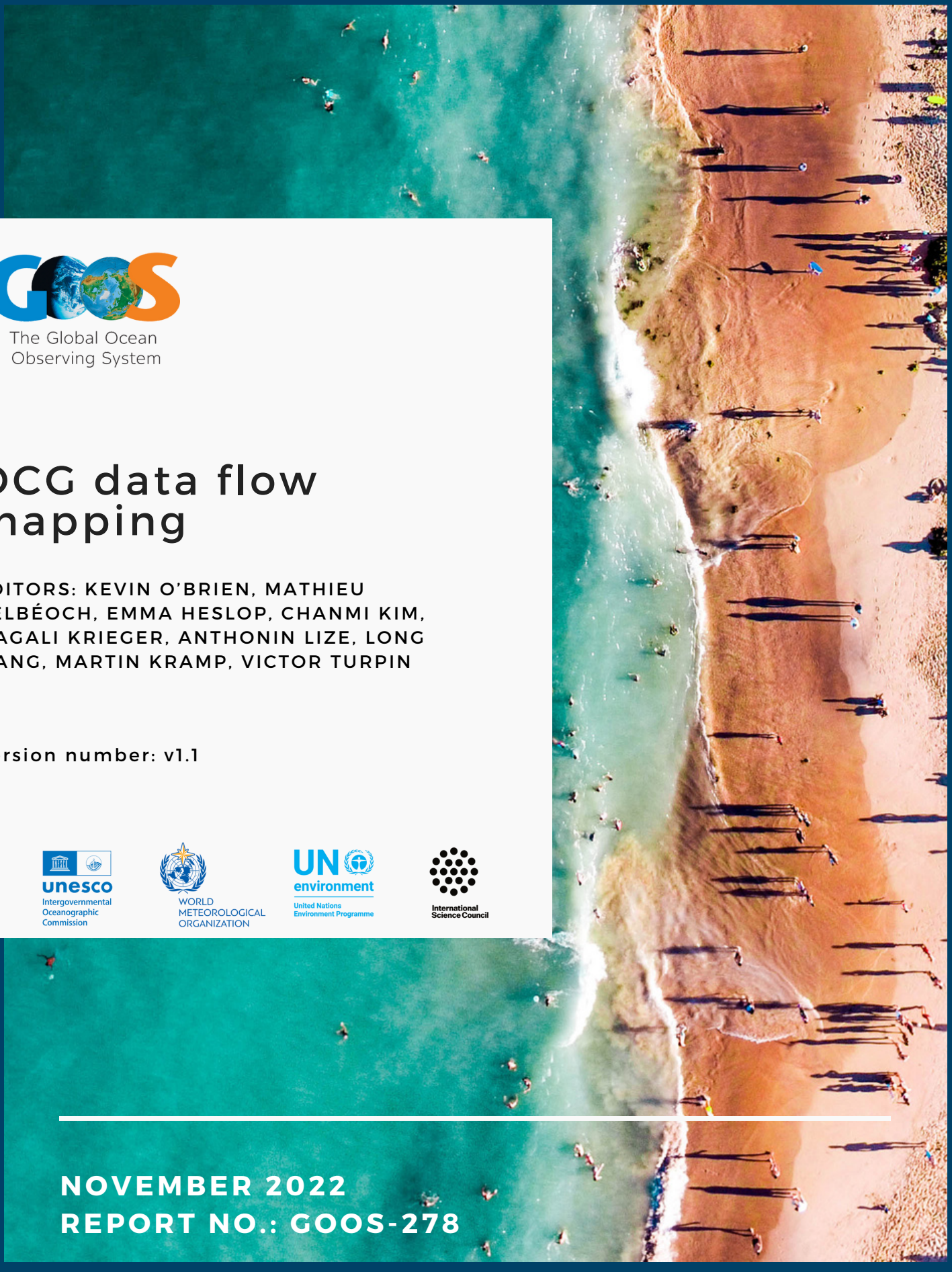
GOOS PUBLICATION



The Global Ocean Observing System

OCG data flow mapping

EDITORS: KEVIN O'BRIEN, MATHIEU BELBÉOCH, EMMA HESLOP, CHANMI KIM, MAGALI KRIEGER, ANTHONIN LIZE, LONG JIANG, MARTIN KRAMP, VICTOR TURPIN

Version number: v1.1

unesco Intergovernmental Oceanographic Commission

WORLD METEOROLOGICAL ORGANIZATION

UN environment United Nations Environment Programme

International Science Council

NOVEMBER 2022
REPORT NO.: GOOS-278

Introduction

As part of the Observations Coordination Group (OCG) Data Strategy, and Metadata harmonization efforts, and in line with a request from the tenth GOOS Steering Committee meeting in September 2020, GOOS initiated a Data and Metadata mapping project to clearly map out the data and metadata flows for both real-time and delayed mode data, across all the recognized OCG global networks: Argo, OceanGliders, Data Buoy Cooperation Panel (DBCP), Ship Observations Team (Voluntary Observing Ships (VOS), Ships of Opportunity Program (SOOP), Automated Shipboard Aerological Programme (ASAP)), the Global Ocean Ship-Based Hydrographic Investigations Program (GO-SHIP), OceanSITES, Global Sea Level Observing System (GLOSS), Animal Borne Ocean Sensors (AniBOS), and High Frequency (HF) Radar.

Our aims for this mapping exercise are to: 1) enable those outside the networks to better understand how network data moves through the global and national data management systems; 2) enable us in identifying gaps and areas where we can potentially improve or better support data and metadata access; 3) ensure that the required metadata is accessible and flowing into the OceanOPS monitoring system, 4) use as a base for a cross-network data strategy, ensuring that the data from global networks reaches existing and future global access points for both operational real-time and quality controlled delayed mode data. This is a focused effort to increase value and visibility of OCG network data by improving its interoperability and ensuring that OCG data meets its critical role as an integral part of the global ocean information digital ecosystem.

The information and insight from this data mapping will inform and guide the development of an OCG Data Implementation Strategy, to better support observational network development in these areas, and recommend best practices to the community. Understanding these data and metadata flows and identifying areas of enhancement are crucial in order to increase FAIR compliance of OCG network data and compliance with the WMO Unified Data Policy.

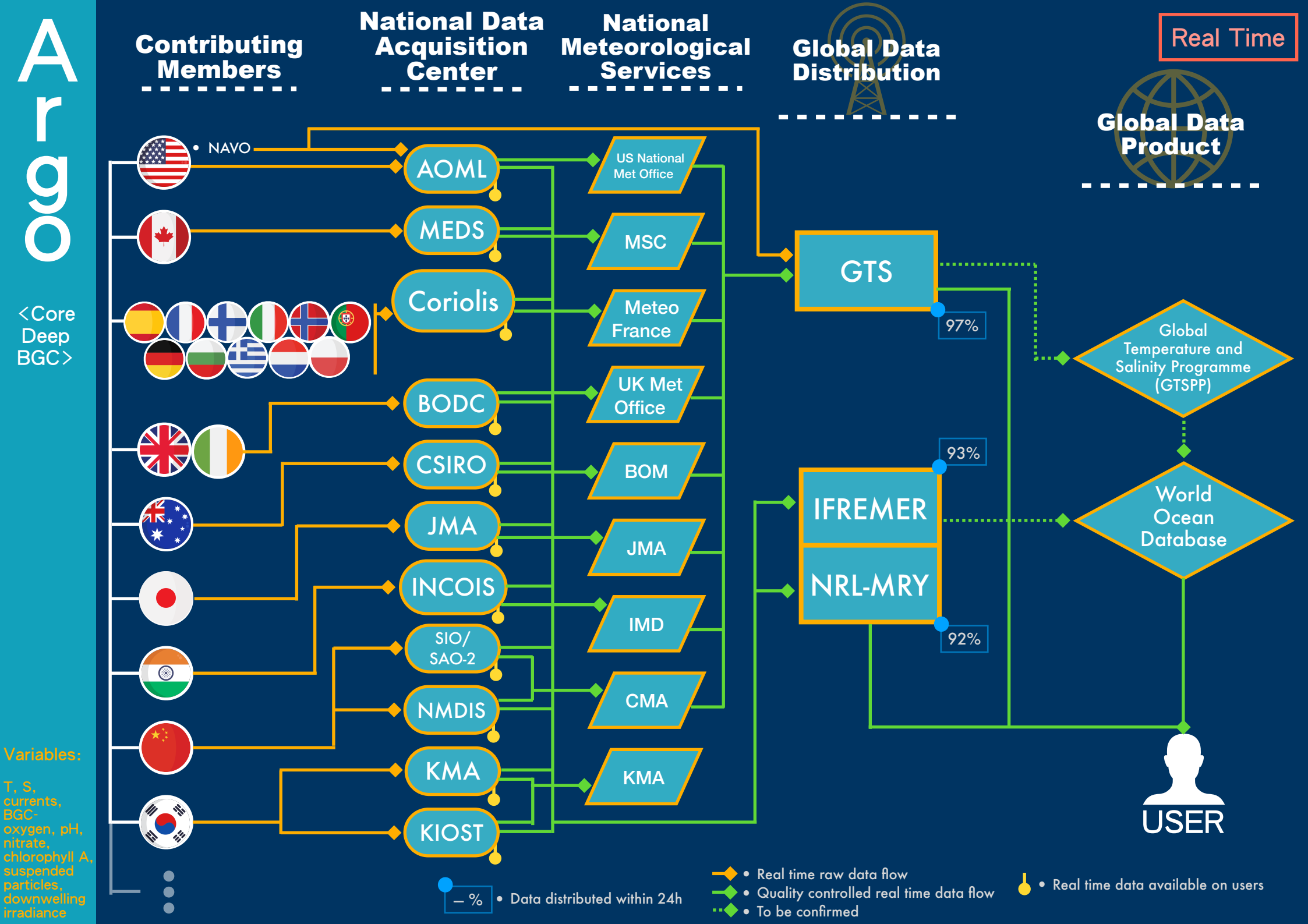
The data mapping contains data structures, QC elements, and key performance indicators such as data availability, timeliness, and completeness of metadata, to identify the current state of data and metadata flows for the networks. With this picture of the data flows within the different networks, we can also work with WMO and IODE to integrate this information into their data mapping efforts to extend mapping beyond the scope of just OCG and its networks.

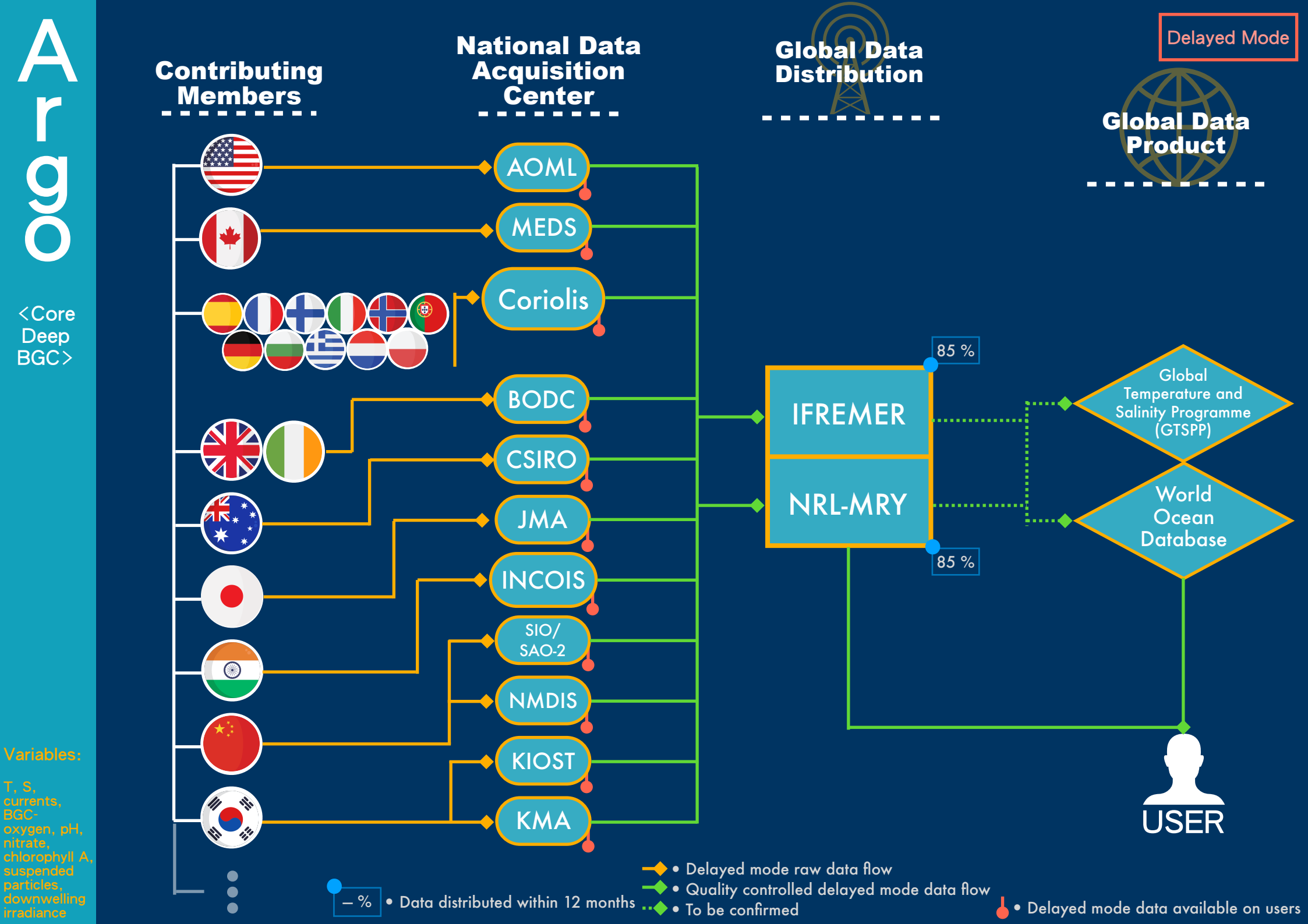
Beyond the work of the GOOS OCG the data maps provided here are useful for global, national and regional observing and data management systems, GOOS partners and others that want to understand the existing data pathways.

