GOV IV-TT MONTREAL'S 1ST WORKSHOP MINUTES

20-22th of September, Environment Canada, Montreal, Canada

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and

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Participants:

Alain Caya (Env. Canada)
Julia Crout (NRL)
Fraser Davidson (DFO, co-chair GOV)
Prasanth Divakaran (BoM)
Katja Fennel (Dalhousie. Univ, co-chair MEAP-TT)
Fabrice Hernandez (Mercator Océan, co-chair IV-TT)
Yimin Liu (Env. Canada)
Avichal Mehra (NOAA, by webex)
Kristjan Onu (EC)
Pam Posey (NRL)
Charly Regnier (Mercator Océan)
Hal Ritchie (Env. Canada, co-chair CP-TT)
Andy Ryan, (UK Metoffice)
Greg Smith (Env. Canada, co-chair IV-TT)
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Todd Spindler (NOAA)
Dorina Surcel-Colan (Env. Canada)
Jinshan Xu (DFO, by webex)

Scope of the document

This document reports on presentations, discussions and decisions made during the First IV-TT workshop held the 20-22 September 2016 in Montreal, Canada, hosted by Environment Canada with support from MEOPAR.

Agenda of the workshop

DAY 1 - TUESDAY SEPTEMBER 20

Introduction

8:30 – 9:00 Coffee and registration

9:00 – 9:30 Welcome and meeting objectives

Class-4 Evaluation Updates

9:30 – 10:00 **Review of Class-4 results over 2014/15** – *Greg Smith (EC) and Fabrice Hernandez (Mercator Ocean)*

10:00 – 10:20 **Update on UK Met Office Class-4 Evaluations** – *Andy Ryan (Met Office)*

10:20 – 10:40 **Update on Mercator Ocean Class-4 Evaluations** – *Charly Regnier (Mercator Ocean)*

10:40 – 11:00 BREAK

11:00 – 11:20 **Update on BOM Class-4 Evaluations** – *Prasanth Divakaran (BoM)*

11:20 – 11:40 **Update on CONCEPTS Class-4 Evaluations** – *Jinshan Xu/ Fraser Davidson (DFO)*

11:40 – 12:00 **Update on NOAA Class-4 Evaluations** – *Todd Spindler (IMSG/NOAA)*

12:00 – 13:30 LUNCH

Future directions of Class-4 Intercomparison

13:30 – 14:00 **Extension to sea ice concentration** – *Greg Smith/Jinshan Xu (EC/DFO)*

14:00 – 14:20 **Sea ice evaluations** – *Charly Regnier (Mercator Ocean)*

14:20 – 15:00 **Discussion**

15:00 – 15:30 BREAK

15:30 – 16:00 **Extension to surface drift** – *Fabrice Hernandez (Mercator Ocean)*

16:00 – 17:00 **Discussion on future directions for Class-4** (New metrics and other datasets)

17:00 **Close of DAY 1**

DAY 2 - WEDNESDAY SEPTEMBER 21

Discussion on Class-4 Intercomparison

9:00 – 10:15 **Organization of Class-4 intercomparison**

- Guidelines for announcing changes and technical issues (system updates….)
- Annual Report (Greg/Fabrice)
- IV-TT Wiki
- BOM Website (Prasanth)
- GOV Website (Greg/Fabrice)
- Status of US GODAE Server
- ETOOFS

10:15 – 10:45 BREAK

10:45 – 12:00 **Methods for Class-4 intercomparison**

- Standardization of quality control and results
- Producing Class-4 metrics: interpolation methods, tools
- Computing ensemble from Class-4 individual files
- Specific aspect of intercomparison of global vs. regional Class-4 results
- New Metrics (Jinshan, any others with slides to share)

12:00 – 13:30 LUNCH

Evaluations by new members of the IV-TT

13:30 – 14:00 **GODAE OceanView intercomparison and validation with Class-1 /-4 metrics in NMEFC** – *Mo Huier & ZiqingYu (NMEFC) - WITHDRAWN*

14:00 – 14:30 **The US Navy's Current and Future Sea Ice Forecast Capabilities** – *Pam Posey (NRL)*

14:30 – 15:00 **Discussion about inclusion of new members in intercomparison activities**

