substantial items we*

need to discuss.

Special Issue 5: The case for a meridional line at 170W (MC, KT)

- ❑ *Also discuss practicalities of 95W and the ITCZ/SPCZ extensions in general*

Special Issue 6: Is 2x Argo too general? Is the evidence for such an enhancement adequate? (SW, DR)

Special Issue 7: Should moorings be added to enhance the meridional resolution of the TMA around the equator? (BK)

1045 Morning Tea

1115 Chapter Seven: Remaining issues

1145 General discussion

Session 3: Interim Report Recommendations and Actions: the Executive Summary

ITEM 6: EXECUTIVE SUMMARY PART 1
Desired Outcomes: A paragraph-by-paragraph consideration of the Executive Summary in the light of reviewer comments and the outcomes of Item 5.

1200 Executive Summary Recommendations and Actions

- SC: We WILL NOT be editing on the screen. Rather we will be agreeing issues/points that will be considered by the relevant Lead Authors offline. PART 2 will consider the revised draft. PART 3 (if needed) will agree the final draft.

1230 – 1330 Lunch BreakSession 4: Activity updates

ITEM 7 NATIONAL/AGENCY PRESENTATIONS

1330 Special scientific presentations

1. Instituto del Mar del Perú - IMARPE
2. Instituto Geofísico del Perú (IGP)

1430 Agency activity update

- NOAA
- SOA
- KORDI
- Peru – feedback from Workshop
- IRD
- CSIRO – 170E line?

1530 Coffee Break

Session 5: Task Team activities
ITEM 8: TASK TEAMS[4]

[4] To allow others to join in, the Western Pacific TT will be moved forward to the end of Day 2

TT Chairs: The key items are the same for each TT and are listed for the BB. The reporting for 2016-17 can be brief but it is important this is captured in the Report of the meeting. A key aspect is responding to the First Report: Where do the TTs see their role? Where will they be placing priority? What work needs to be completed in preparation for the second Report due by the end of 2018? The studies/projects will be key. Also note any issues in terms of reference and/or membership.

1600 Backbone TT (SCra, SW)

- Activities 2016-17
- Updates on projects/studies (Chapter 6, Annex 10)
- Plans for 2017-2020
- Membership, ToR review

1645 Biogeochemistry TT (PS, AS)

Note to SC: BGC and biology/ecosystem observations will be a major focus over the next 2 intersessional periods. The SC should look to provide advice on how best to advance projects.

- Activities 2016-17
- Updates on projects/studies (Chapter 6, Annex 10)
- Plans for 2017-2020
- Membership, ToR review

1745 General discussion

1800 Close for day (reception, dinner?)

0900 Thu 27 Oct

Session 5: (continued)
ITEM 8 (CONTINUED)

0900 Eastern Pacific TT (KT, YS)

- Activities 2016-17
- Updates on projects/studies (Chapter 6, Annex 10)
- Plans for 2017-2020
- Membership, ToR review

0945 Modeling and Data Assimilation TT (EG, AK)[5]
NB: Scheduled so Eric (+5) and Andrew W (+1) can join

- Activities 2016-17
- Updates on projects/studies (Chapter 6, Annex 10)
- Plans for 2017-2020
- Membership, ToR review

1030 Coffee break

1100 Planetary Boundary Layer TT (MC, TF)

[5] Depending upon availability, M&DA may need to move to 0900

- Activities 2016-17
- Updates on projects/studies (Chapter 6, Annex 10)
- Plans for 2017-2020
- Membership, ToR review

1145 Western Pacific TT (JS, KA)

NB: We could adjust timing if Yukio (+14) and/or Weidong (+13) wanted to join (make it last item on Day 2)

- Activities 2016-17
- Updates on projects/studies (Chapter 6, Annex 10)
- Plans for 2017-2020
- Membership, ToR review

1230-1330 Lunch Break

Session 6: Finalization of the Executive Summary and advice to LAs

1330 ITEM 6 PART 2

Desired Outcomes: Finalization of Executive Summary

- SC Co-Chair Moderated; LA for each chapter to join as appropriate

1500 Coffee break

1530 ITEM 6 (continued)

1630 Wrap-up and agreement on remaining tasks

1730 Close for day [*NB May need evening to complete editing of ES]*

0900 Fri 28 Oct

Final Session: *Steering Committee Business*

ITEM 9 FUTURE WORK OF REPORT LEAD AUTHORS

0900 TRANSITION arrangements (see Section 7.7) (NS, KH)

- Plans
- Next Steps/SC Needs

0930 Finalization of 2016 First Report

- Schedule for final drafting
- Dates and Process for publication

ITEM 10 SC BUSINESS

1000 Report from the DPO

- Including indicative 2016/2017 Schedule/Timeline
- DPO: Integrated Master Schedule (introduction and use)

