Report on HFR - Finnmark Historical data files QA/QC

Data provider information:

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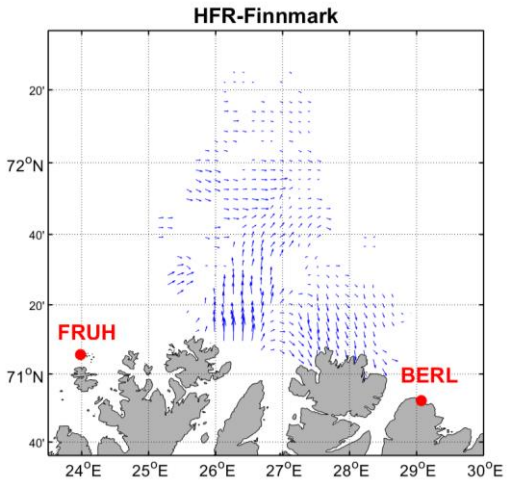
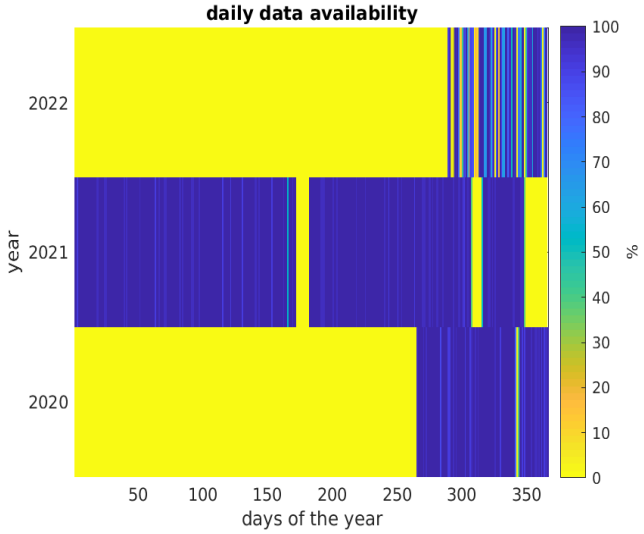
- contributors contact: terjeb@met.no
- acknowledgements: HFR-Finnmark Radar Network has been designed, implemented and managed through the efforts of the Norwegian Meteorological Institute.

System: **Finnmark**
Sites: **BERL, FRUH**
Data set: **Totals**
Data source: Totals from the radials combination in de EU Node
Period: **2020-Sep-21 - 2022-Dec-31**





Daily data % available during the whole time period

INFO ON QA/QC Settings and Calibration

%%% QC info for 21-Sep-2020 – 31-Dec-2022
OceanSITES quality flagging for GDOP threshold QC test. Threshold set to 2.
OceanSITES quality flagging for Data density threshold QC test. Threshold set to 3 radials.
OceanSITES quality flagging for Velocity threshold QC test. Threshold set to 1.2 m/s.
OceanSITES quality flagging for variance threshold QC test. Test not applicable to Direction Finding systems. The Temporal Derivative test is applied. Threshold set to 1.2 m/s.

%%% Calibration info for 21-Sep-2020 – 31-Dec-2022
BERL: 2019-10-02T00:00:00Z; FRUH: 2016-10-18T00:00:00Z

RESULTS OF HIST DATA INSPECTION

General comments:
The "number of good data" is quite unstable and the main QC flags correspond to GDOP and in some cases to the velocity threshold.

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

The data availability is very low and the spatial coverage is of 0% availability 80% of the time for all the years. The best year is 2020 where there are areas reaching data availability 60% of the time.

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

Period	General comments	Nb. analysed hours	80%-80% obj.
2020	0% spatial availability 80% of the time.	2367	n
2021	0% spatial availability 80% of the time.	7820	n
2022	0% spatial availability 80% of the time.	1322	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.

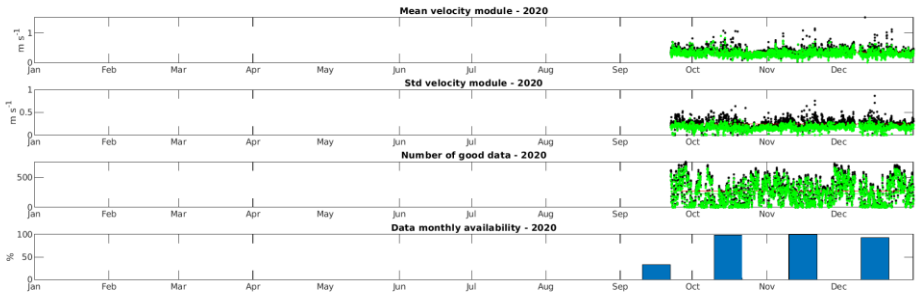
Fig D - Spatial (x-axis) vs. temporal (y-axis) coverage 80/80 annual metric. Allows to check if the system has reached the goal of providing surface currents over the 80% of the area during 80% of the time. The grid points taken in account for the % are the ones inside the GDOP limits defined by the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

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

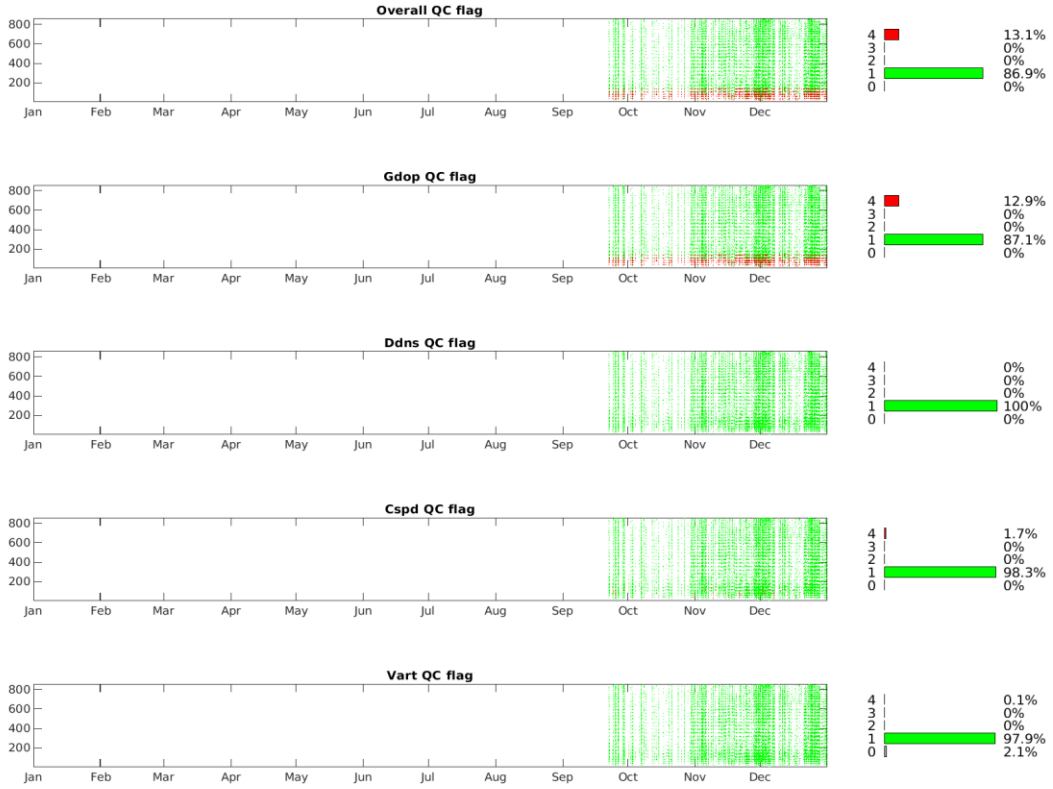
Fig F- Mean surface current maps for the indicated systems and periods. The means are computed in the area of 80% temporal coverage for the target year.

Period: 2020

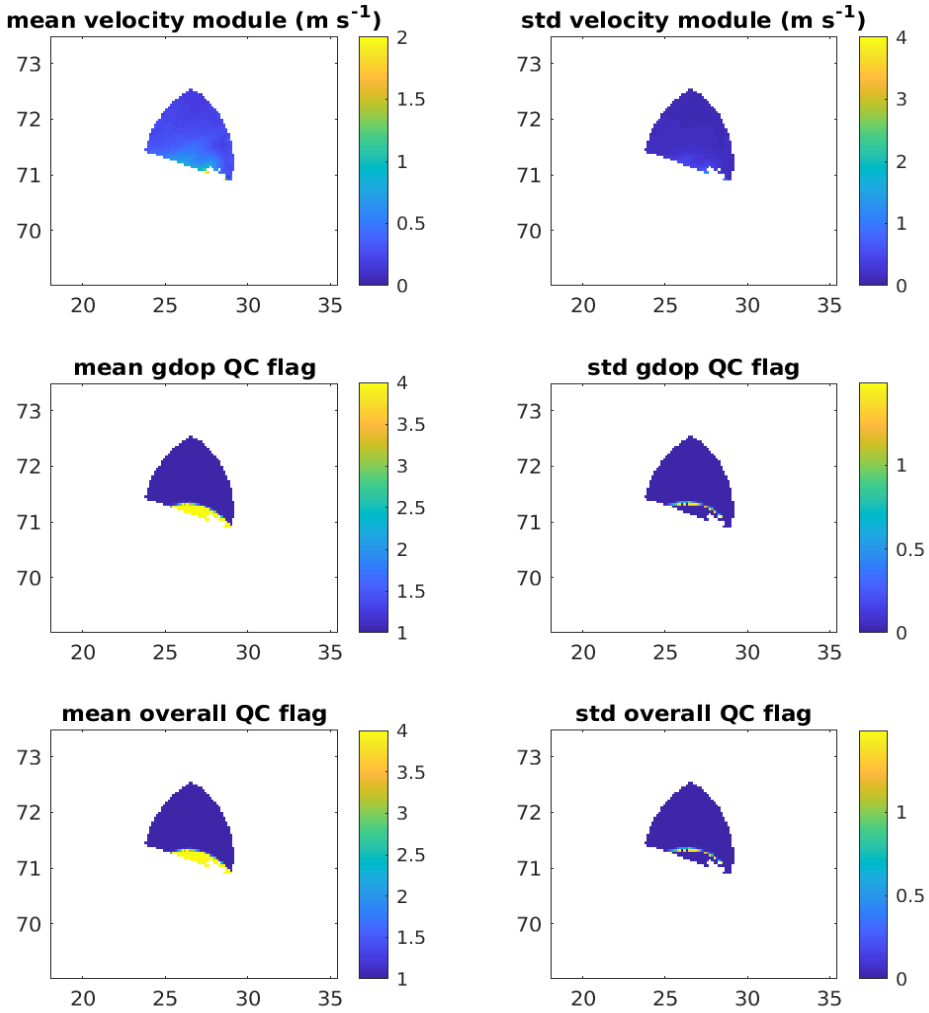
A



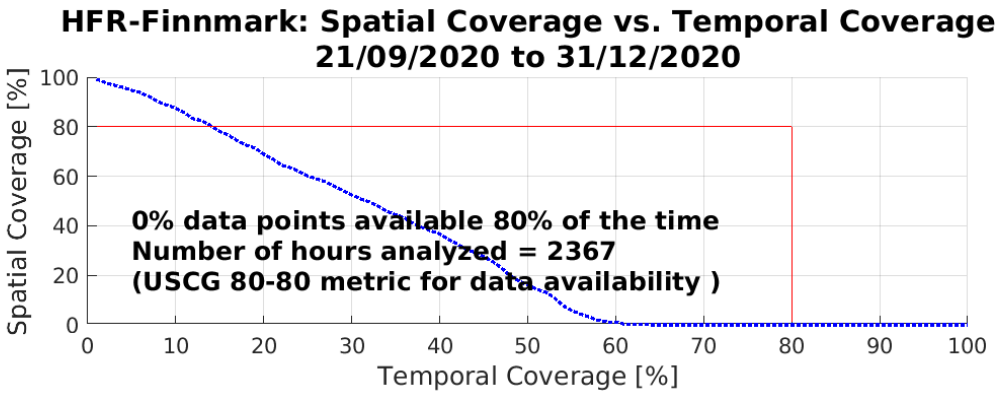
B



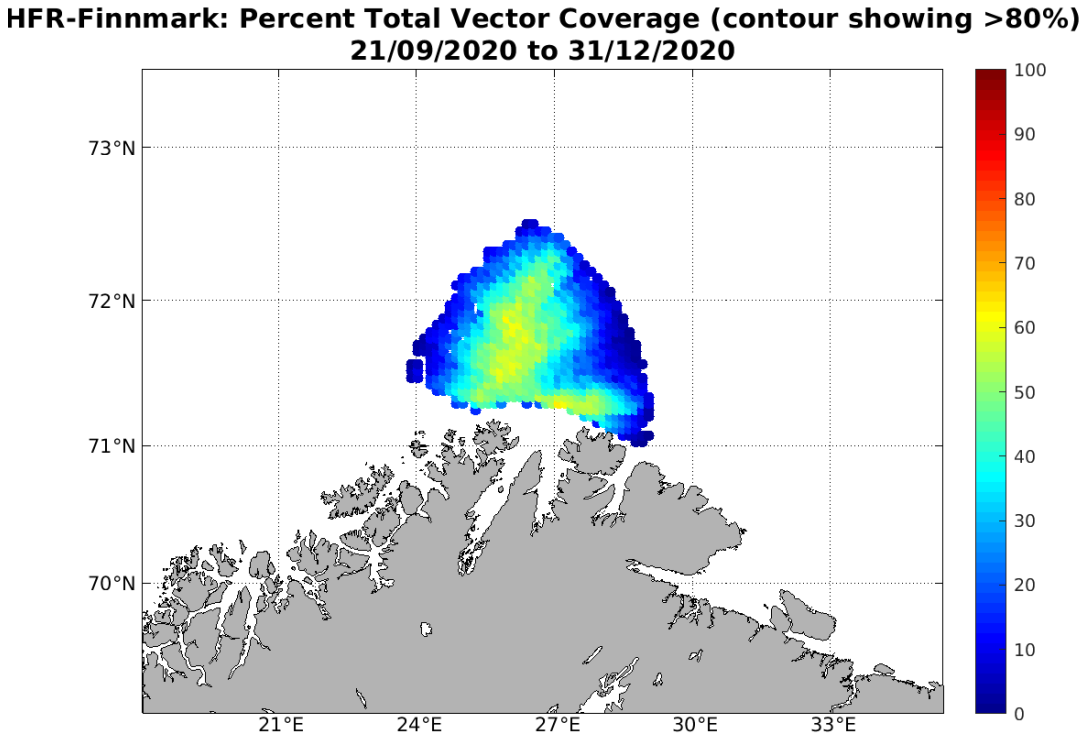
C


mean velocity module (m s-1)
std velocity module (m s-1)
mean gdop QC flag
std gdop QC flag
mean overall QC flag
std overall QC flag
73
72
71
70
20
25
30
35
0
0.5
1
1.5
2
2.5
3
3.5
4

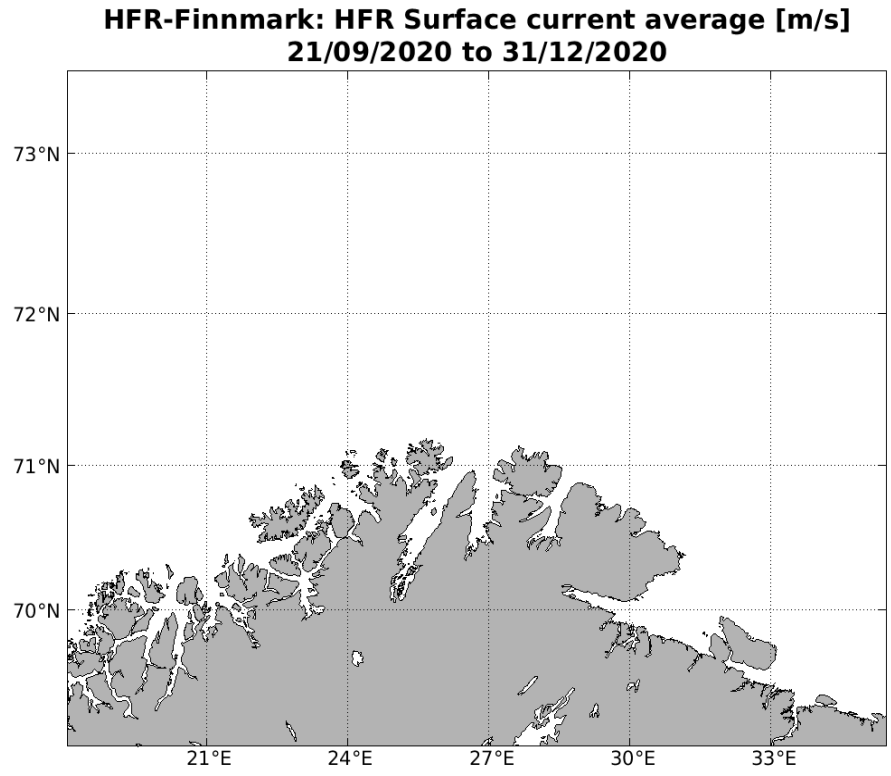
D


HFR-Finnmark: Spatial Coverage vs. Temporal Coverage
21/09/2020 to 31/12/2020
Spatial Coverage [%]
Temporal Coverage [%]
0% data points available 80% of the time
Number of hours analyzed = 2367
(USCG 80-80 metric for data availability)

E

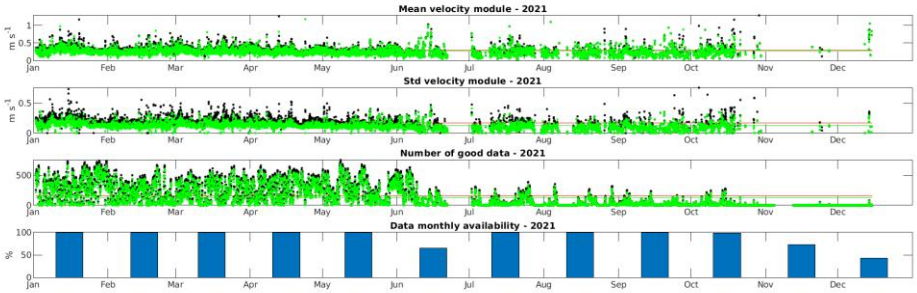

HFR-Finnmark: Percent Total Vector Coverage (contour showing >80%)
21/09/2020 to 31/12/2020
73°N
72°N
71°N
70°N
21°E
24°E
27°E
30°E
33°E

F

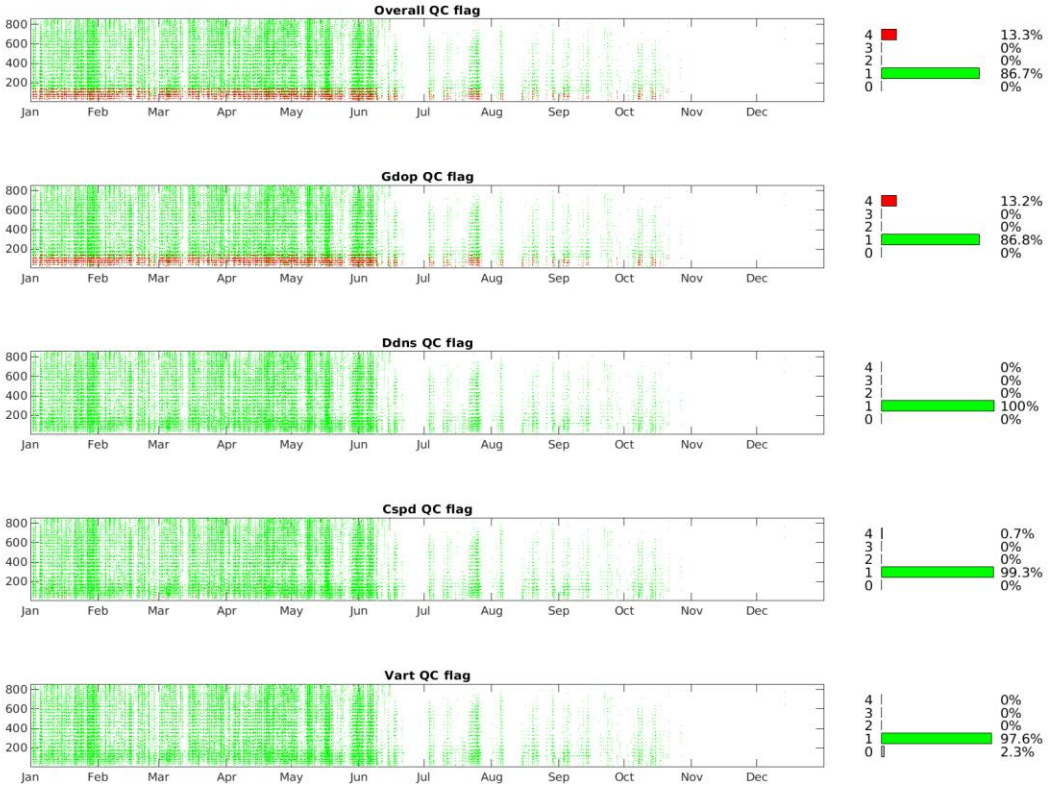

HFR-Finnmark: HFR Surface current average [m/s]
21/09/2020 to 31/12/2020
73°N
72°N
71°N
70°N
21°E
24°E
27°E
30°E
33°E

Period: 2021

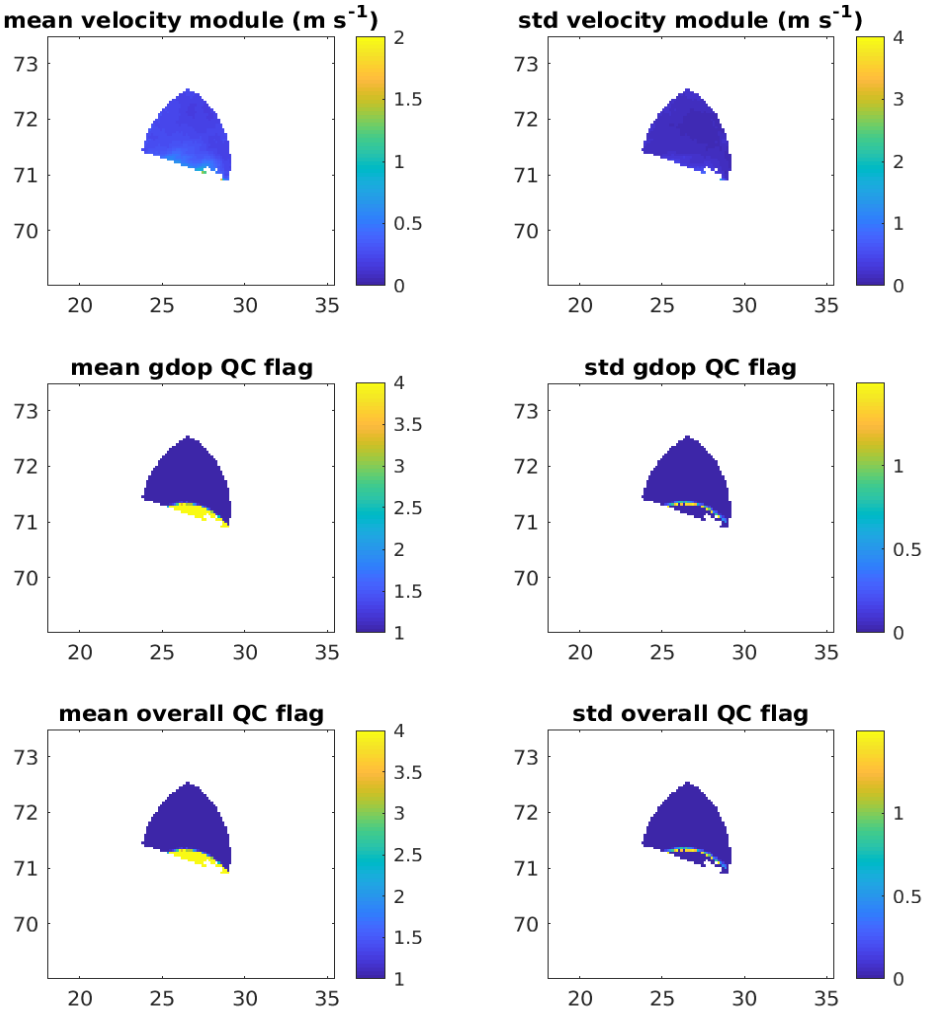
A



B



C


mean velocity module (m s-1)
std velocity module (m s-1)
mean gdop QC flag
std gdop QC flag
mean overall QC flag
std overall QC flag
73
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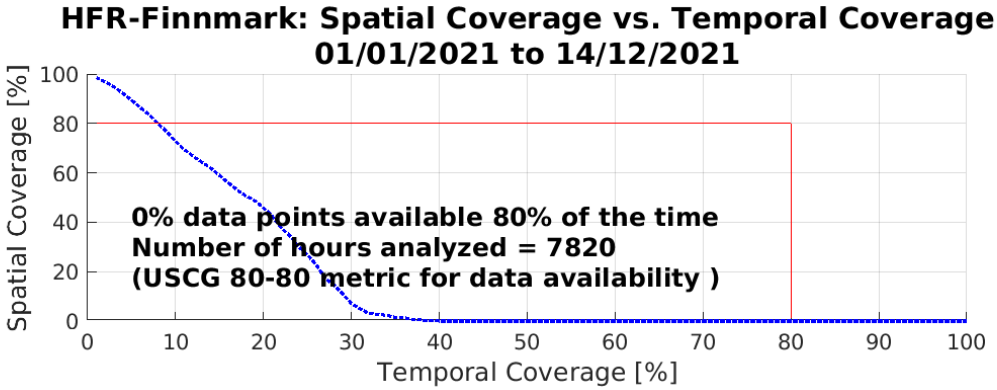
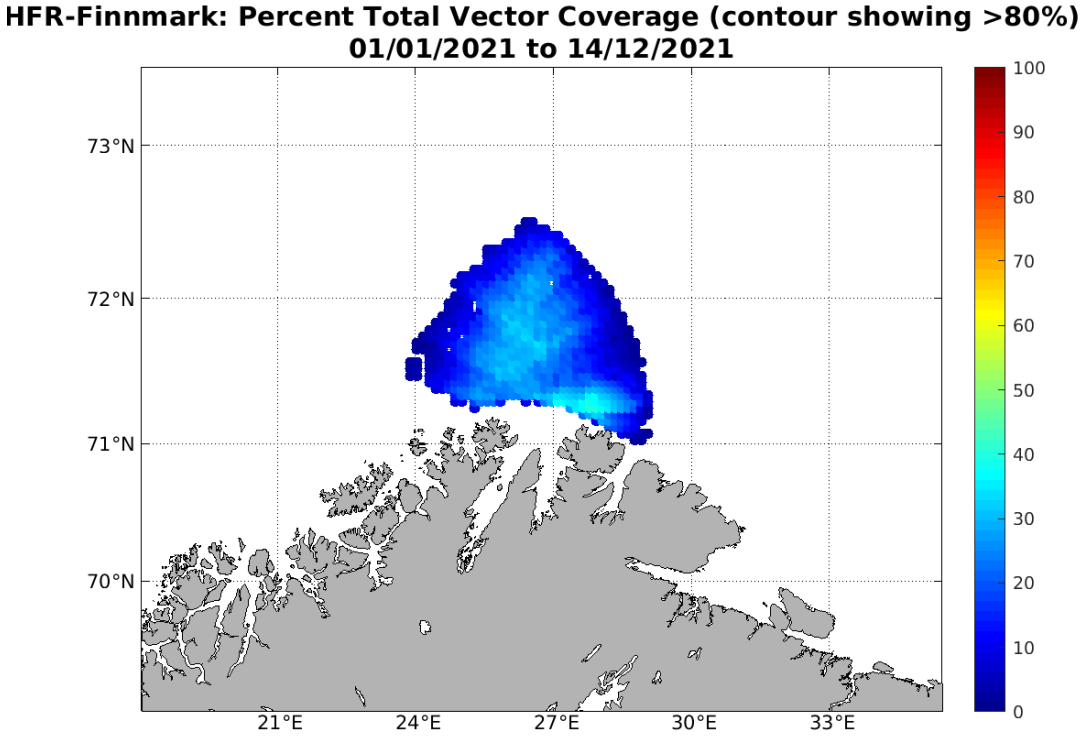
4

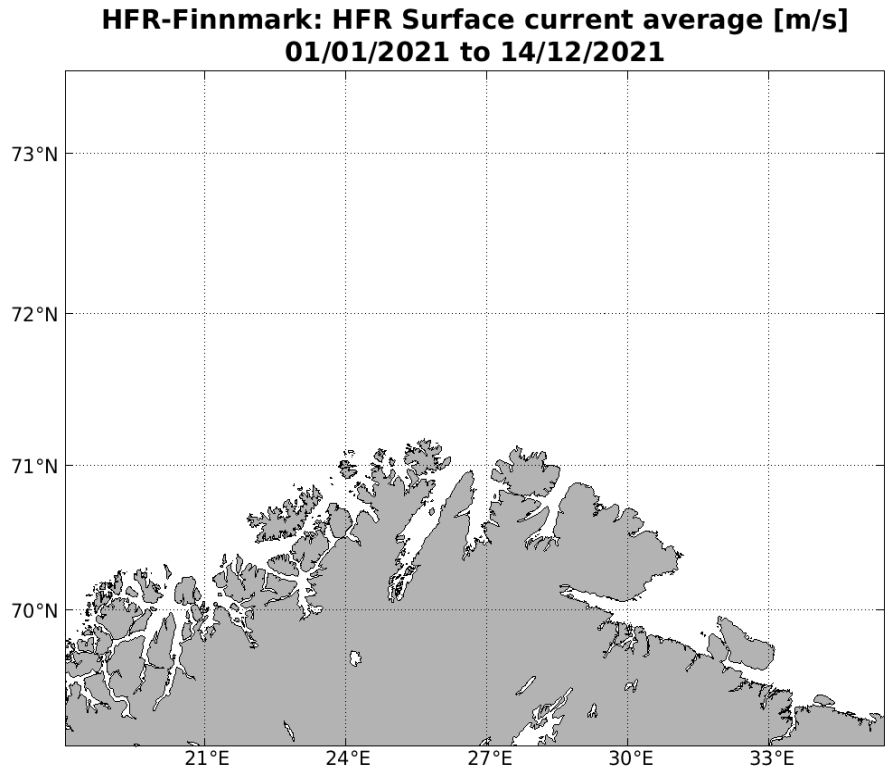
D


HFR-Finnmark: Spatial Coverage vs. Temporal Coverage
01/01/2021 to 14/12/2021
Spatial Coverage [%]
Temporal Coverage [%]
0% data points available 80% of the time
Number of hours analyzed = 7820
(USCG 80-80 metric for data availability)

E

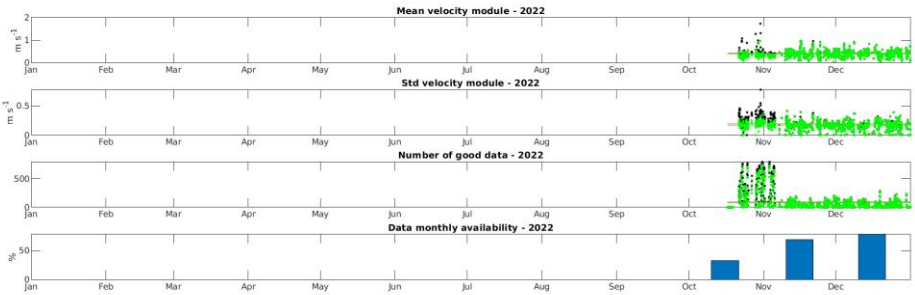

HFR-Finnmark: Percent Total Vector Coverage (contour showing >80%)
01/01/2021 to 14/12/2021
73°N
72°N
71°N
70°N
21°E
24°E
27°E
30°E
33°E

F


HFR-Finnmark: HFR Surface current average [m/s]
01/01/2021 to 14/12/2021
73°N
72°N
71°N
70°N
21°E
24°E
27°E
30°E
33°E

Period: 2022

A



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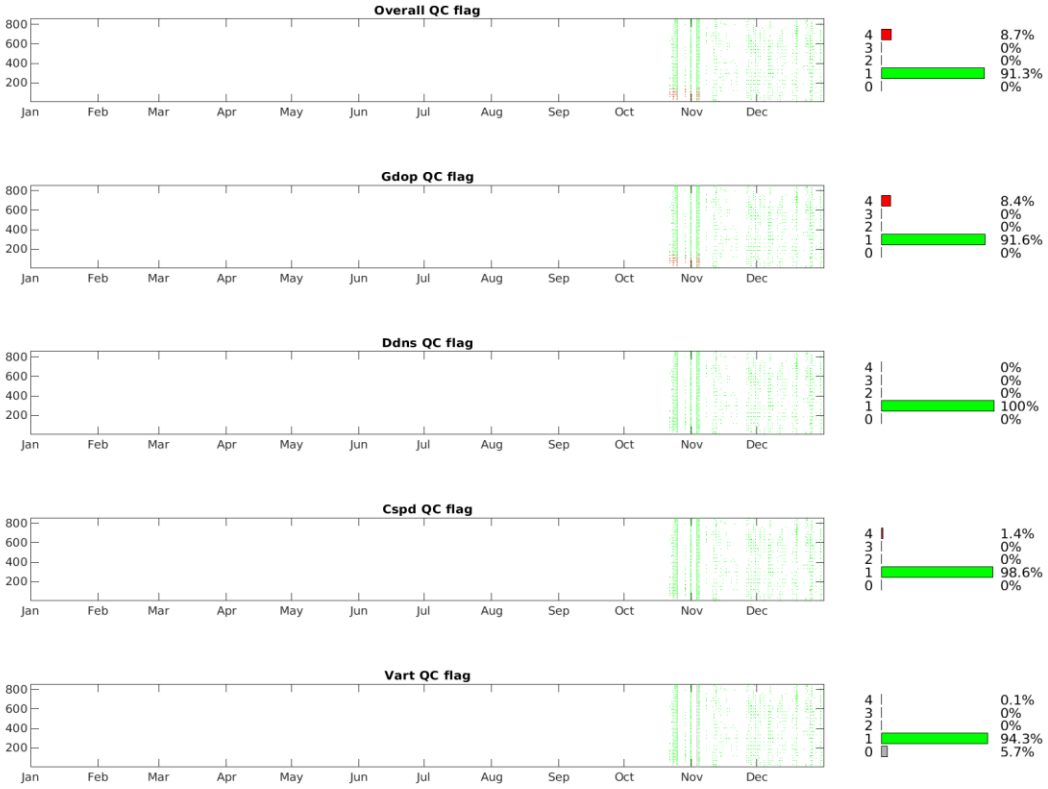

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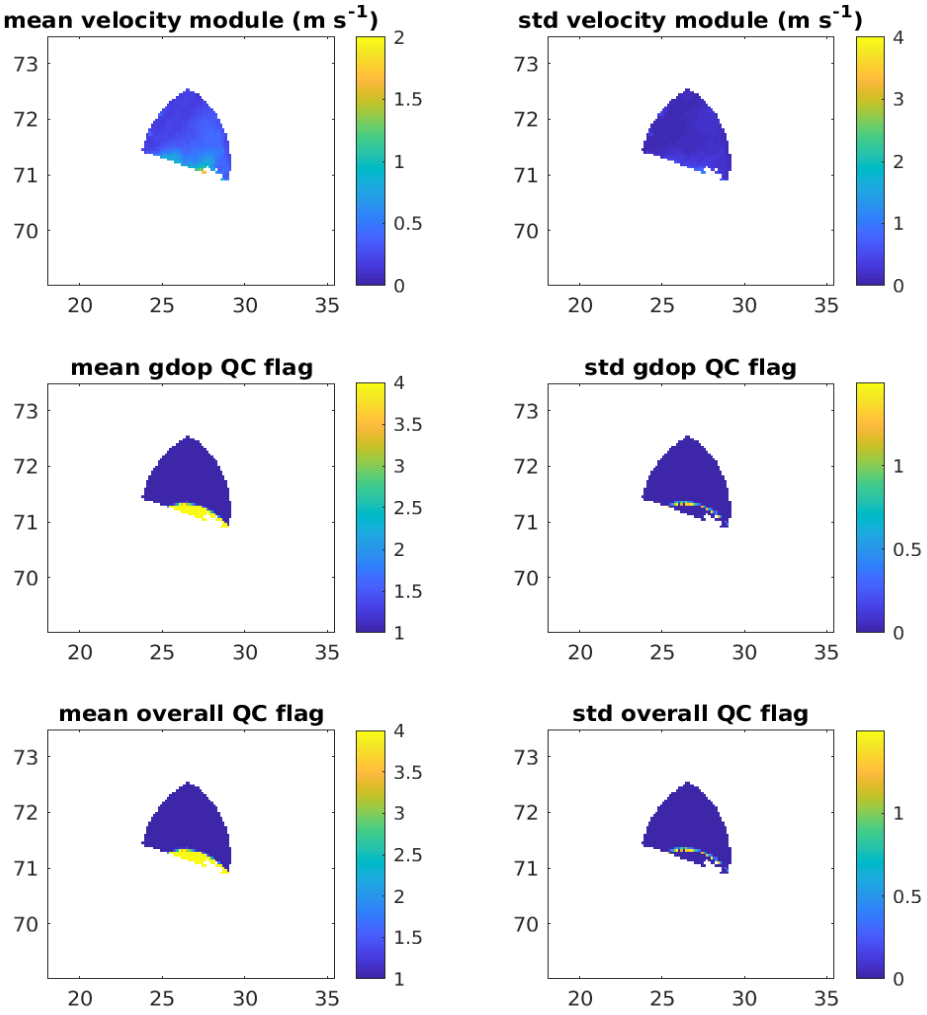
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std velocity module (m s-1)
mean gdop QC flag
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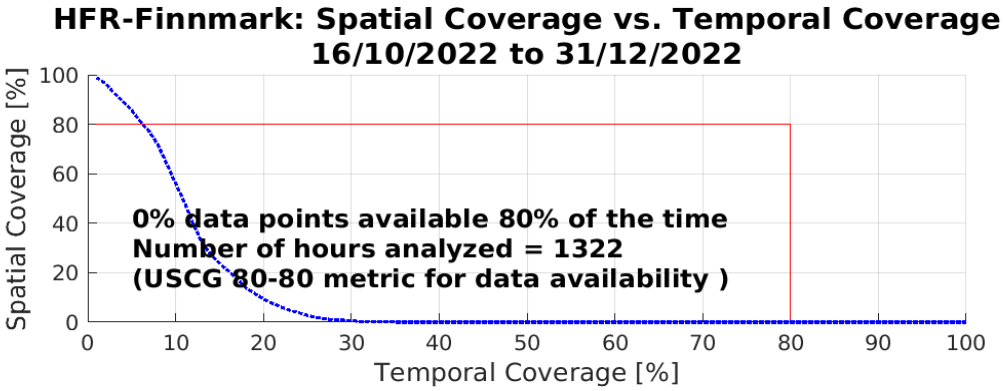
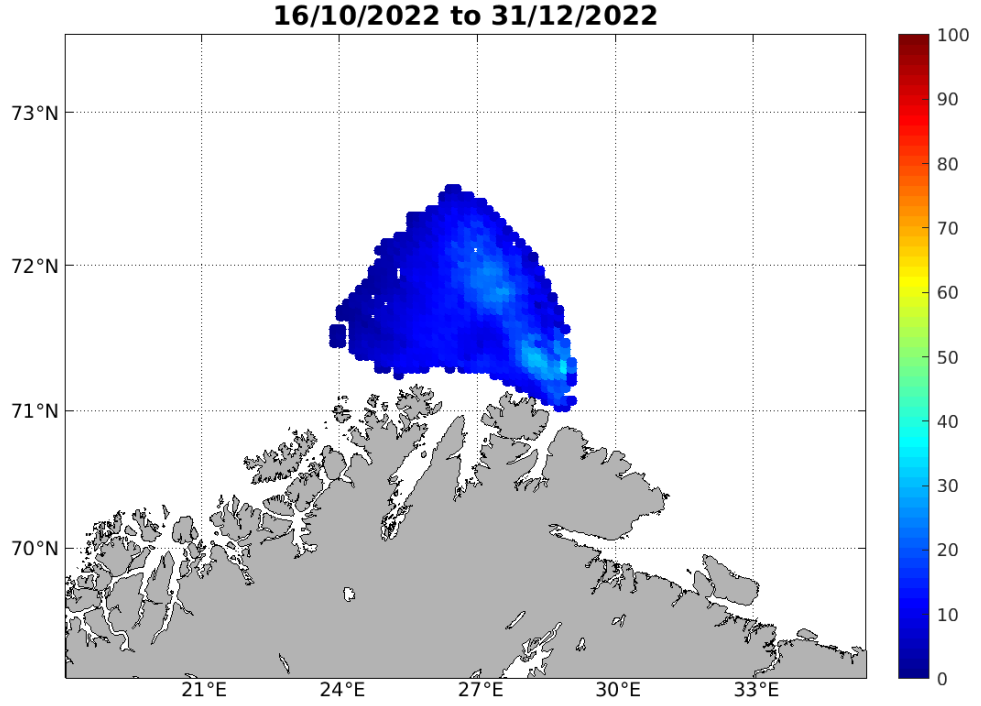

HFR-Finnmark: Spatial Coverage vs. Temporal Coverage
16/10/2022 to 31/12/2022
Spatial Coverage [%]
Temporal Coverage [%]
0% data points available 80% of the time
Number of hours analyzed = 1322
(USCG 80-80 metric for data availability)

E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16/10/2022 to 31/12/2022
73°N
72°N
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24°E
27°E
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33°E

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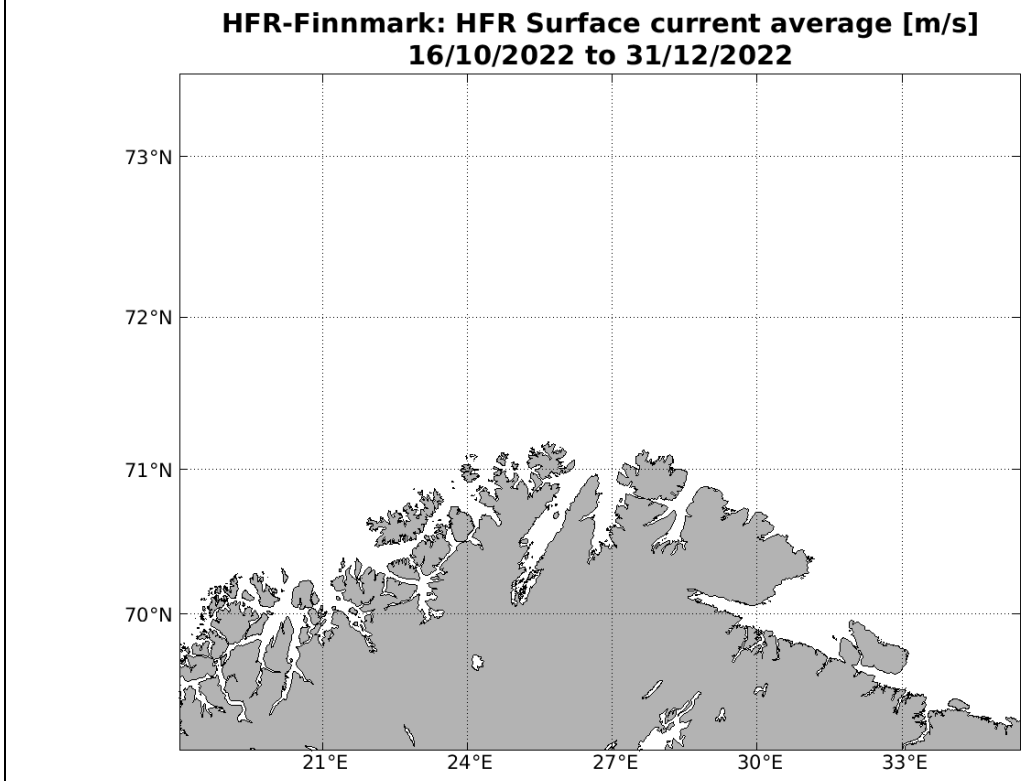

Version of the report	Changes made by	Nature of changes
VR2023_11	L. Solabarrieta & I. Manso	First complete version of the report until 2022
Contact the EU HFR general Node email for more information about this report: euhfrnode@azti.es Other possible contacts: lsolabarrieta@azti.es; arubio@azti.es; jmader@azti.es; imanso@azti.es		