15:00 – 15:30 BREAK

New approaches: Ensemble methods and verification of Coupled Forecasts

15:30 – 16:00 **Methods used by the NWP Community (JWGFVR)** – *Greg Smith (EC)*

16:00 – 16:30 **Applying Multi-Model Superensemble Methods to Global Ocean Operational Systems** – *Todd Spindler (IMSG/NOAA)*

16:30 – 17:00 **First steps toward ensemble ice ocean forecasting for CONCEPTS and Mercator** – *Kristjan Onu (EC)*

17:00 **Close of DAY 2**

DAY 3 – THURSDAY SEPTEMBER 22

New approaches: Ensemble methods and verification of Coupled Forecasts

9:00 – 9:30 **Development of Metrics for Coupled Prediction Systems** – *Hal Ritchie (EC)*

9:30 – 10:00 **Methods used by the NWP Community (JWGFVR)** – *Greg Smith (EC)*

10:00 – 10:30 General Discussion on new methods and probabilistic forecasting

10:30 – 11:00 BREAK

Other IV-TT Activities

11:00 – 11:30 **Update on Class-1 intercomparison activity** – *Fabrice Hernandez (Mercator Ocean)*

11:30 – 12:00 **Review of other IV-TT activities (e.g. CLIVAR GSOP)** – *Fabrice Hernandez (Mercator Ocean)*

12:00 – 13:30 LUNCH

13:30 – 14:00 **Biogeochemical assessments** – *Katja Fennel, Dalhousie University*

14:00 – 14:30 **Collaboration/Interactions with other Task Teams**

14:30 – 15:00 **General Discussion** on future directions for ocean verification and the IV-TT

15:00 – 15:30 BREAK

15:30 – 16:00 **IV-TT Communication plan** (future workshops, teleconferences, GOVST)

16:00 – 17:00 **Wrap-up and close**

17:00 **END OF DAY 3**

Short summary of presentations

- Fabrice Hernandez starts the meeting with a rapid overview of IV-TT framework and ongoing actions.
- Greg Smith summarizes Class4 results to date and raises some issues over the past year.
- Andy Ryan summarizes UK-Met Class4 activities. Raises issues on bad SST (non physical) data drifters, opening discussion on QC, and possible change of sources of SST measurements: GHRSST expertise and matchup database instead of US GODAE source. Similar problems mentioned with Argo floats. Finally he proposes a tool to implement in the GOV website for providing graphics and statistics of Class 4 (online monitoring).
- Prasanth Divakaran summarizes BoM Class4 activities. Comparison between OMAPS2.1 and OMAPS3.0. Class 4 are part of the routine monitoring. Shows metrics for profile based on PDF anomalies.
- Charly Regnier summarizes Mercator Océan Class 4 activities. New metrics are presented, in particular water mass assessment. MLD, drifter velocities.
- Todd Spindler describes the RTOFS system. Class 1,2,3,4 are used for evaluation of system upgrade. Interest for specific regional assessment targeting specific stakeholders/users.
- Fraser Davidson summarizes Class 4 assessment performed by DFO for Canadian systems. He presents internal server (storage, visualisation tool). Raises issues on SLA along track assessment and spectral analysis. Presents dedicated assessment based on AZMP surveys and drifter buoys.
- Greg Smith presents Class 4 sea ice summary, and mentions activity scheduled with YOPP (2017-2019).
- Charly Regnier summarizes sea ice Class 4 assessment performed at Mercator Océan, shows assessment on specific areas, categorical statistics and mentions new PSY4 system upgrade in October 2016.
- Fabrice Hernandez describes the proposition for new Class 4 based on drifter's velocities, presents scientific and technical issues.
- Pamela Posey presents US Navy systems, and specific sea ice assessment. Shows Class 4 sea ice assessment performed in August 2016, and indicates that NRL should be part of IV-TT intercomparison soon.
- Todd Spindler presents Class 1 assessment, k-means ensemble and clustering approaches. Activity is now extended to T/S/U/V and specific focus is carried on in the North Atlantic.
- Kristjan Onu describes ensemble predictions activities (including sea ice) at Environment Canada, and presents ensemble assessment metrics based on pdf, rank histograms.
- Hal Ritchie, co-chair of CP-TT presents CP-TT framework, issues, then give examples with Canadian and ECMWF coupled systems. Mention a list of processes of interest, and metrics to develop, potentially with IV-TT.
- Katja Fennel, co-chair of MEAP-TT describes issues on biogeochemical systems assessment. She proposes some possible common validation framework with IV-TT, in particular with the growing number of bio-argo floats.
- Greg Smith provides an overview of JWGFVR assessment from B. Casati (JWGFVR),
- Fabrice Hernandez provides an overview of Class 1 assessment activities, and GSOP / ORA-IP follow on activities.

