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AGENDA ITEM 9: **Recommendations by the Task Teams**

AGENDA ITEM 9.5.2: **Recommendations by Task Team Buoy Data Management Centers**

SUMMARY

This document provides a report by the Task Team on Buoy Data Management Centers including actions/decisions required. Report will focus on challenges, opportunities and risks, and derived recommendations.

(Draft text for inclusion in the final report)

A. INTRODUCTION/SUMMARY[1]:

(maximum length half (1/2) a page)

In the Marine Climate Data System (MCDS) scheme, two Drifting Data Buoys Global Data Assembly Centre (DDB GDAC), have been established; lead by "Fisheries and Oceans Canada" (DFO) and Coriolis (French organization including Météo-France and Ifremer).

Both GDACs acquire data circulated on the Global Telecommunication System (GTS) of WMO. Additionally, Coriolis acquires data from Copernicus Marine service. The GDACs aim to consolidate near-real-time and delayed-mode data, to deliver a comprehensive best version archive of data and metadata.

Both GDACs routinely compare GTS bulletin headings and data volume received and have ways to make data available to requesters (DFO: through an offline form request system, France: through the Copernicus Marine Environment Monitoring Service: http://www.marineinsitu.eu/access-data/.

In addition, a public FTP server distributing data and metadata as one file per drifting buoy is operated in France: ftp://ftp.ifremer.fr/ifremer/dbcp-drifter/ (NetCDF format), and Canada distributes data grouped in monthly files on their ftp server: ftp://ftp.meds-sdmm.dfo-mpo.gc.ca/pub/dribu_bufr in CSV format.

[1] Half a page or less of Summary

The two DDB GDAC are working together to establish DDB GDAC organization document and user manual, to formulate exchanges and best practices between the two GDACs.

B. ACTIONS/DECISIONS[2] REQUIRED:

(a) Adopt draft Action(Decision)[2] 9.5.2/1 —*Action(Decision) title;*

- Drifter DACs are to forward at regular intervals (either in near-real-time or in delayed mode) the Iridium SBD drifter messages to the Coriolis DAC.
- Participants to try out the new services provided by the GDACs and provide feedback as needed.

C. RECOMMENDATIONS[3] :

(a) Adopt draft Recommendation[3] 0.0.0/1 — *Recommendation title;*

- What, To who, Timeline
- Rational

[2] An Action/Decision is an item directly related to DBCP and on which DBCP can action or decide directly. Details on rational for the action/decision should be included in the Background under Draft Actions/Decisions.

[3] A Recommendation involves proposed action(s)on another body outside of DBCP (e.g. SOT, JCOMM, WMO, IOC, CBS etc.). Details on rational for the Recommendation should be included in the Background under Draft Recommendation.

C. BACKGROUND INFORMATION (not to be included in the session report):

References (if any):

1. *[Link to the full report on the website]*

2. .....

Draft Actions/Decisions

- Participants to review the two GDAC documents (Drifter data management and Proposal for drifting buoy metadata in the WIGOS Metadata Standard) and send comments to the authors by 1 November 2021.

Draft Recommendations

[Comment: Details on main points and arguments leading to formulation of draft actions/decision presented in this document]

French Drifting Buoys Global Data Assembly Center report

The migration to a GDAC for Drifting Data Buoys, through the MCDS implementation phase II, involves Météo-France, Ifremer (Coriolis Data Center) and Fisheries and Oceans Canada.

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 OceanOPS and also CLS-Argos are main aspects of this FR DDB GDAC, beside regular exchanges with other data centres, measurement teams and agencies, and with users.

The global data buoy collection activity is strongly supported by EU Copernicus service.

Data products

Copernicus Marine service (https://marine.copernicus.eu) aggregates drifting buoys observations from DB-GDAC and WMO-GTS.

Copernicus In Situ service (https://insitu.copernicus.eu) supports delayed mode activity on drifting buoy data (data retrieval "archeology" and scientific assessment).

Drifting buoys global dataset

- INSITU_GLO_NRT_OBSERVATIONS_013_030 in situ data product
  Real-time drifting buoys: the last 30 days of 1.490 active drifting buoys
  One NetCDF file per day and per platform
  From ERDDAP server:
  https://nrt.cmems-du.eu/erddap/tabledap/copernicus_GLO_insitu_nrt_DB.html
  From ftp server:
  ftp://***@nrt.cmems-du.eu/
  Core/INSITU_GLO_NRT_OBSERVATIONS_013_030/nrt/latest/*/*_TS_DB*.nc

- History drifting buoys: all observations from 14.015 drifting buoys
  One NetCDF file per drifting buoy
  ftp://***@nrt.cmems-du.eu/
  Core/INSITU_GLO_NRT_OBSERVATIONS_013_030/nrt/history/DB/*.nc

Drifting buoys surface currents product

The surface currents product derived from drifting buoys data are produced in real-time and delayed mode by EU Copernicus Marine service.

Surface current product, real time

Since the 1st of January 2002, Coriolis (Météo-France and Ifremer) produces a **weekly surface current data** calculated from SVP drifter tracks.

This product is distributed by Copernicus Marine service as:

- INSITU_GLO_UV_NRT_OBSERVATIONS_013_048 product
  Active buoys (the last 30 days)
  ftp://nrt.cmems-du.eu/Core/INSITU_GLO_UV_NRT_OBSERVATIONS_013_048/drifter/latest
  YYYYMMDD/GL_TS_DC_*_YYYYMMDD.nc

- All buoys ("history")
  ftp://nrt.cmems-du.eu/Core/INSITU_GLO_UV_NRT_OBSERVATIONS_013_048/drifter/history
  GL_TS_DC_*.nc

The Copernicus NetCDF CF format is documented in:

- *Copernicus Marine in situ NetCDF format reference manual* https://doi.org/10.13155/59938

Surface current products, delayed mode

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

- *Rio Marie-Hélène, Etienne Hélène (2019). Copernicus Global Ocean delayed mode in-situ observations of ocean surface currents http://doi.org/10.17882/41334*
- Product user manual: http://doi.org/10.13155/41257
- Quality Information Document: http://doi.org/10.13155/41256

This product is updated once a year.

Météo-France QCTools

Météo-France operates quality control (QC) procedures on drifting buoys data. Buoy data QC tools developed by Météo-France are available on the Internet (http://esurfmar.meteo.fr/qctools/) to help buoy operators to check their own buoys: monthly statistics carried out by four 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.

