WORLD METEOROLOGICAL ORGANIZATION

DATA BUOY COOPERATION PANEL

THIRTY-SECOND SESSION

LA JOLLA, USA
17-21 OCTOBER 2016

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

DBCP-32 / Doc 9.3
(20-Oct-16)

ITEM: 9.3

ENGLISH ONLY

BUOY DATA MANAGEMENT CENTRES

(Submitted by Gilbert Emzivat (France), and Mathieu Ouellet (Canada))

SUMMARY AND PURPOSE OF DOCUMENT

The document provides for the reports by the Marine Climate Data System (MCDS) trial Global Data Assembly Centres (GDACs), operated by the Canadian Oceans Science branch (OSB) and Météo-France.

ACTION PROPOSED

The Meeting is invited to note the information contained in this document when discussing how it organises its work and formulates its recommendations.

Appendix: A. Canadian MCDS trial GDAC report
B. French MCDS trial GDAC report

DISCUSSION

-A- DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

Error! Reference source not found.~~10.2~~.1 Mathieu Ouellet (Canada) reported on the activities of the Marine Climate Data System (MCDS) trial Global Data Assembly Centres (GDACs), operated by the Marine Environmental Data Section (MEDS) of Fisheries and Oceans Canada's Oceans Science branch (previously Oceanography and Scientific Data branch; formerly Integrated Science Data Management).

Error! Reference source not found.~~10.2~~.2 specific issues of interest to the Panel on GDAC/Canada activities to be added here according to actual discussion during the Session]

Error! Reference source not found.~~10.2~~.3 The Panel then reviewed the report of the Marine Climate Data System (MCDS) trial Global Data Assembly Centres (GDACs), operated by Météo-France, presented by Mr Gilbert Emzivat (France).

Error! Reference source not found.~~10.2~~.4 specific issues of interest to the Panel on GDAC/France activities to be added here according to actual discussion during the Session]

Error! Reference source not found.~~10.2~~.5 The Panel thanked both centres for their reports. The full reports are provided in Appendices A and B respectively and will be included in the DBCP annual report for 2016.

Error! Reference source not found.~~10.2~~.6 **The meeting made the following recommendations**:

(i.) Rec1;

(ii.) Rec2;

Error! Reference source not found.~~10.2~~.7 **The meeting decided on the following action items**:

(i.) Action1 (**action; by; deadline**);

(ii.) Action2 (**action; by; deadline**);

-B- BACKGROUND INFORMATION *(if necessary, provide additional material to further explain the information in part A but that will not be included in the report of the meeting)*

APPENDIX A

REPORT OF THE CANADIAN MARINE CLIMATE DATA SYSTEM (MCDS) TRIAL

GLOBAL DATA ASSEMBLY CENTRE (GDAC)

Introduction

MEDS was designated as the Responsible National Oceanographic Data Centre (RNODC) for Drifting Buoy data (RNODC-DB) under the auspices of the International Oceanographic Data Exchange system (IODE) of the Intergovernmental Oceanographic Commission (IOC) in 1986. In 2005, the Eighteenth IODE session decided to abolish the RNODC system and MEDS' role has since been recast as that of a Global Data Assembly Center (GDAC-DB).

As part of its role of GDAC-DB, MEDS acquires, processes, quality controls and archives data from real-time drifting and moored buoy reporting messages in FM 18 BUOY code form and FM 94 BUFR format over the GTS, as well as delayed mode data acquired from other sources. All data are made available to the international scientific community through online products and custom requests.

Data Flow to MEDS

In the real-time drifting buoy processing system, GTS data are ftp'd to MEDS every half hour from the Canadian Ice Service, a division of Environment and Climate Change Canada's Meteorological Service. Every hour, these messages are processed to extract BUOY messages, as well as other oceanographic reports such as TRACKOB, BATHY and TESAC. Once a day, the BUOY messages are decoded to an in-house format after which automated tests are run to check for acceptable ranges of values in several measurements (SST, atmospheric pressure, air temperature, wind direction/speed, sub-surface temperature/salinity and wave height/period) and reported position/date/time information. After collecting the data for an entire calendar month, several automatic and interactive processes are run to detect and resolve best versions of duplicate messages, flag erroneous data and run in-house quality control procedures to validate and flag individual measurements. Trained scientific personnel review displays of time-series measurements, drift tracks and speed charts. Flags are set according to the international QC flag definitions derived from IODE and JCOMM. Once completed, the data are merged into the archive and the website is updated.

