The use of Data Buoy, Ship and Argo Float observations – data flows and processing

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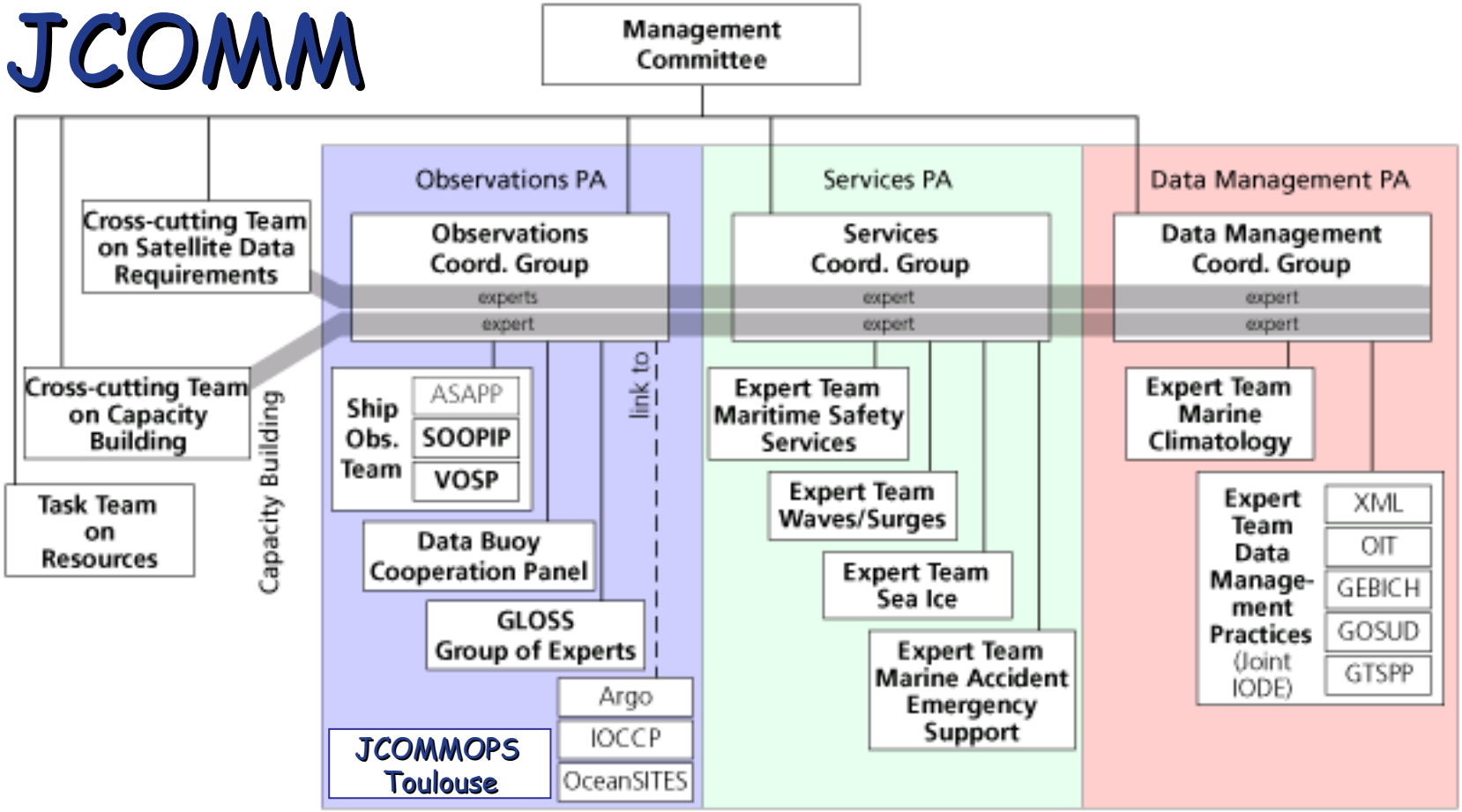
JCOMM



- Represents a bridge between the oceanographic and meteorological communities
- Encompasses data for Operational and Research applications – different data processing is required

JCOMMOPS - JCOMM In-situ Operational Platform Support Centre

- Ocean observation programmes
  - implemented nationally
  - cooperate internationally through dedicated JCOMM panels.
- JCOMMOPS comprises two international technical coordinators:
  - Argo (Mathieu Belbeoch)
  - Data Buoy Cooperation Panel
  - Ship Observations Team - VOS & SOOP
  - OceanSITES (as of mid-2008)
- Each observing programme has its own specific requirements, though there are many cross-cutting issues.

Data Buoy Cooperation Panel
http://www.jcommops.org/dbcp/

Argo Information Centre
http://argo.jcommops.org/

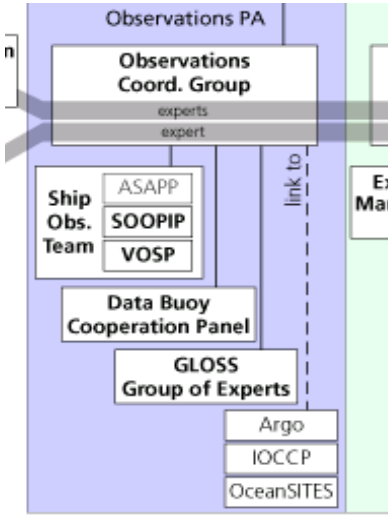
Ship Observations Team
http://www.jcommops.org/sot/

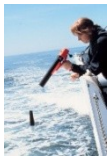
JCOMM In-situ Operational Platform Support Centre

- JCOMMOPS is a component of the international coordination mechanism, to provide a day-to-day link with platform operators and actors involved in meteorology and oceanographic programmes, and aims on behalf of JCOMM, to:
  - assist in the **planning**, **implementation** and **operations** of the observing systems
  - **monitor** and **evaluate** the performance of the networks
  - encourage **cooperation** between communities and member states and service providers
  - encourage **data sharing** for key JCOMM data
  - assist in **data distribution** on Internet and GTS
  - relay users **feedback on data quality** to platforms operators
  - provide **technical assistance** and **user worldwide support**
  - develop **synergies** between observing systems
  - act as a **clearing house** and **focal point** for programmes

- JCOMMOPS **is not a data centre,** rather, it:
  - gathers, monitors and distributes essential metadata
  - encourages data sharing and guides users to data centers
- More general information is available at **http://www.jcommops.org**

