NetCOLOR
Quebec City, 7-8 March 2016
Université Laval, Pavillon Alexandre-Vachon,
Room 2064

Present: Marlon Lewis, Cesar Fuentes Yaco, Eddie Loos, Pierre Larouche, Martin Bergeron, Georges Fournier, Clémence Goyens, Marie-Hélène Forget, Marcel Babin, Debbie Christiansen-Stowe
By videoconference: Emmanuel Devred, Maycira Costa, Simon Bélanger
Regrets: Susanne Craig

March 7

Marcel Babin and Marie Hélène Forget welcomed everybody to Université Laval (13h45) and participants introduced themselves.

Objective of the NetCOLOR report (M. Bergeron)
The CSA will guide rather than lead the writing of the NetCOLOR report.

The report must emphasize NetCOLOR's ability to federate and coordinate ocean colour activities at multiple levels, define priorities and a implementation strategy and develop a critical mass of scientists that can advise the CSA. There has been a marked change in the interest in research and science since the election of the new federal government in November. The report must address societal benefits and highlight the need for space infrastructure if CSA is to fund this initiative. Developing services to end-users must be a priority and support must be extended to the national EO community so that the end users can use EO data. An effort must be made to improve the synergy within the academic, private and government sectors.

Using the CASCA example, the NetCOLOR report should define goals, progress, needs and priorities. However, the scope should be adapted to reflect the fact that NetCOLOR is completing its first mandate. Duplication with other initiatives should be avoided (IOCCG, MEOPAR). We should reuse/refer to exiting material. CSA is only one user of the document; other stakeholders may be interested in other aspects (results etc).

The report should include the following, although it is not necessary to be exhaustive:

- Executive summary
- Overview of long range plan (LRP)
- Overview of science
- Existing facilities
- Proposed new facilities (space/ground)
- Funding/governance
- Demographics
- Societal benefits
- Priorities and recommendations

Marcel added that CASCA is very space-based, whereas ground based observations may be more important. Ocean colour is not the only spaced-based technology used in oceanography (sea surface temperature etc). It is important to have a report that emphasizes Canadian priorities.

Forty priority research questions were developed by the Canadian Council of Academies (M. Babin, L. Fortier and M. Lewis participated in exercise). The process was convened to determine the priorities for oceanography in Canada. After several iterations, the 600 questions were pared down to 40.
This document was produced in two steps, 1) The science questions, and 2) The infrastructure required over 10 years to answer the set of questions. However, this document is only for oceanography, not for inland waters.

The NetCOLOR report will serve as a 'lobby' for the aquatic colour community at CSA. It is essential if Martin is to defend the community and secure and maintain future funding. It should not take the form of a scientific report (i.e. research results). He needs the report early in January 2017. His WaterSat funding application would be jeopardized, if the NetCOLOR report was not included.

The language of the report should at the DG level and be geared to government stakeholders. It will be necessary to explain what aquatic colour remote sensing is, its societal benefits and to justify its priority in terms of space utilization (CSA dollars and missions). Canada has a profound expertise in marine optics and aquatic colour. We have to make an effort to convince senior management of the need for spatial/temporal resolution and continuity of observations. By emphasizing the consequences of ignorance we can influence policy.

Pierre Larouche felt that a document from the community would carry more weight than one from a single scientist. It is hoped that scientists can use the report internally at DFO to advance science. It is difficult to 'push' from within government ministries. Scientists in academia and industry can get access to decision makers in government agencies from outside.

Why should we produce this report?
To get the attention of higher-level officials at CSA, DFO and other government department for funding high-level infrastructure and science.
How is this document going to go up from scientists to top-level bureaucrats? 1) through the government hierarchy from government scientists to management level, 2) by academics pushing this issue to high-level governance and 3) by lobbying from the top-down, potentially from CSA to high level department managers.

Clemence told the group that young scientists are interested in using EO for "current concerns" such as pollution, plastic in the ocean, environmental fouling, etc. They would use the report as a 'phone book' of who else is doing research in their area(s) of interest.
Emmanuel reiterated the problem of lack of 1) accessibility of data to all users and 2) communication between researchers.

Science issues (should identify 5-10 max):

1. Ecosystems shift northward, impact of climate change on ecosystem shifts and ecosystem health
2. Eutrophication and blue-green algae in inland waters, Increasing occurrence of cyanobacteria in lakes in Canada - (Or overall degradation of freshwater quality) due to anthropogenic pressure and climate change
3. Coastal erosion and sediment transport in near shore waters
4. Ecosystems spatial temporal dynamic (variability): ex: spring bloom dynamic and relationship with fisheries - west coast; HABs dynamics and implications for aquaculture; nearshore (watershed) development, climate shifts and decline of nearshore habitats such as eelgrass and kelp and implications for fisheries
5. Fate of organic carbon released from permafrost, (thaw lakes, greenhouse gases, etc.)
6. Characterisation of sea ice
7. Uptake of CO2 from coastal regions
8. Impact of energy budget, input for meteorological models
9. Discrimination of phytoplankton groups
10. Accelerating loss of sea grasses across the globe threatens coastal ecosystems (see http://www.pnas.org/content/106/30/12377.full)
11. Detection of foreign objects at sea (Defence applications)
12. Shallow water bathymetric mapping
13. Characterisation of oil spills
14. Impact of small-scale short-duration events
15. Lagoon process, coral bleaching
16. Wetlands, erosion, degradation, spatial distribution
17. Marine protected areas
18. Visibility, water mass and front predictions in coastal areas, support from real-time environmental assessment in intertidal and near-shore zones
19. Mine site tailing ponds, remediation
20. Public health event related, waterborne zoonoses (insect borne diseases)
21. Flood, safety, security, reclamation, impact, water quality, shoreline changes
22. Sea ice infested waters, conditions and atmospheric conditions
23. Stratification of the water, salinity, and acidification, as assessed with autonomous platforms with biogeochemical sensors, 3D view of the oceans.

Emmanuel Devred noted that many of theses issues can be addressed my multispectral Earth Observation (WaterSat – 2 day temporal at 45°N)

Questions that cannot be addressed by satellites (need autonomous platforms with biogeochemical sensors – 3D view of the ocean): water column stratification, acidification, and salinity.

Tuesday March 8

The report should be divided into three broad categories: Environment, Safety, and Societal

Martin has offered to edit the first draft of the report. The challenges cited above will be grouped into three major categories. Emmanuel, Simon and Pierre will write the section on scientific challenges. Maycira, Cesar and Eduardo will address the history and provide an overview of the Canadian capacity – this section can be placed in the annex. It is important to position Canada in the Global EO community.

Recommendations:

Recommendations will be prioritized and the section will be written after first draft of scientific challenges section has been completed

1. Archiving and availability of satellite products and in situ data
2. Synergy between different EO data to address merging of different spatial resolution data and sub pixel classification – upcoming RadarSat Constellation Mission and RadarSat Follow-on Mission
3. Validation of Canadian satellite products
4. Product validation should include range of wavebands including for CDOM applications- short wave lengths (atmospheric corrections)
5. Critical assessment and review the added the value of hyperspectral data for coastal and inland waters
6. Support and maintain cohesion of Canadian aquatic colour community – knowledge transfer and networking
7. Encourage training of HQP for sustainability and retention of Canadian expertise
8. Develop outreach program for industry, government and general public – emphasize communication and training (showcase)
9. Develop new technologies and algorithms specific to coastal environments/inland waters
10. Critical assessment of the spatial resolution to tackle the science questions addressed in the previous section
11. Support studies that combines microwave and OC in characterisation of sea ice
12. Evaluate the atmospheric correction in coastal environments
13. Ensure the continuity in the availability of satellite data
14. Range of wavebands including UV for CDOM applications
15. Facilitate access to computing capacity in Canada
16. Evaluation of the atmospheric correction in coastal and inland waters

WaterSat and PACE Programs (M. Bergeron)

New opportunities emerged in January 2016. A feasibility study for Microsat option was completed and the system proved to be too expensive for the available budget ($25 million with launch costs of $7-$9 million). An application was developed in collaboration with government department representatives (DRDC, DFO, PHAC, ECCC, NRCan). US Navy Research Laboratory approached the CSA based on Canadian Industry capability to cover the coastal needs for USA, but the NASA budget doesn't permit this second payload. The timeline is feasible to match the PACE mission, for a launch in 2023,

so a proposal must to be submitted by January 2017. WaterSat key characteristics include swath width 240km, ground sampling distance 100km, SNR 640:1. Under the negotiation process with NASA, CSA will have to identify what's in it for Canada. CSA can provide the system and NRL will continue to do the processing There is a meeting scheduled with NASA/NRL/industry on March 15/16. Some scientists were involved in the discussion with CSA, with representatives from DFO, EC, RDDC and Susanne Craig as a representative from PACE. Should there be a ground segment dedicated for Canadian waters, for processing level 2 to 4 data?
How can NetCOLOR participate more formally in WaterSat?

PACE (phytoplankton, aerosols, clouds, ocean ecosystem) is a precursor to decadal survey – Tier 2 mission, ACE. Its objectives are to conduct global measurements, obtain a better understanding of the carbon cycle and provide extended cloud/aerosol data. It is fully funded by USA.

Emmanuel, Simon and Susanne are already involved in the WaterSat/PACE program. Emmanuel Boss is the Chief scientist of PACE

CalVal program for PACE
Vicarious calibration is critical after the launch of the satellite. Traditionally, the two main sites are MOBY and BOUSSOLE, which represent a limited dataset. Satlantic got awarded the Cal/Val approach for the hyperspectral PACE and other ocean colour mission, the HYPERNAV, using radiometric sensors on floats (derived from the Seabird Argo floats). Systems have been developed and tested and 8 have been deployed in the global oceans. Good match-up data except for the 555nm waveband. This is a viable approach for calibration of multispectral imagers, but there are still challenges for hyperspectral sensors. Issues remains on stability of wavelength and stray light corrections. The 'final' instruments are currently being developed using the specification tested. These floats will provide better special coverage than ship-based measurements and bouys.

Moving forward:
National Meeting early in 2017: Cesar will take the lead to try and secure hosting by DFO in Ottawa. This will facilitate participation by stakeholders and government officials, while giving NetCOLOR a bit of exposure!

Draft document should be circulated to stakeholders in October 2016 and DGs should be invited to the National Meeting. NSERC, CCMEO, DRDC, ECCC, Coast Guard, Canadian Hydrographic Service, and CIS should be targeted as well as industry (consulting companies, SEACOR).

We have to implement a plan for renewing funding for NetCOLOR (3yr @ $50K/yr). We have to show that we have successfully addressed the needs of the community.

Marie Hélène Forget and Debbie Christiansen Stowe