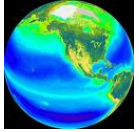
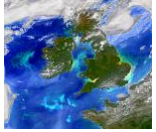
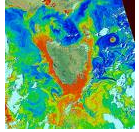
Report for the Bio-Argo workshop

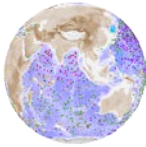
Prepared by

Hervé Claustre, Nick Hardman-Mountford, Ken Johnson, Antoine Poteau, Catherine Schmechtig, Violeta Slabakova, Haili Wang, Xiaogang Xing

With the help / contribution of ADMT



Beside O2, the biogeochemical community has identified the first variables ready to be implemented on Argo

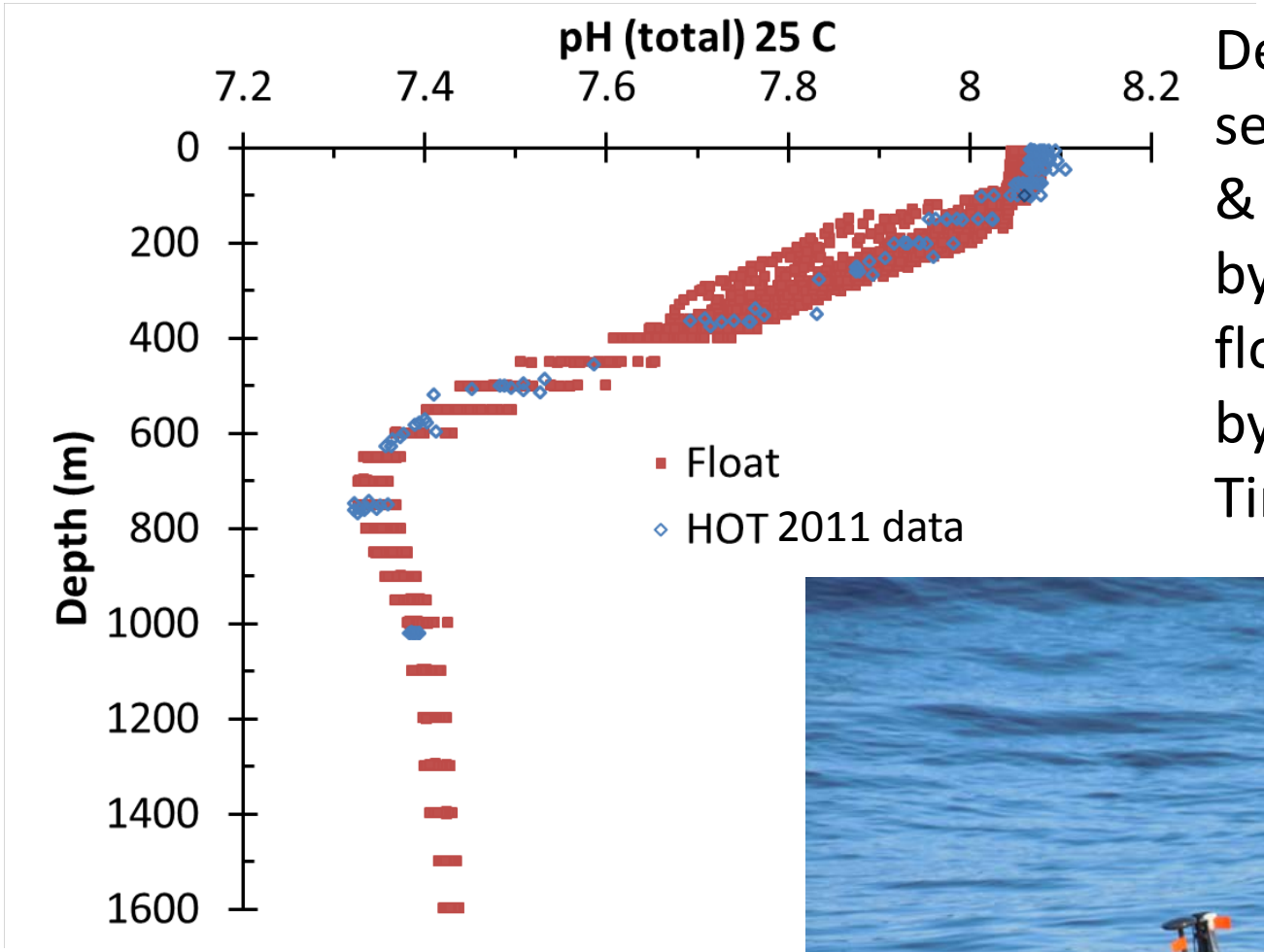
- Oxygen: exchange with atmosphere, marine photosynthesis and respiration.