DAC – Data Assembly Centre activity

Coriolis/Météo France operates a Data Assembly Centre for drifting buoys.
The DAC function is to:

- Receive original drifting buoys data and preserve them
- Aggregate drifting buoys data and metadata into standardized NetCDF-CF files
- Decode and apply quality control in real-time
- Distribute quality controlled data on GDAC and GTS
- Manage updates (calibration, reprocessing) in delayed mode

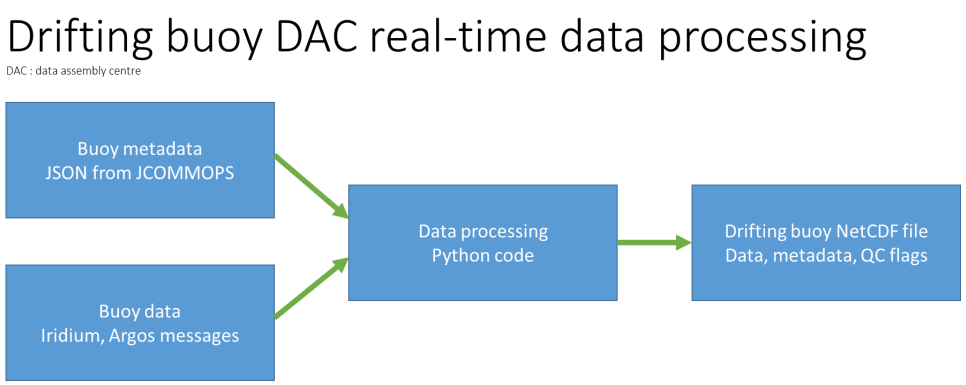
In September 2021, 851 drifting buoys with Iridium-SBD communication are managed by Coriolis-DAC, metadata are provided by JCOMMOPS.

Fisheries and Oceans Canada sends its drifters iridium data to Coriolis DAC.

Coriolis DAC may act as a DAC for SVP Iridium buoy data providers. This is realistic if the complexity and the number of type of buoys is not too big. Coriolis may also act as the DAC for orphan buoys whose data circulate on GTS only.

The drifting buoy data processing chain is freely available from:

- **Drifting buoys DAC data processing chain version 1.0**
  http://doi.org/10.17882/51148



GDAC – Global Data Assembly Centre activity

Coriolis operates a Global Data Assembly Centre for drifting buoys.
The GDAC function is to:

- Aggregate real-time and delayed-mode NetCDF-CF files provided by DACs
- Check the NetCDF-CF compliance of the DACs files
- Preserve NetCDF-CF drifting buoys files
- Distribute files on multiple channels
  FTP, HTTP, ERDDAP

The Drifting buoys GDAC MCDS is documented with:

- **Drifting buoys GDAC organization**

- **Drifting buoys GDAC NetCDF data and metadata format version 1.0**
  http://doi.org/10.13155/52037

- **Drifting buoys DAC data quality control manual version 1.0**
  http://doi.org/10.13155/52040

- **Drifter metadata in the WIGOS standard**
  https://doi.org/10.5281/zenodo.1406121

Drifting Buoys GDAC ftp server

The Drifting Buoys GDAC activity started in August 2018.

ftp://ftp.ifremer.fr/ifremer/dbcp-drifter

- gdac/active real-time drifting buoys
- gdac/history delayed-mode drifting buoys
- gdac-index.csv index of all GDAC drifting buoys

The gdac/active and gdac/history directories are populated with one file per buoy. Each file contains the buoy data and metadata (from OceanOPS).

The gdac/active is populated with iridium data received from Coriolis DAC (851 active Iridium-SBD drifting buoys in September 2021). The objective is to extend it to all history and active buoys managed by Meteo-France.

Historical data of drifting buoys with no access to original telemetry data may be recovered from AOML or MEDS historical GTS database.

The C-RAID project described in the following chapter is working on retrieving and reprocessing original drifting buoys data.

Drifting buoys Coriolis DAC ERDDAP access

The GDAC NetCDF files are also distributed on ERDDAP server

- DBCP Coriolis DAC ERDDAP server

Drifting buoys GDAC DOI access

A snapshot of the whole GDAC content is performed regularly (quarterly). The snapshot is preserved and published with a unique DOI: Digital Object Identifier.

- DBCP drifting buoys data and metadata from Global Data Assembly Centre (DBCP GDAC) https://doi.org/10.17882/57247
    - The DOI should systematically used for DBCP data citation: crucial for efficient bibliographic surveys.
    - The DOI and its associated fragment identifies a specific snapshot: crucial for reproducibility of result cited in scientific publications.

Statistics on drifting buoy data collected from GTS, Ifremer, SHOM

With Copernicus Marine funding, Coriolis (Météo-France, Ifremer) collects, quality controls, archives and distributes marine in situ data circulating on GTS or deployed by French and European institutions. Most of these data come from observation networks: drifting buoys, Argo floats, moorings, vessels, gliders or sea-mammals.

Observation networks

In 2021, Coriolis data centre managed 52.975 platforms including 14.248 drifting buoys.

To measure the impact of the observations available from these platforms on models using in situ data, we calculate a platform-day histogram.
Definition of platform-day: a platform that reported at least one observation on a day: +1.

In 2021, drifting buoys represent 43% of the platform-day observations.

The diagram below illustrates the importance of drifting buoys along animal, Argo float, mooring, glider and vessel observation networks.

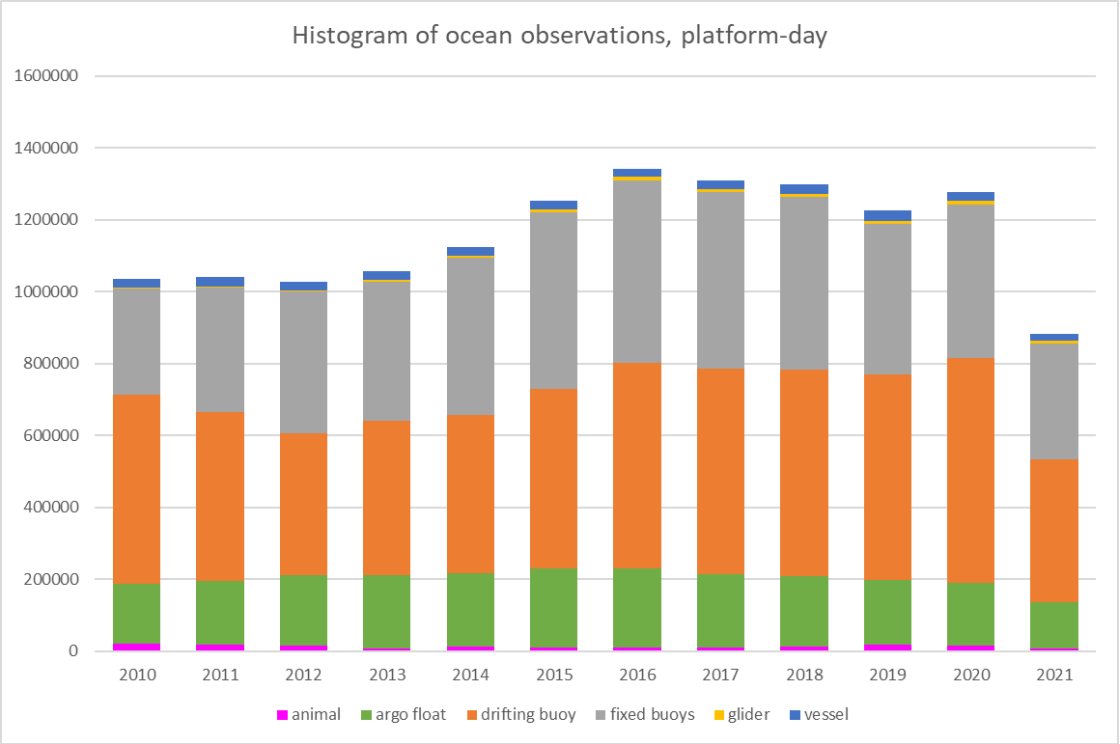


Figure 1: observation network observations in platform-day (year 2021 is not over)

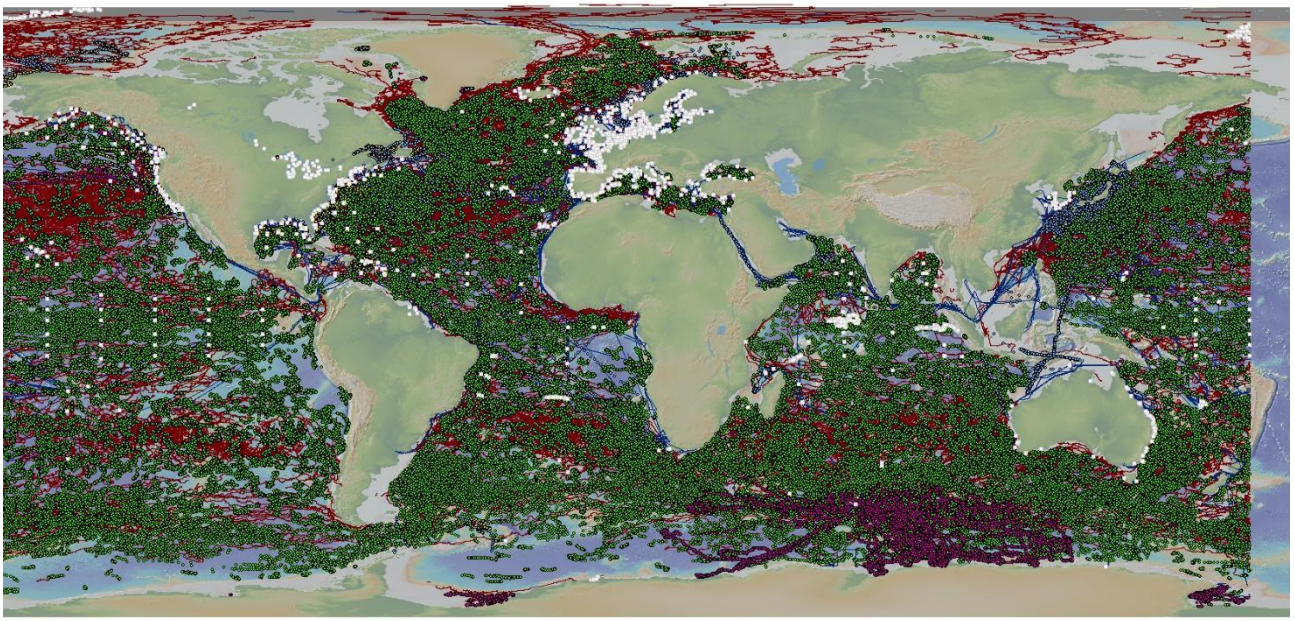


Figure 2: observation networks geographic coverage, 2021 (one year)
The drifting buoys trajectories (red lines) are somewhat hidden by Argo profiles (green dots)

Drifting buoys observation network

In 2021, Coriolis Data Center managed **14 248 drifting buoys** (+2% from 2020), **1490** were active.

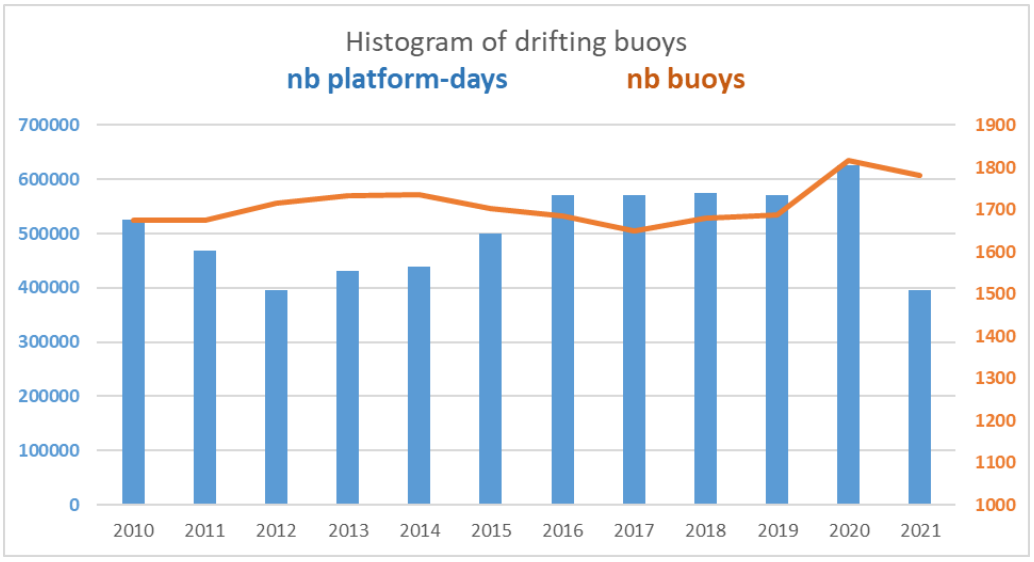


Figure 3: drifting buoys observations yearly distribution (year 2021 is not over)
(**blue: platform-day**, **orange: number of active platforms**)
One day of observation from one buoy = +1

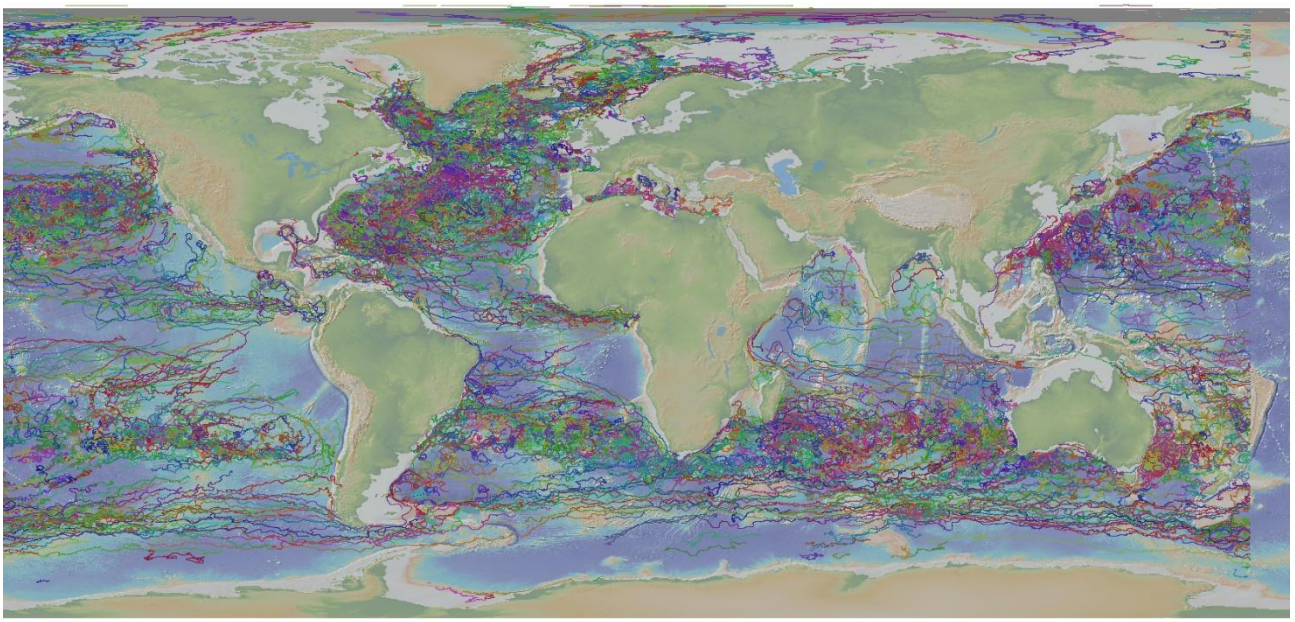


Figure 5: drifting buoys trajectories distributed by Coriolis - Copernicus in 2021 (one color one buoy).

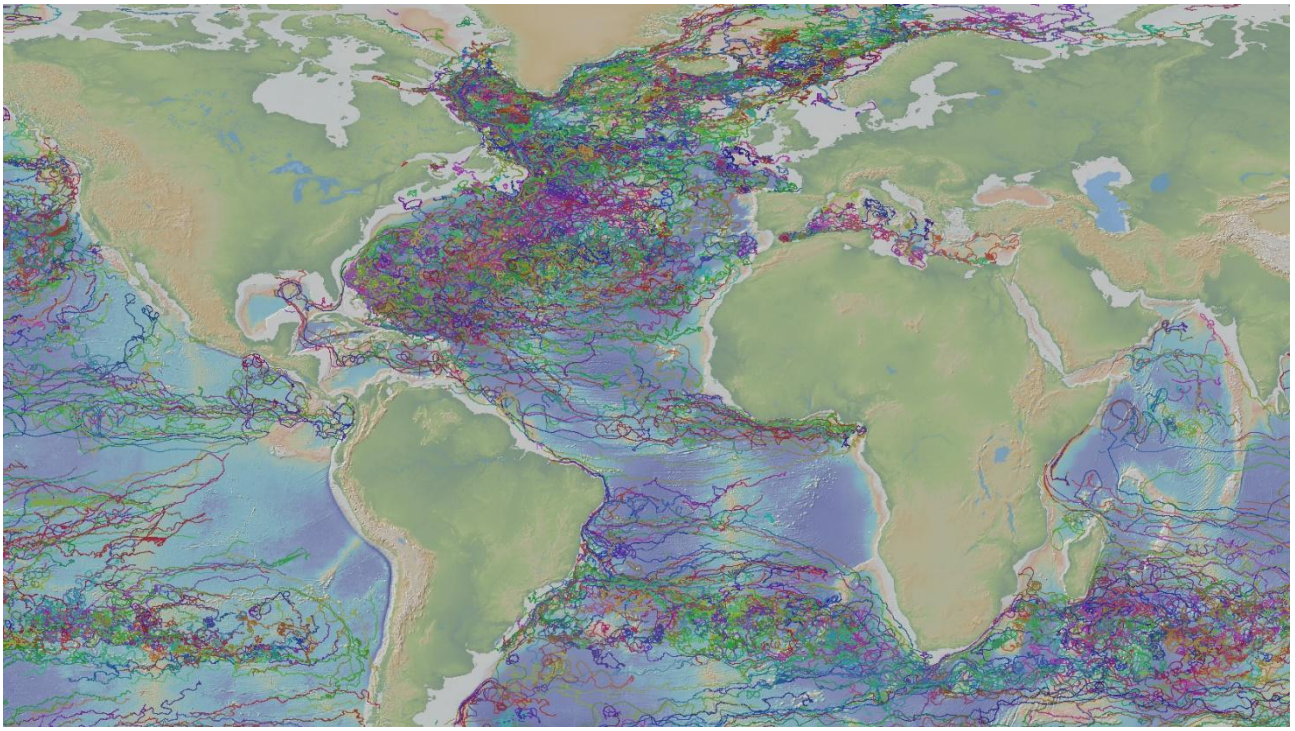


Figure 5a: drifting buoys trajectories, zoom on North Atlantic, 2020-2021 activity

DAC GDAC Objectives 2021/2022

- Consolidate the European DAC activity
- Initiate the activity of new DACs
- Organize the data management of orphan drifting buoys (no DAC), in particular from C-RAID project

C-RAID project contribution to Drifting Buoys GDAC

A data rescue project: C-RAID - Copernicus Reprocessing and Access Improvement for Drifter data https://doi.org/10.17882/77184

C-RAID project is a global reprocessing of drifting buoys data and metadata: 25 000 drifting buoys, deployed between 1979 and 2018. The data of 10 000 drifting buoys deployed between 1997 and 2010 have been delayed mode processed (including comparison with ERA5 reanalysis). The project is continuing in 2021-2022 as "C-RAID phase 2" to reprocess drifting buoys data deployed between 1979 - 1996 and 2011 - 2018.

C-RAID deliverables

1. An improved drifting buoys data archive
2. FAIR interfaces to drifting buoys data : Web data discovery for human users, API data discovery/subsetting/download services

By "Improved drifting buoy data record" we mean:

- Missing datasets and parts of datasets recovered (data rescue)
- Homogeneous & rich metadata and data format (NetCDF-CF)
- Homogeneous expert QC on marine and atmospheric data
- Matchup ERA5 data (temperature, atm pressure, wind)

C-RAID phase1 data, metadata and documentation are now published on

- https://doi.org/10.17882/77184

FAIR data commitment

Findable	DOI published on DataCite & Google Schema.org, Link with bibliography and authors (ORCID)
Accessible	One click download, anonymous access
Interoperable	CF and SeaDataNet standards, QC documented
Re-usable	CC-BY license

C-RAID stakeholders

- **Ocean-Atmosphere community**
  C-RAID higher resolution data would complement ICOADS buoys data and improve Copernicus ERA reanalyses.
- **Ocean community**
  Temperature for satellite calibration/validation, model and reanalyses validation or forcing
  - **CMEMS**: Global "OSTIA" L4REP and L4NRT use drifter SST to force the analyses in complement of satellites with a maximum nb of sensors, to solve mesoscale structures.
  - The drifter SST data are assimilated by CMEMS MFCs to constrain the surface fields. They are also used to validate surface fields.
    C3S: Global ESA SST CCI and C3S L4REP use in situ drifter SST to validate fields built from satellite only data
    "climat" type product = stable in time

References

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WMO, 2016. The Global Observing System for Climate: Implementation Needs. GCOS- No. 200. https://library.wmo.int/doc_num.php?explnum_id=3417

Canadian Drifting Buoys Global Data Assembly Center Report

1. Functions of Global Data Assemble Center

The Marine Environmental Data Section (MEDS) of Fisheries and Oceans Canada (DFO) began operating as Global Data Assembly Center (GDAC) for drifting buoys in July 2017. The performed GDAC functions are as follows:

- Acquire and decode real-time drifting buoy data transmitted on the Global Telecommunication System (GTS) in Binary Universal Form (BUFR) TM315009 format or any combinations of data containing TM315009.
- Examine compliance of received BUFR messages and notify encoding / transmitting centers as needed.
- Monitor data stream for gaps and interruptions and contact encoding / transmitting centers as needed to recover missing data.
- Conduct data comparisons received at MEDS with the one available at NOAA Observing System Monitoring Center (OSMC) and at the Copernicus Marine Environment Monitoring Service (CMEMS) to address GTS routing issues.
- Distribute drifting buoy data on multiple channels such as FTP and website through data request.

2. Data Flow

Drifting buoy data is acquired by MEDS from the GTS of the World Meteorological Organization (WMO) through its National Meteorological Center (NMC) every 30 minutes. The Japan Meteorological Agency (JMA) provides MEDS, on a best-effort basis, daily bundled collections of drifting buoy data received from its nearest World Meteorological Center (WMC) through the GTS.

Recently, MEDS added a supplementary data pipeline through its NMC by using a more efficient tool called Sarracenia (https://github.com/MetPX/sarracenia). The real-time GTS data are synchronized to our local servers and python scripts are run to wrap the data every 15 min.

3. Data Distribution

All decoded BUFR drifting buoy data (TM315009) are available on a FTP server with anonymous login: ftp://ftp.meds-sdmm.dfo-mpo.gc.ca/pub/DRIBU_BUFR/. They are updated to the server on a monthly basis and the server contains the data from 2015 until now. These data are routinely downloaded by the U.S. NOAA NCEI Centre for Coasts, Oceans and Geophysics for inclusion in the International Comprehensive Ocean-Atmosphere Data Set (ICOADS). The WMO-IOC Centre for Marine-Meteorological and Oceanographic Data (CMOC) of Tianjin, China, has been provided with the FTP address.

The buoy data under Traditional Alphanumeric Codes (TAC) buoy category (ZZYY) from 1970s to today can be requested on a website: https://isdm.gc.ca/isdm-gdsi/request-commande/form-eng.asp.

4. Summary of Work

Although the WMO-mandated TAC-to-BUFR migration was to have been completed by November 2014, it is still far from finished. We still found TAC data transmitted on the GTS under buoy category (ZZYY). A closer examination of these buoy data reveals that they are extracted from tropical moored buoys and coastal wave moored buoys instead of drifting buoys. That being said, all the drifting buoy data transmitted on the GTS are in BUFR format. This finding is consistent with the European Center for Medium-Range Weather Forecasts (ECMWF) migration report in 2018 (https://confluence.ecmwf.int/display/TCBUF/Drifting+buoys). We therefore report our findings and comparisons based on our BUFR drifting buoy data.

All BUFR-format data are decoded by our in-house Java package and then archived in Oracle database.

4.1 Temporal Variability

There are 8 data encoding / transmitting centers for drifting buoys and their symbols, related bulletin headings and their data providers can be seen in Table 1. The names of data provider groups are referenced to OceanOps metadata (https://www.ocean-ops.org/share/OceanOPS/GTS/wmo/wmo_list.txt). Compared with last year, a new encoding / transmitting center named KMA appeared and its bulletin heading is RKSL (Table 1). There are also changes of data provider groups for the centers of MetOcean, CLS, OOAR and MF (Table 1) when compared with last year's report.

Table1: GTS encoding/ transmitting centres with their bulletin headings and data provider groups. The average subsets and trend corresponding to each center for the last 13 months are calculated.

Symbol	***Originating / generating centre (table C-1)***	***Bulletin heading(s)***	***Groups (according to OceanOps except KMA)***	***Average subsets (1e4)***	***Trend (1e3)***
MetOcean	MSC Monitoring	CWAO (Canada)	AWI (Germany), DFO (Canada), ECCC (Canada), USCG (USA), BOM (Australia), NOAA (USA), Univ. Washington (USA)	2.5±0.9	1.1±0.6
CLS	Service ARGOS - Toulouse	LFVW (France)	AARI (Russia), Meteo France (France), NIO (India), DBCP, NOAA (USA), US NavOceano (USA), Univ. Washington (USA)	3.5±0.6	-0.9±0.4
NavOceano	US Naval Oceanographic Office	KWBC (USA)	US NavOceano (USA)	0.3±0.0	-0.0±0.0
OOAR	US NOAA Office of Oceanic and Atmospheric Research	KWBC (USA)	BOM (Australia), JMA (Japan), Meteo France (France), HongKong (China), DBCP, SIO (USA), OGS (Italy), NOAA (USA), SAWS (South African), UK Meteorological Office (UK)	60.3±2.5	-4.3±1.4
NOS	US NOAA National Ocean Service	KWBC (USA)	Univ. Washington (USA)	1.2±0.4	-0.8±0.2
MF	Toulouse (RSMC)	LFPW (France)	Meteo-France (France), OGS (Italy), DBCP, SIO	11.8±0.8	-1.8±0.3

			(USA), NOAA (USA), UK MetOffice (UK)		
JMA	Tokyo (RSMC), Japan Meteorological Agency	RJTD (Japan)	Japan Meteorological Agency (Japan)	0.1±0.0	0.0±0.0
KMA	Seoul	RKSL(South Korea)	Korean Meteorological Administration (Korea)	0.1±0.1	0.1±0.0

The monthly drifting buoy subsets transmitted on the GTS over the last 13 months, as well as their monthly unique platforms, are shown in Figure 1 by grouping them into 8 encoding / transmitting centers. One subset is defined as one measurement reporting its location, time and all relevant data. On average, there are about 799,767 subsets received each month for the last 13 months with a standard deviation of 37,722 (Figure 1a). The Coefficient of Variation (CV) as the ratio of standard deviation to mean is 0.05 and the low CV indicates less variance of monthly subsets over the last 13 months. The number of subsets is slightly decreasing from August 2020 to August 2021 with a trend of 6.6 e3± 2.1e3 (Figure 1a). There is a sudden dip of subsets for February 2021 as well as the same month in 2020 (Referred to last year's report) and the drop is strongly attributed to the subsets decreasing from the center of OOAR. Among 8 centers, the data from OOAR is the majority with a monthly average of 603,350 subsets (shown in Table 1 as well as the averages from other centers) transmitted on the GTS, 75% out of the total subsets. The data from KMA has the largest variabilities with its CV of 1 because of its first appearance in December 2020. All centers except KMA and MetOcean have decreasing numbers of subsets for the last 13 months with the largest trend for the center of OOAR (Table 1).

The majority of subsets only report surface conditions but some contain sub-surface temperature profiles. We calculated the monthly subsets with temperature profiles in Figure 1a (Black line). The average number of subsets are 62,355 ± 7,178 for a period of 13 months, 8% out of the total subsets.

The temporal variability of unique platforms transmitted on the GTS for the last 13 months is presented in Figure 1b. The average monthly platform reporting on the GTS is about 1,826 and the number of platforms from each encoding / transmitting center (their names in Table.1) is relatively stable for the last 13 months except the decreasing one from OOAR.

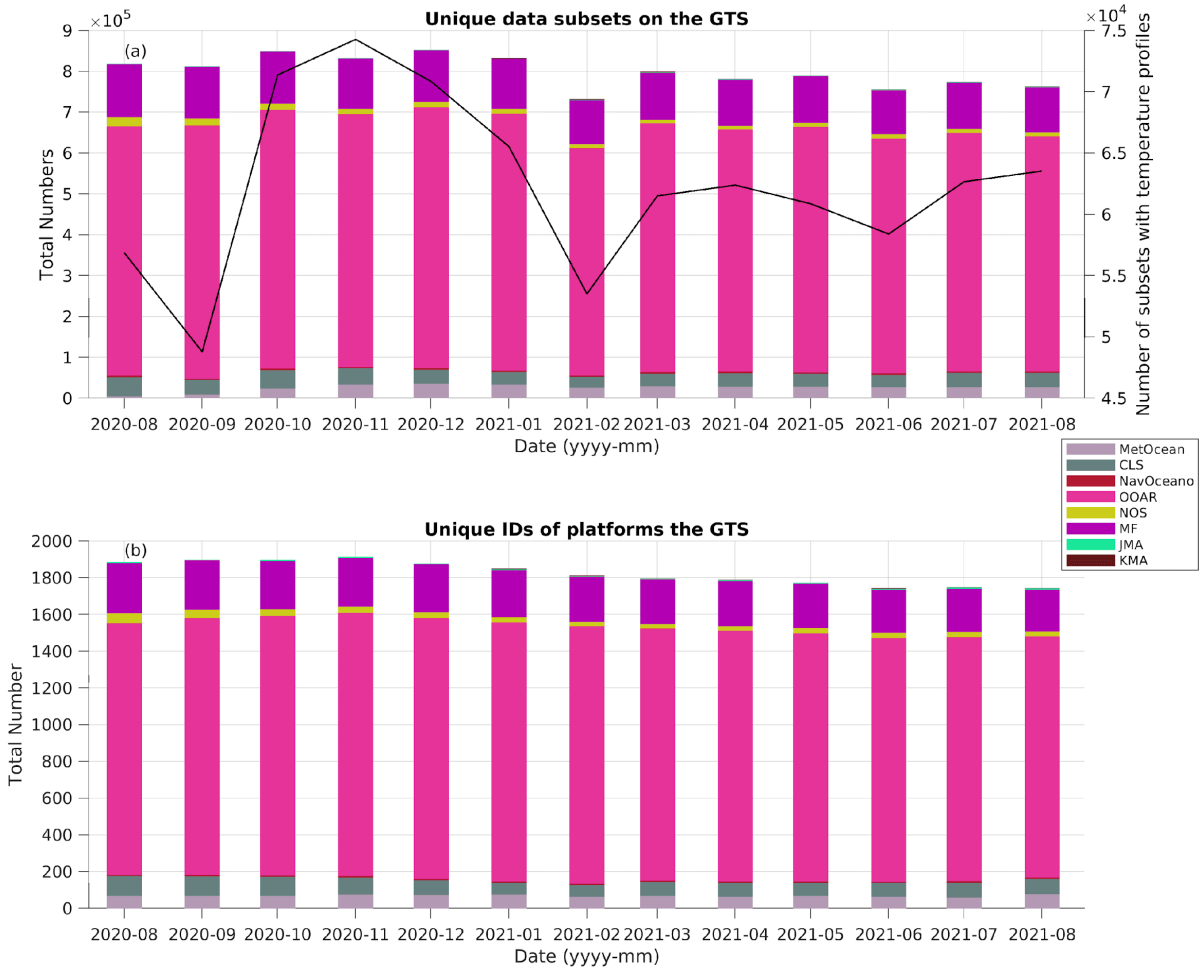

Figure 1: Monthly drifting buoy data subsets (a) and platforms (b) transmitted on the GTS for the last 13 months from 8 encoding / transmitting centers.

4.2 Spatial Distribution

We examined the spatial distributions of drifting buoys for the last 13 months by their tracks (Figure 2). Subsets without locations or with bad locations were removed and the number of removed subsets is less than 1% of the total subsets. Figure 2 shows seven groups of tracks which are located in the North Atlantic, South Atlantic, East Pacific, West Pacific, Arctic, South Pacific and Indian Ocean. The track group is defined as an area that contains above-average numbers of buoy tracks, indicating frequent measurements in the area.

To better quantitatively examine the spatial distributions, we counted all the subsets at each $1^o \times 1^o$ for the last 13 months and added them up to a total number of subsets (Figure 3). The total subsets ranges from 0 to $\geq$ 8000 for a period of 13 months, equivalent to ~20 measurements per day on average. The locations containing a significant amount of subsets (Figure 3) are fairly consistent with the seven groups defined for Figure 2, for example the area located at the Eastern Pacific off the USA coast and the Labrador Sea. The remarkable amount of subsets in these two areas is primarily attributed to anticyclone circulation of the subtropical gyre (gyre location can be referred to Figure 1 in [1]) in the North Pacific and cyclonic circulation of the subpolar gyre (gyre location can be referred to Figure 1 in [2]) in the North Atlantic with significant quantities of buoys trapped by the circulations. The hypothesis also applies to buoys trapped within the gyres of the southern hemisphere. The high data coverage in the Labrador Sea (Figure 3) allows

for the potential of a high quality dataset of annual mean surface conditions in the region. Contrarily, low coverage in other regions such as the Antarctic or Canadian Archipelago creates data sparsity, consequently leading to low quality dataset. Regional inconsistency for drifting buoys are expected considering large-scale gyre circulations along with unbalanced buoys deployed among regions. It is therefore recommended to include other observed data such as moored buoys data, remote sensing data or ship-based data to complete coverage of subsets in these low-coverage regions.

The rate of the number of months in which at least one subset is available is shown in Figure 4 for the last 13 months. No subset existing at the $1^{o} \times 1^{o}$ area is 0% and at least one subset existing every month at the $1^{o} \times 1^{o}$ area is 100%. There are some consistencies on the locations of high percentages (Figure 4) and the locations of significant amounts of total subsets (Figure 3). It is therefore recommended to reconstruct the seasonal variabilities from high-percentage regions such as the Labrador Sea.

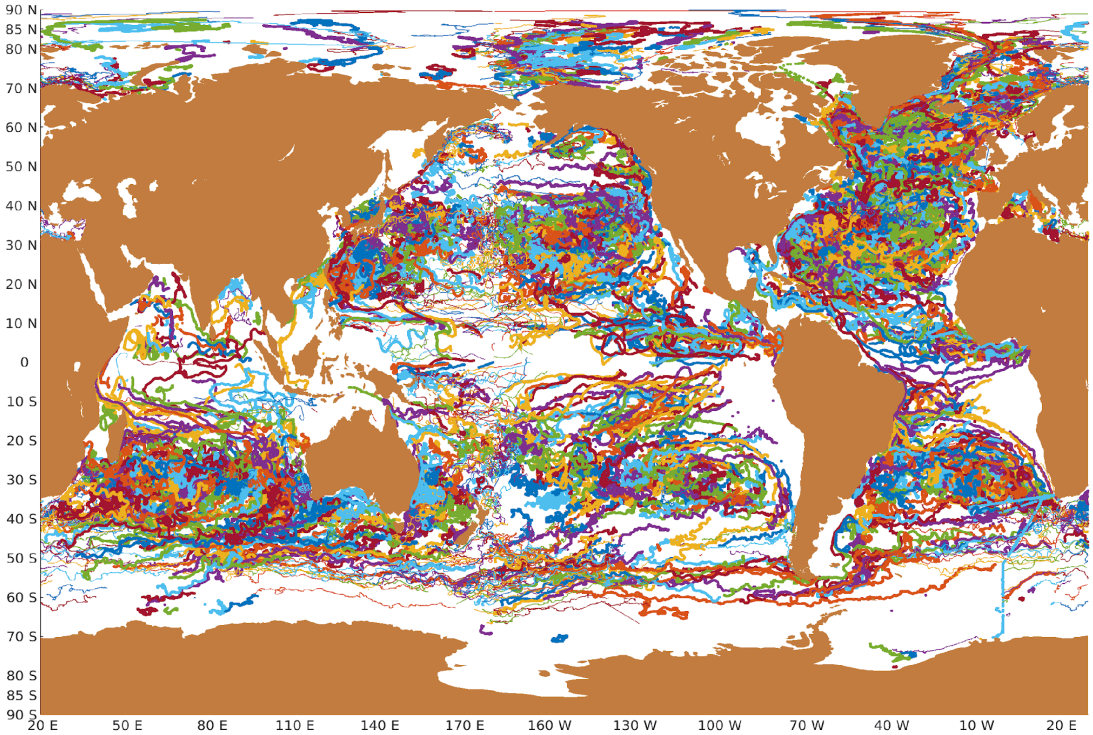

Figure 2 : Geographic coverage achieved by the buoys transmitting on the GTS in BUFR TM315009 format from August 2020 to August 2021 (13 months).

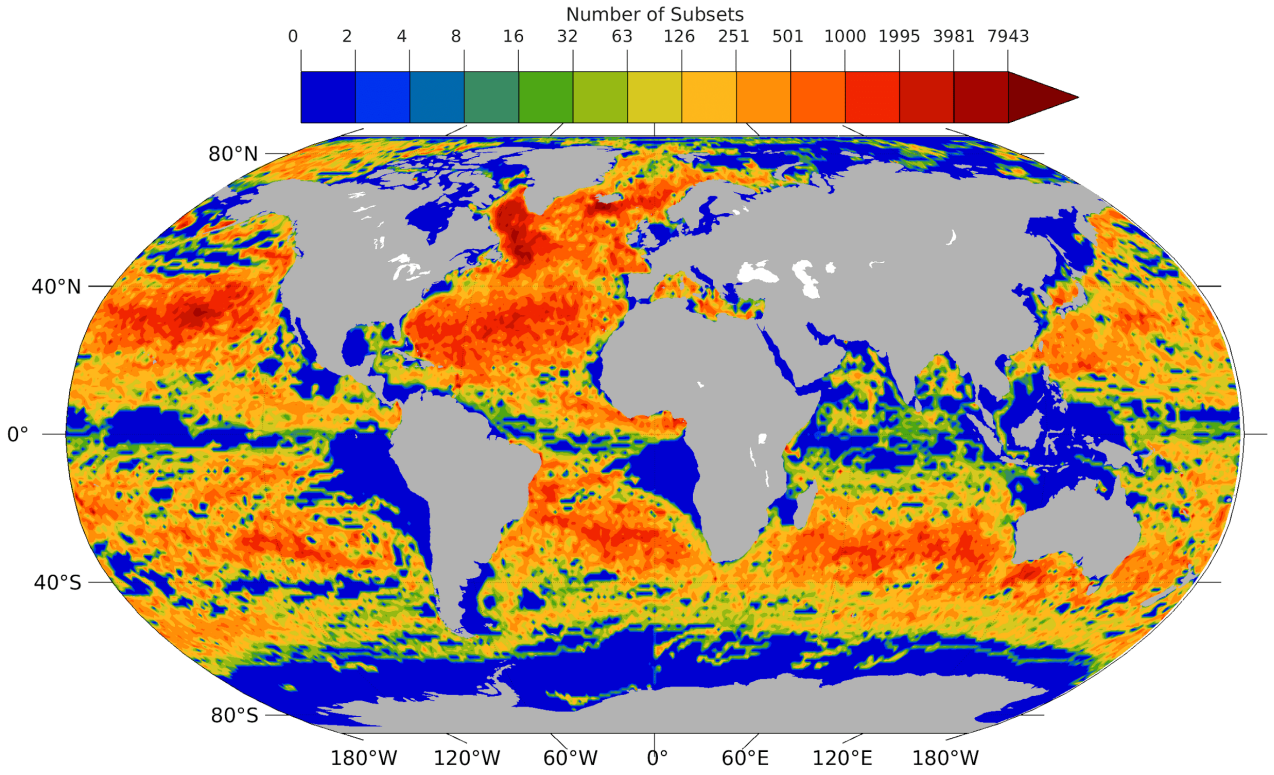

Figure 3: Map of total subsets for the last 13 months.

