GOVST-I
Meeting Report

First GODAE OceanView Science Team Meeting

8 – 10 June 2009

Mercator Ocean, Toulouse, France

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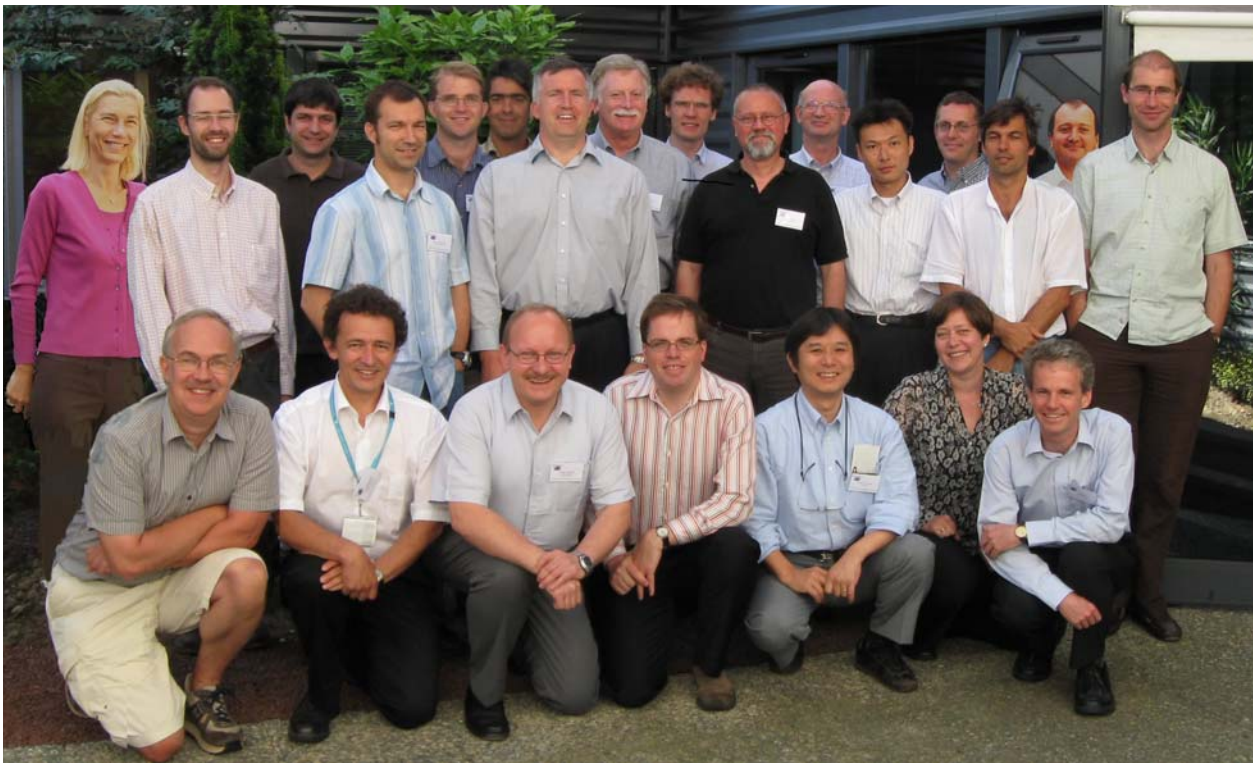

The new GODAE OceanView Science Team[1] at Mercator Ocean/CLS, Toulouse, France

Presentations referred to in this report are downloadable from the GODAE website
http://www.godae.org/GOVST-I-presentations.html

July 2009

[1] Top from left: Villy Kourafalou, Gerald Dibarboure, Srdjan Dobricic, Fabrice Hernandez, Peter Oke, Pierre Bahurel, Gary Brassington, Jim Cummings, Hans Bonekamp, Pierre De Mey, Hal Ritchie, Shiro Ishizaki, Matt Martin, Gilles Larnicol, Pat Hogan, Laurent Bertino; bottom from left: Hendrik Tolman, Eric Dombrowsky, Andreas Schiller, Fraser Davidson, Masafumi Kamachi, Kirsten Wilmer-Becker, Mike Bell

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The meeting started at 9.00 on Monday, 8 June 2009 at Mercator Ocean/CLS, 8-10, rue Hermès, Parc Technologique du Canal, 31520 Ramonville Saint-Agne, France.

The GODAE co-chairs welcomed all participants and thanked them for coming. This first meeting allows engaging on discussions about GODAE OceanView structures, plans and responsibilities; national status reports, reports from Task Teams and activities of international bodies. The outcome of this first meeting provides the starting point for the development of the 4-year work plan of GODAE OceanView.

Following the introduction of the agenda (Appendix B.2) and logistical information, the morning schedule was proposed to be mainly dedicated to inform the GOVST of the status of the new groups' scope, objectives, relationships with external groups, tasks teams, membership and the project office.

1. Introduction to GODAE OceanView

1.1 Scope and objectives

ED, by presenting a summary of GODAE achievements, highlighted the GODAE legacy and the need to transition to a new phase with GODAE OceanView. He emphasised the new challenges that lie ahead, such as new emerging societal needs, system capability expansion, the requirement to support the international/intergovernmental organisations in their decision making, support for the further development and improvement of the ocean observing system and the interaction with end users. ED stressed that there is no other international group of experts such as this one, which is involved in operational oceanography, which shares expertise, decides as a working team and has an international voice to communicate findings and recommendations. GODAE OceanView is assigned to be an active, pragmatic group whose members will work together closely in a collaborative way.

"Decide what to do and do it" rather than *"define what should be done and expect it to be done".*

The primary purpose of the GODAE OceanView Science Team (GOVST) is to accelerate the improvement and exploitation of the major systems for generating real-time operational ocean forecasts, hindcasts and reanalysis through exchange of information and expertise and the coordination of joint assessments. The tasks of the GOVST will be to:

- Improve accuracy and utility of ocean analysis and forecasting products
- Promote the development of downstream use of ocean data and information products from GODAE systems
- Demonstrate the value of the observing systems
- Support the transition to operational services → Link to JCOMM/ET-OOFS
- Coordinate the development of new capabilities and links to other communities → Task teams

The societal benefits from GODAE OceanView systems will only be realised through joint work with other teams of experts. Potential benefits include improvements in the day-to-day management of coastal waters, management of marine ecosystems, weather prediction from hours to decades ahead, and the expected impacts of climate change on the oceans and coastal waters.

*See presentation **1.1-1.2-20090608-GOV-ST_EDY.ppt** (Appendix C.1)*

1.2 Task Teams and international relationships

AS introduced GOVST plans for current and potential future task teams, collaboration with the ET-OOFS and how GODAE OceanView is expected to interact with international research & intergovernmental organisations.

- **Core activities:** A forum where the main operational and research institutions involved in global ocean analysis and forecasting develop collaborations and international coordination.

- **Task Teams:** These teams will address specific topics of particular importance to GODAE OceanView that require collaboration with international research programs (e.g. OOPC, CLIVAR, IMBER, SOLAS, WCRP) or other groups (e.g. coastal community) (see table 1).
- **ET-OOFS:** Operational aspects related to product harmonization and standardization will be carried out by the JCOMM ET-OOFS (see also 2.2)

The need to collaborate closely with the international ocean community has been recognised. The GOVST and its task teams will liaise with other international programs of interest to, and interested in, GODAE OceanView, to coordinate and foster international collaboration in ocean research aimed at improving and extending capabilities of ocean forecasting and analysis systems for operational and research applications.

Task teams	Description	Co-chairs
Intercomparison and Validation	Assess the performance, quality and consistency of ocean forecasting and analysis systems.	Fabrice Hernandez & Matthew Martin
Observing System Evaluation	Assess the impact of observations on forecasts and analyses and improving the design of the global ocean observing system (includes developing new approaches).	Peter Oke & Gilles Larnicol
Coastal Ocean and Shelf Seas	Assessing and demonstrating the value of GODAE OceanView results for regional,coastal and shelf seas analysis and forecasting systems (includes coupling open ocean/coastal zone; seamless transition from the open sea down to the coastal zone).	Pierre DeMey & Villy Kourafalou
Marine Ecosystem Analysis and Prediction	Developing new strategies for the design and exploitation of analysis and forecasting systems for ecosystem applications.	Pierre Brasseur & Nicolas Gruber

Table 1: Current GOVST Task Teams (Description & co-chairs)

The suggestion to start up a new task team related to coupled data assimilation was discussed. It was agreed that such task team would not fully fall under GOVST, but would need to collaborate with existing groups. The scope of such group needs to be defined and this issue is revisited in the work plan discussion *(see 8. GODAE OceanView work plan).*

*See presentation **1.2.-GOVST_Schiller.ppt** (Appendix C.1)*

1.3 Membership

KWB introduced the GOVST membership details. Besides the general terms of membership, the associated responsibilities and representation of each member, the current membership list was also provided.

The GODAE Ocean Science Team (GOVST) membership should reflect all major activities supported by GODAE Ocean View. The number of members is currently limited to 30 members to allow for an efficient and effective operation of the team and will initially be co-chaired by two of its members. New members will be proposed by the chair or co-chairs and are subject to approval by the Science Team itself. The term of membership will normally be 4 years but can be extended with the agreement of the chair or co-chairs. The chair of ET-OOFS and the chairs of the Task Teams are members of GODAE Ocean View Science Team. Representatives from Argo, GHRSST and OSTST are also ex officio members of the

science team. The GOVST co-chairs and the project office oversee the activities of the task teams and assist the TT co-chairs if and when required.

The Science Team is responsible for (main points from the terms of reference):

- Leading and managing the execution of the GODAE OceanView
- Promoting the development of improved capabilities in ocean analysis and forecasting
- Developing collaborations and improved communications between the GODAE OceanView partners
- Evaluating scientific developments to optimize the use of knowledge and technology in GODAE Ocean View implementations
- Reporting on national activities related to GODAE Ocean View. Maintain an up-to-date description of national capabilities related to ocean analysis and forecasts (national reports)
- Liaising with other international programs of interest to, and interested in, GODAE Ocean View

The members are grouped to represent particular areas of expertise and are split into the national representatives, task team co-chairs and the representatives from the different international research groups & inter-governmental organisations (see table below).

	Role	**First name**	**Surname**	**Affiliation**
1	GODAE Co-chair	Dombrowsky	Eric	Mercator Ocean, France
2	GODAE Co-chair	Schiller	Andreas	CSIRO, Australia
3	GOVST Co-ordinator	Kirsten	Wilmer-Becker	Met Office, UK
	Representatives from national forecasting systems			
4	System rep. TOPAZ, Norway	Laurent	Bertino	NERSC, Norway
5	System rep. BLUElink, Australia ET-OOFS chair	Gary	Brassington	BoM, Australia
6	System rep. HYCOM, USA WGOMD	Eric	Chassignet	COAPS/University of Miami, USA
7	System rep. HYCOM, USA WGOMD	Jim	Cummings	NRL Monterey, USA
8	System rep. CONCEPTS, Canada	Fraser	Davidson	DFO, Canada
9	System rep. MFS, Italy	Srdjan	Dobricic	INGV, CMCC, Italy
10	System rep. Mercator Ocean, France	Nicolas	Ferry	Mercator Ocean, France
11	System rep. US-Navy, USA	Pat	Hogan	NRL Stennis, USA
12	System rep. MRI/MOVE.COM, Japan	Masafumi	Kamachi	JMA-MRI, Japan
13	System rep. FOAM, UK Co-chair Intercomparison TT	Matt	Martin	Met Office, UK
14	System rep. NCEP/RTOFS, USA	Hendrik	Tolman	NOAA/NCEP, USA
15	System rep. China	Hui	Wang	SOA, China
	Task Team Co-chairs			
16	Co-chair MEAP TT	Pierre	Brasseur	CNRS, France

17	Co-chair Coastal TT	Pierre	De Mey	LEGOS, France
18	Co-chair Intercomparison TT	Fabrice	Hernandez	Mercator Ocean, France
19	Co-chair Coastal TT	Villy	Kourafalou	RSMAS/MPO, University of Miami, USA
20	Co-chair OSE/OSSE TT	Gilles	Larnicol	CLS, France
21	Co-chair OSE/OSSE TT	Peter	Oke	CSIRO, Australia
	Representatives from different international research/intergovernmental organisations			
22	Scientific expert	Toshiyuki	Awaji	Kyoto University, Japan
23	Scientific expert	Magdalena	Balmaseda	ECMWF, UK
24	Scientific expert	Hans	Bonekamp	EUMETSAT, Germany
25	PICO representative	Paul	Digiacomo	NOAA, USA
26	GHRSST representative	Craig	Donlon	ESA, Netherlands
27	OOPC representative	Eric	Lindstrom	NASA, USA
28	OSTST representative	Rui	Ponte	AER, USA
29	GSSC representative	Ralph	Rayner	IMarEST, UK
30	Scientific expert	Hal	Ritchie	Environment Canada
31	Argo representative	Dean	Roemmich	UCSD, USA

Table 2: List of current GOVST members

The GOVST is interested to broaden its current representation and include new forecasting systems. GOVST member are encouraged to explore options.

Action GM-I-1: GB and LB to contact potential new members of the GOVST in Brazil and India. It will be required to identify only one person per system/country.

Before inviting new system representatives to become a member of the GOVST, it was suggested to initially invite them to the next GOVST meeting for further discussion. New members will be asked to make a case to be represented in GODAE OceanView and the GOVST will be asked to decide on the membership concertedly.

*See presentation **1.3_GOVST_membership.ppt** (Appendix C.1)*

1.4 Status report from the project office

KWB presented the status report from the GODAE OceanView project office, in particular focussing on work carried out on transitioning from the GODAE project office and preparing & establishing GODAE OceanView. Based on the GODAE Strategic plan[2] the tasks for the Project Office have been defined as:

- Facilitating and supporting the GOVST and its task teams in their various undertakings (communications, event organisation, reporting, funding, etc.)
- Fostering communication/collaboration with the ET-OOFS
- Maintaining and updating the GODAE OceanView Web site
- Preparing and publishing GODAE OceanView Reports

[2] http://www.godae.org/documents.htm?parent=161

- Promoting the practical benefits and objectives of GODAE among the operational and research communities in collaboration with the Patrons and the GOVST (e.g. brochure)
- Liaising with the GODAE OceanView Patrons on funding issues and with JCOMM regards reporting, etc. (we have still to decide in what way this will be done)

The next months and years will see the development of a new GODAE OceanView website and strengthening links with JCOMM. The project office has to investigate how to best liaise with related groups and to secure the future funding for GODAE OceanView activities.

