



EuroGOOS
European Global Ocean
Observing System

EuroGOOS AISBL Annual General Meeting
21-23 May 2014
EuroGOOS AISBL, Brussels

Agenda Item 10: Approval of new activities and subsidiary bodies

Meeting Document 10: ToR for joint EMB-EuroGOOS WG

The General Meeting is invited to ***approve*** the ToR of the Working Group



Operational Ecology: opportunities and perspectives

or

2020: the horizon for Operational Ecology

Draft Terms of Reference

<i>Draft Version 1.0</i>	<i>A. Crise</i>	<i>26/03/14</i>
<i>Draft Version 1.1</i>	<i>K.Nittis&A.Crise</i>	<i>31/03/14</i>

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1. Background and Rationale

In the sector of marine science and technology the concept of Operational Ecology is rather new (e.g. the concept has been used in OpEC, an FP7 GMES R&D Project) and defines a target for the evolution of the present biogeochemical operational products and services to better characterize the past, present and future state and functioning of a marine ecosystem by routinely delivering and updating products related to key marine environmental variables. The OE products are currently delivered embedded in OO systems and therefore heavily depend on OO infrastructure deployment and operations. OE includes output from data-driven modelling systems, satellite observation, observational time series and surveys and therefore entails a strong connection with the biogeochemical component of ocean observing systems. The development of OE therefore requires a crosscutting contribution of different disciplines (experimental and numerical oceanography, marine ecology, engineering and ICT). A close dialogue with intermediate users and the downstream services is an integral part of OE development in order to prioritize the research topics more urgently requested to respond to users needs (problem-driven research and innovation).

Presently Europe has a leading role in the operational application of biogeochemical models: 6 over 7 MyOCEAN's Monitoring and Forecasting Centers are currently delivering biogeochemical products (20 near real-time products and 26 reanalysis) and there is a growing interest by users, marked by an increasing uptake. During year 2012, 1367 downloads have been performed by authenticated users through MyOCEAN site and higher number are expected for the following period.

A major driver for an increase of the EO products demand is related by the entry in force of European and international policies and regulations: the Integrated Maritime Policy and the Blue Growth agenda, the European Directives (e.g. MSFD, etc.) that calls for descriptors and indicators for assessment, monitoring and definition of a target status of the European marine ecosystems. (e.g. biodiversity, commercial fish, eutrophication, food webs, and invasive species, contaminants). The needs of EU agencies, regional conventions, national services are also relevant for the development of the OE products and services.

End users, including the public at large, has shown more interest in the living ocean more that its physical state, and OE products must meet this request, even if very few efforts have been done so far to engage popularization events and initiatives.

Private sector can be indeed involved in the exploitation of OE (e.g. fishery associations, downstream services, tourism, science popularization and education). The wide diffusion of portable devices and smartphones has dramatically increased the potential number of users and open an interesting market for targeted downstream services. On the other end, the HPC power is exponentially increasing and operational simulations outputs can be routinely produced with an unprecedented details. The new observational technologies (e.g. lagrangian and semi-lagrangian platforms, AUVs, ocean observatories, citizen science, etc.), the new sensors, and the consolidated satellite observations provide a near RT access to a wide data base that begins to cover also biogeochemical automatic measurements.

There is still a gap, however, in order to combine a variety of independent advancements that will help the delivery of fit-for-purpose OE products and facilitate the user uptake: observations vs models, core variables vs customized products, smartphones vs high performance computers, big data vs useful information for outreach and application. The overall aim of this working group is therefore is to try to bridge this gap by providing a fresh, innovative vision on the near future of Operational Ecology and its perspectives on a scientific, managerial and application-oriented view.

2. Objectives of the Expert Working Group

The objective of OE Expert Working is to produce a visionary description of OE state by 2020, to identify barriers (scientific lack of knowledge, scarcity of data, legal obstacles, poor model schemes, difficulties in the uptake, limitation in the outreach, few specialists, partial involvement of marine ecologists), to propose tentative solutions, and to pinpoint both mature and innovative research and innovation themes.

What is evident up to now is that the OE's development has been slowed down (but this is generally true for the biogeochemical models) and the setup of the models used closely reflects the structure proposed by seminal projects and articles in '90. The difficulties in the implementation of coupled models derived to proper definition of boundary conditions (including external forcing), initial conditions, numerical discretization, validation and model sensitivity may explain this delay.

Most probably the OE evolution will still proceed at a reduced speed because of the persistence of the above obstacles, making the OE future state prediction simpler.

Objectives of a proposed EuroGOOS - EMB Expert Working Group:

- Conduct a state-of-art of the current OE operational services
- Identify which are the major drivers coming from the societal needs (problem-driven objectives)
- Prioritize the most promising new products to be developed
- List the new biological variables to be made available
- Design the state of OE by 2020 included in the operational oceanography framework ;
- Describe the expected/requested improvements in:
 - biogeochemical models structure and functioning
 - end-to-end implementations
 - mixed model approach (BGC, habitat suitability, bioenergetics)
 - Data assimilation of biogeochemical variables
 - Light/bio-optical models
 - Uncertainty assessment: model sensitivity analysis and skill assessment
 - Transition from core products to L2 products (and higher): indicators, trends, anomalies, climatologies
 - Implementation of new schemes (on-demand high-res relocatable systems, individual based models coupled with bgc models) to be operated upon request in selected areas also for implementation of scenario analyses (what-if approach)
- Envisage the potential development to be introduced by the new ICT technologies (HPC, hybrid supercomputers, GPU paradigms, FPGA): the solution of advection-diffusion-reaction equations by means of a Lattice Boltzmann algorithms (extremely performant on GPU systems)
- Identify the proper measures to facilitate the dialogue and the feedback reporting of the user community by adopting different development paradigms (co-design, continuous delivery)

3. Output and Impact

The group will be expected to deliver a report, critically evaluating current systems operating OE modules while assessing and proposing the design of the new OE systems as a key component of OO infrastructure.

The document will be short (about 25-35 pages) and designed to be understood by non-specialist readers. Some boxes may be inserted to discuss in depth some issues of particular importance.

An external review with minimum two reviewers (selected from a list proposed by the working group members and the EMB 7 EuroGOOS delegates) will be organized by the EMB Secretariat. In accordance with EMB procedures, the document will be approved by the Marine Board before publication by the Secretariat.

The impact of the publication will be achieved *via* a targeted dissemination strategy. Working Group members will be required to both make suggestions on how to reach end-user contacts and to contribute to the dissemination. Promotion of the FSB may include dedicated presentations at stakeholder events.

A summary can be considered for publication in a peer-reviewed journal.

4. Composition and Operation of the Expert Working Group

Composition

Approximately 8-10 experts nominated by the European Marine Board in liaison with EuroGOOS and other relevant stakeholders. The group will be lead by a Chair (or two Co-chairs) and facilitated by the EMB & EuroGOOS Secretariat.

Mode of Operation

The establishment of the expert working group is for a limited duration, requested to fulfil to the specific mandate. EMB expert working groups are facilitated by the EMB Secretariat. EMB will edit and publish the resulting Future Science Brief document.

The work programme for the expert working group will consist of:

- 2 meetings (a third meeting optional);
- Writing assignments;
- Regular email interactions/web conferences;
- Facilitation of the WG by the EMB and EuroGOOS Secretariats;
- External peer review;
- Coordination of the document writing to publication standards by the WG Chair(s);
- Final editing of the Future Science Brief document in preparation of the publication by the Marine Board Secretariat and WG Chair.

Support from the European Marine Board & EuroGOOS:

- provide meeting facilities and organizational support;
- cover the costs of publication and dissemination of the document;
- secretariats will attend each meeting and will maintain regular dialogue with the WG Chair and members;
- The EMB will cover the costs of participation (economy travel and accommodation) for the participation of Working Group experts in one meeting only (normally the first meeting). Experts are asked to find alternative funds to cover participation in subsequent meetings.