Class 4 activities, ongoing plans and decisions

Presentation by the different contributing investigators allowed to update status on the present activity, discuss difficulties, and propose solutions with the series of decisions hereafter.

A first series of actions are devoted to improve the existing management of Class 4 assessment synthesis.

Action 1 : Andy Ryan introduces QC on SST drifter class4 production. Documentation stored on Wiki.

Action 2 : Greg Smith, Fabrice Hernandez. Find alternative sources of SST measurements from drifters, and contact GHRSST experts.

Action 3 : Andy Ryan to implement blacklisting of SST toward the appropriate source once we know who is that source.

Action 4: Andy Ryan, to prepare notification for CORIOLIS GDAC of rejected Argo floats (blacklisting) during Class 4 production

Action 5 : Andy Ryan to provide documentation for Class 4 files on sources of data (specific links) and procedures and QC. Documentation stored on Wiki.

Action 6 : Andy Ryan to check if possible to extend T/S observations (from CORIOLIS GDAC source) to other instruments than only Argo.

Action 7 : Andy Ryan to provide altimetry track numbers in Class4 SLA files.

Action 8: Fabrice Hernandez to investigate provision of SLA/SSH by TAPAS CLS group.

Action 9 : Greg Smith to provide timestamp for Class 4 Sea Ice concentration files

Action 10: each expert performing Class 4 synthesis assessment, to document QC and procedures applied to compute metrics and statistics toward definition of "Best practices" (Action 12). Documentation stored on Wiki.

Action 11 ; each expert producing Class 4 files to document horizontal/vertical interpolation methods and give this description in Class 4 NetCDF file as attribute. Put document on Wiki – IF POSSIBLE PUT tools for others on dedicated place (wiki or GitLab).

Action 12 : all experts. Once documentation available on Wiki, to discuss, decide and adopt best Class 4 practices.

Action 13 : Greg Smith/Fabrice Hernandez. Define an overall strategy and ways to submit for outlier monitoring (obs QC and synthesis QC).

Then, actions are proposed in order to enhance the Class 4 assessment by performing new metrics on existing files.

Action 14 : Charly Regnier and Fabrice Hernandez. For the annual review, for a given area, to demonstrate T-S diagram metrics with all systems Class 4 T/S files for specific area (proposed MED, Labrador).

Action 15: All experts contributing to Class 4 assessment synthesis, to list possible new metrics (e.g., discussed during the meeting: sea level horizontal scales, mixed layer depth, D20…), and initiate group discussions (wiki, forum).

Then new Class 4 parameters and relevant observations are discussed.

Action 16 : Fabrice Hernandez, Charly Regnier. Class 4 drifters' velocities: provide documentation, in particular describe windage/slippage corrections and drogue loss detection. Provide model equivalent for the surface and the 15-m depth layers.

Action 17 : Greg Smith to investigate possible new class 4 observations for sea ice drift in the Arctic Ocean, based on ITP (Ice Tethered Profiler), and International Arctic Buoy Program drifters

Class 1 activities, further actions

From Todd Spindler's presentation, and discussions that followed, Class 1 intercomparison activity appears as a good complement in the model space to the Class 4 assessment that focuses on the observational space. Todd Spindler's results on ensemble approaches show promising outcomes also.

It is decided to come back to the initial definition (GODAE and MERSEA) and purposes of Class 1 assessment by adopting common 3D grids and not anymore provide native grid surface files. It was suggested that target grid should be 1/12°, contingent on storage and transfer issues (to be investigated).

Action 18: Charly Regnier to provide documentation to all other contributing centres for a 1/12° global grid, with the relevant vertical levels. Documentation stored on Wiki.

Action 19 : Charly Regnier to provide documentation to all other contributing centres for a stereopolar grid in the Arctic (e.g., existing grid used for sea ice product), with the relevant vertical levels. Documentation stored on Wiki.

Action 20 : All contributing Class 1 experts: to discuss and adopt proposed common grids.

Provision and storage of Class 1 files might cause difficulties to some centres:

Action 21: Pamela Posey and Todd Spindler to evaluate possibilities concerning NRL and NOAA/NCEP provision of Class 1 files on new decided grids.

Action 22 : Fabrice Hernandez, Greg Smith to evaluate possibilities of storage of Class 1 files from centres that are not capable of archiving these data

The success of Class 1 activities will also depend on specific actions performed in the near future using these files.

Action 23: Pamela Posey, Greg Smith to define plans for intercomparison and validation in the Arctic considering the new Class 1 files, including assessment of regional systems.

Action 24 : Greg Smith to discuss with ECMWF and YOPP groups to adopt with them common framework for the Arctic intercomparison.

Organisation issues: managing routine operations

The daily production of Class 4 files since January 2013, as well as the synthetic assessment has raised a series of issues, in particular Class 4 files production outage or changes in some contributing operational systems. Moreover, some of the operational centres involved in IV-TT intercomparison are now using this intercomparison framework in their operational routine assessment.

Thus, it appears necessary to better describe what are the procedures adopted by all participants (see Class 4 assessment decisions and actions above). It is also necessary to implement common tools in order to 1) store documentation and tools (e.g. software); 2) inform and track on everyday operations changes and anomalies (upstream observations, upgrade of operational systems); 3) implement a tool for discussions. Note that the proposition to use the Copernicus Marine Service Forum for discussion, where dedicated IV-TT pages were implemented in 2015 does not appear to be successful. This means the Wiki and Forum should be hosted in the same server, with the same access for the contributing members.

Action 25 : Greg Smith. It is decided to rely on the GOV wiki. Greg Smith to design a first skeleton in order to host different documentation.

Action 26 : Andy Ryan and Kirsten Wilmer-Becker. To check access and account for every IV-TT member to the GOV wiki.

Action 27 : Andy Ryan and Kirsten Wilmer-Becker. To check the feasibility of a forum inside the GOV wiki.

Concerning changes on operational systems, or outage while producing Class 4 files, some procedures are proposed and discussed, like sending a warning by email with a specific message and inform/track on the wiki. For system changes, the message would contain a short explanation on changes, and could link to a dedicated one-sheet description of the system, or a table with all system descriptions. Changes should be stored permanently, in order to provide an historical overview of intercomparison since the beginning.

Action 28: Greg Smith and Fabrice Hernandez to define procedures for informing on changes, anomalies and outage, and define template for system's one-sheet description or table description. Then provide this in a dedicated document on the wiki.

Action 29 : Andy Ryan and Greg Smith. Once wiki in place, to copy all past Class 4 files outages on the "track" section, then keeping on these activity by "posting" future outages or anomalies.

Action 30 : Each expert contributing to Class 4 files production, to provide their system changes on the "track" section, then keeping on this activity by "posting" future changes or anomalies.

Organisation issues: BoM visual tool for Class 4

An improved version of the Bureau of Meteorology visualisation tool is presented by Prasanth Divakaran. The objective and possible use of this tool are discussed.

Action 31: Greg Smith and Fabrice Hernandez to verify with Class 4 contributing centres if the tool could be opened to 1) GOV participants, in particular members of task team that are interested to follow the IV-TT monitoring (COSS-TT, CP-TT, OSE-val-TT) ; 2) or open to all external to GOV.

Action 32 : all experts producing Class 4 files to evaluate this tool, feedback to BoM.

Organisation issues: use of the GOV website

Andy Ryan proposes a graphical tool in order to monitor some Class 4 synthesis assessment. All operational centres involved in Class 4 intercomparison accepted last year to give visibility to this activity. Discussions bring decision to use Andy Ryan's tool linked to the GOV IV-TT pages, with a typical running monitoring of the last 6 to 12-months.

Action 33 : Andy Ryan and Kirsten Wilmer-Becker to propose a technical solution in order to link the graphical tool to the GOV IV-TT section.

Action 34 : All contributing expert to the Class 4 activity: to review Andy Ryan's proposition once online, and feedback for needed modifications.

IV-TT annual report

An annual report based on Class 4 synthesis was proposed last year by Greg Smith in order to provide external visibility to intercomparison and validation activities over the previous year, and offer a demonstration of GOV effectiveness. This report is discussed, with the following propositions:

- The report should cover the period of the 1st of October of the previous year, the 30th of September of the current year. This will allow monitoring the four past seasons.
- The report synthesis should start in October the current year, and allow a first draft to be presented at the GOV ST meeting (usually during fall). Feedback from GOV ST should be taken into account. The report should circulate among contributing experts until the next January for a publication in February.
- The report should contain new metrics every year.

Action 35 : Greg Smith and Fabrice Hernandez. To freeze annual report procedure and document on Wiki.

Action 36 : all contributing experts to Class 4 synthesis: to prepare figures for the next GOV ST, and be prepared to discuss/review the report during the November to next January period.

Storage and archive of IV-TT activities

Class 4 files are presently stored at the US GODAE server, whose manager is M. Frost. There is no visibility of the availability in the future of this server. Moreover, Class 1 files intercomparison also need dedicated server for secure storage and archiving.

Action 37 : Pamela Posey to investigate who at NRL is the program manager, or decision maker on support of this GODAE server, then inform IV-TT.

Global versus regional assessment

It has been identified over the last two years that the global Class 4 assessment performed by the five operational centres could be enhanced regionally by assessment of existing GOV regional operational centres. Either with regional systems operated by one of the five contributing global centres, or by incorporating other regional GOV participants. For instance, NMEFC (China, western north Pacific), JAMSTEC/MRI (Japan, western north Pacific), REMO (Brazil, tropical and south Atlantic), MFS (Italy, Mediterranean Sea), Rutgers Univ. east USA coastal system etc….

First proposition would be to allow regional system to use the existing framework (existing Class 4 files, parameters and observations) to measure differences with global systems on the “open ocean” scales. In a second stage, in order to measure the additional benefit of these regional/coastal systems, an assessment using specific regional observations not gathered through the existing Class 4 framework could be carried out. Class 4 files will be proposed by these regional systems, and the global or other regional system interested could participate in this specific regional assessment by providing their model equivalent to the new observations.

Action 38: All contributing Class 4/Class 1 global assessment to indicate their region of interest and systems involved (e.g., CREG/RIOPS for EC, CREG and IBI for Mercator Océan, NWS for UK-met, Arctic systems for NRL, NOAA/NCEP).

Action 39 : Fabrice Hernandez and Greg Smith to invite GOV members (in particular COSS-TT) to contribute to IV-TT intercomparison (restricted to operational systems) and define other regional systems ready to be incorporated, from IV-TT or other GOV task teams.

Action 40 : Fabrice Hernandez and Greg Smith, to define a framework for Class 4 assessment proposed by regional systems with regional dataset.

Common workplan with other GOV task teams

The CP-TT (Hal Ritchie) has identified a series of assessment topics that could be managed together with IV-TT. In particular assessment for surface ocean parameters, that could include air-sea fluxes.

Action 41 : all experts contributing to Class 4 assessment synthesis, to propose metrics dedicated to surface parameters assessment.

The MEAP-TT (Katja Fennel) explains that ocean colour validation (chlorophyll content deduced from satellite imagery, compared to phytoplankton fluorescence estimated from models) is not fully reliable, and does not allow a correct assessment of the biogeochemical modelling. The opportunity of the recent bio-Argo floats initiative should be an interesting complement to existing ocean colour validation, or validation of model solutions against climatologies. The bio-Argo float's measurements should allow designing new Class 4 parameter and observation in the near future. In parallel, it is noted that the UK-Met and Mercator Océan are performing a Class 4 assessment using satellite ocean colour data.

Some IV-TT actions in the 2017 workplan could allow some collaboration with these task teams.

Action 42 : Fabrice Hernandez to provide documentation to MEAP-TT about Class 4 assessment.

Action 43 : Andy Ryan and Charly Regnier to document their assessment against ocean colour.

Summary of actions

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