1020 TRF-2

- Plans for face-to-face TPOS 2020 Resources Forum in May
- Member needs and suggestions for engagement

1040 OTHER BUSINESS

- Membership and commitment
- Venue, date for SC-4

1100 Close session

Appendix 2 SC-2 Attendance

TPOS 2020 Steering Committee Members

Kentaro ANDO
Research Scientist
Japan Agency for Marine-Earth Science and Technology, Yokosuka
Research Institute for Global Change Japan Marine Science and Technology Centre 2-15 Natsushima-cho
Yokosuka
237-0061
Japan
Tel: +81-46-867-9462
Fax: +81-46-867-9835
Email: andouk@jamstec.go.jp

Prof. Dake CHEN
Professor
Second Institute of Oceanography, SOA
No.36 baochubei Road
310012 Hangzhou
Zhejiang
China
Email: dchen@sio.org.cn

Sophie CRAVATTE
Researcher
Institut de Recherche pour le Développement, Centre de Nouméa
101 Promenade Roger Laroque
Anse
BP A5
98848 Noumea Cedex
New Caledonia
Email: sophie.cravatte@ird.fr

Tom FARRAR
Woods Hole Oceanographic Institution
Woods Hole MA 02543
United States
Email: jfarrar@whoi.edu

Harry HENDON (unable to attend)
Bureau of Meteorology, Melbourne
700 Collins Street
Docklands
GPO Box 1289
Melbourne VIC 3001
Australia
Email: h.hendon@bom.gov.au

Dr Dongchull JEON
P.I. of POSEIDON Project/KORDI
Korea Institute of Ocean Science and Technology
787 Haeanlo
Ansan 426-744
Korea Rep
Tel: +82 010 3305 6124
Email: dcjeon@kiost.ac

William KESSLER (Co-Chair)
NOAA Pacific Marine Environmental Laboratory
7600 Sand Point Way NE, Bldg. 3
Seattle WA 98115
United States
Email: William.S.Kessler@noaa.gov

Dr. Arun KUMAR
Chief, Development Division
National Centers for Env
NOAA Center for Weather and Climate Prediction
5830 University Research Court
College Park Maryland 20740
United States
Tel: (1) 3016833385
Fax: (1) 3016831557
Email: arun.kumar@noaa.gov

William LARGE
University Cooperation for Atmospheric Research
3090 Center Green Drive
P.O.Box 3000
Boulder Colorado 80301
United States
Email: wily@ucar.edu

Dr Yukio MASUMOTO (unable to attend)
Co-Chair, Indian Ocean Panel of CLIVAR/GOS
Observational Research System for Global Change
2-15 Natsushima-cho
Yokosuka-city
237-0061
Kanagawa
Japan
Email: masumoto@eps.s.u-tokio.ac.jp

Dr. Neville SMITH (Co-Chair)
Australia
Tel: +61 407 824 129
Email: nsmi3118@bigpond.net.au

Peter STRUTTON
University of Tasmania, Institute for Marine and Antarctic Studies
Private Bag 129
Hobart TAS 7001
Australia
Email: peter.strutton@utas.edu.au

Dr. Ken TAKAHASHI
Instituto Geofísico del Perú
Peru
Email: ken.takahashi@igp.gob.pe

Dr Weidong YU (unable to attend)
Senior Scientist
National Marine Environmental Forecasting Center
State Oceanic Administration
First Institute of Oceanography, SOA
6 Xian-xia-lin Road
High Technology Park
266061 Qingdao
China
Tel: + 86 532 88967403
Fax: +86 532 88967403
Email: wdyu@fio.org.cn

Task Team Co-Chairs

Dr Meghan Cronin (PBL Task Team)
NOAA PMEL Bldg #3
7600 Sand Point Way NE
Seattle, WA 98115 USA
Tel: +1 206-526-6449
Email: Meghan.F.Cronin@noaa.gov

Dr Eric Guilyardi (Model and Data Assimilation TT; by videoconference day 1)
IPSL/LOCEAN - Dir. Rech
CNRS
Tour 45, 4eme, piece 406
UPMC, case 100
4 place Jussieu, F-75252 Paris
Tel: +33 (0)1 44 27 70 76
Email: Eric.Guilyardi@locean-ipsl.upmc.fr

Dr Yolande Serra (EP Task Team)
JISAO
University of Washington
Box 357941, Seattle, WA 98195
Email: yserra@uw.edu

Dr Adrienne Sutton (BGC Task Team)
Research Scientist
Carbon Program
Pacific Marine Environmental Laboratory
NOAA-UW Joint Institute for the Study of the Atmosphere and Ocean
Tel: 206.526.6879
Email: adrienne.sutton@noaa.gov

Dr Susan Wijffels (BB Task Team)
Research Oceanographer
Oceans & Atmosphere Flagship CSIRO
Tel: +61 3 6232 5450
Email: Susan.Wijffels@csiro.au

Expert Participants/Lead Authors:

Tong Lee
Principal Scientist
Jet Propulsion Laboratory
California Institute of Technology

Andrew Wittenberg (by video conference)
GFDL

Organisation Representatives

Dr David LEGLER
Chief, Climate Observations
National Oceanic and Atmospheric Administration Office of Oceanic and Atmospheric Research
1100 Wayne Ave
Suite 1202
Washington DC 20910
United States
Tel: +1 301 427-2460
Email: david.legler@noaa.gov

Kathy TEDESCO
Program Manager
Climate Observation Division
NOAA Climate Program Office
1315 East West Highway (SSMC3)
Silver Spring, MD 20910
Tel: +1 301 427 2462
Email: kathy.tedesco@noaa.gov

Observers and local organisation

DHN
Laos, Gustavo - DHN
Chauca, Roberto - DHN
Gabriel, Rina - DHN

IGP
Prieto, Eva
Martínez, Alejandra - Director of Geophysics and Society
Katherine Morón
Luis Martín Santos
Almendra Rojas
Gilt, Huber
Huaccachi, Susana
Huincho, César
Leucci, Cristiana

IMARPE
Carmen Grados
Dimitri Gutierrez

Secretariat/Distributed Project Office

Dr Katherine (Katy) HILL
GOOS/GCOS Programme Specialist
World Meteorological Organization
7bis, avenue de la Paix
Case Postale 2300
1211 Geneva
Switzerland
Tel: +41 (0)22 730 80 83
Fax: +41 (0)22 730 8052
Email: khill@wmo.int

Andrea MCCURDY
Sr. Program Manager
University Corporation for Atmospheric Research
1201 New York Ave. NW, 4th Floor
Washington DC 20005
United States
Tel: 01 202 288 1989
Email: mccurdy@ucar.edu

Lucia Upchurch
NOAA PMEL Bldg #3
7600 Sand Point Way NE
Seattle, WA 98115 USA

Appendix 3 Tropical Pacific Observing System 2020 Eastern Pacific Task Team Workshop

TALLER

Proyecto "Sistema Observacional del Pacífico Tropical hacia el 2020" (TPOS 2020): Necesidades y oportunidades en el Pacífico Oriental

Organizado por el Instituto Geofísico del Perú

Día: Lunes 24 de octubre de 2016
Hora: 09:00 horas – 12:45 horas
Lugar: Hotel Marriott – Malecón de la Reserva 615, Miraflores, Lima 18

PROGRAMA	
8:30-9:00	**Recepción de invitados**
9:00-9:05	Bienvenida Dr. Ronald Woodman - Presidente Ejecutivo IGP
9:05-9:10	Presentación del taller y objetivos Dr. Ken Takahashi – IGP
Primer bloque: Presentaciones técnicas	
9:10-9:25	TPOS2020: Background, objectives and plan Dr. Neville Smith – Australia
9:25-9:40	TPOS2020: Science questions, new ideas Dr. William Kessler – PMEL/NOAA, USA
9:40-9:55	Grupo de Trabajo del Pacífico Oriental TPOS2020: Necesidades regionales, avances Dr. Ken Takahashi – IGP
Segundo bloque: Panel	
9:55-10:35	Dr. Dimitri Gutiérrez - Imarpe Teniente César Valdivieso - DHN Ing. Christian Barreto - Senamhi Ing. Aníbal Aliaga - SNP
10:35-10:50	Preguntas del público
Tercer o bloque: Necesidades, oportunidades y amenazas	
10:50-12:20	Necesidades, oportunidades y amenazas en el Sistema Observacional del Pacífico Tropical
12:20-12:30	Conclusiones
12:30-12:35	Cierre del Taller

Appendix 4 SC-3 Consolidated Decisions and Actions

Actions Carried Over

ACTION SC-2.12: Consider requirements relevant to, and the adequacy of, the proposed Deep Argo Array for meeting TPOS objectives (BB TT)

ACTION SC-2.13: Develop guidance on requirements for deep ocean sampling, utilizing tropical Pacific moorings as appropriate (BB TT)

ACTION SC-2.18: The draft TPOS 2020 performance metrics to be further elaborated to include specific milestones and targets (A. McCurdy, N. Smith)

Summary of Actions from SC-3

Action SC-3.1 Consider the development of a science capability matrix (or similar device) to summarise the links from high-level objectives through to recommendations and actions (TPOS 2020 SC Co-Chairs, DPO and KT; April 2017).

