Diagtool Report

Round Robin (GT cotier) : Range. Medsea. J2. Mle4 vs Adaptive vs Ales.

11 avril 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 Medsea
— Mission : J2
— Git last tag : 0.7 Appliquer le flag à l'adaptive
— Git changeset number : b8633aa-2022-04-11

2 Processing

2.1 sla formula

2.1.1 Mle4 product ' sla

sla = ORBIT.ALTI.POE_GDR_E -
RANGE.ALTI -
MEAN_SEA_SURFACE.MODEL.CNESCLS15 -
SEA_STATE_BIAS.ALTI.NON_PARAMETRIC -
IONOSPHERIC_CORRECTION.MODEL.GIM -
WET_TROPOSPHERIC_CORRECTION.RAD -
DRY_TROPOSPHERIC_CORRECTION.MODEL.ECMWF_GAUSS -
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_MPL2017

2.1.2 Adaptive product ' sla

sla = ORBIT.ALTI.POE_GDR_E -
RANGE.ALTI.RTK_ADAPTIVE -
0.18092 -
MEAN_SEA_SURFACE.MODEL.CNESCLS15 -
SEA_STATE_BIAS.ALTI.NON_PARAMETRIC_RTK_ADAPTIVE -
IONOSPHERIC_CORRECTION.MODEL.GIM -
WET_TROPOSPHERIC_CORRECTION.RAD -
DRY_TROPOSPHERIC_CORRECTION.MODEL.ECMWF_GAUSS -
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_MPL2017

2.1.3 Ales product ' sla

sla = ORBIT.ALTI.POE_GDR_E -
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_GAUSS -

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_MPL2017

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 1 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 Range

3.1.1 Range 's count

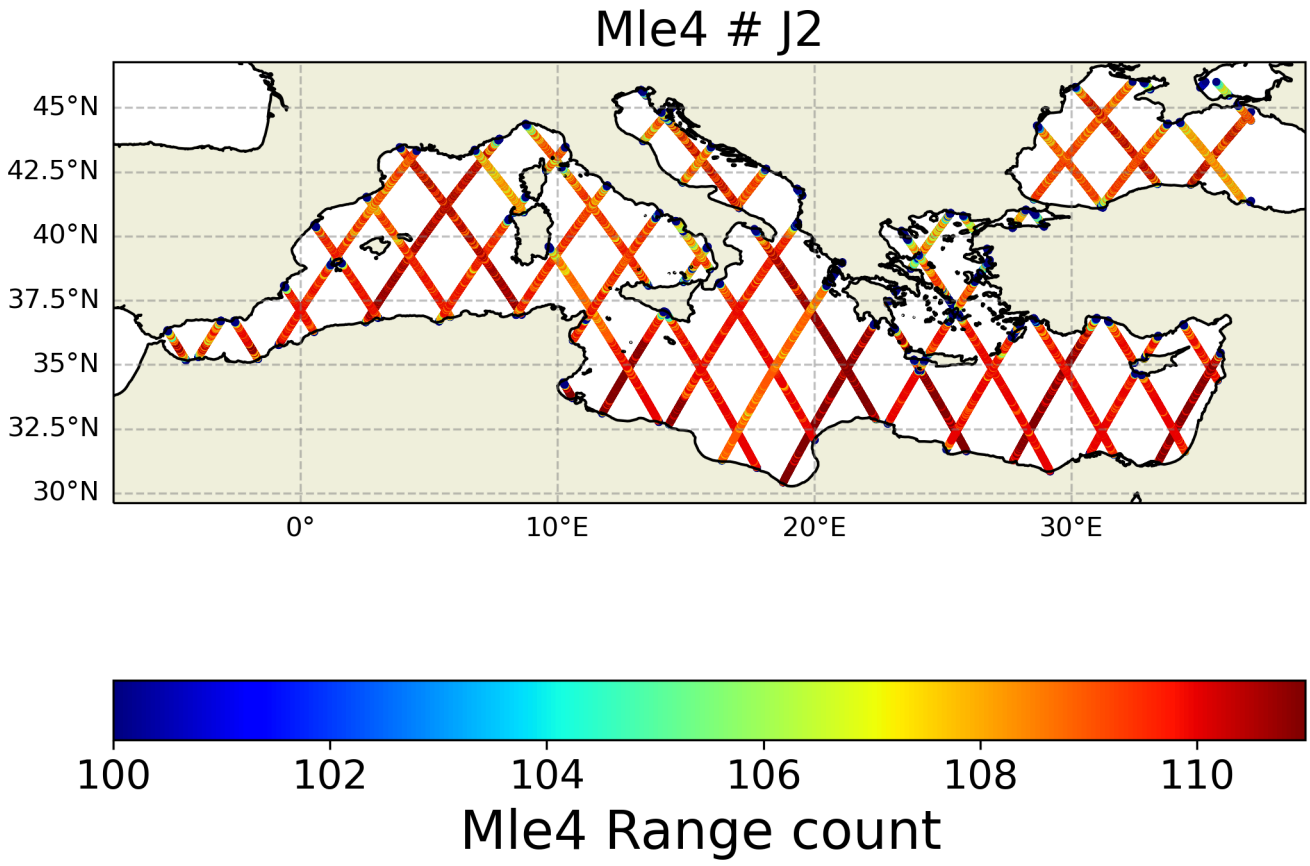

FIGURE 1 – Spatial coherence analysis of the count of the Mle4 version of Range variable

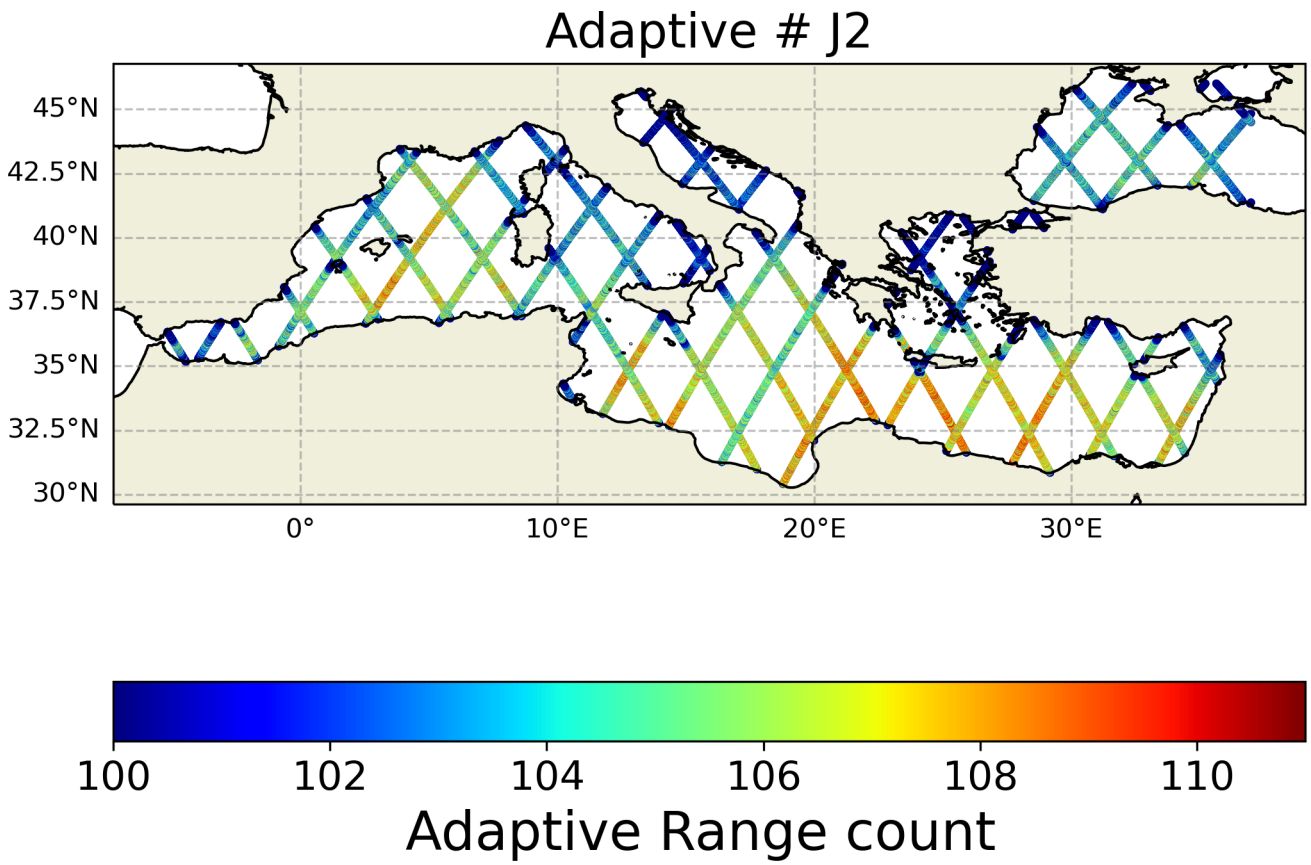

FIGURE 2 – Spatial coherence analysis of the count of the Adaptive version of Range variable

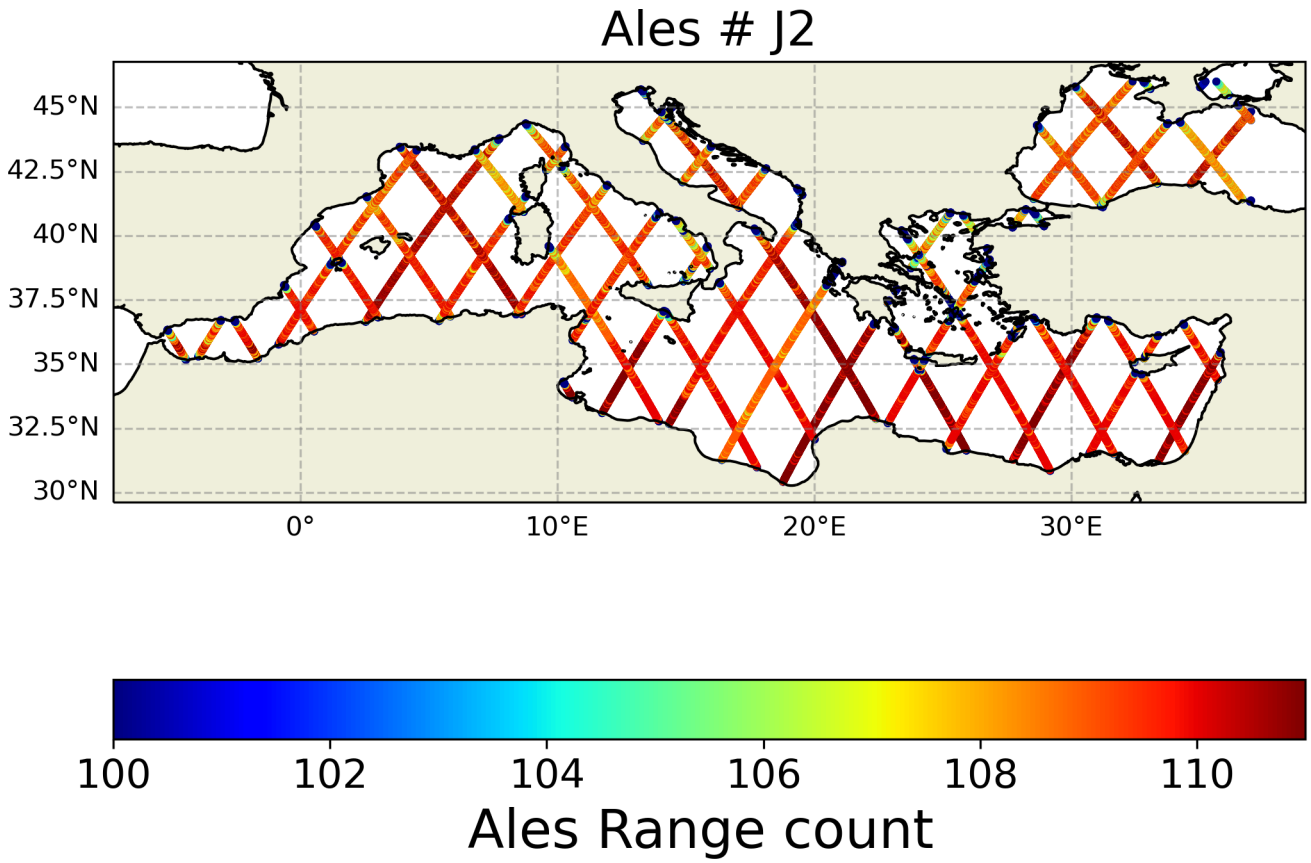

FIGURE 3 – Spatial coherence analysis of the count of the Ales version of Range variable

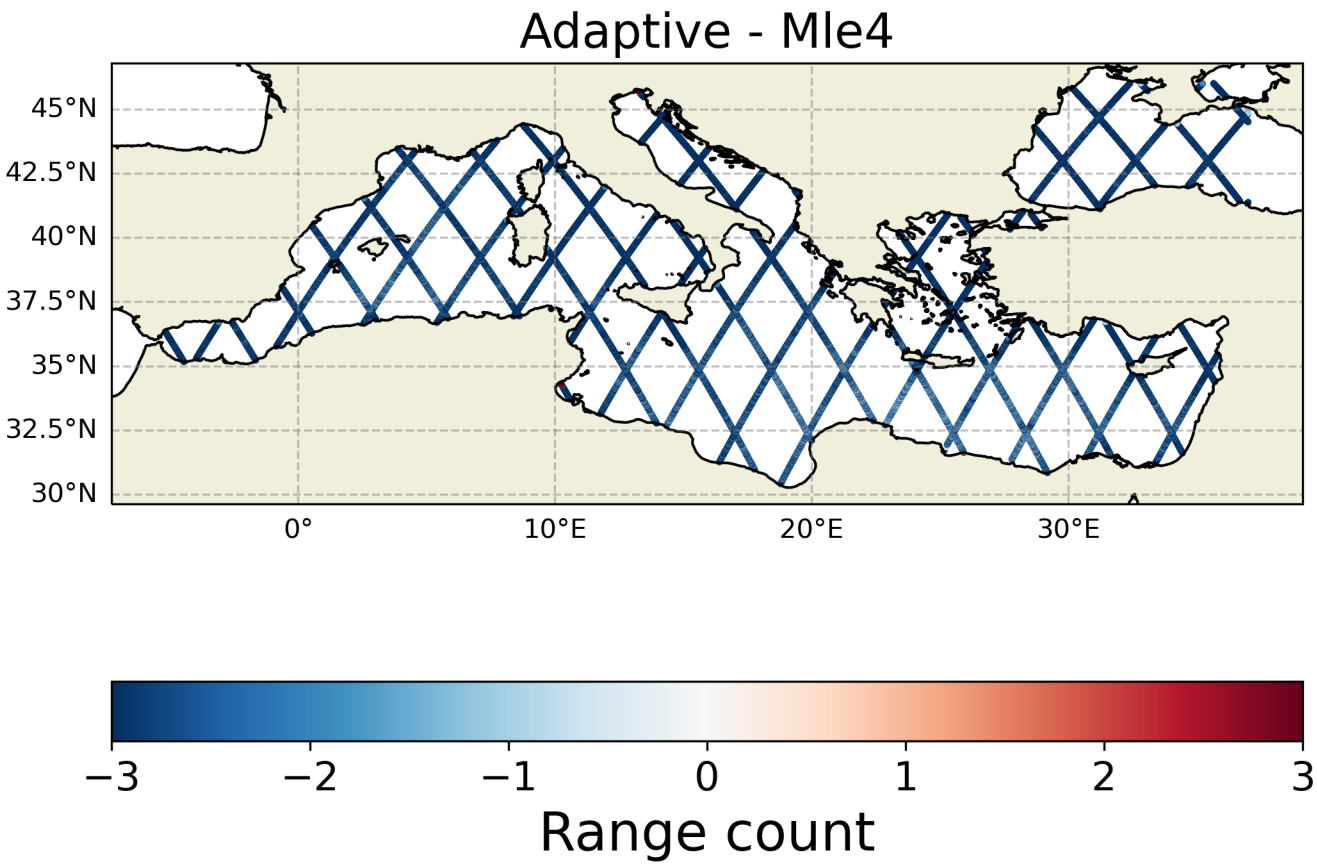

Figure 4 – Spatial coherence analysis of the Difference in Range 's count between Adaptive and Mle4

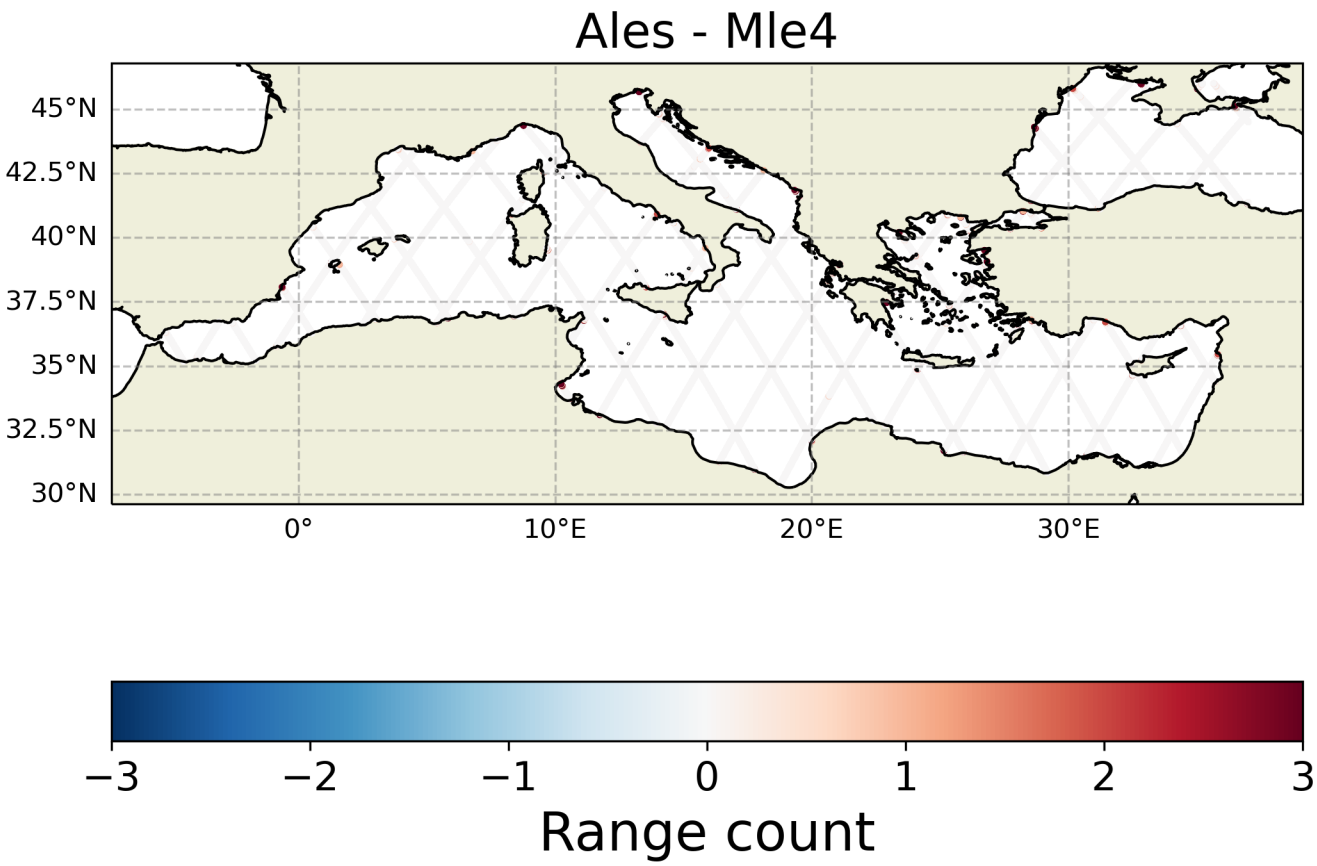

Figure 5 – Spatial coherence analysis of the Difference in Range 's count between Ales and Mle4

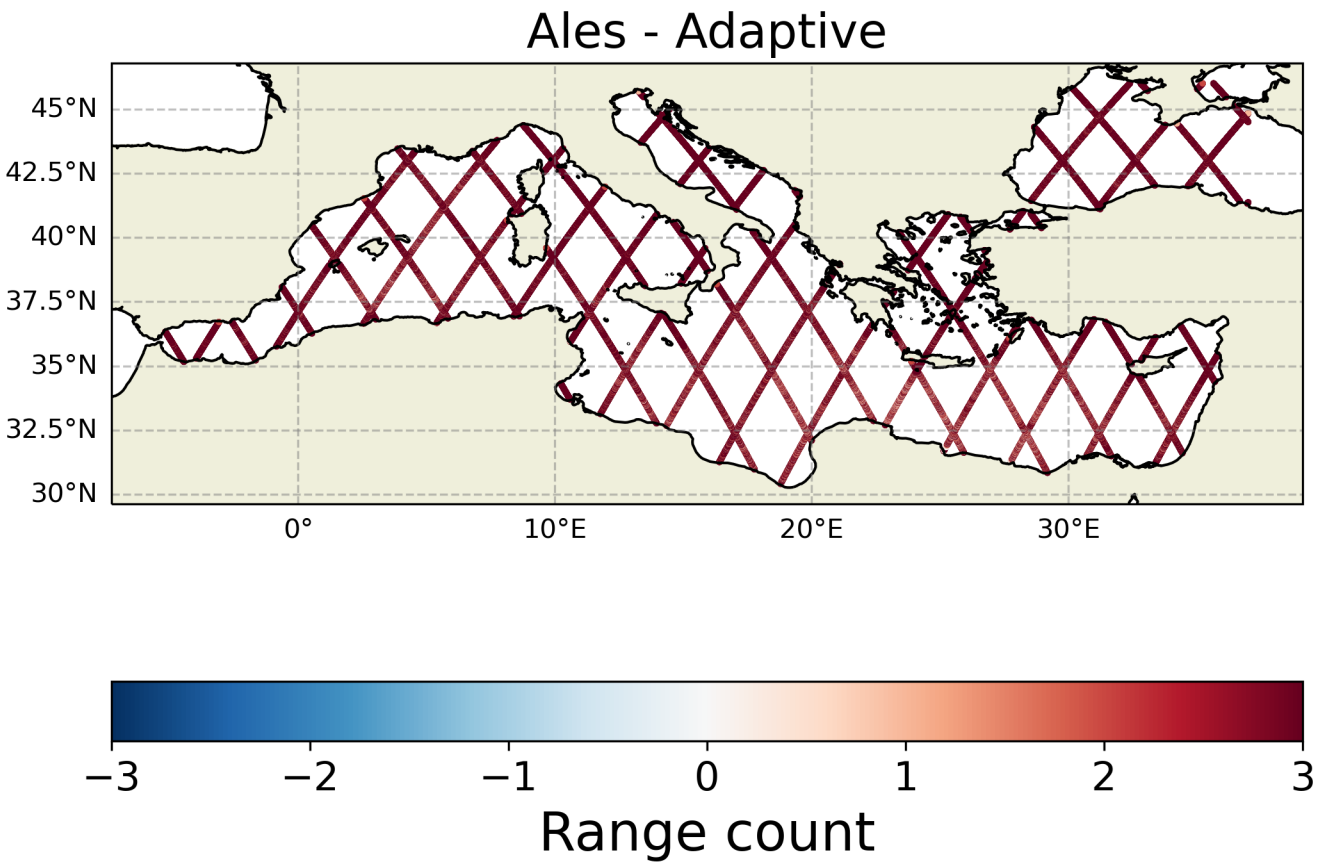

FIGURE 6 – Spatial coherence analysis of the Difference in Range 's count between Ales and Adaptive

3.2 sla

3.2.1 sla 's count

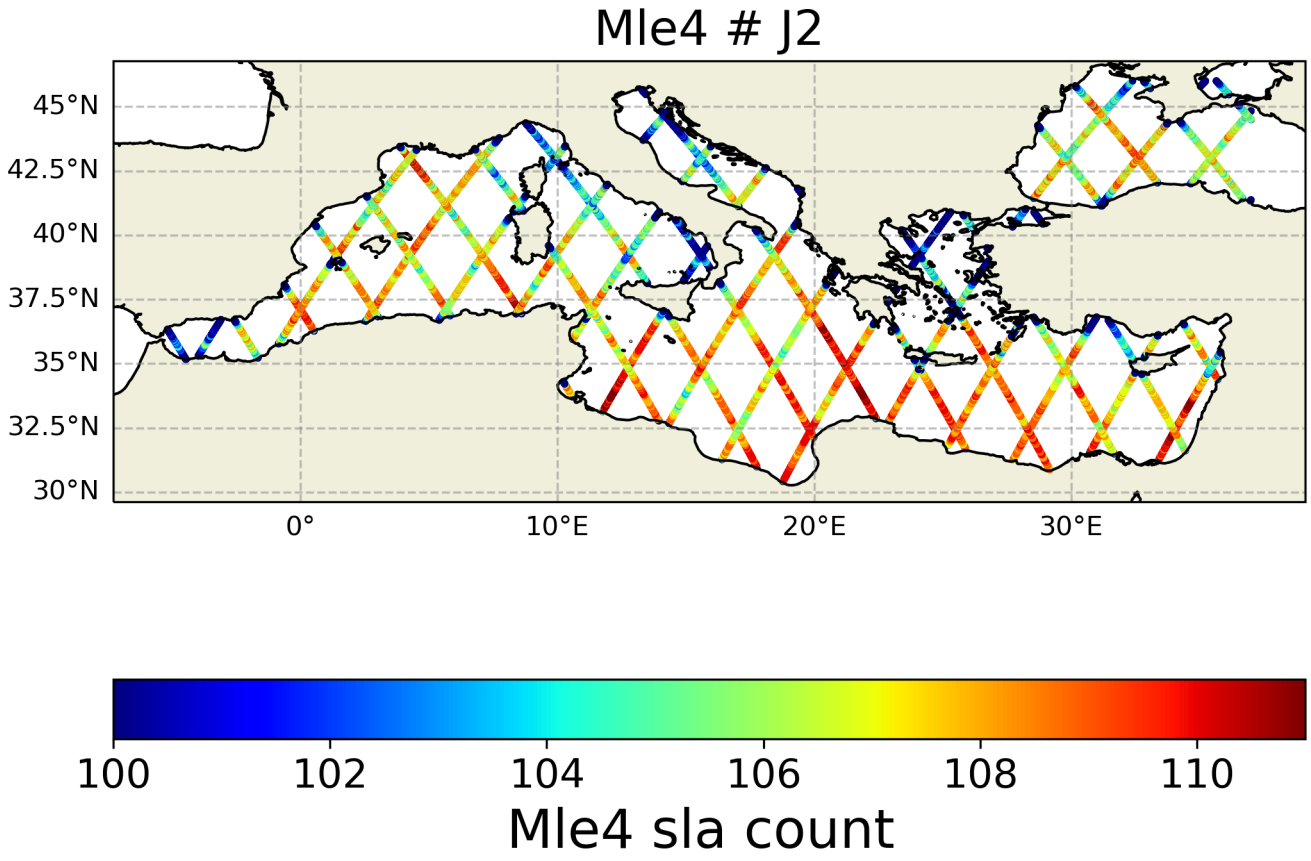

FIGURE 7 – Spatial coherence analysis of the count of the Mle4 version of sla variable

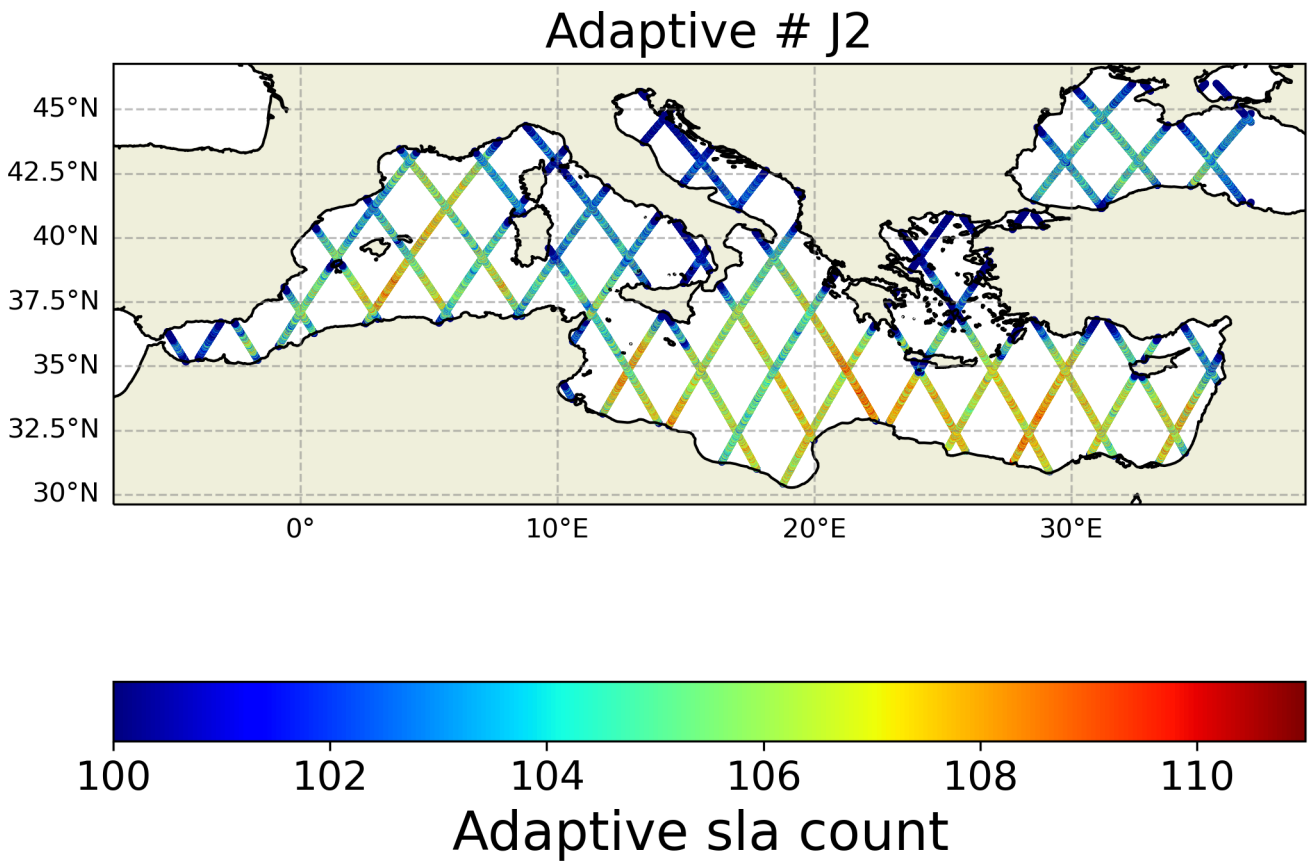

FIGURE 8 – Spatial coherence analysis of the count of the Adaptive version of sla variable

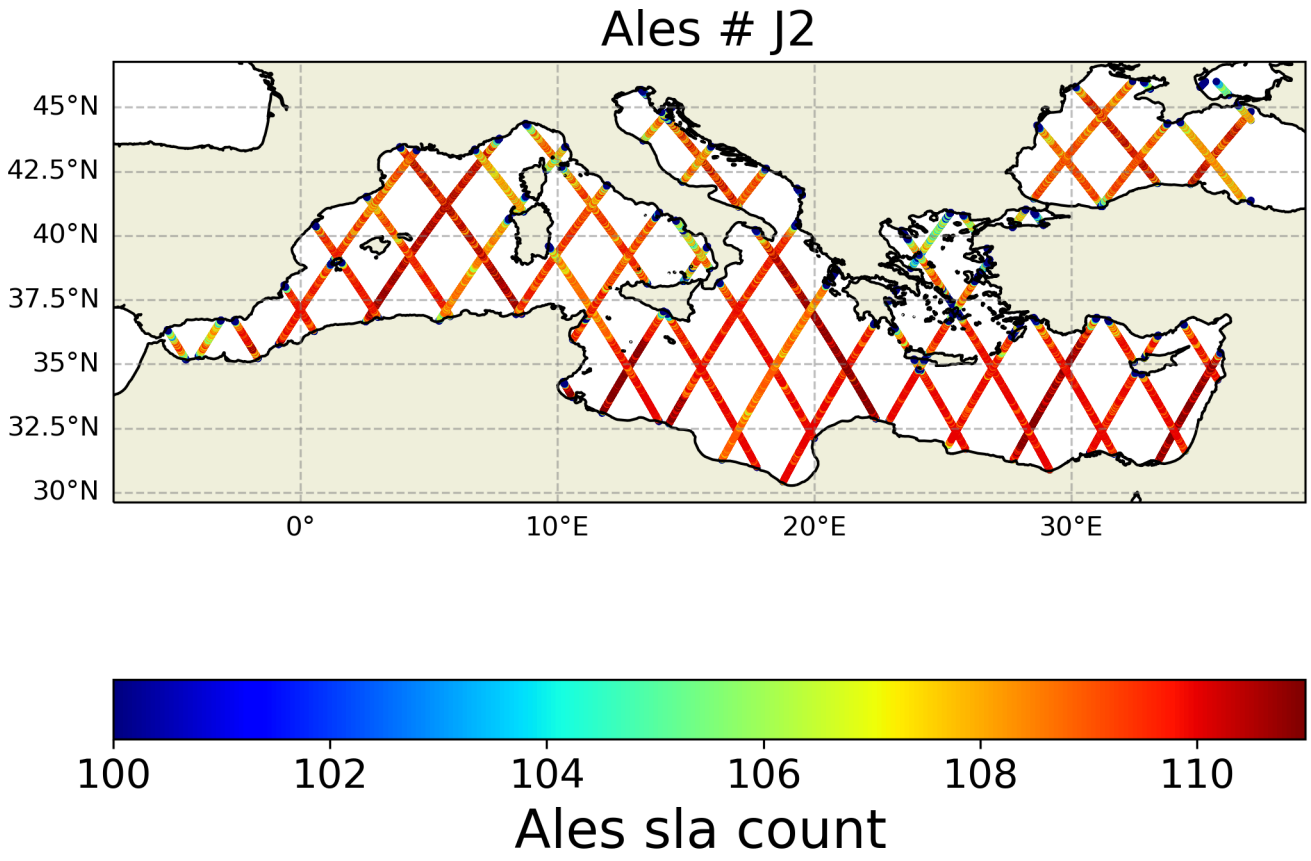

FIGURE 9 – Spatial coherence analysis of the count of the Ales version of sla variable

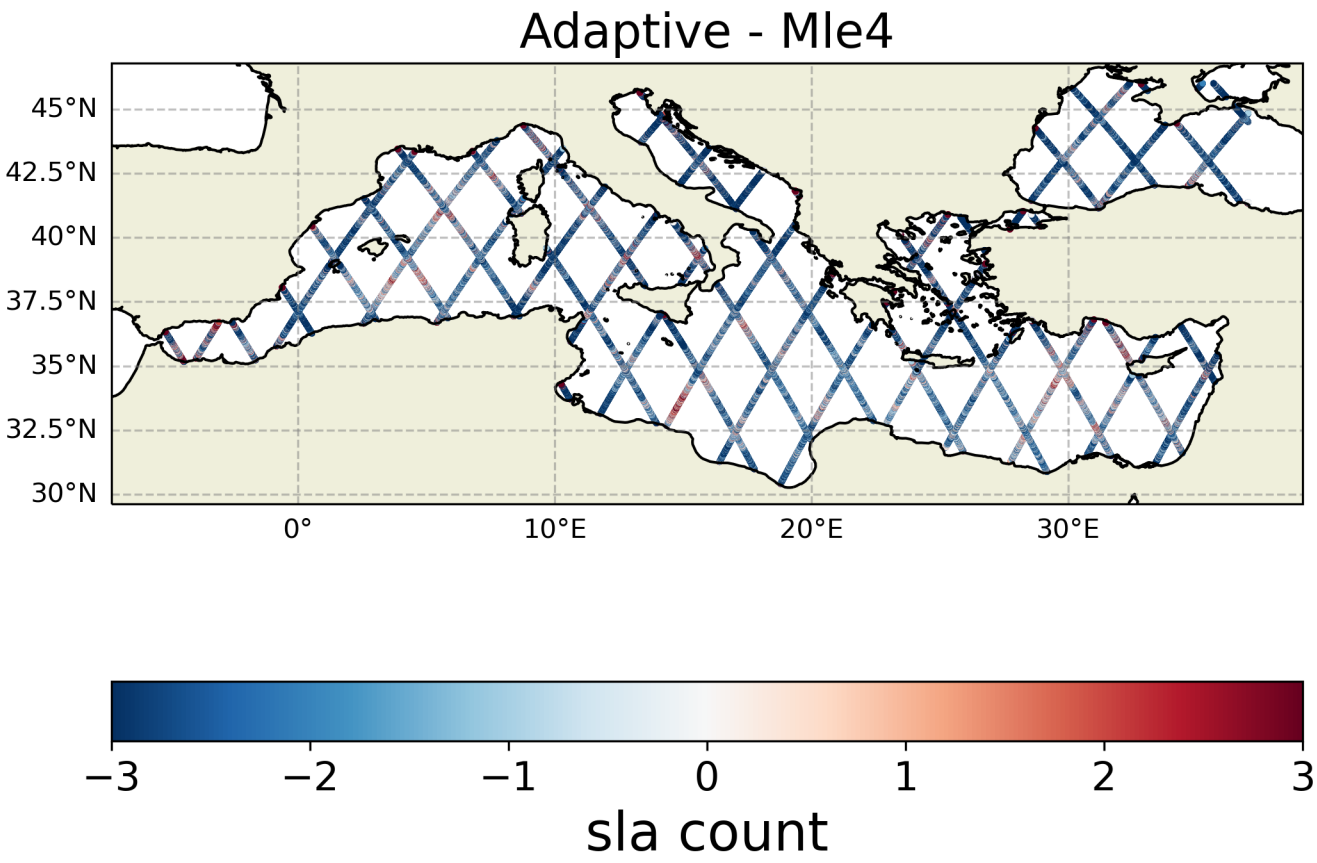

Figure 10 – Spatial coherence analysis of the Difference in sla 's count between Adaptive and Mle4

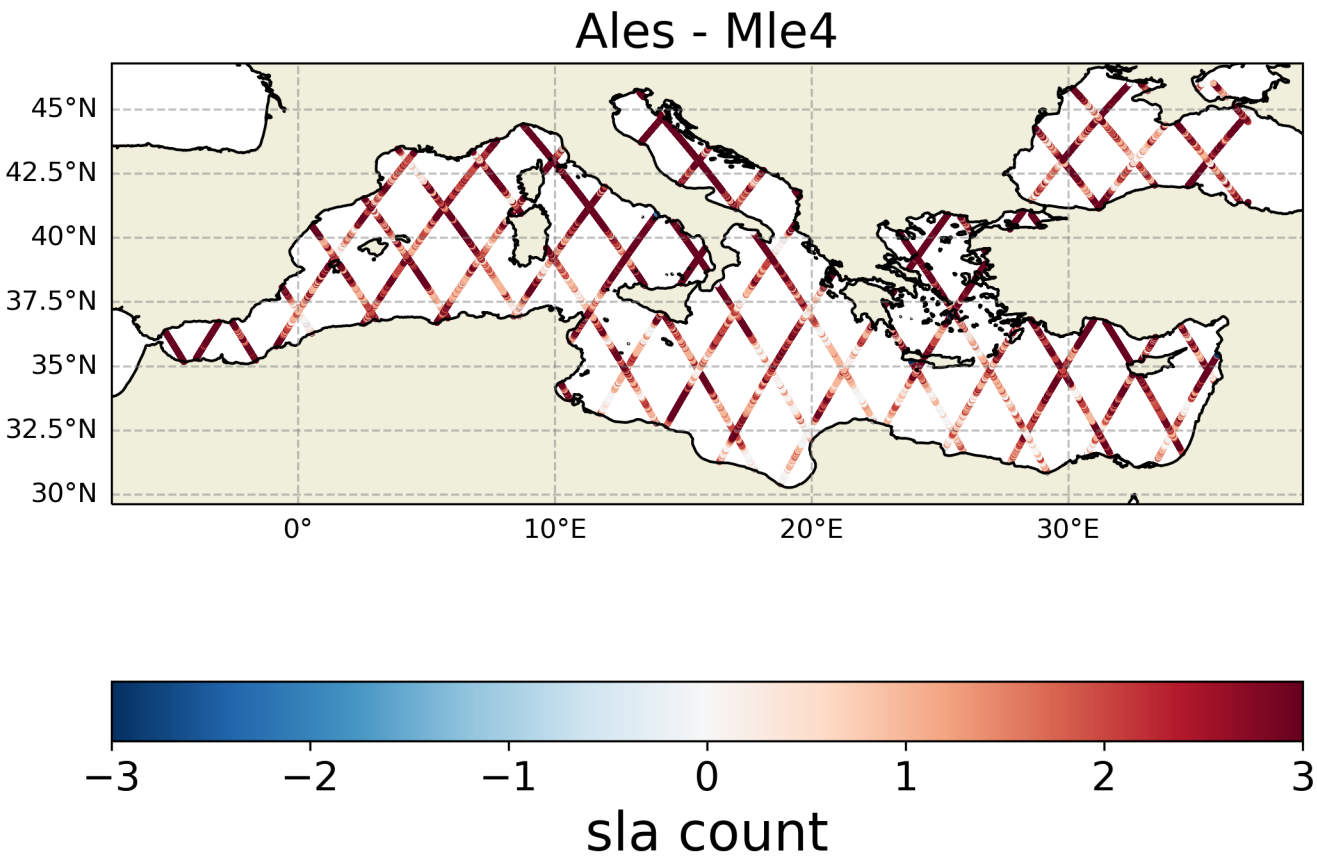

FIGURE 11 – Spatial coherence analysis of the Difference in sla 's count between Ales and Mle4

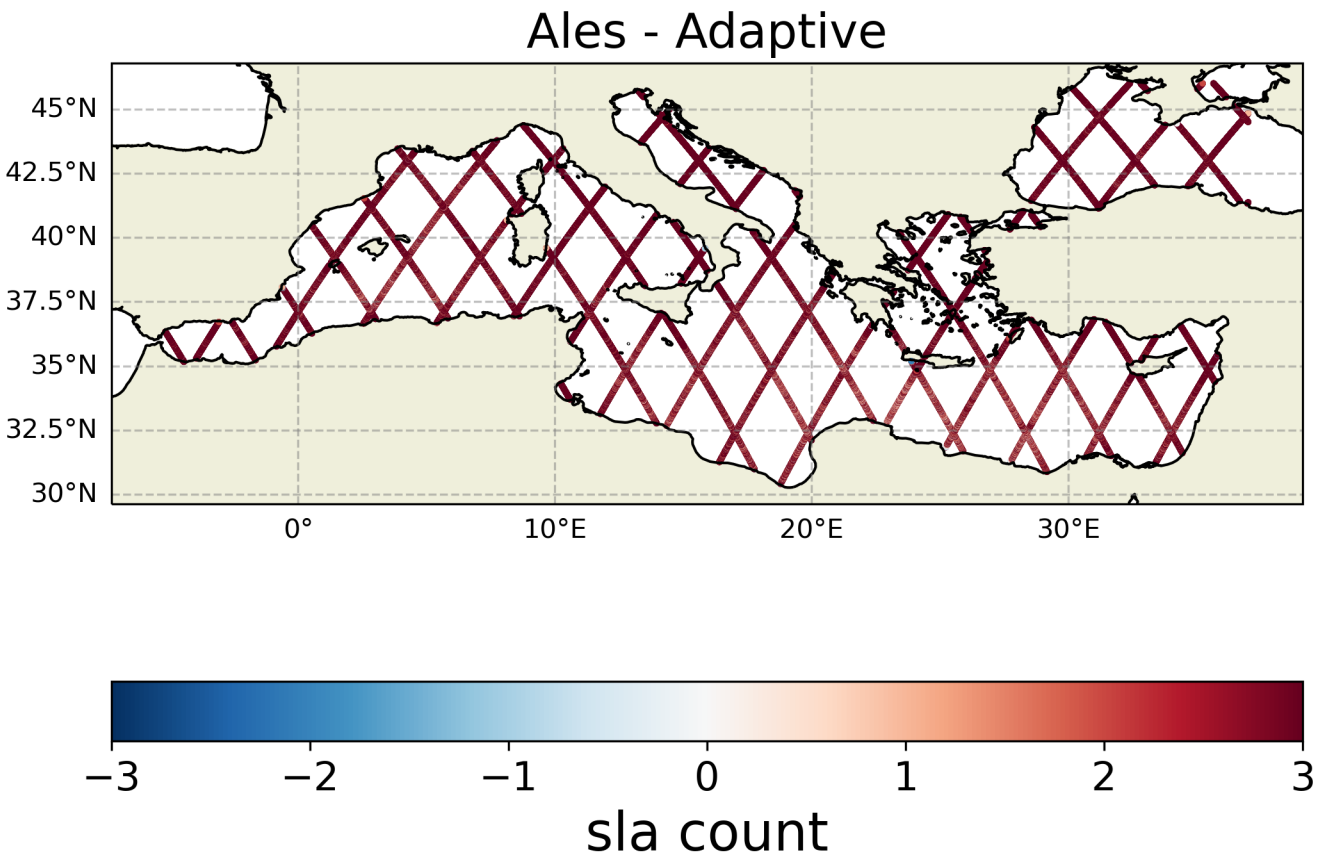

FIGURE 12 – Spatial coherence analysis of the Difference in sla 's count between Ales and Adaptive

3.2.2 sla 's std

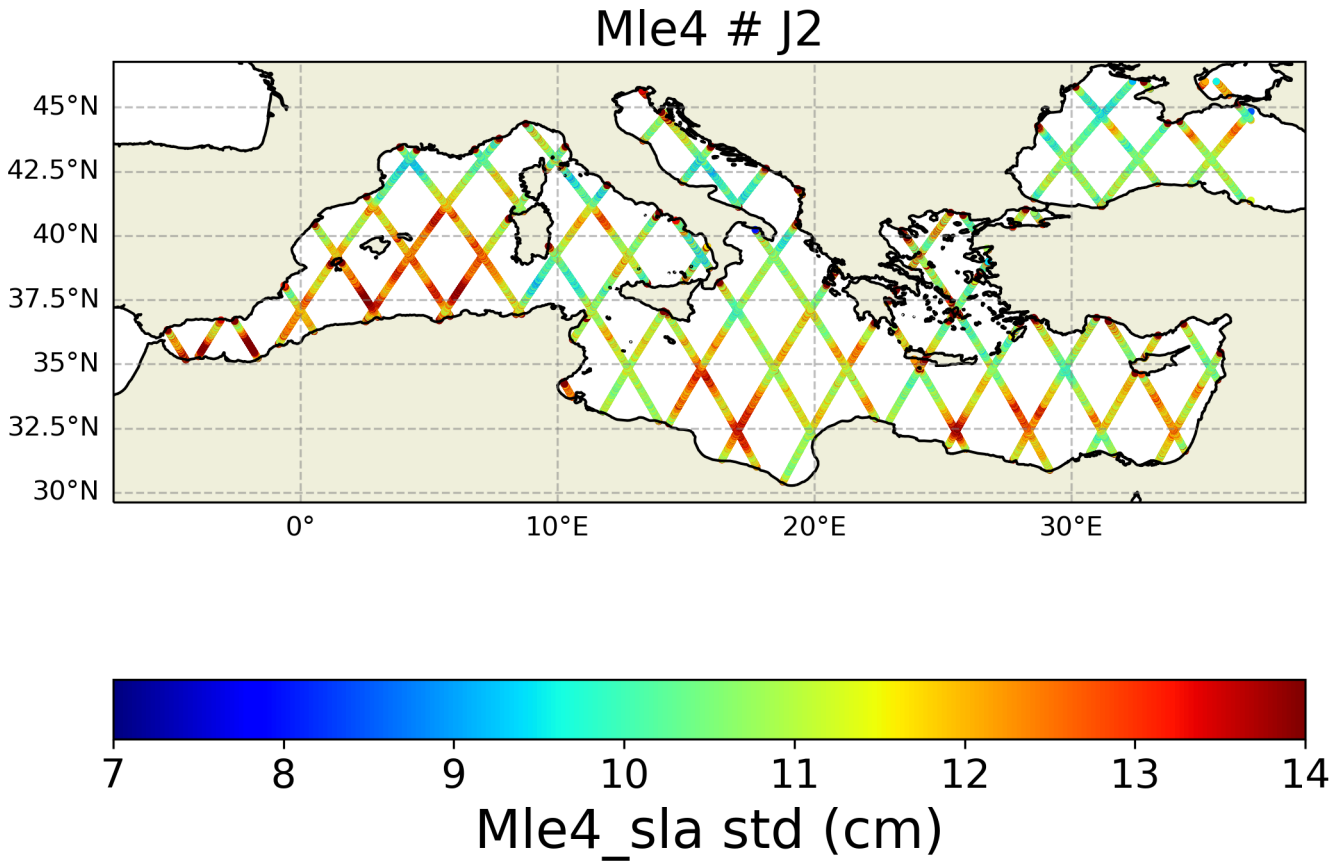

FIGURE 13 – Spatial coherence analysis of the std of the Mle4 version of sla variable

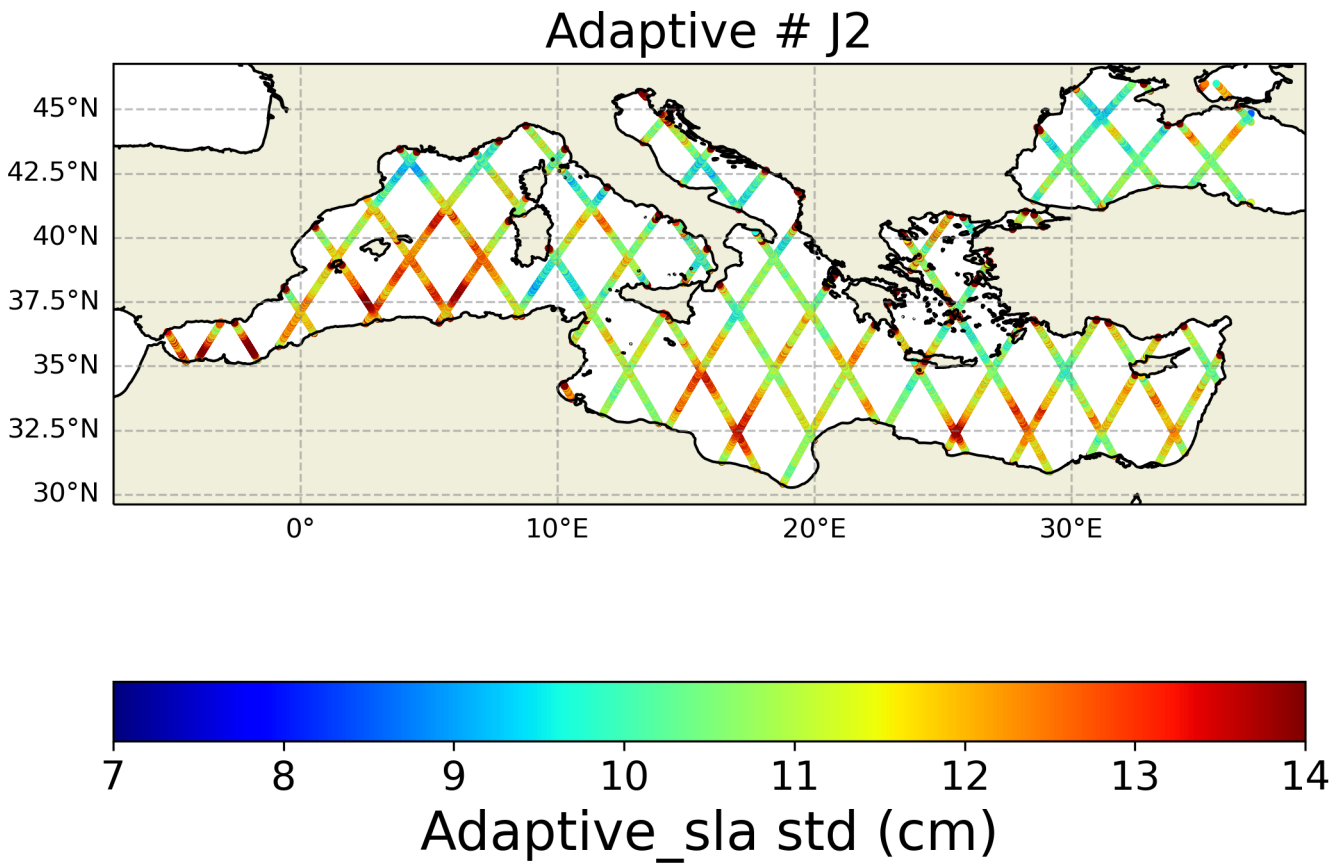

FIGURE 14 – Spatial coherence analysis of the std of the Adaptive version of sla variable

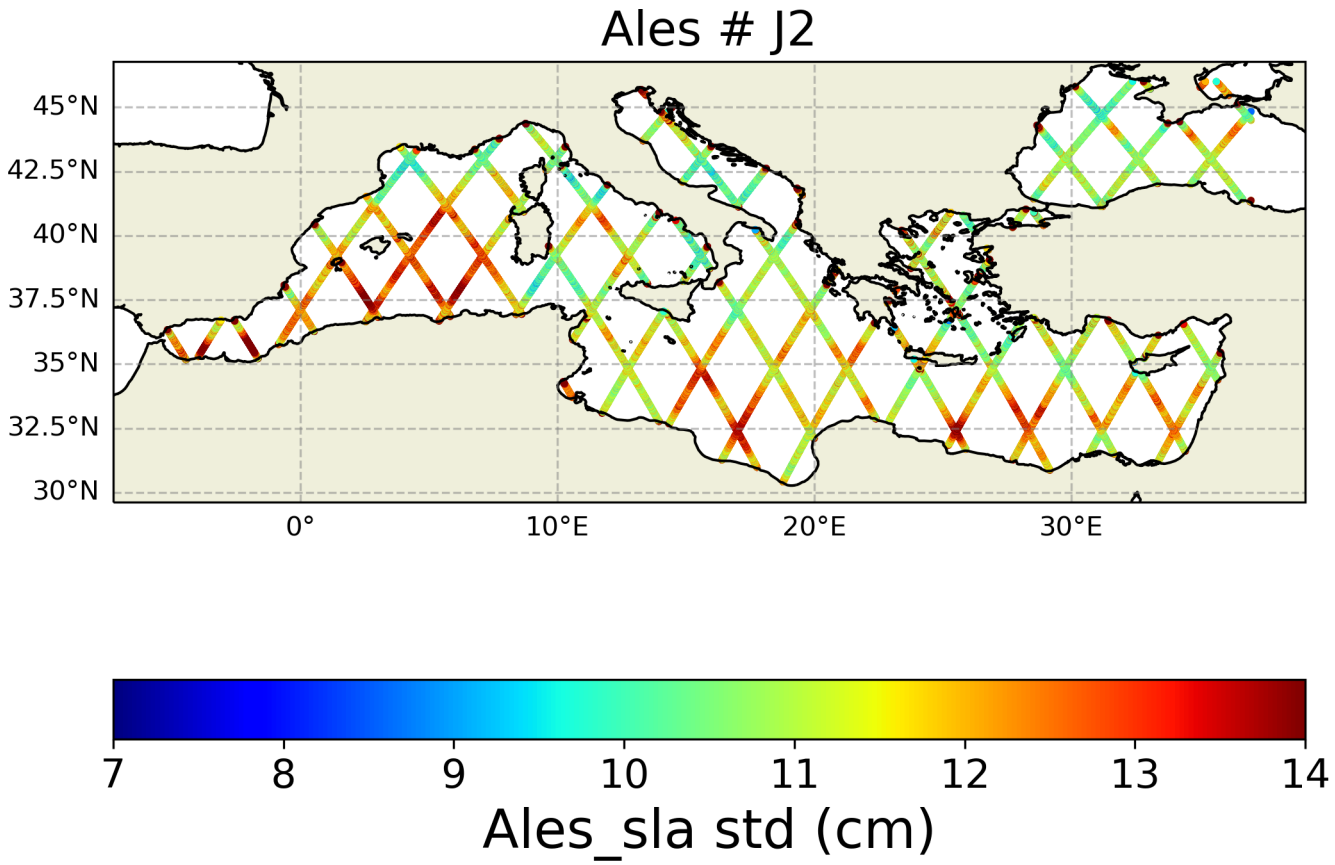

FIGURE 15 – Spatial coherence analysis of the std of the Ales version of sla variable

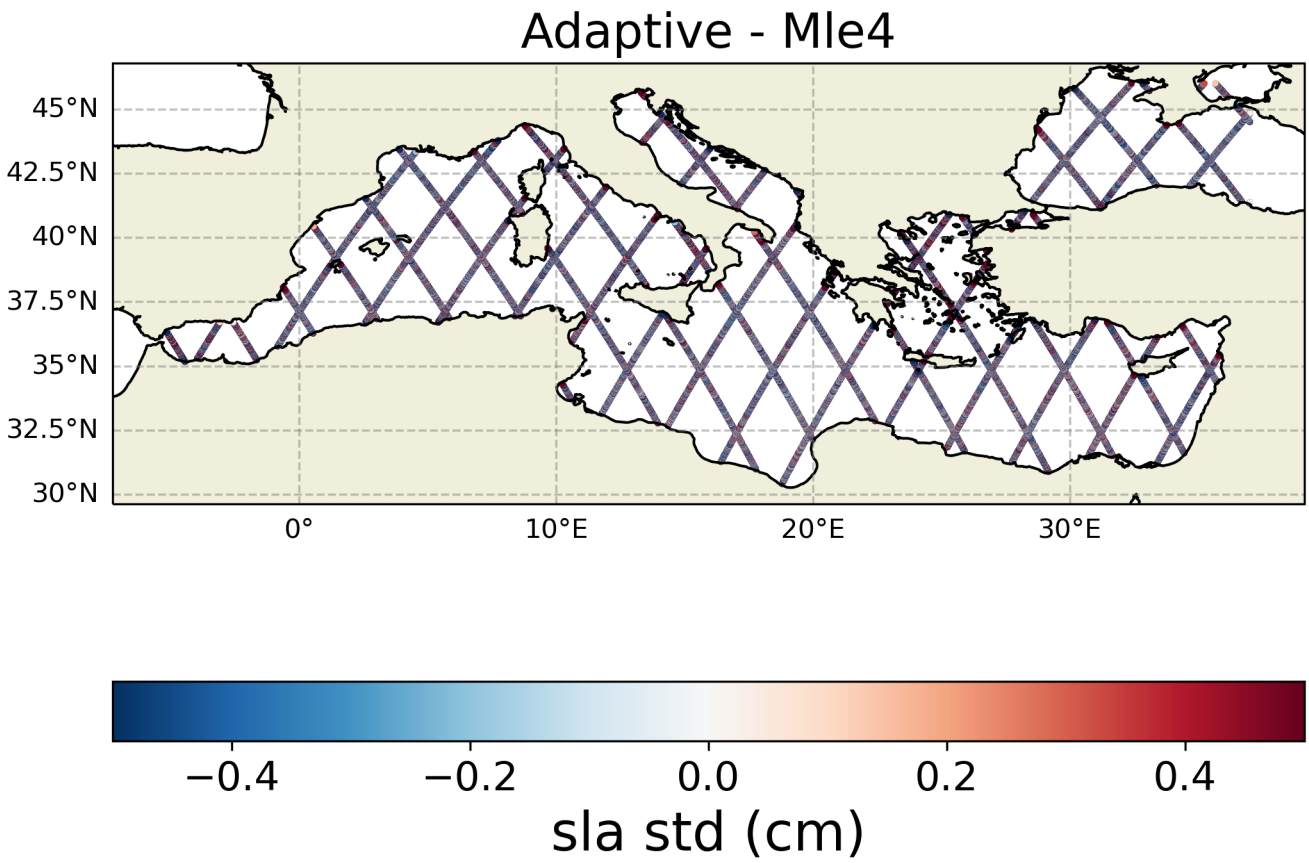

FIGURE 16 – Spatial coherence analysis of the Difference in sla 's std between Adaptive and Mle4

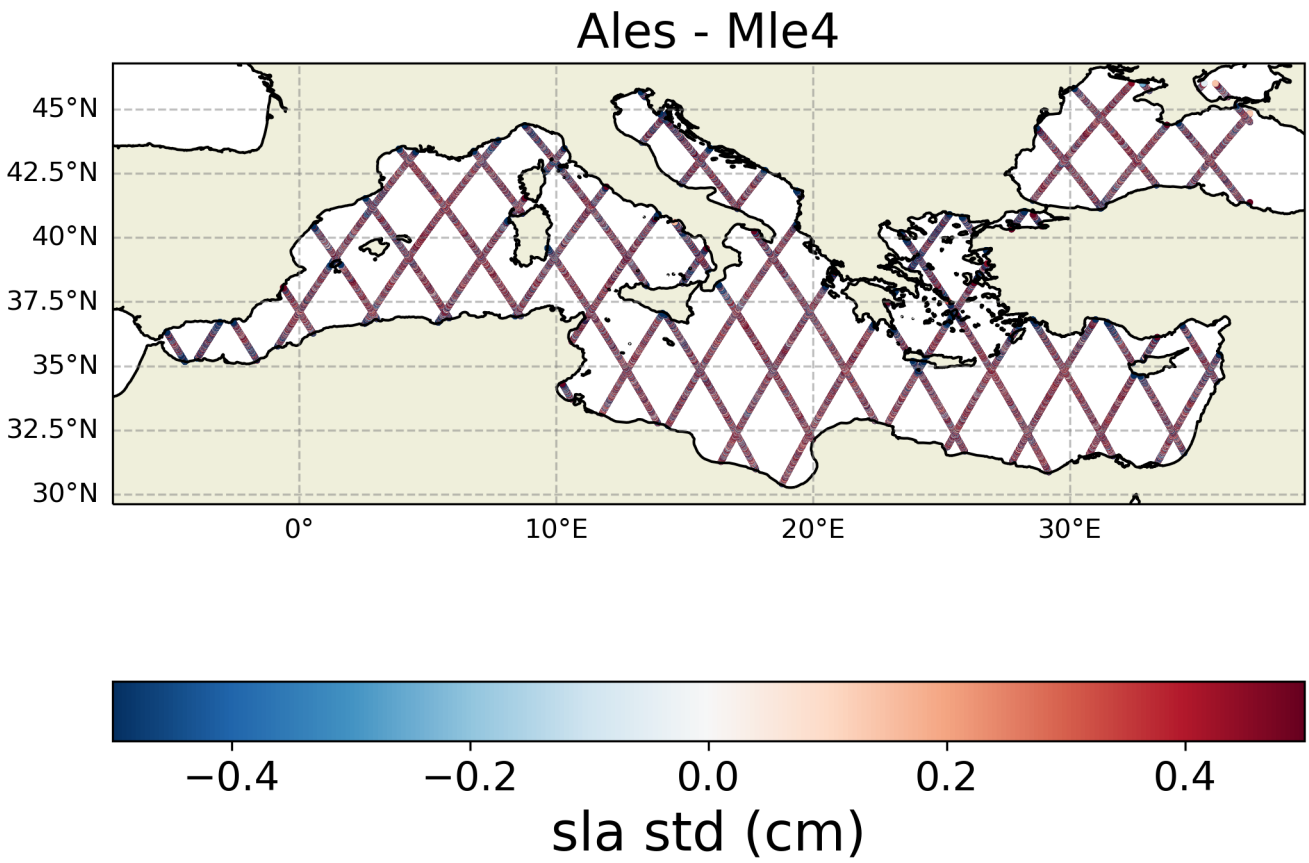

Figure 17 – Spatial coherence analysis of the Difference in sla 's std between Ales and Mle4

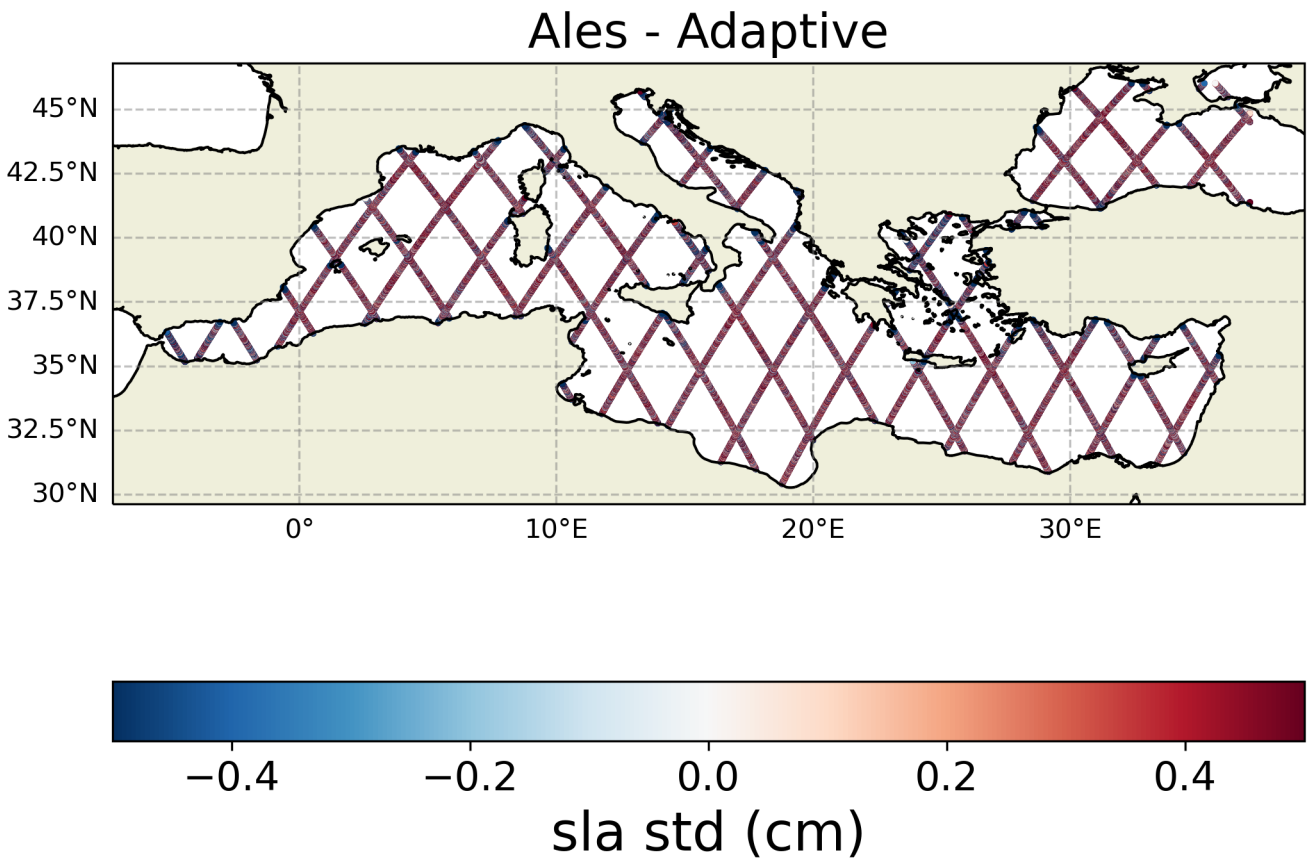

FIGURE 18 – Spatial coherence analysis of the Difference in sla 's std between Ales and Adaptive

3.2.3 sla 's mean

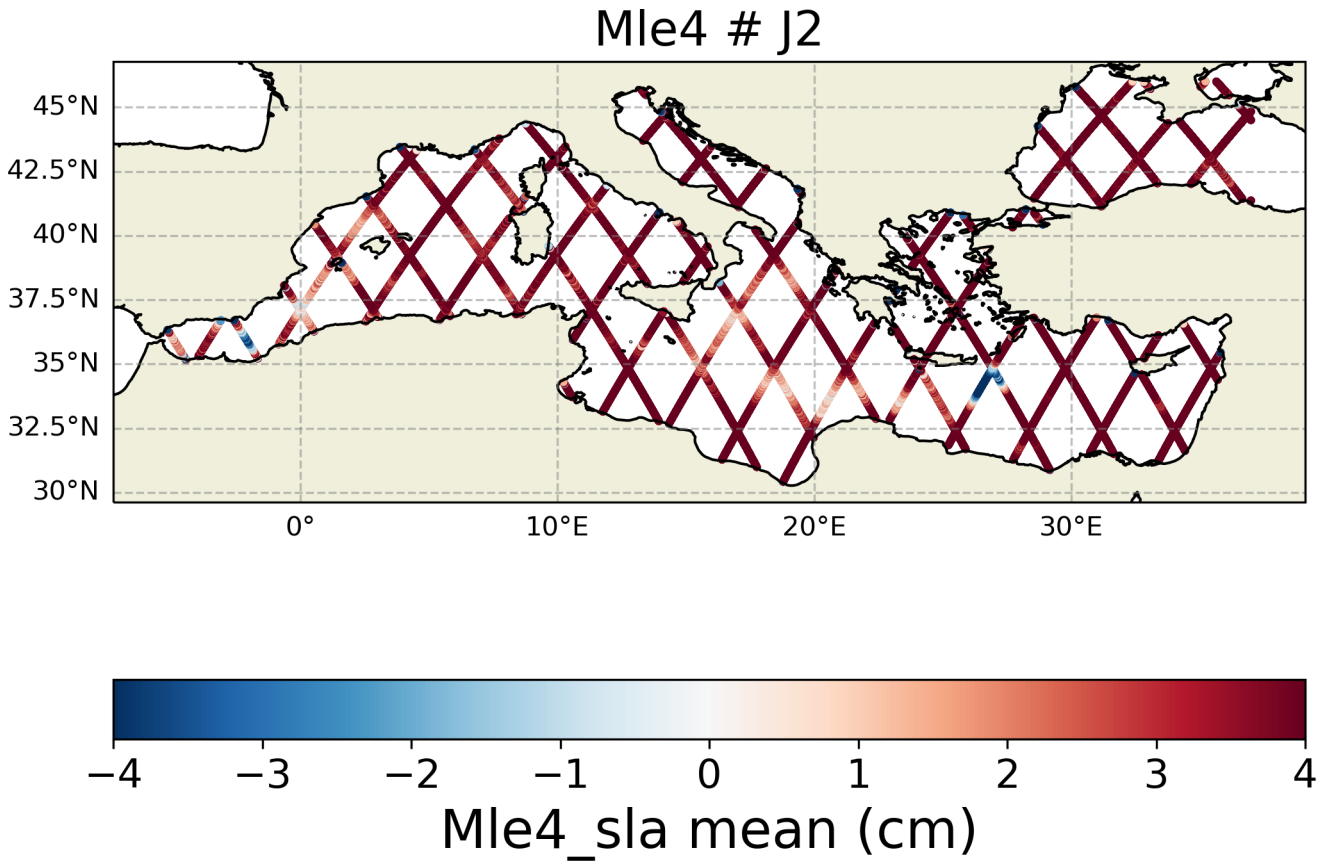

FIGURE 19 – Spatial coherence analysis of the mean of the Mle4 version of sla variable

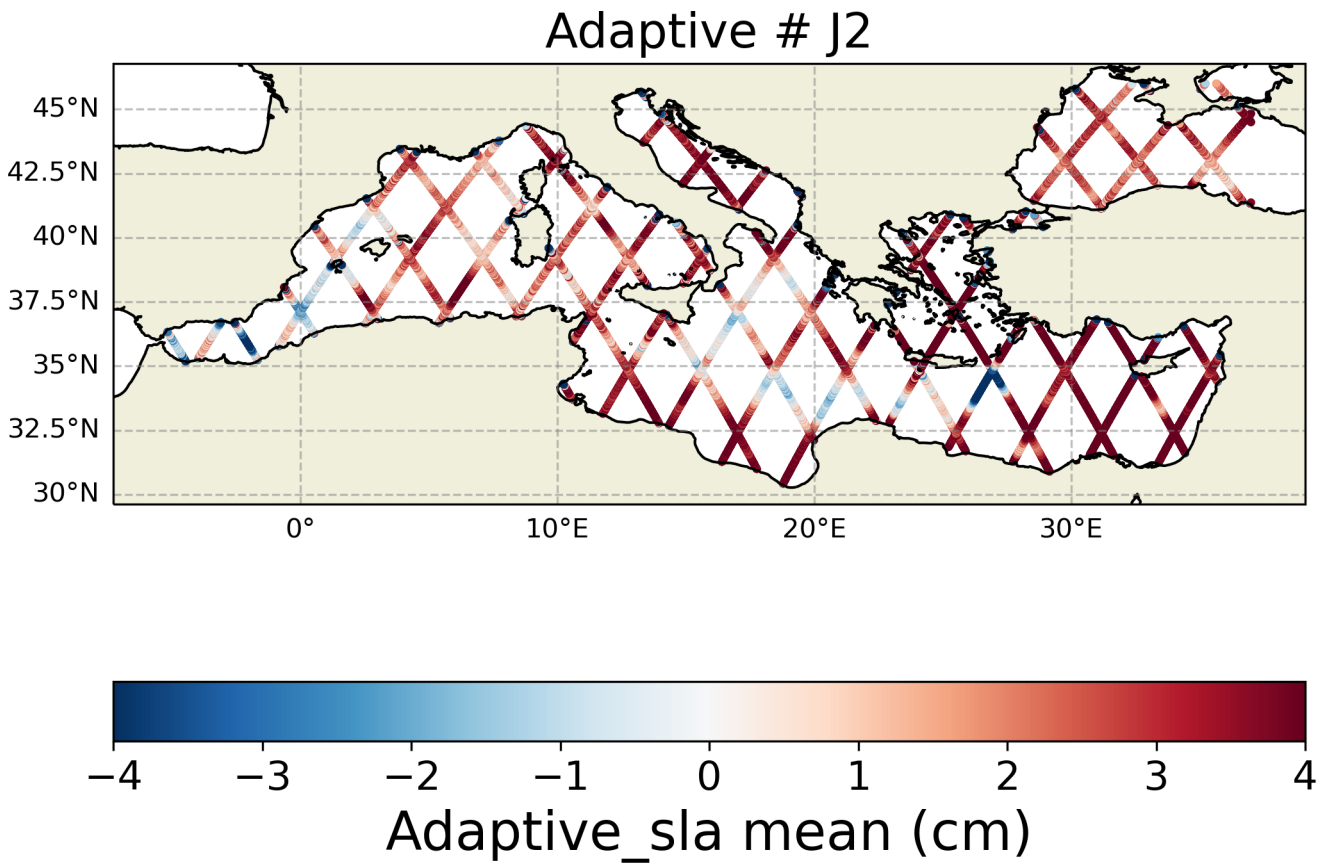

FIGURE 20 – Spatial coherence analysis of the mean of the Adaptive version of sla variable

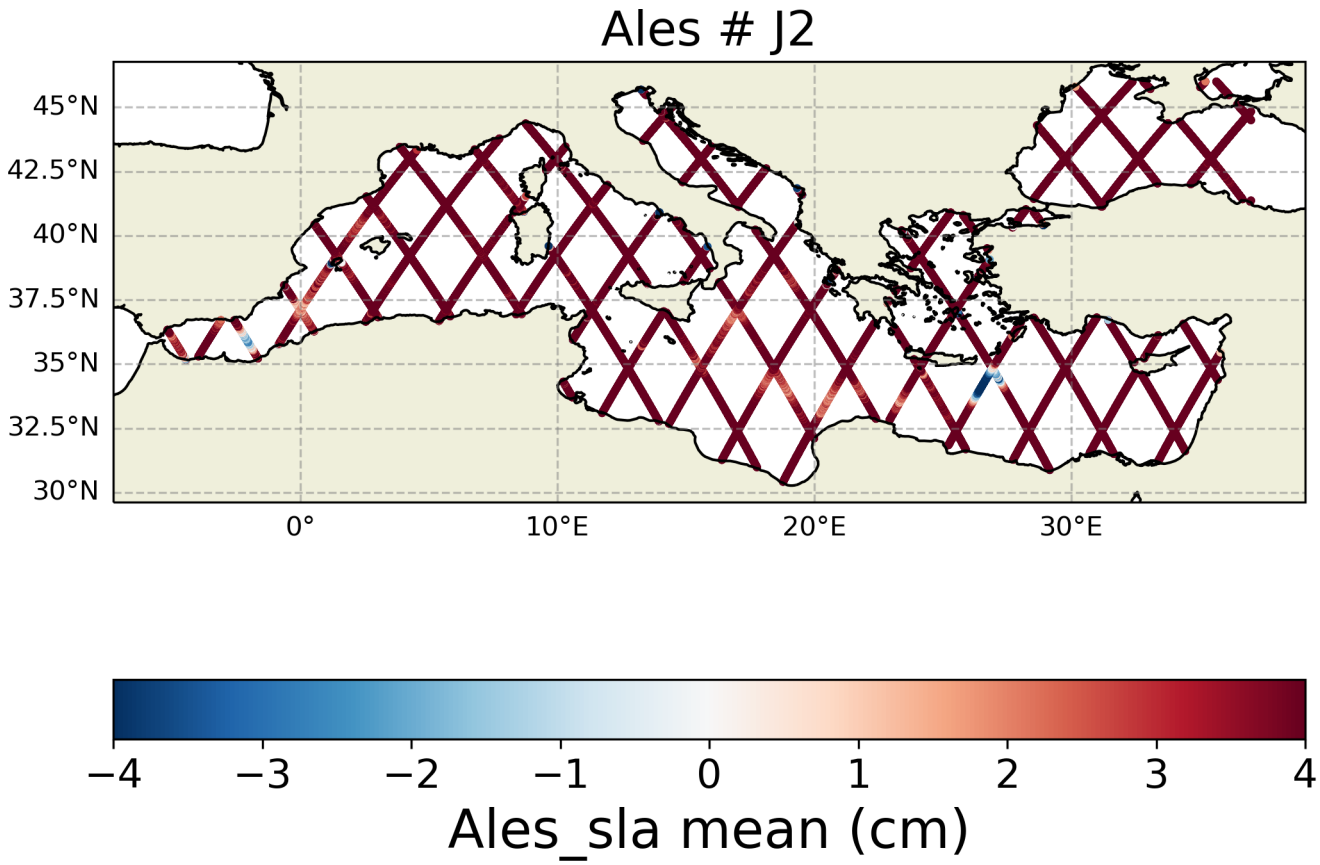

FIGURE 21 – Spatial coherence analysis of the mean of the Ales version of sla variable

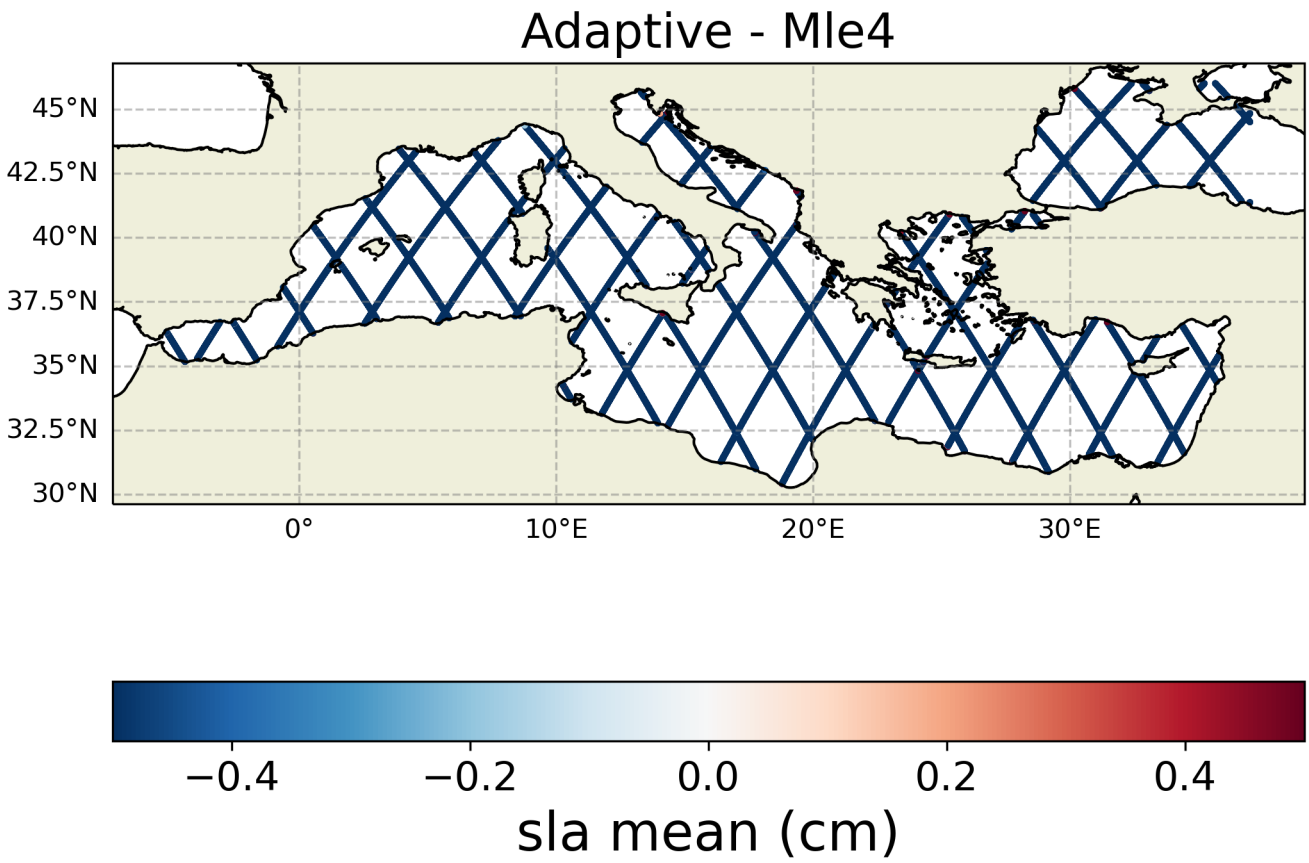

FIGURE 22 – Spatial coherence analysis of the Difference in sla 's mean between Adaptive and Mle4

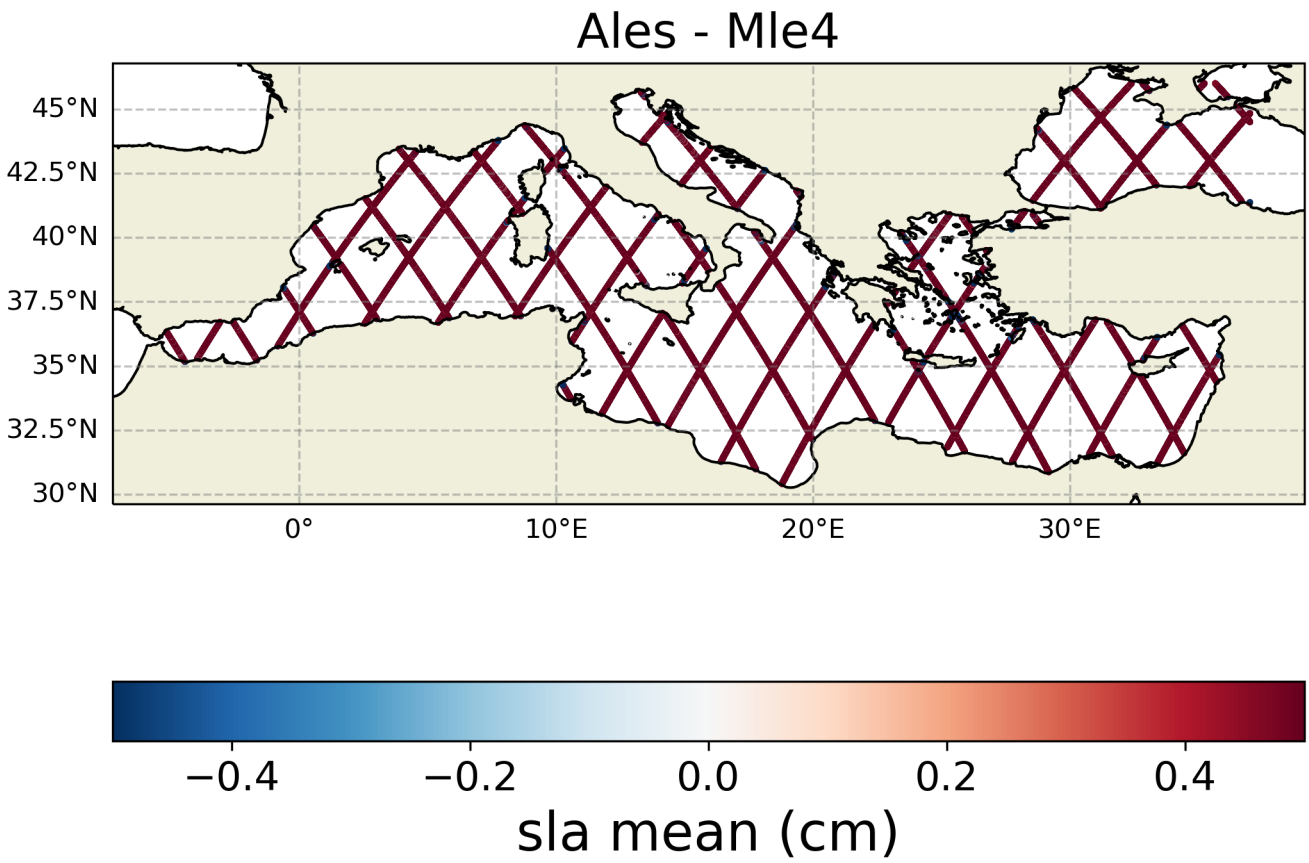

FIGURE 23 – Spatial coherence analysis of the Difference in sla 's mean between Ales and Mle4

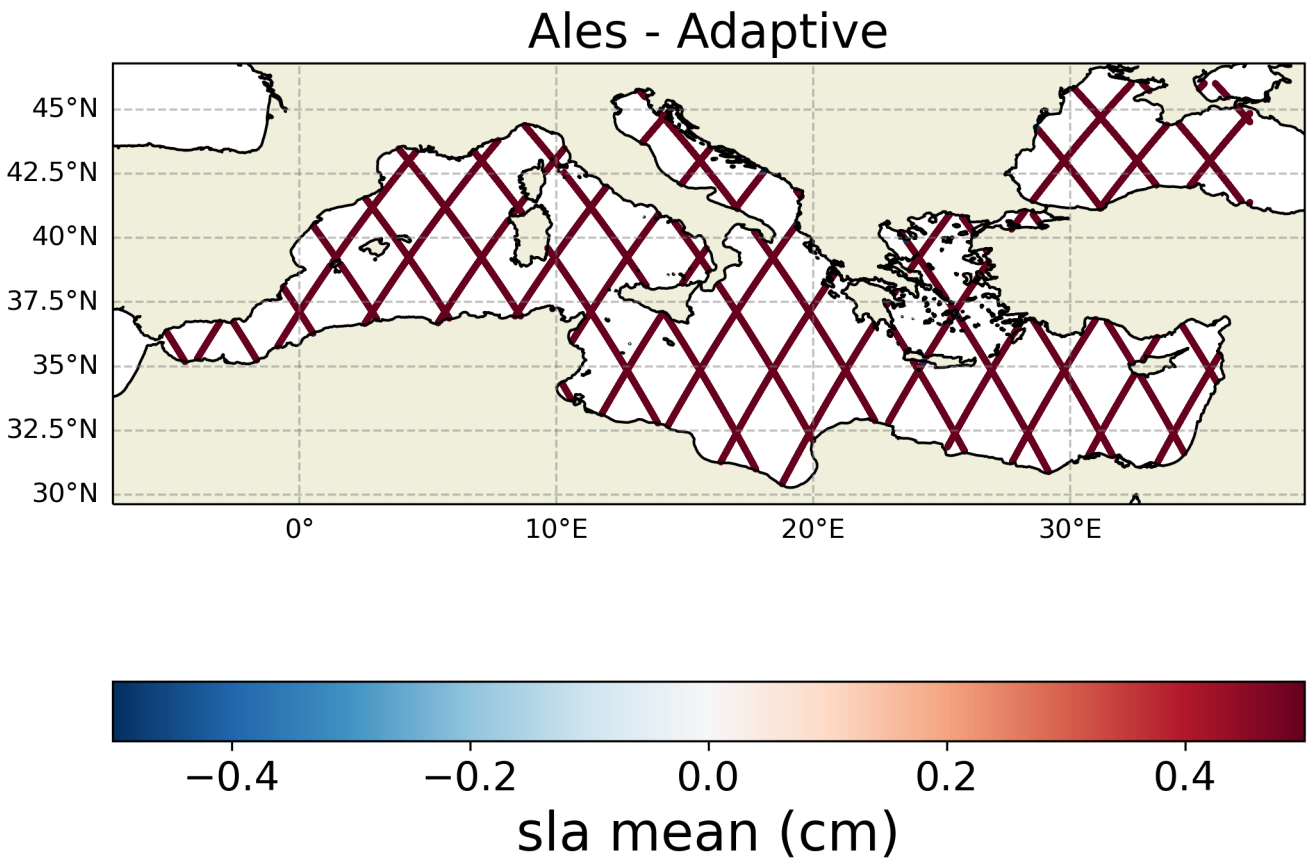

FIGURE 24 – Spatial coherence analysis of the Difference in sla 's mean between Ales and Adaptive

4 Histograms

4.1 sla

	min (cm)	max (cm)	mean (cm)	std (cm)
Mle4	-99.99	99.92	4.999	12.336
Adaptive	-99.952	99.818	2.499	12.351
Ales	-99.67	99.62	6.487	12.428

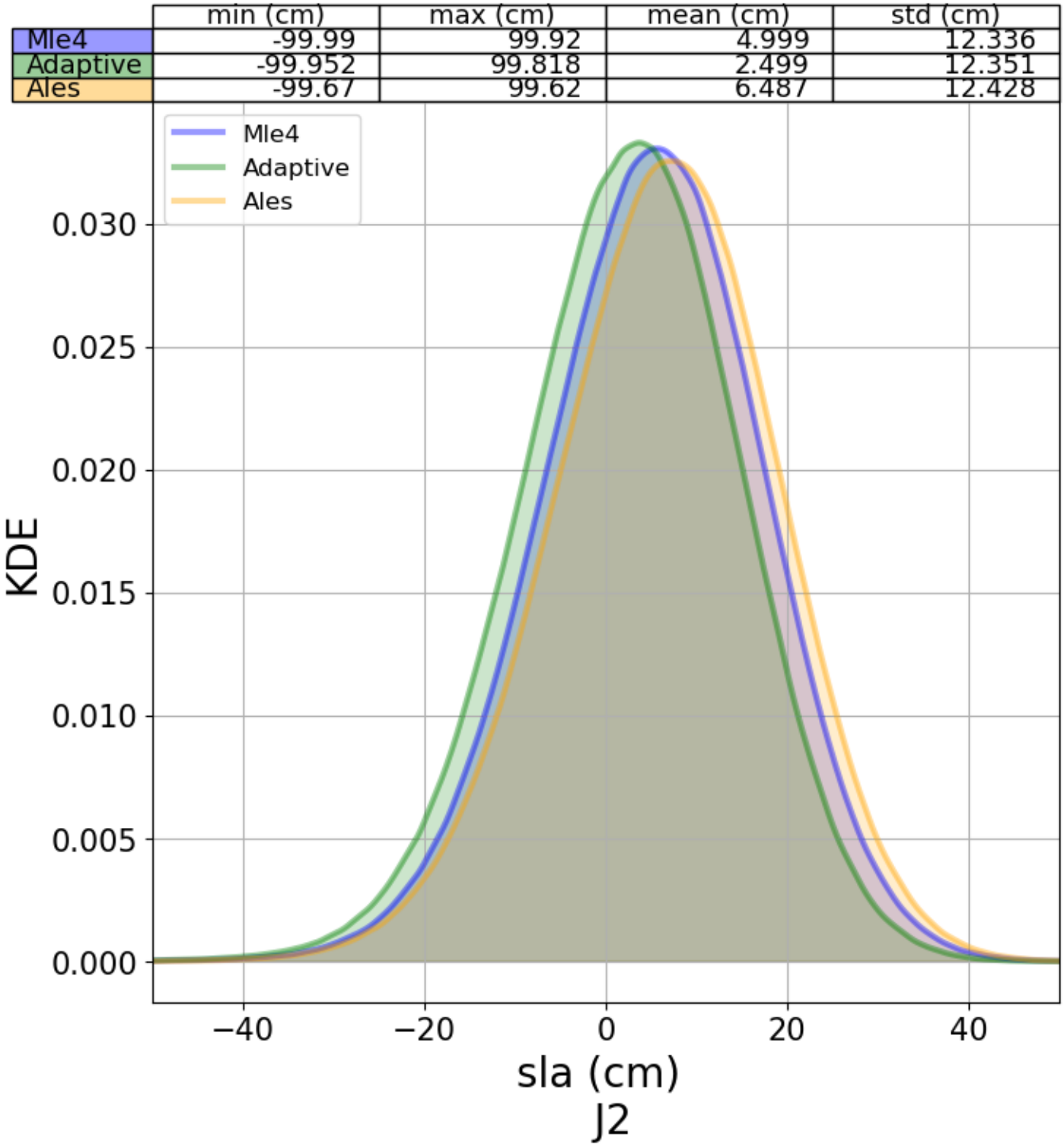

Figure 25 – Histogram of each of sla version

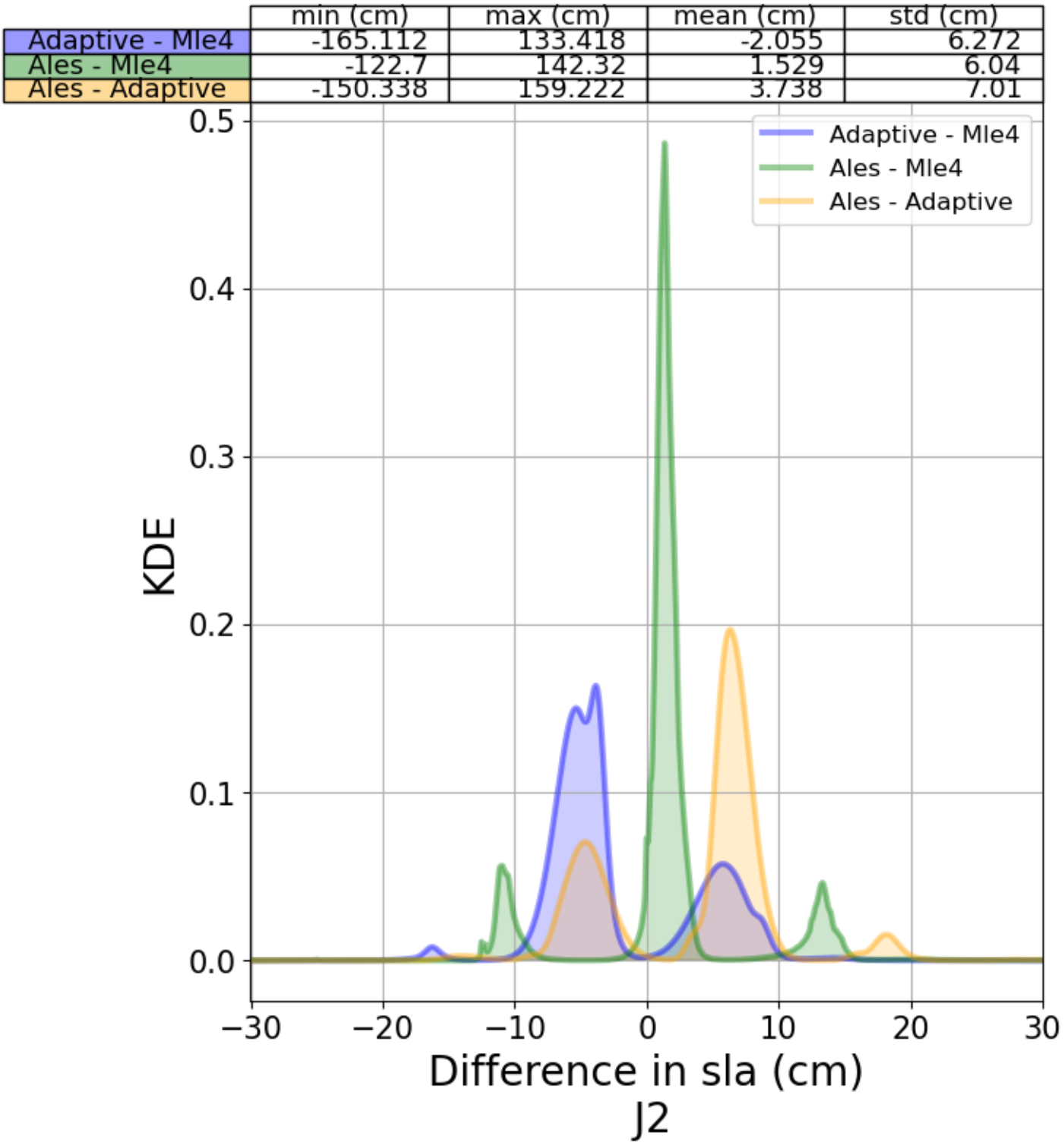

Figure 26 – Histograms of difference of each sla version and reference one

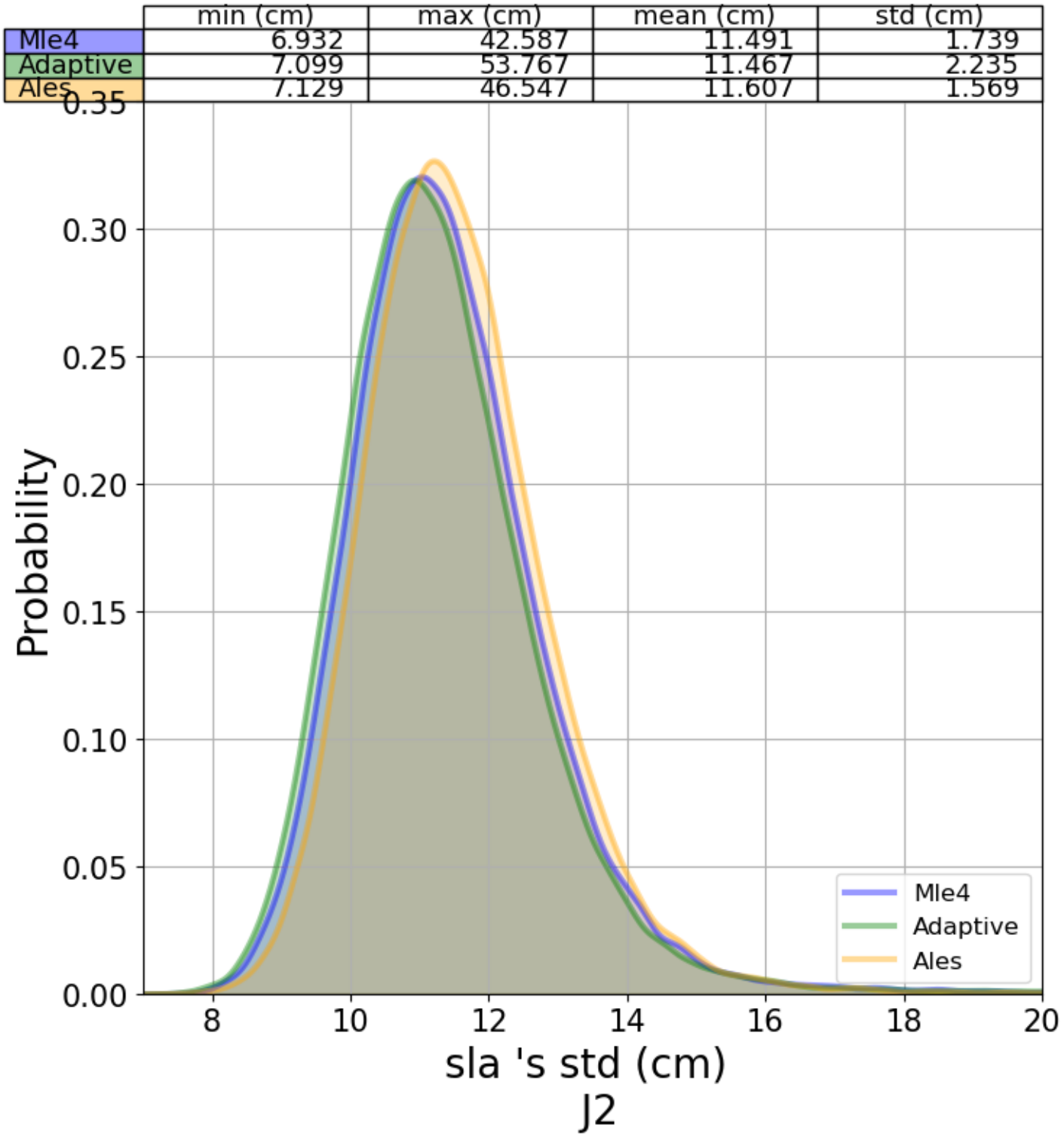

FIGURE 27 – Histograms of the standard deviation of each sla version

5 Along-track analysis

5.1 Range

5.1.1 Range 's count

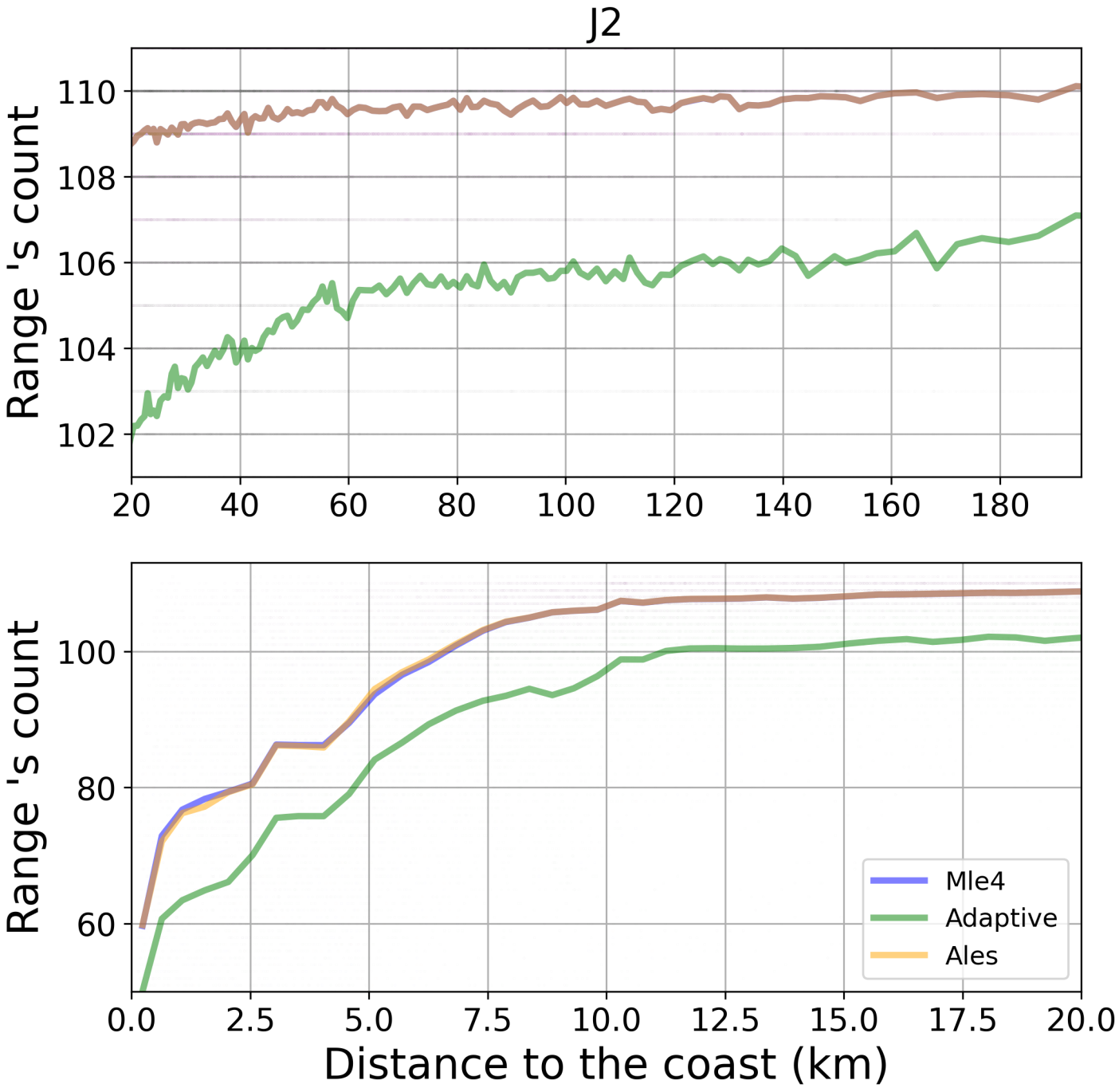

FIGURE 28 – Along-track analysis of Range 's count

5.2 sla

5.2.1 sla 's count

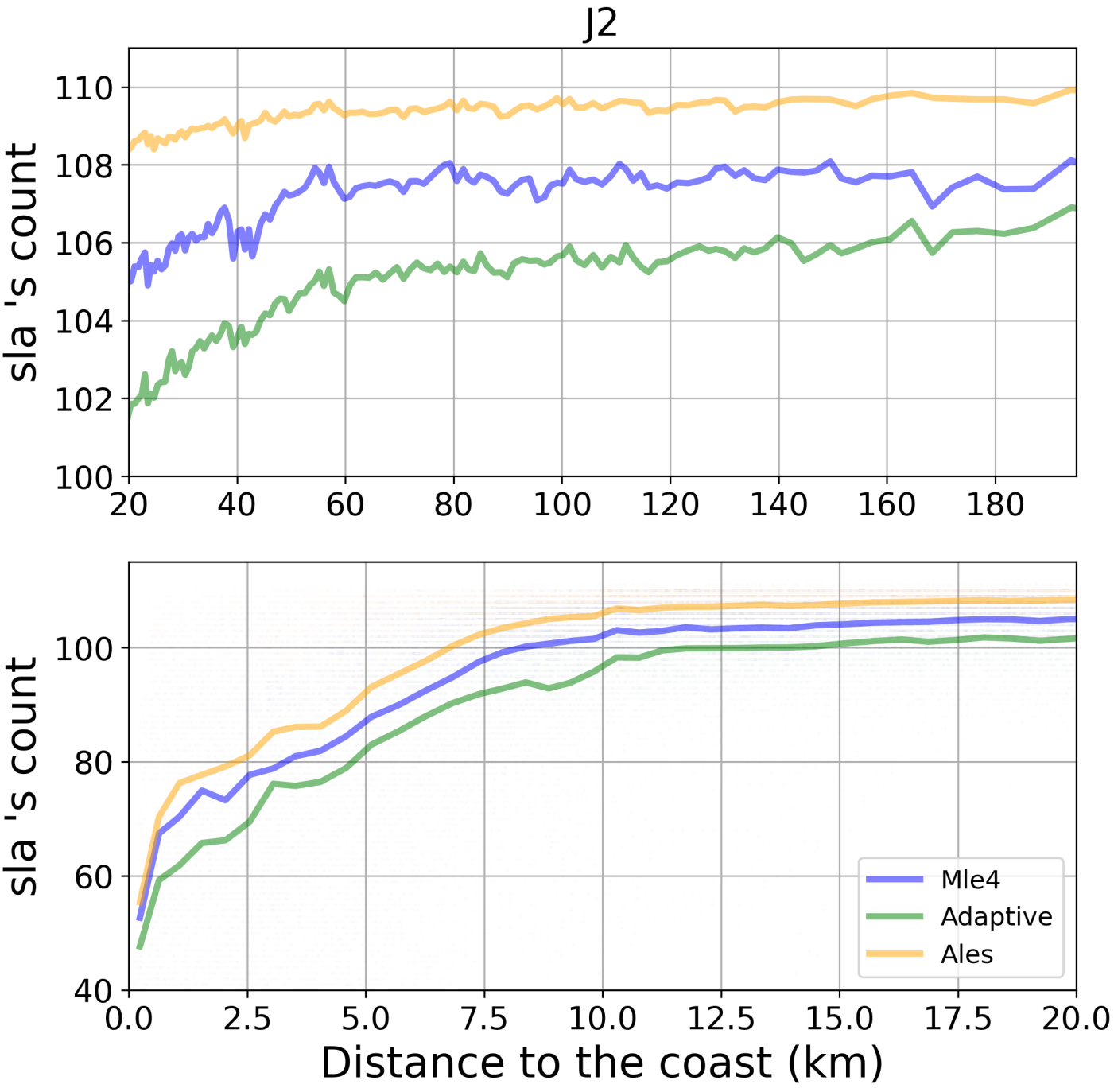

FIGURE 29 – Along-track analysis of sla 's count

5.2.2 sla 's std

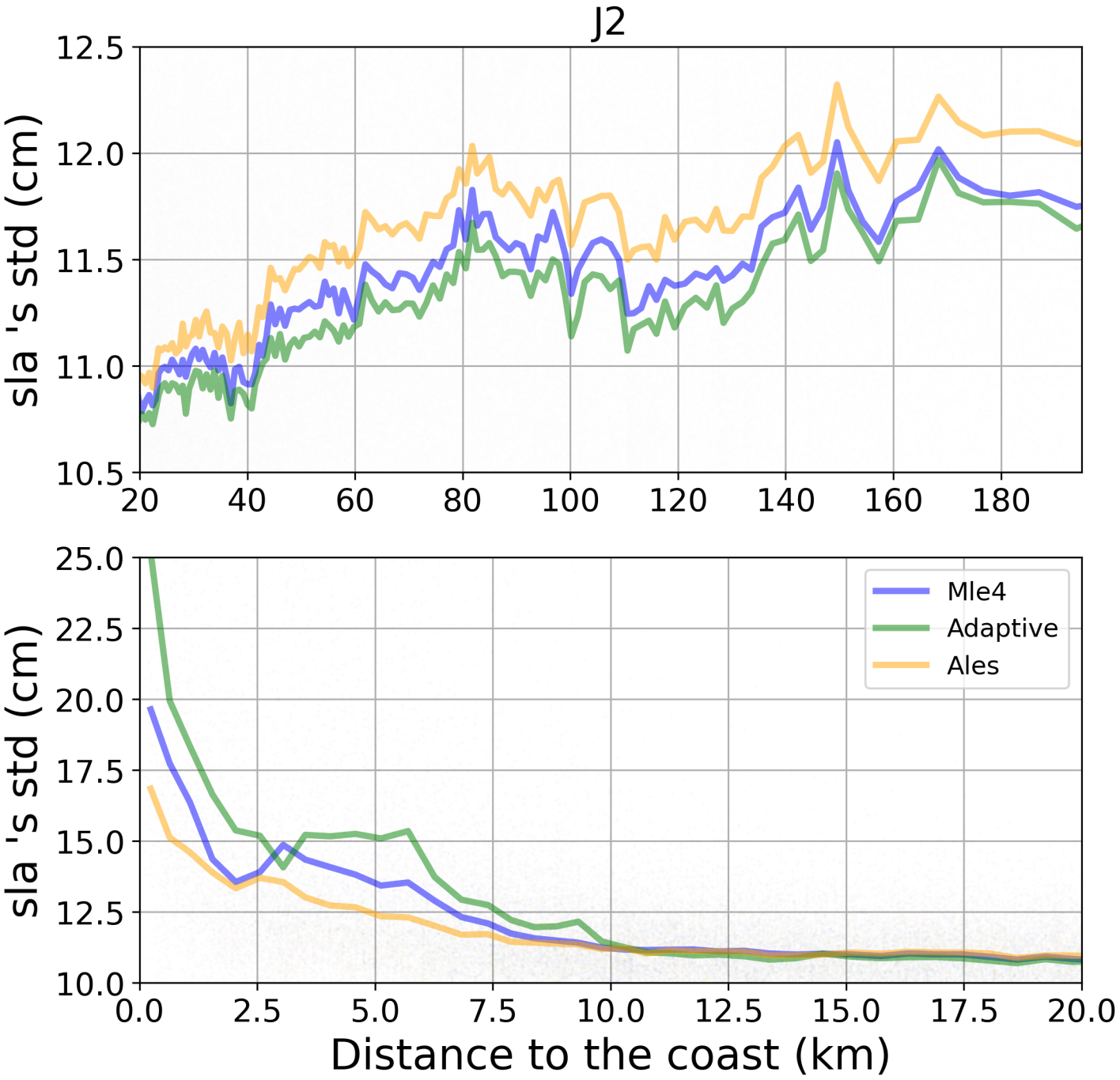

FIGURE 30 – Along-track analysis of sla 's std

5.2.3 sla 's mean

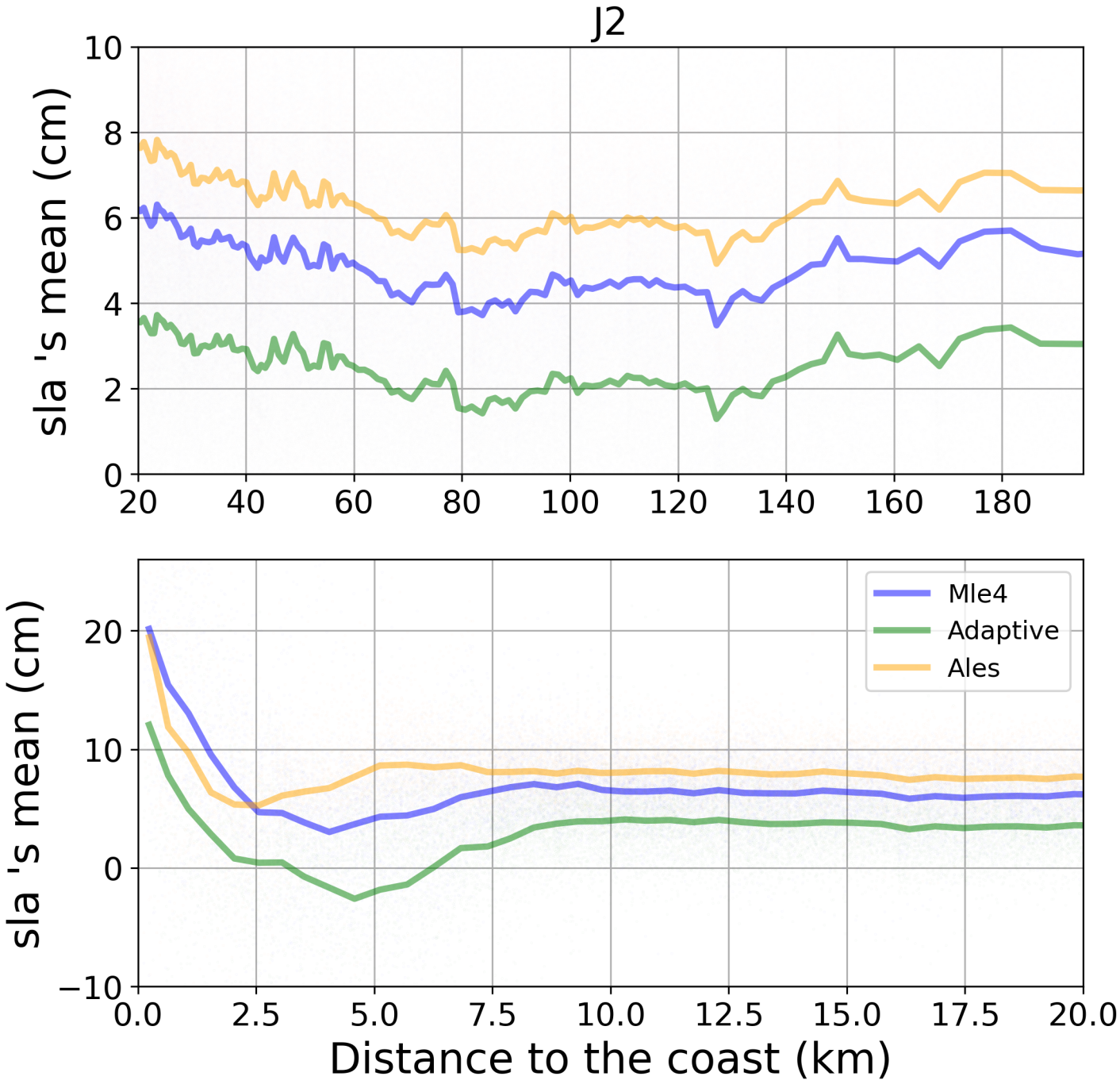

FIGURE 31 – Along-track analysis of sla 's mean

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 coast

6.1 Station : SETE

- Nearest track to SETE station is the track number track146
- The area of interest is limited by :
  - A circle which it's center is the SETE tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km

6.1.1 correlation visualization in maps view % SETE tide gauge

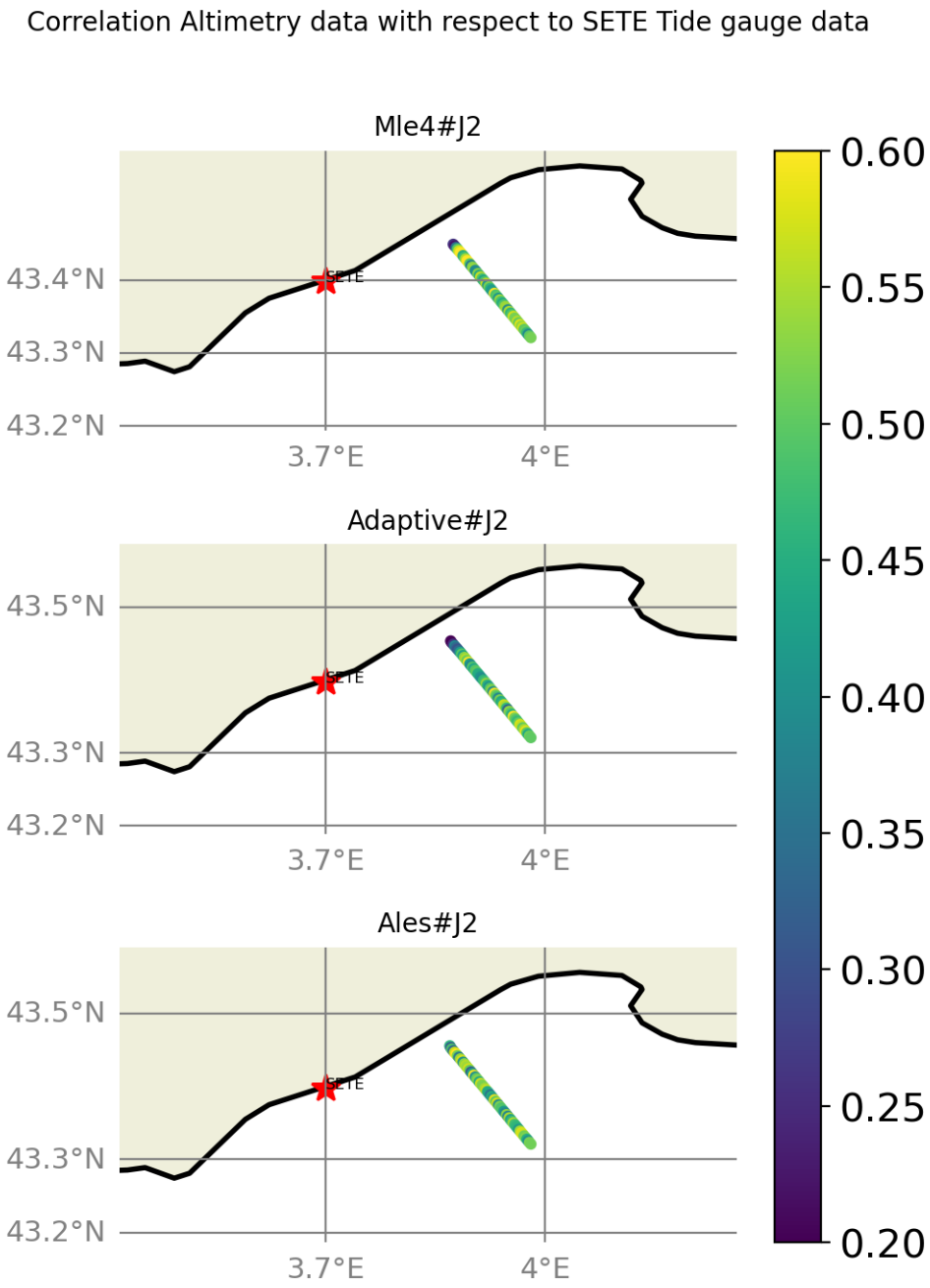

FIGURE 32 – correlation visualization in maps view % SETE tide gauge

6.1.2 rmsd visualization in maps view % SETE tide gauge

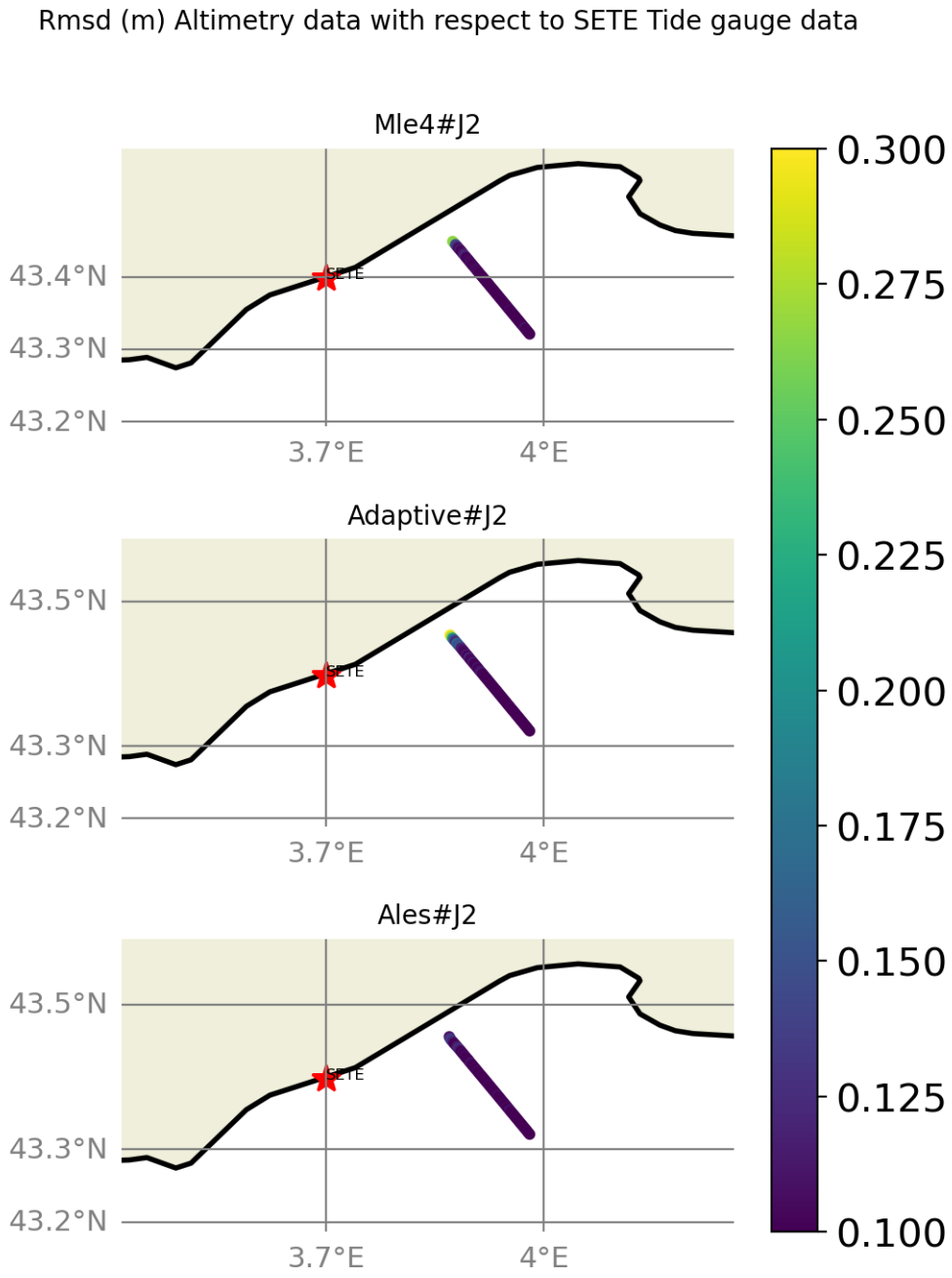

FIGURE 33 – rmsd visualization in maps view % SETE tide gauge

6.1.3 std visualization in maps view % SETE tide gauge

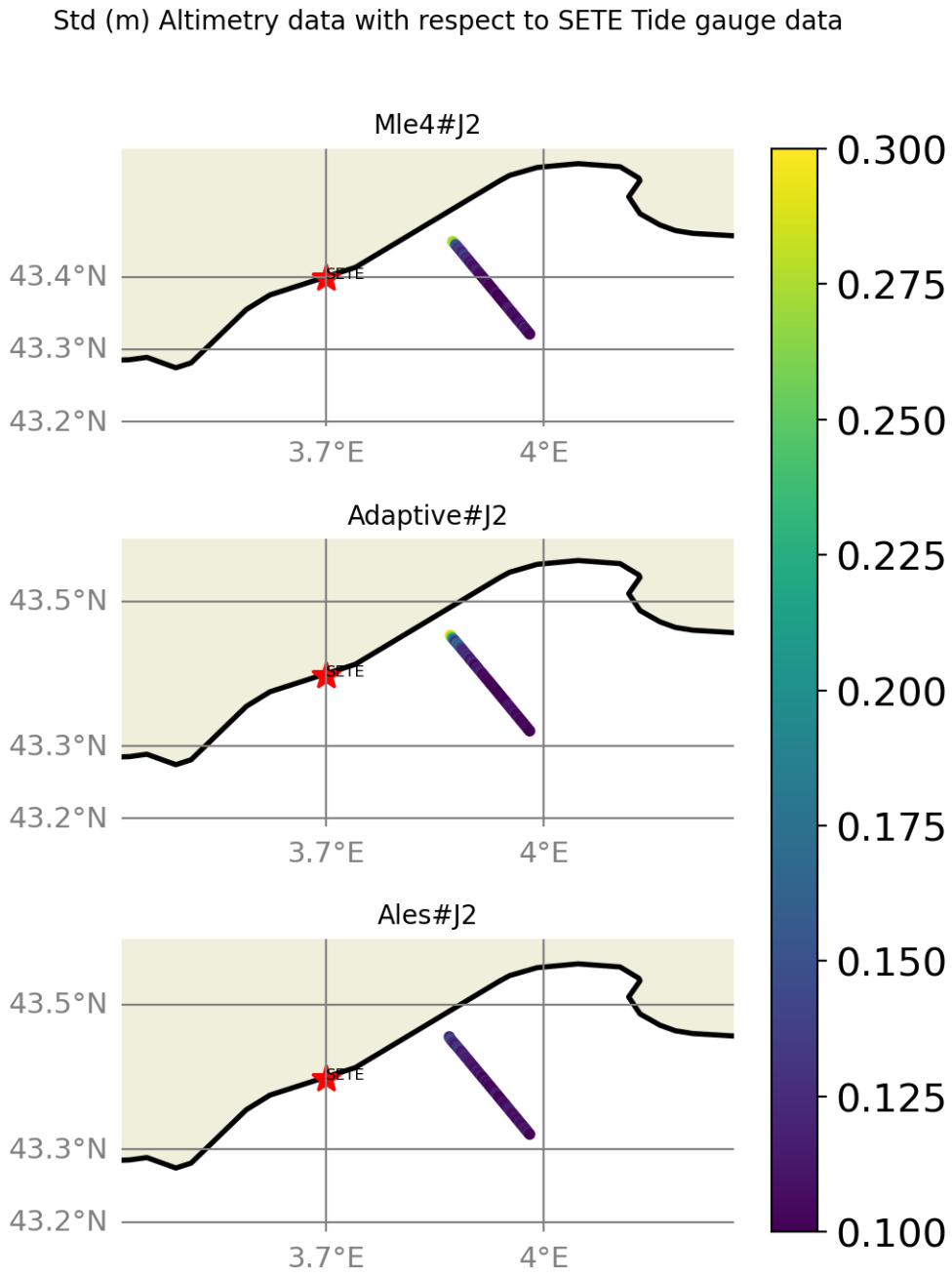

Figure 34 – std visualization in maps view % SETE tide gauge

6.1.4 valid_data_percent visualization in maps view % SETE tide gauge

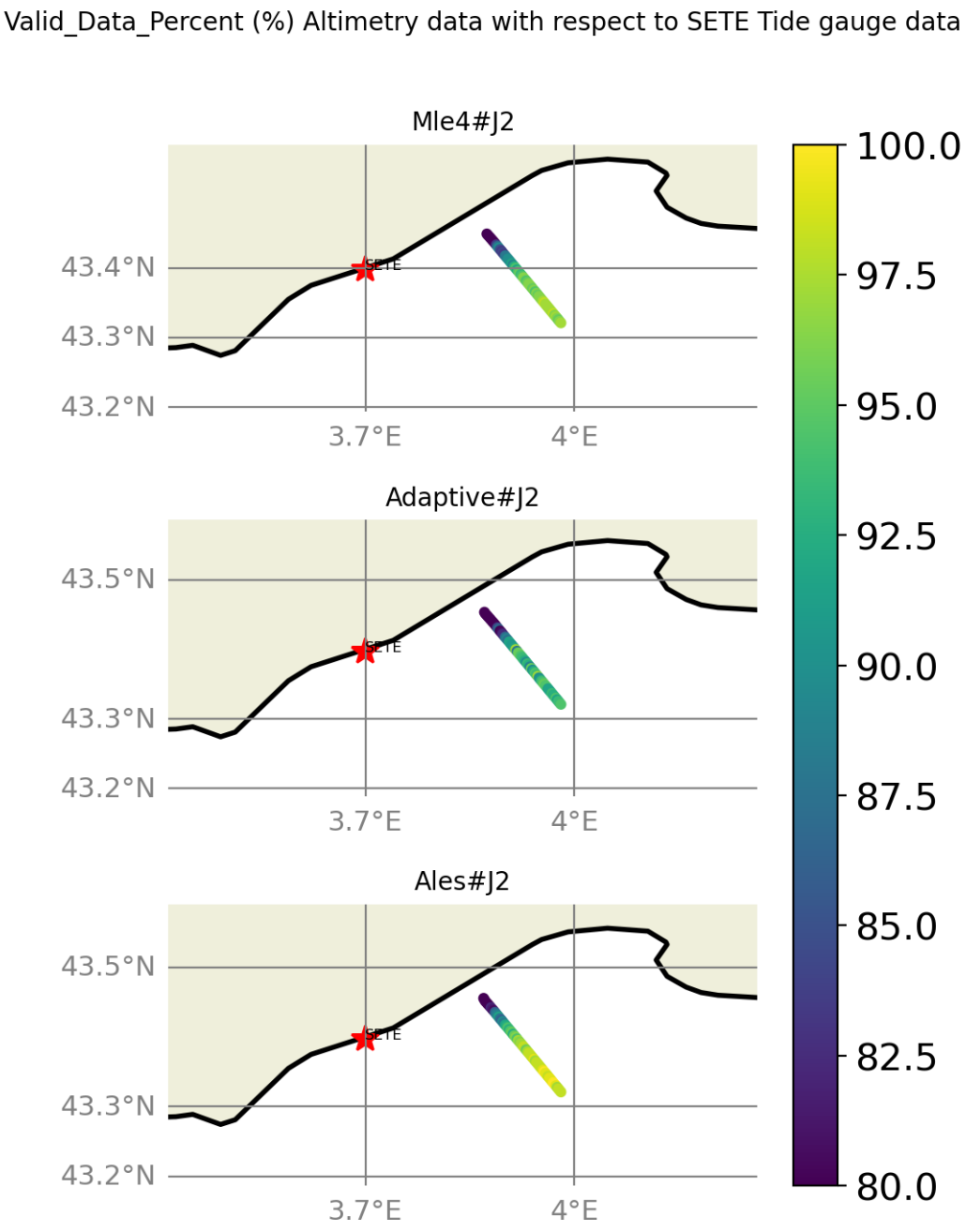

FIGURE 35 – valid_data_percent visualization in maps view % SETE tide gauge

6.1.5 Valid data (%) in function of distance to coast/SETE 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.

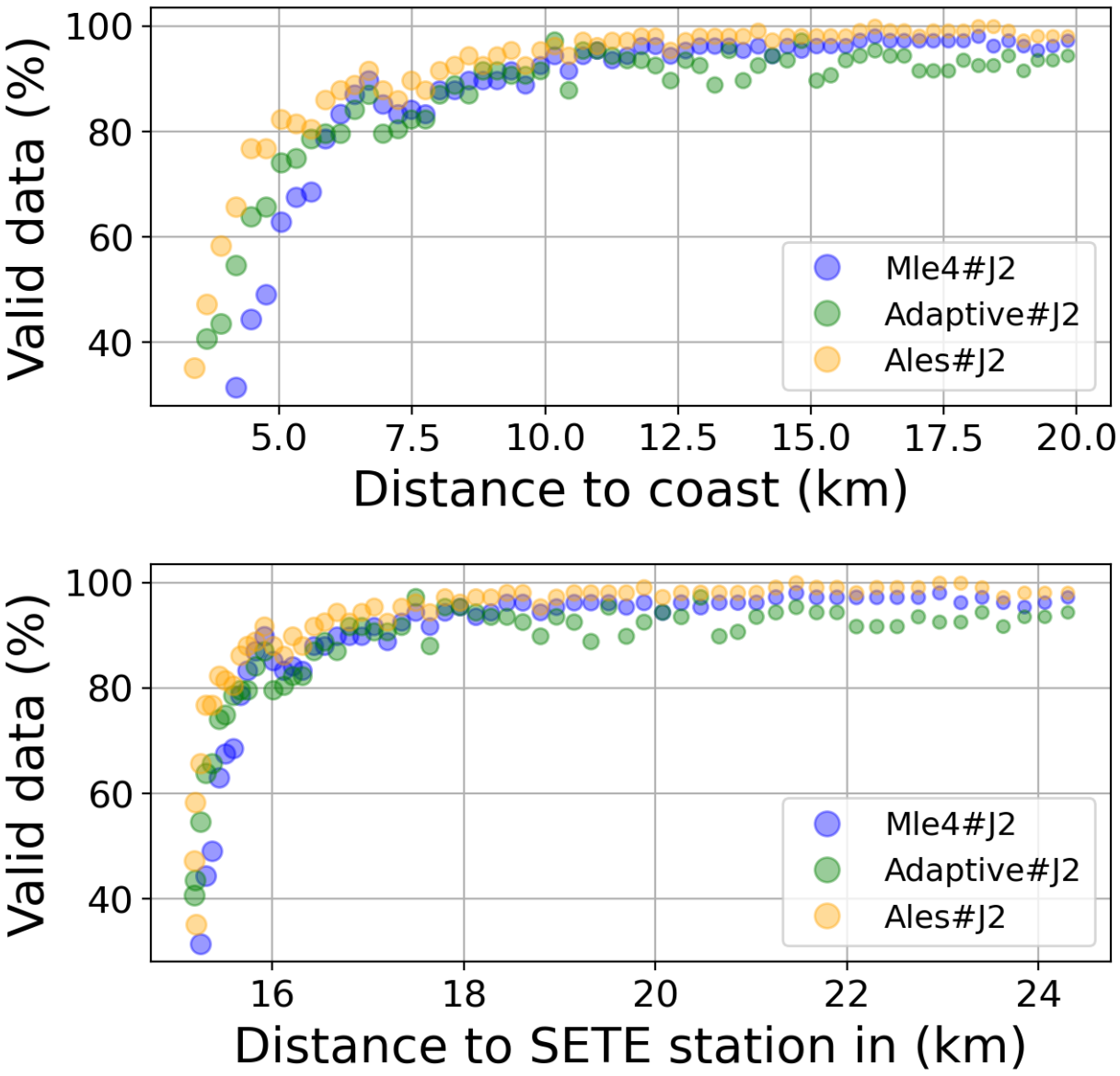

Figure 36 – Valid data (%) in function of distance to coast/SETE station

6.1.6 Std in function of distance to coast/SETE station

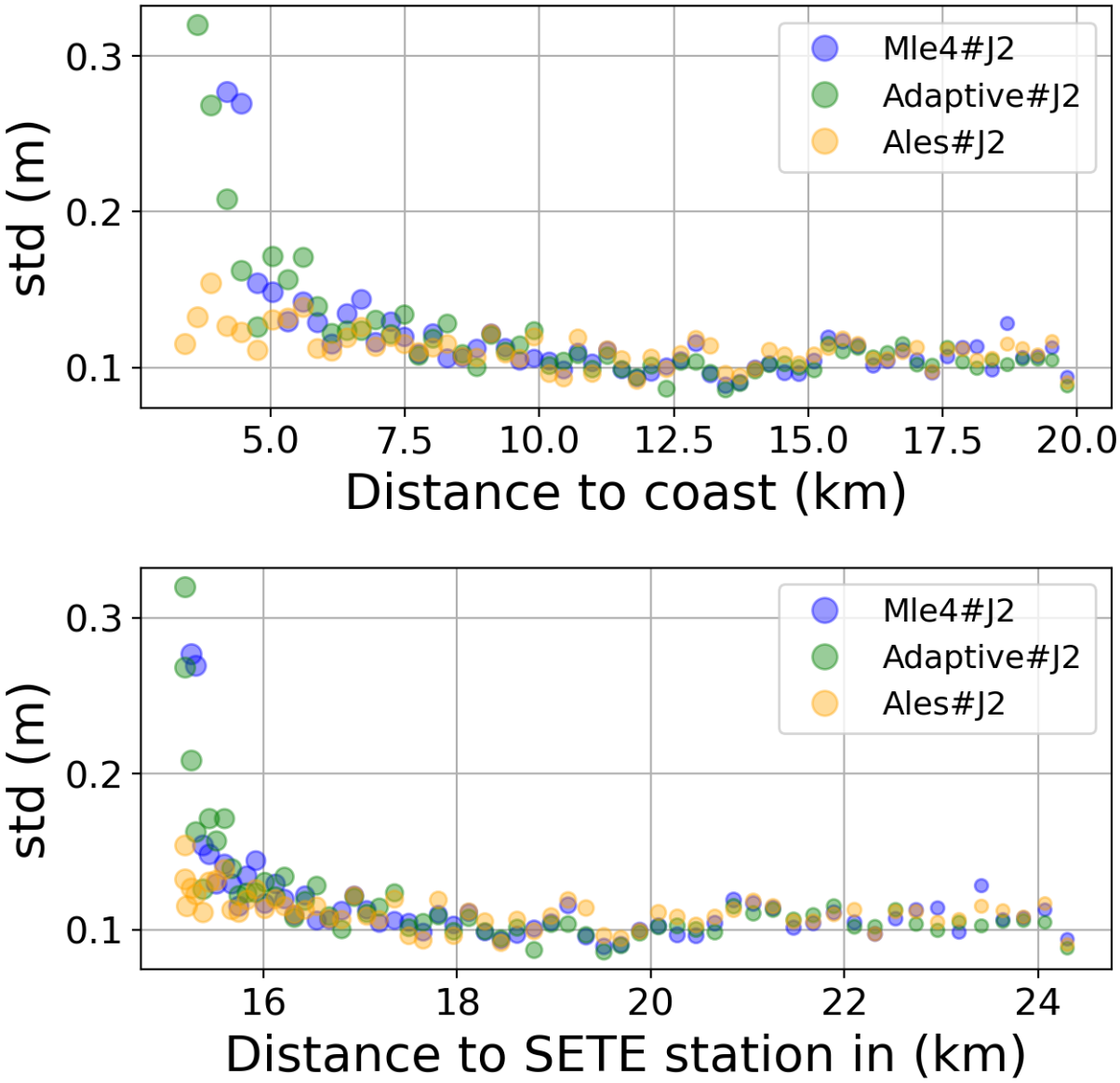

FIGURE 37 – Std in function of the distance to the coast/SETE station

6.1.7 Correlation in function of distance to coast/SETE station

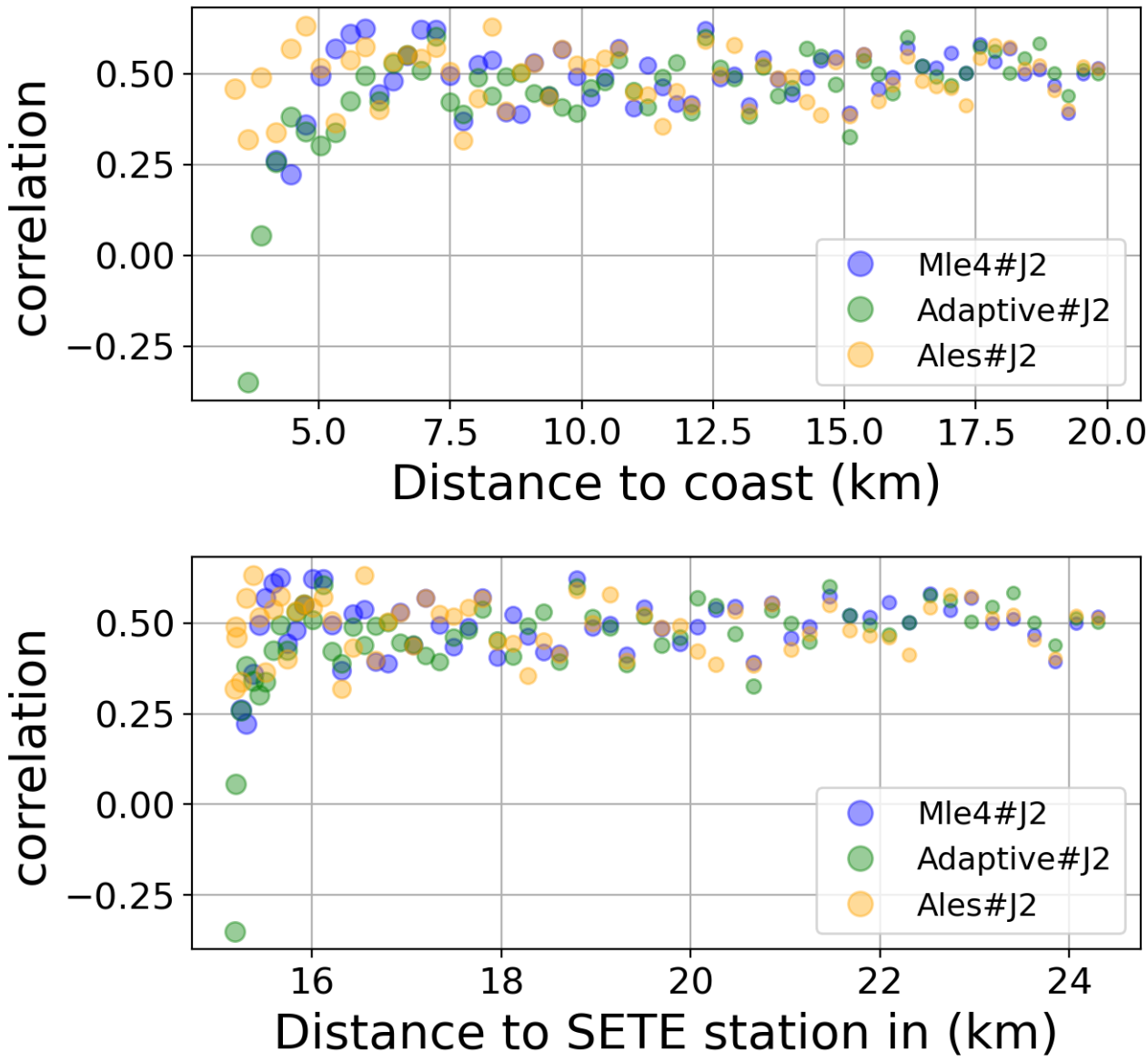

FIGURE 38 – Correlation in function of the distance to the coast/SETE station

6.1.8 Taylor Diagram

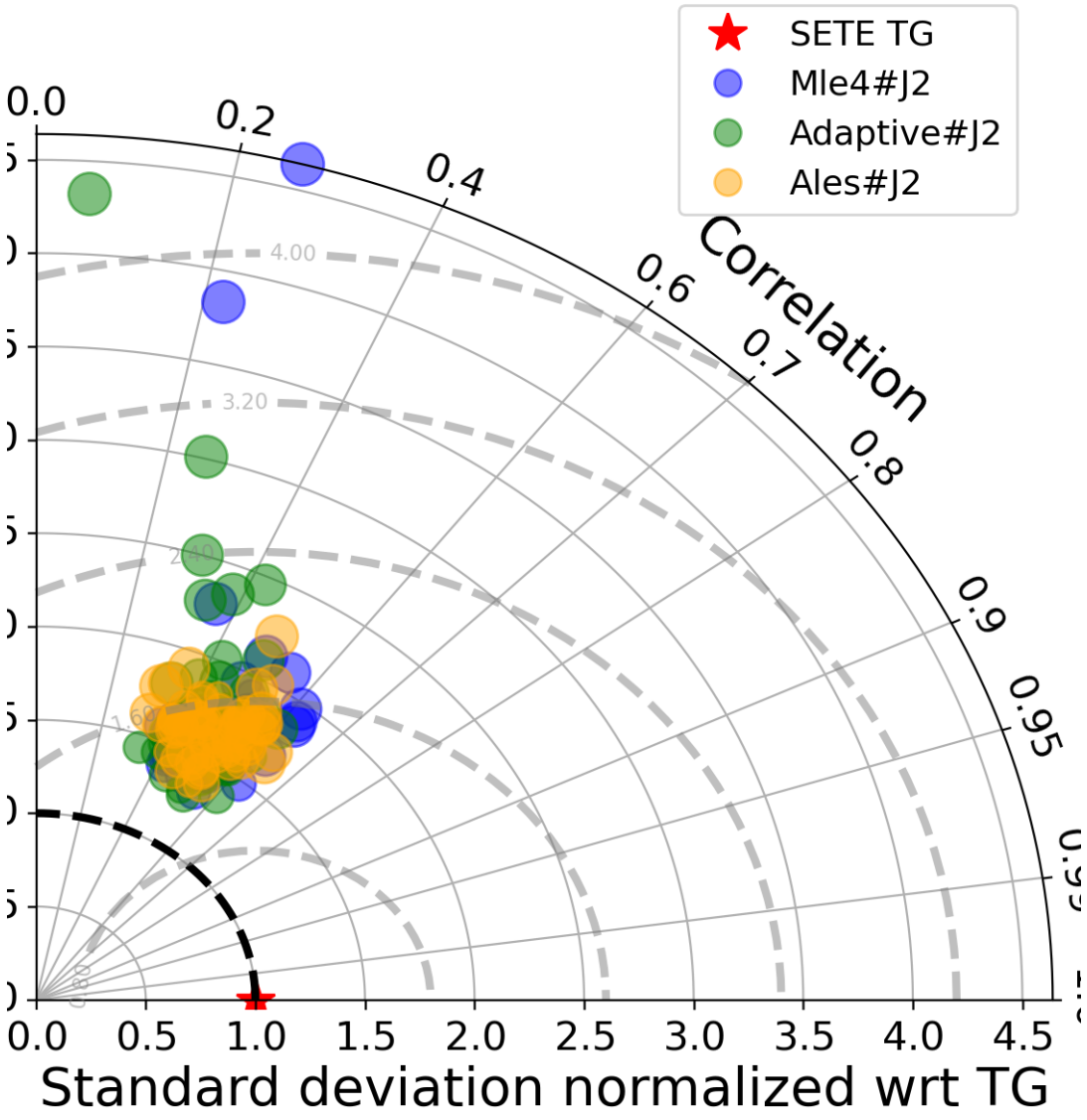

FIGURE 39 – Taylor diagram

6.1.9 Mean statistics table of products comparison with SETE 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#J2	89.224	0.492	0.117	0.103
Adaptive#J2	88.602	0.473	0.114	0.102
Ales#J2	93.966	0.49	0.111	0.098

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 108 point.

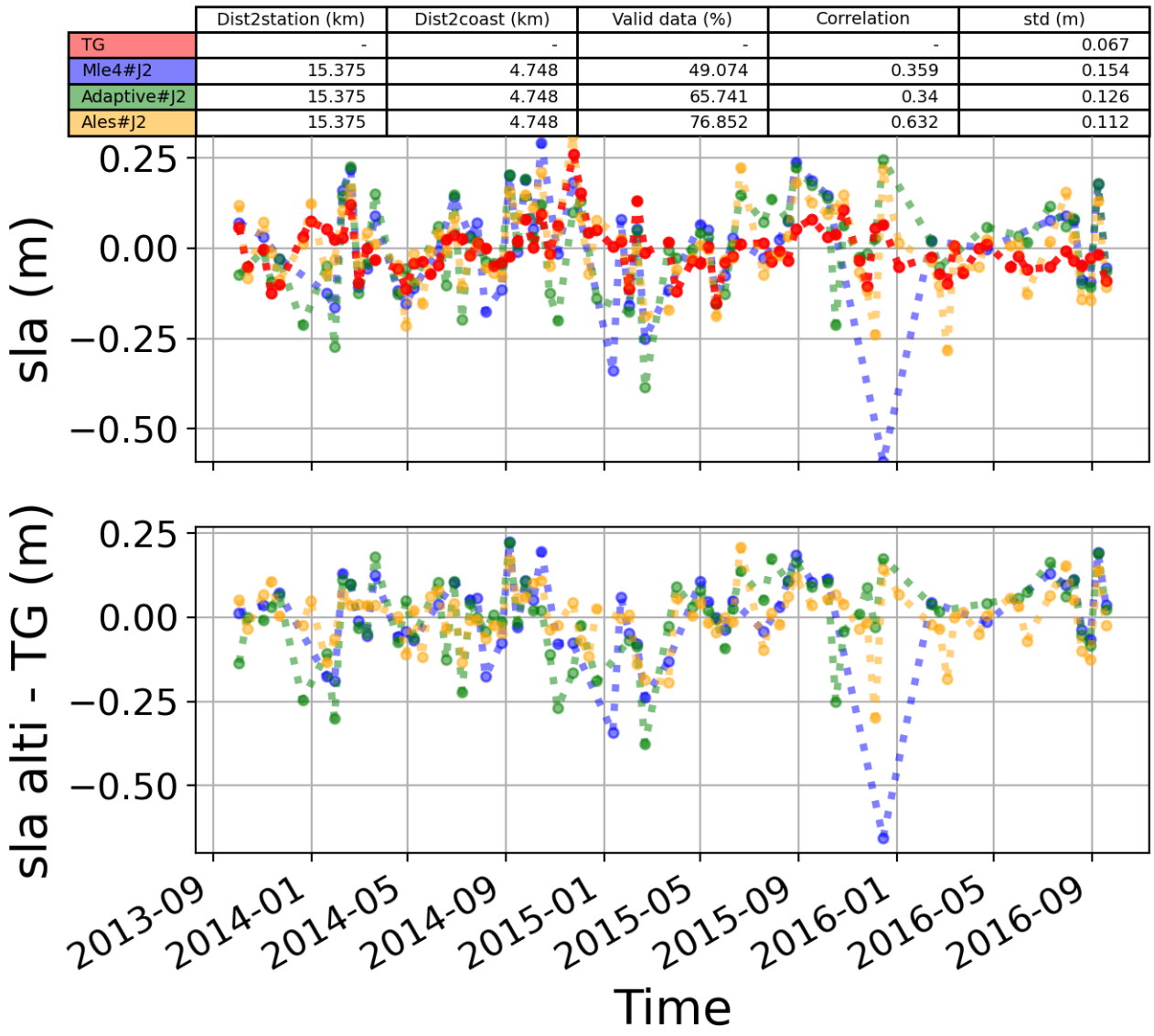

FIGURE 41 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

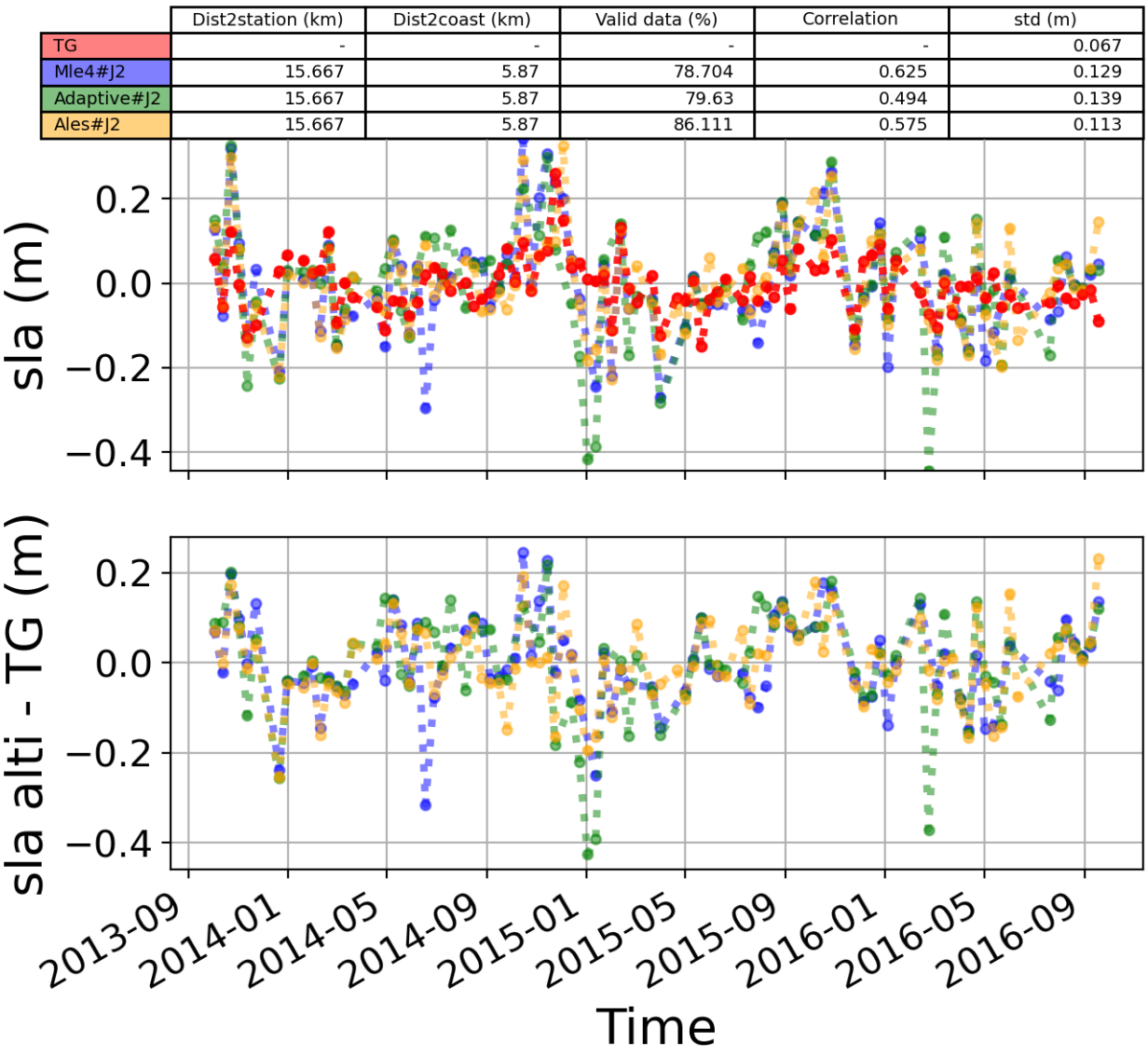

FIGURE 42 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

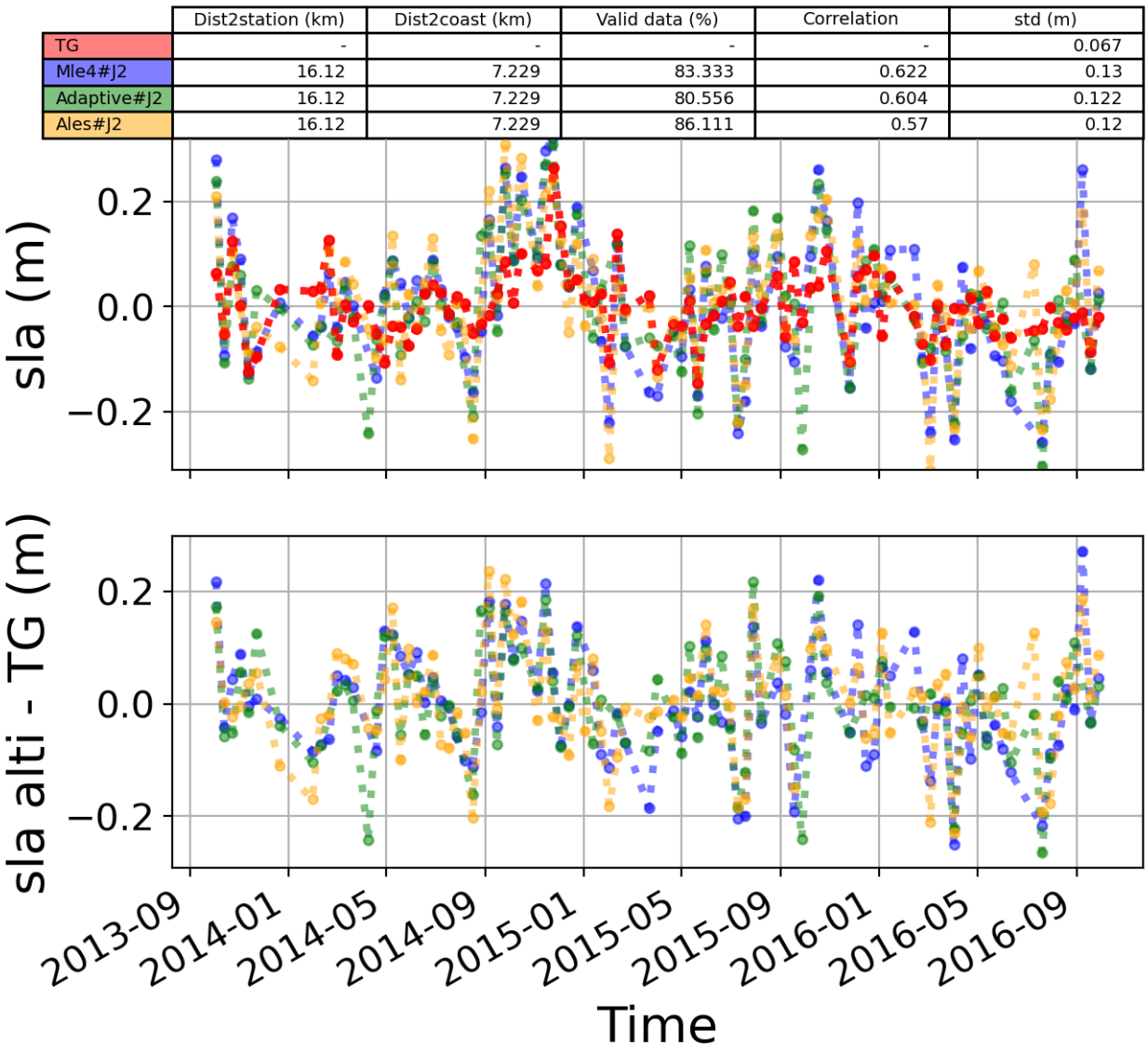

FIGURE 43 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.2 Station : Mentes

- Nearest track to Mentes station is the track number track109
- The area of interest is limited by :
  - A circle which it's center is the Mentes tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km
  - Latitude limits : [38.5, 39] °

6.2.1 correlation visualization in maps view % Mentes tide gauge

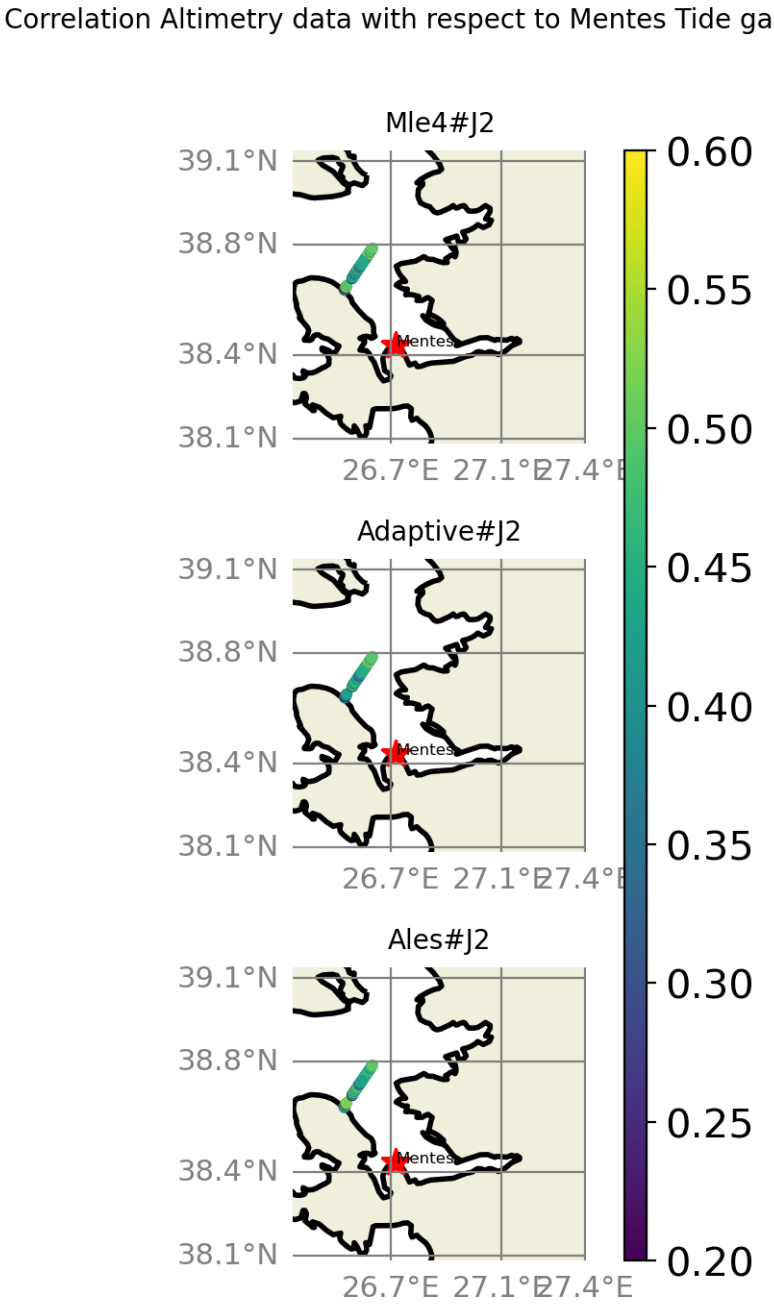

FIGURE 44 – correlation visualization in maps view % Mentes tide gauge

6.2.2 rmsd visualization in maps view % Mentes tide gauge

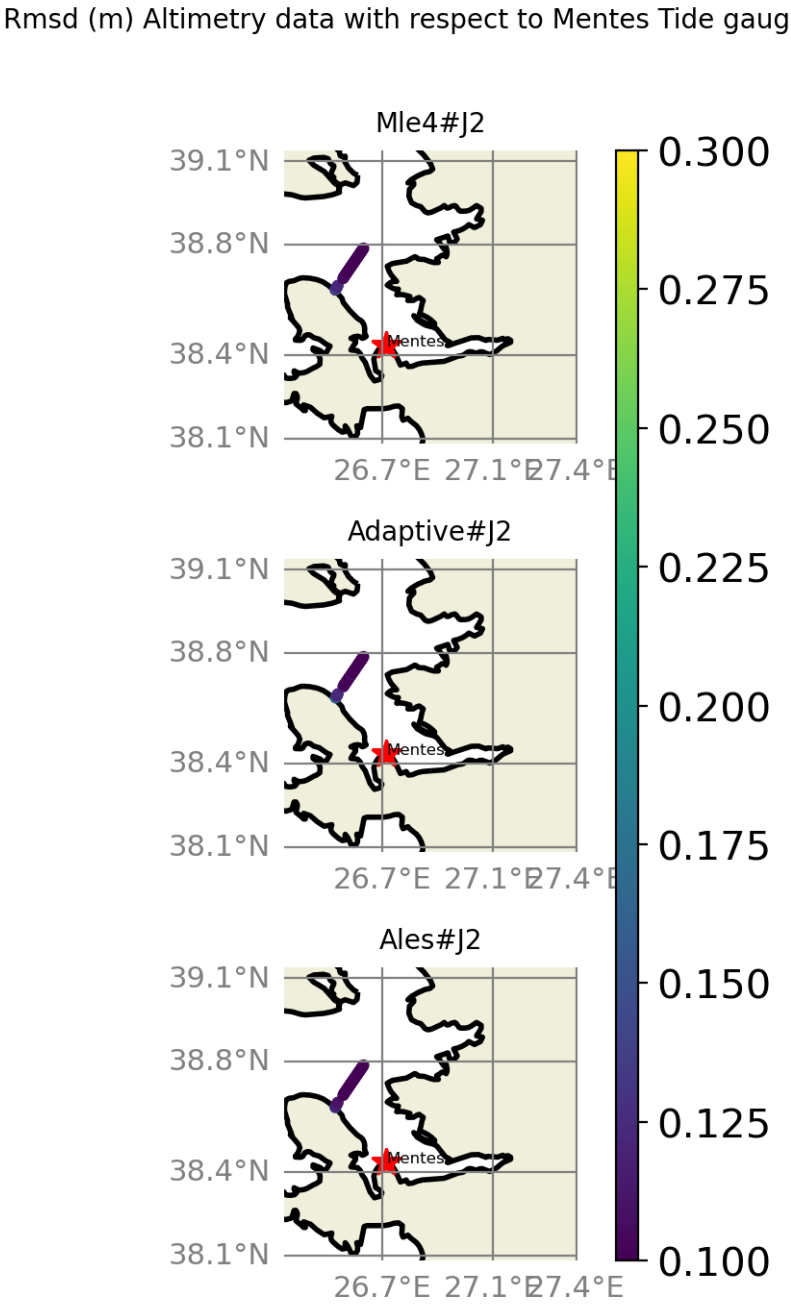

Figure 45 – rmsd visualization in maps view % Mentes tide gauge

6.2.3 std visualization in maps view % Mentes tide gauge

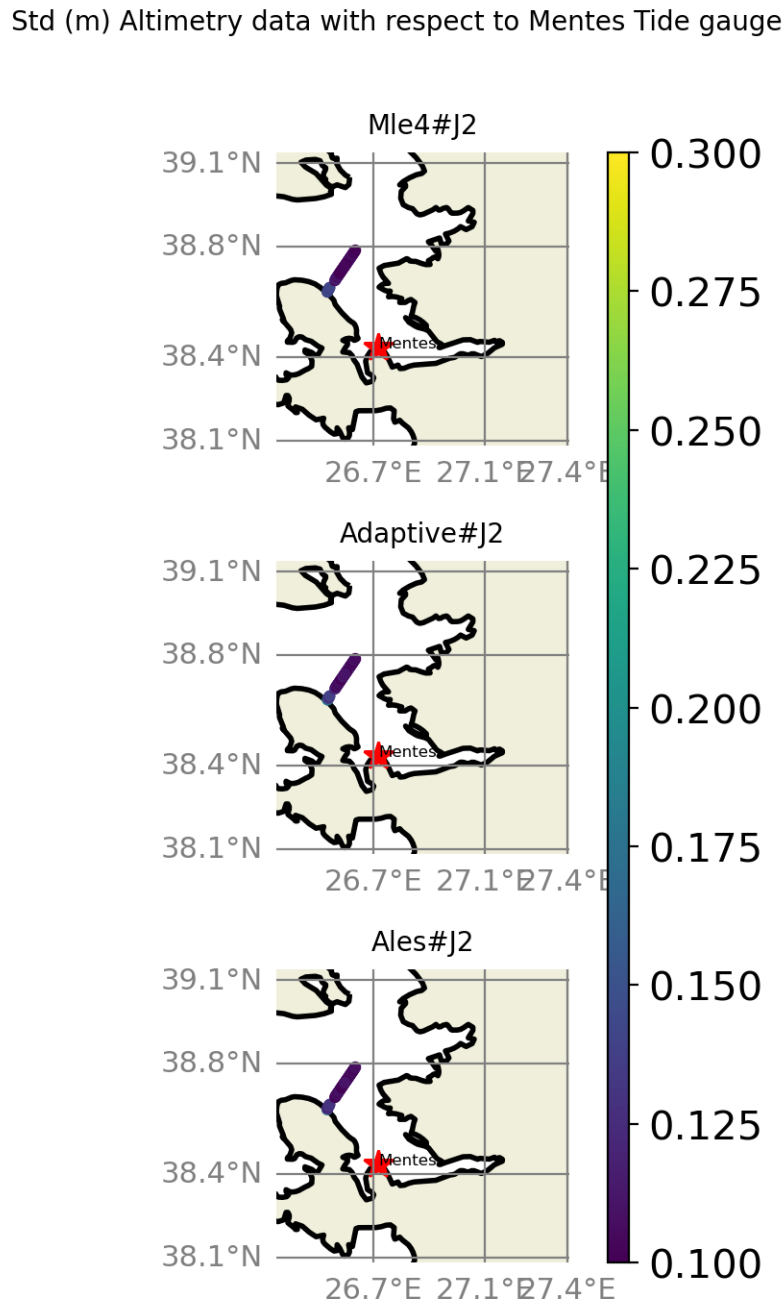

FIGURE 46 – std visualization in maps view % Mentes tide gauge

6.2.4 valid_data_percent visualization in maps view % Mentes tide gauge

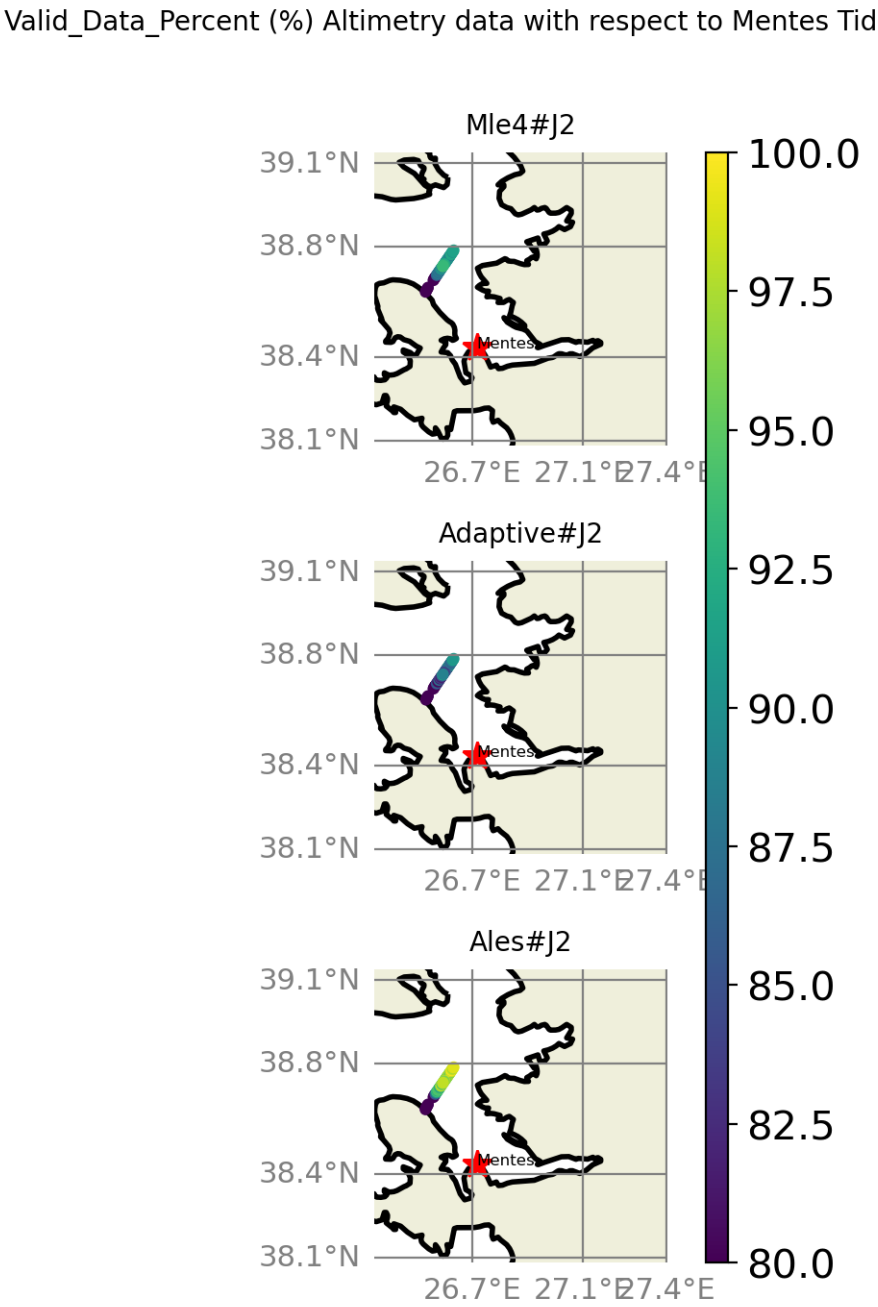

FIGURE 47 – valid_data_percent visualization in maps view % Mentes tide gauge

6.2.5 Valid data (%) in function of distance to coast/Mentes 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.

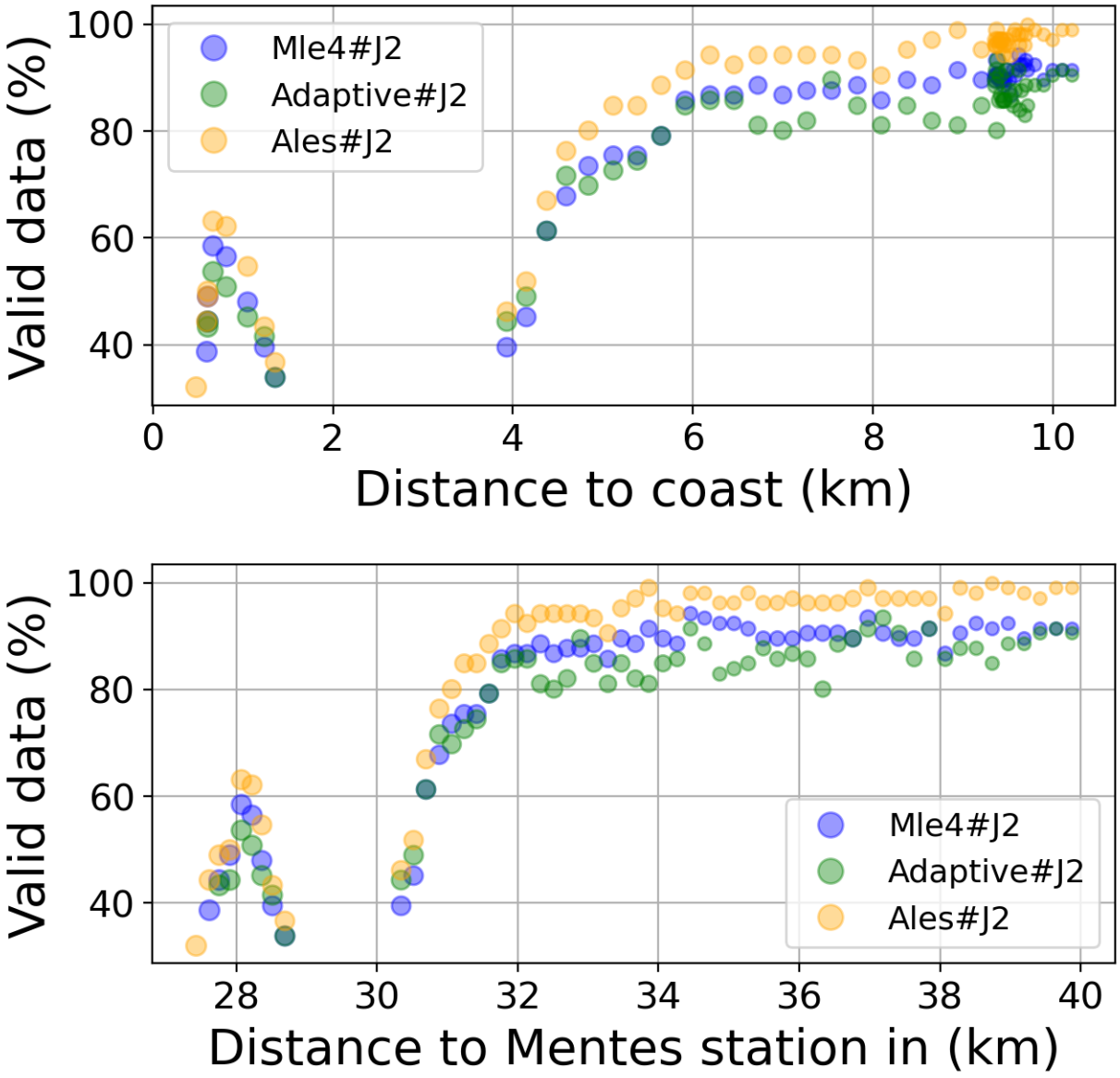

FIGURE 48 – Valid data (%) in function of distance to coast/Mentes station

6.2.6 Std in function of distance to coast/Mentes station

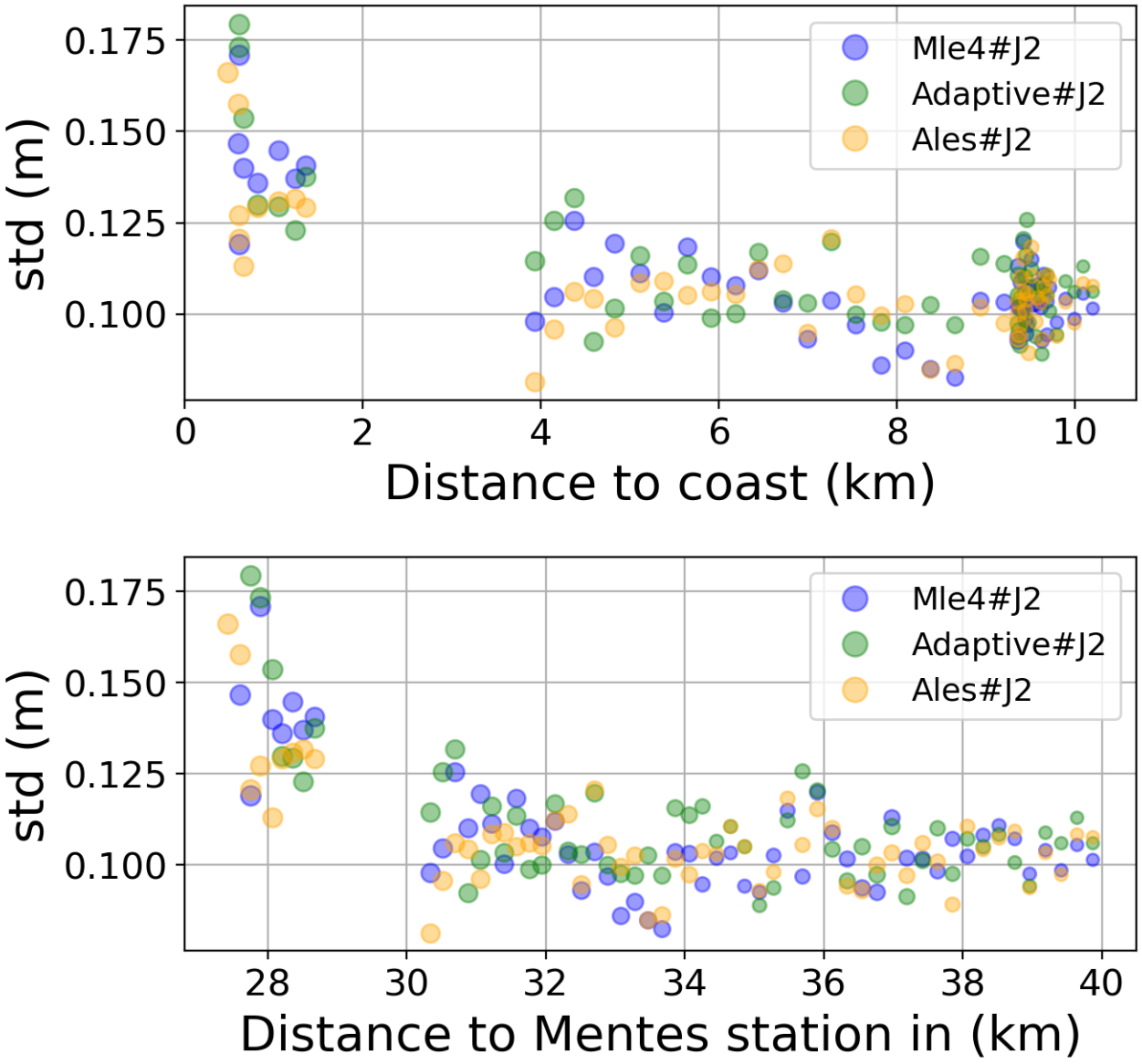

FIGURE 49 – Std in function of the distance to the coast/Mentes station

6.2.7 Correlation in function of distance to coast/Mentes station

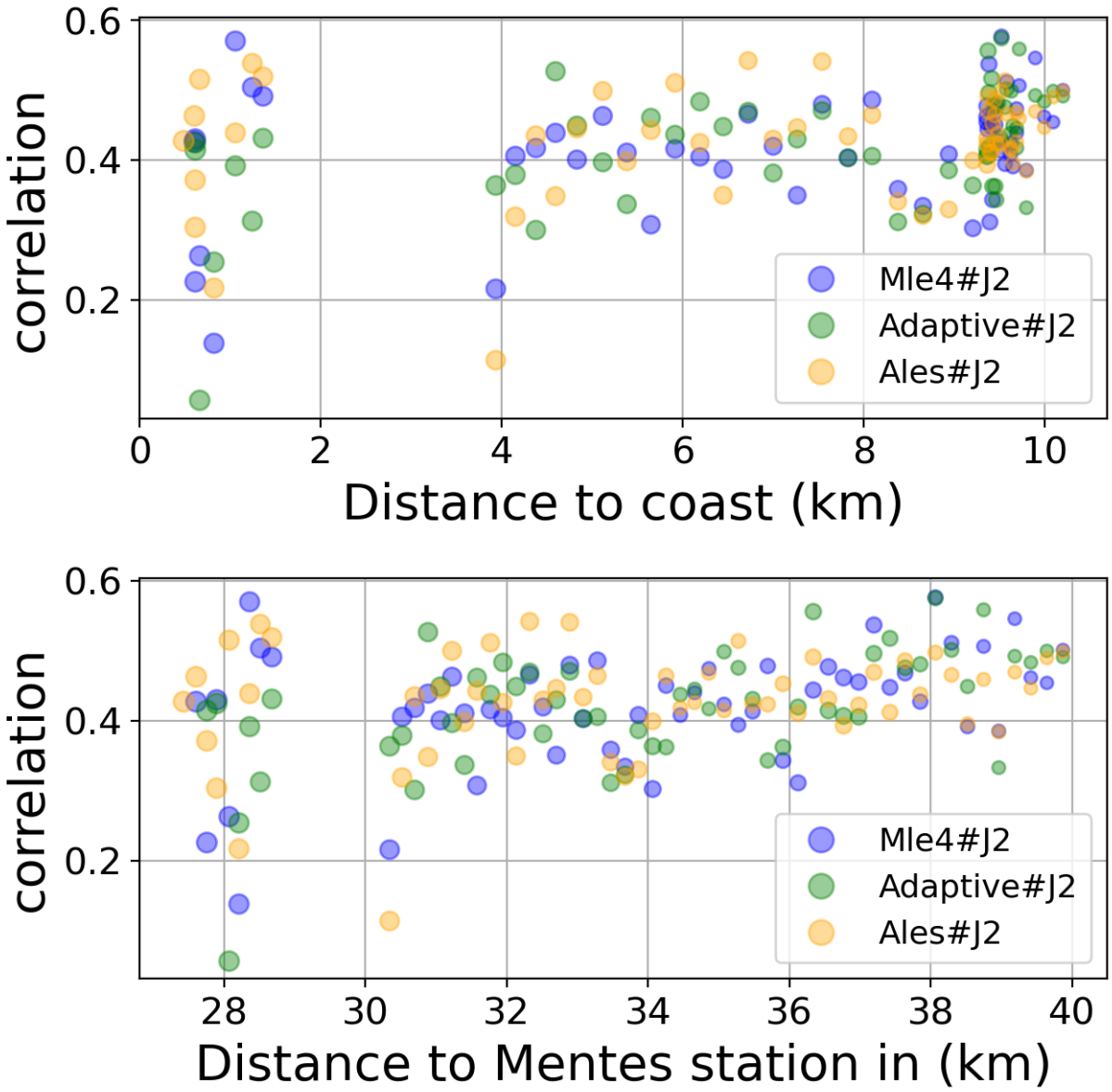

Figure 50 – Correlation in function of the distance to the coast/Mentes station

6.2.8 Taylor Diagram

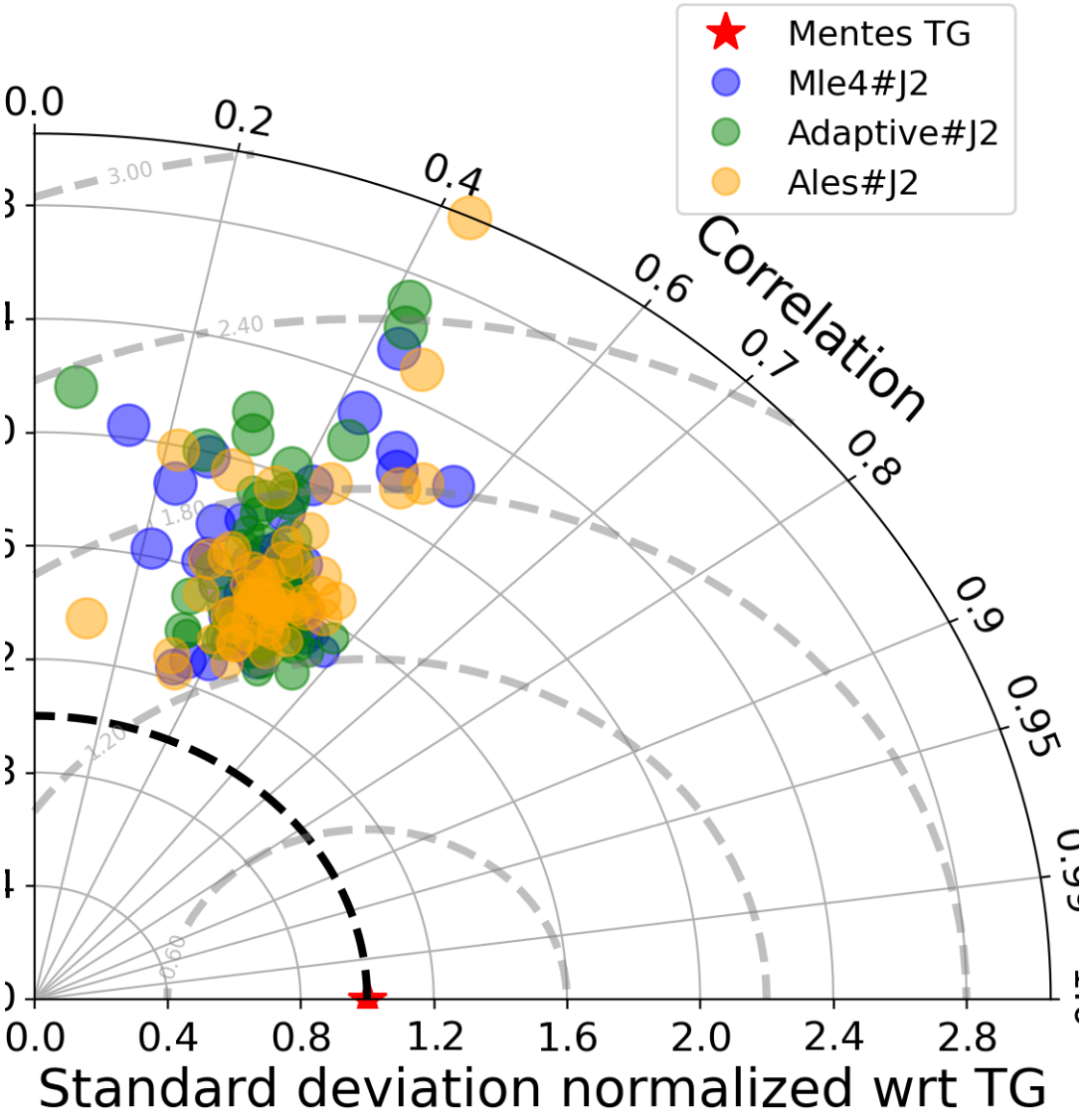

FIGURE 51 – Taylor diagram

6.2.9 Mean statistics table of products comparison with Mentes 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#J2	80.875	0.42	0.108	0.1
Adaptive#J2	78.113	0.421	0.112	0.103
Ales#J2	87.17	0.428	0.106	0.098

FIGURE 52 – 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 106 point.

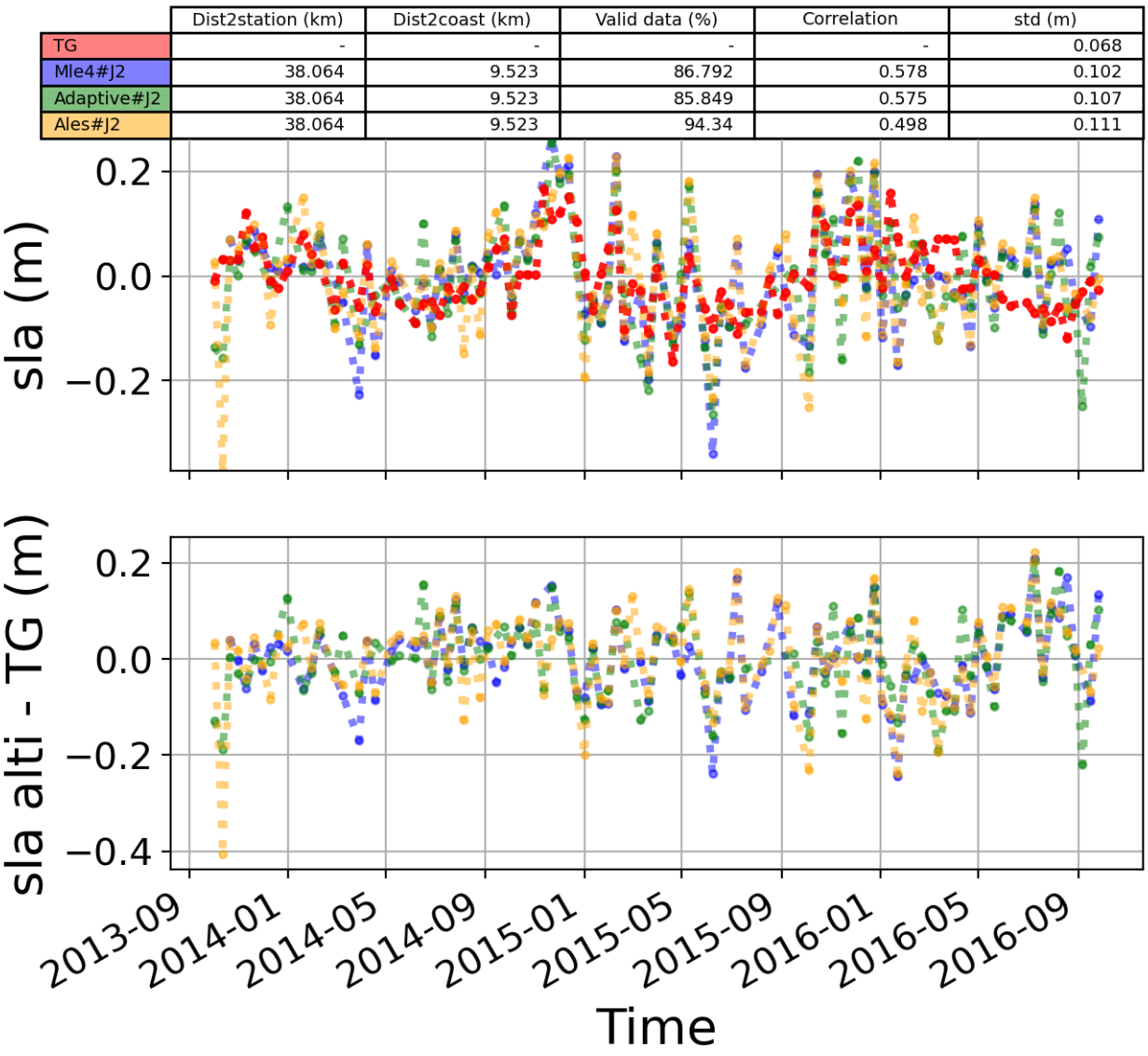

FIGURE 53 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

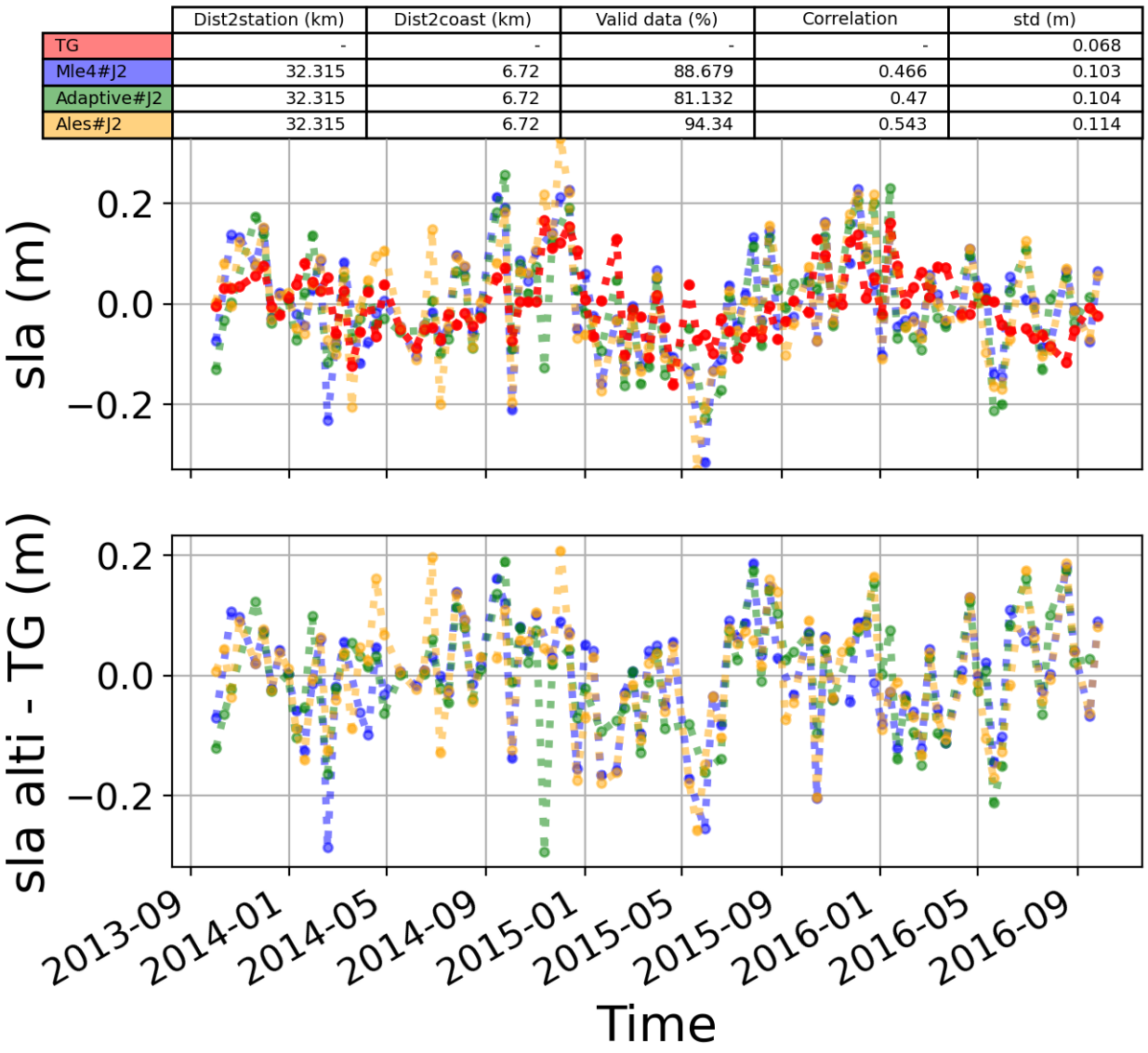

FIGURE 54 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.3 Station : Ibiza

- Nearest track to Ibiza station is the track number track248
- The area of interest is limited by :
  - A circle which it's center is the Ibiza tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km
  - Latitude limits : [38.6, 39.05] °

6.3.1 correlation visualization in maps view % Ibiza tide gauge

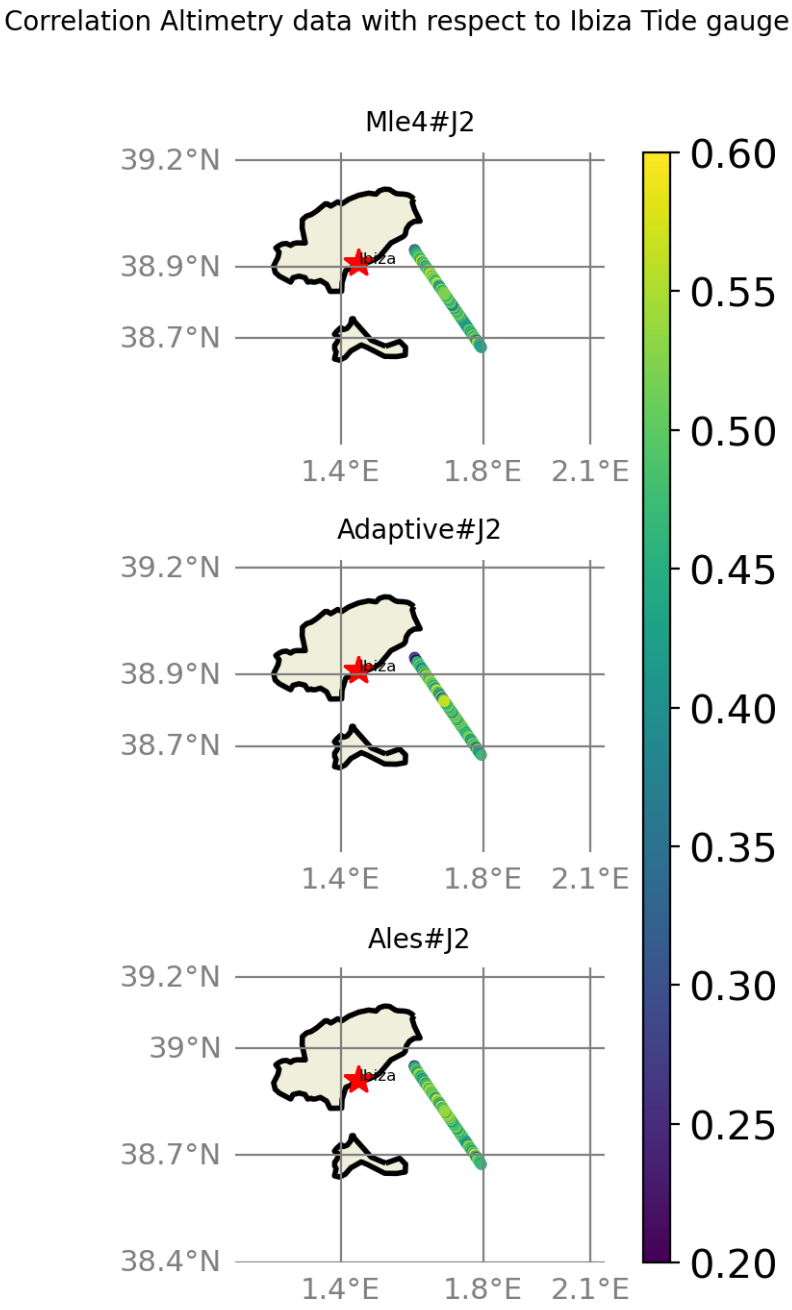

FIGURE 55 – correlation visualization in maps view % Ibiza tide gauge

6.3.2 rmsd visualization in maps view % Ibiza tide gauge

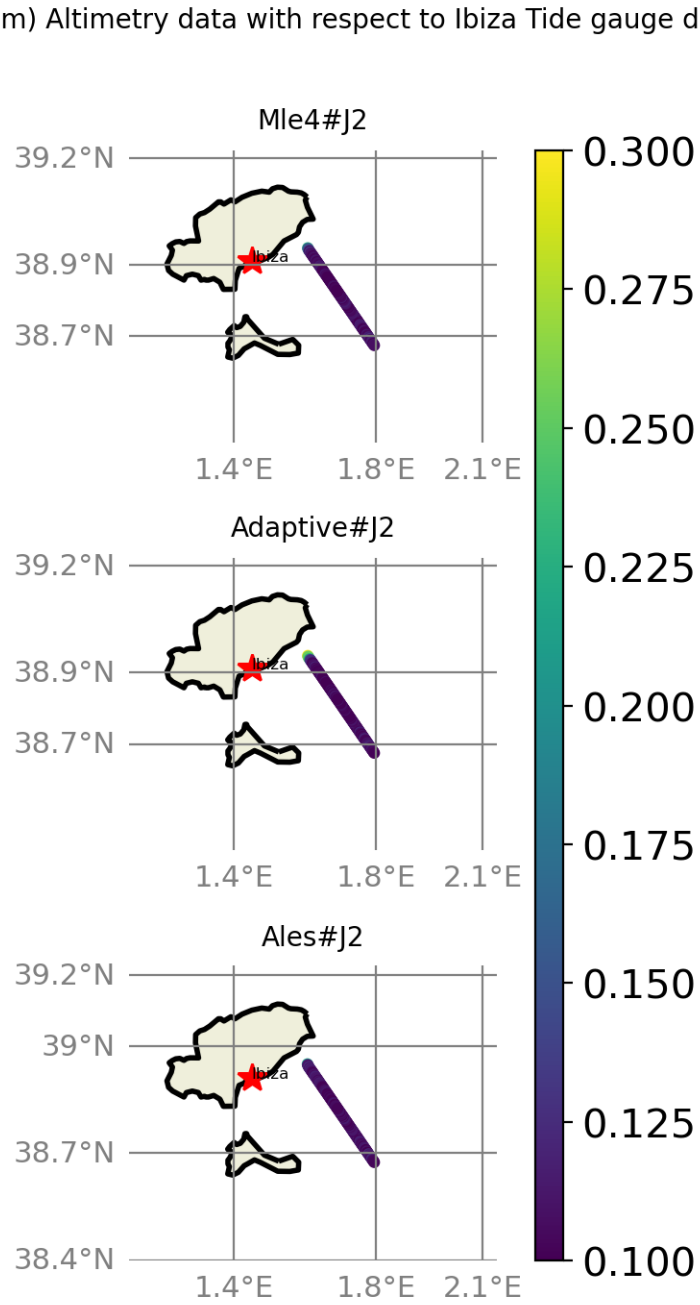

FIGURE 56 – rmsd visualization in maps view % Ibiza tide gauge

6.3.3 std visualization in maps view % Ibiza tide gauge

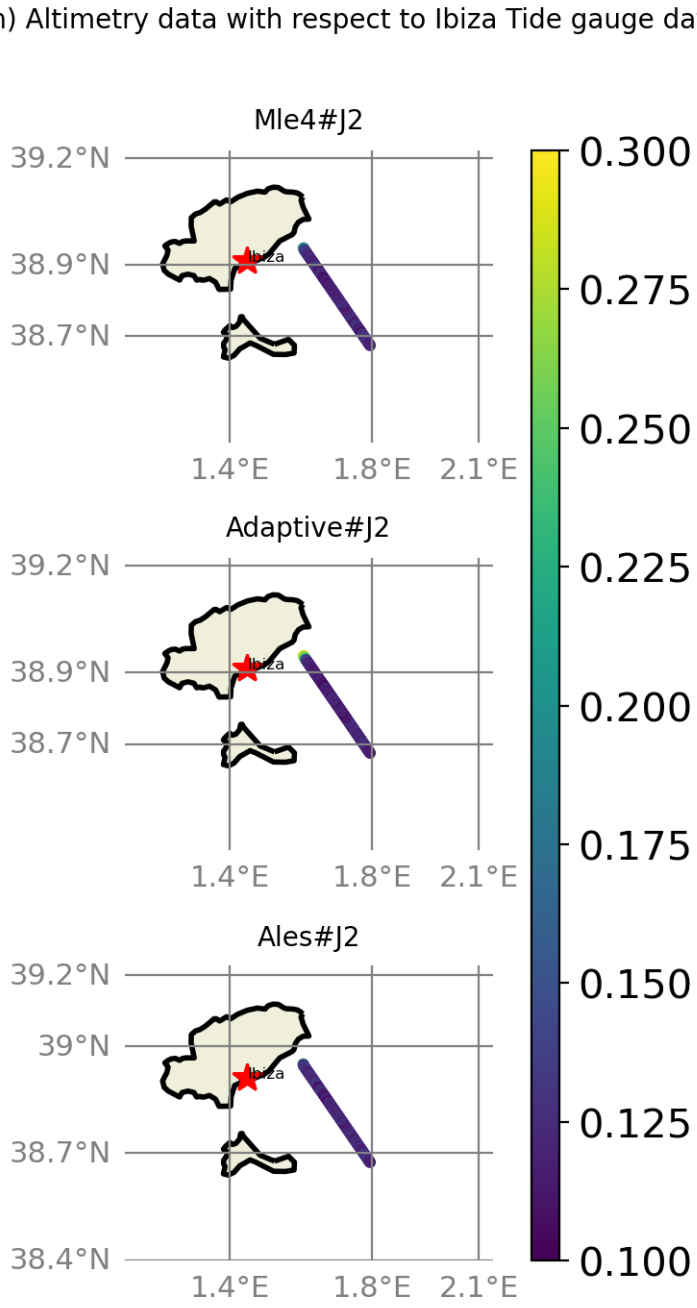

FIGURE 57 – std visualization in maps view % Ibiza tide gauge

6.3.4 valid_data_percent visualization in maps view % Ibiza tide gauge

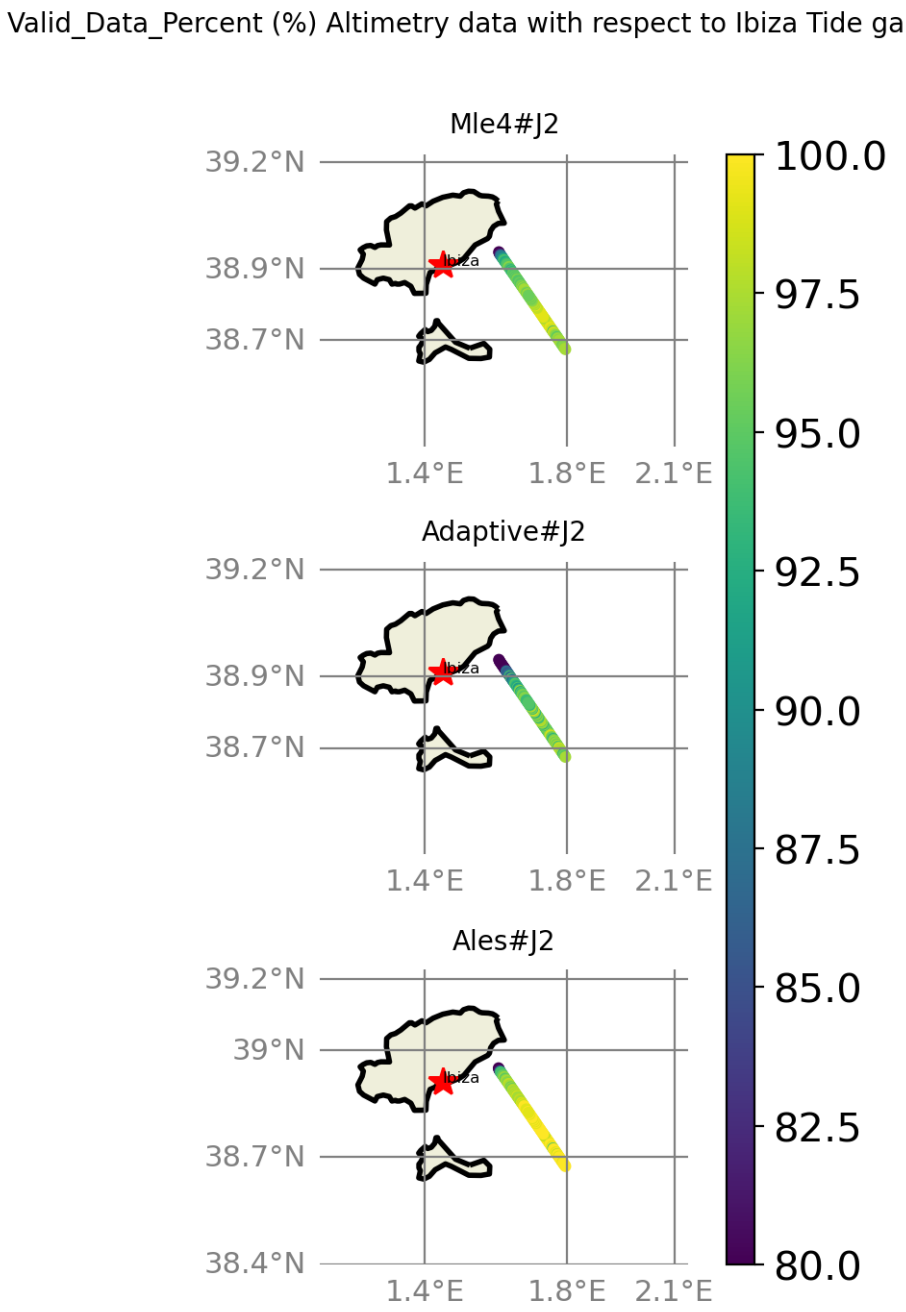

FIGURE 58 – valid_data_percent visualization in maps view % Ibiza tide gauge

6.3.5 Valid data (%) in function of distance to coast/Ibiza 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. $maxNB = 110$ 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.

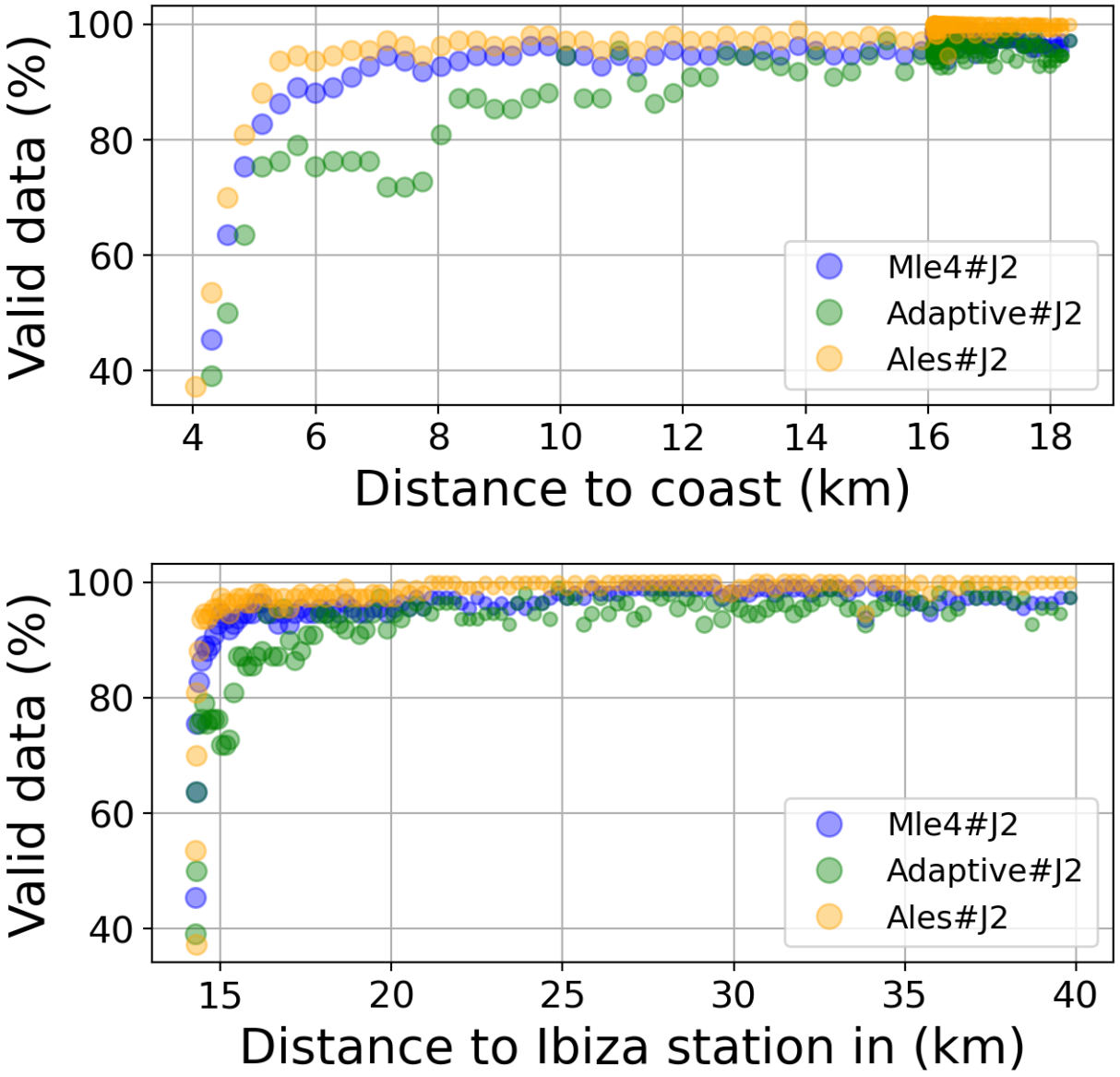

FIGURE 59 – Valid data (%) in function of distance to coast/Ibiza station

6.3.6 Std in function of distance to coast/Ibiza station

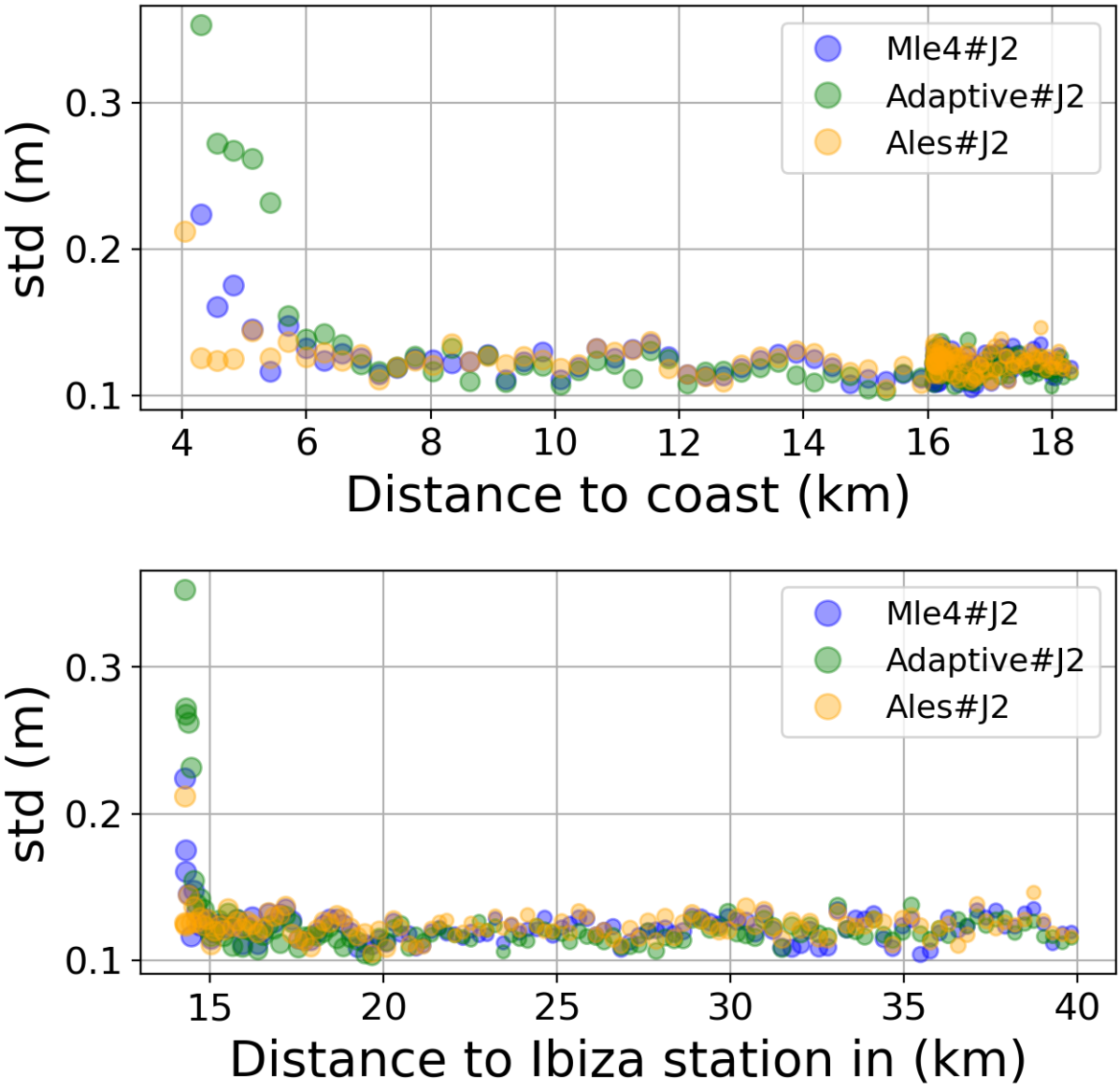

FIGURE 60 – Std in function of the distance to the coast/Ibiza station

6.3.7 Correlation in function of distance to coast/Ibiza station

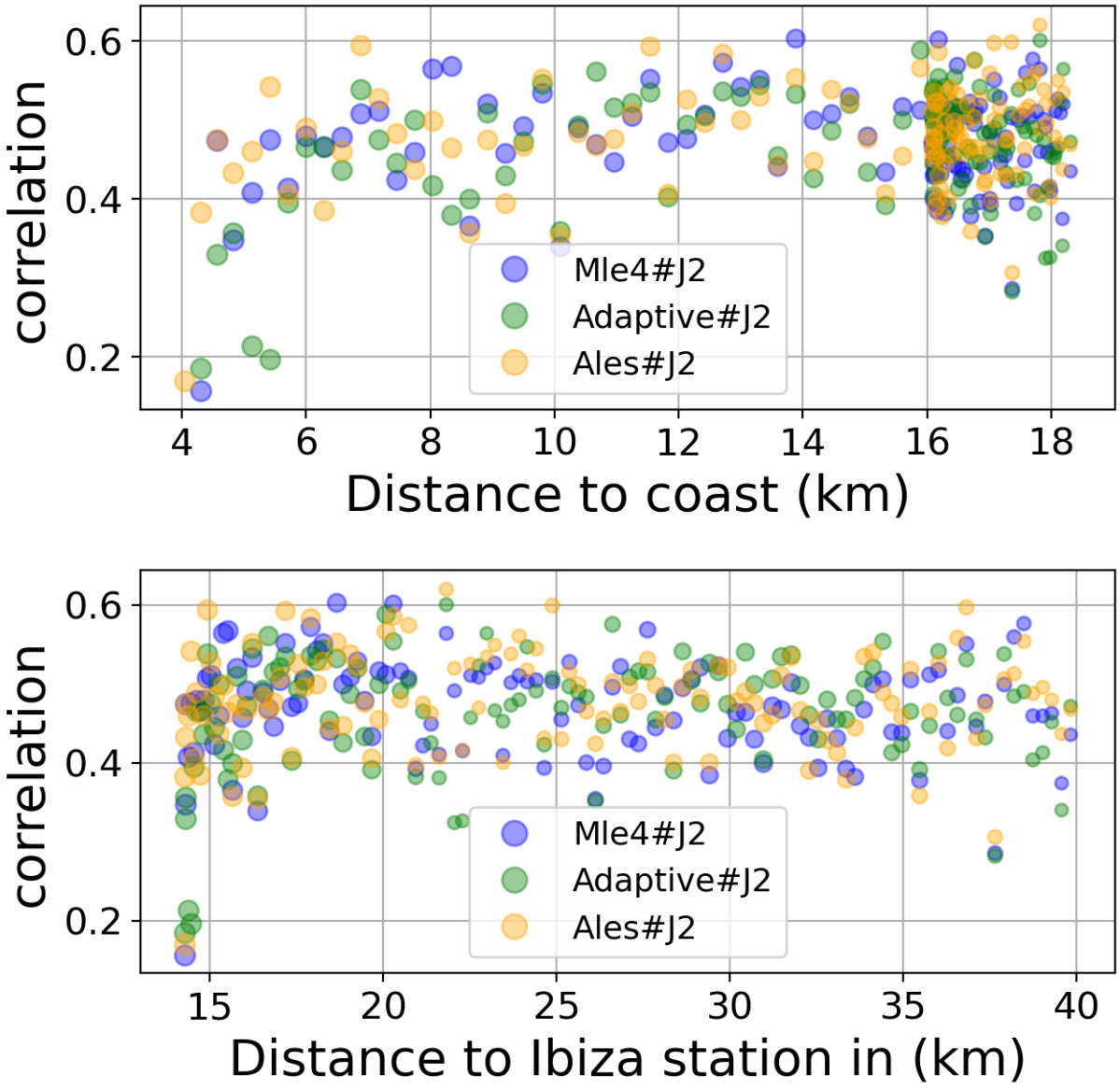

Figure 61 – Correlation in function of the distance to the coast/Ibiza station

6.3.8 Taylor Diagram

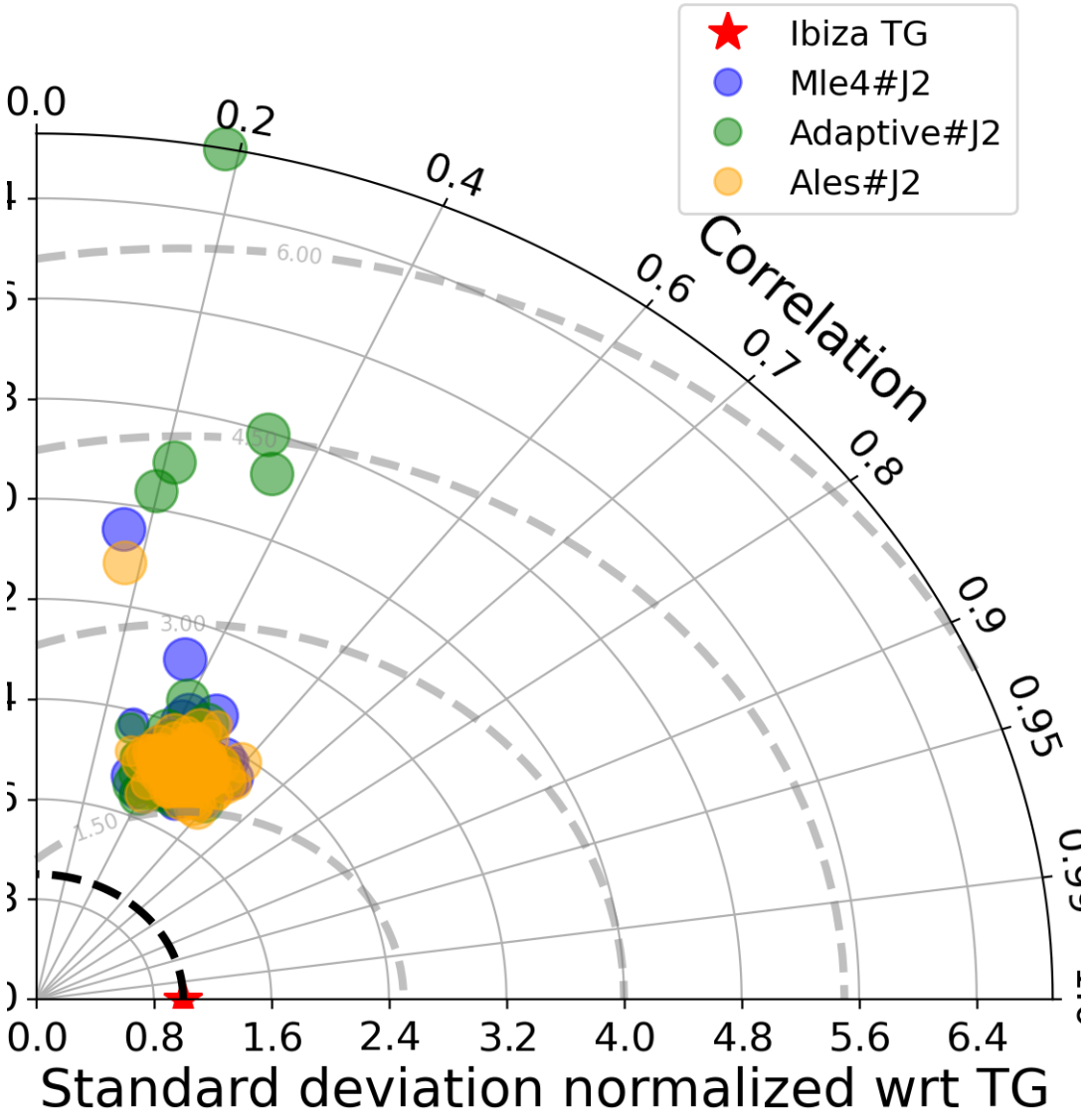

FIGURE 62 – Taylor diagram

6.3.9 Mean statistics table of products comparison with Ibiza 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#J2	95.317	0.47	0.123	0.109
Adaptive#J2	91.711	0.465	0.126	0.112
Ales#J2	97.83	0.482	0.123	0.108

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 110 point.

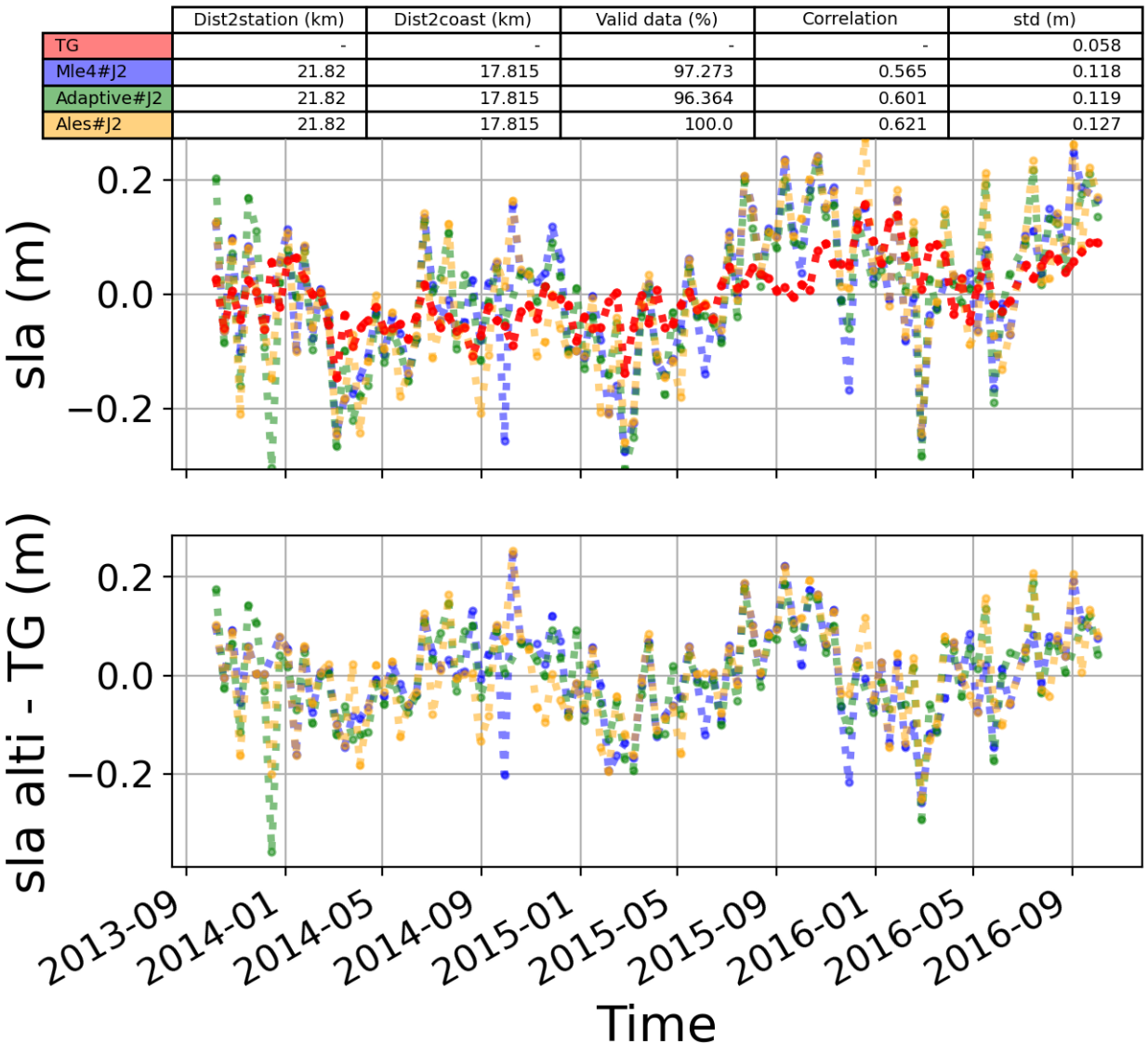

FIGURE 64 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.058
Mle4#J2	18.649	13.878	96.364	0.604	0.128
Adaptive#J2	18.649	13.878	91.818	0.533	0.114
Ales#J2	18.649	13.878	99.091	0.554	0.131

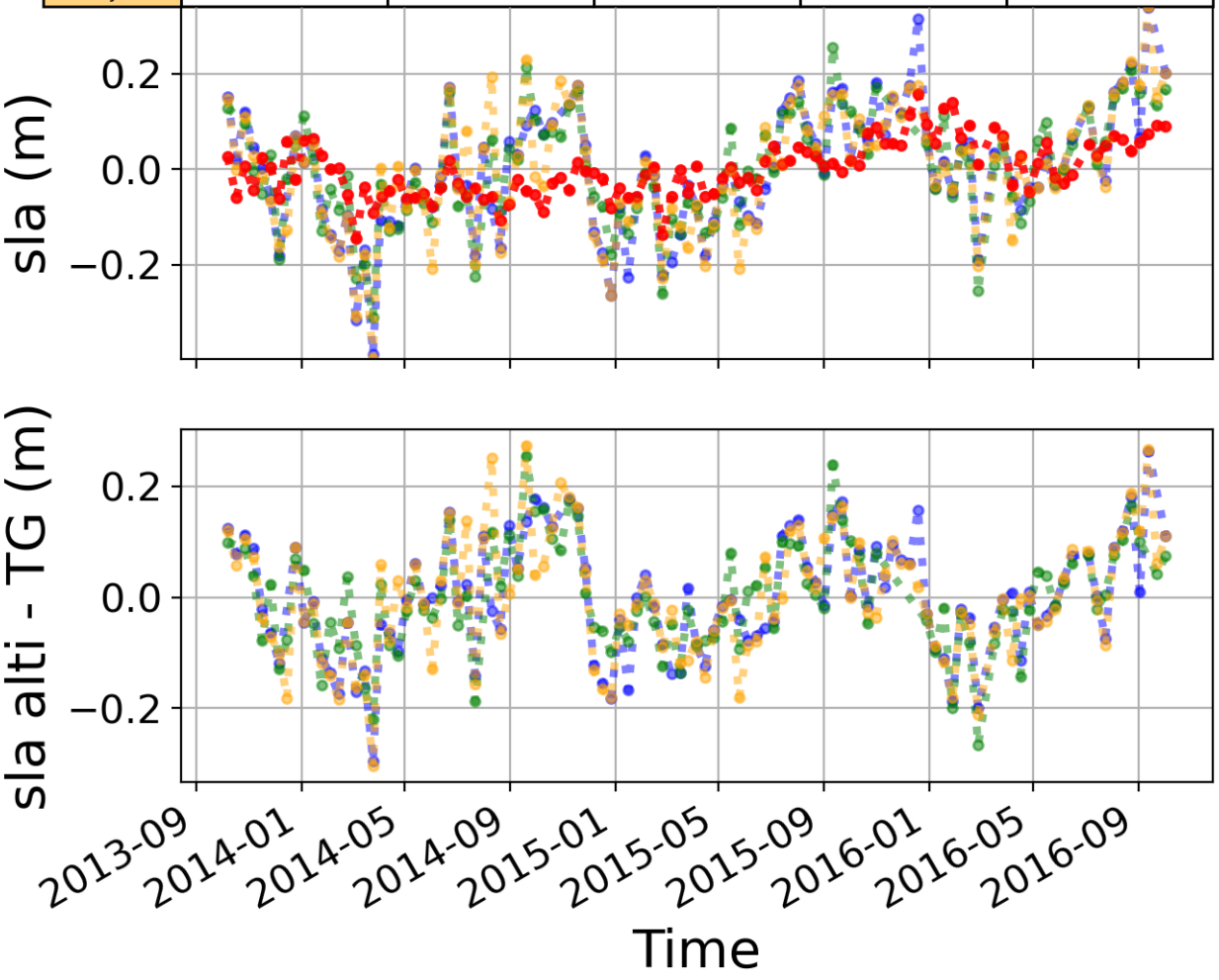

FIGURE 65 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.4 Station : LA_FIGUEIRETTE

- Nearest track to LA_FIGUEIRETTE station is the track number track222
- The area of interest is limited by :
  - A circle which it's center is the LA_FIGUEIRETTE tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km

6.4.1 correlation visualization in maps view % LA_FIGUEIRETTE tide gauge

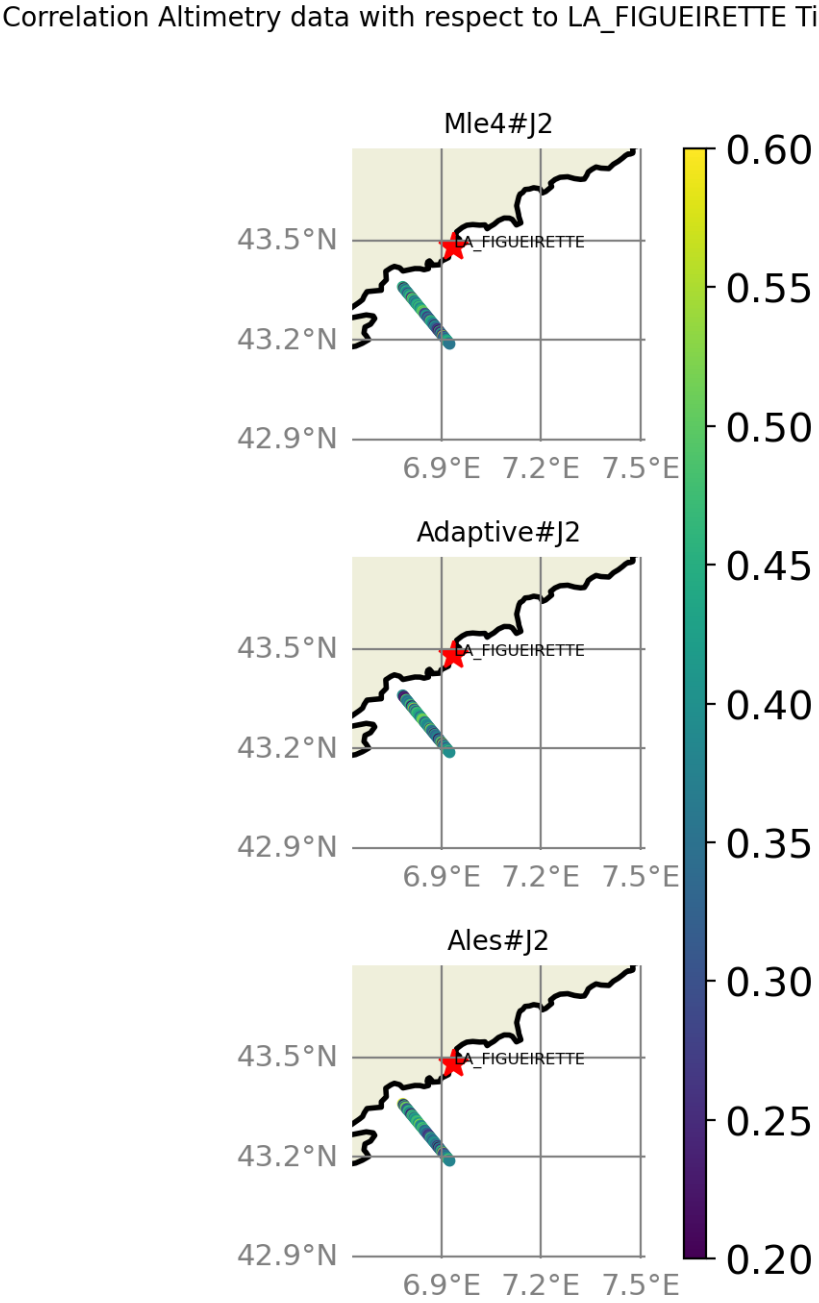

FIGURE 66 – correlation visualization in maps view % LA_FIGUEIRETTE tide gauge

6.4.2 rmsd visualization in maps view % LA_FIGUEIRETTE tide gauge

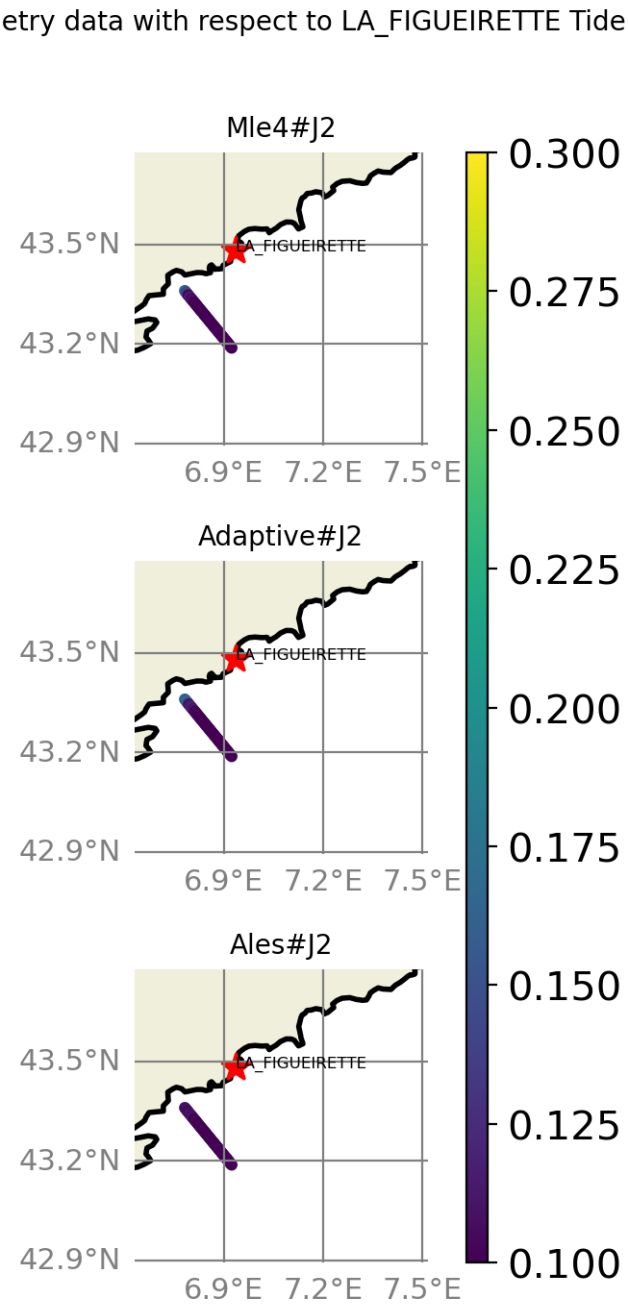

FIGURE 67 – rmsd visualization in maps view % LA_FIGUEIRETTE tide gauge

6.4.3 std visualization in maps view % LA_FIGUEIRETTE tide gauge

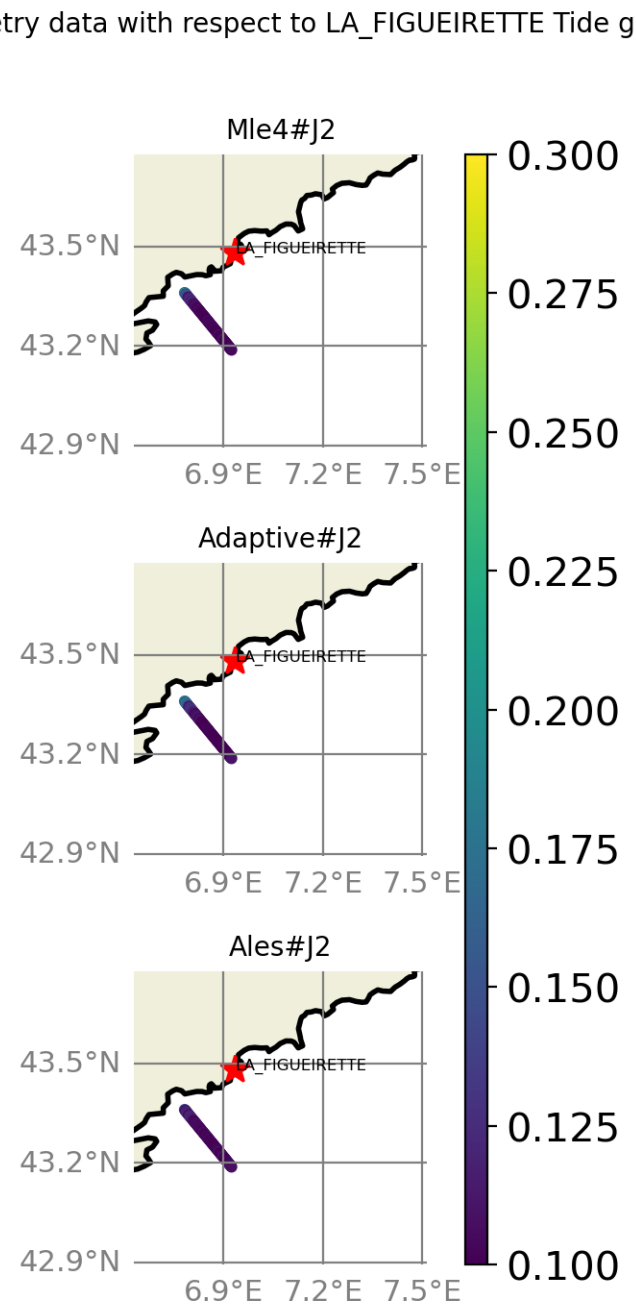

FIGURE 68 – std visualization in maps view % LA_FIGUEIRETTE tide gauge

6.4.4 valid_data_percent visualization in maps view % LA_FIGUEIRETTE tide gauge

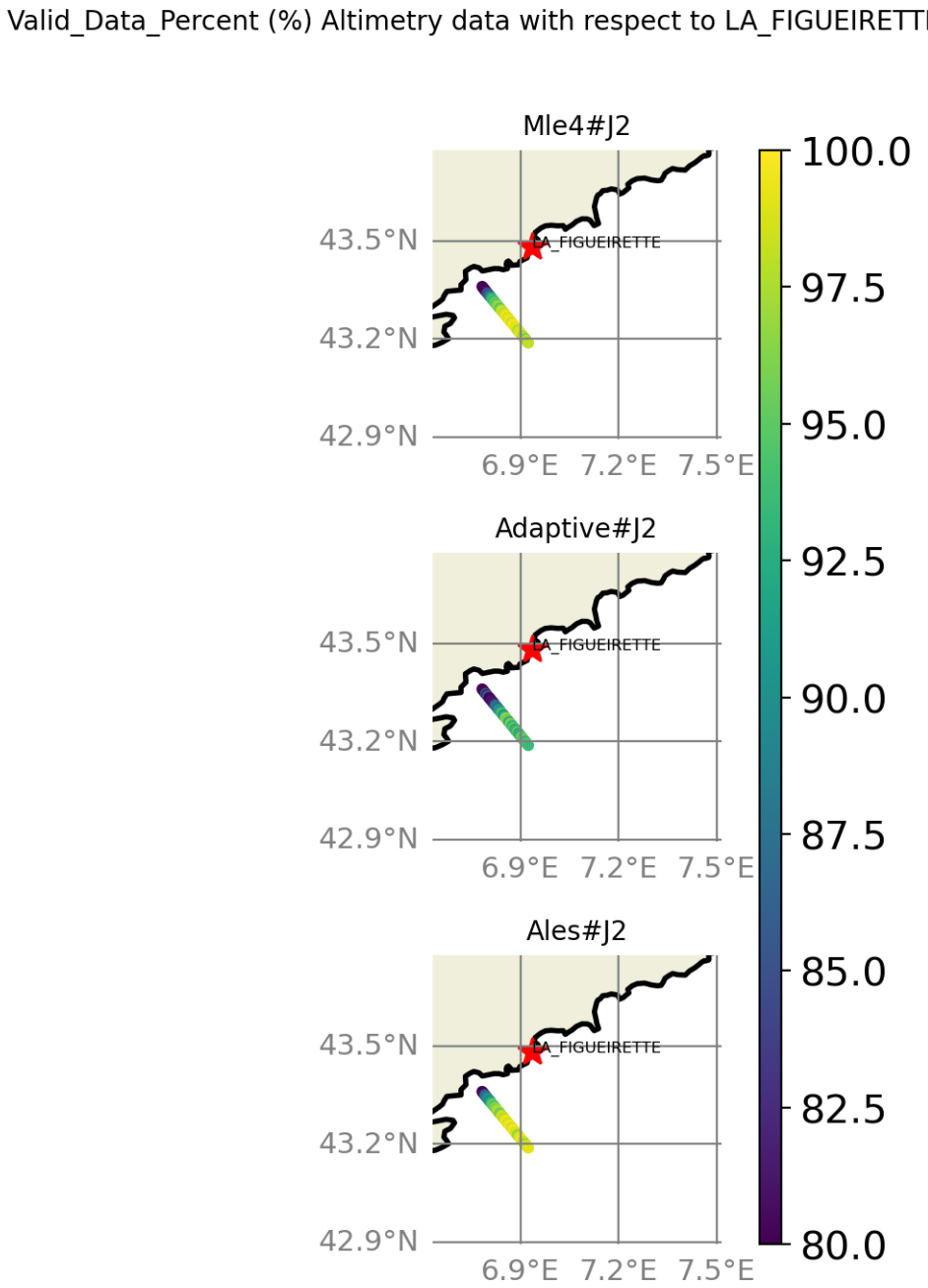

FIGURE 69 – valid_data_percent visualization in maps view % LA_FIGUEIRETTE tide gauge

6.4.5 Valid data (%) in function of distance to coast/LA_FIGUEIRETTE 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. $maxNB = 107$ 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.

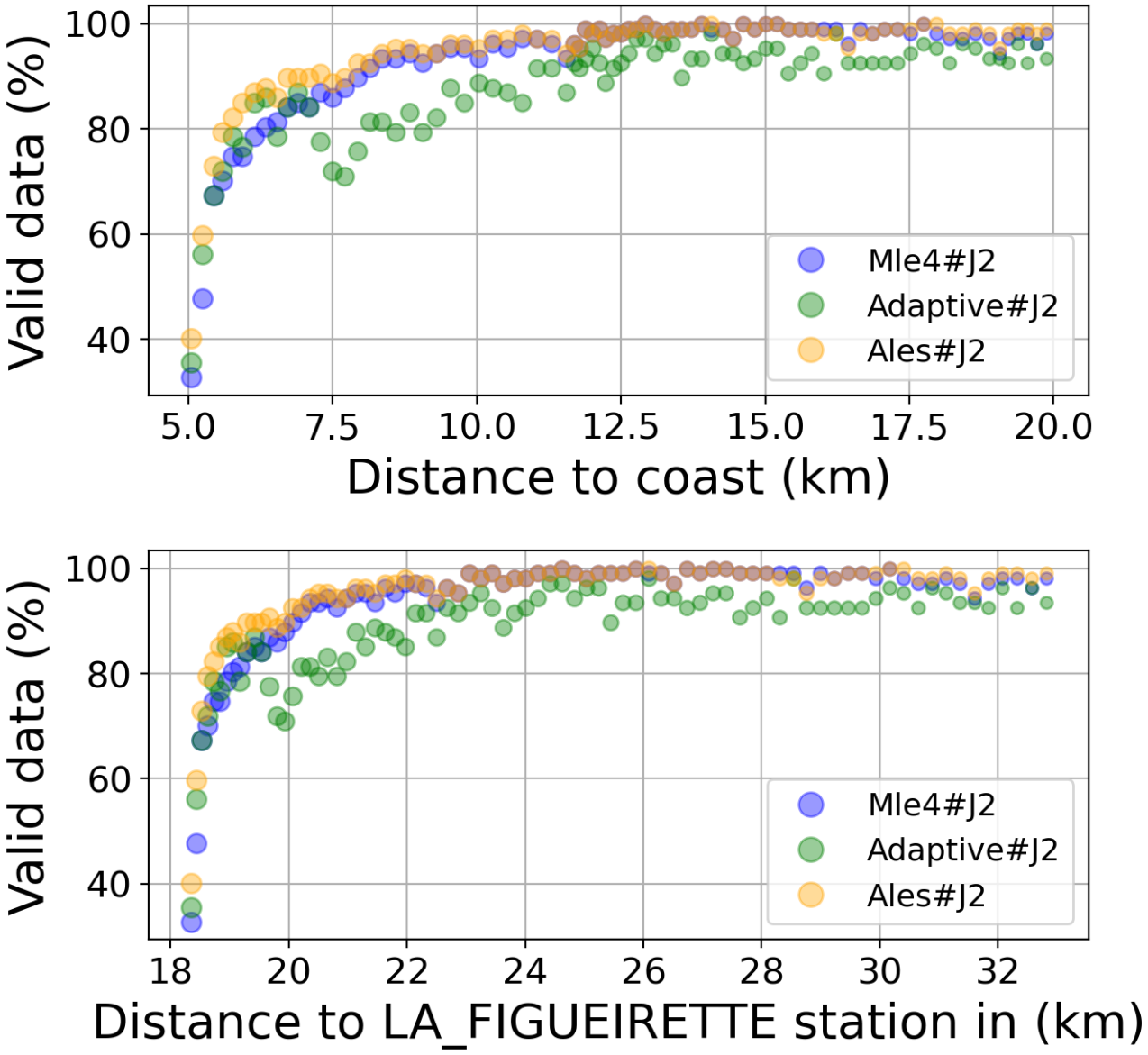

FIGURE 70 – Valid data (%) in function of distance to coast/LA_FIGUEIRETTE station

6.4.6 Std in function of distance to coast/LA_FIGUEIRETTE station

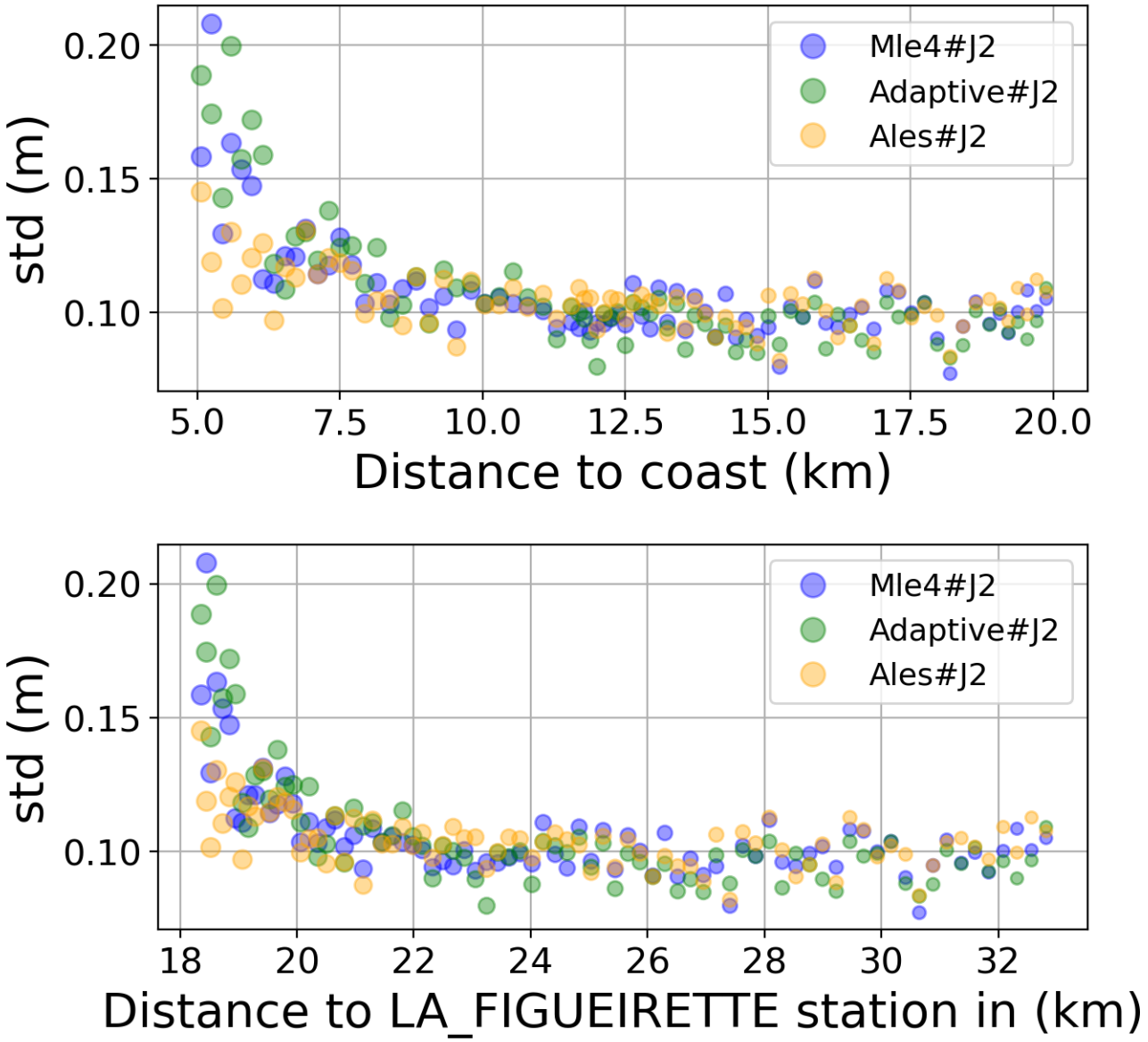

FIGURE 71 – Std in function of the distance to the coast/LA_FIGUEIRETTE station

6.4.7 Correlation in function of distance to coast/LA_FIGUEIRETTE station

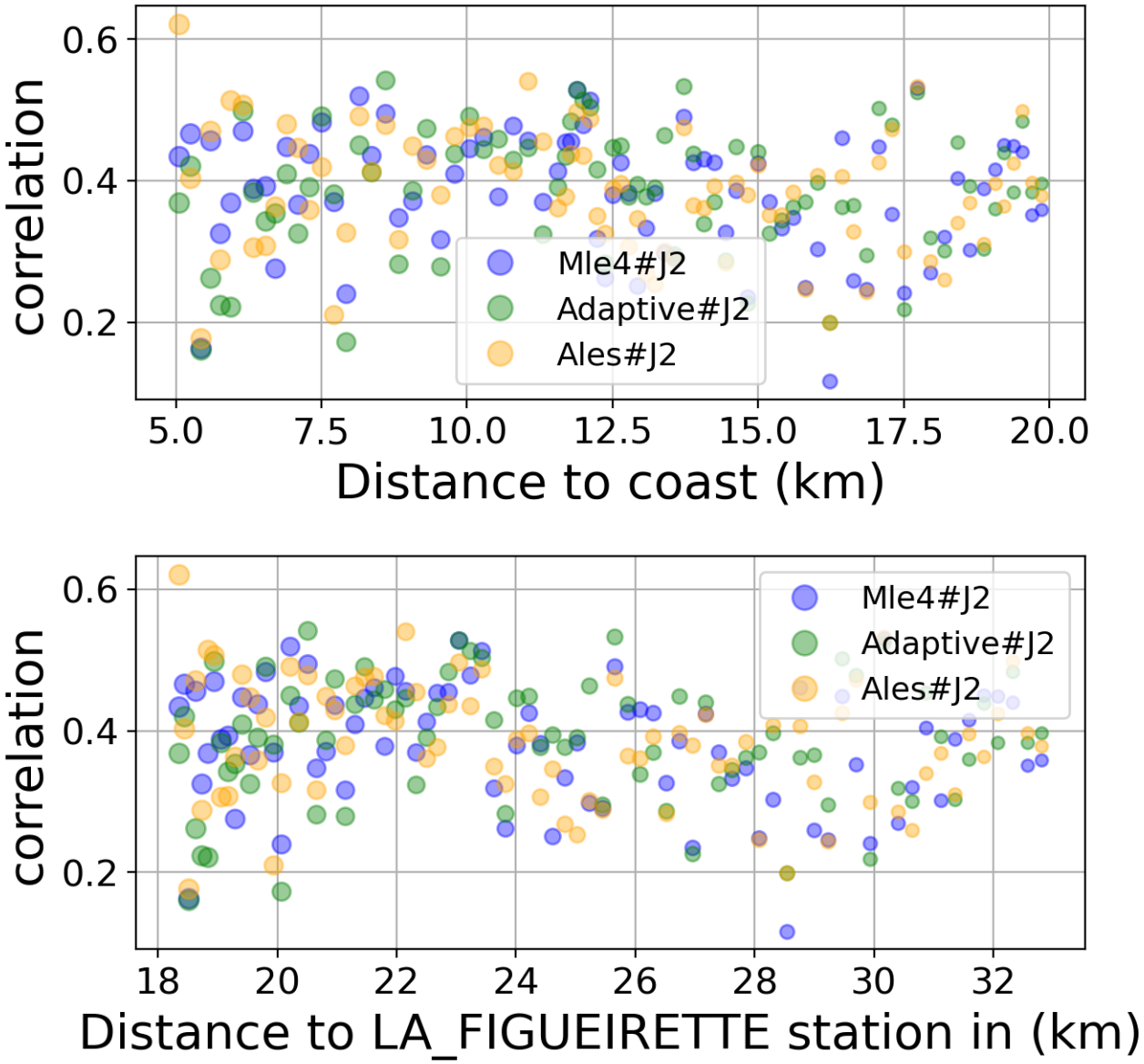

FIGURE 72 – Correlation in function of the distance to the coast/LA_FIGUEIRETTE station

6.4.8 Taylor Diagram

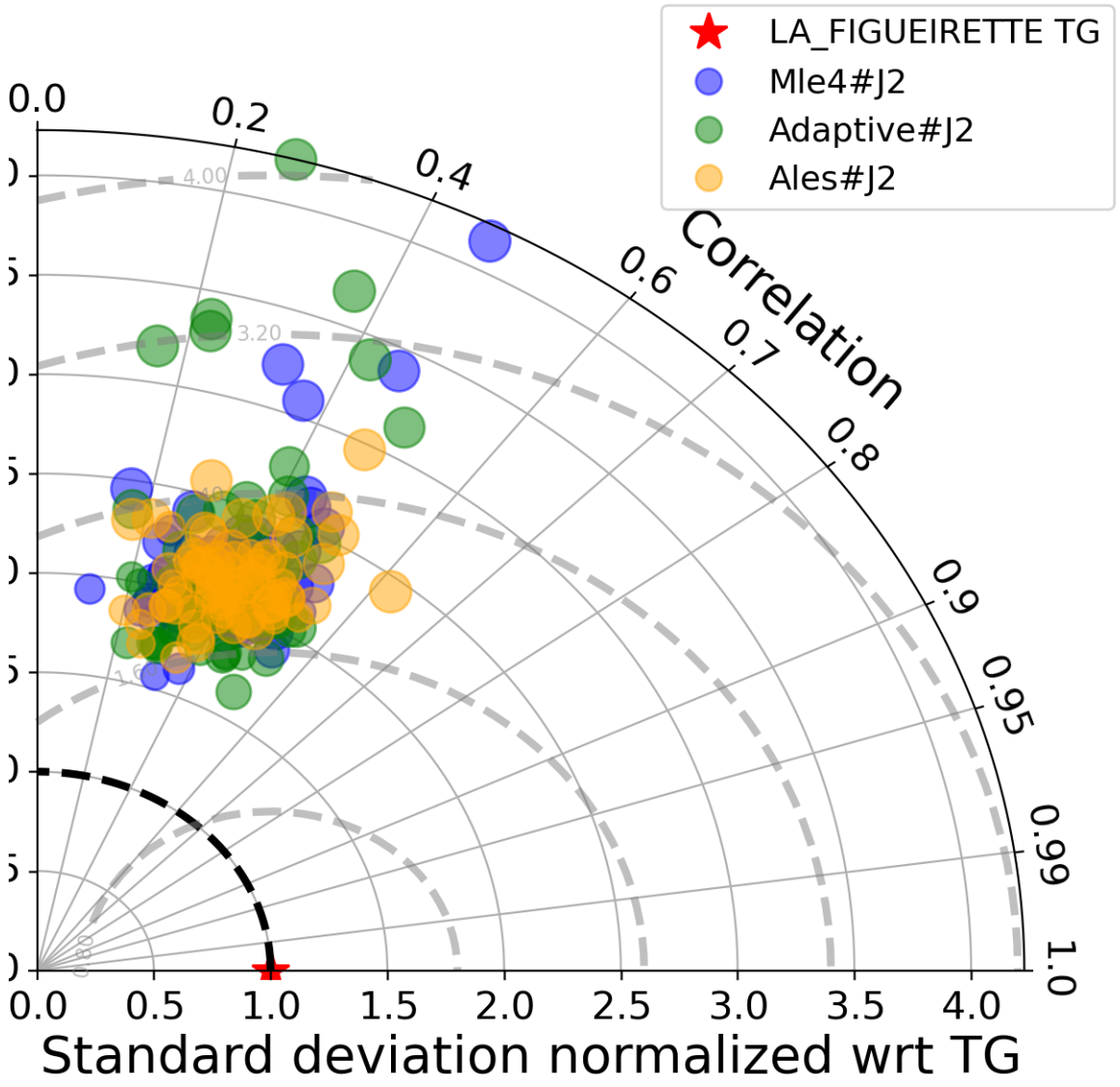

FIGURE 73 – Taylor diagram

6.4.9 Mean statistics table of products comparison with LA_FIGUEIRETTE 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#J2	93.003	0.381	0.107	0.099
Adaptive#J2	88.162	0.385	0.107	0.1
Ales#J2	94.62	0.384	0.105	0.097

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 107 point.

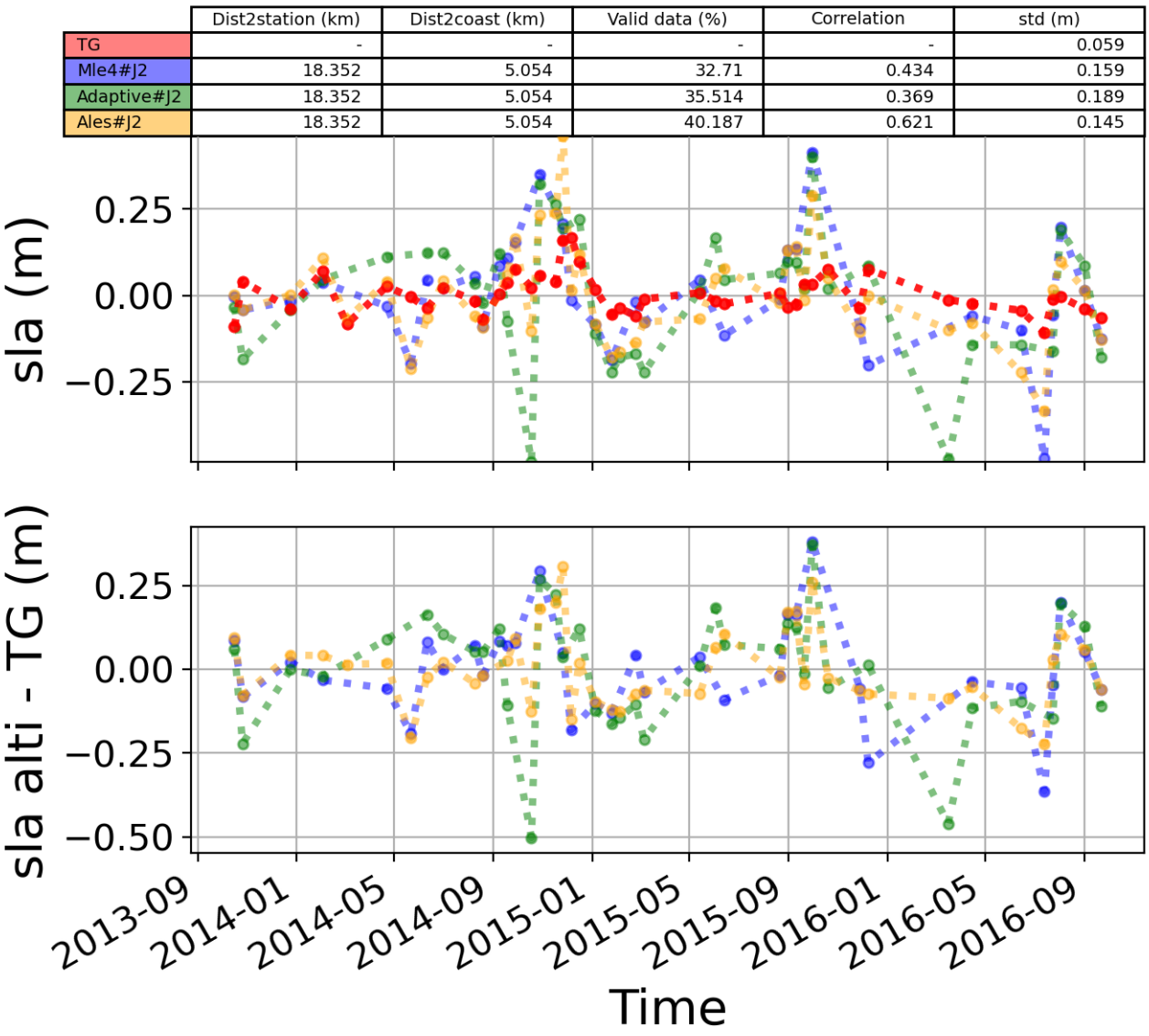

FIGURE 75 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

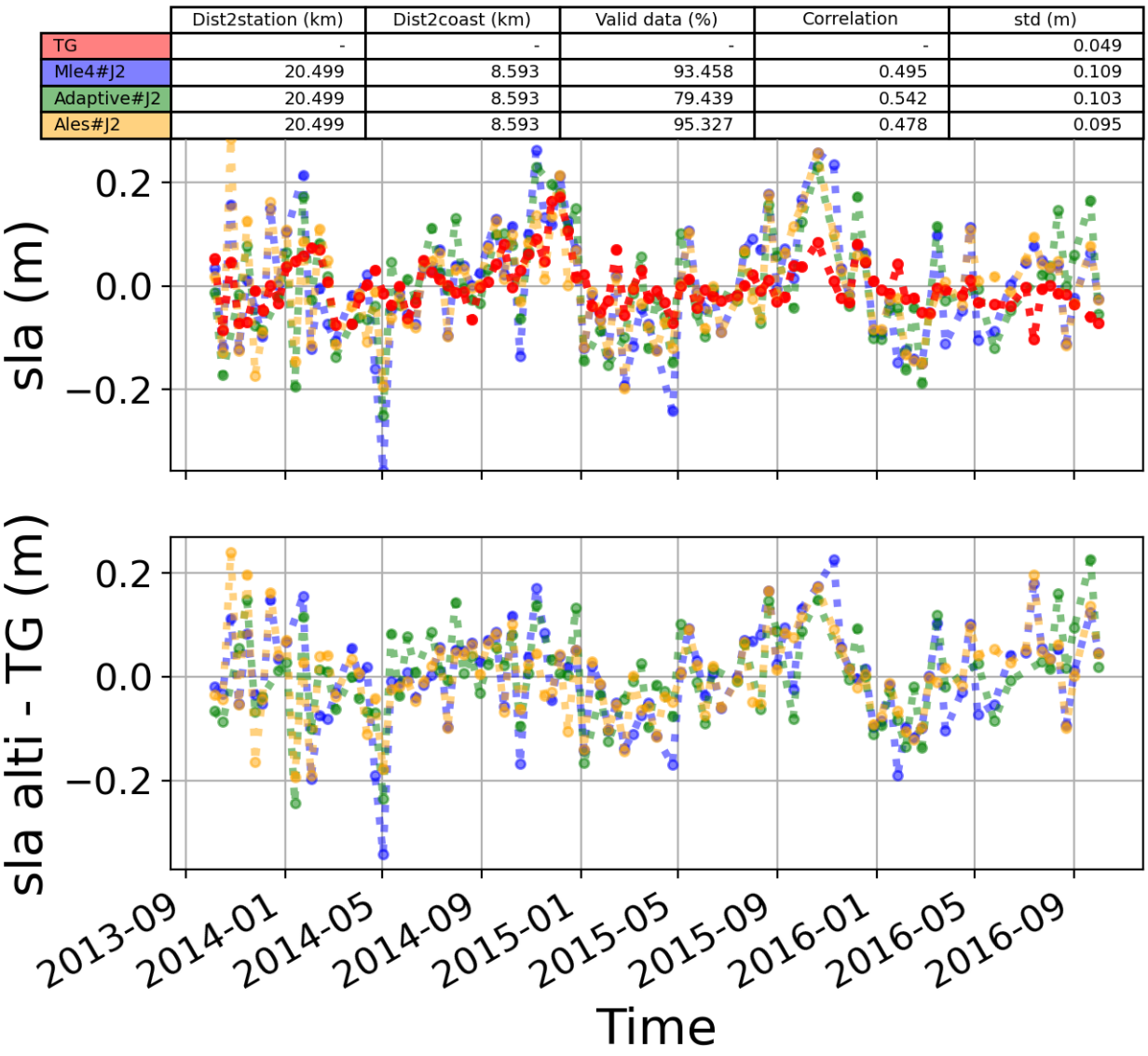

FIGURE 76 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

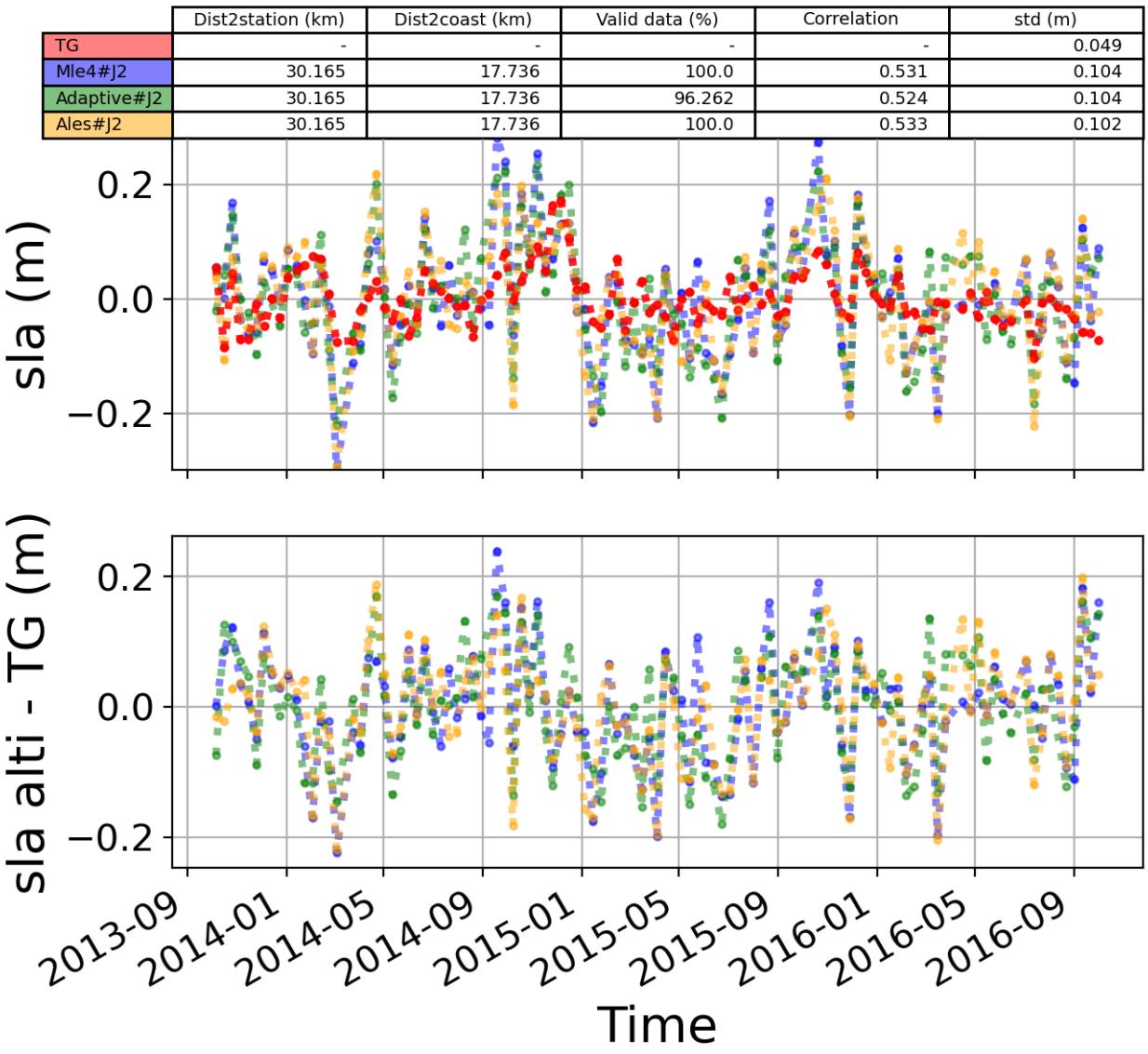

FIGURE 77 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.5 Station : Ancona

- Nearest track to Ancona station is the track number track161
- The area of interest is limited by :
  - A circle which it's center is the Ancona 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 % Ancona tide gauge

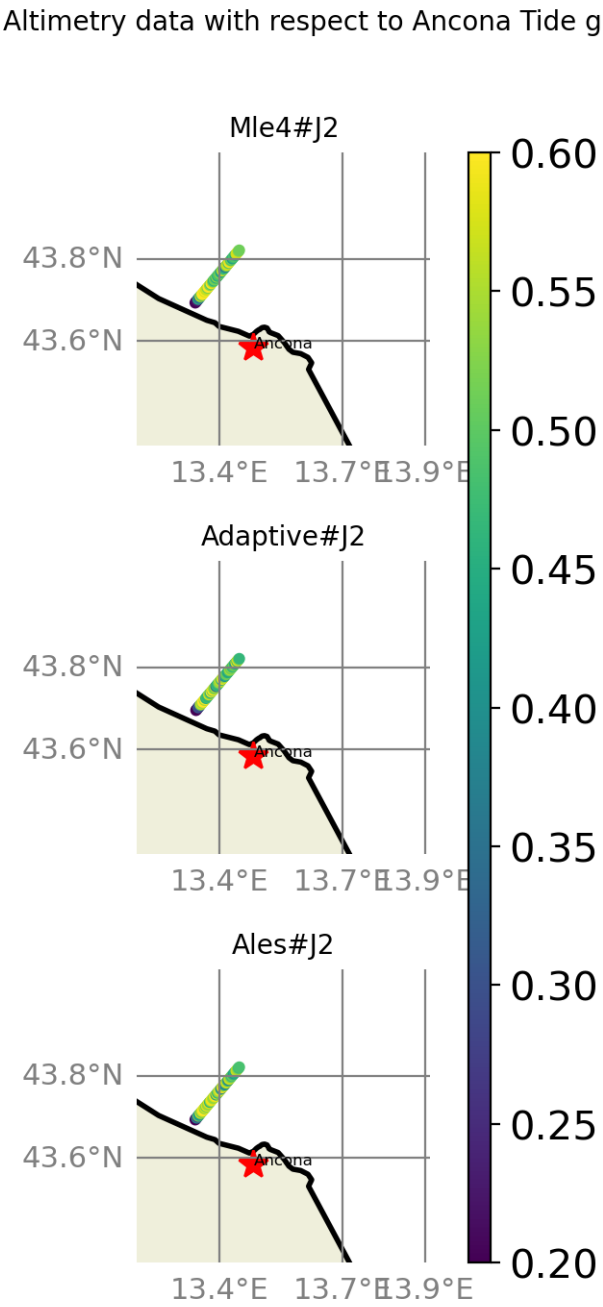

FIGURE 78 – correlation visualization in maps view % Ancona tide gauge

6.5.2 rmsd visualization in maps view % Ancona tide gauge

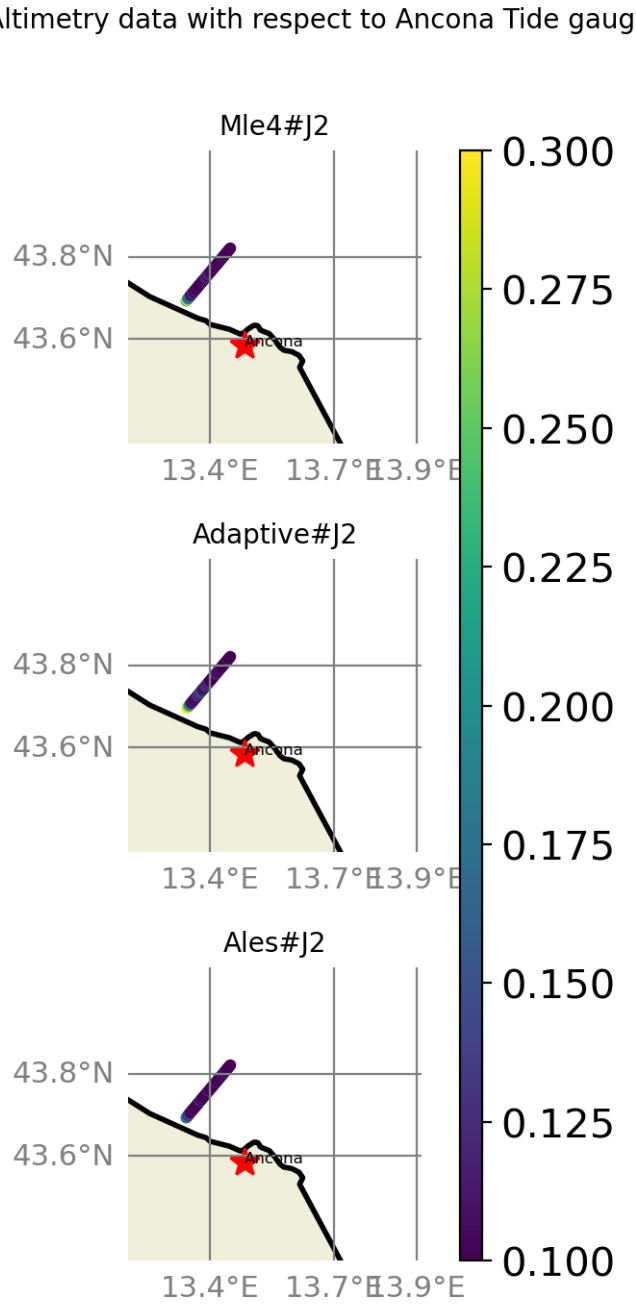

FIGURE 79 – rmsd visualization in maps view % Ancona tide gauge

6.5.3 std visualization in maps view % Ancona tide gauge

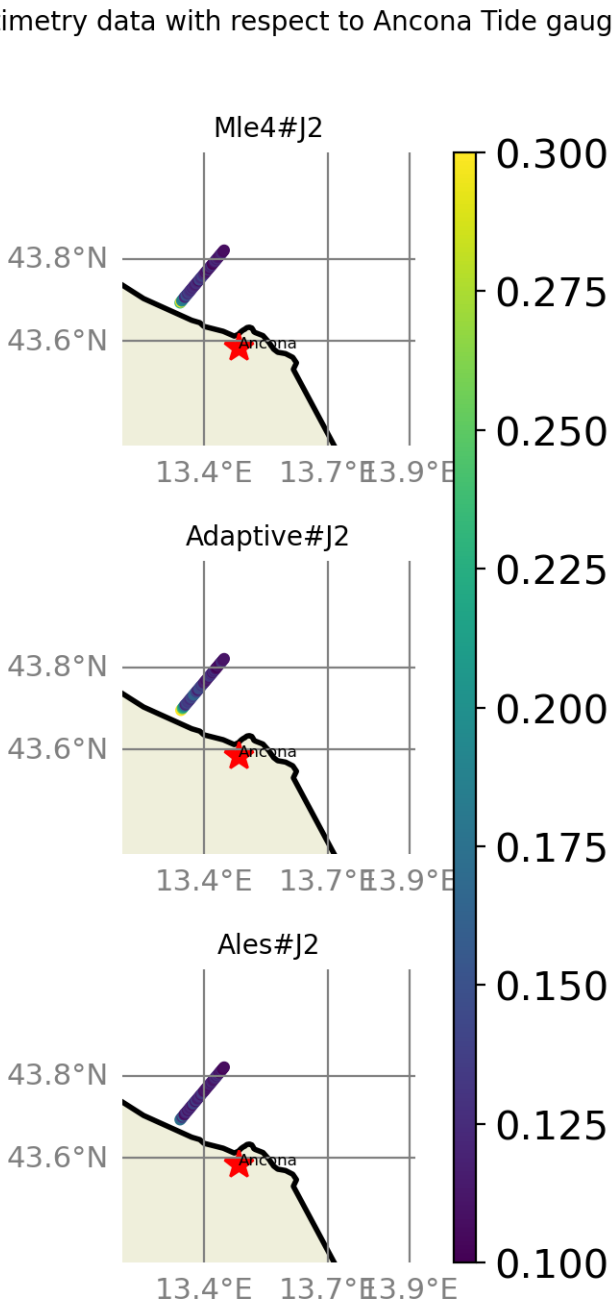

FIGURE 80 – std visualization in maps view % Ancona tide gauge

6.5.4 valid_data_percent visualization in maps view % Ancona tide gauge

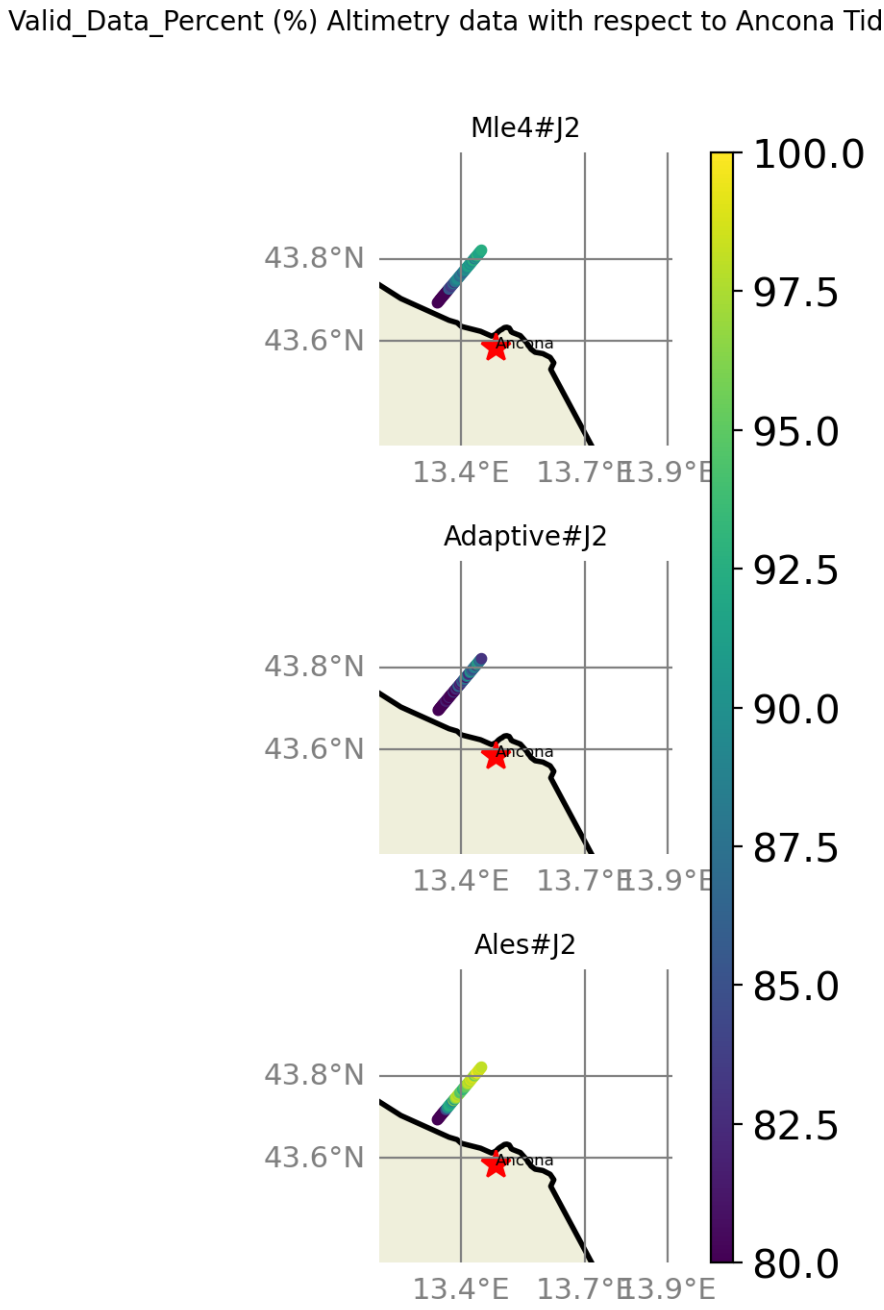

FIGURE 81 – valid_data_percent visualization in maps view % Ancona tide gauge

6.5.5 Valid data (%) in function of distance to coast/Ancona 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.

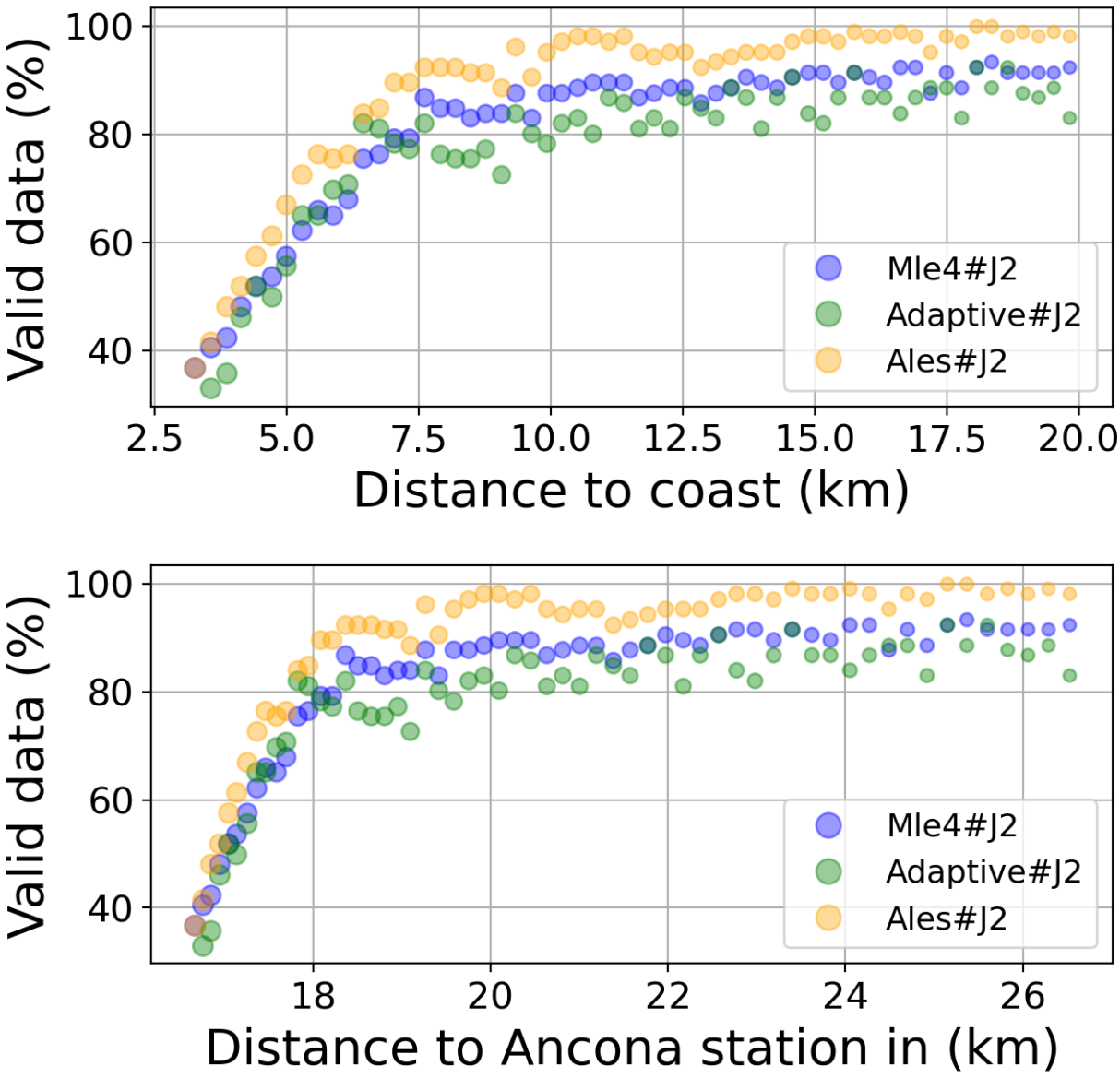

FIGURE 82 – Valid data (%) in function of distance to coast/Ancona station

6.5.6 Std in function of distance to coast/Ancona station

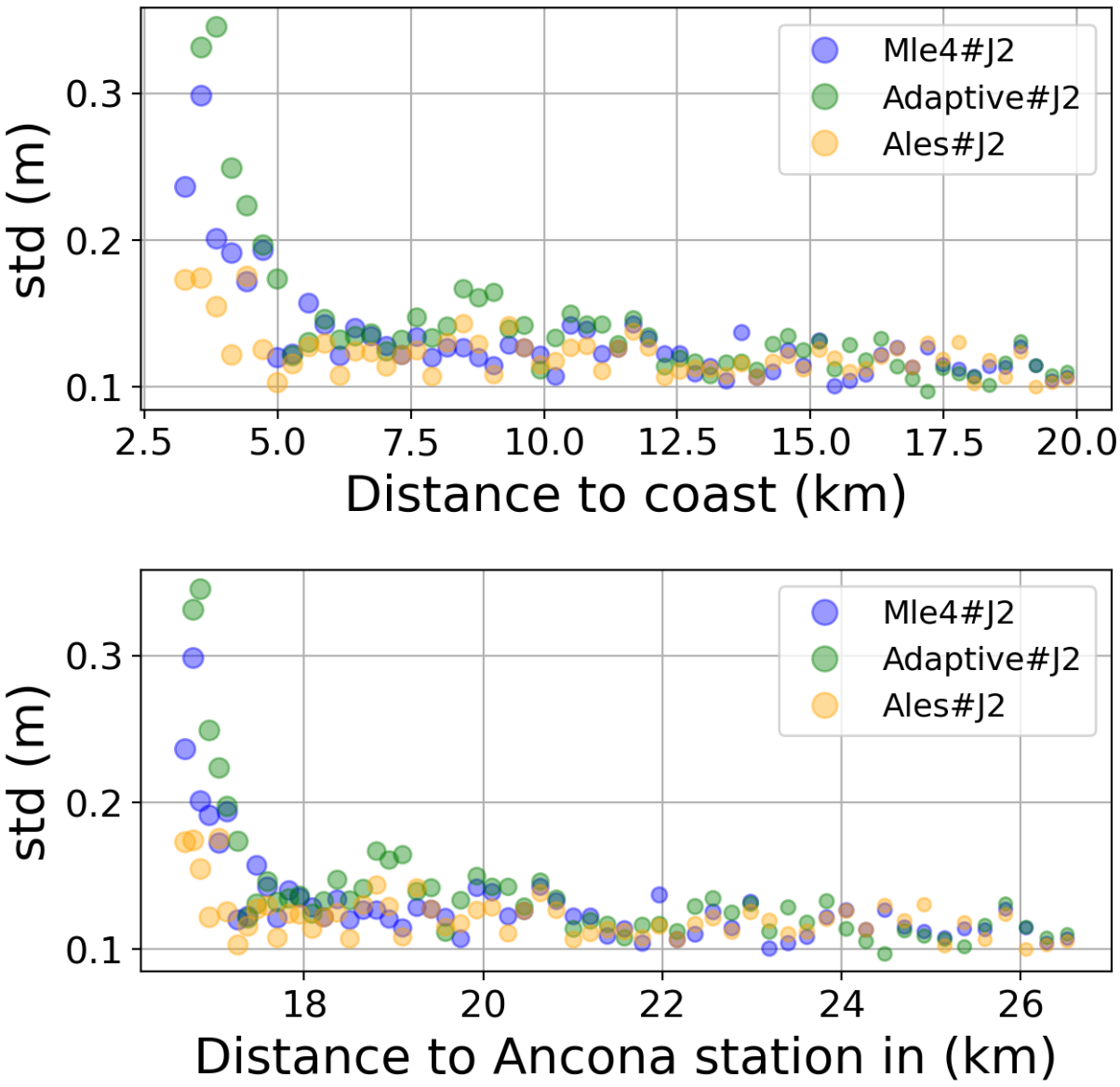

Figure 83 – Std in function of the distance to the coast/Ancona station

6.5.7 Correlation in function of distance to coast/Ancona station

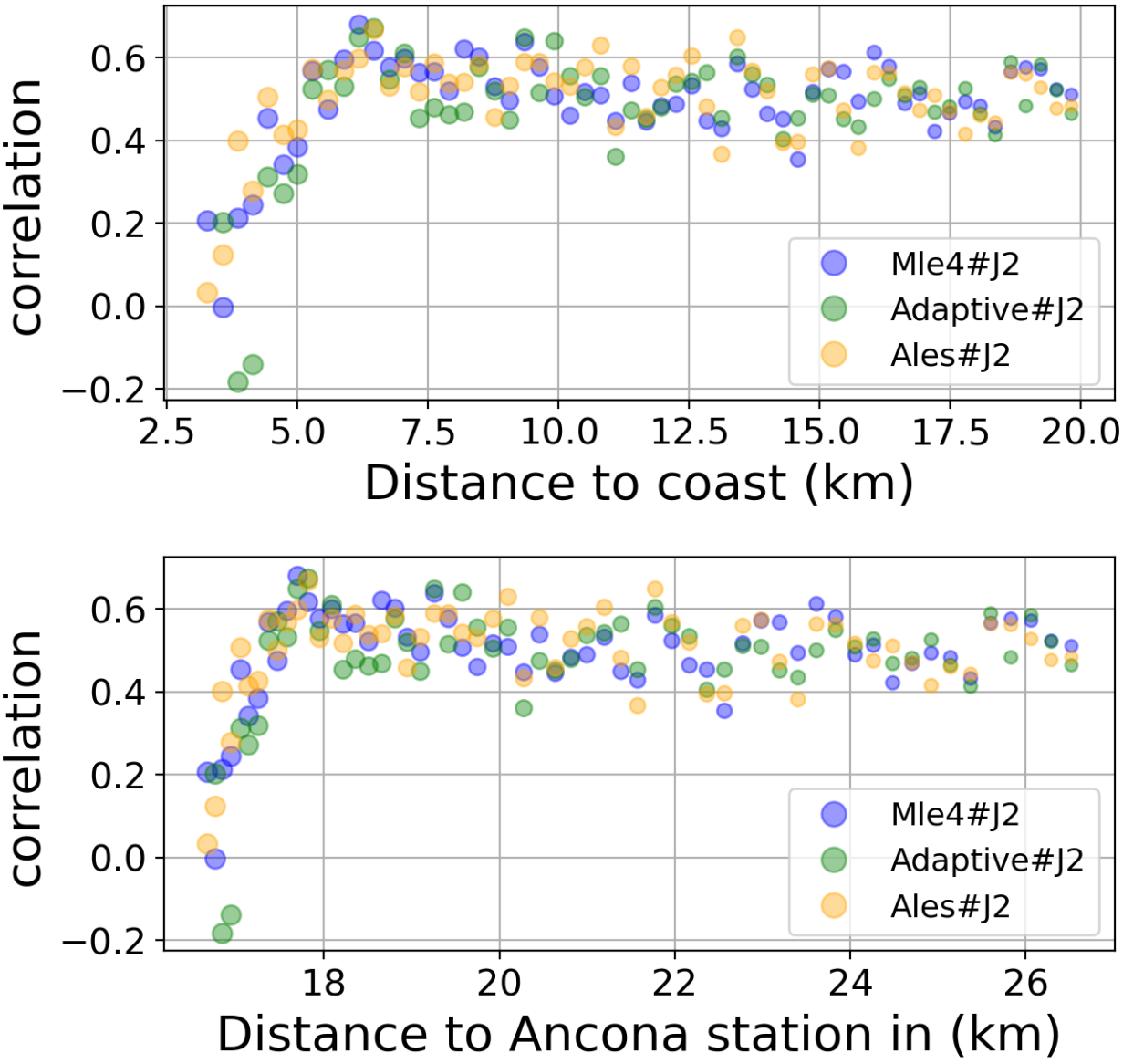

FIGURE 84 – Correlation in function of the distance to the coast/Ancona station

6.5.8 Taylor Diagram

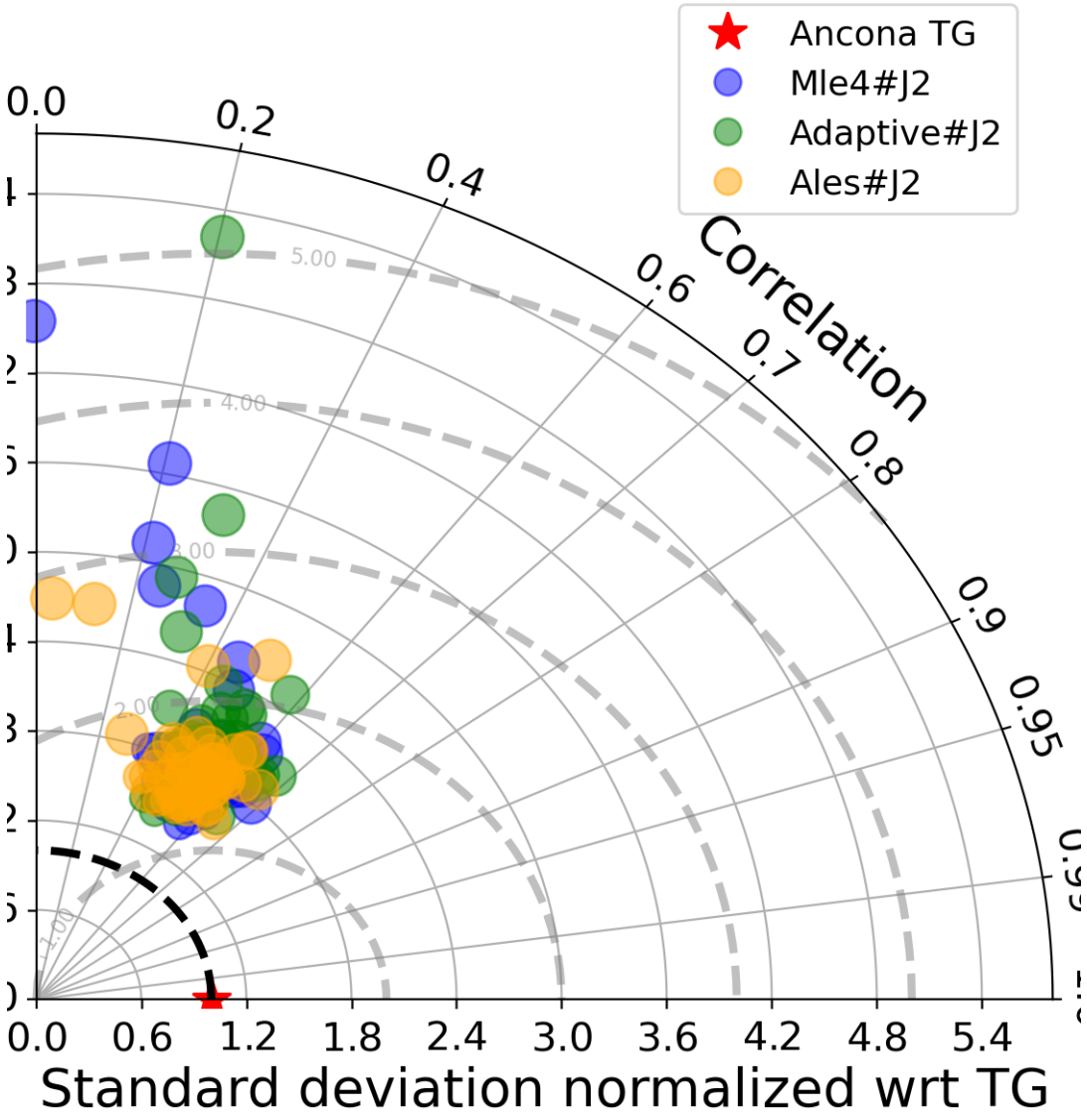

FIGURE 85 – Taylor diagram

6.5.9 Mean statistics table of products comparison with Ancona 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#J2	82.324	0.499	0.13	0.113
Adaptive#J2	78.683	0.476	0.141	0.125
Ales#J2	89.623	0.508	0.121	0.105

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 106 point.

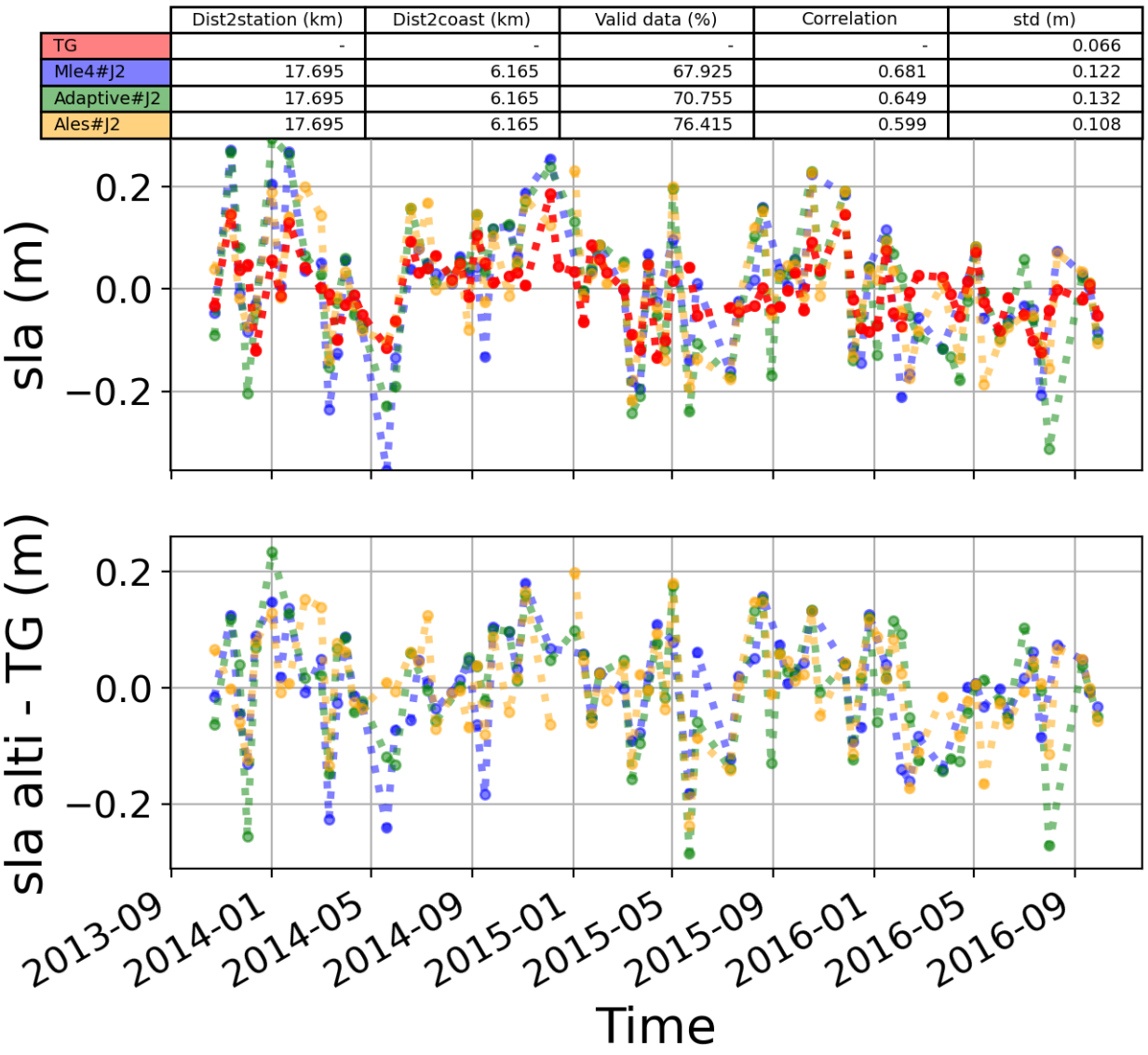

FIGURE 87 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

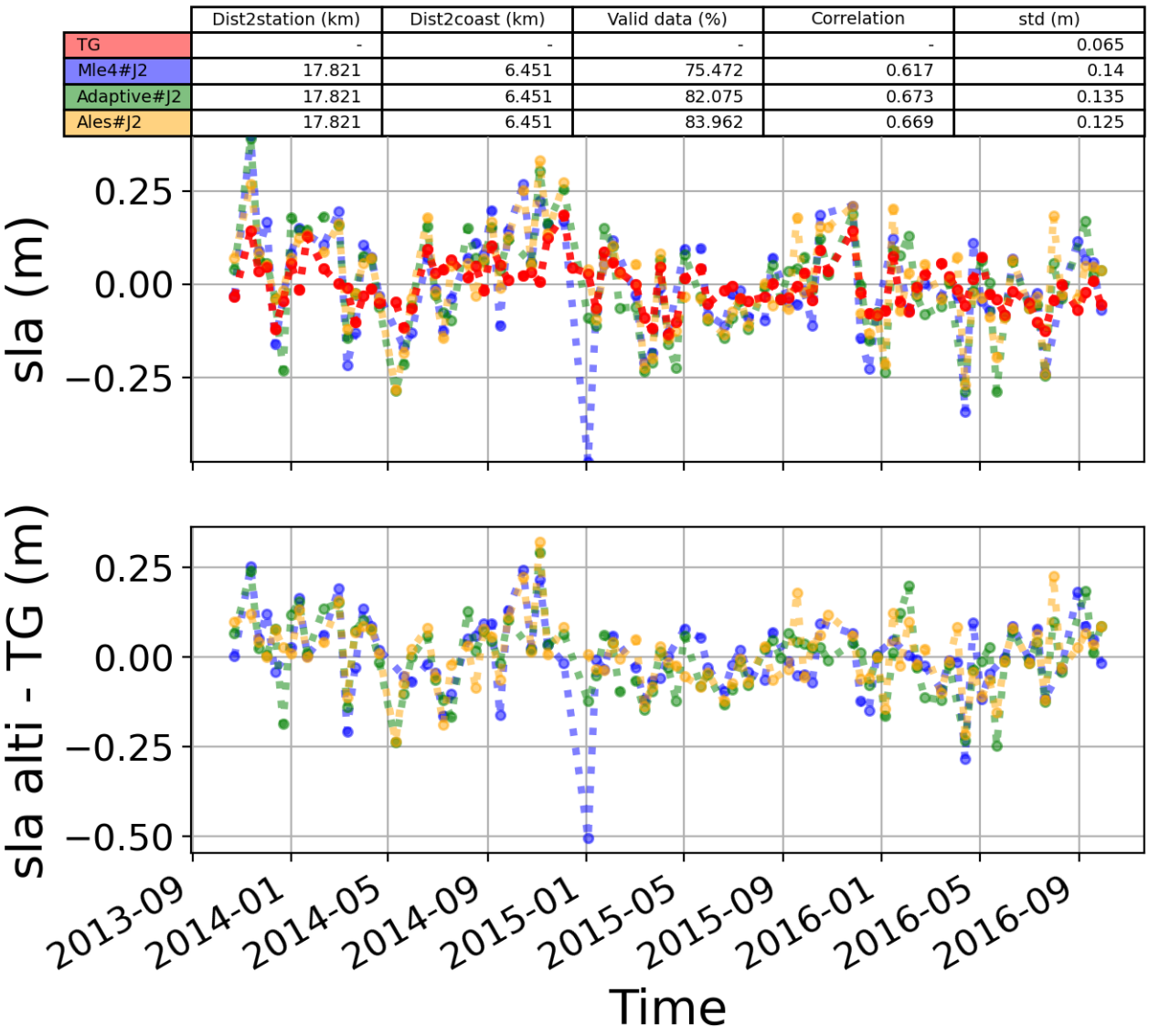

FIGURE 88 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.6 Station : Livourne

- Nearest track to Livourne station is the track number track85
- The area of interest is limited by :
  - A circle which it's center is the Livourne tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km

6.6.1 correlation visualization in maps view % Livourne tide gauge

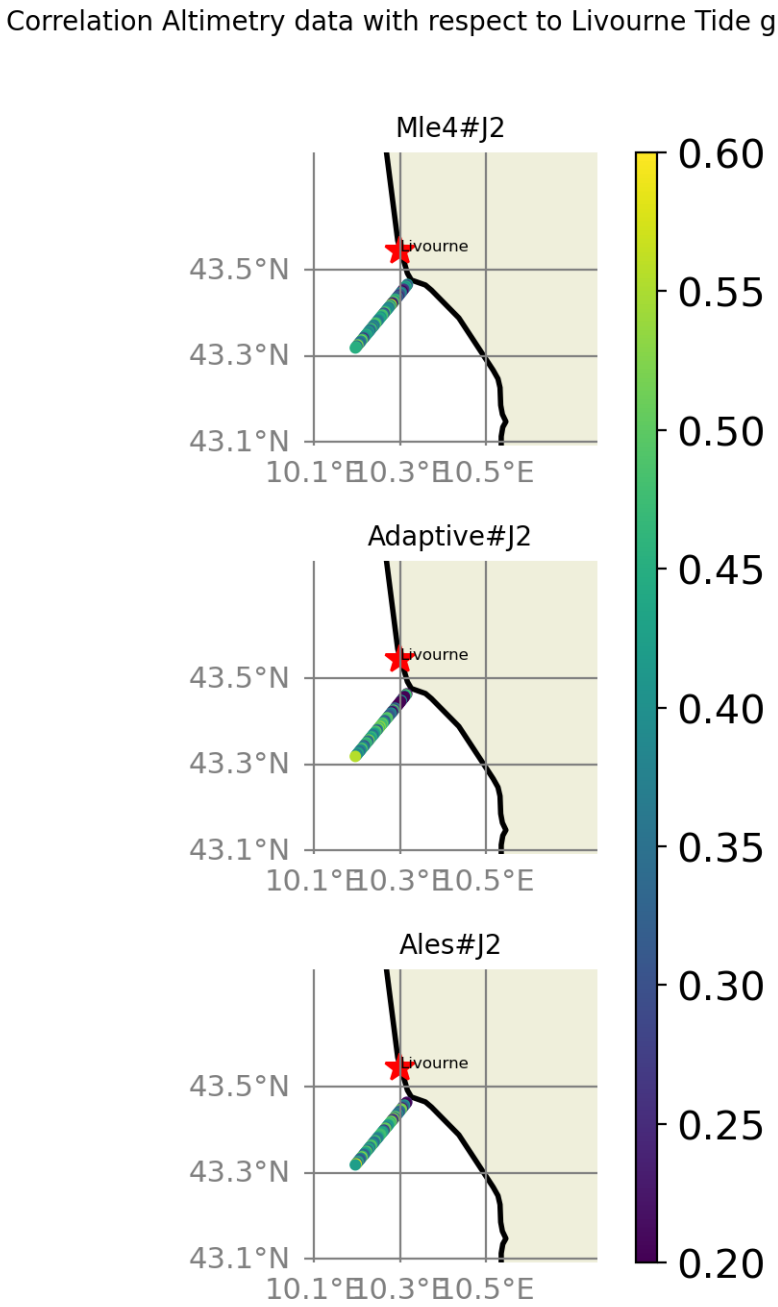

FIGURE 89 – correlation visualization in maps view % Livourne tide gauge

6.6.2 rmsd visualization in maps view % Livourne tide gauge

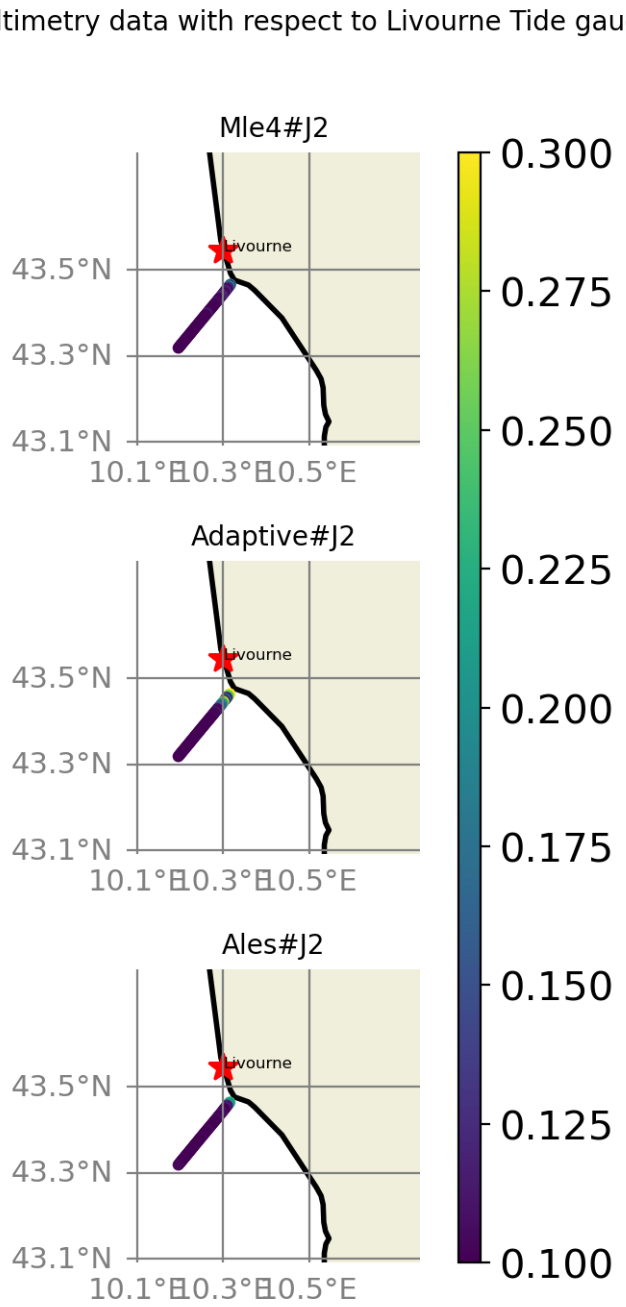

FIGURE 90 – rmsd visualization in maps view % Livourne tide gauge

6.6.3 std visualization in maps view % Livourne tide gauge

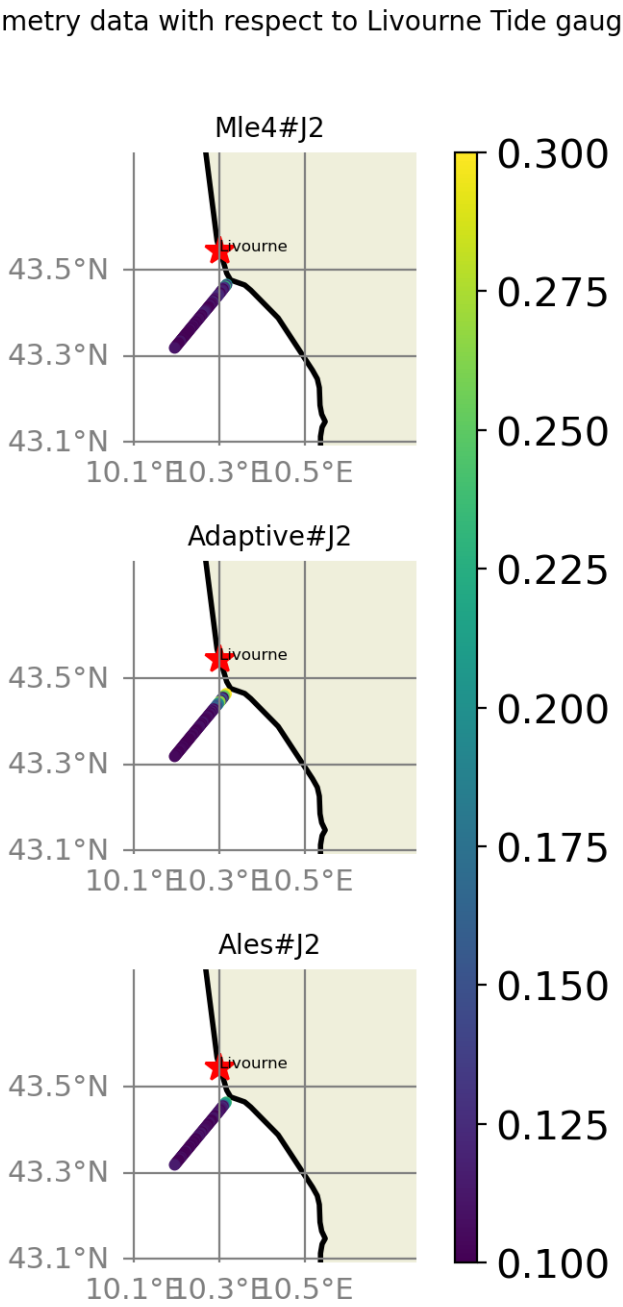

FIGURE 91 – std visualization in maps view % Livourne tide gauge

6.6.4 valid_data_percent visualization in maps view % Livourne tide gauge

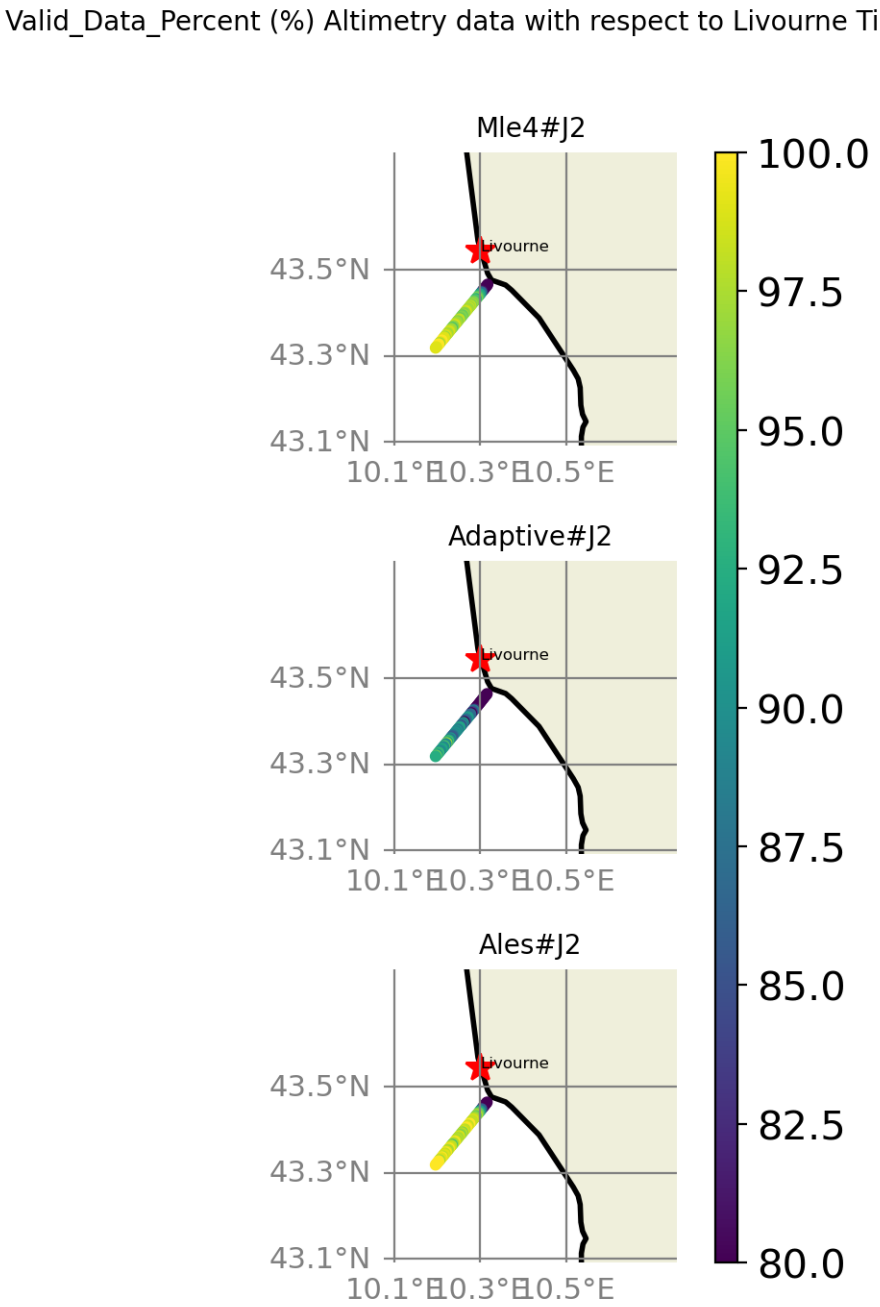

FIGURE 92 – valid_data_percent visualization in maps view % Livourne tide gauge

6.6.5 Valid data (%) in function of distance to coast/Livourne 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.

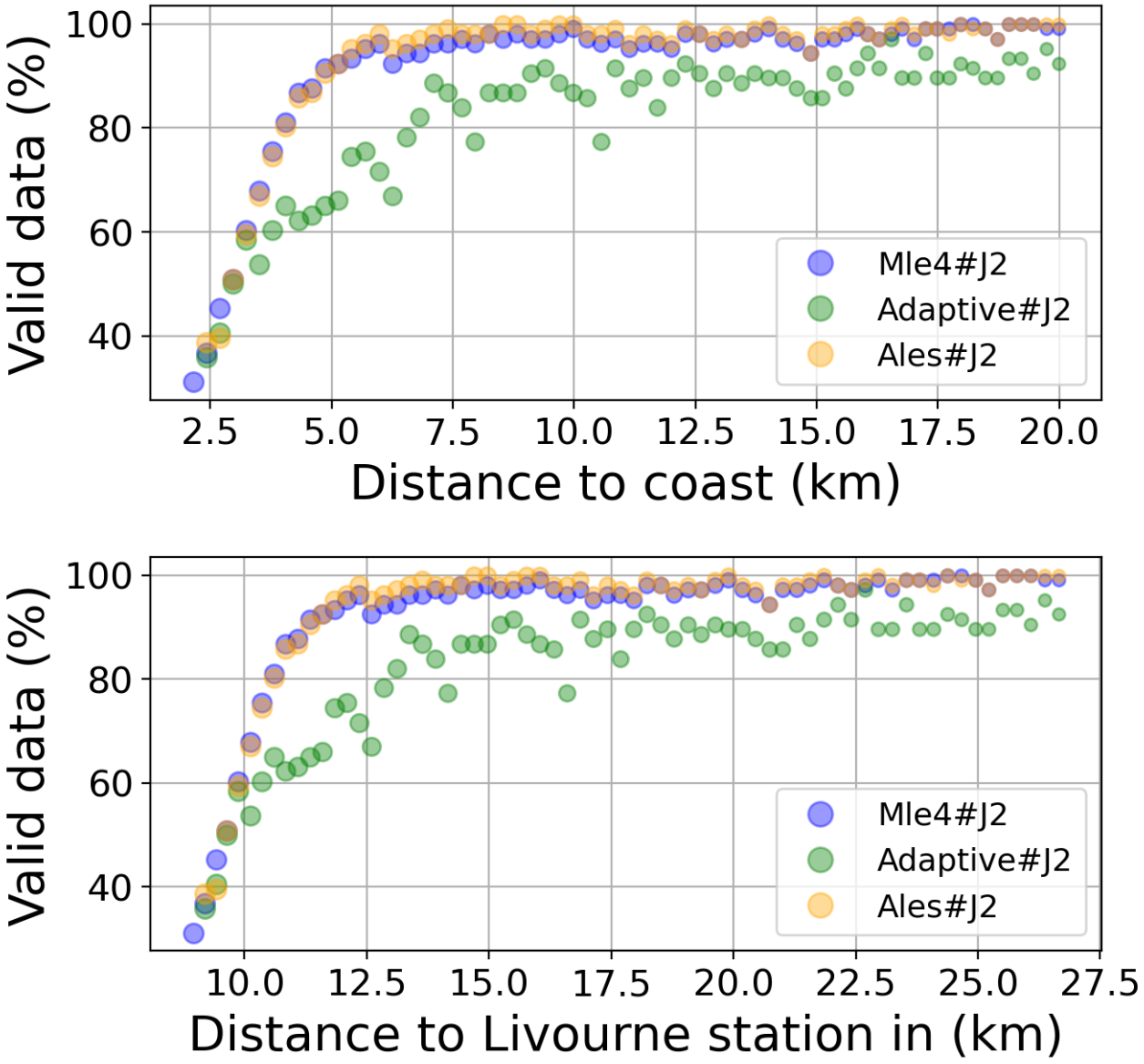

FIGURE 93 – Valid data (%) in function of distance to coast/Livourne station

6.6.6 Std in function of distance to coast/Livourne station

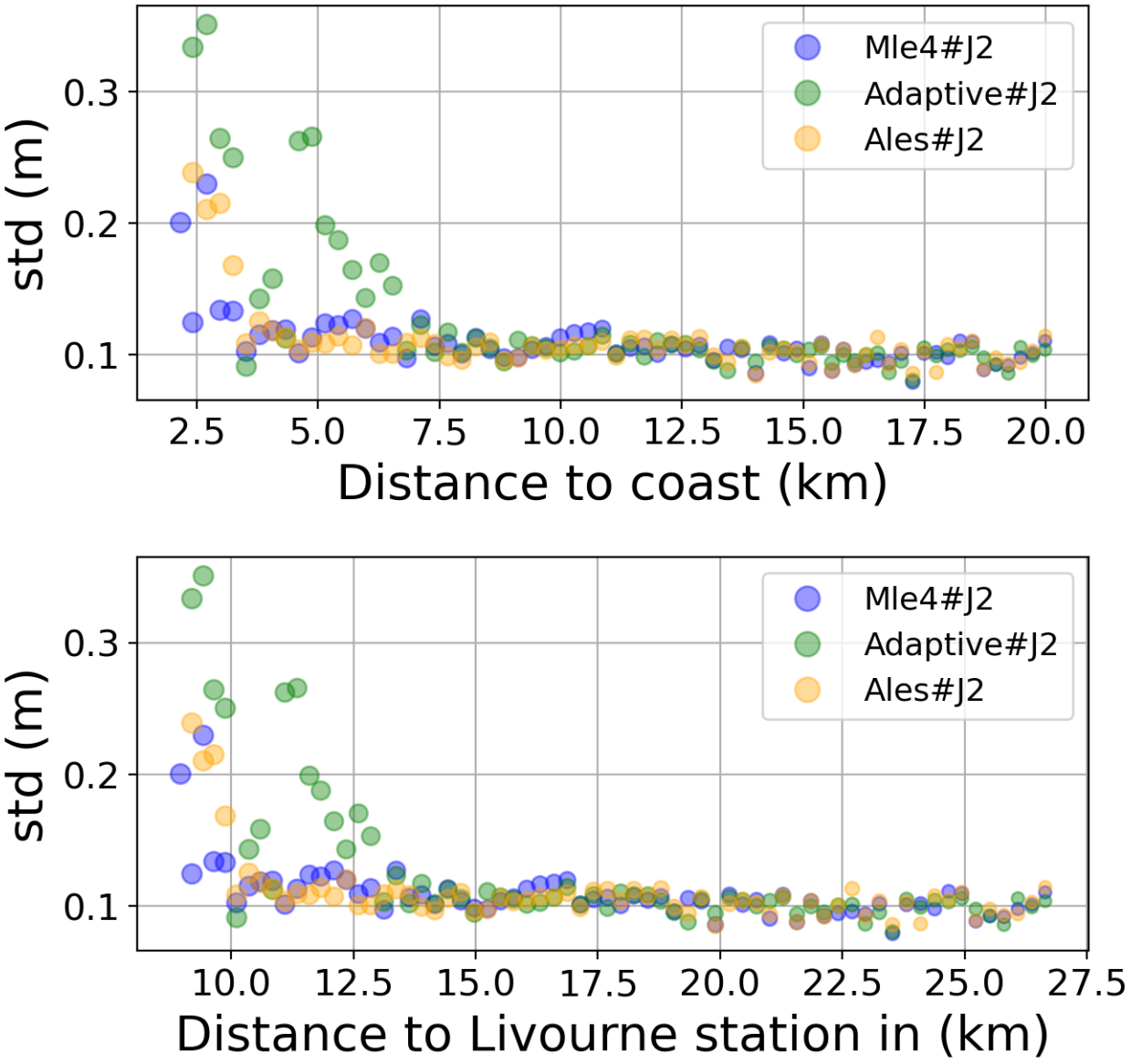

FIGURE 94 – Std in function of the distance to the coast/Livourne station

6.6.7 Correlation in function of distance to coast/Livourne station

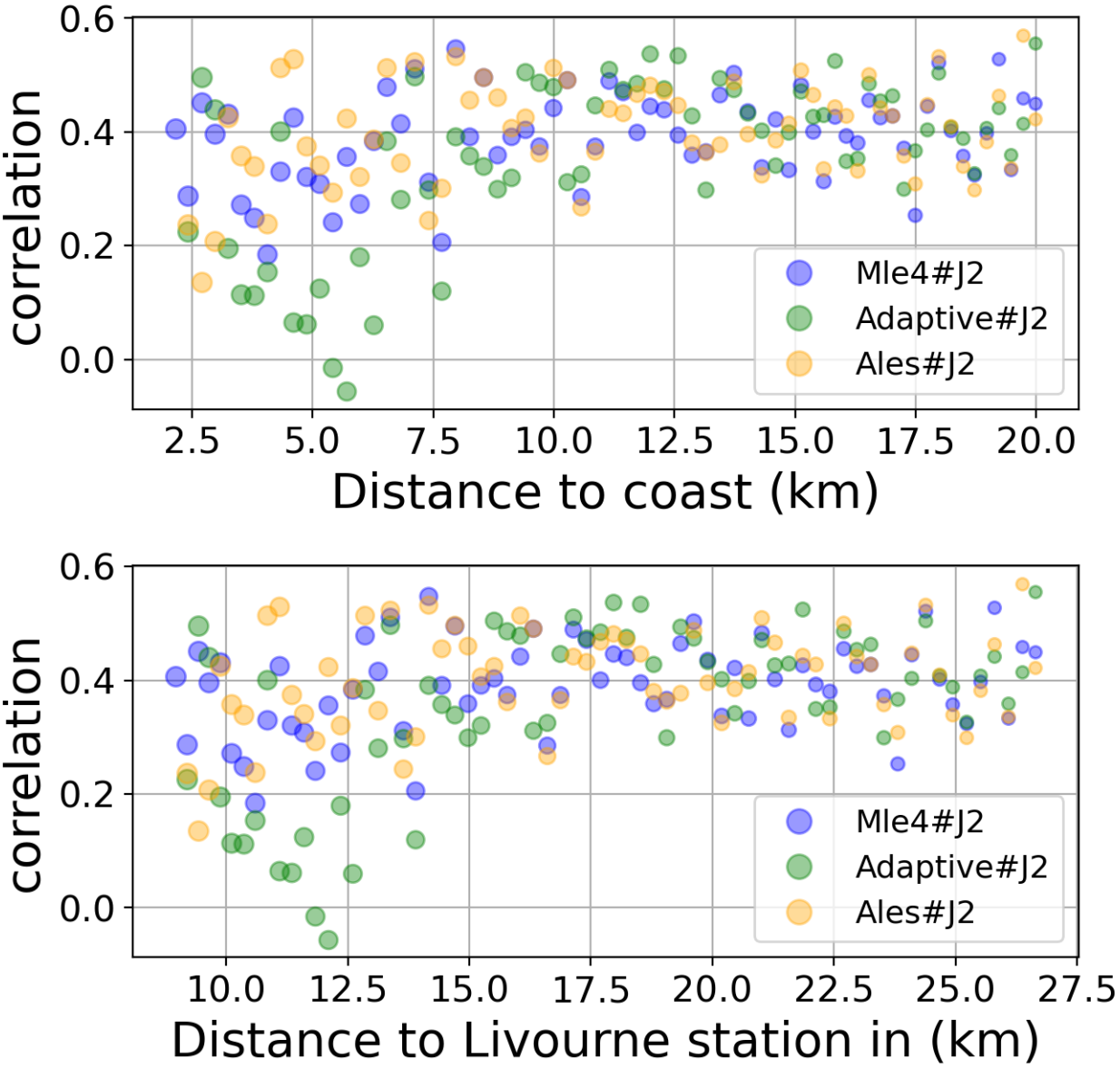

FIGURE 95 – Correlation in function of the distance to the coast/Livourne station

6.6.8 Taylor Diagram

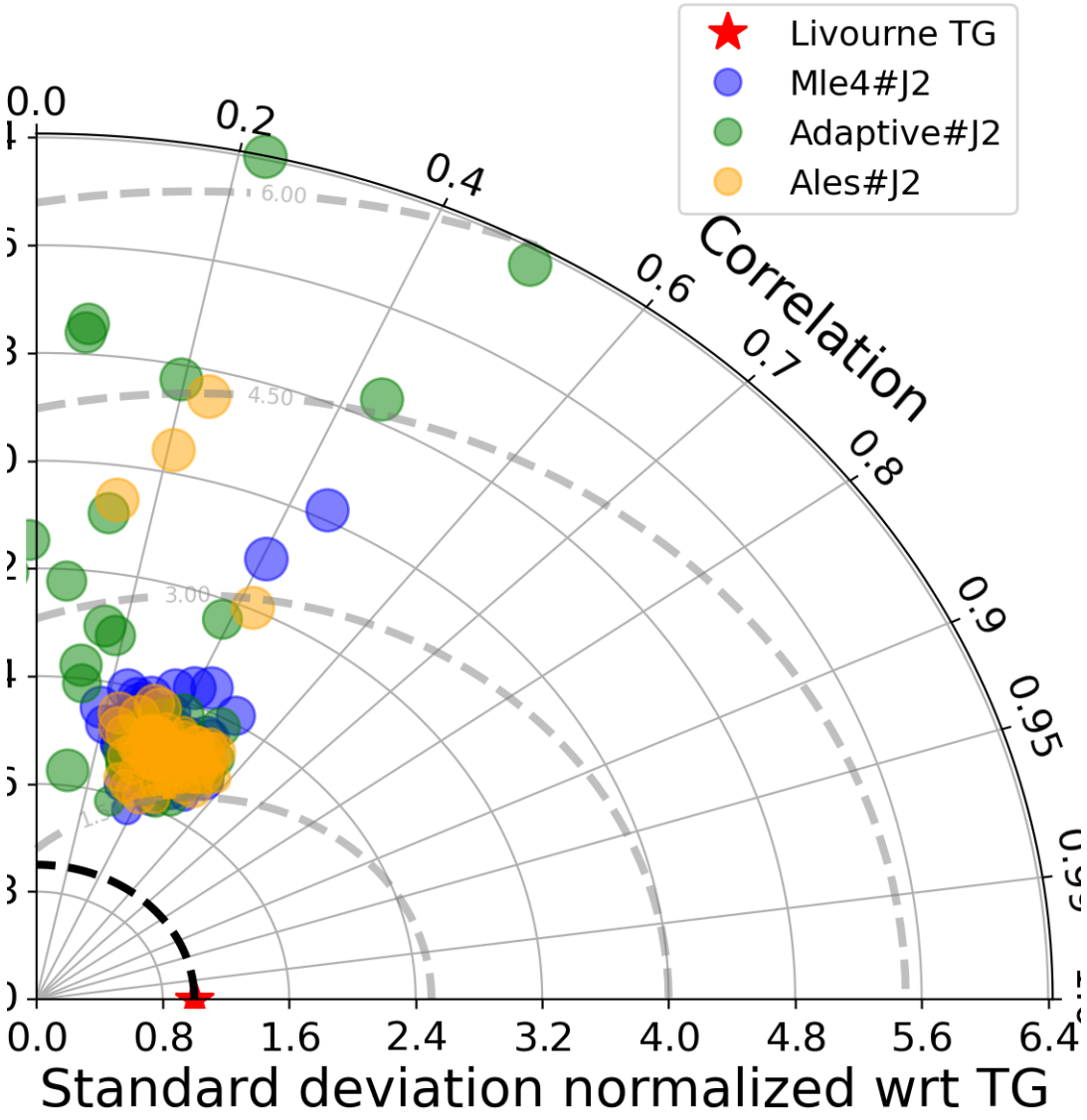

FIGURE 96 – Taylor diagram

6.6.9 Mean statistics table of products comparison with Livourne 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#J2	92.896	0.391	0.108	0.1
Adaptive#J2	82.476	0.357	0.127	0.12
Ales#J2	93.539	0.401	0.11	0.102

Figure 97 – 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 106 point.

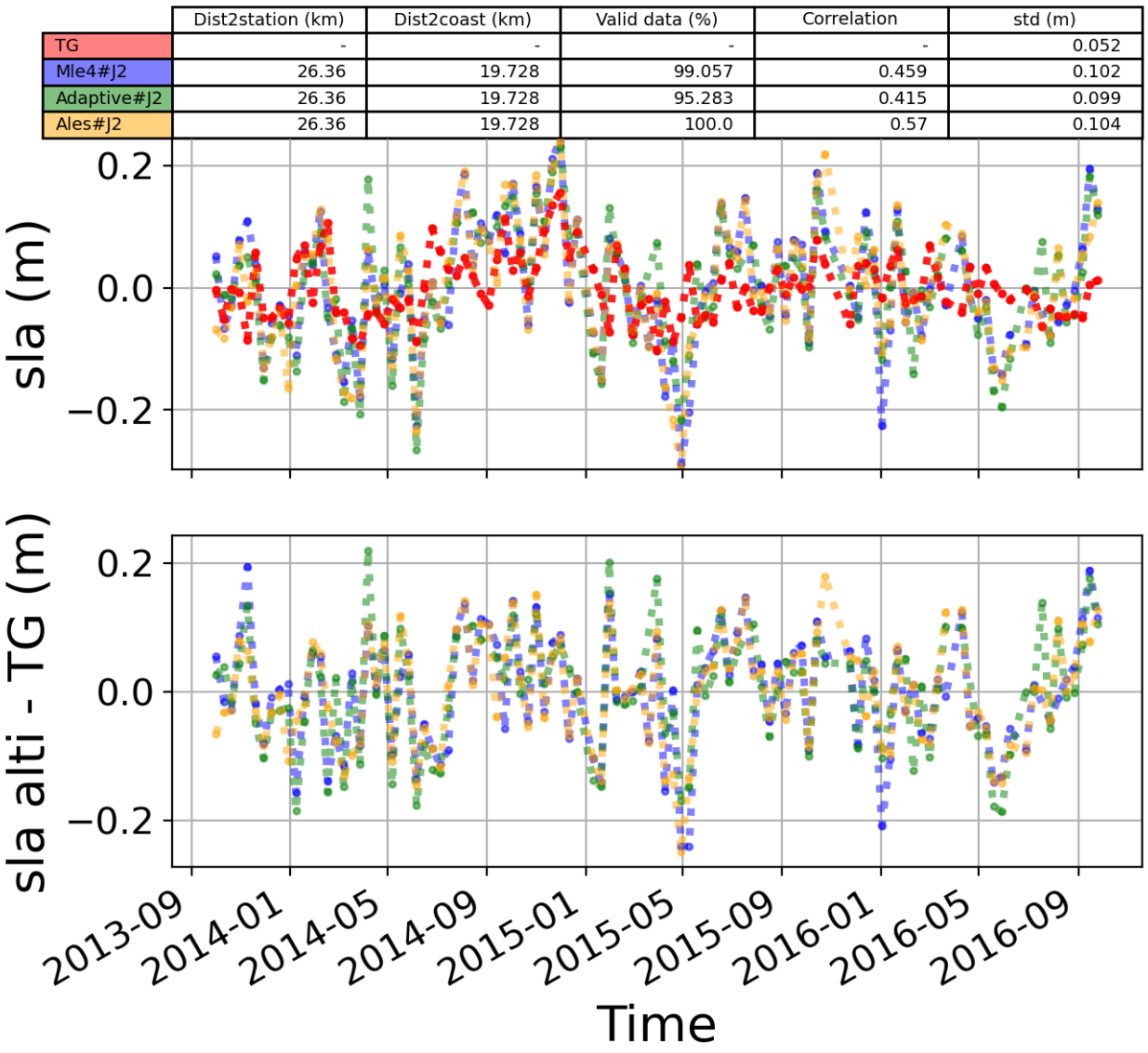

FIGURE 98 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

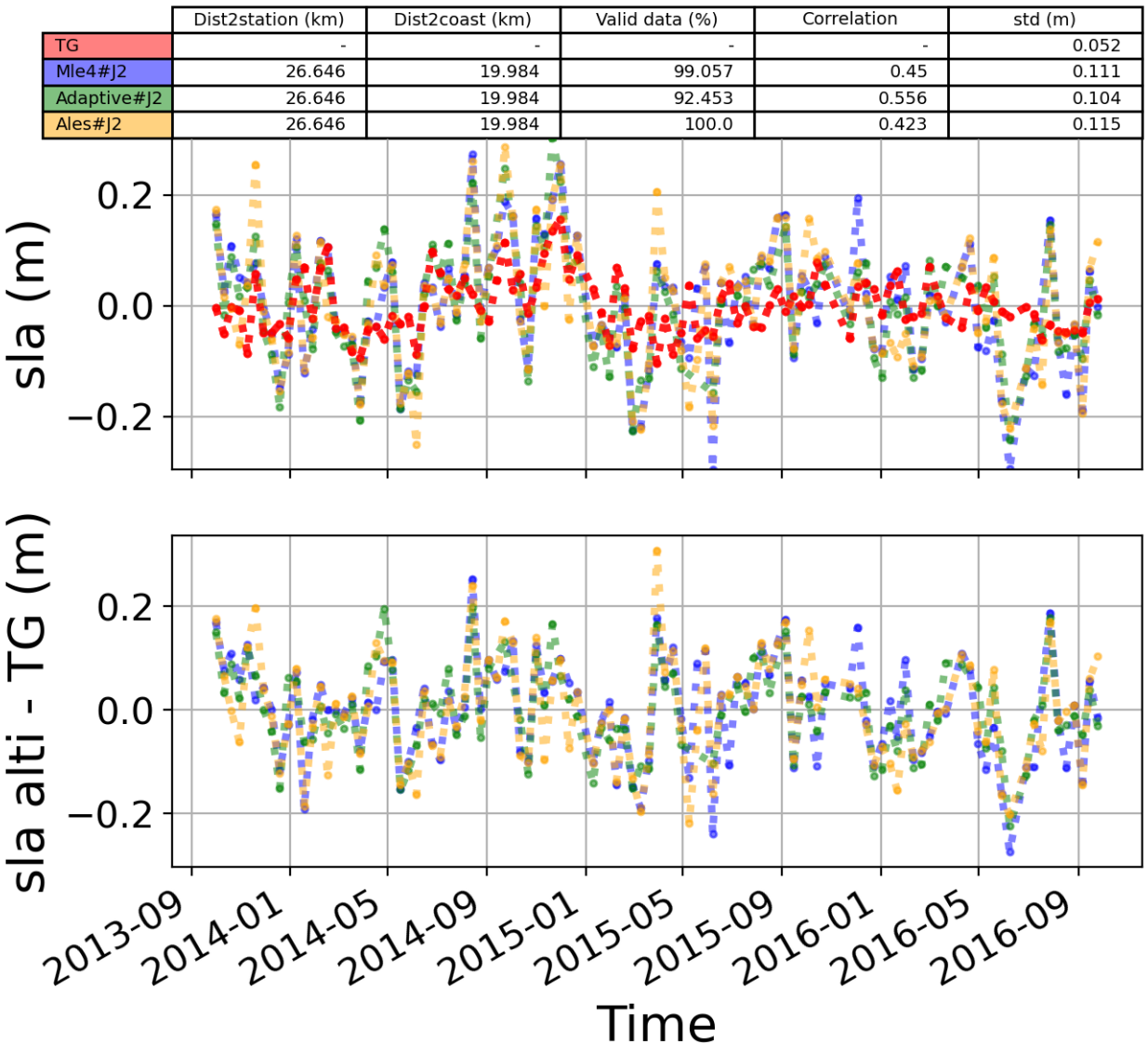

FIGURE 99 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

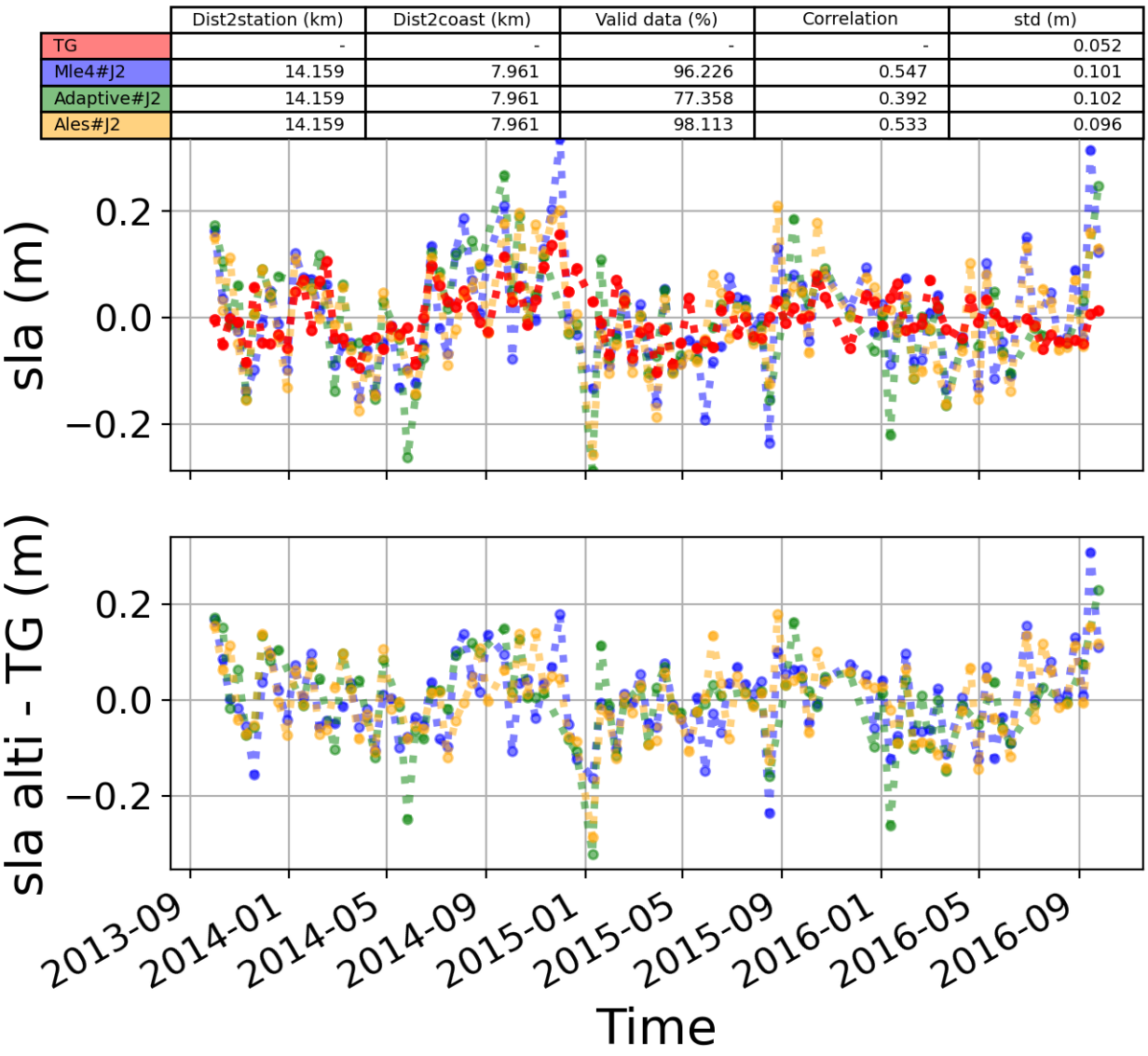

FIGURE 100 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.7 Station : MONACO_FONTVIEILLE

- Nearest track to MONACO_FONTVIEILLE station is the track number track9
- The area of interest is limited by :
  - A circle which it's center is the MONACO_FONTVIEILLE tide gauge station location and has a Raduis of 40 Km

6.7.1 correlation visualization in maps view % MONACO_FONTVIEILLE tide gauge

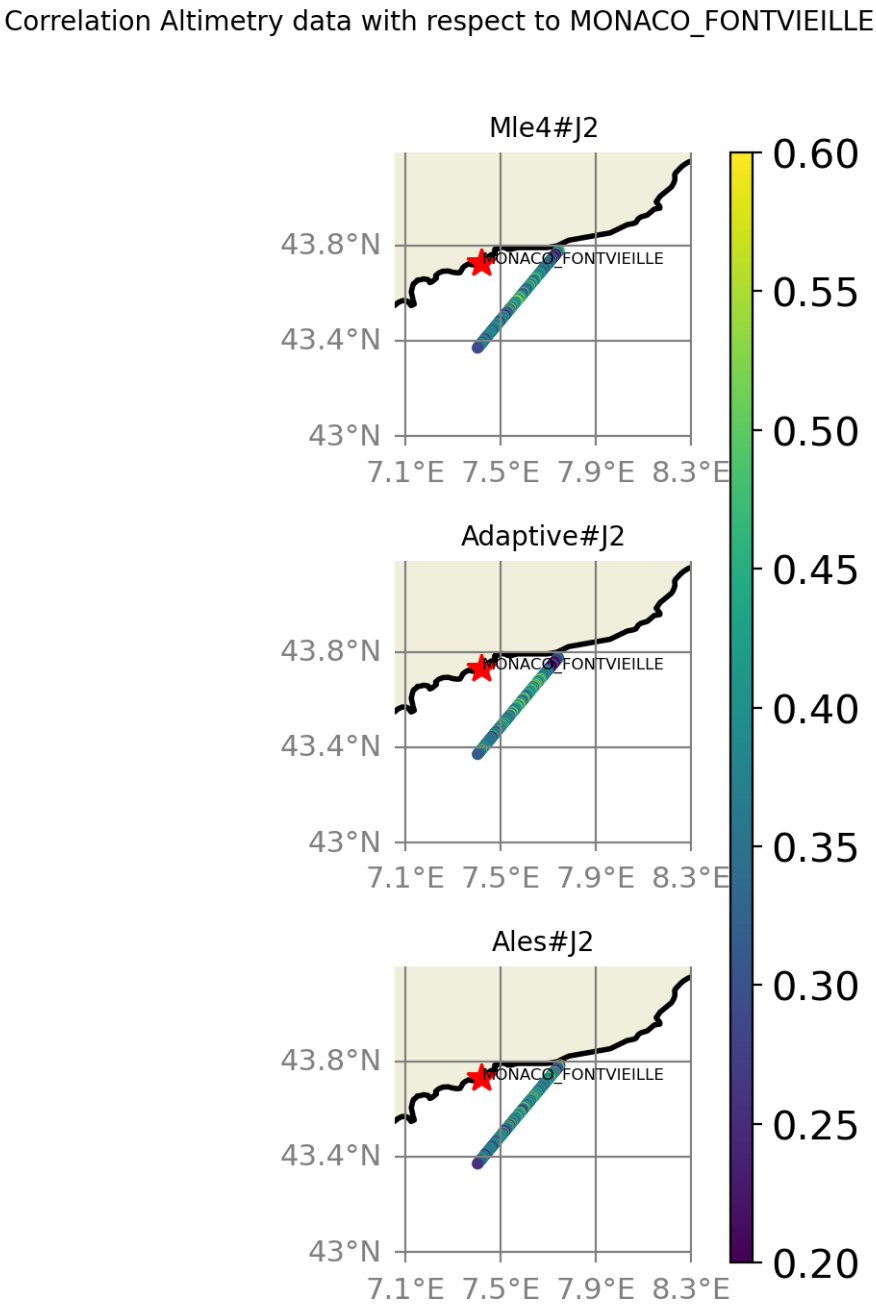

Figure 101 – correlation visualization in maps view % MONACO_FONTVIEILLE tide gauge

6.7.2 rmsd visualization in maps view % MONACO_FONTVIEILLE tide gauge

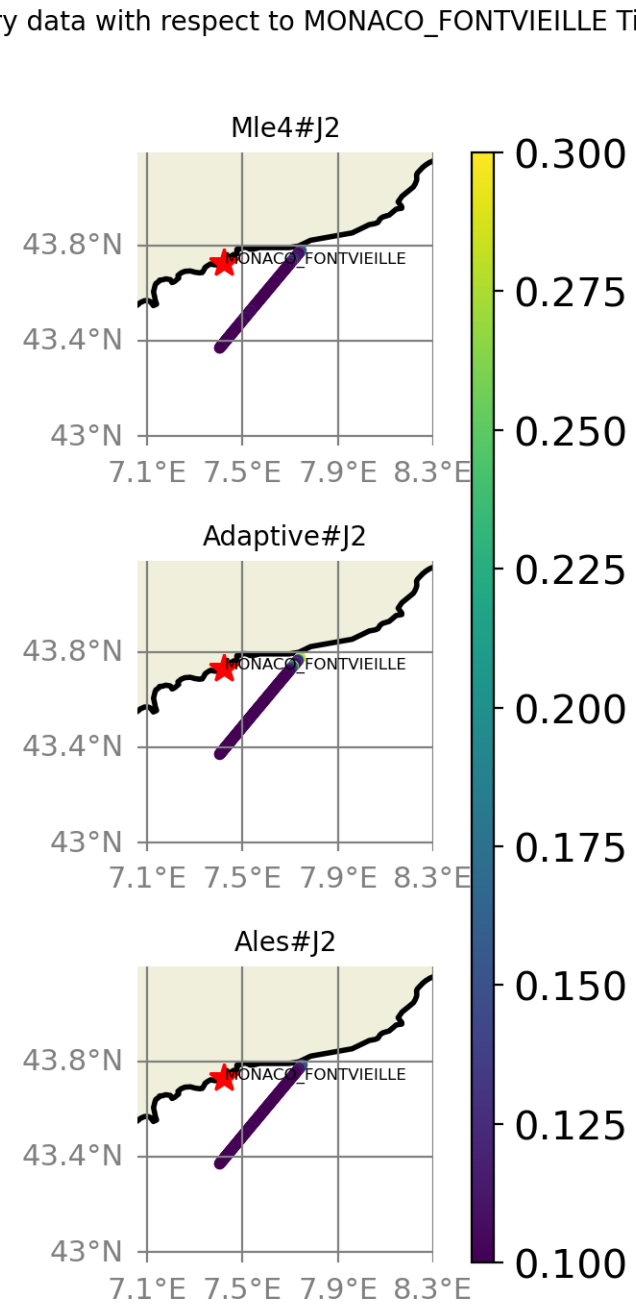

FIGURE 102 – rmsd visualization in maps view % MONACO_FONTVIEILLE tide gauge

6.7.3 std visualization in maps view % MONACO_FONTVIEILLE tide gauge

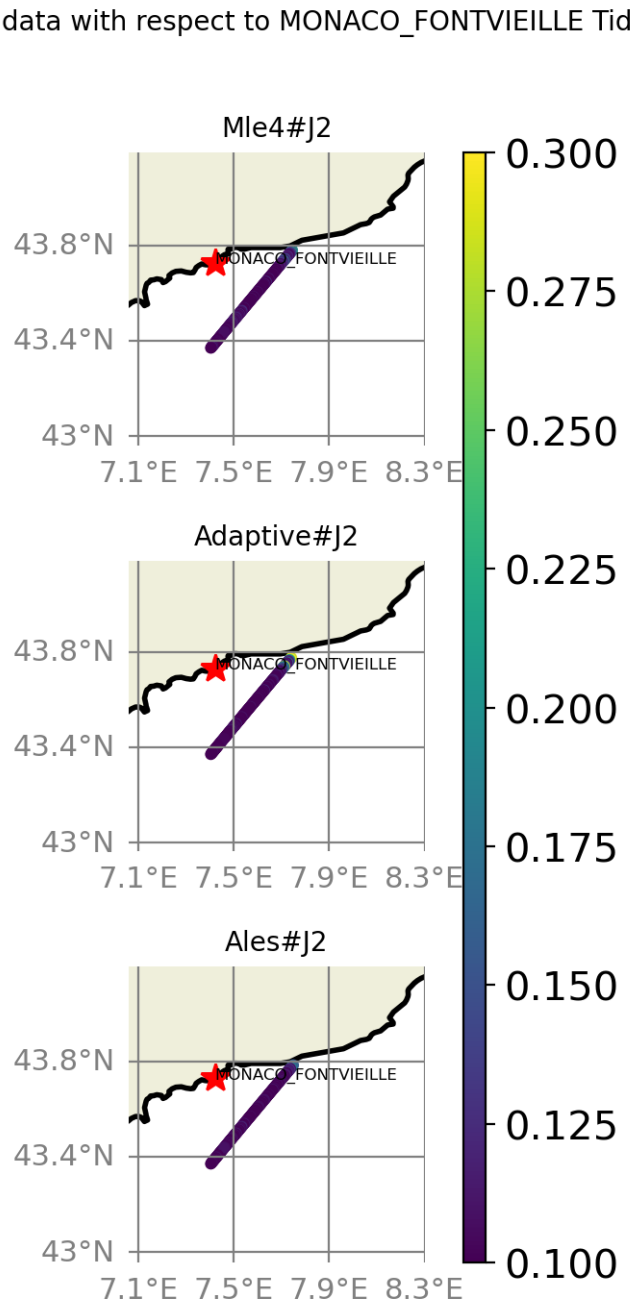

Figure 103 – std visualization in maps view % MONACO_FONTVIEILLE tide gauge

6.7.4 valid_data_percent visualization in maps view % MONACO_FONTVIEILLE tide gauge

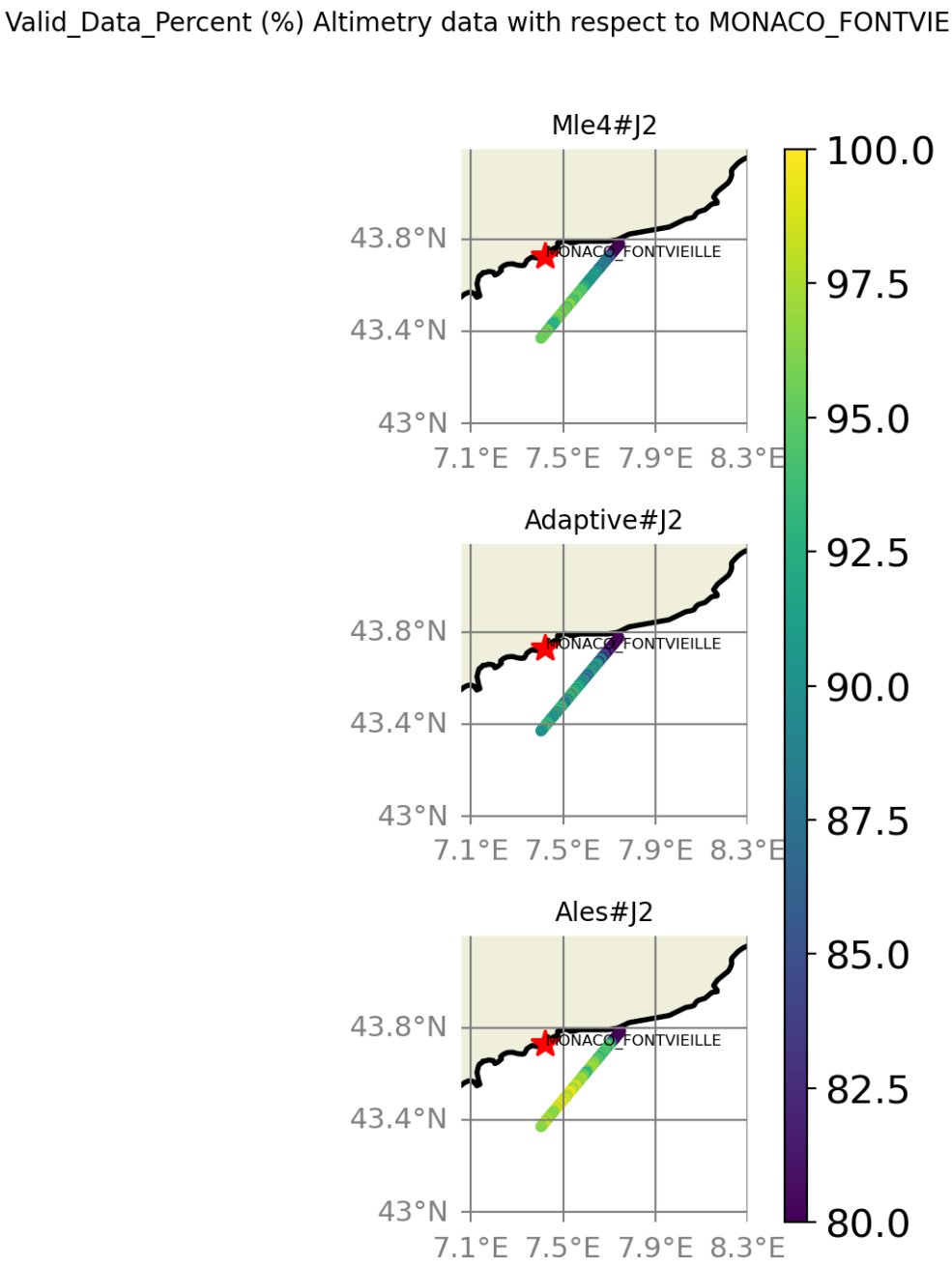

FIGURE 104 – valid_data_percent visualization in maps view % MONACO_FONTVIEILLE tide gauge

6.7.5 Valid data (%) in function of distance to coast/MONACO_FONTVIEILLE 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. $maxNB = 110$ 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.

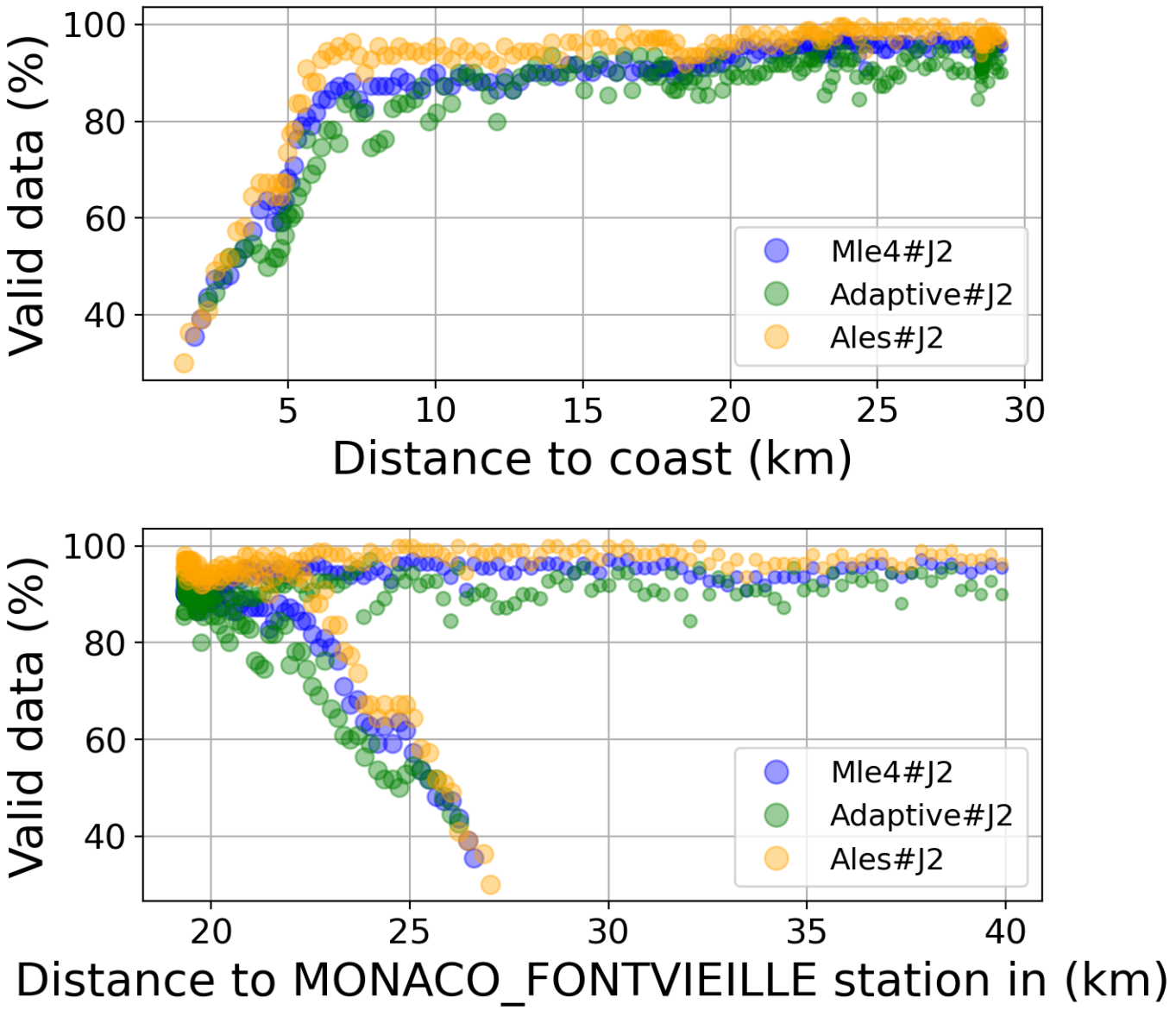

FIGURE 105 – Valid data (%) in function of distance to coast/MONACO_FONTVIEILLE station

6.7.6 Std in function of distance to coast/MONACO_FONTVIEILLE station

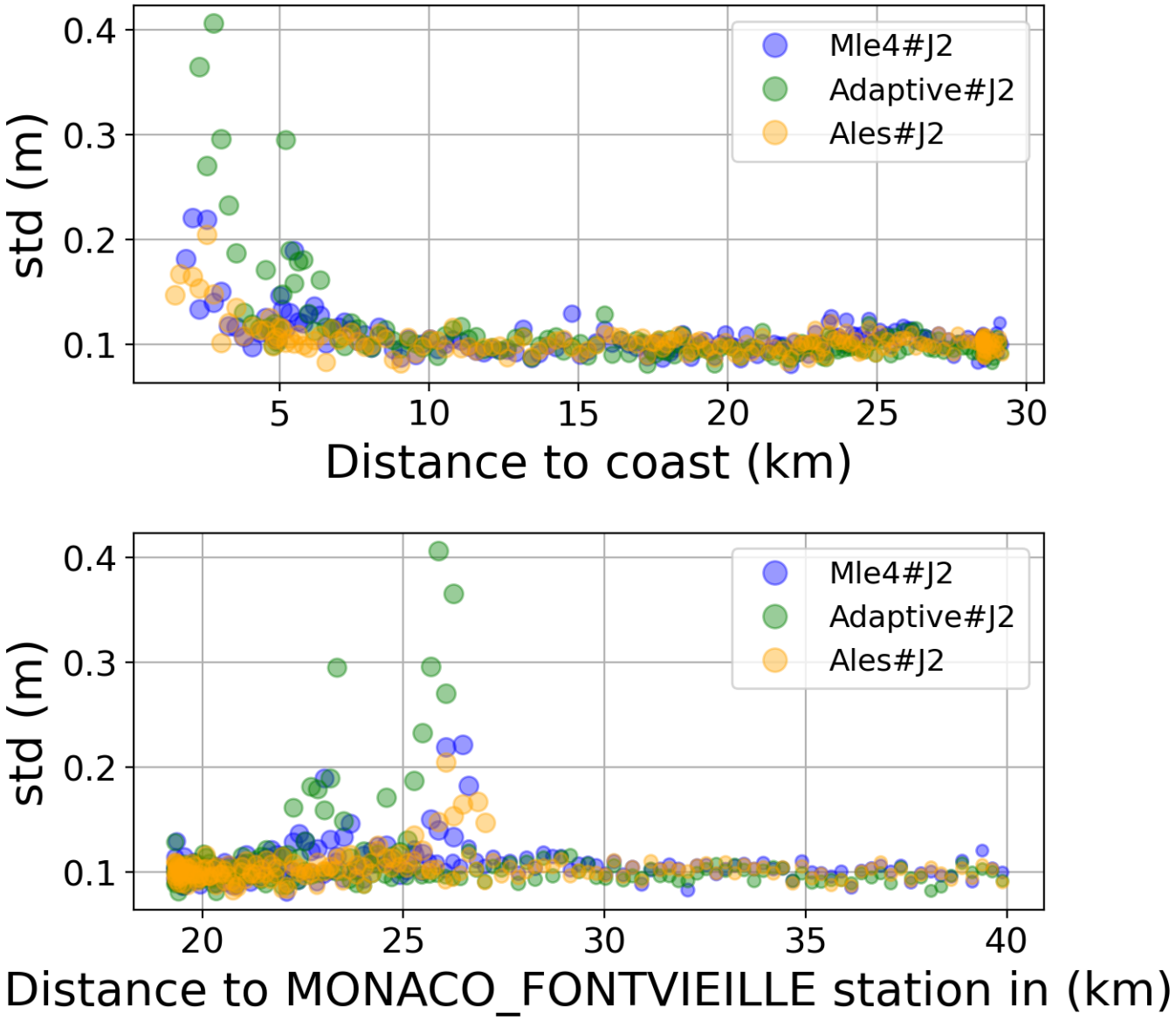

FIGURE 106 – Std in function of the distance to the coast/MONACO_FONTVIEILLE station

6.7.7 Correlation in function of distance to coast/MONACO_FONTVIEILLE station

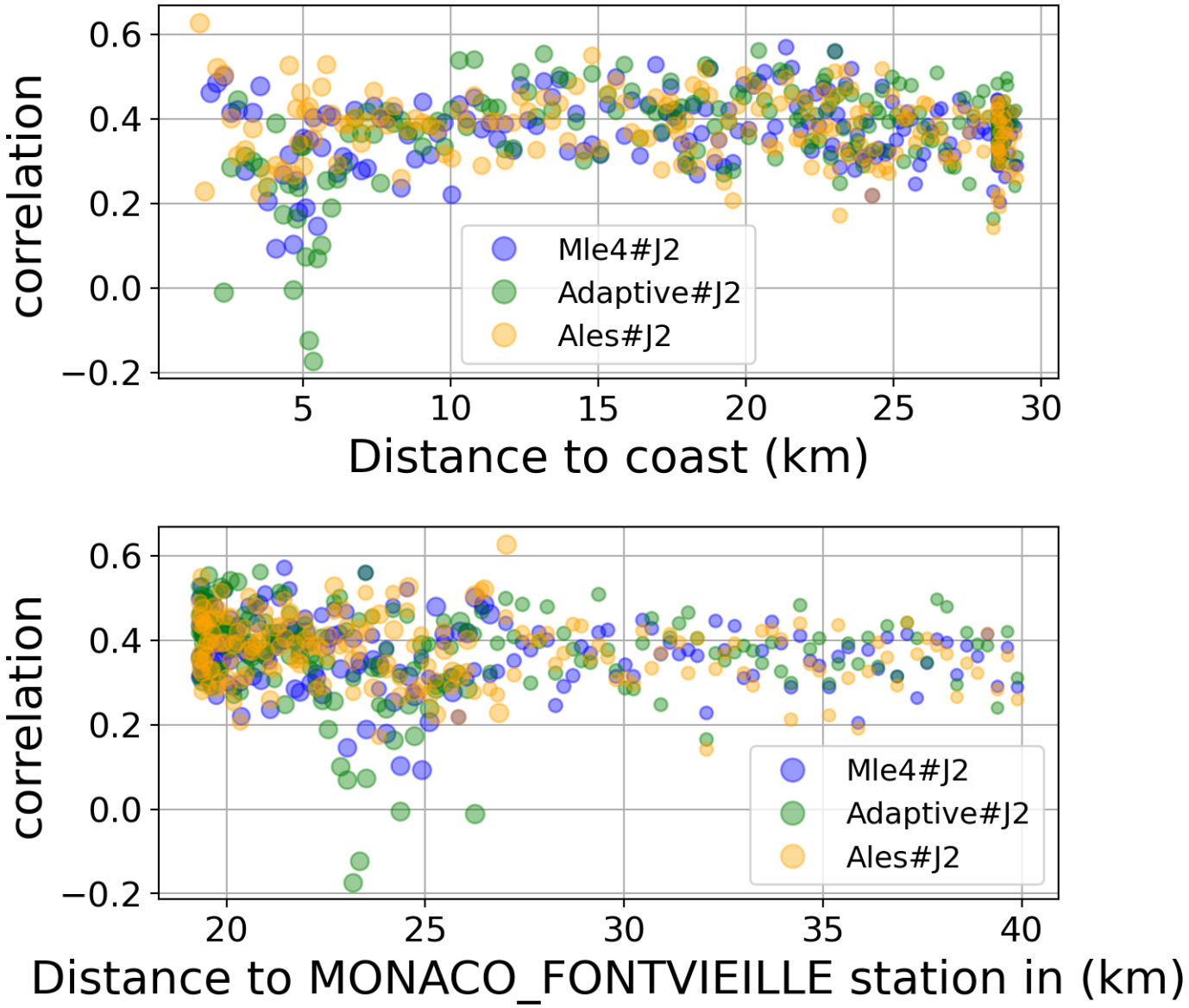

FIGURE 107 – Correlation in function of the distance to the coast/MONACO_FONTVIEILLE station

6.7.8 Taylor Diagram

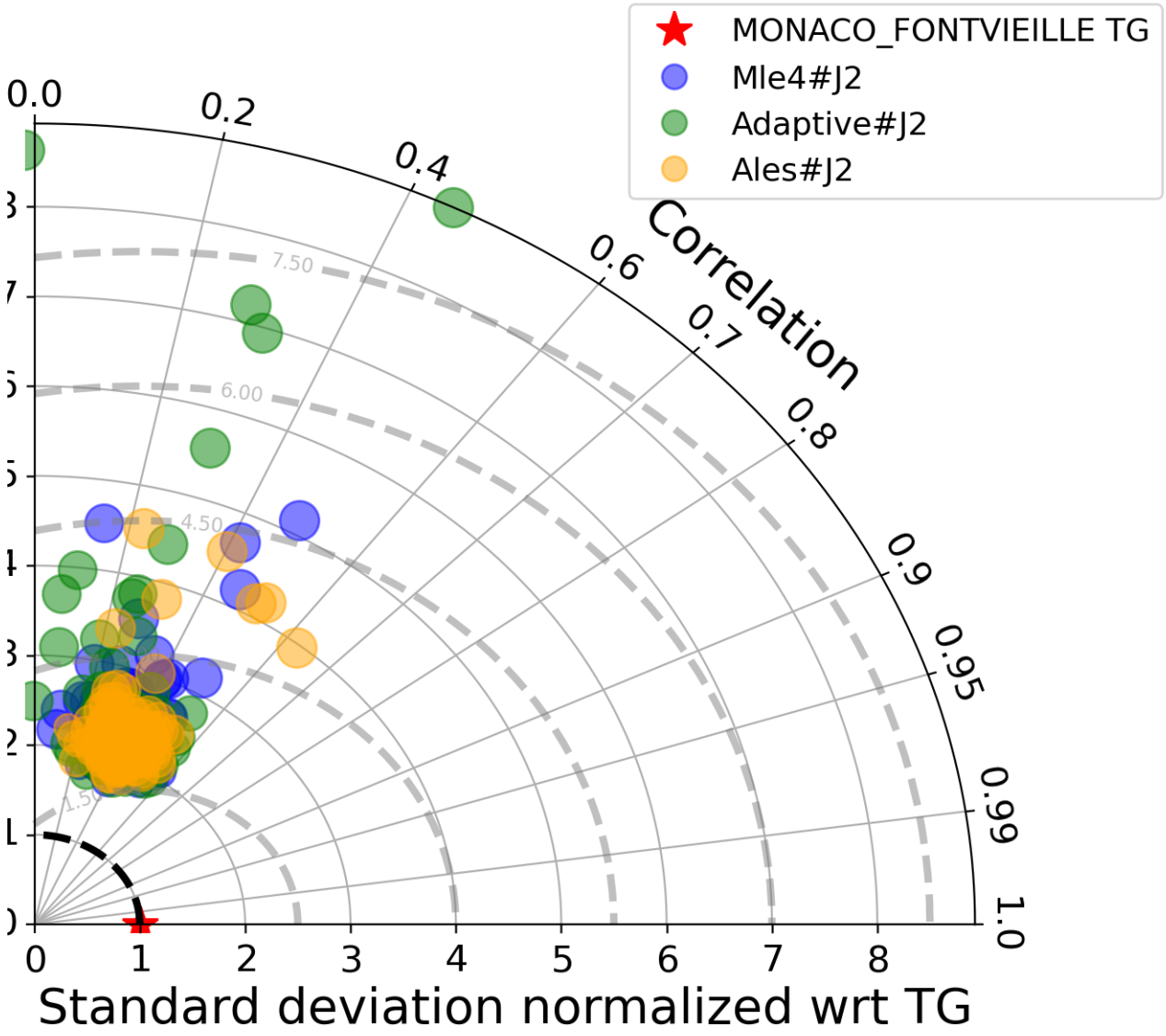

Figure 108 – Taylor diagram

6.7.9 Mean statistics table of products comparison with MONACO_FONTVIEILLE 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#J2	89.096	0.37	0.106	0.099
Adaptive#J2	85.624	0.371	0.11	0.103
Ales#J2	93.187	0.374	0.103	0.095

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 110 point.

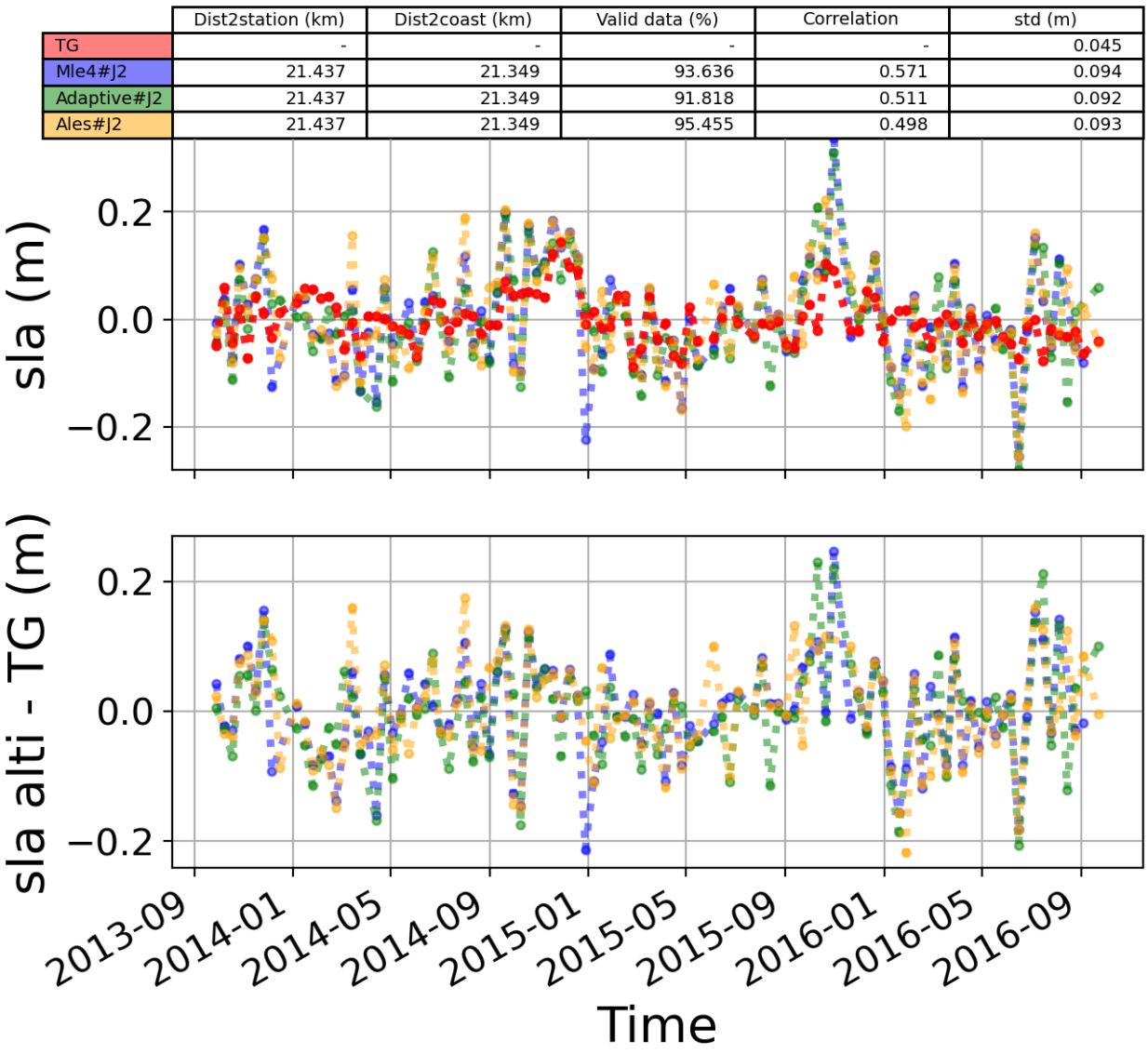

Figure 110 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

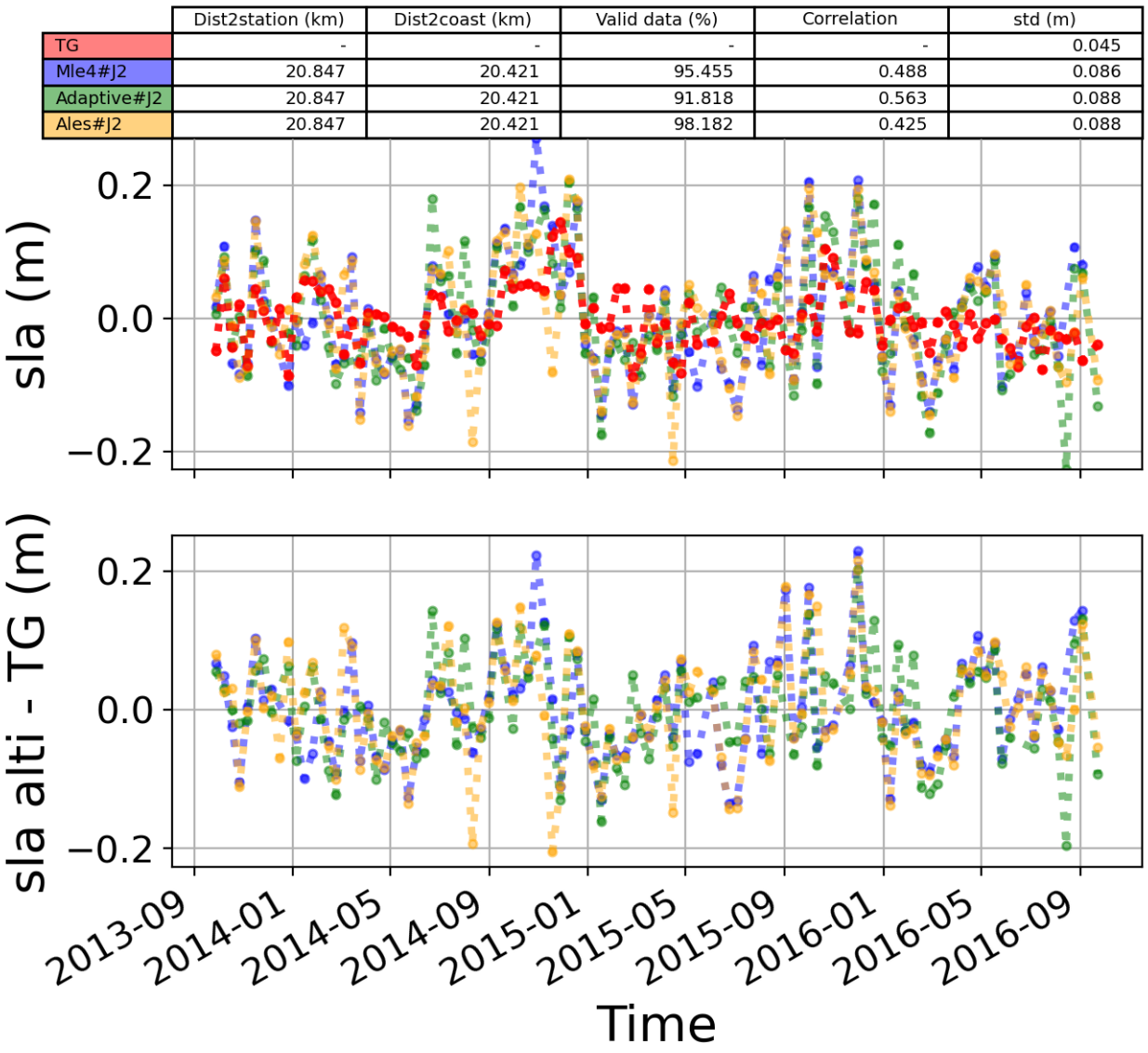

FIGURE 111 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

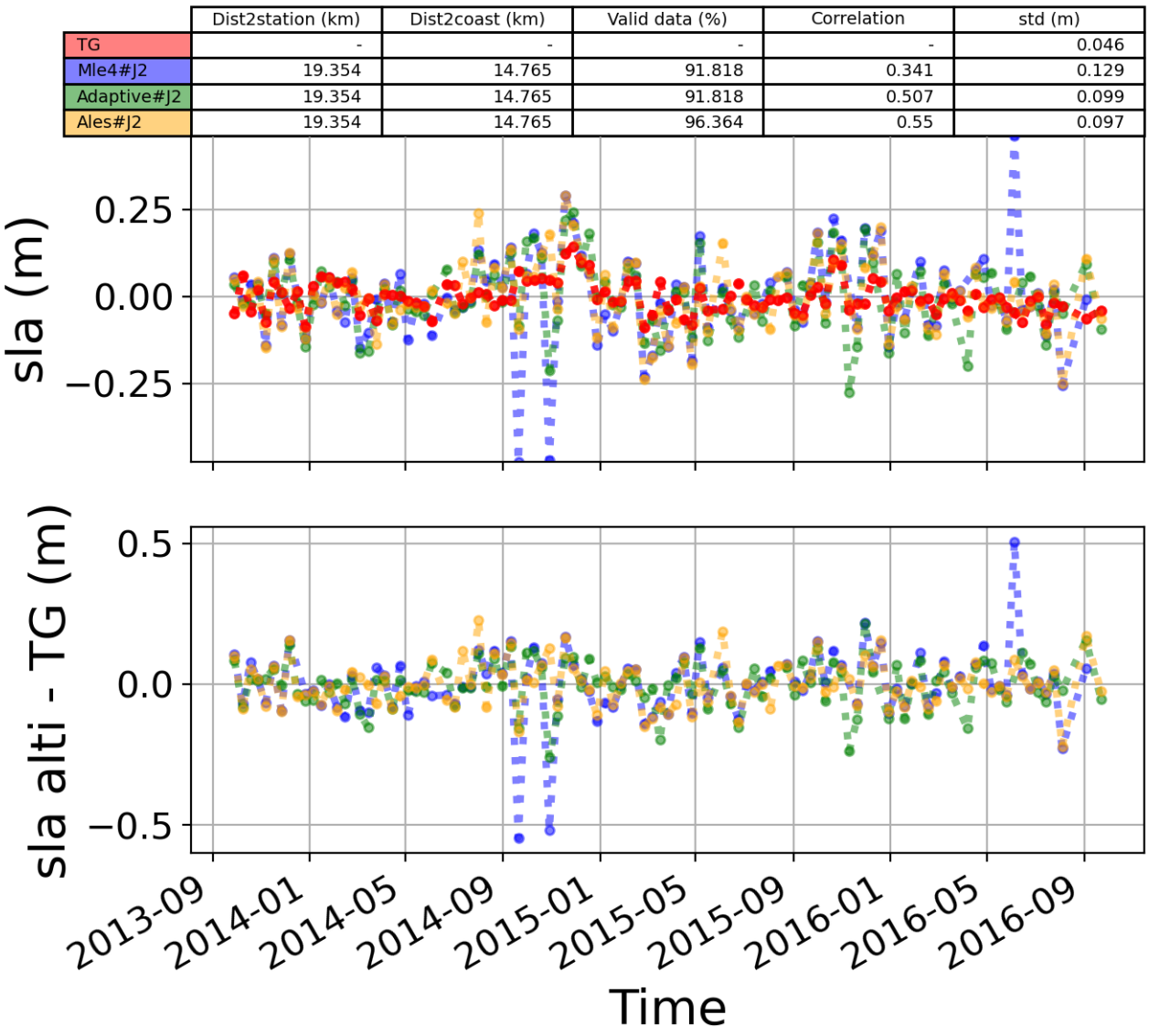

FIGURE 112 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.8 Station : Erdemli

- Nearest track to Erdemli station is the track number track68
- The area of interest is limited by :
  - A circle which it's center is the Erdemli tide gauge station location and has a Raduis of 40 Km

6.8.1 correlation visualization in maps view % Erdemli tide gauge

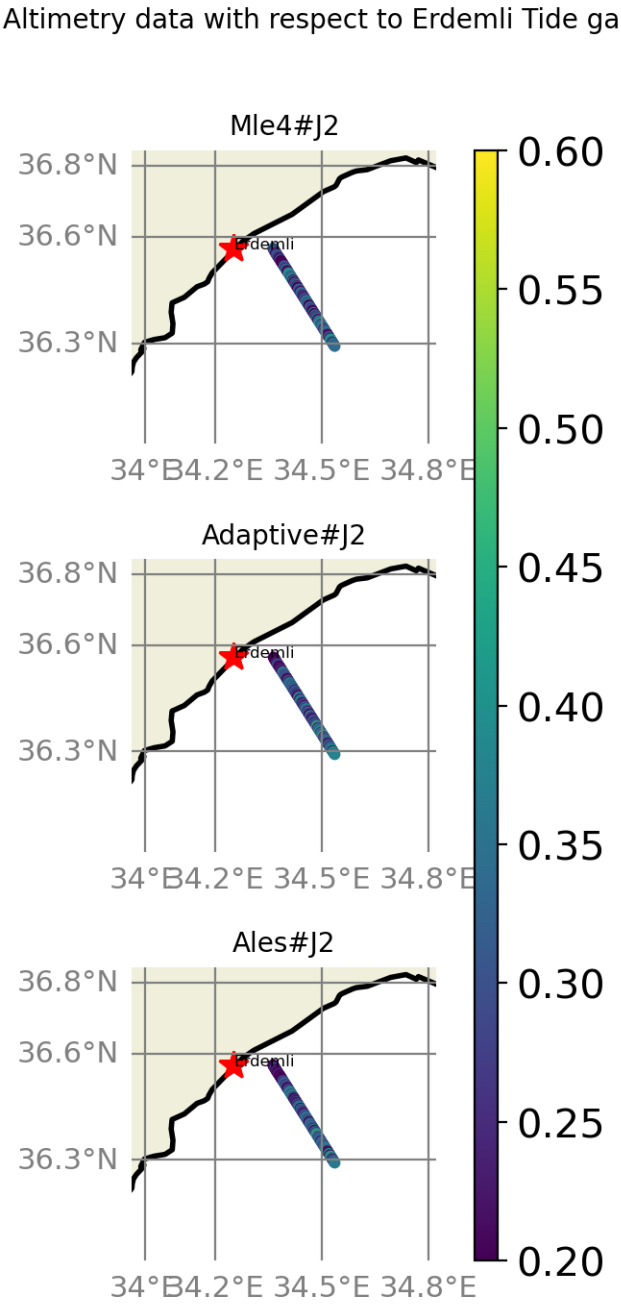

FIGURE 113 – correlation visualization in maps view % Erdemli tide gauge

6.8.2 rmsd visualization in maps view % Erdemli tide gauge

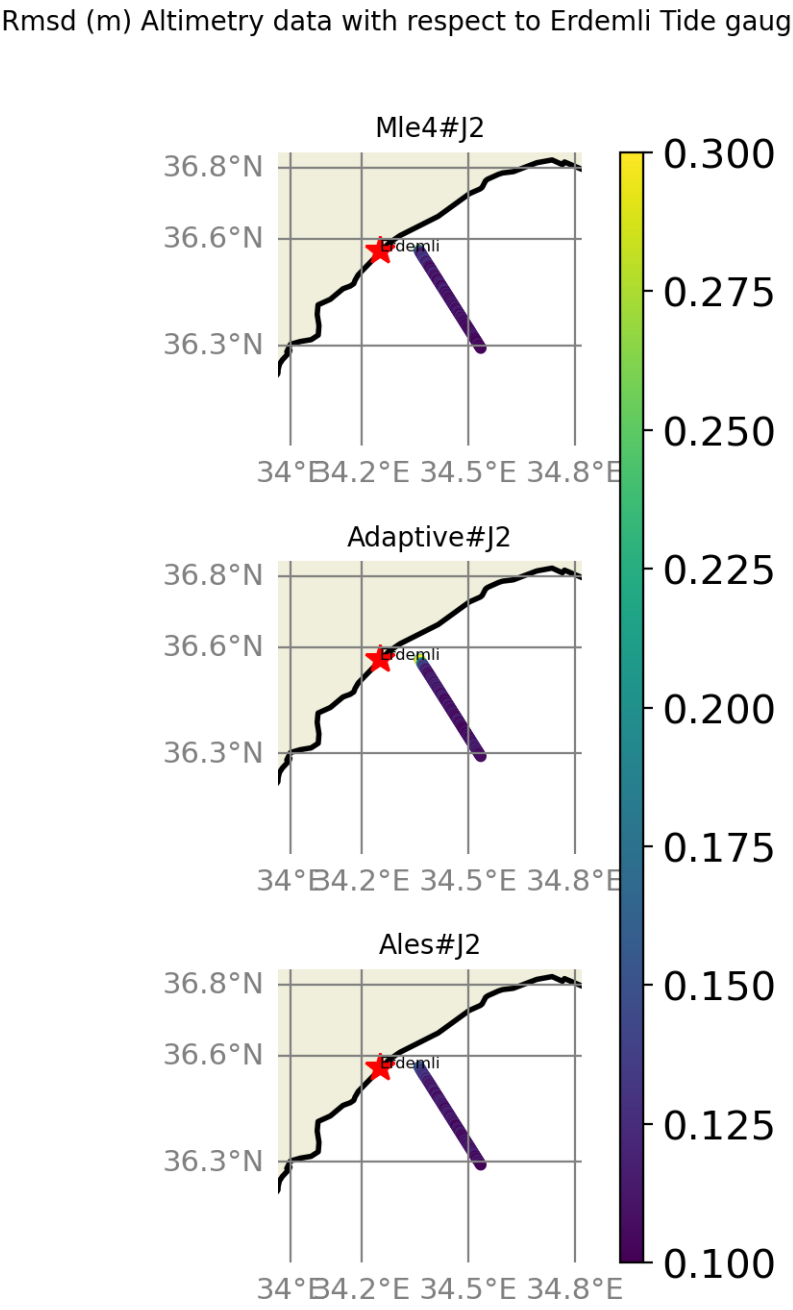

FIGURE 114 – rmsd visualization in maps view % Erdemli tide gauge

6.8.3 std visualization in maps view % Erdemli tide gauge

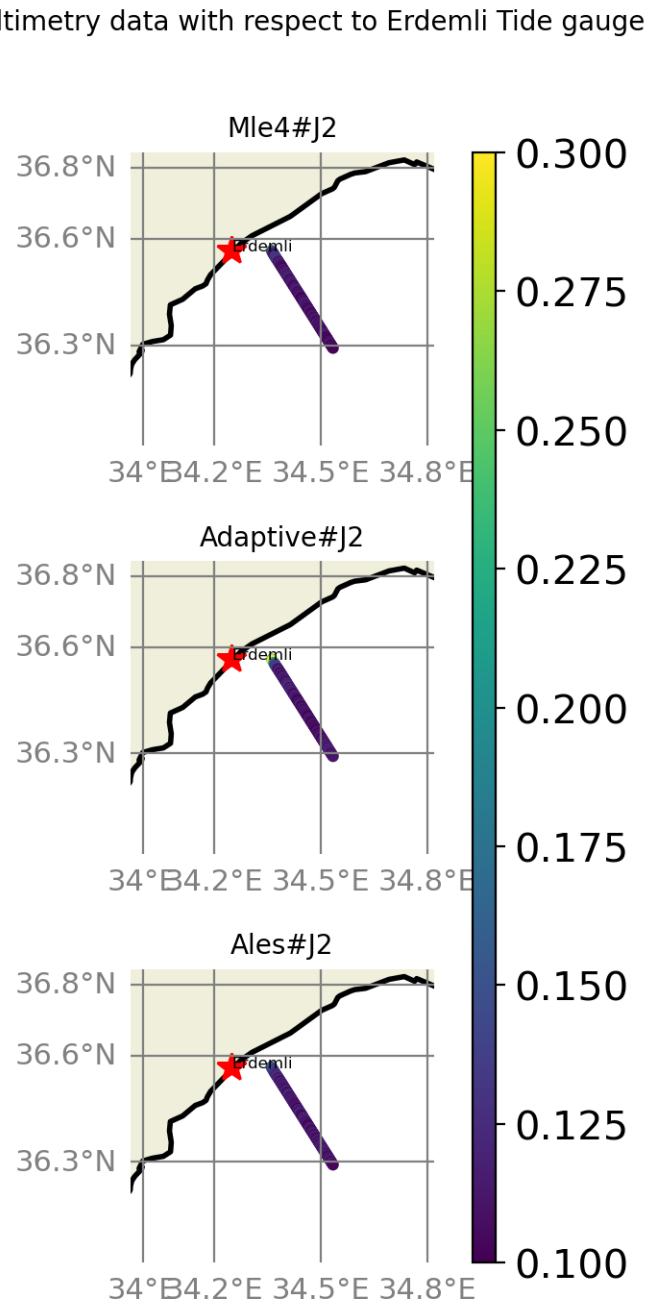

Figure 115 – std visualization in maps view % Erdemli tide gauge

6.8.4 valid_data_percent visualization in maps view % Erdemli tide gauge

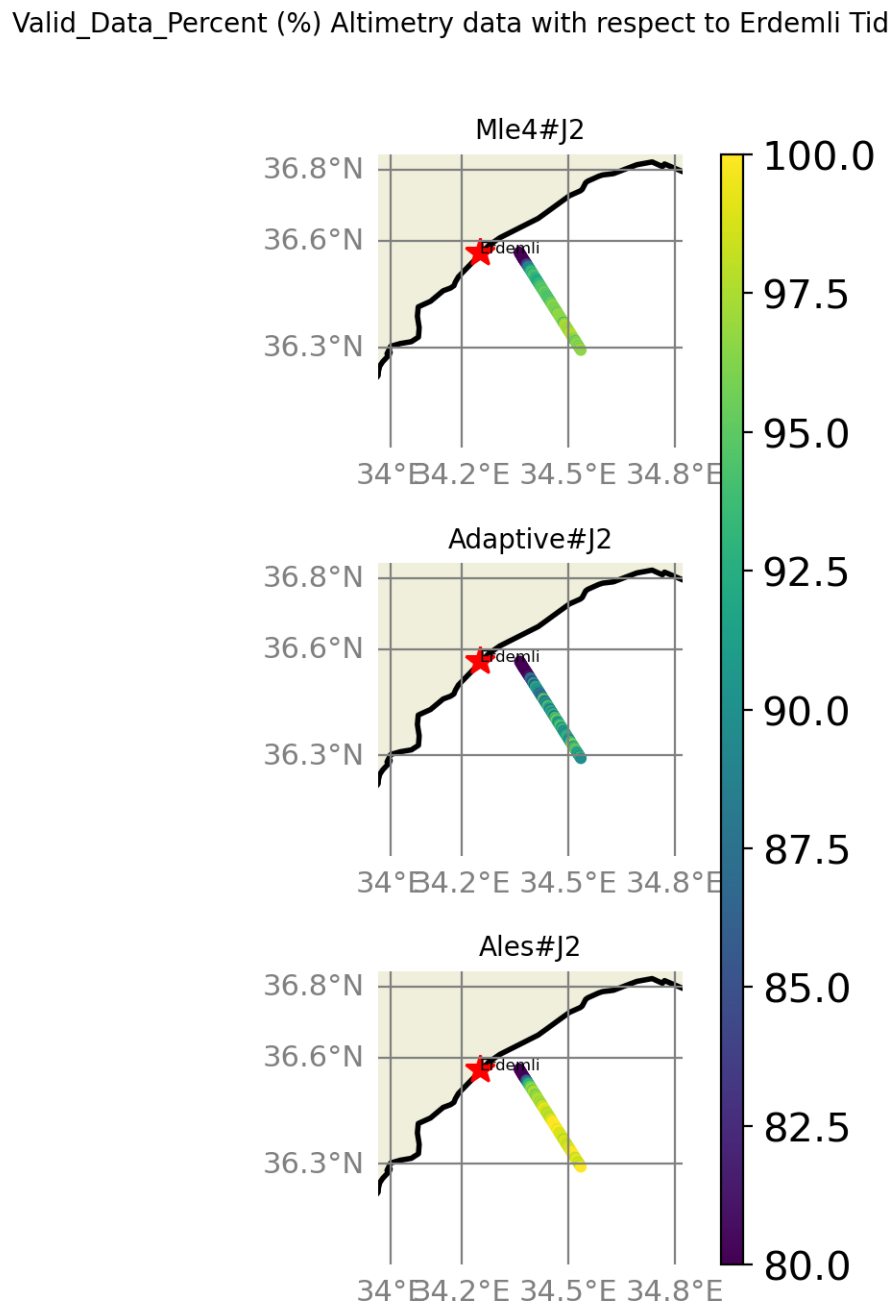

FIGURE 116 – valid_data_percent visualization in maps view % Erdemli tide gauge

6.8.5 Valid data (%) in function of distance to coast/Erdemli 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. $maxNB = 88$ 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.

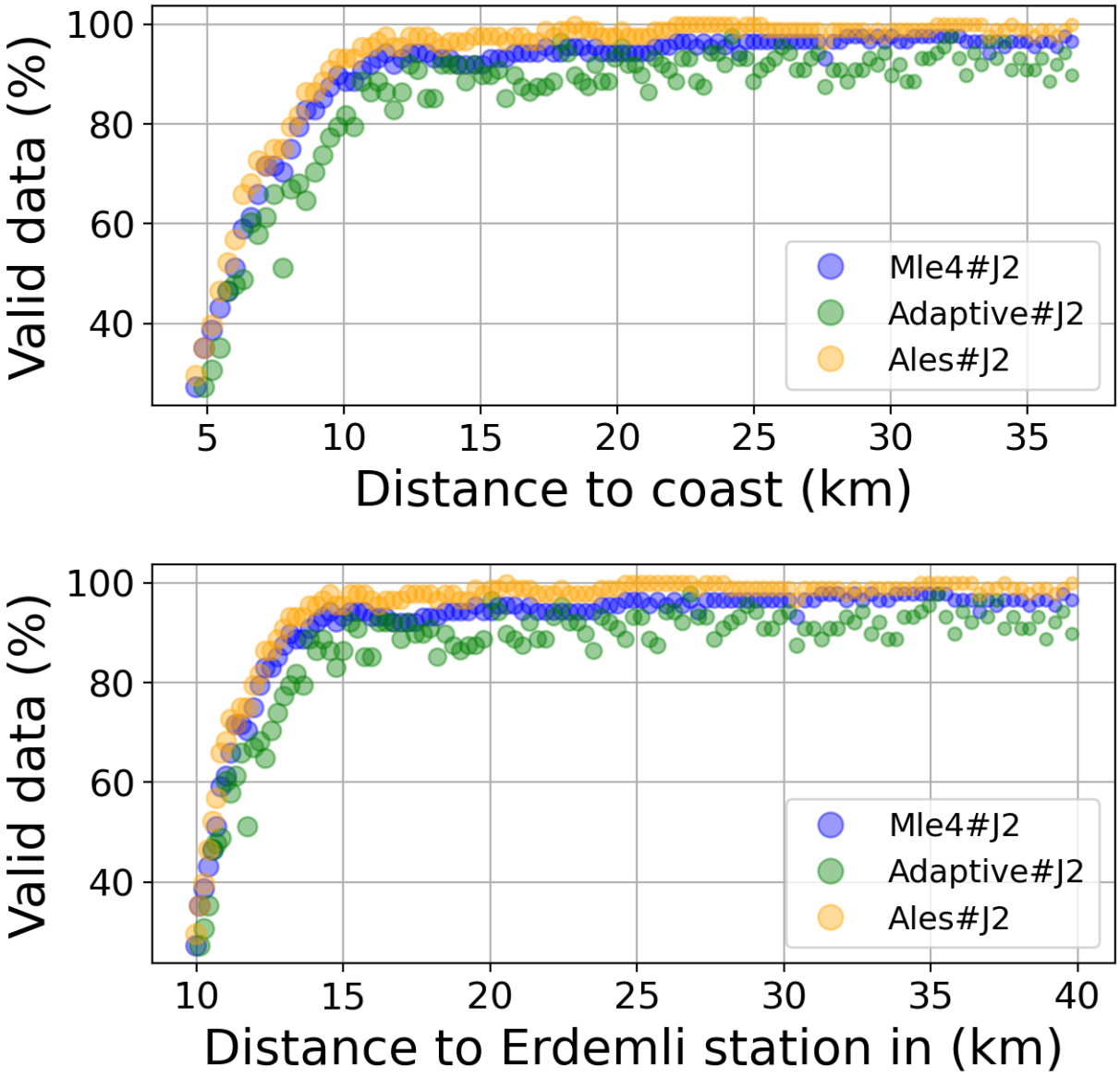

FIGURE 117 – Valid data (%) in function of distance to coast/Erdemli station

6.8.6 Std in function of distance to coast/Erdemli station

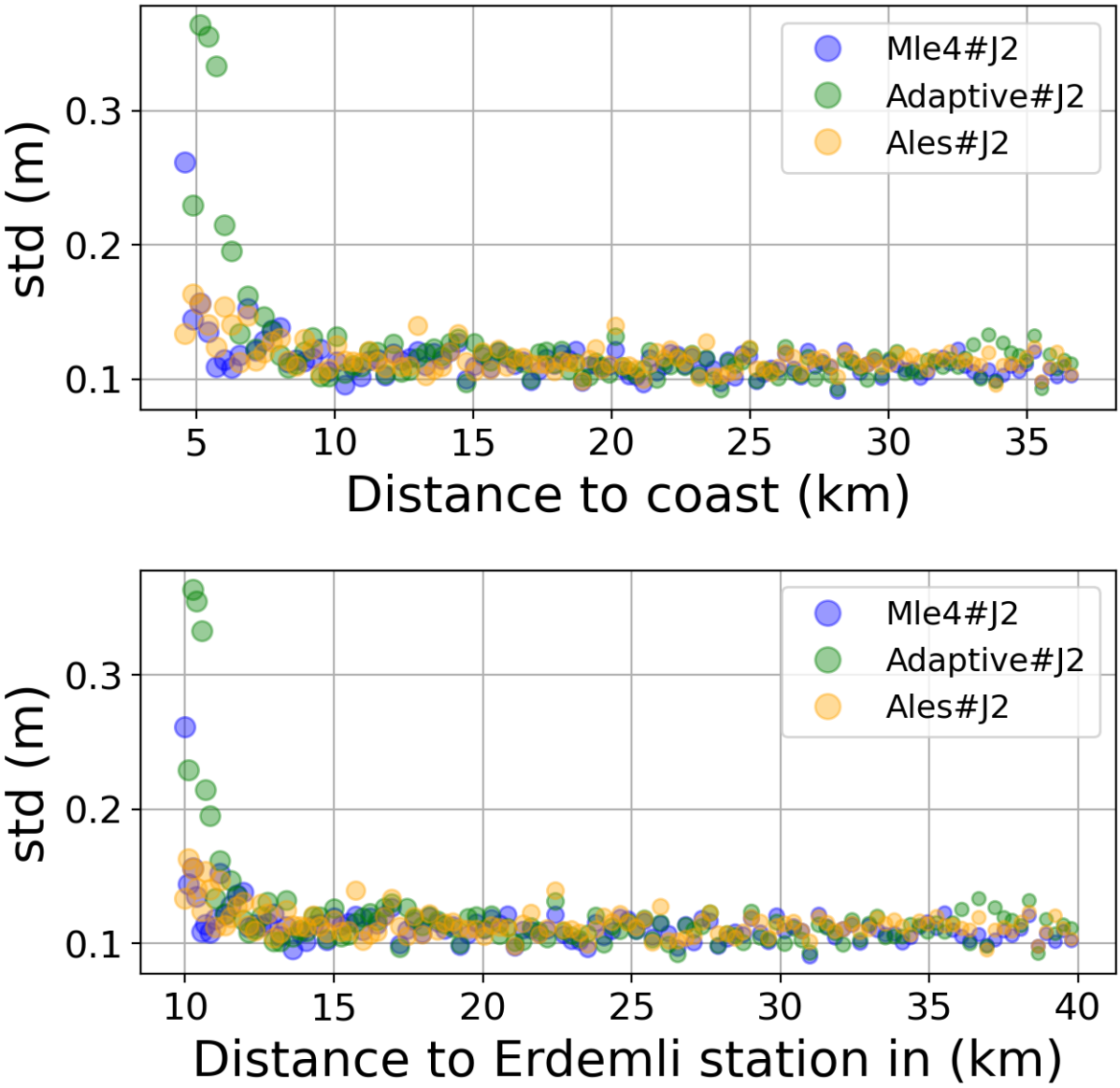

Figure 118 – Std in function of the distance to the coast/Erdemli station

6.8.7 Correlation in function of distance to coast/Erdemli station

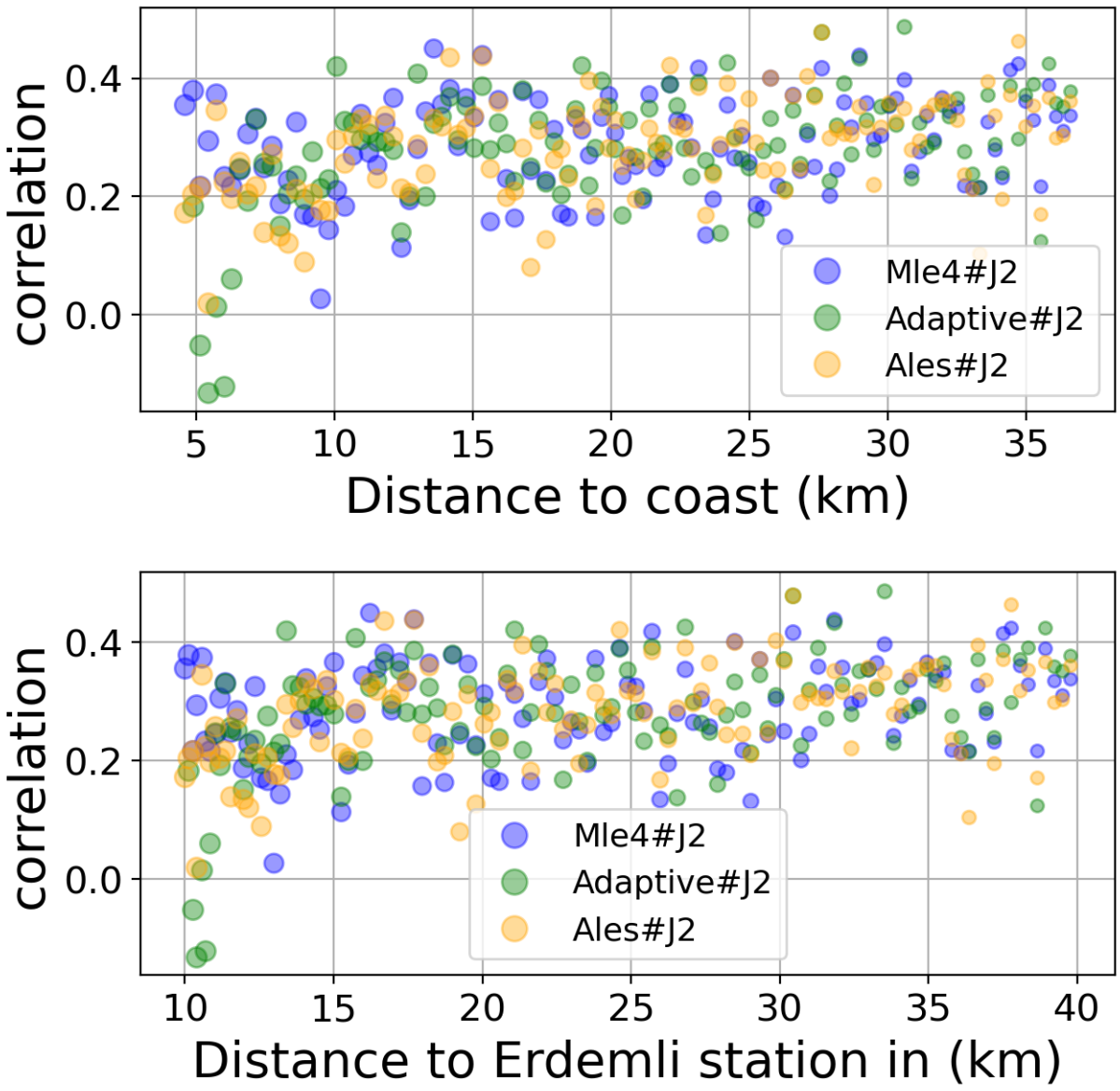

FIGURE 119 – Correlation in function of the distance to the coast/Erdemli station

6.8.8 Taylor Diagram

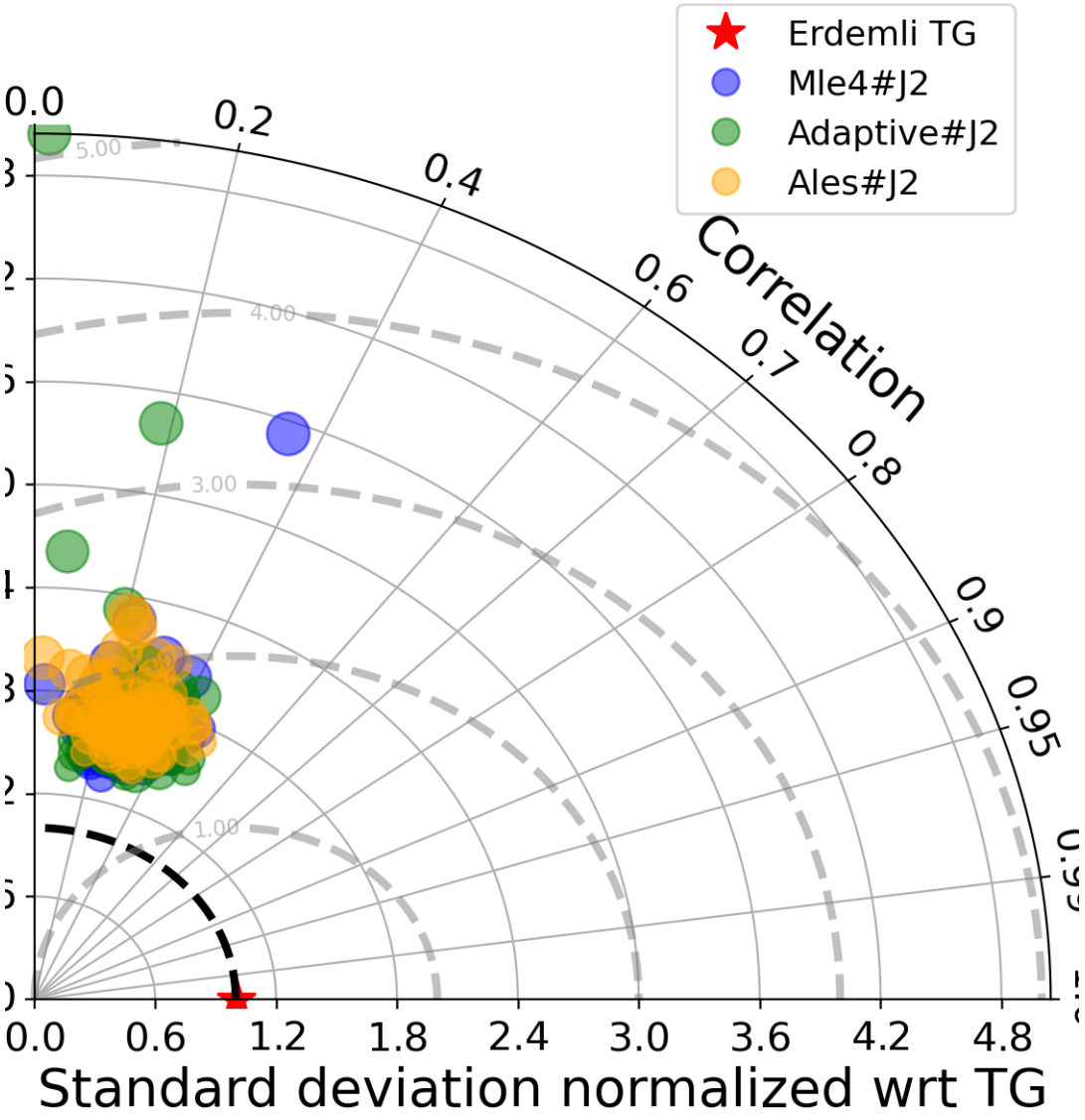

Figure 120 – Taylor diagram

6.8.9 Mean statistics table of products comparison with Erdemli 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#J2	90.87	0.287	0.112	0.113
Adaptive#J2	85.732	0.283	0.122	0.123
Ales#J2	94.046	0.284	0.115	0.116

FIGURE 121 – 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 88 point.

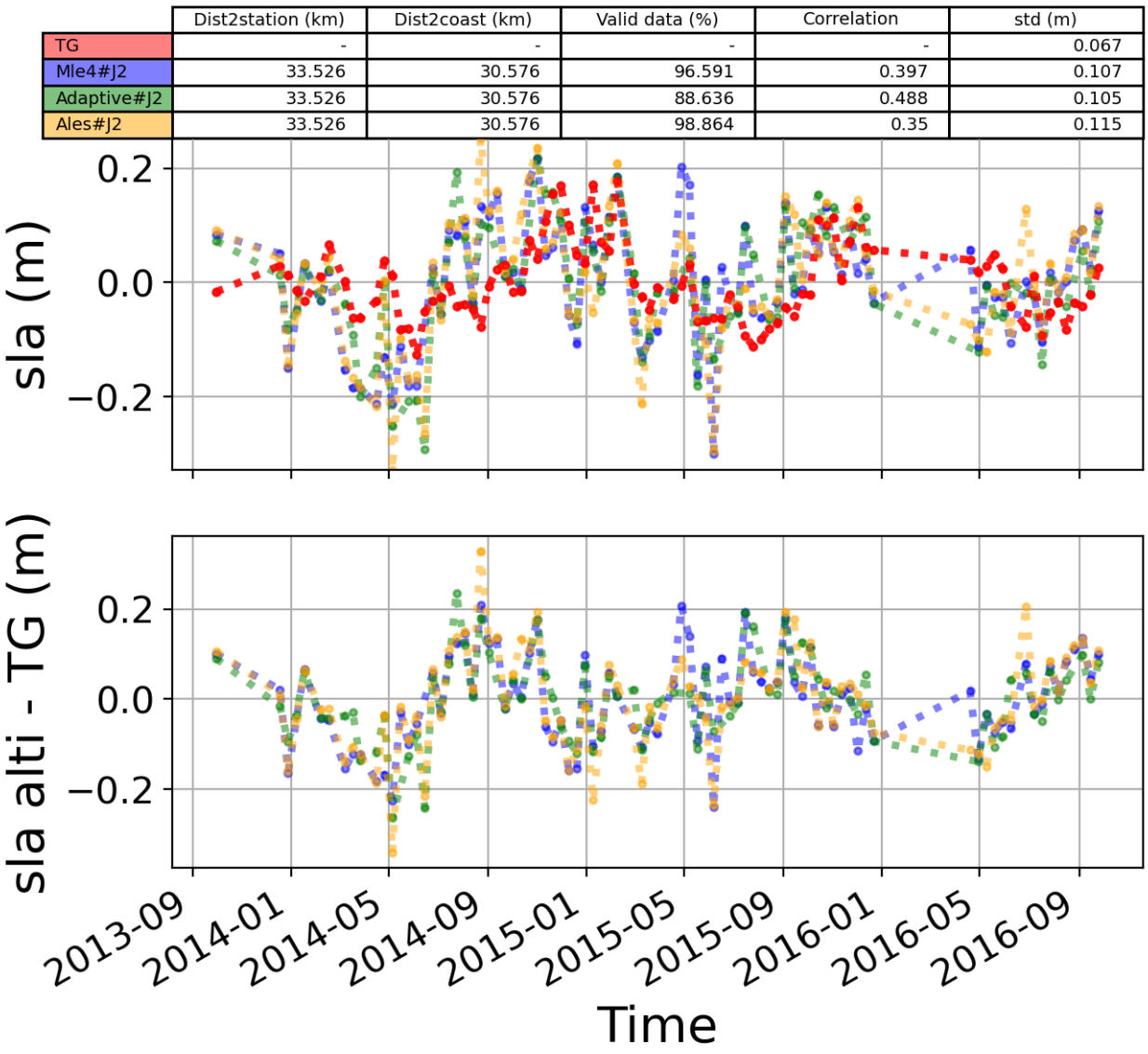

Figure 122 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

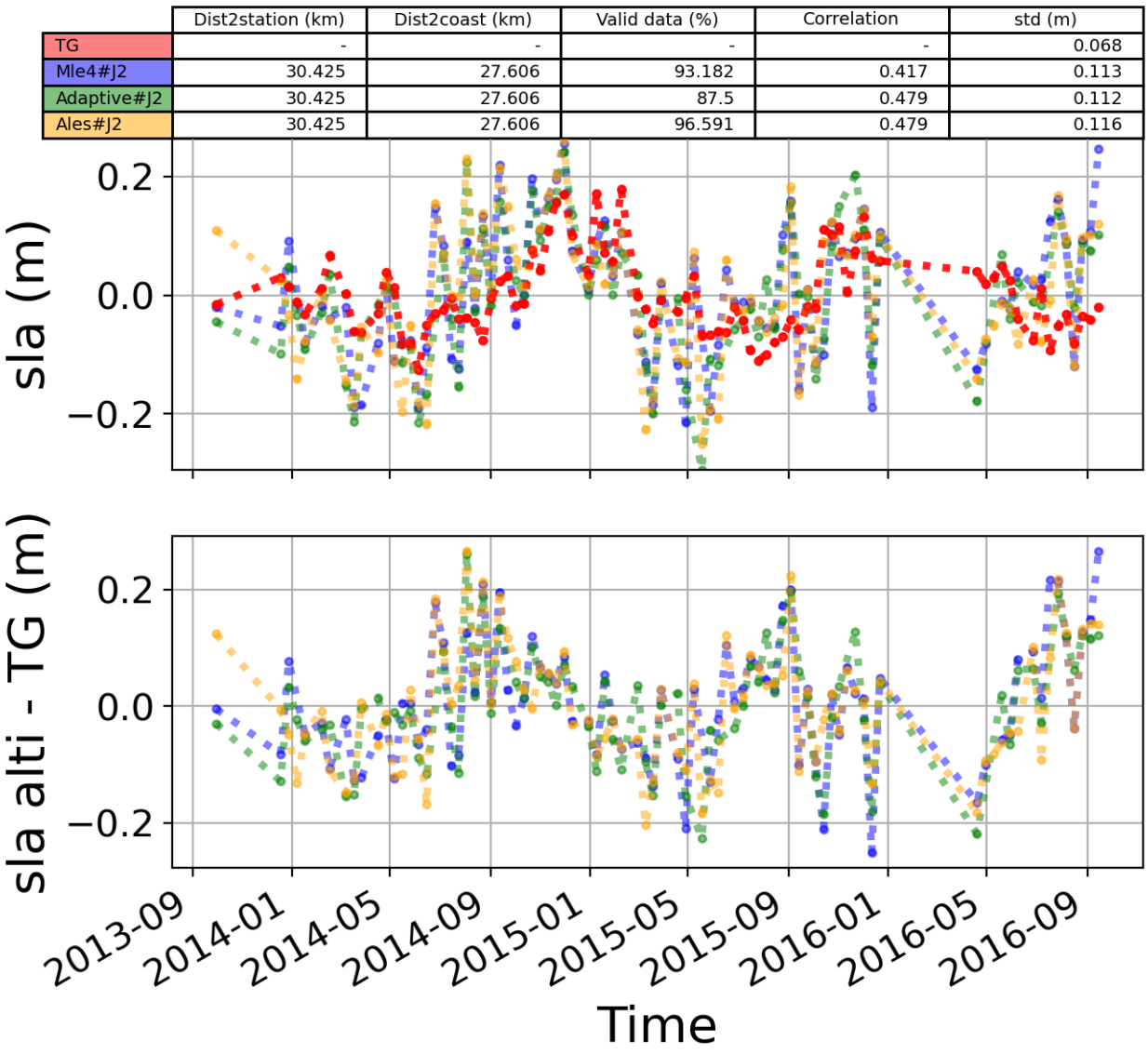

Figure 123 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

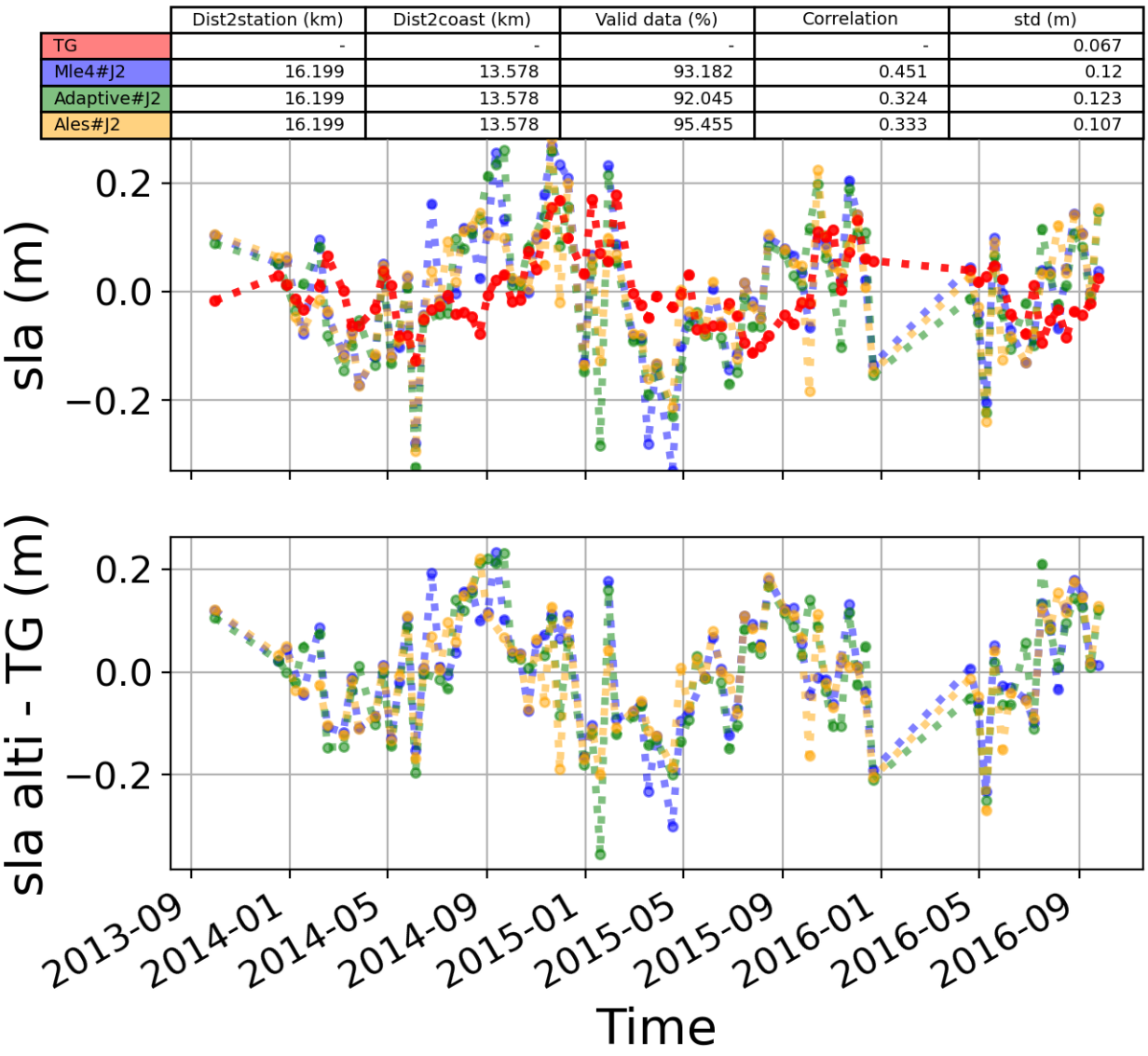

FIGURE 124 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.9 Station : Almeria

- Nearest track to Almeria station is the track number track96
- The area of interest is limited by :
  - A circle which it's center is the Almeria tide gauge station location and has a Raduis of 40 Km

6.9.1 correlation visualization in maps view % Almeria tide gauge

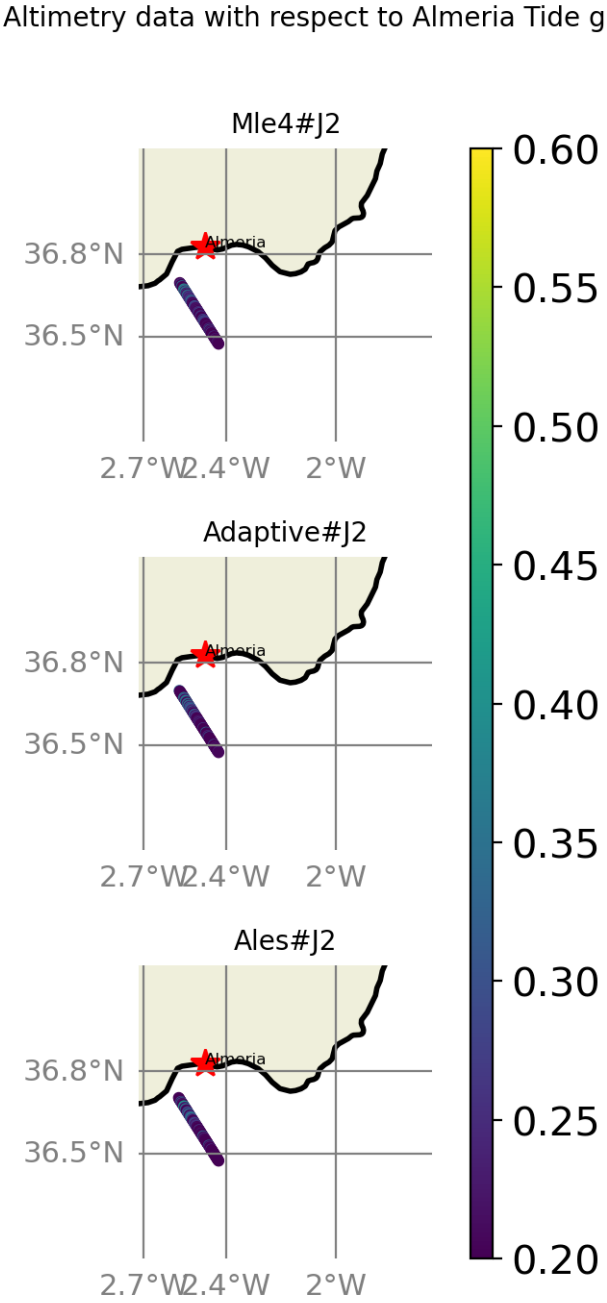

FIGURE 125 – correlation visualization in maps view % Almeria tide gauge

6.9.2 rmsd visualization in maps view % Almeria tide gauge

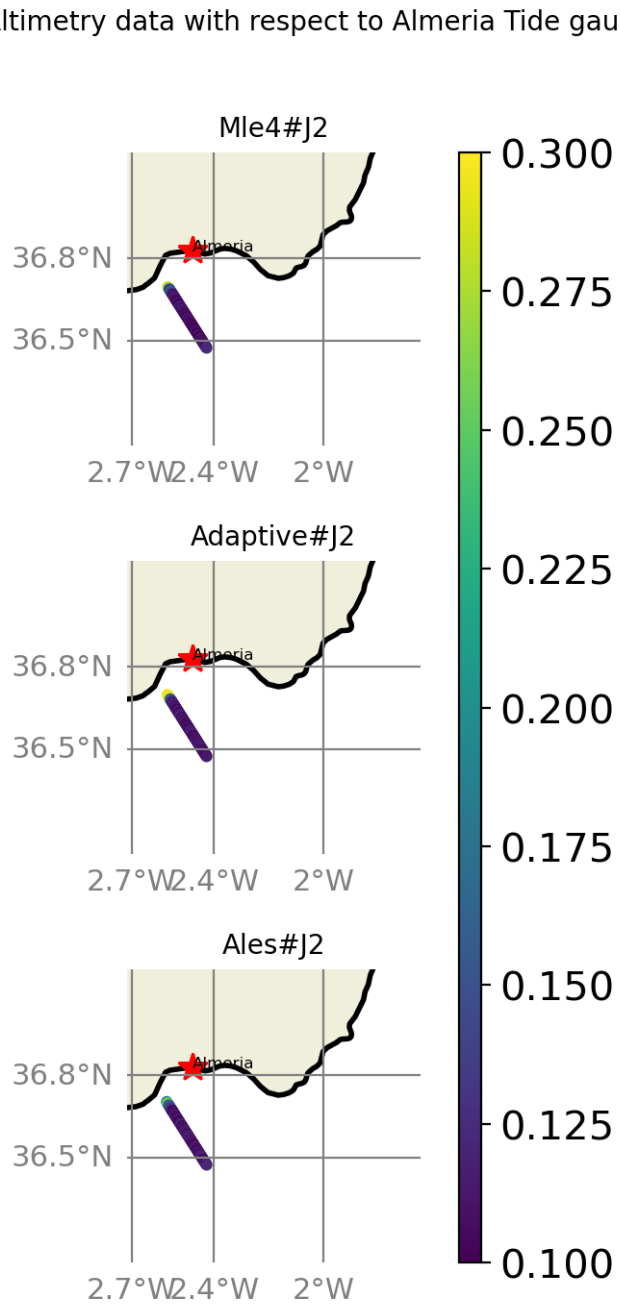

FIGURE 126 – rmsd visualization in maps view % Almeria tide gauge

6.9.3 std visualization in maps view % Almeria tide gauge

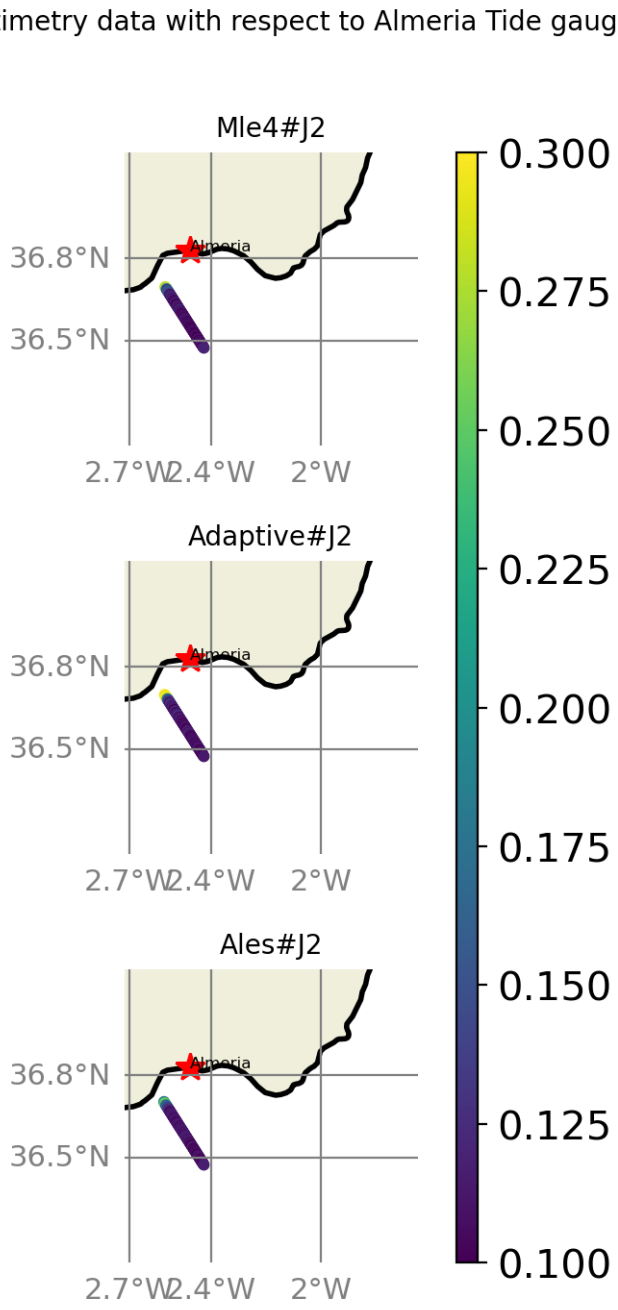

Figure 127 – std visualization in maps view % Almeria tide gauge

6.9.4 valid_data_percent visualization in maps view % Almeria tide gauge

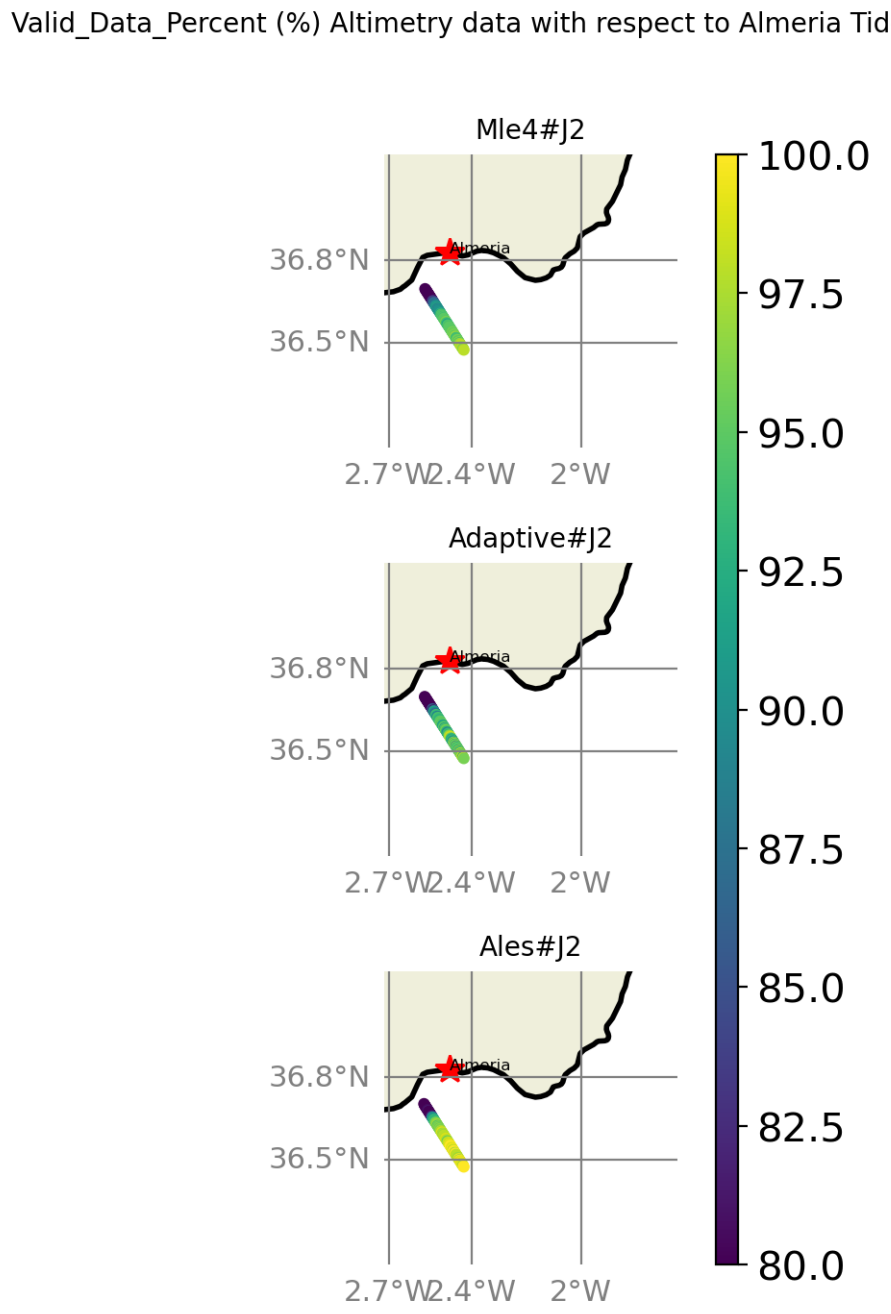

FIGURE 128 – valid_data_percent visualization in maps view % Almeria tide gauge

6.9.5 Valid data (%) in function of distance to coast/Almeria 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. $maxNB = 98$ 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.

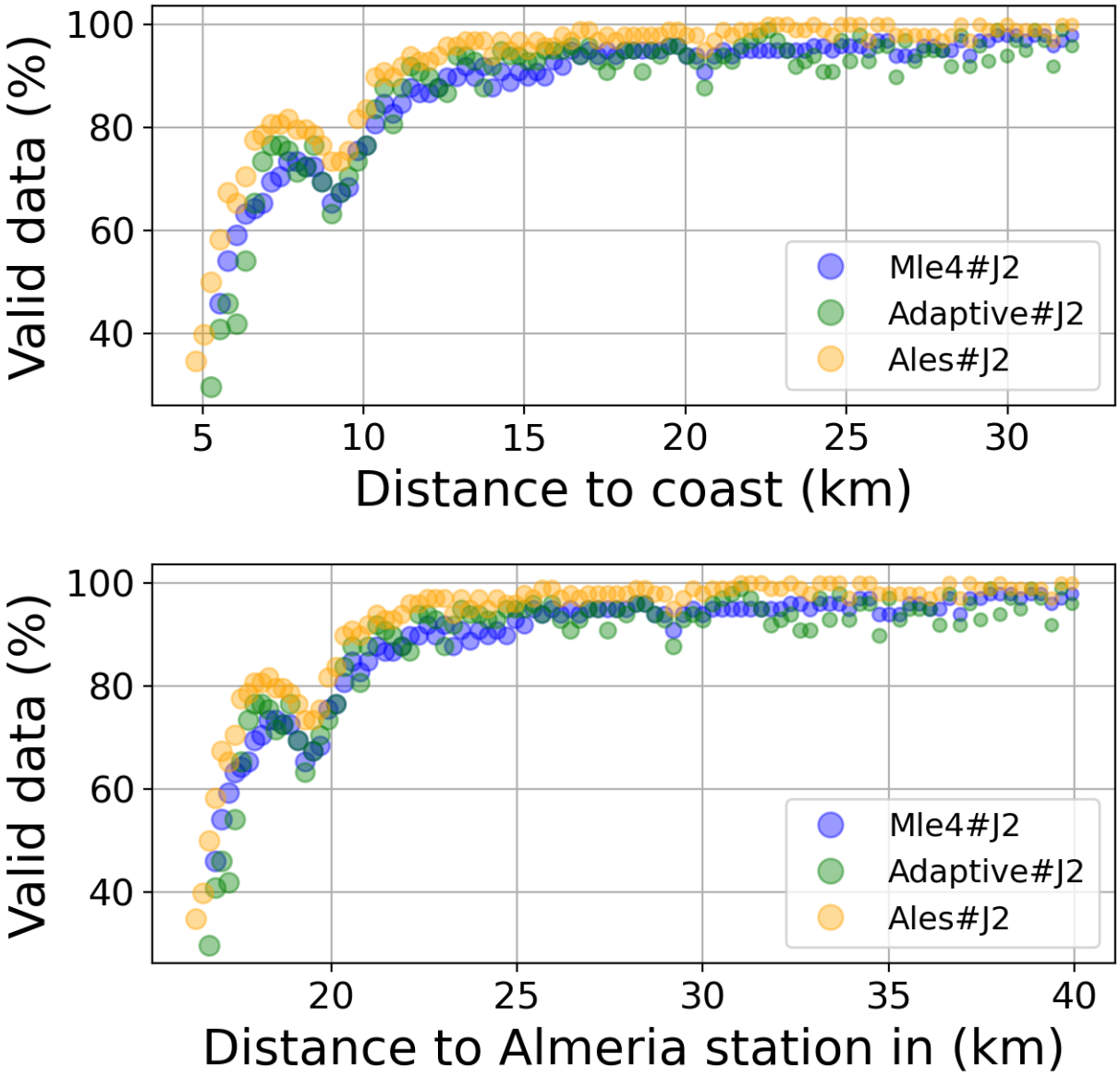

FIGURE 129 – Valid data (%) in function of distance to coast/Almeria station

6.9.6 Std in function of distance to coast/Almeria station

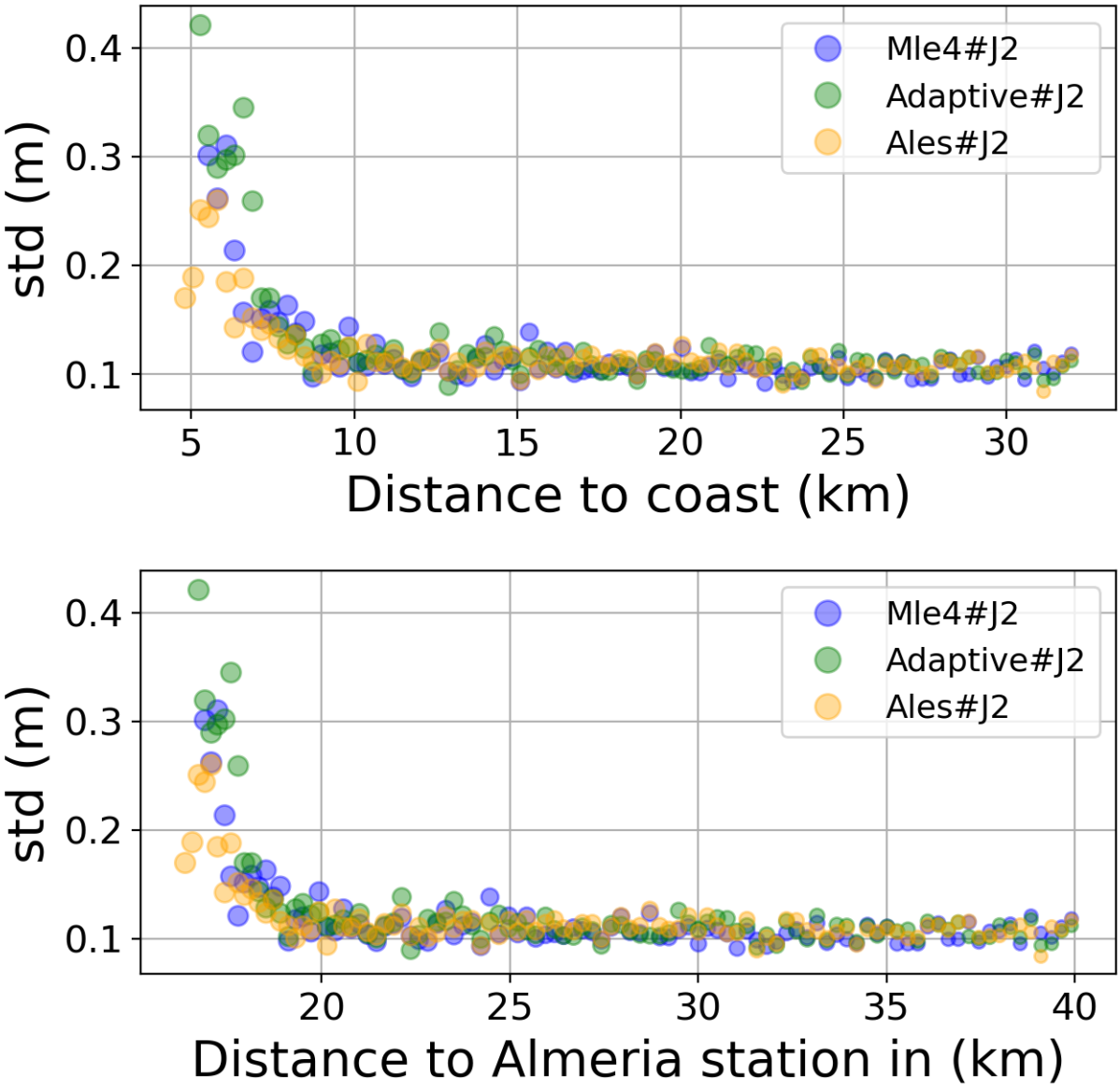

Figure 130 – Std in function of the distance to the coast/Almeria station

6.9.7 Correlation in function of distance to coast/Almeria station

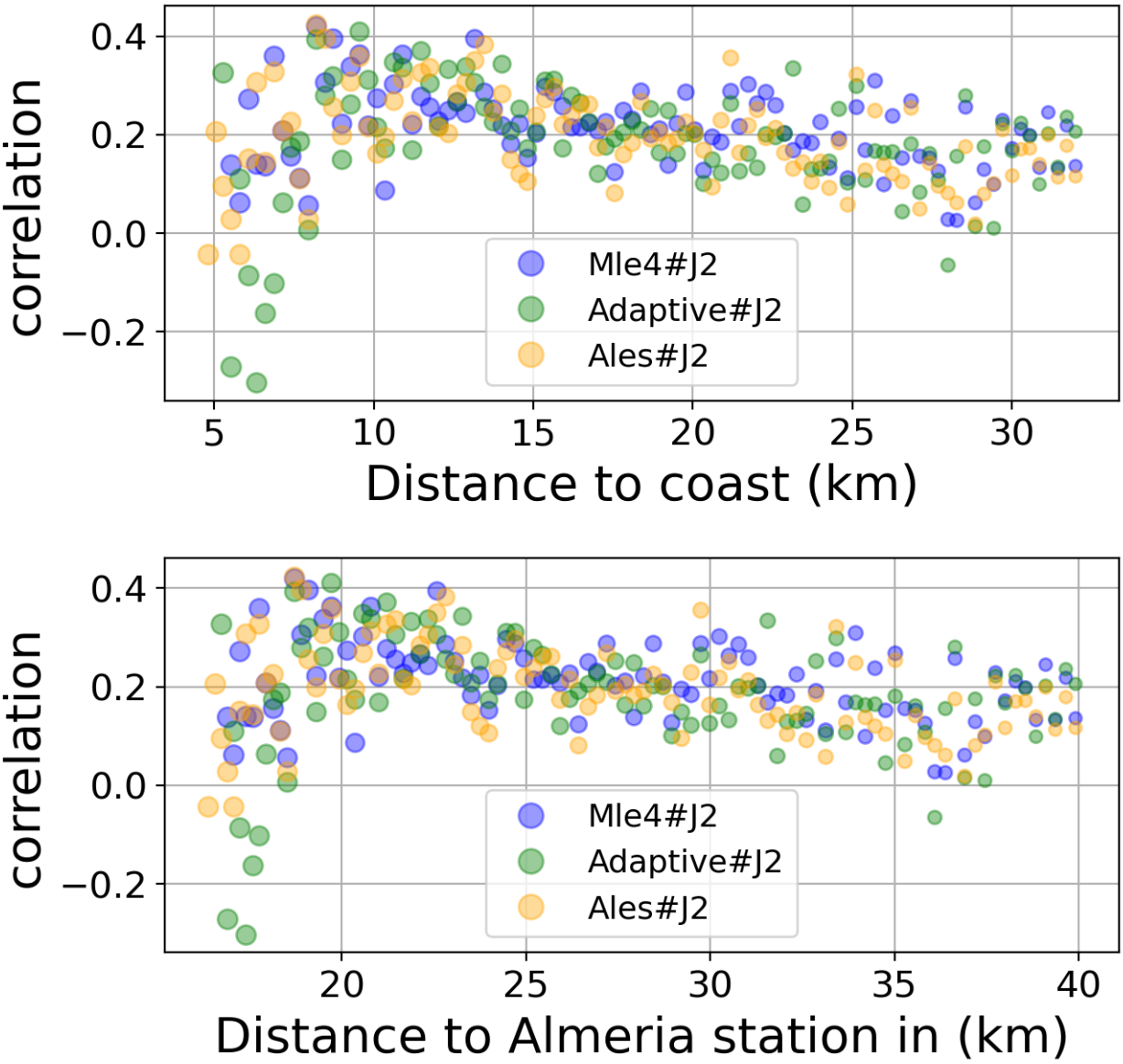

FIGURE 131 – Correlation in function of the distance to the coast/Almeria station

6.9.8 Taylor Diagram

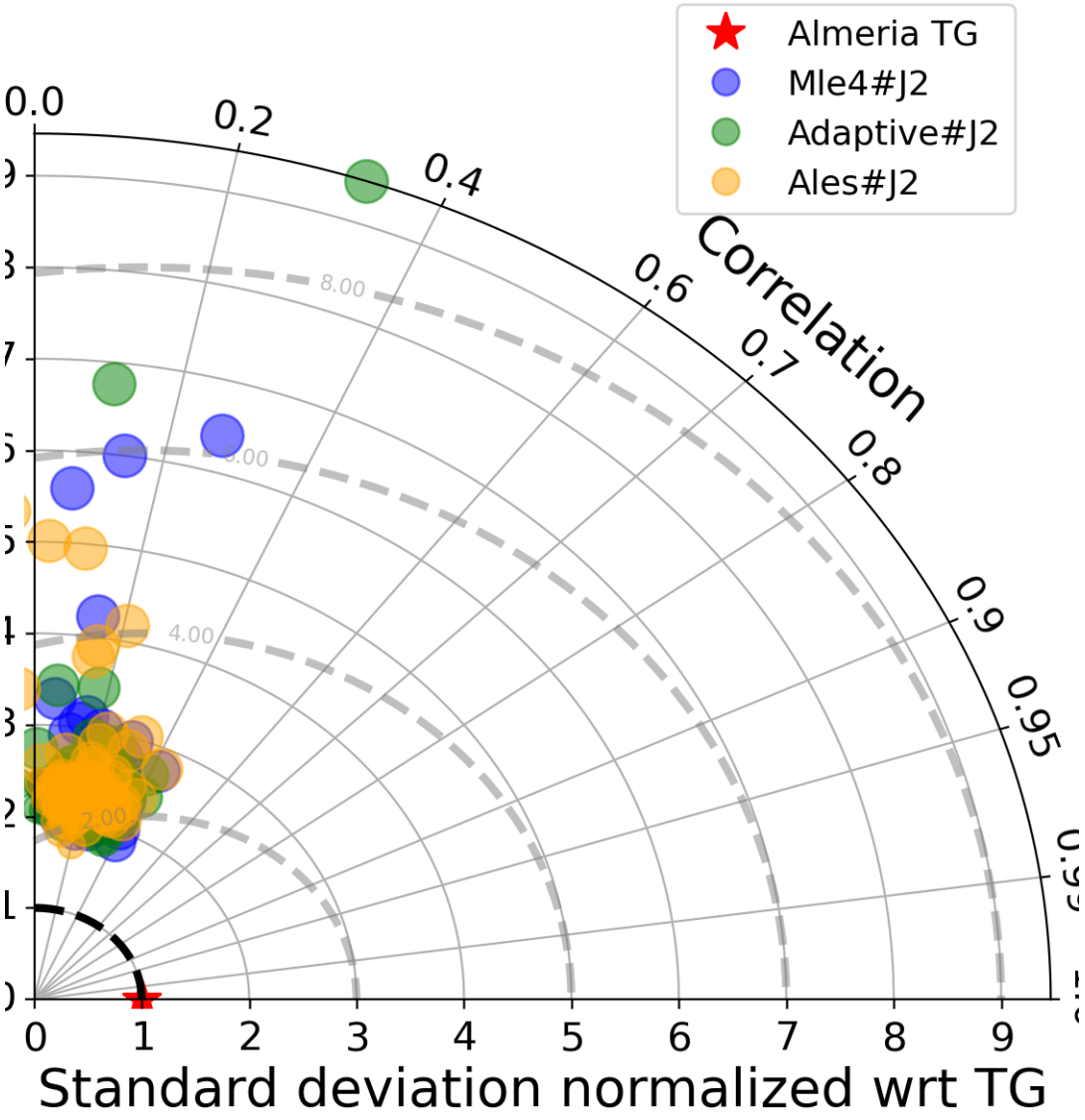

Figure 132 – Taylor diagram

6.9.9 Mean statistics table of products comparison with Almeria 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#J2	88.499	0.213	0.118	0.118
Adaptive#J2	88.382	0.18	0.125	0.126
Ales#J2	93.389	0.195	0.117	0.117

FIGURE 133 – 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 98 point.

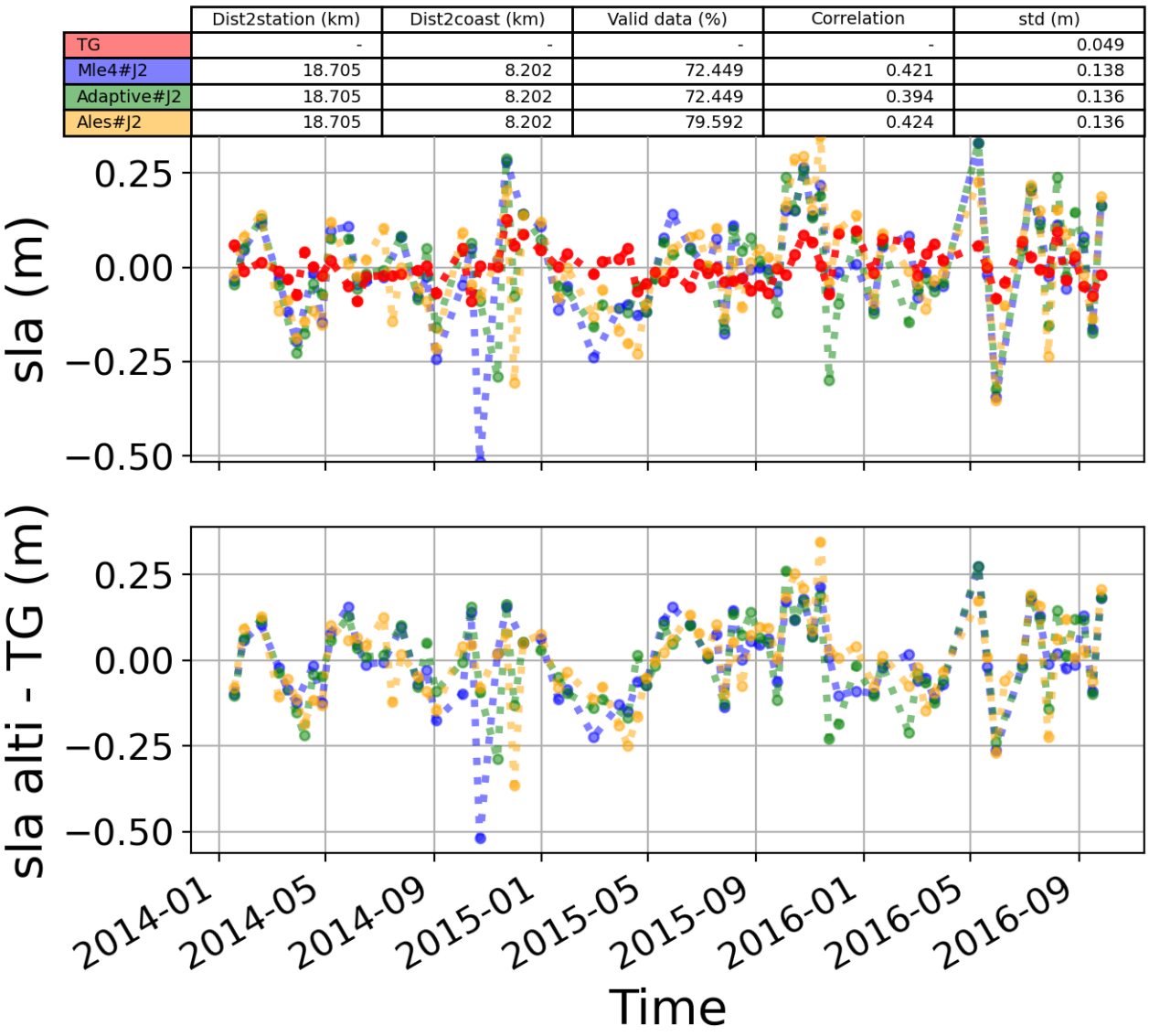

Figure 134 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

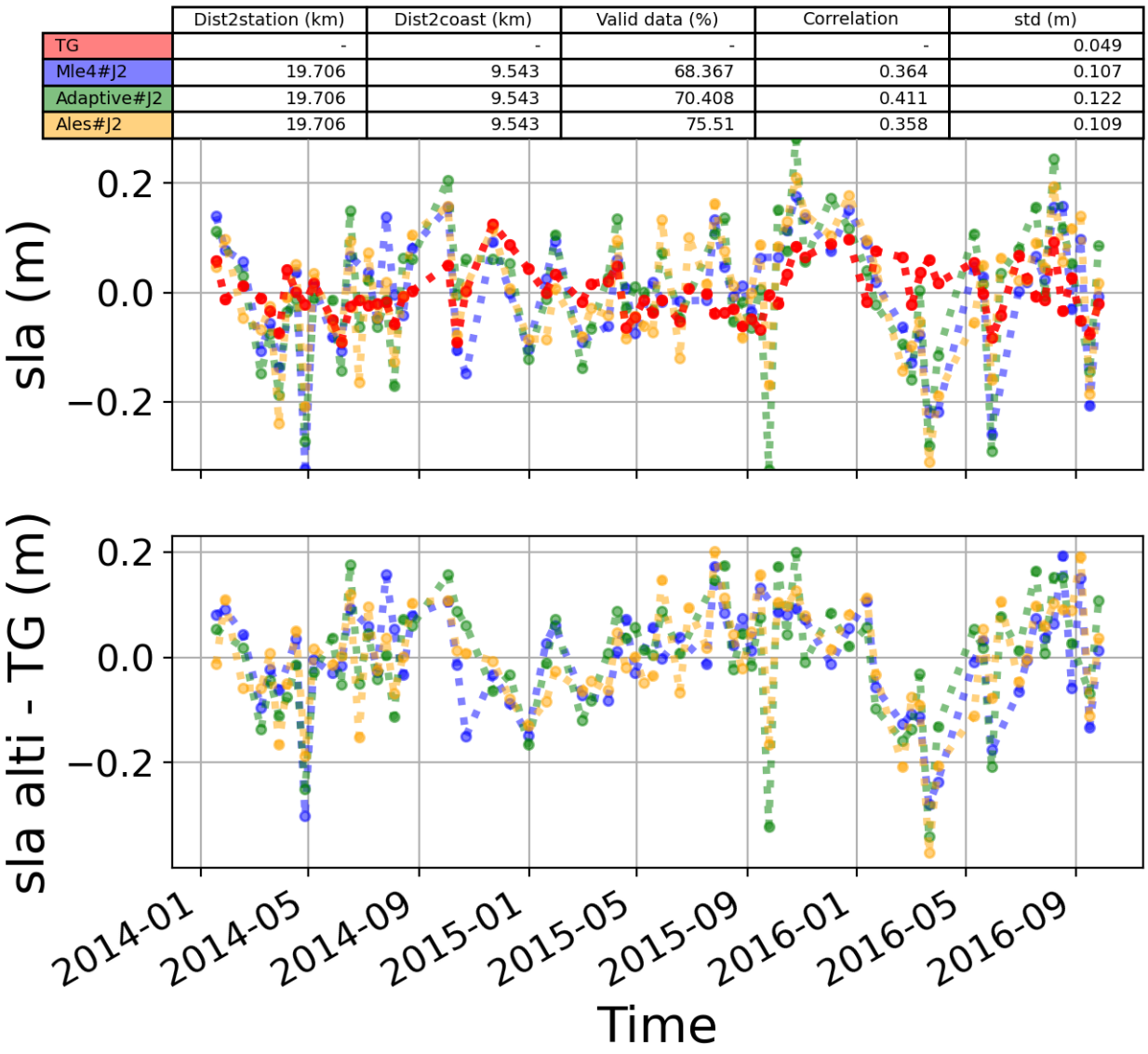

FIGURE 135 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.10 Station : Civitavecchia

- Nearest track to Civitavecchia station is the track number track161
- The area of interest is limited by :
  - A circle which it's center is the Civitavecchia tide gauge station location and has a Raduis of 40 Km

6.10.1 correlation visualization in maps view % Civitavecchia tide gauge

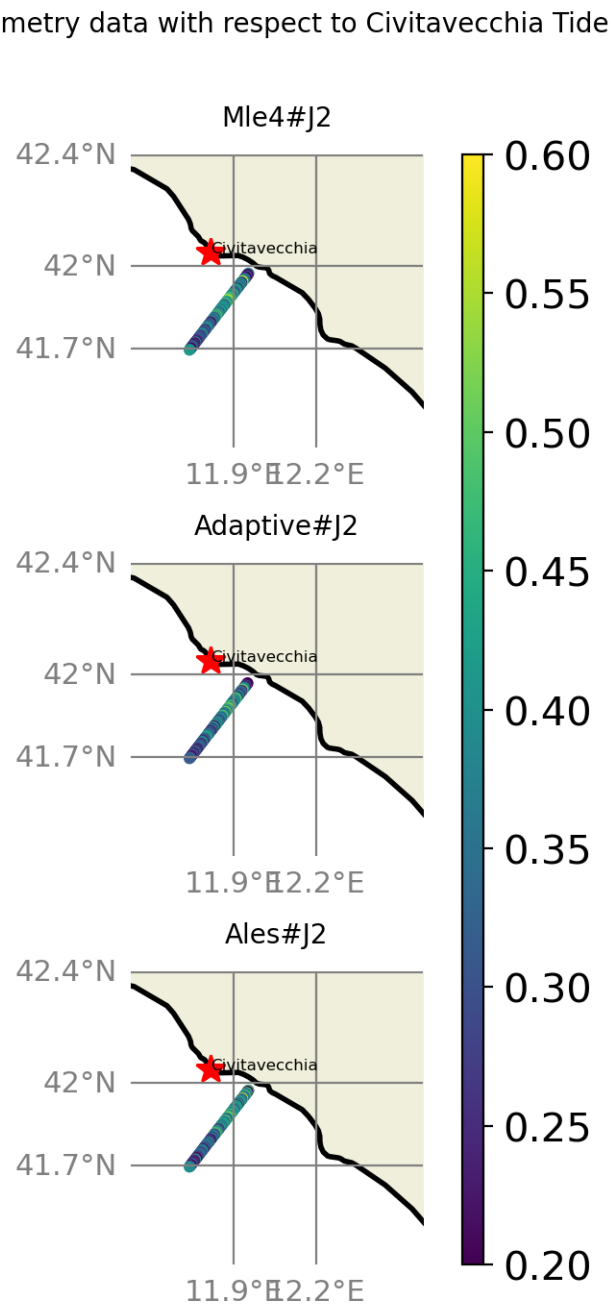

FIGURE 136 – correlation visualization in maps view % Civitavecchia tide gauge

6.10.2 rmsd visualization in maps view % Civitavecchia tide gauge

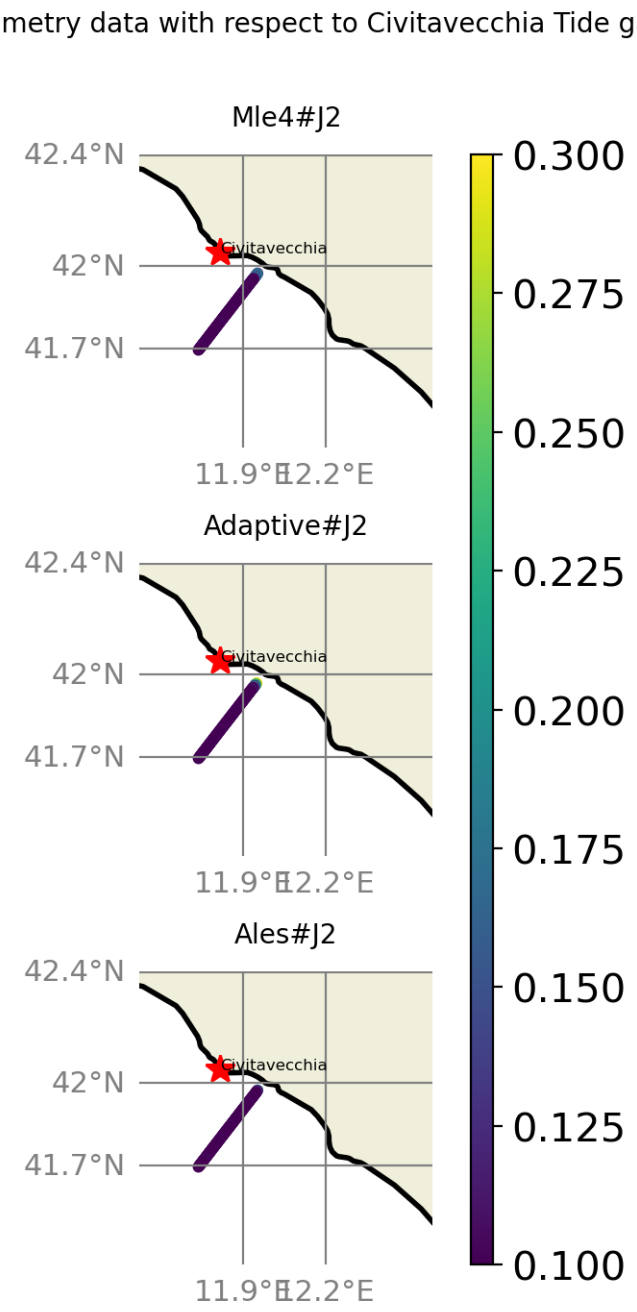

FIGURE 137 – rmsd visualization in maps view % Civitavecchia tide gauge

6.10.3 std visualization in maps view % Civitavecchia tide gauge

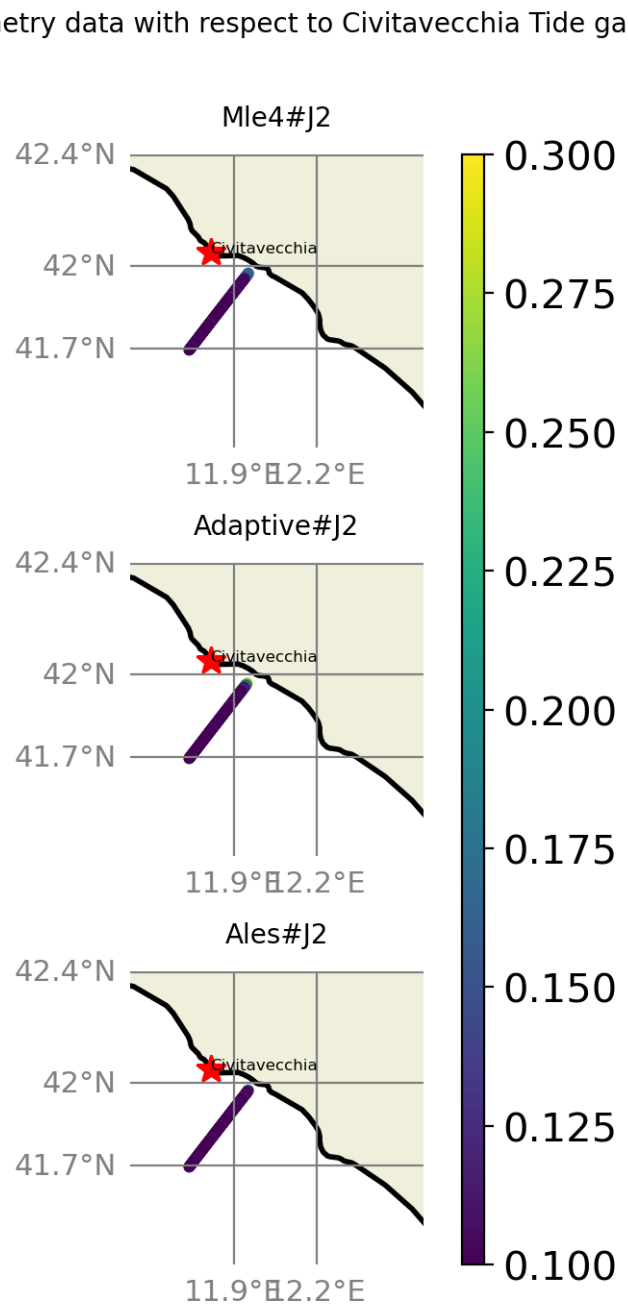

Figure 138 – std visualization in maps view % Civitavecchia tide gauge

6.10.4 valid_data_percent visualization in maps view % Civitavecchia tide gauge

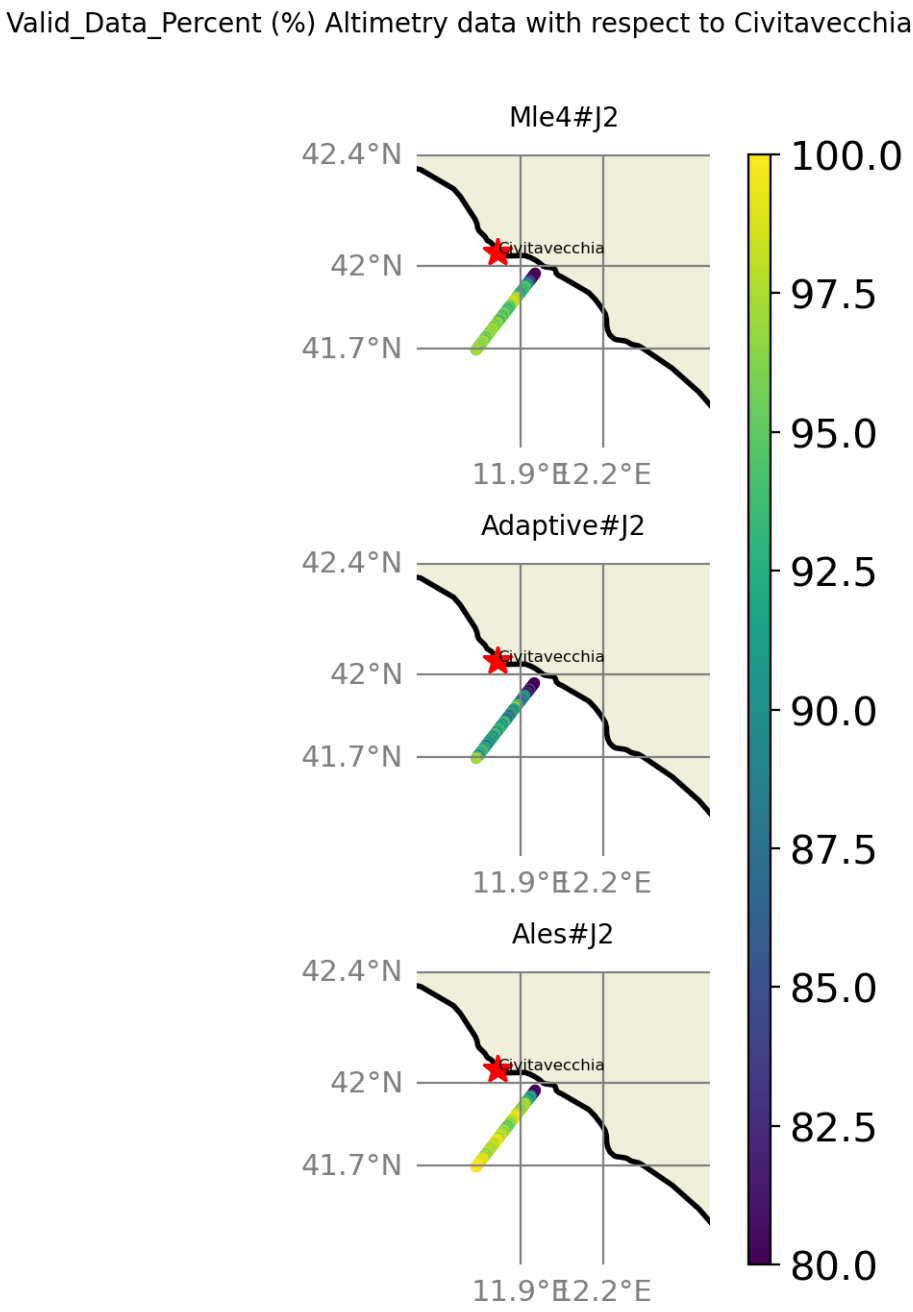

FIGURE 139 – valid_data_percent visualization in maps view % Civitavecchia tide gauge

6.10.5 Valid data (%) in function of distance to coast/Civitavecchia 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. $maxNB = 107$ 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.

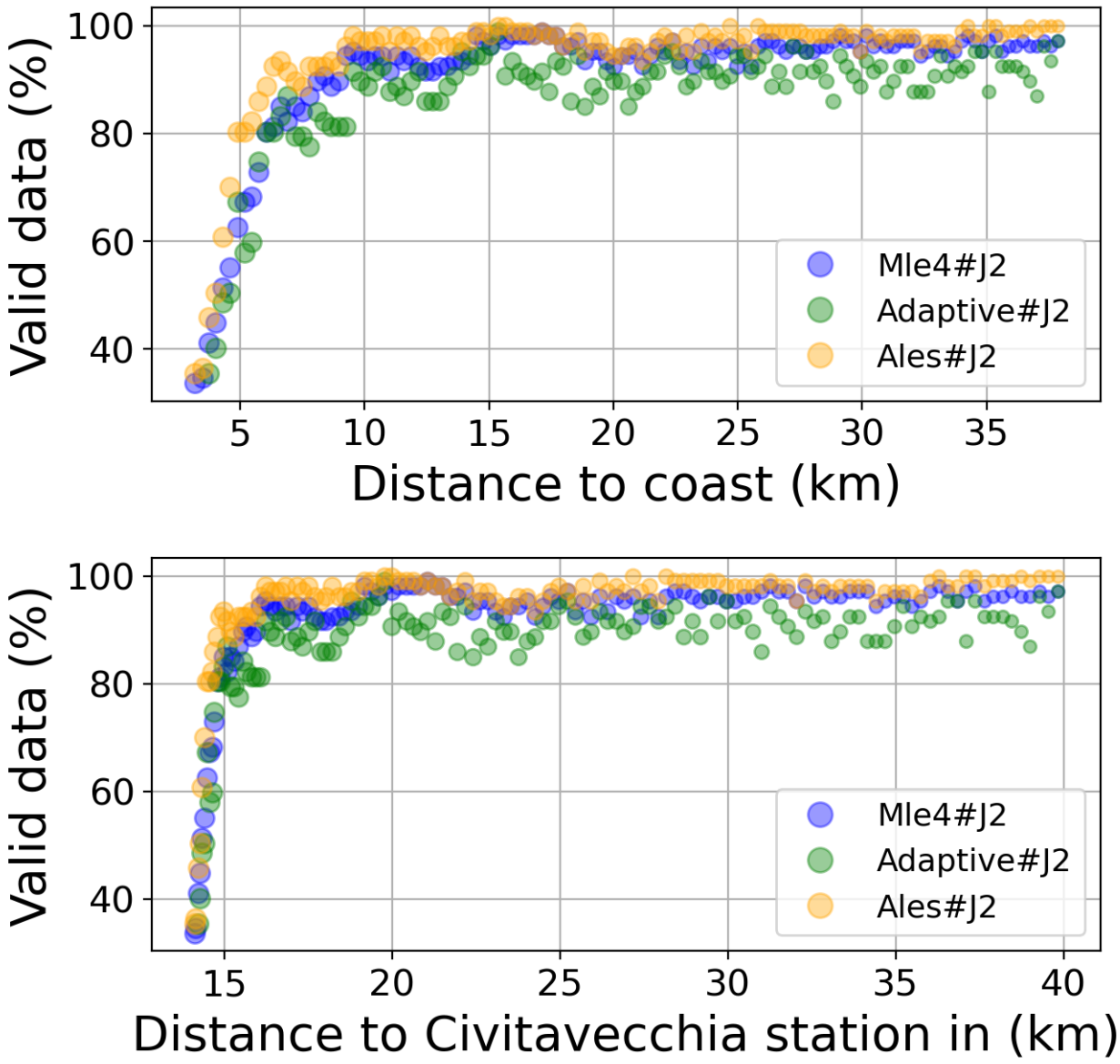

FIGURE 140 – Valid data (%) in function of distance to coast/Civitavecchia station

6.10.6 Std in function of distance to coast/Civitavecchia station

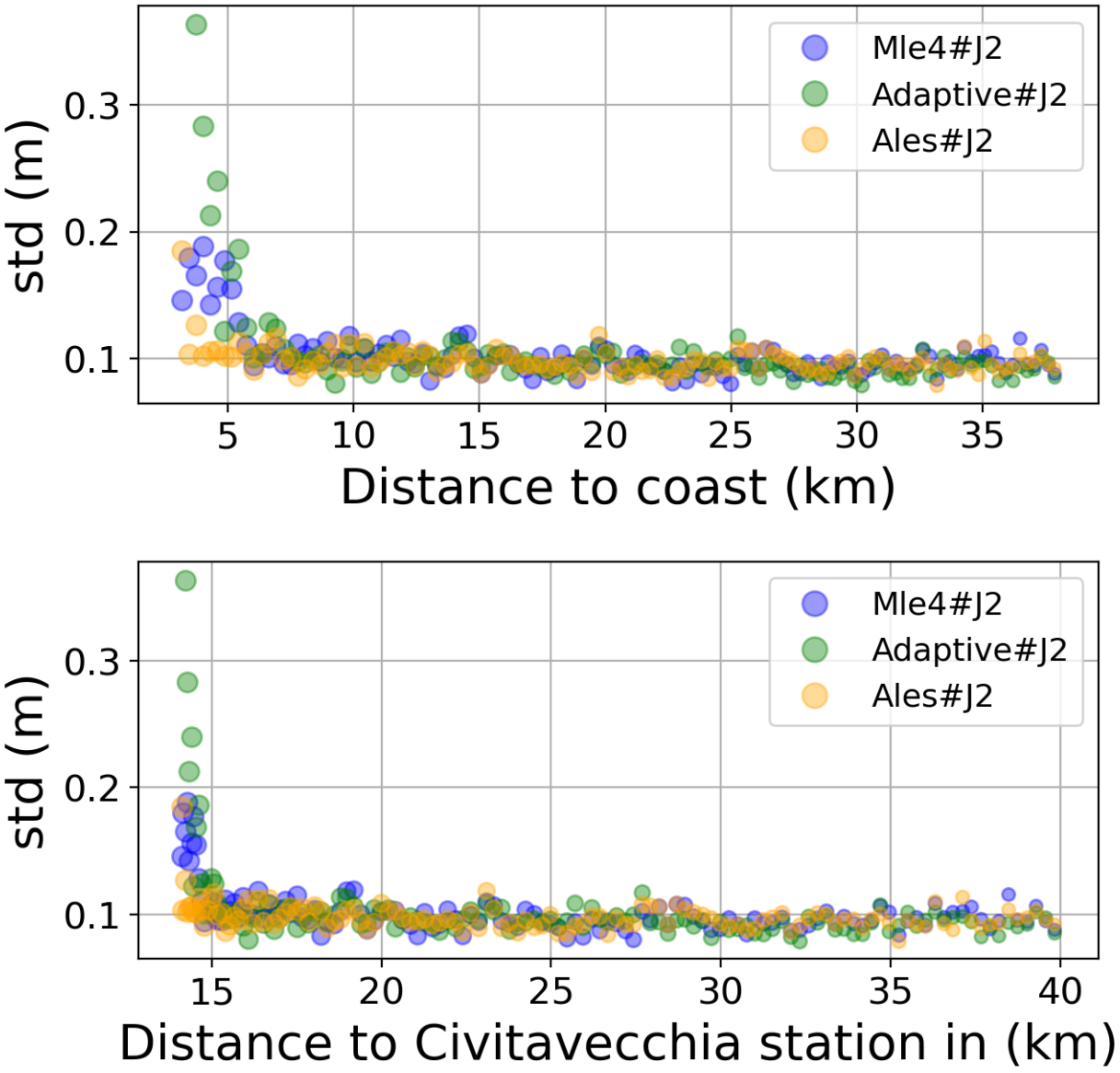

Figure 141 – Std in function of the distance to the coast/Civitavecchia station

6.10.7 Correlation in function of distance to coast/Civitavecchia station

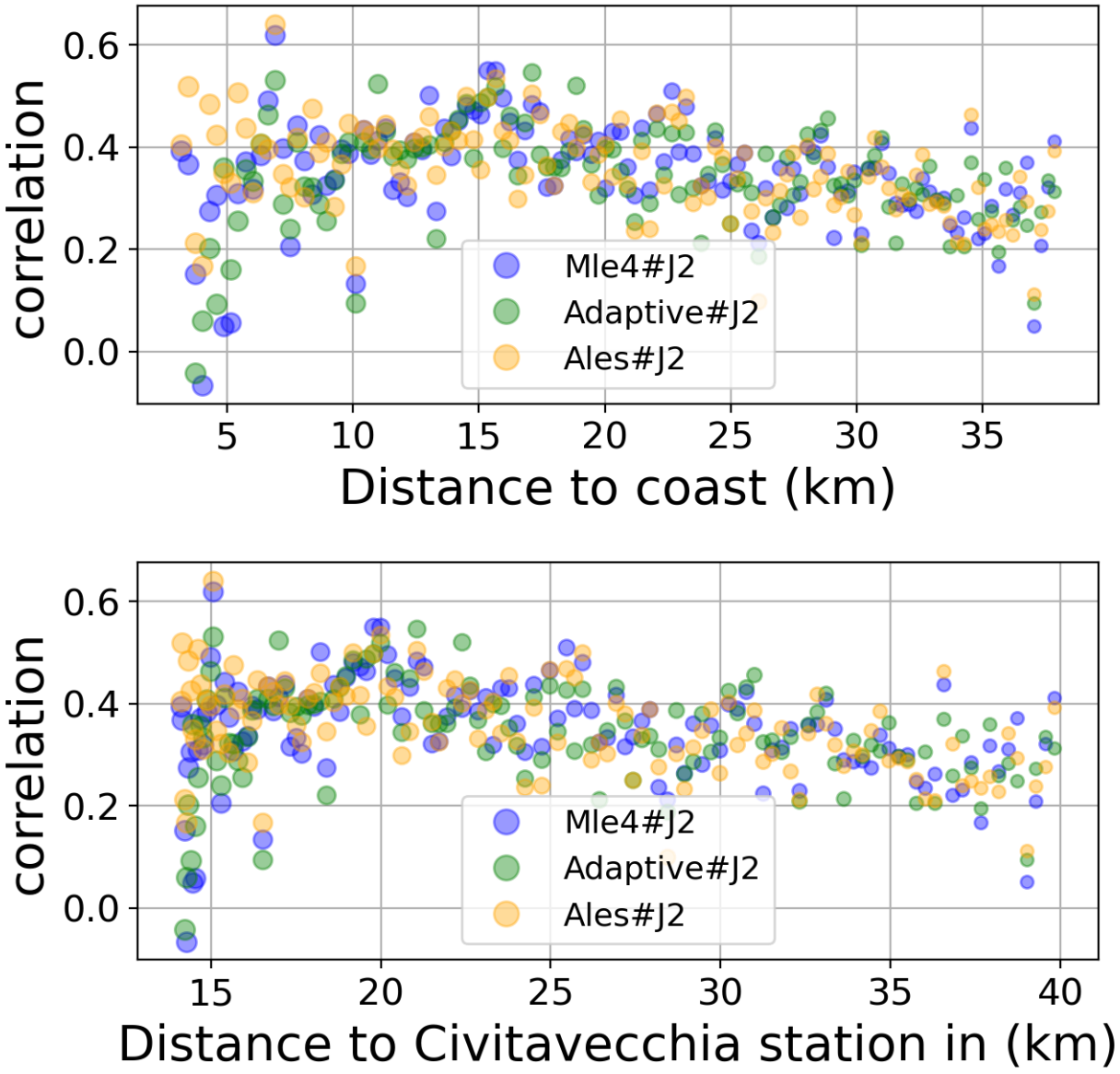

FIGURE 142 – Correlation in function of the distance to the coast/Civitavecchia station

6.10.8 Taylor Diagram

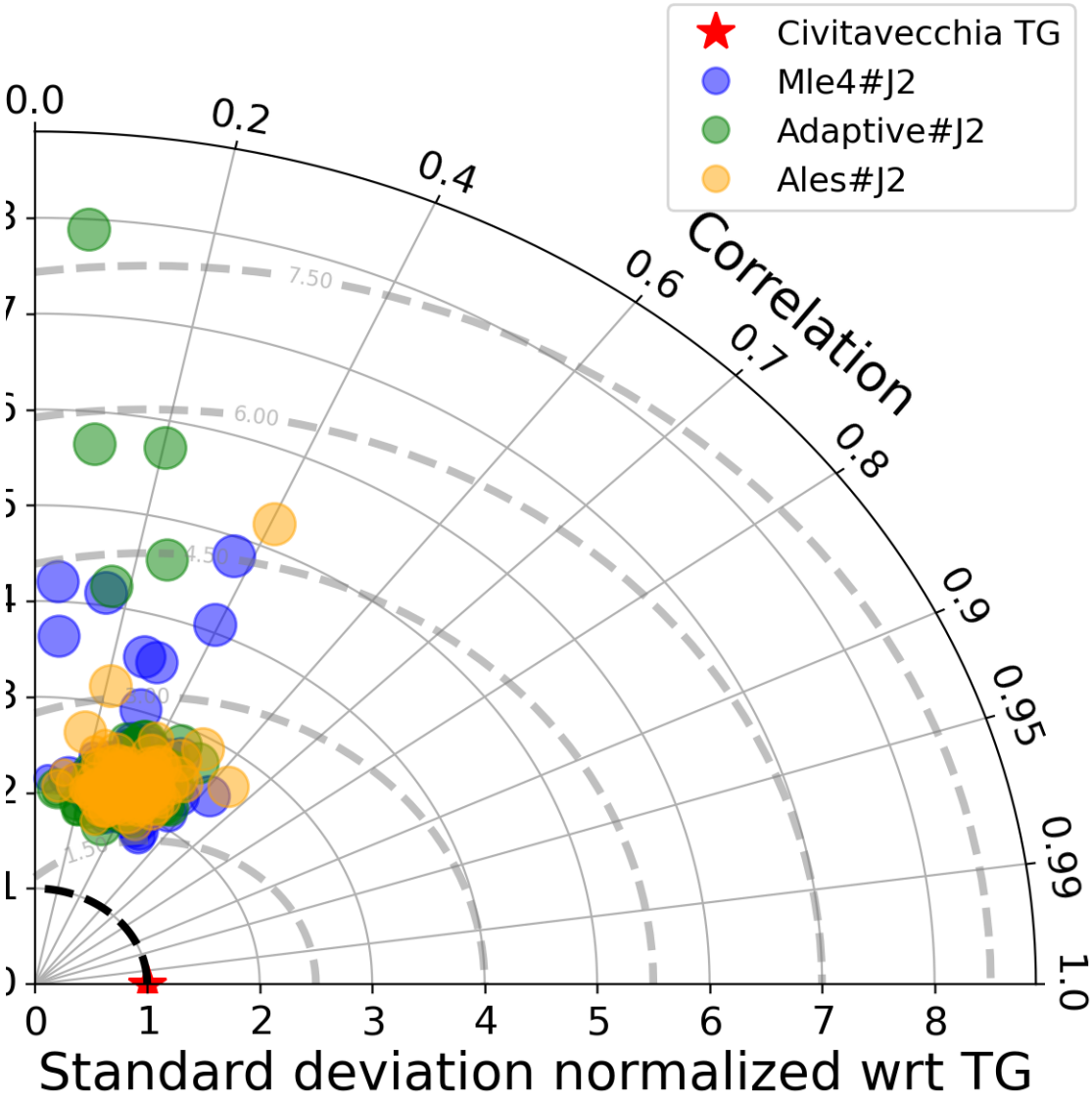

Figure 143 – Taylor diagram

6.10.9 Mean statistics table of products comparison with Civitavecchia 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#J2	92.276	0.347	0.101	0.096
Adaptive#J2	87.812	0.339	0.104	0.099
Ales#J2	95.358	0.354	0.098	0.092

FIGURE 144 – 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 107 point.

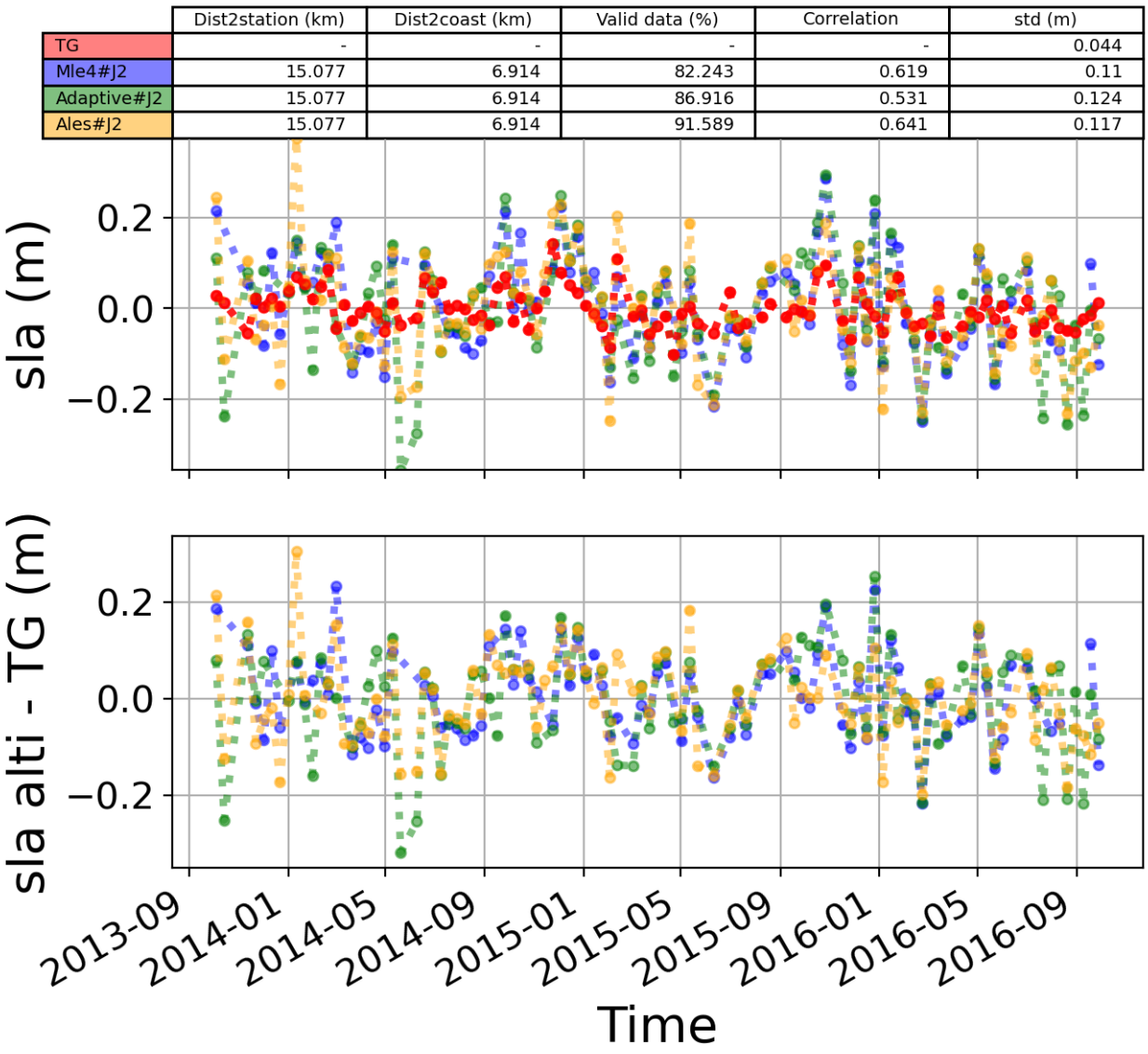

Figure 145 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.043
Mle4#J2	21.055	17.109	99.065	0.484	0.083
Adaptive#J2	21.055	17.109	91.589	0.546	0.095
Ales#J2	21.055	17.109	99.065	0.506	0.095

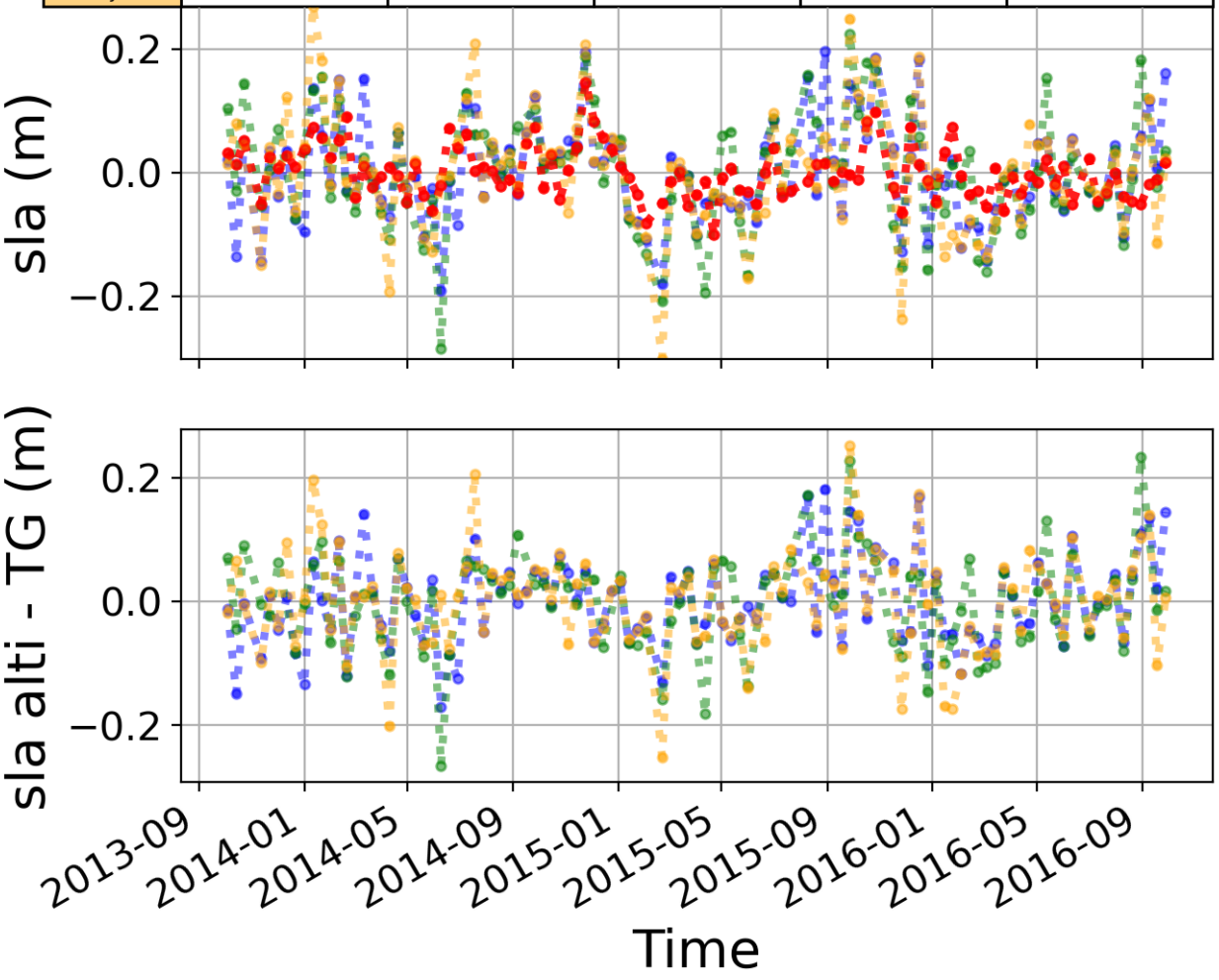

FIGURE 146 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.11 Station : FOS-SUR-MER

- Nearest track to FOS-SUR-MER station is the track number track187
- The area of interest is limited by :
  - A circle which it's center is the FOS-SUR-MER tide gauge station location and has a Raduis of 40 Km

6.11.1 correlation visualization in maps view % FOS-SUR-MER tide gauge

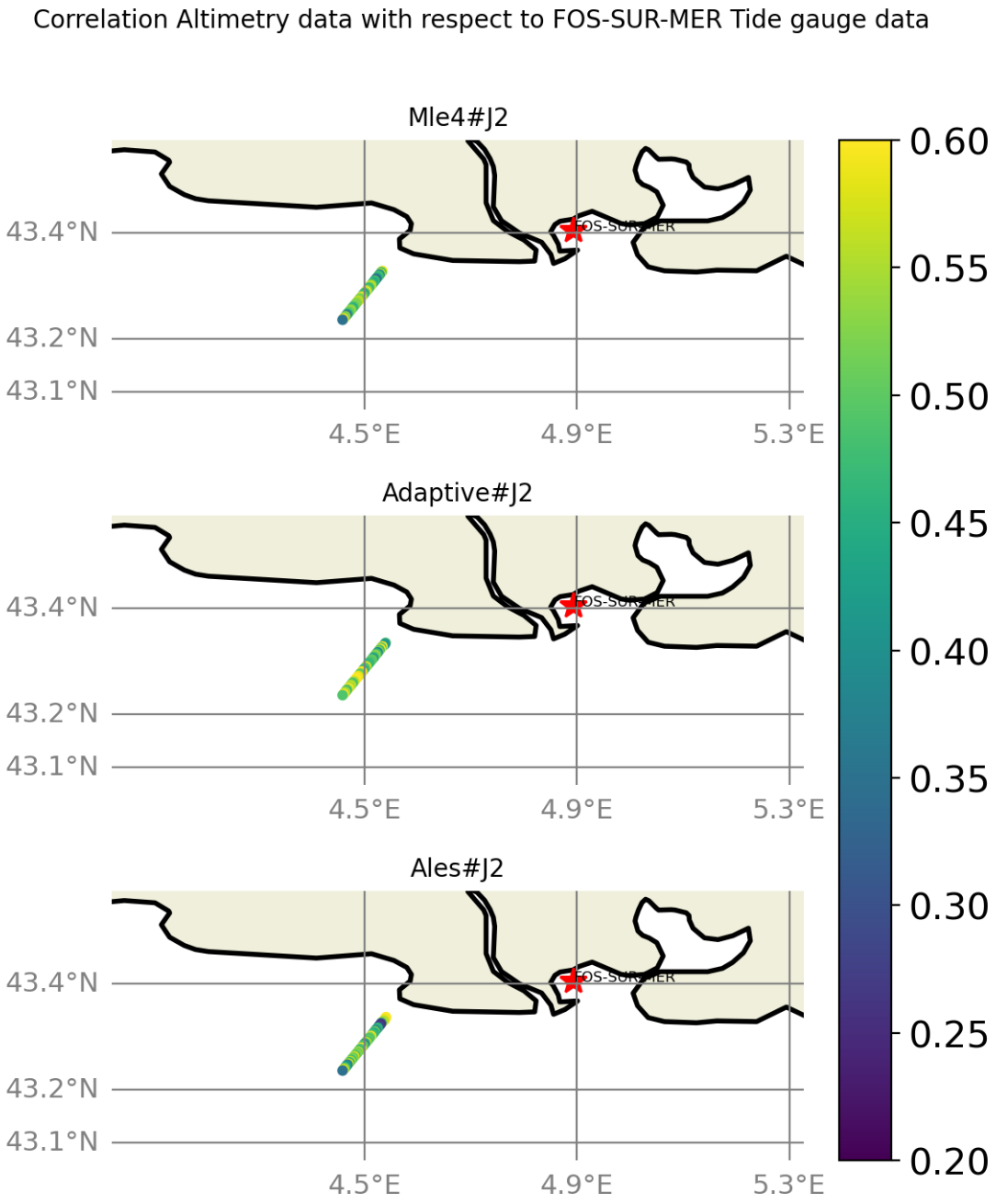

FIGURE 147 – correlation visualization in maps view % FOS-SUR-MER tide gauge

6.11.2 rmsd visualization in maps view % FOS-SUR-MER tide gauge

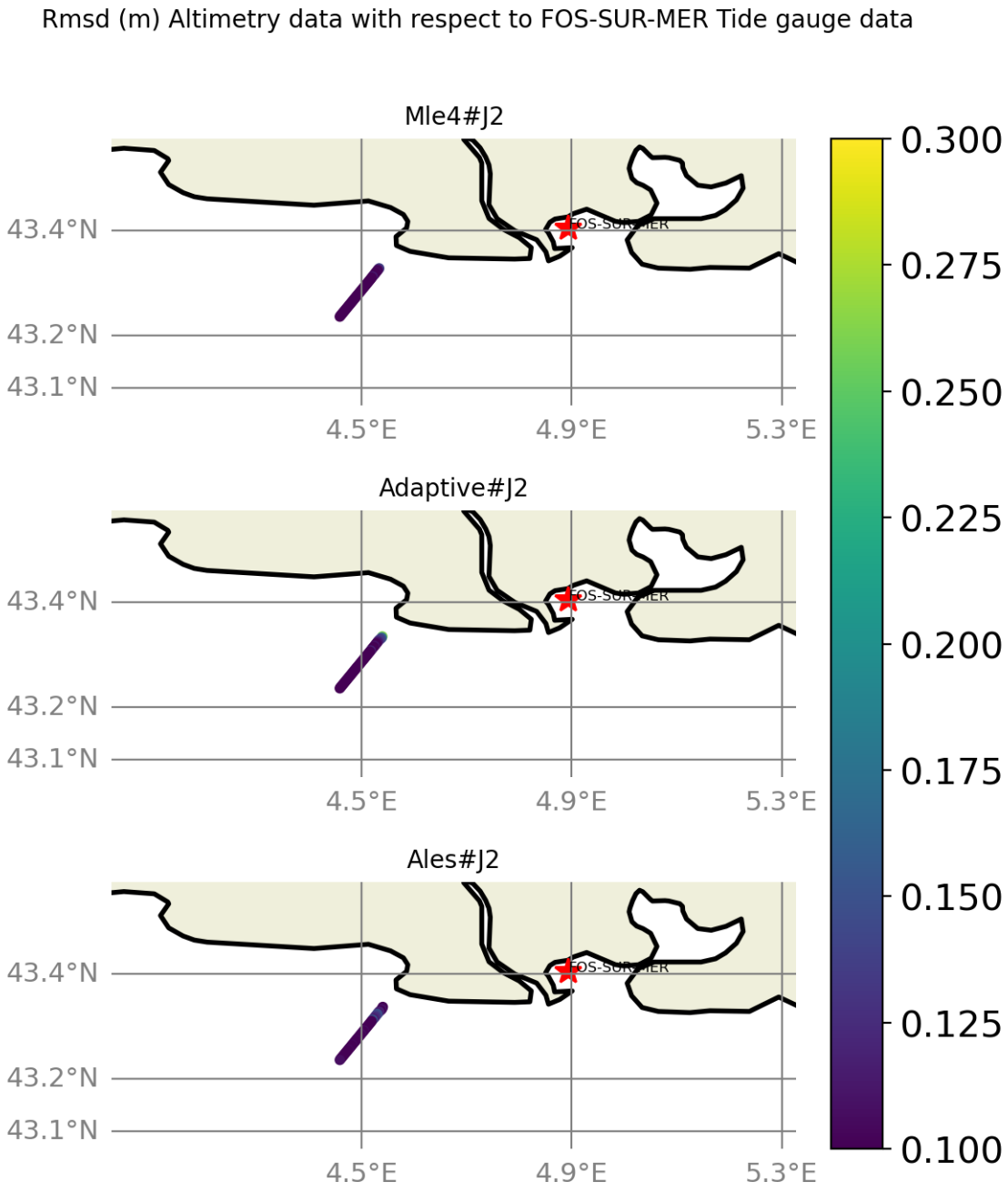

FIGURE 148 – rmsd visualization in maps view % FOS-SUR-MER tide gauge

6.11.3 std visualization in maps view % FOS-SUR-MER tide gauge

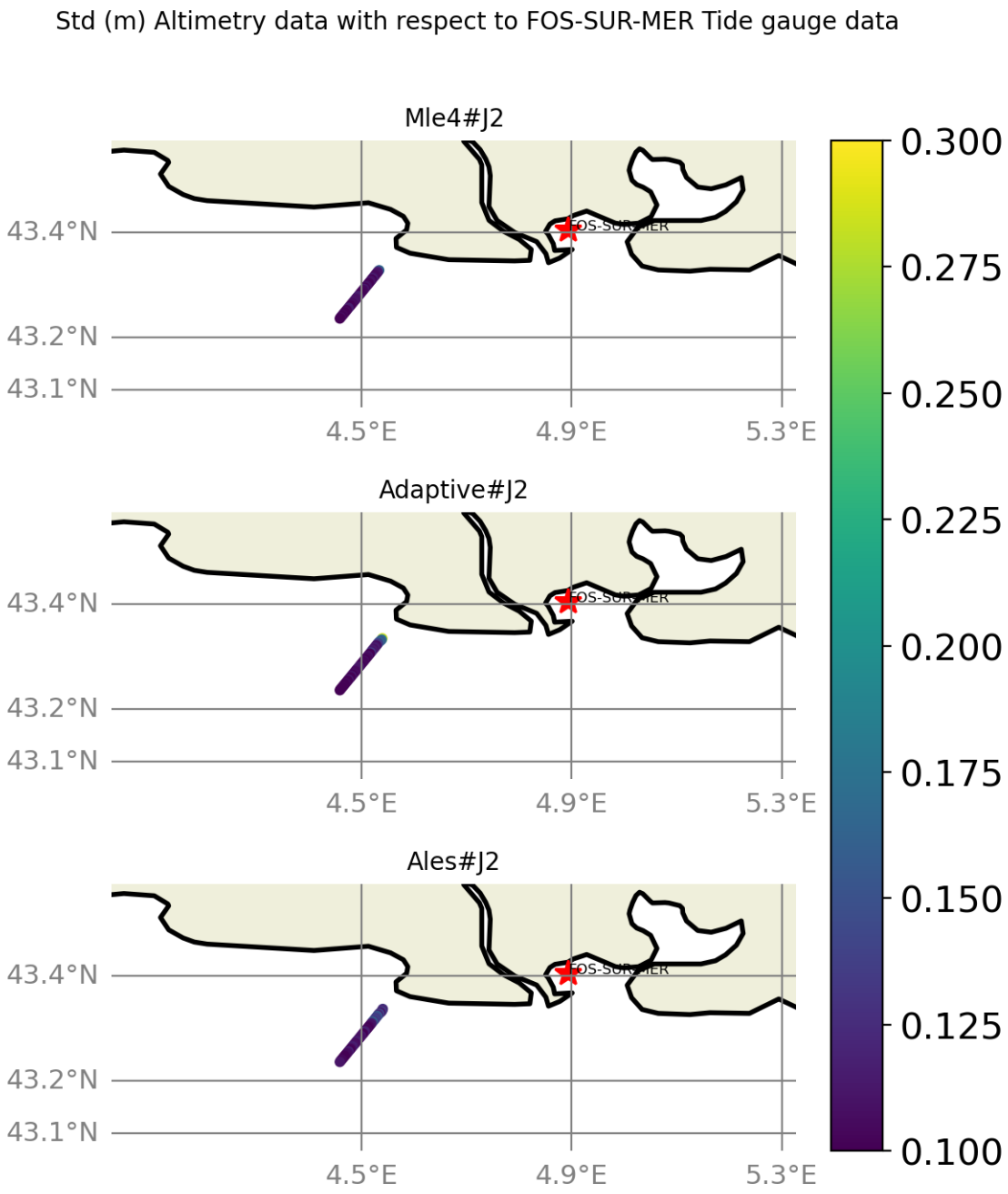

FIGURE 149 – std visualization in maps view % FOS-SUR-MER tide gauge

6.11.4 valid_data_percent visualization in maps view % FOS-SUR-MER tide gauge

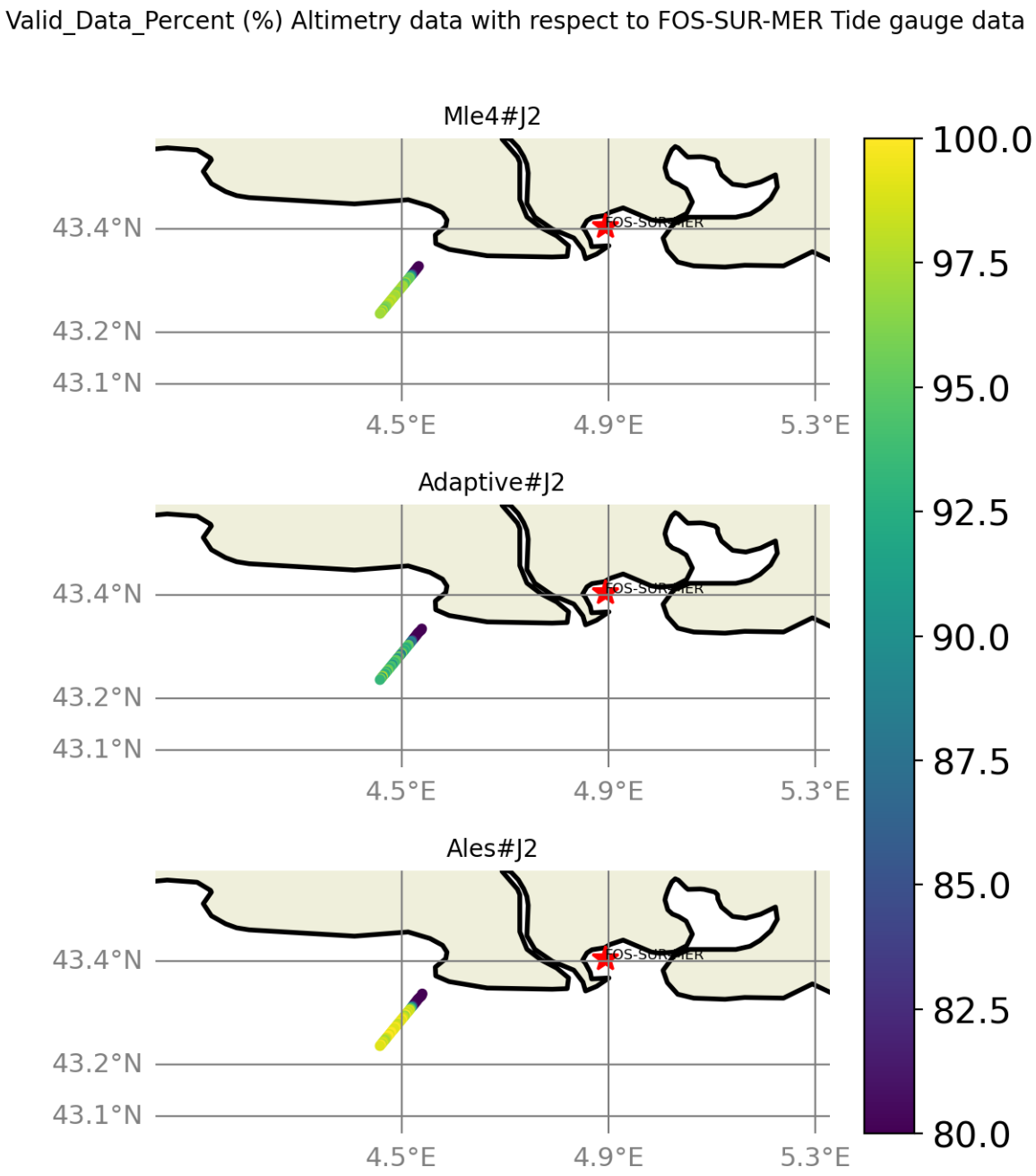

FIGURE 150 – valid_data_percent visualization in maps view % FOS-SUR-MER tide gauge

6.11.5 Valid data (%) in function of distance to coast/FOS-SUR-MER 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. $maxNB = 104$ 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.

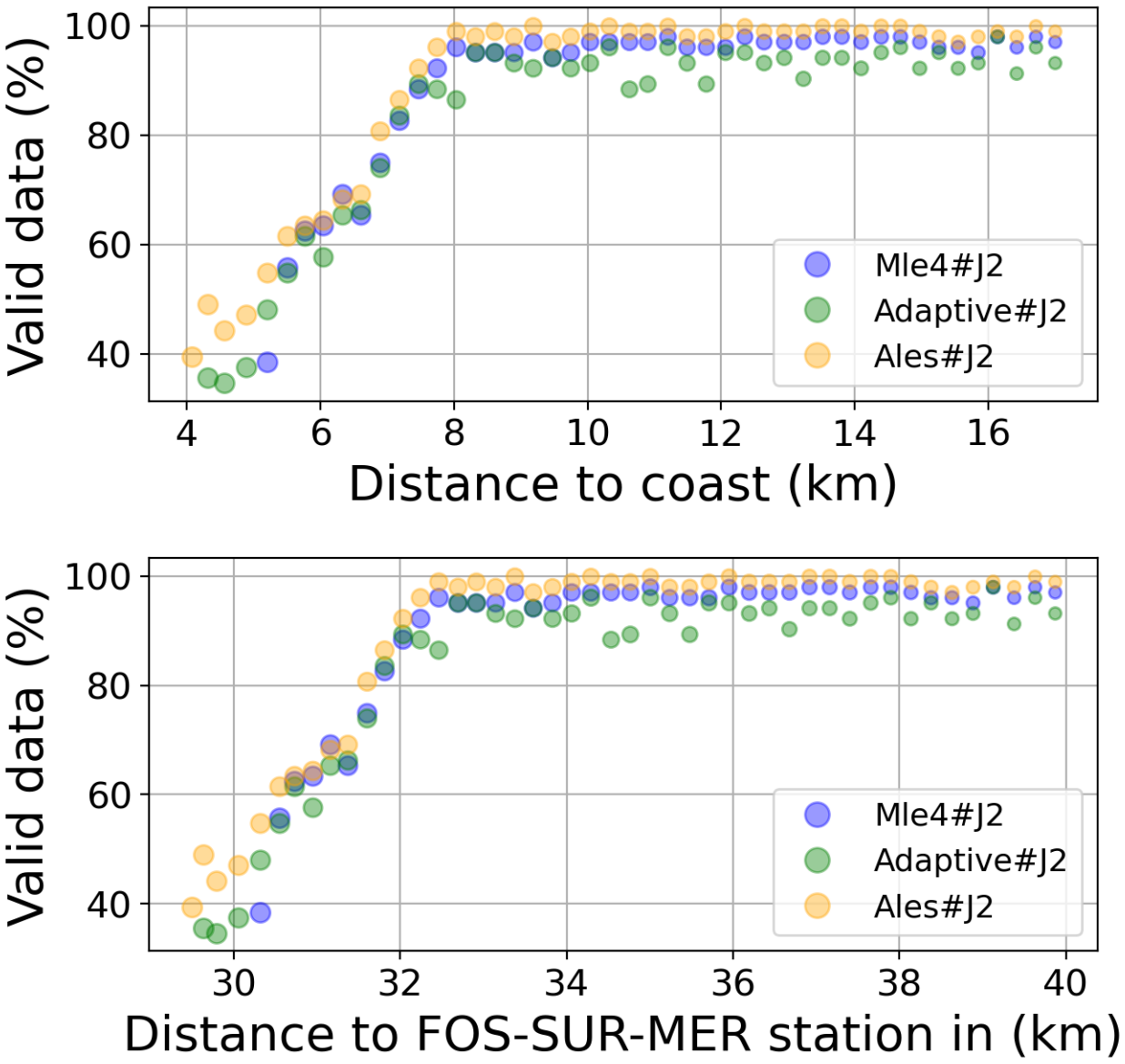

Figure 151 – Valid data (%) in function of distance to coast/FOS-SUR-MER station

6.11.6 Std in function of distance to coast/FOS-SUR-MER station

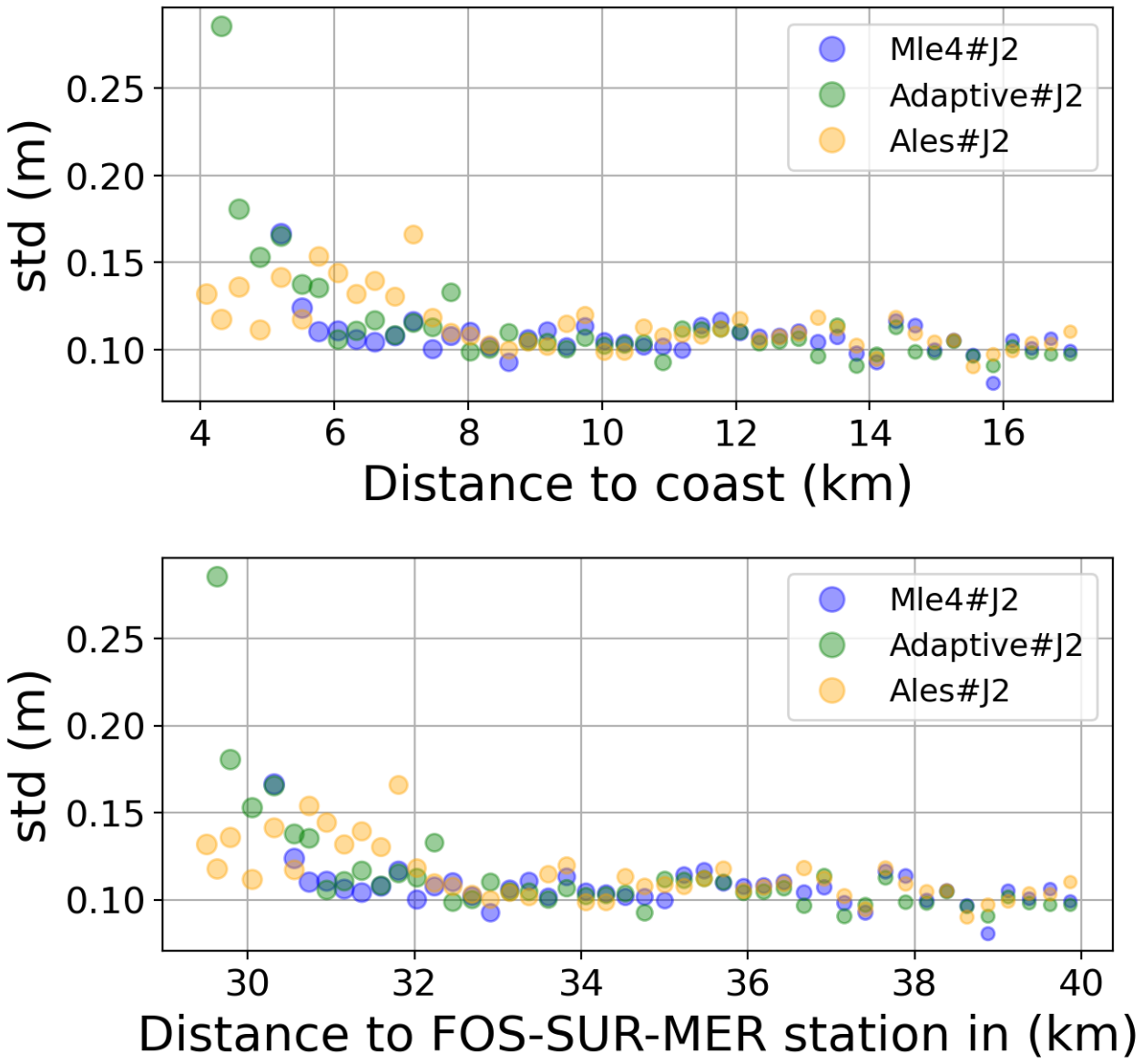

FIGURE 152 – Std in function of the distance to the coast/FOS-SUR-MER station

6.11.7 Correlation in function of distance to coast/FOS-SUR-MER station

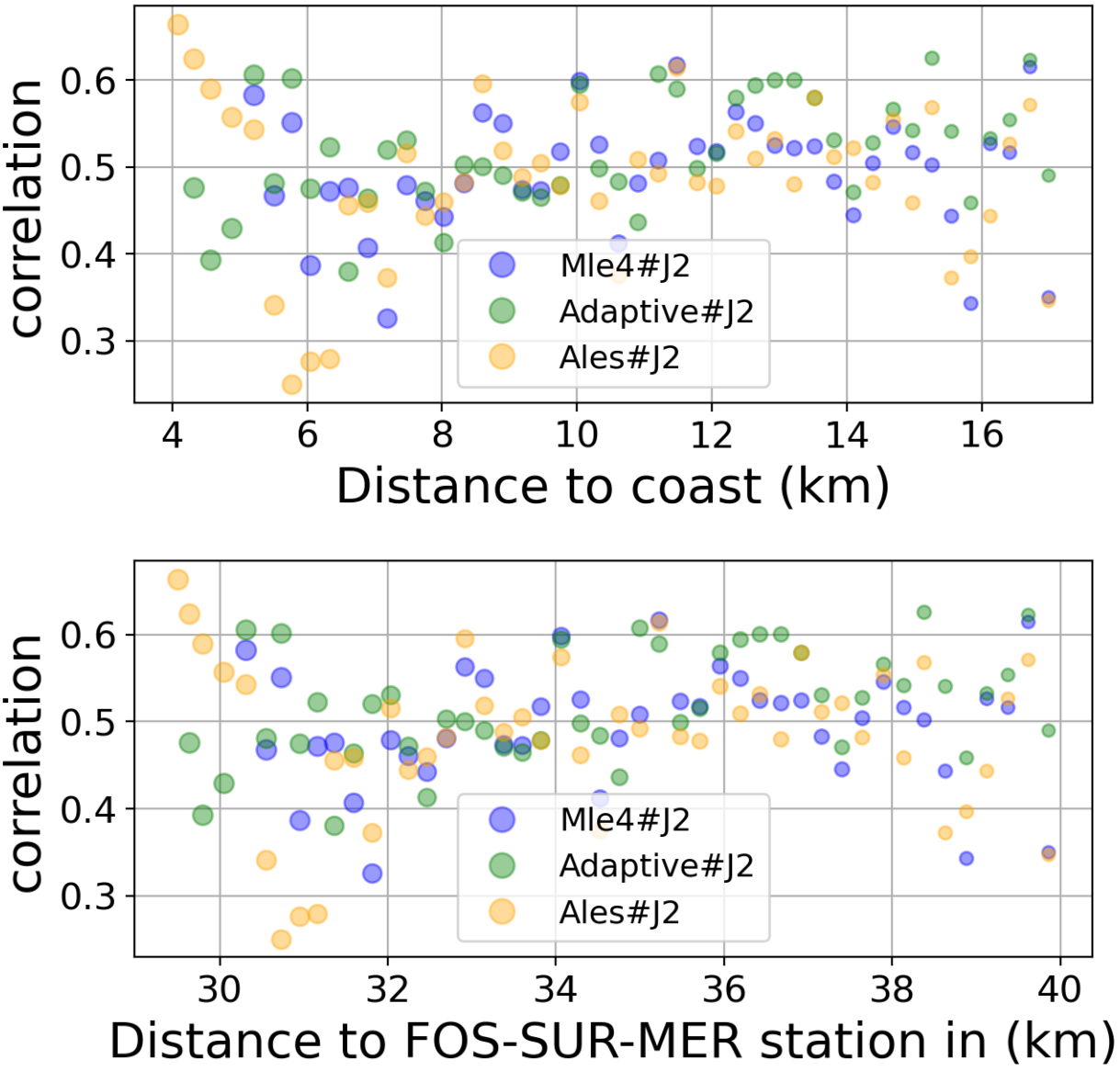

FIGURE 153 – Correlation in function of the distance to the coast/FOS-SUR-MER station

6.11.8 Taylor Diagram

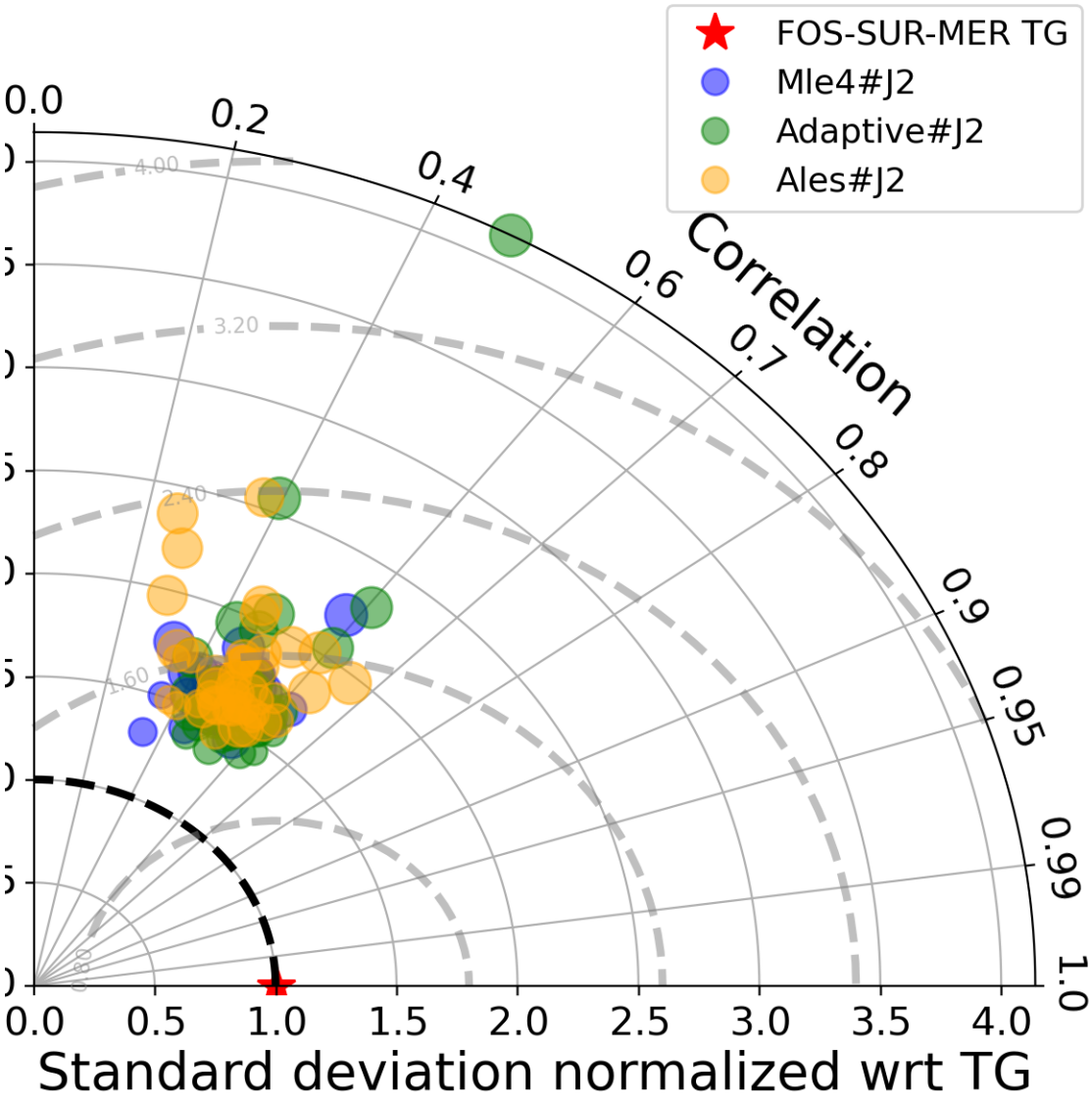

Figure 154 – Taylor diagram

6.11.9 Mean statistics table of products comparison with FOS-SUR-MER 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#J2	90.224	0.495	0.107	0.094
Adaptive#J2	87.546	0.524	0.108	0.093
Ales#J2	92.949	0.473	0.114	0.101

FIGURE 155 – Mean statistics table of the common points in the altimetry products

6.11.10 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 104 point.

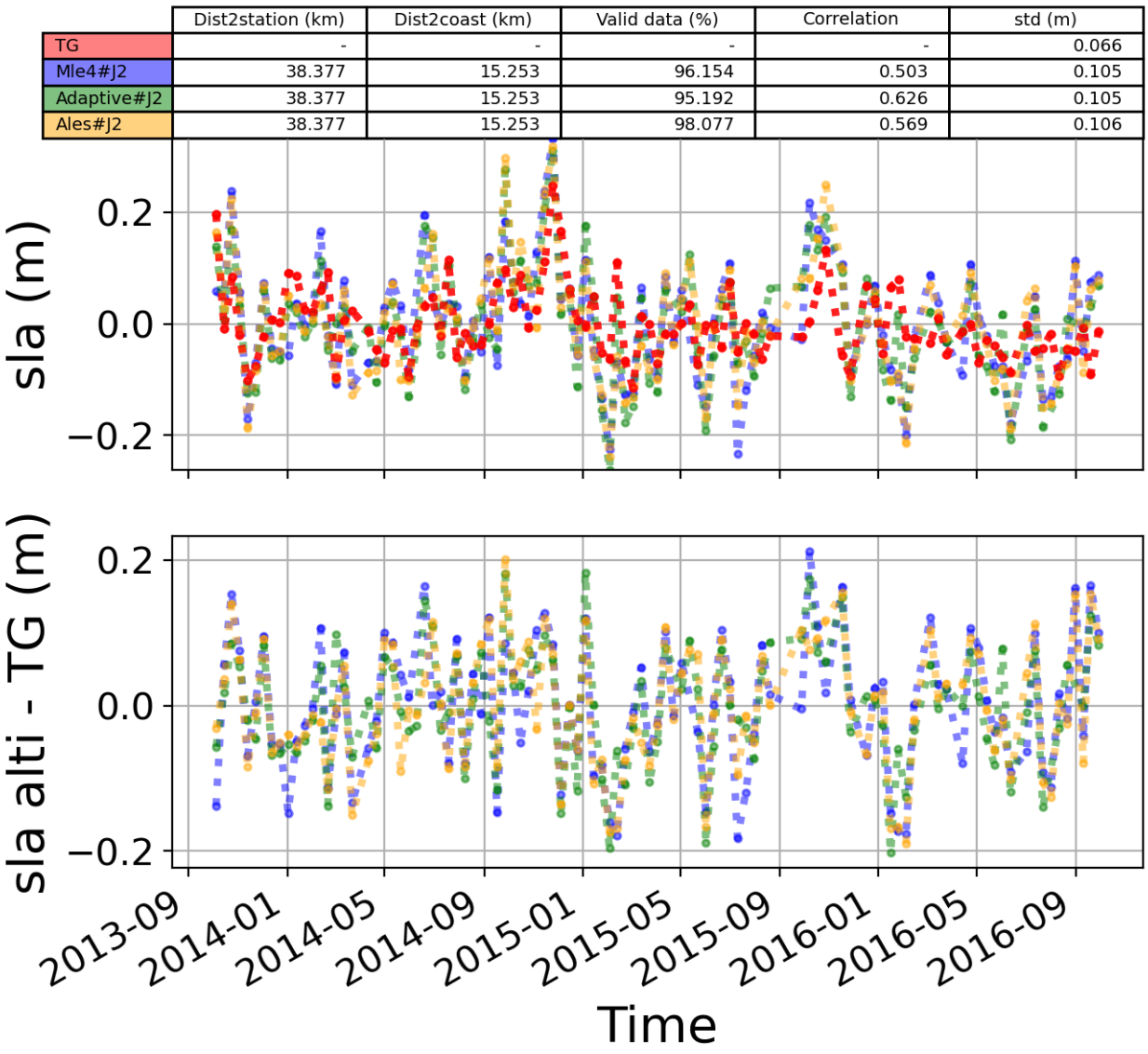

FIGURE 156 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

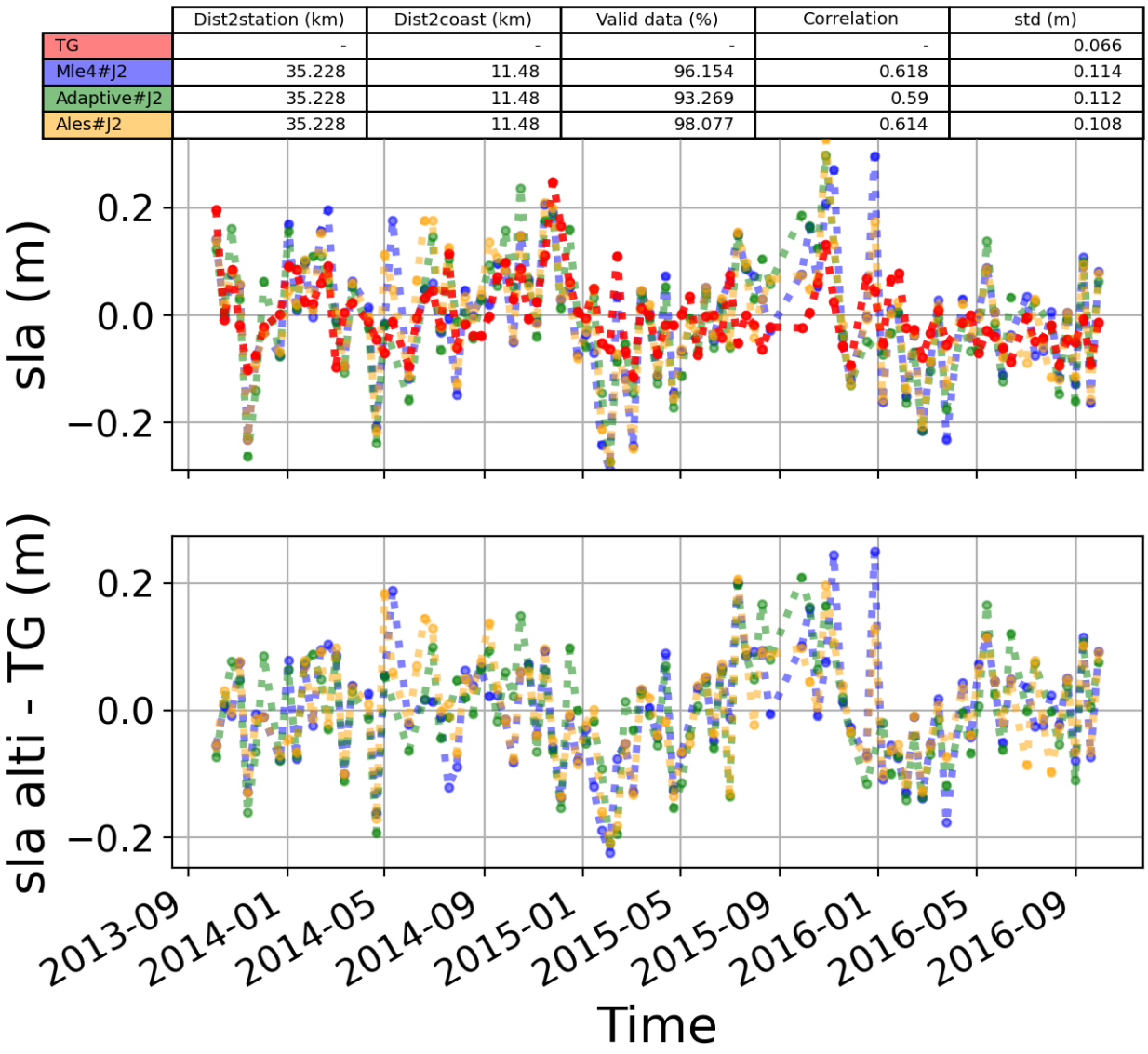

Figure 157 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie