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Ocean Data Standards

Volume 1

Recommendation to Adopt ISO 3166-1 and 3166-3 Country Codes as the Standard for Identifying Countries in Oceanographic Data Exchange

UNESCO

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Ocean Data Standards

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Recommendation to Adopt ISO 3166-1 and 3166-3 Country Codes as the Standard for Identifying Countries in Oceanographic Data Exchange

UNESCO 2010

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1. BACKGROUND

The value of standards for the management and exchange of data has always been acknowledged. In the oceanography and marine meteorology domain, there have been many efforts to develop common standards and data frameworks for processing data and information but these have never been widely adopted by the community.

IODE and JCOMM recognized that, although there were mechanisms to facilitate coordinated ocean data exchange, these had not resulted in the degree of agreement on a wide range of matters that were needed in order to allow the easy exchange and interoperability of collected data. In 2008, the joint IODE/JCOMM Forum on Oceanographic Data Management and Exchange Standards established the Ocean Data Standards Pilot Project (ODS).

One of the objectives of this Project is to initiate discussions on a limited set of topics for which it is felt that broad agreement is possible and to achieve broad agreement and commitment to adopt key standards related to ocean data management and exchange to facilitate exchange between data centres and contributing programmes. A second objective is to establish an internationally recognized process for submitting proposed standards and their acceptance by the ocean community.

The recommended standards that are produced by this process are intended primarily for the use of the oceanographic and marine meteorological community. After recommendation, their use will be widely encouraged within IOC and WMO.

This recommendation to adopt ISO 3166-1 and 3166-3 Country Codes as the Standard for Identifying Countries in Oceanographic Data Exchange has been evaluated and approved in accordance with the IODE/JCOMM Standards Process.

2. USE OF COUNTRY CODES FOR DATA EXCHANGE

The use of a country code in the exchange of data has long been recognized as an important element for the management and exchange of oceanographic data. The seventh session of the Intergovernmental Oceanographic Commission Working Group on International Oceanographic Data Exchange (1973) recommended the adoption of country codes for the purpose international data exchange.

The IOC Country Codes have been maintained,since 1983, by the International Council for the Exploration of the Sea (ICES) as part of its responsibility as RNODC Formats. Although the system of RNODCs was abolished in 2005, ICES continued to maintain the codes.

3. INTERNATIONAL STANDARD ISO 3166

ISO 3166 is the International Standard for country codes. Its purpose is to establish codes for the representation of names of countries (current and formerly used names), territories and areas of geographical interest, and their subdivisions. ISO 3166 do not express any opinion whatsoever concerning the legal status of any country, dependency, or concerning its frontiers or boundaries. It is based on the list in the “Standard Country or Area Codes for Statistical Use” established by the United Nations Statistics Division.

ISO 3166 lists over 220 countries and has become one of the world’s most popular and widely used standard for the representation of names of countries ISO 3166 is used in many of today's computerized systems to store and process information related to countries and

country names. The ISO 3166 standard is maintained by the ISO 3166 Maintenance Agency (ISO 3166/MA).

The International Standard was published in 1974, 1981, 1988 and 1993 as ISO 3166. In 1997, it was split into three parts:

- **ISO 3166-1:2006** ***Codes for the representation of names of countries and their subdivisions - Part 1: Country codes.*** This defines codes for the names of countries, dependent territories, and special areas of geographical interest. It was first published in 1974, it is has since then become one of the world's most popular and most widely used standard solution for coding country names. It defines three sets of country codes: (i) ISO 3166-1 alpha-2 contains a two-letter code which is recommended as the general purpose code, (ii) ISO 3166-1 alpha-3 contains a three-letter code which has better mnenomic properties and (iii) ISO 3166-1 numeric which is a numeric-3 code which can be useful if script independence of the codes is important.

- **ISO 3166-2:2007** ***Codes for the representation of names of countries and their subdivisions - Part 2: Country subdivision code.*** This gives codes for the names of the principal subdivisions (e.g. provinces or states) of all countries coded in ISO 3166-1. This code is based on the two-letter code element from ISO 3166-1 followed by a separator and a further string of up to three alphanumeric characters.

- **ISO 3166-3:1999** ***Codes for the representation of names of countries and their subdivisions - Part 3: Code for formerly used names of countries.*** This contains a four-letter code for those country names which have been deleted from ISO 3166-1 since its first publication in 1974. The code elements for formerly used country names have a length of four alphabetical characters (alpha-4 code elements).

In ISO 3166-1 each country or territory has three codes: (i) a two letter (alpha-2) code, (ii) a three letter (alpha-3) code, and (iii) a three digit (numeric-3) code. The alpha-2 and the alpha-3 byte codes are used to represent country names. However, it is recognized that countries that do not use the Latin alphabet may find the numeric-3 code (e.g., 056 for Belgium) preferable since it has a stronger script independence than the alpha-2 and alpha-3 byte representation. A simple lookup table showing the ISO country names and codes is available and most importantly, the names and codes are standardized and maintained by the ISO/Maintenance Agency. A list ofcountry names (official short names in English) and the corresponding ISO 3166-1-alpha-2 code elementsis described in Annex I.

ISO 3166-3 has a four character code notation for withdrawn codes. The first two characters are the withdrawn code while the last two are the code that replaced it, the code of the country that absorbed the country whose code is withdrawn, or a special code to indicate that there is no single successor code. A list ofthe current ISO 3166-3 codes is described in Annex II.

This Recommendation will consider only ISO 3166-1 and ISO 3166-3.

4. SCOPE OF THIS RECOMMENDATION

This recommendation seeks to standardize country code usage for the exchange of oceanographic and marine meteorological data and metadata. The use of the ISO 3166 can facilitate standardization of the exchange of data and information and was recommended by the IODE/JCOMM Forum on Oceanographic Data Management and Exchange Standards. Integrating the ISO 3166 standard into oceanographic data and associated items of metadata will facilitate interoperability and comparability among data systems and domains

such as atmosphere for climate science. It is intended for all local, national, and international bodies, programs and projects that exchange oceanographic and marine meteorological data. It applies to all instances where a country needs to be identified within oceanographic and meteorological data or accompanying metadata. There is no statutory requirement for the adoption of ISO 3166 standards.

The main benefit for the oceanographic and marine meteorology communities in using ISO 3166 country codesis to standardize across the IOC and WMO communities by implementing a widely used and internationally accepted standard to describe a geopolitical entity regardless of language. Another advantage is that the ISO Maintenance Agency (ISO 3166/MA) has full responsibility for maintaining and providing new codes when a new country is established, when an existing country is split, or countries are merged. If a name is not published by the United Nations, it will not appear in the list of country names and codes.

This recommendation should be applied to oceanographic and marine meteorological data exchange,although it is acknowledged that it may take time to implement across allNational Oceanographic Data Centres and within existing oceanographic data collection and management projects. However, failure to adopt the ISO country codes as an exchange standard will have significant negative consequences for a data centre. If a data centre, or data submitter diverge from the codes being used by other communities, both nationally and internationally, this divergence will require routine expenditure of resources to enable translations and maintain independent country code tables.

Data collection projects are also encouraged to adopt this standard. If an ongoing project has difficulties to implement the standard, depending on the stage of project development, the National Oceanographic Data Centres with responsibility for long-term management of the data may be able to provide assistance.

Many NODCs have implemented the ISO country codes to describe their data while other NODCs have agreed to adopt and integrate the standard in their databases and products. In addition, several international oceanographic communities have already implemented ISO 3166-1into their data management practices. These organizations include: (i) SeaDataNet, the Pan-European and European Union Infrastructure for Ocean and Marine Data Management, has included the ISO country codes in their master database and metadata as vocabulary options, (ii) WMO has included the ISO country codes into their metadata format and published the code in the International List of Selected, Supplementary and Auxiliary Ships, (WMO Pub47), (iii) NOAA Observing System Monitoring Center project, (iv) the International Hydrographic Organization (IHO) has agreed to use the alpha-2 codes (Technical Resolution A 1.19), and (v) World Data Centre for Oceanography (WDC) Obninsk, Russia.

5. RECOMMENDATION

IODE and JCOMM recommend the use of the International Standard ISO 3166-1 (*Codes for the representation of names of countries and their subdivisions - Part 1: Country codes*) and ISO 3166-2 (*Codes for the representation of names of countries and their subdivisions - Part 3: Code for formerly used names of countries*) for the representation of names of countries to be used to annotate oceanographic and marine meteorological data and metadata. The ISO country codes will replace the IOC country codes currently used by data centres.

6. REFERENCES

International Oceanographic Data and Information Exchange (IODE), 2009. *Ocean Data Standards Pilot Project (ODS)*.http://www.oceandatastandards.org/(accessed 28 September 2009).

International Organization for Standardization. 2009. *What is ISO 3166?*Available from http://www.iso.org/iso/country_codes/background_on_iso_3166/what_is_iso_3166.htm (accessed 28 September 2009).

International Organization for Standardization. 2009. *ISO 3166 code lists.*Available from http://www.iso.org/iso/en/prods-services/iso3166ma/02iso-3166-code-lists/index.html (accessed 28 September 2009).

Wikipedia. 2009. *ISO 3166-3*. Available from http://en.wikipedia.org/wiki/ISO_3166 (accessed 28 September 2009).

ANNEX I

ISO 3166-1

CODES FOR THE REPRESENTATION OF NAMES OF COUNTRIES AND THEIR SUBDIVISIONS – PART 1: COUNTRY CODES

The official publication ISO 3166-1is available for purchase from the ISO web site at www.iso.org.

The list of country names and codes are officially published by ISO and are updated whenever a change of country name and/or code element is made in ISO 3166-1.The list of country names for ISO 3166-1 are made available by ISO at no charge for internal use and non-commercial purposes.

Reference: http://www.iso.org/iso/en/prods-services/iso3166ma/02iso-3166-code-lists/index.html

ANNEX II

ISO 3166-3

CODES FOR THE REPRESENTATION OF NAMES OF COUNTRIES AND THEIR SUBDIVISIONS – PART 3: CODE FOR FORMERLY USED NAMES OF COUNTRIES

The official publication ISO 3166-3is available for purchase from the ISO web site at www.iso.org.

The ISO 3166 Maintenance Agency (ISO 3166/MA) updates the code lists for all parts of ISO 3166 and is the ISO focal point for country codes (see http://www.iso.org/iso/country_codes.htm).

A complete list of the current ISO 3166-3 codes is also available from Wikipedia at http://en.wikipedia.org/wiki/ISO_3166-3

ANNEX III

LIST OF ACRONYMS

ICES	International Council for the Exploration of the Sea
IHO	International Hydrographic Organization
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IODE	International Oceanographic Data and Information Exchange (IOC)
ISO	International Organization for Standardization
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
MA	Maintenance Agency (ISO)
NODC	National Oceanographic Data Centre (IODE)
ODS	Ocean Data Standards Pilot Project (IODE/JCOMM)
OSMC	Observing System Monitoring Center Project
RNODC	IODE Responsible National Oceanographic Data Centre (now abolished)
WDC	World Data Centre (ICSU)
WMO	World Meteorological Organization

IOC Manuals and Guides

No.	Title
1 rev. 2	Guide to IGOSS Data Archives and Exchange (BATHY and TESAC). 1993. 27 pp. (English, French, Spanish, Russian)
2	International Catalogue of Ocean Data Station. 1976. *(Out of stock)*
3 rev. 3	Guide to Operational Procedures for the Collection and Exchange of JCOMM Oceanographic Data. Third Revised Edition, 1999. 38 pp. (English, French, Spanish, Russian)
4	Guide to Oceanographic and Marine Meteorological Instruments and Observing Practices. 1975. 54 pp. (English)
5 rev. 2	Guide for Establishing a National Oceanographic Data Centre. Second Revised Edition, 2008. 27 pp. (English) *(Electronic only)*
6 rev.	Wave Reporting Procedures for Tide Observers in the Tsunami Warning System. 1968. 30 pp. (English)
7	Guide to Operational Procedures for the IGOSS Pilot Project on Marine Pollution (Petroleum) Monitoring. 1976. 50 pp. (French, Spanish)
8	*(Superseded by IOC Manuals and Guides No. 16)*
9 rev.	Manual on International Oceanographic Data Exchange. (Fifth Edition). 1991. 82 pp. (French, Spanish, Russian)
9 Annex I	*(Superseded by IOC Manuals and Guides No. 17)*
9 Annex II	Guide for Responsible National Oceanographic Data Centres. 1982. 29 pp. (English, French, Spanish, Russian)
10	*(Superseded by IOC Manuals and Guides No. 16)*
11	The Determination of Petroleum Hydrocarbons in Sediments. 1982. 38 pp. (French, Spanish, Russian)
12	Chemical Methods for Use in Marine Environment Monitoring. 1983. 53 pp. (English)
13	Manual for Monitoring Oil and Dissolved/Dispersed Petroleum Hydrocarbons in Marine Waters and on Beaches. 1984. 35 pp. (English, French, Spanish, Russian)
14	Manual on Sea-Level Measurements and Interpretation. (English, French, Spanish, Russian)
	Vol. I: Basic Procedure. 1985. 83 pp. (English)
	Vol. II: Emerging Technologies. 1994. 72 pp. (English)
	Vol. III: Reappraisals and Recommendations as of the year 2000. 2002. 55 pp. (English)
	Vol. IV: An Update to 2006. 2006. 78 pp. (English)
15	Operational Procedures for Sampling the Sea-Surface Microlayer. 1985. 15 pp. (English)
16	Marine Environmental Data Information Referral Catalogue. Third Edition. 1993. 157 pp. (Composite English/French/Spanish/Russian)
17	GF3: A General Formatting System for Geo-referenced Data
	Vol. 1: Introductory Guide to the GF3 Formatting System. 1993. 35 pp. (English, French, Spanish, Russian)
	Vol. 2: Technical Description of the GF3 Format and Code Tables. 1987. 111 pp. (English, French, Spanish, Russian)
	Vol. 3: Standard Subsets of GF3. 1996. 67 pp. (English)
	Vol. 4: User Guide to the GF3-Proc Software. 1989. 23 pp. (English, French, Spanish, Russian)
	Vol. 5: Reference Manual for the GF3-Proc Software. 1992. 67 pp. (English, French, Spanish, Russian)

No.	Title
	Vol. 6: Quick Reference Sheets for GF3 and GF3-Proc. 1989. 22 pp. (English, French, Spanish, Russian)
18	User Guide for the Exchange of Measured Wave Data. 1987. 81 pp. (English, French, Spanish, Russian)
19	Guide to IGOSS Specialized Oceanographic Centres (SOCs). 1988. 17 pp. (English, French, Spanish, Russian)
20	Guide to Drifting Data Buoys. 1988. 71 pp. (English, French, Spanish, Russian)
21	*(Superseded by IOC Manuals and Guides No. 25)*
22	GTSPP Real-time Quality Control Manual. 1990. 122 pp. (English)
23	Marine Information Centre Development: An Introductory Manual. 1991. 32 pp. (English, French, Spanish, Russian)
24	Guide to Satellite Remote Sensing of the Marine Environment. 1992. 178 pp. (English)
25	Standard and Reference Materials for Marine Science. Revised Edition. 1993. 577 pp. (English)
26	Manual of Quality Control Procedures for Validation of Oceanographic Data. 1993. 436 pp. (English)
27	Chlorinated Biphenyls in Open Ocean Waters: Sampling, Extraction, Clean-up and Instrumental Determination. 1993. 36 pp. (English)
28	Nutrient Analysis in Tropical Marine Waters. 1993. 24 pp. (English)
29	Protocols for the Joint Global Ocean Flux Study (JGOFS) Core Measurements. 1994. 178 pp . (English)
30	MIM Publication Series:
	Vol. 1: Report on Diagnostic Procedures and a Definition of Minimum Requirements for Providing Information Services on a National and/or Regional Level. 1994. 6 pp. (English)
	Vol. 2: Information Networking: The Development of National or Regional Scientific Information Exchange. 1994. 22 pp. (English)
	Vol. 3: Standard Directory Record Structure for Organizations, Individuals and their Research Interests. 1994. 33 pp. (English)
31	HAB Publication Series:
	Vol. 1: Amnesic Shellfish Poisoning. 1995. 18 pp. (English)
32	Oceanographic Survey Techniques and Living Resources Assessment Methods. 1996. 34 pp. (English)
33	Manual on Harmful Marine Microalgae. 1995. (English) [superseded by a sale publication in 2003, 92-3-103871-0. UNESCO Publishing]
34	Environmental Design and Analysis in Marine Environmental Sampling. 1996. 86 pp. (English)
35	IUGG/IOC Time Project. Numerical Method of Tsunami Simulation with the Leap-Frog Scheme. 1997. 122 pp. (English)
36	Methodological Guide to Integrated Coastal Zone Management. 1997. 47 pp. (French, English)
37	Post-Tsunami Survey Field Guide. First Edition. 1998. 61 pp. (English, French, Spanish, Russian)
38	Guidelines for Vulnerability Mapping of Coastal Zones in the Indian Ocean. 2000. 40 pp. (French, English)
39	Manual on Aquatic Cyanobacteria – A photo guide and a synopsis of their toxicology. 2006. 106 pp. (English)
40	Guidelines for the Study of Shoreline Change in the Western Indian Ocean Region. 2000. 73 pp. (English)
41	Potentially Harmful Marine Microalgae of the Western Indian Ocean

No.	Title
	Microalgues potentiellement nuisibles de l'océan Indien occidental. 2001. 104 pp. (English/French)
42	Des outils et des hommes pour une gestion intégrée des zones côtières - Guide méthodologique, vol.II/ Steps and Tools Towards Integrated Coastal Area Management – Methodological Guide, Vol. II. 2001. 64 pp. (French, English; Spanish)
43	Black Sea Data Management Guide *(Cancelled)*
44	Submarine Groundwater Discharge in Coastal Areas – Management implications, measurements and effects. 2004. 35 pp. (English)
45	A Reference Guide on the Use of Indicators for Integrated Coastal Management. 2003. 127 pp. (English). *ICAM Dossier No. 1*
46	A Handbook for Measuring the Progress and Outcomes of Integrated Coastal and Ocean Management. 2006. iv + 215 pp. (English). *ICAM Dossier No. 2*
47	TsunamiTeacher – An information and resource toolkit building capacity to respond to tsunamis and mitigate their effects. 2006. DVD (English, Bahasa Indonesia, Bangladesh Bangla, French, Spanish, and Thai)
48	Visions for a Sea Change. Report of the first international workshop on marine spatial planning. 2007. 83 pp. (English). *ICAM Dossier No. 4*
49	Tsunami preparedness. Information guide for disaster planners. 2008. (English, French, Spanish)
50	Hazard Awareness and Risk Mitigation in Integrated Coastal Area Management. 2009. 141 pp. (English). *ICAM Dossier No. 5*
51	IOC Strategic Plan for Oceanographic Data and Information Management (2008–2011). 2008. 46 pp. (English)
52	Tsunami risk assessment and mitigation for the Indian Ocean; knowing your tsunami risk – and what to do about it. 2009. 82 pp. (English)
53	Marine Spatial Planning. A Step-by-step Approach. 2009. 96 pp. (English). *ICAM Dossier No. 6*
54	Ocean Data Standards Series:
	Vol. 1: Recommendation to Adopt ISO 3166-1 and 3166-3 Country Codes as the Standard for Identifying Countries in Oceanographic Data Exchange. 2010. 13 pp. (English)

The Intergovernmental Oceanographic Commission (IOC) of UNESCO celebrates its 50th anniversary in 2010. Since taking the lead in coordinating the International Indian Ocean Expedition in 1960, the IOC has worked to promote marine research, protection of the ocean, and international cooperation. Today the Commission is also developing marine services and capacity building, and is instrumental in monitoring the ocean through the Global Ocean Observing System (GOOS) and developing marine-hazards warning systems in vulnerable regions. Recognized as the UN focal point and mechanism for global cooperation in the study of the ocean, a key climate driver, IOC is a key player in the study of climate change. Through promoting international cooperation, the IOC assists Member States in their decisions towards improved management, sustainable development, and protection of the marine environment.

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Ocean Data Standards

Volume 2

Recommendation to Adopt ISO 8601:2004 as the Standard for the Representation of Date and Time in Oceanographic Data Exchange

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1. BACKGROUND

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IODE (International Oceanographic Data and Information Exchange) and JCOMM (Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology) recognized that, although there were mechanisms to facilitate coordinated ocean data exchange, these had not resulted in the degree of agreement on a wide range of matters that were needed in order to allow the easy exchange and interoperability of collected data. In 2008, the joint IODE/JCOMM Forum on Oceanographic Data Management and Exchange Standards established the Ocean Data Standards Pilot Project (*International Oceanographic Data and Information Exchange.* 2010).

One of the objectives of this Project is to initiate discussions on a limited set of topics for which it is felt that broad agreement is possible and to achieve broad agreement and commitment to adopt key standards related to ocean data management and exchange to facilitate exchange between data centres and contributing programmes. A second objective is to establish an internationally recognized process for submitting proposed standards and their acceptance by the ocean community.

The recommended standards that are produced by this process are intended primarily for the use of the oceanographic and marine meteorological community. After recommendation, their use will be widely encouraged within IOC and WMO.

ISO 8601 was the standard recommended for the representation of date and time at the IODE/JCOMM Forum on Oceanographic Data Management and Exchange Standards. The recommendation has been evaluated and approved in accordance with the IODE/JCOMM Standards Process.

2. DATE AND TIME FOR DATA EXCHANGE

The representation of date and time is an important element for the management and exchange of oceanographic data. A standardized, unambiguous way of representing date and time is essential to ensure exchanged data is correctly interpreted. A standard notation helps to avoid confusion in international data exchange caused by different national formats.

3. INTERNATIONAL STANDARD ISO 8601:2004

ISO 8601:2004 *Data elements and interchange formats — Information interchange — Representation of dates and times* is an international standard covering the exchange of date and time-related data and is published by the International Organization for Standardization (*International Organization for Standardization. 2004*). The purpose of this standard is to provide an unambiguous and well-defined method of representing dates and times, so as to avoid misinterpretation of numeric representations of dates and times, particularly when data is transferred between countries with different conventions for writing numeric dates and times.

The ISO 8601 standard is used to represent dates in the Gregorian calendar, times in the 24-hour timekeeping system, time intervals and recurring time intervals. It includes (*International Organization for Standardization. 2010):*

- calendar dates expressed in terms of calendar year, calendar month and calendar day of the month;
- ordinal dates expressed in terms of calendar year and calendar day of the year;
- week dates expressed in terms of calendar year, calendar week number and calendar day of the week;
- local time based upon the 24-hour timekeeping system;
- Coordinated Universal Time of day;
- local time and the difference from Coordinated Universal Time;
- combination of date and time of day;
- time intervals;
- recurring time intervals.

The ISO 8601 standard uses the Gregorian calendar, and fixes a reference calendar date to the Gregorian calendar of 1875-05-20 as the date the *Convention du Mètre*. However, ISO calendar dates before the Convention are still compatible with the Gregorian calendar all the way back to the official introduction of the Gregorian calendar on 1582-10-15. Earlier dates, in the proleptic Gregorian calendar, may be used by mutual agreement of the partners exchanging information (*Wikipedia contributors, 2010*). The International Standard ISO 19108 (*Geographic information — Temporal schema*) can be used to define other calendars or calendar eras.

4. DATE AND TIME REPRESENTATION

The International standard states that date and time can be represented in one of two formats: (i) a basic format that has a minimal number of characters and (ii) an extended format that adds separator characters to enhance human readability. The separators used are the hyphen [-] for a date and the colon [:] for a time designation. Separators can be omitted in internal data formats or to describe file names, for example, a file name that corresponds to a date and time could be referred to as MOD021KM.20100516.0930.nc

4.1 Date

The basic date notation is:

YYYYMMDD

where YYYY is the year, MM is the month of the year between 01 (January) and 12 (December), and DD is the day of the month between 01 and 31. For example, the fourth day of February in the year 2005 is written in the basic notation as:

20050204

Apart from the basic date format, ISO 8601 also specifies an extended date format where a hyphen [-] is used to separate the elements “year”, “month’ and “day”, for example as in:

2005-02-04

If only the month and year or only the year is of interest, this is represented as:

2005-02 or **2005**

A week date and an ordinal date can also be represented using the ISO 8601 standard.

4.2 Time

The ISO 8601 standard is based on the 24-hour timekeeping system where:

- hour is represented by two digits from [00] to [24]. The representation of the hour by [24] is only allowed to indicate the end of a calendar day;
- minute is represented by two digits from [00] to [59];
- second is represented by two digits from [00] to [60]. The representation of second by [60] is used to indicate a positive leap second or an instance within that second.

The basic notation for the time of day is:

hhmmss

where hh is the number of complete hours that have passed since midnight, mm is the number of complete minutes that have passed since the start of the hour, and ss is the number of complete seconds since the start of the minute. For example, the time 27 minutes and 46 seconds past 15 hours is represented as:

152746

The extended time format includes a colon [:] to separate the elements “hour”, “minute’ and “second”, for example:

15:27:46

The precision can be reduced by omitting the seconds or both the seconds and minutes as in:

1527 or **15**

It is also possible to add a decimal fraction of hour, minute or second. If a decimal fraction is included then the lower order time element is omitted. The International Standard specifies the decimal sign can be either a comma [,] or full stop [.]. However, as CSV (comma-separated values) is used as a common data exchange format, **it is recommended to use the full stop sign separator**, for example:

152746.5 or **1527.8**

To represent time expressed as Universal Time Coordinated (UTC) the capital letter **Z** is appended to the time. **It is recommended that all exchange of oceanographic and marine meteorological data and metadata use only UTC** as in:

152746Z or **1527Z**

4.3 Combined Date and Time

Date and time represents a specified time of a specified day. The basic notation for combined date and time is:

YYYYMMDDThhmmss

where the capital letter **T** is used to separate the date and time components. For example 27 minutes and 46 seconds past 15 hours on the fourth day of February in the year 2005 is written in basic notation as:

20050204T152746

Combined date and time can also be used to represent UTC, for example:

20050204T152746Z

Combined date and time representations are also used in conjunction with time intervals.

4.4 Time Interval

A time interval is the intervening time between two time points. The ISO 8601 standard states that a time interval can be expressed in one of the following ways:

- by a start and an end;
- by a duration and context information;
- by a start and a duration;
- by a duration and an end.

A solidus or forward slash [/] is used to separate the two time interval components and the designator [P] precedes an expression of time duration.

Duration is a component of time intervals and defines the amount of intervening time in a time interval. Duration can be represented by a combination of components with designators. The number of years is followed by the designator [Y], the number of months by [M], the number of weeks by [W], and the number of days by [D]. The part including time components is preceded by the designator [T], the number of hours is followed by [H], the number of minutes by [M] and the number of seconds by [S].

A time interval using a start date of 27 minutes and 46 seconds past 15 hours on the fourth day of February in the year 2005 and an end date of 30 minutes past 9 hours on the 25th day of March 2005 local time is written in basic notation as:

20050204T152746/20050325T0930

A time interval can also be abbreviated, for example, a time interval within the 12th day of May 2009 from 15 minutes past 14 hours to 16 hours is represented as:

20090512T1415/1600

A time interval from the 12th day of May to the 15th day of May 2009 is represented as:

20090512/15

Further examples of date and time representations are listed in Annex I.

5. DEFINITIONS

The following terms are defined by the International Electrotechnical Commission (IEC) in the International Electrotechnical Vocabulary IEC 60050 (*International Electrotechnical Commission. 2010*).

time interval

part of the time axis limited by two instants

duration

non-negative quantity attributed to a time interval, the value of which is equal to the difference between the time points of the final instant and the initial instant of the time interval, when the time points are quantitative marks

date

time point representing a calendar day on a time scale consisting of an origin and a succession of calendar days

calendar date

date representing a particular calendar day by its calendar year, its calendar month and its ordinal number within its calendar month

ordinal date

date representing a particular calendar day by its calendar year and its ordinal number within its calendar year

week date

date representing a particular calendar day by the calendar year to which its calendar week belongs, the ordinal number of its calendar week within that calendar year and its ordinal number within its calendar week

Coordinated Universal Time - UTC

time scale which forms the basis of a coordinated radio dissemination of standard frequencies and time signals; it corresponds exactly in rate with international atomic time, but differs from it by an integral number of seconds

local time

locally applicable time of day such as standard time of day, or a non-UTC based time of day

calendar day

time interval starting at midnight and ending at the next midnight, the latter being also the starting instant of the next calendar day

6. SCOPE OF THIS RECOMMENDATION

This recommendation seeks to standardize the representation of date and time for the exchange of oceanographic and marine meteorological data and metadata. The use of the ISO 8601:2004 can facilitate this standardization and was recommended by the IODE/JCOMM Forum on Oceanographic Data Management and Exchange Standards. Integrating the ISO 8601:2004 standard into oceanographic data and associated items of metadata will facilitate interoperability and comparability among data systems and domains. It is intended for all local, national, and international bodies, programmes and projects that exchange oceanographic and marine meteorological data. It applies to all instances where a date and time needs to be identified within oceanographic and meteorological data or accompanying metadata. The main benefit for the oceanographic and marine meteorology communities in using ISO 8601:2004 is to standardize the representation of date and time across the IOC and JCOMM communities by implementing a widely used and internationally accepted standard.

All National Oceanographic Data Centres (NODC) are encouraged to adopt this recommendation within existing oceanographic data collection and management projects. Although it is not a requirement that the standard be used to represent date and time in internal databases, many NODCs have already implemented the ISO standard to describe their data while other NODCs have agreed to adopt and integrate the standard in their databases and products. Data collection projects are also encouraged to adopt this standard. If an ongoing project has difficulties to implement the standard, depending on the stage of project development, the National Oceanographic Data Centres with responsibility for long-term management of the data may be able to provide assistance.

The main benefit for the oceanographic community in using the ISO 8601 standards include:

- date and time values are unambiguous;
- easily readable and writable by systems;
- easily comparable and sortable;
- language independent.

7. RECOMMENDATION

IODE and JCOMM recommend the use of the International Standard ISO 8601:2004 *Data elements and interchange formats — Information interchange — Representation of dates and times*) for the representation of date and time for the exchange of oceanographic and marine meteorological data and metadata.

8. REFERENCES

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ANNEX I

EXAMPLES OF DATE AND TIME REPRESENTATIONS

A1. DATE

Calendar date: 26 May 2010

Basic format	**Extended format**
20100526	2010-05-26

Calendar month: May 2010

Basic format	**Extended format**
2010-05	not applicable

Calendar year: 2010

Basic format	**Extended format**
2010	not applicable

A2. TIME OF DAY

Local time: 27 minutes and 46 seconds past 15 hours

Basic format	**Extended format**	
152746	15:27:46	
1527	15:27	(reduced to hour and minute)
15	not applicable	(reduced to hour)

Local time with decimal fractions: 27 minutes and 46 and a half seconds past 15 hours

Basic format	**Extended format**
152746.5	15:27:46.5

UTC time: 20 minutes and 30 seconds past 23 hours

Basic format	**Extended format**	
232030Z	23:20:30Z	
2320Z	23:20Z	(reduced to hour and minute)
23Z	not applicable	(reduced to hour)

Local time and difference from UTC:

27 minutes and 46 seconds past 15 hours locally in Sydney (10 hours ahead of UTC)

Basic format	**Extended format**	
152746+1000	15:27:46+10:00	
152746+10	15:27:46+10	(time difference expressed in hours only)

27 minutes and 46 seconds past 15 hours locally in Ottawa (5 hours behind UTC)

Basic format	**Extended format**	
152746-0500	15:27:46-05:00	
152746-05	15:27:46-05	(time difference expressed in hours only)

27 minutes and 46 seconds past 15 hours locally in Mumbai (5½ hours ahead of UTC)

Basic format	**Extended format**
152746+0530	15:27:46+05:30

Midnight

Basic format	**Extended format**	
000000	00:00:00	beginning of a calendar day
240000	24:00:00	end of a calendar day

A3. DATE AND TIME OF DAY

Combination of calendar date and local time

Basic format	**Extended format**
20100526T152746	2010-05-26T15:27:46

Combination of week date and local time

Basic format	**Extended format**
2010W213T152746	2010-W21-3T15:27:46

A4. TIME INTERVAL

Defined by start and end:

A time interval starting at 20 minutes and 50 seconds past 23 hours on 12 April 1995 and ending at 30 minutes past 10 hours on 25 June 1995

Basic format	**Extended format**
19950412T232050/19950625T103000	1995-04-12T23:20:50/1995-06-25T10:30:00

A time interval starting on 12 April 1995 and ending on 25 June 1995

Basic format	**Extended format**
19950412/0625	1995-04-12/06-25

A time interval of 2 years, 10 months, 15 days, 10 hours, 20 minutes, 30 seconds

Basic format	**Extended format**
P2Y10M15DT10H20M30S	not applicable
P00021015T102030	P0002-10-15T10:20:30

A time interval of seventy-two hours

Basic format	**Extended format**
PT72H	not applicable

ANNEX II

LIST OF ACRONYMS

IOC	Intergovernmental Oceanographic Commission of UNESCO
IODE	International Oceanographic Data and Information Exchange (IOC)
ISO	International Organization for Standardization
JCOMM	Joint Commission for Oceanography and Marine Meteorology (WMO-IOC)
NODC	National Oceanographic Data Centre (of IODE)
ODS	Ocean Data Standards Pilot Project
UTC	Coordinated Universal Time
WMO	World Meteorological Organization

IOC Manuals and Guides

No.	Title
1 rev. 2	Guide to IGOSS Data Archives and Exchange (BATHY and TESAC). 1993. 27 pp. (English, French, Spanish, Russian)
2	International Catalogue of Ocean Data Station. 1976. *(Out of stock)*
3 rev. 3	Guide to Operational Procedures for the Collection and Exchange of JCOMM Oceanographic Data. Third Revised Edition, 1999. 38 pp. (English, French, Spanish, Russian)
4	Guide to Oceanographic and Marine Meteorological Instruments and Observing Practices. 1975. 54 pp. (English)
5 rev. 2	Guide for Establishing a National Oceanographic Data Centre. Second Revised Edition, 2008. 27 pp. (English) *(Electronic only)*
6 rev.	Wave Reporting Procedures for Tide Observers in the Tsunami Warning System. 1968. 30 pp. (English)
7	Guide to Operational Procedures for the IGOSS Pilot Project on Marine Pollution (Petroleum) Monitoring. 1976. 50 pp. (French, Spanish)
8	*(Superseded by IOC Manuals and Guides No. 16)*
9 rev.	Manual on International Oceanographic Data Exchange. (Fifth Edition). 1991. 82 pp. (French, Spanish, Russian)
9 Annex I	*(Superseded by IOC Manuals and Guides No. 17)*
9 Annex II	Guide for Responsible National Oceanographic Data Centres. 1982. 29 pp. (English, French, Spanish, Russian)
10	*(Superseded by IOC Manuals and Guides No. 16)*
11	The Determination of Petroleum Hydrocarbons in Sediments. 1982. 38 pp. (French, Spanish, Russian)
12	Chemical Methods for Use in Marine Environment Monitoring. 1983. 53 pp. (English)
13	Manual for Monitoring Oil and Dissolved/Dispersed Petroleum Hydrocarbons in Marine Waters and on Beaches. 1984. 35 pp. (English, French, Spanish, Russian)
14	Manual on Sea-Level Measurements and Interpretation. (English, French, Spanish, Russian)
	Vol. I: Basic Procedure. 1985. 83 pp. (English)
	Vol. II: Emerging Technologies. 1994. 72 pp. (English)
	Vol. III: Reappraisals and Recommendations as of the year 2000. 2002. 55 pp. (English)
	Vol. IV: An Update to 2006. 2006. 78 pp. (English)
15	Operational Procedures for Sampling the Sea-Surface Microlayer. 1985. 15 pp. (English)
16	Marine Environmental Data Information Referral Catalogue. Third Edition. 1993. 157 pp. (Composite English/French/Spanish/Russian)
17	GF3: A General Formatting System for Geo-referenced Data
	Vol. 1: Introductory Guide to the GF3 Formatting System. 1993. 35 pp. (English, French, Spanish, Russian)
	Vol. 2: Technical Description of the GF3 Format and Code Tables. 1987. 111 pp. (English, French, Spanish, Russian)
	Vol. 3: Standard Subsets of GF3. 1996. 67 pp. (English)
	Vol. 4: User Guide to the GF3-Proc Software. 1989. 23 pp. (English, French, Spanish, Russian)
	Vol. 5: Reference Manual for the GF3-Proc Software. 1992. 67 pp. (English, French, Spanish, Russian)

No.	Title
	Vol. 6: Quick Reference Sheets for GF3 and GF3-Proc. 1989. 22 pp. (English, French, Spanish, Russian)
18	User Guide for the Exchange of Measured Wave Data. 1987. 81 pp. (English, French, Spanish, Russian)
19	Guide to IGOSS Specialized Oceanographic Centres (SOCs). 1988. 17 pp. (English, French, Spanish, Russian)
20	Guide to Drifting Data Buoys. 1988. 71 pp. (English, French, Spanish, Russian)
21	*(Superseded by IOC Manuals and Guides No. 25)*
22 rev.	GTSPP Real-time Quality Control Manual, First revised edition. 2010. 145 pp. (English)
23	Marine Information Centre Development: An Introductory Manual. 1991. 32 pp. (English, French, Spanish, Russian)
24	Guide to Satellite Remote Sensing of the Marine Environment. 1992. 178 pp. (English)
25	Standard and Reference Materials for Marine Science. Revised Edition. 1993. 577 pp. (English)
26	Manual of Quality Control Procedures for Validation of Oceanographic Data. 1993. 436 pp. (English)
27	Chlorinated Biphenyls in Open Ocean Waters: Sampling, Extraction, Clean-up and Instrumental Determination. 1993. 36 pp. (English)
28	Nutrient Analysis in Tropical Marine Waters. 1993. 24 pp. (English)
29	Protocols for the Joint Global Ocean Flux Study (JGOFS) Core Measurements. 1994. 178 pp . (English)
30	MIM Publication Series:
	Vol. 1: Report on Diagnostic Procedures and a Definition of Minimum Requirements for Providing Information Services on a National and/or Regional Level. 1994. 6 pp. (English)
	Vol. 2: Information Networking: The Development of National or Regional Scientific Information Exchange. 1994. 22 pp. (English)
	Vol. 3: Standard Directory Record Structure for Organizations, Individuals and their Research Interests. 1994. 33 pp. (English)
31	HAB Publication Series:
	Vol. 1: Amnesic Shellfish Poisoning. 1995. 18 pp. (English)
32	Oceanographic Survey Techniques and Living Resources Assessment Methods. 1996. 34 pp. (English)
33	Manual on Harmful Marine Microalgae. 1995. (English) [superseded by a sale publication in 2003, 92-3-103871-0. UNESCO Publishing]
34	Environmental Design and Analysis in Marine Environmental Sampling. 1996. 86 pp. (English)
35	IUGG/IOC Time Project. Numerical Method of Tsunami Simulation with the Leap-Frog Scheme. 1997. 122 pp. (English)
36	Methodological Guide to Integrated Coastal Zone Management. 1997. 47 pp. (French, English)
37	Post-Tsunami Survey Field Guide. First Edition. 1998. 61 pp. (English, French, Spanish, Russian)
38	Guidelines for Vulnerability Mapping of Coastal Zones in the Indian Ocean. 2000. 40 pp. (French, English)
39	Manual on Aquatic Cyanobacteria – A photo guide and a synopsis of their toxicology. 2006. 106 pp. (English)
40	Guidelines for the Study of Shoreline Change in the Western Indian Ocean Region. 2000. 73 pp. (English)
41	Potentially Harmful Marine Microalgae of the Western Indian Ocean

No.	Title
	Microalgues potentiellement nuisibles de l'océan Indien occidental. 2001. 104 pp. (English/French)
42	Des outils et des hommes pour une gestion intégrée des zones côtières - Guide méthodologique, vol.II/ Steps and Tools Towards Integrated Coastal Area Management – Methodological Guide, Vol. II. 2001. 64 pp. (French, English; Spanish)
43	Black Sea Data Management Guide *(Cancelled)*
44	Submarine Groundwater Discharge in Coastal Areas – Management implications, measurements and effects. 2004. 35 pp. (English)
45	A Reference Guide on the Use of Indicators for Integrated Coastal Management. 2003. 127 pp. (English). *ICAM Dossier No. 1*
46	A Handbook for Measuring the Progress and Outcomes of Integrated Coastal and Ocean Management. 2006. iv + 215 pp. (English). *ICAM Dossier No. 2*
47	TsunamiTeacher – An information and resource toolkit building capacity to respond to tsunamis and mitigate their effects. 2006. DVD (English, Bahasa Indonesia, Bangladesh Bangla, French, Spanish, and Thai)
48	Visions for a Sea Change. Report of the first international workshop on marine spatial planning. 2007. 83 pp. (English). *ICAM Dossier No. 4*
49	Tsunami preparedness. Information guide for disaster planners. 2008. (English, French, Spanish)
50	Hazard Awareness and Risk Mitigation in Integrated Coastal Area Management. 2009. 141 pp. (English). *ICAM Dossier No. 5*
51	IOC Strategic Plan for Oceanographic Data and Information Management (2008–2011). 2008. 46 pp. (English)
52	Tsunami risk assessment and mitigation for the Indian Ocean; knowing your tsunami risk – and what to do about it. 2009. 82 pp. (English)
53	Marine Spatial Planning. A Step-by-step Approach. 2009. 96 pp. (English). *ICAM Dossier No. 6*
54	Ocean Data Standards Series:
	Vol. 1: Recommendation to Adopt ISO 3166-1 and 3166-3 Country Codes as the Standard for Identifying Countries in Oceanographic Data Exchange. 2010. 13 pp. (English)
	Vol. 2: Recommendation to adopt ISO 8601:2004 as the standard for the representation of date and time in oceanographic data exchange. 2011. 17 pp. (English)
55	Microscopic and Molecular Methods for Quantitative Phytoplankton Analysis. 2010.114 pp. (English)
56	The International Thermodynamic Equation of Seawater—2010: Calculation and Use of Thermodynamic Properties. 2010. 190 pp. (English)

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