

**Distributed Oceanographic Match-up Service (DOMS)  
Translation Specification: ICOADS In Situ Data**

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**Introduction**

To make the OceanWorks-DOMS matchup output meaningful and easy to use, the collaborating partners have standardized their data. This document defines the translation of ICOADS data from the ICOADS Value-Added Database (IVAD) into an ICOADS-DOMS database and finally into Apache Solr. The mapping of ICOADS IMMA formatted data into the OceanWorks-DOMS standard, based on NetCDF Climate Forecast (CF) recommendations, is described below. Refer to the Provenance Access information section below for documents describing the native IMMA format.

**ID:**

Unique Identification for each ICOADS record.

CF name = id

**Date and time:**

Convert separate fields of YR, MO, DY, and decimal HR in UTC to [ISO 8601](#).

ISO 8601 format: YYYY-MM-DDThh:mm:ssZ

The record is not translated if HR or DY are missing, or the value of DY is invalid, e.g. 30 February. Monthly time resolution is inappropriate for match-up studies.

CF name = time

**Latitude:**

Copy LAT in decimal degrees with +North and - South, precision .01 degrees

CF name = latitude

**Longitude:**

Decimal degrees in -180 West to +180 East, precision .01 degrees

Convert LON 0.00 to 359.99 to -179.99 to 180.00 East

Note there will be no 180.00 West, only 180.00 East will exist.

CF name = longitude

Translate ICOADS Platform Type (PT) and instrumentation/device into OceanWorks-DOMS Platform and Device indices. The mappings are aligned with information provided by the Natural Environment Research Council [Natural Environment Research Council \(NERC\) Vocabulary Server](#) developed and maintained by the British Oceanographic Data Centre.

**Platform:**

DOMS Index Code	DOMS Description	ICOADS PT mapping
1	<a href="#">ship</a>	1-5, 9
2	<a href="#">moored surface buoy</a>	6
3	<a href="#">drifting surface float</a>	7
4	<a href="#">drifting subsurface profiling float</a>	18
5	<a href="#">autonomous underwater vehicle</a>	21, 20
6	<a href="#">offshore structure</a>	15
7	<a href="#">coastal structure</a>	13,14,16
8	<a href="#">towed unmanned submersible</a>	19
missing	<a href="#">unknown, and devices</a>	0, 10, 11, 12, 17

**Device:**

DOMS Index Code	DOMS Description	ICOADS Device (from PT) mapping
1	<a href="#">bathythermographs</a>	11,12
2	<a href="#">discrete water samplers</a>	10
3	<a href="#">CTD</a>	17
missing	<a href="#">missing</a>	

**Quality Control**

ICOADS has an array of 25 indicators that include trimming flags, QC flags, landlock flag, and source exclusion flags. These do not map simply to the primary level quality flag scheme used for OceanWorks-DOMS that is proposed by the International

Oceanographic Data and Information Exchange (IODE)<sup>5</sup>. ICOADS uses two established data trimming schemes based on complex combinations of the 25 indicators. The 'Standard Trimming' scheme considers only ship platforms and therefore is not considered useful for OceanWorks-DOMS. The 'Enhanced Trimming' scheme uses all available platforms (ships, moored and drifting buoys, etc.) and is therefore used as a foundation for mapping ICOADS quality information to the IODE primary level quality flag scheme. Many more details are available in the ICOADS document R3.0-stat\_trim<sup>6</sup> and the subroutines trimqc0<sup>7</sup> and trimqc2<sup>8</sup>. The original 25 ICOADS indicators are included in the <meta> string and provide the opportunity for users to customize their own data QC trimming and filtering on ICOADS records.

#### IODE primary level flags and ICOADS mapping assignments

Value	Primary level flag short name	Definition	ICOADS Mapping
1	Good	Passed documented required QC tests	<b>Passed Enhanced Trimming</b> quality check
2	Not evaluated, not available or unknown	Used for data when no QC test performed or the information on quality is not available	<i>Not applicable, not used</i>
3	Questionable / suspect	Failed non-critical documented metric or subjective test(s)	<i>Not applicable, not used</i>
4	Bad	Failed critical documented QC test(s) or as assigned by provider	<b>Failed Enhanced Trimming</b> quality check
9	Missing data	Used as place holder when data are missing	Set when data is missing

Set Mission to the OceanWorks-DOMS agreed upon code.

#### **Mission:**

Set = 2, for ICOADS

#### **Sea\_water\_temperature:**

1. If OTV is available in *Nocn* and OTZ <= 10m or missing
  - a. sea\_water\_temperature = OTV, precision = .001 degrees C
2. If OTV is not available in *Nocn*, or OTZ > 10m, but SST is available in C0
  - a. sea\_water\_temperature = SST, precision = .1 degrees C
3. If OTV and SST are not available
  - a. sea\_water\_temperature = missing

CF name = sea\_water\_temperature

#### **Sea\_water\_temperature\_depth:**

In matching ordered sequence (1. to 3.) with sea\_water\_temperature above.

1. sea\_water\_temperature\_depth = OTZ, depth positive downward, precision .01m

- a. If OTZ is missing, sea\_water\_temperature\_depth = missing
  - 2. sea\_water\_temperature\_depth
    - a. If DOS is available in Meta-vos and it is  $\leq 10\text{m}$ ,  
sea\_water\_temperature\_depth = DOS, precision 1 meter.
    - b. If DOS is missing, sea\_water\_temperature\_depth = missing
  - 3. sea\_water\_temperature\_depth = missing
- CF name = sea\_water\_temperature\_depth

### **Sea\_water\_temperature\_quality:**

If sea\_water\_temperature = SST is from C0 then:  
Evaluate ICOADS quality and trimming flags according to 'Enhanced Filtering' in R3.0-stat\_trim<sup>6</sup>.  
Assign IODE primary level flags and ICOADS mapping assignment according to Table in the Quality Control section (above).

