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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)
EXPERT TEAM ON MARINE CLIMATOLOGY

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ITEM 5.3

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PLATFORM METADATA CATALOGUE

ODAS Metadata

(Submitted by the Secretariat)

Summary and purpose of document

This document provides information on Ocean Data Acquisition Systems (ODAS) metadata as well as on the development of the META-T Pilot Project.

ACTION PROPOSED

The Expert Team on Marine Climatology is invited to:

(a) Review the original ODAS metadata catalogue, and suggest changes, as appropriate;

(b) Clarifies the issue of metadata collection for rigs and platforms reporting in FM-13 SHIP code;

(c) Liaise with the META-T Pilot Project and the ODAS metadata centre in order to design and adopt an electronic format for ODAS (e.g., XML), based on the JCOMM recommended catalogue of ODAS metadata.

Appendices:
A. ODAS Metadata Catalogue adopted by JCOMM-I
B. Terms of References for the Steering Committee of the Water Temperature Metadata Pilot Project (META-T)
C. META-T Pilot Project Categorization of Metadata and Requirements
D. Background information Regarding the Information Service Bulleting on Non-Drifting ODAS

DISCUSSION

1. ODAS Metadata

1.1. Requirements for metadata

1.1.1. Metadata are useful for a number of applications, including: (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 and disaster response), (xi.) quality assurance activities serving above applications, and (xii.) diagnostics for platform operators.

1.1.2. In terms of marine climatology, metadata such as instrument siting, ship or ODAS platform characteristics, and instrument performances are critical for climate variability studies (e.g., wind measurement heights are be used to adjust velocity to a common reference in the boundary layer).

1.1.3. The International Comprehensive Ocean-Atmosphere Data Set (ICOADS) (http://icoads.noaa.gov) has recently associated the WMO Publication No. 47 metadata with individual VOS observations for the periods of 1973 to 2005, with plans for its extension to 2006. Similarly, it would be beneficial to associate ODAS metadata with ICOADS buoy and other ODAS observations, but this is not yet generally practical (particularly for historical metadata).

1.1.4. The ICOADS requirements for metadata are 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 are useful, but one primary requirement is for up-to-date and historical metadatabases.

1.1.5. For climate applications, it is considered good practice to archive the observation in its original format, before any format conversion. An example is the practice by the NCEP of attaching the ship observation in FM-13 (or ODAS report in FM-18) to the end of the BUFR observation.

1.2. The ODAS Metadata format, and ODAS Metadata Centre

1.2.1 At its Twelfth Session, the former CMM (Havana, Cuba, 1997) requested the then Subgroup on Marine Climatology to consider the development of a comprehensive metadatabase for Ocean Data Acquisition Systems (ODAS), including moored and drifting buoys, offshore platforms, etc., and taking into account existing international catalogues. This was followed by the cooperation between the subgroup and the Data Buoy Cooperation Panel (DBCP) to agree on a catalogue to be presented to JCOMM for adoption.

1.2.2. JCOMM, at its First Session (JCOMM-I, Akureyri, Iceland, 19-29 June 2001), agreed that a comprehensive ODAS metadatabase would allow a full and accurate interpretation of the observational data from the ODAS which are available in climatological archives, and that observational data and associated metadata from the ODAS are of importance to global climate studies as well as for a range of marine climate applications. Through Recommendation 1, it therefore adopted the catalogue (Appendix A) recommended by the ETMC, and recommended that it should be used as a basis for the assembly, exchange and archival of metadata from all types of ODAS, including, in particular, drifting and moored buoys and fixed platforms. The Commission requested one or more interested Members/Member States to consider hosting the archive, and invited Members/Member States operating the ODAS to arrange for the assembly of the metadata from these platforms according to the agreed catalogue and for their eventual submission to the ODAS metadata archival centre(s). However, it should be noted that the catalogue recommended by JCOMM-I was describing a content and not a physical format.

1.2.3. At the first meeting of the DMCG in 2002, the National Marine Data and Information Service

(NMDIS) of China offered to host the ODAS metadata centre at the World Data Centre for Oceanography (Tianjin, China). The website for the ODAS metadata service was released in August 2004. JCOMM, at its Second Session (JCOMM-II, Halifax, Canada, September 2005), noted these developments with appreciation and thanked China for its efforts in this regard. The Centre has developed the ODAS metadata management scheme, conducted comparative study on eleven marine metadata formats, and designed the ODAS metadatabase structures. An ODAS metadatabase has now been developed and web-based operating tools provided, together with a users' guide for the collection and inputting of the ODAS metadata (http://jcomm.coi.gov.cn/, slated to become http://odas.org.cn/ in early 2007). Marine information products were made, based on the requirements of users, especially the Chinese users. Online service is provided through the website.

1.2.4. To date, the ODAS Metadata Centre has mainly collected the metadata for international observing platforms. In the past two years, the centre has focused on the automatic collection and transformation into the ODAS metadata catalogue, of metadata from a pre-existing DBCP system and the Argo project (over 8000 records of metadata from the DBCP and Argo were collected). Although the metadata provided by the DBCP and downloaded via the JCOMM *in situ* Observing Platform Support Centre (JCOMMOPS) had a complex structure, the metadata centre has succeeded in transforming the data structure for integration into the centre's metadatabase since September 2005. Argo metadata are obtained via the China Argo Data Centre (CADC) and regular updates have been made since March 2006. Collected metadata are made available via the web.

1.2.5. The NMDIS has followed the recommendations from the Water Temperature Metadata Pilot Project (META-T), and updated its archives, especially with input from the US National Oceanic and Atmospheric Administration (NOAA) and the National Coastal Data Development Center (NCDDC), although better collaboration with the latter needs to be established. An ODAS metadatabase format was released, and online tools have been developed for metadata submission and metadatabase querying. The NMDIS recommended expanding the ODAS metadata standard to make it complementary to META-T.

1.2.6. The Centre is now seeking collection of metadata from other types of ODAS.

1.2.7. The DMCG-2 asked the ODAS Metadata Centre to focus on instrumentation metadata, to improve the presentation of its website, and to document its online and batch submissions procedures. The DMCG-2 also recommended that, "ODAS China, in consultation with ETMC, to document existing XML format for ODAS metadata and recommend to adopt as standard (to ETMC and JCOMM-III)". Therefore, the ETMC is invited to cooperate with the ODAS Metadata Centre and to propose a work plan for reviewing the ODAS metadata content, the XML format, for eventually proposing them for adoption at JCOMM-III.

1.3 The On-line Information Service Bulletin on non-drifting ODAS

1.3.1. This regular service is providing information on ocean data buoys operated by Member Countries/States. It has been in place since 1977 (background information provided in Appendix D of this document). The Service is including non-drifting ODAS only, and is provided electronically through the Marine Environmental Data Service (MEDS; now Integrated Science Data Management), Canada (http://www.meds-sdmm.dfo-mpo.gc.ca/odas/main.htm). Information is requested by the IOC on a yearly basis, through a form agreed upon by the WMO-IOC Integrated Global Ocean Services System (IGOSS, superseded by JCOMM) in 1998. Despite the JCOMM Circular Letter (issued in April 2002) requesting Member Countries/States to provide input on a yearly basis to the On-line Information Service Bulletin on non-drifting ODAS, the META-T Workshop (Reading, United Kingdom, 28-29 March 2006), noted that updates had not been made in the ODAS metadata report.

1.3.2. The DMCG-2 agreed that collecting and recording the metadata for historical purposes was required, and should be regarded as an important activity. Historical metadata should be archived and properly documented. Some older historical ODAS metadata may require additional steps, such as

digitization. The DMCG agreed that the collection of metadata from coastal stations could be facilitated if the global community succeeds in building an operational metadata collection system that could eventually be used as a model. Thus, it was recommended to first stress global issues. It agreed that metadata should, as much as possible, be collected via internationally coordinated observational programmes instead of directly from national programmes.

1.3.3. The DMCG-2 also agreed that the On-line Information Service Bulletin on non-drifting ODAS operated by MEDS (Canada) should be superseded by equivalent tools provided by the ODAS Metadata Centre operated by NMDIS (China). The IOC will continue to collect ODAS metadata on a yearly basis from the IOC Member States, and will submit the information to the ODAS Metadata Centre through data submissions. Practical arrangements need to be discussed between the IOC Secretariat and the ODAS Metadata Centre. MEDS will provide its historical ODAS metadata to the ODAS Metadata Centre.

1.4. Relevant ODAS types

1.4.1. The relevant ODAS types are regarded as lighthouses and light vessels, observing towers and platforms, oil rigs, land-based automatic stations which have been allocated international ocean data buoy identifier numbers, ice drift buoys, and buoys mounted on ships. All of these are suitably instrumented for marine meteorological and oceanographic observation and transmission of data.

1.4.2. The metadata from some of these stations are therefore being made available through the WMO Publication No. 47 by a few WMO Members. This is the case for example of the United Kingdom which is routinely submitting metadata to WMO regarding the instrumented oil rigs operated in the country. However, these metadata are not presently being made available by WMO through Publication No. 47.

1.4.3. The WMO Manual on Codes (No. 306) indicates that rig and platform data transmitted in FM-13 can use either a real callsign or a “buoy” identification number (based on deployment area). Off shore platforms can be fixed or mobile. This, coupled with the current lack of centralized metadata linking both forms of identification, currently results in a situation where the rig and platform data may be difficult or impossible to identify in GTS data (and thus in climate databases such as ICOADS). It should be noted that whilst platforms can use a buoy identification number, they do not come under the jurisdiction of the DBCP. They are more akin to the VOS, however, it was a recommendation from the Ship Observations Team Task Team on Publication No. 47, and temporarily endorsed by ETMC-I (Gdynia, Poland, July 2004), that Publication No. 47 should be restricted to essentially mobile platforms, that mobile offshore units should be reported under the Publication No. 47, and that rigs should be reported under the IOC ODAS metadata scheme. The ETMC may wish to revisit such recommendation in view of the developing metadata collection schemes, i.e., the IOC ODAS being transferred to the JCOMM ODAS metadata centre, and the development of the META-T Pilot Project.

2. META-T Pilot Project (http://marinemetadata.org/examples/external/meta-t)

2.1. Following previous discussions with the DBCP, the SOT, OCG, and the JCOMM Management Committee, the Water Temperature Metadata Pilot Project (META-T PP), was established by JCOMM/OCG Workshop (Reading, United Kingdom, 28-29 March 2006). Terms of References of the Pilot Project Steering Committee, as well as its membership are provided in Appendix B of this document. the JCOMM Management Committee, at its Fifth Meeting (Geneva, Switzerland, 5-7 October 2006), agreed that real-time metadata collection should now be regarded as a priority issue.

2.2. META-T is supporting a number of applications, to include: (i.) Numerical Weather Prediction (NWP), (ii.) SST analysis and GODAE High Resolution SST Pilot Project (GHRSST), in addition to those applications listed under 1.1.1.

2.3. The Pilot Project is aiming at providing a standard framework for collecting SST and temperature profile instrumentation metadata from a number of observational systems, including those

for which implementation or data management are being coordinated via the DBCP, the SOT, the Global Sea-level Observing System (GLOSS), Argo, the OCEAN Sustained Interdisciplinary Timeseries Environment observation System (OceanSITES), GOSUD, the Global Temperature and Salinity Profile Programme (GTSPP), and ODAS. To that end, the following categories of metadata have been drafted so far: (i.) metadata required for real-time distribution along with the observational data, (ii.) metadata required for real-time use, but not necessarily being transmitted along with the observational data (available via servers), and (iii.) other metadata not required in real-time. Possible types of instrumental metadata have been identified and cross-checked with the user requirements. An initial categorization could thus be drafted. Categories, definitions, and categorizations have then been refined by the META-T PP Steering Committee (provided in Appendix C of this document).

2.4 The DMCG noted with appreciation the offer made by the National Marine Data and Information Service (NMDIS), China, to host metadata servers for the Pilot Project. The National Data Buoy Center (NDBC, NOAA, USA) also expressed its interest to participate in this pilot project by hosting a mirror server, and is investigating the feasibility.

2.5. The DMCG agreed that the META-T could eventually be used as a pilot for the collection of instrumentation metadata related to other variables. It recommended that the ETMC should liaise with the META-T Pilot Project and the ODAS metadata centre in order to design and adopt an electronic format for the ODAS, based on the JCOMM recommended ODAS metadata catalogue. The format should thus be compliant with META-T requirements.

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Appendices: 4

APPENDIX A

ODAS METADATA CATALOGUE

(Annex to Resolution 1 (JCOMM-I) following recommendations by the ETMC)

Record type and Sequence#		Field Abbreviation	Input codes	Description of fields
Header Record (HR)				
HR	1	**Ts**	 B 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 in "ind" above, and an 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 the 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 Abbreviation	Input codes	Description of fields
	10	**DA**		Degree of Automation
			1	Fully automated
			2	Always supplemented with manual input
			3	Occasionally supplemented with manual input
			4	Fully manual (no automation)
			5	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**		Hull type
			DS	Discus (Cylinders)
			BS	Boat shaped hull
			RS	Rectangular shape
			SP	Spars
			OD	ODAS 30 series
			NM	NOMAD
			TR	Torus
			CN	Conic
			OR	Omnidirectional wave-rider
			DR	Directional wave-rider
			OT	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 Abbreviation	Input codes	Description of fields
	19	**mtyp**		Mooring type - Mooring type if a moored buoy or drouge type if drifting buoy.
			AC	All Chain (shallow depths generally up to 90 meters)
			ST	Semitaut (intermediated depths generally 60 to 600 meters - generally nylon cable)
			FC	Float Inverse Catenary (deep ocean generally 600 to 6000 m-generally nylon with glass floats)
			PC	Poly-nylon Inverse Catenary (deep ocean generally 1200 to 6000 m)
				Drogue Type
			HS	Holey sock drogue
			TS	Tristar
			WS	Window shade
			PA	Parachute
			NL	Non-Lagrangian sea anchor
				Use for either mooring or drouge as needed
			OT	Other (specify in footnote # 4 Header Record)
	20	**cmsy**		Satellite Data Collection System - system used to transmit the observations
			GO	GOES DCP
			AR	ARGOS PTT
			GA	GOES primary ARGOS backup
			RF	RF
			OT	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**		Digital image - a photograph or schematic of the platform and equipment
			AV	Available in digital file
			NA	Not available
	27	**WebA**		Web Address (URL) where additional information can be obtained

Record type and Sequence#		Field Abbreviation	Input codes	Description of fields
ANEMOMETER (AN)				
DR	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 M 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 Abbreviation	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)				
DR	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))

Record type and Sequence#		Field Abbreviation	Input codes	Description of fields
	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)
WATER TEMPERATURE (WT)				
DR	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))

Record type and Sequence#		Field Abbreviation	Input codes	Description of fields
	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)
SALINITY (SA)				
DR	1	**Sstp**	 CTD STD RM XC NS AL OT	Salinity - sensor type CTD (conductivity-temperature-depth) STD (salinity-temperature-depth) refractometer XCTD (expendable CTD probe) Nansen cast ALACE (autonomus Lagrangian Circulation Explorer) 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)				
DR	1	**bps**		Barometric pressure sensor - instrument type

Record type and Sequence#		Field Abbreviation	Input codes	Description of fields
	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
	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)				
DR	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%)

Record type and Sequence#		Field Abbreviation	Input codes	Description of fields
	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))
	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)				
DR	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)				
DR	1	**srs**		Solar radiation sensor - instrument type
	2	**rMS**		Radiation sensor - model (manufacturer/series no.)

Record type and Sequence#		Field Abbreviation	Input codes	Description of fields
	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)
	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)				
DR	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)

Record type and Sequence#		Field Abbreviation	Input codes	Description of fields
WAVE SPECTRA (WS)				
DR	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)
HORIZONTAL VISIBILITY (HV)				
DR	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)

APPENDIX B

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

(modified slightly by the Steering Committee, August 2006)

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) Refine the list of user requirements and use cases to consider in the context the pilot project;
(iii) Finalize the list of metadata, its categorization and relationships, to meet user requirements;
(iv) 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;
(v) Consider extension to other variables than sea temperature data;
(vi) Address format issues and seek wide acceptance by the ocean observing community (e.g., Marine XML, ISO 19115);
(vii) Facilitate distribution of the metadata to the pilot project data centers, through liaison with relevant observing programmes;
(viii) Encourage the development of tools to access the metadata;
(ix) Suggest other actions to advance the integration and timeliness of marine metadata availability.

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.

Name	Representing	Comment
Elanor Gowland	Global Collecting Centres	Chair, META-T PP
Lin Shaohua	NMDIS metadata server	or her recommendation
Bill Burnett	TAO, NDBC metadata server	
Bob Keeley	JCOMM/DMPA, IODE	or his recommendation
Greg Reed	IODE	
Craig Donlon	JCOMM/SPA, GHRSST, GODAE	
Ed Harrison	OOPC	
David Meldrum	DBCP	and/or TC/DBCP, Hester Viola
Graeme Ball	SOT	
Elizabeth Kent	VOS/VOSClim	
Gustavo Goni	SOOPIP	
Pierre-Yves Le Traon	GODAE	
Thierry Carval	GOSUD, GTSPP, OceanSITES, Argo	
Tom Smith	SST Analysis	to be confirmed
Milan Dragosavac	WIS, NWP	
Neville Smith	Ocean Analysis	or his recommendation
Don Collins Luis Bermudez John Greybeal WIS contacts	Metadata experts	

APPENDIX C

META-T PILOT PROJECT CATEGORIZATION OF METADATA AND REQUIREMENTS

(Version 2.00, 2006-11-06)

Categories of metadata

The following categories of metadata are being considered:

Category 1: Metadata required by operational users for real-time distribution within observational reports. Observational reports therefore include identification, observation date/time, location, sensor values, and category 1 metadata. Observational reports include the GTS reports such as BUFR, BUOY, BATHY, TESAC, or SHIP, as well as reports distributed in real-time through other means (e.g., netCDF reports).

Under Category 1, the following sub-categories can be proposed based on delivery techniques being used:

> Category 1.a: Metadata transmitted directly by the ocean platform (e.g., from the deck of the ship for a VOS) along with its observations and added to the real-time observational reports (BUFR, netCDF, SHIP, etc.).
>
> Category 1.b: Metadata not transmitted directly by the platform, but known by the platform operator, and added on-shore to the real-time observational reports after appropriate data processing (e.g., added in real-time to SHIP or BUFR reports before actual GTS insertion).

Category 2: Metadata of Category 1, plus metadata required by users in real-time, but obtained separately from the observations. Such metadata will not appear in the GTS nor netCDF reports, but platform operators should make them available as soon as possible after platform deployment to the servers for real-time access from there.

Category 3: Metadata of Categories 1 and 2, plus metadata not required by the operational users. These typically include metadata useful for scientific purposes.

All categories of metadata should eventually reach the dedicated metadata server(s). Distribution mode is detailed below.

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

- 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 still needs to be defined by the META-T Pilot Project after careful consideration of existing standards (e.g., XML, MarineXML, ISO 19115).

- Category 3 metadata can be made available to the servers after the start of the platform operational life-time. Formats in which to submit the metadata will be defined by the META-T Pilot Project.

However, Categories 1b and 2 could be combined, depending on the method of delivery of the information (i.e., if 1b is not via the GTS but pulled from a centralised server by the user).

The following user requirements are being considered by META-T: (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.

Categorisation

From the user requirements matrix, the categorisation of metadata types has been proposed, where the fields appear in the earliest section they are mentioned, so the information is provided in time for all users:

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, and ODAS);
- Instrument type (e.g., manufacturer);
- Instrument height or depth (e.g., relative to agreed standard);
- 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); and
- Housekeeping parameter (e.g., battery voltage).

Category 2:

- Platform characteristics (e.g., size, dimensions, and manufacturer);
- Assumed instrument performance/resolution/precision 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);
- Data telecommunication system (e.g., Argos, Iridium, Code 41);
- Type of algorithm used to convert the data.

Category 3:

- Operator of platform or instrument;
- Global programme in which platform is participating (e.g., Argo, VOS);
- Date of last useful transmission;
- Post-Calibration information.

APPENDIX D

BACKGROUND INFORMATION REGARDING THE INFORMATION SERVICE BULLETIN ON NON-DRIFTING ODAS

Recommendation 4 (IPLAN-III) - *Protection from Loss and Wilful Disablement of Buoys Supporting IGOSS and WWW*, which was subsequently endorsed by the WMO Executive Committee at its Twenty-eighth Session (Res. 6 (EC-XXVIII)) and the IOC Executive Council at its Seventh Session (Res. 19 (EC-VII)), requested the two Secretariats to initiate a regular service for obtaining information from Member States on their ocean data buoys and providing wide dissemination of the information collected. The purpose of such a service was not only to ensure the safety of navigation and the protection of buoys against collision, but also to inform the maritime community of the great scientific value of, and the immediate benefits to be derived from, ocean data buoys.

Relevant information was therefore requested from the Member States of the IOC and Permanent Representatives of Members of the WMO through the joint IOC-WMO Circular Letter No. 76026, dated 20 December 1976. On the basis of the information received, the First Issue of a dedicated Bulletin was compiled in June 1977.

Since its Fourth Issue (March 1981), the Bulletin also contains information relating to the ODAS other than ocean data buoys. These are lighthouses and light vessels, observing towers and platforms, oil rigs, land-based automatic stations which have been allocated international ocean data buoy identifier numbers, ice drift buoys, and buoys mounted on ships. All of these are suitably instrumented for marine meteorological and oceanographic observation and transmission of data.

The joint IOC-WMO Working Committee for IGOSS at its Third Session (Paris, France, February - March 1983) recognized that, due to the increasing use of ODAS in the IGOSS and the WWW programmes, the volume of the Bulletin had become very large because of the format being used. The Committee therefore decided that the Bulletin be issued in a simplified form retaining essential elements of the existing Bulletin.

The DBCP, at its Second Session (Geneva, Switzerland, October 1986), "*suggested that, in future, this publication could be restricted to non-drifting ODAS and requested the secretariats to present this suggestion to the Joint IOC-WMO Working Committee for IGOSS at its next session. On the other hand, the panel welcomed the proposal by CLS/Service Argos to issue on a quarterly basis all relevant information with regard to drifting buoys, at no cost to the panel*."

As a result of that suggestion, an inquiry was made among the Bulletin's addressees to decide whether the Bulletin should, or not, be restricted to non-drifting ODAS, in view of the rapid changes in status of drifting buoys. The unanimous answer was that it should. A new format for presentation of the relevant information was therefore prepared and adopted by the Joint IOC-WMO Working Committee for the IGOSS at its Fifth Session (Paris, France, November 1988). The agreed format of the presentation is given herewith in the four working languages, under "Format", together with related explanations ("Notes").

In May-July 1999, the WMO Congress and the IOC Assembly decided to merge the IGOSS and the WMO/CMM into JCOMM. The Bulletin became therefore a joint JCOMM/WWW publication.

The DBCP, at its Fifteenth Session (Wellington, New Zealand, October 1999), "*requested the IOC Secretariat to arrange for the existing Non-Drifting ODAS Catalogue, previously developed under IGOSS, to be made available in electronic form, and provided to the technical coordinator and MEDS to be placed on the appropriate web servers. The Secretariats and the technical coordinator should then ensure that the catalogue was regularly and frequently updated*."

MEDS, Canada, kindly agreed to establish an electronic version of the Bulletin, on the basis of an Excel format.

The JCOMM Data Management Coordination Group, at its Second Session (DMCG-2, Geneva, Switzerland, October 2006), agreed that the On-line Information Service Bulletin on non-drifting ODAS should be superseded by equivalent tools provided by the ODAS Metadata Centre operated by the NMDIS (China). The IOC will continue to collect ODAS metadata on a yearly basis from the IOC Member States and will submit the information to the ODAS Metadata Centre through data submissions. Practical arrangements need to be discussed between the IOC Secretariat and the ODAS Metadata Centre. MEDS will provide its historical ODAS metadata to the ODAS Metadata Centre.