

Progress with analyses for handling new data types: Ingesting, validating, long-term storage and access of HF Radar data

SDC Plenary Meeting - Barcelona, 8-9/11/2018 sdn-userdesk@seadatanet.org - www.seadatanet.org



HFR – European Integration challenges



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Towards a pan European HFR Network





Towards a pan European HFR Network

- Synergy of different initiatives and projects at European level aiming at:
 - being effective in the implementation of the coordinated development of coastal High Frequency Radar technology and its products
 - establishing the operational HFR European network.
- Active initiatives and projects:
 - EuroGOOS HFR Task Team
 - **EMODnet Physics**
 - CMEMS Service Evolution project INCREASE
 - EU project Jerico-Next
 - EU project SeaDataCloud
 - **CMEMS** INSTAC Phase 2
- Collaboration with: IOOS (US Integrated Ocean Observing System), IMOS-ACORN (Integrated Marine Observing System Australian Coastal Ocean Radar Network), ROWG (Radiowave Operators Working Group)



Towards a pan European HFR Network



http://www.emodnetphysics.eu/map/Products/V2/PRODUCTS.aspx?PRODTYPE=RD





The European common data and metadata model for real-time HFR current data

- The purpose of the format specification is to ensure both efficient and automated HFR data discovery and interoperability, with tools and services across distributed and heterogeneous earth science data systems.
- The recommendations for producing HFR data in the European common model have been published in Jerico-Next D5.14 and include SDC compliance, specifying:
 - File format: *netCDF-4 classic model*
 - Global attribute scheme: mandatory and recommended attributes
 - Dimensions, coordinate variables, data variables and QC variables specification and syntax
 - Quality Control tests and flagging policy



For Radial Data:

- Syntax
- Over water
- Variance threshold / Temporal Gradient
- Velocity threshold
- Median Filter
- Average Radial Bearing
- Radial Count

For Total Data:

- Syntax
- Data Density threshold
- Variance threshold / Temporal Gradient
- Velocity threshold
- GDOP threshold

SDC Plenary Meeting - Barcelona, 8-9/11/2018 Mandatory Quality Control Test

Argo Quality Control flag scale							
Code	Meaning	Comment					
0	unknown	No QC was performed					
1	good data	All QC tests passed					
2	probably good data						
3	potentially correctable bad data	These data are not to be used without scientific correction or re-calibration					
4	bad data	Data have failed one or more QC tests					
5	-	Not used					
6	-	Not used					
7	nominal value	Data were not observed but reported (e.g. instrument target depth)					
8	interpolated value						
9	missing value						

The **overall QC variable** will report the quality flags related to the results of all the QC tests: it is a "good data" flag **if and only if all QC tests are passed**.





Mapping from HFR data model to SDC CDI

CDI FIELD	MIKADO var	HFR data model	PARAMETERS	var10	P02 keywords: RFVL, ACFL
		-	INSTRUMENT and	var11	L05 code 303 (surface current
cdi-identifier	Ś	id	POSITIONING SYSTEM		radars)
ISO 19139 header xml header	not available	default	PLATFORM	var12	source
METADATA CREATING	var01	institution edmo code			source_platform_category_code
ORGANISATION			PROJECTS	var13	project (EDMERP codes)
METADATA CREATION-DATE	not available	date created	Use Limitation	not available	text description of limit of use
Metadata Standard Name	not available	default	DATASET ACCESS	var14	"LS" or "UN" if it is preferred
Metadata Standard Version	not available	default	RESTRICTIONS		
MEASURING AREA TYPE	var02	feature type	STATION NAME and/or	var15	cruise name = site_code
SPATIAL REPRESENTATION		grid resolution (for total data),	CRUISE NAME	var16	station name = platform_code
HORIZONTAL RESOLUTION	var47, var48	geospatial vertical resolution,		var17	
VERTICAL RESOLUTION	var45, var 46	time coverage resolution		Var18	
TIME RESOLUTION	var21, var22	_ 0_		var19	
DATUM OF COORDINATE	var03	reference_system	EDMED REFERENCE	var80	EDMED codes
SYSTEM			CSR Reference	var81	Not applicable
Metadata Extension info	not available	default	SPATIAL RESOLUTION	var45, var46	grid resolution (for total data)
NAME/ALTERNATIVE NAME OF	var04	title	Dataset Language	not available	data language
THE DATASET			Characterset	not available	"utf8"
DATASET-ID	var05	id	Main theme of the dataset	not available	"oceans"
REVISION-DATE OF DATASET	var06	date_modified	GEOGRAPHICAL COVERAGE		
IDENTIFIER	\$	id	WEST	var24	geospatial lon min
ORIGINATORS OF THE DATASET	var07	institution_edmo_code	EAST	var25	geospatial lon max
ABSTRACT ON DATASET	var08	summary	SOUTH	var26	geospatial_lat_min
ORGANISATION MANAGING	var09	institution_edmo_code	NORTH	var27	geospatial_lat_max
THE DATASET			TRACKS (Curves)	var60	Not applicable
RESOURCE MAINTENANCE	not available	update_interval		var62	
INSPIRE reference	not available	default values		var63	



Mapping from HFR data model to SDC CDI

AREAS (Surfaces)	var70 var72 var73	Not applicable	ORGANISATION DISTRIBUTING THE DATASET	var36	institution_edmo_code
			Dataformat Version	var37 var38	"CF 4"
START AND END DATE (AND TIME)	var28 var29	time_coverage_start, time_coverage_end	DISTRIBUTION INFO / SERVICE BINDINGS Data size Distribution website	var39 var40	Link to THREDDS catalog
MINIMUM DEPTH OF OBSERVATION	var30	geospatial_vertical_min, geospatial_vertical_max, geospatial_vertical_units, vertical_datum	Distribution protocol Database reference Distribution Method	var42 var41 var43	
OBSERVATION	var31				
WATER DEPTH	var35		Data Quality Information Scope Report - Name Report - Date Report - Comment Report - Status Lineage	not available var95 var96 var97 var98 not available	processing_level list of each QC test applied on data with related date
VERTICAL DATUM	var34				



Full compliance of HFR data model to SDC CF extension

The data model is intended to be the unique model for HFR data distribution, thus it integrates CMEMS and SeaDataCloud (SDC) requirements.

In the final release of the data model all the global attributes required for the SDC CDI scheme and for the SDC CF extension have been added as mandatory.

- Variable attributes required in the SDC CF extension have been added as mandatory:
 - coordinates for geophysical data variables --> list of the coordinate variables for the measurement value as a space-delimited list (e.g. "TIME DEPTH LATITUDE LONGITUDE" for a geographic gridded variable.
 - **:ancillary_variables** --> name of the flag channel for the variable.
- site_code and platform_code attributes have been linked to the EDIOS Series and Platform codes and they build the CDI local identifier of the data file and the SDN namespace variables required in the SDC CF extension.
- QC variables (TIME_SEADATANET_QC, POSITION_SEADATANET_QC and DEPTH_SEADATANET_QC) for coordinate variables have been added as mandatory.



Full compliance of HFR data model to SDC CF extension

In the final release of the data model, SDN namespace variables and variable attributes have been added as mandatory.

SDN namespace variables:

- char SDN_CRUISE --> site_code
- **char SDN_STATION** --> platform_code
- char SDN_LOCAL_CDI_ID --> id
- **int SDN_EDMO_CODE** --> institution_edmo_code
- **char SDN_REFERENCE** --> it is be the link to the TDS metadata page of the dataset.
- **char SDN_XLINKS** --> link to CDI will be adopted with proper namespace 'SDN:L23::CDI'.
- SDN namespace variable attributes:
 - **:sdn_parameter_name** --> Entryterm from the P01 vocabulary.
 - **:sdn_parameter_urn**--> URN from the P01 vocabulary.
 - **:sdn_uom_name** --> Entryterm from the P06 vocabulary.
 - **:sdn_uom_urn**--> URN from the P06 vocabulary .
 - :sdn_convention_urn only for QC ancillary variables --> a SDN extension set to 'SDN:L20::'
- Other specific variable attributes:
 - :Conventions for QC ancillary variables --> 'SeaDataNet measurand qualifier flags'



Full compliance of HFR data model to SDC CF extension

Left incompatibilities/issues will be resolved in automatic way while timeaggregating NRT data to build historical datasets:

- Different QC variable type and flagging scheme
 - QC variable type is **'byte'**.
 - :flag_values = 48b, 49b, 50b, 51b, 52b, 53b, 54b, 55b, 56b, 57b, 65b ;
 - :flag_meanings = "no_quality_control good_value probably_good_probably_bad_value bad_value changed_value value_below_detection value_in_excess interpolated_value missing_value value_phenomenon_uncertain";
- Depth variable
 - SDC CF extension requires the depth variable to be named DEPTH, while CMEMS-INSTAC requires it to be named DEPH.

\rightarrow we generate 2 files: 1 for CMEMS REP product, 1 for SDC product



Full compliance of HFR data model to SDC CF extension

- The flag values and meanings will be converted via a mapping table when the temporal aggregation is performed: duplication of variables for the same QC tests is avoided.
 - :Conventions and :sdn_conventions_urn attributes will be added to the QC variables.
- DEPH coordinate variable will be renamed as DEPTH for SDC datasets.



HFR Data Model Reference Card

The European common data and metadata model for real-time High Frequency Radar surface current data

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Background of research

rishle attributes MUST be

ent for each coordinate and data variable

Activity and results

Conclusions

High Frequency Radars (HFR) have become invaluable tools in the field of operational oceanography for monitoring surface currents, waves and winds, with direct applications in Search and Rescue, renewable energy, fishery management and monitoring of pollutants and biological quantities. They are increasingly used to support decision making by coastal ocean users and managers, and it is expected that HFR surface current data will be soon systematically ingested in data assimilation processes. It is then crucial to promote and distribute high quality HFR data for scientific, operational and societal applications.

An appropriate data description complying with an accepted standard, is crucial for enforcing discovery and access The comprehensive metadata description is a prerequisite for the full implementation of EuroGOOS, providing an inventory of the continuously available data for operational models, and for creating and giving an overview of marine monitoring programmes relevant for the Marine Strategy Framework Directive (MSFD) implementation.

Active international initiatives and ongoing projects aim at fostering and promoting the use of HFR technology in Europe. As part of these efforts, a model for data and metadata was defined and implemented for becoming the official European standard for producing near real-time HFR surface current data and for ensuring efficient and automated HFR data discovery and interoperability. The model has been implemented according to the standards of Open Geospatial Consortium (OGC) for access and delivery of geospatial data, and compliant with the Climate and Eorecast Metadata Convention CE-1.6, the OceanSITES convention, the Copernicus-InSituTAC-SRD-14 and the INSPIRE directive. The model has been defined following the guidelines of the DATAMEQ working

group and it fulfils the recommendations given by the Radiowave Operators Working Group (ROWG). The model specifies the file format (i.e. netCDE-4 classic model), the global attribute scheme, the dimensions, the coordinate data and Quality Control (QC) variables and their syntax, the QC procedures and the flagging policy for both radial and total data

HFRadar 🚔 EuroGOOS FJERKOopernicus (1) IOOS

A common data and metadata model was implemented to ensure efficient and automated HFR data discovery and interoperability across distributed and heterogeneous earth science data systems. A battery of mandatory OC tests was also defined, in order to ensure the delivery of high quality data. Further activities are planned to make

HFR technology is rapidly expanding in Europe, and there

is the need for promoting and distributing high quality HFR

Rowg the model compliant with the SDC CF extension model.

For questions, information, collaboration please contact

data for scientific and societal applications.

The data and metadata profile for netCDF-4 classic format HFR data



and only if all QC tests are passe

by the data

http://marineinsitu.eu/wp-content/uploads/2018/02/HFR Data Model Reference Card v1.pdf

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oventions urn attributes are added

"CF 4"

ance Threshold / 1

GDOP Threehold



HFR Workcamp, 22-24/10/2018 Bilbao



The main purpose of the Workcamp was practical, putting hands on the software tools we developed, making HFR data providers able to start converting their own data (both Codar and WERA) to the European HFR Standard.

The workcamp has been a successful meeting point where data provider requirements and harmonization needs came together.

The openness transmitted for collaborating with the operators has been very well received and they will contribute to drive European HFR Standard developments.

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HF RADAR WORKCAMP "The EU standard: make it your own"

AZTI- Derio (SPAIN), 22-24 OCTOBER 2018

VENUE

AZTI Parque Tecnológico de Bizkaia Astondo Bidea. Edif. 609 48160 – Derio (Bizkaia)

GPS Coordinates Lat. 43.298850860797366 Long. -2.8704932297118



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Next steps – HFR Europen Node

- work on/release the deliverable
- Implement the processing/validation chain
 - test mode of the
 - Operational mode



Thanks for your attention

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