Cryosat Plus for Oceans – USER CONSULTATION

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PROJECT DESCRIPTION

1. BACKGROUND

- ESA's CryoSat-2 mission is the first one to carry a radar altimeter that can operate in SAR mode.
- Although the primary aim is land and marine ice monitoring, the SAR mode capability of the Cryosat-2 SIRAL altimeter also offers potential benefits for ocean applications;

❼The "**Cryosat Plus for Oceans**" (**CP4O**) project is dedicated to the exploitation of Cryosat-2 data over the ocean.

❼It is supported by the ESA Support to Science Element (STSE) Programme, and brings together an expert European consortium.

Fig.1. An image of the Cryosat-2 Satellite

Work Package	WP Title	WP Leader	WP Description
WP1000	Scientific Requirements Consolidation	Starlab	Consolidation of preliminary scientific requirements for the four sub-themes.
WP2000	Preliminary Analysis of the State of the Art	TU Delft	Review of relevant reports, algorithms, models, initiatives and EO-based products.
WP3000	Data Set Collection	isardSAT	Definition of the set of Cryosat-2 data needed for WP4000, of auxiliary data and of validation data;
WP4000	Product Development and Validation	NOC	Analysis, development and validation of the methods and algorithms to derive Cryosat-2 products;
WP5000	Impact Assessment	CLS	Use of standard tools to evaluate the new algorithms and the quality of the new products, quantify the improvement of the methods and models, assess the benefits and impact of the new products.
WP6000	Scientific Roadmap	SatOC	Definition of a scientific roadmap to ensure full exploitation of Cryosat-2 data over the oceans, and to define activities to optimize the data flowing from the Sentinel-3 series of satellites.
WP7000	Outreach, promotion and publication	SatOC	Promotion of project results, products, methods and datasets used, presentations at conferences and submissions of papers, preparation of a project website;
WP8000	Project Management	SatOC	

2. OBJECTIVES & SUB-THEMES

The general objectives of the CP4O project are:

•To build a sound scientific basis for new scientific and operational applications of Cryosat-2 data over the open ocean, polar ocean, coastal seas and for sea-floor mapping.

•To generate and evaluate new methods and products that will enable the full exploitation of the capabilities of the Cryosat-2 SIRAL altimeter, and extend their application beyond the initial mission objectives.

•To ensure that the scientific return of the Cryosat-2 mission is maximised.

The specific themes that will be addressed by the project are:

1)Open Ocean Altimetry;
2)High Resolution Coastal Zone Altimetry;
3)High Resolution Polar Ocean Altimetry;
4)High Resolution Sea-Floor Altimetry.

USER REQUIREMENTS

3. GENERAL APPROACH

WP100 aims to consolidate the preliminary scientific requirements for the four sub-themes under investigation.

To achieve this goal the following tasks are to be completed:

•**A user consultation with key institutions** to derive an updated analysis of the high-level needs per sub-theme.

•**The characterization of limitations and drawbacks of existing products** to achieve the desired needs when applied to CryoSat-2 data.

•T**he definition of a list of scientific and operational requirements per sub-theme**, detailing the technical and scientific constraints for the methods and models to be developed, if any.

4. USER CONSULTATION METHODOLOGY

The user consultation task within CP4O will follow the approach pursued within the **COASTALT** and **PISTACH** projects, and will benefit from the results obtained from these projects.

The methodology includes the following steps:

1.Defining a questionnaire (see Fig. 2)**,** covering the four sub-themes under analysis (open ocean, coastal zone, polar ocean and sea-floor);

2.Defining a list of users covering the four sub-themes, and working for different institutions (public and private, research and operational);

3.Distributing the questionnaire to the users by email or through direct interviews;

4.Gathering and analysing the consultation results.

Fig.2. Main sections of the user consultation questionnaire

Some preliminary information on user requirements is already available from the **COASTALT** AND **PISTACH** projects, focused on coastal altimetry. An in-depth **analysis of the results of the surveys**, and the definition of a list of recommendations for the new coastal-altimetry products [1], [2], [3].

In order to take advantage of these synergies, and to avoid duplication of actions, results, and efforts from the users, the current strategy is:

a.To **re-exploit the information available** from the COASTALT and PISTACH surveys, and possibly integrate the existing questionnaire/list of users, to cover the **Open Ocean and the Coastal Zone** sub-themes;

b.To **gather new information for the Polar Ocean and the sea floor sub-themes**, through new questions and new relevant users.

5. RECOMMENDATIONS FROM COASTALT AND PISTACH PROJECTS

Some of the recommendations from the COASTALT and PISTACH projects can be re-used for the new product. However, some others will have to be modified or integrated to account for the new characteristics of SAR-mode data, and for new sub-themes.

The coastal altimetry product should:

- …be mostly used with a model for validation or for assimilation;
  ➔What is the main application for the other three sub-themes?
- …provide Sea Surface Height (SSH) and Sea Level Anomaly (SLA) as the fundamental physical parameters, but also include Mean Sea Level (MSL), Mean Dynamic Topography (MDT), Significant Wave Height (SWH) and wind speed;
  ➔What are the most useful parameters for the other sub-themes?
- …be provided at the maximum spatial resolution (maximum posting rate), but with a reasonable SNR;
  ➔These requirements can be largely improved by the availability of SAR-mode!
- …be developed as a delayed product, but with a processing chain compatible with Real-Time (RT) data and Near-Real Time (NRT) data;
  ➔Are the requirements the same for for polar-ocean and sea-floor applications?
- …be provided along-track, but also as 2D gridded fields;
  ➔What type of product would be most required in the context of SAR-mode data, and for the other sub-themes?
- …provide quality flags together with all the separate corrections;
  ➔Which correction is still reliable, and which should be changed or modified for SAR-mode, and for the other sub-themes?
- …Guarantee continuity with altimetric products provided over open ocean;
  ➔Securing a seamless transition between open ocean and coastal zone products in SAR-mode is a particularly important issue;

Etc… (for the full list of recommendations please see [1], [2] and [3]).

6. SUMMARY AND FUTURE WORK

•The user consultation task needs to be completed by integrating the existing information database primarily with information for polar ocean and sea-floor sub-themes.

- **New relevant users will be identified and an integrated questionnaire will be distributed;**

•The limitations and drawbacks analysis of existing altimetric products, as well as the definition of the scientific and operational requirements for open ocean and coastal zone sub-themes will exploit the existing results from the COASTALT and PISTACH projects;

- **A new analysis and requirements definition is needed for polar-ocean and sea-floor subthemes.**

Comments, suggestions, or a request to take part to the user consultation survey for CP4O can be provided by email to the following address:

cp4o@starlab.es

Your feedback and help is encouraged and appreciated!

References [1] Moreno L. *et al.*, "COASTALT Report on User Requirements for Coastal Altimetry Products", ESA/ESRIN Contract No. 21201/08/I-LG, available at http://www.coastalt.eu/files/results/COASTALT-WP1-D12-final-red.pdf
[2] Dufau C. *et al.*, "User Requirements", summary presentation given at the 2nd Coastal Altimetry Workshop 2008, Pisa, ITALY. Available at http://www.coastalt.eu/sites/coastalt.eu/files/pisaworkshop08/pres/01-PISTACH-COASTALT-CAW-V4-CMP.pdf
[3] Dufau C. *et al.*, "User Requirements in the Coastal Ocean for Satellite Altimetry", in Vignudelli S., Kostianoy A.G., Cipollini P., Benveniste J. (eds.), "Coastal Altimetry", Springer-Verlag Berlin Heidelberg, 578 pp, 2011.DOI: 10.1007/978-3-642-12796-0