sea state cci

# Project Management Plan

Version 1.3, 27 March 2019

## Contents



| Author | Approved | Signature | Date |
|---|---|---|---|
| Ellis Ash | Fabrice Ardhuin |  | 27/03/19 |
| **ESA Acceptance** | | Digitally signed by Craig Donlon<br>Date: 2019.03.27 15:25:07 Z<br>Adobe Acrobat DC version: 2015.006.30464 | |

| Issue | Date | Comments |
|---|---|---|
| 0.1 | Feb 2018 | Draft prepared for negotiation meeting |
| 0.2 | June 2018 | Updates reflecting revised proposal |
| 1.0 | 4 July 2018 | Fixed dates added following KO meeting |
| 1.1 | 3 Sept 2018 | Minor corrections, updates to WPDs, added description of working teams, inclusion of new partners and WPD for WP8000 pending CCN approval |
| 1.2 | 23 Oct 2018 | Updates for inclusion of WP8000, composition of CRG, other edits following review by ESA. |
| 1.3 | 27 Mar 2019 | Updates to WP8000 description. |

# 1. Introduction

## 1.1 Purpose and scope

This document presents the Project Management Plan for **Sea_State_cci**. It contains information about the project organisation and management practices to be adopted in the project.

## 1.2 Overview of document

This Project Management Plan is organised into the following sections:

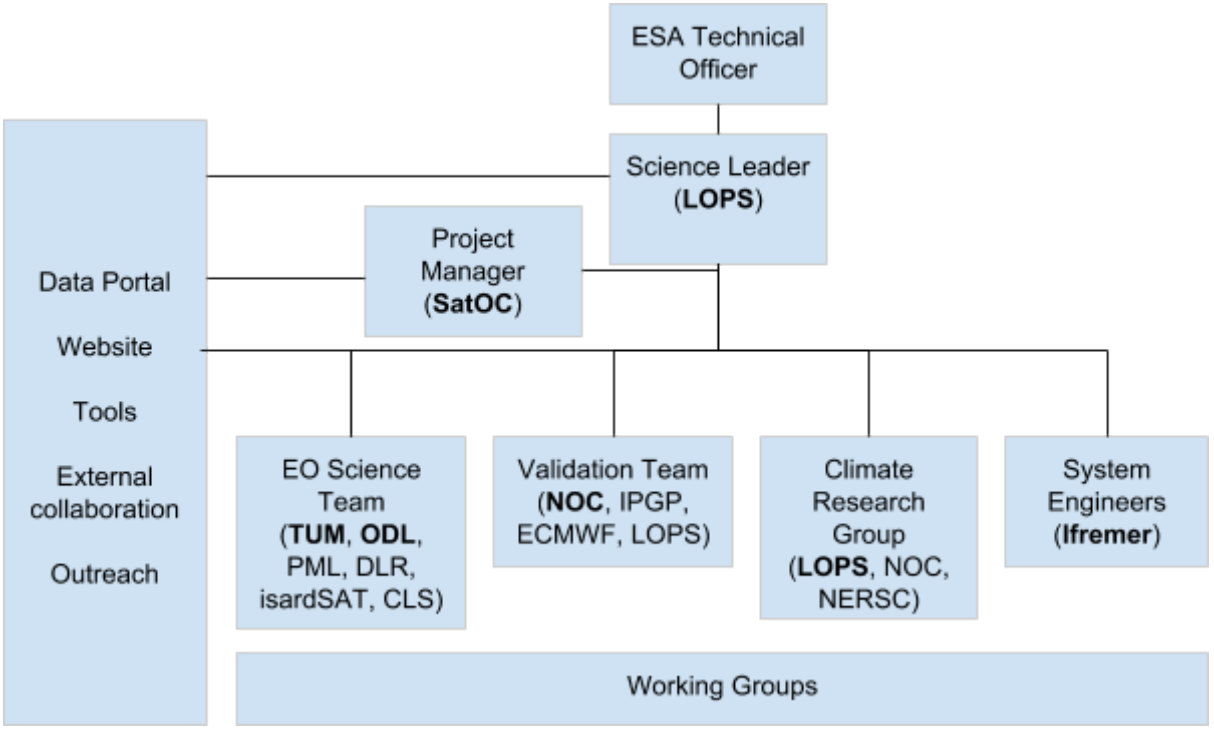
Section 2. Project team
Section 3. Management approach
Section 4. Project communication and website
Section 5. Risk analysis
Section 6. List of deliverables
Section 7. Work Breakdown Structure
Section 8. Planning
Section 9. Work package descriptions

# 2. Project team

The **Sea_State_cci** team consists of 15 organisations: LOPS (through CNRS) as Prime Contractor, with Ifremer, SatOC, TUM, ODL, NOC, PML, DLR, ECMWF, NERSC, CLS, isardSAT, IPGP, UGal, IHC.

This consortium includes organisations that have the breadth of scientific, technical and project management expertise necessary to carry out this project successfully, and who have played leading roles in highly-relevant previous activities linked to CCI and sea state from satellite.

The figure below presents the consortium structure and reporting lines. To summarise, CNRS, as prime contractor, is responsible for overall delivery and science coordination of the Project. SatOC, as specialist project managers, is responsible for general management of the consortium to ensure timely delivery of all deliverables. The rest of the consortium comprises of the Working Teams, described further in the next section.




## 2.1 Composition of the working teams

For the baseline work:

- EO retrieval algorithm developers,
  - Altimeter: M. Passaro (TUM), G. Quartly (PML), P. Thibaut (CLS)
  - SAR: F. Collard (ODL) , A. Pleskachevsky (DLR), M. Roca (IsardSAT)
- System development engineers:
  - J.F. Piolle (Ifremer): representative to the Data Engineering Working Group (DEWG)
  - M. Accensi (Ifremer): assembly of in situ buoy data sets.
- Validation scientists:
  - Validation against in situ and model data: Christine Gommenginger (NOC)
  - uncertainties: S. Abdalla (ECMWF)
  - Trends and variability: J. Stopa (Uni. Hawaii), M. Menendez (IH Cantabria), M. Hemer (CSIRO)
  - swell spectra, partitions and directions: Alexis Mouche (LOPS), Jesus Portilla-Yandun (Escuela Politecnica National, Quito, Ecuador)[1], Haoyu Jiang (China University of Geosciences, Wuhan, China)
  - Validation of “very extreme sea states”: F. Ardhuin and L. Pineau-Guillou (LOPS)

[1] Some of the travel for J. Portilla-Yandun will be covered by ESA through LOPS/CNRS.

- Validation in the MIZ (Anton Korosov)

- A dedicated Climate Research Group (CRG). This group involved both personnel from the proposing partners and members of the COWCLIP group. Further details are given in the next sub-section.

And researchers that will contribute expertise and work at no cost to ESA[2]

- Justin Stopa (UH, Honolulu, USA)
- Mark Hemer (CSIRO, Hobart, Australia)
- Melisa Menendez (IH Cantabria, Spain)
- Sergei Gulev (Shirshov Inst. Oceanography, Russia)
- Ian Young (Uni. Melbourne, Australia)

In particular the activities of CSIRO and Uni. Melbourne are funded by an ARC grant on wave climate.