JCOMM observing platforms



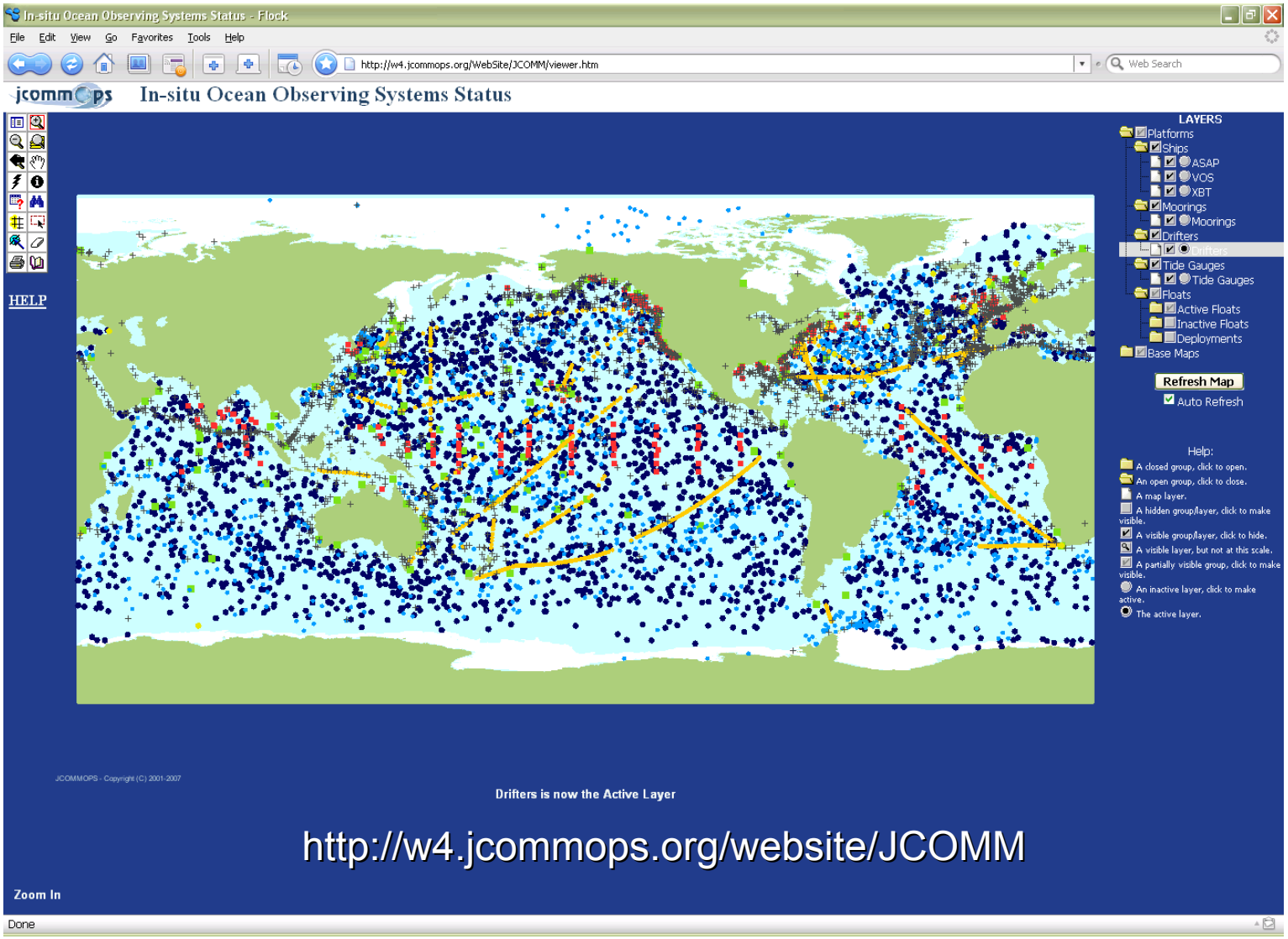





The in-situ observing platforms that JCOMM is concerned with are:

- **Profiling floats**
  - Argo, measuring T,S at depth
  - others (Argo equivalent) measuring T, S and other parameters
- **Data Buoys**
  - Moored buoys measuring surface meteorology and atmospheric properties and physical oceanography plus other parameters
  - Drifting buoys in the high seas, measuring surface meteorology and physical oceanography e.g. currents (if drogue attached) and SST
- **Ship observations**
  - VOS measuring surface meteorology plus the Automated Shipboard Aerological programme (ASAP), measuring atmospheric temperature profiles
  - Ship of Opportunity Programme (SOOP) measuring temperature profiles with XBTs and some ocean data from Themosalinographs
- Sea Level – GLOSS stations, some real time data
- Carbon - IOCCP, repeat hydrography and time series
- OceanSITES climate and physical oceanography time series and reference stations including non-physical parameters.

JCOMMOPS Interactive Maps: JCOMM, Argo, DBCP, SOT, (GLOSS)



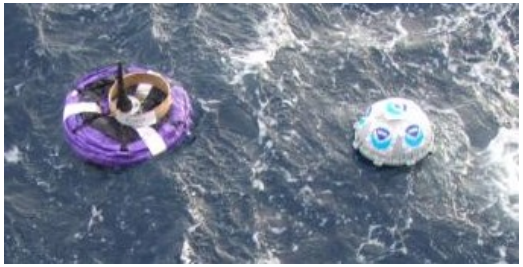
http://w4.jcommops.org/website/JCOMM

Real Time data flow - GTS

- The Global Telecommunication System (GTS) is part of the WMO Information System (WIS), which provides:
  - rapid collection, exchange and distribution of observations and processed information,
  - between an interconnected network of national and regional centres
  - in standard message formats
- Data from a single platform is identified by a unique WMO Identifier.
- The route taken by any one message is determined by the GTS bulletin header, which includes the type of message (BUOY, TESAC etc) included and its source.
- GTS centres choose to ‘opt in’ to particular data type.

Real Time data flow - GTS

- Existing GTS message types within JCOMM
  - **Argo** - TESAC message (every 10 days).
  - **Data Buoys** – BUOY message (hourly). Some moorings use SHIP message (hourly, 3 hourly, daily)



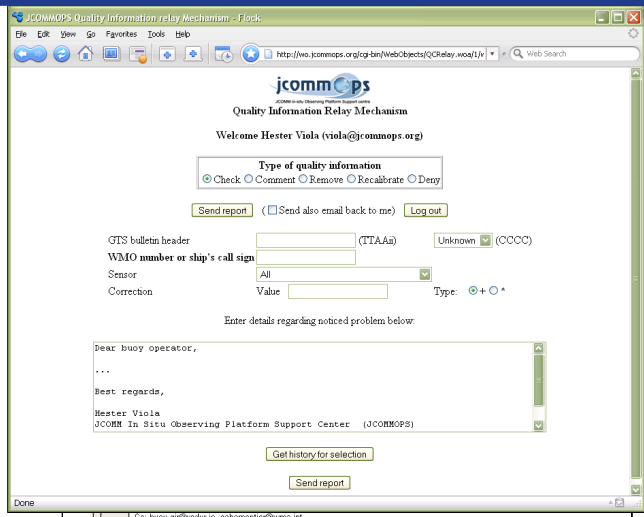
  - **Ship observations** – SHIP, TEMPSHIP, BATHY, TRACKOB,(TESAC) messages (time frames vary).
- Most of these formats should be on the GTS within hours of the satellite connecting to the platform
- These formats will be replaced (by 2012) by WIS reporting formats such as BUFR/CREX, (already begun for some data types)

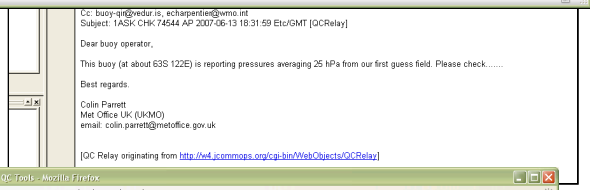
Real time data flow – quality control

- Operational centre
  - Real time satellite telecommunications
  - receives the data from the telecommunications network (primarily Argos for JCOMM),
  - constructs the data from the platform message - location, time, decode sensor values etc
  - some real time quality control, e.g. gross errors, range checks, checksum for bit errors, location quality flag etc
  - sends data onto the GTS, correct message format, following WMO specifications (e.g. “FM18 XII BUOY”, BUFR) or onto a programme website (NetCDF)
- This allows for minimal metadata and only the most basic (automated) quality control.

QC Tools - User feedback and monitoring centre reports

- Tools available via JCOMM monitoring centres and JCOMMOPS:
- Real time data users and monitoring centres provide feedback on Buoy and VOS platforms on the GTS,
  - Comparison with the in-house model to identify systematic errors – allowing platform operators to check data, recalibrate biased data, flag the GTS data or remove the sensor in question from the GTS entirely.
- DBCP and VOS, QC Relay Mechanism hosted at JCOMMOPS, used by monitoring centres to contact platform operators.
- Daily identification of buoys reporting erroneous air pressure data or not agreeing with adjacent buoys (Météo France).
- JCOMMOPS reports Argo floats which are Grey listed by Data Assembly Centres and reports on delays
- UKMO reports persistent problems with Ship observations via a monthly report

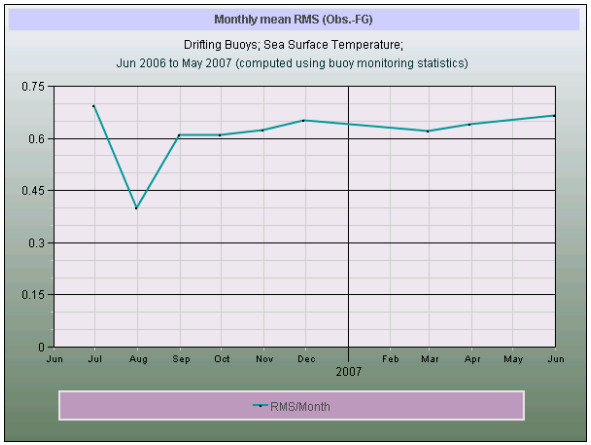




QC Tools – Buoy Monitoring Statistics

RMS (Obs-FG) for drifting buoy Air Pressure
(from ECMWF stats.)
Last 6 months, MAY 2007
644 platforms, total obs.=1458842, average=0.8 hPa

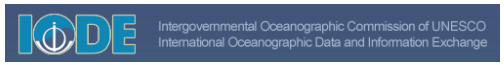
Range	Value	Percent
0-1 hPa	1190157	81.58
1-2 hPa	210285	14.41
2-3 hPa	41906	2.87
3-4 hPa	7903	0.54
4-5 hPa	3349	0.23
>5hPa	5242	0.36



- The DBCP monthly Buoy Monitoring Statistics are generated by operational monitoring centres (e.g. Météo France, Australia, UKMO, ECMWF, NCAP) following guidelines set out by the DBCP
- Monthly model comparison (RMS) for Data Buoys, from various global or regional models
- The statistics include, for each buoy –
  - Number of Gross Errors,
  - Number of Accepted Observations,
  - RMS (of First Guess minus Observation using the centre's Numerical Model) etc.
- JCOMMOPS provides query tools for plotting monthly Buoy monitoring statistics, which helps to assess and demonstrate the quality and usefulness of buoy data.

Data Centres – Archives of GTS and Delayed Mode Quality Control

- Data archives such as ISDM/MEDS, GODAE Server, CORIOLIS, and NODC USA and UK can be queried by users of JCOMM data.



- Argo successfully manages its centralised Global data set (GODAE/CORIOLIS GDACs) fed by Data Assembly Centres, which store GTS data and replace it with scientific quality controlled data in delayed mode.

- On behalf of the DBCP, ISDM (MEDS Canada) archives all GTS data for Drifting Buoys and checks quality, identifying duplicates. This data is quality controlled by AOML, Global Drifter Programme and NDBC, TAO and provided to ISDM (MEDS Canada) for Drifting Buoys and NODC (USA) for Moored Buoys

- The GTSPP programme has put in place mechanisms for storing all XBT data both in real-time and delayed mode (disk). Three regional centres had previously undertaken scientific quality control for this programme. The data is maintained in a continuously updated archive at NODC.

Metadata storage

- Sources of metadata within JCOMM:
  - Argo and Buoys:
    - Full metadata for Argo and some Buoy Metadata entered by operators, e.g. platform manufacture date, type and model, data format, program country and contact, telecommunications system used, deployment method etc. This is made available at JCOMMOPS upon deployment.
  - SOOP:
    - Metadata is reported annually to JCOMMOPS for XBT drops and a report compiled on success for each SOOP line.
  - VOS (VOS Clim & ASAP):
    - WMO Publication 47 provides a quarterly VOS metadata list.
    - JCOMMOPS will store metadata for a few ships using MASK callsigns in future.
  - Meta-T pilot project for SST.

- The ODAS metadata servers (NMDIS China and NDBC USA) will hold buoy metadata provided by Data Centres and other metadata centres, like JCOMMOPS (to be used in real time and delayed mode).

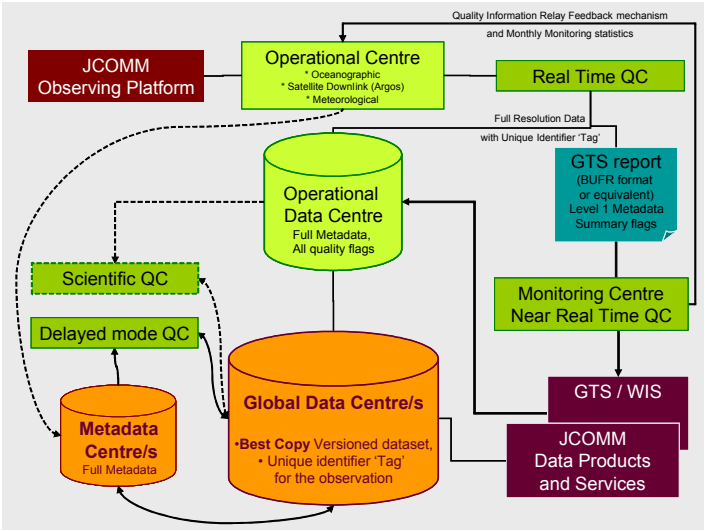
- BUFR should assist, in future, as newly developed templates, and revisions to existing ones, will include the necessary platform metadata within the real-time GTS message.

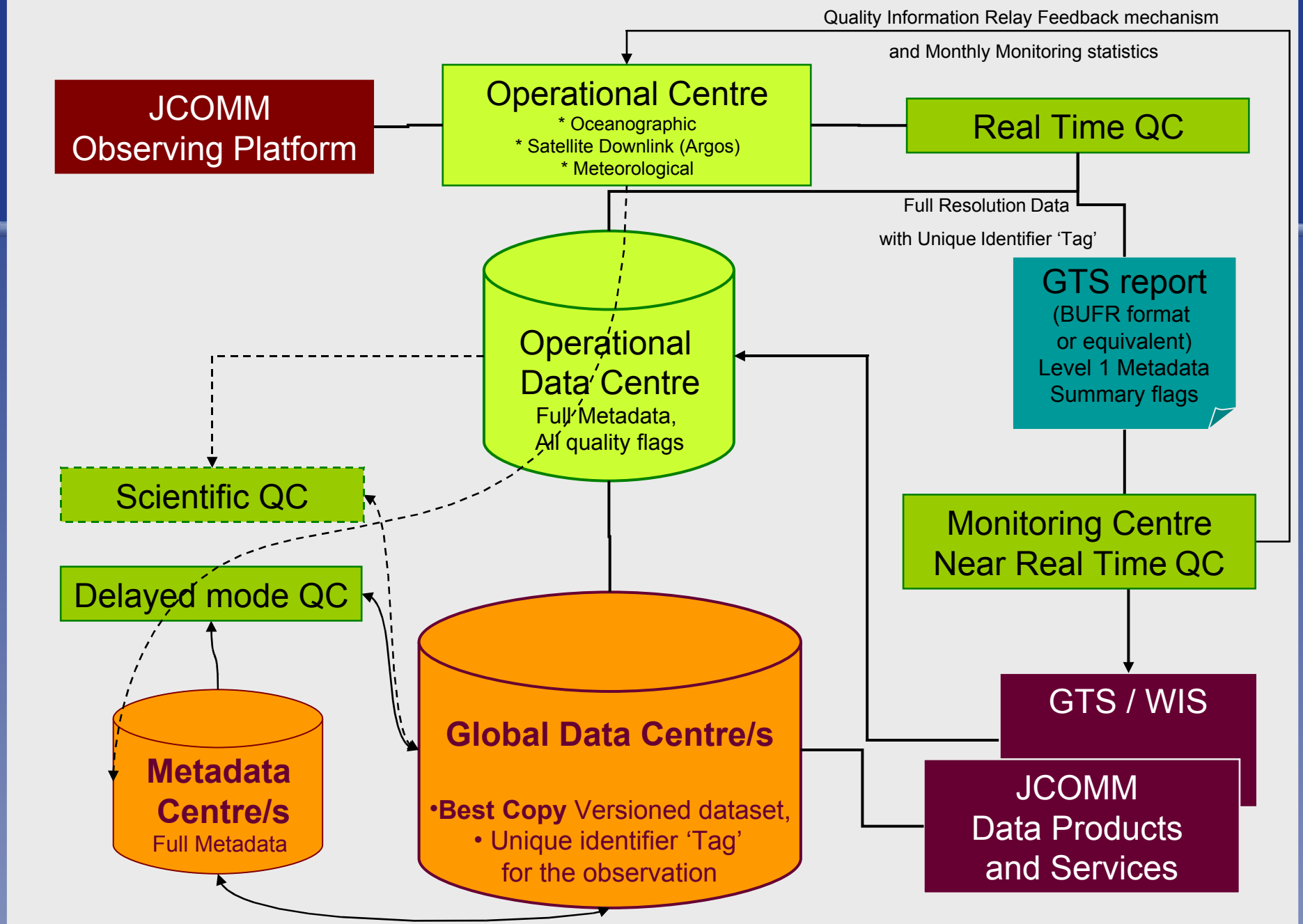
JCOMM data end-users

- The data produced under JCOMM programmes is used by various different types of application areas, in operational and research fields.
- JCOMM end-users need data products, from real time and delayed mode data streams, with differing levels of quality controls and alternative views on the same dataset.
- Currently, the data flows for JCOMM platforms are strongly linked to individual JCOMM programmes, when collected in archives and when presented as data products .
- There is a need for more integration and flexibility with how data is viewed, to take into account the different audiences of JCOMM data.

A standardised JCOMM Data Flow

- One model for how JCOMM data flows could be standardised in future includes:
  - All data being available in real time, including full resolution and most metadata (BUFR or equivalent)
  - Some delayed mode QC would be performed by the Operational center responsible for that data or by the Global Data Center (preferably scientific QC also).
  - "Best Copy" data stored at Global Data Center/s in a continuously updated archive
  - Unique identifier to link different views of data e.g. at varying levels of QC, or for different applications
  - Data would be stored and presented in products relating to the variables measured, rather than the platforms used to measure them.
  - Full metadata stored at and easily available from global metadata centres




Quality Information Relay Feedback mechanism
and Monthly Monitoring statistics
JCOMM
Observing Platform
Operational Centre
* Oceanographic
* Satellite Downlink (Argos)
* Meteorological
Real Time QC
Full Resolution Data
with Unique Identifier 'Tag'
GTS report
(BUFR format
or equivalent)
Level 1 Metadata
Summary flags
Operational
Data Centre
Full Metadata,
All quality flags
Scientific QC
Monitoring Centre
Near Real Time QC
Delayed mode QC
Global Data Centre/s
•Best Copy Versioned dataset,
• Unique identifier 'Tag'
for the observation
GTS / WIS
Metadata
Centre/s
Full Metadata
JCOMM
Data Products
and Services

Conclusions

- JCOMM data is being disseminated and shared successfully, in high quality, within the Meteorological and Oceanographic communities.
- JCOMMOPS provides network monitoring tools and compiles quality control information for JCOMM programmes in the Operational and Research fields. JCOMMOPS also stores platform metadata for the Argo, DBCP and SOT programmes.
- Real time data is monitored well by a small number of centres, to ensure that bad data is removed from the operational data network, the GTS of WMO.
- The standardised data flow diagram presented merges the current best practice from many of the existing JCOMM data flows. It demonstrates that many elements of the existing data management systems are working well or have a good basis for continued development.

Future challenges

- During discussions this week, some of the challenges JCOMM will face in ensuring that data is collected and shared, could be considered, such as:
  - sustainability of the observing networks in the long term,
  - ability to support quality monitoring and scientific quality control (human resources)
  - integration of information products or services based around types of data (variables/sensors) rather than observing platforms,
  - unique identification of datasets, in order to store and present different views on the same dataset for different applications,
  - and metadata management and retrieval.

- Questions?