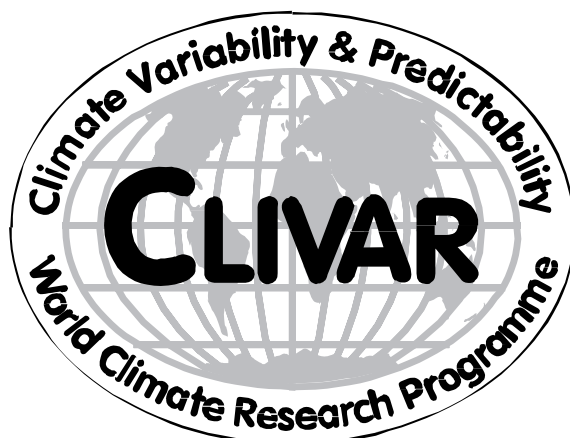


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ACTION ITEMS

Email panel asking suggestions of datasets to be linked from GSOP webpage (ICPO)

Draft letter about the state of the observing system and send to CLIVAR SSG for approval. SSG to send to JSC who would pass it onto GCOS and GOOS (co-chairs, E. Harrison)

Panel to comment on recommendations of Velocity workshop and identify s (all)

Review workshop's report by December 2008 and communicate with workshop co-convenors (U. Send)

Draft letter of endorsement for activities of ADCP DACs (co-chairs)

Make the IOC assembly aware of the need for quick release of CTD data, asking the assembly to request from countries (co-chairs, E. Harrison)

Panel to comment on recommendations of XBT fall rate workshop and endorse them (all)

Send letter to POGO asking institute vessels to start collecting intercomparison data for XBT (S. Wijffels, E. Harrison, co-chairs)

Develop plan for XBTs on long N-S tracks (S. Wijffels, E. Harrison)

Request basin panels to provide topics of interest to be evaluated by ocean synthesis products (ICPO, K. Haines)

Provide comments on SPICE documents (all)

Review OceanObs'09 draft goal statements (all)

Provide comments on objectives of decadal prediction experiment (all)

Contact ocean synthesis groups and ask for updated datasets to be used on the decadal prediction experiment (K. Haines, D. Stammer, D. Behringer, A. Weaver)

Provide requirements of decadal prediction experiment for ocean synthesis products (T. Stockdale)

Invite basin panel representatives to attend next ocean synthesis meeting in Japan, October 2008, so they could help the writing of intercomparison papers (K. Haines, ICPO)

Investigate the possibility of special issue for intercomparison of ocean synthesis products in the Journal of Operational Oceanography (E. Harrison)

Draft an article to EOS highlighting the need for quick release of CTD data, and circulate it to the panel for comments (J. Willis)

After EOS article on the need for quick release of CTD data, and in consultation with GCOS, write letter to funding agencies and UNFCCC asking them to enforce quick release from projects (E. Harrison)

Provide to GSOP moorings timeliness document after OceanSITES meeting (U. Send)

Bring to AST the possibility of holding a success meeting for agencies, and highlight value of the Argo array and need for sustained funding (S. Wijffels)

OOPC to report back about the status of TSG network and summary of existing science requirement (E. Harrison)

Revise document about reanalysis data requirements and circulate (D. Stammer)

Organise with CLIVAR DACs an effort to publish a DVD with ocean observations from 1990 (B. Sloyan and D. Legler to lead effort, ICPO to provide support)

Request basin panels to submit a list of observations being undertaken from 1990 and passed them onto GSOP (ICPO)

Send CLIVAR data requirements to JCOMM (co-chairs, E. Harrison)

Send CLIVAR data requirements to Bob Keely so they could be passed onto IODE (B. Sloyan, E. Harrison, D. Legler)

Create a single resource (on-line archive) of ocean heat and freshwater transport estimates. Update WOCE book entries (S. Wijffels, ICPO)

Include link to WHOI flux reference datasets (liaise with Bob Weller) and SeaFlux project (liaise with Carol Anne Clayson) (S. Josey, ICPO)

Comment on new equation of state and salinity definition and pass it onto the SCOR/IAPSO Working Group (B. Sloyan to lead)

Investigate the possibility of holding next meeting on 23-26 March 2009 in association with Argo Steering Team meeting. (S. Wijffels, co-chairs)

1. INTRODUCTION

The Global Synthesis and Observations Panel (GSOP) was setup in 2004 with the task to oversee CLIVAR'S ocean synthesis and data management activities.

The Panel's Terms of Reference are:

1. Develop, promote and seek to implement strategies for a synthesis of global ocean, atmosphere and coupled climate information through analysis and reanalysis efforts and through the use of other techniques where appropriate. Initial emphasis will be on global ocean synthesis efforts, building on previous experiences and developments.
2. Be responsible for the definition and fulfilment of CLIVAR's global needs for sustained observations (in collaboration with relevant WMO and IOC bodies, including GCOS, GTOS, GOOS, AOPC and OOPC, and JCOMM), and for the development of a strategy for their evolution/optimization based on new science and reanalysis insights, and fostering the use of resulting data sets in global synthesis efforts.
3. Promote activities to develop the surface flux data sets required by CLIVAR in liaison with the WGNE, global atmospheric reanalysis efforts and the WCRP Working Group on Surface Fluxes.
4. Provide an overview of and directions to CLIVAR data management and information activities in collaboration with other WCRP projects and in liaison with CLIVAR-relevant data centres and DACS and the ICPO.
5. Liaise and collaborate with CLIVAR Panels and Working Groups in identifying the requirements for and coordinating the development of an observing system for CLIVAR.

2. OPENING SESSION

2.1 Welcome and charge to the meeting

The Third Session of the Global Synthesis and Observations Panel was held at the National Oceanography Centre, Southampton (NOCS), UK on 13-14 March 2008. The meeting agenda can be seen in Appendix A. The panel co-chair, Detlef Stammer opened the meeting welcoming panel members and guests (Appendix B). Howard Cattle, the International CLIVAR Project Office (ICPO) Director also welcomed the meetings participants on behalf of NOCS Director, CLIVAR and WCRP. Apologies were received from Masao Fukasawa, Sylvie Pouliquen, Dean Roemmich and Anthony Weaver. The panel would like to thank the NOCS and the ICPO for hosting this meeting, and WCRP and US CLIVAR for their financial support.

Detlef Stammer reminded the group of this meeting's objectives: (i) advance plans for OceanObs'09 symposium; (ii) define GSOP participation in decadal prediction experiment, aiming at the IPCC AR5; (iii) agree on a strategy for development of climate datasets in support of ocean synthesis and develop implementation plans; and, (iv) refine synthesis evaluation activities and foster basin-wide and global science applications of ocean syntheses.

The group started with a review of last meeting's action items. Most of items have been being acted on. Some issues would be revisited during this meeting, in particular the ones related to CLIVAR datasets. The group identified one item which requires an effort from all the panel members to be completed, the need to include links on the GSOP webpage to global or regional high quality datasets. The ICPO have been tasked with taking the panel suggestions for such datasets and their links, and including them on GSOP webpage.

