Processing Chlorophyll-a at the DAC level

ACTION 3
Plan

- Introduction
- Recommendations for addressing the Chlorophyll-a processing
- ECO sensor
  - Measurements and Data processing
  - Sensor METADATA
  - Chlorophyll-a related parameters
Introduction

The measurements:

- Part of the photons absorbed by a chlorophyll-a molecule in the blue part of the spectrum is re-emitted as less energetic photons in the red part
- Fluorescence measurements are converted to chlorophyll-a concentrations thanks to laboratory or in-situ fluorometer calibrations

This method is widely used for shipboard measurement (mainly through fluorometers mounted on CTD rosette) and is also the one used onboard floats

=> fluorescence of the chlorophyll-a is (with oxygen) the most measured biological property in the open ocean
Recommendations for addressing the Chlorophyll-a processing

-The official Bio-Argo unit for chlorophyll-a concentration is mg/m³

-Store any data transmitted by the chlorophyll-a fluorometer with meaningful names. The proposed name for the counts transmitted by the fluorometer is "CHLA_RAW".

-Store in "CHLA" the chlorophyll-a concentration in mg/m³, estimated from the "CHLA_RAW" counts.

-Fill properly the metadata to document the calibration, the conversions equations and the fields to identify a sensor.
Raw data from the ECO chlorophyll-a fluorometer (CHLA_RAW) are transmitted as counts, ranging from 0 to 4120 +/- 5.

The basic equation allowing the retrieval of Chlorophyll-a concentration from raw transmitted measurement is:

\[ \text{CHLA} = (\text{CHLA}_{\text{RAW}} - \text{DARK}_{\text{CHLA}}) \times \text{SCALE}_{\text{CHLA}} \]

where

- \text{CHLA} = \text{concentration of chlorophyll-a of a sample of interest (mg/m}^3\text{) }
- \text{CHLA}_{\text{RAW}} = \text{raw counts output when measuring a sample of interest}
- \text{DARK}_{\text{CHLA}} = \text{dark counts, the measured signal output of the fluorometer in clean water with black tape over the detector}
- \text{SCALE}_{\text{CHLA}} = \text{multiplier in mg/m}^3/\text{counts}

The scale factor (SCALE_CHLA), dark counts (DARK_CHLA) are on the instrument’s characterization sheet, supplied by WET Labs and will be stored in the « PREDEPLOYMENT_CALIB_EQUATION » and in the « PREDEPLOYMENT_CALIB_COEFFICIENT ».
## ECO sensor: Sensor metadata

<table>
<thead>
<tr>
<th>Sensors and measurements method</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENSOR</td>
</tr>
<tr>
<td>SENSOR MAKER</td>
</tr>
<tr>
<td>SENSOR_MODEL</td>
</tr>
<tr>
<td>SENSOR_SERIAL_NUMBER</td>
</tr>
<tr>
<td>SENSOR_UNITS</td>
</tr>
<tr>
<td>SENSOR_ACCURACY</td>
</tr>
<tr>
<td>SENSOR_RESOLUTION</td>
</tr>
</tbody>
</table>
ECO sensor: Chlorophyll-a related parameters

Raw data from the ECO sensor is output in counts (CHLA_RAW) from the sensor.

**PARAMETER**=
"CHLA_RAW"

**PREDEPLOYMENT_CALIB_EQUATION**=
"none"

**PREDEPLOYMENT_CALIB_COEFFICIENT**=
"none"

**PREDEPLOYMENT_CALIB_COMMENT**=
"Uncalibrated chlorophyll-a fluorescence measurement".

This CHLA_RAW is converted in chlorophyll-a concentration (CHLA)

**PARAMETER**=
"CHLA"

**PREDEPLOYMENT_CALIB_EQUATION**=
"CHLA=(CHLA_RAW-DARK_CHLA)*SCALE_CHLA"

**PREDEPLOYMENT_CALIB_COEFFICIENT**=
"DARK_CHLA=71 , SCALE_CHLA=0.008"

**PREDEPLOYMENT_CALIB_COMMENT**=
""