*See presentation **1.4_GOVST_organisation.ppt** (Appendix C.1)*

2. Future ownership and direct collaborations

2.1 Report from JCOMM/IOC

Jean-Louis Fellous (JCOMM) presented the JCOMM view regarding the formation of GODAE OceanView. JCOMM serves as a coordination mechanism for the implementation of the worldwide met-ocean operational systems including forecasting systems JLF expressed support for the proposal from GODAE OceanView to be linked to the JCOMM structure.

"JCOMM has, as its mandate, the intergovernmental coordination of the implementation and maintenance of an operational, global, ocean observing (in situ and space-based), data management and services system, in support of the provision of marine services, operational marine meteorology, global climate studies, a range of other service applications, and operational oceanography. As such, JCOMM is recognized as a primary implementation mechanism for global GOOS, and it underpins the World Weather Watch with marine data. It also has developing responsibilities for assisting in the implementation of coastal GOOS. This work is performed with scientific guidance in relation to observing system design and the integration of new advances deriving from the Ocean Observations Panel for Climate, and the new Panel for Integrated Coastal Observations, coordinated through the GOOS Scientific Steering Committee.

JCOMM also has long-standing responsibility for the global regulation and coordination of a range of marine meteorological services in support of maritime safety and coastal hazard warning, and thus has both the expertise and mandate to undertake a similar intergovernmental role for the operational ocean forecast systems deriving from GODAE."[3]

A proposal to establish a "Joint Statement of Work between GODAE Ocean View and the JCOMM Expert Team on Operational Ocean Forecasting" was put forward by the ET-OOFS. This draft document provides details on the background, justification, objectives, governance and relationships between ET-OOFS and GODAE OceanView, and the wider ocean community. The joint statement will be treated as an internal document and is not meant to be circulated widely (see Appendix E.1).

Action GM-I-2:	AS and ED to contact Peter Dexter & Jean-Louis Fellous (JCOMM co-presidents) to further negotiate the relationship between JCOMM and GOVST in regard to reporting and other issues.

*See presentation **2.1_JCOMM-Report_to_GOVST.ppt** (Appendix C.1)*

2.2 Report from ET-OOFS

GB reported from the progress made in the ET-OOFS (Expert Team for Operational Ocean Forecasting Systems) since in initiation last year. He proposed that the members of GOVST should be encouraged to

[3] Excerpt from JCOMM abstract at the GODAE Final Symposium, November 2008

contribute/respond to ET-OOFS' related activities and that both groups are jointly presented to stakeholders and the international forum. GB suggested that ET-OOFS and GOVST maintain communication on matters relating to operational ocean forecasting systems which are of potential interest to either group and proposed that both, the OSE and the Inter-comparison Task Team should have a joint set of tasks from both groups and that an ET-OOFS member should be a member of the TT's to lead the ET-OOFS tasks within the TT.

Furthermore GB emphasized that it will be critical that GOVST is unanimous in its support for ET-OOFS and that all members of ET-OOFS and GOVST provide a unified position to the stakeholders and wider community. There is consensus that both groups need to work in a complementary way.

As already mention in 2.1, GB presented the joint statement between the ET-OOFS and the GOVST, which was adopted by JCOMM. ET-OOFS and GOVST need to understand the relationship between research & operational systems to complement each other well. It is expected that ET-OOFS will oversee the transition to operational services, while GOVST will provide the research background. Both groups have similar objectives, but different mandates and roles.

It was also suggested for GODAE OceanView to engage in more outreach & capacity building activities, which are expected to be supported by JCOMM *(see also 8.GODAE OceanView Work Plan).*

Following these presentation the science team was divided into five groups which were asked to discuss the future work plan for GODAE OceanView. From the output of this discussion AS and ED developed the first draft of the GODAE OceanView Work Plan, which was presented and discussed by the GOVST on day 3 of the meeting *(see 8.GODAE OceanView Work Plan)*

Report below provided by Gary Brassington

Report of the Expert Team for Operational Ocean Forecasting Systems for GODAE OceanView Science Team

Background

JCOMM is a joint commission of the IOC and WMO has the mandate to provide coordination and management for the integration of observations, services and data management for ocean and marine meteorology services. ET-OOFS is an expert team for the Service Programme Area of JCOMM that JCOMM-MAN approved in 2007 with the objective to coordinate improved quality of ocean forecasting services across agencies and operators.

Membership

ET-OOFS has established the following membership intended to obtain representation across the current operational ocean forecasting systems and a range of skills that span the specific tasks outlined below.

Current members of the ET-OOFS	
Gary Brassington (Chair)	BLUElink, Bureau of Meteorology, Australia
Jim Cummings	NRL, USA
Eric Dombrowsky	Mercator Ocean, France
Ming Ji	NOAA/NCEP, USA
Adrian Hines	FOAM, Met Office, UK
Masafumi Kamachi	MRI, Japan
Fraser Davidson	DFO-NAFC, Canada

Table 3: Current ET-OOFS members

Specific tasks

The ET-OOFS have identified the following task areas:

1) Communication of ET-OOFS activities to the oceanographic community and establish linkages to MAES/SI/MSS
2) Report on the status of national systems and services
3) Specification of the observation requirements for operational ocean forecasting as part of the SPA statement of guidance
4) Maintain the "Guide to ocean forecasting" provided to agencies and operators to advice on best practices, standards and conventions
5) Maintain and publish performance monitoring of operational ocean forecasting systems
6) Support the development of quality services from agencies and improve the impact to user applications
7) Establish inter-operability among agencies and operators

JCOMM-3

ET-OOFS will be proposing a renewed mandate as part of JCOMM-3 to revise the TOR and membership.

Relationship with GODAE OceanView

A joint statement was prepared and distributed for comment to establish an informal guidance for the members of the two groups and stakeholders. A copy of the latest revision is attached.

Proposed linkages between GOV-ST and ET-OOFS

- ET-OOFS/GOV-ST to conduct consecutive meetings at agreed time/location
- Chair of ET-OOFS will be a ex-officio member of GOVST
- Co-chairs of GOV-ST to be ex-officio members of ET-OOFS
- Joint national report

Proposed ET-OOFS tasks for TT-OSE

- ET-OOFS to seek expert advice from the TT
- Identify deficiencies in OOFS performance and recommend observational requirements
- Prepare recommendations based on evidence of cost effective metrics for operational monitoring of operational systems. ET-OOFS to review and include in the “The guide” as part of the operational monitoring system
- Prepare a report on specific metrics for ET-OOFS to submit to contribute to the “Statement of Guidance”
- Developing the cost vs benefit case. Feedback on what the TT can deliver to this process.

Proposed ET-OOFS tasks for TT-Intercomparison

- Identify deficiencies in OOFS performance and recommend system changes
- Prepare recommendations of mature and cost efficient metrics for operational monitoring of operational systems. ET-OOFS to review and include in the “The guide” as part of the operational monitoring system
- Adapt existing metrics to standards for transition to
- Adapt frameworks to standards to facilitate transition of future metrics to operations

*See presentation **2.2_JCOMM_ET-OOFS_GOVST.ppt** (Appendix C.1)*

3. Task team presentations

3.1 Intercomparison

FH presented the overview of the intercomparison task team and reported on the outcome of the latest intercomparison exercise conducted for the period Feb-May 2008. The importance to make intercomparisons a routine operational activity was discussed. This will require encouraging all to make these exercises more consistent (e.g. in regard of time). One of the foci are planned to be the scientific

assessment in identifying the system differences. This needs to be taken forward in a structured way in order to find out what is useful and viable, operationally and scientifically. Not all groups are ready to run intercomparisons routinely. It was suggested to ask groups, who so far did not participate in the intercomparison exercise, to do so. MFS and NCOM were suggested. Pat Hogan commented that NCOM will be discontinued from next year, but that he would be interested in participating using HYCOM.

Both, routine monitoring as well as scientific assessments are seen as important components and so it was suggested to address intercomparisons through this two-way approach. To take this step further, intercomparisons could be used to develop a way to identify and track events (cyclones, eddy-shedding events, etc.) by sharing particular pieces of information.

Summary below provided by Fabrice Hernandez and Matt Martin

First report of the GOVST Intercomparison and Validation Task Team (IV-TT)

Overall activities since the end of the GODAE project:

- Latest activity concerning the Oceanography Magazine manuscript on the GODAE intercomparison experiment
- Further work on producing diagnostics from the existing intercomparison dataset (Indian and Pacific Ocean, BLUElink work)
- Preparation of discussions for the first GOVST meeting
- Discussion of the objectives and plans for the IV-TT during the GOVST meeting
- Prepare a “questionnaire” in order to properly define objectives and work plan of the IV-TT

Presentation of the IV-TT during the 1st GOVST meeting:

- Historical background: Cal/Val activities during GODAE
  - Brief time charts of validation/intercomparison activities in the framework of GODAE, together with the OOFS involved, the outcomes (metrics, technologies developed
- Brief overview of existing metrics definitions
  - Reminding Class 1, 2, 3 and 4 metrics definitions and goals
- Results from final GODAE intercomparison
  - The schedule of the experiment
  - The OOFS involved
  - Some results over the different ocean basins, based on the available OOFS, showing consistency and quality assessment
- Issues coming out of that Intercomparison
  - General scientific conclusions, main successes, and shortcomings

Discussion and outlook concerning the IV-TT:

1. What is the role of a validation/intercomparison Task Team?
   Propose some objectives and ToR
2. Strategy of the validation/intercomparison Task Team
   Proposition for activity (permanent monitoring, targeted intercomparison phases?)
   Suggested scientific aspects that should be addressed
3. Clarify work plan of IV-TT and interactions/overlap with other task teams
   Which OOFS are involved? Links with other Task Teams?
   Extended use of GODAE Intercomparison dataset?

   Suggested work plan:
   - Prepare a roadmap document by end of September 2009
   - Review by OOFS

- Beginning of implementation in 2010
- Prepare calendar for meetings/discussions

Topics to be addressed in the roadmap:

- Discuss technical aspect of NRT production (storage and exchange): possible link with ET-OOFS
- Focus on a sub-set of useful metrics

*See presentation **3.1_GOVST_Intercomparison_TT.ppt** (Appendix C.1)*

3.2 OSE/OSSE

Summary below provided by Peter Oke and Gilles Larnicol

Report from the Ocean Simulation Evaluation Task Team

The primary goals of the OSE TT is to demonstrate the value of existing observing systems by supporting observational agencies/patrons by demonstrating the importance of each observation platform to GODAE; to contribute to the ongoing design and assessment of the GOOS; and to help GODAE groups refine their use of observations to improve system performance. These goals will be achieved by the TT through coordinated community activities and capability building. Following a brief overview of OSE activities using GODAE systems, the outcomes from the 2nd GODAE Workshop on Observing System Evaluation, help on 4-5 June 2009, were presented. These outcomes included agreement on:

1. Short-term actions to demonstrate the importance of continuing Jason-1 operations;
2. Facilitation of community Observing System Simulation Experiments (OSSEs), by identifying and disseminating a community "nature run", and a set of key OSSE questions;
3. The specification, collation, and dissemination of common assimilation diagnostics from GODAE systems to demonstrate the impact of "observing system events" (e.g., altimeter safe-hold) on the skill of GODAE systems; and
4. Capability building for routine analysis sensitivity using GODAE systems.

Action GM-I-3:	**All** to provide co-chairs with recommendation for new core members of the OSE/OSSE task team

Action GM-I-4:	**Task team co-chairs (PO & GL)** to formalise new members through invitation

It was stated that the OSE/OSSE Task Team should work closely with the observational and climate community and needs to be proactive in supporting missions that are high on the agenda (e.g. climate issues). A new SCOR Task Team on observing system evaluations is planned to be set up and PO has contacted OOPC, CLIVAR and other groups to investigate the option to merge with the new SCOR working group. PO will keep the GOVST informed about progress in this matter.

The OSE-II workshop report can be downloaded from the GODAE website: http://www.godae.org

*See presentation **3.2_GOVST_OSE_TT.ppt** (Appendix C.1)*

3.3 Coastal and Shelf Seas

The GOVST members see it as important to develop and maintain good relationships with the coastal communities as "this is where the people are". Of all GOVST task teams, the coastal task team is likely to have the strongest impact on the socioeconomic component. Engagement with coastal communities will need to be addressed in view of identifying relevant applications and as a potential item to be included in the Terms of reference for the Coastal Task Team. It has been suggested to broaden the scope and also include waves as well as share diagnostics/metrics with the other task teams (OSE and

Intercomparisons). This will also require the coastal task team to open up and invite a broader membership.

Following this discussion it became apparent that it will be required to define a place for cross task team coordination.

The coastal TT is planning a third workshop in spring next year (maybe again within the AGU 2010) and possibly a "coastal" summer school thereafter.

Action GM-I-5: **All** national representatives to contact the coastal TT co-chairs if they wish to contribute/participate in the coastal task team

Summary below provided by Villy Kourafalou and Pierre de Mey

Coastal Ocean and Shelf Seas Task Team

The target processes of the TT are typically shelf break exchanges, shelf dynamics, coastal current & associated (sub-) mesoscale. One important aspect is that the influence of coastal ocean processes is felt far beyond shelf break, and overlaps & interacts with open ocean dynamics. The coastal ocean is characterized by a continuous spectrum of low-frequency and high-frequency processes with specific physics: free surface, tides, 3D processes, etc.