ACTION: Email panel asking suggestions of datasets to be linked from GSOP webpage (ICPO)

3. MEETING REPORTS

3.1 JSC-28

Howard Cattle gave an overview on WCRP's strategic plans and reported on the 28th meeting of the JSC in Zanzibar, March 2007. They reviewed the progress of the core projects, WCRP panels and working groups, and cross-cutting topics, as well as making decisions on the latter. It has agreed that the WCRP Core projects (CLIVAR, GEWEX, SPARC and CliC) should continue to their agreed "sunset dates". The JSC acknowledged the severe pressure on WCRP finances, and made decisions on budget allocations. Howard Cattle also summarized the discussions on the future of WCRP, which has appointed a new director, Dr. Ghassem Asrar. The WCRP Strategic Plan (2005-15) does not discuss a vision for future WCRP structure post the projects (CLIVAR, GEWEX CliC, SPARC). At the moment, the JSC iputs a strong emphasis on cross cutting topics as key part of present strategy but there are still discussions if this is the best way to proceed. An open question discussed at JSC28 is whether WCRP should merge with IGBP. Howard Cattle reported that JSC-29 is due to meet in Arcachon, France from 31 March to 4 April. The agenda includes considerable time for discussion of the future strategy of WCRP including the strategy for WCRP post 2015.

3.2 CLIVAR SSG

Howard Cattle also presented the outcomes of the 15th Session of the CLIVAR Scientific Steering Group which met in September 2007, in Geneva. The meeting was overshadowed by the discussion on WCRP's financial situation. CLIVAR's core allocation for 2007 was about a quarter of previous years. With this perspective, several options were considered by the group in relation to CLIVAR's future. The SSG recognized that WCRP support for meetings will be minimal. CLIVAR panels and working groups will be required to seek other support for meetings and to seek to reduce costs by arranging meetings in the margins of Workshops/Conferences. In addition, the SSG agreed to provide guidance on allotment of WCRP funds for meetings.

David Legler suggested that CLIVAR panels and working groups should prepare bids to US agencies. Funding for non-US researchers to attend meetings, would have to come from their countries national funding however.

With regard to GSOP, the SSG fully endorsed the efforts and plans for the OceanObs'09 Symposium and made some suggestions on format. It also suggested that CLIVAR panels and working groups should work with the organizers to ensure that the role of CLIVAR science and scientists are fully represented. The SSG also requested that the panel should engage with the activity for design of near term climate experiments (decadal timescale, out to ~2030), and also consider broadening GSOP membership to include an IMBER or Japanese reanalysis efforts' representative. Detlef Stammer commented that consideration of the former is an agenda item for this 3rd GSOP meeting. With regard to the latter, GSOP already has a representative from the carbon community and IMBER has close links with the newly formed hydrography group (see discussion on GO_SHIP), and the Japanese reanalysis efforts are well represented on the synthesis meetings.

3.3 OOPC

Ed Harrison, Chair of the Ocean Observations Panel for Climate (OOPC), reported on the panel's activities and its related issues. OOPC continues to develop the State of the Ocean Climate webpage, being responsive to requests from the community. On the Observing Programme Support Centre, it had a good response, with 12 letters of intent being submitted, and many countries agreeing to provide support.

During his presentation, Ed Harrison also reported on the evaluation of the Observing System. Sustaining and building on the present system will require ongoing efforts to evaluate it, for which input from the climate research community is very important. It would thus be helpful if GSOP could provide written feedback on the importance and state of the current ocean observing system and its continuation.

ACTION: Draft letter about the state of the observing system and send to CLIVAR SSG for approval. SSG to send to JSC who would pass it onto GCOS and GOOS (co-chairs, E. Harrison)

3.4 Synthesis Evaluation 2

Detlef Stammer reported on the Second CLIVAR/GODAE Meeting on Ocean Synthesis Evaluation which took place at the Massachusetts Institute of Technology (MIT), USA, on 24-25 September 2007. Some of the issues discussed at the meeting were data errors and use of different datasets, ocean reanalyses that span the 20th Century and a review of data requirements for assimilation. Error covariances were also discussed at the meeting and it was agreed that it is necessary to push this discussion further than just comparing results. A report of this meeting with recommendations will be available soon.

Attendees of GSOP-3 meeting had a lively discussion on the need for a good dataset, particularly in the deep ocean to provide a better understanding of synthesis results. Interested groups need to define what is the right resolution to sample the deep ocean, and then decide which instrument is the best. OSE experiments with eddy resolving models could be used as a tool in order to determine the right resolution for observing the deep ocean.

3.5 Velocity Workshop

Brian King, co-convenor of the “First CLIVAR GSOP Workshop on Ocean Velocity Measurements and their Application”, presented the outcomes of the meeting, which was held at the Scripps Institution of Oceanography (SIO) on 5-7 December 2007. A full meeting report is available at the following web address: http://eprints.soton.ac.uk/50803/01/129_GSOP_Workshop.pdf.

The scope of workshop was to establish the requirements for ocean velocity measurements as part of an observing system for climate. All the major data streams measuring ocean velocity were reviewed: drifters, floats, moored instruments, ship-based, remotely-derived and gliders, as well as the use of such data by assimilation into models. Several recommendations and issues were identified and these are described in detail in the meeting report.

GSOP members thanked Brian King and Rick Lumpkin for organising the meeting and producing a detailed report. The group recognised that velocity information is scientifically necessary to help to evaluate models, particularly in regions like ocean boundaries. One question was that whether workshop attendees discussed the role of velocity measurements made by cable. Brian King mentioned that unfortunately there were no experts on cable measurements present at the workshop.

Uwe Send enquired what would be the workshop’s follow-up. Brian King explained that workshop attendees felt that they did not have the mandate to propose action items but they should make recommendations and that GSOP should identify actions. After a brief discussion, GSOP members encouraged the organisation of a follow-up meeting, with the aim of writing a white paper to OceanObs’09. This follow-up meeting should be forward looking, perhaps with more scientific questions such as “What velocity measurements we need to answer some of the scientific questions?” or involve a different group of people.

ACTION: Panel to comment on recommendations of Velocity workshop and identify actions
(all)

ACTION: Review workshop's report by December 2008 and communicate with workshop co-convenors (U. Send)

One of the issues clearly identified in the workshop was the view that CLIVAR community ought to provide guidance to the ADCP Data Assembly Centres (DACs) in terms of its scientific needs. At minimum, CLIVAR should send a letter of endorsement of the activities of ADCP DACs acknowledging the DACs efforts.

ACTION: Draft letter of endorsement for activities of ADCP DACs (co-chairs)

3.6 GO_SHIP

Bernadette Sloyan reported on the implementation of the Global Ocean Shipbased Hydrographic Investigations Panel (GO_SHIP). The panel is sponsored by IOCCP, CLIVAR, and the SOLAS-IMBER Carbon Coordination Group to bring together interests from physical hydrography, carbon, biogeochemistry, Argo, OceanSITES, and other users and collectors of hydrographic data, to develop guidelines and advice for the development of a globally coordinated network of sustained ship-based hydrographic sections that will become an integral component of the ocean observing system.