With a monthly QC system, it takes between one and eight weeks for individual BUOY reports to be added to the archive. The average delay between reception and update is 27 days. Messages in BUFR format are also from the Canadian Ice Service to MEDS, and their buoy data are decoded and archived in a database which can be harvested for special requests and for monitoring purposes. MEDS and Météo-France run comparisons of their respective incoming BUFR buoy stream. Details on this activity are provided in the Report by the Task Team on Data Management.

MEDS also receives, decodes and archives, as part of its involvement in the Global Temperature Salinity Profile Programme, a large volume of messages (>2M / year) from moored data buoys transmitting in TESAC or BATHY code form over the GTS. These buoys belong to various organizations, the majority of which are located in the USA and affiliated with the National Data Buoy Center of NOAA; for instance, the National Estuarine Research Reserve System, the Center for Coastal Margin Observation and Prediction, etc. The data from those buoys are not integrated with the data from BUOY code form messages, but are rather included in the data provided by MEDS to the Global Temperature Salinity Profile Programme's Continuously Managed Database at the NOAA NCEI National Oceanographic Data Center (NODC), three times a week.

Data Distribution

Data is freely available through a request system provided on the MEDS website (www.meds-sdmm.dfo-mpo.gc.ca). Additionally, the data from Buoy code form messages processed by MEDS are deposited yearly in the US NCEI/NODC (of NOAA) ocean archive system, from where they are publically available.

Summary of Work carried during the Year

- Sent NOAA NCEI/NODC's Ocean Archive System a submission containing all GTS Buoy code form data from 2015. The submission received accession number 156004: http://data.nodc.noaa.gov/cgi-bin/iso?id=gov.noaa.nodc:0156004. The data are available in NODC ASCII format, with all metadata elements, and also as a product in CSV format with more requested data fields.

- Carried BUFR stream comparison exercises with Météo-France and contacted DACs as needed to resolve identified problems (see TT-DM report for details)

- Established BUFR TM315009 database at DFO

- Designed method to fill missing BUOY data from drifting buoys with BUFR data

- Attended the "First CMOC/China Workshop" hosted by NMDIS (SOA), Aug 29th to Sep 1st 2016 in Tianjin (China)

- Reviewed MEDS drifting buoy web content in collaboration with AOML and Météo-France

Annual Statistics Summary

All statistics in this section refer to GTS data from drifting buoys. Only data from BUFR messages in the TM315009 template were taken into account in this summary since the mapping of legacy BUFR messages to a common data model, to allow identification of duplicates and to correctly map WMO IDs to platform types, is a work in progress. To distinguish between drifting and moored buoys in the BUOY stream, we used the WMO rule for allocating WMO identifiers.

During the 12 month period from January 2015 to December 2015, MEDS archived 10,683,739 unique drifting buoy messages from 2177 platforms in BUOY format, 1,476,591 additional unique drifting buoy messages from 1367 platforms in BUFR TM315009 and 943394 messages from 1978 platforms (211 additional) in legacy BUFR . Once both streams combined and duplicates eliminated, with priority given to BUOY messages, the number of unique drifting buoy messages is 13103724, from 2388 drifting buoys.

Format	# unique messages	# unique buoys
FM18 BUOY	10683739	2177
FM94 BUFR TM315008	1476591	1367 (+0)
FM94 BUFR No TM	943394	1978 (+211)
Integrated Total	13103724	2388