### 2.2 Climate Research Group (CRG)

The project Cilmate Research Group (CRG) consists of the following nine people, drawn from both the project partnership and representatives of the COWCLIP wave climate modelling community:

- Justin Stopa (Uni. Hawaii), **chair of the CRG**
- Melisa Menendez (IH Cantabria, Spain)
- Christine Gommenginger (NOC, UK)
- Johnny A. Johannessen (NERSC, member of GCOS Ocean obs. panel)
- Jean Bidlot (ECMWF)
- Sergey Gulev (SAIL)
- Mark Hemer (CSIRO)
- Ian Young (Uni Melbourne)
- Guillaume Dodet (Uni Brest)

The role of the CRG includes:

- Give feedback and advice on the project work.
- Interact with GCOS to manage and possibly update the requirements for sea state measurements.
- Interact with other appropriate bodies to ensure the widest use of the CCI data and gather the feedback of a diverse community.

Interaction will be through a mixture of email, videoconference and meetings of opportunity including at conferences and project progress meetings.

### 2.3 List of Key Personnel

Key personnel are described in the following table:

| Name | Company | Position | Time Commitment and | Work Package |
|---|---|---|---|---|

[2] Some of the travel for S. Gulev will be covered by ESA through LOPS/CNRS.

| | | | Role | hours |
|---|---|---|---|---|
| Dr Fabrice Ardhuin | LOPS | Director of research | 15% Science Leader | WP1000 (680)<br>WP5000 (100) |
| Dr Justin Stopa | LOPS | Associate researcher | 27% User Requirements, Product Assessment | WP1000 (100)<br>WP5000 (1333) |
| Dr Ellis Ash | SatOC | Technical Director, Senior Project Manager | 25%<br>Project Manager | WP1000 (72)<br>WP2000 (128)<br>WP6000 (96)<br>WP7000 (768) |
| Dr David Cotton | SatOC | Managing Director, Senior Project Manager | Management and Technical Support, links to DeDop and SCOOP projects | WP2000(32)<br>WP4000(16)<br>WP7000(72) |
| Dr Graham Quartly | PML | Researcher | 28% Altimeter algorithm developer | WP2000 (1123)<br>WP6000 (222) |
| Dr Andrey Kurekin | PML | Researcher | 18% Altimeter algorithm developer | WP2000<br>(866 hr) |
| Dr Marcello Passaro | TUM | Researcher | 57% Altimeter algorithm developer | WP2000<br>(2739 hr) |
| Dr Saleh Abdalla | ECMWF | Research Scientist | Validation and error estimations | WP4000 (342)<br>WP5000 (84) |
| Dr Jean Bidlot | ECMWF | Senior Research Scientist | Advisor on open ocean and coastal wave dynamics; theory and measurements of ocean waves; altimetry; validation; wave climate, trends and variability | WP4000<br>(in-kind)<br>WP5000<br>(in-kind) |
| Jean-François Piollé | Ifremer | CERSAT manager | System development, ECV data production | WP3000(330)<br>WP4000(600) |
| Dr Fabrice Collard | ODL | Research Expert Scientist | 32% SAR algorithm coordination | WP1000 ( 60)<br>WP2000 (760)<br>WP3000 (320)<br>WP7000 (200) |
| Sylvain Herlédan | ODL | Confirmed Engineer | 12% Software/ System development, data processing | WP3000 (570) |
| Gilles GUITTON | ODL | Research Scientist | 24% Algorithm developer | WP2000(320)<br>WP4000 (840) |
| Dr Christine Gommenginger | NOC | Senior Research Scientist | NOC technical lead for validation and wave climate; Delay Doppler | WP4000 (118hr)<br>WP5000 (118hr) |

| | | | | |
|---|---|---|---|---|
| | | | Altimetry, Coastal Altimetry and SAR. Member of CRG | |
| Giuseppe Foti | NOC | Research Scientist | Validation against buoys, models & other satellites; link to GNSS-Reflectometry (sea state, mss) | WP4000 (697 hr) |
| Dr Nadim Dayoub | NOC | Research Scientist | Sea level and waves in coastal zone; link to H2020 Co-ReSyf. | WP5000 (697 hr) |
| Dr Adrien Martin | NOC | Research Scientist | Support mss and SAR in coastal zone analyses; link to H2020 CEASELESS and ESA CCI+ Salinity | WP4000 (106 hr) |
| Dr Chris Banks | NOC | Research Scientist | Support altimeter validation; link to ESA CryOcean-QCV and ESA CCI+ Salinity | WP4000 (106 hr) |
| Dr Andrew Shaw | Skymat Ltd (via NOC) | Research Scientist | Support validation, trend and uncertainty analyses in coastal zone; link to CCI Sea Level (coastal) | WP5000 (135 hr) |
| Dr Francisco Mir Calafat | NOC | Senior Research Scientist | Advisor on global & coastal altimetry validation, coastal processes, trends and variability; link to CCI Sea Level & ESA CryOcean-QCV | WP4000 + WP5000 (in-kind) |
| Dr Helen Snaith | BODC/NOC | Senior data scientist | Advisor on global & coastal altimetry validation; link to ESA CryoOcean-QCV, Globwave, H2020 Co-ReSyf and eSurge. | WP4000 + WP5000 (in-kind) |
| Prof Meric Srokosz | NOC | Senior Research Scientist | Advisor on open ocean and coastal wave dynamics; theory and measurements of ocean waves; altimetry; validation; wave climate, trends and variability | WP4000 + WP5000 (in-kind) |
| Dr Pierre Thibaut | CLS | Research Expert Scientist | CLS technical lead for development and validation of altimeter processing | WP2000 |
| Dr. Andrey | DLR | Senior | SAR algorithm | WP2000 + |

| | | | | |
|---|---|---|---|---|
| Pleskachevsky | | Research Scientist | developer | WP4000 (671 hr) |
| Björn Tings | DLR | Research Scientist | SAR algorithm developer and project administrator | WP2000 + WP4000 (117 hr) |
| Dr. Susanne Lehner | DLR | Senior Research Scientist | SAR algorithm developer, advisor | WP2000 + WP4000 (in-kind) |
| Dr. Sven Jacobsen | DLR | Head of DLR's Maritime Safety and Security Lab | Project administrator | WP2000 + WP4000 (in-kind) |
| Johnny Johannessen | NERSC | Research Coordinator | Validation | WP4000, WP5000 |
| Anton Korosov | NERSC | Researcher | Validation | WP4000, WP5000 |
| Mònica Roca | isardSAT | Managing Director | Internal management | WP2000 |
| Chandra Taposeea | isardSAT | Researcher | Technical development | WP2000 |
| Chris Ray | isardSAT | Researcher | Technical development | WP2000 |
| Eduard Makhoul | isardSAT | Researcher | Technical development | WP2000 |
| Eleonore Stutzmann | IPGP | | | WP4000 |
| Melisa Menendez | IH Cantabria | | | WP8000 |
| Liliana Rusu | Uni Galati | | | WP8000 |

## 2.4 Project resources

The table below describes the hours of effort allocated to each project partner for each work package (WP).

| Partner | Allocated staff time per WP (hours) | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | WP1000 | WP2000 | WP3000 | WP4000 | WP5000 | WP6000 | WP7000 | WP8000 | |
| LOPS | 700 | | | | 1433 | 80 | | | 2213 |
| Ifremer | | | 330 | 1645 | 135 | | | | 2110 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TUM | | 2739 | | | | | | | 2739 |
| PML | | 1989 | | | | 222 | | | 2211 |
| ODL | 60 | 1080 | 890 | 840 | | | 200 | | 3070 |
| DLR | | 708 | | 80 | | | | | 788 |
| NOC | | | | 1027 | 815 | | | | 1842 |
| ECMWF | | | | | 342 | 84 | | | 426 |
| NERSC | | | | 230 | 83 | | | | 313 |
| SatOC | 72 | 160 | | 64 | | 96 | 840 | | 1232 |
| CLS | | 229 | | | | | | | 229 |
| isardSAT | | 2160 | | | | | | | 2160 |
| IPGP | | | | 802 | | | | | 802 |
| IH Cantabria | | | | | | | | 2200 | 2200 |
| Uni Galati | | | | | | | | 830 | 830 |

# 3. Management Approach

## 3.1 Project and subcontractor control

A structured and professional approach to controlling the project will be utilised whereby each task is planned, allocated, and reviewed according to consistent procedures. These techniques will be used at all stages of the work.

This Project Management Plan will form the basis for project control by the Project Manager, enabling the following objectives to be met:

- all project tasks to be specified, allocated, tracked and reviewed
- the project organisation to be clearly defined and individual responsibilities clearly understood
- both external milestones and internal goals to be identified to provide a framework for team management and allow effective progress monitoring
- the severity of any problems arising will be identifiable in relation to the plan, allowing an objective assessment in reporting them to ESA.

From a contracts point-of-view, all contractual matters will be handled in the first instance by the LOPS Contracts Officer who will then liaise with the appropriate members of the consortium.

The Work Package (WP) leaders are responsible for coordinating the activities within each WP, for monitoring and controlling progress and for ensuring the deliverables are available according to the agreed schedule. Finally, all partners are responsible to the Work Package leaders where activities are assigned to them. If any partner identifies any risk or difficulty in carrying out assigned tasks they should immediately advise the WP leader and the Project Manager, so that actions can be taken to limit or manage the risk.

Any disagreements will be identified at the earliest opportunity and resolved as quickly as possible through direct discussion between the affected parties. If disagreements persist then they will be subject to the procedure agreed within subcontracts between LOPS and individual partners.

### 3.2 Work package management

Each Work Package (WP) has a manager and they will have the responsibility of coordinating the WP contributors to ensure sub-tasks are performed in accordance with the work package specifications (WPS) given in section 8.

It will be the **Project Manager**'s job to oversee WP management to ensure efficient and timely running of the project. Where necessary WP managers will integrate outputs from different consortium members into a coherent whole (e.g. document, design, specification etc.).

Since there are a number of dependencies between work packages, the SatOC Project Manager in particular will take overall responsibility for ensuring that the outputs of work packages, which are used as inputs in others, are completed according to the agreed schedule.

### 3.3 Project reviews and meetings

Formal Project Review and Progress Meetings will be held according to the schedule given in the section 8.2 of this Management Plan. These meetings will be organised by the Project Manager and planned at least 2 months in advance. Typically the date for a subsequent quarterly progress meeting or annual review will be fixed during the present meeting.
Internal progress meetings will be held on at least a monthly basis and will be web based. At some times it may be necessary to hold bi-weekly internal meetings for example in the early stages of the project and at the start of certain activities.

Two User Consultation meetings will be organised by PML and Ifremer in collaboration with climate users, in years 2 and 3 of the project.

Colocation meetings, as arranged by ESA, will be attended by up to four partners from the consortium. Annual CMUG Integration Meetings will be attended by key members of the Climate Research Group.

Meeting inputs, especially the agenda and related deliverables, will be made available to ESA for approval at least 2 weeks before each meeting. SatOC will be responsible for recording the minutes of progress meetings. Meeting presentations and draft minutes will be

made available within 3 working days of each meeting, and the minutes will be provided in final format within two working days of approval.

### 3.4 Progress reporting

WP progress briefs will be collected by the Project Manager and used as inputs into the monthly progress updates that SatOC will produce on behalf of LOPS for the agency. The content of these monthly updates will be as follows:

- Summary of project achievements in the previous three months
- Status of all minuted actions
- Issues affecting the project and proposed solutions
- Schedule to completion and forward look to next milestone
- Major planned project activities in the coming months

Progress shall always be reported with respect to the agreed Project Plan.
An action register will be created by SatOC to track actions agreed at progress meetings. Each progress meeting will begin with a review of the action register.

### 3.5 Action control

An action register will be created by SatOC to track actions agreed at progress meetings. The action register will form part of the monthly progress report and tracked as part of routine progress monitoring. Each progress meeting, with ESA and within the consortium, will begin with a review of the action register.

### 3.6 Quality management

Quality management of technical outputs will be achieved through an internal review process. All deliverables will be produced in draft form and reviewed by the project Partners before release to ESA. The Project Team are committed to concise yet informative reporting. Documentation will be prepared according to the requirements of section 4.8.2 of the SoW.

## 4. Project communication and website

A communication and promotion plan will be established early in the project and monitored as part of the Project Management Plan. This will cover both communication within the project, and communications to the wider community. The latter includes plans for refereed publications and for contributions by partners to meetings and international conferences. Relevant conferences and meetings will be listed to determine their suitability for the promotion of the project results.

For relevant events, individual project partners will be assigned to attend and present the project. Routine communications between partners and with ESA will take place via web conference, phone and email.

The project website will form the basis of communication regarding the project with all stakeholders. All users will have access to the public website with details of the project aims, progress, participants and the other materials specified in the ESA SoW. A secure partner-only area will provide project up-to-date documentation including meeting minutes,

actions database and other documents relevant to the consortium members. Regularly updated email lists will be maintained: one for use within the project and another for interested parties outside of the consortium.

### 5.1 External website

The public project website will be hosted by ESA and content managed by **SatOC** with support from LOPS, ODL and PML for scientific input and specific online tools (for example data visualisation).

The website will use the template already established for other CCI Projects, which will include: a central news feed; a right column with search facility and events listing; a left column with logo, listing of sub pages, consortium logos.

The sub pages will include:

- Overview of Sea_State_cci Project
- Data availability and descriptions
- Resources (public documents, presentations, references)
- Contacts and user support

The initial web site is active as of June 2018 at http://cci.esa.int/seastate

### 5.2 Internal website

The internal project website uses a shared Google Drive for all project documentation. This includes the use of Google online office suite for the collaborative preparation and management of documents.