The panel's membership is formed by Masao Fukasawa (JAMSTEC, Japan), Chris Sabine (NOAA, USA), Bernadette Sloyan (CSIRO, Australia), Toste Tanhua and Arne Koertzing (IfM-GeoMar, Germany), Gregory Johnson (NOAA, USA) and Nicolas Gruber (ETH, Switzerland). The first panel meeting was held in Victoria B.C., Canada on 1-2 November 2007. It is envisaged that the advisory group will develop a report within a two year period that will be circulated widely for consultation and consensus on the way forward. The final strategy will be presented at OceanObs 09.

One of the points identified by the group was that the Atlantic sections need to be redefined. There is also the issue of who is going to occupy them. Ed Harrison enquired what the panel's position is about the hydrography lines which are not part of the CLIVAR- long lines, e.g. the Canadian Line P, or the British Ellett line? Bernadette Sloyan pointed out that certain requirements have been identified if a cruise is to be included as part of the repeat lines but the panel will certainly look at this again. She also mentioned that the issue of quick data release by PIs was discussed by GO_SHIP members, who identified it as a problem in many countries. Susan Wijffels said that these ocean data are necessary for Argo calibration, and CCHDO is trying to collect as much data as possible.

ACTION: Make the IOC assembly aware of the need for quick release of CTD data, asking the assembly to request action from countries (co-chairs, E. Harrison)

Ed Harrison pointed out that it is important for GO_SHIP to have good contact with the biogeochemistry community. Bernadette Sloyan noted that Julie Hall (IMBER) was present at the meeting in Canada and that this link is being made. Susan Wijffels enquired if the group discussed the issue of high quality meteorological measurements packages aboard of ships. Bernadette Sloyan said that GO_SHIP members have not discussed this issue but she would take it to the other members. Ed Harrison mentioned that POGO could be a right place to advocate updating packages on ships.

Bernadette Sloyan also informed GSOP members of another GO_SHIP's activity which is the review of the WOCE Hydrography Manual. Reviewers for each of the chapters have been agreed by GO_SHIP members. The timeframe suggested is to have the first drafts of the chapters ready to post

on a on-line review system by September 2008, with a review period from September to December, and final revision and publication by March 2009.

3.7 XBT Fall Rate Workshop

Susan Wijffels reported on the XBT Fall Rate Workshop which was organised by Gustavo Goni and held in Miami, March 2008. XBTs remain important and useful elements of the GOOS, and profiles comprise 60-70% of past ocean in situ temperature data, crucial for determining past ocean structure, variability and change. At present, XBTs make up only 20% of ocean profiles collected since the maturation of the Argo array, and complement it by resolving ocean geostrophic transport, associated heat transports of major current systems and eddies along repeat transects. Many lines have been occupied for 10-20 years, and as such are precious, even more when currently no mature technology exists to replace XBT sampling along these lines. XBTs also sample in marginal seas which Argo currently does not cover. It is also important to note that the scientific community is not the major user of XBTs but the navies are.

Time-variable bias arises from small changes at the XBT factory affecting the speed at which an XBT falls through the water. However, several studies have been done in this topic but currently there is no consensus on the true bias and its associated error bars. Workshop participants identified a serious problem with metadata labeling. Field intercomparisons clearly show that the fall-rate is now closer to the original manufacturer's fall-rate from 1965 but the source of these changes is not clear. It has been suggested that this could be due to manufacturing changes, ship speed, higher drop heights, or acquisition system changes. Until there is a definitive understanding of the problem, the workshop participants recommended that the fall-rate for reporting data should not change i.e. remain the Hanawa et al. (1995) standard where possible and the metadata should label fall-rates correctly.

The workshop recommendations regarding quantification of past biases are:

- comparisons of the indirect statistical approaches should be made - US NODC has volunteered to host the corrections for users to compare and apply.
- the scientific community should work to assemble all known side-by-side XBT and CTD data sets, and that these be re-analysed in a consistent way to determine, if possible, the time-history of the fall-rates and be used to test the results of the indirect methods.
- past test data from the manufacturers (Sippican/LMCO and TSK) should also be sought and examined, and possibly compared with other data, e.g., BATS.
- the need to reduce metadata problems regarding which fall rate was used. Where possible originating institutions should check their XBT data held at US NODC and its associated metadata to ensure the data and metadata match.

Until the source of the time-variable bias is understood and removed, the workshop participants recommended that future biases be tracked through ongoing and regular XBT/CTD intercomparisons:

- the community should co-ordinate and collaborate with the manufacturers for regular and ongoing comparison data to be collected and analysed in a timely and consistent way. Any fall-rate detectable changes should be discussed by an XBT WG. Several ongoing activities present opportunities for this – the CLIVAR/Carbon repeat hydrographic sections, ocean-time series sites (BATS, HOTS, PAPA), Argo, altimetry.
- a system needs to be created to associate biases with XBT data arriving at the NODCs – this will require much better tracking of metadata
- further field comparisons are required to tease out possible sources of biases (besides manufacture changes) such as drop height, wind speed, ship speed, acquisition system
- the form of the fall-rate equation should be revisited and ideally informed by laboratory or dedicated field experiments to understand near-surface acceleration, startup transients and

other non-uniformity of the fall-rate.

GSOP members decided to look more closely at the recommendations, making the appropriate comments and endorse them. It has been decided that this would be done by email. However, two actions that could be agreed immediately were those regarding intercomparisons, where POGO could play an important role. Another point would be to develop plans for deployment of XBTs on long N-S tracks.

ACTION: Panel to comment on recommendations of XBT fall rate workshop and endorse them (all)

ACTION: Send letter to POGO asking institute vessels to start collecting intercomparison data for XBT (S. Wijffels, E. Harrison, co-chairs)

ACTION: Develop plan for XBTs on long N-S tracks (S. Wijffels, E. Harrison)

4. BASIN PANEL REPORTS

4.1 Atlantic Panel

Detlef Stammer gave an overview of the Atlantic Panel's activities. The panel has a strategy to promote a balanced approach to describe, understand and assess predictability of climate phenomena using observations (joint with OOPC and GSOP), modelling and theory (joint with WGCM and WGOMD), synthesis (joint with GSOP and partly WGSIP), and predictability and predictions. The Atlantic sector has several components of the observing system and the panel has funding from the German CLIVAR to update its observing system pages. One topic for concern is that Argo floats in the Atlantic are mostly 4-year old, so a strategy to replace them is necessary.

Bernadette Sloyan commented that sustained observations are much more North Atlantic oriented and enquired if the panel has a strategy for the South Atlantic. Detlef Stammer mentioned that several proposals are currently being made for that region. In addition to TACE (Tropical Atlantic Climate Experiment) which would extend the PIRATA array, a new programme is being proposed: WAVES (southWestern Atlantic climate Variability Experiment). There is also a discussion for a mooring array similar to RAPID to be put in place and that would monitor the MOC in the South Atlantic. Mike McPhaden enquired about the rationale for such array and where at what latitude it is going to be placed. Detlef Stammer replied that discussions are still on early stages but that 35°S has been suggested.

The Atlantic Panel had raised the issue of management of datasets, particularly datasets originating from process studies. Since these data are not part of the sustained observing system, there is no component of the DACs system that would archive them. David Legler reminded GSOP members that, although the CLIVAR DACs do not have enough manpower to go after all these data, they would archive any datasets submitted by PIs, including those originating from process studies.

4.2 Pacific Panel

Mike McPhaden gave a talk on behalf of the Pacific Panel. The panel has met in GuangZhou, China, in November 2007. Some of the scientific issues being addressed by the Pacific Panel are: scale interactions in the ENSO system, western Pacific recharge-discharge processes, ENSO response to greenhouse warming, origin and cure for model biases in eastern and western Pacific, predictability on decadal timescales, origin of multidecadal variability and Atlantic-Pacific connections and the Pacific boundary currents and their influence on climate.

Some points identified are that there are some potential decadal predictability on sea level and in the tropics. Another issue, shown by the GSOP ocean synthesis intercomparison study, is the rapid shift in heat content (HC) in the late 80's early 90's in the North Pacific. This shift has been consistently reproduced by all the ocean reanalyses (observation-only and ocean-model only). It is the largest change in SST and HC on record, with reports of effects on fisheries and water mass properties. However, does it have a tropical origin, and how predictable is it?

Ed Harrison pointed out that this is a good example of interaction between CLIVAR basin panels and GSOP's ocean synthesis intercomparison project. In order to further improve this, the Pacific Panel should provide indices to GSOP's intercomparison project and focus the discussion in those areas. The intercomparison project would then provide results and ask feedback to the Pacific Panel experts on the differences between them. A similar strategy could be followed for all CLIVAR basin panels.

ACTION: Request basin panels to provide topics of interest to be evaluated by ocean synthesis products (ICPO, K. Haines)

Other Pacific Panel activities include, among others, an ENSO summer school on the Big Island, June 14th – 23rd, 2008 (<http://www.clivar.org/organization/pacific/meetings/ENSOsummerschool.php>), a review paper "ENSO stochasticity revisited", preparation of an ENSO Metrics white paper, review of the possibility to equip Argo floats with pH sensors, and an online system for ENSO expert prediction. The panel has also discussed the issue of biophysical feedbacks. Several recent modelling studies have demonstrated that the optical properties of phytoplankton have an important influence on the tropical Pacific mean state and its variability. So the question now is if this is an important factor to consider for ocean analyses, and forecasting.

Another topic presented by Mike McPhaden was the SPICE project (Southwest Pacific Ocean Circulation and Climate Experiment). SPICE Principal Investigators have requested CLIVAR SSG endorsement, and are seeking comments from CLIVAR panels on the SPICE Science Plan (http://eprints.soton.ac.uk/46331/01/111_SPICEscienceplan.pdf), particularly recommendations on sustainability, use of hindcast and flux products. GSOP members briefly discussed the plan and found that SPICE does not seem to look at large scale issues. It was agreed that GSOP members would further comment on the document by email.

ACTION: Provide comments on SPICE documents (all)

4.3 Indian Ocean Panel

Mike McPhaden also reported on activities of the CLIVAR/GOOS Indian Ocean Panel. The Indian Ocean climate science drivers identified by the panel are the seasonal monsoon variability, the Indian Ocean Dipole, intraseasonal oscillations and far field impacts (ENSO, hurricane formation, west coast US rainfall), decadal variability, warming trends since the 1970s, ocean circulation (e.g., Indonesian Throughflow, shallow and deep overturning circulation), and marine ecosystems and biogeochemistry.

Regarding the Indian Ocean Observing System, PMEL is leading an effort to develop a comprehensive moored buoy array in the Indian Ocean for climate research and forecasting. The array named RAMA (Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction) is over a third complete at present, with several nations contributing to its implementation. Argo floats have an uneven distribution and will require additional deployments. Regarding XBT lines, IX8 has been reactivated with monthly observations, and IX1 was enhanced to weekly.

Much of the panel's effort until now has been in designing the observing system. However the panel has now moved its focus on products, and several process studies are underway or have been proposed. Recent completed process studies include MISMO (focused on the onset of the convection), VASCO-CIRENE (focused on winter MJO and its oceanic signature), and INSTANT (monitoring of Indonesian Throughflow). The only ongoing process study is HARIMAU (radar monitoring of the atmospheric structure over Indonesia, in collaboration with Japan). There are three process studies planned for the near future: Bay of Bengal, Equatorial Transport Array and MISMO - Vasco-Cirene follow-on (which will focus on the intraseasonal variability with an intensive observation period in 2012).

A coordinated study and intercomparison of the predictions of the 2006 and 2007 Indian Ocean Dipole events has started between IOP and AAMP. However, there is no dedicated funding for this activity. A high level review of IOP activities was also done in December 2007, with the following recommendations made, which the panel is looking at:

- increased emphasis and attention should be given to the remote sensing aspects of the IndOOS
- there is an appropriate level of redundancy in the observing system; needs to begin to understand this redundancy with particular attention on quality control
- strengthen links to ocean state estimation science
- the importance of quality control, integration and assembling of data sets
- establish a mechanism to coordinate resources for IndOOS, especially RAMA and ship-time
- IOGOOS to immediately consider SIBER as an initiative in its work program, and undertake to bring nations of the Indian Ocean into the program, as part of an extended IndOOS.

4.4 Southern Ocean Panel

Nico Caltabiano gave a talk on the CLIVAR/CLIC/SCAR Southern Ocean Panel's activities on behalf of the panel. The SO panel has not met since GSOP-2 and since then a new co-chair, Matthew England (University of New South Wales, Australia), is in place. One of the main issues for the SO panel has been the funding of DIMES, a process study which will obtain multiple, concurrent measures of mixing and upwelling and their driving processes in the South Eastern Pacific and South Western Atlantic sectors of the Antarctic Circumpolar Current. Another point highlighted during the presentation was the increasing numbers of ocean profiles measured by Southern Elephant seals as oceanographic samplers. An issue is that these datasets do not have an international repository for them.

Southern Ocean Panel members have had an active participation during IPY, within projects such as CASO and SASSI, and during the SOOS Planning meeting. SOOS participants intend to publish the final document on SOOS implementation by the end of October 2008. More details can be found on the following website: <http://www.clivar.org/organization/southern/expertgroup/SOOS.htm>.

A major Southern Ocean Panel science goal is to quantify freshwater fluxes. To achieve that it is necessary to make diverse datasets, already in various pipelines, available to re-analysis efforts. An IPY-period synthesis is also strongly recommended by the SO panel in order to make use of the large number of data which will be gathered during this intensive observation period. Another issue that the panel is pursuing is the identification of several indices of scientific importance for the region. Such indices can also be used by the ocean synthesis efforts as a way to assess their results.

