Diagtool Report

Round Robin (GT cotier) : Range. Nea. J3. Mle4 vs Adaptive vs Ales.

7 juillet 2022

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1 General description

- Figures and notes have been included in this report to evaluate different altimetry products.
- In order to test different version of the Range used to calculate the sea level anomaly. Each version has been compared with a reference version. In this case the Mle4 is the reference one.
- The sea level anomaly has been calculated using each version of the variable and has been compared to the sea level anomaly calculated using the reference version.
- The region of study is Nea
- Mission : J3
- Git last tag :
- Git changeset number : 3b970d7-2022-07-05

2 Processing

2.1 sla formula

2.1.1 Mle4 product ' sla

sla = ORBIT.ALTI.CNES_POE_F -
RANGE.ALTI -
MEAN_SEA_SURFACE.MODEL.CNESCLS15 -
SEA_STATE_BIAS.ALTI -
IONOSPHERIC_CORRECTION.MODEL.GIM -
WET_TROPOSPHERIC_CORRECTION.RAD -
DRY_TROPOSPHERIC_CORRECTION.MODEL.ECMWF -
DYNAMICAL_ATMOSPHERIC_CORRECTION.MODEL.MOG2D_HR -
OCEAN_TIDE_HEIGHT.MODEL.FES14B -
SOLID_EARTH_TIDE_HEIGHT.MODEL.CARTWRIGHT_TAYLER_71 -
POLE_TIDE_HEIGHT.MODEL.DESAI_2015

2.1.2 Adaptive product ' sla

sla = ORBIT.ALTI.CNES_POE_F -
RANGE.ALTI.RTK_ADAPTIVE_PROTO -
MEAN_SEA_SURFACE.MODEL.CNESCLS15 -
SEA_STATE_BIAS.ALTI.ADAPTIVE_PROTO -
IONOSPHERIC_CORRECTION.MODEL.GIM -
WET_TROPOSPHERIC_CORRECTION.RAD -
DRY_TROPOSPHERIC_CORRECTION.MODEL.ECMWF -
DYNAMICAL_ATMOSPHERIC_CORRECTION.MODEL.MOG2D_HR -
OCEAN_TIDE_HEIGHT.MODEL.FES14B -
SOLID_EARTH_TIDE_HEIGHT.MODEL.CARTWRIGHT_TAYLER_71 -
POLE_TIDE_HEIGHT.MODEL.DESAI_2015

2.1.3 Ales product ' sla

sla = ORBIT.ALTI.CNES_POE_F -
range_20hz_ales -
MEAN_SEA_SURFACE.MODEL.CNESCLS15 -
sea_state_bias_20hz_ales -
IONOSPHERIC_CORRECTION.MODEL.GIM -
WET_TROPOSPHERIC_CORRECTION.RAD -
DRY_TROPOSPHERIC_CORRECTION.MODEL.ECMWF -
DYNAMICAL_ATMOSPHERIC_CORRECTION.MODEL.MOG2D_HR -
OCEAN_TIDE_HEIGHT.MODEL.FES14B -
SOLID_EARTH_TIDE_HEIGHT.MODEL.CARTWRIGHT_TAYLER_71 -
POLE_TIDE_HEIGHT.MODEL.DESAI_2015

2.2 Binning

Each track has been divided to a set of sections, where the center of each section is separated by the sample frequency of the satelitte times it's velocity.

The data located within the sections limits represent the altimetry time-series on which the statistics will be calculated and visualized in this report.

2.3 Filtering

— The sla has been filtered by a threashold of 3 m.
— Each sla time-serie has been filtred by a window of $[-4\sigma, 4\sigma]$, where σ is the standard deviation of the sla time serie

3 Spatial coherence analysis

3.1 sla

3.1.1 sla 's count

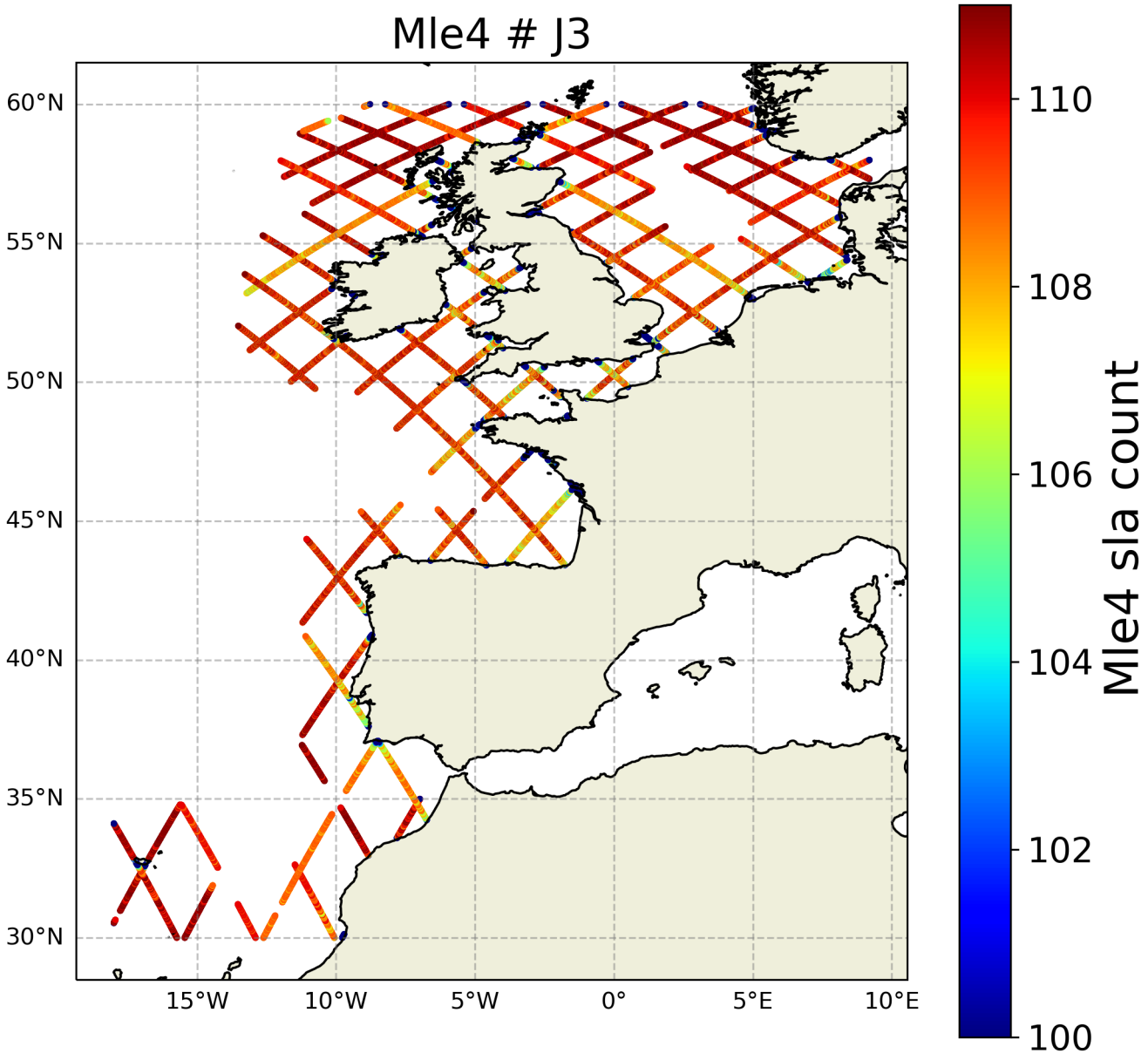

FIGURE 1 – Spatial coherence analysis of the count of the Mle4 version of sla variable

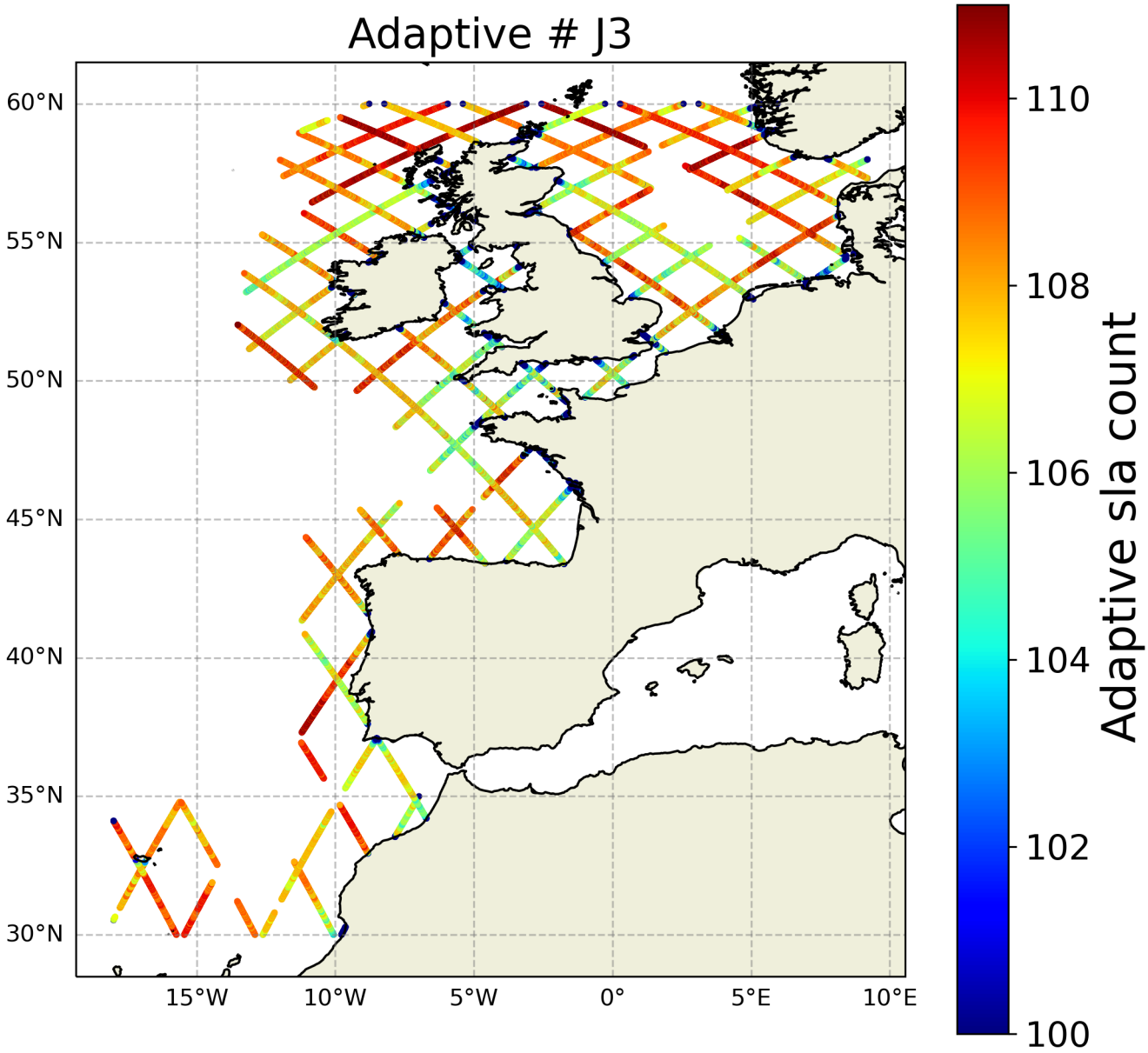

FIGURE 2 – Spatial coherence analysis of the count of the Adaptive version of sla variable

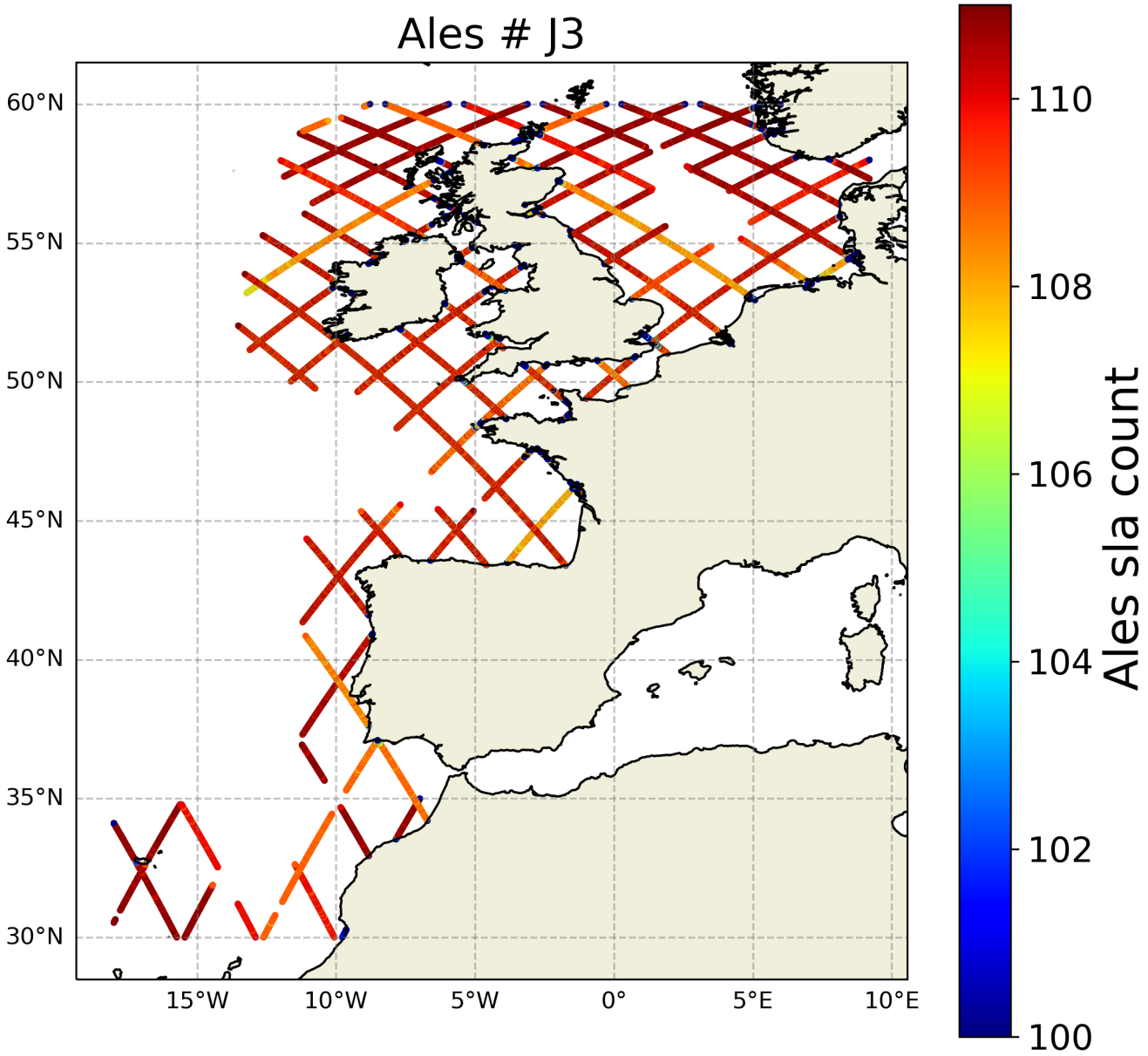

FIGURE 3 – Spatial coherence analysis of the count of the Ales version of sla variable

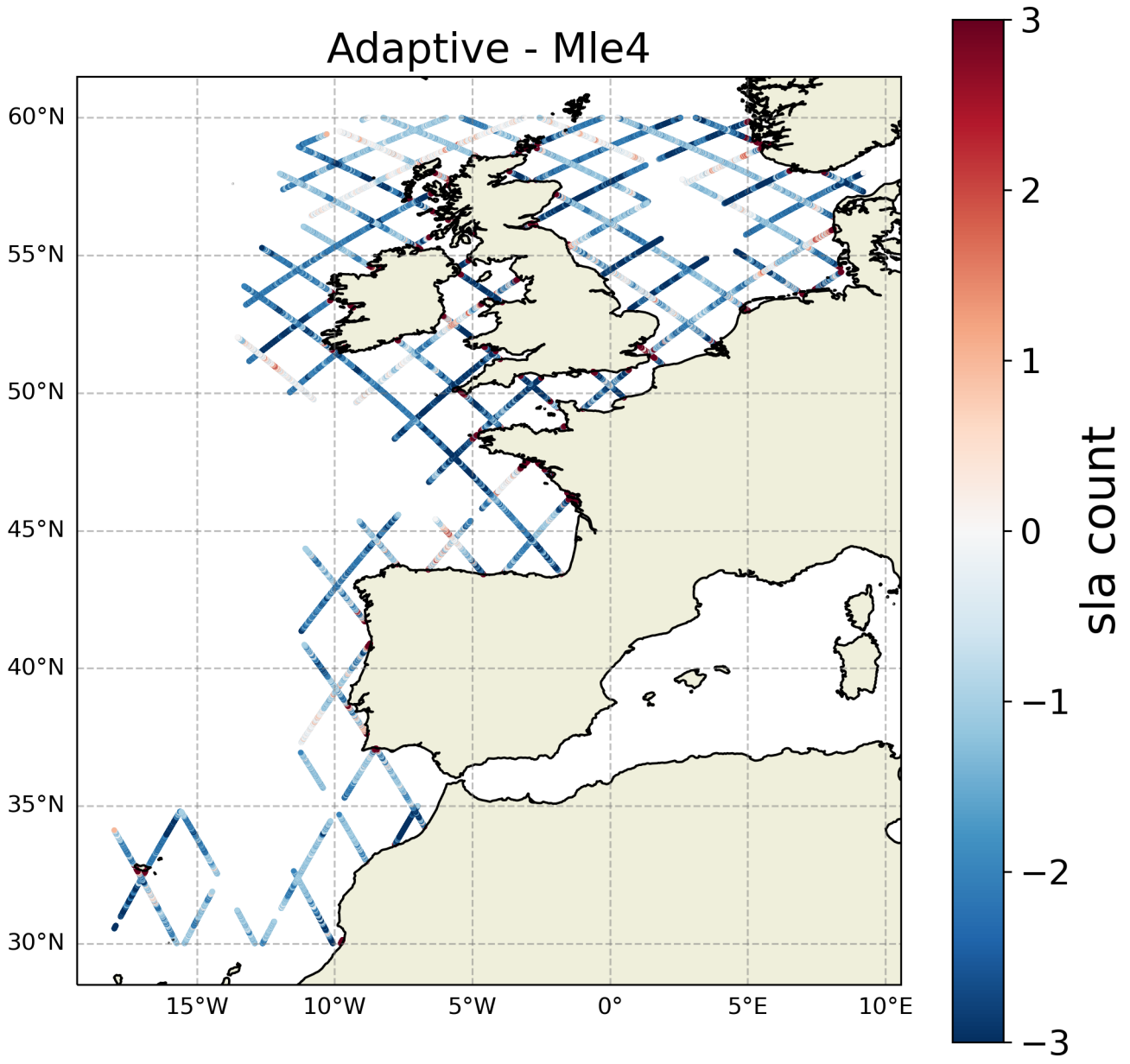

FIGURE 4 – Spatial coherence analysis of the Difference in sla 's count between Adaptive and Mle4

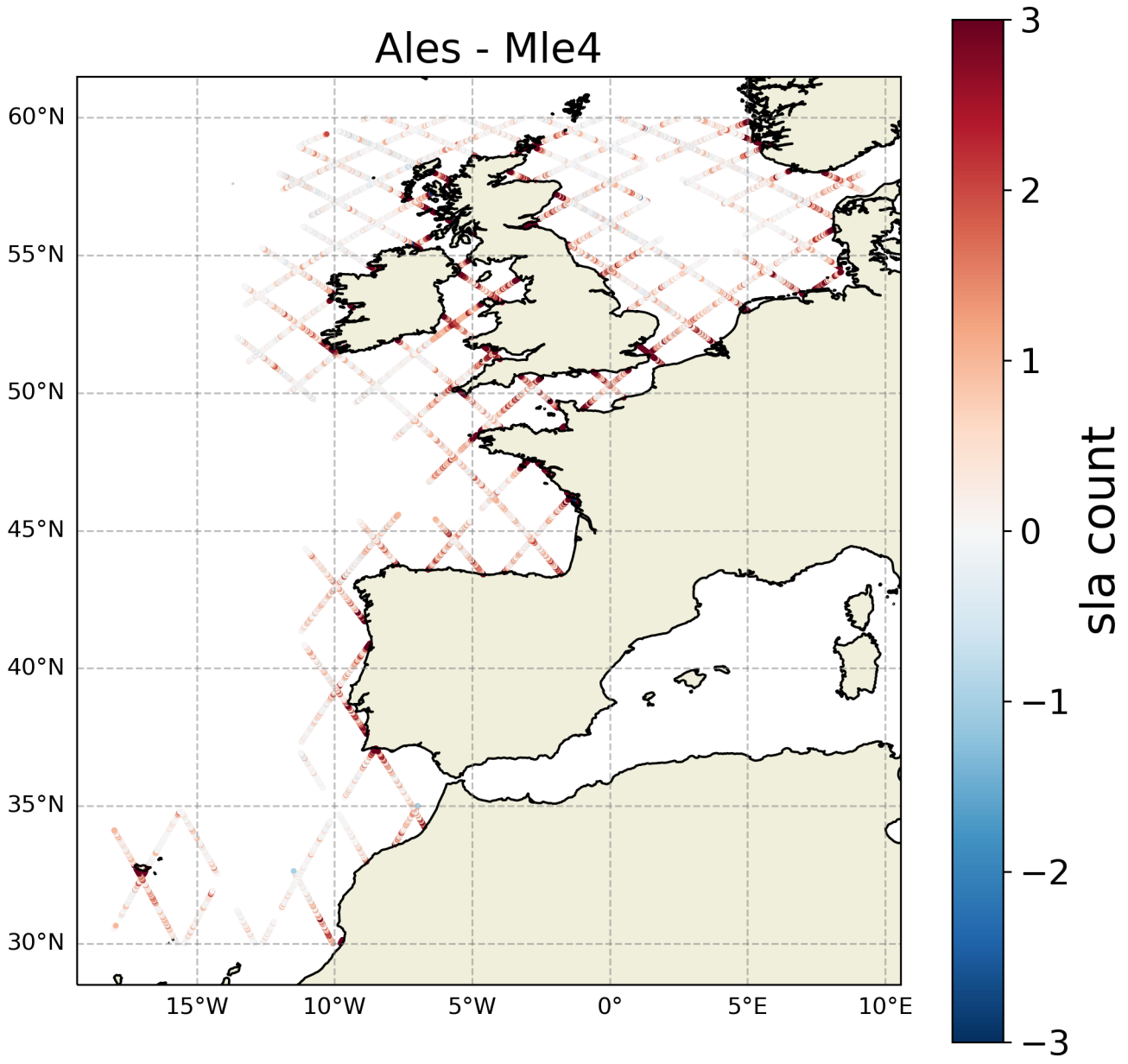

FIGURE 5 – Spatial coherence analysis of the Difference in sla 's count between Ales and Mle4

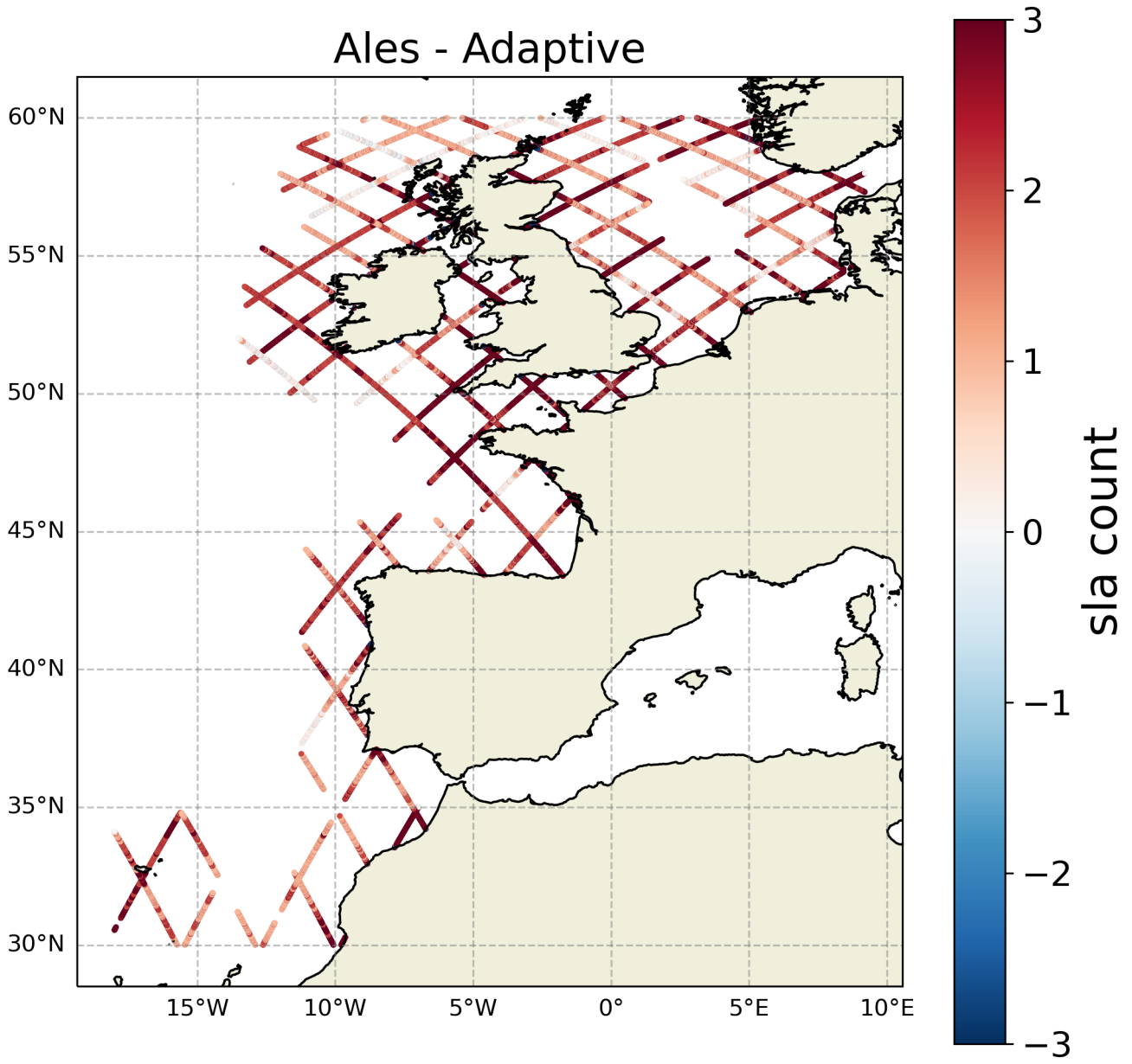

Figure 6 – Spatial coherence analysis of the Difference in sla 's count between Ales and Adaptive

3.1.2 sla 's std

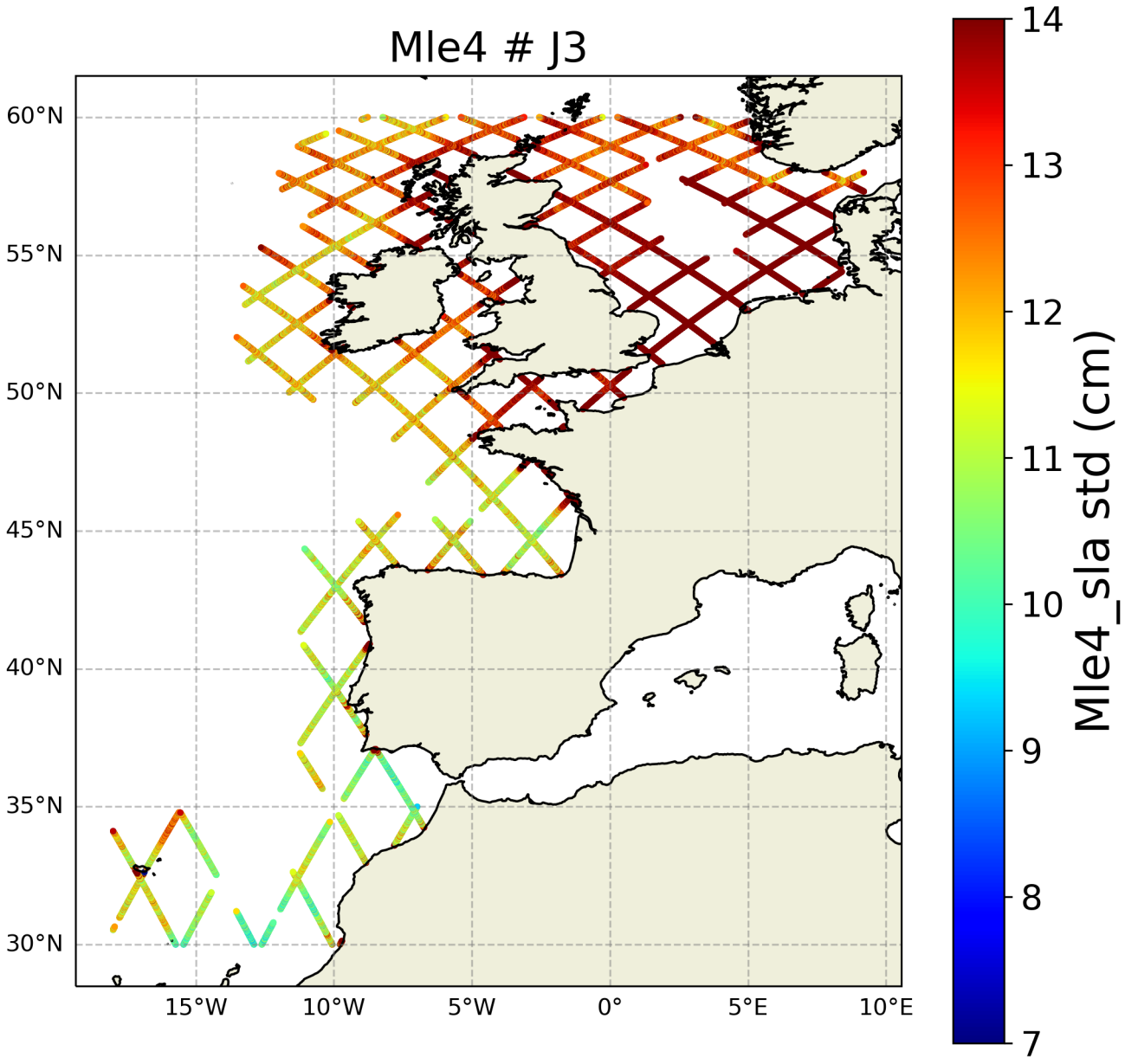

FIGURE 7 – Spatial coherence analysis of the std of the Mle4 version of sla variable

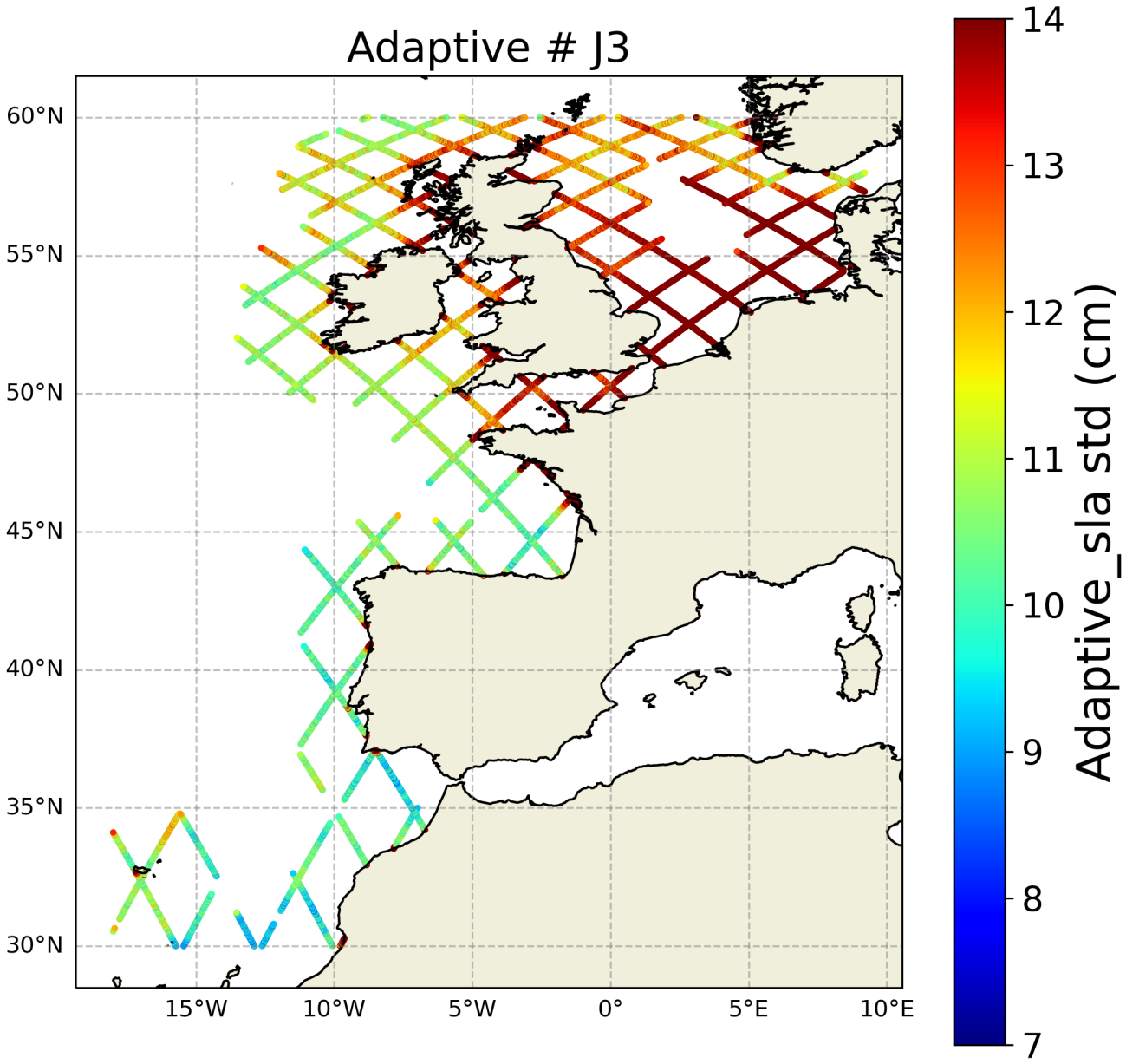

FIGURE 8 – Spatial coherence analysis of the std of the Adaptive version of sla variable

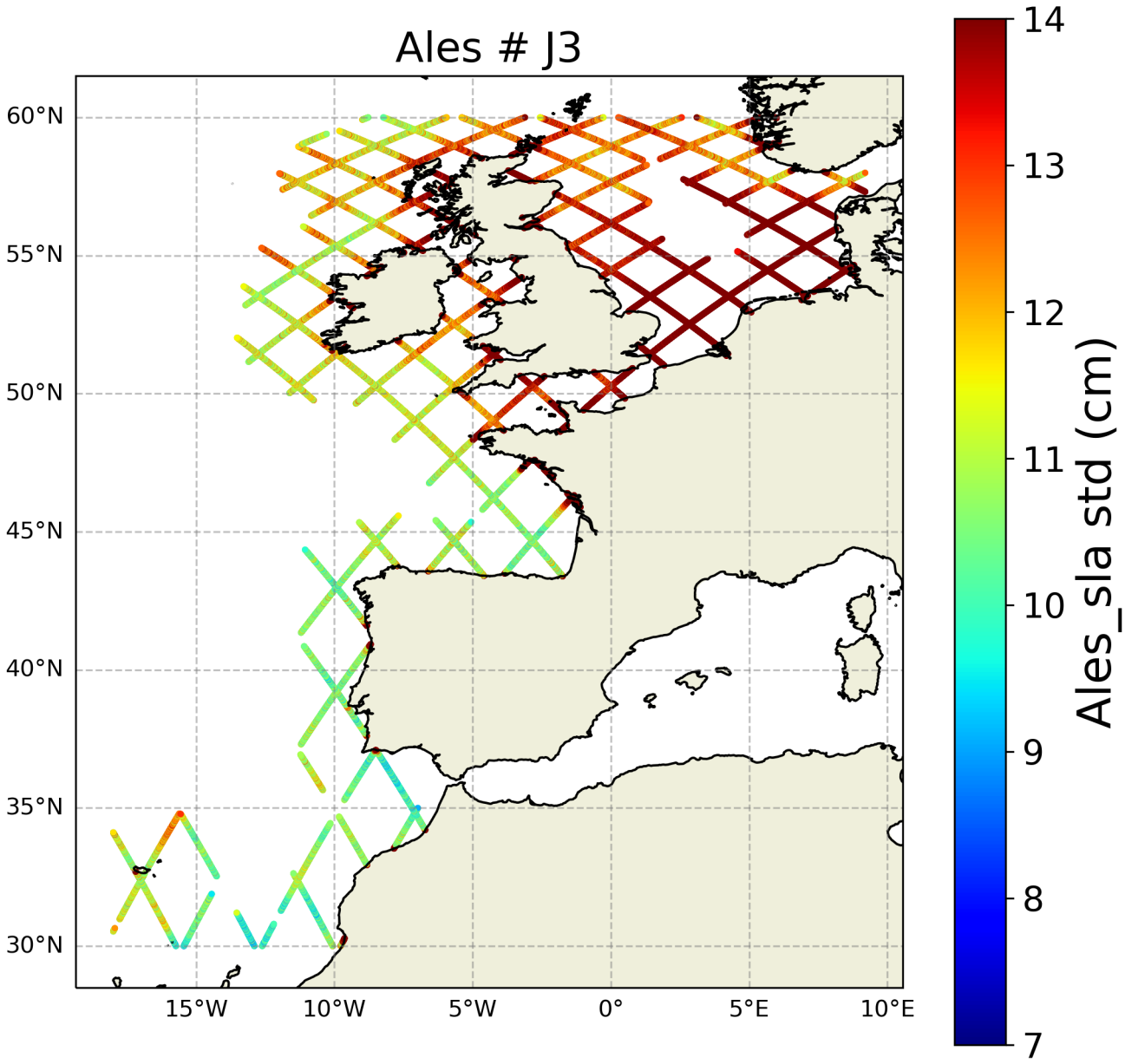

FIGURE 9 – Spatial coherence analysis of the std of the Ales version of sla variable

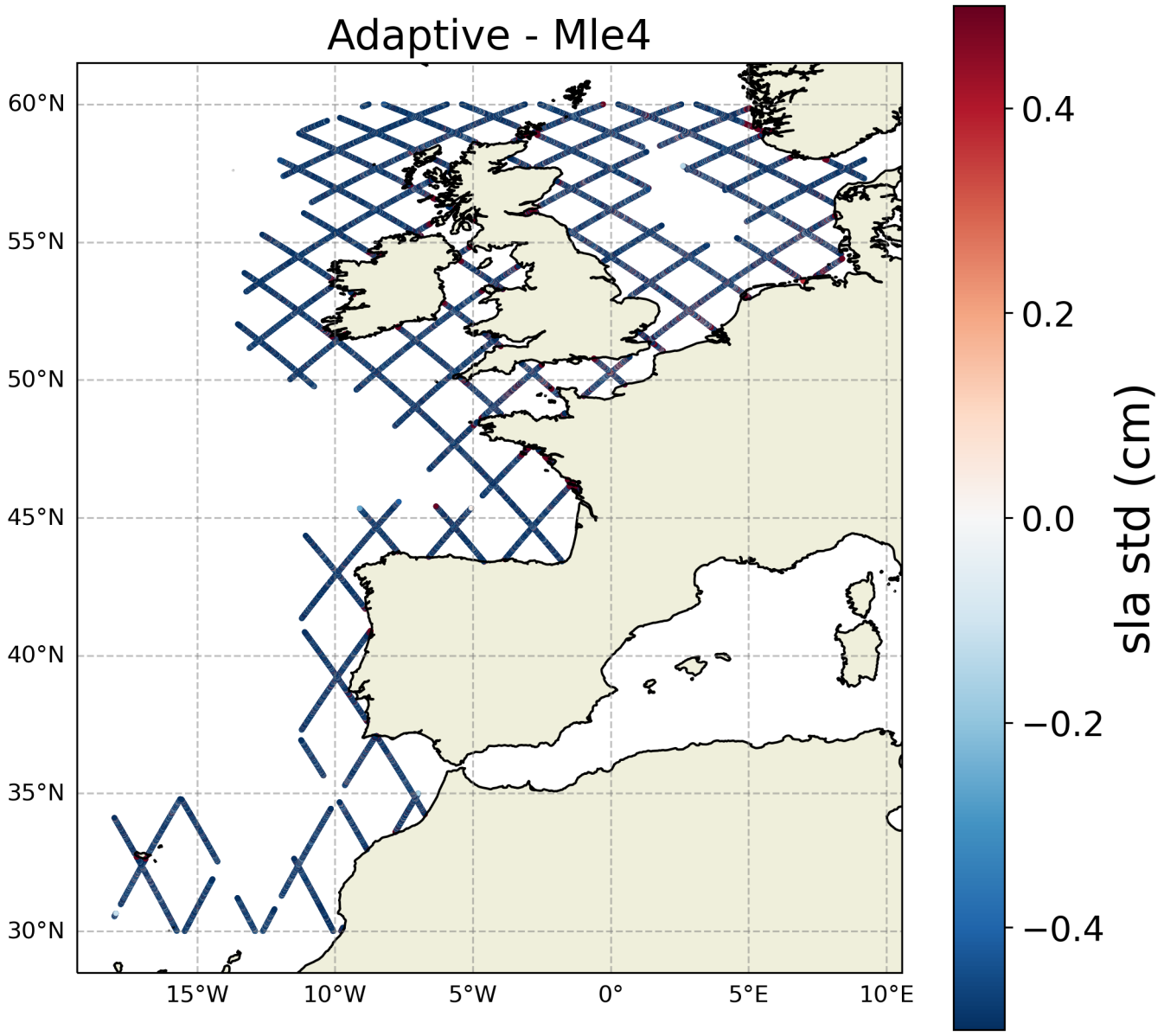

Figure 10 – Spatial coherence analysis of the Difference in sla 's std between Adaptive and Mle4

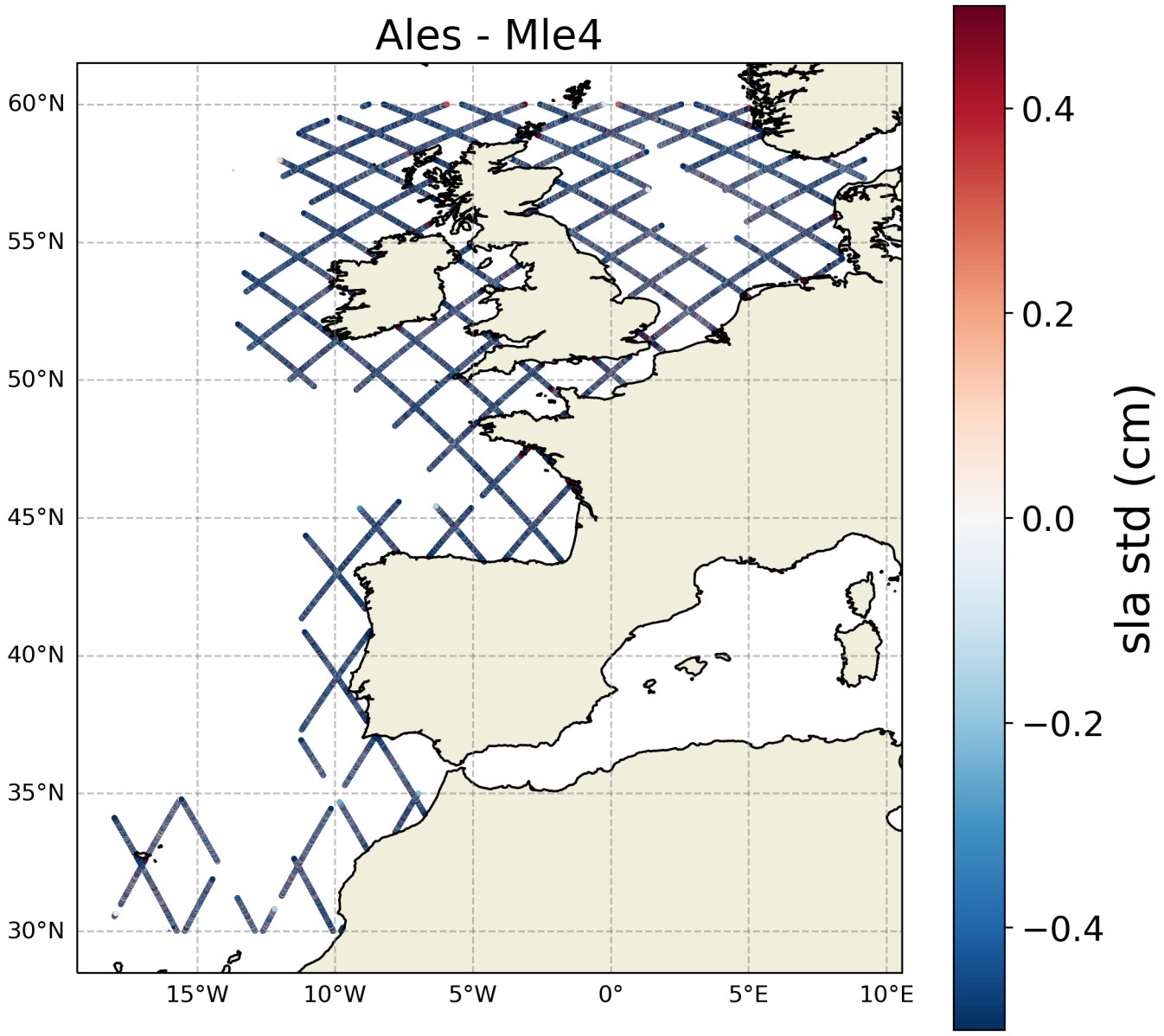

Figure 11 – Spatial coherence analysis of the Difference in sla 's std between Ales and Mle4

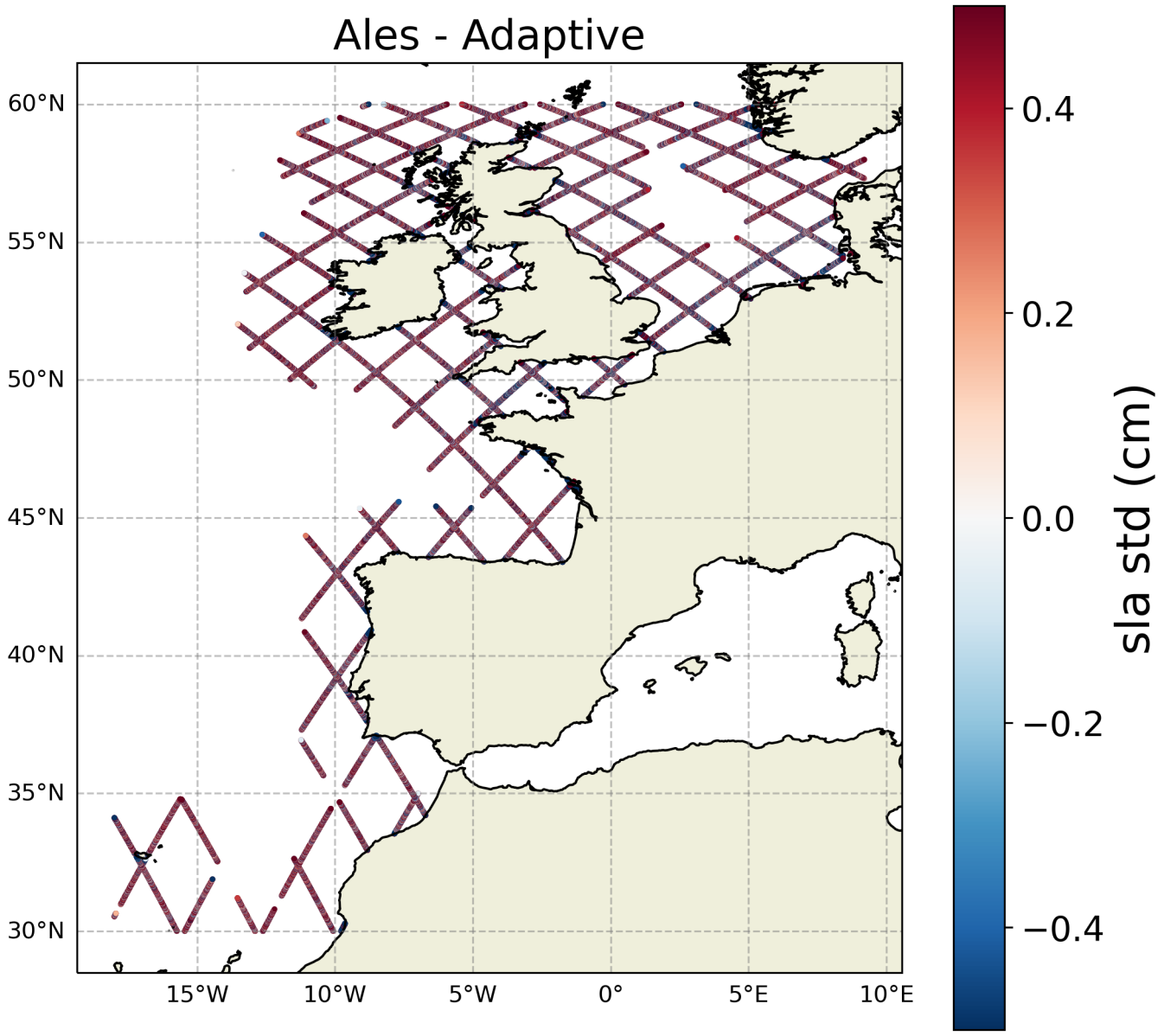

FIGURE 12 – Spatial coherence analysis of the Difference in sla 's std between Ales and Adaptive

3.1.3 sla 's mean

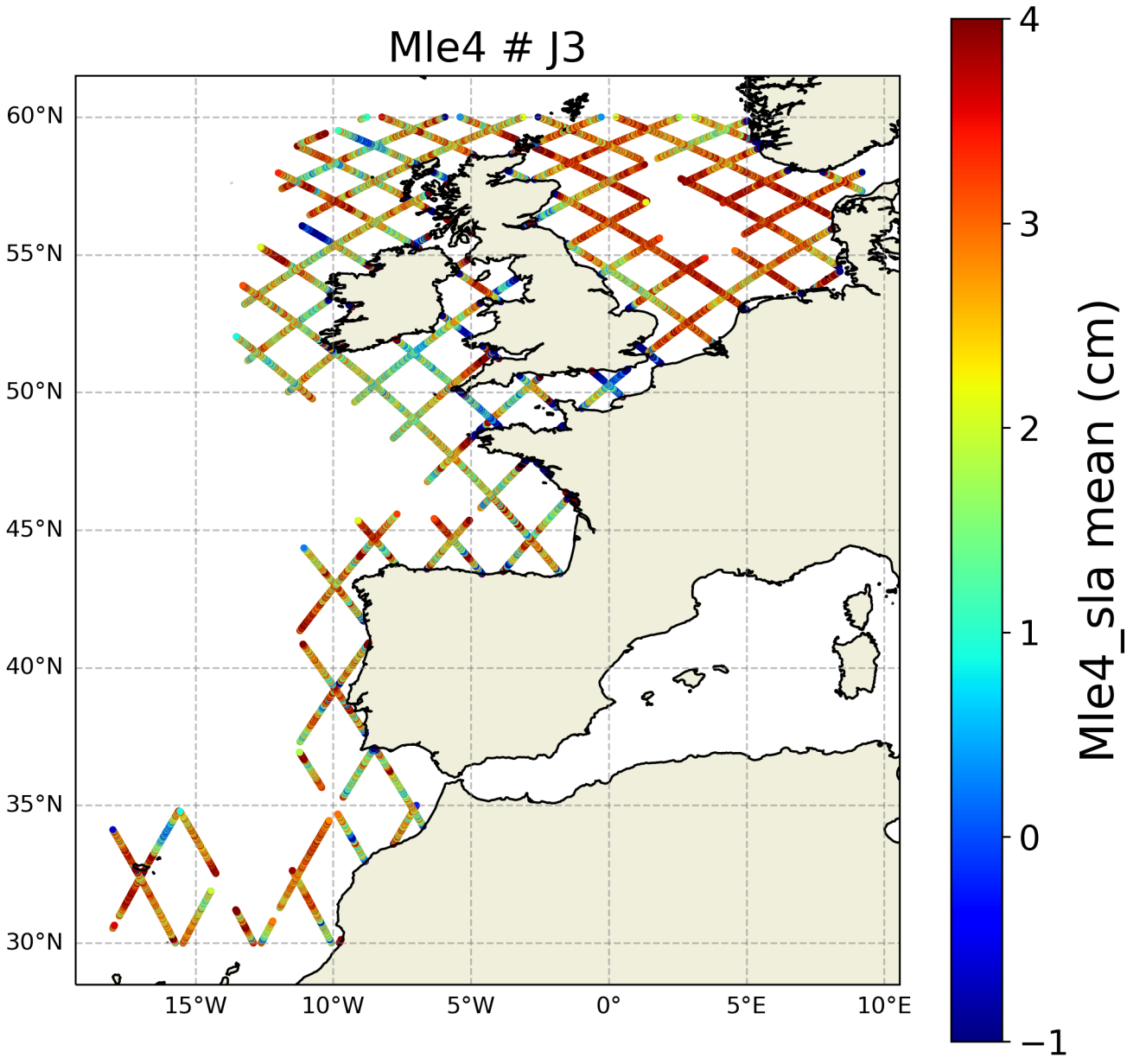

FIGURE 13 – Spatial coherence analysis of the mean of the Mle4 version of sla variable

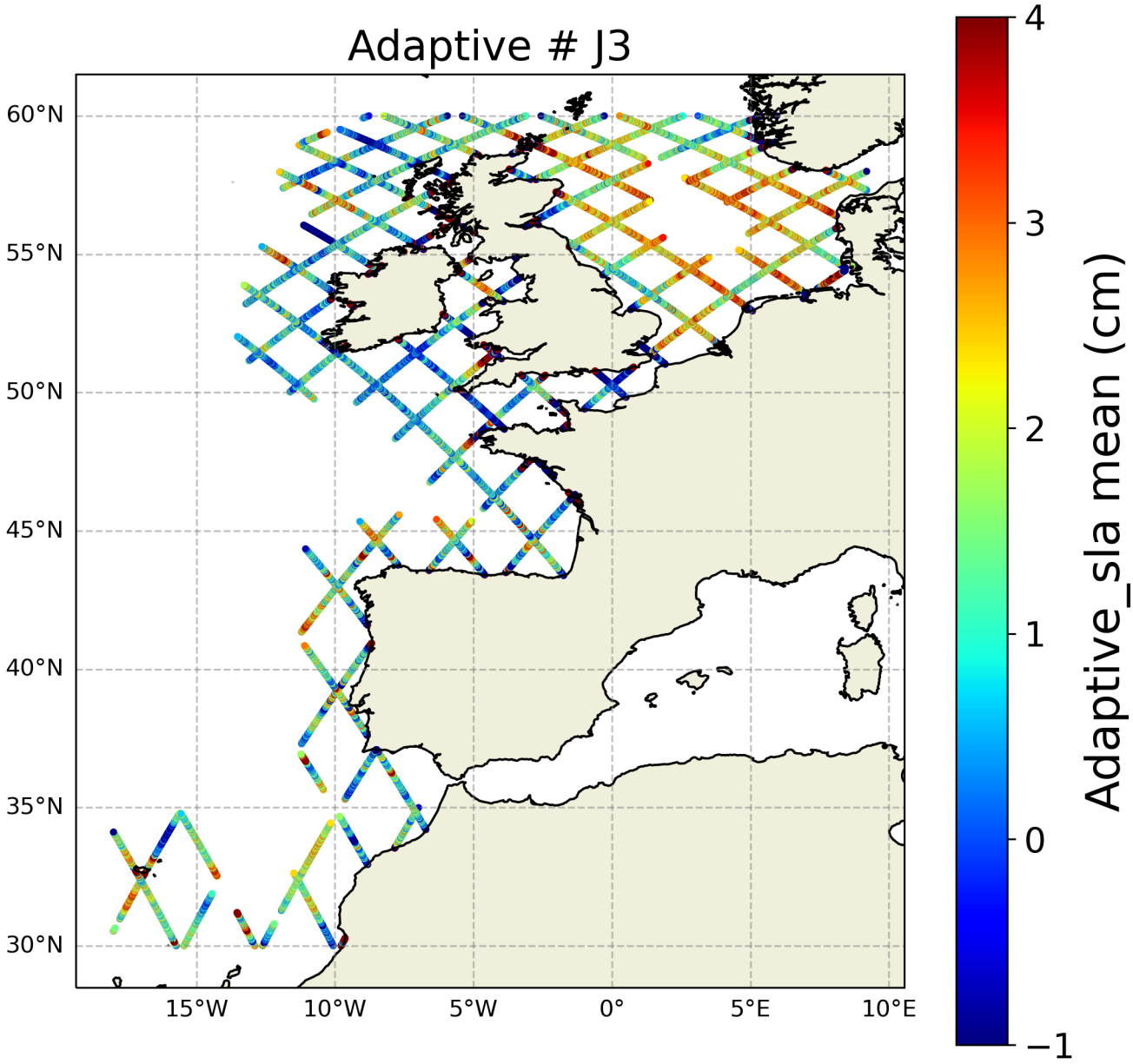

FIGURE 14 – Spatial coherence analysis of the mean of the Adaptive version of sla variable

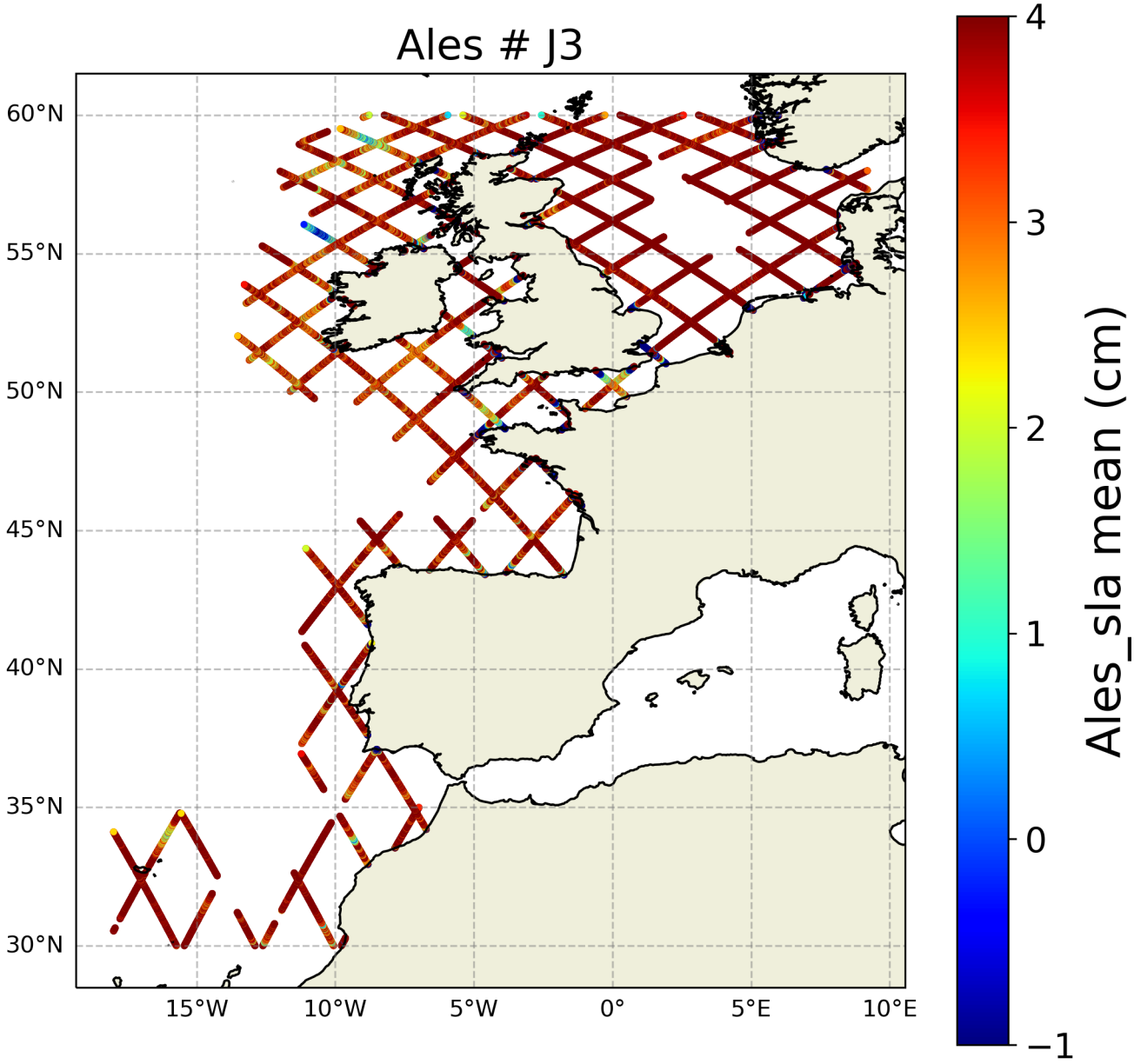

FIGURE 15 – Spatial coherence analysis of the mean of the Ales version of sla variable

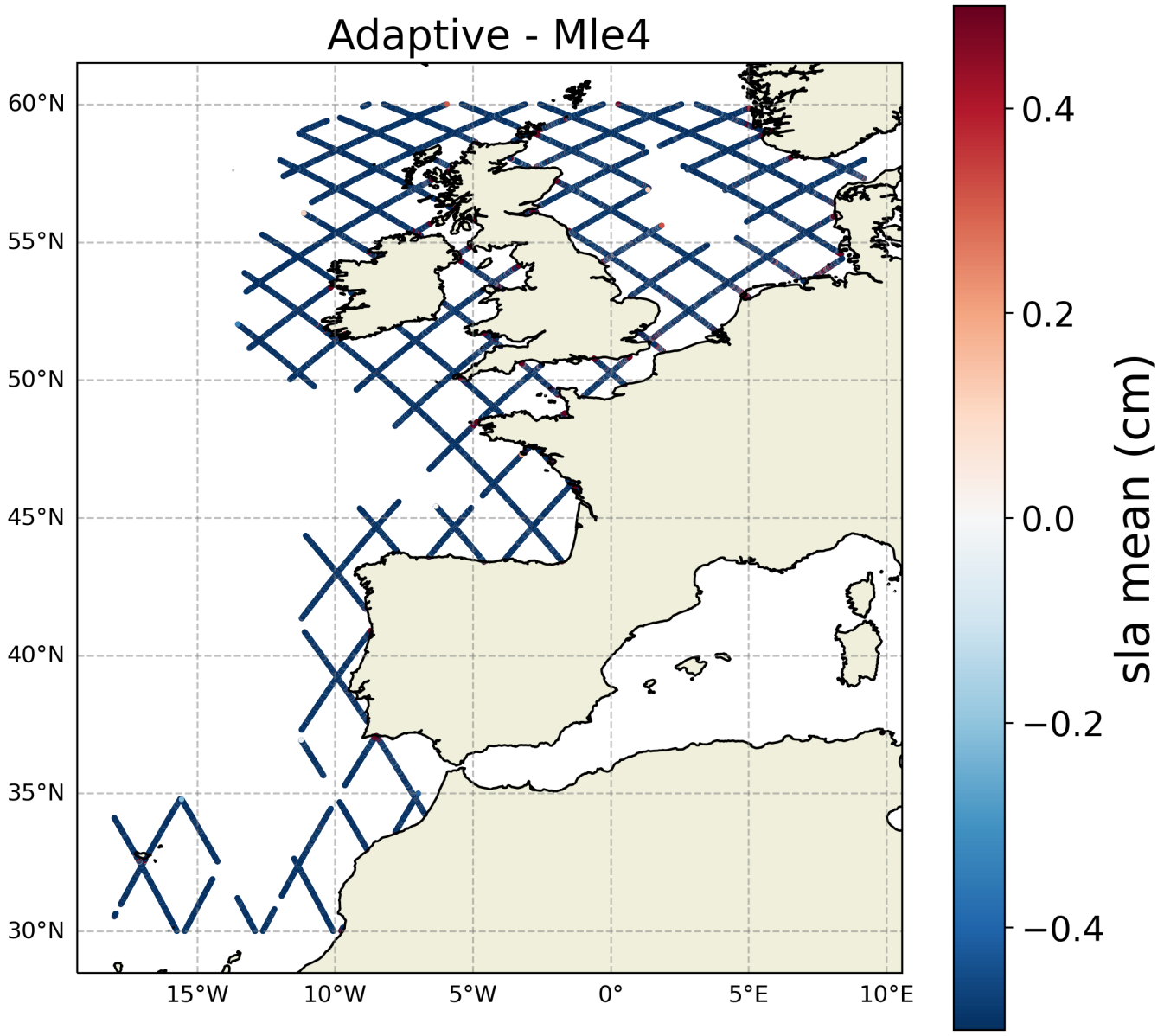

FIGURE 16 – Spatial coherence analysis of the Difference in sla 's mean between Adaptive and Mle4