If sea\_water\_temperature = OTV from Nocr then:  
Assign IODE primary level flag = 1, good data  
CF name = sea\_water\_temperature\_quality

### **Sea\_water\_salinity:**

- 1. If OSV is available in *Nocr*, and OSZ  $\leq 10\text{m}$  or missing
  - a. sea\_water\_salinity = OSV, precision = .001 PSU
- 2. If OSV is not available in *Nocr*, or OSZ  $> 10\text{m}$ 
  - a. sea\_water\_salinity = missing

CF name = sea\_water\_salinity

Note: These data are from the WOD2013 and GOSUD. PSU is the assumed unit of measure.

### **Sea\_water\_salinity\_depth:**

In matching ordered sequence with sea\_water\_salinity above.

- 1. sea\_water\_salinity\_depth = OSZ, depth positive downward, precision .01m
  - a. If OSZ = missing, sea\_water\_salinity\_depth = missing
- 2. sea\_water\_salinity\_depth = missing

CF name = sea\_water\_salinity\_depth

### **Sea\_water\_salinity\_quality:**

Assign IODE primary level flag = 1, good data  
CF name = sea\_water\_salinity\_quality

### **Wind\_speed:**

Copy wind\_speed = W, precision = .1 m/s  
CF Name = wind\_speed

**Eastward\_wind and Northward\_wind:**

Use D and W from IMMA C0 segment to derive

- eastward\_wind, positive east, precision = .1 m/s
- northward\_wind, positive north, precision = .1 m/s

Note: D = wind\_from\_direction i.e. the "oceanographic standard convention"

If D or W are missing, eastward\_wind = northward\_wind = missing

CF names = eastward\_wind and northward\_wind

**Wind\_depth:**

If the IMMA segment Meta-vos exists and HOA is non-missing, wind\_depth = - HOA, precision = 1 m

If Meta-vos is missing or HOA is missing, wind\_depth = missing

CF Name = wind\_depth

**Wind\_speed\_quality:**

Evaluate ICOADS quality and trimming flags according to 'Enhanced Filtering' in R3.0-stat\_trim<sup>6</sup>. Wind speed and direction are QC'd simultaneously during the Enhanced Filtering scheme, therefore wind\_speed\_quality and the wind components derived from wind speed and direction will be assigned the same IODE primary level flags.

Assign IODE primary level flags and ICOADS mapping assignment according to the "IODE primary level flags and ICOADS mapping assignments" table in the Quality Control section (above).

CF name = wind\_speed\_quality

**Wind\_component\_quality**

Assigned the same IODE primary level flag as determined for Wind\_speed\_quality for the reason noted above. This flag applies to the eastward\_wind and the northward\_wind.

CF name = wind\_component\_quality

**Meta:**

ICOADS specific metadata string

# Char.	ICOADS Name	Description
6	UID <sup>1</sup>	ICOADS unique record number
3	RN1-3 <sup>1</sup>	Release number primary, secondary, tertiary sequence, e.g. Release 3.0.0

<sup>1</sup> Table C98, *Uida* attachment in the IMMA1 documentation: [R3.0-imma1\\_short.pdf](#)

3	DCK <sup>2</sup>	Source Deck Number
3	SID <sup>2</sup>	Source Identification
2	PT <sup>2</sup>	Platform Type
2	SI <sup>3</sup>	SST measurement method, only if used in sea_water_temperature is obtained from C0 as noted above.
1	WI <sup>3</sup>	Wind speed indicator, only if wind_speed is obtained from C0 as noted above.
1	DI <sup>3</sup>	Wind direction indicator, only if wind_speed is obtained from C0 as noted above.
54	Meta-vos <sup>4</sup>	21 elements of the Ship metadata attachment MDS through SMV
29	Stat_trim	25 elements including 10-degree box number, day/night flag, trimming flags, QC flags, landlock flag, and source exclusion flags, see R3.0-stat_trim <sup>6</sup>
104	Total Char.	

In the DOMS Solr index query responses, each non-missing meta-string field/element is represented in a JSON object. Only the non-missing field values are returned.

CF name = meta

## Provenance Access

With regards to DOMS we define provenance access as the ability for the user to retrieve the original ICOADS data that has been included in a data matchup service. We leverage the fact that every ICOADS record has a unique identification value (UID). The UID is used for indexing the records in Solr as the ID, and is available as the first six characters of the <meta> string. By using the ICOADS web service API with specification of the UID the full original ICOADS data record, in IMMA1 format, can be retrieved by any user. The methods for using the API and understanding the IMMA1 format are available at:

- [ICOADS Value Added Database \(IVAD\) Web Service API](#)

<sup>2</sup> Table C1, *Icoads* attachment in the IMMA1 documentation: [R3.0-imma1\\_short.pdf](#)

<sup>3</sup> Table C0, *Core* record segment in the IMMA1 documentation: [R3.0-imma1\\_short.pdf](#)

<sup>4</sup> Table C7, *Meta-vos* attachment in the IMMA1 documentation: [R3.0-imma1\\_short.pdf](#)

<sup>5</sup> Intergovernmental Oceanographic Commission, Manuals and Guides, 54, Volume 3, 18 April 2013, *Recommendation for a Quality Flag Scheme for the Exchange of Oceanographic and Marine Meteorological Data*.

<sup>6</sup> ICOADS Quality Control (QC) and Related Processing, [R3.0-stat\\_trim](#)

<sup>7</sup> ICOADS trimming and quality control subroutine [trimqc0](#)

<sup>8</sup> ICOADS trimming and quality control subroutine [trimqc2](#)

- [ICOADS Release 3.0 IMMA1 Short Description](#)