Report on HFR - South Historical data files QA/QC

Data provider information:

   - contributors name: Instituto Hidrografico

   - contributors contact: ih.snig.metadados@hidrografico.pt

   - acknowledgements: Instituto Hidrografico and Puertos del Estado
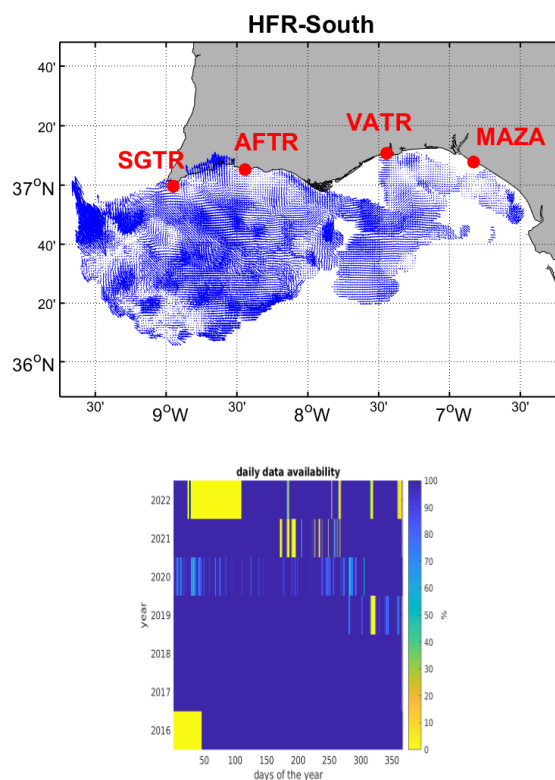

System: **South**
      Sites: **AFTR (019), MAZA, SGTR (017), VATR (018)**
Data set: **Totals**
      Data source: Totals from the radials combination in de EU Node
Period: **2016-Feb-15 - 2022-Dec-31**

Daily data % available during the whole time period

INFO ON QA/QC Settings and Calibration

%%% QC info for all the period 15-Feb-2016 – 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 time: 15-Feb-2016 – 31-Dec-2022

MAZAG: 2019-12-05T00:00:00Z; 2751-PdE-MAZAG: 2022-11-14T00:00:00Z;
SGTR_017: 2020-01-16T00:00:00Z;
VATR_018: 2020-01-16T00:00:00Z;
AFTR_019: 2013-12-09T00:00:00Z; 590-IHOC-PL019: 2021-06-07T00:00:00Z

RESULTS OF HIST DATA INSPECTION

General comments:

The available data series contains 6 and a half years of valid data

The system was installed on February 2016 with 3 antennas and a new antenna was set up on June 2016. This is the reason of the increase of the number of data (and good data) in the figure A (2016). The number of good data presents a notable variability for the whole study period. The availability of number of good data varies when one of the antennas is not working and those periods need to be in account for temporal analysis of this dataset. They can be identified easily in the figures A for the different years.

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

From 2016 to 2020 the spatial/temporal coverage for the USCG 80-80% objective is low, and it does not reach the 80%-80% goal. But there 2 areas have a quite stable availability (around 9º15'W, 36º45' N and 8º30'W, 36º45' N) since the installation of the 4th antenna during June 2016. The big number of grid points need to be taken in account for the understanding of the low percentages of the 80%-80% condition and the good coverage of figures E.
2020 is a specially bad year for the data availability.

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

Period	General comments	Nb. analysed hours	80%-80% obj.
2016	39.4813% spatial availability 80% of the time.	7704	n
2017	76.8574% spatial availability 80% of the time.	8760	n
2018	65.4462% spatial availability 80% of the time.	8760	n
2019	62.9291% spatial availability 80% of the time.	8504	n
2020	9.4737% spatial availability 80% of the time.	8394	n
2021	3.3715% spatial availability 80% of the time.	8219	n

2022	1.495% spatial availability 80% of the time.	6351	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: 2016

A

Mean velocity module - 2016

Std velocity module - 2016

Number of good data - 2016

Data monthly availability - 2016

B

Overall QC flag

4	28.7%
3	0%
2	0%
1	71.3%
0	0%

Gdop QC flag

4	28.6%
3	0%
2	0%
1	71.4%
0	0%

Ddns QC flag

4	0%
3	0%
2	0%
1	100%
0	0%

Cspd QC flag

4	0.3%
3	0%
2	0%
1	99.7%
0	0%

Vart QC flag

4	0.2%
3	0%
2	0%
1	99.7%
0	0.1%

C

mean velocity module (m s^{-1})

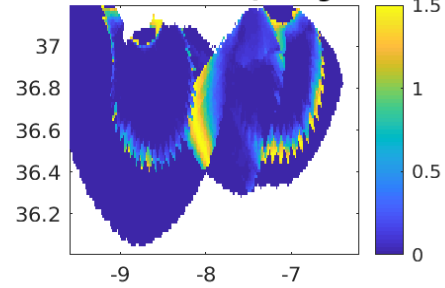std velocity module (m s^{-1})
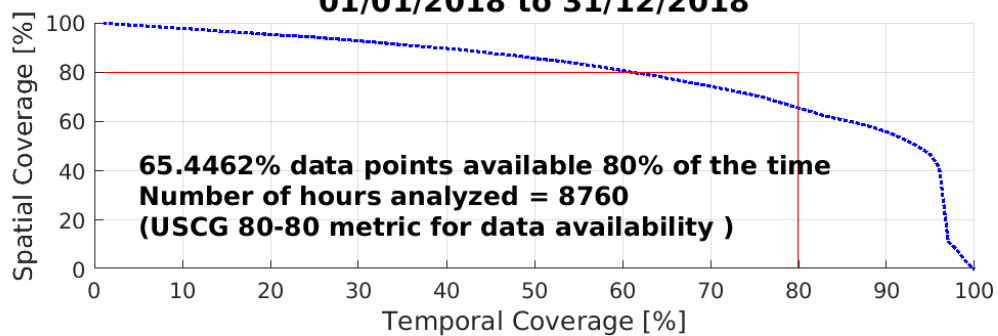
mean gdop QC flag

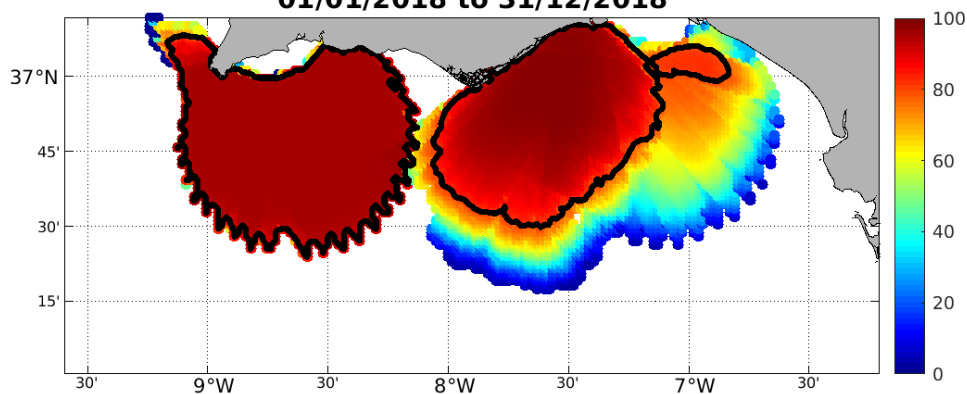std gdop QC flag

mean overall QC flag

std overall QC flag

D

## HFR-South: Spatial Coverage vs. Temporal Coverage
15/02/2016 to 31/12/2016

39.4813% data points available 80% of the time
Number of hours analyzed = 7704
(USCG 80-80 metric for data availability)

E

HFR-South: Percent Total Vector Coverage (contour showing >80%)
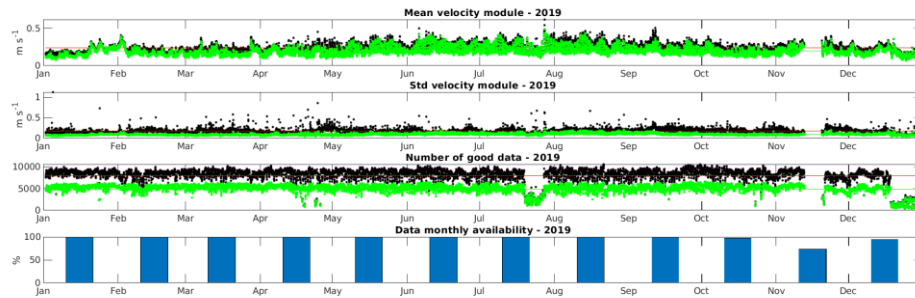## 15/02/2016 to 31/12/2016

F
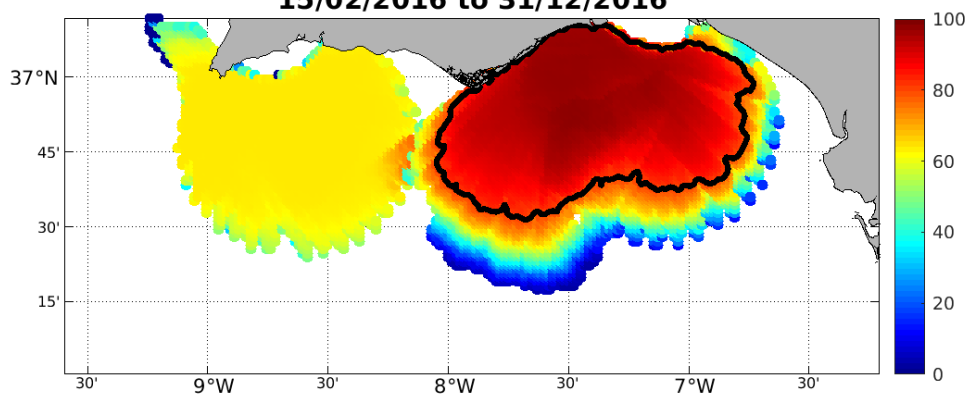
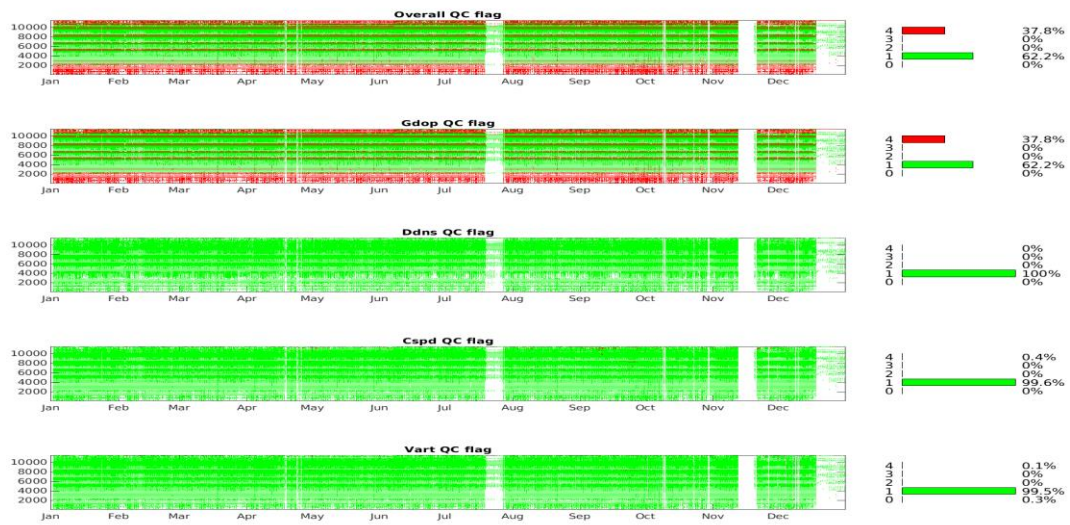### HFR-South: HFR Surface current average [m/s]
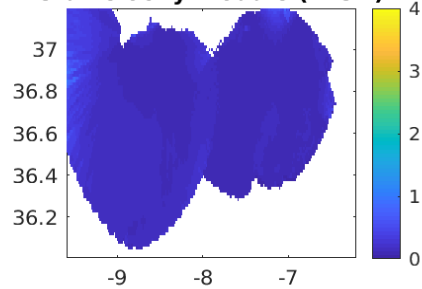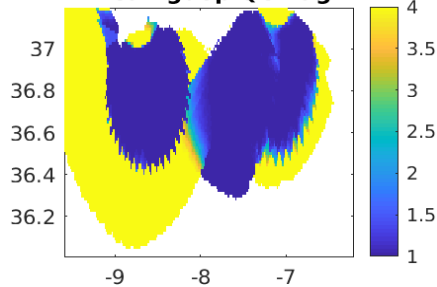### 15/02/2016 to 31/12/2016
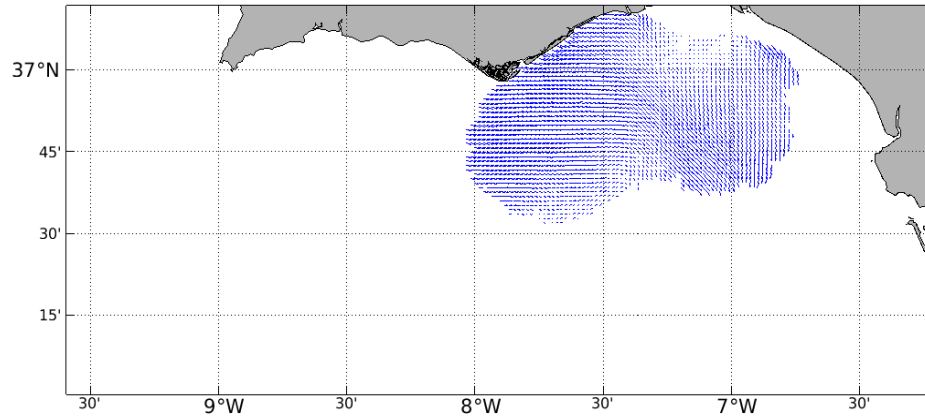
Period: 2017

A
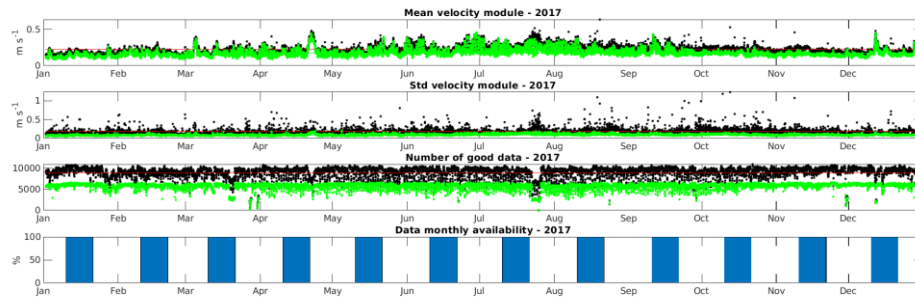
B
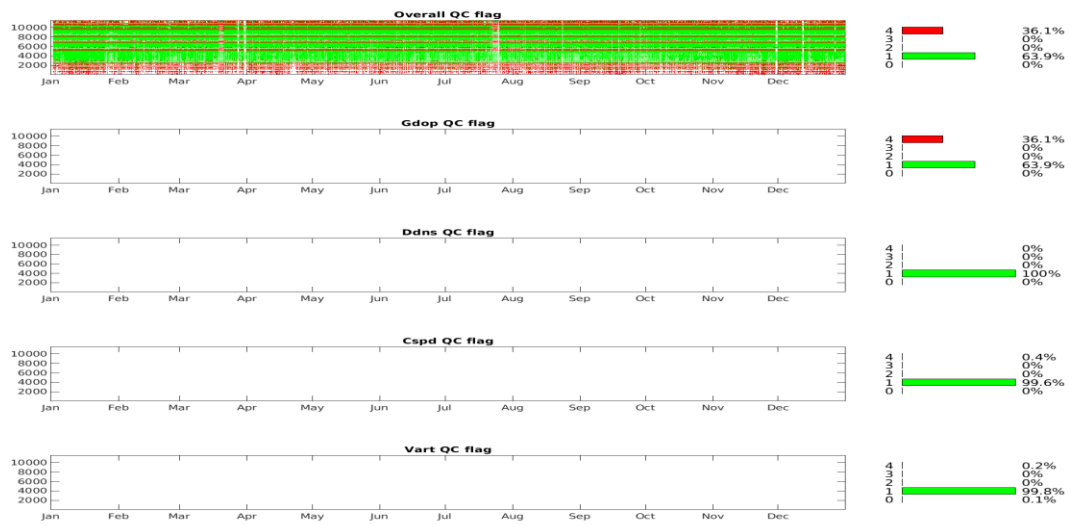
C

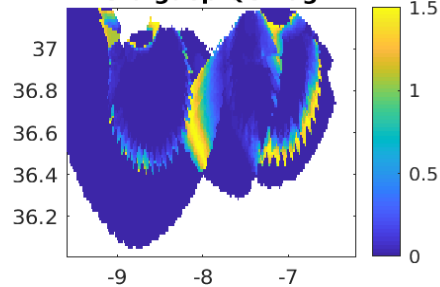**mean velocity module (m s^{-1})**
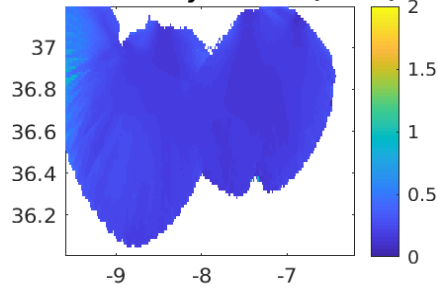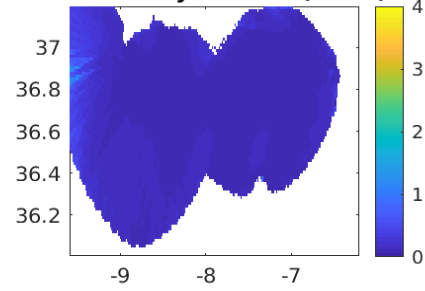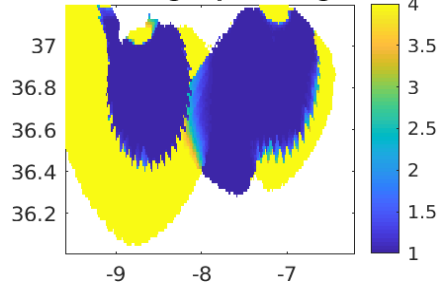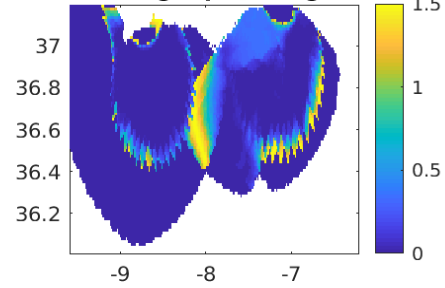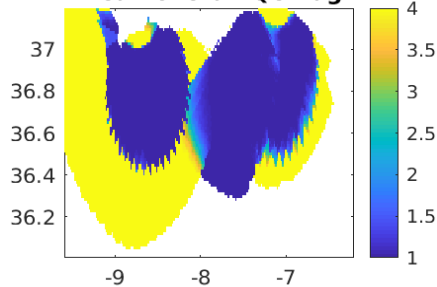
std velocity module (m s^{-1})

mean gdop QC flag

std gdop QC flag

mean overall QC flag

std overall QC flag

D
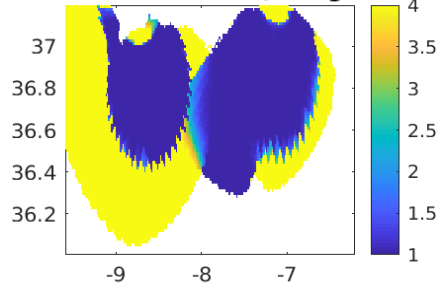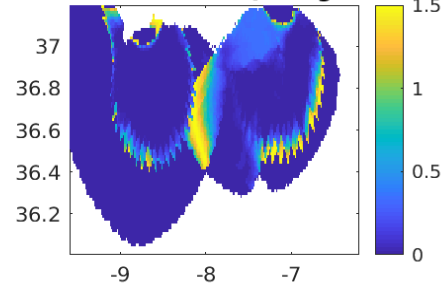
HFR-South: Spatial Coverage vs. Temporal Coverage
01/01/2017 to 31/12/2017

**76.8574% data points available 80% of the time
Number of hours analyzed = 8760
(USCG 80-80 metric for data availability)**

E
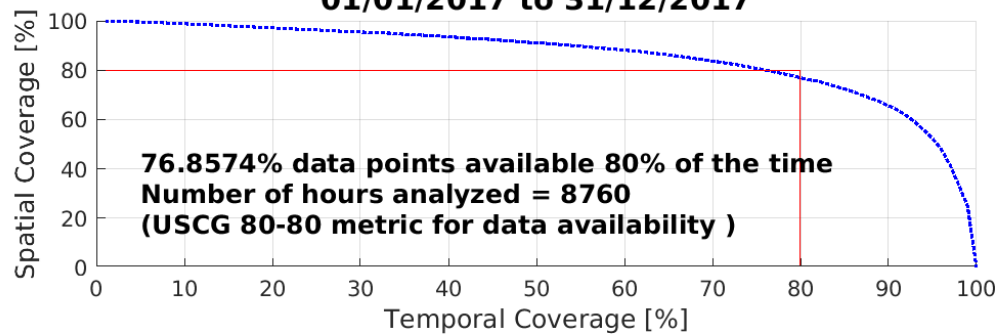
HFR-South: Percent Total Vector Coverage (contour showing >80%)
01/01/2017 to 31/12/2017

F
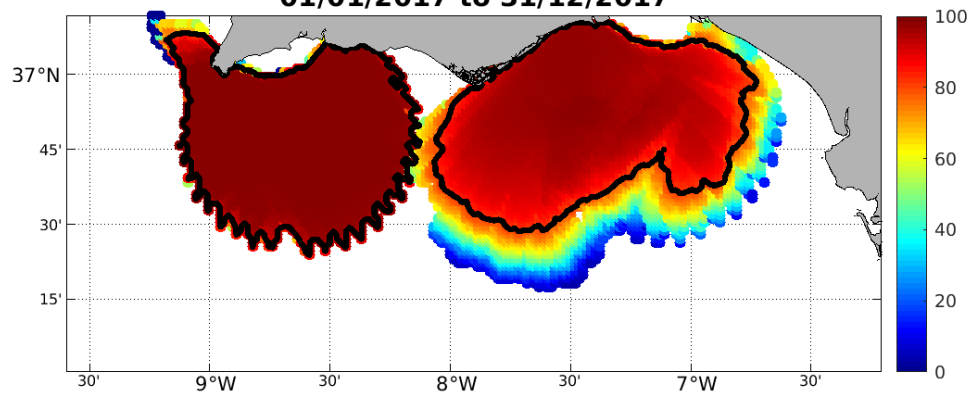
HFR-South: HFR Surface current average [m/s]
01/01/2017 to 31/12/2017
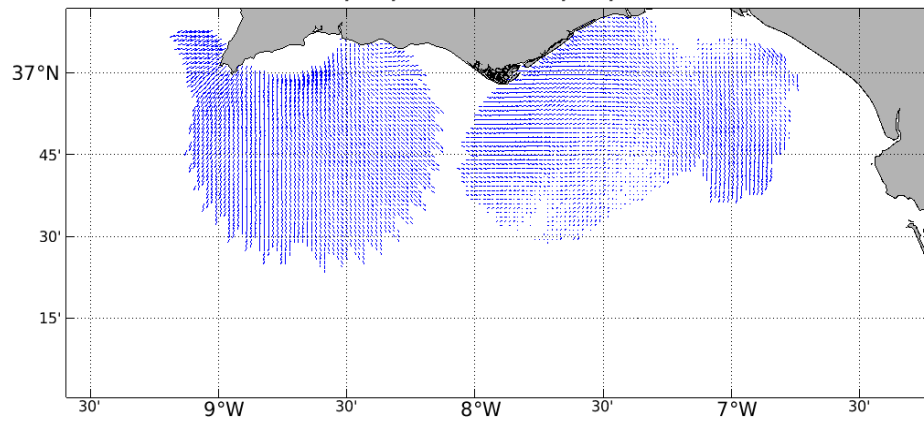
Period: 2018

A
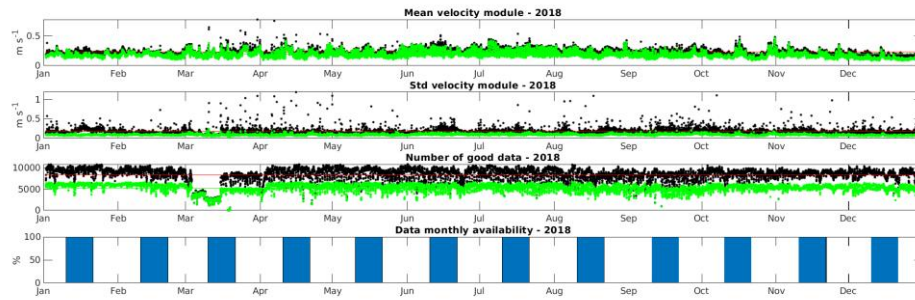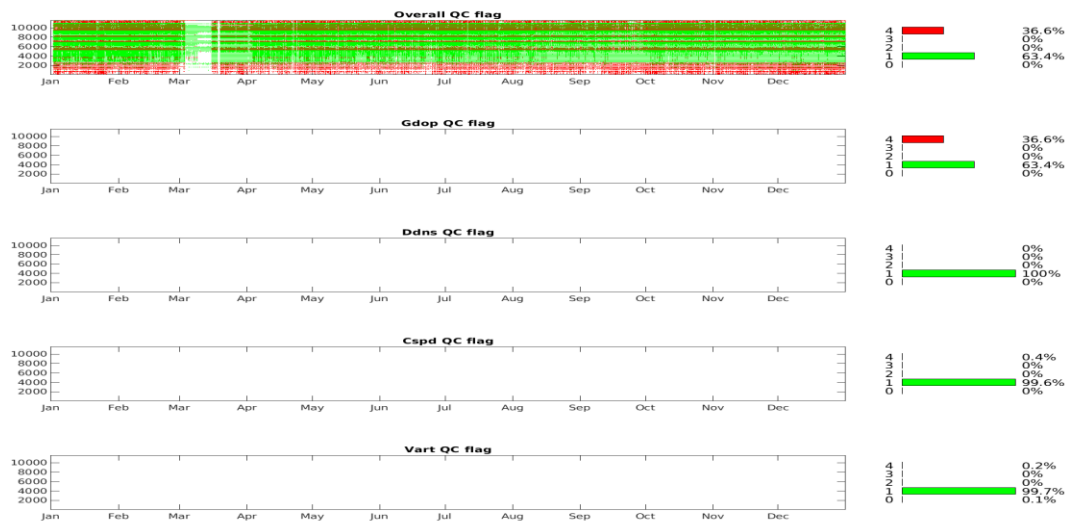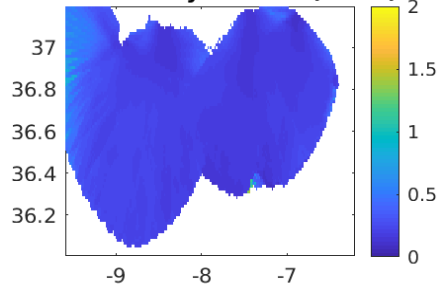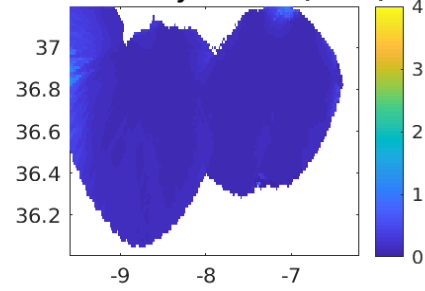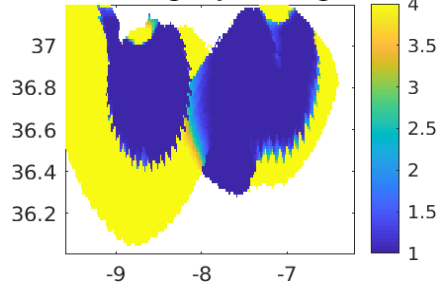
Mean velocity module - 2018

Std velocity module - 2018

Number of good data - 2018

Data monthly availability - 2018

B

Overall QC flag

4	36.6%
3	0%
2	0%
1	63.4%
0	0%

Gdop QC flag

4	36.6%
3	0%
2	0%
1	63.4%
0	0%

Ddns QC flag

4	0%
3	0%
2	0%
1	100%
0	0%

Cspd QC flag

4	0.4%
3	0%
2	0%
1	99.6%
0	0%

Vart QC flag

4	0.2%
3	0%
2	0%
1	99.7%
0	0.1%

C

mean velocity module (m s^{-1})

std velocity module (m s^{-1})

mean gdop QC flag

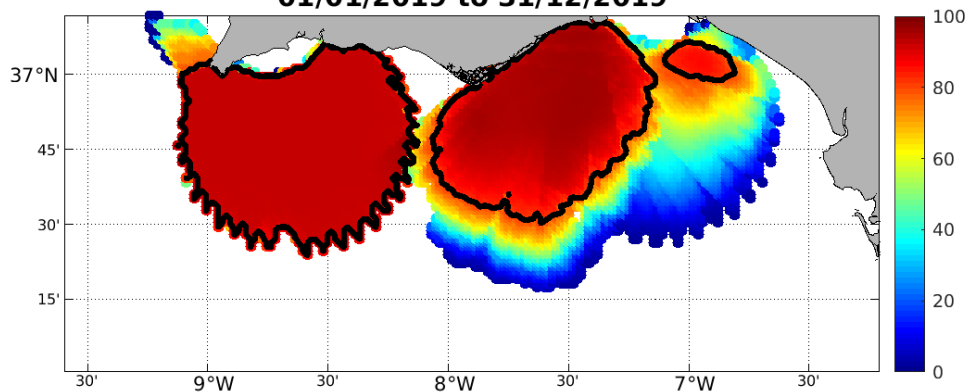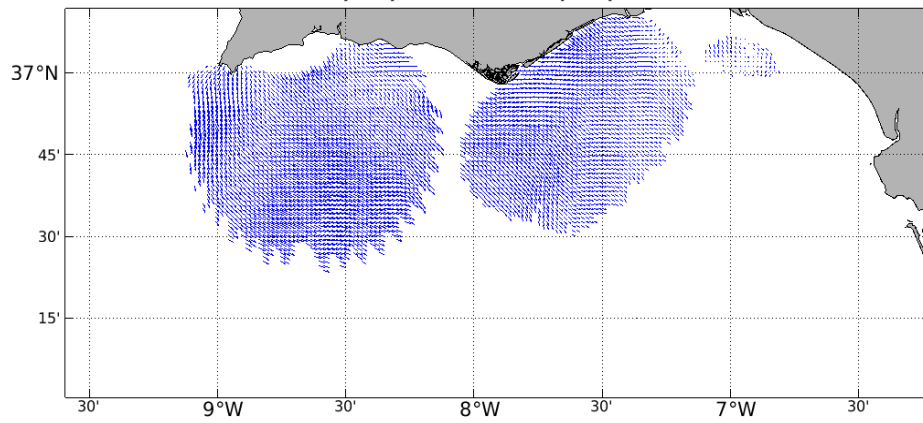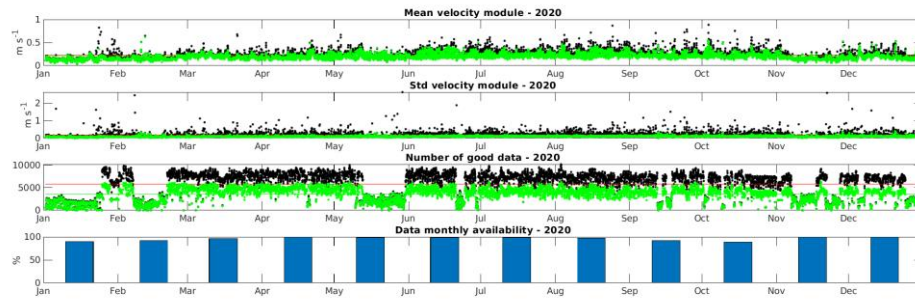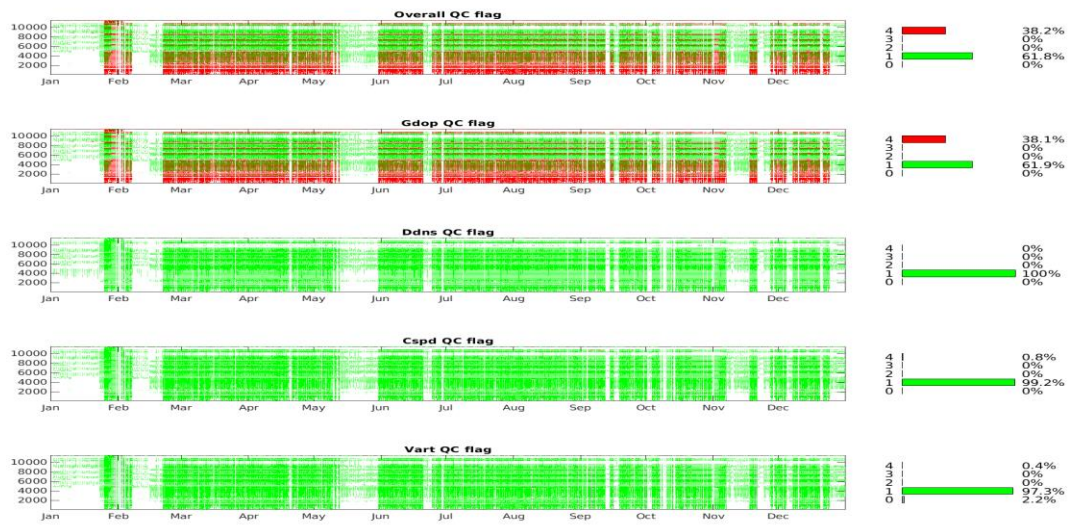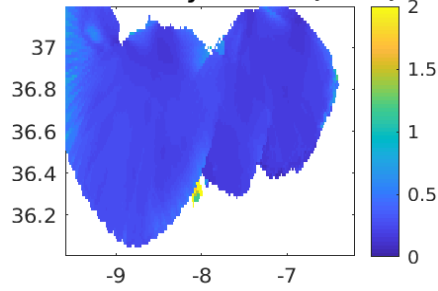std gdop QC flag

mean overall QC flag

std overall QC flag

D
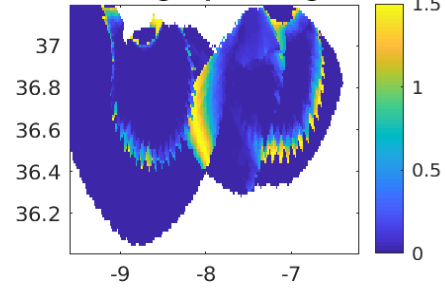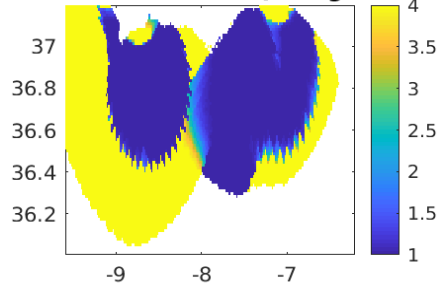
HFR-South: Spatial Coverage vs. Temporal Coverage
01/01/2018 to 31/12/2018

65.4462% data points available 80% of the time
Number of hours analyzed = 8760
(USCG 80-80 metric for data availability)

E

HFR-South: Percent Total Vector Coverage (contour showing >80%)
01/01/2018 to 31/12/2018

F

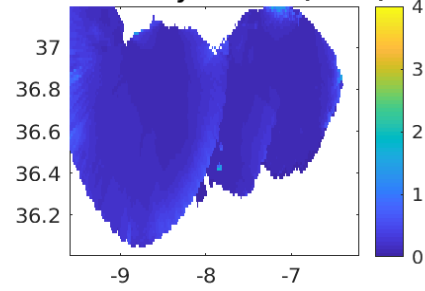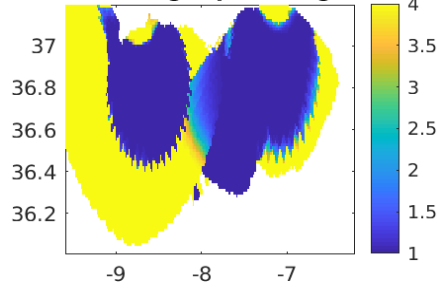### HFR-South: HFR Surface current average [m/s] 01/01/2018 to 31/12/2018
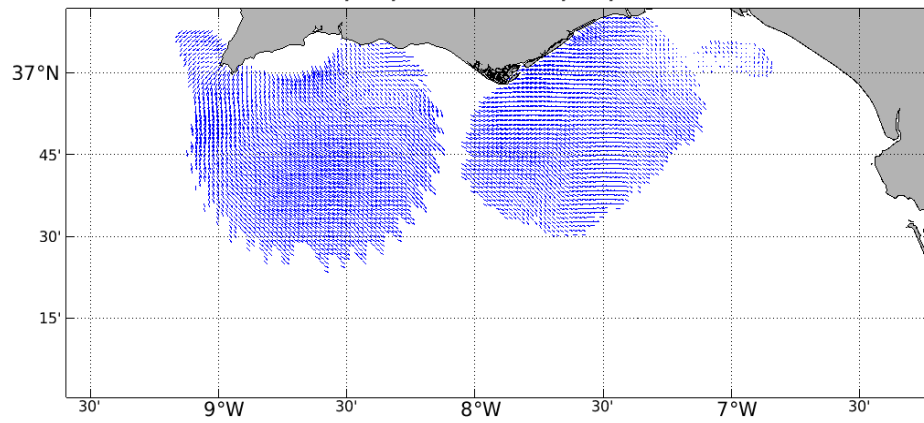
Period: 2019
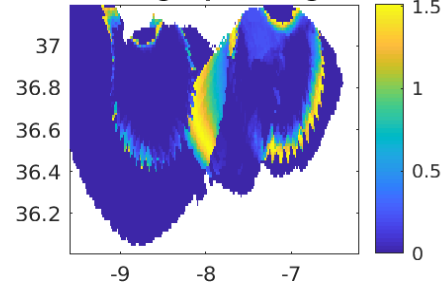
A

B

C

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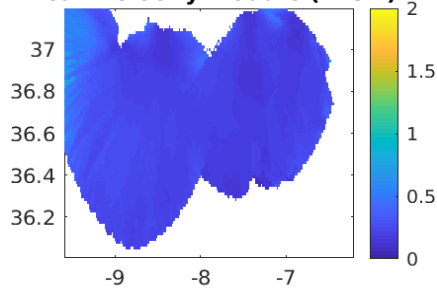
std velocity module (m s^{-1})
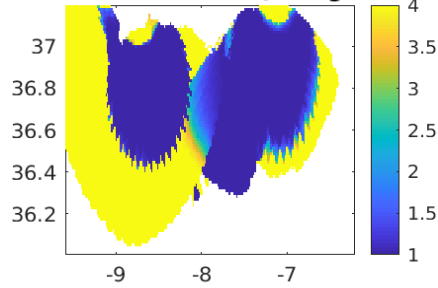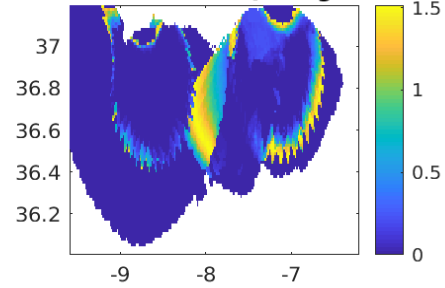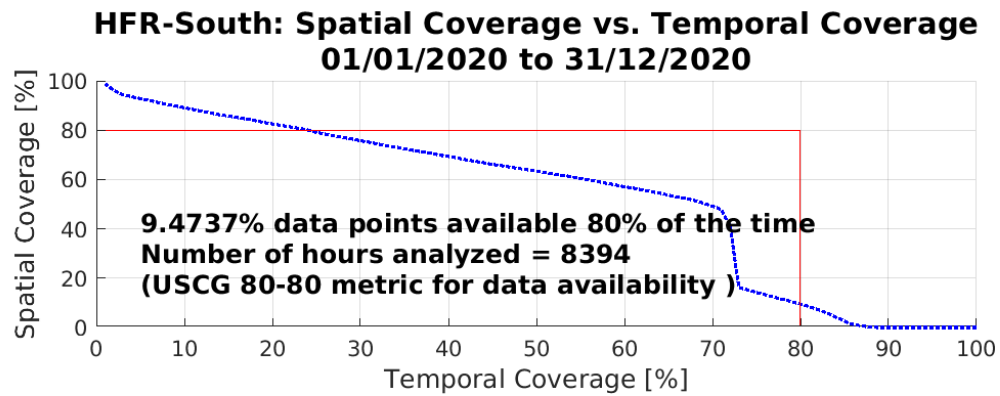
mean gdop QC flag

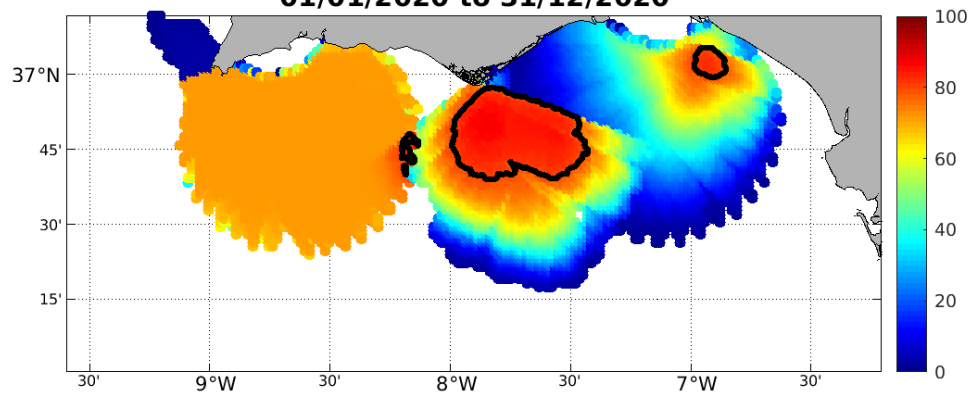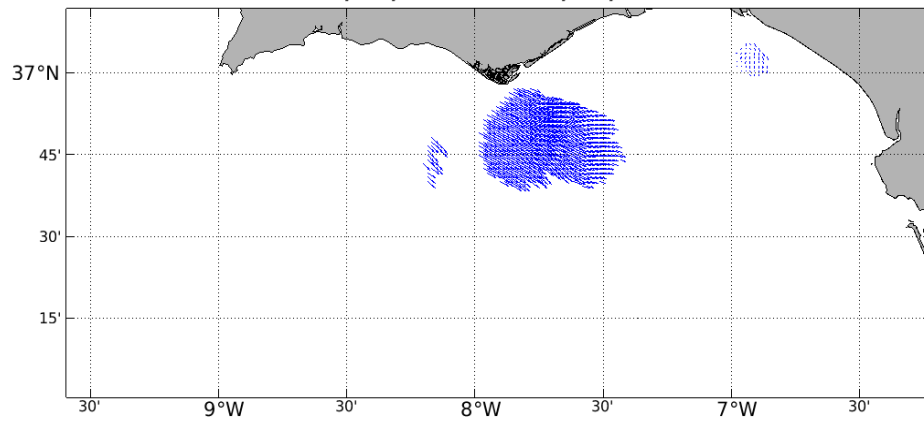std gdop QC flag

mean overall QC flag

std overall QC flag

D

HFR-South: Spatial Coverage vs. Temporal Coverage
01/01/2019 to 31/12/2019

62.9291% data points available 80% of the time
Number of hours analyzed = 8504
(USCG 80-80 metric for data availability)

E
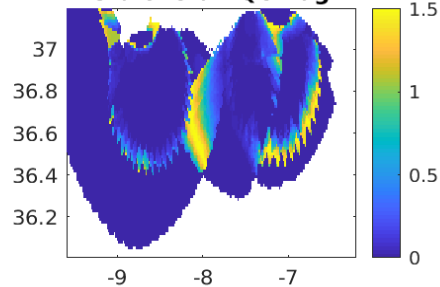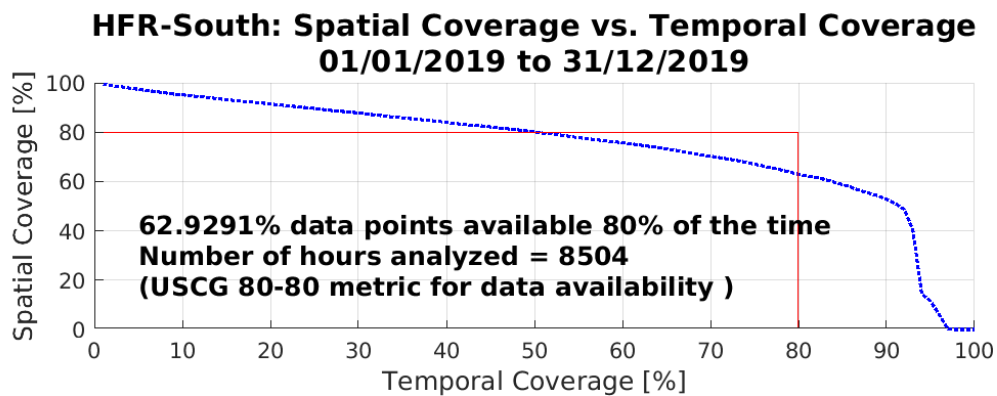
HFR-South: Percent Total Vector Coverage (contour showing >80%)
## 01/01/2019 to 31/12/2019

F

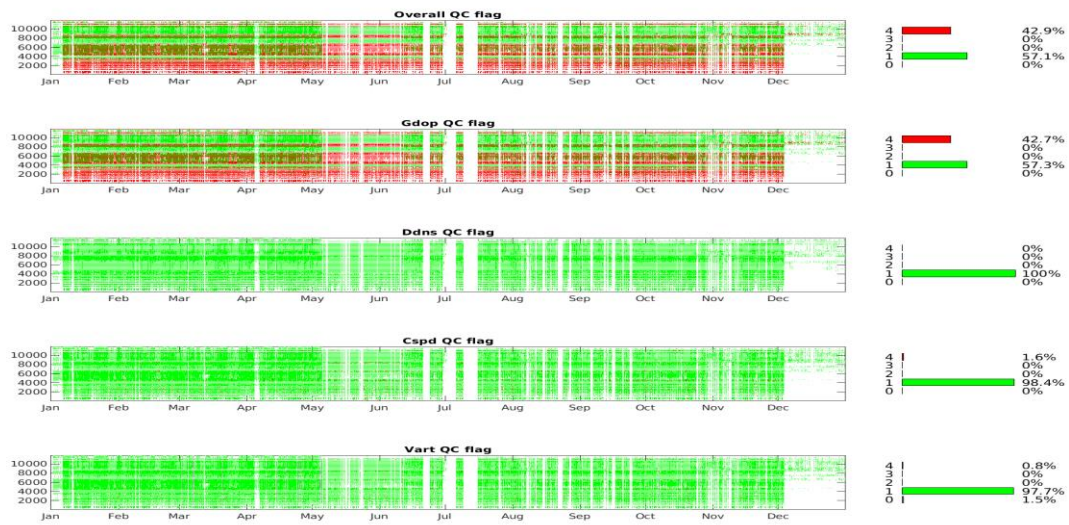### HFR-South: HFR Surface current average [m/s]
### 01/01/2019 to 31/12/2019

Period: 2020

A	

Mean velocity module - 2020

Std velocity module - 2020

Number of good data - 2020

Data monthly availability - 2020

B	

Overall QC flag
- 4: 38.2%
- 3: 0%
- 2: 0%
- 1: 61.8%
- 0: 0%

Gdop QC flag
- 4: 38.1%
- 3: 0%
- 2: 0%
- 1: 61.9%
- 0: 0%

Ddns QC flag
- 4: 0%
- 3: 0%
- 2: 0%
- 1: 100%
- 0: 0%

Cspd QC flag
- 4: 0.8%
- 3: 0%
- 2: 0%
- 1: 99.2%
- 0: 0%

Vart QC flag
- 4: 0.4%
- 3: 0%
- 2: 0%
- 1: 97.3%
- 0: 2.2%

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

D

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

9.4737% data points available 80% of the time
Number of hours analyzed = 8394
(USCG 80-80 metric for data availability)

E

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

F

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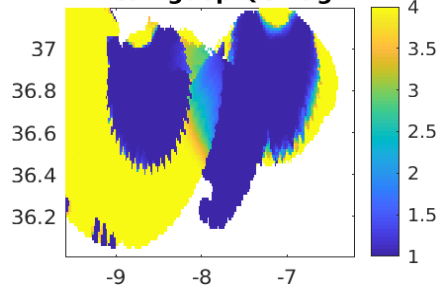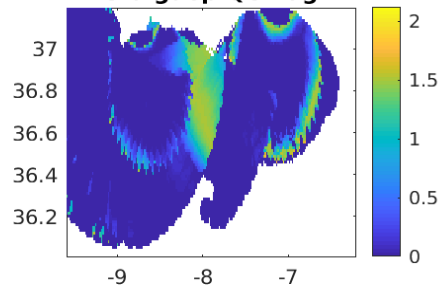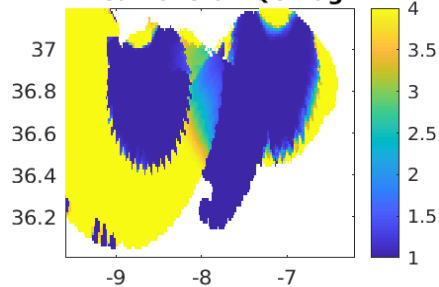### 01/01/2020 to 31/12/2020

Period: 2021

A
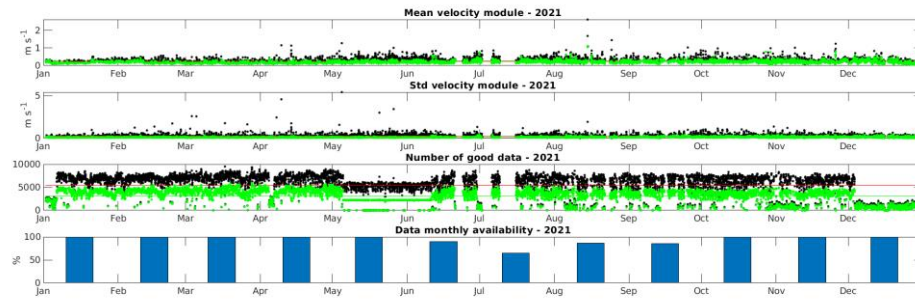
B

C

mean velocity module (m s^{-1})
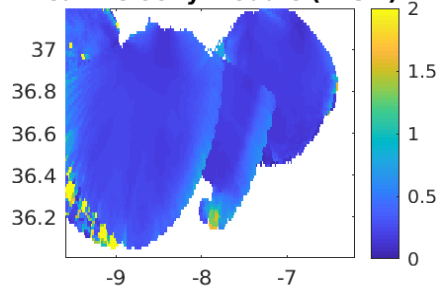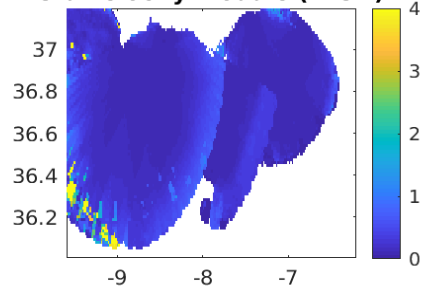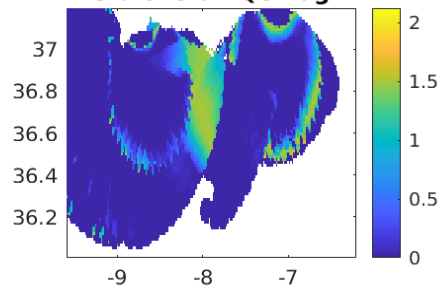
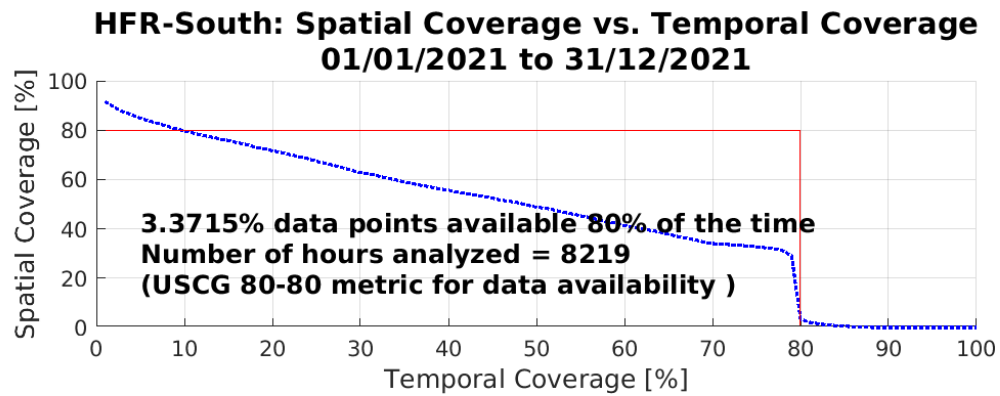std velocity module (m s^{-1})

mean gdop QC flag

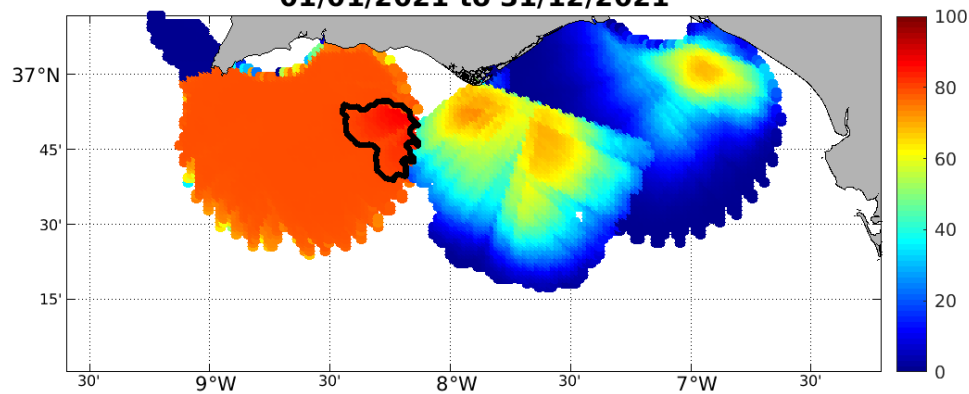std gdop QC flag

mean overall QC flag

std overall QC flag

D

HFR-South: Spatial Coverage vs. Temporal Coverage
01/01/2021 to 31/12/2021

3.3715% data points available 80% of the time
Number of hours analyzed = 8219
(USCG 80-80 metric for data availability)

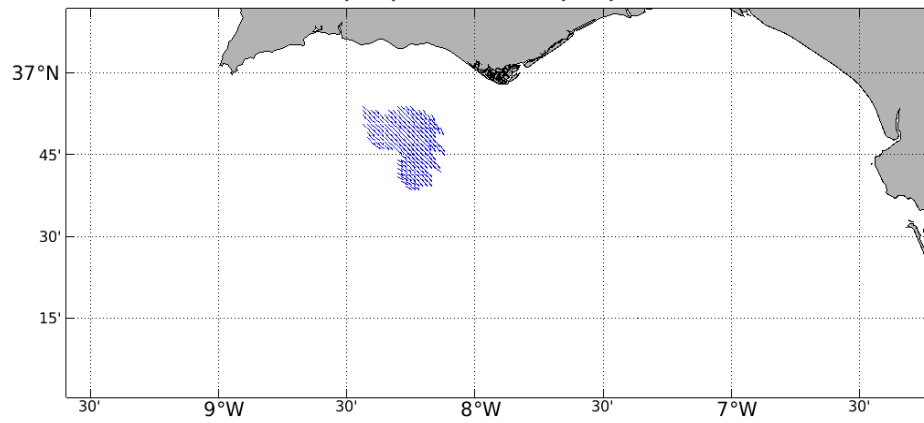*y-axis: Spatial Coverage [%]*
x-axis: Temporal Coverage [%]

E

HFR-South: Percent Total Vector Coverage (contour showing >80%)
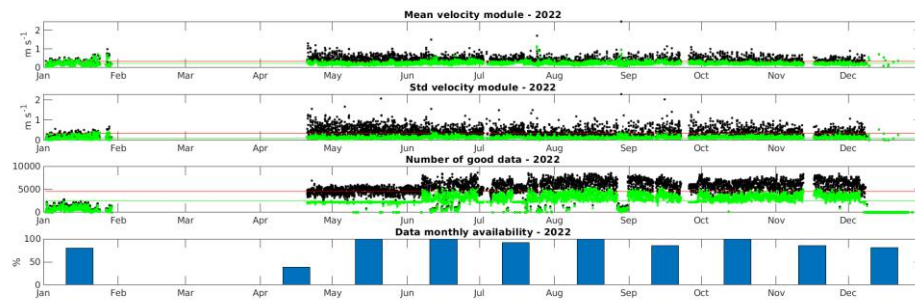## 01/01/2021 to 31/12/2021

F

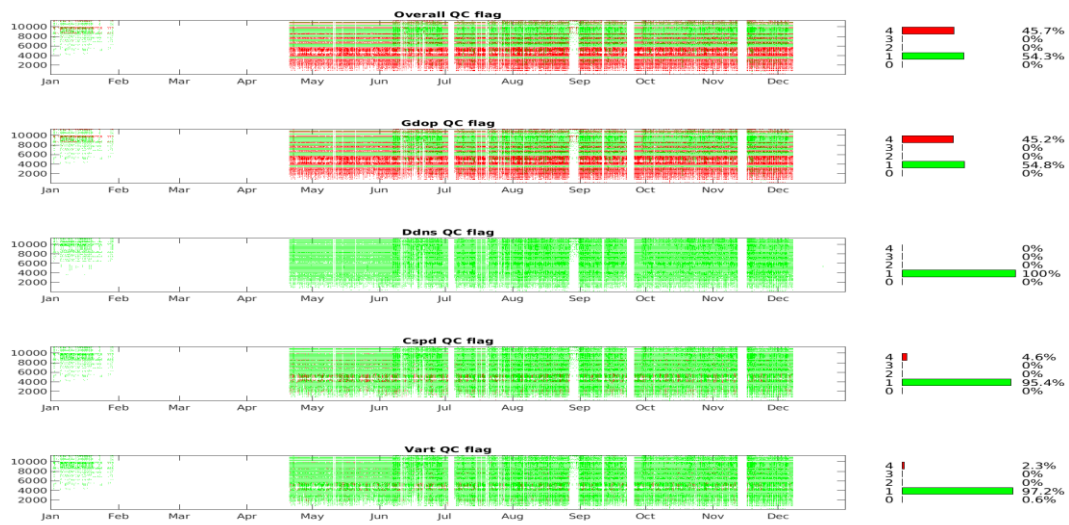## HFR-South: HFR Surface current average [m/s]
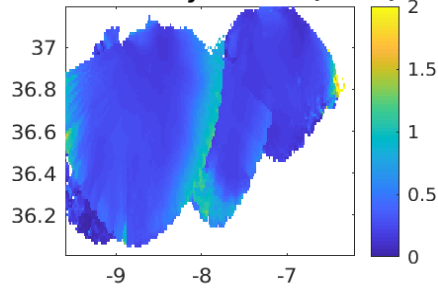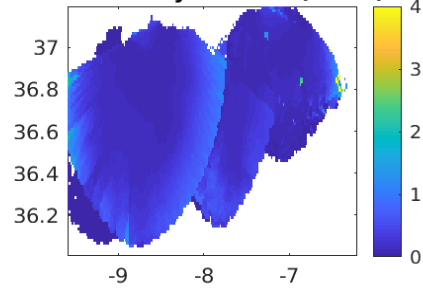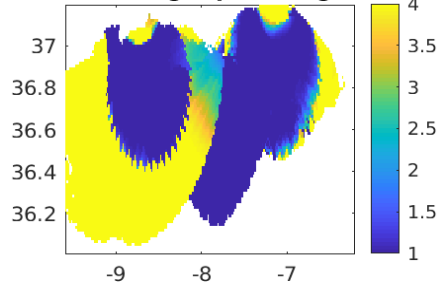## 01/01/2021 to 31/12/2021

Period: 2022

A

Mean velocity module - 2022

Std velocity module - 2022

Number of good data - 2022

Data monthly availability - 2022

B

Overall QC flag

4	45.7%
3	0%
2	0%
1	54.3%
0	0%

Gdop QC flag

4	45.2%
3	0%
2	0%
1	54.8%
0	0%

Ddns QC flag

4	0%
3	0%
2	0%
1	100%
0	0%

Cspd QC flag

4	4.6%
3	0%
2	0%
1	95.4%
0	0%

Vart QC flag

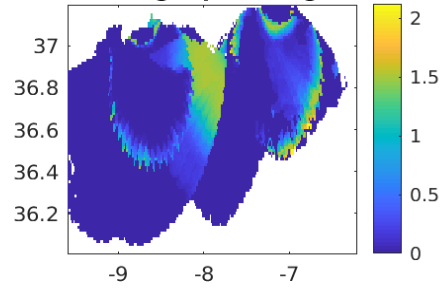|	
4	2.3%
3	0%
2	0%
1	97.2%
0	0.6%

C

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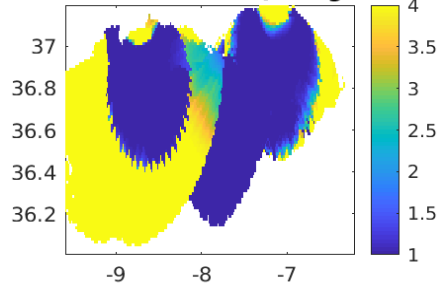
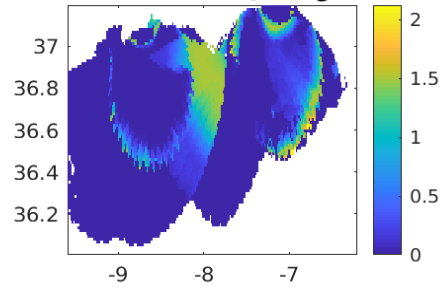std velocity module (m s^{-1})
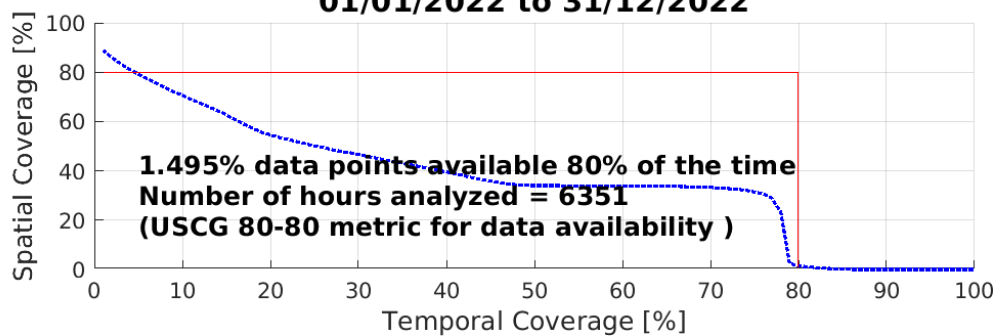
mean gdop QC flag

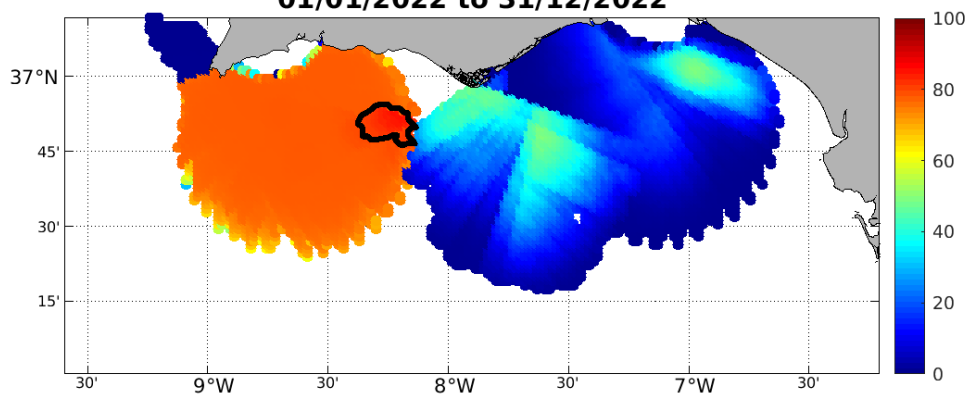std gdop QC flag

mean overall QC flag

std overall QC flag

D

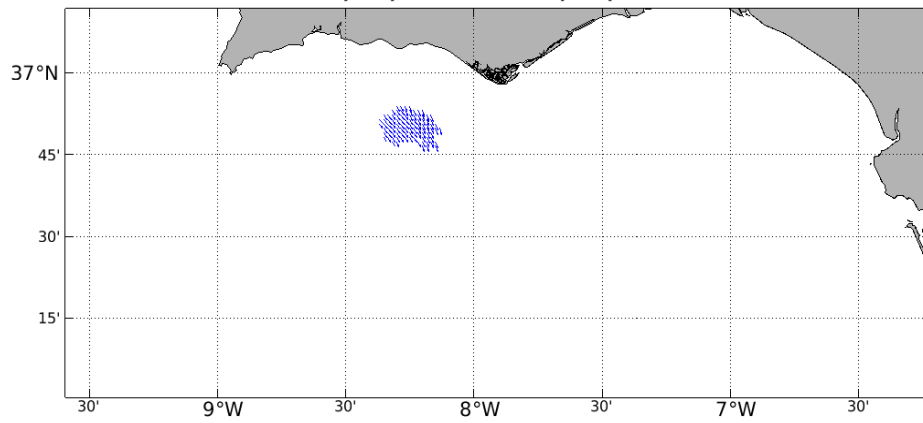**HFR-South: Spatial Coverage vs. Temporal Coverage**
01/01/2022 to 31/12/2022

1.495% data points available 80% of the time
Number of hours analyzed = 6351
(USCG 80-80 metric for data availability)

E

HFR-South: Percent Total Vector Coverage (contour showing >80%)
01/01/2022 to 31/12/2022

F

HFR-South: HFR Surface current average [m/s]
01/01/2022 to 31/12/2022

Version of the report	Changes made by	Nature of changes
V2	M. Chifflet & A. Rubio	Spatial coverage details
V3	M. Chifflet & A. Rubio	Including figures in Annex III
VR2020_12	L. Solabarrieta & A. Rubio	Update for 2020 & historical dataset (2016-2019)
VR2023_11	L. Solabarrieta& I. Manso-Narvarte	Update 2021-22
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;		