



ESA Sea level CCI

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## 1. Executive Summary

### 1.1. Scope

The Sea Level CCI responds directly to the GCOS requirements for the Sea level ECV (Product O.2 in GCOS-107) through the generation and validation of multi-mission ECV products from the altimeters on TOPEX/Poseidon and Jason series, as well as ERS1/2, Envisat and GFO. To achieve this global objective, the specific objectives for the Sea Level CCI are:

- To involve the Climate research community to improve the understanding of their needs;
- To develop, test and select the best algorithms and standards in order to produce high quality sea level products for climate applications;
- To assess and collect information on the quality and error characteristics of the Sea Level ECV product through the involvement of independent climate research groups;
- To provide a complete specification of the operational production system that should be developed during the phase 2 of the ESA CCI programme.

### 1.2. Project Status

After 9 months since the starting date, the project has entered into a new phase with an intense activity on three main topics. First, the work on the user requirements, key issue in this project, continued on this period: there were numerous exchanges which resulted in several upgrades of the User Requirements Document. Secondly, activities on algorithm development have strongly intensified. For some algorithms, some issues had and still have to be solved concerning the data requirement (property right, phasing with other projects) but for other, the preparatory activities are well advanced and development have started. Some of the proposed algorithms are promising, such as the new Envisat instrumental processing which will have a major impact at Climate scales. The SLCCI will be the first opportunity to have an extensive scientific assessment. Finally, work has commenced and continues on the System Requirements, including elicitation of "business goals" from the CCI Statement of Work, a comprehensive and reasoned mapping from a system apt for re-use, namely DUACS, towards a SLCCI operational system, and construction of a draft Requirements Baseline. Through the 6 first months of the project, the Sea Level CCI team has set up connection with other European altimetry projects, and communicated to the international altimetric and climate community. This is the key element to fulfil the ambitious objectives of this project.

## 2. Project Progress

### 2.1. Data Requirements

30 types of data are necessary to run the algorithms and to perform the inter-comparison and selection task: satellite and ancillary from 6 altimeter missions (ERS-1, ERS-2, Envisat, Jason-1, Jason-2, T/P, GFO) as well as in situ data. Among all the input dataset to retrieve several issues were encountered which have induced a delay in the development planning. Moreover the availability of reprocessed Envisat dataset will not be phased anymore with SLCCI WP2 planning and some corrective actions had to be taken. Strong efforts have been supplied by the SL project in terms of coordination: several meeting and teleconferences with ESA and CNES were organised in order to allow the CCI to benefit from the optimal input data from the external projects. Among the data to be ordered, 2 kinds of deliveries were requested: a one shot delivery on the overall period of availability and for data (satellite, ancillary, ...) that are processed operationally. This will allow the generation of the most complete possible sea level ECV time series.



## 2.2. User Requirements

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The synthesis of the user consultation and review of the requirements were presented at the 2nd Progress Meeting. The discussion organised during this meeting with all the partners and also with a representative of the CMUG (T. Phulpin, Meteo-france) led to several recommendations. It was in particular recommended that input from the community working on mesoscale and coastal signals be included in the URD. It was also emphasized that it is necessary to share a common definition for the term accuracy, precision and stability. A new version of the URD was updated and delivered to ESA on 4 March 2011. At PM2 it was also agreed that the URD might be updated in 2nd phase of the project to catch the evolving views and requirements in the scientific user community. This would also bring special attention to the sea level requirements in the high latitude seas and the Arctic Ocean where the permanent and seasonal sea ice cover cause challenges in the altimeter based sea level processing.

The sea level URD was presented during the CMUG meeting in March. The approach aims to point out that the actual User requirements could not be met by the existing data. The SL CCI is a real opportunity to reduce the gap and to also improve the characterization of the error budget.

The feedback from the CMUG meeting is that the attempt to differentiate the User requirement from the current status of the altimetry was not fully understood. Similarly to the conclusion of the PM2, it was also mentioned that requirements for regional signal need to be added. Consequently, there is a need to better explain the way the User Requirements were collected and probably to add the “target” and “achievable” notions into the URD.

No difficulty is foreseen with respect to the link with the on-going update of the GCOS satellite supplement due to the deep involvement of A. Cazenave in this activity.

## 2.3. Products Specification

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A first version of the PSD has been delivered in March. It has been presented at the integration meeting in order to demonstrate how the product specifications meet the needs of the climate research group in the SL CCI. The requirements concerning the global and regional mean sea level applications in terms of spatial resolution and length of the time data series have been taken into account in the definition of the sea-level ECV. In comparison with sea-level products currently available, new information (crucial for climate studies) will be provided concerning the evolution of the time data series (such as the trend, the description of periodic signals...) and the errors associated. Work is on-going to improve the PSD waiting for the next version of the URD where requirements will be improved.

## 2.4. Scientific Cooperation

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The Sea Level CCI Project is closely connected to international activities related to global and regional analyses of the climate system specifically activities within the WCRP, such as CLIVAR or CLIC. Both are concerned with the Arctic system and its changes. This concerns observations (CLIVAR/GSOP and OOPC), changes in the climate system (CLIVAR/AIP) and specifically sea level (CLIC). In February a joint WCRP/IOC workshop on regional sea level variations and drifts was held in Paris. During the workshop detailed discussions of regional sea level variability was held and the role of the Arctic and its hydrological cycle was highlighted for predictions of regional and global sea level.

The ESA CCI on sea level has also cooperated with two EU projects, notably MONARCH-A (led by NERC) and MyOcean (led by Mercator-Ocean), either through direct collaborations such as envisioned with MONARCH-A or through the interface with MyOcean for which high resolution sea level products should be delivered. The role played by CLS, as leader of the SL Thematic Assembly in MyOcean, ensures a good coordination between the two projects. The work of MONARCH-A is directly related to the CCI effort both with respect to altimetry, but also Arctic tide gauges. At the



same time MONARCH-A is a candidate model for bringing several ECVs together in a joint use and evaluation.

The ECV Integration meeting was also a very good opportunity to reactivate the links with the other ECV teams and the modelling community, established at the 1st collocation meeting. Although the sea level ECV does not have direct linkage with other ECV projects, a potential synergy has been identified with the SST ECV. The correlation between those two ECV at low frequencies/long term will be useful for the ECV product assessment. It has to be noted that the ESA CCI on sea level will also cooperate with the two soon to be launched CCI projects on respectively sea ice and ice sheet and glaciers.

One outcome from the collocation meeting and the CMUG meeting is that despite its relatively good maturity, the sea level ECV is not really used by the coupled climate models even for validation exercise. The ESA CCI program represents consequently a very good opportunity to enhance the use of the sea level ECV.

## 2.5. Next Steps

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In 2011 Q2, most of the efforts will be dedicated on the development of the improved algorithms (WP2000). The first Round Robin datapackage will also be generated which will allow to tune the validation procedure, necessary steps to prepare the selection process at the end of year.

Concerning WP1000, the CMUG meeting allowed to point out that additional work is needed for the URD in order to define the user's requirements better. The PSD will also have to be completed in the next months in agreement with the next URD version.

Finally, regarding WP 5100 the System Requirements Document (SRD) is due for delivery in mid April 2011, with a stable and complete Requirements Baseline. Then, effort will commence on the design of the system, via a System Specification Document (SSD), which takes as its main input the SRD.