

Report on HFR - Cosyna Historical data files QA/QC

Data provider information:

- contributors name: Jochen Horstmann; Jan Widera
- contributors contact: jochen.horstmann@hzg.de; widera@helzel.com
- acknowledgements: The COSYNA HF Radar Network has been installed and maintained jointly by the Helmholtz Zentrum Geesthacht and Helzel Meestechnik GMBH.

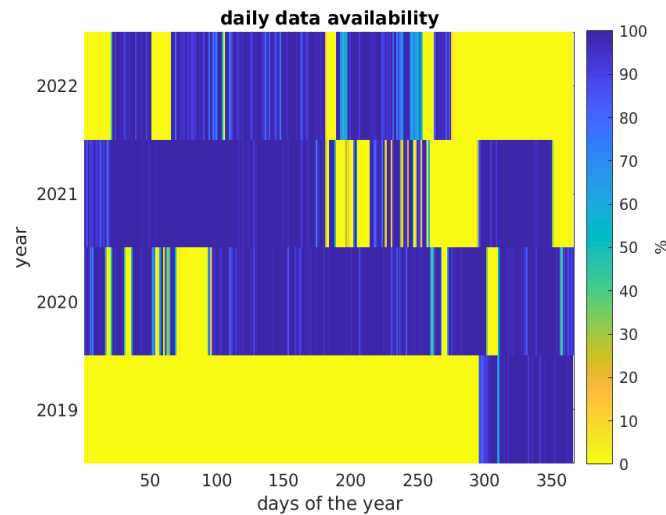
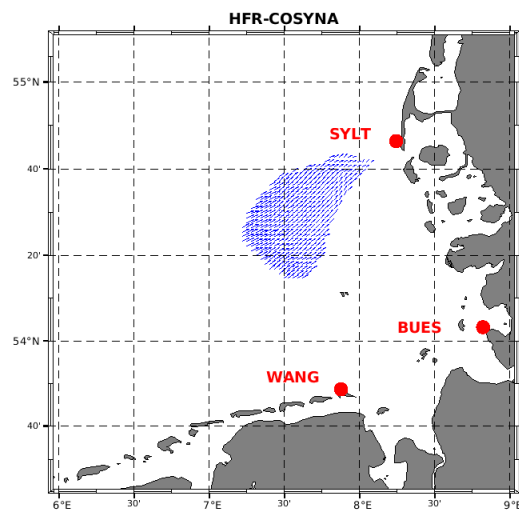
System: **Cosyna**

Sites: **BUES, SYLT, WANG**

Data set: **Totals**

Data source: Totals from the radials combination in de EU Node

Period: **2019-Oct-22 - 2022-Oct-02**



Daily data % available during the whole time period

INFO ON QA/QC Settings and Calibration

%%% QC info for time: 22-Oct-2019 15:00:00

OceanSITES quality flagging for GDOP threshold QC test. Threshold set to 2.

%%% QC info for time: 22-Oct-2019 15:00:00

OceanSITES quality flagging for Data density threshold QC test. Threshold set to 3 radials.

%%% QC info for time: 22-Oct-2019 15:00:00

OceanSITES quality flagging for Velocity threshold QC test. Threshold set to 1.2 m/s.

%%% QC info for time: 22-Oct-2019 15:00:00

OceanSITES quality flagging for variance threshold QC test. Threshold set to 1 m²/s².

%%% Calibration info for the period: 22-Oct-2019 – 02-Oct-2022

BUES: 2007-02-09T00:00:00Z; SYLT: 2007-02-09T00:00:00Z; WANG: 2007-02-09T00:00:00Z

RESULTS OF HIST DATA INSPECTION

General comments:

Low “number of good data” around the end of October 2019 and in the first half of 2020. Seems to be related to the lack of SYLT radial data.

Low “number of good data” around December 2020 and January 2021 probably related to the low availability of radial data.

In 2022 the “number of good data” is quite variable. Could be affected by the lack of data availability in BUES radials.

NO reflagging is proposed as the low availability seems to be due to the geometry of the antennas location.

year	General comment	Periods to be reflagged	Reason for new flagging	Sugg. Flag
After exchanges with the provided the following periods where reflagged:				
Year	General comment	Periods to be reflagged	Reason	New Flag

From October to December 2019 the spatial/temporal coverage is small. In 2020, 2021 and 2022 the spatial/temporal coverage is bigger centred in the middle and SE part of the radar footprint area. The mean circulation presents a N-NE-NW pattern.

Spatial Coverage vs. Temporal coverage: objective of USCG 80-80% data availability

Period	General comments	Nb. analysed hours	80%-80% obj.
2019	8.28% spatial availability 80% of the time. <i>80% of spatial availability reached in a small zone between 7°15'E and 8°E</i>	1641	n
2020	19.7577% spatial availability 80% of the time. <i>80% of spatial availability covered a bigger area than in 2019, around 7°40'E and 8°30' E</i>	7260	n
2021	29.4514% spatial availability 80% of the time.	6569	n

	<i>80% of spatial availability covered an area similar to 2020</i>		
2022	21.5079% spatial availability 80% of the time. <i>80% of spatial availability covered an area similar to 2020</i>	4948	n

Annex I Applied QA/QC tests

QC Flag Variable name	Short name	Short description
-	Syntax	Syntax check: this test will ensure the proper formatting and the existence of all the necessary fields within the total NetCDF file. This test is performed on the NetCDF files and it assesses the presence and correctness of all data and attribute fields and the correct syntax throughout the file. This test is performed by the European HFR Node before pushing data to the distribution platforms.
DDNS_QC	Data Density Threshold	Data Density Threshold: this test labels total velocity vectors with a number of contributing radials bigger than the threshold with a “good data” flag and total velocity vectors with a number of contributing radials smaller than the threshold with a “bad data” flag.
CSPD_QC	Velocity Threshold	Velocity Threshold: this test labels total velocity vectors whose module is bigger than a maximum velocity threshold with a “bad data” flag and total vectors whose module is smaller than the threshold with a “good data” flag.
VART_QC	Variance Threshold	Variance Threshold: this test labels total vectors whose temporal variance is bigger than a maximum threshold with a “bad data” flag and total vectors whose temporal variance is smaller than the threshold with a “good data” flag. This test is applicable only to Beam Forming (BF) systems. Data files from Direction Finding (DF) systems will apply instead the “Temporal Derivative” test reporting the explanation “Test not applicable to Direction Finding systems. The Temporal Derivative test is applied.” in the comment attribute.
TIME_QC	Temporal Derivative	Temporal Derivative: for each total bin, the current hour velocity vector is compared with the previous and next hour ones. If the differences are bigger than a threshold (specific for each grid cell and evaluated on the basis of the analysis of one-year-long time series), the present vector is flagged as “bad data”, otherwise it is labelled with a “good data” flag. Since this method implies a one-hour delay in the data provision, the current hour file should have the related QC flag set to 0 (no QC performed) until it is updated to the proper values when the next hour file is generated.
GDOP_QC	GDOP Threshold	GDOP Threshold: this test labels total velocity vectors whose GDOP (Geometrical Dilution Of Precision) is bigger than a maximum threshold with a “bad data” flag and the vectors whose GDOP is smaller than the threshold with a “good data” flag.
QCflag	Overall QC	

Annex II QC Flags

Code	Meaning	Comment
0	No QC was performed	-
1	Good data	All real-time QC tests passed.
2	Probably good data	-*

3	Bad data that are potentially correctable	These data are not to be used without scientific correction.*
4	Bad data	Data have failed one or more of the tests.
5	Value changed	Data may be recovered after transmission error.
6	Not used	-
7	Nominal value	-
8	Interpolated value	Missing data may be interpolated from neighbouring data in space or time.
9	Missing value	-

*These two are to be used after examination of the hist data sets and exchanges with the data provider

Annex III Figures for the QA/QC tests

Fig A – Temporal series of the spatial average of the current velocity module (first panel), its standard deviation (second panel), the grid points of the total coverage (third panel), and monthly data availability. Black dots are the values obtained considering all the data in the domain, in green those considering only data with QC flag =1 (good data).

Fig B - Temporal series of the QC flags for all the grid nodes with data and percentage of data with each flag (0,1,2,3,4).

Fig C - Maps of the mean velocity module and the mean value of QC flags for the target year (left column) and their standard deviations (right column) for the target year.

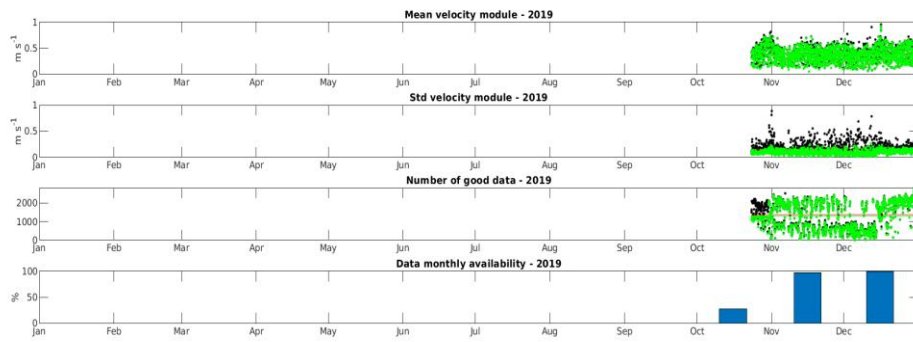
Fig D - Spatial (x-axis) vs. temporal (y-axis) coverage 80/80 annual metric. Allows to check if the system has reached the goal of providing surface currents over the 80% of the area during 80% of the time. The grid points taken in account for the % are the ones inside the GDOP limits defined by the data provider.

Fig E – Map of the % of availability of data in each grid point and contour showing the area of temporal availability >80%

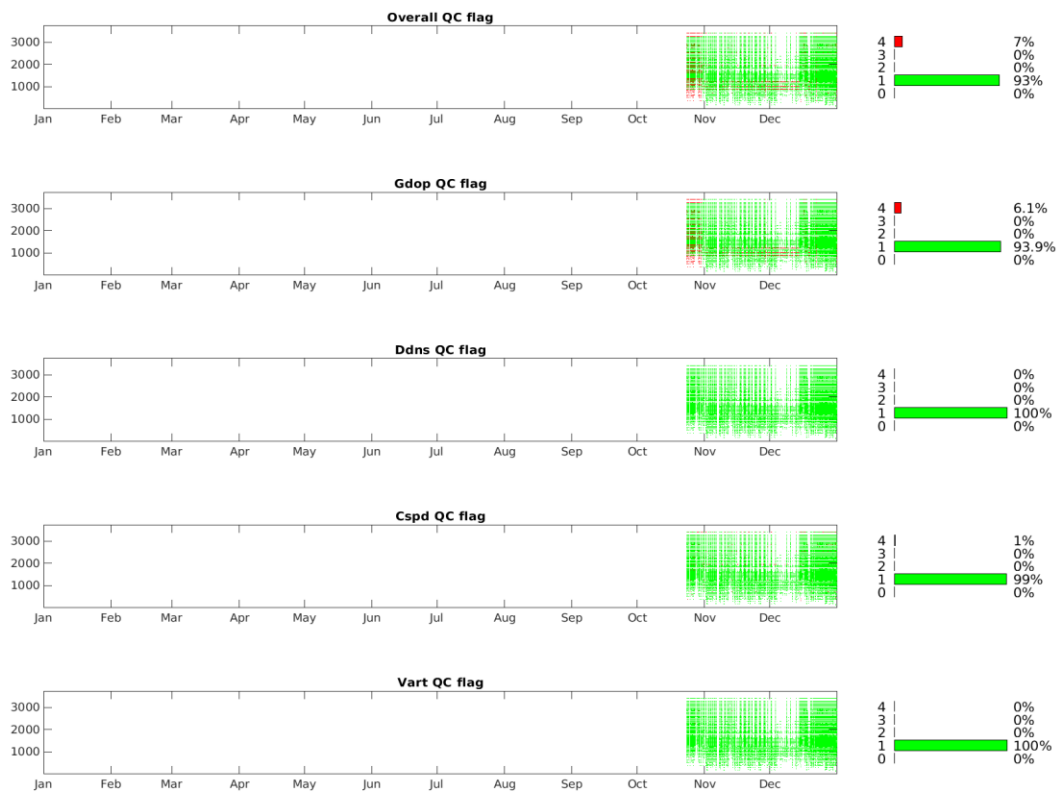
Fig F- Mean surface current maps for the indicated systems and periods. The means are computed in the area of 80% temporal coverage for the target year.

Period: 2019

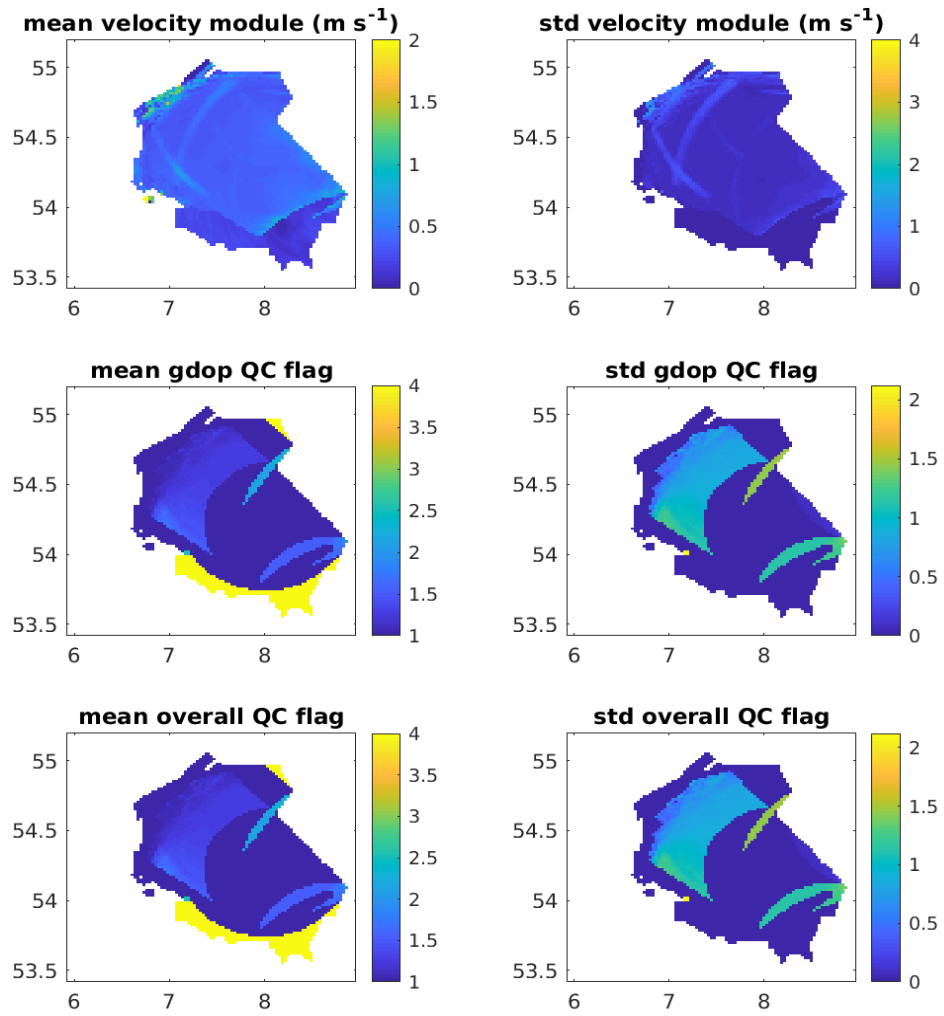
A



B

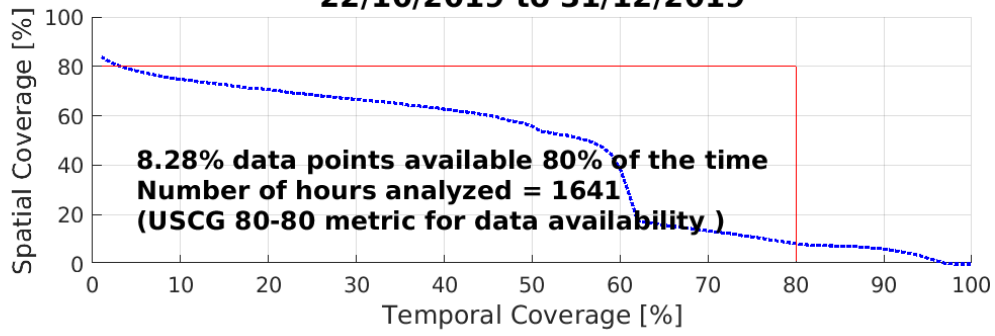


C



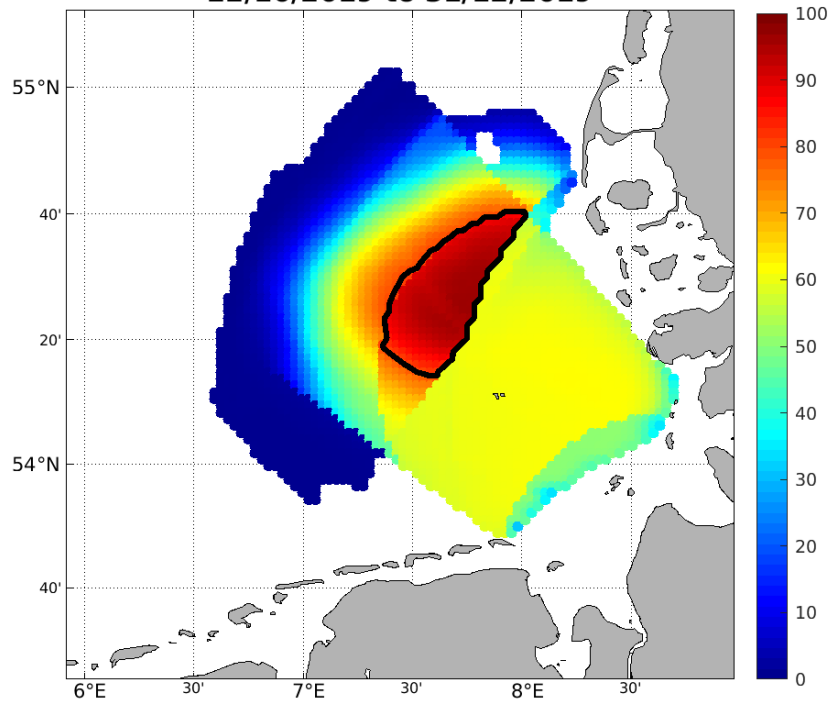
D

HFR-COSYNA: Spatial Coverage vs. Temporal Coverage 22/10/2019 to 31/12/2019



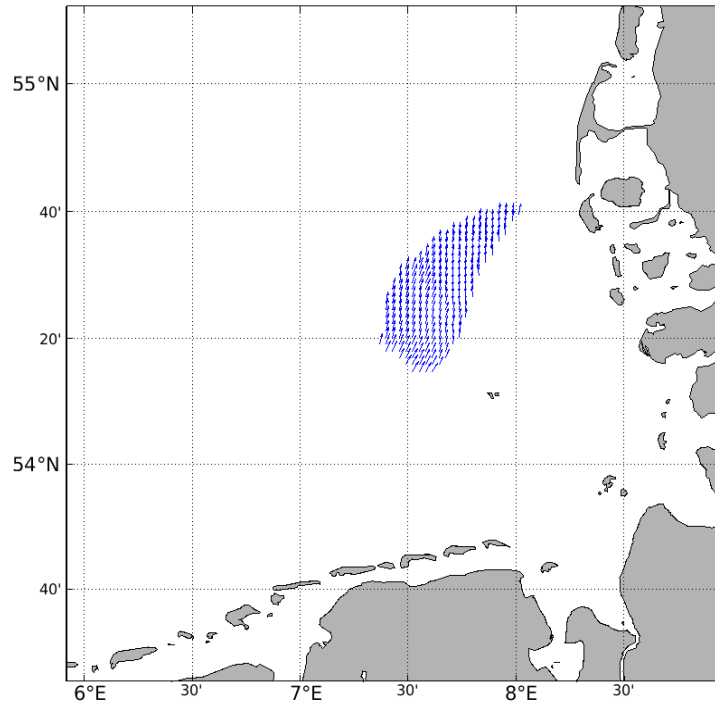
E

HFR-COSYNA: Percent Total Vector Coverage (contour showing >80%) 22/10/2019 to 31/12/2019



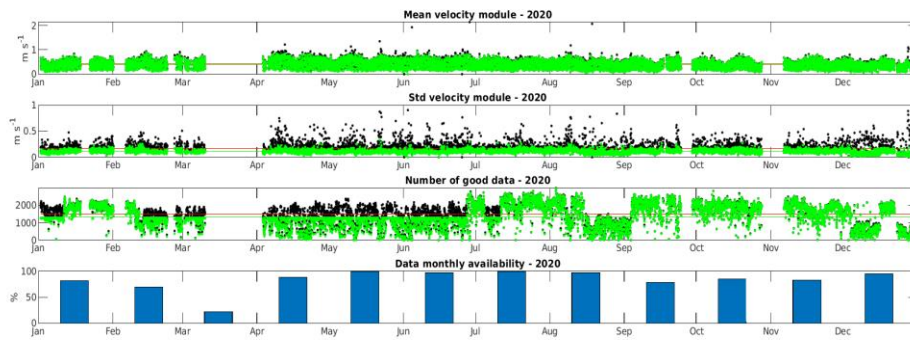
F

**HFR-COSYNA: HFR Surface current average [m/s]
22/10/2019 to 31/12/2019**

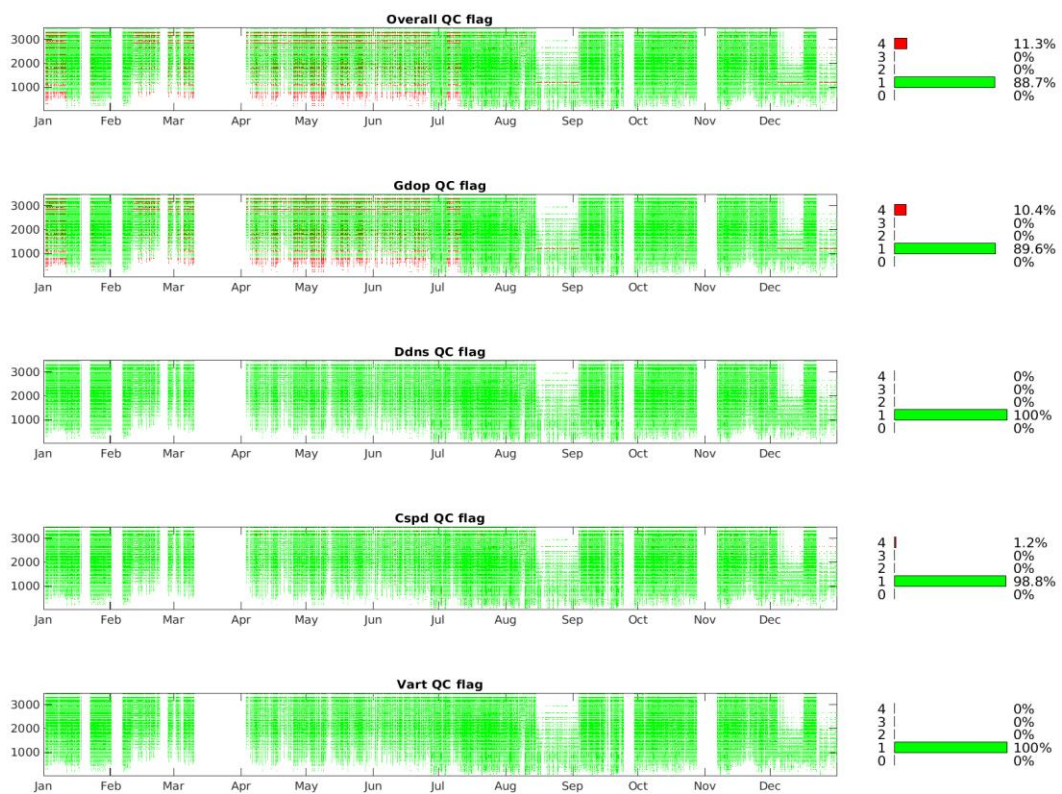


Period: 2020

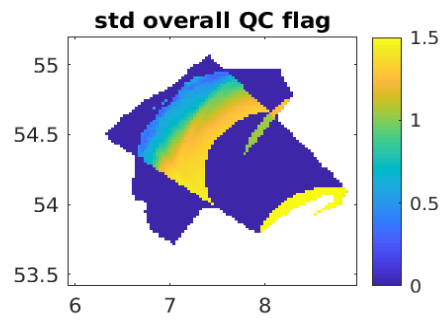
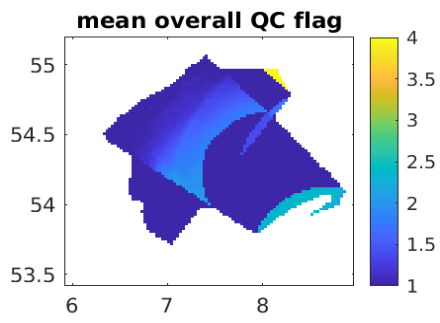
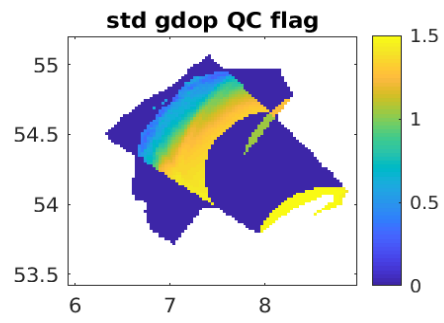
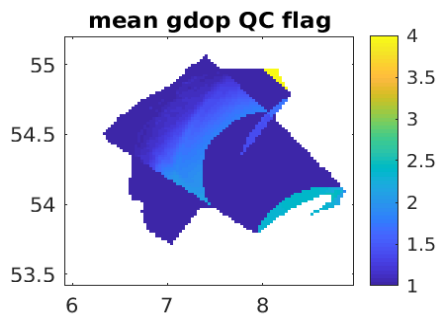
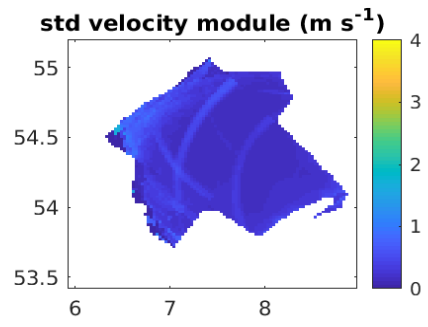
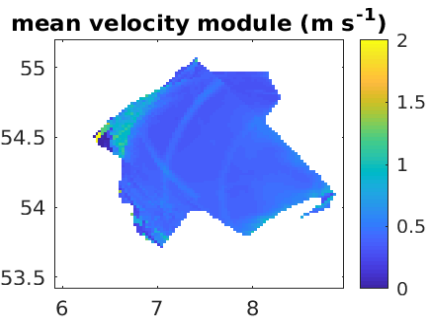
A



B

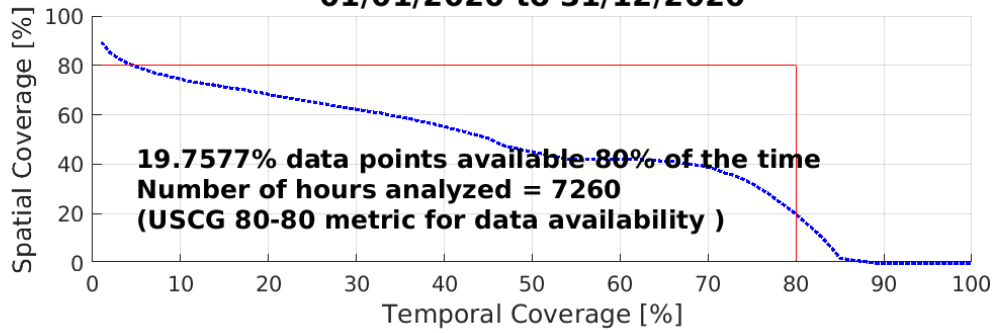


C



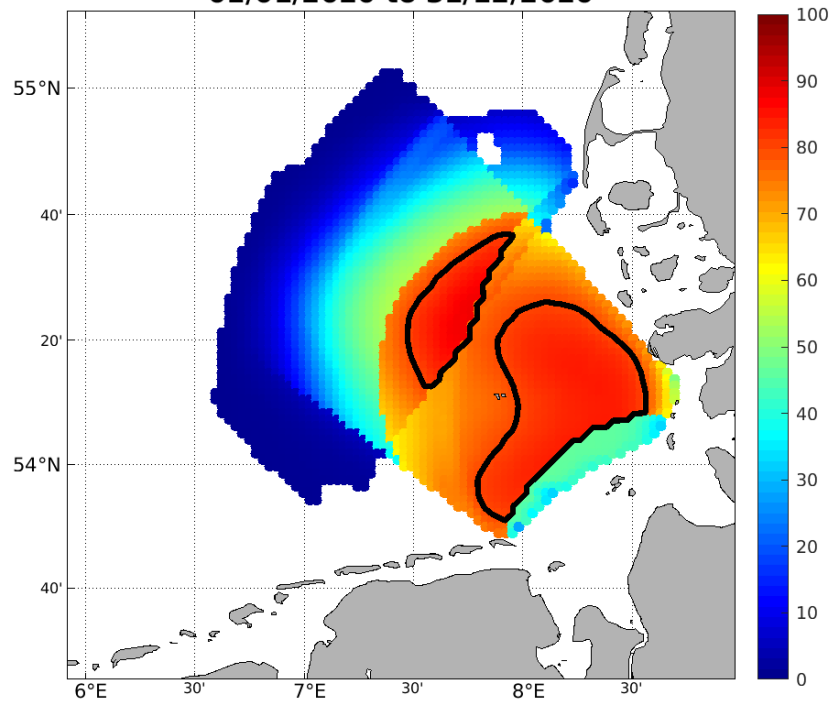
D

HFR-COSYNA: Spatial Coverage vs. Temporal Coverage 01/01/2020 to 31/12/2020



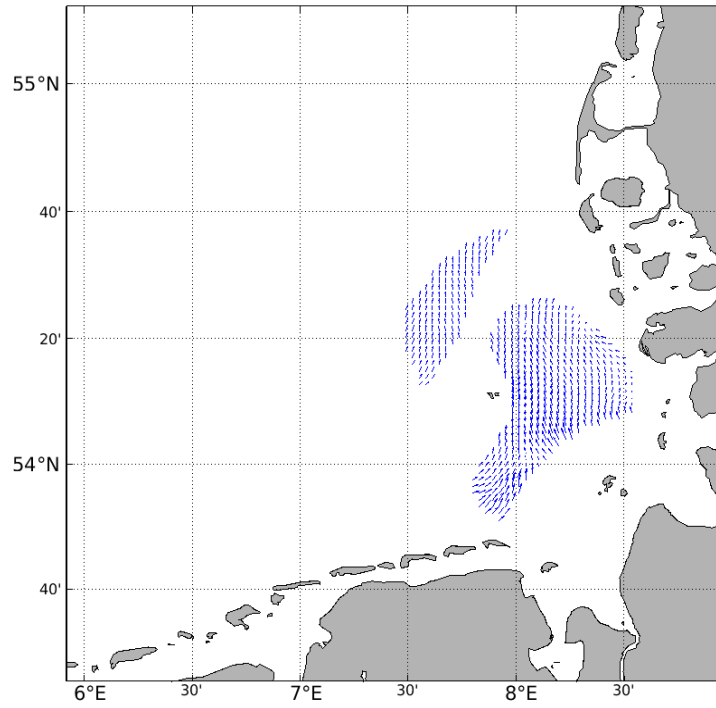
E

HFR-COSYNA: Percent Total Vector Coverage (contour showing >80%) 01/01/2020 to 31/12/2020



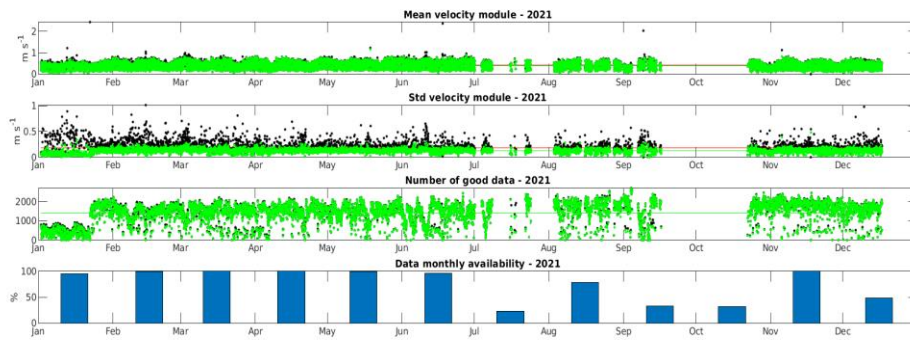
F

**HFR-COSYNA: HFR Surface current average [m/s]
01/01/2020 to 31/12/2020**

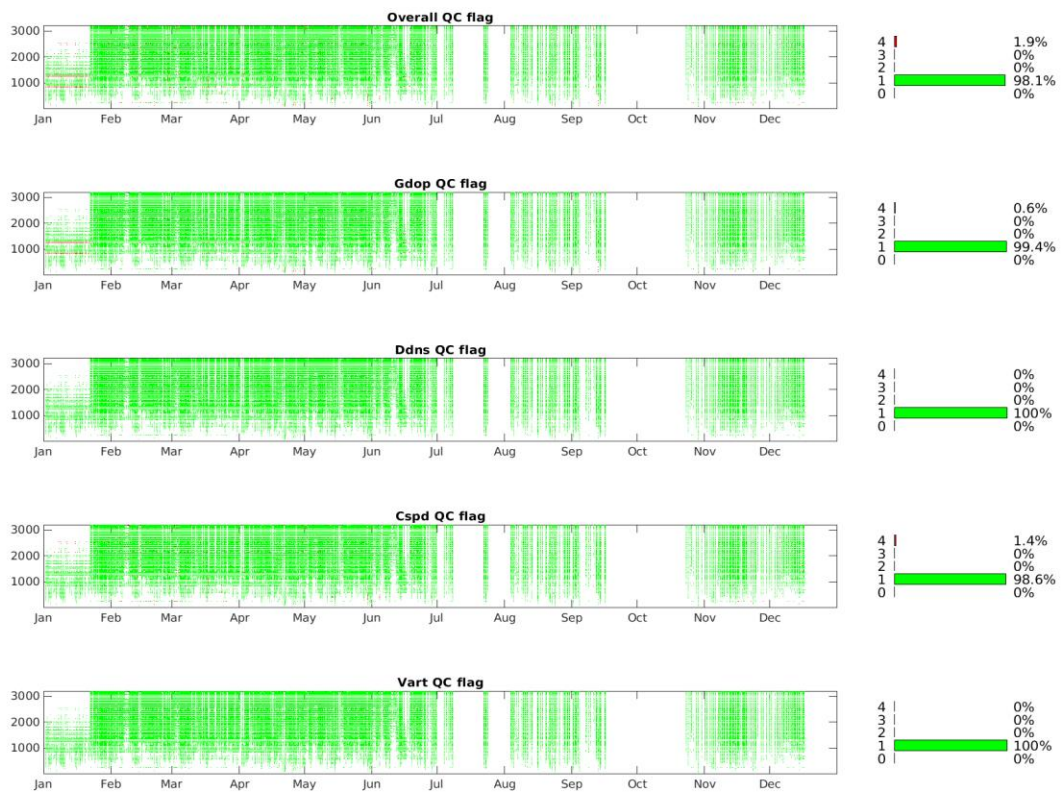


Period: 2021

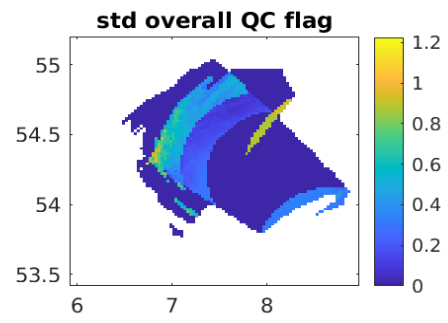
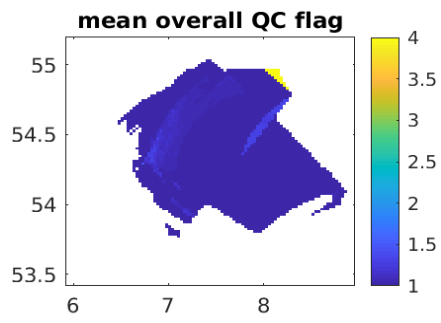
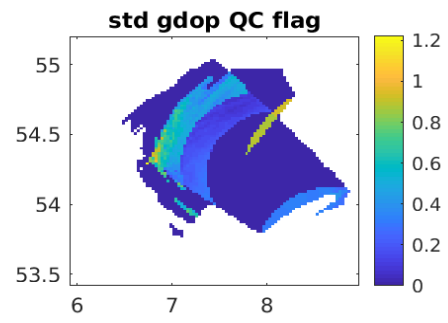
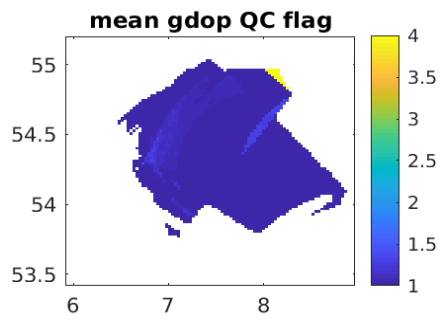
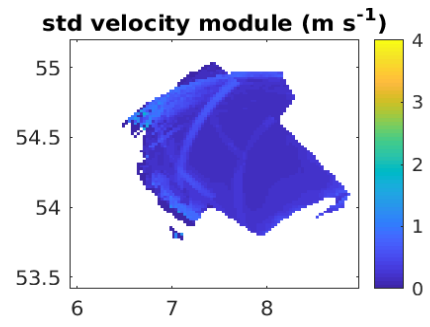
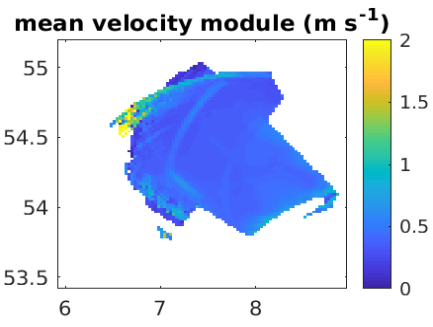
A



B

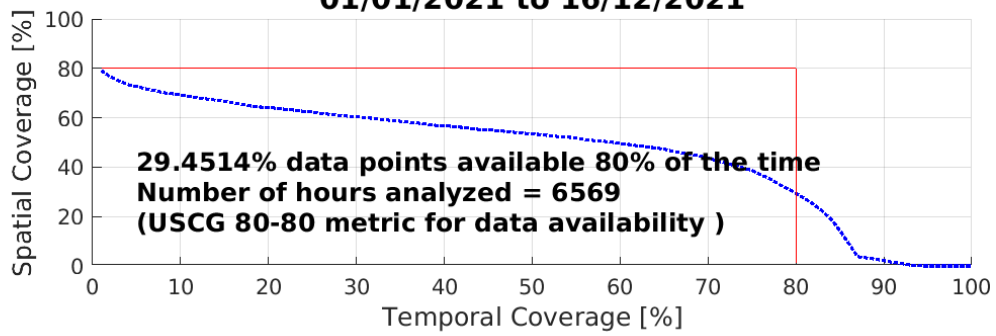


C



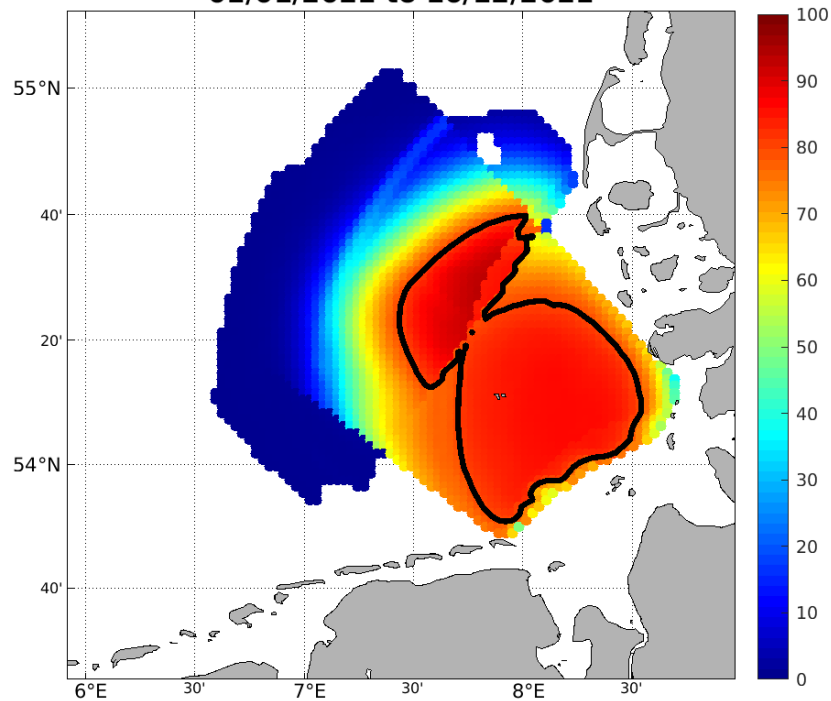
D

HFR-COSYNA: Spatial Coverage vs. Temporal Coverage 01/01/2021 to 16/12/2021



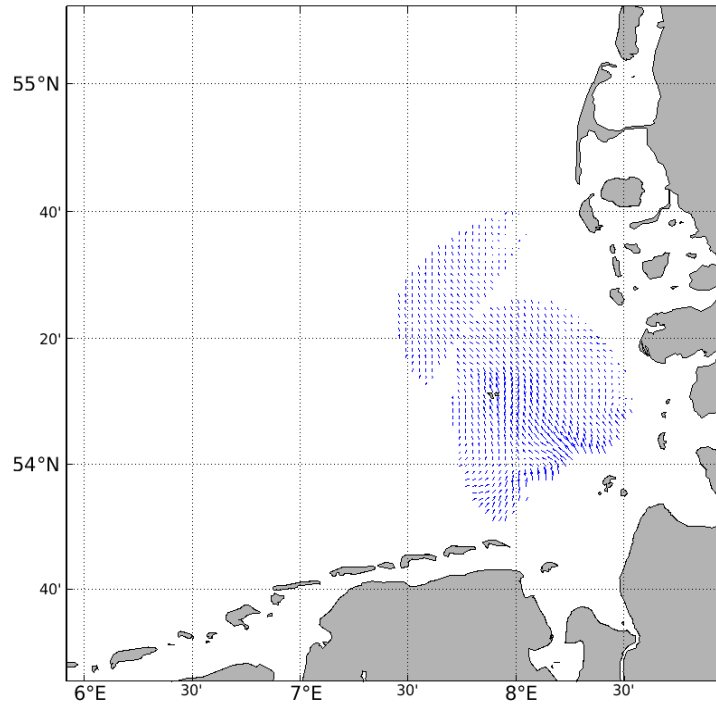
E

HFR-COSYNA: Percent Total Vector Coverage (contour showing >80%) 01/01/2021 to 16/12/2021



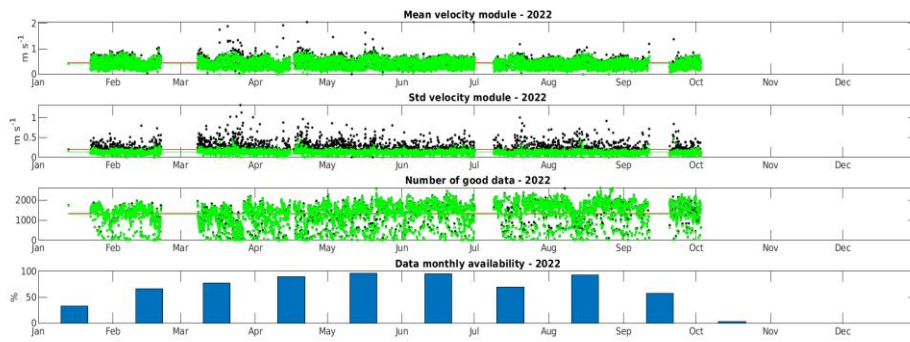
F

**HFR-COSYNA: HFR Surface current average [m/s]
01/01/2021 to 16/12/2021**

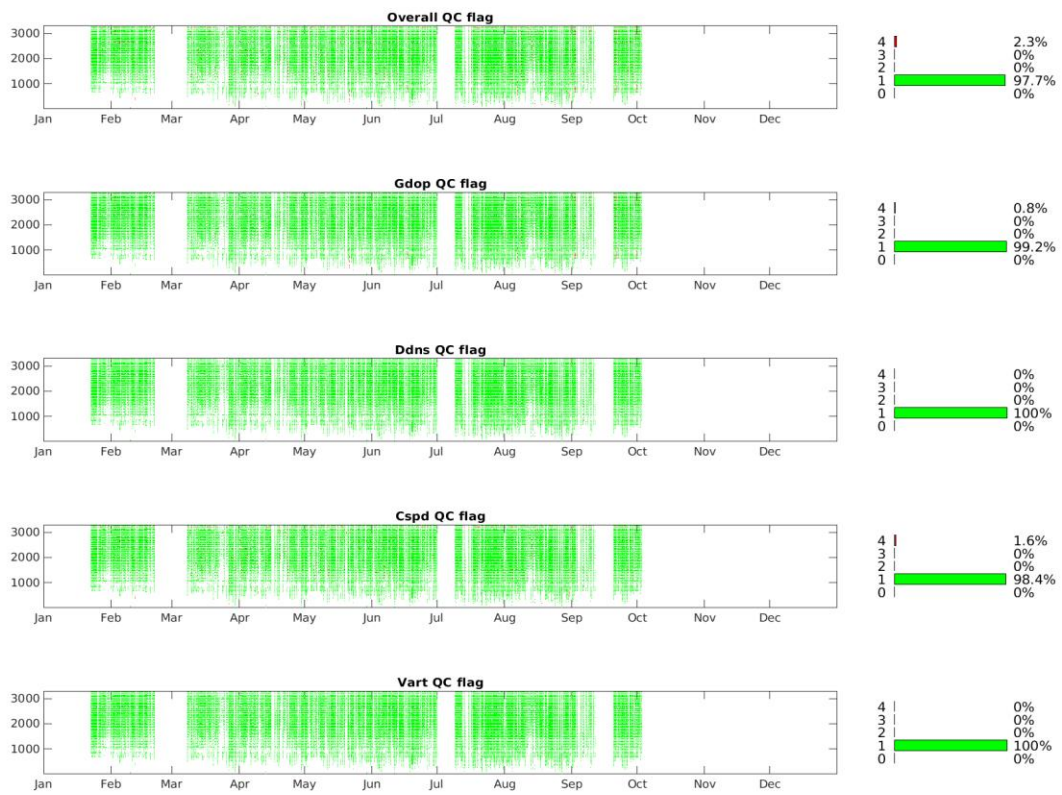


Period: 2022

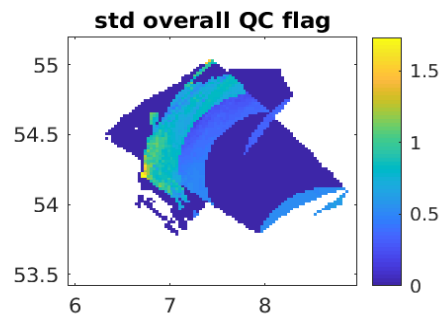
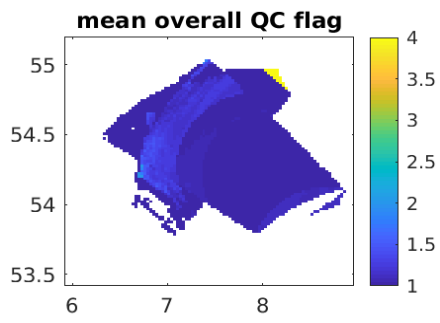
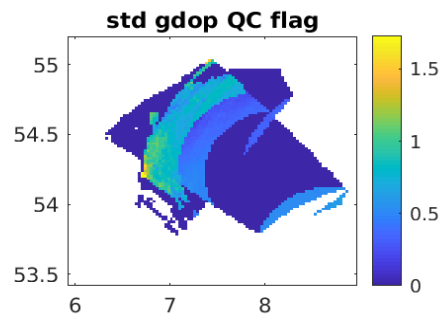
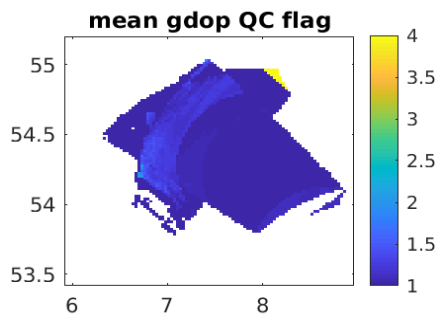
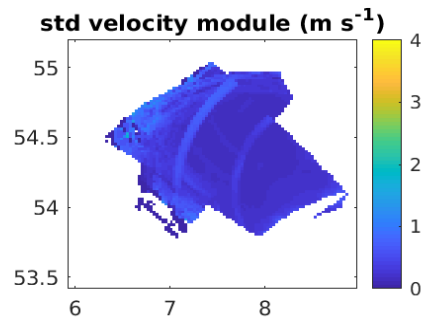
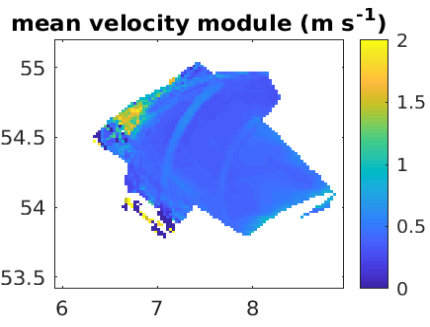
A



B

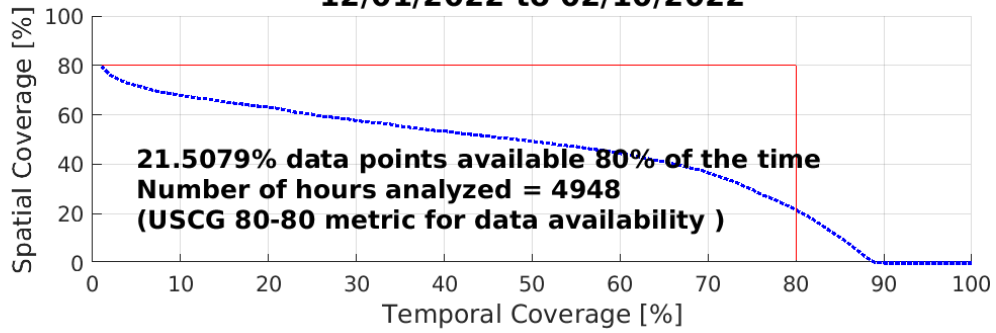


C



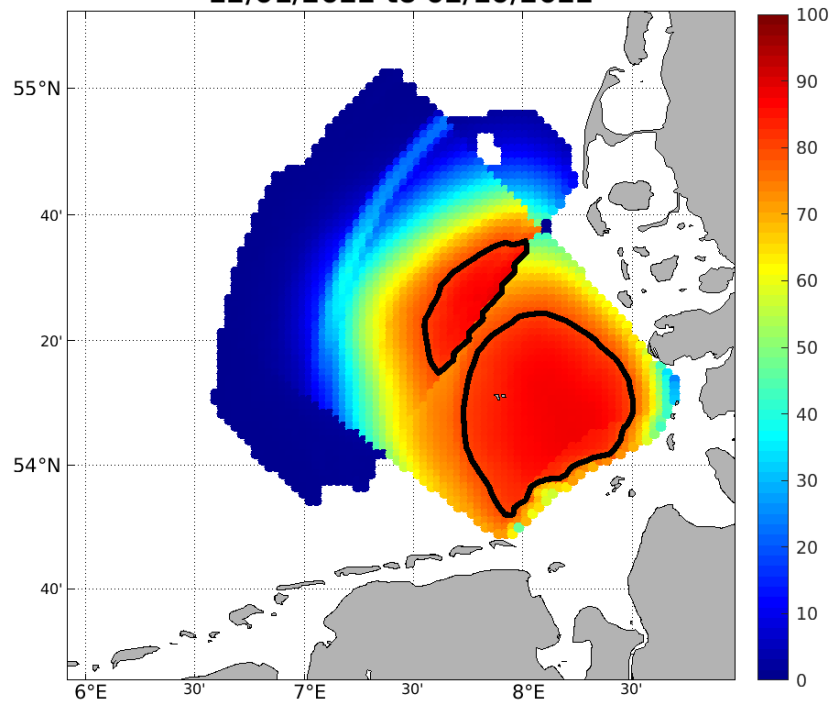
D

HFR-COSYNA: Spatial Coverage vs. Temporal Coverage 12/01/2022 to 02/10/2022



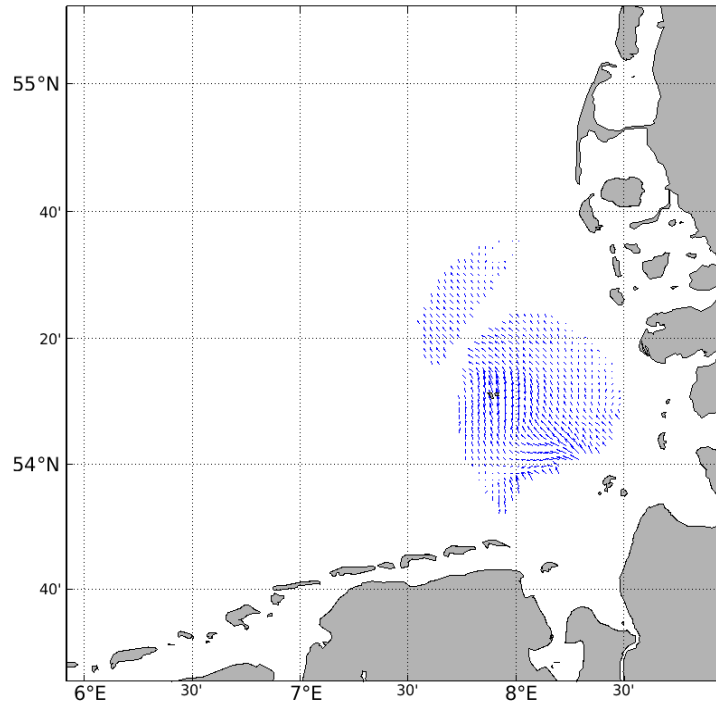
E

HFR-COSYNA: Percent Total Vector Coverage (contour showing >80%) 12/01/2022 to 02/10/2022



F

**HFR-COSYNA: HFR Surface current average [m/s]
12/01/2022 to 02/10/2022**



Version of the report	Changes made by	Nature of changes
V2	M. Chifflet/ A. Rubio	First complete version of the report
V3	M. Chifflet/ A. Rubio	Version including Figures
V_R2020_12	L. Solabarrieta/A. Rubio	Version updated for 2020
V_R2023_11	L. Solabarrieta/I. Manso	Version updated for 2021 and 2022

Contact the EU HFR general Node email for more information about this report: uhfrnode@azti.es
Other possible contacts: lsolabarrieta@azti.es; arubio@azti.es; jmader@azti.es; imanso@azti.es