# CDOM-proxy retrieval from aeOLus ObseRvations



## Deliverable Report D7-PUM

# Prototype product description

**Dionisi[1] D., Bucci[2] S., Cesarini[1] C., Colella[1] S., D'Alimonte[3] D., Di Ciolo[2] L., Di Girolamo[4] P., Di Paolantonio[1] M., Franco[4] N., Kajiyama[3] T., Liberti[1] G. L., Organelli[1] E., Santoleri[1] R.**

1: Consiglio Nazionale delle Ricerche, Istituto di Scienze Marine (CNR-ISMAR), Rome, Italy
2: Serco Italy S.p.a, Rome, Italy
3: AEQUORA, Lisbon, Portugal
4: School of Engineering, University of Basilicata, viale dell'Ateneo Lucano 10, 85100 Potenza, Italy

**Date: 25 November 2022**

1

**Version: 1.0**

# Acceptance

**Accepted on date:**

**By (for ESA):**

**Table of Contents**

## LIST OF TABLES

# 1. Document introduction

## 1.1 Version Control

| Version | Reason | Date of Release |
|---------|--------|-----------------|
| 1.0 | First version delivered | 01 12 2022 |
| | | |
| | | |

## 1.2 Applicable Documents

| | |
|------|------------------------------------------------------------------------------------------------|
| AD-1 | Statement of Work: Statement of Work ESA Express Procurement Plus - [EXPRO+] - Aeolus+ Innovation (Aeolus+I) |
| AD-2 | CDOM-proxy retrieval from aeOLus ObseRvations<br>Detailed Proposal: COLOR |
| AD-3 | Contract: ESA Contract 4000133933/21/I-BG<br>Aeolus+ Innovation (Aeolus+I) COLOR – CDOM-proxy retrievals from aeOLus ObseRvations |

## 2. Prototype product description

### 2.1 Introduction

The AEOLUS OC product implemented is based on the inversion algorithm described in section 2.4 and 2.5 of the Deliverable Report D4-ALGO that uses the EBL approach through the analysis of the data acquired by the AEOLUS Mie channel.

The AEOLUS OC product is given for the seven regions of interest (ROIs) considered in COLOR project: BLSEA (Black Sea), NWMED (North-West Mediterranean), SEMED (South-East Mediterranean), NASPG (North Atlantic Sub-Polar Gyre), NASTG (North Atlantic Sub-Tropical Gyre), SASTG (South Atlantic Sub-Tropical Gyre), SOIND (Southern Ocean Indian Sector). The geographical limits of each region are provided in section 2.3 of the Deliverable Report D3-AUX.

For each region, the AEOLUS OC product contains: i) the in-water contributions term ($B_w$) to the signal (backscattering and extinction from all components) of the AEOLUS ground bin with associated uncertainty computed taking into account only the lidar random error according to Poisson statistics; ii) the in-water extinction value $\alpha_{tot}$; iii) the atmospheric aerosol transmission term $T_{BLa}$ obtained as a by-product of the OC AEOLUS retrieval. The product is Level-3 (L3). L3 are products as obtained by algorithm procedures discussed in section 2.5 of the Deliverable Report D4-ALGO. Two different AEOLUS COLOR 3.0 products are provided according if the integration procedure is applied or not to the dataset. At this stage, only the product with no integration on the dataset, which has a temporal resolution of 0.5-1 seconds equivalent to a horizontal length of 3 km to 7 km (see section 2.5 of the Deliverable Report D4-ALGO for further details), has been released. Next sections provide details only about this AEOLUS OC product.

### 2.2 Description of the AEOLUS OC product

The general information of the AEOLUS OC product is presented in the following subsections.