## 5. Risk Analysis

This section provides the project risk register to anticipate, monitor, and mitigate the impact of, risks to the project.

| No. | Risk | Impact | Mitigation | Owner |
|---|---|---|---|---|
| 1 | Loss of key personnel, affecting the ability of one of the partners to deliver on a critical task | Moderate | Transfer responsibility for task to other staff in the same institution, or to another partner in the team if necessary. | LOPS, SatOC |
| 2 | Communication difficulties within a fairly large consortium | Moderate | Regular internal progress meetings (web conference). Use of online shared drive for all project documentation. | SatOC, LOPS |
| 3 | CCI philosophy of open source software | Moderate | Establish the | LOPS |

| | | | | |
|---|---|---|---|---|
| | not adhered to | | requirement for open source software in partner subcontracts. | |
| 4 | Difficulty with preparation and / or late completion of deliverables | Moderate | Use of shared drive for deliverable preparation gives full visibility to project management, who can provide support and guidance as required. | SatOC |

## 6. List of deliverables

| Deliverable | Title | Due | Partner |
|---|---|---|---|
| PMP | Project Management Plan | Jun 2018 | SatOC |
| MR | Monthly Progress Reports including Actions Database | monthly | SatOC |
| QR | Quarterly Progress Summary | quarterly | SatOC |
| PSH | Project Science Highlights | quarterly | LOPS |
| MoM | Meeting minutes | as required | SatOC |
| D1.1 URD | User Requirement Document | Nov 2018, Sep 2020 | LOPS |
| D1.2 PSD | Product Specification Document | Nov 2018, Sep 2020 | LOPS |
| D1.3 DARD | Data Access Requirement Document | Nov 2018, Sep 2020 | SatOC |
| D2.1 PVASR | Product Validation and Algorithm Selection Report | Feb 2019, Nov 2019, Mar 2021 | TUM |
| D2.2 ATBD | Algorithm Theoretical Basis Document | Feb 2019, Nov 2019, Mar 2021 | TUM/PML |
| D2.3 E3UB | End-to-end ECV Uncertainty Budget | Feb 2019, Nov 2019, Mar 2021 | PML |
| D2.4 ADP | Algorithm Development Plan | Feb 2019, Nov 2019, Mar 2021 | isardSAT |
| D2.5 PVP | Product Validation Plan | Feb 2019 | ODL |
| D3.1 SRD | System Requirements Document | May 2019, Mar 2021 | Ifremer |
| D3.2 SSD | System Specification Document | May 2019, May 2020, Mar 2021 | Ifremer |

| | | | |
|---|---|---|---|
| D3.3 SVR | System Verification Report | May 2019, May 2020, Mar 2021 | Ifremer |
| D4.0 ISDBR | In Situ Database Report | Sep 2019 | Ifremer |
| D4.1 PVIR | Product Validation and Intercomparison Report | Sep 2019, Nov 2020, May 2021 | NOC |
| D4.2 CRDP | Climate Research Data Package | May 2019, May 2020, May 2021 | Ifremer |
| D4.3 PUG | Product User Guide | Sep 2019, May 2020, May 2021 | SatOC |
| D5.1 CAR | Climate Assessment Report | Sep 2019, Nov 2020, May 2021 | LOPS |
| D5.2 Pubs | Submitted science publications | May 2021 | LOPS |
| D8.1 | WP8100 study report | May 2020, May 2021 | IH Cantabria |
| D8.2 | WP8200 study report | May 2020, May 2021 | Uni Galati |

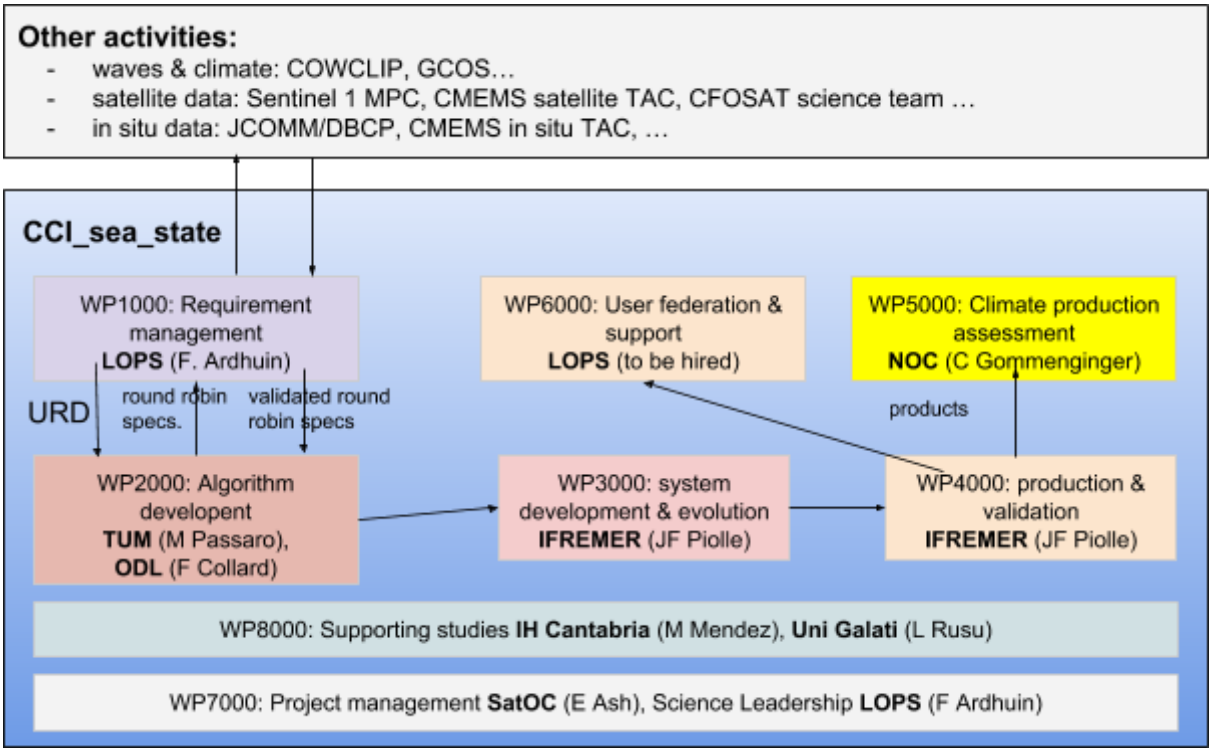
# 7. Work Breakdown Structure

## 7.1 Summary of workpackages

| Number | Title | WP Leader |
|---|---|---|
| **WP1000** | **Requirements Management** | **LOPS** |
| WP1100 | User Requirements | LOPS |
| WP1200 | Product Specification | LOPS |
| WP1300 | Data Access Requirements | SatOC |
| **WP2000** | **Algorithm Development** | **TUM(alt), ODL(SAR)** |
| WP2100 | Algorithm Selection | TUM |
| WP2200 | Algorithm Theoretical Basis | TUM |
| WP2300 | ECV Uncertainty Budget | PML |
| WP2400 | Algorithm Development Plan | PML |
| WP2500 | Product Validation Plan | ODL |
| WP2*10 | Legacy altimetry (open ocean) | TUM |
| WP2*20 | Delay doppler altimetry | TUM |
| WP2*30 | Coastal altimetry | TUM |
| WP2*40 | SAR open ocean | ODL |
| WP2*50 | SAR coastal zone | DLR |
| WP2*60 | Marginal ice zone | ODL |
| WP2*70 | L3/L4 merging tools | SatOC |
| **WP3000** | **System Development and Evolution** | **Ifremer** |
| WP3100 | System Requirements | Ifremer |
| WP3200 | System Specification | Ifremer |
| WP3300 | System Development and Verification | Ifremer |

| | | |
|---|---|---|
| **WP4000** | **Data Collection, Production, Validation** | **Ifremer** |
| WP4100 | In Situ Database | Ifremer |
| WP4200 | Auxiliary Database | Ifremer |
| WP4300 | EO Database | Ifremer |
| WP4400 | Climate Research Data Production | Ifremer |
| WP4500 | Product Validation and Intercomparison | NOC |
| WP4600 | Product User Guide | SatOC |
| **WP5000** | **Climate Product Assessment** | **NOC** |
| WP5100 | Case Study 1: Extremes at the coast | NOC |
| WP5200 | Case Study 2: Tropical storms and swell | LOPS |
| WP5300 | Case Study 3: Link with C3S | LOPS |
| WP5400 | Case Study 4: Waves near ice | NERSC |
| WP5500 | Product Impact and Quality Assessment | LOPS |
| WP5600 | CMUG Liaison | ECMWF |
| **WP6000** | **User Federation and Support** | **LOPS** |
| WP6100 | User Community Development | LOPS |
| WP6200 | User Support | Ifremer |
| WP6300 | User Consultation Meeting 1 | Ifremer |
| WP6400 | User Consultation Meeting 2 | PML |
| **WP7000** | **Project Management** | **SatOC** |
| **WP8000** | **Supporting Studies** | **IH Cantabria / Uni Galati** |

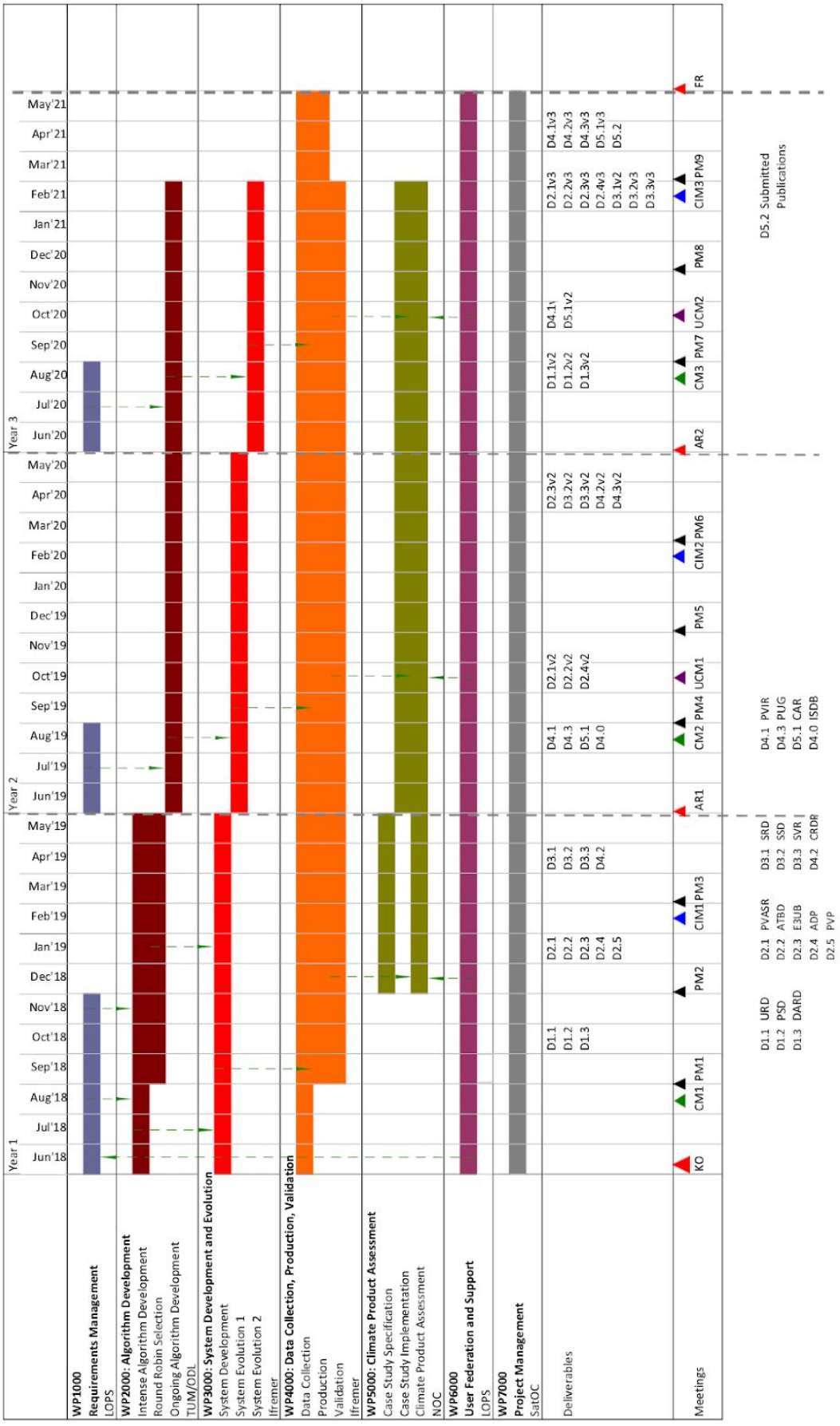
## 7.2 Work Package Diagram



## 8. Planning

This section provides the Project schedule in the form of a GANTT chart, and the listing of meetings to be held and associated milestones.

## 8.1 GANTT chart



## 8.2 Meetings and milestones

| Meeting | Date | Place | Deliverables | Milestone |
|---|---|---|---|---|
| Kick Off (KO) | 11-12/06/18 | ECSAT, UK | PMP | M0 |
| Colocation Meeting 1 | 20-22/03/18 | Oxford, UK | | |
| Progress Meeting 1 | 04-05/09/18 | Brest, FR | | |
| Progress Meeting 2 | 18/12/18 | NOC, UK | D1.1, D1.2, D1.3 | M1 |
| CMUG Integration 1 | Autumn ‘18 | TBD EU | | |
| Progress Meeting 3 | Mar 2019 | TUM/DLR, DE | D2.1, D2.2, D2.3, D2.4, D2.5 | |
| Annual Review 1 | Jun 2019 | ECSAT, UK | D3.1, D3.2, D3.3, D4.2 | M2 |
| Colocation Meeting 2 | Spring ‘19 | ECSAT, UK | | |
| Progress Meeting 4 | Sep 2019 | Brest, FR | D4.1, D4.3, D5.1 | |
| User Consultation 1 | Sep/Oct 2019 | Brest, FR | | |
| Progress Meeting 5 | Dec 2019 | TUM/DLR, DE | $D2.1_{v2}$, $D2.2_{v2}$, $D2.4_{v2}$ | M3 |
| CMUG Integration 2 | Autumn ‘19 | TBD EU | | |
| Progress Meeting 6 | Mar 2020 | Brest, FR | | |
| Annual Review 2 | June 2020 | ECSAT, UK | $D2.3_{v2}$, $D3.2_{v2}$, $D3.3_{v2}$, $D4.2_{v2}$, $D4.3_{v2}$ ,D8.1 draft, D8.2 draft | M4 |
| Colocation Meeting 3 | Spring ‘20 | ECSAT, UK | | |
| Progress Meeting 7 | Sep 2020 | Brest, FR | $D1.1_{v2}$, $D1.2_{v2}$, $D1.3_{v2}$ | |
| User Consultation 2 | Dec 2020 | PML, UK | | |
| Progress Meeting 8 | Dec 2020 | NOC, UK | $D4.1_{v2}$, $D5.1_{v2}$ | M5 |
| CMUG Integration 3 | Autumn ‘20 | TBD EU | | |
| Progress Meeting 9 | Mar 2021 | Brest, FR | $D2.1_{v3}$ to $D2.4_{v3}$, $D3.1_{v3}$ to $D3.3_{v3}$ | |
| Final Review | June 2021 | ECSAT, UK | $D4.1_{v3}$ to $D4.3_{v3}$, $D5.1_{v3}$, D5.2, D8.1, D8.2 | M6 |

Expected participation at meetings:

Given the wide range of expertise required for the different sensors and applications field, the proposing consortium has 9 partners. Participation of representatives of all partners at all meetings would be a waste of precious resources. Based on the requirements laid out in sections 4.3 (science leader) and 4.4 (project manager) and

*R-12) Participation of at least one representative of each ECV project's CRG in the cross-programme Climate Science Working Group (CSWG) led by CMUG*

we are proposing the following :

1) The Kick-off meeting will be done via videoconference
2) Participation in the Collocation Meeting 1 will be restricted to the science leader and 3 members of the CRG
3) Progress meeting 1, 3, 5, 7 will combine videoconference and face to face participation.
4) Participation at CMUG integration meetings will be restricted to F. Ardhuin and JR Bidlot
5) The progress meeting 4 will be organized around the UCM1, and PM8 with UCM2.

## 9. Work Package Descriptions

| **WP1000** | | **Start:** Jun 2018 | **End:** Sep 2020 |
|---|---|---|---|
| **Title:** Requirements Management | | | **WP Leader: LOPS** |
| **Partners and Effort:** LOPS (700), SatOC (72), ODL(60) | | | |
| **Objectives:** This work package will include the collection of user requirements, translation into product specifications and definition of data access requirements. The tasks will be revisited on an annual basis. | | | |
| **Tasks** | | | **Responsible** |
| **WP1100 User Requirements**<br>Consult with the CRG, CMUG and wider science community and prepare the User Requirements report.<br>**WP1200 Product Specification**<br>Prepare the Product Specification including ECV uncertainty targets based on User Requirements.<br>**WP1300 Data Access Requirements**<br>Prepare the Data Access Requirement Document | | | LOPS<br><br>LOPS<br><br>SatOC |
| **Inputs** | **From** | **Critical Dependencies** | |
| Proposal<br>User requirements | Consortium<br>CRG and wider community (GCOS …) | None | |
| **Internal Deliverables** | **To** | **External Deliverables** | **To** |
| | | User Requirements Document (D1.1) | ESA |

| | | | |
|---|---|---|---|
| | | Product Specification Document (D1.2)<br>Data Access Requirements Document (D1.3) | ESA<br><br>ESA |
| **Quality Control**<br>Peer-review within CRG and management team | | | |

| **WP2000** | **Start:** Jun 2018 | **End:** Mar 2021 |
|---|---|---|
| **Title:** Algorithm Development | | **WP Leader: TUM, ODL** |
| **Partners and Effort:** TUM (2739), PML(1989), ODL(1080), DLR(708), SatOC(160),CLS(229) | | |
| **Objectives:** To develop new and improved sea state retrieval algorithms for altimetry and SAR satellite datasets. To perform a round-robin exercise to select the best algorithms for ECV data production. To understand the uncertainty in ECV products. To consolidate techniques for merging L2 data into L3 and L4 products. | | |

| **Tasks** | **Responsible** |
|---|---|
| Second-level work packages correspond to deliverables. Technical work along different themes and for altimetry and SAR separately is cross-cutting and further described in subsequent tables (WP2*10 to WP2*70). | |
| **WP2100 Algorithm Selection**<br>Develop and improve sea state algorithms. Organise the round robin selection of sea state algorithms and select the best for production of the sea state ECV. Prepare the Product Validation and Algorithm Selection Report. | TUM |
| **WP2200 Algorithm Theoretical Basis**<br>Prepare the Algorithm Theoretical Basis Document based on output of WP2100 | TUM/PML |
| **WP2300 ECV Uncertainty Budget**<br>Develop an end-to-end uncertainty budget for sea state ECV products considering all sources of uncertainty during processing stages and how they contribute to uncertainty in the final products. Characterise uncertainties in validation data sources. Prepare the End-to-end ECV Uncertainty Budget report. | PML |
| **WP2400 Algorithm Development Plan**<br>Produce a plan of algorithm developments to be performed in subsequent years of the project. | isardSAT |
| **WP2500 Product Validation Plan**<br>Described the validation approach for each ECV product and the reference datasets to be used. | ODL |

| **Inputs** | **From** | **Critical Dependencies** |
|---|---|---|
| Statement of Work Proposal | | Outputs from WP1000 |
| User Requirements | WP1000 | |
| Product Specification | WP1000 | |
| Data Access Requirements | WP1000 | |

| Internal Deliverables | To | External Deliverables | To |
|---|---|---|---|
| | | Product Validation and Algorithm Selection Report (D2.1)<br>Algorithm Theoretical Basis Document (D2.2)<br>Enf-to-end ECV Uncertainty Budget (D2.3)<br>Algorithm Development Plan (D2.4)<br>Product Validation Plan (D2.5) | ESA<br>ESA<br>ESA<br>ESA<br>ESA |
| **Quality Control**<br>Outputs to be reviewed by management team before delivery to ESA | | | |

| **WP2*10, WP2*20, WP2*30** | **Start:** Jun 2018 | **End:** Mar 2021 |
|---|---|---|
| **Title:** Algorithm Development (altimetry) | | **WP Leader: TUM** |
| **Partners and Effort: PML, CLS, isardSAT** | | |
| **Objectives: These workpackages are dedicated to the development of algorithms applied to Level 1B altimetry products ("waveforms") for. They aim at:**<br>**- Adopting a baseline strategy for deriving Hs and sigma0 for LRM and DD altimetry**<br>**- Developing new algorithms to improve the estimation of Hs and sigma0**<br>**- Evaluating existing and new algorithms in a Round Robin exercise**<br>**- Provide proper algorithm description to the System Development** | | |

| **Tasks** | **Responsible** |
|---|---|
| - Adopt ALES as baseline LRM strategy, expand it to other LRM missions | TUM |
| - Recode and adopt SAMOSA as baseline DD strategy | TUM/PML |
| - Design and perform the Round Robin exercise | TUM/PML |
| - Design a subwaveform retracker tuned on Hs and Sigma0 estimation | TUM |
| - Test different L1A DD processing choices and their impact on Hs and Sigma0 estimation | TUM/PML |
| - Test empirical Hs-only retracking solutions | TUM |
| - Test new Point Target Response solutions | PML |
| - Explore techniques for decorrelating retracking errors | PML |
| - Developments in the "Adaptive Numerical Retracker" | CLS |
| - L1A to L1B developments with DeDop | isardSAT |
| - Amplitude and Dilation Compensation (ACDC) retracker developments | isardSAT |
| - Effect of swell and sea state on retracker performance | isardSAT |
| - Document the work in the corresponding documents (listed below) | TUM/PML/CLS/ isardSAT |

| **Inputs** | **From** | **Critical Dependencies** |
|---|---|---|
| -Documentation concerning SAMOSA algorithm for Sentinel-3 | ESA | The Documentation is needed to use SAMOSA as baseline for DD altimetry |
| -Set of post-processed in-situ | Validation Team | The in-situ data are needed for the Round Robin exercise |

| Internal Deliverables | To | External Deliverables | To |
|---|---|---|---|
| Description of the chosen algorithms*<br><br>*only concerning WP2000, no responsibility on algorithm tested in optional work | WP3000 | PVASR<br>ATBD<br>E3UB<br>ADP<br>PVP | ESA |
| **Quality Control**<br>Peer-review within the consortium, through presentations at conferences and publications | | | |

| **WP2*40, WP2*50, WP2*60** | **Start:** Jun 2018 | **End:** Mar 2021 |
|---|---|---|
| **Title:** Algorithm Development (SAR) | | **WP Leader: ODL** |
| **Partners and Effort: ODL(), DLR()** | | |
| **Objectives: These work packages are dedicated to the development of algorithms applied to Level 1 SAR products. They aim at:**<br>- **Adopting a baseline strategy for deriving Hs and directional wave spectra parameters**<br>- **Developing new algorithms to improve and qualify the estimation of Hs and directional wave spectra parameters**<br>- **Evaluating existing and new algorithms in a Round Robin exercise**<br>- **Provide proper algorithm description to the System Development** | | |

| **Tasks** | **Responsible** |
|---|---|
| -Development of new algorithm for directional wave spectra parameters estimation for open ocean, based on nonlinear velocity bunching model. | ODL |
| -Development of new algorithm for directional wave spectra parameters estimation in the marginal ice zone. | ODL |
| -Development of new algorithm for spectral partition cross check and quality control. | ODL |
| -The application and adoption of empirical model functions (EMFs) for SENTINEL-1 WV mode and then for ENVISAT ASAR and ERS WV mode:<br>● Collection of acquisitions and collocated in-situ measurements<br>● Processing of acquisitions, creation of internal database of extracted features (e.g. from image spectra and GSHHS) for verification and then tuning of EMFs.<br>○ EMFs key capacity is the estimation of significant wave height (Hs)<br>○ EMFs optional capacities are the estimation of peak period and peak direction | DLR<br><br>ODL/DLR |
| - Design and perform the Round Robin exercise | |

| **Inputs** | **From** | **Critical Dependencies** |
|---|---|---|
| | | |

| Internal Deliverables | To | External Deliverables | To |
|---|---|---|---|
| Description of the chosen algorithms | WP3000 | PVASR<br>ATBD<br>E3UB<br>ADP<br>PVP | ESA |
| **Quality Control**<br>Peer-review within the consortium, through presentations at conferences and publications | | | |

| **WP3000** | | **Start:** Jun 2018 | **End:** Mar 2021 |
|---|---|---|---|
| **Title:** System Development and Evolution | | | **WP Leader: Ifremer** |
| **Partners and Effort:** Ifremer (330), ODL(890) | | | |
| **Objectives:** To develop the system for producing Sea State ECV products from satellite source data using algorithms provided from WP2000. | | | |
| **Tasks** | | | **Responsible** |
| ● Prepare the system requirements report<br>● Produce the system specification<br>● Develop the processing system<br>● Produce the system verification report | | | Ifremer<br>Ifremer<br>Ifremer<br>Ifremer |
| **Inputs** | **From** | **Critical Dependencies** | |
| Sea State ECV Algorithms | WP2000 | Provision of suitable algorithms from WP2000 | |
| **Internal Deliverables** | **To** | **External Deliverables** | **To** |
| | | System Requirements Document (D3.1)<br>System Specification Document (D3.2)<br>System Verification Report (D3.3) | ESA<br>ESA<br>ESA |
| **Quality Control**<br>Outputs to be reviewed by management team before delivery to ESA | | | |

| **WP4000** | **Start:** Jun 2018 | **End:** Jun 2021 |
|---|---|---|
| **Title:** Data Collection, Production, Validation | | **WP Leader: Ifremer** |
| **Partners and Effort:** Ifremer (1645), ODL(840), DLR(80), NOC(1027), NERSC(230),SatOC(64) | | |
| **Objectives:** To collect all data required for the ECV product generation, produce the ECV products and perform a comprehensive validation. | | |
| **Tasks** | | **Responsible** |

| | |
|---|---|
| ● WP4100 Collate in situ data into database<br>● WP4200 Collate auxiliary data into database (model, supporting parameters)<br>● WP4300 Collate EO data into database<br>● WP4400 Climate Research Data Production<br>● WP4500 Product Validation and Intercomparison. See WP4500 table for more details.<br>● WP4600 Product User Guide | Ifremer<br>Ifremer<br><br>Ifremer<br>Ifremer<br>NOC<br><br>SatOC |

| **Inputs** | **From** | **Critical Dependencies** | |
|---|---|---|---|
| Source Data<br><br>Processing System | Partner repositories, ESA<br>WP3000 | Processing system from WP3000 | |
| **Internal Deliverables** | **To** | **External Deliverables** | **To** |
| | | Product Validation and Intercomparison Report (D4.1)<br>Climate Research Data Package (D4.2)<br>Product User Guide (D4.3) | ESA<br><br>ESA<br><br>ESA |
| **Quality Control**<br>Outputs to be reviewed by management team before delivery to ESA | | | |

| **WP4500** | **Start:** Sep 2018 | **End:** Jun 2021 |
|---|---|---|
| **Title:** Data Validation | | **WP Leader: NOC** |
| **Partners and Effort: LOPS, NERSC** | | |
| **Objectives:** CCI+Sea State ECV quality assessment against independent validation data | | |
| **Tasks** | | **Responsible** |
| WP4510 Validation of Sea State ECV altimetry in ocean & coastal zone<br>● check consistency and compute global diagnostics<br>● validate against in situ data<br>● compare accuracy and stability against URD requirements<br>● inter-compare with models<br>● document in PVIR and produce peer-reviewed papers | | NOC, LOPS |
| WP4520 Validation of Sea State ECV SAR in ocean & coastal zone<br>● | | LOPS, NOC |
| WP4530 Validation of Sea State ECV over marginal ice zone<br>● systematically identify cases of ice break up and increase in MIZ width using ice charts and SAR images and cases with consistently stable MIZ<br>● compare sea state parameters near MIZ with MIZ dynamics<br>● document in PVIR and produce peer-reviewed papers | | NERSC |

| | | | |
|---|---|---|---|
| WP4540 Review products and algorithms to draw up PVIR conclusions and provide feedback to next phase of WP2000 | | | NOC, LOPS, NERSC |
| **Inputs** | **From** | **Critical Dependencies** | |
| ● User Requirement Document (URD)<br>● Algorithm Theoretical Basis Document (ATBD)<br>● Product Validation Plan (PVP)<br>● End to End ECV Uncertainty Budget (E3UB)<br>● *In situ* fiducial reference database<br>● Ice charts and SAR imagery of ice covered areas<br>● CCI+SS ECV Products<br>● Product User Guide (PUG) | WP1000<br>WP2000<br>WP4200 | Availability of CCI+ ECV products, *in situ* fiducial reference database and product documentation. | |
| **Internal Deliverables** | **To** | **External Deliverables** | **To** |
| N/A | | Product Validation and Intercomparison Report (PVIR) | ESA |
| **Quality Control**<br>Peer-review within the consortium, through presentations at conferences and publications | | | |

| | | |
|---|---|---|
| **WP5000** | **Start:** Dec 2018 | **End:** Mar 2021 |
| **Title:** Climate Product Assessment | | **WP Leader: NOC** |
| **Partners and Effort:** NOC(815), LOPS(1433), NERSC(83), ECMWF(342), Ifremer(135), Uni Melbourne | | |
| **Objectives:** To assess the Sea State ECV products through case studies and interaction with climate users | | |
| **Tasks** | | **Responsible** |
| **WP5100 Case Study 1: Extremes at the coast** | | NOC |
| **WP5200 Case Study 2: Tropical storms and swell**<br>Validate the level 2 & 3 datasets with a targeted effort on tropical and extra-tropical storms | | LOPS |
| **WP5300 Case Study 3: Link with C3S** | | LOPS |
| **WP5400 Case Study 4: Waves near ice**<br>Identify long term relation between sea state parameters and ice break up process in extreme events associated with climate change in the Arctic. | | NERSC |