- Nitrate : New production (build up of organic material) ; remineralization; biogeochemical modeling

- Chlorophylle a : Proxy of phytoplankton biomass, photosynthesis

- Particulate scattering (b_{bp}): Stock of particulate matter (detrital and living). Proxy of Particulate Carbon (POC) and Suspended Particulate Matter (SPM)

Selection of these variables through an international consensus : IOCCG Working group"Bio-optical sensors on Argo floats Argo", OceanObs09



Deep-Sea DuraFET pH sensor built at MBARI & Honeywell, tested by SIO, integrated to float by UW, deployed by HOT (Hawaii Ocean Time-series)

42 vertical profiles over 140 days. All data on FLOATVIZ web site in real time.

Outline

- Variable naming
- For Chlorophyll a, b_{bp} and NO3
  - Processing at the DAC level
  - Real-time QC
  - Delayed mode QC
- Additional documentation
- Next step

Important prerequisite

- N_VALUES for the spectral dimension of some measurements (NO_3, b_{bp})
- Naming of variables
  - Put a suffix the so-called “parameter family” to better define the measurement (e.g. NITRATE, BACKSCATTERING, CHLA…)
  - This recommendation also apply for other variables which are not “core Bio-Argo variables” e.g. radiometry, pH…

  $\Rightarrow$ Argo manual accordingly be updated
- As soon as these actions are closed the first definitive version of the documents (Chla, b_{bp}, NO_3) will be produced.

Other points

- Vertical_Pressure_Offset_Sensor vs CTD

Processing Chla

- Adding wavelength of fluorescence sensor (anticipate evolving sensors)
  - in the attribute of the parameter
  - in the sensor model description in the metadata file
- New calibrations (e.g. prior to deployment) should be stored in the profile file and in the SCIENTIFIC_CALIB_EQUATION. The last calibration will be the one to be used.
- As soon as “naming” is OK, the “final” version of the document “processing Chla at the DAC level” will be produced (action 3 closed)

Chla RT QC
actions 4, 7, 8

- Correction with the deep value
  - If it is not possible to determine the deep value (MLD >>) then CHLA and CHLA_ADJUSTED will be flag = 2
  - If calculated deep value > 20% of the DARK_CHLA then CHLA and CHLA_ADJUSTED will be flag = 2

Chla RT QC
actions 4, 7, 8

- Correction with the deep value
- The global -0.1-50 mg m-3 is adopted
  - A point outside is flagged =4
- The spike test is relevant for « negative » spikes only: flag = 4
- Positive « spikes » are OK. No need to flag
- Gradient test is not relevant
- « Jumps » (rare) can not be treated in RT.

Chla RT QC
actions 4, 6

- NPQ mean correction is recommended
  Reference paper Xing et al., 2012
- On the profile part affected by NPQ
  - CHLA will be flag = 3
  - CHLA_ADJUSTED will be flagged 2
  - Action for Xiaogang: restablish the variance after the correction.

Chla DM QC:
the use of remote sensing

- To identify problems
- Not to correct for float
- Both data set (in situ and satellite) have to be « prepared » independently

Chla DM QC metrics

- Find metrics to identify (anomalous) drift/changes in the deep values (1)
- Find metrics to compare surface float data with remote sensing Chla (2)
- When appropriate, compare (1) and (2) to identify a mixing problem from a sensor drift

Action for LOV (and Nick? and Xiaogang?)

Chla DM QC
Use of « sparse data bases »

- Method of data aggregation / classification into « biogeochemical provinces » have to be tested
  - IOCCG, 2009
  - Hardman-Mountford et al., 2008
  - Dowell et al., 2009
  - D'Ortenzio and Dalcala. 2009
- => action to be taken Nick and LOV

Chla DM QC
Use of additional « onboard » measurement

- e.g. when radiometry is present, combined used of FLUO_CHLA and Ed(490) is a way to get a better DM Chla product.
  - Xing et al., 2011
- Advantage: make consistent database originating from different float (a single “calibration” for all of them)
- Drawback: the use of a global bio-optical prevents to identify potentially interesting regional anomalies.
- Test have to be undertaken for the floats having both measurements = > action for Xiaogang

Processing b_{bp}

- Cf Argo update
- Length of the calibration equation

Real-time b_{bp} QC

- At the moment it is **not recommended to correct for deep values** in RT.
  - It might be possible to correct as part of DM-QC (return of experience still needed)
- Presently, for real-time QC, the main test/flag remains **range: 5.10^{-5}-10^{-1} m^{-1}.**
- As for Chlorophyll a, it is not relevant to remove/ flagg positive spikes. **Negative spikes** flagging (4) is recommended.

b_{bp} DM QC metrics

- Find metrics to identify (anomalous) drift/changes in the deep values (1)
- Find metrics to compare surface float data with remote sensing Chla (2)
- When appropriate, compare (1) and (2) to identify a mixing problem from a sensor drift

Action for LOV (and Nick? and Xiaogang?)

Processing NO3

- Require to have comments on the draft presented by ken Johnson by the Argo community: Thierry, Ann, Claudia, LOV: New Action XXX
- Require to translate the calibration equation in less than 1024 characters. New action for Ken
- Sensor Model
  - SUNA_WITH_SCOOP
  - SUNA
  - ISUS_IN_PUMP_STREAM
  - ISUS

Real-time NO3 QC

- 2 proposed tests to be tested implemented
  - Range : 0-46 ± 5 μM kg^{-3} (-5 to 51)
  - Spike / gradient test in steep gradients (including Vertical_Pressure_Offset_Sensor)
- Spectral quality test
  - Either: SUNA_Absorbance_Fit_Residual: threshold at 0.004
  - Or better: Absorbance_At_240: threshold at 0.8
  - Action: Ken + LOV to test these tests

NO3 DM QC

- WOA is for the moment the best reference especially for deep values
- Takeshita et al. JGR 2013 as an initial reference.

Bio-Argo float « good practice »

- Produce a document of reference (pre-deployment, sensor management, metadata, deployment….) that can be used for « capacity building » and for helping any user.

=> action for Antoine Poteau and others (?)

Session 085 - Towards a Global Ocean Biogeochemical Observing System Based on Profiling Floats and Gliders

CLAUSTRE Hervé , CNRS & UPMC, LOV claustre@obs-vlfr.fr
JOHNSON Kenneth , MBARI johnson@mbari.org

~ ***30 abstracts recieved***

Tutorial - TOWARD A GLOBAL OCEAN BIOGEOCHEMICAL OBSERVING SYSTEM BASED ON PROFILING FLOATS

Johnson, K. S., MBARI, USA, johnson@mbari.org
Claustre, H., CNRS & UPMC, LOV , France, claustre@obs-vlfr.fr
Sarmiento, J. L., Princeton University, USA, jls@princeton.edu

WG 142 Quality Control Procedures for Oxygen and Other Biogeochemical Sensors on Floats and Gliders

Arne Körtzinger (Germany)
Ken Johnson (USA)