Action SC-3.2 The TPOS 2020 SC agreed to translation of the Executive Summary into French, Spanish, Chinese, Japanese and Korean (DakeC offered assistance for Chinese; KA for Japanese; DJ for Korean; KH can help with UN Languages) (DPO, Dec 2016)

Action SC-3.3 Develop high-level messages around the First TPOS 2020 Report (target: senior managers; objective: effective communication; form: around 10 bullet points) (TPOS 2020 SC Co-Chairs, 31 Dec 2016)

Action SC-3.4 Provide guidance on the way that research and operational groups can work together (sustained and experimental observations) (develop as part of preparations for TRF -2; NS, March 2017)

Action SC-3.5 TPOS 2020 SC to provide input to Sophie Cravatte for Coriolis Steering Committee briefing (comité directeur de Coriolis) on 20 Dec (TPOS 2020 SC Co-Chairs, Sophie C; Dec 2016).

Action SC-3.6 Further develop Pilot/Process studies into “implementation strategy” style documents, with guidance on who may contribute, when, and in what form (Study authors, Task Teams, SC, by mid-March 2017)

Action SC-3.7 Develop a ~ 15 pp draft roadmap for implementation of TPOS 2020 actions, including the Projects and Pilot studies as part of the preparation for the TPOS 20202 Resources Forum (NS 15 March 2017).

Action SC-3.8 Develop a note on the risks around satellite scatterometer data and the importance of the Chinese HY-2B/CFOSAT contribution for informal communications with WMO, Chinese agencies, the OVWST and CEOS (NS, TL, JTF, DC; Feb 2017)

Action SC-3.9 Follow-up on importance of wind and surface flux sensitivity studies with John Eyre ahead of the CBS Meeting in China next month (Guangzhou, 21-29 November) (NS, KH, 7 Nov 2016)

Action SC-3.10 COD Pilot Project progress updates should be provided to the community (as part of MSR updates). (DPO, Kathy T, ongoing)

Action SC-3.11 Katy/David to work with Dake/Weidong to consider opportunities JCOMM OCG Meeting in Qingdao next May to raise TPOS 2020 Opportunities with SOA/CMA, and Other Chinese organisations (KH, DC, DL, Feb 2017).

Action SC-3.12 Liaise with SOA through DC to scope out how TPOS 2020 may be interfaced with Chinese planning (expand to other agencies as appropriate) (TPOS 2020 SC Co-Chairs, DC, March 2017)

Action SC-3.13 DPO to keep track of regional planning activities e.g. in China and Peru/South America and any input needed from TPOS 2020 SC (as part of engagement plans) (DPO, ongoing).

Action SC-3.14 Explore options for a small project demonstrating the utility and benefits of data exchange (Ken T, NS; May 2017)

Action SC-3.15 Note plans for a meeting in CPPS May 2017 and consider representation. Carmen to provide details and be contact point for CPPS (DPO, Carmen G, March 2017).

Action SC-3.16 Provide guidance on how TPOS 2020 may take advantage of offers for cooperation with Mercator/Atlantos (TPOS 2020 SC through Sophie C, immediately).

Action SC-3.17 Develop guidance for TPOS 2020 SC on modalities for working with NMHSs and the atmospheric community more generally, taking account of Transition Group and TRF activities (NS, KH, Jan 2017)

Action SC-3.18 Wyrtki challenge: SC to consider whether they know bright post doc who could take this on and perform the necessary calculations (TPOS 2020 SC, TL;, Dec 2016)

Action SC-3.19 Tony Lee to contact Yukio Masumoto about engaging in the Wyrtki Calculation (TL, YM; Nov 2016).

Action SC-3.20 Develop a slide deck highlighting the scientific background, rationale, Recommendations, Actions, and key technological/scientific challenges of the First Report (DPO with TPOS 2020 SC, Jan 2017)

Action SC-3.21 The BB TT to work with the BGC TT in the development of model sensitivity experiments (BB and BGC TTs; April 2017)

Action SC-3.22 Develop a 2-page project plan around wind/flux inter-comparisons (NS, TL, JTF; Jan 2016)

Action SC-3.23 Contact John Eyre re cooperation with WMO community on sensitivity experiments relevant to wind and surface flux estimates (NS; 7 Nov 2016)

Action SC-3.24 Provide guidance on deep observations for TPOS 2020 (see Roemmich presentation SC-2 and actions SC-2:12, 13) (TPOS 2020 SC through SW; Dec 2016)

Action SC-3.25 The TPOS 2020 SC and BGC TT agree to place priority on BGC activities for the next inter-sessional period, including activities identified in the Pilot Project 6.1.3 of the First Report (TPOS 2020 SC and BGC TT; ongoing 2017).

Action SC-3.26 TPOS 2020 SC Chairs to discuss with Ken, Carmen, DongChull how to take forward and support activities in the Eastern Pacific Task Team (including improving regional data availability; see *Action SC-3.14*) (April 2017)

Action SC-3.27 The TPOS 2020 SC agreed that modeling and data assimilation must a priority area for the Steering Committee and for the 2nd Report (M&DA TT, ongoing 2017).

Action SC-3.28 Stronger engagement from M&DA TT is needed with broader community activities. The TPOS 2020 SC to assist in the organization of a regular schedule of telecons with key groups. i.e. GOV Coupled assimilation group, GOV OSEval Group. (M&DA TT Co-Chairs, NS; ongoing 2017).

Action SC-3.29 Scope and organise a workshop on the take up and needs for observations (sustained and experimental) for model development and field programme (SC Co-Chairs, Bill Large, PBL TT, M&DA TT (Andrew W), by Jan 2016)

Action SC-3.30 The PBL TT to continue to lead discussions focused on refining the location of meridional

regime mooring lines (PBL TT, June 2017).

Action SC-3.31 PBL TT to engage with groups planning to put flux moorings in the tropical Pacific region to ensure they align with TPOS goals (PBL TT, ongoing 2017).

Action SC-3.32 Consider governance arrangements with research using the NPOCE/SPICE/TPOS 2020 cooperation in the LLWBC pilot as an example, with particular focus on data exchange which is essential (WP TT Co-Chairs, SC Co-Chairs; June 2017)

Action SC-3.33 WP TT to Develop an inventory of observations/data in the western Pacific. Consider a technical workshop to facilitate data delivery (WP TT, August 2017).

Action SC-3.34 Further develop a background note on the Transition and Implementation Group structure, form and key engagement points; also, develop an explanation around implementation mechanisms (NS, KH; Nov 2016)

Action SC-3.35 Update the organisation chart and output schedule figures to reflect development of a transition group alongside TRF (DPO, Co-Chairs, Dec 2016)

Action SC-3.36 Clarify input requirements for JCOMM MAN (form, deadline) (Katy Hill; Dec 2016)).

Action SC-3.37 Clarify input requirements for ICG WIGOS (Katy Hill, Dec 2016)

Action SC-3.38 Dongchull Jeon and Ken Ando to make enquiries at home institutes regarding potential to translate the Exec Summary into Korean and Japanese (DJ, KA, KH; Nov 2016).

Action SC-3.39 Communicate to convenors of the TRF through the interim Co-Chair on the SC perspective of objectives and desired outcomes (Co-Chairs, DPO; Nov 2016)

Action SC-3.40 Maintain communication with SC on the plans for the TRF (DPO; ongoing)

Action SC-3.41 Develop a schedule of activities leading up to the TRF meeting in May 2017, including the initial response to TPOS 2020 recommendations and actions (NS, DPO; Dec 2016)

Action SC-3.42 Ahead of TRF-2, DPO to work through JCOMMOPS and other mechanisms to pre-populate a view of existing activities, capability in the Tropical Pacific. (DPO, KH; Jan 2016)

Action SC-3.43 SC Co-Chairs to liaise offline with respect to SC membership and membership/terms of reference for TTs (Feb 2017, SC Co-Chairs)

Action SC-3.44 Develop small paper on SC terms of reference for the TRF, taking note of the interest in atmospheric observations (EP TT) and perhaps palaeo data (SC Co-Chairs, April 2017)

Action SC-3.45 Agree to convene the Fourth Session of the TPOS 2020 SC in Seattle, during the last week of October, 2017.

Action SC-3.46 Send note of thanks to DHN, IMARPE for hosting the SC_3 meeting (KH, DPO, NS; Nov 2016)