5. NEW ACTIVITIES

5.1 *OceanObs'09*

Detlef Stammer, co-chair of the OceanObs'09 organising committee, reported on the developments regarding the organisation of this event. The conference has been scheduled for 21-25 September 2009, in Venice, Italy. The present objectives of the conference are:

- Document the importance and benefits of the existing ocean observing system.
- Demonstrate its scientific, societal and economic impacts.
- Revisit the current status, and update plans for the physical and carbon ocean observing systems.
- Advance capabilities for marine biogeochemistry and ecosystems.

A draft agenda has been proposed with each of the days adopting the following themes:

Day 1: Celebrate a decade of progress

Day 2: Scientific results based on global observations

Day 3: Societal benefit areas progress and opportunities

Day 4: Frontiers of global ocean observations

Day 5: The way forward

GSOP agreed that perhaps the biggest challenge is making the biogeochemical community understand that they are part of the observing system, therefore there is a need to share all the data gathered.

A lengthy discussion about the organisation of the event followed, particularly regarding the objectives of the conference and how to best present them. Goals need to be presented correctly, and need more encouraging/exciting words. All participants agreed to review goals and continue the discussion by email.

ACTION: Review OceanObs'09 draft goal statements (all)

Susan Wijffels asked if issues regarding the coastal observing system would be included. Ed Harrison pointed that in principle this will be covered but still needs to be decided how much of the agenda would be dedicated to coastal issues. The organising committee needs to look at this issue and perhaps include representatives from the coastal community in the steering committee.

Suggestions were also made regarding the advertisement of the event to the scientific community in general and to industry (e.g., oil, insurance). Use of technological resources like webcasting of some keynote talks was also suggested. There are also plans to produce a book containing white papers on the global observing system.

5.2 *RAPID, THOR, AMOC Changes*

Three presentations were made on programmes related to the Atlantic Meridional Overturning Circulation. David Legler gave an overview on the "Atlantic Meridional Overturning Circulation (AMOC): Implications for Rapid Climate Change". Detlef Stammer talked about "THOR: Thermohaline Overturning – at Risk?". And Torsten Kanzow presented some results of the RAPID array. It is important to note that the CLIVAR Atlantic Panel is looking at the 3 programmes and identifying gaps between them.

AMOC is a 5-year program, with a potential of US\$ 5M-15M per year. Its Implementation Strategy was released in October 2007, and CLIVAR is engaging to help coordinate international activities. David Legler reminded the group that AMOC has still space for proposals, including implementation of a

monitoring system. AMOC is supported by NSF, NASA and NOAA. The AMOC Science Team has requested an increase in support for ocean data assimilation from GSOP particularly aimed at AMOC issues, and increased focus on decadal variability/predictability studies, especially initialized climate predictions.

THOR is a European initiative to assess and forecast MOC variability in the Atlantic, with a budget of approximately US\$ 12.8 M, and duration from April 2008 to March 2012. Its goals are: (i) Identify induced climate impacts of changes of the THC and the probability of extreme climate events; (ii) Develop and operate an optimal ocean observing system for the North Atlantic component of the THC; (iii) Forecast the Atlantic THC and its variability out to 2025; and, (iv) Assess the stability of the THC to increased freshwater run-off from the Greenland ice sheets for various global warming scenarios. THOR will have a large component of coupled modelling, different to the other two programmes.

RAPID already has a time series of two and a half continuous years of monitoring the MOC, which has proved that the array works for such activity. Results of the monitoring show that the MOC strength is 18.8 ± 5.0 Sv. These results also indicate that Ekman transport dominates intra-seasonal variability and that the Upper Mid-Ocean and the Gulf Stream dominate seasonal variability.

5.3 Decadal Prediction Experiment

Tim Stockdale presented the proposals for the Coordinated Experimentation to study multi-decadal prediction and near-term climate change. The proposal describes a framework for coordinating intended experimentation covering two different but related objectives:

1. Short-term prediction of climate for the next 30 years (to 2030 or 2035)
2. Developing the science of multi-decadal prediction in the context of a changing climate

A document outlining the characteristics of the runs for each of the objectives was presented. Tim Stockdale requested that GSOP members provide comments on the objectives.

ACTION: Provide comments on objectives of decadal prediction experiment (all)

A timeframe has not been set but this coordinated effort is aiming at IPCC AR5 so possibly it would begin in 2009. The Hadley Centre is currently working on sea-ice dataset which should be available in 2010. This way, it will not be used in the runs but for verifications of the model outputs. Ed Harrison asked if CliC has been approached regarding extreme ranges of sea-ice for initialization. Tim Stockdale replied that CliC has not been approached. Some estimates are available but it is not clear yet how they will be used.

A discussion followed on the issue of data quality and data availability. Most of the groups are assimilating data from the GTS and so not use archived datasets. Detlef Stammer pointed out that there are long time series available from the ocean synthesis efforts. GSOP needs to identify which observation datasets are available to be used for this study, e.g., SST, sea level.

ACTION: Contact ocean synthesis groups and ask for updated datasets to be used for the decadal prediction experiments (K. Haines, D. Stammer, D. Behringer, A. Weaver)

There is also a possibility to transplant ocean synthesis data to the decadal prediction experiment runs. However, it is necessary that the requirements for ocean synthesis products are defined so they could take part in the study.

ACTION: Provide requirements of decadal prediction experiments for ocean synthesis products (T. Stockdale)

6. Assimilation issues

6.1 Data error covariances in synthesis efforts

Keith Haines talked about data error covariances in ocean synthesis efforts. This is a critical issue for interpretation of raw data, which can be used as global or basin indices, e.g., ocean heat content, but need to be quality controlled. It is also critical for data assimilation as there are many “dubious” assumptions for background/model errors. This should be a very natural topic for GSOP through comparison of synthesis and observations datasets. The quality of a data assimilation method is largely determined by the quality of the background and observation error covariance models. Practical estimation/specification of background and observation error statistics is often based on dubious assumptions (e.g., stationarity, uncorrelated errors). So proper specification of the error statistics remains a major challenge in data assimilation.

A discussion followed on how the assimilation and observation communities could work together in ocean synthesis efforts. Keith Haines said that study of covariance errors should be something the two communities could do jointly. Besides, the ocean synthesis products have to be evaluated. Some GSOP members proposed that the group agree on a shortlist of science questions and ask group leaders from the first synthesis meeting to lead comparisons and help with writing of scientific papers on the intercomparison of products. This would however need involvement of representatives from CLIVAR ocean panels and a suggestion was made to extend an invitation to them so they can attend the next ocean synthesis meeting in Japan, October 2008. The scientific papers could be published in a special issue of a journal. Ed Harrison suggested the Journal of Operational Oceanography.

ACTION: Invite basin panel representatives to attend next ocean synthesis meeting in Japan, October 2008, so they could help the writing of intercomparison papers (K. Haines, ICPO)

ACTION: Investigate the possibility of special issue for intercomparison of ocean synthesis products in the Journal of Operational Oceanography (E. Harrison)

6.2 Ocean synthesis, IPY and GSOP-Carbon synthesis pilot project

Toste Tanhua gave an overview of ocean synthesis activities made by the carbon community and how new activities could be made jointly by the carbon and physical community. The carbon community has set up working groups to do synthesis of data in the Pacific and the Atlantic. Some of the data are still being collected and made available through repositories.