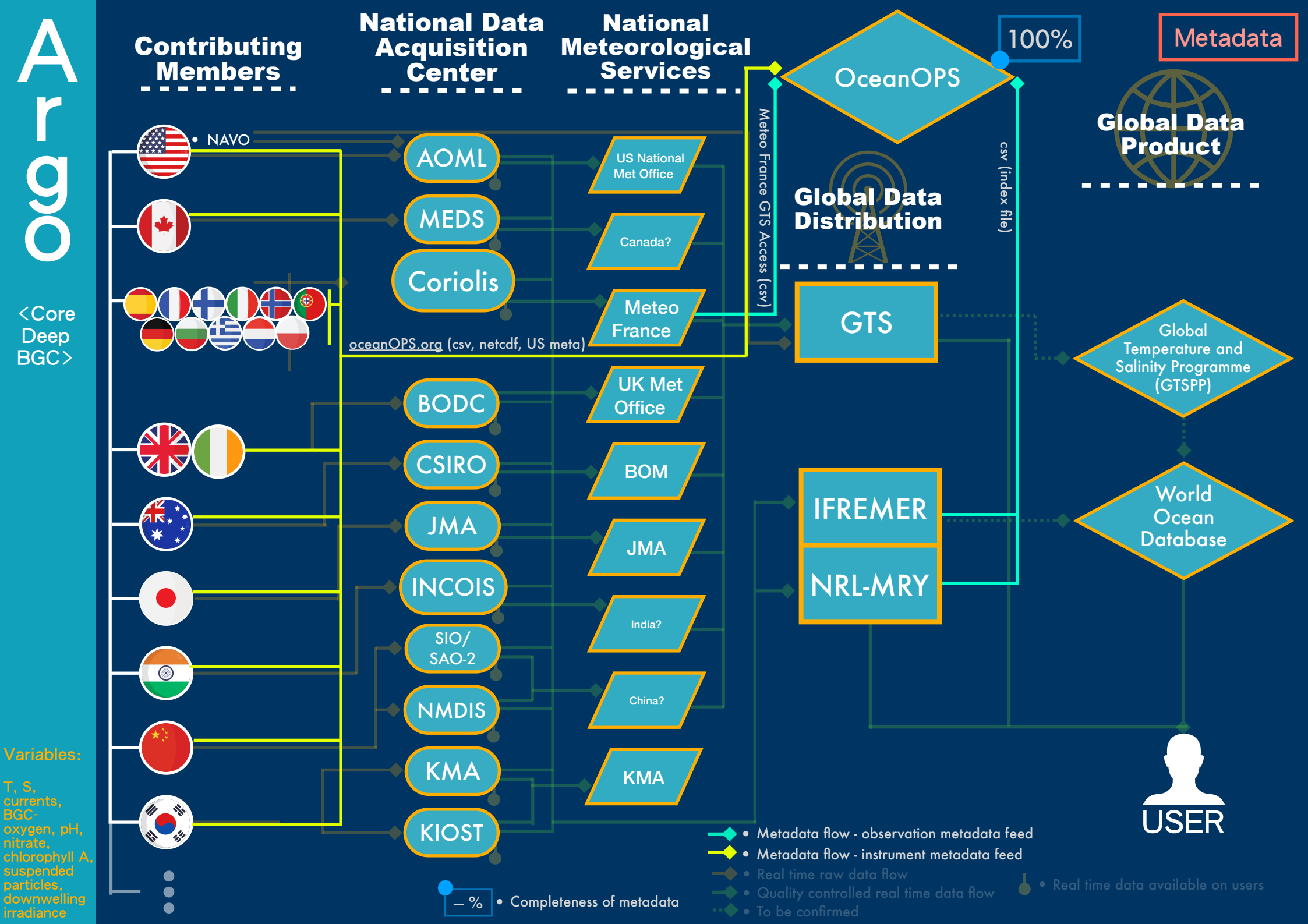
Description of the mapping

For each OCG global network, the data mappings consist of three parts: real-time data, delayed mode data and metadata. The mappings illustrate the pathway of 1) real-time data to availability on the WMO GTS and/or through non-GTS services (e.g. GDACs), 2) delayed mode data from network specific repositories, and 3) metadata flow from networks to be available in the OceanOPS monitoring system, and from endpoint locations to OceanOPS to verify for example metadata quality, data arrival and timeliness.
The mapping effort is an on-going work as the OCG networks evolve in partners, EOVs/ECVs, and data pathways. While the initial effort concentrated on the delivery of individual observations or primary data, it will continue to map the products (gridded e.g.) made available, where possible.

GOOS report 278 v1,1
Contact: Kevin.M.O'Brien@noaa.gov

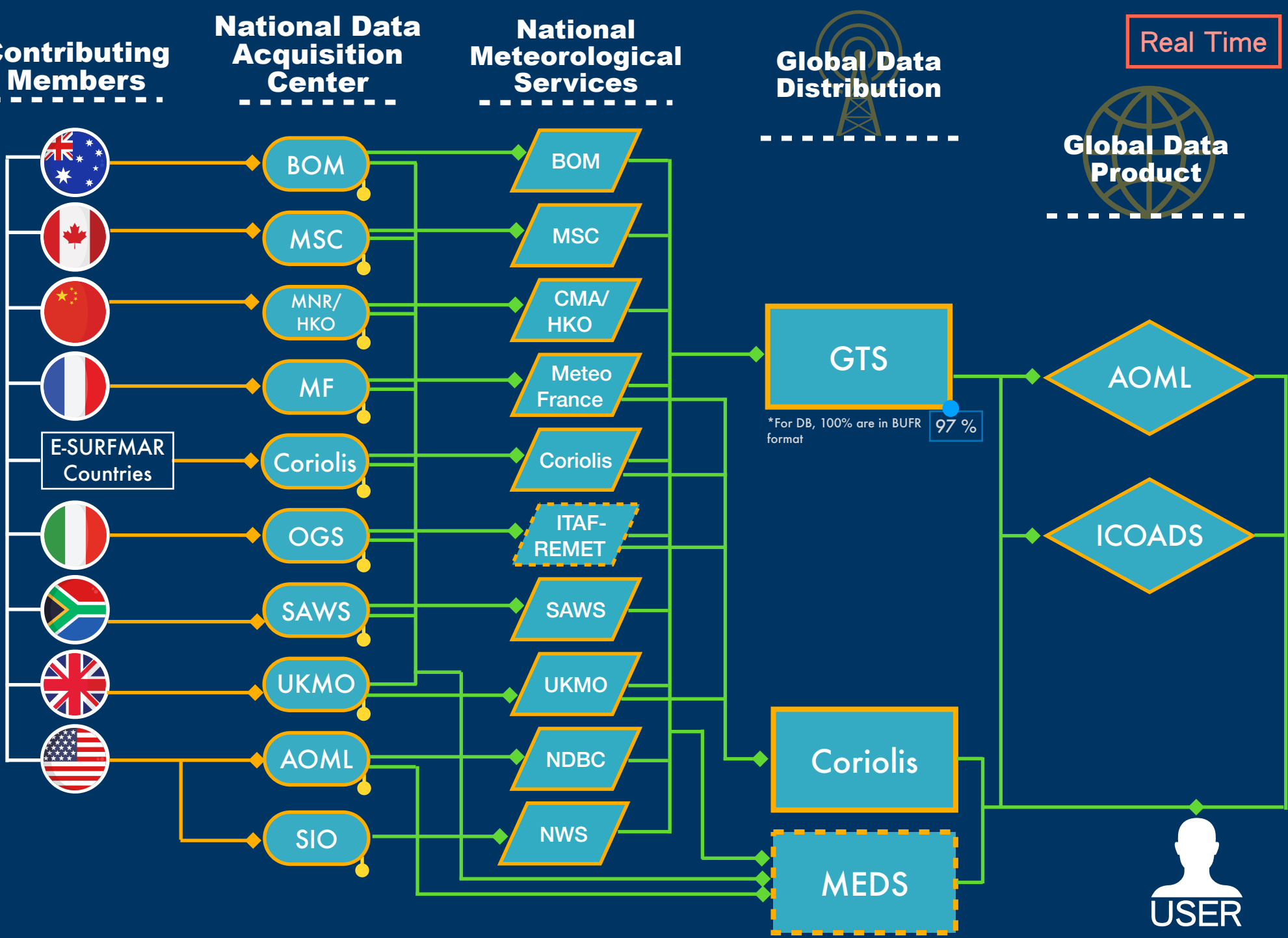

Argo
<Core Deep BGC>
Variables:
T, S, currents, BGC-oxygen, pH, nitrate, chlorophyll A, suspended particles, downwelling irradiance
Contributing Members
National Data Acquisition Center
National Meteorological Services
Global Data Distribution
Real Time
Global Data Product
NAVO
AOML
MEDS
Coriolis
BODC
CSIRO
JMA
INCOIS
SIO/ SAO-2
NMDIS
KMA
KIOST
US National Met Office
MSC
Meteo France
UK Met Office
BOM
JMA
IMD
CMA
KMA
GTS
97%
IFREMER
93%
NRL-MRY
92%
Global Temperature and Salinity Programme (GTSPP)
World Ocean Database
USER
– % • Data distributed within 24h
• Real time raw data flow
• Quality controlled real time data flow
• To be confirmed
• Real time data available on users


Argo
<Core Deep BGC>
Variables:
T, S, currents, BGC-oxygen, pH, nitrate, chlorophyll A, suspended particles, downwelling irradiance
Contributing Members
National Data Acquisition Center
Global Data Distribution
Global Data Product
Delayed Mode
AOML
MEDS
Coriolis
BODC
CSIRO
JMA
INCOIS
SIO/ SAO-2
NMDIS
KIOST
KMA
IFREMER
NRL-MRY
85 %
85 %
Global Temperature and Salinity Programme (GTSPP)
World Ocean Database
USER
– % • Data distributed within 12 months
• Delayed mode raw data flow
• Quality controlled delayed mode data flow
• To be confirmed
• Delayed mode data available on users


Argo
<Core Deep BGC>
Contributing Members
National Data Acquisition Center
National Meteorological Services
NAVO
AOML
MEDS
Coriolis
BODC
CSIRO
JMA
INCOIS
SIO/ SAO-2
NMDIS
KMA
KIOST
US National Met Office
Canada?
Meteo France
UK Met Office
BOM
JMA
India?
China?
KMA
oceanOPS.org (csv, netcdf, US meta)
Meteo France GTS Access (csv)
OceanOPS
100%
csv (index file)
Global Data Distribution
GTS
IFREMER
NRL-MRY
Metadata
Global Data Product
Global Temperature and Salinity Programme (GTSPP)
World Ocean Database
USER
Variables:
T, S, currents, BGC- oxygen, pH, nitrate, chlorophyll A, suspended particles, downwelling irradiance
– % • Completeness of metadata
• Metadata flow - observation metadata feed
• Metadata flow - instrument metadata feed
• Real time raw data flow
• Quality controlled real time data flow
• To be confirmed
• Real time data available on users

DBCP

Drifting Buoy (DB)



Variables:

SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity

DBCP

Drifting Buoy (DB)

Delayed Mode

Contributing Members

National Data Acquisition Center

Global Data Distribution

E-SURFMAR Countries

BOM

MSC

MNR/ HKO

MF

Coriolis

OGS

SAWS

UKMO

AOML

NDBC

Coriolis

MEDS

USER

Variables:

SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity

– %
– %

- Data distributed within ??
- Completeness of meta data
- DB delayed mode raw data flow
- DB quality controlled delayed mode data flow
- Delayed mode data available to users
- Developing GDAC

DBCP

Drifting Buoy (DB)

Contributing Members

- E-SURFMAR Countries

National Data Acquisition Center

- BOM
- MSC
- MNR/ HKO
- MF
- Coriolis
- OGS
- SAWS
- UKMO
- AOML
- NDBC
- SIO

National Meteorological Services

- BOM
- MSC
- CMA/ HKO
- Meteo France
- Coriolis
- ITAF-REMET
- SAWS
- UKMO
- NDBC

OceanOPS — 97 %

Metadata

Global Data Distribution

GTS — 97 %

*For DB, 100% are in BUFR format

Meteo France GTS Access (csv)

Global Data Product

- AOML
- ICOADS

Coriolis

MEDS

USER

Variables:

SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity

— % • Data distributed within 1hr

• DB real time raw data flow

• DB quality controlled real time data flow

Metadata flow - Manually harvested metadata

Automated metadata harvesting

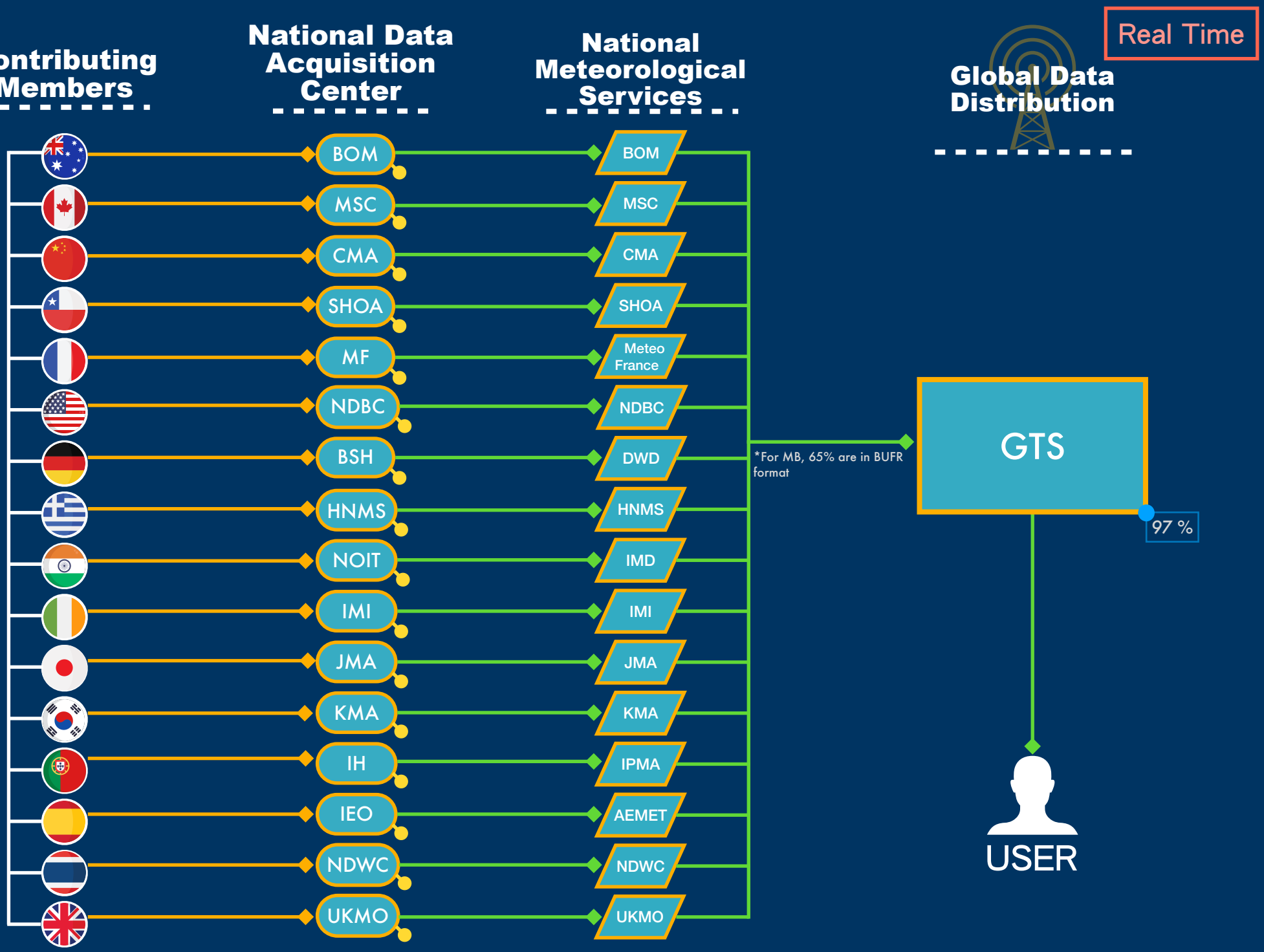
• Real time data available to users

• To be confirmed

• Developing GDAC

DBCP

Moored Buoy (MB)



Variables:

SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity

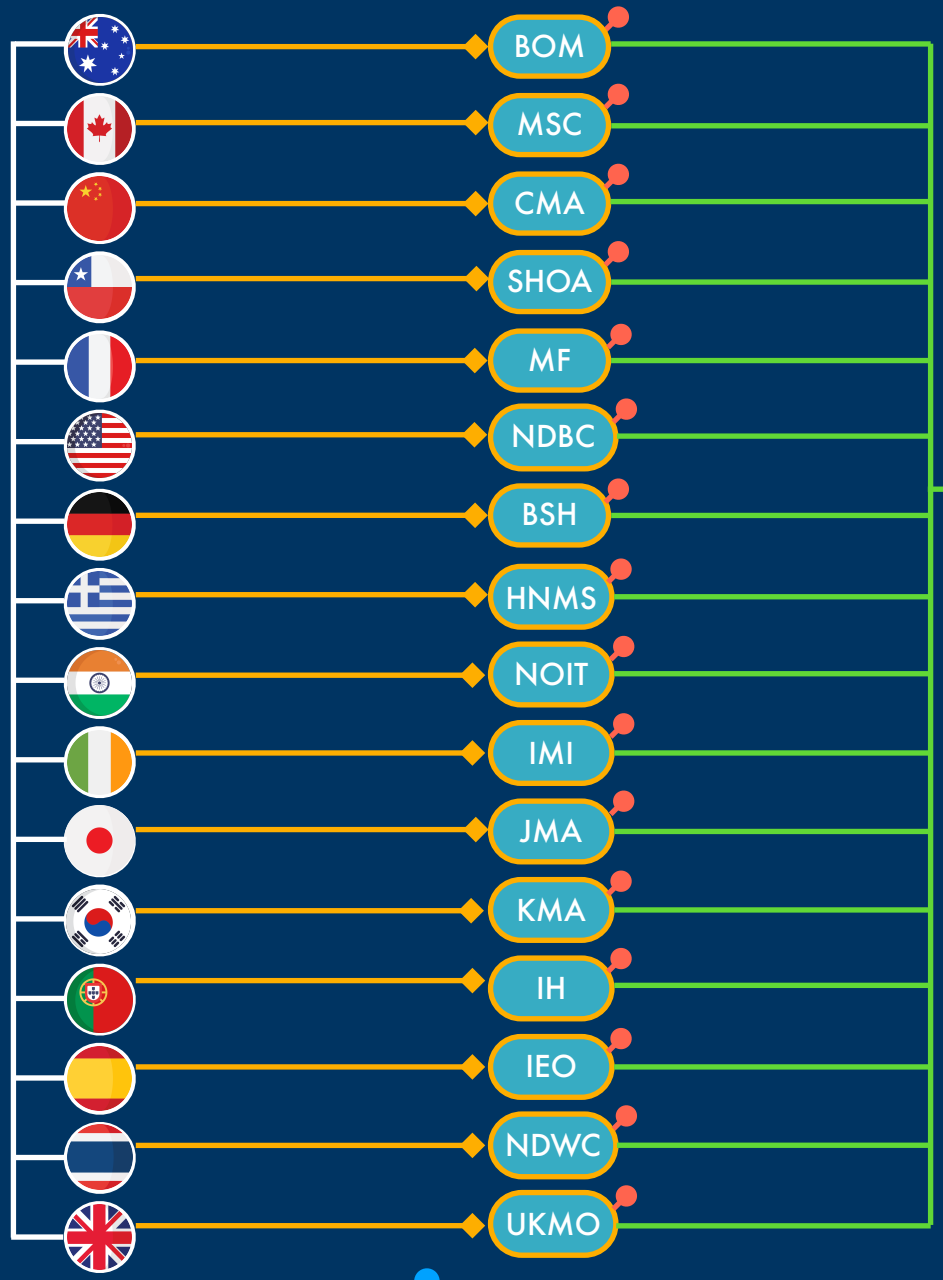
DBCP

Moored Buoy (MB)

Delayed Mode

Contributing Members

National Data Acquisition Center



Variables:

SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity

– % • Data distribution within ??

– % • Completeness of meta data

• MB delayed mode raw data flow

• MB quality controlled delayed mode data flow

• Delayed mode data available to users

DBCP

Moored Buoy (MB)

Contributing Members

National Data Acquisition Center

National Meteorological Services

BOM
MSC
CMA
SHOA
MF
NDBC
BSH
HNMS
NOIT
IMI
JMA
KMA
IH
IEO
NDWC
UKMO

Meteo France

OceanOPS

98 %

Metadata

Global Data Distribution

GTS

*For MB, 65% are in BUFR format

USER

Variables:

SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity

– % • Completeness of meta data

• Monitoring data flow
• Manually harvested metadata (csv or website harvesting)
• Semi-automated metadata harvesting
• MB real time raw data flow
• MB quality controlled real time data flow
• Real time data available to users

DBCP

Tsunameter

Contributing Members

National Data Acquisition Center

BOM
SHOA
CCO
INOCAR
INCOIS
JMA
MSNZ
FERHR
NDWC
NDBC

National Meteorological Services

BOM
Meteo Chile
IDEAM
INAMHI
IMD
JMA
MSNZ
FERHR
NDWC
NDBC

Global Data Distribution

Real Time

GTS

*For Tsunameter, none of them are in BUFR format

77 %

USER

NDBC

Variables:

SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity

— % • Data distribution within 1hr

• Tsunameter real time raw data flow

• Tsunameter quality controlled real time data flow

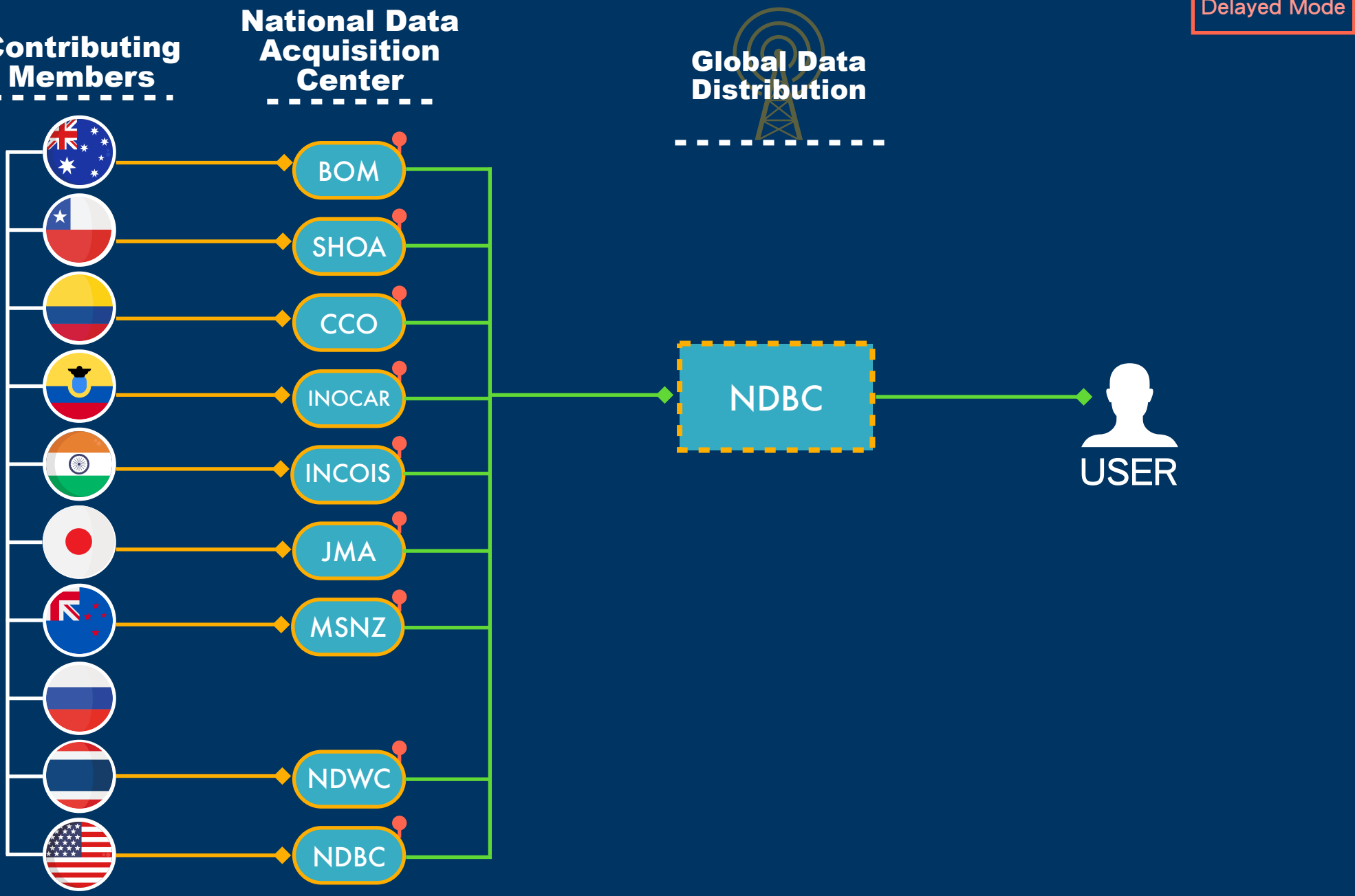
• Real time data available to users

• Developing GDAC

DBCP

Tsunameter

Delayed Mode



Variables:

SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity

– %
– %

- Data distribution within ??
- Completeness of meta data
- Tsunameter delayed mode raw data flow
- Tsunameter quality controlled delayed mode data flow
- Delayed mode data available to users
- Developing GDAC

DBCP

Tsunameter

Contributing Members

National Data Acquisition Center

National Meteorological Services

BOM
SHOA
CCO
INOCAR
INCOIS
JMA
MSNZ
FERHR
NDWC
NDBC

BOM
Meteo Chile
IDEAM
INAMHI
IMD
JMA
MSNZ
FERHR
NDWC
NDBC

OceanOPS

100 %

Metadata

OSMC Open-GTS Access Node

Global Data Distribution

GTS

*For Tsunameter, none of them are in BUFR format

USER

NDBC

Variables:

SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity

• Monitoring data flow
• Manually harvested metadata (csv or website)

– % • Completeness of meta data

• Tsunameter real time raw data flow
• Tsunameter quality controlled real time data flow

• Real time data available to users

• Developing GDAC

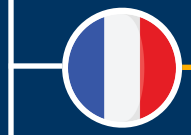
DBCP

Polar Buoy

Real Time

Contributing Members	National Data Acquisition Center	National Meteorological Services	Global Data Distribution

E-SURFMAR Countries



BOM → BOM

MSC → MSC

Coriolis → Coriolis

MF → Meteo France

OGS → ITAF-REMET

SIO/AOML → NDBC

BOM, MSC, Coriolis, Meteo France, ITAF-REMET, NDBC → GTS

GTS → USER

*For Polar buoy, 100% are in BUFR format

97.8%

GTS → Coriolis

GTS → MEDS

Coriolis → USER

MEDS → USER

Variables:

SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity

– % • Data distributed within 1hr

• PB real time raw data flow

• PB quality controlled real time data flow

• Real time data available to users

• To be confirmed

• Developing GDAC

DBCP

Polar Buoy

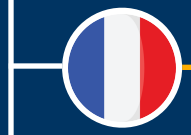
Delayed Mode

Contributing Members

National Data Acquisition Center

Global Data Distribution

E-SURFMAR Countries



BOM

MSC

Coriolis

MF

OGS

SIO/ AOML

Coriolis

MEDS

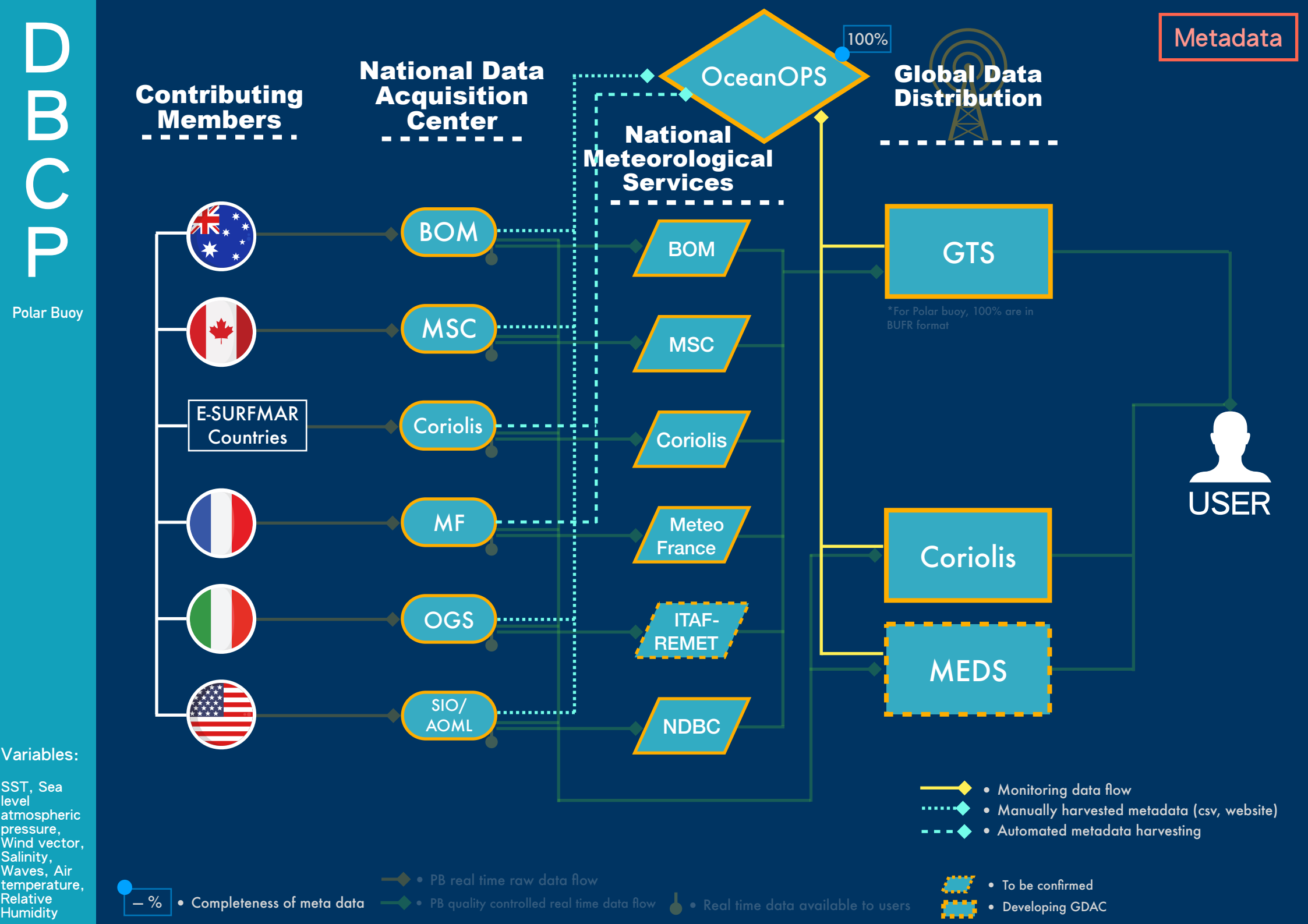
USER

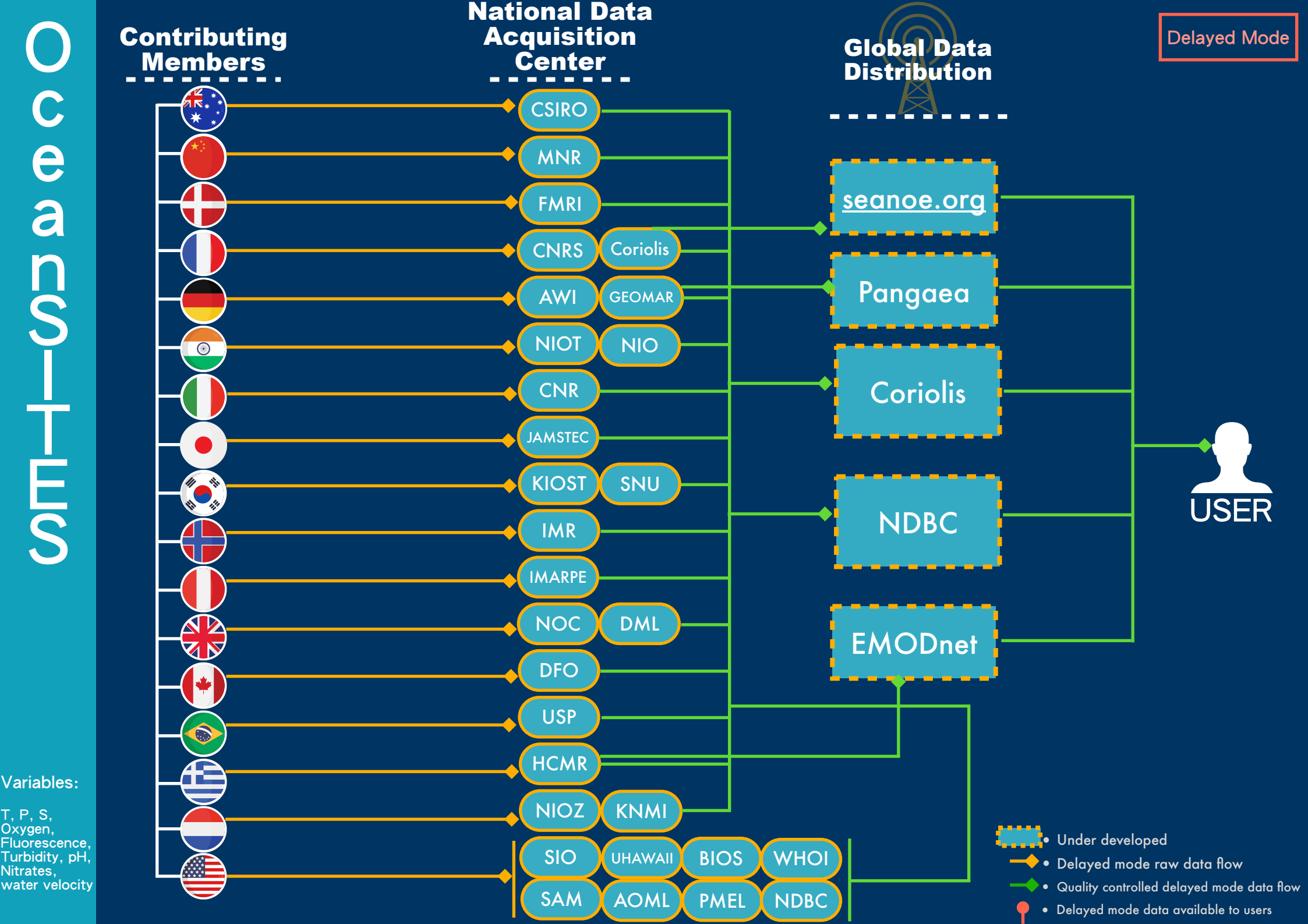
Variables:

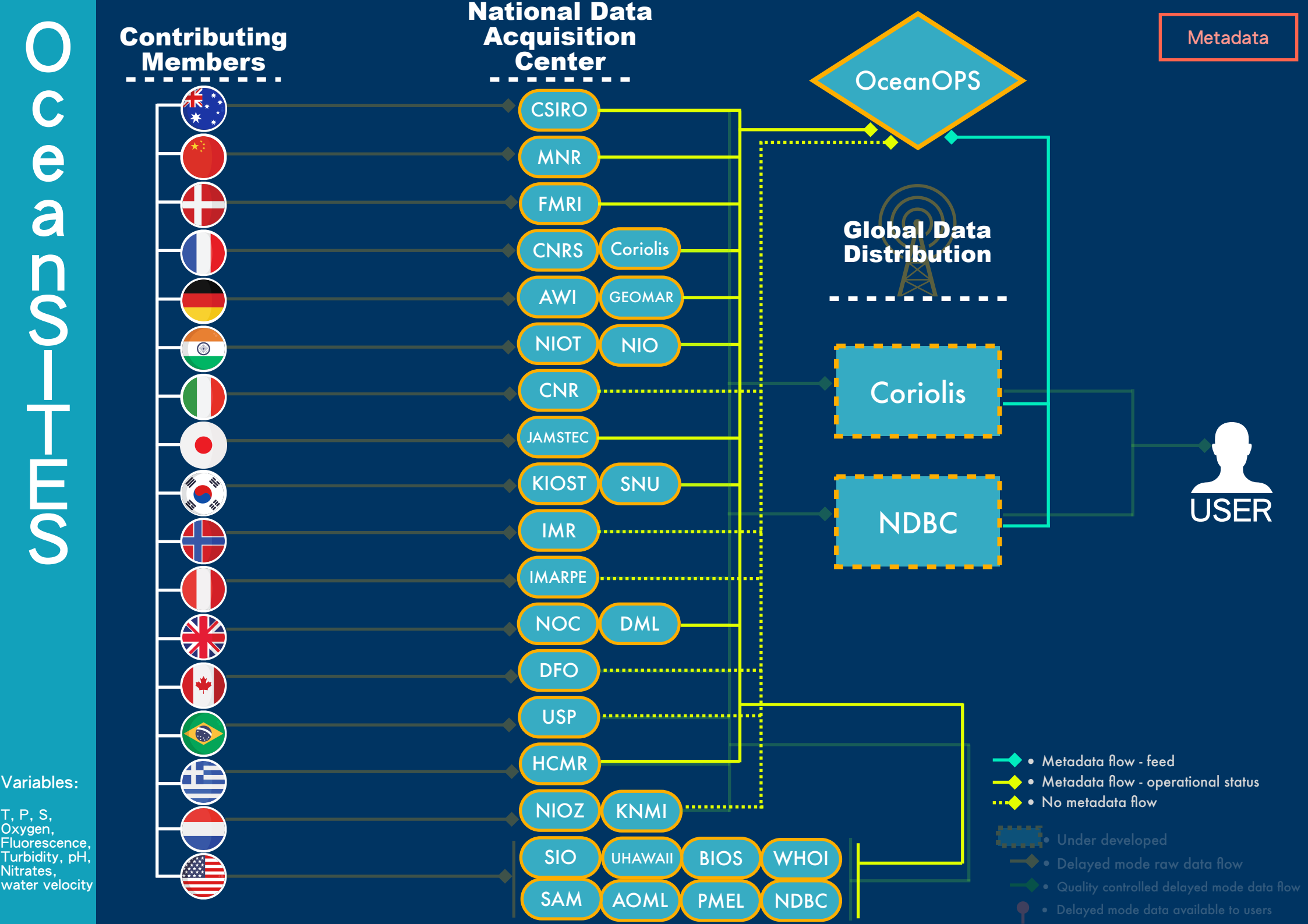
SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity

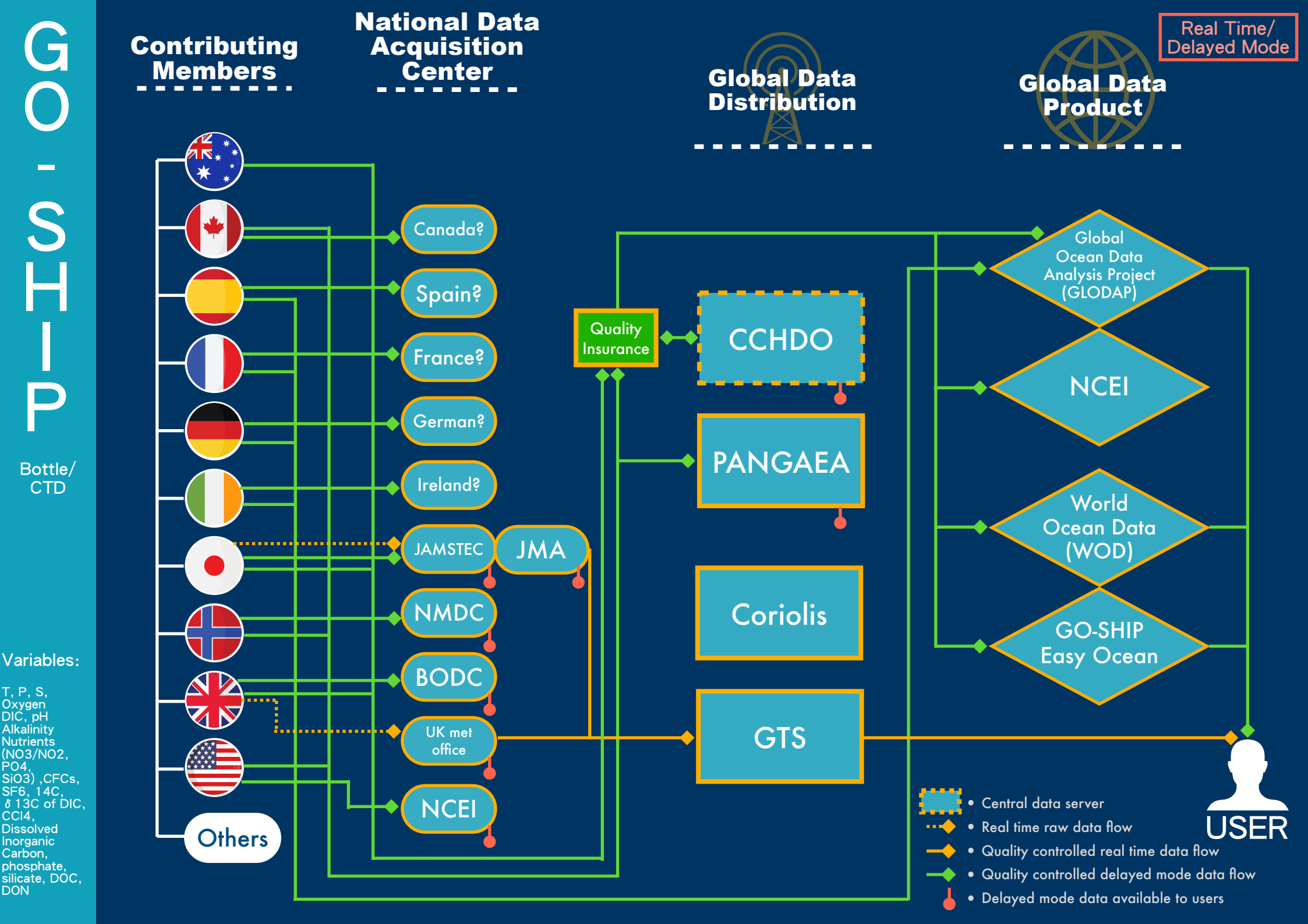
– %
– %

- Data distributed within 1hr
- Completeness of meta data
- PB delayed mode data flow
- PB quality controlled delayed mode data flow
- Delayed mode data available to users
- Developing GDAC


DBCP
Polar Buoy
Variables:
SST, Sea level atmospheric pressure, Wind vector, Salinity, Waves, Air temperature, Relative Humidity
Contributing Members
National Data Acquisition Center
National Meteorological Services
OceanOPS
100%
Global Data Distribution
Metadata
BOM
MSC
E-SURFMAR Countries
Coriolis
MF
OGS
SIO/ AOML
BOM
MSC
Coriolis
Meteo France
ITAF-REMET
NDBC
GTS
*For Polar buoy, 100% are in BUFR format
Coriolis
MEDS
USER
Monitoring data flow
Manually harvested metadata (csv, website)
Automated metadata harvesting
– % • Completeness of meta data
PB real time raw data flow
PB quality controlled real time data flow
Real time data available to users
To be confirmed
Developing GDAC


Oceansites
Contributing Members
National Data Acquisition Center
Global Data Distribution
Delayed Mode
CSIRO
MNR
FMRI
CNRS
Coriolis
AWI
GEOMAR
NIOT
NIO
CNR
JAMSTEC
KIOST
SNU
IMR
IMARPE
NOC
DML
DFO
USP
HCMR
NIOZ
KNMI
SIO
UHAWAII
BIOS
WHOI
SAM
AOML
PMEL
NDBC
seanoe.org
Pangaea
Coriolis
NDBC
EMODnet
USER
Variables:
T, P, S, Oxygen, Fluorescence, Turbidity, pH, Nitrates, water velocity
Under developed
Delayed mode raw data flow
Quality controlled delayed mode data flow
Delayed mode data available to users


OceanSITES
Contributing Members
National Data Acquisition Center
OceanOPS
Metadata
CSIRO
MNR
FMRI
CNRS
Coriolis
AWI
GEOMAR
NIOT
NIO
CNR
JAMSTEC
KIOST
SNU
IMR
IMARPE
NOC
DML
DFO
USP
HCMR
NIOZ
KNMI
SIO
UHAWAII
BIOS
WHOI
SAM
AOML
PMEL
NDBC
Global Data Distribution
Coriolis
NDBC
USER
Variables:
T, P, S, Oxygen, Fluorescence, Turbidity, pH, Nitrates, water velocity
Metadata flow - feed
Metadata flow - operational status
No metadata flow
Under developed
Delayed mode raw data flow
Quality controlled delayed mode data flow
Delayed mode data available to users


GO-SHIP
Bottle/ CTD
Variables:
T, P, S, Oxygen DIC, pH Alkalinity Nutrients (NO3/NO2, PO4, SiO3) ,CFCs, SF6, 14C, δ13C of DIC, CCl4, Dissolved Inorganic Carbon, phosphate, silicate, DOC, DON
Contributing Members
National Data Acquisition Center
Global Data Distribution
Global Data Product
Real Time/ Delayed Mode
Canada?
Spain?
France?
German?
Ireland?
JAMSTEC
JMA
NMDC
BODC
UK met office
NCEI
Others
Quality Insurance
CCHDO
PANGAEA
Coriolis
GTS
Global Ocean Data Analysis Project (GLODAP)
NCEI
World Ocean Data (WOD)
GO-SHIP Easy Ocean
USER
Central data server
Real time raw data flow
Quality controlled real time data flow
Quality controlled delayed mode data flow
Delayed mode data available to users

GO-SHIP

Bottle/
CTD

Variables:

T, P, S, Oxygen DIC, pH Alkalinity Nutrients (NO3/NO2, PO4, SiO3) ,CFCs, SF6, 14C, δ13C of DIC, CCl4, Dissolved Inorganic Carbon, phosphate, silicate, DOC, DON

Contributing Members

National Data Acquisition Center

Global Data Distribution

Global Data Product

Metadata

Others

Canada?

Spain?

France?

German?

Ireland?

JAMSTEC

JMA

NMDC

BODC

UK met office

NCEI

GTS

OceanOPS

- Metadata flow - Basic Cruise information (pre cruise)
- Metadata flow - Detailed Cruise information (post cruise)
- Metadata flow - Observation (GTS) metadata
- ? Not known or unconfirmed

VOS

Contributing Members

National Data Acquisition Center

National Meteorological Services

Global Data Distribution

Real Time

BOM
CWAO
KNMI NOAA
DWD
AEMET
MF
UK Met office
NOAA/ NWSTG
Met Eireann
Washington?
IMD
JMA
SMHI
Hongkong observatory
Corresponding Land Earth Station
?

AMMC (Melbourne)
KWBC (Washington)
EDZW (Offenbach)
LEMM (Madrid)
LFPW (Toulouse)
EGRR (Bracknell)
EIDB (Dublin)
PANC (Anchorage)
DEMS (New Delhi)
RJTD (Tokyo)
ESWI (Norrköping)
VHHH (Hongkong)

TAC FM-13
Header: SMV[A,B,C,D,E,F,J]01 AMMC, S[I,N]V[A,B,C,D,E,F,J]21 AMMC

TAC FM-13
Header: S[MIN]V[A-X] 01-19 KWBC
TAC FM-13
Header: SNVD01 KWBC
TAC FM-13
Header: S[MIN]V[A-X] ii KWBC
BUFR 308009
Header: ISS[A-L]01-19 KWBC
BUFR 308009
Header: ISS[A-L]01 EDZW

BUFR 308009
Header: ISSA01 LEMM, ISSA22 LEMM, ISSA21 LEMM
BUFR 308009
Header: ISSX01 LEMM
BUFR 308009

Header: ISS[A-L]01 LFPW
BUFR 308009
Header: ISS[A-L]05 LFPW
TAC FM-13
Header: S[MIN]V[A-X] ii LFPW
BUFR 308009
Header: ISS[A-L]0[2,4] LFPW
BUFR 308009
Header: ISS[A-L]0[1,3] LFPW
BUFR 308009

Header: ISS[A-L]ii EGRR
TAC FM-13
Header: SXVX88 EGRR
TAC FM-13
Header: S[MIN]V[A..X] ii EGRR

BUFR 308009
Header: ISSA[20]1 EIDB
TAC FM-13
Header: S[MIN]V[A-X] 01-19 PANC

TAC FM-13
Header: SMVX02 DEMS

TAC FM-13
Header: S[MIN]V[BDEX]ii RJTD
BUFR 308009
Header: ISS[A-L]ii RJTD

GISC Melbourne
GISC Washington
GISC Offenbach
GISC Toulouse
GISC Exeter
GISC New Delhi
GISC Tokyo
GTS

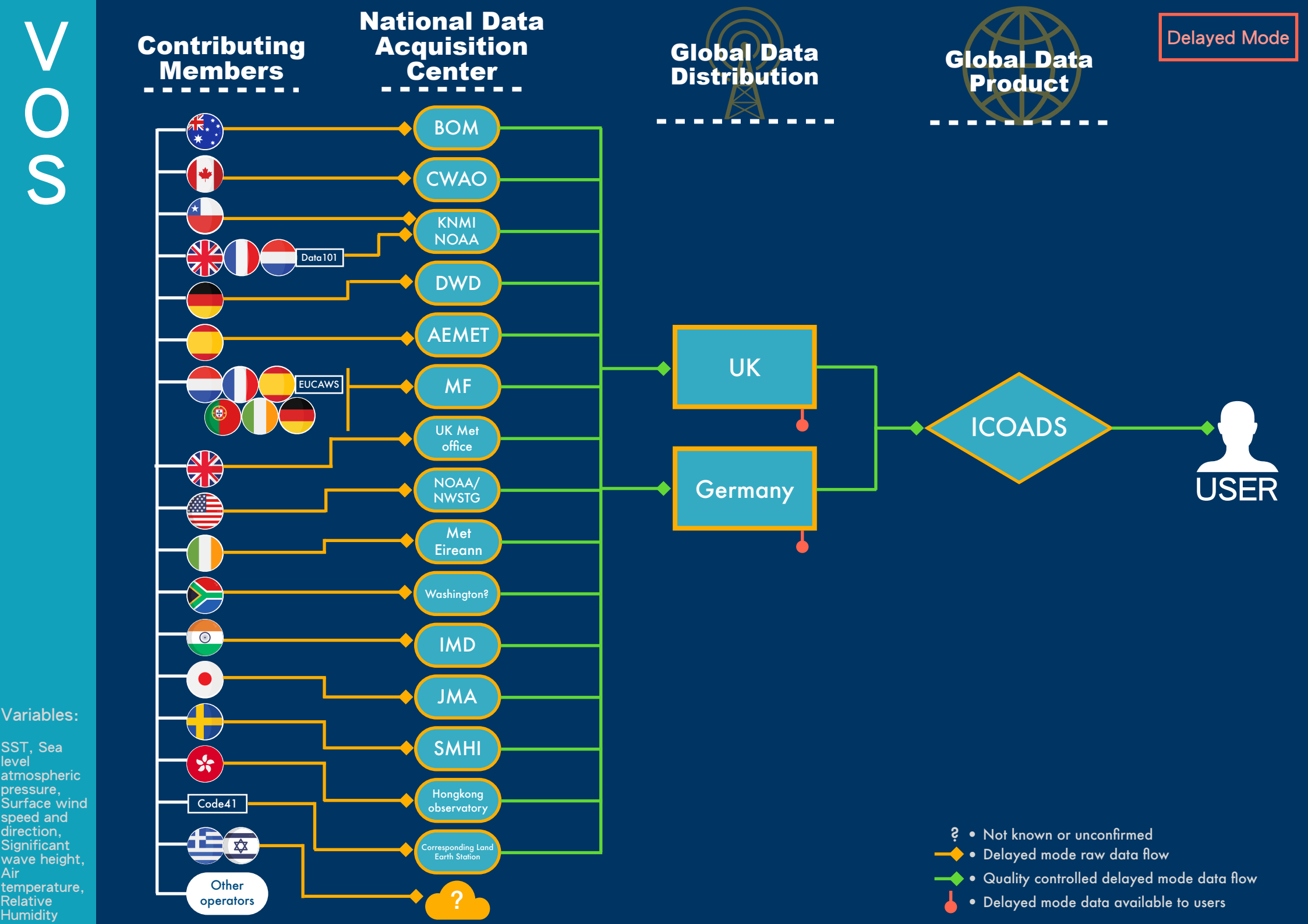
USER

? • Not known or unconfirmed
• Real time raw data flow
• Quality controlled real time data flow
• Real time data available to users

Variables:

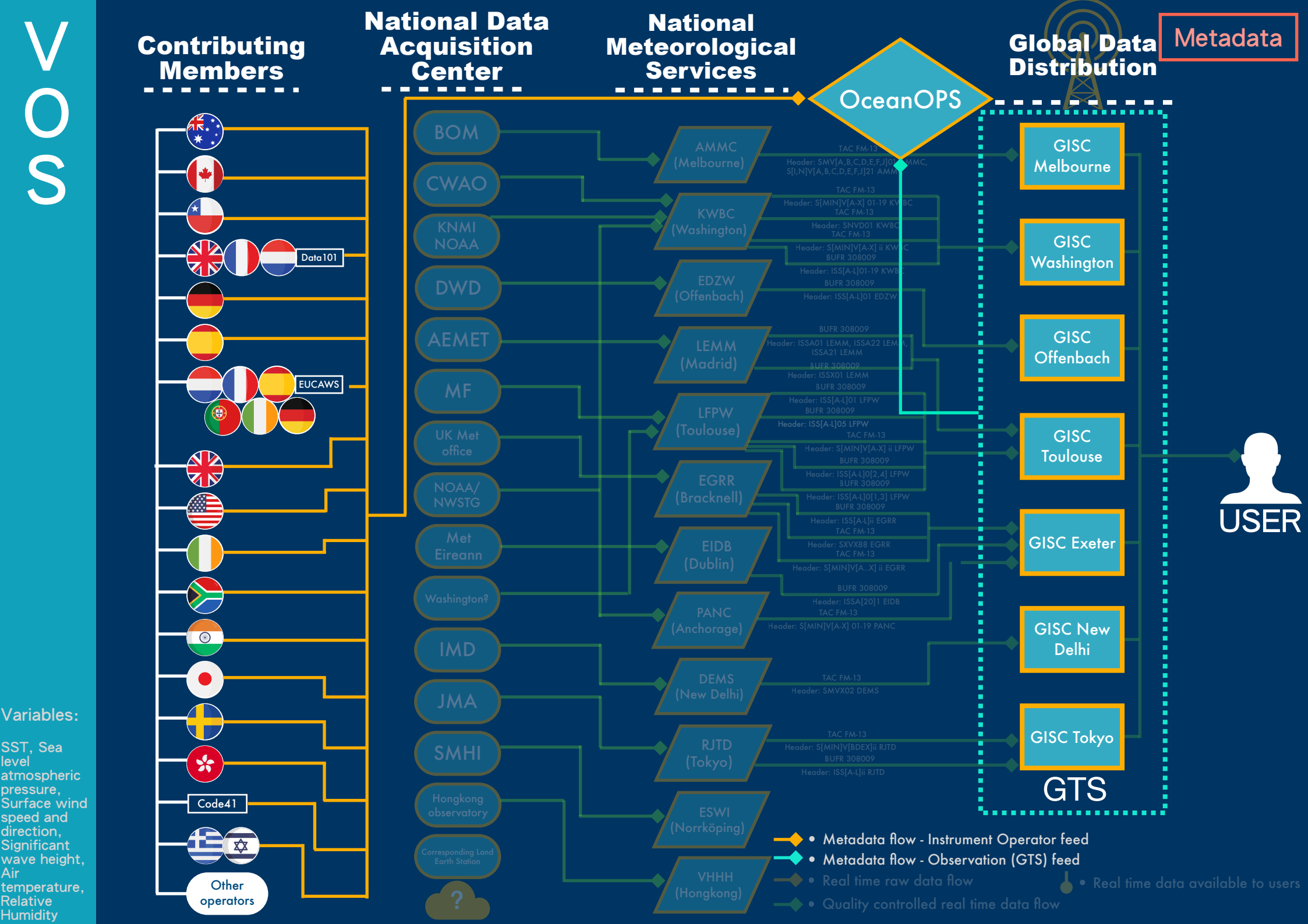
SST, Sea level atmospheric pressure, Surface wind speed and direction, Significant wave height, Air temperature, Relative Humidity

VOS



Variables:

SST, Sea level atmospheric pressure, Surface wind speed and direction, Significant wave height, Air temperature, Relative Humidity

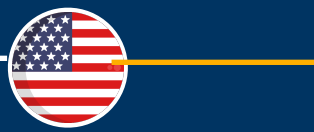

VOS
Contributing Members
National Data Acquisition Center
National Meteorological Services
OceanOPS
Global Data Distribution
Metadata
Data101
EUCAWS
Code41
Other operators
BOM
CWAO
KNMI NOAA
DWD
AEMET
MF
UK Met office
NOAA/ NWSTG
Met Eireann
Washington?
IMD
JMA
SMHI
Hongkong observatory
Corresponding Land Earth Station
AMMC (Melbourne)
KWBC (Washington)
EDZW (Offenbach)
LEMM (Madrid)
LFPW (Toulouse)
EGRR (Bracknell)
EIDB (Dublin)
PANC (Anchorage)
DEMS (New Delhi)
RJTD (Tokyo)
ESWI (Norrköping)
VHHH (Hongkong)
GISC Melbourne
GISC Washington
GISC Offenbach
GISC Toulouse
GISC Exeter
GISC New Delhi
GISC Tokyo
GTS
USER
Variables:
SST, Sea level atmospheric pressure, Surface wind speed and direction, Significant wave height, Air temperature, Relative Humidity
Metadata flow - Instrument Operator feed
Metadata flow - Observation (GTS) feed
Real time raw data flow
Quality controlled real time data flow
Real time data available to users

SOOP

<XBT>

Real Time

Contributing Members	National Data Acquisition Center	National Meteorological Services	Global Data Distribution	Global Data Product



AOML

SIO

CSIRO

BOM

RAN

AOML

BOM

AMMC GTS node

NCEI

GTS

WOD

GTSPP

IQUOD

USER

Variables:

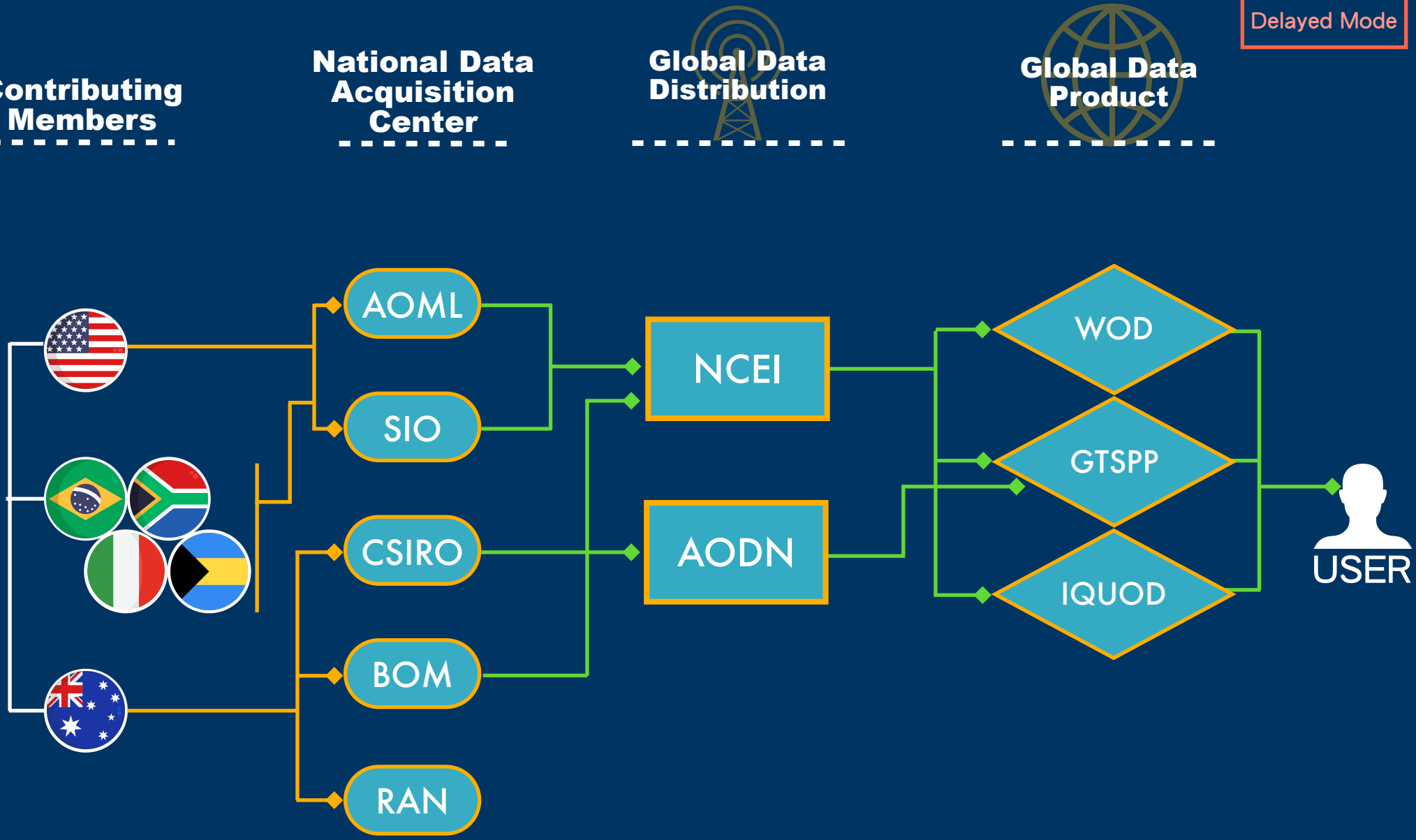
T

- Real time raw data flow
- Quality controlled real time data flow
- Real time data available to users

SOOP

<XBT>

Delayed Mode



Variables:

T

ASAP

Real Time

Contributing Countries	National Data Acquisition Center	National Meteorological Services	Global Data Distribution	Global Data Product
	US Met Office	KWBC (Washington)		
	MF	LFPW (Toulouse)	GTS	??
	AEMET	LEMM (Madrid)		
	DWD	EDZW (Offenbach)		
	DMI	BOM	??	??
	JMA	JMA		
	KMA	KMA		

USER

Variables:

? • Not known or unconfirmed

– % • Data distributed within 24h

• Real time raw data flow

• Quality controlled real time data flow

• Real time data available to users

ASAP

Delayed Mode

Contributing Countries	National Data Acquisition Center	National Meteorological Services
	US Met Office	KWBC (Washington)
	MF	LFPW (Toulouse)
	AEMET	LEMM (Madrid)
	DWD	EDZW (Offenbach)
	DMI	BOM
	JMA	JMA
	KMA	KMA

Global Data Distribution

??

Global Data Product

??

??

USER

Variables:

? • Not known or unconfirmed

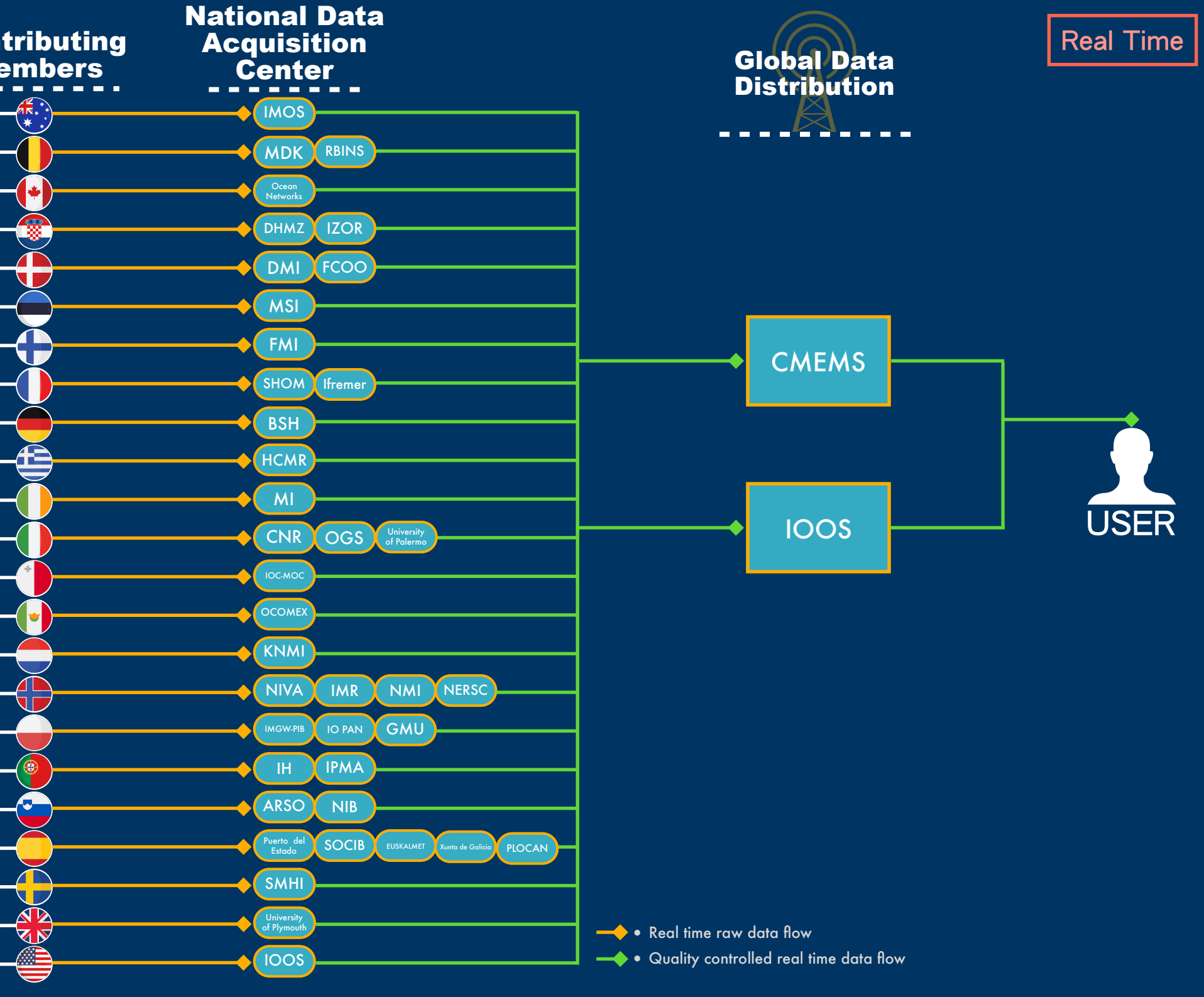
– % • Data distributed within 24h

• Delayed mode raw data flow

• Quality controlled delayed mode data flow

• Delayed mode data available to users

HFRadar



Variables:

surface currents, wave height, wave direction, wave period, wind direction

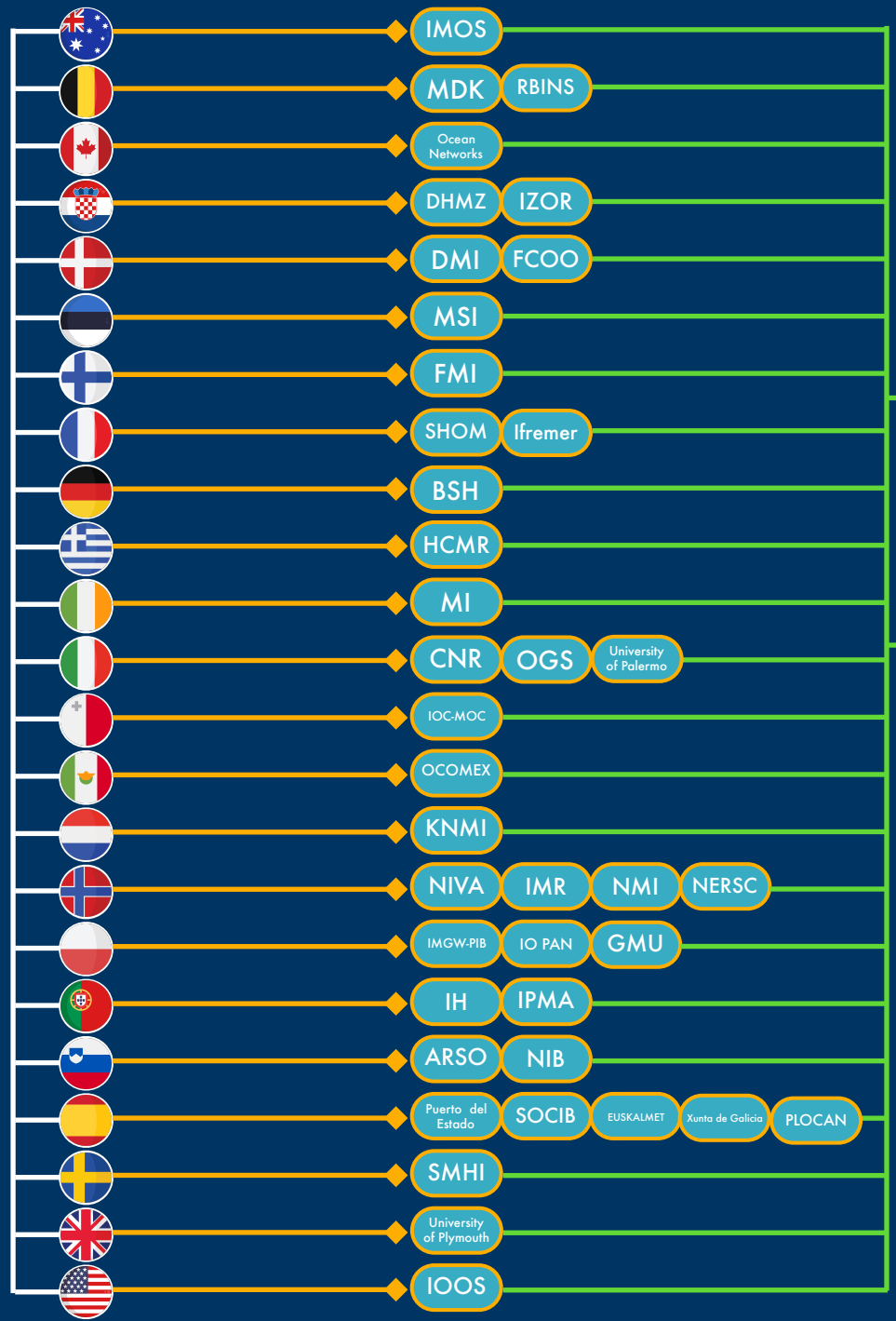
HFRadar

Delayed Mode

Contributing Members

National Data Acquisition Center

Global Data Distribution



CMEMS

IOOS

USER

Variables:

surface currents, wave height, wave direction, wave period, wind direction

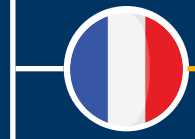
- Delayed mode raw data flow
- Quality controlled delayed mode data flow

AniBOS

Real Time

Contributing Members	National Data Acquisition Center	National Meteorological Services	Global Data Distribution




NOAA ATN → NDBC (TM315003)

? → (not known or unconfirmed)

? → (not known or unconfirmed)

Coriolis → Coriolis

SOCIB

UKMO → UKMO

JMA? → JMA?

NDBC, Coriolis, UKMO → GTS → USER

Variables:

T, P, S, Oxygen, Pressure, Fluorescence, Light

? • Not known or unconfirmed

– % • Data distributed within ??h

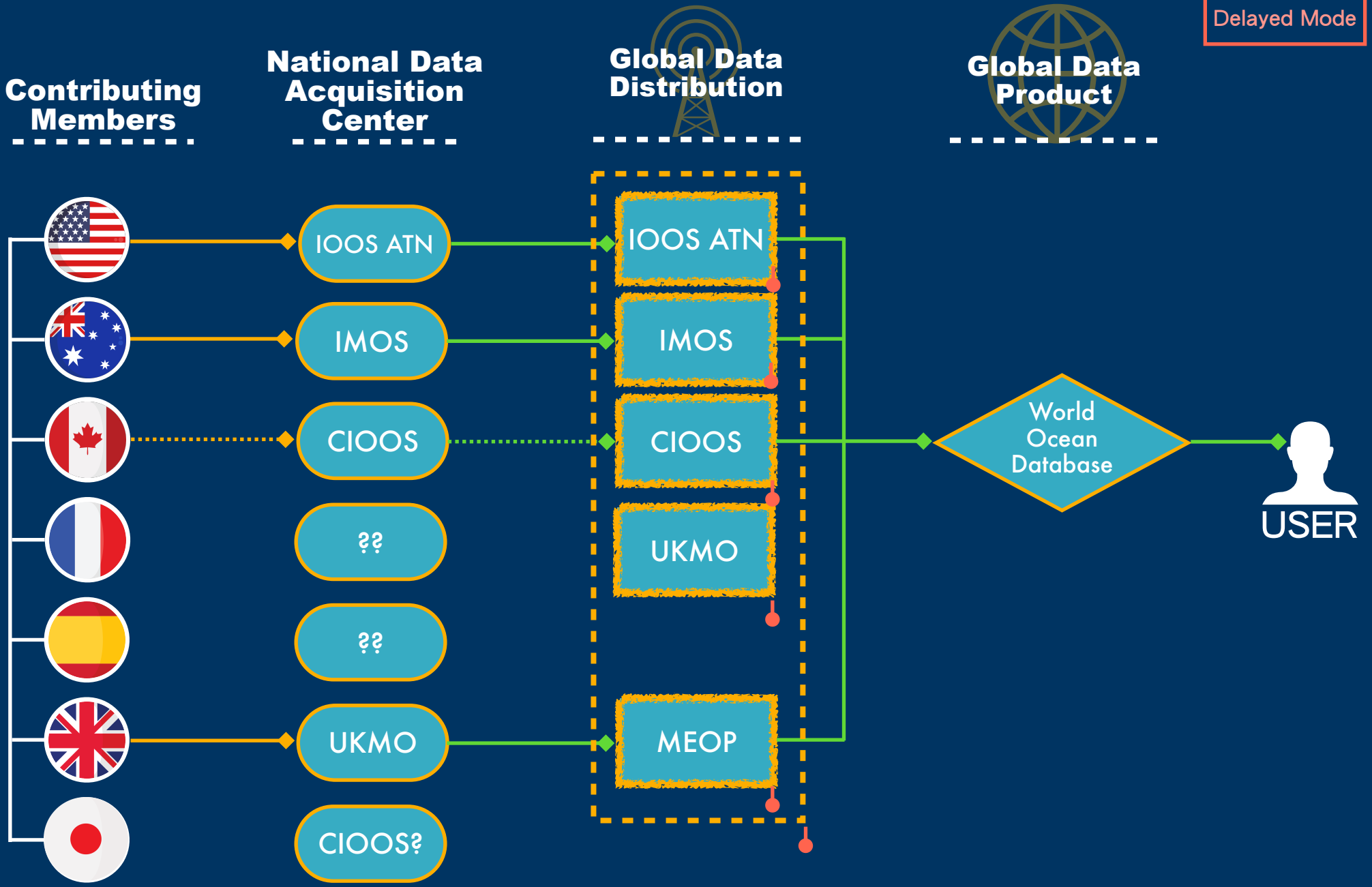
• Real time raw data flow

• Quality controlled real time data flow

• Real time data available to users

AniBOS

Delayed Mode



Variables:

T, P, S, Oxygen, Pressure, Fluorescence, Light

? • Not known or unconfirmed

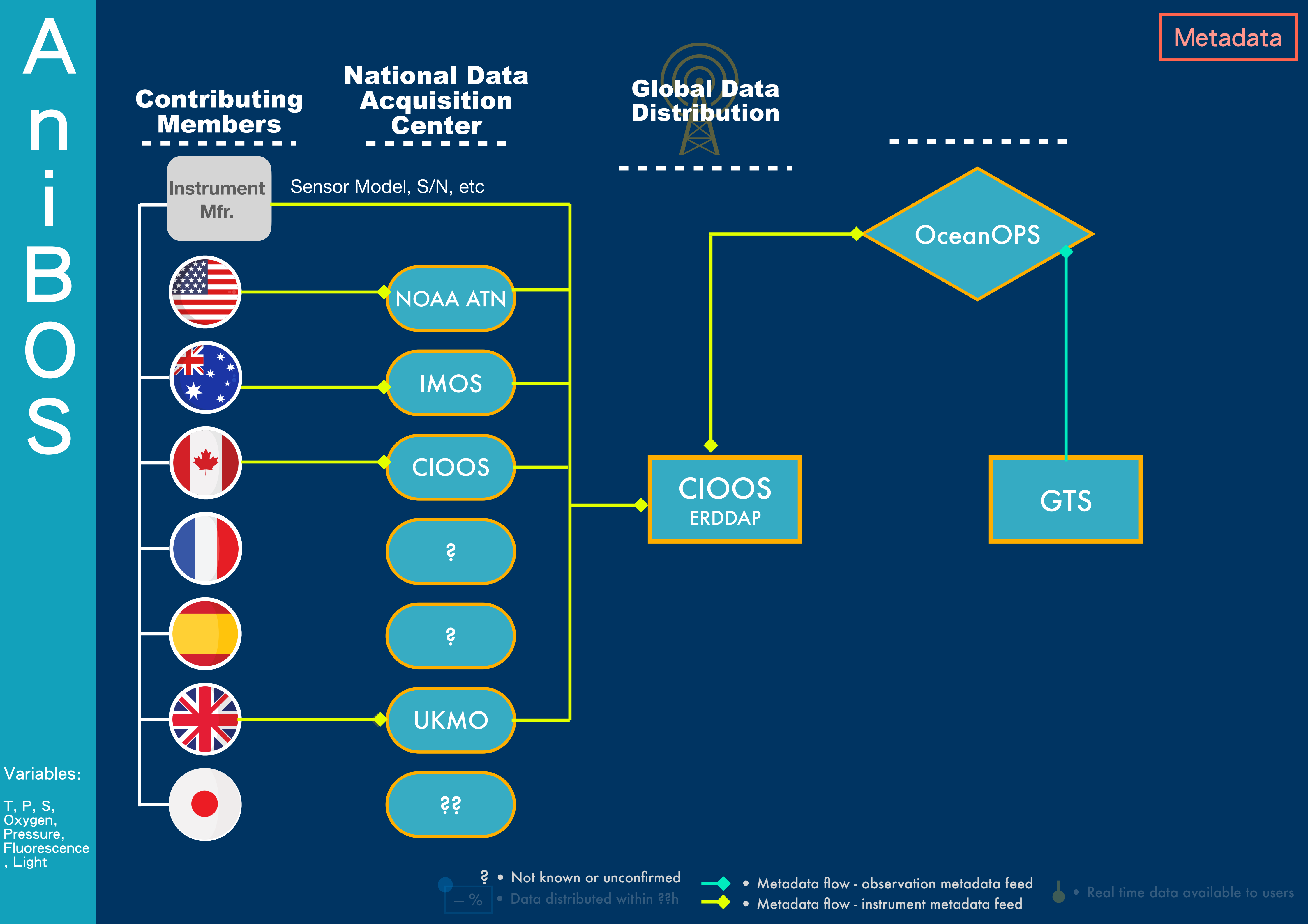
– % • Data distributed within a year

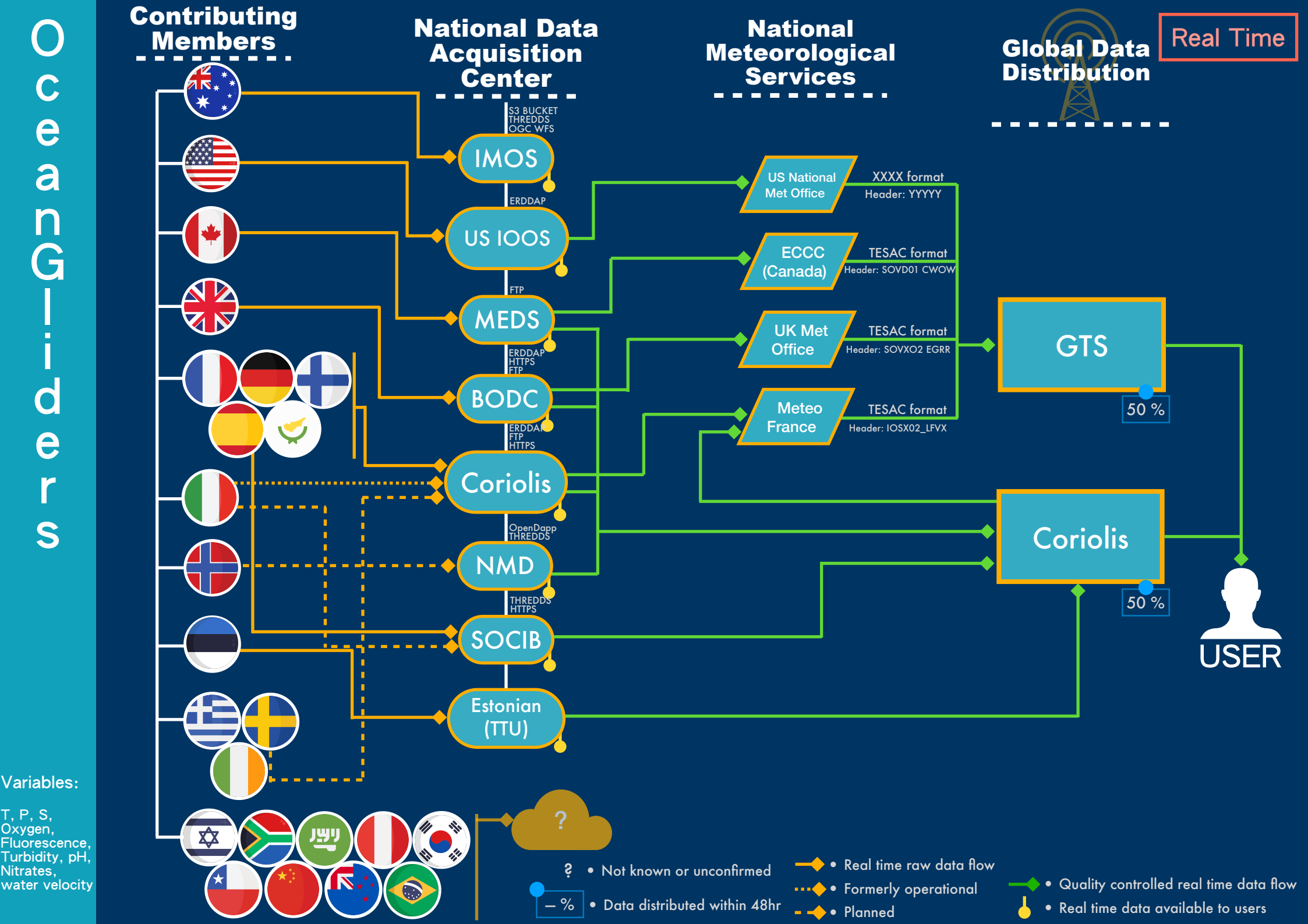
• Delayed mode raw data flow

• Quality controlled delayed mode data flow

• Delayed mode data available to users

• Virtual GDAC


AniBOS
Metadata
Contributing Members
National Data Acquisition Center
Global Data Distribution
Instrument Mfr.
Sensor Model, S/N, etc
NOAA ATN
IMOS
CIOOS
?
?
UKMO
??
OceanOPS
CIOOS
ERDDAP
GTS
Variables:
T, P, S, Oxygen, Pressure, Fluorescence, Light
? • Not known or unconfirmed
– % • Data distributed within ??h
• Metadata flow - observation metadata feed
• Metadata flow - instrument metadata feed
• Real time data available to users


OceanGliders
Contributing Members
National Data Acquisition Center
National Meteorological Services
Global Data Distribution
Real Time
S3 BUCKET
THREDDS
OGC WFS
IMOS
ERDDAP
US IOOS
FTP
MEDS
ERDDAP
HTTPS
FTP
BODC
ERDDAP
FTP
HTTPS
Coriolis
OpenDapp
THREDDS
NMD
THREDDS
HTTPS
SOCIB
Estonian (TTU)
US National Met Office
XXXX format
Header: YYYYY
ECCC (Canada)
TESAC format
Header: SOVD01 CWOW
UK Met Office
TESAC format
Header: SOVXO2 EGRR
Meteo France
TESAC format
Header: IOSX02_LFVX
GTS
50 %
Coriolis
50 %
USER
Variables:
T, P, S, Oxygen, Fluorescence, Turbidity, pH, Nitrates, water velocity
?
? • Not known or unconfirmed
– % • Data distributed within 48hr
• Real time raw data flow
• Formerly operational
• Planned
• Quality controlled real time data flow
• Real time data available to users

OceanGliders

Delayed Mode

Contributing Members

National Data Acquisition Center

Global Data Distribution








S3 BUCKET
THREDDS
OGC WFS

IMOS

ERDDAP

US IOOS

FTP

MEDS

ERDDAP
HTTPS
FTP

BODC

THREDDS
HTTPS

SOCIB

OpenDapp
THREDDS

NMD

Individual PIs

Coriolis

2 %

Data Publishing Services (PANGAEA, SEANOE, others)

– %

USER

Variables:

T, P, S, Oxygen, Fluorescence, Turbidity, pH, Nitrates, water velocity

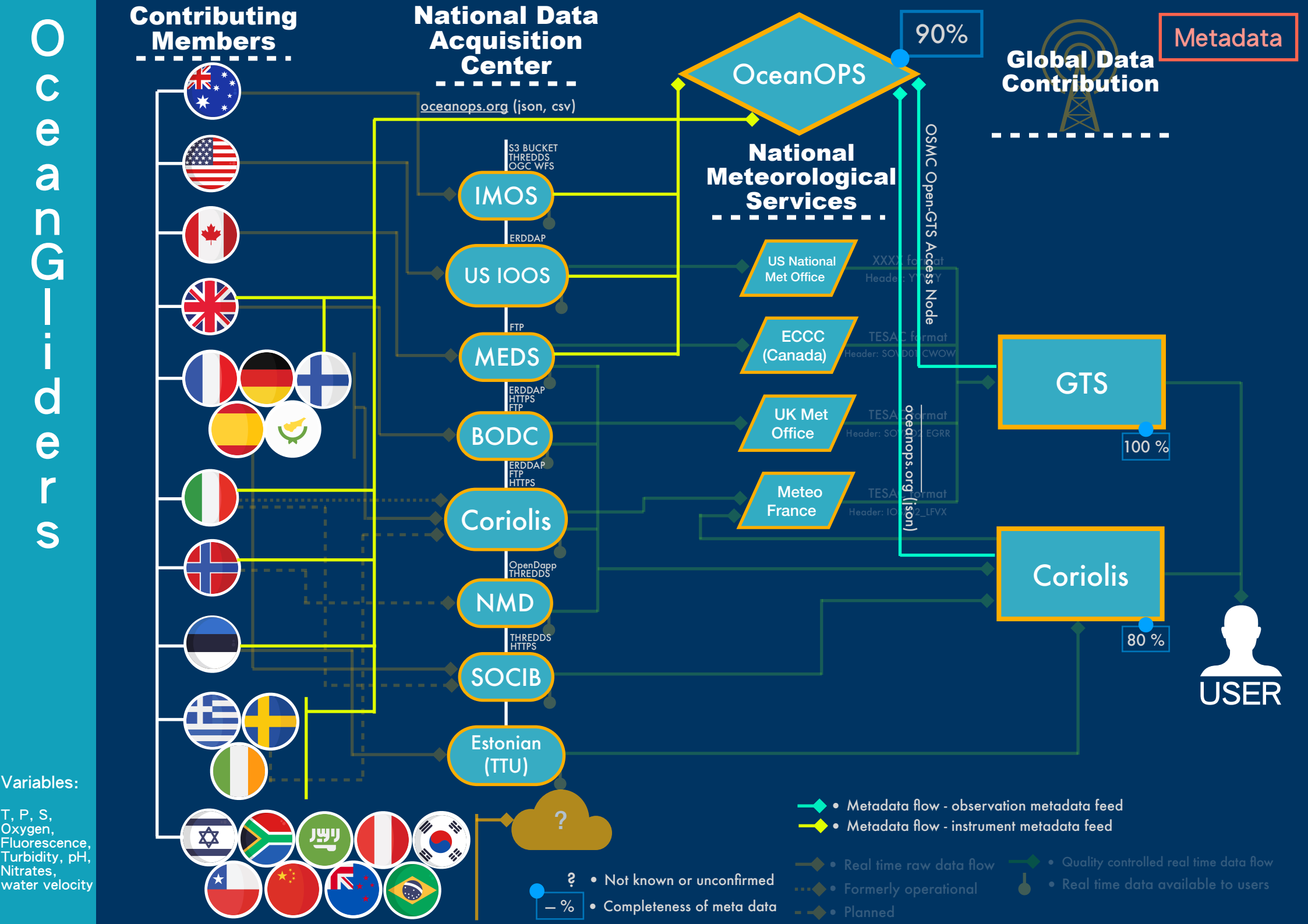
? • Not known or unconfirmed

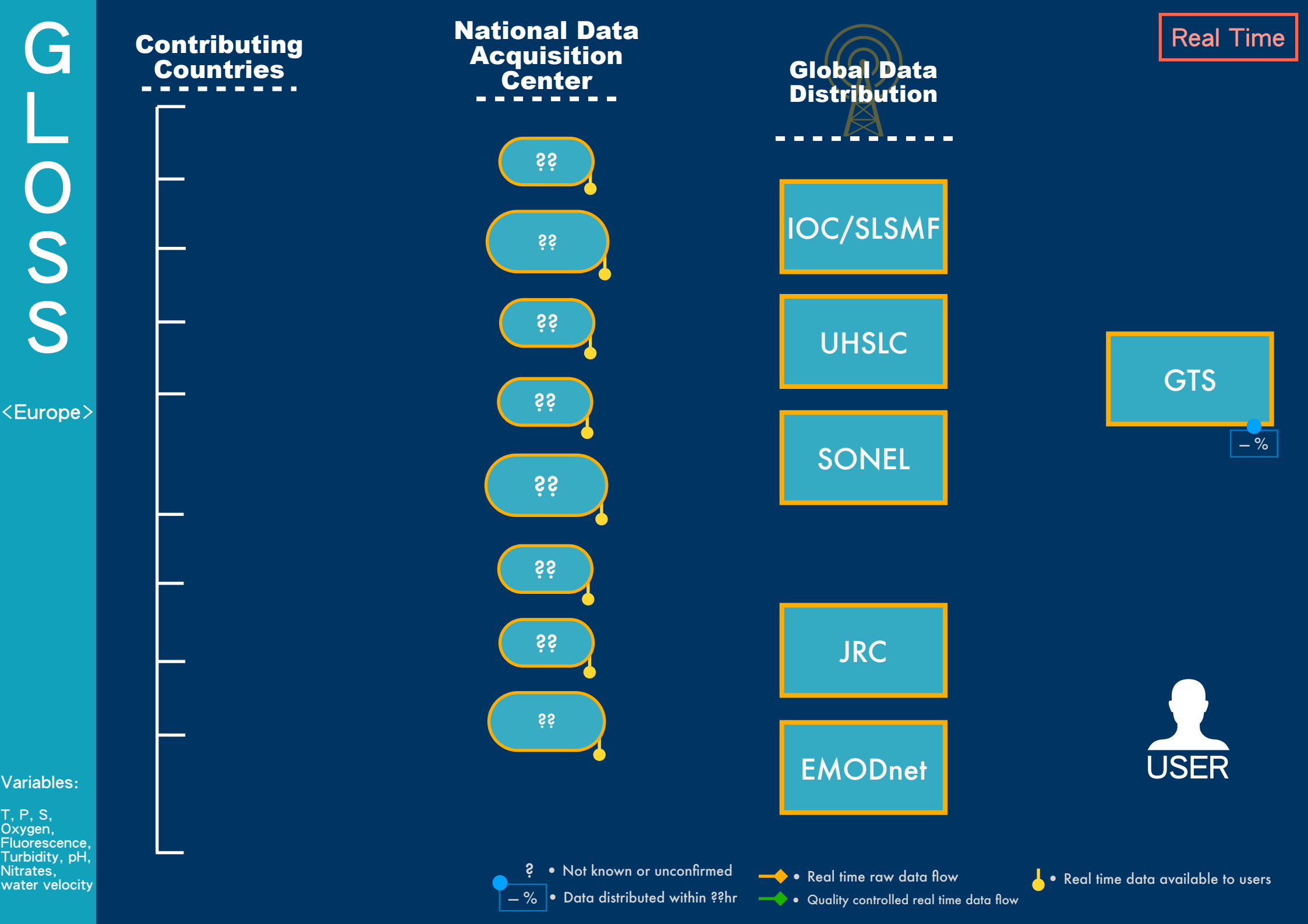
– % • Data distributed within 1yr

• Delayed mode raw data flow

• Quality controlled delayed mode data flow

• To be confirmed


OceanGliders
Contributing Members
National Data Acquisition Center
oceanops.org (json, csv)
S3 BUCKET
THREDDS
OGC WFS
IMOS
ERDDAP
US IOOS
FTP
MEDS
ERDDAP
HTTPS
FTP
BODC
ERDDAP
FTP
HTTPS
Coriolis
OpenDapp
THREDDS
NMD
THREDDS
HTTPS
SOCIB
Estonian (TTU)
?
OceanOPS
90%
National Meteorological Services
US National Met Office
ECCC (Canada)
UK Met Office
Meteo France
OSMC Open-GTS Access Node
oceanops.org (json)
Global Data Contribution
Metadata
GTS
100 %
Coriolis
80 %
USER
Variables:
T, P, S, Oxygen, Fluorescence, Turbidity, pH, Nitrates, water velocity
• Metadata flow - observation metadata feed
• Metadata flow - instrument metadata feed
• Real time raw data flow
• Formerly operational
• Planned
• Quality controlled real time data flow
• Real time data available to users
? • Not known or unconfirmed
– % • Completeness of meta data


GLOSS
<Europe>
Contributing Countries
National Data Acquisition Center
Global Data Distribution
Real Time
??
??
??
??
??
??
??
??
IOC/SLSMF
UHSLC
SONEL
JRC
EMODnet
GTS
– %
USER
Variables:
T, P, S, Oxygen, Fluorescence, Turbidity, pH, Nitrates, water velocity
? • Not known or unconfirmed
– % • Data distributed within ??hr
• Real time raw data flow
• Quality controlled real time data flow
• Real time data available to users

GLOSS

<Europe>

Variables:

T, P, S, Oxygen, Fluorescence, Turbidity, pH, Nitrates, water velocity

Contributing Countries

National Data Acquisition Center

Global Data Distribution

Delayed Mode

BODC

PSMSL

CMEMS

SeaDataNet

USER

? • Not known or unconfirmed

– % • Completeness of metadata

• Delayed mode raw data flow

• Quality controlled delayed mode data flow

• Delayed mode data available to users

Supplementaries

- AEMET - State Meteorological Agency
- AODN - Australian Ocean Data Network
- AOML - Atlantic Oceanographic and Meteorological Laboratory
- AWI - Alfred Wegener Institute
- BIOS - Bermuda Institute of Ocean Sciences
- BODC - British Oceanographic Data Centre
- BOM - Bureau of Meteorology
- BSH - Federal Maritime and Hydrographic Agency of Germany
- CCHDO - CLIVAR and Carbon Hydrographic Data Office
- CCO - Colombian Ocean Commission
- CIOOS - Canadian Integrated Ocean Observing System
- CMA - China Meteorological Administration
- CNR - National Research Council
- CNRS - National Center for Scientific Research
- CSIRO - Commonwealth Scientific and Industrial Research Organization
- DFO - Fisheries and Oceans Canada
- DMI - German Maritime Institute
- DML -
- DWD - Germany's National Meteorological Service
- ECCC - Environment and Climate Change Canada
- FERHR -
- FMRI - Faroe Marine Research Institute
- GEOMAR - Helmholtz Centre for Ocean Research Kiel
- GISC - Geographic Information Science
- GLODAP - Global Ocean Data Analysis Project
- GTS - Global Telecommunication System
- HCMR - Hellenic Center for Marine Research
- HKO - Hong Kong Observatory
- HNMS - Hellenic National Meteorological Service
- ICOADS - International Comprehensive Ocean-Atmosphere Data Set
- IDEAM - Colombia Institute of Hydrology, Meteorology and Environmental Studies
- IEO - Spanish Institute of Oceanography
- IFREMER - French Research Institute for Exploitation of the Sea
- IH - Hydrographic Institute
- IMD - India Meteorological Department
- IMI - Marine Data Center
- IMOS - Integrated Marine Observing System
- IMR - Institute of Marine Research
- IMRPE - Marine Institute of Peru
- INAMHI - Ecuadoran Institute for Meteorology and Hydrology
- INCOIS - Indian National Centre for Ocean Information Service
- INOCAR - Oceanographic Institution of the Navy
- IOOS - Integrated Ocean Observing System
- IPMA - Portuguese Institute for Ocean and Atmosphere
- IQUOD - International Quality-Controlled Ocean Database
- ITAF-REMET - Italian Airforce - Operational Forces Command - Department for Meteorology
- JAMSTEC - Japan Agency for Marine-Earth Science and Technology
- JMA - Japan Meteorological Agency
- KIOST - Korea Institute of Ocean Science and Technology
- KMA - Korea Meteorological Administration
- KNMI - Royal Netherlands Meteorological Institute
- MEDS - Marine Environmental Data Service
- MEOP - Marine Mammals Exploring the Oceans Pole to Pole
- MF - Meteo France
- MNR - Ministry of Natural Resources
- MSC - Meteorological Service of Canada
- MSNZ - Marine Services New Zealand
- NCEI - National Centers for Environmental Information
- NDBC - National Data Buoy Center
- NDWC - National Disaster Warning Center
- NIO - National Institute of Oceanography
- NIOZ - Royal Netherlands Institute for Sea Research
- NMDC - Norwegian Marine Data Centre
- NMDIS - National Marine Data and Information Service
- NOAA - National Oceanic and Atmospheric Administration
- NOIT - National Institute of Ocean Technology
- NOC - National Oceanography Centre
- NRL-MRY - Naval Research Laboratory, Marine Meteorology Division
- NWSTG - National Weather Service Telecommunication Gateway
- OGS - National Institute of Oceanography and Experimental Geophysics
- PMEL - Pacific Marine Environmental Laboratory
- RAN - Royal Australian Navy
- SAM - Southwest Atlantic Meridional Overturning Circulation
- SAWS - South African Weather Service
- SHOA - Spanish for Hydrographic and Oceanographic Service of the Chilean Navy
- SIO - Second Institute of Oceanography
- SMHI - Swedish Meteorological and Hydrological Institute
- SNU - Seoul National University
- SOCIB - Balearic Islands Coastal Observing and Forecasting System
- TTU - Tallinn University of Technology
- UKMO - UK Met Office
- USP - University of Sao Paulo
- WHOI - Woods Hole Oceanographic Institution
- WOD - World Ocean Database

Supplementaries


AUSTRALIA


BAHAMAS


BELGIUM


BRAZIL


BULGARIA


CANADA


CHILE


CHINA


COLUMBIA


CROATIA


CYPRUS


DENMARK


ECUADOR


ESTONIA


FINLAND


FRANCE


GERMANY


GREECE


INDIA


IRELAND


ISRAEL


ITALY


JAPAN


MALTA

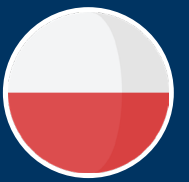

MEXICO


NETHERLANDS


NEW ZEALAND


NORWAY


PERU


POLAND


PORTUGAL


REPUBLIC OF KOREA


RUSSIA


SAUDI ARABIA


SLOVENIA


SOUTH AFRICA


SPAIN


SWEDEN


THAILAND


UNITED KINDOM


UNITED STATES

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The Global Ocean Observing System

unesco Intergovernmental Oceanographic Commission

WORLD METEOROLOGICAL ORGANIZATION

UN environment United Nations Environment Programme

International Science Council

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Editorial Team: Kevin O'Brien, Mathieu Belbéoch, Emma Heslop, Chanmi Kim, Magali Krieger, Anthonin Lize, Long Jiang, Martin Kramp, Victor Turpin

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Changes from v1.0: Reorder individual PDF files, fix typos in supplementary information.

Contact: Kevin.M.O'Brien@noaa.gov