

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.ALT.PO.E_GDR_E -
RANGE.ALT -
MEAN_SEA_SURFACE.MODEL.CNESCLS15 -
SEA_STATE_BIAS.ALT.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.ALT.PO.E_GDR_E -
RANGE.ALT.RTK_ADAPTIVE -
0.18092 -
MEAN_SEA_SURFACE.MODEL.CNESCLS15 -
SEA_STATE_BIAS.ALT.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.ALT.PO.E_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 satellite 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 threshold of 1 m.
- Each sla time-serie has been filtered 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

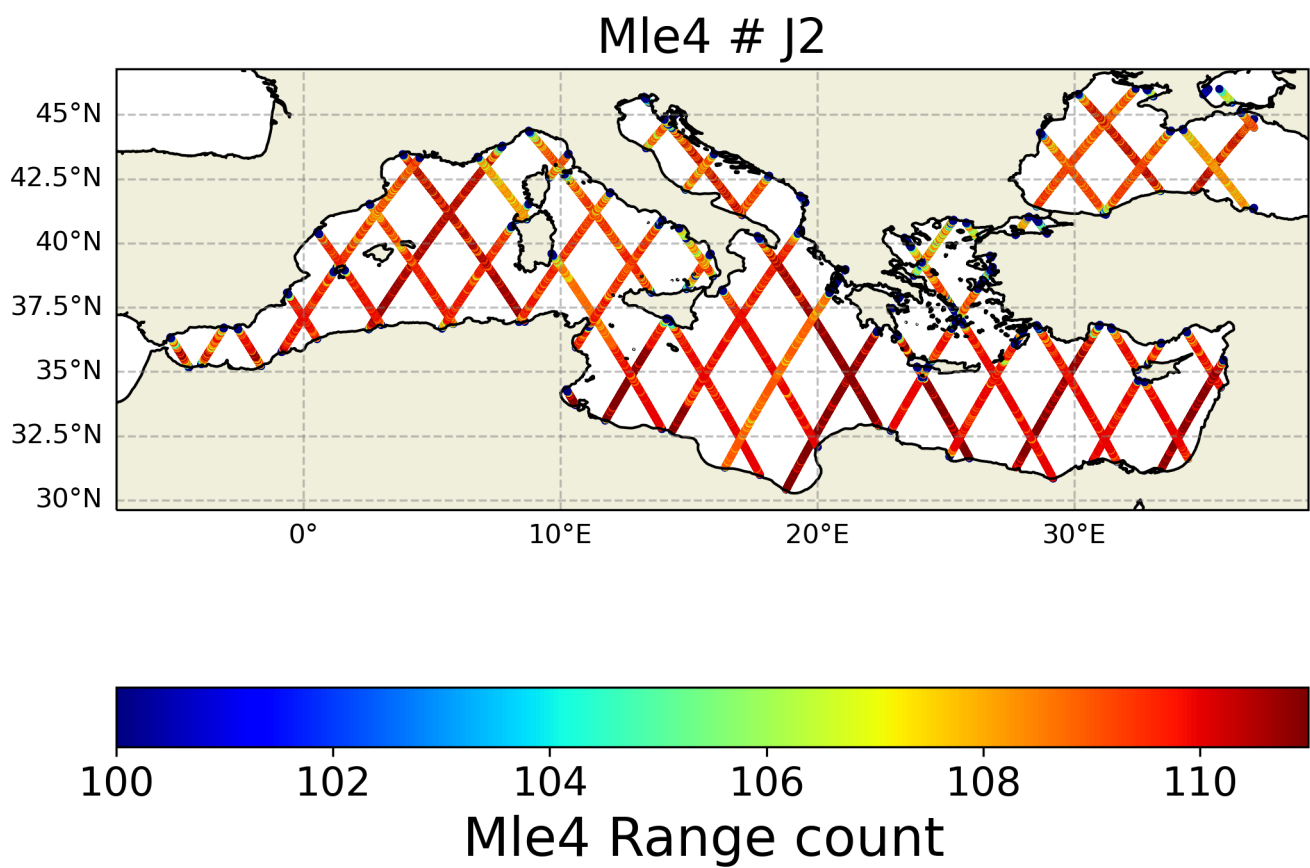


FIGURE 1 – Spatial coherence analysis of the count of the Mle4 version of Range variable

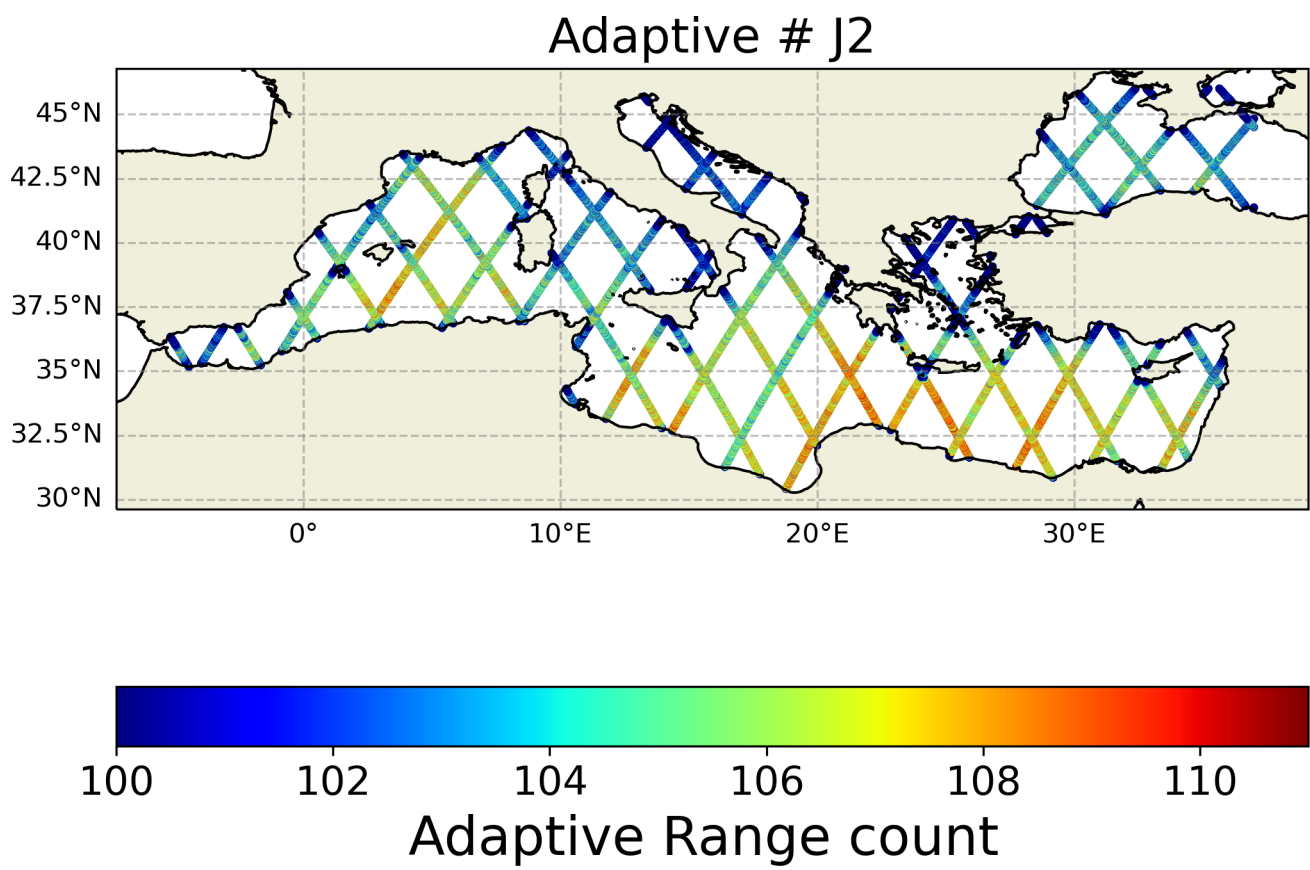


FIGURE 2 – Spatial coherence analysis of the count of the Adaptive version of Range variable

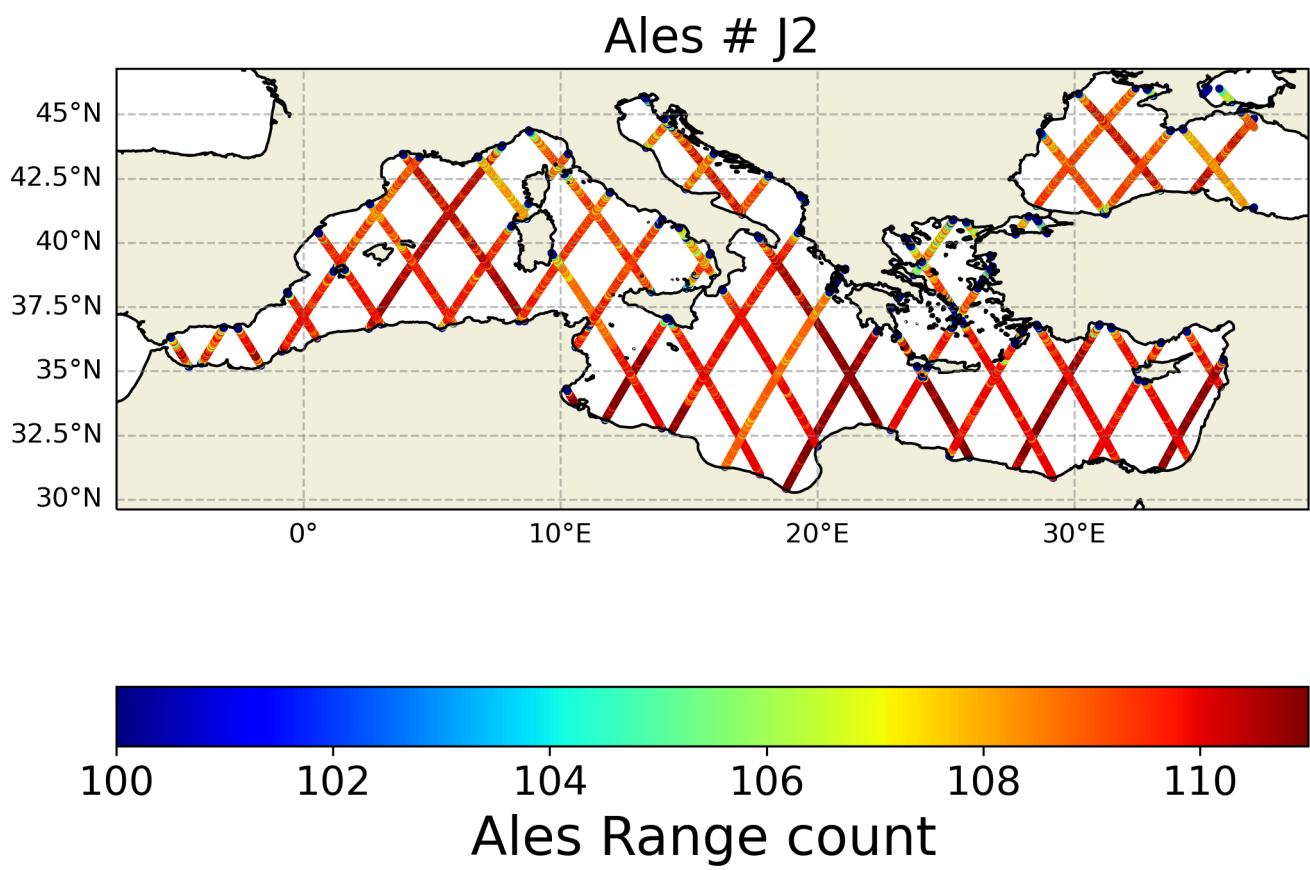


FIGURE 3 – Spatial coherence analysis of the count of the Ales version of Range variable

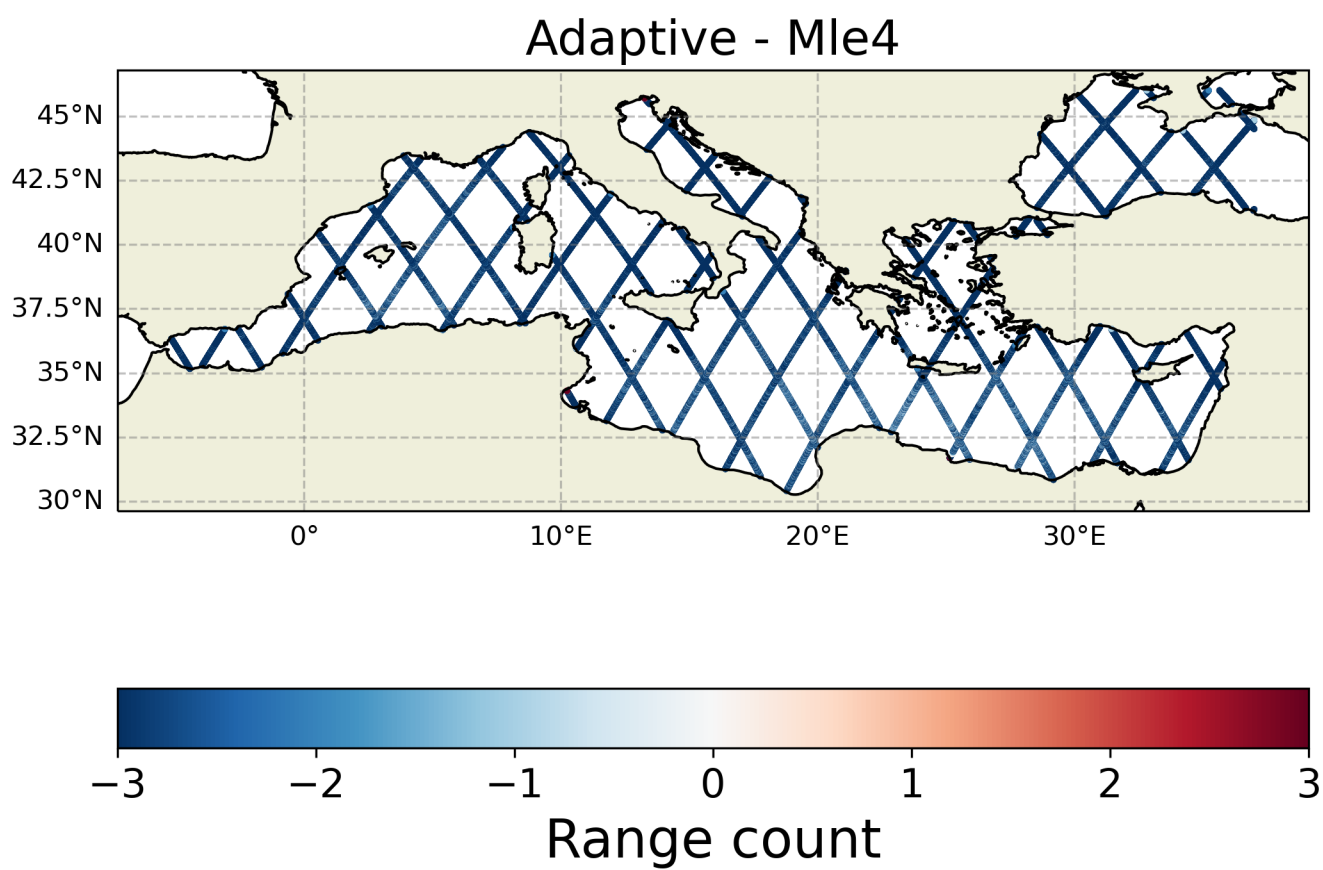


FIGURE 4 – Spatial coherence analysis of the Difference in Range 's count between Adaptive and Mle4

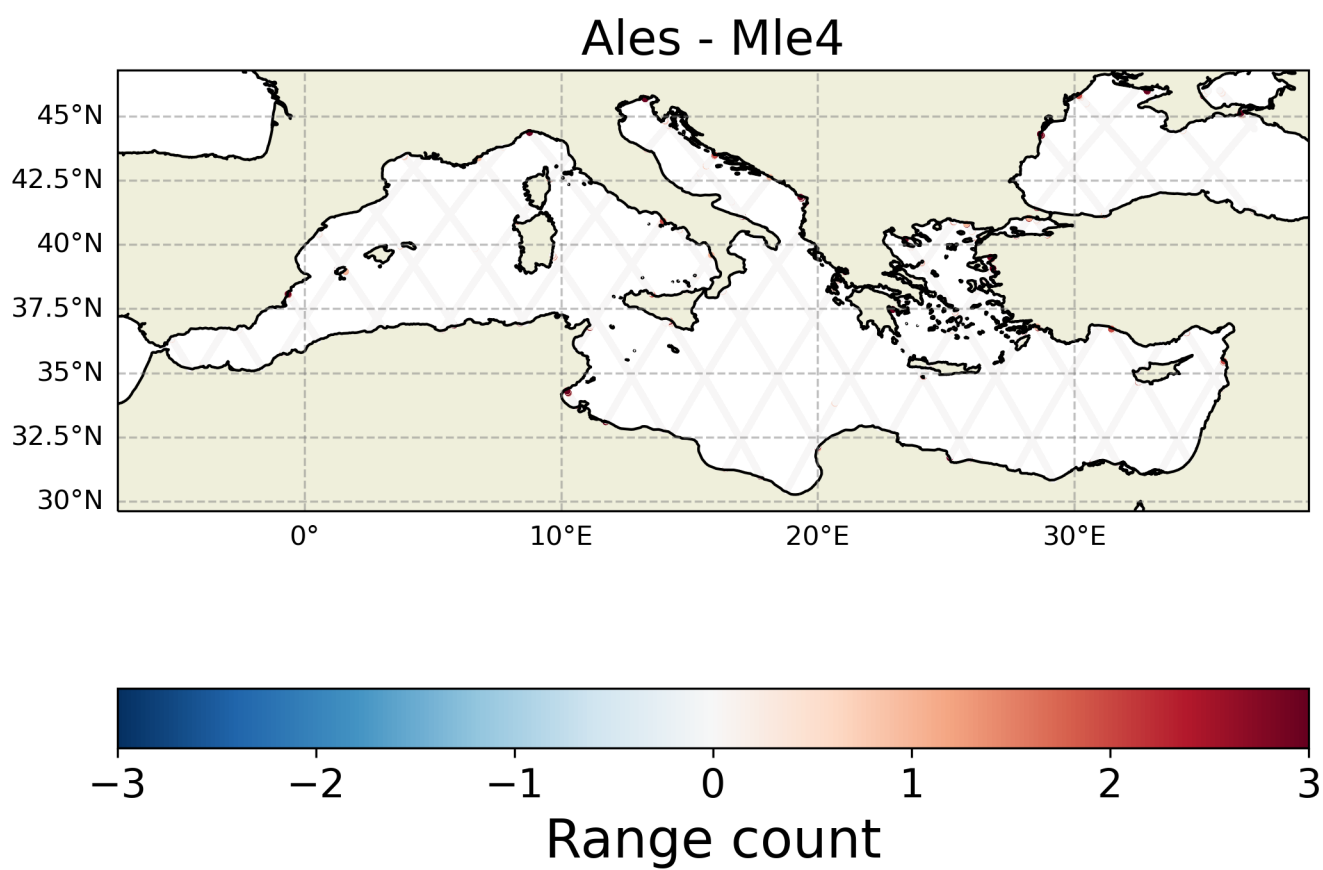


FIGURE 5 – Spatial coherence analysis of the Difference in Range 's count between Ales and Mle4

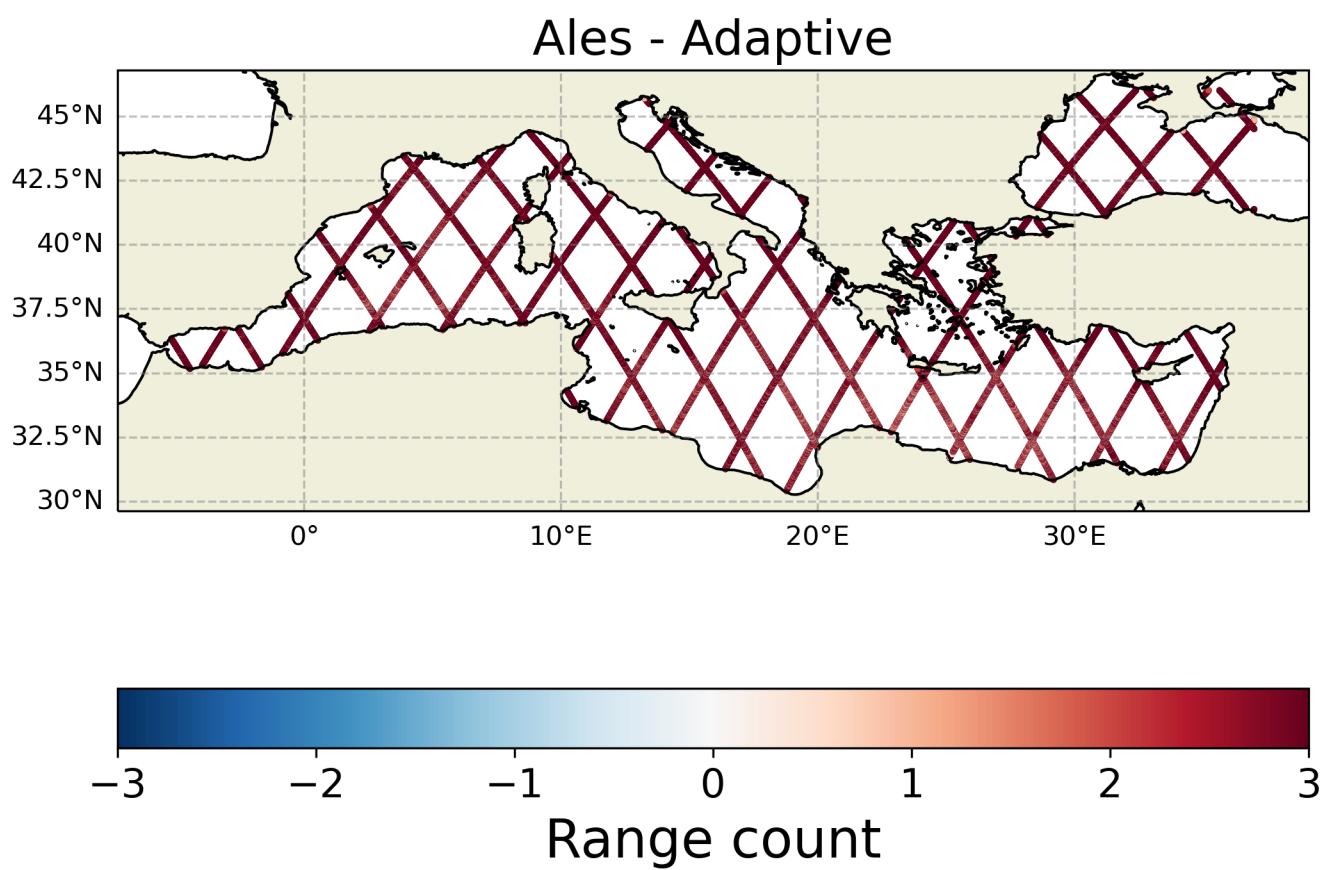


FIGURE 6 – Spatial coherence analysis of the Difference in Range 's count between Ales and Adaptive

3.2 sla

3.2.1 sla's count

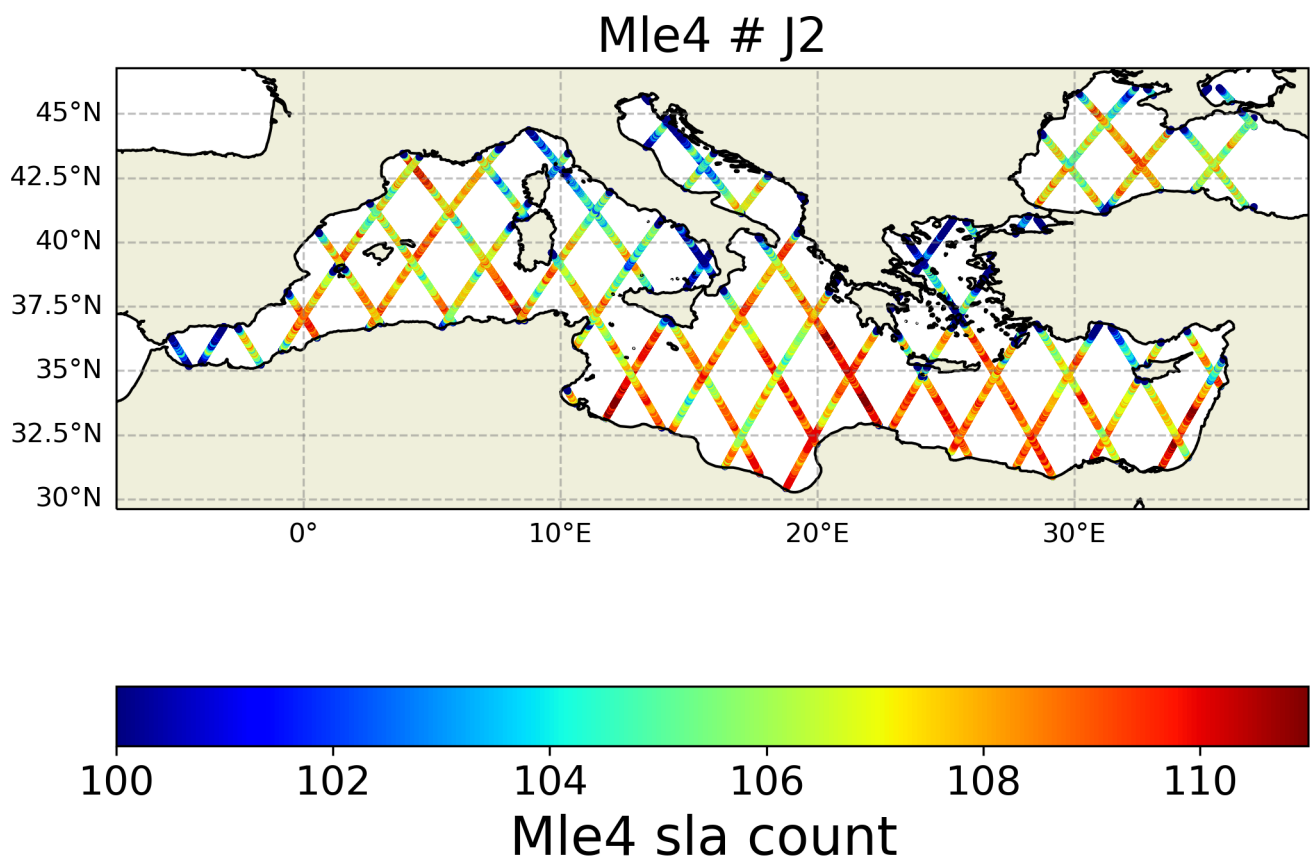


FIGURE 7 – Spatial coherence analysis of the count of the Mle4 version of sla variable

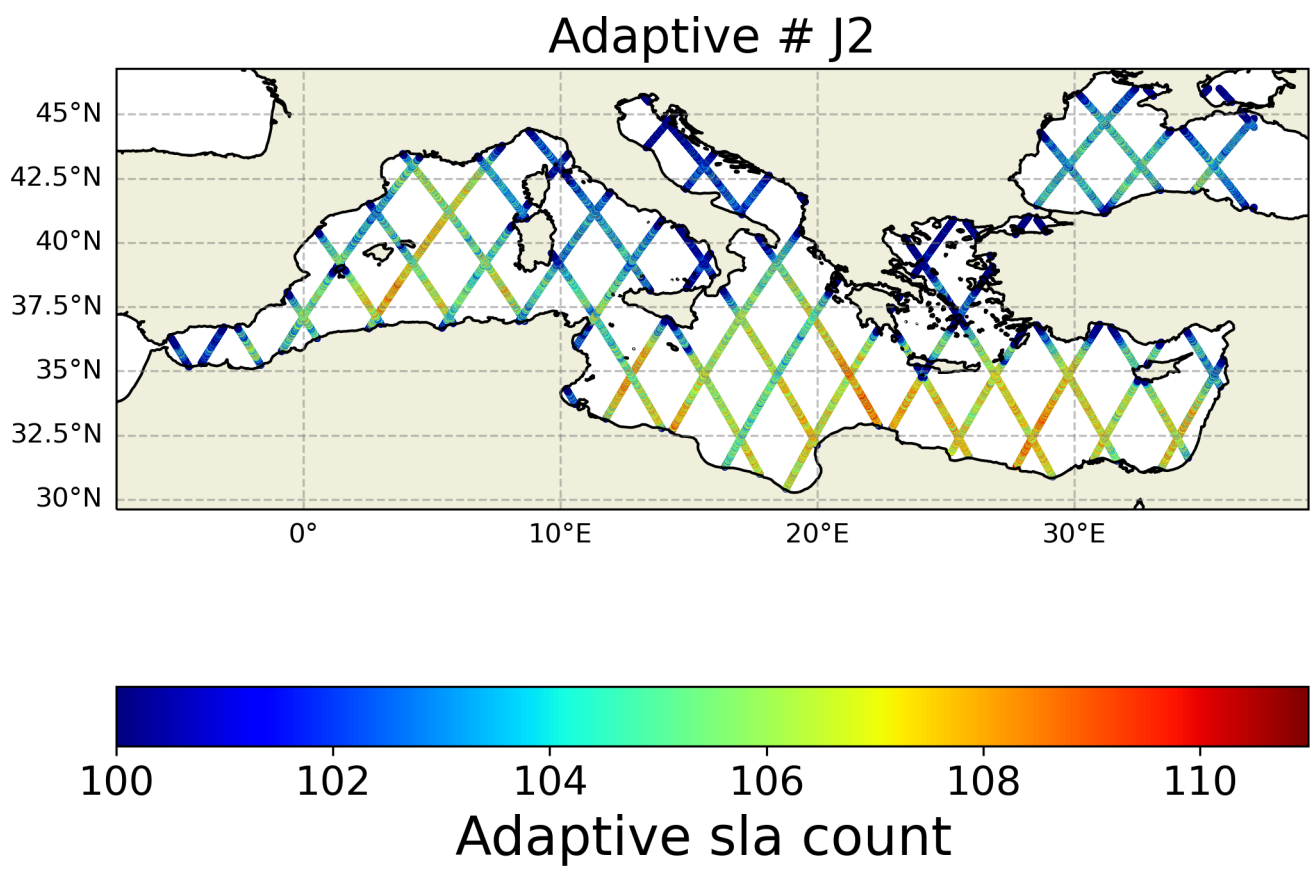


FIGURE 8 – Spatial coherence analysis of the count of the Adaptive version of sla variable

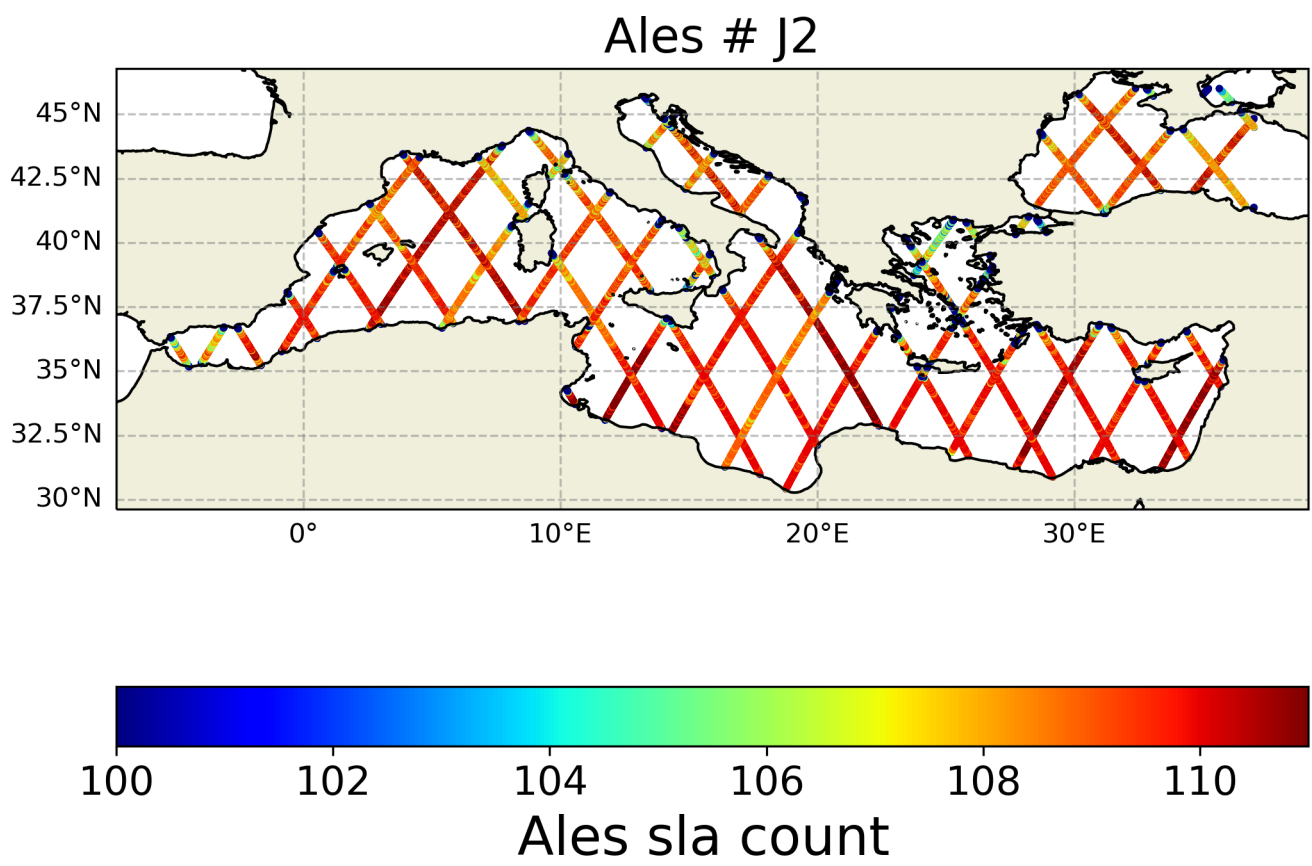


FIGURE 9 – Spatial coherence analysis of the count of the Ales version of sla variable

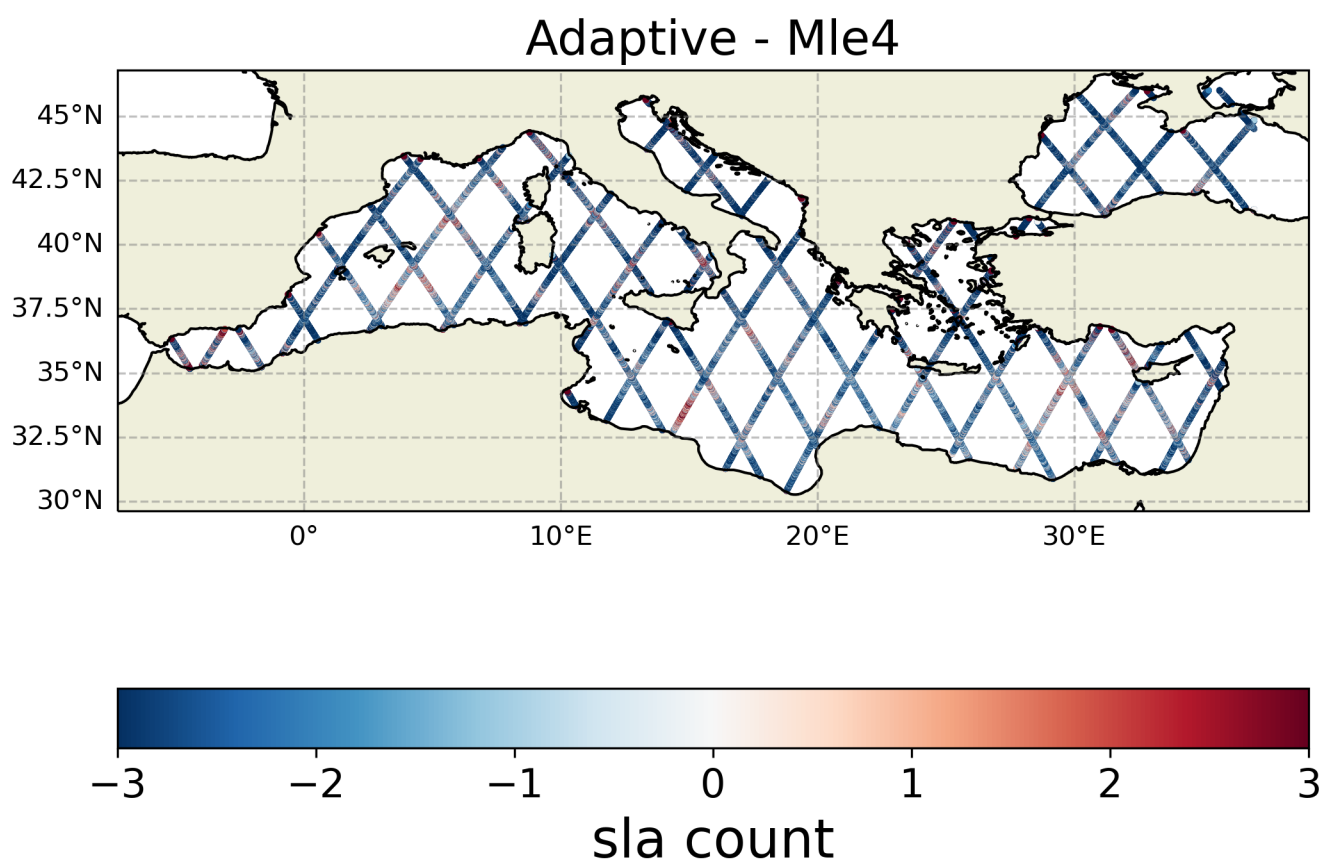


FIGURE 10 – Spatial coherence analysis of the Difference in sla 's count between Adaptive and Mle4

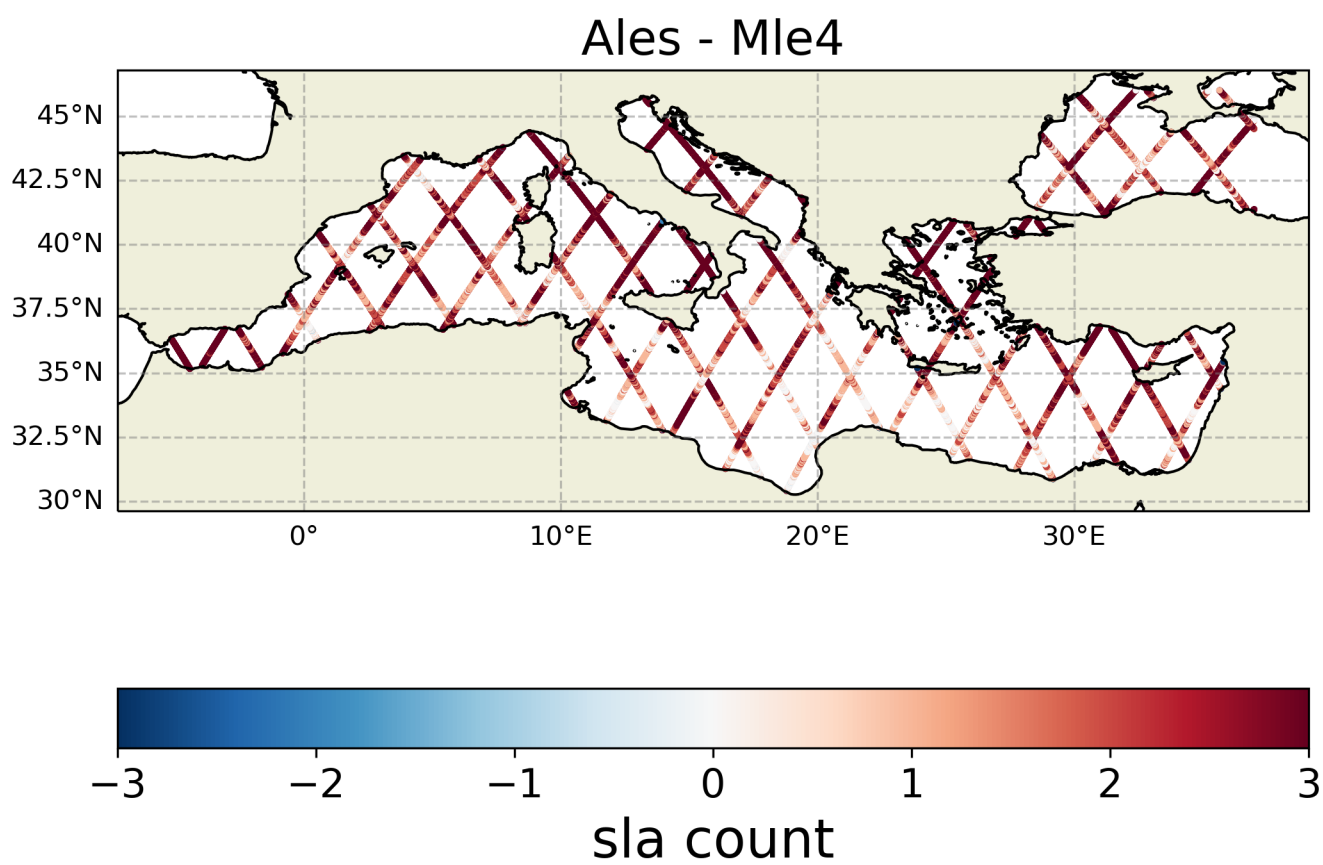


FIGURE 11 – Spatial coherence analysis of the Difference in sla 's count between Ales and Mle4

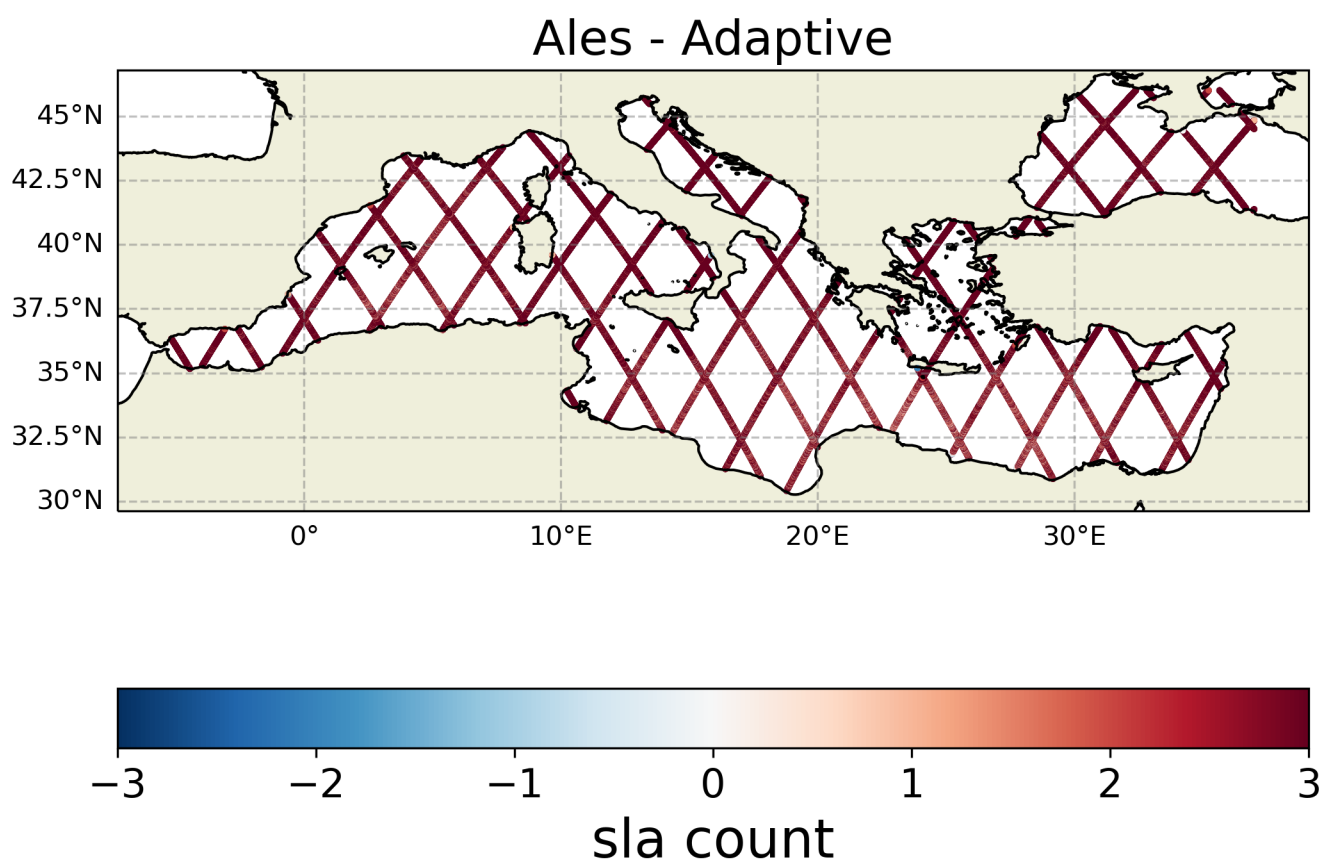


FIGURE 12 – Spatial coherence analysis of the Difference in sla 's count between Ales and Adaptive

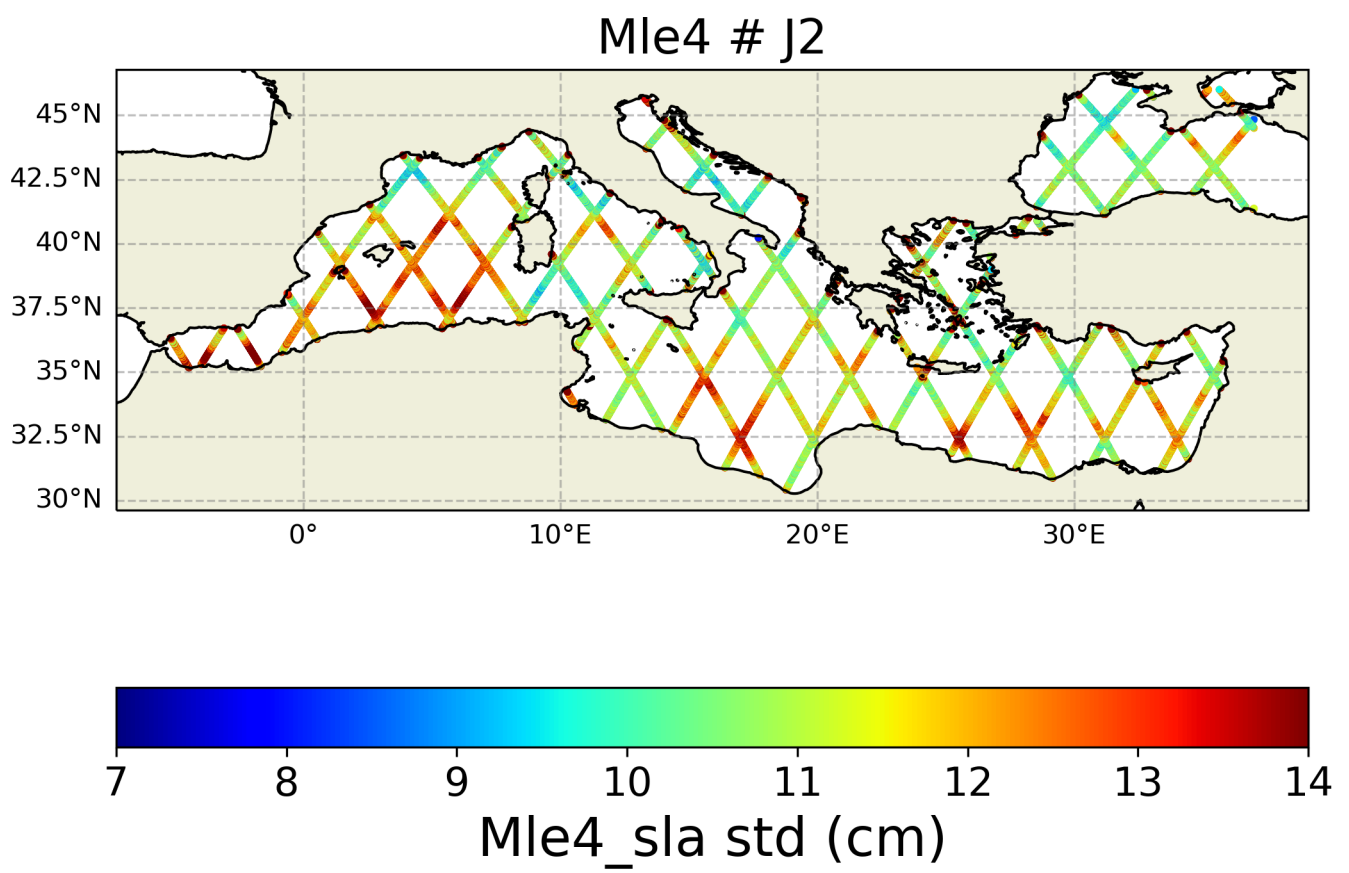


FIGURE 13 – Spatial coherence analysis of the std of the Mle4 version of sla variable

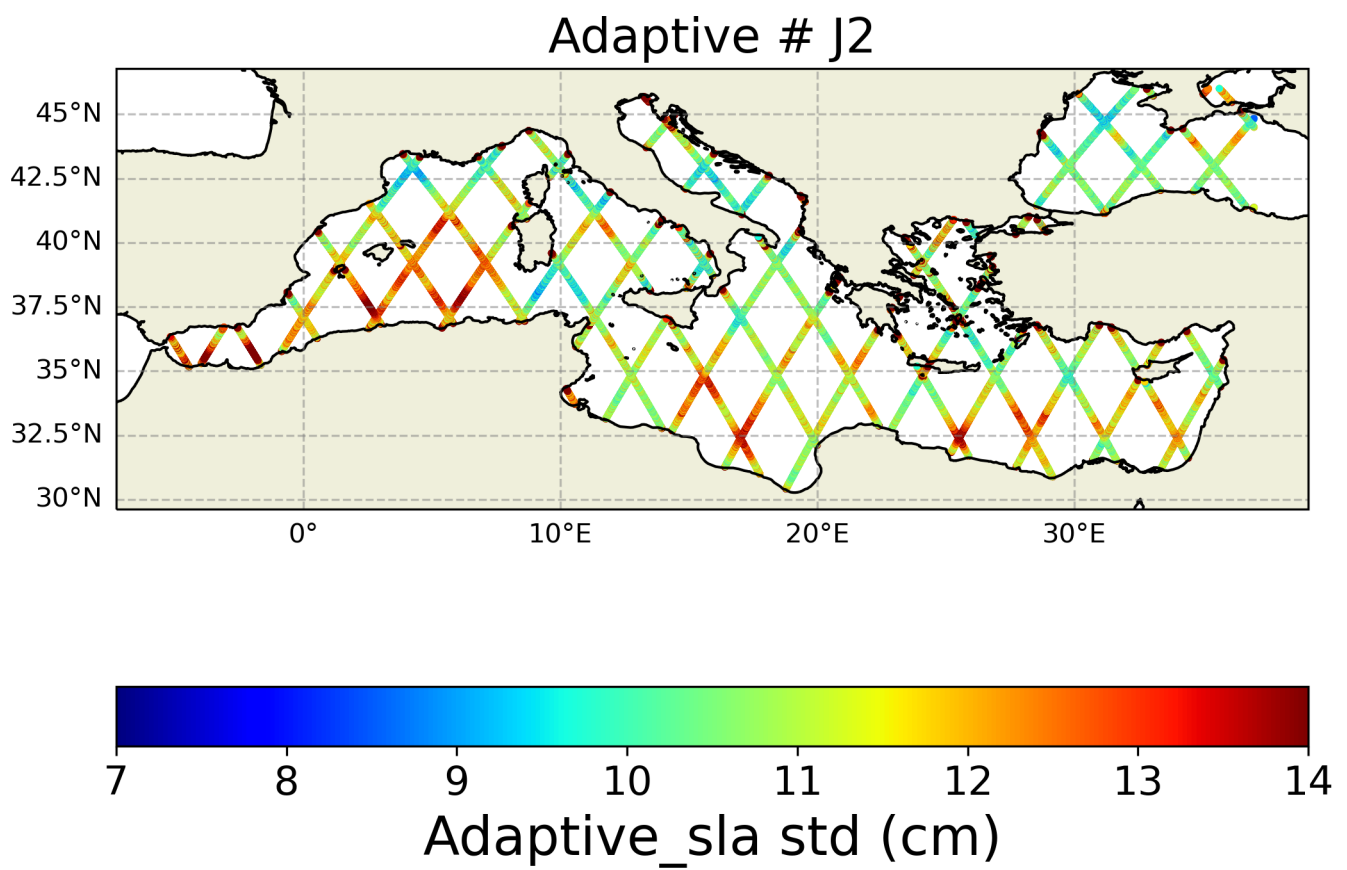


FIGURE 14 – Spatial coherence analysis of the std of the Adaptive version of sla variable

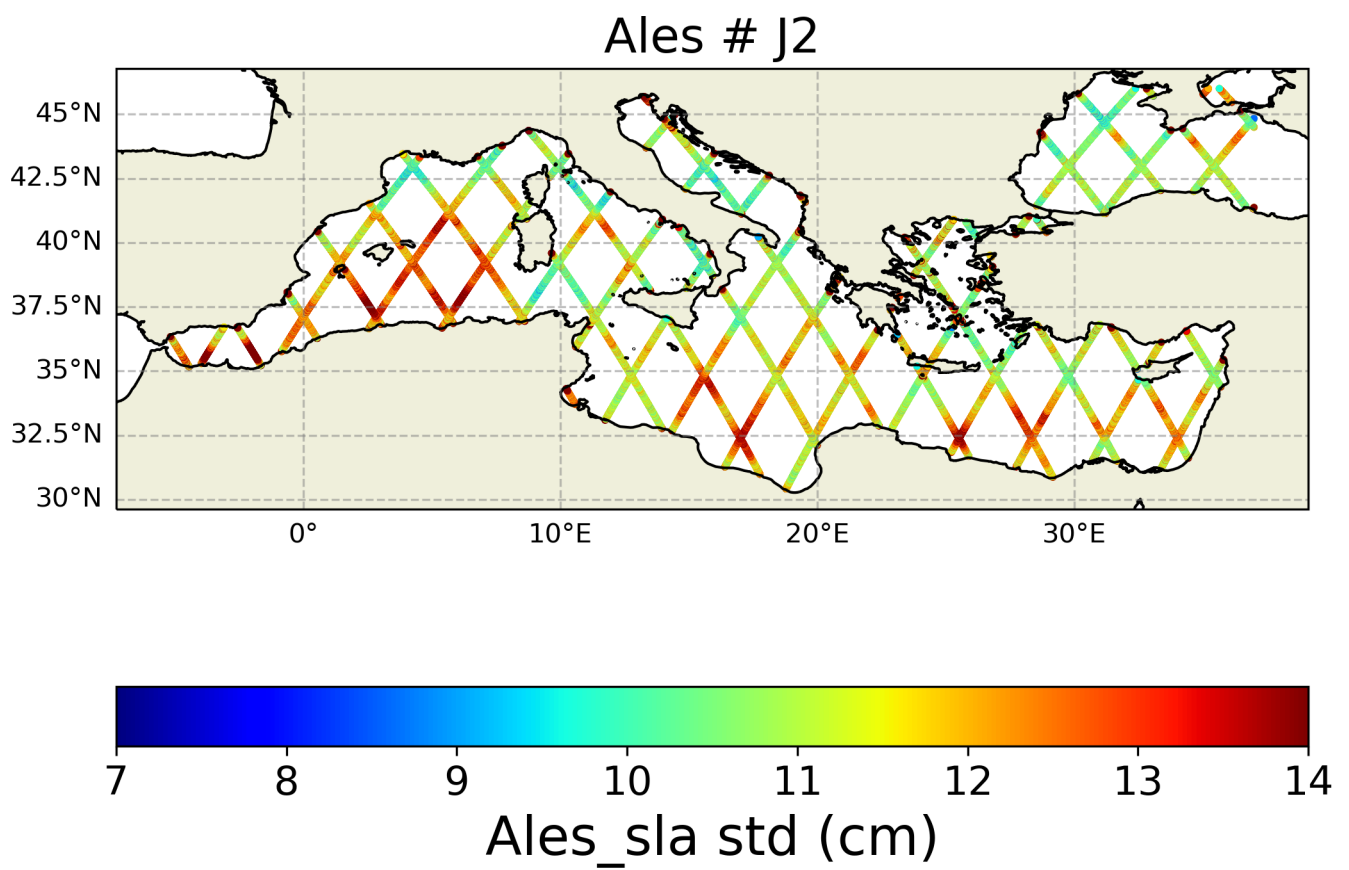


FIGURE 15 – Spatial coherence analysis of the std of the Ales version of sla variable

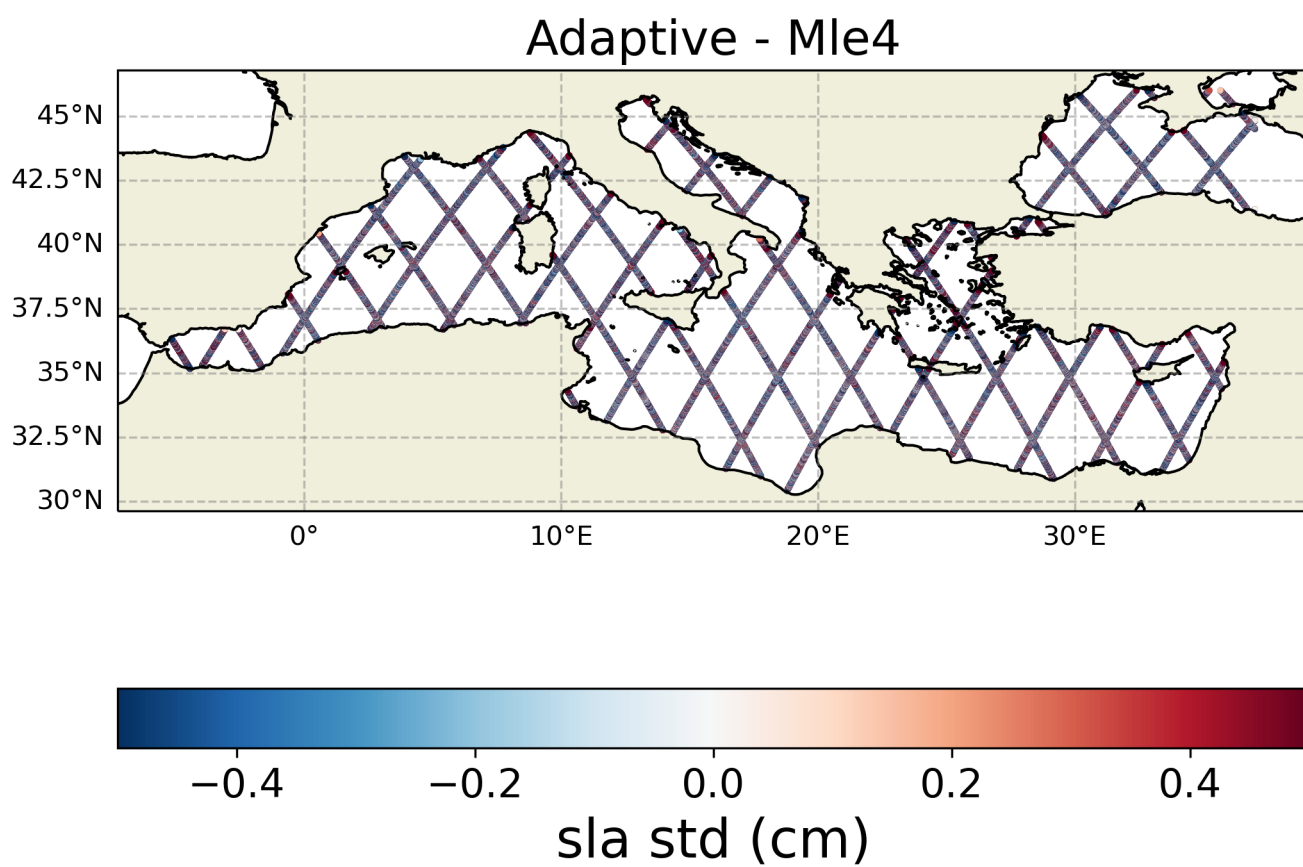


FIGURE 16 – Spatial coherence analysis of the Difference in sla 's std between Adaptive and Mle4

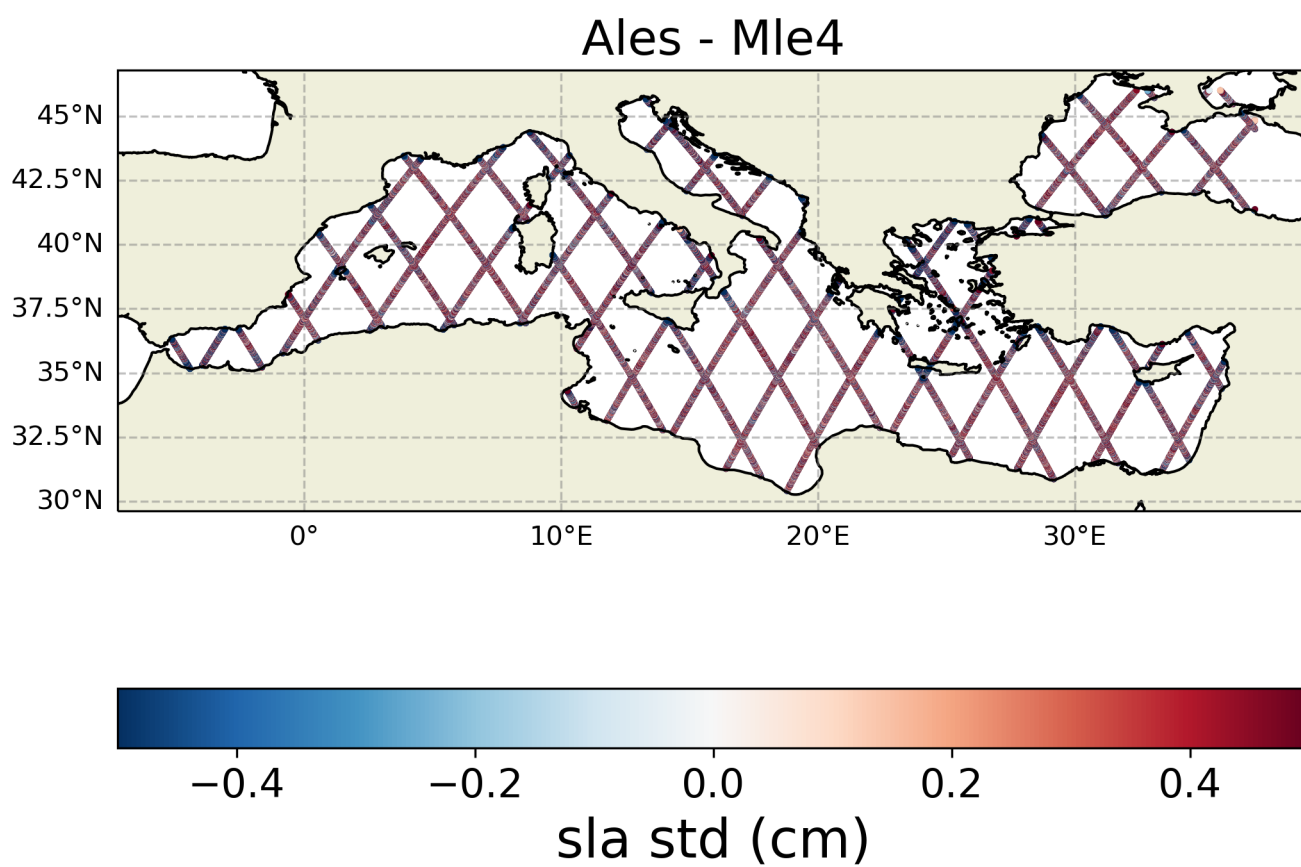


FIGURE 17 – Spatial coherence analysis of the Difference in sla 's std between Ales and Mle4