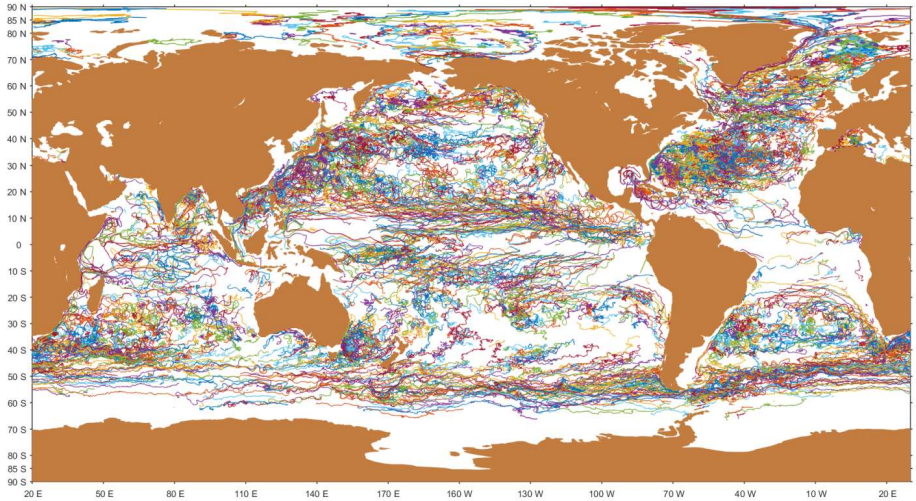
Of the GTS messages quality controlled, 98.1% of the buoy positions were flagged as good after the quality control performed at MEDS.

Drifting buoy locations from the combined dataset for the 12 month period are represented in Figure 1 and a plot showing the density of measurements, as number of days with at least one measurement per degree square, are represented in Figure 2. Only data with good position quality flags are shown.

Figure 3, upper panel, shows counts of BUOY and BUFR messages per month. Each message is equivalent to an observation performed by a platform at a given geographical point in time. Figure 3, lower panel, shows the counts of buoys reporting per month, by format (BUOY and BUFR).

Figure 4, upper panel, shows counts of unique drifting buoy messages after reconciling the BUOY and BUFR streams and eliminating duplicates (priority is given to the BUOY format). Figure 4, lower panel, shows counts of buoys reporting per month, by format, after reconciling the BUOY and BUFR streams and eliminating duplicates (priority is given to the BUOY format).

Figure 1: Drifting buoy tracks, 2015



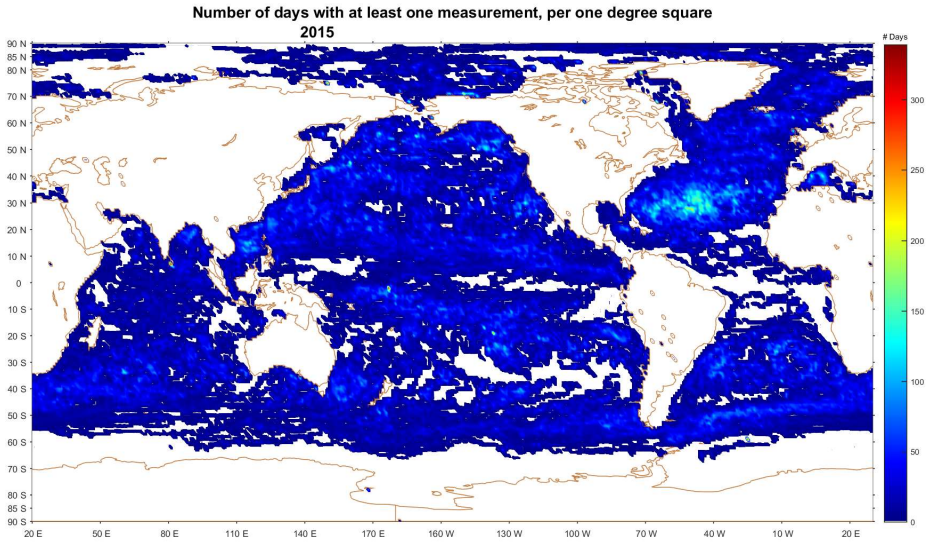


Figure 2: Number of days with at least one drifting buoy measurement per degree square, 2015