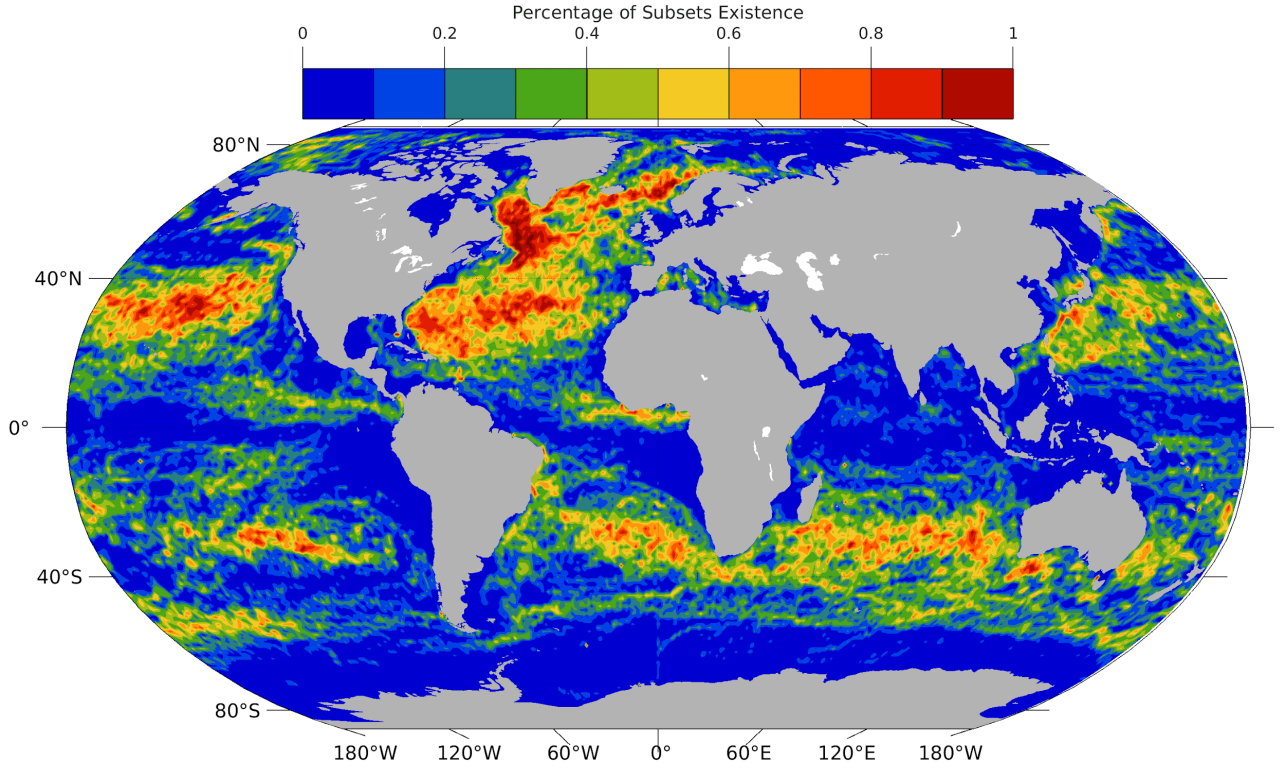

Figure 4: Map showing the subset rate of the number of months in which at least one subset is available over the 13 months. No subset is 0 and at least one subset existing every month is 100%.

4.3 Data Completion Monitoring

Data flow from various Data Assembly Centres (DACs) is monitored in MEDS for any potential outages or encoding errors in incoming data. Data encoding / transmitting centers are contacted as required to address encoding issues and a potential schedule to publish data in corrected form, while NMCs are contacted as required to address GTS transmission issues and to secure a better data feed. Outages or other issues were noticed at the following dates between August 2020 and August 2021 (Table 2).

Table 2: Outages or other GTS issues between August 2020 and August 2021.

Bulletin Headings	Time	Issues	Actions	Results
LFVW	9-14 September 2020	Missing data	Reported	Resolved
IOBA01 LFPW 051500 RRA	8 February 2021	Wrong observation date of 5 July 2021	Not reported	Flagged and resolved
IOWX	Since November 2020	Extra wave spectral data not archived	Reported	Not resolved

4.4 Metadata Comparisons

We routinely compare metadata (WMO IDs) archived in Canadian GDAC database (we call it GTS CAN hereafter) with JCOMMOPS (http://www.jcommops.org/ftp/DBCP/Status/dbcp_all.csv). Additionally, we compare metadata, including bulletin headings and WMO ID, from our GTS CAN with the CMEMS and with the OSMC. The CMEMS drifting buoy data are downloaded from its FTP site (ftp://nrt.cmems-du.eu/Core/INSITU_GLO_NRT_OBSERVATIONS_013_030/latest/) and the OSMC data are obtained from its ERDDAP server (http://osmc.noaa.gov/erddap/tabledap/OSMC_30day.html) by selecting time and the platform type that equals to “DRIFTING BUOYS (GENERIC)”.Two days are selected as reference dates for comparisons: November 30th 2020 and May 15th 2021.

The results show missing WMO IDs from the archived metadata at JCOMMOPS, with 167 WMO IDs missing on November 30th 2021 and 130 WMO IDs missing on May 15th 2021. The absence of buoys metadata at JCOMMOPS is a result of delayed updates to the metadata file and the recommendation is to conduct the updates on a timely basis.

Regarding the metadata comparison between the CMEMS and our GTS CAN, both data sources cover all the active drifting buoy bulletin headings. However, there is a long list of buoys whose WMO IDs are absent from the CMEMS when compared to GTS CAN. The missing WMO IDs are spread across five encoding / transmitting centers including MF, OOAR, NOS, CLS and MetOcean (full name and data providers in Table.1). We especially noticed that wave drifter data (bulletin heading of IOWX) did not exist at the CMEMS. Therefore, it is recommended to update the CMEMS drifting buoy metadata. In addition, we discovered that there was one buoy (WMO ID : 1500009) reported as a moored buoy on the GTS but appeared in the CMEMS drifting buoy dataset. It is acceptable to include this buoy data within a drifting buoy global dataset at the CMEMS, but it should be highlighted.

We conducted the same comparison between the metadata at the OSMC and our GTS CAN. The results suggested one bulletin heading (IOBC11 RJTD) encoded in JMA was missing at the OSMC and some WMO IDs across MF, JMA, MetOcean, CLS and OOAR were missing too. Before reporting missing metadata to the OSMC, it is recommended to review our data querying steps on the OSMC's ERDDAP server in case there is mismatch between our selected dataset and other datasets on their server. Similar to the CMEMS drifting buoy dataset, there was one buoy (WMO ID : 6200056) reported as a moored buoy on the GTS but existed as a drifting buoy from the OSMC dataset. Additionally, we found a coastal wave moored buoy (WMO ID : 2300497 and bulletin heading : SSVX01 DEMS) reported as TAC buoy data (ZZYY) on the GTS as well as from the OSMC dataset. It is recommended to encode it in FM 64-X TESAC (KKYY) or BUFR format on the GTS.

5. Objectives 2021/2022

- Extract TAC data between 2015 to 2018 from a legacy database and integrate them into the new database with BUFR data.
- Archive wave spectral data reporting with drifting buoy data into database.
- Continue monitoring and reporting the GTS routing issue as well as any format issues.
- Redefine own role in the Marine Climate Data System (MCDS).

References:

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[2] Hátún, H., Azetsu-Scott, K., Somavilla, R. et al. The subpolar gyre regulates silicate concentrations in the North Atlantic. Sci Rep 7, 14576 (2017). https://doi.org/10.1038/s41598-017-14837-4.