Another large activity has been the improvement of carbon budget estimates with the use of oxygen data. A white paper on the addition of oxygen to the global Argo array showed that the collection of these data will be very relevant for biogeochemical studies. So far there are 126 Argo floats with oxygen sensors deployed but the plans are to increase this number.

7. Data Sets and Data Issues

7.1 Argo errors and estimating heat content

Josh Willis gave a presentation on Argo errors and estimating heat content. Some studies have shown a cooling trend of the upper ocean. However, recent investigations have found that the recent cooling

of the upper ocean is an artifact resulting from two different instrument biases discovered in the in situ data, rather than actual climate variability. Some WHOI Argo floats have a cool bias relative to climatology, which mostly affected measurements over the entire Atlantic Ocean where they have been deployed. Although the problem has not necessarily been fixed, most floats have been flagged appropriately. Removing the bad float data reduces the implied cooling but does not completely eliminate it.

Quick availability of a high quality controlled hydrography data is essential in order that early evaluation of the Argo data can be done. GSOP members suggested that a top-to-bottom approach is necessary, with national funding agencies enforcing quick release from PIs. It would also be good to publish an article on EOS highlighting the issue.

ACTION: Draft an article to EOS highlighting the need for quick release of CTD data, and circulate it to the panel for comments (J. Willis)

ACTION: After publication of the EOS article on the need for quick release of CTD data, and in consultation with GCOS, write a letter to funding agencies and the UNFCCC asking them to enforce quick release from projects (E. Harrison)

7.2 Met Office Hadley Centre subsurface data set and HadISST

Matthew Palmer gave an overview of the HadISST and the UK Met Office Hadley Centre subsurface data set. HadSST2 is a gridded SST data set, based on ICOADS version 2.0, without interpolation or sea ice. Nominally the dataset is on 5° grid but it can be gridded to meet user requirements. Data can be found at <http://www.metoffice.gov.uk/hadobs/hadsst2>. HadSST2 aims are to be a flexible analysis system compatible with OSTIA. It plans to incorporate new sources of historical data with homogeneous, bias-free fields. More importantly it aims at provide

- Realistic variability everywhere
- Fully characterised uncertainty estimates
- Release in Spring 2010

HadISST is the UK MetOffice's globally complete SST and sea ice analysis. The HadISST comprises monthly fields of SST and sea ice concentration from 1870 onwards and is used primarily for model validation, atmospheric climate model and reanalysis forcing and for climate monitoring. Details and data can be seen at <http://www.metoffice.gov.uk/hadobs>. HadISST2 is being developed with a planned release in Spring 2010. It incorporates a flexible analysis system, compatible with OSTIA and incorporating new sources of historical data. The UK MetOffice aims at gather requirements from users and is, therefore, requesting volunteers to use the data. They plan to inter-compare and understand data sources used, develop homogenisation/bias correction techniques and test the analysis system, which will be updated in near real time.

The EN3 data set contains quality controlled global, sub-surface ocean profiles of temperature and salinity for 1950-2006 inclusive. Part of the future work on it will be aimed at applying the XBT fall-rate corrections proposed by Wijffels et al. for the whole data set, further development of quality control procedures to feed into NCOF operational and Met Office Hadley Centre seasonal and decadal forecasts and work with the research community to improve EN3 and work towards a bias corrected climate quality data stream.

7.3 OceanSITES Timeseries Stations

Uwe Send, co-chair of the OceanSITES Science Team, gave an overview of the status of the programme. The fixed timeseries can provide unique contributions and strengths, particularly related to high sampling rate to resolve rapid processes and events. Long sustained timeseries in fixed places

allow observations of small changes and trends without danger of aliasing. They provide the most accurate data since recovery and sensor post-calibration is possible. The programme also enables simultaneous measurements of many variables, providing the best chance to unravel linkages and forcings between parameters, with a unique capability for vertical coverage, i.e. atmospheric and oceanic surface boundary layer, full water column coverage, and benthic observations.

Although there are several interesting science projects being done using some of the timeseries datasets, it is still difficult to develop users and demonstrate value of the network mainly because the current sites are very inhomogeneous and there are no comparable quality control procedures. OceanSITES GDACs are not operation yet but the plan is for data from twelve timeseries site operators to flow via DACs to two global GDACs and be available from there in a unified format, with comparable quality control applied. DACs will exist in India, Australia, Japan, the US and Europe and will also receive, format, process, and forward data from other sites. OceanSITES also plans to make available global ocean timeseries indicators (e.g., pH, assembled heat and freshwater content, eddy energy, and geostrophic transports). The Project office at JCOMMOPS is now supporting all activities and there is a plan underway to establish a core subset set of comparable sites.

GSOP members enquired if sites with cables that measure transport are seen as part of the programme's network. Uwe Send said that this should definitely be discussed by the OceanSITES Science Team, and perhaps be included in the OceanSITES network. Another issue raised was that, during the first GSOP meeting and as part of the CLIVAR's data policy, all the major data streams were requested to develop a data release specification, including definition of timeliness, management and dissemination of data. OceanSITES' data policy should incorporate CLIVAR's data policy and provide data release specification to CLIVAR.

ACTION: Provide moorings timeliness document to GSOP after OceanSITES meeting (U. Send)

7.4 The ARGO Success

Susan Wijffels reported on the Argo Program on behalf of Dean Roemmich. In November, 2007, Argo achieved its target of 3,000 active floats, with global distribution. This was only possible because of a broad international partnership. The number of winter Argo profiles south of 30°S in one year exceeds the World Ocean Database total whilst delivering public real-time and research quality datasets. However, there are still some remaining issues. The global coverage still has some gaps, particularly in the Southern Hemisphere and an coordinated effort should be the way to fill these. Ship time can be a big issue. Argo reports oxygen data without quality control procedures. The program needs to be careful in order to avoid this becoming a distraction from completing and getting the Argo core data set up to date. Another issue is the near surface sampling with 5db being the shallowest. The UK will pilot a GRHSST-Argo float with some extra sensors and sampling at very shallow depths.

Sustained funding is a big challenge, including the funding for Argo's international infrastructure. Many countries are still on a 'research funding base' for Argo deployments with no institutional model for a transition. The program is highly dependent on US contributions but there is a EU initiative to fund 30% of the global array. Still, the Argo program needs to deploy between 800 and 900 per year to maintain the array. Other challenges include achieving even distribution of floats including marginal seas and seasonal ice zones, extending the lifetime of floats, integration of Argo and other global observations, demonstration of new applications, and increasing public awareness. GSOP members suggested that AST could organise a meeting to demonstratye the program's success in order to highlight the value of the Argo array.

ACTION: Take to the AST the possibility of holding a success meeting for agencies, highlighting the value of the Argo array and need for sustained funding (S. Wijffels)

Other issues highlighted were the need to have CTD data quickly available as mentioned in section 3.6. High quality sea surface salinity measurements made from ships are crucial but the status of the TSG network is not clear. GSOP members requested that OOPC report back on the status of TSG network and provide a summary of existing science requirements.

ACTION: OOPC to report back on the status of TSG network and summary of existing science requirement (E. Harrison)

7.5 CLIVAR DAC's

A discussion led by David Legler took place on the CLIVAR Data Assembly Centres and the CLIVAR data management strategy. This issue has been a recurrent and very challenging issue. David Legler pointed out some of the challenges faced by CLIVAR on data management. A document describing CLIVAR's requirements for data management turned out to be extremely difficult to develop.

Extremely few of the ongoing ocean observations are labeled as "CLIVAR", therefore the bounds of what data CLIVAR should manage is unclear. There are no agreements for most of the ocean data collected by PIs to become a part of any CLIVAR data activity, therefore data flow has become an acute issue for some data streams (e.g. hydrography data). Besides, the DACs were not set up to collect and analyze historical data. Those DACs whose data stream has no or little connection to the sustained observing system remain unorganized and may be difficult to continue to support with research funds. Even some of the DACs established in data centers need help justifying their continuation. However, most of the DACs found funding to continue to operate, and have continued with little or no guidance.

There has been no credible assessment of DAC activities (e.g. the QC efforts), so it is difficult to determine their value, and how or if they should change their practices. Nevertheless, some groups (e.g. Argo, DMAC) are leading the evolution of ocean data management best practices (e.g. metadata standardization, interoperability), so their experience could be shared with the CLIVAR DACs. Also, ocean reanalyses have catalyzed groups to assemble and clean up historical ocean data sets (e.g. ENACT). The reanalysis groups have not provided much guidance on what their requirements are regarding data. A draft document on the reanalysis data requirements was initiated after the first CLIVAR Workshop on Ocean Reanalysis but it would need to be revised.

ACTION: Revise document on reanalysis data requirements and circulate (D. Stammer)

A proposal was then made to produce an update to the 2002 WOCE Global Data Set V3. This project, in addition to the requirements from the reanalysis group could be used to engage the DACs in order to help with the production of a DVD set containing the datasets. These would have the best collection possible of data, with the adoption of best practices for standardization (metadata, file format, etc) across DACs. It is suggested that two updates are made, the first one in 2010 and the second one in 2012. GSOP members discussed the proposal, which assumes that data would have to be in the DAC system to be used in the compilation. However, as pointed out by David Legler, DACs were not tasked to go after data and extract them from the National Data Centres. This project could be a catalyst for PIs to submit data directly to the DACs and for NDCs to transfer data from their systems to the DACs. However, because the flow of data has been slow or inexistent from some NDCs to the DAC system, CLIVAR's data requirements should be taken to IODE and JCOMM so that they can help in passing the requirements onto NDCs. It was suggested that GSOP should request basin panels to submit knowledge of observations being undertaken from 1990 in order to help with the identification of datasets not in the DACs system. GSOP members supported the suggestion to organise with the CLIVAR DACs an effort to publish a DVD with ocean observations from 1990.

ACTION: Organise with CLIVAR DACs an effort to publish a DVD with ocean observations from 1990 (B. Sloyan and D. Legler to lead effort, ICPO to provide support)

ACTION: Request basin panels to submit a list of observations being undertaken from 1990 and to pass them onto GSOP (ICPO)

ACTION: Send CLIVAR data requirements to JCOMM (co-chairs, E. Harrison)

ACTION: Send CLIVAR data requirements to Bob Keely so they could be passed onto IODE (B. Sloyan, E. Harrison, D. Legler)

7.6 News on surface fluxes (including AOFlux) and flux uncertainties

Simon Josey presented some news on surface fluxes products that are used by the scientific community. ICOADS (International Comprehensive Ocean-Atmosphere Data Set) is planning the development of bias corrected marine dataset that will include correction factors, with errors, and will be a major resource for climate change assessment, reanalysis efforts, air-sea fluxes, satellite validation and climate monitoring. It will be presented at CLIMAR-3 in May 2008 and will be seeking endorsement from relevant international bodies/panels including GSOP. Regarding flux datasets, OAFlex v3 has now been released. It has partly taken up the recommendations of the Josey and Smith (2006) GSOP White Paper on flux dataset evaluation. The NOC2 dataset is a new version with error estimates, and it is under development. It contains global monthly fields from early 1970s - 2006 and will be available in Summer 2008.

Regarding intercomparison of reanalysis products, Simon Josey strongly recommended that all future ocean reanalysis fluxes should be evaluated against research quality data (flux buoys, research vessels), in addition to large scale constraints (e.g. heat transport), to determine whether they have improved. A link to these flux reference datasets should be placed on GSOP webpage. Heat and freshwater transport estimates should also be included as an online archive from GSOP webpage, as recommended during GSOP-2. GSOP also should not recommend a reference flux climatology as the existing climatologies (OAFlex, NOC, NCEP) are not independent of the ocean reanalysis fluxes.

ACTION: Create a single resource (on-line archive) of ocean heat and freshwater transport estimates. Update WOCE book entries (S. Wijffels, ICPO)

ACTION: Include link to WHOI flux reference datasets (liaise with Bob Weller) and SeaFlux project (liaise with Carol Anne Clayson) (S. Josey, ICPO)

7.7 SCOR/IAPSO Working Group on Thermodynamics and the Equation of State of Seawater

On request of the SCOR/IAPSO Working Group on Thermodynamics and the Equation of State of Seawater, GSOP discussed on the proposed options for the implementation of the suggested changes to salinity reporting to national and international data base as described in the document circulated to the oceanographic community in February 2008. After a short explanation by Bernadette Sloyan and Brian King, GSOP members decide that the panel should support option 2 which is to:

- Continue to report Practical Salinity S from cruise and other data sources (i.e. autonomous floats, XCTD, moorings)
- Provide software (for example, of the form $SA(S,x,y,p)$) to produce the best available estimate of Absolute Salinity from Practical Salinity (using additional information on position or water properties)
- Have all the thermodynamic software in the form $p(SA,t,p)$

GSOP arrived at this decision after careful consideration of both options and using its expert knowledge of how databases are maintained and lessons learnt from the incomplete changes applied to the XBT archive which is now causing many difficulties in assessing the data quality of this instrument for climate studies. GSOP strongly oppose any changes to the reporting of salinity from practical salinity to reference salinity to the national and international data bases. GSOP will provide this comments in writing to the SCOR/IAPSO Working Group.

ACTION: Comment on new equation of state and salinity definition and pass it onto the SCOR/IAPSO Working Group (B. Sloyan to lead)

8. PANEL BUSINESS

The panel discussed dates of next meeting and it has been suggested 23-26 March 2009 as tentative dates. The main goal of the next GSOP meeting would be a review of OceanObs'09 white papers. Brian King suggested that next meeting could be hosted together with the Argo Steering Team meeting. The panel agreed with the suggestion and Susan Wijffels has been tasked to take this to the AST meeting in Exeter, UK on 17-19 March 2008.

ACTION: Investigate the possibility of holding next meeting on 23-26 March 2009 in association with Argo Steering Team meeting. (S. Wijffels, co-chairs)

AGENDA

Thursday, 13 March 2008

08:30 Welcome and Charge to the meeting (D. Stammer)

08:45 Review GSOP-2 Actions (D. Stammer)

Meeting reports

09:00 CLIVAR SSG and Future (directions) of WCRP (H. Cattle)

09:20 OOPC (E. Harrison)

09:40 Synthesis Evaluation 2 (D. Stammer)

10:00 Velocity workshop (B. King)

10:20 Coffee break

10:40 GO-SHIP and Hydrography Manual (B. Sloyan, M. Fukasawa)

Basin panel reports

11:00 Atlantic Panel report (S. Cuninghan)

11:20 Pacific Panel report + SPICE (M. McPhaden)

11:40 Indian Ocean Panel report (M. McPhaden)

12:00 Southern Ocean Panel report (N. Caltabiano)

12:30 Lunch

New activities

14:30 OceanObs'09 (E. Harrison, D. Stammer)

14:50 Discussion of OceanObs'09

15:10 RAPID, THOR, AMOC Changes (S. Cunningham, D. Stammer, D. Legler)

15:30 Coffee break

15:50 Decadal Prediction Experiment (T. Stockdale)

16:10 Discussion: GSOP participation in decadal prediction experiment and the AR 5.

Assimilation Issues:

16:30 Data error covariances in synthesis efforts (K. Haines)

17:30 Discussion: Refine synthesis evaluation activities and foster basin-wide and global science studies of ocean syntheses.

18:30 End of day

Friday, 14 March 2008Data Sets and Data Issues:

8:30 Ocean synthesis, IPY and GSOP-Carbon synthesis and pilot project (D. Stammer, T. Tanhua)

08:45 XBT Fall Rate Workshop (S. Wijffels)

09:15 ARGO Errors and Estimating heat content and ARGO errors (J. Willis)

09:40 Met Office Hadley Centre subsurface data set and HadISST (M. Palmer)

10:00 OceanSites Timeseries Stations (U. Send)

10:20 The ARGO Success (D. Roemmich)

10:45 Coffee break

11:15 CLIVAR Datasets and data errors (including underway measurements) (D. Stammer)

11:45 CLIVAR DAC's (B. Sloyan, D. Legler)

12:15 News on surface fluxes (including AOF flux) and flux uncertainties (S. Josey)

12:45 Lunch

13:45 Discussion: Strategy for development of climate datasets in support of ocean synthesis and develop implementation plan

15:00 Salinity standards

15:30 Meeting wrap up

LIST OF ATTENDEES

BEHRINGER, David
NOAA / NWS / NMC
World Weather Building Room 807
5200 Auth Road
Camp Springs MD 20746-4303 USA
David.Behringer@noaa.gov

CATTLE, Howard
National Oceanography Centre, Southampton
European Way
Southampton, UK, SO14 3ZH
hyc@noc.soton.ac.uk

HARRISON, Ed
PMEL/NOAA/OCRD
7600 Sand Point Way NE
Seattle WA 98115, USA
d.e.harrison@noaa.gov

KING, Brian
National Oceanography Centre, Southampton
European Way
Southampton, UK, SO14 3ZH
bak@noc.soton.ac.uk

MCPHADEN, Michael
NOAA/ PMEL
7600 Sand Point Way NE,
Bldg. #3
Seattle WA 98115 USA
michael.j.mcphaden@noaa.gov

SEND, Uwe
Scripps Institution of Oceanography
Mail Code 0230
University of California, San Diego
La Jolla, CA 92093-0230 USA
usend@ucsd.edu

CALTABIANO, Antonio
Instituto Nacional de Pesquisas Espaciais
Prédio Planejamento/IGBP
Av. dos Astronautas 1758 - Jardim da Granja
São José dos Campos - São Paulo - Brazil
CEP: 12227-010
nico@igbp.inpe.br

HAINES, Keith
ESSC, Harry Pitt Bld
3 Earley Gate
Reading University, Reading, UK, RG6 6AL
kh@mail.nerc-essc.ac.uk

JOSEY, Simon
National Oceanography Centre, Southampton
European Way
Southampton, UK, SO14 3ZH
Simon.A.Josey@noc.soton.ac.uk

LEGLER, David
US CLIVAR Office
Suite 250
1717 Pennsylvania Avenue NW
Washington DC 20006 USA
legler@usclivar.org

PALMER, Matthew
Met Office, Hadley Centre
Fitzroy Rd, Exeter, Devon, UK
EX1 3PB
matthew.palmer@metoffice.gov.uk

SLOYAN, Bernardette
CSIRO Marine Research
GPO Box 1538
Hobart, Tasmania 7001 Australia
Bernadette.Sloyan@csiro.au

STAMMER, Detlef
Institut fuer Meereskunde
University of Hamburg
Tropowitzstr. 7/11
22529 Hamburg, Germany
stammer@ifm.uni-hamburg.de

WIJFFELS, Susan
CSIRO Marine Research
GPO Box 1538
Hobart, Tasmania 7001 Australia
Susan.Wijffels@csiro.au

TANHUA, Toste
Leibniz Institute of Marine Sciences at Kiel
University
Marine Biogeochemistry
Duesternbrooker Weg 20 D-24105 Kiel,
Germany
ttanhua@ifm-geomar.de

WILLIS, Josh
Jet Propulsion Laboratory
M/S 300-323
4800 Oak Grove Dr.
Pasadena, CA 91109 USA
joshua.k.willis@jpl.nasa.gov

PANEL MEMBERS

NAME	AFFILIATION
Bernadette Sloyan (co-chair)	CSIRO, Marine Research, Hobart, Australia
Detlef Stammer (co-chair)	Institut für Meereskunde, Hamburg, Germany
David Behringer	NOAA NCEP, Camp Springs, USA
Masao Fukasawa	JAMSTEC, Yokosuka, Japan
Keith Haines	Environmental Systems Science Centre, Reading, UK
Simon Josey	National Oceanography Centre, Southampton, UK
Mike McPhaden	NOAA PMEL, Seattle, USA
Sylvie Pouliquen	Ifremer, France
Dean Roemmich	Scripps Inst. of Oceanography, La Jolla, USA
Uwe Send	Scripps Inst. of Oceanography, La Jolla, USA
Toste Tanhua	IfM-GeoMar, Germany
Anthony Weaver	CERFACS, Toulouse, France
Susan Wijffels	CSIRO, Marine Research, Hobart, Australia
Josh Willis	Jet Propulsion Laboratory, USA

National Oceanography Centre, Southampton
University of Southampton Waterfront Campus
European Way, Southampton SO14 3ZH
United Kingdom
Tel: +44 (0) 23 8059 6777
Fax: +44 (0) 23 8059 6204
Email: icpo@noc.soton.ac.uk