Report on Historical data files QA/QC

<table>
<thead>
<tr>
<th>Version of the report</th>
<th>Changes made by</th>
<th>Nature of changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>V2</td>
<td>M. Chifflet &amp; A. Rubio</td>
<td>Spatial coverage details</td>
</tr>
<tr>
<td>V3</td>
<td>M. Chifflet &amp; A. Rubio</td>
<td>Including figures</td>
</tr>
</tbody>
</table>

System: Lisboa  
Data set: [Totals/Radials] Total  
Period: 24-Sep-2012 – 21-Jul-2020

INFO ON QA/QC Settings and Calibration

- 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 the period 24-Sep-2012 – 21-Jul-2020*:  
  590_IHOC_PL015: 2017-08-08T00:00:00Z; 590_IHOC_PL016: 2014-08-07T00:00:00Z

*Calibration info for time 27-Sep-2017 11:00 to 29-Sep-2019:  
Inconsistencies between the information provided for the 590_IHOC_PL015 HF Radar site and the dates of the last calibration performed: 590_IHOC_PL015: 2114-08-10T00:00:00Z; (not possible date)

RESULTS OF HIST DATA INSPECTION

General comments:

The available data series is quite long with almost 8 years of data.  
We did not notice any periods to be controlled and/or reflagged.  
The system presents temporal gaps of few weeks for the whole dataset, during the months indicated below:
- 2012: December
- 2013: April, May, September
- 2014: June, July, August
- 2015: --
- 2016: March, April, June, July, December
- 2017: January, August, September
- 2018: May, June
- 2019: September, November
- 2020: --

<table>
<thead>
<tr>
<th>Year</th>
<th>General comment</th>
<th>Periods to be reflagged</th>
<th>Reason for new flagging</th>
<th>Sugg. Flag</th>
</tr>
</thead>
</table>

From 2012 to 2020 the spatial/temporal coverage for the USCG 80-80% objective is quite stable.
Mean surface currents present the next characteristics for the different analyzed years:

- 2012: weak southward currents under 38ºN 24’. No clear pattern in the rest of the study area
- 2013: southward currents
- 2014: southward currents
- 2015: weak south-southwestward currents
- 2016: southward currents under 38ºN 24’. No clear pattern in the rest of the study area
- 2017: southward currents under 38ºN 24’. No clear pattern in the rest of the study area
- 2018: southward currents under 38ºN 24’. No clear pattern in the rest of the study area
- 2019: southward currents under 38ºN 24’. No clear pattern in the rest of the study area
- 2020: weak southward currents under 38ºN 24’. No clear pattern in the rest of the study area

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

<table>
<thead>
<tr>
<th>Period</th>
<th>General comments</th>
<th>Nb. analysed hours</th>
<th>80%-80% obj.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>82.89 % spatial availability 80% of time</td>
<td>2105</td>
<td>y</td>
</tr>
<tr>
<td>2013</td>
<td>64.80 % spatial availability 80% of time</td>
<td>7379</td>
<td>n</td>
</tr>
<tr>
<td>2014</td>
<td>80.15 % spatial availability 80% of time</td>
<td>7671</td>
<td>y</td>
</tr>
<tr>
<td>2015</td>
<td>91.16 % spatial availability 80% of time</td>
<td>8073</td>
<td>y</td>
</tr>
<tr>
<td>2016</td>
<td>90.32 % spatial availability 80% of time</td>
<td>6599</td>
<td>y</td>
</tr>
<tr>
<td>2017</td>
<td>83.18 % spatial availability 80% of time</td>
<td>6505</td>
<td>y</td>
</tr>
<tr>
<td>2018</td>
<td>92.99 % spatial availability 80% of time</td>
<td>8171</td>
<td>y</td>
</tr>
<tr>
<td>2019</td>
<td>95.8 % spatial availability 80% of time</td>
<td>8166</td>
<td>y</td>
</tr>
<tr>
<td>Jan-Jul 2020</td>
<td>97.80 % spatial availability 80% of time</td>
<td>4817</td>
<td>y</td>
</tr>
</tbody>
</table>

### Annex I Applied QA/QC tests

<table>
<thead>
<tr>
<th>QC Flag</th>
<th>Variable name</th>
<th>Short name</th>
<th>Short description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>Syntax</td>
<td>Syntax</td>
<td>Syntax check: this test will ensure the proper formatting and the existence of all</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>the necessary fields within the total NetCDF file. This test is performed on the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NetCDF files and it assesses the presence and correctness of all data and attribute</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>fields and the correct syntax throughout the file. This test is performed by the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>European HFR Node before pushing data to the distribution platforms.</td>
</tr>
<tr>
<td>DDNS_QC</td>
<td>Data Density</td>
<td>Data</td>
<td>Data Density Threshold: this test labels total velocity vectors with a number of</td>
</tr>
<tr>
<td></td>
<td>Threshold</td>
<td>Threshold</td>
<td>contributing radials bigger than the threshold with a “good data” flag and total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>velocity vectors with a number of contributing radials smaller than the threshold</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>with a “bad data” flag.</td>
</tr>
<tr>
<td>CSPD_QC</td>
<td>Velocity</td>
<td>Velocity</td>
<td>Velocity Threshold: this test labels total velocity vectors whose module is bigger</td>
</tr>
<tr>
<td></td>
<td>Threshold</td>
<td>Threshold</td>
<td>than a maximum velocity threshold with a “bad data” flag and total vectors whose</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>module is smaller than the threshold with a “good data” flag.</td>
</tr>
</tbody>
</table>
**VART_QC**

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No QC was performed</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>Good data</td>
<td>All real-time QC tests passed.</td>
</tr>
<tr>
<td>2</td>
<td>Probably good data</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Bad data that are potentially correctable</td>
<td>These data are not to be used without scientific correction.*</td>
</tr>
<tr>
<td>4</td>
<td>Bad data</td>
<td>Data have failed one or more of the tests.</td>
</tr>
<tr>
<td>5</td>
<td>Value changed</td>
<td>Data may be recovered after transmission error.</td>
</tr>
<tr>
<td>6</td>
<td>Not used</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Nominal value</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Interpolated value</td>
<td>Missing data may be interpolated from neighbouring data in space or time.</td>
</tr>
<tr>
<td>9</td>
<td>Missing value</td>
<td>-</td>
</tr>
</tbody>
</table>

*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 (top panel), its standard deviation (middle panel) and the grid points of the total coverage (bottom panel). 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

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.

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.
HFR-Lisboa: Spatial Coverage vs. Temporal Coverage
24/09/2012 to 31/12/2012

82.8926% data points available 80% of the time
Number of hours analyzed = 2105
(USCG 80-80 metric for data availability)
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-Lisboa: Spatial Coverage vs. Temporal Coverage
01/01/2013 to 31/12/2013

64.8069\% data points available 80\% of the time
Number of hours analyzed = 7379
(USCG 80-80 metric for data availability)
D

HFR-Lisboa: Spatial Coverage vs. Temporal Coverage
01/01/2014 to 31/12/2014

80.1508% data points available 80% of the time
Number of hours analyzed = 7671
(USCG 80-80 metric for data availability)
B

C

D

HFR-Lisboa: Spatial Coverage vs. Temporal Coverage
01/01/2015 to 31/12/2015

91.1595% data points available 80% of the time
Number of hours analyzed = 8073
(USCG 80-80 metric for data availability)
Period: 2017

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HFR-Lisboa: Percent Total Vector Coverage (contour showing >80%) 01/01/2016 to 07/12/2016

HFR-Lisboa: HFR Surface current average [m/s] 01/01/2016 to 07/12/2016
**D**

**HFR-Lisboa: Spatial Coverage vs. Temporal Coverage**

26/01/2017 to 31/12/2017

83.1824% data points available 80% of the time

Number of hours analyzed = 6505

(USCG 80-80 metric for data availability)
Period: 2018

HFR-Lisboa: Percent Total Vector Coverage (contour showing >80%)
26/01/2017 to 31/12/2017

HFR-Lisboa: HFR Surface current average [m/s]
26/01/2017 to 31/12/2017
B

C

D

HFR-Lisboa: Spatial Coverage vs. Temporal Coverage
02/01/2019 to 31/12/2019

95.8% data points available 80% of the time
Number of hours analyzed = 8166
(USCG 80-80 metric for data availability)
HFR-Lisboa: Spatial Coverage vs. Temporal Coverage
01/01/2020 to 21/07/2020

97.7971% data points available 80% of the time
Number of hours analyzed = 4817
(USCG 80-80 metric for data availability)

HFR-Lisboa: Percent Total Vector Coverage (contour showing >80%)
01/01/2020 to 21/07/2020

HFR-Lisboa: HFR Surface current average [m/s]
01/01/2020 to 21/07/2020