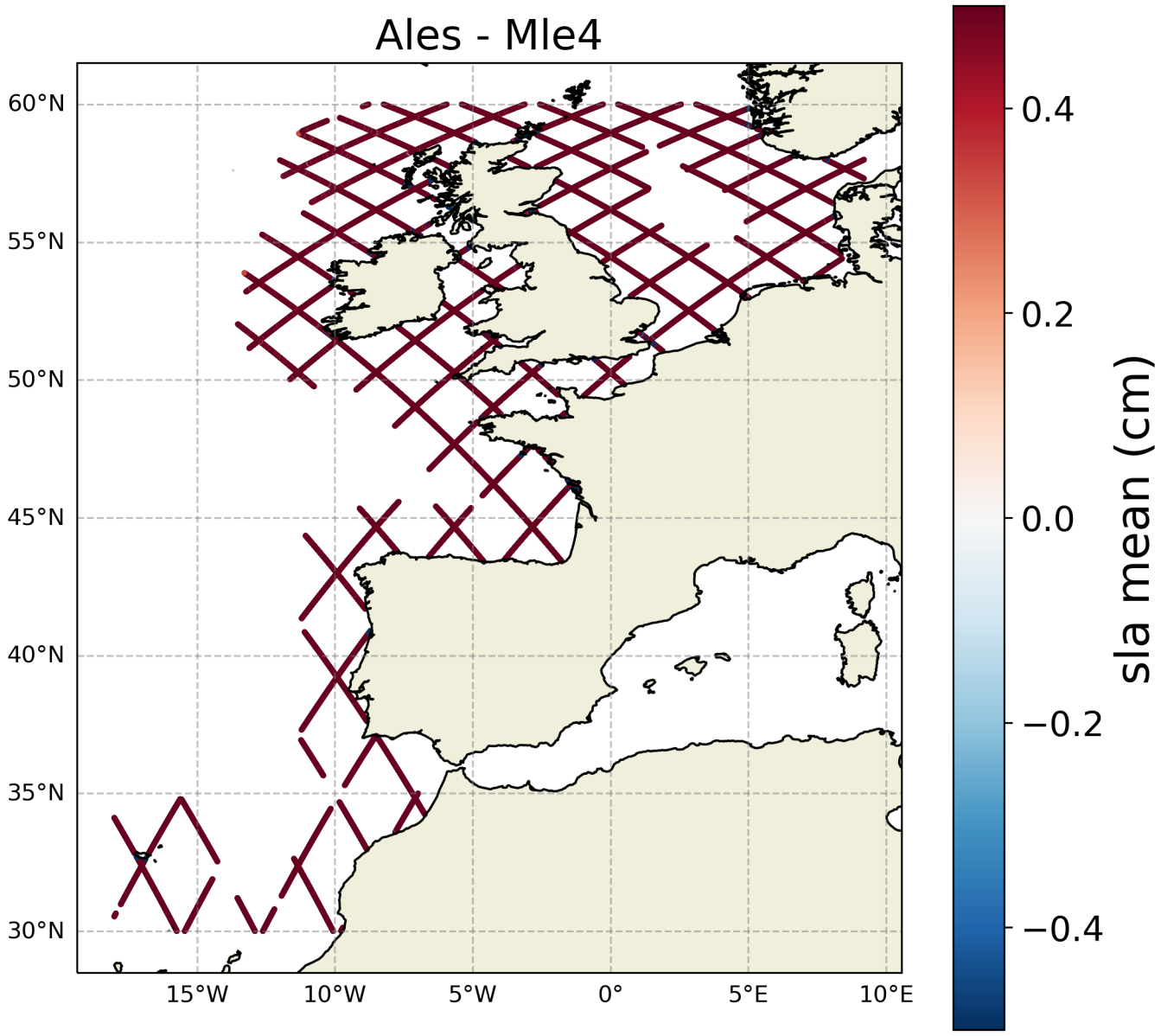

FIGURE 17 – Spatial coherence analysis of the Difference in sla 's mean between Ales and Mle4

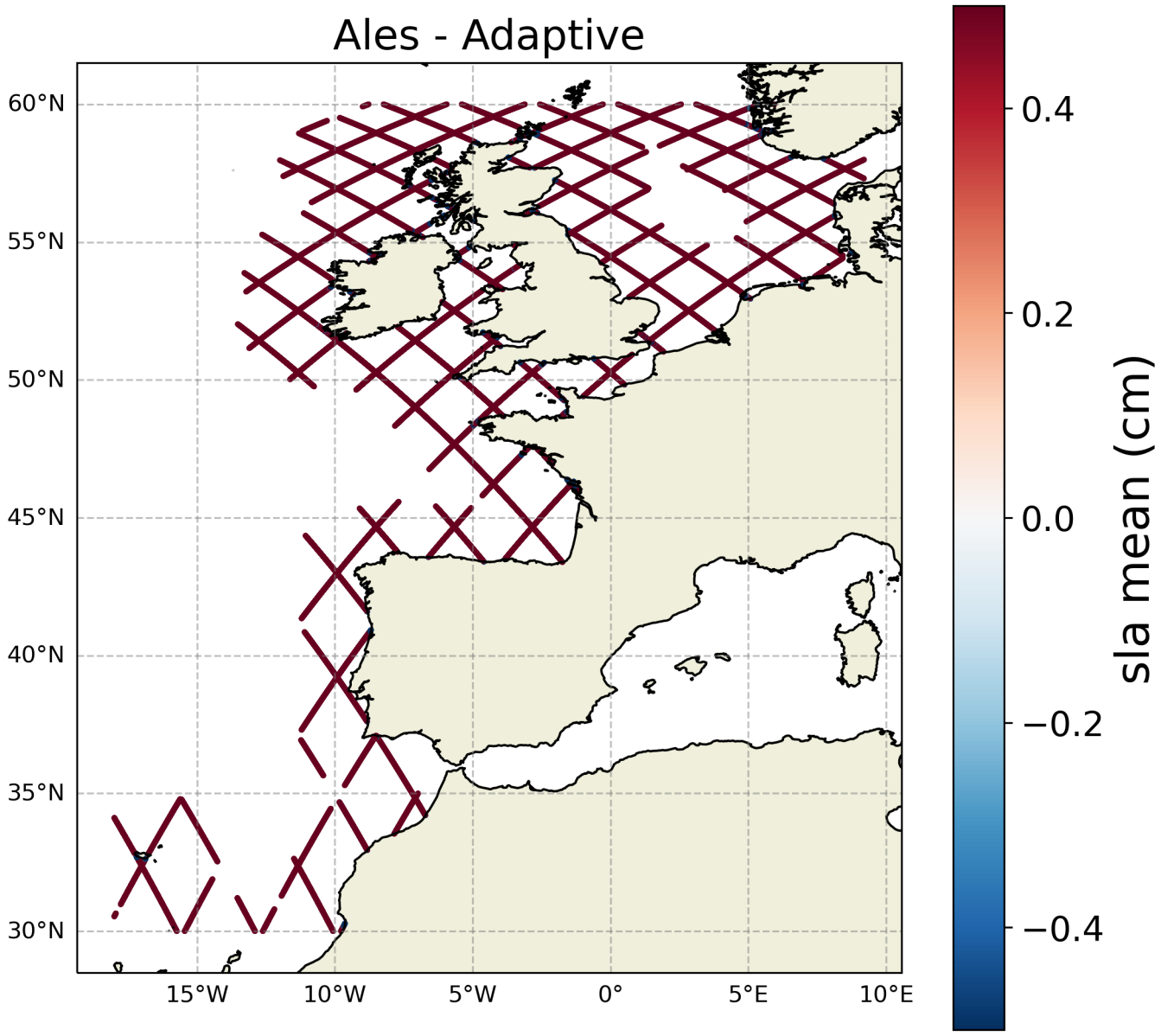

FIGURE 18 – Spatial coherence analysis of the Difference in sla 's mean between Ales and Adaptive

3.2 Range

3.2.1 Range 's count

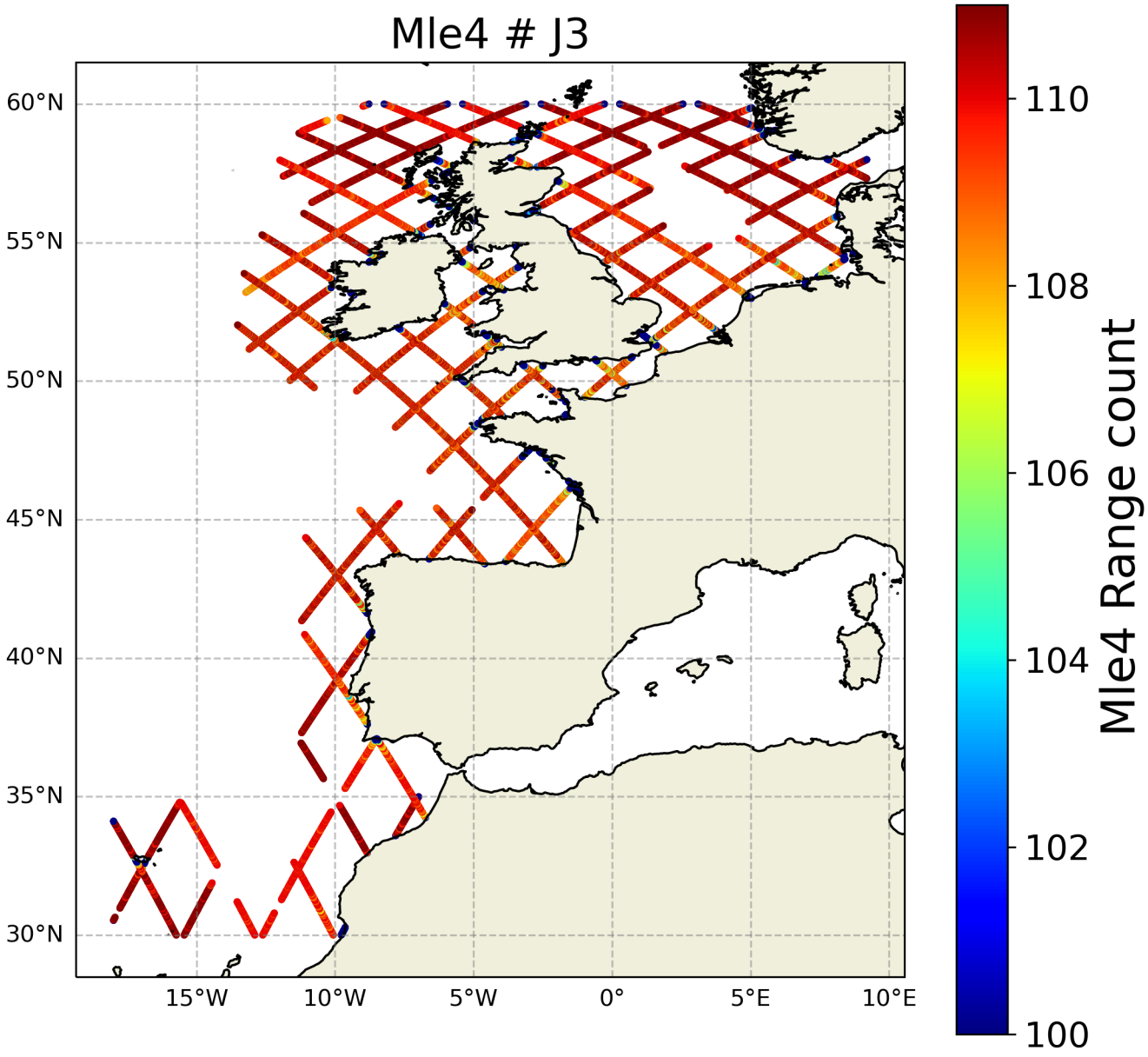

FIGURE 19 – Spatial coherence analysis of the count of the Mle4 version of Range variable

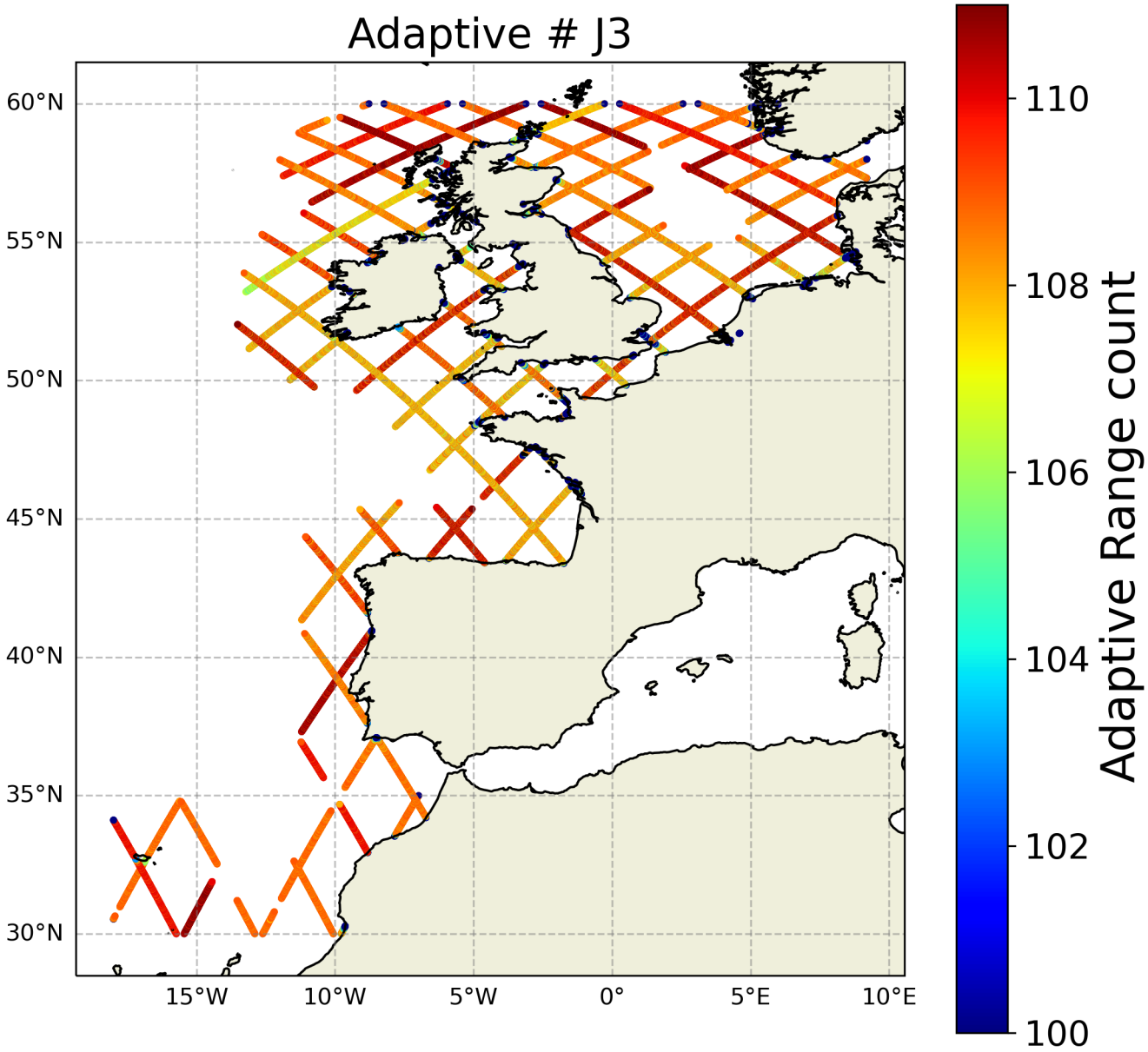

FIGURE 20 – Spatial coherence analysis of the count of the Adaptive version of Range variable

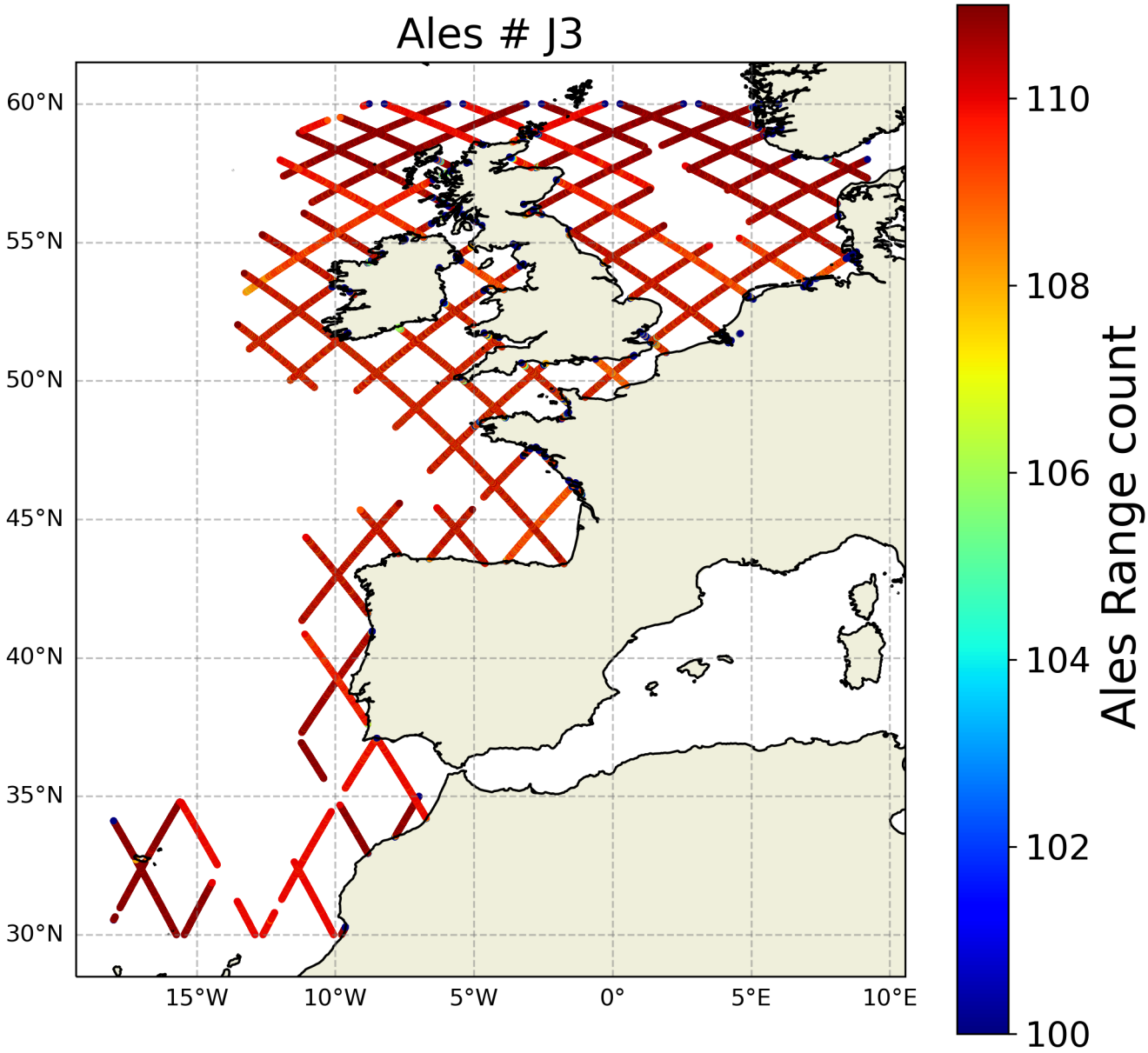

FIGURE 21 – Spatial coherence analysis of the count of the Ales version of Range variable

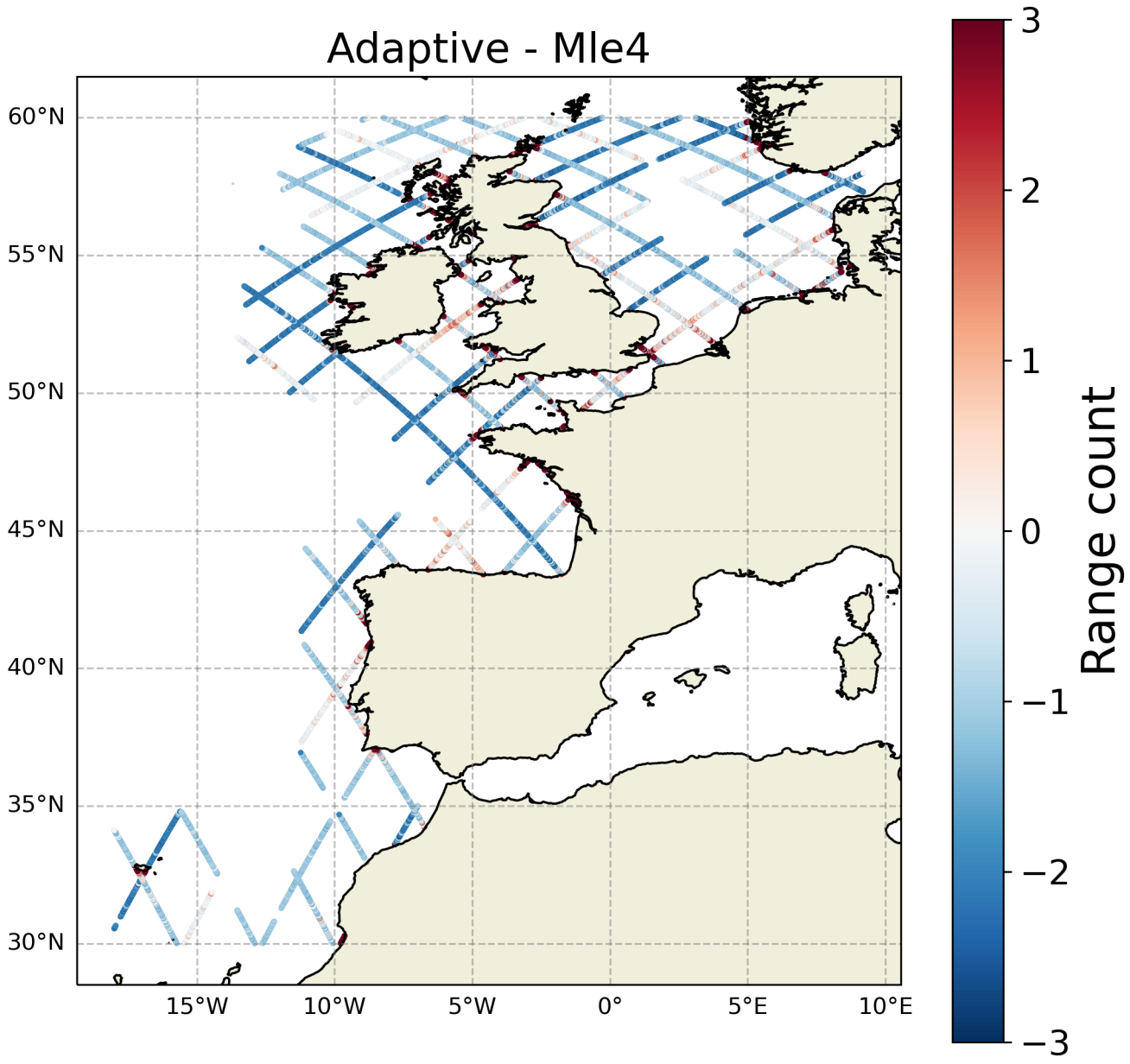

FIGURE 22 – Spatial coherence analysis of the Difference in Range 's count between Adaptive and Mle4

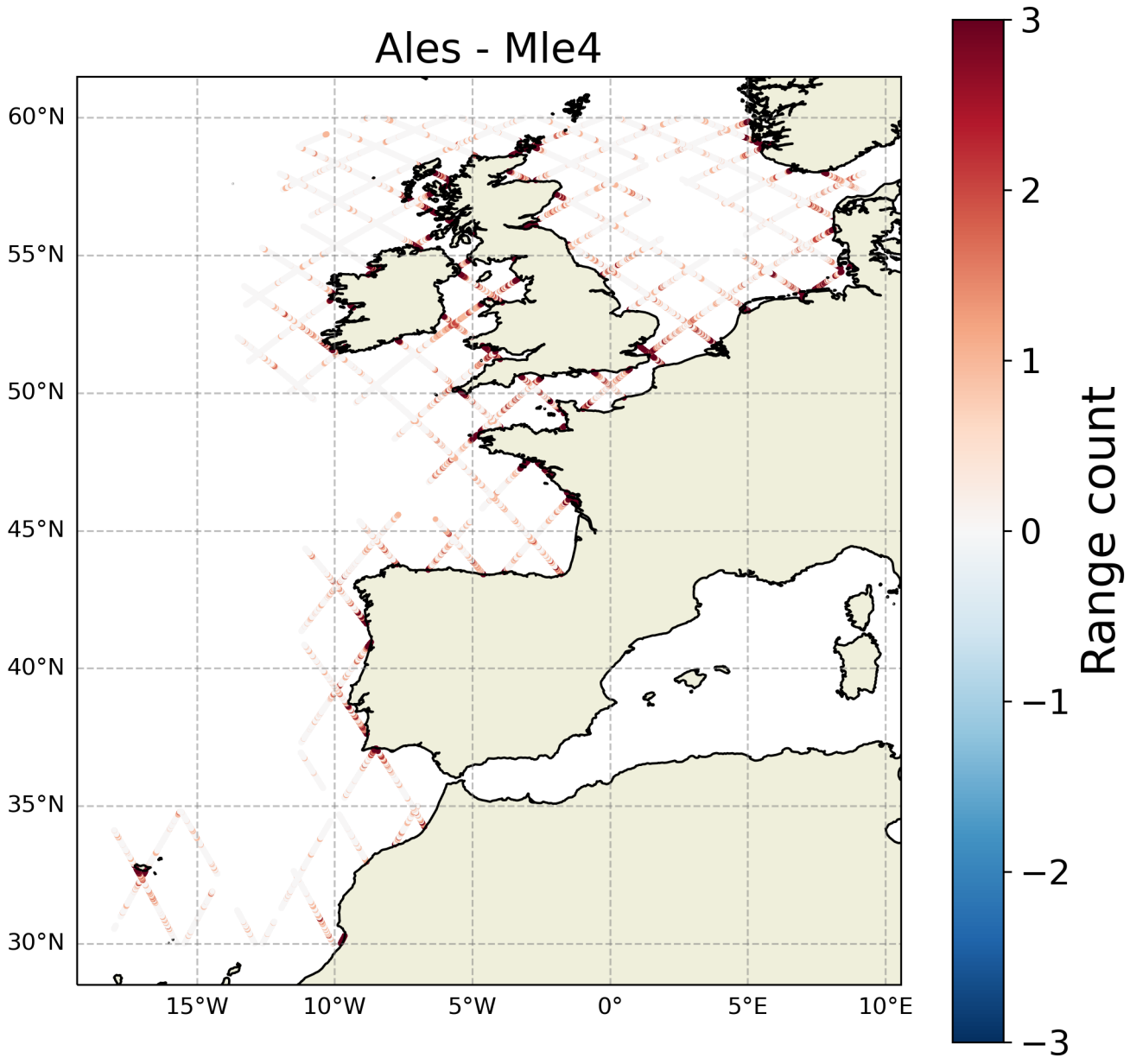

FIGURE 23 – Spatial coherence analysis of the Difference in Range 's count between Ales and Mle4

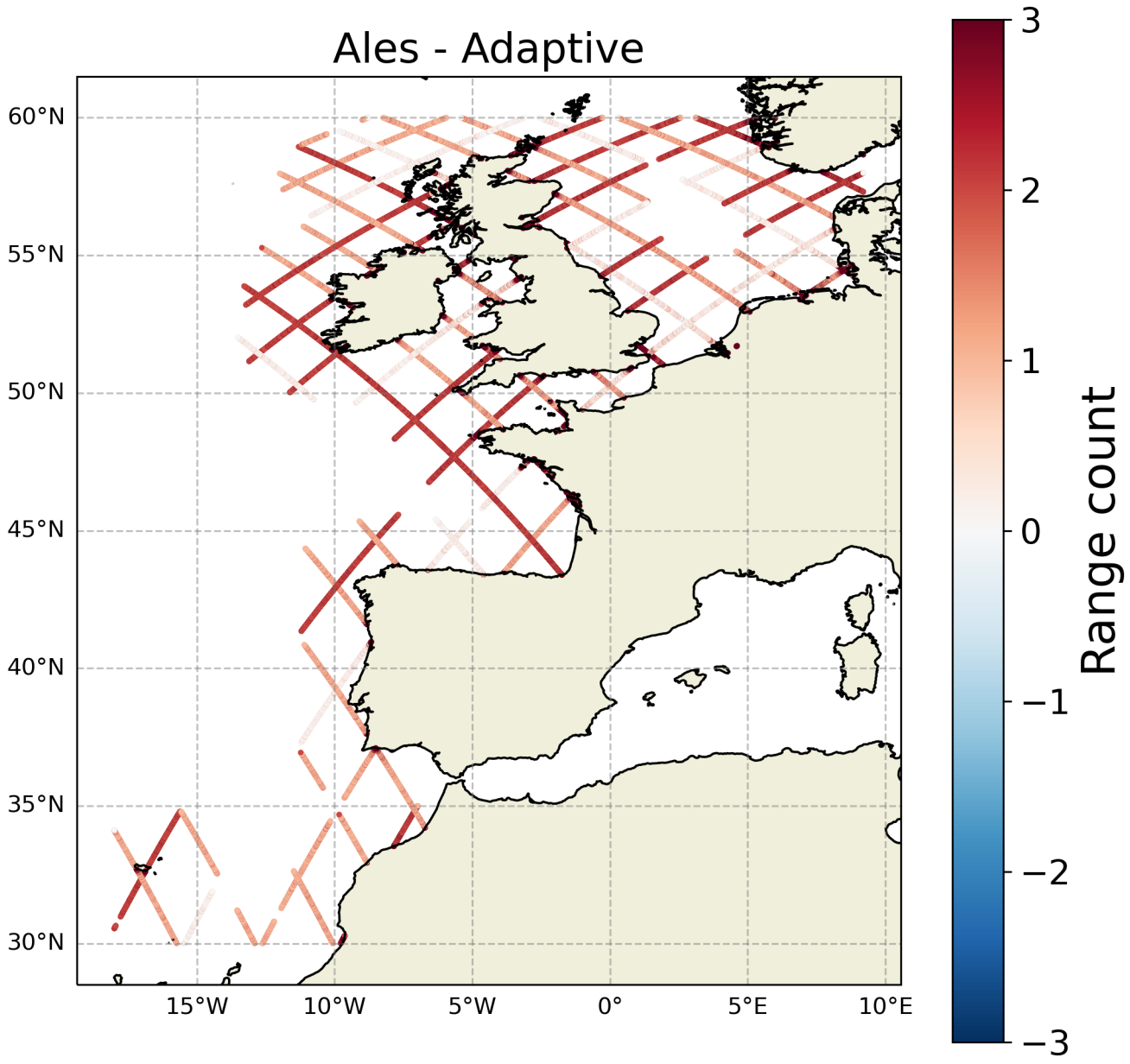

FIGURE 24 – Spatial coherence analysis of the Difference in Range 's count between Ales and Adaptive

4 Histograms

4.1 sla

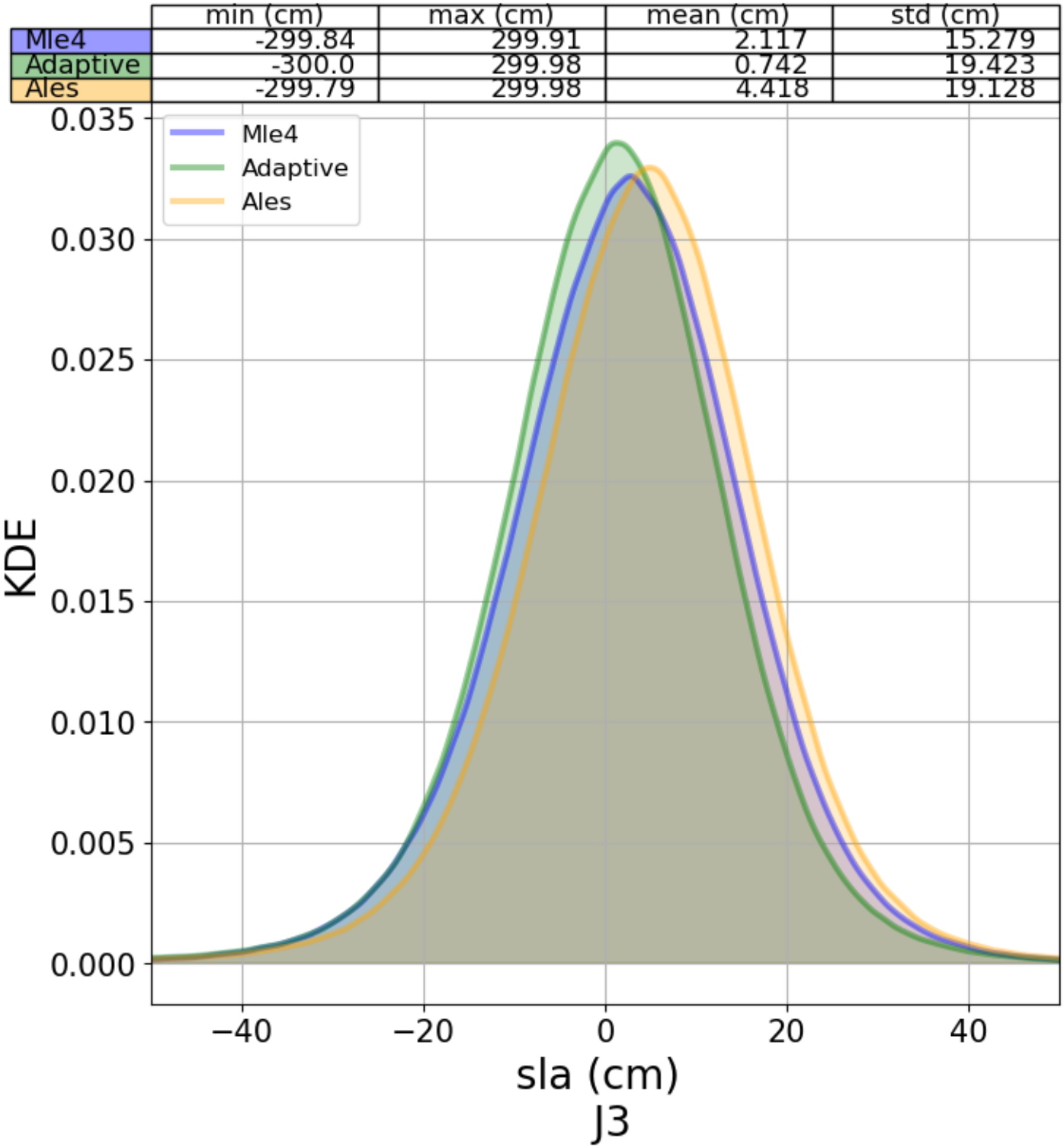

Figure 25 – Histogram of each of sla version

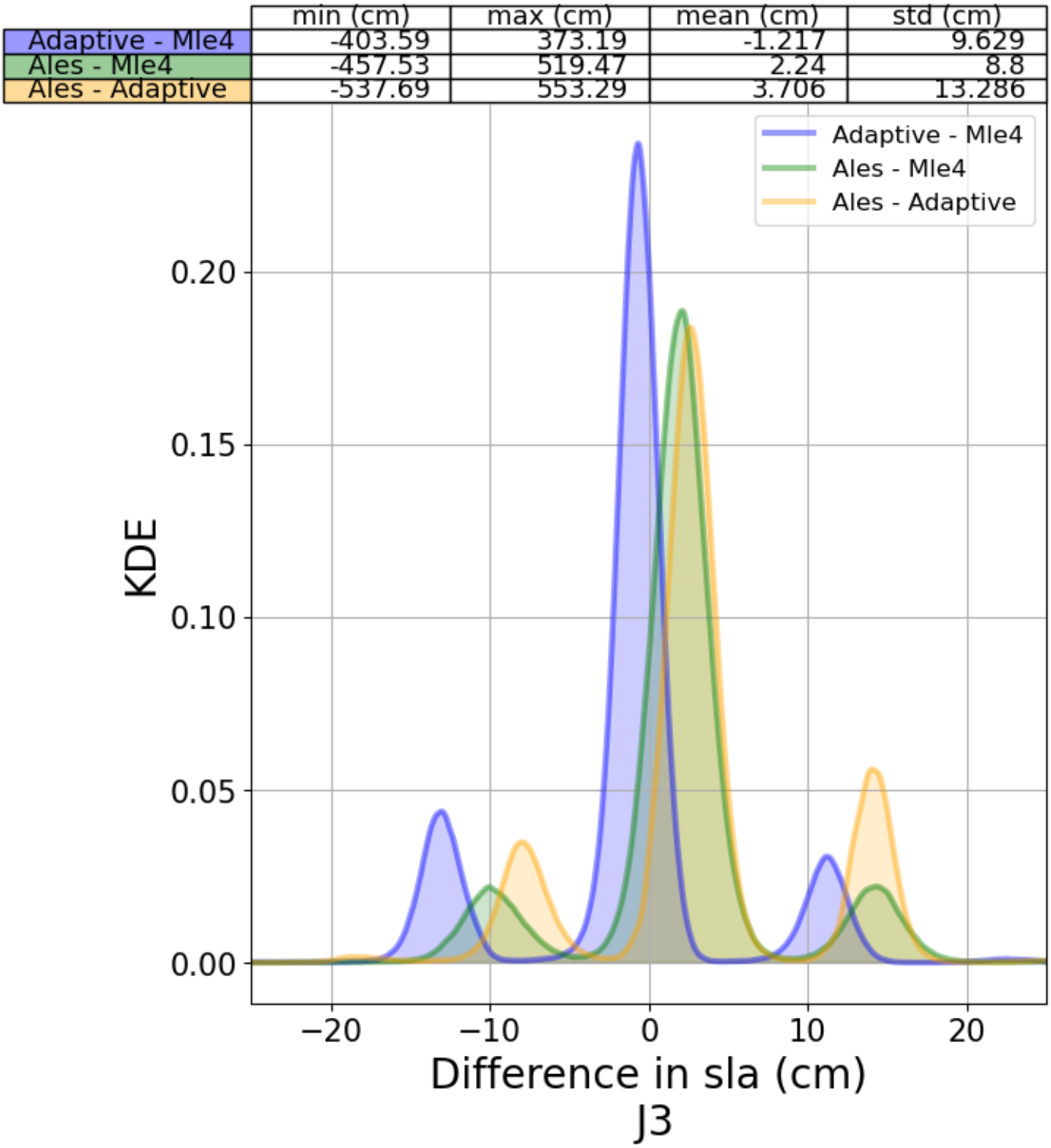

FIGURE 26 – Histograms of difference of each sla version and reference one

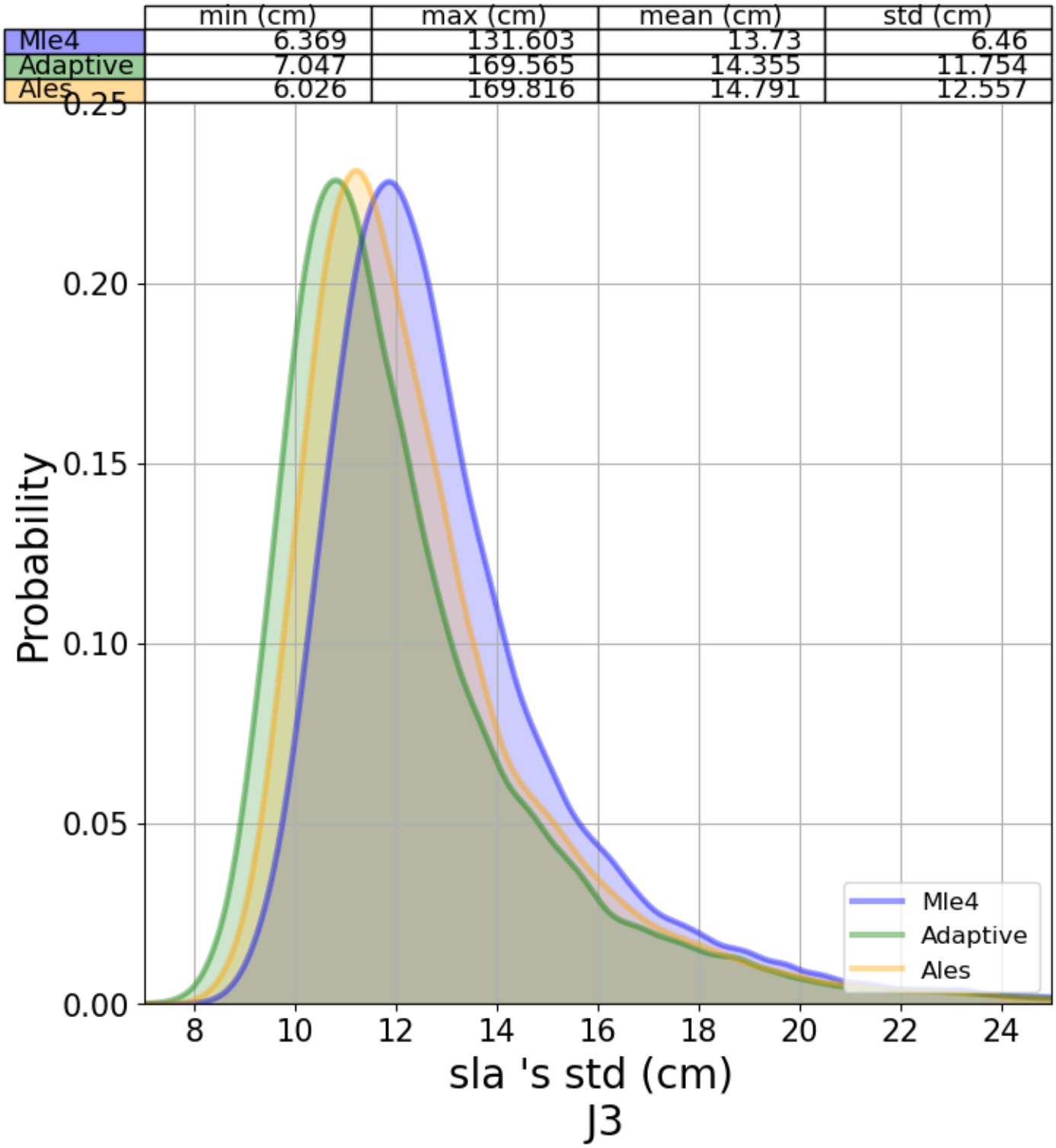

FIGURE 27 – Histograms of the standard deviation of each sla version

5 Along-track analysis

5.1 Range

5.1.1 Range 's count

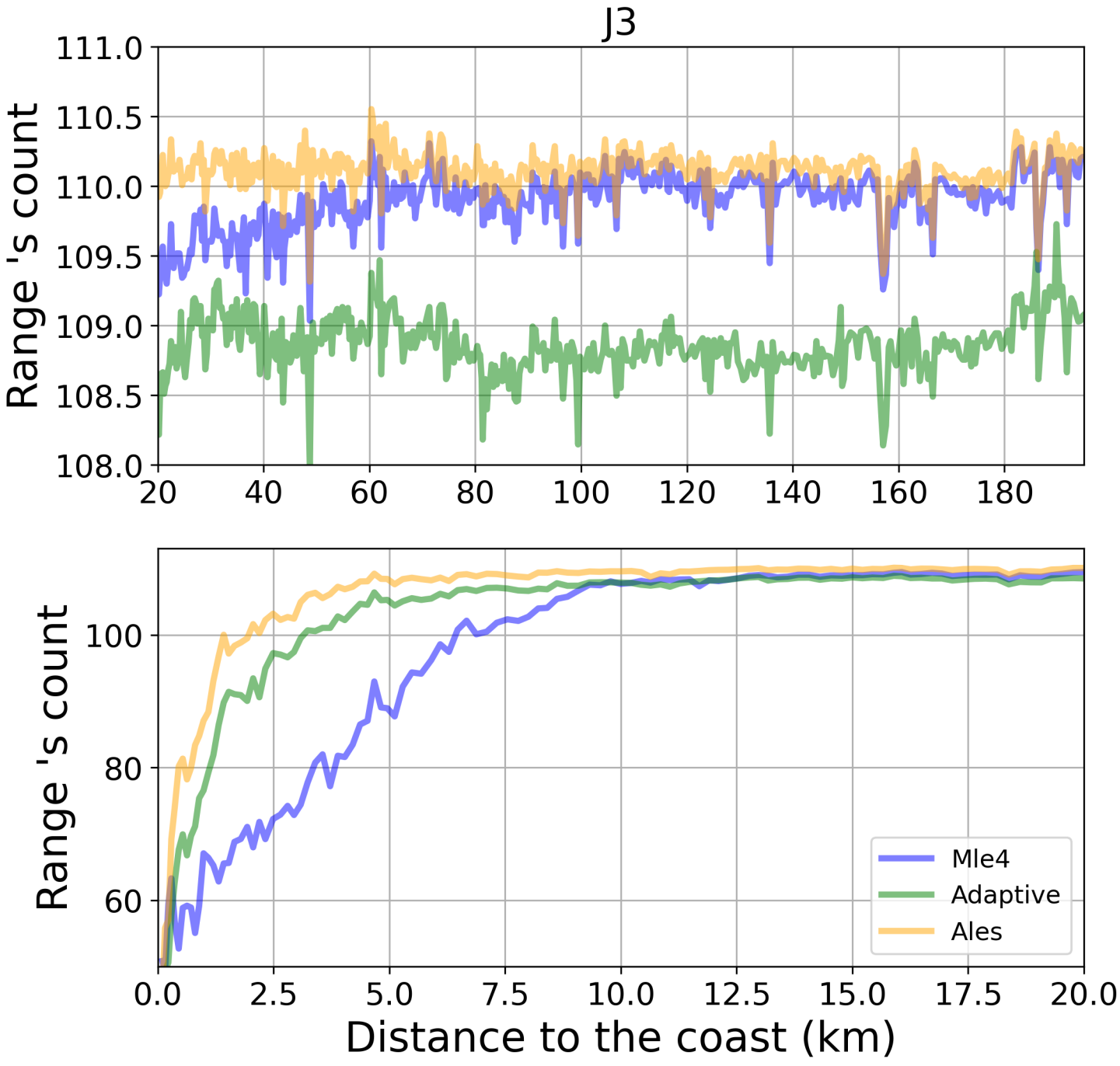

FIGURE 28 – Along-track analysis of Range 's count

5.2 sla

5.2.1 sla 's count

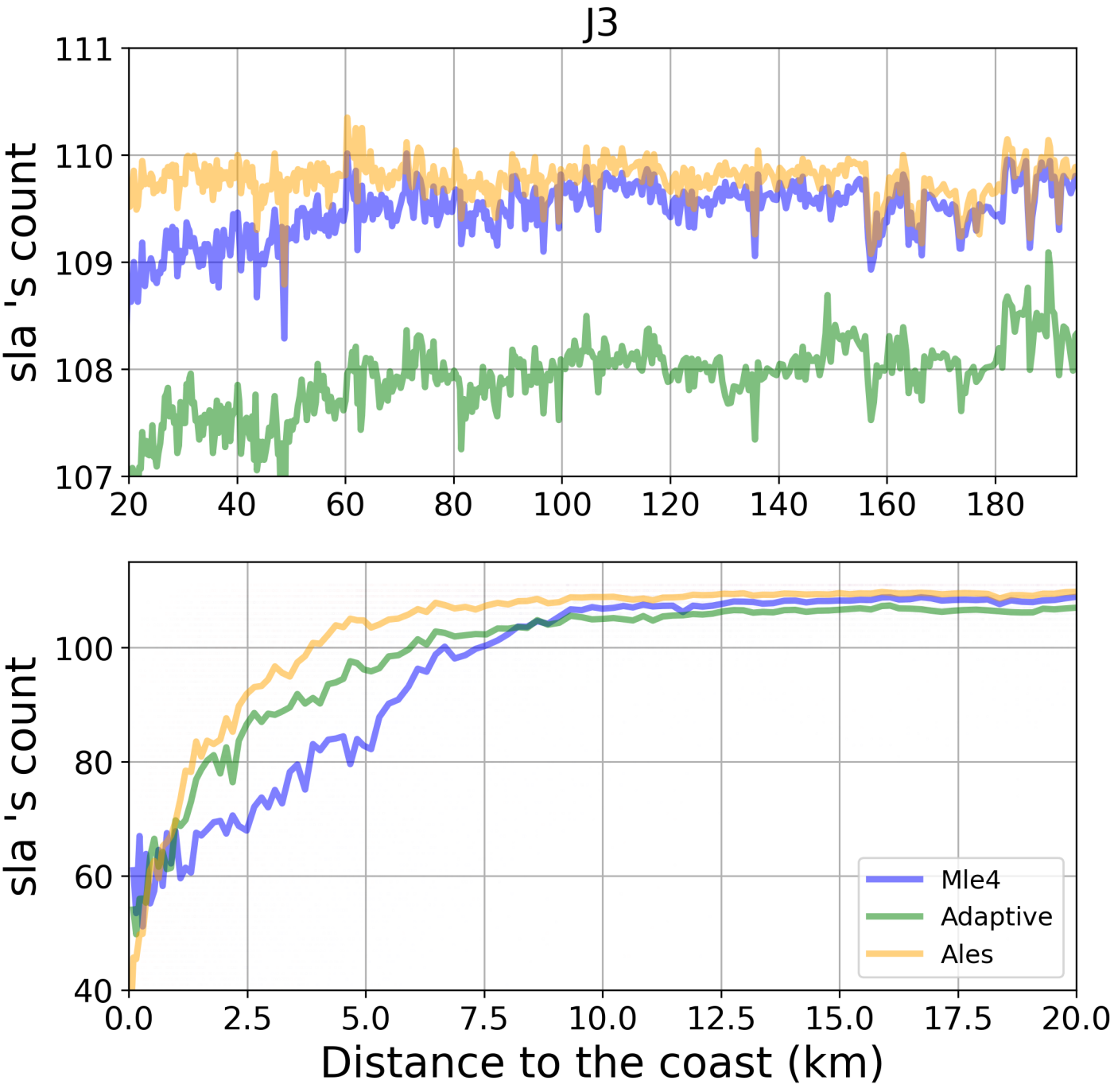

FIGURE 29 – Along-track analysis of sla 's count

5.2.2 sla 's std

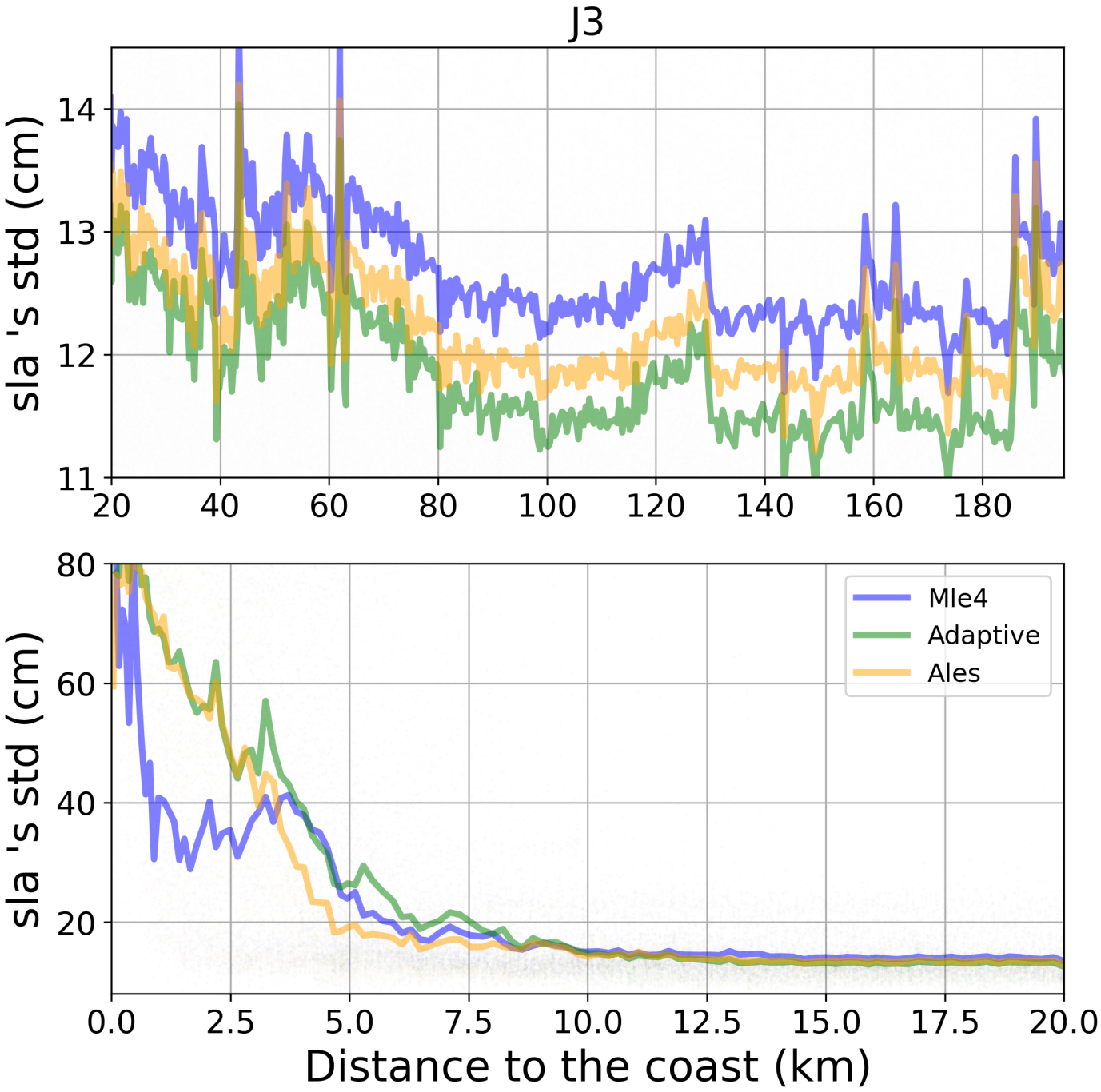

FIGURE 30 – Along-track analysis of sla 's std

5.2.3 sla 's mean

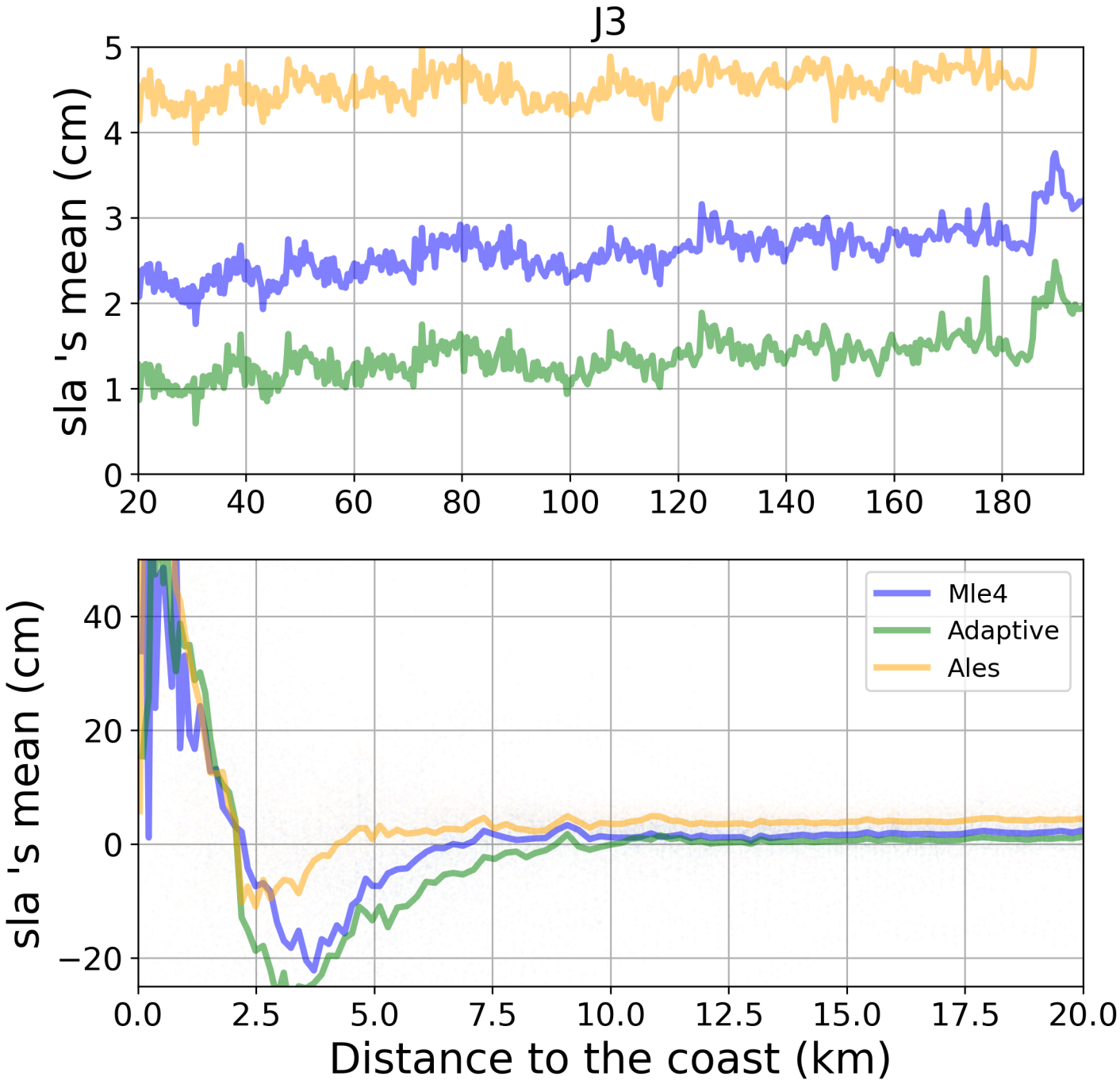

FIGURE 31 – Along-track analysis of sla 's mean

6 Comparison with Insitu Data (Tide Gauge)

The size of the marker representing each point in the figures below increase by getting closer to the tide Gauge station

6.1 Station : HERBAUDIERE

- Nearest track to HERBAUDIERE station is the track number track70
- The area of interest is limited by :
  - A circle which it's center is the HERBAUDIERE tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km
  - Latitude limits : [None, 47.1] °

6.1.1 correlation visualization in maps view % HERBAUDIERE tide gauge

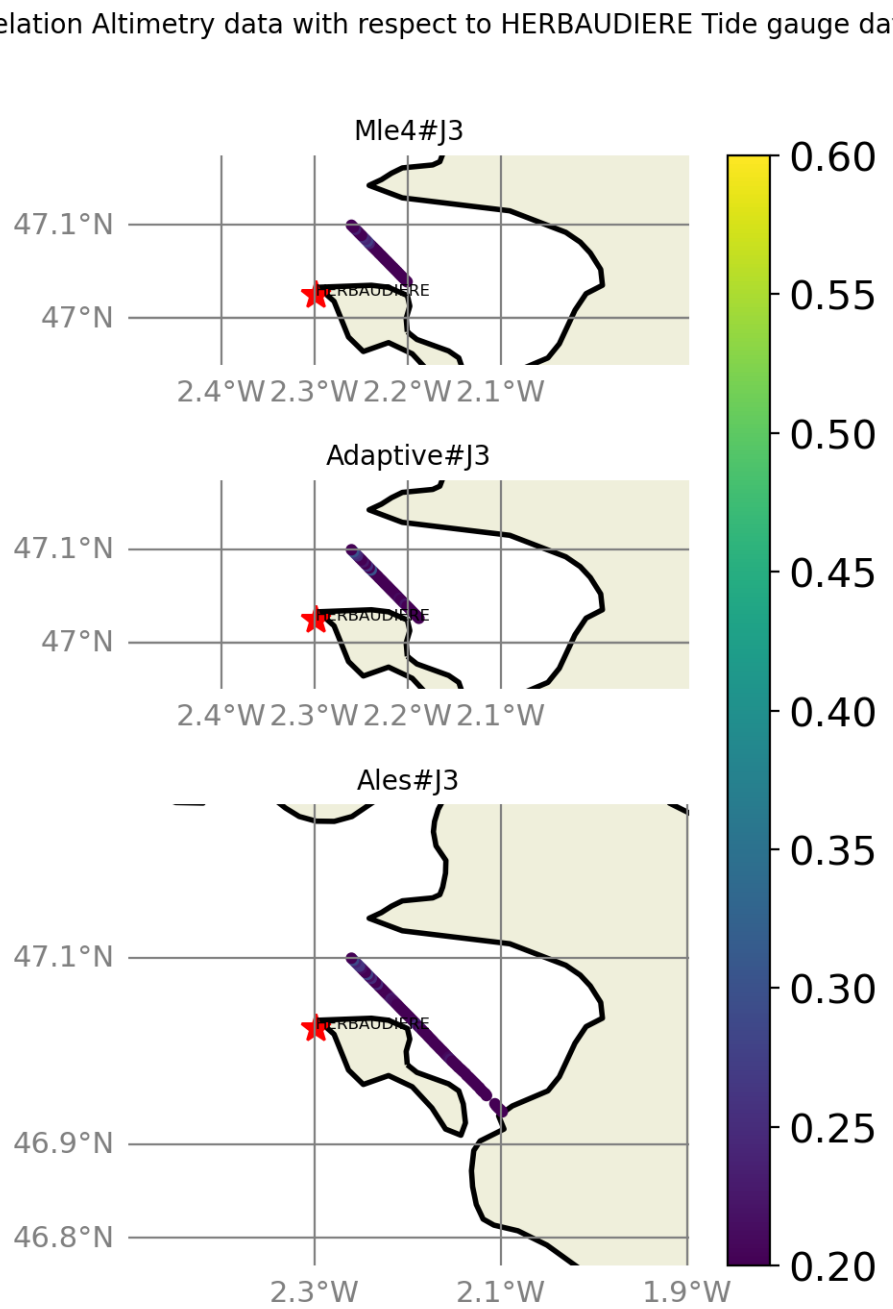

Figure 32 – correlation visualization in maps view % HERBAUDIERE tide gauge

6.1.2 rmsd visualization in maps view % HERBAUDIERE tide gauge

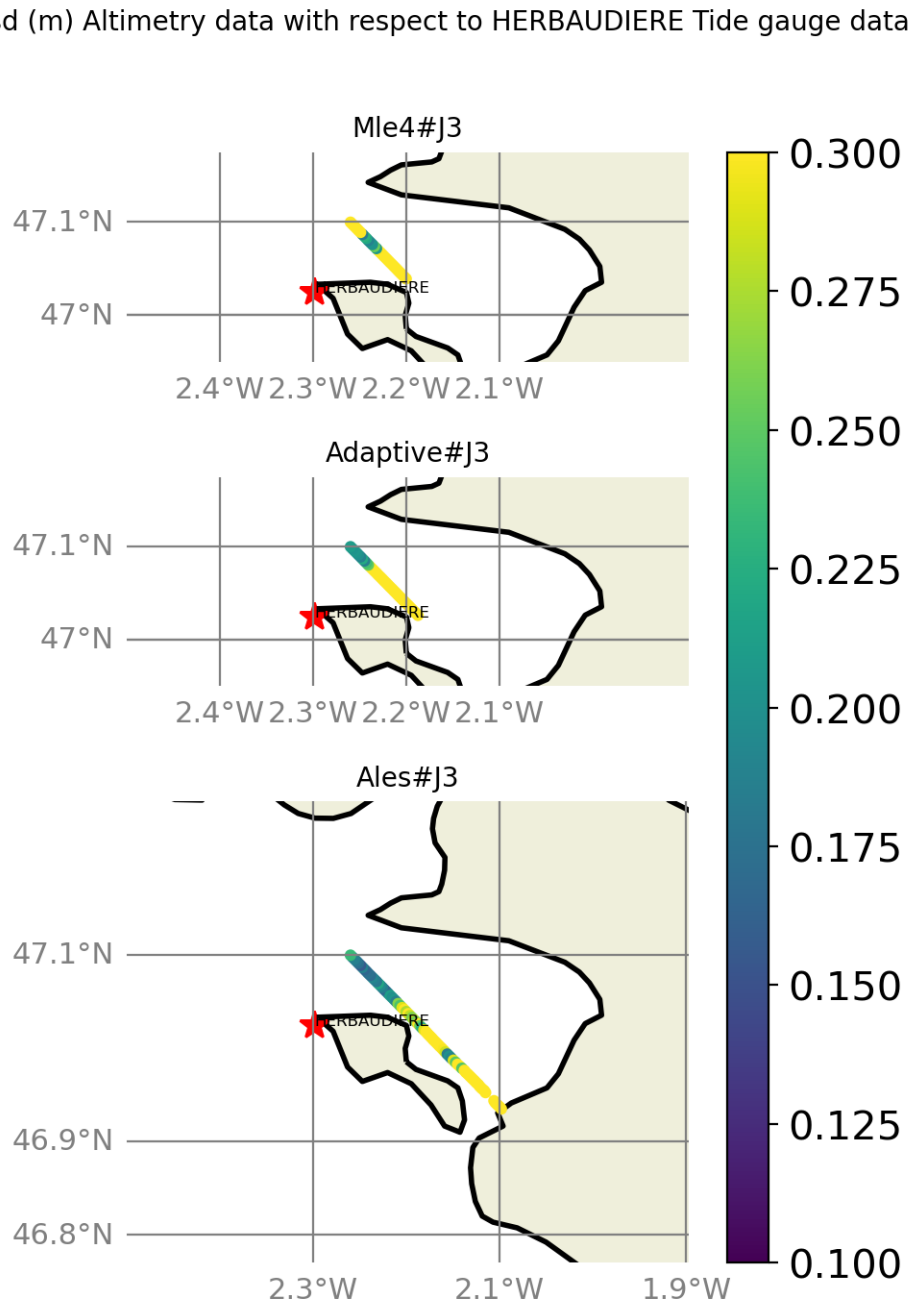

FIGURE 33 – rmsd visualization in maps view % HERBAUDIERE tide gauge

6.1.3 std visualization in maps view % HERBAUDIERE tide gauge

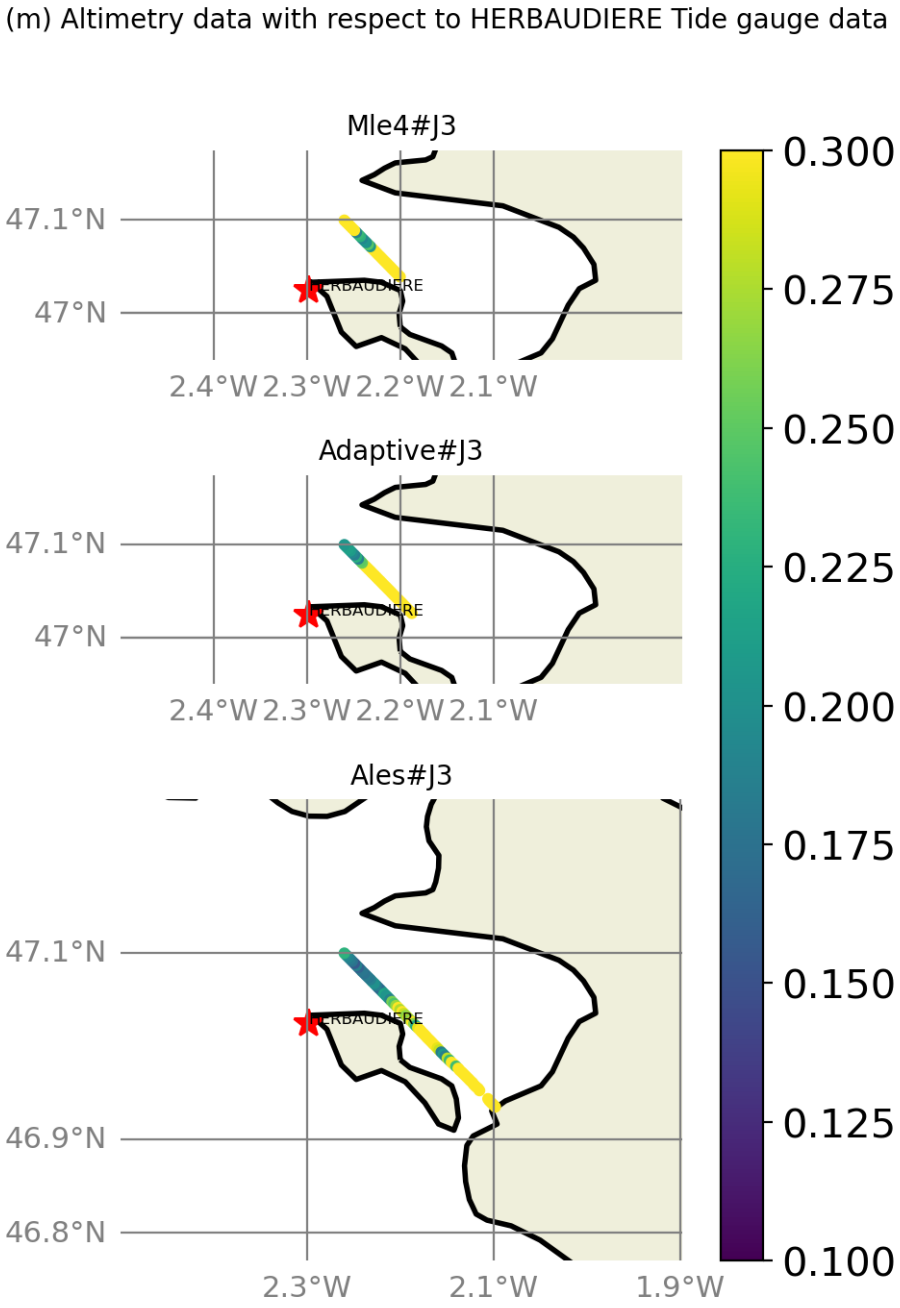

FIGURE 34 – std visualization in maps view % HERBAUDIERE tide gauge

6.1.4 valid_data_percent visualization in maps view % HERBAUDIERE tide gauge

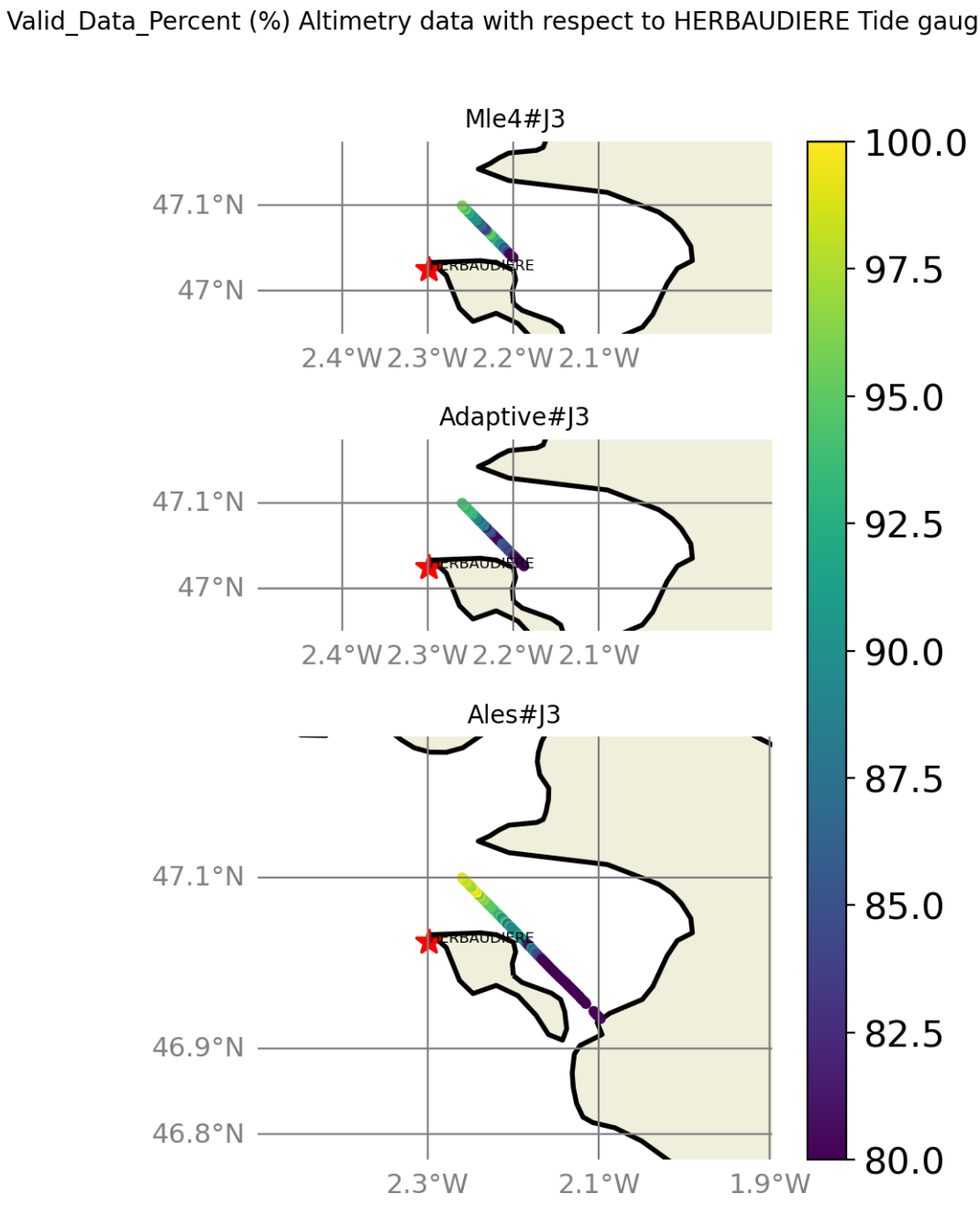

FIGURE 35 – valid_data_percent visualization in maps view % HERBAUDIERE tide gauge

6.1.5 Valid data (%) in function of distance to coast/HERBAUDIERE station

The formula to calculate the percentage of valid data in each time serie is;

$$pvd_i = \frac{nvd_i}{maxNB}, i = 1, np$$

Where *pvd* and *nvd* are the percentage of data and the number of altimetry data in the period covered by the tide gauge sla time serie, respectively in the time serie, i is the index of the time serie, np is the number of the selected altimetry time series. $maxNB = 97$ point is the maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie.