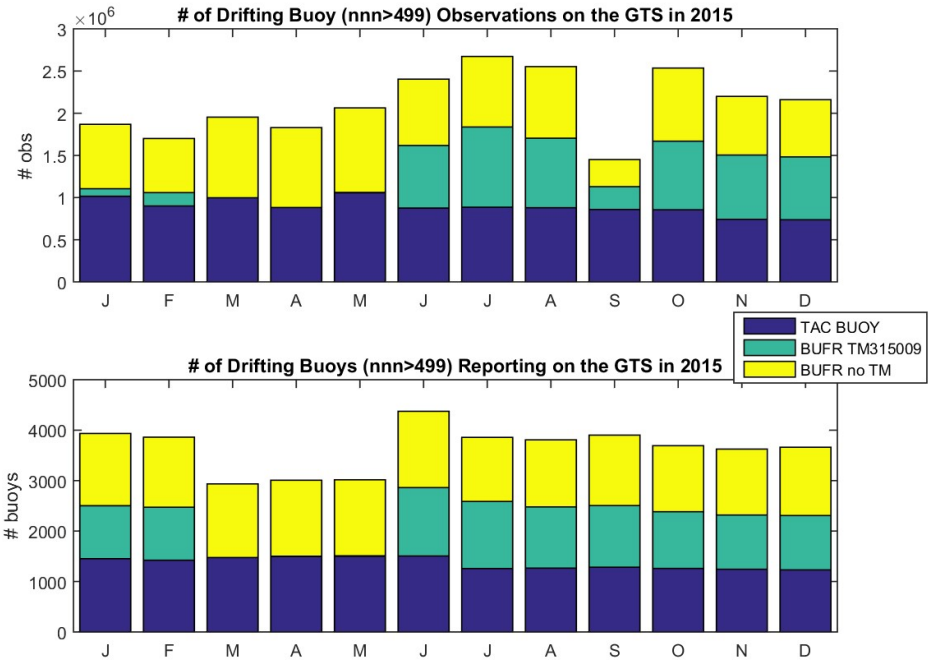


Figure 3a: Counts of BUOY and total BUFR TM 315009 messages

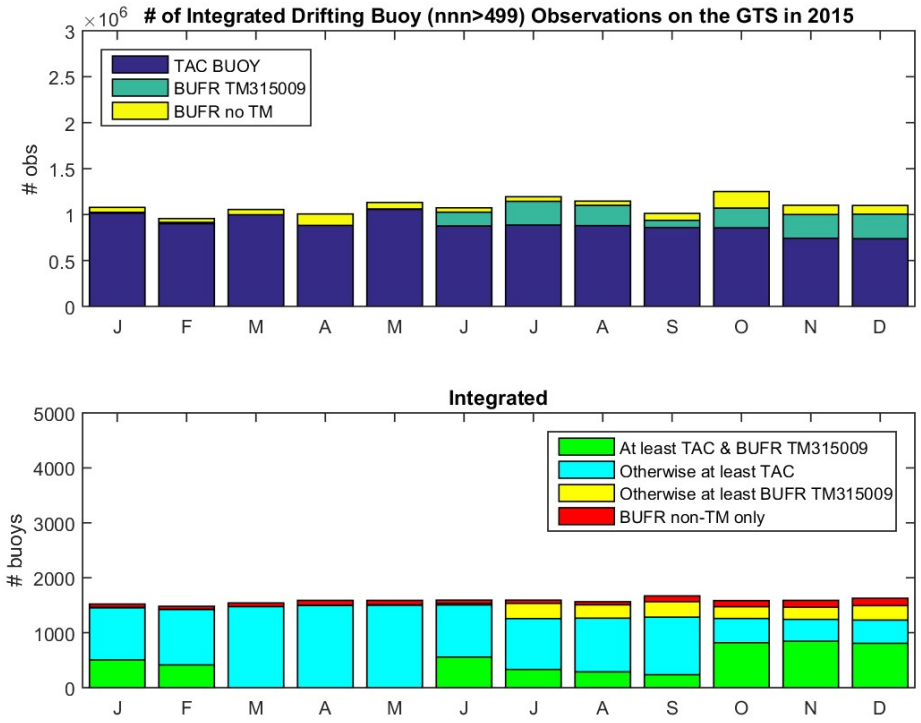


Figure 4a: Counts of combined BUOY and BUFR TM315009 messages

The drop in the number of drifting buoy messages received in April 2015, due to a temporary problem upstream with buoys normally encoding their messages under bulletin SSVX02 encoding them as SVBX02 from April 2nd to April 6th, could not be completely resolved with the BUFR data. MEDS will try recovering the missing data from CLS or Météo-France. The drop in number of BUOY code form messages from drifting starting in June 2015 is partly due to Météo-France switching the GTS routing of their BUOY messages to a national circuit. It can be seem that using the BUFR stream solves the problem except for September 2015. A comparison with Météo-France of the full year dataset will allow to identify the source of these gaps.

Objectives 2016/2017

- Carry comparison of 2015 data with Météo-France and , recover missing data and submit addendum to NOAA NCEI/NODC Ocean Archives
- Ingest the entire AOML GDP data received at MEDS
- Further definition of GDAC scope with Météo-France and TT-MCDS
- Help diagnose fluctuations in BUOY messages identified by NOAA NCEI's Center for Weather and Climate during the creation of ICOADS 3.0
- Ongoing comparisons with Météo-France
- Reconcile 2016 BUOY data with BUFR
- Test and further develop netCDF format in collaboration with Météo-France

APPENDIX B

FRENCH MARINE CLIMATE DATA SYSTEM (MCDS) TRIAL GLOBAL DATA ASSEMBLY CENTRE (GDAC) REPORT

Introduction

The previous Specialized Oceanographic Center (SOC) for Drifting Buoys is now obsolete per JCOMM-4 decision. The SOC/DB operated by Meteo-France has been migrated into a trial GDAC (Global Data Assembly Centre) of the Marine Climate Data System (MCDS) also by JCOMM-4 decision.

This migration to a GDAC for Drifting Data Buoys, through the Marine Climate Data System (MCDS) implementation phase II (2015-2017), involves Météo-France teams in Toulouse and Brest as well as teams involved in the French inter-agency program Coriolis (Ifremer leading the program, and in charge for delayed mode aspects, portal to external users, etc).

A daily collection and archiving of buoy reports from the global ocean is performed by Météo-France. Collaboration within the Coriolis project (www.coriolis.eu.org), with JCOMMOPS and also CLS-Argos are main aspects of this FR DDB Trial GDAC, beside regular exchanges with other data centres, measurement teams and agencies, and with users.

Data Flow to FR DDB Trial GDAC

Since the 1st of January 2002, Météo-France has been providing the Coriolis Data Centre with surface current data computed thanks to SVP drifter tracks. Coriolis contributes to the French operational oceanographic project with in-situ data. Buoy positions, obtained from the GTS, are interpolated every 3 hours. Surface current data are computed over 6 hours, on a weekly basis. Data are flagged with drogue presence indexes. Since mid-2004, wind speed and wind stress data from ECMWF analysis model coupled with sampled surface current data are delivered too and used by operational oceanography centres (such as Mercator, French component of the GODAE international experiment).

Meteo-France operates quality control (QC) procedures on drifting buoys data. Warning messages are sent to the buoy-qir@vedur.is mailing list of Internet, when a problem appears (e.g. bad location detected, wrong acceleration and loss of drogue, sensor drift, etc) or when a modification seems needed (i.e. to recalibrate or to remove a sensor from GTS) via the JCOMMOPS interface. Statistics on comparisons with analysis fields are set up for each buoy. Monthly statistics are sent to the buoy-qir@vedur.is mailing list too.

Buoy data QC tools developed by Météo-France are available on the Internet (www.meteo.shom.fr/qctools) to help buoy operators to check their own buoys: monthly statistics carried out by 4 meteorological centres for individual buoys; plots of data and differences with model outputs; blacklists of buoys reporting dubious air pressure values or being perhaps ashore can be seen.

For the specific needs of IFREMER and SHOM, Coriolis maintains a data processing system for drifting buoys. These buoys (Woce and SVP type) allow high frequency data measurements of sea surface temperature and currents.

Coriolis flags all the data received in accordance with Real-time Quality controls : from ‘1’ (good data) to ‘4’ (bad data).

Since June 2016, CORIOLIS is collecting GTS Buoy BUFR data.

Data Distribution
Coriolis is providing all the drifting buoys data collected on the GTS, through Meteo-France access.

In addition to the products linked to buoy QC, the FR DDB Trial GDAC produces users requested products for buoys (mooring and drifting buoys).

For the Global Ocean delayed mode in-situ observations of ocean surface currents, use the following links to access to :

- Rio Marie-Hélène, Etienne Hélène (2016). Copernicus Global Ocean delayed mode in-situ observations of ocean surface currents. SEANOE. http://doi.org/10.17882/41334
- Product user manual: http://doi.org/10.13155/41257
- Quality Information Document: http://doi.org/10.13155/41256

Field Code Changed
Field Code Changed

Summary of Work carried during the Year
Two documents were established between Meteo-France, CORIOLIS and MEDS :

- DDB GDAC organization,
- DDB GDAC user manual.

in order to establish rules for the two DDB GDACs described in MCDS.
Drafts have been issued and are under discussion, during the trial period. CORIOLIS already operating as trial DDB GDAC.

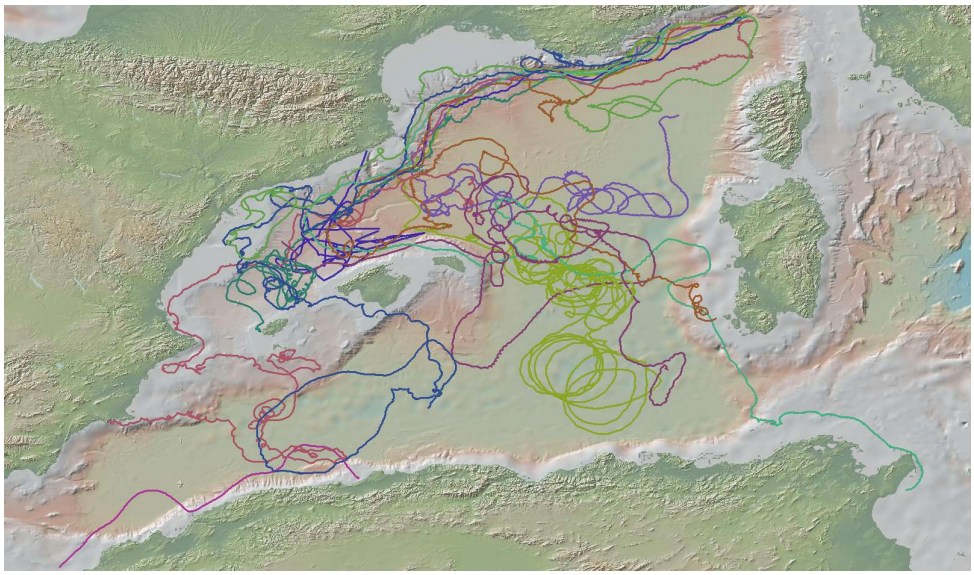


Figure 1 : drifting buoys processed by Coriolis in the Mediterranean Sea, in 2015.

In 2015 network counts :

- 2238 active drifters (3% less than 2014)
- Transmitting 2,9 millions of observations (9% more than 2014)
- 408 000 day-platform observations (one platform one day = 1)

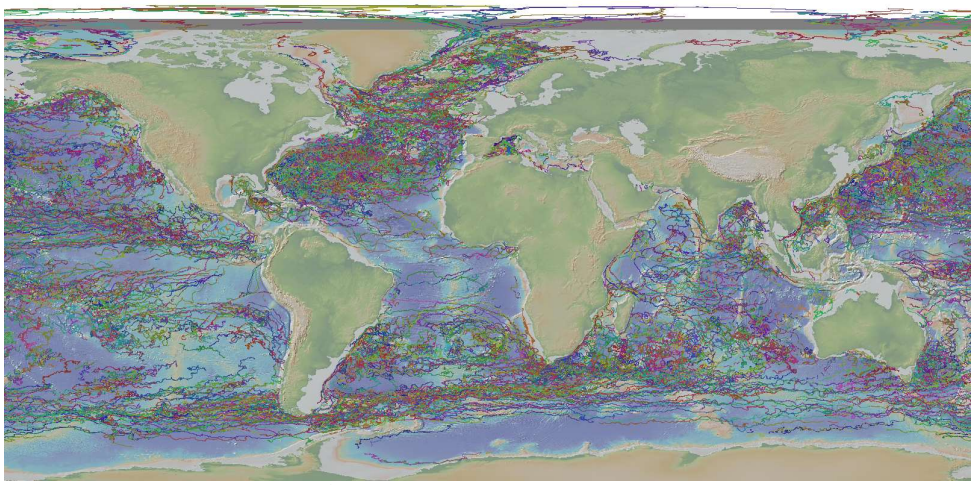


Figure 1 : 2238 drifting buoys transmit 2.9 million measurement points.

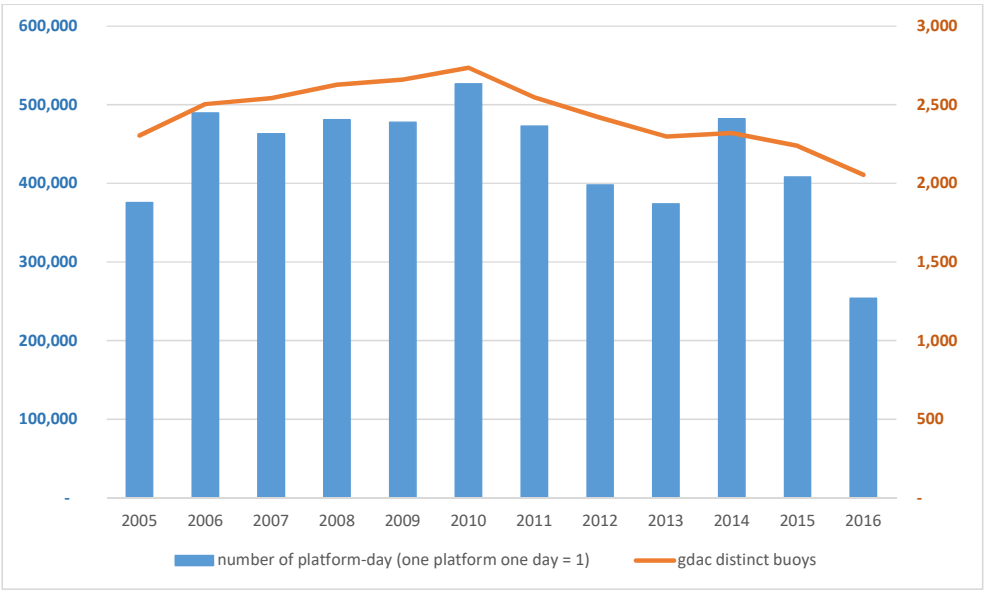


Figure 2 : Distribution of buoys and observations on Coriolis GDAC

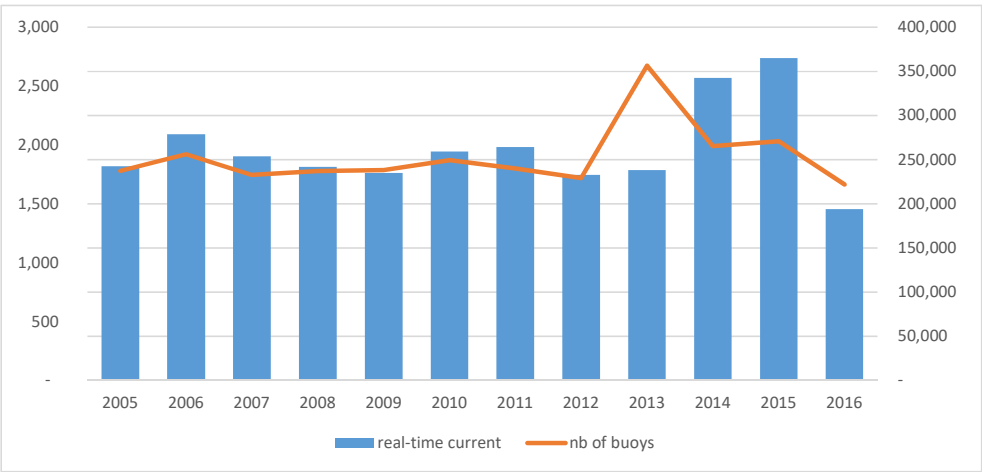


Figure 3 : Real-time current from drifting buoys

Objectives 2016/2017

- Definition of GDAC perimeter, dataflows, data contents by EUMETNET, with CORIOLIS and MEDS (2016)
- Import of BUFR data from Météo-France GTS node by CORIOLIS to complete historical database overwriting corresponding FM18 data (2016-2017)
- Reconciliation of JCOMMOPS metadata with data by CORIOLIS (2016-2017)
- Data recovery previous 2005 (2016-2017)
- Development of a specimen of a NetCDF drifting buoys data set (2016-2017).