#### Product specification

Details about the product specification are provided in different tables (Table 1-7) for each ROI selected in the COLOR project

*Table 1: AEOLUS OC product for the Black Sea region*

| Product Lines | AEOLUS_L3.0COLOR_BLSEA |
|---|---|
| Geographical Coverage | upper/lower latitude: 47N/41N<br>western/eastern longitude: 27E/42E |
| Variables | Listed in table 8 |
| Product Type | Prototype |
| Available Time series | From April 2020 to March 2021 |
| Temporal resolution | Seasonal |
| Horizontal resolution | 3-7 km |
| Format | ASCII |

*Table 2: AEOLUS OC product for the North West Mediterranean region*

| Product Lines | AEOLUS_L3.0COLOR_NWMED |
|---|---|

| Geographical Coverage | upper/lower latitude: 44N/39N<br>western/eastern longitude: 0/9E |
|---|---|
| Variables | Listed in table 8 |
| Product Type | Prototype |
| Available Time series | From April 2020 to March 2021 |
| Temporal resolution | Seasonal |
| Horizontal resolution | 3-7 km |
| Format | ASCII |

*Table 3: AEOLUS OC product for the South East Mediterranean region*

| Product Lines | AEOLUS_L3.0COLOR_SEMED |
|---|---|
| Geographical Coverage | upper/lower latitude: 38N/30N<br>western/eastern longitude: 22E/35E |
| Variables | Listed in table 8 |
| Product Type | Prototype |
| Available Time series | From April 2020 to March 2021 |
| Temporal resolution | Seasonal |
| Horizontal resolution | 3-7 km |
| Format | ASCII |

*Table 4: AEOLUS OC product for the North Atlantic South Polar Gyre*

| Product Lines | AEOLUS_L3.0COLOR_NASPG |
|---|---|
| Geographical Coverage | upper/lower latitude: 66N/53N<br>western/eastern longitude: 61W/15W |
| Variables | Listed in table 8 |
| Product Type | Prototype |
| Available Time series | From April 2020 to March 2021 |
| Temporal resolution | Seasonal |
| Horizontal resolution | 3-7 km |
| Format | ASCII |

*Table 5: AEOLUS OC product for the North Atlantic South Tropical Gyre*

| Product Lines | AEOLUS_L3.0COLOR_NASTG |
|---|---|
| Geographical Coverage | upper/lower latitude: 26N/16N<br>western/eastern longitude: 55W/30W |
| Variables | Listed in table 8 |

| | |
|---|---|
| Product Type | Prototype |
| Available Time series | From April 2020 to March 2021 |
| Temporal resolution | Seasonal |
| Horizontal resolution | 3-7 km |
| Format | ASCII |

*Table 6: AEOLUS OC product for the South Atlantic South Tropical Gyre*

| | |
|---|---|
| Product Lines | AEOLUS_L3.0COLOR_SASTG |
| Geographical Coverage | upper/lower latitude: 14S/22S<br>western/eastern longitude: 33W/19W |
| Variables | Listed in table 8 |
| Product Type | Prototype |
| Available Time series | From April 2020 to March 2021 |
| Temporal resolution | Seasonal |
| Horizontal resolution | 3-7 km |
| Format | ASCII |

*Table 7: AEOLUS OC product for the Southern Ocean Indian sector*

| | |
|---|---|
| Product Lines | AEOLUS_L3.0COLOR_SOIND |
| Geographical Coverage | upper/lower latitude: 40S/60S<br>western/eastern longitude: 40E/110E |
| Variables | Listed in table 8 |
| Product Type | Prototype |
| Available Time series | From April 2020 to March 2021 |
| Temporal resolution | Seasonal |
| Horizontal resolution | 3-7 km |
| Format | ASCII |

**List of the variables**

The variables provided by the AEOLUS OC product are listed in Table 8.

*Table 8: AEOLUS OC product for the Southern Ocean Indian sector*

| Variable name | Variable name in the ASCII file | Units | Additional information |
|---|---|---|---|
| Year | YYYY | - | - |
| Month | MM | - | - |
| Day | DD | - | - |
| Hours | hh | hours | - |
| Minutes | min | minutes | - |

| Variable name | Variable name in the ASCII file | Units | Additional information |
|---|---|---|---|
| Seconds | sec | seconds | - |
| Longitude | LON | Degrees east | - |
| Latitude | LAT | Degrees north | - |
| Altitude of DEM intersection | DEM | meters | |
| Bathymetry | BATHY | meters | |
| Altitude of bin 21 | ALT21 | meters | - |
| Altitude of bin 22 | ALT22 | meters | - |
| Altitude of bin 23 | ALT23 | meters | - |
| Altitude of bin 24 | ALT24 | meters | - |
| Altitude of bin 25 | ALT25 | meters | - |
| Satellite range of bin 21 | RNG21 | meters | - |
| Satellite range of bin 22 | RNG22 | meters | - |
| Satellite range of bin 23 | RNG23 | meters | - |
| Satellite range of bin 24 | RNG24 | meters | - |
| Satellite range of bin 25 | RNG25 | meters | - |
| Mie useful signal of bin 21 | SIG21 | N° of photons | - |
| Mie useful signal of bin 22 | SIG22 | N° of photons | - |
| Mie useful signal of bin 23 | SIG23 | N° of photons | - |
| Mie useful signal of bin 24 | SIG24 | N° of photons | - |
| Mie useful signal of bin 25 | SIG25 | N° of photons | - |
| Mie signal to noise ratio of bin 21 | SNR21 | - | - |
| Mie signal to noise ratio of bin 22 | SNR22 | - | - |
| Mie signal to noise ratio of bin 23 | SNR23 | - | - |
| Mie signal to noise ratio of bin 24 | SNR24 | - | - |
| In-water contributions term to the signal of the AEOLUS bin 23 | Bw | Steradians^-1 | Please see section 2.4 of the Deliverable Report D4-ALGO for further details. |
| Error of the In-water contributions term to the signal of bin 23 | Err_Bw | Steradians^-1 | Please see section 2.4 of the Deliverable Report D5-VAL for further details. |
| In-water extinction value of bin 23 | Alfa_tot | meters^-1 | Please see section 2.4 of the Deliverable Report D4-ALGO for further details. |
| Atmospheric molecular transmittance from surface to top of bin 21 | Tblm | - | Please see section 2.4 of the Deliverable Report D4-ALGO for further details. |
| Atmospheric aerosolic transmittance from surface to top of bin 21 | Tbla | - | Please see section 2.4 of the Deliverable Report D4-ALGO for further details. |
| Pressure at surface level | p0 | Pascal | Parameter derived from the Auxiliary Meteorological Data (AUX_MET files) provided by ECMWF. Please see section 2.4 of the Deliverable Report D3-AUX for further details. |
| Temperature at surface level | T0 | Kelvin | Parameter derived from the Auxiliary Meteorological Data (AUX_MET files) provided by ECMWF. Please see section 2.4 of the Deliverable Report D3-AUX for further details. |
| Wind component at surface parallel to the longitude | u | meters*seconds^-2 | Parameter derived from the Auxiliary Meteorological Data (AUX_MET files) provided by ECMWF. Please see section 2.4 of the Deliverable Report D3-AUX for further details. |
| Wind component at surface parallel to the latitude | v | meters*seconds^-2 | Parameter derived from the Auxiliary Meteorological Data (AUX_MET files) provided by ECMWF. Please see section 2.4 of the Deliverable Report D3-AUX for further details. |
| Mass concentration of chlorophyll | Chla | milligram*meters^-3 | Please see ESA-0C-CCI multisensory V6 data (https://climate.esa.int/en/projects/ocean-colour/data/) for further details |
| Standard deviation of mass concentration of chlorophyll | std_Chla | milligram*meters^-3 | |
| Absorption coefficients for dissolved and detrital material at 412 nm | Adg | meters^-1 | Please see ESA-0C-CCI multisensory V6 data (https://climate.esa.int/en/projects/ocean-colour/data/) for further details |
| Standard deviation of absorption coefficients for dissolved and detrital material at 412 nm | std_Adg | meters^-1 | |

| Variable name | Variable name in the ASCII file | Units | Additional information |
|---|---|---|---|
| Number of pixel | npixel | | Number of pixel used to estimate both Mass concentration of chlorophyll and Absorption coefficients for dissolved and detrital material at 412 nm parameters. |

### Files Nomenclature

Nomenclature of each file is on the format of:
AEOLUS_L3.0COLOR_ROI_season_year(yyyy)_dateofcreation(ddmmyyyy).txt

### Files Format

The AEOLUS L3 COLOR products are stored using the ASCII format.  In particular, ASCII text files .TXT with comma as a delimiter character and no quotes around the text strings are used. The first raw of the file contains the header that reports the name of the variable for each column.

### Download AEOLUS OC COLOR product

The preliminary prototype of the AEOLUS L3 COLOR product can be downloaded from the COLOR data pool in the folder 'AEOLUS_DATA/L3.0/V1_05122022/'. Further details on access to the COLOR data pool can be found in the D2-DP delivery report.