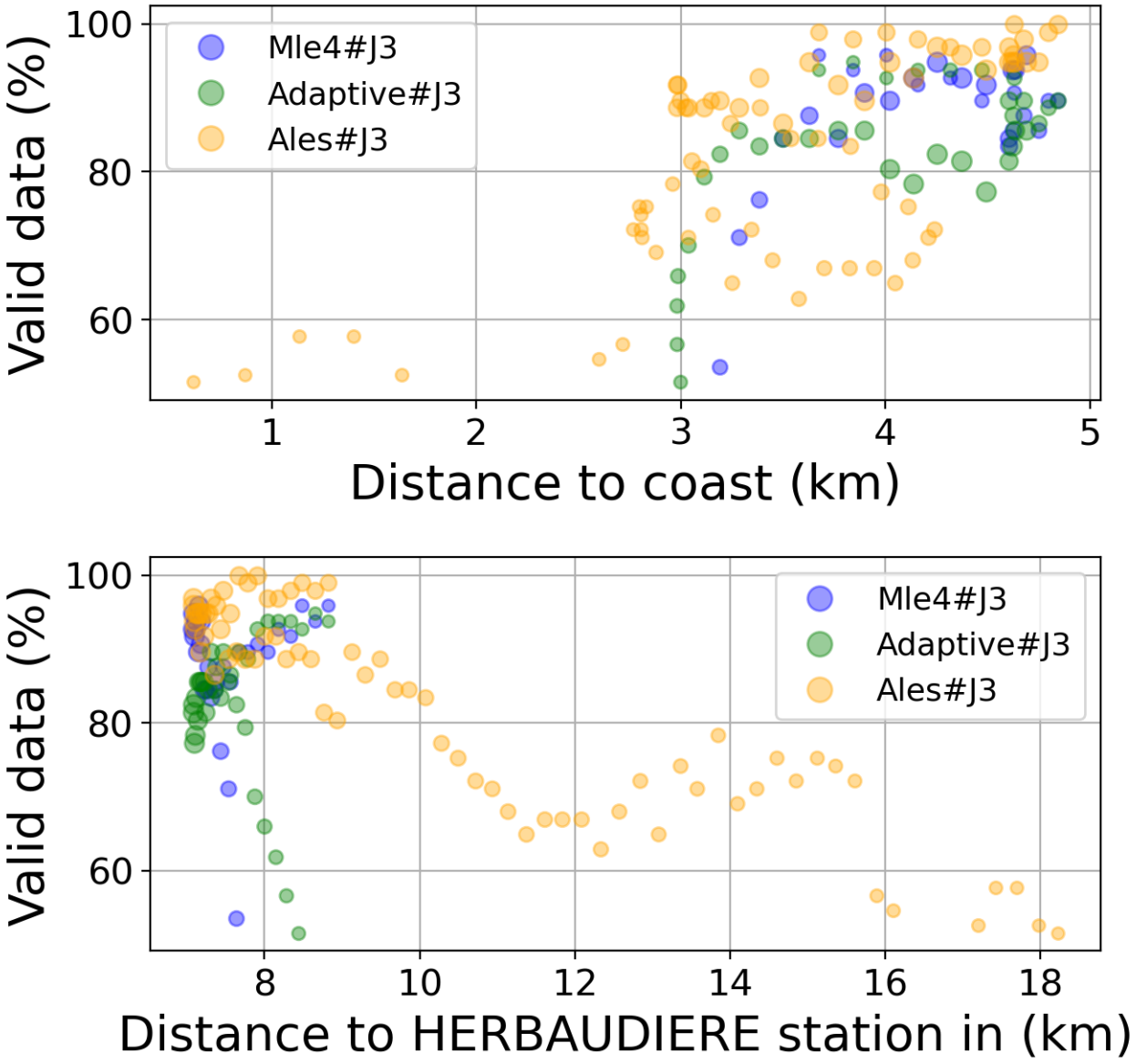

Figure 36 – Valid data (%) in function of distance to coast/HERBAUDIERE station

6.1.6 Std in function of distance to coast/HERBAUDIERE station

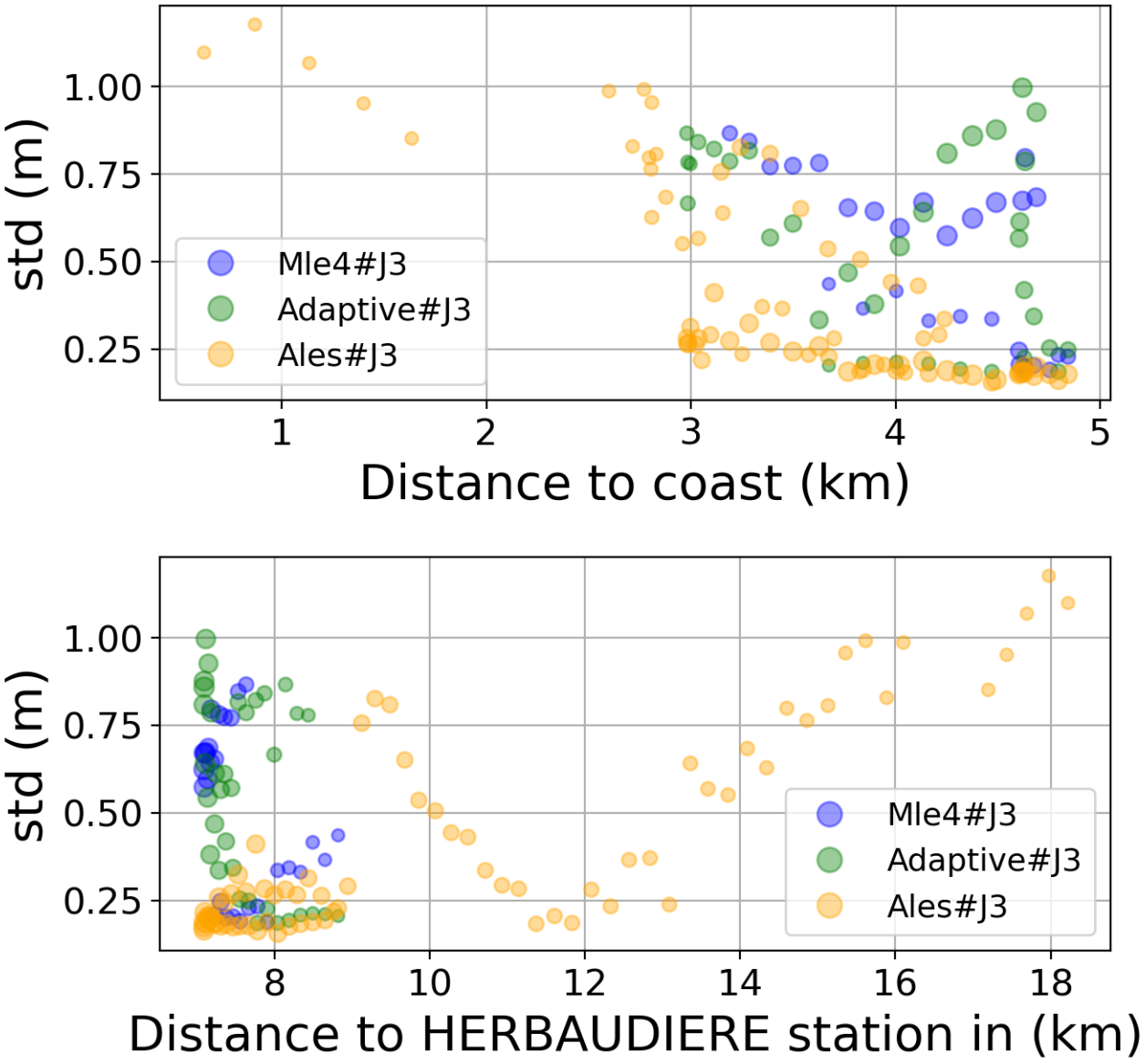

FIGURE 37 – Std in function of the distance to the coast/HERBAUDIERE station

6.1.7 Correlation in function of distance to coast/HERBAUDIERE station

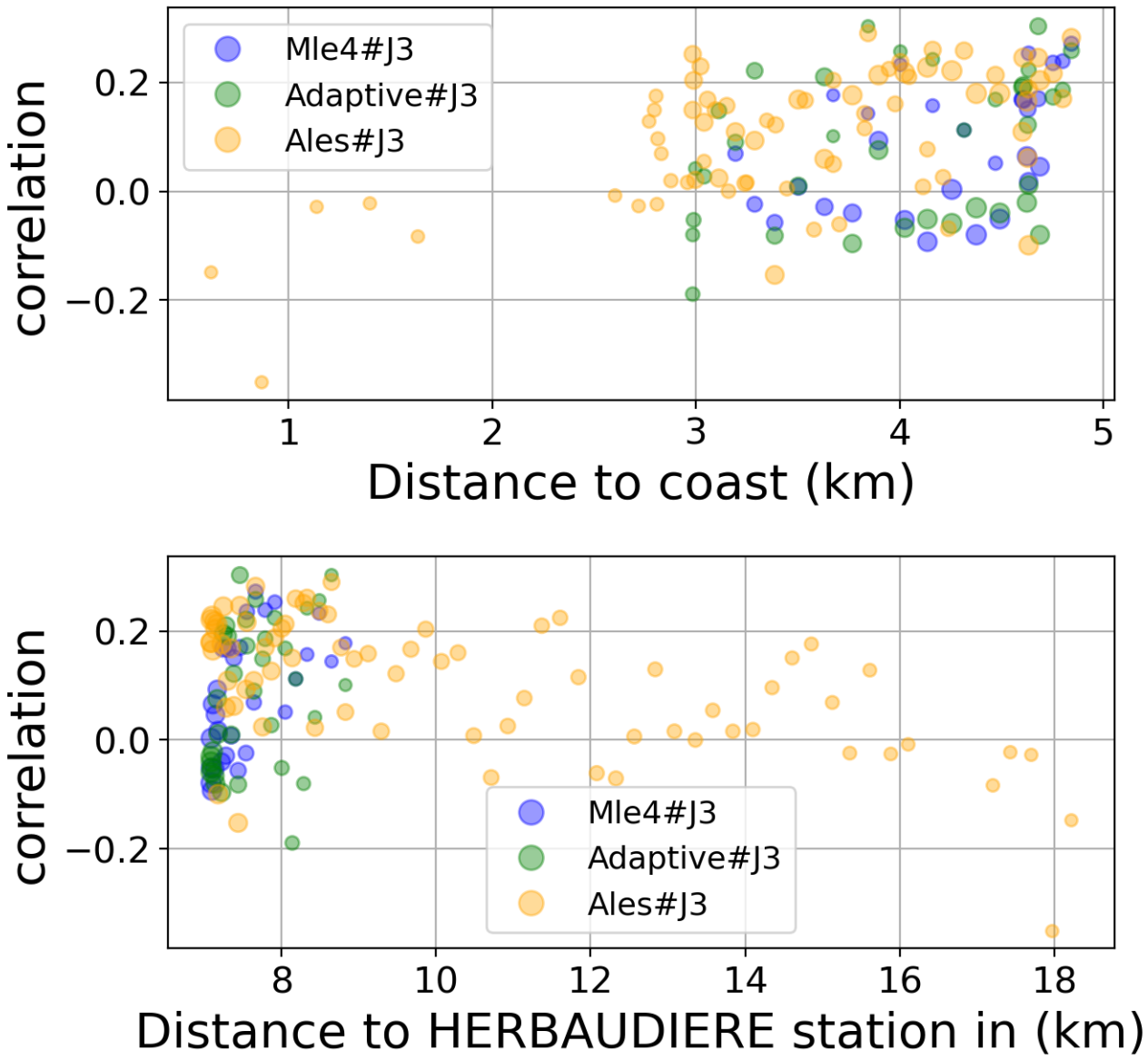

FIGURE 38 – Correlation in function of the distance to the coast/HERBAUDIERE station

6.1.8 Taylor Diagram

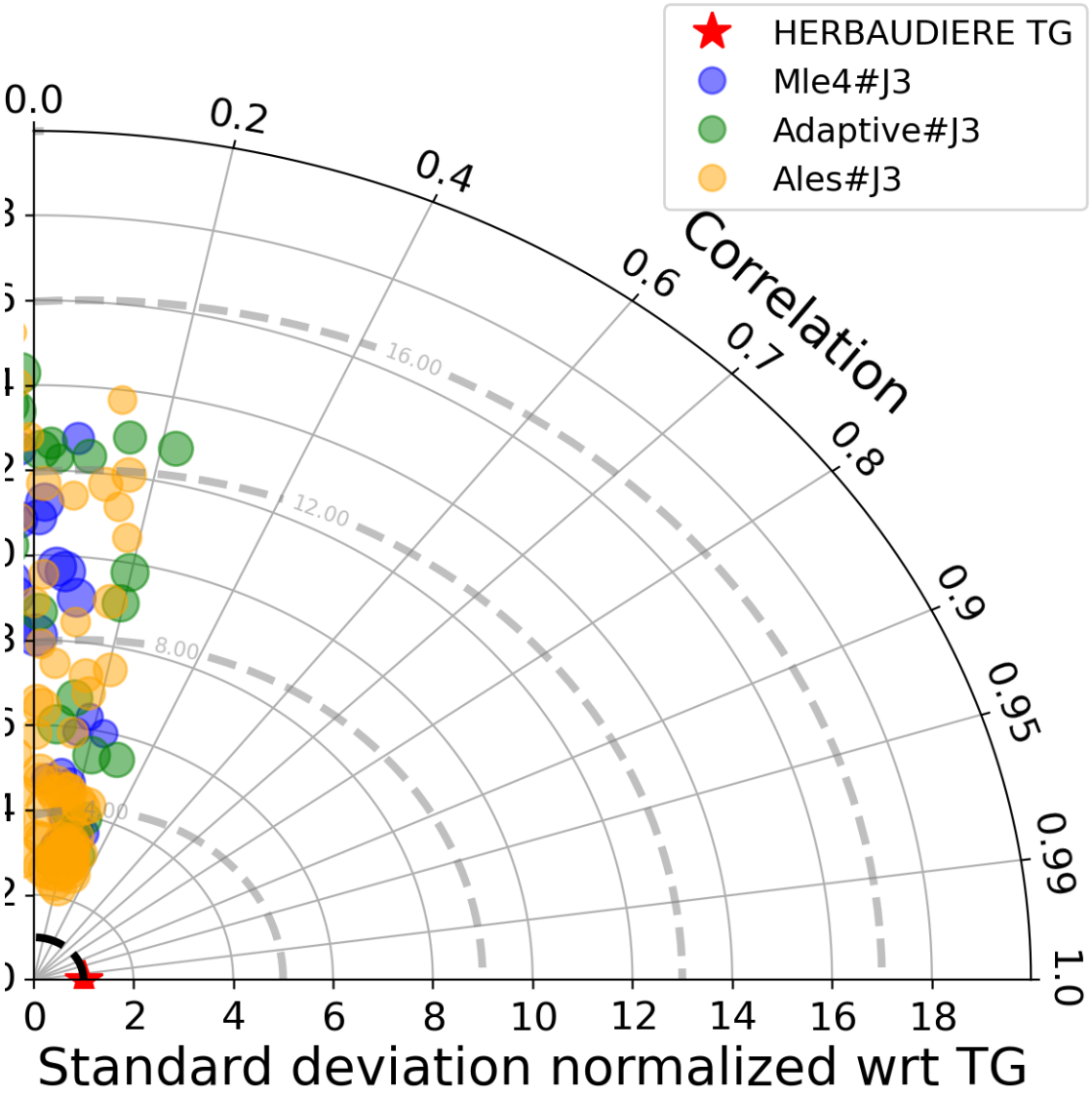

FIGURE 39 – Taylor diagram

6.1.9 Mean statistics table of products comparison with HERBAUDIERE tide gauge data

The table below contains the mean statistics of the common points between the different products in the selected area.

Product	Valid data (%)	Correlation	std (m)	rmsd (m)
Mle4#J3	87.949	0.084	0.503	0.503
Adaptive#J3	86.74	0.102	0.5	0.5
Ales#J3	95.165	0.166	0.202	0.203

FIGURE 40 – Mean statistics table of the common points in the altimetry products

6.1.10 The most correlated sla altimetry Time series with the tide gauge sla time serie

The maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie is 97 point.

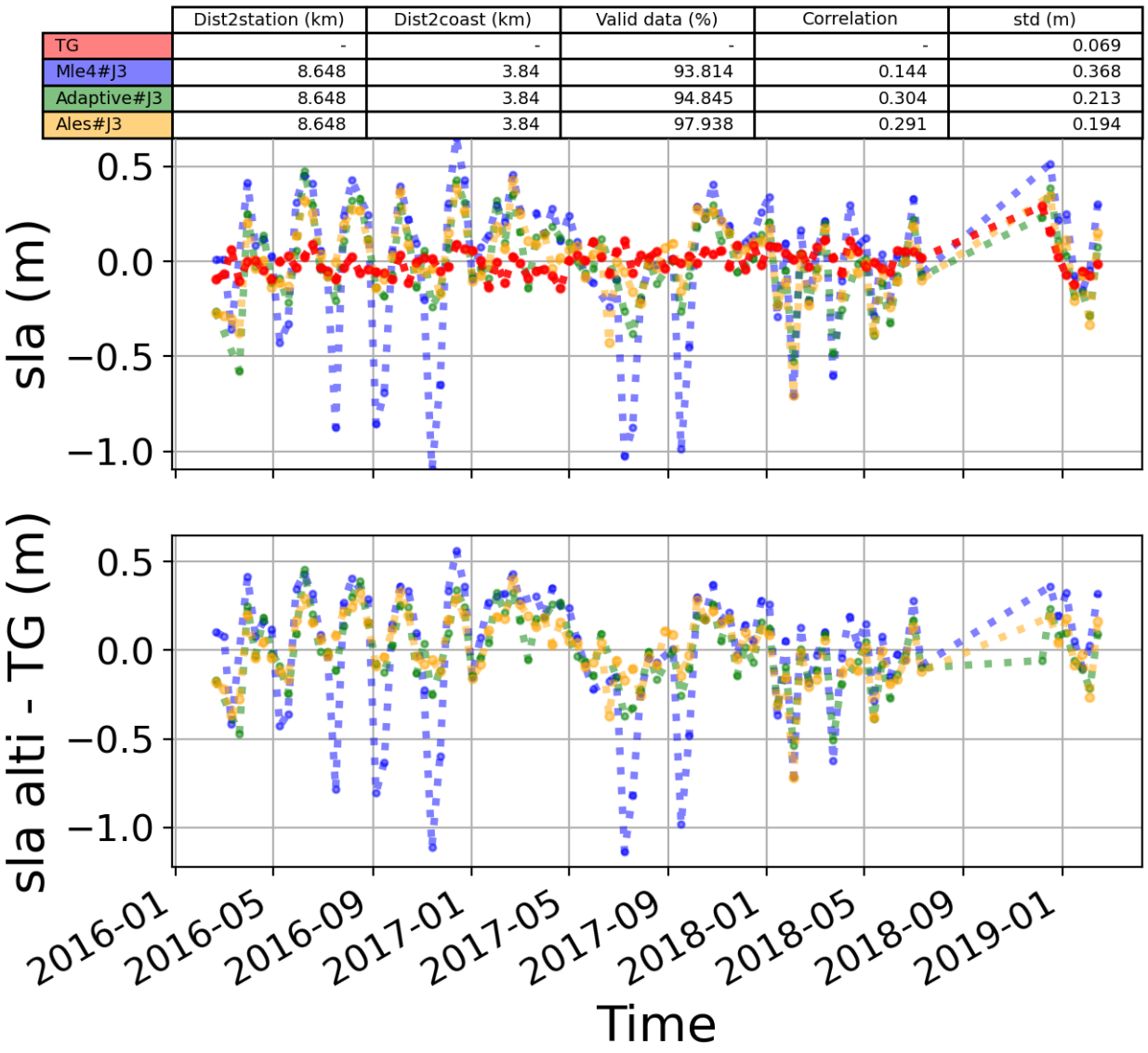

FIGURE 41 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

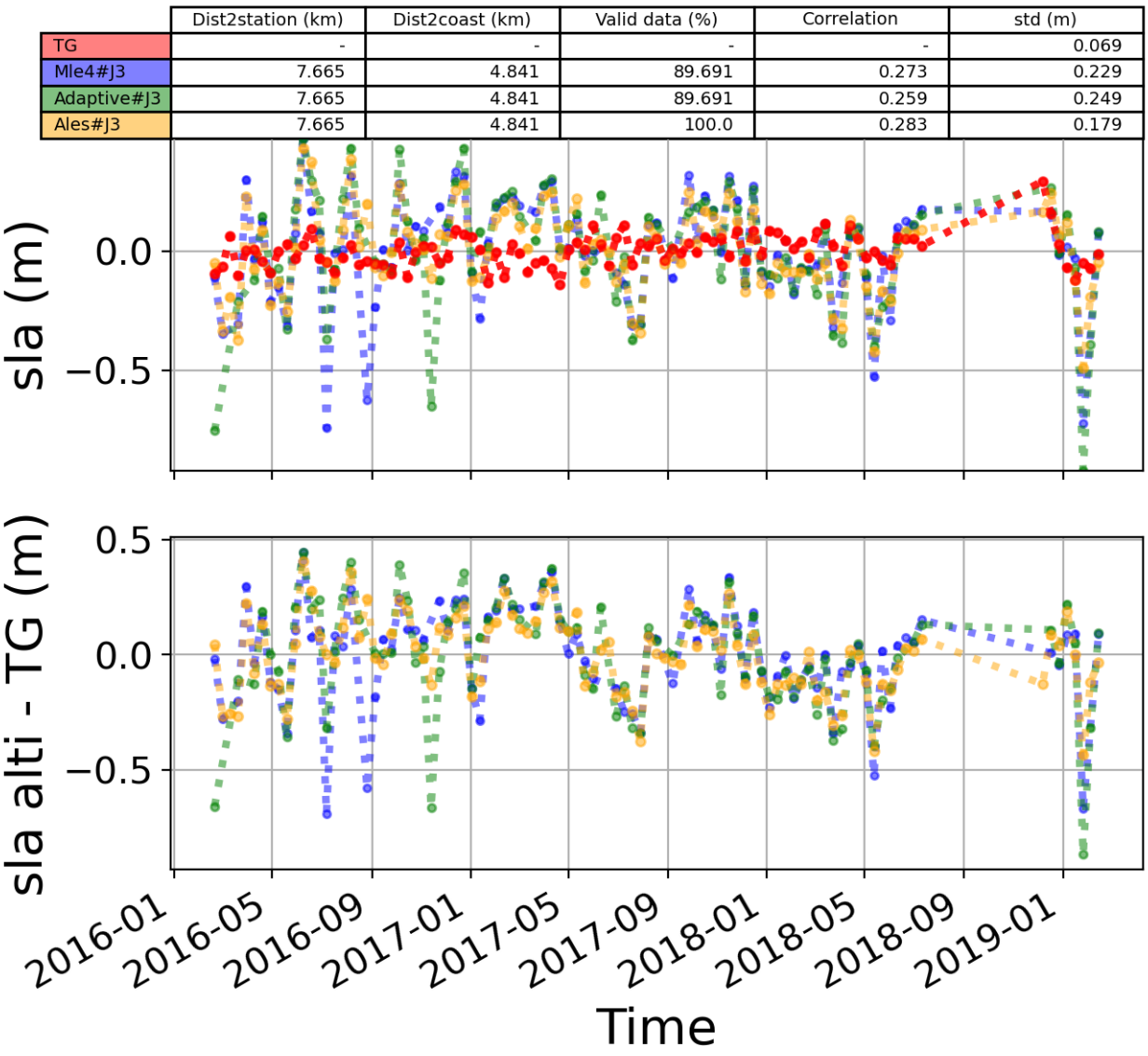

FIGURE 42 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.2 Station : Llandudno

- Nearest track to Llandudno station is the track number track222
- The area of interest is limited by :
  - A circle which it's center is the Llandudno tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km
  - Latitude limits : [None, 53.4] °

6.2.1 correlation visualization in maps view % Llandudno tide gauge

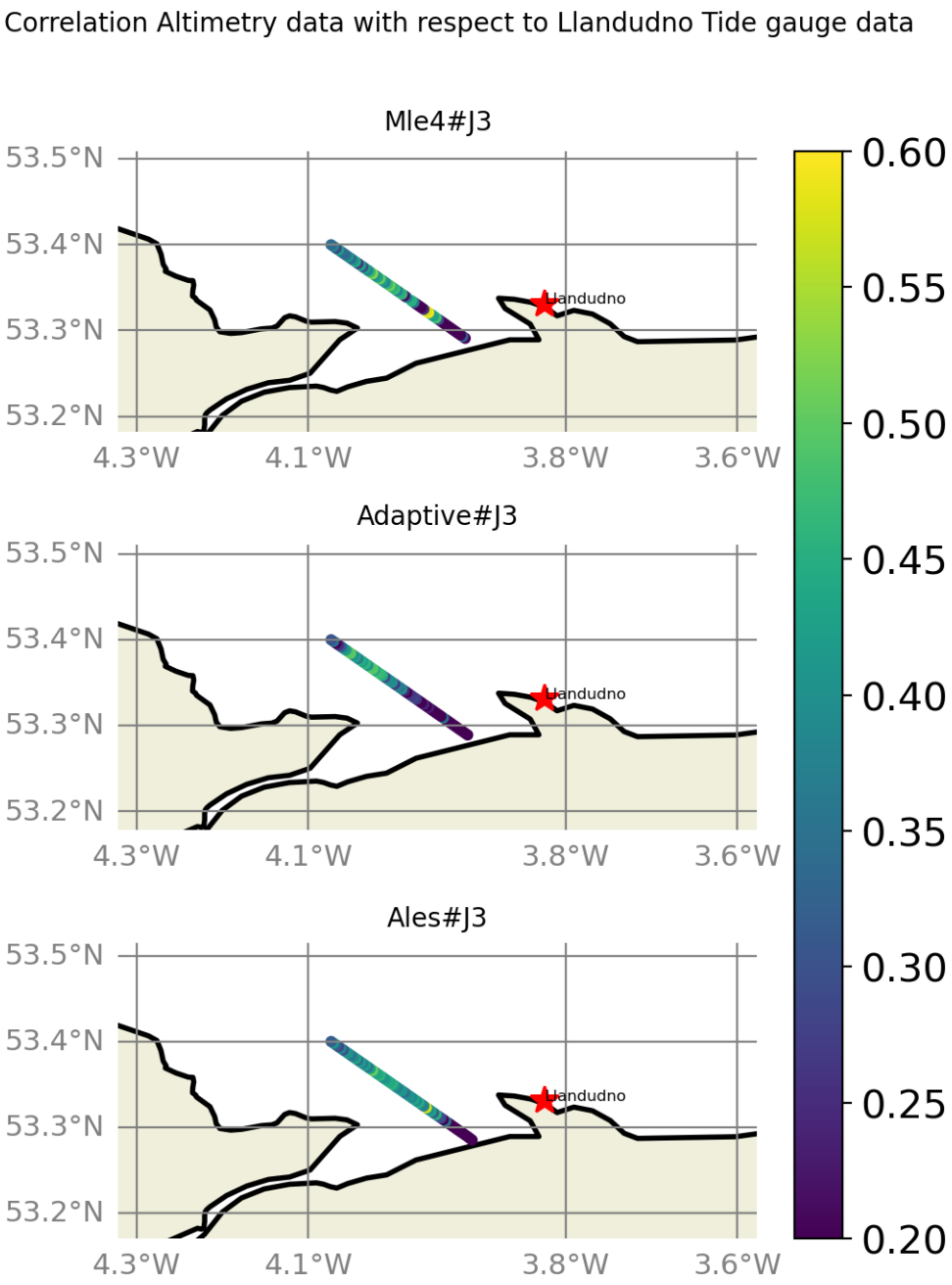

FIGURE 43 – correlation visualization in maps view % Llandudno tide gauge

6.2.2 rmsd visualization in maps view % Llandudno tide gauge

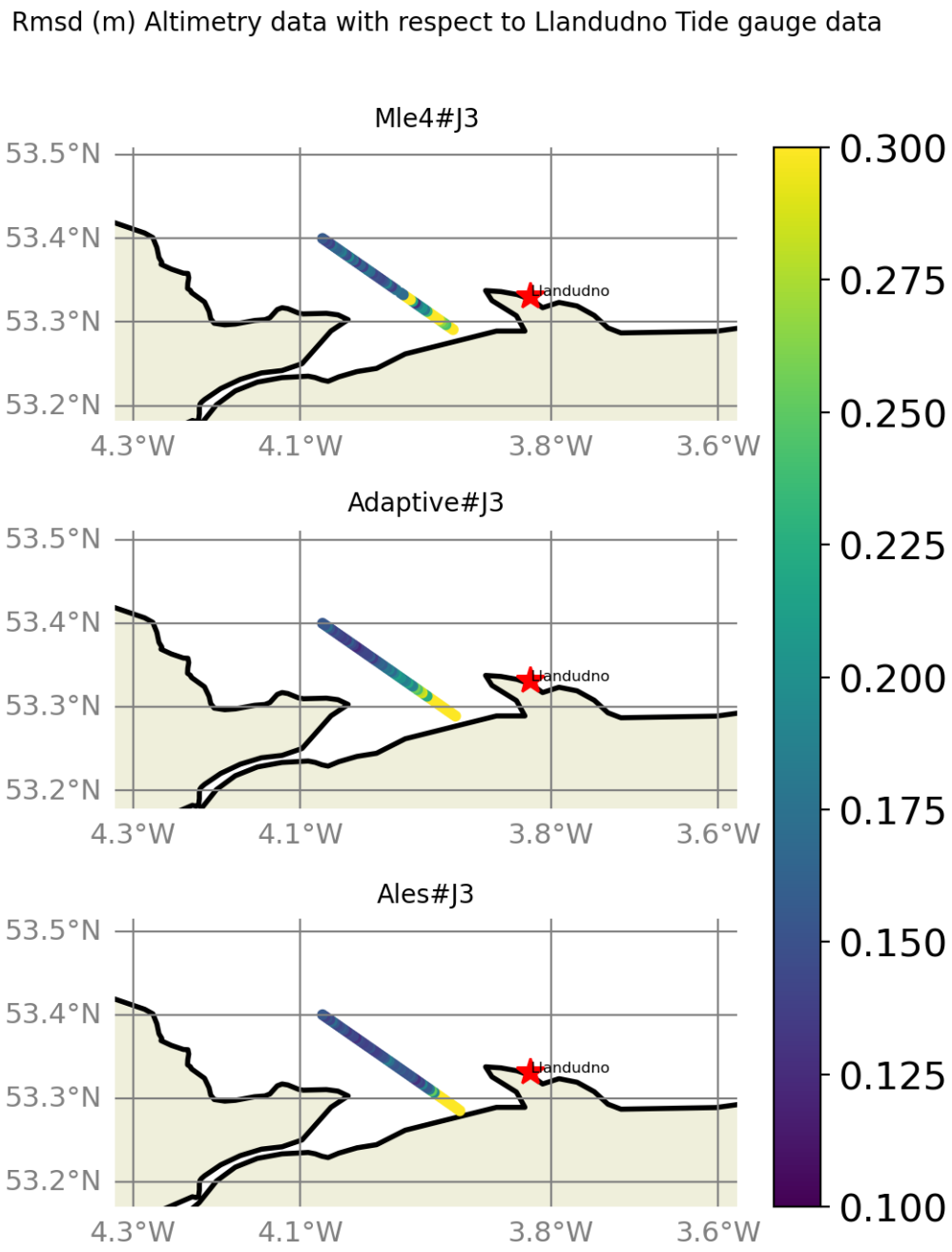

FIGURE 44 – rmsd visualization in maps view % Llandudno tide gauge

6.2.3 std visualization in maps view % Llandudno tide gauge

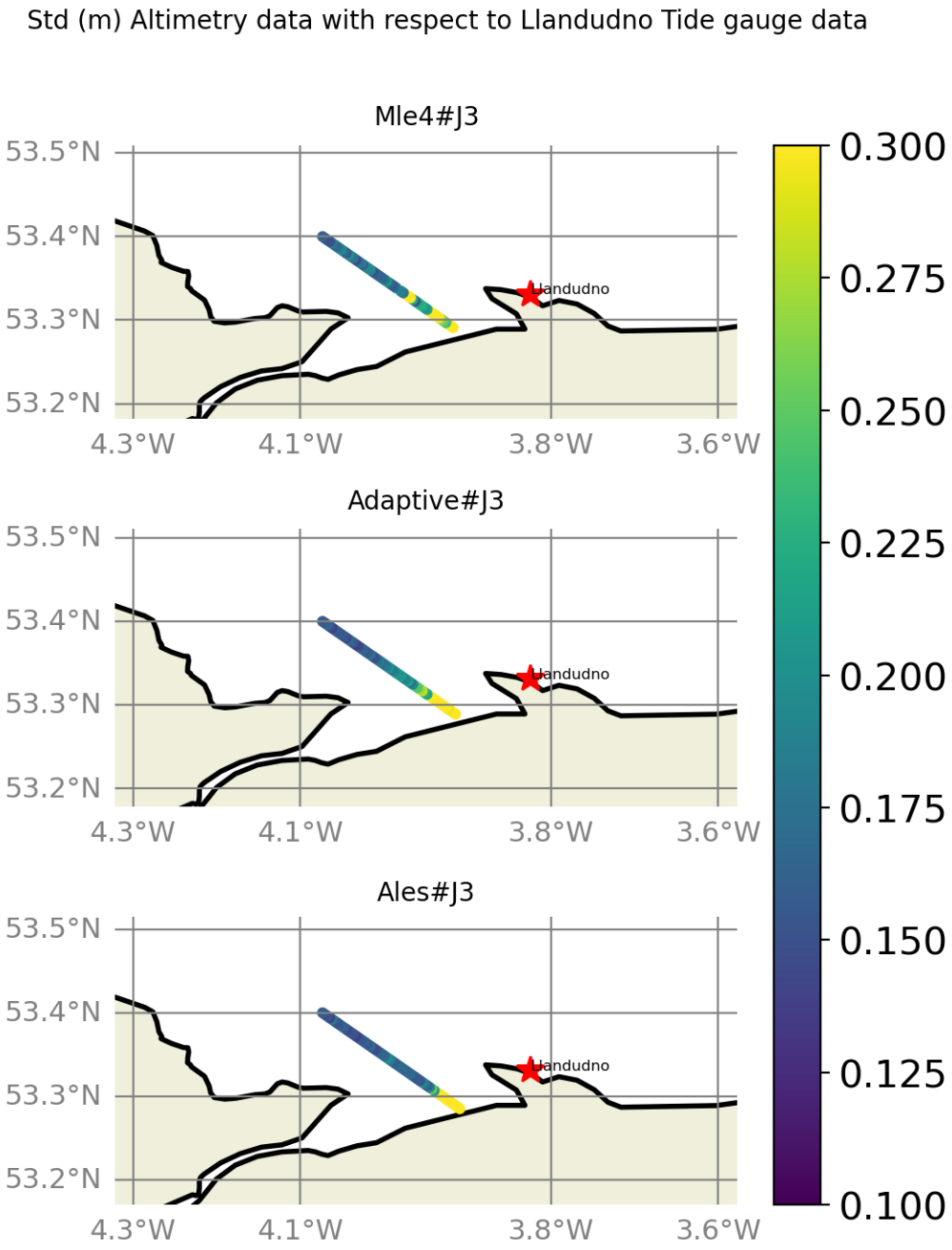

FIGURE 45 – std visualization in maps view % Llandudno tide gauge

6.2.4 valid_data_percent visualization in maps view % Llandudno tide gauge

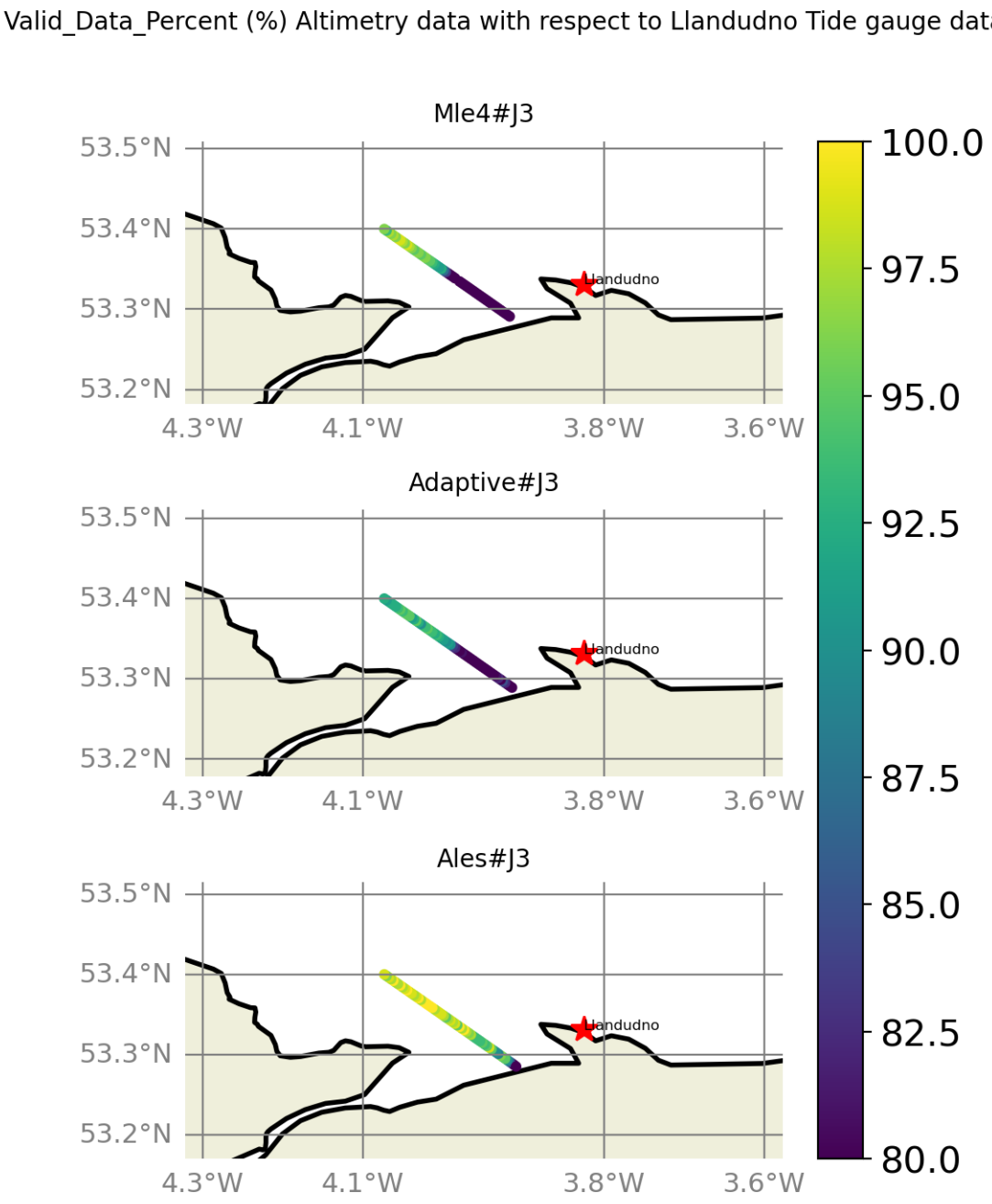

FIGURE 46 – valid_data_percent visualization in maps view % Llandudno tide gauge

6.2.5 Valid data (%) in function of distance to coast/Llandudno station

The formula to calculate the percentage of valid data in each time serie is;

$$pvd_i = \frac{nvd_i}{maxNB}, i = 1, np$$

Where *pvd* and *nvd* are the percentage of data and the number of altimetry data in the period covered by the tide gauge sla time serie, respectively in the time serie, i is the index of the time serie, np is the number of the selected altimetry time series. $maxNB = 79$ point is the maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie.

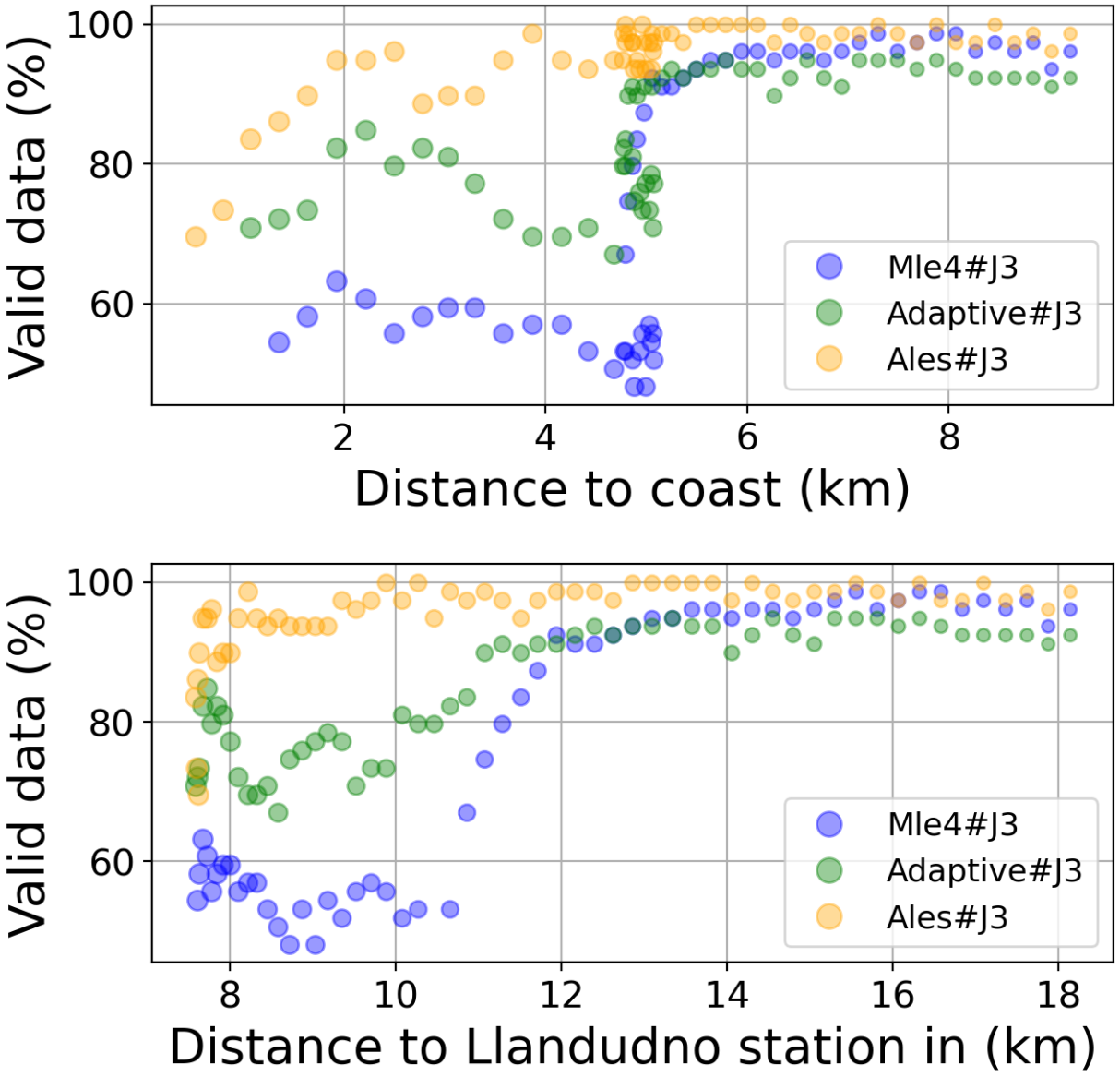

FIGURE 47 – Valid data (%) in function of distance to coast/Llandudno station

6.2.6 Std in function of distance to coast/Llandudno station

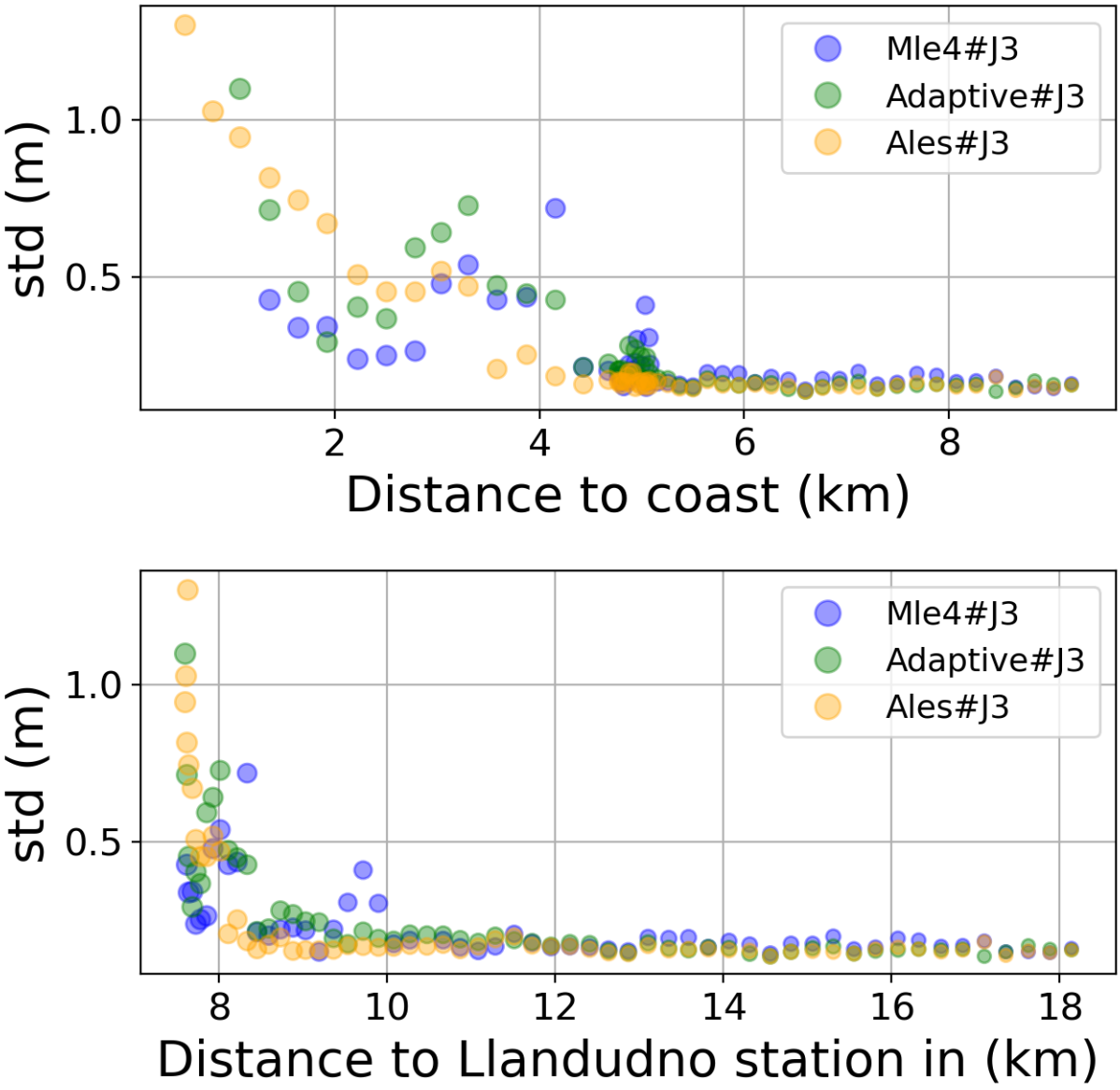

FIGURE 48 – Std in function of the distance to the coast/Llandudno station

6.2.7 Correlation in function of distance to coast/Llandudno station

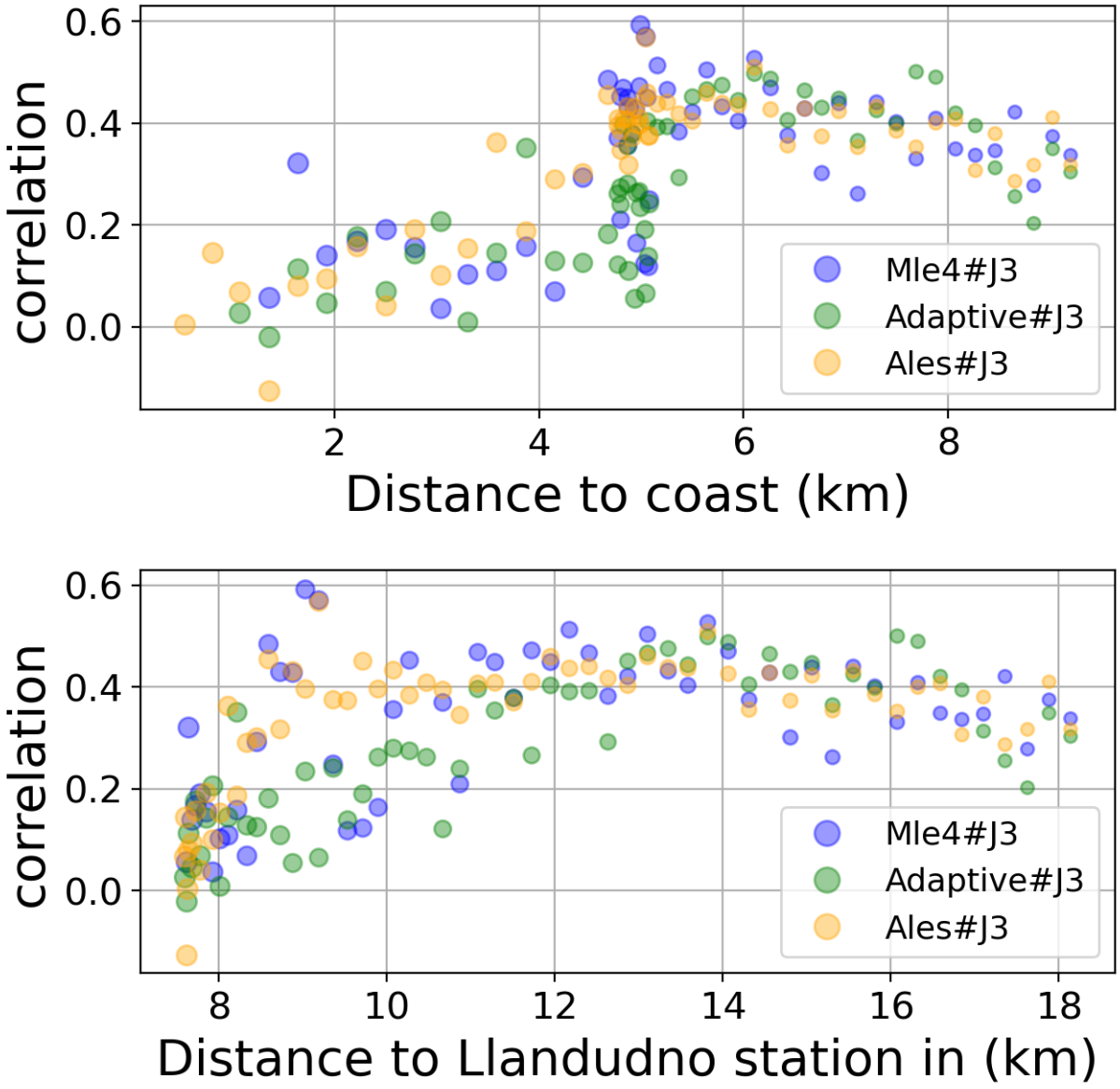

FIGURE 49 – Correlation in function of the distance to the coast/Llandudno station

6.2.8 Taylor Diagram

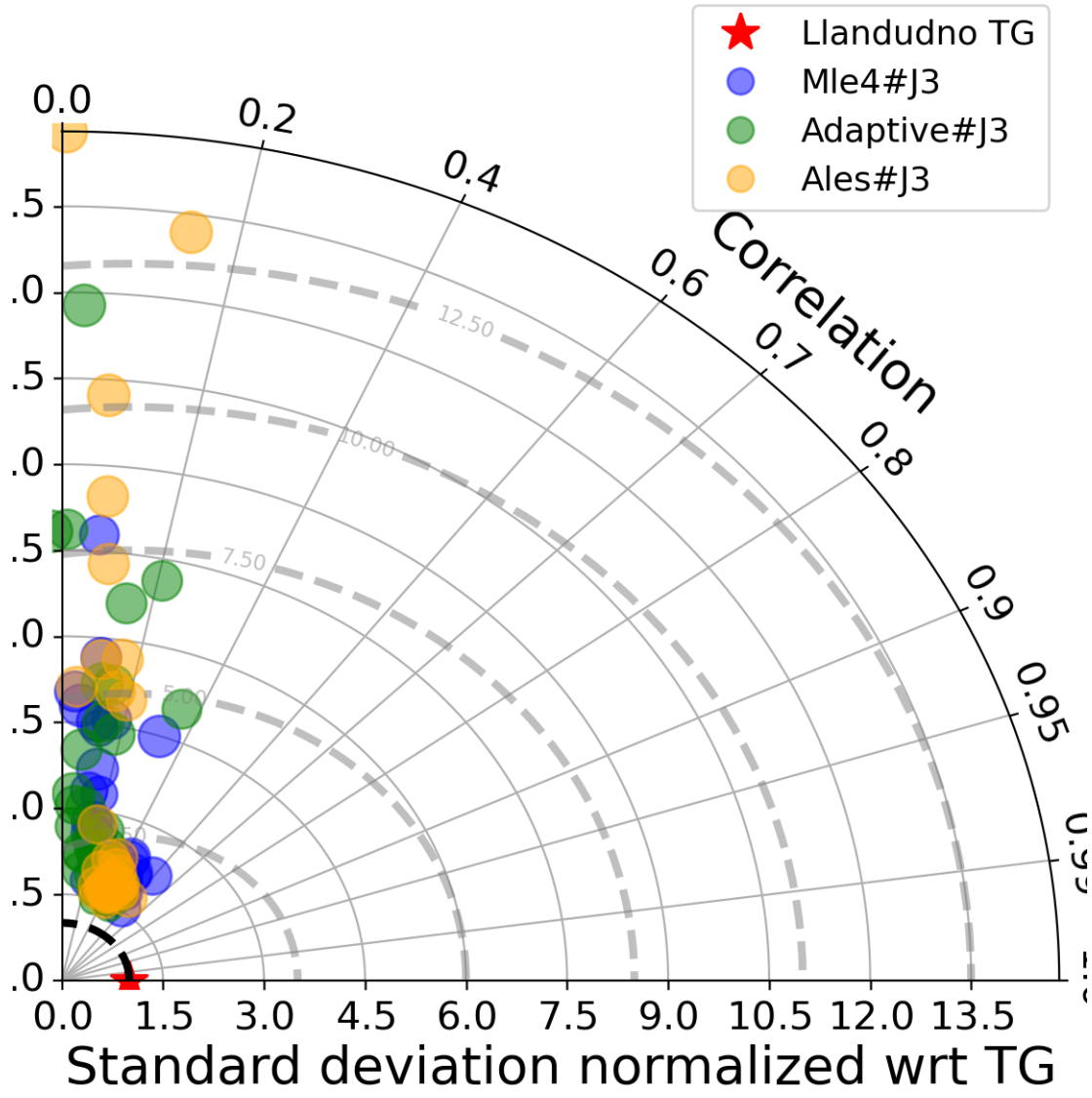

FIGURE 50 – Taylor diagram

6.2.9 Mean statistics table of products comparison with Llandudno tide gauge data

The table below contains the mean statistics of the common points between the different products in the selected area.

Product	Valid data (%)	Correlation	std (m)	rmsd (m)
Mle4#J3	76.433	0.337	0.233	0.223
Adaptive#J3	85.316	0.287	0.245	0.239
Ales#J3	96.778	0.348	0.225	0.215

FIGURE 51 – Mean statistics table of the common points in the altimetry products

6.2.10 The most correlated sla altimetry Time series with the tide gauge sla time serie

The maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie is 79 point.

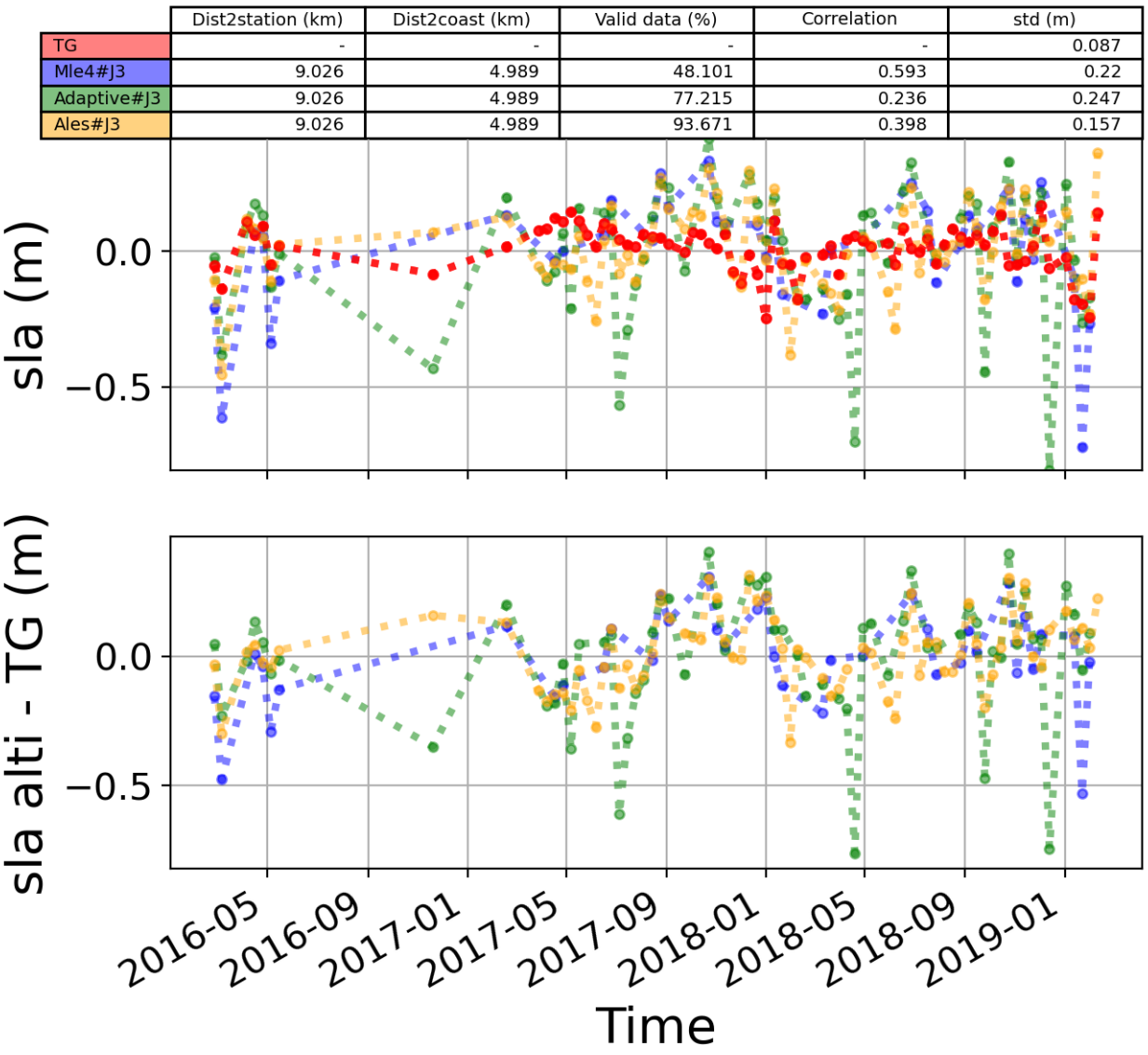

FIGURE 52 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

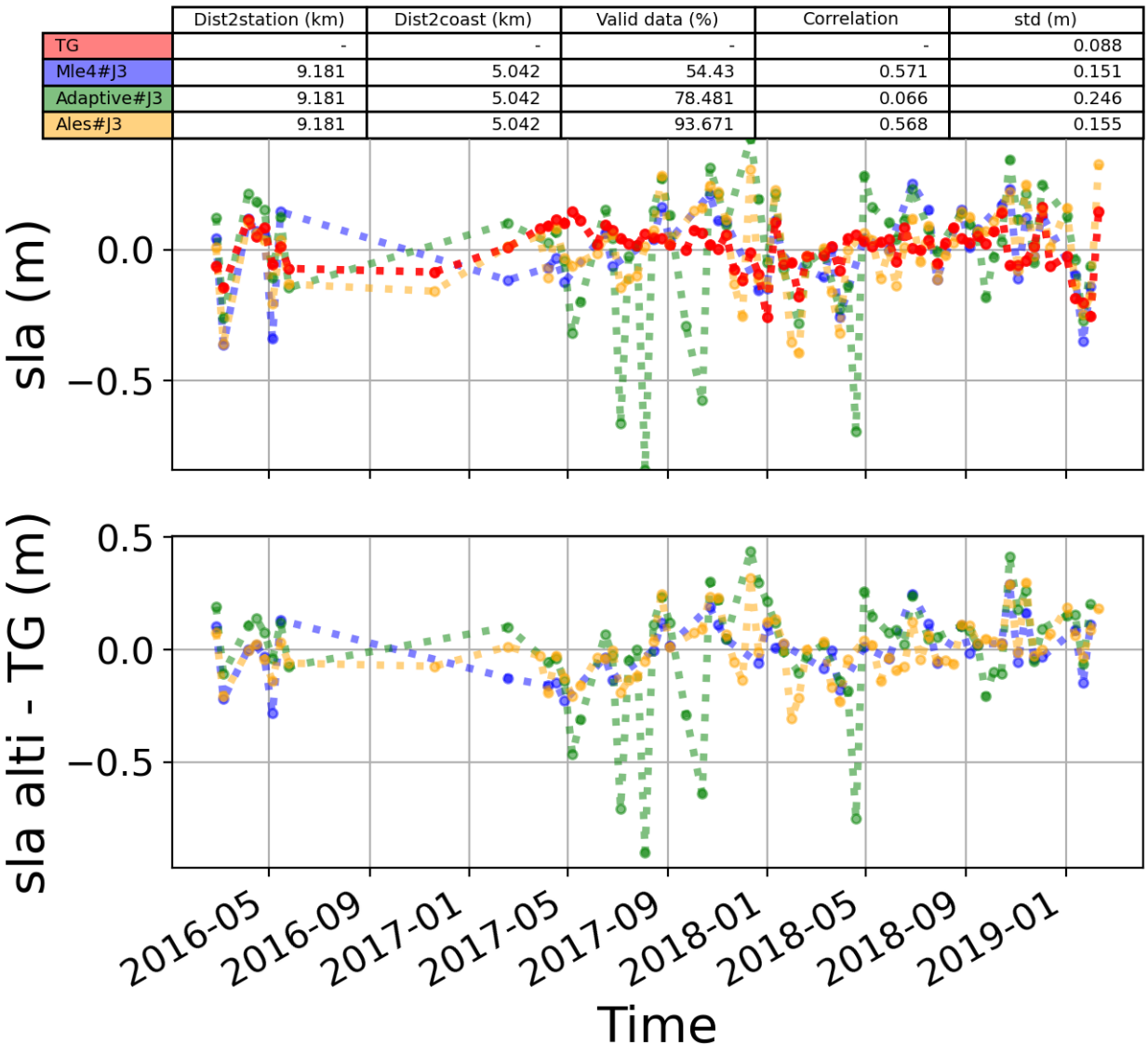

FIGURE 53 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

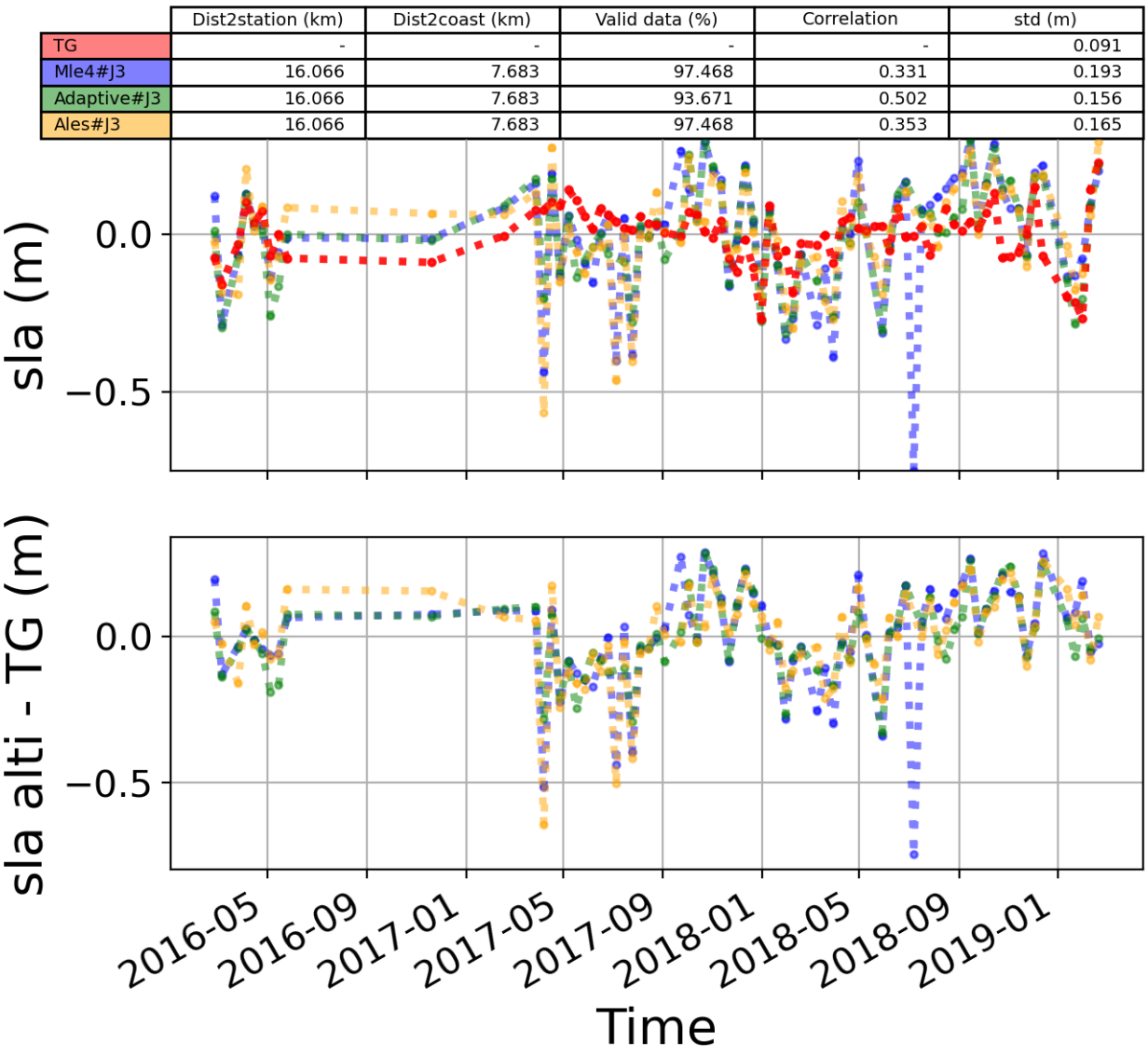

FIGURE 54 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.3 Station : Newhaven

- Nearest track to Newhaven station is the track number track137
- The area of interest is limited by :
  - A circle which it's center is the Newhaven tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km

6.3.1 correlation visualization in maps view % Newhaven tide gauge

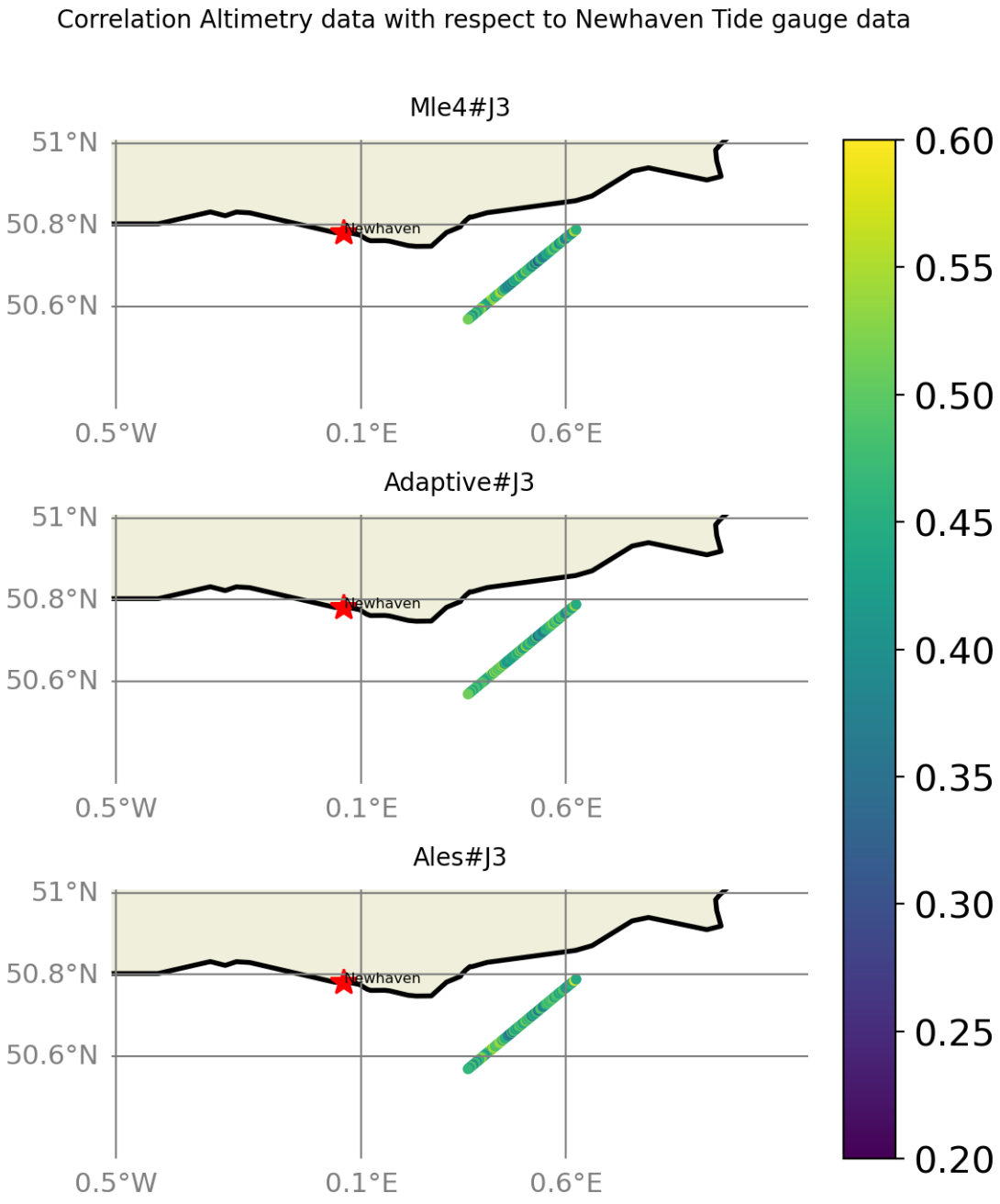

FIGURE 55 – correlation visualization in maps view % Newhaven tide gauge

6.3.2 rmsd visualization in maps view % Newhaven tide gauge

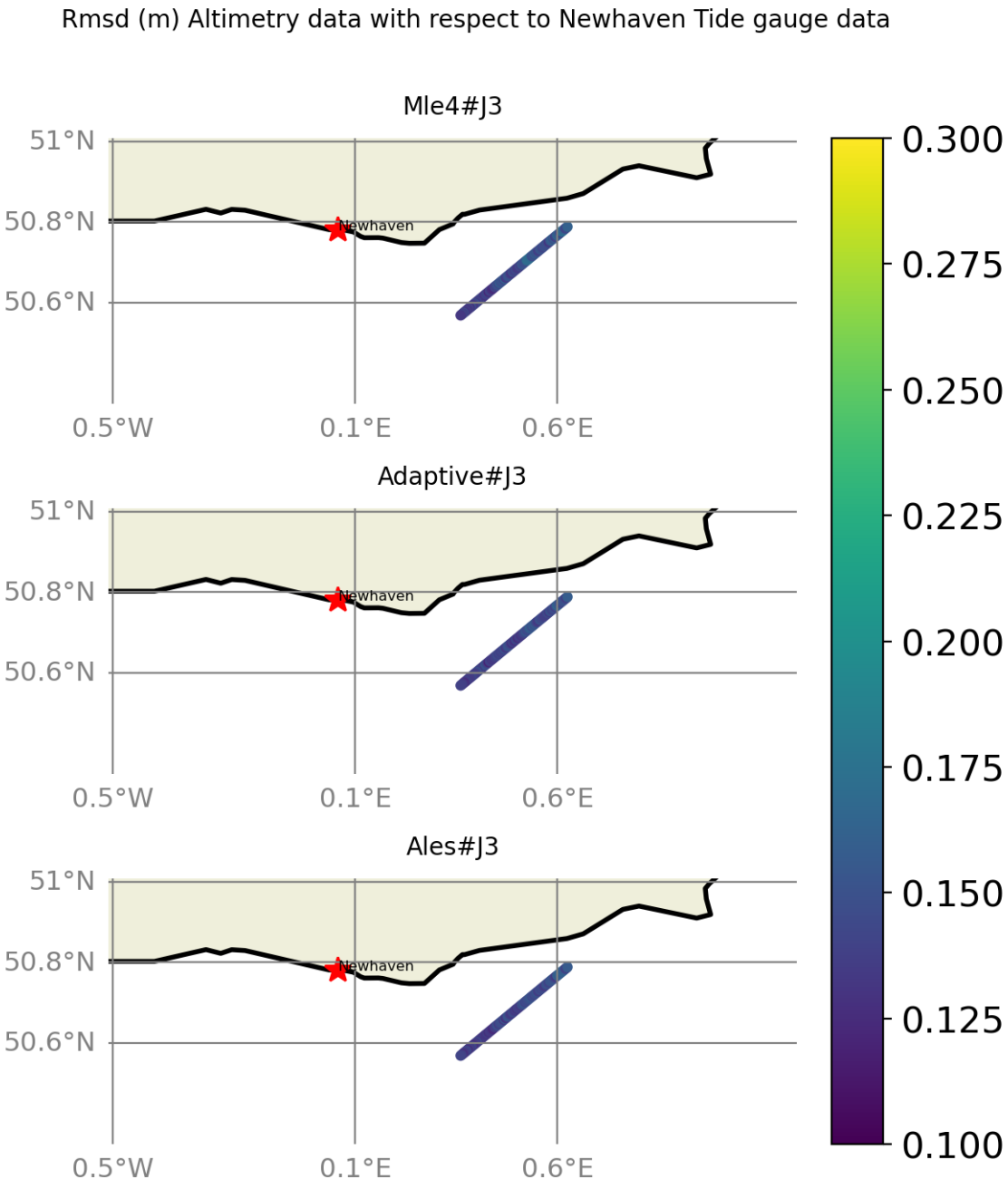

FIGURE 56 – rmsd visualization in maps view % Newhaven tide gauge

6.3.3 std visualization in maps view % Newhaven tide gauge

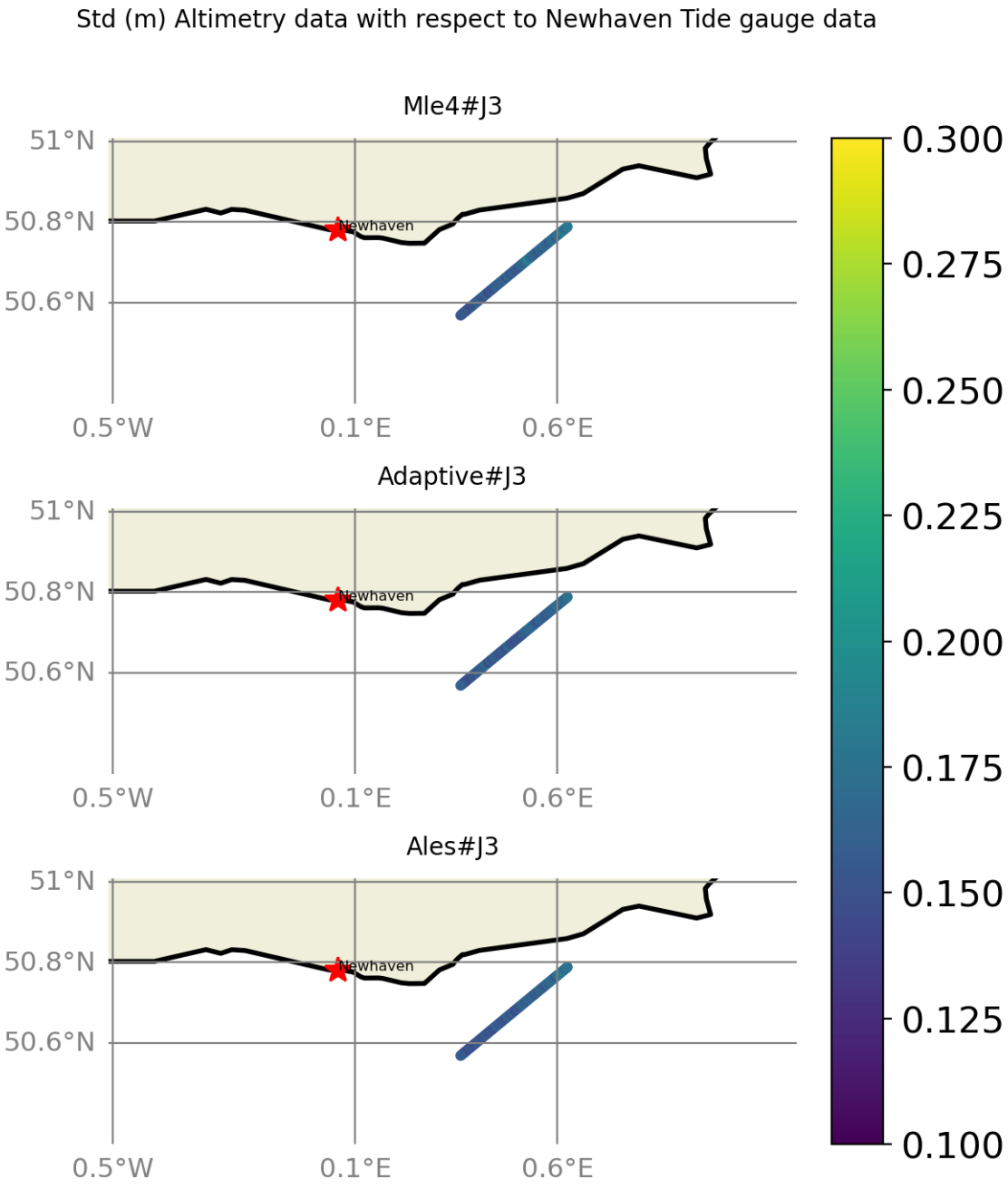

FIGURE 57 – std visualization in maps view % Newhaven tide gauge

6.3.4 valid_data_percent visualization in maps view % Newhaven tide gauge

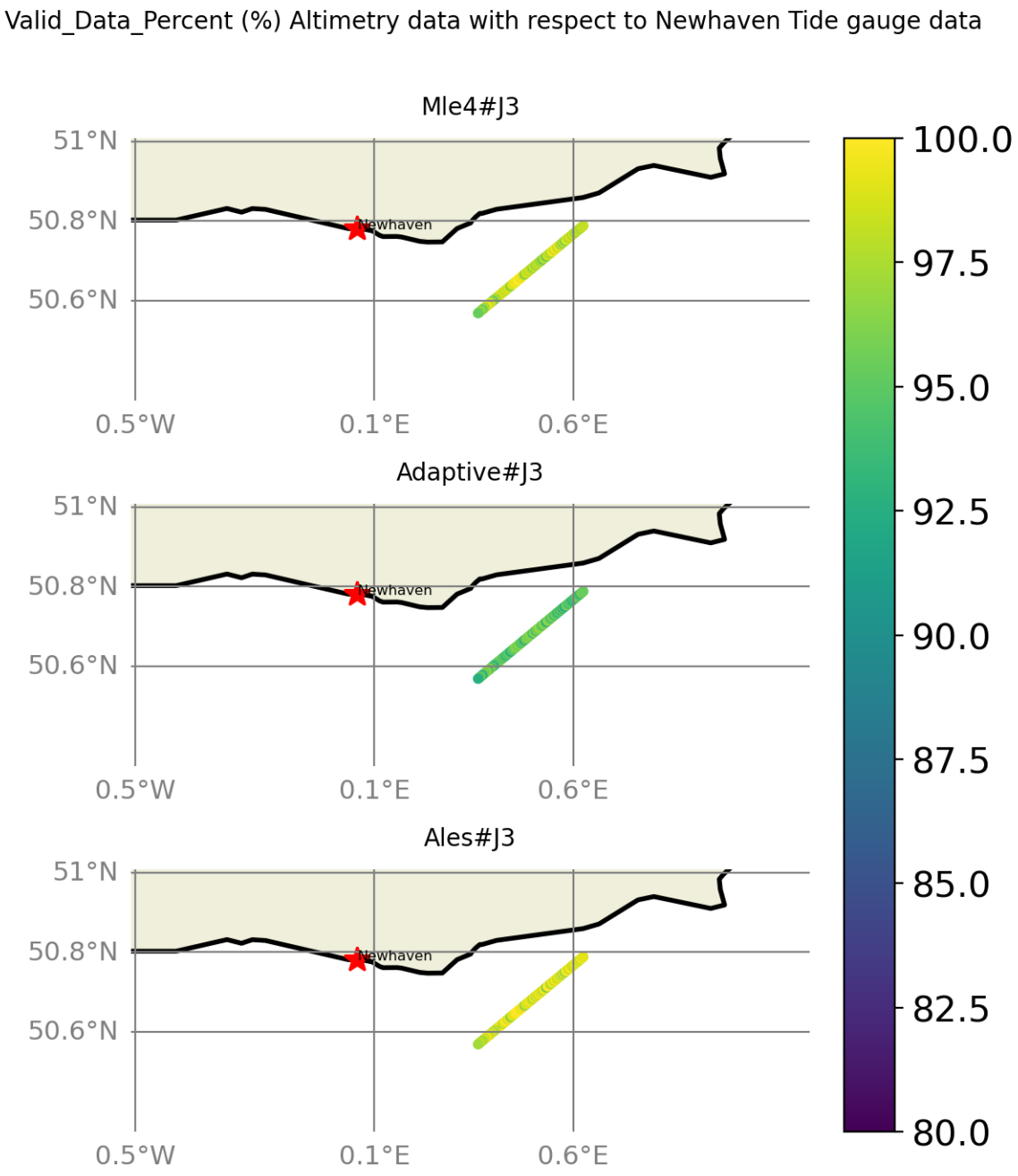

FIGURE 58 – valid_data_percent visualization in maps view % Newhaven tide gauge

6.3.5 Valid data (%) in function of distance to coast/Newhaven station

The formula to calculate the percentage of valid data in each time serie is;

$$pvd_i = \frac{nvd_i}{maxNB}, i = 1, np$$

Where *pvd* and *nvd* are the percentage of data and the number of altimetry data in the period covered by the tide gauge sla time serie, respectively in the time serie, i is the index of the time serie, np is the number of the selected altimetry time series. $maxNB = 108$ point is the maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie.

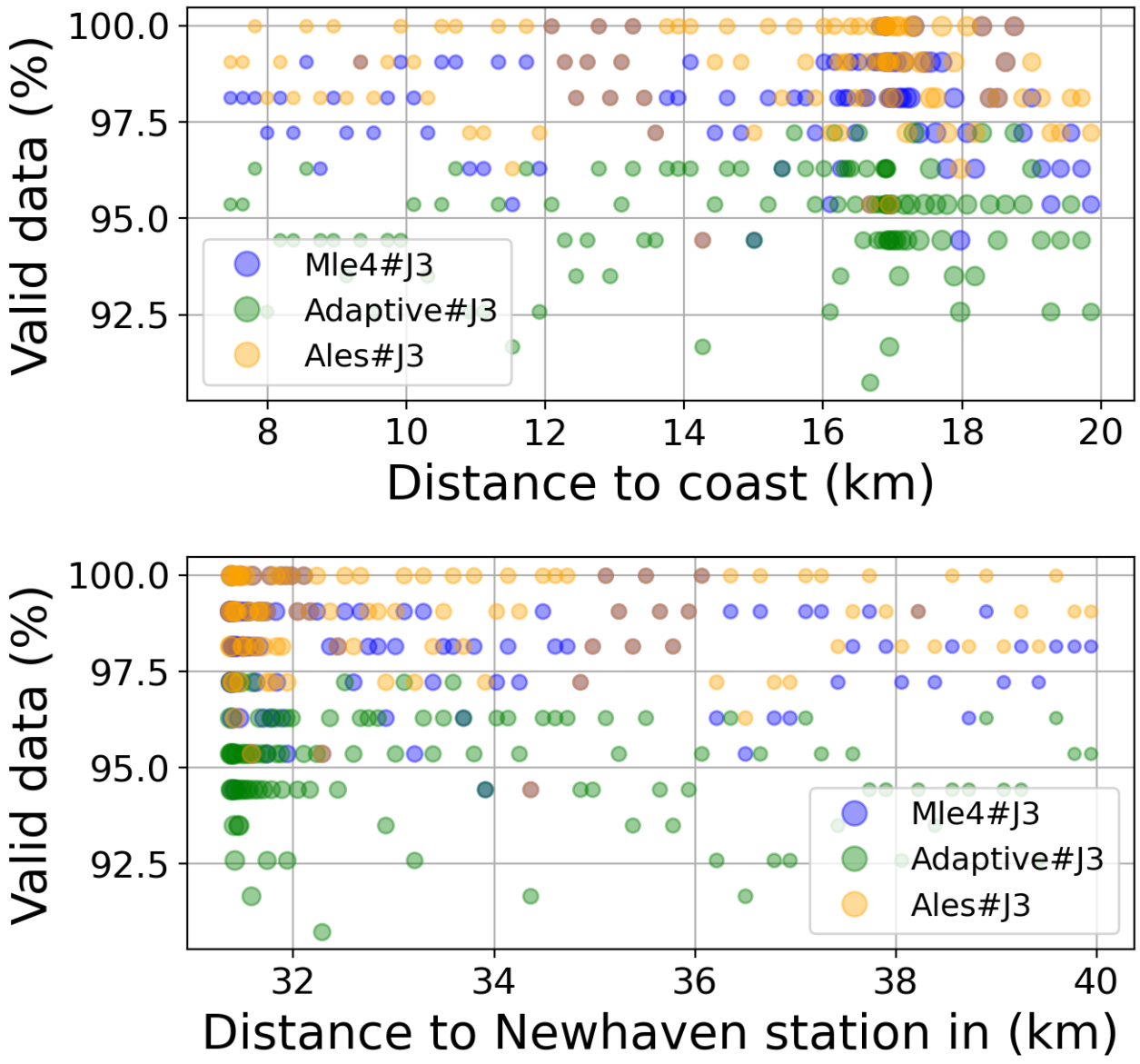

FIGURE 59 – Valid data (%) in function of distance to coast/Newhaven station

6.3.6 Std in function of distance to coast/Newhaven station

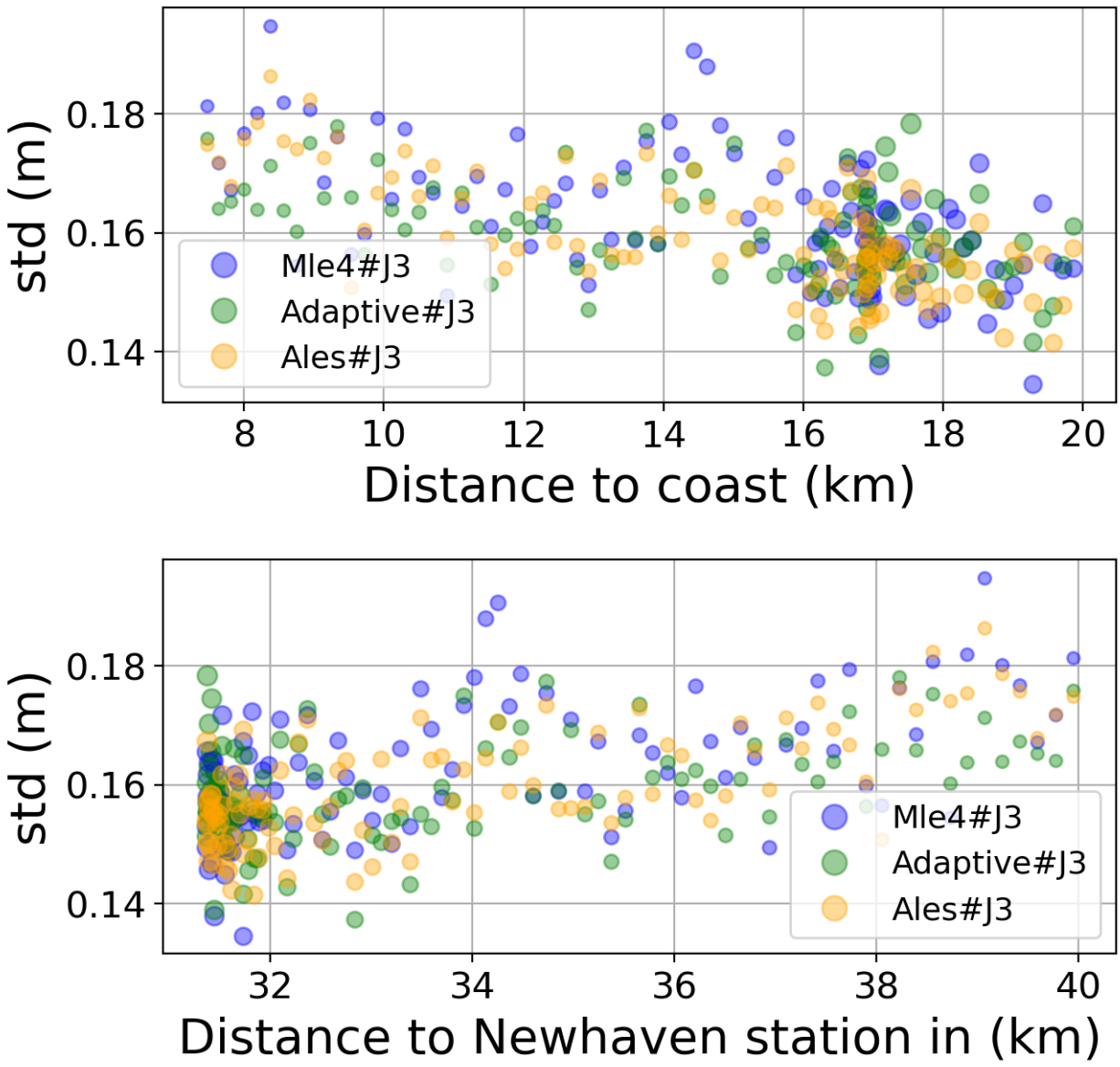

FIGURE 60 – Std in function of the distance to the coast/Newhaven station

6.3.7 Correlation in function of distance to coast/Newhaven station

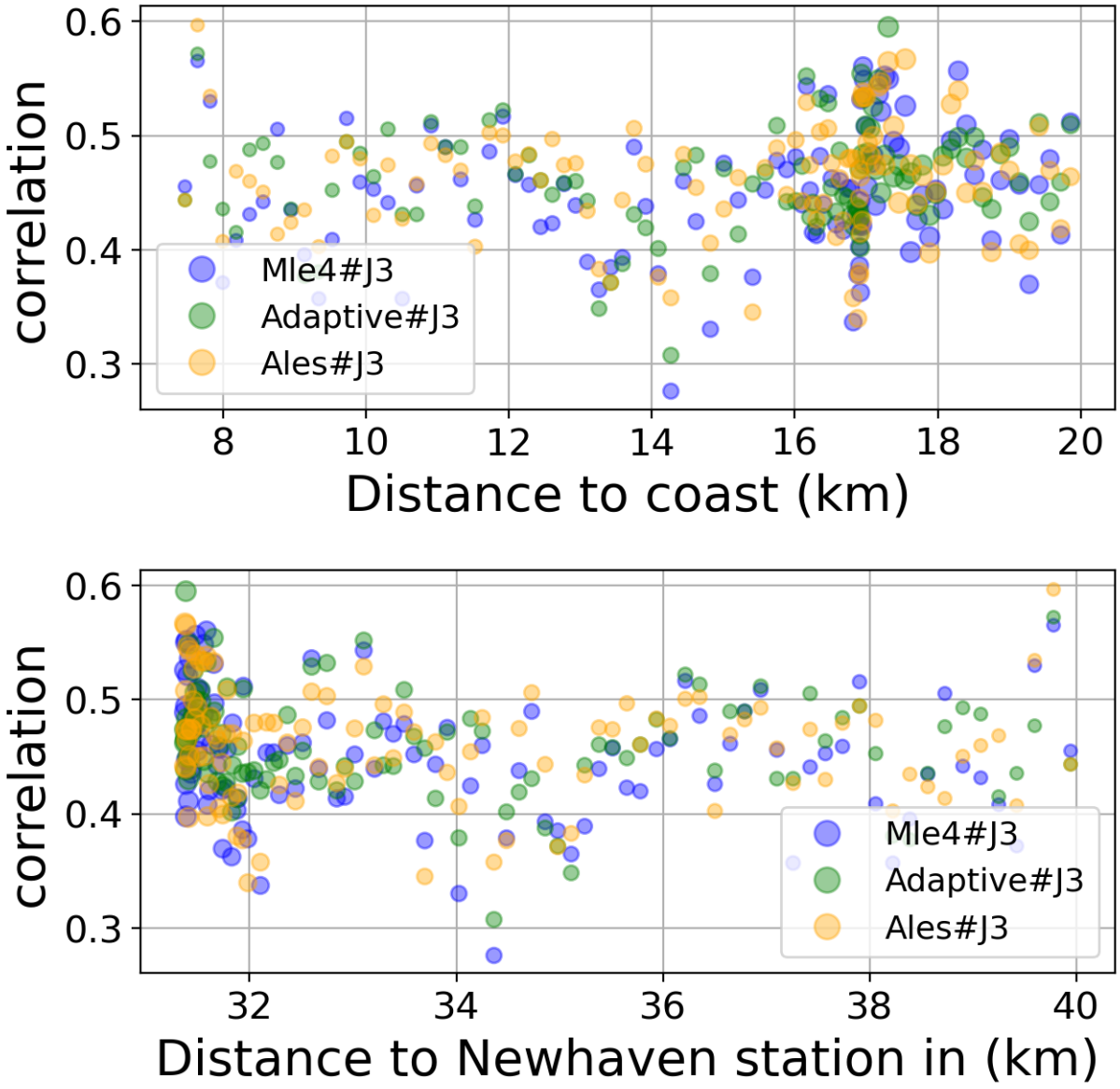

FIGURE 61 – Correlation in function of the distance to the coast/Newhaven station

6.3.8 Taylor Diagram

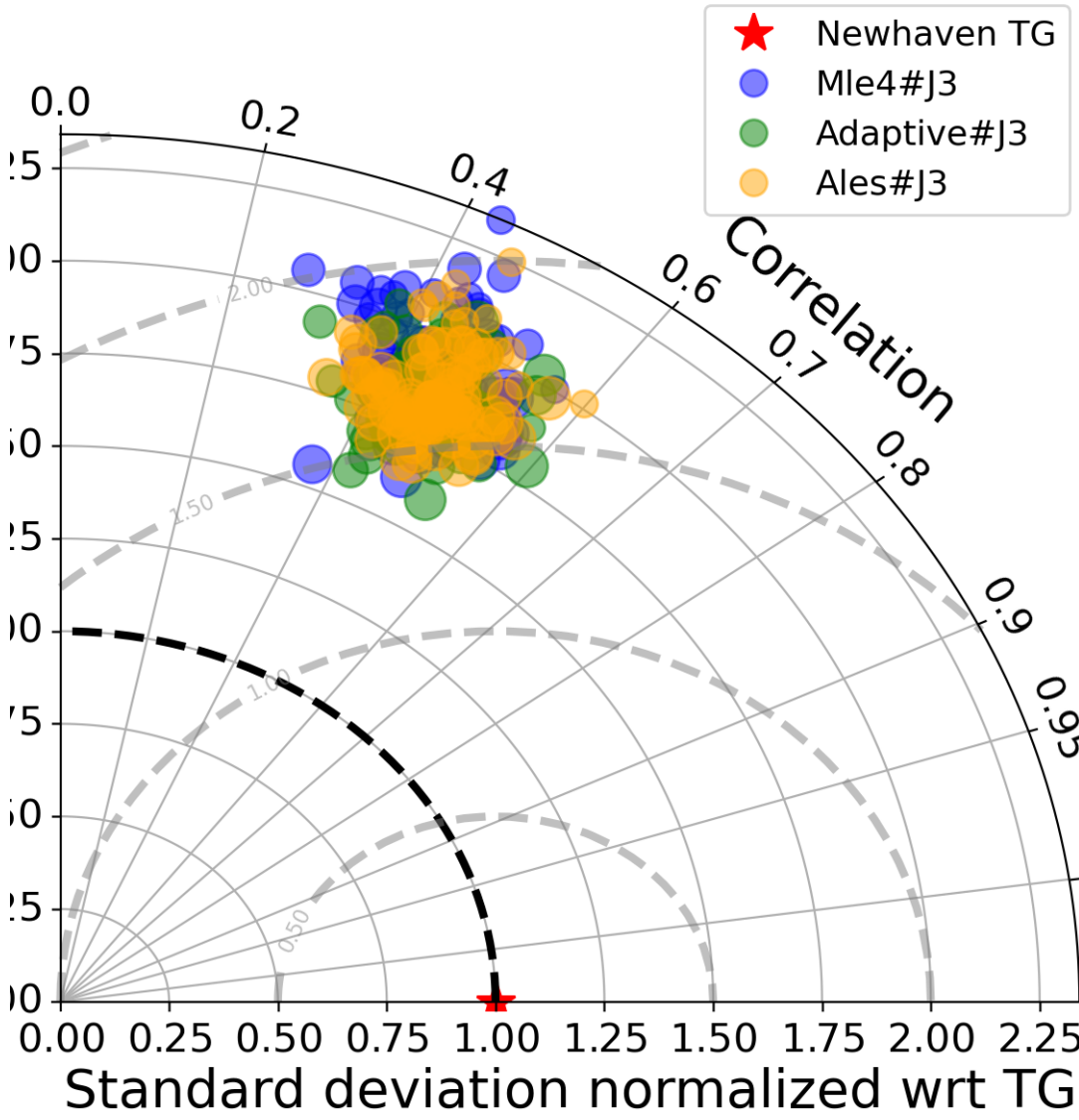

FIGURE 62 – Taylor diagram

6.3.9 Mean statistics table of products comparison with Newhaven tide gauge data

The table below contains the mean statistics of the common points between the different products in the selected area.

Product	Valid data (%)	Correlation	std (m)	rmsd (m)
Mle4#J3	98.01	0.451	0.162	0.145
Adaptive#J3	94.92	0.462	0.159	0.142
Ales#J3	98.806	0.462	0.159	0.142

FIGURE 63 – Mean statistics table of the common points in the altimetry products

6.3.10 The most correlated sla altimetry Time series with the tide gauge sla time serie

The maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie is 108 point.

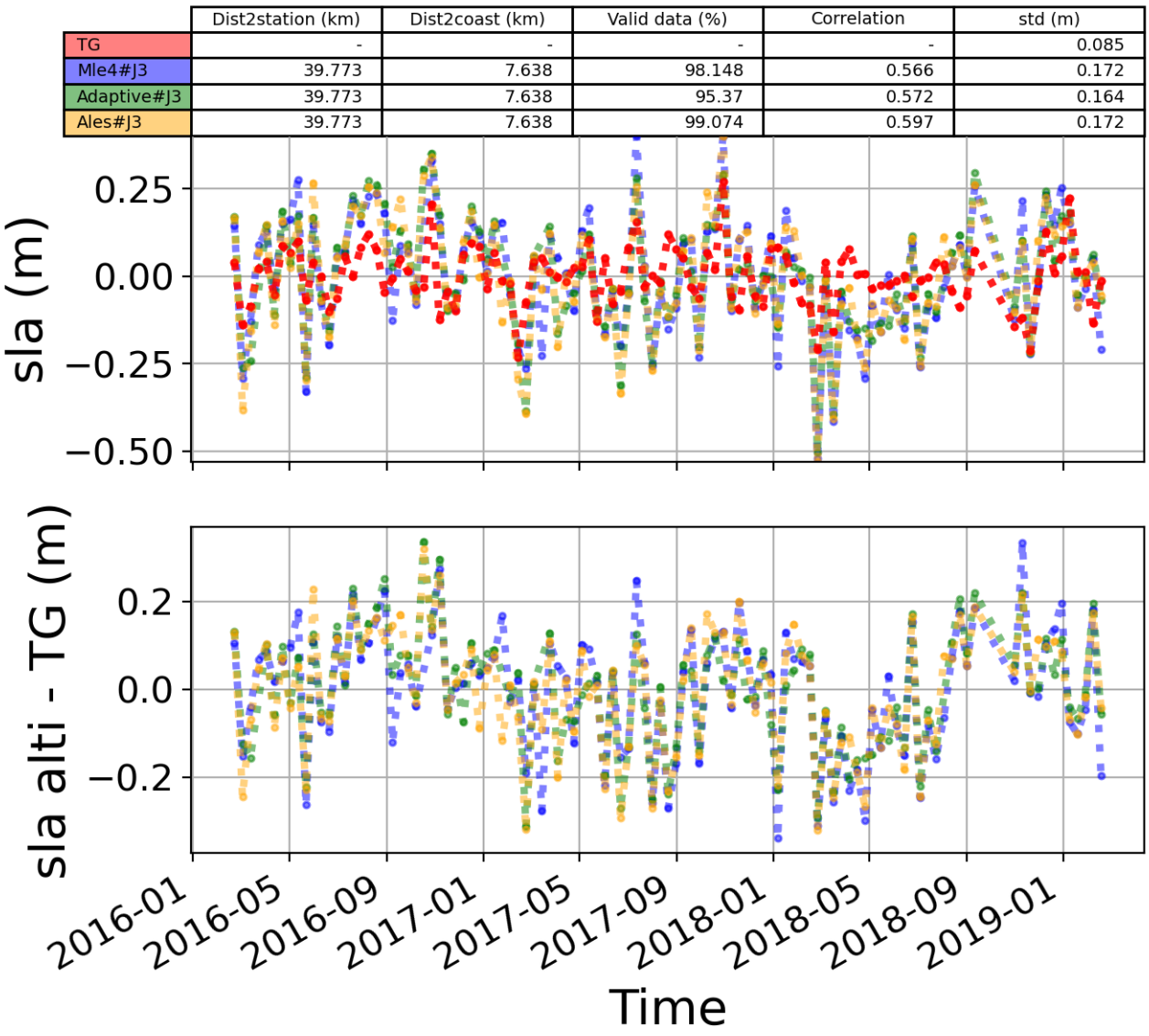

FIGURE 64 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

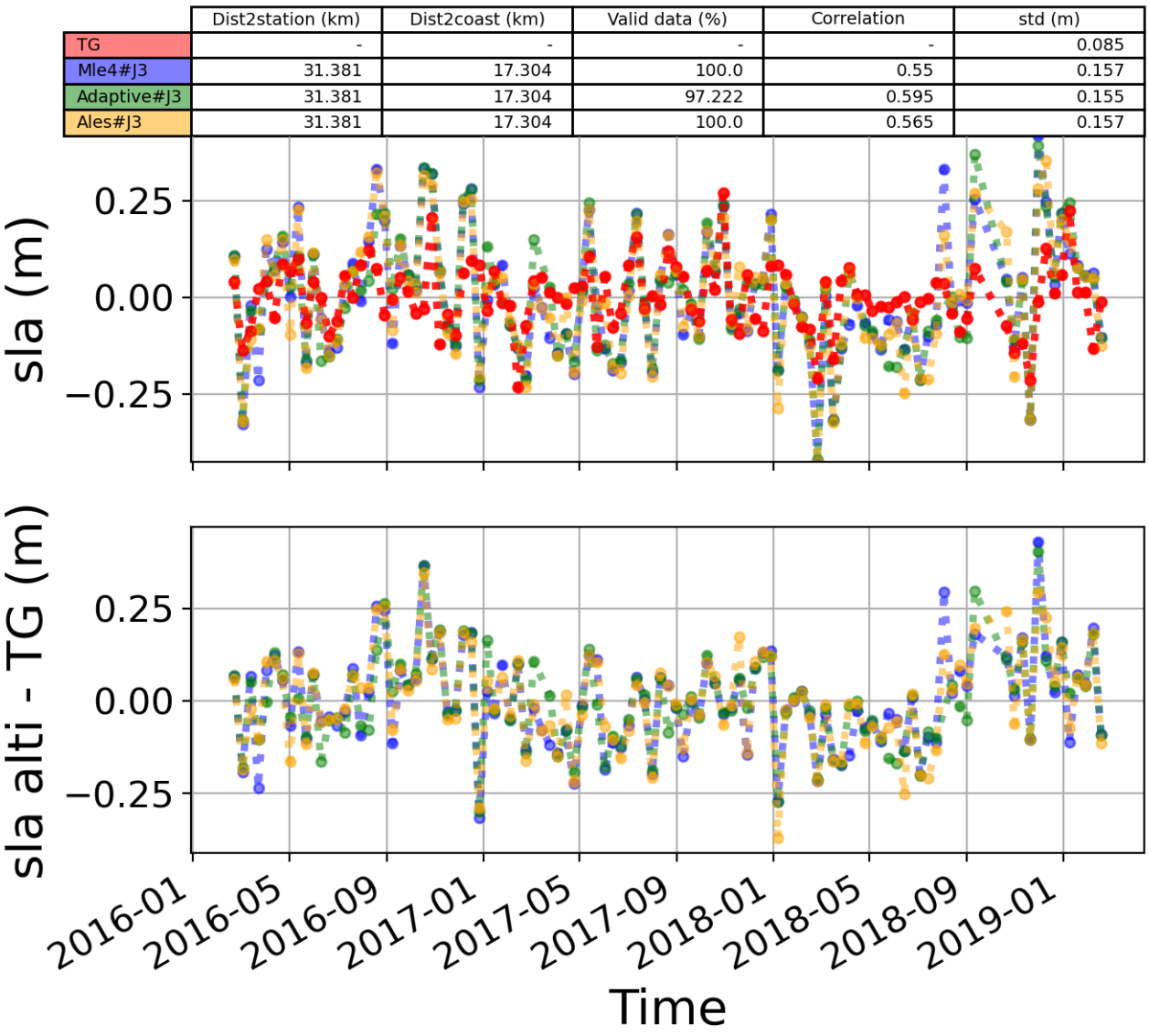

FIGURE 65 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.4 Station : CALAIS

- Nearest track to CALAIS station is the track number track44
- The area of interest is limited by :
  - A circle which it's center is the CALAIS tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 14 Km
  - Latitude limits : [50.8, 51.21] °

6.4.1 correlation visualization in maps view % CALAIS tide gauge

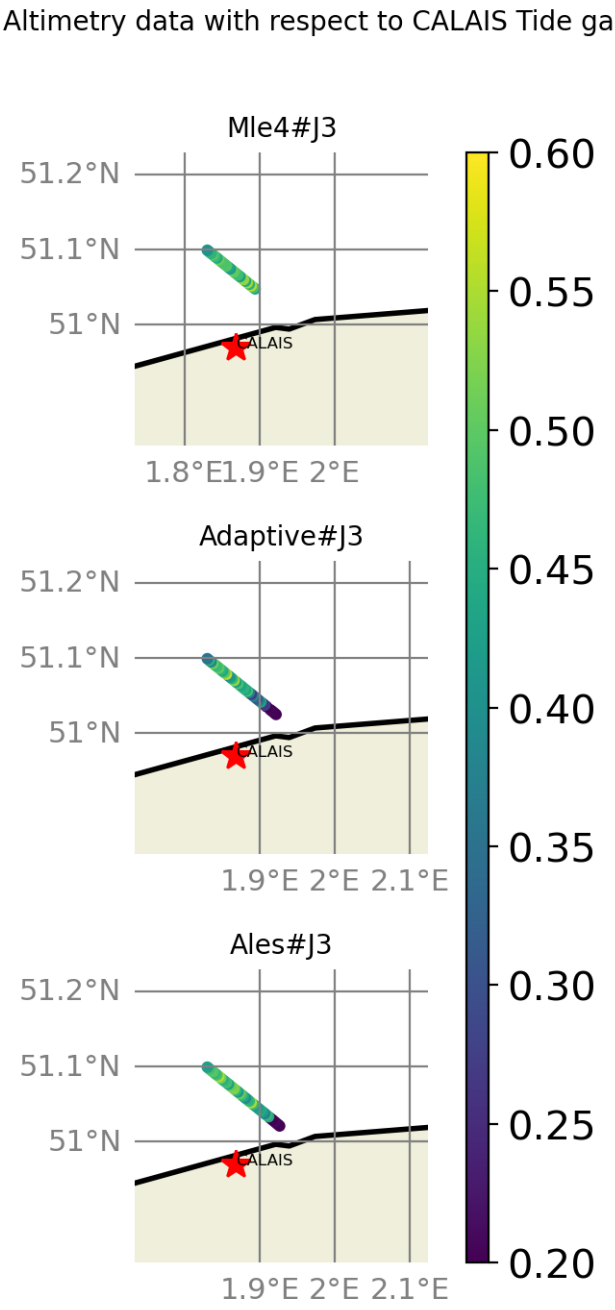

FIGURE 66 – correlation visualization in maps view % CALAIS tide gauge

6.4.2 rmsd visualization in maps view % CALAIS tide gauge

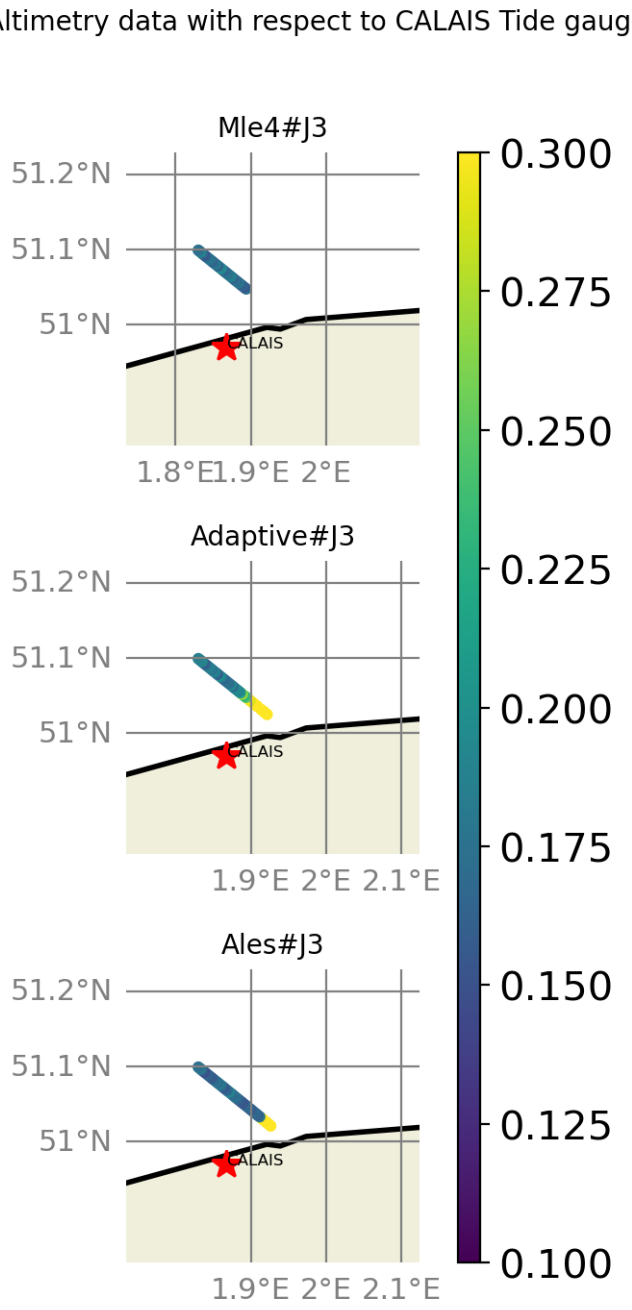

FIGURE 67 – rmsd visualization in maps view % CALAIS tide gauge

6.4.3 std visualization in maps view % CALAIS tide gauge

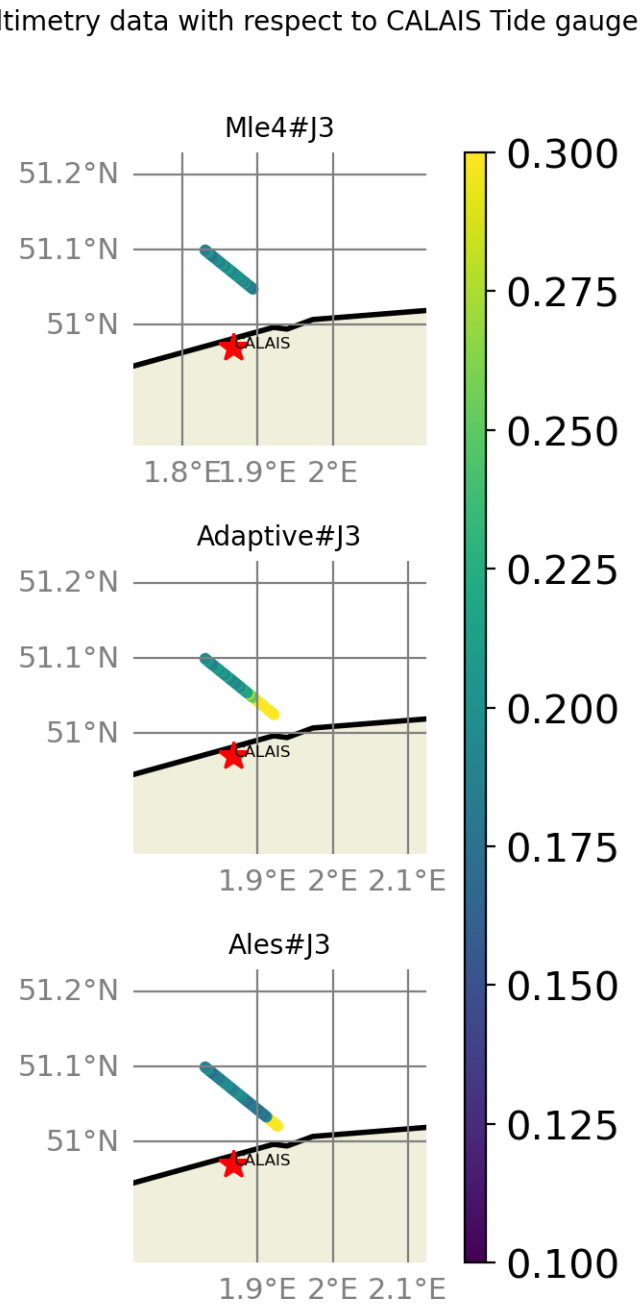

FIGURE 68 – std visualization in maps view % CALAIS tide gauge

6.4.4 valid_data_percent visualization in maps view % CALAIS tide gauge

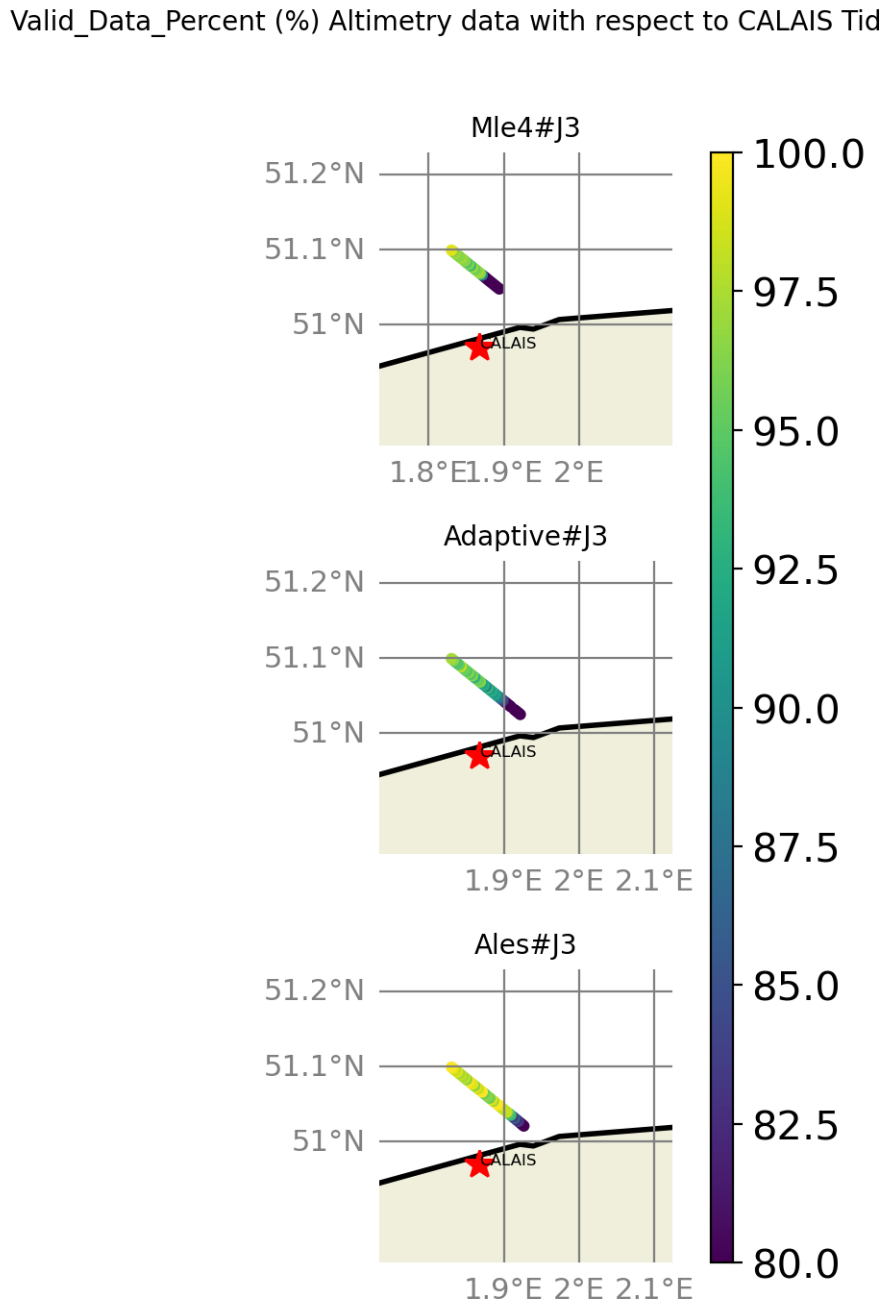

FIGURE 69 – valid_data_percent visualization in maps view % CALAIS tide gauge

6.4.5 Valid data (%) in function of distance to coast/CALAIS station

The formula to calculate the percentage of valid data in each time serie is;

$$pvd_i = \frac{nvd_i}{maxNB}, i = 1, np$$

Where *pvd* and *nvd* are the percentage of data and the number of altimetry data in the period covered by the tide gauge sla time serie, respectively in the time serie, i is the index of the time serie, np is the number of the selected altimetry time series. $maxNB = 109$ point is the maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie.

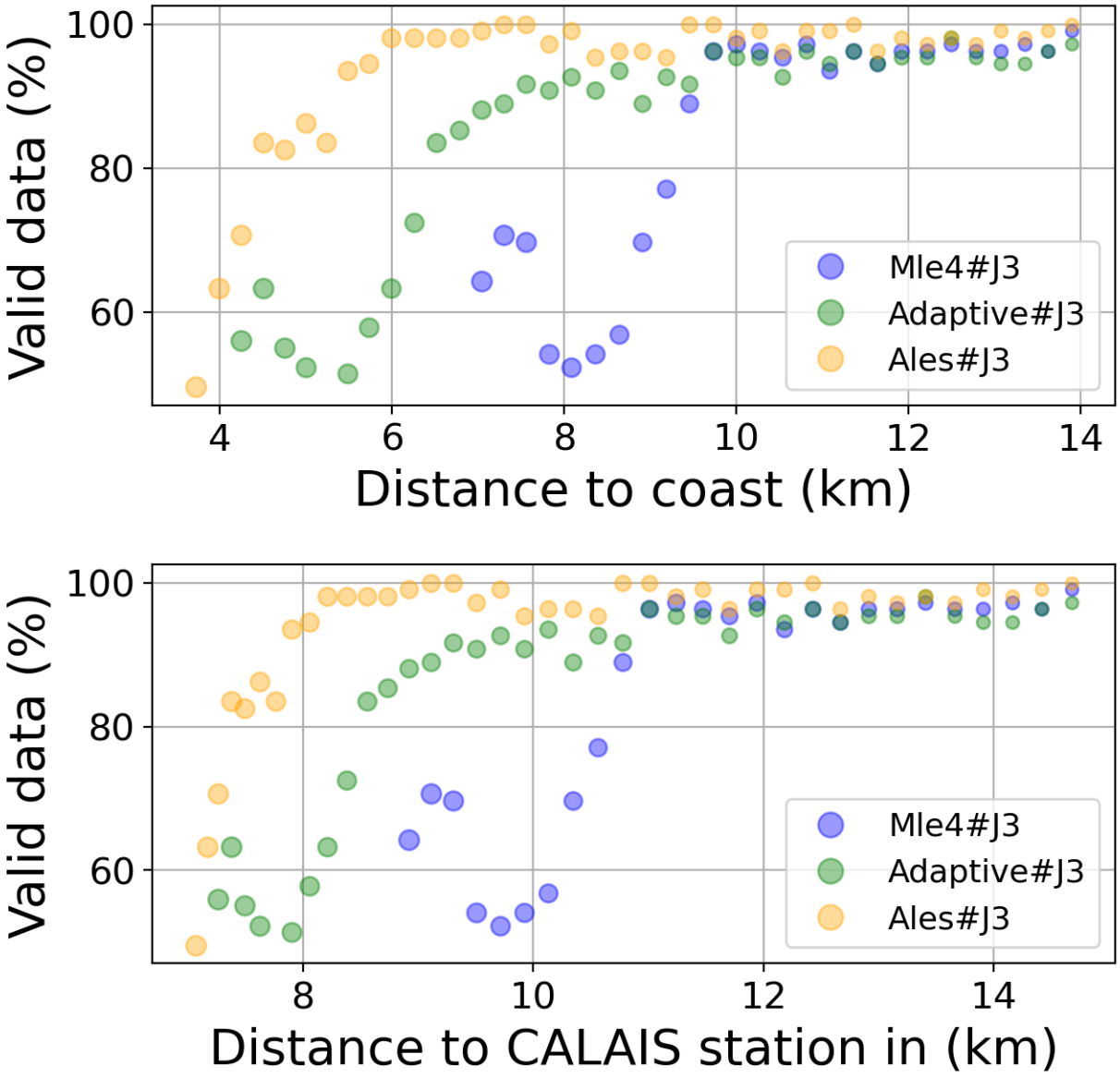

FIGURE 70 – Valid data (%) in function of distance to coast/CALAIS station

6.4.6 Std in function of distance to coast/CALAIS station

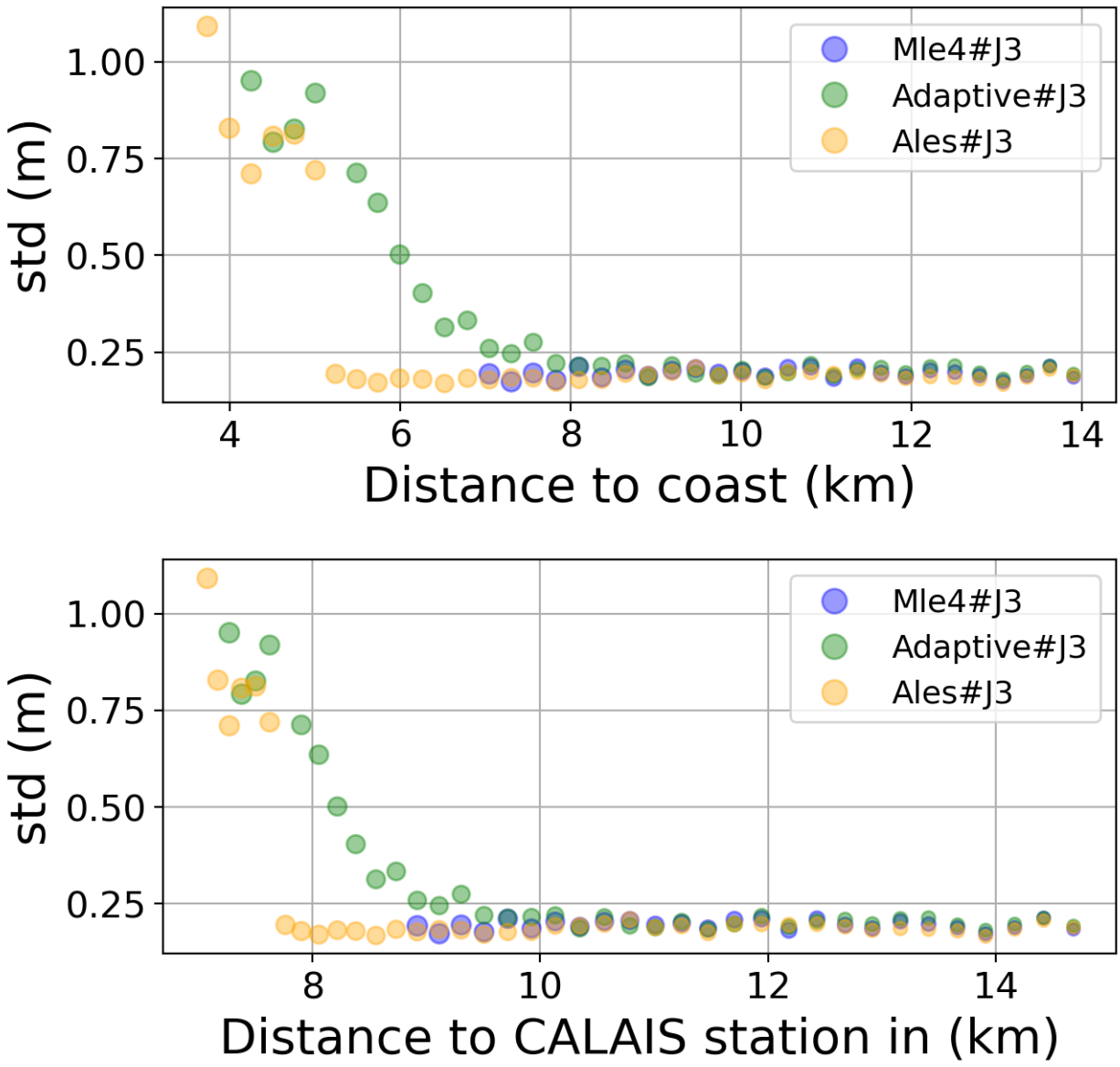

Figure 71 – Std in function of the distance to the coast/CALAIS station

6.4.7 Correlation in function of distance to coast/CALAIS station

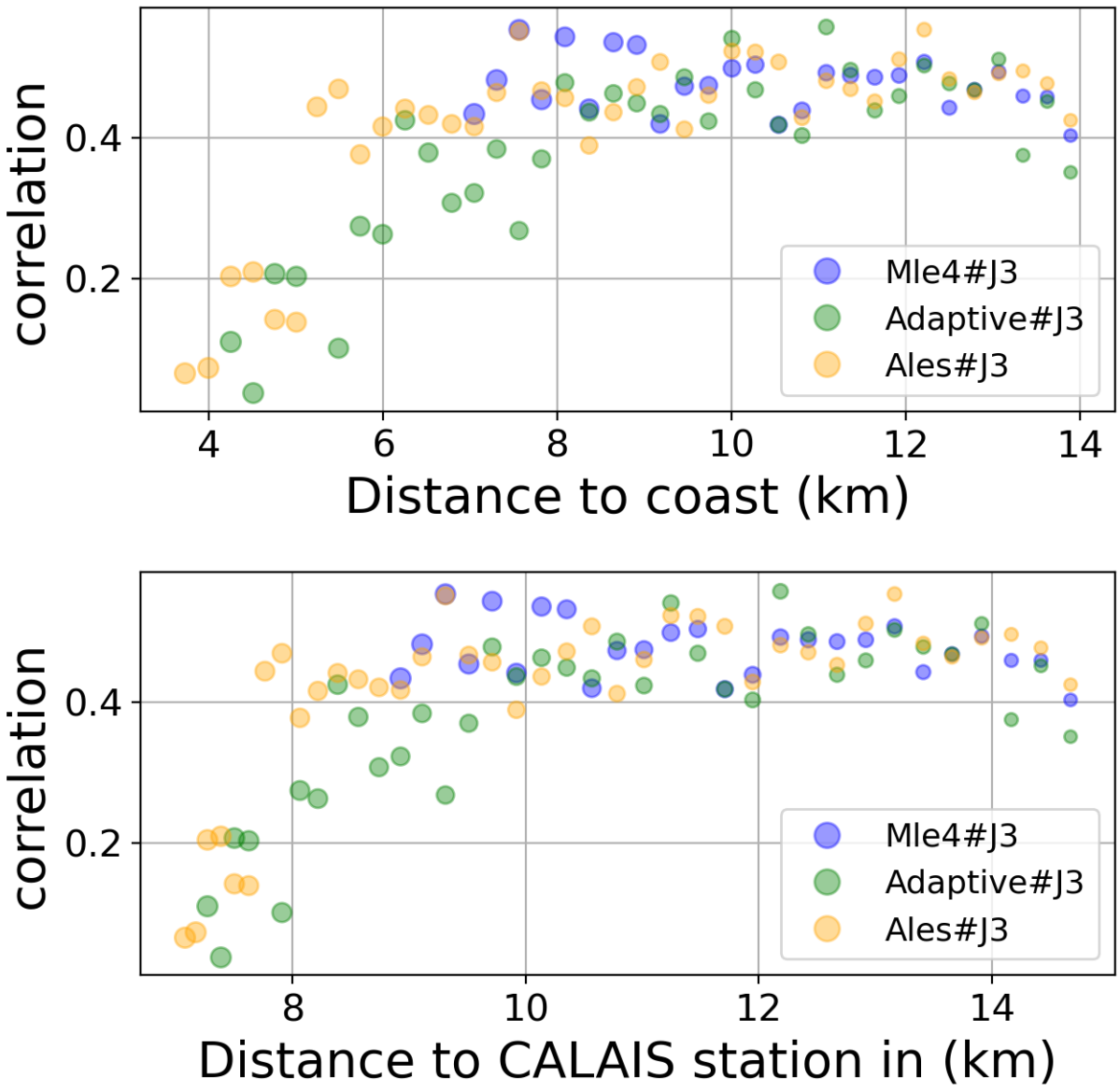

FIGURE 72 – Correlation in function of the distance to the coast/CALAIS station

6.4.8 Taylor Diagram

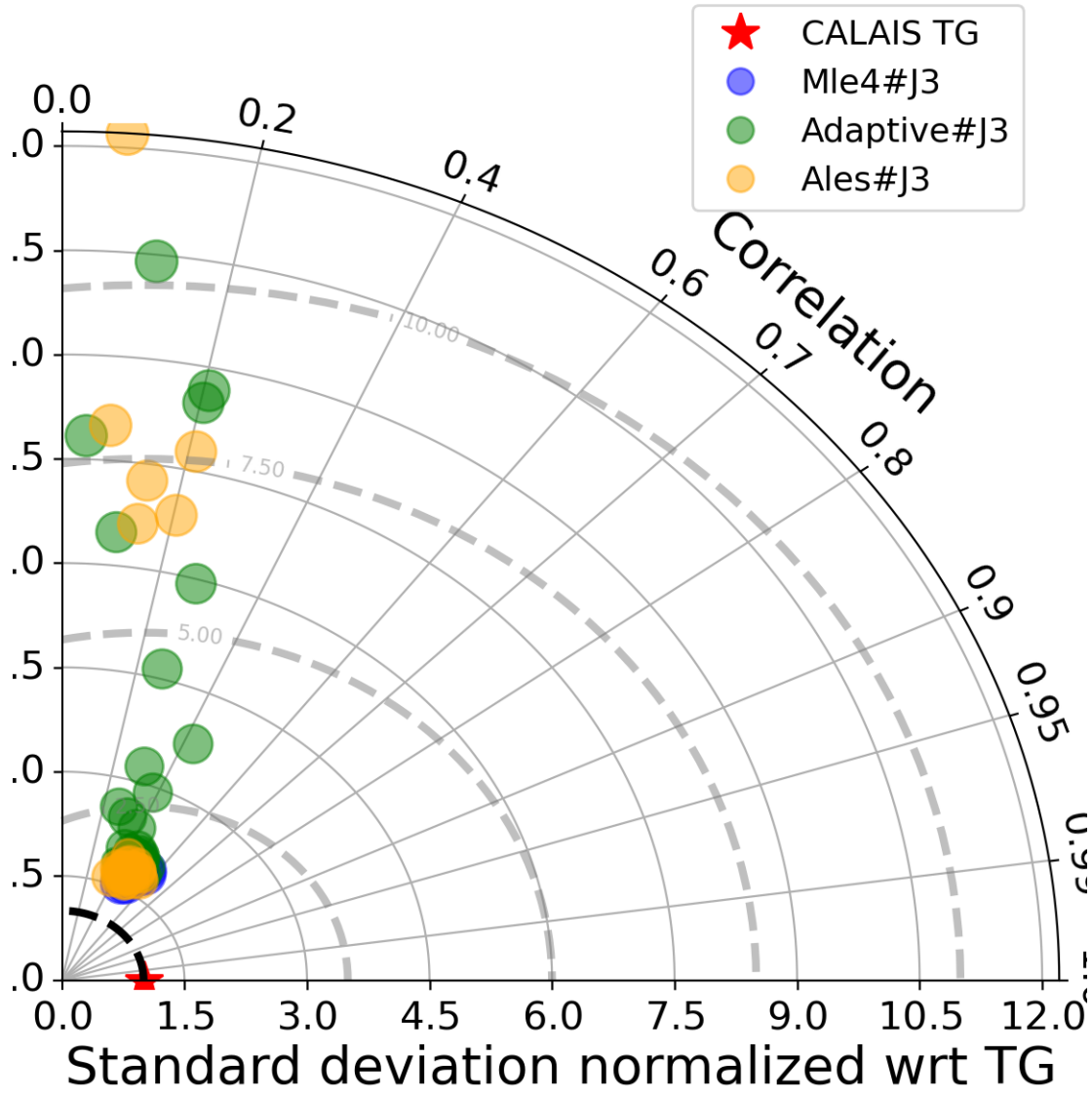

FIGURE 73 – Taylor diagram

6.4.9 Mean statistics table of products comparison with CALAIS tide gauge data

The table below contains the mean statistics of the common points between the different products in the selected area.

Product	Valid data (%)	Correlation	std (m)	rmsd (m)
Mle4#J3	84.615	0.477	0.196	0.173
Adaptive#J3	93.79	0.44	0.21	0.19
Ales#J3	98.236	0.474	0.189	0.167

FIGURE 74 – Mean statistics table of the common points in the altimetry products

6.4.10 The most correlated sla altimetry Time series with the tide gauge sla time serie

The maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie is 109 point.

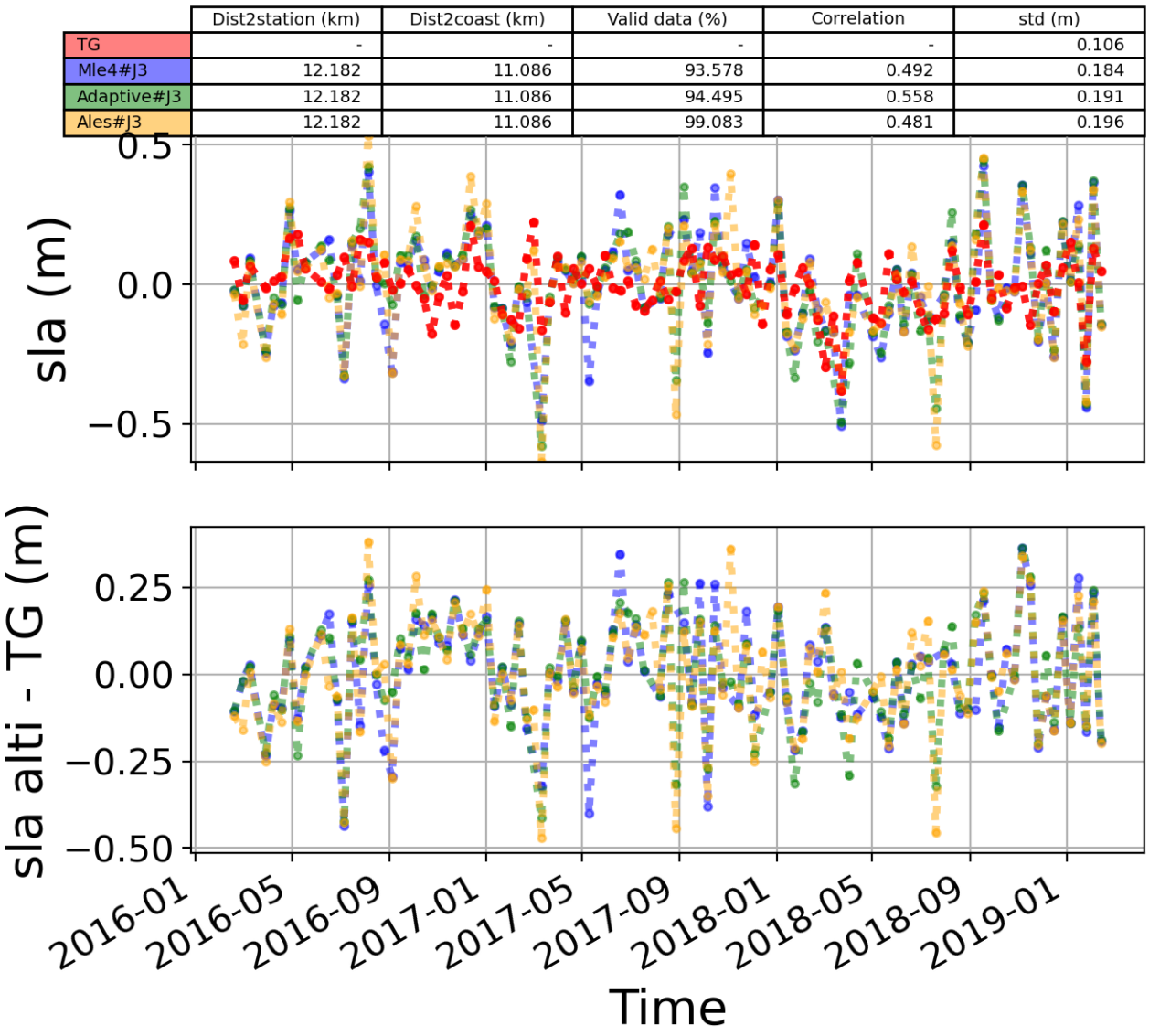

FIGURE 75 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

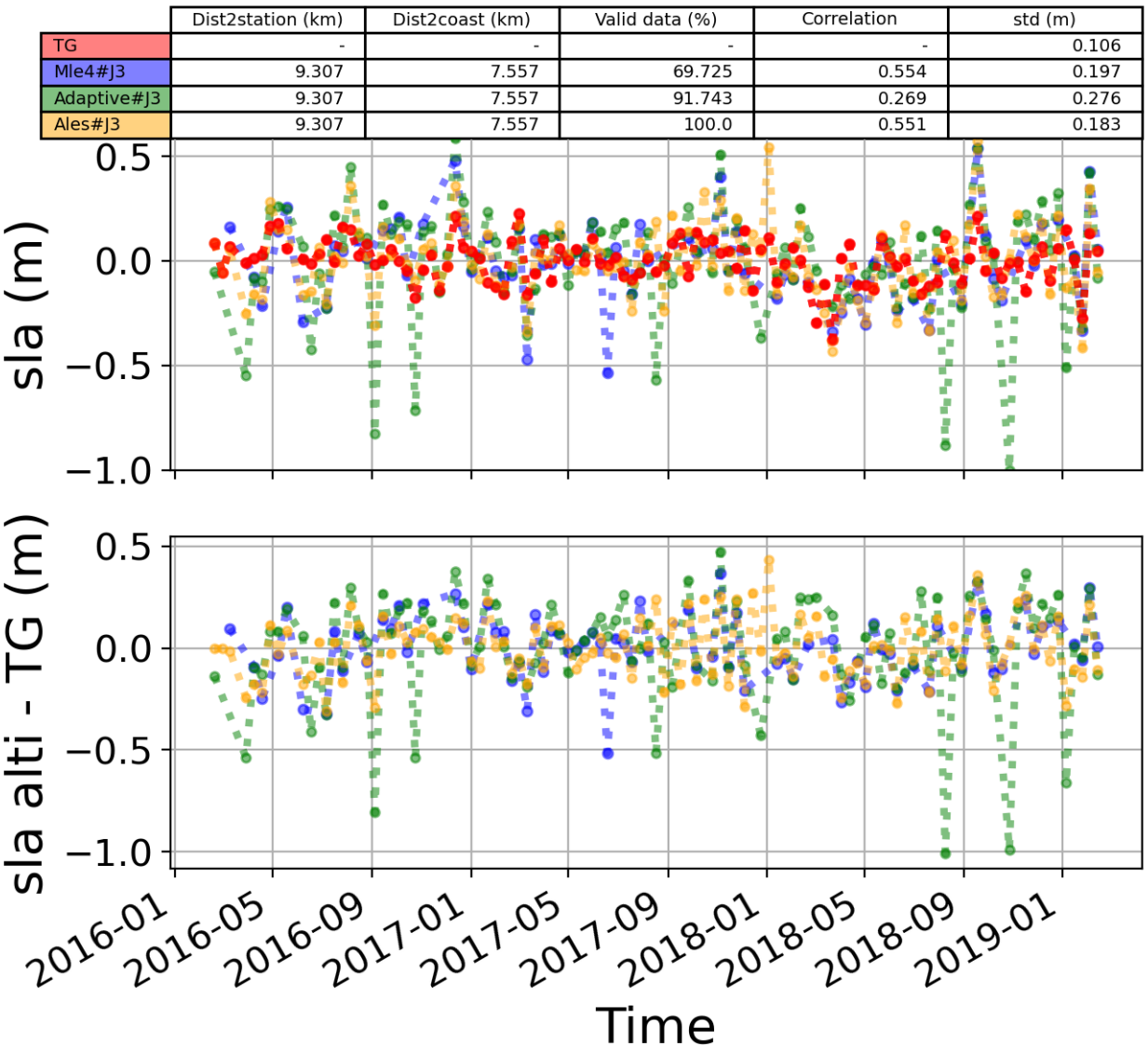

FIGURE 76 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

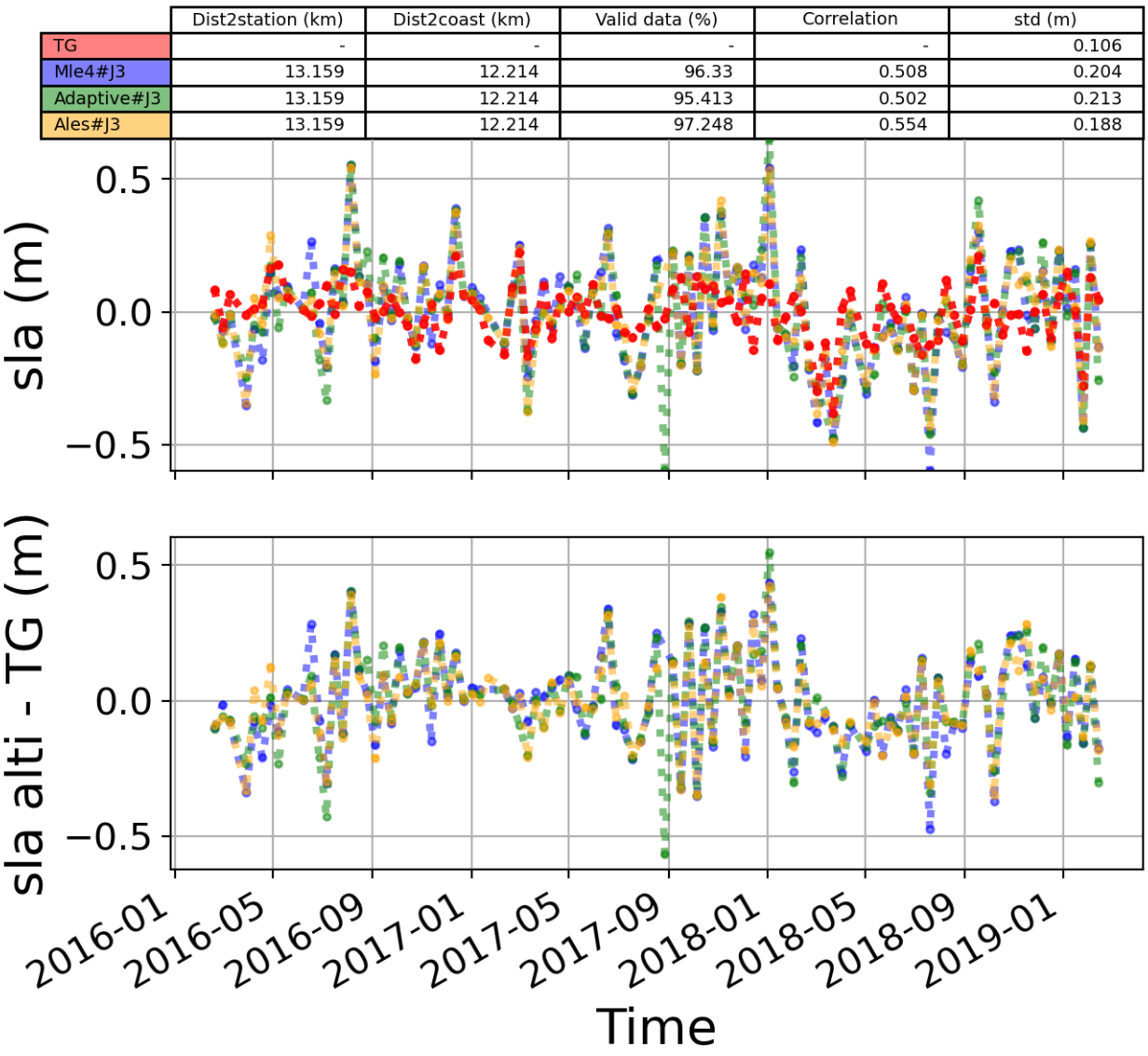

FIGURE 77 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.5 Station : Portpatrick

- Nearest track to Portpatrick station is the track number track87
- The area of interest is limited by :
  - A circle which it's center is the Portpatrick tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km

6.5.1 correlation visualization in maps view % Portpatrick tide gauge

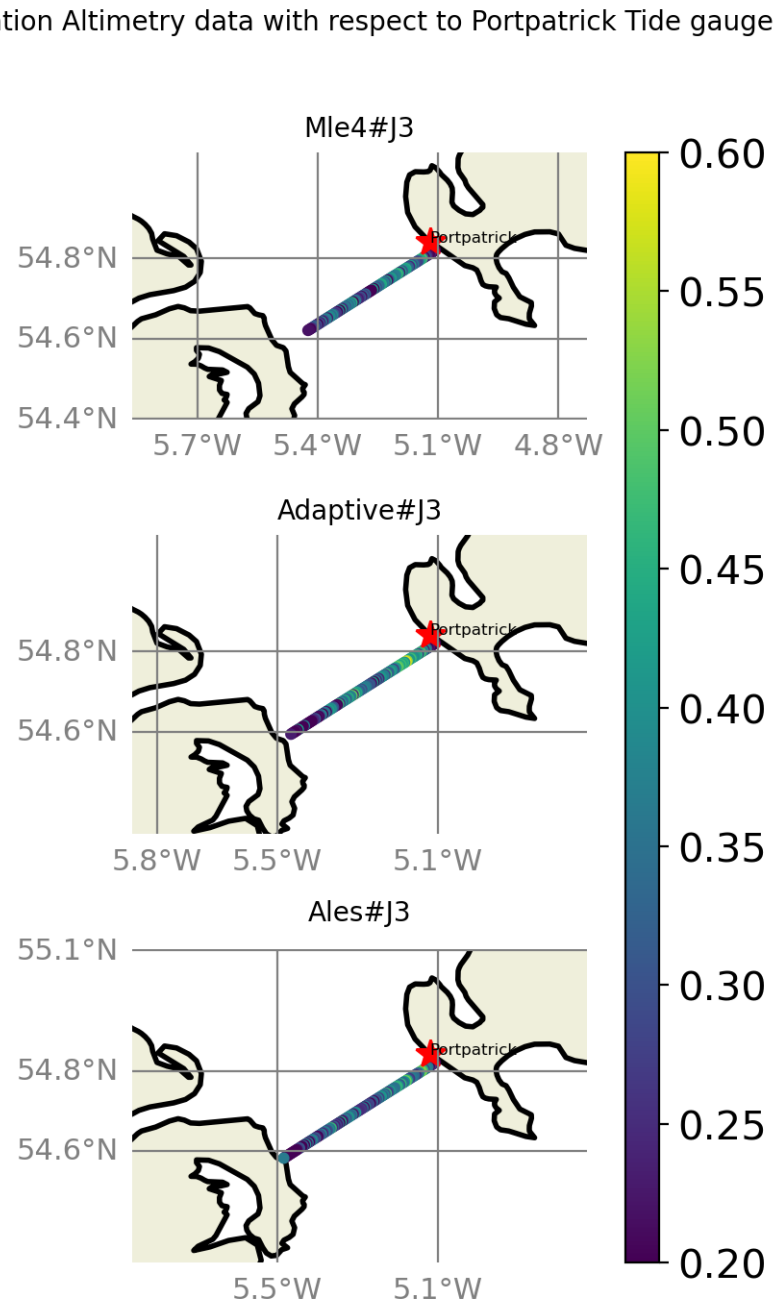

FIGURE 78 – correlation visualization in maps view % Portpatrick tide gauge

6.5.2 rmsd visualization in maps view % Portpatrick tide gauge

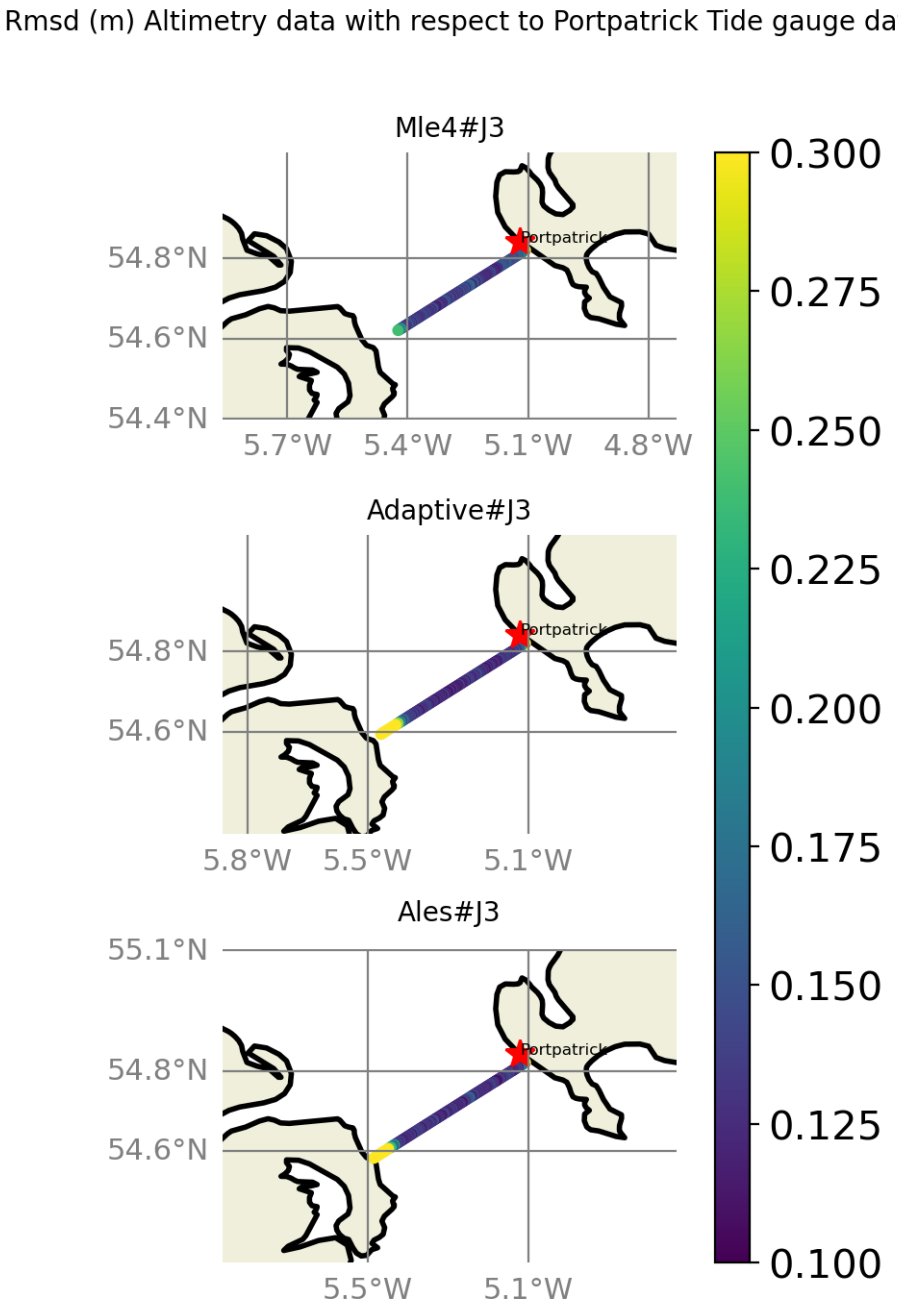

Figure 79 – rmsd visualization in maps view % Portpatrick tide gauge

6.5.3 std visualization in maps view % Portpatrick tide gauge

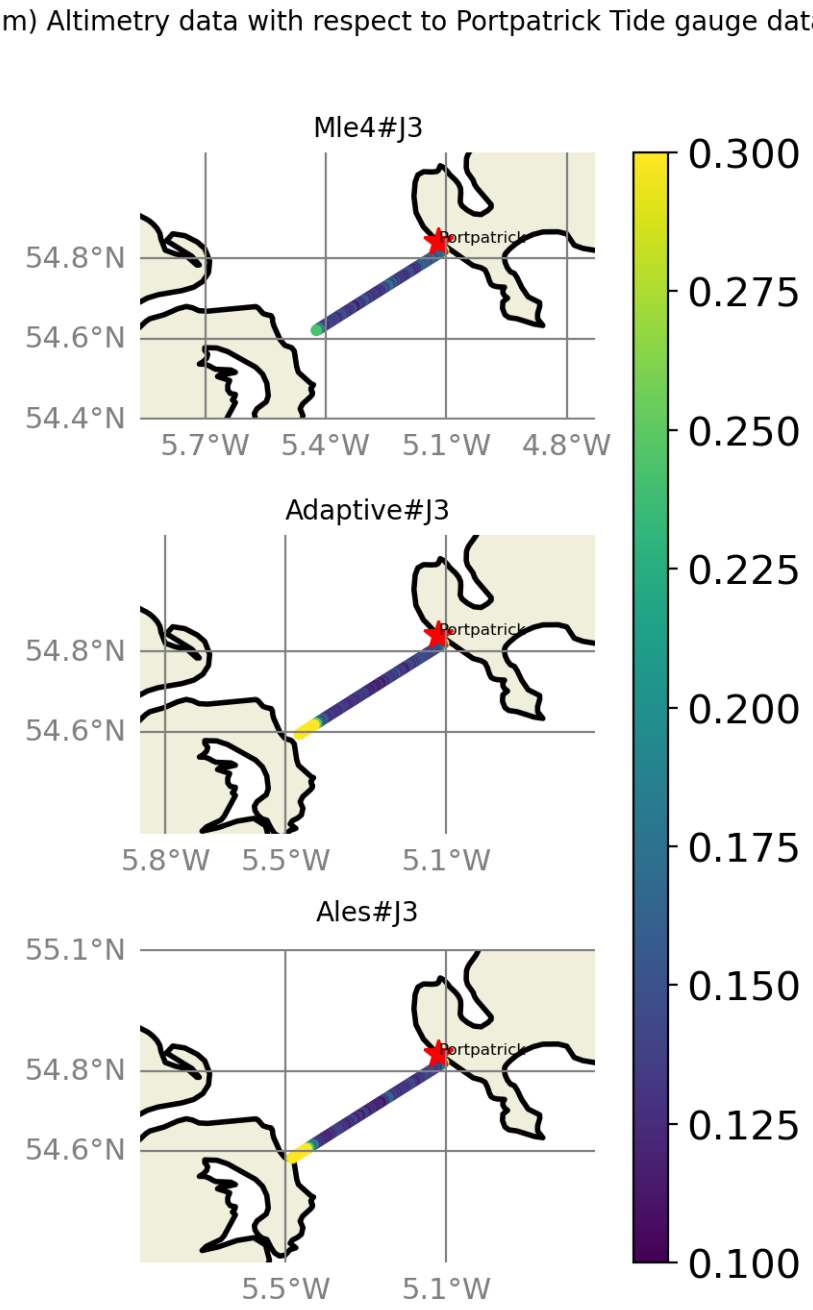

FIGURE 80 – std visualization in maps view % Portpatrick tide gauge

6.5.4 valid_data_percent visualization in maps view % Portpatrick tide gauge

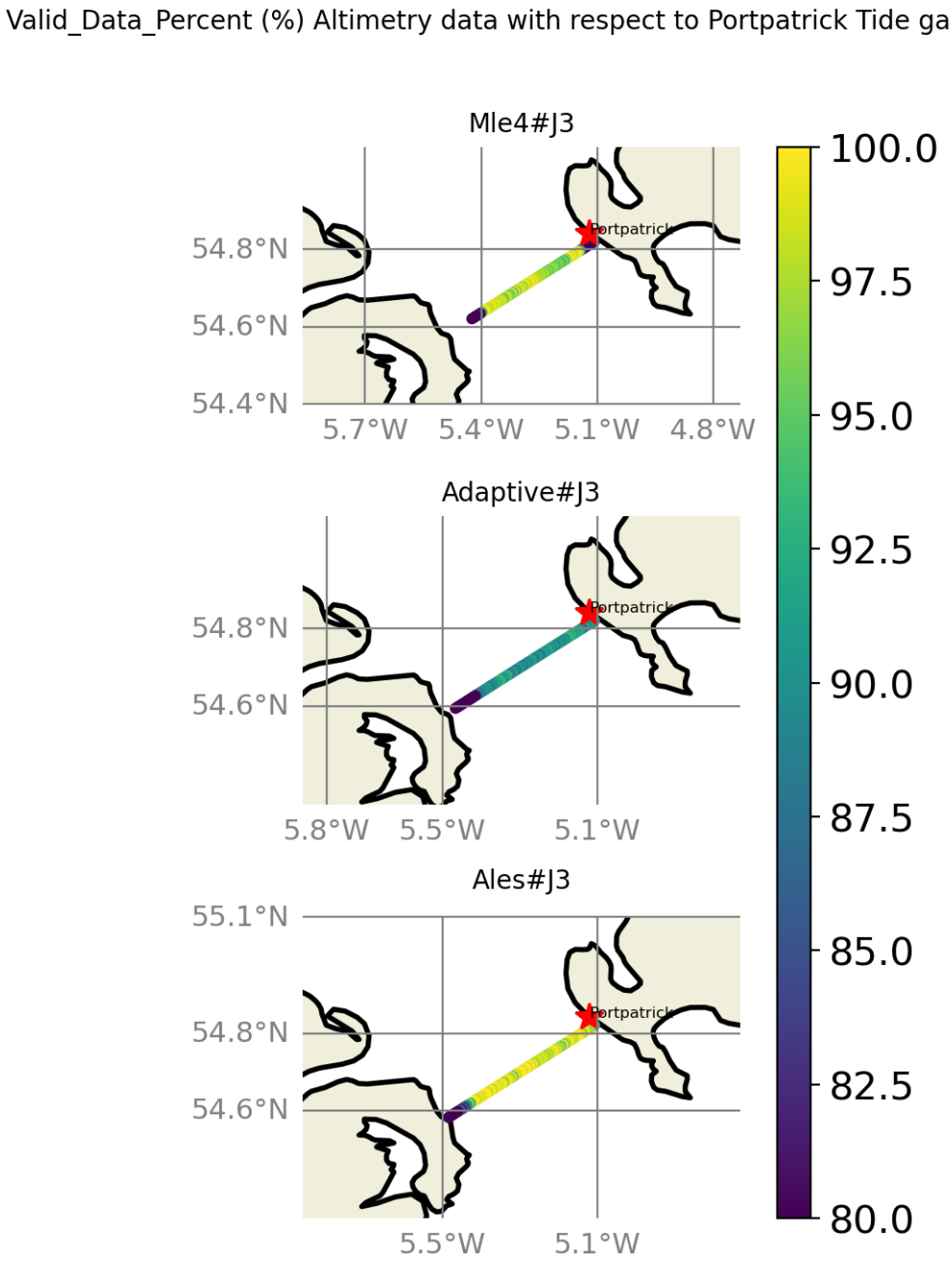

FIGURE 81 – valid_data_percent visualization in maps view % Portpatrick tide gauge

6.5.5 Valid data (%) in function of distance to coast/Portpatrick station

The formula to calculate the percentage of valid data in each time serie is;

$$pvd_i = \frac{nvd_i}{maxNB}, i = 1, np$$

Where *pvd* and *nvd* are the percentage of data and the number of altimetry data in the period covered by the tide gauge sla time serie, respectively in the time serie, i is the index of the time serie, np is the number of the selected altimetry time series. $maxNB = 59$ point is the maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie.

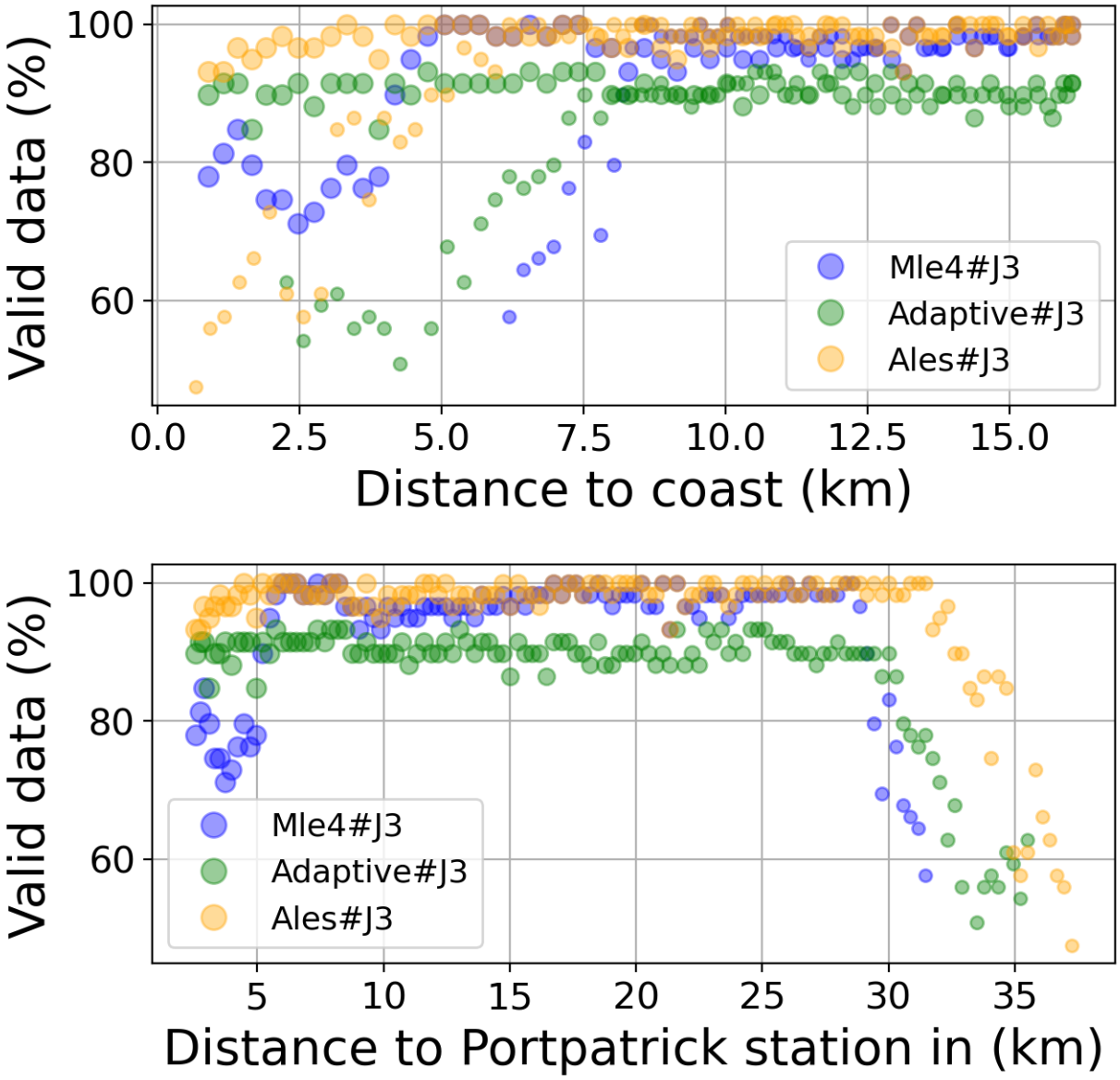

FIGURE 82 – Valid data (%) in function of distance to coast/Portpatrick station

6.5.6 Std in function of distance to coast/Portpatrick station

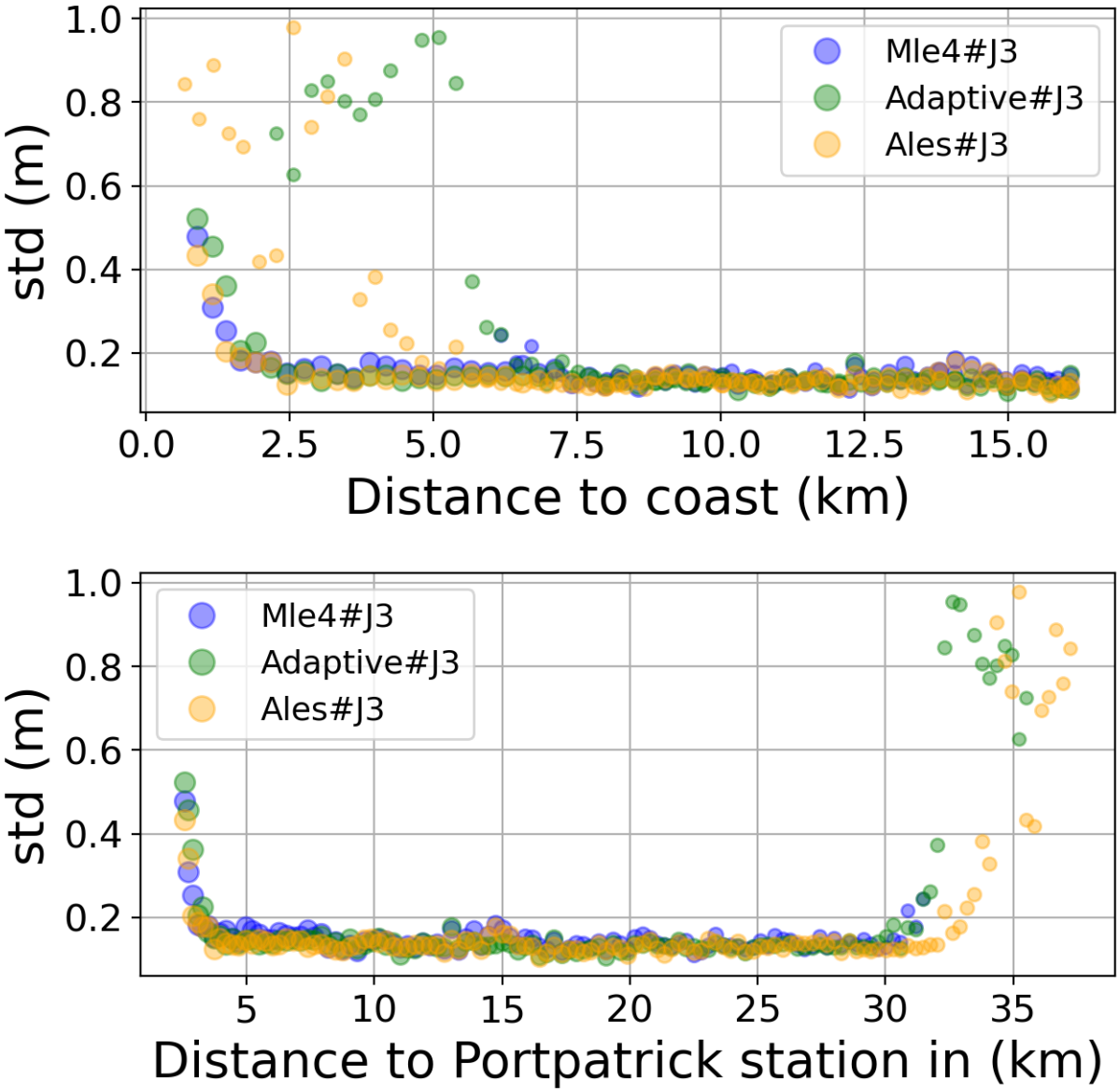

FIGURE 83 – Std in function of the distance to the coast/Portpatrick station

6.5.7 Correlation in function of distance to coast/Portpatrick station

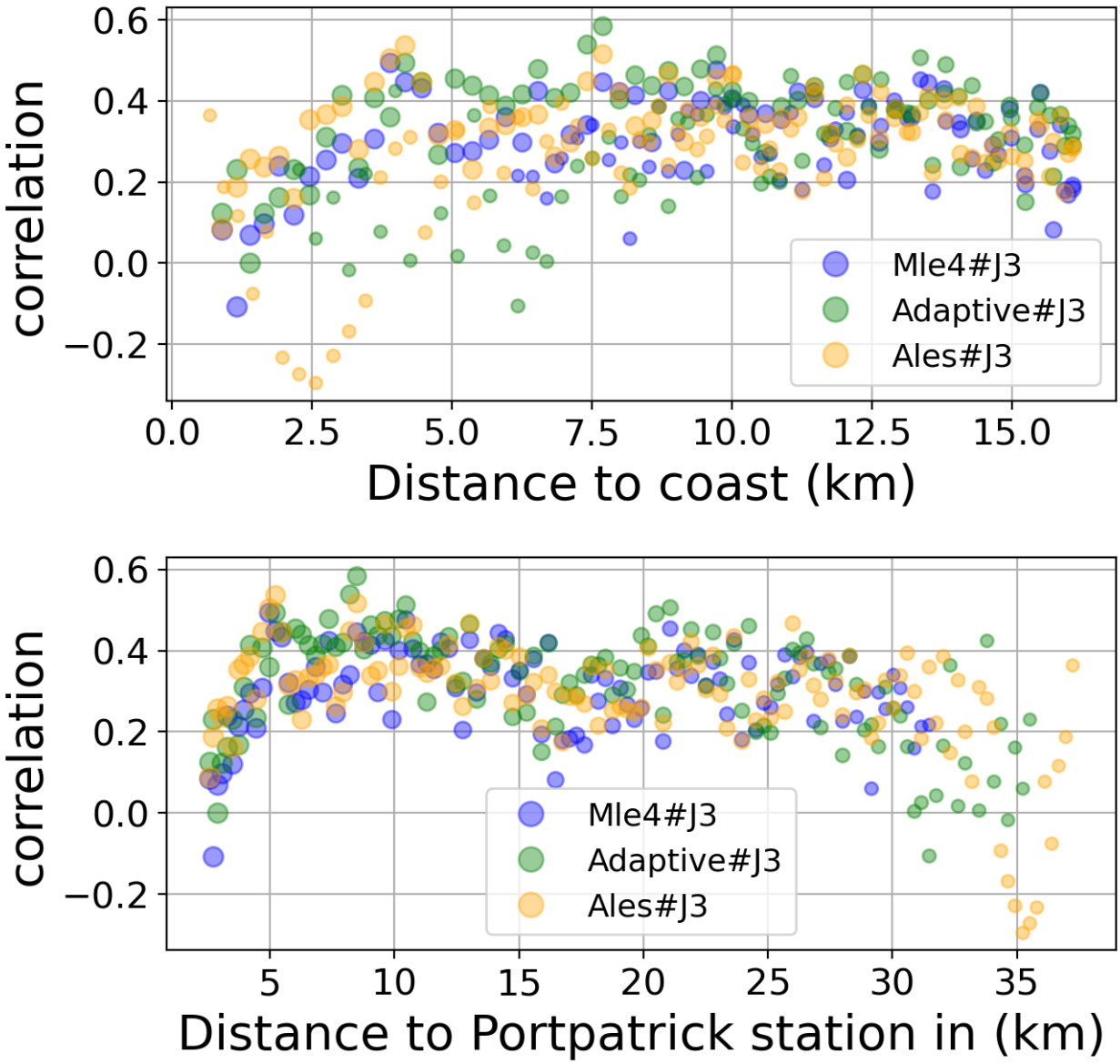

Figure 84 – Correlation in function of the distance to the coast/Portpatrick station

6.5.8 Taylor Diagram

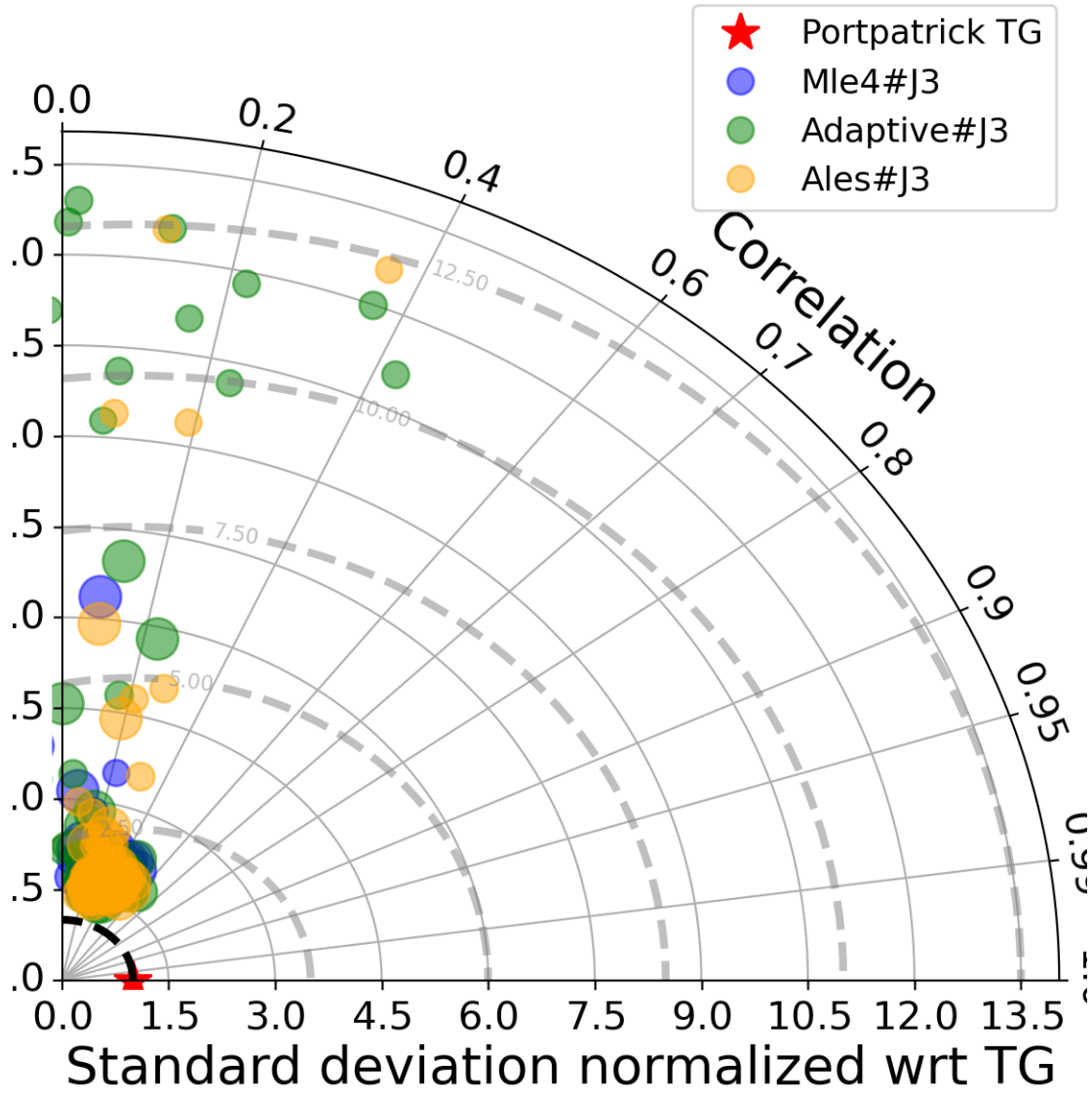

FIGURE 85 – Taylor diagram

6.5.9 Mean statistics table of products comparison with Portpatrick tide gauge data

The table below contains the mean statistics of the common points between the different products in the selected area.

Product	Valid data (%)	Correlation	std (m)	rmsd (m)
Mle4#J3	93.107	0.303	0.152	0.149
Adaptive#J3	89.895	0.334	0.147	0.143
Ales#J3	98.547	0.325	0.14	0.137

FIGURE 86 – Mean statistics table of the common points in the altimetry products

6.5.10 The most correlated sla altimetry Time series with the tide gauge sla time serie

The maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie is 59 point.

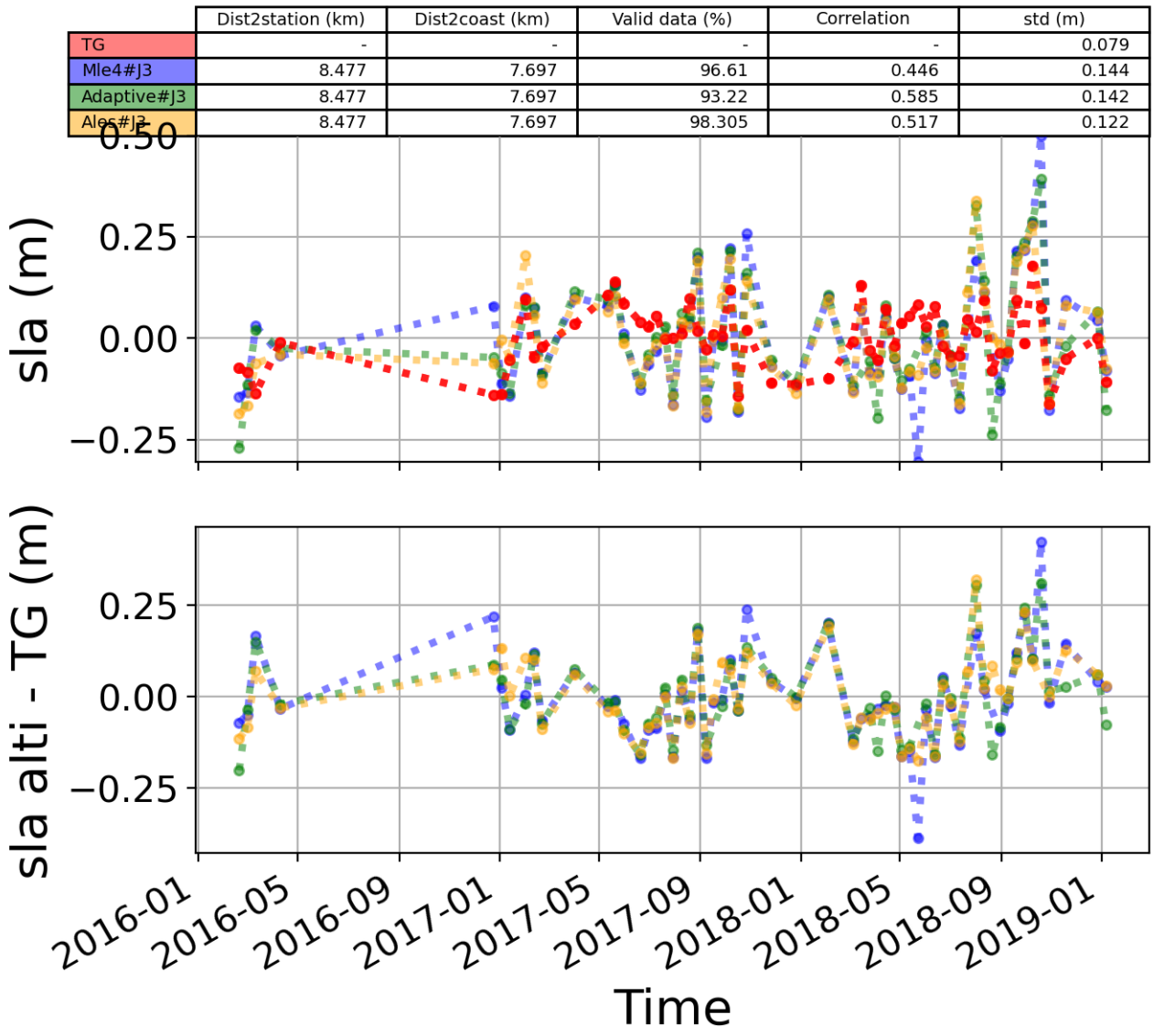

FIGURE 87 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

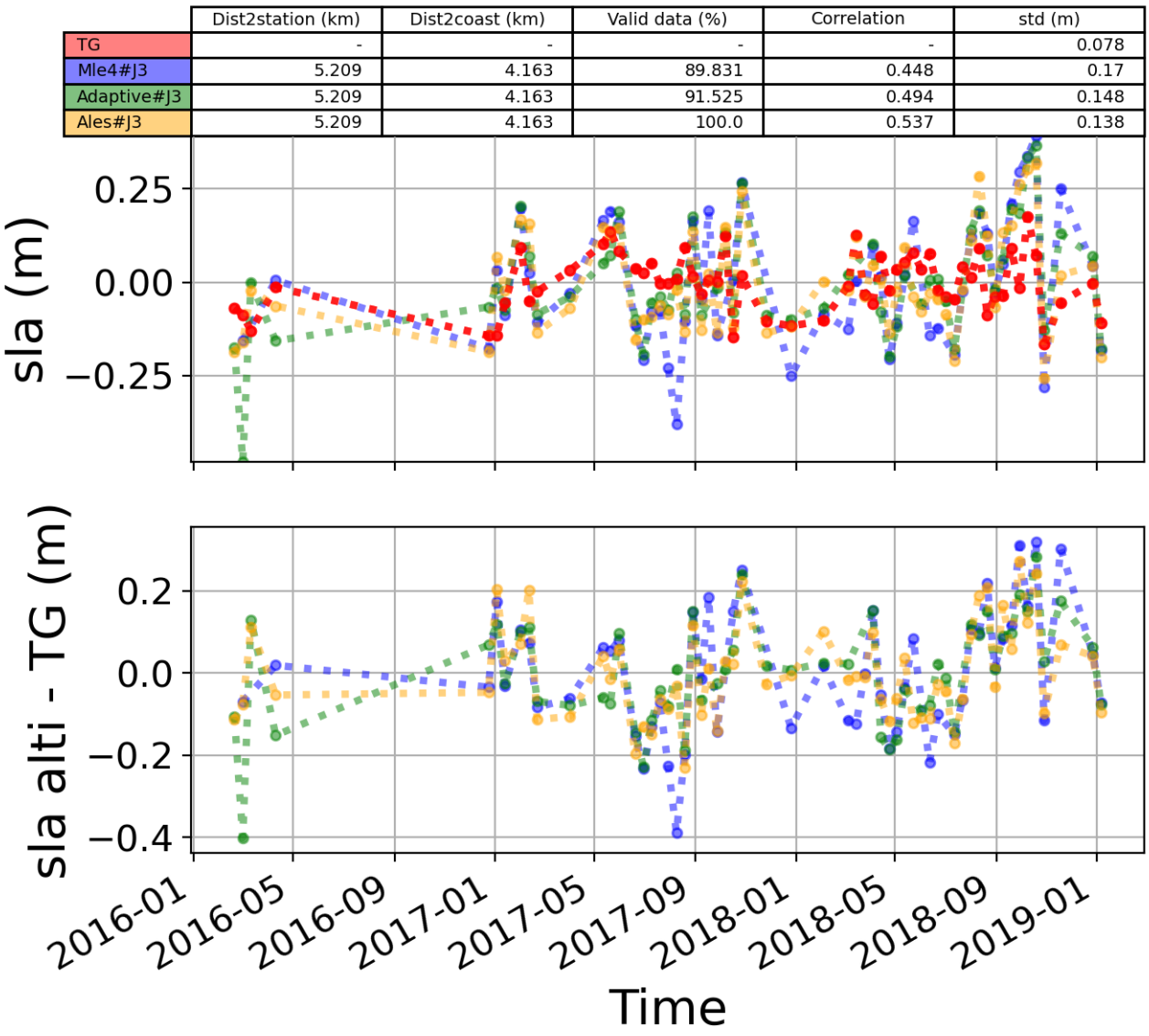

FIGURE 88 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

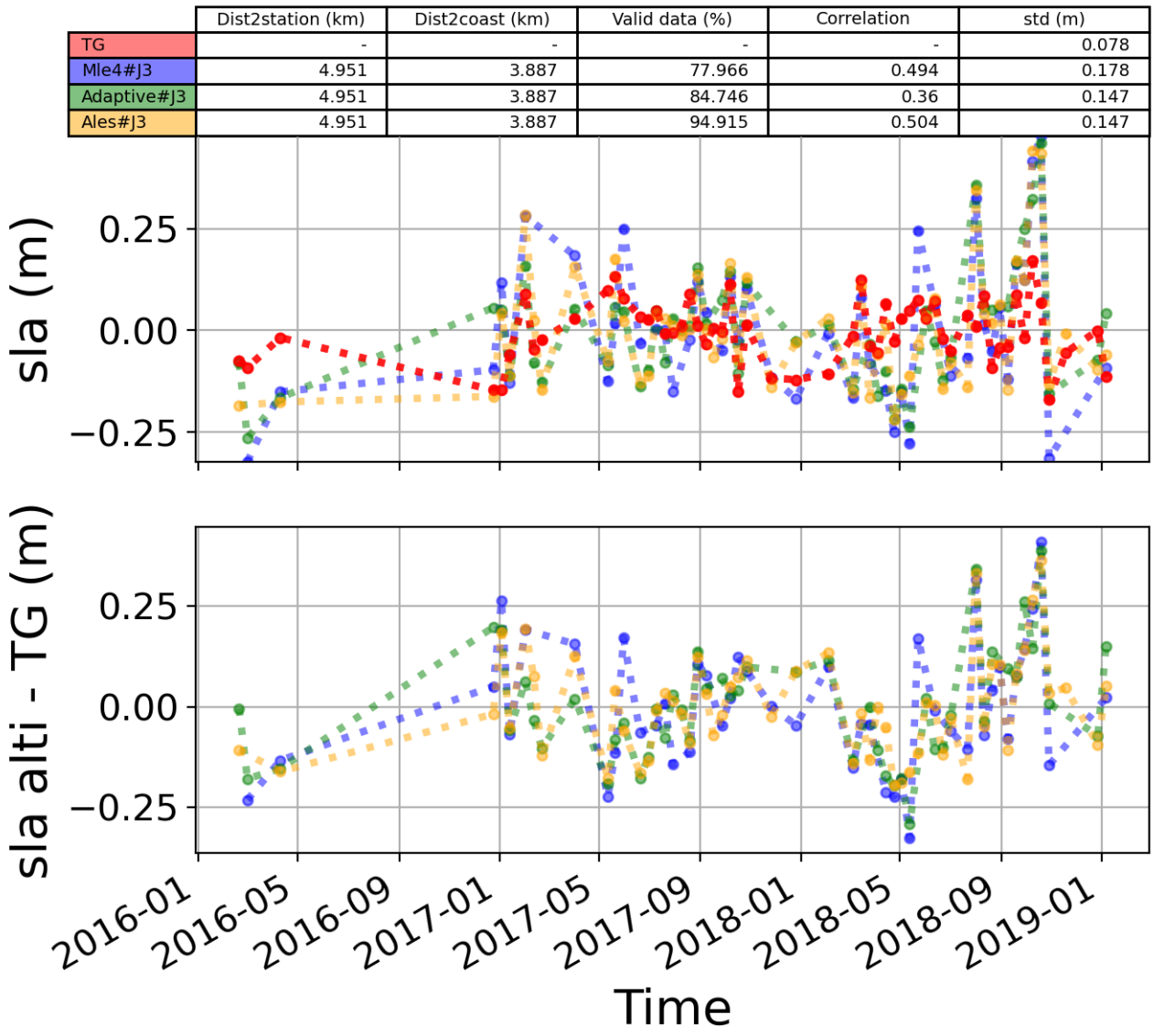

FIGURE 89 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.6 Station : Newlyn

- Nearest track to Newlyn station is the track number track70
- The area of interest is limited by :
  - A circle which it's center is the Newlyn tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km
  - Latitude limits : [49.8, 50.06] °