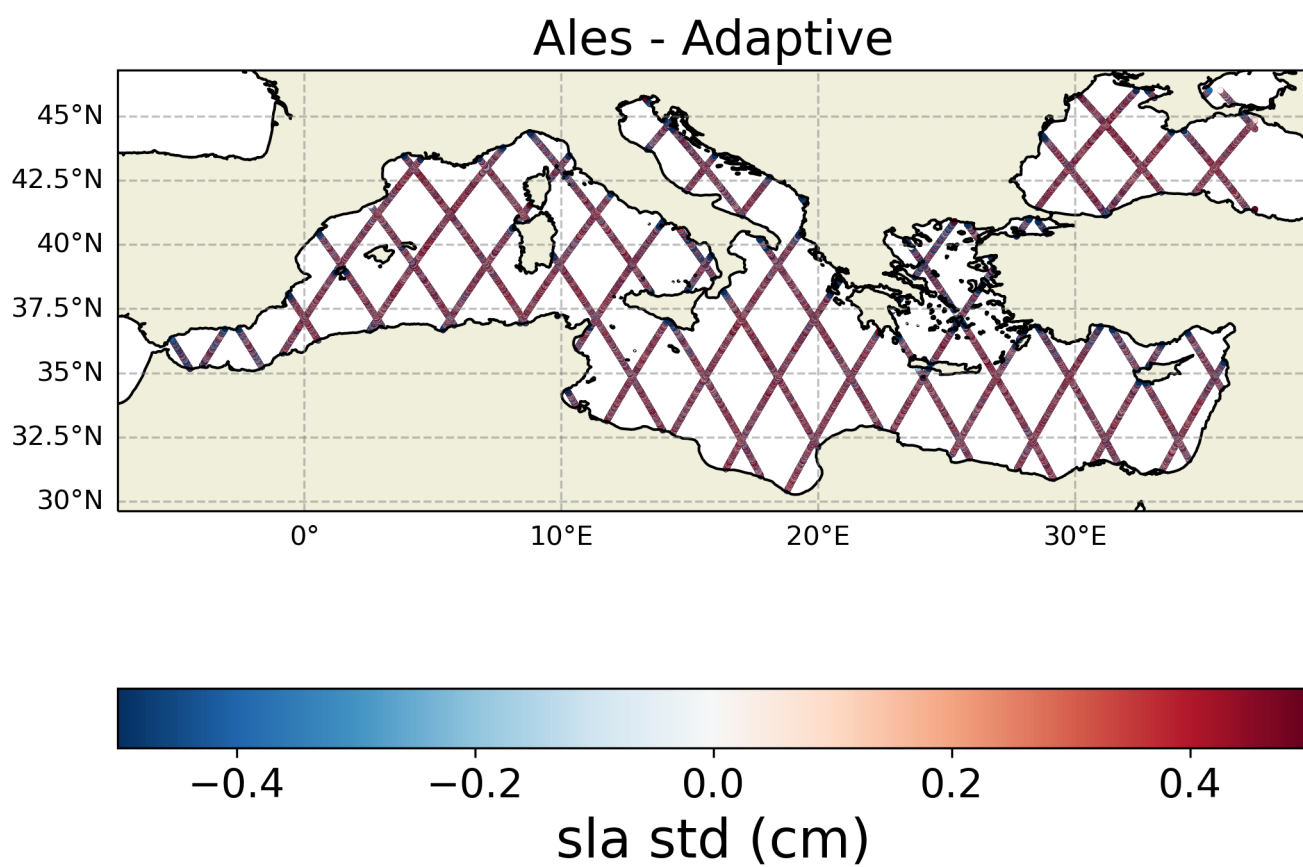


FIGURE 18 – Spatial coherence analysis of the Difference in sla 's std between Ales and Adaptive

3.2.3 sla's mean

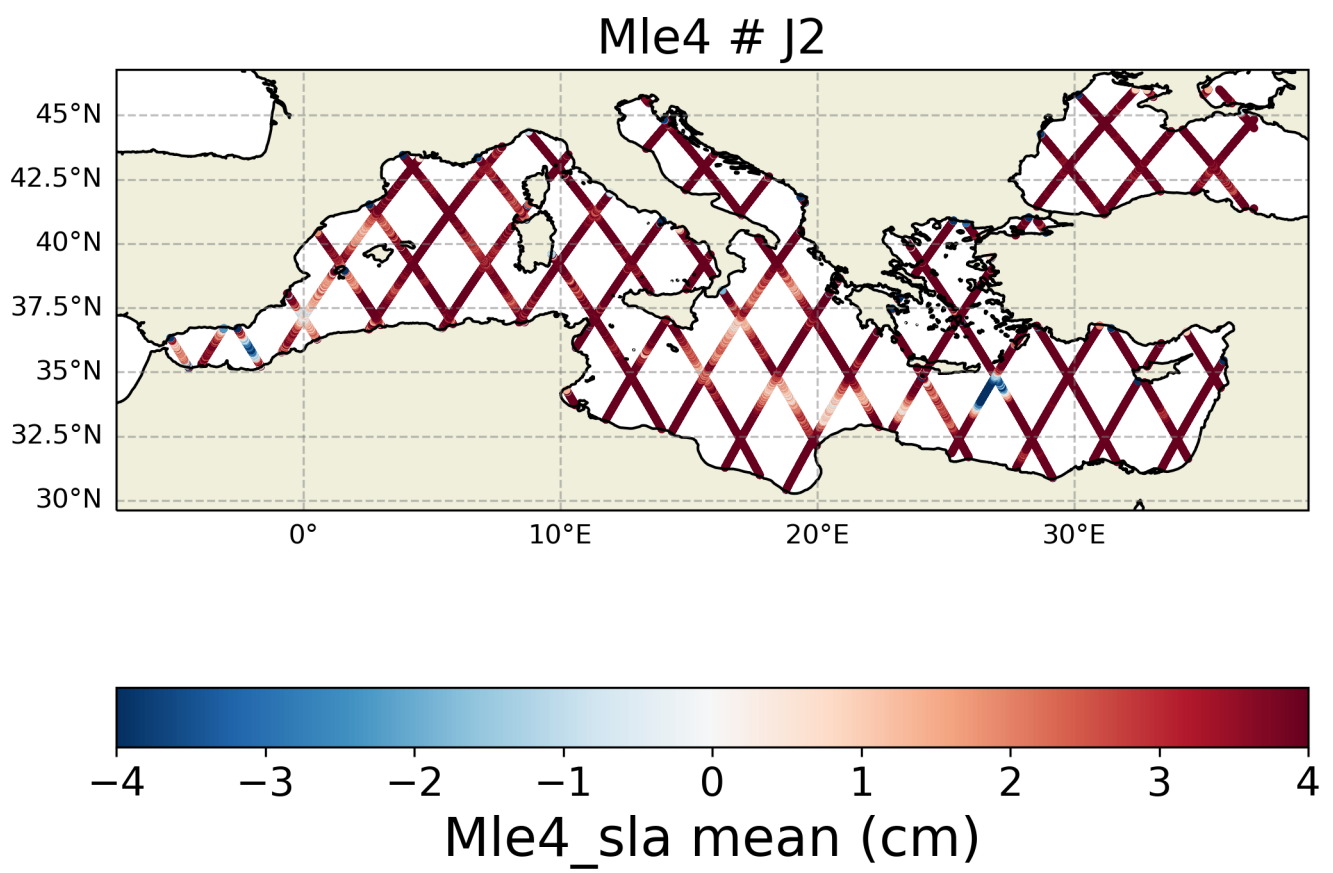


FIGURE 19 – Spatial coherence analysis of the mean of the Mle4 version of sla variable

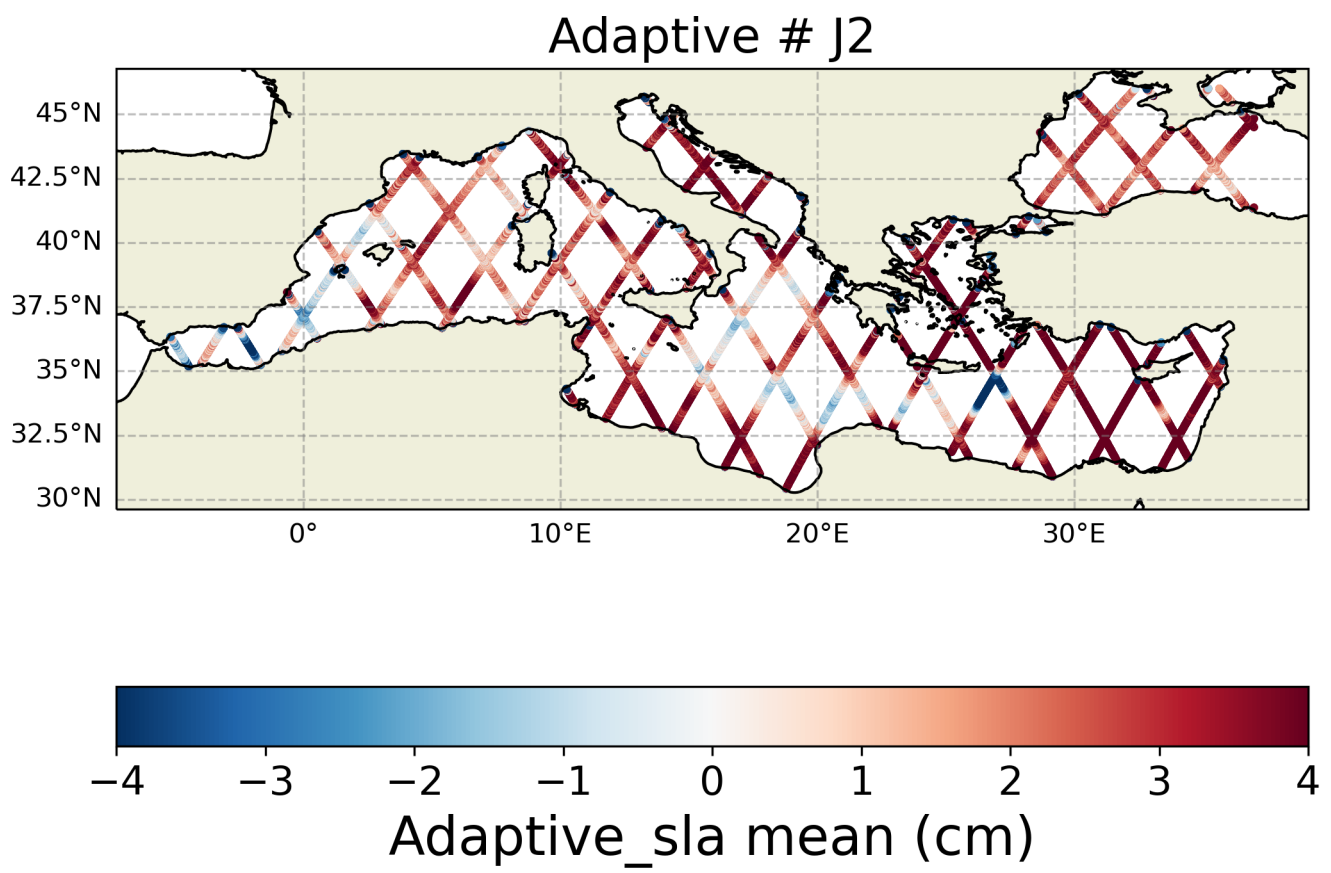


FIGURE 20 – Spatial coherence analysis of the mean of the Adaptive version of sla variable

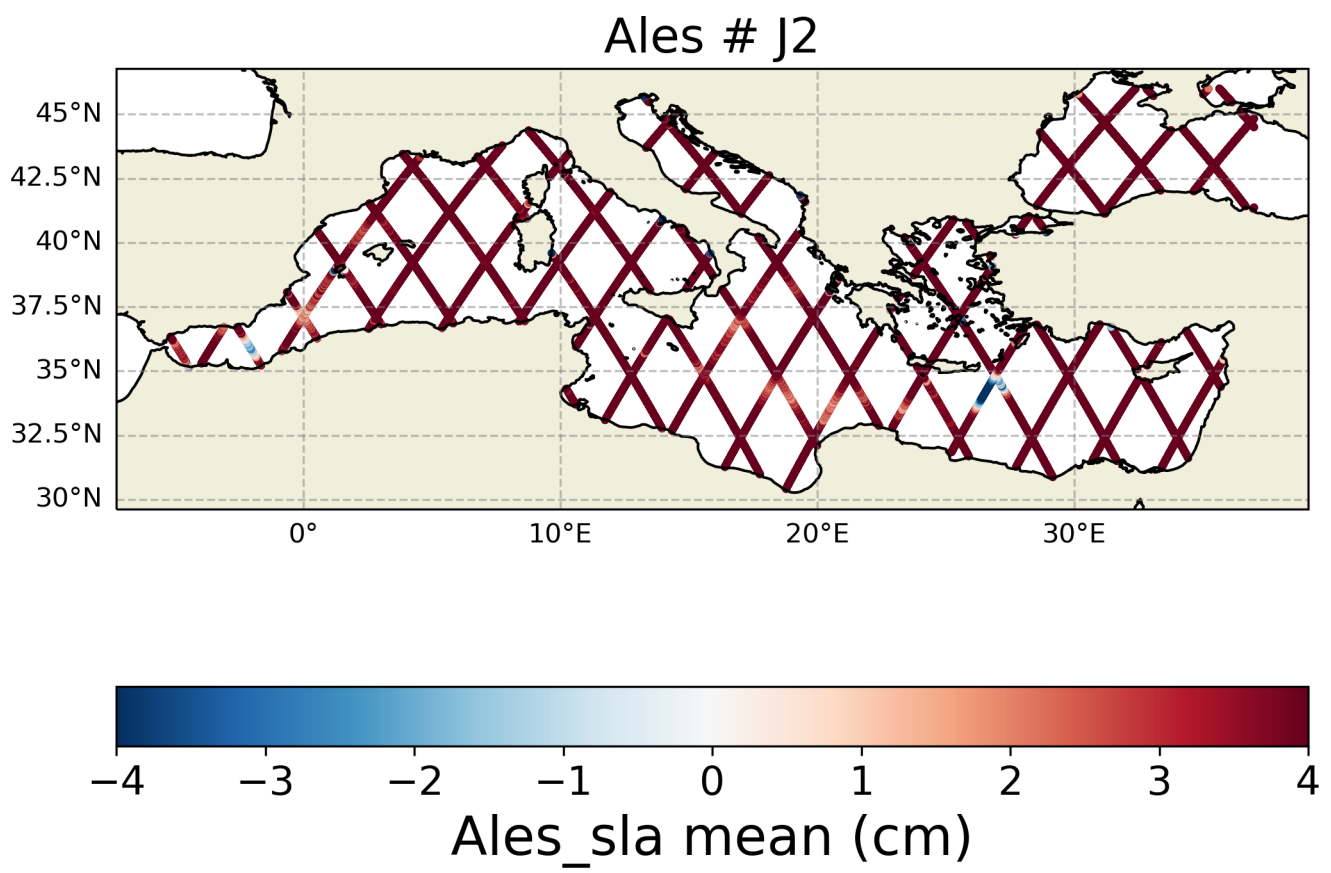


FIGURE 21 – Spatial coherence analysis of the mean of the Ales version of sla variable

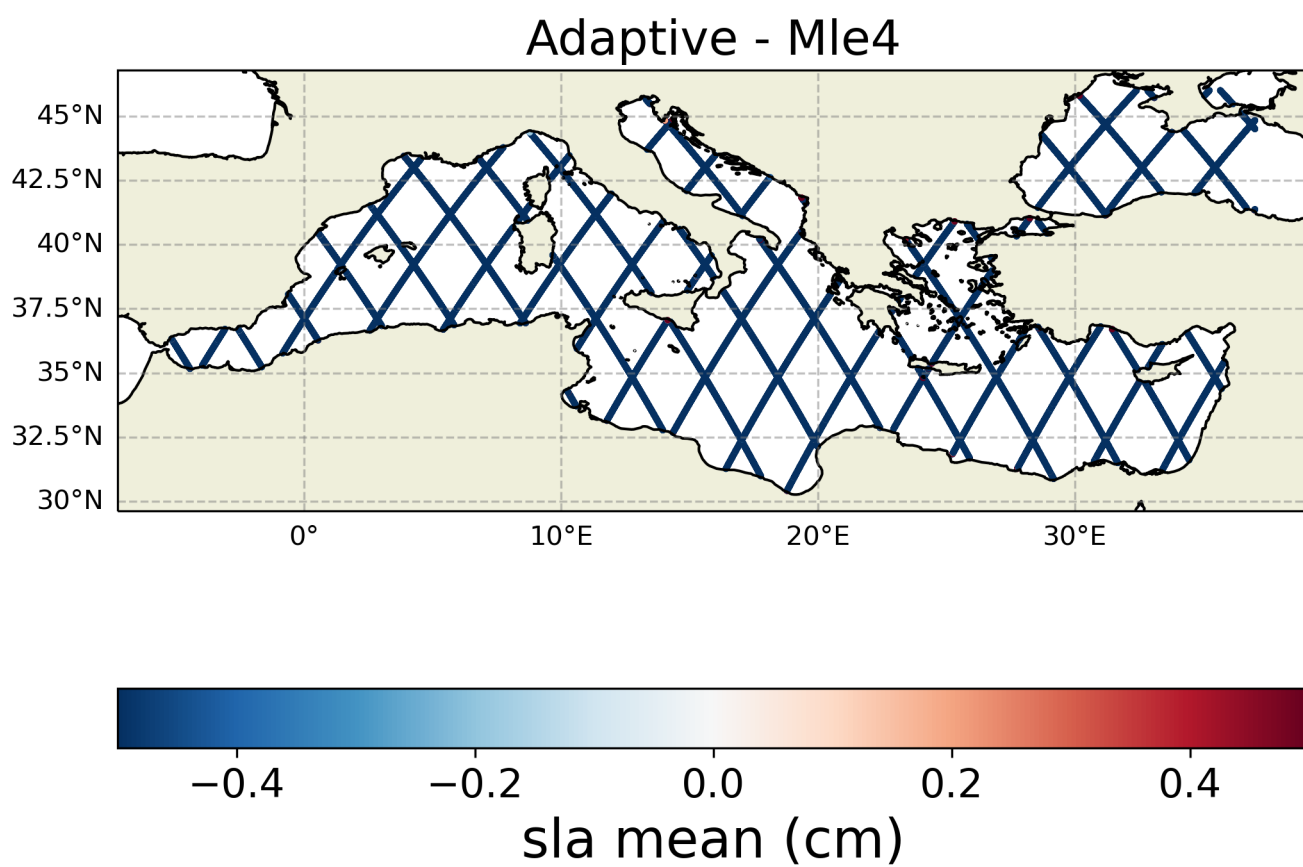


FIGURE 22 – Spatial coherence analysis of the Difference in sla 's mean between Adaptive and Mle4

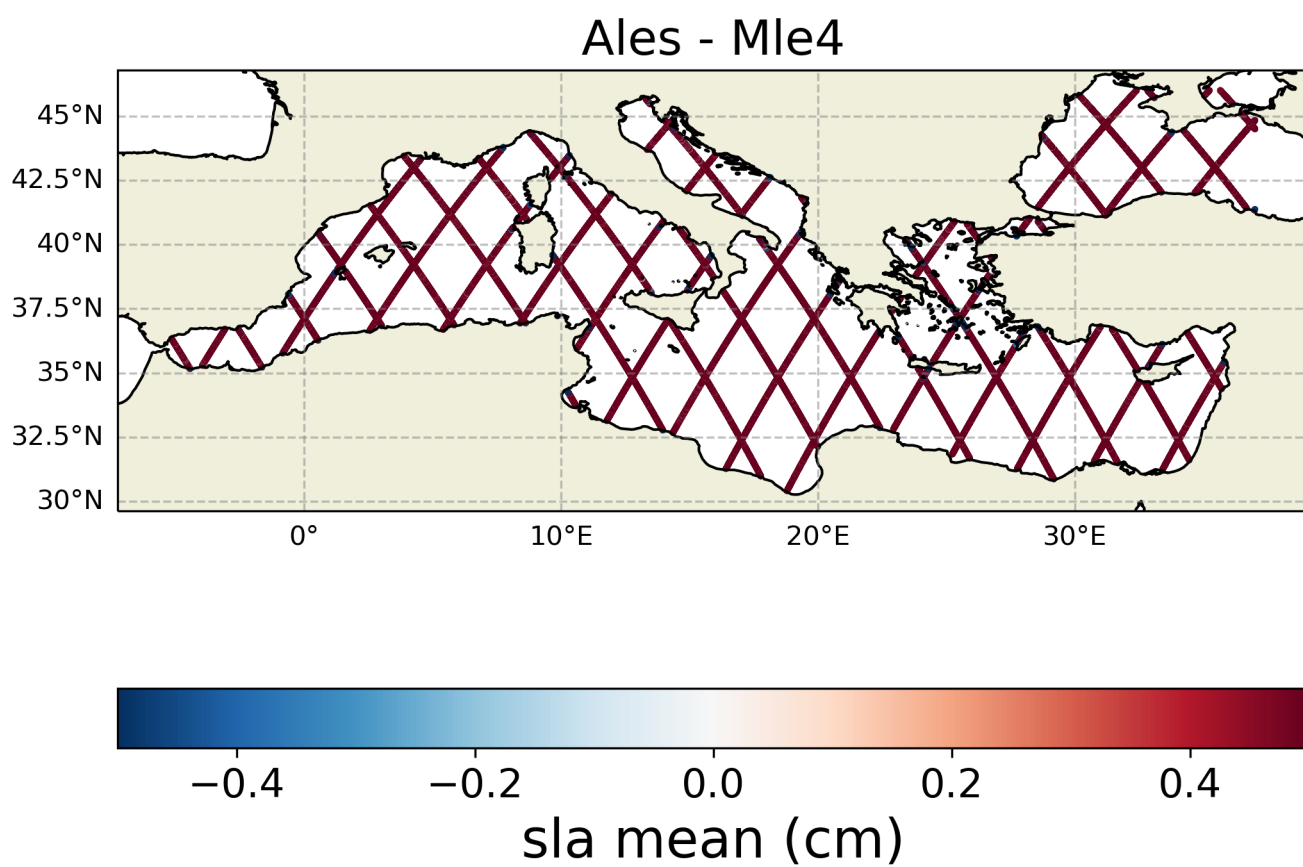


FIGURE 23 – Spatial coherence analysis of the Difference in sla 's mean between Ales and Mle4

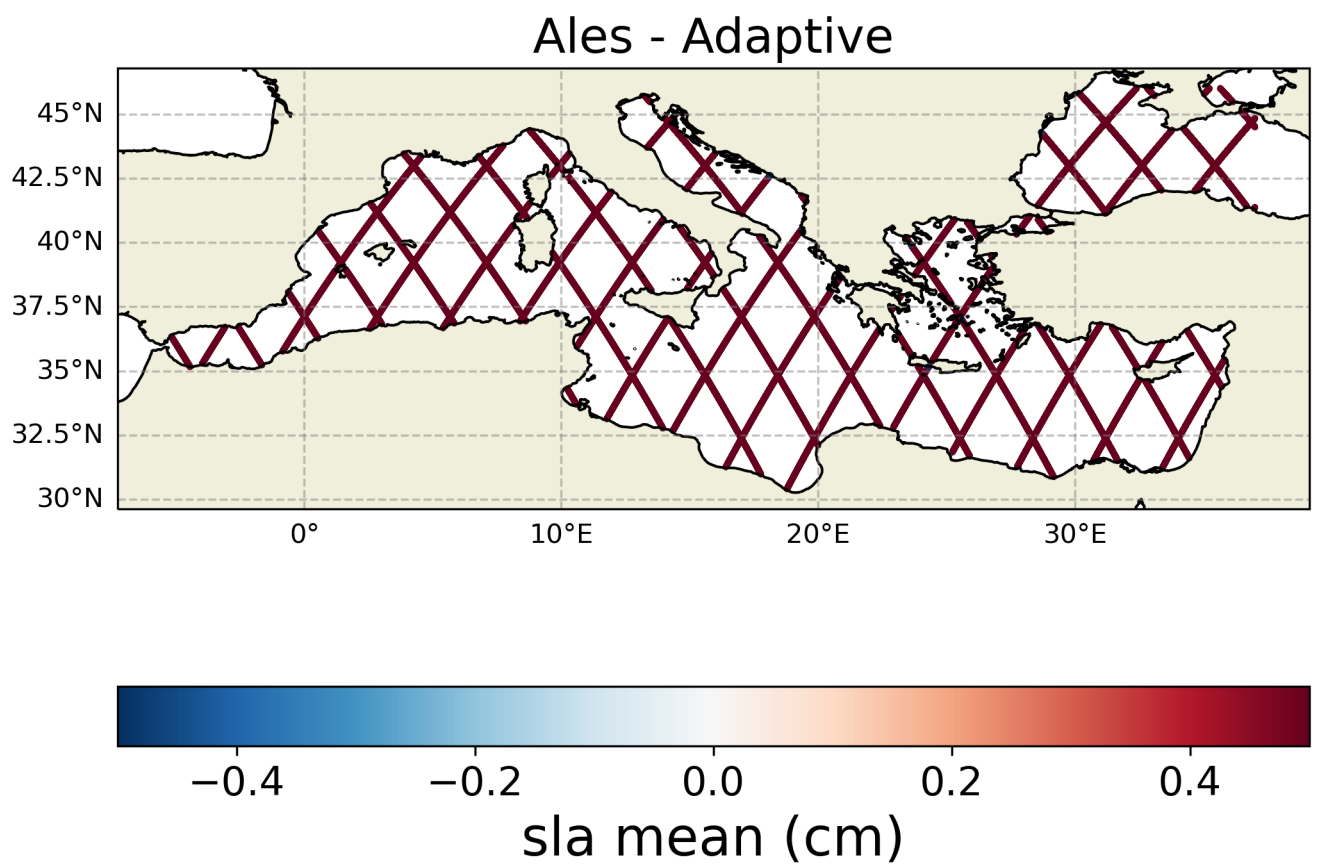


FIGURE 24 – Spatial coherence analysis of the Difference in sla 's mean between Ales and Adaptive

4 Histograms

4.1 sla

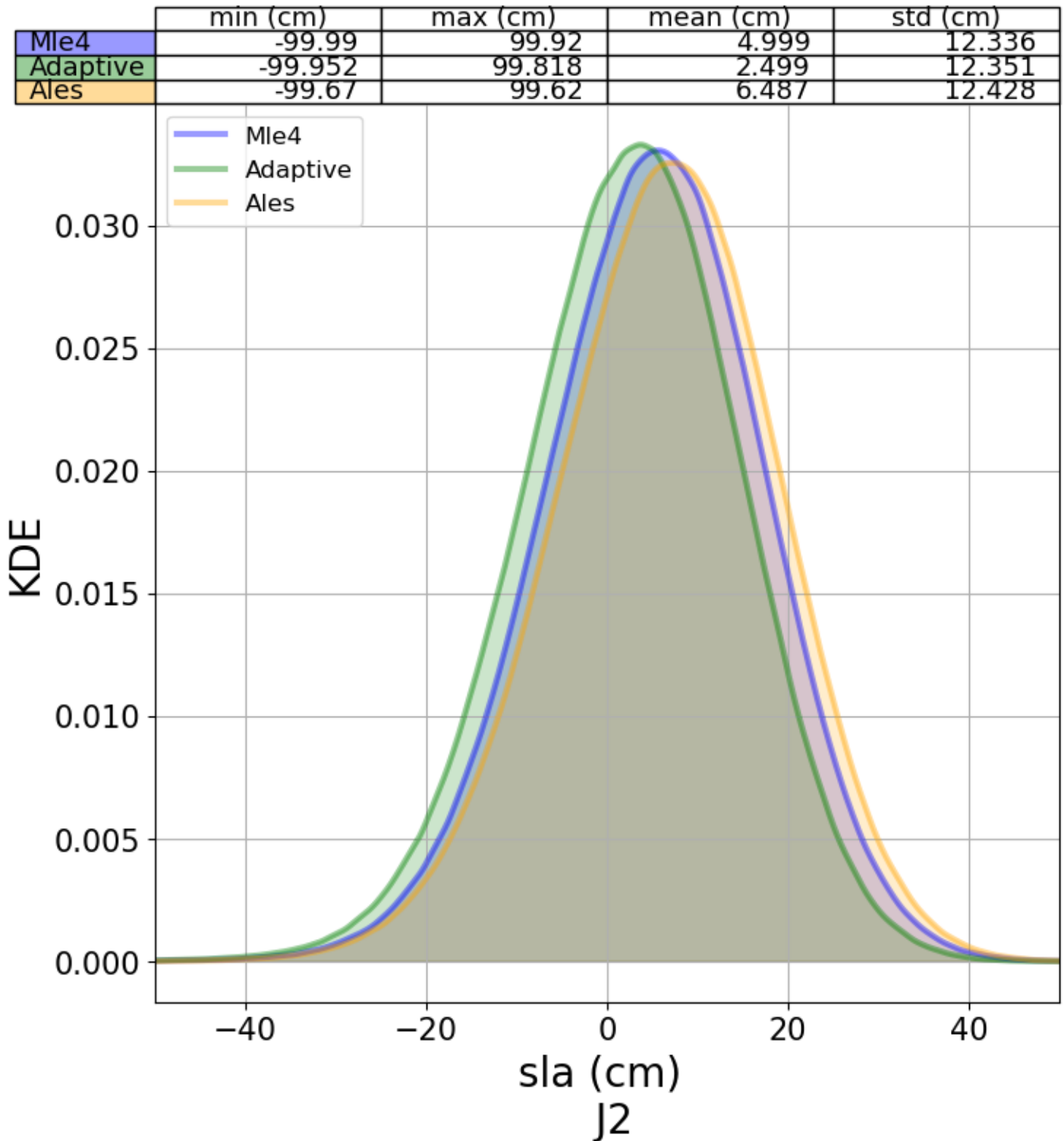


FIGURE 25 – Histogram of each of sla version

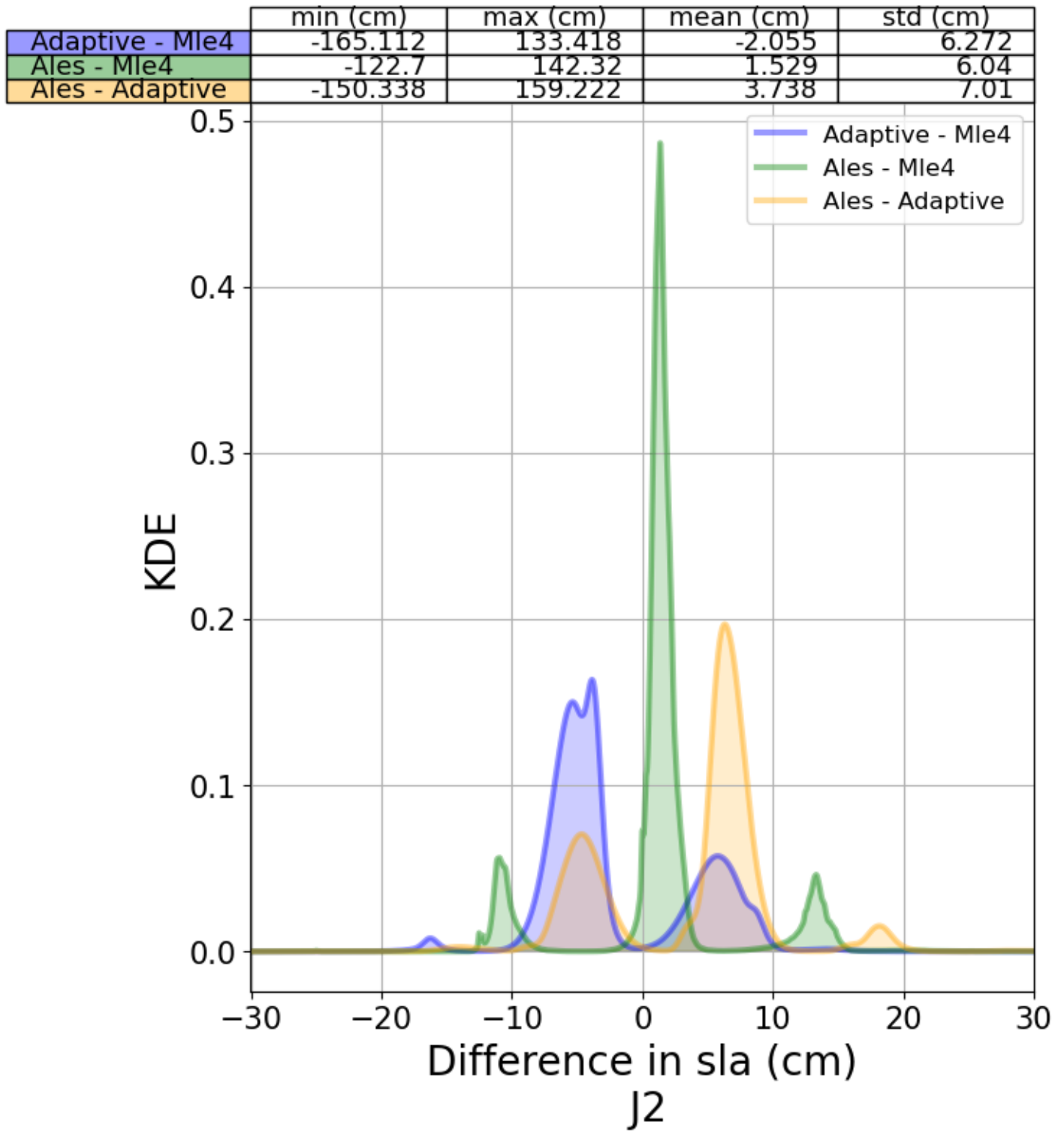


FIGURE 26 – Histograms of difference of each sla version and reference one

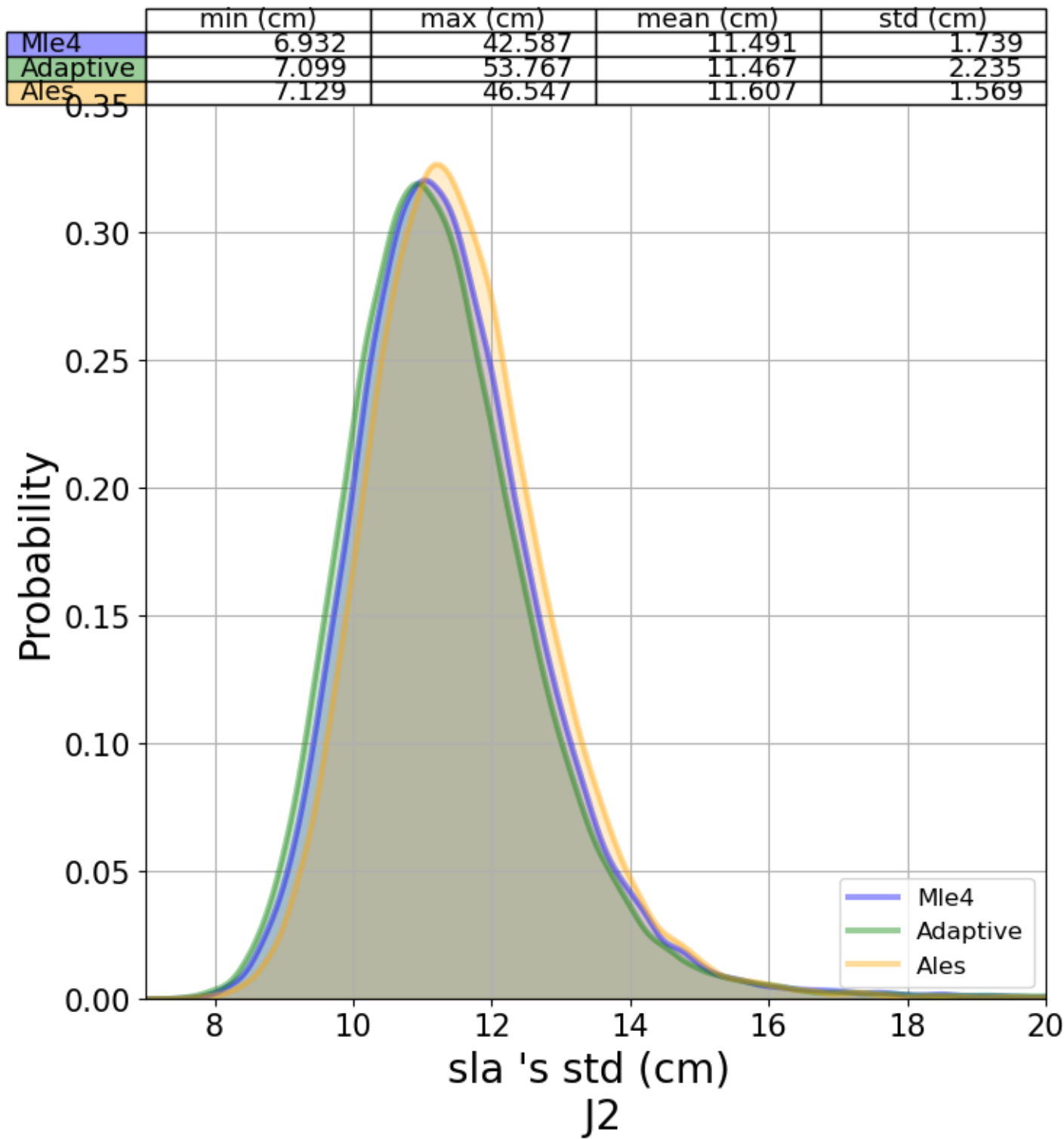


FIGURE 27 – Histograms of the standard deviation of each sla version

5 Along-track analysis

5.1 Range

5.1.1 Range 's count

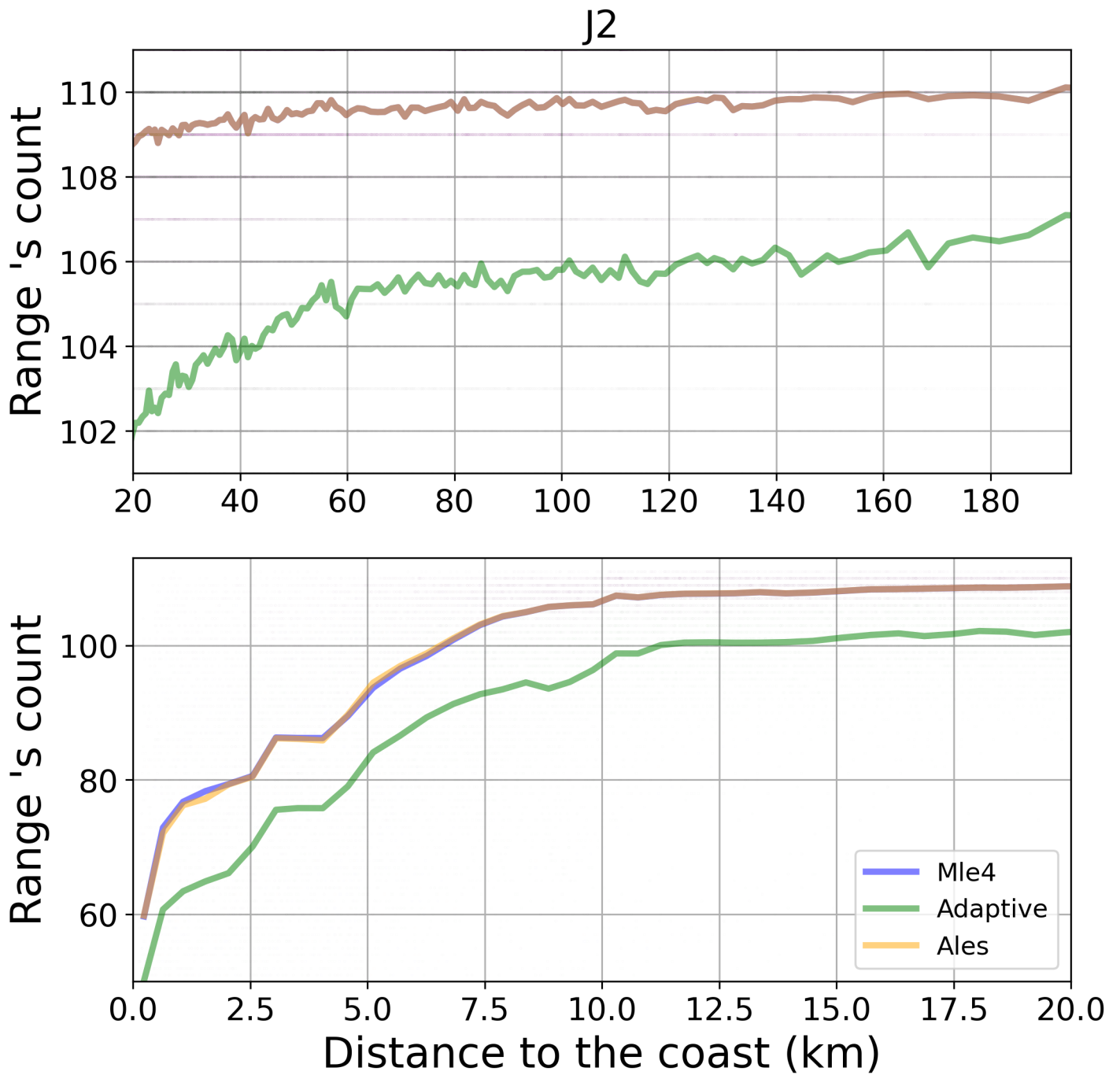


FIGURE 28 – Along-track analysis of Range 's count

5.2 sla

5.2.1 sla 's count

J2

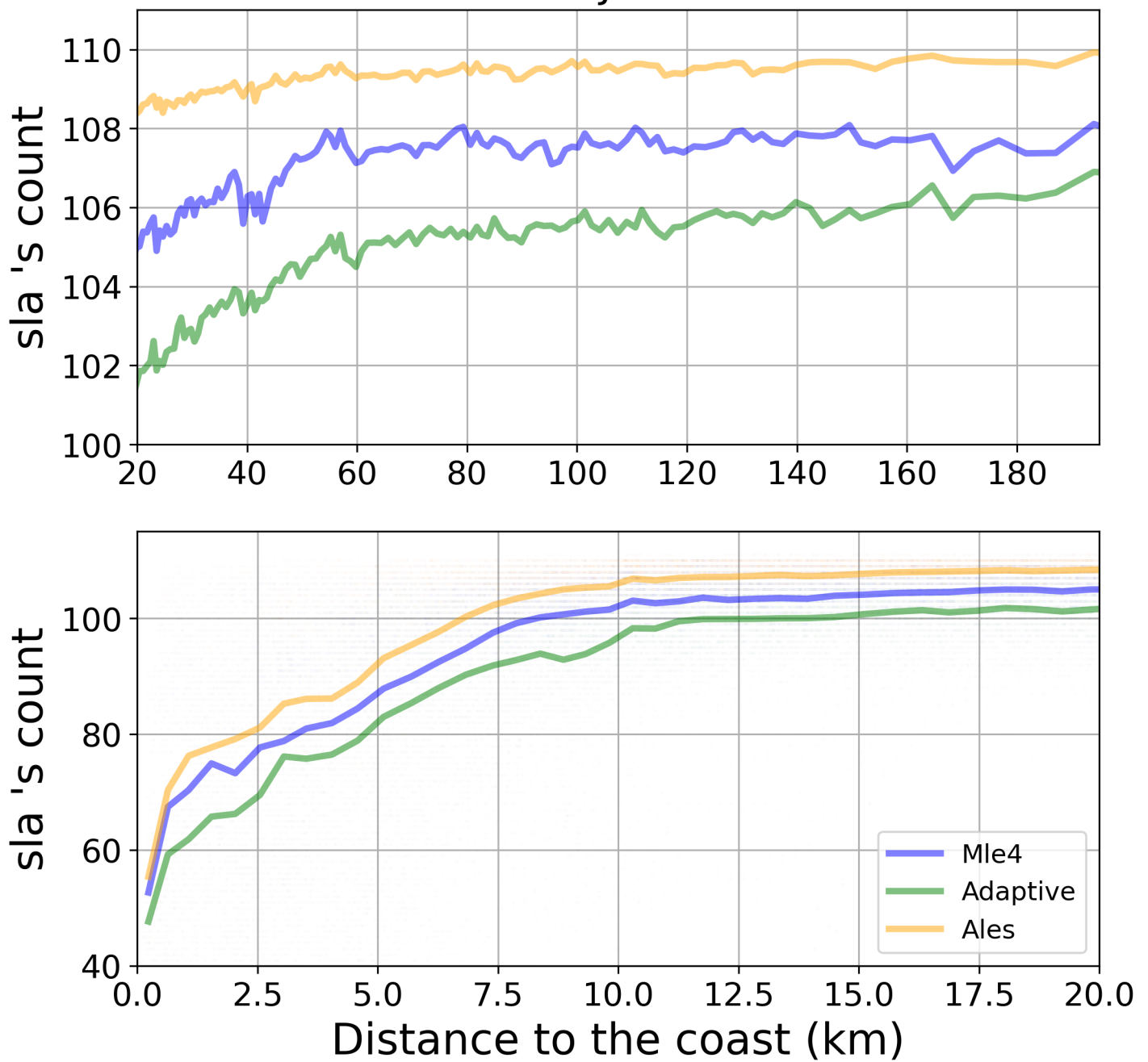


FIGURE 29 – Along-track analysis of sla 's count

J2

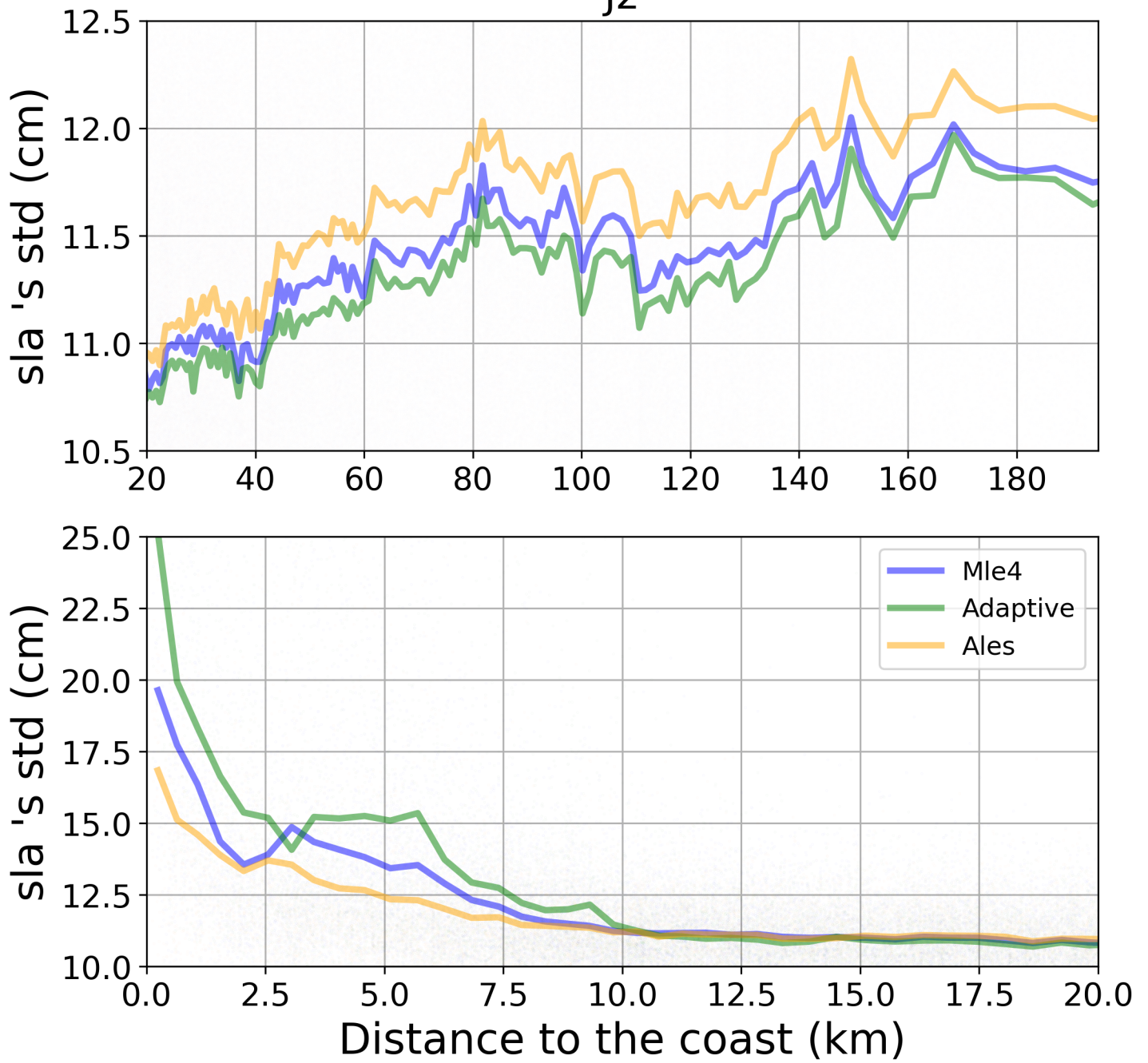


FIGURE 30 – Along-track analysis of sla's std

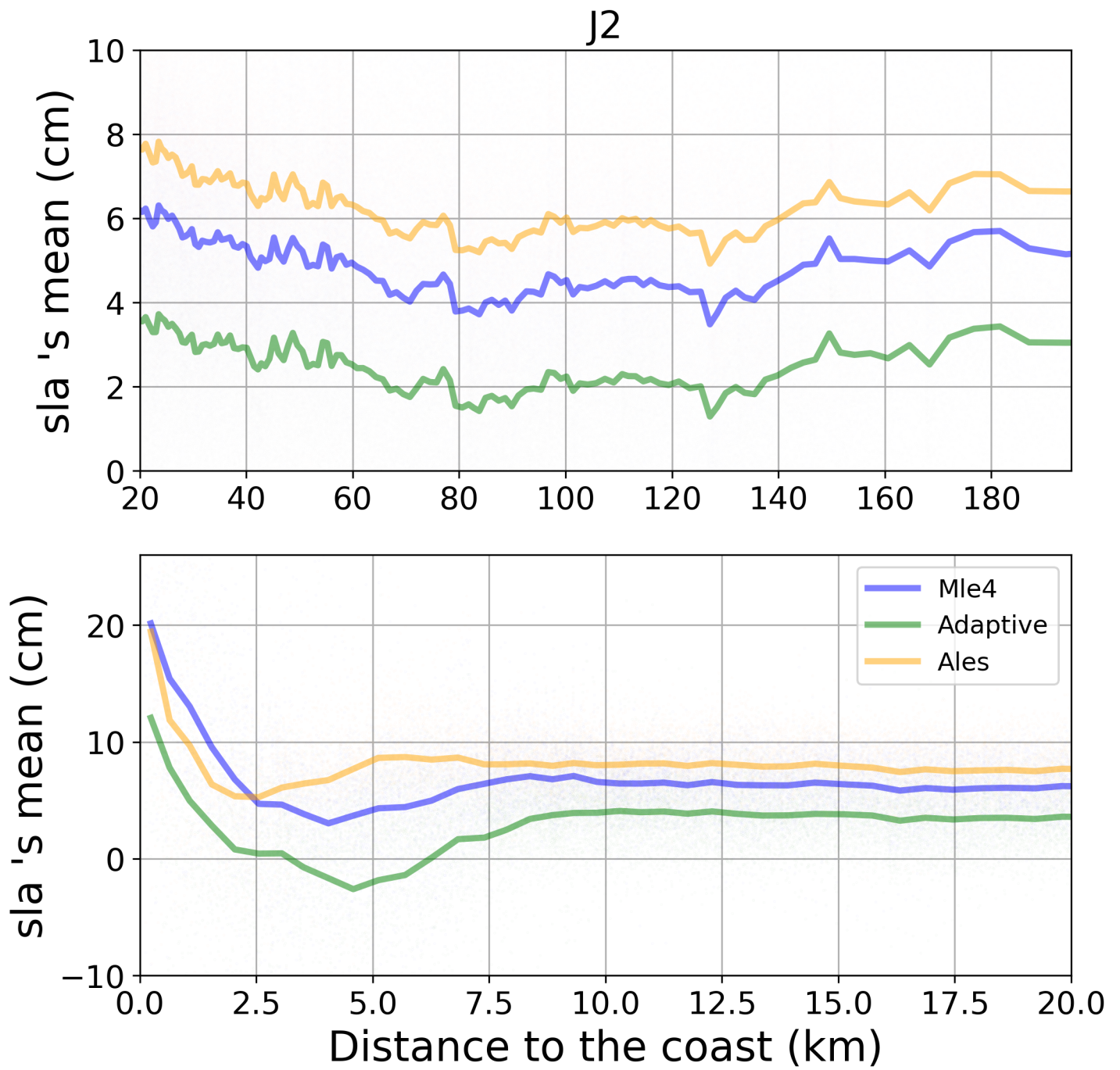


FIGURE 31 – Along-track analysis of sla 's mean

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 Radius of 40 Km
 - Maximum distance to the coast : 20 Km

6.1.1 correlation visualization in maps view % SETE tide gauge

Correlation Altimetry data with respect to SETE Tide gauge data

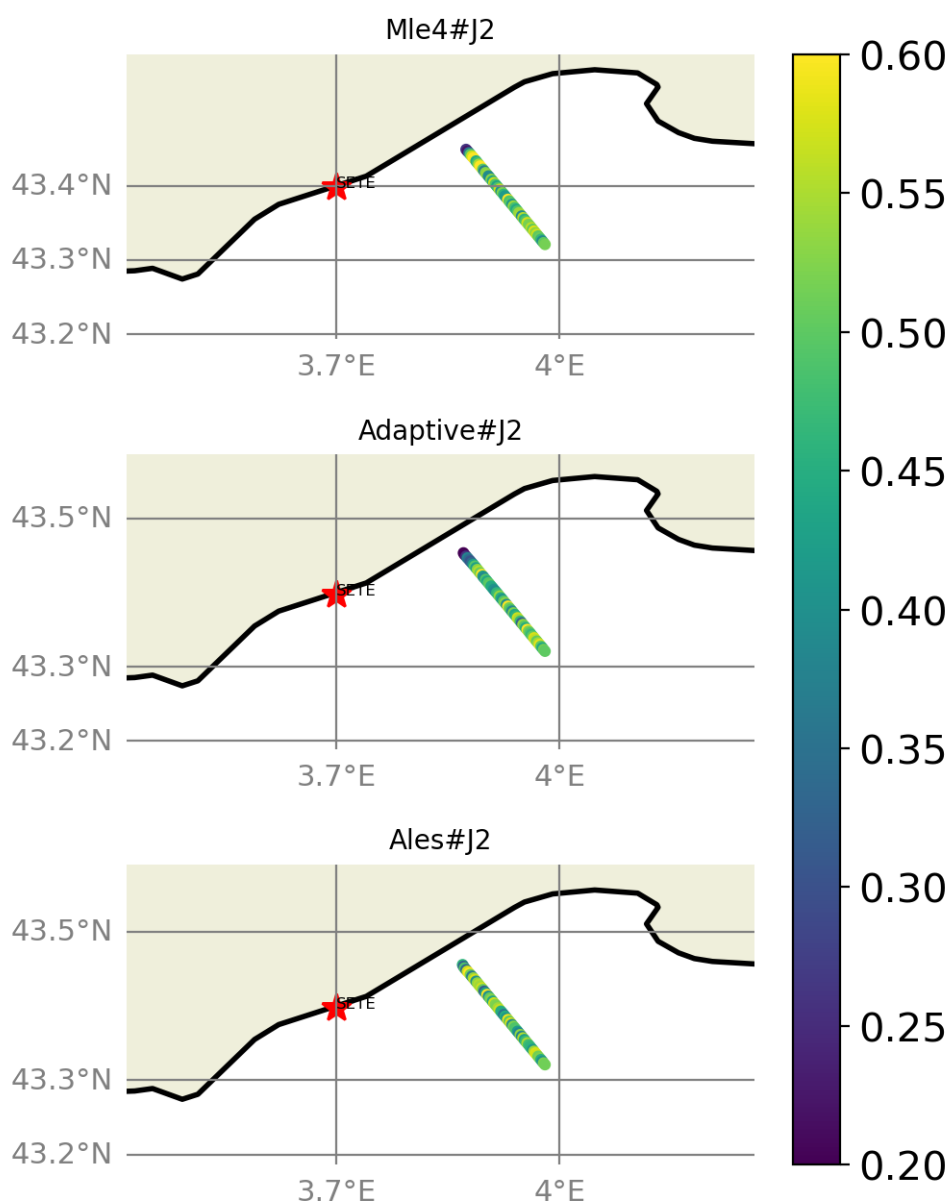


FIGURE 32 – correlation visualization in maps view % SETE tide gauge

6.1.2 rmsd visualization in maps view % SETE tide gauge

Rmsd (m) Altimetry data with respect to SETE Tide gauge data

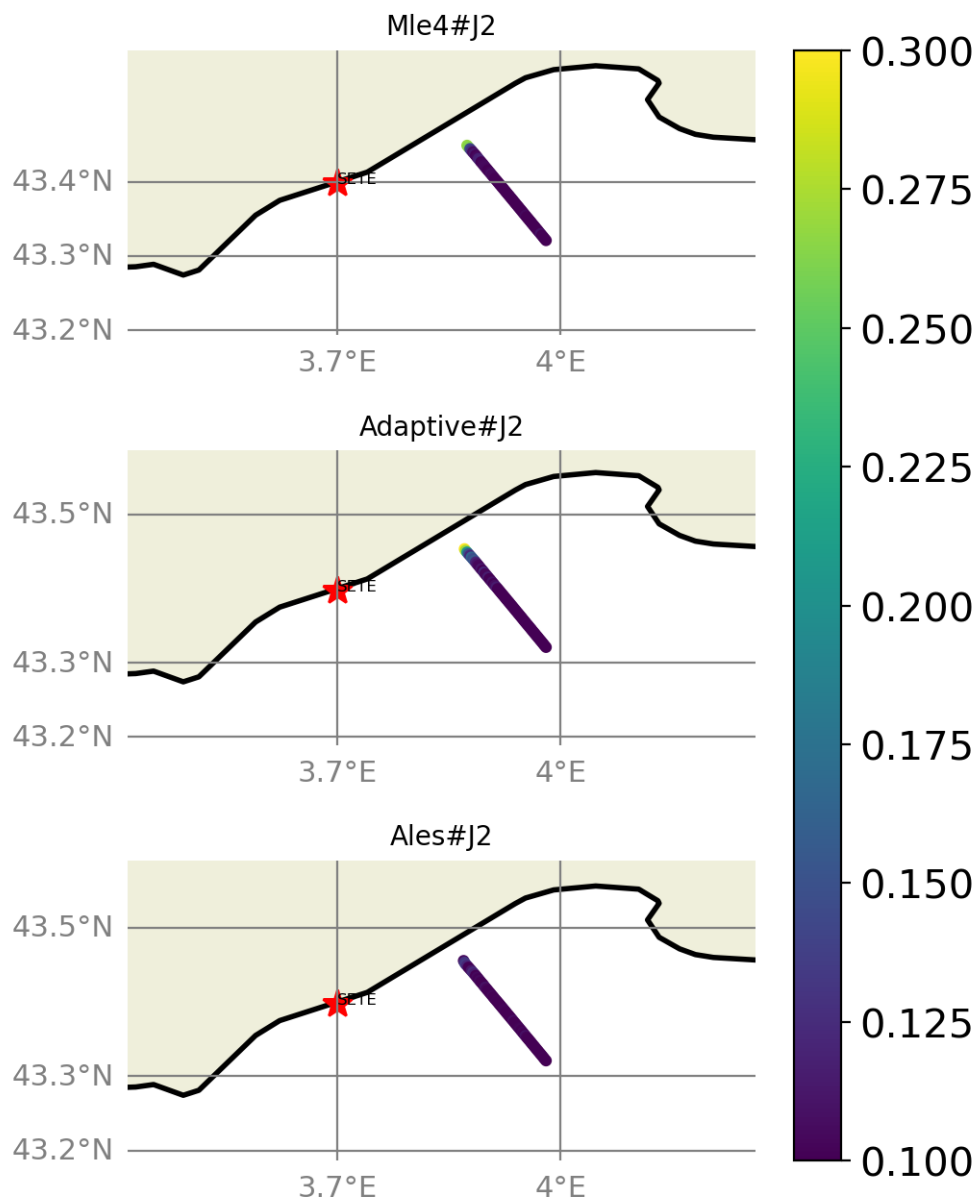


FIGURE 33 – rmsd visualization in maps view % SETE tide gauge

6.1.3 std visualization in maps view % SETE tide gauge

Std (m) Altimetry data with respect to SETE Tide gauge data

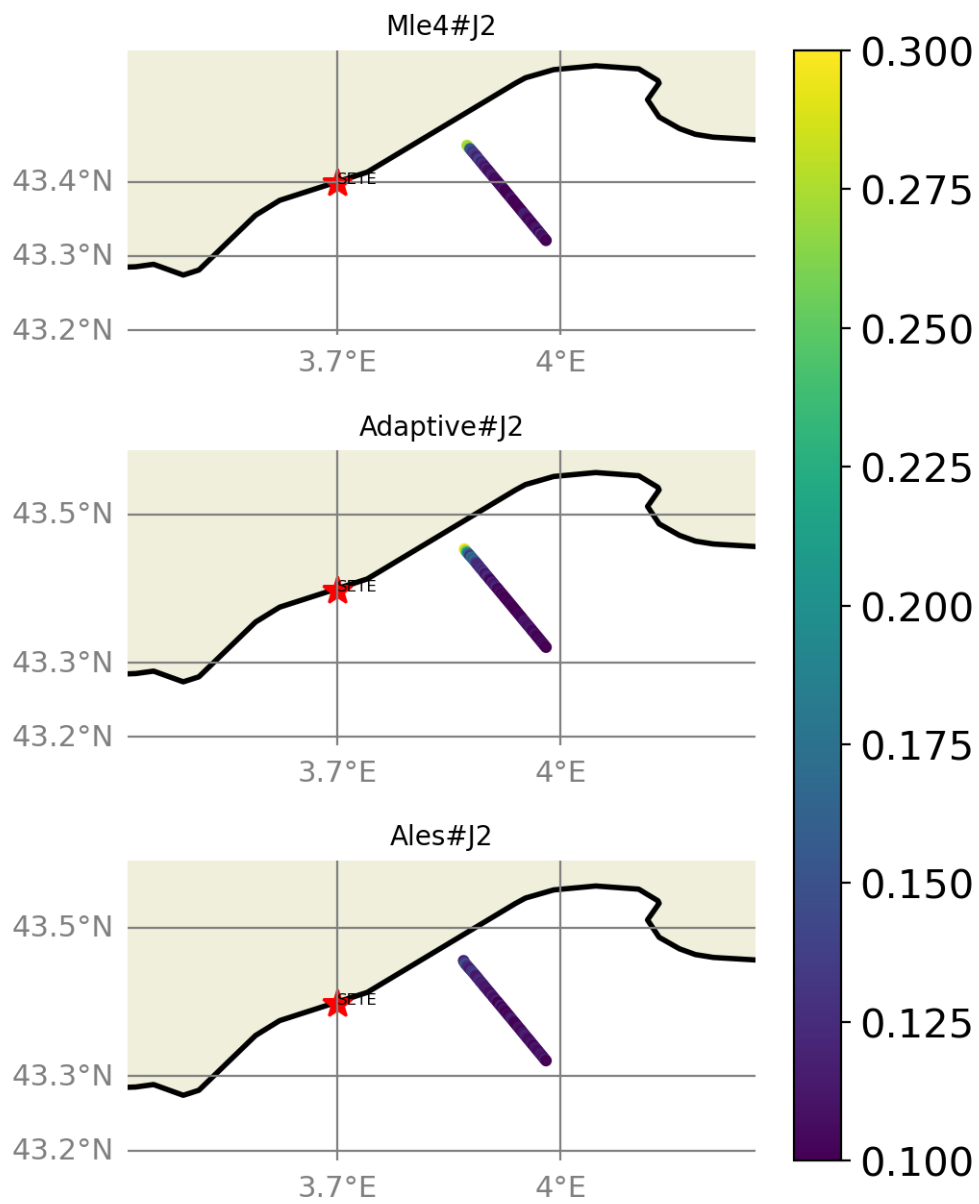


FIGURE 34 – std visualization in maps view % SETE tide gauge

6.1.4 valid_data_percent visualization in maps view % SETE tide gauge

Valid_Data_Percent (%) Altimetry data with respect to SETE Tide gauge data

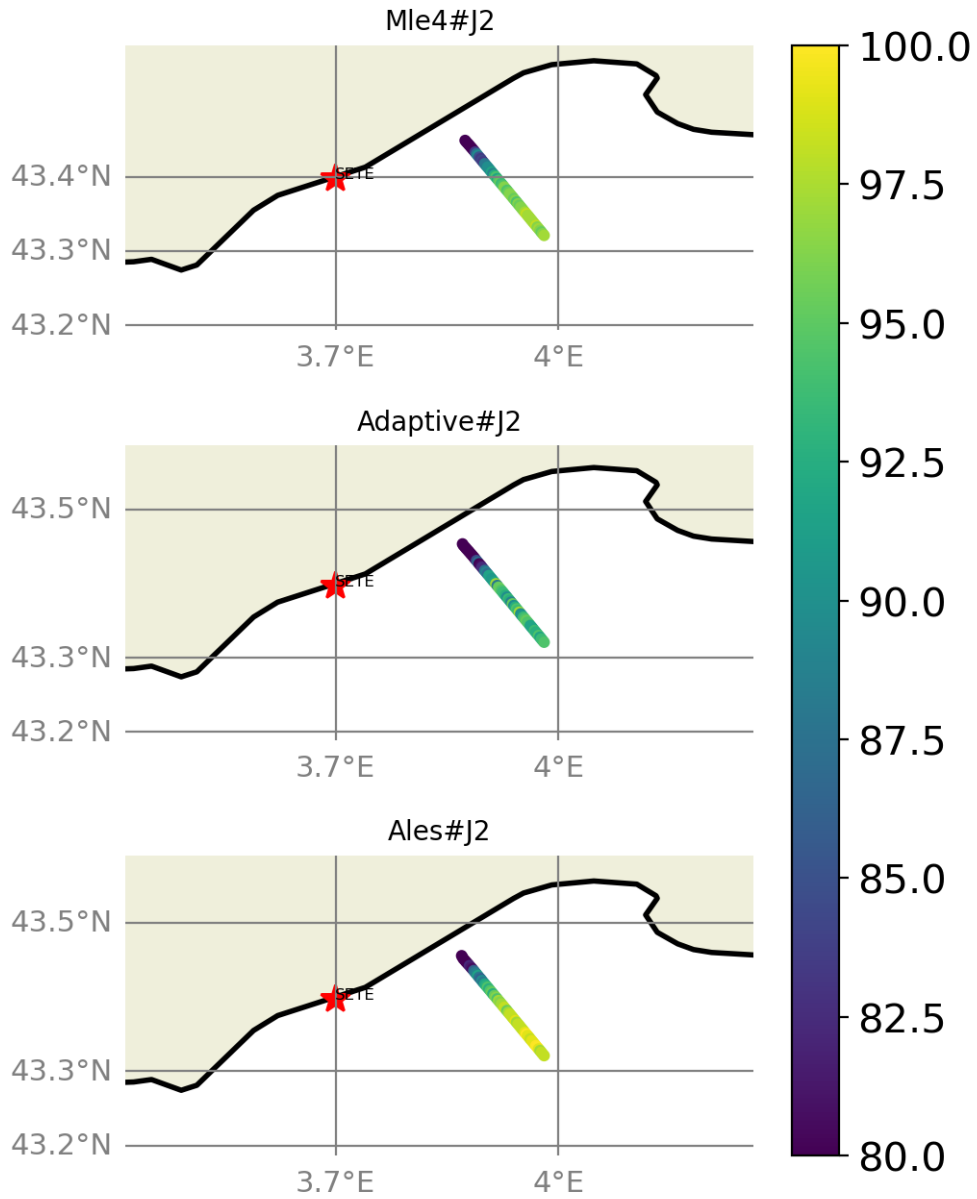


FIGURE 35 – valid_data_percent visualization in maps view % SETE tide gauge

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.

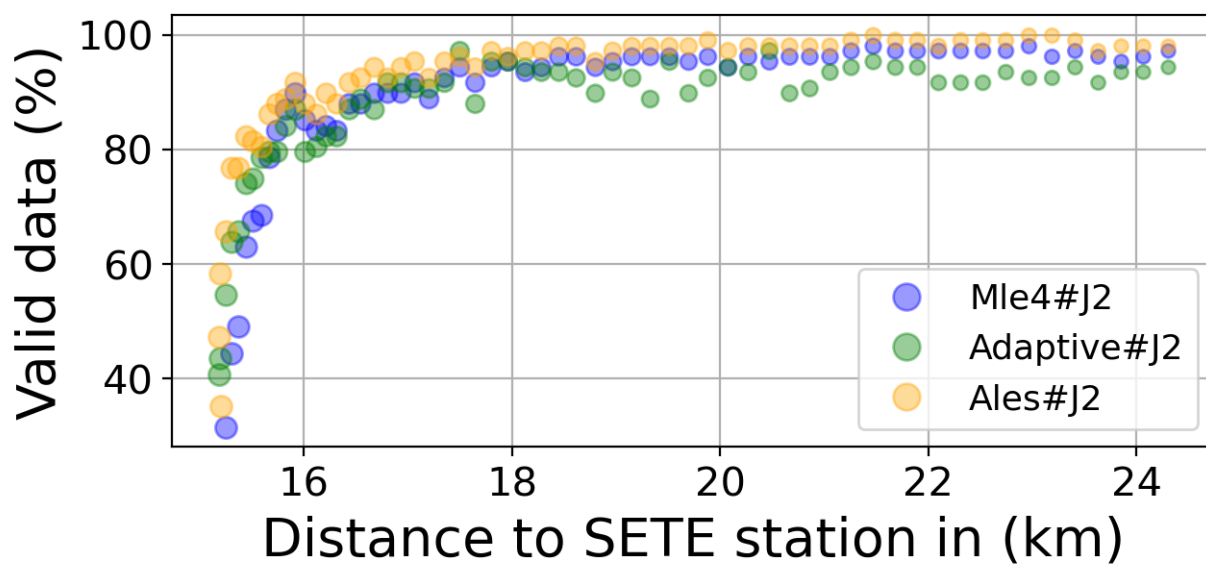
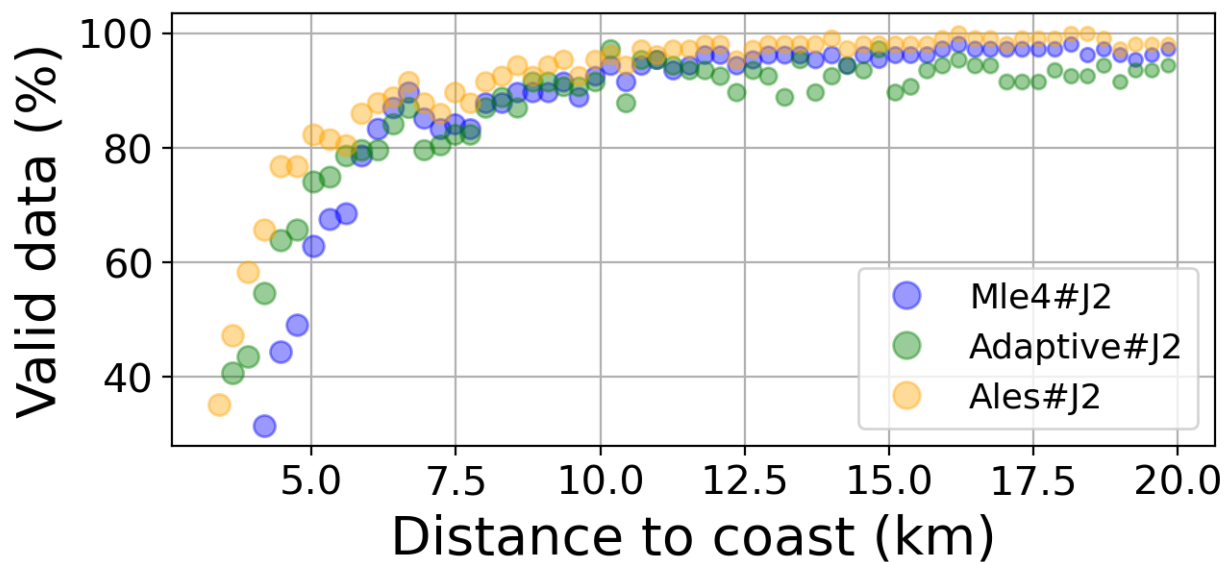


FIGURE 36 – Valid data (%) in function of distance to coast/SETE station

6.1.6 Std in function of distance to coast/SETE station

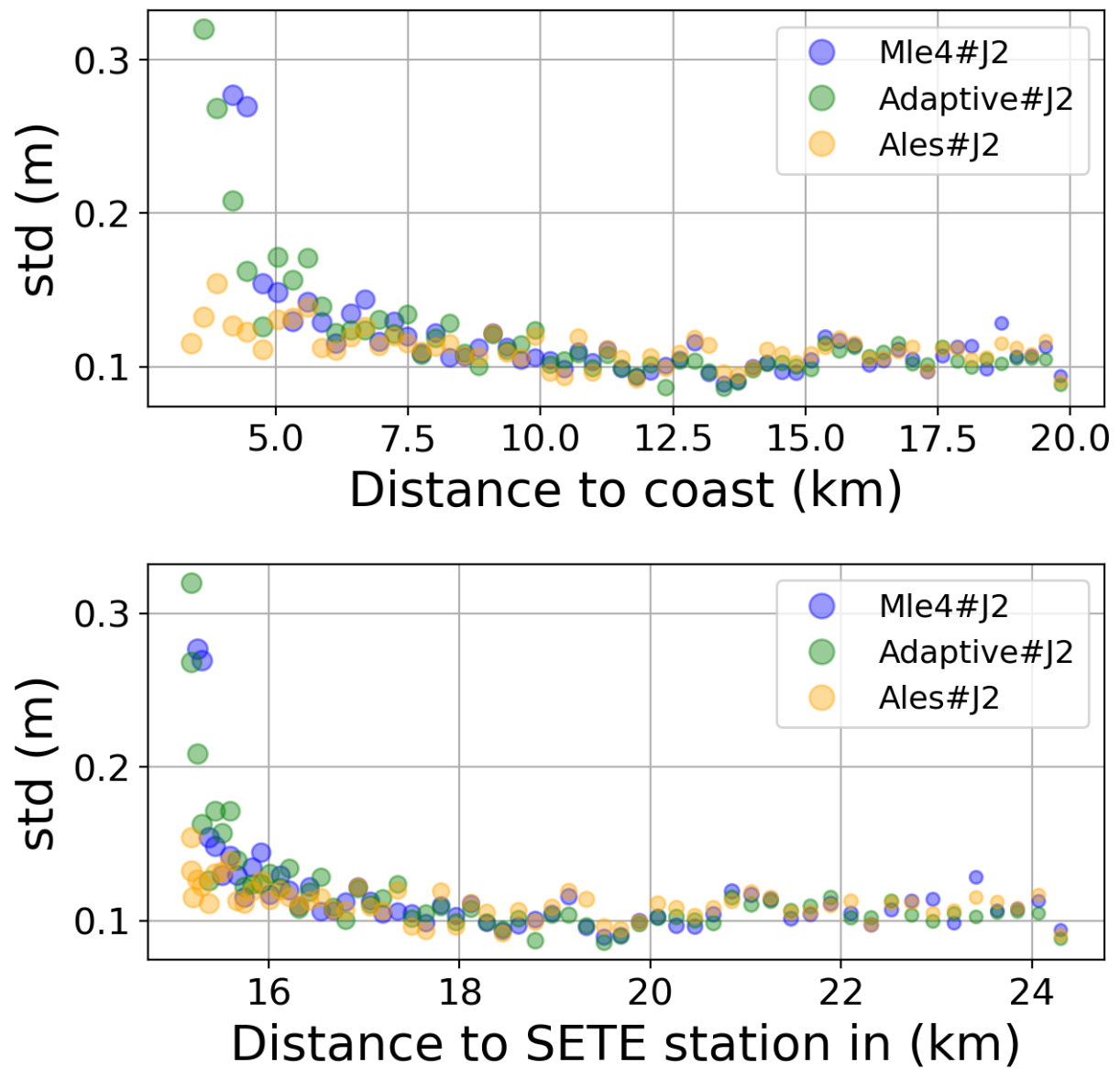


FIGURE 37 – Std in function of the distance to the coast/SETE station

6.1.7 Correlation in function of distance to coast/SETE station

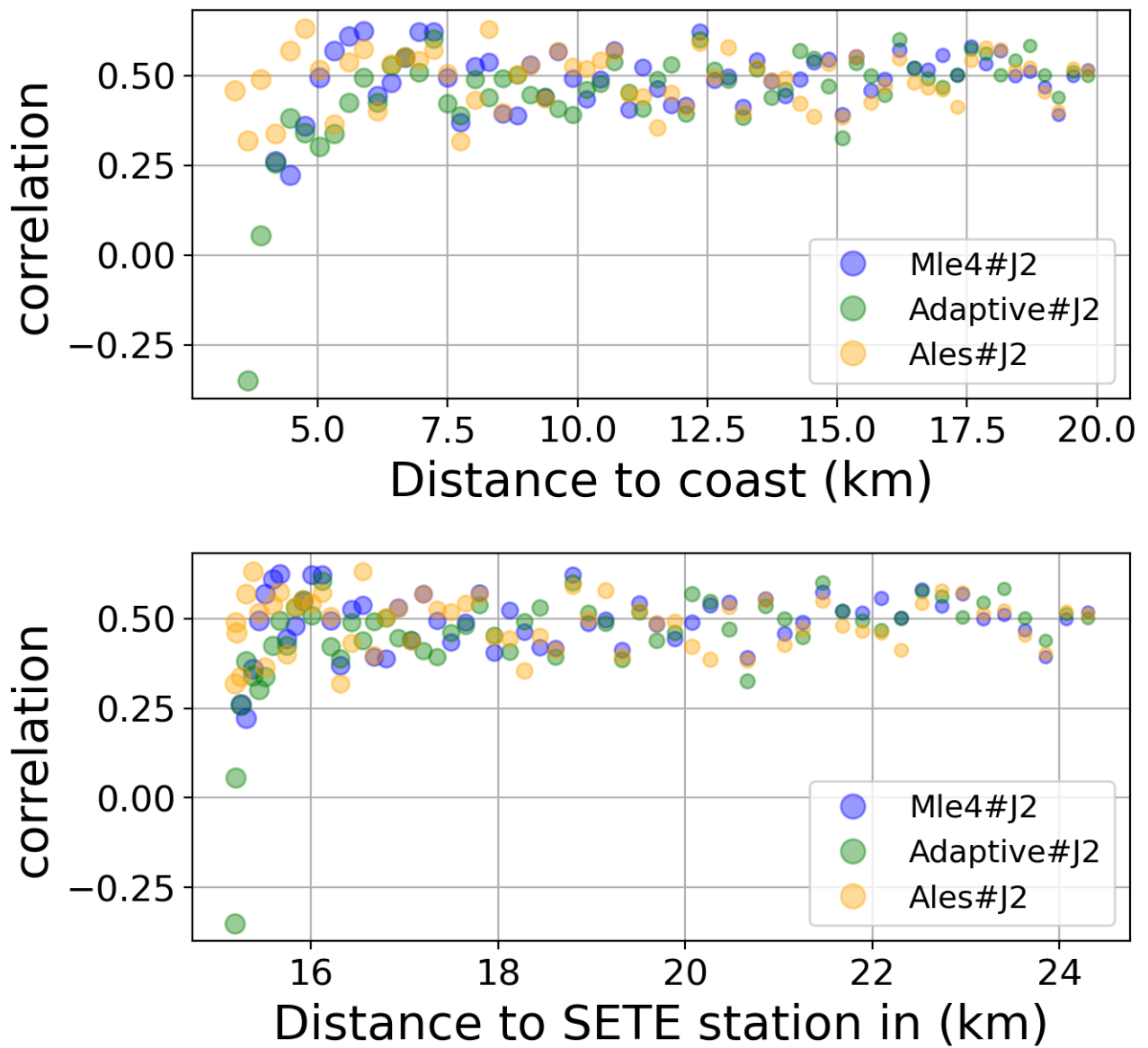


FIGURE 38 – Correlation in function of the distance to the coast/SETE station

6.1.8 Taylor Diagram

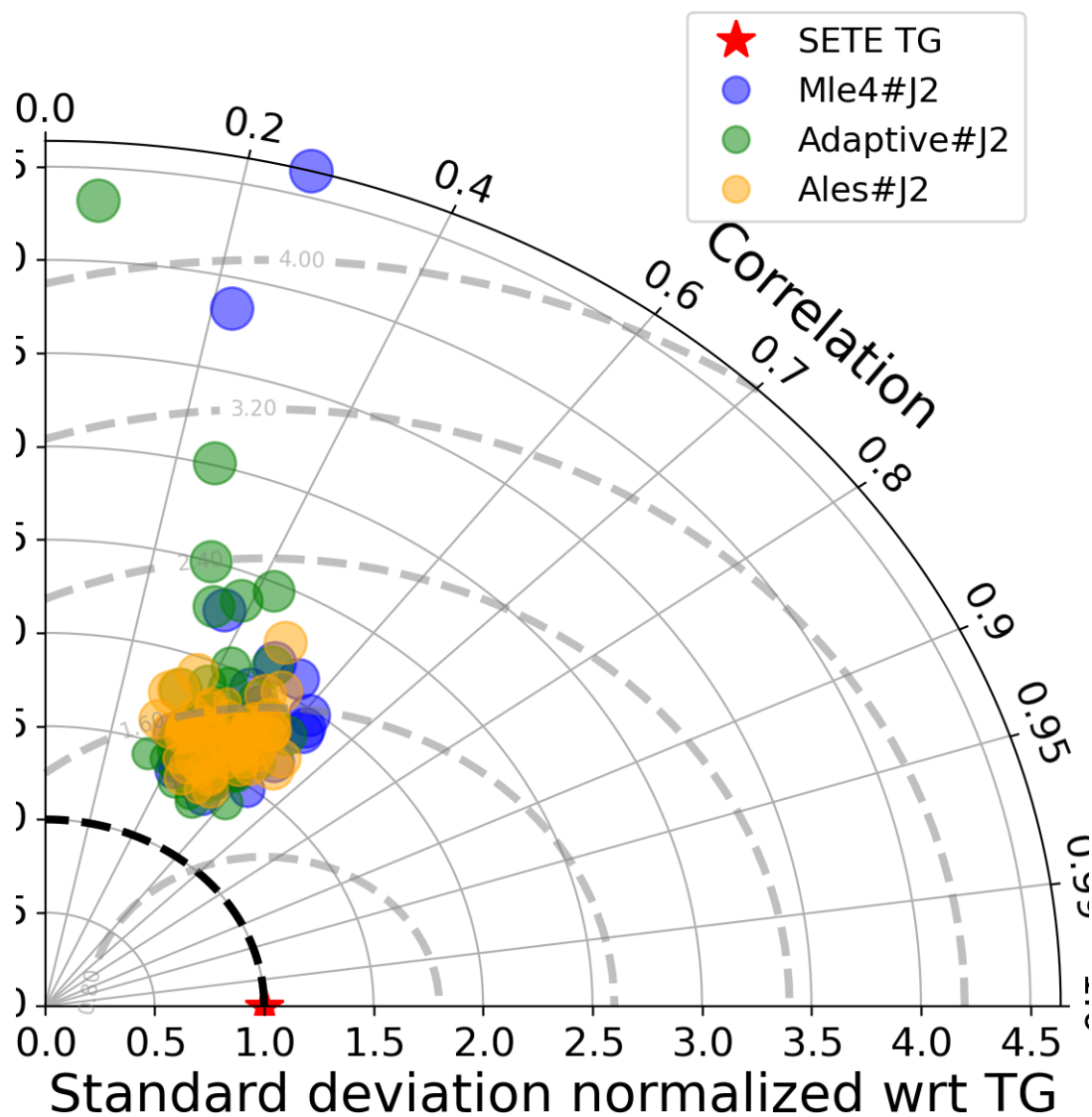


FIGURE 39 – Taylor diagram

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.

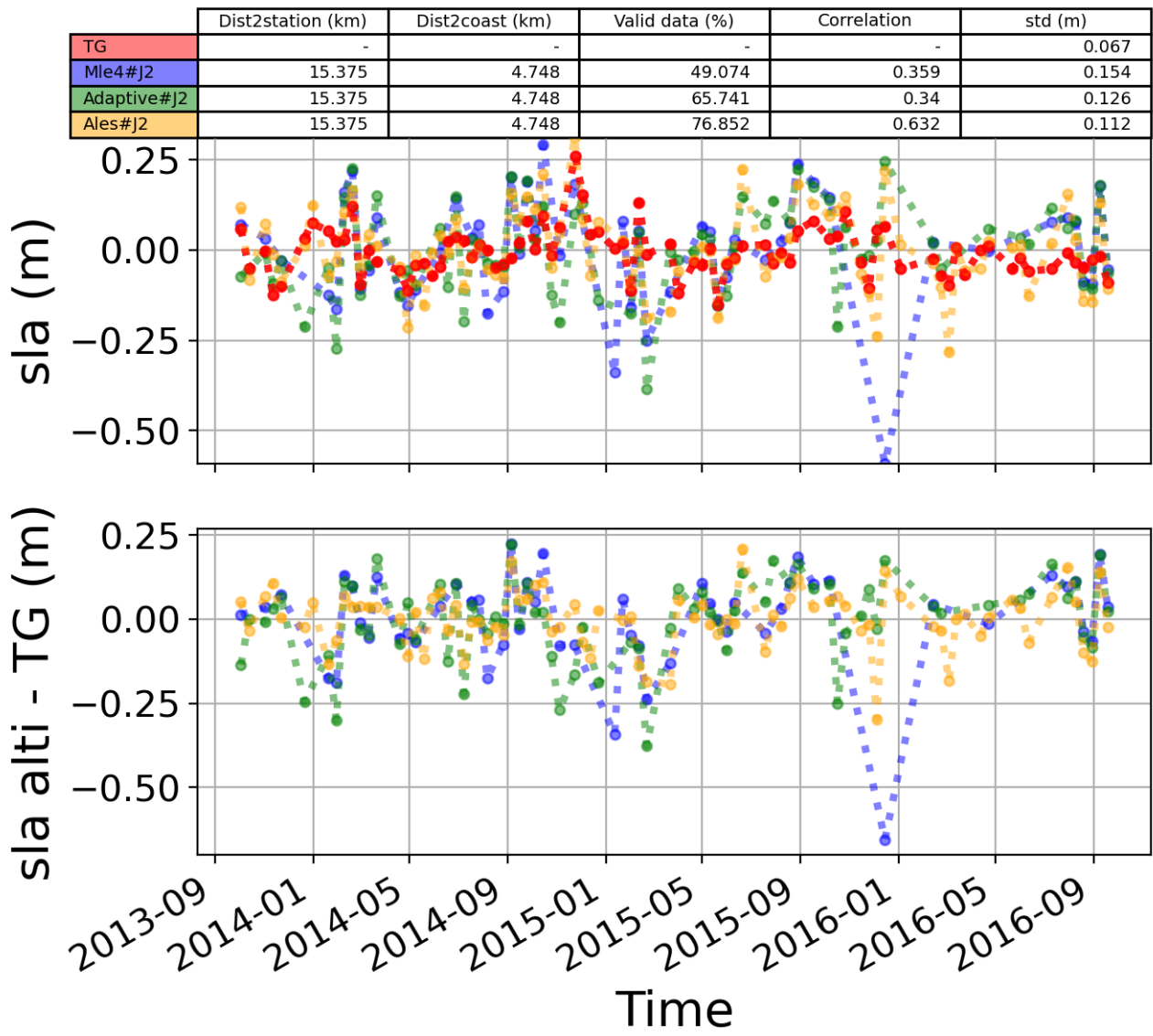


FIGURE 41 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

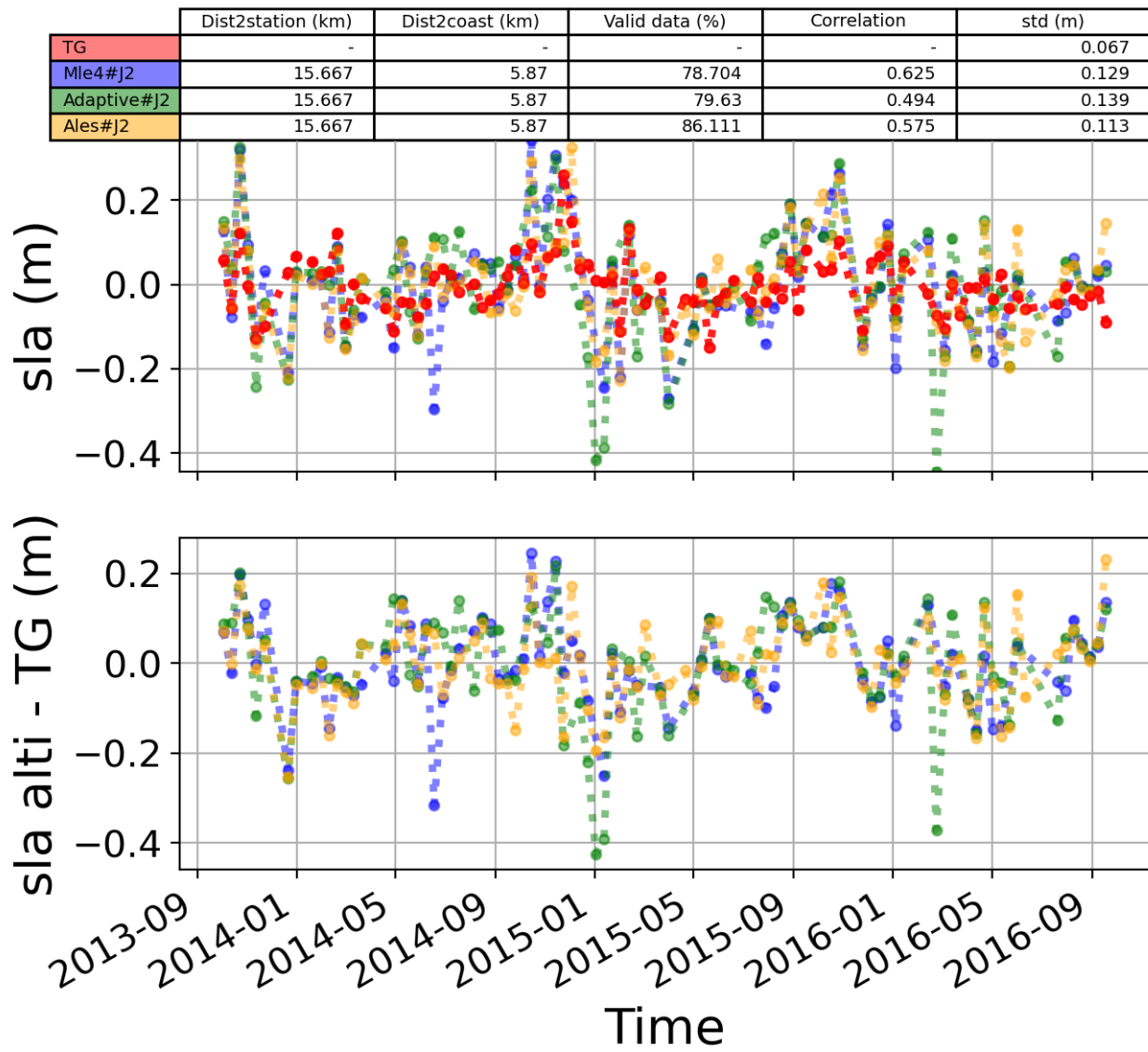


FIGURE 42 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

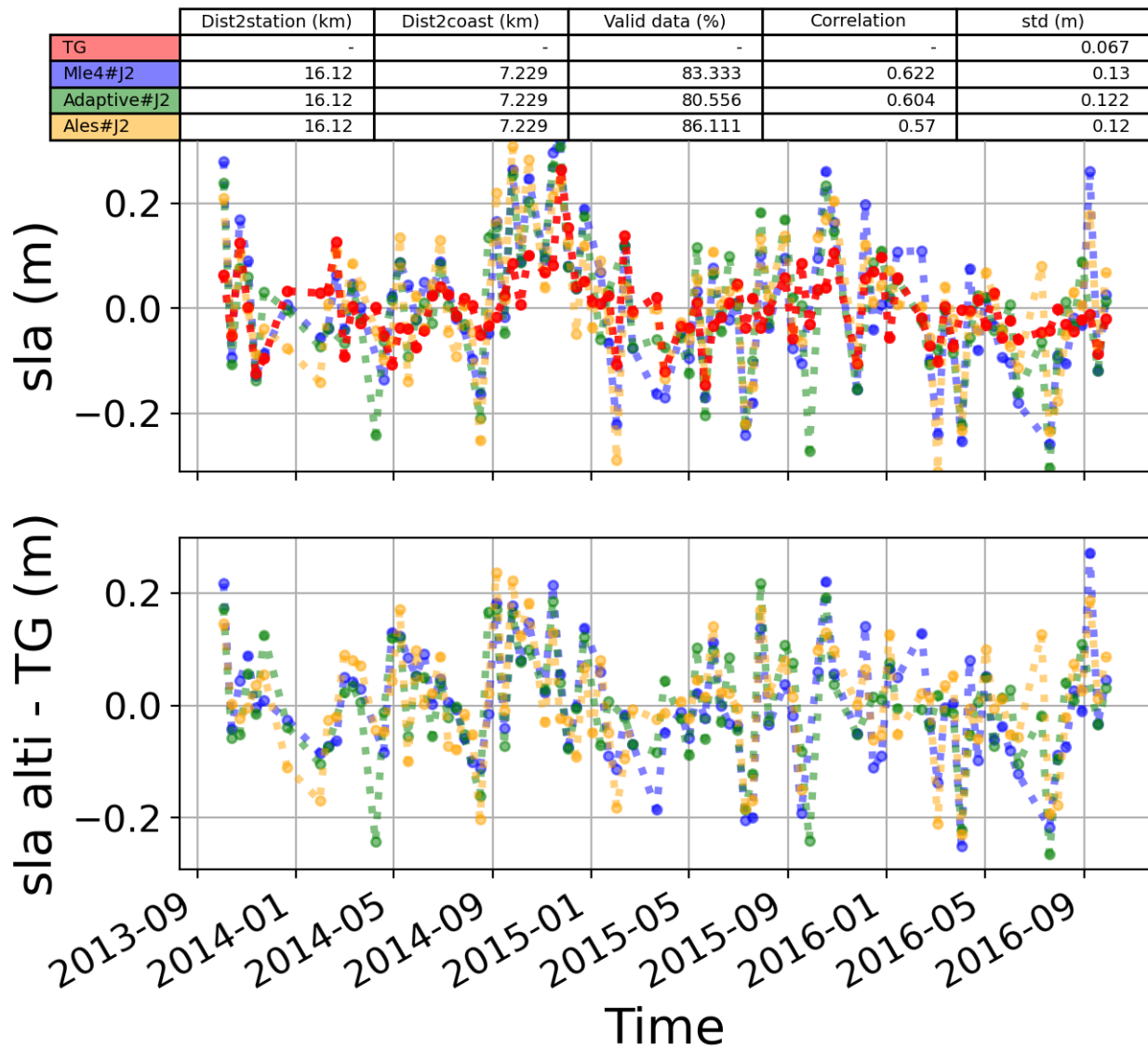


FIGURE 43 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.2 Station : Mentès

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

6.2.1 correlation visualization in maps view % Mentès tide gauge

Correlation Altimetry data with respect to Mentès Tide gauge data

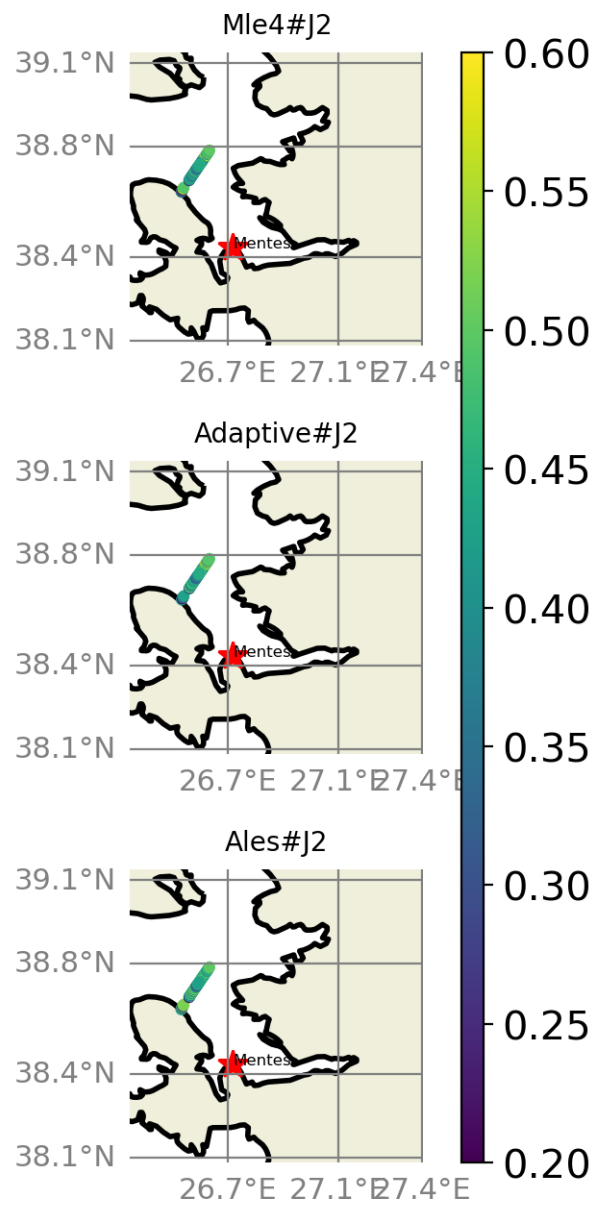


FIGURE 44 – correlation visualization in maps view % Mentès tide gauge

6.2.2 rmsd visualization in maps view % Mentès tide gauge

Rmsd (m) Altimetry data with respect to Mentès Tide gauge data

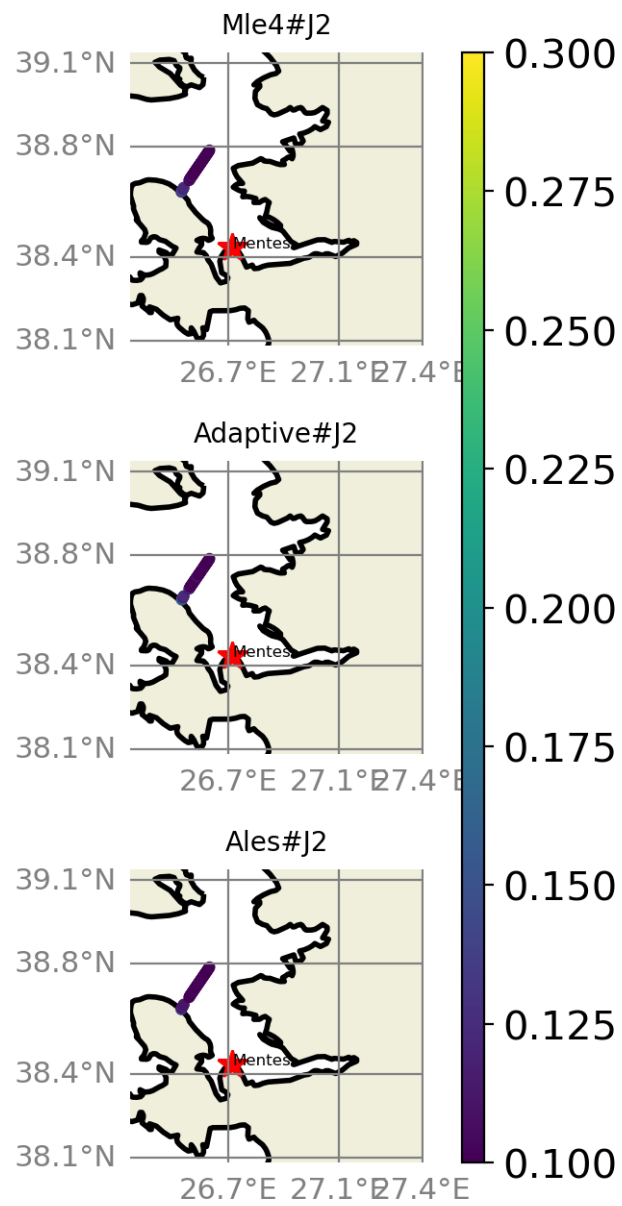


FIGURE 45 – rmsd visualization in maps view % Mentès tide gauge

6.2.3 std visualization in maps view % Mentès tide gauge

Std (m) Altimetry data with respect to Mentès Tide gauge data

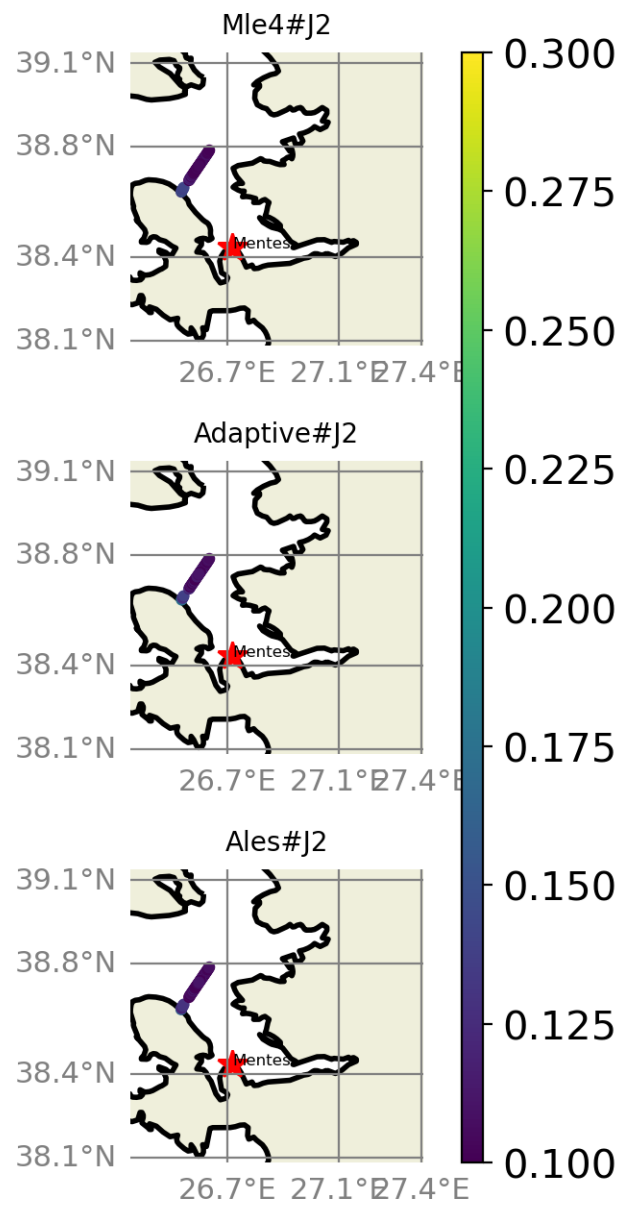


FIGURE 46 – std visualization in maps view % Mentès tide gauge

6.2.4 valid_data_percent visualization in maps view % Mentès tide gauge

Valid_Data_Percent (%) Altimetry data with respect to Mentès Tide gauge data

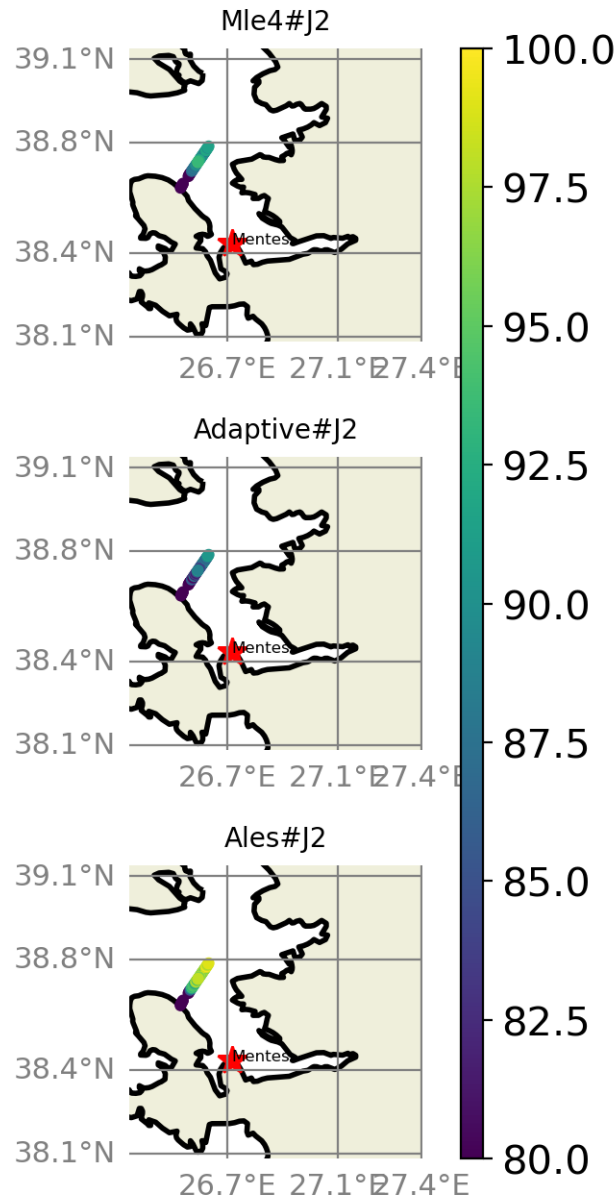


FIGURE 47 – valid_data_percent visualization in maps view % Mentès tide gauge

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

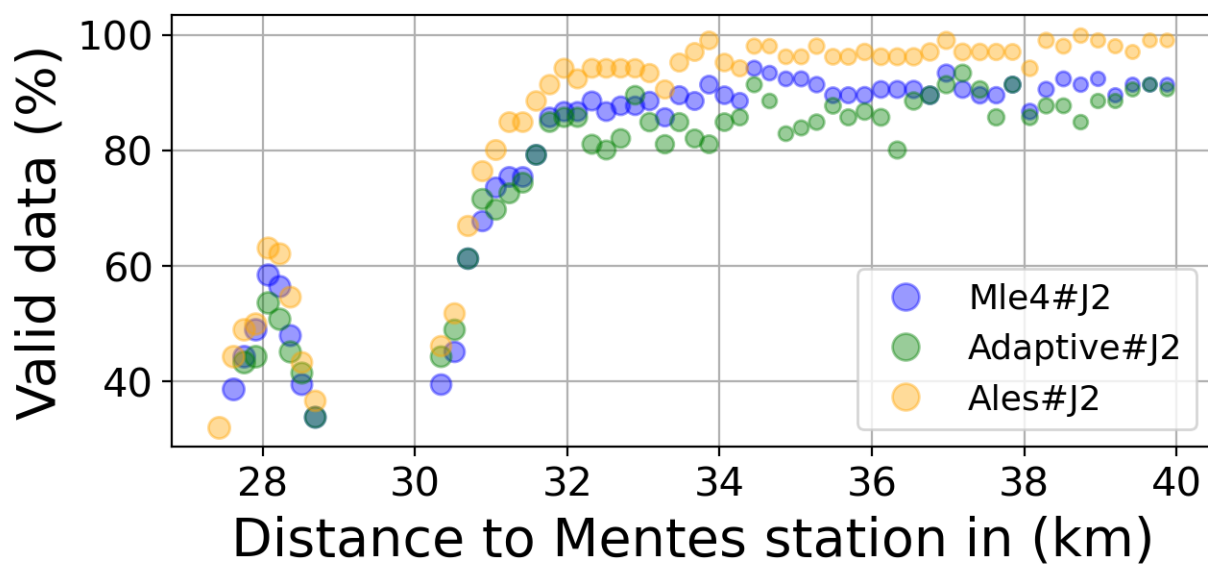
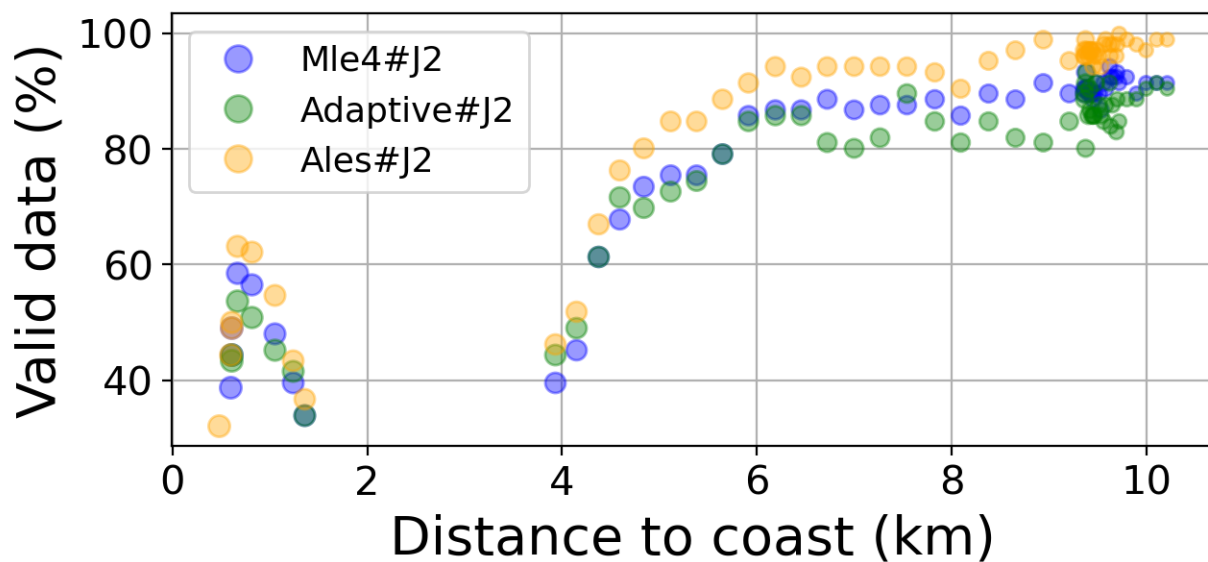


FIGURE 48 – Valid data (%) in function of distance to coast/Mentés station

6.2.6 Std in function of distance to coast/Mentes station

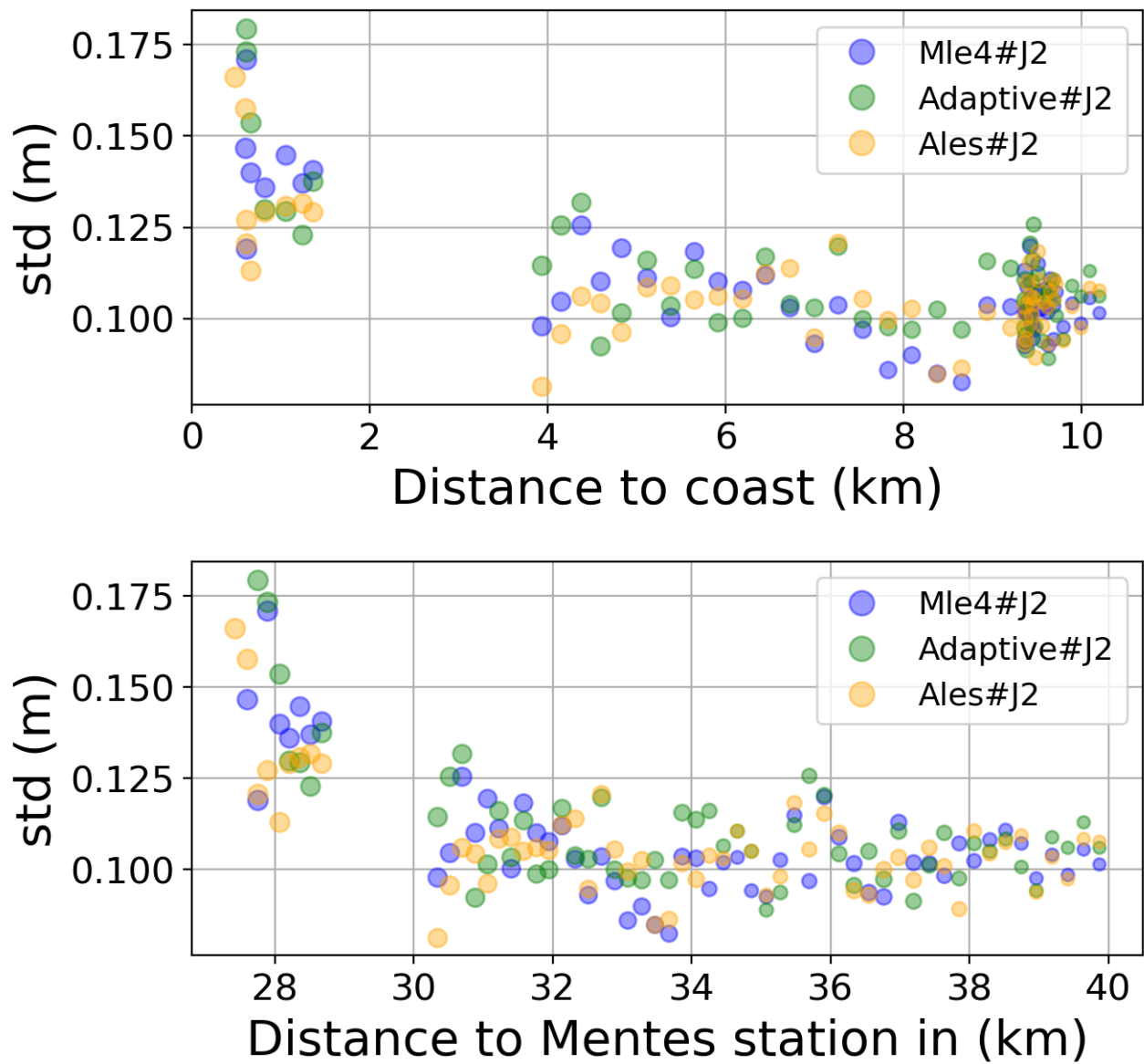


FIGURE 49 – Std in function of the distance to the coast/Mentes station

6.2.7 Correlation in function of distance to coast/Mentes station

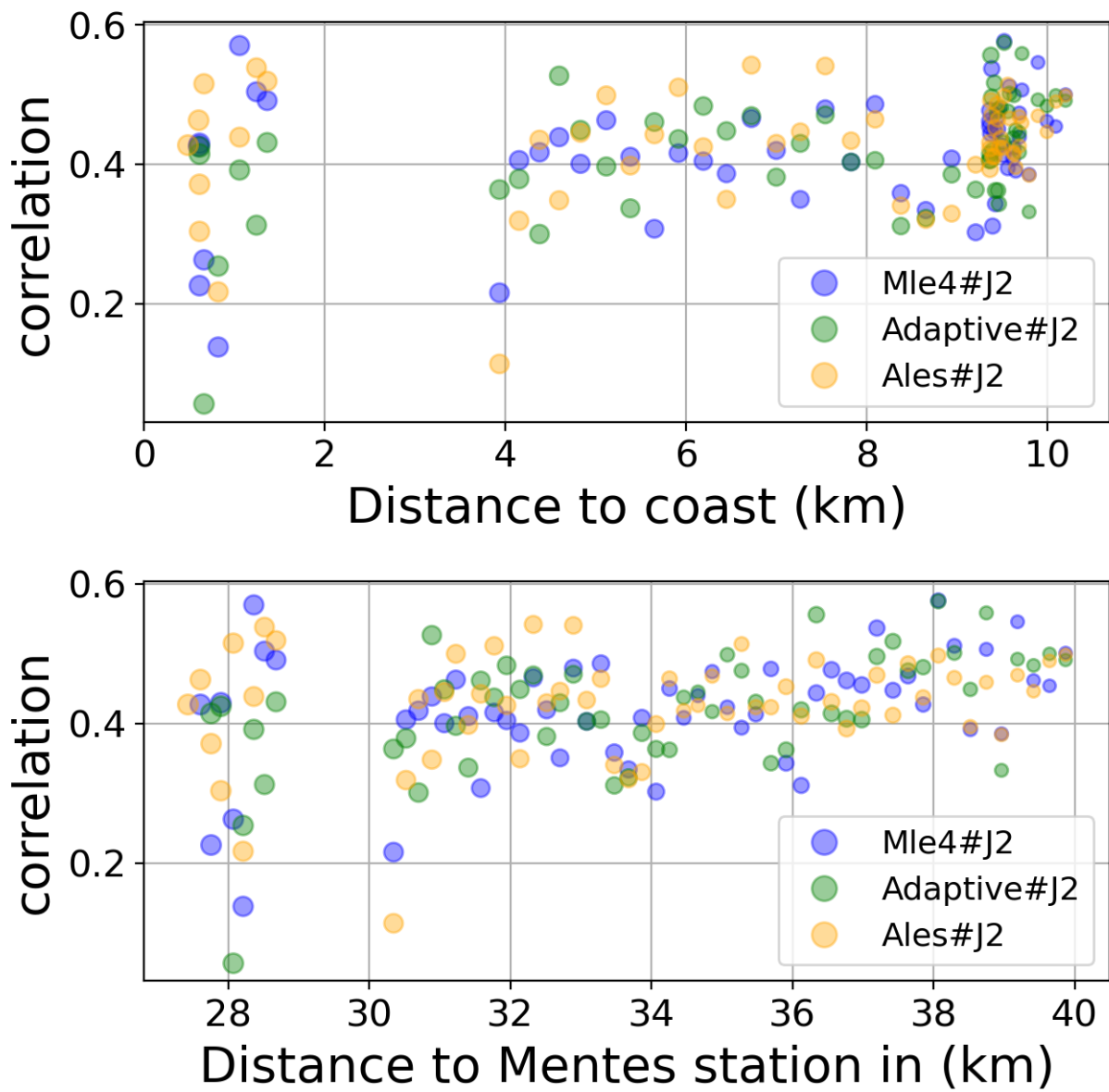


FIGURE 50 – Correlation in function of the distance to the coast/Mentes station

6.2.8 Taylor Diagram

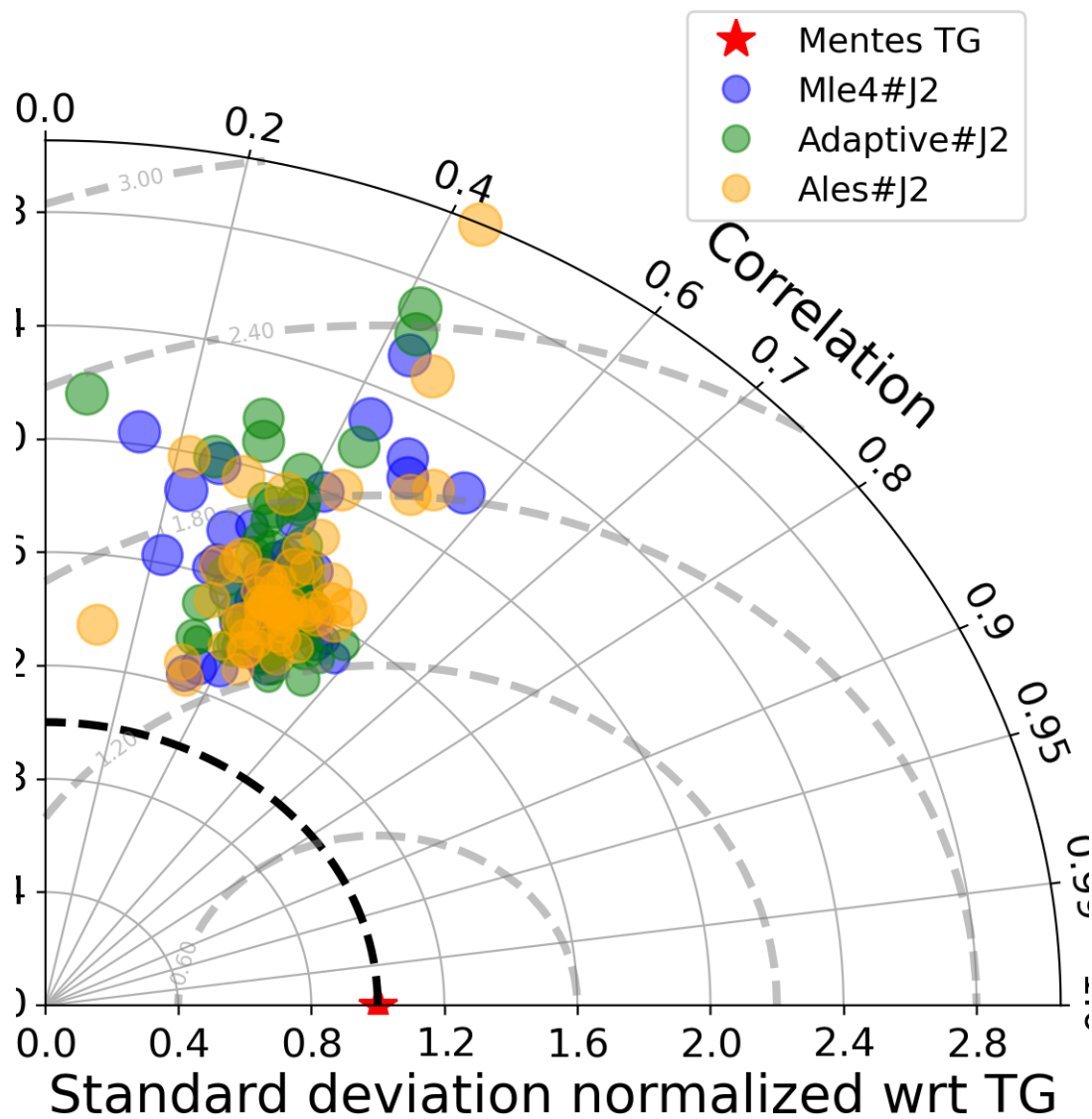


FIGURE 51 – Taylor diagram

6.2.9 Mean statistics table of products comparison with Menten 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.

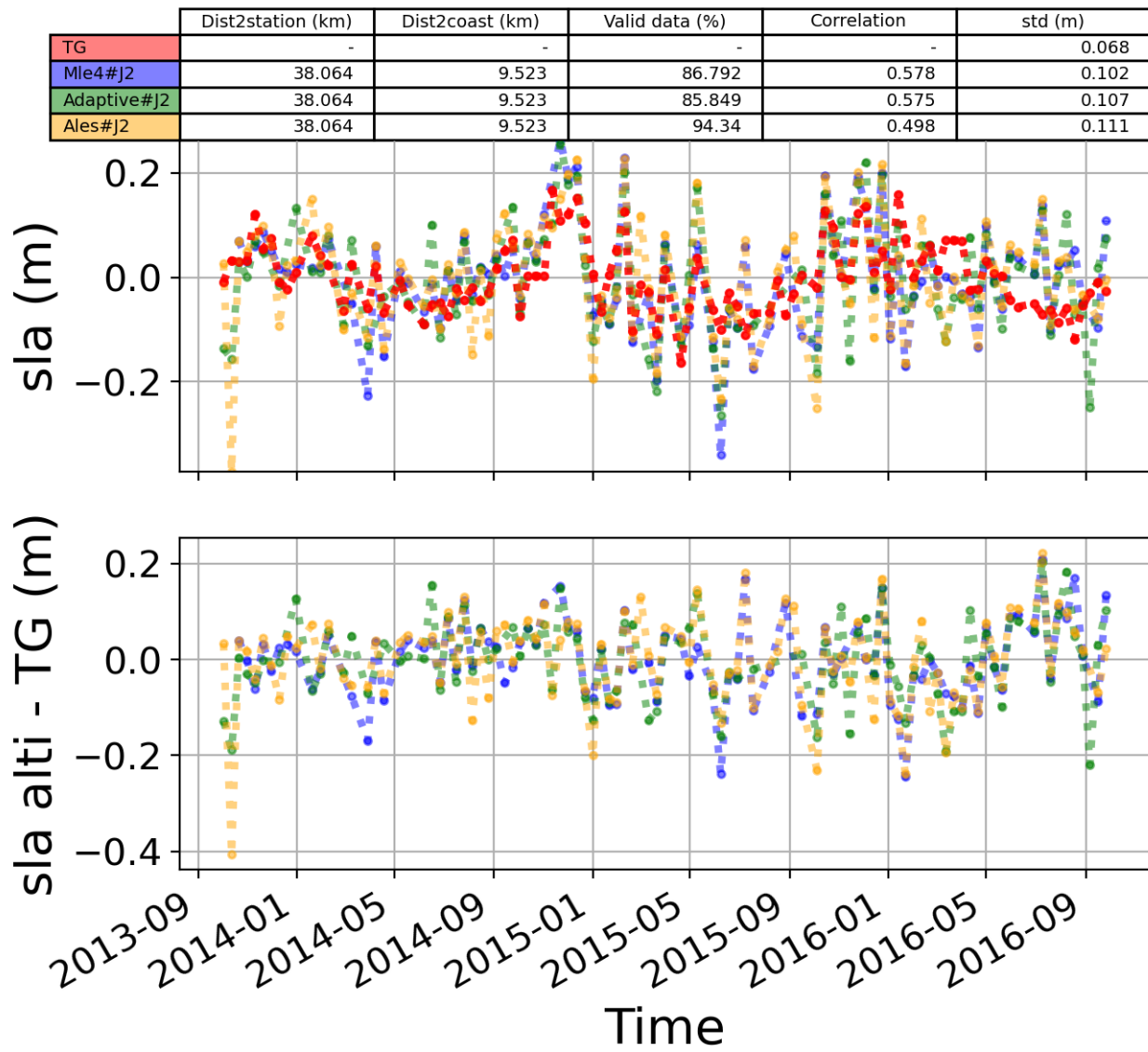


FIGURE 53 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

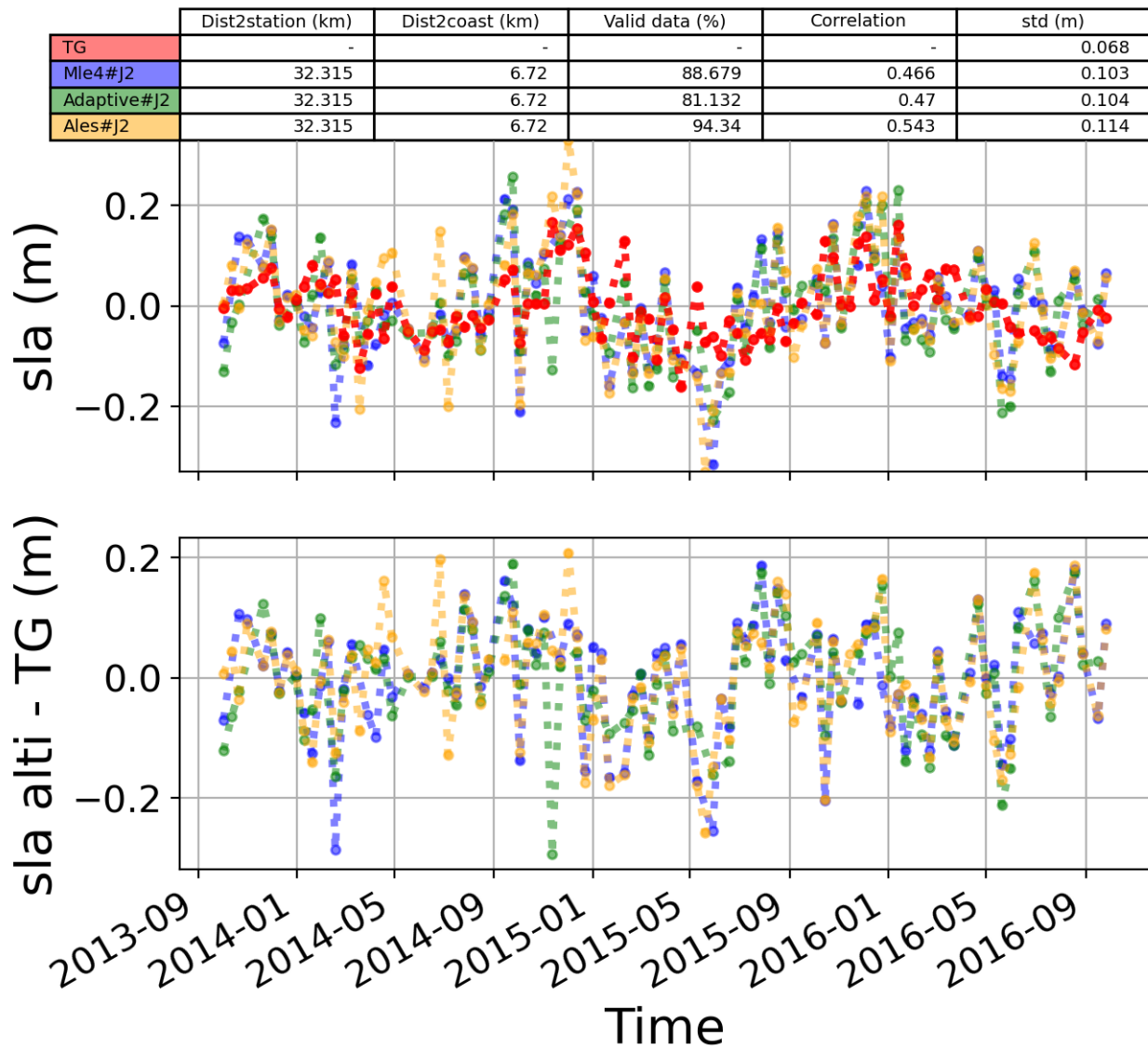


FIGURE 54 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

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 : $[38.6, 39.05]^\circ$

6.3.1 correlation visualization in maps view % Ibiza tide gauge

Correlation Altimetry data with respect to Ibiza Tide gauge data

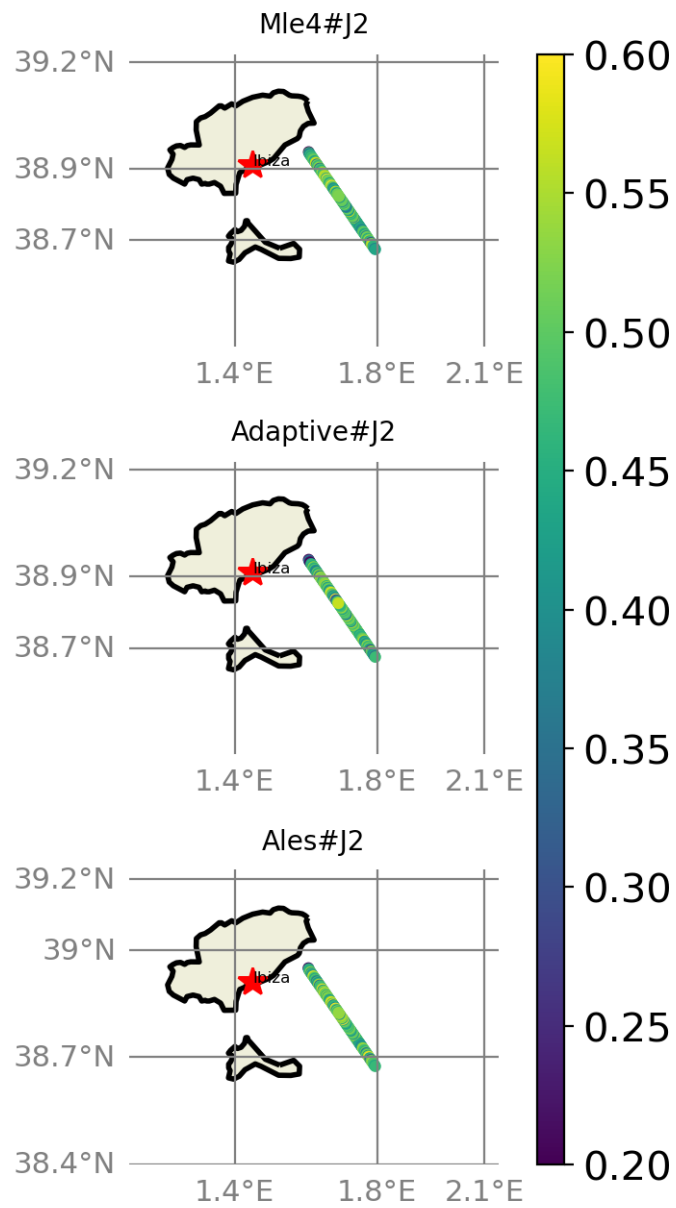


FIGURE 55 – correlation visualization in maps view % Ibiza tide gauge

6.3.2 rmsd visualization in maps view % Ibiza tide gauge

Rmsd (m) Altimetry data with respect to Ibiza Tide gauge data

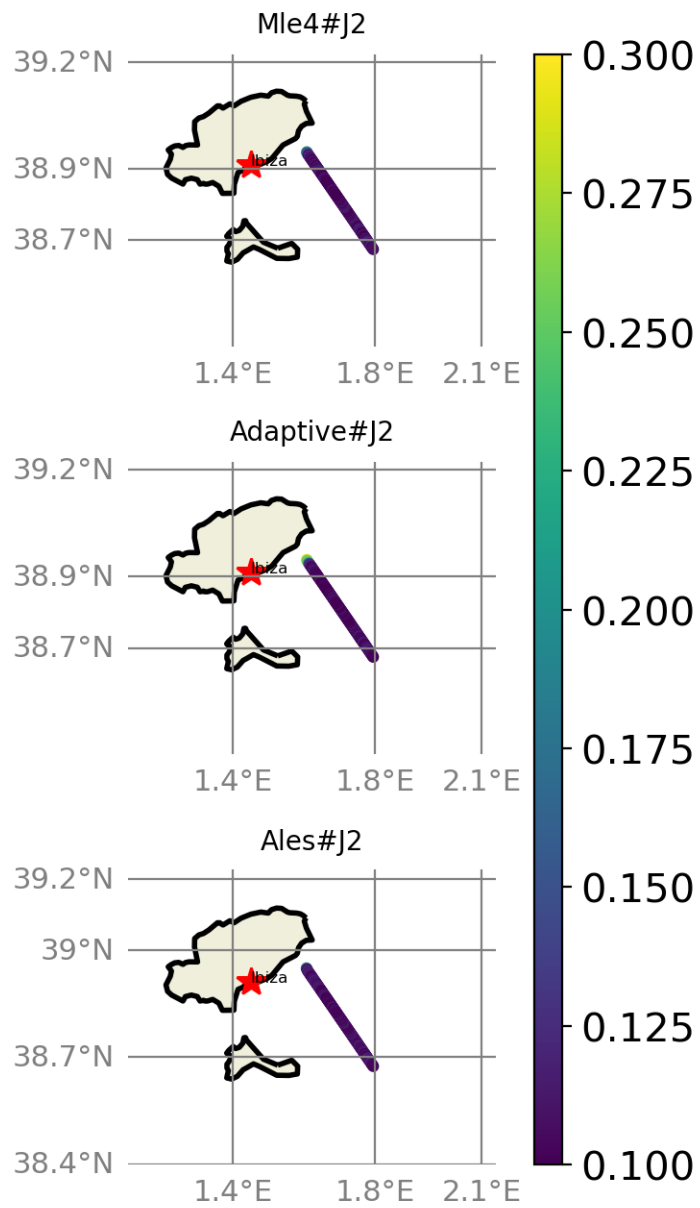


FIGURE 56 – rmsd visualization in maps view % Ibiza tide gauge

6.3.3 std visualization in maps view % Ibiza tide gauge

Std (m) Altimetry data with respect to Ibiza Tide gauge data

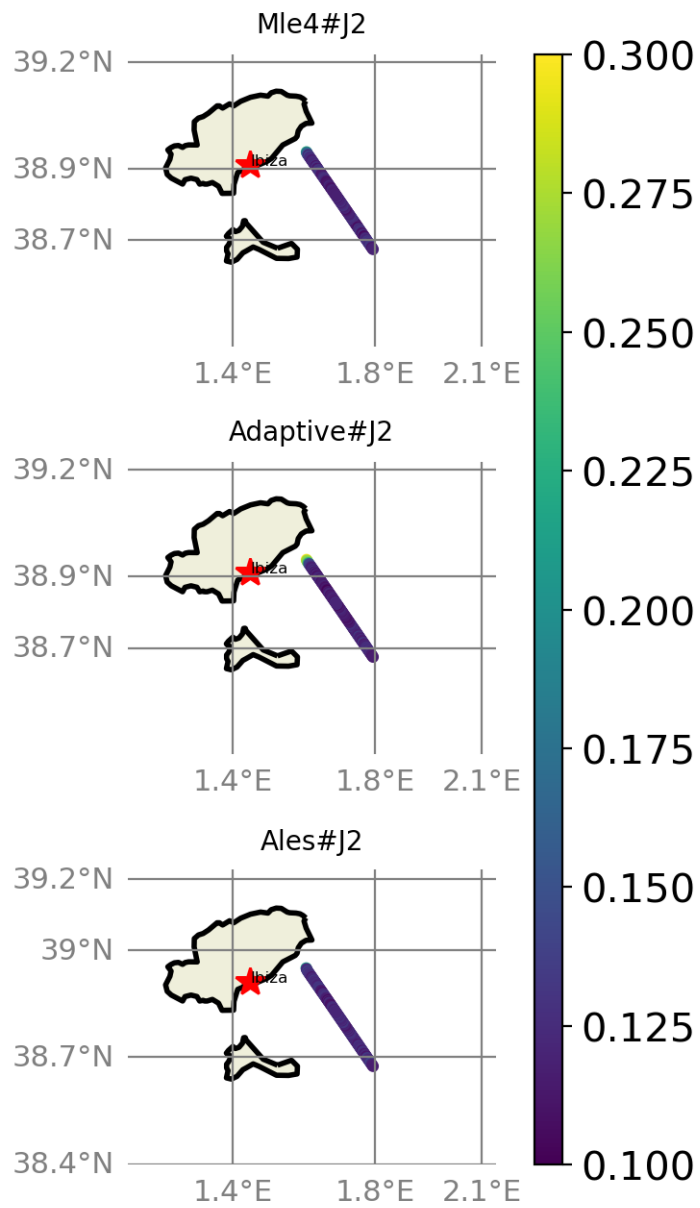


FIGURE 57 – std visualization in maps view % Ibiza tide gauge

6.3.4 valid_data_percent visualization in maps view % Ibiza tide gauge

Valid_Data_Percent (%) Altimetry data with respect to Ibiza Tide gauge data

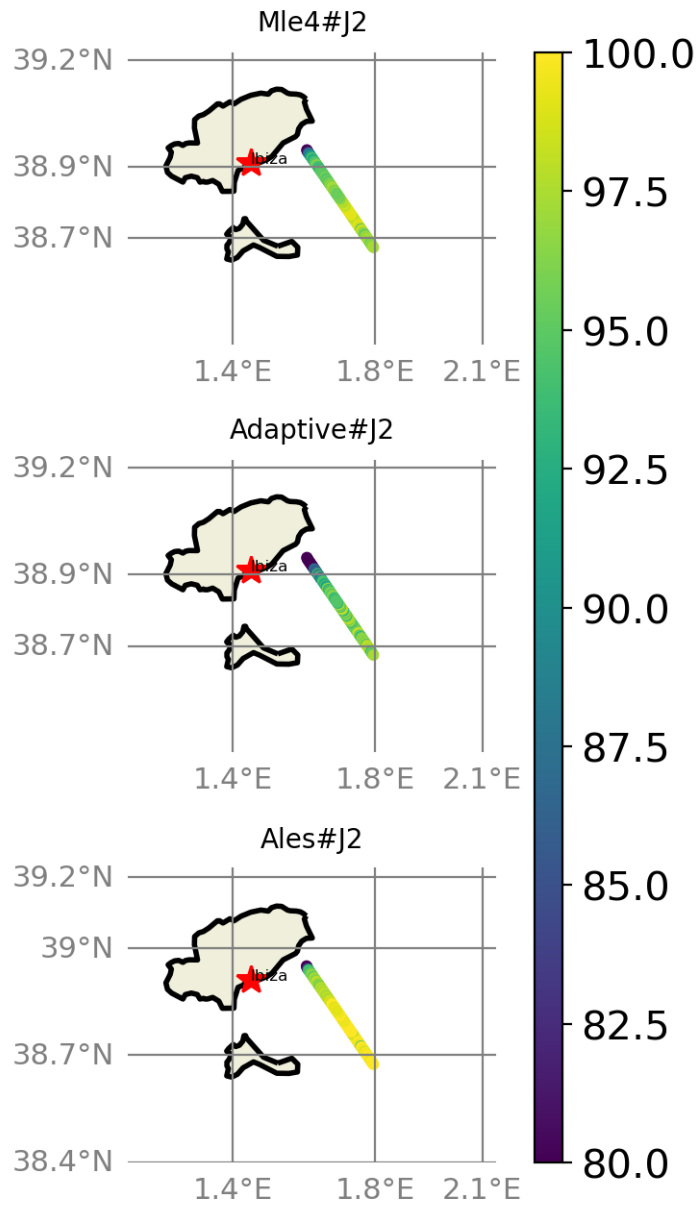


FIGURE 58 – valid_data_percent visualization in maps view % Ibiza tide gauge

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.

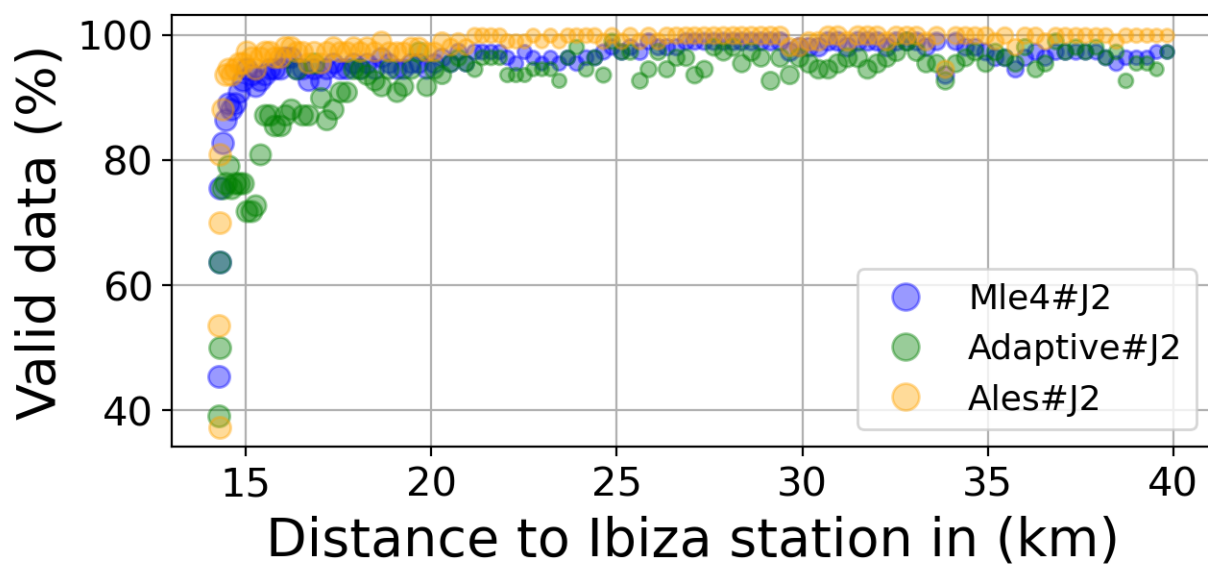
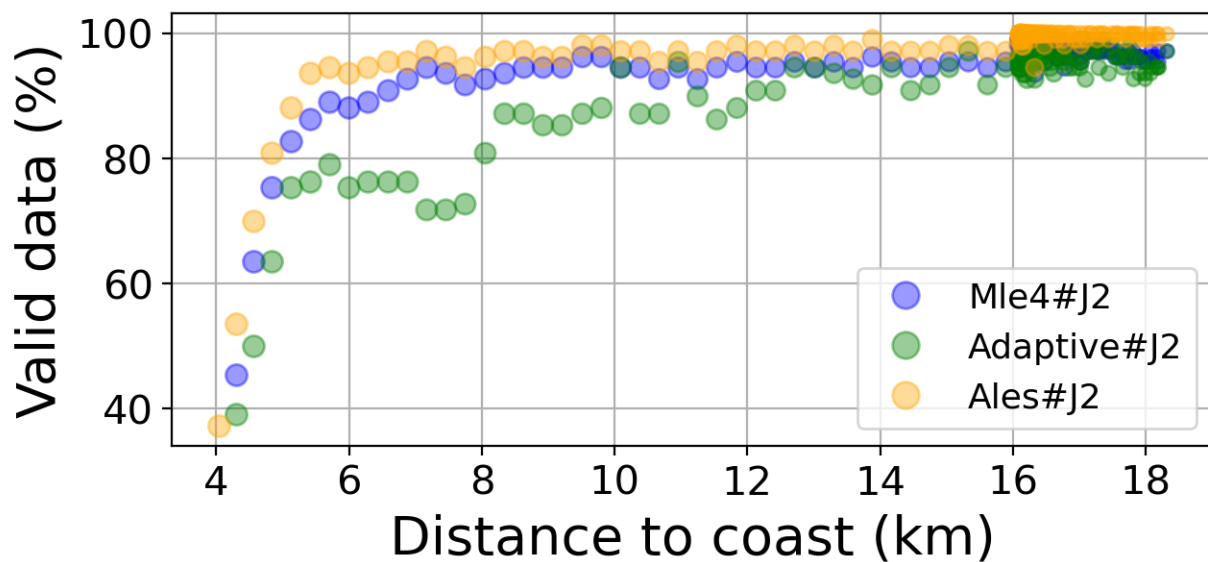


FIGURE 59 – Valid data (%) in function of distance to coast/Ibiza station

6.3.6 Std in function of distance to coast/Ibiza station

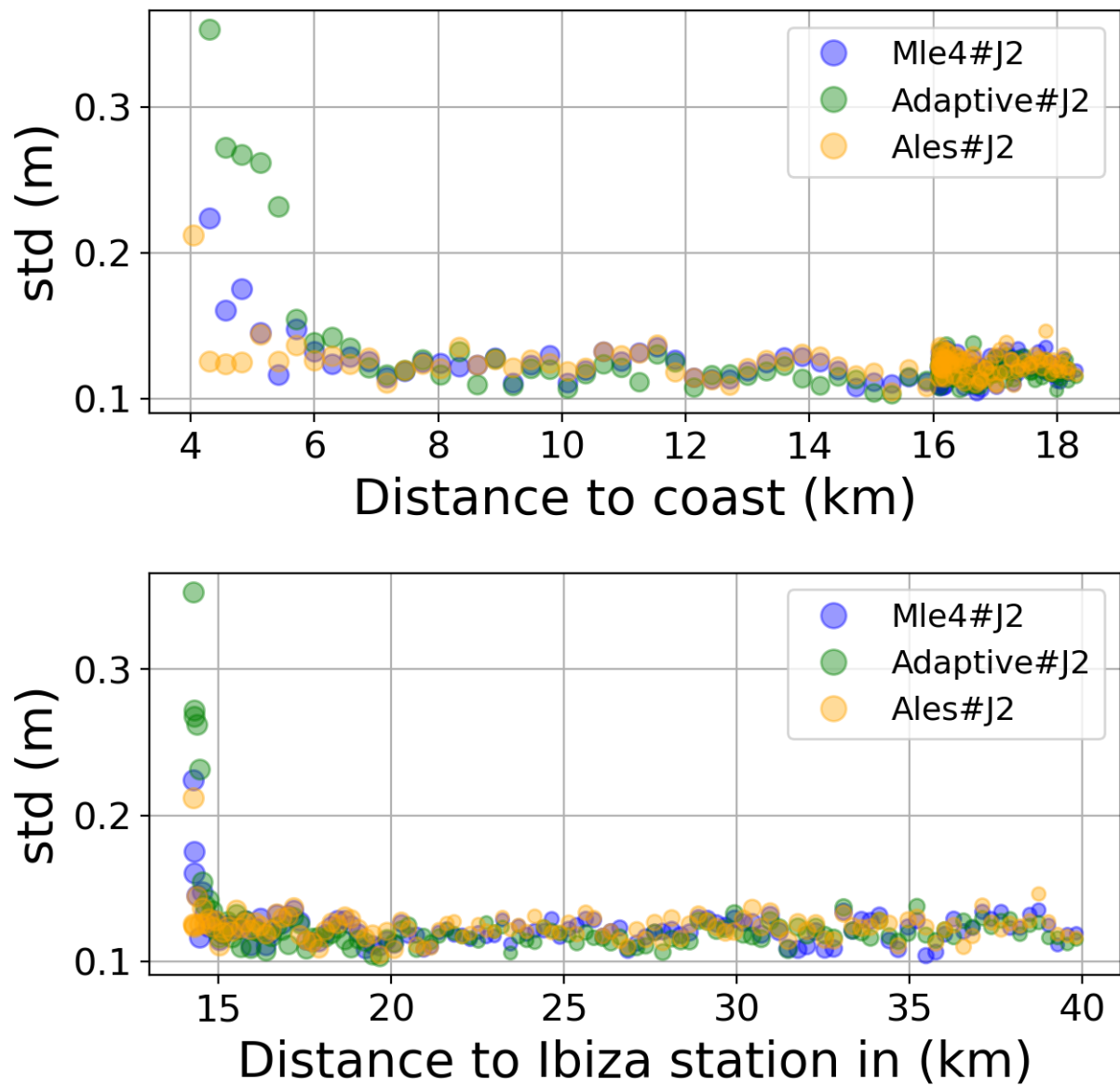


FIGURE 60 – Std in function of the distance to the coast/Ibiza station

6.3.7 Correlation in function of distance to coast/Ibiza station

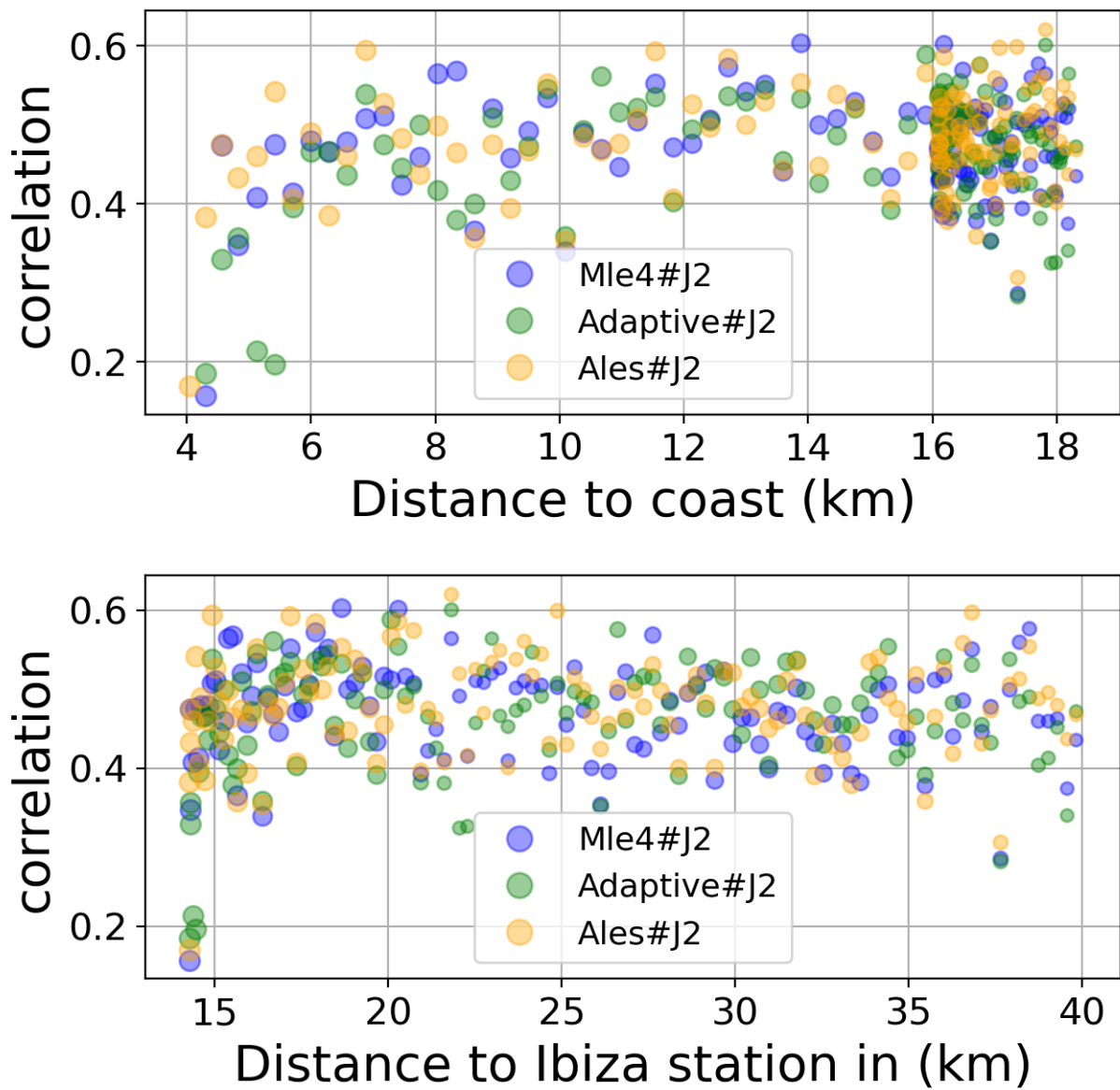


FIGURE 61 – Correlation in function of the distance to the coast/Ibiza station

6.3.8 Taylor Diagram

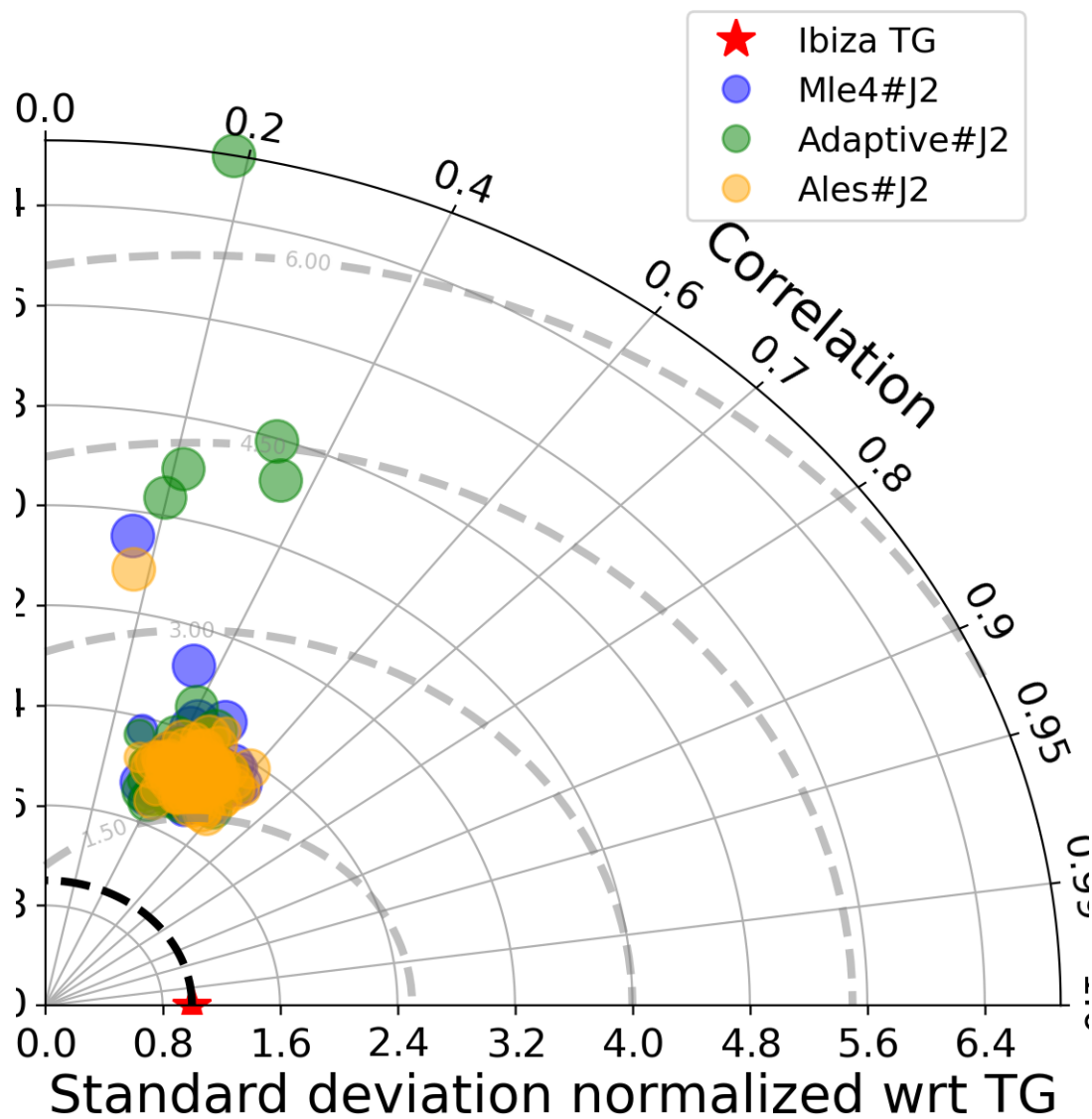


FIGURE 62 – Taylor diagram

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.

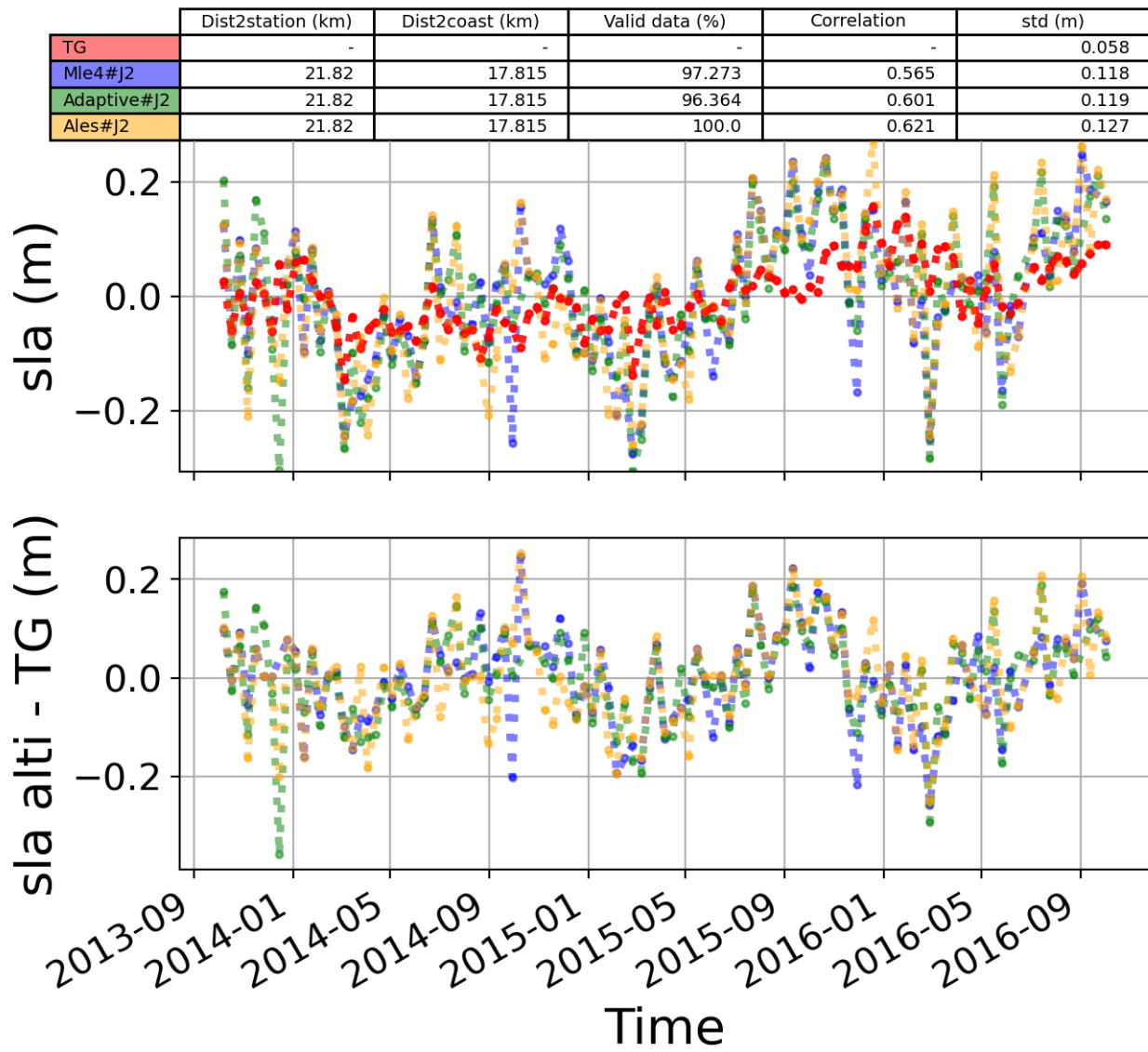


FIGURE 64 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

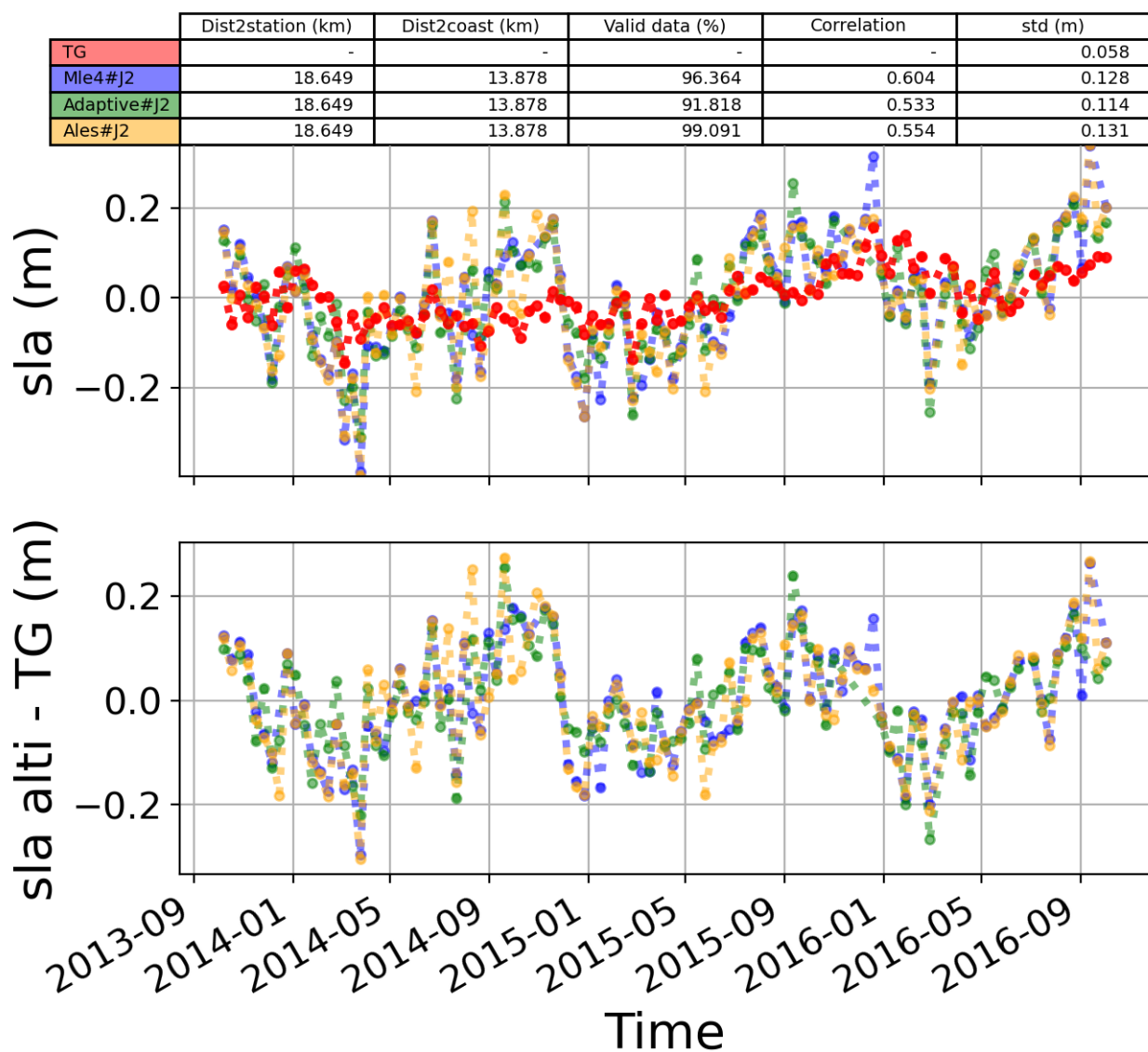


FIGURE 65 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

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 Radius of 40 Km
 - Maximum distance to the coast : 20 Km

6.4.1 correlation visualization in maps view % LA_FIGUEIRETTE tide gauge

Correlation Altimetry data with respect to LA_FIGUEIRETTE Tide gauge data

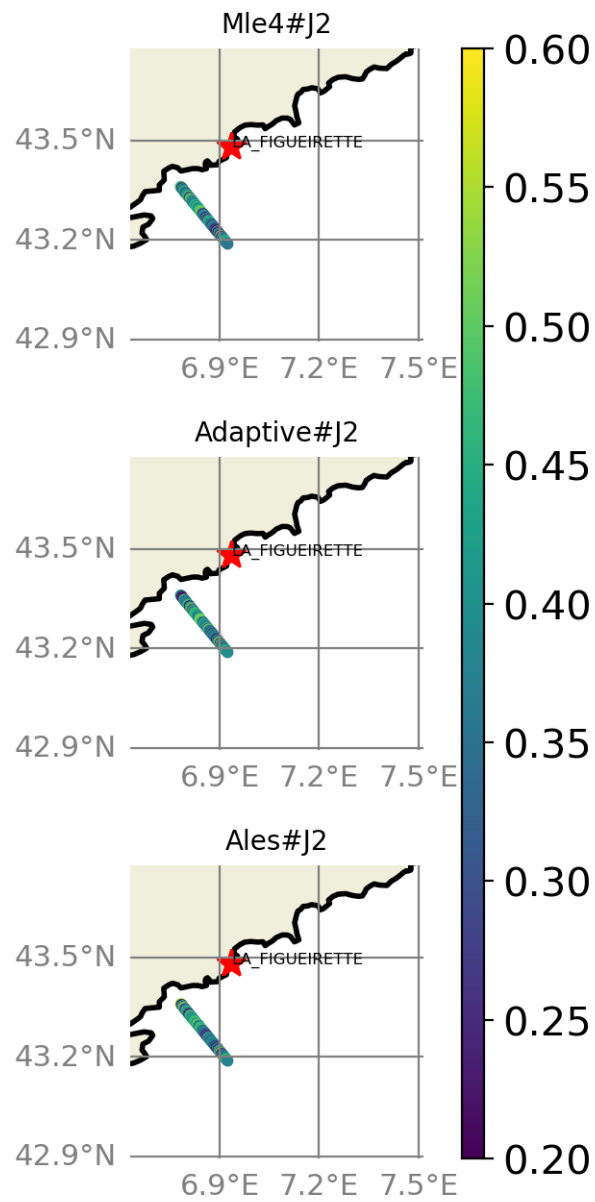


FIGURE 66 – correlation visualization in maps view % LA_FIGUEIRETTE tide gauge

6.4.2 rmsd visualization in maps view % LA_FIGUEIRETTE tide gauge

Rmsd (m) Altimetry data with respect to LA_FIGUEIRETTE Tide gauge data

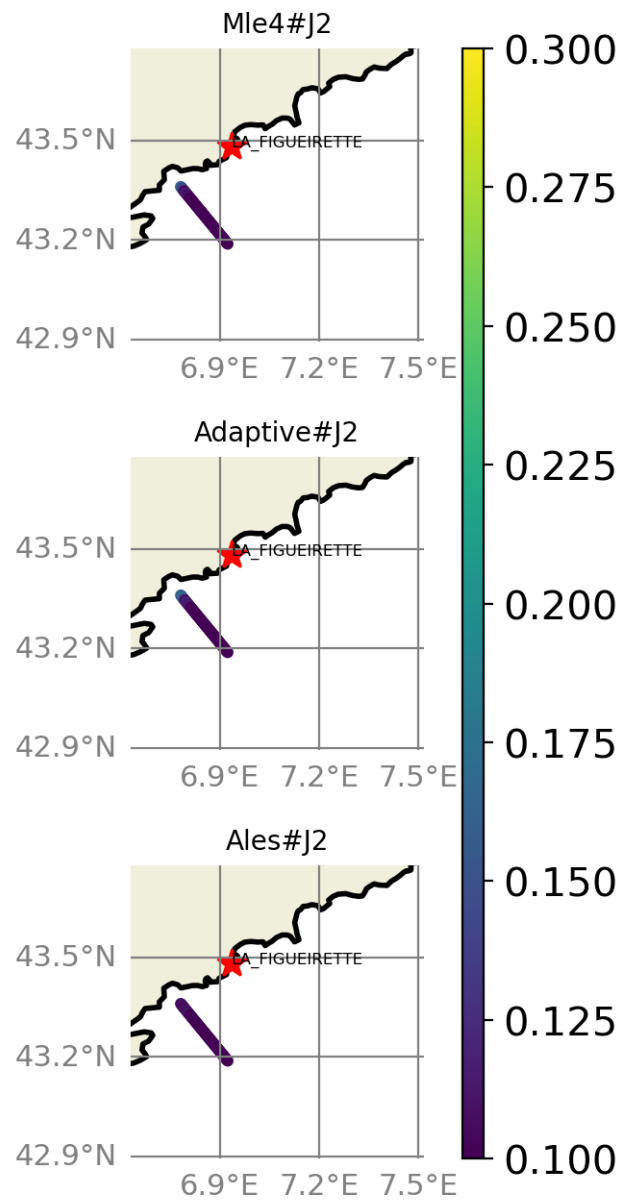


FIGURE 67 – rmsd visualization in maps view % LA_FIGUEIRETTE tide gauge

6.4.3 std visualization in maps view % LA_FIGUEIRETTE tide gauge

Std (m) Altimetry data with respect to LA_FIGUEIRETTE Tide gauge data

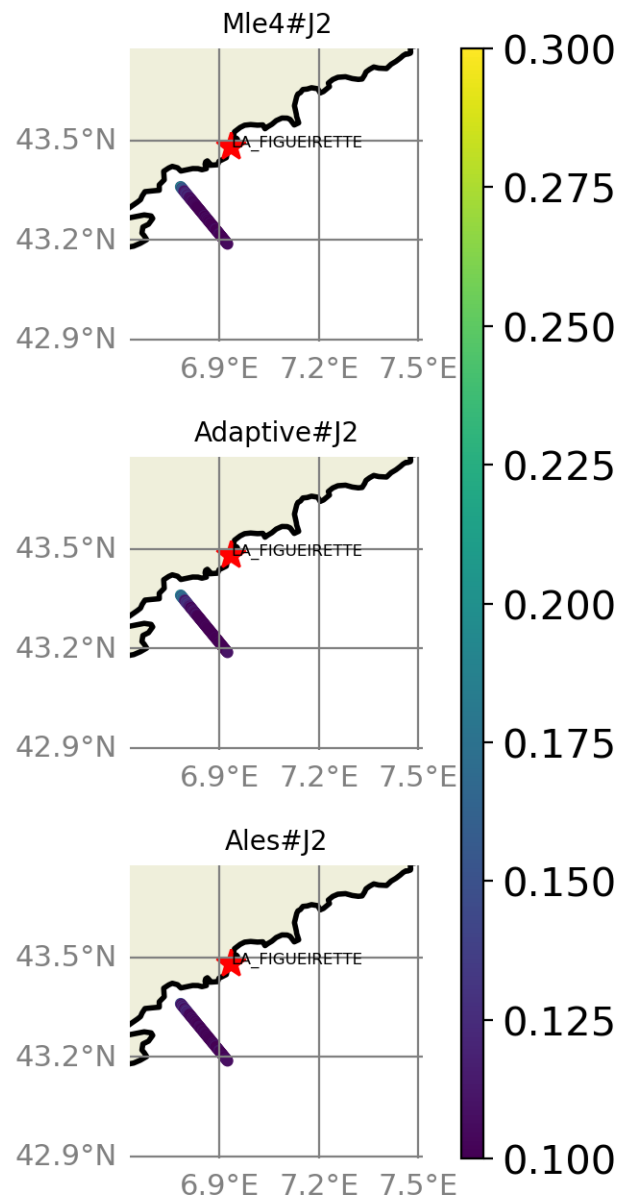


FIGURE 68 – std visualization in maps view % LA_FIGUEIRETTE tide gauge

6.4.4 valid_data_percent visualization in maps view % LA_FIGUEIRETTE tide gauge

Valid_Data_Percent (%) Altimetry data with respect to LA_FIGUEIRETTE Tide gauge data

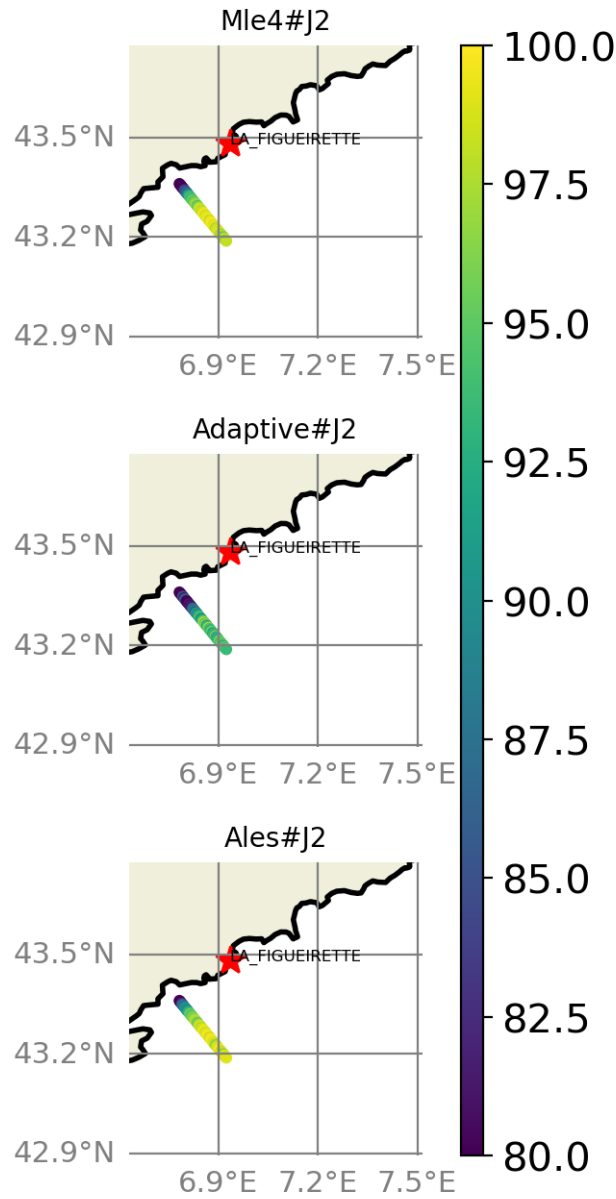


FIGURE 69 – valid_data_percent visualization in maps view % LA_FIGUEIRETTE tide gauge

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.

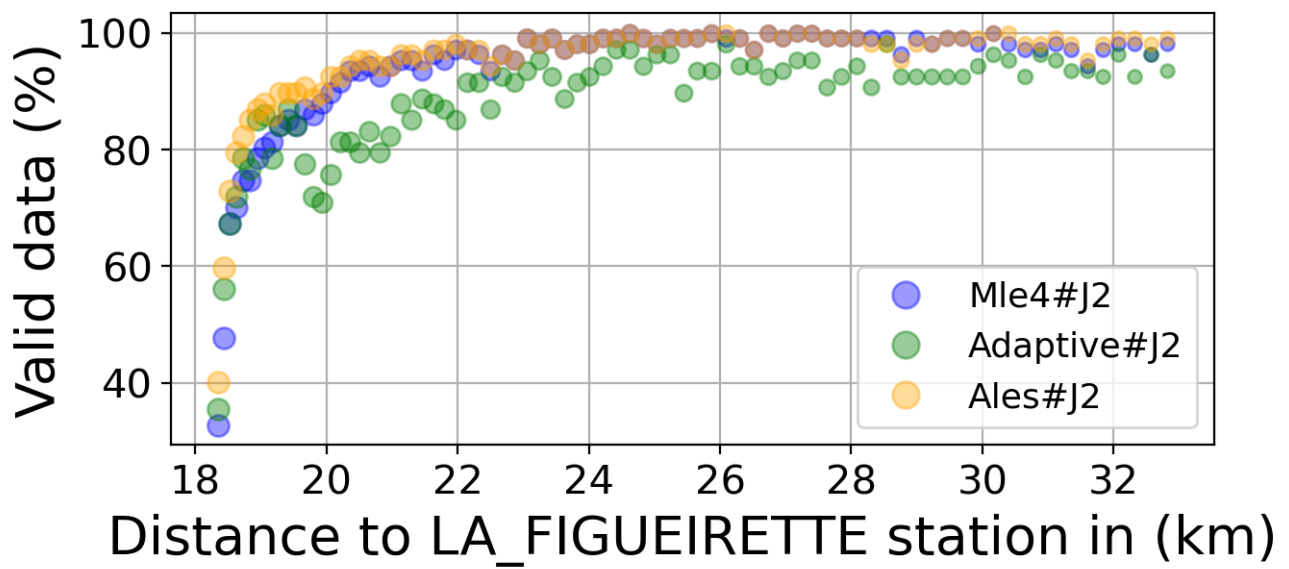
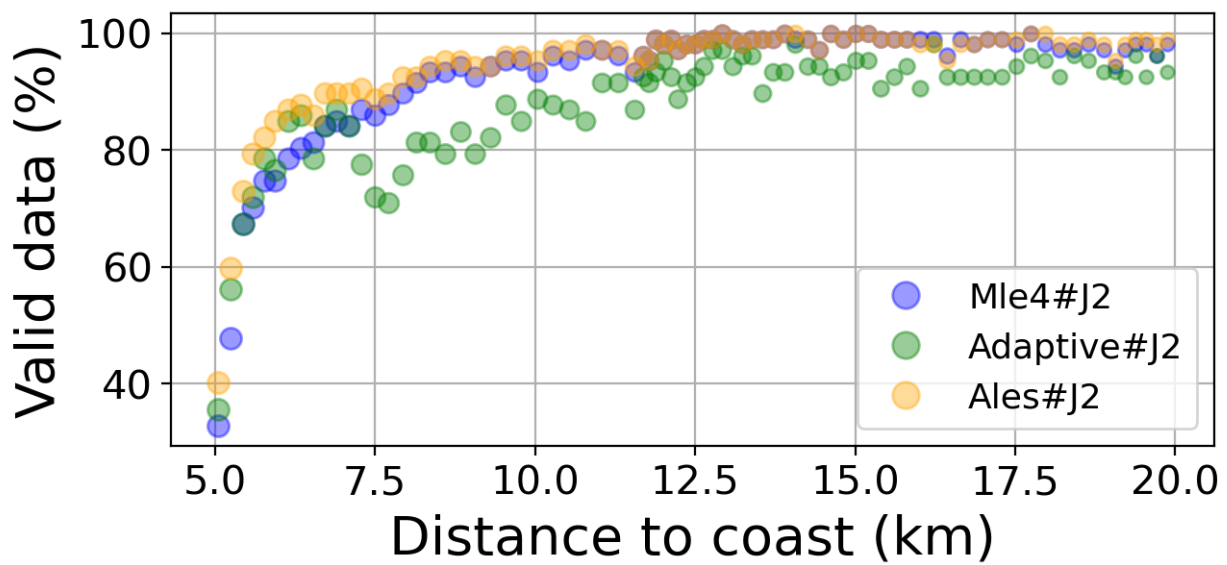


FIGURE 70 – Valid data (%) in function of distance to coast/LA_FIGUEIRETTE station

6.4.6 Std in function of distance to coast/LA_FIGUEIRETTE station

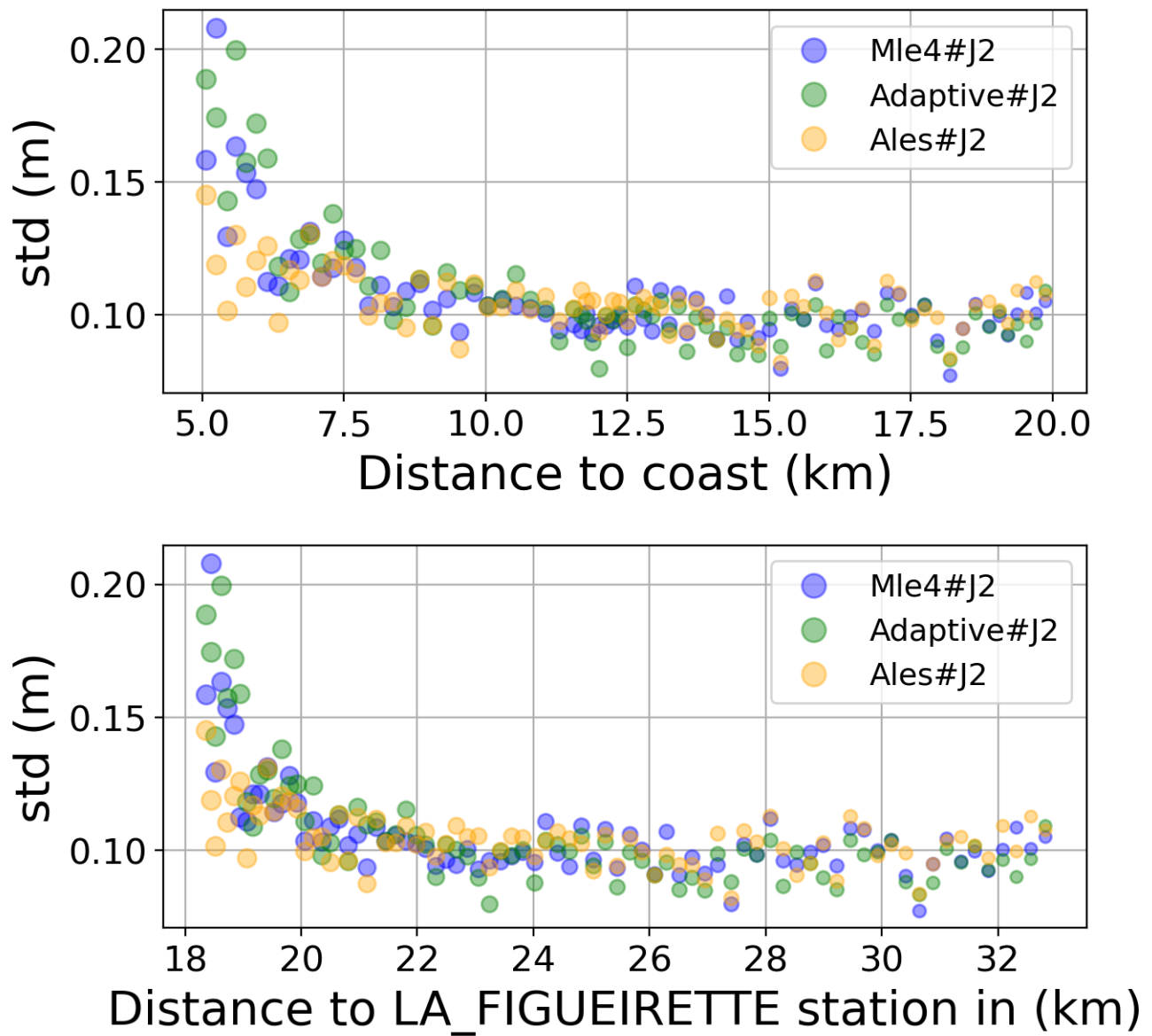


FIGURE 71 – Std in function of the distance to the coast/LA_FIGUEIRETTE station

6.4.7 Correlation in function of distance to coast/LA_FIGUEIRETTE station

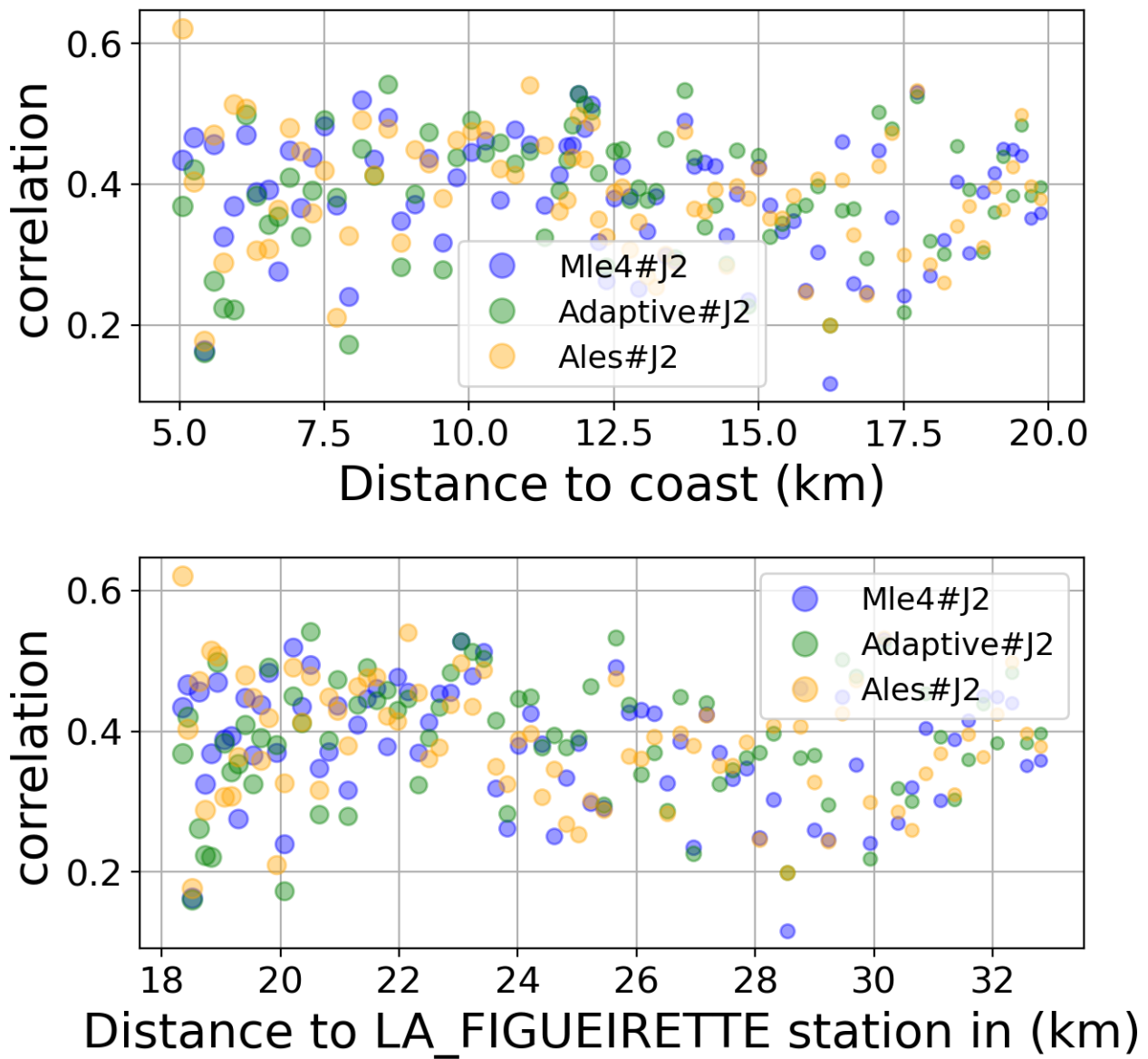


FIGURE 72 – Correlation in function of the distance to the coast/LA_FIGUEIRETTE station

6.4.8 Taylor Diagram

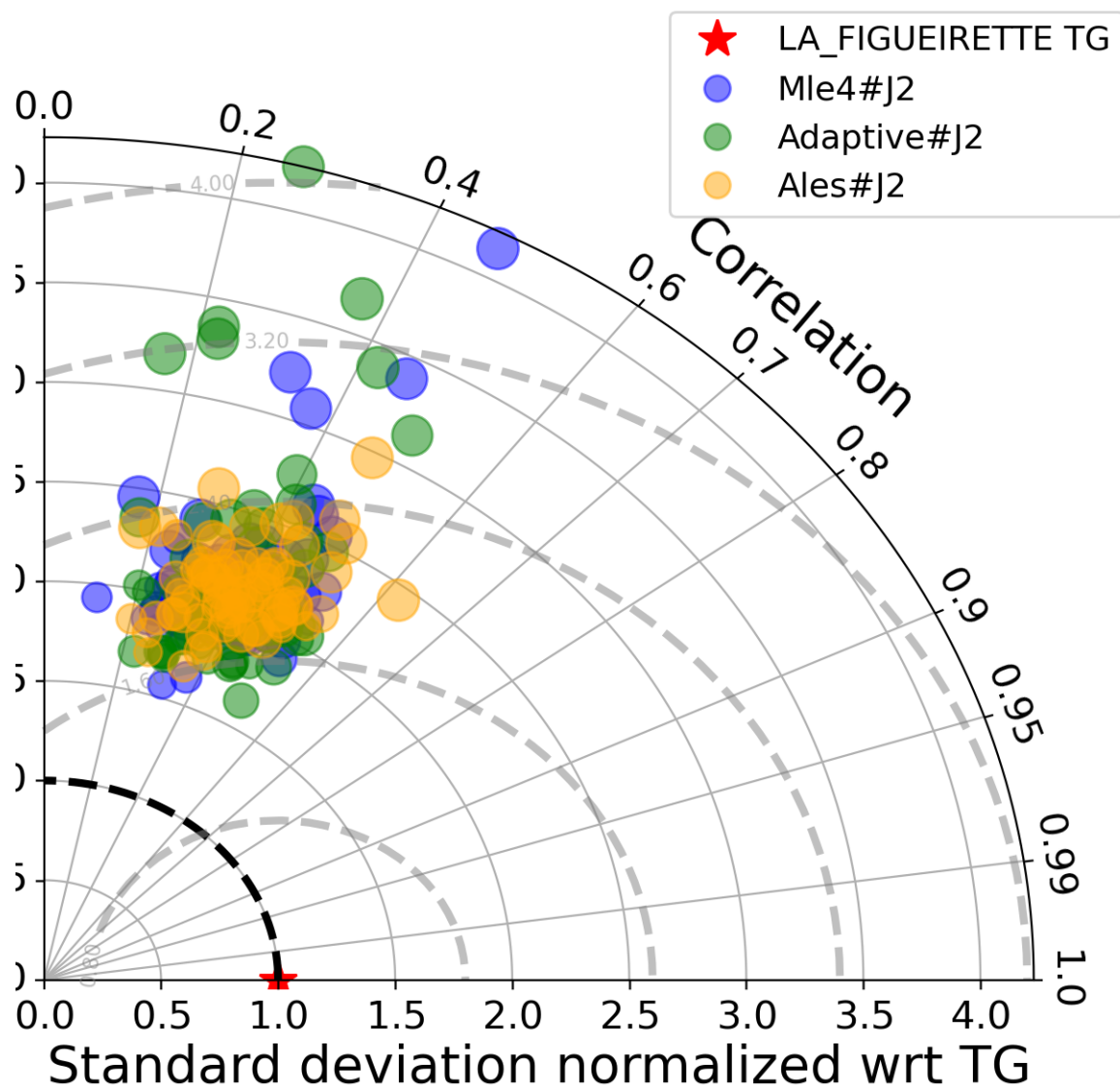


FIGURE 73 – Taylor diagram

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.

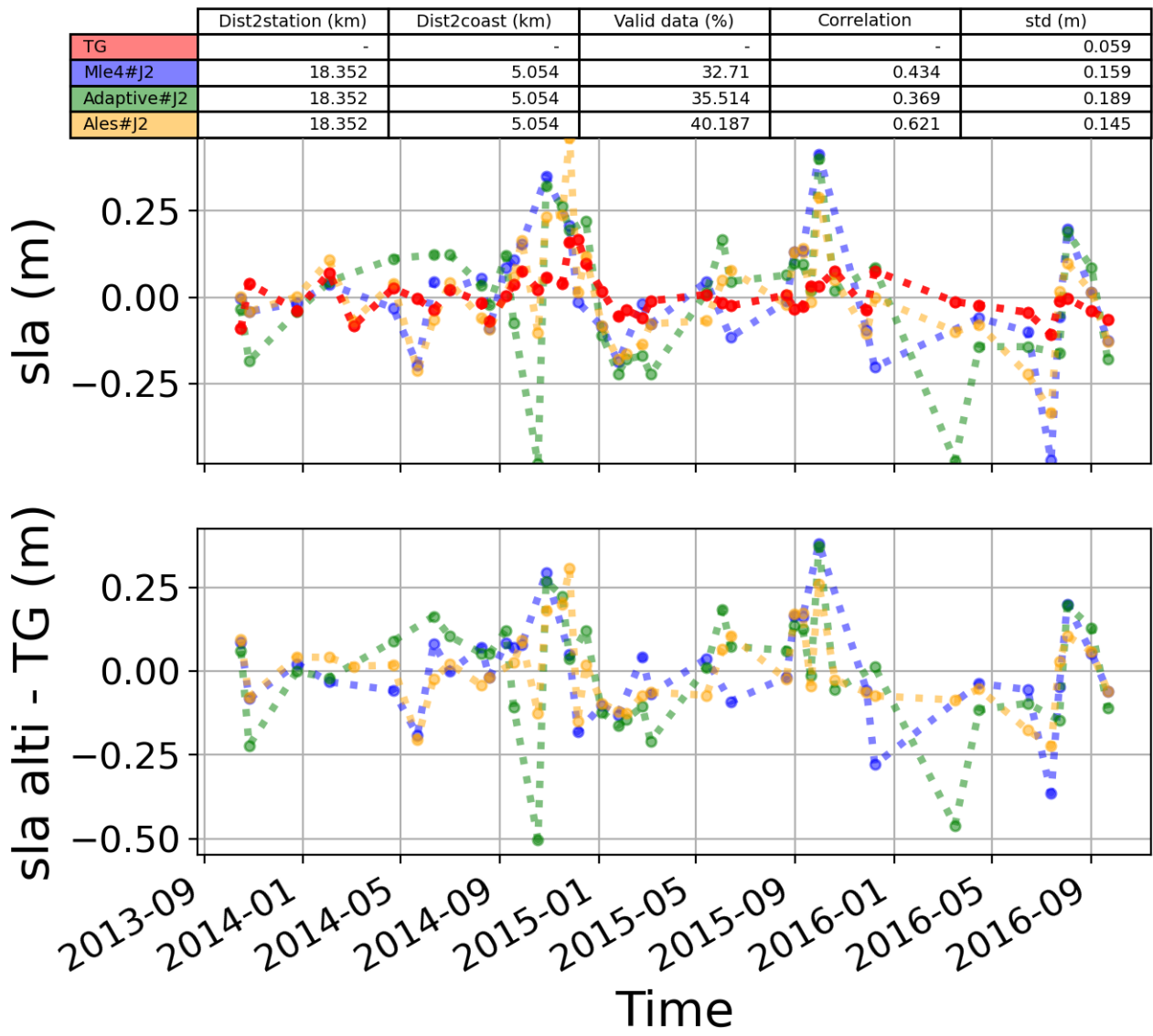


FIGURE 75 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

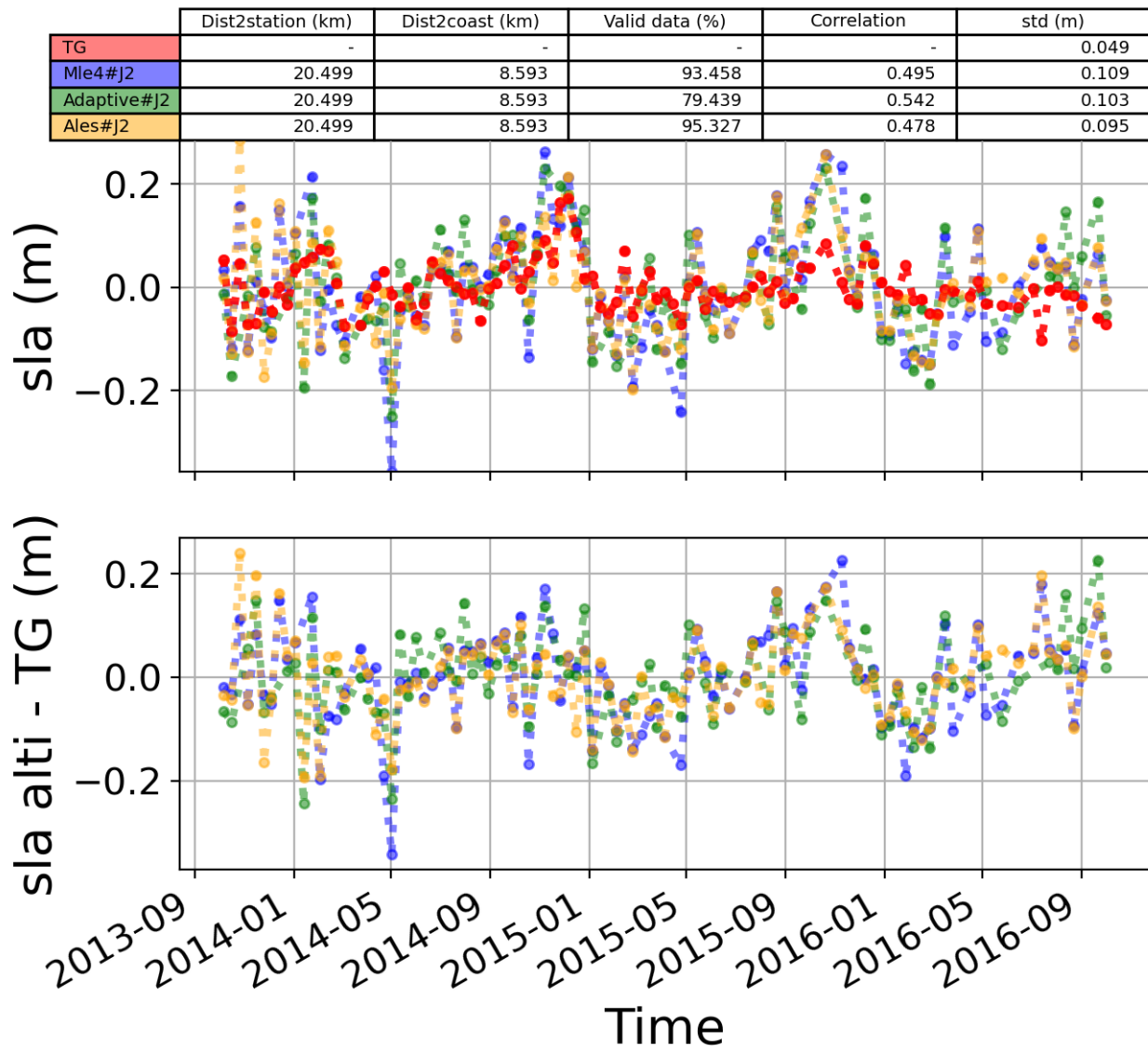


FIGURE 76 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

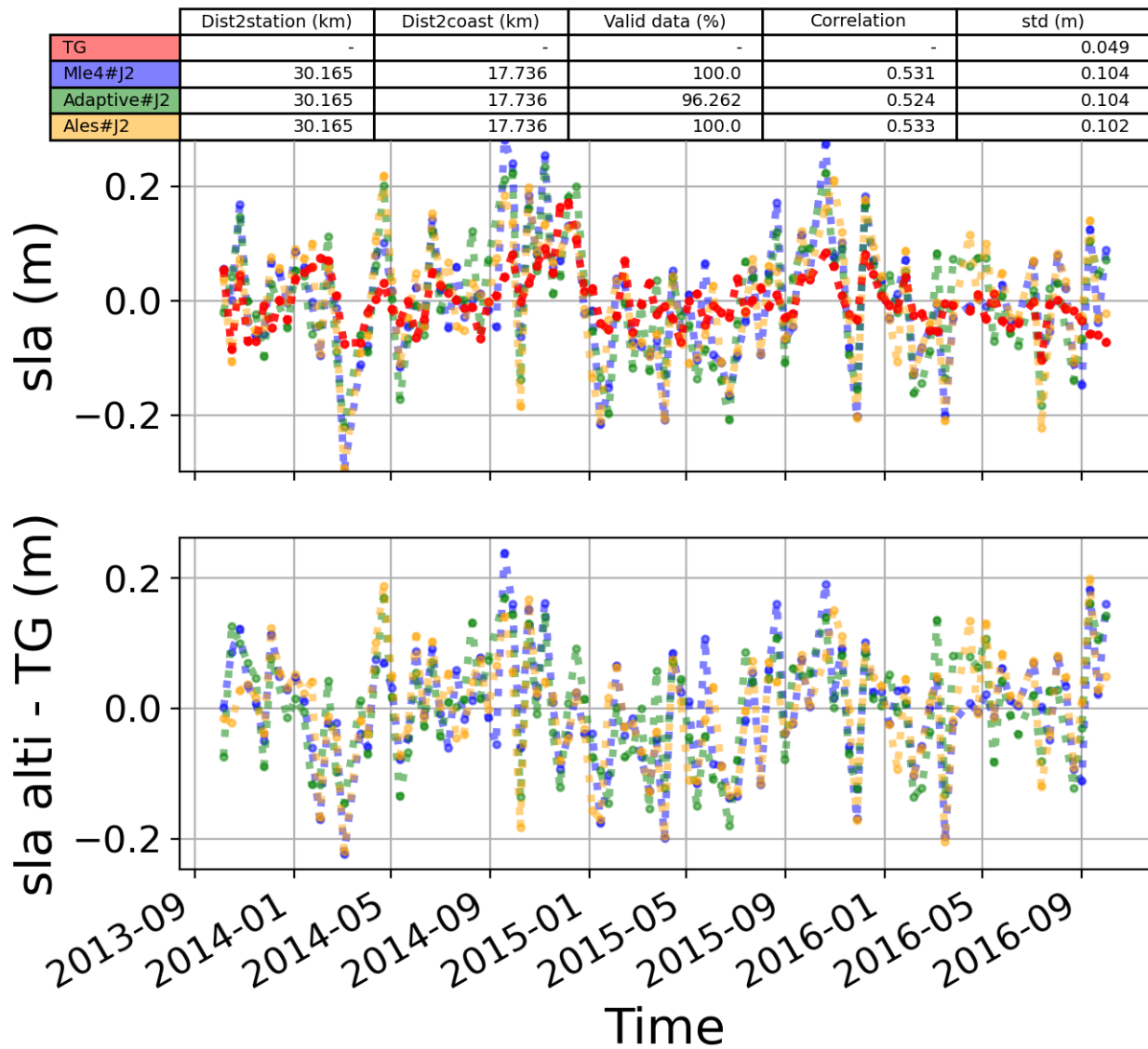


FIGURE 77 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

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

Correlation Altimetry data with respect to Ancona Tide gauge data

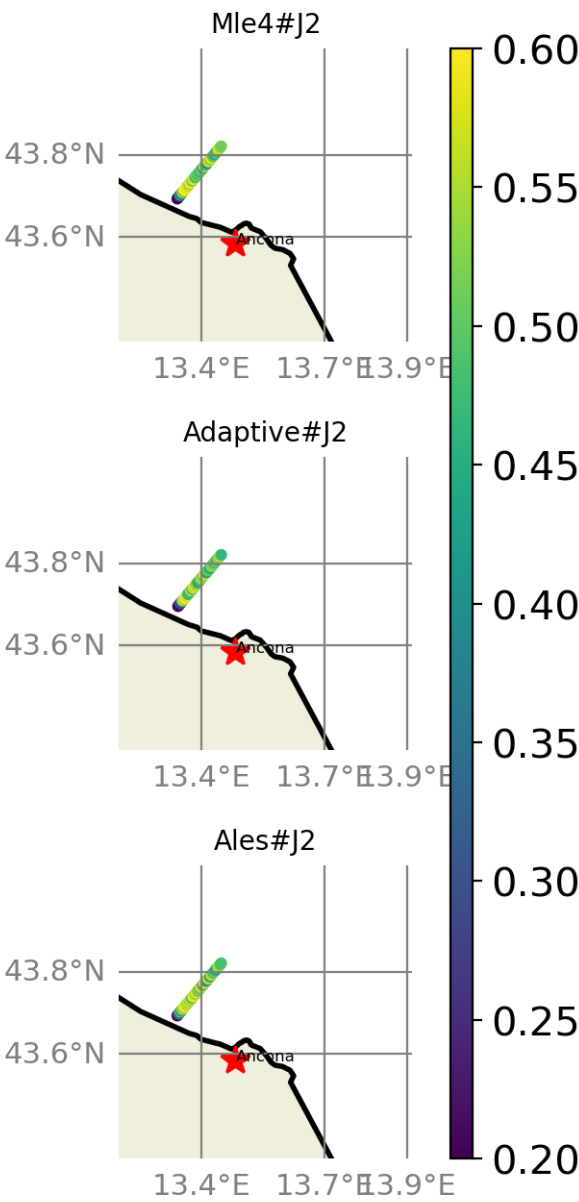


FIGURE 78 – correlation visualization in maps view % Ancona tide gauge

6.5.2 rmsd visualization in maps view % Ancona tide gauge

Rmsd (m) Altimetry data with respect to Ancona Tide gauge data

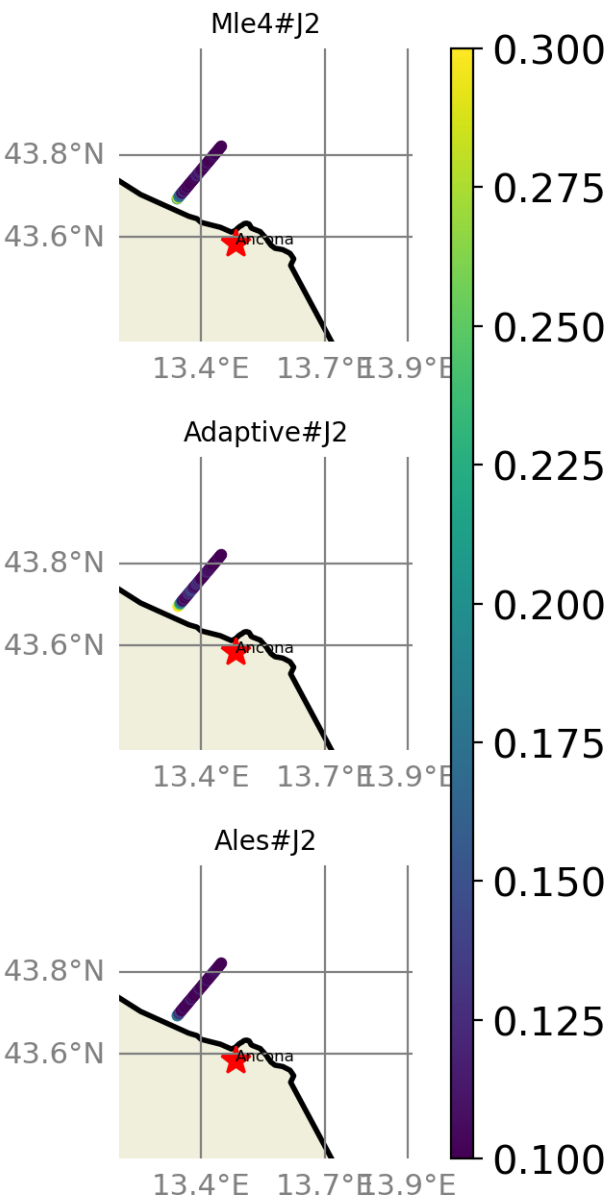


FIGURE 79 – rmsd visualization in maps view % Ancona tide gauge

6.5.3 std visualization in maps view % Ancona tide gauge

Std (m) Altimetry data with respect to Ancona Tide gauge data

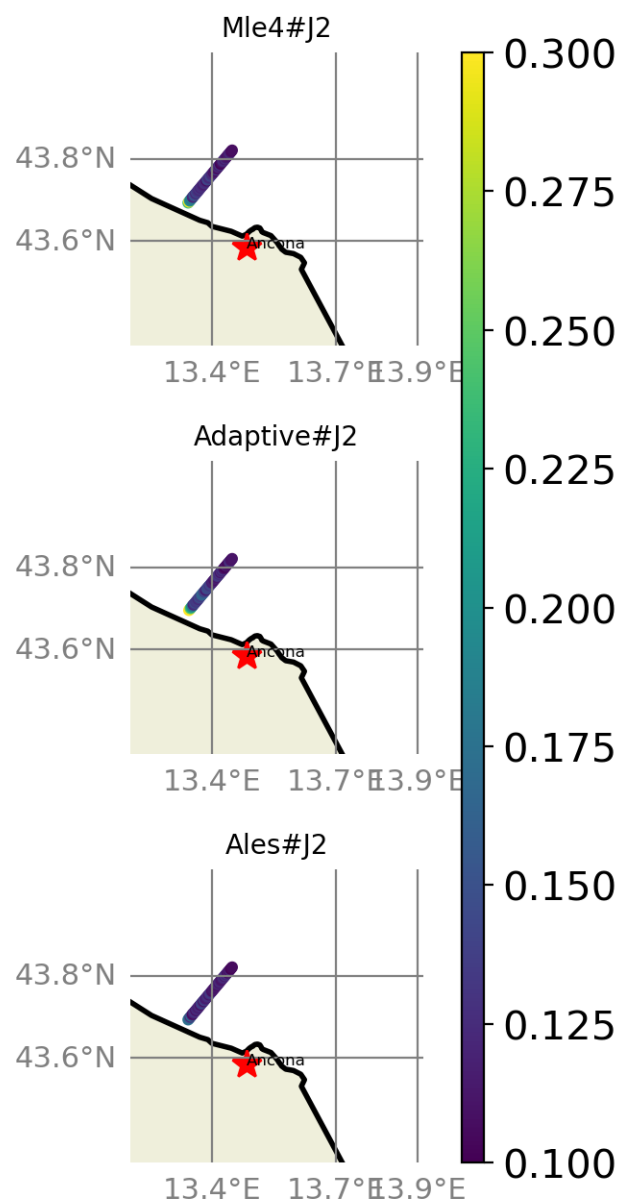


FIGURE 80 – std visualization in maps view % Ancona tide gauge

6.5.4 valid_data_percent visualization in maps view % Ancona tide gauge

Valid_Data_Percent (%) Altimetry data with respect to Ancona Tide gauge data

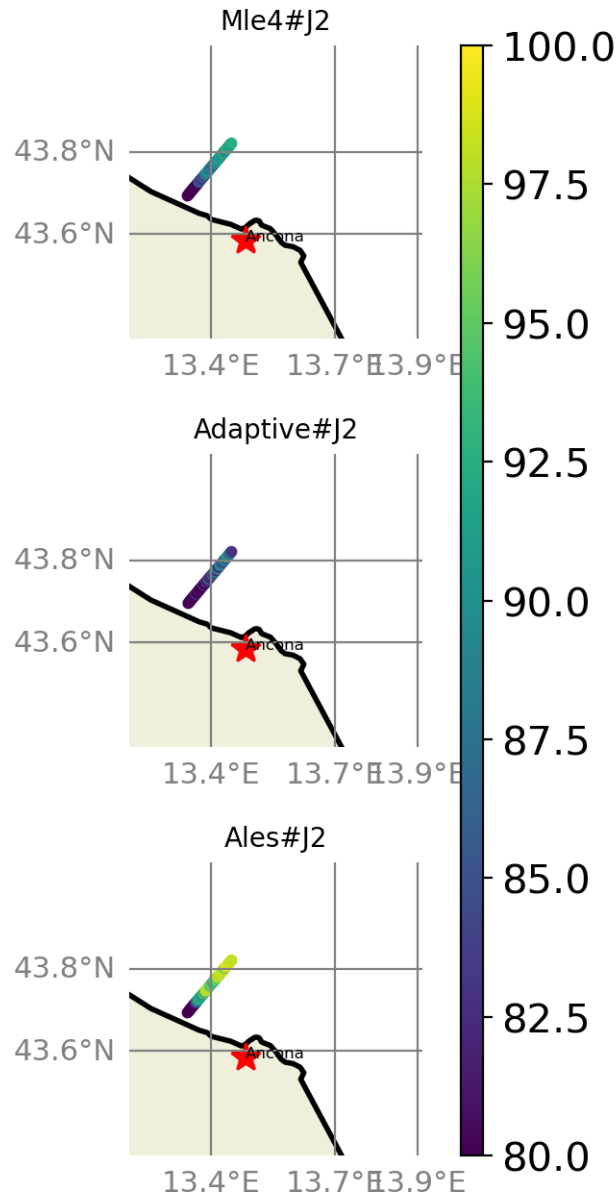


FIGURE 81 – valid_data_percent visualization in maps view % Ancona tide gauge

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.

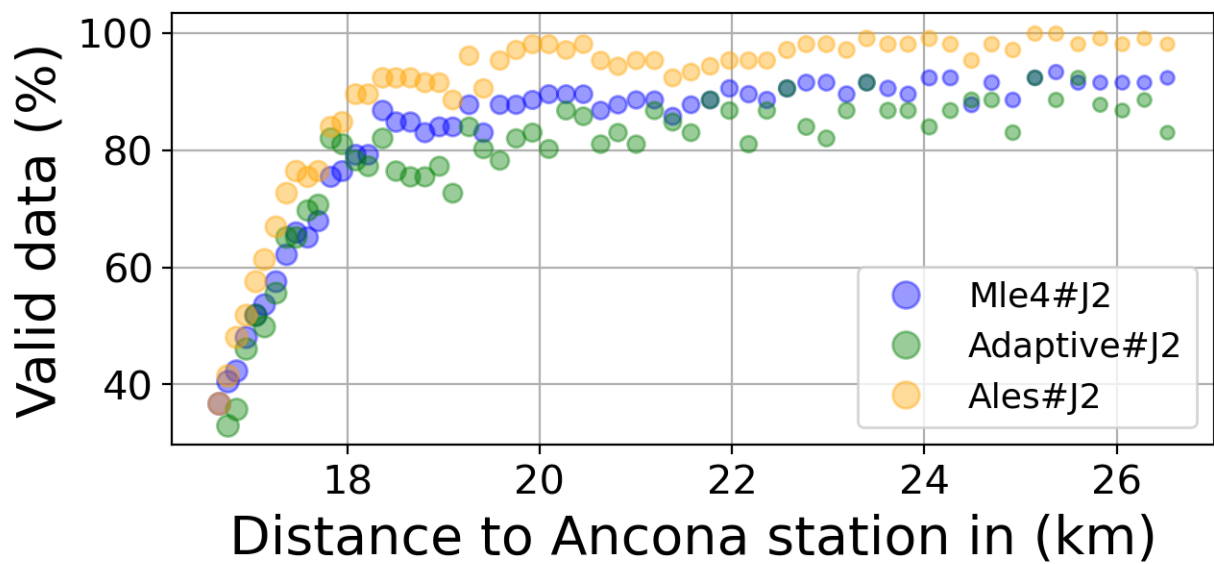
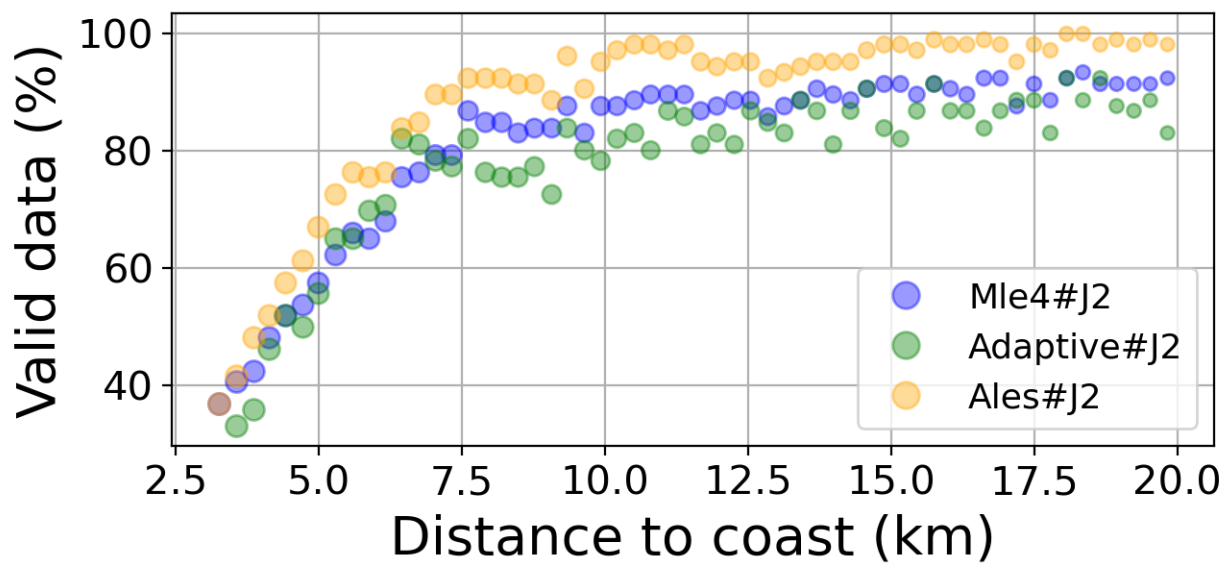


FIGURE 82 – Valid data (%) in function of distance to coast/Ancona station

6.5.6 Std in function of distance to coast/Ancona station

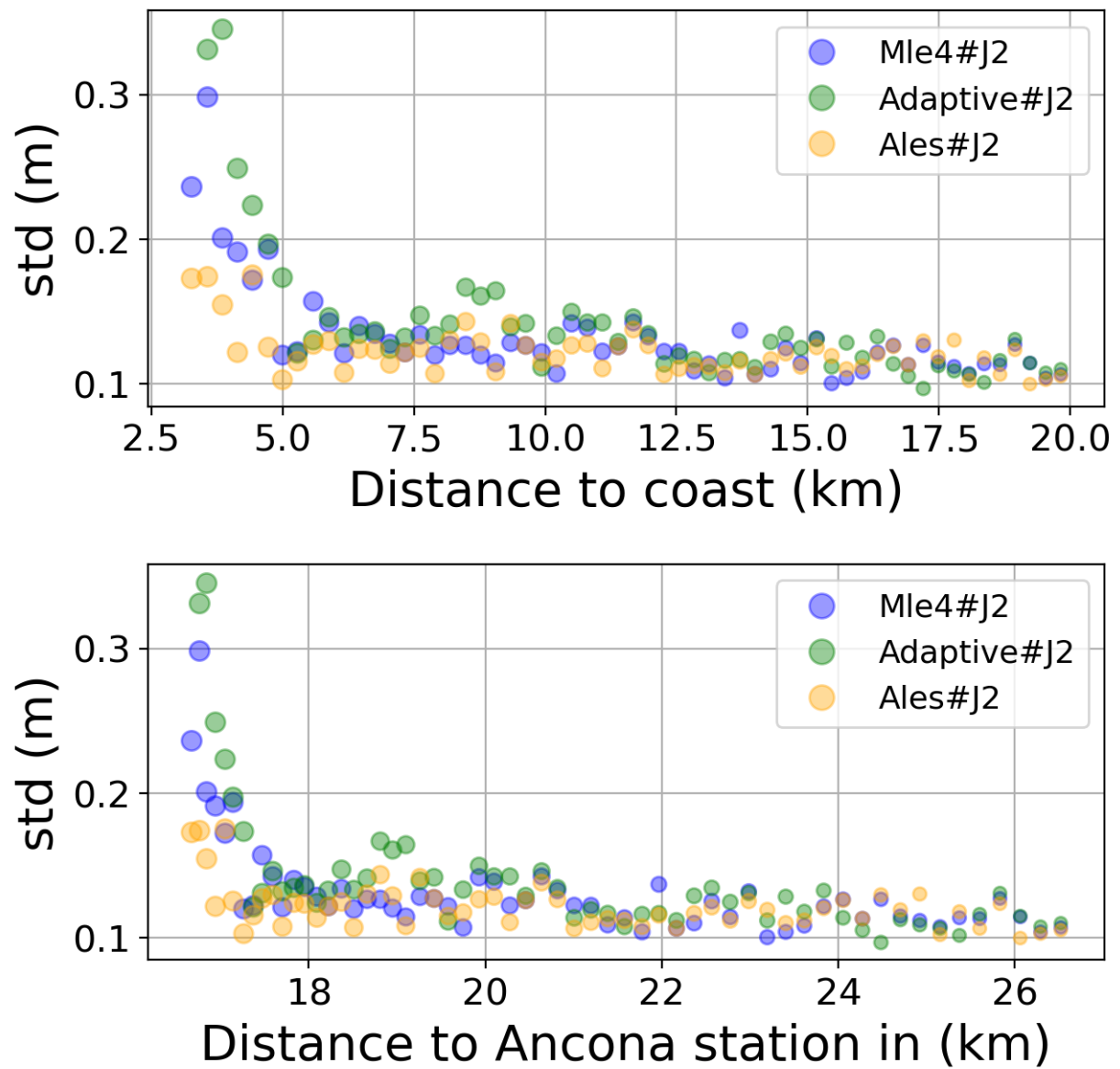


FIGURE 83 – Std in function of the distance to the coast/Ancona station

6.5.7 Correlation in function of distance to coast/Ancona station

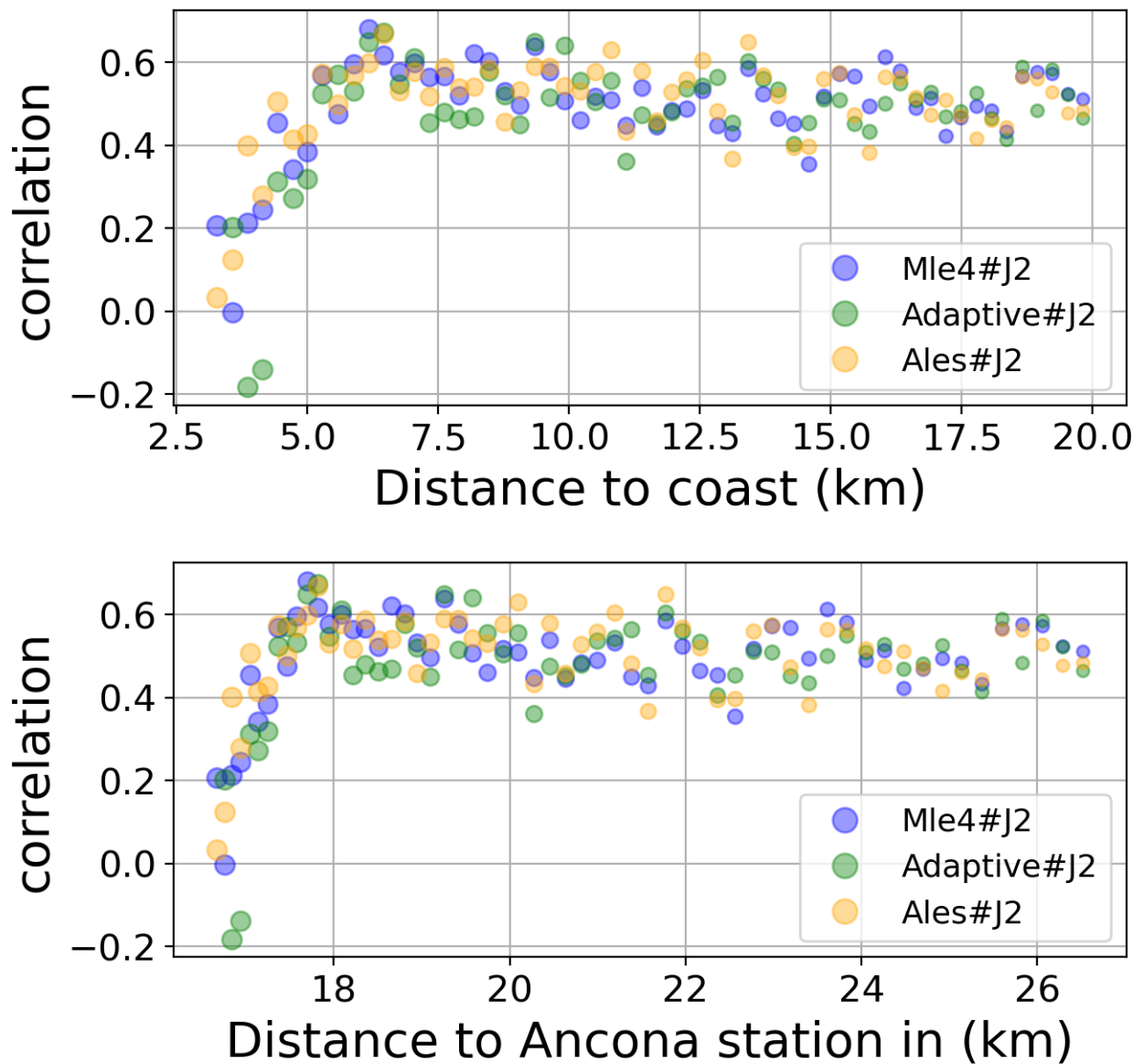


FIGURE 84 – Correlation in function of the distance to the coast/Ancona station

6.5.8 Taylor Diagram

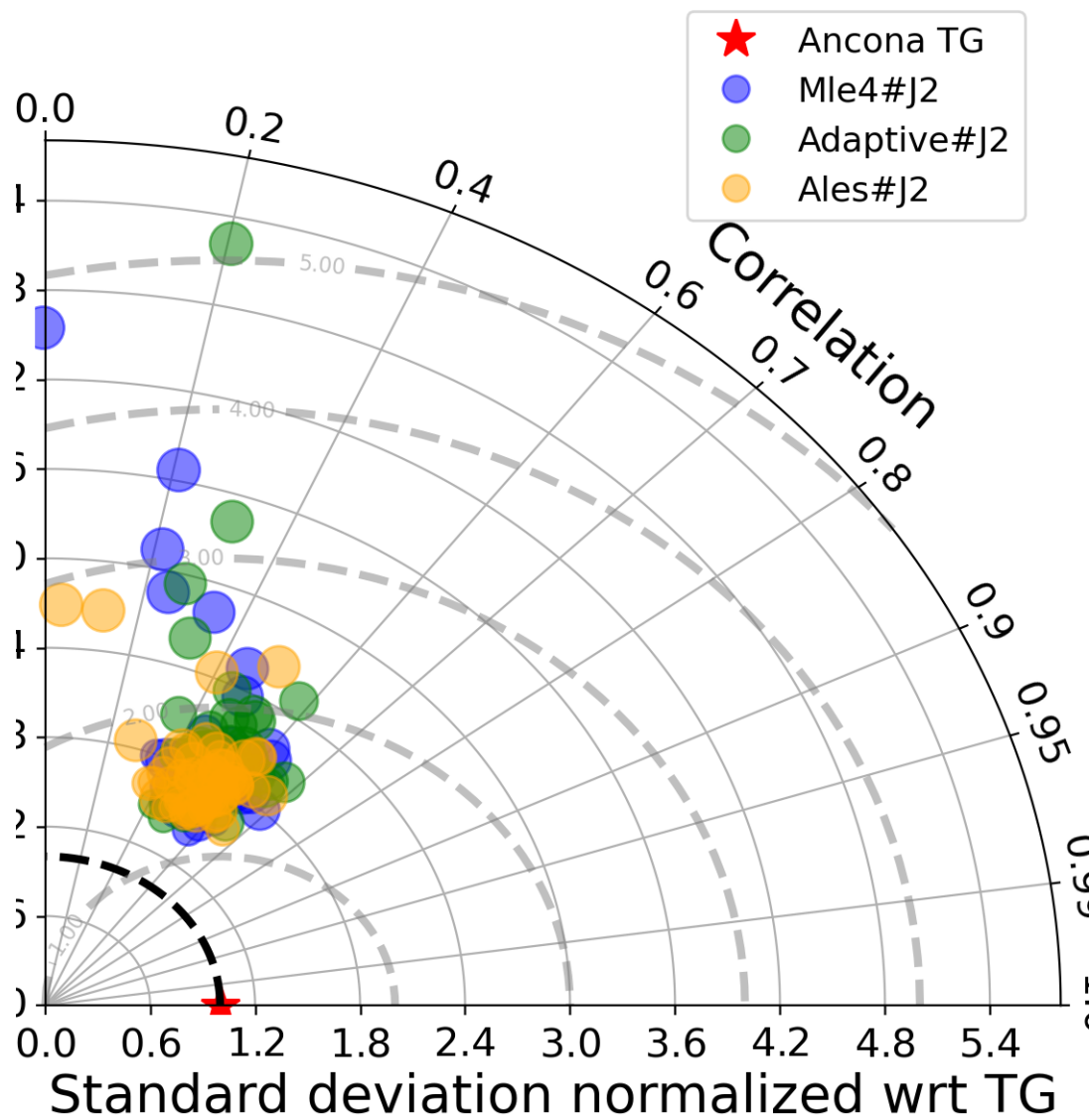


FIGURE 85 – Taylor diagram

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.

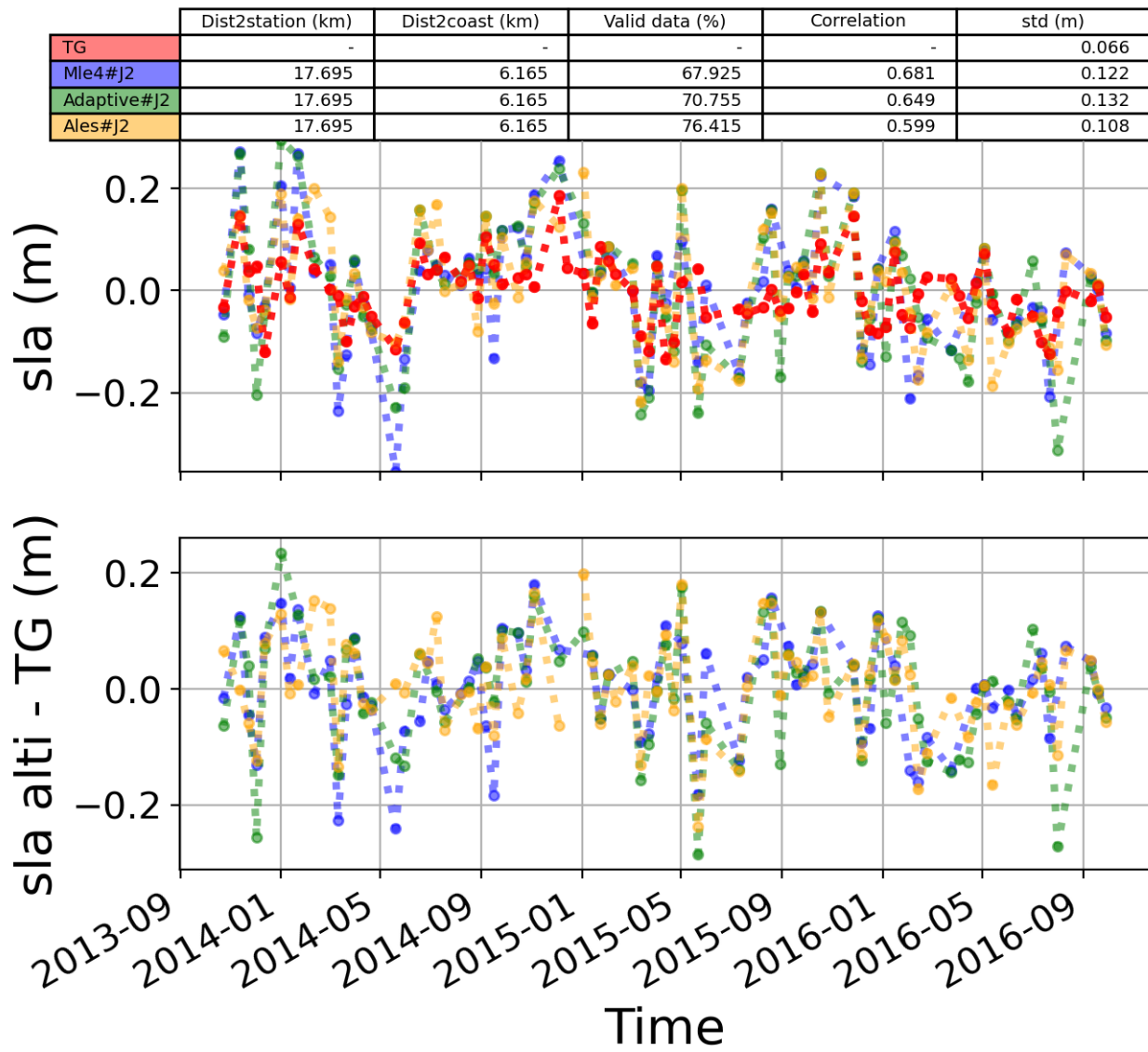


FIGURE 87 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

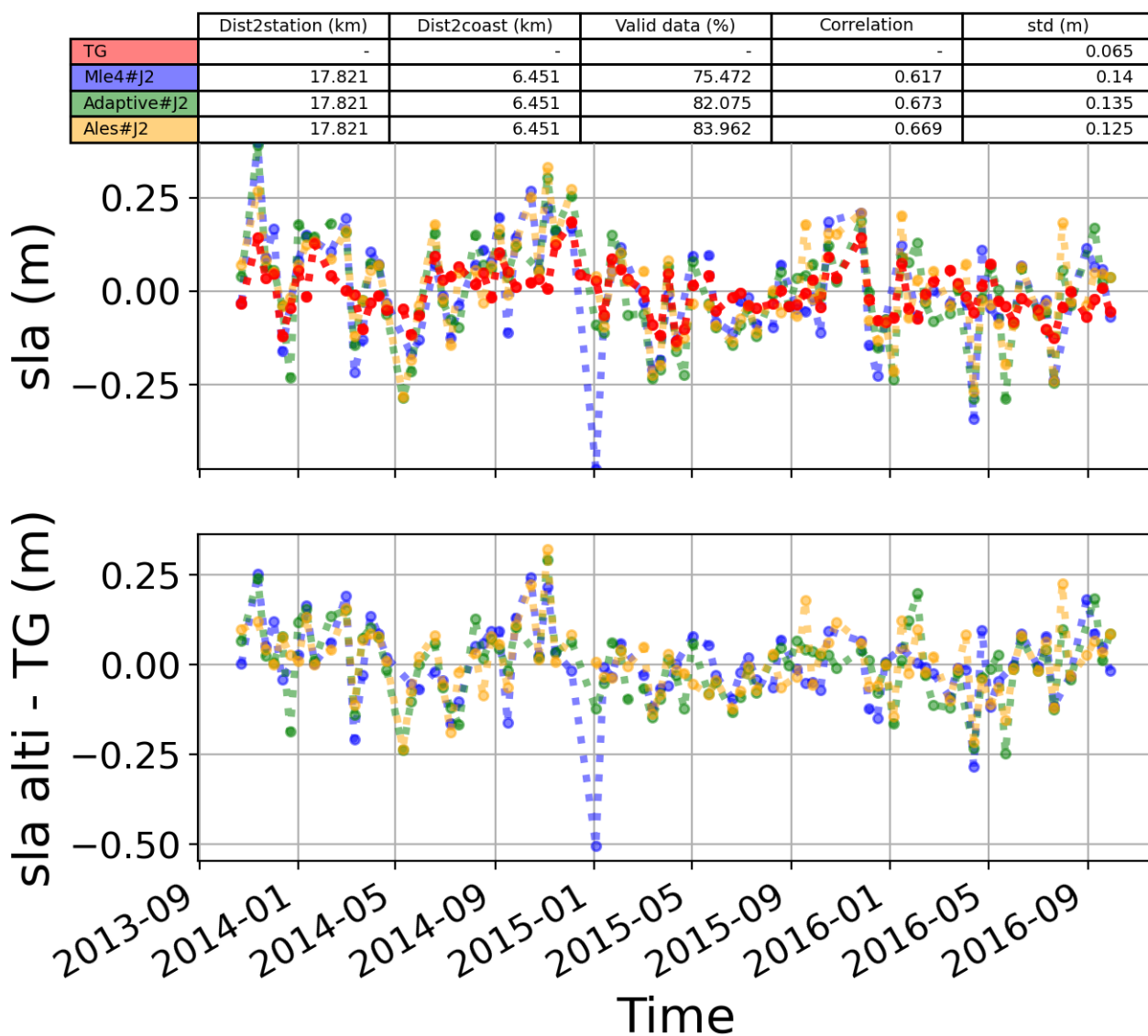


FIGURE 88 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

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

Correlation Altimetry data with respect to Livourne Tide gauge data

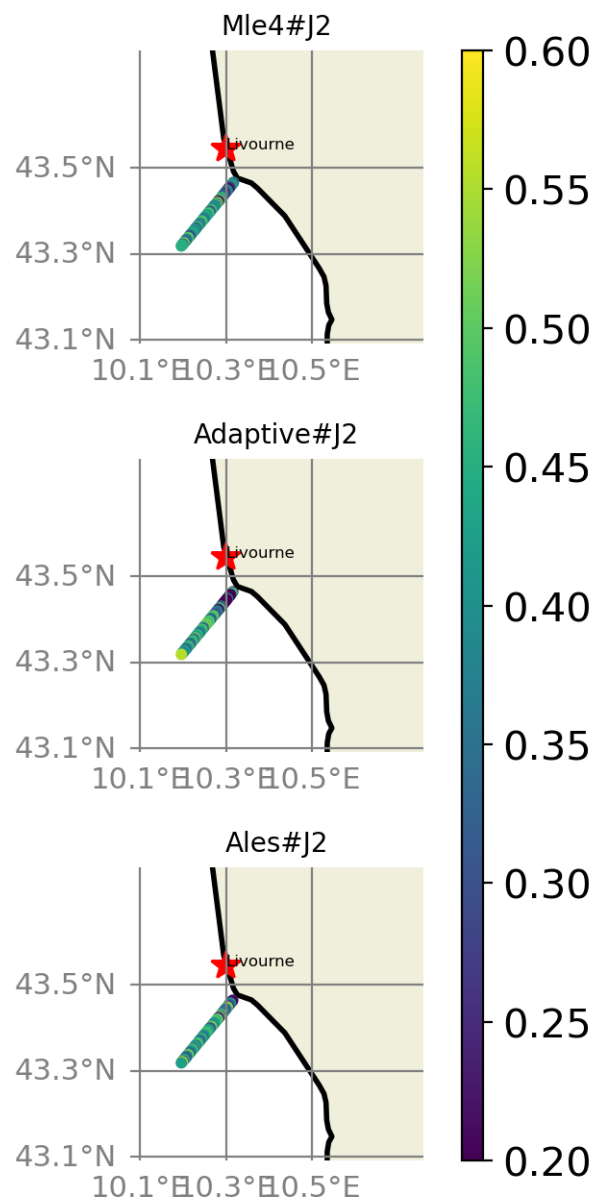


FIGURE 89 – correlation visualization in maps view % Livourne tide gauge

6.6.2 rmsd visualization in maps view % Livourne tide gauge

Rmsd (m) Altimetry data with respect to Livourne Tide gauge data

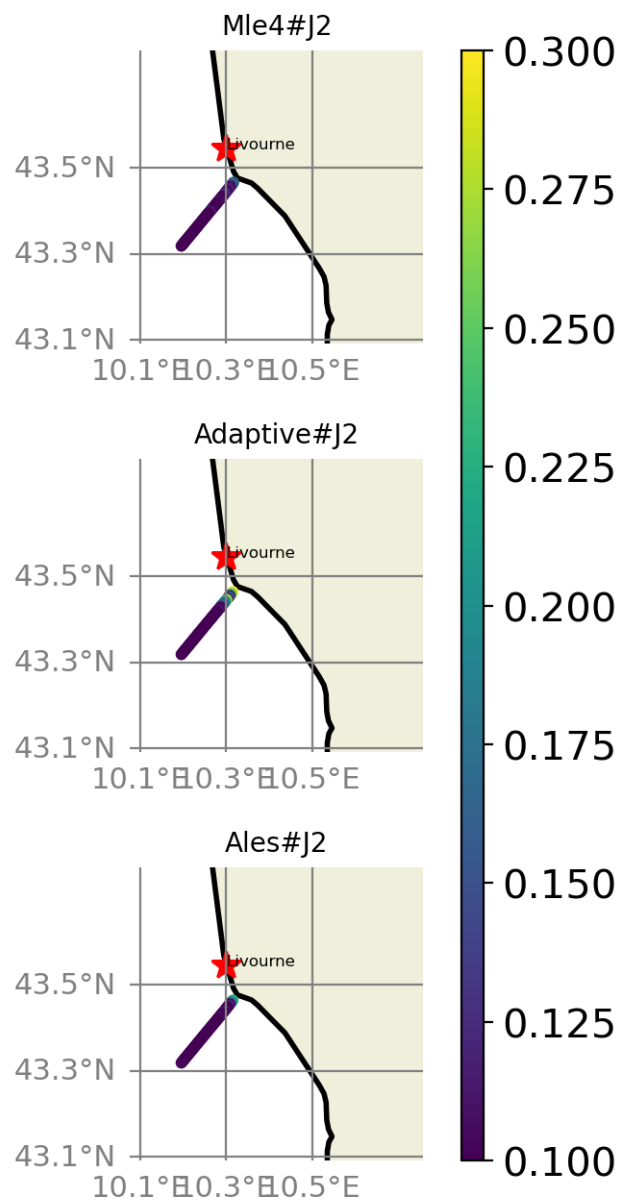


FIGURE 90 – rmsd visualization in maps view % Livourne tide gauge

6.6.3 std visualization in maps view % Livourne tide gauge

Std (m) Altimetry data with respect to Livourne Tide gauge data

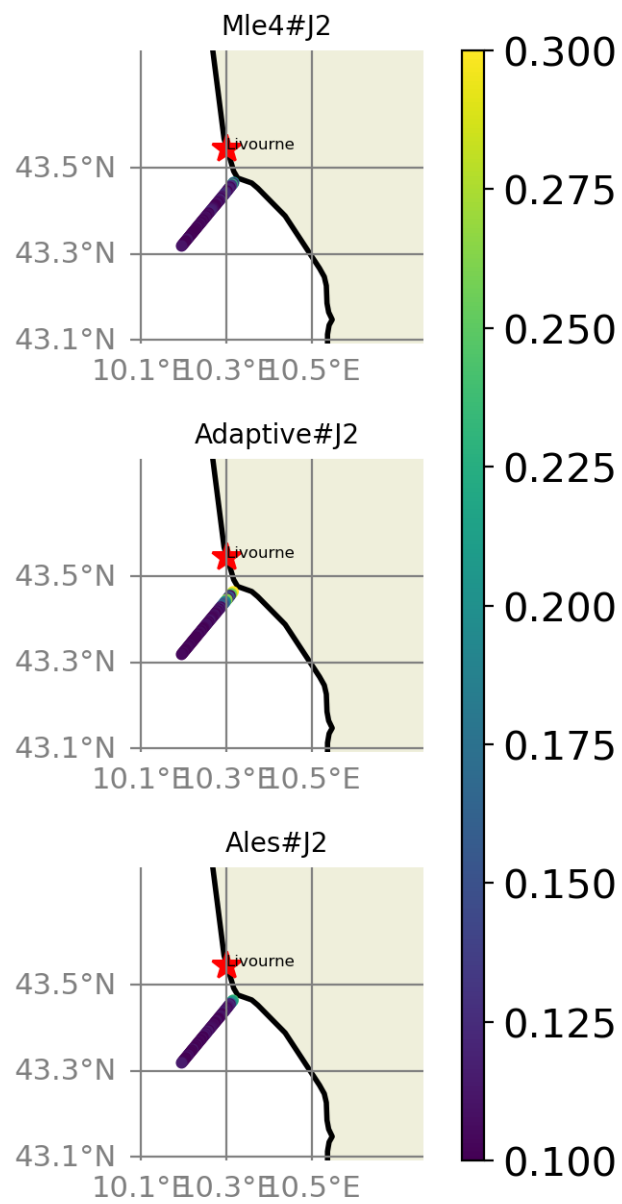


FIGURE 91 – std visualization in maps view % Livourne tide gauge

6.6.4 valid_data_percent visualization in maps view % Livourne tide gauge

Valid_Data_Percent (%) Altimetry data with respect to Livourne Tide gauge data

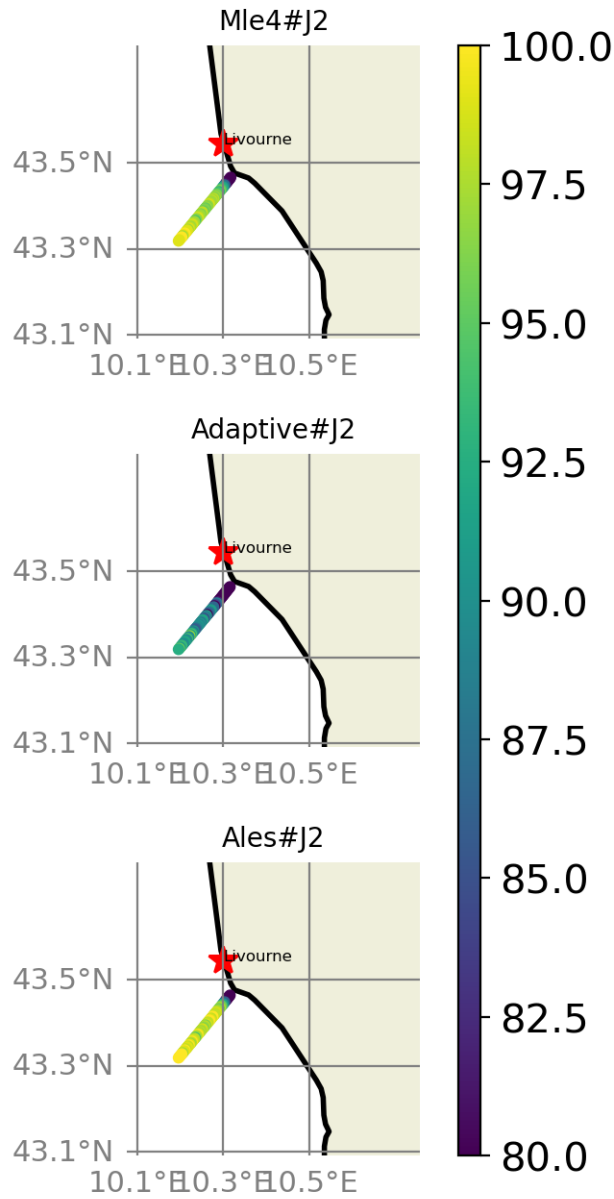


FIGURE 92 – valid_data_percent visualization in maps view % Livourne tide gauge

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.

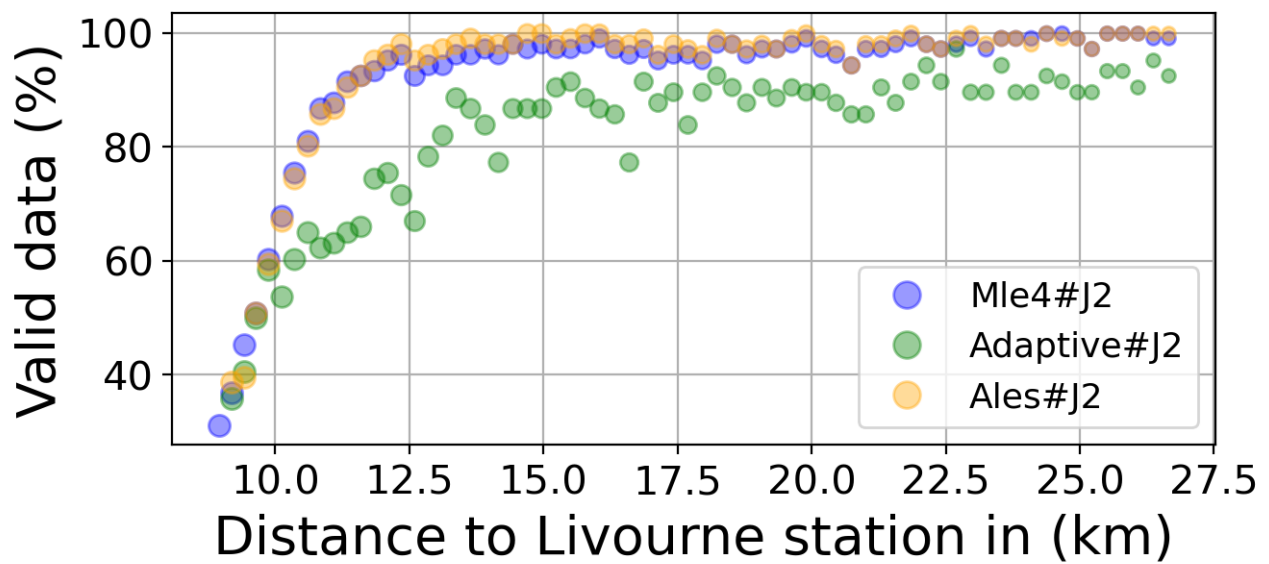
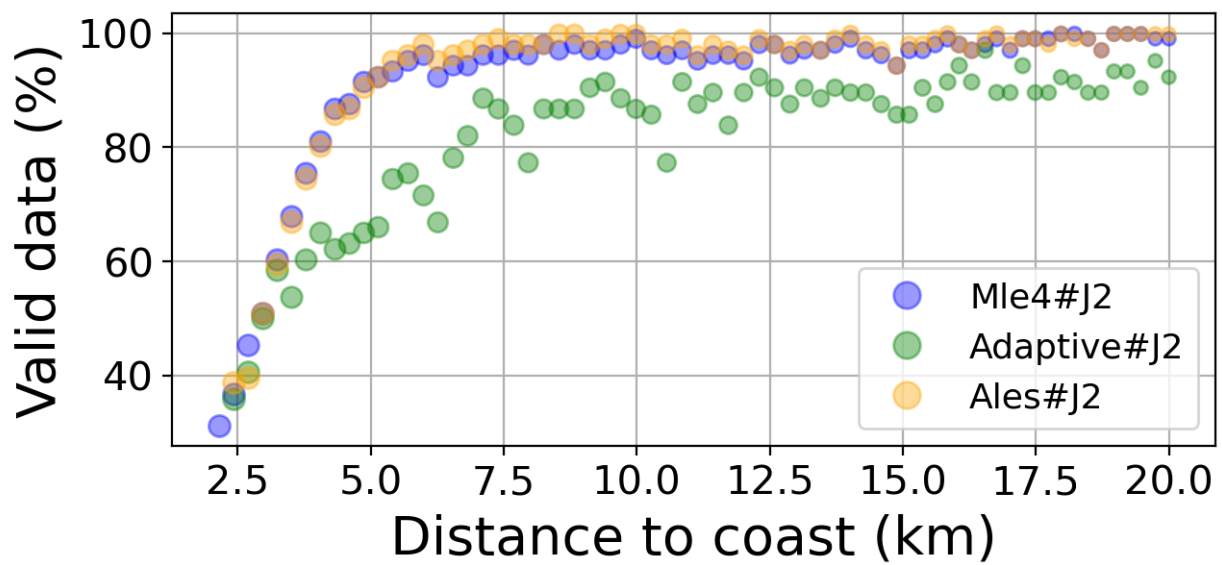


FIGURE 93 – Valid data (%) in function of distance to coast/Livourne station

6.6.6 Std in function of distance to coast/Livourne station

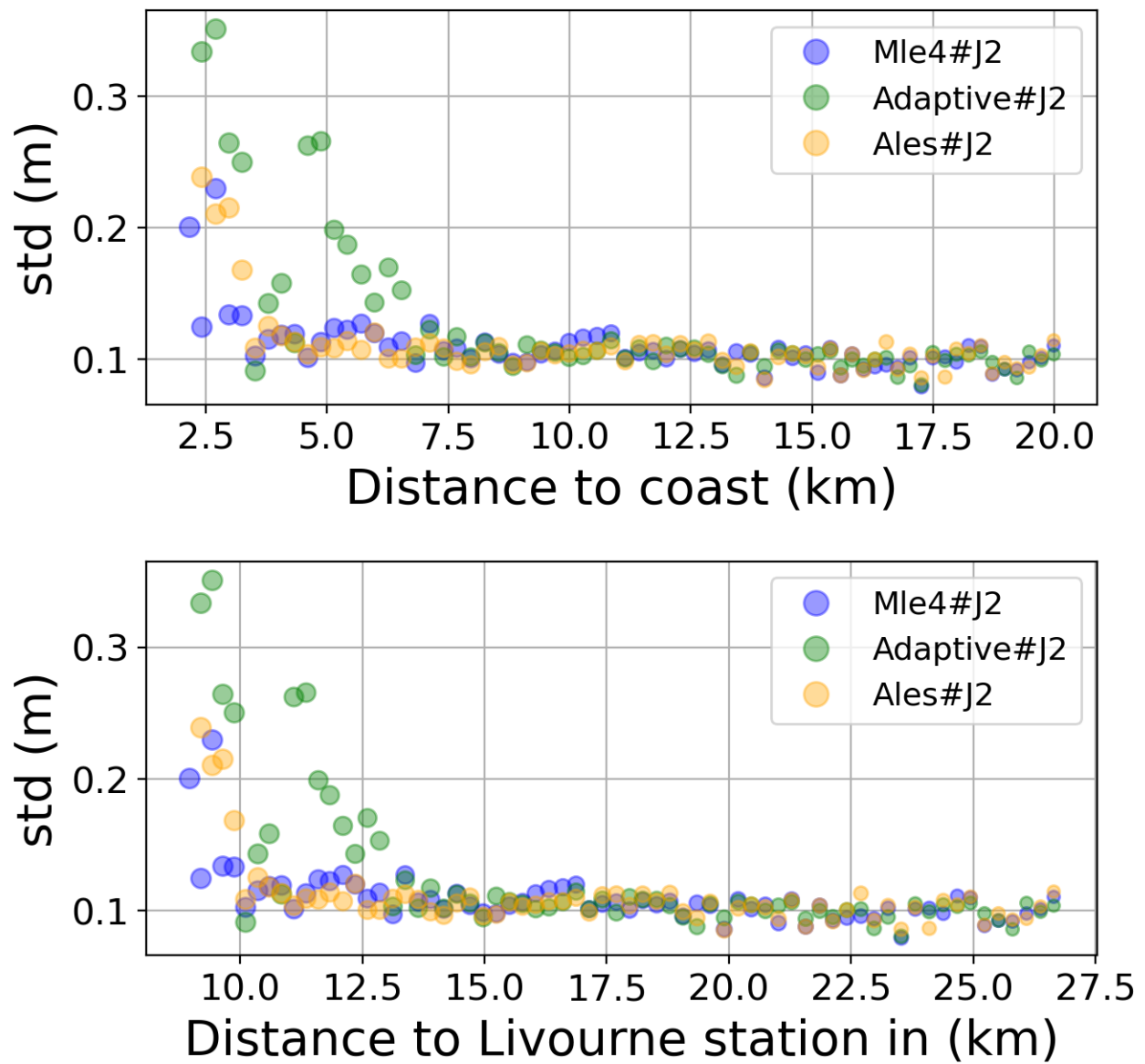


FIGURE 94 – Std in function of the distance to the coast/Livourne station

6.6.7 Correlation in function of distance to coast/Livourne station

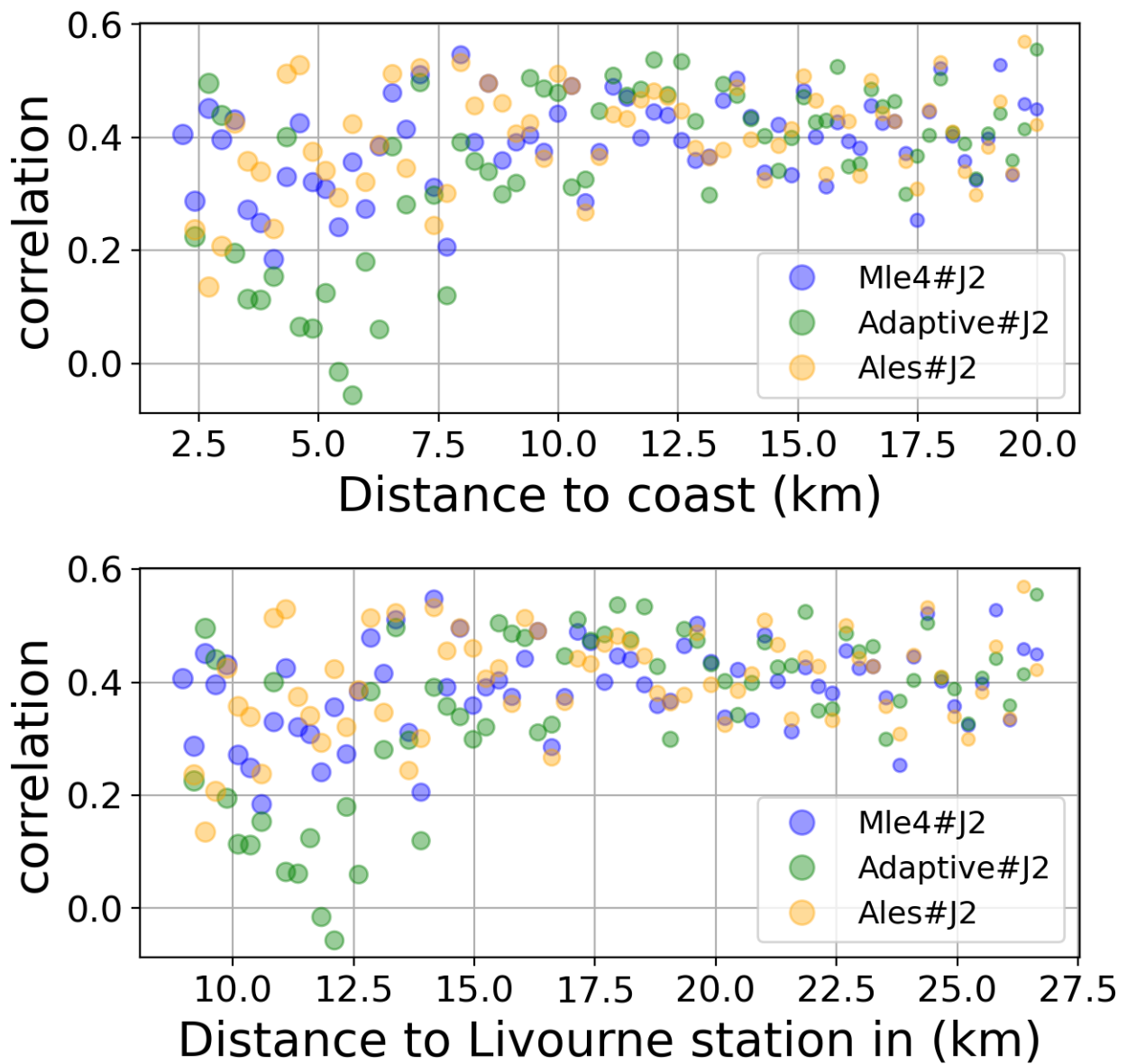


FIGURE 95 – Correlation in function of the distance to the coast/Livourne station

6.6.8 Taylor Diagram

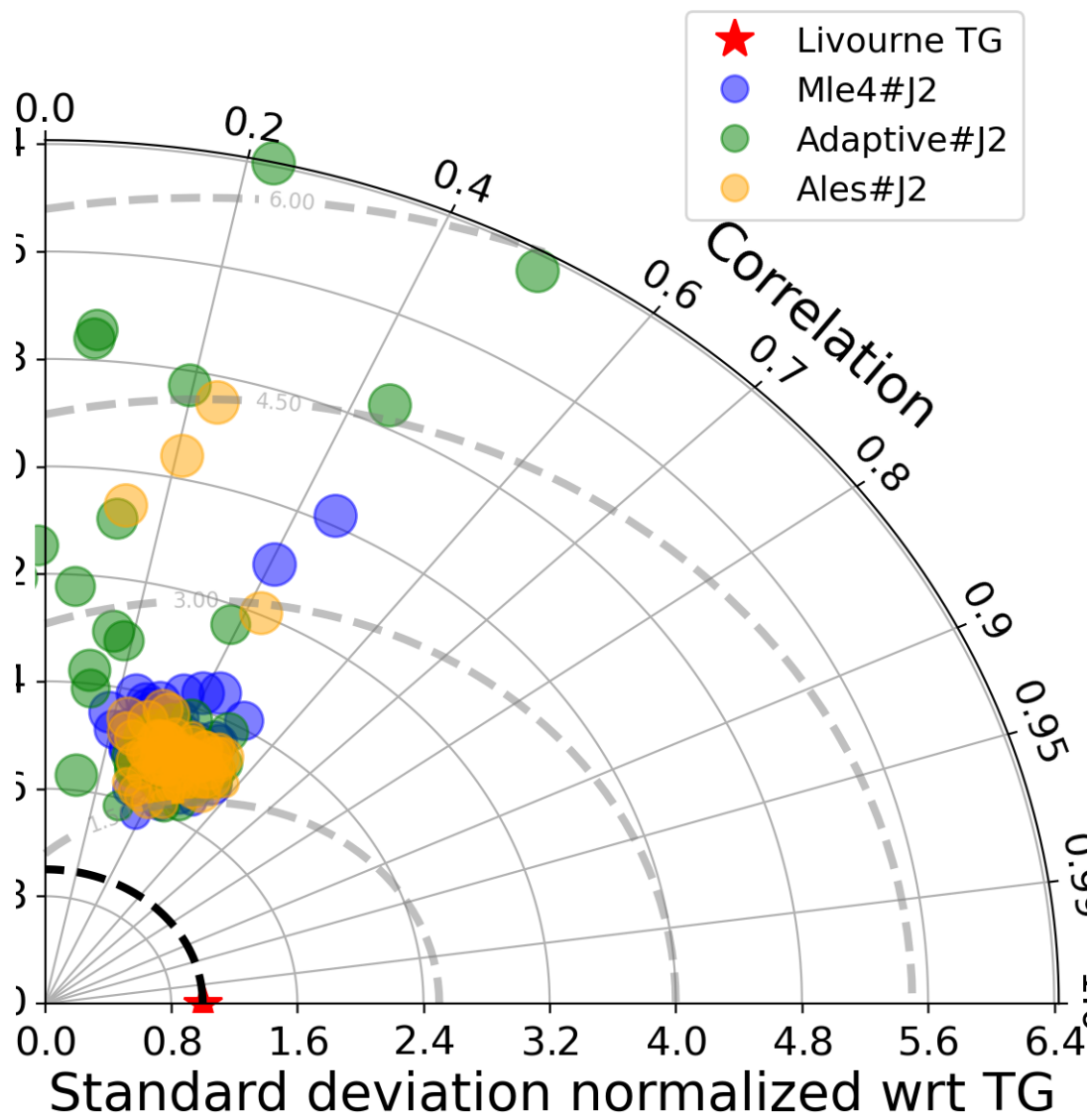


FIGURE 96 – Taylor diagram

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.

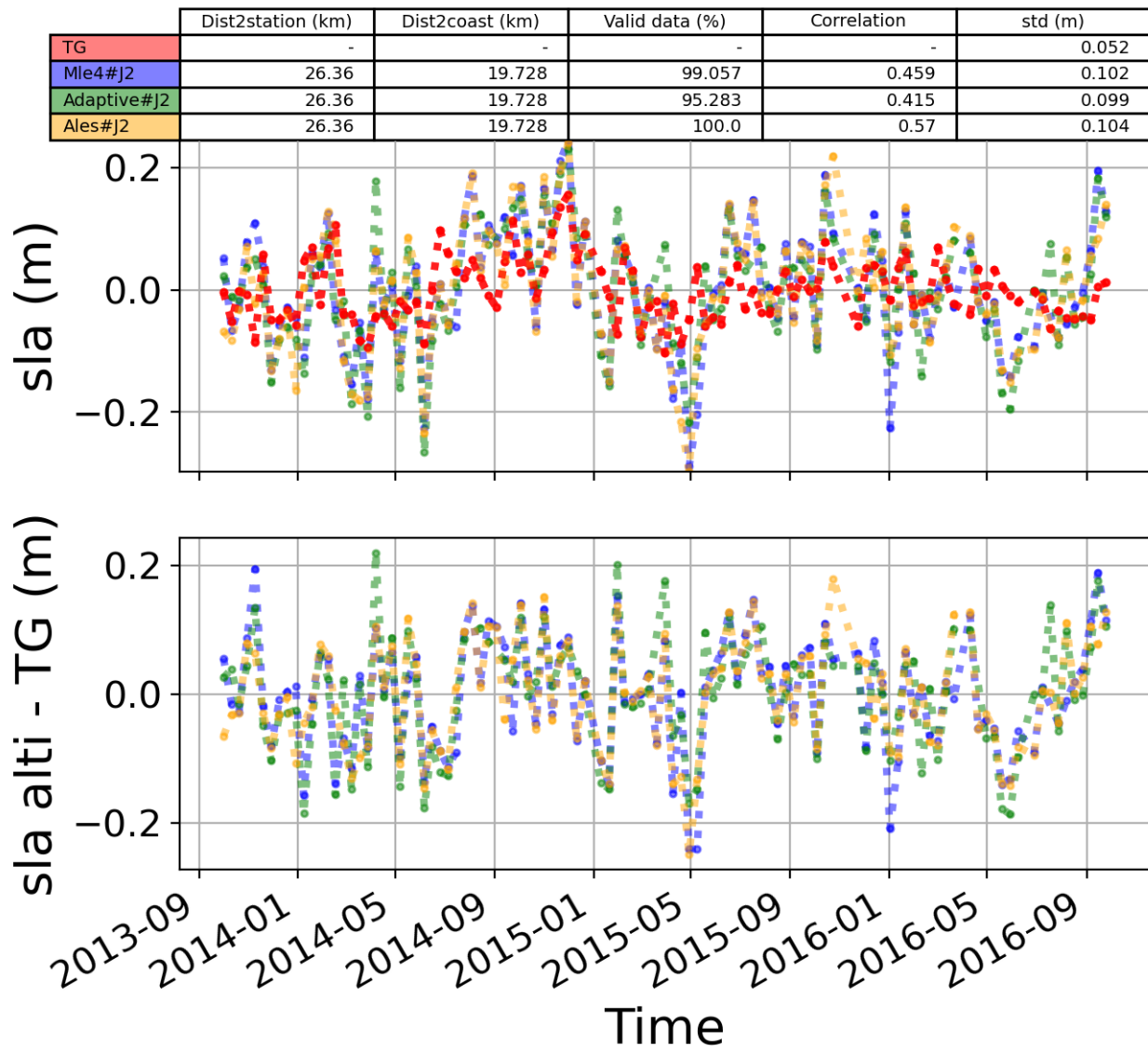


FIGURE 98 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

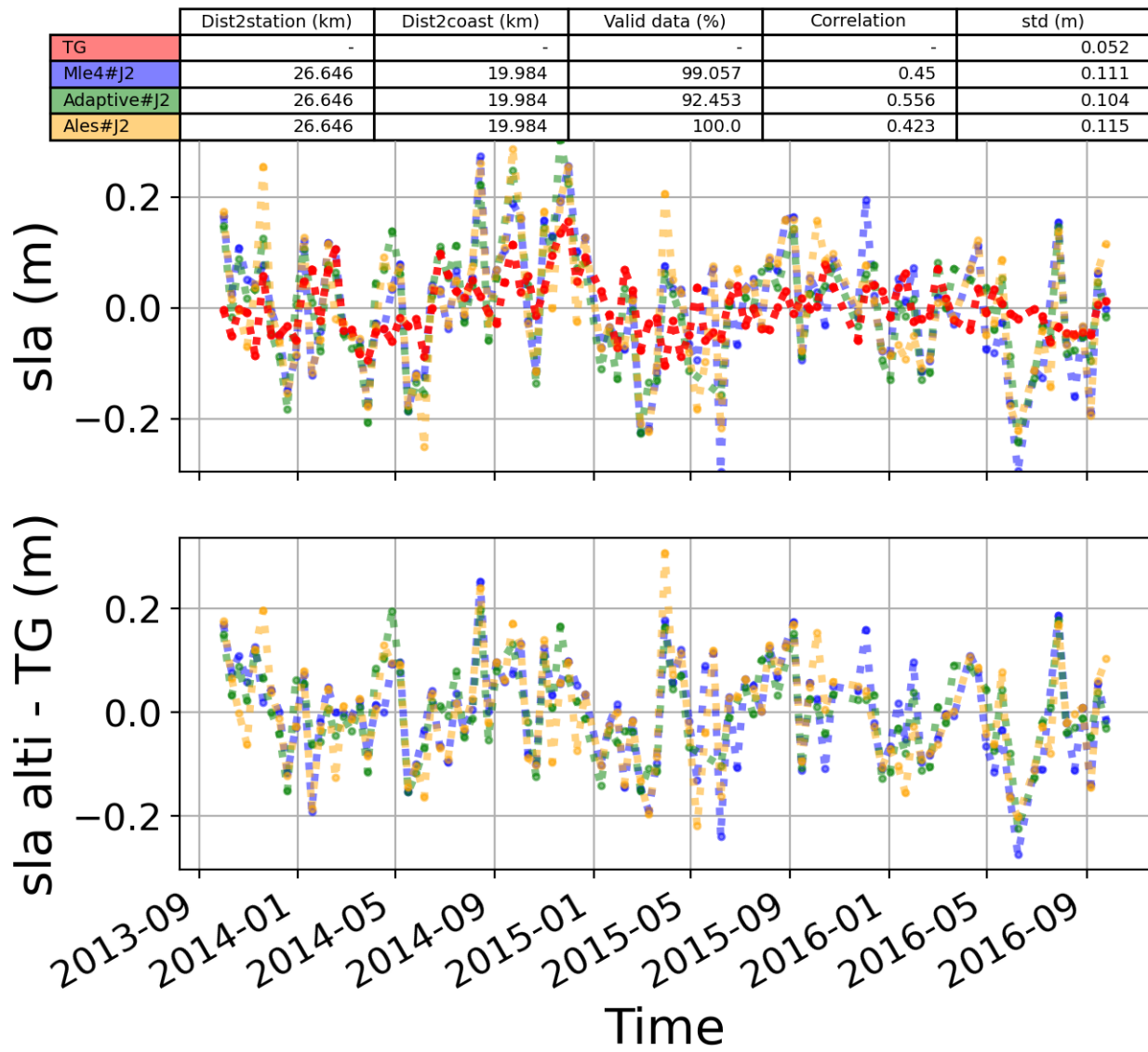


FIGURE 99 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

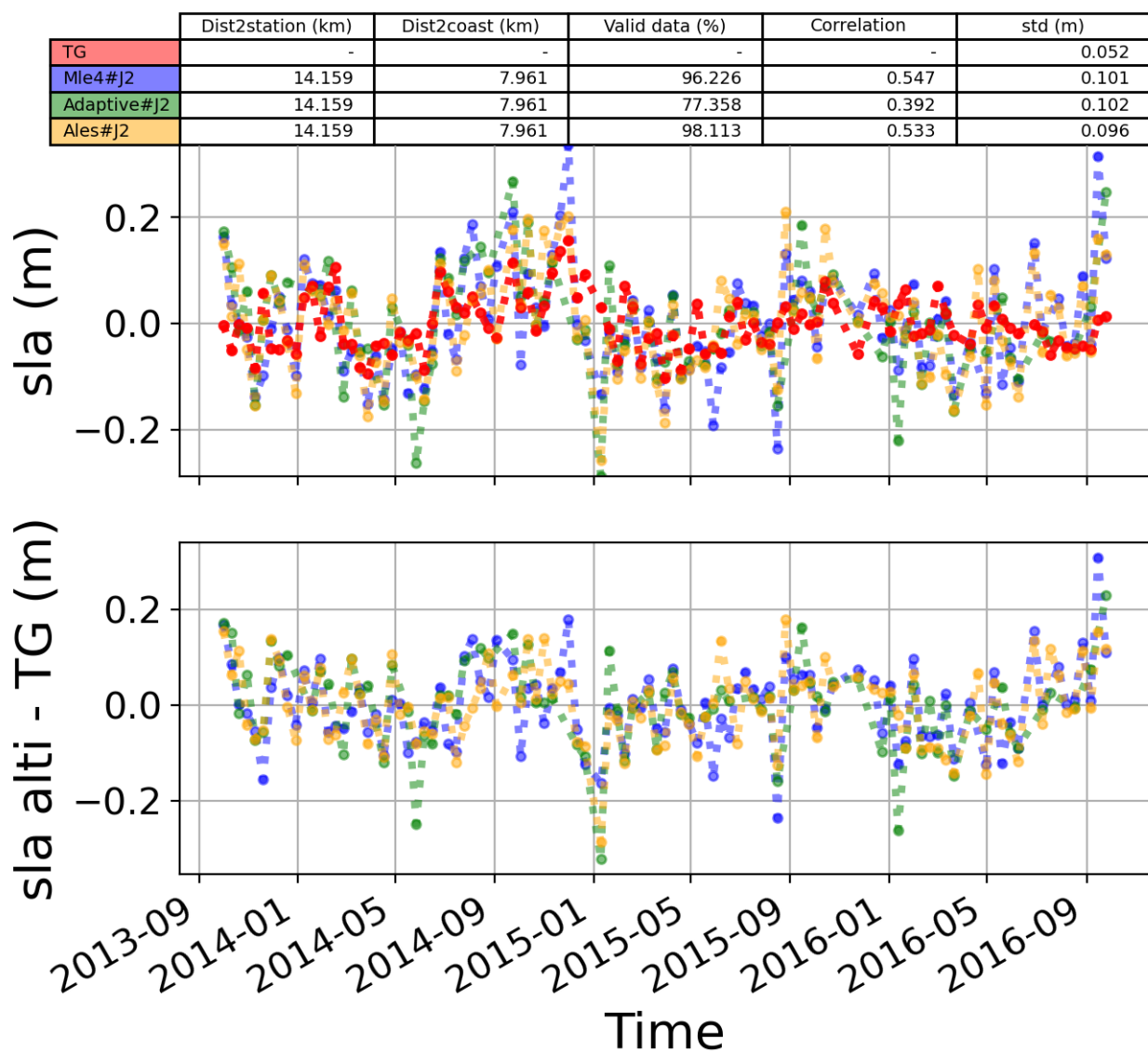


FIGURE 100 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

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

Correlation Altimetry data with respect to MONACO_FONTVIEILLE Tide gauge data

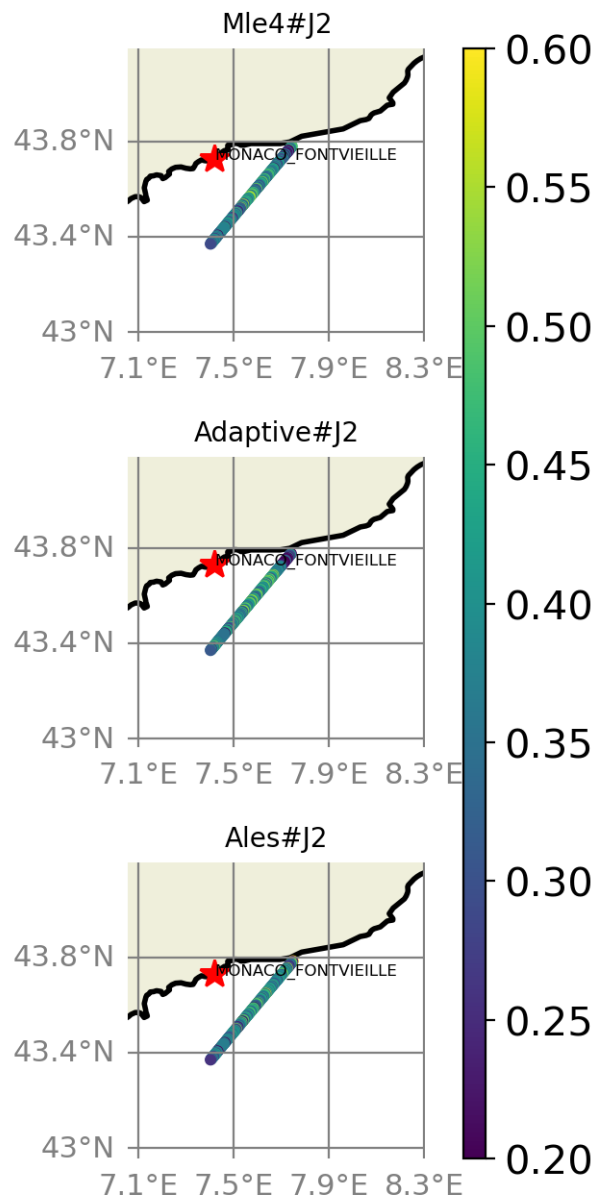


FIGURE 101 – correlation visualization in maps view % MONACO_FONTVIEILLE tide gauge

6.7.2 rmsd visualization in maps view % MONACO_FONTVIEILLE tide gauge

Rmsd (m) Altimetry data with respect to MONACO_FONTVIEILLE Tide gauge data

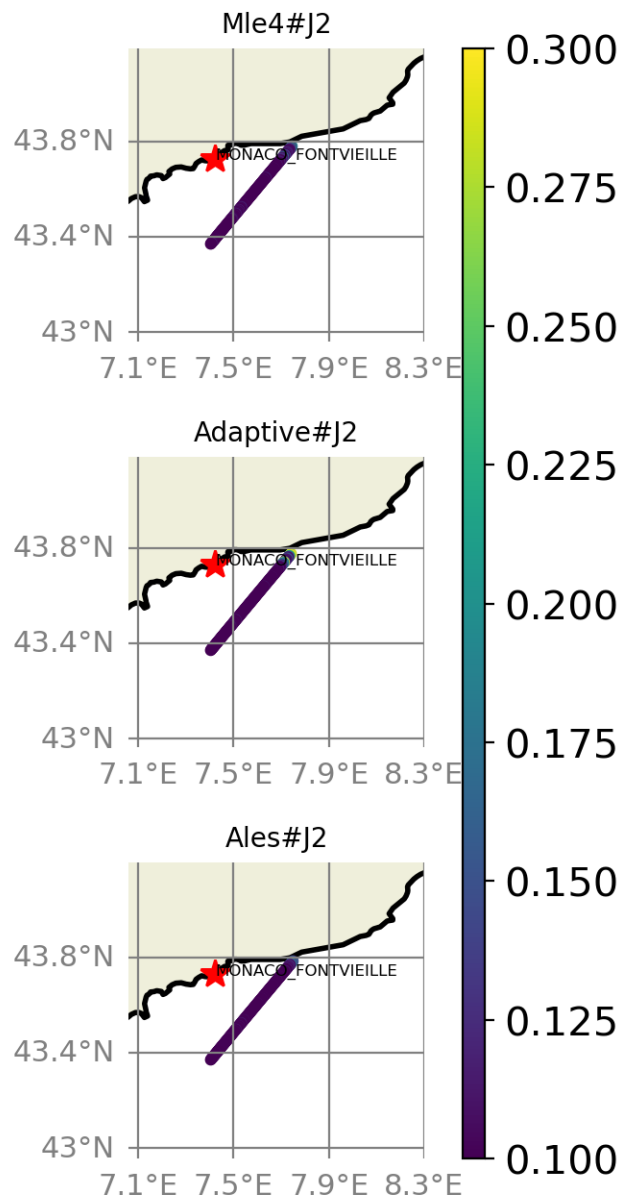


FIGURE 102 – rmsd visualization in maps view % MONACO_FONTVIEILLE tide gauge

6.7.3 std visualization in maps view % MONACO_FONTVIEILLE tide gauge

Std (m) Altimetry data with respect to MONACO_FONTVIEILLE Tide gauge data

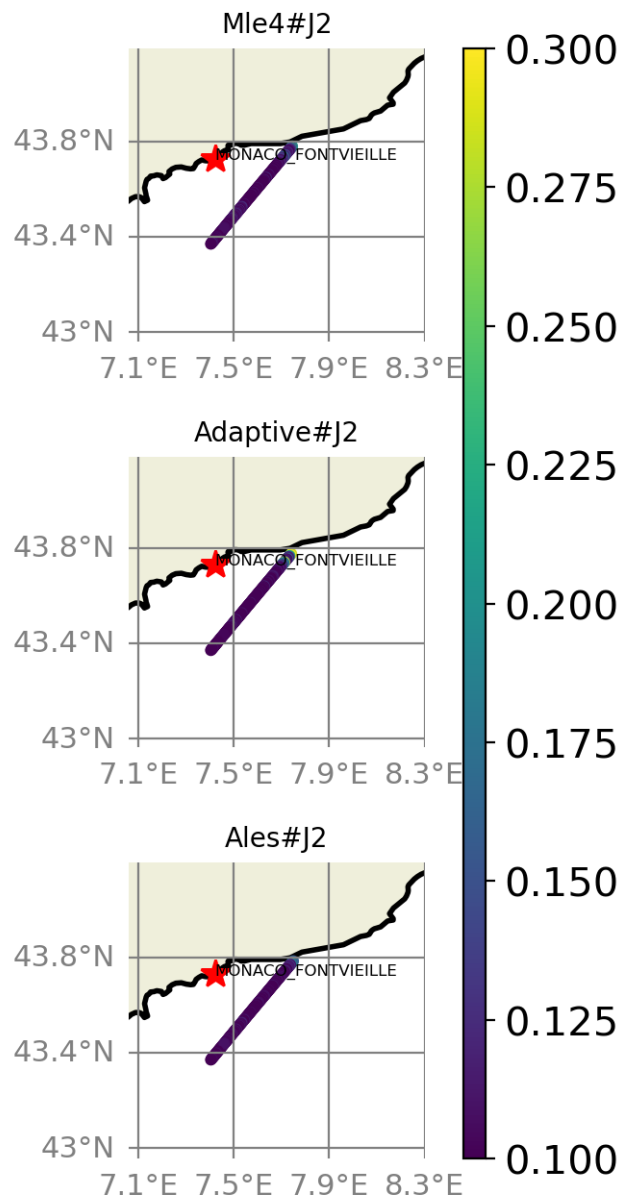


FIGURE 103 – std visualization in maps view % MONACO_FONTVIEILLE tide gauge

6.7.4 valid_data_percent visualization in maps view % MONACO_FONTVIEILLE tide gauge

Valid_Data_Percent (%) Altimetry data with respect to MONACO_FONTVIEILLE Tide gauge data

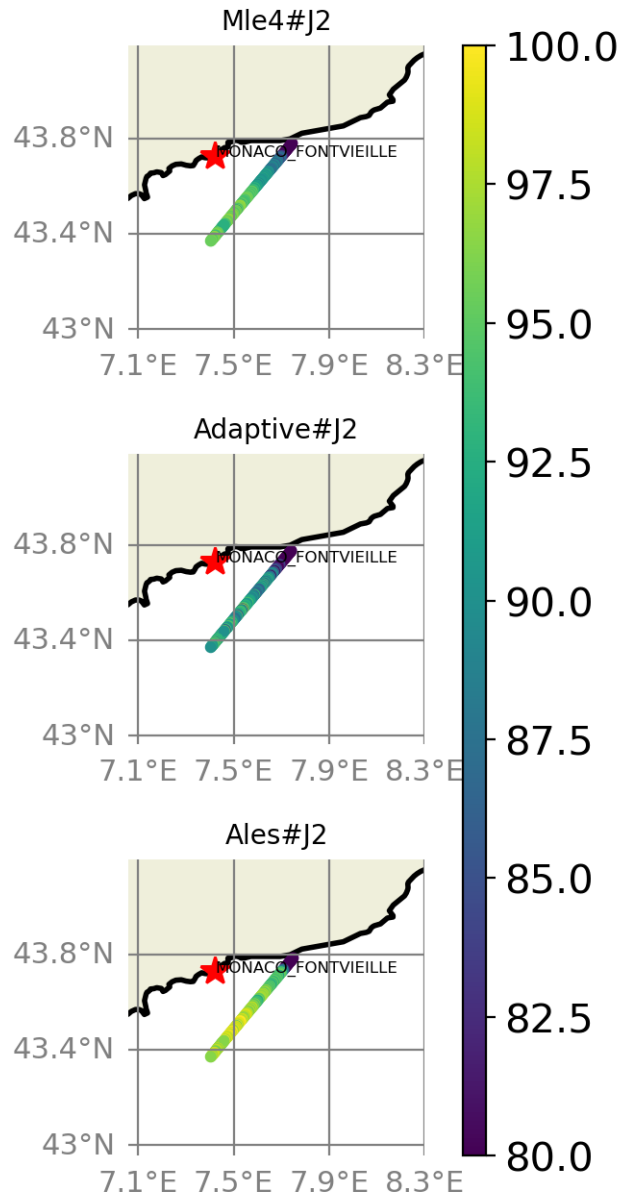


FIGURE 104 – valid_data_percent visualization in maps view % MONACO_FONTVIEILLE tide gauge

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 series 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 series, respectively in the time series, i is the index of the time series, 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 series.

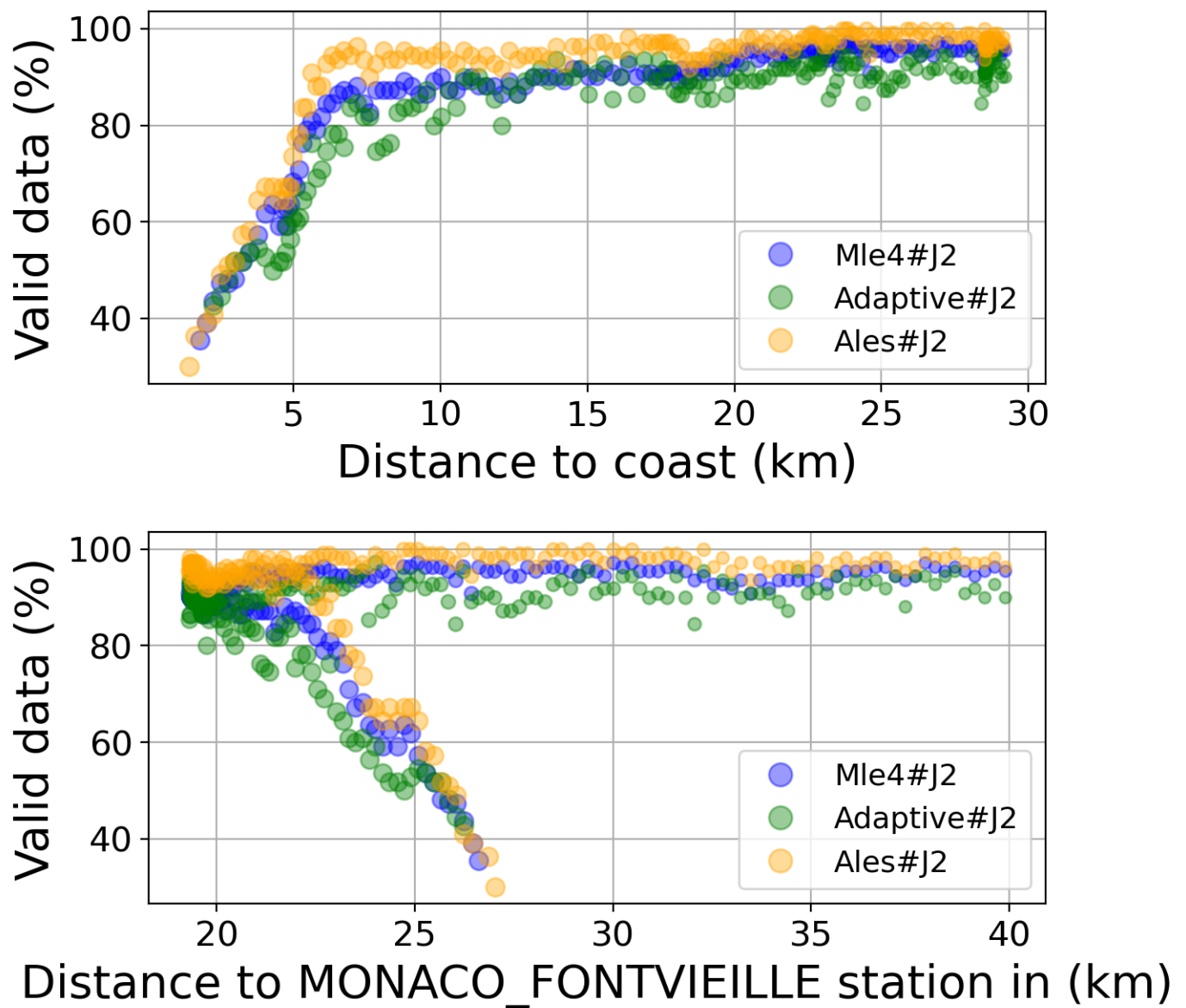


FIGURE 105 – Valid data (%) in function of distance to coast/MONACO_FONTVIEILLE station

6.7.6 Std in function of distance to coast/MONACO_FONTVIEILLE station

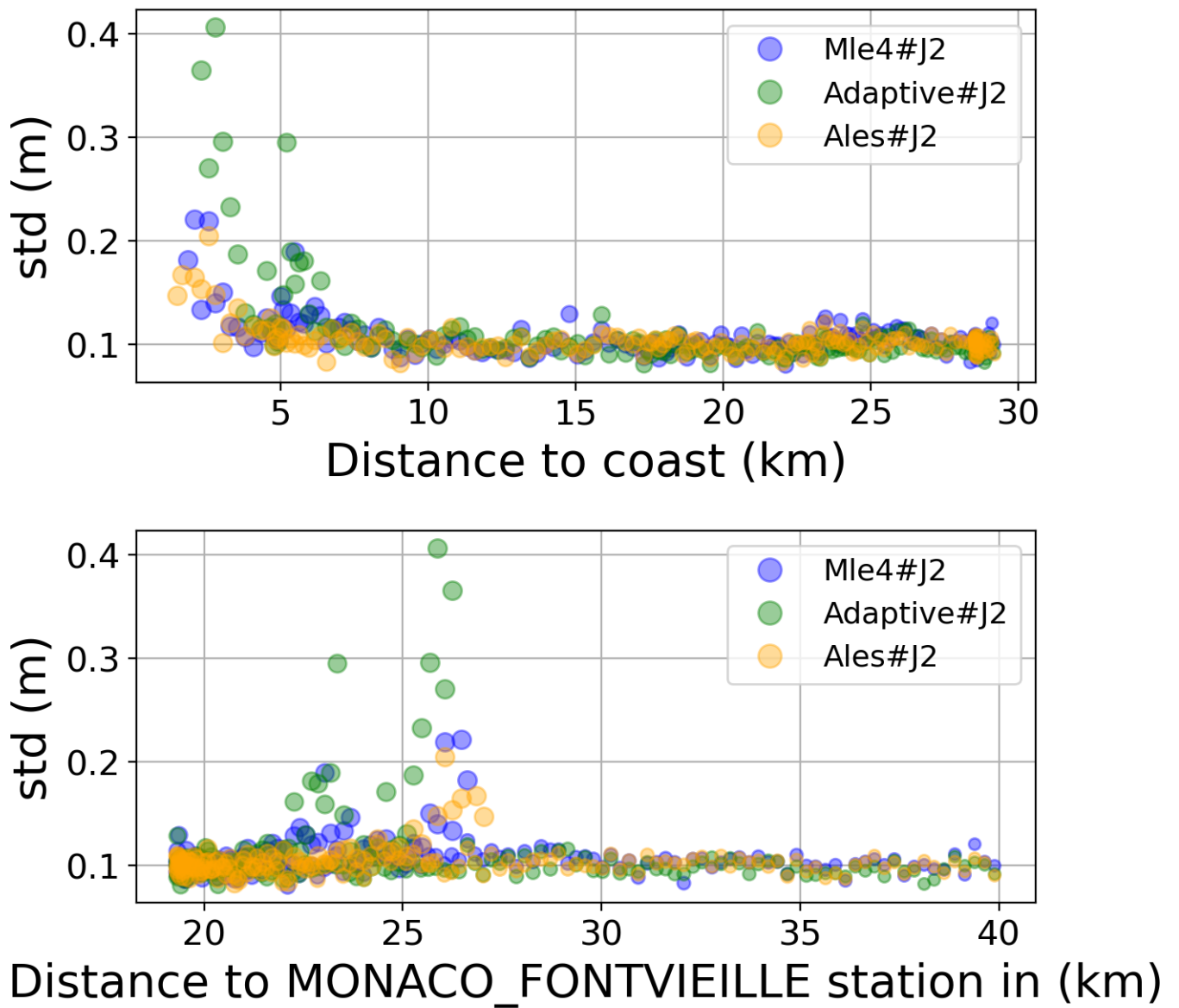


FIGURE 106 – Std in function of the distance to the coast/MONACO_FONTVIEILLE station

6.7.7 Correlation in function of distance to coast/MONACO_FONTVIEILLE station

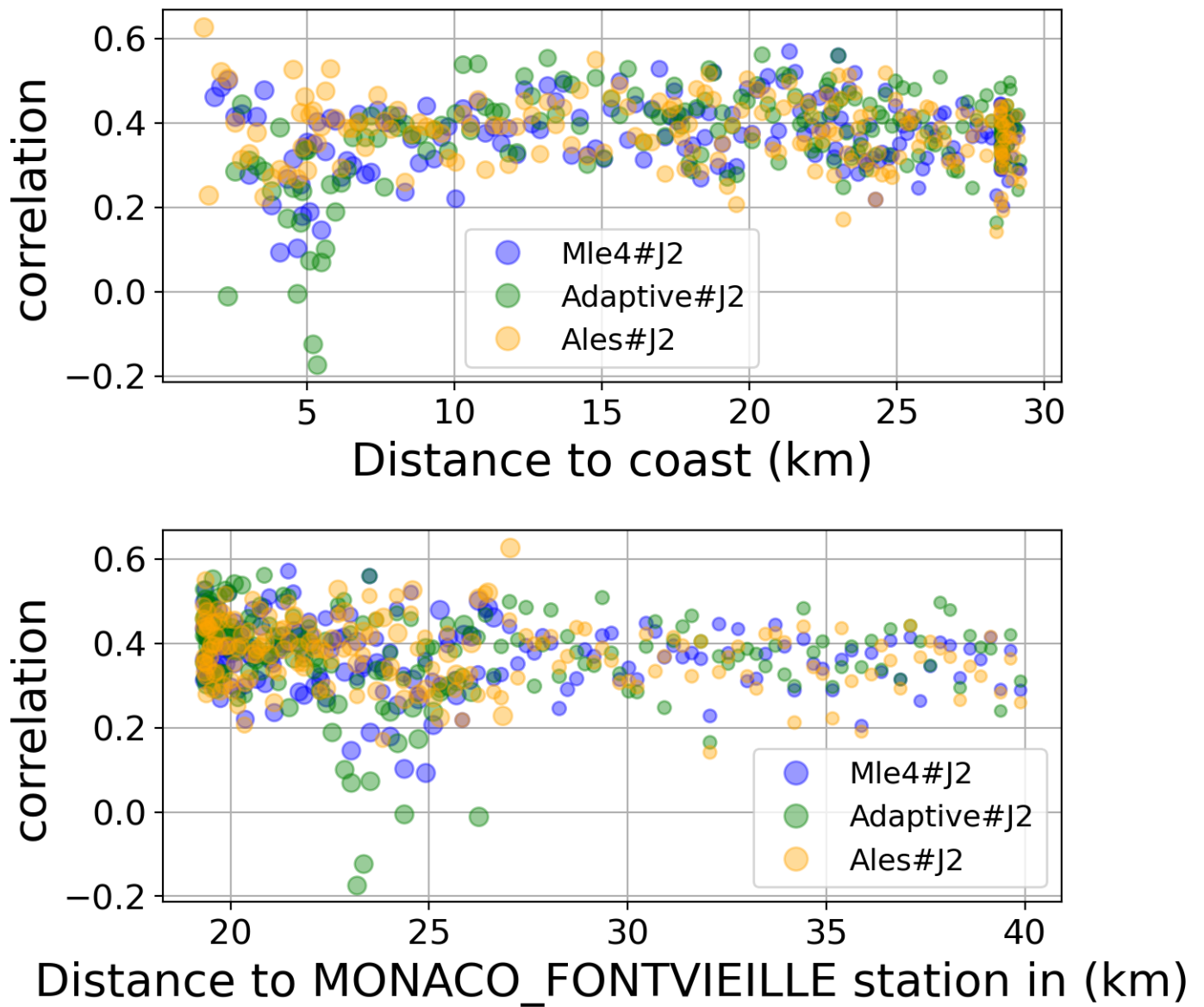


FIGURE 107 – Correlation in function of the distance to the coast/MONACO_FONTVIEILLE station

6.7.8 Taylor Diagram

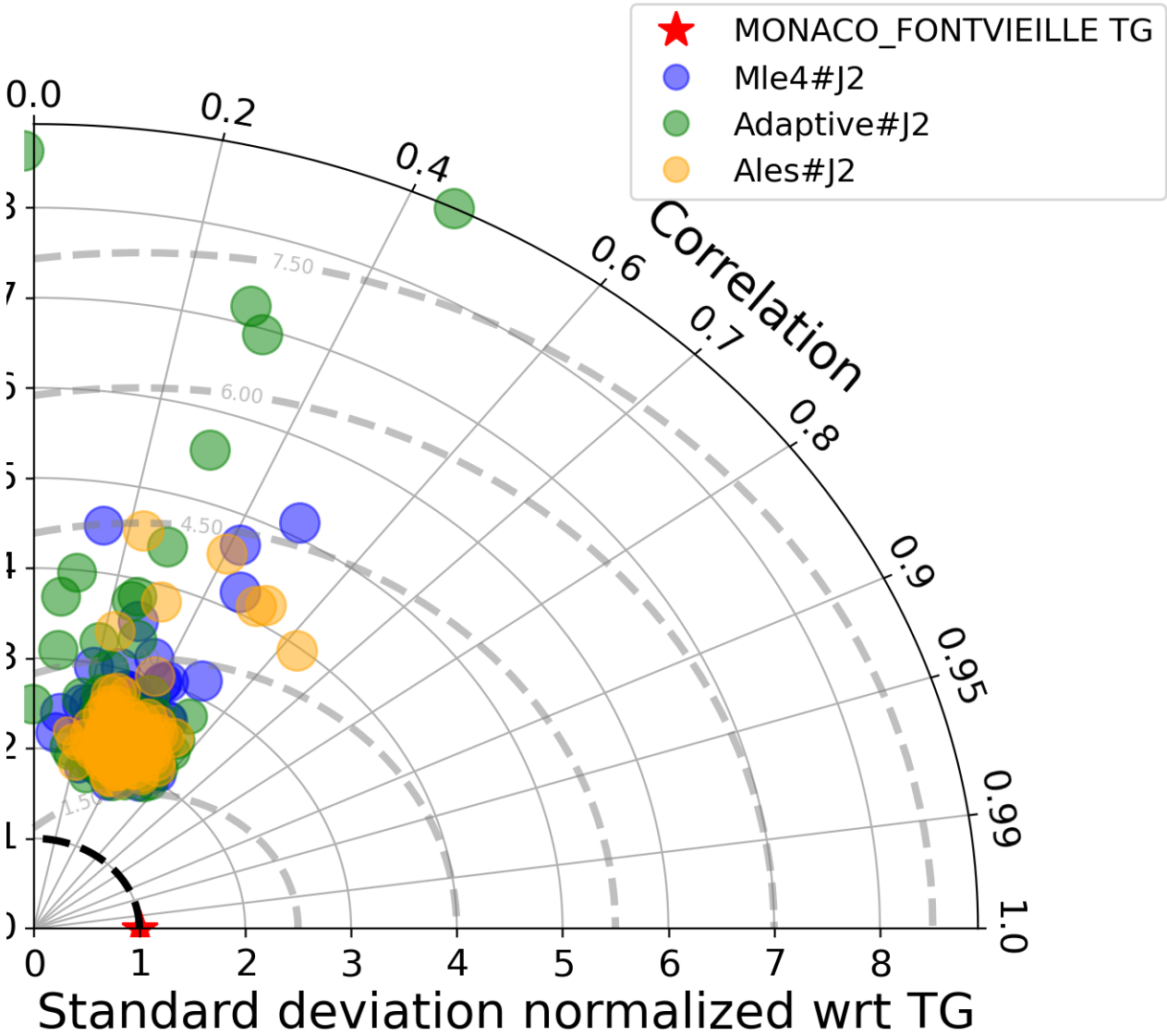


FIGURE 108 – Taylor diagram

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.

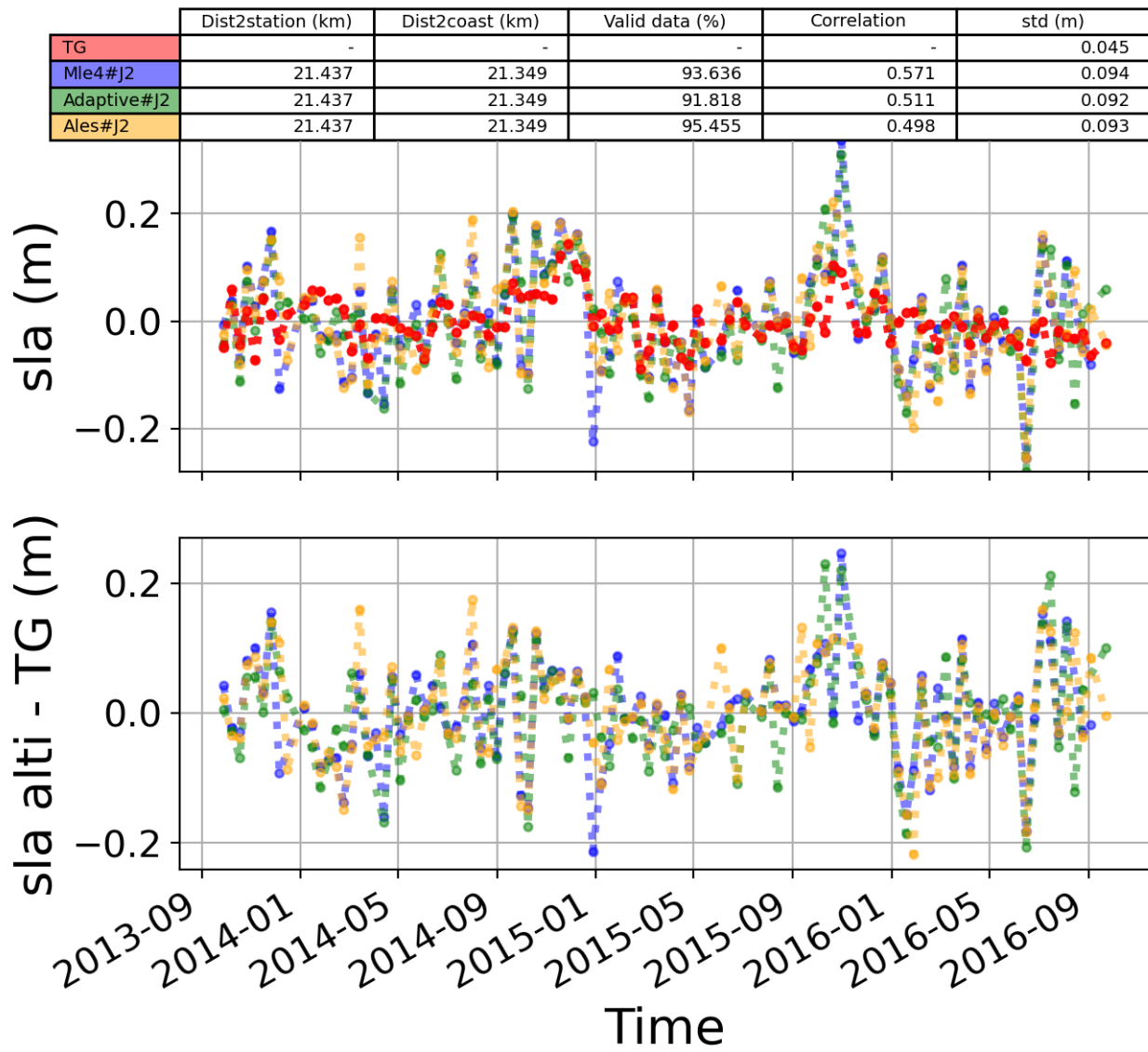


FIGURE 110 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

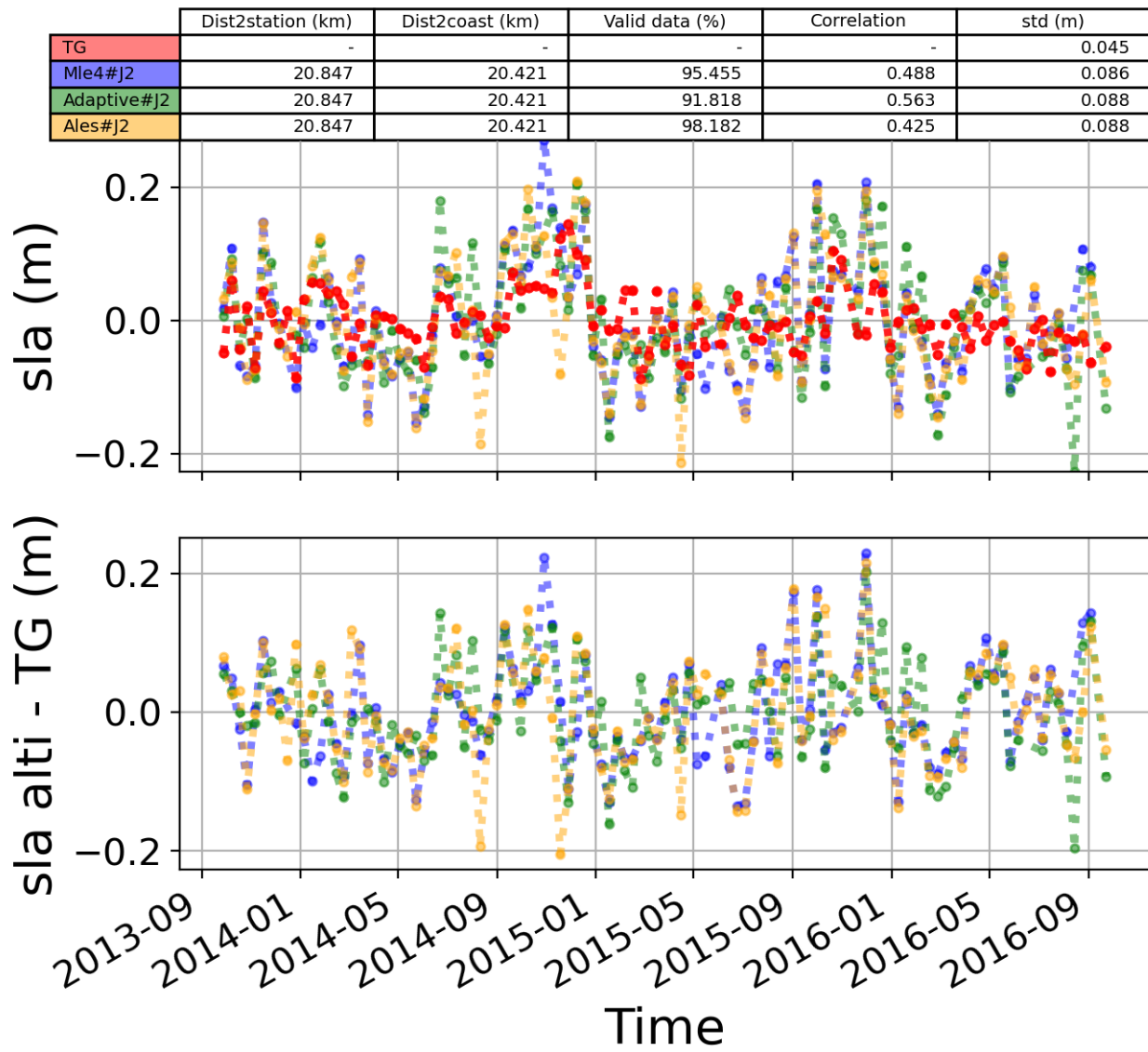


FIGURE 111 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

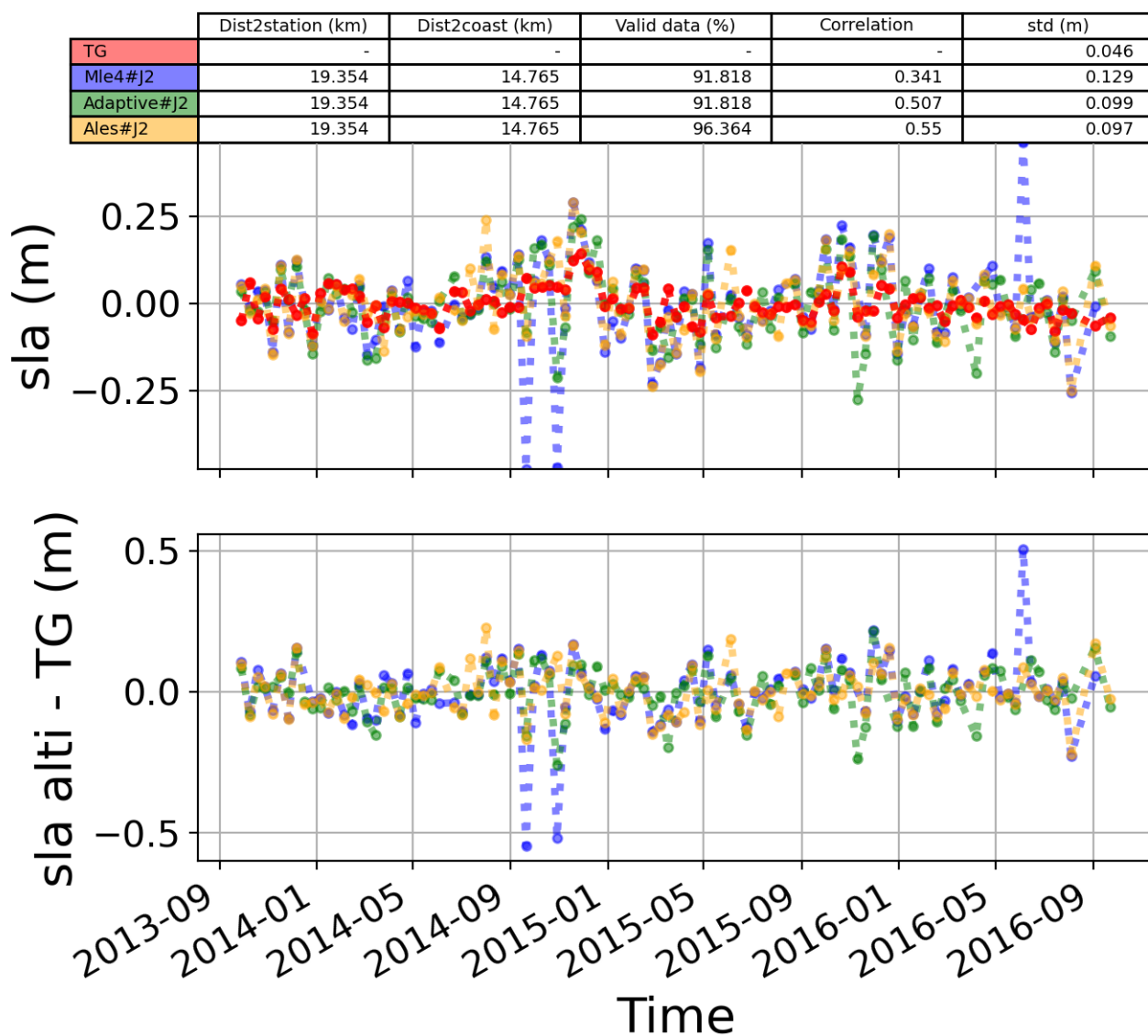


FIGURE 112 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

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

Correlation Altimetry data with respect to Erdemli Tide gauge data

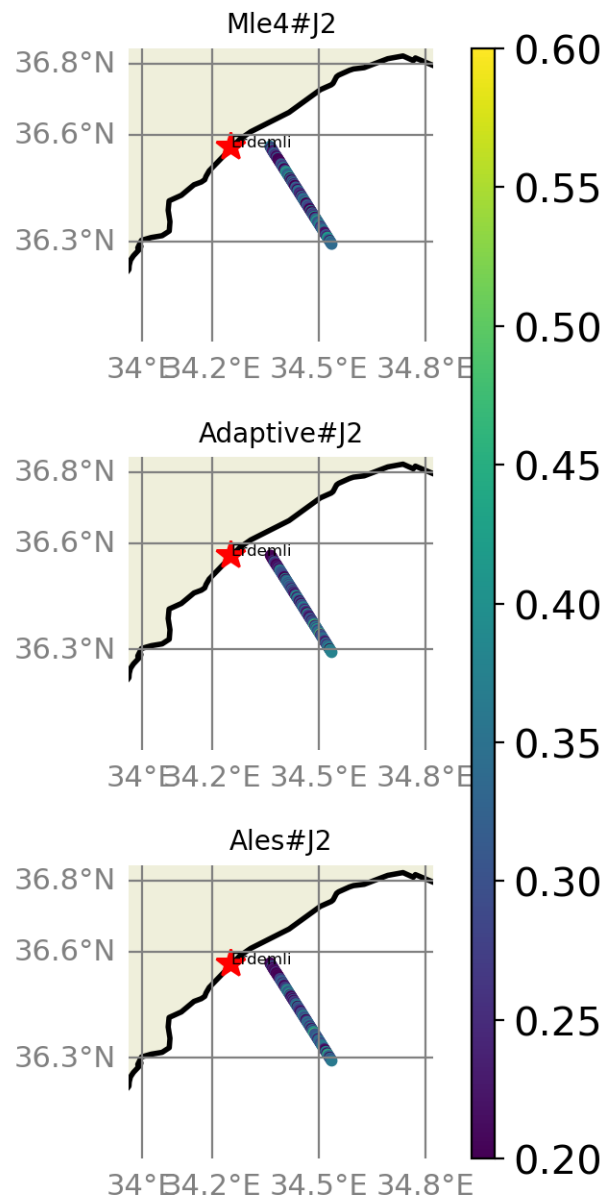


FIGURE 113 – correlation visualization in maps view % Erdemli tide gauge

6.8.2 rmsd visualization in maps view % Erdemli tide gauge

Rmsd (m) Altimetry data with respect to Erdemli Tide gauge data

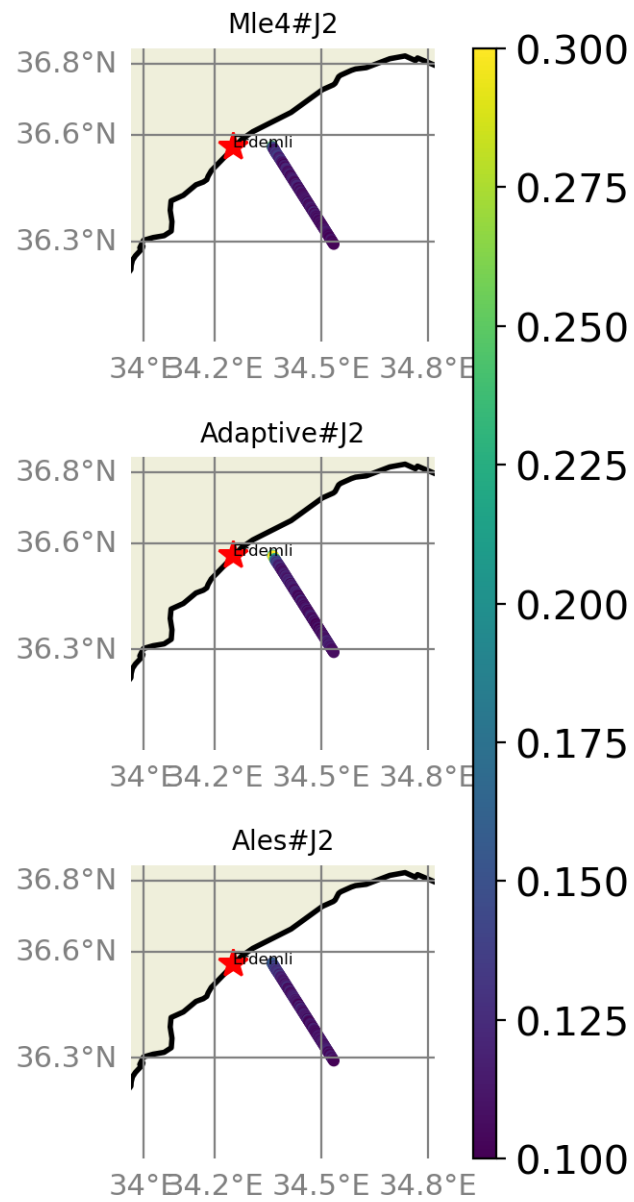


FIGURE 114 – rmsd visualization in maps view % Erdemli tide gauge

6.8.3 std visualization in maps view % Erdemli tide gauge

Std (m) Altimetry data with respect to Erdemli Tide gauge data

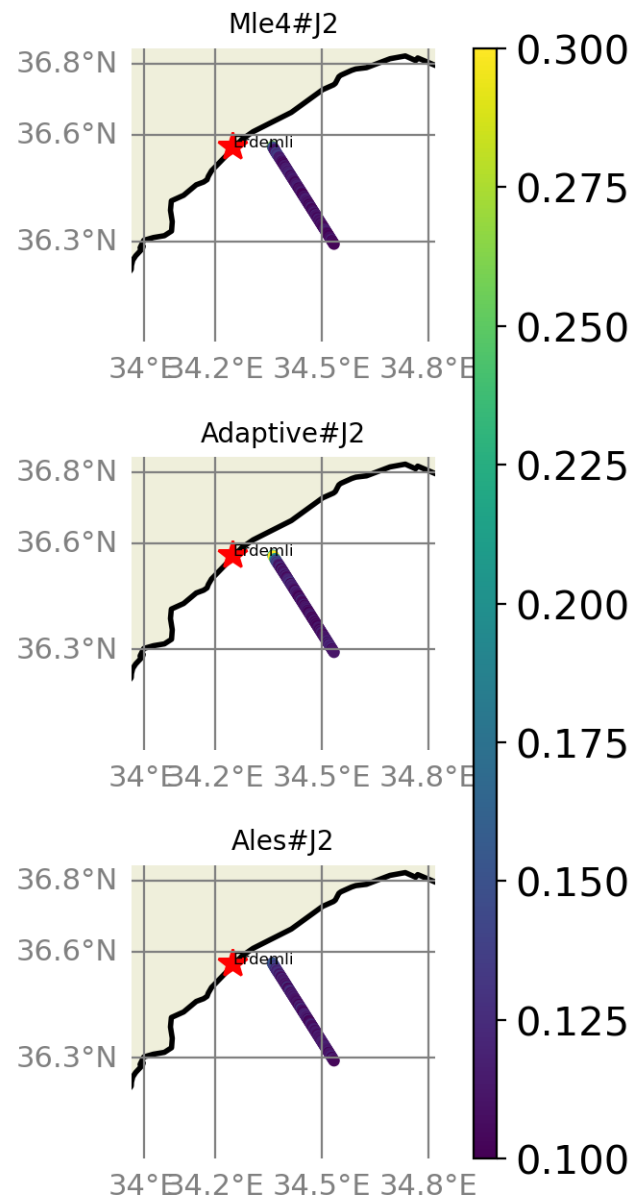


FIGURE 115 – std visualization in maps view % Erdemli tide gauge

6.8.4 valid_data_percent visualization in maps view % Erdemli tide gauge

Valid_Data_Percent (%) Altimetry data with respect to Erdemli Tide gauge data

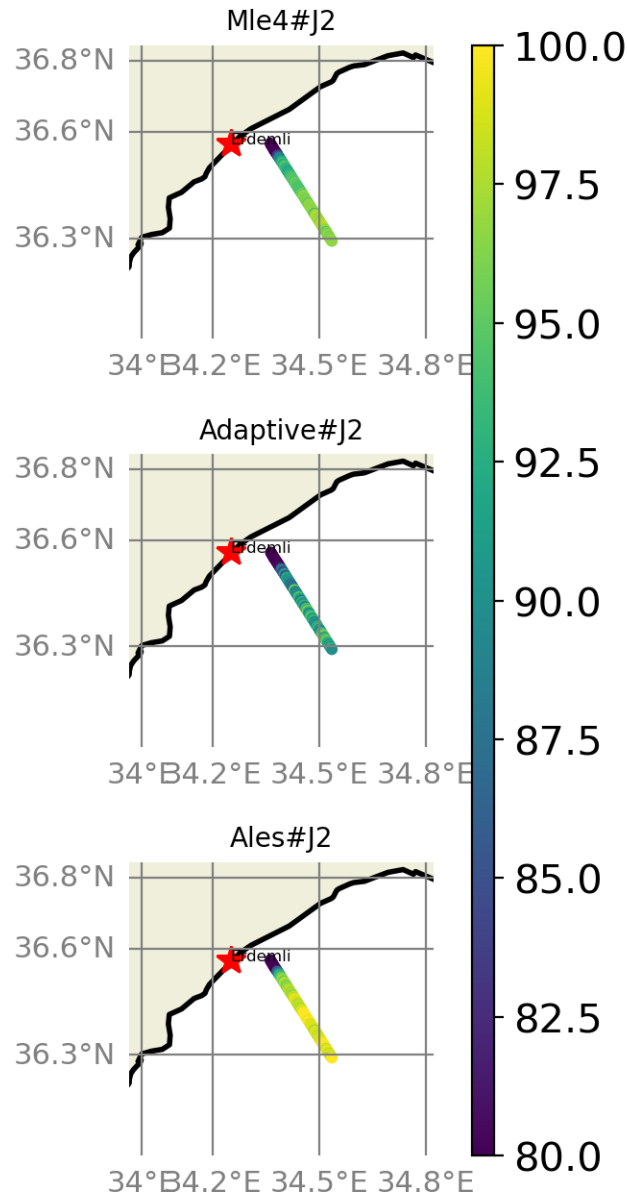


FIGURE 116 – valid_data_percent visualization in maps view % Erdemli tide gauge

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 series 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.

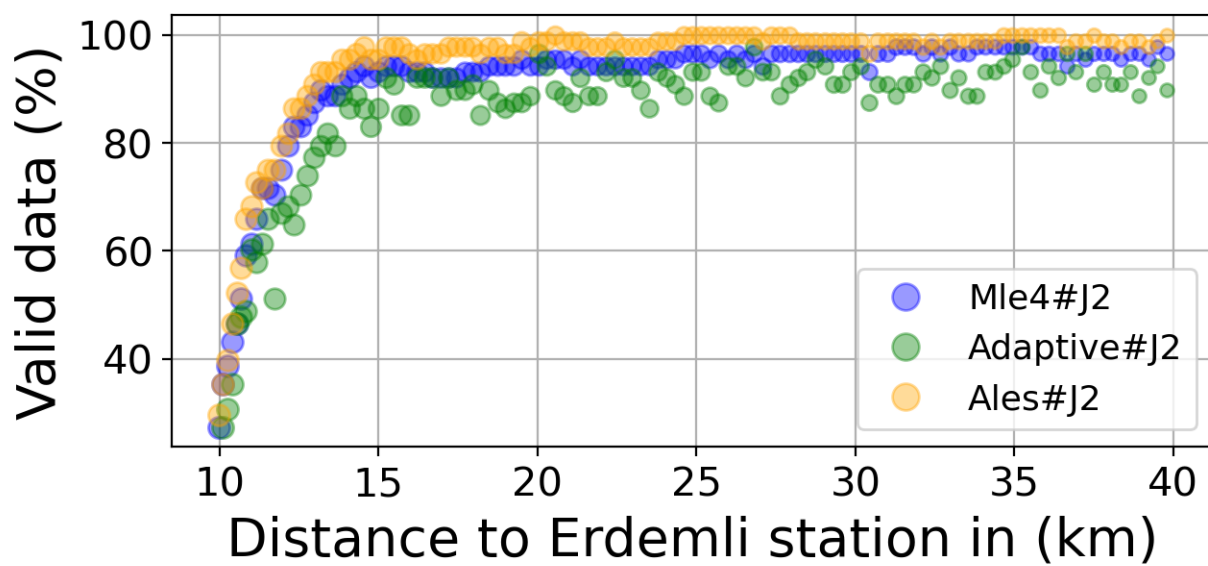
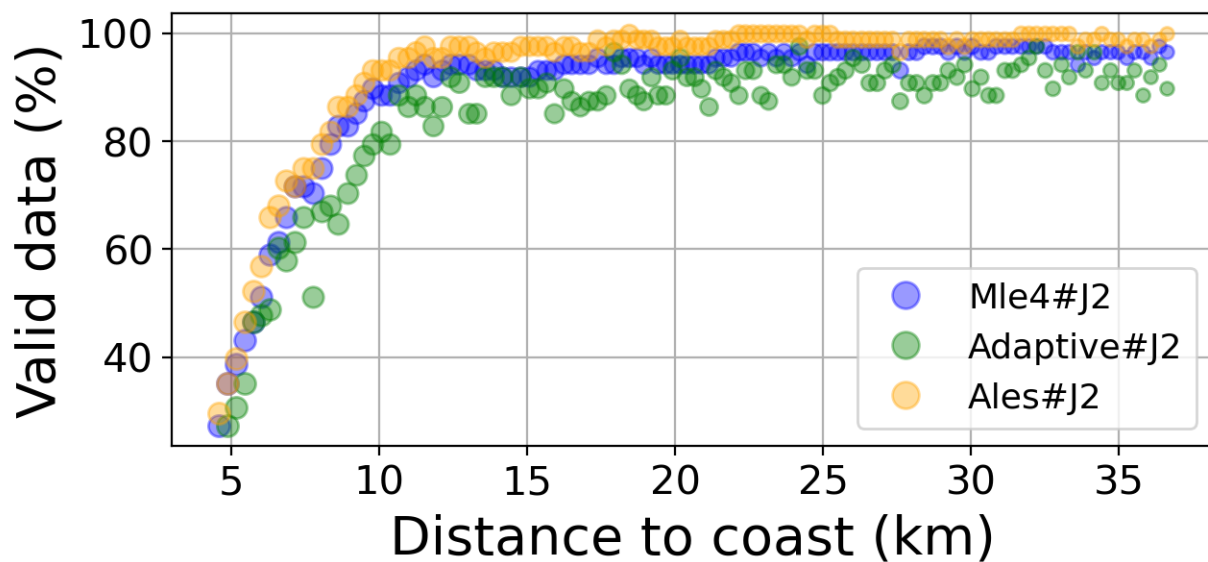


FIGURE 117 – Valid data (%) in function of distance to coast/Erdemli station

6.8.6 Std in function of distance to coast/Erdemli station

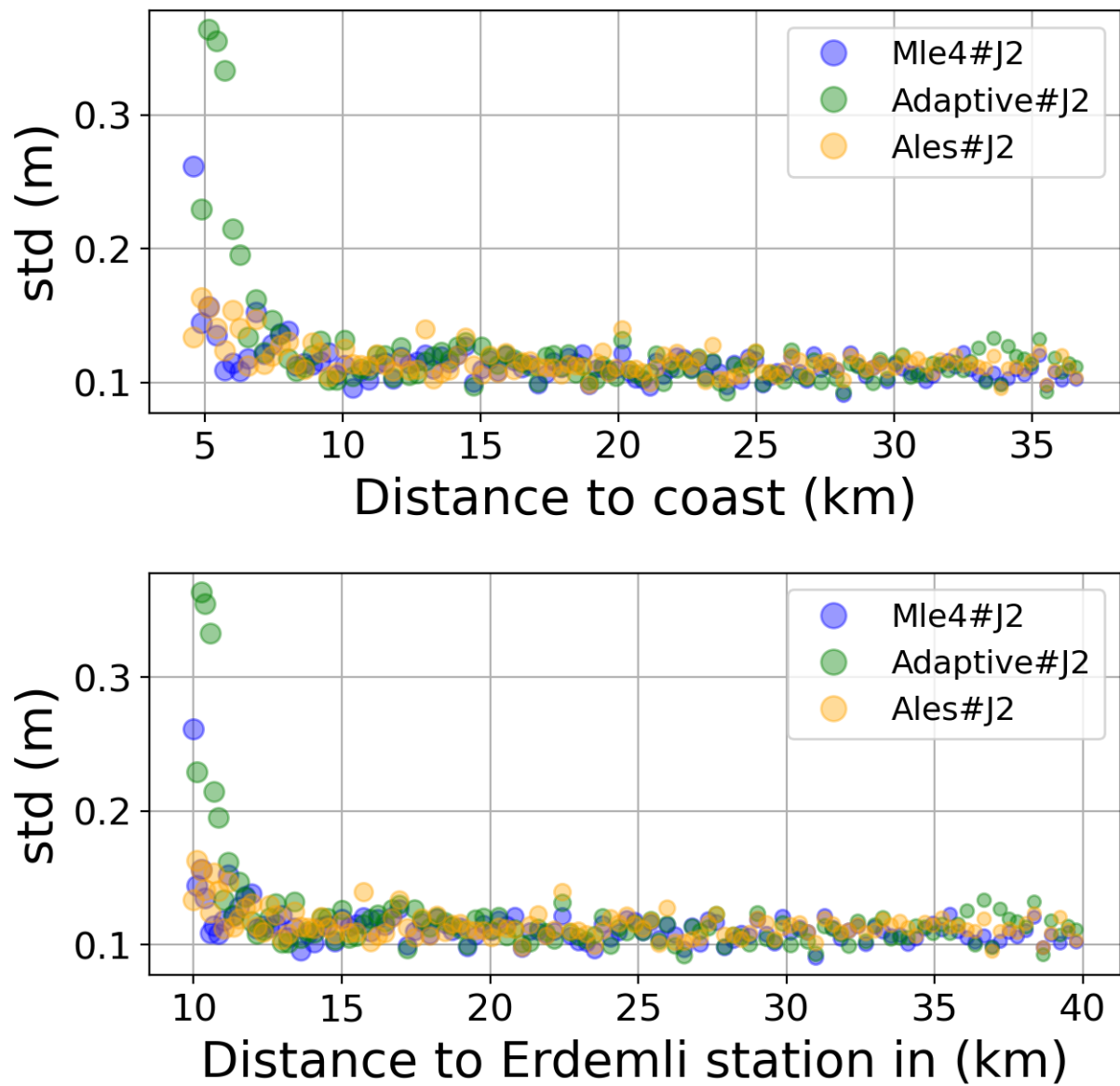


FIGURE 118 – Std in function of the distance to the coast/Erdemli station

6.8.7 Correlation in function of distance to coast/Erdemli station

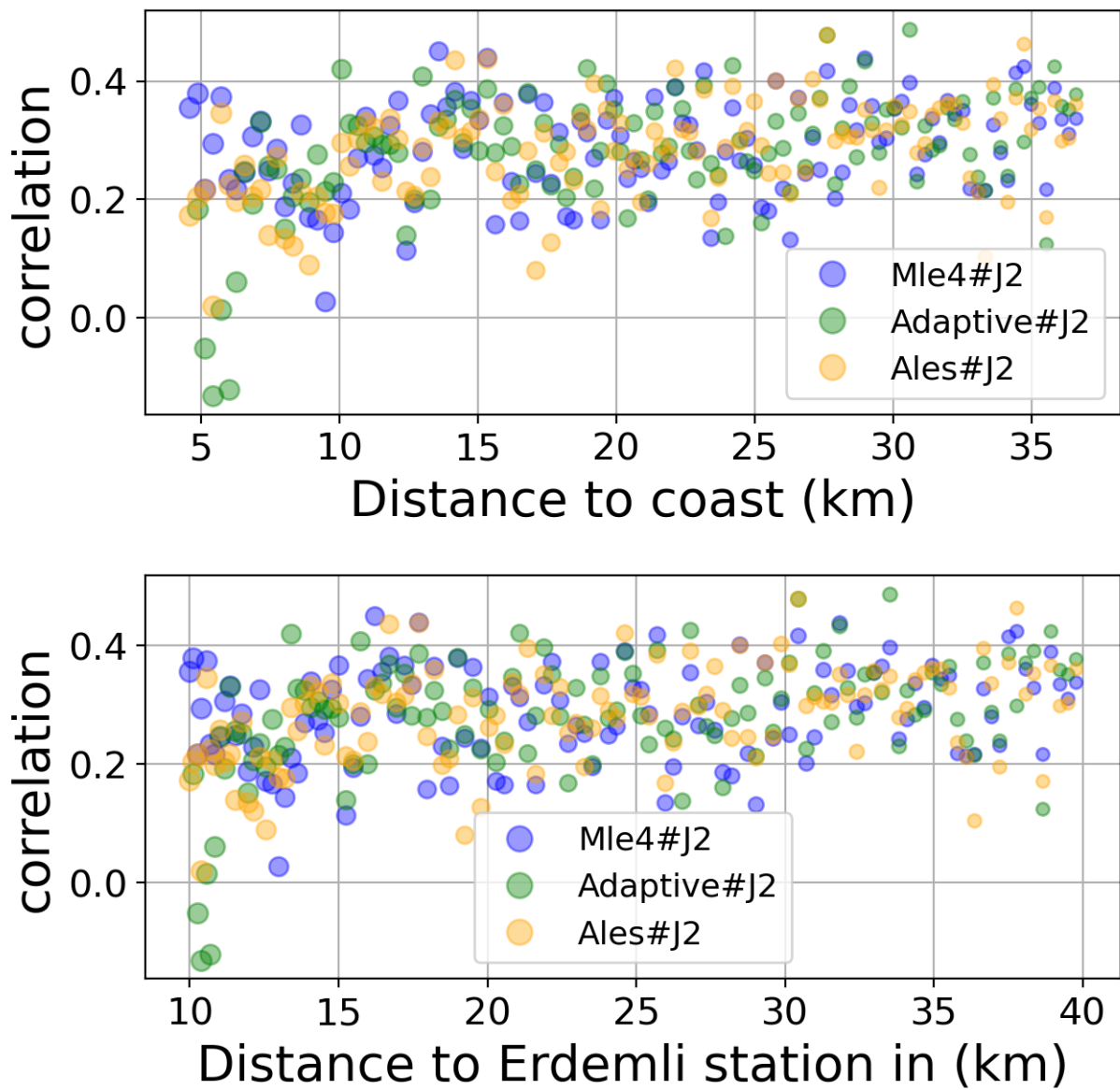


FIGURE 119 – Correlation in function of the distance to the coast/Erdemli station

6.8.8 Taylor Diagram

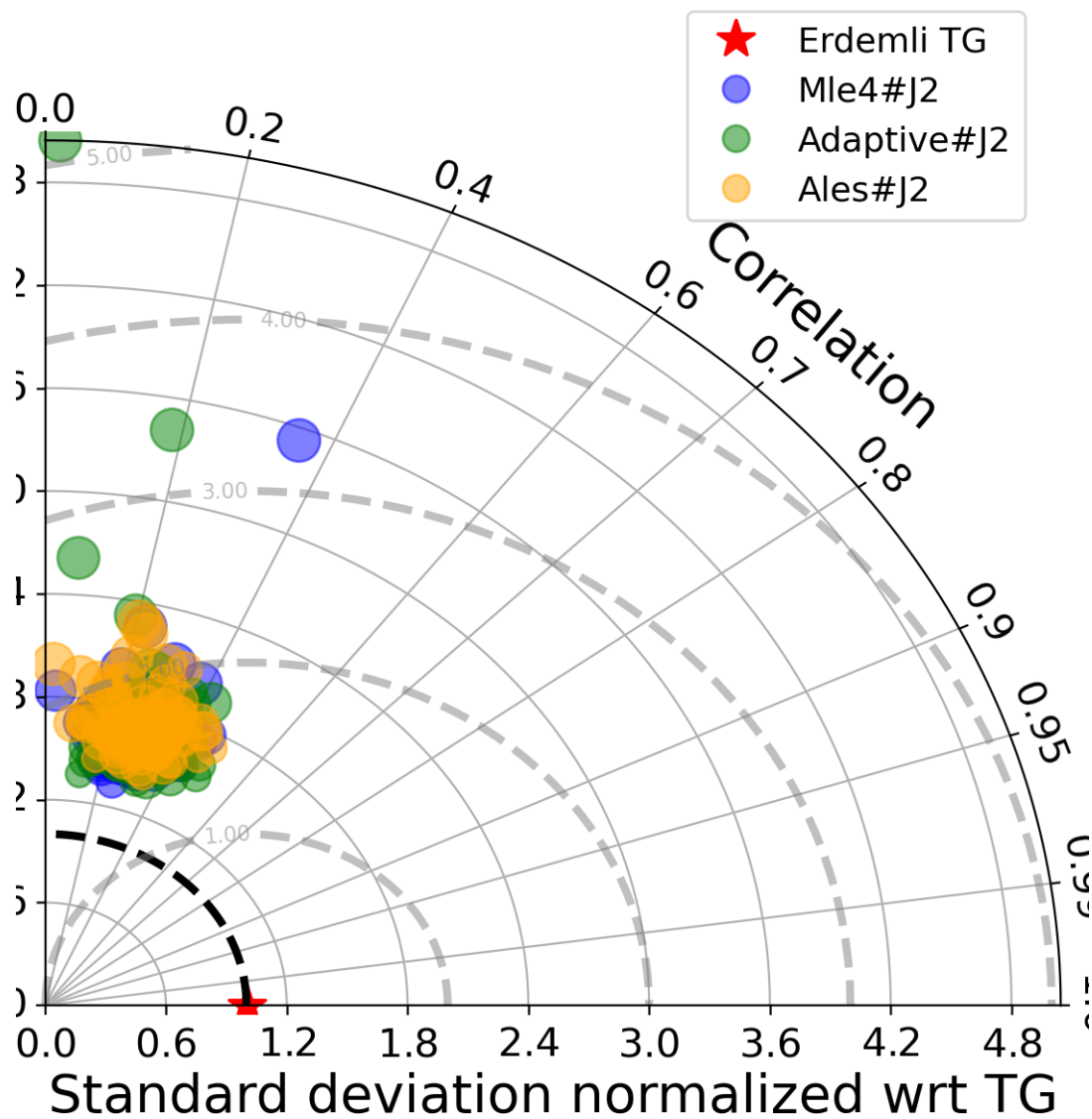


FIGURE 120 – Taylor diagram

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.

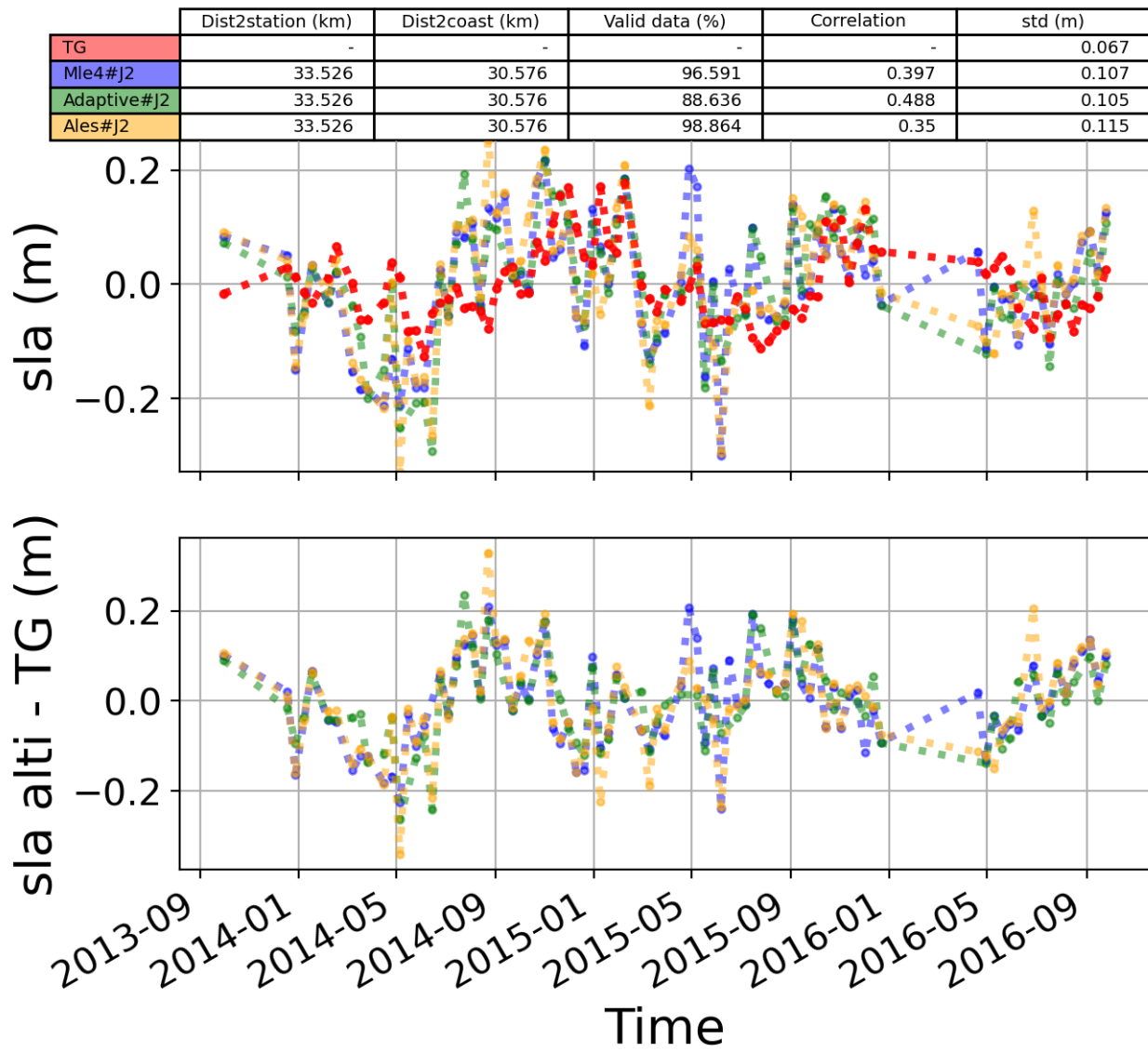


FIGURE 122 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

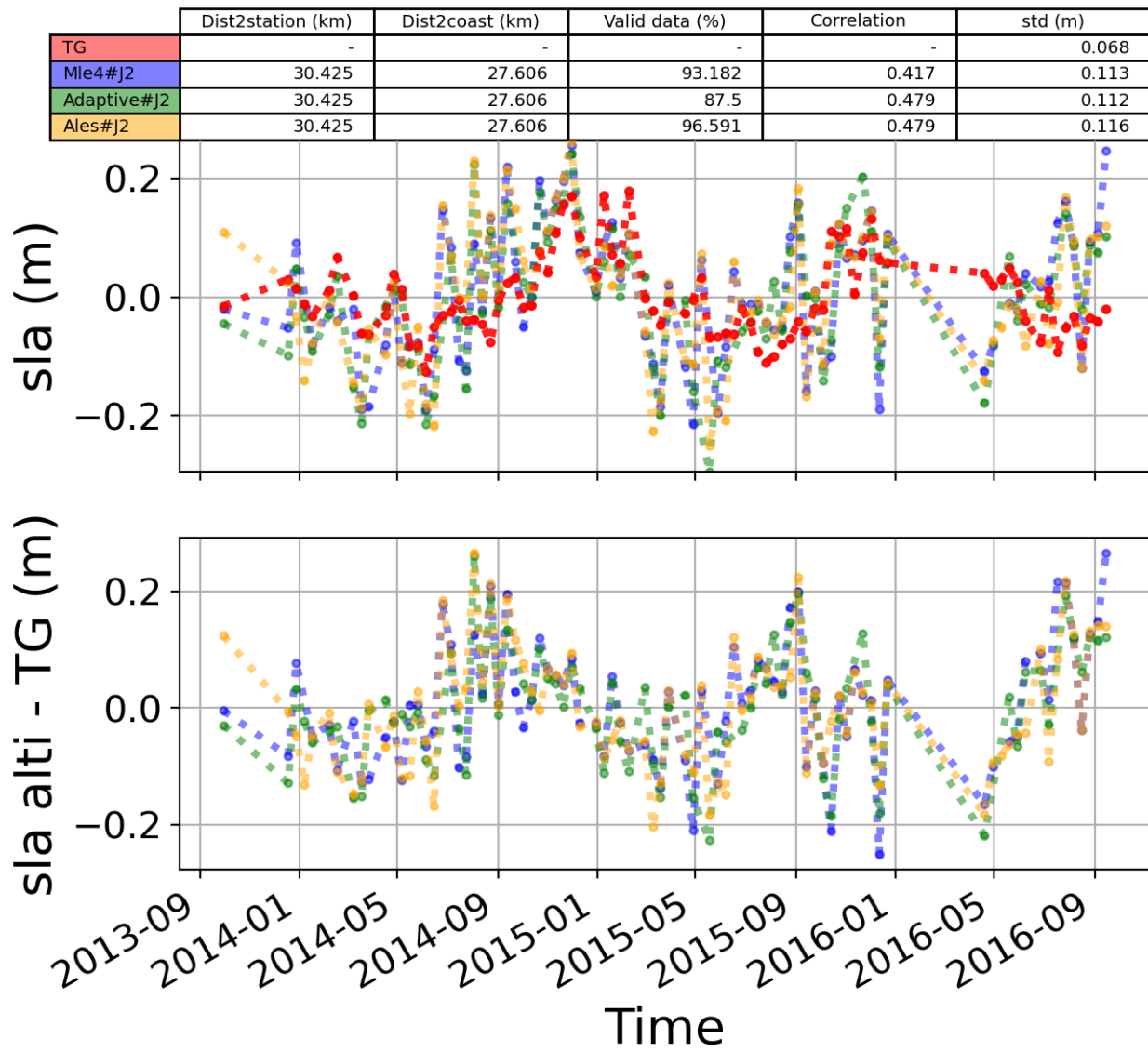


FIGURE 123 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

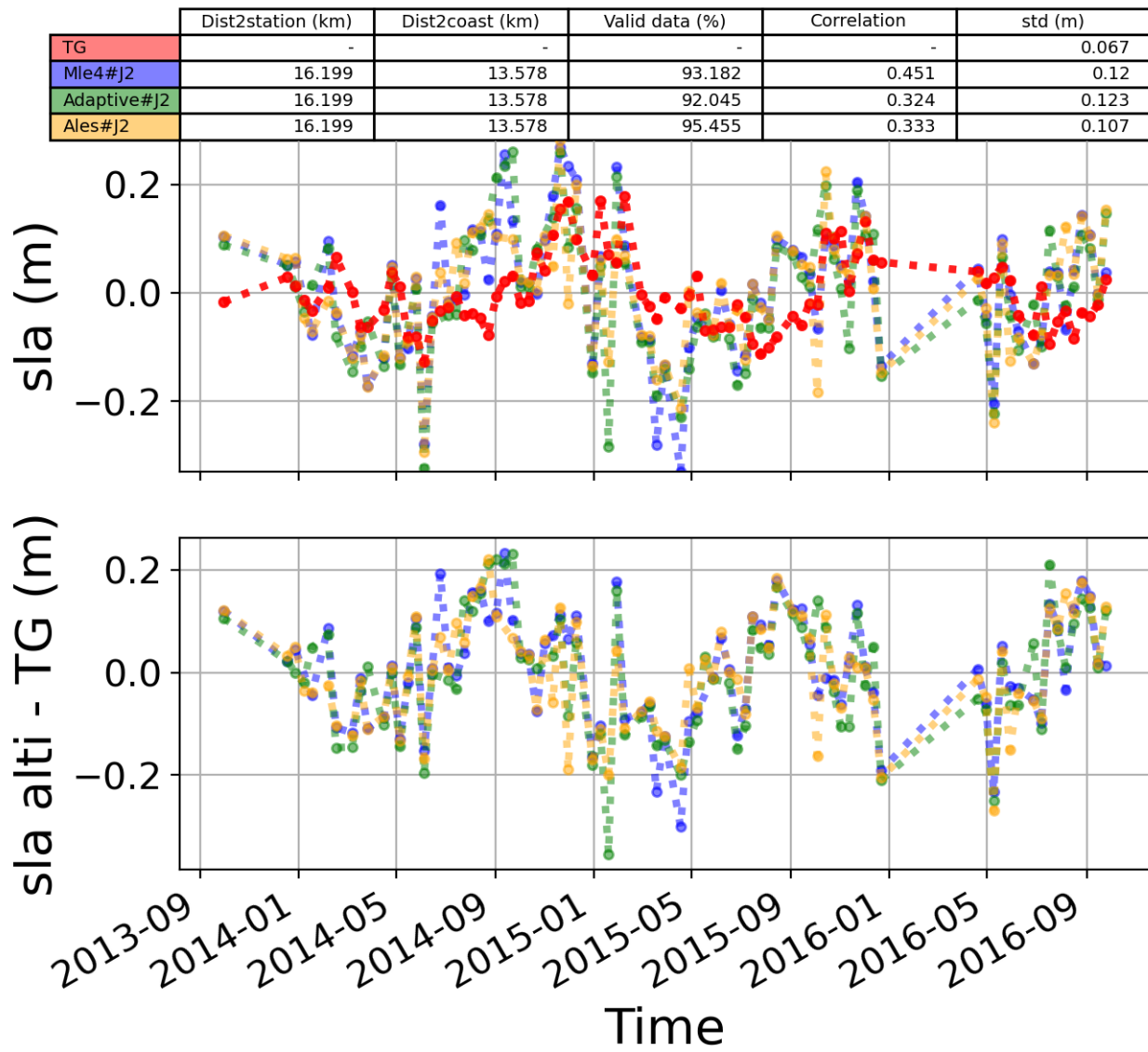


FIGURE 124 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

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

Correlation Altimetry data with respect to Almeria Tide gauge data

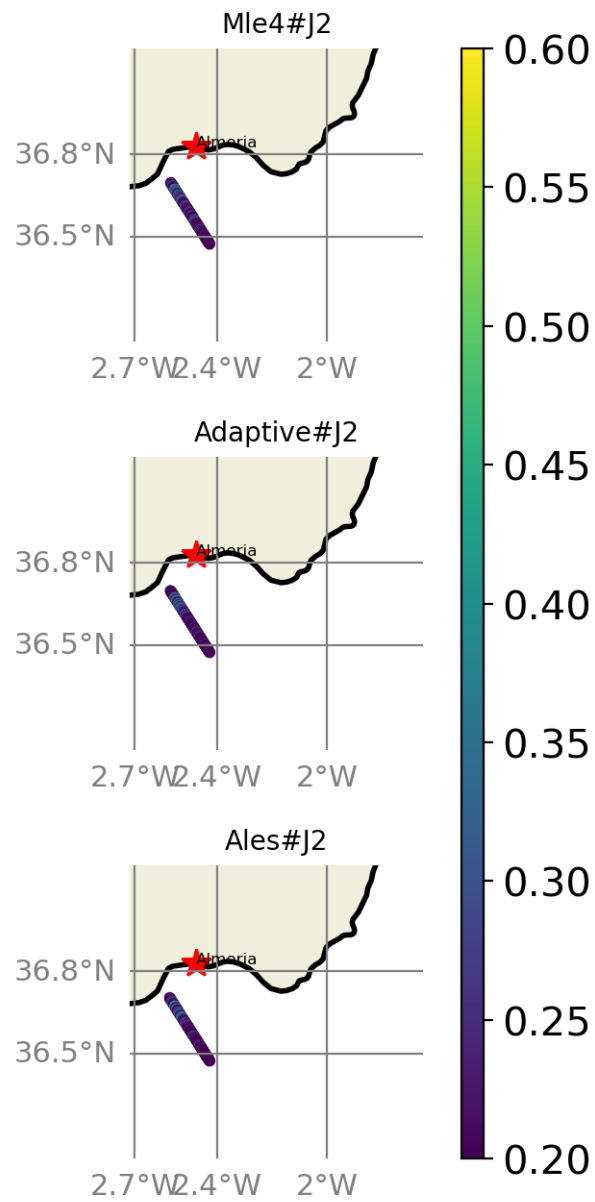


FIGURE 125 – correlation visualization in maps view % Almeria tide gauge

6.9.2 rmsd visualization in maps view % Almeria tide gauge

Rmsd (m) Altimetry data with respect to Almeria Tide gauge data

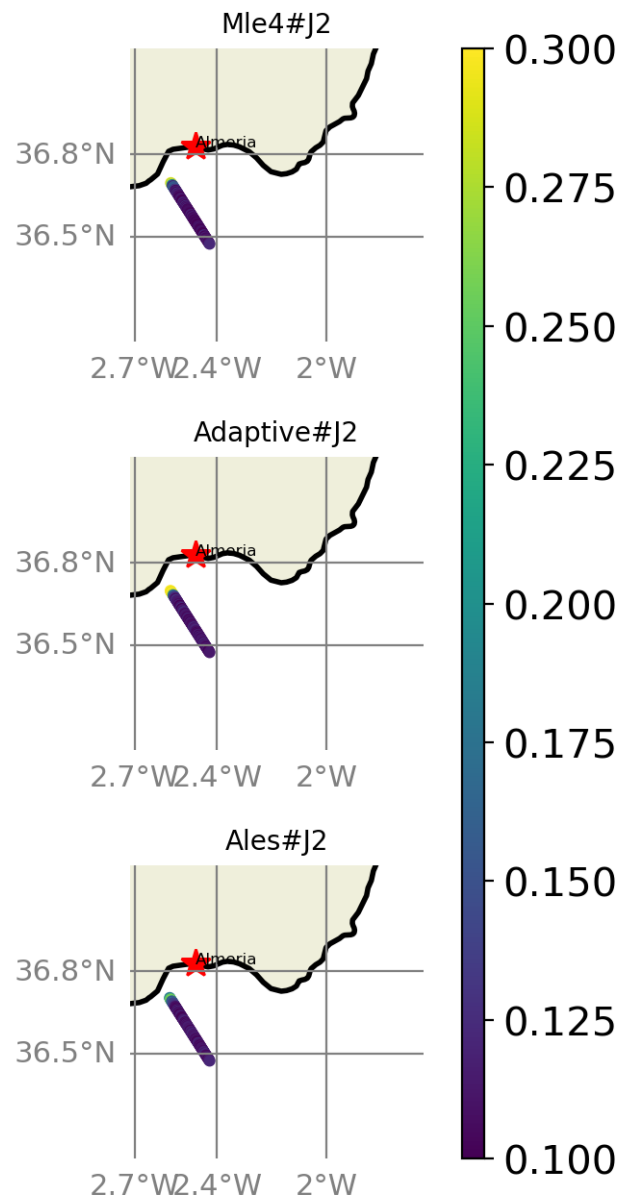


FIGURE 126 – rmsd visualization in maps view % Almeria tide gauge

6.9.3 std visualization in maps view % Almeria tide gauge

Std (m) Altimetry data with respect to Almeria Tide gauge data

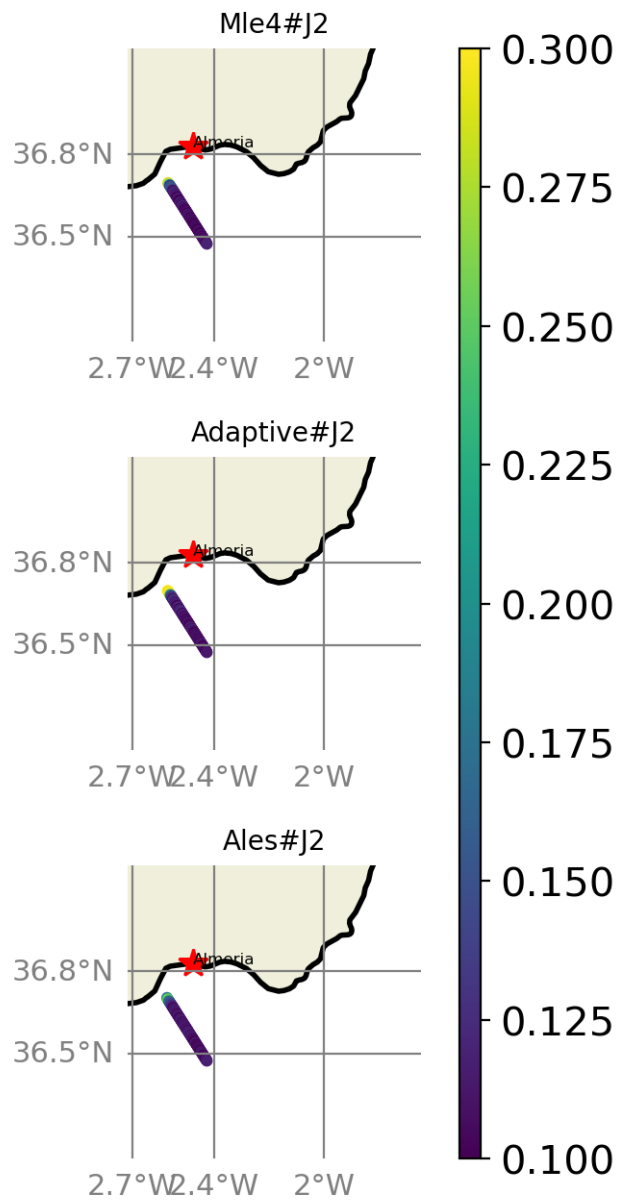


FIGURE 127 – std visualization in maps view % Almeria tide gauge

6.9.4 valid_data_percent visualization in maps view % Almeria tide gauge

Valid_Data_Percent (%) Altimetry data with respect to Almeria Tide gauge data

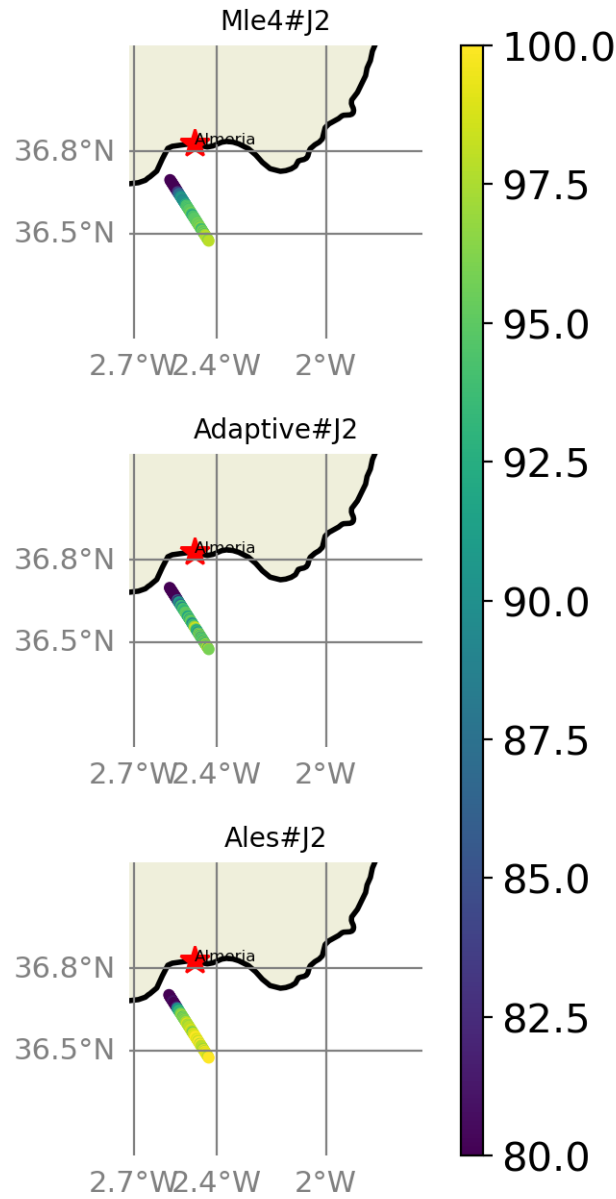


FIGURE 128 – valid_data_percent visualization in maps view % Almeria tide gauge

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.

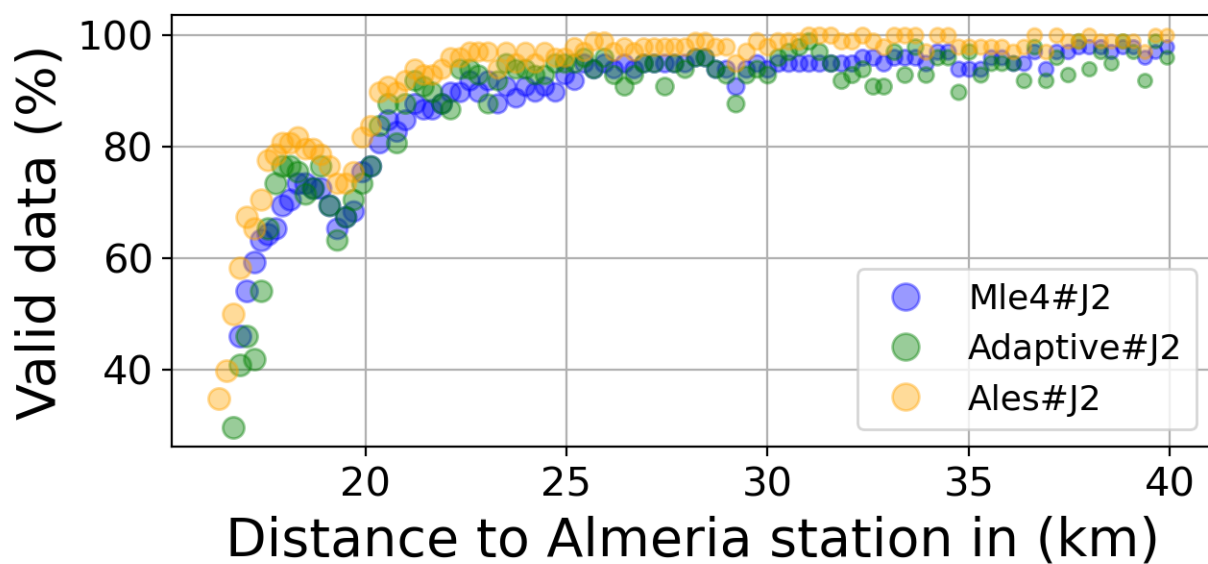
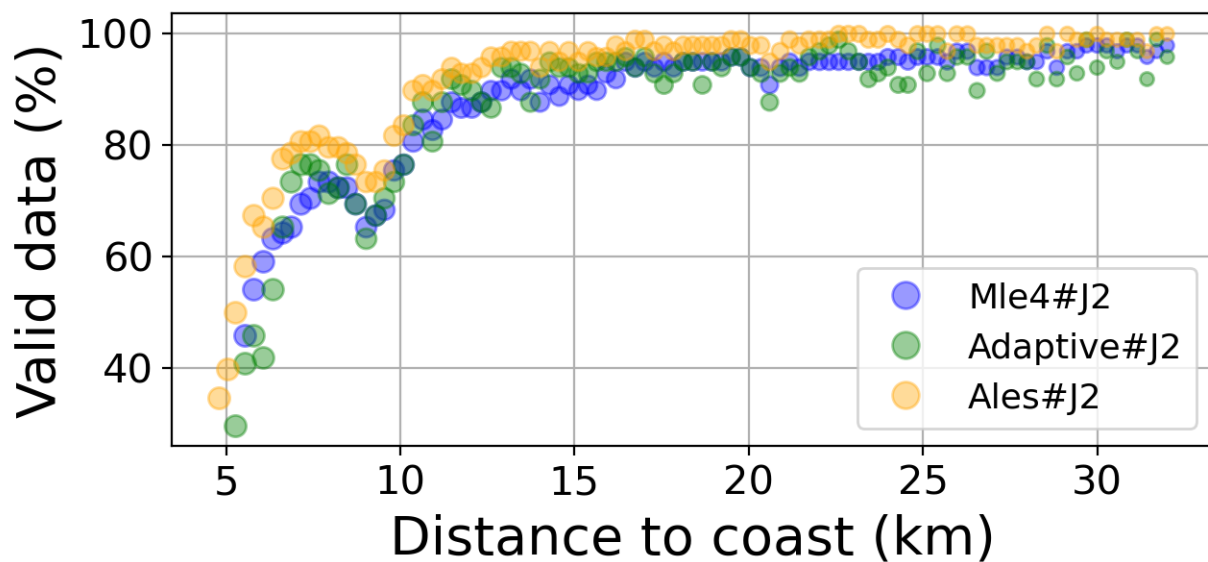


FIGURE 129 – Valid data (%) in function of distance to coast/Almeria station

6.9.6 Std in function of distance to coast/Almeria station

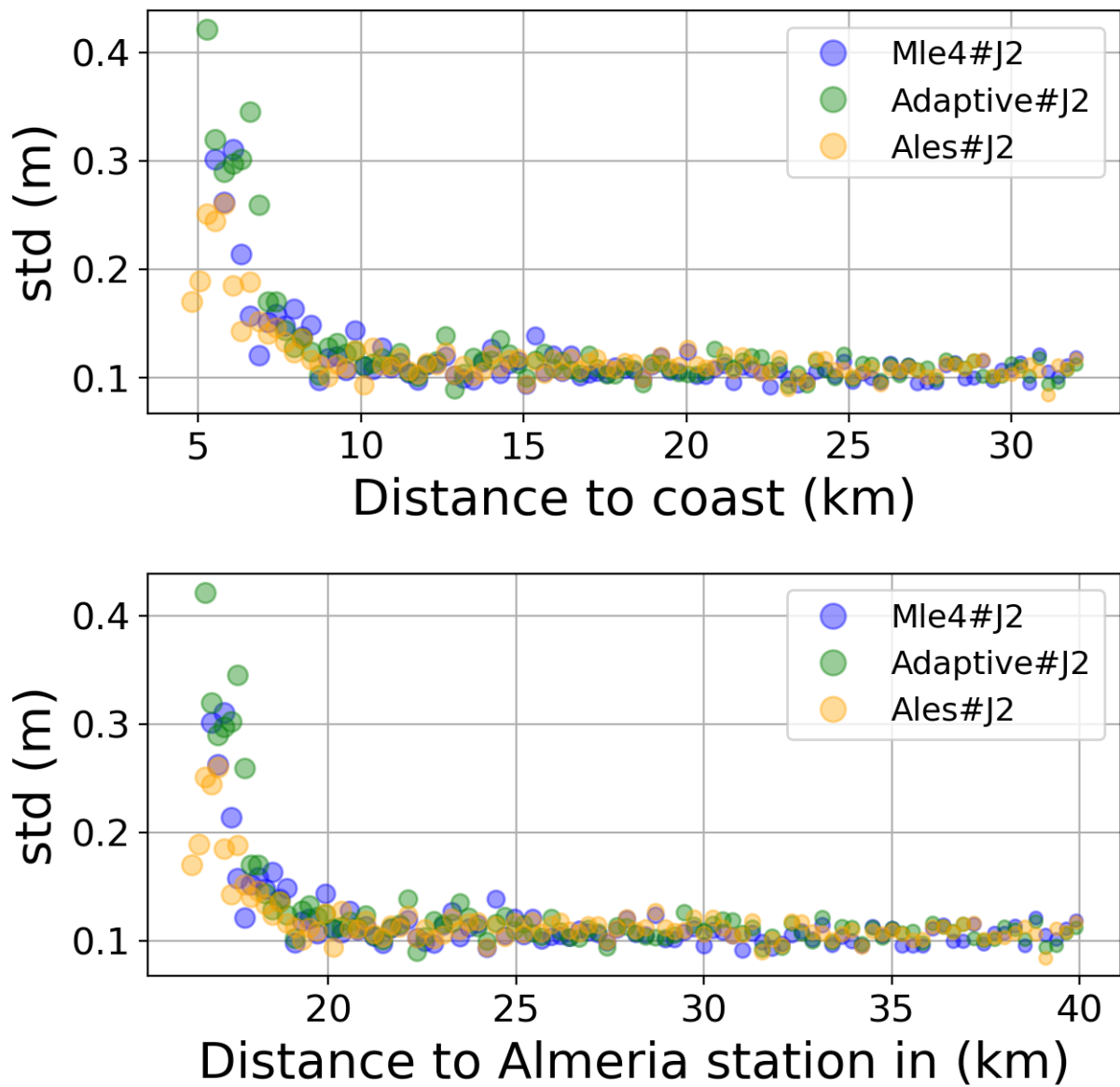


FIGURE 130 – Std in function of the distance to the coast/Almeria station

6.9.7 Correlation in function of distance to coast/Almeria station

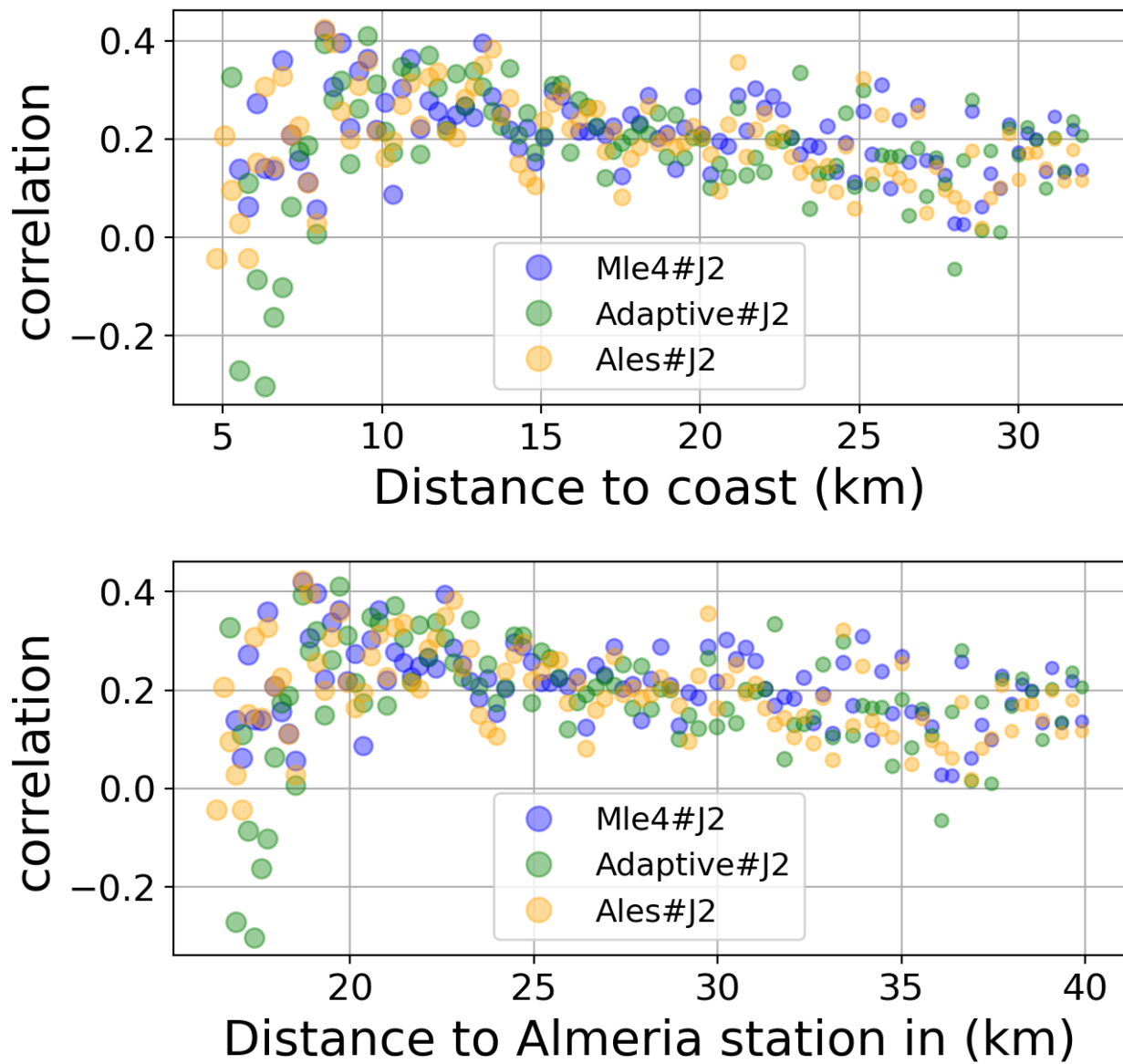


FIGURE 131 – Correlation in function of the distance to the coast/Almeria station

6.9.8 Taylor Diagram

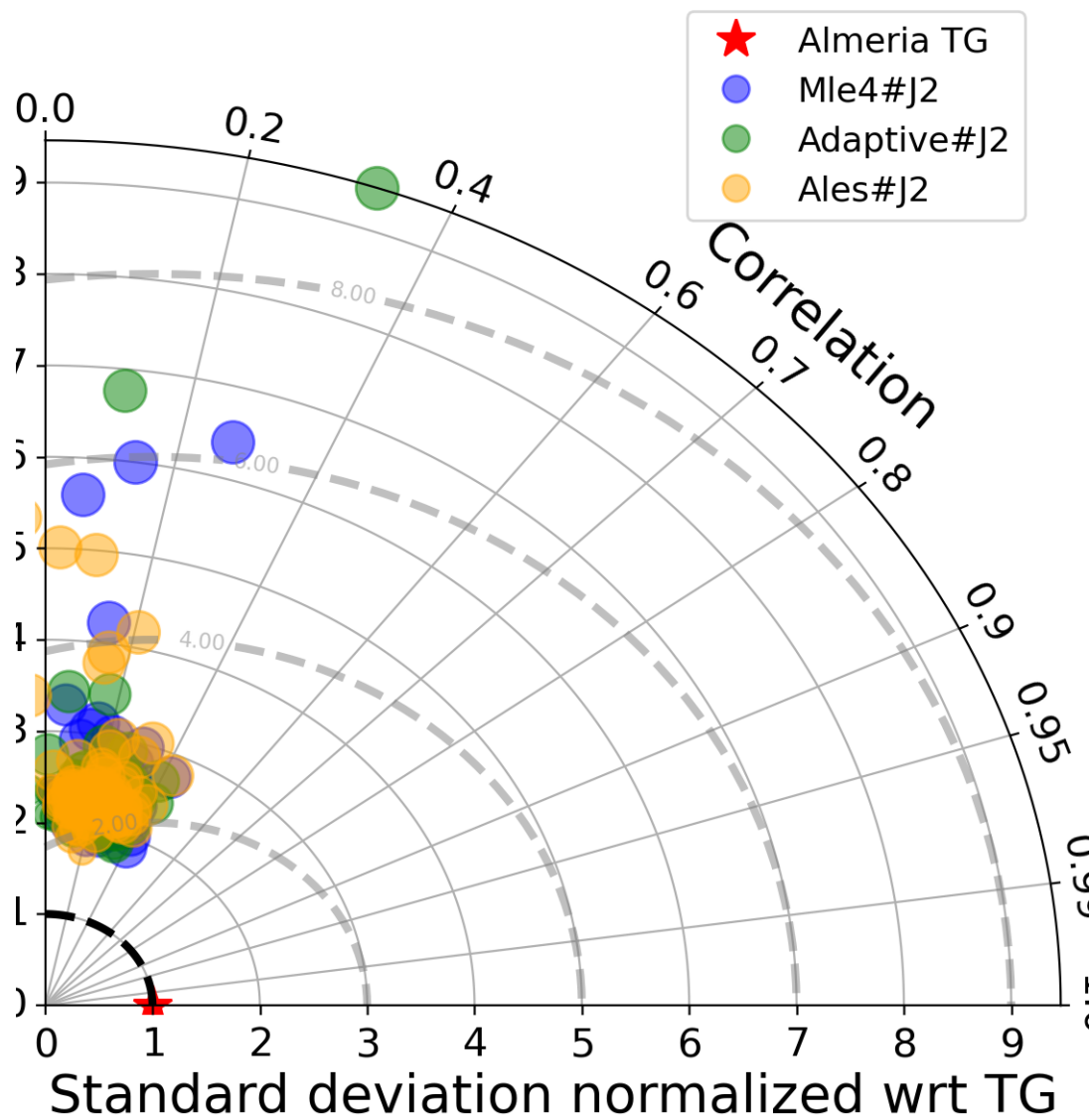


FIGURE 132 – Taylor diagram

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.

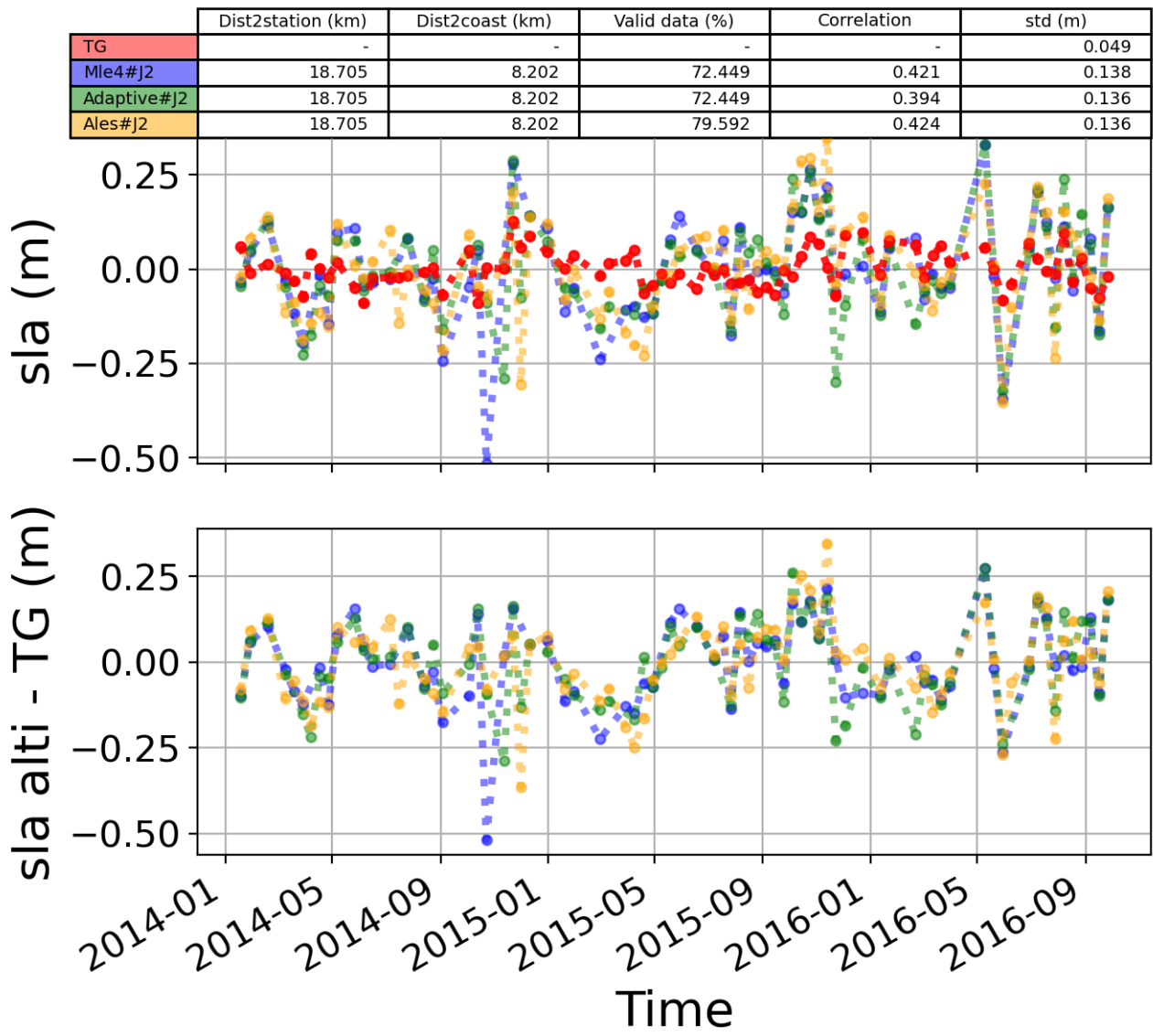


FIGURE 134 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

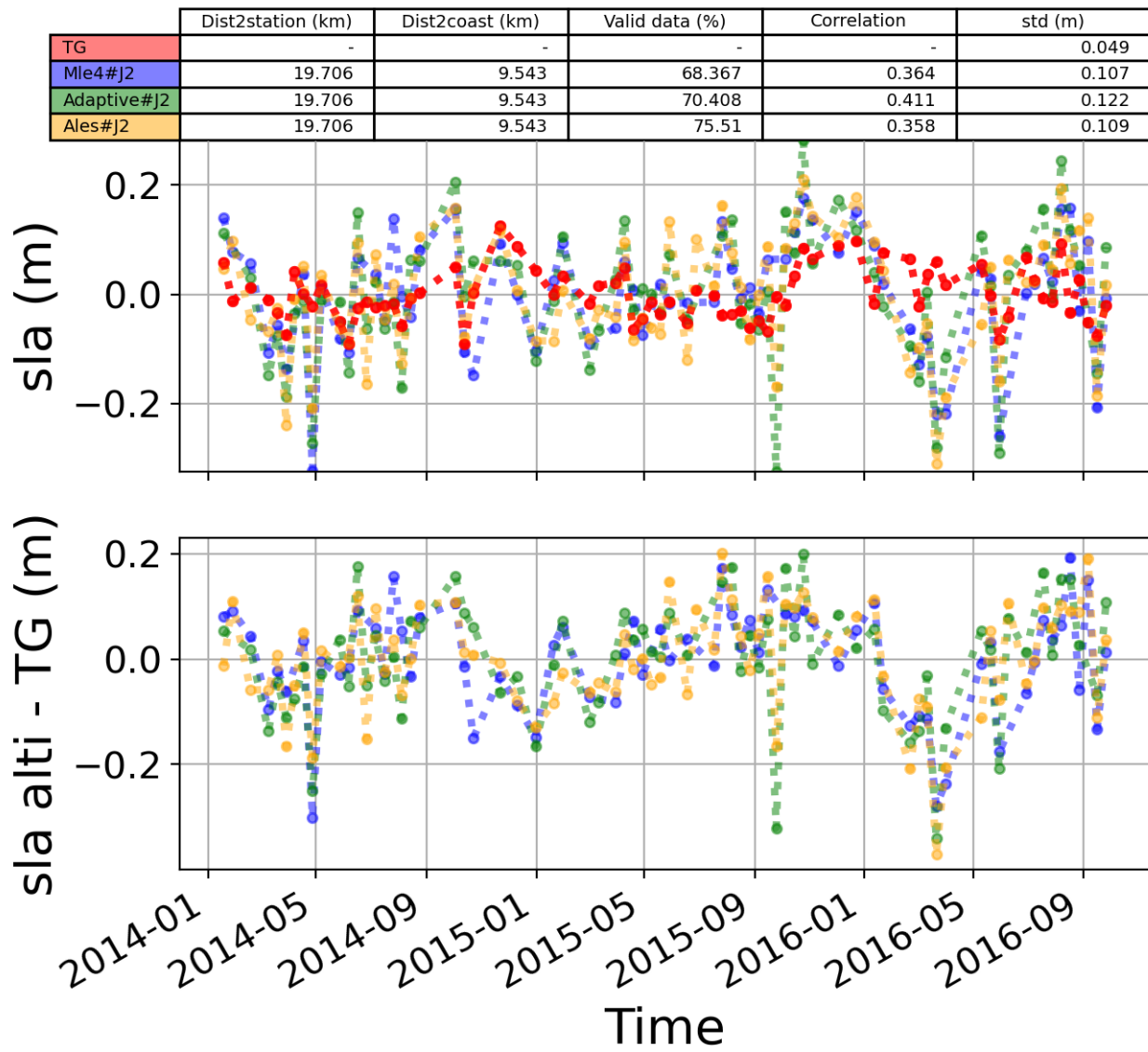


FIGURE 135 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

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

Correlation Altimetry data with respect to Civitavecchia Tide gauge data

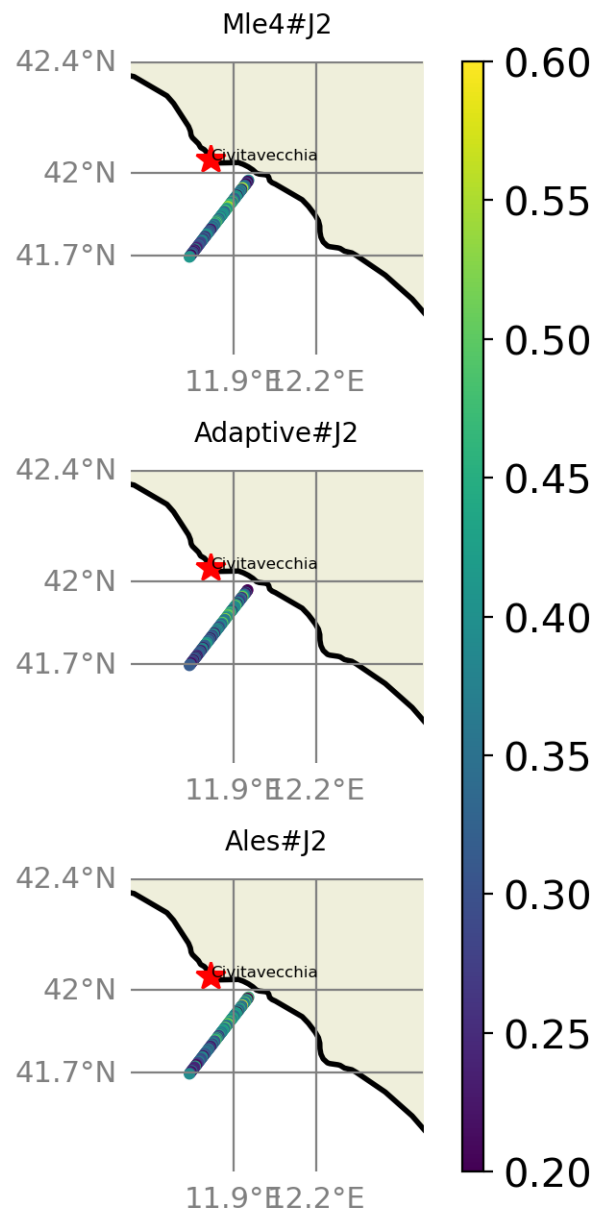


FIGURE 136 – correlation visualization in maps view % Civitavecchia tide gauge

6.10.2 rmsd visualization in maps view % Civitavecchia tide gauge

Rmsd (m) Altimetry data with respect to Civitavecchia Tide gauge data

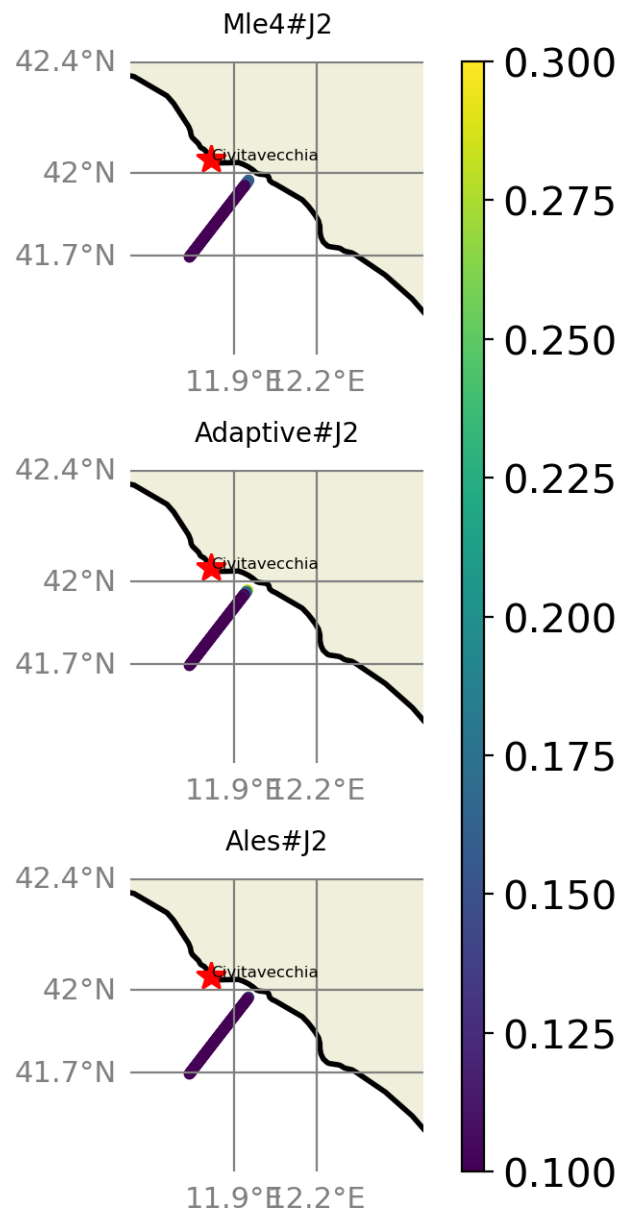


FIGURE 137 – rmsd visualization in maps view % Civitavecchia tide gauge

6.10.3 std visualization in maps view % Civitavecchia tide gauge

Std (m) Altimetry data with respect to Civitavecchia Tide gauge data

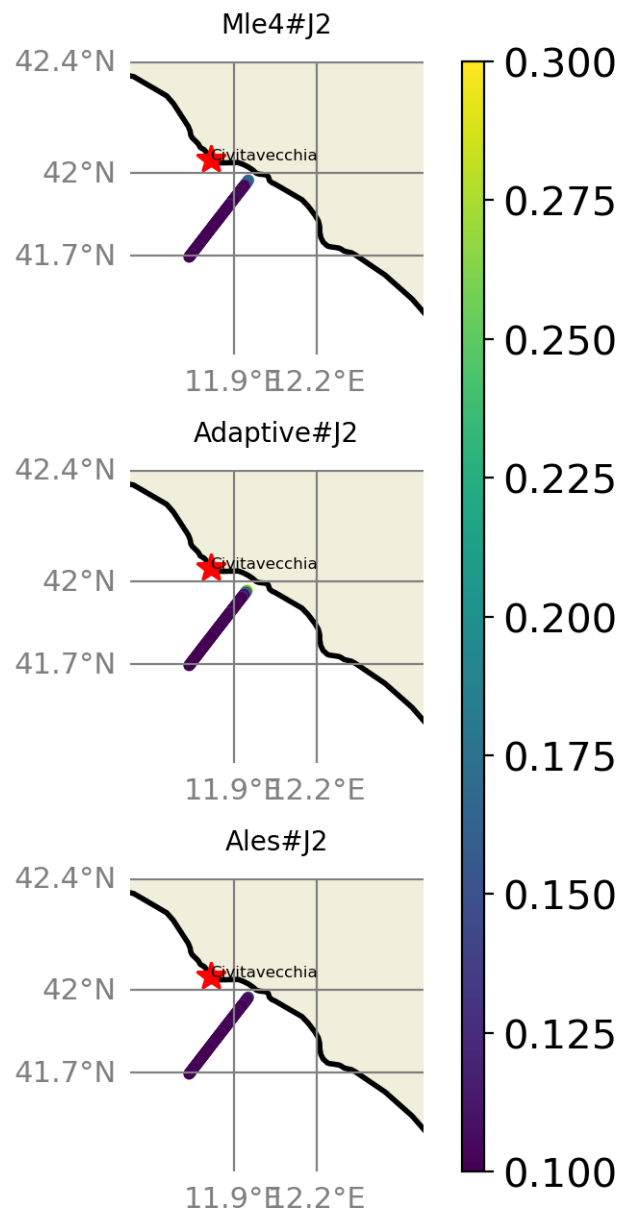


FIGURE 138 – std visualization in maps view % Civitavecchia tide gauge

6.10.4 valid_data_percent visualization in maps view % Civitavecchia tide gauge

Valid_Data_Percent (%) Altimetry data with respect to Civitavecchia Tide gauge data

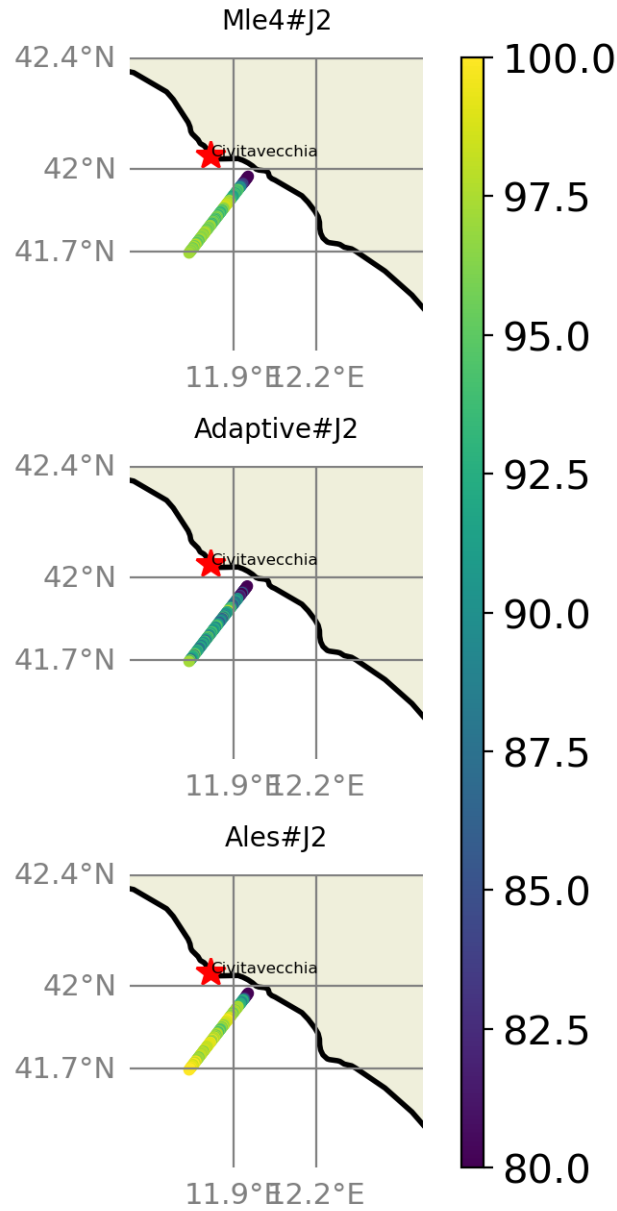


FIGURE 139 – valid_data_percent visualization in maps view % Civitavecchia tide gauge

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 series 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 series, respectively in the time series, i is the index of the time series, 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 series.

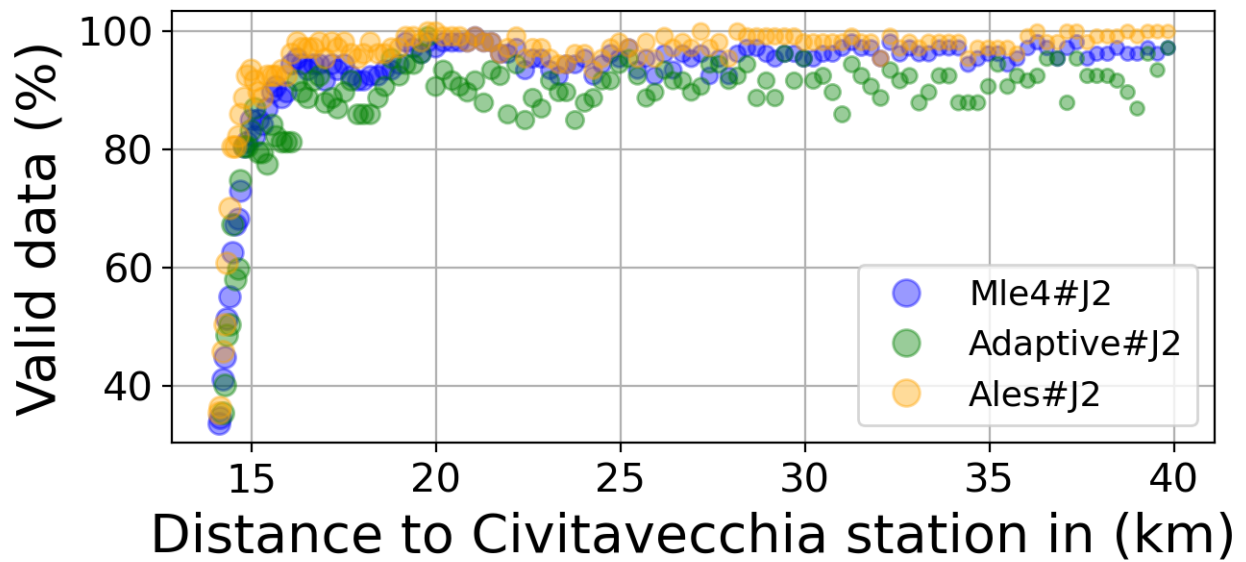
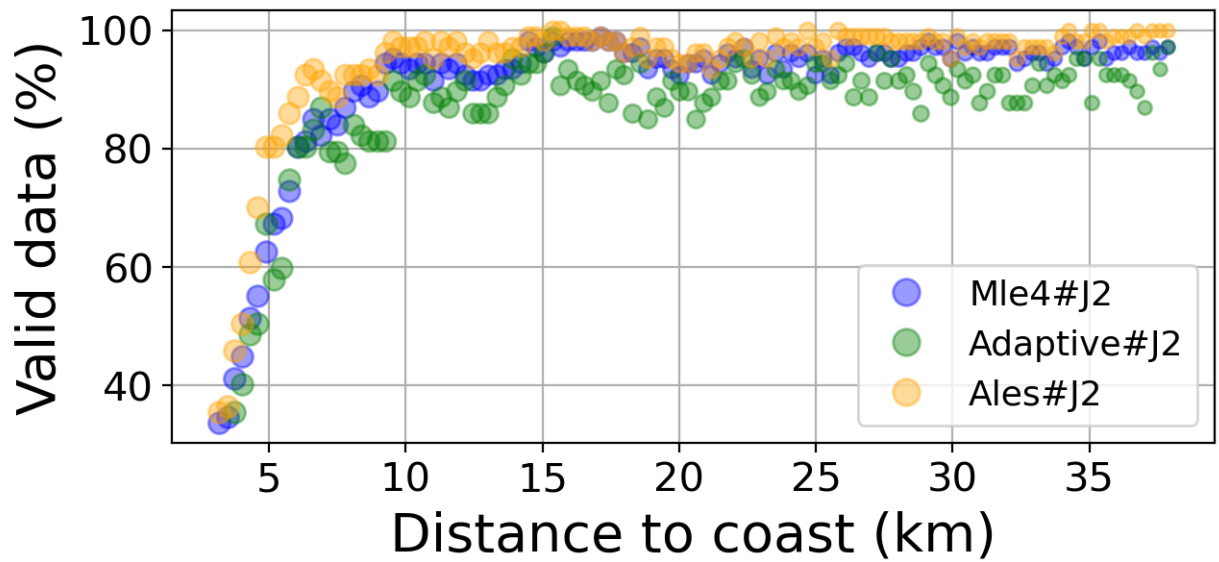


FIGURE 140 – Valid data (%) in function of distance to coast/Civitavecchia station

6.10.6 Std in function of distance to coast/Civitavecchia station

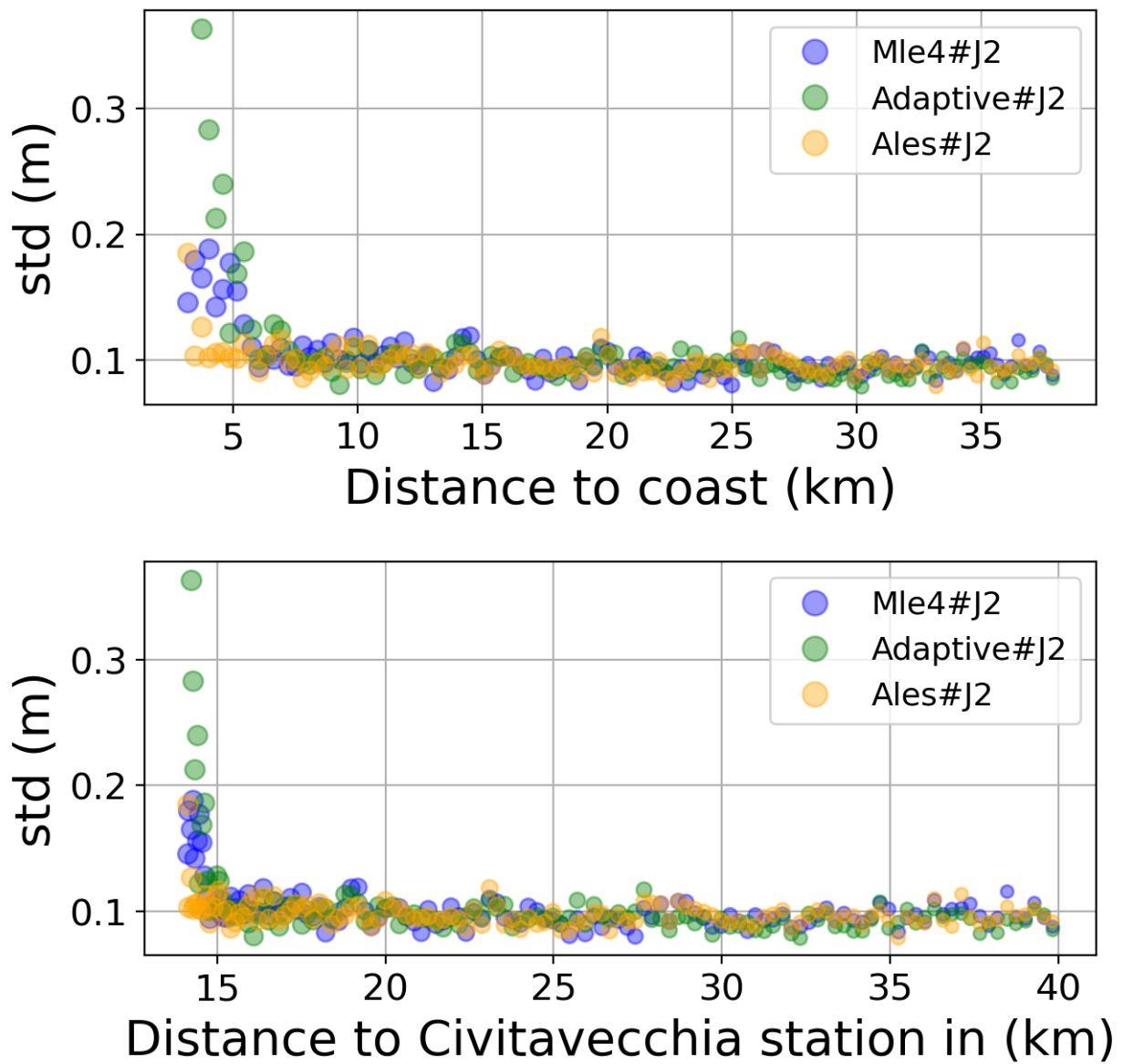


FIGURE 141 – Std in function of the distance to the coast/Civitavecchia station

6.10.7 Correlation in function of distance to coast/Civitavecchia station

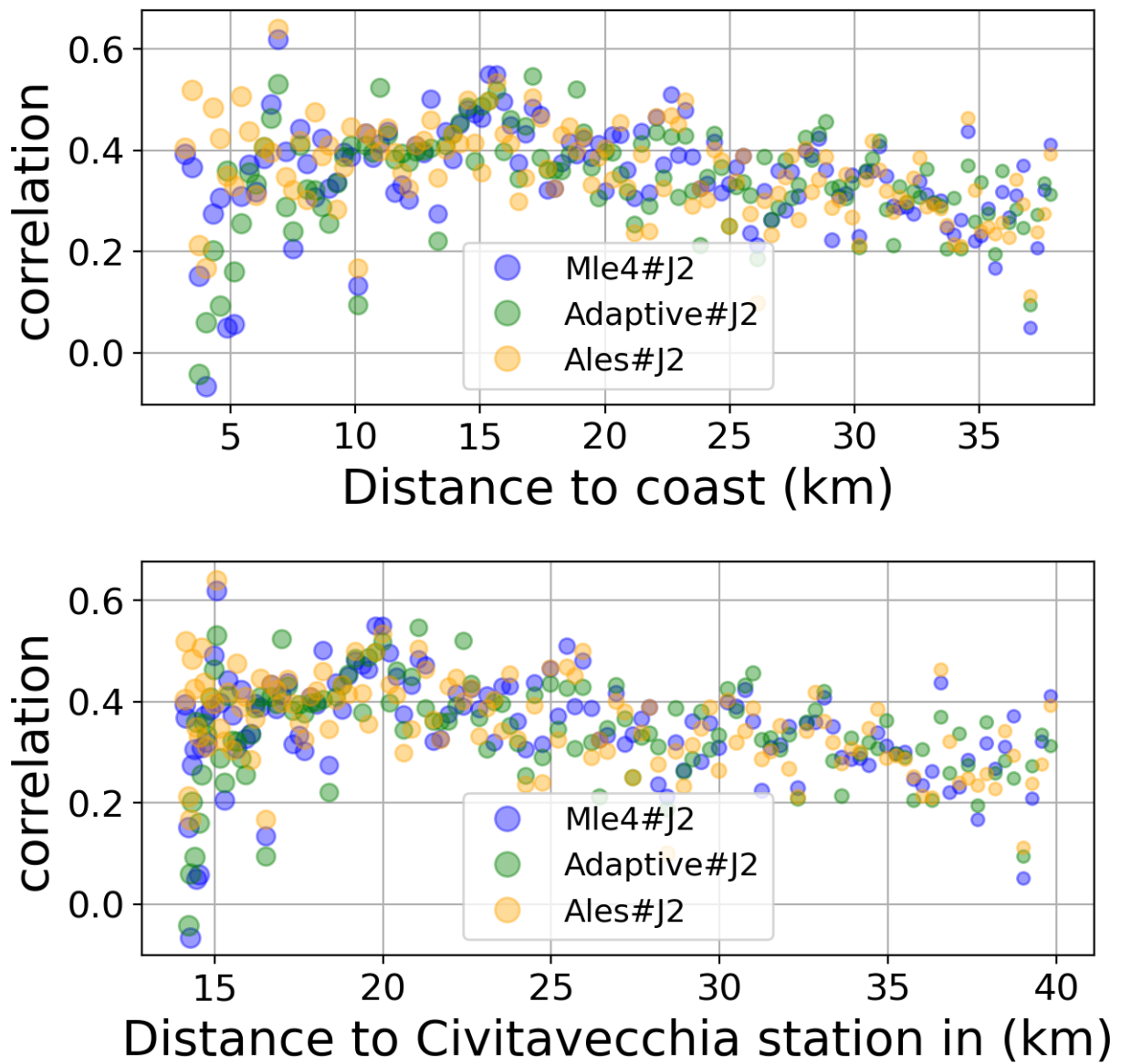


FIGURE 142 – Correlation in function of the distance to the coast/Civitavecchia station

6.10.8 Taylor Diagram

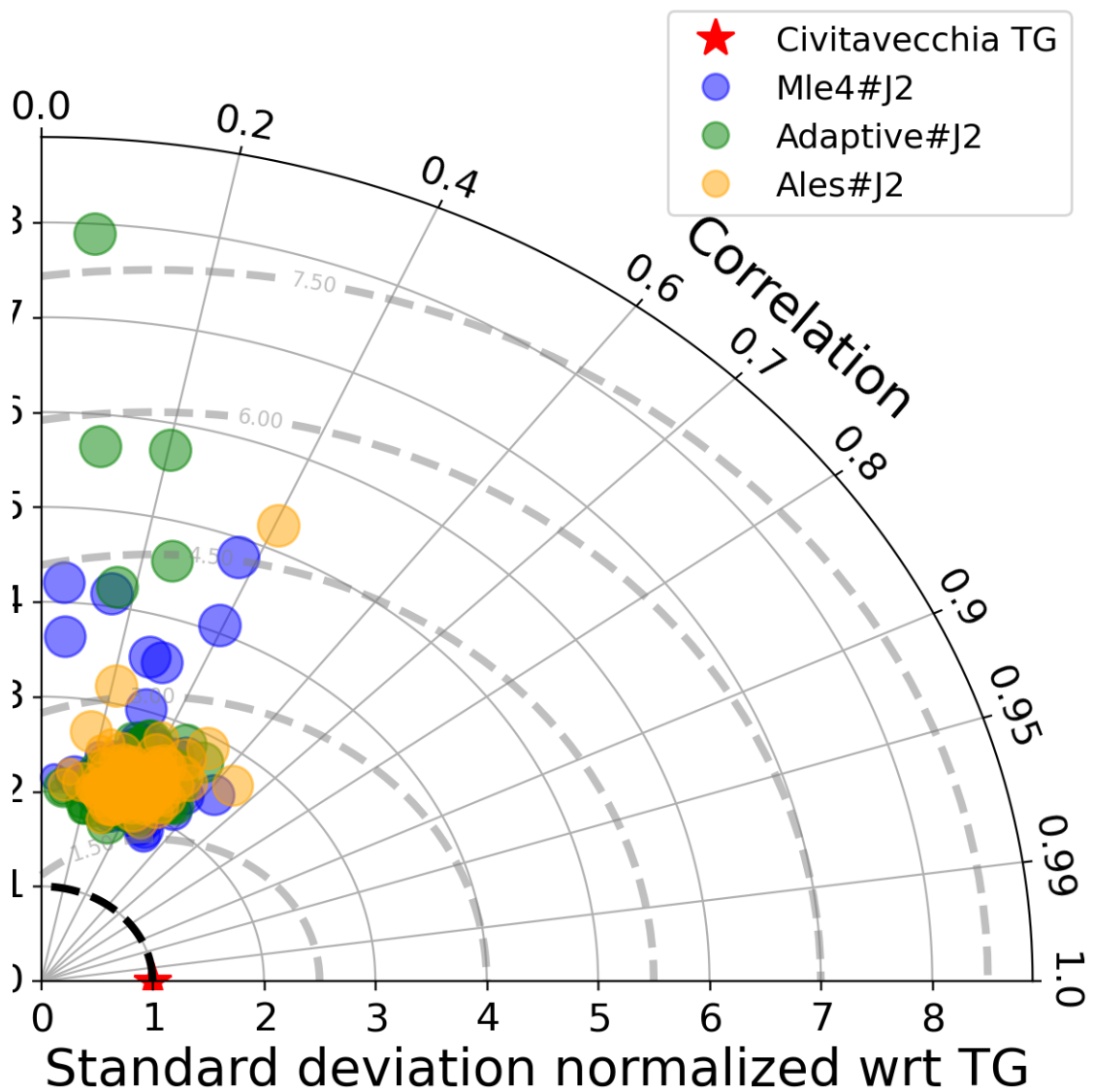


FIGURE 143 – Taylor diagram

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.

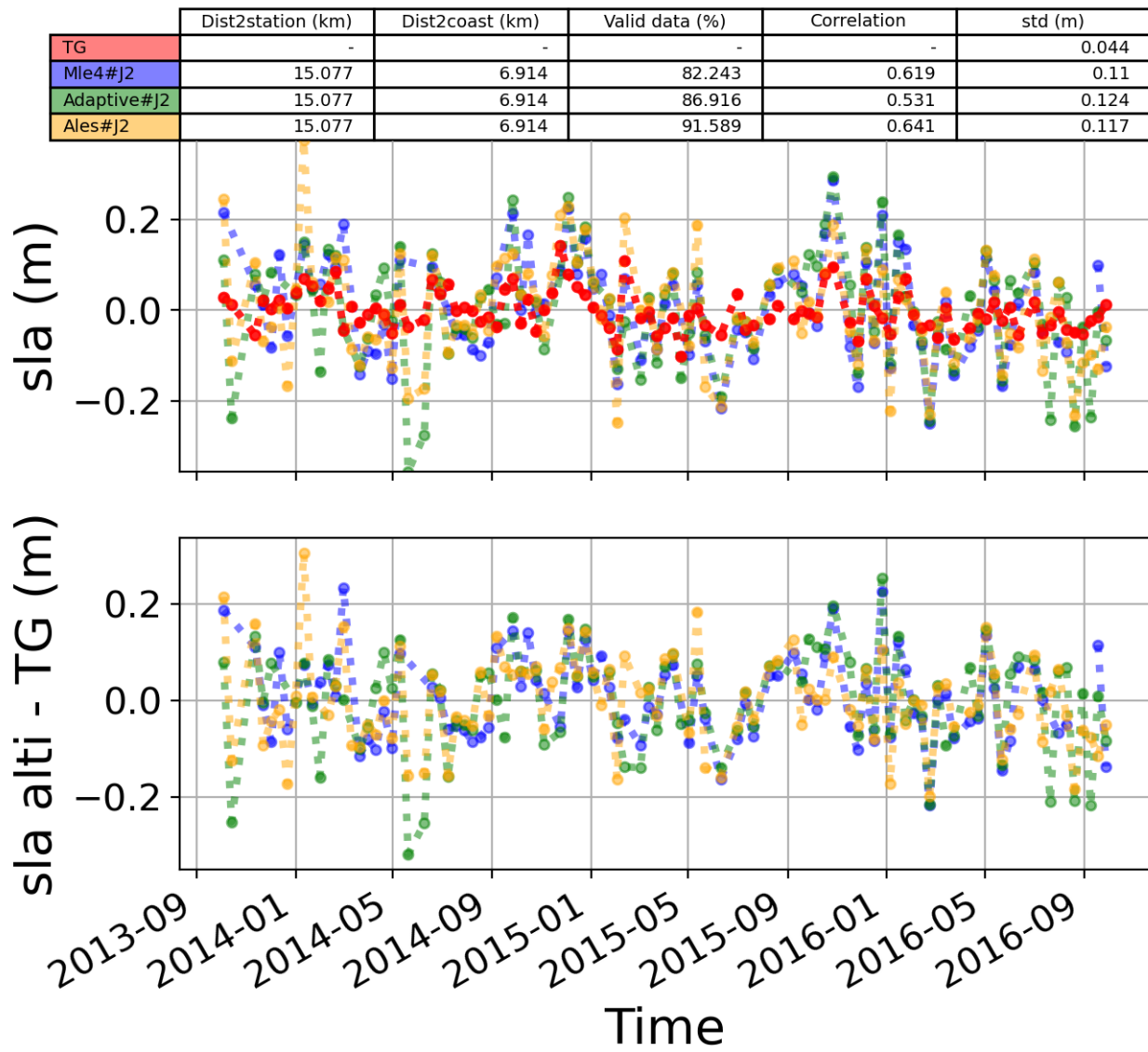


FIGURE 145 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

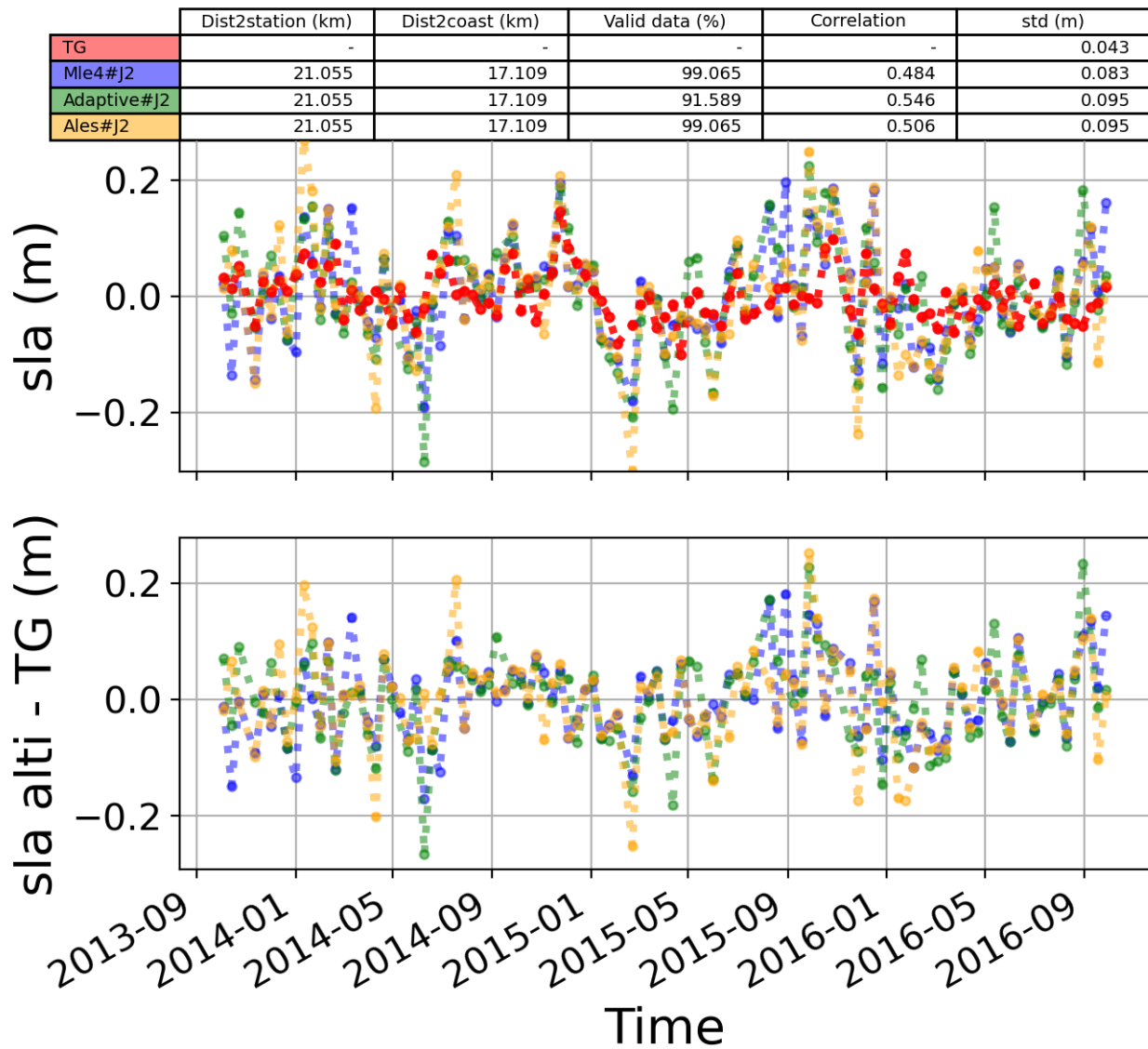


FIGURE 146 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

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

Correlation Altimetry data with respect to FOS-SUR-MER Tide gauge data

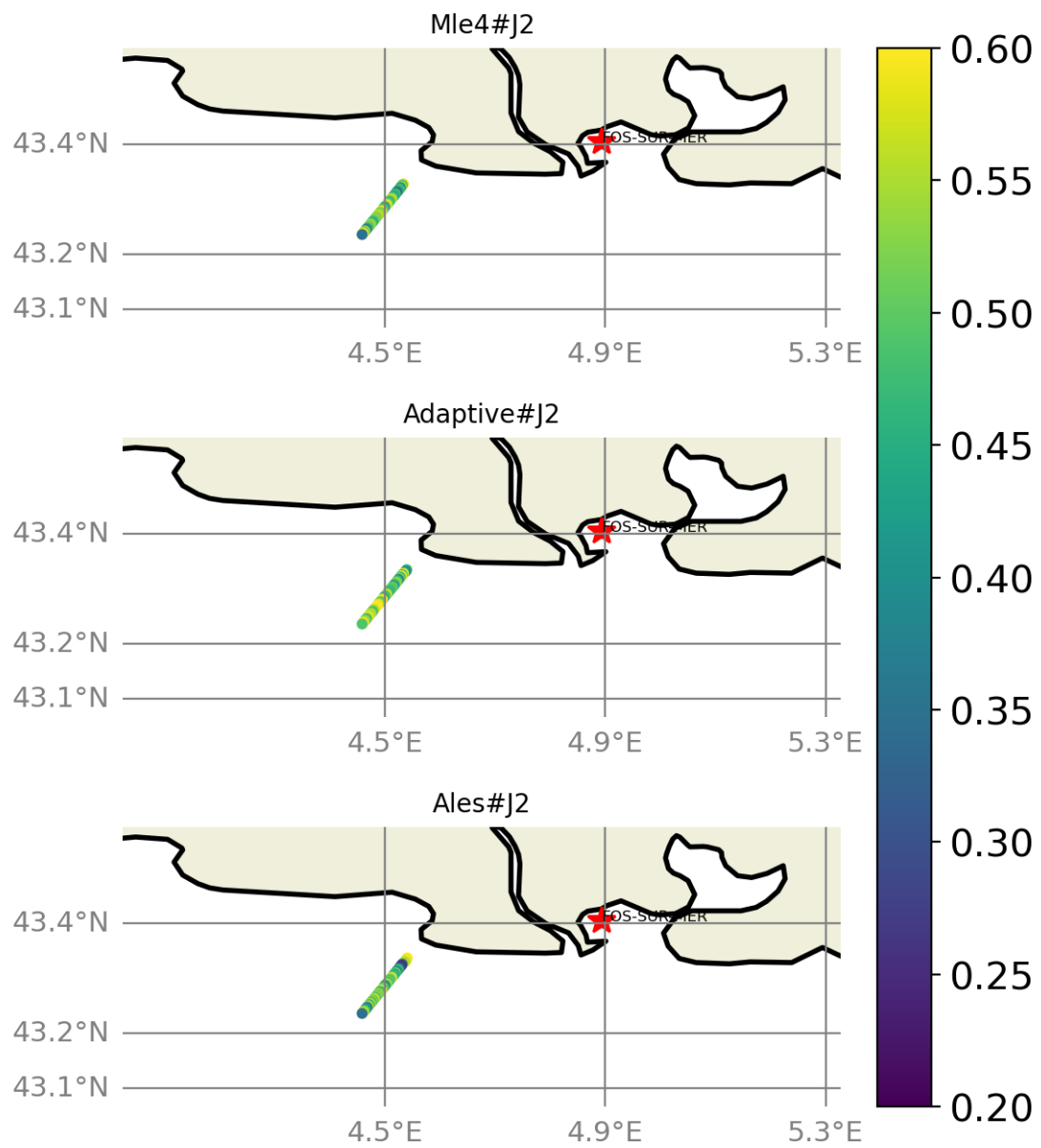


FIGURE 147 – correlation visualization in maps view % FOS-SUR-MER tide gauge

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

Rmsd (m) Altimetry data with respect to FOS-SUR-MER Tide gauge data

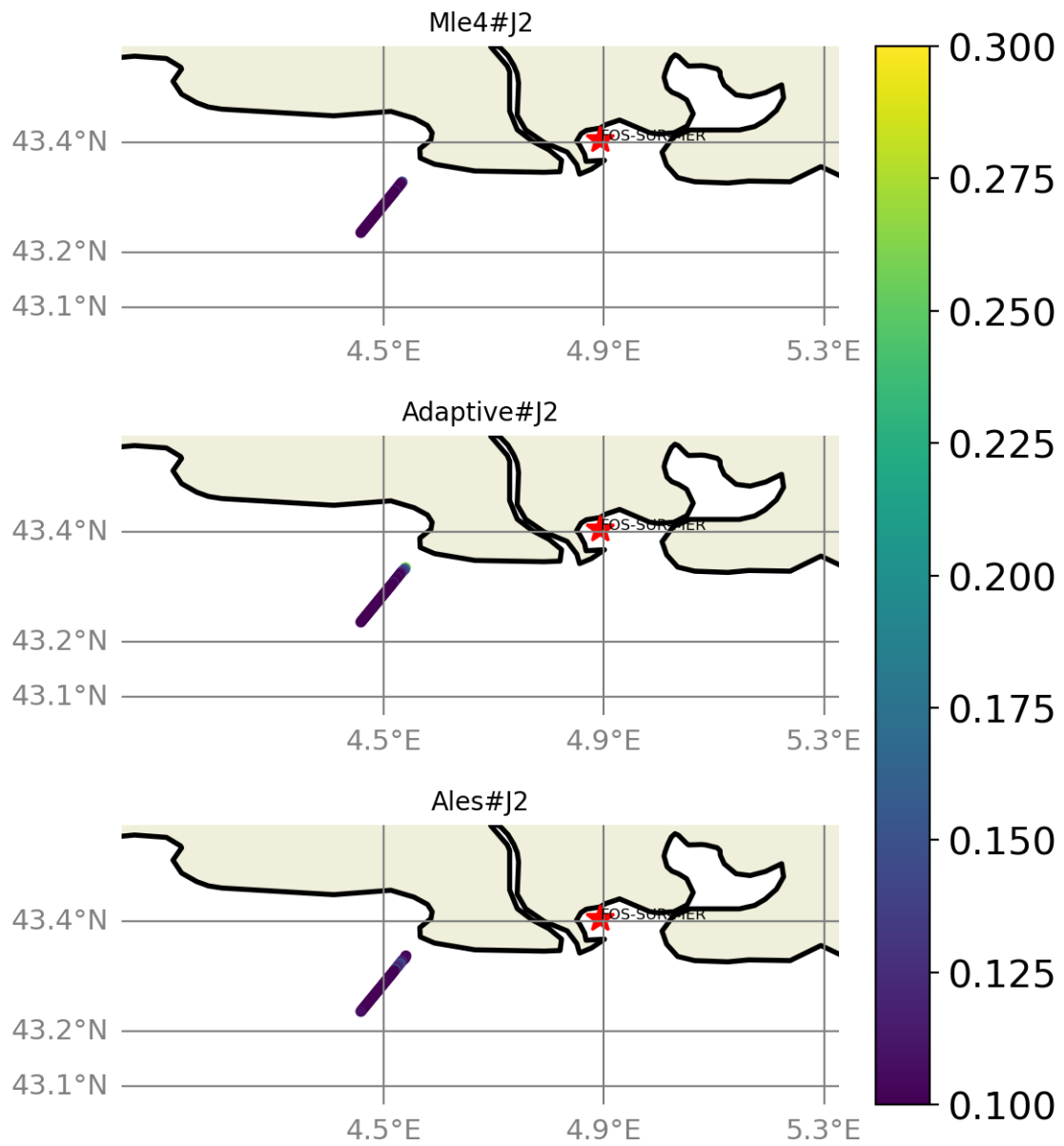


FIGURE 148 – rmsd visualization in maps view % FOS-SUR-MER tide gauge

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

Std (m) Altimetry data with respect to FOS-SUR-MER Tide gauge data

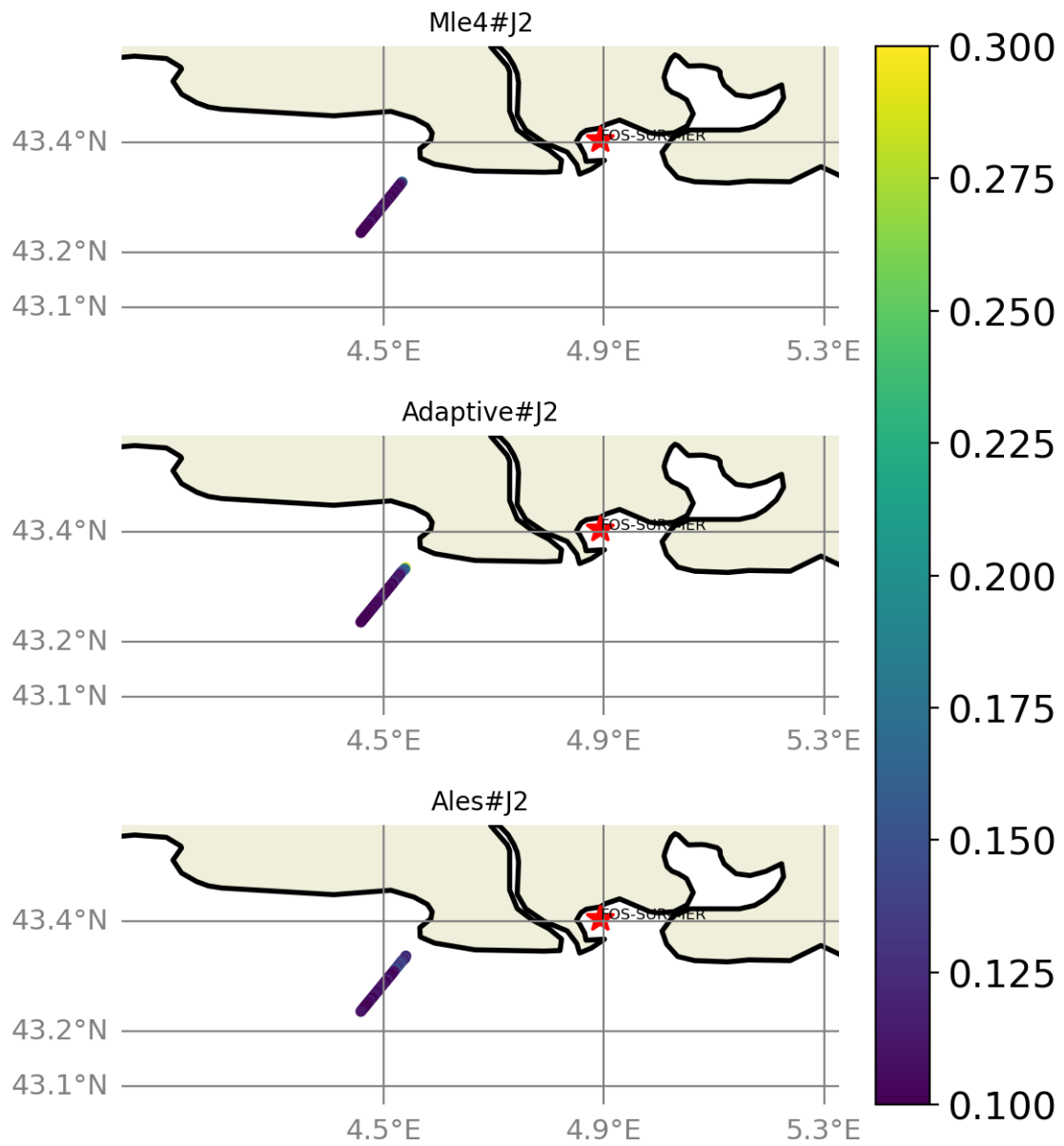


FIGURE 149 – std visualization in maps view % FOS-SUR-MER tide gauge

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

Valid_Data_Percent (%) Altimetry data with respect to FOS-SUR-MER Tide gauge data

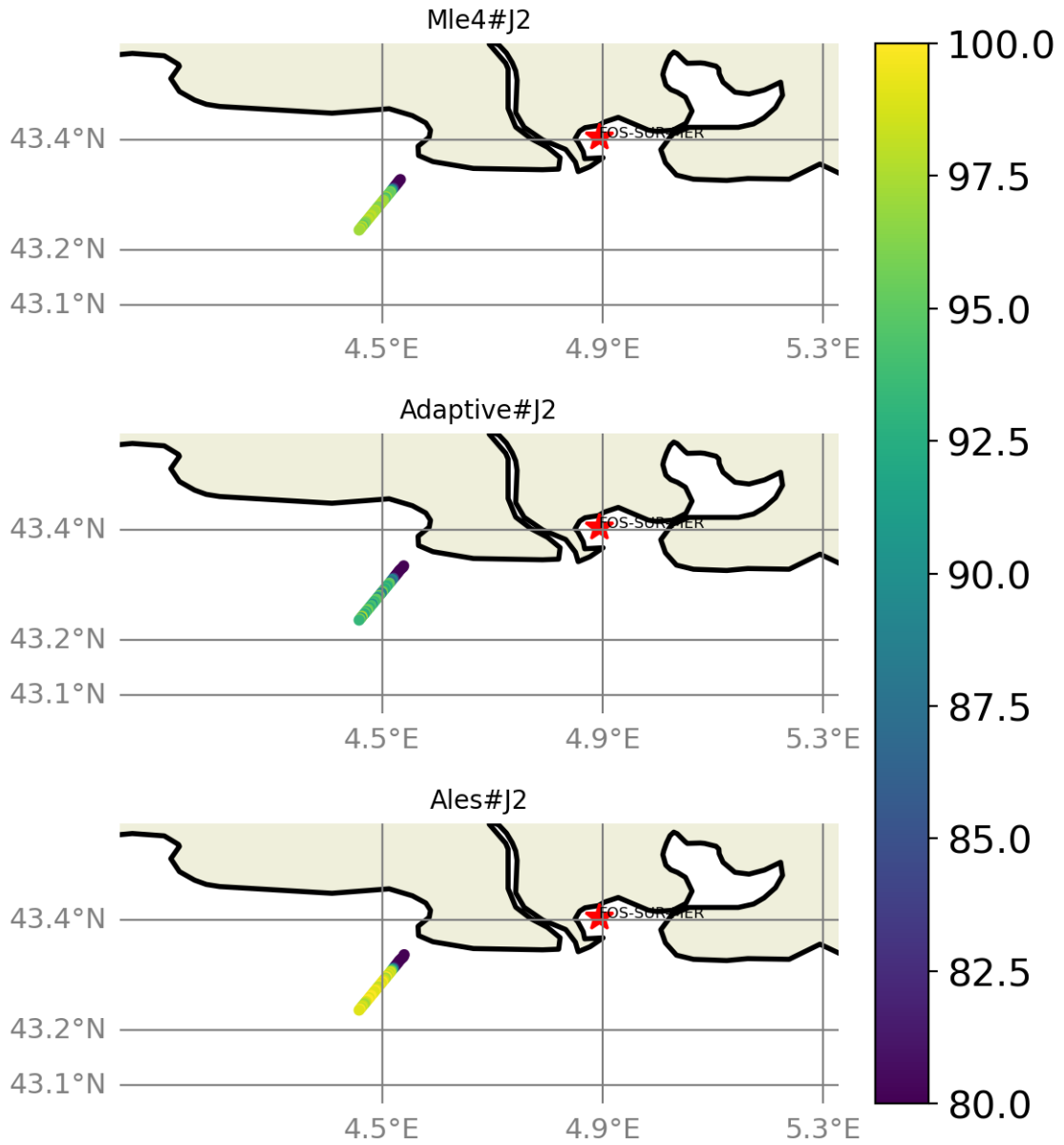


FIGURE 150 – valid_data_percent visualization in maps view % FOS-SUR-MER tide gauge

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 series 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.

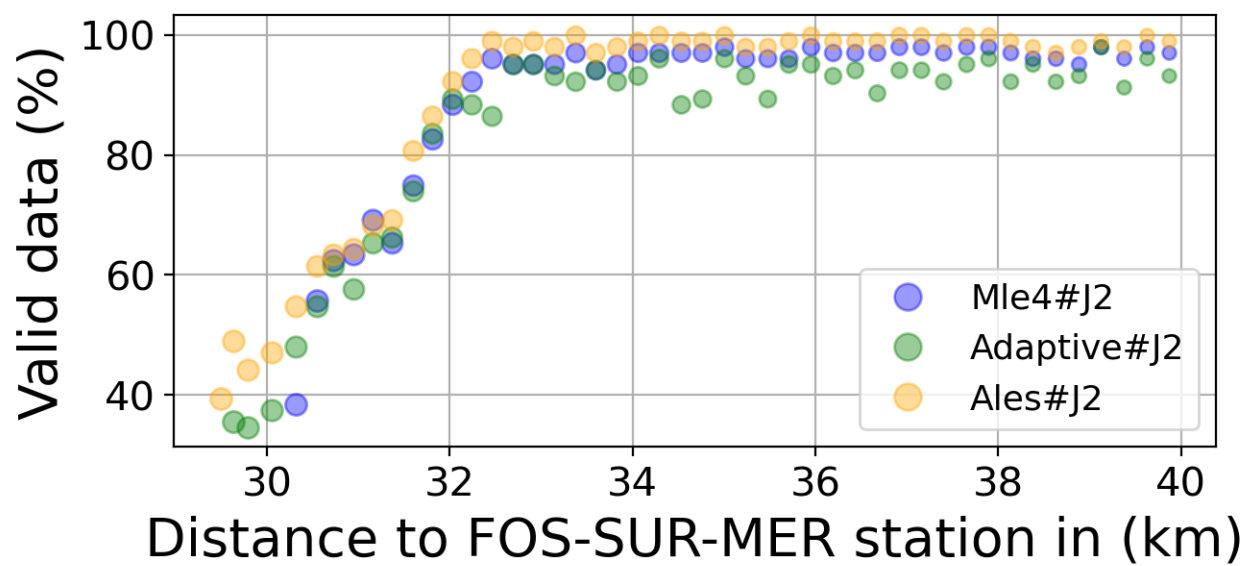
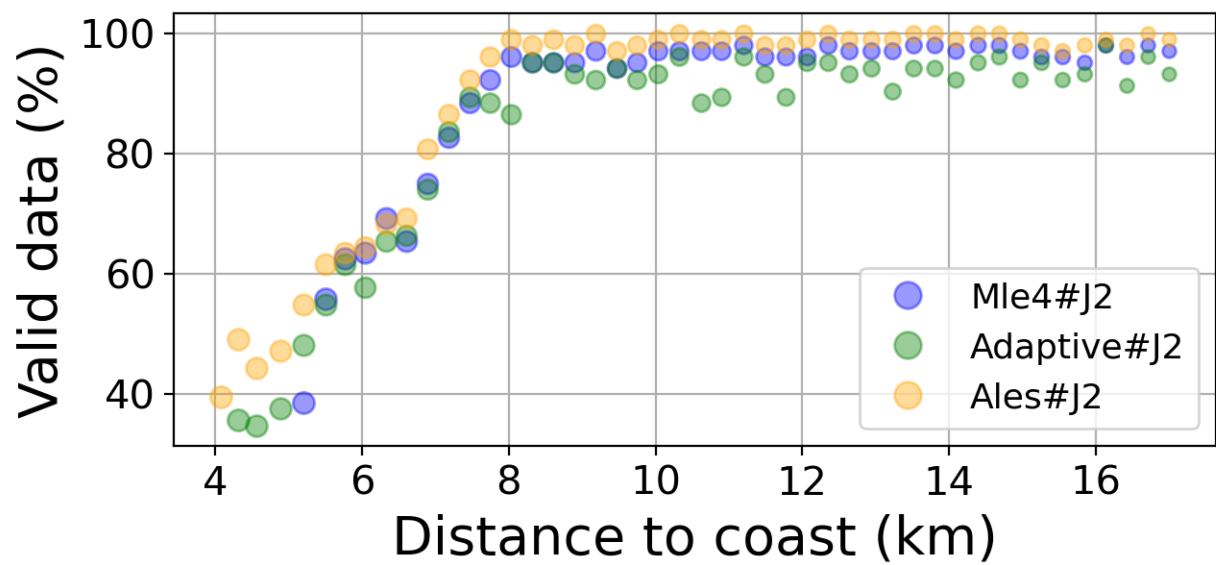


FIGURE 151 – Valid data (%) in function of distance to coast/FOS-SUR-MER station

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

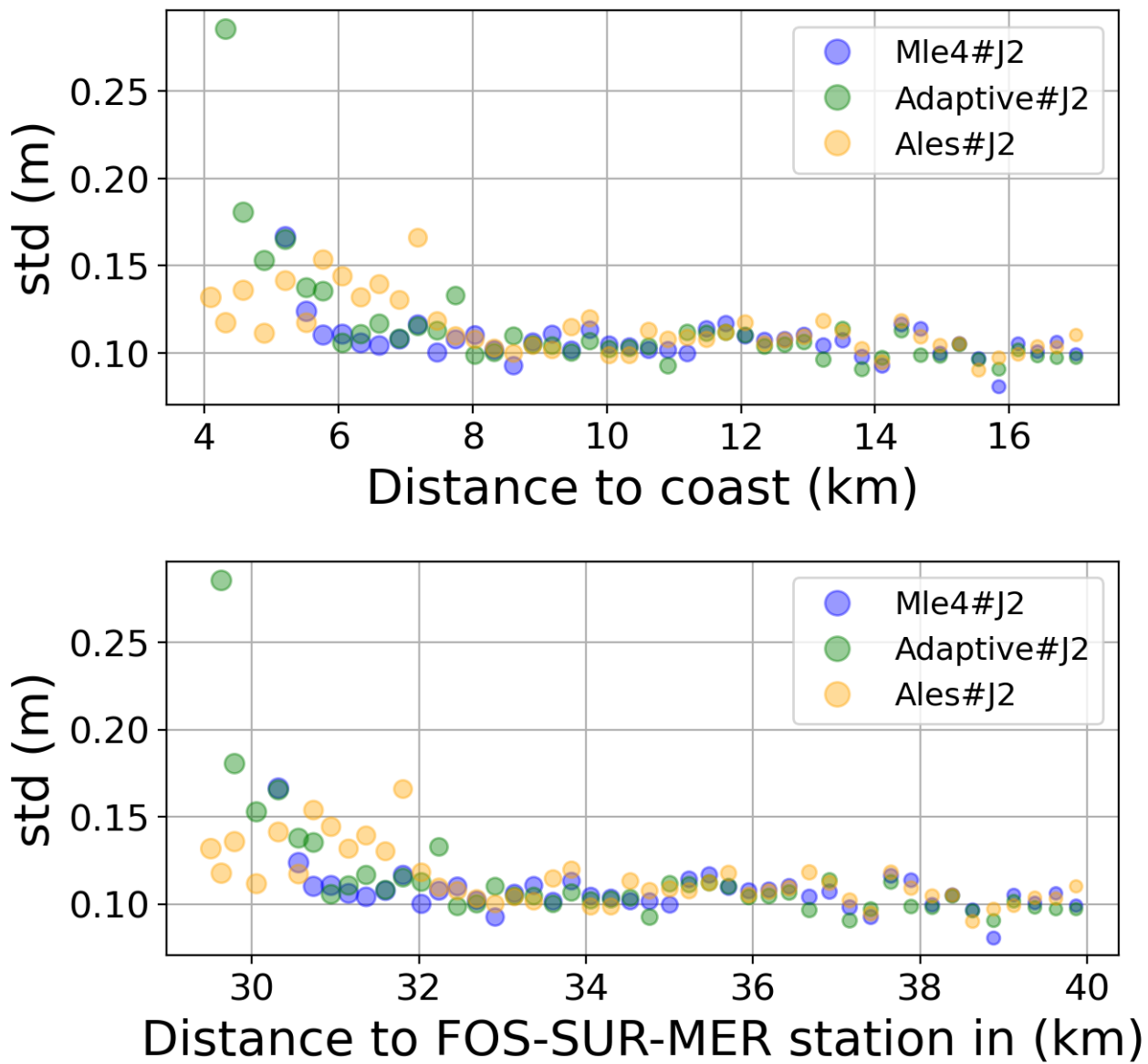


FIGURE 152 – Std in function of the distance to the coast/FOS-SUR-MER station

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

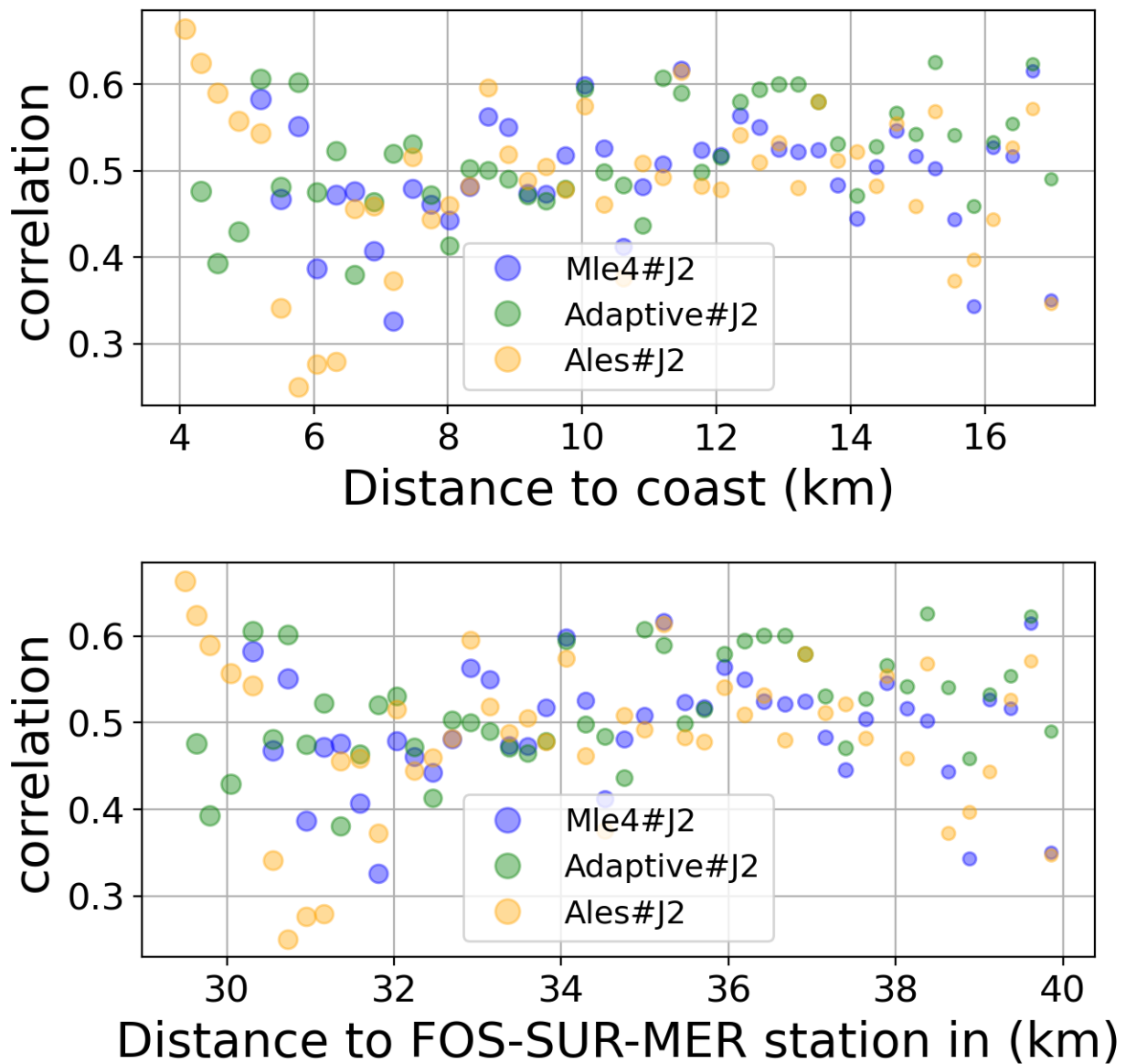


FIGURE 153 – Correlation in function of the distance to the coast/FOS-SUR-MER station

6.11.8 Taylor Diagram

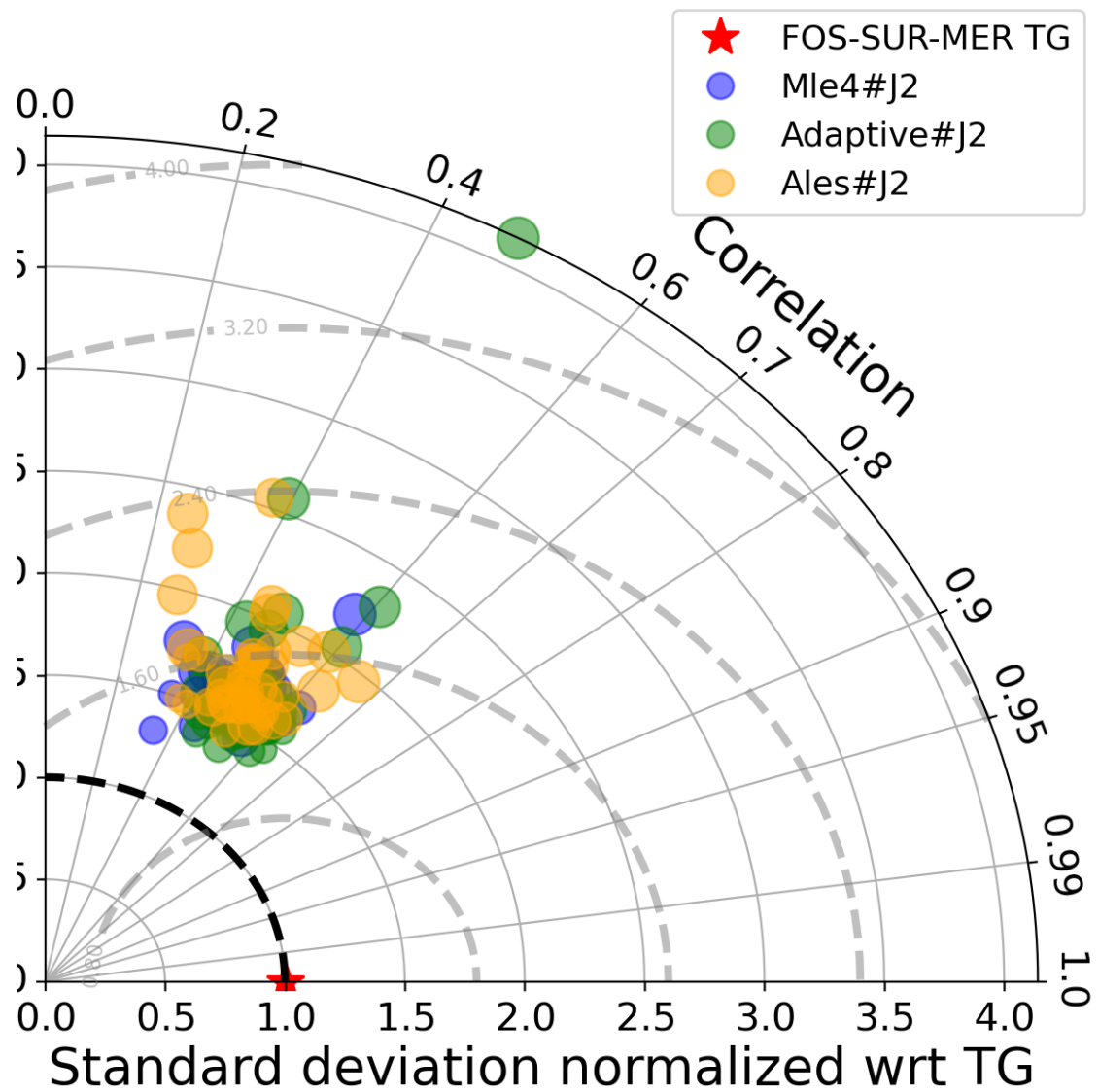


FIGURE 154 – Taylor diagram

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.

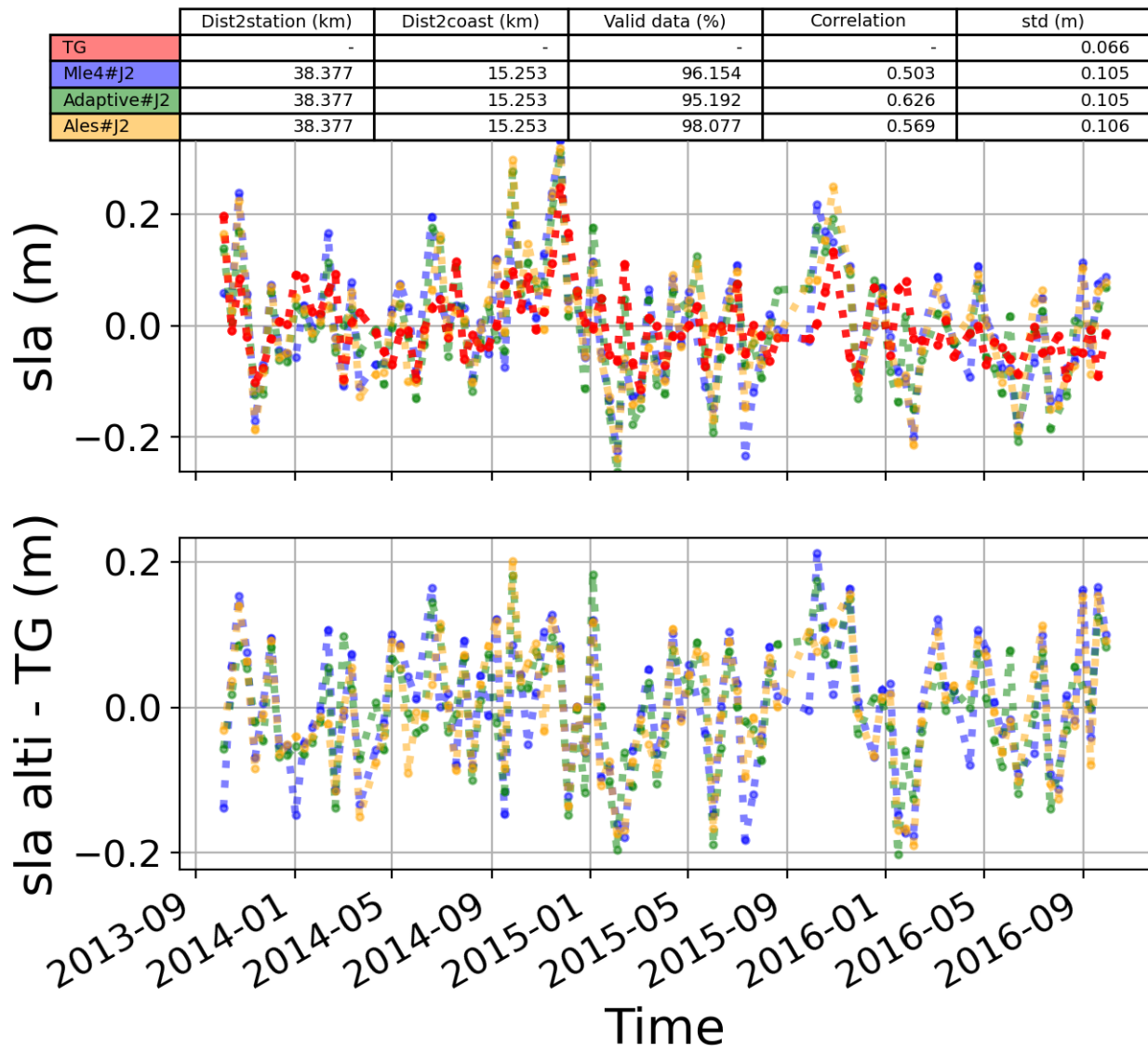


FIGURE 156 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

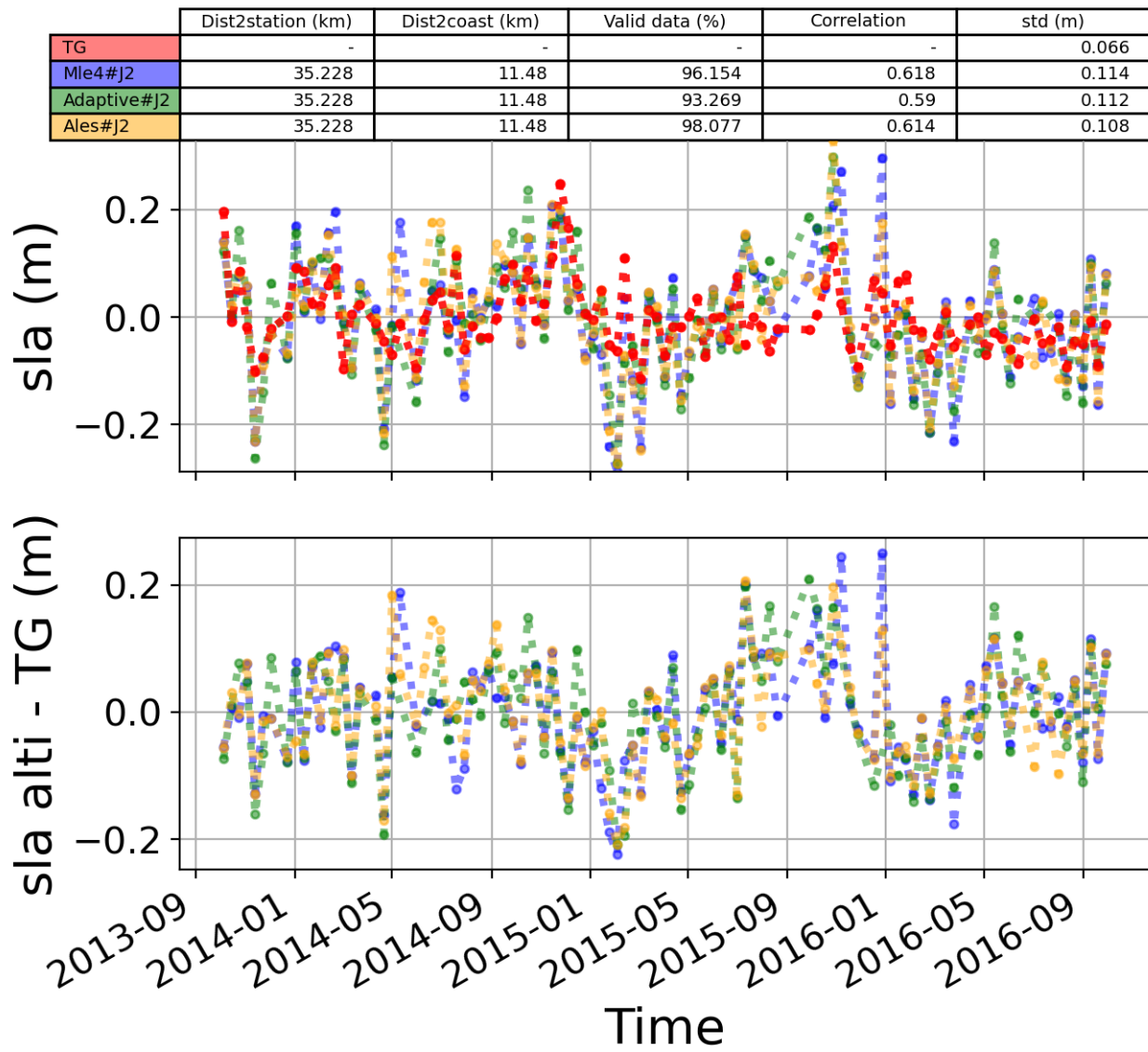


FIGURE 157 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie