WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)

WATER TEMPERATURE METADATA (META-T) PILOT PROJECT

SECOND WORKSHOP

GENEVE, SWITZERLAND, 16 - 17 SEPTEMBER 2008

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ITEM: 4

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FINAL REPORT FORM THE FIRST META-T WORKSHOP

(JCOMM/OCG Workshop to Establish a Pilot Project for the Collection of Real-time Metadata Regarding Sea Surface Temperature and Water Temperature Profile Data, Reading, UK, 28-29 March 2006)

(Submitted by the Secretariat)

Appendix:

A **Final report of the first META-T workshop**

JCOMM/OCG WORKSHOP TO ESTABLISH A PILOT PROJECT FOR THE COLLECTION OF REAL-TIME METADATA REGARDING SEA SURFACE TEMPERATURE AND WATER TEMPERATURE PROFILE DATA

Reading, United Kingdom, 28-29 March 2006

FINAL REPORT

JCOMM Meeting Report No. 41

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JCOMM/OCG WORKSHOP TO ESTABLISH A PILOT PROJECT FOR THE COLLECTION OF REAL-TIME METADATA REGARDING SEA SURFACE TEMPERATURE AND WATER TEMPERATURE PROFILE DATA

Reading, United Kingdom, 28-29 March 2006

FINAL REPORT

JCOMM Meeting Report No. 41

NOTE

C O N T E N T S

GENERAL SUMMARY OF THE WORKSHOP

1. Opening

1.1. The JCOMM/OCG Workshop to Establish a Pilot Project for the Collection of Real-time Metadata Regarding Sea Surface Temperature and Water Temperature Profile Data was opened in the Council Room of the ECMWF, at 14:00 hours on Tuesday, 28 March 2006.

1.2. The list of participants for the workshop is given in *Annex I.*

2. Programme Approval

2.1. The participants approved the programme for this workshop, as given in *Annex II*.

3. Introduction and Goal of the Workshop

3.1. Dr Ed Harrison (USA), the chairperson of this workshop, introduced the background and goal of the workshop. At its seventh session (Brest, France, 26-29 April 2004), the Global Ocean Observing System Scientific Steering Committee (GSSC-VII) requested JCOMM to explore the feasibility of greatly facilitating use of ocean temperature information by increasing the quality and quantity of relevant metadata for real time as well as delayed mode activities.

3.2. The chairperson introduced the following issues to be considered by the workshop:

(i) Minimizing the number of duplicate records;
(ii) Seeking agreed formats and practices, as several communities had been pursuing metadata development strategies;
(iii) Seeking to harmonize the ocean, met-ocean and atmospheric community practices as far as possible;
(iv) Reviewing metadata needs of the developing operational oceanography community.

The meeting was expected to develop a strategy, and to establish the pilot project bearing the above considerations in mind.

3.3. Dr Harrison then noted that "metadata" were in principle restricted to that subset of information about a particular measurement or profile that were not time-dependent and/or subjective. Thus such metadata did not include Quality Control flags or information about actual sensor performance.

3.4. Mr Etienne Charpentier (WMO) then presented the goals of the workshop, i.e.

(i) To consider user requirements, metadata relevant for the pilot project, and to draft the list of required metadata and categorization;
(ii) To identify the metadata information that needs to be available in real-time ;
(iii) To identify centre(s) to host/serve metadata;
(iv) To develop an action plan for advancing the pilot project.

A document describing the general scope of the Pilot Project was then introduced. This had been approved by the DBCP, SOT, and JCOMM Management Committee, and is reproduced in *Annex III*. The Terms of Reference for the ad hoc working group for a pilot project are reproduced in *Annex IV*.

4. Brief Description of Observational Networks Producing SST and Temperature Profile Data and Existing/Proposed Metadata Collection Systems

4.0. The workshop reviewed all the observing systems that provide SST and/or temperature profile data, and considered those metadata collection systems already in place, as well as their data management practices.

4.1. Global Ocean Surface Underway Data Pilot Project (GOSUD), Global Temperature-Salinity Profile Program (GTSPP)

4.1.1. The participants noted that the GOSUD data files in NetCDF format which were available on the ftp (ftp://ftp.ifremer.fr/ifremer/gosud/) contained a metadata subset. However metadata distribution was not in real-time whereas the observation data files were distributed in real-time. Information on GOSUD was available on the website: http://www.ifremer.fr/sismer/program/gosud/.

4.1.2. The participants noted that data distributed via GTSPP (http://www.nodc.noaa.gov/GTSPP/) did include information about the location and time of the station, information about how the data were received and the number of repeats of other components found in the 'Station' record. Metadata also included a unique tag, and indicated whether quality control and corrections had been applied. Additional metadata included whether or not a profile was a duplicate of another, and some information about the accuracy and precision of the variables measured. The deepest depth of each profile was also recorded.

4.1.3. It was noted that all metadata, including historical, should be available through GTSPP and GOSUD **(recommendation)**.

4.2. Argo

4.2.1. Dr Brian King (United Kingdom) introduced the current status of the Argo programme. The Argo Project had deployed about 3800 profiling floats in three years of operation of which about 2,500 were currently active. Globally about 100,000 TESACs were produced each year. Extensive efforts had been made for metadata collection and establishing a metadata database: real-time metadata files were available at Argo Global Data Assembly Centres (GDACs, US-GODAE and Ifremer) in NetCDF format (FTP site address: ftp://ftp.ifremer.fr/ifremer/argo/). A description of the Argo metadata format is reproduced in *Annex V*.

4.2.2. The participants noted with appreciation that the present efforts of the Argo group with regard to metadata were very comprehensive and consistent with the goals of thie workshop. The participants also noted that metadata tended to be prepared by national data centres. That is, only a small number of trained people, working in communication with manufacturers, who were required to generate the metadata. This could be a good model for other scientific programmes.

4.2.3. The participants enquired about the possible adjustment/extension of the Argo metadata format, with a view to the real-time distribution of all temperature profile metadata, bearing in mind that the TESAC format does not allow the distribution of metadata. Dr Milan Dragosavac (ECMWF), a member of the WMO CBS Expert Team on Data, noted that BUFR code has shown its efficiency in many situations in this regard. The participants asked the

Secretariat to communicate with WMO/CBS regarding the possible inclusion of metadata in BUFR tables **(action)**. The participants considered that a format for the exchange of real-time metadata should eventually be proposed, subject to general acceptance by the ocean community including JCOMM. Some technical options, including the operational flexibility afforded by two way communications with observing platforms, were also noted for further development and evaluation.

4.3. Data Buoy Cooperation Panel (DBCP)

4.3.1. Mr Etienne Charpentier (WMO), the former Technical Coordinator of the DBCP, introduced the current status of the DBCP regarding metadata collection and transmission. It was noted that the DBCP only deals with drifting buoys and moored buoys in the high seas, hence coastal moorings (with the exception of networks; also included high seas buoys, e.g. USA, Canada, India, United Kingdom) are not monitored by the DBCP. A web based buoy metadata collection system was operationally implemented at JCOMMOPS in January 2005. The scheme was designed in cooperation with the European Group on Ocean Station (EGOS), now subsumed within E-SURFMAR. EGOS provided funding for the required developments. Users' and reference guides were prepared and available for downloading from the system home page (http://wo.jcommops.org/cgi-bin/WebObjects/meta).

4.3.2. The participants also noted that the EGOS historical database had been uploaded into the JCOMMOPS database and that the E-SURFMAR Data Buoy Technical Advisory Group (DB-TAG) was now using it to notify new buoy deployments. The meeting noted that the International Arctic Buoy Programme (IABP) had agreed to use it for the collection of its own metadata, that the Global Drifter Programme was using it through specific procedures that had been discussed between GDC and JCOMMOPS, and that managers of national buoy programmes including those of France, New Zealand, and Ukraine, had started using it. So far, the system had been presented to and agreed upon by three buoy manufacturers (Technocean, Marlin-Yug, and Metocean).

4.3.3. However, the participants recognized that many buoy operators were not using the scheme, mainly because it was time consuming and duplicated work already in place with their own metadata databases. The workshop nonetheless urged buoy operators and manufacturers to comply with the scheme, or to discuss other technical solutions with JCOMMOPS so as to make the metadata available through JCOMMOPS **(recommendation)**. The workshop invited the DBCP Technical Coordinator to work with DBCP Action Groups and Panel Members in order to implement alternate solutions on a case by case basis (e.g. agree on formats, and set up procedures for automatic transfer of files). All buoy deployments should be notified through the web page by the buoy operators **(action)**.

4.3.4. The participants also noted that buoy manufacturers' compliance in collecting metadata, not only for sensors but also for the system itself, was essential. Following the decision at the 21st DBCP session, manufacturers were now asked to clearly and precisely define in the database all the buoy models they are making **(action).**

4.3.5. Professor Guo Fengyi (China) noted that, from his experience in national buoy operation, some important DBCP metadata fields were missing from metadata made available via JCOMMOPS, and that current JCOMMOPS daily files were listing all the buoys from the database instead of only the buoys for which new information was available (updates). That made the JCOMM ODAS metadata database update more difficult. The workshop asked JCOMMOPS to refine its daily file production procedures accordingly and to include record creation and update dates in the daily files (**action**).

4.3.6. The workshop also invited the DBCP to work with CLS/Service Argos to make sure that any metadata required for GTS distribution along with the observations could eventually be processed for inclusion in distributed BUFR reports **(recommendation).**

4.4. Ship Observations Team (SOT)

4.4.1. Mr Graeme Ball (Australia), the JCOMM Ship Observations Team (SOT) chairperson, introduced the current status and plans for metadata under the Voluntary Observing Ship (VOS) and the VOS Climate Project (VOSClim). He noted that no real differences existed between VOS and VOSClim in metadata fields and format, apart from extra photos (drawings) for VOSClim. VOSClim required a range of active metadata to be collected with each observation, including i) ship's heading; ii) apparent wind direction; iii) actual course over ground; iv) actual speed over the ground, v) maximum cargo height; and vi) departure of the Summer Load Line from sea level. Due to limitations in the SHIP code and the CBS decision to suppress further change to character-based codes, these additional elements are recorded in the IMMT log file which is then collected in delayed-mode. In total, there were currently 110 desired fields in VOS metadata, typically collected when recruited and only required to be altered if equipment was subsequently changed. About 80% of VOS observations in ICOADS could be associated with some metadata fields. Other metadata that are not currently recorded but which ideally are required to adequately describe the observation are: i) height of the pressure measurement; ii) height of the wind measurement; and iii) depth of the SST measurement. The list of VOS metadata fields is reproduced in *Annex VI,* as approved by the third session of the Ship Observations Team (SOT-III), Brest, March 2005. This will eventually be incorporated within WMO Publication No. 47.

4.4.2. The participants noted that an *ad hoc* SOT Task Team on Migration to Table Driven Codes (Etienne Charpentier, Graeme Ball, Sarah North, Julie Fletcher, Frits Koek and Pierre Blouch) was established during PMO-III (Hamburg, 23-24 March 2006) to progress the introduction of BUFR from the VOS and VOSClim. Ms Sarah North and Mr Frits Koek, in consultation with Dr. Elizabeth Kent, will compile a draft list of the required data and real-time metadata that are needed to be reported. The draft list will be distributed to all Task Team members by 1 June 2006 with the final list of requirements to be determined by 1 July 2006. The Task Team will also work with the ET/DRC to develop a BUFR template for VOS/VOSClim in time for SOT-IV (April, 2007). The participants recommended that the ad hoc SOT Task Team should interact closely with the Pilot Project in defining a new BUFR template for ship data **(recommendation)**.

4.4.3. The participants noted the issues for VOS/VOSClim, for i) transmitting the data and metadata from ship to shore; and ii) transmitting the data and metadata economically. It was noted that ship to shore data formats will need to be modified to accommodate the additional metadata requirements. The participants also noted that NMSs were very concerned about the additional costs they might incur in transmitting additional metadata from ship to shore. The challenge for the VOS would be to receive the observed data and metadata economically from those ships that, for whatever reason, must send a manual message.

4.4.4. The participants noted that the Ship-of-Opportunity Programme Implementation Panel (SOOPIP) Technical Coordinator maintained a database of profile metadata, including i) probe type and serial number; ii) instrument type, iii) sampling line; iv) maximum depth of the drop; v) QC indicators; and vi) software version. It was noted that some of those metadata were already distributed in real-time in BATHY format (i.e. probe type and associated fall rate equation coefficients, type of data acquisition system).

4.4.5. The participants noted that many SOOPIP ships also belonged to the VOS Scheme and thus must appear in WMO Publication No. 47. For the remaining ships that are not part of the VOS, the participants recommended that the SOT address the issues and consider finding ways for eventually including them in the publication as well **(recommendation)**.

4.4.6. The participants noted that some XBT metadata are routinely provided to the SOOP Coordinator on a semestrial basis (information on ships, probe types, acquisition systems, software versions, quality). The participants recommended that SOOPIP address the issue and propose ways to make these metadata more readily available to the metadata distribution server once/if established by the Pilot Project **(recommendation).**

4.4.7. Regarding real-time distribution of metadata, the workshop noted with concern that SOOPIP (which includes members who are not from operational agencies) had not seriously addressed GTS distribution of XBT data in BUFR. The participants suggested that the JCOMM/OCG address the issue and identify funding for any required software developments **(recommendation).** Dr Dragosavac pointed out that ECMWF used BUFR for all of its observations, including radiosonde observations.

4.5. OceanSITES and Tropical Atmosphere Ocean (TAO) Project

4.5.1. Mr Paul Freitag introduced the current status and plans of OceanSITES and TAO for metadata collection and transmission. The OceanSITES data files in NetCDF format which were available on the ftp (ftp://ftp.ifremer.fr/ifremer/oceansites/) contained a metadata subset. However metadata distribution was not in real-time whereas the observation data files were distributed in real-time. Further information on the project was available on the website: http://www.oceansites.org.

4.5.2. During the first OceanSITES Data Management meeting held in Honolulu HI, USA (16-17 February 2006), a draft format and file naming convention for OceanSITES data was reviewed, modified and accepted. A catalogue of Sites, as well as stations associated with Sites, was still to be created. A report is available from S. Pouliquen, IFREMER.

4.5.3. OceanSITES was in the process of developing a list of quality control best practices and a uniform set of accepted quality indices. A real time QC manual would be developed using a MERSEA document as a starting point. Operators would be asked to document their delayed mode QC procedures for distribution on the WWW, and be encouraged to provide accuracy estimates, as defined by the OceanSITES Steering Team, for inclusion in the metadata. A parameter dictionary based on GF3 family names would also be adopted.

4.5.4. The OceanSITES Data Management meeting also decided that the time series data distribution would be based on a three-tiered system of PI, DAC and GDAC. The DAC responsibility included receipt of PI data, quality control and formatting. The GDAC would provide virtual or centralized access to DAC data sets, maintenance of the OceanSITES catalog, and synchronization with other GDACs.

4.5.5. The participants were pleased to note that the Coriolis Centre would establish a European GDAC for OceanSITES in 2006, and NOAA has expressed interest in developing a second GDAC. The Marine Metadata Interoperability Initiative (http://marinemetadata.org) was considered as a clearinghouse for information on metadata topics. Initial data distribution would be via ftp, and in the future, technologies such as OpenDap would be considered.

4.5.6. Mr Freitag then informed the meeting that the TAO Array metadata were available on the web at http://www.pmel.noaa.gov/tao. Historically there was a vast collection of human-readable metadata for TAO, including all sensors, model numbers, and assumed accuracy information. However, no real-time metadata were available at the moment.

4.5.7. As part of the transition of TAO to NDBC, TAO metadata would be incorporated into an existing database of NOAA coastal buoy and CMAN station metadata. NDBC had also taken up the task of distributing ocean current observations from oil rigs in the Gulf of Mexico.

4.6. Others

Ocean Data Acquisition System (ODAS)

4.6.1. The participants noted that, since 1977, there had been a regular service for obtaining information from Member States on their ocean data buoys and providing wide dissemination of the information collected, in the form of a bulletin. Since 1988, in view of the rapid changes in status of drifting buoys, this bulletin contained only non-drifting ocean data acquisition systems, with the agreed format of presentation decided by the Joint IOC-WMO Working Committee for IGOSS at its fifth session (Paris, November 1988).

4.6.2. In 1999, it was decided to arrange for the existing Non-Drifting ODAS Catalogue to be made available in electronic form. MEDS (Canada) kindly agreed to establish an electronic version of the Bulletin. All countries deploying non-drifting ODAS were to fill in a consolidated form describing the particulars of their ODAS and send it to the IOC Secretariat. This procedure was to be repeated every time there was a change in the status of the deployment. So far, comparative study had been carried out on the different formats of metadata for DBCP, Argo and ODAS.

4.6.3. In response to Recommendation 1 (JCOMM-I), NMDIS (China) volunteered to host the ODAS Metadata Management Center which is responsible for collection, processing and management of ODAS metadata operated by JCOMM Member States, international organizations and cooperative projects. Also an on-line ODAS metadatabase and website (http://www.jcomm.coi.gov.cn) has been established. Professor Fengyi Guo noted that, for operation of ODAS metadata base, more metadata sources for SOT, VOS, and GLOSS are still required to feed the database to improve application and service tools in the metadata management system. It was also noted that streamlined contact with JCOMM Members/Member States on a regular basis was very important to update relevant data and information.

4.6.4. The DBCP worked with the JCOMM Expert Team on Marine Climatology (ETMC) to agree and define a comprehensive list of metadata for ODAS. The current ODAS metadata catalogue is reproduced in *Annex VII*, as adopted by the ETMC. Member States should make their ODAS metadata available to the JCOMM ODAS mtadata cntre.

4.6.5. The participants noted that updates had not been properly incorporated in the ODAS metadata report. Besides, format and procedures for submitting metadata to the JCOMM ODAS metadata database had yet to be defined. Therefore, the participants noted the need for a precise definition and format, and recommended that the Secretariat revisit this issue as soon as possible **(action)**. The participants also urged the ODAS metadata centre to update the archives, including for existing databases (e.g. National Coastal Data Development Centre, NOAA) **(recommendation)**.

5. User requirements

5.1. NWP

5.1.1. The participants noted that, while metadata might not be used in real time assimilation, it was quite useful for reanalysis and model verification. However, only a few centres – such as NAVOCEANO and NCEP – currently perform real time SST assimilation for ocean analysis purposes.

5.1.2. Considering data assimilation, the NWP operators expressed an interest in having metadata such as instrument type transmitted in real time along with the observational data. Meanwhile, it was noted that the assimilation of metadata independent of observational data was more complicated and could possibly introduce errors.

5.1.3. Mr Milan Dragosavac noted that XML could eventually be used for the exchange of metadata. He also informed the participants that the WMO Commission for Basic Systems (CBS) was defining a catalogue of metadata for Automatic Weather Stations that should be agreed upon by the end of 2006. JCOMM had been invited to provide input to CBS in this regard.

5.2. Climate Variability and Related Research / Ocean Modelling and Forecasting.

5.2.1. The participants noted with regret that there was insufficient user representation for climate research, ocean modelling, and climate forecasting at the workshop. It was noted that input from these fields was absolutely needed for establishing and implementing the pilot project.

5.2.2. Dr Ed Harrison (USA) explained that GOOS, GCOS, and WCRP had provided the ocean observation requirement input to the WMO CEOS database, which was used as a reference not only for CEOS but for CGMS as well. It contained two levels of requirements – ideal and threshold – specified by each user community including climate, NWP, and operational oceanography.

5.2.3. Global uniform coverage centres on deployment challenges: a feasibility analysis is required for best integration of existing/planned platforms, with identification of spatial/regional gaps and best deployment capabilities for each region. Sampling requirements should be considered at the same time.

5.2.4. The participants expressed their concerns regarding duplication of data in the historical record. To avoid this, it was recommended to use unique tags as is being practiced with the SOOPIP data (e.g. use of CRC). Other ways include using platform identification and date/time/location as a unique key, together with other types of information such as GTS bulletin header. Indeed, a unique tag might be seen as a required metadata field in the context of the pilot project.. Meanwhile, the participants pointed out that the volume of real-time metadata should be carefully limited as a large amount of metadata would eventually be ignored by many users.

International Comprehensive Ocean-Atmosphere Data Set (ICOADS)

5.2.5. Dr Elizabeth Kent (United Kingdom) introduced this item. ICOADS (http://icoads.noaa.gov) was an archive of GTS and delayed mode data from VOS, drifting and moored buoys, platforms and coastal/island stations. It had recently associated WMO Publication No. 47 metadata with individual VOS observations for the period 1973-2004. ICOADS and the metadata attachment derived from WMO Publication No. 47 would shortly be extended to 2005. The real-time component of ICOADS (ICOADS.RT) derived from the NCEP real time data stream.

5.2.6. Dr Kent noted that ICOADS requirements for metadata were primarily for an accurate archive of metadata and their data sources, for example, WMO Publication No. 47

for VOS or the JCOMM ODAS metadata. Any real time metadata available would be used, but one primary requirement was for up-to-date and historical metadata databases.

5.2.7. For climate applications, it was considered good practice to archive the observation in its original format, before any format conversion. An example is the practice by NCEP of attaching the ship observation in FW-B to the end of the BUFR observation. Dr Kent expressed her concern that BUFR, as a software dependent format, was probably not an ideal archive format.

6. Metadata Categorization

6.0.1 The workshop considered very carefully the definition of metadata for the purpose of the Pilot Project. After considerable discussion, it was agreed that it did not have to precisely define what metadata were, but nonetheless had to address user needs and list required metadata. These metadata might include additional non-observational information characteristic of the platform or its instruments necessary to make better use of the data. The workshop agreed that metadata are generally non-time varying information about data, but that some time-varying information could also be considered by the Pilot Project as metadata.

6.0.2 The participants agreed that the following metadata should be in particular considered by the Pilot Project; (i) information intrinsic to the platform or its instruments and which are not varying during the platform operational life-time; (ii) type of probes (e.g. Deep Blue); (iii) sensor accuracy, as obtained from manufacturers or through pre-deployment calibration; (iv) drogue type of Lagrangian drifter; (v) information from Argo floats, which is cycle dependant and is presently appended to float profiles in technical files; (vi) quality information flags associated to observations, and (vii) quality information such as standard deviation or bias estimated after platform deployment. The above list is non-exclusive, and the participants emphasized that other types of metadata would still be considered by the Pilot Project depending upon actual needs.

6.1. Categorization of required metadata

6.1.1. The participants discussed the categories of metadata that could be considered in the context of the Pilot Project. It was finally agreed that only the following categories should be considered:

(i) Metadata required for real-time distribution along with the observational data;
(ii) Metadata required for real-time applications but made available separately from the observations;
(iii) Metadata made available in delayed mode.

6.1.2. The participants agreed that all categories of metadata should eventually reach the dedicated metadata server(s) that the Pilot Project will be planning to establish. The categories were provisionally defined as follows:

(i) Category 1 metadata require encoding in appropriate observational reports. The meeting agreed that BUFR and NetCDF formats were appropriate and should be the recommended ones. Category 1 metadata should be collected by dedicated metadata server(s) from the GTS and from dedicated data systems (e.g. Argo, OceanSITES, GOSUD) for distribution.

(ii) Category 2 metadata should be made available to the servers by platform operators as soon as possible after operational deployment of observing platforms. Formats in which to make the metadata available will be defined by the

Pilot Project after careful consideration of existing standards (e.g. XML, MarineXML, ISO 19115).

(iii) Category 3 metadata can be made available to the servers after the end of the platform operational lifetime. Formats in which to submit the metadata will be defined by the Pilot Project.

6.2. Metadata Requirement Matrix (categories vs. user requirements)

6.2.1. The participants agreed that the following user requirements should be considered: (i) data assimilation and ocean field analysis; (ii) ocean modelling; (iii) ocean modelling validation; (iv) climate forecasting; (v) seasonal to decadal climate variability; (vi) numerical weather prediction; (vii) satellite calibration; (viii) satellite validation; (ix) SST analysis; (x) operational activities (e.g. weather forecasters, disaster response)' (xi) quality assurance activities serving above applications, and (xii) diagnostics for platform operators.

6.2.2. The participants discussed how metadata from the different observing systems could be organized, and agreed on an initial list of metadata types that the Pilot Project would have to refine. The list of the metadata types is given in *Annex VIII.*

6.2.3. The participants also agreed that the user requirements had to be cross-checked with categories of metadata: in this regard it suggested setting up a matrix. This matrix would include in every requirement vs. category box a list of required metadata types. A draft matrix, which would be continuously updated through the evolution of the Pilot Project, is reproduced in *Annex IX.*

6.2.4. From the matrix, an initial categorization of metadata types could be proposed:

Category 1:

- Operational state of platform (e.g. state of ship)
- Platform type (e.g. moored buoy, drifter, VOS ship, SOOP ship, Research Vessel, profiling float, ODAS)
- Instrument type (e.g. manufacturer)
- Instrument height or depth (e.g. relative to agreed standard)
- Assumed instrument performance/resolution/precision
- Quality information
- Data QC'ed indicator (y/n)
- Data modified indicator (y/n)
- Sampling intervals and schemes
- Averaging schemes
- Unique tag (e.g. CRC)
- Instrument behaviour (e.g. fall rate equation)
- Type of algorithm used to convert the data

Category 2:

- Platform characteristics (e.g. size, dimensions, manufacturer)
- Instrument calibration status
- Instrument location information
- Period of validity of metadata
- Information regarding data centre processing the data
- Location of further information (e.g. photos, drawings)
- Data management information (e.g. creation date, update date)

- Housekeeping parameter (e.g. battery voltage)
- Data telecommunication system (e.g. Argos, Iridium, Code 41)

Category 3:

- Operator of platform or instrument
- Global programme in which platform is participating (e.g. Argo, VOS)

The participants again emphasized that this was only an initial exercise which required further refinement and in depth analysis. The Pilot Project would be tasked to refine types of metadata, the matrix, and categorization **(action)**.

7. Observational Data Collected via Iridium

7.1. The participants noted that observation programme operators were increasingly considering the use of Iridium for data transmission, as an alternative to the Argos system which had been used for many years. However the use of Iridium, while attractive for many reasons, had implications for inputting the data on to the GTS. In this respect it was noted that it was now possible for CLS/Service Argos to accept Iridium data for encoding for GTS insertion. The meeting recognized the need to address Iridium issues within the context of the pilot project, and the necessity to keep abreast of Iridium developments. The workshop however agreed that it was not the role of the Pilot Project to implement any practical solution.

8. Participation in Developing Pilot Project

8.1. The participants noted with considerable appreciation the offer made by the National Marine Data and Information Service (NMDIS, China), to host metadata servers for the Pilot Project. Professor Fengui Guo suggested the following initial workplan:

(i) To ensure the migration of some important existing metadata fields into the ODAS metadata database;

(ii) To add some new metadata fields – since JCOMMOPS database is continuously being updated, there is a need to include record update date in submitted data to avoid having to process again information that has already been submitted before. At the same time, information regarding where data can be obtained (e.g. URL) should as far as possible be added to the database.

The participants also recommended that JCOMM/OCG address the issue of metadata collection, in view of its eventual integration through the JCOMM ODAS metadata centre **(recommendation)**.

8.2. The National Data Buoy Center (NDBC, NOAA) also expressed its interest to participate in this pilot project by hosting a mirror server, and would investigate feasibility.

9. Funding of Required Developments

9.1. Taking into consideration the requirements for the Pilot Project that had been clearly expressed, not only from data/observation operators but also from metadata users; the participants noted that the project should definitely proceed, but that further support for implementation should be sought.

9.2. The participants also encouraged the experts in relevant fields to voluntarily participate in the Pilot Project.

10. Future Membership of Pilot Project Steering Committee

10.1. While recognizing that there was still a requirement for real-time distribution of some of the metadata, the participants agreed that reference to “real-time” should be deleted from the title of the Pilot Project as the basic goal for the Pilot Project was to facilitate collection and distribution of metadata. The participants agreed that the expression “water temperature” covered requirements for both SST and temperature profile data.

10.2. The participants developed a draft Terms of Reference and membership for the Pilot Project Steering Committee of the Water Temperature Metadata Pilot Project (META-T), considering the relevant activities such as JCOMM/DMPA, IODE, and Marine Metadata projects. The ToR and proposed membership are given in *Annex X*.

11. Pilot Project Specifications, Workshop Recommendations, and Action Plan

11.1. The recommendations and actions from the workshop are given in *Annex XI.*

12. Closing

12.1. The JCOMM/OCG Workshop for Establishing a Pilot Project to Collect Real-time Metadata from Sea Surface Temperature and Temperature Profile Data closed at 16:00 hours on Wednesday, 29 March 2006.

Annex I

LIST OF PARTICIPANTS

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Annex II

PROGRAMME

28 March 2006, 13h00 – 18h00 (1/2 day)

1. Welcome, call to order, meeting information, working arrangements

2. Agenda approval

3. Introduction and goal of the workshop

4. Brief description of observational networks producing SST and temperature profile data and existing/proposed metadata collection systems

   Rapporteur: Graeme Ball

   4.1 GOSUD, GTSPP
   4.2 Argo
   4.3 DBCP
   4.4 SOT, VOS, VOSClim
   4.5 OceanSITES
   4.6 Other, e.g. ODAS

5. User requirements

   Rapporteur: Paul Freitag

   5.1 NWP
   5.2 Climate variability and related research
   5.3 Ocean modeling and climate forecast

6. Metadata categorization

   Rapporteur: Etienne Charpentier

   6.1 List of categories
   6.2 Metadata requirement matrix
      6.2.1 NWP
      6.2.2 Climate variability and related research
      6.2.3 Ocean modeling and climate forecast

29 March 2006, 08h00 – 12h00 hours

   6.2 Con't …
   6.3 Proposed additions to BUFR tables
   6.4 Catalogue of metadata and related documentation
   6.5 Format issues and possible extension to other variables

29 March 2006, 13h00 – 18h00 hours

7 Observational data collected via Iridium

8 Participation in developing Pilot Project

Rapporteur Sarah North

8.1 Candidate JCOMM centre(s) for serving metadata in real-time
8.2 Data Processing Scheme

9 Funding of required developments

10 Future membership of Pilot Project Steering Committee

11 Pilot project specifications, workshop's recommendations, and action plan

11.1 Draft Terms of References for the Pilot Project Steering Committee

Annex III

GENERAL SCOPE FOR PILOT PROJECT

(as approved by the DBCP, the SOT, and JCOMM Management Committee)

DISCUSSION

Introduction

At its seventh session, Brest, France, 26-29 April 2004, the Global Ocean Observing System Steering Committee (GSC-VII) requested JCOMM to develop and implement, through its OPA and sub-panels, a pilot project for the real-time transmission, through the GTS, of all metadata relevant to the observational data for SST and subsurface temperature profiles. The issue has a number of implications because the various observational systems, data telecommunication systems, and data processing systems in place are not necessarily homogeneous. Moreover, platform operators in charge of such in situ marine observing systems often come from different communities with different perspectives and priorities. Implementation is achieved nationally, although there is substantial room for international coordination and standardization. Fortunately, implementation of most of these systems is well coordinated through dedicated JCOMM sub-panels (e.g. SOT, DBCP, TIP) and other associated pilot projects (e.g. Argo). Each of these sub-panels define, or are defining, their strategy regarding metadata in relatively independent ways. Considering the kind of resources that can be expected within the JCOMM community, there are a number of things that can be achieved realistically, but unfortunately others which might seem difficult to implement. This document analyzes what's in place, and provides suggestions regarding how such a project could be developed realistically.

Definition: For the purpose of this pilot project, metadata are defined as information intrinsic to the platform or its instruments and which are not varying during the platform operational lifetime. Information which is varying during the platform operational lifetime is regarded as observational data and is normally transmitted in real-time (the latter is therefore not relevant for this pilot project). For example, quality information flags are not regarded as metadata. Also sensor accuracy, as obtained from manufacturers or through pre-deployment calibration, is regarded as a metadata but not the real accuracy after six months at sea as such accuracy might have drifted. For a Lagrangian drifter, drogue type is a metadata but the drogue status (attached/detached) is not a metadata and can be regarded as real-time data. Information from Argo floats, which is cycle dependant and is presently appended to float profiles in technical files, is not regarded as metadata.

1) Observing systems

Concerned observing platforms and instrumentation are indicated in the table below.

SST

Table 1: Observing systems measuring SST

	Technology	Implementation body	Number of platforms	Reliability	Telecom system	R/T distrib.
Drifting buoys	Hull thermistor (e.g. PT-100).	DBCP	>900	Reliable and robust	Argos	FM 18-XII BUOY FM 94-XII Ext. BUFR
Meteorological moorings	Hull thermistor	DBCP and National	>120	Reliable and robust	DCP, Iridium	FM 13-XII Ext. SHIP
Oil rigs platforms	Wide range; Intake (e.g. 21m below), Hull contact	National	<100 (e.g. UK operates 36 platforms & 10 rigs)	Reliable and robust	DCP, email	FM 13-XII Ext. SHIP
TAO type moorings	Hull thermistor	DBCP/TIP (TAO/TRITON/PIRATA)	83	Reliable and robust	Argos	FM 18-XII BUOY, FM 94-XII Ext. BUFR
Time series stations (moorings)	Hull sensor, floating sensor, …	OceanSites	60 planned	Reliable and robust	Argos, Iridium Not all stations report in real-time	FM 18-XII BUOY
Voluntary Observing Ships (VOS)	Bucket, hull sensor, condenser or seawater intake	SOT/VOS	4000 – 6000 approx.	Variable	Primarily Inmarsat-C, code 41 Occasionally Inmarsat B or A, email, coast radio delayed mode	FM 13-XII Ext. SHIP
VOSClim	Bucket, hull sensor, intake	VOSClim	100	Acceptable	Inmarsat-C, code 41	FM 13-XII Ext. SHIP
Thermosalinographs	Water intake	SOT/SOOP GOSUD	Small	Good	Inmarsat-C, GOES	FM 62-VIII Ext. TRACKOB

Temperature profiles

<u>Table 2</u>: Observing systems measuring water temperature profiles

	Technology	Implementation	Number of platforms	Reliability	Telecom system	R/T distrib
Drifting buoys	Thermistor strings	DBCP	Small	Fragile but reliable data	Argos	FM 18-XII BUOY, FM 94-XII Ext. BUFR
TAO type moorings	Thermistor string down to 500m	DBCP-TIP	85	Reliable and relatively robust	Argos	FM 18-XII BUOY, FM 94-XII Ext. BUFR
Time series stations (moorings)	Thermistor string	OceanSites	60 planned	Reliable and robust	Argos, Iridium Not all stations report in real-time	FM 18-XII BUOY
Ships Of Opportunity (SOOP)	XBT, CTD, towed CTD	SOOP GTSPP	100	Reliable and robust	Inmarsat, DCP, Argos	FM 63-XI Ext. BATHY
Profiling floats	SEABIRD, FSI	Argo	1200 in May 2004, target: 3000	Very good and robust	Argos, Irridium	NetCDF, FM 64-XI Ext. TESAC

2) Data telecommunication systems

As seen in the above tables, the following satellite data telecommunication systems are being used or might be used in the future:

- o Argos, used operationally
- o DCP, used operationally (e.g. GOES, METEOSAT, GMS)
- o Inmarsat-C, used operationally (WMO code 41)
- o Iridium, potentially used operationally in the future

For all of these systems except VOS data transmitted in SHIP format via Inmarsat, observational data are transmitted in real-time or quasi real-time to the ground segment via satellite in raw format (note, however, that Shipborne AWS systems using Inmarsat or Argos are increasingly being used). However, the raw data are not necessarily included in all observed data (e.g. all high resolution XBT data from the US SEAS programme are transmitted in real-time, while XBT data transmitted via Argos are low resolution; in which case the high resolution data are collected in delayed mode once the ship comes to port). Real time distribution to operational users therefore implies data processing, either at the ground segment dedicated to the system (e.g. Argos, DCP), or at centres operated by data users (e.g. Inmarsat, Iridium). Even for VOS data, some data processing must be achieved at national meteorological centres.

3) Data formats

Two different real-time data distribution systems are being used at the moment for the concerned platforms.

3.1) The Global Telecommunications system (GTS)

1. FM 18 XII BUOY, frozen format, limited number of metadata applicable to SST or profile data (i.e. identification, buoy type, drogue type, drogue depth, depth correction indicator, length of cable).
2. FM 63-XI Ext.BATHY, frozen format, limited number of metadata applicable (i.e. identification, selected depth vs. significant depth, instrument type, probe type and associated fall rate equation coefficients for XBT data).
3. FM 64-XI Ext. TESAC, limited number of metadata, frozen format (i.e. identification, selected depth vs. significant depth, instrument type, probe type and associated fall rate equation coefficients for XBT data).
4. FM 13-XII Ext. SHIP, frozen format, limited number of metadata (i.e. identification, manual vs. automatic, type of SST measurement (intake, bucket, hull contact)).
5. FM 62-VIII Ext. TRACKOB, frozen format, no metadata.
6. FM 94-XII Ext. BUFR, a number of templates are presently defined for specific observation systems (http://www.wmo.ch/web/www/DPS/Migration/BUFRCREXTemplates0403.pdf). BUFR templates relevant to SST and temperature profile data (i.e. buoys, ship, XBT/XCTD, sub-surface profiling floats) include some metadata. Additions are possible, including for new metadata descriptors that do not presently exist in BUFR tables. Any modification to the BUFR templates, or additions of new descriptors must be requested through the CBS Expert Team on Data Representation and Codes. This process works but takes between one and two years from initial proposal to operational implementation. It should be noted, that a limited number of metadata information can be included in BUFR templates provided that such metadata are essential for data assimilation into the models. The Expert Team on Data Representation and Codes would probably be reluctant to approve BUFR templates that would include extensive sets of metadata which are not essential for operational models. This will have to be properly addressed anyway once the need for real-time distribution of metadata is clearly identified, justified, and documented.
7. FM 95-XII CREX; CREX is similar to BUFR except that this is a character code form which can be readable by a human. BUFR templates can be used with CREX. However, BUFR, not CREX, is already being used for GTS distribution of buoy data, and BUFR provides for data compression, not CREX. Buoys are an important component for the provision of in situ SST data, and extra/new software developments would be required in case CREX would be chosen. It is therefore recommended to go to BUFR instead of CREX.

The only practicable and realistic solution for the real time GTS distribution of metadata is therefore BUFR provided that the number of metadata fields added remains limited and that justification for addition of such fields is well documented.

3.2) the Argo Data System

Argo Data System provides for real-time distribution of Argo profiling float data in real-time (less than 24 hours) in NetCDF format (see http://www.coriolis.eu.org/cdc/argo/argo-dm-user-manual.pdf). Real-time data are made available through ftp sites at the Argo Global Data Acquisition Centres (GDAC), i.e. US-GODAE server, USA, and Coriolis, France. Argo NetCDF templates were defined and implemented by the Argo Data Management team. They include (i) a template for profile data, (ii) a template for float trajectories, (iii) a template for metadata, and (iv) a template for technological parameters. Profile and trajectory data include a limited number of metadata. The metadata template is comprehensive. However, metadata are not transmitted in real-time along with the observational data but are made available through dedicated ftp sites at GDACs so they are available to users routinely as of platform deployment.

Note that as far as GTS distribution of Argo data are concerned, only TESAC code form is being used at the moment. The Argo Data Management Team is working at developing BUFR encoding and distribution of Argo data in parallel to the Argo Data System.

It should be noted that GOSUD and OceanSites are defined and is defining respectively metadata NetCDF formats compatible with Argo Data System to a large extend. The GOSUD NetCDF metadata are now being distributed via Coriolis GDAC.

4) Real-time data processing and distribution systems

Depending upon the satellite telecommunication system and distribution data system being used, different solutions exist:

Table 3: Real-time data processing systems and distribution used in conjunction with the different satellite data collection systems

	GTS	Argo Data System
Argos	Argos GTS sub-system	Argo GDACs: US-GODAE and Coriolis
DCP	GOES: NOAA data processing METEOSAT: EUMETSAT GMS: JMA	Not used
Inmarsat	VOS: WMO Code 41 SOOP : NOAA/AOML	Not used
Iridium	To be developed	To be developed

For the metadata directly provided by the platform operators, disseminating the metadata in real time together with the observed data would require upgrading such data processing systems. This implies (i) software development, (ii) testing, (iii) operating the new system to permit practical insertion of the required metadata into the system upon platform deployment. As shown in the following table, all these steps take time and resources, including development and running costs.

For the metadata only available onboard and that have to be transmitted ashore via satellite data transmission, onboard software will need to have the capability to acquire them and send them through satellite channels along with the observational data.

Table 4: Development efforts and running costs implied for the different real-time data processing and distribution systems

	Development effort	Running costs
Argos GTS sub-system	Limited provided BUFR is chosen, as the system has already the capability of encoding observational data in BUFR	Metadata entered manually into the system by Argos user office. Could be limited for buoy data provided that metadata collected via DBCP metadata collection scheme can be uploaded into Argos database automatically
NOAA data processing for GOES data	NDBC moorings are mainly concerned here. BUFR encoding would have to be developed. This is to be investigated.	To be investigated. Probably limited for NOAA as metadata database is already in place.
EUMETSAT	To be investigated. BUFR encoding would have to be developed.	To be investigated
JMA data processing for GMS data	To be investigated. BUFR encoding would have to be developed.	To be investigated
Argo GDACs	Not necessary as adequate system is already in place. BUFR development is planned.	Resources are presently committed
NOAA/AOML Inmarsat data processing capability	To be investigated. BUFR encoding would have to be developed	Probably limited as required metadata should already be present in NOAA database for most of concerned observing platforms

Generally, metadata are not transmitted by the platform so must be made available at the appropriate centre responsible for real-time distribution to the users. Collecting the metadata can be a very difficult task when dealing with (i) a large number of platform operators and types of observational platforms, and (ii) different satellite data telecommunication systems and ground segments. Hence, even with a fully developed system capable of transmitting the metadata in real time along with the observational data, there is no guarantee that the required metadata will eventually be available at these centres for real-time distribution.

This is one of the challenges: metadata collection from platform operators.

5) Platform operators

Platform operators are well identified through the JCOMM Observations Programme Area dedicated sub-panels. Any recommendations regarding real-time distribution of metadata can therefore be made through such sub-panels with good chances of success provided that all necessary tools are in place; and their development have been funded. Required work for platform operators should be kept to a minimun as many of them provide the data free-of-charge, work under budget constraints, and don't necessarily derive a direct benefit from distribution of the data to the community. As noted above, metadata collection from them remains a challenge.

6) User needs

A list of metadata can easily become extensive and the collection of required metadata not practical. **It is therefore recommended that the rationale for inclusion of any metadata into the real-time distribution system be properly documented and justified by user needs.** It is essential to include such justification in the eventual catalogue of required metadata.

The list below includes metadata that might be considered for distribution. It is given as an example and is not exhaustive. Entries should be inserted or deleted as needed.

1. Agency in charge of the platform
2. Contact for the data.
3. Platform type (CTD, XBT, XCTD, TSG, drifting buoy, moored buoy, Argo float…)
4. Platform manufacturer
5. Date of manufacture
6. Platform model of manufacturer
7. Platform identifier,
8. Data acquisition system type
9. Software name and version that works on data acquisition system
10. Instrument type (e.g. probe type for XBTs)
11. Method of measurement (e.g. hull contact, intake, bucket)
12. In case of intake, sampling depth/pressure of the intake
13. Are the vertical units pressure or depth
14. Sensor type (e.g. PT-100)
15. Sensor accuracy (units to be defined)
16. Sensor resolution (units to be defined)
17. Sensor highest expected drifter (units/year)
18. Fall rate equation for XBTs
19. Hull type for buoys an floats
20. Hull size for drifting buoys
21. Depth of SST sensor below water level
22. Method of SST calculation, if any (e.g. mixed layer average temperature based on profile data)
23. Drogue type for drifting buoys
24. Drogue length for drifting buoys
25. Drogue depth for drifting buoys
26. Information about averaging that may have been applied
27. Raw sampling interval
28. Whether or not any QC has been applied,
29. Whether or not filtering has been applied
30. Whether or not data reduction has been applied
31. Whether or not any values are interpolated/extrapolated rather than measured
32. The identifier of the track if it is a standard line sampled
33. Etc.

Requirement for metadata should be crossed-checked with identified user needs and rationale explained:

1. Data assimilation and ocean field analysis
2. Ocean modelling
3. Ocean modelling validation
4. Climate forecast
5. Seasonal to decadal climate variability
6. Numerical weather prediction
7. Satellite calibration
8. Satellite validation

7) Operational implications

7.1) Metadata distributed in real-time along with the observational data

Operational implications are three-fold:

(i) In order to maximize the number of platforms for which metadata will eventually be available, a proper mechanism should be put in place to permit collection of required metadata from platform operators and implementation of these into the appropriate data processing systems. This mechanism should limit work load on platform operators.

(ii) Distribution of the metadata along with the observational data is a scheme which is not efficient in terms of transmitted data volume as for a given observational platform the same metadata are repeated with every observation. This has potential implications in terms of data telecommunication costs and/or data telecommunication systems load. For example, National operators are presently trying to cut their transmission costs, or to develop cost sharing methods. Also taking the GTS example into account, the size of GTS bulletins is presently limited to 15000 bytes, including for BUFR reports (limit increased to 500,000 bytes for binary reports as of 9/11/2007).

(iii) Observational reports are archived at operational centres and data centres. Duplication can be eliminated through appropriate data processing techniques which would need to be developed. Those data centres not eliminating duplicated data would have to substantially increase the size of the databases hosting the observational data.

7.2) Metadata made available separately from the real-time observational data

As for the metadata distributed in real-time, metadata need to be collected from platform operators through a proper scheme.

Ideally, operational users willing to access such metadata should go to a formal, well advertized, and dedicated centralized place to download the data routinely according to standardized data access protocols. In practice there can be more than one centre running the global metadata distribution system in mirror mode. Format in which such metadata are available should be standardized. This implies that (i) collected metadata are routinely properly formatted and submitted to the dedicated metadata distribution centre(s), and (ii) and that operational users develop the capability to access the metadata routinely, decode them, link them to the corresponding observational data, and assimilate them.

8) Need for international coordination and standardization

The need for international coordination and standardization has already been recognized to some extent through the dedicated panels in charge of in situ observational programmes implementation. Some metadata collection mechanisms have already been put in place or are in the process of being put in place. This is however not sufficient as these mechanisms have been developed in an independent way to a large extent. JCOMM/DMA should therefore work on the following aspects:

1. Proposing categories of metadata, e.g.

   (a) Metadata required for real-time distribution along with the observational data (push approach);
   (b) Metadata useful for operational data assimilation but not necessarily included in observational reports; operational users would access the metadata in real-time through dedicated servers (pull approach);
   (c) Metadata not required in real-time but available internationally in delayed mode for instrument evaluation, re-analysis, and scientific studies;
   (d) Metadata required only for historical records and not necessarily meant for international exchange;

2. Developing a common and standardized metadata data format;

3. Defining protocols and procedures for the exchange of properly formatted metadata reports from the different schemes;

4. Identifying one or more centres willing to host a dedicated metadata database that would collect required information from the different schemes in a centralized way and make such information routinely available to real-time end users.

Table 5: Existing metadata schemes within specific panels, and possible evolutions

Panel	Existing scheme and required developments
DBCP	Metadata collection mechanism scheme is being put in place at JCOMMOPS. Metadata eventually made available to JCOMM ODAS metadata database who could act as a dedicated metadata distribution centre. Format and procedures for submitting metadata to JCOMM ODAS metadata database yet to be defined.
TIP	Metadata are available from TAO project pages (e.g. http://www.pmel.noaa.gov/tao/proj_over/sensors.shtml for TAO, http://www.jamstec.go.jp/jamstec/TRITON/future/index.html for TRITON) but are not however in standard form. Some work involved in order to make metadata available in appropriate data format once such format is agreed upon.
VOS	WMO Publication No. 47. Metadata collected via WMO Secretariat and operationally made available on the WMO web site (http://www.wmo.int/web/www/ois/pub47/pub47-home.htm). VOS Task Team recently revised metadata format. Latter was approved at SOT-III in Brest in March 2004. However, some work would be involved in order to make such metadata available in appropriate JCOMM data format once such format is agreed upon. Note that VOS Task Team is considering XML, as well as for VOSClim. KNMI is planning to implement a BUFR template in the TurboWin software.
VOSClim	Metadata requirements are identical to normal VOS although metadata are stored in a different location. Metadata made available through VOSClim web site (http://www.ncdc.noaa.gov/servlets/marinemeta). Fine to access metadata on a case by case basis through web queries. Some other system should be developed to make the data routinely available for automated operational systems. XML being considered for the future.
SOOP, GTSPP	Some metadata distributed in real-time (probe type and associated fall rate equation coefficients, type of data acquisition system). Other metadata normally provided to the SOOP Coordinator on a semestrial basis. SOOP to address the issue and propose a new system to make these other metadata more readily available. Historical metadata also available through GTSPP and GOSUD.
Argo	Argo data system. Metadata data files in NetCDF format made routinely available routinely through GDACs. NetCDF files to be possibly converted to new JCOMM agreed upon metadata format.
GOSUD	Data system based on NetCDF format compatible with Argo NetCDF format to a large extent. Files made available through GDACs (e.g. ftp://ftp.ifremer.fr/ifremer/gosud/)
OceanSites	Data system being designed and based on NetCDF format compatible with Argo NetCDF format to a large extent. Files eventually made available through GDACs. Note that not all of the sites might be distributing the data in real-time; at least those operated in common with TAO and MERSEA should.

9) General scope for a pilot project and recommendations

Distributing all the required metadata in real-time along with the observations is perhaps not the best approach. For example, Argo defined its own scheme which works well: real-time distribution of the data on one hand, and metadata files made available for every platform via GDACs on the other hand. If the number of required real-time metadata fields is limited to say three or four in every report, then it's probably fine to include them in observational data reports. However, if at the end it appears that we need to distribute 10, 20, or more metadata fields in every RT report, it can surely be expected that CBS and those in charge of GTS data telecommunications within operational meteorological centres, and even data centres to a lower extend, will complain about high and useless volumes of duplicated data as well as about inefficient data exchange.

If source(s) of metadata are well identified, formalized, and work in an operational way, end-users should have no trouble to get the metadata they need from there. Of course, ideally, an end user willing to access the global metadata should get access through one place. To ensure backup and accessibility, more than one dedicated data centre would hold the global metadata database and distribution system in mirror mode with the others. Besides as one would start basically from scratch, one would have a lot of flexibility in defining metadata formats and data exchange procedures. This is an area where JCOMM can provide a lot of expertise and offer solutions. What would be required initially is to identify a number of dedicated and competent people to work at this, and then JCOMM to establish an ad hoc working group to make practical proposals relatively rapidly. As there is a need for this, it can be expected that the required resources be eventually committed.

In any case, whatever the solution, as there are numerous types of platforms, operators, and JCOMM panels involved, the challenge lies with the collection of the metadata from the platform operators, not so much with the distribution. Regarding the distribution, a good, well normalized JCOMM metadata distribution scheme should be more simple to develop than adapting a number of data processing systems (e.g. Argos GTS sub-system, NOAA/AOML for SOOP data, national meteo centres for code 41) to deal with this. It is proposed to establish a combination of (i) real-time distribution of a very limited subset of metadata along with the observational, and (ii) provision of an extensive set of metadata through dedicated JCOMM global data centre(s). Examples of such schemes are proposed in figures 1 and 2 below. In any case, that there should be strong justification by the users for any metadata to be included in real-time reports, and this would have to be documented. The need for other metadata not necessarily included in the real-time reports should also be documented.

In the context of metadata definition given in the introduction to this document, there are metadata which are absolutely needed for real-time distribution (i) platform identifier, (ii) platform location for fixed stations, and (iii) depth of measurement when sensor is placed at fixed depth.

Considering the above situation, the following could be realistically proposed:

1) Introduce four categories of metadata as suggested in paragraph 8 above (1=real-time, 2=operational/pulled, 3=delayed, 4=historical). In the context of this pilot project, we are concerned with categories 1 and 2 only. Such categorization might be refined to some extend.

2) For metadata of category 1, select BUFR for real-time GTS distribution as BUFR is already available for buoy data, and buoys are the primary source of in situ SST data. A number of metadata fields appearing in category 1 should be restricted to the minimum.

3) Identify a contact point for every one of the concerned data processing systems (i.e. Argos, NOAA processing for GOES, EUMETSAT, JMA, Argo GDACs, NOAA/AOML) willing to work closely with JCOMM in this regard.

4) Identify contact points in every national centre (e.g. NOAA/NDBC, JMA, UKMO, Météo France) that has implemented a national solution for GTS distribution of their platform data based upon data collected from a satellite data collection system.

5) For metadata of category 2, establish one or more JCOMM centres dedicated to the routine distribution of metadata from in situ marine observational platforms to operational end users.

6) Organize a workshop with fairly broad community representation, including representatives from (1) the modelling user community, (2) observational platform programme managers or operators from the different observing systems involved (JCOMM/OPA), (3) the scientific community using historical records, (4) data processing centres (JCOMM/DMA, IODE, WDC system), (5) satellite data telecommunication systems, (6) code format experts. The workshop would be tasked to (i) start the project, (ii) refine metadata categorization, (iii) establish rules that determine what metadata fall into what category, (iv) scope out the metadata model framework that starts to organize content, (v) clarify priorities (e.g. what observational systems to target first), (vi) look for candidate centres that might be willing to eventually implement JCOMM dedicated metadata server, and (vii) establish a JCOMM *ad hoc* working group tasked to:

   (i) List metadata that should appear in categories 1 and 2, establish the catalogue, and provide justification in terms of data assimilation in numerical models and operational applications for each of the proposed metadata fields in these categories. Metadata in categories 3 and 4 might still be available, however not in real time, through other existing or yet to be defined scheme(s) (e.g. ODAS metadata database, WMO publication 47).

   (ii) Review BUFR tables and templates and list any required additions and modifications to the templates (from category 1). Work through the CBS Expert Team on Data Representation and Codes for proposing such additions and/or modifications.

   (iii) Work with identified contact points for each concerned data processing system and national centre to investigate and report on implications in terms of development cost and subsequent running costs for routinely producing and distributing in real-time BUFR reports that include category 1 metadata in addition to observations. Suggest alternate solutions if needed, e.g. for VOS data, rather than directly producing real-time BUFR reports. It might be more appropriate to have a centre dedicated to encoding and distributing BUFR reports in real-time, including observational data and metadata, based on one hand on regular SHIP reports collected through Code-41, and on the other hand WMO Publication No. 47 information. On the other hand, KNMI is planning to implement a BUFR template in the TurboWin software so direct distribution of some metadata which might also be a solution for those ships using Turbowin, provided that a cost-effective satellite data transmission is found.

   (iv) Possibly investigate how GTS distribution of data collected via Iridium could be realized. For example, a set of national solutions could be proposed, or a dedicated centre could provide this as a contribution in kind or it could be internationally funded. Development and operating costs for the latter solution would therefore have to be evaluated.

   (v) For metadata in category 2, define dictionary and format for the exchange of such metadata. Investigate level of compatibility and feasibility to merge such a database with JCOMM ODAS metadata database as defined by JCOMM Expert Team on Marine Climatology (ETMC). ODAS metadata database was not designed for real-time data exchange, and covers buoys, island stations, platforms, rigs, light stations etc. However, neither ODAS metadata database nor WMO Publication No. 47 are covering oil platforms and rigs very well. ETMC was asked by JCOMM/SOT to review the ODAS database in this respect. The subgroup is invited to make sure that the model can be extended to other variables than SST and temperature profile data, and to consider existing standards when making recommendations regarding any international standard applicable to the issue (e.g. Marine XML, http://www.marinexml.net/, or Content Standard for Digital Geospatial Metadata of the US Federal Geographic Data Committee, http://www.fgdc.gov/metadata/metadata.html).

(vi) Liaise with appropriate JCOMM/DMPA, JCOMM/OPA sub-panels, and Argo, to suggest how category 2 metadata would be made readily available to centralized and operational JCOMM database and distribution system and how they would eventually be made available to the end users (procedures and protocols). The subgroup is also invited to consider the integration that is taking place in the oceanographic community regarding metadata (e.g. Argo, GOSUD, and OceanSites are integrating their metadata NetCDF formats and distribution systems).

(vii) Identify one or more centres willing to host such a database and associated distribution system, and possibly willing to support associated development and running costs as a contribution in kind to the project (if not, evaluate costs).

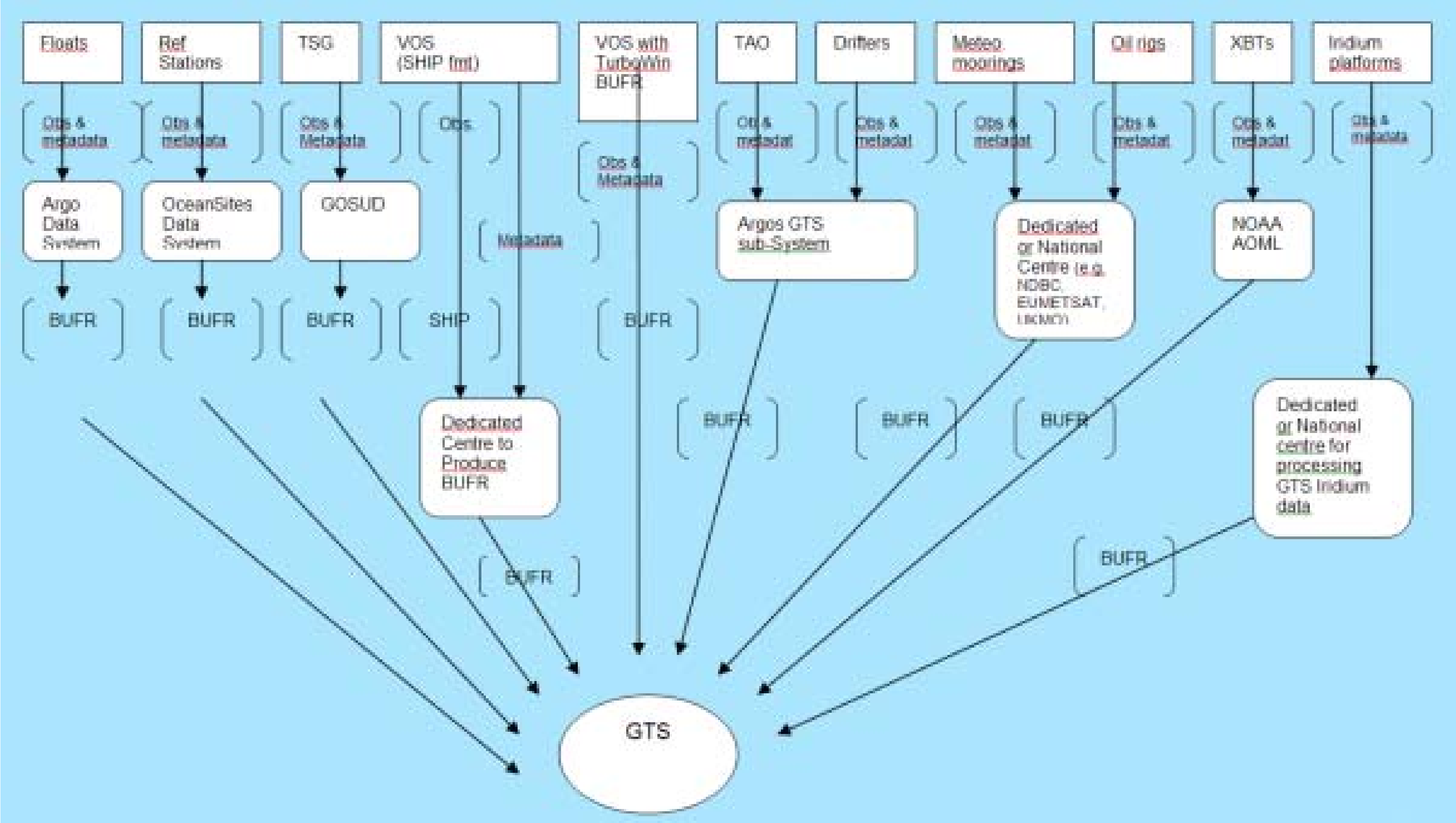
(viii) Make final recommendation regarding development feasibility, schedule and funding.

(ix) Suggest other solutions if needed.

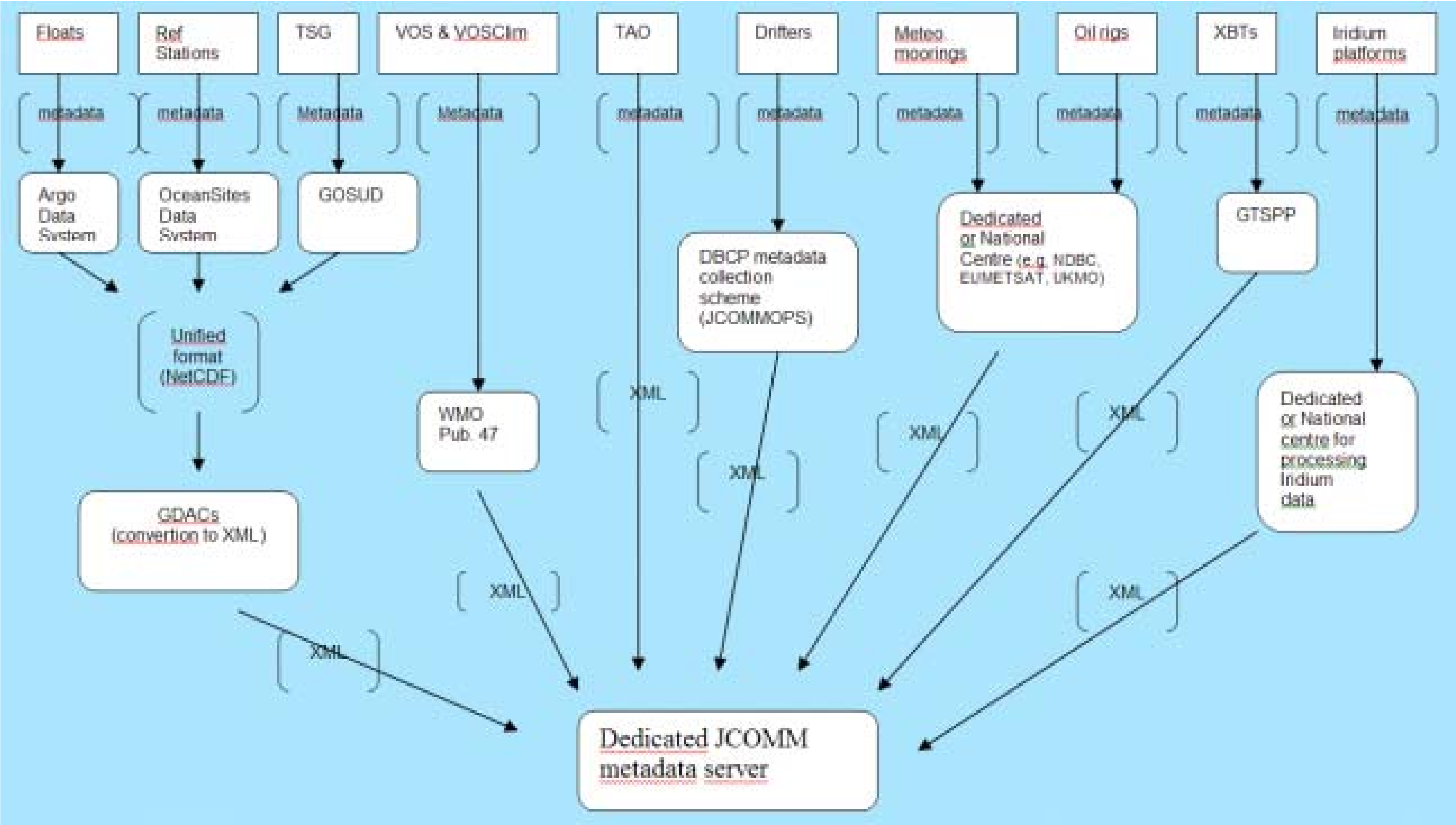
7) Look for funding sources to implement proposed solutions.

8) Implement and document the new system, and recommend that platform operators make sure that the required metadata are properly made available to the system.

<u>Figure 1</u>: An example of real-time GTS distribution for a limited sub-set of metadata (category 1)



<u>Figure 2</u>: An example of metadata collection and distribution scheme for real-time users (category 2)



Annex IV

TERMS OF REFERENCE

for the *ad hoc* Working Group for Establishing a Pilot Project to Collect in Real-time Metadata from SST and Temperature Profile Data

The ad hoc working group shall:

(i) Categorize metadata, establish the catalogue, and provide justification in terms of data assimilation in numerical models and operational applications for each of the proposed metadata fields in these categories.

(ii) For metadata which distribution would be required along with the observational data, review BUFR tables and templates and list any required additions and modifications to the templates.

(iii) Work with identified contact points for each concerned data processing system and national centre to investigate and report on implications in terms of development cost and subsequent running costs for routinely producing and distributing in real-time BUFR reports that include required metadata in addition to the observations. Suggest alternate solutionS if needed (e.g. for VOS data).

(iv) Possibly investigate how GTS distribution of data collected via Iridium could be realized and investigate financial implications.

(v) For metadata which distribution would not be required along with the observational data, define dictionary and format for the exchange of such metadata. Investigate level of compatibility and feasibility to merge such a database with JCOMM ODAS metadata database as defined by JCOMM Expert Team on Marine Climatology (ETMC).

(vi) Make sure that the defined model can potentially be extended to other variables than SST and temperature profile data, and consider existing standards when making recommendations regarding any international standard applicable to the issue (e.g. Marine XML, or Content Standard for Digital Geospatial Metadata of the US Federal Geographic Data Committee).

(vii) For metadata which distribution would not be required along with the observational data, liaise with appropriate JCOMM/DMPA, JCOMM/OPA sub-panels, and Argo, to suggest how they would be made readily available to a centralized and operational JCOMM database and distribution system and how they would eventually be made available to the end users (procedures and protocols). The subgroup is also invited to consider the integration that is taking place in the oceanographic community regarding metadata (e.g. Argo, GOSUD, and OceanSITES are integrating their metadata NetCDF formats and distribution systems).

(viii) Identify one or more centres willing to host such a database and associated distribution system, and possibly willing to support associated development and running costs as a contribution in kind to the project (if not, evaluate costs).

(ix) Write specifications for the pilot project, and make final recommendations to OCG regarding development feasibility, schedule and funding.

(x) Suggest other solutions if needed.

Annex V

ARGO METADATA FORMAT

(from Argo Users's manual v. 2.01b)
(http://www.coriolis.eu.org/cdc/argo/argo-dm-user-manual.doc)

Meta-data format 2.1

An Argo meta-data file contains information about an Argo float.

For file naming conventions, see §4.1 .

Dimensions and definitions

Name	Definition	Comment
DATE_TIME	DATE_TIME = 14;	This dimension is the length of an ASCII date and time value. Date_time convention is : YYYYMMDDHHMISS YYYY : year MM : month DD : day HH : hour of the day MI : minutes SS : seconds Date and time values are always in universal time coordinates (UTC). Examples : 20010105172834 : January 5th 2001 17:28:34 19971217000000 : December 17th 1997 00:00:00
STRING256 STRING64 STRING32 STRING16 STRING8 STRING4 STRING2	STRING256 = 256; STRING64 = 64; STRING32 = 32; STRING16 = 16; STRING8 = 8; STRING4 = 4; STRING2 = 2;	String dimensions from 2 to 256.
N_CYCLES	N_CYCLES = <int value> ;	Number of different nominal cycles. This value is usually set to 1 : all the cycles are programmed to be the same. However, some floats may perform cycles with different programming. Example : a float is programmed to perform regularly 4 cycles with 400 decibar profiles and the 5th cycle with a 2000 decibar profile. In that case, N_CYCLE is set to 2. N_CYCLES = 2 The first N_CYCLE has a REPETITION_RATE of 4 and the second has a REPETITION_RATE of 1.
N_PARAM	N_PARAM=<int value> ;	Number of parameters measured or calculated for a pressure sample. Examples : (pressure, temperature) : N_PARAM = 2 (pressure, temperature, salinity) : N_PARAM = 3 (pressure, temperature, conductivity, salinity) : N_PARAM = 4

General information on the meta-data file

This section contains information about the whole file.

Name	Definition	Comment
DATA_TYPE	char DATA_TYPE(STRING16); DATA_TYPE:comment = "Data type"; DATA_TYPE:_FillValue = " ";	This field contains the type of data contained in the file. The list of acceptable data types is in the reference table 1. Example : Argo meta-data
FORMAT_VERSION	char FORMAT_VERSION(STRING4); FORMAT_VERSION:comment = "File format version "; FORMAT_VERSION:_FillValue = " ";	File format version Example : «2.1»
HANDBOOK_VERSION	char HANDBOOK_VERSION(STRING4); HANDBOOK_VERSION:comment = "Data handbook version"; HANDBOOK_VERSION:_FillValue = " ";	Version number of the data handbook. This field indicates that the data contained in this file are managed according to the policy described in the Argo data management handbook. Example : «1.0»
DATE_CREATION	char DATE_CREATION(DATE_TIME); DATE_CREATION:comment = "Date of file creation "; DATE_CREATION:conventions = "YYYYMMDDHHMISS"; DATE_CREATION:_FillValue = " ";	Date and time (UTC) of creation of this file. Format : YYYYMMDDHHMISS Example : 20011229161700 : December 29th 2001 16:17:00
DATE_UPDATE	char DATE_UPDATE(DATE_TIME); DATE_UPDATE:long_name = "Date of update of this file"; DATE_UPDATE:conventions = "YYYYMMDDHHMISS"; DATE_UPDATE:_FillValue = " ";	Date and time (UTC) of update of this file. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 09:05:00

Float characteristics

This section contains the main characteristics of the float.

Name	Definition	Comment
PLATFORM_NUMBER	char PLATFORM_NUMBER(STRING8); PLATFORM_NUMBER:long_name = "Float unique identifier"; PLATFORM_NUMBER:conventions = "WMO float identifier : A9IIIII"; PLATFORM_NUMBER:_FillValue = " ";	WMO float identifier. WMO is the World Meteorological Organization. This platform number is unique. Example : 6900045 Mandatory
PTT	char PTT (STRING256); PTT:long_name = "Transmission identifier (ARGOS, ORBCOMM, etc.)"; PTT:_FillValue = " ";	Transmission identifier of the float. Comma separated list for multi-beacon transmission. Example : 22507 : the float is equipped with one ARGOS beacon. 22598,22768 : the float is equipped with 2 ARGOS beacons. Mandatory
TRANS_SYSTEM	char TRANS_SYSTEM(STRING16); TRANS_SYSTEM:long_name = "The telecommunications system used"; TRANS_SYSTEM:_FillValue = " ";	Name of the telecommunication system from reference table 10. Example : ARGOS Mandatory
TRANS_SYSTEM_ID	char TRANS_SYSTEM_ID(STRING32); TRANS_SYSTEM_ID:long_name = "The program identifier used by the transmission system"; TRANS_SYSTEM_ID:_FillValue = " ";	Program identifier of the telecommunication subscription. Example : 38511 is a program number for all the beacons of an ARGOS customer. Mandatory
TRANS_FREQUENCY	char TRANS_FREQUENCY(STRING16); TRANS_FREQUENCY:long_name = "The frequency of transmission from the float"; TRANS_FREQUENCY:units = "hertz"; TRANS_FREQUENCY:_FillValue = " ";	Frequency of transmission from the float. Unit : hertz Example : … Mandatory
TRANS_REPETITION	float TRANS_REPETITION; TRANS_REPETITION:long_name = "The repetition rate of transmission from the float"; TRANS_REPETITION:units = "second"; TRANS_REPETITION:_FillValue = 99999.f;	Repetition rate of the transmission system. Unit : second Example : 40 for a repetition of messages every 40 seconds. Mandatory
POSITIONING_SYSTEM	char POSITIONING_SYSTEM(STRING8); POSITIONING_SYSTEM:long_name = "Positioning system"; POSITIONING_SYSTEM:_FillValue = " ";	Position system from reference table 9. ARGOS or GPS are 2 positioning systems. Example : ARGOS Mandatory
CLOCK_DRIFT	float CLOCK_DRIFT; CLOCK_DRIFT:long_name = "The rate of drift of the float clock"; CLOCK_DRIFT:units = "decisecond/day"; CLOCK_DRIFT:_FillValue = "99999.f";	Rate of drift of the float internal clock. Unit : decisecond/day Example : 1.57 Optional
PLATFORM_MODEL	char PLATFORM_MODEL (STRING16); PLATFORM_MODEL:long_name = "Model of the float "; PLATFORM_MODEL:_FillValue = " ";	Model of the float. Example : APEX-SBE Mandatory
PLATFORM_M	char PLATFORM_MAKER (STRING256);	Name of the manufacturer.

Name	Definition	Comment
AKER	PLATFORM_MAKER:long_name = "The name of the manufacturer "; PLATFORM_MAKER:_FillValue = " ";	Example : Webb research Mandatory
INST_REFERENCE	char INST_REFERENCE(STRING64); INST_REFERENCE:long_name = "Instrument type"; INST_REFERENCE:conventions = "Brand, type, serial number"; INST_REFERENCE:_FillValue = " ";	References of the instrument : brand, type, serial number Example : APEX-SBE 259 Mandatory
WMO_INST_TYPE	char WMO_INST_TYPE(STRING4); WMO_INST_TYPE:long_name = "Coded instrument type"; WMO_INST_TYPE:conventions = "Argo reference table 8"; WMO_INST_TYPE:_FillValue = " ";	Instrument type from WMO code table 1770. A subset of WMO table 1770 is documented in the reference table 8. Example : 846 : Webb Research float, Seabird sensor Mandatory
DIRECTION	char DIRECTION; DIRECTION:long_name = "Direction of the profiles"; DIRECTION:conventions = "A: ascending profiles, B: descending and ascending profiles"; DIRECTION:_FillValue = " ";	Direction of the profiles of the float. A : ascending profiles only B : descending and ascending profiles Mandatory
PROJECT_NAME	char PROJECT_NAME(STRING64); PROJECT_NAME:long_name = "The program under which the float was deployed"; PROJECT_NAME:_FillValue = " ";	Name of the project which operates the profiling float that performed the profile. Example : GYROSCOPE (EU project for Argo program) Mandatory
DATA_CENTRE	char DATA_CENTRE(STRING2); DATA_CENTRE:long_name = "Data centre in charge of float real-time processing"; DATA_CENTRE:conventions = "Argo reference table 4"; DATA_CENTRE:_FillValue = " ";	Code of the data centre in charge of the float data management. The data centre codes are described in the reference table 4. Example : ME for MEDS Mandatory
PI_NAME	char PI_NAME (STRING64); PI_NAME:comment = "Name of the principal investigator"; PI_NAME:_FillValue = " ";	Name of the principal investigator in charge of the profiling float. Example : Yves Desaubies Mandatory
ANOMALY	char ANOMALY(STRING256); ANOMALY:long_name = "Describe any anomalies or problems the float may have had."; ANOMALY:_FillValue = " ";	This field describes any anomaly or problem the float may have had. Example : “the immersion drift is not stable.” Optional

Mandatory/optional fields :

- A mandatory field have a valid content, otherwise a warning is sent to the DAC responsible of the float.
- An optional field has a fill value if it is not available.

Float deployment and mission information

Name	Definition	Comment
LAUNCH_DATE	char LAUNCH_DATE(DATE_TIME); LAUNCH_DATE:long_name = "Date (UTC) of the deployment"; LAUNCH_DATE:conventions = "YYYYMMDDHHMISS"; LAUNCH_DATE:_FillValue = " ";	Date and time (UTC) of launch of the float. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 03:05:00
LAUNCH_LATITUDE	double LAUNCH_LATITUDE; LAUNCH_LATITUDE:long_name = "Latitude of the float when deployed"; LAUNCH_LATITUDE:units = "degrees_north"; LAUNCH_LATITUDE:_FillValue = 99999.; LAUNCH_LATITUDE:valid_min = -90.; LAUNCH_LATITUDE:valid_max = 90.;	Latitude of the launch. Unit : degree north Example : 44.4991 : 44° 29’ 56.76’’ N
LAUNCH_LONGITUDE	double LAUNCH_LONGITUDE; LAUNCH_LONGITUDE:long_name = "Longitude of the float when deployed"; LAUNCH_LONGITUDE:units = "degrees_east"; LAUNCH_LONGITUDE:_FillValue = 99999.; LAUNCH_LONGITUDE:valid_min = -180.; LAUNCH_LONGITUDE:valid_max = 180.;	Longitude of the launch. Unit : degree east Example : 16.7222 : 16° 43’ 19.92’’ E
LAUNCH_QC	char LAUNCH_QC; LAUNCH_QC:long_name = "Quality on launch date, time and location"; LAUNCH_QC:conventions = "Argo reference table 2"; LAUNCH_QC:_FillValue = " ";	Quality flag on launch date, time and location. The flag scale is described in the reference table 2. Example : 1 : launch location seems correct.
START_DATE	char START_DATE(DATE_TIME); START_DATE:long_name = "Date (UTC) of the first descent of the float."; START_DATE:conventions = "YYYYMMDDHHMISS"; START_DATE:_FillValue = " ";	Date and time (UTC) of the first descent of the float. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 06 :05 :00
START_DATE_QC	char START_DATE_QC; START_DATE_QC:long_name = "Quality on start date"; START_DATE_QC:conventions = "Argo reference table 2"; START_DATE_QC:_FillValue = " ";	Quality flag on start date. The flag scale is described in the reference table 2. Example : 1 : start date seems correct.
DEPLOY_PLATFORM	char DEPLOY_PLATFORM(STRING32); DEPLOY_PLATFORM:long_name = "Identifier of the deployment platform"; DEPLOY_PLATFORM:_FillValue = " ";	Identifier of the deployment platform. Example : L’ATALANTE
DEPLOY_MISSION	char DEPLOY_MISSION(STRING32); DEPLOY_MISSION:long_name = "Identifier of the mission used to deploy the float"; DEPLOY_MISSION:_FillValue = " ";	Identifier of the mission used to deploy the platform. Example : POMME2
DEPLOY_AVAILABLE_PROFILE_ID	char DEPLOY_AVAILABLE_PROFILE_ID(STRING256);	Identifier of CTD or XBT stations used to verify the first profile. Example : 58776, 58777

Name	Definition	Comment
	DEPLOY_AVALAIBLE_PROFILE_ID:long_name = "Identifier of stations used to verify the first profile"; DEPLOY_AVAILABLE_PROFILE_ID:_FillValue = " ";	
END_MISSION_DATE	char END_MISSION_DATE (DATE_TIME); END_MISSION_DATE:long_name = "Date (UTC) of the end of mission of the float"; END_MISSION_DATE:conventions = "YYYYMMDDHHMISS"; END_MISSION_DATE:_FillValue = " ";	Date (UTC) of the end of mission of the float. Format : YYYYMMDDHHMISS Example : 20011230090500 : December 30th 2001 03:05:00
END_MISSION_STATUS	char END_MISSION_STATUS; END_MISSION_STATUS:long_name = "Status of the end of mission of the float"; END_MISSION_STATUS:conventions = "T:No more transmission received, R:Retrieved"; END_MISSION_STATUS:_FillValue = " ";	Status of the end of mission of the float.

Float sensor information

This section contains information about the sensors of the profiler.

Name	Definition	Comment
SENSOR	char SENSOR(N_PARAM,STRING16); SENSOR:long_name = "List of sensors on the float "; SENSOR:conventions = "Argo reference table 3"; SENSOR:_FillValue = " ";	Parameters measured by sensors of the float. The parameter names are listed in reference table 3. Examples : TEMP, PSAL, CNDC TEMP : temperature in celsius PSAL : practical salinity in psu CNDC : conductvity in mhos/m
SENSOR_MAKER	char SENSOR_MAKER(N_PARAM,STRING256); SENSOR_MAKER:long_name = "The name of the manufacturer "; SENSOR_MAKER:_FillValue = " ";	Name of the manufacturer of the sensor. Example : SEABIRD
SENSOR_MODEL	char SENSOR_MODEL (N_PARAM,STRING256); SENSOR_MODEL:long_name = "Type of sensor"; SENSOR_MODEL:_FillValue = " ";	Model of sensor. Example : Salinity sensor
SENSOR_SERIAL_NO	char SENSOR_SERIAL_NO(N_PARAM,STRING16); SENSOR_SERIAL_NO:long_name = "The serial number of the sensor"; SENSOR_SERIAL_NO:_FillValue = " ";	Serial number of the sensor. Example : SBE211
SENSOR_UNITS	char SENSOR_UNITS(N_PARAM, STRING16); SENSOR_UNITS:long_name = "The units of accuracy and resolution of the sensor"; SENSOR_UNITS:_FillValue = " ";	Units of accuracy of the sensor. Example : psu
SENSOR_ACCURACY	float SENSOR_ACCURACY(N_PARAM); SENSOR_ACCURACY:long_name = "The accuracy of the sensor"; SENSOR_ACCURACY:_FillValue = 99999.f;	Accuracy of the sensor. Example : 0.005
SENSOR_RESOLUTION	float SENSOR_RESOLUTION(N_PARAM); SENSOR_RESOLUTION:long_name = "The resolution of the sensor"; SENSOR_RESOLUTION:_FillValue = 99999.f;	Resolution of the sensor. Example : 0.001

Float calibration information

This section contains information about the calibration of the profiler. The calibration described in this section is an instrumental calibration. The delayed mode calibration, based on a data analysis is described in the profile format.

Name	Definition	Comment
PARAMETER	char PARAMETER(N_PARAM,STRING16); PARAMETER:long_name = "List of parameters with calibration information"; PARAMETER:conventions = "Argo reference table 3"; PARAMETER:_FillValue = " ";	Parameters measured on this float. The parameter names are listed inreference table 3. Examples : TEMP, PSAL, CNDC TEMP : temperature in celsius PSAL : practical salinity in psu CNDC : conductvity in mhos/m
PREDEPLOYMENT_CALIB_EQUATION	char PREDEPLOYMENT_CALIB_EQUATION(N_PARAM,STRING256); PREDEPLOYMENT_CALIB_EQUATION:long_name = "Calibration equation for this parameter"; PREDEPLOYMENT_CALIB_EQUATION:_FillValue = " ";	Calibration equation for this parameter. Example : Tc = a1 * T + a0
PREDEPLOYMENT_CALIB_COEFFICIENT	char PREDEPLOYMENT_CALIB_COEFFICIENT(N_PARAM,STRING256); PREDEPLOYMENT_CALIB_COEFFICIENT:long_name = "Calibration coefficients for this equation"; PREDEPLOYMENT_CALIB_COEFFICIENT:_FillValue = " ";	Calibration coefficients for this equation. Example : a1=0.99997 , a0=0.0021
PREDEPLOYMENT_CALIB_COMMENT	char PREDEPLOYMENT_CALIB_COMMENT(N_PARAM,STRING256); PREDEPLOYMENT_CALIB_COMMENT:long_name = "Comment applying to this parameter calibration"; PREDEPLOYMENT_CALIB_COMMENT:_FillValue = " ";	Comments applying to this parameter calibration. Example : The sensor is not stable

Float cycle information

This section contains information on the cycle characteristics of the float. The values included in this section are programmed or estimated. They are not measured.

Each value has a N_CYCLES dimension. Each N_CYCLE describes a cycle configuration.

Name	Definition	Comment
REPETITION_RATE	int REPETITION_RATE(N_CYCLES); REPETITION_RATE:long_name = "The number of times this cycle repeats"; REPETITION_RATE:units = "number"; REPETITION_RATE:_FillValue = 99999;	Number of times this cycle repeats. Usually, REPETITION_RATE and N_CYCLE are set to 1 : all the cycles are programmed to be the same. However, some floats may perform cycles with different programming. Example : a float is programmed to perform regularly 4 cycles with 400 decibar profiles and the 5th cycle with a 2000 decibar profile. In that case, N_CYCLE is set to 2. The first N_CYCLE has a REPETITION_RATE of 4 and the second has a REPETITION_RATE of 1.
CYCLE_TIME	float CYCLE_TIME(N_CYCLES); CYCLE_TIME:long_name = "The total time of a cycle : descent + parking + ascent + surface"; CYCLE_TIME:units = "decimal hour"; CYCLE_TIME:_FillValue = 99999.f;	Total time of a cycle. This time includes the descending time, the parking time, the ascending time and the surface time. Unit : decimal hour Example : 240 hours for a ten day cycle.
PARKING_TIME	float PARKING_TIME(N_CYCLES); PARKING_TIME:long_name = "The time spent at the parking pressure"; PARKING_TIME:units = "decimal hour"; PARKING_TIME:_FillValue = 99999.f;	Time spent at the parking pressure. This time does not include the descending and ascending times. Unit : decimal day Example : 222 for 9 days and 6 hours at parking pressure.
DESCENDING_PROFILING_TIME	float DESCENDING_PROFILING_TIME(N_CYCLES); DESCENDING_PROFILING_TIME:long_name = "The time spent sampling the descending profile"; DESCENDING_PROFILING_TIME:units = "decimal hour"; DESCENDING_PROFILING_TIME:_FillValue = 99999.f;	Time spent in descent. Unit : decimal hour Example : 8.5 for 8 hours 30 minutes of descending
ASCENDING_PROFILING_TIME	float ASCENDING_PROFILING_TIME(N_CYCLES); ASCENDING_PROFILING_TIME:long_name = "The time spent sampling the ascending profile"; ASCENDING_PROFILING_TIME:units = "decimal hour"; ASCENDING_PROFILING_TIME:_FillValue = 99999.f;	Time spent in ascent. Unit : decimal hour Example : 7.5 for 7 hours 30 minutes of descending
SURFACE_TIME	float SURFACE_TIME(N_CYCLES); SURFACE_TIME:long_name = "The time spent at the surface."; SURFACE_TIME:units = "decimal hour";	Time spent on the surface (surface drift). Unit : decimal hour Example : 10 for a 10 hours surface drift.

Name	Definition	Comment
	SURFACE_TIME:_FillValue = 99999.f;	
PARKING_PRESSURE	float PARKING_PRESSURE(N_CYCLES); PARKING_PRESSURE:long_name = "The pressure of subsurface drifts"; PARKING_PRESSURE:units = "decibar"; PARKING_PRESSURE:_FillValue = 99999.f;	Pressure of the subsurface drift. Unit : decibar Example : 1500.0 for a subsurface drift at 1500.0 decibars.
DEEPEST_PRESSURE	float DEEPEST_PRESSURE(N_CYCLES); DEEPEST_PRESSURE:long_name = "The deepest pressure sampled in the ascending profile"; DEEPEST_PRESSURE:units = "decibar"; DEEPEST_PRESSURE:_FillValue = 99999.f;	Deepest pressure sampled in the ascending profile. Unit : decibar Example : 2000.0 for an ascending profile starting at 2000.0 decibar.
DEEPEST_PRESSURE_DESCENDING	float DEEPEST_PRESSURE_DESCENDING(N_CYCLES); DEEPEST_PRESSURE_DESCENDING:long_name = "The deepest pressure sampled in the descending profile"; DEEPEST_PRESSURE_DESCENDING:units = "decibar"; DEEPEST_PRESSURE_DESCENDING:_FillValue = 99999.f;	Deepest pressure sampled in the descending profile. Unit : decibar Example : 500.0 for a descending profile ending at 500.0 decibar.

Annex VI

VOS METADATA FIELDS, IN SEMI-COLON DELIMITED EXCHANGE FORMAT, FOR INCLUSION IN WMO PUBLICATION NO. 47 (FROM 1 JULY 2007)

(proposed at JCOMM/SOT-III, Brest, 7-12 March 2005)

Order	Code name	Explanation	Table	Format	Example
1	rcnty;	Recruiting country.	1801		
2	ver;	Version of Pub47 format.			03
3	prepared;	Date of report preparation.		ddmmyyyy	
4	name;	Ship's name.			
5	reg;	Country of registration.	1801		
6	call;	Call sign or WMO Number. Some sea stations are identified by a WMO Number instead of a call sign			
7	IMOn;	IMO Number. Unique identifying number assigned by Lloyd's Register to the hull of the ship.			
8	vssl;	Vessel type.	2201		
9	vsslP;	Vessel digital image.	2203		
10	lenvsslD;	Length overall of the ship, ignoring bulbous bow.		0.0 m	
11	brdvsslD;	Moulded breadth. The greatest breadth amidships.		0.0 m	
12	frbvsslD;	Freeboard. The average height of the upper deck above the maximum Summer load line.		0.0 m	
13	drfvsslD;	Draught. The average depth of the keel below the maximum Summer load line.		0.0 m	
14	chtvsslD;	Cargo height. Maximum height above the maximum Summer load line.		0.0 m	
15	brdg;	Distance of the bridge from the bow.		0.0 m	
16	rte;	Route No.1.	1802		
17	rte;	Route No.2.	1802		
18	rte;	Route No.3.	1802		
19	rte;	Route No.4.	1802		
20	rte;	Route No.5.	1802		
21	rte;	Route No.6.	1802		
22	rte;	Route No.7	1802		
23	rte;	Route No.8.	1802		
24	rte;	Route No.9.	1802		
25	rte;	Route No.10.	1802		

Order	Code name	Explanation	Table	Format	Example
26	vosR;	Recruitment date of the current VOS participation.		ddmmyyyy	
27	vosD;	De-recruitment date of the last VOS participation (report only if the vessel has been re-recruited).		ddmmyyyy	
28	vclmR;	Last VOSClim recruitment date if within the current period of VOS participation.		ddmmyyyy	
29	vclmD;	Last VOSClim de-recruitment date if within the current period of VOS participation.		ddmmyyyy	
30	vsslM;	Type of meteorological reporting ship.	2202		
31	atm;	General observing practice.	0105		
32	freq;	Routine observing frequency.	0602		
33	prST;	Satellite system for transmitting reports.			INMARSAT-C
34	logE;	Name and version of the electronic logbook software.			TurboWin 2.12
35	wwH;	Visual wind/wave observing height.		0.0 m	
36	anmU;	General wind observing practice.	0103		
37	blc;	Baseline check of the automatic weather station.	0203		
38	awsM;	Make and model of the automatic weather station.			Vaisala Milos 500
39	awsP;	Name and version of the automatic weather station processing software.			Yourlink 1.03.20
40	awsC;	Name and version of the automatic weather station data entry/display software.			Milos 500 2.56
41	barm;	Primary barometer type.	0202		
42	barm;	Secondary barometer type.	0202		
43	bMS;	Make and model of the primary barometer.			Vaisala PTB220B
44	bMS;	Make and model of the secondary barometer.			
45	brmH;	Height of the primary barometer above the maximum Summer load line.		0.0 m	
46	brmH;	Height of the secondary barometer above the maximum Summer load line.		0.0 m	
47	brmL;	Location of the primary barometer.	0204		
48	brmL;	Location of the secondary barometer.	0204		
49	brmU;	Pressure units of the primary barometer.			hPa
50	brmU;	Pressure units of the secondary barometer.			
51	brmC;	Most recent calibration date of the primary barometer.		ddmmyyyy	
52	brmC;	Most recent calibration date of the secondary barometer.		ddmmyyyy	

Order	Code name	Explanation	Table	Format	Example
53	thrm;	Dry bulb thermometer type No.1.	2002		
54	thrm;	Dry bulb thermometer type No.2.	2002		
55	thMS;	Make and model of the dry bulb thermometer No.1.			Rosemount ST401
56	thMS;	Make and model of the dry bulb thermometer No.2.			
57	thmE;	Exposure of the dry bulb thermometer No.1.	0801		
58	thmE;	Exposure of the dry bulb thermometer No.2.	0801		
59	thmL;	Location of dry bulb thermometer No.1 and hgyrometer No.1.	2001		
60	thmL;	Location of dry bulb thermometer No.2 and hgyrometer No.2.	2001		
61	thmH;	Height of the dry bulb thermometer No.1 and hygrometer No.1 above the maximum Summer load line.		0.0 m	
62	thmH;	Height of the dry bulb thermometer No.2 and hygrometer No.2 above the maximum Summer load line.		0.0 m	
63	tscale;	General reporting practice for dry bulb thermometer No.1 and hygrometer No.1.	2003		
64	tscale;	General reporting practice for dry bulb thermometer No.2 and hygrometer No.2.	2003		
65	hygr;	Hygrometer type No.1.	0802		
66	hygr;	Hygrometer type No.2.	0802		
67	hgrE;	Exposure of the hygrometer No.1.	0801		
68	hgrE;	Exposure of the hygrometer No.2.	0801		
69	sstM;	Primary method of obtaining the sea surface temperature.	1901		
70	sstM;	Secondary method of obtaining the sea surface temperature.	1901		
71	sstD;	Depth of the primary sea surface temperature observation below the maximum Summer load line.		0.0 m	
72	sstD;	Depth of the secondary sea surface temperature observation below the maximum Summer load line.		0.0 m	
73	barg;	Primary barograph type, or method of determining pressure tendency.	0201		
74	barg;	Secondary barograph type, or method of determining pressure tendency.	0201		
75	anmT;	Primary anemometer type.	0102		
76	anmT;	Secondary anemometer type.	0102		
77	anmM;	Make and model of the primary anemometer.			Vaisala WAV151 & WAA151
78	anmM;	Make and model of the secondary anemometer.			

Order	Code name	Explanation	Table	Format	Example
79	anmL;	Location of the primary anemometer.	0101		
80	anmL;	Location of the secondary anemometer.	0101		
81	anDB;	Distance of the primary (fixed) anemometer from the bow.		0.0 m	
82	anDB;	Distance of the secondary (fixed) anemometer from the bow.		0.0 m	
83	anDC;	Distance of the primary (fixed) anemometer from the centre line.		0.0 m	
84	anSC;	Side indicator of the primary (fixed) anemometer from the centre line, if appropriate.	0104		
85	anDC;	Distance of the secondary (fixed) anemometer from the centre line.		0.0 m	
86	anSC;	Side indicator of the secondary (fixed) anemometer from the centre line, if appropriate.	0104		
87	anHL;	Height of the primary (fixed) anemometer above the maximum Summer load line.		0.0 m	
88	anHL;	Height of the secondary (fixed) anemometer above the maximum Summer load line.		0.0 m	
89	anHD;	Height of the primary (fixed) anemometer above the deck on which it is installed.		0.0 m	
90	anHD;	Height of the secondary (fixed) anemometer above the deck on which it is installed.		0.0 m	
91	anmC;	Most recent calibration date of the primary anemometer.		ddmmyyyy	
92	anmC;	Most recent calibration date of the secondary anemometer.		ddmmyyyy	
93	othI;	Other meteorological/oceanographic instrument No.1.	1501		
94	othI;	Other meteorological/oceanographic instrument No.2.	1501		
95	othI;	Other meteorological/oceanographic instrument No.3.	1501		
96	othI;	Other meteorological/oceanographic instrument No.4.	1501		
97	othI;	Other meteorological/oceanographic instrument No.5.	1501		
98	othI;	Other meteorological/oceanographic instrument No.6.	1501		
99	chgd;	Last date of change to any metadata.value		ddmmyyyy	

Order	Code name	Explanation	Table	Format	Example
100	fieldabbrev;	Code name of the field to which footnote No.1 applies.	0601		vssl
101	fieldabbrev;	Code name of the field to which footnote No.2 applies.	0601		thmE
102	fieldabbrev;	Code name of the field to which footnote No.3 applies.	0601		
103	fieldabbrev;	Code name of the field to which footnote No.4 applies.	0601		
104	fieldabbrev;	Code name of the field to which footnote No.5 applies.	0601		
105	fieldabbrev;	Code name of the field to which footnote No.6 applies.	0601		
106	fieldabbrev;	Code name of the field to which footnote No.7 applies.	0601		
107	fieldabbrev;	Code name of the field to which footnote No.8 applies.	0601		
108	fieldabbrev;	Code name of the field to which footnote No.9 applies.	0601		
109	fieldabbrev;	Code name of the field to which footnote No.10 applies.	0601		
110	footID;	Footnote No.1 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			Ice strengthened
111	footID;	Footnote No.2 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			Plastic screen
112	footID;	Footnote No.3 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
113	footID;	Footnote No.4 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
114	footID;	Footnote No.5 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
115	footID;	Footnote No.6 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
116	footID;	Footnote No.7 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
117	footID;	Footnote No.8 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
118	footID;	Footnote No.9 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
119	footID;	Footnote No.10 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			

Annex VII

ODAS METADATA CATALOGUE

(as adopted by JCOMM Expert Team on Marine Climatology)

Record type and sequence #		Field Abbre-viation	Input codes	Description of fields
Header Record (HR)				
HR	1	**ts**	 MB DB ID FP IS AL CM PF OT	Type of station - Moored Buoy Drifting buoy Ice Drifter Fixed Platform (oil Rig, etc.) Island Station Automatic Light Station Coastal Marine Automated Station Profiling floats (e.g. ARGO - a global array of profiling floats) Other (specify in footnote # 1 Header Record)
	2	**WMOn**		WMO Number - 5 digit identifier
	3	**stn**		Unique call sign if available; otherwise, station name (C-MAN, Platforms, etc.)
	4	**AIn**		Additional Identifier Number ; define in footnote # 2 (e.g. ARGOS = up to 7 digits, GOES No., others)
	5	**ind**		Period of validity / beginning of historical record (initiation date - year, month, day e.g. 19950321) date of mooring, launching, or platform instrumentation (date the platform began collecting weather observations under its current ID and location). If the platform is moved or assigned a new ID then a new period of validity should be initiated.
	6	**oed**		Operational end date of platform operations (year, month, day e.g. 20000127). This item is associated with the entry above which shows the beginning date and this item the ending date when a platform closed operations. If for example a moored buoy was placed in the Great Lakes each Spring and withdrawn each Winter the beginning date would not change unless the identifier, ownership, or location changed at some point. When one of these change a new beginning date should be entered ind above and a operational end date entered in this field.
	7	**cnty**	see list	Country of ownership - International Organization for Standardization (ISO) country code (Alpha-2; two character alpha code)
	8	**ragy**		Responsible agency/organization within a country responsible for the platform s operations, launch, and metadata [e.g. in the USA it could be National Ocean Service (NOS) NOAA , National Data Buoy Center (NDBC) NOAA, Woods Hole Institute, etc.] List the full name of the organization or agency responsible. There should be a link between the responsible agency/organization and web address listed in item 114.
	9	**ldmu**		Last date metadata updated (year, month, day e.g. 20000527 representing 27 May 2000)

Record type and sequence #		Field Abbre-viation	Input codes	Description of fields
	10	**DA**	 1 2 3 4 5	Degree of Automation Fully automated Always supplemented with manual input Occasionally supplemented with manual input Fully manual (no automation) Unknown
	11	**Lat**		latitude - degrees, up to three decimal places if available (e.g. 50. 985 N/S)
	12	**Lon**		Longitude - degrees, up to three decimal places if available (e.g. 124.976 E/W)
	13	**WC**		Watch Circle - nearest whole meter (e.g. 346.5 = 347 meters) . The maximum distance a moored buoy can be located from its central position related to the length and type of mooring. Outside the watch circle and the moored buoy is likely adrift.
	14	**lngth**		Length - the length of the platform (if rectangular or boat shape hull). See code diam below if the platform is a discus. Meters to tenths (e.g. 26. 9 meters)
	15	**brth**		Breath - the breath (width) of the platform (if rectangular or boat shaped hull). Meters to tenths (e.g. 12.6 m)
	16	**diam**		Diameter - platform dimension for discus type hulls. Diameter in meters to tenths (e.g. 6.0 m)
	17	**hult**	 DS BS RS SP OD NM TR CN OR DR OT	Hull type Discus (Cylinders) Boat shaped hull Rectangular shape Spars ODAS 30 series NOMAD Torus Conic Omnidirectional wave-rider Directional wave-rider Other (specify in footnote # 3 Header Record)
	18	**huln**		Hull or platform number - enter as assigned (a combination of numeric and alpha characters if required)

Record type and sequence #	Field Abbre-viation	Input codes	Description of fields
19	**mtyp**	 AC ST FC PC HS TS WS PA NL OT	Mooring type - Mooring type if a moored buoy or drouge type if drifting buoy. All Chain (shallow depths generally up to 90 meters) Semitaut (intermediated depths generally 60 to 600 meters-generally nylon cable) Float Inverse Catenary (deep ocean generally 600 to 6000 m-generally nylon with glass floats) Poly-nylon Inverse Catenary (deep ocean generally 1200 to 6000 m) Drouge Type Holey sock drogue Tristar Window shade Parachute Non-Lagrangian sea anchor Use for either mooring or drouge as needed Other (specify in footnote # 4 Header Record)
20	**cmsy**	 GO AR GA RF OT	Satellite Data Collection System - system used to transmit the observations GOES DCP ARGOS PTT GOES primary ARGOS backup RF Other (specify in footnote # 5 Header Record)
21	**Stt**		Satellite transmission time - time slot assigned for observation transmission. Hours and minutes UTC (e.g. 1230) or for example, on the hour, on the half hour, two orbits per day, etc.
22	**foo**		Frequency of observations - hours and minutes (e.g. every hour = 1.0, every 6 hours = 6.0, or every half hour 0.5, etc., I = irregular)
23	**dfmt**		Data format - data format (WMO codes; Pub 306) the observations was transmitted or digitized (i.e. observational form). Buoy code -FM 18-X Ship code - FM 13-X TESAC - FM 64-IX WAVEOB - FM 65-IX BUFR - FM 94-XI Other WMO codes added as needed Note: use actual WMO Code designator as the abbreviation (e.g. FM 18-X)
24	**wdpth**		Water Depth (nearest whole meter)
25	**plt**		Payload Type (e.g. DACT, VEEP, GSBP, ZENO, ODAS33, etc.) Details should be provided regarding each type of payload (payload description)
26	**DI**	 AV NA	Digital image - a phtograph or schematic of the platform and equipment Available in digital file Not available

Record type and sequence #		Field Abbre-viation	Input codes	Description of fields
	27	**WebA**		Web Address (URL) where additional information can be obtained
ANEMOMETER (AN)				
D R	1	**anmI**	 P TC FC S WT OT	Anemometer instrument type propeller/vane three cup four cup sonic WOTAN (wind observation through ambient noise) other (define in footnote)
	2	**aMS**		Anemometer - model (manufacturer/series no.)
	3	**anmL**	 FM AM CM RY LY OT	Anemometer - location foremast aftmast centermast (mainmast) right yardarm left yardarm other (define in footnote)
	4	**anDB**		Anemometer - distance from the bow or front of platform (meters to tenths)
	5	**anDC**		Anemometer - distance from center line or from center of discus (meters to tenths)
	6	**hwl**		Anemometer- height above water line (meters to tenths). Value can be negative for WOTAN
	7	**ouAN**		Anemometer - operational range and units of measurement (e.g. 0 to 60 m/s ; 000 to 360 degrees)
	8	**sfWD**		Sampling frequency (Hz) - wind direction (e.g. 1.28 Hz)
	9	**sfWS**		Sampling frequency (Hz) - wind speed (e.g. 1.28 Hz)
	10	**apWD**		Averaging period (minutes to tenths) - wind direction (e.g. 8.0 minutes)
	11	**apWS**		Averaging period (minutes to tenths) - wind speed (e.g. 8.0 minutes)
	12	**amWS**	 S V	Averaging method - wind speed Scalar Vector
	13	**cmpT**		Compass type/model No. - anemometer
	14	**apWG**		Averaging period (seconds) - wind gust (e.g. 5 seconds)
	15	**amWG**	 S V	Averaging method - wind gust Scalar Vector
	16	**amScd**		Calibration date- Anemometer sensor No. Date sensor was last calibrated (year, month, day e.g. 20000723)

Record type and sequence #		Field Abbre-viation	Input codes	Description of fields
	17	**amID**		Anemometer sensor installation date (year, month, day e.g. 19950228). If the direction sensor and speed sensor are separate instruments then use footnote # 1 in the Anemometer data record to enter the dates for speed sensor and this position for direction sensor.
	18	**amSD**		Anemometer out of service dates (beginning and ending dates; year, month, day e.g. 19960123-19960212). If known these dates should be entered anytime either the direction , speed, or both is unavailable due to equipment outage (non-reporting or invalid reports)
AIR TEMPERATURE (AT)				
D R	1	**ats**	 ER M MS A AS OT	Air temperature sensor- instrument type electrical resistance thermometer mercury-in-glass thermometer screen shelter - mercury thermometer alcohol-in-glass thermometer screen shelter - alcohol thermometer other (specify in footnote # 1 in the air temperature data record)
	2	**atsMS**		Air temperature sensor - model (manufacturer/series no.)
	3	**atsL**	 FM AM CM RY LY OT	Air temperature sensor - location foremast aftmast centermast (mainmast) right yardarm left yardarm other (specify in footnote # 2 in the air temperature data record)
	4	**atsDB**		Air temperature sensor - distance (meters to tenths) from bow or front of platform note: leave this field blank if platform is a discus
	5	**atsC**		Air temperature sensor - distance (meters to tenths) from center line or center of discus
	6	**atswl**		Air temperature sensor - height (meters to tenths) above water line
	7	**ouAT**		Air temperature sensor - Operational range and units of measurement (e.g. - 40C to + 50C)
	8	**sfAT**		Sampling frequency (Hz) - air temperature sensor (e.g. 1.28 Hz)
	9	**apAT**		Averaging period (minutes to tenths) - air temperature sensor (e.g. 8.0 minutes)
	10	**atScd**		Calibration date- Air temperature sensor No. Date sensor was last calibrated (year, month, day e.g. 20000723)
	11	**atID**		Air temperature sensor installation date (year, month, day e.g. 19950228).
	12	**atSD**		Air temperature sensor out of service dates (beginning and ending dates; year, month, day e.g. 19960123-19960212). If known these dates should be entered anytime the air temperature is unavailable due to equipment outage (non-reporting or invalid reports)

Record type and sequence #		Field Abbre-viation	Input codes	Description of fields
WATER TEMPERATURE (WT)				
D R	1	**wts**	 HC HT RT ER TT BU CTD STD RM XC NS AL XBT OT	Water temperature sensor - instrument type Hull contact sensor "Through hull" sensor Radiation thermometer Electrical resistance thermometer Trailing thermistor Bucket thermometer CTD (conductivity-temperature-depth) STD (salinity-temperature-depth) refractometer XCTD (expendable CTD probe) Nansen cast ALACE (autonomus Lagrangian Circulation Explorer) Expendable Bathythermograph Other (specify in footnote # 1 in the water temperature data record)
	2	**wtsMS**		Water (sea) temperature sensor - model (manufacturer/series no.)
	3	**wtsL**		Water temperature sensor - location (e.g. port bow, bottom of discus, etc.)
	4	**wtsDB**		Water temperature sensor - distance (meters to tenths) from the bow or front of platform Note: left blank for discus hulls and subsurface temperatures
	5	**wtsC**		Water temperature sensor- distance (meters to tenths) from center line or center of discus
	6	**dws**		Depth of water temperature sensor; tenths of meters (e.g. 10.3 meters) below the water line.
	7	**ouWT**		Operational range and units of measurement-water temperature sensor (e.g. range - 4 C to + 40 C)
	8	**sfWT**		Sample frequency (Hz) - Water temperature sensor (e.g. 1.28 Hz)
	9	**apWT**		Averaging period (minutes to tenths) - Water temperature sensor (e.g. 8.0 minutes)
	10	**wtScd**		Calibration date- Water temperature sensor No. Date sensor was last calibrated (year, month, day e.g. 20000723)
	11	**wtID**		Water temperature sensor installation date (year, month, day e.g. 19950228).
	12	**wtSD**		Water temperature sensor out of service dates (beginning and ending dates; year, month, day e.g. 19960123-19960212). If known these dates should be entered anytime the water temperature is unavailable due to equipment outage (non-reporting or invalid reports)

Record type and sequence #		Field Abbre-viation	Input codes	Description of fields
SALINITY (SA)				
D R	1	**Sstp**		Salinity - sensor type
			CTD	CTD (conductivity-temperature-depth)
			STD	STD (salinity-temperature-depth)
			RM	refractometer
			XC	XCTD (expendable CTD probe)
			NS	Nansen cast
			AL	ALACE (autonomus Lagrangian Circulation Explorer)
			OT	Other (specify in footnote # 1 in the salinity data record)
	2	**Ssm**		Salinity sensor (model/manufacturer/series no.)
	3	**SsL**		Salinity sensor No. - Location (note: to be used only for those sensors attached to a platform)
	4	**SsDB**		Salinity sensor No. - distance from bow or front of platform Note: to be used only when sensor is attached to a platform (same as location above)
	5	**SsC**		Salinity sensor No. - distance from center line or center of discus
	6	**dss**		Depth of salinity sensor No. - meters to tenths (e.g. 10.7 m) of salinity sensor below the water line (surface of the water)
	7	**ouSs**		Salinity sensor - operational range and units of measurement (e.g. 25 to 45 parts per thousand. Salinity is calculated based on the measurement of chlorinity)
	8	**sfSs**		Sample frequency - available only for automated digital sensors
	9	**apSs**		Averaging period - available only for automated digital sensors
	10	**mSs**		Method used to compute the salinity (e.g. chlorinity, electrical conductivity, refractive index, etc.)
	11	**SsScd**		Calibration date - salinity sensor No. Date the sensor was last calibrated (year, month, day e.g. 20000207)
	12	**SsID**		salinity sensor installation date (year, month, day e.g. 19950228).
	13	**SsSD**		Salinity sensor out of service dates (beginning and ending dates; year, month, day e.g. 19960123-19960212). If known these dates should be entered anytime the salinity is unavailable due to equipment outage (non-reporting or invalid reports)
BAROMETRIC PRESSURE (BP)				
D R	1	**bps**		Barometric pressure sensor - instrument type
	2	**bpsMS**		Barometric pressure sensor - model (manufacturer/series no.)
	3	**bpsL**		Barometric pressure sensor - location (e.g. centermast)
	4	**bpsDB**		Barometric pressure sensor - distance (meters to tenths) from the bow or front of platform Note: leave this field blank if platform is a discus

Record type and sequence #		Field Abbre-viation	Input codes	Description of fields
	5	**bpsC**		Barometric pressure sensor - distance (meters to tenths) from center line or center of discus
	6	**bpswl**		Barometric pressure sensor - height (meters to tenths) above water line
	7	**ouBP**		Barometric pressure sensor - Operational range and units of measurement (e.g. 900-1100 hPa)
	8	**sfBP**		Sampling frequency (Hz) - Barometric pressure sensor (e.g. 1.28 Hz)
	9	**apBP**		Averaging period (minutes to tenths) - Barometric pressure sensor (e.g. 8.0 minutes)
	10	**bpScd**		calibration date - barometric pressure sensor No. Latest date of calibration (year, month, day e.g. 20000207)
	11	**bpsID**		Barometric pressure sensor installation date (year, month, day e.g. 19950228).
	12	**bpsSD**		Barometric pressure sensor out of service dates (beginning and ending dates; year, month, day e.g. 19960123-19960212). If known these dates should be entered anytime the barometric pressure is unavailable due to equipment outage (non-reporting or invalid reports)
RELATIVE HUMIDITY (RH)				
D R	1	**hs**		Relative Humidity (wet bulb/dew point) sensor -instrument type
	2	**hsMS**		Relative Humidity (wet bulb/dew point) sensor -model (manufacturer/series no.)
	3	**hsL**		Relative Humidity (wet bulb/dew point) sensor -location (left yardarm mast)
	4	**hsDB**		Relative Humidity sensor - distance (meters to tenths) from the bow or front of platform Note: leave this field blank if platform is a discus
	5	**hsC**		Relative Humidity sensor - distance (meters to tenths) from center line or center of discus
	6	**hswl**		Relative Humidity sensor - height (meters to tenths) above water line
	7	**ouhs**		Relative Humidity (wet bulb/dew point) sensor - Operational range and units of measurement (e.g. range 0-100 %)
	8	**sfhs**		Sampling frequency (Hz)-Relative Humidity (wet bulb/dew point) sensor (e.g. 1 Hz)
	9	**aphs**		Averaging period (minutes)-Relative Humidity (wet bulb/dew point) sensor (e.g.1 min.)
	10	**hsScd**		Calibration date - Relative Humidity (wet bulb/dew point) sensor No. Latest date the sensor was calibrated (year, month, day e.g. 20000207)
	11	**hsID**		Relative Humidity (wet bulb/dew point) sensor installation date (year, month, day e.g. 19950228).

Record type and sequence #		Field Abbre-viation	Input codes	Description of fields
	12	**hsSD**		Relative Humidity (wet bulb/dew point) sensor out of service dates (beginning and ending dates; year, month, day e.g. 19960123-19960212). If known, these dates should be entered anytime the Relative Humidity (wet bulb/dew point) is unavailable due to equipment outage (non-reporting or invalid reports)
PRECIPITATION (PG)				
D R	1	**pg**		Precipitation gauge -instrument type (e. g. weighing bucket, tipping bucket, etc.)
	2	**pgMS**		Precipitation gauge - model (manufacturer/series no.)
	3	**pgL**		Precipitation gauge -location
	4	**pgDB**		Precipitation gauge - distance (meters to tenths) from the bow or front of platform
	5	**pgC**		Precipitation gauge - distance (meters to tenths) from center line or off center of a discus
	6	**pgwl**		Precipitation gauge- height (meters to tenths) above water line
	7	**oupg**		Precipitation gauge - Operational range and units of measurement (e.g. 0 to 25 cm per hour)
	8	**sfPG**		Sampling frequency - Precipitation gauge (e.g. continuous)
	9	**apPG**		Averaging period-Precipitation gauge (e.g. 6 hours; then reset)
	10	**pgScd**		Calibration date -Precipitation gauge No. Latest date sensor/gauge was calibrated (year, month, day e.g. 20000207)
	11	**pgID**		Precipitation gauge installation date (year, month, day e.g. 19950228).
	12	**pgSD**		Precipitation gauge out of service dates (beginning and ending dates; year, month, day e.g. 19960123-19960212). If known, these dates should be entered anytime the precipitation measurement is unavailable due to equipment outage (non-reporting or invalid reports)
RADIATION (RD)				
D R	1	**srs**		Solar radiation sensor -instrument type
	2	**rMS**		Radiation sensor - model (manufacturer/series no.)
	3	**rsL**		Radiation sensor -location (e.g. foremast)
	4	**rsDB**		Radiation sensor - distance (meters to tenths) from the bow or front of platform Note: leave this field blank if platform is a discus
	5	**rsC**		Radiation sensor - distance (meters to tenths) from center line or center of discus
	6	**srwl**		Solar radiation sensor- height (meters to tenths) above water line
	7	**ours**		Radiation sensor - Operational range and units of measurement (e.g. 0.07-1.65 cal. cm^{-2} min^{-1})
	8	**sfSR**		Sampling frequency (Hz)-Solar radiation sensor (e.g. 1 Hz)
	9	**apSR**		Averaging period (minutes to tenths) - Solar radiation sensor (e.g. 8.0 minutes)

Record type and sequence #		Field Abbre-viation	Input codes	Description of fields
	10	**srScd**		Calibration date - Solar radiation sensor No. Latest date the sensor was calibrated (year, month, day e.g. 20000207)
	11	**rsID**		Radiation sensor installation date (year, month, day e.g. 19950228).
	12	**rsSD**		Radiation sensor out of service dates (beginning and ending dates; year, month, day e.g. 19960123-19960212). If known, these dates should be entered anytime the radiation measurement is unavailable due to equipment outage (non-reporting or invalid reports)
OCEAN CURRENTS (CR)				
D R	1	**OC**	 C M E	Ocean current speed reported calculated measured estimated
	2	**TSmoc**		Type sensor measuring ocean currents (type/model/manufacturer)
	3	**dmOC**		Depth of measurement (in meters, e.g. 10 m) of the ocean current
	4	**ouOC**		Ocean currents - Operational range and units of measurement (range e.g.-10 m/s to +10m/s)
	5	**sfOC**		Sampling frequency (Hz) -Ocean currents (e.g.0.667 Hz)
	6	**apOC**		Averaging period (minutes to tenths) - Ocean currents (e.g. 20.0 minutes)
	7	**ocScd**		Calibration date - Ocean current sensor (year, month, day e.g. 20000208)
	8	**ocID**		Ocean current sensor installation date (year, month, day e.g. 19950228).
	9	**ocSD**		Ocean current sensor out of service dates (beginning and ending dates; year, month, day e.g. 19960123-19960212). If known, these dates should be entered anytime the ocean current measurement is unavailable due to equipment outage (non-reporting or invalid reports)
WAVE SPECTRA (WS)				
D R	1	**wasp**		Wave spectra - type of surface elevation sensor (From which wave spectra is derived)
	2	**Digf**		Digital filter used - wave spectra
	3	**Nblks**		Number of blocks used for averaging - wave spectra
	4	**Npts**		Number of points in each block - wave spectra
	5	**spAT**		Spectral analysis technique (e.g. FFT, MEM, etc.)
	6	**sfWAS**		Sampling frequency -Wave spectra (e.g. 2.56 Hz)
	7	**apWAS**		Averaging period- length of record for averaging period -Wave spectra (e.g. 20 minutes)

Record type and sequence #		Field Abbre-viation	Input codes	Description of fields
HORIZONTAL VISIBILITY (HV)				
D R	1	**hvm**	 MAN ATM	Horizontal visibility manual automated
	2	**hvit**		Instrument type (automated sensor) - model/manufacturer/series no.
	3	**hvl**		Location - Horizontal visibility sensor No.
	4	**hvDB**		Horizontal visibility sensor - distance (meters to tenths) from the bow or front of platform Note: leave this field blank if platform is a discus
	5	**hvC**		Horizontal visibility sensor - distance (meters to tenths) from center line or center of discus
	6	**hvwl**		Horizontal visibility sensor- height (meters to tenths) above water line
	7	**hvou**		Horizontal visibility sensor - Operational range and units of measurement (e.g. 0000 to 9999 meters or < 0.1km -10km)
	8	**hvsf**		Sampling frequency - Horizontal visibility sensor No.
	9	**hvap**		Averaging period - Horizontal visibility sensor No.
	10	**hvScd**		Calibration date- Horizontal visibility sensor No. Latest date sensor was calibrated (year, month, day e.g. 20000208)
	11	**hvID**		Horizontal visibility sensor installation date (year, month, day e.g. 19950228).
	12	**hvSD**		Horizontal visibility sensor out of service dates (beginning and ending dates; year, month, day e.g. 19960123-19960212). If known, these dates should be entered anytime the visibility measurement is unavailable due to equipment outage (non-reporting or invalid reports)

Annex VIII

TYPES OF METADATA

- Operator of platform or instrument
- Global programme in which platform is participating (e.g. Argo, VOS)
- Operational state of platform (e.g. state of ship)
- Platform type (e.g. moored buoy, drifter, VOS ship, SOOP ship, Research Vessel, profiling float, ODAS)
- Platform characteristics (e.g. size, dimensions, manufacturer)
- Instrument type (e.g. manufacturer)
- Instrument calibration status
- Instrument location information
- Instrument height or depth (e.g. relative to agreed standard)
- Assumed instrument performance/resolution/precision
- Quality information
- Data QC'ed indicator (y/n)
- Data modified indicator (y/n)
- Sampling intervals and schemes
- Averaging schemes
- Instrument behaviour (e.g. fall rate equation)
- Type of algorithm used to convert the data
- Unique tag (e.g. CRC)
- Period of validity of metadata
- Information regarding data centre processing the data
- Location of further information (e.g. photos, drawings)
- Data management information (e.g. creation date, update date)
- Housekeeping parameter (e.g. battery voltage)
- Data telecommunication system (e.g. Argos, Iridium, Code 41)

Annex IX

REQUIREMENTS MATRIX

(to be updated/modified/completed by Pilot Project)

From the matrix, it can be deduced in what category every type of metadata should eventually be placed.

	Category 1 (real time with obs)	**Category 2 (real-time via server)**	**Category 3 (delayed, e.g. for research)**
NWP	(SST related only) • Platform type • Instrument type • Instrument height/depth • Assumed instrument performance/resolution/precision • Quality information • Data QC'ed indicator (y/n) • Data modified indicator (y/n) • Sampling intervals and schemes • Averaging schemes • Unique tag	Any metadata useful for programme management • Operational state of platform • Platform characteristics • Instrument calibration status • Instrument location information • Instrument behaviour • Type of algorithm used to convert the data • Period of validity of metadata • Information regarding data centre processing the data • Location of further information • Data management information • Housekeeping parameter • Data telecommunication system	• Operator of platform or instrument • Global programme
SST analysis GHRSST	• Platform type • Instrument type • Instrument height/depth • Assumed instrument performance/resolution/precision • Quality information • Data QC'ed indicator (y/n) • Data modified indicator (y/n) • Sampling intervals and schemes • Averaging schemes • Unique tag	Any metadata useful for programme management • Operational state of platform • Platform characteristics • Instrument calibration status • Instrument location information • Instrument behaviour • Type of algorithm used to convert the data • Period of validity of metadata • Information regarding data centre processing the data • Location of further information • Data management information • Housekeeping parameter • Data telecommunication system	• Operator of platform or instrument • Global programme
Data assimilation and ocean field analysis	• Platform type • Instrument type • Instrument height/depth • Assumed instrument performance/resolution/precision	Any metadata useful for programme management • Operational state of platform • Platform characteristics	• Operator of platform or instrument • Global programme

	• Quality information • Data QC'ed indicator (y/n) • Data modified indicator (y/n) • Sampling intervals and schemes • Averaging schemes • Unique tag	• Any metadata useful for programme management • • Instrument calibration status • Instrument location information • Instrument behaviour • Type of algorithm used to convert the data • Period of validity of metadata • Information regarding data centre processing the data • Location of further information • Data management information • Housekeeping parameter • Data telecommunication system	
Ocean modelling	• Platform type • Instrument type • Instrument height/depth • Assumed instrument performance/resolution/precision • Quality information • Data QC'ed indicator (y/n) • Data modified indicator (y/n) • Sampling intervals and schemes • Averaging schemes • Unique tag	Any metadata useful for programme management • Operational state of platform • Platform characteristics • Instrument calibration status • Instrument location information • Instrument behaviour • Type of algorithm used to convert the data • Period of validity of metadata • Information regarding data centre processing the data • Location of further information • Data management information • Housekeeping parameter • Data telecommunication system	• Operator of platform or instrument • Global programme
Ocean modelling validation	• Platform type • Instrument type • Instrument height/depth • Assumed instrument performance/resolution/precision • Quality information • Data QC'ed indicator (y/n) • Data modified indicator (y/n) • Sampling intervals and schemes • Averaging schemes • Unique tag	Any metadata useful for programme management • Operational state of platform • Platform characteristics • Instrument calibration status • Instrument location information • Instrument behaviour • Type of algorithm used to convert the data • Period of validity of metadata • Information regarding data centre processing the data • Location of further information • Data management information • Housekeeping parameter • Data telecommunication system	• Operator of platform or instrument • Global programme
Climate forecast	• Platform type • Instrument type • Instrument height/depth	Any metadata useful for programme management • Operational state of platform	• Operator of platform or instrument • Global programme

	• Assumed instrument performance/resolution/precision • Quality information • Data QC'ed indicator (y/n) • Data modified indicator (y/n) • Sampling intervals and schemes • Averaging schemes • Unique tag	• Platform characteristics • Instrument calibration status • Instrument location information • Instrument behaviour • Type of algorithm used to convert the data • Period of validity of metadata • Information regarding data centre processing the data • Location of further information • Data management information • Housekeeping parameter • Data telecommunication system	
Seasonal to decadal climate variability	Category 1 as a practical way to access the data. Platform type and Instrument type as an indication of where the data can be accessed. • Operational state of platform • Platform type • Platform characteristics • Instrument type • Instrument height/depth • Assumed instrument performance/resolution/precision • Quality information • Data QC'ed indicator (y/n) • Data modified indicator (y/n) • Sampling intervals and schemes • Averaging schemes • Instrument behaviour • Type of algorithm used to convert the data • Unique tag	Any metadata useful for programme management • Instrument calibration status • Instrument location information • Data telecommunication system • Period of validity of metadata • Information regarding data centre processing the data • Location of further information • Data management information • Housekeeping parameter	• Operator of platform or instrument • Global programme
Satellite calibration	• Platform type • Instrument type • Instrument depth/height • Quality information • Data modified indicator (y/n) • Data QC'ed indicator (y/n) • Unique tag	• Operational state of platform • Platform characteristics • Instrument calibration status • Instrument location information • Assumed instrument performance/resolution/precision • Sampling intervals and schemes • Averaging schemes • Instrument behaviour • Type of algorithm used to convert the data • Period of validity of metadata • Information regarding data centre processing the data • Data management information • Housekeeping parameter • Data telecommunication system	• Operator of platform or instrument • Global programme • Location of further information

Satellite validation	• Platform type • Instrument type • Instrument depth/height • Quality information • Data modified indicator (y/n) • Data QC'ed indicator (y/n) • Unique tag	• Operational state of platform • Platform characteristics • Instrument calibration status • Instrument location information • Assumed instrument performance/resolution/precision • Sampling intervals and schemes • Averaging schemes • Instrument behaviour • Type of algorithm used to convert the data • Period of validity of metadata • Information regarding data centre processing the data • Data management information • Housekeeping parameter • Data telecommunication system	• Operator of platform or instrument • Global programme • Location of further information
operational activities (e.g. weather forecasters, disaster response)	• Platform type • Instrument type • Operational state of platform • Instrument height/depth • Quality information • Instrument behaviour • Assumed instrument performance/resolution/precision • Sampling intervals and schemes • Averaging schemes	• Platform characteristics • Instrument location information • Type of algorithm used to convert the data • Period of validity of metadata • Information regarding data centre processing the data • Data modified indicator (y/n) • Data QC'ed indicator (y/n)	• N/A
Quality assurance activities serving above applications	• Platform type • Instrument type • Operational state of platform • Instrument height/depth • Quality information • Data modified indicator (y/n) • Data QC'ed indicator (y/n) • Instrument behavior • Unique tag • Housekeeping parameter • Assumed instrument performance/resolution/precision • Sampling intervals and schemes • Averaging schemes	• Platform characteristics • Instrument calibration status • Instrument location information • Type of algorithm used to convert the data • Period of validity of metadata • Information regarding data centre processing the data • Location of further information • Data management information • Data telecommunication system	• Operator of platform or instrument • Global programme in which platform is participating
diagnostic by platform operators	• Platform type • Instrument type • Operational state of platform • Instrument height/depth • Quality information • Data QC'ed indicator (y/n)	• Platform characteristics • Instrument calibration status • Instrument location information • Assumed instrument performance/resolution/precision • Sampling intervals and schemes • Averaging schemes	• Operator of platform or instrument • Global programme in which platform is participating

	• Data modified indicator (y/n) • Unique tag • Instrument behavior • Housekeeping parameter	• Type of algorithm used to convert the data • Period of validity of metadata • Information regarding data centre processing the data • Location of further information • Data management information • Data telecommunication system	

Annex X

TERMS OF REFERENCE FOR THE STEERING COMMITTEE OF THE WATER TEMPERATURE METADATA PILOT PROJECT (META-T)

The Pilot Project is to demonstrate feasibility of international access to a comprehensive and up-to-date marine temperature metadata.

A Steering Team shall be selected and tasked to guide the Pilot Project through the following actions:

(i) Liaise with existing marine metadata projects to develop support for the goals of the Pilot Project (e.g. ODAS, IODE, WIS);

(ii) Finalize the list of metadata, its categorization and relationships, to meet user requirements;

(iii) Liaise with relevant task teams and working groups to ensure that required metadata for distribution along with the observation can be properly encoded in BUFR reports or other relevant formats;

(iv) Consider extension to other variables than sea temperature data;

(v) Address format issues and seek wide acceptance by the ocean observing community (e.g. Marine XML, ISO 19115);

(vi) Facilitate distribution of the metadata to the pilot project data centres, through liaison with relevant observing programmes;

(vii) Encourage the development of tools to access the metadata;

(viii) Suggest other actions to advance the integration and timeliness of marine metadata availability.

Proposed Membership

The Steering Team shall include, to the greatest extent feasible, participants from the affected and interested marine community groups. Names are to be determined.

NMDIS (Lin Shaohua, Guo Fengyi)
NDBC/TAO (Bill Burnett)
JCOMM/DMPA, GTSPP (Bob Keeley)
JCOMM/SPA, GHRSST, GODAE (Craig Donlon)
IODE (Greg Reed)
OOPC (Ed Harrison)
DBCP (David Meldrum)
SOT (Graeme Ball)
VOS/VOSClim (Elizabeth Kent)

SOOPIP (Gustavo Goni)
GOSUD, OceanSITES, Argo (Thierry Carval)
SST Analysis (Tom Smith)
WIS, NWP (Milan Dragosavac)
Metadata expert (Don Collins, John Graybeal)
Global Collecting Centres (Elanor Gowland)

Annex XI

RECOMMENDATIONS AND ACTIONS

Recommendations:

Para	Item	By whom	Target date
4.1.3	to ensure that collected metadata, either existing or planned, be archived in the pilot project data centre (in particular, Argo, GOSUD, GTSPP, OceanSITES, WMO Publication No. 47), and be available through those programmes/projects in return.	Pilot Project Steering Team	continuous
4.3.3	to use the buoy metadata collection system from JCOMMOPS	Buoy operators and manufacturers	continuous
4.3.6	to ensure that that any required metadata for GTS distribution along with the observations could eventually be processed for inclusion in distributed BUFR reports	DBCP	continuous
4.4.2	to collaborate for defining new BUFR template for ship data	*ad hoc* SOT Task Team on Migration to Table Driven Codes, Pilot Project Steering Committee	ASAP
4.4.5	to consider adding all SOOP and ASAP ships added into Publication No. 47, and find ways to implement it in appropriate ways.	SOT	ASAP
4.4.6	to ensure that the metadata from ships of opportunity are included in the national quarterly submissions of WMO Publication No. 47	SOT (SOOPIP operators)	ASAP
4.4.7	to find ways to facilitate BUFR transition (through financial support), in particular, regarding GTS distribution of SOOPIP data.	JCOMM/OCG	ASAP
4.6.5	JCOMM ODAS metadata centre to update the archive, with linkage with existing databases (e.g. National Coastal Data Development Center, NOAA)	NMDIS(ODAS metadata centre)	ASAP
8.1	to address metadata collection, in view of its eventual integration through JCOMM ODAS metadata centre	JCOMM/OCG	Next OCG meeting

Actions:

Para	Item	By whom	Target date
4.2.3	to work with WMO/CBS to seek possibilities to add metadata in BUFR tables	WMO Secretariat	ASAP
4.3.3	to discuss with buoy operators on alternate solutions for routine submission of metadata (agree on formats, distribution FTP). By TC/DBCP and SOOPIP.	TC/DBCP/SOOPIP, buoy manufacturers	ASAP
4.3.4	to address the issue of using JCOMMOPS metadata collection system. By DBCP	TC/DBCP	DBCP-22 (2006)
4.3.5	to refine its daily procedures for producing metadata files so that only updated buoy records appear in those files. Records creation and update dates must be included in the files.	TC/DBCP	ASAP
4.6.5	to clarify the ODAS format, definition and requirements, and encourage Members/Member States to duly submit metadata and its catalogue (information)	Secretariat	ASAP

Para	Item	By whom	Target date
6.2.4	to refine types of metadata, the matrix, and categorization	Pilot Project Steering Team.	ASAP
8.2	to present a plan/proposal, including financial aspects, for participation in the pilot project as a host of metadata server	NDBC	ASAP
10.2	to consolidate the membership of the Pilot Project Steering Team	Secretariat	ASAP

Annex XII

ACRONYMS AND OTHER ABBREVIATIONS

BUFR	Binary Universal Form for the Representation of meteorological data
CEOS	Committee on Earth Observation Satellites
CGMS	Coordination Group for Meteorological Satellites (WMO)
CMAN	Coastal-Marine Automated Network
DAC	Data Assembly Centers
DBCP	Data Buoy Cooperation Panel (WMO-IOC)
DMPA	JCOMM Data Management Programme Area
DBCP TC	DBCP Technical Coordinator
ECMWF	European Centre for Medium-Range Weather Forecasting
EGOS	European Group on Ocean Station (now merged under E-SURFMAR)
E-SURFMAR	EUMETNET Surface Marine Programme
ET/DRC	Expert Team on Data Representation and Codes (WMO)
ETMC	Expert Team on Marine Climate (JCOMM)
EUCOS	European Composite Observing System
EUMETNET	The Network of European Meteorological Services
EU	European Union
GCOS	Global Climate Observing System
GDAC	Global Data Assembly Centers
GDC	Global Drifter Center
GDP	Global Drifter Programme
GHRSST	GODAE High Resolution SST Pilot Project
GODAE	Global Ocean Data Assimilation Experiment
GOOS	Global Ocean Observing System
GOSUD	Global Ocean Surface Underway Data Pilot Project
GSSC	Global Ocean Observing System (GOOS) Scientific Steering Committee
GTS	Global Telecommunication System (WMO)
GTSPP	Global Temperature-Salinity Profile Program
IABP	International Arctic Buoy ProgrammeICOADS
ICOADS	International Comprehensive Ocean-Atmosphere Data Set
IFREMER	Institut Français de Recherche pour l'Exploitation de la MER (France)
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IODE	International Oceanographic Data and Information Exchange (IOC)
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	JCOMM *in situ* Observing Platform Support Centre
MEDS	Marine Environmental Data Services (Canada)
MSLP	Mean Sea Level Pressure
MERSEA	Marine EnviRonment and Security for the European Area (EU)
NCEP	National Centers for Environmental Prediction (USA, NOAA)
NDBC	National Data Buoy Center (USA, NOAA)
NMDIS	National Marine Data & Information Service (China)
NMS	National Meteorological Services
NOAA	National Oceanographic and Atmospheric Administration (USA)
NWP	Numerical Weather Prediction
OceanSITES	Ocean Sustained Interdisciplinary Timeseries Environment observation System
OCG	JCOMM Observations Programme Area Coordination Group
ODAS	Ocean Data Acquisition System
OOPC	Ocean Observation Panel for Climate (of GOOS, GCOS, WCRP)
PMO	Port Meteorological Officer
QC	Quality Control
SOOP	Ship Of Opportunity Programme
SOT	Ship Observations Team
SST	Sea Surface Temperature
TAO	Tropical Atmosphere Ocean Array
UNESCO	United Nations Educational, Scientific and Cultural Organization
URL	Universal Resource Locator
US	United States

VOS	Voluntary Observing Ship
VOSClim	VOS Climate Project
WCRP	World Climate Research Programme
WIS	WMO Information System
WMO	World Meteorological Organization
WWW	World Weather Watch (WMO)
XBT	Expendable Bathythermograph
XML	Extended Markup Language