6.6.1 correlation visualization in maps view % Newlyn tide gauge

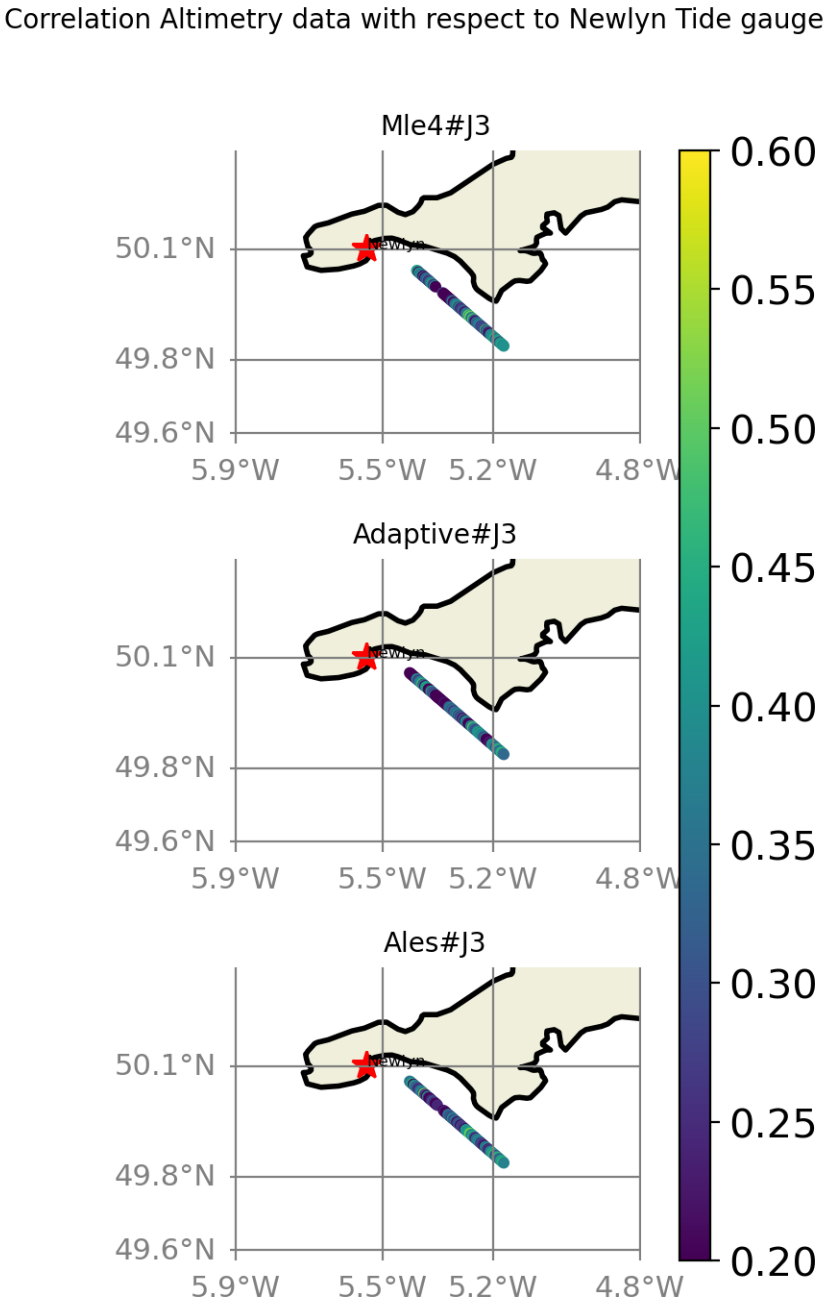

FIGURE 90 – correlation visualization in maps view % Newlyn tide gauge

6.6.2 rmsd visualization in maps view % Newlyn tide gauge

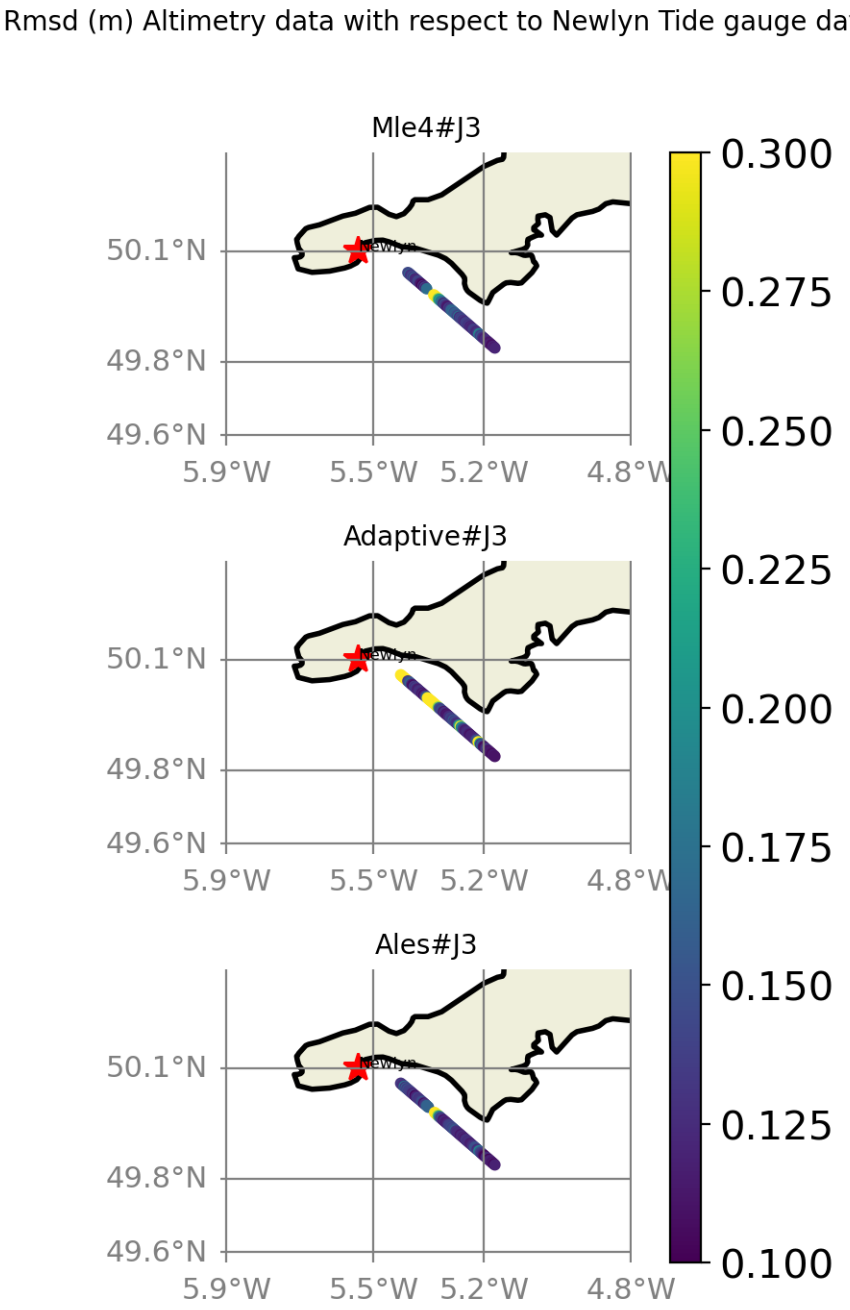

FIGURE 91 – rmsd visualization in maps view % Newlyn tide gauge

6.6.3 std visualization in maps view % Newlyn tide gauge

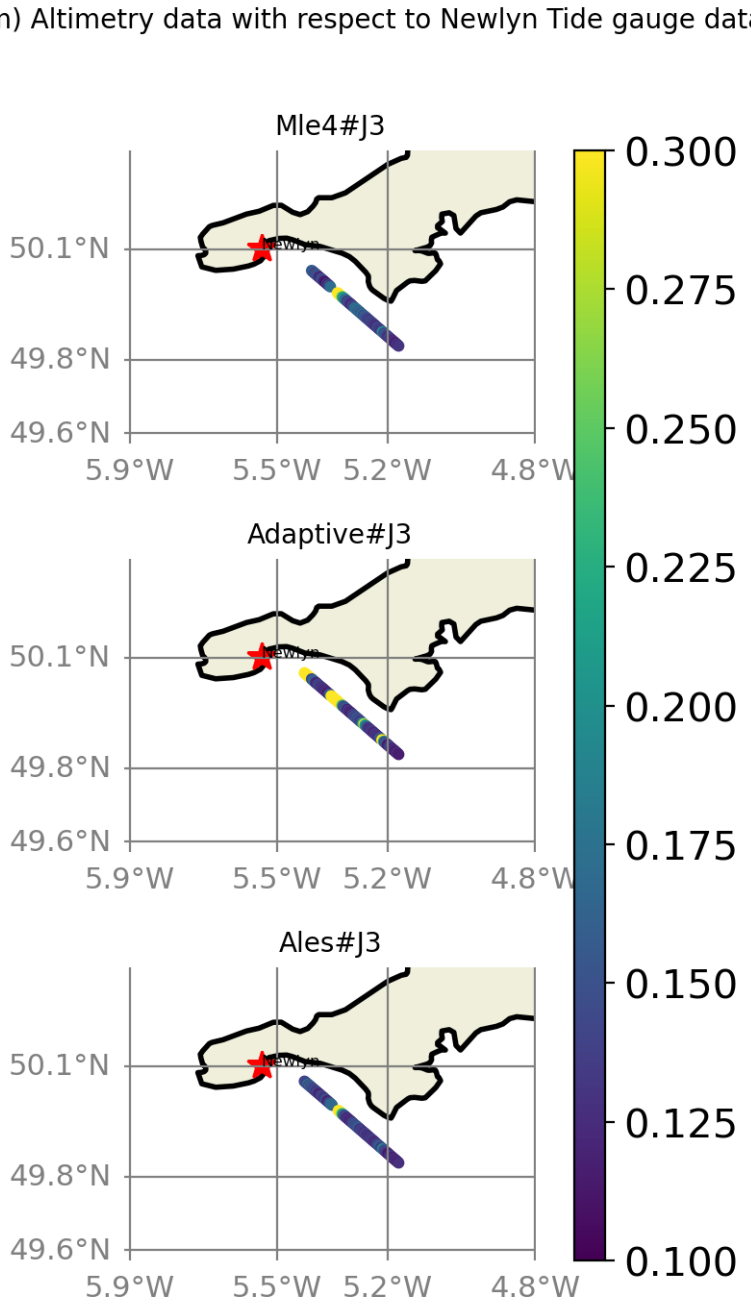

FIGURE 92 – std visualization in maps view % Newlyn tide gauge

6.6.4 valid_data_percent visualization in maps view % Newlyn tide gauge

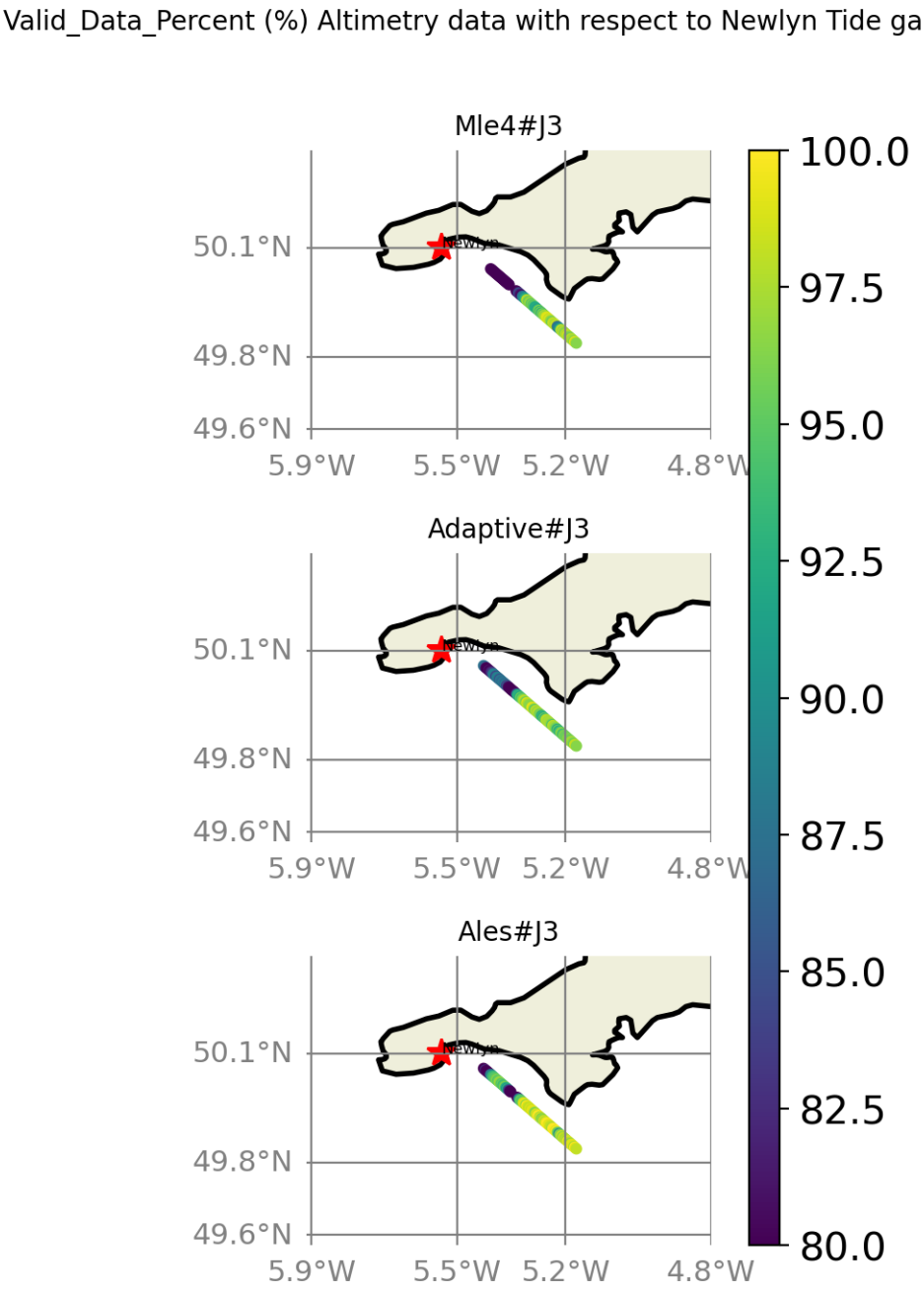

FIGURE 93 – valid_data_percent visualization in maps view % Newlyn tide gauge

6.6.5 Valid data (%) in function of distance to coast/Newlyn station

The formula to calculate the percentage of valid data in each time serie is;

$$pvd_i = \frac{nvd_i}{maxNB}, i = 1, np$$

Where *pvd* and *nvd* are the percentage of data and the number of altimetry data in the period covered by the tide gauge sla time serie, respectively in the time serie, i is the index of the time serie, np is the number of the selected altimetry time series. $maxNB = 111$ point is the maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie.

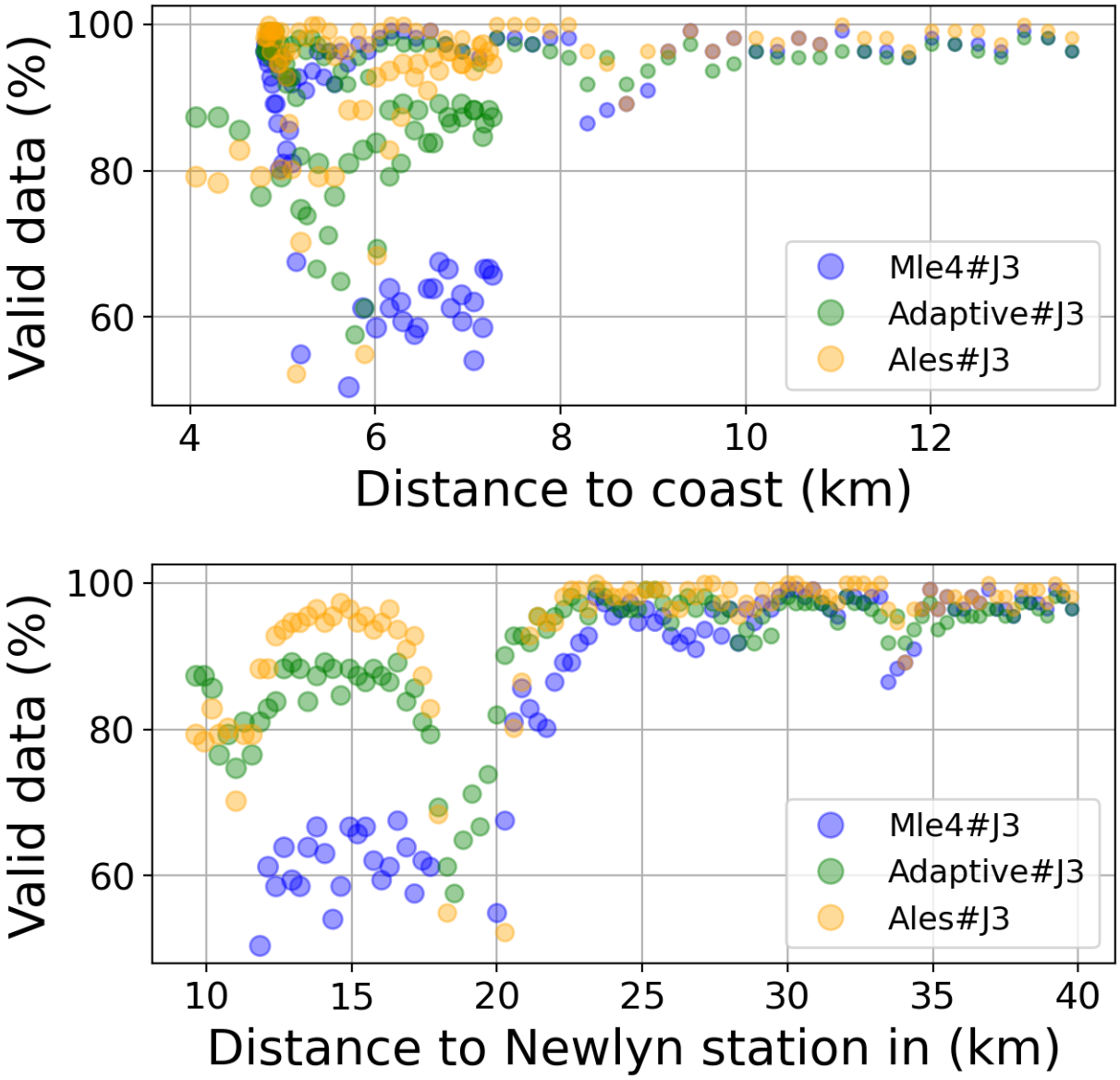

FIGURE 94 – Valid data (%) in function of distance to coast/Newlyn station

6.6.6 Std in function of distance to coast/Newlyn station

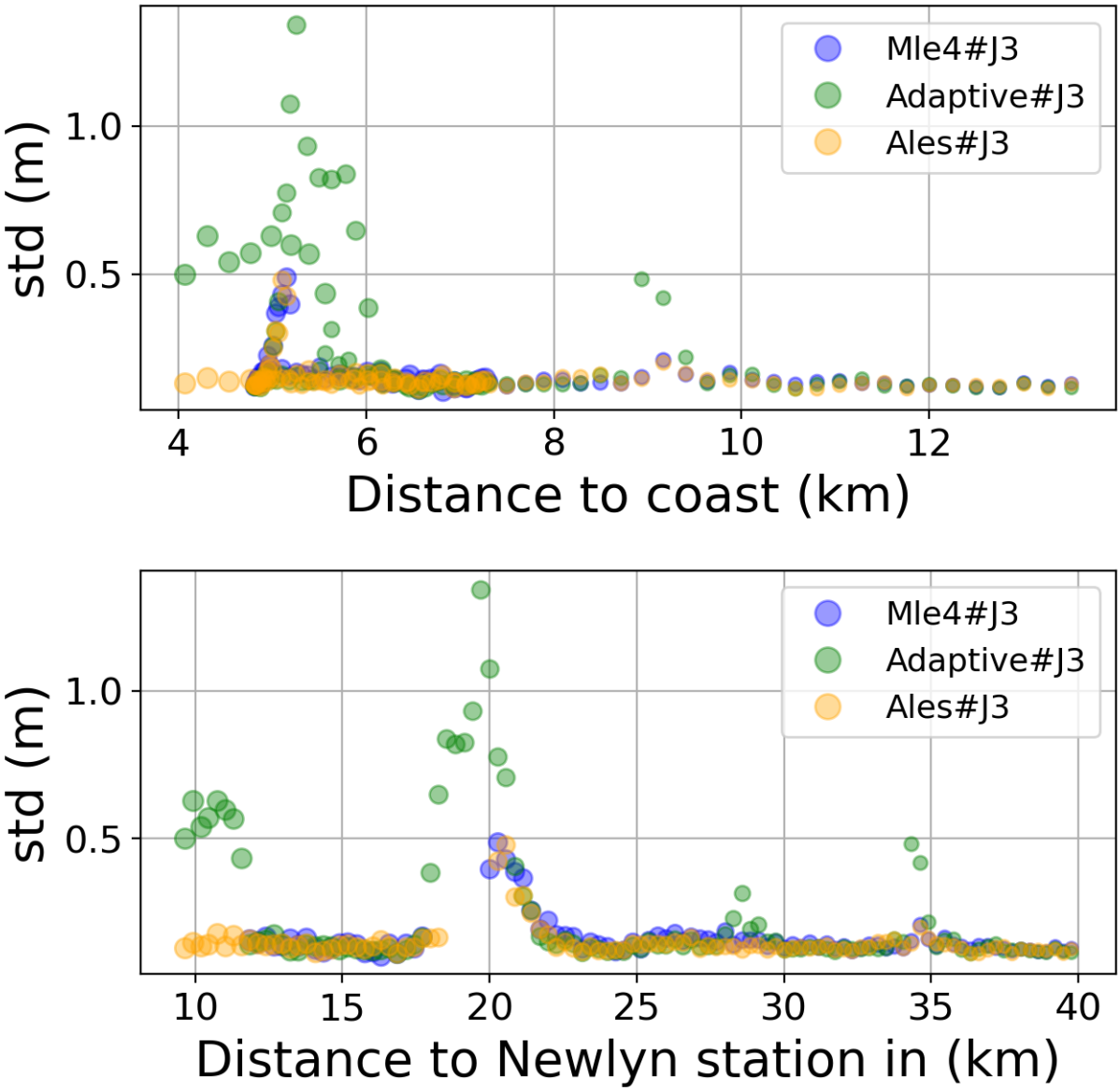

Figure 95 – Std in function of the distance to the coast/Newlyn station

6.6.7 Correlation in function of distance to coast/Newlyn station

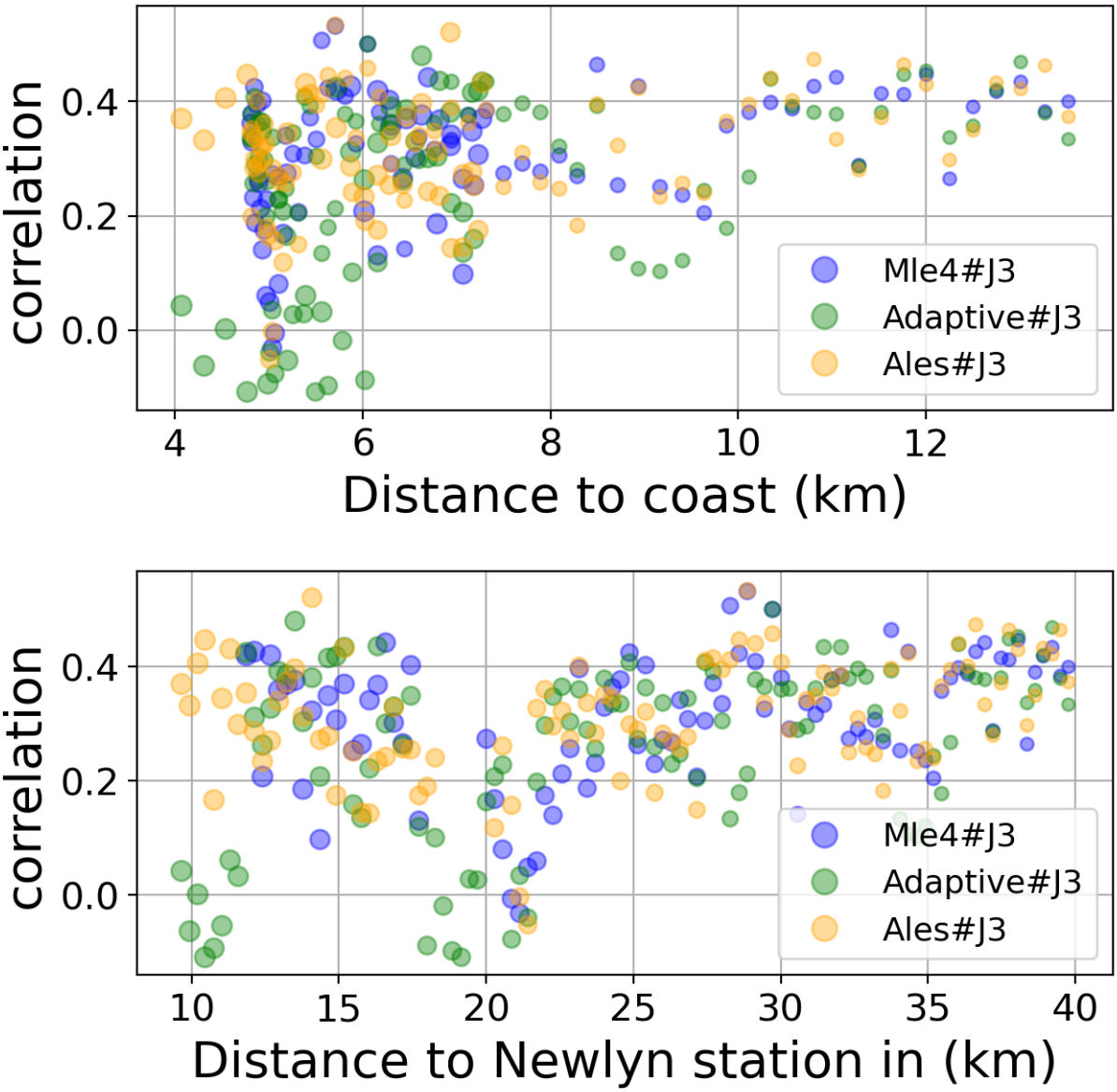

FIGURE 96 – Correlation in function of the distance to the coast/Newlyn station

6.6.8 Taylor Diagram

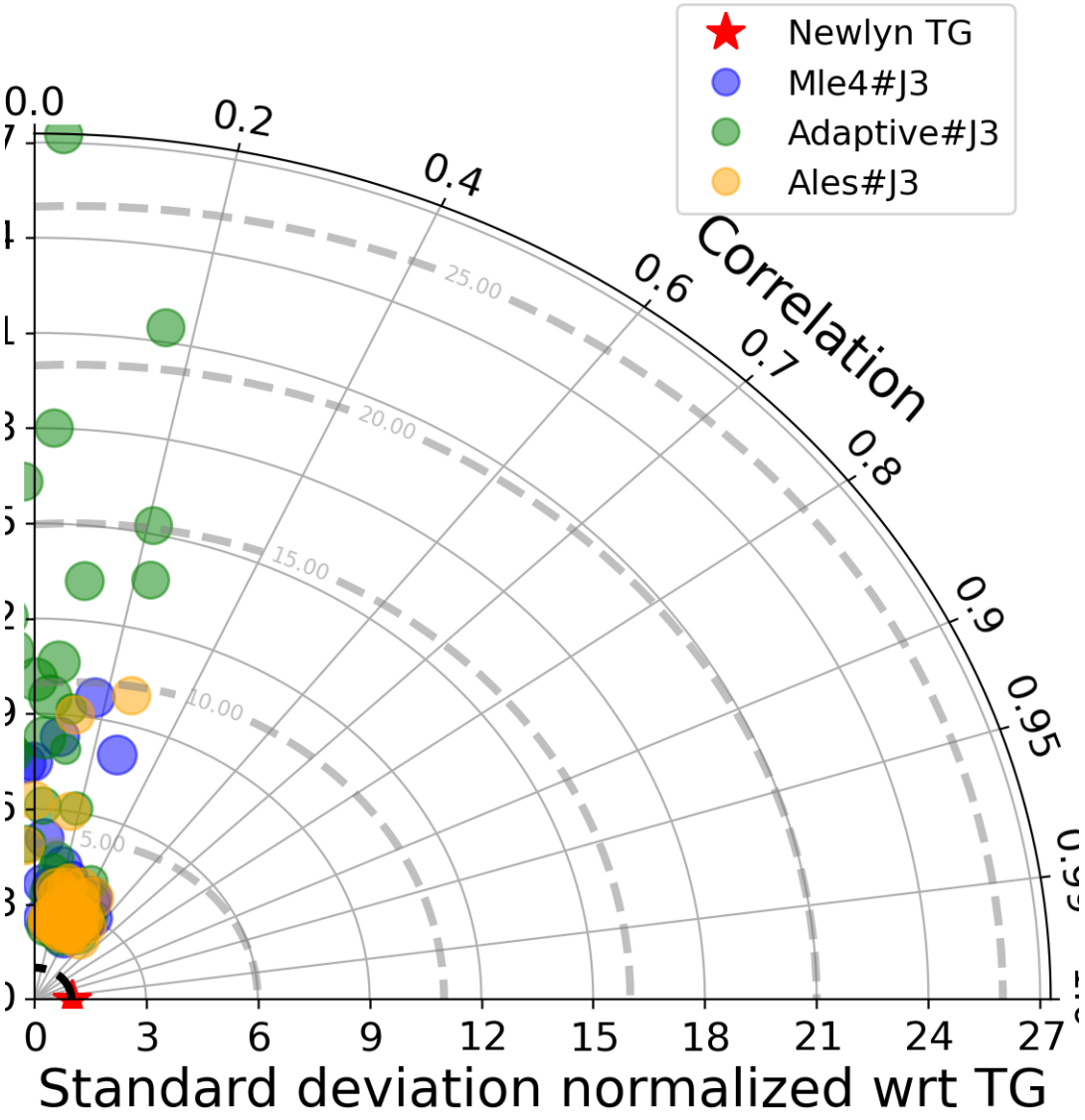

FIGURE 97 – Taylor diagram

6.6.9 Mean statistics table of products comparison with Newlyn tide gauge data

The table below contains the mean statistics of the common points between the different products in the selected area.

Product	Valid data (%)	Correlation	std (m)	rmsd (m)
Mle4#J3	86.239	0.313	0.159	0.151
Adaptive#J3	93.506	0.31	0.168	0.161
Ales#J3	95.981	0.315	0.149	0.142

FIGURE 98 – Mean statistics table of the common points in the altimetry products

6.6.10 The most correlated sla altimetry Time series with the tide gauge sla time serie

The maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie is 111 point.

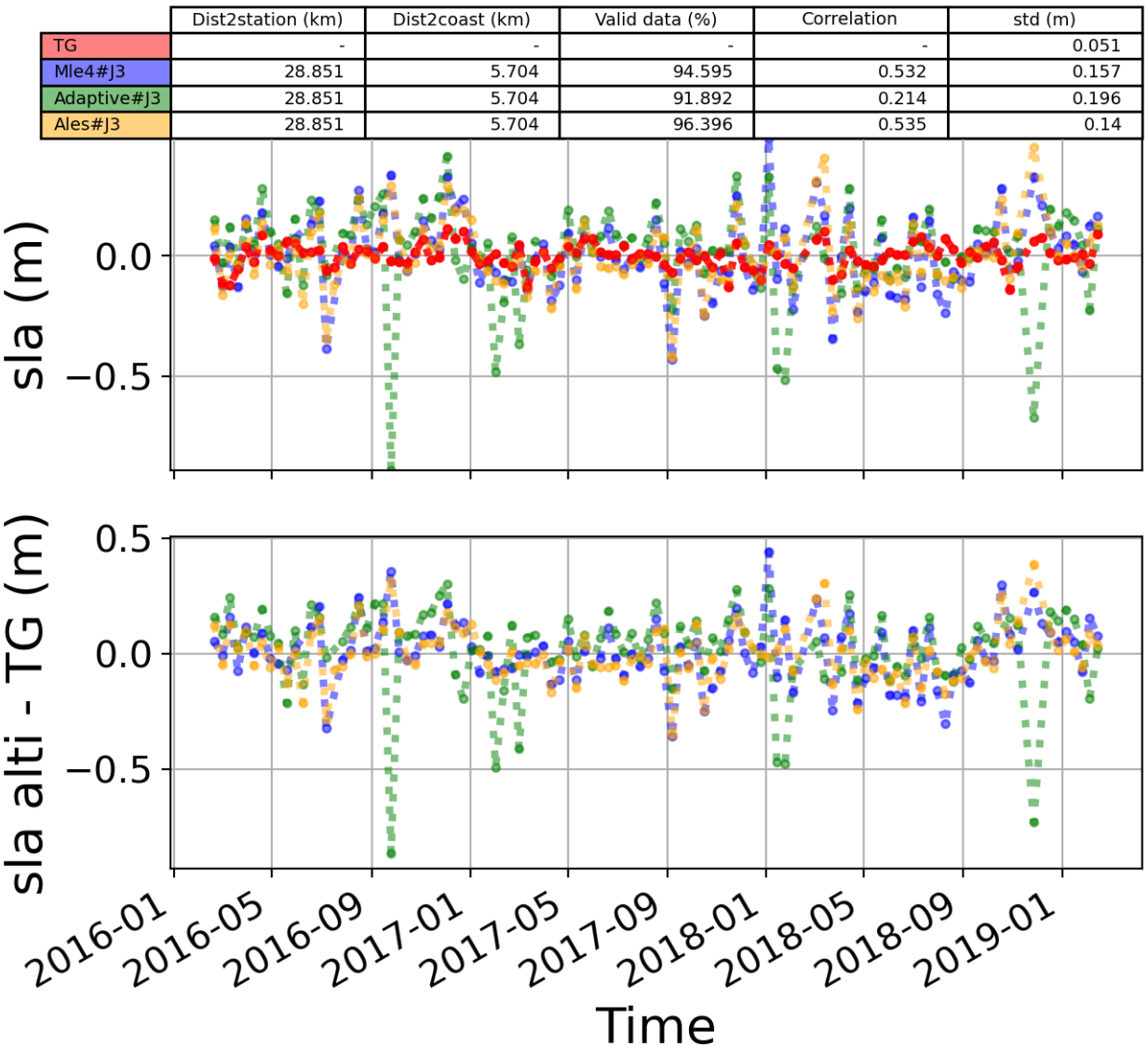

FIGURE 99 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

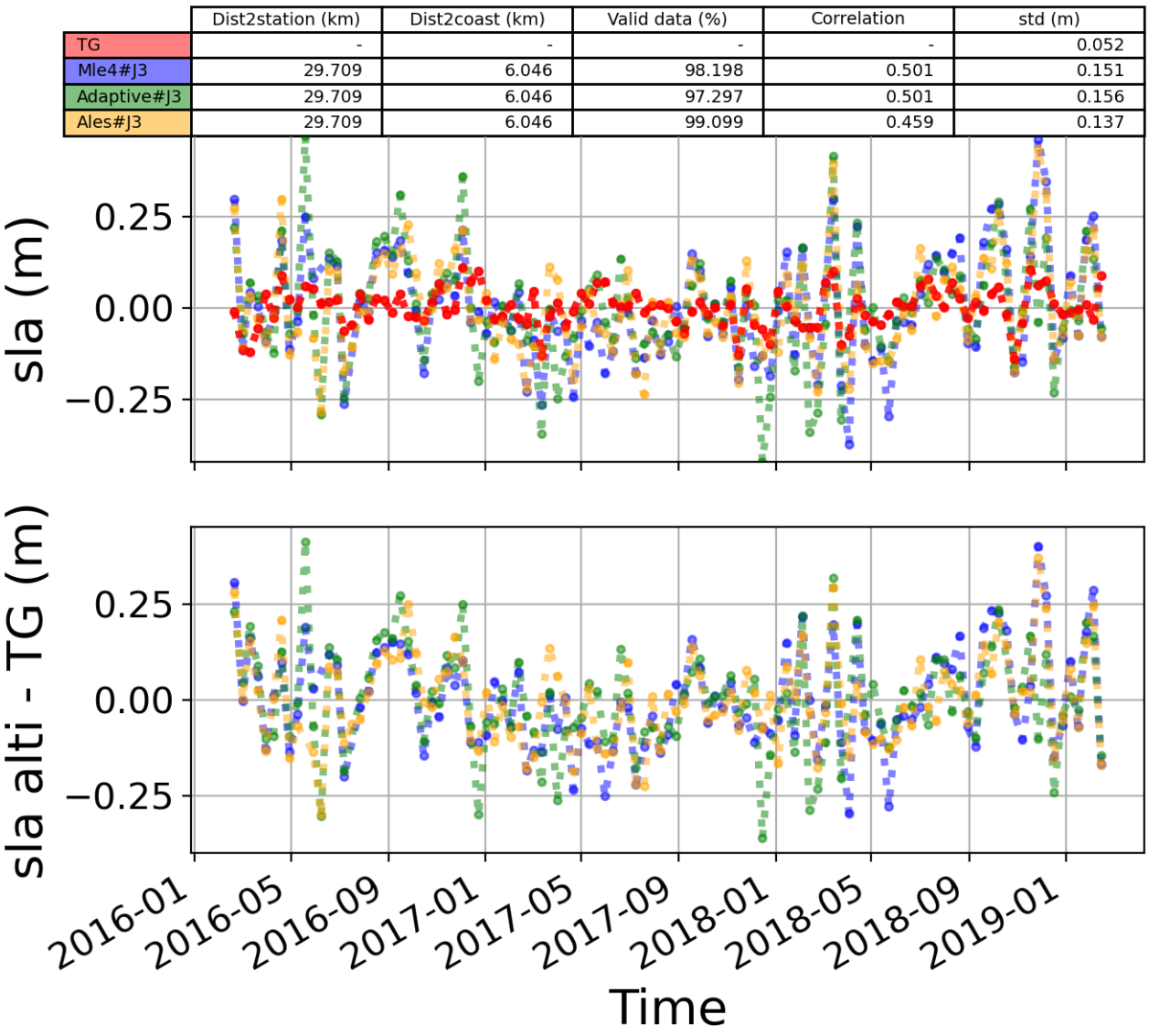

FIGURE 100 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.7 Station : LE_CONQUET

- Nearest track to LE_CONQUET station is the track number track61
- The area of interest is limited by :
  - A circle which it's center is the LE_CONQUET tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km

6.7.1 correlation visualization in maps view % LE_CONQUET tide gauge

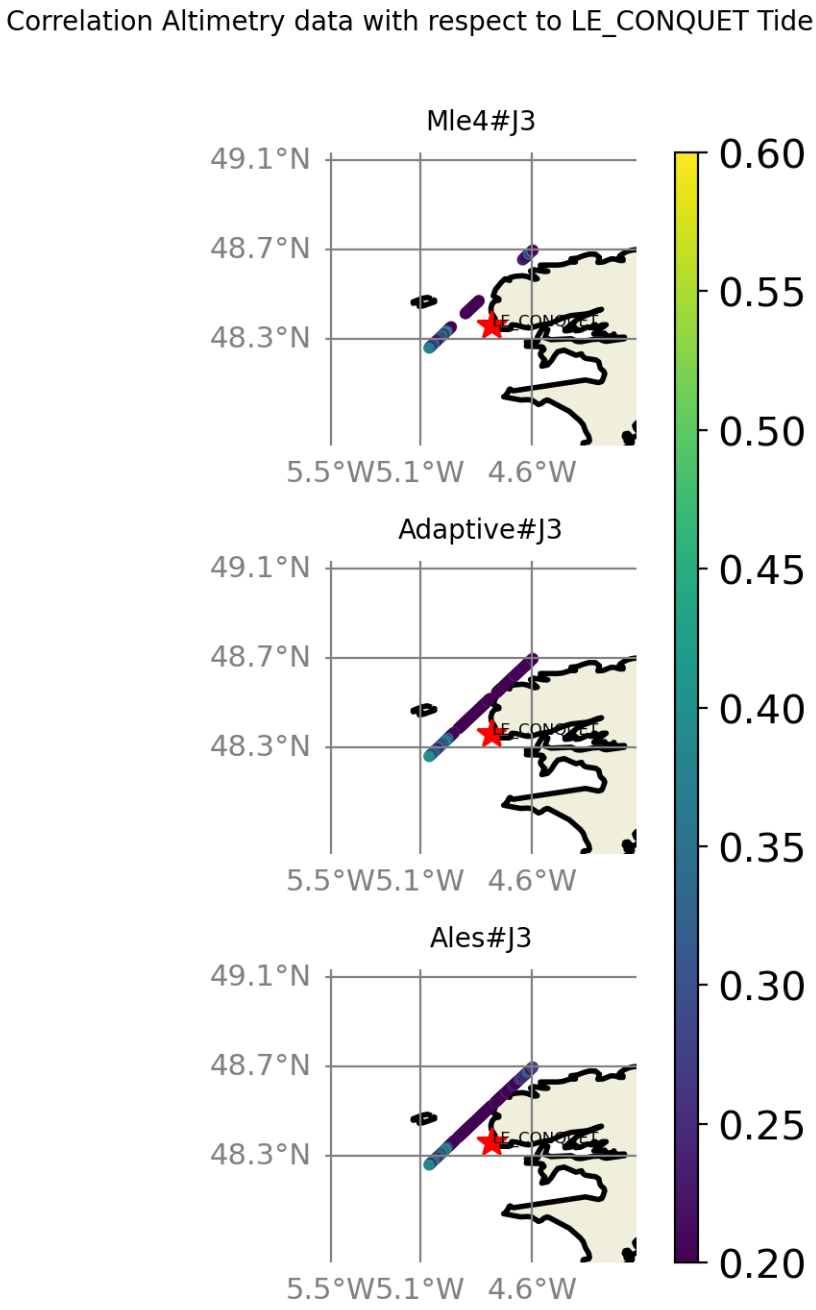

FIGURE 101 – correlation visualization in maps view % LE_CONQUET tide gauge

6.7.2 rmsd visualization in maps view % LE_CONQUET tide gauge

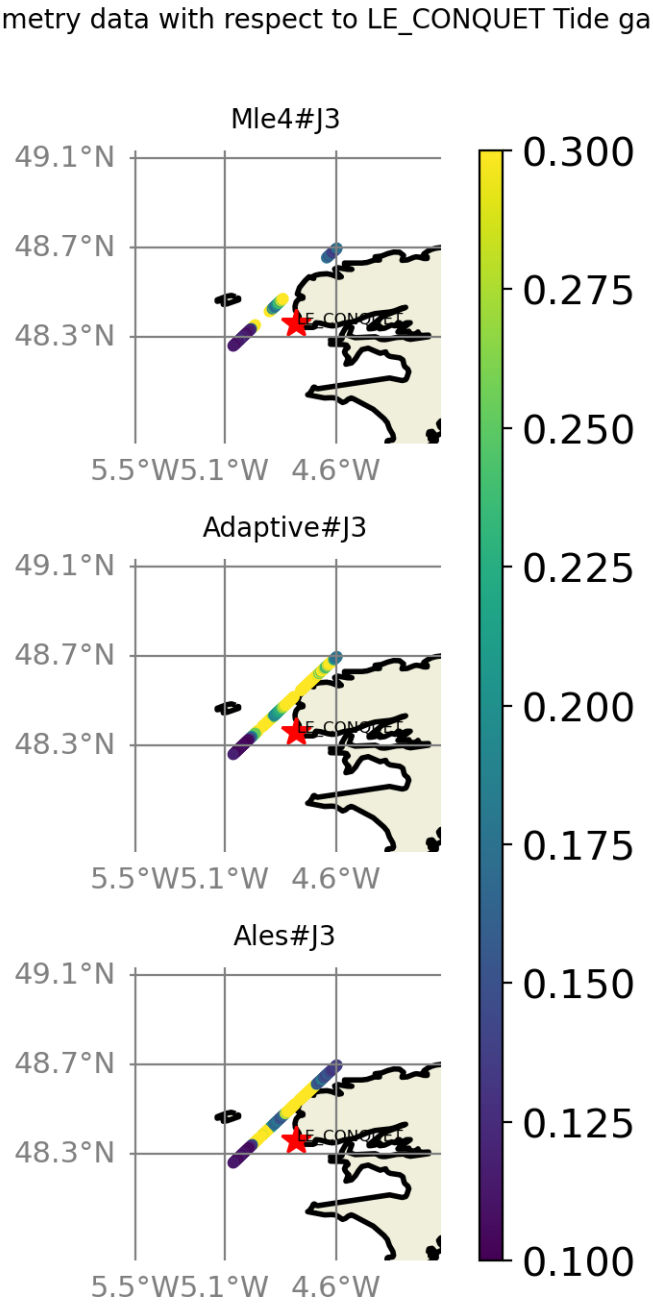

FIGURE 102 – rmsd visualization in maps view % LE_CONQUET tide gauge

6.7.3 std visualization in maps view % LE_CONQUET tide gauge

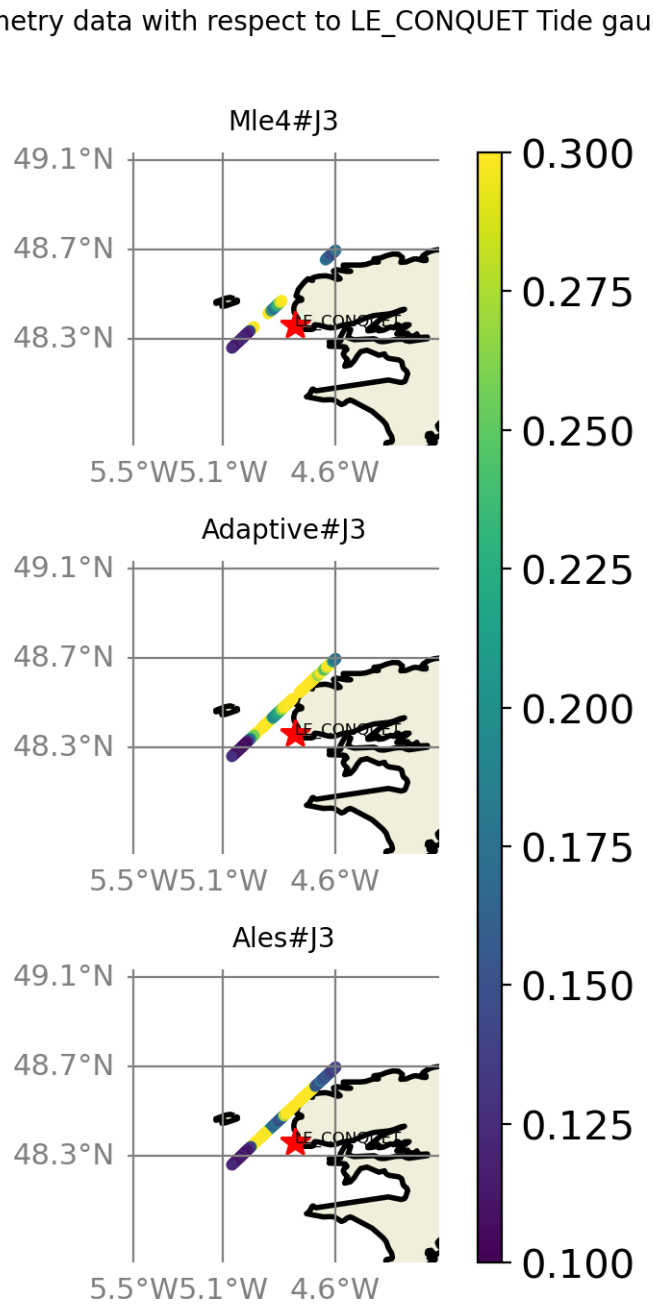

Figure 103 – std visualization in maps view % LE_CONQUET tide gauge

6.7.4 valid_data_percent visualization in maps view % LE_CONQUET tide gauge

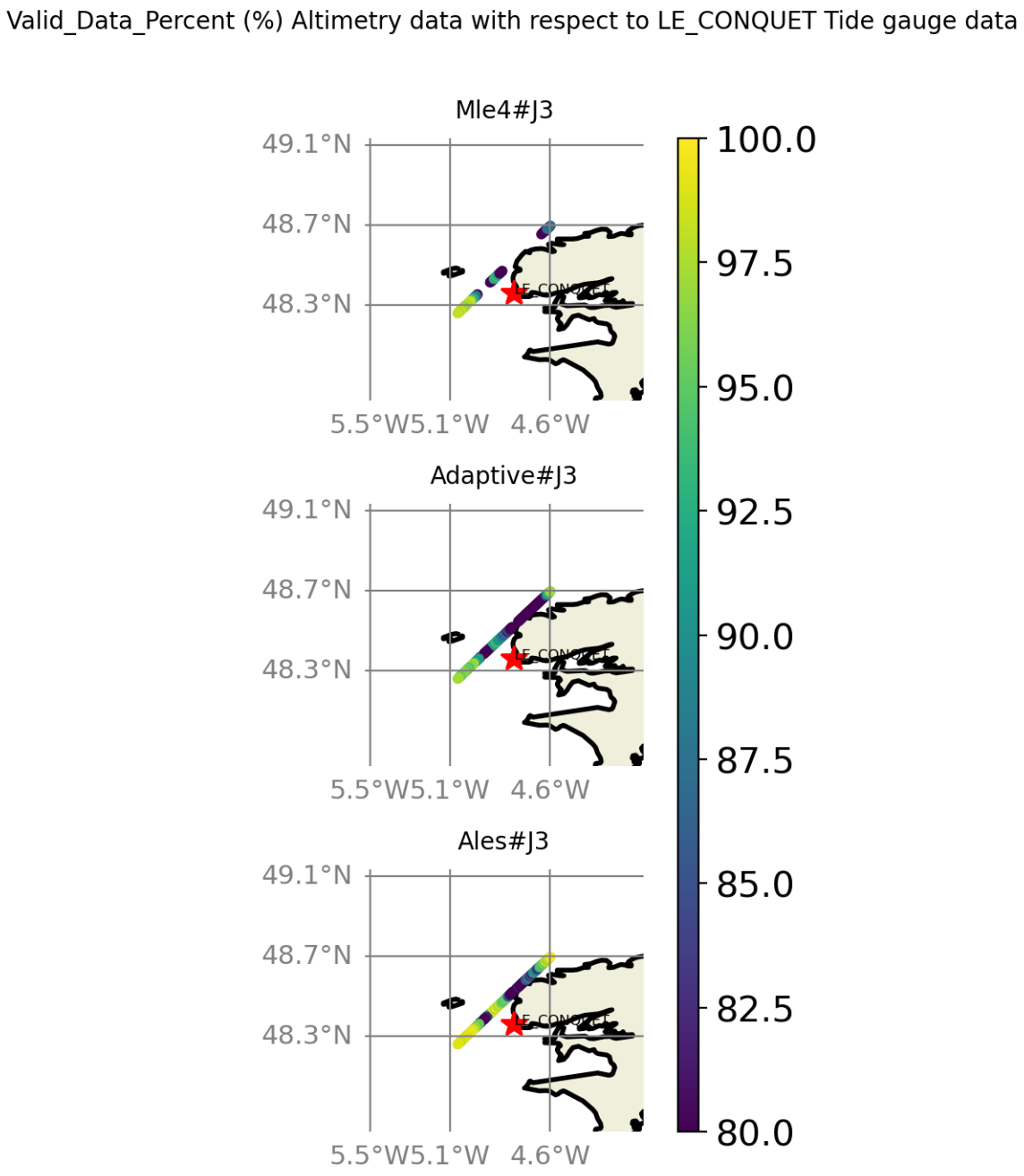

FIGURE 104 – valid_data_percent visualization in maps view % LE_CONQUET tide gauge

6.7.5 Valid data (%) in function of distance to coast/LE_CONQUET station

The formula to calculate the percentage of valid data in each time serie is;

$$pvd_i = \frac{nvd_i}{maxNB}, i = 1, np$$

Where *pvd* and *nvd* are the percentage of data and the number of altimetry data in the period covered by the tide gauge sla time serie, respectively in the time serie, i is the index of the time serie, np is the number of the selected altimetry time series. $maxNB = 106$ point is the maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie.

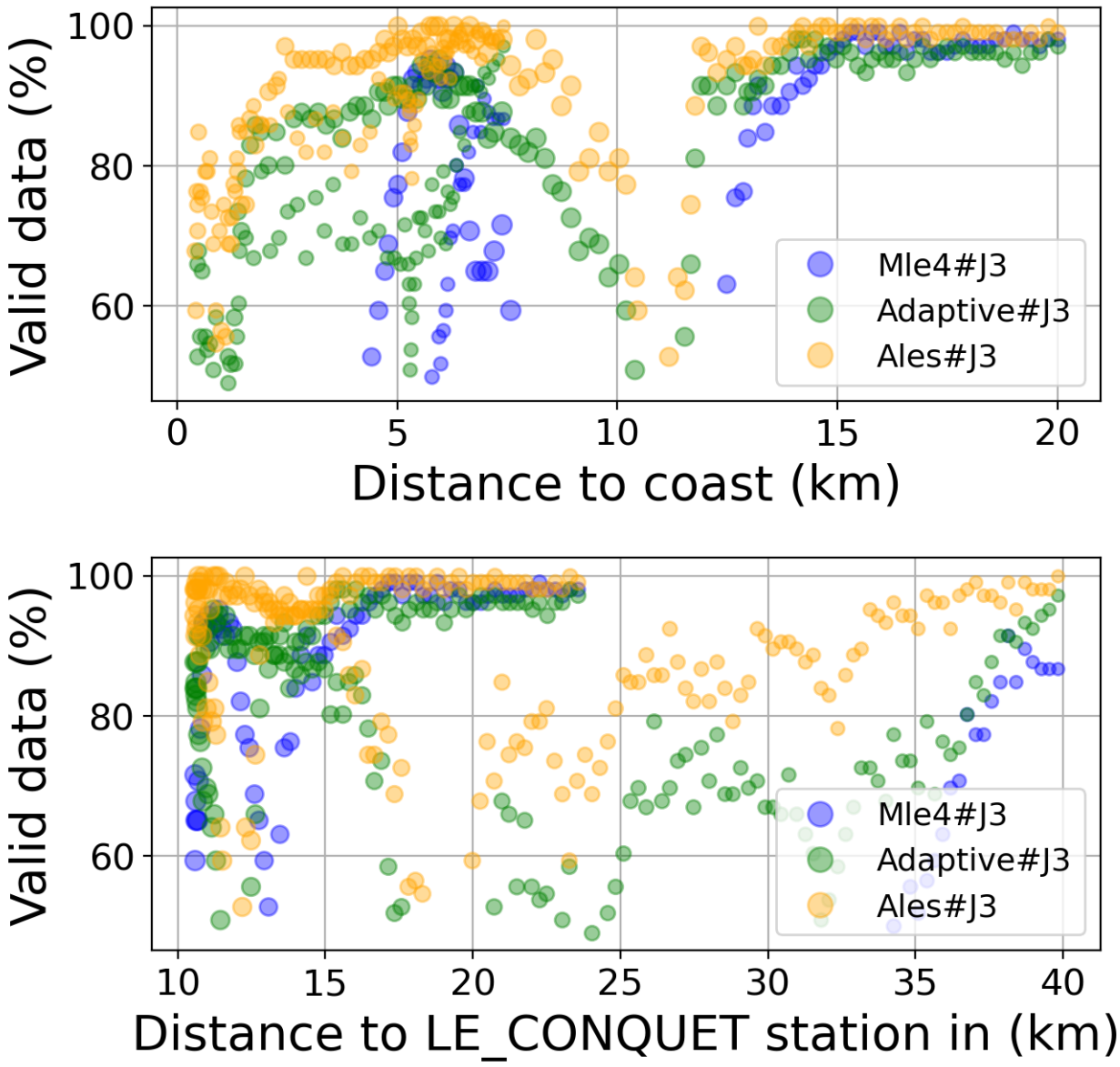

Figure 105 – Valid data (%) in function of distance to coast/LE_CONQUET station

6.7.6 Std in function of distance to coast/LE_CONQUET station

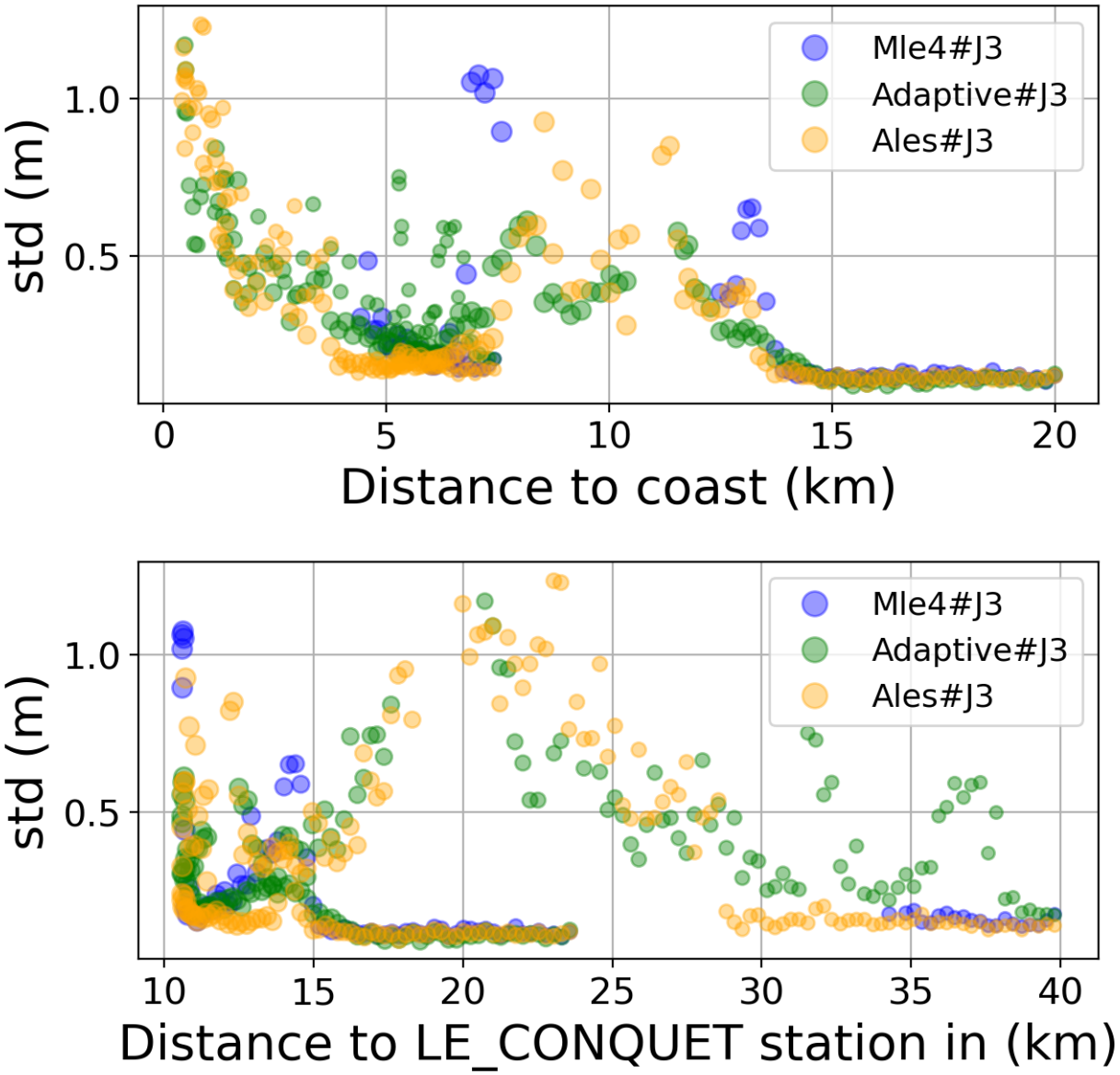

FIGURE 106 – Std in function of the distance to the coast/LE_CONQUET station

6.7.7 Correlation in function of distance to coast/LE_CONQUET station

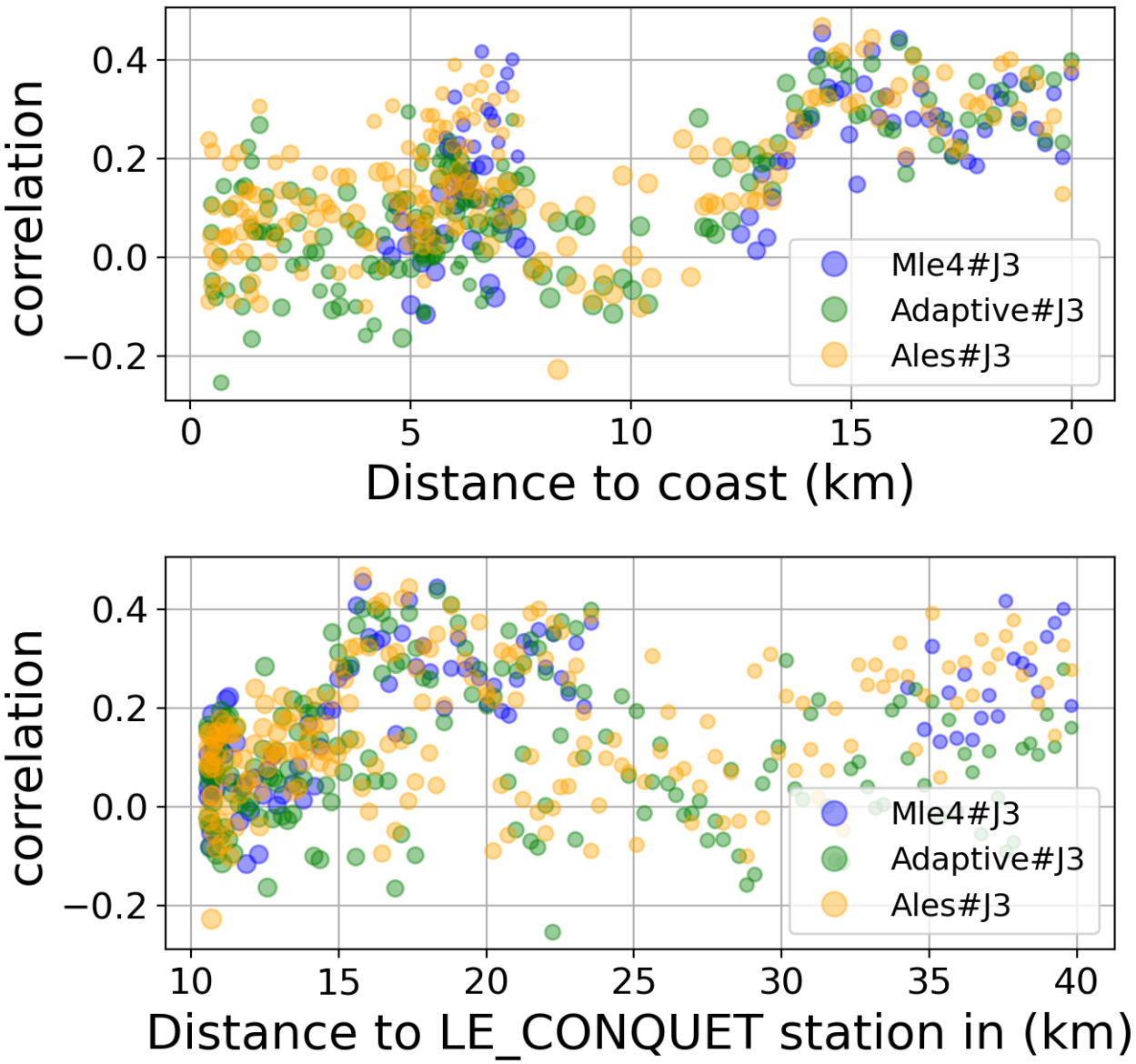

FIGURE 107 – Correlation in function of the distance to the coast/LE_CONQUET station

6.7.8 Taylor Diagram

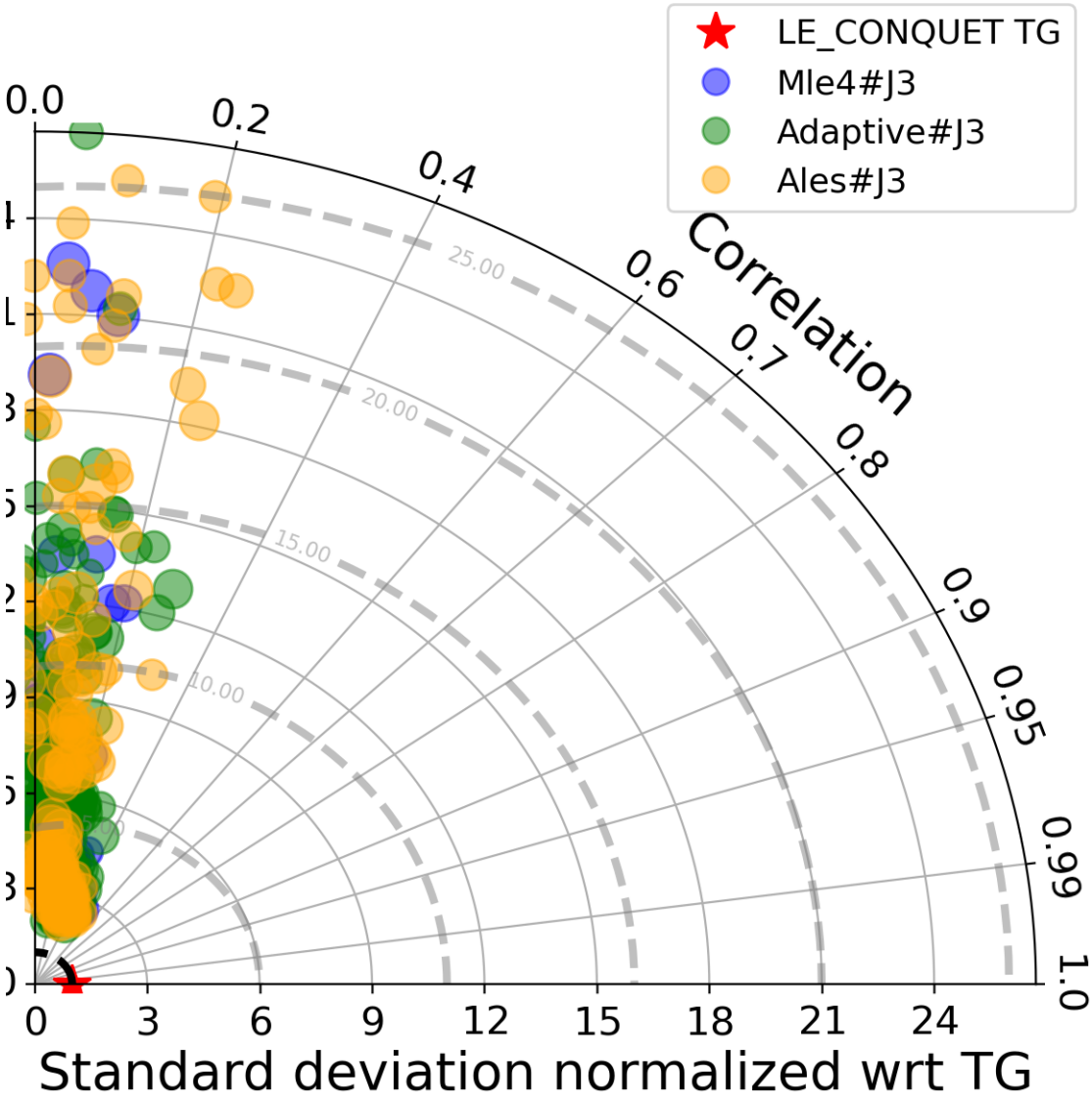

Figure 108 – Taylor diagram

6.7.9 Mean statistics table of products comparison with LE_CONQUET tide gauge data

The table below contains the mean statistics of the common points between the different products in the selected area.

Product	Valid data (%)	Correlation	std (m)	rmsd (m)
Mle4#J3	85.413	0.2	0.241	0.238
Adaptive#J3	91.286	0.184	0.22	0.218
Ales#J3	97.971	0.235	0.161	0.157

FIGURE 109 – Mean statistics table of the common points in the altimetry products

6.7.10 The most correlated sla altimetry Time series with the tide gauge sla time serie

The maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie is 106 point.

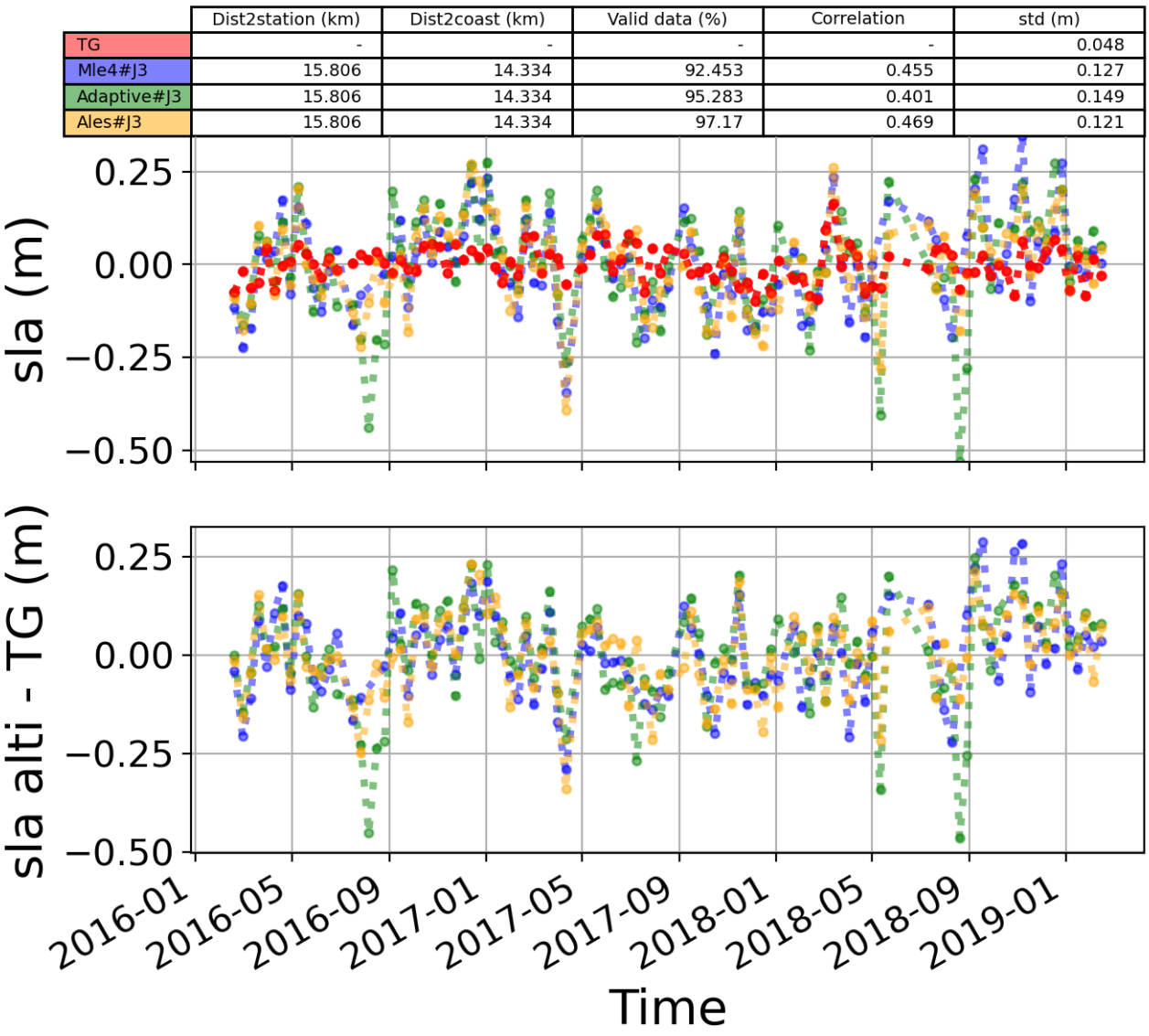

FIGURE 110 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

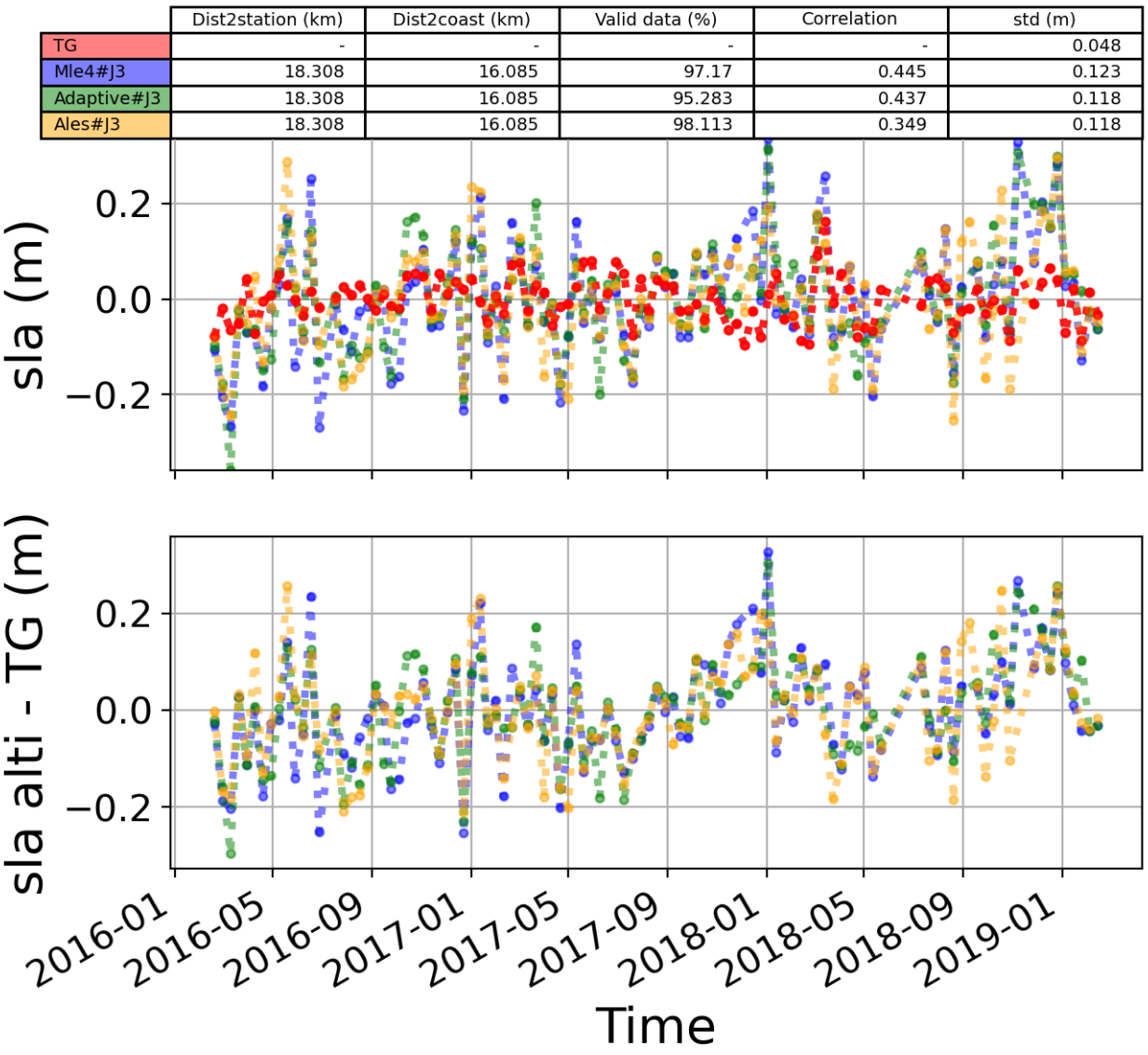

FIGURE 111 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.8 Station : Holyhead

- Nearest track to Holyhead station is the track number track163
- The area of interest is limited by :
  - A circle which it's center is the Holyhead tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km

6.8.1 correlation visualization in maps view % Holyhead tide gauge

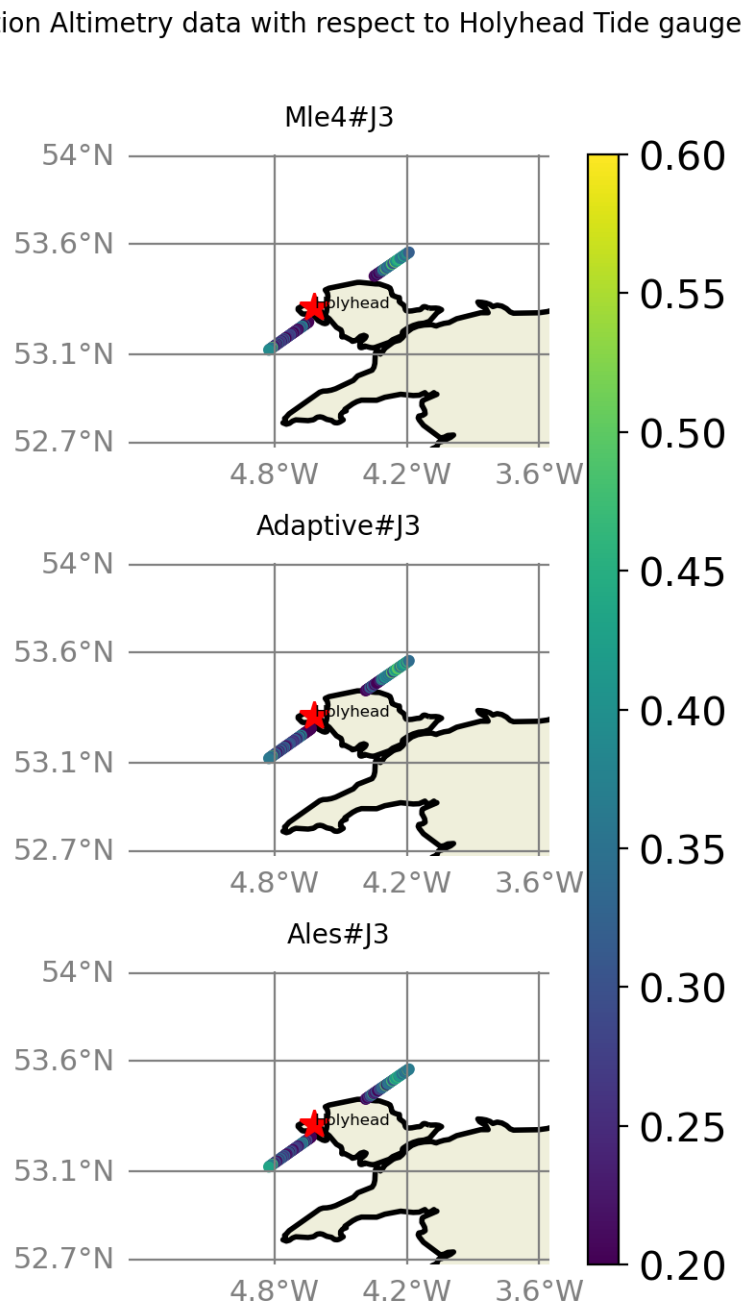

FIGURE 112 – correlation visualization in maps view % Holyhead tide gauge

6.8.2 rmsd visualization in maps view % Holyhead tide gauge

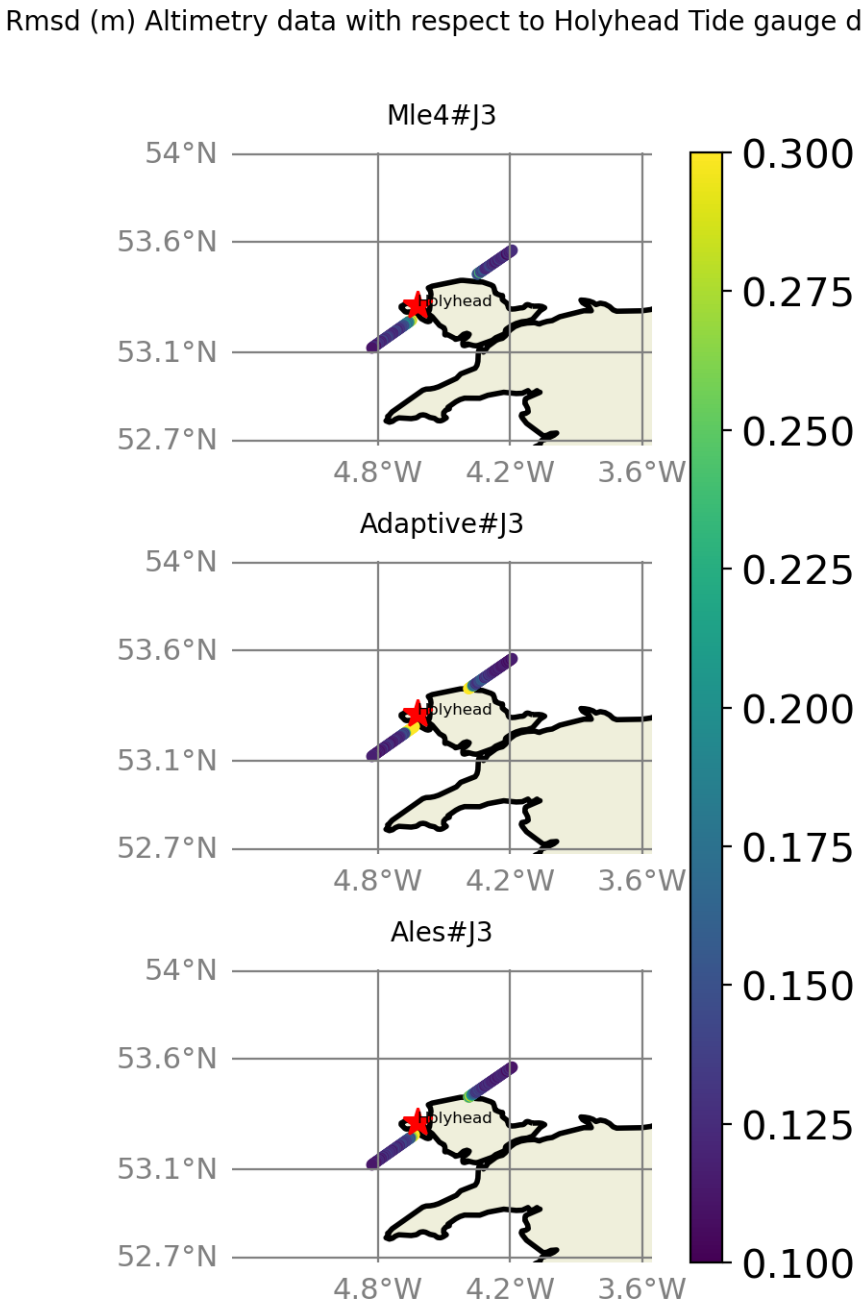

FIGURE 113 – rmsd visualization in maps view % Holyhead tide gauge

6.8.3 std visualization in maps view % Holyhead tide gauge

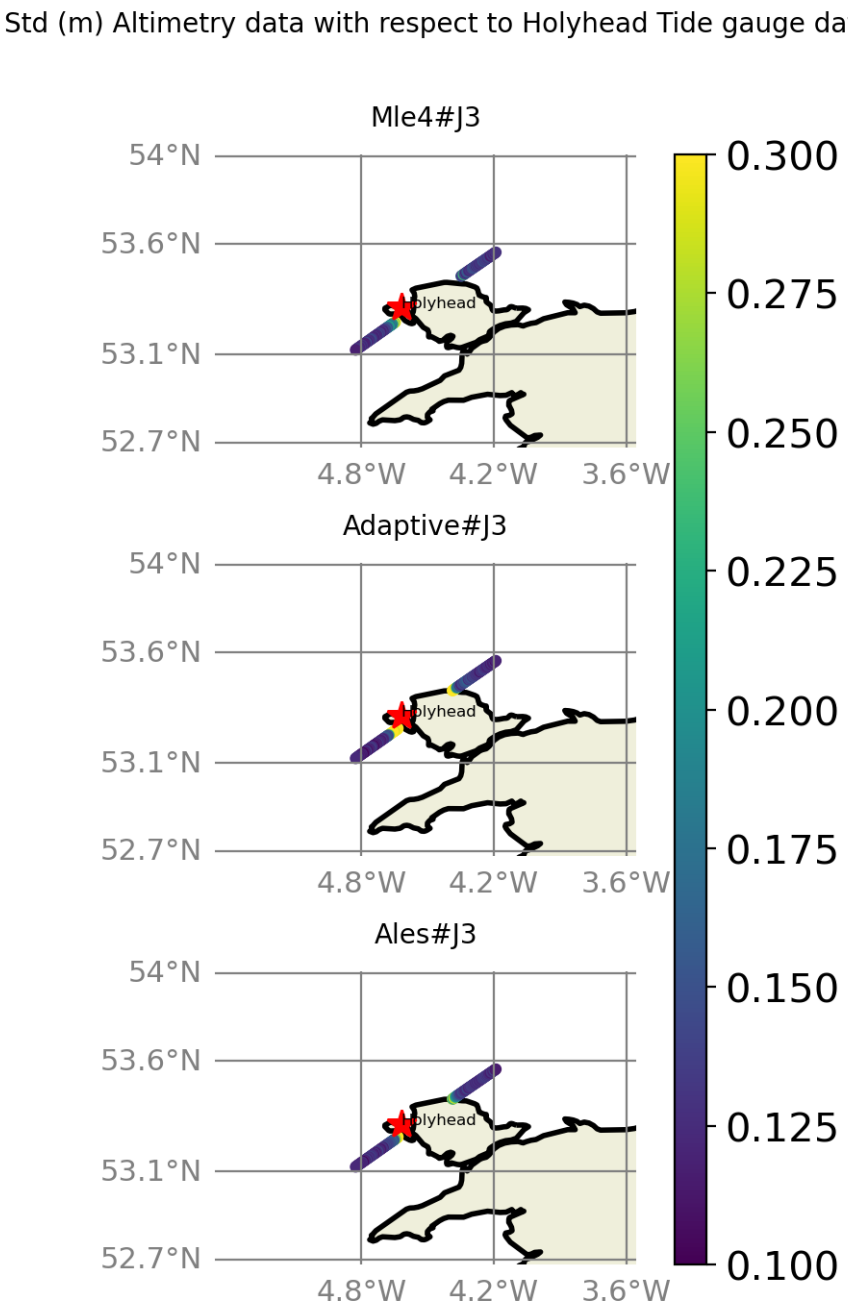

FIGURE 114 – std visualization in maps view % Holyhead tide gauge

6.8.4 valid_data_percent visualization in maps view % Holyhead tide gauge

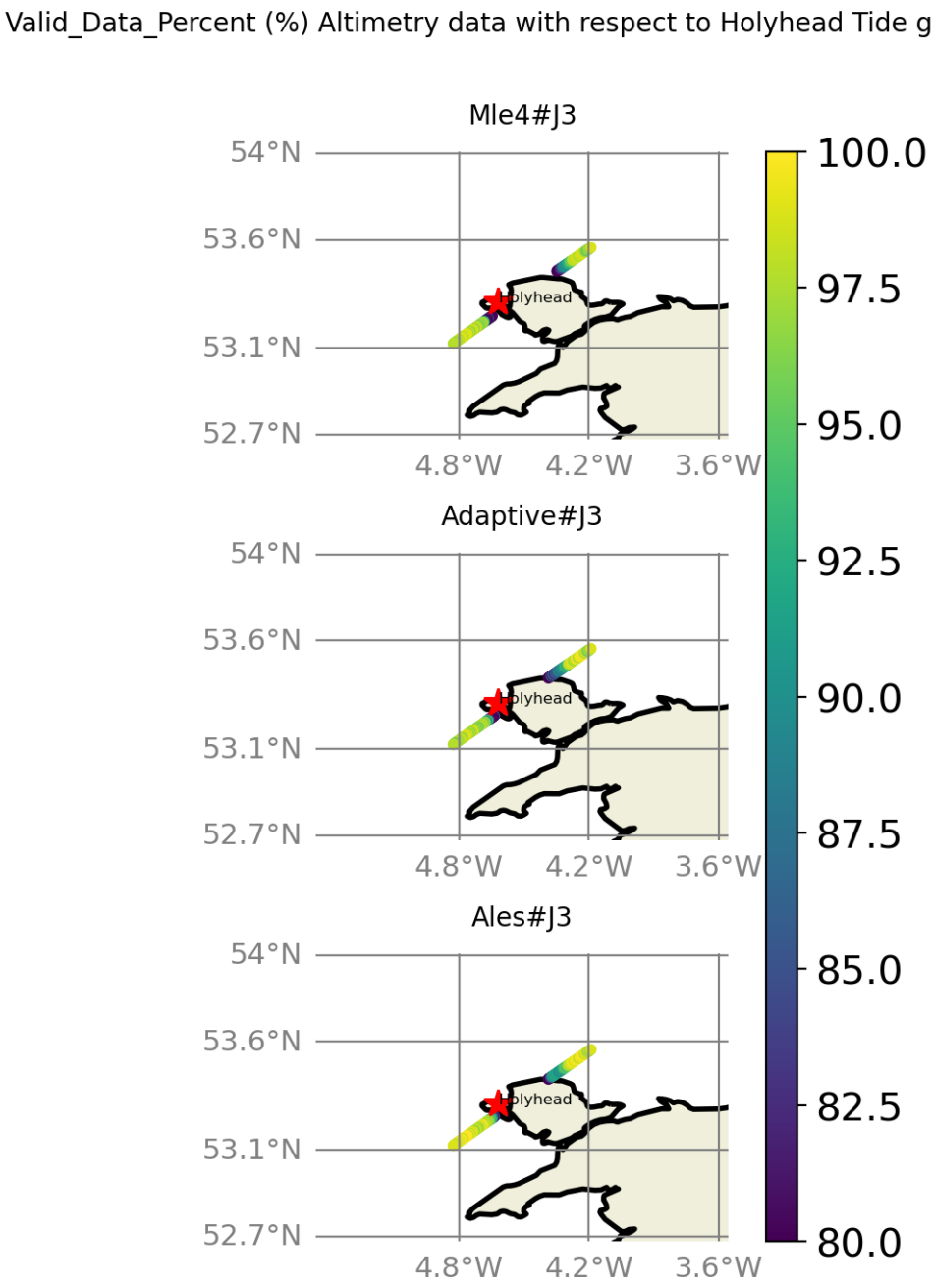

FIGURE 115 – valid_data_percent visualization in maps view % Holyhead tide gauge

6.8.5 Valid data (%) in function of distance to coast/Holyhead station

The formula to calculate the percentage of valid data in each time serie is;

$$pvd_i = \frac{nvd_i}{maxNB}, i = 1, np$$

Where *pvd* and *nvd* are the percentage of data and the number of altimetry data in the period covered by the tide gauge sla time serie, respectively in the time serie, i is the index of the time serie, np is the number of the selected altimetry time series. $maxNB = 89$ point is the maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie.

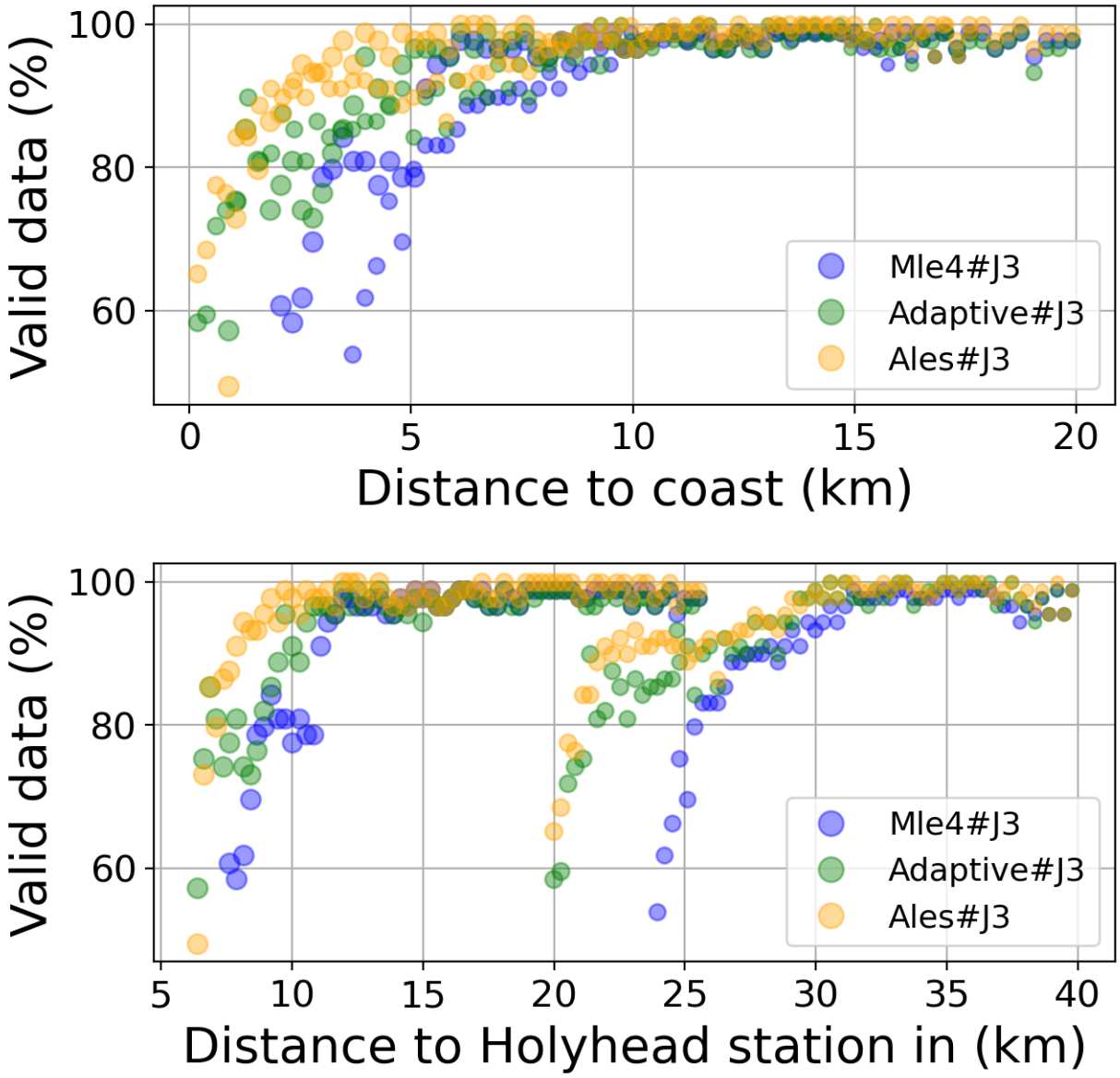

FIGURE 116 – Valid data (%) in function of distance to coast/Holyhead station

6.8.6 Std in function of distance to coast/Holyhead station

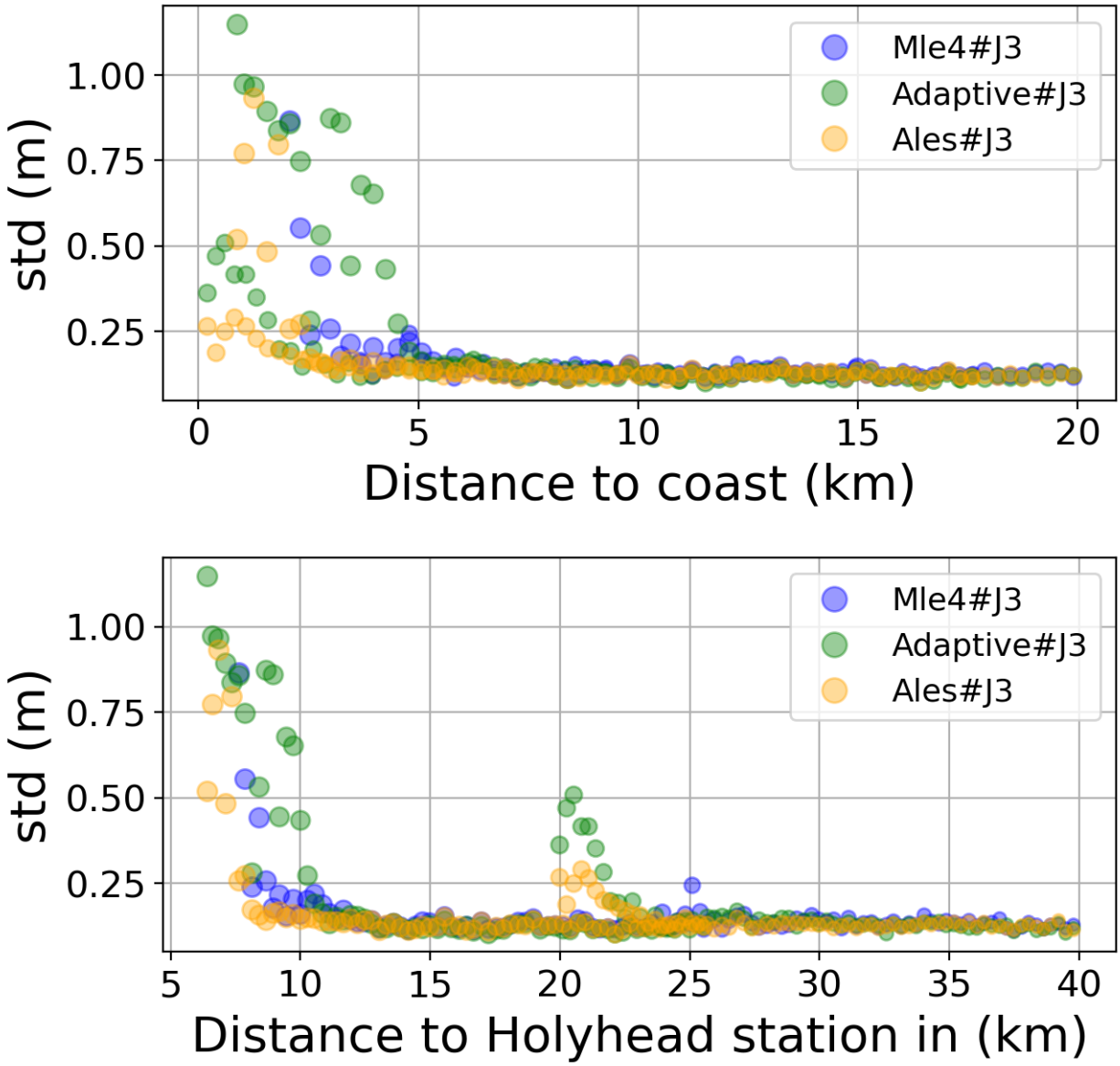

Figure 117 – Std in function of the distance to the coast/Holyhead station

6.8.7 Correlation in function of distance to coast/Holyhead station

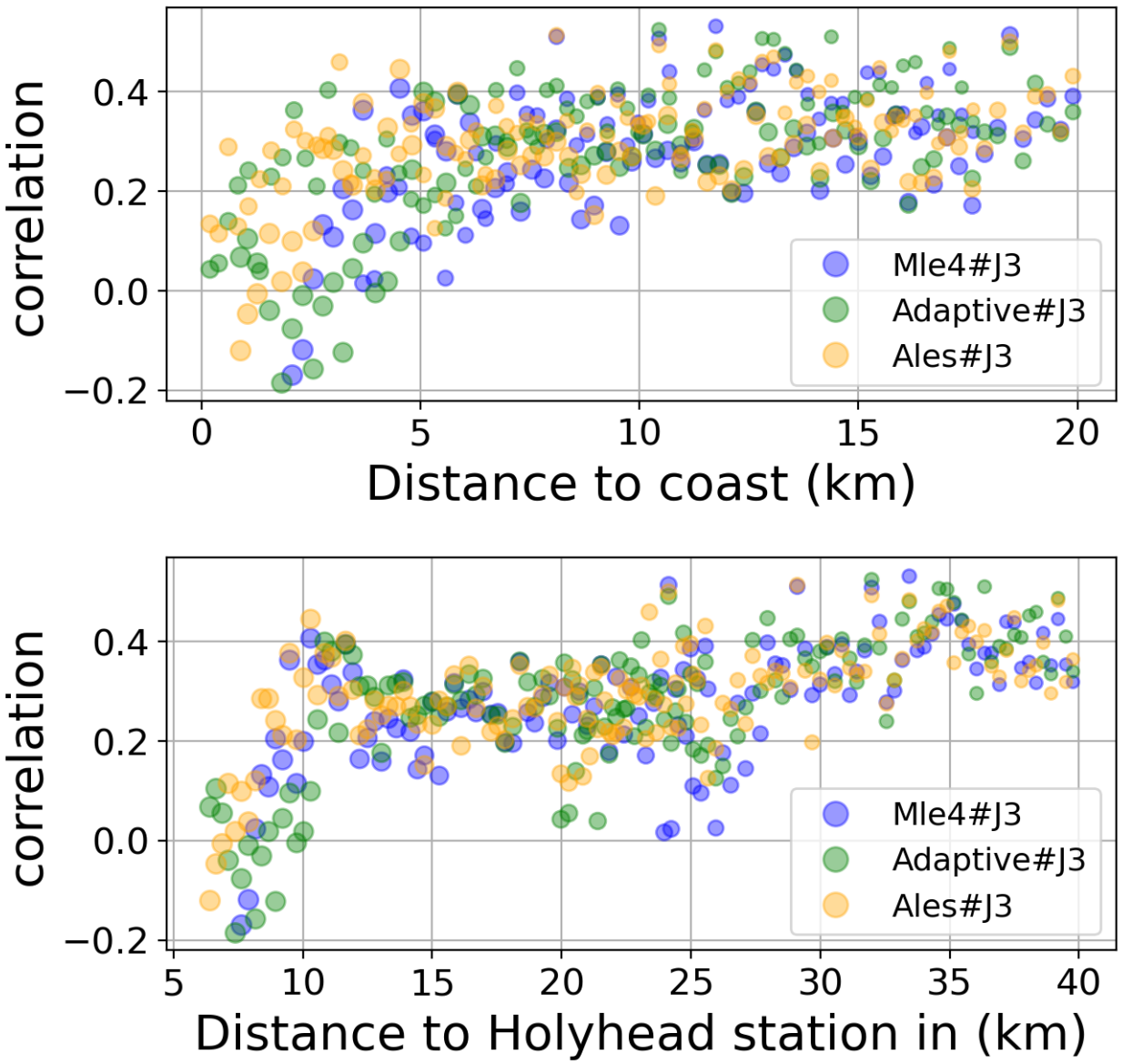

Figure 118 – Correlation in function of the distance to the coast/Holyhead station

6.8.8 Taylor Diagram

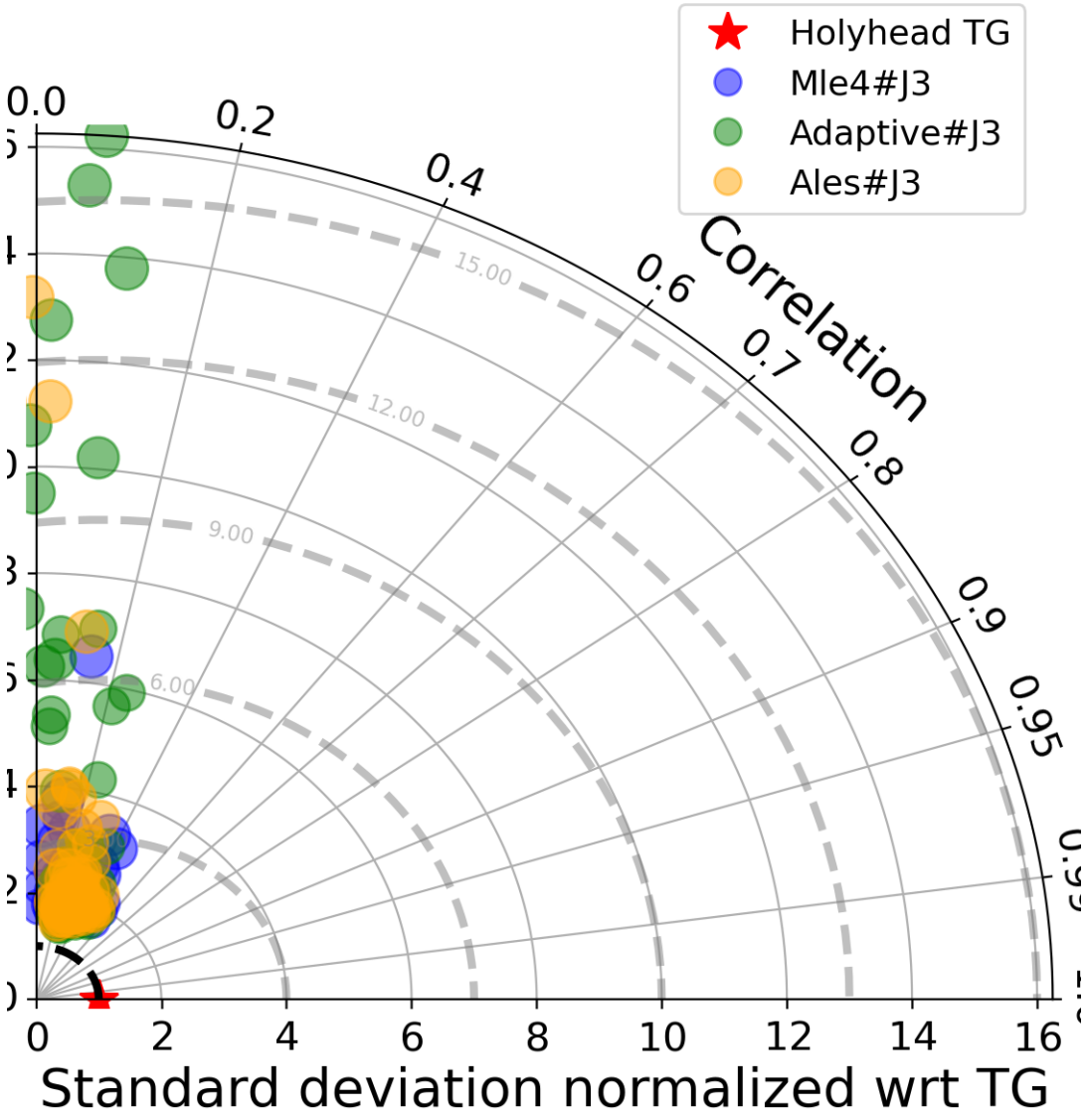

Figure 119 – Taylor diagram

6.8.9 Mean statistics table of products comparison with Holyhead tide gauge data

The table below contains the mean statistics of the common points between the different products in the selected area.

Product	Valid data (%)	Correlation	std (m)	rmsd (m)
Mle4#J3	92.497	0.286	0.152	0.149
Adaptive#J3	95.181	0.298	0.172	0.169
Ales#J3	97.391	0.313	0.132	0.129

FIGURE 120 – Mean statistics table of the common points in the altimetry products

6.8.10 The most correlated sla altimetry Time series with the tide gauge sla time serie

The maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie is 89 point.

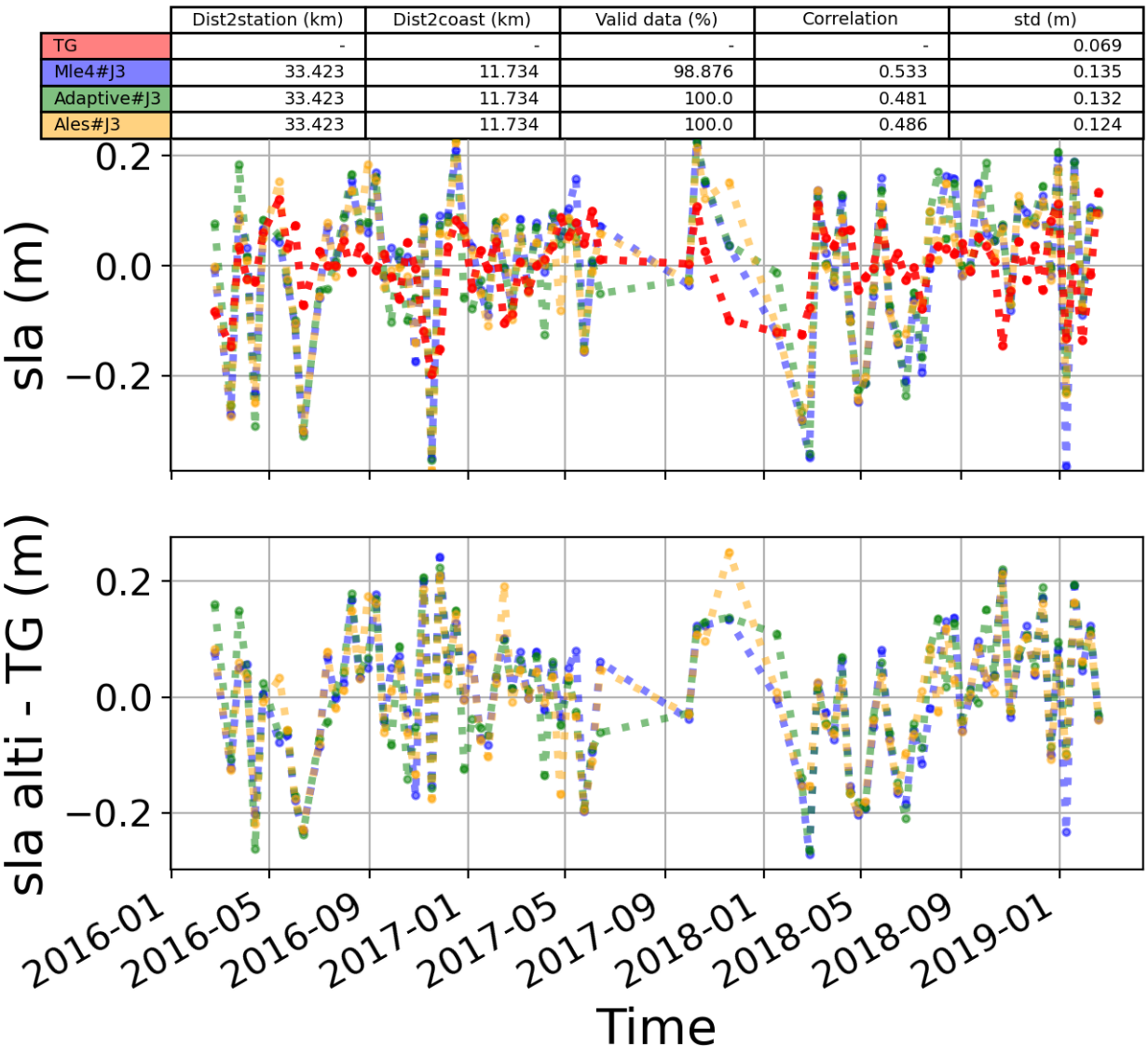

Figure 121 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

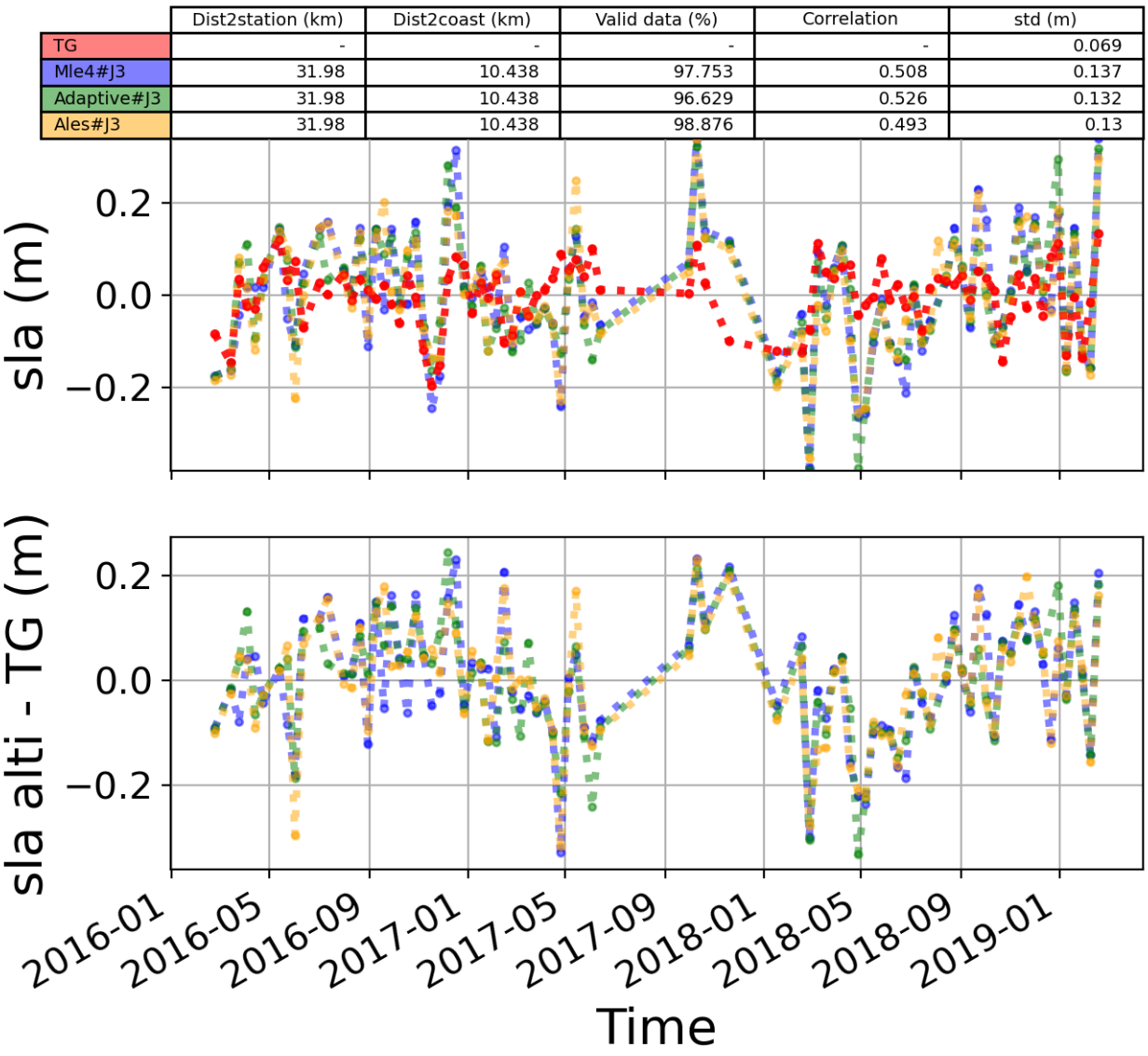

Figure 122 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

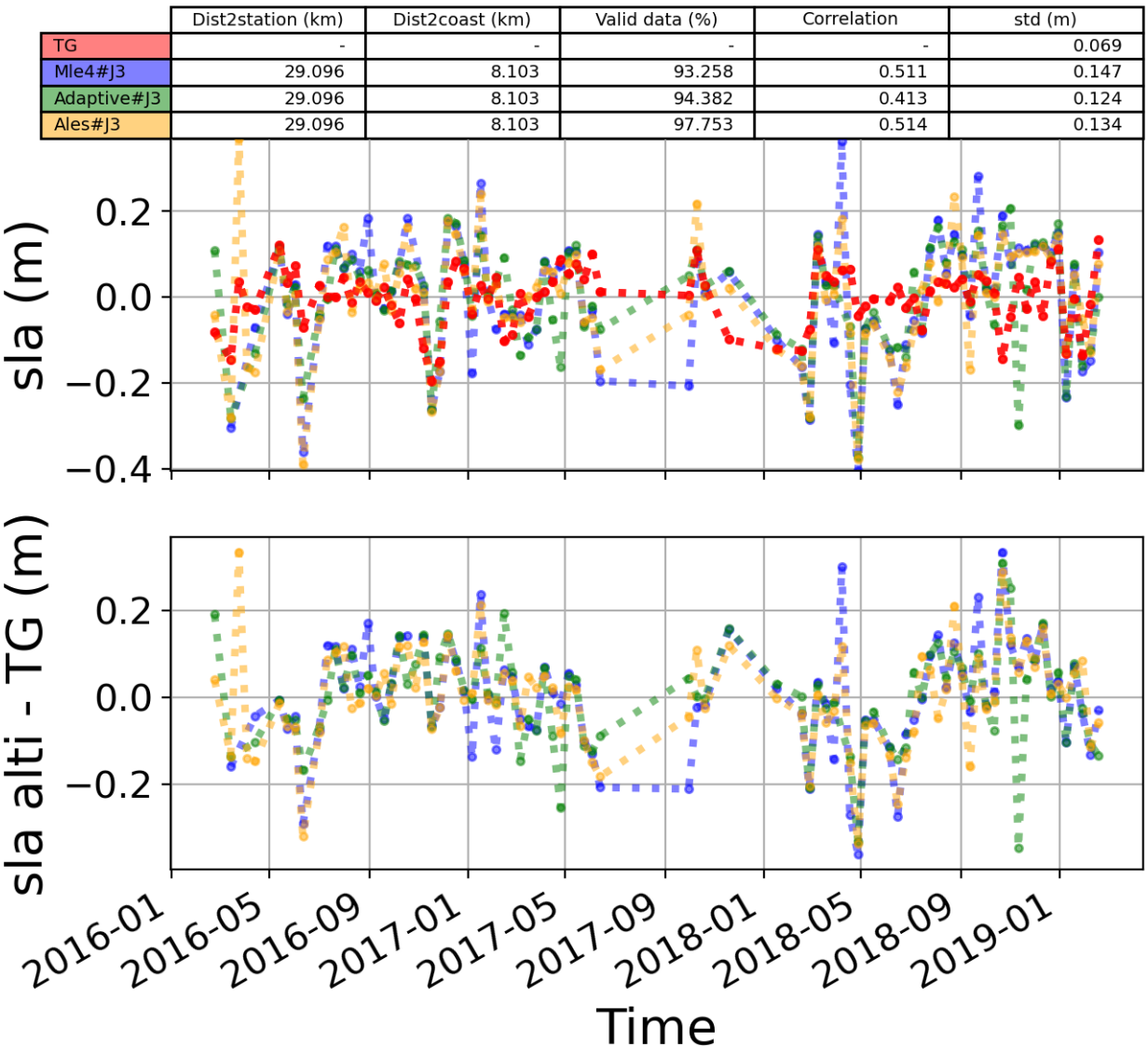

FIGURE 123 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.9 Station : LE_CROUESTY

- Nearest track to LE_CROUESTY station is the track number track137
- The area of interest is limited by :
  - A circle which it's center is the LE_CROUESTY tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km

6.9.1 correlation visualization in maps view % LE_CROUESTY tide gauge

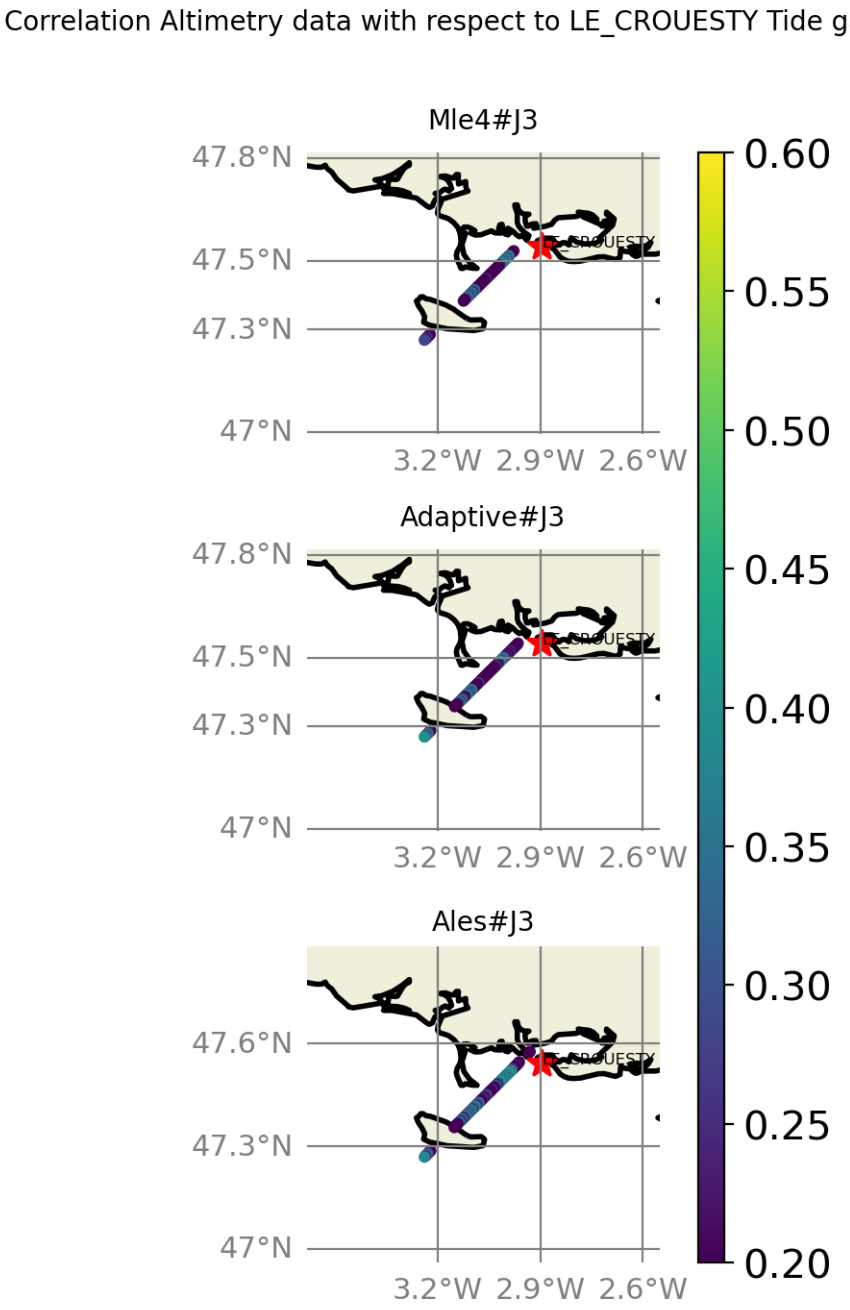

Figure 124 – correlation visualization in maps view % LE_CROUESTY tide gauge

6.9.2 rmsd visualization in maps view % LE_CROUESTY tide gauge

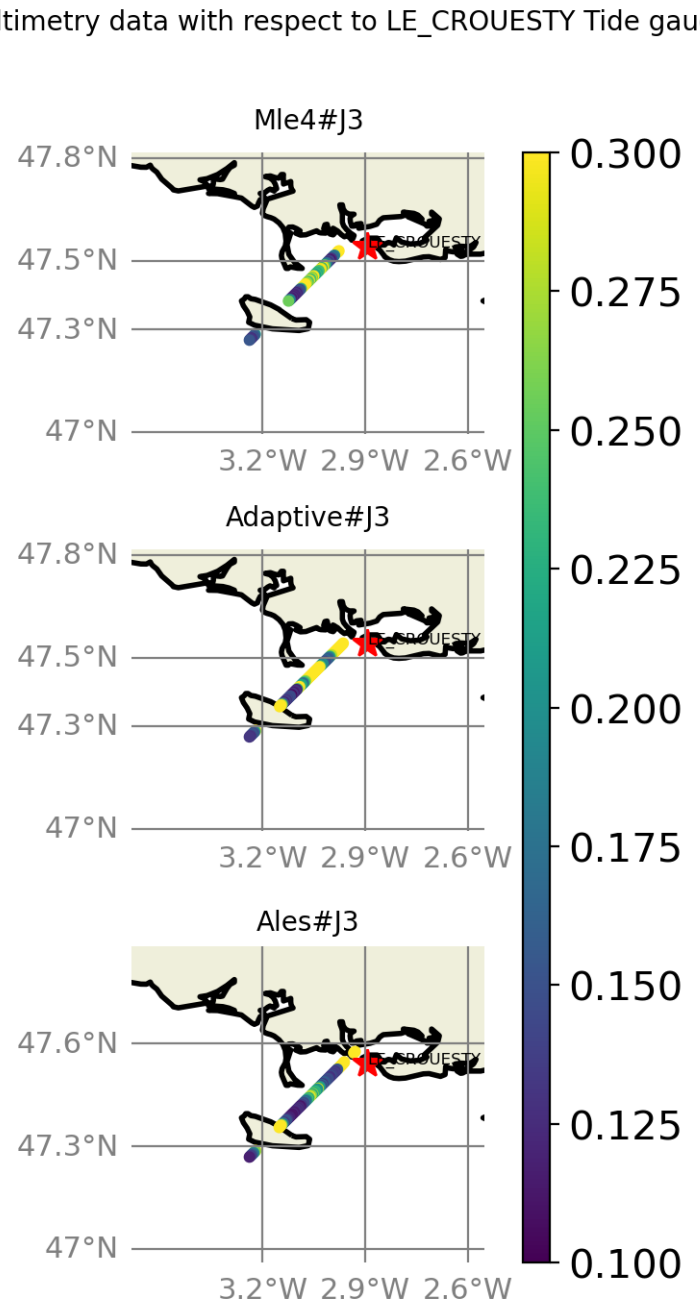

FIGURE 125 – rmsd visualization in maps view % LE_CROUESTY tide gauge

6.9.3 std visualization in maps view % LE_CROUESTY tide gauge

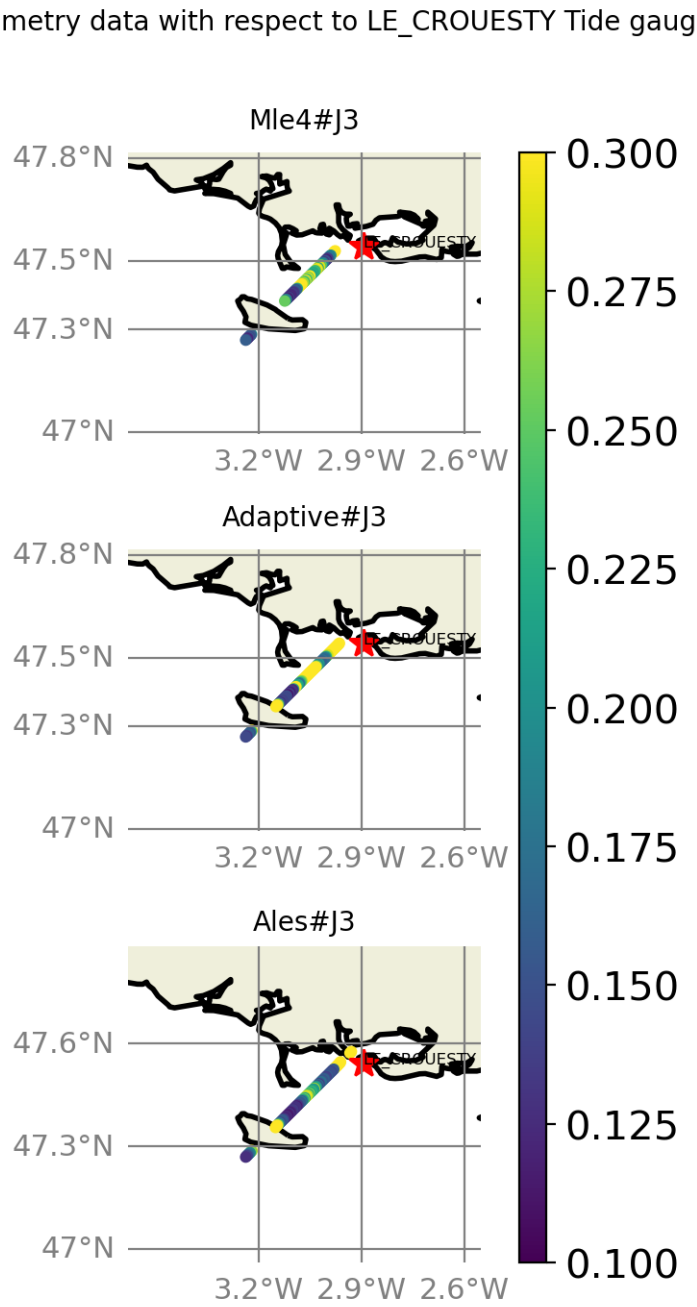

FIGURE 126 – std visualization in maps view % LE_CROUESTY tide gauge

6.9.4 valid_data_percent visualization in maps view % LE_CROUESTY tide gauge

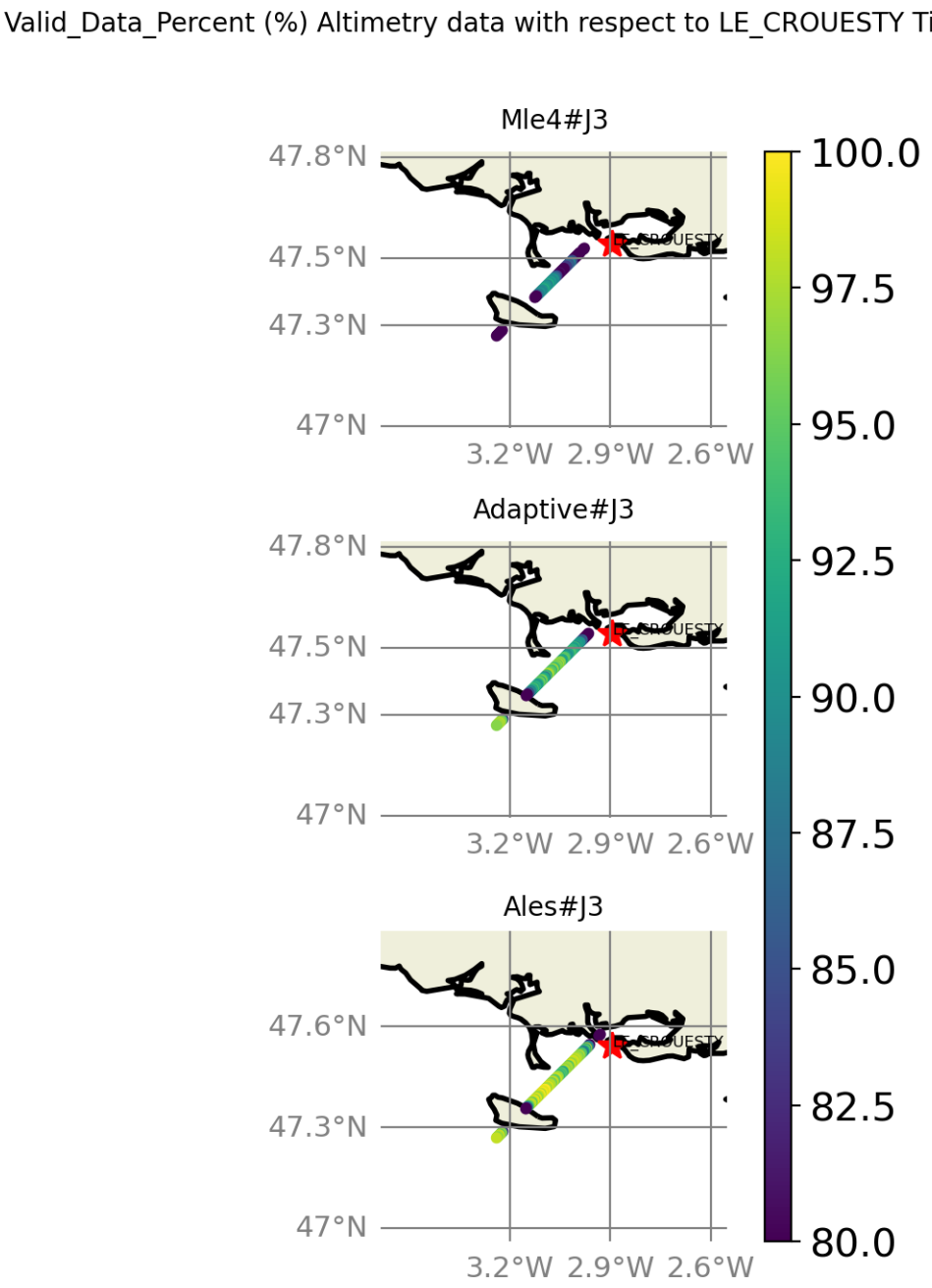

FIGURE 127 – valid_data_percent visualization in maps view % LE_CROUESTY tide gauge

6.9.5 Valid data (%) in function of distance to coast/LE_CROUESTY station

The formula to calculate the percentage of valid data in each time serie is;

$$pvd_i = \frac{nvd_i}{maxNB}, i = 1, np$$

Where *pvd* and *nvd* are the percentage of data and the number of altimetry data in the period covered by the tide gauge sla time serie, respectively in the time serie, i is the index of the time serie, np is the number of the selected altimetry time series. $maxNB = 111$ point is the maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie.

