PyCAMA report generated by tropl2-proc

tropl2-proc

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1 Short Introduction

1.1 The list of parameters

You may want to keep the list given in table 1 at hand when viewing the results.

2 Definitions

The averages shown here are *unweighed* averages:

$$\overline{x} = \frac{1}{N}\sum_{i=1}^{N} x_i \tag{1}$$

with N the number of observations in the dataset.

The spread of the measurements is indicated with the variance $V(x)$, or rather the standard deviation $\sigma(x) = \sqrt{V(x)}$.

$$V(x) = \frac{1}{N-1}\sum_{i=1}^{N}(x_i - \overline{x})^2 \tag{2}$$

We also report the more robust statistics median, minimum, maximum, various percentiles and inter quartile range.

The median m is the value of parameter x for which half of the observations of x is smaller than m:

$$P(x \leq m) = P(x \geq m) = \int_{-\infty}^{m} f(x)\,\mathrm{d}x = \frac{1}{2} \tag{3}$$

with $f(x)$ the probability density function.

The median is a special case of a percentile. Instead of ½ in equation 3, other threshold values can be used. We report results for 1 %, 5 %, 10 %, 15.9 %, 25 %, 75 %, 84.1 %, 90 %, 95 % and 99 %. The inter quartile range is the difference between the 75 % and 25 % percentiles. Similarly the minimum and maximum values correspond to the 0 % and 100 % percentiles respectively.

For normally distributed parameters the mean and median are the same, while the $\mu \pm \sigma$ values and the 15.9 % and 84.1 % percentiles coincide.

To get a measure for the relation of one variable $x_{(k)}$ with another $x_{(l)}$, we calculate the covariance matrix C_{kl}.

$$C_{kl} = C(x_{(k)}, x_{(l)}) = \frac{1}{N-1}\sum_{i=1}^{N}(x_{(k),i} - \overline{x_{(k)}})(x_{(l),i} - \overline{x_{(l)}}) \tag{4}$$

Rather than a dimensionally dependent covariance, it is often easier to interpret a correlation matrix R_{kl}, a matrix of Pearson's r coefficients:

$$R_{kl} = R(x_{(k)}, x_{(l)}) = \frac{C_{kl}}{\sqrt{C_{kk}C_{ll}}} = \frac{C_{kl}}{\sqrt{V(x_k)V(x_l)}} \tag{5}$$

The diagonal elements of the covariance matrix are the variances of the elements, $V(x_{(k)}) = C_{kk}$ and obviously $R_{kk} = 1$.

Table 1: Parameterlist and basic statistics for the analysis

Variable	mean $\pm\sigma$	Count	Mode	IQR	Median	Minimum	Maximum
qa value [1]	0.655 ± 0.398	17300675	0.995	0.770	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.453 \pm 107.914) \times 10^{-2}$	17300675	0.278	0.461	1.113×10^{-2}	-87.6	301
sulfurdioxide total vertical column precision [DU]	0.537 ± 0.786	17300675	0.222	0.347	0.327	4.317×10^{-2}	64.6
sulfurdioxide slant column density corrected [DU]	$(2.095 \pm 39.579) \times 10^{-2}$	17300675	0.242	0.375	9.767×10^{-3}	-20.6	94.7
sulfurdioxide slant column density cobra [DU]	$(2.072 \pm 37.890) \times 10^{-2}$	17300675	0.242	0.375	9.767×10^{-3}	-20.6	29.7
sulfurdioxide slant column density cobra precision [DU]	0.303 ± 0.139	17300675	0.213	0.147	0.264	8.630×10^{-2}	18.4
sulfurdioxide slant column density window1 [DU]	0.163 ± 0.708	17300675	0.175	0.754	0.176	-73.9	47.0
sulfurdioxide slant column density window1 precision [DU]	0.303 ± 0.139	17300675	0.213	0.147	0.264	8.630×10^{-2}	18.4
sulfurdioxide slant column density corrected win1 [DU]	$(4.372 \pm 70.112) \times 10^{-2}$	17300675	2.500×10^{-2}	0.740	2.320×10^{-2}	-73.9	47.1
background so2 slant column offset window1 [DU]	-0.119 ± 0.167	17300675	-0.220	0.172	-0.155	-1.09	3.09
sulfurdioxide slant column density window2 [DU]	2.37 ± 9.24	17300675	2.25	11.8	2.21	-1.171×10^{3}	1.296×10^{3}
sulfurdioxide slant column density window2 precision [DU]	8.19 ± 2.27	17300675	7.43	2.55	7.84	1.84	719
sulfurdioxide slant column density corrected win2 [DU]	0.521 ± 8.789	17300675	0.250	11.1	0.544	-1.170×10^{3}	1.296×10^{3}
background so2 slant column offset window2 [DU]	-1.85 ± 3.13	17300675	0.750	3.98	-0.767	-23.0	8.96
sulfurdioxide slant column density window3 [DU]	-11.2 ± 24.1	17300675	-12.9	30.4	-11.5	-825	875
sulfurdioxide slant column density window3 precision [DU]	28.2 ± 13.4	17300675	22.5	9.78	24.6	9.43	624
sulfurdioxide slant column density corrected win3 [DU]	-4.86 ± 23.24	17300675	-5.04	29.1	-4.80	-823	874
background so2 slant column offset window3 [DU]	6.32 ± 6.65	17300675	-0.560	11.7	6.16	-13.4	27.1
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17300675	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.420 \pm 9.479) \times 10^{-2}$	17300675	1.423×10^{-2}	1.804×10^{-2}	1.381×10^{-2}	2.399×10^{-4}	1.99
fitted radiance shift [nm]	$(-3.421 \pm 26.227) \times 10^{-4}$	17300675	-5.000×10^{-4}	1.771×10^{-3}	-3.290×10^{-4}	-4.355×10^{-2}	5.266×10^{-2}
fitted radiance squeeze [1]	$(-2.273 \pm 18.351) \times 10^{-5}$	17300675	-1.000×10^{-5}	2.056×10^{-4}	-1.509×10^{-5}	-1.787×10^{-2}	1.658×10^{-2}
fitted root mean square [1]	$(1.319 \pm 0.573) \times 10^{-3}$	17300675	9.750×10^{-4}	5.769×10^{-4}	1.157×10^{-3}	3.019×10^{-4}	0.113
sulfurdioxide total air mass factor polluted [1]	0.865 ± 0.422	17300675	0.860	0.533	0.823	5.000×10^{-2}	2.85
sulfurdioxide total air mass factor polluted precision [1]	0.105 ± 0.109	17300675	4.500×10^{-2}	9.772×10^{-2}	6.508×10^{-2}	2.500×10^{-3}	1.87
sulfurdioxide clear air mass factor polluted [1]	0.741 ± 0.299	17300675	0.620	0.403	0.724	3.381×10^{-2}	2.85
number of spectral points in retrieval [1]	73.4 ± 0.5	17300675	73.0	1.000	73.0	52.0	74.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	6.000×10^{-2}	0.120	0.230	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.38	−0.890	−0.541	−0.364	−0.216	0.245	0.406	0.604	1.01	2.80
sulfurdioxide total vertical column precision [DU]	0.103	0.140	0.168	0.192	0.221	0.568	0.761	0.991	1.48	3.77
sulfurdioxide slant column density corrected [DU]	−0.882	−0.509	−0.367	−0.273	−0.176	0.199	0.303	0.407	0.571	1.09
sulfurdioxide slant column density cobra [DU]	−0.882	−0.509	−0.367	−0.273	−0.176	0.199	0.303	0.407	0.571	1.09
sulfurdioxide slant column density cobra precision [DU]	0.143	0.170	0.183	0.195	0.210	0.357	0.410	0.462	0.558	0.826
sulfurdioxide slant column density window1 [DU]	−1.80	−0.937	−0.620	−0.415	−0.207	0.547	0.742	0.928	1.21	2.01
sulfurdioxide slant column density window1 precision [DU]	0.143	0.170	0.183	0.195	0.210	0.357	0.410	0.462	0.558	0.826
sulfurdioxide slant column density corrected win1 [DU]	−1.71	−0.982	−0.712	−0.531	−0.341	0.399	0.605	0.810	1.13	2.07
background so2 slant column offset window1 [DU]	−0.392	−0.298	−0.271	−0.252	−0.225	-5.279×10^{-2}	1.033×10^{-2}	7.981×10^{-2}	0.196	0.464
sulfurdioxide slant column density window2 [DU]	−19.2	−12.3	−8.94	−6.43	−3.59	8.17	11.2	13.9	17.6	25.3
sulfurdioxide slant column density window2 precision [DU]	4.35	5.27	5.81	6.22	6.72	9.26	10.1	11.0	12.3	15.0
sulfurdioxide slant column density corrected win2 [DU]	−20.9	−13.7	−10.3	−7.82	−5.03	6.09	8.85	11.3	14.7	21.7
background so2 slant column offset window2 [DU]	−10.8	−8.52	−6.78	−5.25	−3.48	0.500	0.787	0.993	1.27	2.32
sulfurdioxide slant column density window3 [DU]	−70.3	−50.1	−40.7	−33.9	−26.4	3.97	12.0	19.2	28.9	47.8
sulfurdioxide slant column density window3 precision [DU]	13.5	16.1	17.9	19.3	20.9	30.7	35.4	41.5	53.8	85.9
sulfurdioxide slant column density corrected win3 [DU]	−63.2	−43.0	−33.5	−26.7	−19.3	9.78	17.2	23.9	33.0	51.6
background so2 slant column offset window3 [DU]	−5.47	−2.72	−1.62	−0.815	0.243	11.9	13.8	15.2	16.9	19.8
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	7.124×10^{-4}	1.711×10^{-3}	3.378×10^{-3}	5.336×10^{-3}	7.821×10^{-3}	2.586×10^{-2}	3.974×10^{-2}	6.349×10^{-2}	0.114	0.407
fitted radiance shift [nm]	-8.374×10^{-3}	-4.208×10^{-3}	-2.763×10^{-3}	-1.948×10^{-3}	-1.258×10^{-3}	5.134×10^{-4}	1.196×10^{-3}	2.075×10^{-3}	3.624×10^{-3}	7.917×10^{-3}
fitted radiance squeeze [1]	-5.525×10^{-4}	-3.204×10^{-4}	-2.339×10^{-4}	-1.776×10^{-4}	-1.202×10^{-4}	8.544×10^{-5}	1.366×10^{-4}	1.837×10^{-4}	2.510×10^{-4}	4.089×10^{-4}
fitted root mean square [1]	5.987×10^{-4}	7.438×10^{-4}	8.185×10^{-4}	8.764×10^{-4}	9.494×10^{-4}	1.526×10^{-3}	1.770×10^{-3}	2.015×10^{-3}	2.405×10^{-3}	3.452×10^{-3}
sulfurdioxide total air mass factor polluted [1]	8.762×10^{-2}	0.258	0.361	0.452	0.565	1.10	1.28	1.46	1.67	2.02
sulfurdioxide total air mass factor polluted precision [1]	1.047×10^{-2}	1.845×10^{-2}	2.479×10^{-2}	3.023×10^{-2}	3.839×10^{-2}	0.136	0.179	0.223	0.304	0.530
sulfurdioxide clear air mass factor polluted [1]	0.199	0.297	0.364	0.433	0.524	0.927	1.02	1.10	1.24	1.63
number of spectral points in retrieval [1]	73.0	73.0	73.0	73.0	73.0	74.0	74.0	74.0	74.0	74.0

Table 3: Parameterlist and basic statistics for the analysis for observations in the northern hemisphere

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.617 ± 0.401	10238903	0.790	0.490	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(4.124 \pm 128.005) \times 10^{-2}$	10238903	0.488	1.107×10^{-2}	-87.6	301	-0.228	0.260
sulfurdioxide total vertical column precision [DU]	0.617 ± 0.954	10238903	0.408	0.348	4.317×10^{-2}	64.6	0.226	0.634
sulfurdioxide slant column density corrected [DU]	$(2.245 \pm 39.548) \times 10^{-2}$	10238903	0.379	9.423×10^{-3}	-20.6	40.5	-0.178	0.202
sulfurdioxide slant column density cobra [DU]	$(2.232 \pm 39.005) \times 10^{-2}$	10238903	0.379	9.423×10^{-3}	-20.6	14.1	-0.178	0.202
sulfurdioxide slant column density cobra precision [DU]	0.310 ± 0.149	10238903	0.163	0.268	8.639×10^{-2}	14.3	0.207	0.370
sulfurdioxide slant column density window1 [DU]	0.158 ± 0.739	10238903	0.765	0.176	-11.6	23.8	-0.213	0.552
sulfurdioxide slant column density window1 precision [DU]	0.310 ± 0.149	10238903	0.163	0.268	8.639×10^{-2}	14.3	0.207	0.370
sulfurdioxide slant column density corrected win1 [DU]	$(5.053 \pm 73.118) \times 10^{-2}$	10238903	0.753	2.540×10^{-2}	-10.6	23.5	-0.344	0.409
background so2 slant column offset window1 [DU]	-0.108 ± 0.189	10238903	0.186	-0.155	-0.562	2.03	-0.227	-4.190×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.02 ± 9.04	10238903	11.7	2.83	-647	182	-2.91	8.75
sulfurdioxide slant column density window2 precision [DU]	7.90 ± 2.10	10238903	2.35	7.56	2.15	295	6.52	8.87
sulfurdioxide slant column density corrected win2 [DU]	0.383 ± 8.410	10238903	10.8	0.436	-650	178	-4.98	5.79
background so2 slant column offset window2 [DU]	-2.63 ± 3.63	10238903	5.93	-1.59	-23.0	8.96	-5.39	0.538
sulfurdioxide slant column density window3 [DU]	-12.8 ± 22.9	10238903	28.8	-13.2	-430	182	-27.3	1.46
sulfurdioxide slant column density window3 precision [DU]	26.6 ± 12.8	10238903	8.22	23.2	9.43	283	20.1	28.3
sulfurdioxide slant column density corrected win3 [DU]	-4.56 ± 21.89	10238903	27.4	-4.50	-434	188	-18.2	9.21
background so2 slant column offset window3 [DU]	8.22 ± 6.76	10238903	12.2	9.64	-13.2	27.1	1.53	13.7
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.20	10238903	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(4.545 \pm 11.854) \times 10^{-2}$	10238903	3.094×10^{-2}	1.624×10^{-2}	2.399×10^{-4}	1.99	6.609×10^{-3}	3.755×10^{-2}
fitted radiance shift [nm]	$(-2.003 \pm 24.873) \times 10^{-4}$	10238903	1.586×10^{-3}	-2.035×10^{-4}	-3.925×10^{-2}	3.763×10^{-2}	-1.016×10^{-3}	5.698×10^{-4}
fitted radiance squeeze [1]	$(-4.142 \pm 18.831) \times 10^{-5}$	10238903	2.074×10^{-4}	-2.717×10^{-5}	-5.766×10^{-3}	1.107×10^{-2}	-1.355×10^{-4}	7.186×10^{-5}
fitted root mean square [1]	$(1.349 \pm 0.623) \times 10^{-3}$	10238903	6.317×10^{-4}	1.164×10^{-3}	3.234×10^{-4}	2.286×10^{-2}	9.388×10^{-4}	1.570×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.845 ± 0.456	10238903	0.605	0.786	5.000×10^{-2}	2.85	0.505	1.11
sulfurdioxide total air mass factor polluted precision [1]	0.109 ± 0.126	10238903	0.101	6.344×10^{-2}	2.500×10^{-3}	1.87	3.456×10^{-2}	0.136
sulfurdioxide clear air mass factor polluted [1]	0.711 ± 0.339	10238903	0.465	0.671	3.381×10^{-2}	2.85	0.447	0.912
number of spectral points in retrieval [1]	73.4 ± 0.5	10238903	1.000	73.0	71.0	74.0	73.0	74.0

Table 4: Parameterlist and basic statistics for the analysis for observations in the southern hemisphere

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.710 ± 0.388	7061772	0.680	1.000	0.0	1.000	0.320	1.000
sulfurdioxide total vertical column [DU]	$(2.479 \pm 69.076) \times 10^{-2}$	7061772	0.427	1.121×10^{-2}	-58.7	94.6	-0.200	0.227
sulfurdioxide total vertical column precision [DU]	0.422 ± 0.414	7061772	0.279	0.302	5.047×10^{-2}	51.4	0.215	0.494
sulfurdioxide slant column density corrected [DU]	$(1.878 \pm 39.621) \times 10^{-2}$	7061772	0.369	1.025×10^{-2}	-13.1	94.7	-0.173	0.196
sulfurdioxide slant column density cobra [DU]	$(1.840 \pm 36.210) \times 10^{-2}$	7061772	0.369	1.025×10^{-2}	-13.1	29.7	-0.173	0.196
sulfurdioxide slant column density cobra precision [DU]	0.292 ± 0.122	7061772	0.123	0.259	8.630×10^{-2}	18.4	0.214	0.338
sulfurdioxide slant column density window1 [DU]	0.169 ± 0.662	7061772	0.737	0.176	-73.9	47.0	-0.197	0.540
sulfurdioxide slant column density window1 precision [DU]	0.292 ± 0.122	7061772	0.123	0.259	8.630×10^{-2}	18.4	0.214	0.338
sulfurdioxide slant column density corrected win1 [DU]	$(3.385 \pm 65.496) \times 10^{-2}$	7061772	0.723	2.014×10^{-2}	-73.9	47.1	-0.338	0.386
background so2 slant column offset window1 [DU]	-0.135 ± 0.127	7061772	0.154	-0.155	-1.09	3.09	-0.221	-6.672×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.44 ± 9.44	7061772	11.8	1.30	-1.171×10^{3}	1.296×10^{3}	-4.54	7.27
sulfurdioxide slant column density window2 precision [DU]	8.61 ± 2.43	7061772	2.72	8.27	1.84	719	7.07	9.78
sulfurdioxide slant column density corrected win2 [DU]	0.721 ± 9.307	7061772	11.7	0.714	-1.170×10^{3}	1.296×10^{3}	-5.12	6.55
background so2 slant column offset window2 [DU]	-0.724 ± 1.680	7061772	2.13	-0.357	-8.67	8.60	-1.67	0.464
sulfurdioxide slant column density window3 [DU]	-8.85 ± 25.59	7061772	32.4	-8.69	-825	875	-24.8	7.55
sulfurdioxide slant column density window3 precision [DU]	30.5 ± 14.0	7061772	10.7	26.9	9.70	624	22.7	33.4
sulfurdioxide slant column density corrected win3 [DU]	-5.29 ± 25.07	7061772	31.8	-5.32	-823	874	-21.1	10.7
background so2 slant column offset window3 [DU]	3.57 ± 5.39	7061772	8.84	2.22	-13.4	22.4	-0.707	8.13
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	7061772	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.789 \pm 3.450) \times 10^{-2}$	7061772	9.348×10^{-3}	1.241×10^{-2}	5.212×10^{-4}	1.33	8.439×10^{-3}	1.779×10^{-2}
fitted radiance shift [nm]	$(-5.477 \pm 27.947) \times 10^{-4}$	7061772	2.000×10^{-3}	-5.527×10^{-4}	-4.355×10^{-2}	5.266×10^{-2}	-1.601×10^{-3}	3.995×10^{-4}
fitted radiance squeeze [1]	$(4.355 \pm 172.774) \times 10^{-6}$	7061772	2.038×10^{-4}	2.381×10^{-6}	-1.787×10^{-2}	1.658×10^{-2}	-9.874×10^{-5}	1.050×10^{-4}
fitted root mean square [1]	$(1.276 \pm 0.488) \times 10^{-3}$	7061772	5.005×10^{-4}	1.151×10^{-3}	3.019×10^{-4}	0.113	9.647×10^{-4}	1.465×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.894 ± 0.365	7061772	0.451	0.860	5.000×10^{-2}	2.67	0.635	1.09
sulfurdioxide total air mass factor polluted precision [1]	$(9.904 \pm 7.918) \times 10^{-2}$	7061772	9.406×10^{-2}	6.730×10^{-2}	7.371×10^{-3}	1.40	4.269×10^{-2}	0.137
sulfurdioxide clear air mass factor polluted [1]	0.783 ± 0.221	7061772	0.329	0.779	0.173	1.85	0.616	0.945
number of spectral points in retrieval [1]	73.4 ± 0.5	7061772	1.000	73.0	52.0	74.0	73.0	74.0

Table 5: Parameterlist and basic statistics for the analysis for observations over water

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.697 ± 0.391	11531537	0.710	1.000	0.0	1.000	0.290	1.000
sulfurdioxide total vertical column [DU]	$(2.441 \pm 76.751) \times 10^{-2}$	11531537	0.430	9.650×10^{-3}	-44.8	103	-0.203	0.227
sulfurdioxide total vertical column precision [DU]	0.456 ± 0.526	11531537	0.298	0.299	5.597×10^{-2}	27.3	0.214	0.511
sulfurdioxide slant column density corrected [DU]	$(1.698 \pm 36.223) \times 10^{-2}$	11531537	0.364	8.667×10^{-3}	-20.6	49.2	-0.172	0.193
sulfurdioxide slant column density cobra [DU]	$(1.693 \pm 35.943) \times 10^{-2}$	11531537	0.364	8.667×10^{-3}	-20.6	22.8	-0.172	0.193
sulfurdioxide slant column density cobra precision [DU]	0.296 ± 0.136	11531537	0.143	0.253	8.630×10^{-2}	18.4	0.206	0.348
sulfurdioxide slant column density window1 [DU]	0.163 ± 0.686	11531537	0.737	0.177	-34.9	47.0	-0.196	0.540
sulfurdioxide slant column density window1 precision [DU]	0.296 ± 0.136	11531537	0.143	0.253	8.630×10^{-2}	18.4	0.206	0.348
sulfurdioxide slant column density corrected win1 [DU]	$(3.537 \pm 67.765) \times 10^{-2}$	11531537	0.724	1.918×10^{-2}	-34.9	47.1	-0.338	0.386
background so2 slant column offset window1 [DU]	-0.128 ± 0.154	11531537	0.166	-0.158	-0.562	3.09	-0.227	-6.103×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.96 ± 9.18	11531537	11.6	1.75	-1.171×10^{3}	1.296×10^{3}	-3.97	7.66
sulfurdioxide slant column density window2 precision [DU]	8.20 ± 2.22	11531537	2.59	7.85	2.15	435	6.73	9.32
sulfurdioxide slant column density corrected win2 [DU]	0.540 ± 8.818	11531537	11.2	0.560	-1.170×10^{3}	1.296×10^{3}	-5.04	6.14
background so2 slant column offset window2 [DU]	-1.42 ± 2.85	11531537	3.10	-0.511	-23.0	8.96	-2.54	0.566
sulfurdioxide slant column density window3 [DU]	-8.18 ± 24.48	11531537	31.2	-8.41	-430	227	-23.8	7.44
sulfurdioxide slant column density window3 precision [DU]	28.1 ± 12.5	11531537	9.60	24.7	9.43	283	21.2	30.8
sulfurdioxide slant column density corrected win3 [DU]	-2.74 ± 23.37	11531537	29.6	-2.89	-434	226	-17.5	12.1
background so2 slant column offset window3 [DU]	5.44 ± 6.38	11531537	10.7	4.53	-13.4	27.1	-8.610×10^{-2}	10.7
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	11531537	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.350 \pm 6.206) \times 10^{-2}$	11531537	1.294×10^{-2}	1.331×10^{-2}	4.051×10^{-4}	1.99	8.361×10^{-3}	2.131×10^{-2}
fitted radiance shift [nm]	$(-3.692 \pm 24.442) \times 10^{-4}$	11531537	1.766×10^{-3}	-3.439×10^{-4}	-3.604×10^{-2}	4.611×10^{-2}	-1.282×10^{-3}	4.843×10^{-4}
fitted radiance squeeze [1]	$(-1.305 \pm 17.981) \times 10^{-5}$	11531537	2.006×10^{-4}	-7.280×10^{-6}	-1.323×10^{-2}	1.658×10^{-2}	-1.089×10^{-4}	9.170×10^{-5}
fitted root mean square [1]	$(1.296 \pm 0.564) \times 10^{-3}$	11531537	5.768×10^{-4}	1.121×10^{-3}	3.234×10^{-4}	0.113	9.309×10^{-4}	1.508×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.885 ± 0.378	11531537	0.469	0.858	5.000×10^{-2}	2.51	0.621	1.09
sulfurdioxide total air mass factor polluted precision [1]	$(9.572 \pm 8.619) \times 10^{-2}$	11531537	8.460×10^{-2}	6.462×10^{-2}	2.877×10^{-3}	1.87	4.172×10^{-2}	0.126
sulfurdioxide clear air mass factor polluted [1]	0.767 ± 0.254	11531537	0.344	0.769	6.174×10^{-2}	2.23	0.589	0.933
number of spectral points in retrieval [1]	73.4 ± 0.5	11531537	1.000	73.0	71.0	74.0	73.0	74.0

Table 6: Parameterlist and basic statistics for the analysis for observations over land

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.614 ± 0.409	4056219	0.810	1.000	0.0	1.000	0.190	1.000
sulfurdioxide total vertical column [DU]	$(4.534 \pm 138.933) \times 10^{-2}$	4056219	0.514	1.300×10^{-2}	-87.6	301	-0.238	0.276
sulfurdioxide total vertical column precision [DU]	0.648 ± 1.024	4056219	0.393	0.380	4.653×10^{-2}	64.6	0.243	0.636
sulfurdioxide slant column density corrected [DU]	$(2.557 \pm 44.783) \times 10^{-2}$	4056219	0.378	1.074×10^{-2}	-11.3	94.7	-0.176	0.202
sulfurdioxide slant column density cobra [DU]	$(2.485 \pm 39.334) \times 10^{-2}$	4056219	0.378	1.074×10^{-2}	-11.3	29.7	-0.176	0.202
sulfurdioxide slant column density cobra precision [DU]	0.300 ± 0.133	4056219	0.134	0.265	8.870×10^{-2}	13.5	0.215	0.349
sulfurdioxide slant column density window1 [DU]	0.179 ± 0.704	4056219	0.749	0.185	-73.9	46.5	-0.193	0.556
sulfurdioxide slant column density window1 precision [DU]	0.300 ± 0.133	4056219	0.134	0.265	8.870×10^{-2}	13.5	0.215	0.349
sulfurdioxide slant column density corrected win1 [DU]	$(5.040 \pm 69.786) \times 10^{-2}$	4056219	0.734	2.666×10^{-2}	-73.9	45.4	-0.335	0.399
background so2 slant column offset window1 [DU]	-0.129 ± 0.166	4056219	0.160	-0.168	-1.09	1.89	-0.232	-7.218×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.49 ± 9.26	4056219	11.8	2.42	-1.153×10^{3}	563	-3.43	8.35
sulfurdioxide slant column density window2 precision [DU]	8.21 ± 2.45	4056219	2.50	7.86	2.32	719	6.73	9.23
sulfurdioxide slant column density corrected win2 [DU]	0.523 ± 8.794	4056219	11.1	0.548	-1.153×10^{3}	564	-5.00	6.06
background so2 slant column offset window2 [DU]	-1.97 ± 3.18	4056219	4.50	-0.786	-15.0	8.96	-4.00	0.494
sulfurdioxide slant column density window3 [DU]	-17.1 ± 22.7	4056219	28.3	-16.8	-825	875	-31.0	-2.76
sulfurdioxide slant column density window3 precision [DU]	29.4 ± 16.0	4056219	10.8	25.0	9.70	624	20.7	31.5
sulfurdioxide slant column density corrected win3 [DU]	-10.2 ± 23.0	4056219	28.5	-9.48	-823	874	-24.1	4.41
background so2 slant column offset window3 [DU]	6.81 ± 6.71	4056219	12.1	7.01	-13.4	26.4	0.519	12.6
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.14	4056219	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.829 \pm 13.436) \times 10^{-2}$	4056219	4.515×10^{-2}	1.919×10^{-2}	2.399×10^{-4}	1.98	7.151×10^{-3}	5.230×10^{-2}
fitted radiance shift [nm]	$(-2.539 \pm 31.145) \times 10^{-4}$	4056219	1.799×10^{-3}	-2.705×10^{-4}	-4.355×10^{-2}	5.266×10^{-2}	-1.183×10^{-3}	6.161×10^{-4}
fitted radiance squeeze [1]	$(-3.111 \pm 17.955) \times 10^{-5}$	4056219	2.062×10^{-4}	-2.396×10^{-5}	-1.787×10^{-2}	1.533×10^{-2}	-1.295×10^{-4}	7.668×10^{-5}
fitted root mean square [1]	$(1.293 \pm 0.535) \times 10^{-3}$	4056219	4.942×10^{-4}	1.166×10^{-3}	3.019×10^{-4}	5.237×10^{-2}	9.665×10^{-4}	1.461×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.821 ± 0.489	4056219	0.618	0.704	5.000×10^{-2}	2.81	0.471	1.09
sulfurdioxide total air mass factor polluted precision [1]	0.125 ± 0.148	4056219	0.137	6.586×10^{-2}	2.500×10^{-3}	1.84	3.051×10^{-2}	0.167
sulfurdioxide clear air mass factor polluted [1]	0.681 ± 0.344	4056219	0.440	0.610	3.522×10^{-2}	2.81	0.423	0.864
number of spectral points in retrieval [1]	73.4 ± 0.5	4056219	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

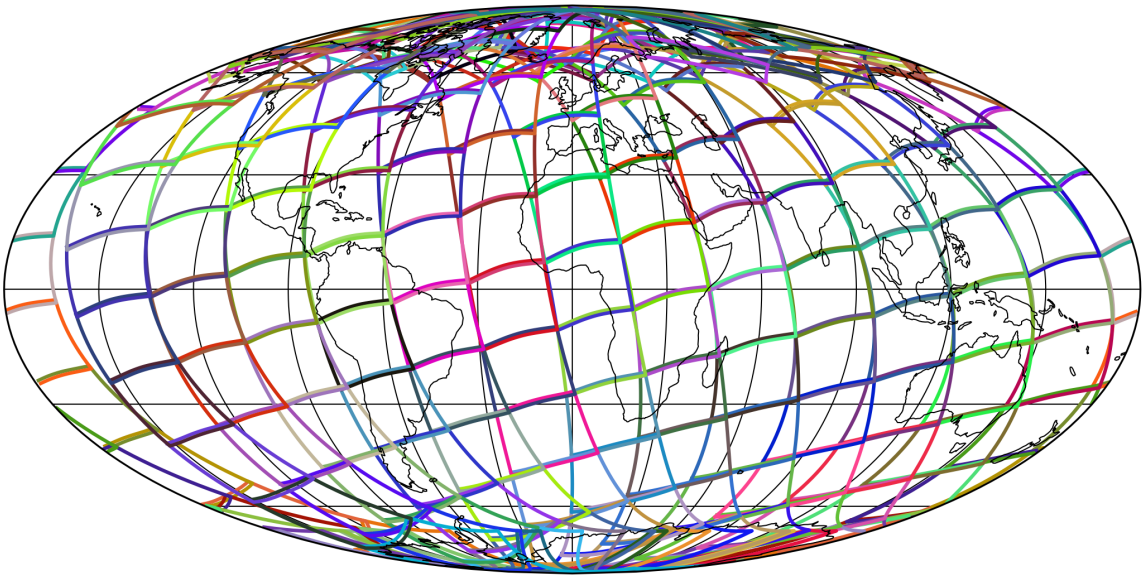


Figure 1: Outline of the granules.

4 Input data monitoring

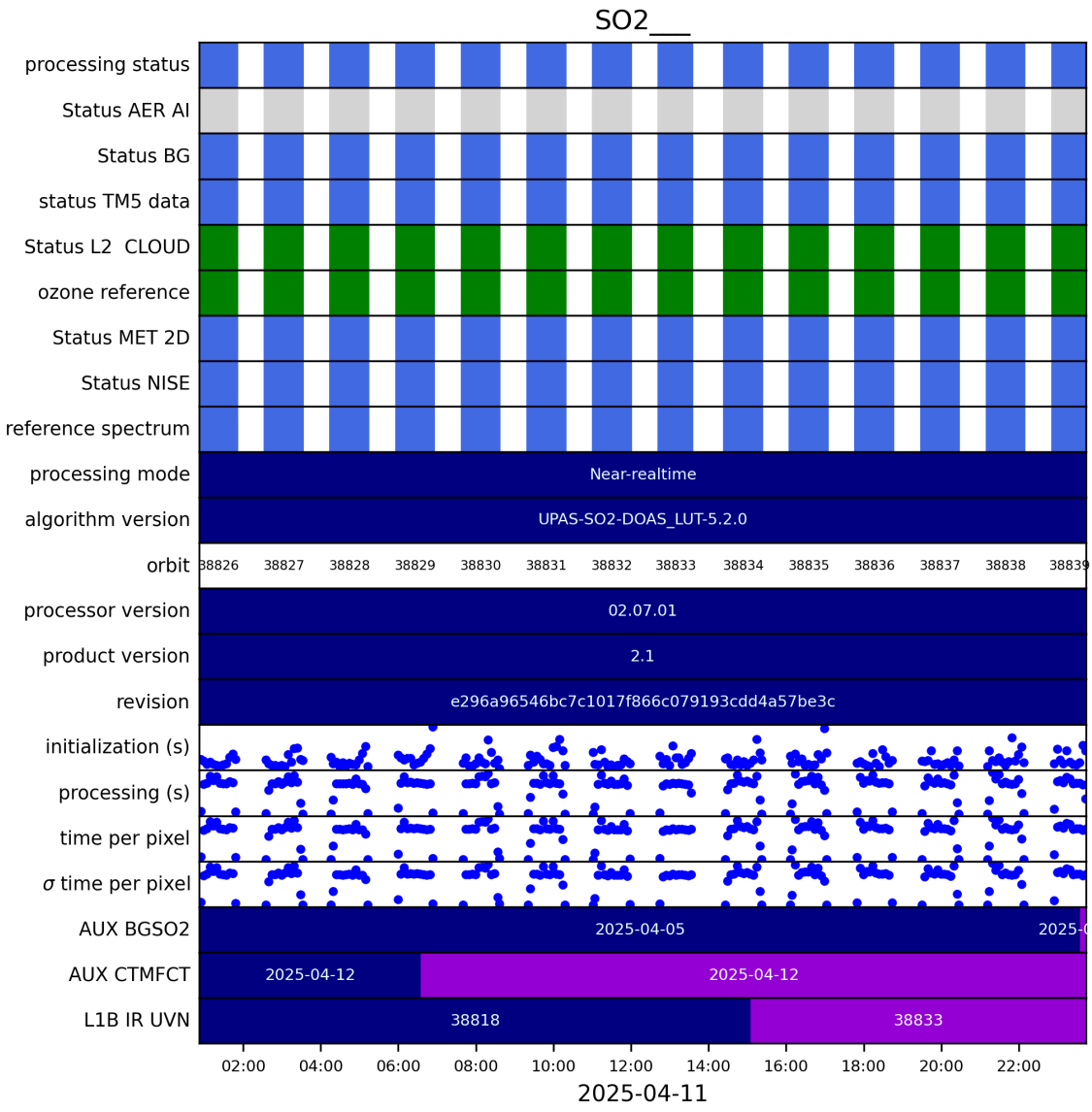


Figure 2: Input data per granule

5 Warnings and errors

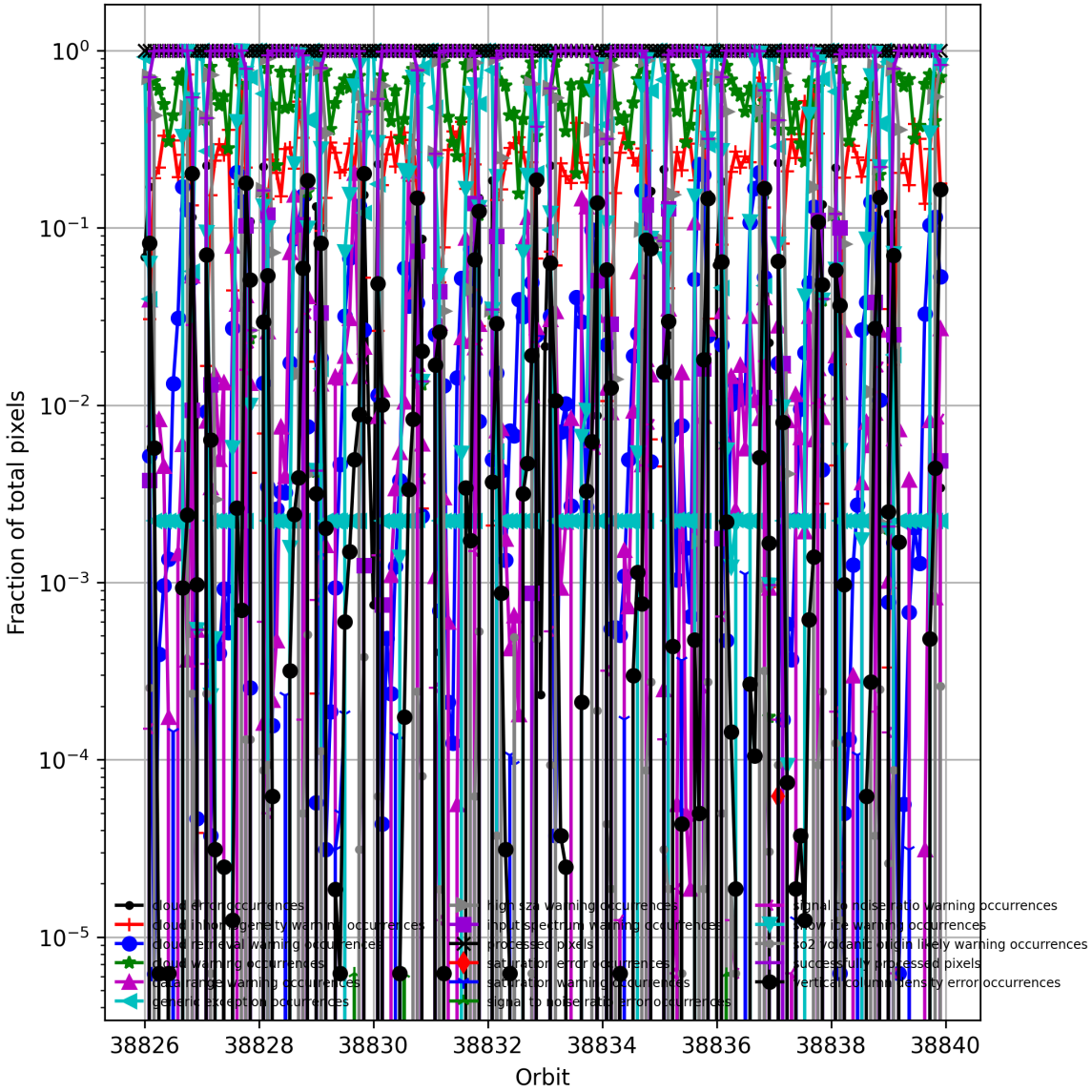


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

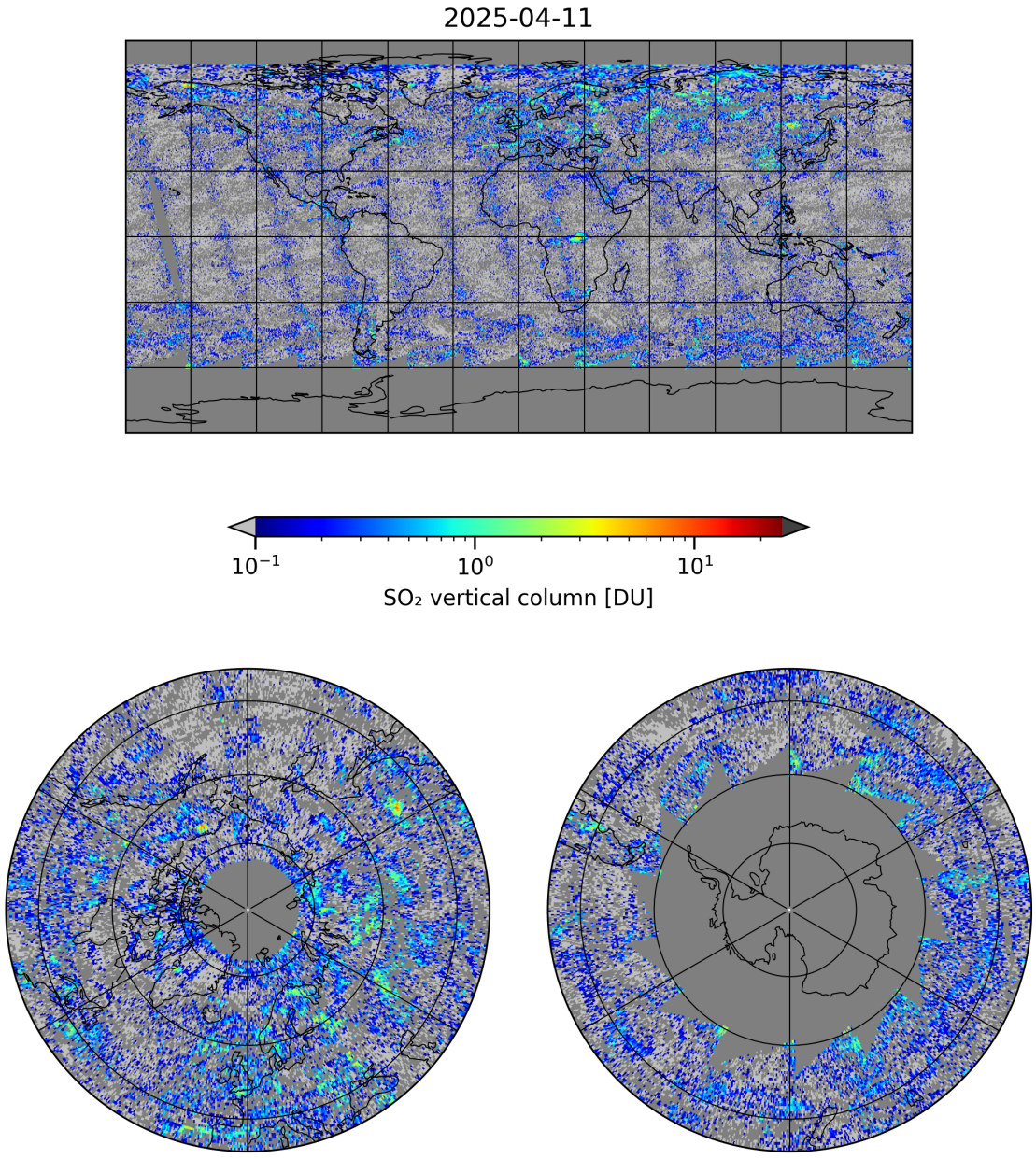


Figure 4: Map of "SO_2 vertical column" for 2025-04-11 to 2025-04-11

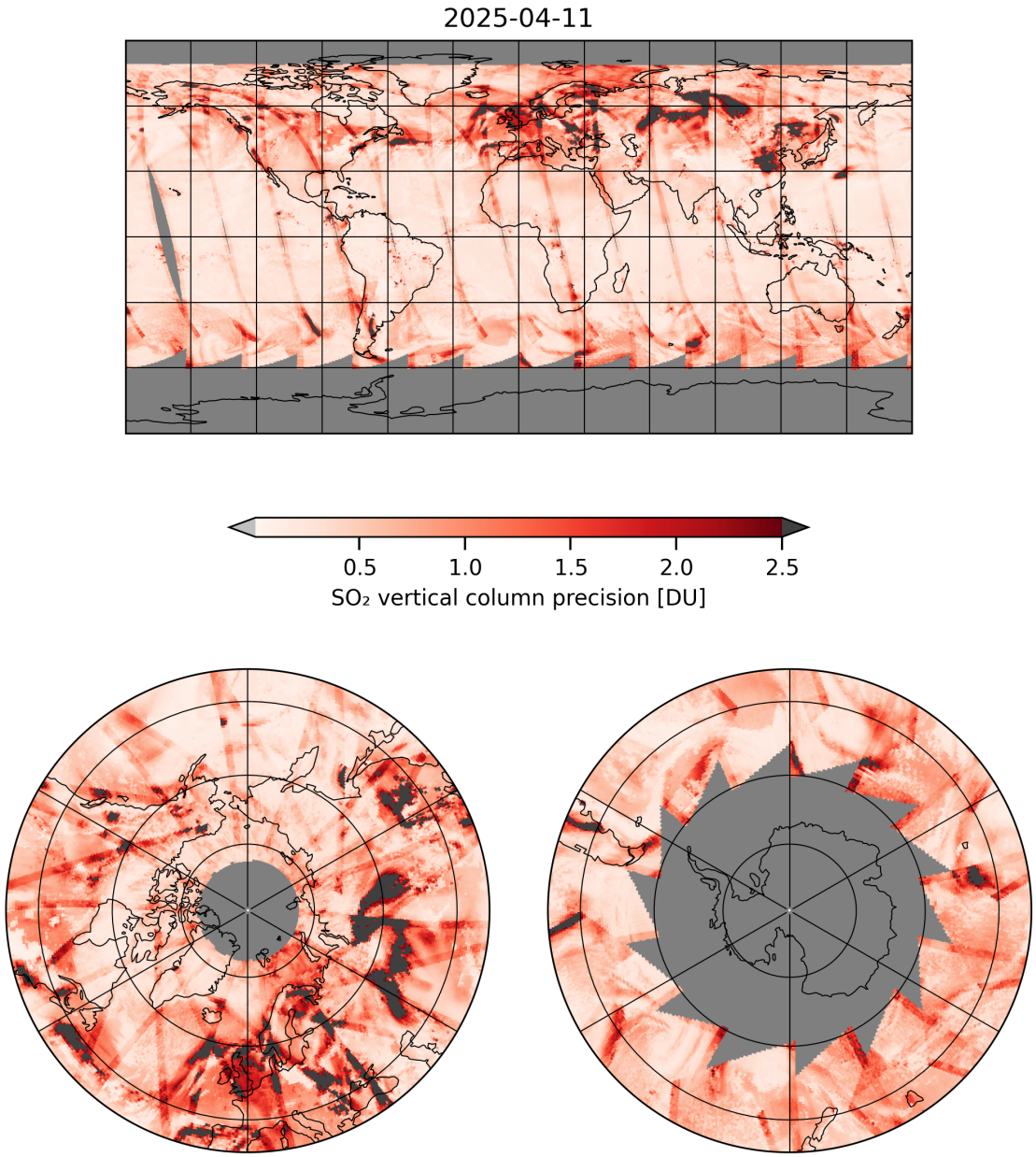


Figure 5: Map of "SO_2 vertical column precision" for 2025-04-11 to 2025-04-11

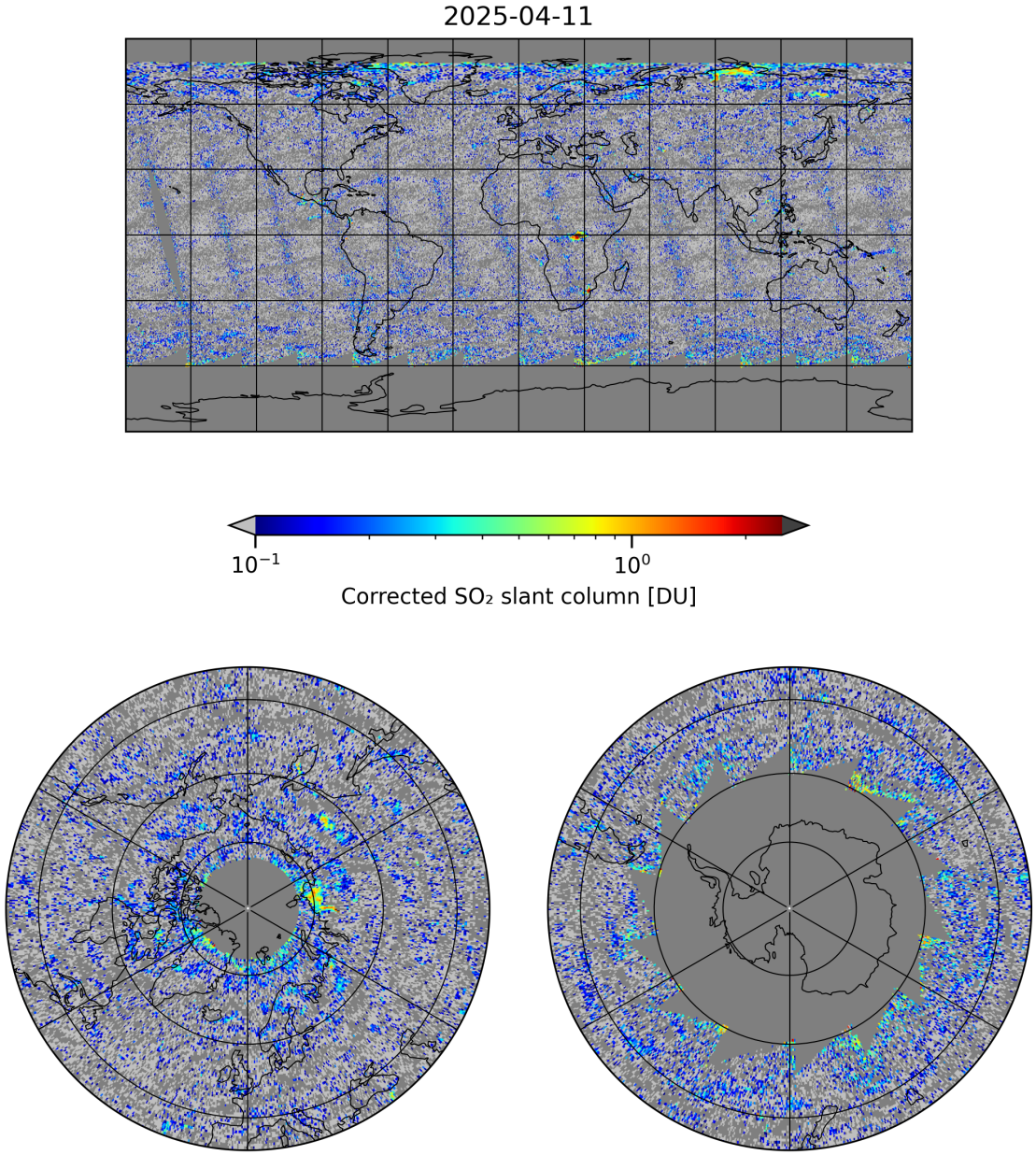


Figure 6: Map of “Corrected SO_2 slant column” for 2025-04-11 to 2025-04-11

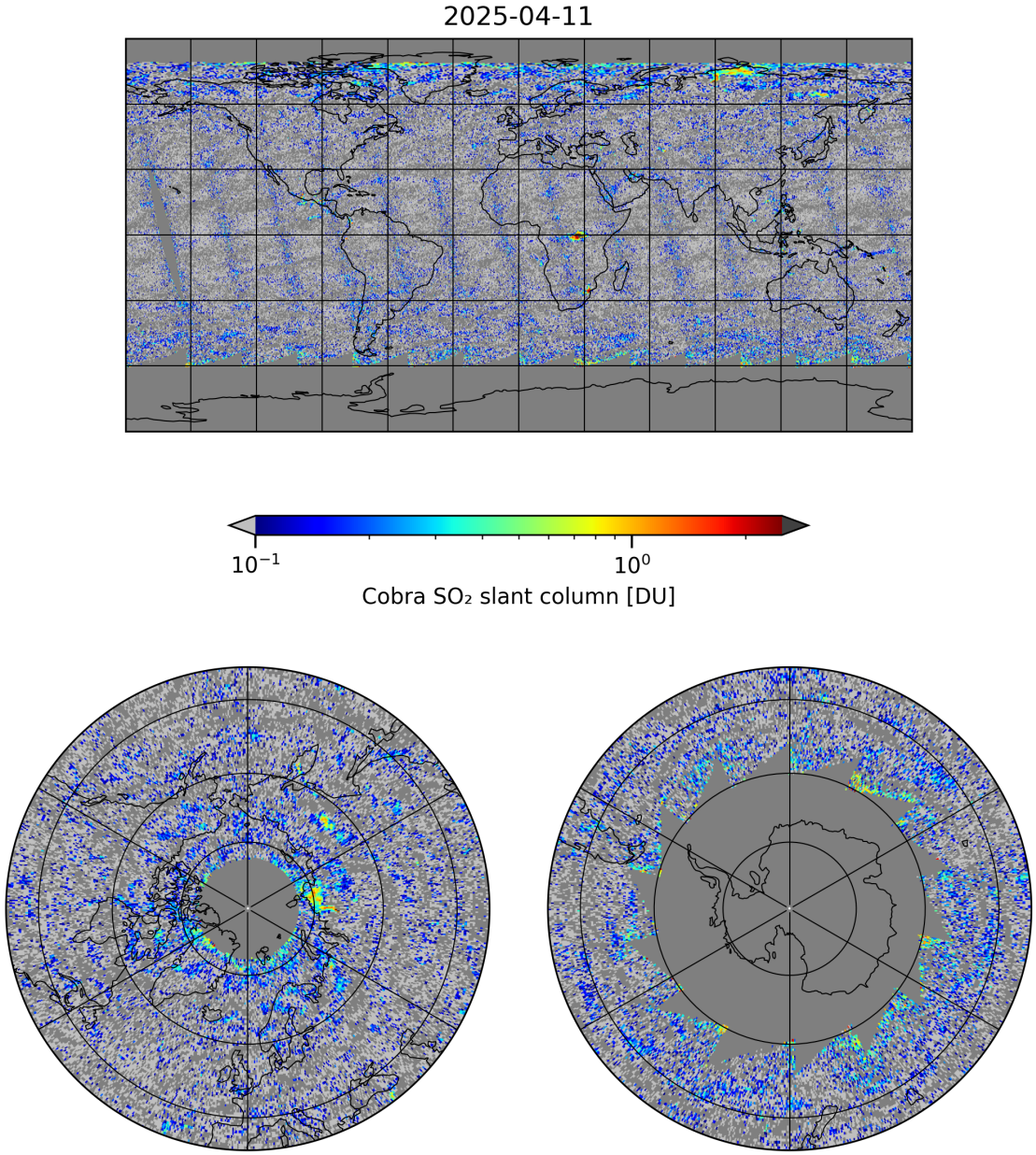


Figure 7: Map of “Cobra SO_2 slant column” for 2025-04-11 to 2025-04-11

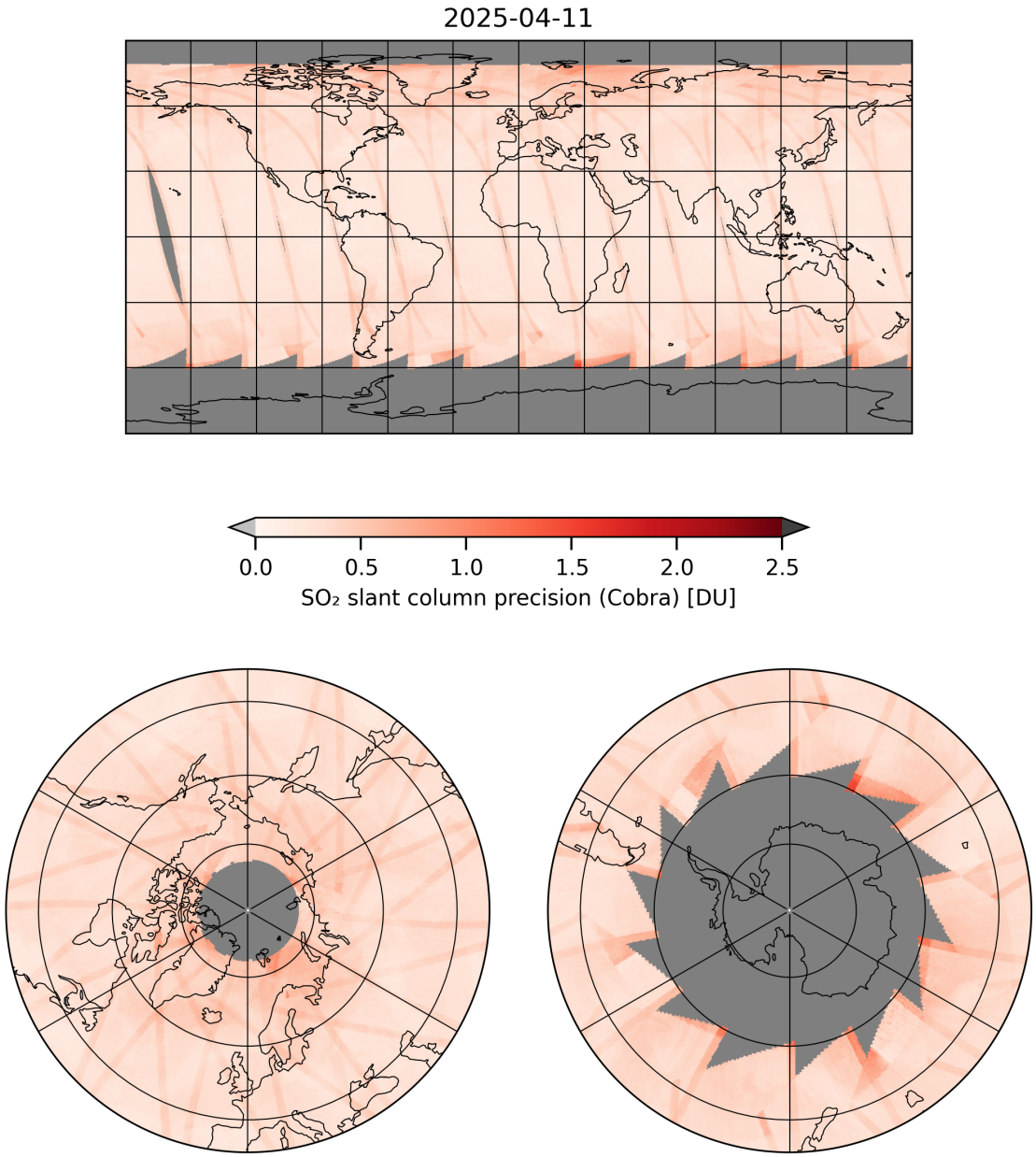


Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-04-11 to 2025-04-11

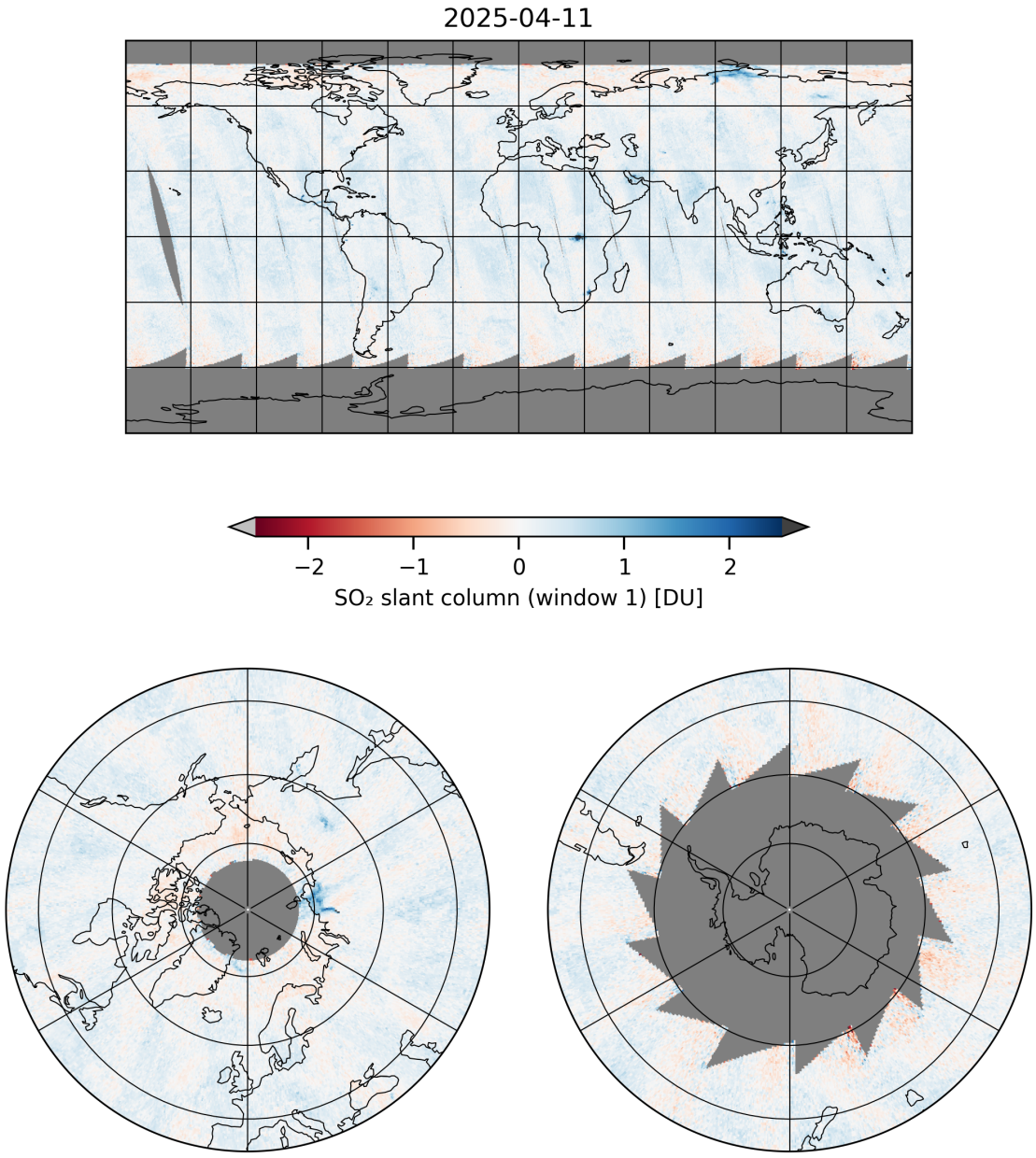


Figure 9: Map of "SO_2 slant column (window 1)" for 2025-04-11 to 2025-04-11

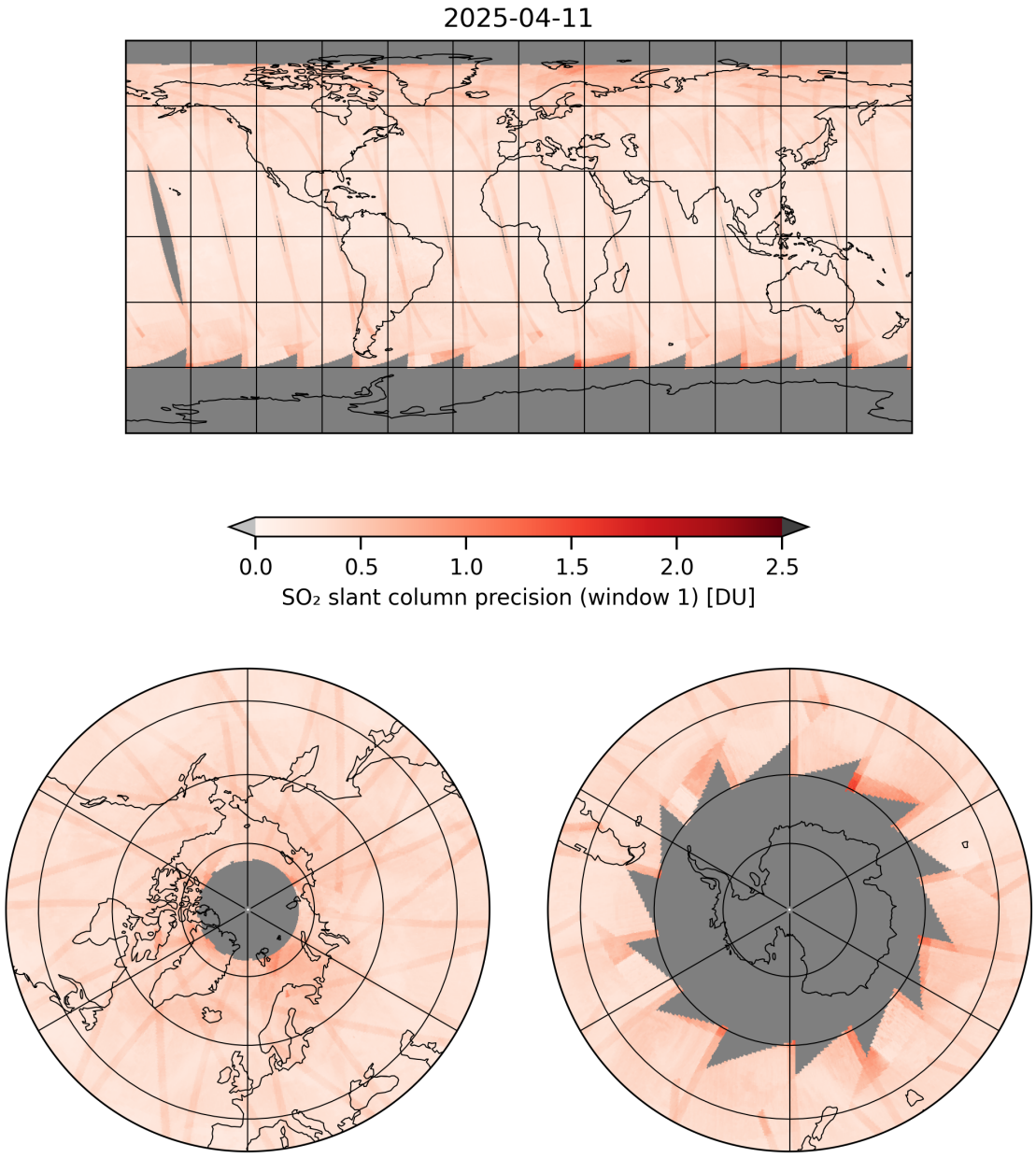


Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-04-11 to 2025-04-11

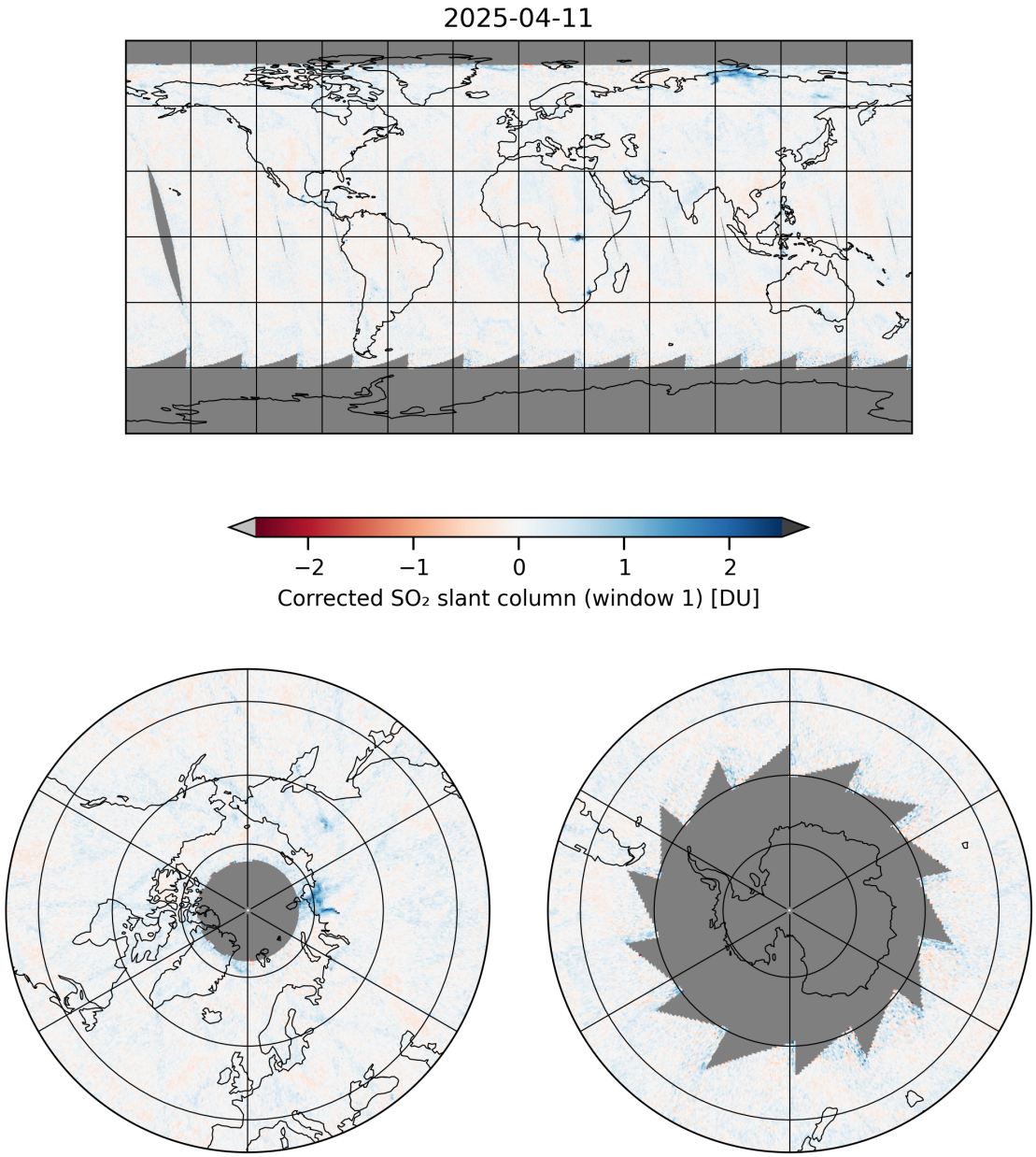


Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-04-11 to 2025-04-11

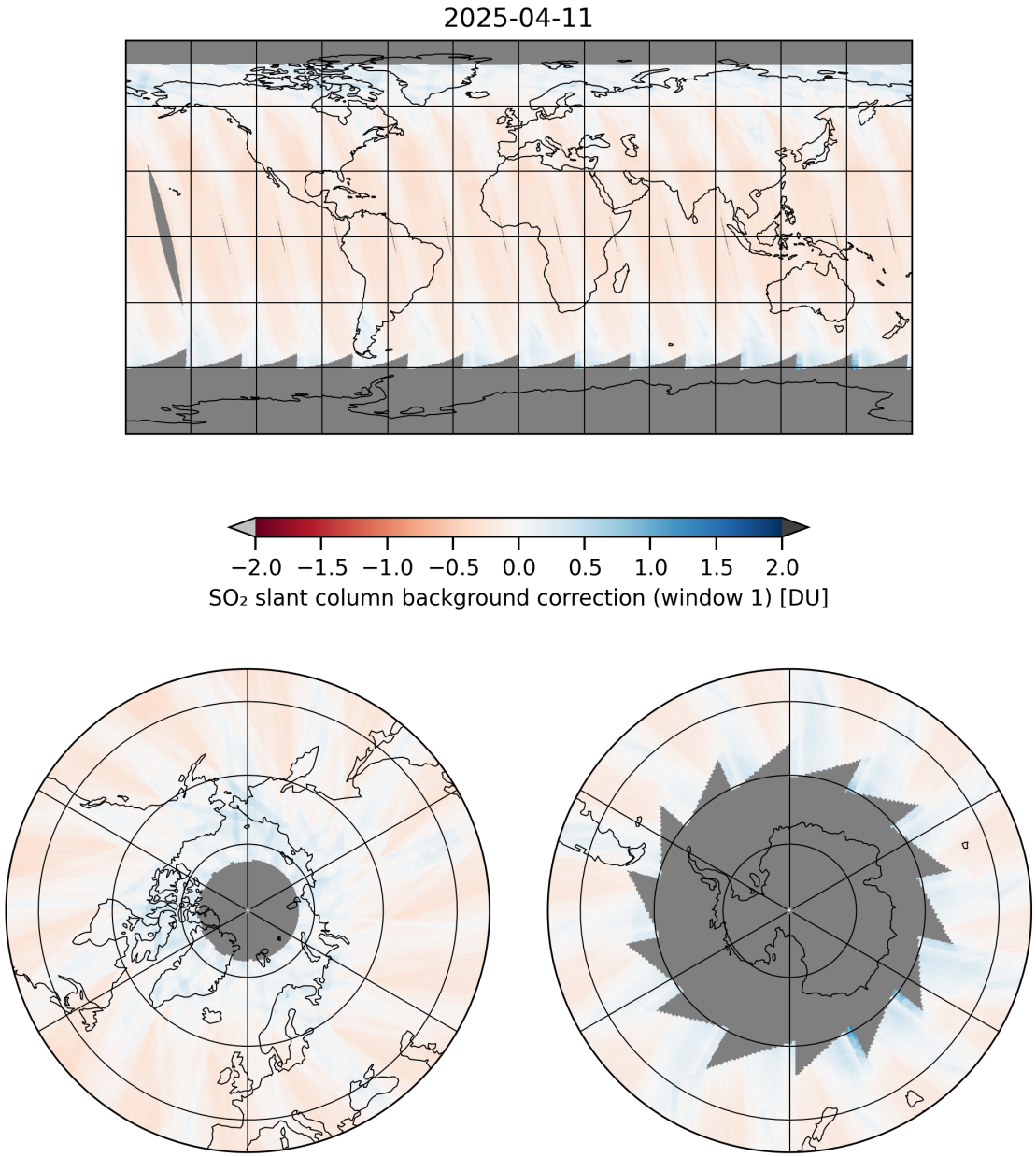


Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-04-11 to 2025-04-11

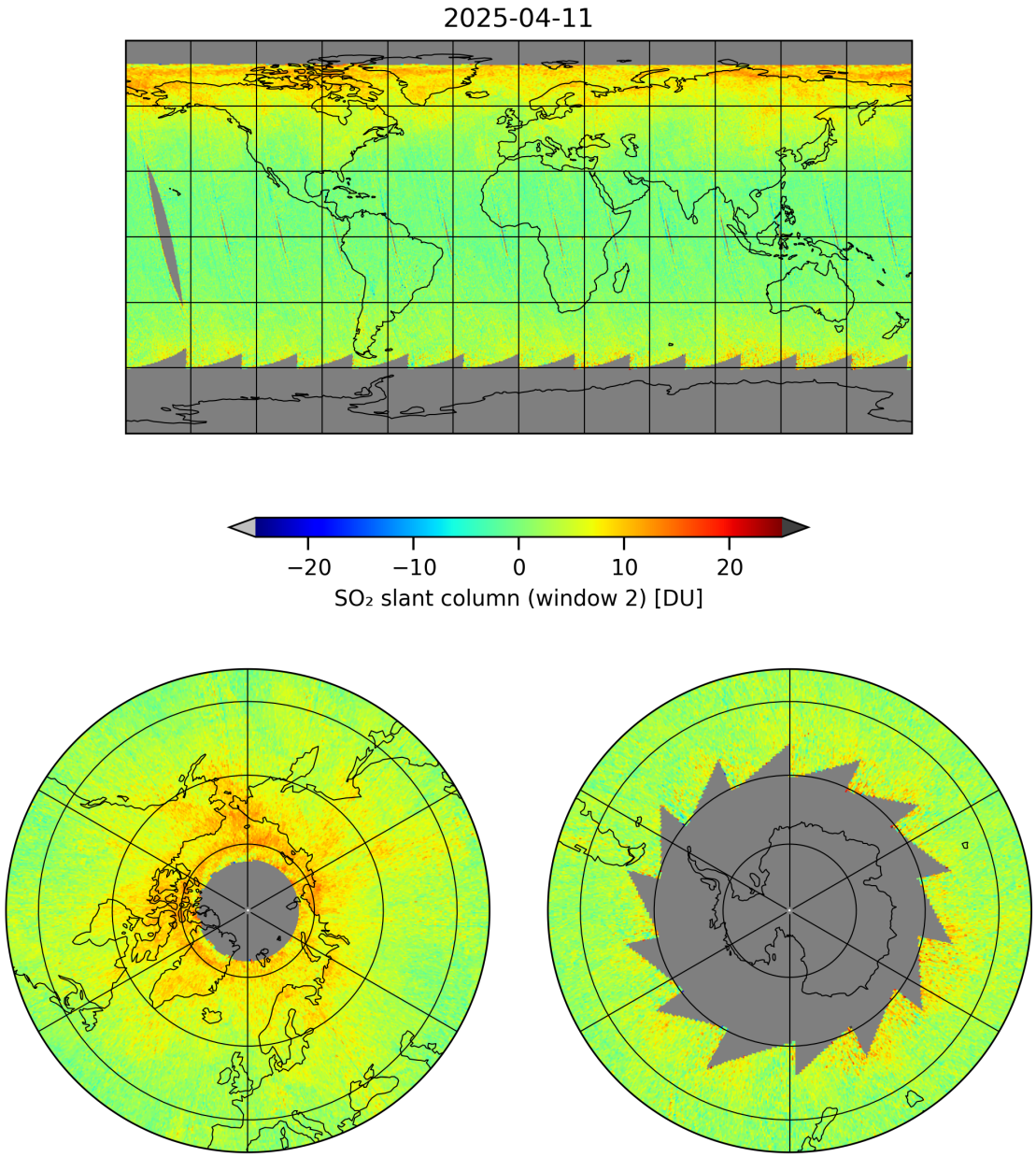


Figure 13: Map of "SO_2 slant column (window 2)" for 2025-04-11 to 2025-04-11

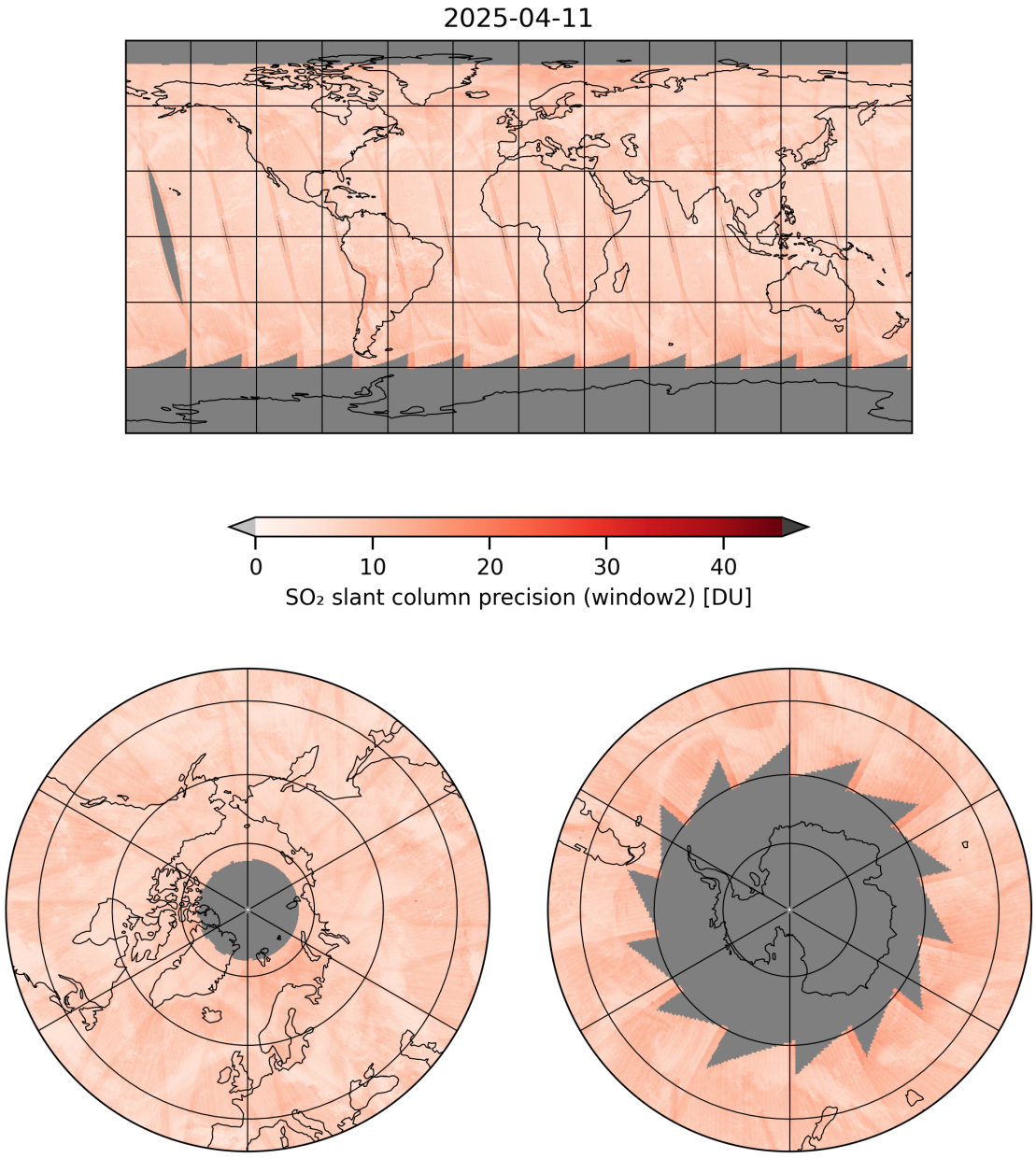


Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-04-11 to 2025-04-11

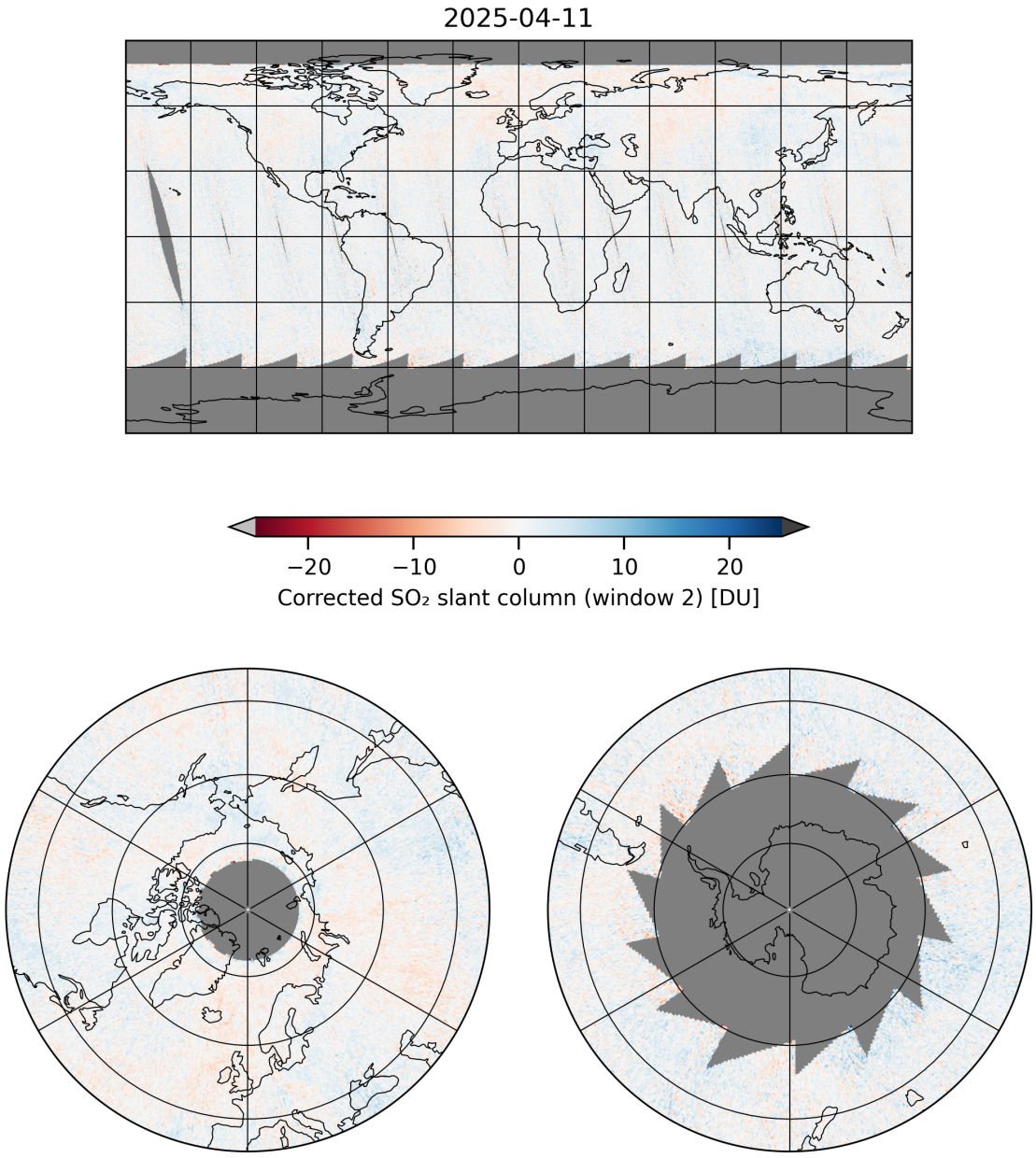


Figure 15: Map of “Corrected SO_2 slant column (window 2)” for 2025-04-11 to 2025-04-11

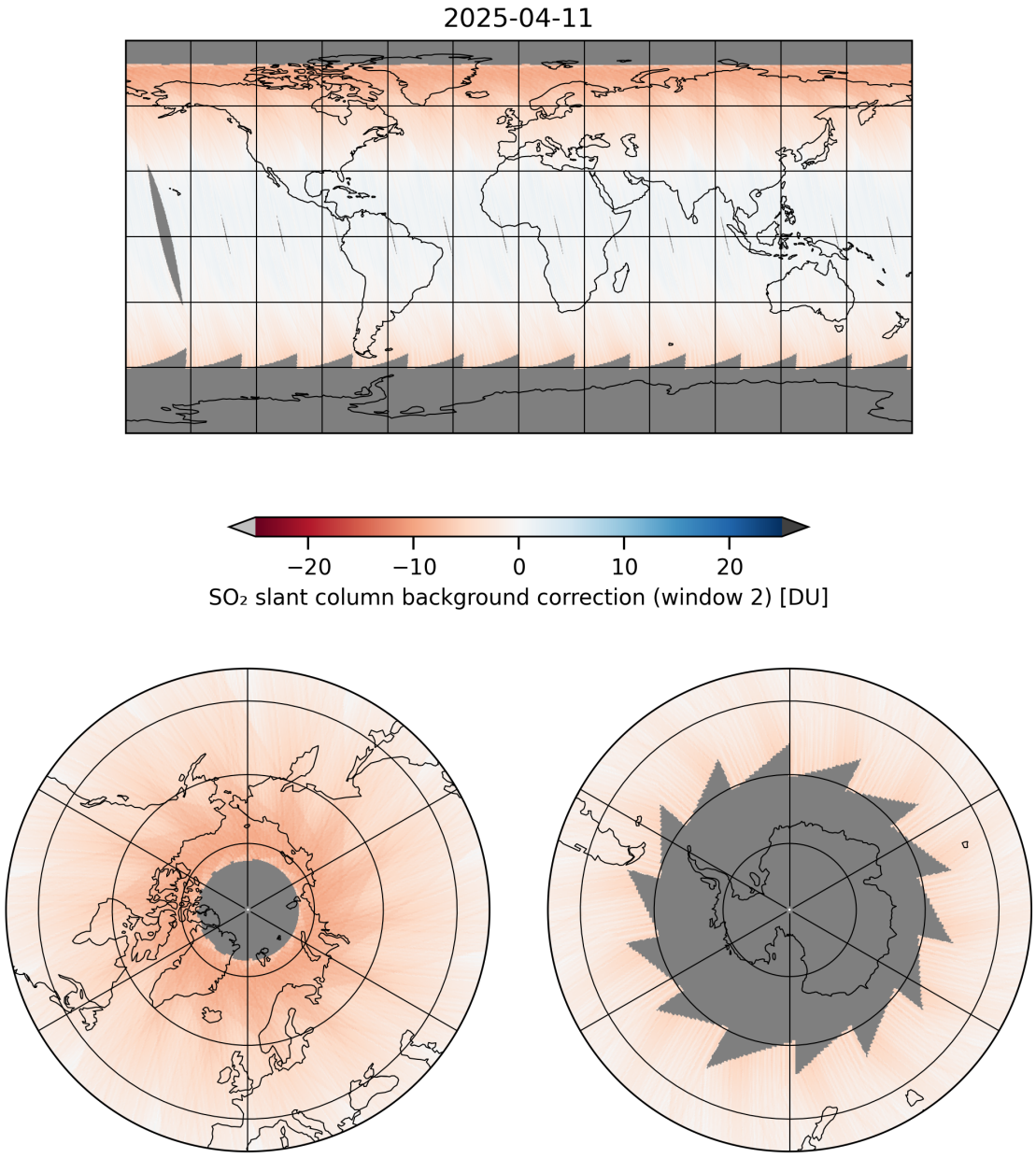


Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-04-11 to 2025-04-11

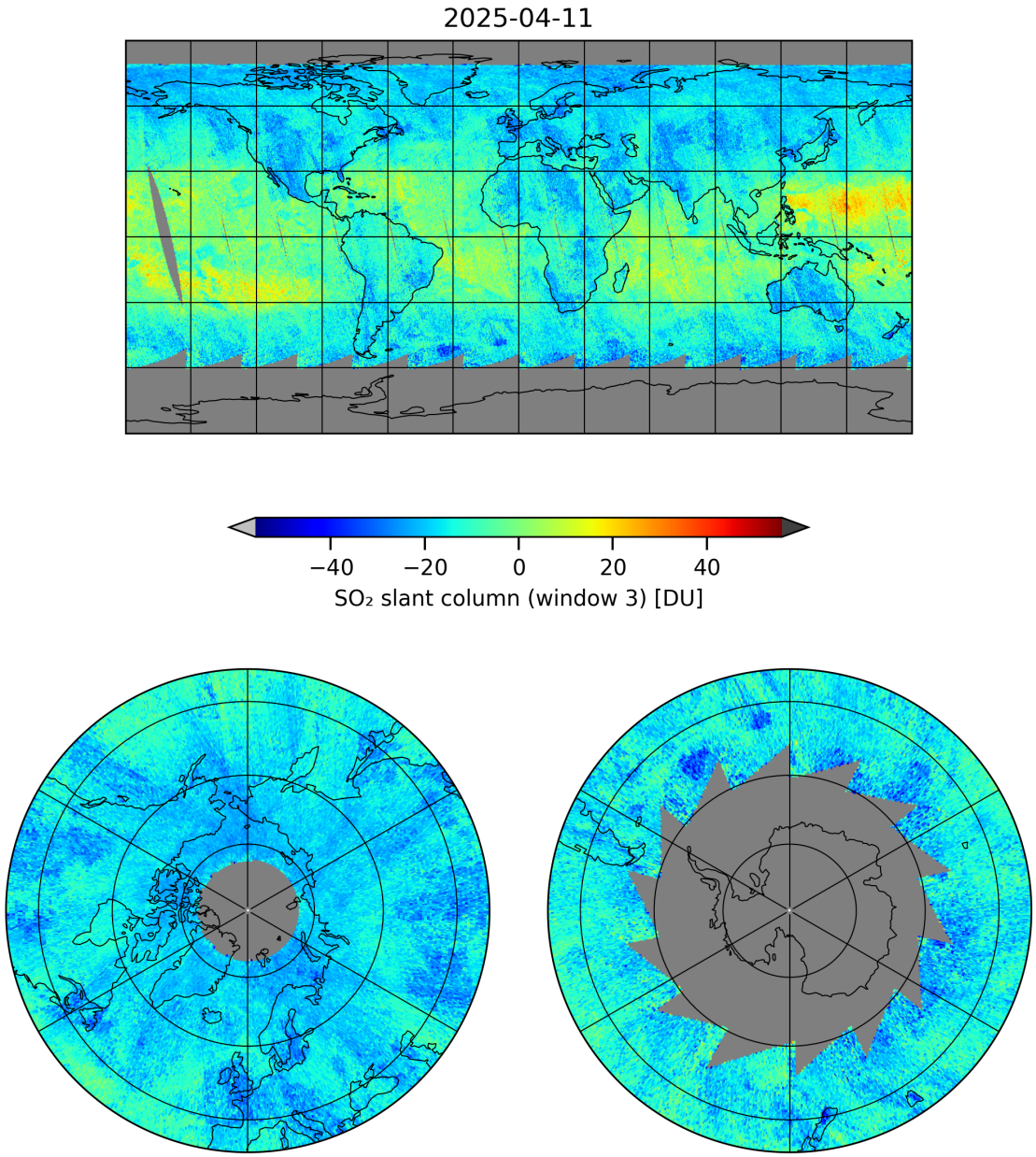


Figure 17: Map of "SO_2 slant column (window 3)" for 2025-04-11 to 2025-04-11

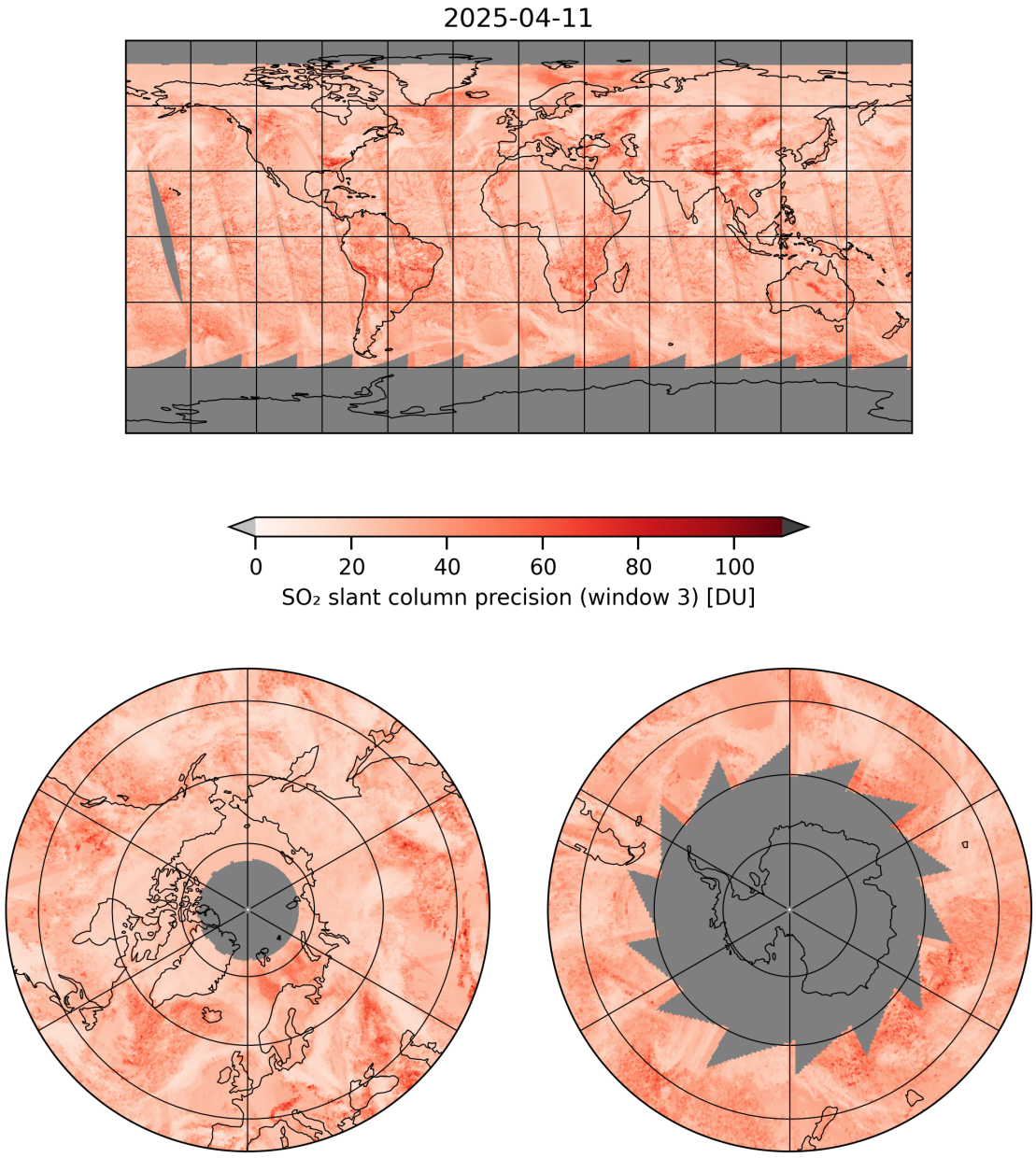


Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-04-11 to 2025-04-11

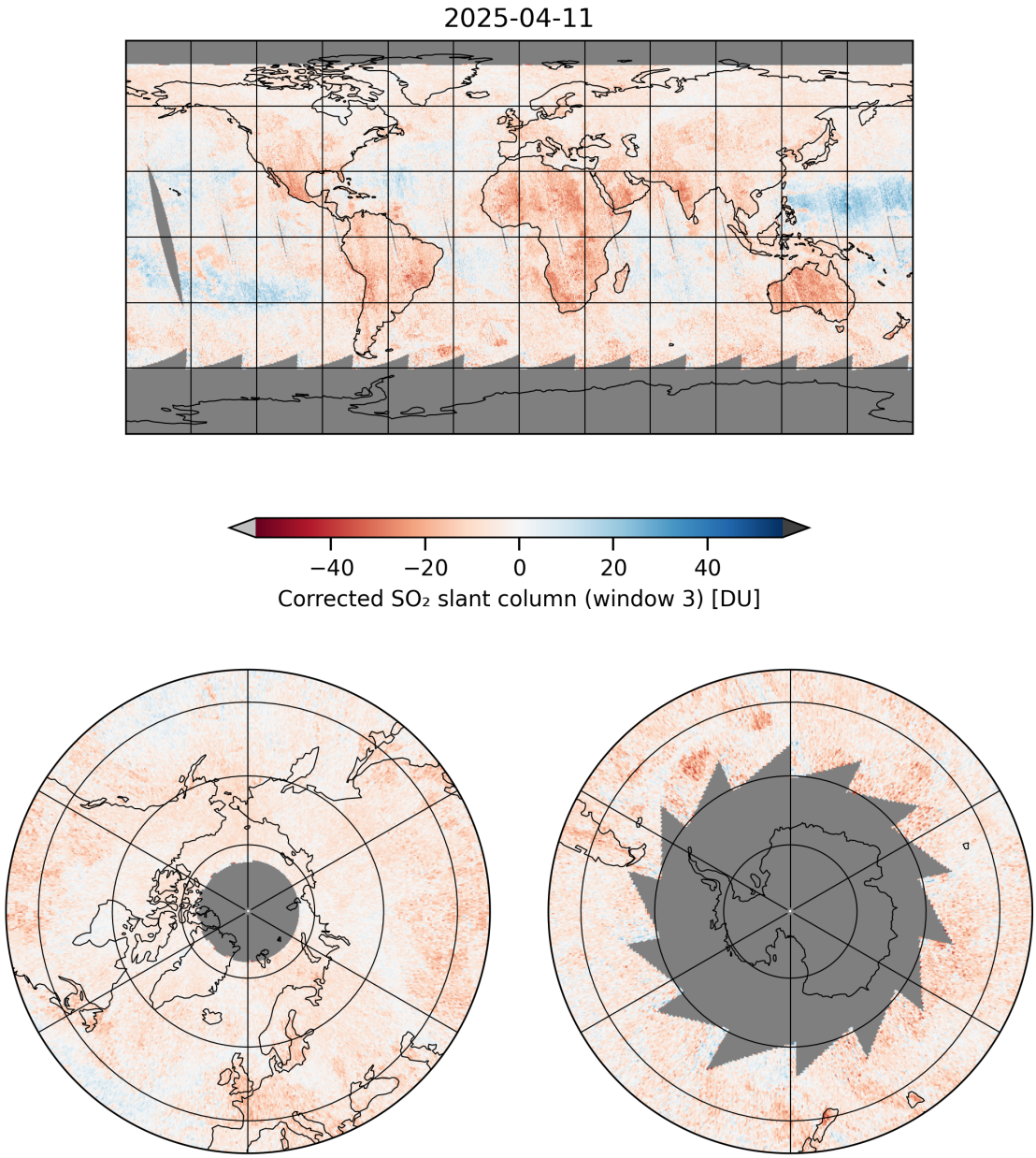


Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-04-11 to 2025-04-11

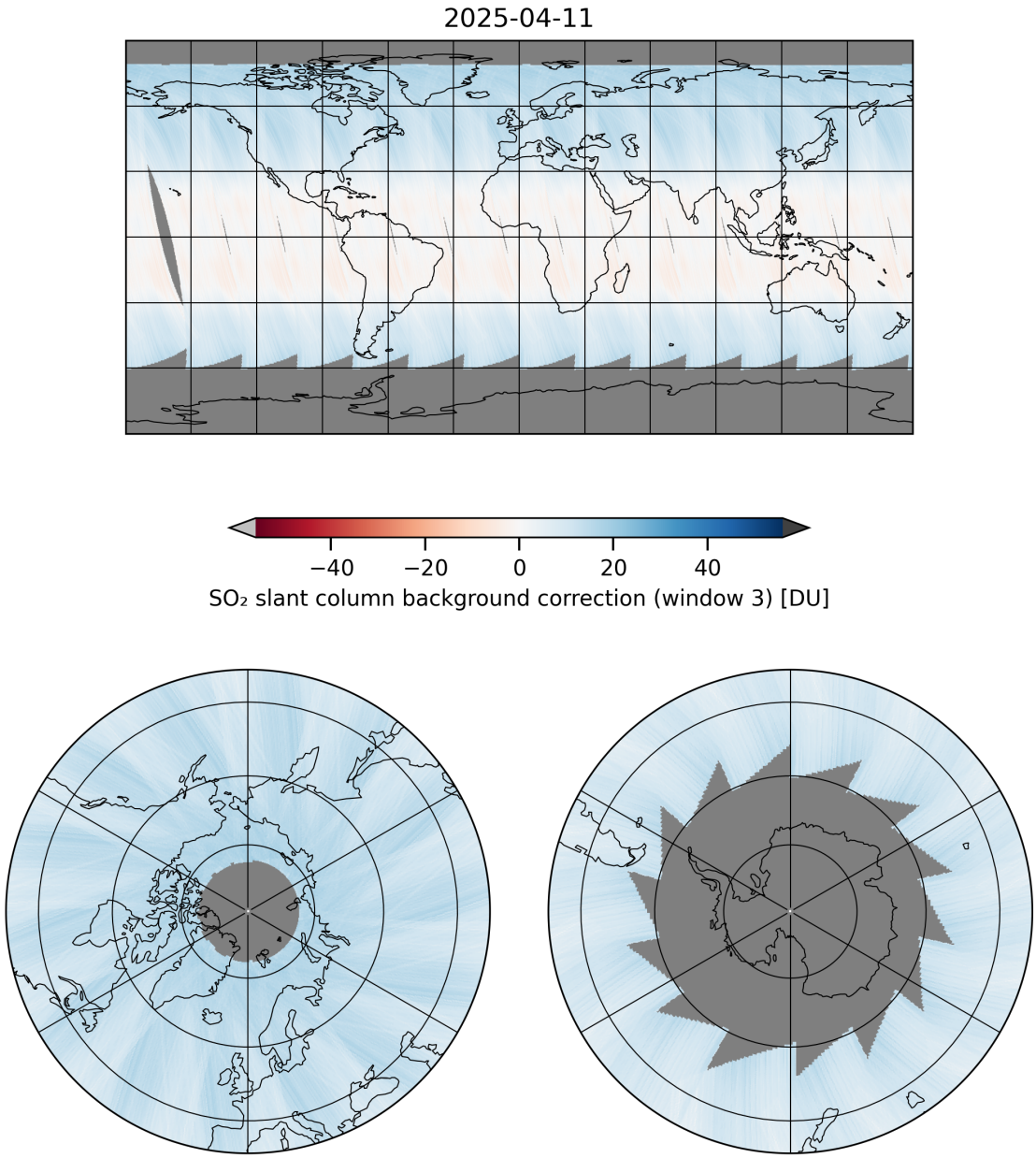


Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-04-11 to 2025-04-11

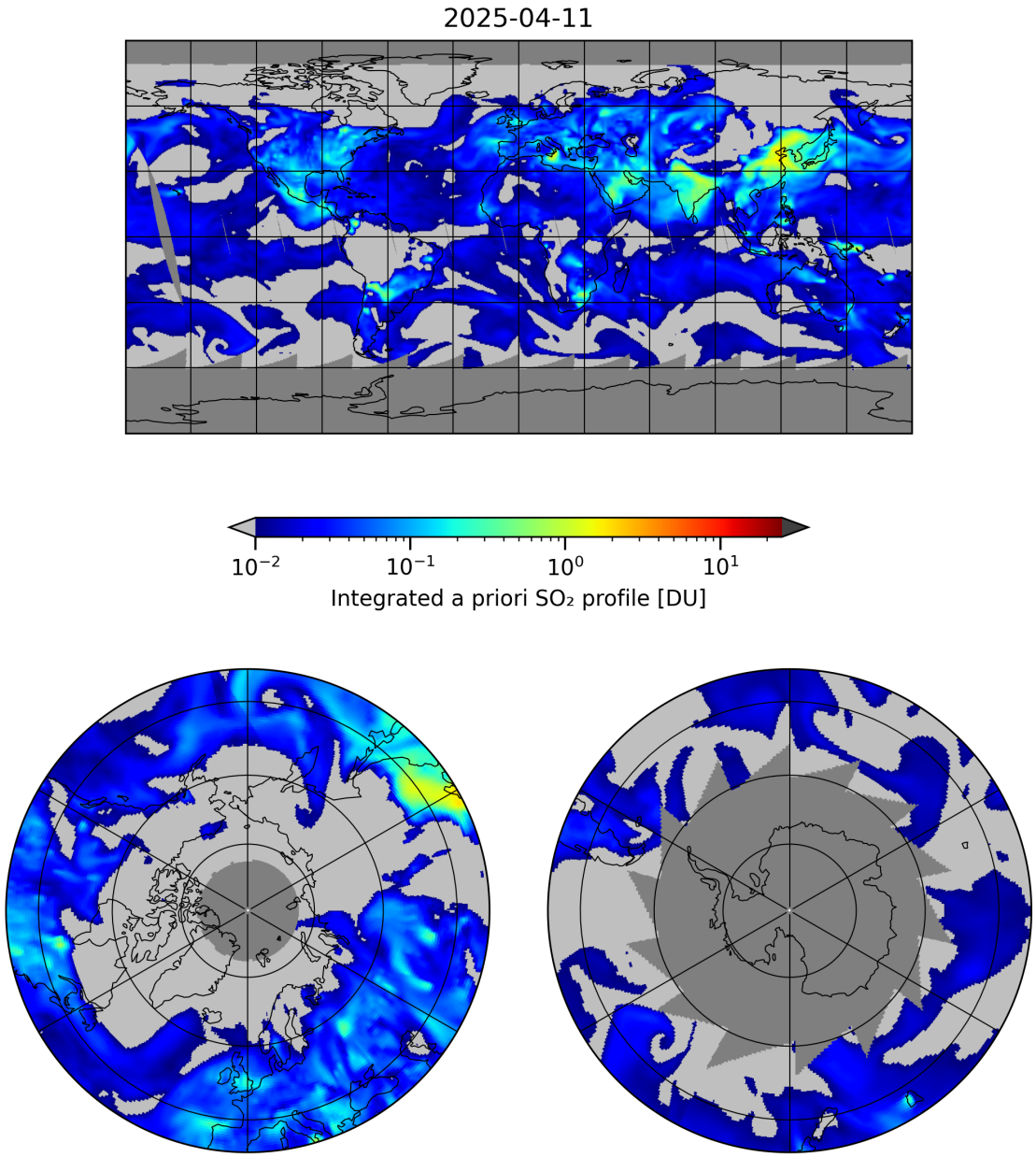


Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-04-11 to 2025-04-11

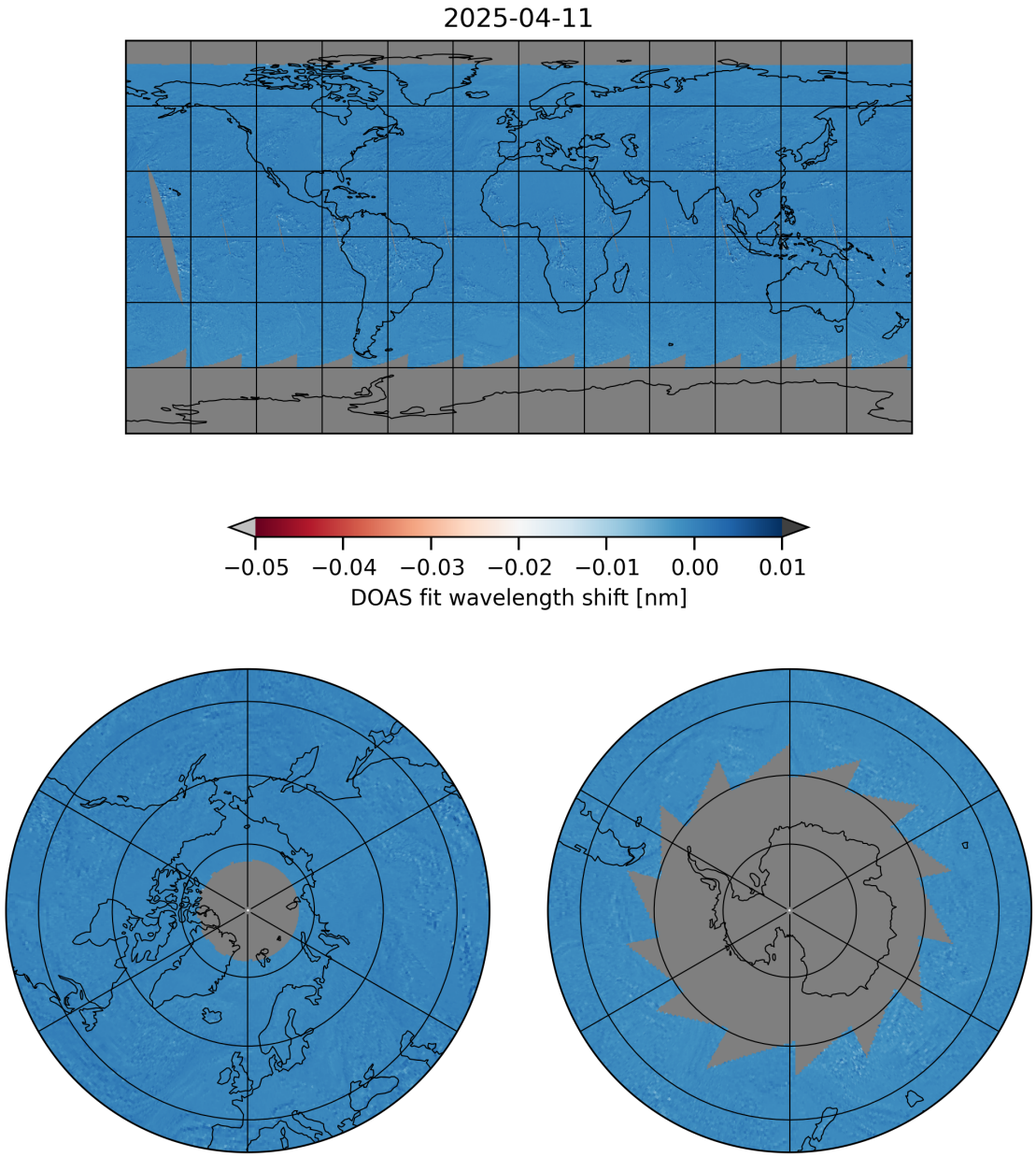


Figure 22: Map of “DOAS fit wavelength shift” for 2025-04-11 to 2025-04-11

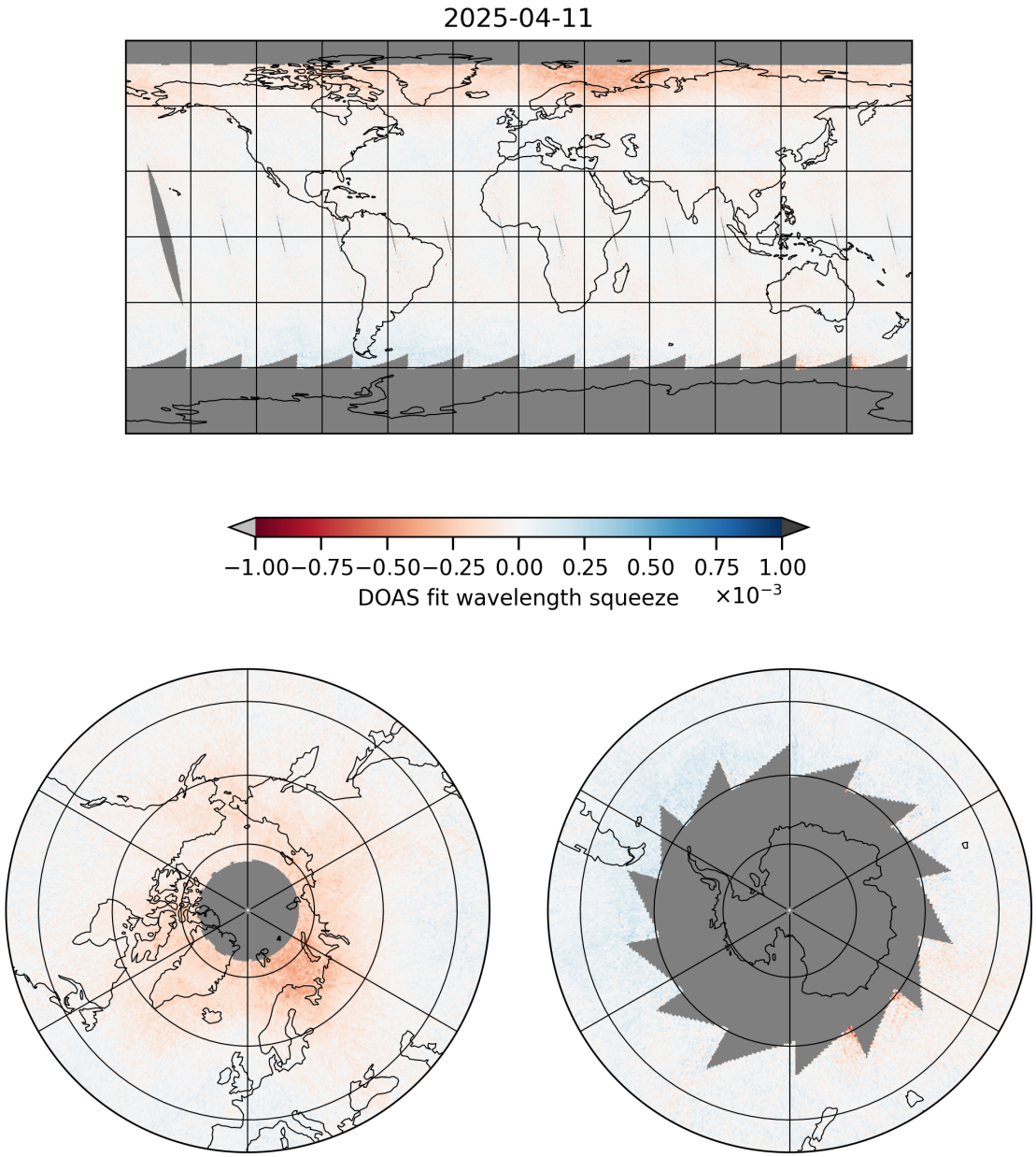


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-04-11 to 2025-04-11

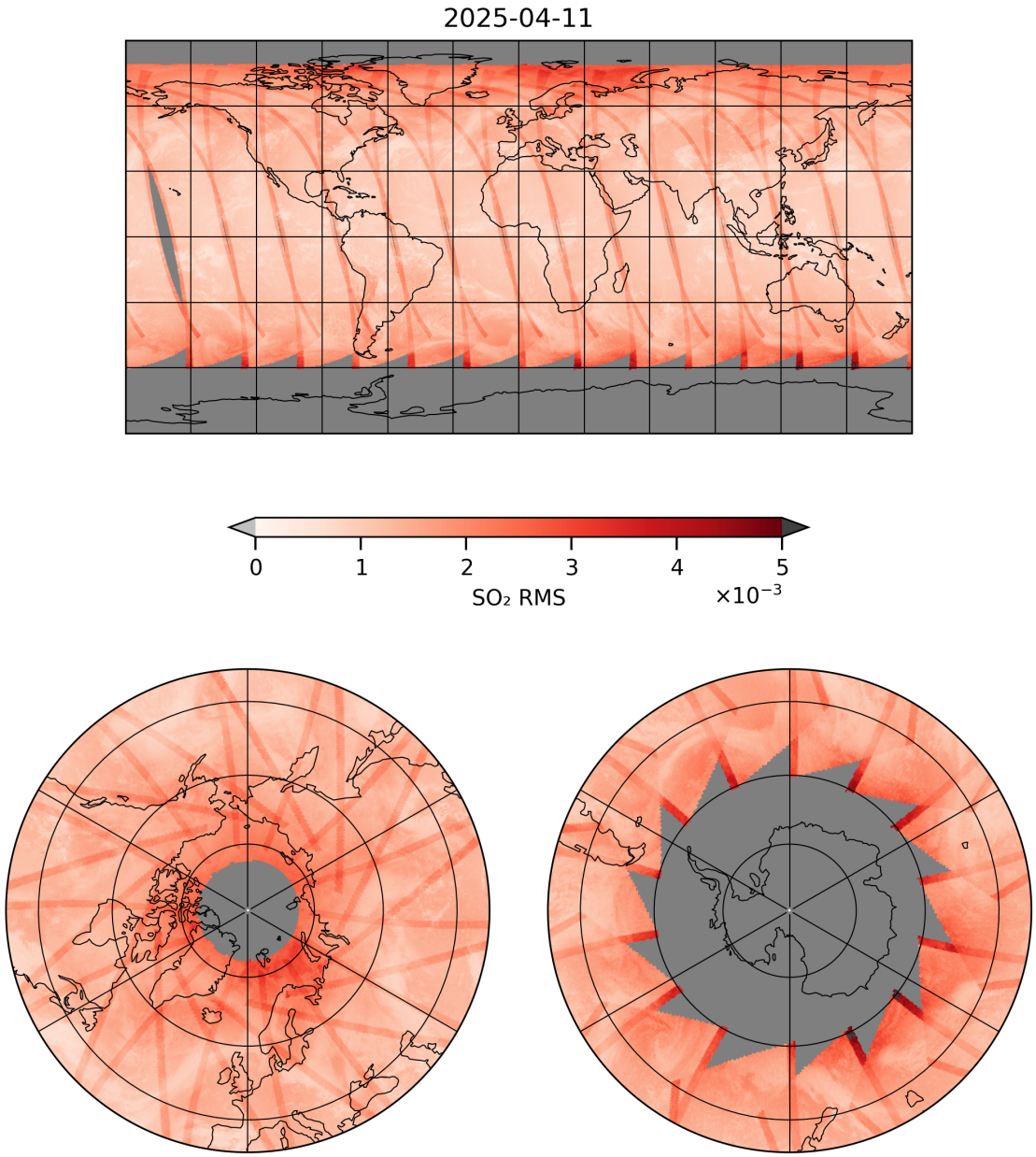


Figure 24: Map of "SO_2 RMS" for 2025-04-11 to 2025-04-11

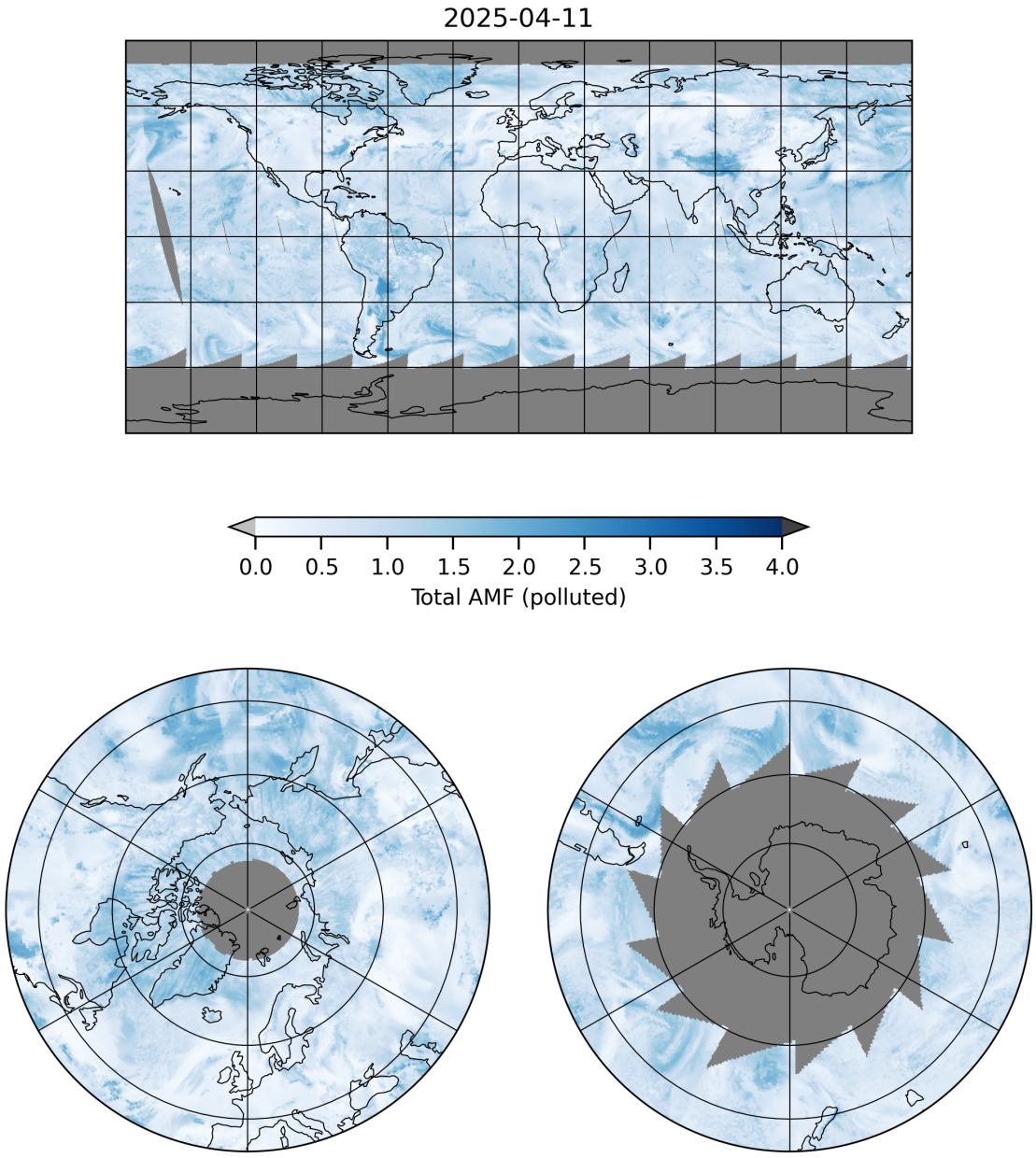


Figure 25: Map of “Total AMF (polluted)” for 2025-04-11 to 2025-04-11

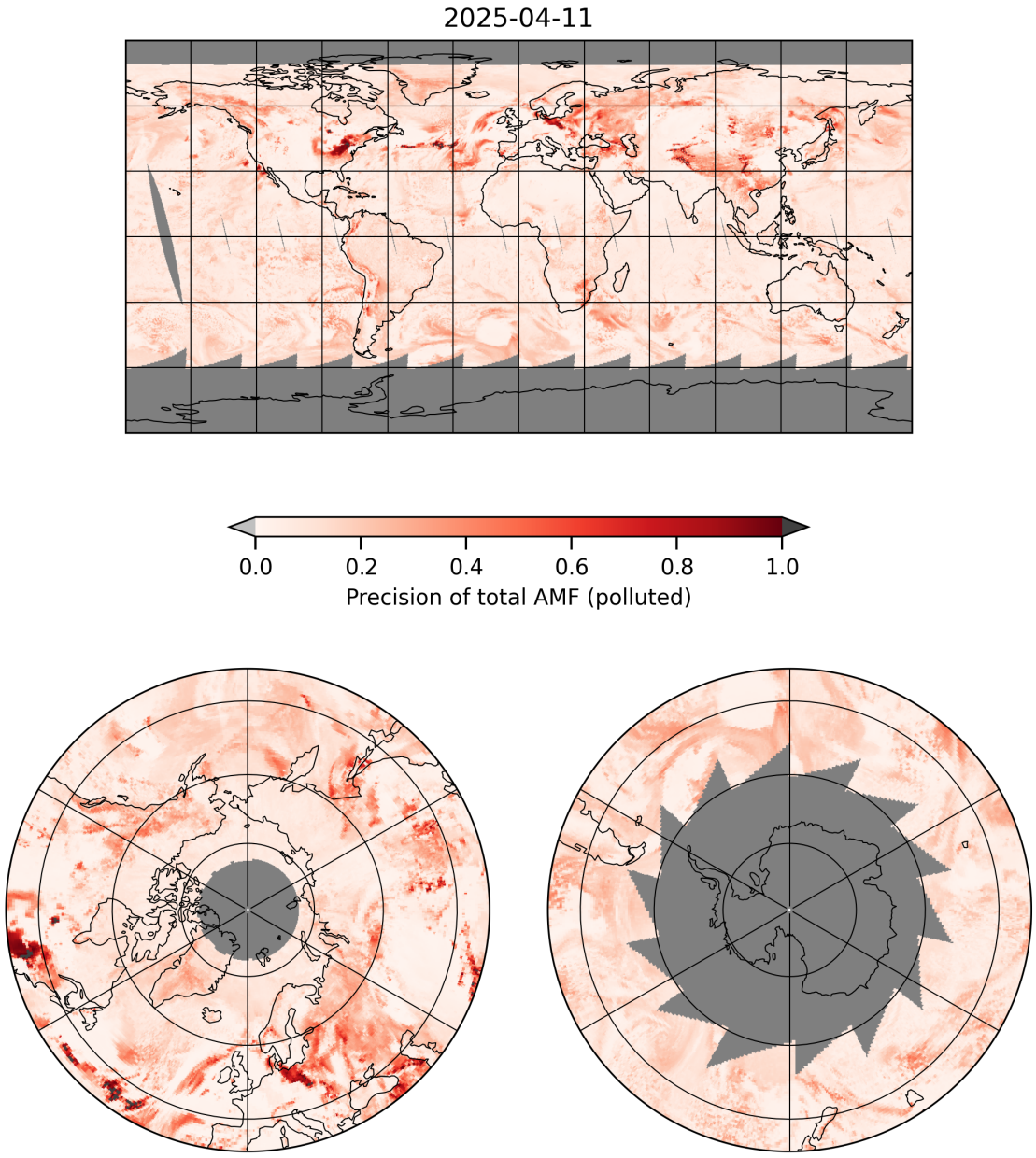


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-04-11 to 2025-04-11

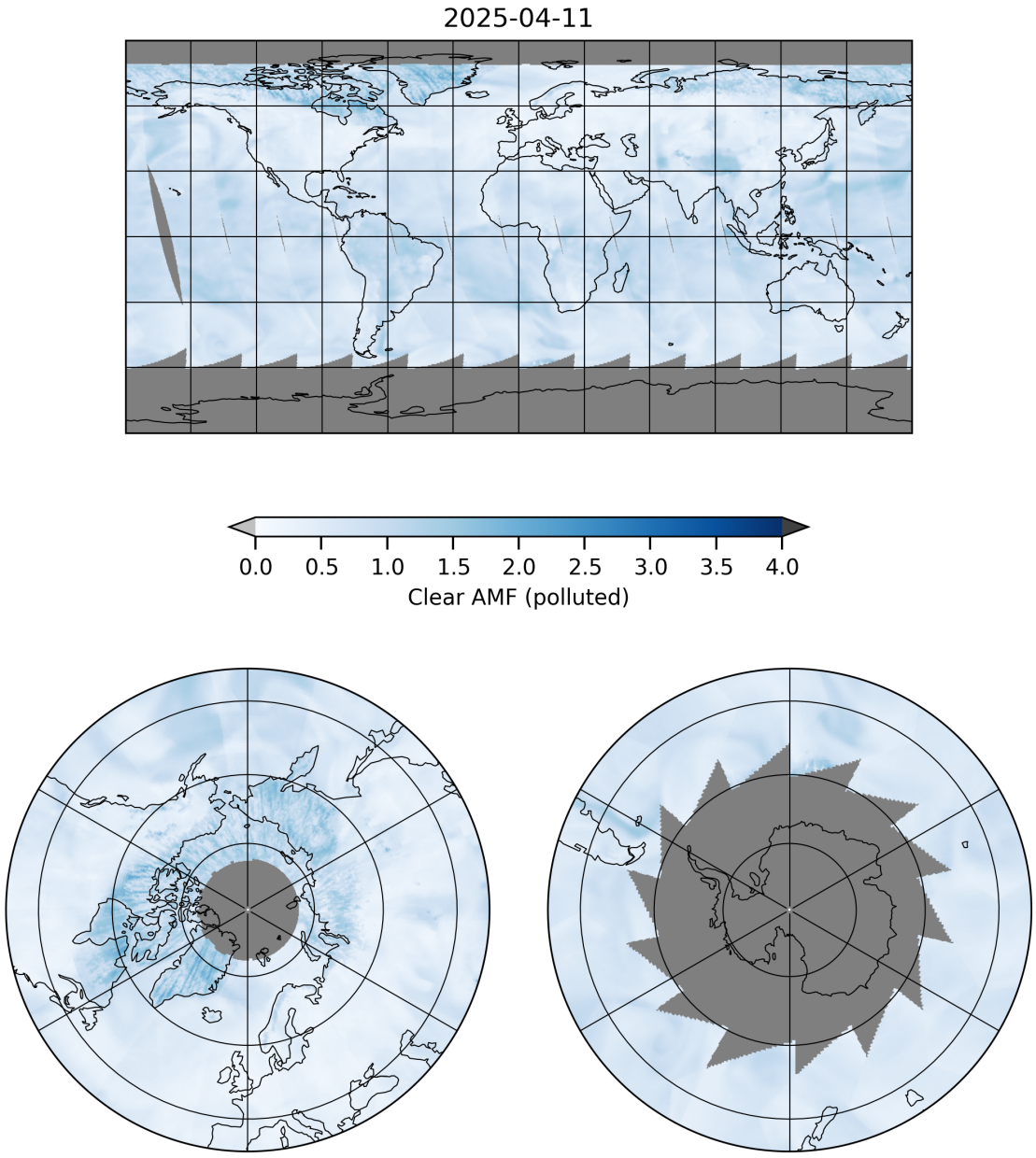


Figure 27: Map of “Clear AMF (polluted)” for 2025-04-11 to 2025-04-11

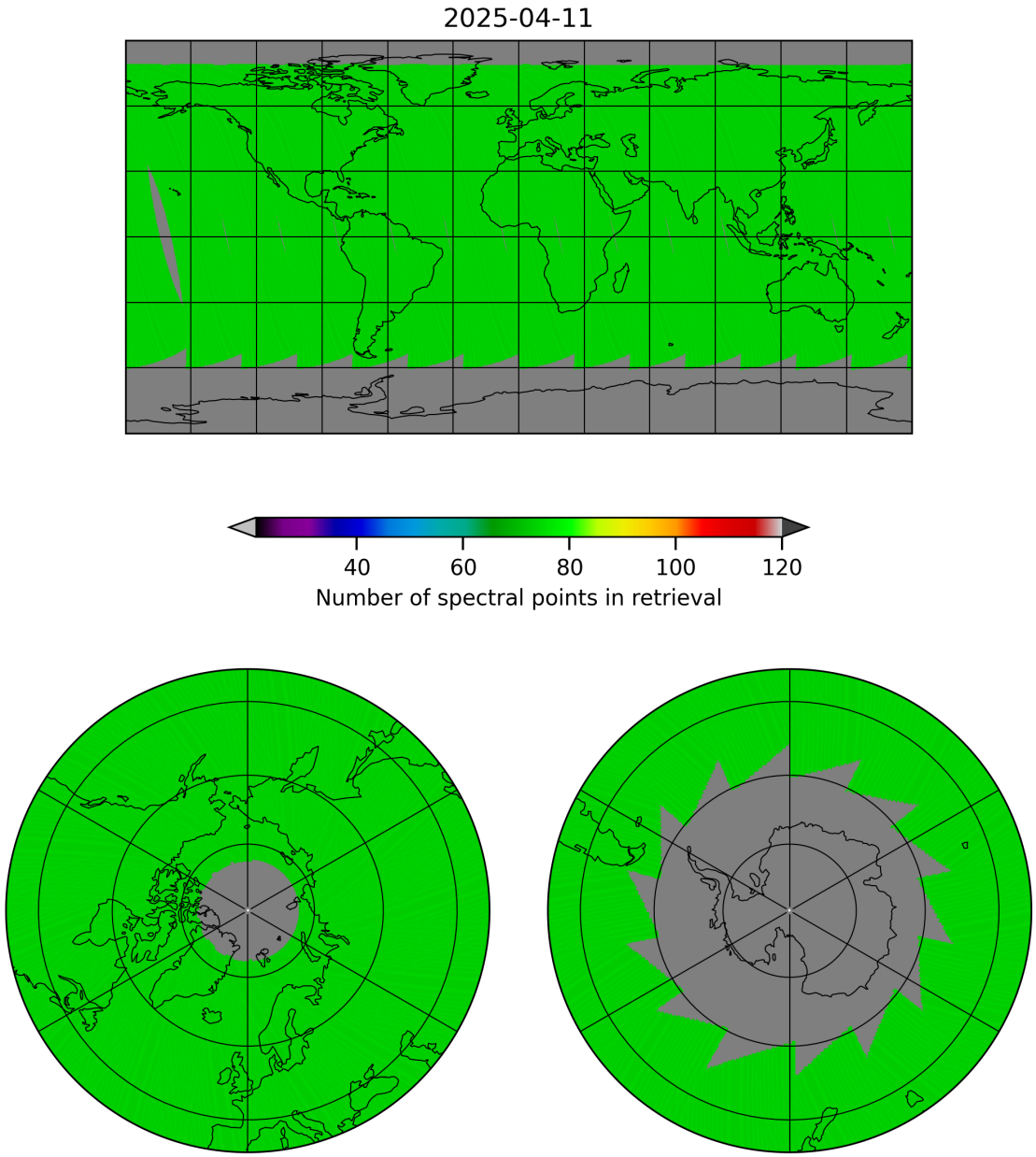


Figure 28: Map of “Number of spectral points in retrieval” for 2025-04-11 to 2025-04-11

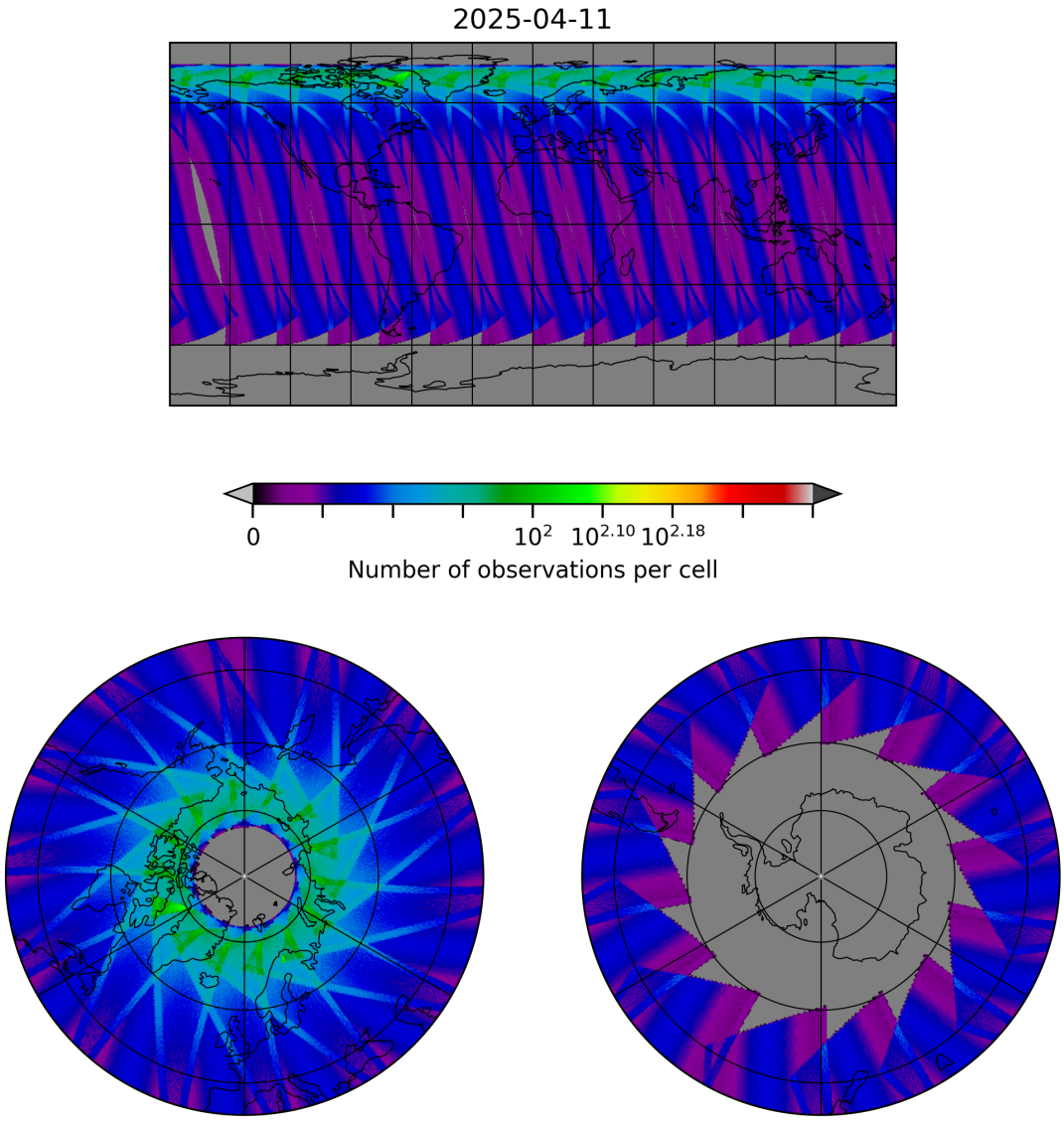


Figure 29: Map of the number of observations for 2025-04-11 to 2025-04-11

7 Zonal average

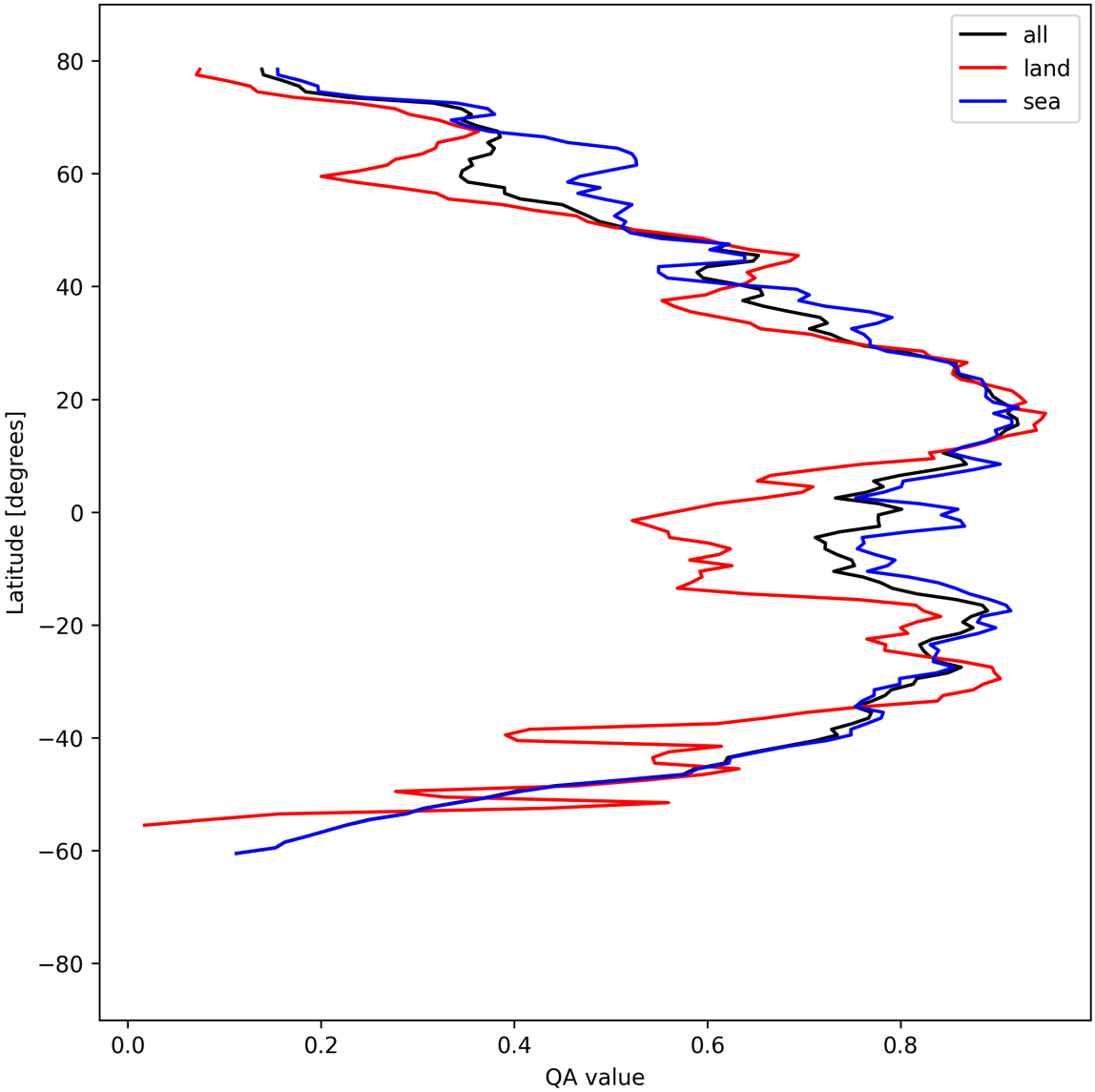


Figure 30: Zonal average of “QA value” for 2025-04-11 to 2025-04-11.

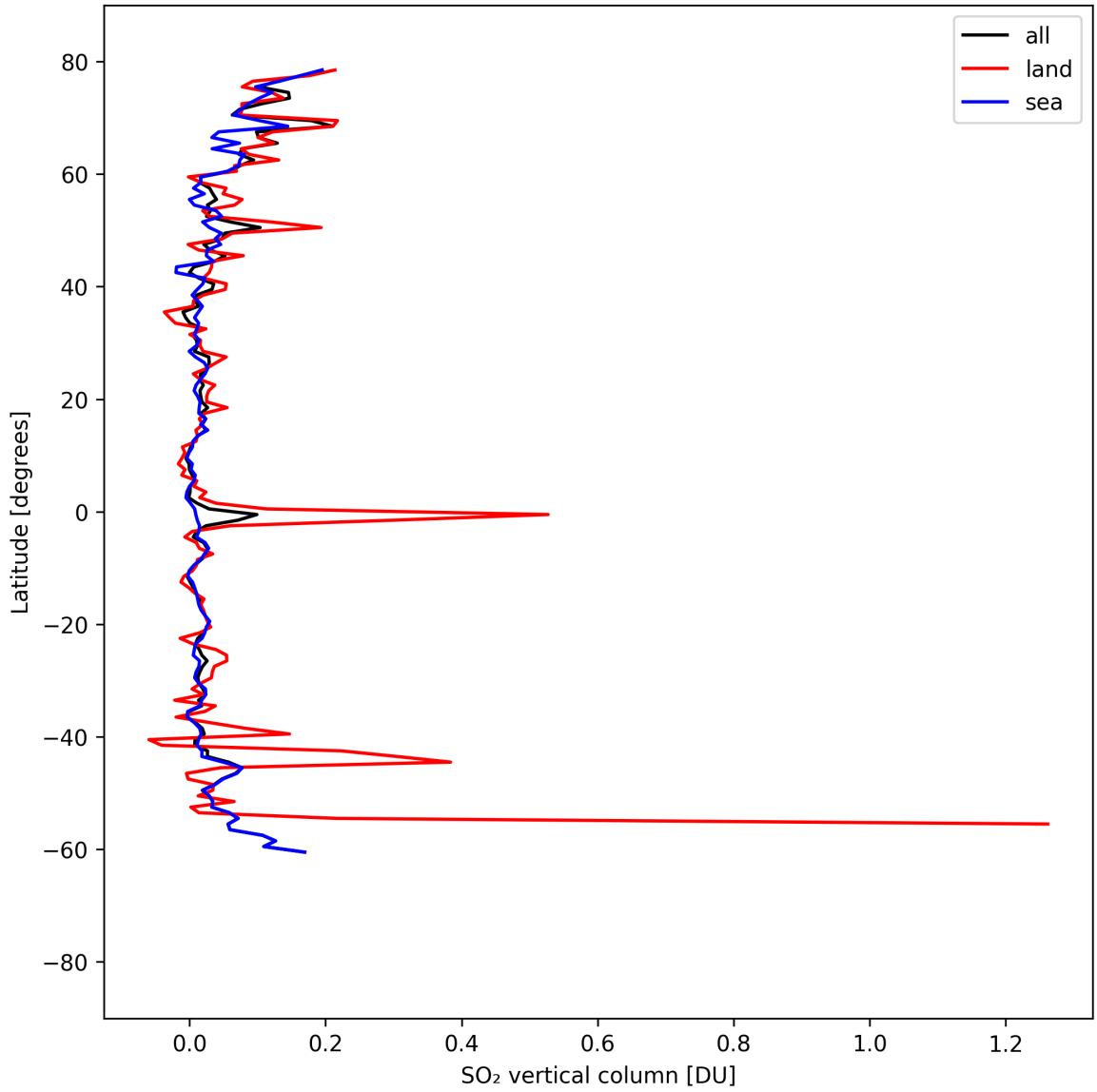


Figure 31: Zonal average of "SO_2 vertical column" for 2025-04-11 to 2025-04-11.

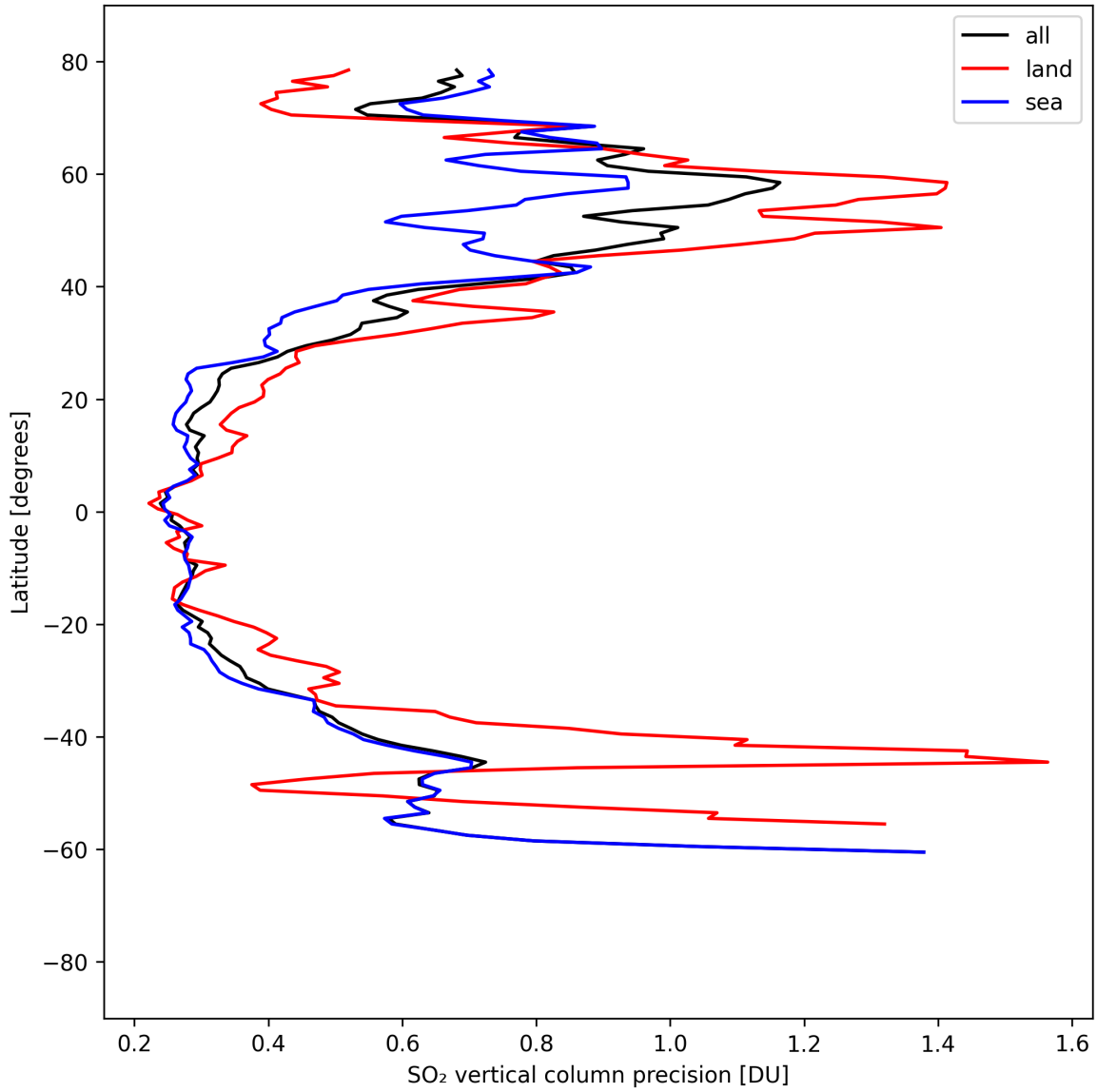


Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-04-11 to 2025-04-11.

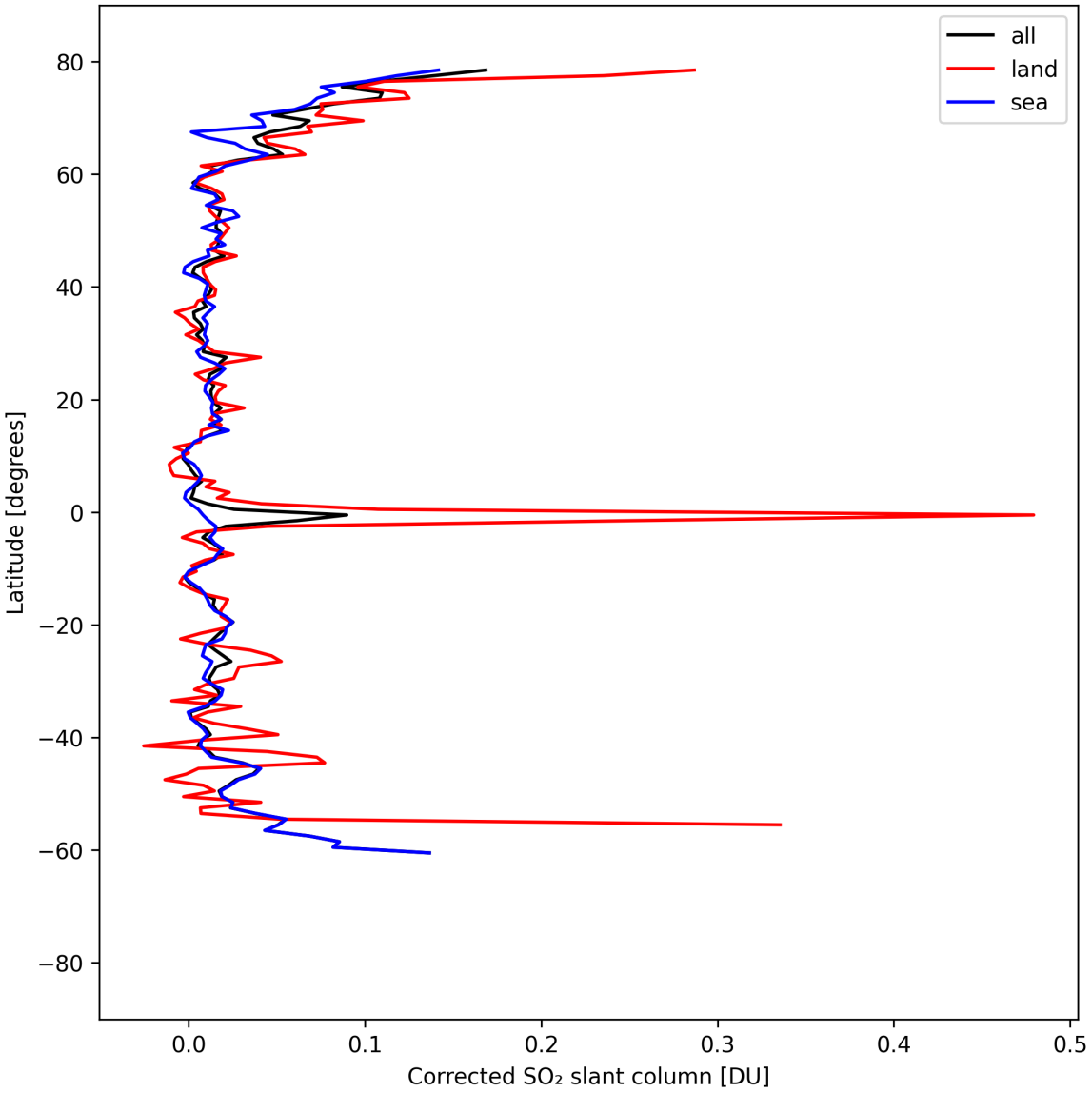


Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-04-11 to 2025-04-11.

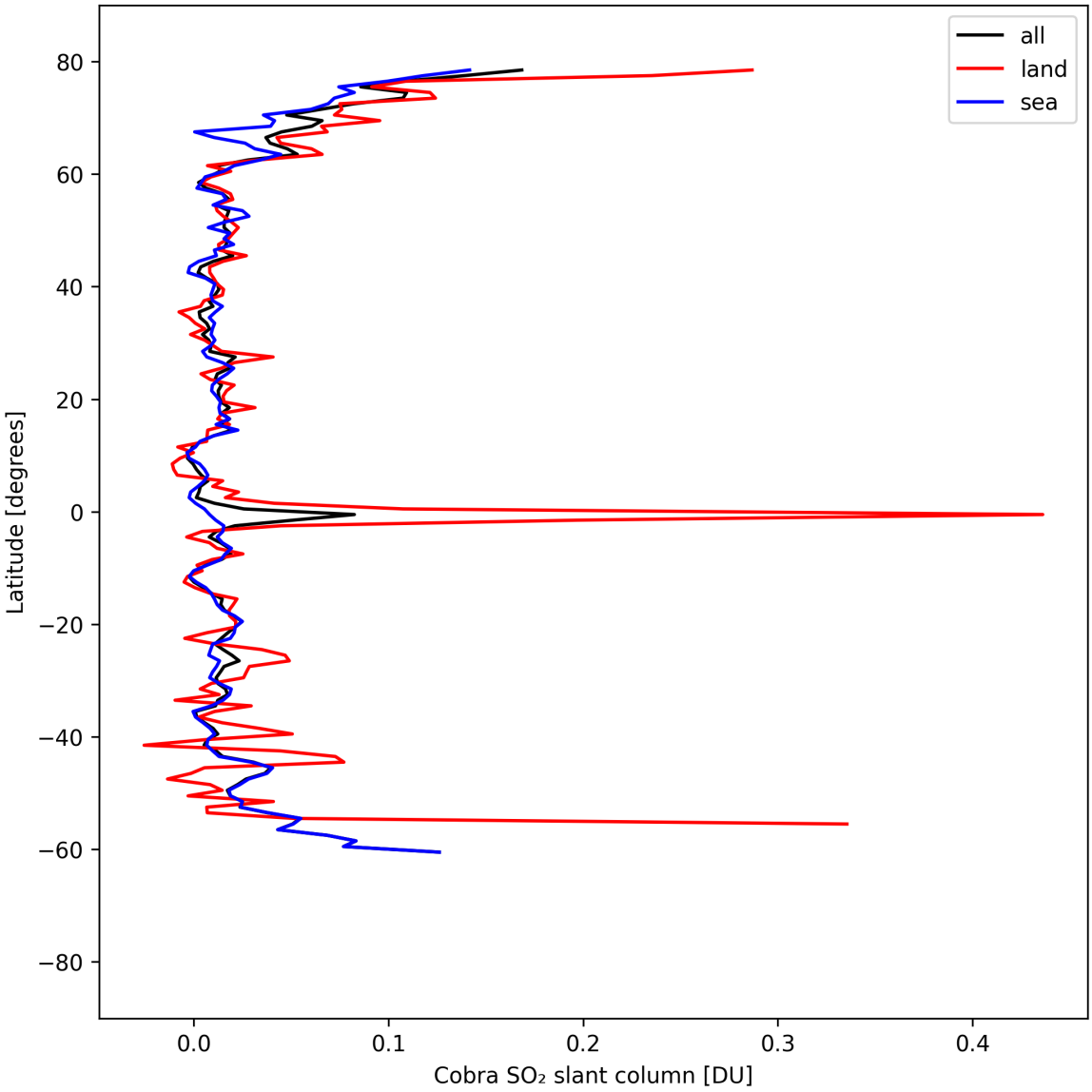


Figure 34: Zonal average of “Cobra SO_2 slant column” for 2025-04-11 to 2025-04-11.

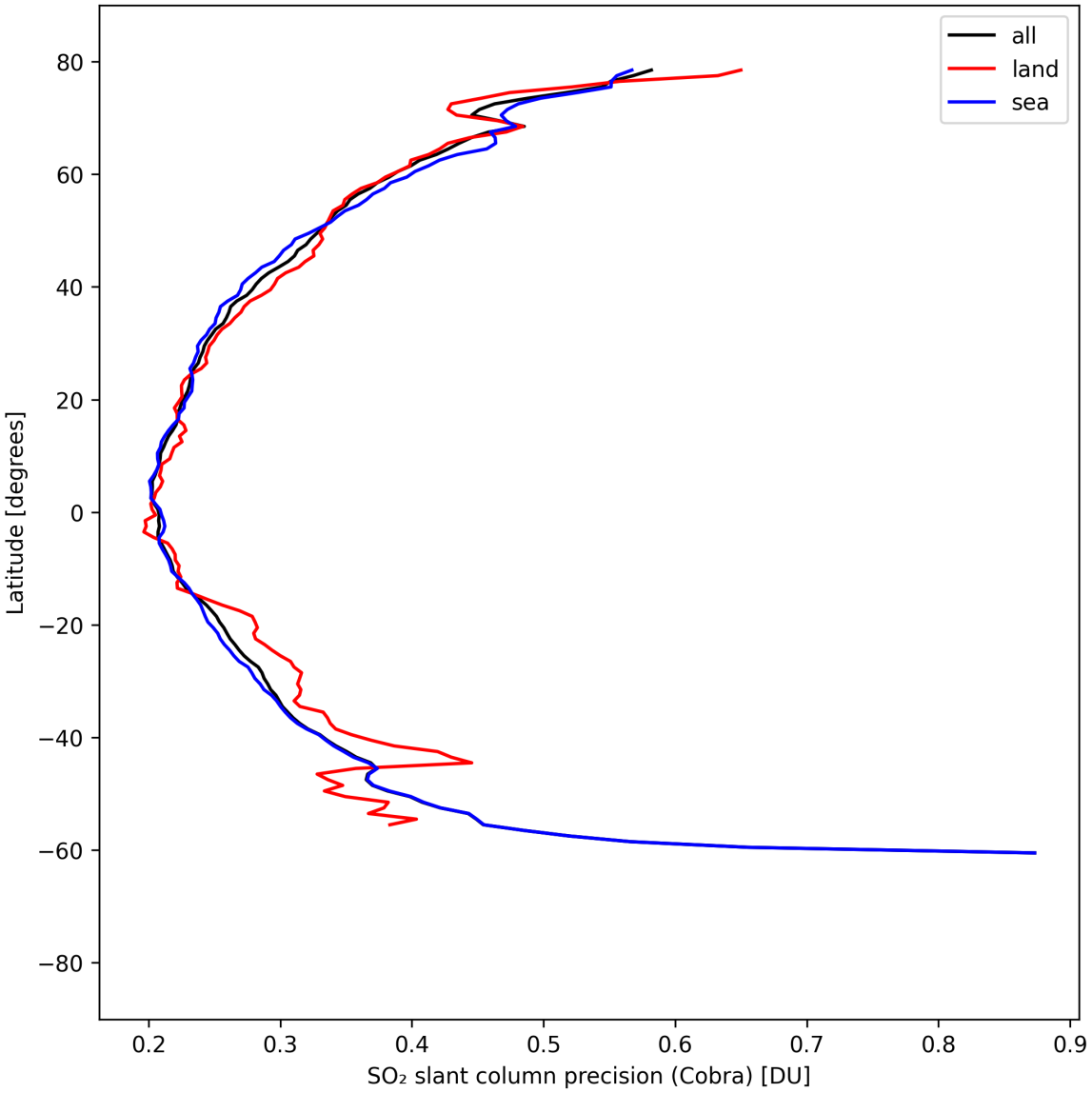


Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-04-11 to 2025-04-11.

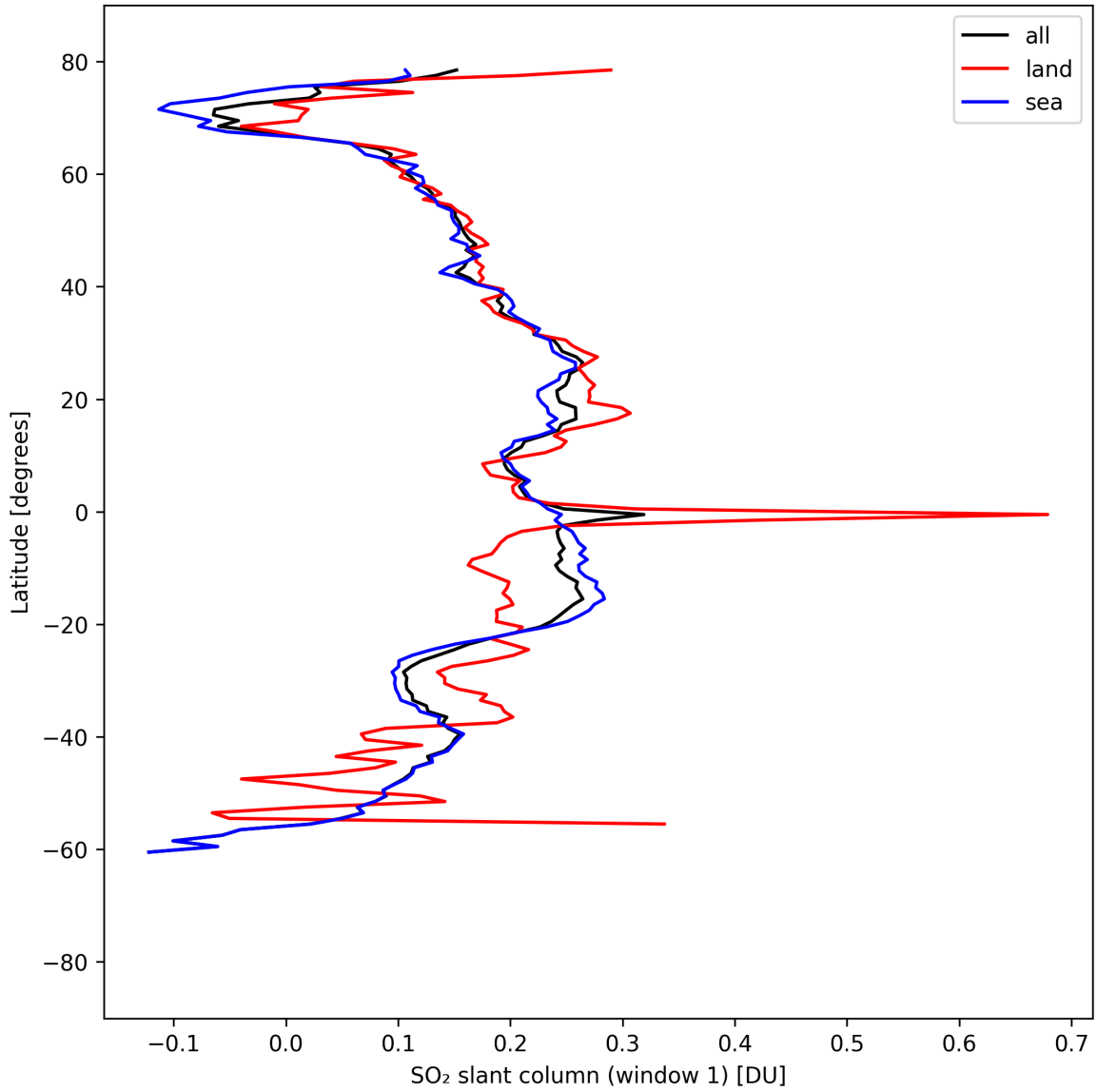


Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-04-11 to 2025-04-11.

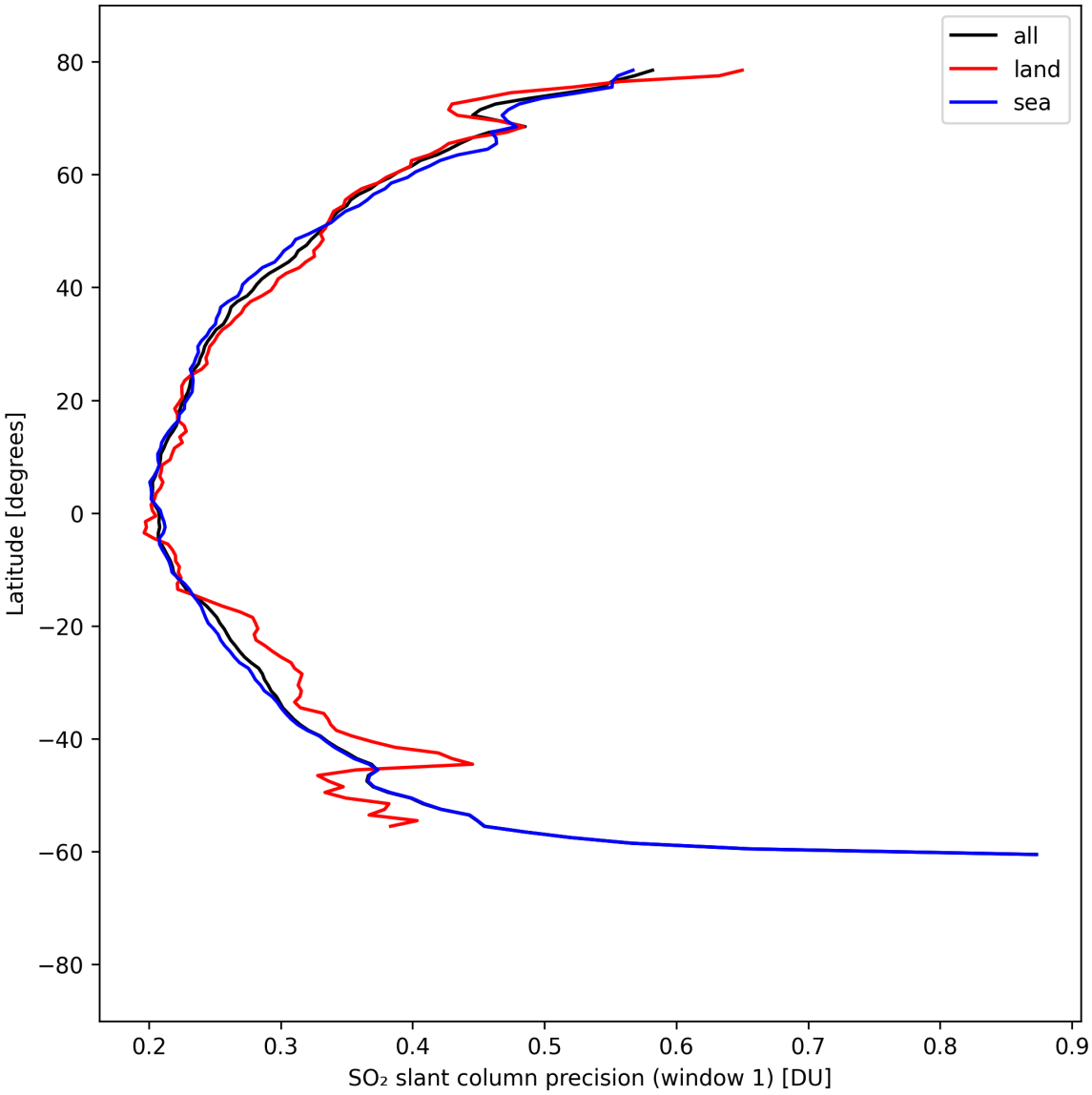


Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-04-11 to 2025-04-11.

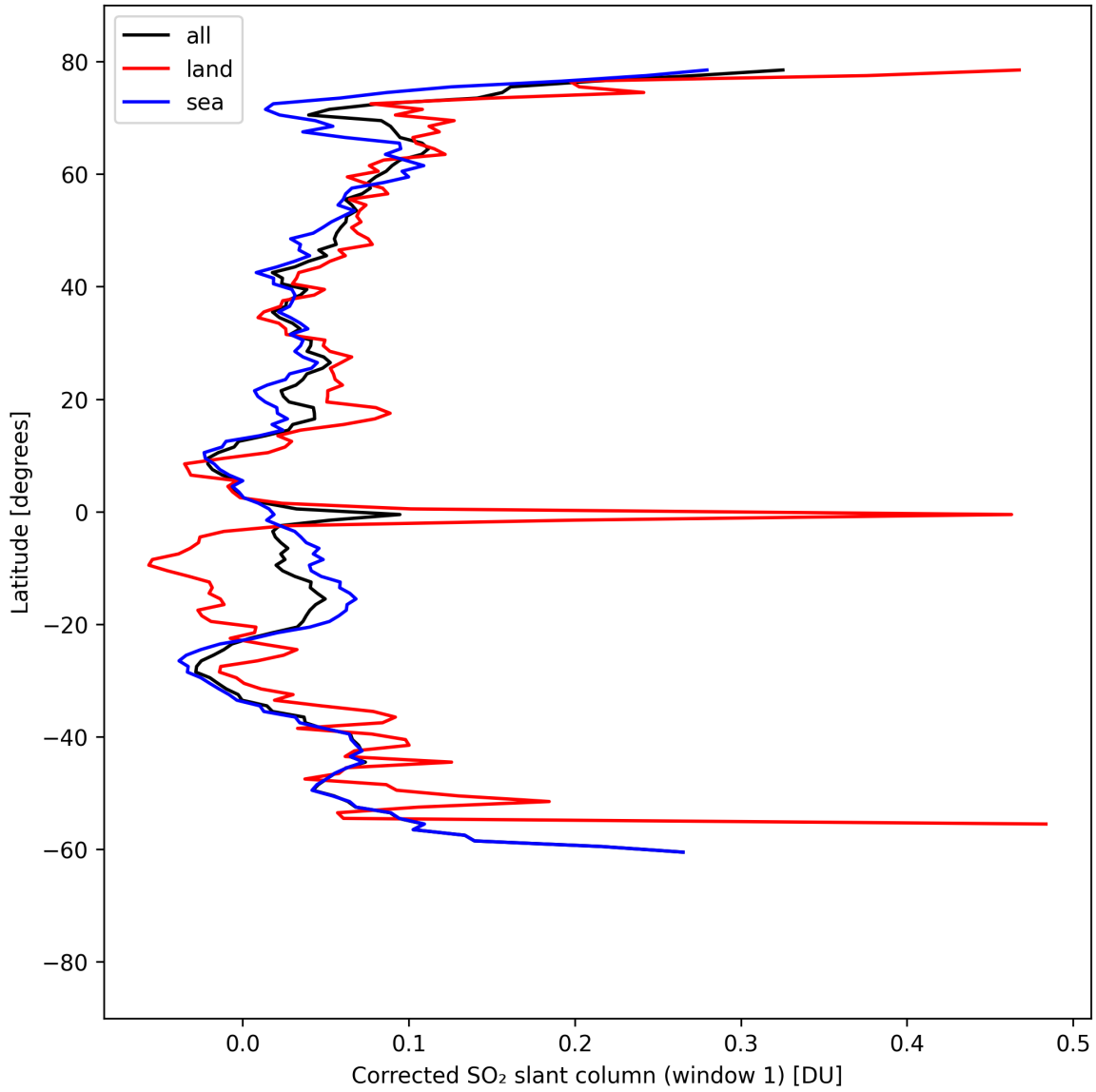


Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-04-11 to 2025-04-11.

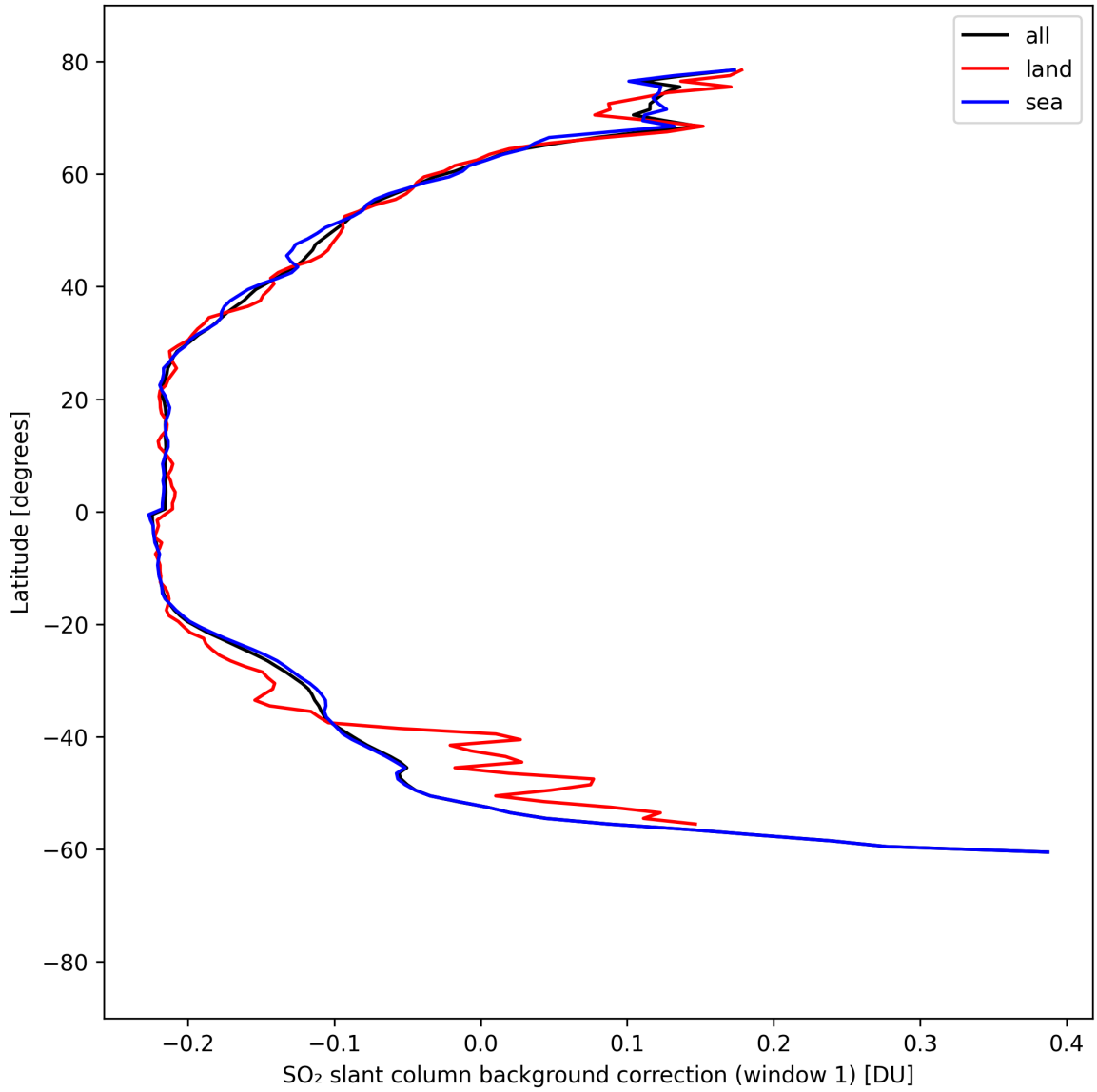


Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-04-11 to 2025-04-11.

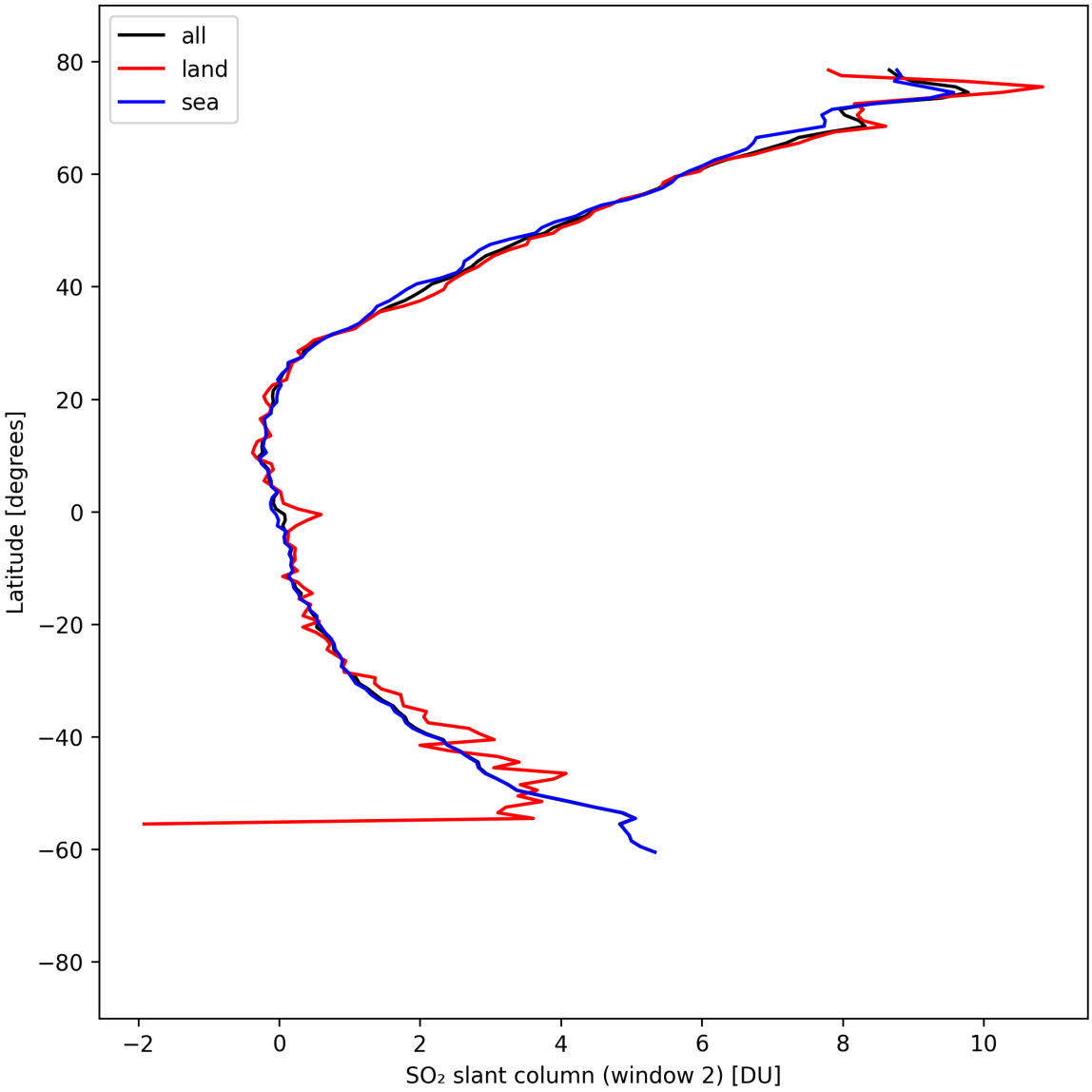


Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-04-11 to 2025-04-11.

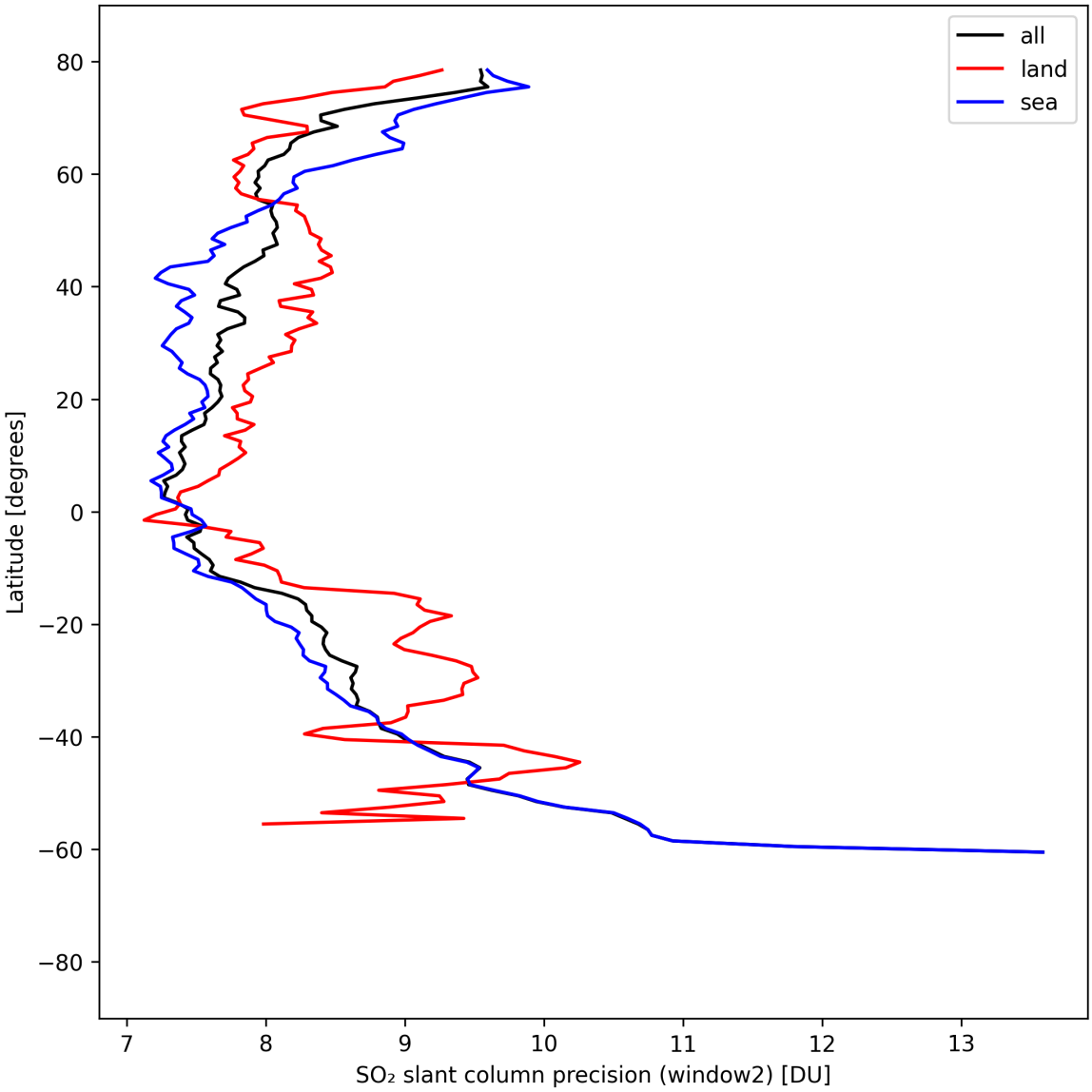


Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-04-11 to 2025-04-11.

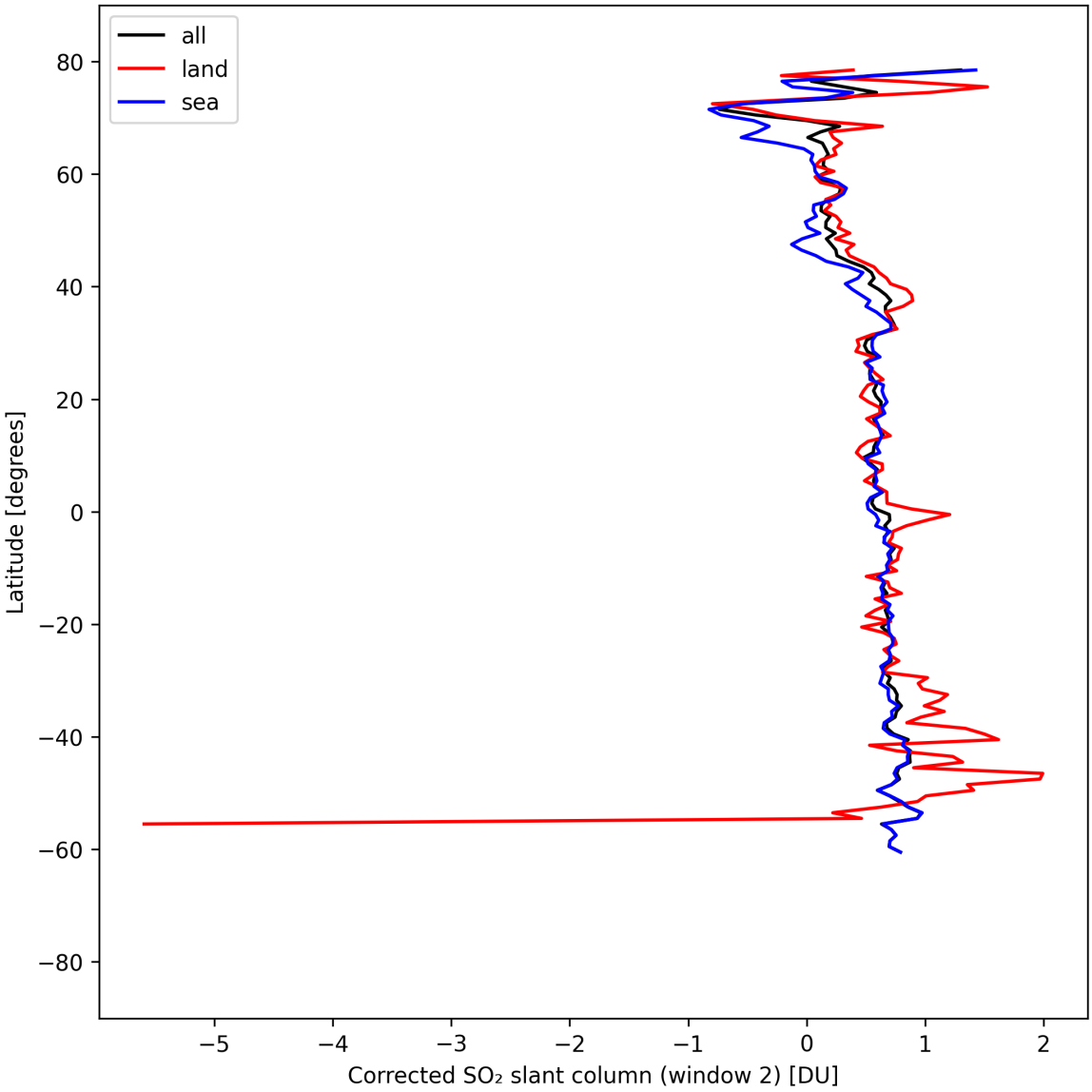


Figure 42: Zonal average of “Corrected SO_2 slant column (window 2)” for 2025-04-11 to 2025-04-11.

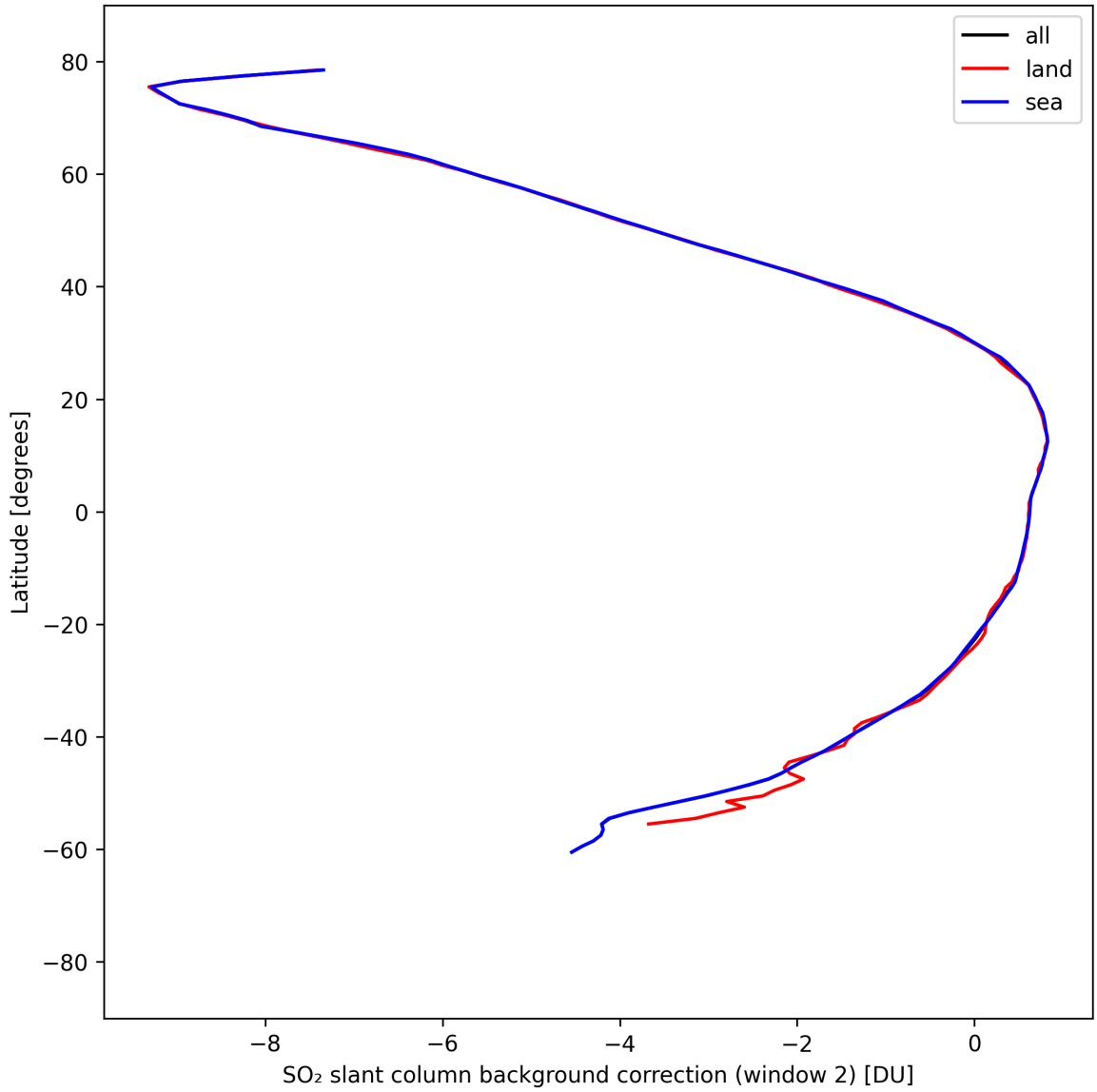


Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-04-11 to 2025-04-11.

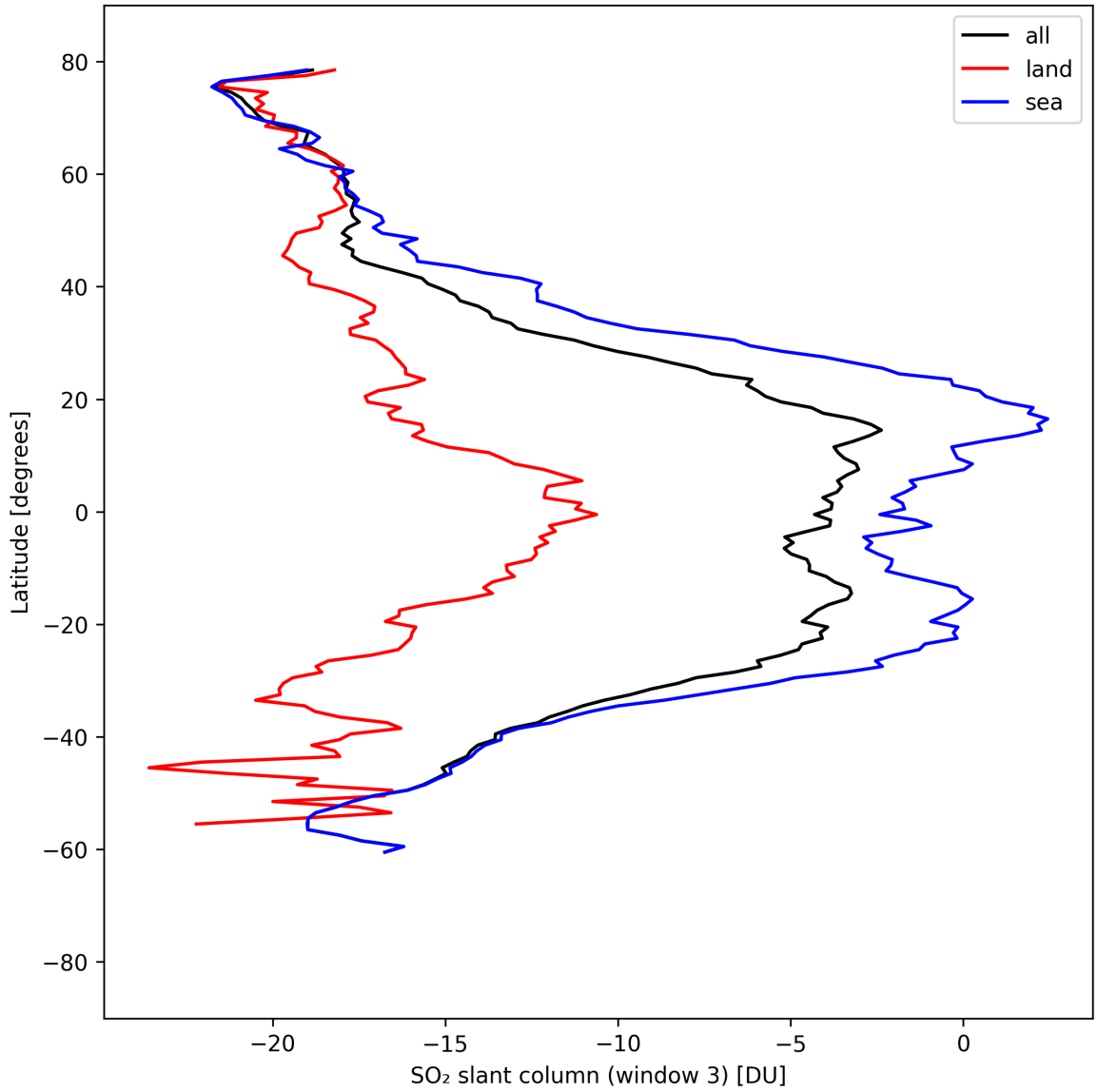


Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-04-11 to 2025-04-11.

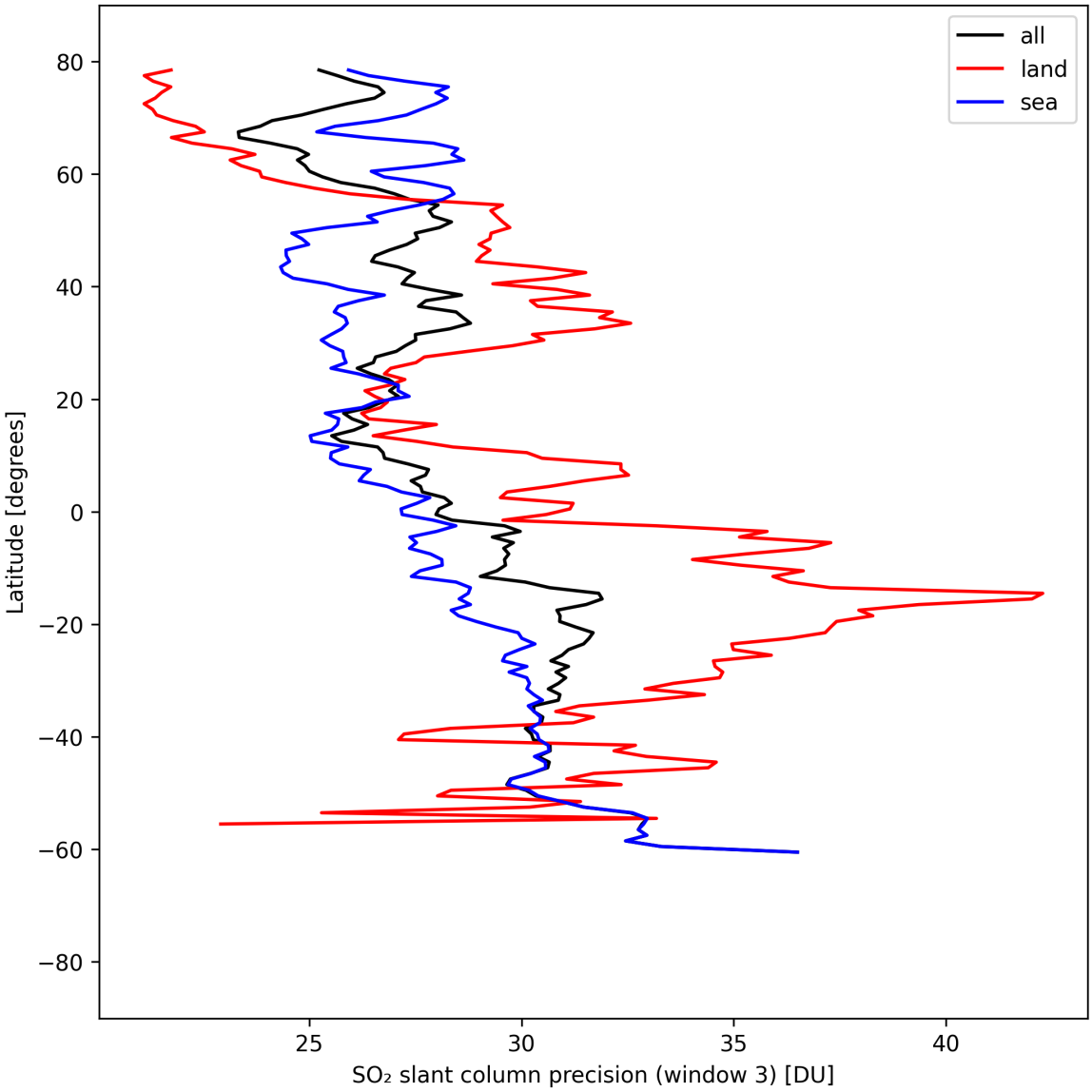


Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-04-11 to 2025-04-11.

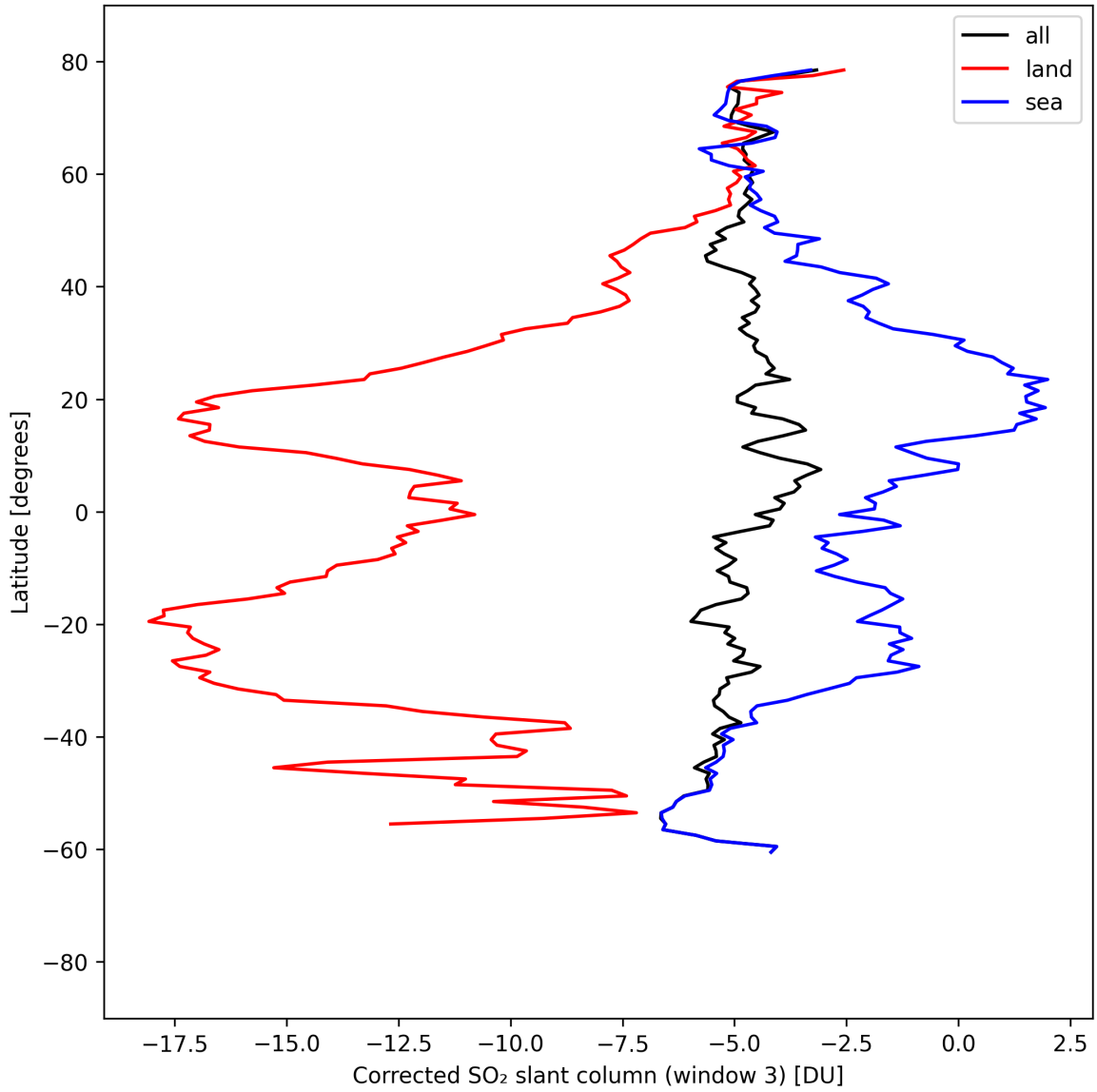


Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-04-11 to 2025-04-11.

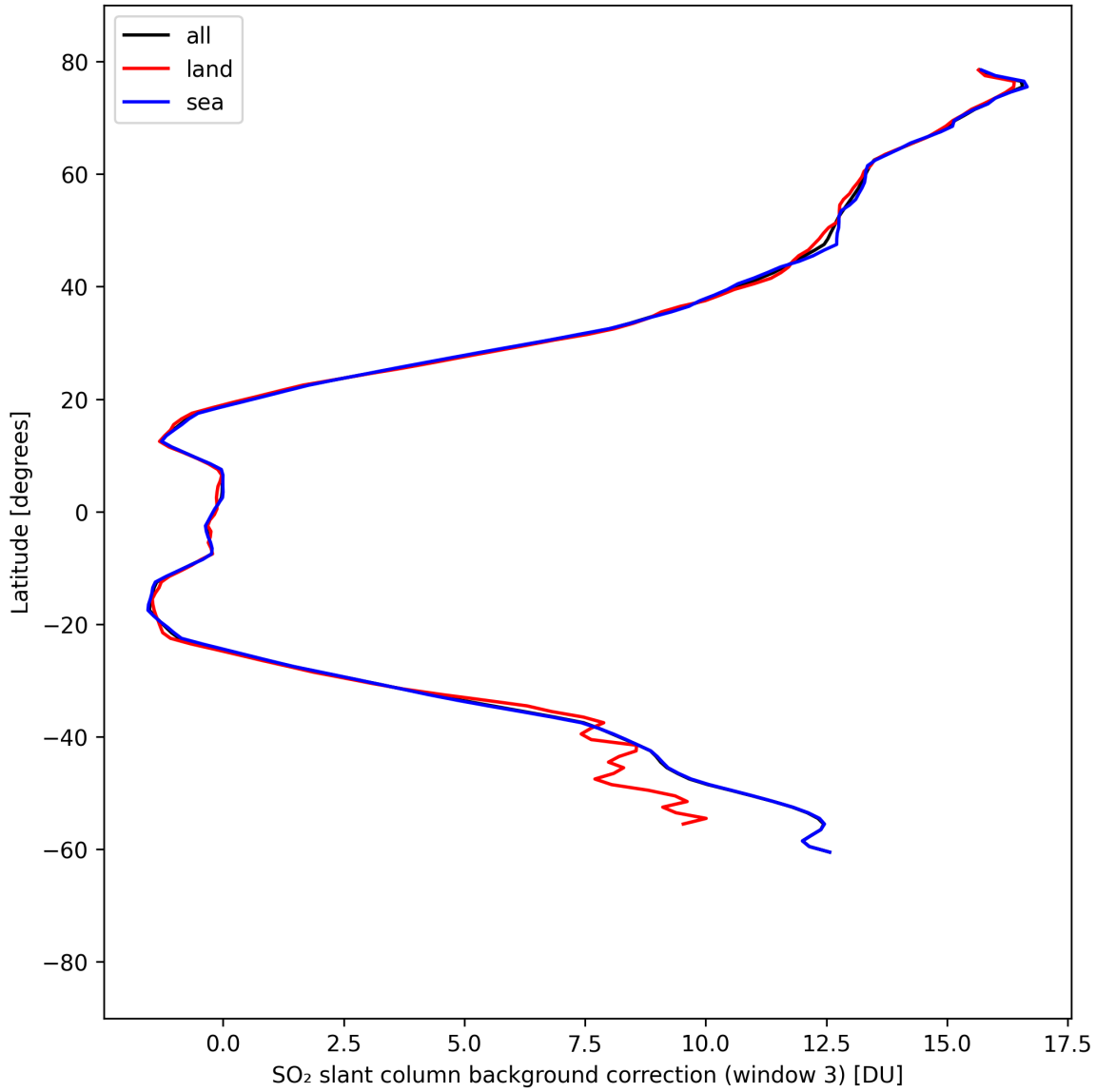


Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-04-11 to 2025-04-11.

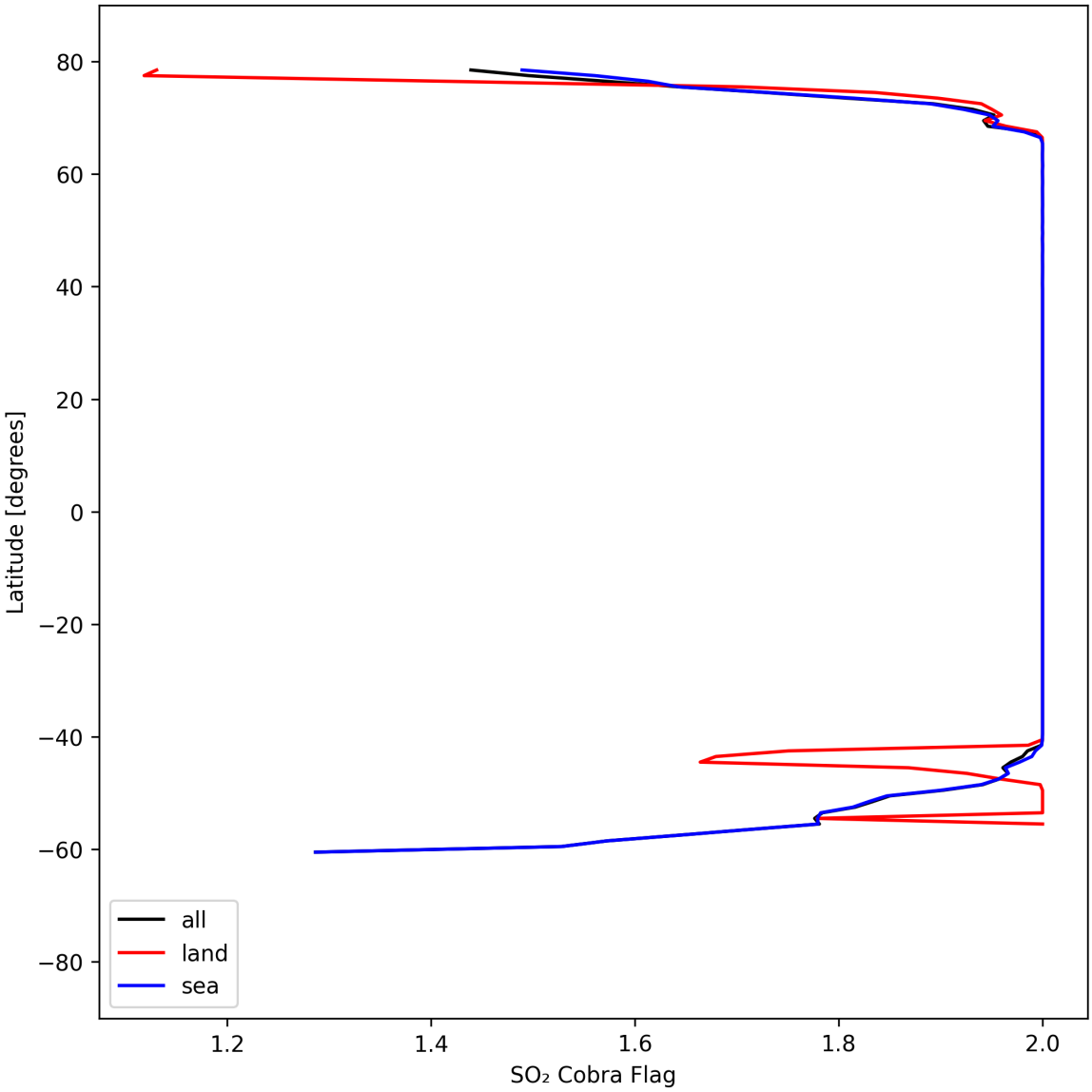


Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-04-11 to 2025-04-11.

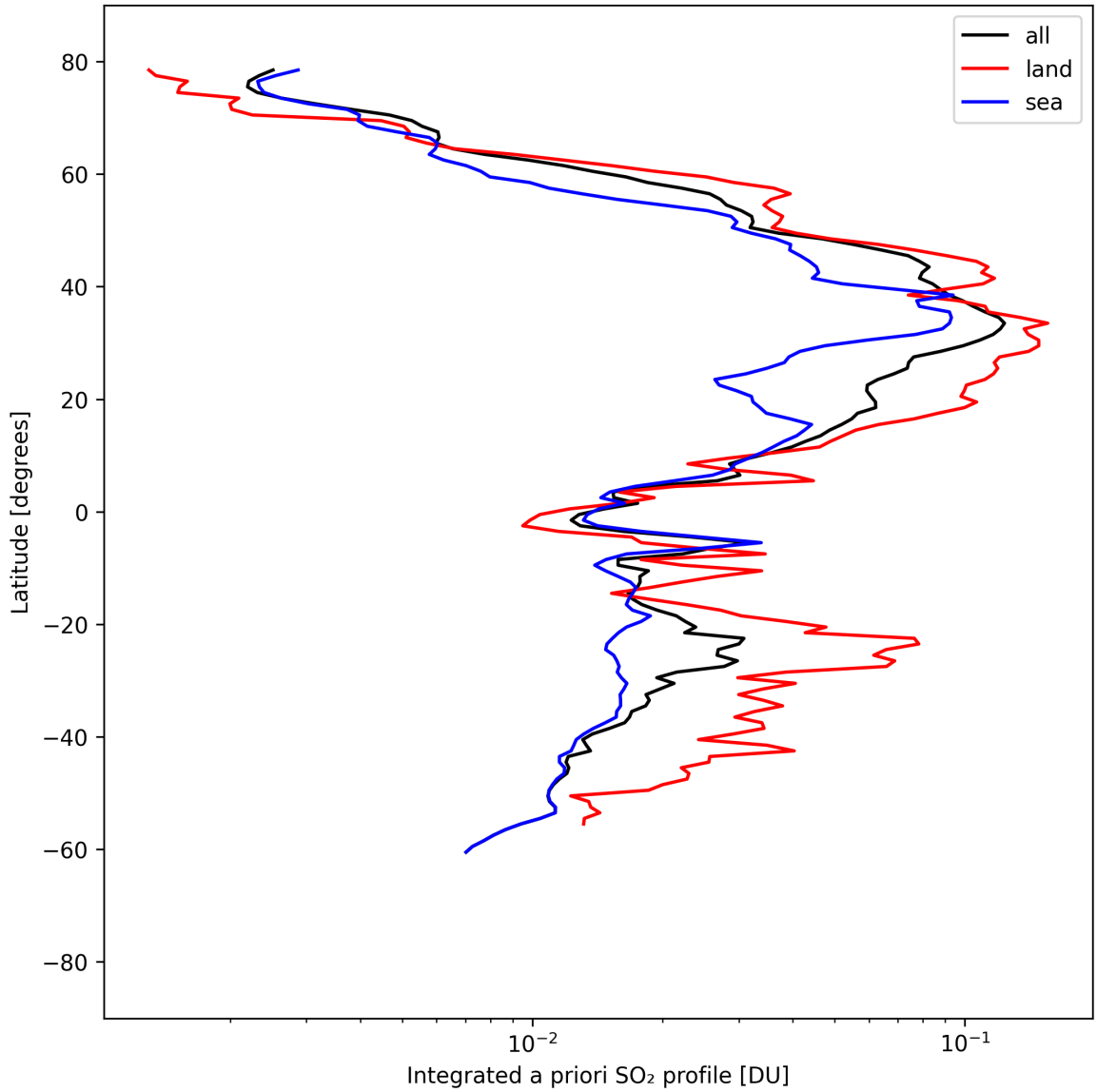


Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-04-11 to 2025-04-11.

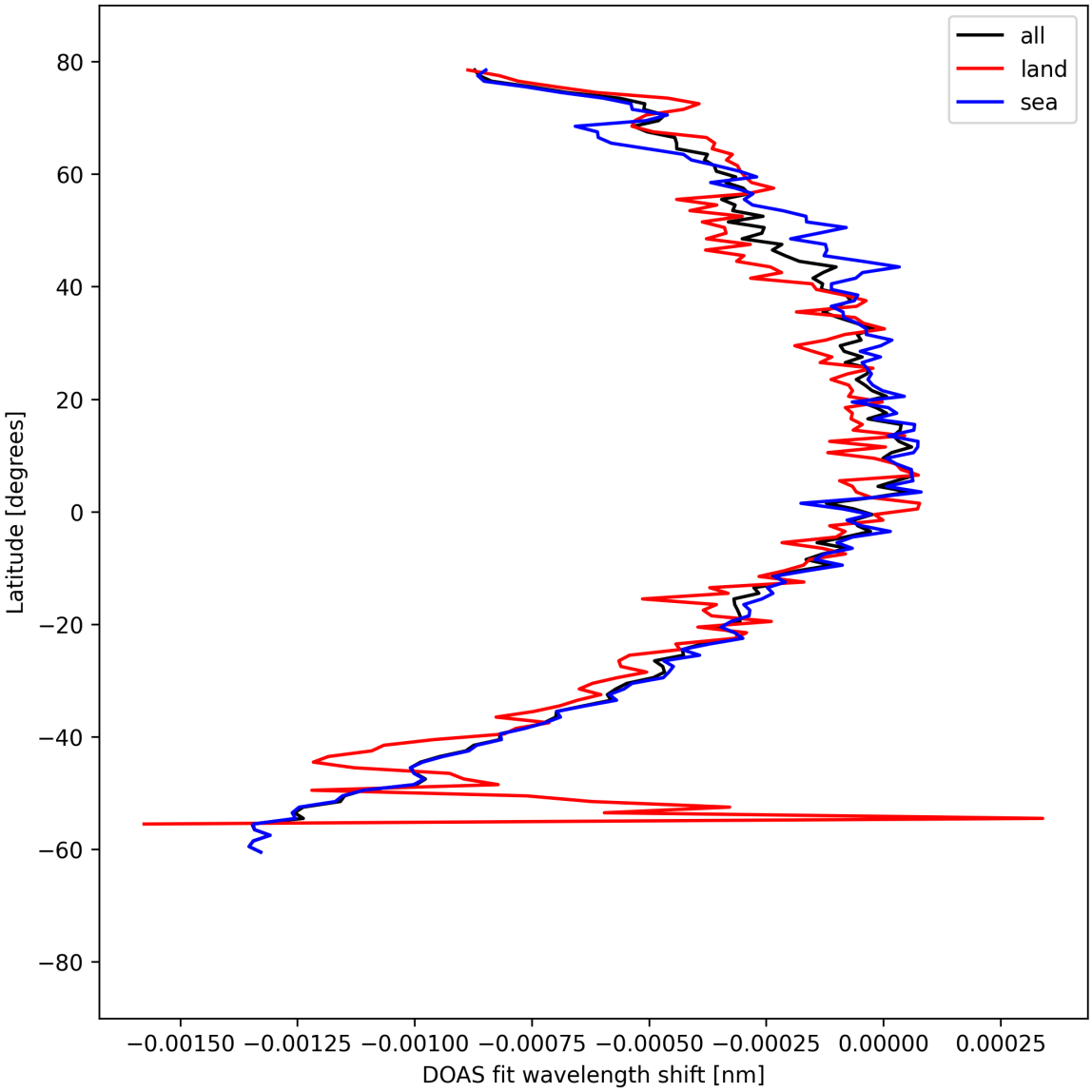


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-04-11 to 2025-04-11.

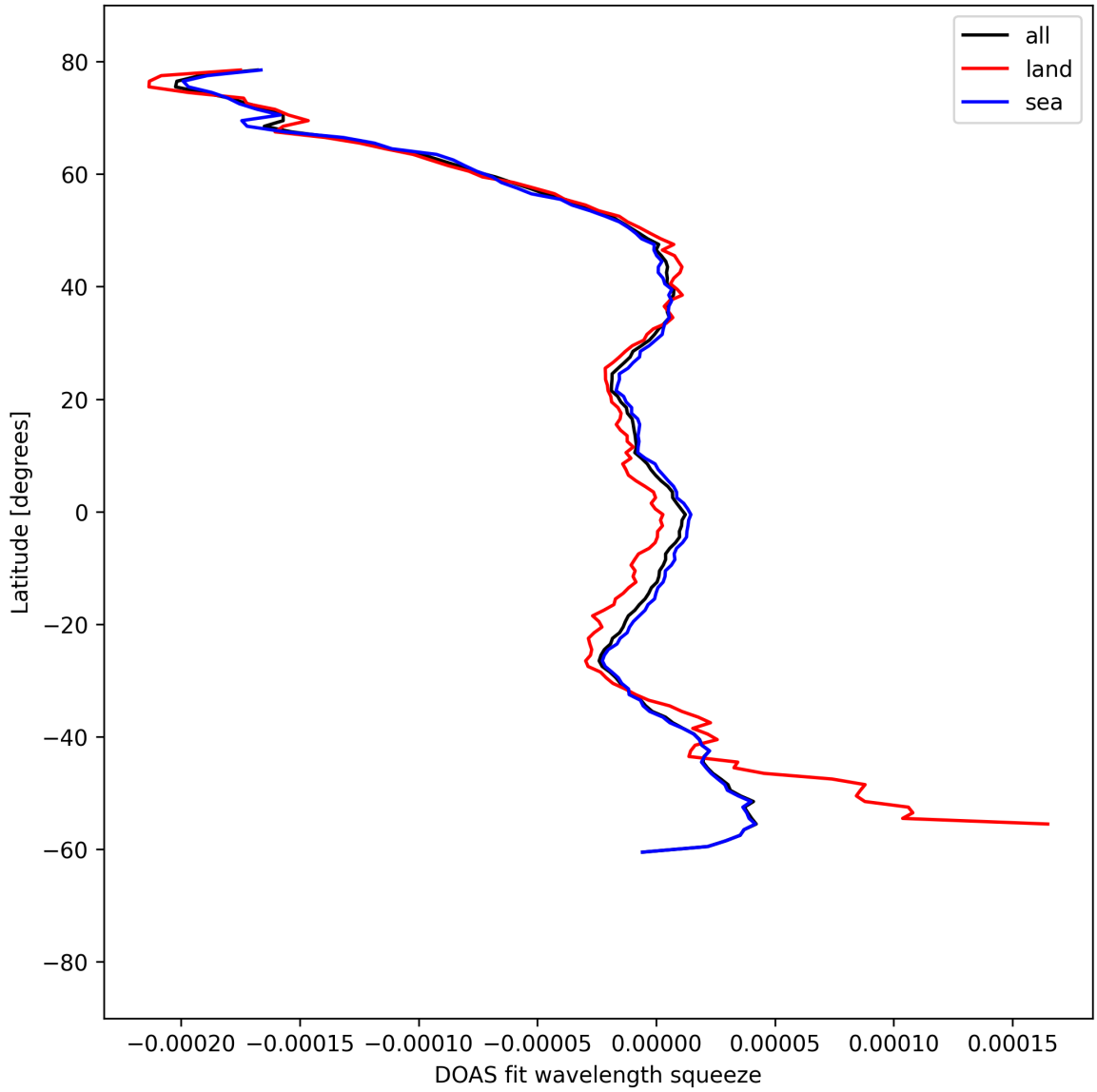


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-04-11 to 2025-04-11.

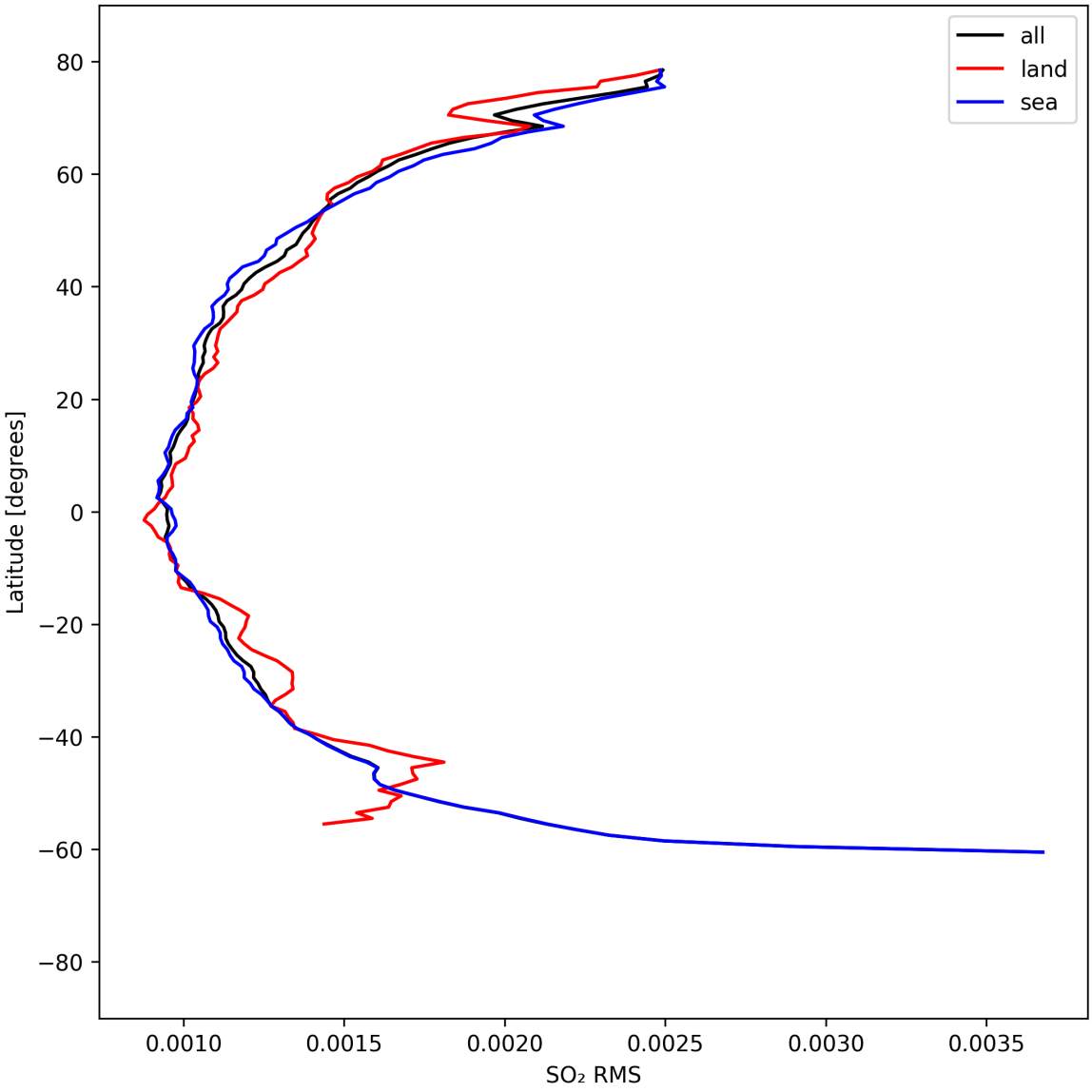


Figure 52: Zonal average of "SO_2 RMS" for 2025-04-11 to 2025-04-11.

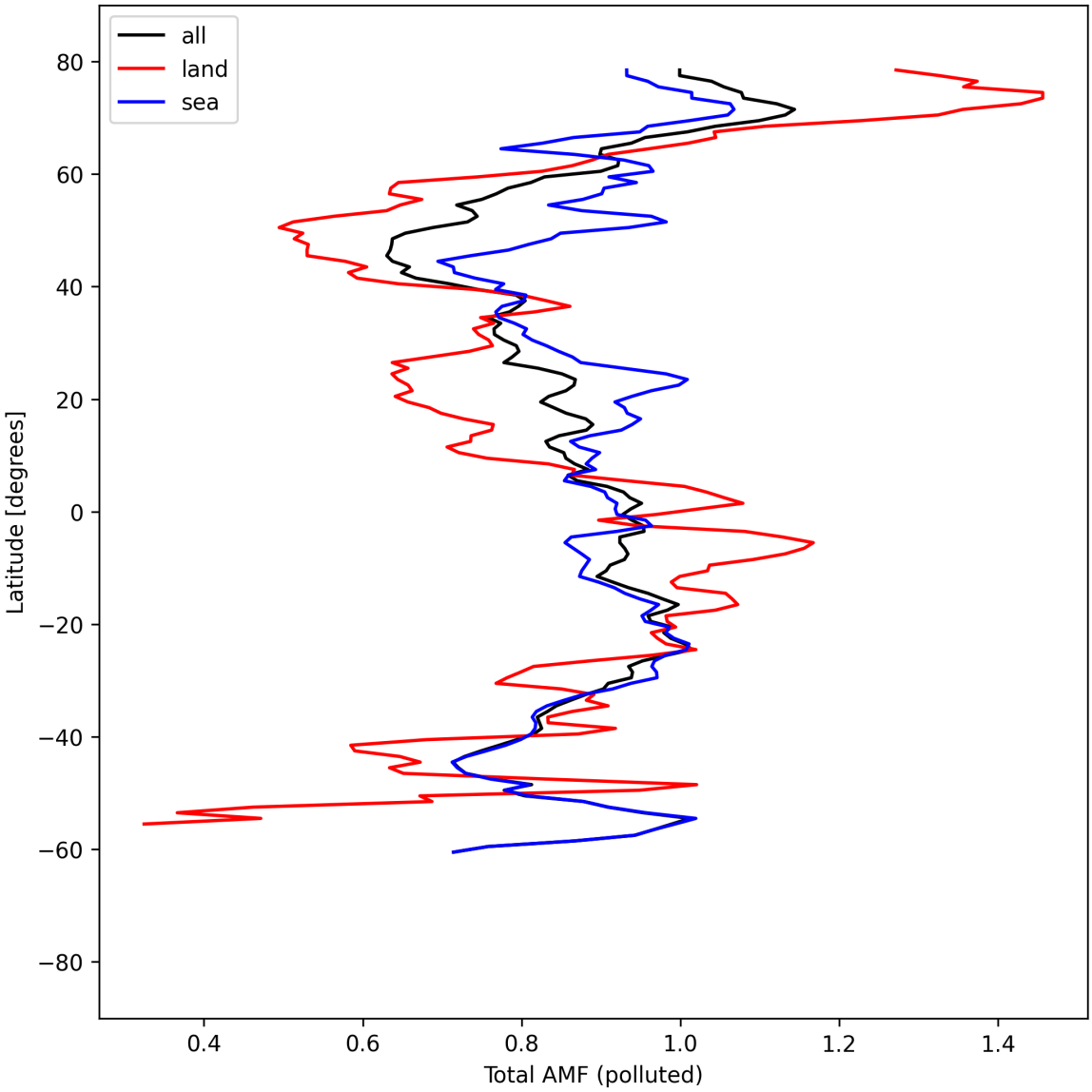


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-04-11 to 2025-04-11.

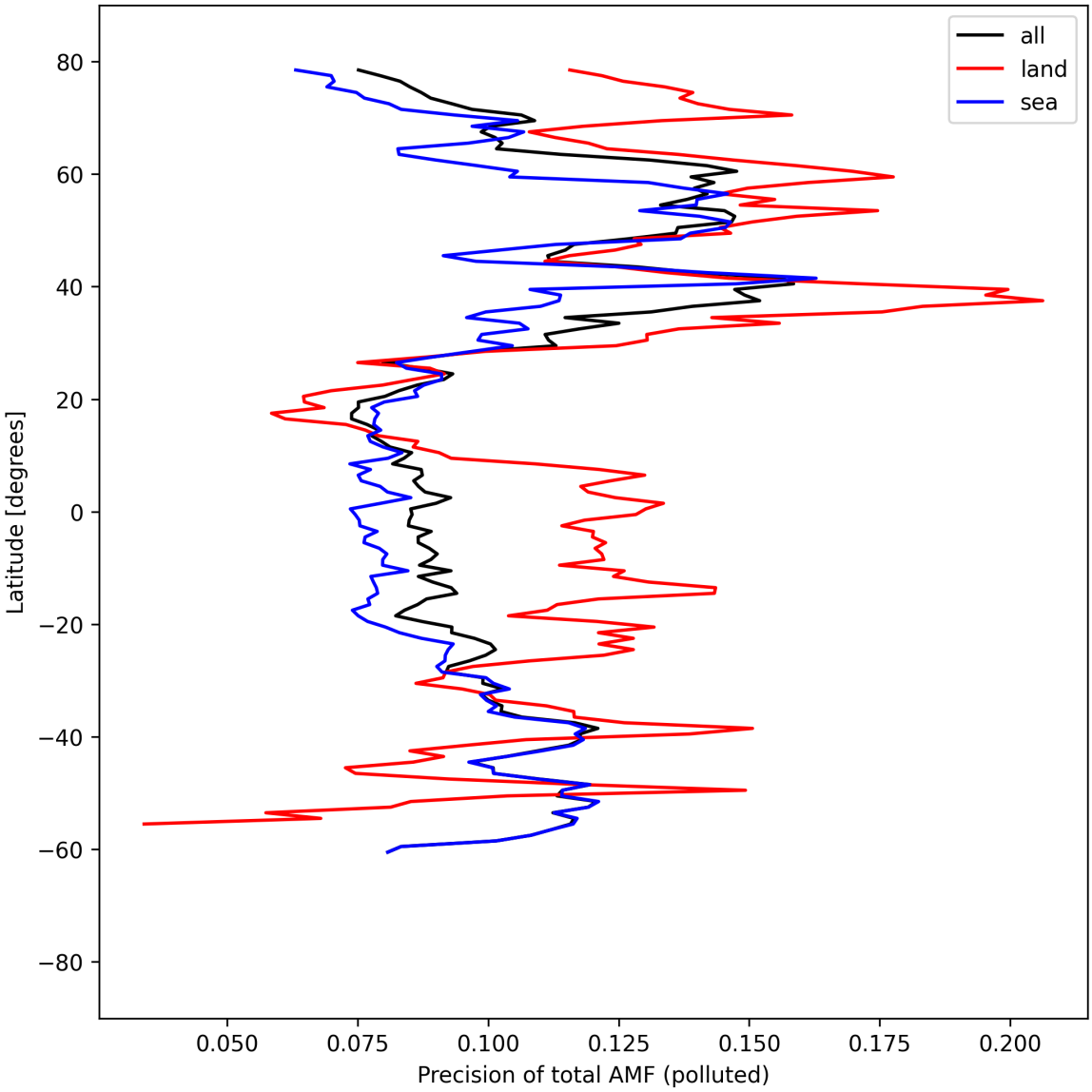


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-04-11 to 2025-04-11.

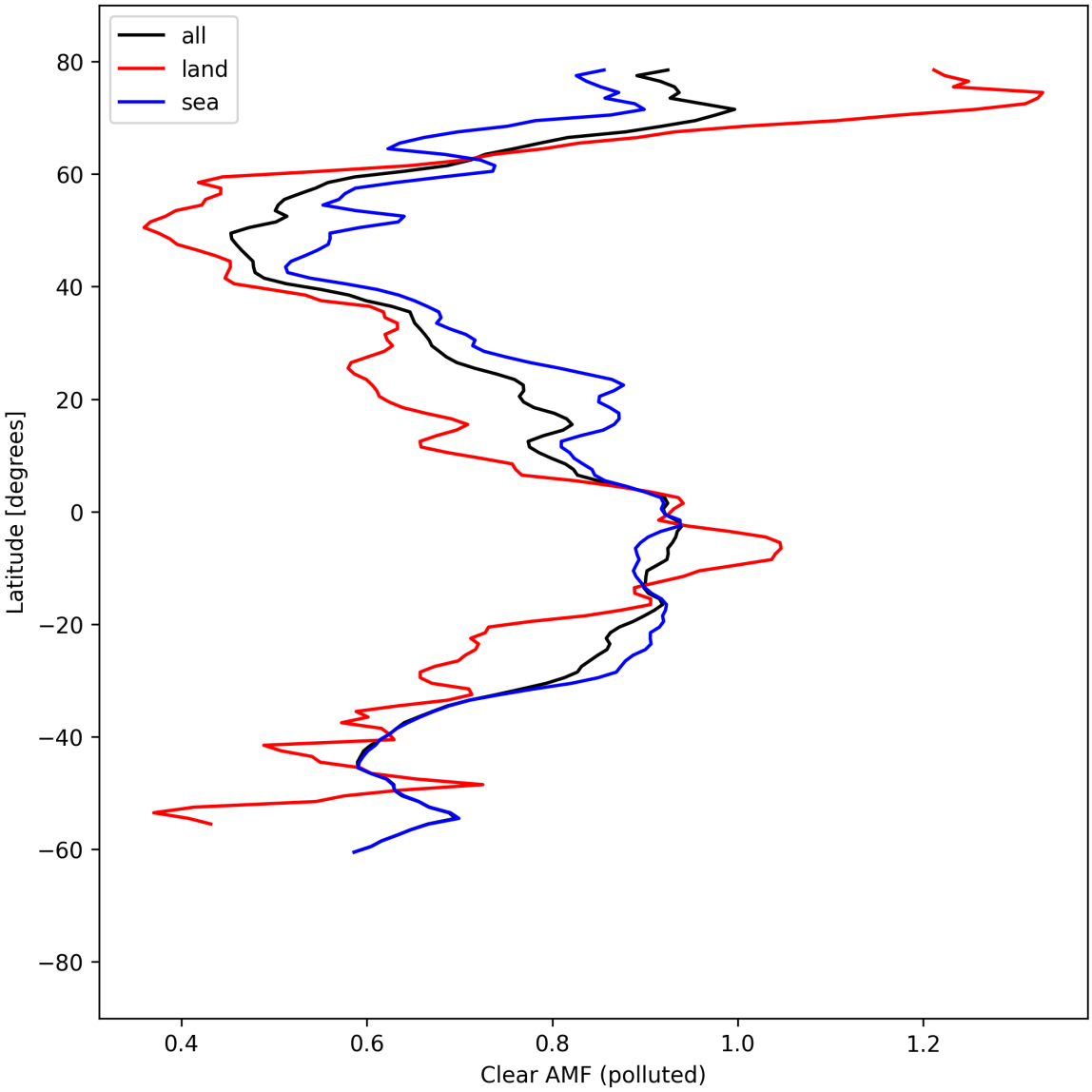


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-04-11 to 2025-04-11.

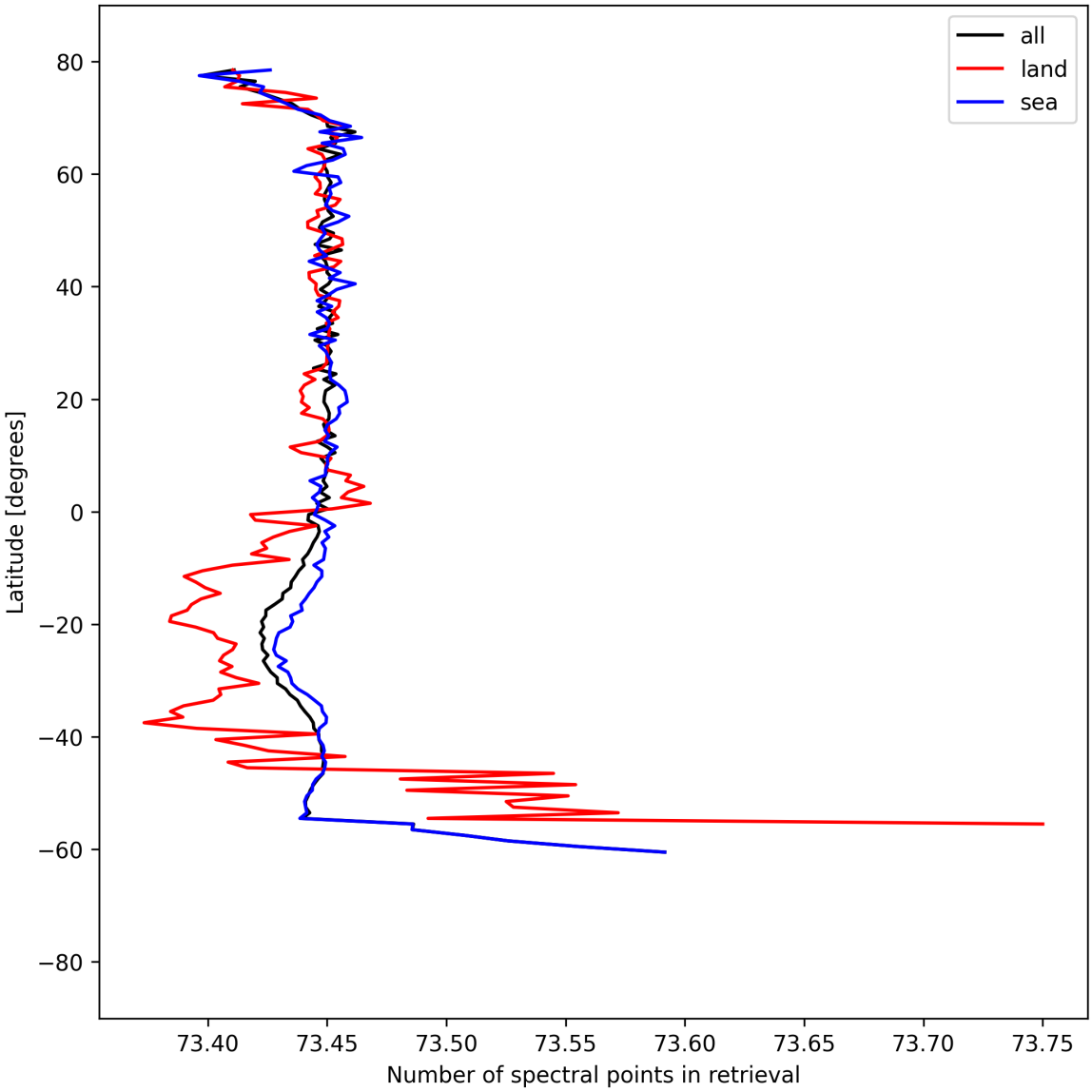


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-04-11 to 2025-04-11.

8 Histograms

The definitions of the parameters given in this section can be found in section 2.

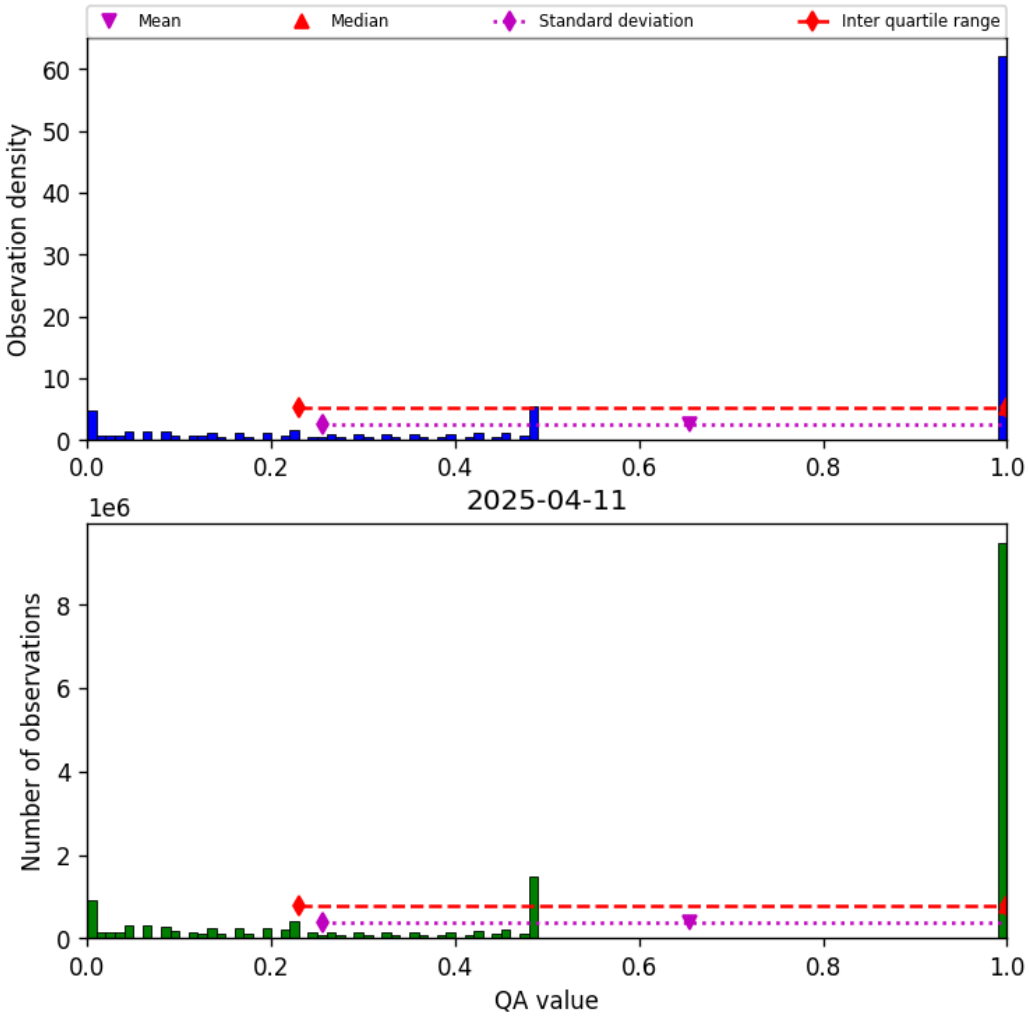


Figure 57: Histogram of “QA value” for 2025-04-11 to 2025-04-11

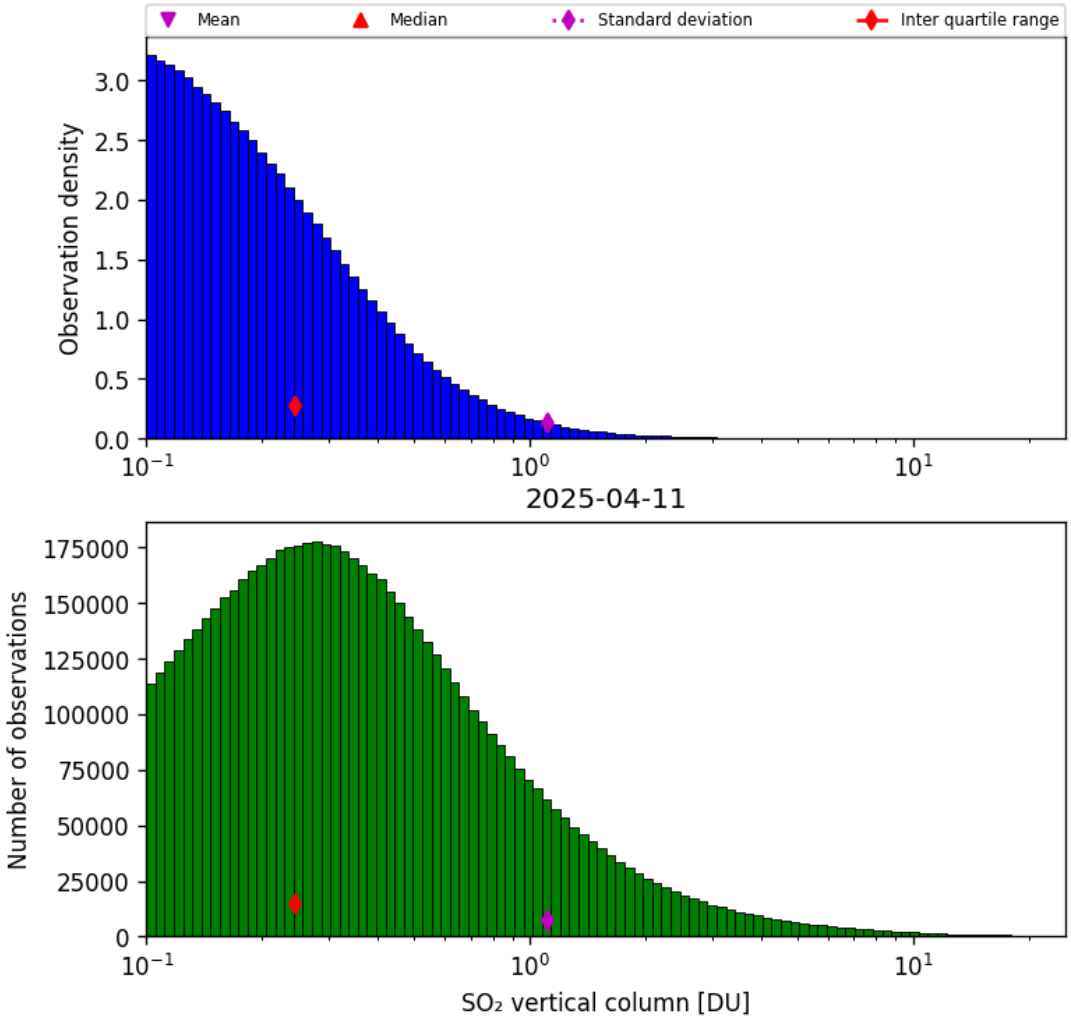


Figure 58: Histogram of "SO_2 vertical column" for 2025-04-11 to 2025-04-11

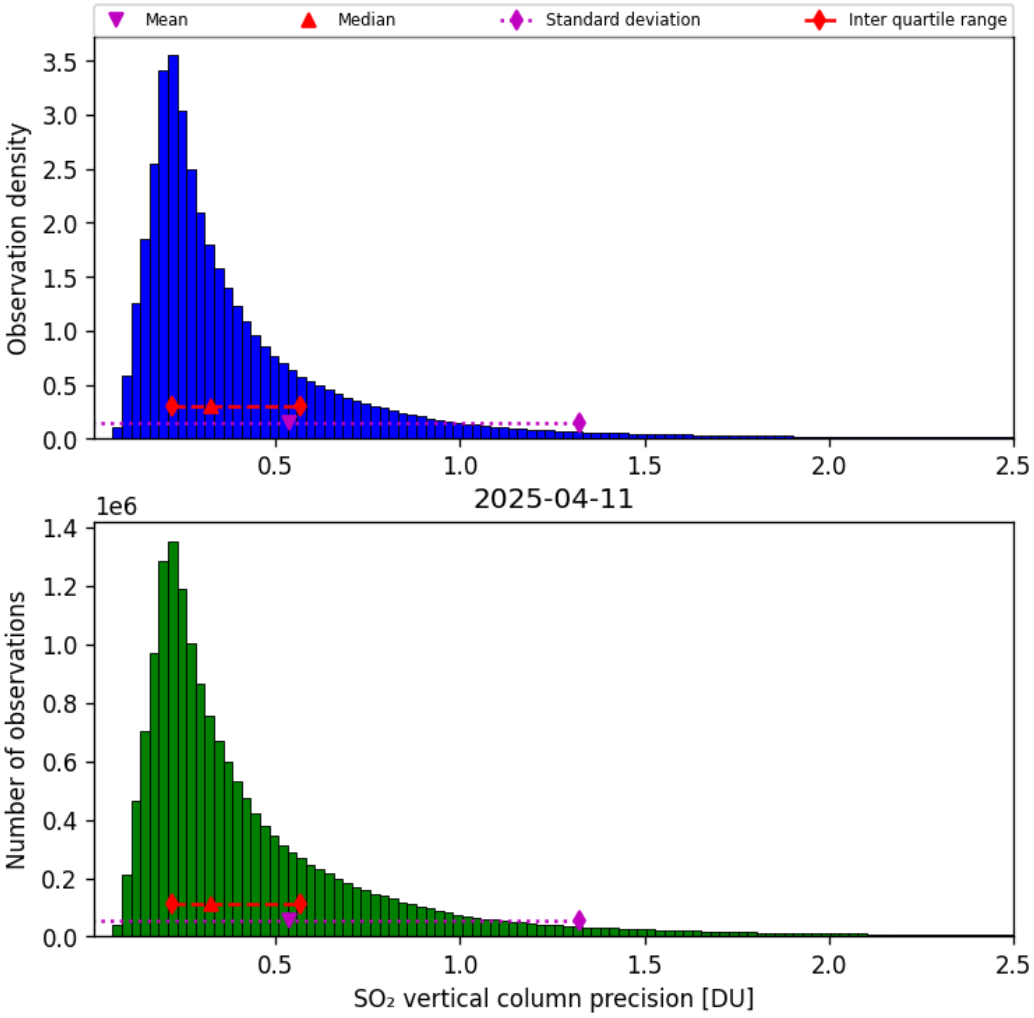


Figure 59: Histogram of "SO_2 vertical column precision" for 2025-04-11 to 2025-04-11

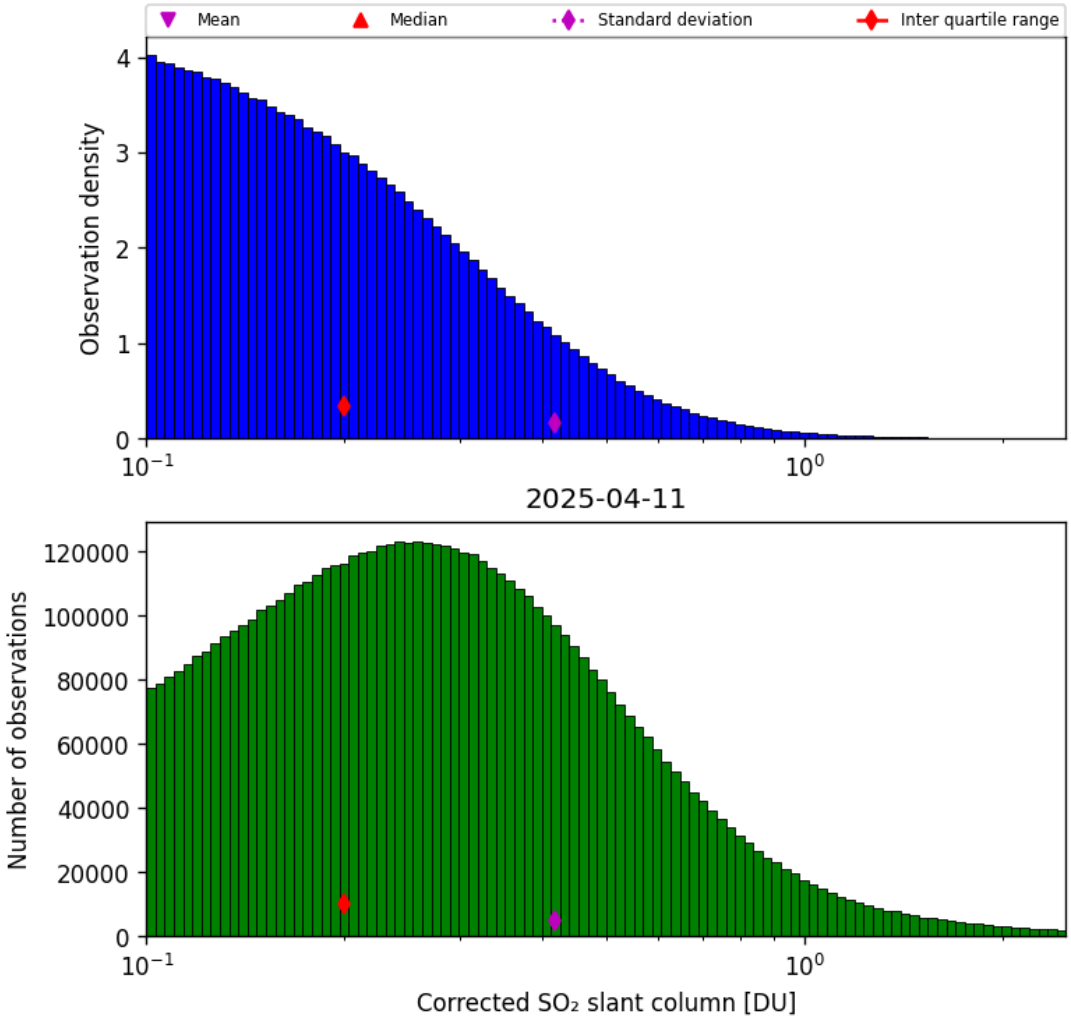


Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-04-11 to 2025-04-11

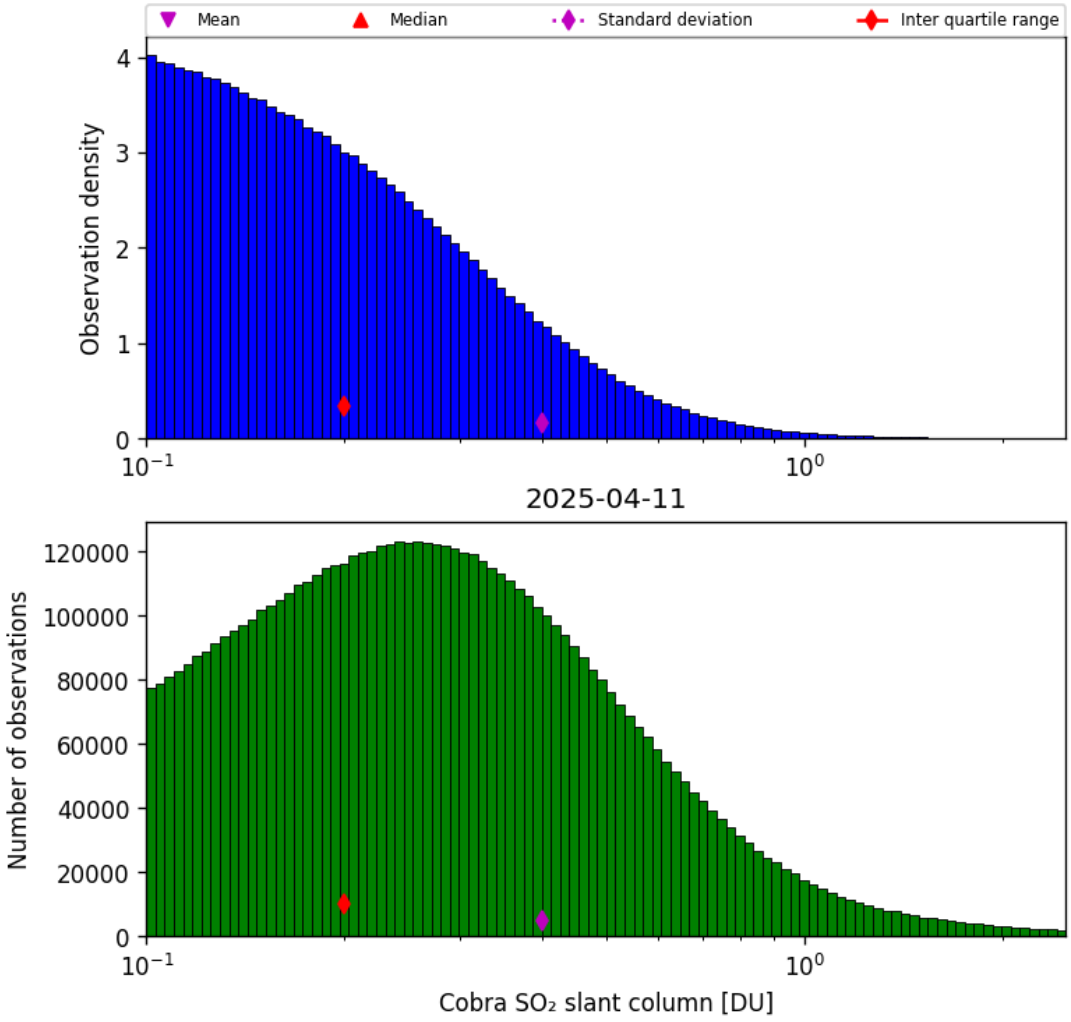


Figure 61: Histogram of “Cobra SO_2 slant column” for 2025-04-11 to 2025-04-11

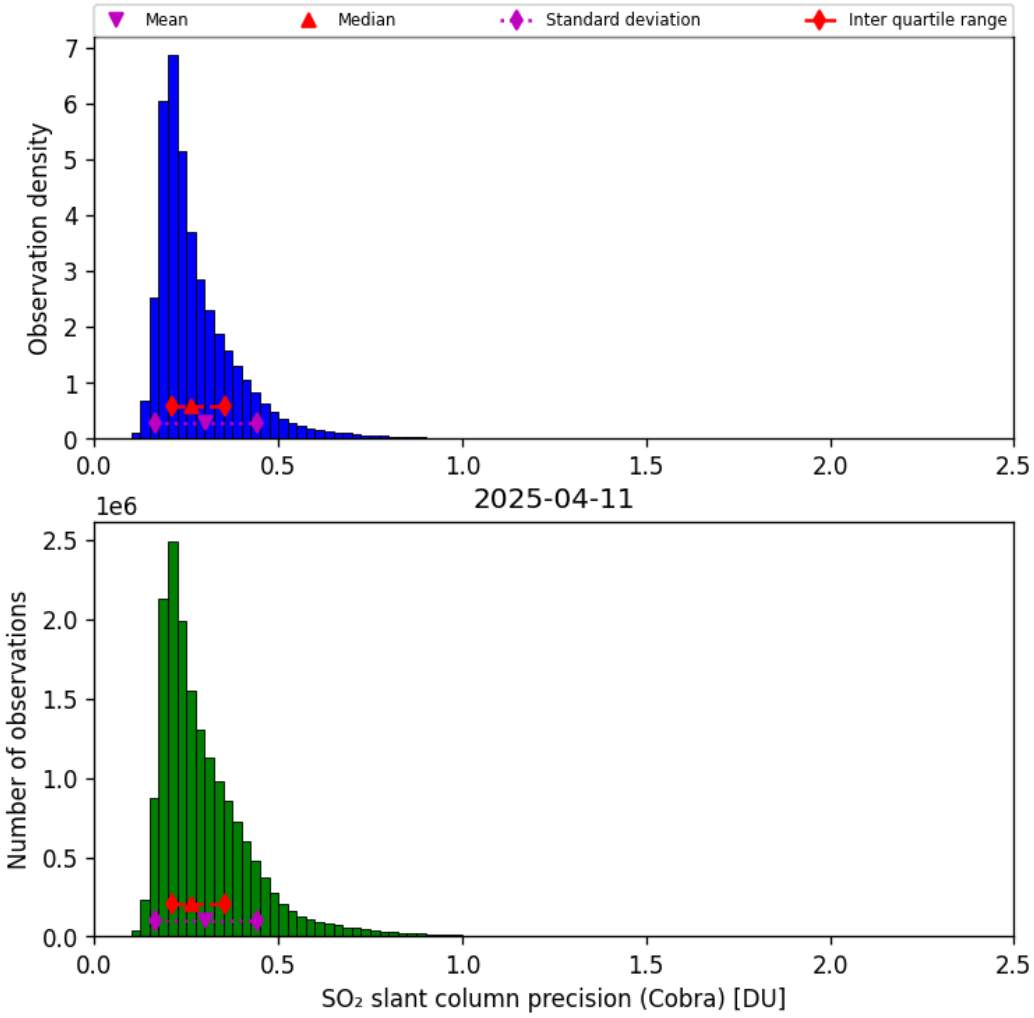


Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-04-11 to 2025-04-11

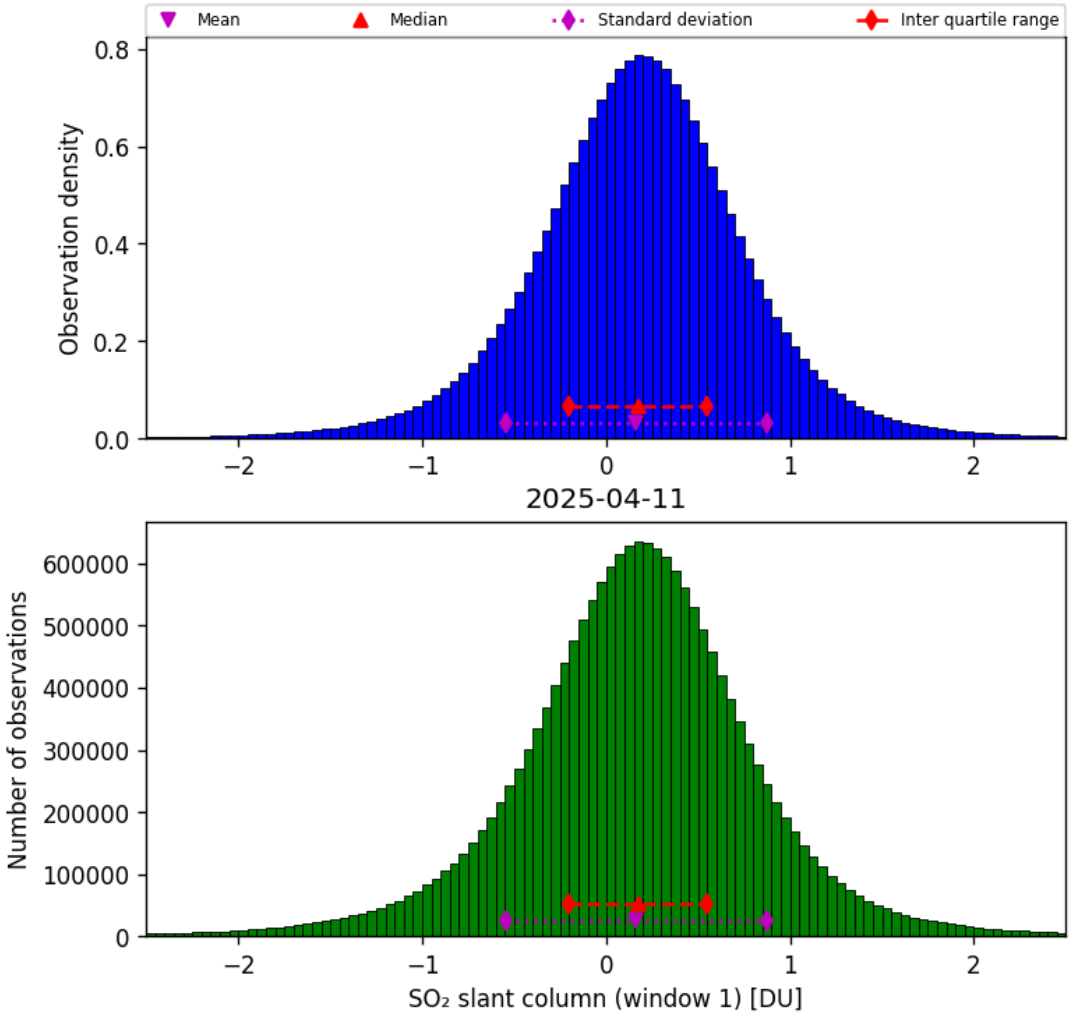


Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-04-11 to 2025-04-11

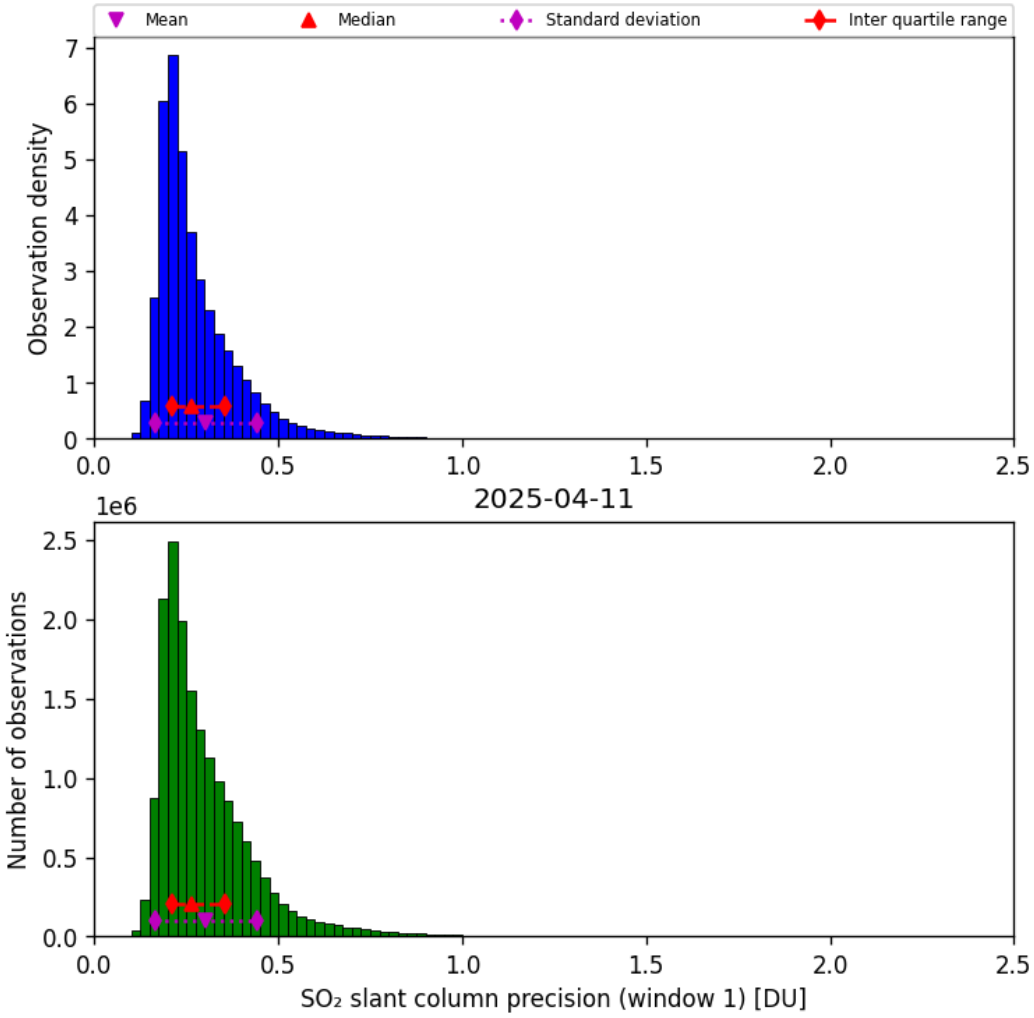


Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-04-11 to 2025-04-11

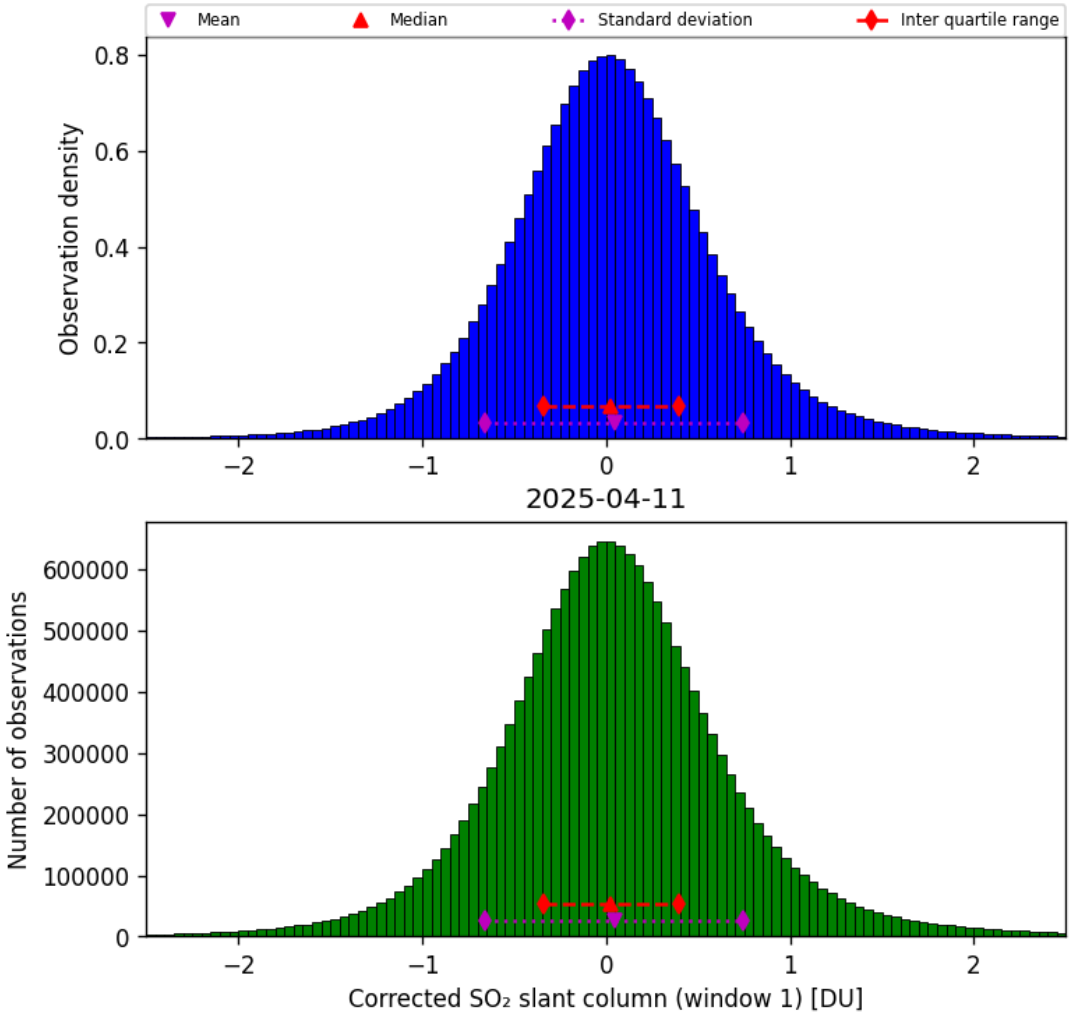


Figure 65: Histogram of “Corrected SO_2 slant column (window 1)” for 2025-04-11 to 2025-04-11

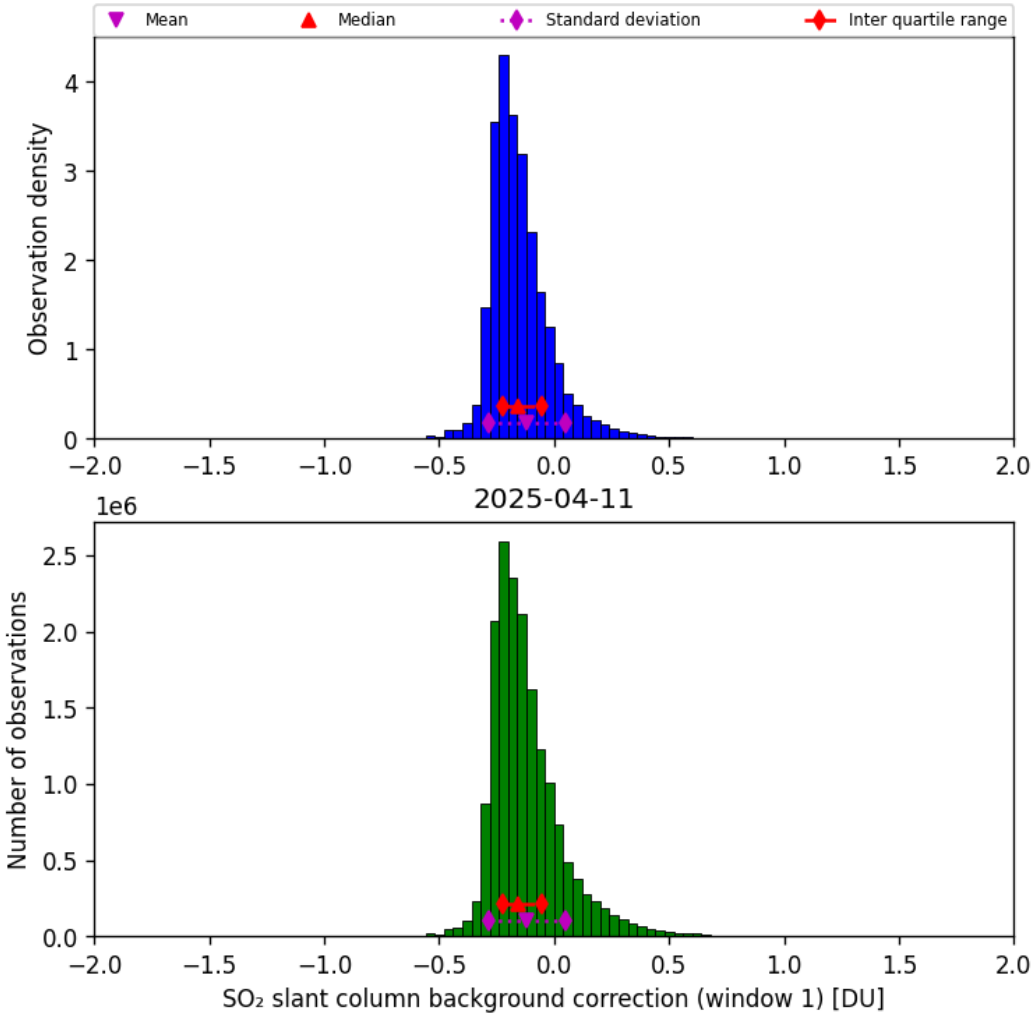


Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-04-11 to 2025-04-11

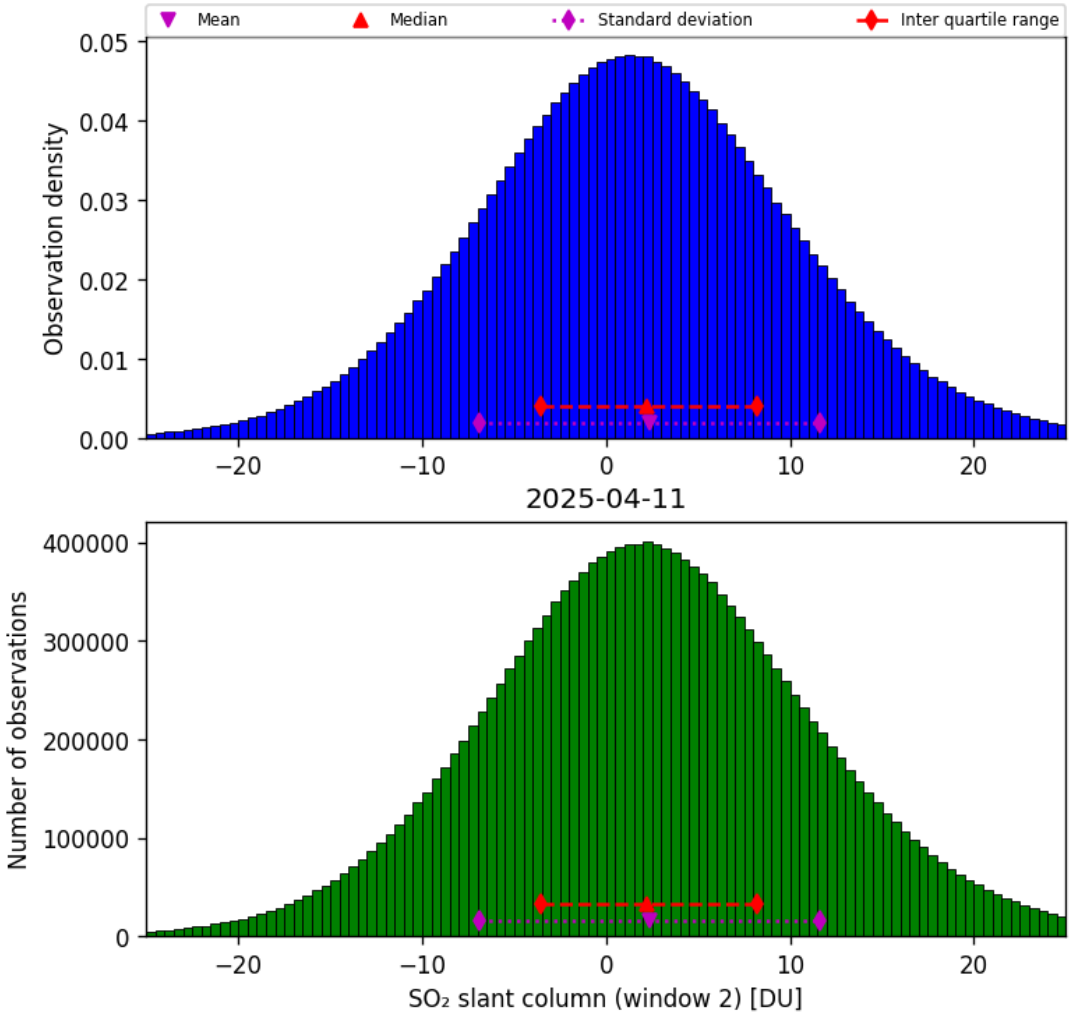


Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-04-11 to 2025-04-11

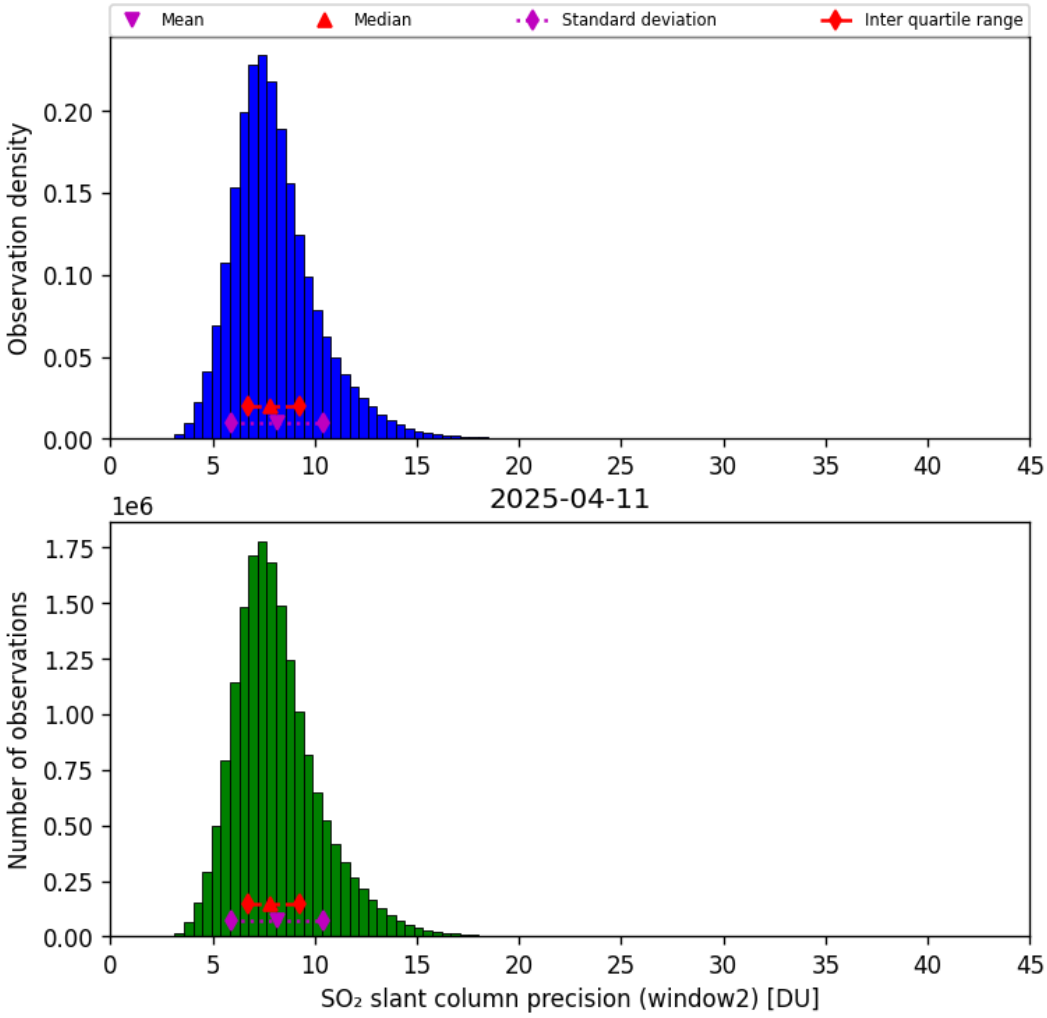


Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-04-11 to 2025-04-11

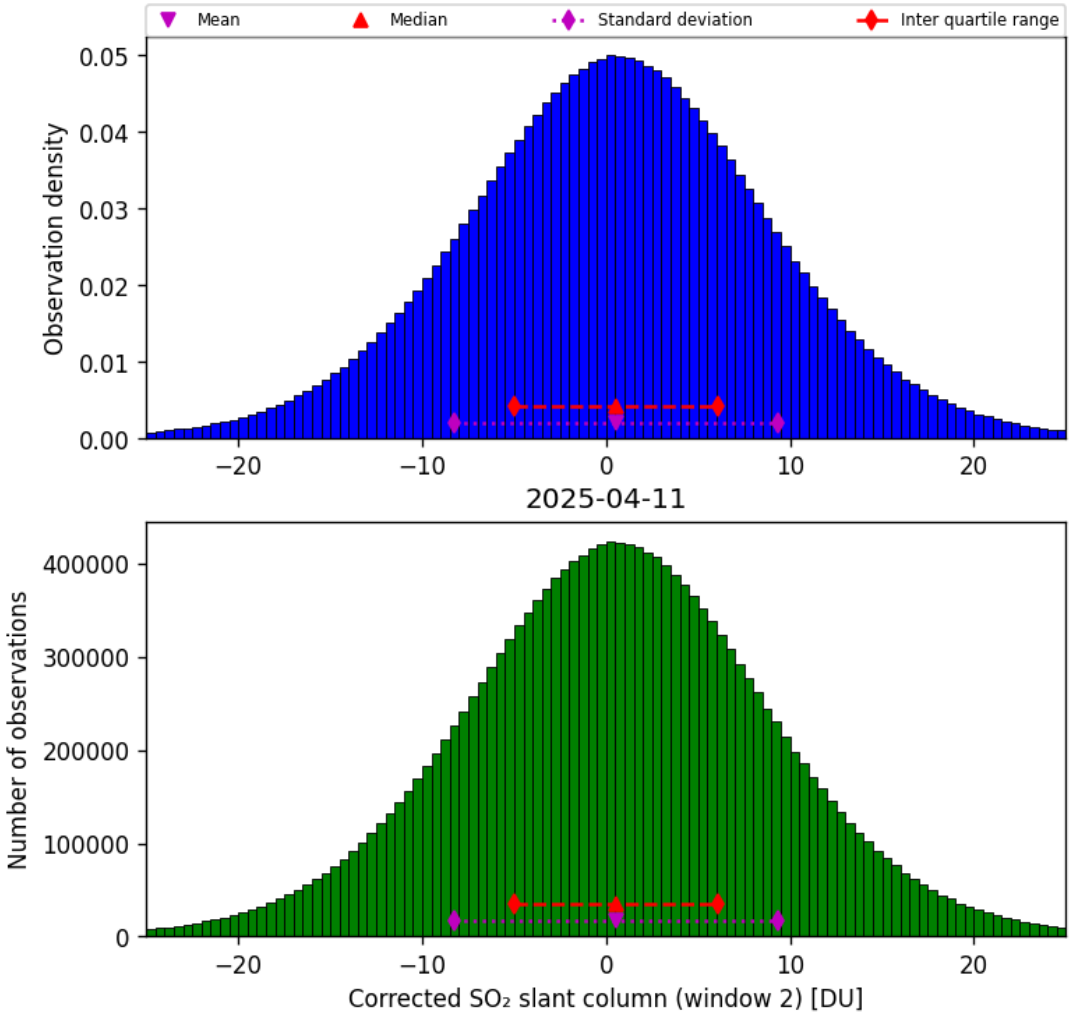


Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-04-11 to 2025-04-11

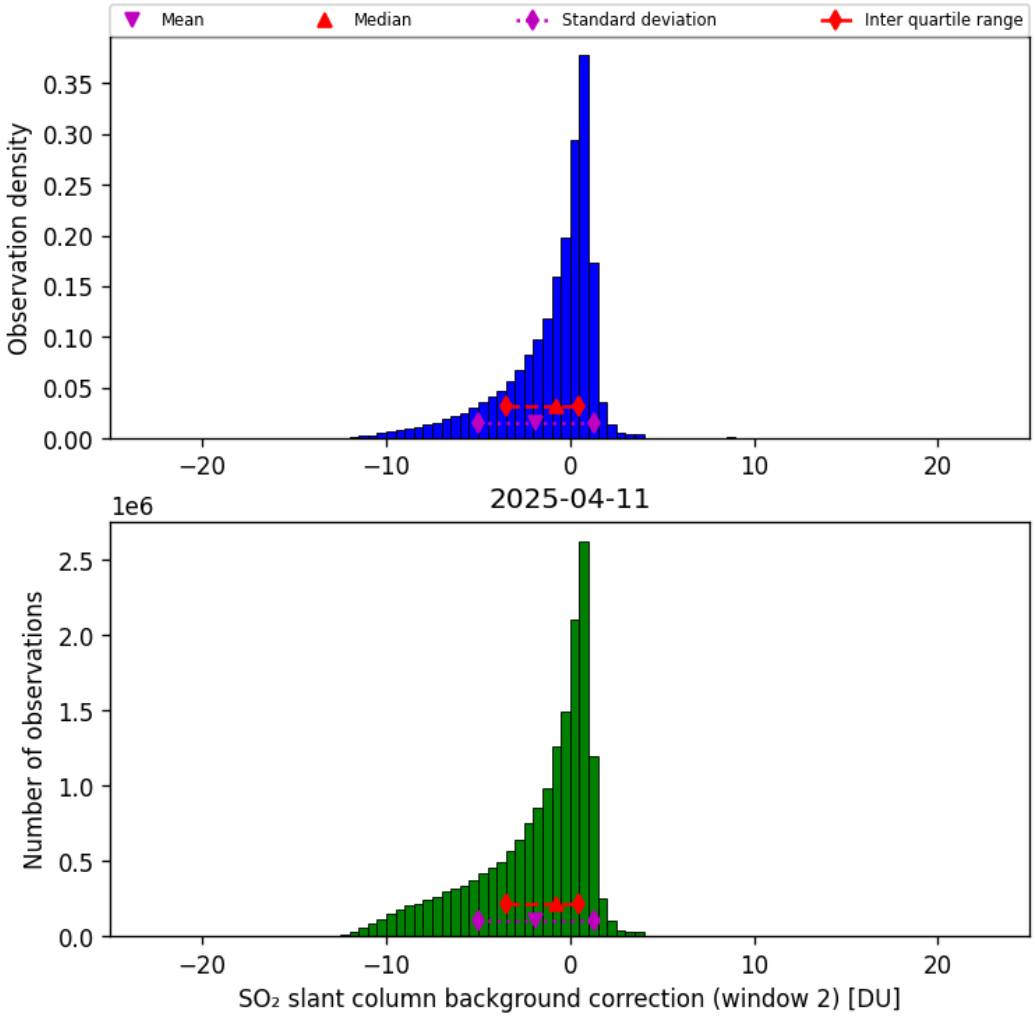


Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-04-11 to 2025-04-11

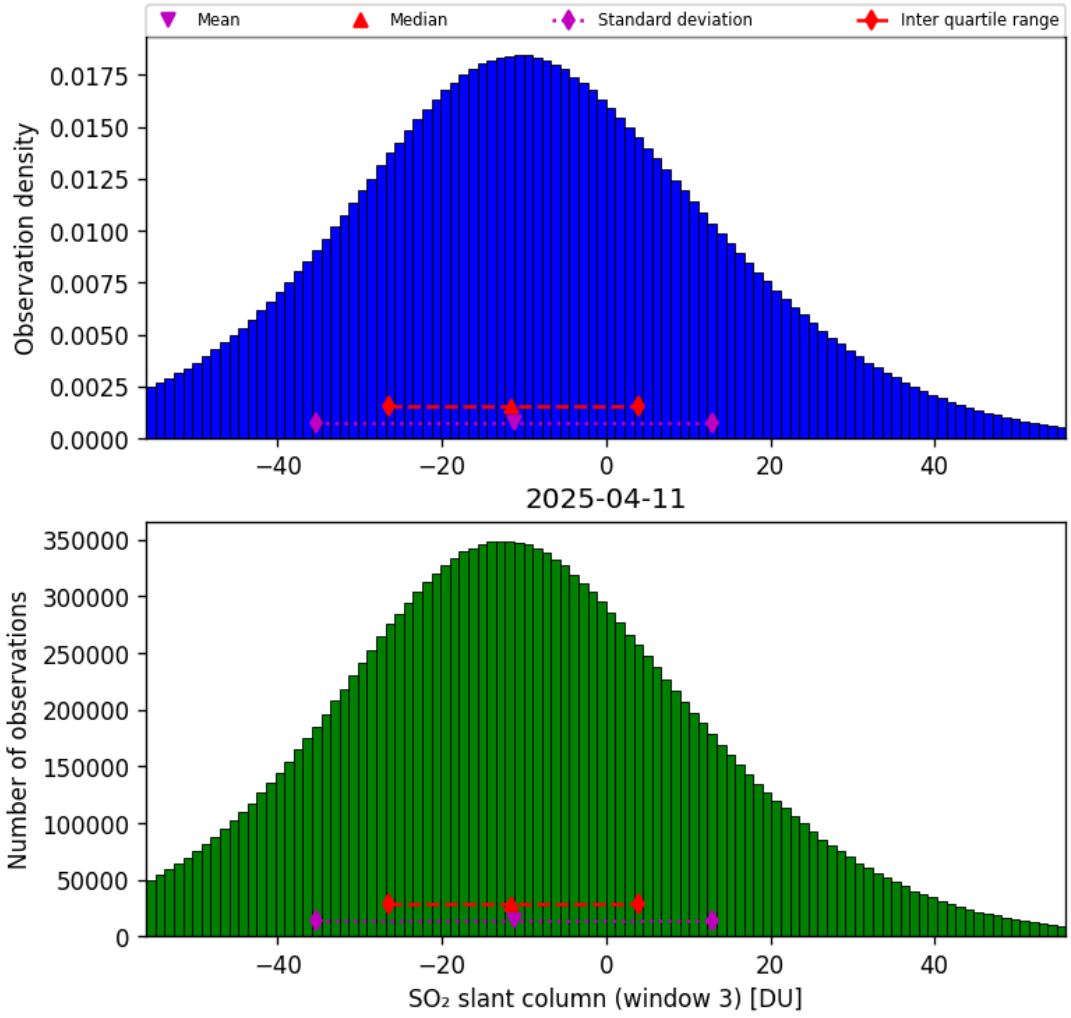


Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-04-11 to 2025-04-11

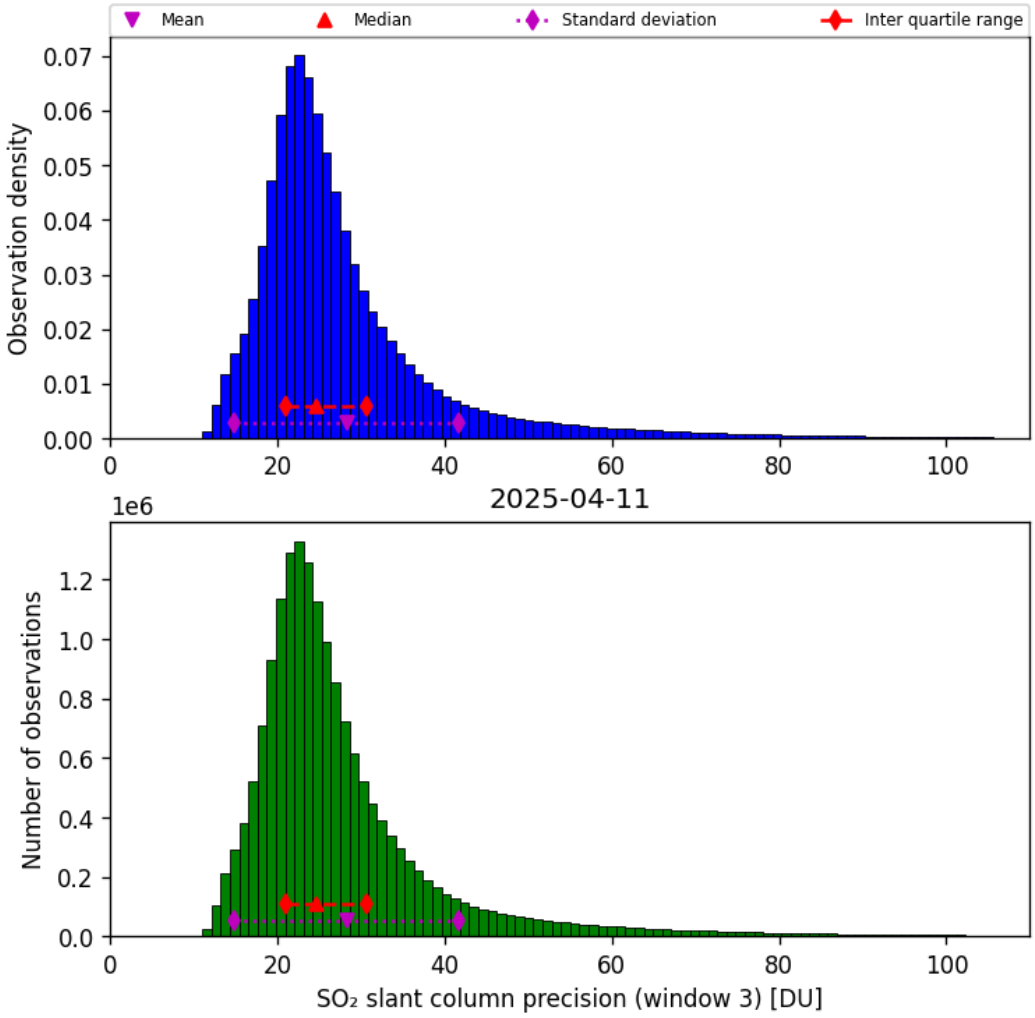


Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-04-11 to 2025-04-11

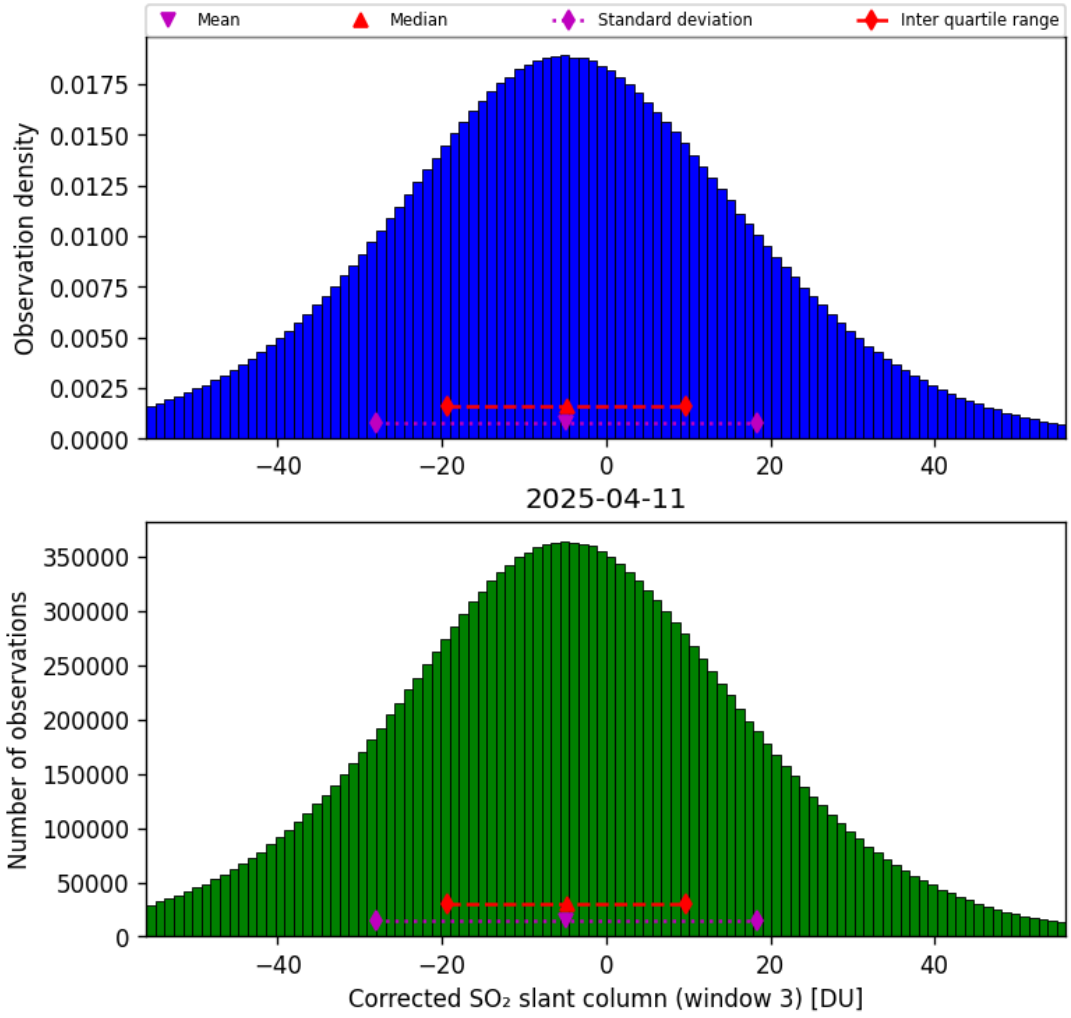


Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-04-11 to 2025-04-11

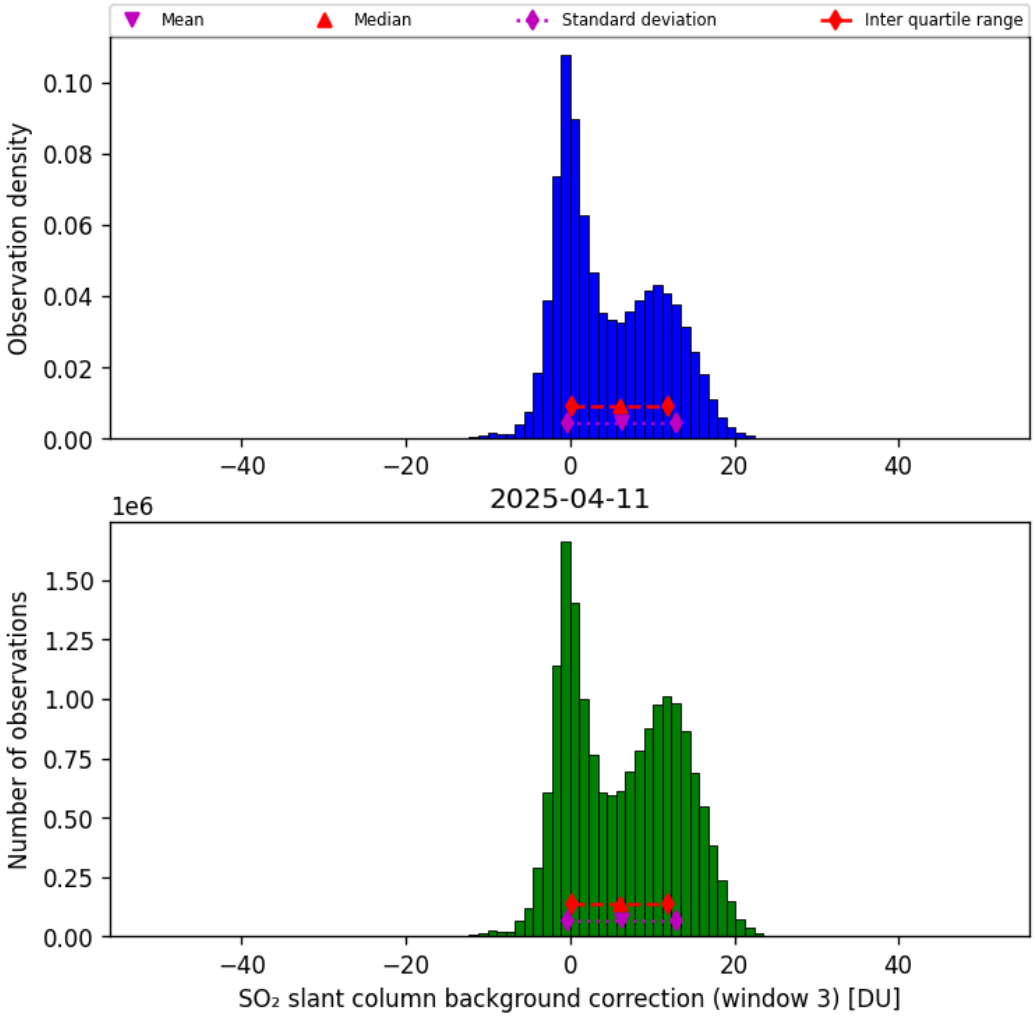


Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-04-11 to 2025-04-11

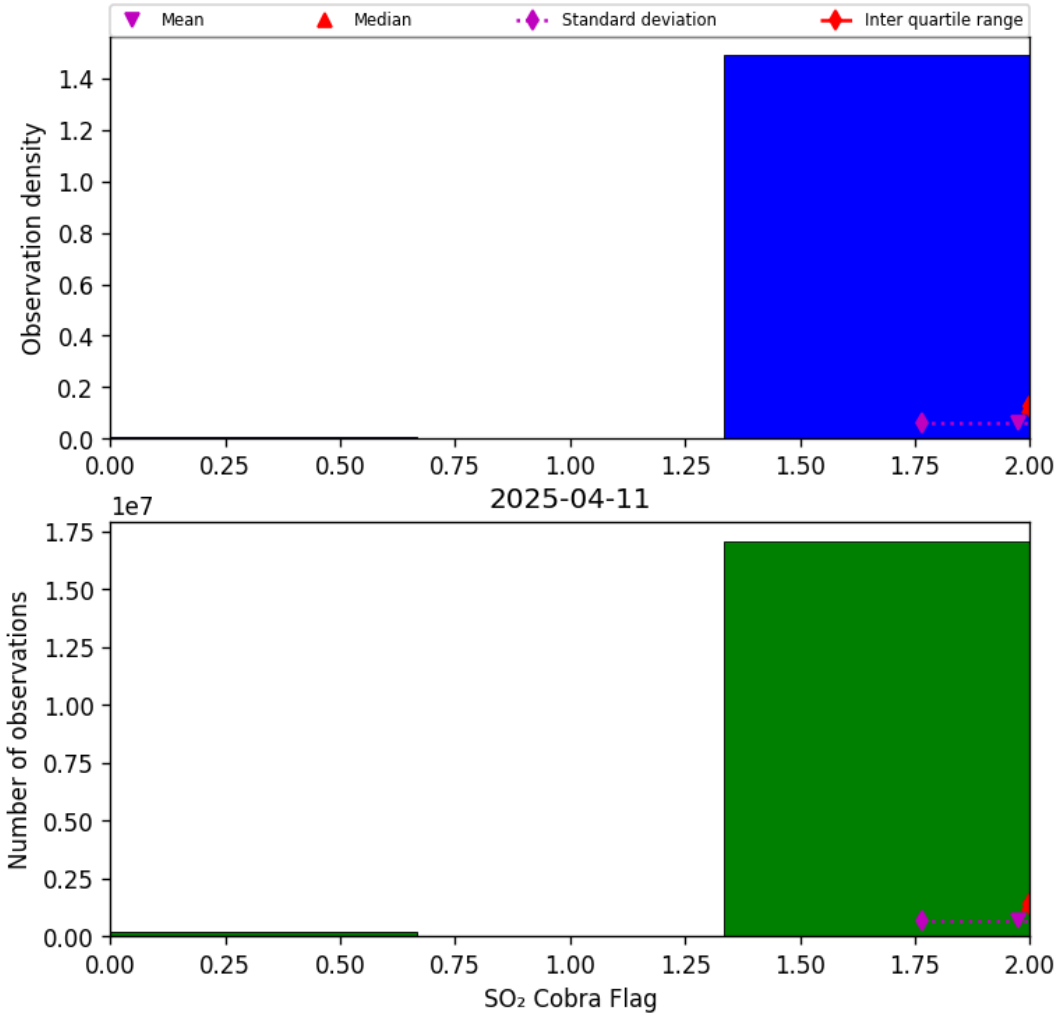


Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-04-11 to 2025-04-11

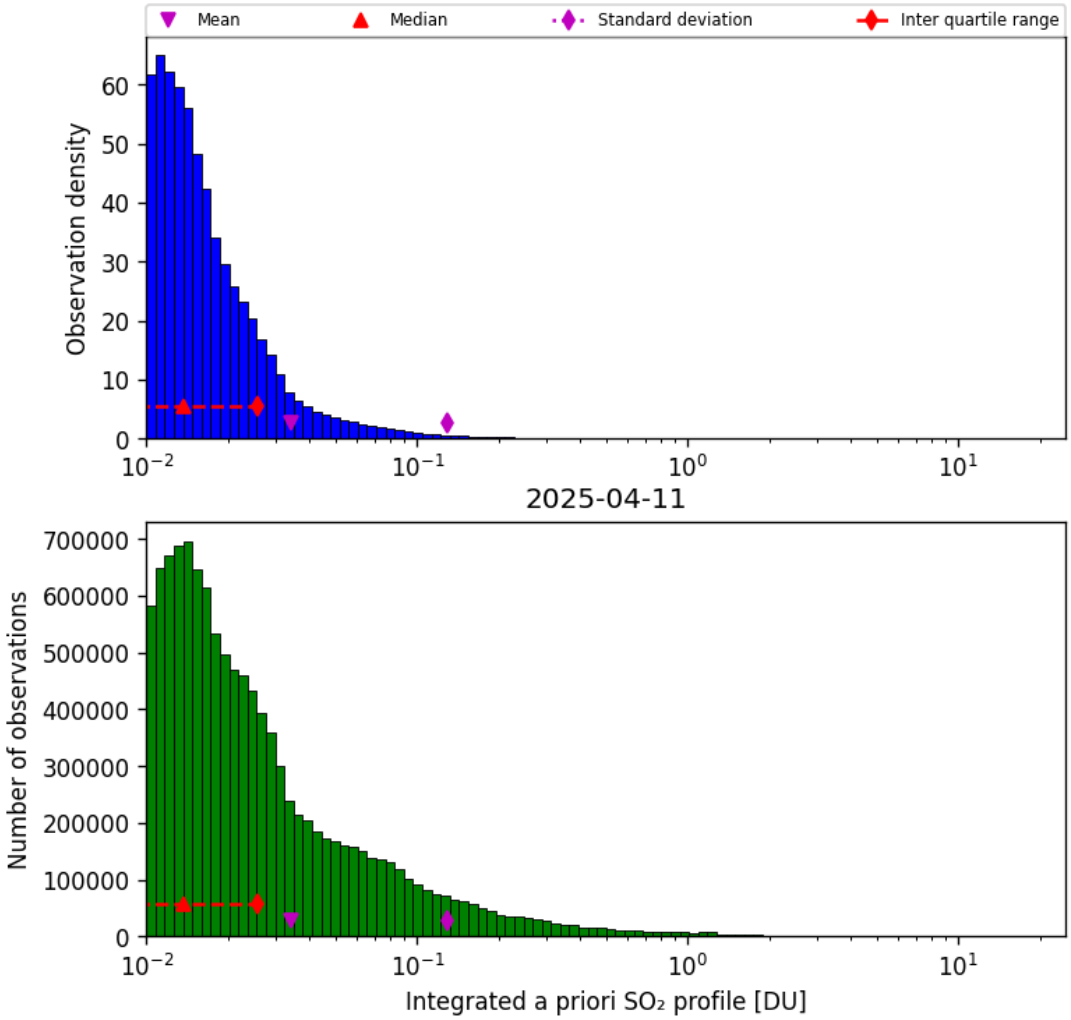


Figure 76: Histogram of “Integrated a priori SO_2 profile” for 2025-04-11 to 2025-04-11

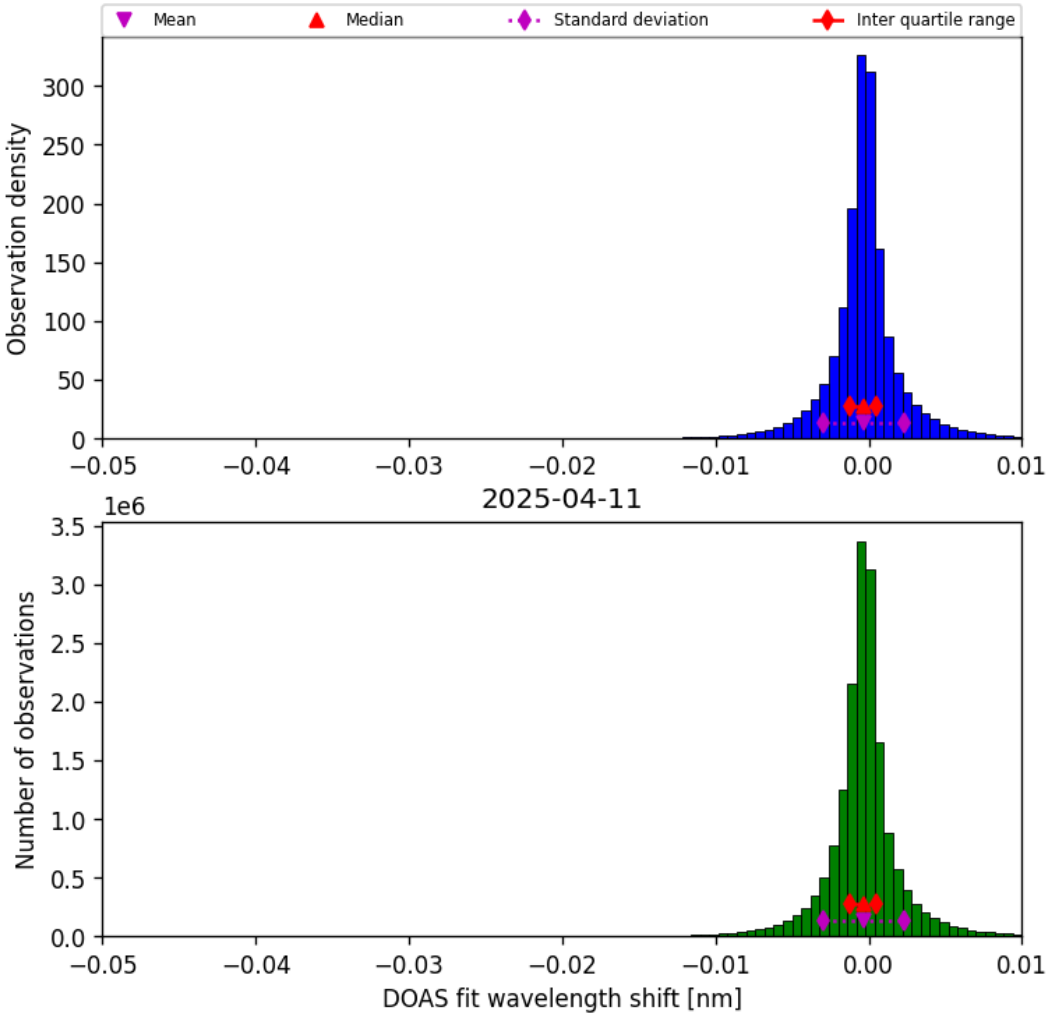


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-04-11 to 2025-04-11

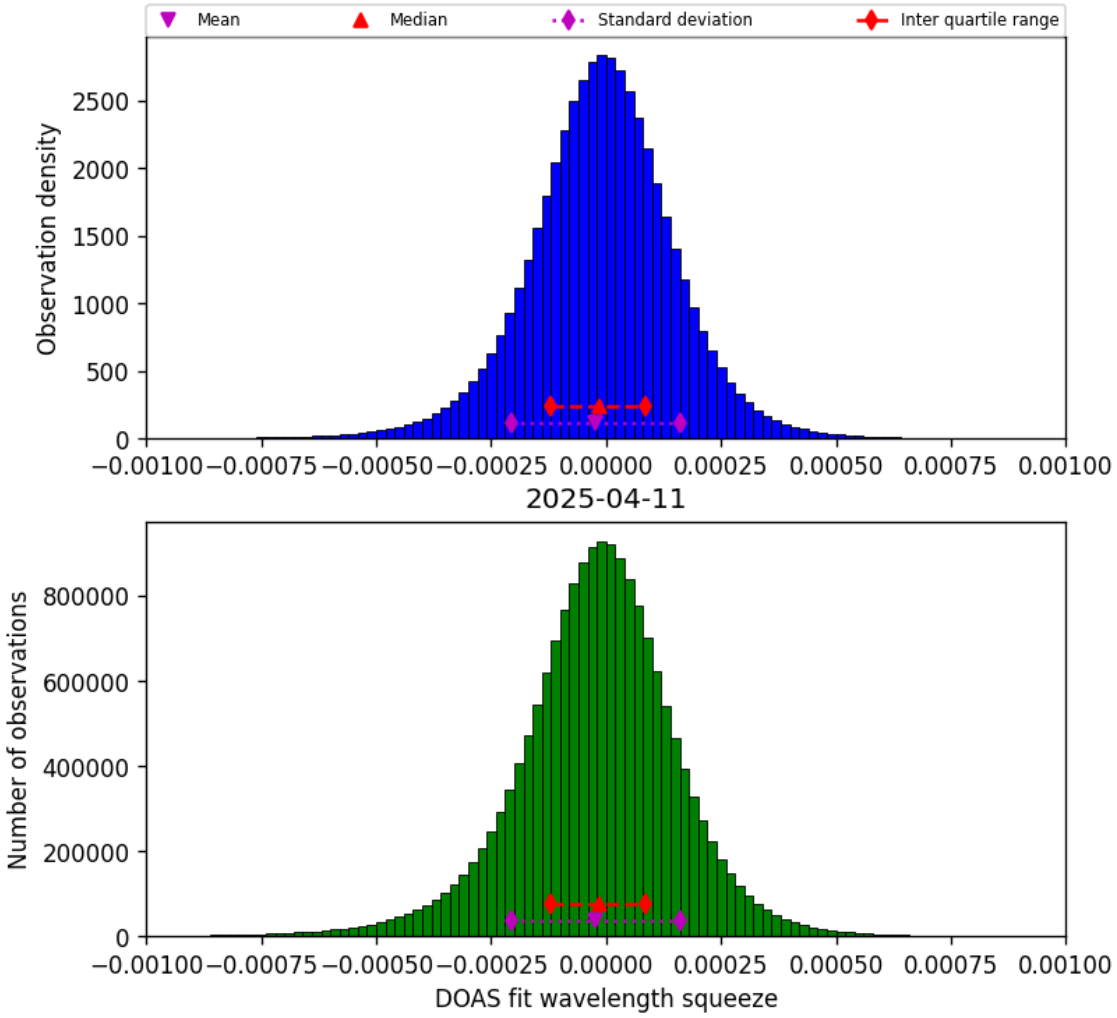


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-04-11 to 2025-04-11

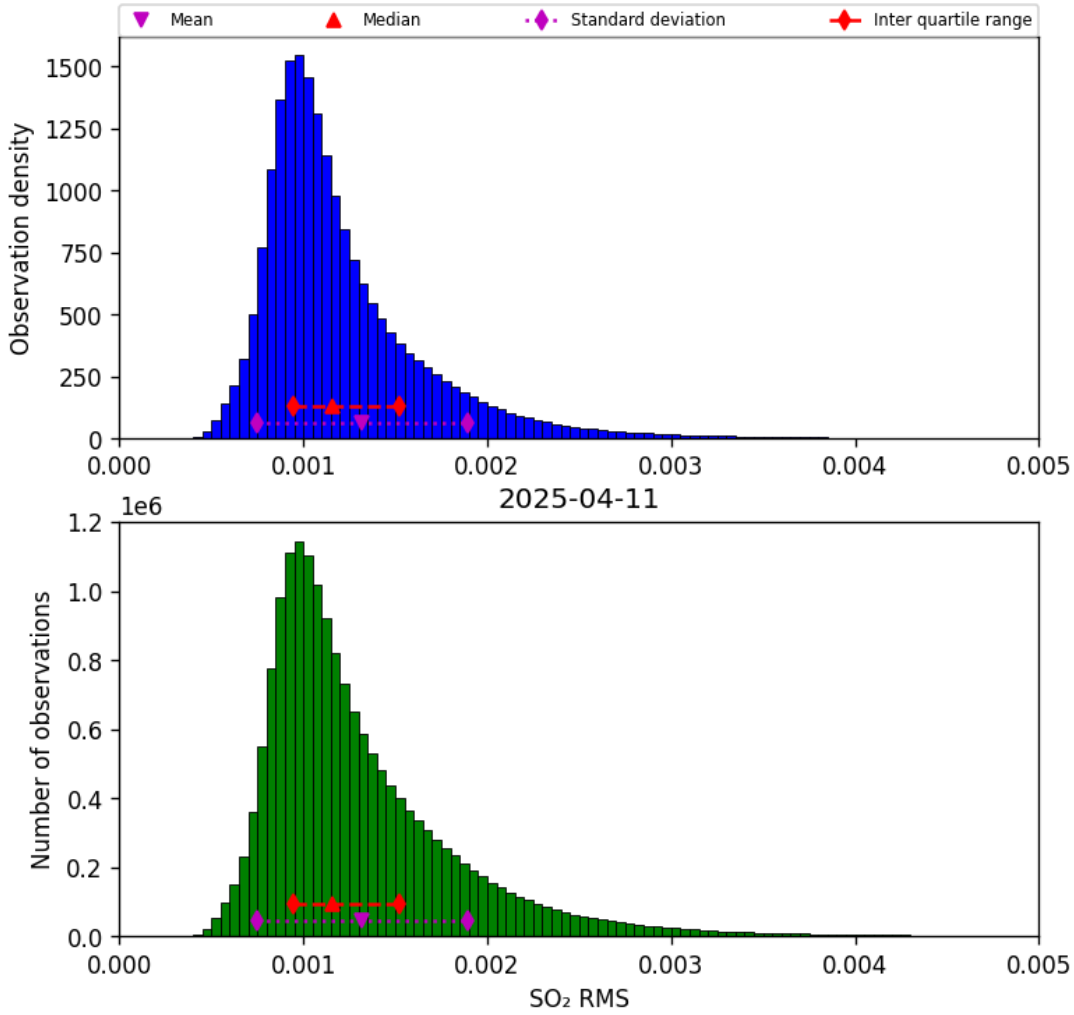


Figure 79: Histogram of "SO_2 RMS" for 2025-04-11 to 2025-04-11

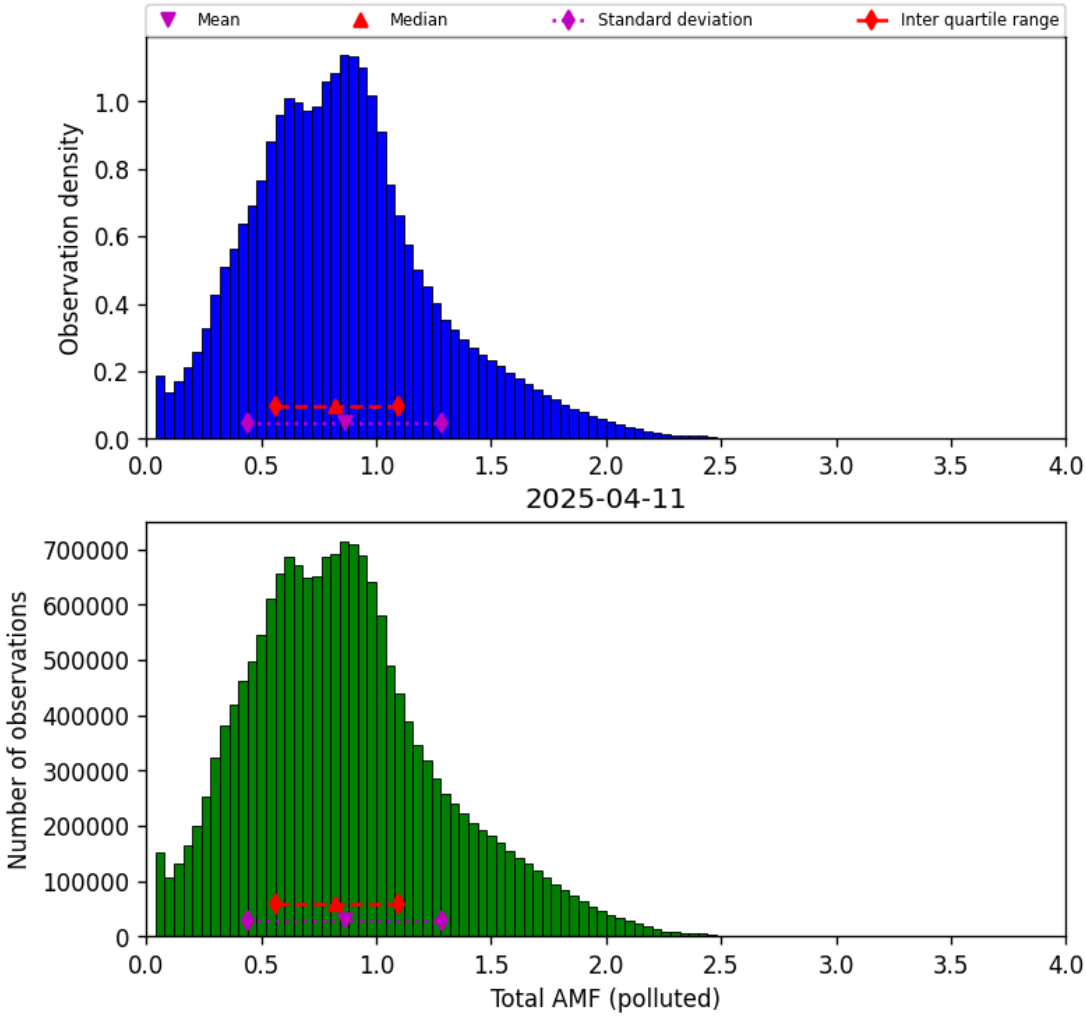


Figure 80: Histogram of “Total AMF (polluted)” for 2025-04-11 to 2025-04-11

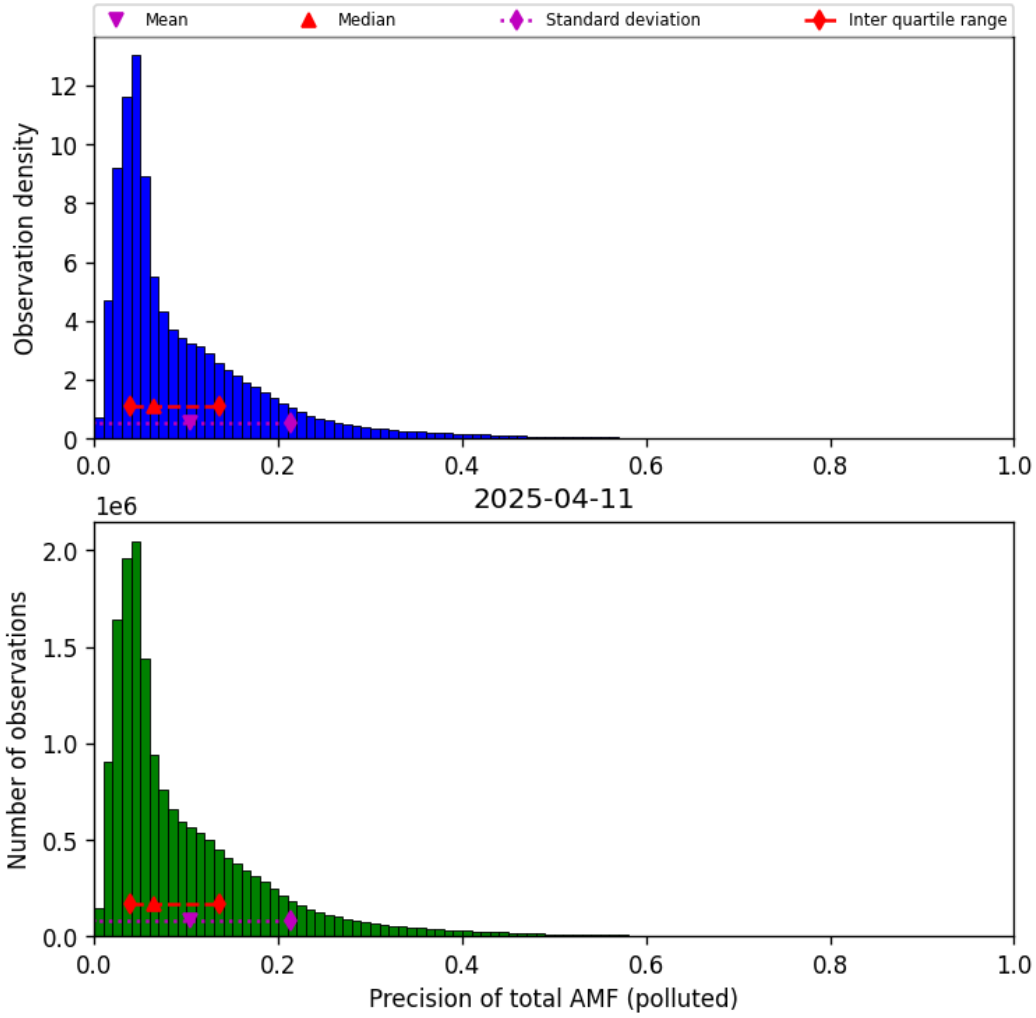


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-04-11 to 2025-04-11

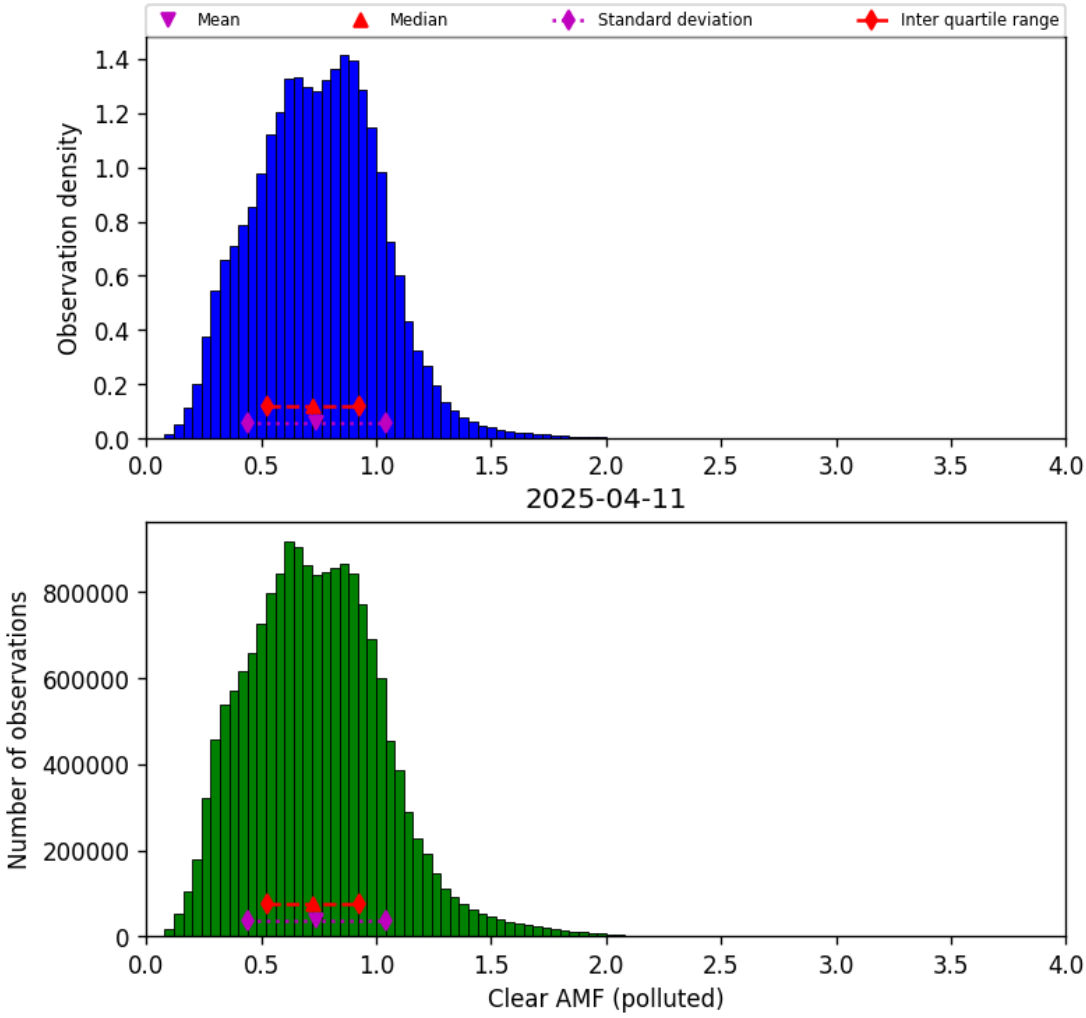


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-04-11 to 2025-04-11

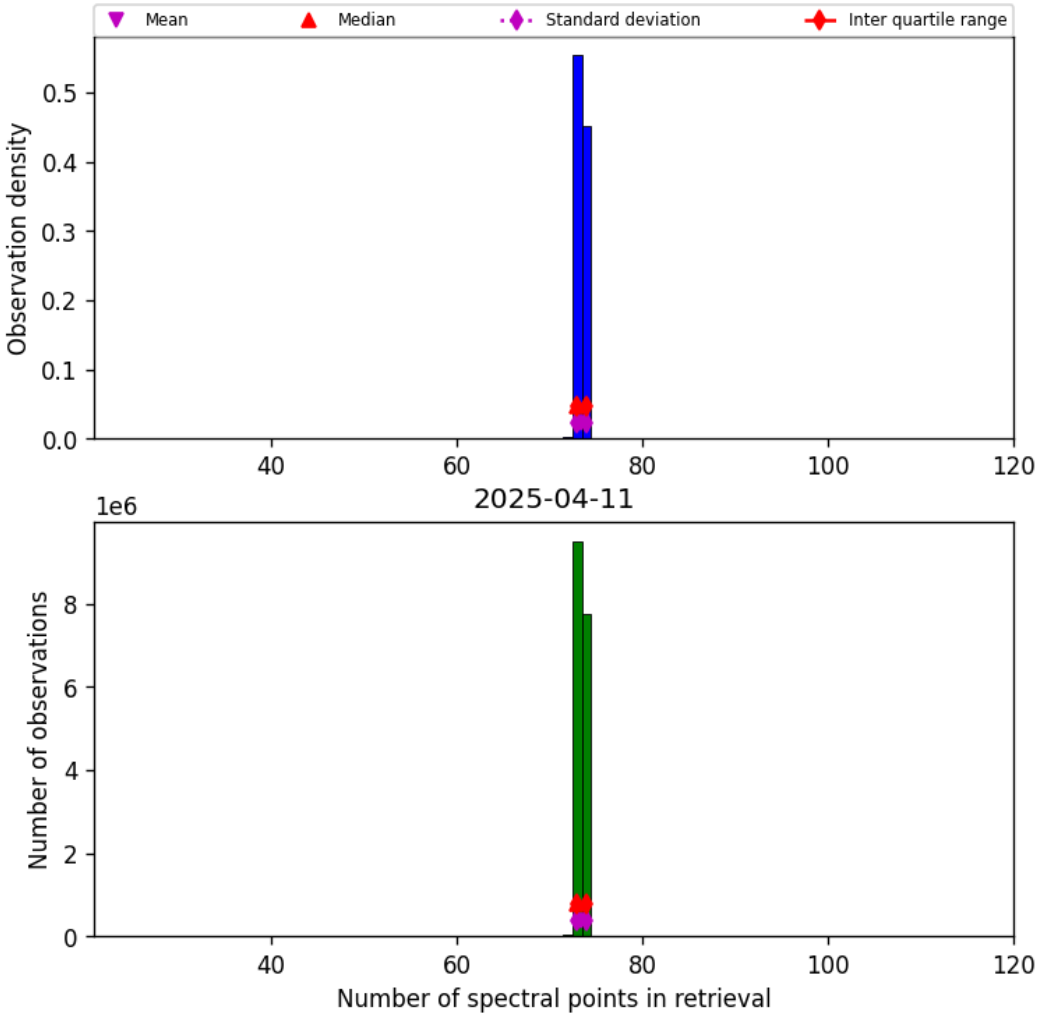


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-04-11 to 2025-04-11

9 Along track statistics

The TROPOMI instrument uses different binned detector rows for different viewing directions. In this section statistics are presented for each of the binned rows in the instrument.

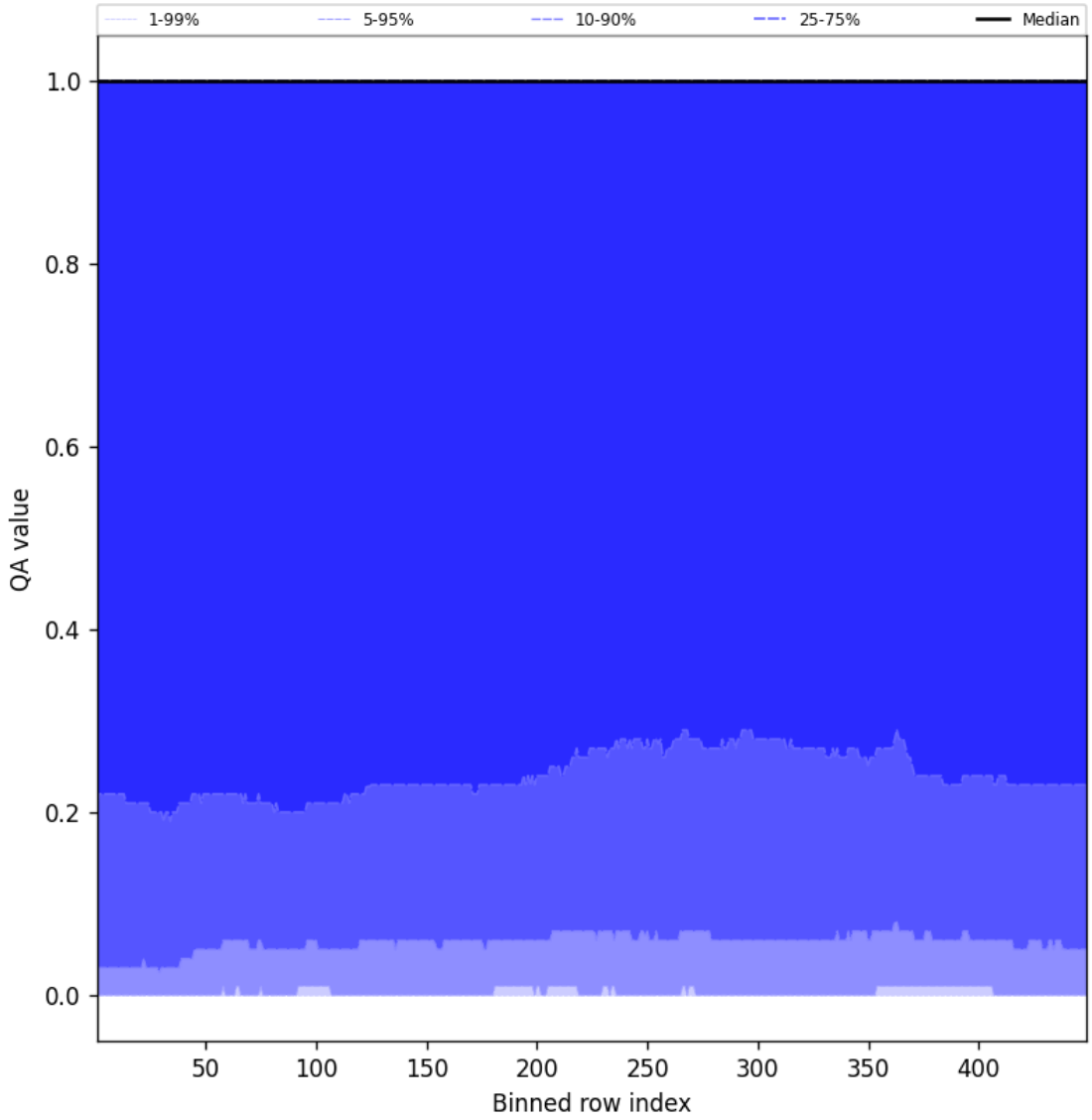


Figure 84: Along track statistics of “QA value” for 2025-04-11 to 2025-04-11

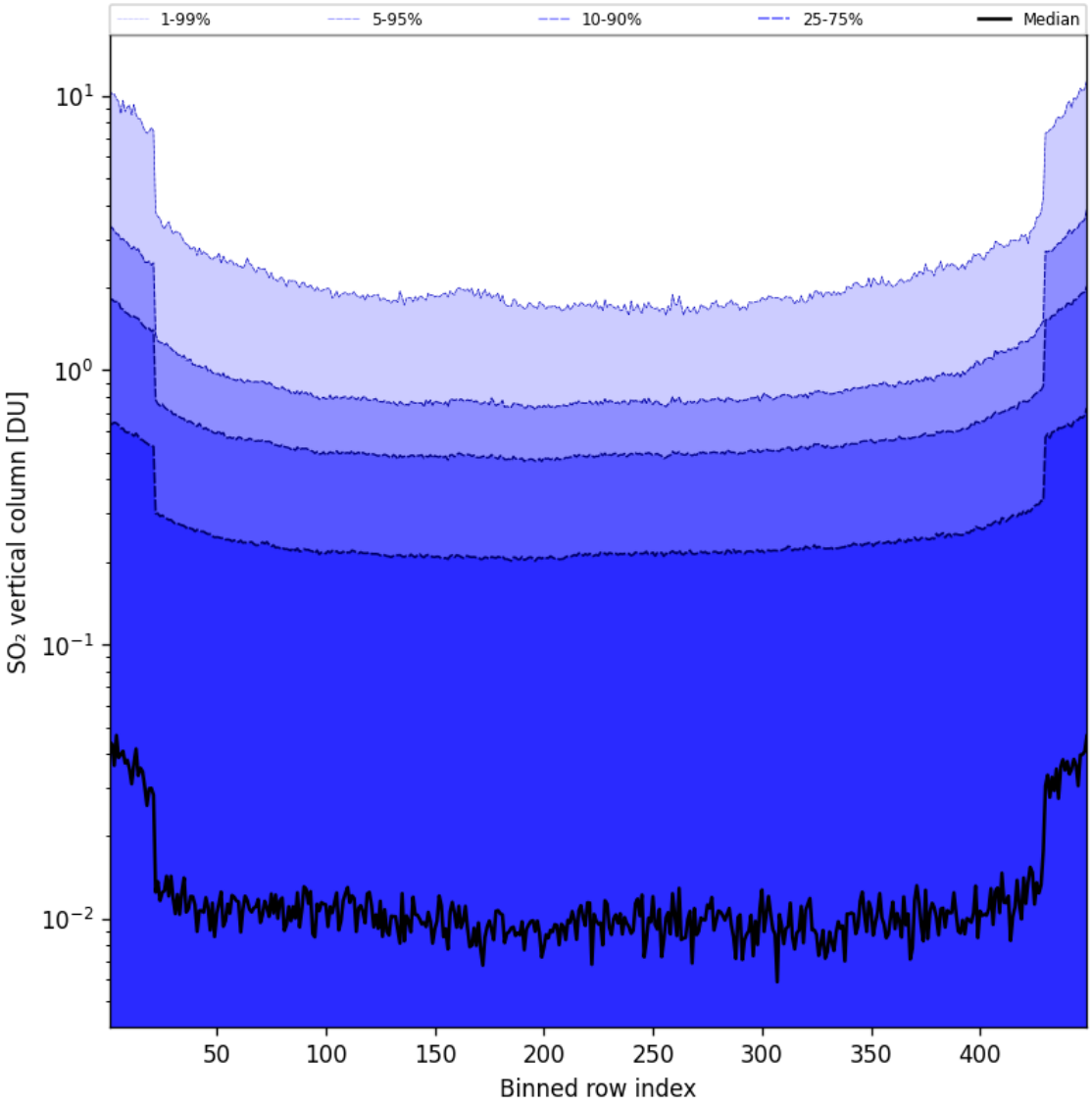


Figure 85: Along track statistics of "SO_2 vertical column" for 2025-04-11 to 2025-04-11

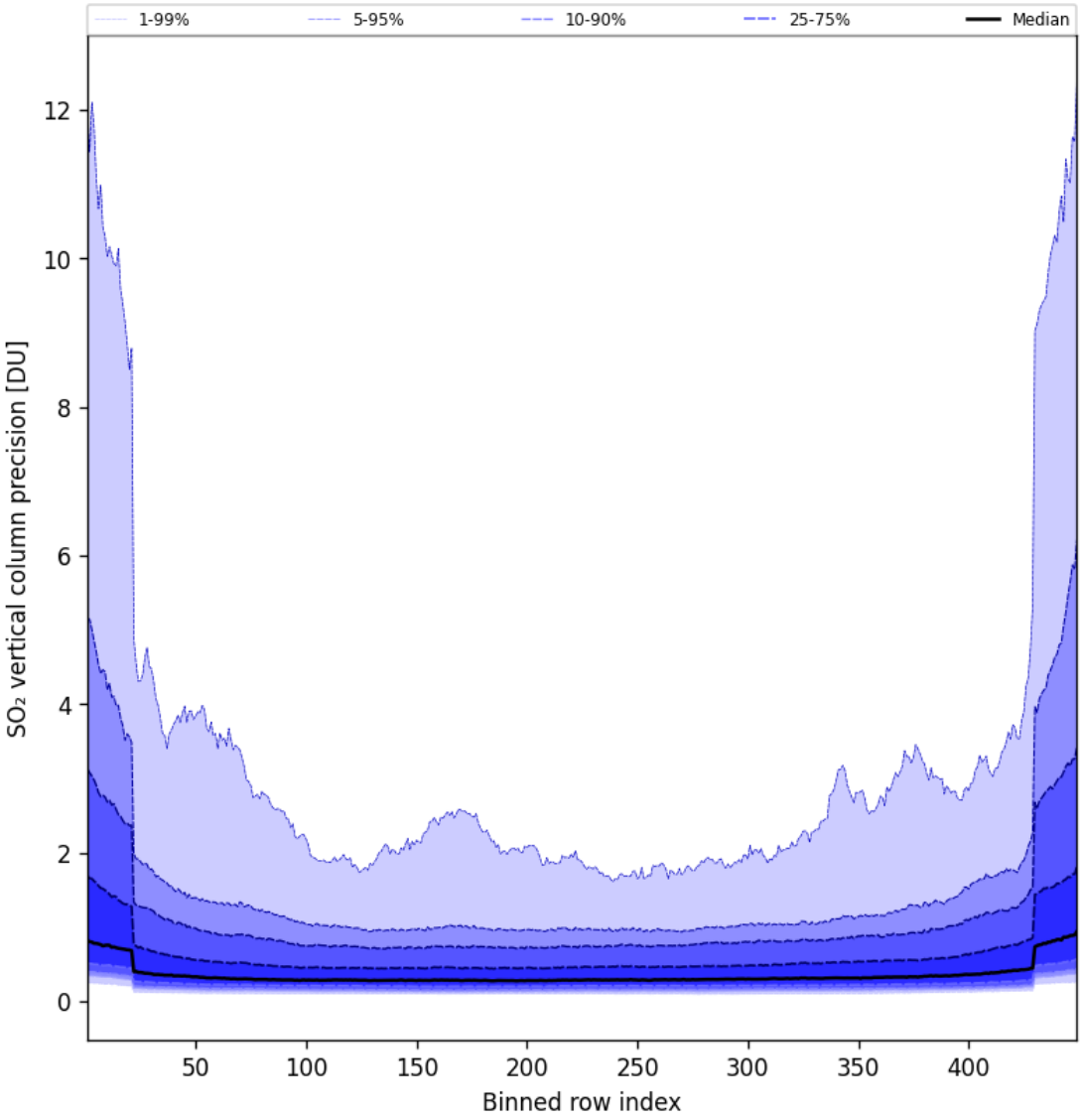


Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-04-11 to 2025-04-11

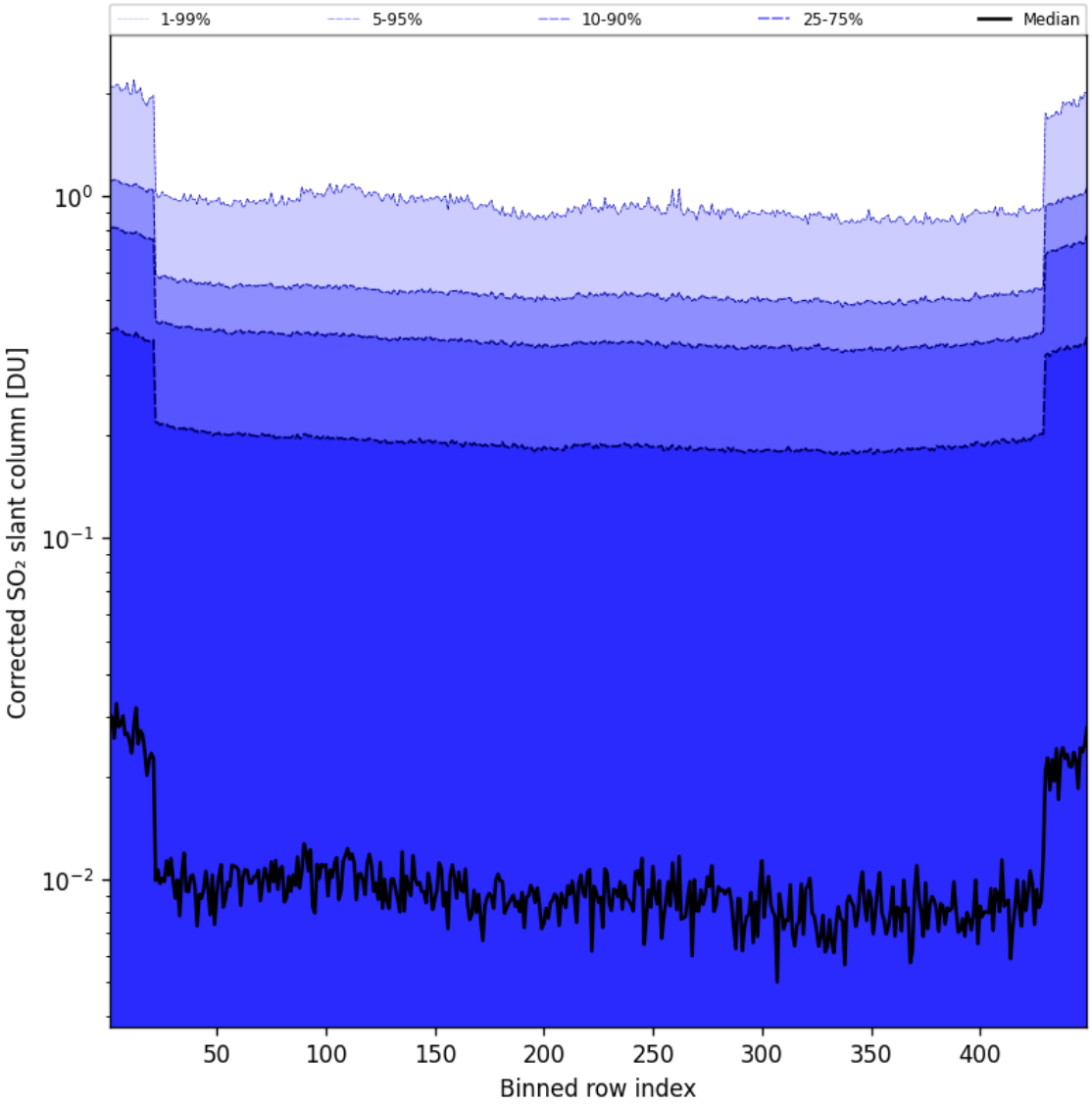


Figure 87: Along track statistics of “Corrected SO_2 slant column” for 2025-04-11 to 2025-04-11

