

Weather Warnings Data Classification and Encoding Guide

Edition 1.9.0 – December 2025

IHO



International
Hydrographic
Organization

Published by the
International Hydrographic Organization
4b quai Antoine 1^{er}
Principauté de Monaco
Tel: (377) 93.10.81.00
Fax: (377) 93.10.81.40
info@ihodata.int
www.ihodata.int

© Copyright International Hydrographic Organization 2025

This work is copyright. Apart from any use permitted in accordance with the Berne Convention for the Protection of Literary and Artistic Works (1886), and except in the circumstances described below, no part may be translated, reproduced by any process, adapted, communicated or commercially exploited without prior written permission from the International Hydrographic Organization (IHO). Copyright in some of the material in this publication may be owned by another party and permission for the translation and/or reproduction of that material must be obtained from the owner.

This document or partial material from this document may be translated, reproduced or distributed for general information, on no more than a cost recovery basis. Copies may not be sold or distributed for profit or gain without prior written agreement of the IHO Secretariat and any other copyright holders.

In the event that this document or partial material from this document is reproduced, translated or distributed under the terms described above, the following statements are to be included:

"Material from IHO publication [reference to extract: Title, Edition] is reproduced with the permission of the IHO Secretariat (Permission No/...) acting for the International Hydrographic Organization (IHO), which does not accept responsibility for the correctness of the material as reproduced: in case of doubt, the IHO's authentic text shall prevail. The incorporation of material sourced from IHO shall not be construed as constituting an endorsement by IHO of this product."

"This [document/publication] is a translation of IHO [document/publication] [name]. The IHO has not checked this translation and therefore takes no responsibility for its accuracy. In case of doubt the source version of [name] in [language] should be consulted."

The IHO Logo or other identifiers shall not be used in any derived product without prior written permission from the IHO Secretariat.

Contents

1	Overview.....	1
1.1	Preface.....	1
1.2	S-412 Annex A—Data Classification and Encoding Guide—Metadata.....	1
1.3	Terms, definitions and abbreviations.....	1
1.3.1	Terms and definition.....	1
1.3.2	Abbreviated terms.....	1
1.4	Use of language.....	1
1.5	Maintenance.....	2
2	General.....	2
2.1	Introduction.....	2
2.2	Multiple Datasets.....	2
2.3	Descriptive characteristics.....	2
2.3.1	Feature.....	2
2.3.2	Geographic feature class.....	2
2.3.3	Meta feature class.....	2
2.3.4	Charted background feature.....	3
2.4	Spatial characteristics.....	3
2.4.1	Spatial primitives.....	3
2.4.2	Time.....	3
3	Geo Features.....	3
3.1	Convergent Boundary.....	3
4	Attributes and Enumerates Descriptions.....	3

Document History

Changes to the Product Specification S-412 are coordinated by the SERCOM, formerly JCOMM.

Table 1

Version Number	Date	Approved By	Purpose
1.2.0	January 2026	WMO	Initial document creation by IIC Technologies. Version number in line with the PS.

1 Overview

1.1 Preface

The “Data Classification and Encoding Guide” has been developed to provide consistent, standardized instructions for encoding S-412 data.

The purpose of the Data Classification and Encoding Guide is to facilitate S-412 encoding to meet WMO SERCOM standards for the proper display of Marine Weather Warning information in an ECDIS. The document describes how to encode marine weather information considered relevant to be displayed on an ECDIS.

The content of a Marine Weather Warning product is at the discretion of the producing authority, provided that the conventions described within this document are followed. A “producing authority” is a Hydrographic Office (HO) or an organization authorized by a government, HO or other relevant government institution to produce Marine Weather Warning product.

1.2 S-412 Annex A—Data Classification and Encoding Guide—Metadata

NOTE This information uniquely identifies this Annex to the Product Specification and provides information about its creation and maintenance.

Title	The World Meteorological Organization Marine Weather Warning Product Specification, Annex A – Data Classification and Encoding Guide
Version	1.2.0
Date	January 2026
Language	English
Classification	Unclassified
Contact	World Meteorological Organization 7 bis, avenue de la Paix P.O. Box 2300 CH-1211 Geneva 2, Switzerland Telephone: +41 (0) 22 730 84 03 Email: publications@wmo.int
URL	www.wmo.int
Identifier	S-412 Annex A
Maintenance	Changes to S-412 Annex A; Data Classification and Encoding Guide are coordinated by the SERCOM, formerly JCOMM and must be made available via the IHO web site.

1.3 Terms, definitions and abbreviations

1.3.1 Terms and definition

See S-412 Product Specification main document, clause 1.4.

1.3.2 Abbreviated terms

For a list of abbreviations, see S-412 Product Specification main document, Clause 1.6.1.

1.4 Use of language

Within this document:

- “Must” indicates a mandatory requirement.
- “Should” indicates an optional requirement, that is the recommended process to be followed, but is not mandatory.
- “May” means “allowed to” or “could possibly” and is not mandatory.

1.5 Maintenance

Changes to the Data Classification and Encoding Guide must occur in accordance with the S-412 Marine Weather Warning Product Specification clause 1.9.

2 General

2.1 Introduction

This S-412 Data Classification and Encoding Guide (DCEG) contains rules and guidance for converting data describing the real world into data products that conform to the S-412 specification.

The S-412 specification contains an application schema (UML model) describing the conceptual domain model in terms of classes and a Feature Catalogue that specifies the data model, i.e., specifies the data model types corresponding to the various classes in the application schema.

To simplify the DCEG text, the various data model types will be provided without the suffixes “class”, “type” or “instance”; e.g. the term “feature” should be understood as “feature class” or “feature type” or “feature instance” as best fits the immediate context in which it is used (and where there might be confusion, it is written out in full as feature class/type-instance). The model defines real world entities as a combination of descriptive and spatial characteristics (S-412 Product Specification — section 4).

This clause of the DCEG contains general information needed to understand the encoding rules and describes fundamental common rules and constraints. It also describes datasets and metadata. The data model object types used within S-412 and their encoding rules and guidelines are defined in detail in subsequent clauses of this document.

Within this document the features and attributes appear in bold text or italic text, to distinguish them from surrounding words.

2.2 Multiple Datasets

In order to facilitate the efficient processing and exchange of S-412 data, S-412 data files will be split by the time and date in which the file data is valid.

Guidance to be enhanced by WMO.

2.3 Descriptive characteristics

2.3.1 Feature

A feature contains descriptive attributes that characterize real world entities.

The word ‘feature’ as used in the ISO 191xx series and in S-100 based product specifications has two distinct but related senses – ‘feature type’ and ‘feature instance’. A feature instance is a single occurrence of the feature and is represented as an object in a dataset.

The location of a feature instance on the Earth’s surface is indicated by a relationship to one or more spatial primitive instances.

S-412 makes use of the Geographic (Geo) feature type which carries the descriptive characteristics of a real-world entity and of the Information type feature which carries information associated to one or more geo feature.

2.3.2 Geographic feature class

Geographic (Geo) feature types carry the descriptive characteristics of a real world entity which is provided by a spatial primitive instance.

2.3.3 Meta feature class

S-412 does not make use of meta features.

2.3.4 Charted background feature

The data product is primarily distributed to be visualized as an overlay of an S-101 ENC on an ECDIS or other GIS applications. Consequently, all necessary descriptive and spatial characteristics to provide a charted background should be provided by the underlying application.

2.4 Spatial characteristics

2.4.1 Spatial primitives

The allowable geometric primitive for each feature type is defined in the Feature Catalogue. The only allowable geometric primitive in an S-412 data product is surface.

Each spatial value must be referenced by at least one feature instance.

2.4.2 Time

S-412 datasets can represent real-world phenomena in the present or future. Because of the unique nature of atmospheric and oceanographic concepts and their geographical changes in time, a variety of time attributes are included in S-412 to ensure instances of features are attributed correctly through time. Features or information types outside of the temporal range of a dataset shall not be included in a dataset. Time shall always be provided in Coordinated Universal Time (UTC).

The `dateTimeRange` is a complex attribute consisting of simple attributes, `dateTimeStart` and `dateTimeEnd`, to allow certain features to define a specific temporal range. The `dateTimeRange` attribute is mandatory for each feature. This attribute provides data producers the flexibility to manage the temporal resolution of their datasets at the feature level and to concatenate data files in a manner which best suits their workflow and customer's needs. In order for features to be portrayed, the user's system must clearly indicate the `dateTimeRange` of a feature or a group of features if the values are the same. Instances of this attribute may be used for data validation and to ensure temporal quality.

Three other simple `dateTime` attributes (`issuedDateTime`, `nextUpdateDateTime`, and `cancellationDate`) are mandatory for each `WeatherWarning` and inherited into the sub-feature types. The `issuedDateTime` attribute provides a timestamp for when the `WeatherWarning` has been issued. The `nextUpdateDateTime` attribute provides the time information for the next expected `WeatherWarning` to be issued. The `cancellationDate` {is used to mark when a `WeatherWarning` is set to expire, or be cancelled}.

3 Geo Features

3.1 Convergent Boundary

Table 3-1

IHO Definition: CONVERGENT BOUNDARY. The interface or transition zone between air masses of similar densities (temperature, humidity).				
S-101 Geo Feature: Convergent Boundary				
Primitives: Curve				
S-412 Attribute	alias	Allowable Encoding Value	*Type	Multiplicity*
Date Time range			C	1,1

4 Attributes and Enumerates Descriptions

Page intentionally left blank