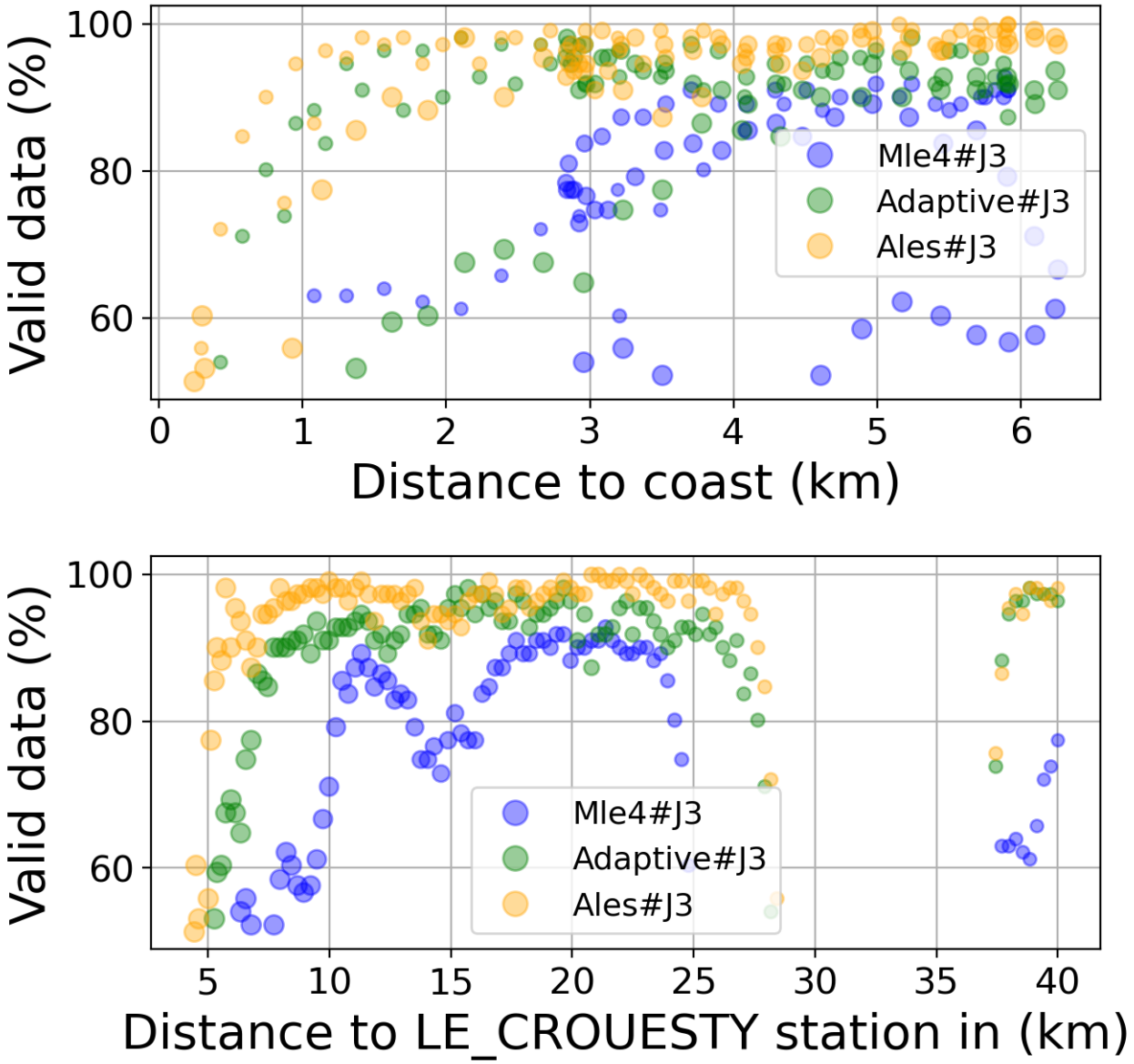

Figure 128 – Valid data (%) in function of distance to coast/LE_CROUESTY station

6.9.6 Std in function of distance to coast/LE_CROUESTY station

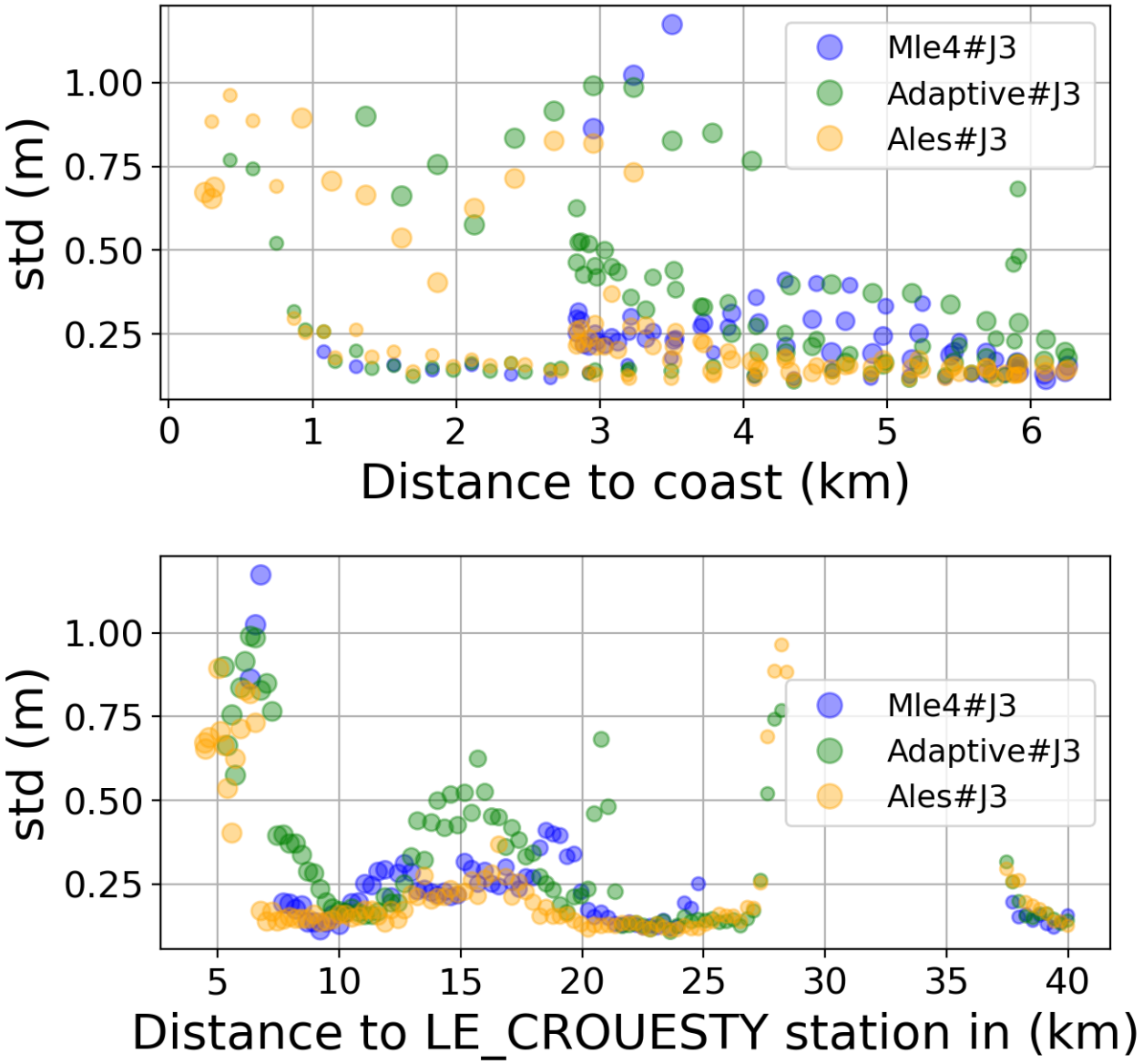

Figure 129 – Std in function of the distance to the coast/LE_CROUESTY station

6.9.7 Correlation in function of distance to coast/LE_CROUESTY station

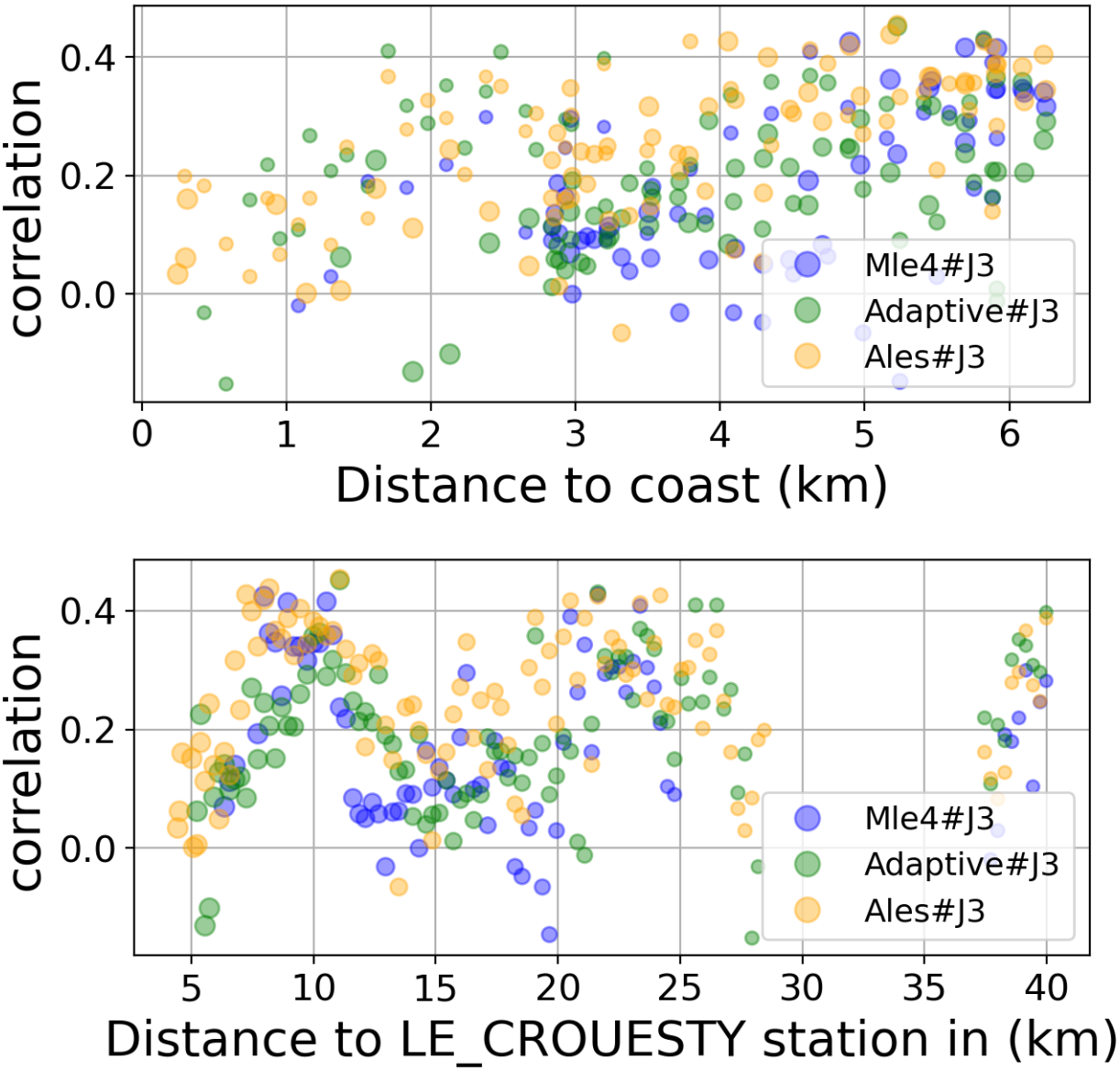

FIGURE 130 – Correlation in function of the distance to the coast/LE_CROUESTY station

6.9.8 Taylor Diagram

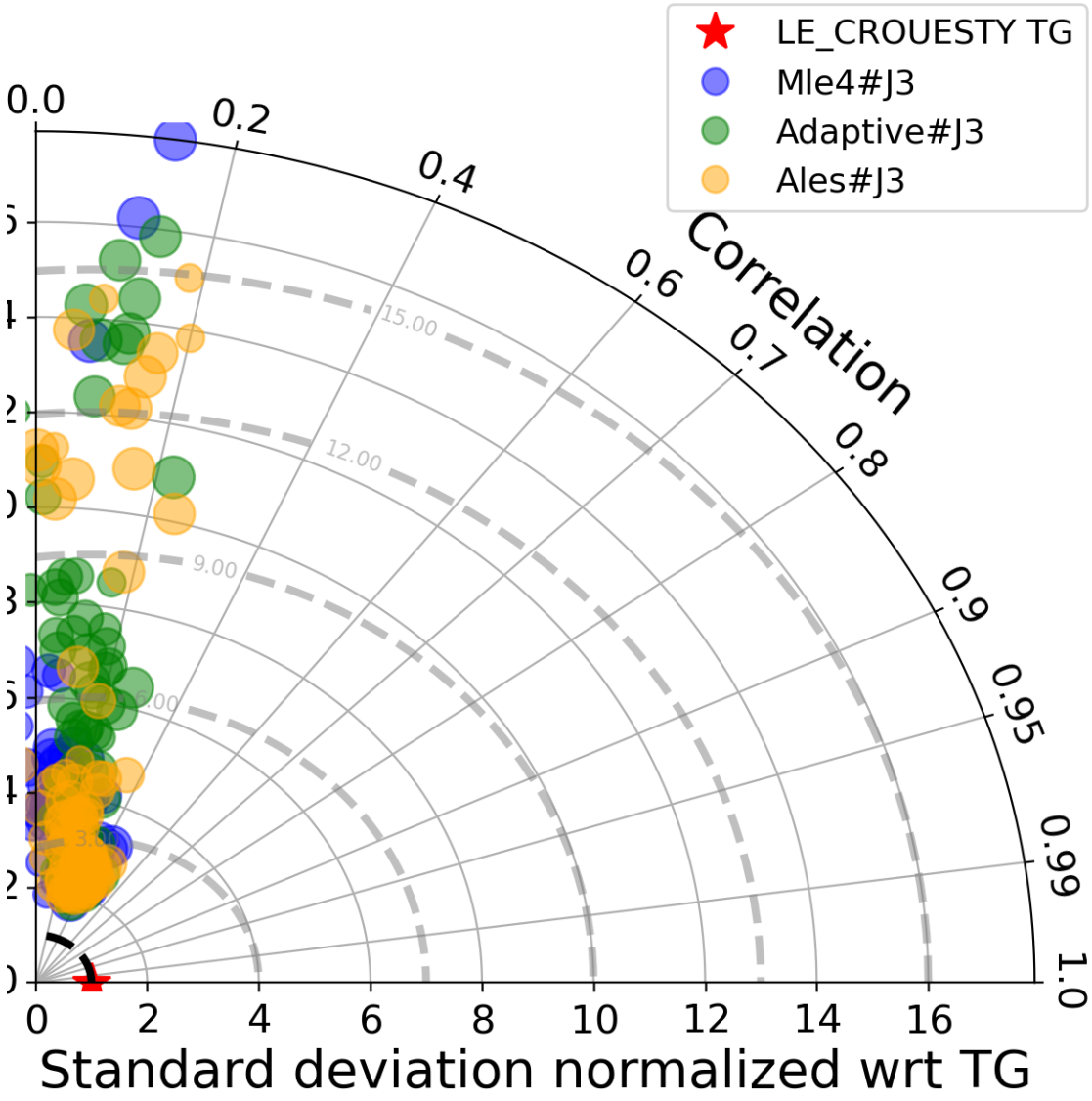

Figure 131 – Taylor diagram

6.9.9 Mean statistics table of products comparison with LE_CROUESTY tide gauge data

The table below contains the mean statistics of the common points between the different products in the selected area.

Product	Valid data (%)	Correlation	std (m)	rmsd (m)
Mle4#J3	78.366	0.182	0.244	0.243
Adaptive#J3	92.793	0.207	0.3	0.296
Ales#J3	96.781	0.274	0.19	0.185

FIGURE 132 – Mean statistics table of the common points in the altimetry products

6.9.10 The most correlated sla altimetry Time series with the tide gauge sla time serie

The maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie is 111 point.

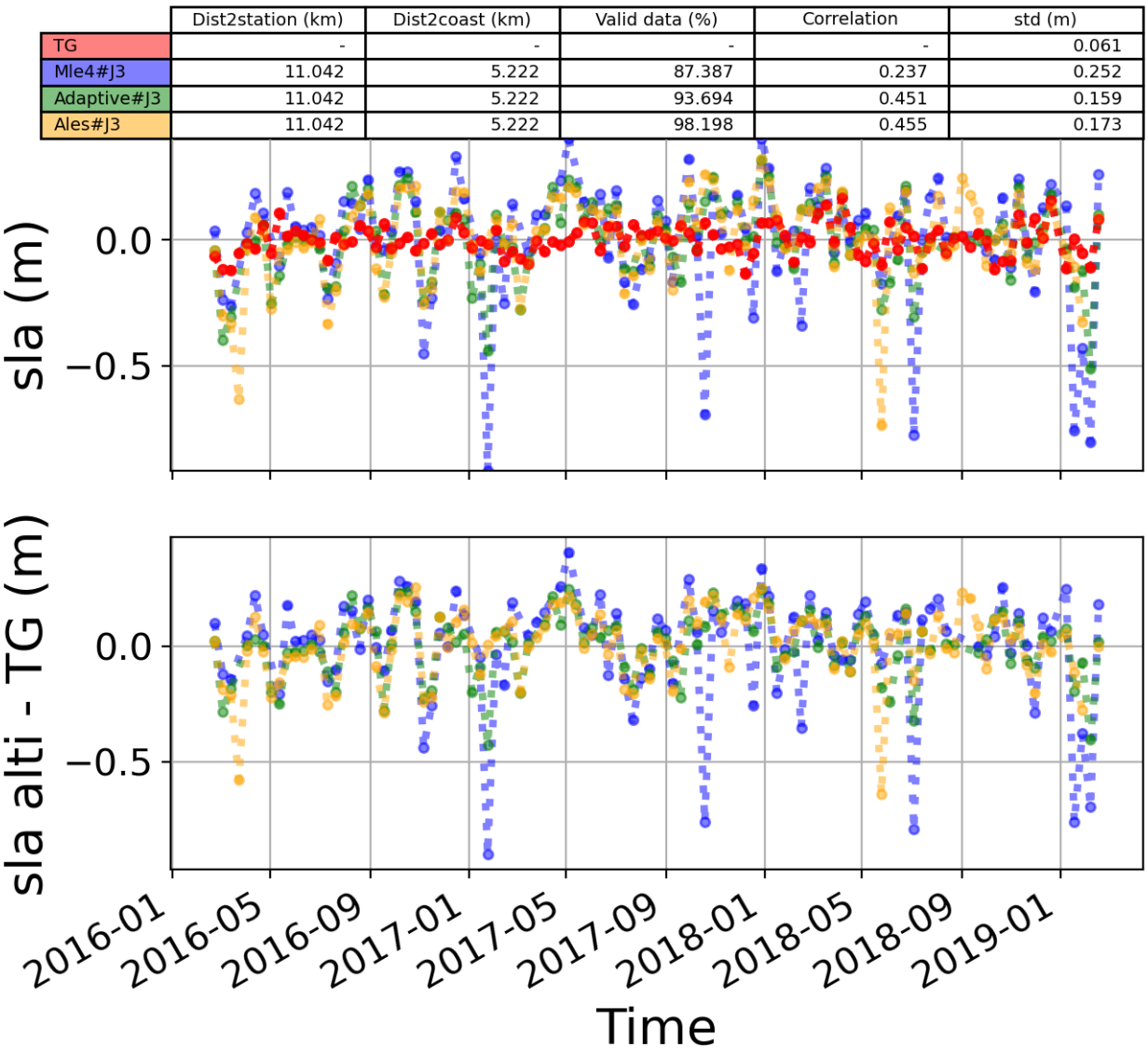

Figure 133 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

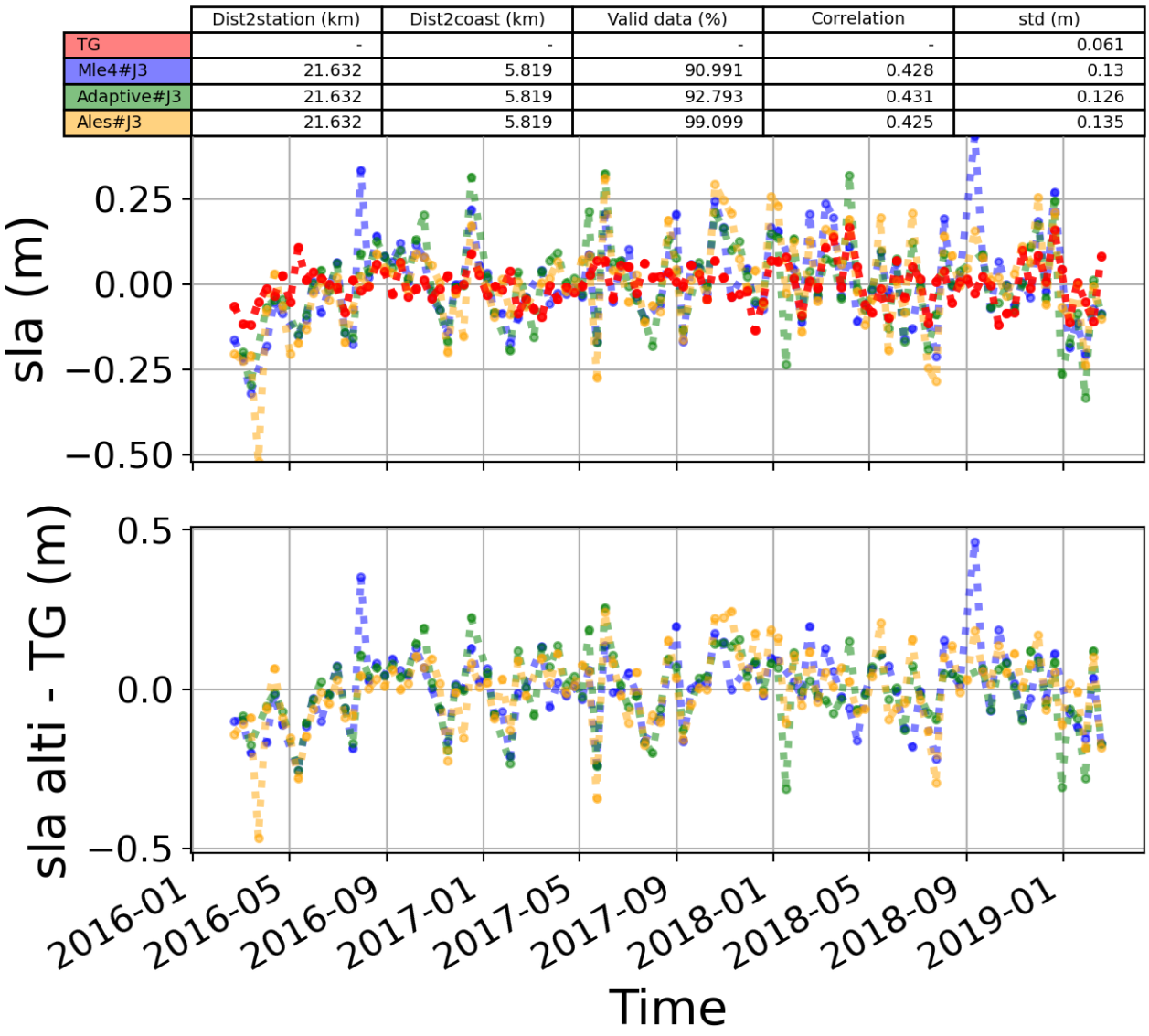

FIGURE 134 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.10 Station : North_Shields

- Nearest track to North_Shields station is the track number track120
- The area of interest is limited by :
  - A circle which it's center is the North_Shields tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km

6.10.1 correlation visualization in maps view % North_Shields tide gauge

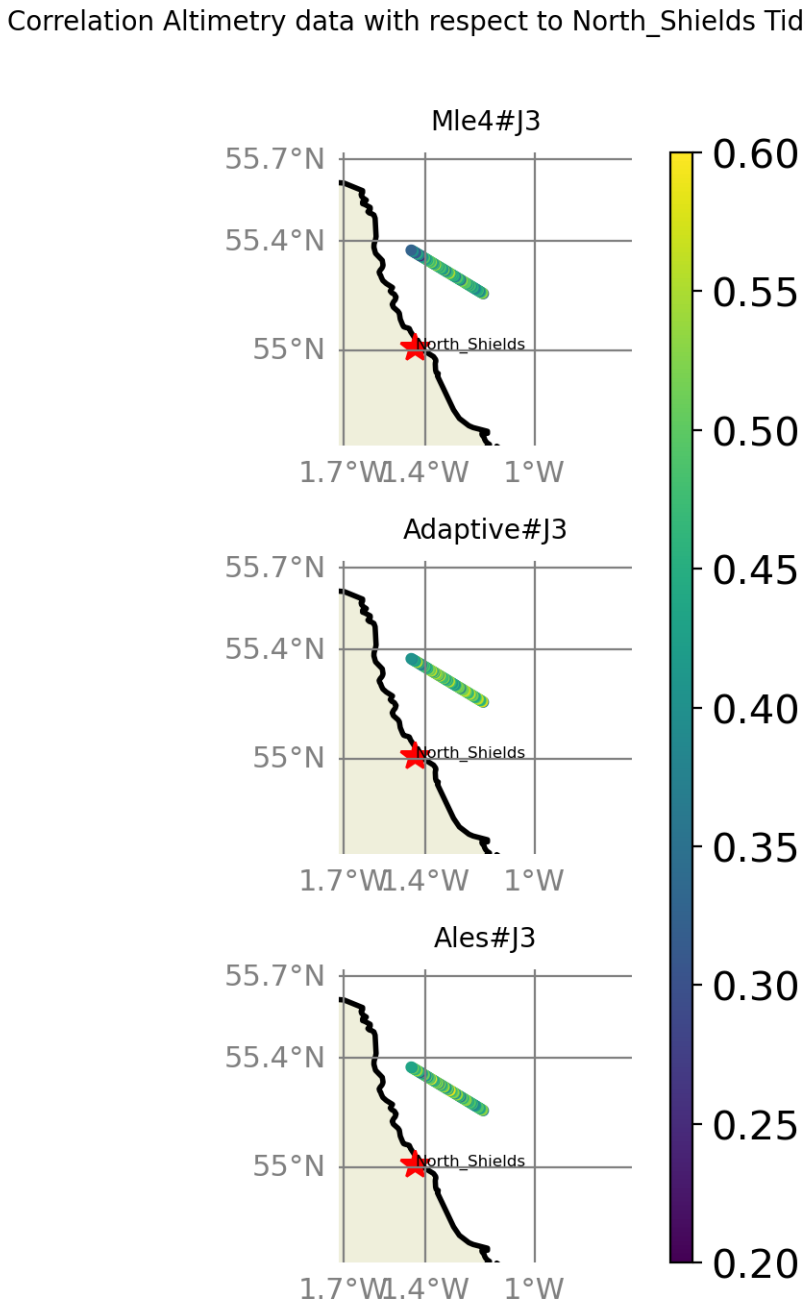

FIGURE 135 – correlation visualization in maps view % North_Shields tide gauge

6.10.2 rmsd visualization in maps view % North_Shields tide gauge

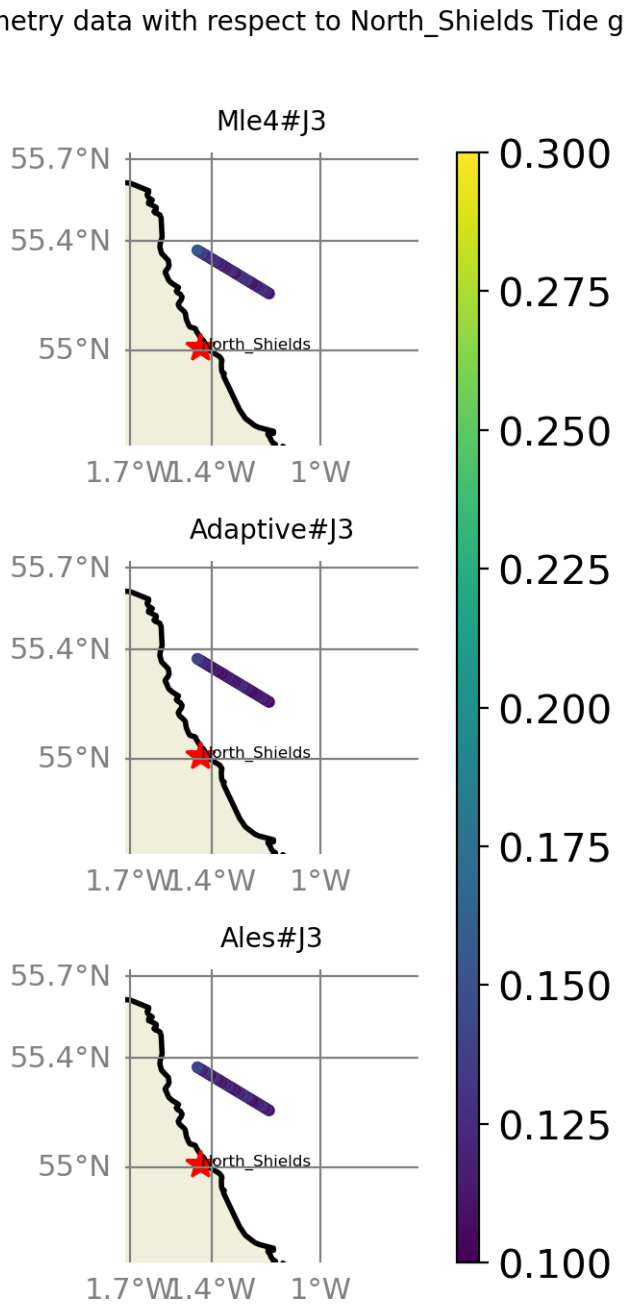

FIGURE 136 – rmsd visualization in maps view % North_Shields tide gauge

6.10.3 std visualization in maps view % North_Shields tide gauge

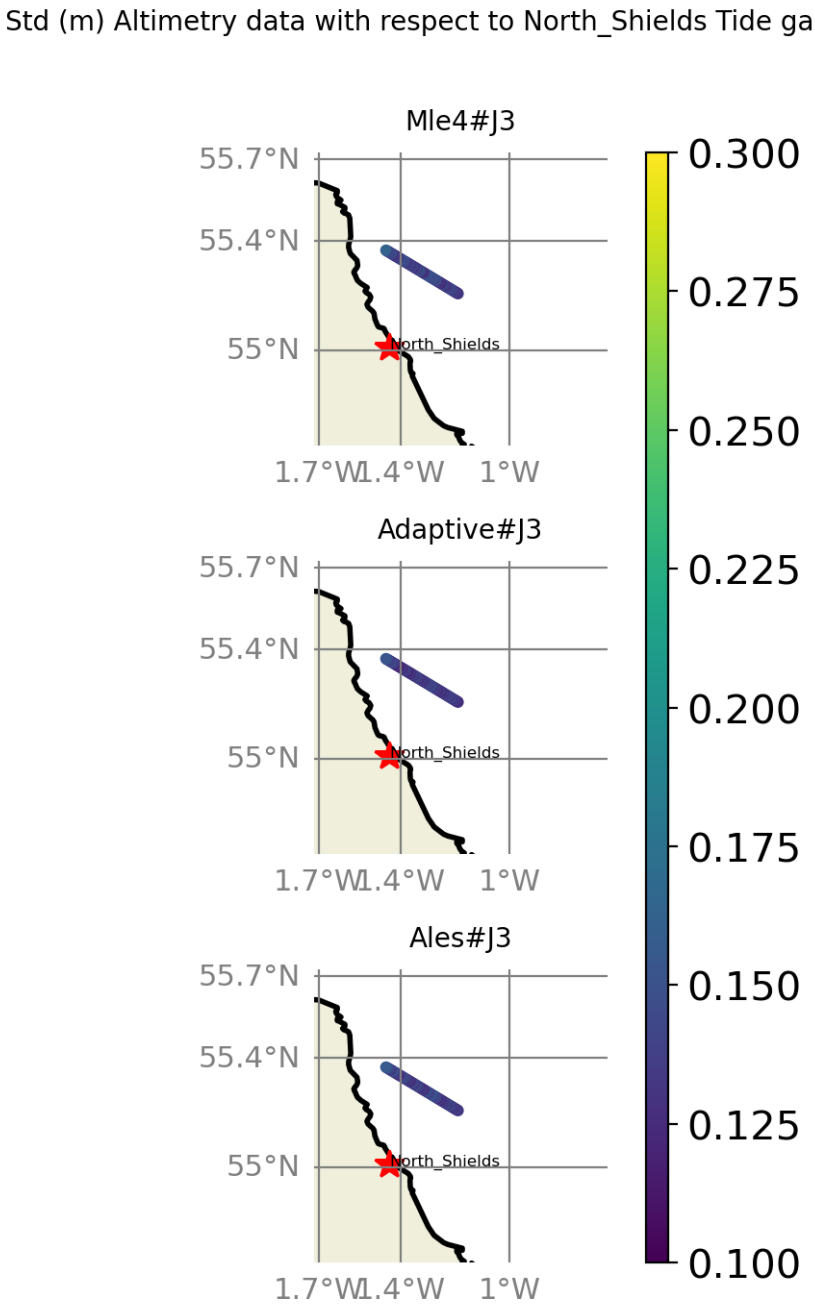

FIGURE 137 – std visualization in maps view % North_Shields tide gauge

6.10.4 valid_data_percent visualization in maps view % North_Shields tide gauge

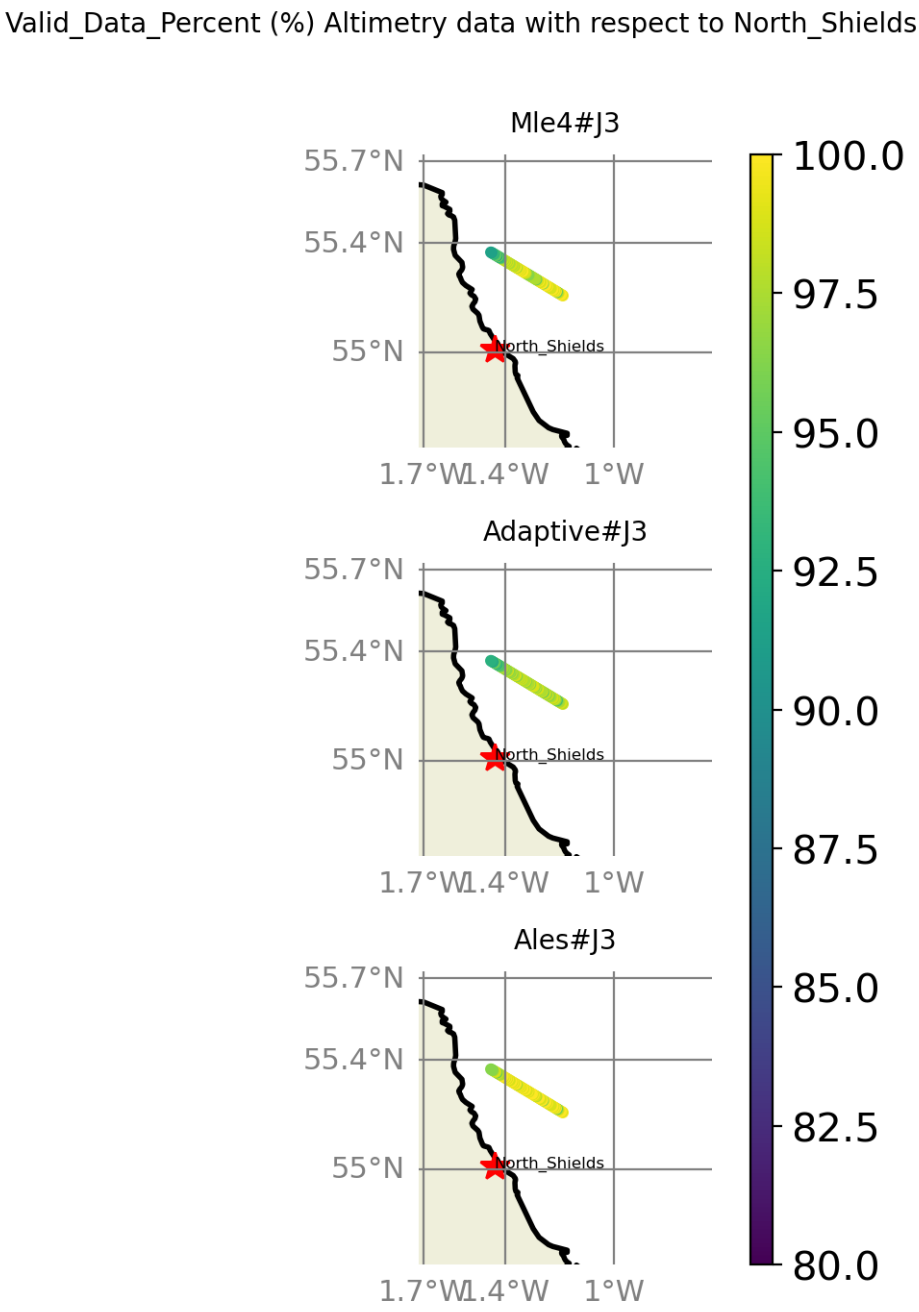

FIGURE 138 – valid_data_percent visualization in maps view % North_Shields tide gauge

6.10.5 Valid data (%) in function of distance to coast/North_Shields station

The formula to calculate the percentage of valid data in each time serie is;

$$pvd_i = \frac{nvd_i}{maxNB}, i = 1, np$$

Where *pvd* and *nvd* are the percentage of data and the number of altimetry data in the period covered by the tide gauge sla time serie, respectively in the time serie, i is the index of the time serie, np is the number of the selected altimetry time series. $maxNB = 82$ point is the maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie.

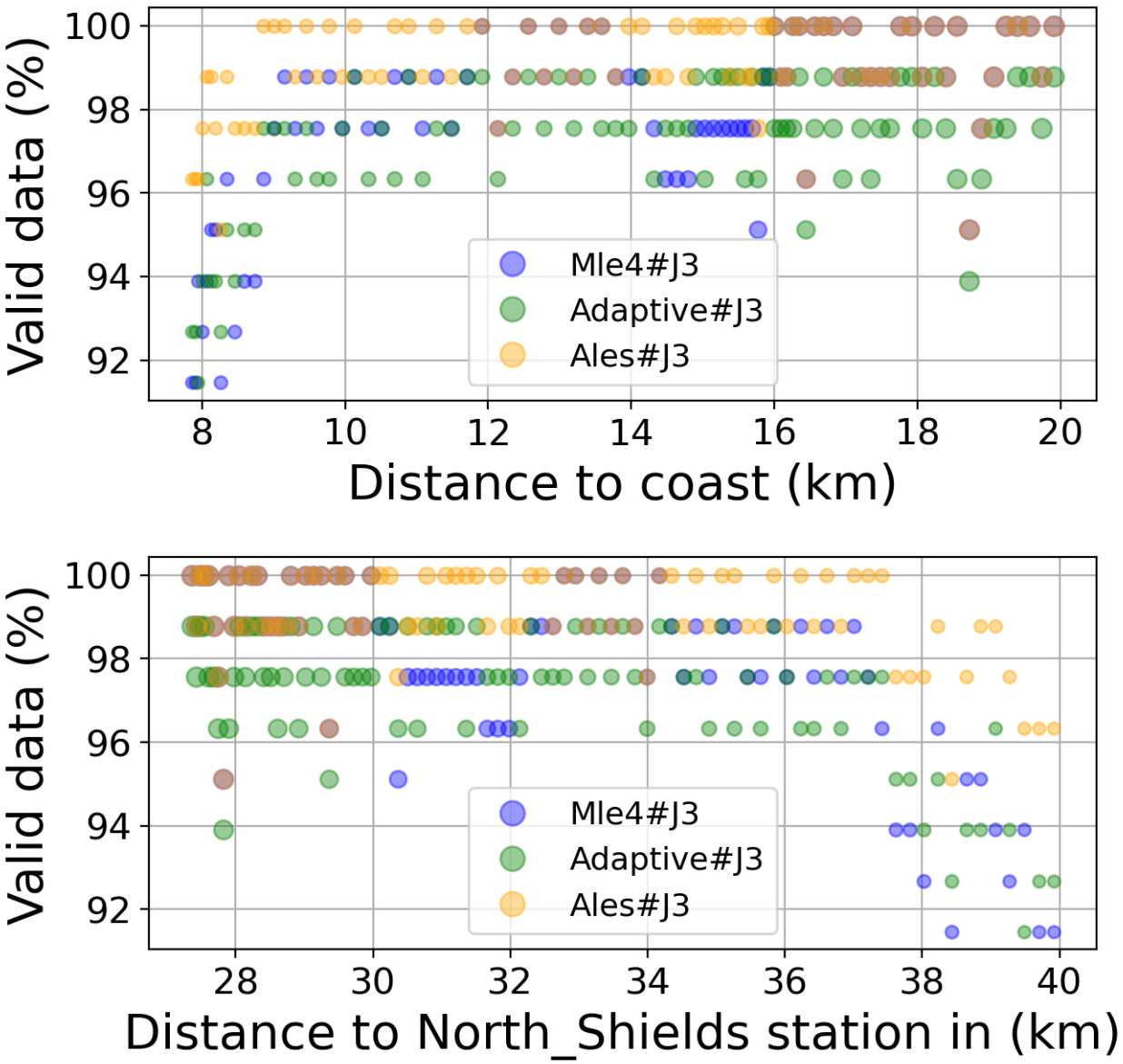

FIGURE 139 – Valid data (%) in function of distance to coast/North_Shields station

6.10.6 Std in function of distance to coast/North_Shields station

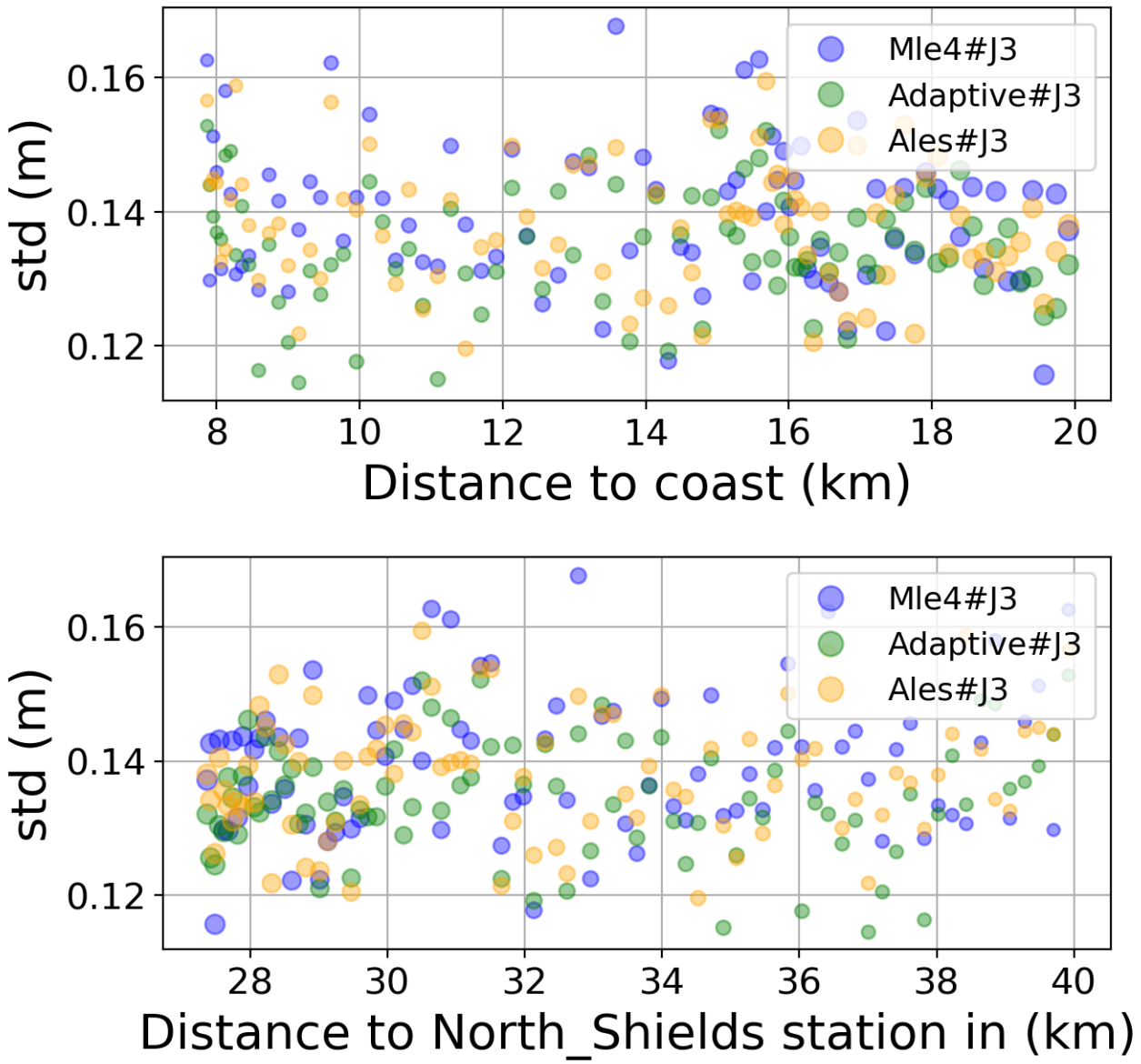

FIGURE 140 – Std in function of the distance to the coast/North_Shields station

6.10.7 Correlation in function of distance to coast/North_Shields station

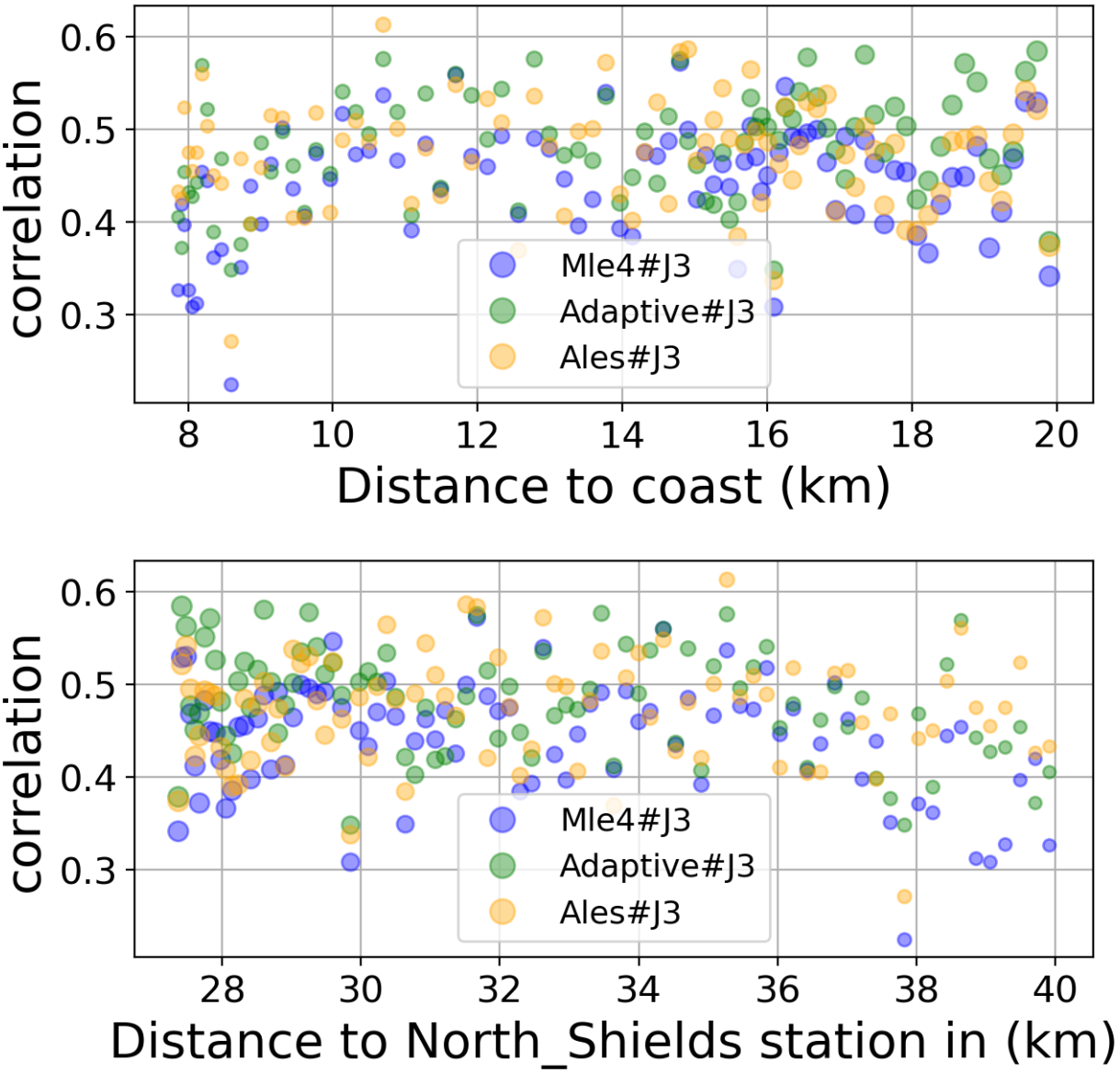

FIGURE 141 – Correlation in function of the distance to the coast/North_Shields station

6.10.8 Taylor Diagram

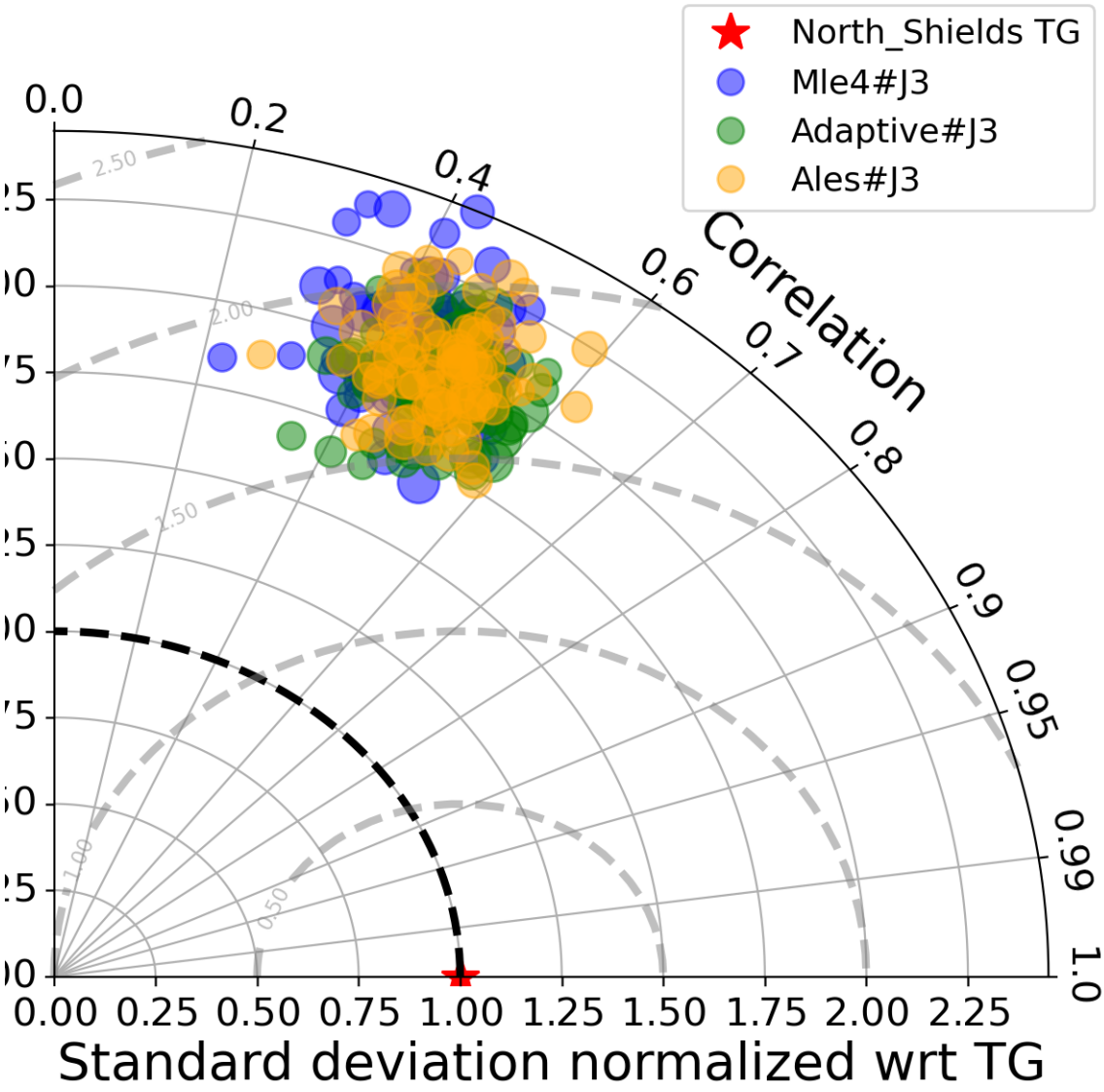

Figure 142 – Taylor diagram

6.10.9 Mean statistics table of products comparison with North_Shields tide gauge data

The table below contains the mean statistics of the common points between the different products in the selected area.

Product	Valid data (%)	Correlation	std (m)	rmsd (m)
Mle4#J3	97.819	0.442	0.14	0.126
Adaptive#J3	97.116	0.482	0.134	0.118
Ales#J3	99.039	0.473	0.138	0.122

FIGURE 143 – Mean statistics table of the common points in the altimetry products

6.10.10 The most correlated sla altimetry Time series with the tide gauge sla time serie

The maximum number of valid altimetry points in the set of all the altimetry sla time series covered by the period of time of the Tide gauge sla time serie is 82 point.

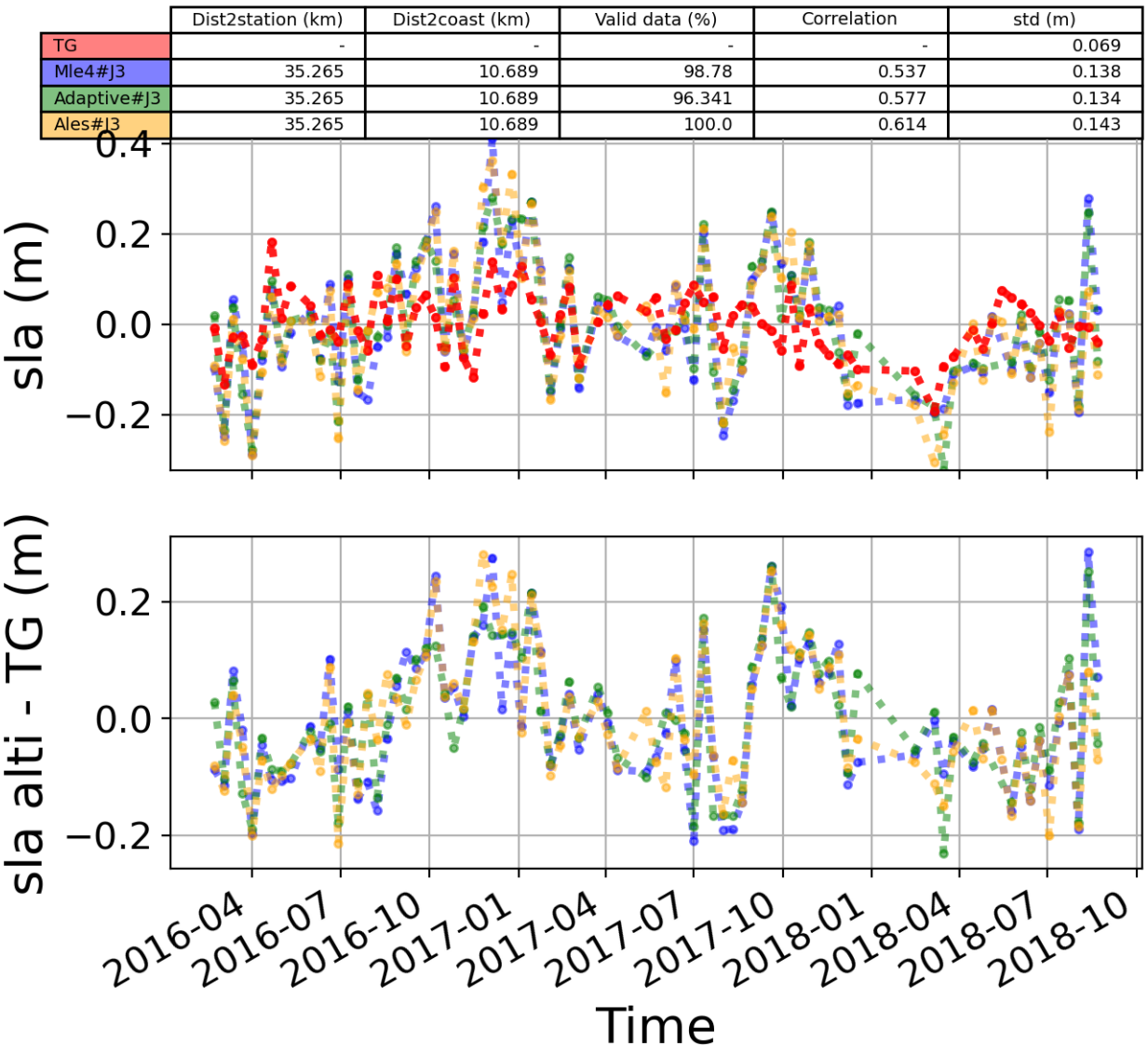

Figure 144 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

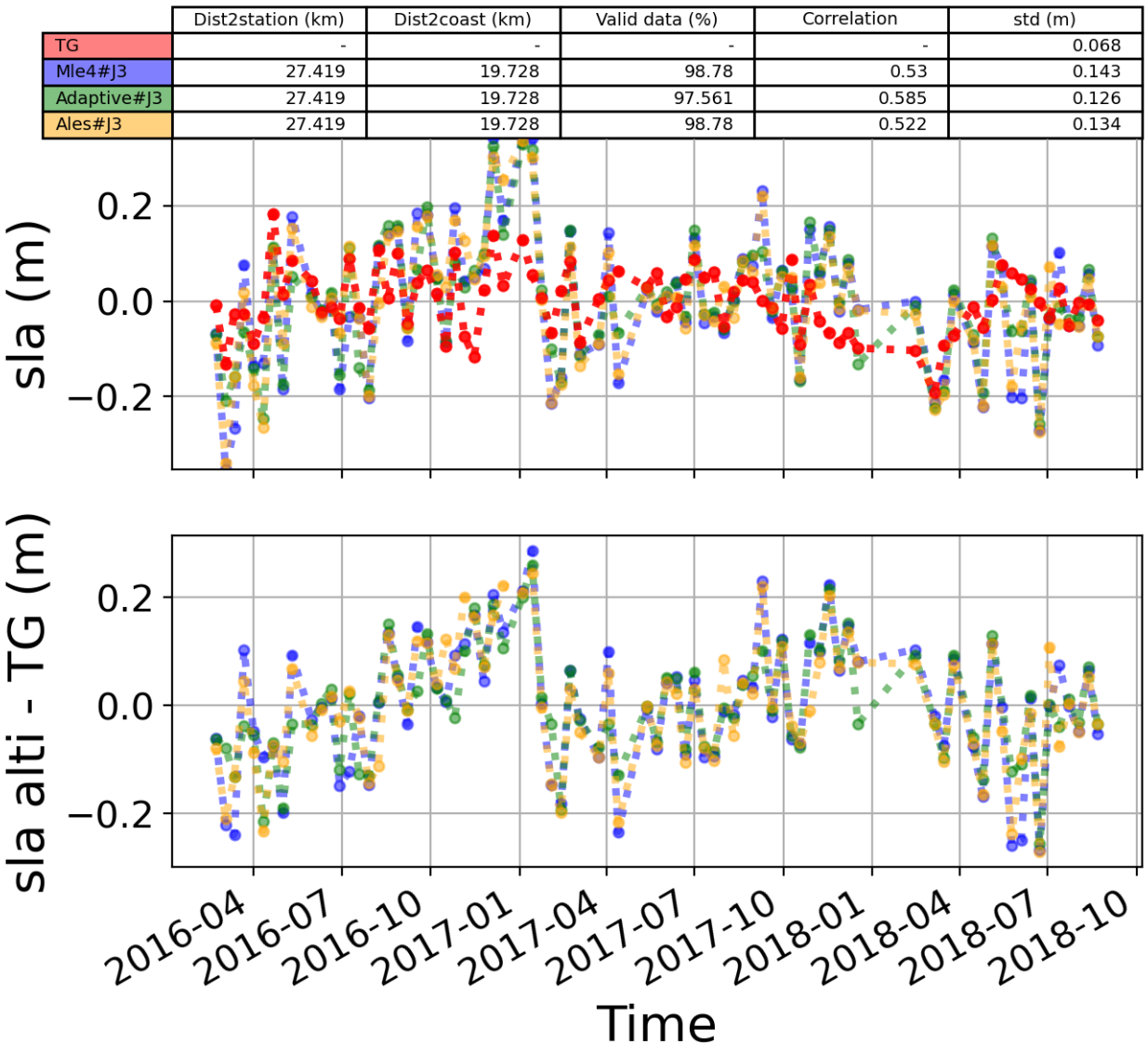

Figure 145 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

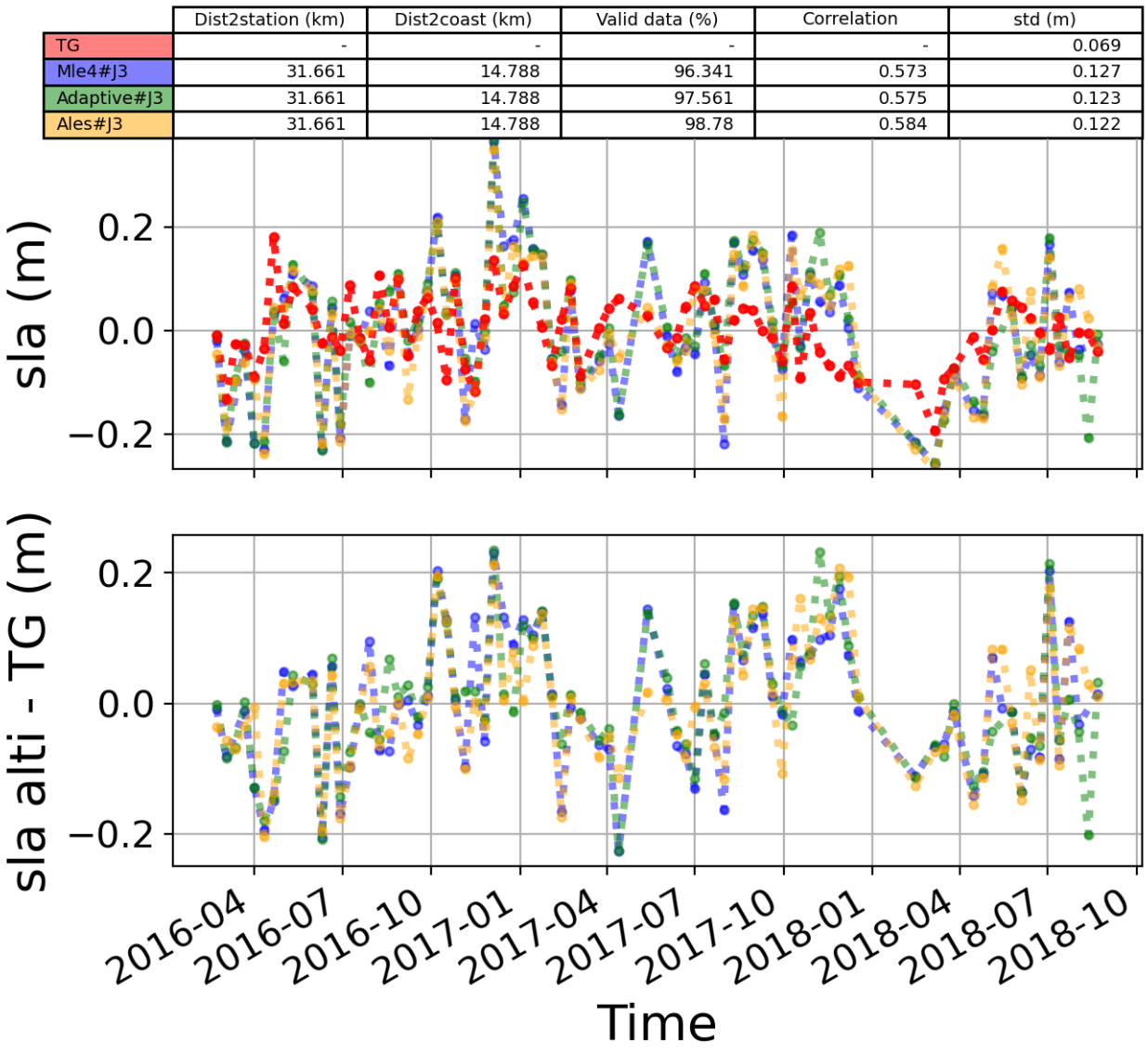

Figure 146 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie