Diagtool Report

Round Robin (GT cotier) : Tide. Eaustralia. J2. fes14b struct vs fes14b unstruct vs fes14b unstruct reg vs EOT20.

11 juillet 2022

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1 General description

- Figures and notes have been included in this report to evaluate different altimetry products.
- In order to test different version of the Tide used to calculate the sea level anomaly. Each version has been compared with a reference version. In this case the Fes14b_struct 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 Eaustralia
- Mission : J2
- Git last tag :
- Git changeset number : 3b970d7-2022-07-05

2 Processing

2.1 sla formula

2.1.1 fes14b_struct 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 fes14b_unstruct 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 -
tide_FES2014b_unstruct -
LOAD_TIDE.MODEL.FES14B -
SOLID_EARTH_TIDE_HEIGHT.MODEL.CARTWRIGHT_TAYLER_71 -
POLE_TIDE_HEIGHT.MODEL.DESAI_2015_MPL2017

2.1.3 fes14b_unstruct_reg 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 -
tide_RegAT -
LOAD_TIDE.MODEL.FES14B -
SOLID_EARTH_TIDE_HEIGHT.MODEL.CARTWRIGHT_TAYLER_71 -
POLE_TIDE_HEIGHT.MODEL.DESAI_2015_MPL2017

2.1.4 EOT20 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 -
tide_EOT20 -
LOAD_TIDE.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 3 m.
— Each sla time-serie has been filtred by a window of $[-4\sigma, 4\sigma]$, where σ is the standard deviation of the sla time serie

3 Spatial coherence analysis

3.1 sla

3.1.1 sla 's count

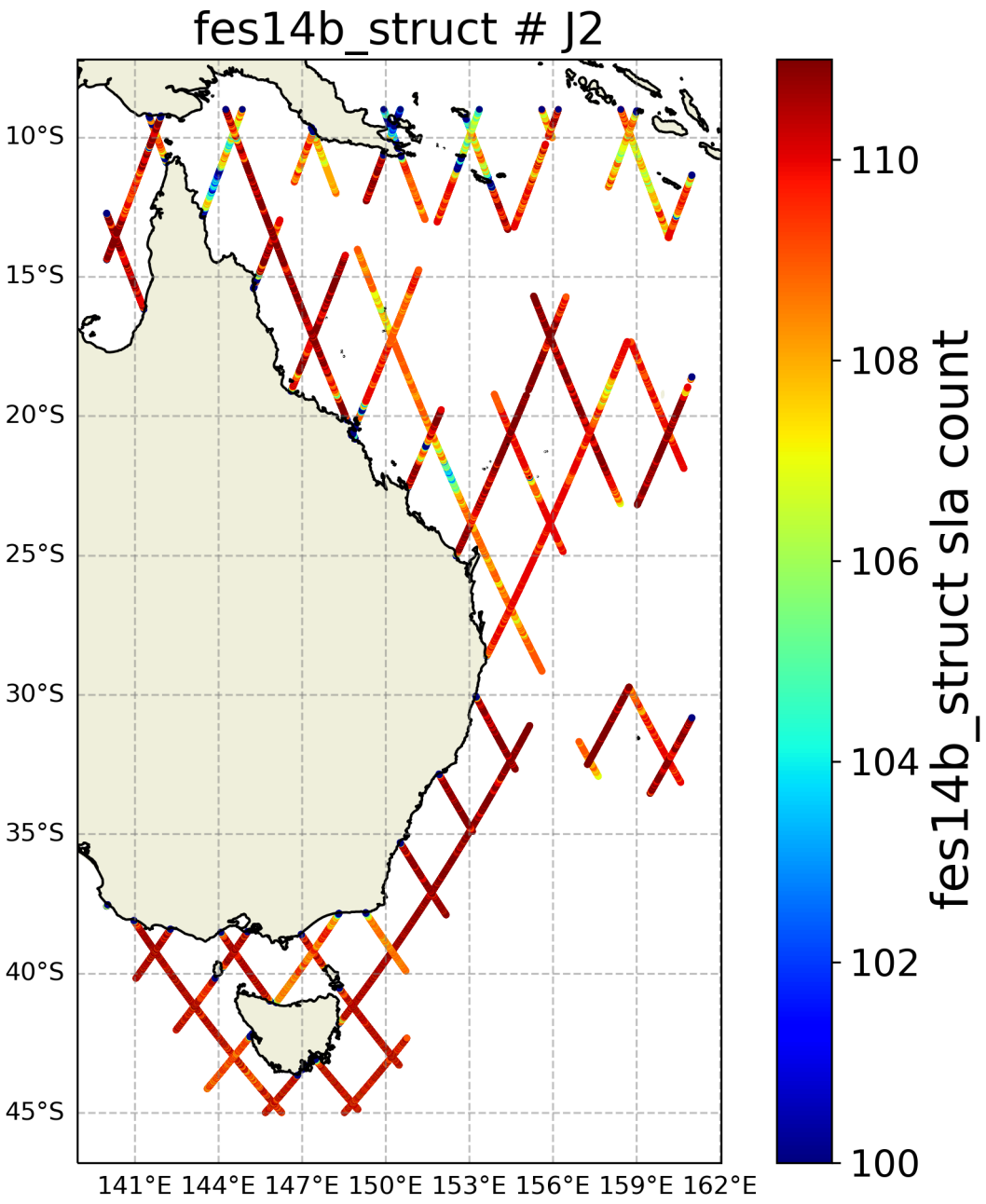

FIGURE 1 – Spatial coherence analysis of the count of the fes14b_struct version of sla variable

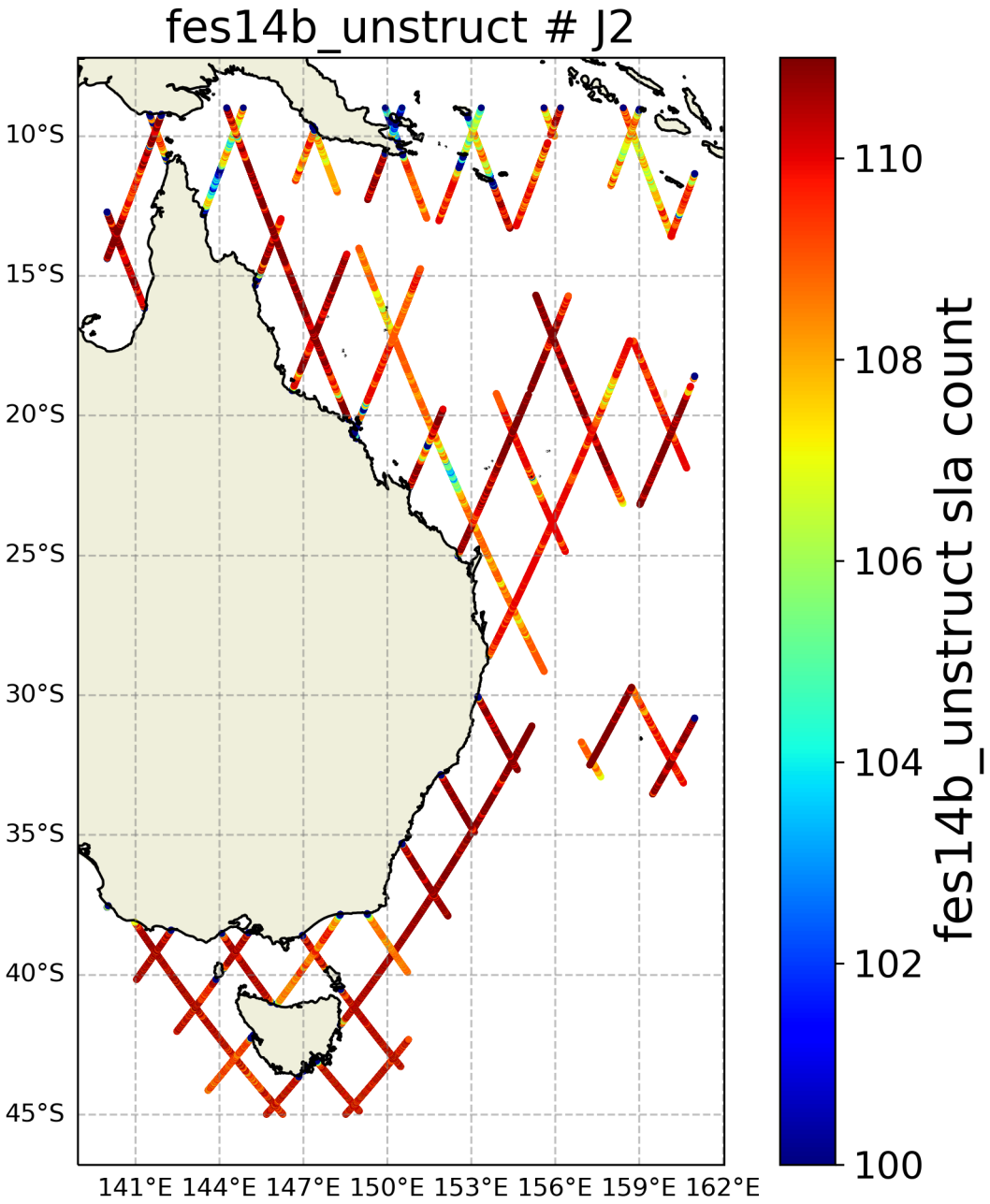

FIGURE 2 – Spatial coherence analysis of the count of the fes14b_unstruct version of sla variable

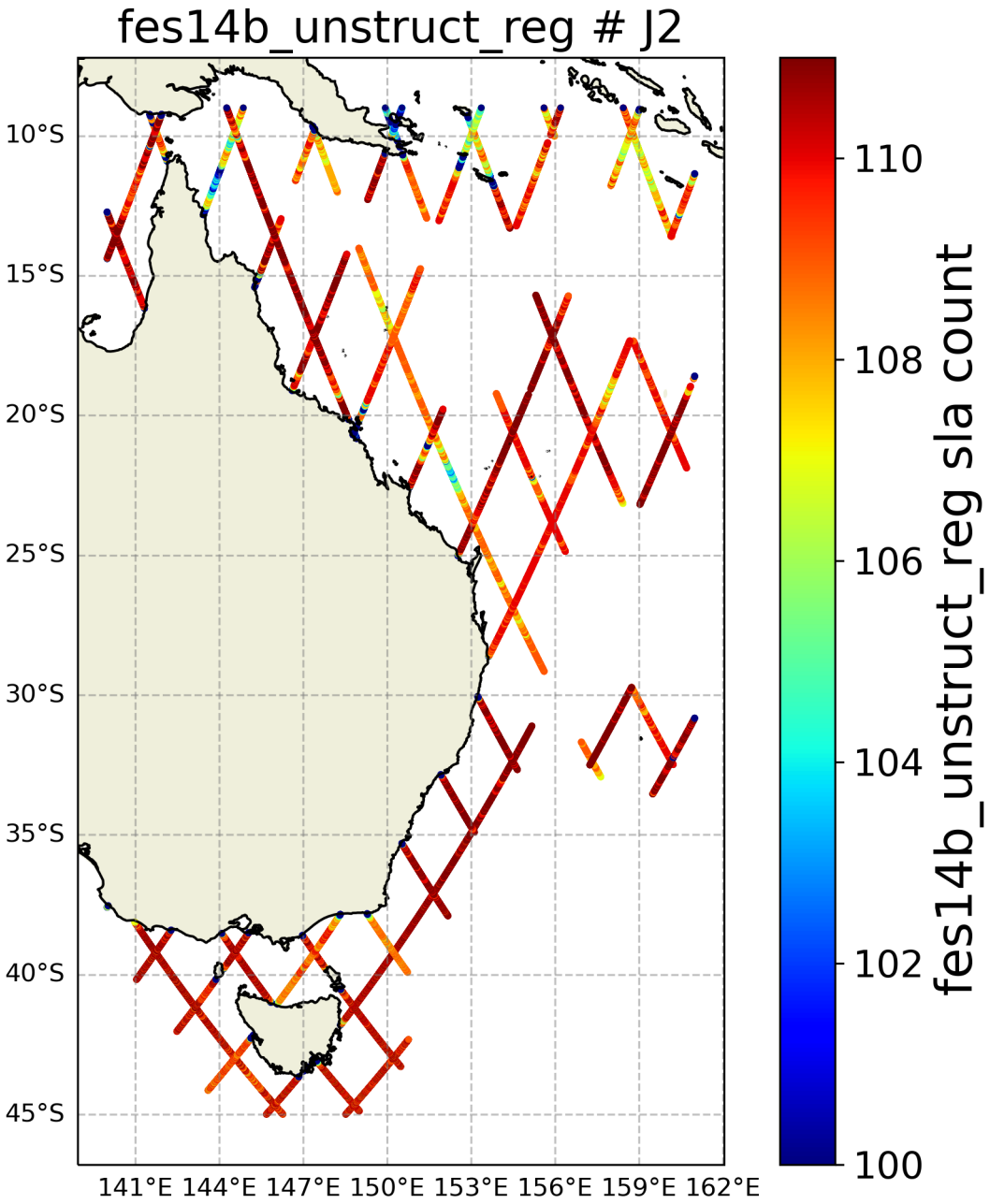

FIGURE 3 – Spatial coherence analysis of the count of the fes14b_unstruct_reg version of sla variable

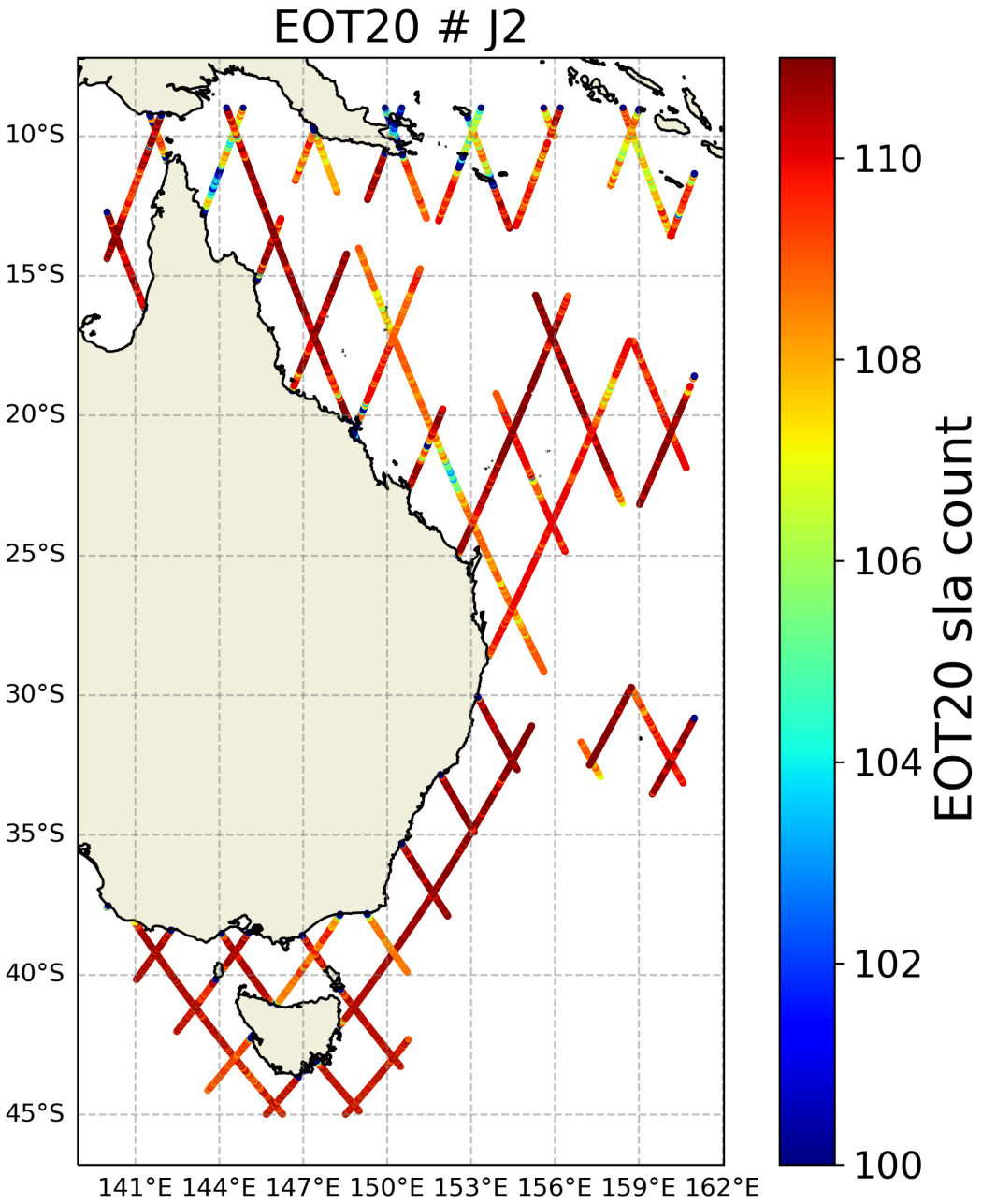

Figure 4 – Spatial coherence analysis of the count of the EOT20 version of sla variable

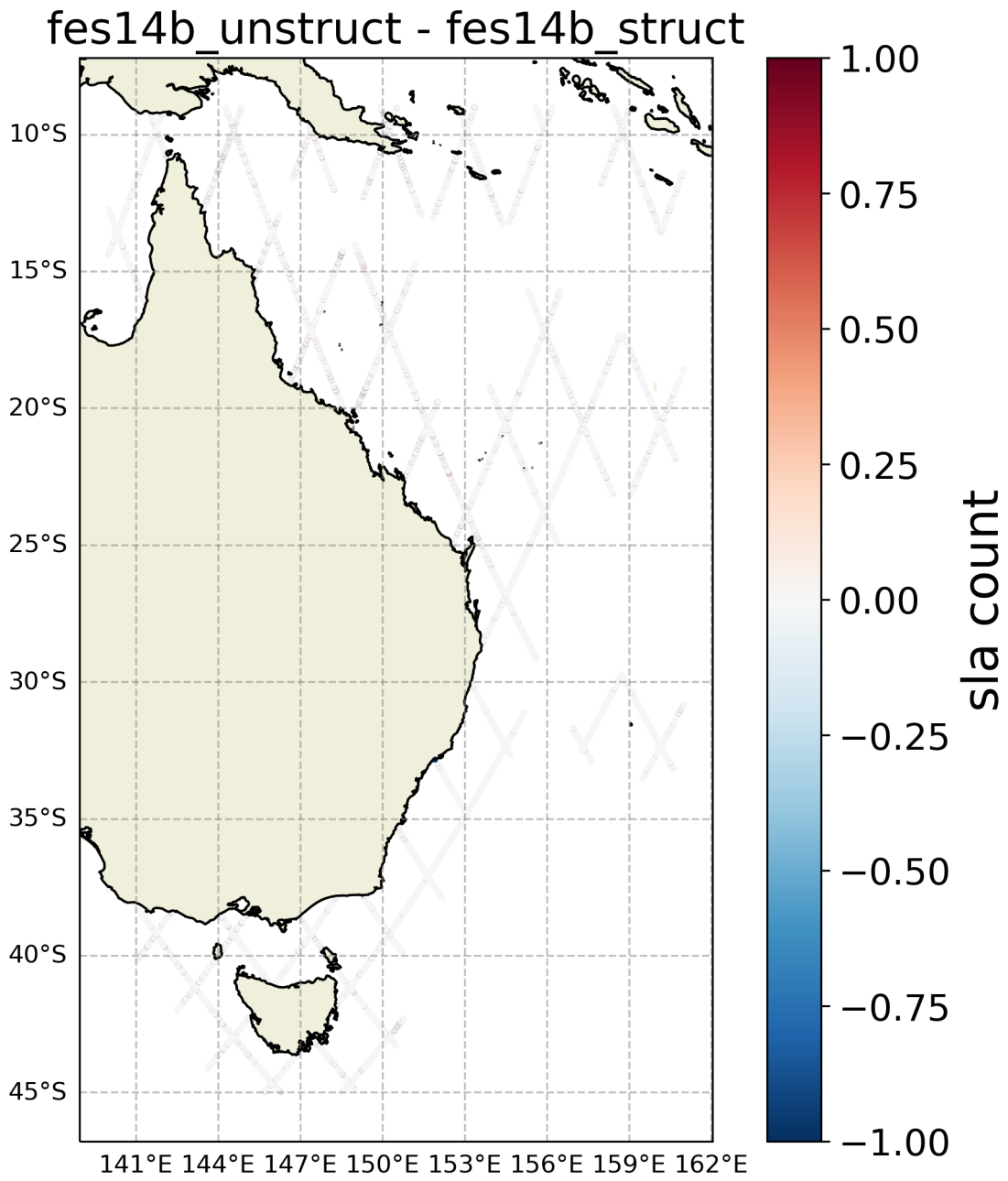

Figure 5 – Spatial coherence analysis of the Difference in sla 's count between fes14b_unstruct and fes14b_struct

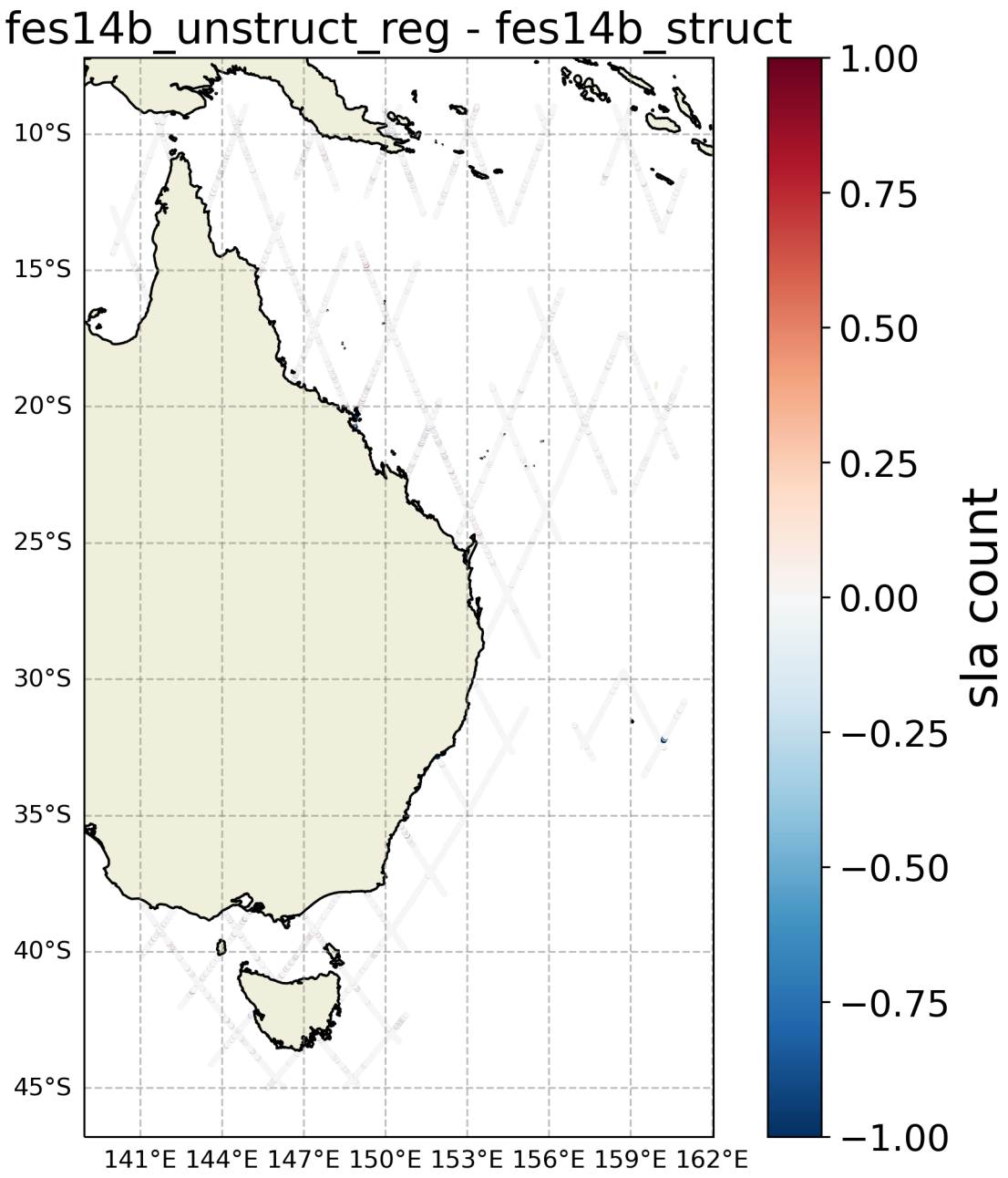

FIGURE 6 – Spatial coherence analysis of the Difference in sla 's count between fes14b_unstruct_reg and fes14b_struct

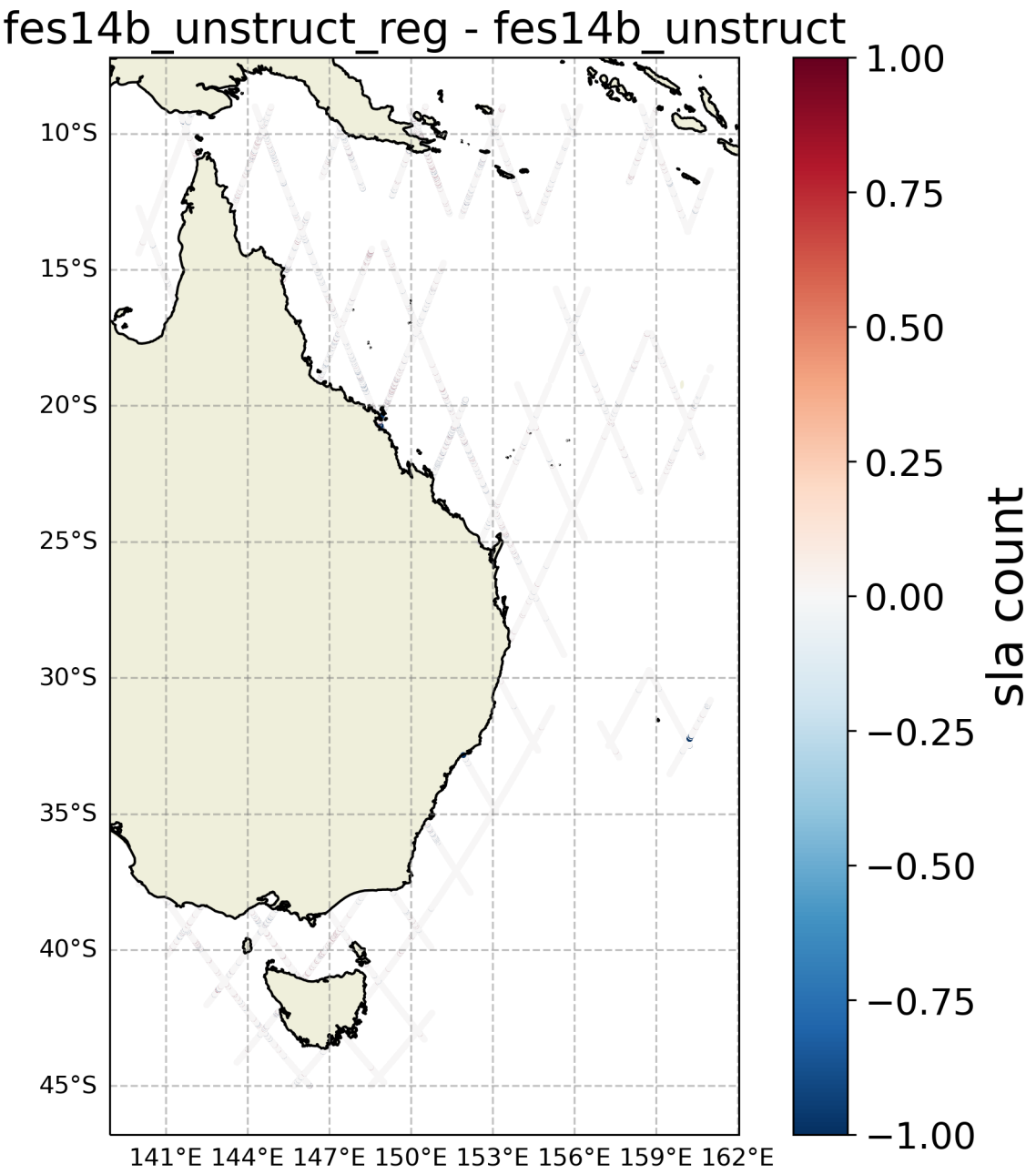

FIGURE 7 – Spatial coherence analysis of the Difference in sla 's count between fes14b_unstruct_reg and fes14b_unstruct

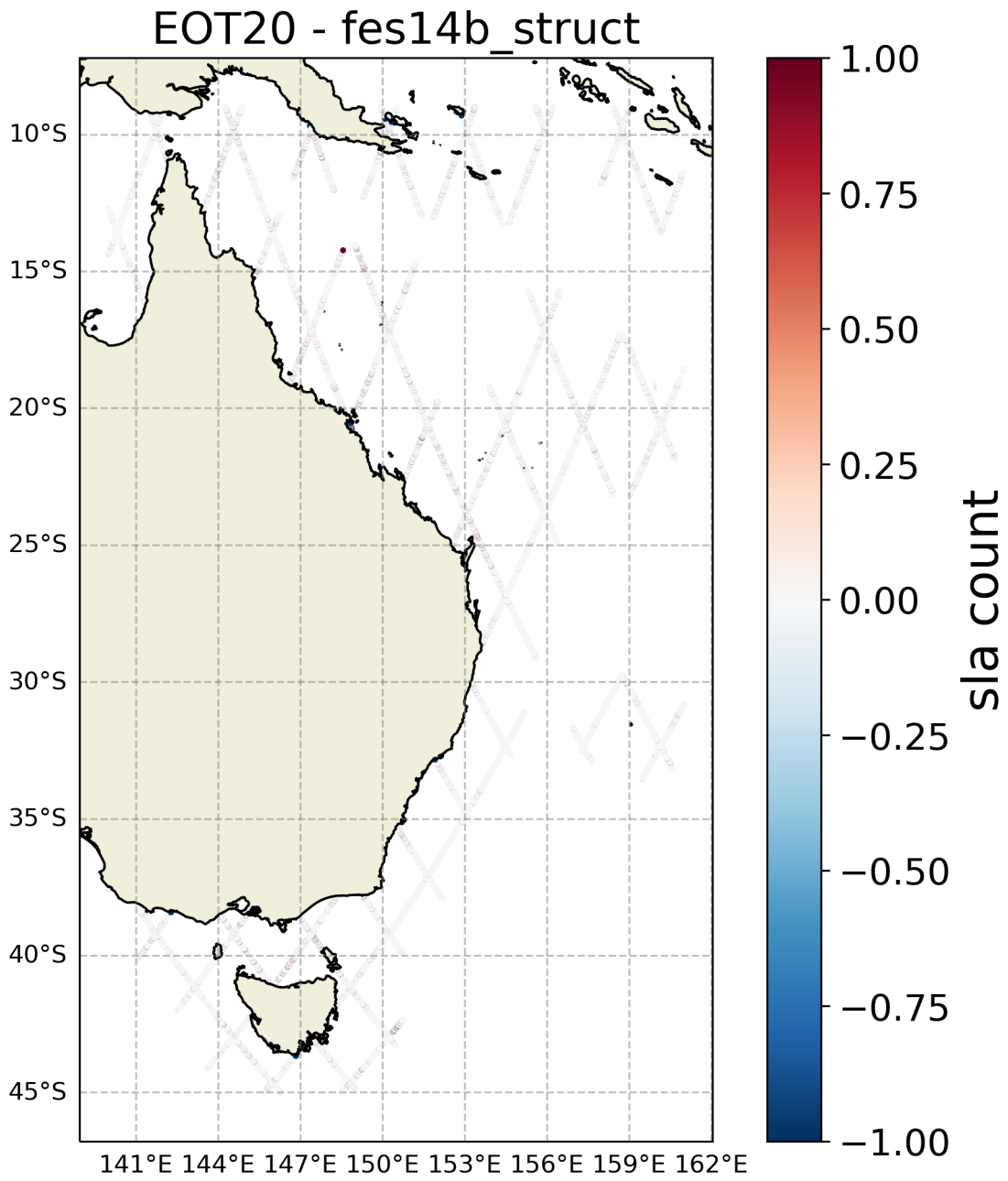

FIGURE 8 – Spatial coherence analysis of the Difference in sla 's count between EOT20 and fes14b_struct

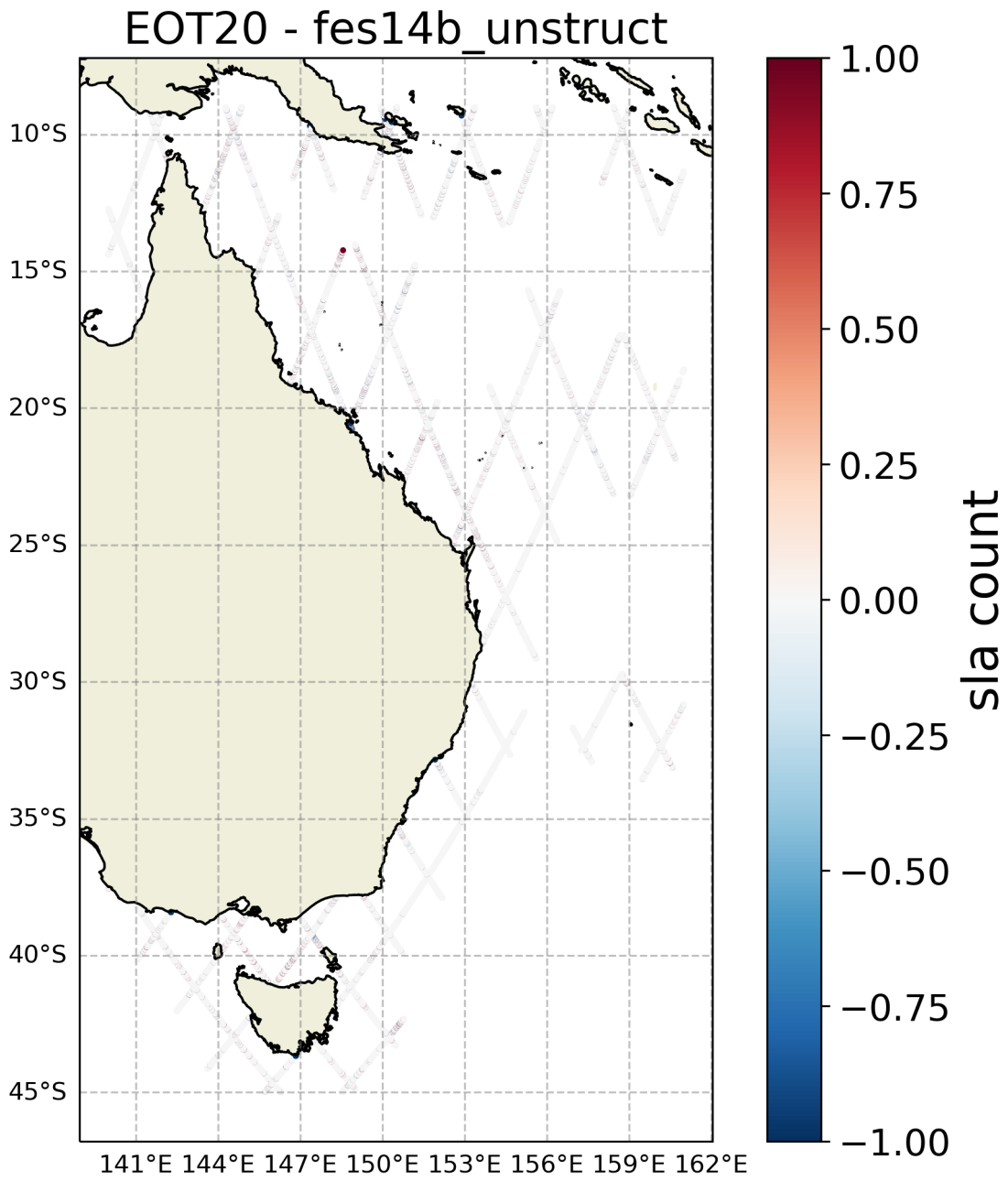

FIGURE 9 – Spatial coherence analysis of the Difference in sla 's count between EOT20 and fes14b_unstruct

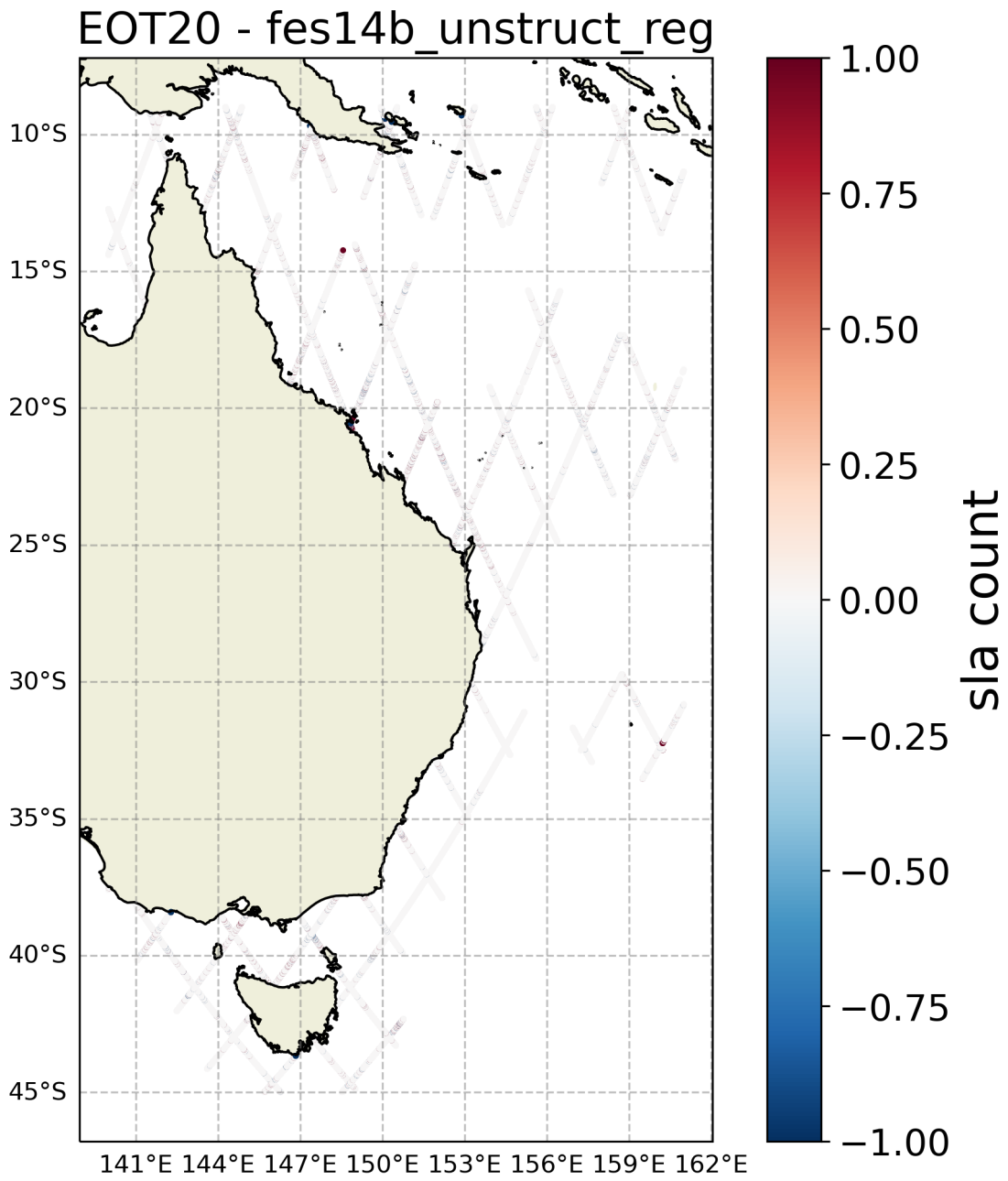

Figure 10 – Spatial coherence analysis of the Difference in sla 's count between EOT20 and fes14b_unstruct_reg

3.1.2 sla 's std

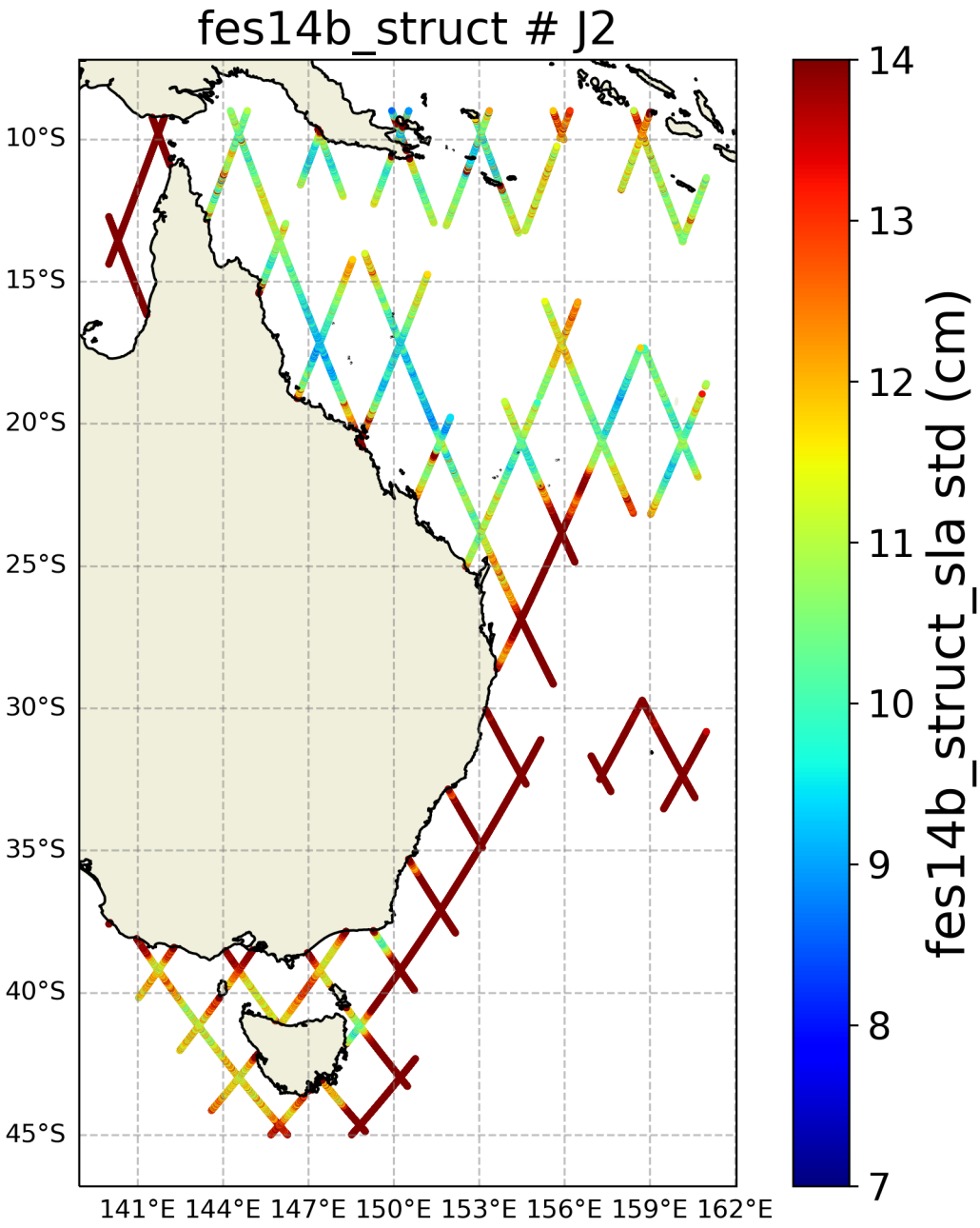

FIGURE 11 – Spatial coherence analysis of the std of the fes14b_struct version of sla variable

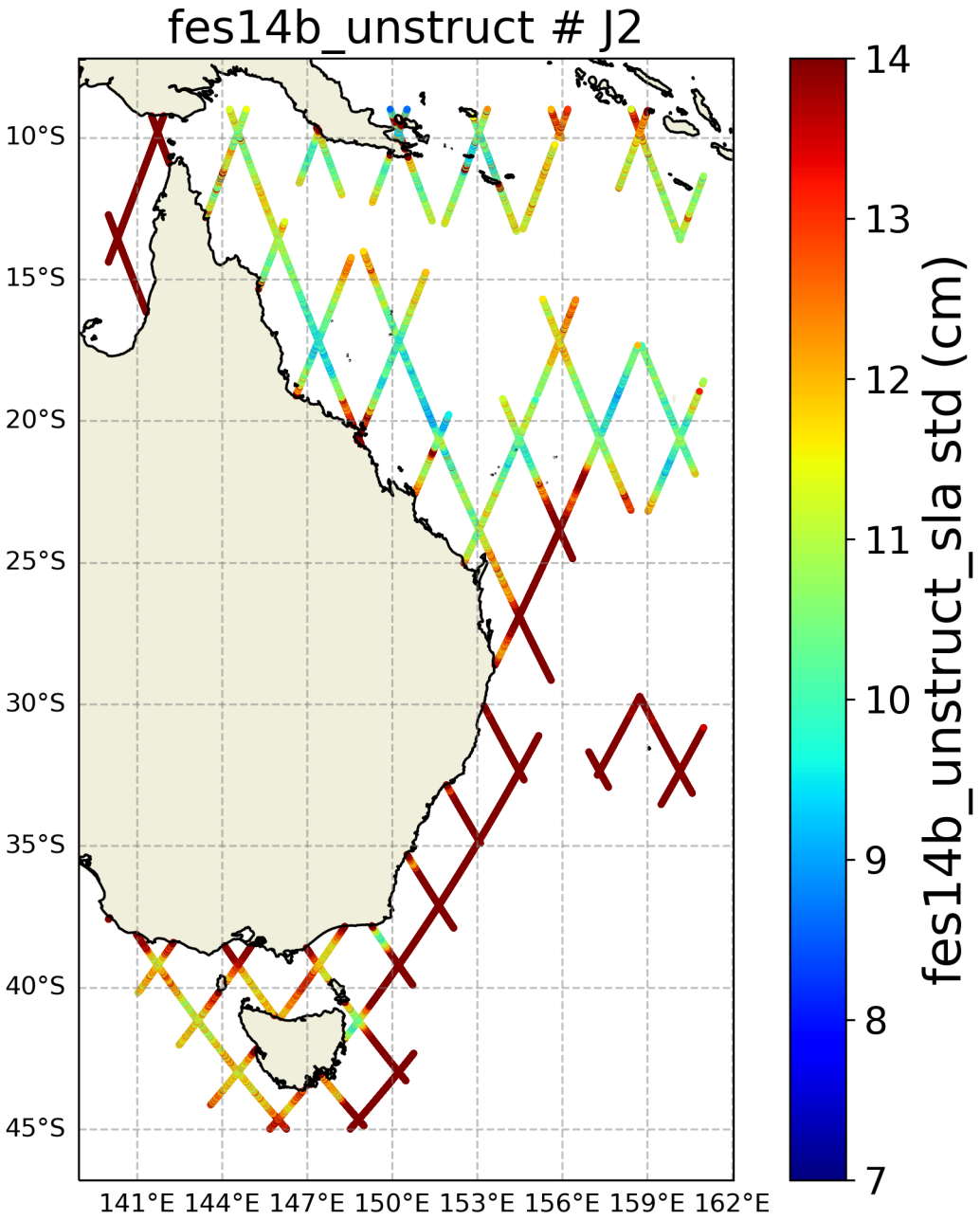

FIGURE 12 – Spatial coherence analysis of the std of the fes14b_unstruct version of sla variable

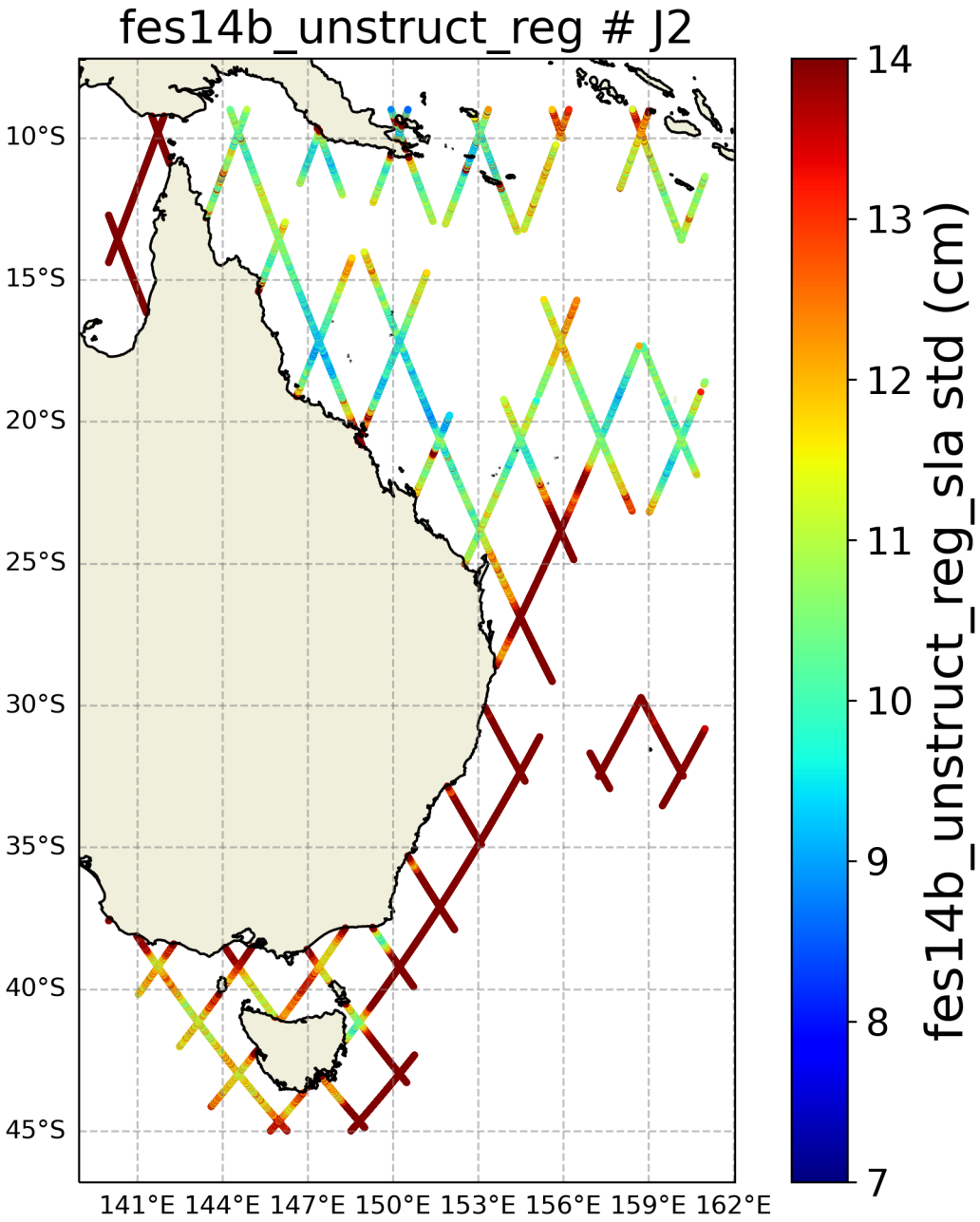

FIGURE 13 – Spatial coherence analysis of the std of the fes14b_unstruct_reg version of sla variable

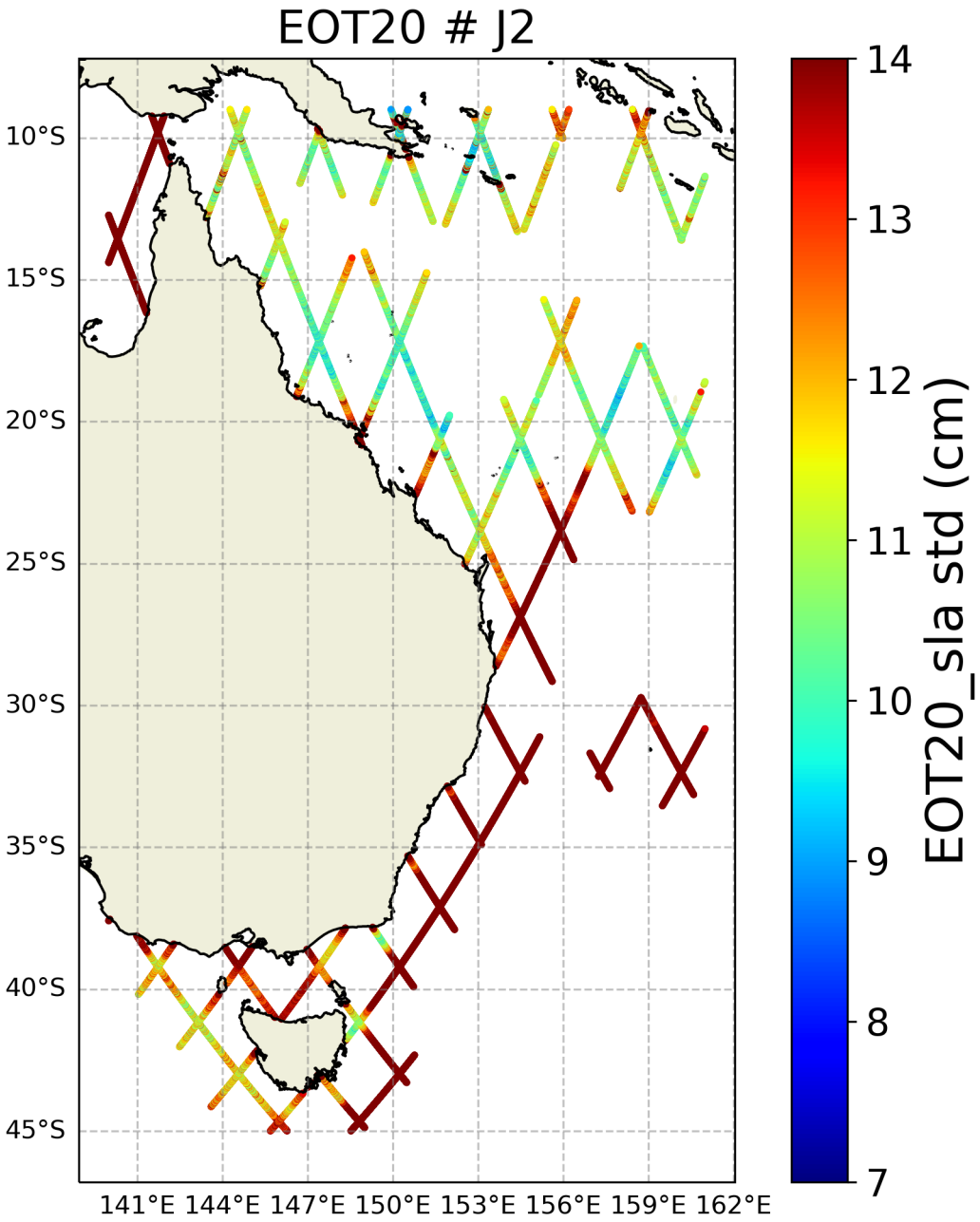

FIGURE 14 – Spatial coherence analysis of the std of the EOT20 version of sla variable

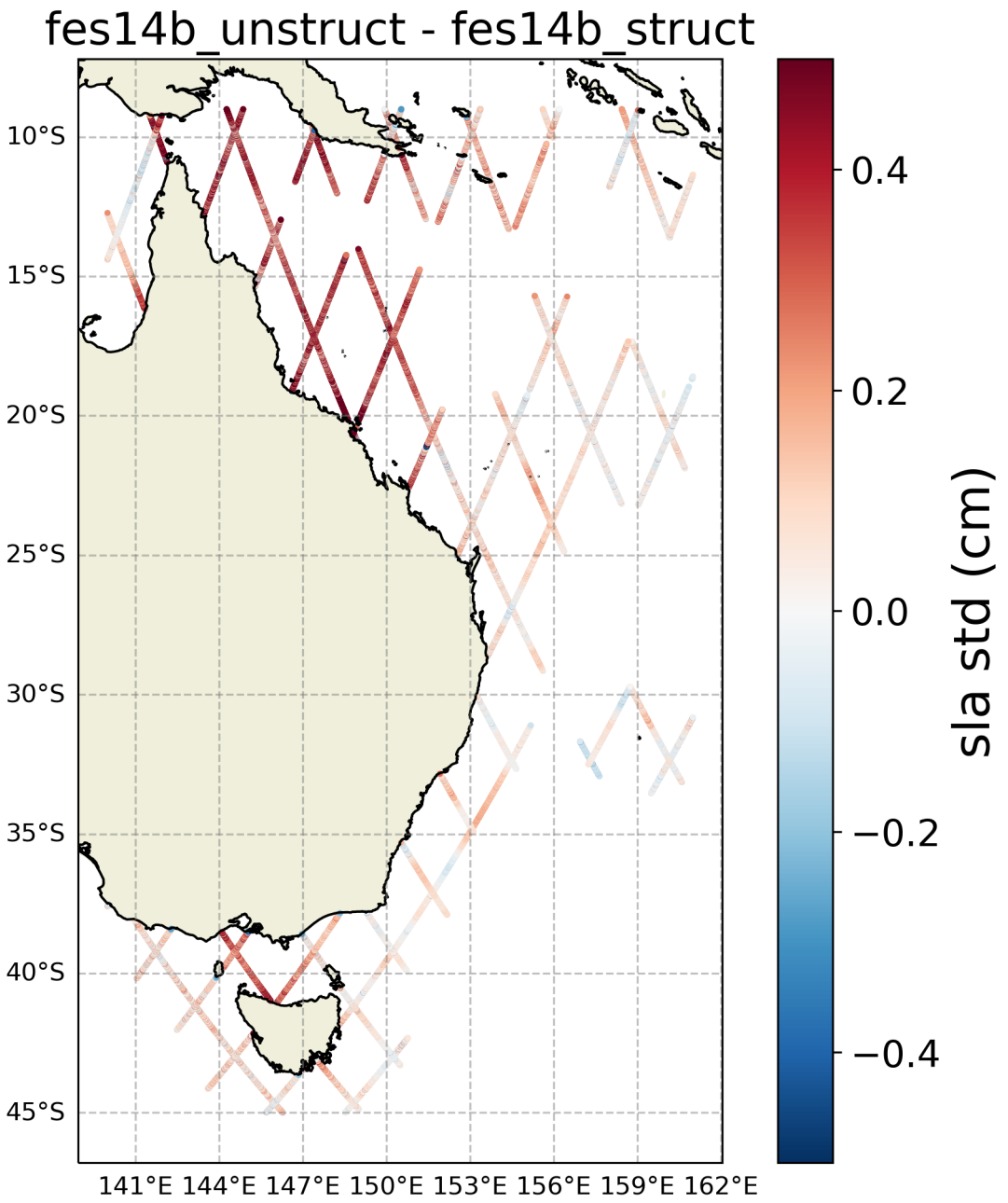

FIGURE 15 – Spatial coherence analysis of the Difference in sla 's std between fes14b_unstruct and fes14b_struct

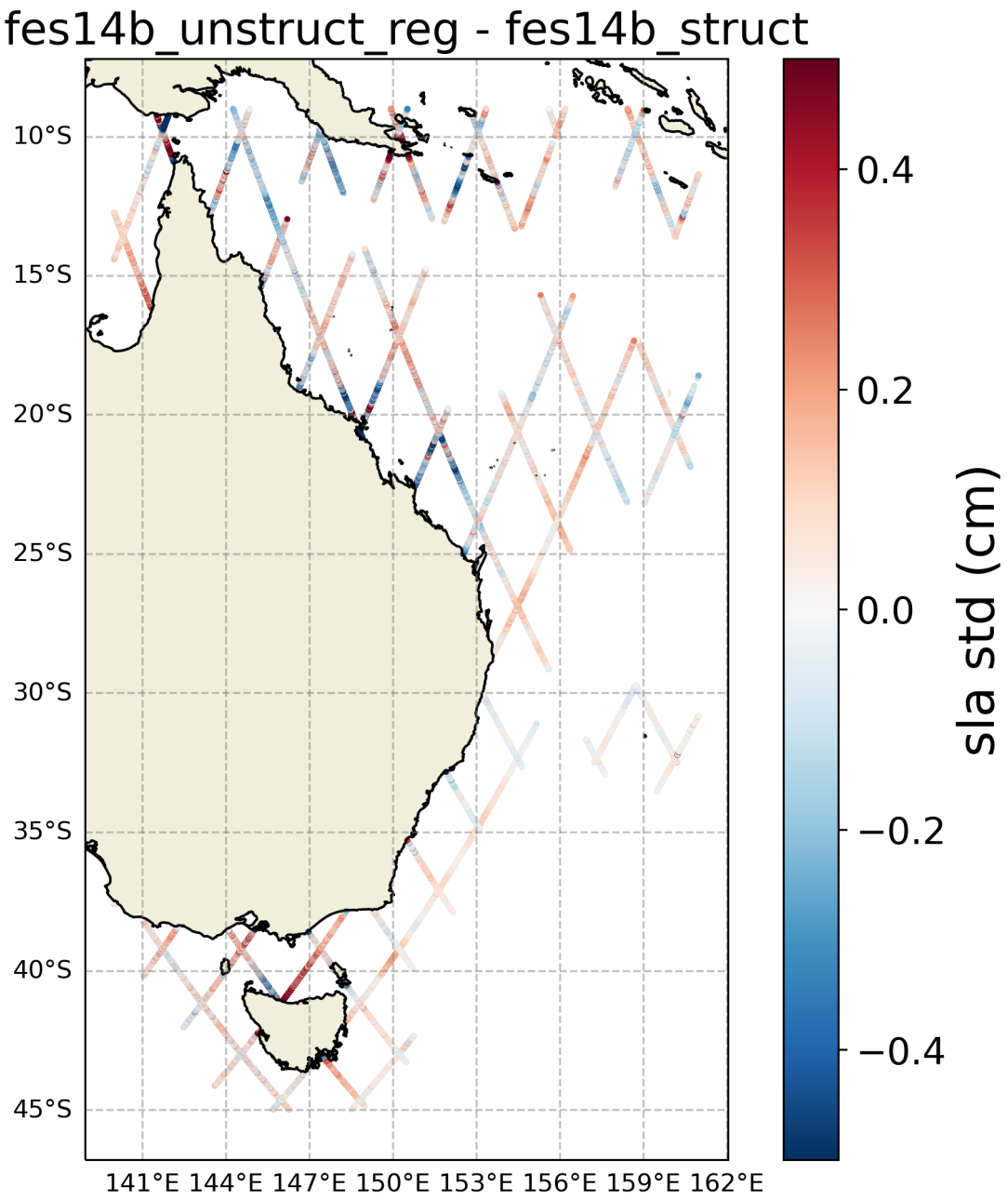

FIGURE 16 – Spatial coherence analysis of the Difference in sla 's std between fes14b_unstruct_reg and fes14b_struct

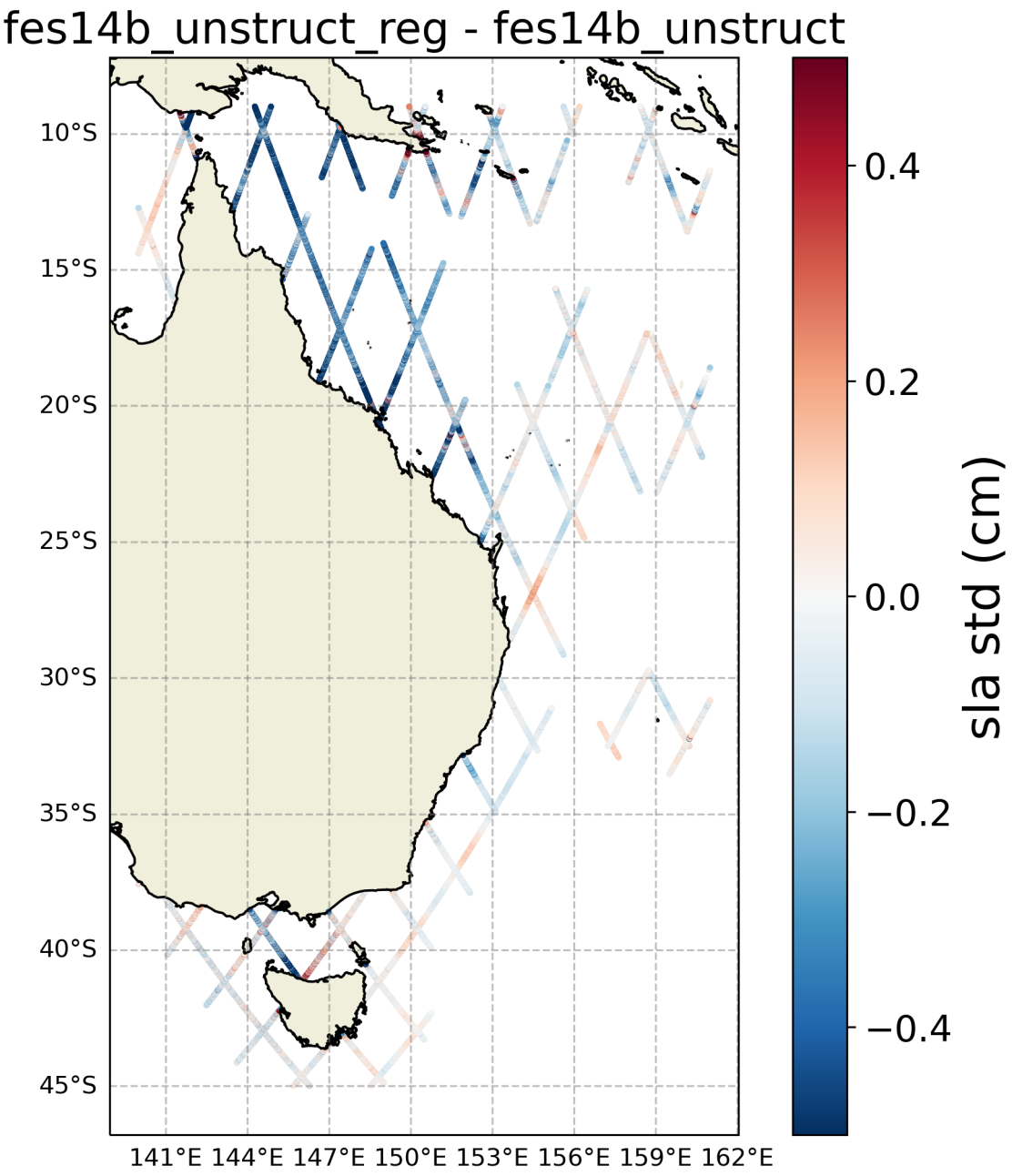

FIGURE 17 – Spatial coherence analysis of the Difference in sla 's std between fes14b_unstruct_reg and fes14b_unstruct

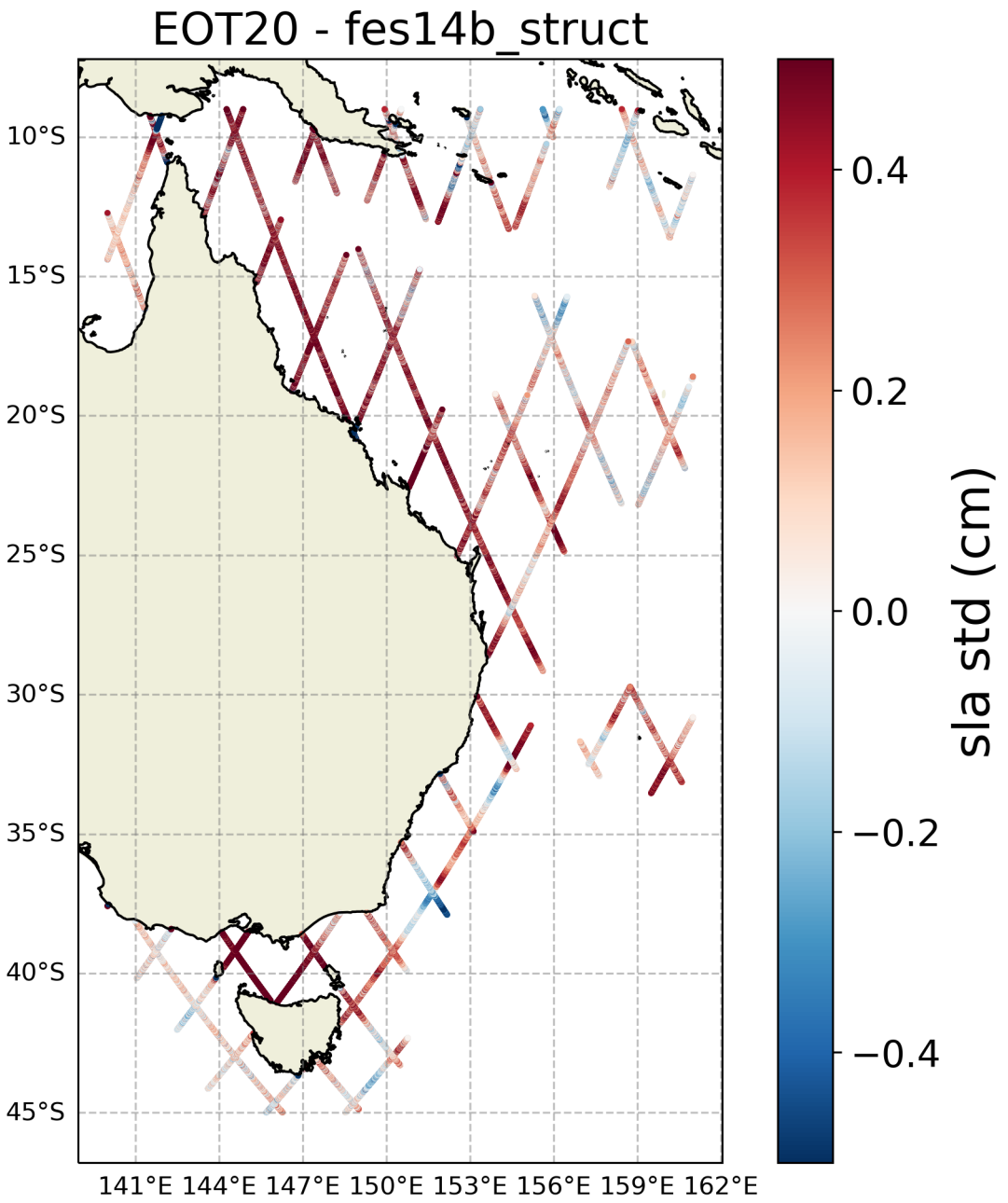

FIGURE 18 – Spatial coherence analysis of the Difference in sla 's std between EOT20 and fes14b_struct

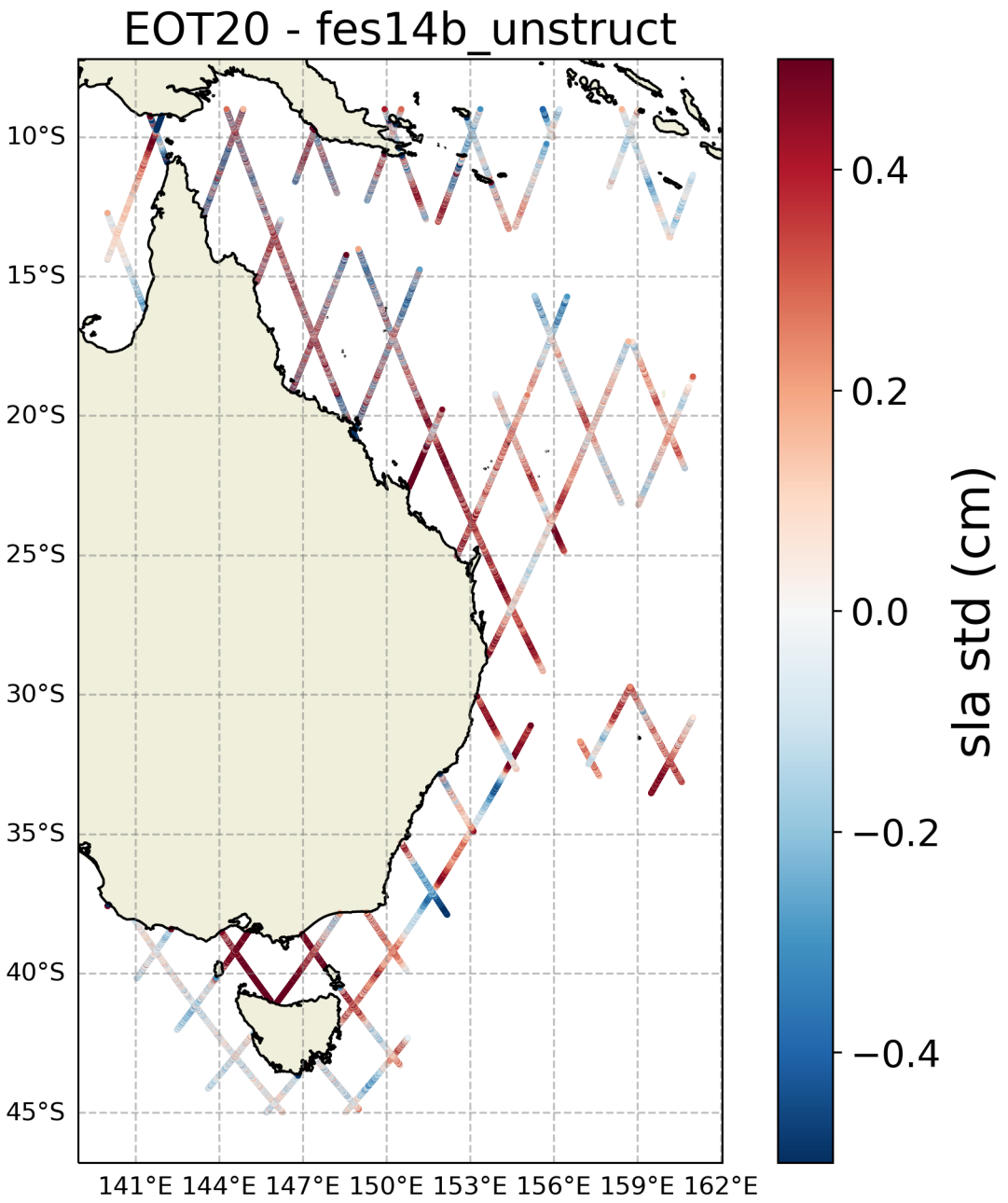

FIGURE 19 – Spatial coherence analysis of the Difference in sla 's std between EOT20 and fes14b_unstruct

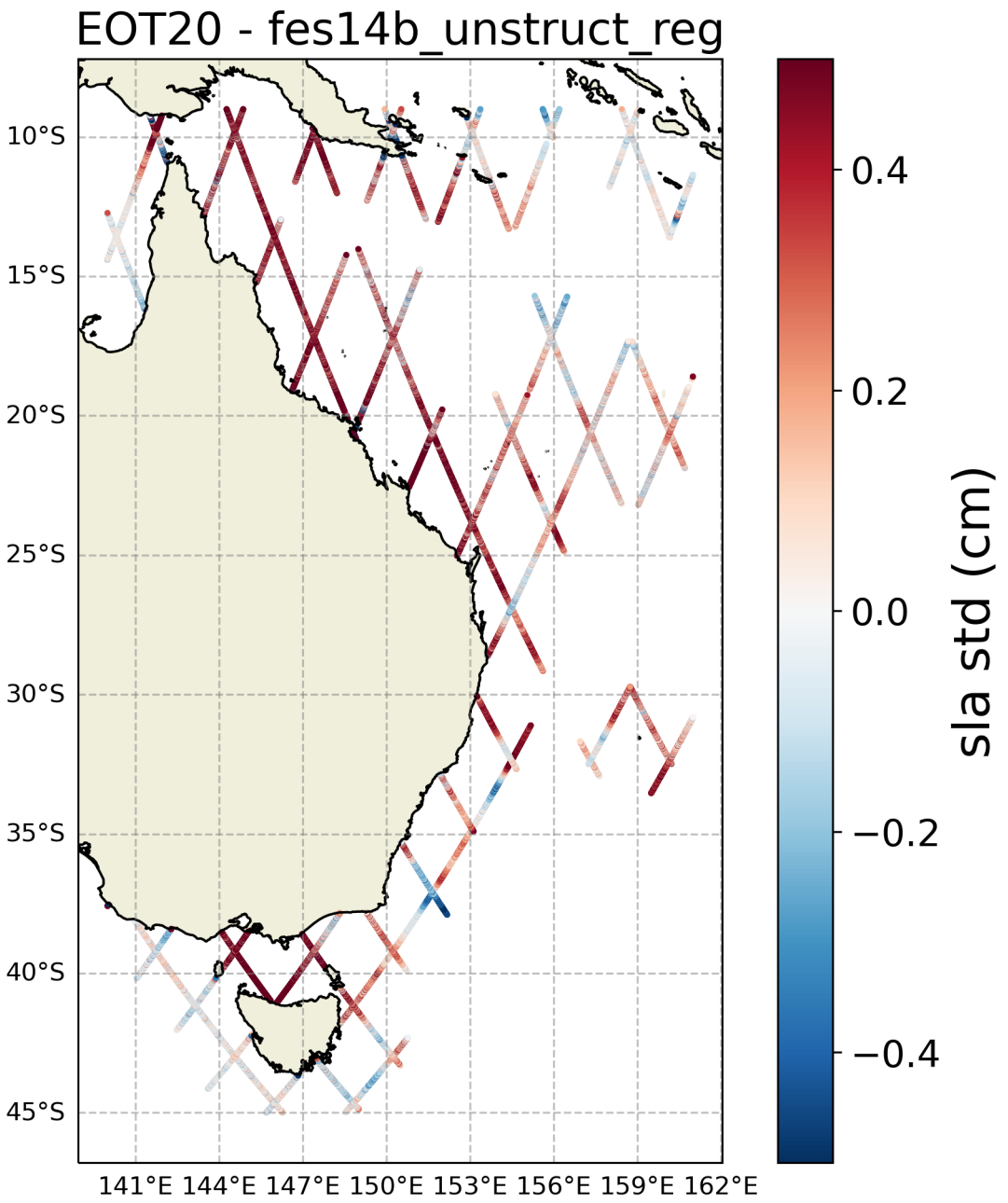

FIGURE 20 – Spatial coherence analysis of the Difference in sla 's std between EOT20 and fes14b_unstruct_reg

3.1.3 sla 's mean

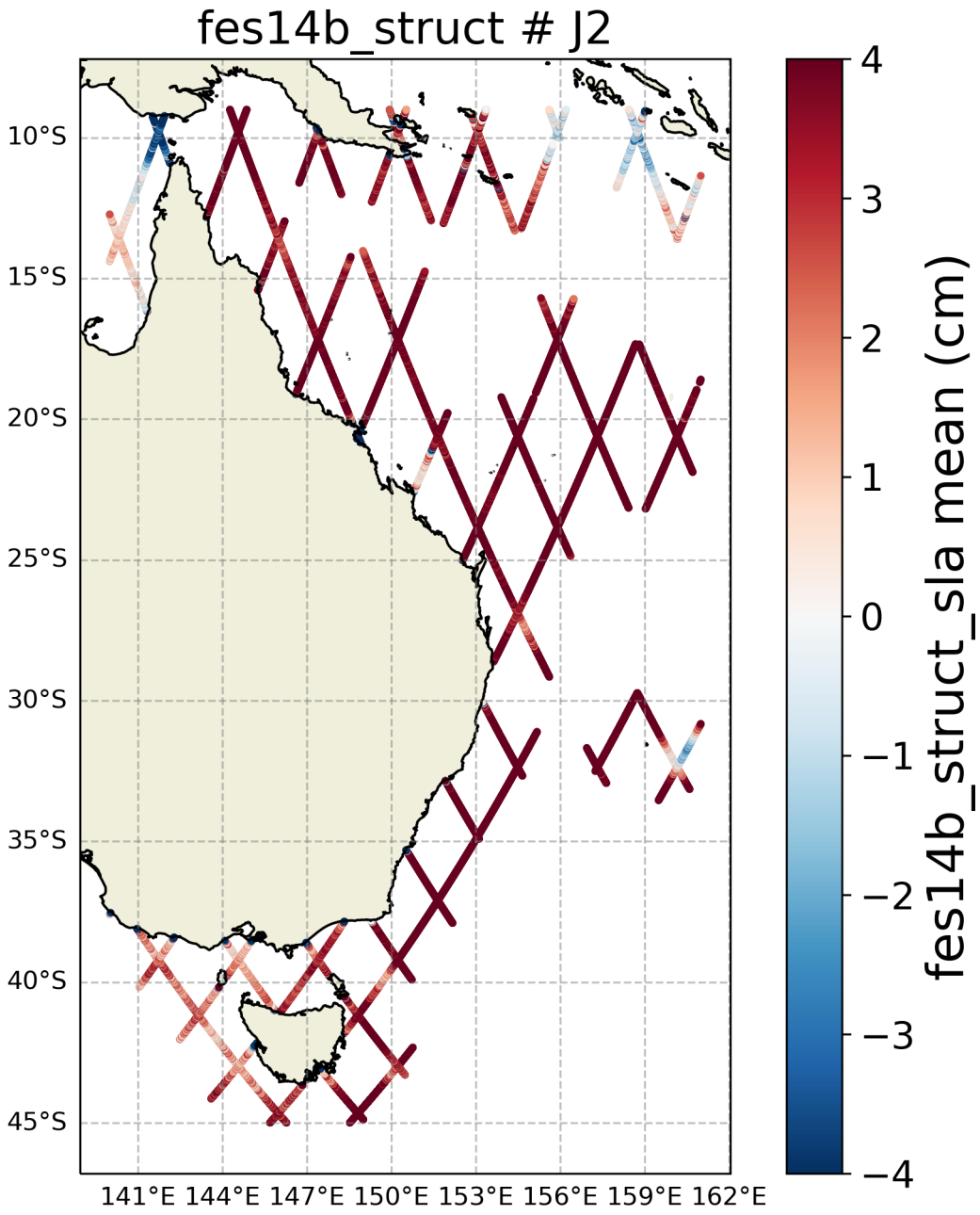

FIGURE 21 – Spatial coherence analysis of the mean of the fes14b_struct version of sla variable

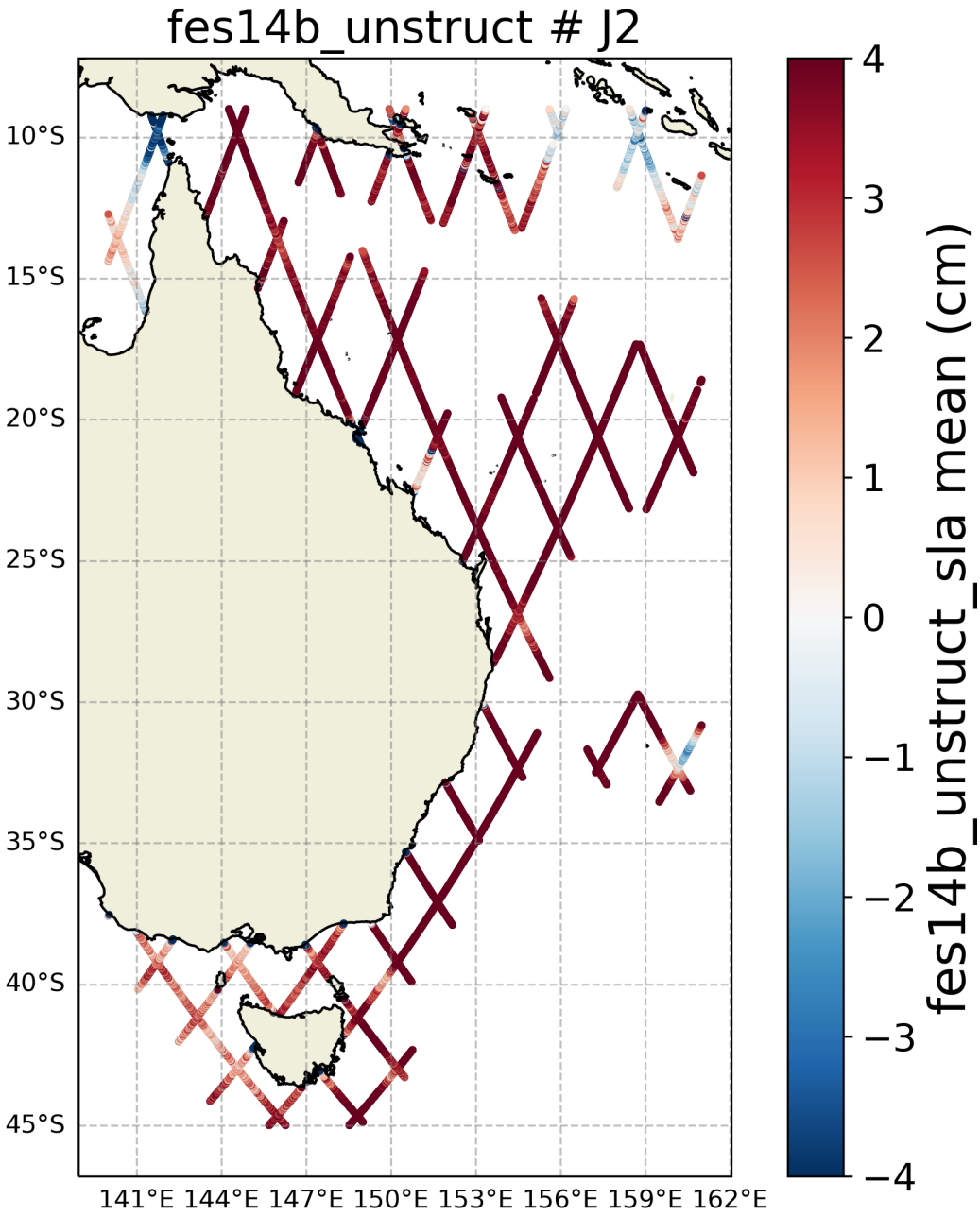

FIGURE 22 – Spatial coherence analysis of the mean of the fes14b_unstruct version of sla variable

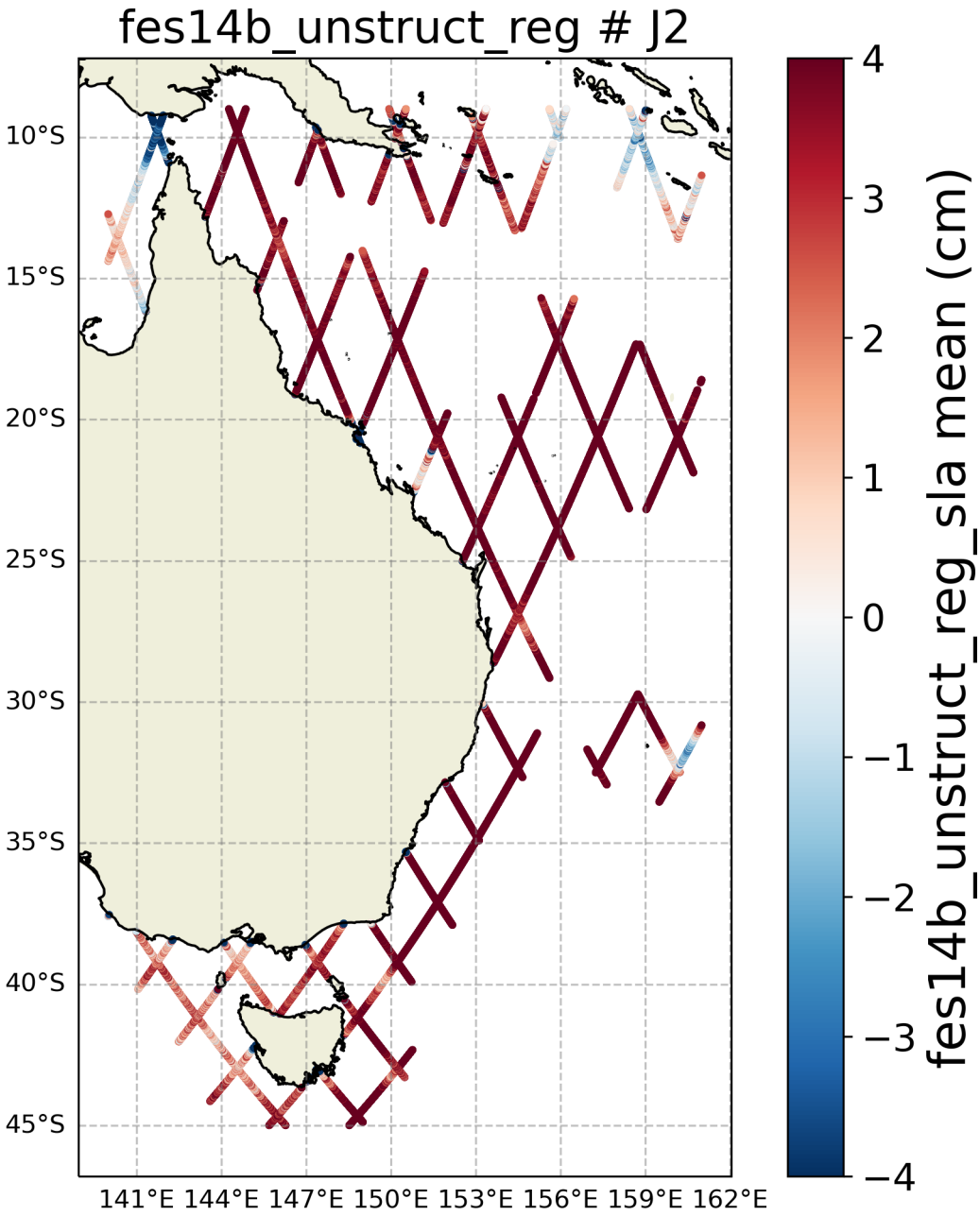

FIGURE 23 – Spatial coherence analysis of the mean of the fes14b_unstruct_reg version of sla variable

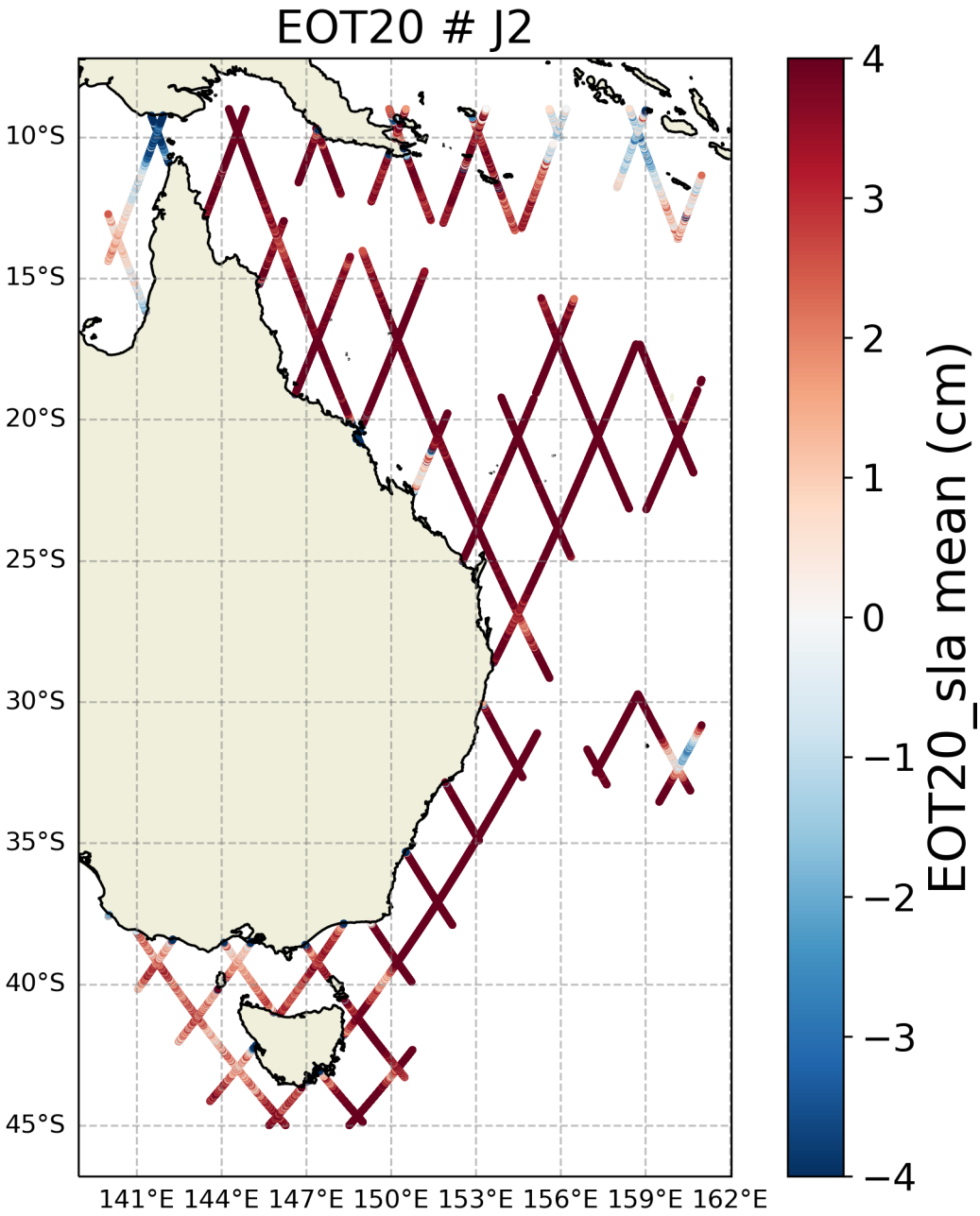

FIGURE 24 – Spatial coherence analysis of the mean of the EOT20 version of sla variable

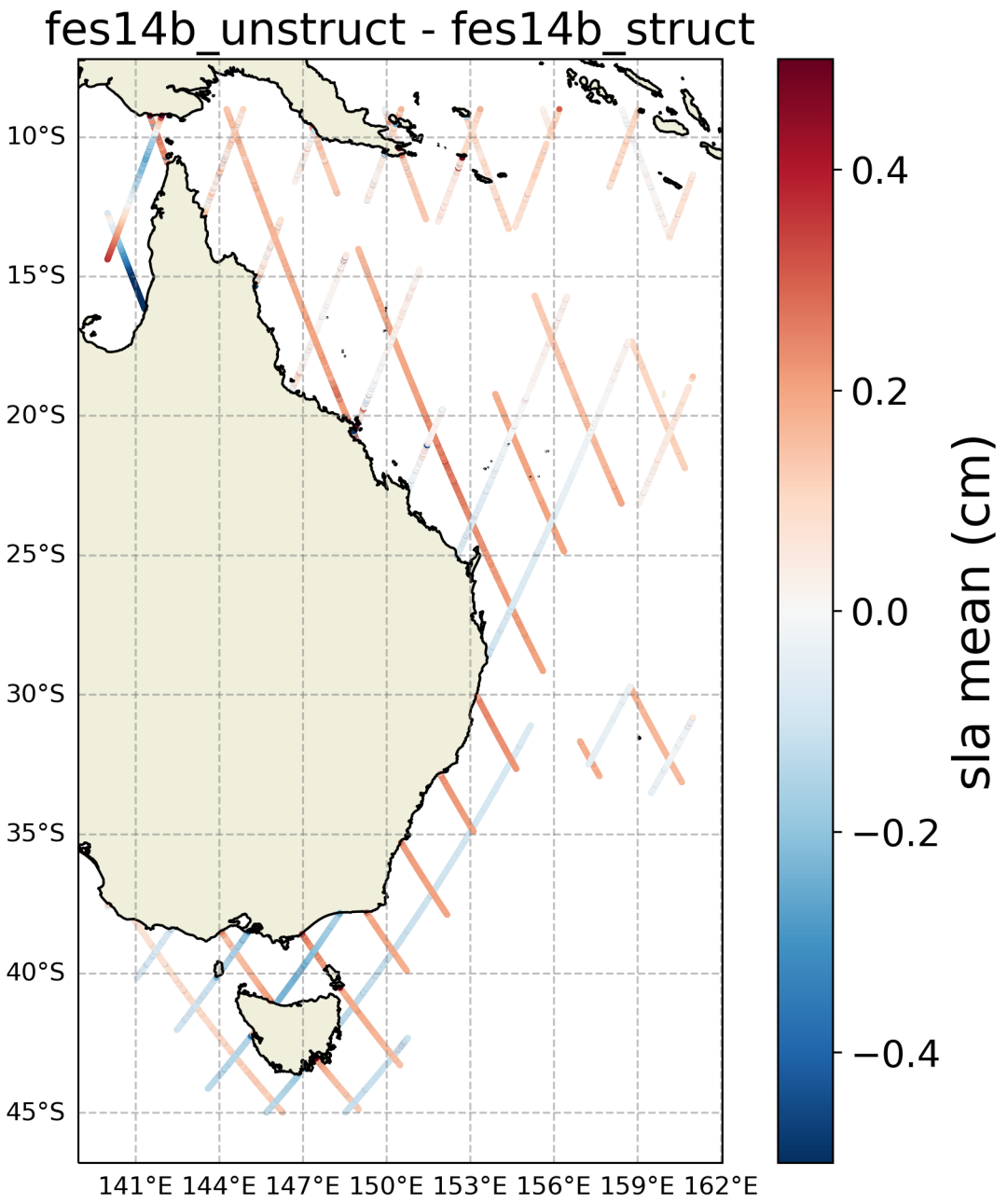

FIGURE 25 – Spatial coherence analysis of the Difference in sla 's mean between fes14b_unstruct and fes14b_struct

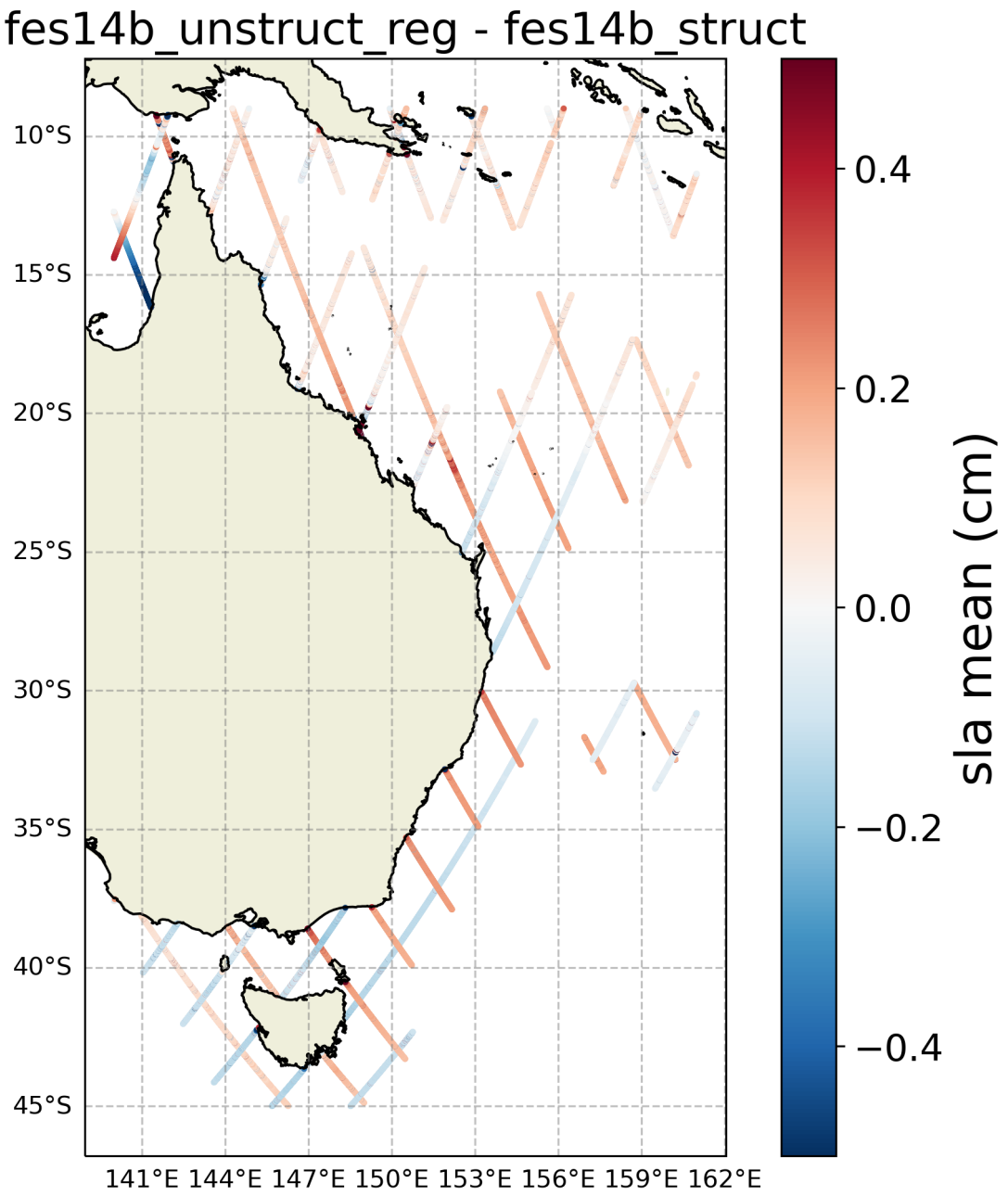

FIGURE 26 – Spatial coherence analysis of the Difference in sla 's mean between fes14b_unstruct_reg and fes14b_struct

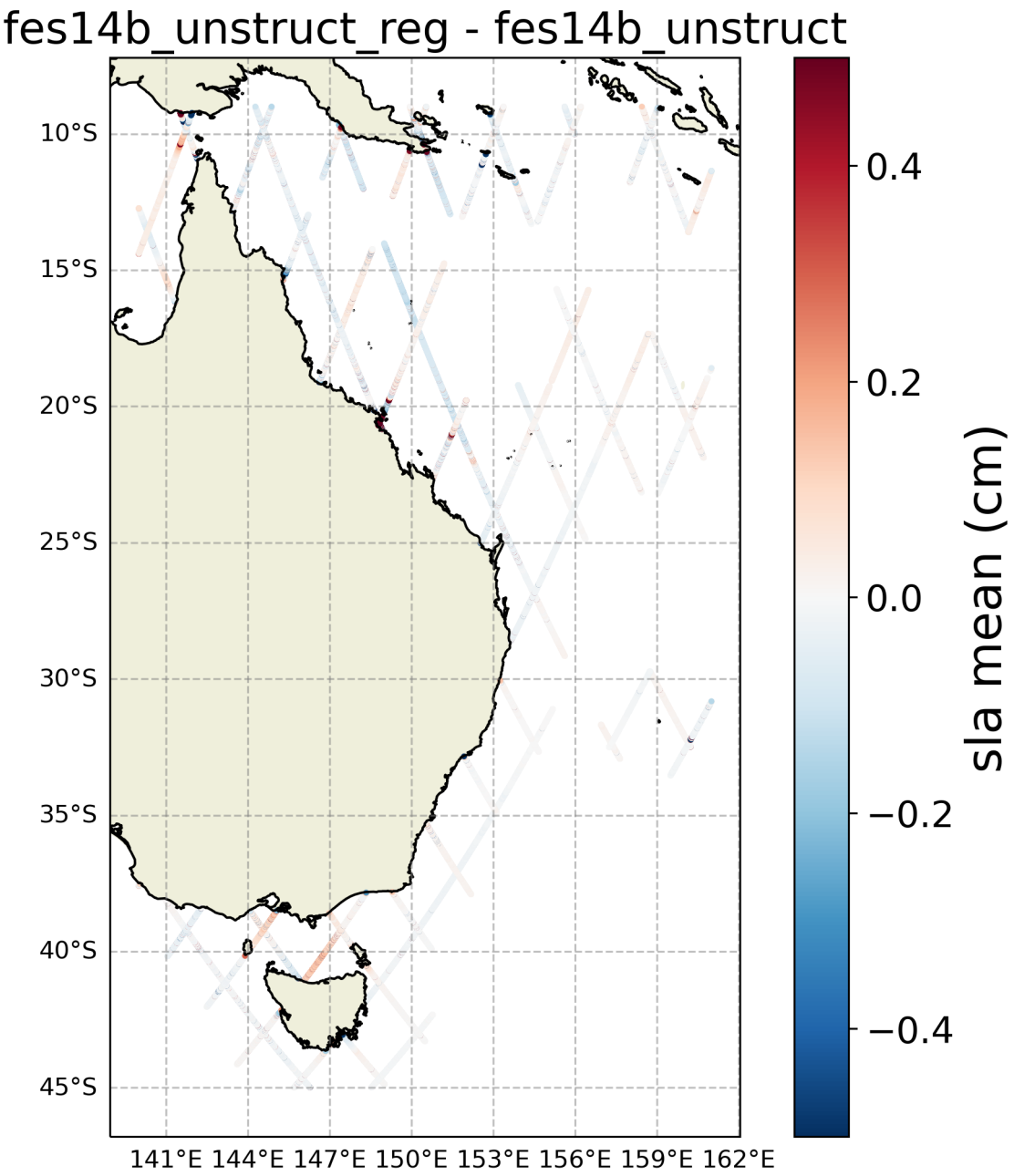

FIGURE 27 – Spatial coherence analysis of the Difference in sla 's mean between fes14b_unstruct_reg and fes14b_unstruct

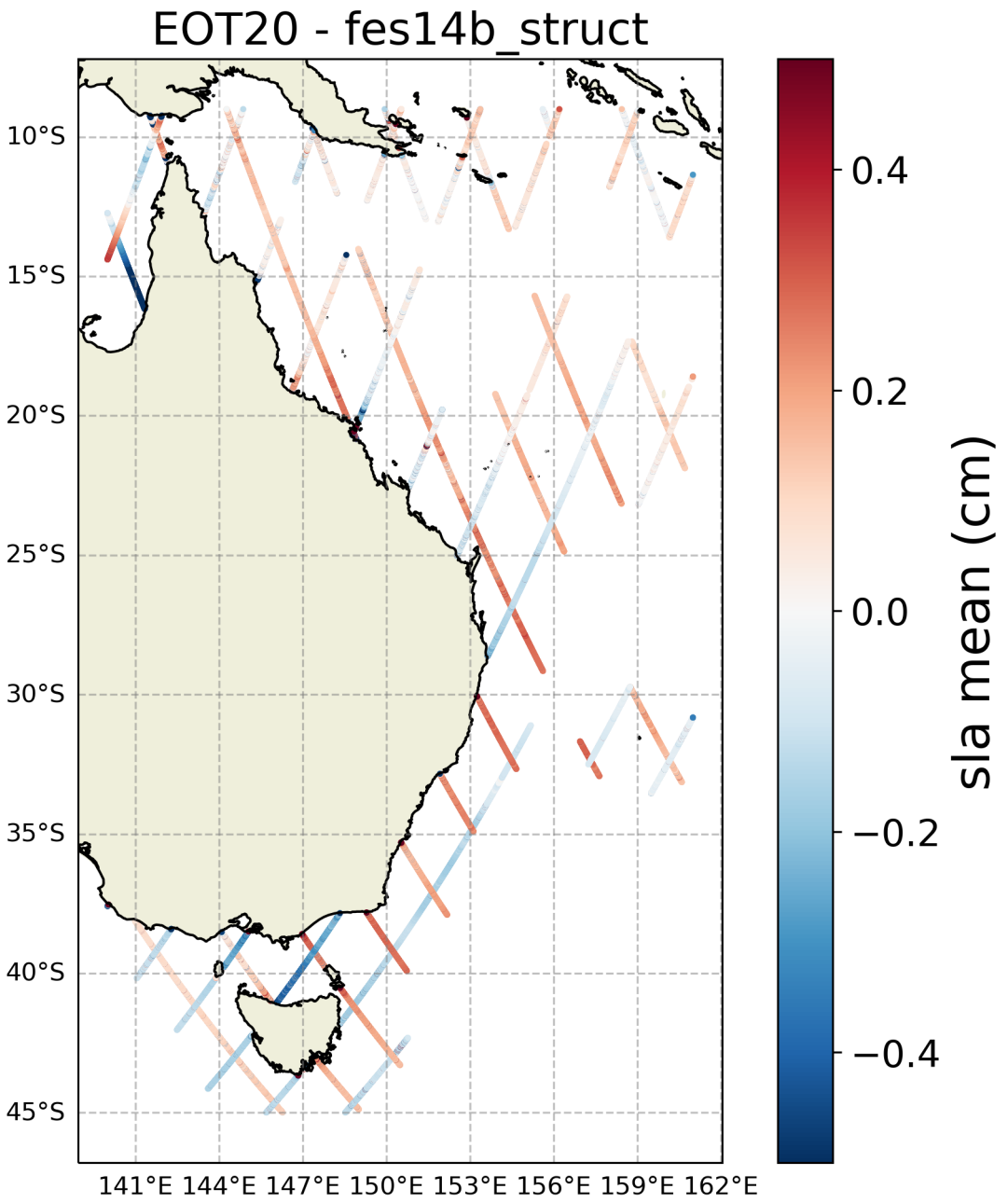

FIGURE 28 – Spatial coherence analysis of the Difference in sla 's mean between EOT20 and fes14b_struct

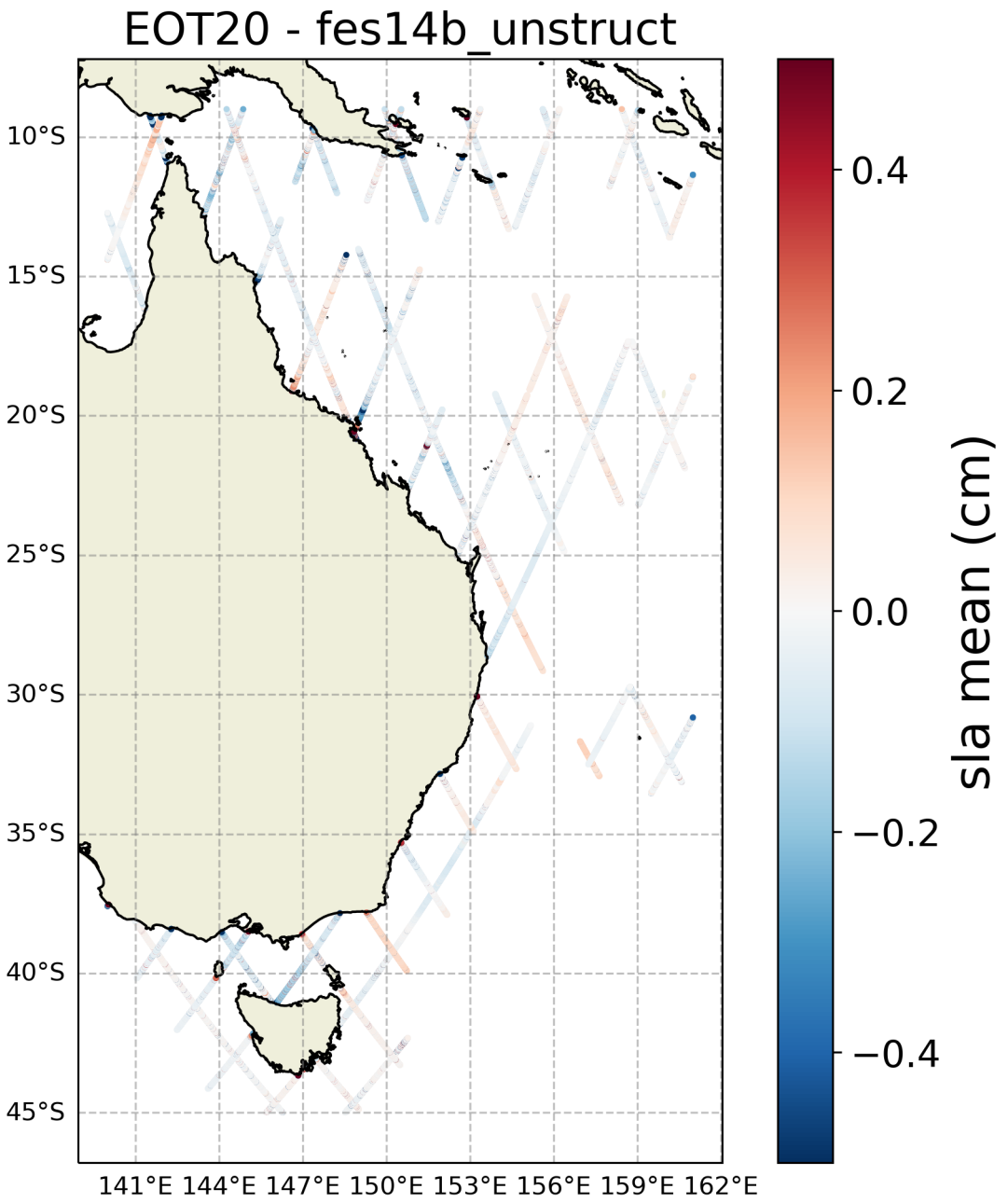

FIGURE 29 – Spatial coherence analysis of the Difference in sla 's mean between EOT20 and fes14b_unstruct

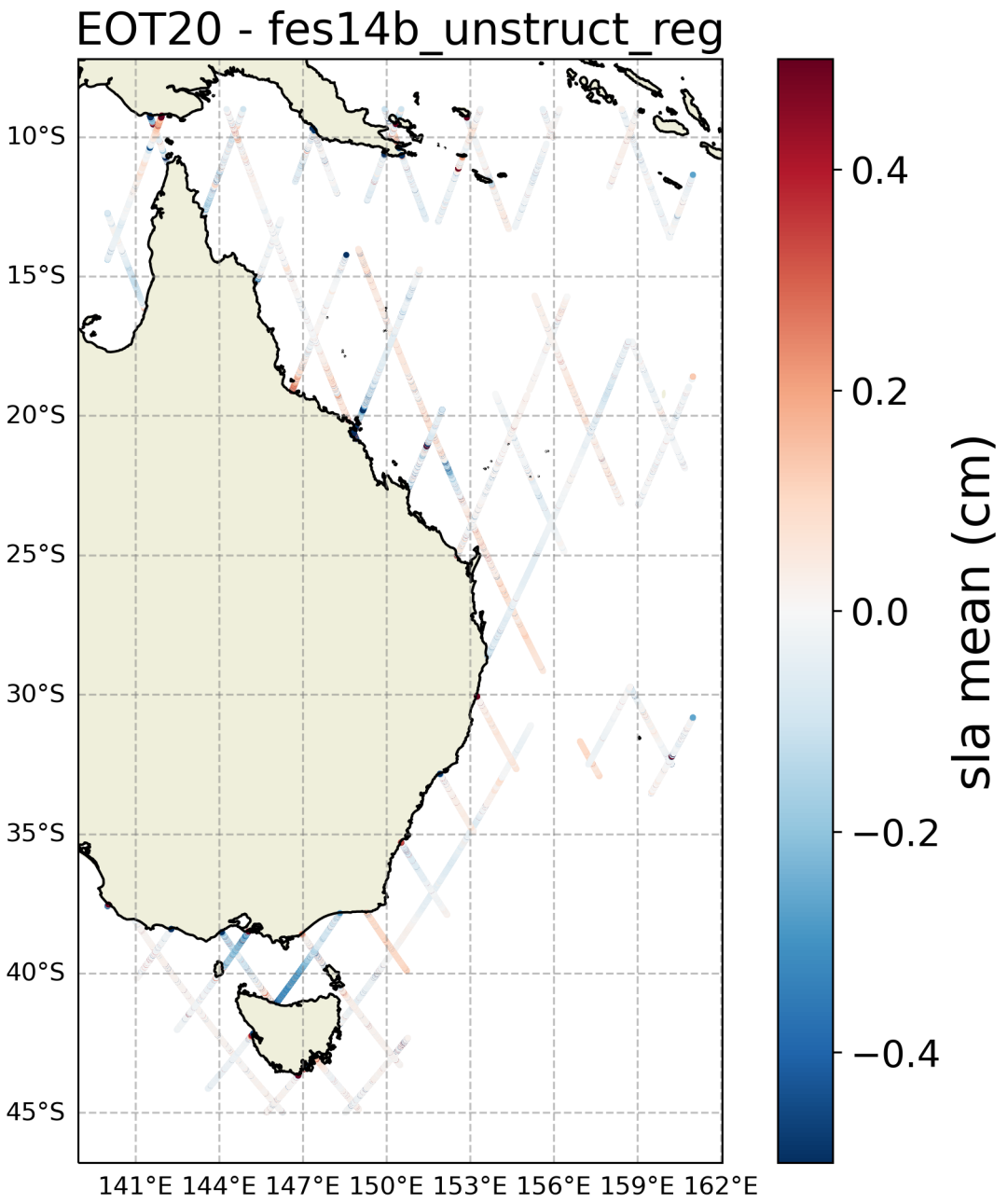

FIGURE 30 – Spatial coherence analysis of the Difference in sla 's mean between EOT20 and fes14b_unstruct_reg

3.2 Tide

3.2.1 Tide 's count

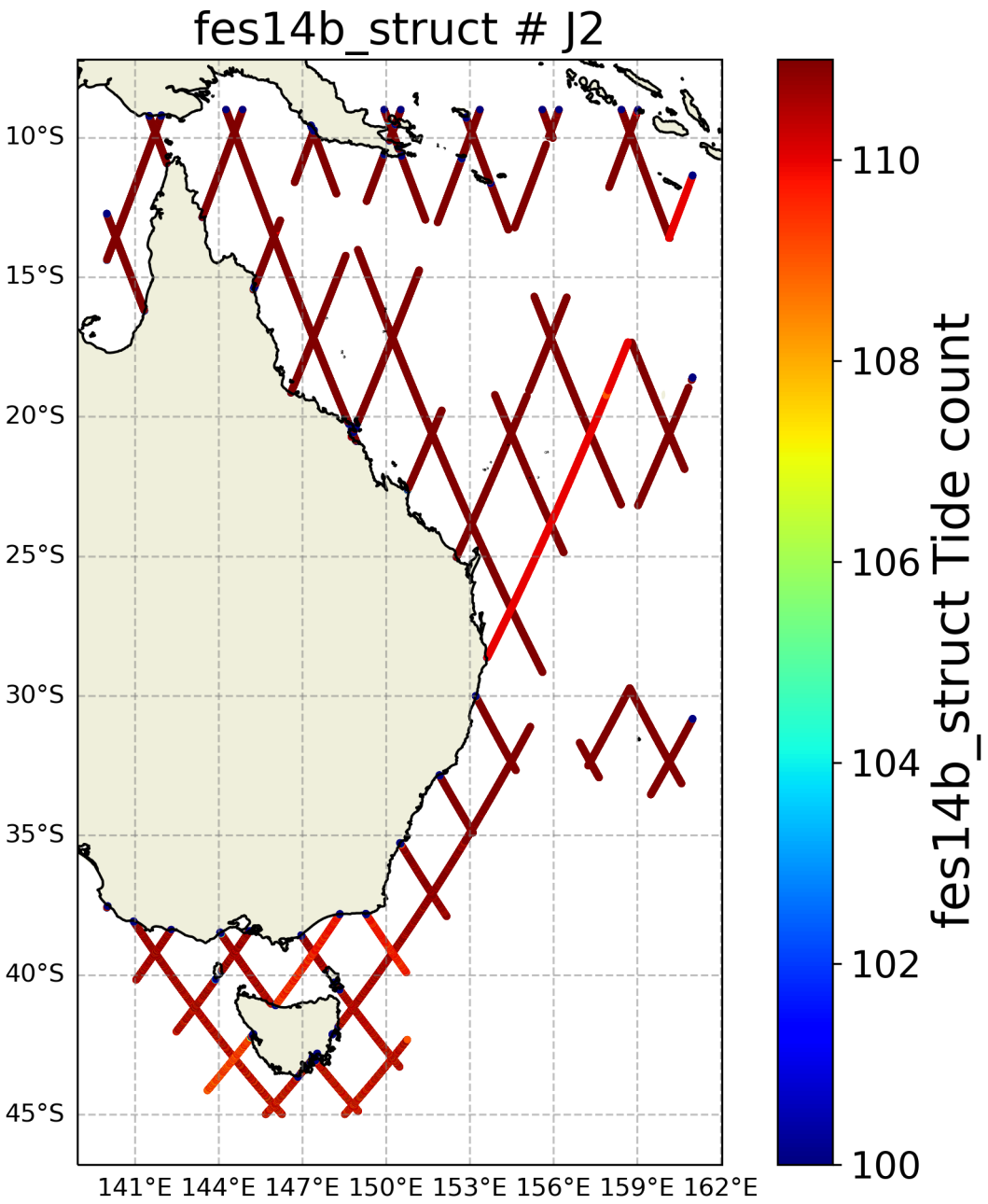

FIGURE 31 – Spatial coherence analysis of the count of the fes14b_struct version of Tide variable

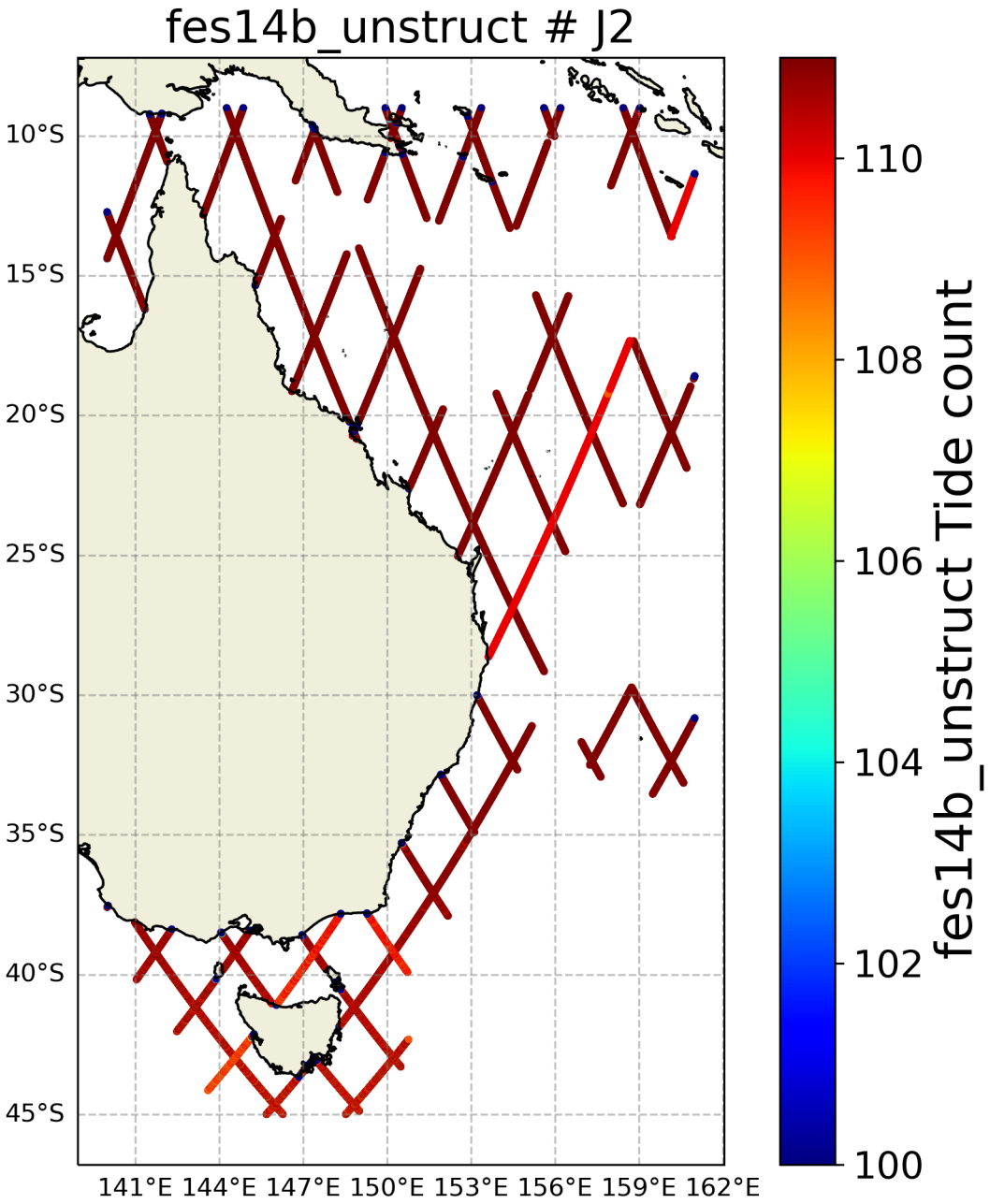

FIGURE 32 – Spatial coherence analysis of the count of the fes14b_unstruct version of Tide variable

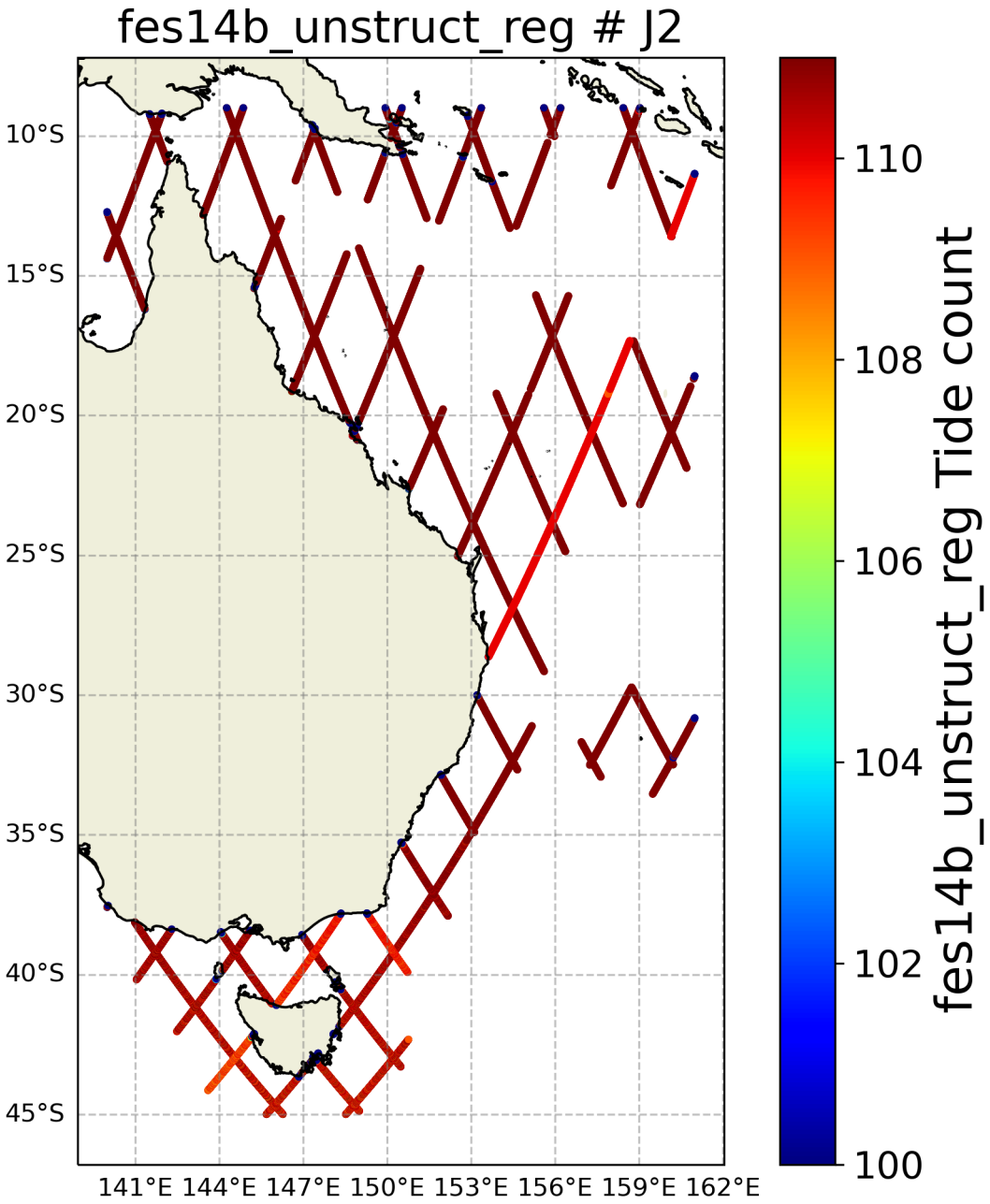

FIGURE 33 – Spatial coherence analysis of the count of the fes14b_unstruct_reg version of Tide variable

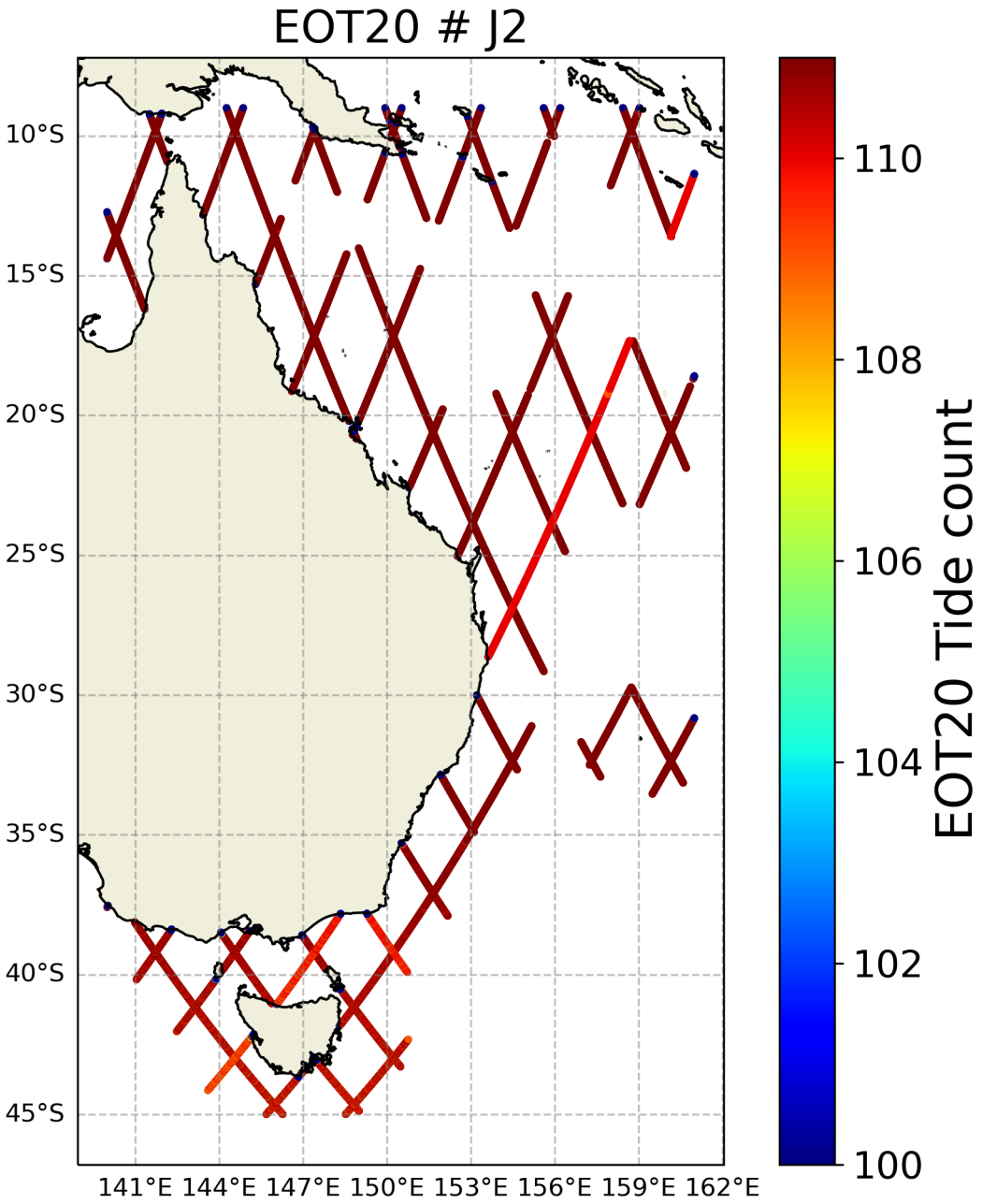

FIGURE 34 – Spatial coherence analysis of the count of the EOT20 version of Tide variable

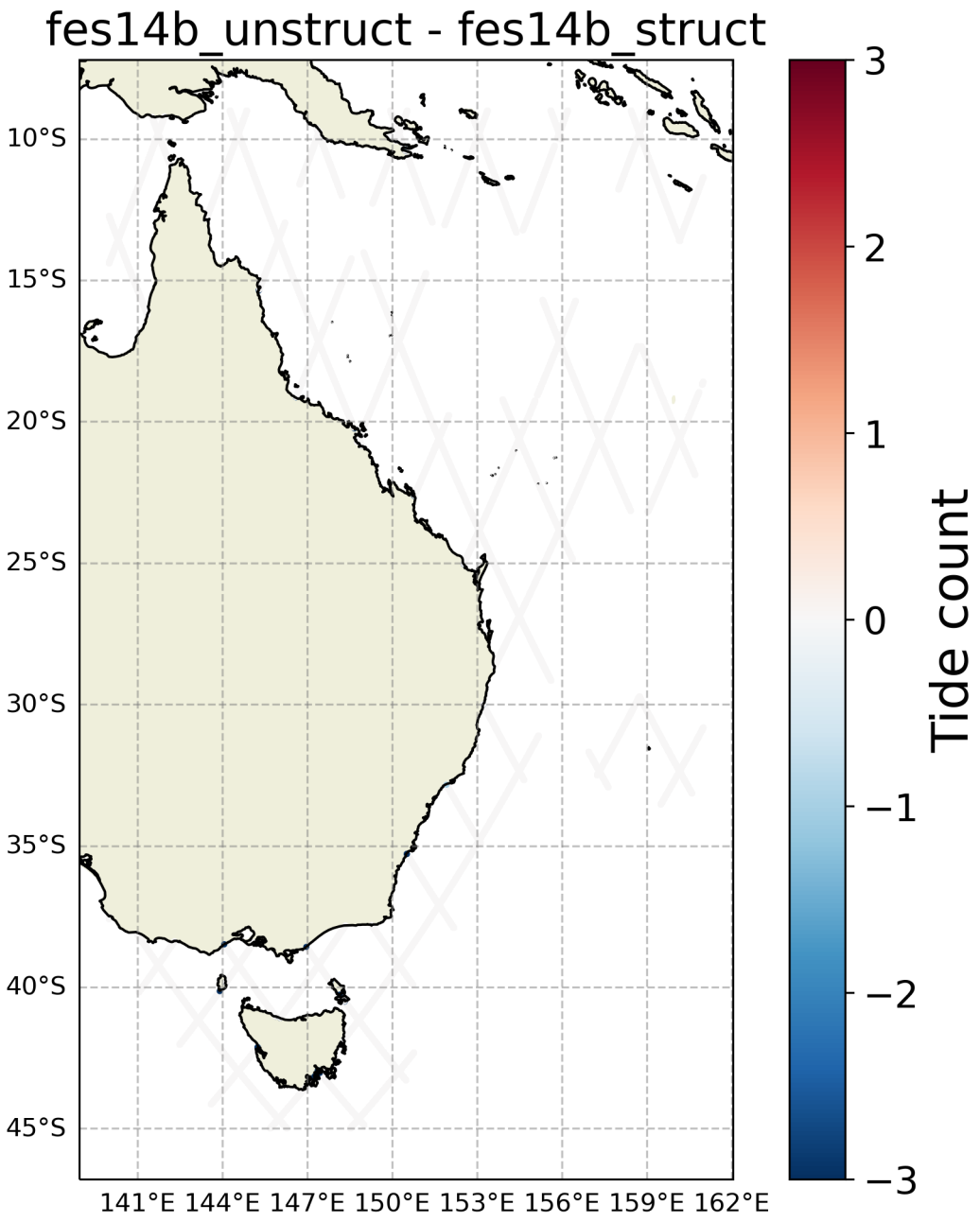

FIGURE 35 – Spatial coherence analysis of the Difference in Tide 's count between fes14b_unstruct and fes14b_struct

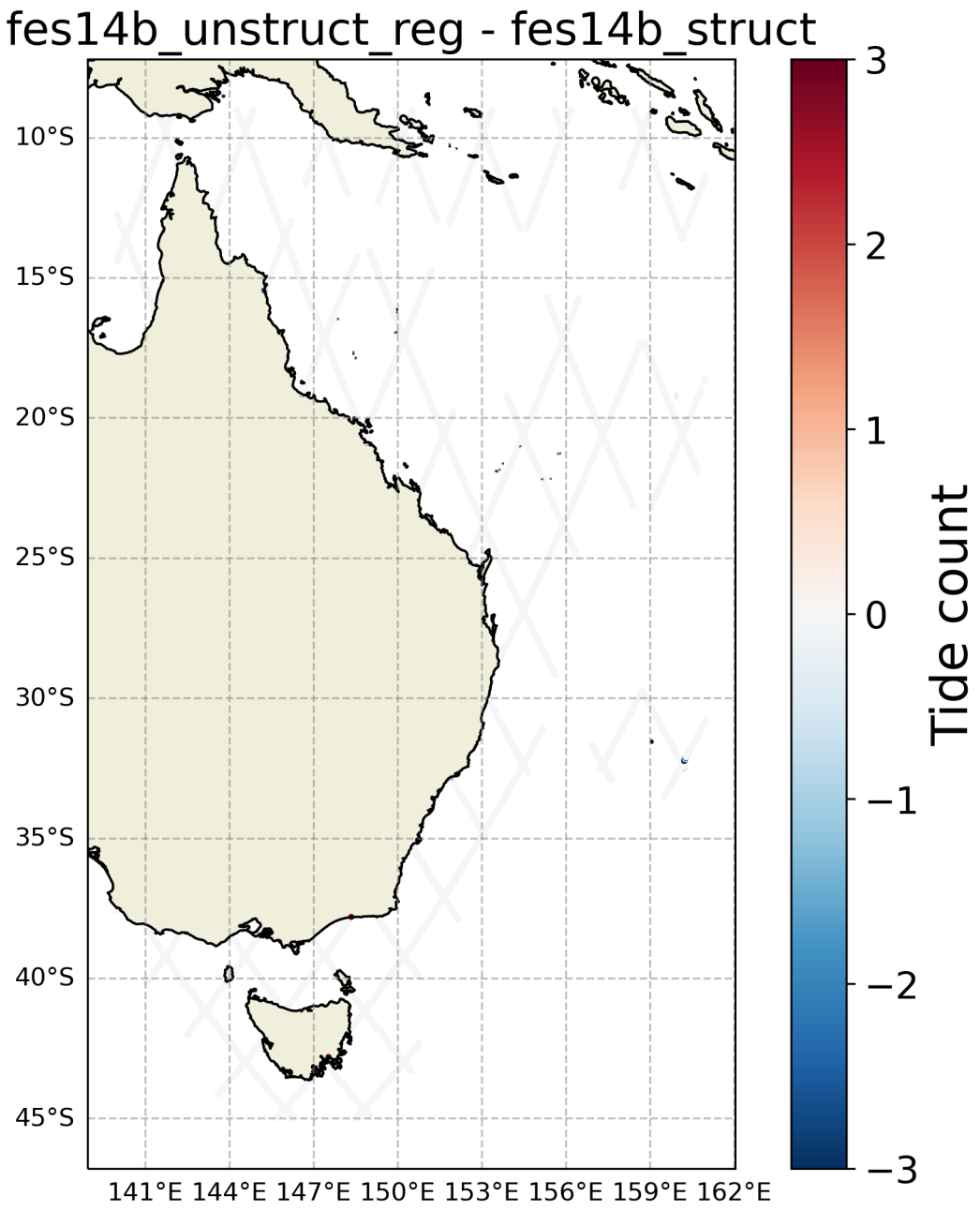

FIGURE 36 – Spatial coherence analysis of the Difference in Tide 's count between fes14b_unstruct_reg and fes14b_struct

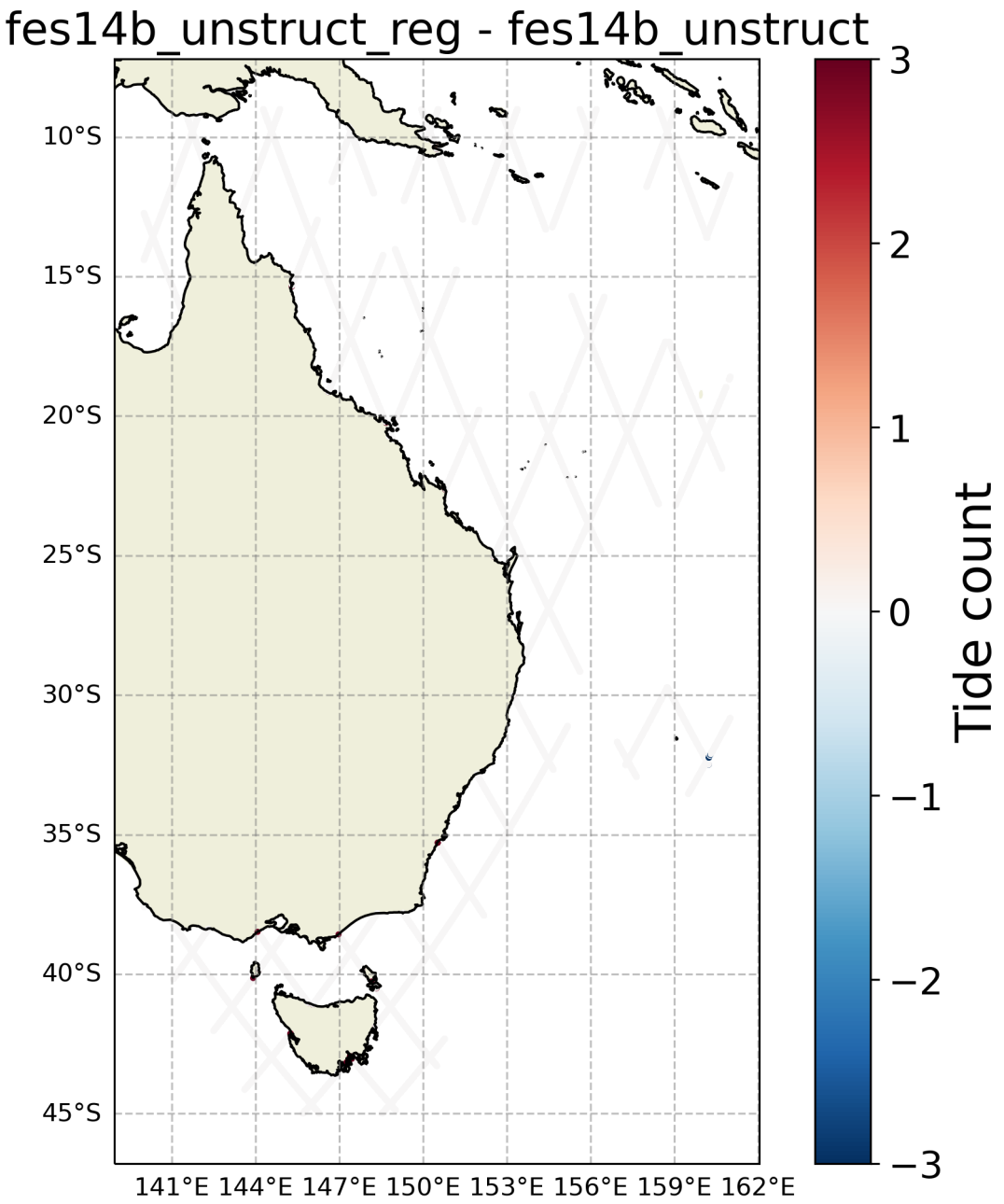

FIGURE 37 – Spatial coherence analysis of the Difference in Tide 's count between fes14b_unstruct_reg and fes14b_unstruct

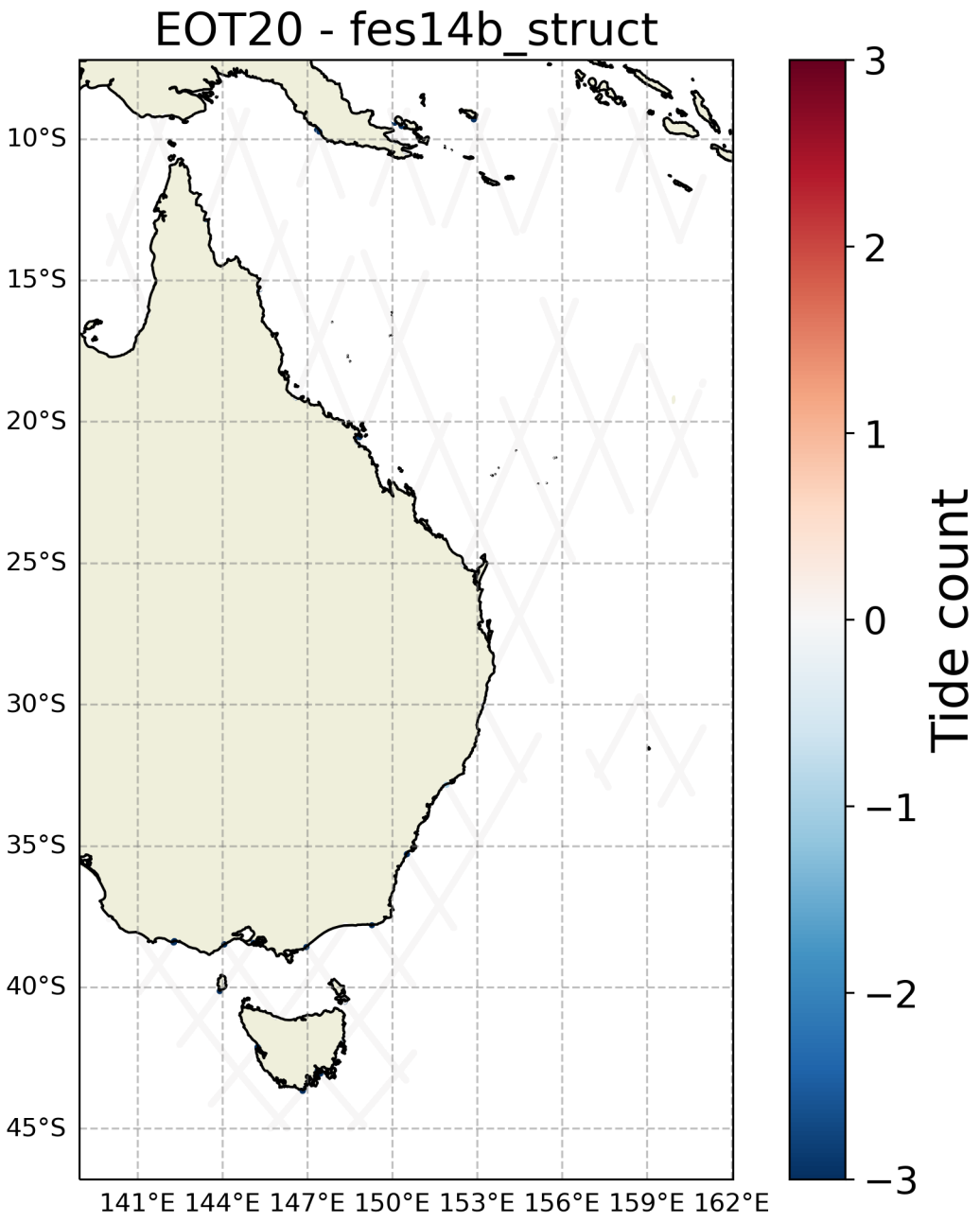

FIGURE 38 – Spatial coherence analysis of the Difference in Tide 's count between EOT20 and fes14b_struct

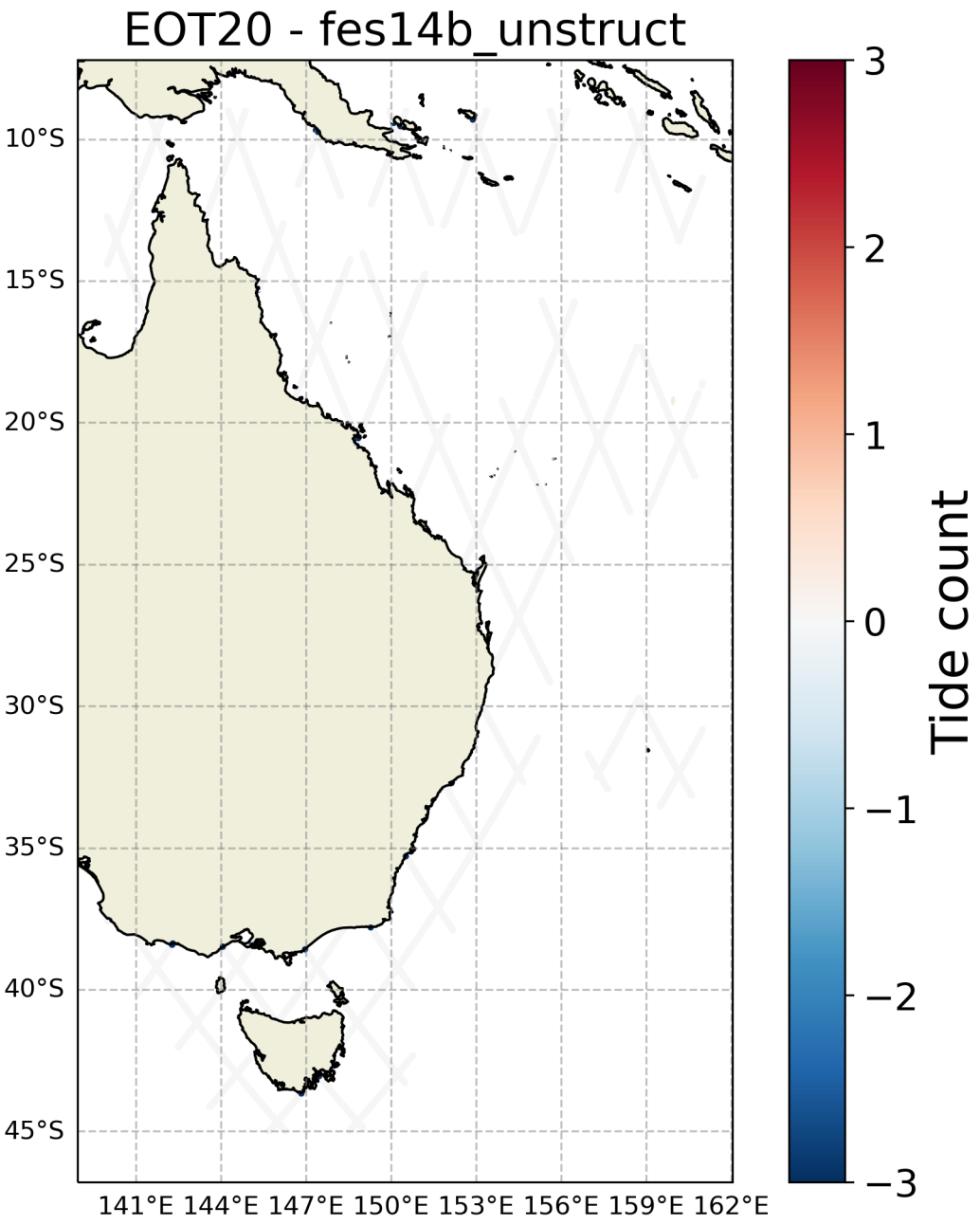

Figure 39 – Spatial coherence analysis of the Difference in Tide 's count between EOT20 and fes14b_unstruct

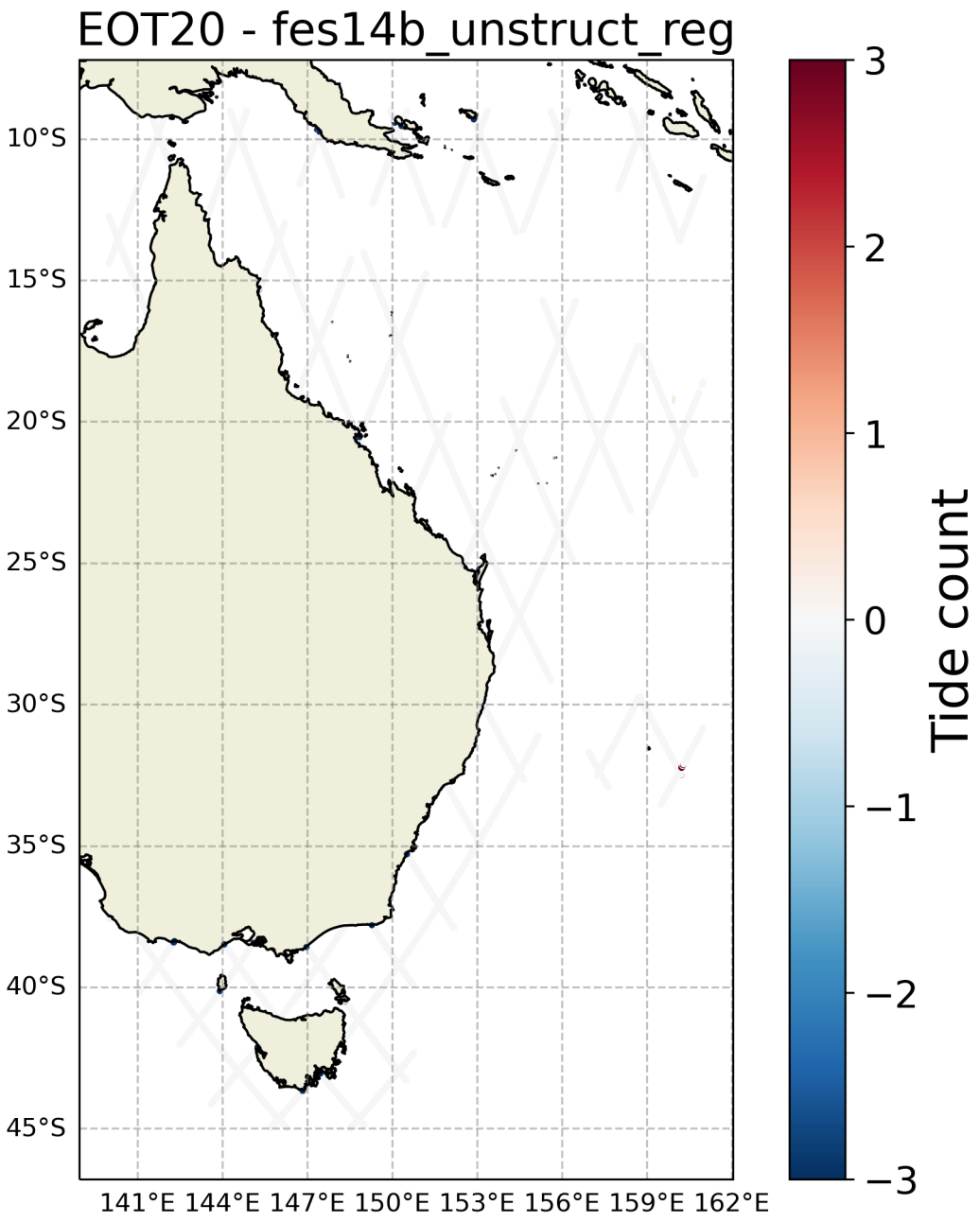

FIGURE 40 – Spatial coherence analysis of the Difference in Tide 's count between EOT20 and fes14b_unstruct_reg

3.2.2 Tide 's std

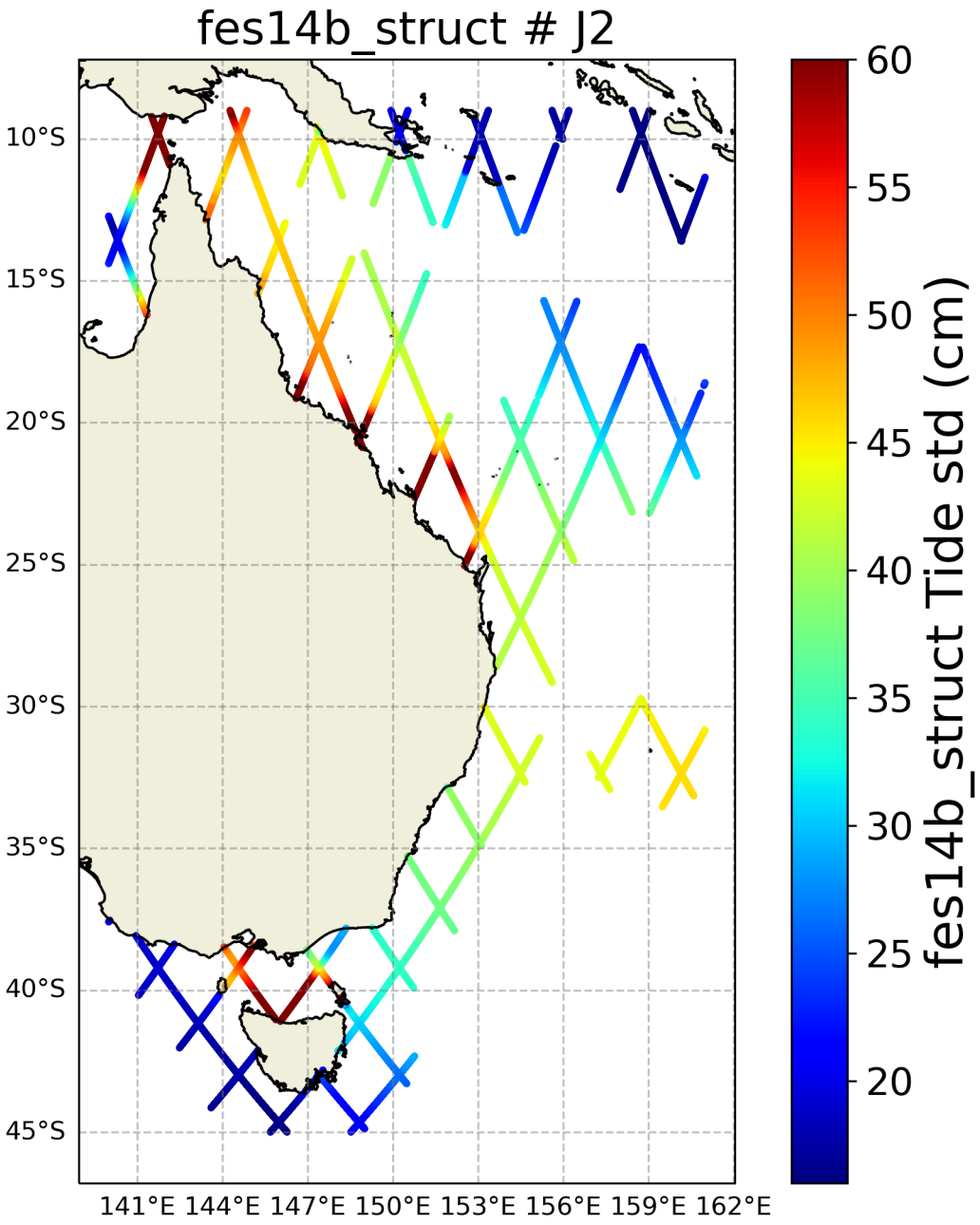

FIGURE 41 – Spatial coherence analysis of the std of the fes14b_struct version of Tide variable

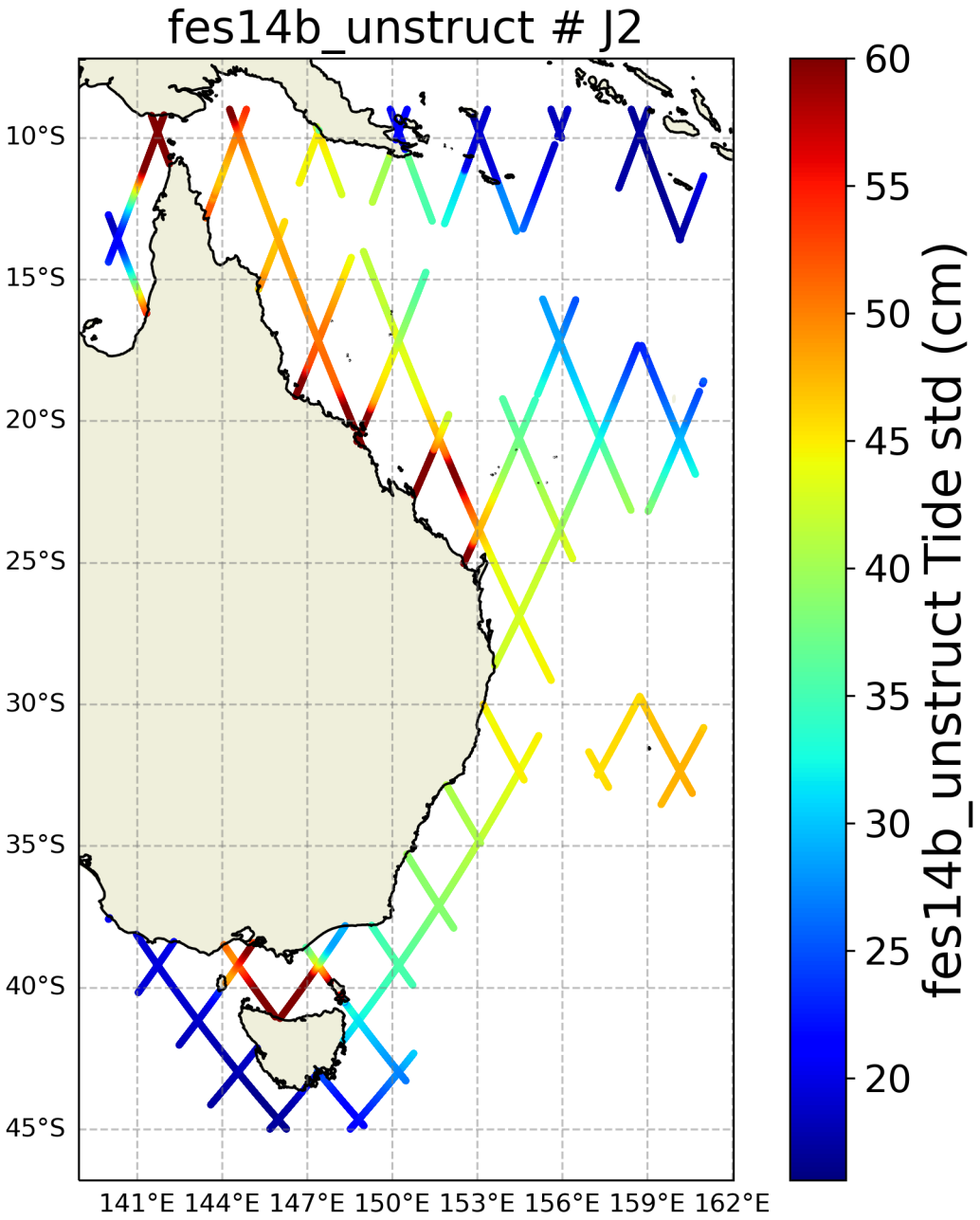

FIGURE 42 – Spatial coherence analysis of the std of the fes14b_unstruct version of Tide variable

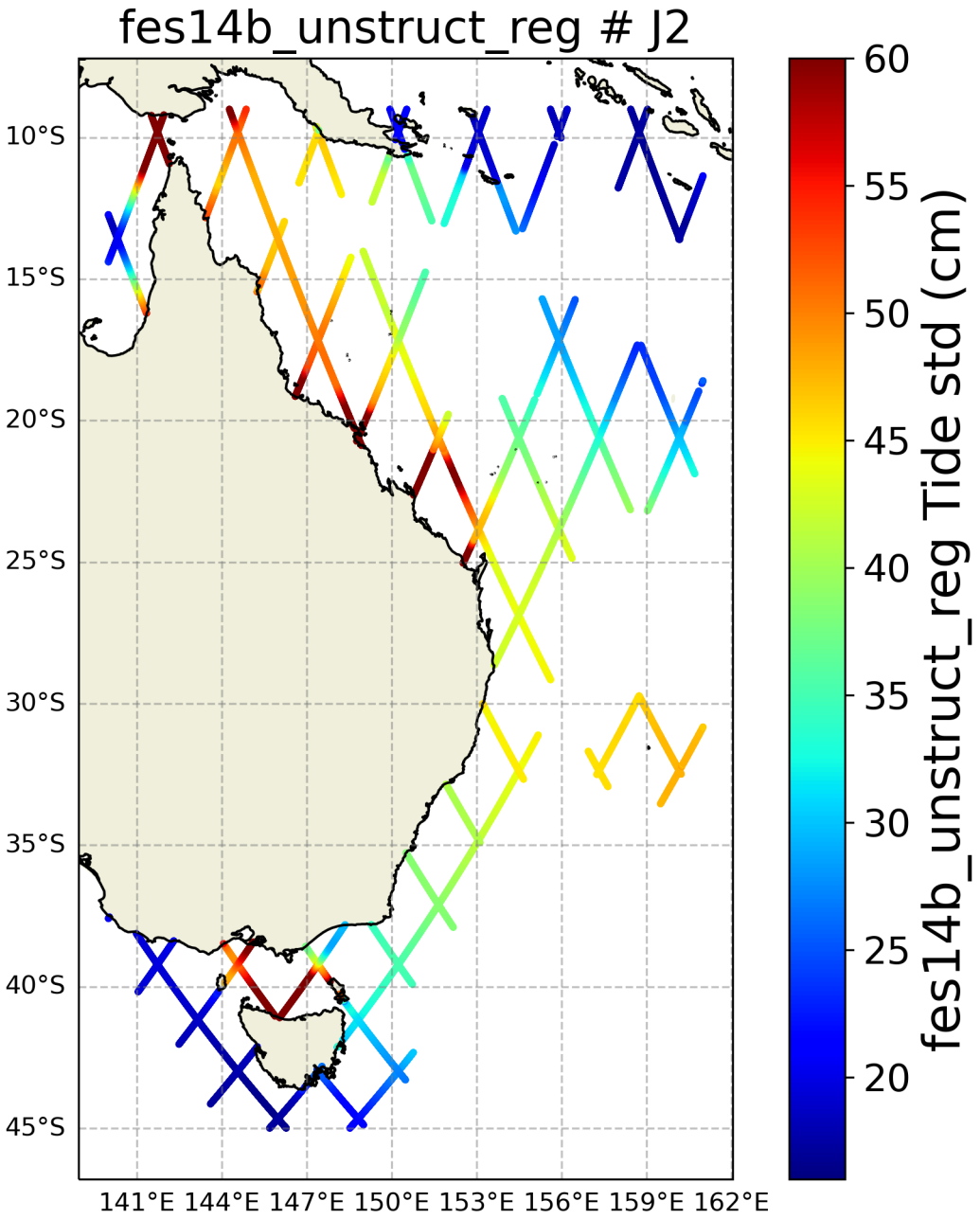

FIGURE 43 – Spatial coherence analysis of the std of the fes14b_unstruct_reg version of Tide variable

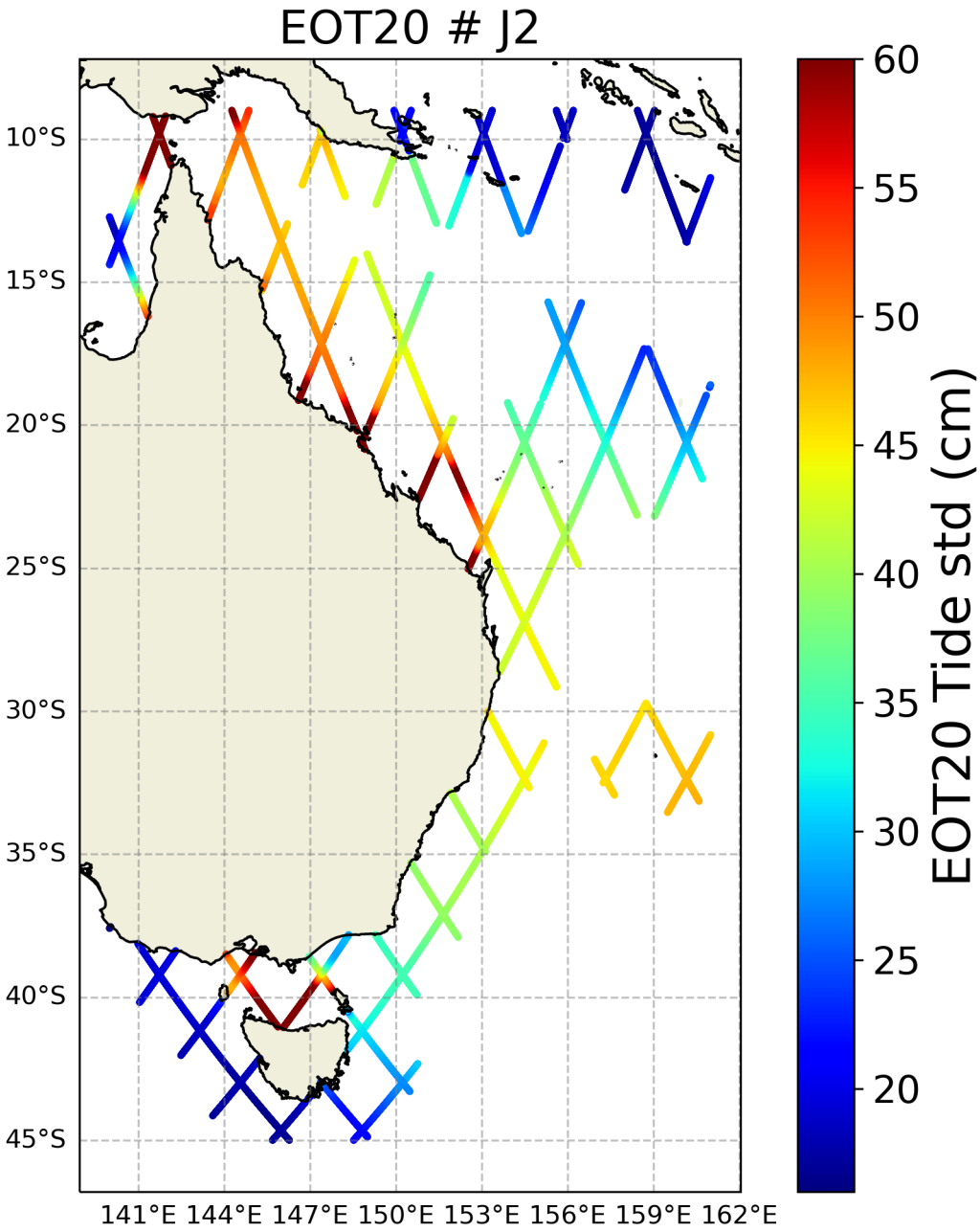

Figure 44 – Spatial coherence analysis of the std of the EOT20 version of Tide variable

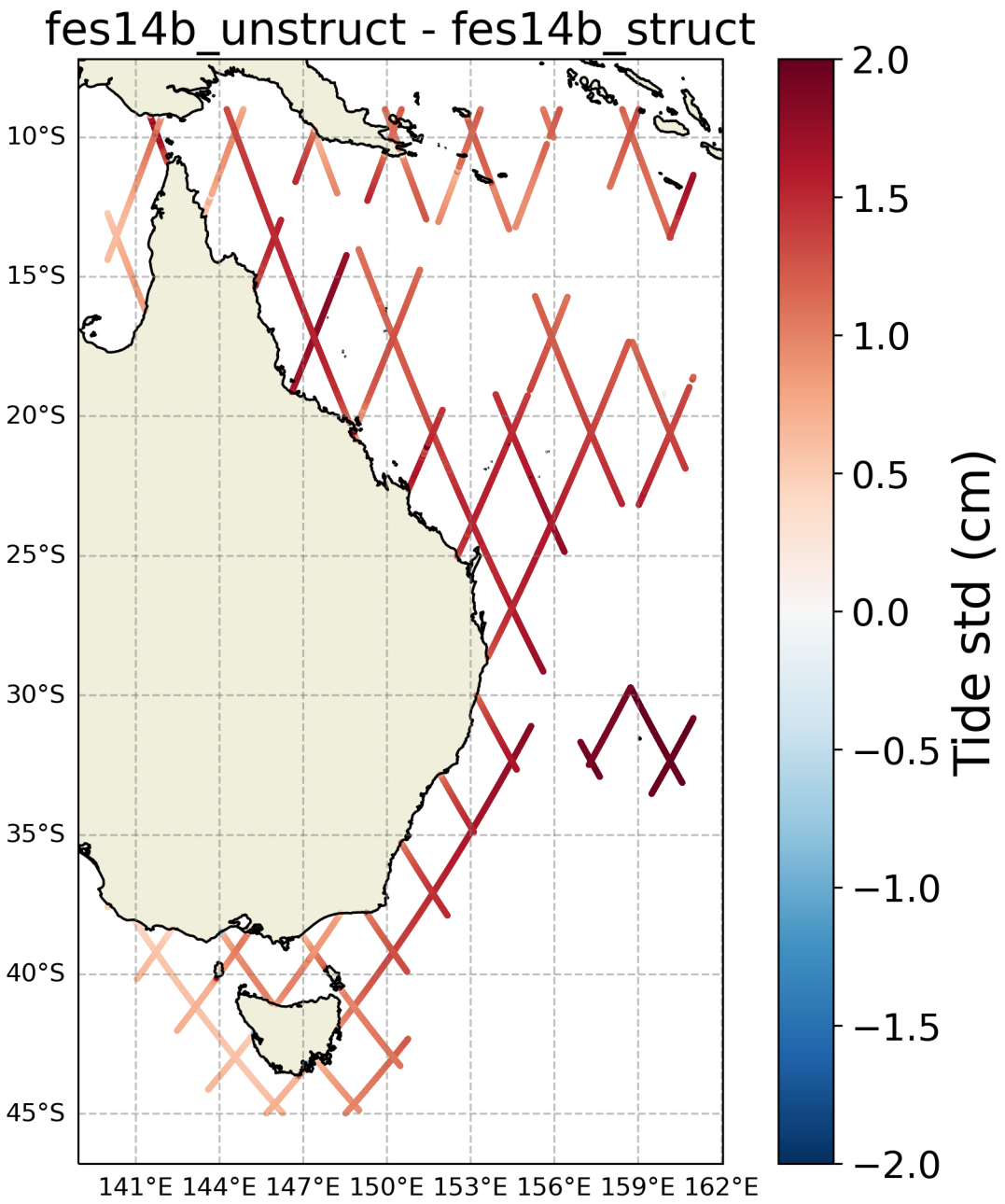

FIGURE 45 – Spatial coherence analysis of the Difference in Tide 's std between fes14b_unstruct and fes14b_struct

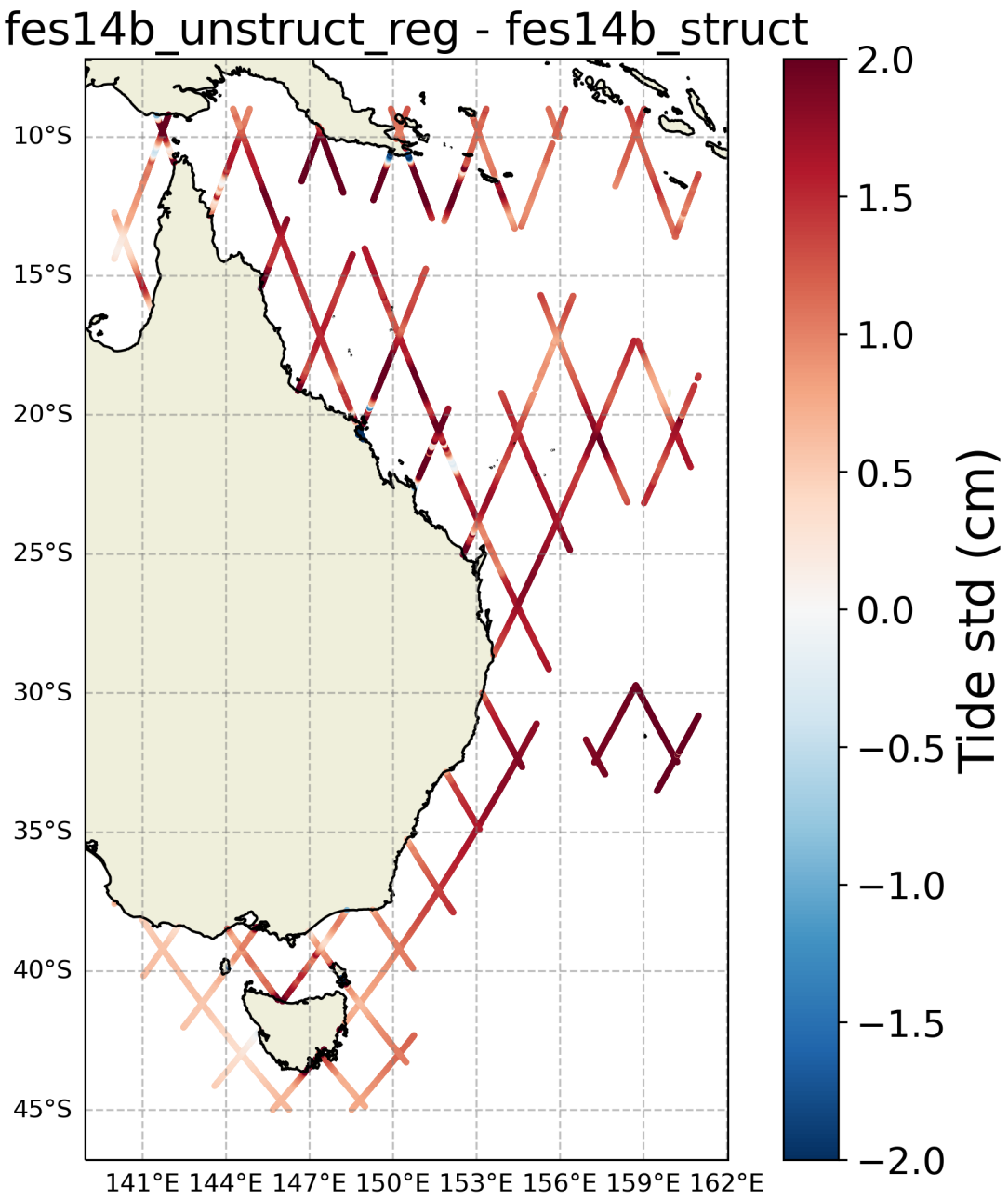

FIGURE 46 – Spatial coherence analysis of the Difference in Tide 's std between fes14b_unstruct_reg and fes14b_struct

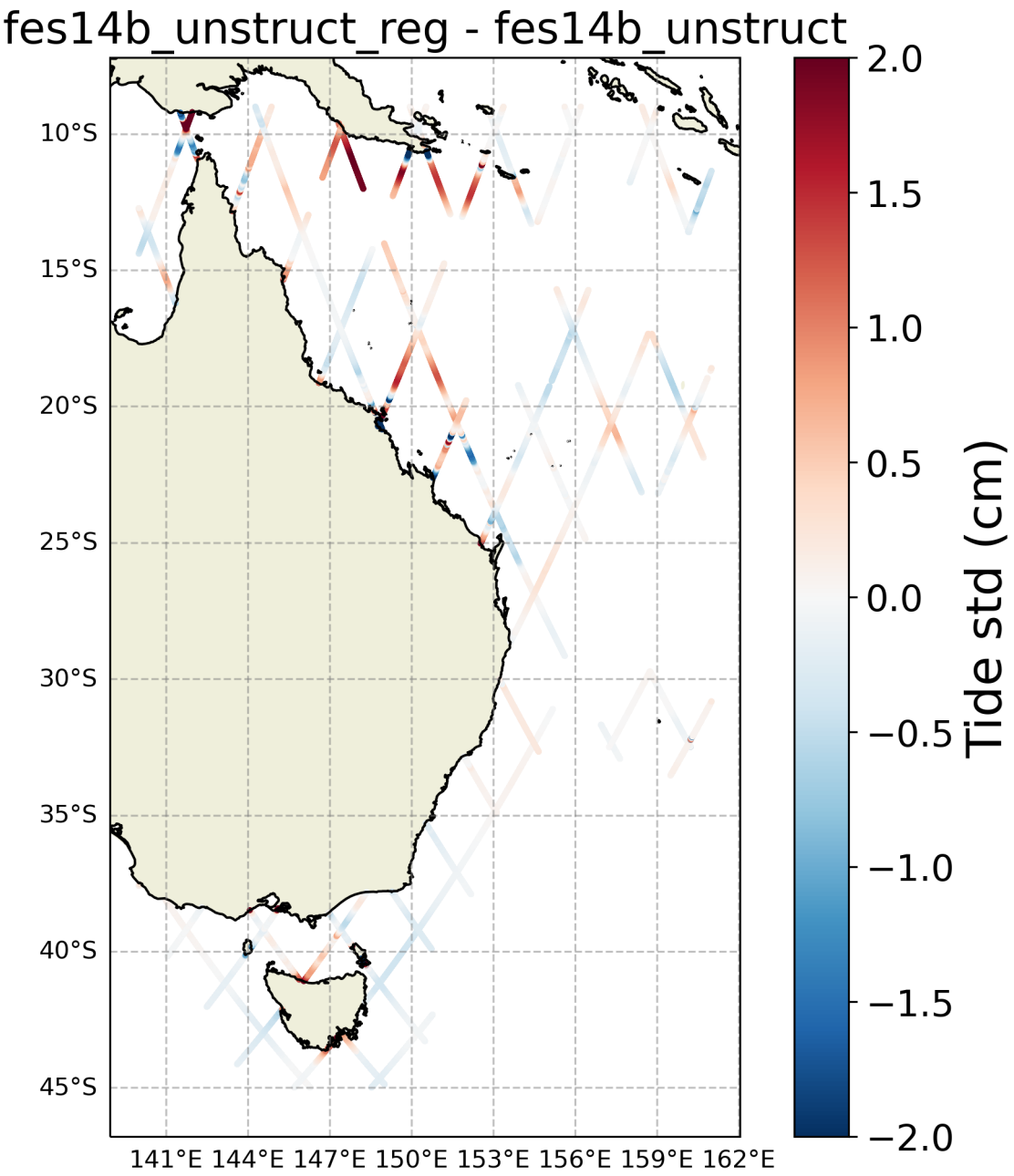

FIGURE 47 – Spatial coherence analysis of the Difference in Tide 's std between fes14b_unstruct_reg and fes14b_unstruct

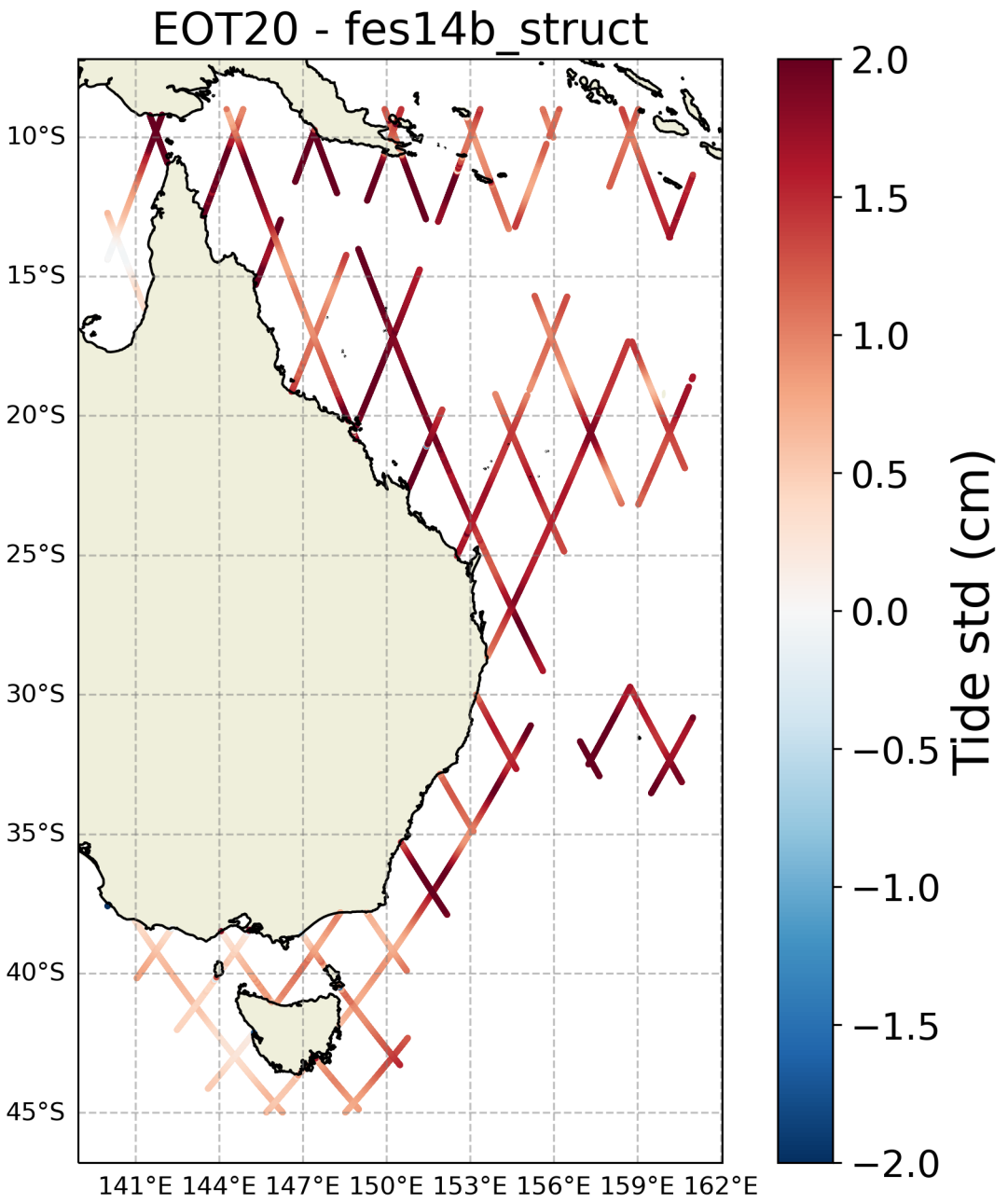

FIGURE 48 – Spatial coherence analysis of the Difference in Tide 's std between EOT20 and fes14b_struct

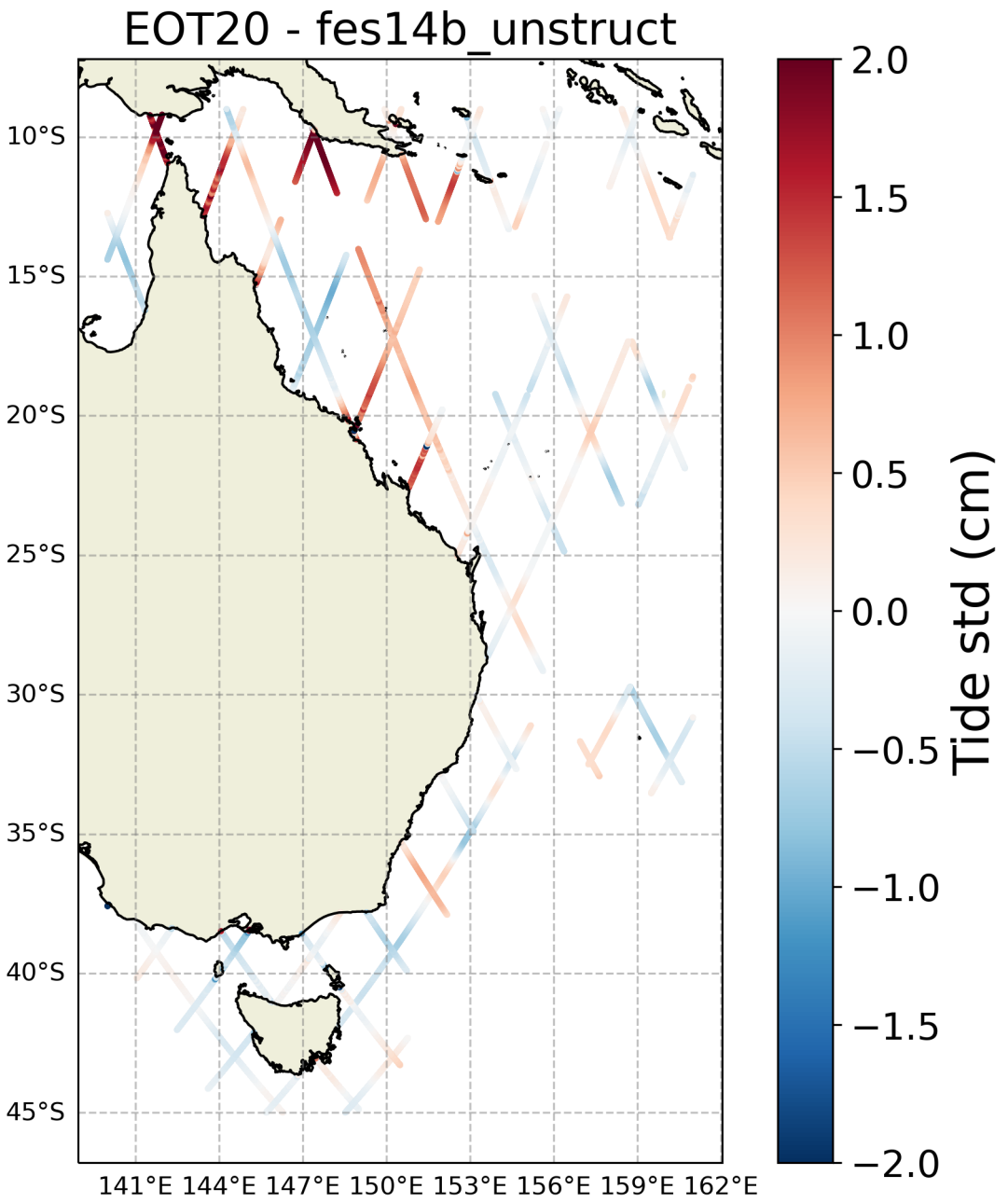

FIGURE 49 – Spatial coherence analysis of the Difference in Tide 's std between EOT20 and fes14b_unstruct

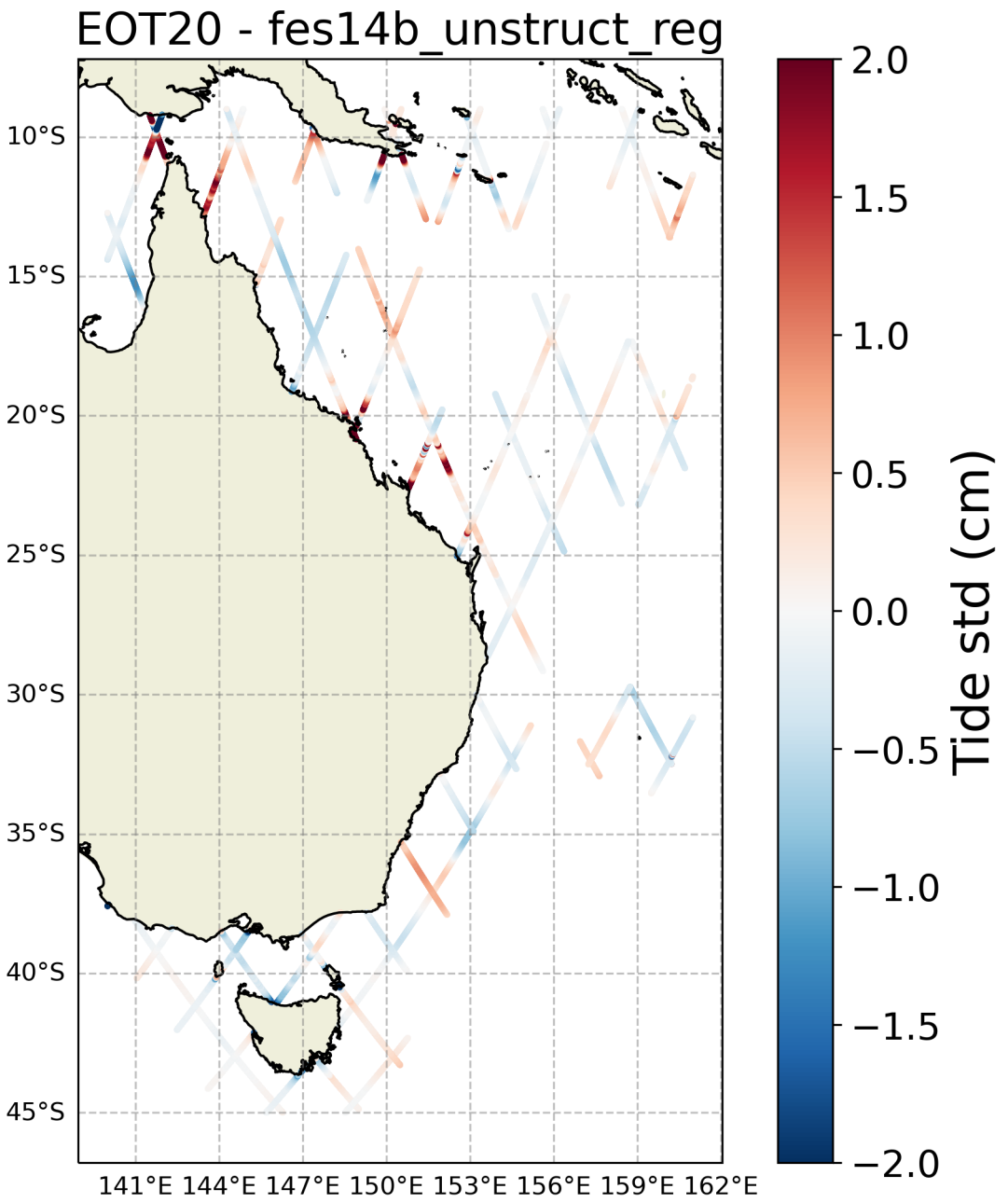

FIGURE 50 – Spatial coherence analysis of the Difference in Tide 's std between EOT20 and fes14b_unstruct_reg

3.2.3 Tide 's mean

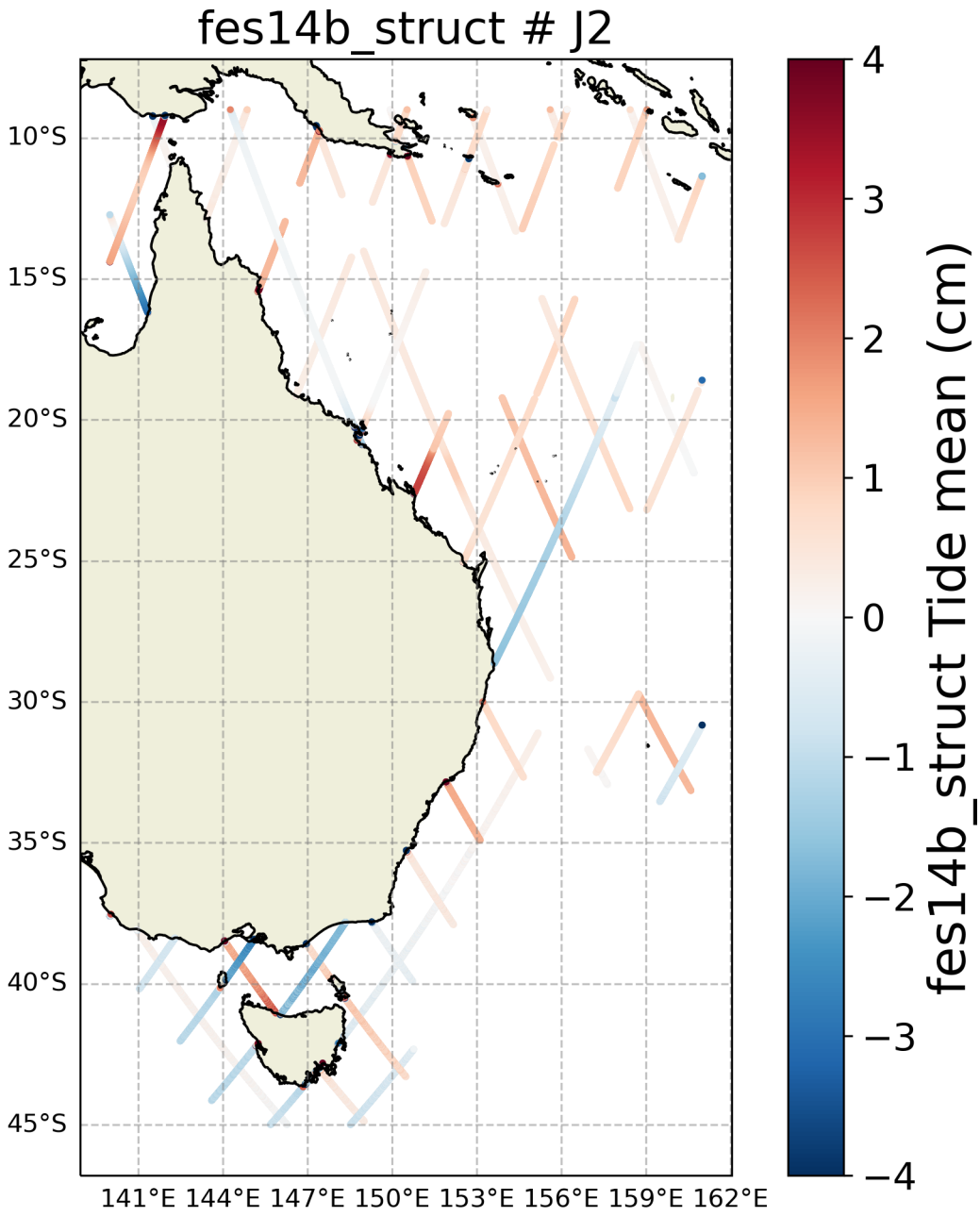

FIGURE 51 – Spatial coherence analysis of the mean of the fes14b_struct version of Tide variable

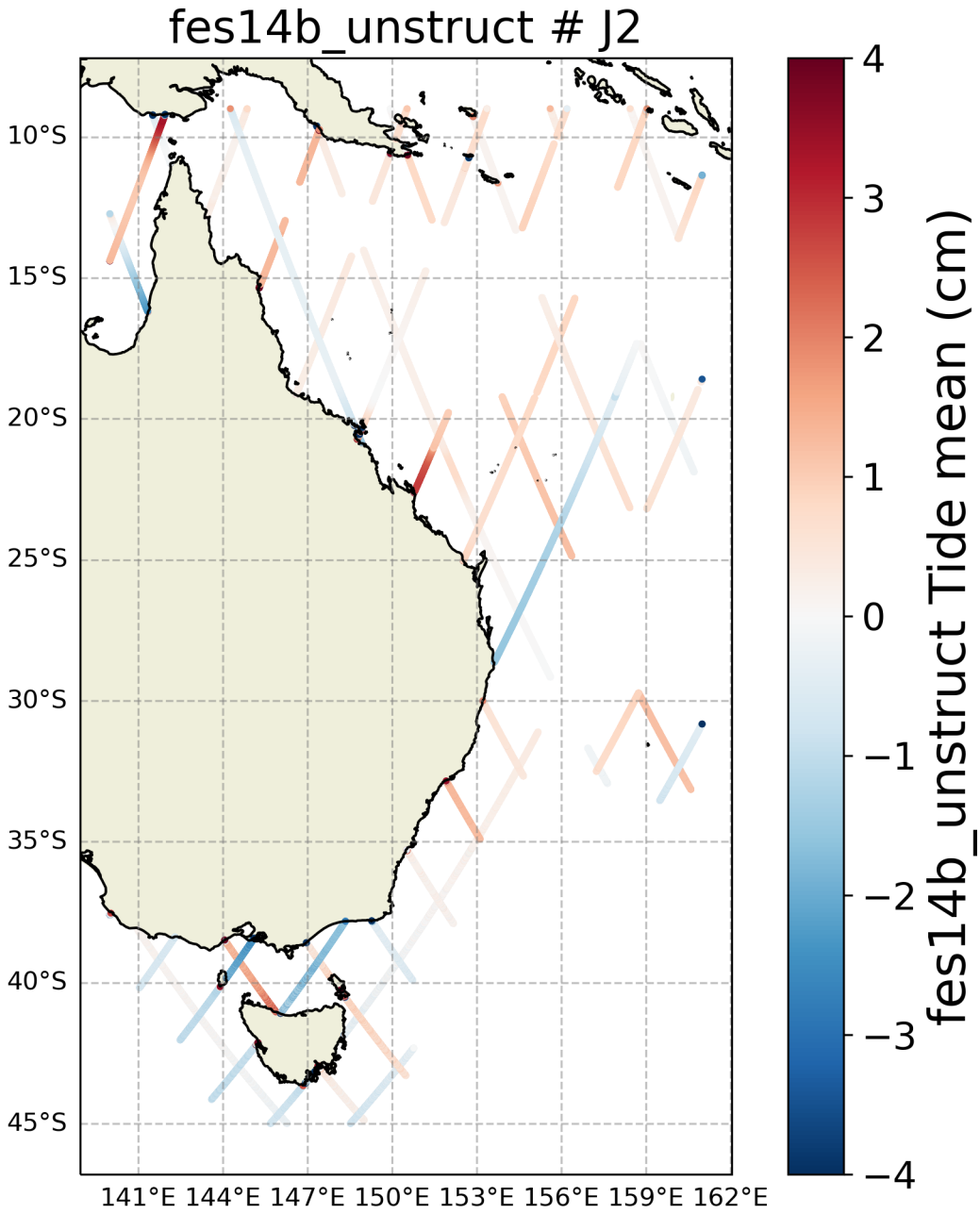

FIGURE 52 – Spatial coherence analysis of the mean of the fes14b_unstruct version of Tide variable

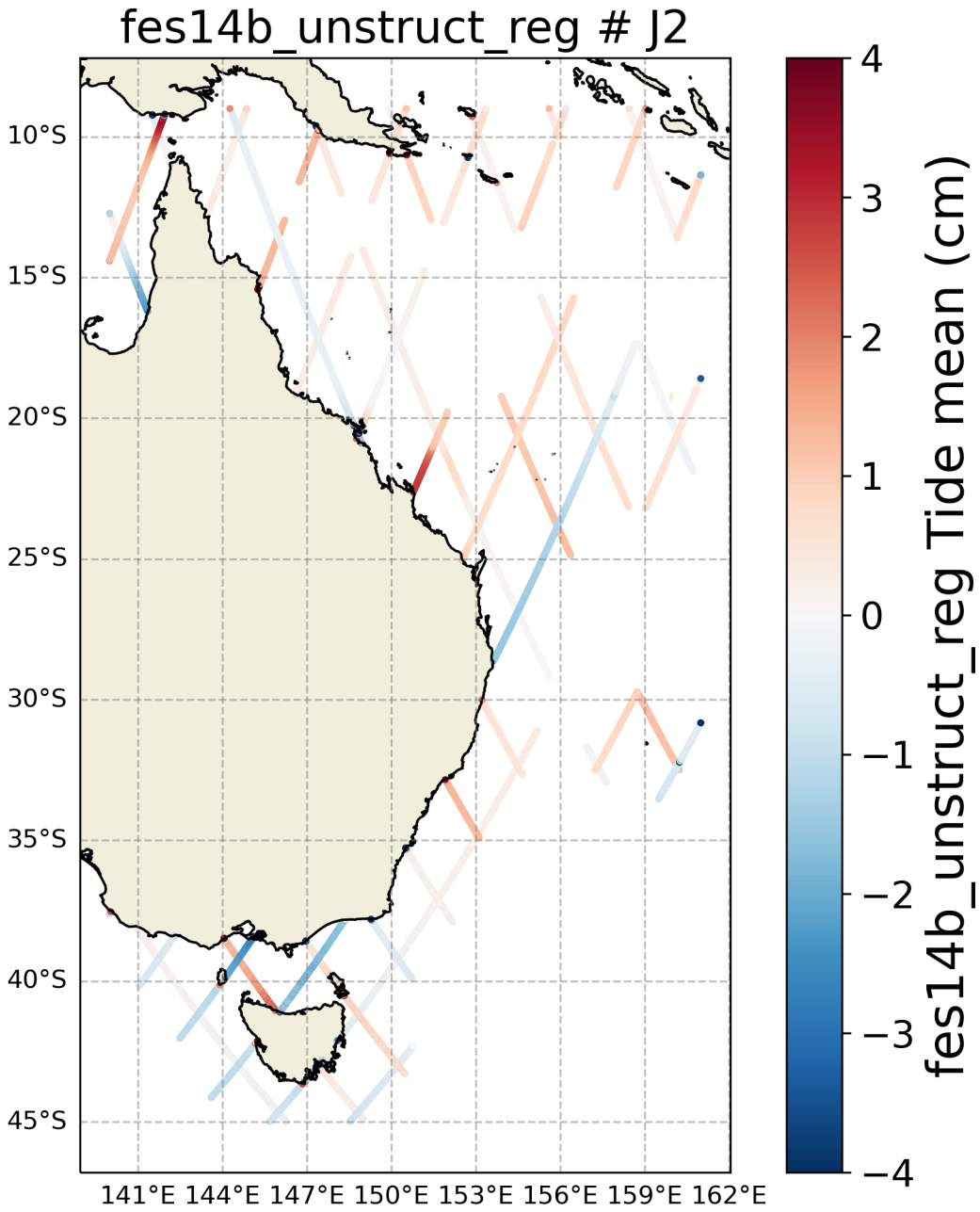

FIGURE 53 – Spatial coherence analysis of the mean of the fes14b_unstruct_reg version of Tide variable

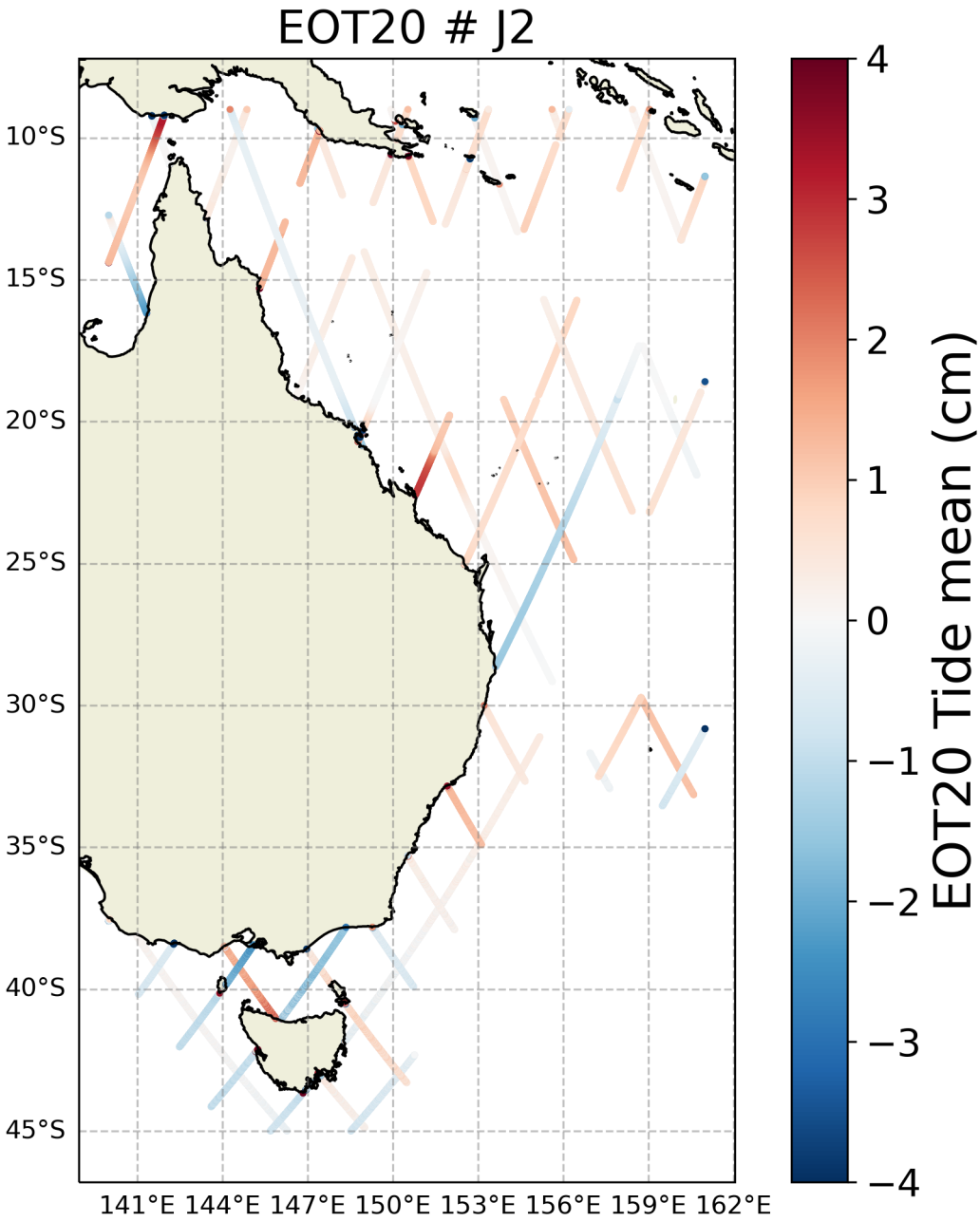

FIGURE 54 – Spatial coherence analysis of the mean of the EOT20 version of Tide variable

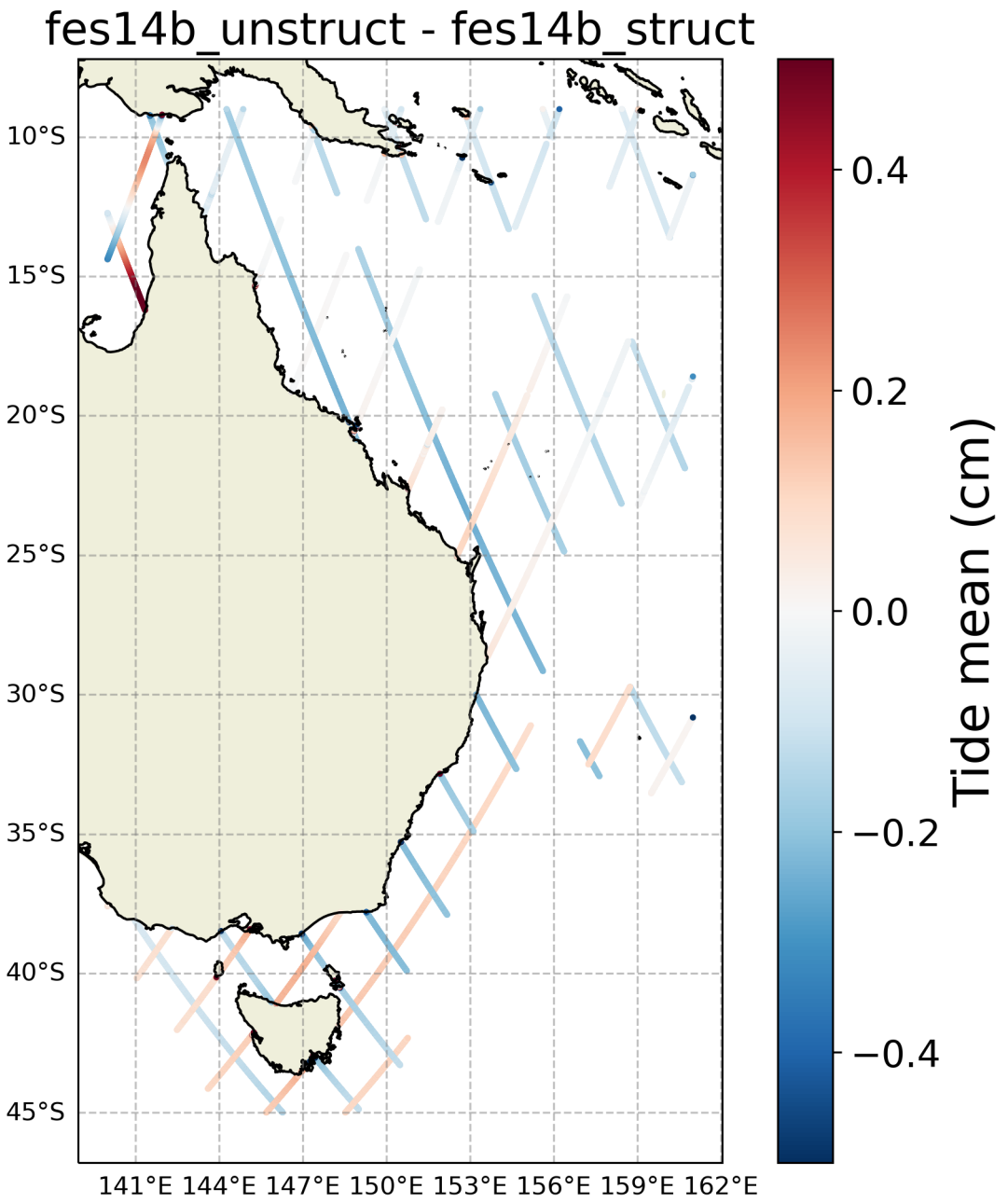

FIGURE 55 – Spatial coherence analysis of the Difference in Tide 's mean between fes14b_unstruct and fes14b_struct

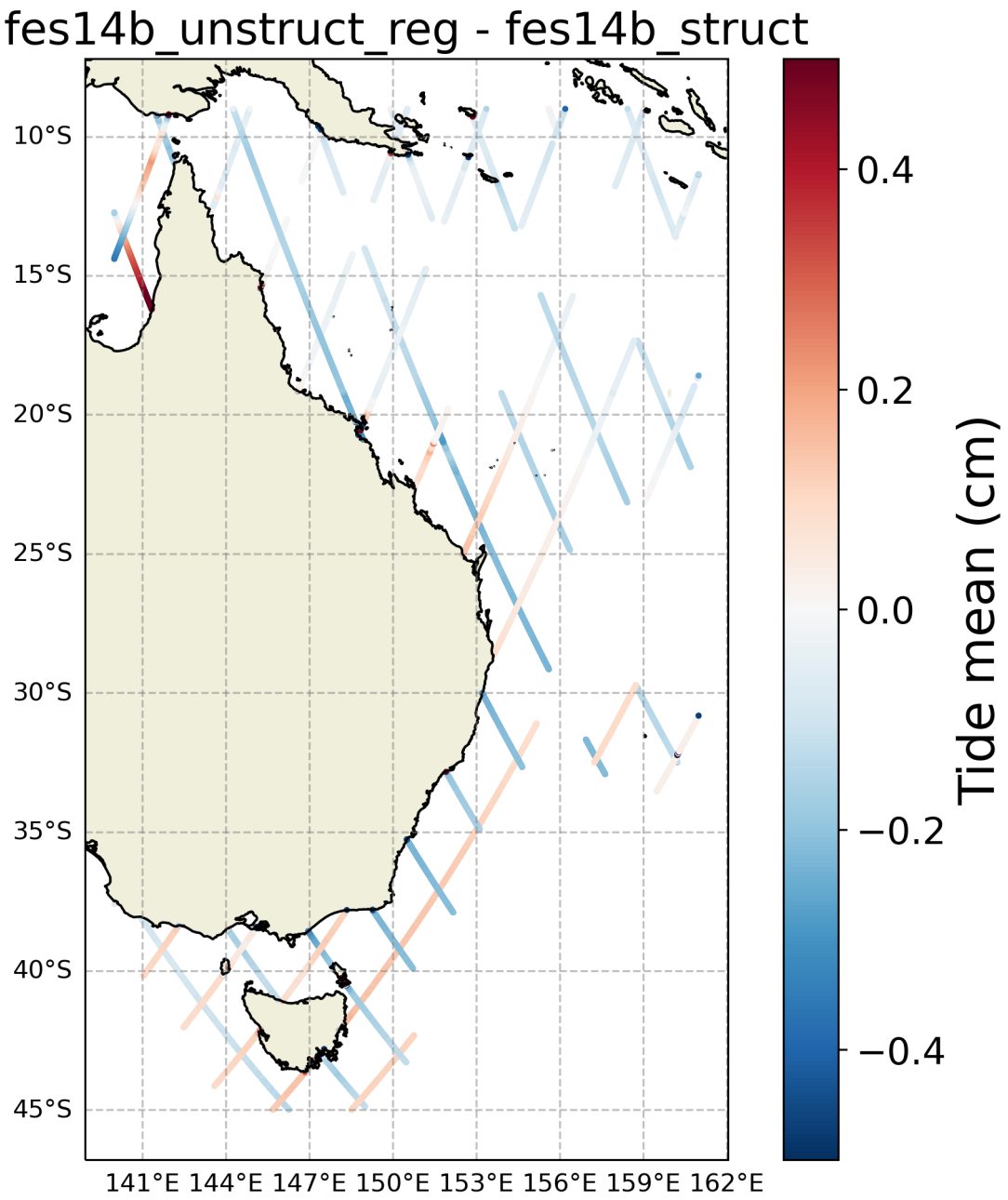

FIGURE 56 – Spatial coherence analysis of the Difference in Tide 's mean between fes14b_unstruct_reg and fes14b_struct

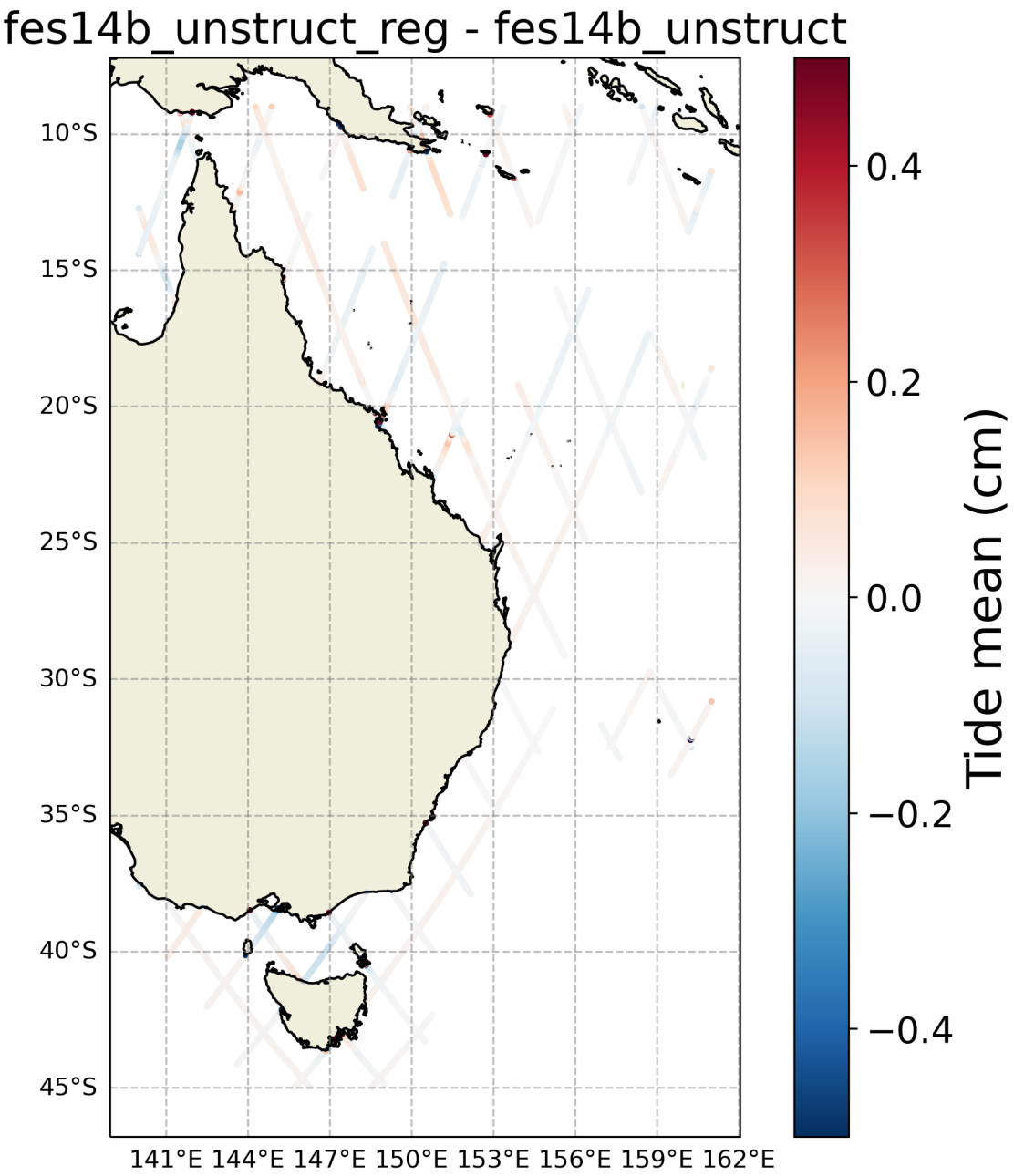

FIGURE 57 – Spatial coherence analysis of the Difference in Tide 's mean between fes14b_unstruct_reg and fes14b_unstruct

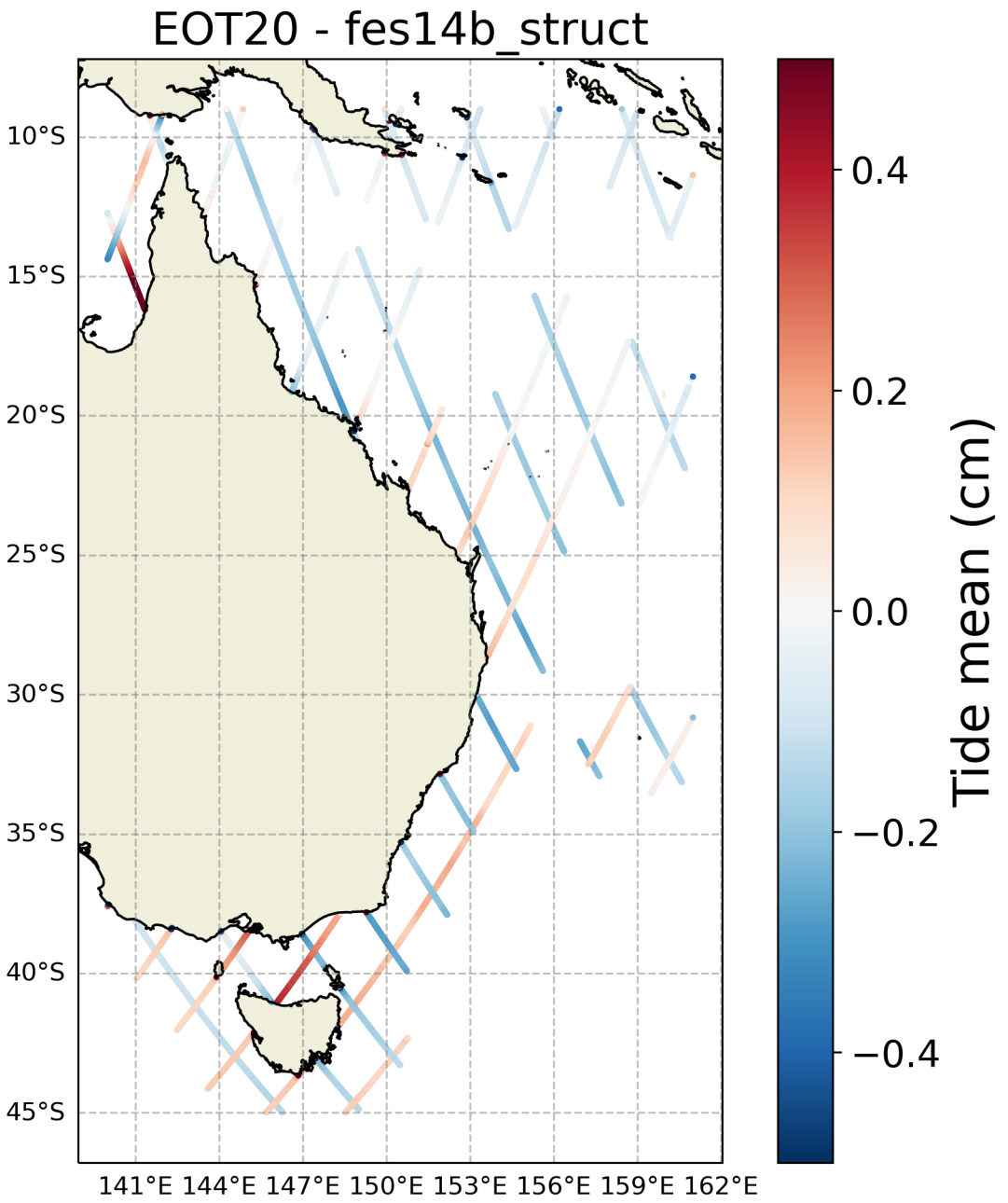

FIGURE 58 – Spatial coherence analysis of the Difference in Tide 's mean between EOT20 and fes14b_struct

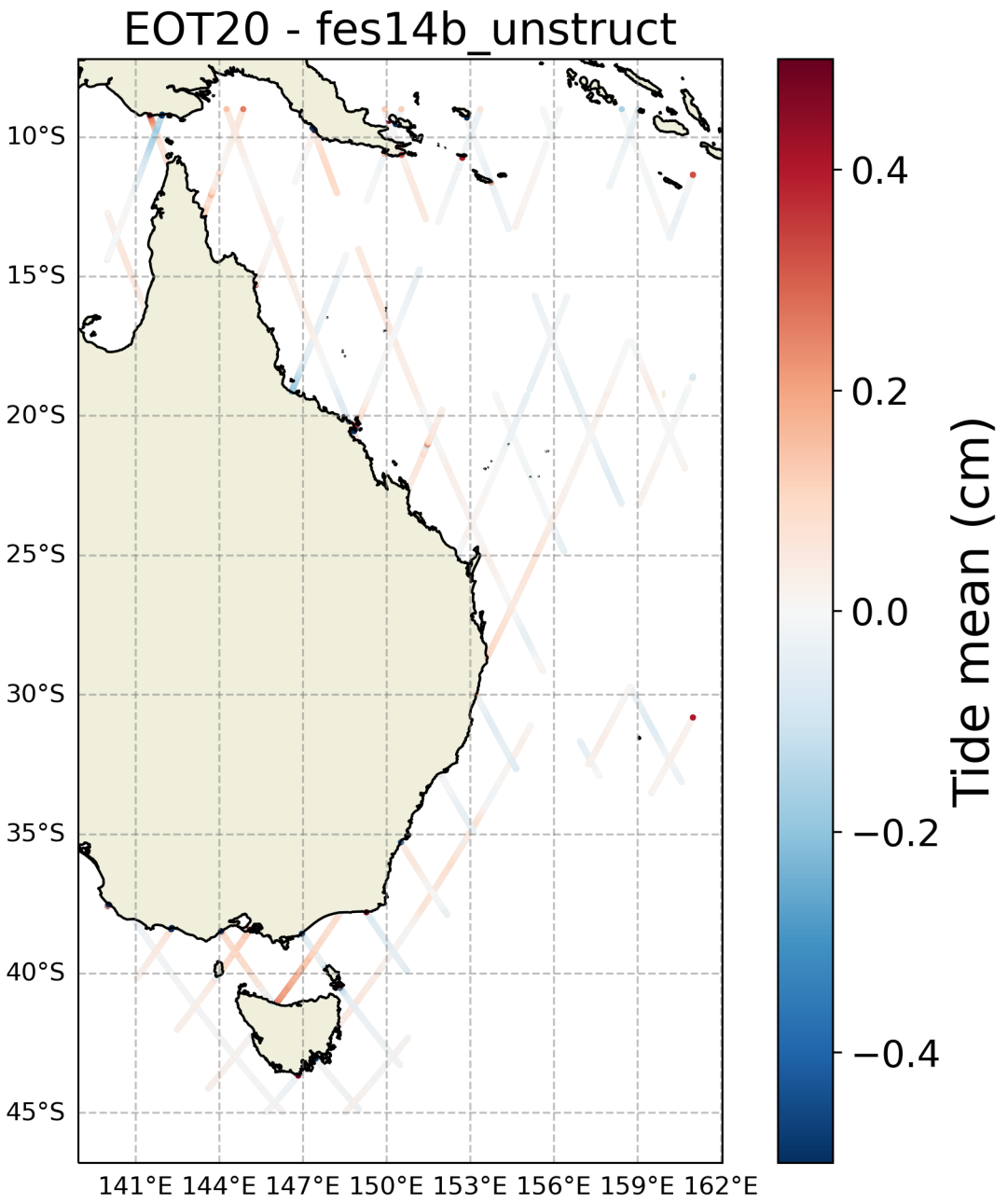

FIGURE 59 – Spatial coherence analysis of the Difference in Tide 's mean between EOT20 and fes14b_unstruct

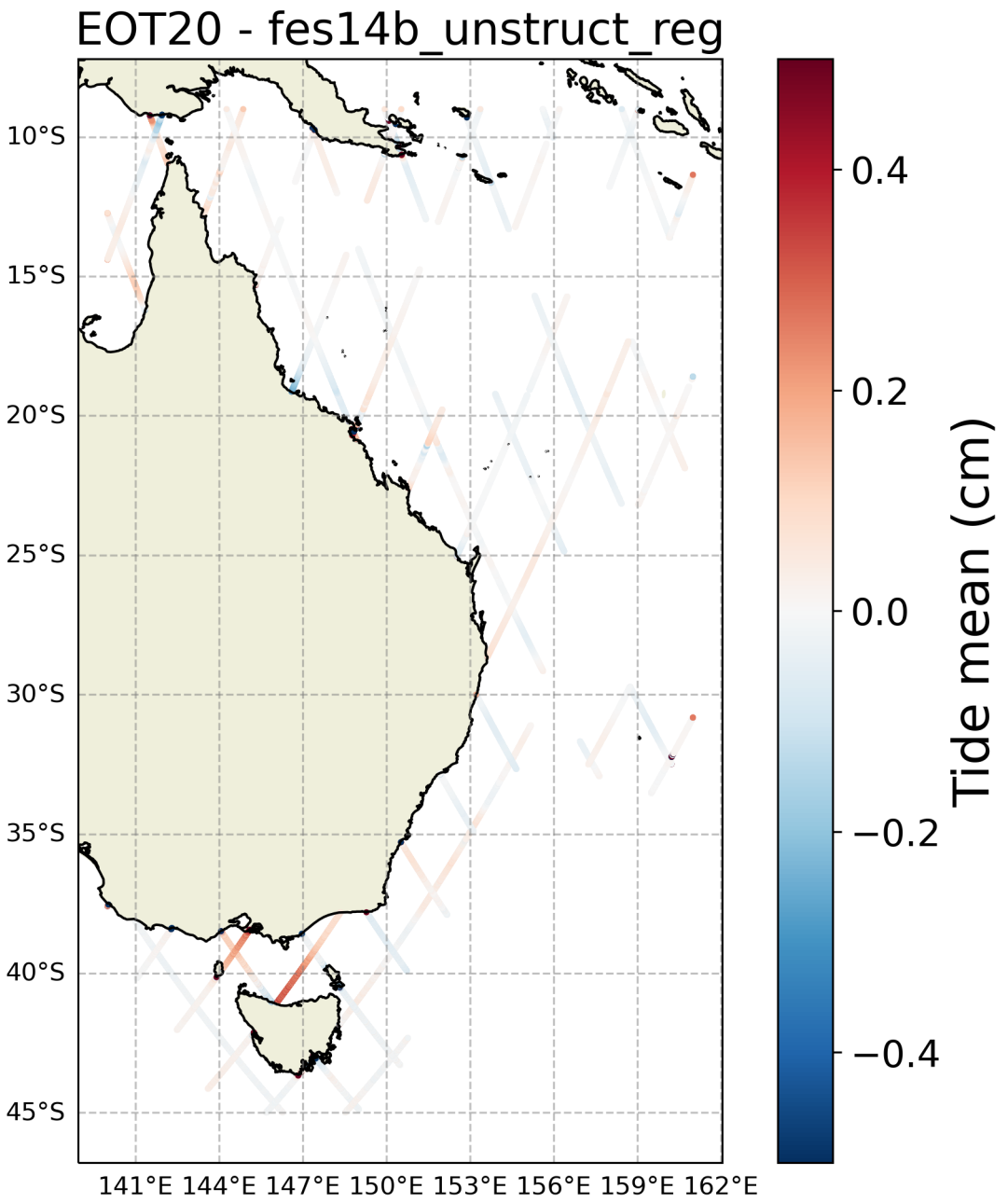

FIGURE 60 – Spatial coherence analysis of the Difference in Tide 's mean between EOT20 and fes14b_unstruct_reg

4 Histograms

4.1 Tide

	min (cm)	max (cm)	mean (cm)	std (cm)
fes14b_struct	-229.1	255.66	0.068	41.839
fes14b_unstruct	-232.887	257.713	0.033	43.059
fes14b_unstruct_reg	-226.986	236.804	0.025	43.067
EOT20	-240.005	258.708	0.046	42.839

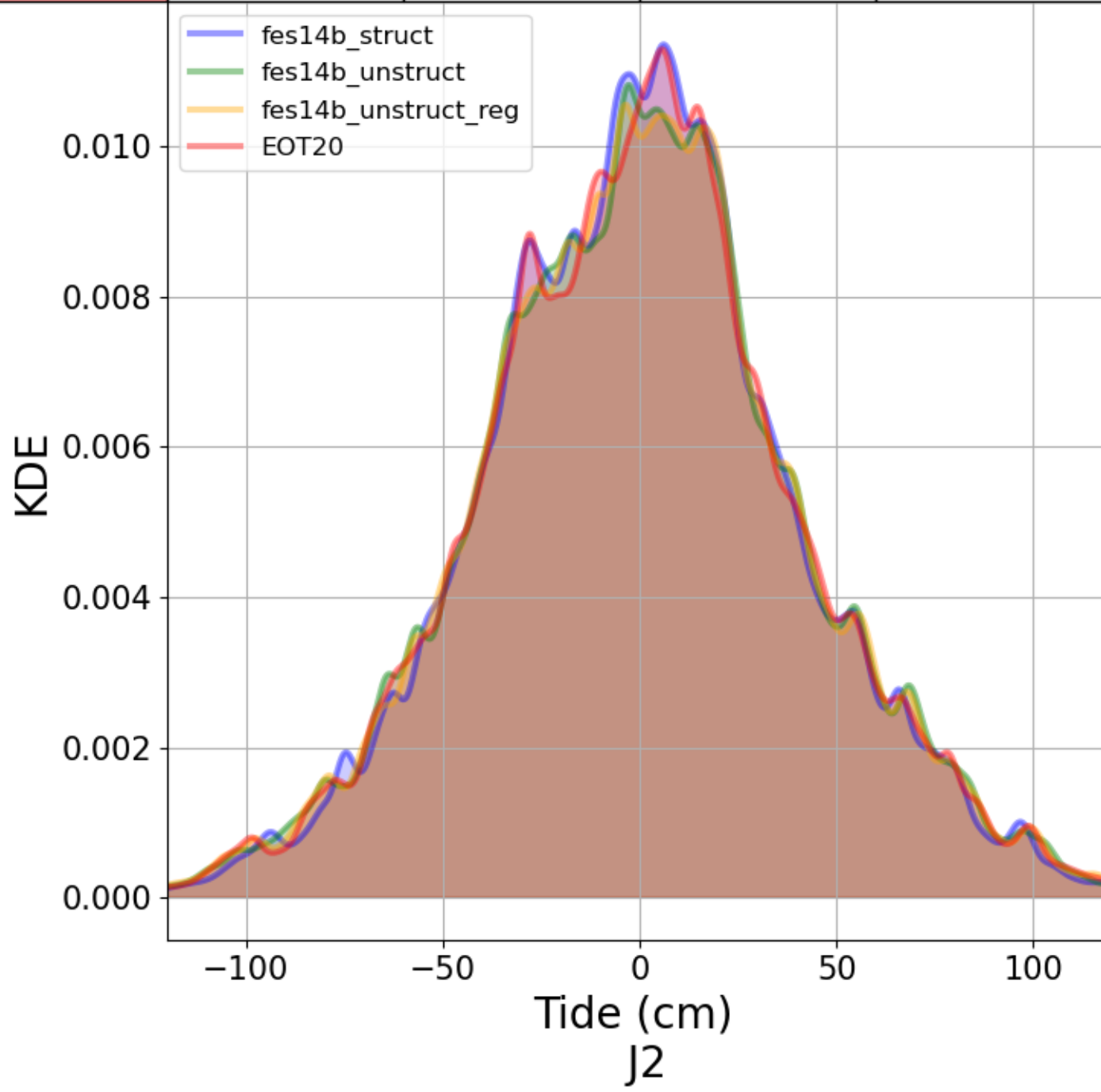

Figure 61 – Histogram of each of Tide version

	min (cm)	max (cm)	mean (cm)	std (c
4b_unstruct - fes14b_struct	-13.573	13.617	-0.055	2
4b_unstruct_reg - fes14b_struct	-63.317	62.75	-0.052	
20 - fes14b_struct	-35.317	36.203	-0.047	3
4b_unstruct_reg - fes14b_unstruct	-66.43	65.81	0.002	
20 - fes14b_unstruct	-32.313	37.637	0.008	3
20 - fes14b_unstruct_reg	-58.124	63.718	0.006	3

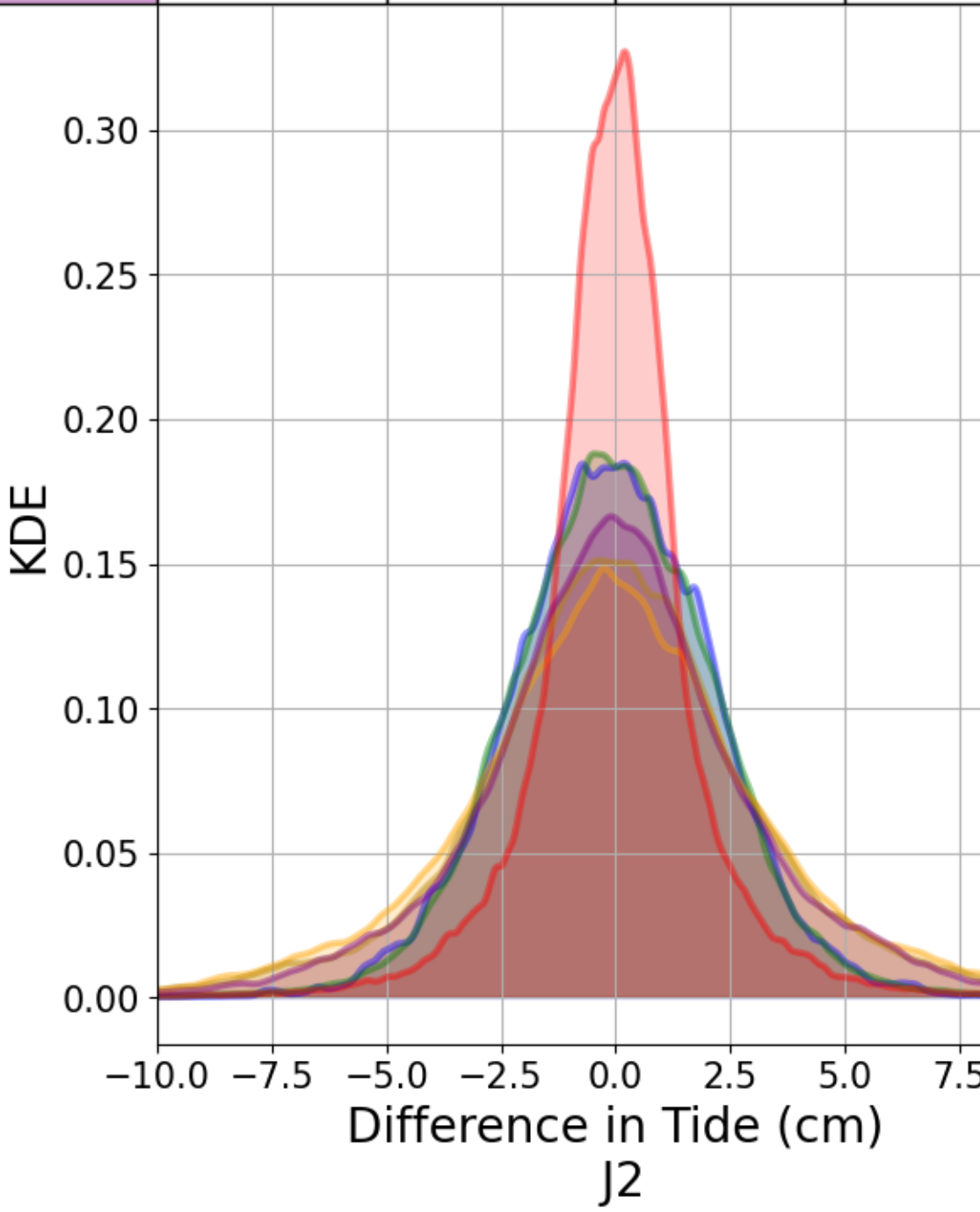

FIGURE 62 – Histograms of difference of each Tide version and reference one

	min (cm)	max (cm)	mean (cm)	std (cm)
fes14b_struct	15.186	129.117	37.216	15.905
fes14b_unstruct	16.202	130.908	38.458	15.988
fes14b_unstruct_reg	15.853	126.243	38.492	16.034
EOT20	6.996	131.296	38.526	16.066

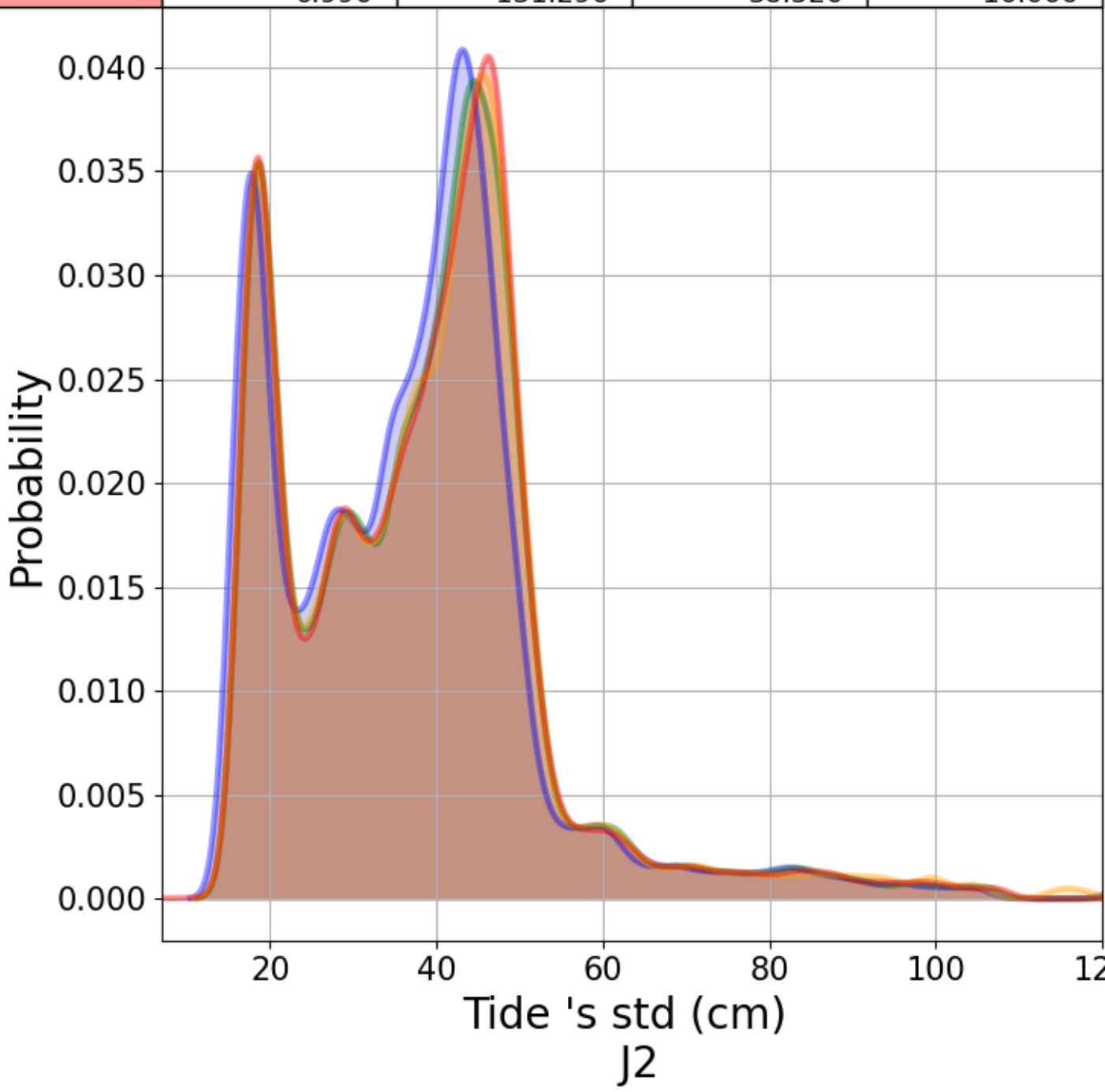

Figure 63 – Histograms of the standard deviation of each Tide version

4.2 sla

5 Along-track analysis

5.1 Tide

5.1.1 Tide 's count

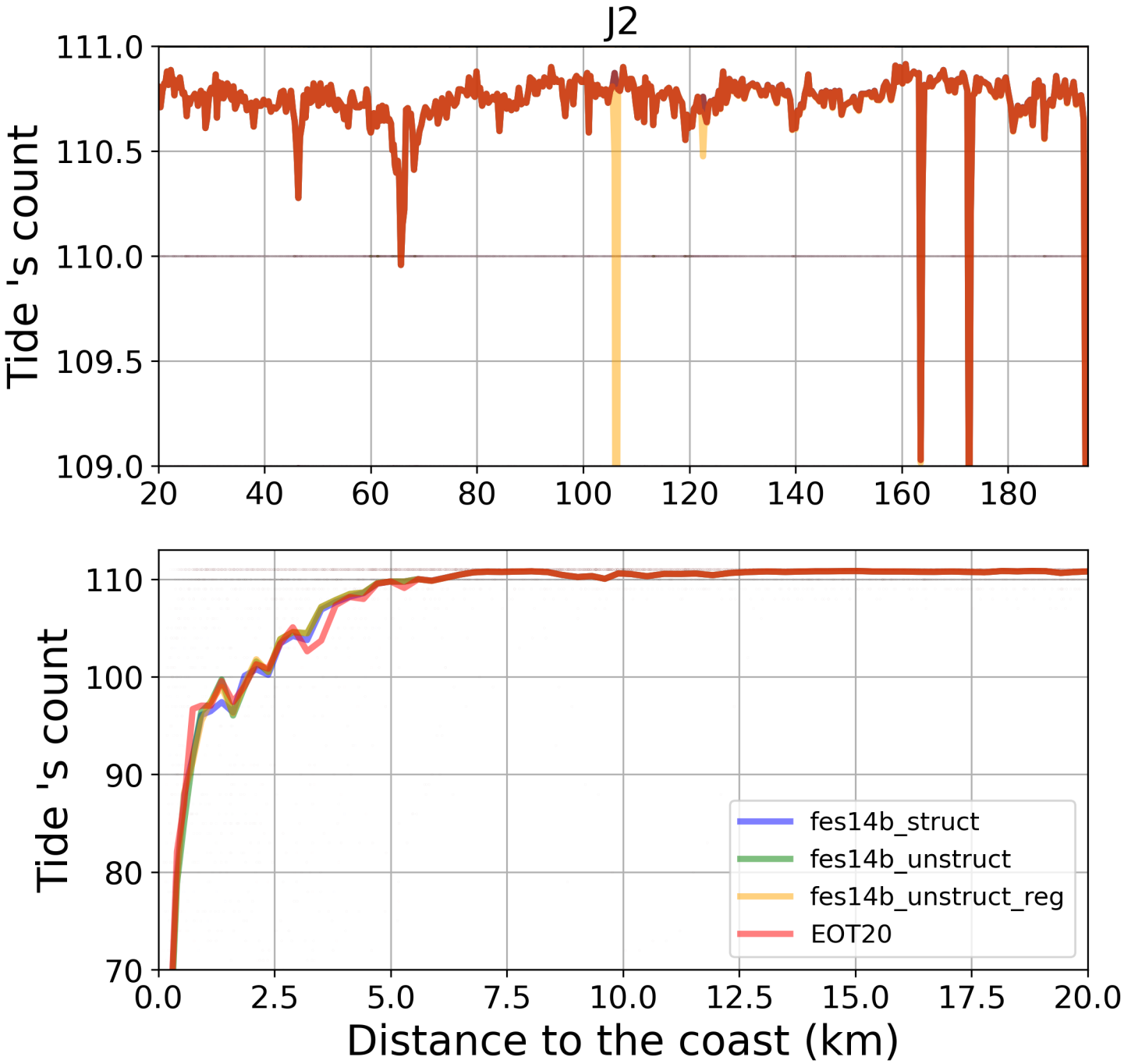

Figure 64 – Along-track analysis of Tide 's count

5.1.2 Tide 's std

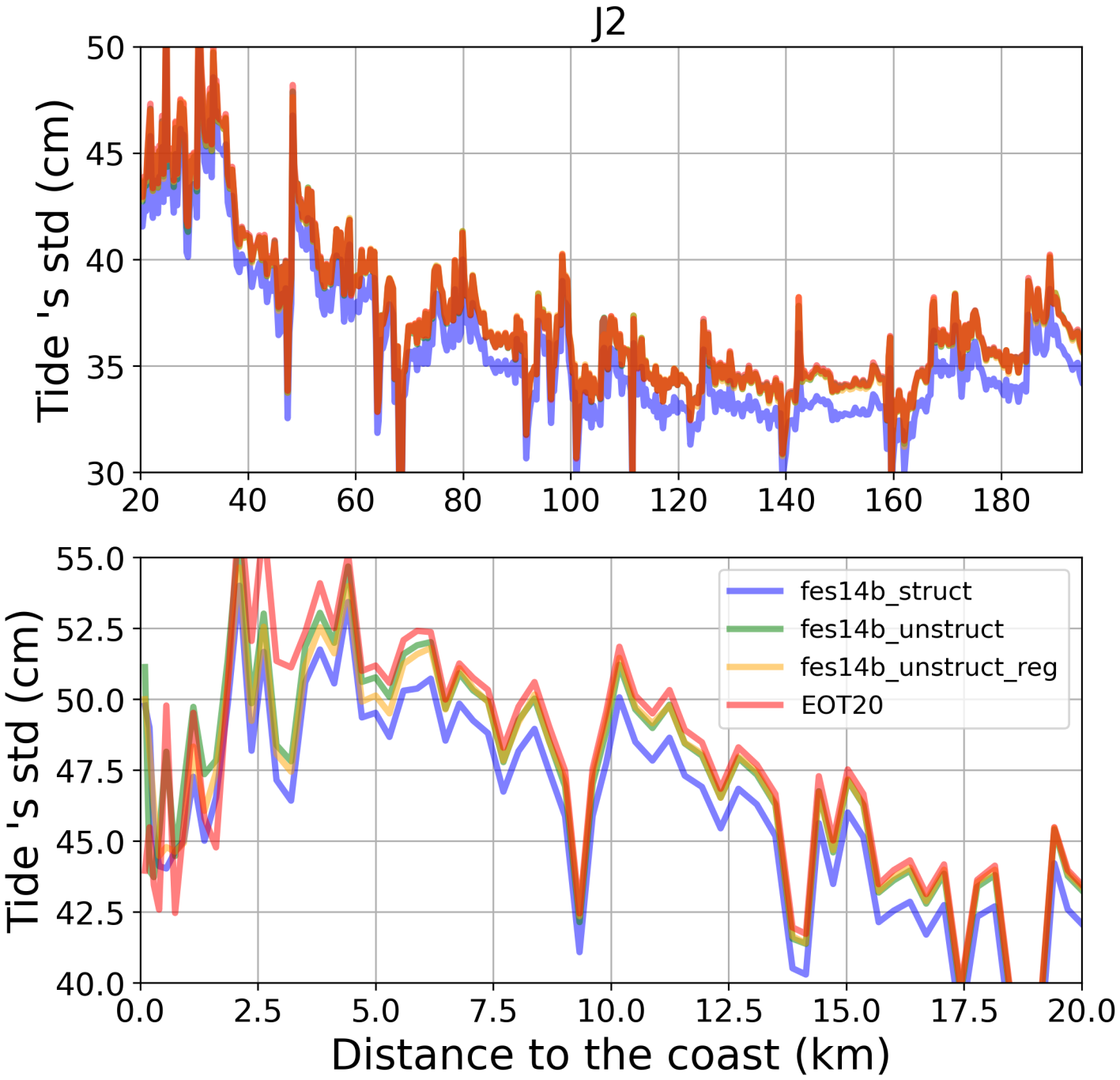

FIGURE 65 – Along-track analysis of Tide 's std

5.1.3 Tide 's mean

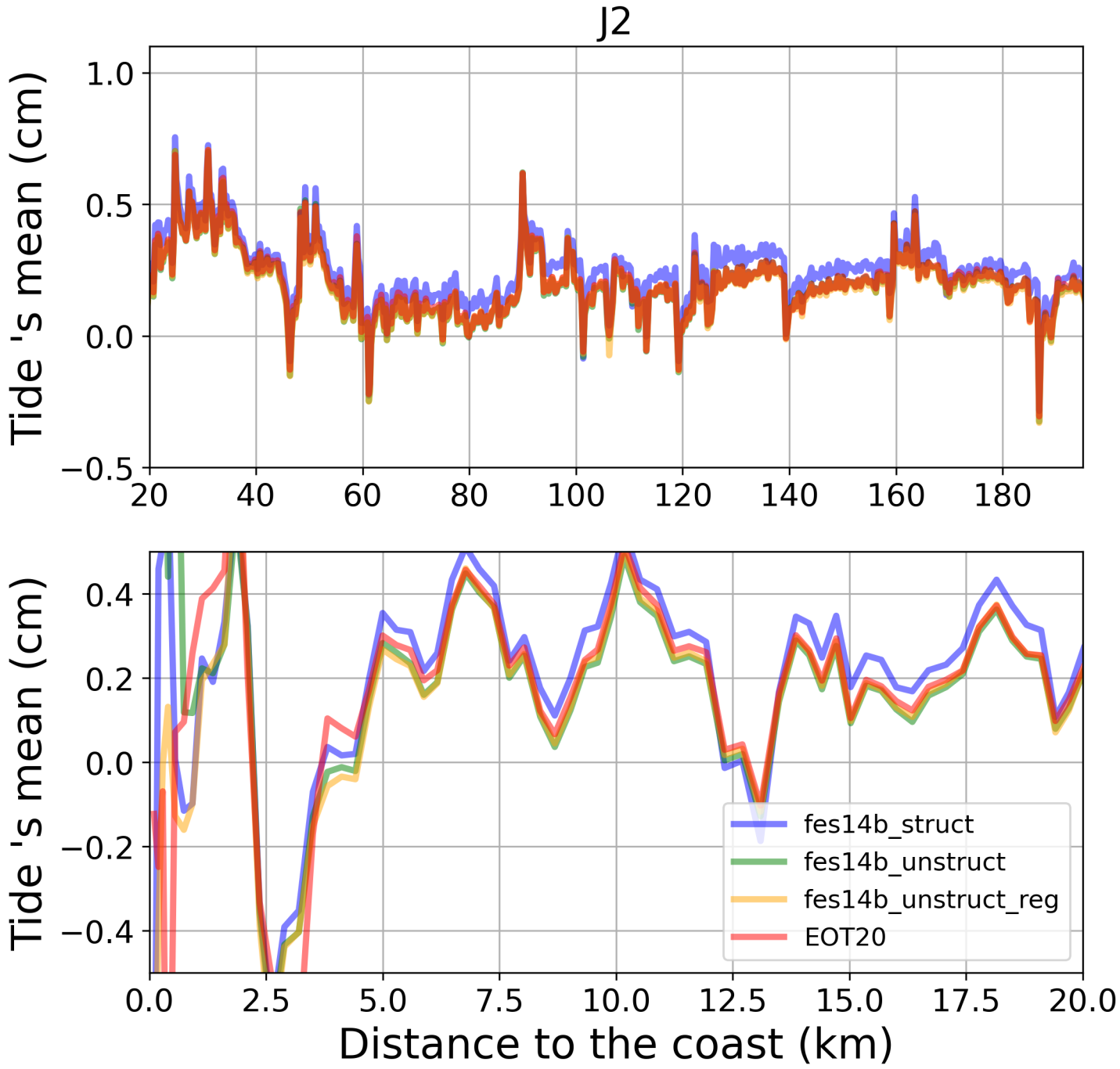

FIGURE 66 – Along-track analysis of Tide 's mean

5.2 sla

5.2.1 sla 's count

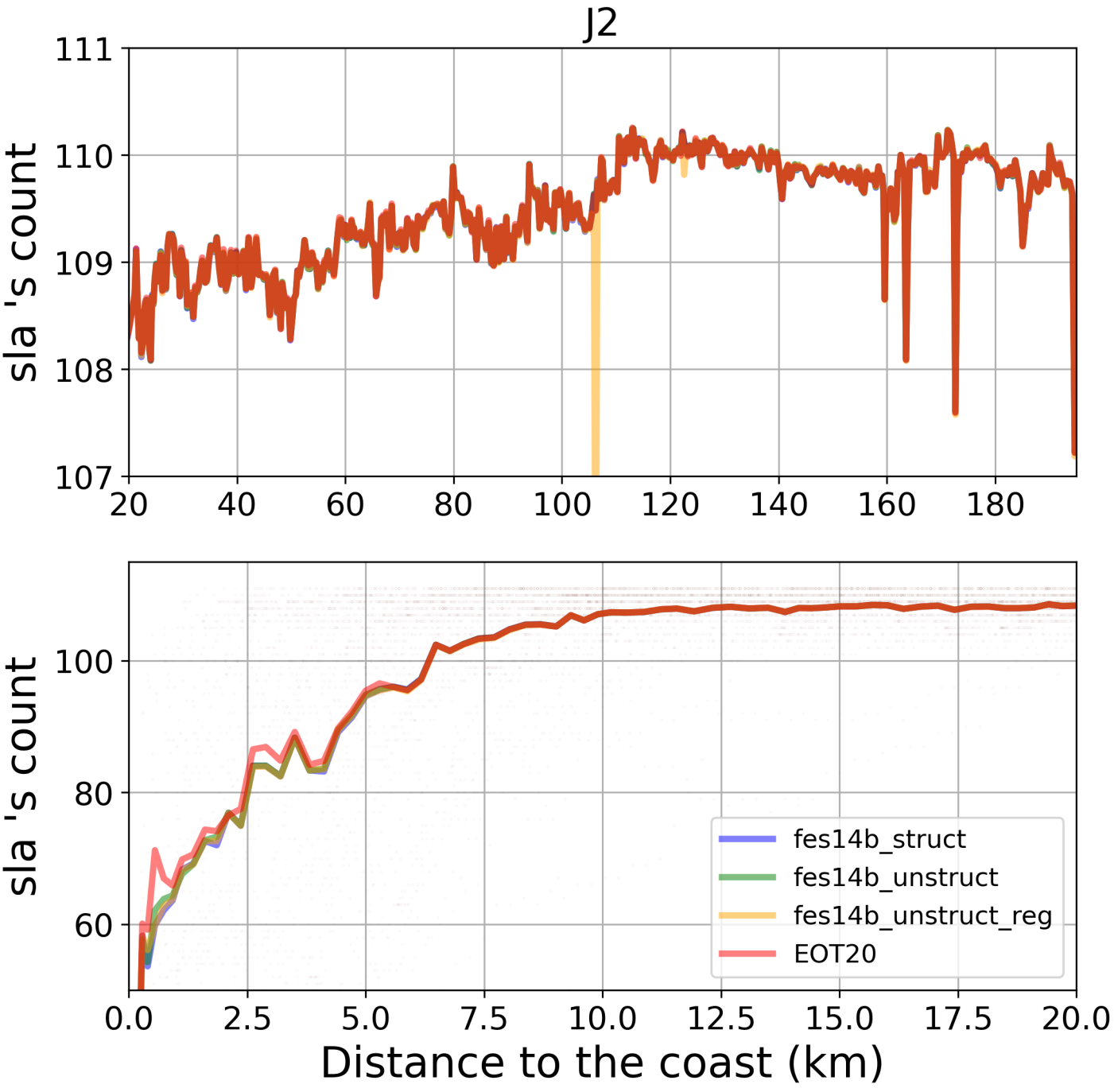

FIGURE 67 – Along-track analysis of sla 's count

5.2.2 sla 's std

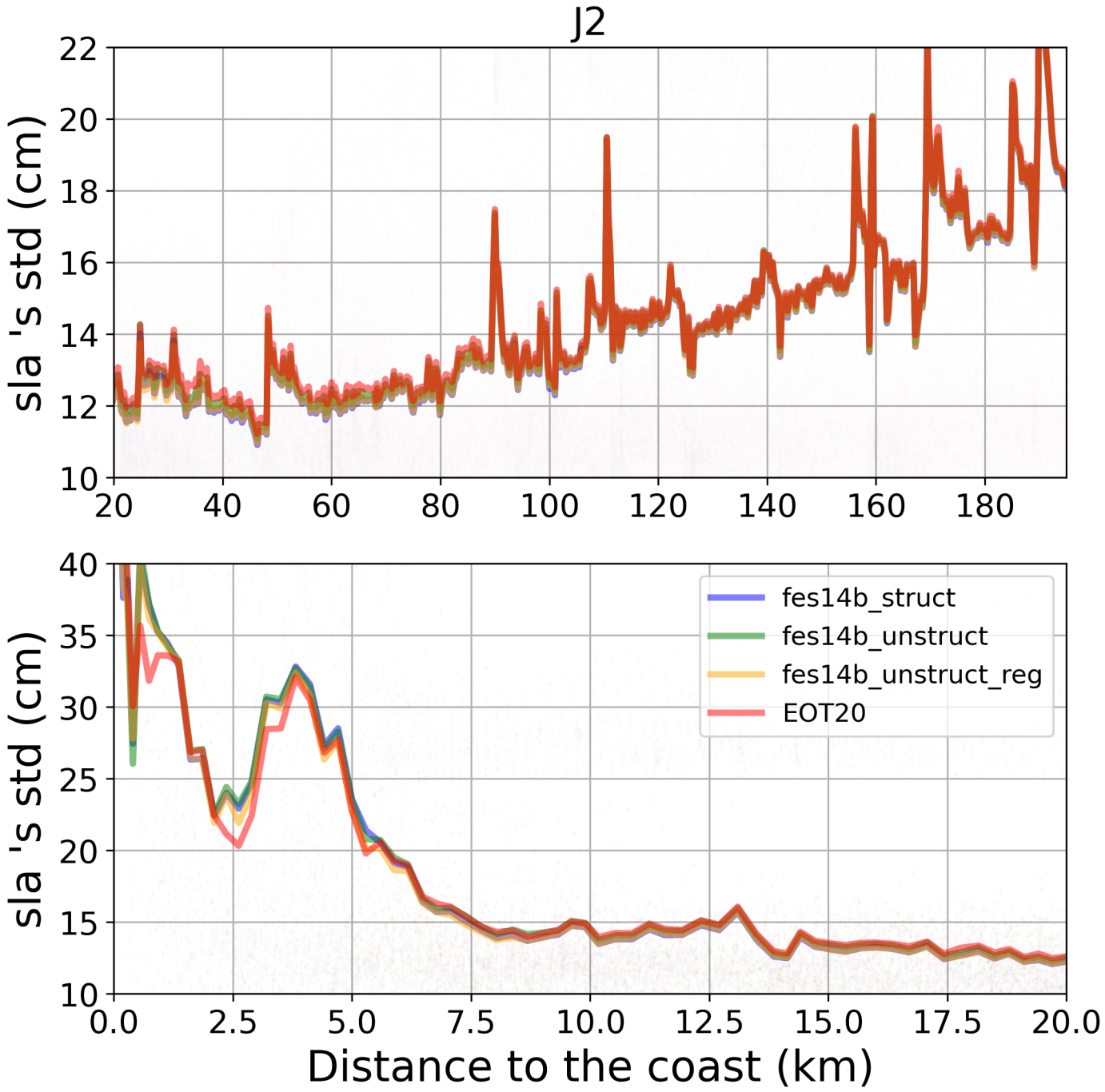

FIGURE 68 – Along-track analysis of sla 's std

5.2.3 sla 's mean

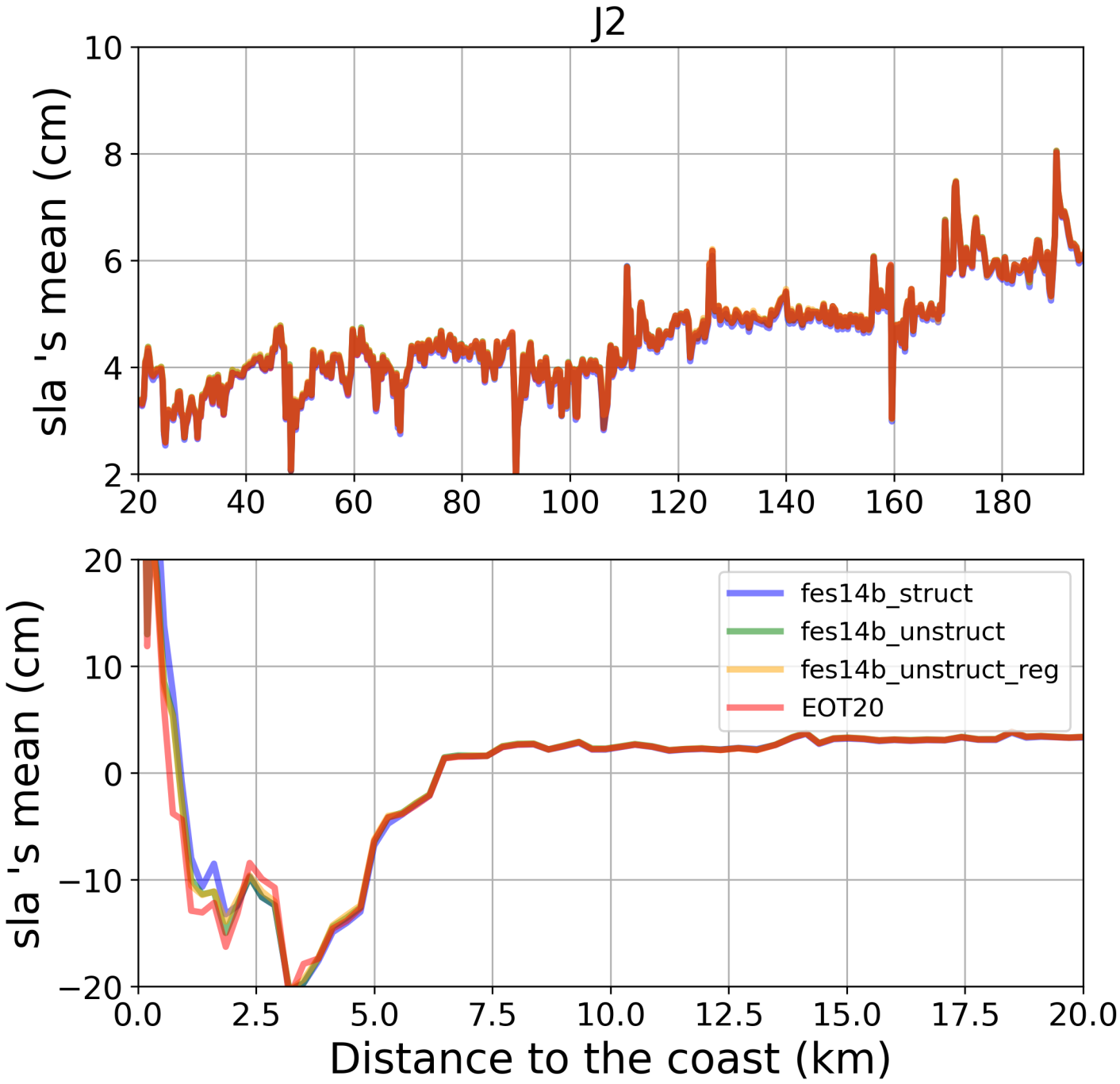

Figure 69 – Along-track analysis of sla 's mean

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 : Lorne_Jetty

- Nearest track to Lorne_Jetty station is the track number track88
- The area of interest is limited by :
  - A circle which it's center is the Lorne_Jetty 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 % Lorne_Jetty tide gauge

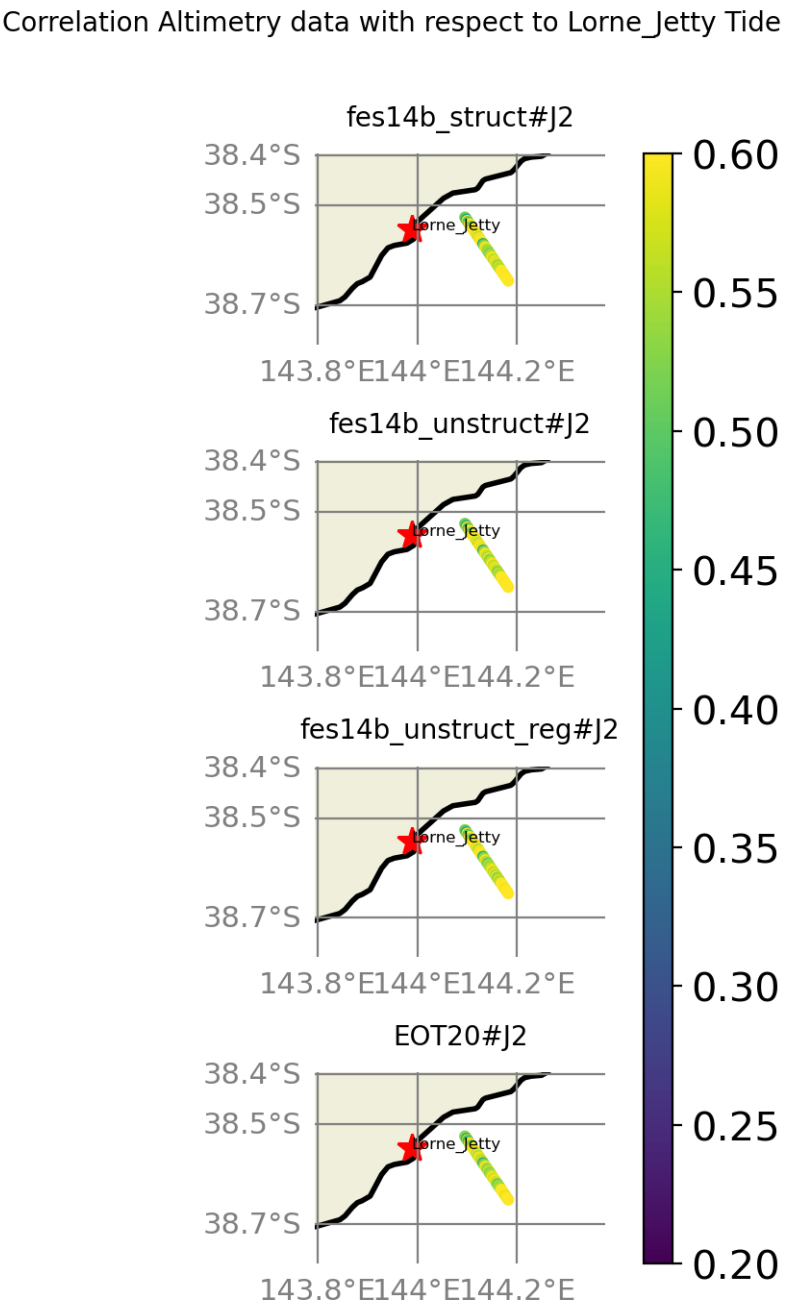

Figure 70 – correlation visualization in maps view % Lorne_Jetty tide gauge

6.1.2 rmsd visualization in maps view % Lorne_Jetty tide gauge

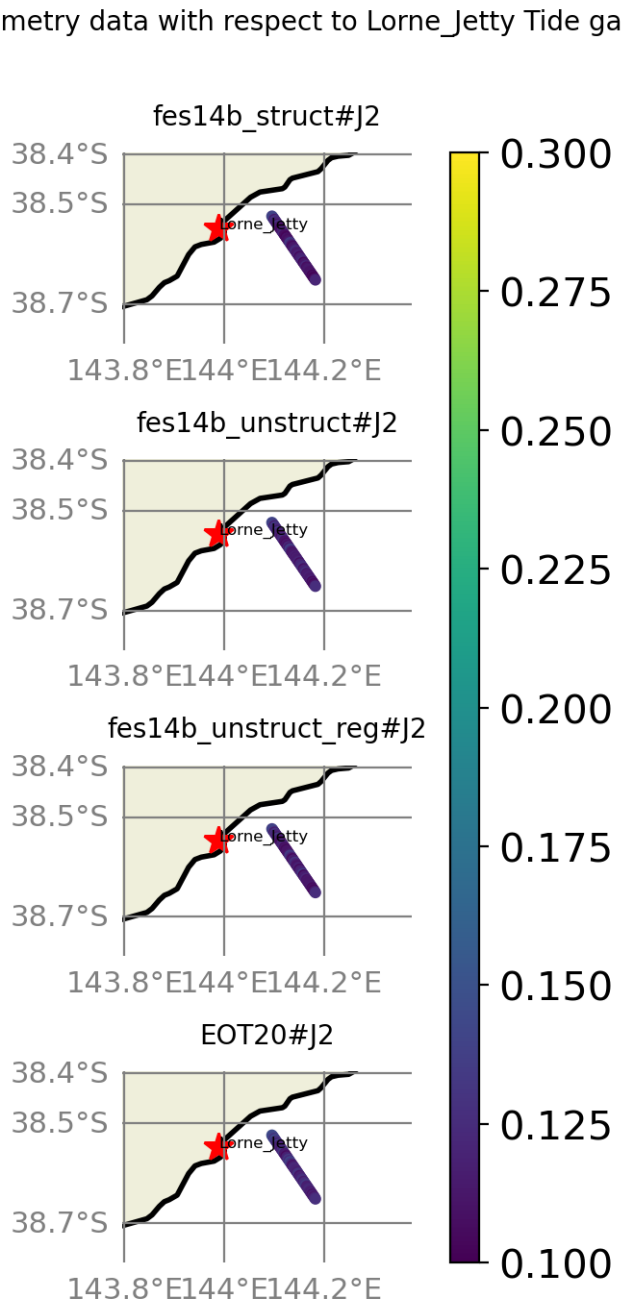

FIGURE 71 – rmsd visualization in maps view % Lorne_Jetty tide gauge

6.1.3 std visualization in maps view % Lorne_Jetty tide gauge

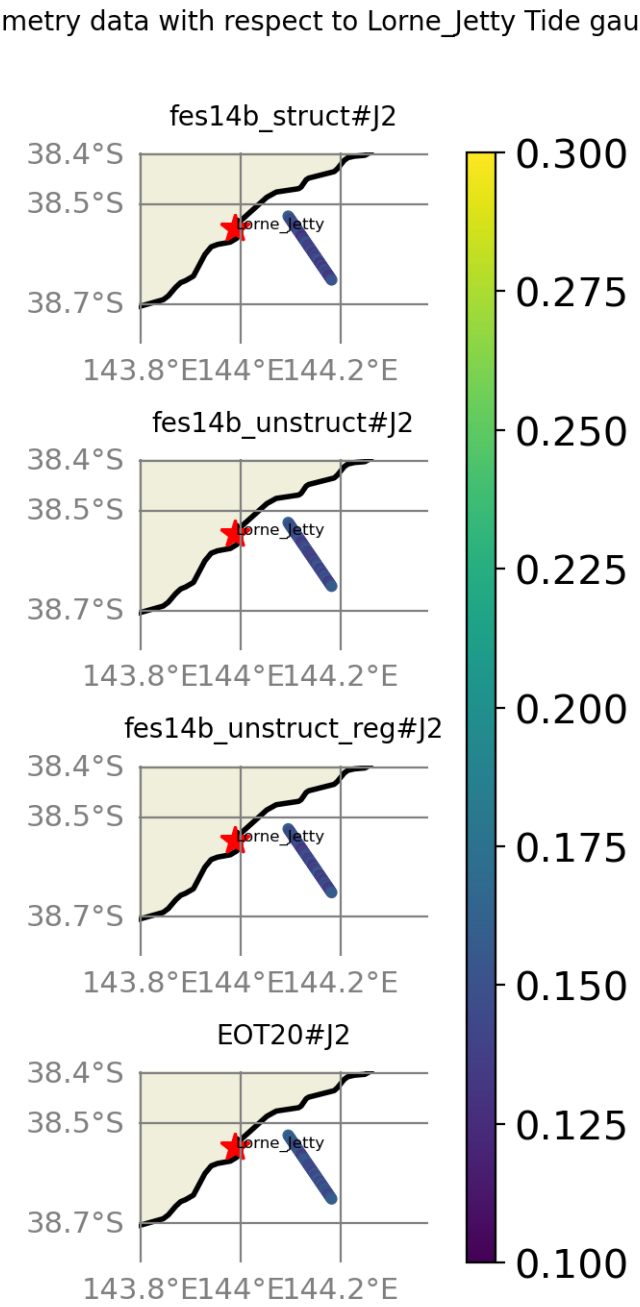

FIGURE 72 – std visualization in maps view % Lorne_Jetty tide gauge

6.1.4 valid_data_percent visualization in maps view % Lorne_Jetty tide gauge

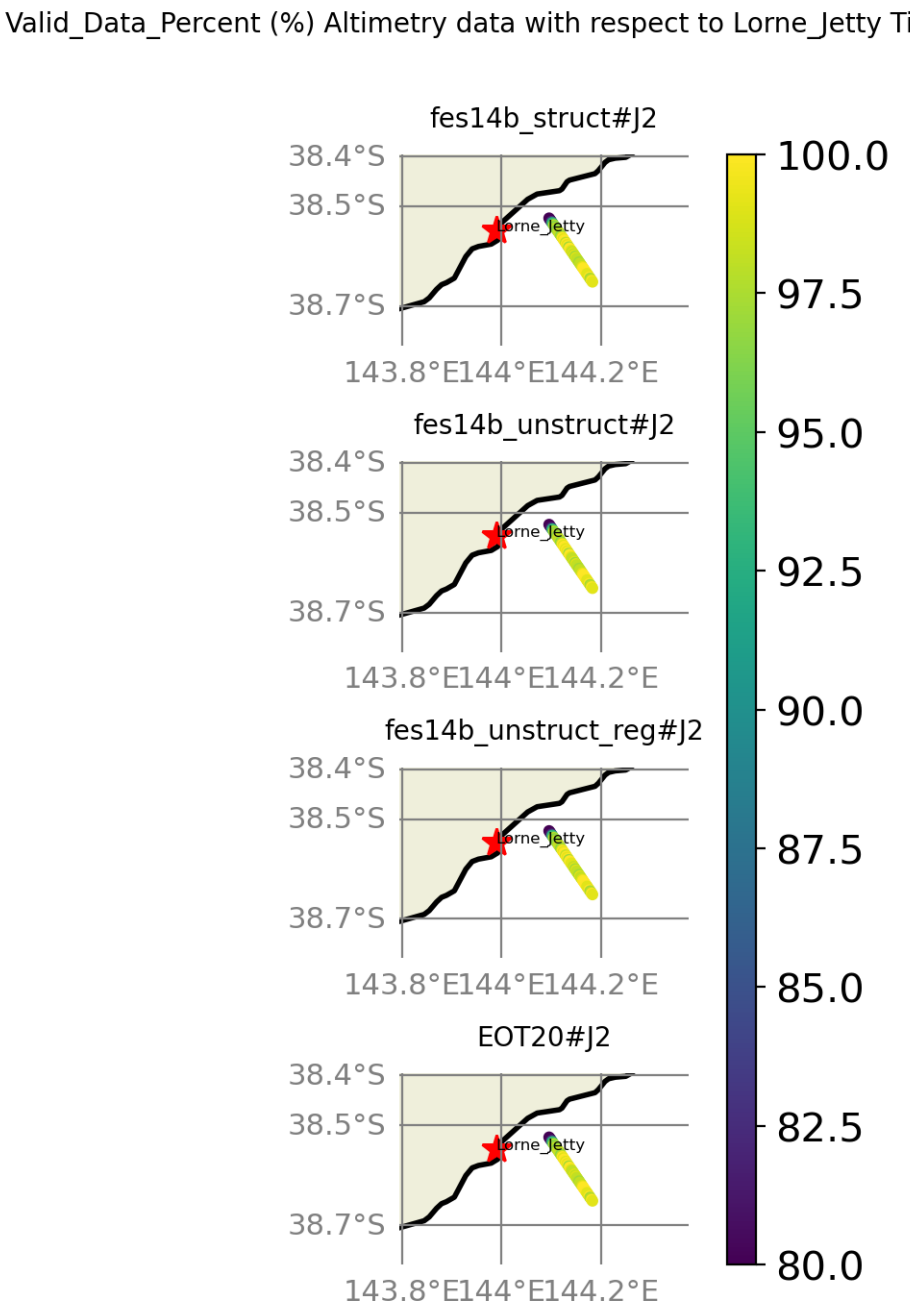

FIGURE 73 – valid_data_percent visualization in maps view % Lorne_Jetty tide gauge

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

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

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

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

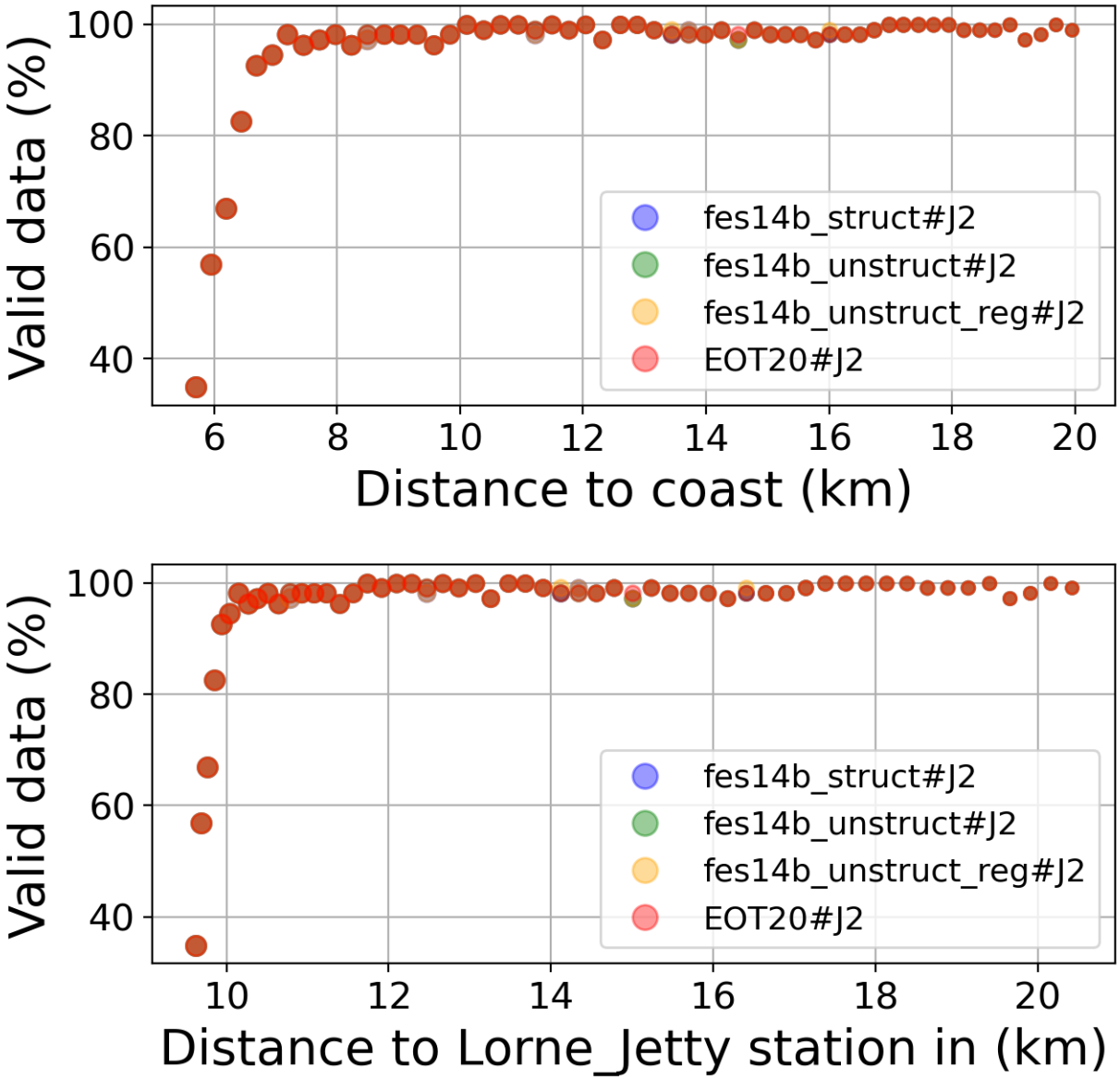

Figure 74 – Valid data (%) in function of distance to coast/Lorne_Jetty station

6.1.6 Std in function of distance to coast/Lorne_Jetty station

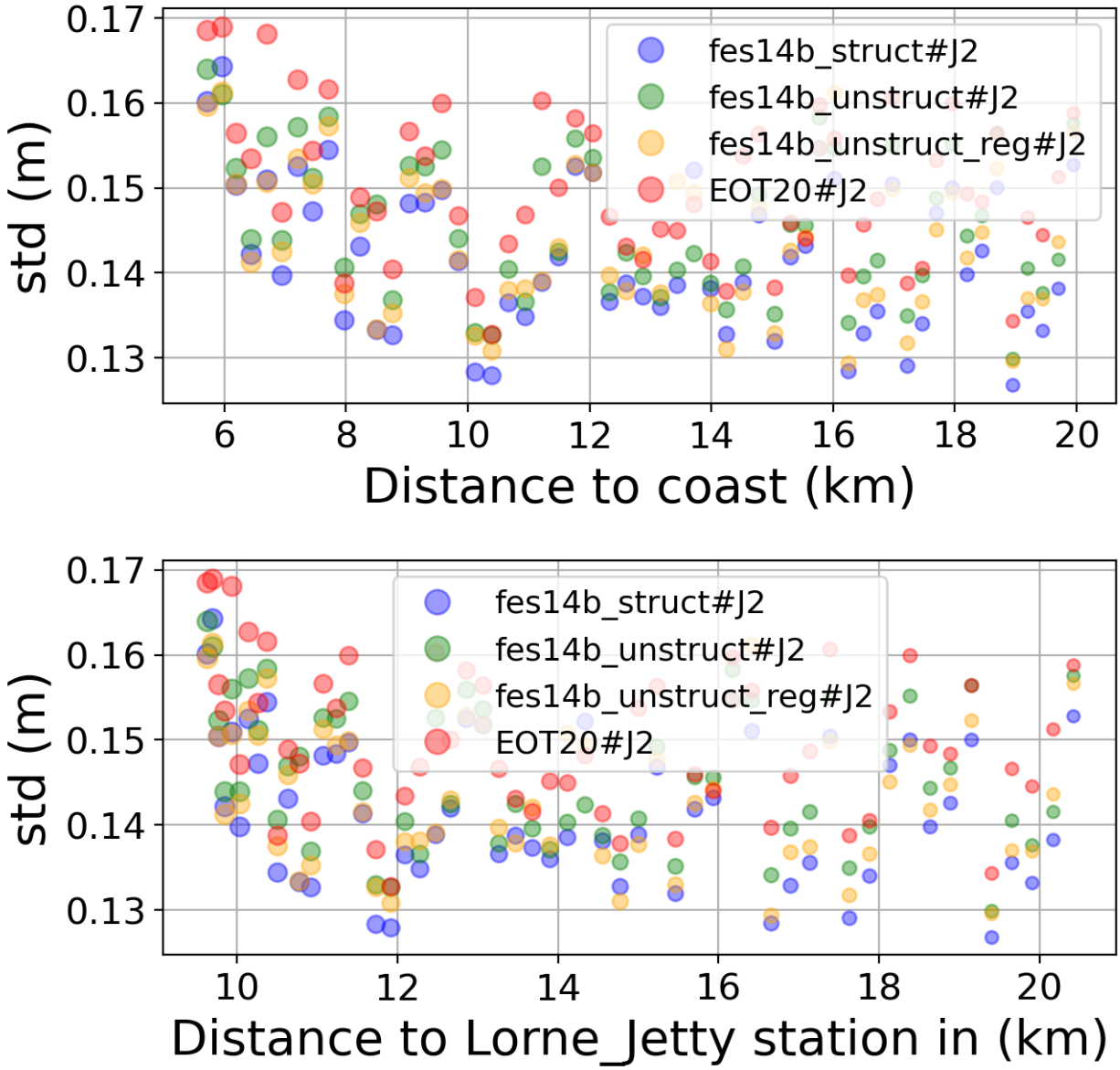

FIGURE 75 – Std in function of the distance to the coast/Lorne_Jetty station

6.1.7 Correlation in function of distance to coast/Lorne_Jetty station

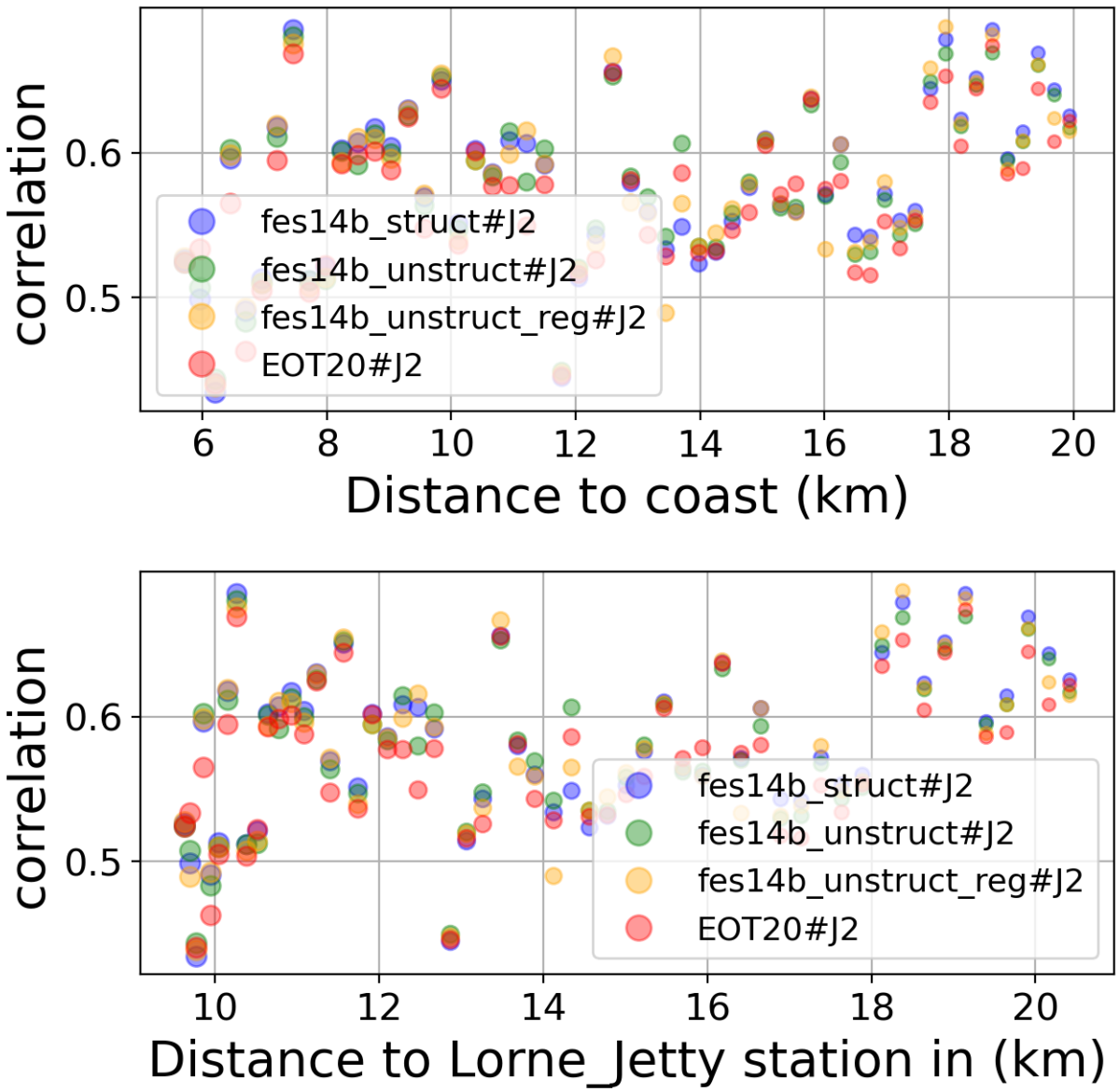

FIGURE 76 – Correlation in function of the distance to the coast/Lorne_Jetty station

6.1.8 Taylor Diagram

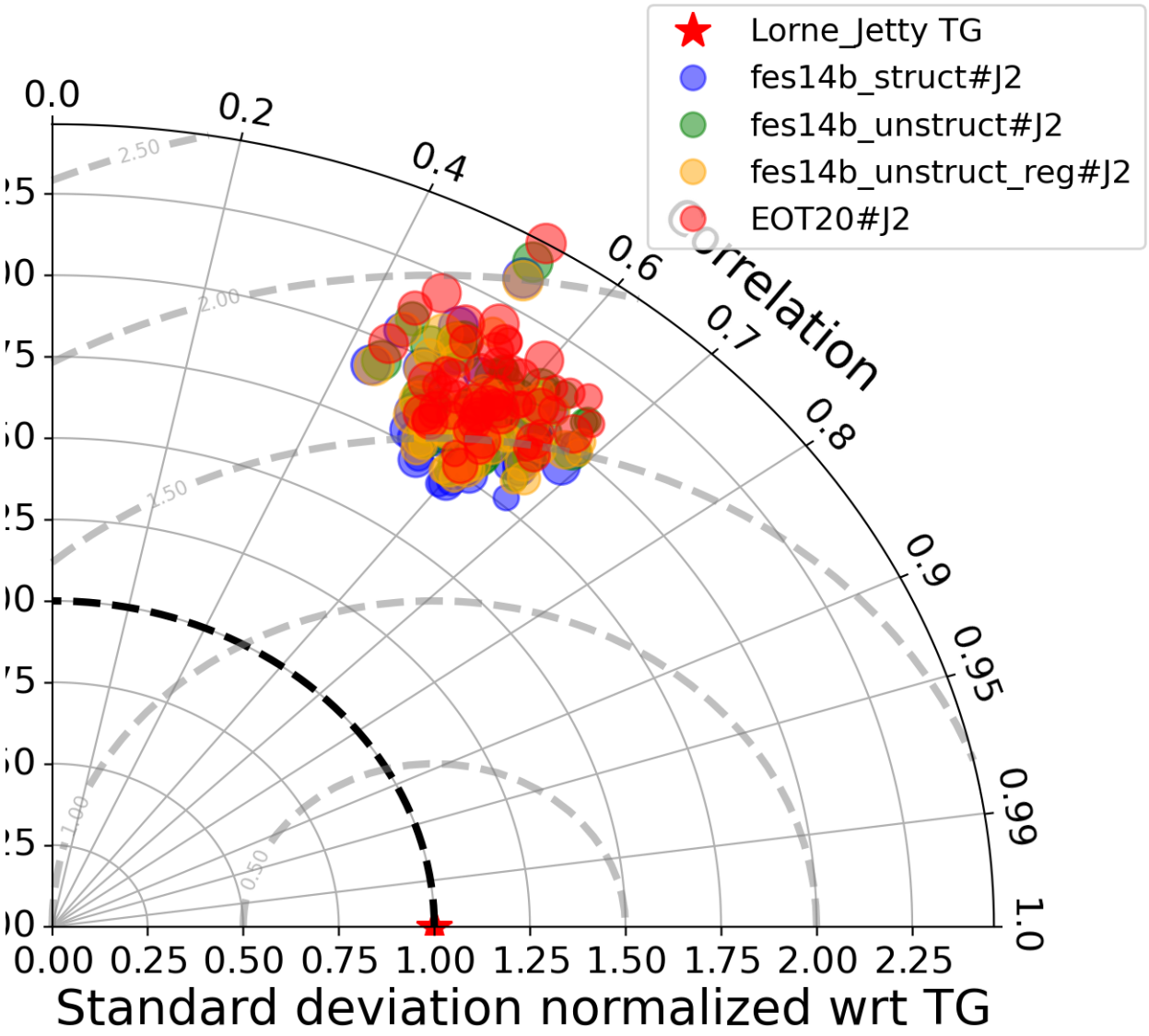

FIGURE 77 – Taylor diagram

6.1.9 Mean statistics table of products comparison with Lorne_Jetty 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)
fes14b_struct#J2	95.74	0.581	0.142	0.116
fes14b_unstruct#J2	95.757	0.58	0.146	0.119
fes14b_unstruct_reg#J2	95.773	0.579	0.144	0.117
EOT20#J2	95.773	0.571	0.15	0.124

FIGURE 78 – 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 109 point.

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.075
fes14b_struct#J2	18.38	17.943	100.0	0.679	0.15
fes14b_unstruct#J2	18.38	17.943	100.0	0.668	0.155
fes14b_unstruct_reg#J2	18.38	17.943	100.0	0.687	0.149
EOT20#J2	18.38	17.943	100.0	0.653	0.16

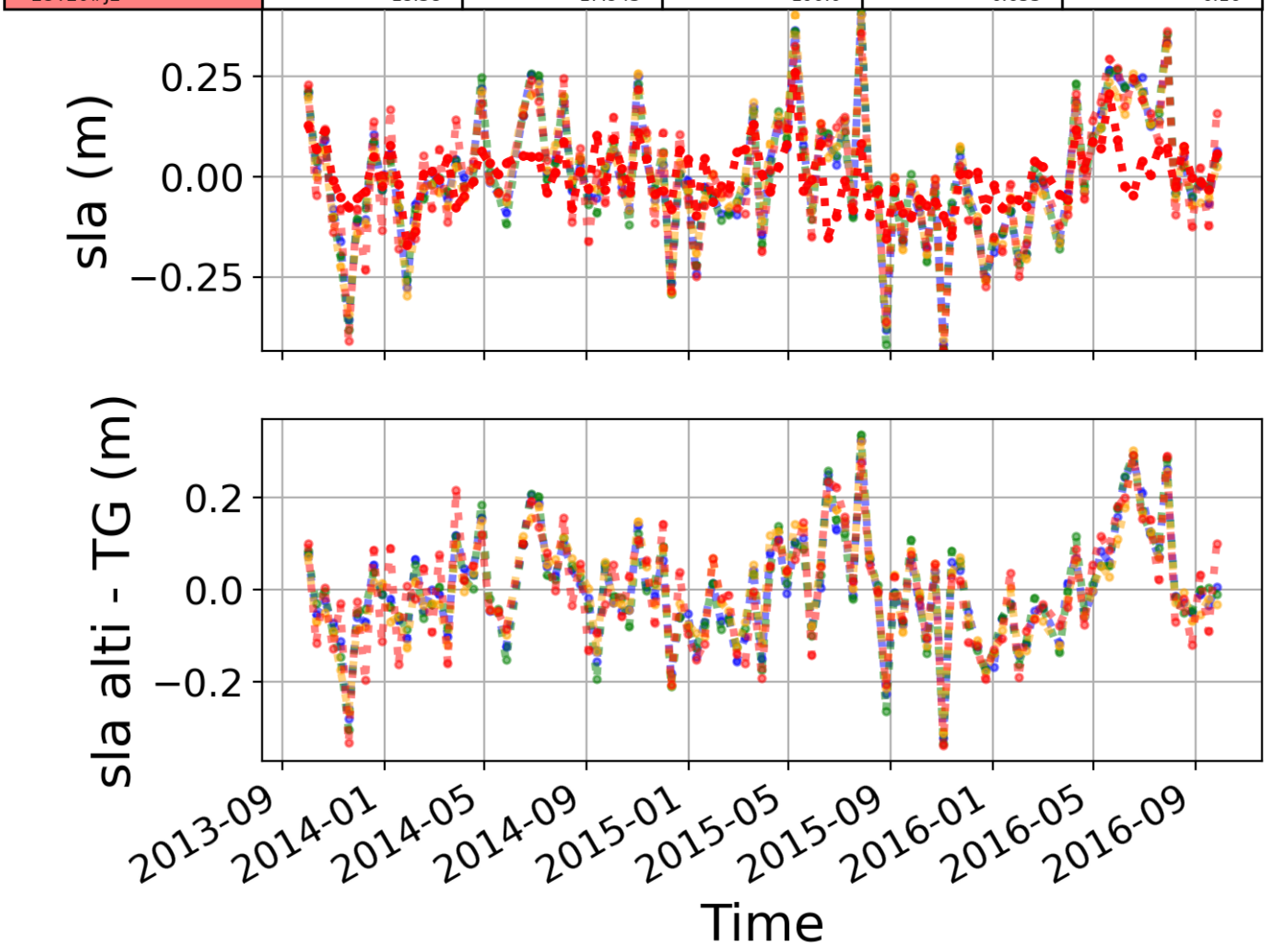

FIGURE 79 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.075
fes14b_struct#J2	19.142	18.689	99.083	0.685	0.15
fes14b_unstruct#J2	19.142	18.689	99.083	0.669	0.156
fes14b_unstruct_reg#J2	19.142	18.689	99.083	0.681	0.152
EOT20#J2	19.142	18.689	99.083	0.674	0.156

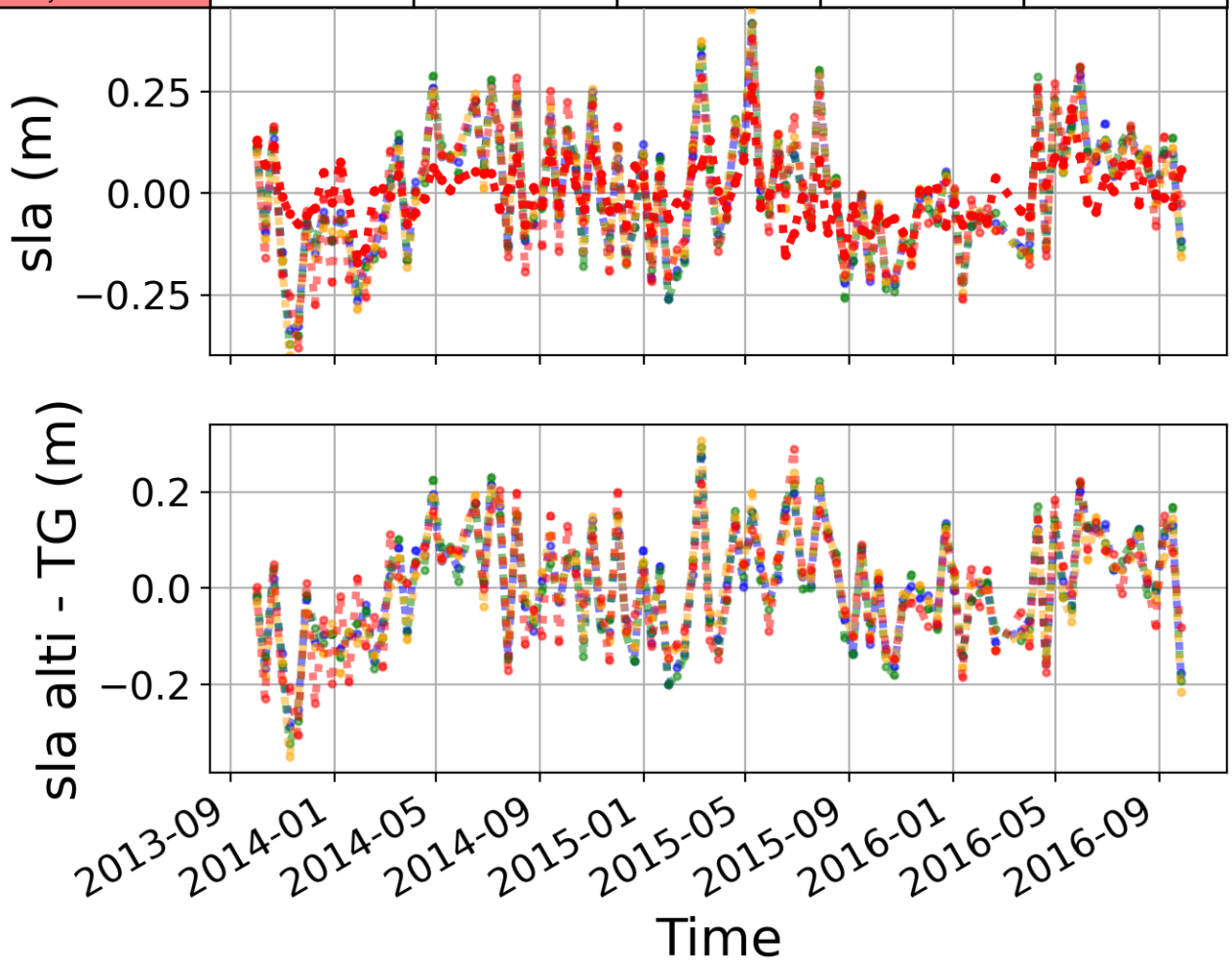

FIGURE 80 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.076
fes14b_struct#J2	10.263	7.452	96.33	0.685	0.147
fes14b_unstruct#J2	10.263	7.452	96.33	0.68	0.151
fes14b_unstruct_reg#J2	10.263	7.452	96.33	0.675	0.151
EOT20#J2	10.263	7.452	96.33	0.669	0.154

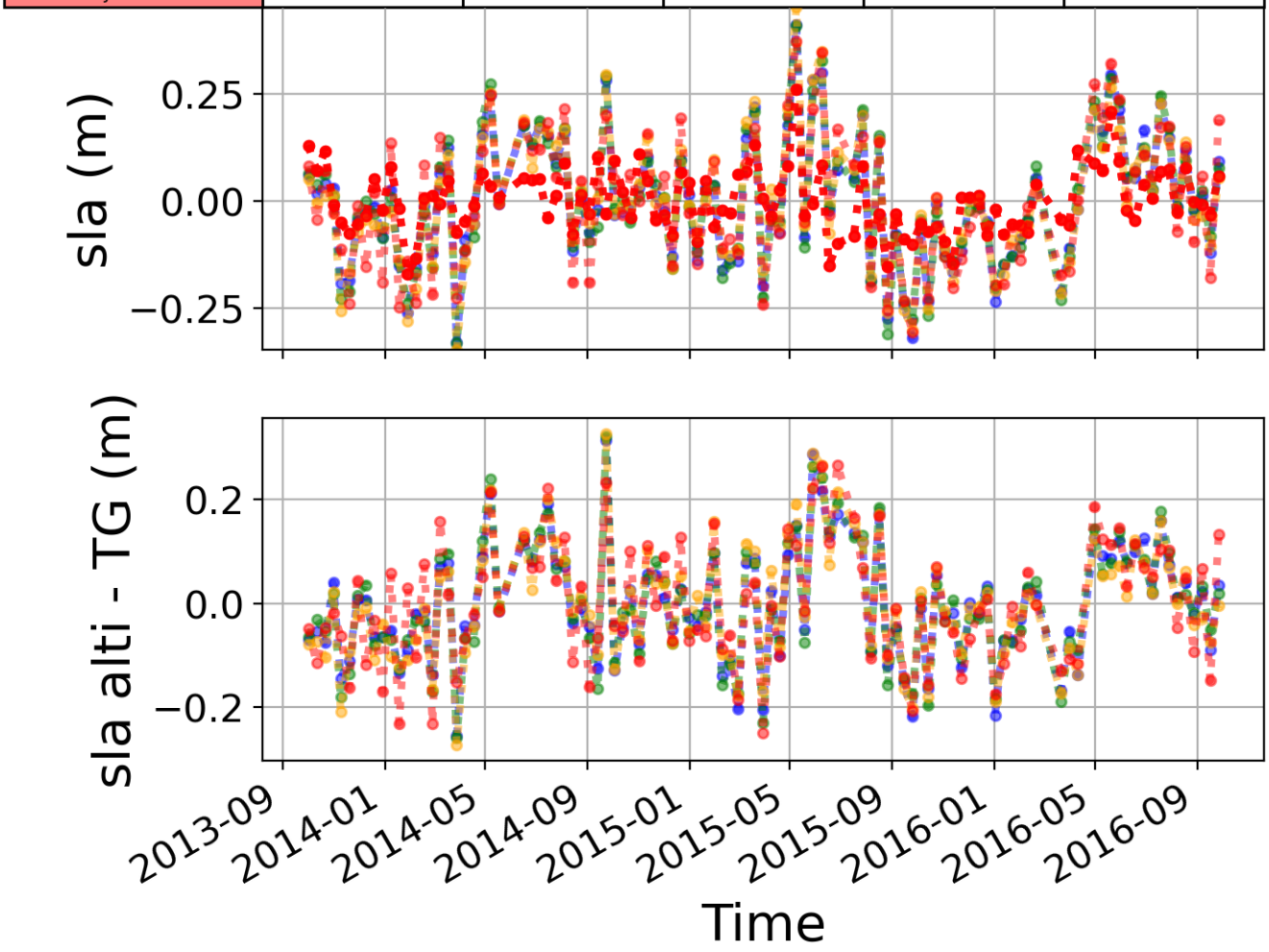

FIGURE 81 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.2 Station : Bundaberg

- Nearest track to Bundaberg station is the track number track149
- The area of interest is limited by :
  - A circle which it's center is the Bundaberg tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km

6.2.1 correlation visualization in maps view % Bundaberg tide gauge

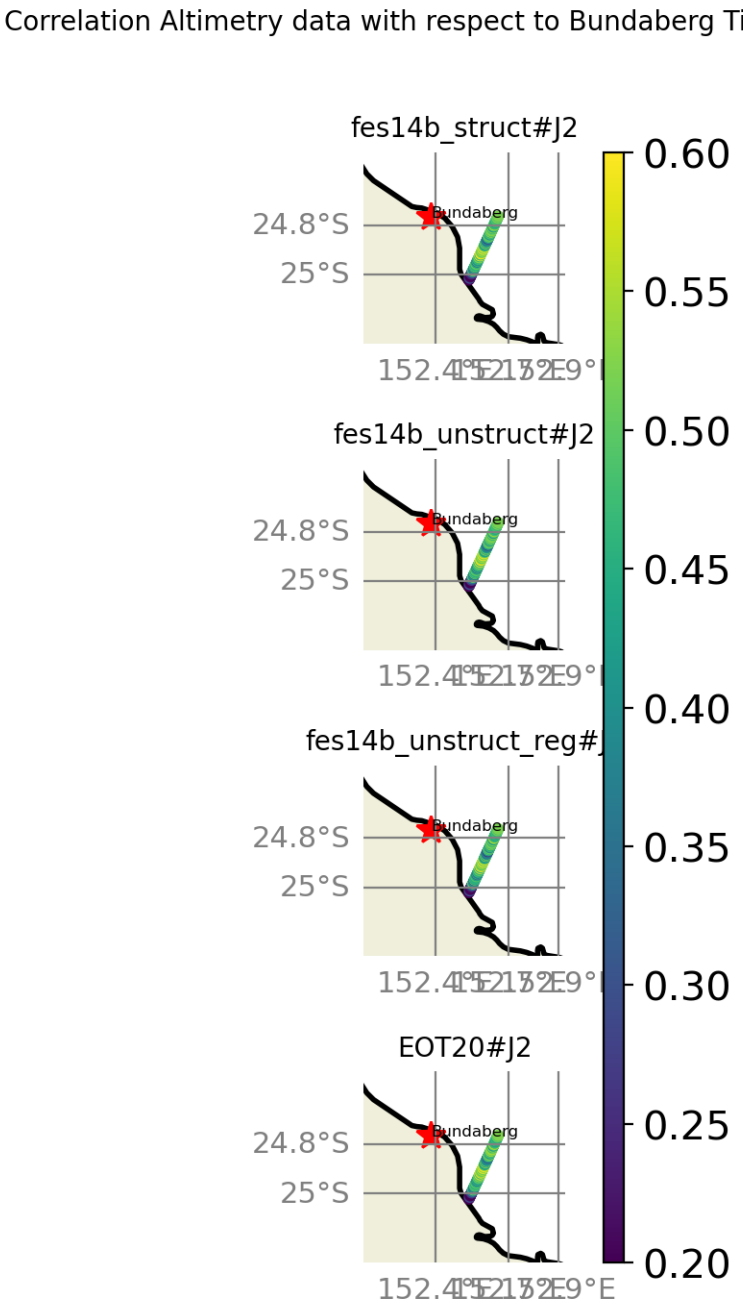

FIGURE 82 – correlation visualization in maps view % Bundaberg tide gauge

6.2.2 rmsd visualization in maps view % Bundaberg tide gauge

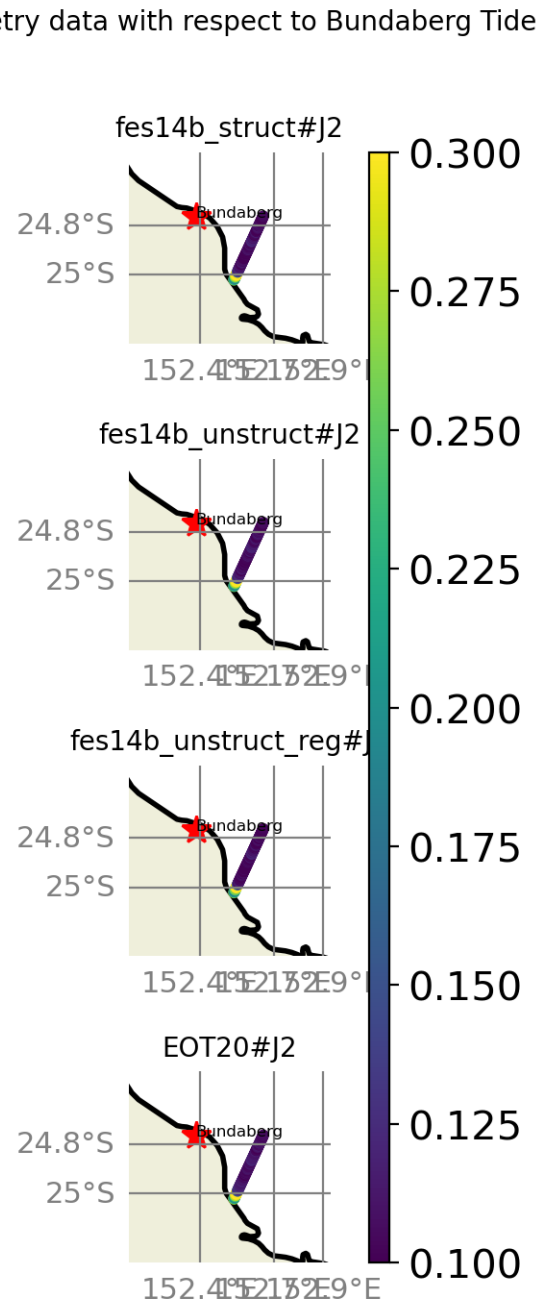

FIGURE 83 – rmsd visualization in maps view % Bundaberg tide gauge

6.2.3 std visualization in maps view % Bundaberg tide gauge

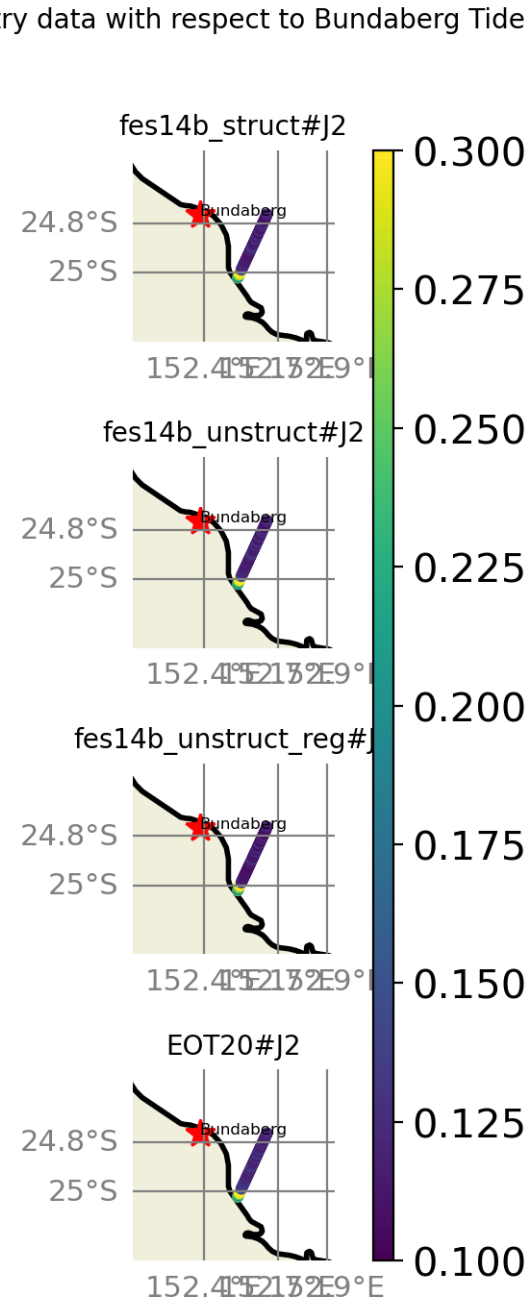

FIGURE 84 – std visualization in maps view % Bundaberg tide gauge

6.2.4 valid_data_percent visualization in maps view % Bundaberg tide gauge

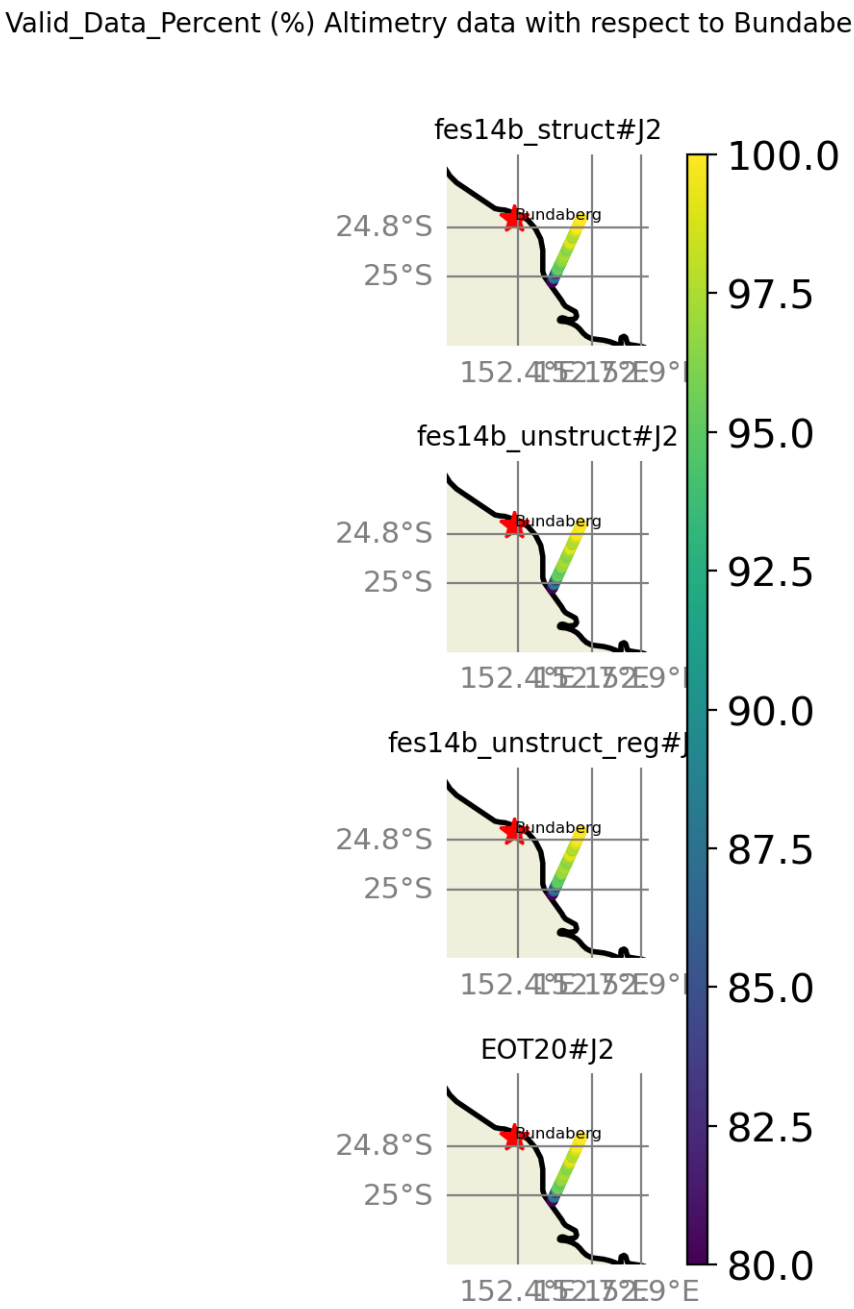

FIGURE 85 – valid_data_percent visualization in maps view % Bundaberg tide gauge

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

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

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

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

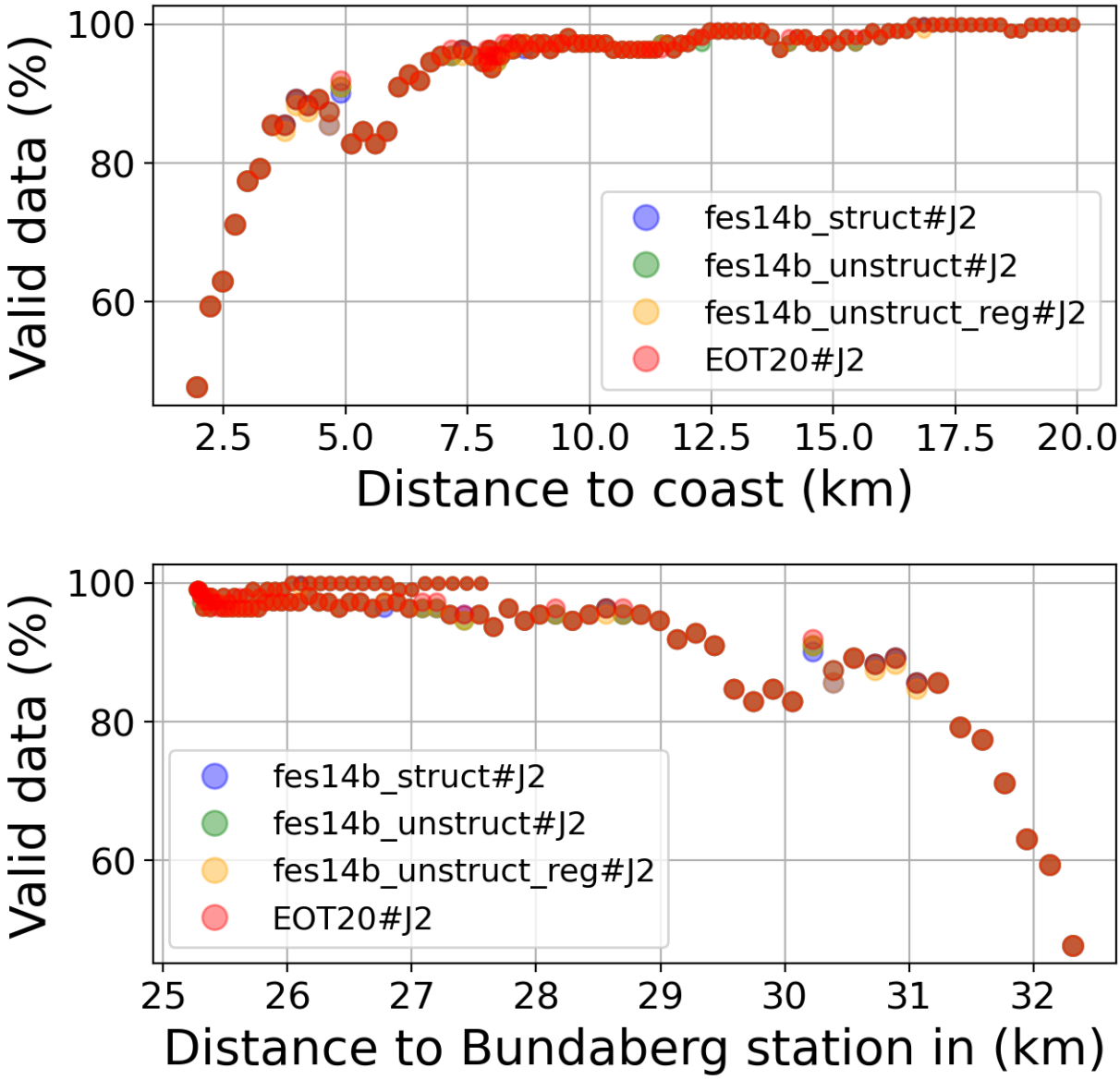

FIGURE 86 – Valid data (%) in function of distance to coast/Bundaberg station

6.2.6 Std in function of distance to coast/Bundaberg station

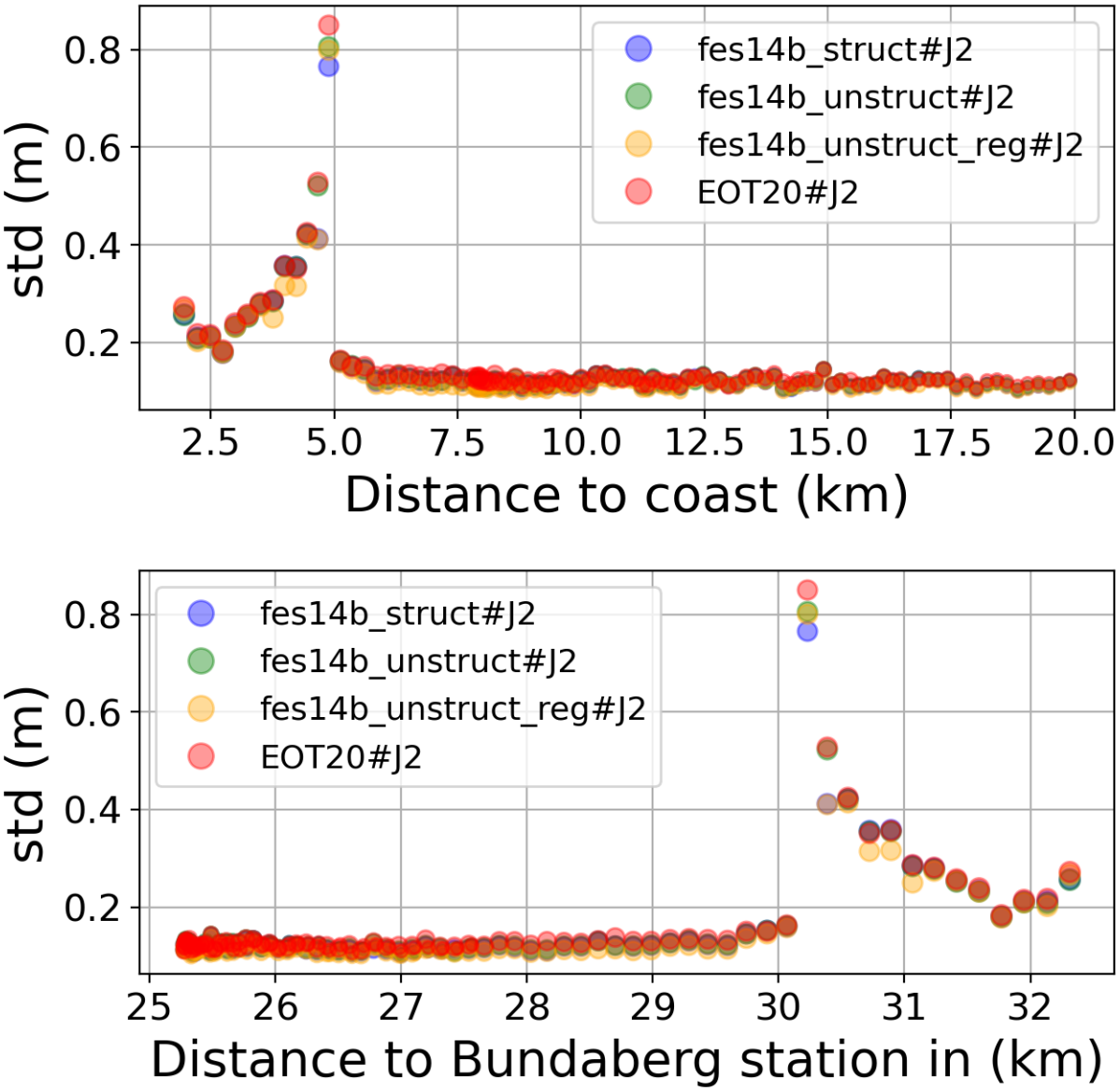

FIGURE 87 – Std in function of the distance to the coast/Bundaberg station

6.2.7 Correlation in function of distance to coast/Bundaberg station

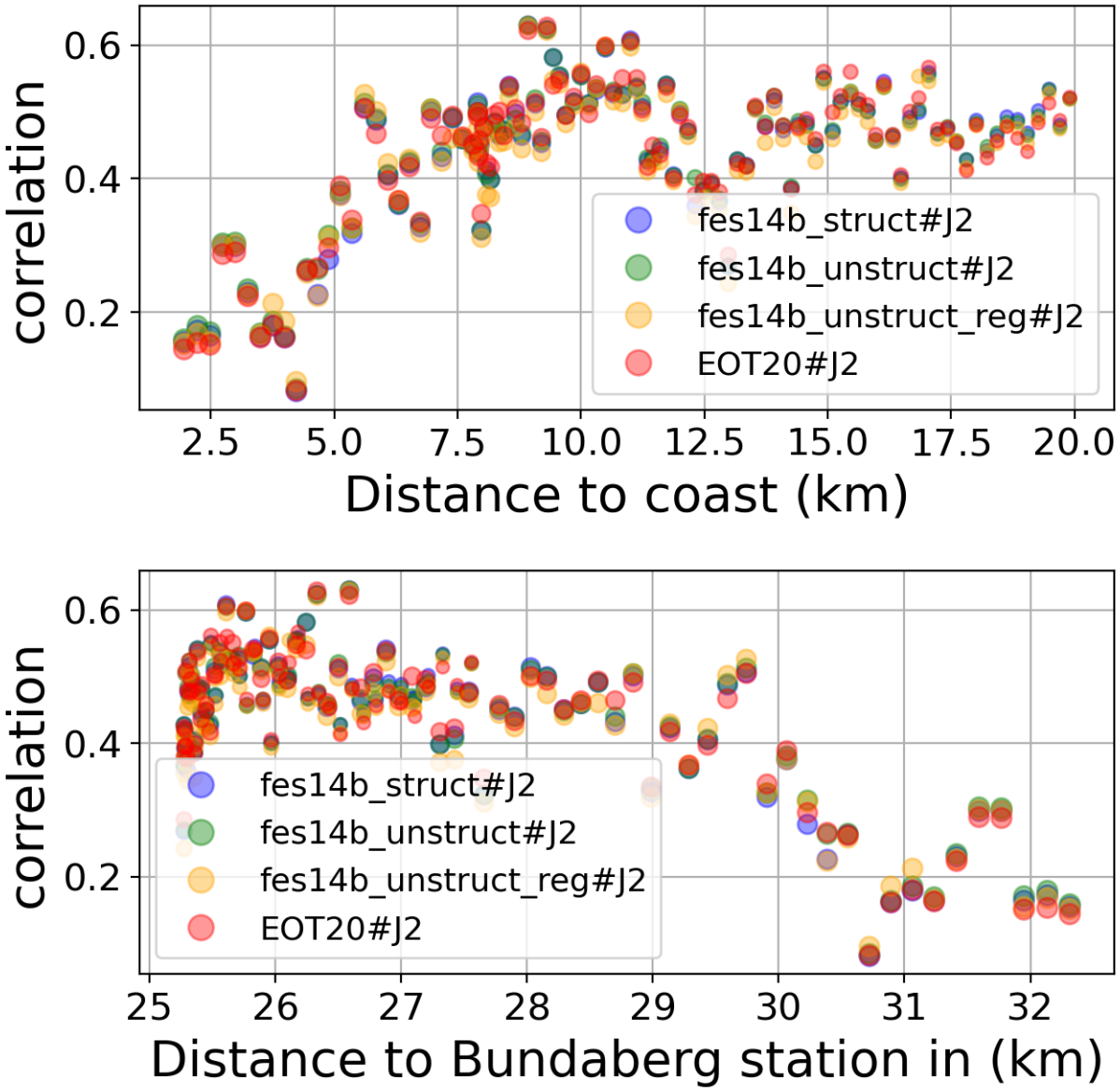

FIGURE 88 – Correlation in function of the distance to the coast/Bundaberg station

6.2.8 Taylor Diagram

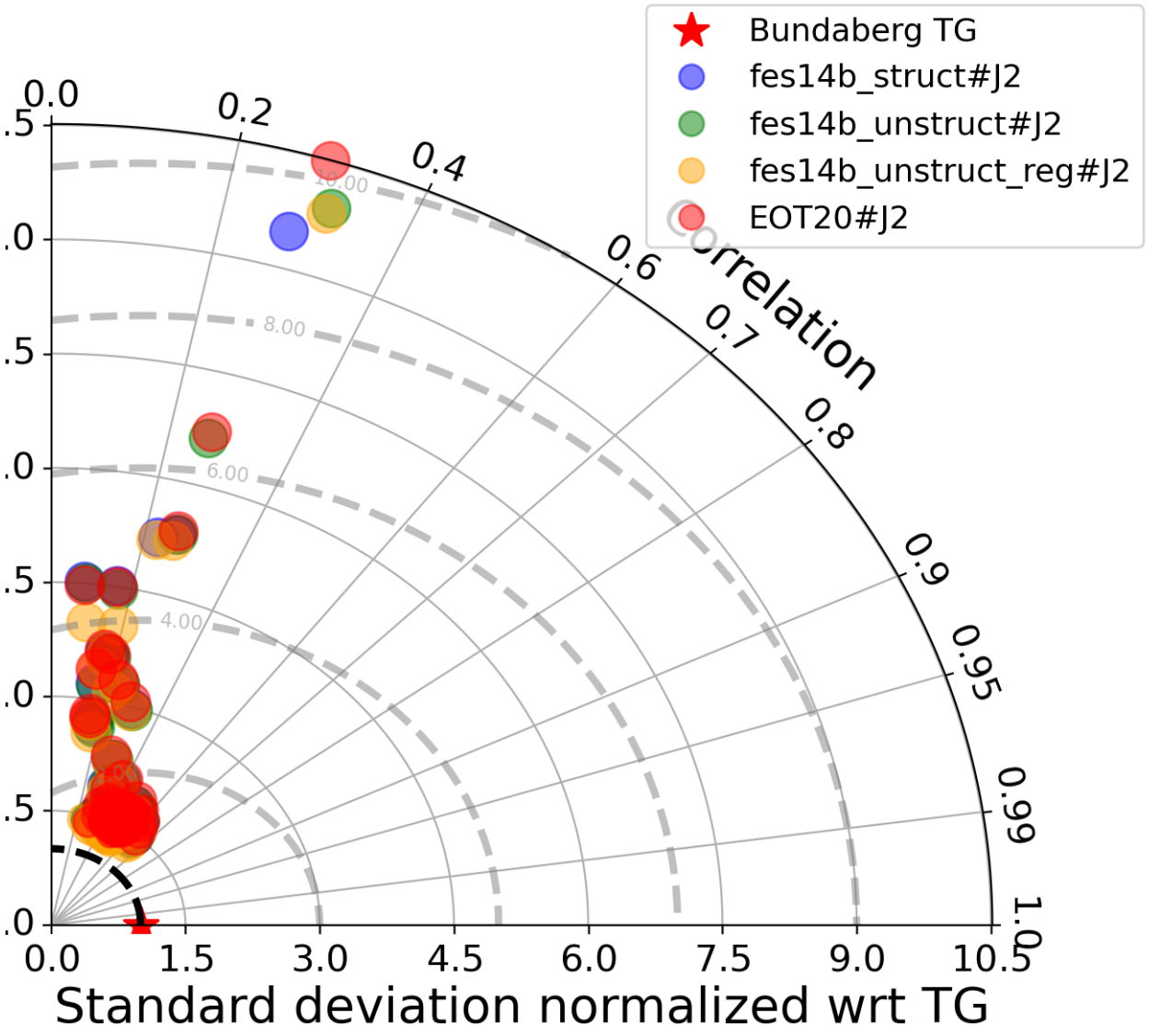

FIGURE 89 – Taylor diagram

6.2.9 Mean statistics table of products comparison with Bundaberg 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)
fes14b_struct#J2	94.544	0.441	0.145	0.134
fes14b_unstruct#J2	94.561	0.443	0.147	0.136
fes14b_unstruct_reg#J2	94.51	0.434	0.14	0.131
EOT20#J2	94.629	0.443	0.152	0.14

FIGURE 90 – 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 111 point.

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.078
fes14b_struct#J2	26.586	8.918	97.297	0.631	0.115
fes14b_unstruct#J2	26.586	8.918	97.297	0.631	0.117
fes14b_unstruct_reg#J2	26.586	8.918	97.297	0.629	0.109
EOT20#J2	26.586	8.918	97.297	0.622	0.123

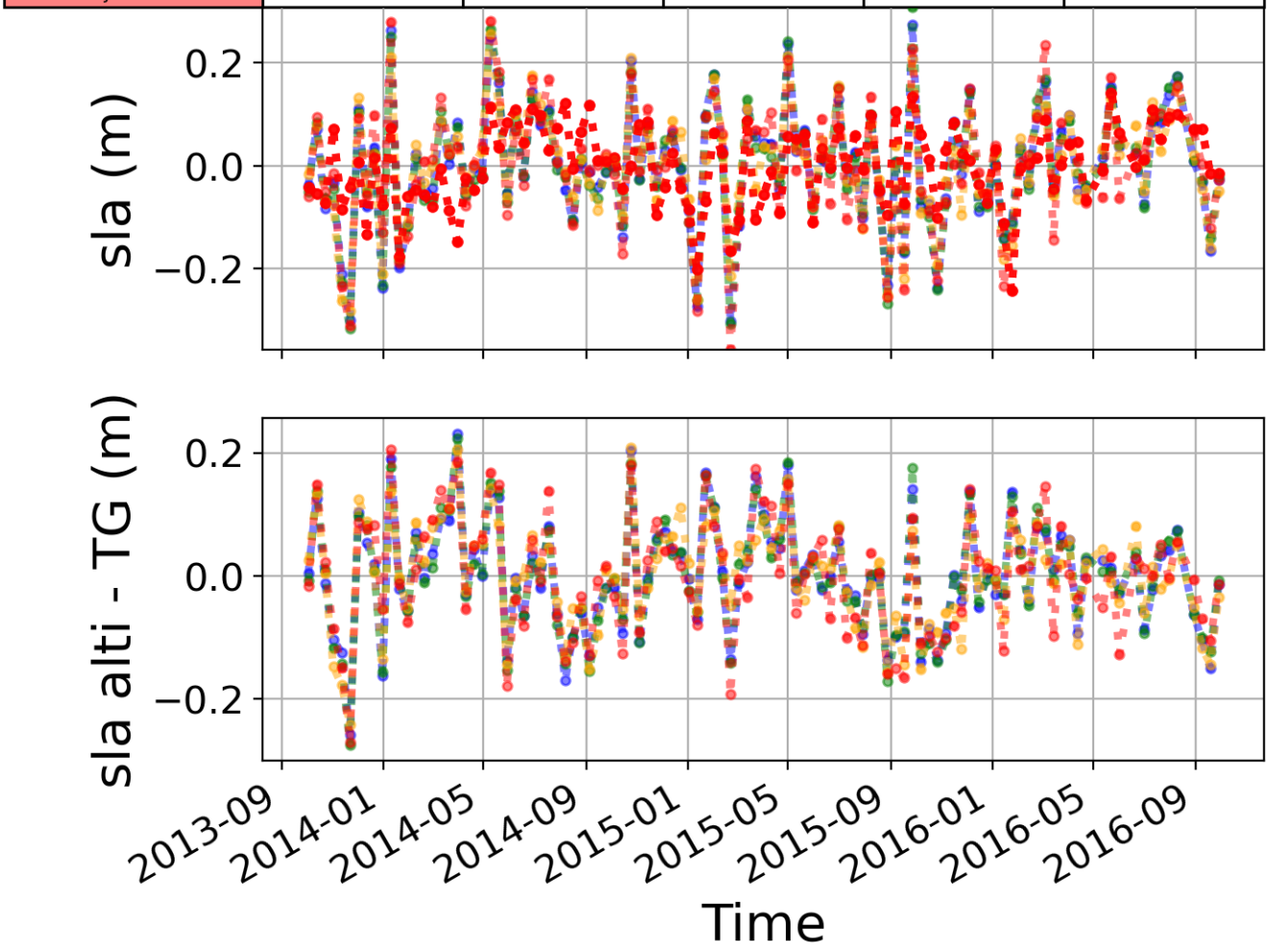

FIGURE 91 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.078
fes14b_struct#J2	26.325	9.308	97.297	0.623	0.111
fes14b_unstruct#J2	26.325	9.308	97.297	0.624	0.113
fes14b_unstruct_reg#J2	26.325	9.308	97.297	0.621	0.105
EOT20#J2	26.325	9.308	97.297	0.629	0.116

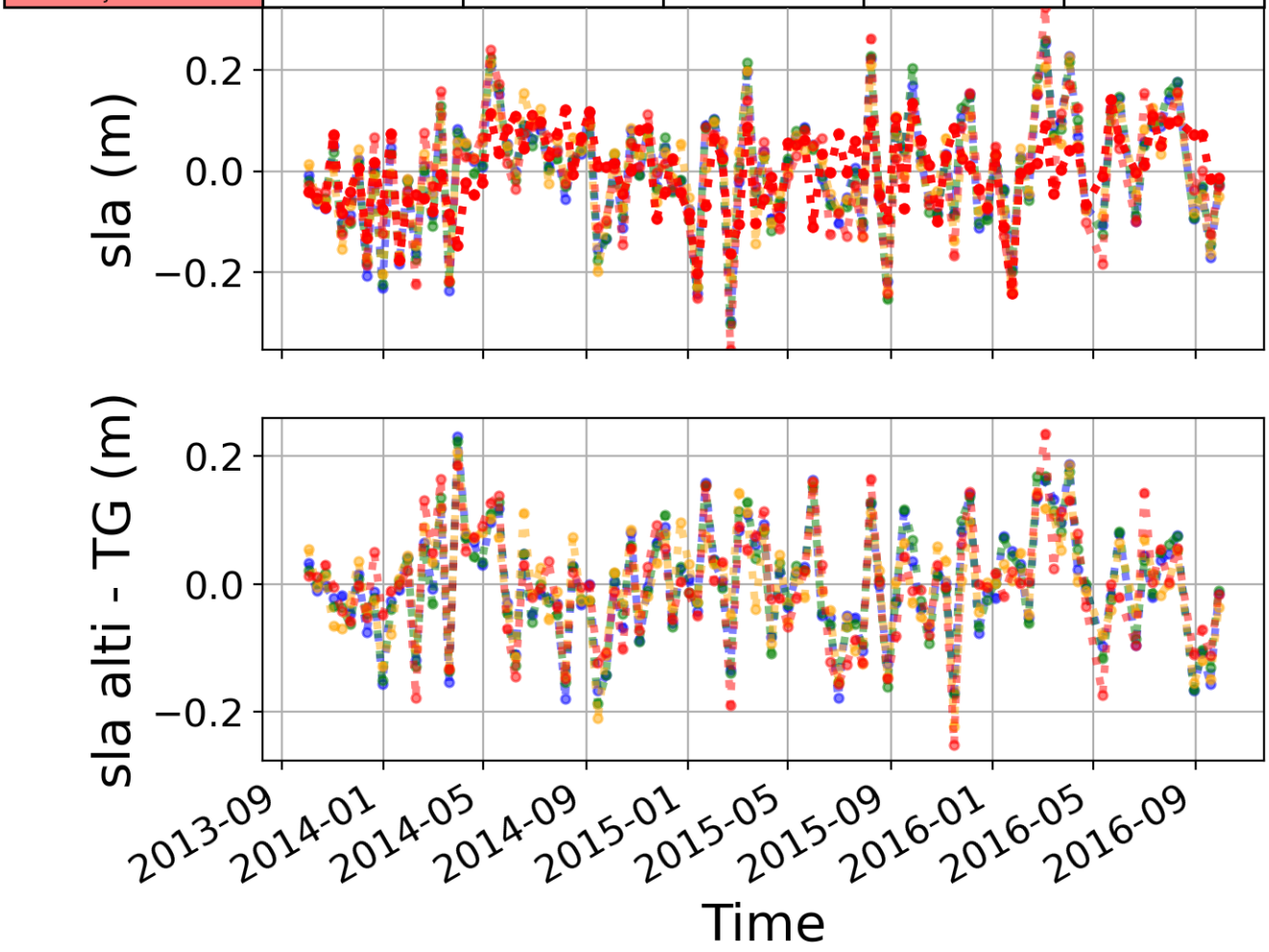

FIGURE 92 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.3 Station : Thursday_Island

- Nearest track to Thursday_Island station is the track number track138
- The area of interest is limited by :
  - A circle which it's center is the Thursday_Island tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km

6.3.1 correlation visualization in maps view % Thursday_Island tide gauge

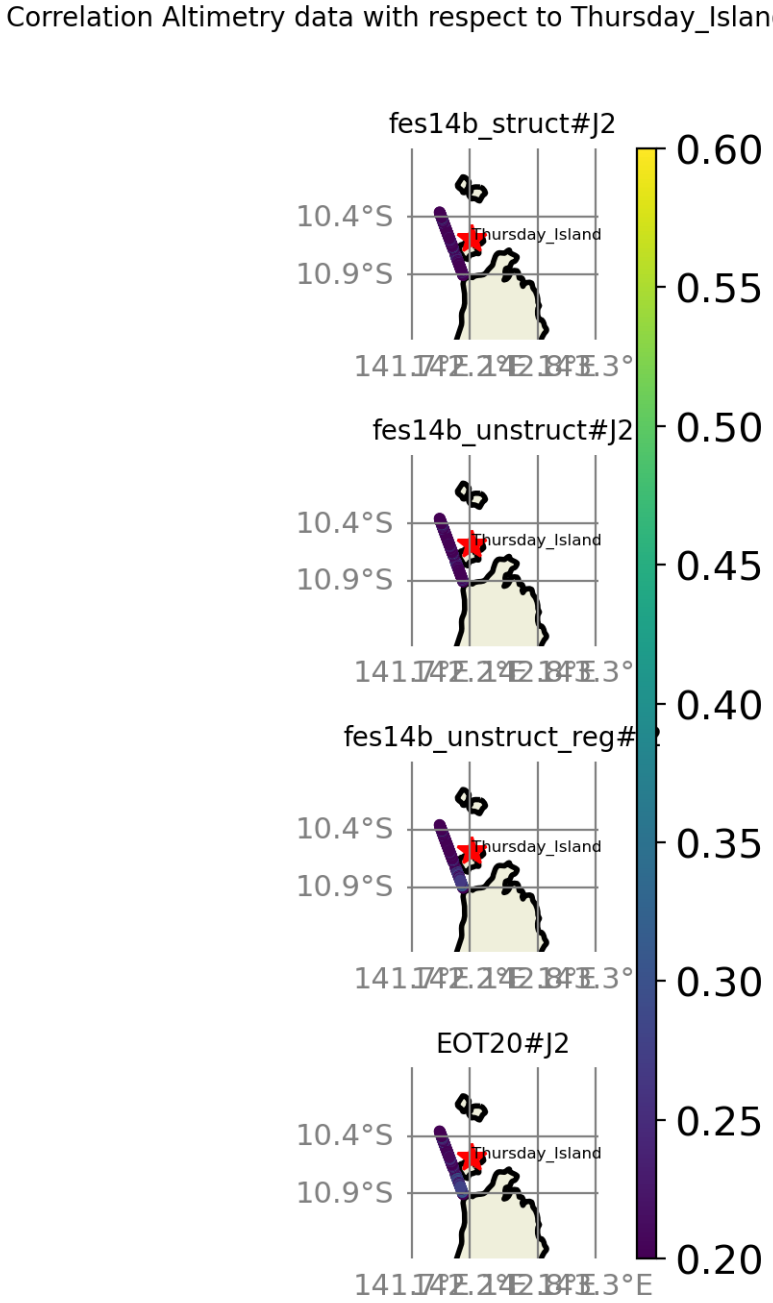

Figure 93 – correlation visualization in maps view % Thursday_Island tide gauge

6.3.2 rmsd visualization in maps view % Thursday_Island tide gauge

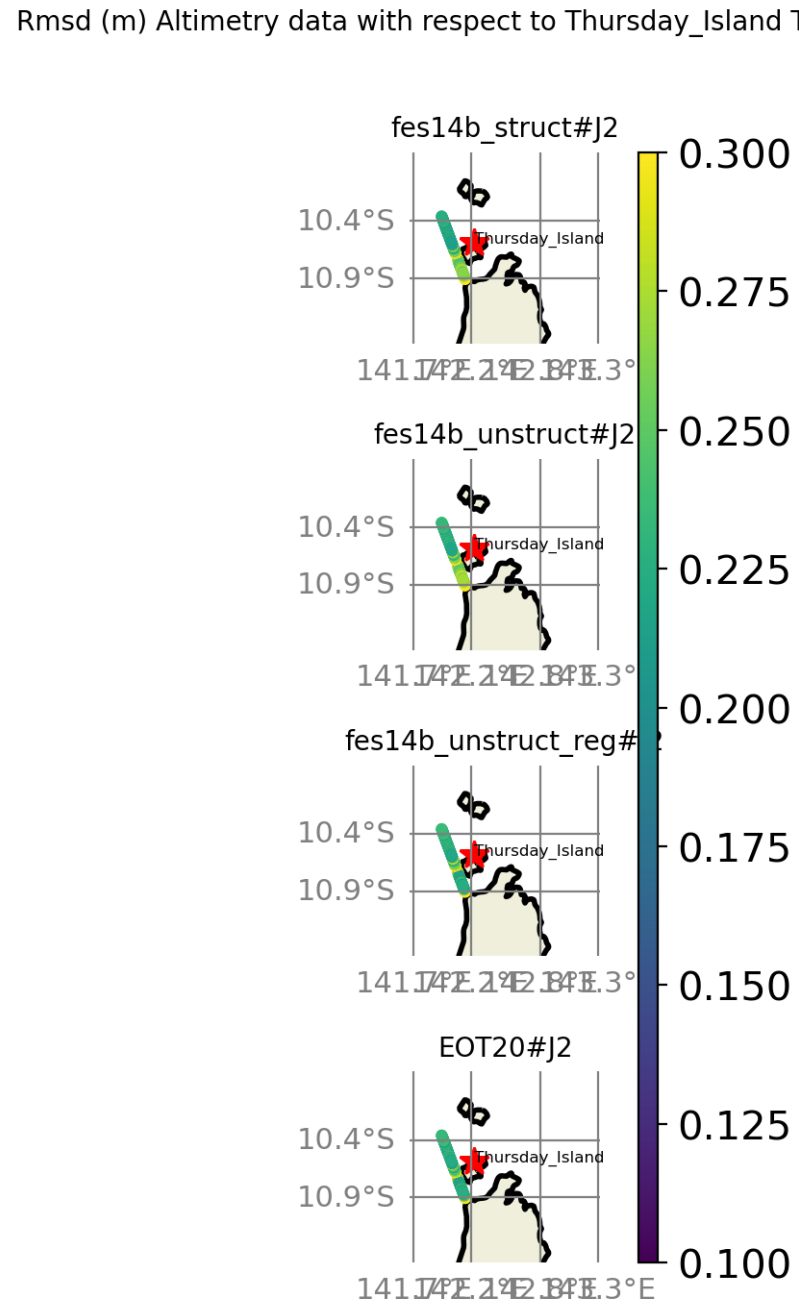

Figure 94 – rmsd visualization in maps view % Thursday_Island tide gauge

6.3.3 std visualization in maps view % Thursday_Island tide gauge

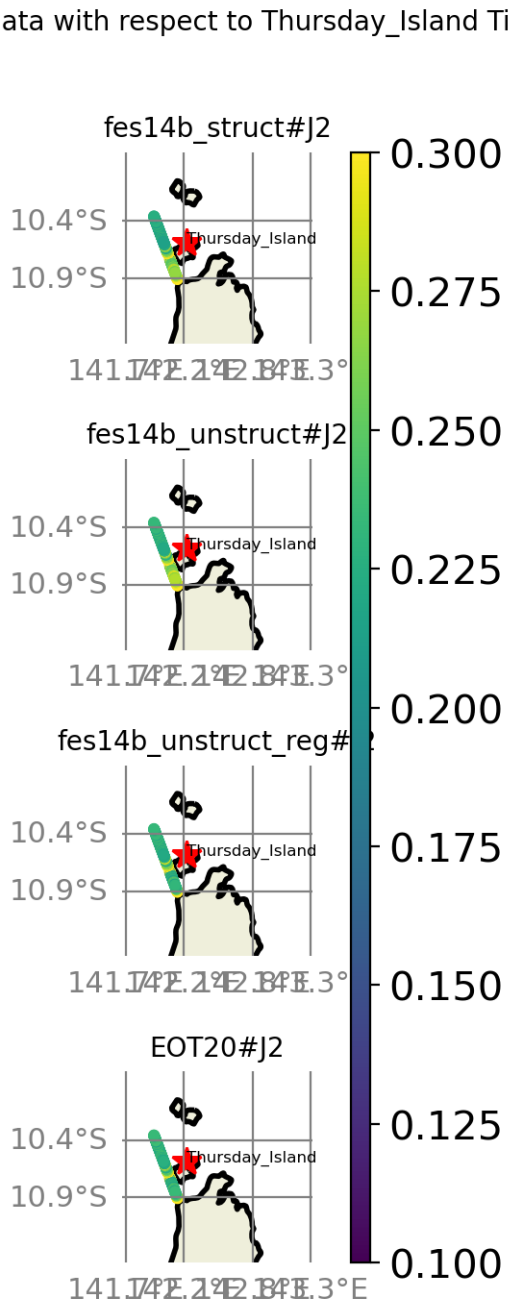

FIGURE 95 – std visualization in maps view % Thursday_Island tide gauge

6.3.4 valid_data_percent visualization in maps view % Thursday_Island tide gauge

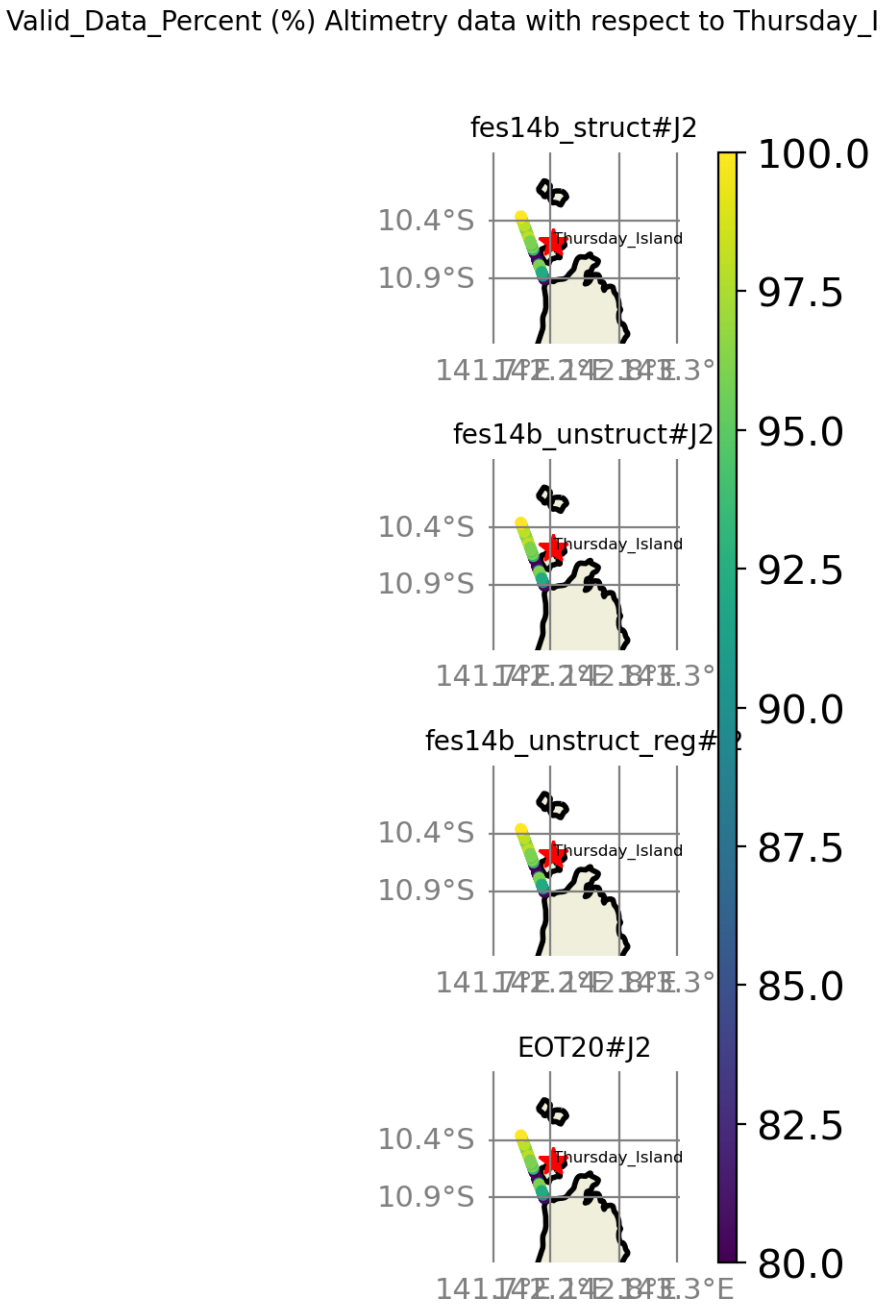

FIGURE 96 – valid_data_percent visualization in maps view % Thursday_Island tide gauge

6.3.5 Valid data (%) in function of distance to coast/Thursday_Island 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. $maxNB = 51$ 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.

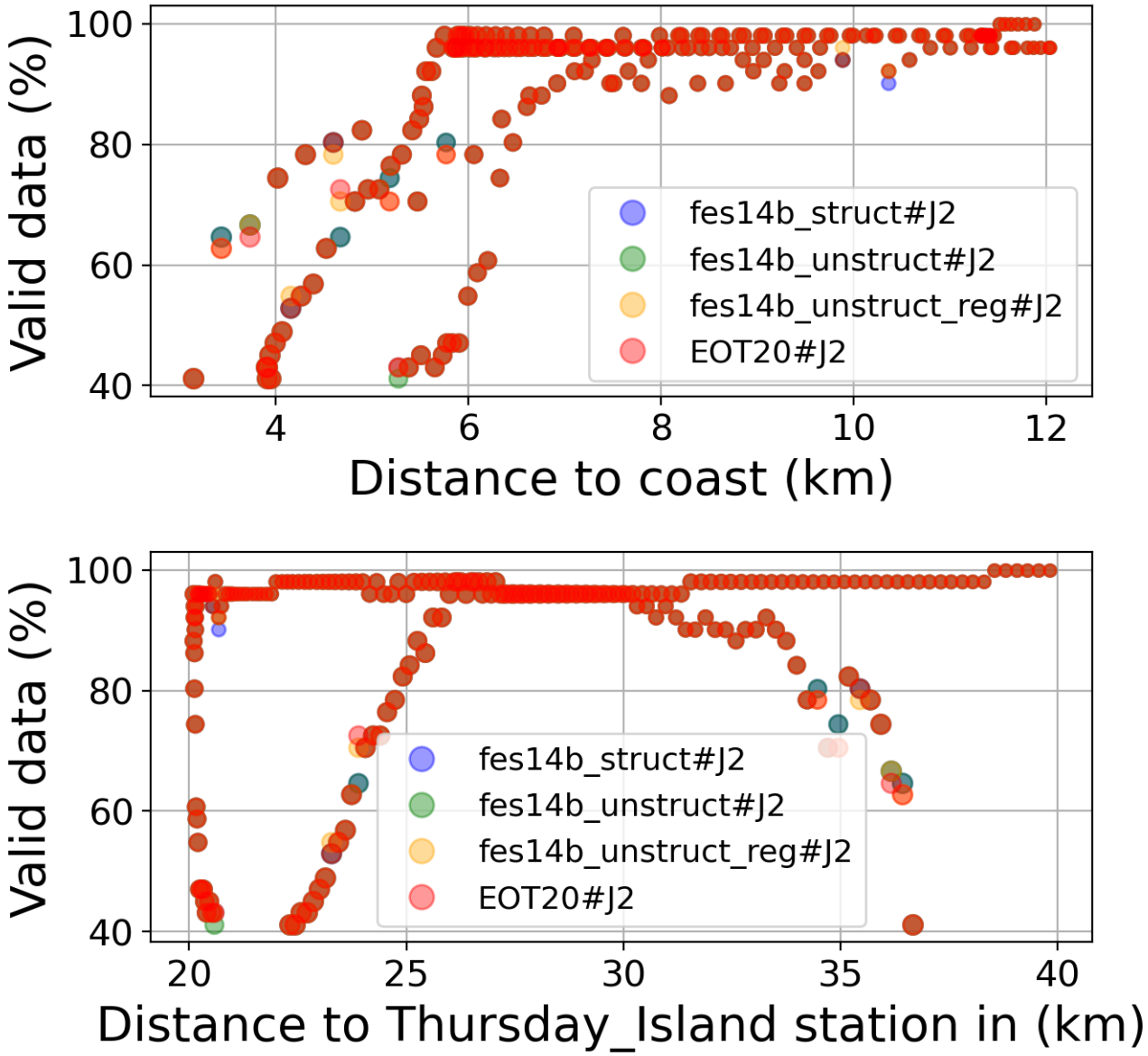

FIGURE 97 – Valid data (%) in function of distance to coast/Thursday_Island station

6.3.6 Std in function of distance to coast/Thursday_Island station

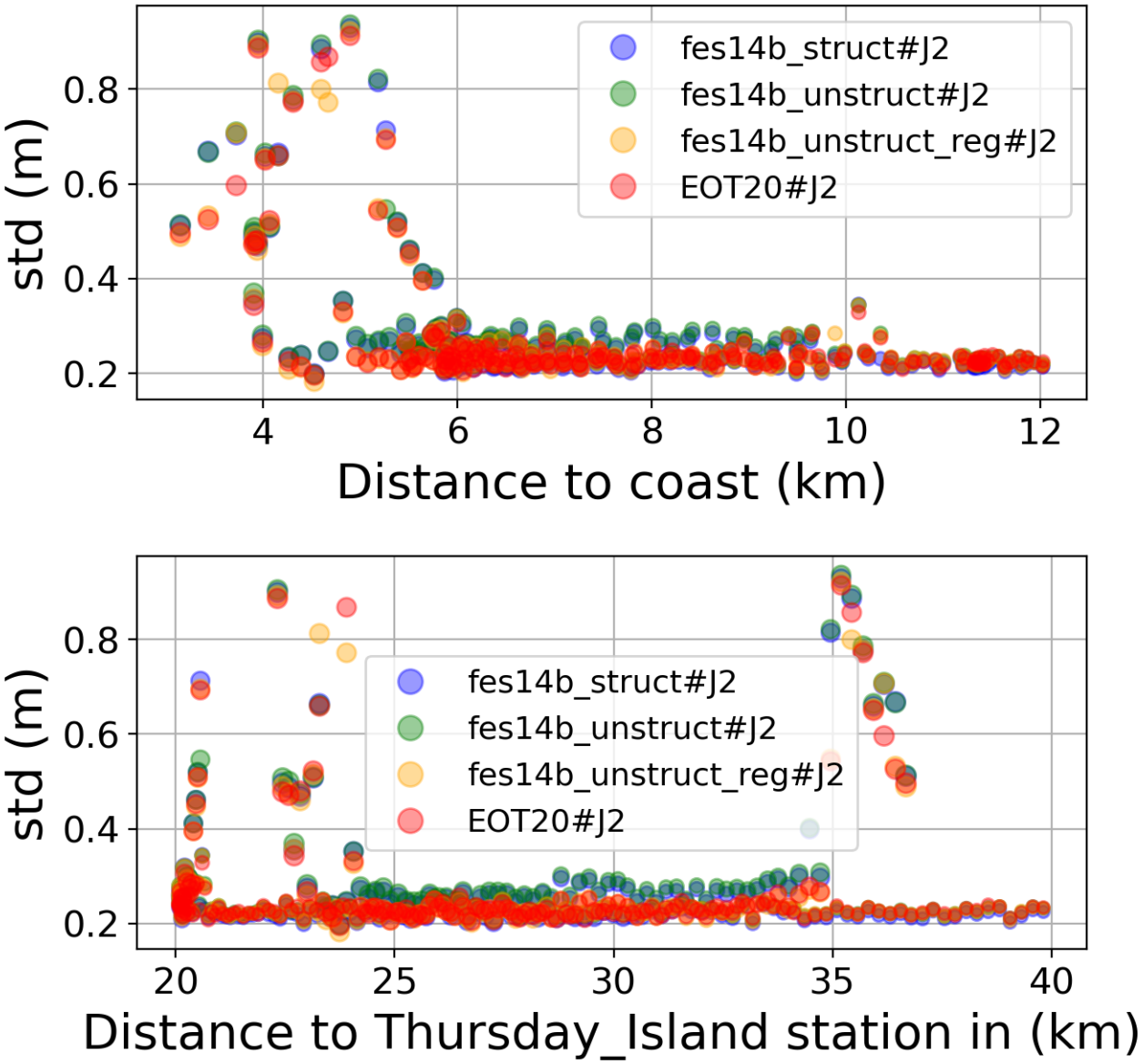

FIGURE 98 – Std in function of the distance to the coast/Thursday_Island station

6.3.7 Correlation in function of distance to coast/Thursday_Island station

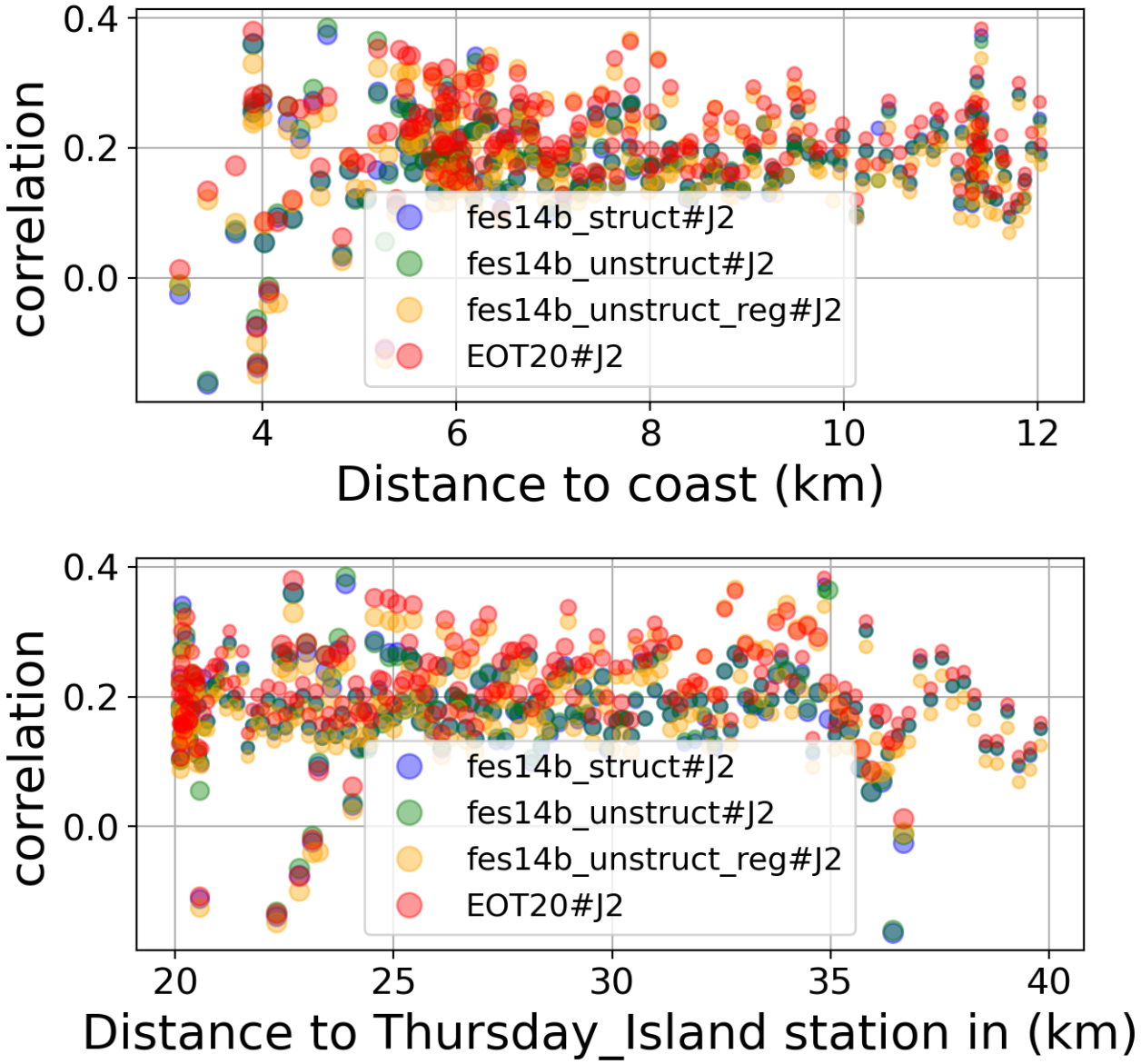

FIGURE 99 – Correlation in function of the distance to the coast/Thursday_Island station

6.3.8 Taylor Diagram

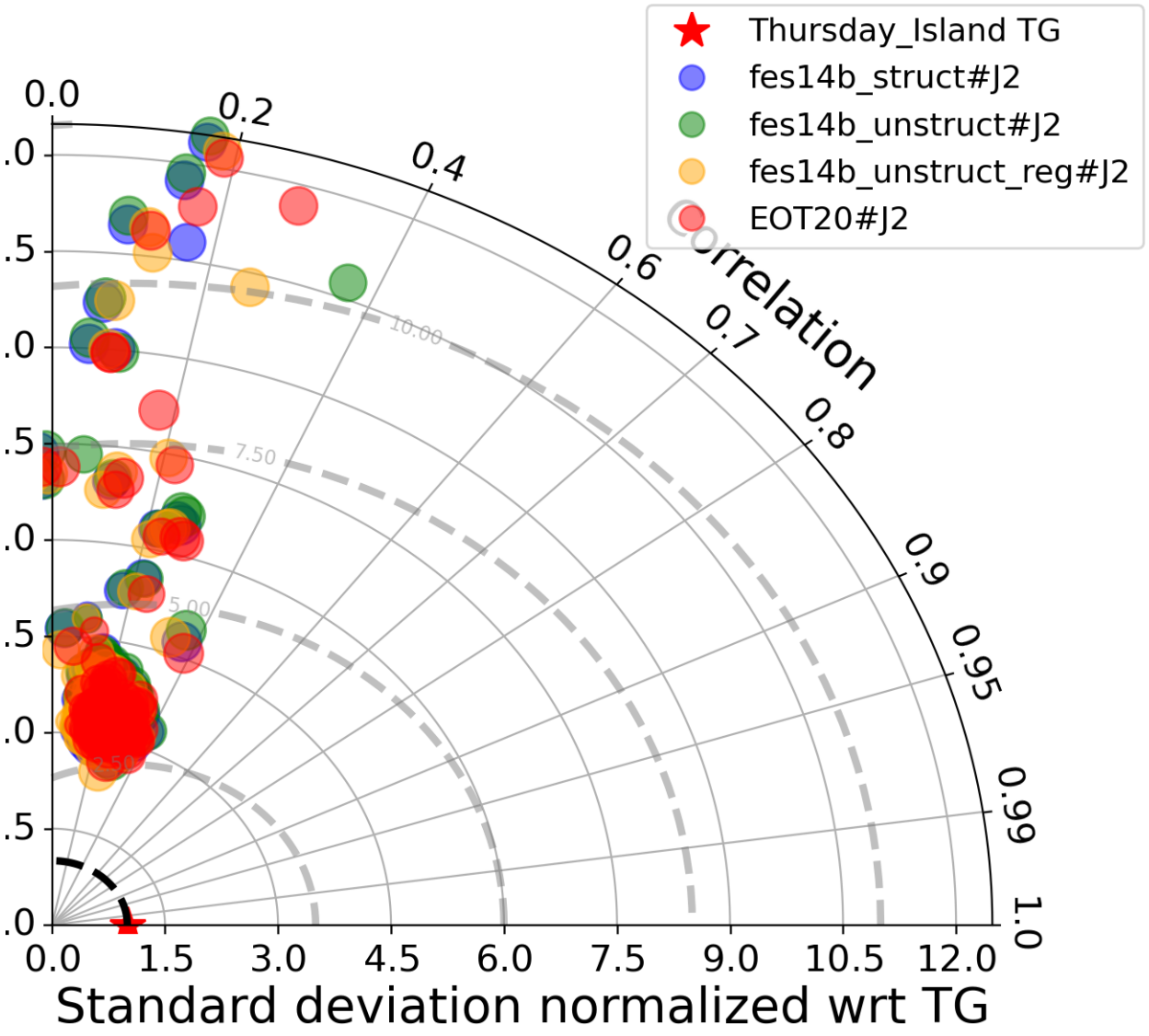

Figure 100 – Taylor diagram

6.3.9 Mean statistics table of products comparison with Thursday_Island 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)
fes14b_struct#J2	88.581	0.179	0.276	0.274
fes14b_unstruct#J2	88.581	0.181	0.282	0.279
fes14b_unstruct_reg#J2	88.591	0.184	0.271	0.268
EOT20#J2	88.581	0.215	0.27	0.265

FIGURE 101 – 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 51 point.

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.074
fes14b_struct#J2	23.894	4.669	64.706	0.375	0.246
fes14b_unstruct#J2	23.894	4.669	64.706	0.386	0.247
fes14b_unstruct_reg#J2	23.894	4.669	70.588	0.255	0.772
EOT20#J2	23.894	4.669	72.549	0.28	0.869

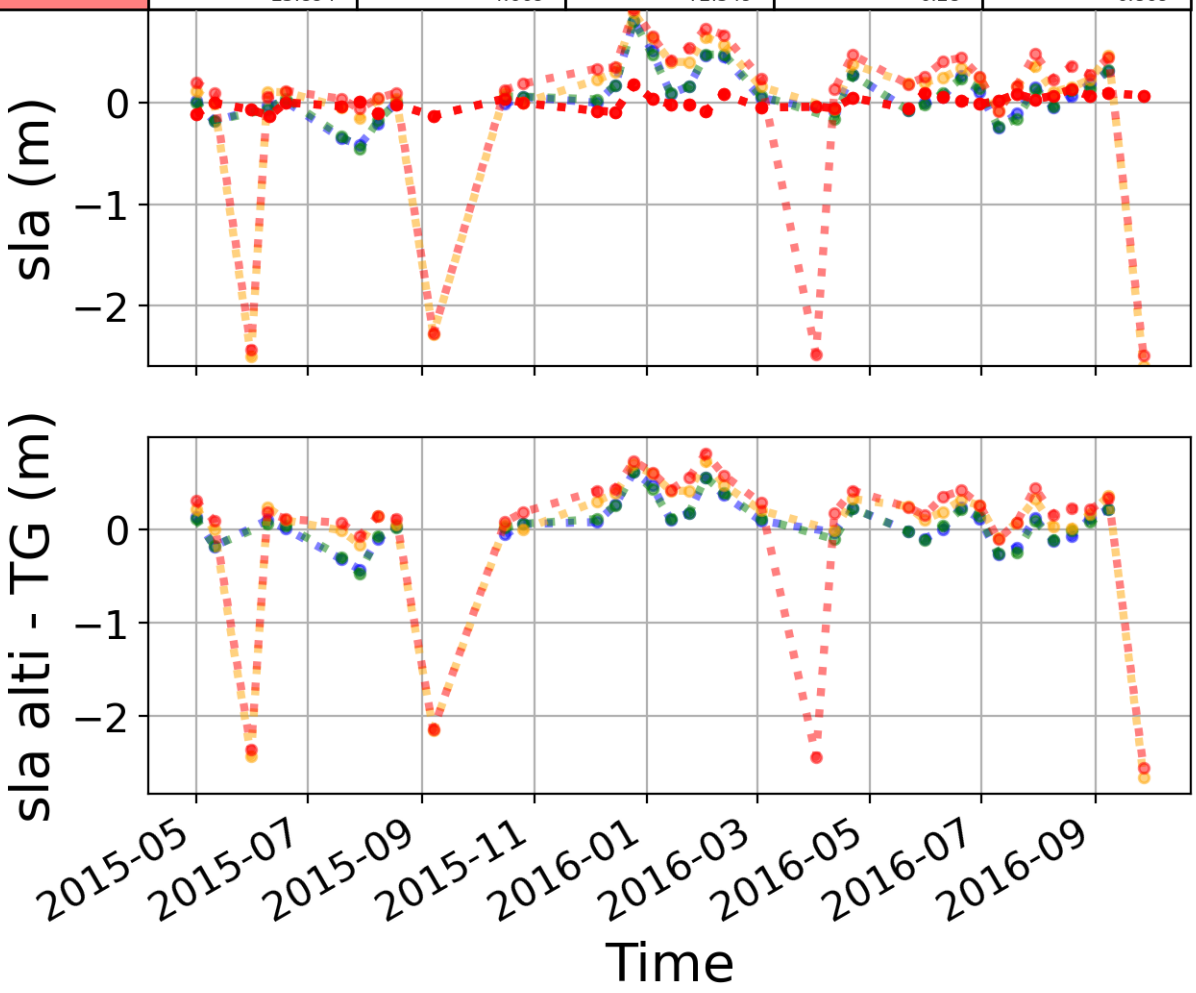

Figure 102 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.071
fes14b_struct#J2	34.837	11.412	98.039	0.373	0.213
fes14b_unstruct#J2	34.837	11.412	98.039	0.364	0.222
fes14b_unstruct_reg#J2	34.837	11.412	98.039	0.339	0.222
EOT20#J2	34.837	11.412	98.039	0.384	0.22

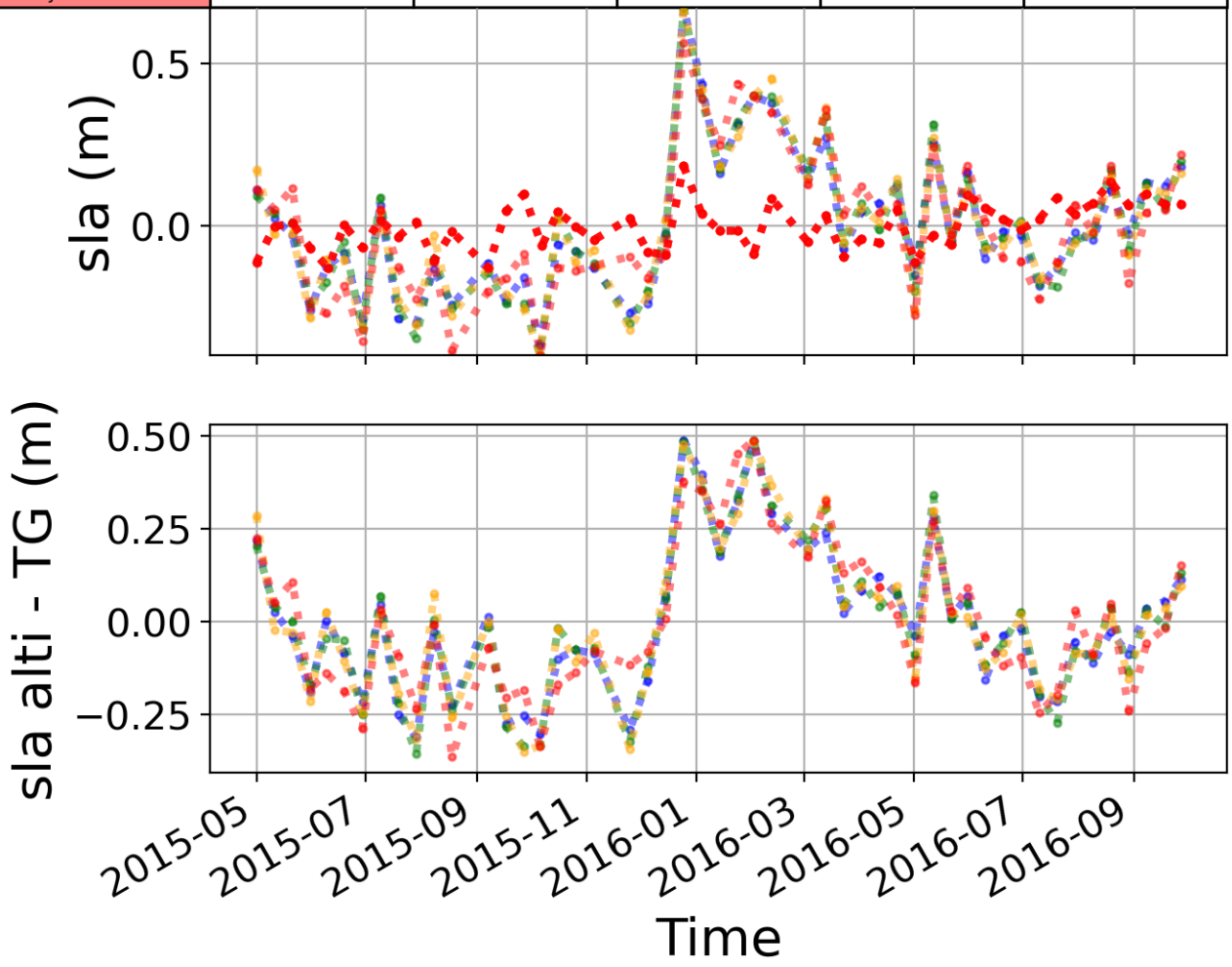

Figure 103 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.073
fes14b_struct#J2	32.805	7.792	90.196	0.267	0.271
fes14b_unstruct#J2	32.805	7.792	90.196	0.269	0.278
fes14b_unstruct_reg#J2	32.805	7.792	90.196	0.368	0.229
EOT20#J2	32.805	7.792	90.196	0.364	0.238

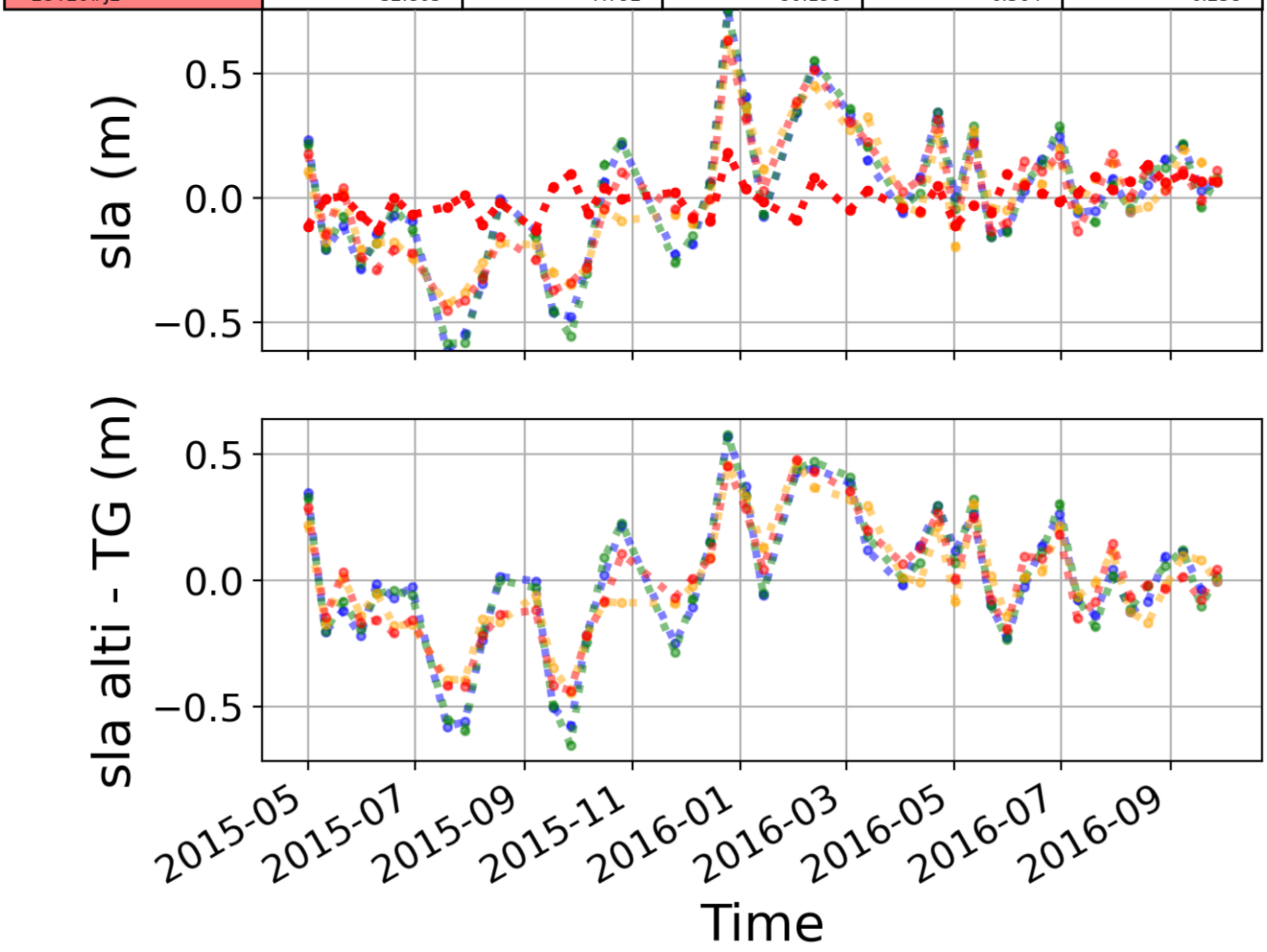

Figure 104 – The 3rd most correlated sla altimetry Time serie with tide gauge sla time serie

6.4 Station : Southport

- Nearest track to Southport station is the track number track47
- The area of interest is limited by :
  - A circle which it's center is the Southport tide gauge station location and has a Raduis of 40 Km
  - Maximum distance to the coast : 20 Km
  - Latitude limits : [-43.55, -43.2] °

6.4.1 correlation visualization in maps view % Southport tide gauge

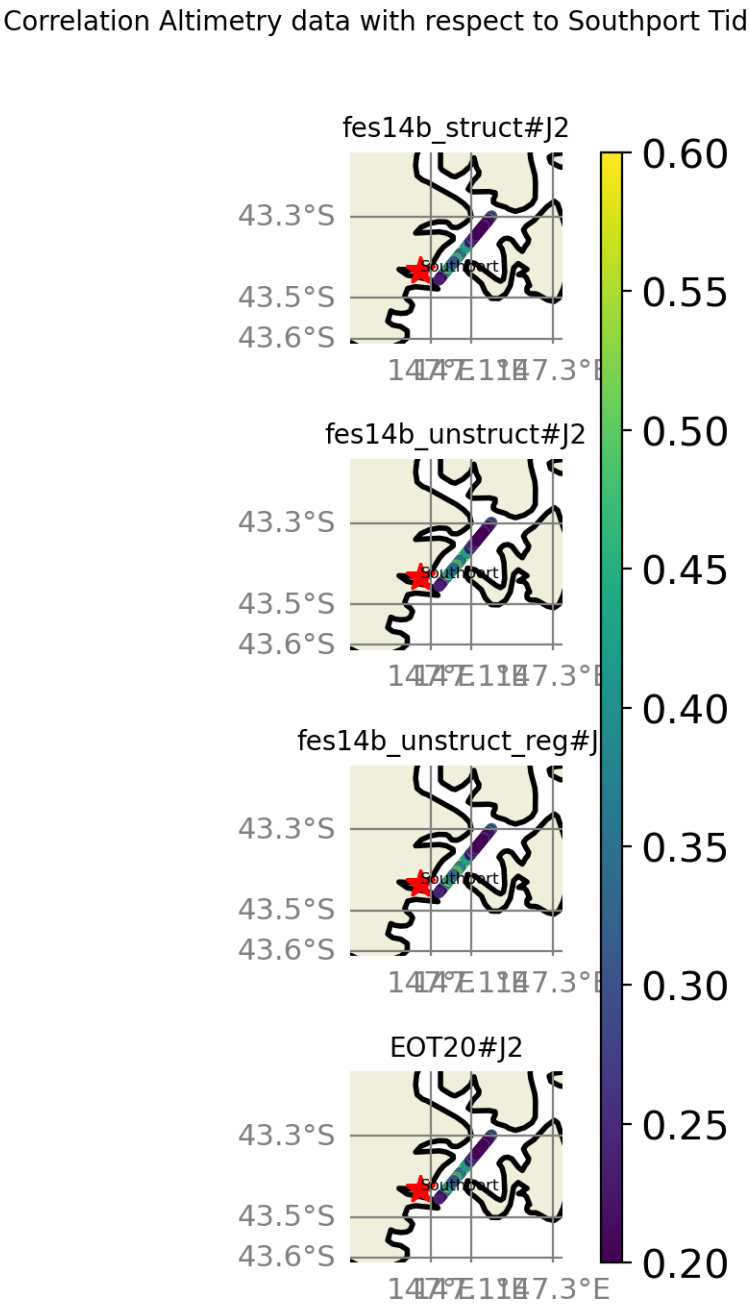

FIGURE 105 – correlation visualization in maps view % Southport tide gauge

6.4.2 rmsd visualization in maps view % Southport tide gauge

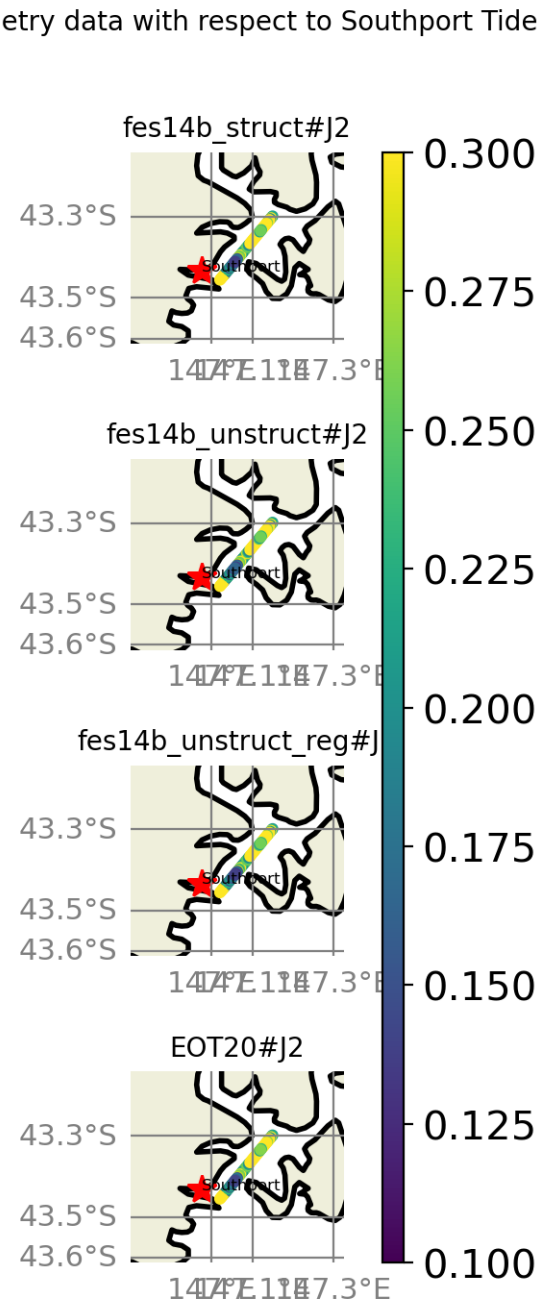

FIGURE 106 – rmsd visualization in maps view % Southport tide gauge

6.4.3 std visualization in maps view % Southport tide gauge

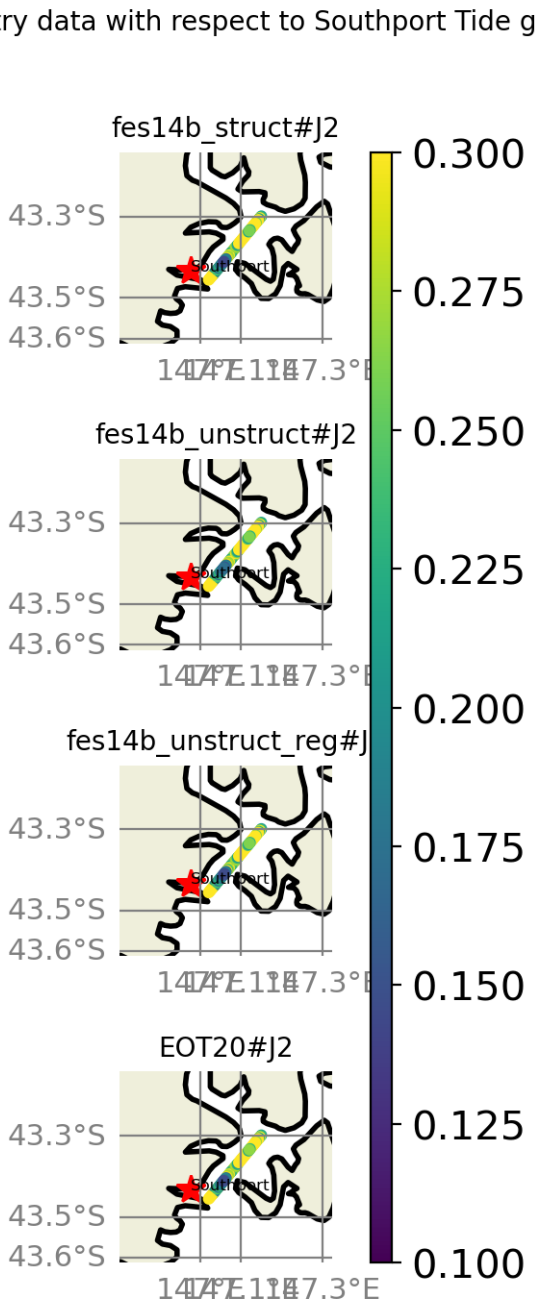

FIGURE 107 – std visualization in maps view % Southport tide gauge

6.4.4 valid_data_percent visualization in maps view % Southport tide gauge

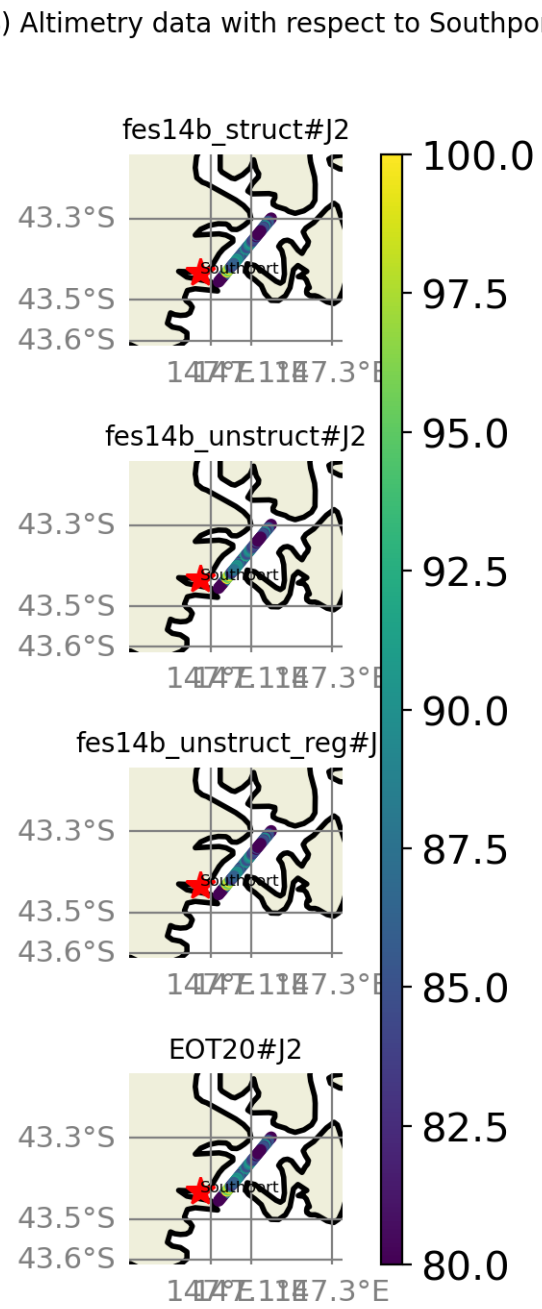

FIGURE 108 – valid_data_percent visualization in maps view % Southport tide gauge

6.4.5 Valid data (%) in function of distance to coast/Southport 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. $maxNB = 65$ 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.

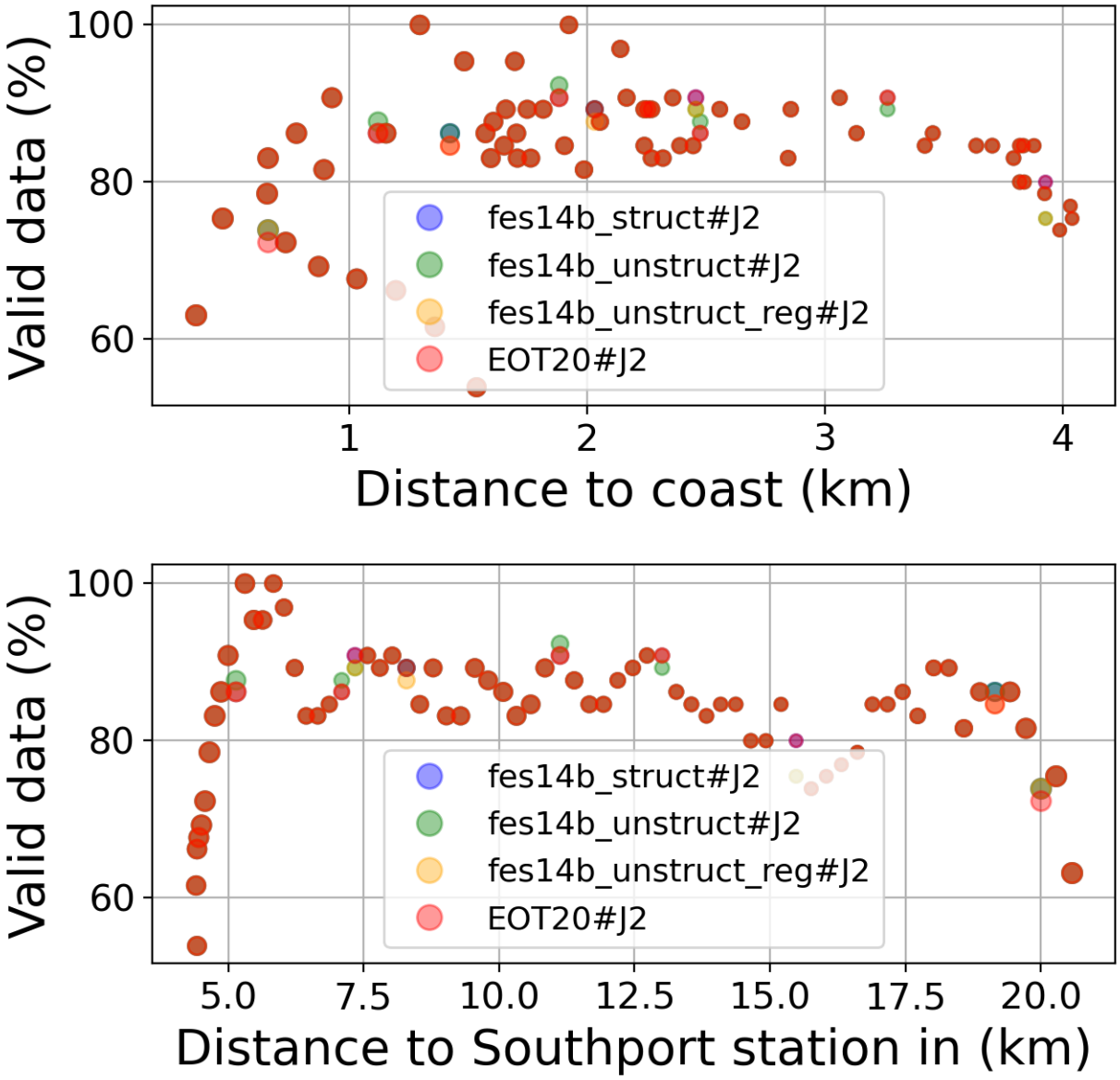

Figure 109 – Valid data (%) in function of distance to coast/Southport station

6.4.6 Std in function of distance to coast/Southport station

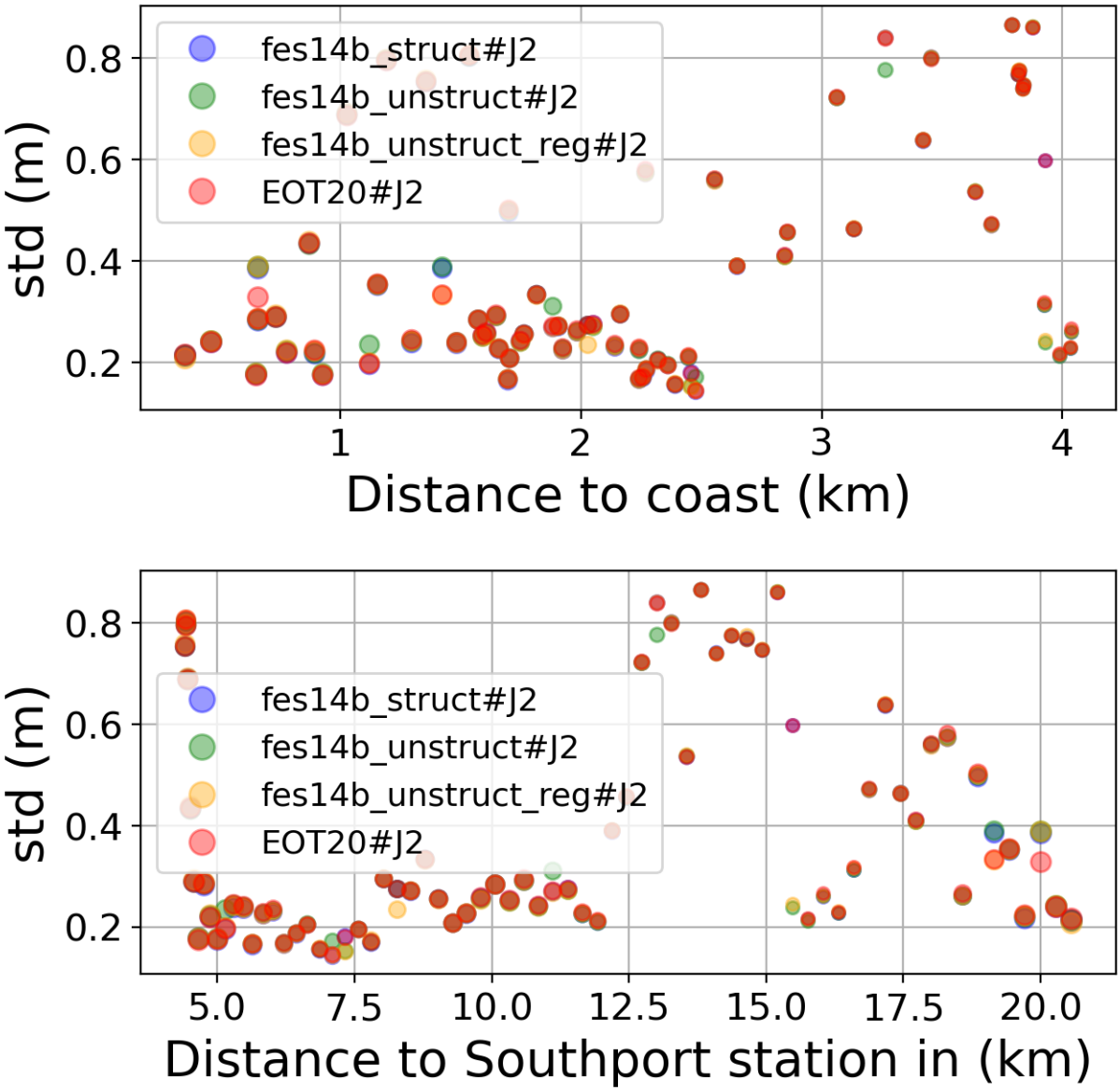

FIGURE 110 – Std in function of the distance to the coast/Southport station

6.4.7 Correlation in function of distance to coast/Southport station

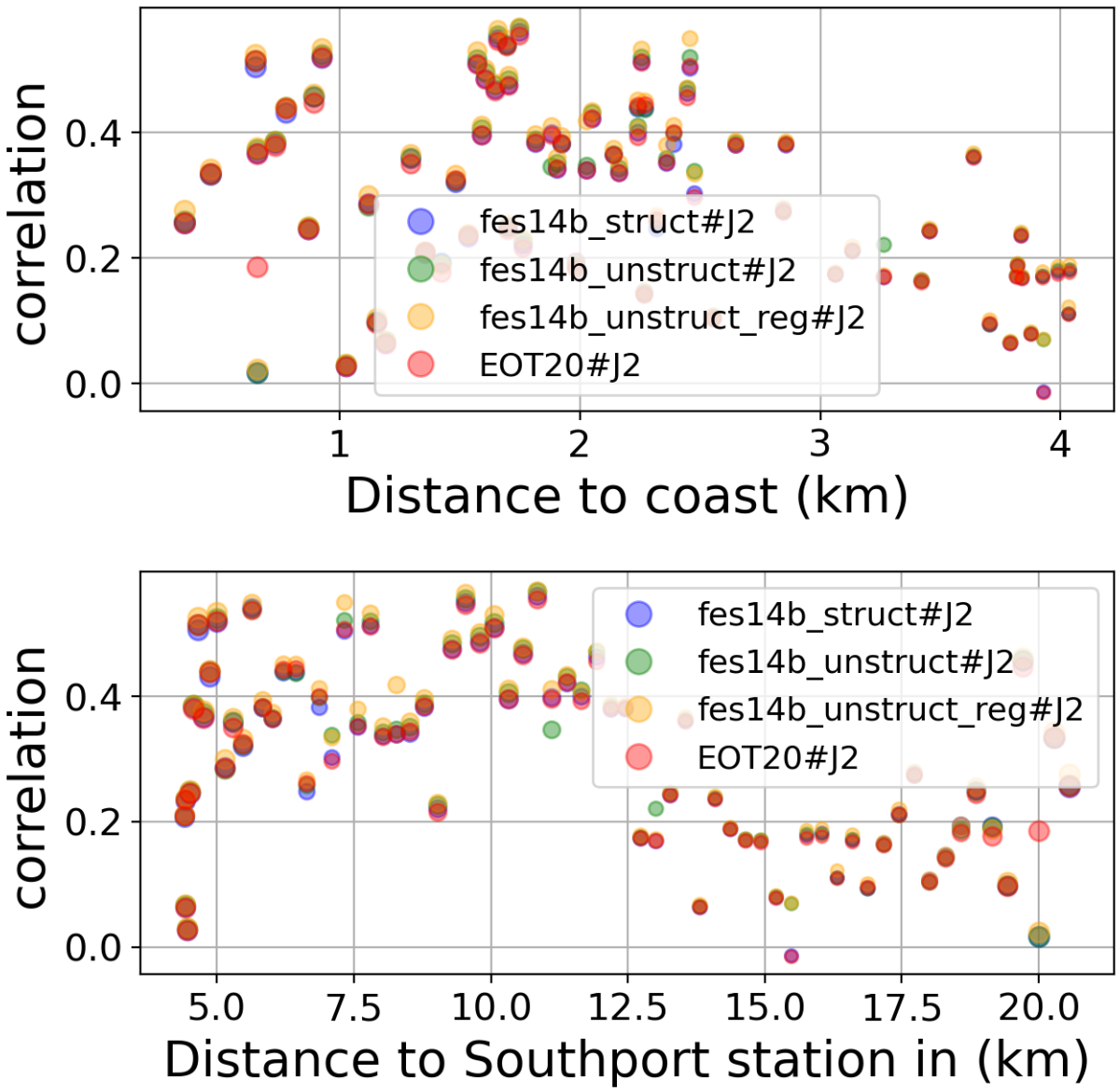

FIGURE 111 – Correlation in function of the distance to the coast/Southport station

6.4.8 Taylor Diagram

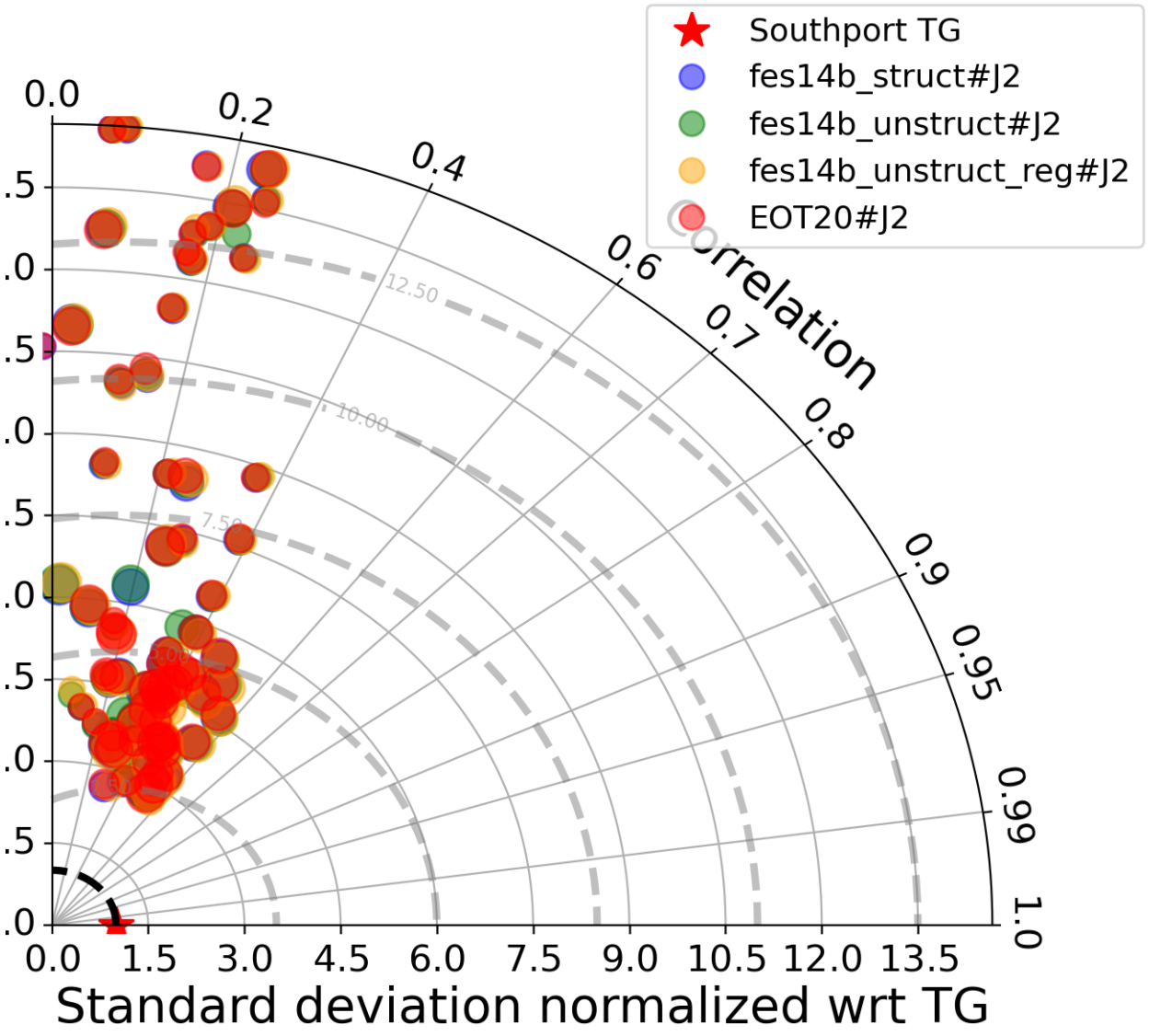

Figure 112 – Taylor diagram

6.4.9 Mean statistics table of products comparison with Southport 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)
fes14b_struct#J2	83.792	0.299	0.385	0.373
fes14b_unstruct#J2	83.749	0.304	0.38	0.369
fes14b_unstruct_reg#J2	83.662	0.311	0.379	0.367
EOT20#J2	83.749	0.3	0.385	0.373

FIGURE 113 – 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 65 point.

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.052
fes14b_struct#J2	10.843	1.746	89.231	0.561	0.242
fes14b_unstruct#J2	10.843	1.746	89.231	0.568	0.241
fes14b_unstruct_reg#J2	10.843	1.746	89.231	0.569	0.241
EOT20#J2	10.843	1.746	89.231	0.554	0.244

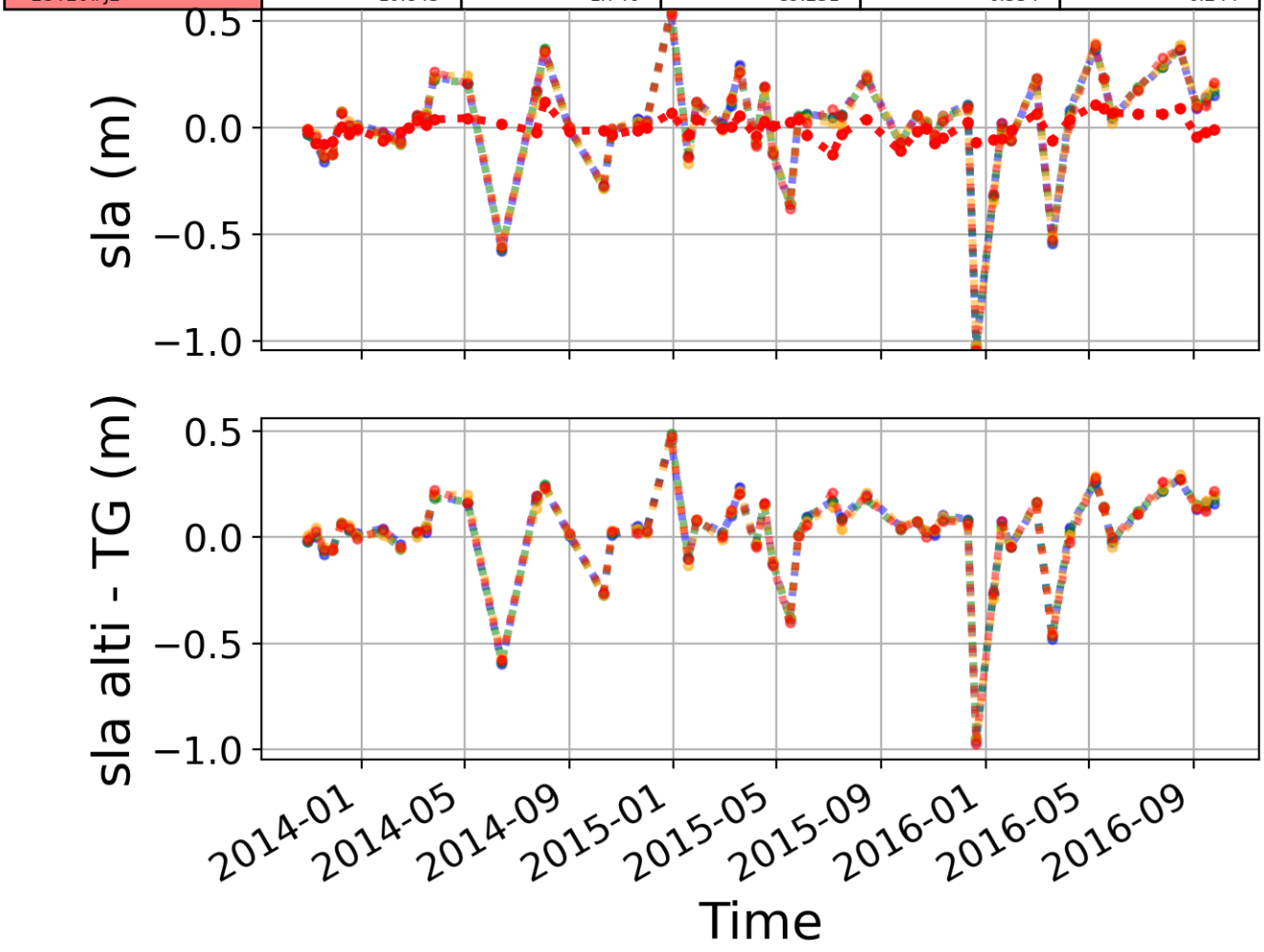

FIGURE 114 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

6.5 Station : Townsville

- Nearest track to Townsville station is the track number track175
- The area of interest is limited by :
  - A circle which it's center is the Townsville 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 % Townsville tide gauge

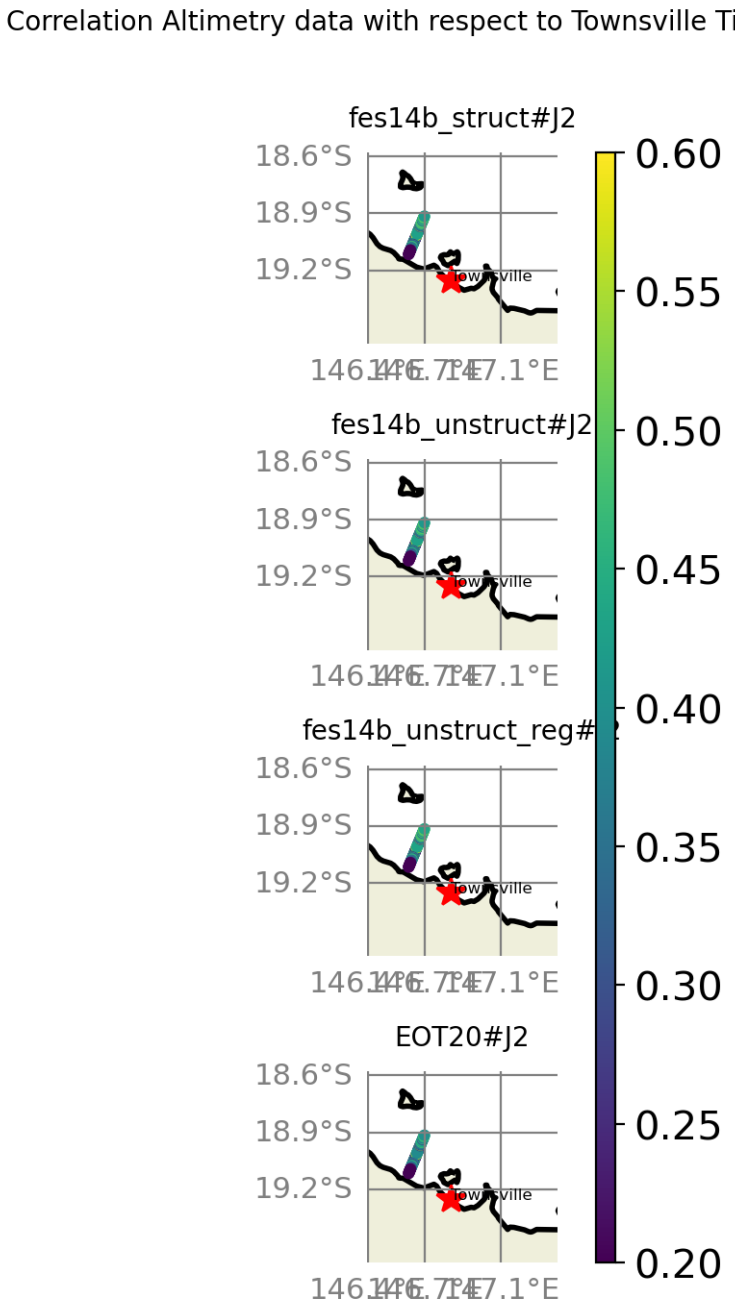

Figure 115 – correlation visualization in maps view % Townsville tide gauge

6.5.2 rmsd visualization in maps view % Townsville tide gauge

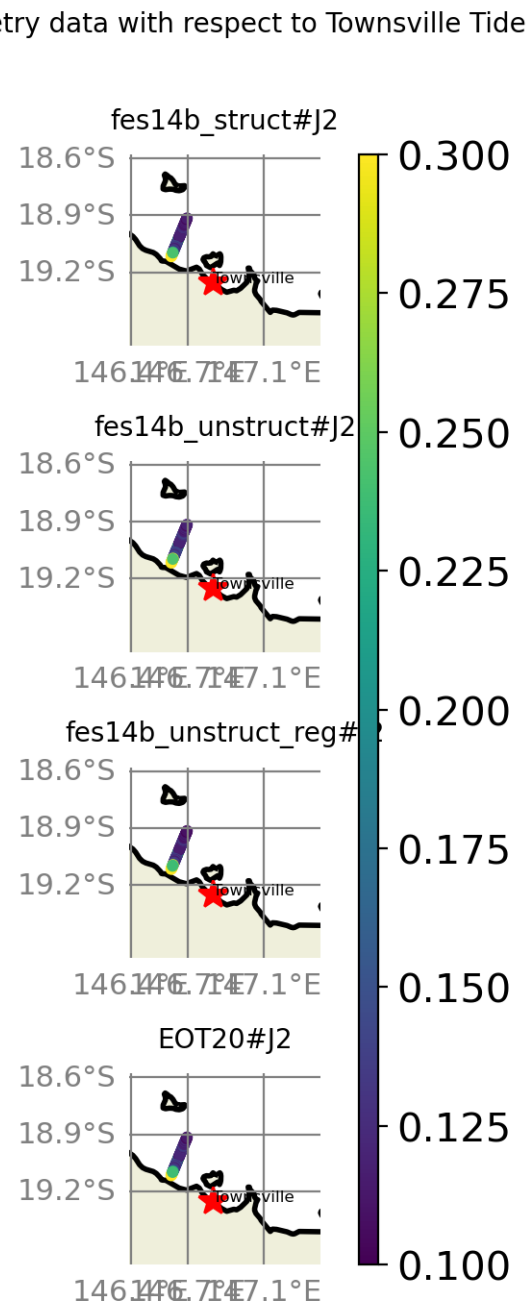

Figure 116 – rmsd visualization in maps view % Townsville tide gauge

6.5.3 std visualization in maps view % Townsville tide gauge

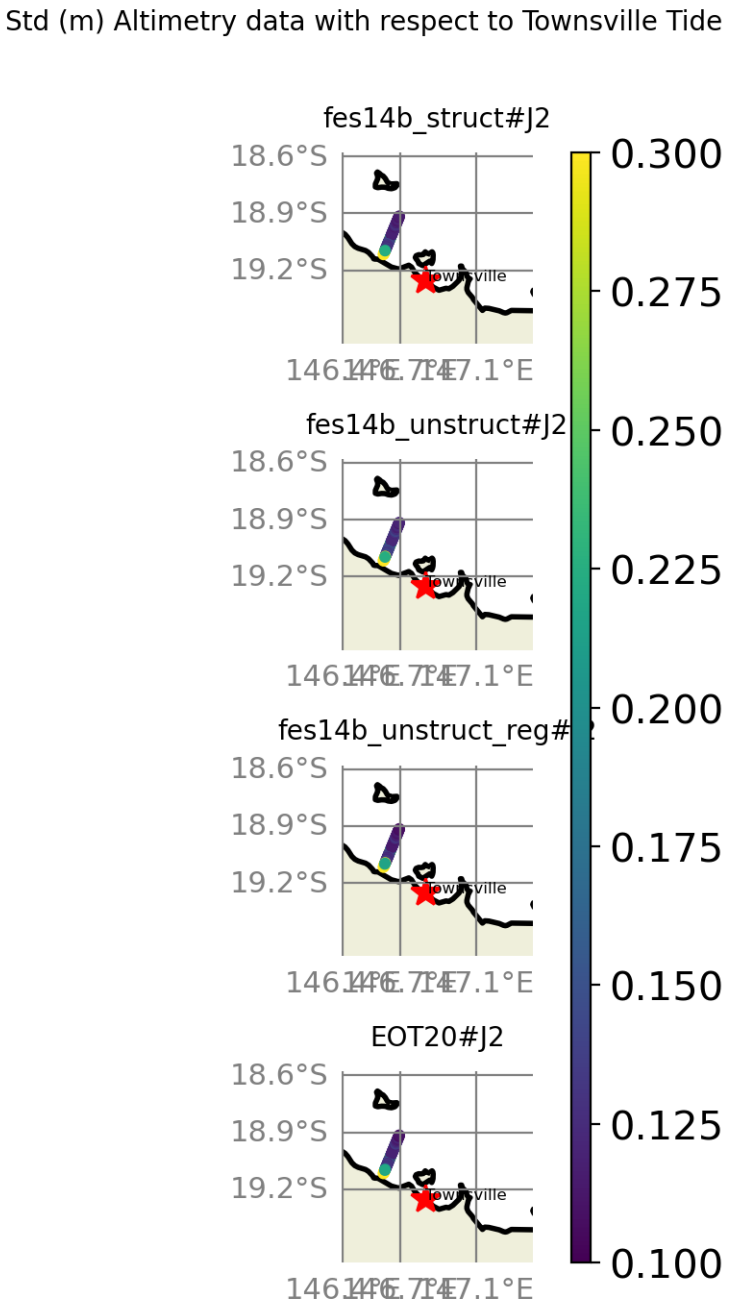

FIGURE 117 – std visualization in maps view % Townsville tide gauge

6.5.4 valid_data_percent visualization in maps view % Townsville tide gauge

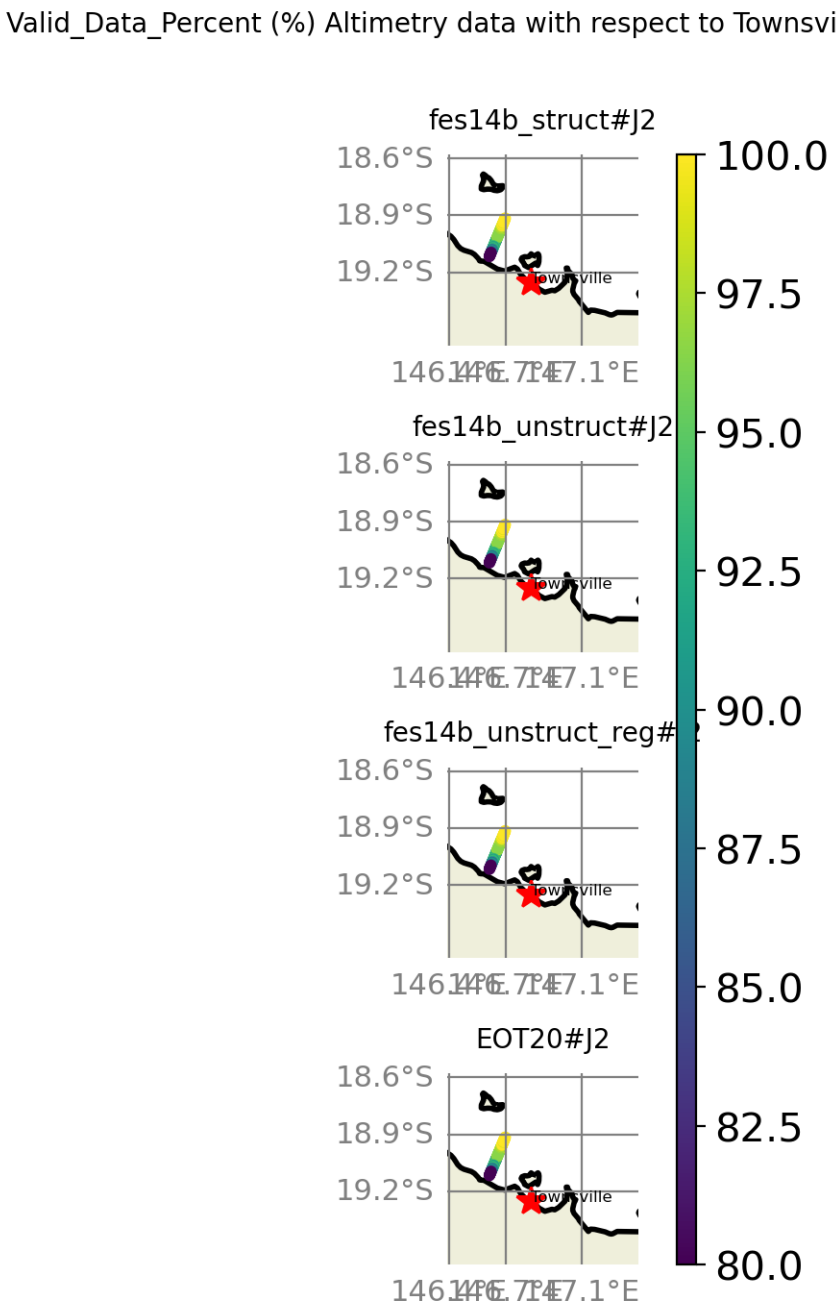

FIGURE 118 – valid_data_percent visualization in maps view % Townsville tide gauge

6.5.5 Valid data (%) in function of distance to coast/Townsville 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. $maxNB = 85$ 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.

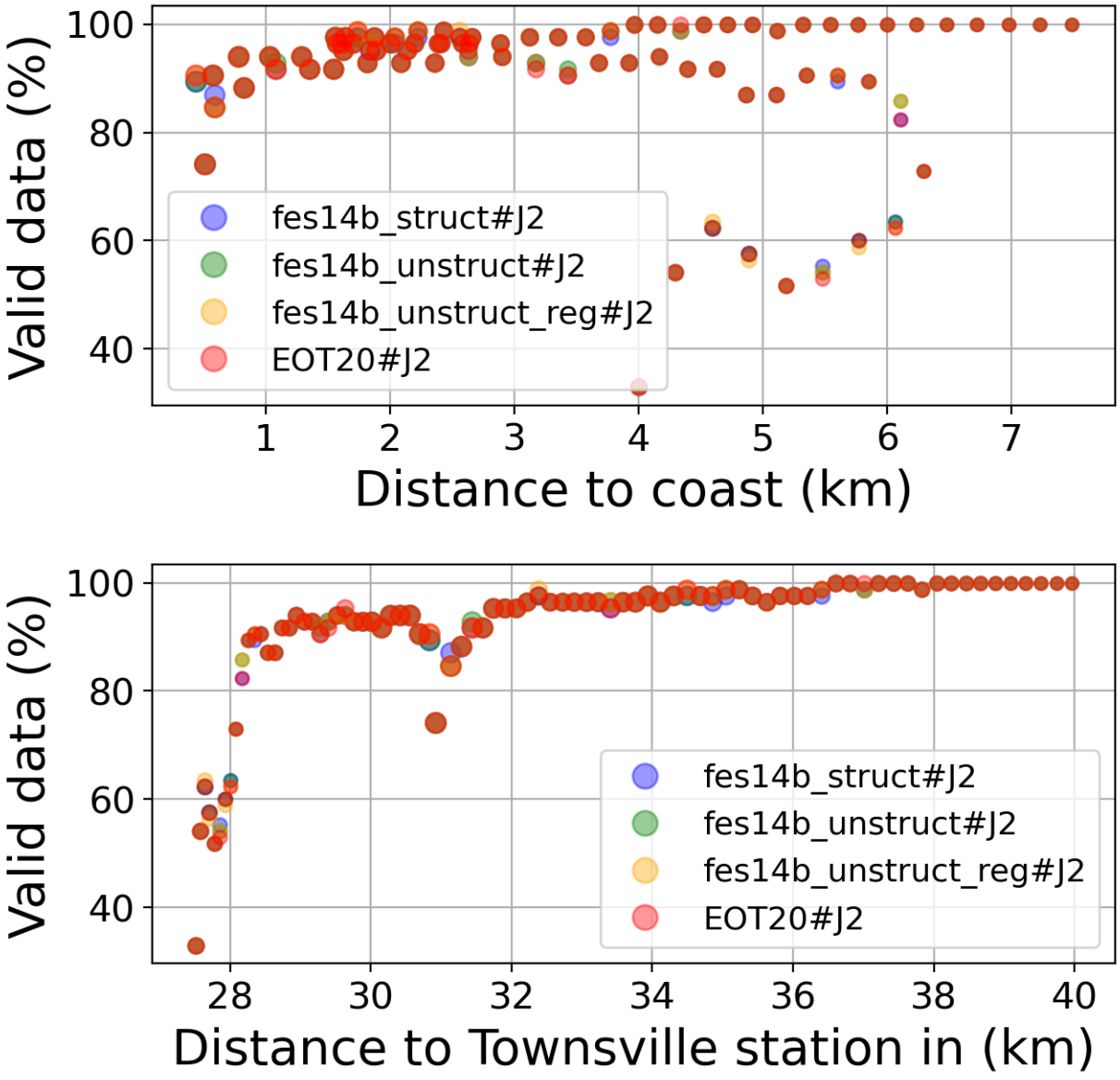

FIGURE 119 – Valid data (%) in function of distance to coast/Townsville station

6.5.6 Std in function of distance to coast/Townsville station

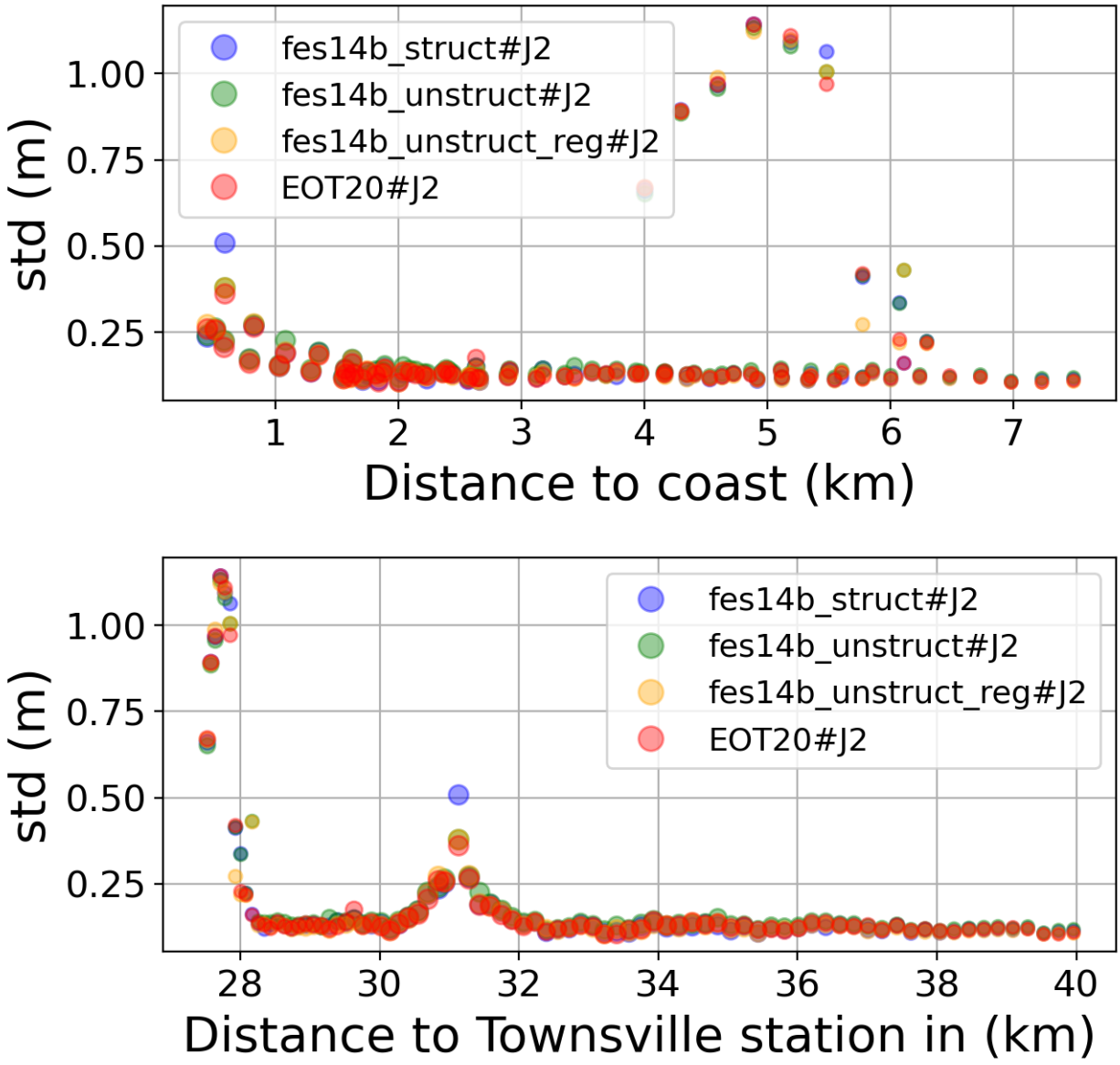

FIGURE 120 – Std in function of the distance to the coast/Townsville station

6.5.7 Correlation in function of distance to coast/Townsville station

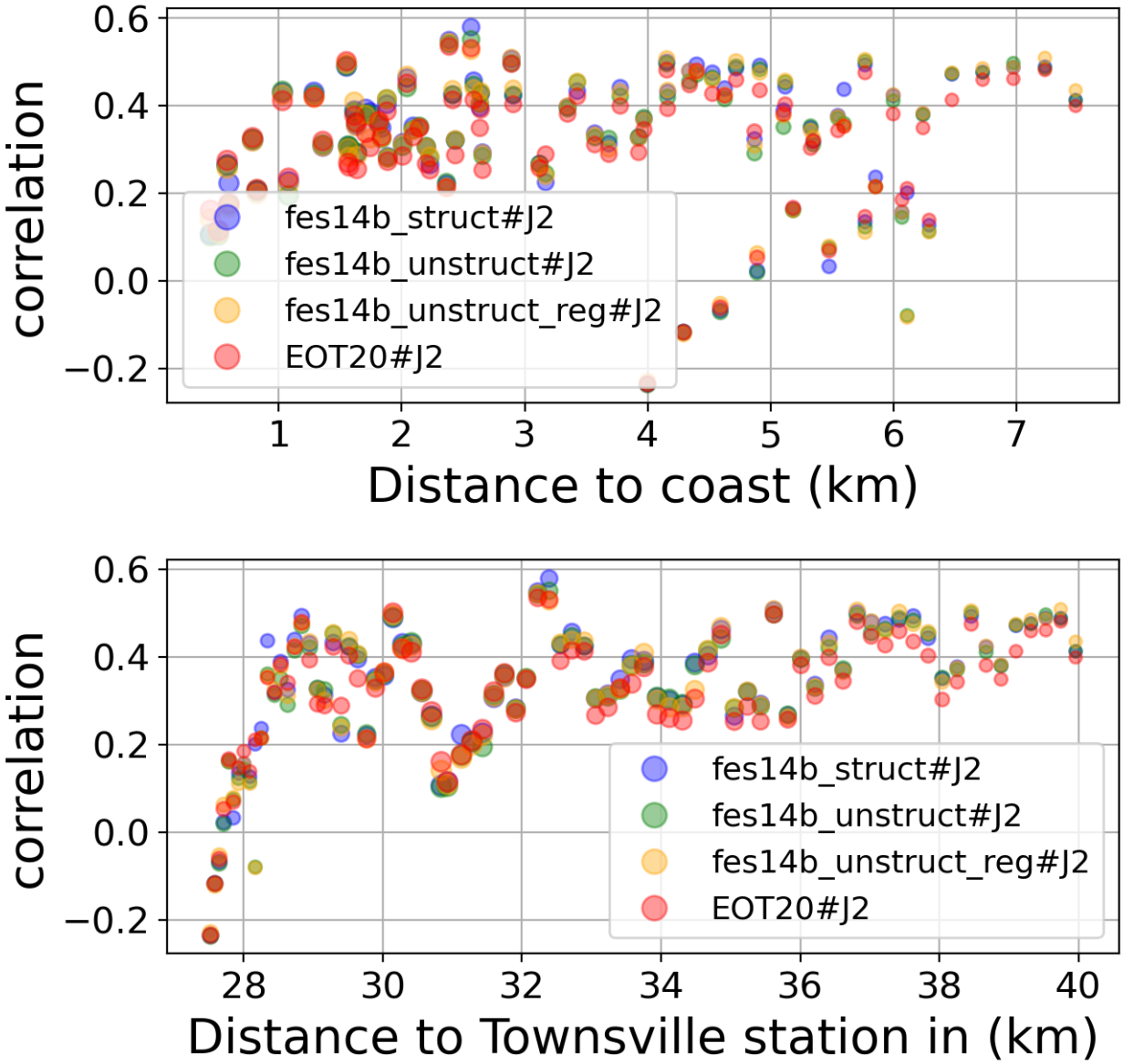

Figure 121 – Correlation in function of the distance to the coast/Townsville station

6.5.8 Taylor Diagram

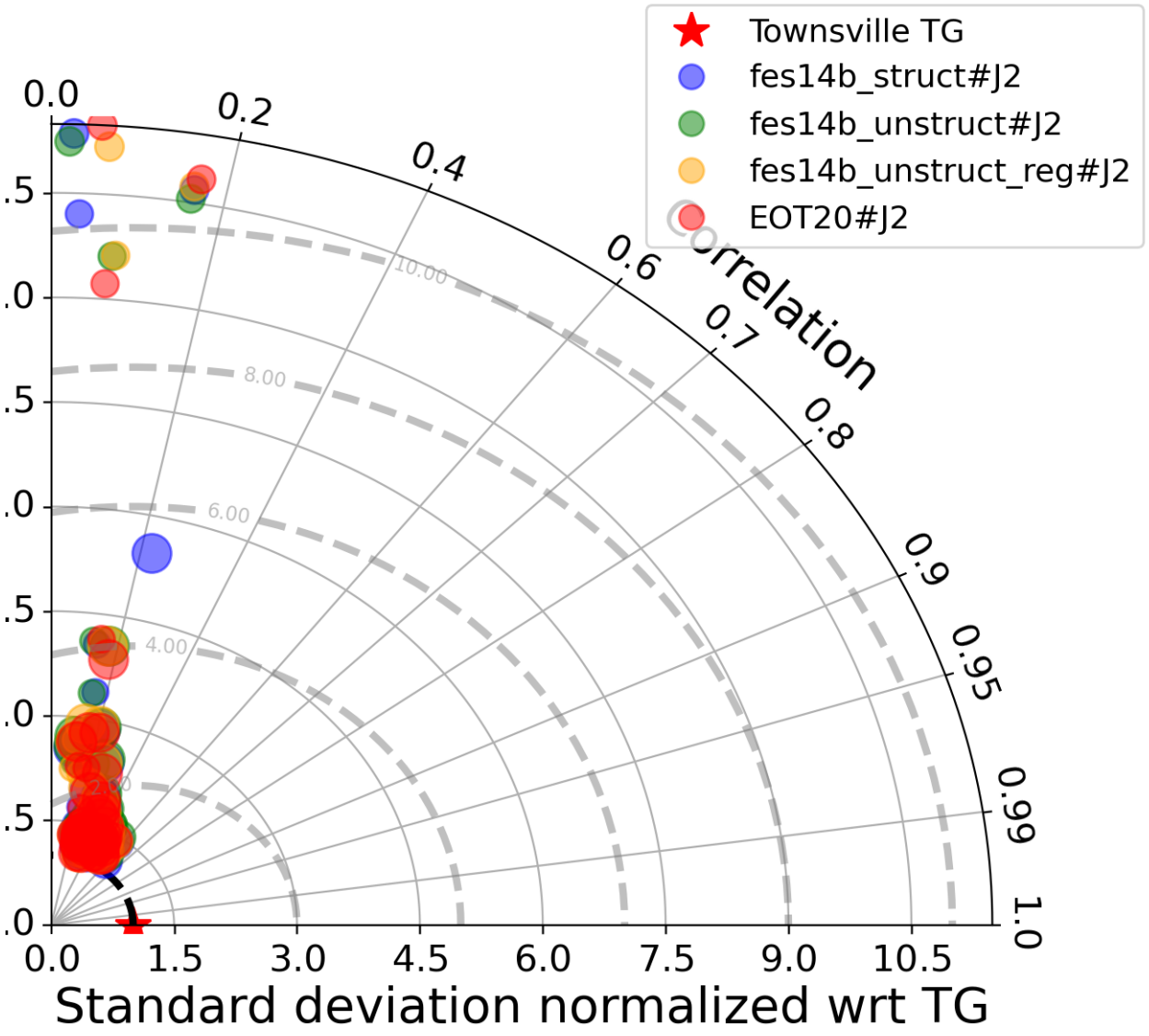

Figure 122 – Taylor diagram

6.5.9 Mean statistics table of products comparison with Townsville 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)
fes14b_struct#J2	90.861	0.335	0.208	0.209
fes14b_unstruct#J2	90.961	0.327	0.215	0.215
fes14b_unstruct_reg#J2	90.947	0.33	0.206	0.207
EOT20#J2	90.89	0.319	0.205	0.207

FIGURE 123 – 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 85 point.

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.097
fes14b_struct#J2	32.384	2.561	97.647	0.581	0.109
fes14b_unstruct#J2	32.384	2.561	97.647	0.552	0.118
fes14b_unstruct_reg#J2	32.384	2.561	98.824	0.527	0.123
EOT20#J2	32.384	2.561	97.647	0.532	0.112

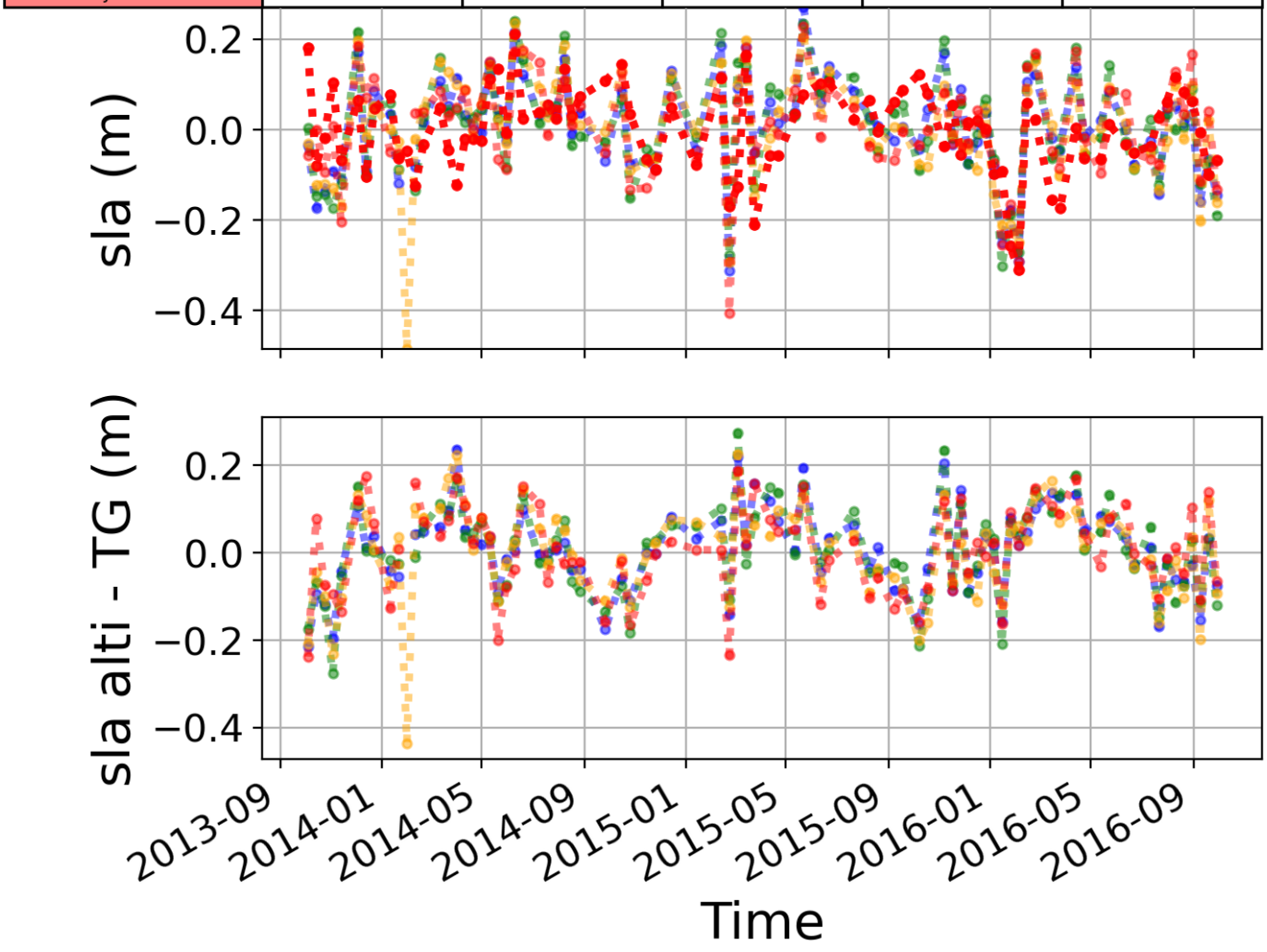

Figure 124 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.097
fes14b_struct#J2	32.222	2.384	96.471	0.55	0.14
fes14b_unstruct#J2	32.222	2.384	96.471	0.543	0.147
fes14b_unstruct_reg#J2	32.222	2.384	96.471	0.547	0.14
EOT20#J2	32.222	2.384	96.471	0.537	0.14

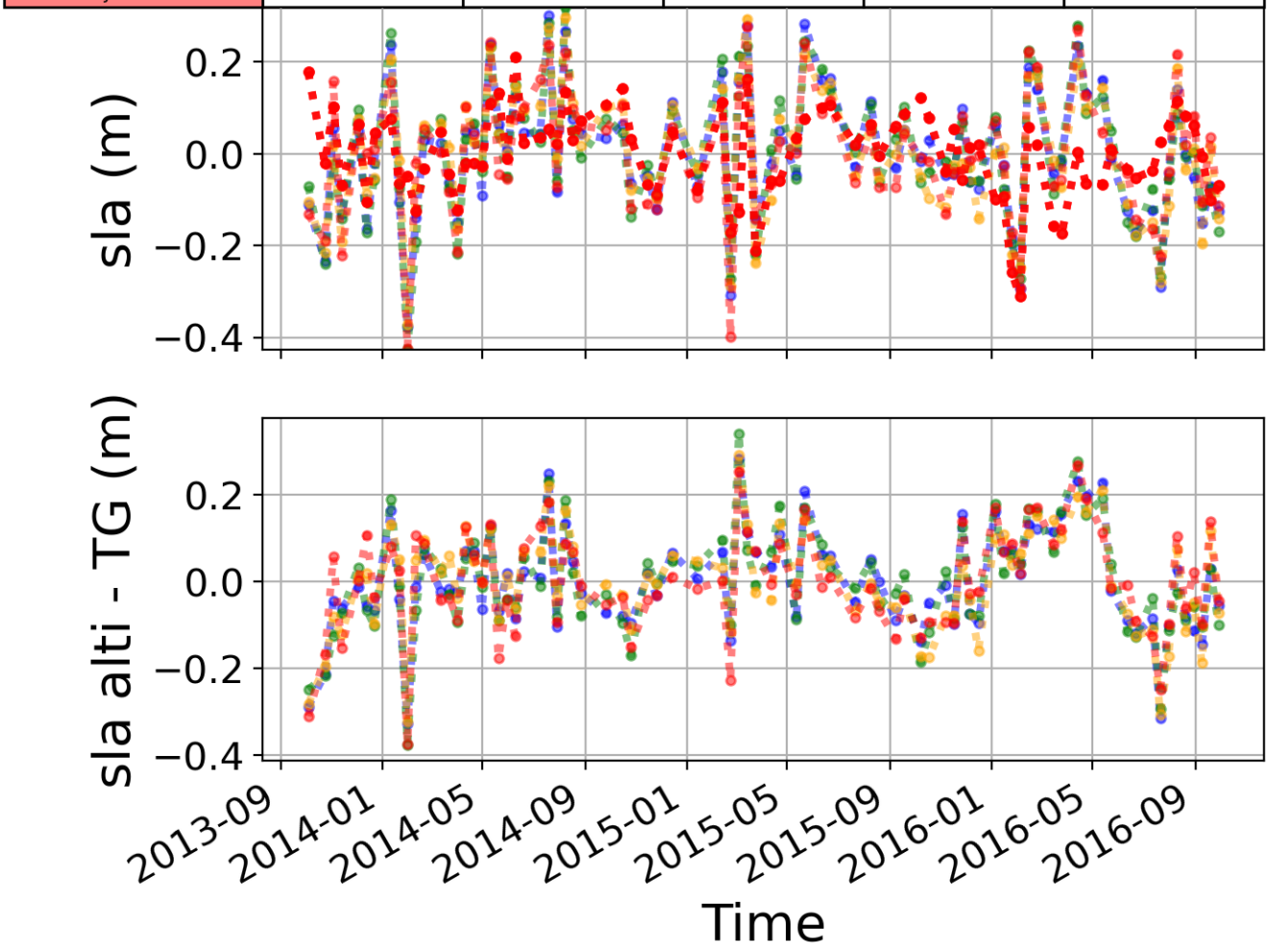

FIGURE 125 – The 2nd most correlated sla altimetry Time serie with tide gauge sla time serie

6.6 Station : Booby_island

- Nearest track to Booby_island station is the track number track138
- The area of interest is limited by :
  - A circle which it's center is the Booby_island 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 % Booby_island tide gauge

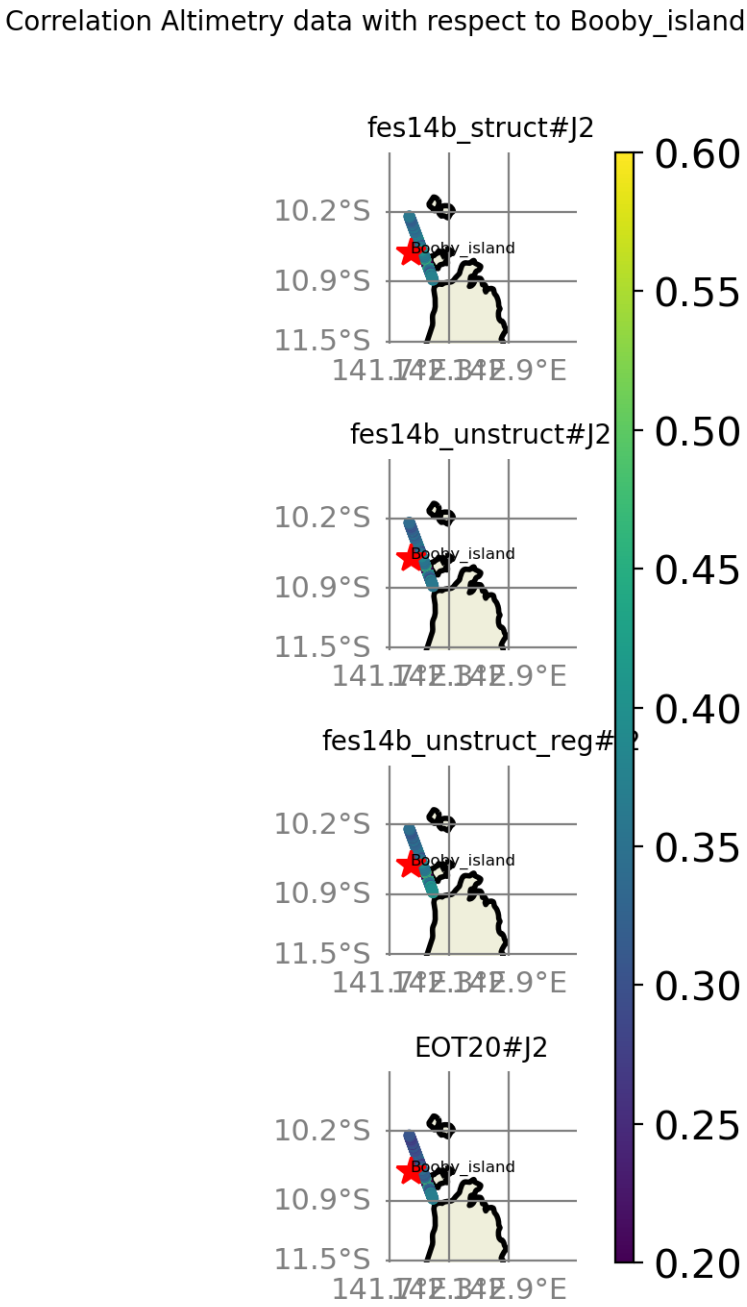

FIGURE 126 – correlation visualization in maps view % Booby_island tide gauge

6.6.2 rmsd visualization in maps view % Booby_island tide gauge

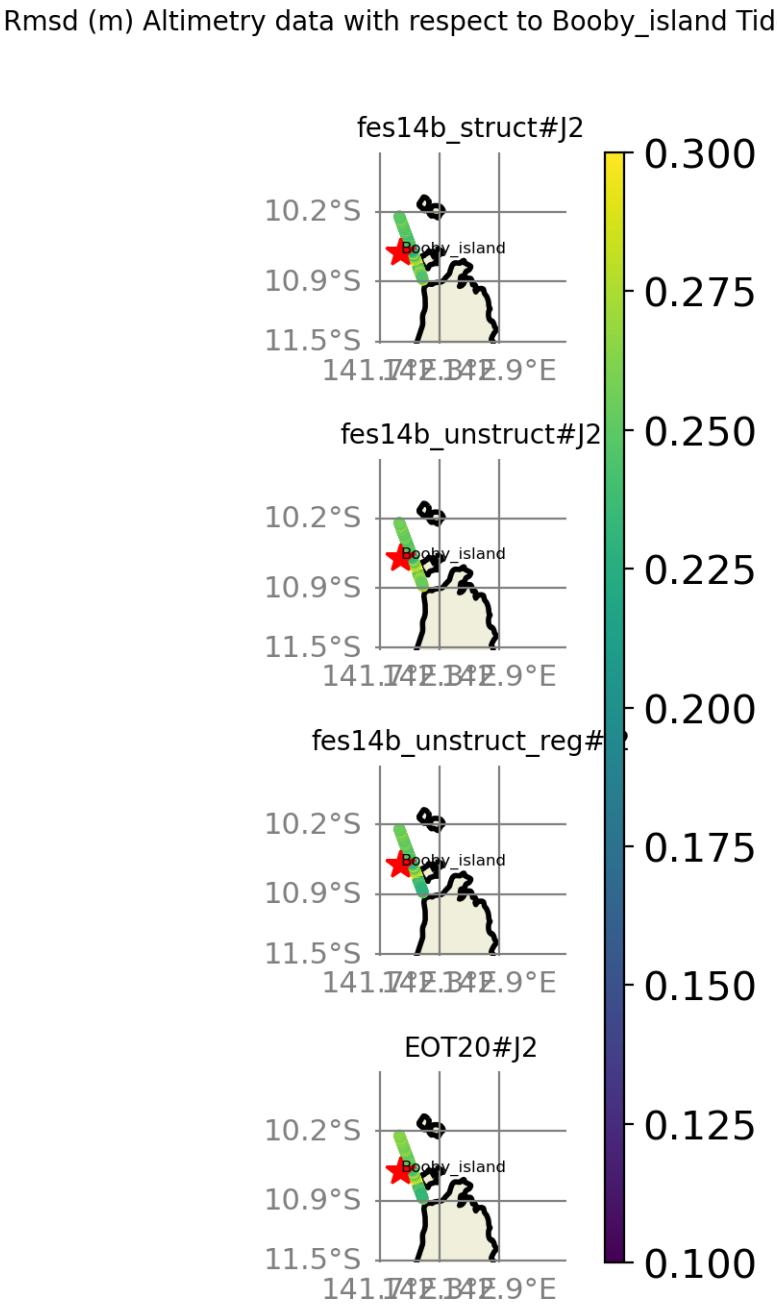

FIGURE 127 – rmsd visualization in maps view % Booby_island tide gauge

6.6.3 std visualization in maps view % Booby_island tide gauge

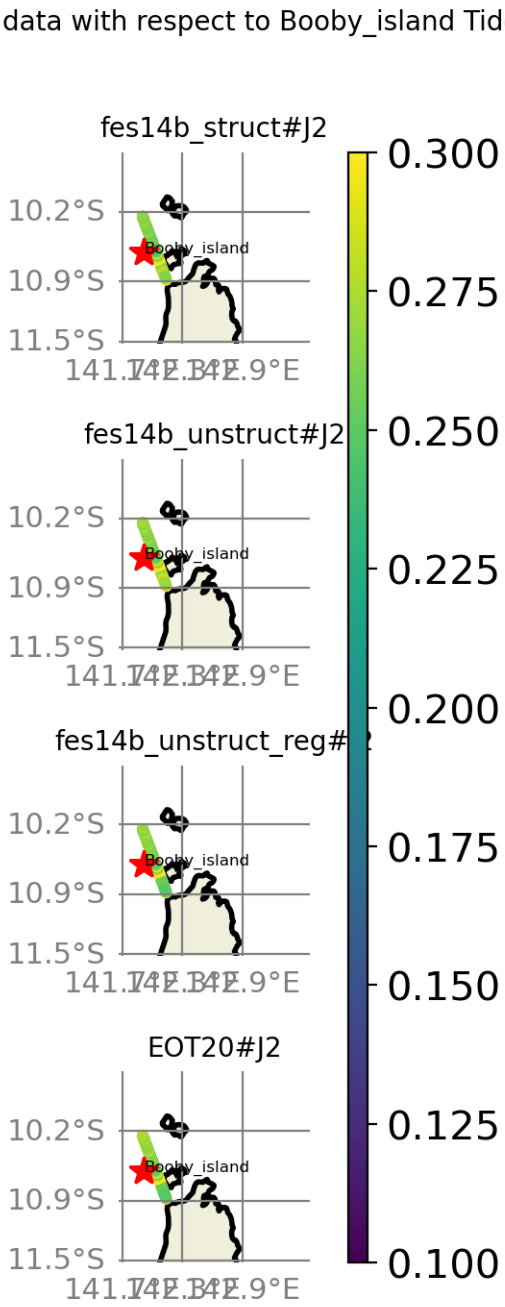

Figure 128 – std visualization in maps view % Booby_island tide gauge

6.6.4 valid_data_percent visualization in maps view % Booby_island tide gauge

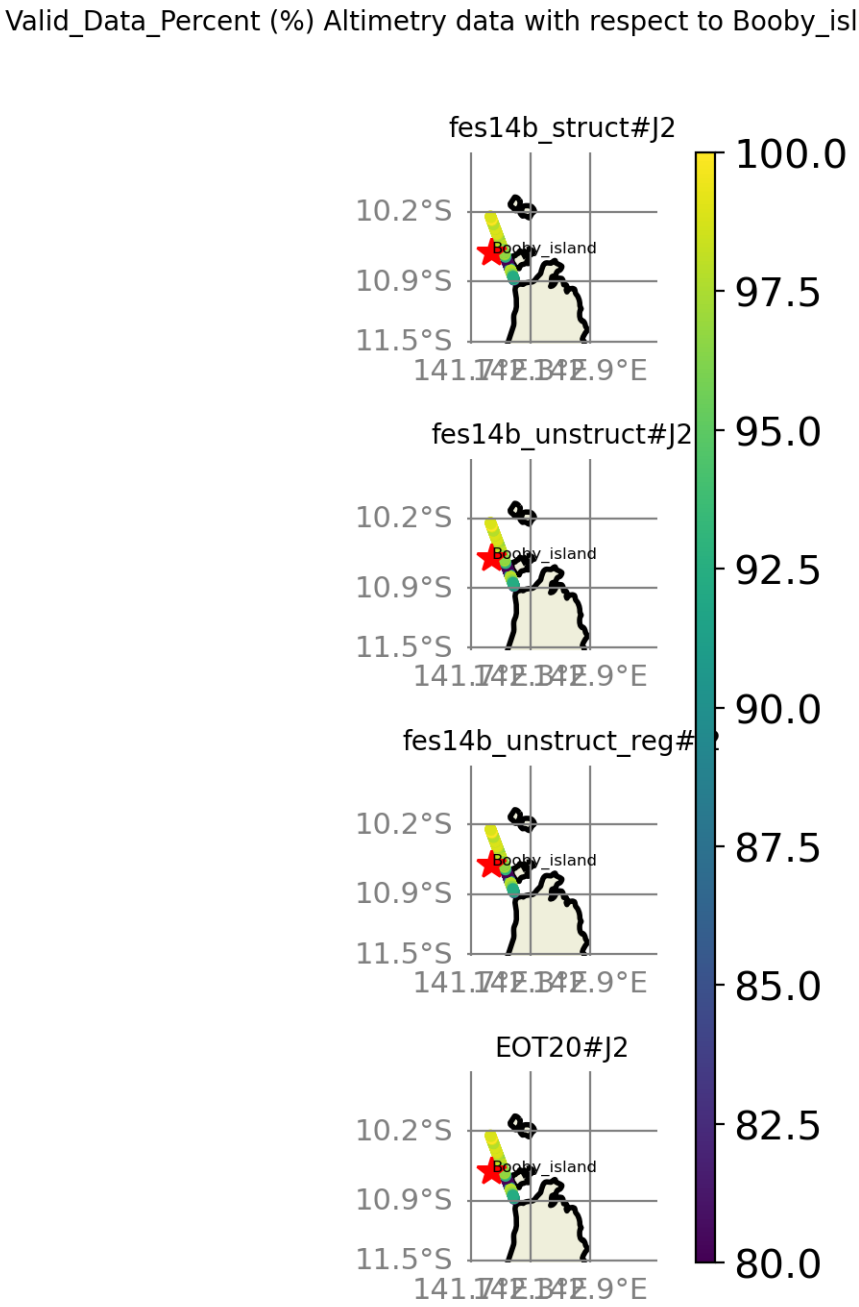

FIGURE 129 – valid_data_percent visualization in maps view % Booby_island tide gauge

6.6.5 Valid data (%) in function of distance to coast/Booby_island 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. $maxNB = 91$ 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.

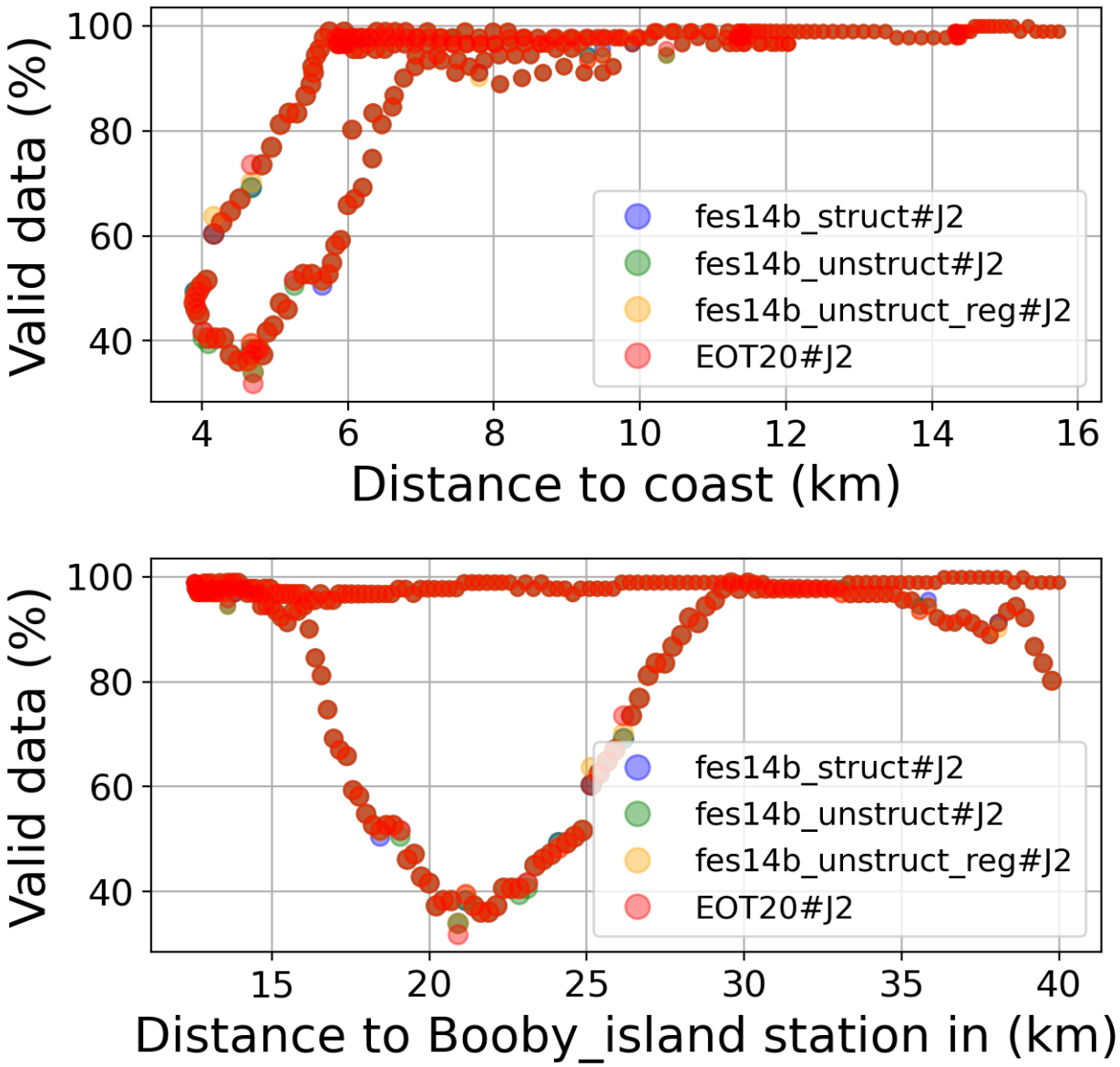

FIGURE 130 – Valid data (%) in function of distance to coast/Booby_island station

6.6.6 Std in function of distance to coast/Booby_island station

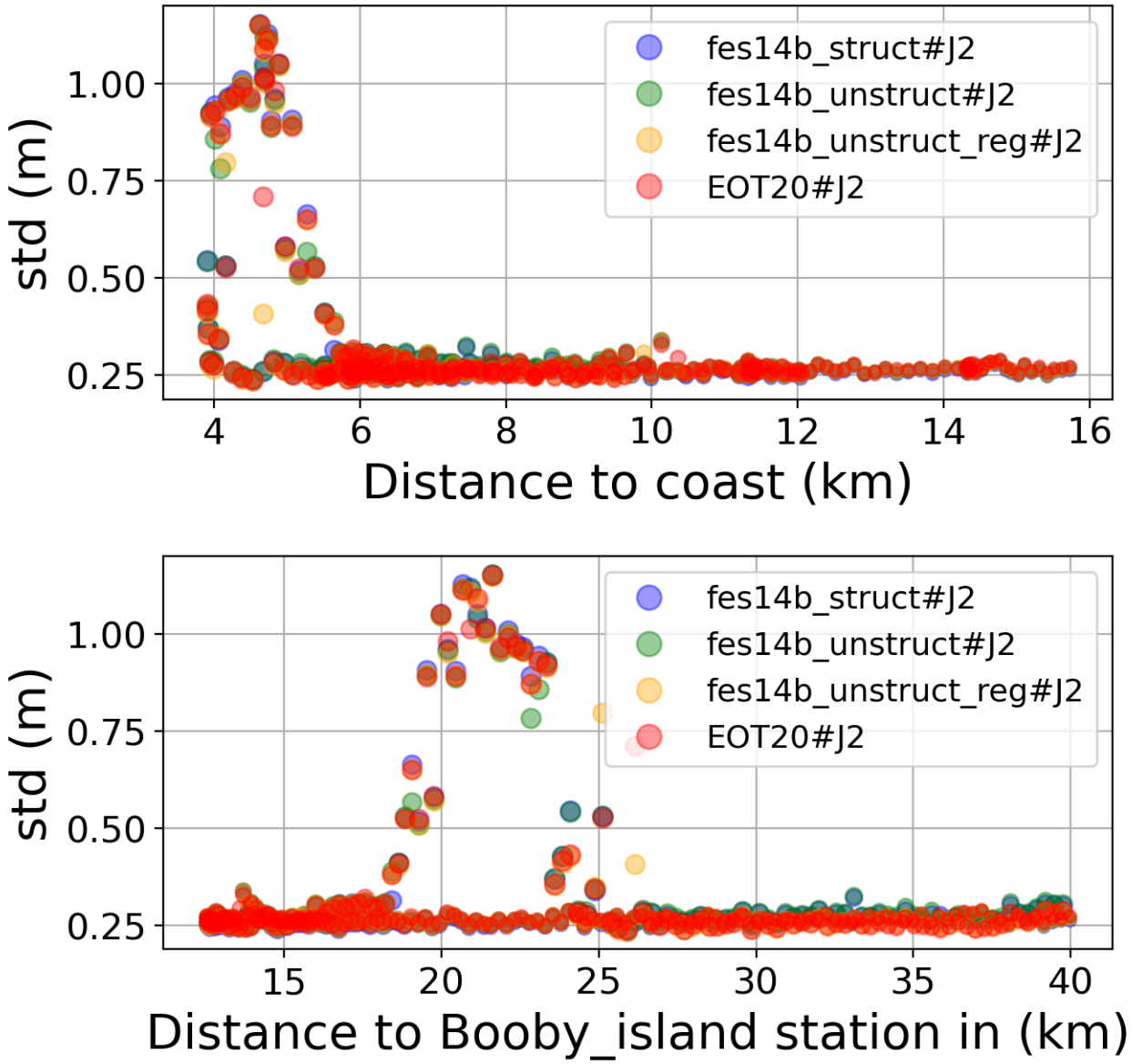

FIGURE 131 – Std in function of the distance to the coast/Booby_island station

6.6.7 Correlation in function of distance to coast/Booby_island station

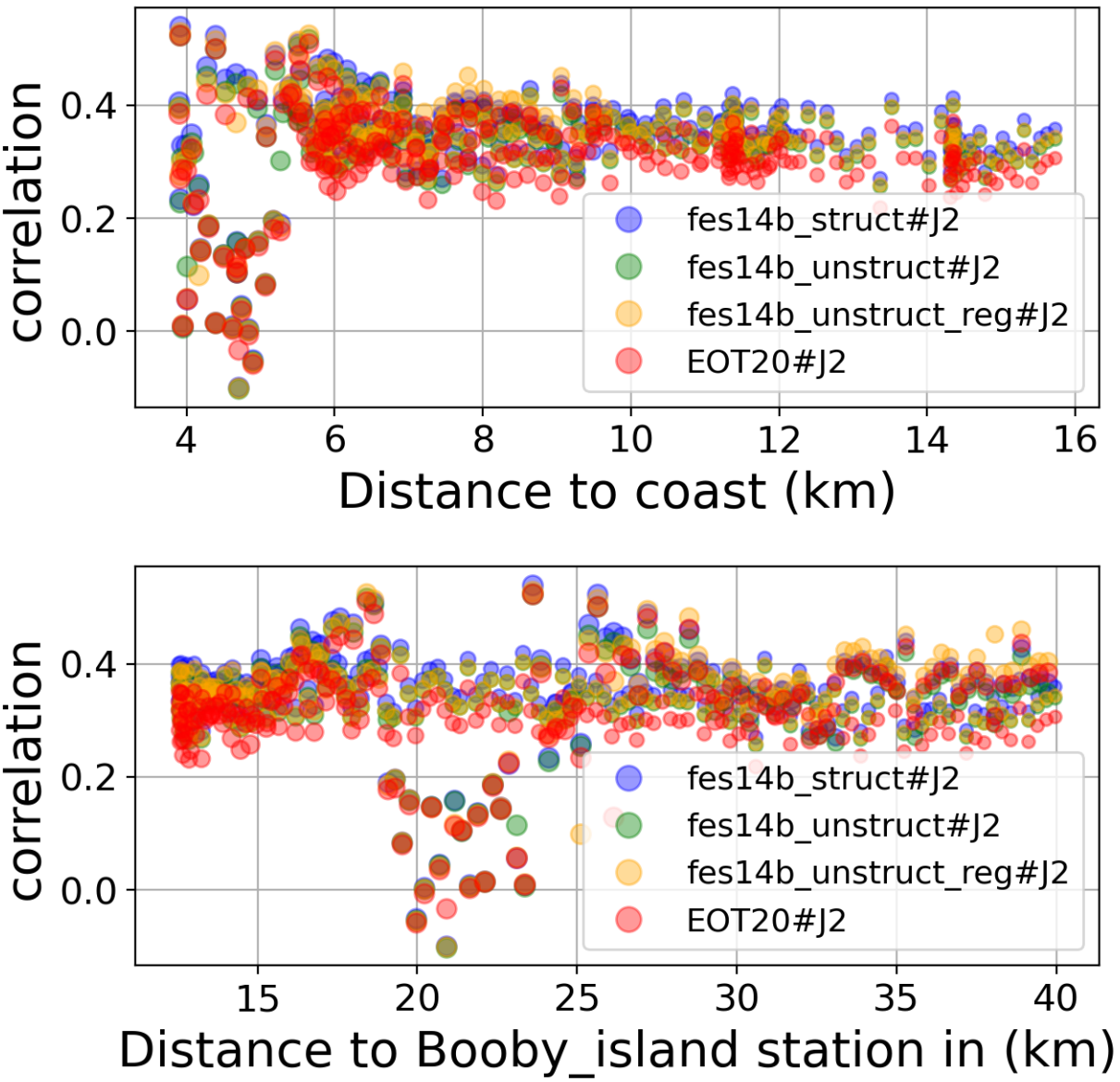

FIGURE 132 – Correlation in function of the distance to the coast/Booby_island station

6.6.8 Taylor Diagram

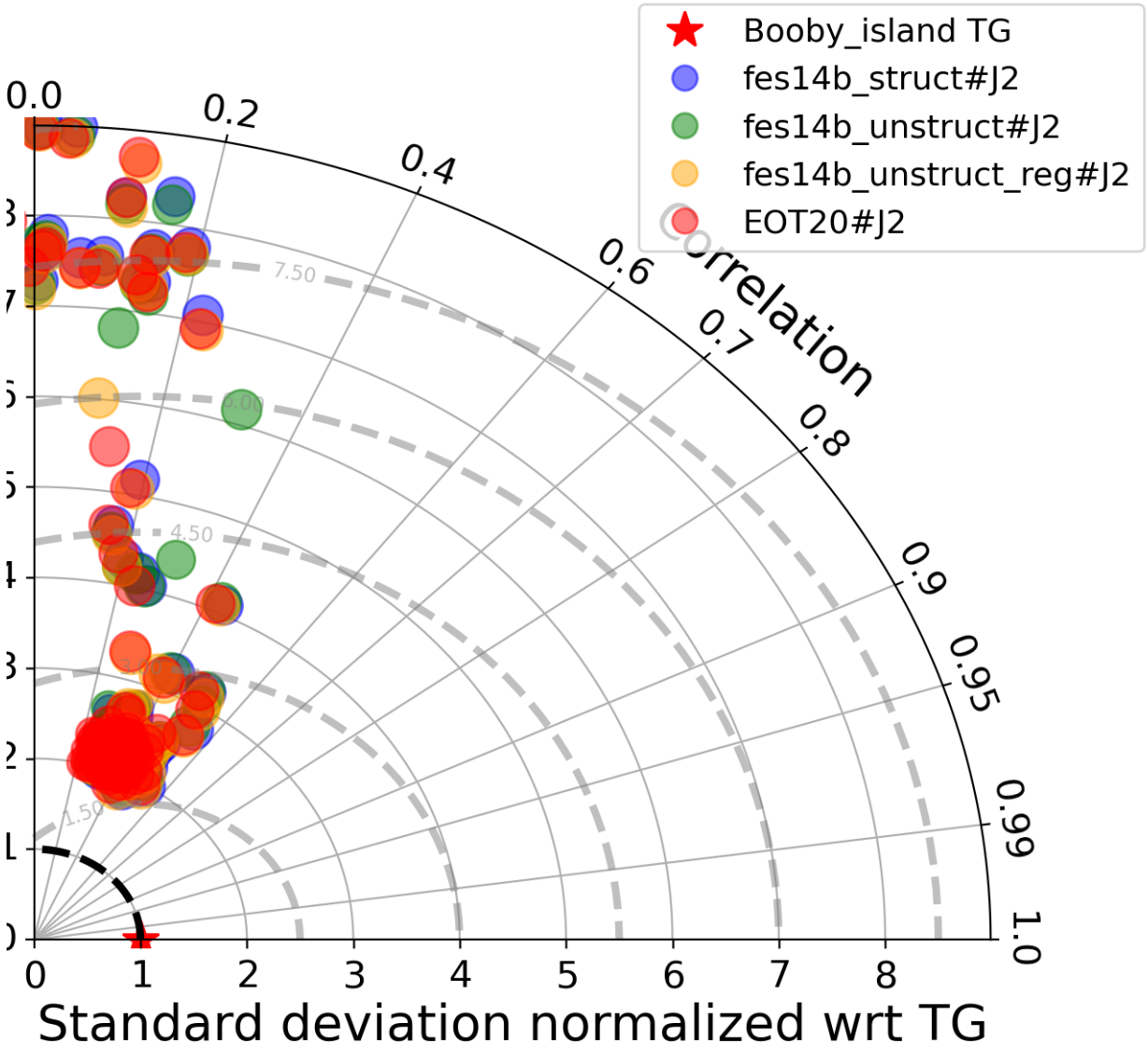

Figure 133 – Taylor diagram

6.6.9 Mean statistics table of products comparison with Booby_island 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)
fes14b_struct#J2	89.015	0.344	0.322	0.305
fes14b_unstruct#J2	89.002	0.332	0.323	0.309
fes14b_unstruct_reg#J2	89.024	0.339	0.32	0.305
EOT20#J2	89.02	0.309	0.322	0.31

FIGURE 134 – 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 91 point.

	Dist2station (km)	Dist2coast (km)	Valid data (%)	Correlation	std (m)
TG	-	-	-	-	0.134
fes14b_struct#J2	23.59	3.913	46.154	0.54	0.37
fes14b_unstruct#J2	23.59	3.913	46.154	0.524	0.372
fes14b_unstruct_reg#J2	23.59	3.913	46.154	0.528	0.354
EOT20#J2	23.59	3.913	46.154	0.525	0.356

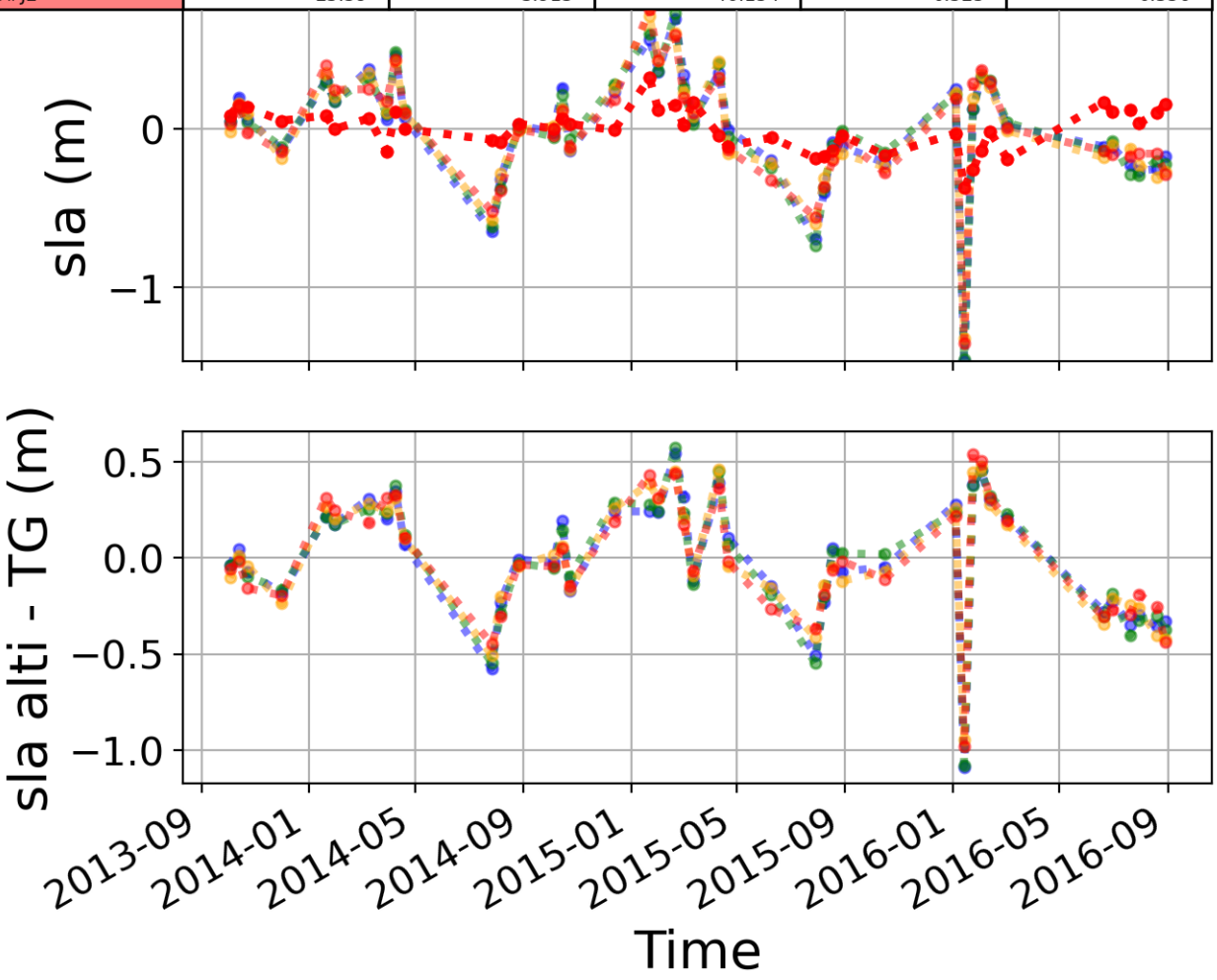

Figure 135 – The 1st most correlated sla altimetry Time serie with tide gauge sla time serie