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## SAR/SARin Radar Altimetry for Coastal Zone and Inland Water Level

### *Parameter Data List* Deliverable D2.2

Sentinel-3 and Cryosat SAR/SARin Radar Altimetry for Coastal Zone and Inland Water  
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<b>Author</b>	Albert Garcia-Mondejar, Ferran Gibert, Ester Vendrell	<b>Organisation</b>	isardSAT
	Nicolas Bercher		AltHydroLab
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## 1 Introduction

### 1.1 The HYDROCOASTAL Project

The HYDROCOASTAL project is a project funded under the ESA EO Science for Society Programme, and aims to maximise the exploitation of SAR and SARin altimeter measurements in the coastal zone and inland waters, by evaluating and implementing new approaches to process SAR and SARin data from CryoSat-2, and SAR altimeter data from Sentinel-3A and Sentinel-3B.

One of the key objectives is to link together and better understand the interactions processes between river discharge and coastal sea level. Key outputs are global coastal zone and river discharge data sets, and assessments of these products in terms of their scientific impact.

### 1.2 Scope of this Report

This is the Parameter Data List (PDL) document for HYDROCOASTAL and represents D2.2 of the project.

This document provides a complete list of the physical constant parameters for all processors and reference to input, output, processing options and product parameters.

Full description of each parameter is to be found in its corresponding dedicated deliverable. Input parameters are fully described in HYDROCOASTAL Deliverable 2.1 IODD (Input Output Data Definitions). Processing options configuration parameters are included in the HYDROCOASTAL Deliverable POCCD (Processing Options Configuration Control Document). Finally, output product format parameters are included in HYDROCOASTAL Deliverable 2.3 PSD (Product Specification Document).

### 1.3 Applicable Documents

AD-01: Sentinel-3 and CryoSat SAR/SARin Radar Altimetry for COASTAL ZONE and INLAND WATER - Statement of Work, V1.0 10/01/2019 Ref: EOP-SD-SOW-2018-089

### 1.4 Reference Documents

RD-01 HYDROCOASTAL Technical Proposal. V1.1 28/11/2019, SatOC and HYDROCOASTAL team.

RD-02 HYDROCOASTAL Implementation Proposal. V1.1 28/11/2019, SatOC and HYDROCOASTAL team.

RD-03 HYDROCOASTAL Management Proposal. V1.3 26/11/2019, SatOC and HYDROCOASTAL team

- RD-04 HYDROCOASTAL Financial Proposal. V1.2 28/11/2019, SatOC and HYDROCOASTAL team
- RD-05 HYDROCOASTAL Contractual Proposal. V1.2 26/11/2019, SatOC and HYDROCOASTAL team
- RD-06 HYDROCOASTAL Deliverable 1.3 ATBD (Algorithm Theoretical Basis Document). V1.1 08/10/2020, isardSAT and HYDROCOASTAL team.
- RD-07 HYDROCOASTAL Deliverable POCCD (Processing Options Configuration Control Document). V1.1 08/10/2020, isardSAT and HYDROCOASTAL team.
- RD-08 HYDROCOASTAL Deliverable 2.3 PSD (Product Specification Document). V1.1 08/10/2020, isardSAT and HYDROCOASTAL team.
- RD-09 HYDROCOASTAL Deliverable 2.1 IODD (Input Output Data Definitions). V1.1 08/10/2020, isardSAT and HYDROCOASTAL team.

## 1.5 Document Organisation

This document is organised as follows:

- [Section 1](#) (this section) is a short introduction defining the scope of this report.
- [Section 2](#) includes the general definition of ESA products and variable types
- [Section 3](#) includes the constant parameters.
- [Section 4](#) refers to input parameters
- [Section 5](#) refers to configuration parameters
- [Section 6](#) refers to output parameters
- [The last section](#) includes the list of acronyms.

## 2 General Definitions

### 2.1 General Product Definitions

Based on the ESA product definition and more specifically on Sentinel-3 Mission, five levels of data can be found:

- Level-1A products containing unpacked L0 complex echoes that have been sorted and calibrated. Geo-location information is included in this product.
- Level-1B-S products contain geo-located, calibrated, azimuth processed complex echoes after geometric correction application arranged in stacks and before power averaging (multilooking). Relevant ancillary data (e.g., beam angles, calibration information, statistical description of stack,...) is included.
- Level-1B products include the SAR averaged measurements (20 Hz).
- Level-2 products are the Level 1 products re-tracked and with the geophysical corrections applied to give the final altimeter parameters including range, backscatter coefficient, wind speed and significant wave height.
- Level-3 River and Lake Level products are the Level 2 products processed to produce River or Lake Level Time Series, or space-time series.
- Level-4 HYDROCOASTAL products are the Level 3 products processed to produce River Discharge Products.

### 2.2 Variable Types

The following table show the different variable types:

*Table 2.1 Variable Types*

Variable Type	Description	Range
uc	8-bit unsigned integer (ubyte)	0 to 255
sc	8-bit signed integer (byte)	-128 to 127
us	16-bit unsigned integer	0 to 65535
ss	16-bit signed integer	-32768 to 32767
ul	32-bit unsigned integer	0 to 4294967295

sl	32-bit signed integer	-2147483648 to 2147483647
sll	64-bit signed integer	-9223372036854775808 to 9223372036854775807
fl	32-bit single precision floating point	1.17549e-38 (min) 3.4028e+38(max)
do	64-bit double precision floating point	2.22e-308(min) 1.79e+308(max)



### 3 Constant parameters

Table 3.1 provides a complete list of constants used for all the processors.

*Table 3.1: List of constants*

Constant symbol	Description	Value	Units	Type
C	Speed of light	299792458.0	m/s	do
WGS84_sma	WGS84 ellipsoid model semi major axis	6378137.0	m	do
WGS84_f	WGS84 ellipsoid model flattening coefficient	1.0/298.257223563	none	do
pi_cst	Pi number	3.1415926535897932	none	do

## 4 Input parameters

HYDROCOASTAL deliverable D2.1 IODD (Input Output Data Definitions) provides a complete list of input parameters used for all the processors. This includes:

1. Raw data input parameters to the L1B/L1B(S) processor
2. Parameters from L2 official ESA products that are integrated to the L2 Master enhanced products
3. Input parameters for the L2 processors
4. Externally computed geophysical corrections that are appended to the L2 Master enhanced product.
5. Input parameters to the L3 river processors
6. Input parameters to the L4 river processors

For each processor, the document includes:

- An overview of the processing scheme;
- The input data specifications, including the details of the variables from the product, calibration, configuration, mask file necessary for the corresponding processor (variable name, description, units, type, dimensions and range);
- The output data specifications, including file name. (Output variables are defined in the HYDROCOASTAL Deliverable D2.3 PSD (Product Specification Document).

## 5 Configuration parameters

HYDROCOASTAL deliverable POCCD (Processing Options Configuration Control Document) provides a complete list of configuration parameters used for all the processors.

For each processor, after an algorithm overview and a description of the additional optional processing stages (if any), the configuration parameters are defined. Each configuration parameter includes field name, description, possible value and units.

## 6 Output parameters

HYDROCOASTAL deliverable D2.3 PSD (Product Specification Document) provides a complete list of output parameters from all the processors.

L2 Master enhanced product, L3 Inland water product and L4 River discharge products are NetCDF format files. The different dimensions, variables and attributes of each product file are detailed. For each variable a table includes: variable name, description, units, type and dimension.

## 7 List of Acronyms

AD	Applicable Documents	L3	Level-3
ATBD	Algorithm Technical Basis Document	L4	Level-4
CryoSat-2	Altimetry satellite for the measurement of the polar ice caps and the ice thickness	netCDF	Network Common Data Form
EO	Earth Observation	PDL	Parameter Data List
ESA	European Space Agency	POCCD	Processing Options Configuration Control Document
IODD	Input Output Data Document	PSD	Product Specification Document
L1A	Level-1A	RD	Reference Document
L1B	Level-1B	SARIn	SAR Interferometric (CryoSat-2/SIRAL mode)
L1B-S, L1BS	Level-1B-S (aka, Stack data)	SAR	Synthetic Aperture Radar
L2	Level-2	SOW	Statement Of Work