| | | | |
|---|---|---|---|
| **WP5500 Product Impact and Quality Assessment**<br>Solicit feedback from climate users on the quality and use of Sea State ECV products. Consolidate with results from the case studies and prepare the Product Impact and Quality Assessment Report.<br>**WP5600 CMUG Liason**<br>Attend CMUG meetings and provide interface between CMUG and the project. | | | LOPS<br><br><br>ECMWF |
| **Inputs** | **From** | **Critical Dependencies** | |
| Technical proposal<br><br>CCI+ Sea State products<br><br>Product User Guide | Consortium<br><br>WP4000<br><br>WP4000 | Depends on availability of validated CCI+ Sea State products | |
| **Internal Deliverables** | **To** | **External Deliverables** | **To** |
| N/A | | Climate Assessment Report (D5.1)<br>Peer-reviewed papers (D5.2) | ESA<br><br>Public |
| **Quality Control**<br>Peer-review within the consortium, through presentations at conferences and publications | | | |

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|---|---|---|---|
| **WP6000** | | **Start:** Jun 2018 | **End:** Jun 2021 |
| **Title:** User Federation and Support | | | **WP Leader: LOPS** |
| **Partners and Effort:** LOPS(80),Ifremer, PML(222), ECMWF(84),SatOC(96) | | | |
| **Objectives:** To build and support the user community and promote the project products, methods and datasets to them. To organise two User Consultation Meetings to facilitate these objectives. | | | |
| **Tasks** | | | **Responsible** |
| • Develop the international wave climate User Community through links to COWCLIP and other initiatives and exposure at international conventions.<br>• Provide technical support to the users of Sea State ECV Products and tools.<br>• Organise two dedicated User Consultation Meetings. | | | LOPS<br><br>Ifremer<br><br>PML, Ifremer |
| **Inputs** | **From** | **Critical Dependencies** | |
| | | None | |
| **Internal Deliverables** | **To** | **External Deliverables** | **To** |
| Contacts database | WP7000, WP1000 | Minutes of User Consultation Meetings | ESA |
| **Quality Control**<br>Outputs to be reviewed by management team before delivery to ESA | | | |

| **WP7000** | **Start:** Jun 2018 | **End:** Jun 2021 |
|---|---|---|
| **Title:** Project Management | | **WP Leader: SatOC** |
| **Partners and Effort:** SatOC(840), LOPS, ODL(200) | | |
| **Objectives:** To provide an efficient management system to support the scientific aims of the project. To facilitate communications amongst partners, ESA and all stakeholders as well as promoting the project results within the relevant scientific communities. To promote the resulting products, methods and datasets to the user community. To manage the project Working Teams. | | |

| **Tasks** | **Responsible** |
|---|---|
| ● Produce Project Management Plan and update as required throughout the project. | SatOC |
| ● Monitor progress against Management Plan, produce the monthly progress reports. | SatOC |
| ● Monitor risks and take pro-active actions to minimise impact on project. | SatOC |
| ● Provide liaison between team and ESA Scientific Officer. | LOPS |
| ● Provide science leadership to the Working Teams. | LOPS |
| ● Provide links to international communities. | LOPS |
| ● Organise and manage meetings as specified. | SatOC |
| ● Establish and maintain the Actions Database. | SatOC |
| ● Manage content and updates for the Project Website. | SatOC |

| **Inputs** | **From** | **Critical Dependencies** | |
|---|---|---|---|
| Statement of Work<br>Proposal | ESA<br>Consortium | None | |
| **Internal Deliverables** | **To** | **External Deliverables** | **To** |
| | | Project Management Plan (PMP)<br>Monthly Reports (MR)<br>Quarterly Progress Summary (QR)<br>Project Science Highlights (PSH)<br>Meeting Minutes | ESA<br>ESA<br>ESA<br>ESA<br>ESA |
| **Quality Control**<br>Outputs to be reviewed by management team before delivery to ESA | | | |

| **WP8000** | **Start:** 2019 | **End:** Jun 2021 |
|---|---|---|
| **Title:** Supporting Studies | | **WP Leader: IH Cantabria / Uni Galati** |
| **Partners and Effort:** IH Cantabria, Uni Galati | | |
| **Objectives:** This WP includes supporting studies that are complementary to the core work plan and that were originally proposed as optional WPs. Work is arranged as independent sub WPs. | | |

| Tasks | Responsible |
|---|---|
| ● **WP8100 Extreme Wave Climate and Coastal Flooding**<br>The aim is to better characterize extreme wave climate conditions using the developed products of the Sea State CCI. Two main objectives are raised within this option:<br><br>**Objective 1**) A global analysis of the extreme wave climate variations from the satellite information. The following tasks summarize the proposed activity:<br>○ Determine the best statistical treatment of the multi-mission products to select the maxima values required on the probabilistic extreme models.<br>○ Incorporate the known climate variations (e.g. seasonal, interannual) into the extreme models to better estimate return values. In this context, non-stationary extreme approaches have proven useful to analyze extreme wave climate variations (e.g. Izaguirre et al. 2012, Menendez et al. 2008).<br>○ A comparison of the global extreme wave estimates (e.g. 50yr Hs) from satellite data against wave climate projections datasets in order to evaluate their bias and a possible calibration<br><br>**Objective 2**) A coastal assessment of the available information of extreme waves from the satellite data.<br>In a wide climate context, the extreme wave climatologies can be generated due to three atmospheric synoptic situations: (i) tropical cyclones (hurricanes, typhoons, etc.); (ii) extratropical cyclones, mainly affecting on mid-latitudinal coasts and seas; and (iii) persistent intense wind conditions blowing over large sea areas (for example specific trade wind conditions). We propose to focus on two coastal study sites that represent tropical and extratropical cyclonic storminess conditions. Preliminary study sites are proposed:<br>○ A study over a coastal area at the Caribbean islands where extreme event are associated with tropical cyclones<br>○ A study over a coastal area in the Atlantic European coast where extreme events are associated with mainly extratropical cyclones<br>○ The wave information provided by the satellite products will be analyzed together with in-situ data and numerical models outcomes in order to evaluate the added value that satellite measurements provide under episodes of extreme wave storms with relevant coastal impacts. | IH Cantabria |
| ● **WP8200 Wave Climate for Marine Energy and Coastal Defence**<br><br>● Evaluation of the global wave energy potential based on the measurements delivered by altimeter missions;<br>● Identification of the locations with the worldwide highest wave energy:<br>- evaluation of the performance of some state-of-the-art wave energy converters;<br>- assessment of the coastal impact of the future marine energy farms;<br>● Comparisons with existing studies based on reanalysis data; | Uni Galati |

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|---|---|---|---|
| | | | |
| **Inputs** | **From** | **Critical Dependencies** | |
| Climate research data | WP4000 | None | |
| **Internal Deliverables** | **To** | **External Deliverables** | **To** |
| | | D8.1 WP8100 Study Report<br>D8.2 WP8200 Study Report<br>D5.2 Science Publications | ESA<br>ESA<br>Public |
| **Quality Control**<br>Outputs to be reviewed by management team before delivery to ESA | | | |

< End of Project Management Plan >