Starting in the mid-2000s, GODAE fully embraced the importance of coastal ocean "intermediate users", on the path to coastal applications. The mission of the Coastal and Shelf Seas Working Group (CSSWG, 2006-2008) was mostly to bring up elements demonstrating the value of GODAE results for regional, coastal and shelf seas models and forecasting systems, as well as to build a community. A total of 40 coastal ocean systems nested in larger-scale systems in many coastal regions of the world ocean were examined. Encouraging results from those and other systems, in particular regarding the suitability of the existing large-scale estimates, scientific quality, demonstrations of utility, as well as critical scientific issues and requirements related to downscaling, were discussed at three events: a session at the GODAE Symposium on Ocean Data Assimilation and Prediction in Asia-Oceania in Beijing in 2006, a workshop held in Liverpool in October 2007, and a special session at the American Geophysical Union Fall Meeting in San Francisco in December 2008. Poster sessions were also held at the 2008 GODAE Final Symposium in Nice. On the publications side, a CSSWG White Paper is available on http://www.godae.org/CSSWG.html, a Special Issue in Ocean Dynamics was published in February 2009, gathering some of the Liverpool papers, and a contribution to the Final Symposium special issue is in print.

As GODAE OceanView assigns itself broader objectives for the continuation of its global ocean forecasting activities, it is time for coastal ocean forecasting science to move, beyond the initial objectives of demonstration of feasibility and utility, to a next-level broader initiative aimed at consolidating its foundation. The main goal of the new TT will be to work within GODAE OceanView towards the provision of a sound scientific basis for sustainable multidisciplinary downscaling and forecasting activities in the world coastal oceans. The main actions will be:

- Continue co-sponsoring forums (AGU, EGU) to discuss cross-cutting science issues (downscaling, predictability, interdisciplinary), so as to retain the GODAE OceanView visibility to the community of coastal modellers and interact with the evolving science background. We will adopt the paradigm of a "critical path" from the routinely-available information (satellite observations, in situ observations, GODAE OceanView basin-scale estimates) to the coastal and littoral multidisciplinary applications, and will assess the importance of the role of the coastal ocean link on that path.
- Promote limited-time Pilot Projects (PPs), or integrate existing projects, focussing on coastal forecasting science (not on coastal forecasting coordination) – we expect fewer groups but more tightly integrated than in the former WG, in several world coastal regions, using GODAE OceanView products and contributing to the training of young scientists to coastal ocean forecasting activities. The test cases are expected to be funded at the national or regional level,

but conducted under suitable coordination and linking, through the COSSTT – clearly this is something the participating groups must accept and value.

To that end, we introduce **ICODAE** (International Coastal Ocean Data Assimilation Experiment), initially a label for Pilot Projects or existing projects adhering to the Terms of Reference of the COSSTT which are being drafted. Pilot Project representatives would be members of the Coastal TT. The types of activities developed in the ToRs would be:

- Conduct core science investigations related to the target processes, e.g. submesoscale, shelf dynamics, biology, validation, etc.
- Interface with (some) end users and conduct application-targeted science investigations related to the target applications, e.g. forecasting, atmosphere interaction, biology (upper trophic levels), etc.
- Coordinate activities and results within TT, relate with GODAE OceanView and operational activities – all of the above is open to coordination, especially regarding tools: metrics, downscaling, assimilation, downscaling error estimates (if available from large-scale systems). Plan (inter-regional) intercomparison, array design studies. All of the above would provide feedback onto GODAE OceanView and foster collaboration with other Task Teams.
- Contribute to training and forums related to coastal forecasting.

Initial steps are expected to be:

- Finish drafting ToRs (summer)
- Contact groups & populate the Task Team with participating projects and experts
- Organize special sessions as forums: 2010 AGU Ocean Sciences meeting, Portland, Oregon, USA – session proposal pending; plan session proposal for 2011 EGU.

*See presentation **3.3_GOVST_Coastal_TT.ppt** (Appendix C.1)*

3.4 Marine ecosystem analysis & prediction

Summary below provided by Pierre Brasseur, CNRS

Report from the Marine Ecosystem Monitoring and Prediction Task Team

The Marine Ecosystem Monitoring and Prediction Task Team is a new task team proposed to bridge the gap between the current status of the GODAE capabilities and new applications in areas such as fisheries management, marine pollution and carbon cycle monitoring. The background for this task team lies in the IMBER-GODAE Working Group that was established in June 2007 with the objective to investigate (i) how IMBER modellers can benefit from the data products and insight generated by GODAE, (ii) how GODAE products can be improved from the particular perspective of IMBER modellers, and (iii) how ocean observing systems can be designed and improved to better observed ocean ecosystem and biogeochemistry.

The WG didn't meet formally in 2008 but used the time to synthesize some of its key findings and conclusions in a synthesis paper presented at the GODAE final Symposium. It focused hereby on the applications of operational oceanography products to ecosystem and biogeochemistry projects and also laid out what is required to integrate biogeochemistry and ecology into ocean data assimilation systems. A number of biogeochemical/ecological studies that make use of GODAE products were examined, showing the need for an improved representation of upper ocean processes such as turbulent mixing and vertical advection in the GODAE products. This paper was then condensed into an article to appear in the Oceanography magazine (Brasseur *et al*., 2009).

As part of GODAE OceanView the objectives of the newly formed Marine Ecosystem Monitoring and Prediction task team will be:

i) to foster research on ecosystem modelling and assimilation strategies that will be compatible with the constraints of operational systems;
ii) to further assess and demonstrate the value of operational products for marine ecosystem monitoring and prediction;
iii) to expand the concept of the "GODAE metrics" to biogeochemical variables and to develop intercomparison exercises across international groups;
iv) to identify the essential sets of physical and biogeochemical observations required to constrain the coupled models and formulate relevant recommendations on these issues;
v) to promote and organize educational activities (summer schools, training workshops, etc.) aimed at sharing experience between young scientists, operational oceanographers and marine ecosystem experts. In addition to the link with IMBER, the task team will articulate its activities with other relevant international initiatives.

The membership of the task team will be consolidated in order to ensure a broad representation of all major GODAE Ocean View groups and a good interface with international programs such as IMBER, ICES, CLIOTOP and SOLAS. One of the first activities of the Task Team will be to revisit the IMBER-GODAE working plan proposed in 2007, taking into account recommendations from IMBER and the IGST. A second joint workshop should be organized in early 2010 in order to review the progress made and elaborate a more structured framework of activities until 2013.

*See presentation **3.4_GOVST_Marine_ecosystem_TT.ppt** (Appendix C.1)*

4. National reports

Before he presented the progress made at BLUElink, GB announced a call for a vision paper for the WMO/CAS (WMO Commission for Atmospheric Science). Peter Dexter is asking the GOVST to contribute to the idea of seamless prediction.

Action GM-I-6:	**All** to comment of the foci for a vision paper invited by WMO/CAS on coupled systems for short range prediction/seamless prediction by 25 July 2009. What evidence/documents/ reports should be passed on to be included in the vision paper? Feedback to Peter Dexter.

In preparation of this meeting report all "national representatives" are asked to provide a summary of their presentation, describing the status of their national forecasting system. In order to consolidate the effort of reporting from the systems for ET-OOFS and GOVST, it was decided that the current "national report" should be revised by both groups. While GOVST agreed to only alter the current version of the report by adding "Publications", ET-OOFS through GB will need to adjust the reporting structure further.

Action GM-I-7:	**National representatives** to provide half page summary for meeting report – by end June 2009.

Action GM-I-8:	**GB** to develop a list of points for the national report for the ET-OOFS (following the national report for the GOVST) and to align both reports, producing an overall report for both groups.

4.1 BLUElink

Provided by Gary Brassington

The Bureau of Meteorology and CSIRO have continued their research partnership as the Centre for Australian Weather and Climate Research (CAWCR; www.cawcr.gov.au) and are have appointed the first director, Bruce Mapstone.

CAWCR are implementing the UKMetOffice Unified Model as the next operational NWP forecasting suite. The trial implementation has been able to reproduce the skill achieved by the UKMetOffice and will be implemented operationally in Dec 2009 with a revised version implemented in June 2010. CAWCR are also developing a coupled climate model based on the UM, MOM4p1, CICE, CABLE and OASIS. All of this model development is termed the Australian Community Climate and Earth-System Simulator (ACCESS) and has established an explicit collaborative link with the university research community.

The BOM, CSIRO and Australian National University have invested in a new SUN supercomputing system that will be located at the BOM for the operational systems and at ANU for climate and research applications. The SUN infrastructure is being implemented in September 2009.

The Australian Government has renewed funding for the Integrated Marine Observing System (www.imos.org.au) to continue funding for existing facilities and support applications for new facilities. Facilities have been established for Argo, HF radar, gliders, reference stations and OceanSITES. IMOS has developed an ocean data portal (http://imos.aodn.org.au/webportal/) to access data in the Australian region.

The Bureau of Meteorology, CSIRO and the Royal Australian Navy are completing the final year of the BLUElink-II project. The project includes three activities: (a) global ocean forecasting, (b) coupled rellocatable and limited area modelling and (c) near-shore wave forecasting.

Global ocean forecasting:
OceanMAPSv1.0: software has been tested with the new compilers ready for porting to the new SUN supercomputer. A minor upgrade has include the implementation of Jason-2, Navoceano L2P and flux regridder.
OceanMAPSv2.0 and BRAN3.0: The final configuration of OFAM2.0 has been determined and will include an upgraded bathymetry, enhanced vertical resolution, climatological river discharge and tidal parameterised mixing. OFAM2.0 will complete a 17-year free-model spinup integration using ERA-INTERIM surface fluxes. BODAS software has been parallelised offering a 6.5 times performance gain which will permit a larger ensemble and relaxation of the localisation constraint.

Coupled limited area model:
A research version based on a regional MOM4p1, OASIS3 and TCLAPSv4 has demonstrated positive skill improvements for the TC intensity. Development has included an inertial coupling scheme, open boundary conditions, regional initialisation and coupled initialisation. The final version for operational trials of MOM4p1, OASIS4 and UM7.3 will be completed in Dec 2009. The rellocatable ocean atmosphere model is being upgraded to include a regional ocean data assimilation system.

*See presentation **4.1a_CAS_vision_paper&Bluelink.ppt** and **4.1b_National-report-list.pdf** (Appendix C.1)*

4.2 CONCEPTS

Provided by Fraser Davidson

Projects in Canadian report:

- CONCEPTS (Canadian Operational Network of Coupled Environmental PredicTion Systems)
    - C-NOOFS: www.c-noofs.gc.ca
    - CONCEPTS: Global
- GOAPP (Global Ocean-Atmosphere Prediction and Predictability) research network. www.goapp.ca)

Government Departments

Fisheries and Oceans Canada (DFO), Environment Canada (EC), National Defence (DND)

1. Input Data (Updated)

- *Forcing Data:* Using 10 day forecast winds instead of 6 day forecast winds freom EC- GEM

system.

- *Ocean Initialization:* Regional system initialised with MERCATOR PSY3V2 analysis.
- *Altimetry:* Continued use of Duacs Altimetry product.
- *Scatterometry:* testing use of A-SCAT and Quickscat assimilated wind forecasts.
- *SST:* Reynolds, and TMI.
- *In-situ, ice data: Same* as Before

2. Data serving

www.c-noofs.gc.ca: Provides image products with 6 day forecasts and access to historic forecasts. Data field availability through DODS is being implemented in 2008.

www.osl.gc.ca: Provides access to model output and observational data for the Gulf of Saint Lawrence

www.mar.dfo-mpo.gc.ca/science/ocean/icemodel/forecast.html: Provides access to model products from the East Coast Forecast System

http://ice-glaces.ec.gc.ca/: The Canadian Ice Service Archive (CISA) provides archived data, climate products and the latest, past and predicted future ice conditions.

3. Ocean Models

NEMO used on East Coast, ROMS on west coast.

Contacts as follows

Global model: Dan Wright (wrightdan@dfo-mpo.gc.ca)

Regional model: Fraser Davidson (davidsonf@dfo-mpo.gc.ca)

West coast models: Mike Foreman (mike.foreman@dfo-mpo.gc.ca)

Atmospheric model: Hal Ritchie (Hal.Ritchie@ec.gc.ca)

Pierre Pellerin (Pierre.Pellerin@ec.gc.ca)

4. Assimilation method

Using SAM2V1 system for Global and Regional prototypes.

Using 3D Var and spectral nudging

5. Assimilation products and dissemination

Comparisons with MERCATOR/C_NOOFS/Observations are presented on C-NOOFS web site using GODIVA2, a monitoring suite and a forecast viewer for individual images. A Thredds data server is being implemented.

A prototype North Atlantic forecast system is being set up to asses 3D Var and spectral nudging implementations.

6. Systems

www.c-noofs.gc.ca

www.osl.gc.ca

7. Links with GODAE pilot projects (Argo, GHRSST)

ARGO data used

GHRSST data not yet in use

8. Internal metrics and inter-comparison plans

Global System: As before.

Regional System Eastern Canada:

- C-NOOFS zones set up for benchmarking statistical differences among models, observations, persistence and climatology

9. Users and external metrics

MERSEA/GODAE metrics are being implemented on the C-NOOFS system for the North West Atlantic. Canadian input on metrics will grow.

10. Reanalysis activities

Same as previous year

11. Computer Resources

Environment Canada provides access to a 200 core linux cluster

DFO/NAFC has a 90 core SUN system with 400 Gig of memory to run the C-NOOFS system.

New DFO computer expected this year: roughly 400 cores and 1600 Gig's of memory.

Access to ACEnet, Atlantic High performance computing network maintained by a consortium of Canadian Universities

12. Consolidation phase and transition to operational systems (activities)

C-NOOFS acts as consolidator for taking research to pre-operations in its prototype system. The plan for the development of long term regional operational systems is to transition coupled atmosphere-ocean-ice forecast systems to the Canadian Meteorological Centre for operations. Continued R&D will take place to keep the coupled systems and individual model components including data assimilation current and relevant.

For the global system, Environment Canada is consolidating the development in conjunction with DFO and MERCATOR-OCEAN.

13. GODAE Achievements and measures of success

Ocean Analysis assimilating observations are now used to initiate ocean forecasts for global and regional systems.

*See presentation **4.2_Canada_overview.ppt** (Appendix C.1)*

4.3 FOAM-NCOF

Provided by Matt Martin, Met Office, UK

The National Centre for Ocean Forecasting (NCOF), launched in March 2005, coordinates ocean forecasting activities within the UK. NCOF brings together research agencies funded by the Natural Environment Research Council (NERC) and the Met Office which has responsibility for operational forecasting activities. Research agencies currently engaged in NCOF are the National Oceanography Centre Southampton (NOCS), Proudman Oceanographic Laboratory (POL), Plymouth Marine Laboratory (PML), and the Environmental Systems Science Centre (ESSC), Reading University. For more information on NCOF, see http://www.ncof.co.uk.

Daily operational forecasts of open ocean variables have been produced using the Forecasting Ocean Assimilation Model (FOAM) system since 1997, which provides the main UK contribution to GODAE. Operational forecasts for the shelf seas are also produced, currently using a model developed by POL. In addition, a high resolution (5km) global Operational Sea Surface Temperature and Ice Analysis (OSTIA) product has been developed to take full advantage of sea surface temperature (SST) products made

available through the Group for High Resolution SST (GHRSST). Full operational production of OSTIA commenced towards the end of 2006.

The NEMO system has now been adopted within the UK as the primary tool for open ocean modelling and is in the process of being adopted for use in the shelf seas forecasting systems. High resolution global modelling for hindcast studies has been developed at NOCS and at ESSC using the NEMO system. ESSC are undertaking research and development into data assimilation techniques for use with open ocean models. This work includes the use of the FOAM and NEMO systems to facilitate pull-through into the operational forecasting system.

The operational FOAM system was upgraded in November 2008 to use the NEMO model with some improvements to the data assimilation scheme. A global ¼ degree configuration is run with nested 1/12 resolution configurations in the North Atlantic, Indian Ocean and Mediterranean. The system has been run in hindcast mode for a 2-year period from 1st April 2005 in order to provide validation information. Longer (~40 year) re-analysis integrations are planned in conjunction with NOCS and ESSC. The shelf seas forecasting system is in the process of being transitioned to use NEMO with operational implementation of the new system expected in 2010.

A new variational data assimilation scheme called NEMOVAR (developed by CERFACS and ECMWF with contributions from the Met Office) is being implemented in the FOAM system. The scheme is based on the incremental formulation and is currently available in 3DVar first-guess-at-appropriate-time (FGAT) mode. Some initial tests in a 1 degree NEMO configuration have shown improved fit of the model background fields to observations compared with the existing data assimilation scheme used in FOAM.

A scheme for assimilating ocean colour data into a coupled physical-biological model has been implemented in the FOAM-NEMO-HadOCC system. Two-dimensional increments to the model's surface chlorophyll fields are calculated using satellite ocean colour data. These are converted into phytoplankton increments using the model's C:Chl ratio, and balancing increments to the other biological variables are made based on knowledge about the biological processes in given regimes. A set of one-year hindcast runs have been made which show a significantly positive impact of the ocean colour assimilation on the model's chlorophyll fields.

A number of systems in the UK are contributing to the MyOcean project (http://www.myocean.eu.org/, a European Marine Core Service as part of the Global Monitoring for Environment and Security program). These include the main NCOF partners listed above, along with the British Antarctic Survey, Cefas and HR Wallingford. The products from the Met Office which will be freely available include:

- FOAM:
  - Global ¼ degree FOAM ocean model products. Interpolated onto a regular grid and tiled by region (based on GODAE metrics definitions)
  - North Atlantic 1/12 degree FOAM ocean model products
  - Mediterranean 1/12 degree FOAM ocean model products
- European North-West Shelf ocean model products
- Satellite derived global SST products from OSTIA

*See presentation **4.3_GOVST_UK_report.ppt** (Appendix C.1)*

4.4 HYCOM

Provided by Jim Cummings

GODAE Ocean View Report – Global HYCOM

Progress in the development and implementation of the global 1/12° resolution assimilative HYCOM system at the Naval Oceanographic Office (NAVOCEANO) since the GODAE symposium is given in this report. A new Office of Naval Research (ONR) sponsored follow-on project to enhance the global HYCOM system was initiated at the Naval Research Laboratory (NRL) in 2009. The goals and progress of the follow-on project are outlined as well.

The objective of the global 1/12° resolution HYCOM project is to develop and transition a global ocean nowcasting and forecasting capability that can depict oceanic features, provide accurate 3D ocean temperature, salinity, currents, ice parameters and boundary conditions and run operationally at U.S. Navy production centers. Assimilation is performed by the Navy Coupled Ocean Data Assimilation (NCODA) system, which is a multivariate optimum interpolation (MVOI) analysis of temperature, salinity, and u, v velocity components. The entire system is referred to as the Global Ocean Forecast System (GOFS) V3.0. It is running in real-time on the operational target machine (Cray XT5) at NAVOCEANO producing a daily 5-day forecast. Documentation in the form of validation test (VTR), system design description (SDD), and user manual (UM) reports have been completed. The validation test included direct comparison of GOFS V3.0 with the current Navy operational ocean forecast system, which consists of a global 1/8° resolution implementation of the Navy Coastal Ocean Model (NCOM) and a mixture of NCODA and MODAS (Modular Ocean Data Assimilation System) assimilation steps (referred to as GOFS V2.6). A formal operational test of the performance of GOFS V2.6 vs. GOFS V3.0 conducted by NAVOCEANO is planned for 2010.

The principal goal of the new ONR project is to perform the necessary research and development to prepare for the next generation global system at higher horizontal resolution (1/25° on the equator, 3.5 km at mid-latitudes, and 2 km in the Arctic). New capabilities in the system will include: (1) sub-daily effects - diurnal cycles and tides, including the internal tide, which are explicitly excluded in the GOFS V3.0 system; (2) community ice model (CICE) integration and coupling, including sea ice data assimilation; (3) 3D variational (3DVar) assimilation; and (4) a variational adjoint system for determining observation impacts on selected measures of forecast error. Spin-up of the 1/25° system has begun, with results showing improvements in western boundary current sea surface height variability and simulated mass and velocity fields along the equator as compared to equivalent spin-up time in the global 1/12° resolution system. The magnitude and locations of the internal tide signature as seen in the steric sea surface height field is realistic, which is important for Navy applications. The 3DVar assimilation will allow for greater flexibility for assimilating different observation data types and a general framework for using more sophisticated background error covariance models. A new non-separable formulation of the background error covariances is in place, with assimilation performed directly in the model isopycnal coordinates. This results in considerable flow-dependence in the analysis increments. More importantly, the 3Dvar assimilation has a much reduced memory footprint over that of the MVOI, which is useful for assimilation on the global 1/25° grid. The variational adjoint data impact system will assess the impact of any and all observations assimilated in the GOFS V3.0 forecasting system. It will be computationally efficient and capable of being run in near-real-time for routine observation monitoring. The data impacts of observation subsets will be easily quantifiable on the basis of: (1) instrument type (platform); (2) measurement variable; (3) geographic region; and (4) vertical depth level.

The HYCOM data impact system will be a direct contribution to the newly formed GODAE Observing System Evaluation Task Team (OSE-TT).

*See presentation **4.4_GOVST_HYCOM.ppt** (Appendix C.1)*

4.5 Mercator Ocean

Provided by Nicolas Ferry, Mercator Ocean, France

The current status of the Mercator-Océan operational oceanography forecasting systems is described below:

OOFS	Geographical domain	Horiz. / Vertic. resolution	Analysis	Forecast
PSY2V3	North Atlantic + Mediterranean Sea	1/12°, 50 levels	weekly	weekly, 14 days forecast
PSY2Q	North Atlantic + Mediterranean Sea	1/12°, 50 levels	weekly	daily, 7 days forecast

PSY3V2	Global Ocean	¼°, 50 levels	weekly	weekly, 14 days forecast
PSY2G2V2	Global Ocean	¼°, 31 levels	weekly	weekly, 14 days forecast

Table 4: Mercator-Ocean operates the following operational ocean forecasting systems (OOFS)

All OOFSs assimilate SST, temperature and salinity profiles, and along track altimetric data. More information can be found on the web page: http://bulletin.mercator-ocean.fr/html/welcome_en.jsp

Progress made since the GODAE Final Symposium:

- New web page design, more user-friendly
- Indicators are available on Mercator web for different regions (global/regional; total signal and inter-annual anomalies for surface temperature and salinity and thermal heat content fields based on Mercator analyses)
- Mercator-Océan GLORYS1V1 ¼° global ocean reanalysis covering 2002-2008 is produced and available for users. The reanalysis system is based on PSY3V2 operational system but also includes a covariance based velocity initialisation and a double backward incremental analysis update. This last feature particularly improves the reanalysis time continuity.

Plans for the future

Mercator-Océan takes part to MyOcean EU funded project, which just started (April 2009- April 2012). It is the implementation project of the GMES Marine Core Service, aiming at deploying a concerted and integrated pan-European capacity for Ocean Monitoring and Forecasting. MyOcean project will strongly drive Mercator-Océan activity in the next years.

The main challenge will be to improve the quality of operational systems, i.e: (i) keep as close as possible to the state-of-the-art in an operational context, (ii) ensure continuity of service with strongly evolving systems and (iii) meet users expectations in terms of product quality.

In this context, new operational systems are planned:

- Global eddy resolving (1/12°) OOFS will be put in demonstration mode in December 2009.
- High resolution (1/36°) OOFS will cover the Iberian Biscay Irish region (IBIROOS) and become pre operational in 2011.

An important effort will be devoted to global ocean réanalyses:

- An new version (V2) of GLORYS1 ¼° global ocean reanalysis will be produced at he end of 2009, with improved model background error covariances, bias correction scheme for temperature and salinity and Interim reanalysis atmospheric forcing.
- A longer stream will be produced in the framework of MyOcean in 2010 covering the period 1993-2008 (GLORYS2). This work will be done in collaboration with CNRS (France), ESSC Reading (U-K), CMCC (Italy) and DFO (Canada).

*See presentation **4.5_GOV-ST_Mercator-Ocean.ppt** (Appendix C.1)*

4.6 MFS

Provided by Srdjan Dobricic (CMCC), Italy

Status of the Mediterranean Forecasting System (INGV) and global reanalyses (CMCC)

Presently at INGV there are two operational systems running in parallel. The first is the national system composed of OPA oceanographic model and the three-dimensional assimilation scheme called OceanVar.

The second system is applied in the EU project MyOcean, and consists of the NEMO oceanographic model and OceanVar.

The major parts of OPA and NEMO codes are the same. Both share the same computational domain, which includes a part of the Atlantic Ocean, and the horizontal resolution is $1/16^0$. However, in the particular set-up NEMO has open lateral boundary conditions, partial cell representation of bottom topography and calculates evaporation-precipitation flux from the estimated latent heat flux and climatological precipitation. On the other hand, the OPA set-up applies closed lateral boundary conditions, has the full cell representation of the bottom topography and the evaporation-precipitation flux is calculated by the relaxation of the surface salinity to the monthly climatology.

OceanVar is a three-dimensional variational data assimilation scheme developed at INGV for oceanographic applications. It combines the representation of vertical covariances between temperature and salinity, represented by EOFs, with horizontal isotropic covarinces in the form of Gaussian functions of distance. The horizontal covariances are modelled by the application of recursive filters. A novel solution for the recursive filter boundary conditions is applied at coastal boundaries. The sea level and barotropic velocity covariances corresponding to temperature and salinity perturbations are modelled by applying a barotropic model forced by the vertically integrated buoyancy force. Covariances with the baroclinic part of the velocity are estimated from the geostrophic relationship, and the velocity field is filtered by the divergence damping filter to remove unphysical features along the coastal boundaries.

The global reanalyses system at CMCC has implemented OceanVar with the global set-up of the OPA model at the horizontal resolution of 2^0. The reanalyses assimilated SLA observations by satellites, and in situ observations of temperature and salinity in the period 1992-2006.

*See presentation **4.6_GOVST_MFS.ppt** (Appendix C.1)*

4.7 MOVE/MRI.COM

Provided by Masafumi Kamachi, JMA-MRI, Japan

Background

The main Japanese contribution, as assimilation centers, to JCOMM/ET-OOFS and GODAE Ocean View consists of the Japan Meteorological Agency operational systems for ocean weather forecasting and ocean climate (El Nino and seasonal) forecasting, and research groups such as MOVE/MRI.COM by MRI for both of ocean weather and climate.

GODAE Achievements and measures of success

1. Product of assimilation and prediction will be adopted for operational oil spill prediction in JMA.
2. Started to develop assimilation method of sea ice concentration. Input data is MGDSST (Japan GHRSST by JMA)
3. Examination of operational monitoring metrics (related to JCOMM/ET-OOFS)
4. OSE experiments for examining impacts of Tao/Tritton array, ARGO, satellite SSH.
5. Started to re-examine operational ocean service in JMA.

*See presentation **4.7_GOVST_MOVE-MRI.ppt** (Appendix C.1)*

4.8 US-Navy

Provided by Pat Hogan, NRL,USA

GODAE OceanView report – Global and RELO NCOM

This report describes the current global and regional applications of operational systems running at the U.S. Naval Oceanographic Office that use the Navy Coastal Ocean Model (NCOM) as their core circulation model.

The present Global Ocean Prediction System (GOPS v2.6) is based on a global implementation of NCOM at a nominal 1/8◦ resolution (1/6◦ in the tropics and subtropics; Barron et al., 2004). It relies heavily on the assimilation of full fields of synthetic temperature and salinity generated using the Modular Ocean Data Assimilation System (MODAS) "dynamic climatology" (Fox et al., 2002) combined with Navy Layer Ocean Model (Shriver et al., 2007) nowcasts and forecasts of SSHA and ocean surface mixed layer depth. The latest version of the NCOM-based GOPS uses the Navy Coupled Ocean Data Assimilation (NCODA) system, a 3D multivariate optimum interpolation system that produces simultaneous analyses of temperature, salinity, geopotential, and vector velocity using remotely-sensed SST, SSH, and sea ice concentration, plus in situ observations of temperature, salinity, and currents from ships, buoys, XBTs, CTDs, profiling floats, and autonomous gliders. GOPSv2.6 uses NCODA to perform analyses of temperature and salinity with the MODAS synthetic fields as the background and recent *in situ* profile observations as observational data. In the global system here is no cycling between the NCOM forecasts and the analysis systems.

The Relocatable Circulation Prediction System Version 1.0 (RELO V1.0) provides a capability for rapidly relocatable ocean forecast modeling and data assimilation, for use in operational forecast support for antisubmarine warfare, intelligence, surveillance, and reconnaissance, Navy special operations, and other applications as needed. It supports Naval Oceanography Operations Command requirements for a mesoscale atmospheric/ocean model (ASW), and for high-resolution near-shore and mid-deep water current models. It produces nowcasts and forecasts of three dimensional ocean temperature, salinity and current structure, the surface mixed layer, the location of mesoscale features such as eddies, meandering currents and fronts, and the generation and propagation of the external and internal tide. Like the global model, the forecast component is NCOM, and system is used to produce real-time forecasts of the ocean state (sea level and 3D temperature, salinity, and horizontal currents). Each regular cycle of the system is organized around an analysis that produces an estimate of the ocean state by assimilating newly-available observations into the previous best estimate of the ocean state, which was the forecast model output valid at the current analysis time, calculated during the previous cycle. The forecast system consists of core ocean data analysis and forecast modules, software for domain configuration, surface and boundary condition forcing processing, and job control, and global databases for ocean climatology, bathymetry, tides, and river locations and transports. Like global NCOM, the analysis component is NCODA. IN RELO, the NCODA analysis uses the forecasts from the NCOM model as the reference fields in a set of optimal interpolation analyses, and the result is a set of correction fields corresponding to the NCOM forecast fields. The RELO system supports one-way nesting and multiple model update methods.

The RELO system has been used to generate ensembles to gauge forecast uncertainty in the region of the Hawaiian Islands. The ensemble system uses the ensemble transform technique with error variance estimates from the NCODA analysis to represent initial condition error. Perturbed surface forcing or an atmospheric ensemble is used to represent errors in surface forcing. The ensembles have been used in a variety of applications, for example defining the window of uncertainty in the forecast of Lagrangian trajectories.

4.9 NCEP/RTOFS

Provided by Hendrik L. Tolman, NOAA/NCEP, USA

This National report focuses on work done at NOAA/NCEP, and does not include work done at NOAA/OAR, in particular GFDL and AOML ocean modeling work.

1) GODAS: The Global Ocean Data Assimilation system (GODAS) has long been part of NCEP's climate forecast system. Currently, GODAS assimilates temperature profiles (XBT, Argo, TAO, TRITON, PIRATA), synthetic salinity profiles derived from a climatological T-S relation and Jason-

1 altimetry, as well as relaxation to Reynolds OIv2 SST. The current CFS consists of a T126 GFS, and MOM3. In 2010, the CFS will be upgraded to include a T382 GFS and MOM4, with full land and ice modeling. MOM3 and MOM4 are provided by GFDL and a treated as black-box models at NCEP.

2) RTOFTS-Atlantic: (Real Time Ocean Forecasting System) This model has had serious problems due to our inability to apply interactive QC in our operational environment. Massive spurious SSH and current features can now be seen in the tropical Atlantic. We expect to remedy this summer 2009, if and when the NCEP moratorium on model changes is lifted. RTOFS Atlantic data similar to GODAS, with direct SST assimilation from various sources and with Altimeter data from both Jason-1 and ENVISAT. Jason-2 data will be included early 2010. This model runs once per day with a six day forecast.

3) RTOFS-Global: NCEP is adopting the 1/12° global HYCOM model from NRL to become RTOFS-Global. The model is scheduled to go into operations early 2010, with live initialization provided by the Navy. With our next computer upgrade in 2012, we hope to have developed an in-house initialization scheme in close collaboration with the US Navy. In parallel to this eddy-resolving model, we intend to develop lower resolution global HYCOM models for coupling with global weather models. This will follow the design of the "weather-climate" approach of NCEP with high resolution deterministic models and lower resolution ensembles out to 1-year forecasts. The coupling work is done in the context of the Earth System Modeling Framework (ESMF).

4) Coupled hurricane modeling: NCEP is testing a coupled HWRF-RTOFS regional relocatable hurricane model in parallel operations for operational implementation for the 2010 Atlantic Hurricane season. The ocean part of this model is nested in RTOFS-Atlantic. Further development is ongoing to expand this to a coupled weather-ocean-wave model by including WAVEWATCH III ^{TM} to this coupled model suite.

*See presentation **4.9_GOVST_NCEP.ppt** (Appendix C.1)*

4.10 TOPAZ

Provided by Laurent Bertino, NERSC, Norway

TOPAZ progress report

The main activities are related to the MyOcean project, during which the work on TOPAZ will be collaborative, involving 2 additional Norwegian institutes met.no, the IMR and NIERSC in Russia.

System development

A TOPAZ4 prototype is being prepared, both in view of the MyOcean reanalysis and for transition to operational runs at met.no.

Model development:
The latest version of HYCOM (v2.2.12) has been adapted to NERSC interface, replacing HYCOM v2.1. The model upgrade should improve various aspects of the simulations, in particular reduce the numerical diffusion below the mixed layer and improve the numerical stability in shallow waters. In addition to the model upgrade, other upgrades have been implemented and tested at NERSC:

- Increase of the number of hybrid vertical layers from 22 to 28
- New advection scheme for sea-ice (WENO: Weighted Essentially Non-Oscillatory scheme)
- Correction of the snow module and parameterization of inhomogeneous subgrid-scale snow distribution
- Tuning of the sea-ice strength (P*)

- River fluxes derived from a hydrological model (TRIP, Oki & Sud, 1998)
- Boundary conditions in the Bering Strait (0.8 Sv inflow)

The interface to ERA-Interim data from ECMWF has been also developed.

Assimilation developments:
Assimilation of altimeter track data and of Ferrybox data has been tested for inclusion in TOPAZ4. An EnKF assimilation module has been implemented for assimilation into the HYCOM-NORWECOM with a Gaussian anamorphosis for strongly non-Gaussian variables.

Distribution developments
The TOPAZ3 surface currents are used by ECMWF for wave forecasting in the North Atlantic, until the ice edge. The TOPAZ results in the Fram Strait are used within the European DAMOCLES IP for evaluating an acoustic tomography array.
The TOPAZ3 currents are used for developing an iceberg drift model, and producing a simulated climatology of icebergs in the Barents Sea.
An open source OPeNDAP client (DAPPER/DCHART, developed at NOAA) has been set up for dynamical viewing of TOPAZ data.
See the development page: http://eva.nersc.no:8183/dchart/index.html

Outreach activities are ongoing in China at the Nansen-Zhu Center (IAP, Beijing), India (NERCI in Kochi and INCOIS in Hyderabad) and South Africa (Uni. Cape Town).

*See presentation **4.10_GOVST_TOPAZ.ppt** (Appendix C.1)*

4.11 NMEFC

Provided by Wang Hui, SOA, China

Ocean Forecasting Systems in **National Marine Environmental Forecasting Center** of China

As a unique national operation center, National Marine Environmental Forecasting Center (NMEFC) provides marine forecasting products directly under the management of the State Oceanic Administration (SOA) of China. It collects and disseminates the real-time data from the GTS system and the national marine observation network, performs marine environmental forecast, marine disaster pre-warning and provides service and technical supports for marine economy, marine management and national safety. The main products in NMEFC include sea wave, storm surge, tsunami, harmful algae bloom (red tide), sea ice, sea current, sea temperature and salinity, ENSO, beach forecast, oil-spill forecast, sea surface height and marine weather of China seas. These forecasting products are directly provided to the users such as governments, industries, public and other special users through TV, internet, fax, mobile messages or other methods.

NMEFC owns global and local operational ocean numerical forecasting system for marine environment and marine disaster. Local systems include the Northwest Pacific, the China Seas, the Bohai Sea, the East China Sea, the South China Sea, and Changjiang River Estuarine, the Pearl River Estuarine, the Beibu Gulf, and so on. Ocean Temperature and current are forecasted by using POM, HYCOM, FVCOM and MOM4 models. For ocean wave, NMEFC provides 72-hour forecast products by using SWAN, WAM4 and WaveWatch III models. For Storm surge, NMEFC has autonomously established typhoon and extra-tropical storm surge model (CTS model and CES model) covering the whole China Sea. For Sea ice, a coupled model has been built by using POM and a three-level sea ice model. NMEFC is developing the ocean ecosystem forecasting system in the Bohai Sea and the South China Sea. For Tsunami, NMEFC has developed two autonomous models named Operational China Tsunami Transit Time Forecast Model (CTTT) and Operational China Numerical Forecast Model of Tsunami (CTSU). For Climate change, NMEFC issues ENSO forecast every one month by using the CCSM3 and the CGCM model (from Institute of Atmospheric Physics, CAS). NMEFC also has own oil spill system and marine rescue system

coupled into the operational ocean numerical forecasting system. All the systems have been forced by the numerical weather forecast system which developed by using MM5 and WRF model.

5. GODAE Summer School

GB presented the status report for the GODAE Summer School. The costs for the summer school are confirmed to be as anticipated and the student online registration has been opened. It will be required to remind potential attendees of the importance to apply for an Australian VISA in good time, latest by September 2009, in order to avoid disappointment.

Action GM-I-9:	**AF and KWB** to promote/advertise the website as widely as possible, providing the link to the summer school website

Action GM-I-10:	**GB** to provide email-text/flyer to be sent out with the advertisement email and add information about VISA requirements

It is expected to admit around 50 students, probably mostly post-docs and early career professionals. The list of student applications will be ranked by the lectures in order of merit and diversity. The selection process will be reviewed prior to confirmation of spaces.

Action GM-I-11:	**AS** to contact local professors to ask if the summer school counts as an accredited course

The availability of studentships depends on the available funding. An internal funding proposal will be distributed to BoM and CSIRO. Potential external supporters also include the British Council (for UK participants), the New Zealand Royal Society, etc.

Action GM-I-12:	**AS** to ask lecturers to prepare lecture draft notes (could be bullet points). These notes could be published as a book after the summer school.

Action GM-I-13:	**GB and AS** to pass information on computer lab lesson on to the lecturers (afternoon lectures)

Action GM-I-14:	**GB and AS** to contact lecturers, to ask for hardware/software requirements to run exercises

6. GODAE Special Journal Issue

MJB gave a short presentation on the progress of the publication of the GODAE Special Issue. Following the GODAE Final Symposium, selected authors have worked on providing a representative set of papers to mark the achievements of GODAE over the last ten years and publish these in a dedicated special issue through the Oceanography Society (TOS) and its magazine.

Eleven full and eight half length papers have been selected and all papers were submitted in time.

No	Title	Main author(s)[4]
1	Introductory paper: GODAE – The Global Ocean Data Assimilation Experiment	Mike Bell, Met Office, Pierre-Yves Le Traon, Ifremer
2	An Overview of Global Observing Systems Relevant to GODAE	Candyce Clark & Stan Wilson (NOAA)
3	The GODAE High Resolution Sea Surface Temperature Pilot Project (GHRSST-PP)	Craig Donlon, ESA

[4] Co-authors are not listed

4	Argo: the challenge of continuing 10 years of progress	Dean Roemmich, UCSD
5	Serving GODAE data and products to the ocean community	Jon Blower, ESSC, Frederique Blanc, CLS
6	Data assembly and processing for operational oceanography: 10 years of achievements	Pierre-Yves Le Traon, Ifremer
7	GODAE systems in operation	Eric Dombrowsky, Mercator Ocean
8	Ocean Data Assimilation Systems for GODAE	Jim Cummings, NRL
9	High Resolution Global and Basin-Scale Ocean Analyses and Forecasts	Harley Hurlburt, NRL, Masafumi Kamachi, JMA/MRI
10	Validation and intercomparison studies within GODAE	Fabrice Hernandez, Mercator Ocean
11	Observing System Evaluations using GODAE systems	Peter Oke, CSIRO
12a	Ocean Initialization for Seasonal Forecasts	Magdalena Balmaseda, ECMWF
12b	Ocean State Estimation for Climate Research	Tony Lee, JPL/NASA
13a	Marine oil pollution prediction	Bruce Hackett, Met.no
13b	Applications of GODAE Ocean Current Forecasts to Search & Rescue and Ship Routing	Fraser Davidson, DFO
14a	Applications from GODAE to Navies throughout the world	Gregg Jacobs, NRL
14b	Applications of satellite-derived ocean measurements to tropical cyclone intensity forecasting	Gustavo Goni, NOAA
15a	Applications In Coastal Modelling and Forecasting	Pierre De Mey, LEGOS
15b	Integrating biogeochemistry and ecology into ocean data assimilation systems	Pierre Brasseur, CNRS

Table 4: Paper titles & authors as submitted to the Oceanography Magazine (status June 2009)

This special issue is dedicated to Christian Le Provost and Yves Menard, which the whole GODAE community would like to thank for their invaluable contributions to GODAE.

The publication of the special issue is planned for September 2009.

See *presentation **6.1_Special_Issue.ppt** (Appendix C.1)*

7. International linkages

GODAE OceanView will require to closely collaborating with international research groups & inter-governmental organisations and agencies. In order to allow exchange, the GOVST is including a number of members from international group.

7.1 MyOcean

Presented by Pierre Bahurel, Mercator Ocean, France

PBA presented the MyOcean project, explaining details of this 3-years EU project (2009-2012), which is developing the Marine Core Service unit for the GMES (Global Monitoring for the Environment and Security) Programme. The objective of this project is to provide a pan-European service for ocean monitoring and forecasting products, targeting a broad user group, including intermediate users and specialised service providers. 61 partners in 29 countries will contribute to the success of the project

MyOcean will deliver regular and systematic reference information (processed data, elaborated products) on the state of the oceans and regional seas at the resolution required by intermediate users &

downstream service providers, of known quality and accuracy, for the global and European regional seas. Access to products is free and will be provided by one single service desk connected to all MyOcean production units in Europe.

MyOcean plans to organise a user symposium in the next few years. One important outcome will be the assessment of the user uptake and the evaluation of user requirements and satisfaction.

*See presentation **7.1_MyOcean.ppt** (Appendix C.1)*

7.2 Argo

Presented by Mathieu Belbeoch, JCOMMOPS

MAB informed the GOVST on the current status of Argo. Although Argo achieved the "3000 floats milestone" in 2007 with global distribution and a comprehensive data management system, the Argo Core Mission, to establish 3200 floats between 60°N and 60°S, no marginal seas) is not yet achieved.

Float deployments still remains a challenge. Most floats are deployed by opportunistic use of commercial ships and RVs. In some remote regions this is not sufficient. U.S./New Zealand collaboration has resulted in the deployment of over 600 floats (plus drifters) using a cost effective vessel, RV Kaharoa (28 m length, 5 crew), but due to lack of funding, future deployments are uncertain.

Argo is the most internationally collaborative program in the history of oceanography. A dozen countries are sustaining the global network, another dozen takes care of regional gaps, and many other are supporting Argo. Argo invests highly in fostering the participation of new countries and is also investing in capacity building exercises (float technology workshop, one-on-one visits and training, teacher training courses, etc.). Argo has also starting to engage with Google Ocean, which would be to publish relevant material. MAB is inviting the GOVST members to an Argo-Workshop in Gabon, which will take place next year.

In summary, MAB highlighted the Argo objectives for the next years related to array performance:

- Achieve mean float lifetimes of 4 years or longer, needed to sustain the core Argo array with 800 floats deployed per year
- Deploy more floats in the southern hemisphere to achieve the array's design requirements
- Extend instrument capabilities for profiling to 2000 m everywhere in the oceans
- Sustain funding (Argo is 20% underfunded)

In particular, MAB would like feedback from the GOVST on the following issues:

- What should be Argo's sampling plan for high latitudes or marginal seas?
- Should Argo sample the deep ocean?
- Should Argo be denser in all WBC regions?
- How the data distribution could be improved?

Action GM-I-15: **All (particularly members of the OSE/OSSE TT)** to provide feedback to Argo (Mathieu Belbeoch) on:
- User requirements
- Data quality from operational centres
- Demonstration the value of Argo (impact studies)

*Presentation **7.2_Argo.ppt** (Appendix C.1)*

Action GM-I-16: **All** are invited to feedback to GHRSST (Craig Donlon) – on the usefulness and value of GHRSST products (e. g. OSEs)

8. GODAE OceanView Work Plan

The last day of the meeting was dedicated to discuss the GOVST work plan which will be developed covering activities and goals for the next 4 years. It was agreed that the work plan will be a living document, evolving with time to take new issues into consideration. Following the break-out sessions earlier in the meeting, AS prepared and presented a first draft of the contents of the GODAE OceanView Work Plan (see Appendix F.1).

The process of writing this consolidated document will include certain specifications and methodology. The work plan needs to be aligned with already existing work plans (GOVST members, task teams, etc.). Its development will need to consider limitations of resources, but also identify and pursue synergistic activities. For newly proposed task teams a detailed justification about scope, objectives and international linkages is required.

The table of contents was proposed and is listed below:

1. *Introduction/Background/Description (incl. Goals and Objectives)*
2. *Common/Overarching Issues*
3. *System and Centre Plans*
4. *GODAE OceanView Science Team (incl. Patrons' Group and ET-OOFS)*
5. *Intercomparison and Validation Task Team*
6. *Observing System Evaluation Task Team*
7. *Coastal Oceans and Shelf Seas Task Team*
8. *Marine Ecosystem Analysis and Prediction Task Team*
9. *Possible New Task Teams*
    a. *Pilot Task Team on Coupled Modelling*
    b. *Pilot Task Team on Forecasting Systems*
10. *GODAE OceanView Project Office*
11. *Capacity Building*
12. *Outreach, Education, Visibility*

Each activity should be described under the subsequent headings and should contain:

- Description of the activity
- Timeline (1-4 years)
- Measure of success

For measuring the success of GODAE OceanView activities, the following options were suggested (others might be considered):

- publications (peer-reviewed)
- innovation statistics
- Media attention
- Demonstration of some special cases – societal benefits

There could be a requirement to commit to broader/higher objectives when defining the measures of success. For review processes we will need to collect all successes from the different headings in a combined document.

GOVST members have been identified to contribute to the collaborative writing of the GODAE OceanView Work Plan. Names have been assigned to draft individual chapters in the work plan.

Action GM-I-17: AS & ED to draft
1) Introduction/Background/Description (incl. Goals and Objectives)

Action GM-I-17: AS, ED and Hans Bonekamp to draft

2) Common/Overarching Issues

Action GM-I-18: System representatives (see also writers of the national reports) to draft
3) System and Centre Plans

Action GM-I-19: AS, ED & MJB to draft
4) GODAE OceanView Science Team

Action GM-I-20: Fabrice Hernandez & Matt Martin to draft
5) Intercomparison and Validation Task Team

Action GM-I-21: **Peter Oke & Gilles Larnicol** to draft
6) Observing System Evaluation Task Team

Action GM-I-22: Pierre De Mey, Villy Kourafalou & Hendrik Tolman to draft
7) Coastal Oceans and Shelf Seas Task Team

Action GM-I-23: **Pierre Brasseur, Rosa Barciela & Laurent Bertino** to draft
8) Marine Ecosystem Analysis and Prediction Task Team

Action GM-I-24: **GB, Jim Cummings, Hal Ritchie, Nicolas Ferry, Magdalena Balmaseda ??** to draft
9) Pilot Task Team on Coupled Modelling

Action GM-I-25: Pat Hogan & Eric Chassignet ?? to draft
10) Pilot Task Team on Forecasting Systems/Models

Action GM-I-26: KWB, AS & ED to draft
11) GODAE OceanView Project Office

Action GM-I-27: Fraser Davidson, Villy Kourafalou, Laurent Bertino & Albert Fischer ?? to draft
12) Capacity Building & Education

Action GM-I-28: KWB, Srdjan Dobricic & Hans Bonekamp to draft
13) Outreach & Visibility

The timetable for completing the GODAE OceanView work plan first draft has been set as:

- **June to 15 September 2009**: Authors work on their contribution to the work plan and submit to GODAE OceanView PO by end of August 2009. Between end of August and 15 September Co-chairs will review entries.
- **15 September 2009**: Co-chairs and GODAE OceanView PO compile one document and circulate to authors for review.
- **October 2009**: GODAE OceanView PO submits DRAFT of GODAE OceanView Work Plan to Patrons and JCOMM Co-chairs

9. Next GOVST meeting

The next GOVST [GOVST-II] will take place at the JAMSTEC Tokyo Office or another place in Japan in September/October 2010. Masafumi Kamachi and Toshiyuki Awaji have kindly agreed to support the organisation of the meeting.

Appendices

Appendix A.1 – Attendance list

Co-chairs:	Eric Dombrowsky, Mercator Ocean, France	(ED)	
	Andreas Schiller, CSIRO, Australia	(AS)	
GOVST members:	Toshiyuki Awaji, Kyoto University, Japan	(TA)	
	Mathieu Belbeoch, JCOMMOPS	(MAB)	
	Laurent Bertino, NERSC, Norway	(LB)	
	Hans Bonekamp, EUMETSAT, Germany	(HB)	
	Gary Brassington, BoM, Australia	(GB)	
	Pierre Brasseur, CNRS/LEGI, France		(PBR)
	Jim Cummings, NRL, USA	(JC)	
	Fraser Davidson, DFO, Canada	(FD)	
	Pierre De Mey, CNRS/LEGOS, France		(PDM)
	Srdjan Dobricic, INGV/ CMCC, Italy	(SD)	
	Nicolas Ferry, Mercator Ocean, France	(NF)	
	Fabrice Hernandez, Mercator Ocean, France	(FH)	
	Pat Hogan, US-Navy, USA	(PH)	
	Masafumi Kamachi, JMA/MRI, Japan	(MK)	
	Villy Kourafalou, University of Miami, USA	(VK)	
	Gilles Larnicol, CLS, France	(GL)	
	Matt Martin, Met Office, UK	(MM)	
	Peter Oke, CSIRO, Australia	(PO)	
	Hal Ritchie, Environment Canada	(HR)	
	Hendrik Tolman, NOAA/NCEP, USA	(HT)	
	Kirsten Wilmer-Becker, Met Office, UK	(KWB)	
Patrons Group:	Pierre Bahurel, Mercator Ocean, France	(PBA)	
	Mike Bell, Met Office, UK	(MJB)	
	Pierre-Yves Le Traon, Ifremer, France	(PYLT)	
	Francois Parisot, EUMETSAT, Germany	(FP)	
	Steve Piotrowicz, NOAA, USA	(SP)	
Invitees:	Jean-Louis Fellous, JCOMM	(JLF)	
	Shuhei Masuda, JAMSTEC, Japan	(SM)	

Apologies received from:

Magdalena Balmaseda, ECMWF, UK
EricChassignet, COAPS/University of Miami, USA
Paul Digiacomo, PICO, USA
Craig Donlon, ESA, The Netherlands
Albert Fischer, IOC, France
Scott Harper, US-Navy/ONR, USA
Tony Lee, JPL/NASA, USA
EricLindstrom, NASA, USA
Rui Ponte, AER, USA
Ralph Rayner, IMarEST, UK
Dean Roemmich, UCSD, USA
Neville Smith, BoM, Australia
Eric Thouvenot, CNES, France
Hui Wang, SOA, China

Appendix B.1 – Meeting outline

1st Meeting of the GODAE OceanView Science Team (GOVST)

Status of the GODAE OceanView and Development of a plan for future work

Where: Mercator Ocean Toulouse, France

When: 8 – 10 June 2009

Duration: 3 days

Organisers: Eric Dombrowsky (Mercator Ocean), Andreas Schiller (CSIRO), Laetitia Mayeur (Mercator Ocean), Kirsten Wilmer-Becker (Met Office)

Purpose of the meeting

The scientists leading the scientific development of the major systems for generating real-time operational ocean forecasts, hindcasts and reanalysis will constitute the core of the GODAE OceanView Science Team (GOVST). The primary purpose of this team is to accelerate the improvement and exploitation of these systems through exchange of information and expertise and the coordination of joint assessments.

GOVST will work on a five-year planning and review cycle and will meet at least once a year.

Initial tasks of GODAE OceanView:

- Consolidate the inner core team, establish collaboration and synergies with other groups (e.g. CLIVAR GSOP) to accelerate progress in the area of ocean forecasting
- Develop a work plan with tangible outcomes
- Continue to develop sustainable joint task teams (or pilot projects) aiming to realise the benefits of the GODAE OceanView systems, in cooperation with experts engaged in GEO, CLIVAR, IMBER etc.
- Work with GSSC, JCOMM and CEOS to find the most efficient and effective way for GODAE OceanView to contribute to the prioritisation, advocacy, implementation and exploitation of the GOOS.

Financial and in kind support required to run the project office, organise Science Team meetings, symposia and summer schools will be provided by stakeholder agencies/groups. They will be represented in the GODAE OceanView Patrons Group which will provide guidance to the Science Team in addition to visibility and recognition of the value of GODAE OceanView at national and international levels. It is planned to organise the first meeting of the GODAE OceanView Patron's group as a side event to the 1st annual meeting of GOVST.

Scope of the meeting

The societal benefits from GODAE OceanView systems will only be realised through joint work with other teams of experts. Potential benefits include improvements in the day-to-day management of coastal waters, management of marine ecosystems, weather prediction from hours to decades ahead, and the expected impacts of climate change on the oceans and coastal waters.

This first meeting will allow us to engage on:

1. Discussions about GODAE OceanView structures, plans and responsibilities

Share up-to-date information on the status of GODAE OceanView (i.e. scope, objectives, membership, patrons group, international relationships, and task teams). Review GOVST linkages with international research/intergovernmental groups (e.g.GSOP/CLIVAR, WGNE, GHRSST, Argo, OOPC, PICO, others).

2. National Status Reports, reports from Task Teams and activities of international bodies

provide a platform for exchange of information with peers on status of national forecasting systems, associated scientific challenges, and international initiatives associated with ocean forecasting (e.g. IOC, JCOMM, GOOS etc.) Summary reports from (established) Task Teams on recent activities and future plans, including links to other relevant international activities.

3. Development of 4-year work plan for GODAE OceanView

- Where do we (as a community) want to be in 2014?
- What are the objectives?
- How will we achieve a greater uptake of and impact by ocean forecasting and what can GODAE OceanView do to accelerate achieving the objectives?
- What are the scientific challenges and activities we need to initiate to meet these goals (e.g. scientific foci, outreach activities etc.)?
- How will we measure success in achieving our objectives (e.g. annual milestones, peer-review in 2014)?

Appendix B.2 – Agenda

Presentations will be motivated with the following questions prior to the meeting:

Session 1:	Introduction to GODAE OceanView What is the status, plans, progress and issues related to development of GODAE OceanView?
Session 2:	Co-chairs to provide a discussion paper/presentation on proposed objectives of a 4-year work plan and how to implement it.
Session 3:	Update (for existing Task Teams (TTs)) and future plans for TTs What is the status, plans, progress and issues related to TTs?
Session 4:	National reports What is the status, plans, progress, strengths and weaknesses of each national effort?
Session 5:	GODAE Summer School
Session 6:	GODAE Special Issue – Oceanography Magazine
Session 7:	GOVST links with international research/intergovernmental groups

Location: CLS, "A" Building - Room A20 Ground floor

Day 1 - Monday, 8 June 2009

09:00	Eric Dombrowsky (ED)/Andreas Schiller (AS) - **Welcome and workshop objectives**
Session 1:	**Introduction and overview of GODAE OceanView plans/responsibilities (AS, ED & Kirsten Wilmer-Becker (KWB))**
09:10	The scope of GODAE OceanView (AS & ED)
09:40	Objectives (discuss a 4-year plan) (AS & ED)
10:10	International relationships (ownership & linkages) (AS & ED)
10:40	**Coffee/tea break**
11:10	Task teams (also discuss the formation of new task teams – coupled ocean/atmos modelling and forecasting ?) (AS & ED)
11:40	Membership (AS, ED & KWB)
12:00	Organisation of GODAE OceanView - Report from the project office (KWB)
12:30	**Lunch**
12:30 - 14:30	**Patrons' Group Meeting (incl. lunch)** **[Patrons and co-chairs only]**
The main meeting will resume at 14:30	
Session 2:	**Presentation of draft paper and discussion of work plan for the next 4 years**
14:30	Report from JCOMM/IOC (Jean-Louis Fellous)
15:00	Report from ET-OOFS (Gary Brassington)
15:30	**Coffee/tea break**
16:00	First discussion of work-plan for the next 5 years (AS & ED) (to be continued on day 3)
17:30	**End of Day 1**

Day 2 - Tuesday, 9 June 2009

Session 3:	**Reports from the (established) GODAE OceanView Task Teams (summaries of previous activities and future plans) (TT chairs)**
09:00	Intercomparison TT (Fabrice Hernandez, Matt Martin)
09:30	OSE TT (Peter Oke, Gilles Larnicol)
10:00	Coastal TT (Pierre De Mey, Villy Kourafalou)
10:30	**Coffee/tea break**
11:00	Ecosystem TT (Pierre Brasseur, *Niki Gruber)*
Session 4:	**Reports/response from representatives of the national forecasting systems (part 1)**
11:30	BLUElink, Australia (Gary Brassington - GB) (30 min)
12:00	C-NOOFS, Canada (Fraser Davidson) (30 min)
12:30	**Lunch**
14:00	FOAM, NCOF, UK (Matt Martin) (30 min)
14:30	HYCOM/NCODA, USA (Eric Chassignet, Jim Cummings) (30 min)
15:00	Mercator-Ocean, France (Nicolas Ferry) (30 min)
15:30	**Coffee/tea break**
16:00	MFS, Italy (Srdjan Dobricic) (30 min)
16:30	MOVE/MRI.COM, Japan (Masafumi Kamachi) (30 min)
17:00	NLOM/NCOM (Pat Hogan) (30 min)
17:30	**End of day 2**
19:00	**Dinner - place to be confirmed (self-pay)**

Day 3 - Wednesday, 10 June 2009

Session 4:	**Reports/response from representatives of the national forecasting systems (part 2)**
09:00	RTOFS, NCEP (Hendrik Tolman) (30 min)
09:30	TOPAZ, Norway (Laurent Bertino) (30 min)
Session 5:	**GODAE Summer School**
10:00	GODAE Summer School – status report (Gary Brassington)
10:30	**Coffee/Tea break**
Session 6:	**GODAE Special Issue (TOS)**
11:00	GODAE Special Issue – status report (Pierre-Yves Le Traon, Mike Bell, KWB)
Session 7:	**GOVST linkages with international research/intergovernmental groups – Reviews**
11:30	MyOcean – Pierre Bahurel (30 min)

12:00 Argo – Mathieu Belbeoch (30 min)

12:30 **Lunch**

13:30 GHRSST – Matt Martin (30 min) **- TBC**

Continued session 2: Discussion of work-plan for the next 4 years

14:00 Continuation of the discussion from day 1, including discussion on how to make GOVST work effectively

15:30 **Coffee/tea break**

16:00 Any other business (next meeting)

16:30 **Meeting closes**

Appendix C.1 – Presentations

Agenda item	Title of presentation	Presenter
Welcome and meeting objectives	GOVST-welcome.ppt (2.3 MB)	Andreas Schiller (CSIRO)
1.1 The scope and objectives of GODAE OceanView	1.1-20090608-GOV-ST_EDY.ppt (0.2 MB)	Eric Dombrowsky (Mercator Ocean)
1.2 International relationships and task teams	1.2.-GOVST_Schiller.ppt (0.3 MB)	Andreas Schiller (CSIRO)
1.3 GODAE OceanView Membership	1.3_GOVST_membership.ppt (0.3 MB)	Kirsten Wilmer-Becker (Met Office)
1.4 GODAE OceanView project office	1.4_GOVST_organisation.ppt (2.6 MB)	Kirsten Wilmer-Becker (Met Office)
2.1 Report from JCOMM/IOC	2.1_JCOMM-Report_to_GOVST.ppt (0.4 MB)	Jean-Louis Fellous (JCOMM)
2.2 Report from ET-OOFS	2.2_JCOMM_ET-OOFS_GOVST.ppt (6.4MB)	Gary Brassington (BoM)
3.1 Intercomparison TT	3.1_GOVST_Intercomparison_TT.ppt (3.7MB)	Fabrice Hernandez (Mercator Ocean) & Matt Martin (Met Office)
3.2 OSE TT	3.2_GOVST_OSE_TT.ppt (12.3MB)	Peter Oke (CSIRO) & Gilles Larnicol (CLS)
3.3 Coasta TT	3.3_GOVST_Coastal_TT.ppt (8.4MB)	Pierre De Mey (LEGOS) & Villy Kourafalou (RSMAS)
3.4 Marine ecosystem TT	3.4_GOVST_Marine_ecosystem_TT.ppt (7.6MB)	Pierre Brasseur (CNRS)
4.1 BLUElink (Australia)	4.1a_CAS_vision_paper&Bluelink.ppt (9.2MB) 4.1b_National-report-list.pdf (0.1MB)	Gary Brassington (BoM)
4.2 CONCEPTS (Canada)	4.2_Canada_overview.ppt (14.8MB)	Fraser Davidson (DFO)
4.3 FOAM, NCOF (UK)	4.3_GOVST_UK_report.ppt (39.7MB)	Matt Martin (Met Office)
4.4 HYCOM/NCODA (USA)	4.4_GOVST_HYCOM.ppt (24.8MB)	Jim Cummings (NRL)
4.5 Mercator Ocean (France)	4.5_GOV-ST_Mercator-Ocean.ppt (3.8MB)	Nicolas Ferry (Mercator Ocean)
4.6 MFS (Italy)	4.6_GOVST_MFS.ppt (14.2MB)	Srdjan Dobricic (CMCC, INGV)
4.7 MOVE/MRI.COM (Japan)	4.7_GOVST_MOVE-MRI.ppt (18.4MB)	Masafumi Kamachi (JMA/MRI)
4.8 US-Navy (USA)		Pat Hogan (NRL)
4.9 NCEP, RTOFS	4.9_GOVST_NCEP.ppt (2.4MB)	Hendrik Tolman (NOAA/NCEP)
4.10 TOPAZ (Norway)	4.10_GOVST_TOPAZ.ppt (14.3MB)	Laurent Bertino (NERSC)
5.1 GODAE Summer School - status report	5.1_GODAE_ETOOFS_summerschool.ppt (11.5 MB)	Gary Brassington (BoM)
6.1 GODAE Special Issue - status report	6.1_Special_Issue.ppt (0.1MB)	Mike Bell (Met Office)
7.1 MyOcean	7.1_MyOcean.ppt (12.3MB)	Pierre Bahurel
7.2 Argo	7.2_Argo.ppt (4.7MB)	Mathieu Belbeoch

Appendix D.1 – Actions

New members

Action GM I-1:	**GB and LB** to contact potential new members of the GOVST in Brazil and India. It will be required to identify only one person per system/country.

JCOMM

Action GM-I-2:	**AS and ED** to contact Peter Dexter & Jean-Louis Fellous (JCOMM co-presidents) to negotiate the relationship between JCOMM and GOVST in regard to reporting and other issues.

Task teams

OSSE/OSE

Action GM-I-3:	**All** to provide co-chairs with recommendation for new core members of the OSE/OSSE task team
Action GM-I-4:	**Task team co-chairs (PO & GL)** to formalise new members through invitation

Coastal and shelf seas

Action GM-I-5:	**All** national representatives to contact the coastal TT co-chairs if they wish to contribute/participate in the coastal task team

CAS vision paper

Action GM-I-6:	**All** to comment of the foci for a vision paper invited by WMO/CAS on coupled systems for short range prediction/seamless prediction by 25 July 2009. What evidence/documents/ reports should be passed on to be included in the vision paper? Feedback to Peter Dexter.

National reporting – task teams

Action GM-I-7:	**National representatives** to provide half page summary for meeting report – by end June 2009.
Action GM-I-8:	**GB** to develop a list of points for the national report for the ET-OOFS (following the national report for the GOVST) and to align both reports, producing an overall report for both groups.

Summer school

Action GM-I-9:	**AF and KWB** to promote/advertise the website as widely as possible, providing the link to the summer school website
Action GM-I-10:	**GB** to provide email-text/flyer to be sent out with the advertisement email and add information about VISA requirements
Action GM-I-11:	**AS** to contact local professors to ask if the summer school counts as an accredited course
Action GM-I-12:	**AS** to ask lecturers to prepare lecture draft notes (could be bullet points). These notes could be published as a book after the summer school.
Action GM-I-13:	**GB and AS** to pass information on computer lab lesson on to the lecturers (after noon lectures)
Action GM-I-14:	**GB and AS** to contact lecturers, to ask for hardware/software requirements to run exercises

Argo, GHRSST,…

Action GM-I-15:	**All (particularly members of the OSE/OSSE TT)** to provide feedback to Argo (Mathieu Belbeoch) on: - user requirements - data quality from operational centres - demonstration the value of Argo (impact studies)

Action GM-I-16:	**All** are invited to feedback to GHRSST (Craig Donlon) – on the usefulness and value of GHRSST products (e. g. OSEs)

Contributions to Work plan

All to write part of the GOVST work plan – paragraphs/names listed below:

Action GM-I-17: AS & ED to draft

1. Introduction/Background/Description (incl. Goals and Objectives)

Action GM-I-17: AS, ED and Hans Bonekamp to draft

2. Common/Overarching Issues

Action GM-I-18: System representatives (see also writers of the national reports) to draft

3. System and Centre Plans

Action GM-I-19: AS, ED & MJB to draft

4. GODAE OceanView Science Team

Action GM-I-20: Fabrice Hernandez & Matt Martin to draft

5. Intercomparison and Validation Task Team

Action GM-I-21: **Peter Oke & Gilles Larnicol** to draft

6. Observing System Evaluation Task Team

Action GM-I-22: Pierre De Mey, Villy Kourafalou & Hendrik Tolman to draft

7. Coastal Oceans and Shelf Seas Task Team

Action GM-I-23: **Pierre Brasseur, Rosa Barciela & Laurent Bertino** to draft

8. Marine Ecosystem Analysis and Prediction Task Team

Action GM-I-24: **GB, Jim Cummings, Hal Ritchie, Nicolas Ferry, Magdalena Balmaseda ??** to draft

9. Pilot Task Team on Coupled Modelling

Action GM-I-25: Pat Hogan & Eric Chassignet ?? to draft

10. Pilot Task Team on Forecasting Systems/Models

Action GM-I-26: KWB, AS & ED to draft

11. GODAE OceanView Project Office

Action GM-I-27: Fraser Davidson, Villy Kourafalou, Laurent Bertino & Albert Fischer ?? to draft

12. Capacity Building & Education

Action GM-I-28: KWB, Srdjan Dobricic & Hans Bonekamp to draft

13. Outreach & Visibility

Appendix E.1 – Joint statement

Joint statement for the stewardship of operational oceanography post GODAE

GODAE OceanView Science Team (GOV-ST)

And

the JCOMM Expert Team on Operational Ocean Forecasting Systems (ET-OOFS)

-Draft Version 4-

Background

This document describes the justification, objectives and relationship of two groups under JCOMM, the GODAE OceanView and ET-OOFS, who have been proposed to share the stewardship of operational oceanography over the next decade following the GODAE period.

This document addresses the key objectives of each group. It is an unofficial document primarily designed to provide guidance to those concerned with the scope of GOV-ST and ET-OOFS. It does not provide guidance on, e.g., funding arrangements of the two groups.

Justification

The formation of two teams is both, a recognition that operational oceanography has matured since the initiation of GODAE, but also that it remains in its infancy compared with comparable services in NWP. GODAE achieved its goals quite handsomely where we now have several international centres providing ocean forecast services supported by a sophisticated infrastructure and open data sharing policies. The first and second generation ocean prediction systems are offering encouraging performance for some applications while remaining inadequate for a majority of applications. Operational oceanography is a complex challenge that will need to be underpinned by continuous scientific and technological innovation to achieve the improved performance given the practical constraints. The quality and pace of innovation will continue to be aided by the coordination of an international group GODAE OceanView. The formation of ET-OOFS under the JCOMM Service Programme Area is also a recognition that the prototype operational forecasting systems and technologies developed under GODAE will need to be transitioned into full operational systems based on international best practices in service delivery meeting agreed performance standards and targets.

Operational oceanography is a costly exercise. Whether this be the human and technological resources required by operational agencies to support operational ocean prediction systems and services or the human and technological resources required to maintain a global ocean observing system. Operational oceanography at both a national and international level will need to present ever more robust evidence that justifies the continued investment. The steadily increasing impact of the existing services is encouraging but remains far from the optimum performance that is possible or the performance level that is demanded by some users. A key role of ET-OOFS will be to provide the intergovernmental coordination for National agencies to identify and encourage best practices in service delivery and seek robust engagement and information from the user communities to identify performance targets as well as demonstrate the impact and benefits of the services.

Objectives

The common objective of both teams is to focus on international activities that will lead to the highest possible quality of ocean forecast services being delivered to users for maximum societal benefit.

The objectives of GOV-ST are to encourage and foster international collaboration to address the scientific and technological challenges associated with operational oceanography and closely related prediction. GOV-ST's role is to foster research that will lead to the next generation systems.

The objectives of JCOMM ET-OOFS are to support operational agencies through inter-agency and intergovernmental coordination to deliver consistent ocean forecasting and related services that positively

impact their users. ET-OOFS's role is to foster international activities that will lead to improved services from existing and planned operational systems.

Governance
ET-OOFS is an expert team under JCOMM Service Program Area which in turn sits under JCOMM/MAN. ET-OOFS has joint secretariat support from IOC and WMO.

GOV-ST is a research team that will sit within JCOMM in a structure to be determined.

Relationships between ET-OOFS and GOV
ET-OOFS and GOV have a common objective and therefore will have an interest in all aspects of operational oceanography. However the objectives will differentiate the level of interest that each group will undertake and the leadership that will be required in each specific area.

Formation of task teams
ET-OOFS and GOV will endeavour to coordinate and collaborate through the formation of task teams to optimise the performance and scientific outputs of these task teams. The process for this collaboration will be further developed between the two teams.

Relationships with the ocean community
The most critical aspect of the two team arrangement will be management of external communications and engagement. The point of contact to specific sections of the ocean community needs to be carefully managed, adhered to and externally communicated. The following arrangements and responsibilities are proposed for some identified external groups.

Ocean research community: Engagement will be coordinated through GOV-ST.

Ocean observing community: ET-OOFS is responsible for coordinating the operational observational requirements through the JCOMM Observational Programme Area. GOV-ST will promote activities that develop new methods and knowledge about the impact of existing observing systems and also designs for new observing systems.

Ocean service providers: Engagement with operational agencies and other third party providers will be coordinated through ET-OOFS within the JCOMM/SPA.

Ocean forecast users: Operational agencies will provide the direct engagement with users and will report progress, feedback through ET-OOFS. Engagement of the user community at international forums will be coordinated through both GOV-ST and ET-OOFS depending on the stage of engagement of the user group.
The subsequent paragraphs outline the objectives of the two groups. For further details see relevant documentation of GOV-ST and ET-OOFS.

GODAE OceanView

GOV-ST will focus on the development of global (physical) ocean forecasting systems for operational implementation. More specifically, the activities on which GOV-ST will focus are

- assessments of the performance of and development of improvements to the components of the forecasting systems. In detail: coordinate the development of new performance metrics and provide coordination for research and development of improvements to the components of the forecasting systems; (Justification: ET-OOFS will adopt a growing set of operational system performance metrics as part of its TOR. GOV-ST's role should be to develop new metrics or expensive posterior metrics and make recommendations for new operational metrics to be adopted. Recommended that this be formed as a joint task team.)

- initiatives aiming to exploit the forecasting systems for greater societal benefit. In detail: coordinate development and validation of new and improved derived products from ocean forecasting products in support of extended operational services and greater societal benefit. (Justification: ET-OOFS will engage ocean forecast providers and users and will be responsible for reporting on the quality and

gaps in services. GOV-ST is expected to respond to these reports and other independent information. ET-OOFS will be discussing the formation of a task team on this activity);

- evaluations of the dependence of the forecasting systems and societal benefits on the components of the observation system. In detail: coordinate research to assess and optimise the design of the operational ocean observing system and evaluate the impact of new observing systems to operational ocean forecasting applications (Justification: ET-OOFS have a responsibility to develop the operational observation requirements document which will need to include the recommendations of the associated task team. It is recommended that this be a joint task team);

  The first task will involve delayed-mode inter-comparisons with new and improved metrics between systems when appropriate and consider all aspects of the forecasting systems (e.g. model formulation and resolution, data assimilation and quality control). Recommendation will be made to ET-OOFS for new metrics suitable for operational implementation.

  The second task will involve
  - the development of new and better performing downstream services;
  - collaborations with closely related prediction service areas such as coastal systems, atmospheric systems and ecosystem experts;
  - and is likely to include development of coupled/nested forecasting and seamless prediction.

  The third task will support the first two tasks and should aim to provide scientific evidence for use in the design improvements of the existing operational systems through ET-OOFS and advocacy of new components to the global observation system.

To address above tasks, GOV-ST will establish specific task teams in support of its objectives:
- Intercomparison and Validation Task Team
- Observing System Evaluation Task Team
- Coastal Ocean and Shelf Seas Task Team
- Marine Ecosystem Monitoring and Prediction Task Team

Under auspices of GOV-ST, members of the task teams are encouraged to collaborate with ET-OOFS.

GOV-ST will work with JCOMM (and others, e.g. GSSC and CEOS) to find the most efficient and effective way for GOV-ST to contribute to the prioritisation, advocacy, implementation and exploitation of the GOOS.

Terms of reference for the ET-OOFS
(as per June 2009)

1. Develop and maintain "The guide to operational oceanographic forecasting systems", and requirement documents, adhering to relevant Quality Management Systems, for members providing ocean forecasting services;
2. Provide advice to JCOMM teams and member states on the application, nomenclature, symbology and standards used by operational ocean forecasting systems;
3. Develop and operate an inter-comparison framework for NRT monitoring of operational ocean forecasting systems and promote interoperability of products and services;
4. Work effectively with the scientific community developing and maintaining operational ocean forecasting systems;
5. Provide observation requirements for OOFS for the JCOMM Observation Programme Area (OPA);
6. Provide advice to the JCOMM Data Management Programme Area (DMPA);
7. Promote and support the development and adoption of member agency services to the wider community, particularly recognised operationasl groups (e.g., MAES, MSS, SI)

Appendix F.1 – GOVST Work Plan (First draft)

GODAE OceanView Work Plan 2009 to 2013

DRAFT
10/06/09

Process:

- The top/down work plan should be complemented by a bottom/up one
  - The groups have already approved work plans
  - No major resources could be allocated by individual groups to conduct new challenges
  - Synergistic activities should be identified and pursued
- Need to define a proper methodology
- Identify the top level issues
- Engage the groups to provide input based on their own plans
- Identify, update, activate and implement existing work plans (e.g. IMBER/GODAE)
- Identify a sub-working group to handle this (writing the work plan)
- Need for a workshop?

Each Activity to be described under subsequent headings to contain:

- Description
- Timelines 1-4 years (GANTT charts?)
- Measure of Success:
  - Produce and regularly (4-year cycle?) update documentation of the systems and their performance (differs from ToR#1 of ET-OOFS)
    - → Synthesize reference status reports
      - Consolidating the OceanView activities: TT, core.
    - → Addressing accuracy/efficiency fitness for purpose issues
    - → Highlighting the value added
    - → To promote GODAE OceanView to
      - Users, agencies, patrons, …

For proposed new Task Teams a detailed justification about scope, objectives and international linkages is required.

1) Introduction/Background/Background/Description (incl. Goals and Objectives) [Dombrowsky and Schiller]

   GOVST ←→ ET-OOFS

   Research – development -- Operations

2) Common/Overarching Issues [Dombrowsky, Schiller and Bonkamp]

   "Positive competition" → real collaboration

   - GOV ST should insist on transparency on system performance
     - all GODAE partners should routinely publish the forecast errors of their systems … this is one of the action items from the GODAE OSE WS.
   - Code sharing to permit collaboration should be encouraged:
     - NERSC EnKF code

    - Analysis sensitivity (from OSE WS)
    - Code/Configuration Management
- Cooperation on usage of OOFS outputs
- Dealing with model visualization and analysis for very large data sets coming out of models becomes more and more difficult. Outreach to computer science and visualization communities is needed. How to get these data out to the public, media, etc, ……
- Possible white papers in the framework of operational oceanography:
    - surface fluxes
    - coupled initialisation

3) System and Centre Plans [System Representatives]

Workplan of each OOFS: 3-4 year plan, with yearly report on the achievements, and possible links that enable collaboration across GODAE OceanView (showed through GANTT chart). Success = what has been achieved after four years….

- Systems
- Models
- DA
- Observing Systems
- Contributions to TTs
- Other

Approximately 5 pages, based on National Report template

4) GODAE OceanView Science Team [Dombrowsky, Bell and Schiller]

- PATRONS/STAKEHOLDER/SPONSORS
- ET-OOFS – GOVST
- Should GOV promote any new pilot projects?
    - Following Argo and GHRSST … should the OSE TT become a pilot project with a mission to service the community and to develop and assess new techniques? Would this help attract funding to support these activities?
- Should GOV move more towards coastal? Ans. We should remain engaged with the coastal community, through enabling the Coastal TT, but we should not assume to lead the coastal community. Similarly for the marine ecosystem task team. Similarly for the climate community.

5) Intercomparison and Validation Task Team [Hernandez and Martin]

- Coordinate any overlaps with OSE TT
- Inter-comparison/validation and OSE TTs should establish the best practice for quantifying the performance of GODAE systems → and every GODAE partner should adopt these practices for routine assessment and dissemination.
- Metrics are not very well designed. Survey user community with respect of what we need from the ocean models. Design metrics accordingly.
- Defining metrics for success of GOVST hinges on first developing a four year technical plan. The success metric should simply be a measure for deliverables met. We also need model performance metrics in place so that improvement of these metrics can be the basis of another metric to identify GOVST success, but how do you baseline this?

- how much outcome and feedbacks from this TT were taken into account for upgrading OOFS?
- Critical review of what has been done in 2008: use of metrics, consistency of actions among the different participants,

- Define a series of metrics (eg, heat content, SST in Nino boxes…) implemented and monitored all along the 4 years
- Figure out the number of operational applications (oil spill, S&R, routing) that have been improved using GODAE products (user oriented metrics)

- Model intercomparison data bases should be based on model data, not metrics, so that alternative metrics can always be addressed. Metrics should be associated with such data bases to allow rapid intercomparisons of all models.

- By the end of 2009 the inter-comparison/validation TT should establish a specific work plan to establish the routine monitoring and dissemination of the performance of all GODAE systems (e.g., 5-day SST forecasts using the ABC system has errors of X degrees … demonstrated by a online map)
    - mechanisms that will help break down the political and technical barriers for this is to more frequent Inter-comparison/validation workshops (e.g., annually)
    - How many projects have been achieved

6) Observing System Evaluation Task Team [Oke and Larnicol]

- Coordinate any overlap with IV TT
    - "GODAE built it, GOVST should focus on model comparison, validation, and data need analysis". We need to develop routine ways of assessing the impact and sensitivity of the observing systems. We should consider assessing observation systems design based on real time model systems rather than off-line OSSE.
    - Working on and with targeted observations
    - How many members of observing community have benefitted from TT outcomes?

7) Coastal Oceans and Shelf Seas [De Mey, Kourafalou and Tolman]

- How far to go in the coastal TT – define new metrics?
    - How do the "coastal" models should get involved in the operational systems?
    - Proposal : Coastal TT deals with science to achieve coastal forecasting more than coordination of coastal forecasting
- Shelf seas and coastal coupling: GOVST should work towards standards for coastal modeling frameworks.

8) Marine Ecosystem Analysis and Prediction Task Team [Brasseur, Barciela-Fernandez and Bertino]

- Assessing the impact of physical data assimilation on biological models, both for biological modeling and for assessing quality of physical models indirectly.
- Talk to David Green (NOAA) (David.Green@noaa.gov), otherwise contact Hendrik Tolman

9) Pilot Task Team on Coupled Modelling [Brassington, Cummings, Ritchie, Ferry and Balmaseda??]

Existing and new TTs should not be given too large a mandate

- Priorities should be set to make sure the work is done
- Should not create too many task teams, but concentrate on what can be achieved in the timeframe

- Pilot Task Team on Coupled Modelling (together with WGNE?)?
    - Having pieces of coupled atmosphere – (wave?) – ocean modeling in place, it should be possible in four years to assess the (potential) impact of this coupling on various forecast ranges (short term , seasonal, etc.).

- A focus area for the next four years should be the addition of physics in particular in ocean-atmosphere boundary layers: use improved physics as available; use model validation efforts to identify potential shortcomings of forward models.
- Talk to coupling team HFIP (hurricane forecasting team) in US (chair: Hendrik Tolman)

10) Pilot Task Team on Forecasting Systems/Models [Hogan and Chassignet??]

- Forecasting Systems/Models
  - GOVST should lead the way in pointing toward high-priority development issues in community models.
  - Ocean Modeling
    - High frequencies
    - Towards high resolution
    - Forecast range

- Data Assimilation
  - Create international multi-model ensembles by exchanging operational model data. Benefits of this can be i) producing error bars on forecasts particularly for users, ii) help with data QC and monitoring of quality of data.
  - Sharing specification of observation accuracy and representation errors in assimilation systems.
  - Start working on assimilation of velocity data from any source (drifters, floats, CODAR, etc.). The same holds for other new data such as ocean colour.
  - Data assimilation
    - Stochastic/deterministic
    - High frequencies
    - Computational efficiency
  - Longer term – methodology?
    - ensemble forecasting (link to the error estimates)

  - "System" issues, e.g. QC

11) GODAE OceanView Project Office [Wilmer-Becker, Dombrowsky, Schiller]

- Meetings/events
- Publications
- Website/brochures
- Funding

12) Capacity Building and Education [Davidson, Kourafalou, Bertino and Fischer ??]

- (incl. China, India, South Africa, Brazil, New Zealand)
- Two GOV ST Scientific WSs (e.g., TT WSs) should be held in a developing country → Day 1 and 2 on WS topic; and Day 3 dedicated capacity building
- Capacity building: success = bringing new countries in implementing OOFS. Helping countries using GODAE forecast to develop their applications…
- Next generation of OO scientists.

13) Outreach and Visibility [Wilmer-Becker, Dobricic and Bonekamp]

- Run training courses
- Run an Application workshop – engage with users

- Define the critical path of communication between the TT and the GOVST
- GOVST could engage with agencies involved in education (example NFS, could also be space agencies)
- To have a policy on error bars (any type)
- Publication should be promoted
    - why? for quality assurance
    - each GODAE group should publish system description and performance every year – documenting status, recent improvements, and planned developments
    - A GOV ST led publication of a specific aspect of GOV every year: e.g., “links between GODAE and the coastal community”, “developments in GOV BGC capability”, “ developments in GOV DA systems”, “developments in GOV models”, “Use of observations in GOV systems”. GOV ST member will lead, solicit and coordinate contributions.
    - Visibility of GODAE: - we need to have a GOV ST contribution to every major oceanography and user-group conference/publication, as well as optional national contributions, e.g., presentations, special session etc
- If resources permit, GOV ST should coordinate 2 GOV summer schools over the next 4-years
- GOV ST should encourage all GODAE partners to hold annual User Forums to engage students, researchers, and end-users. Bluelink can provide advice on their experience.
- Should connect the existing activities
    - Canada GOAPP/CONCEPTS
    - Japanese JMA + Univ work
    - European activities (ECMWF, Met offices, academic)
    - USA, NCEP + academic,
    - Others
- Media?