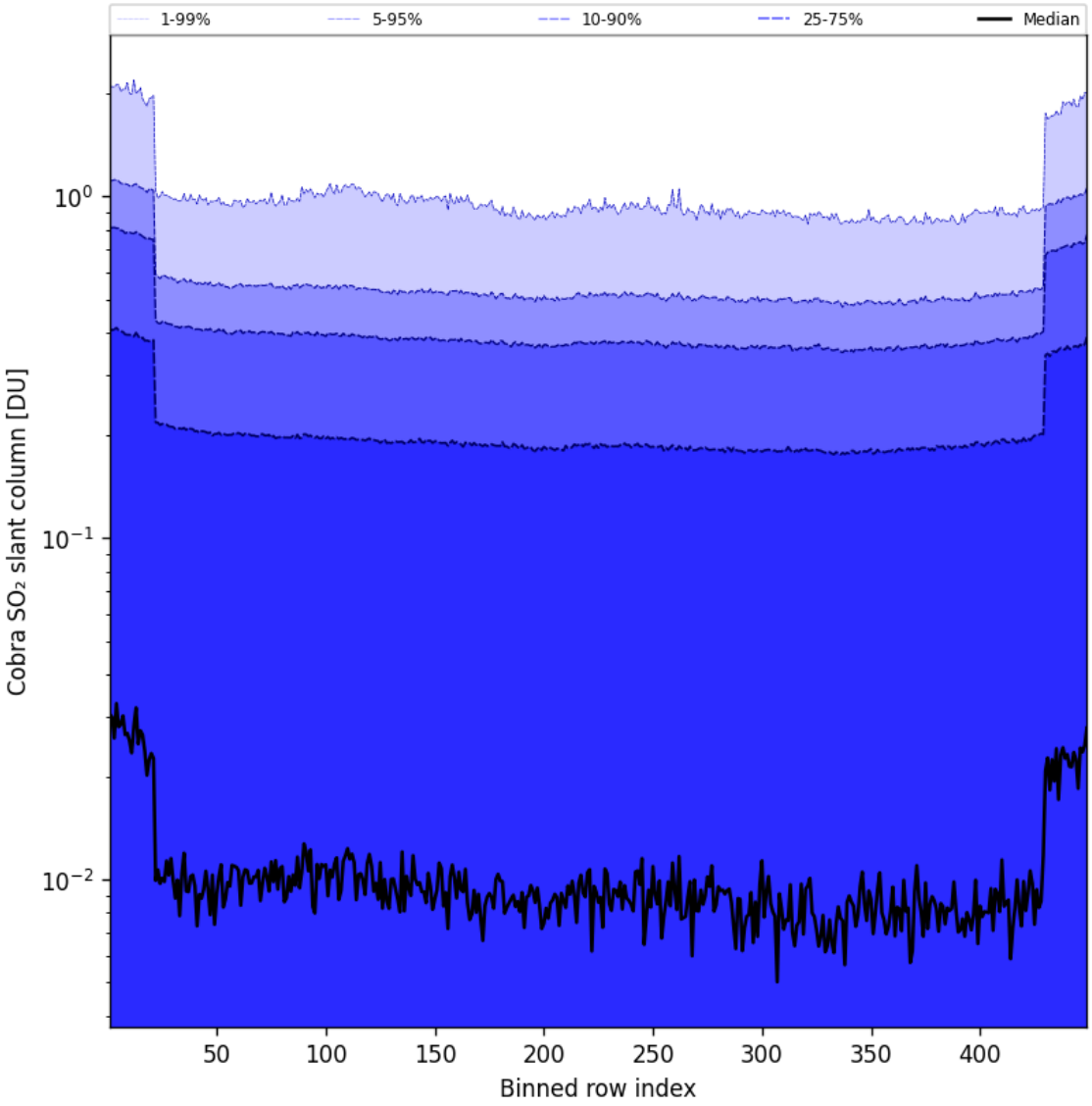


Figure 88: Along track statistics of “Cobra SO_2 slant column” for 2025-04-11 to 2025-04-11

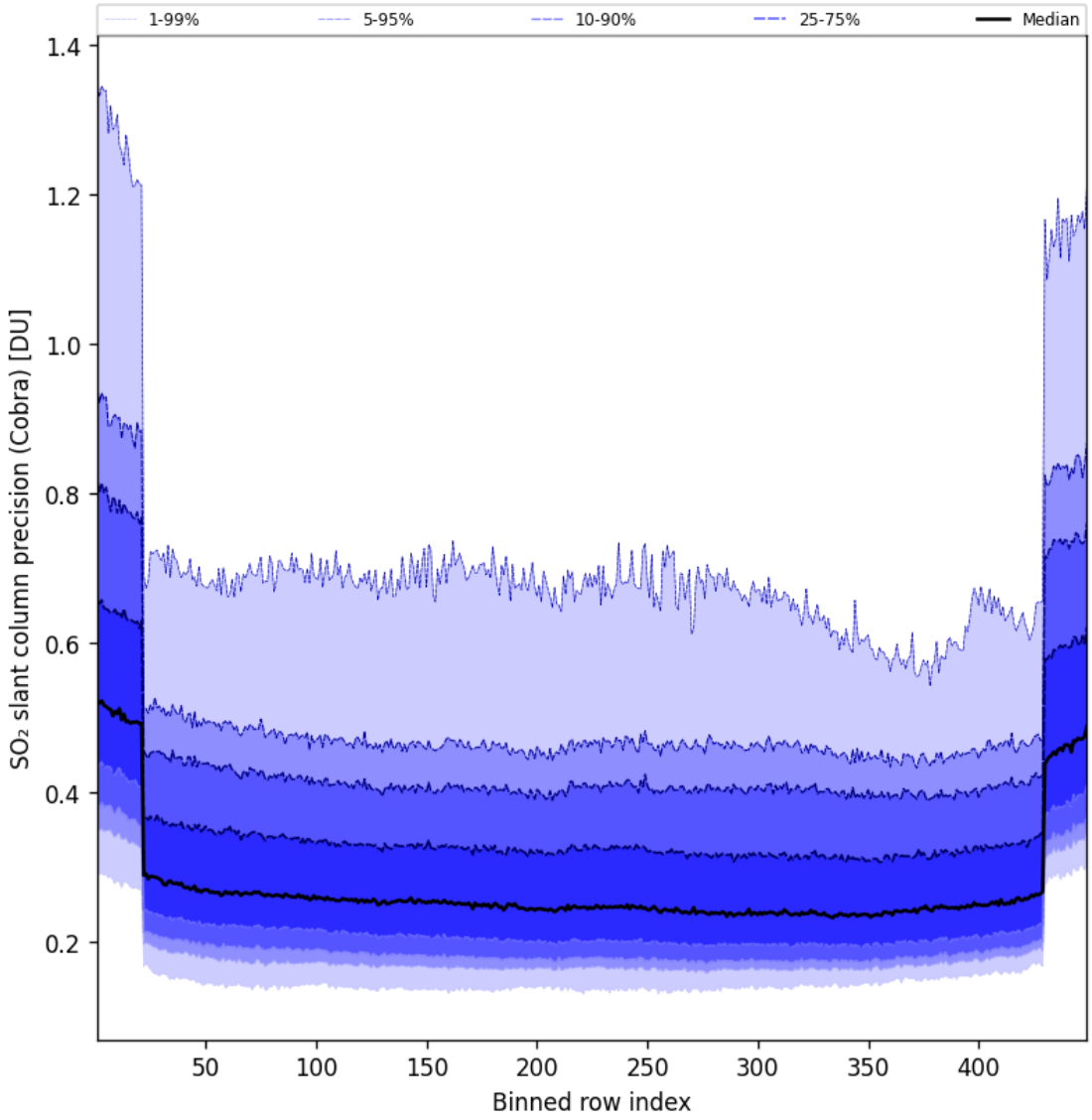


Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-04-11 to 2025-04-11

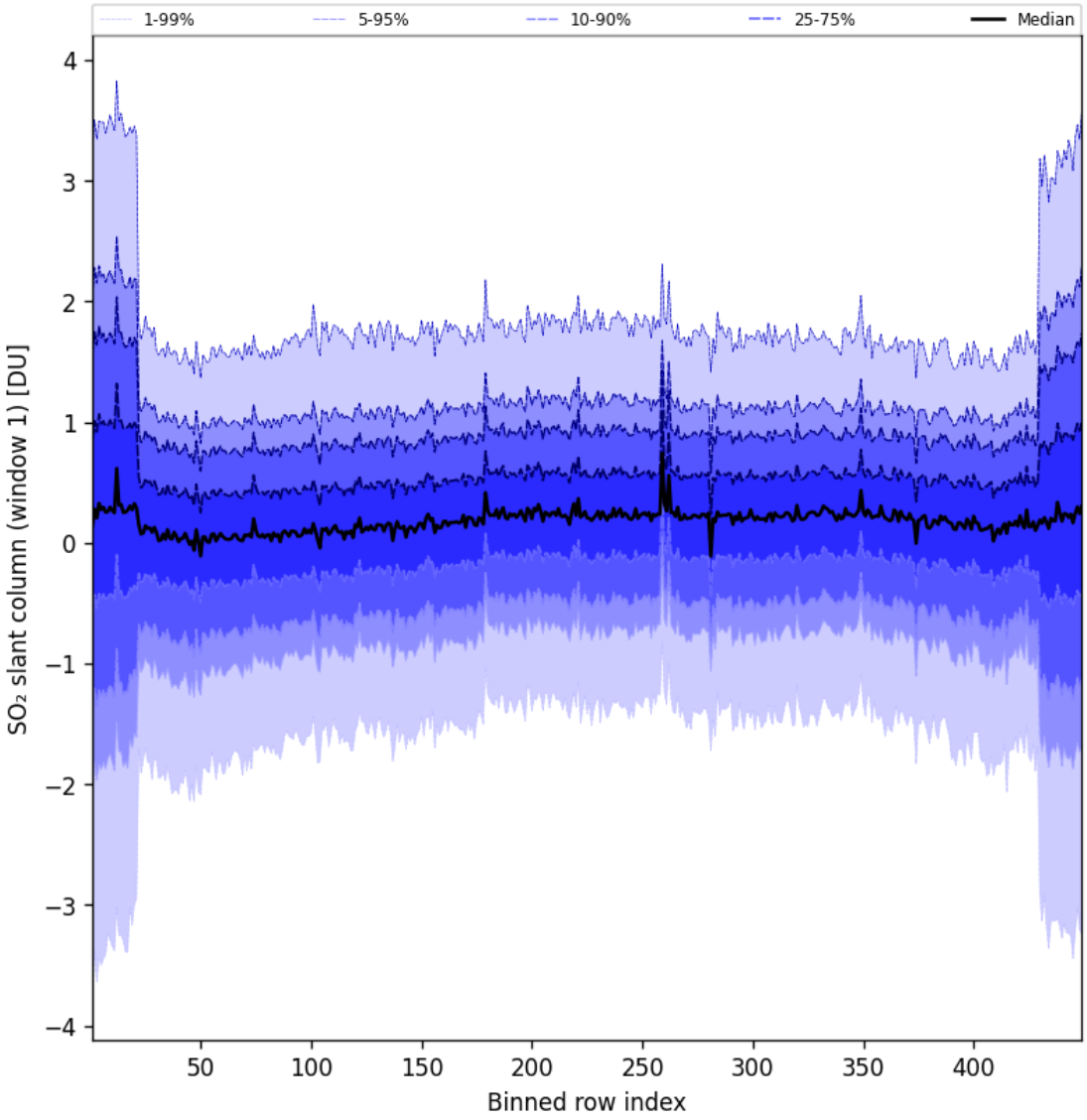


Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-04-11 to 2025-04-11

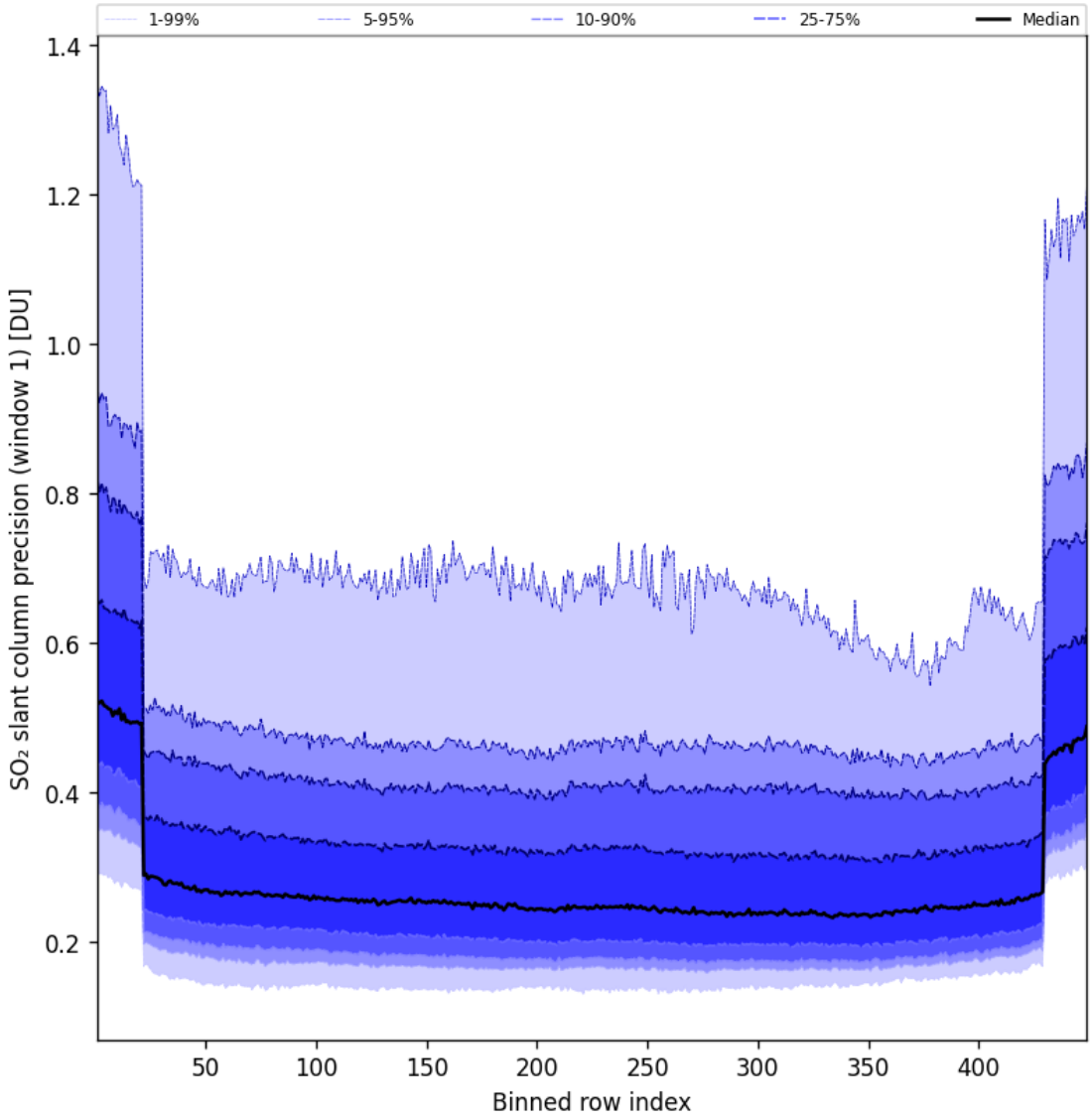


Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-04-11 to 2025-04-11

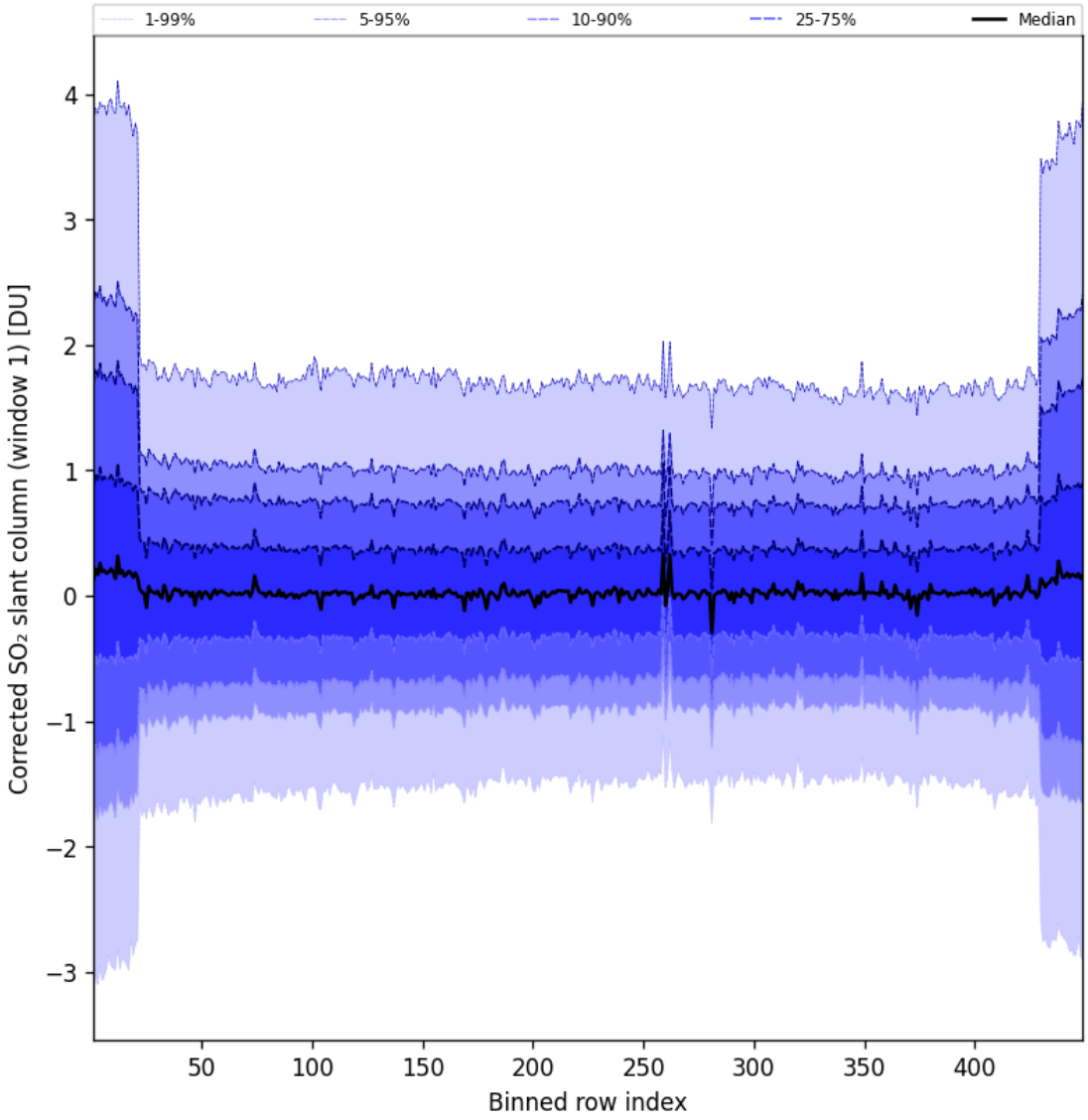


Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-04-11 to 2025-04-11

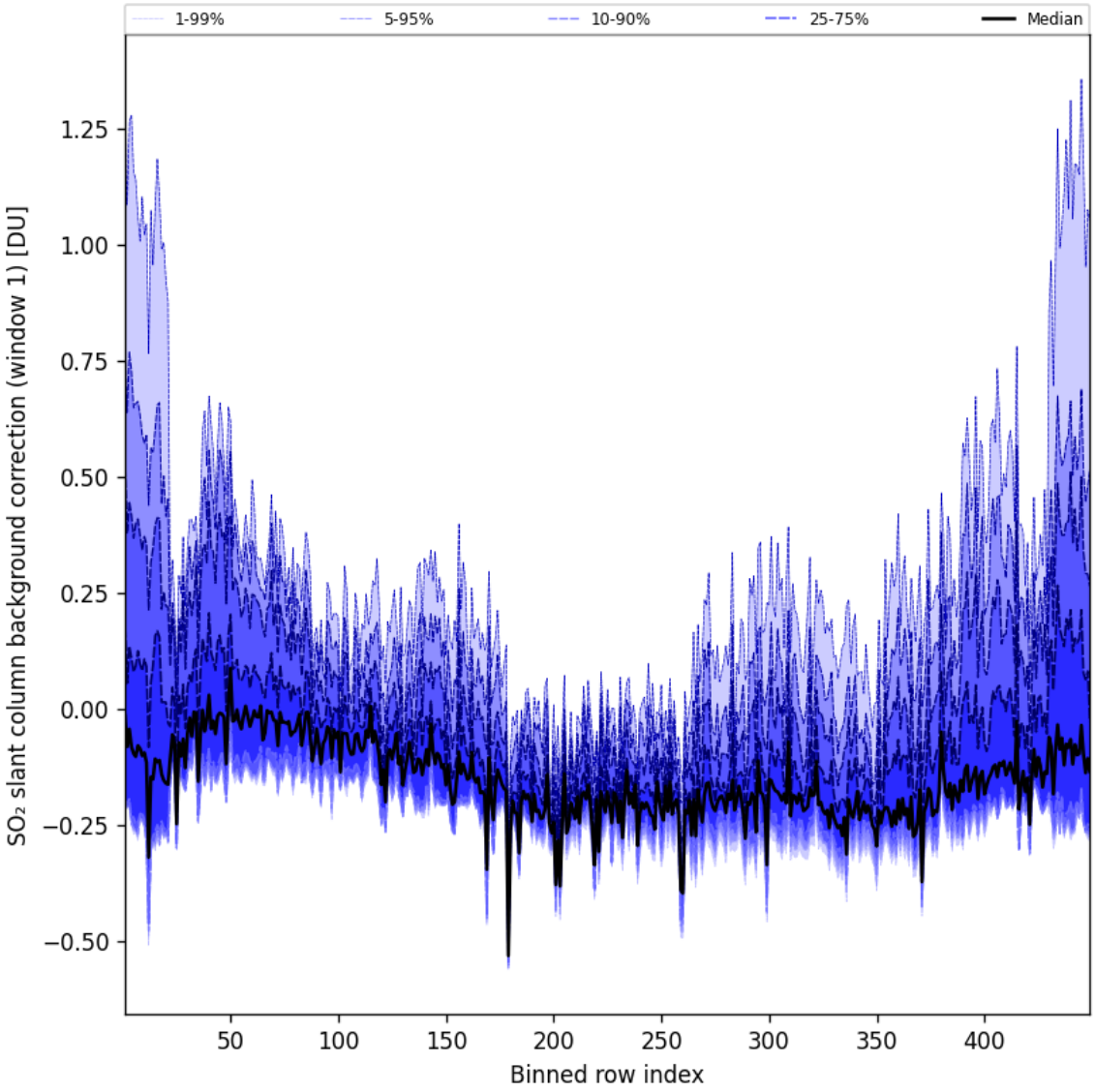


Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-04-11 to 2025-04-11

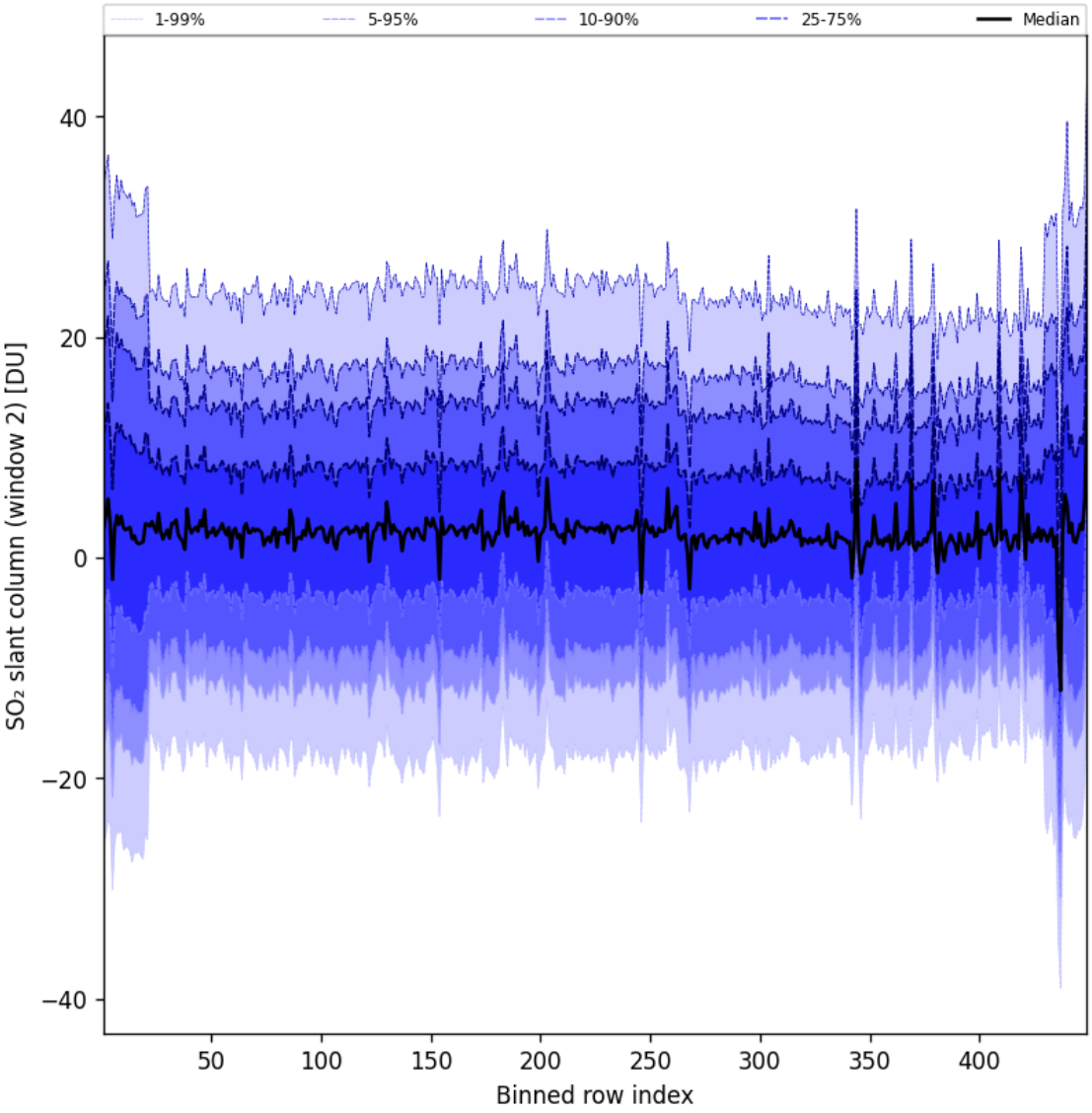


Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-04-11 to 2025-04-11

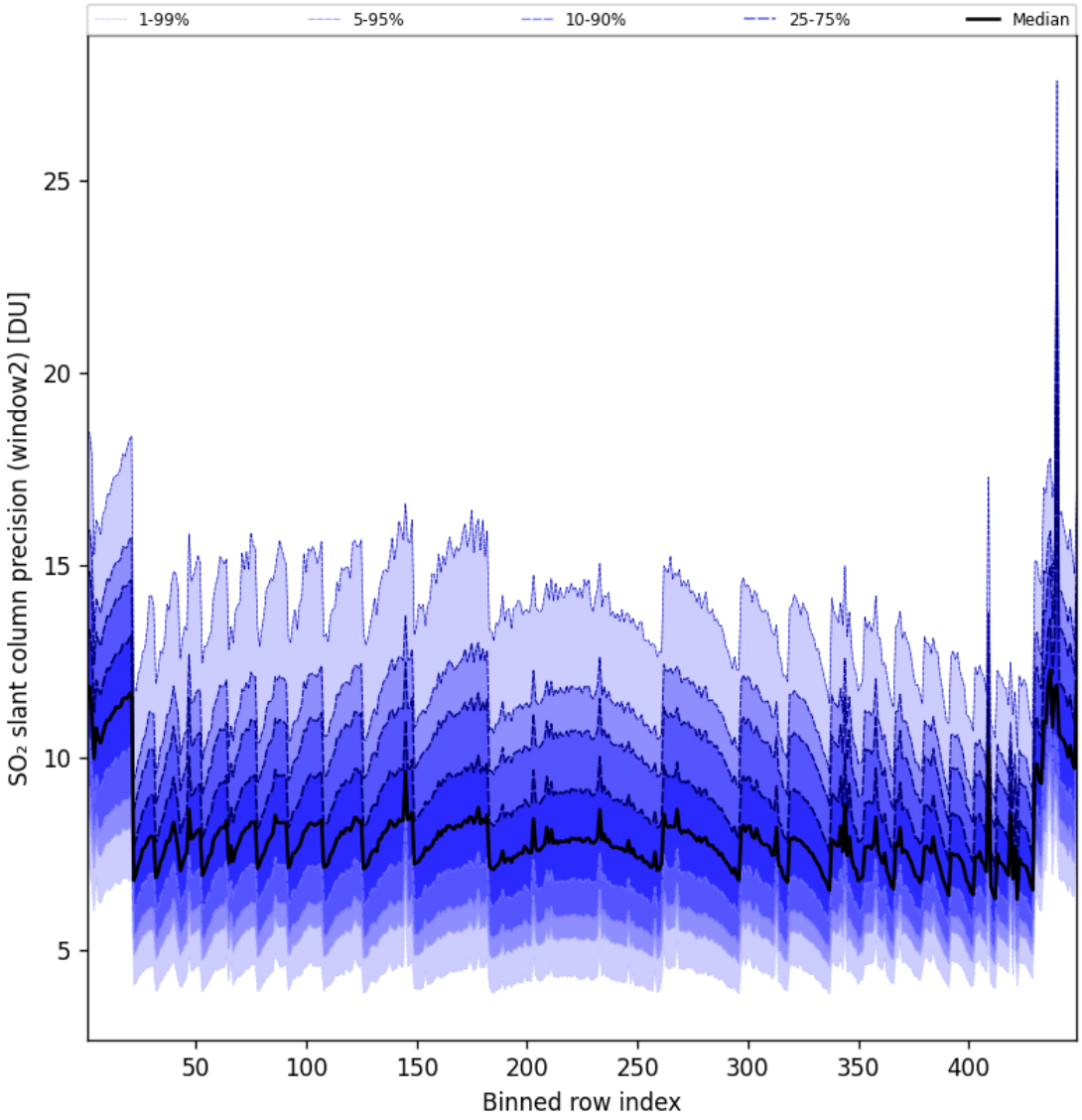


Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-04-11 to 2025-04-11

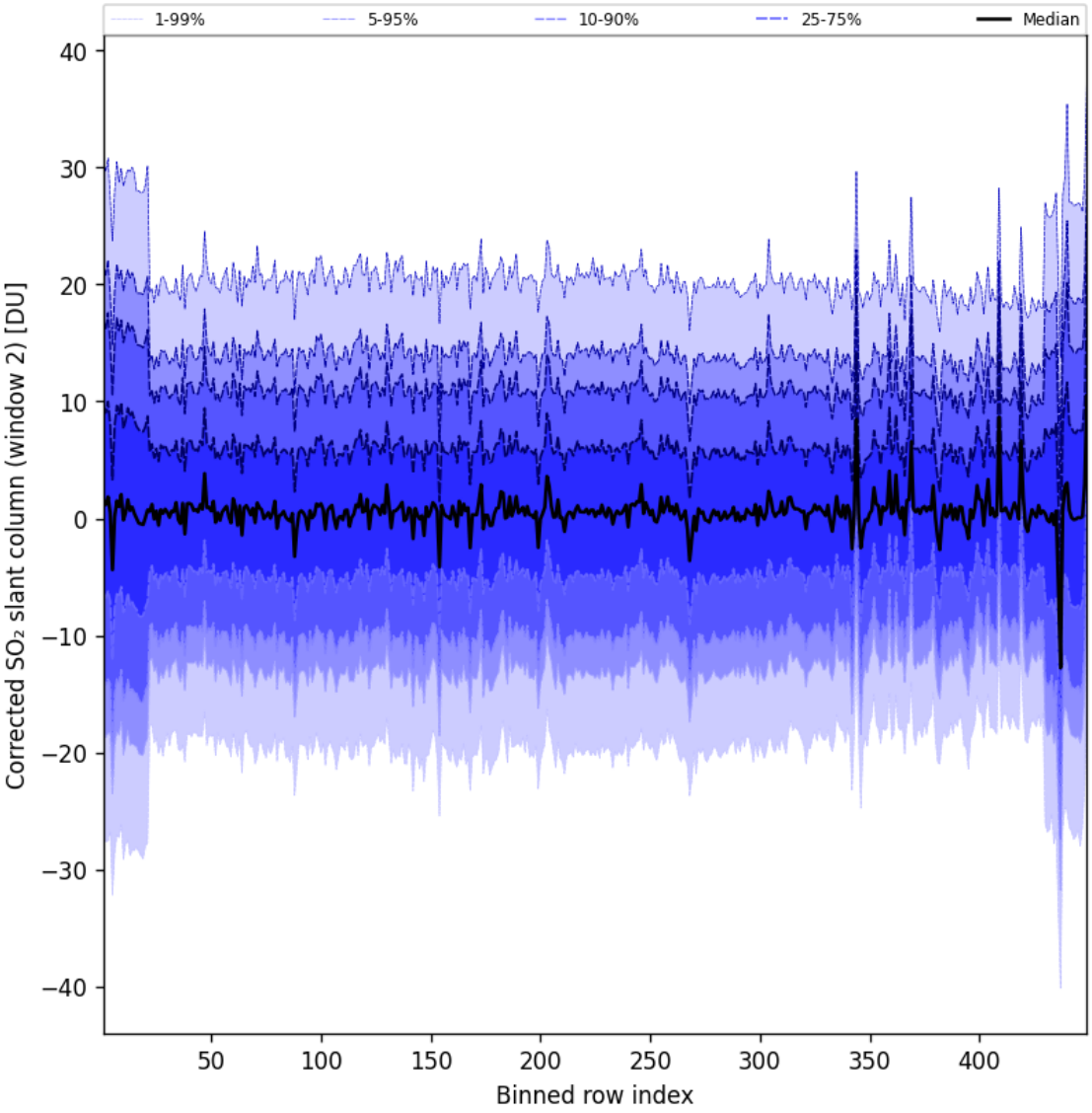


Figure 96: Along track statistics of “Corrected SO_2 slant column (window 2)” for 2025-04-11 to 2025-04-11

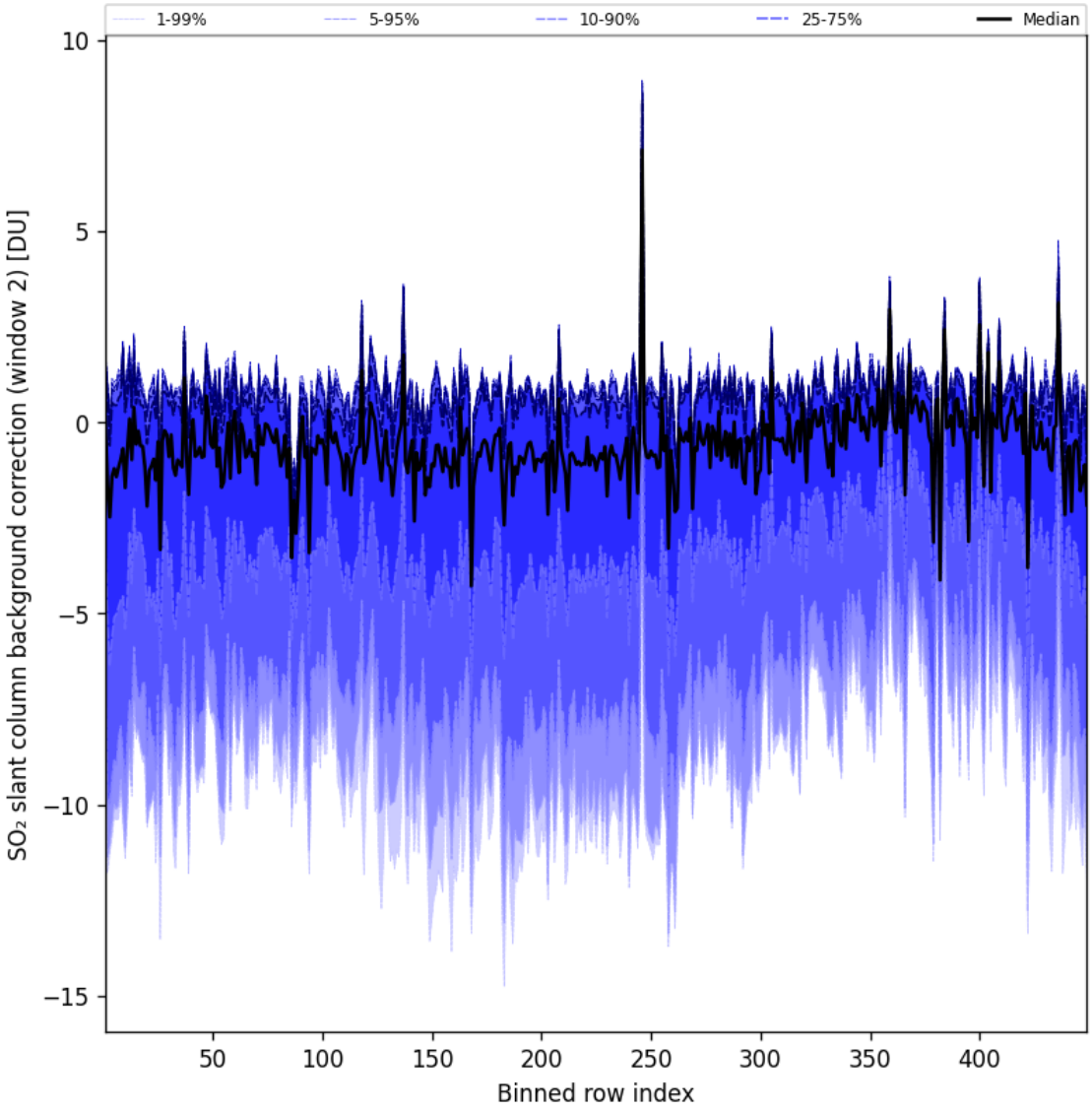


Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-04-11 to 2025-04-11

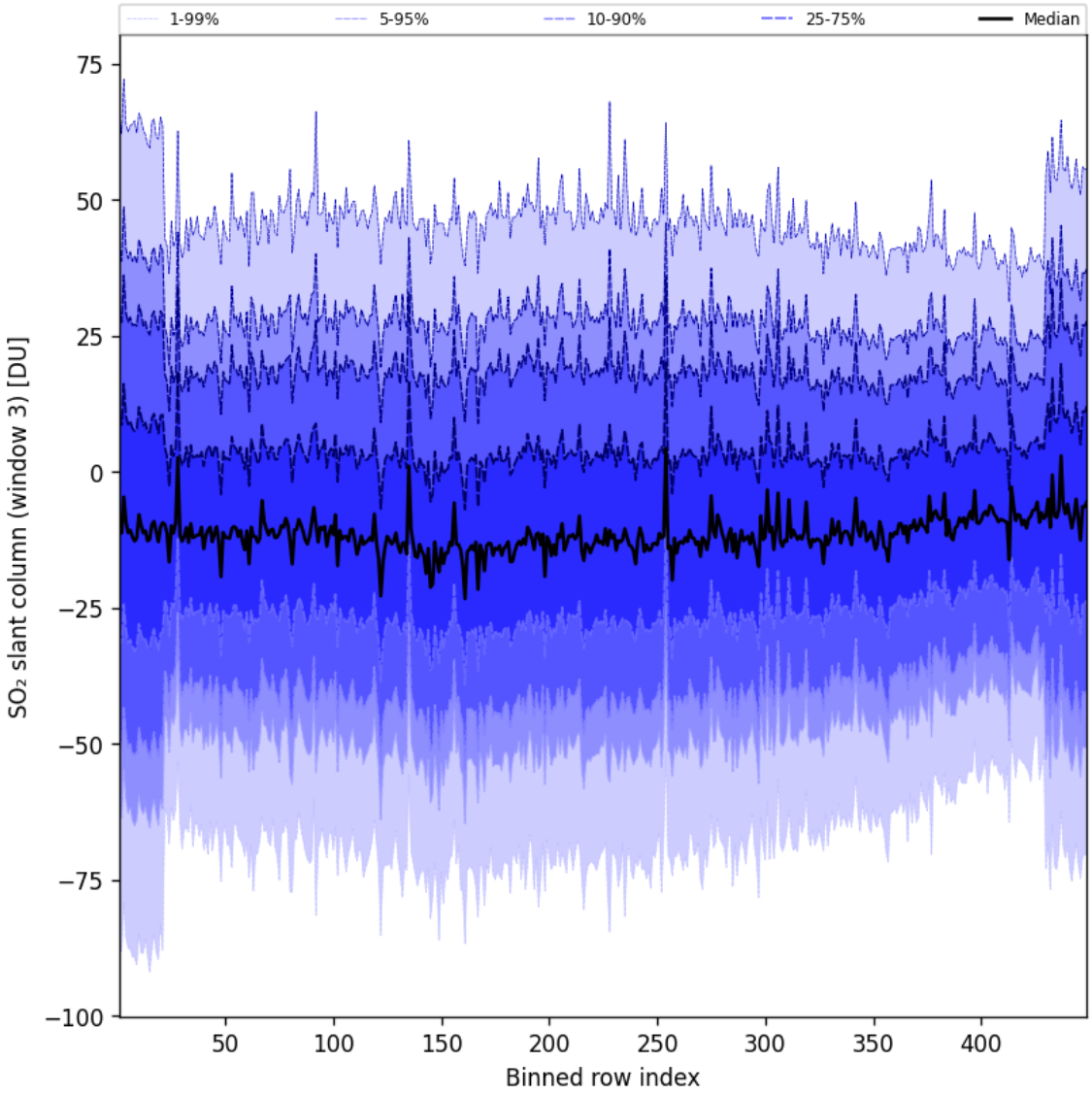


Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-04-11 to 2025-04-11

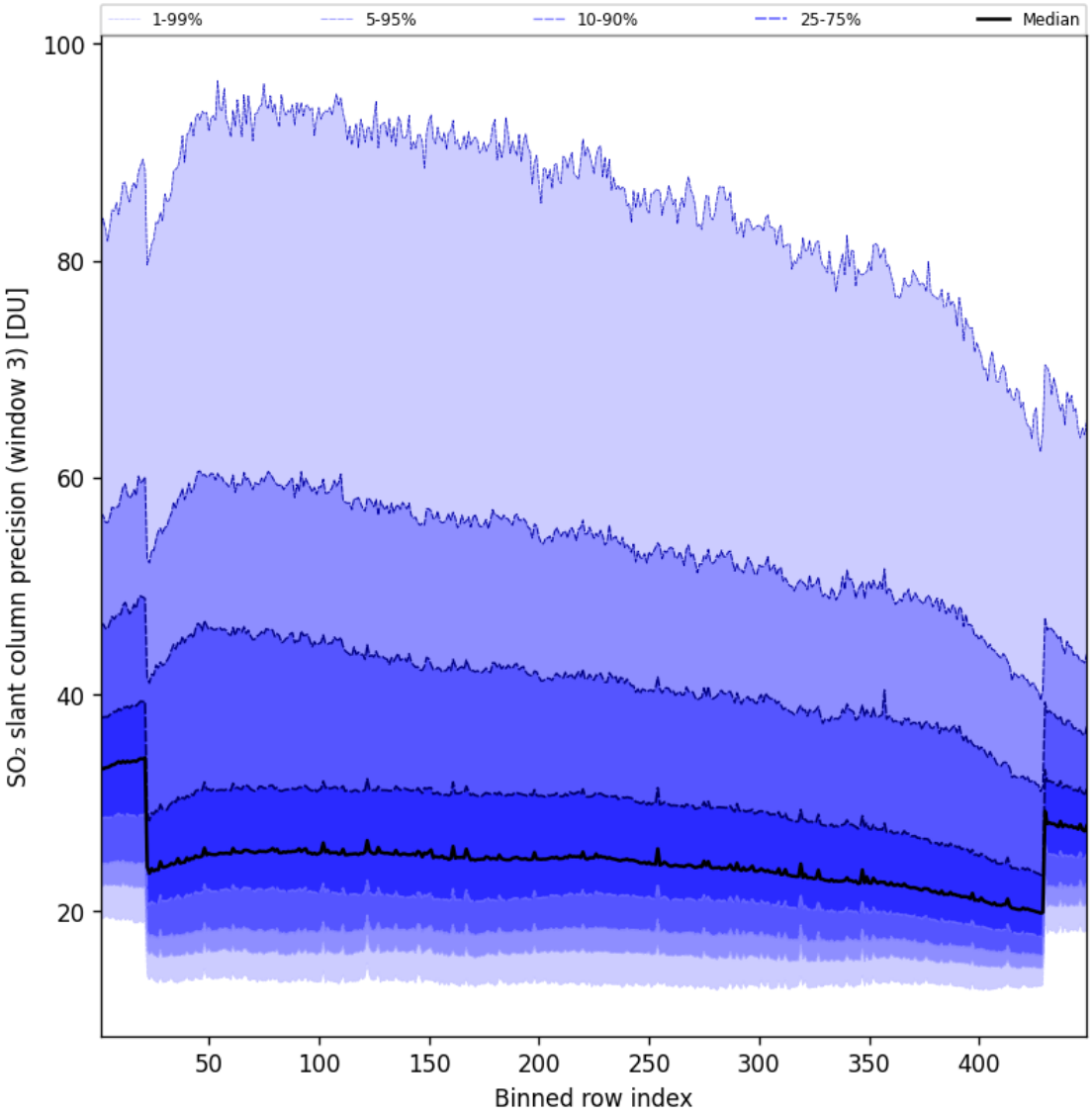


Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-04-11 to 2025-04-11

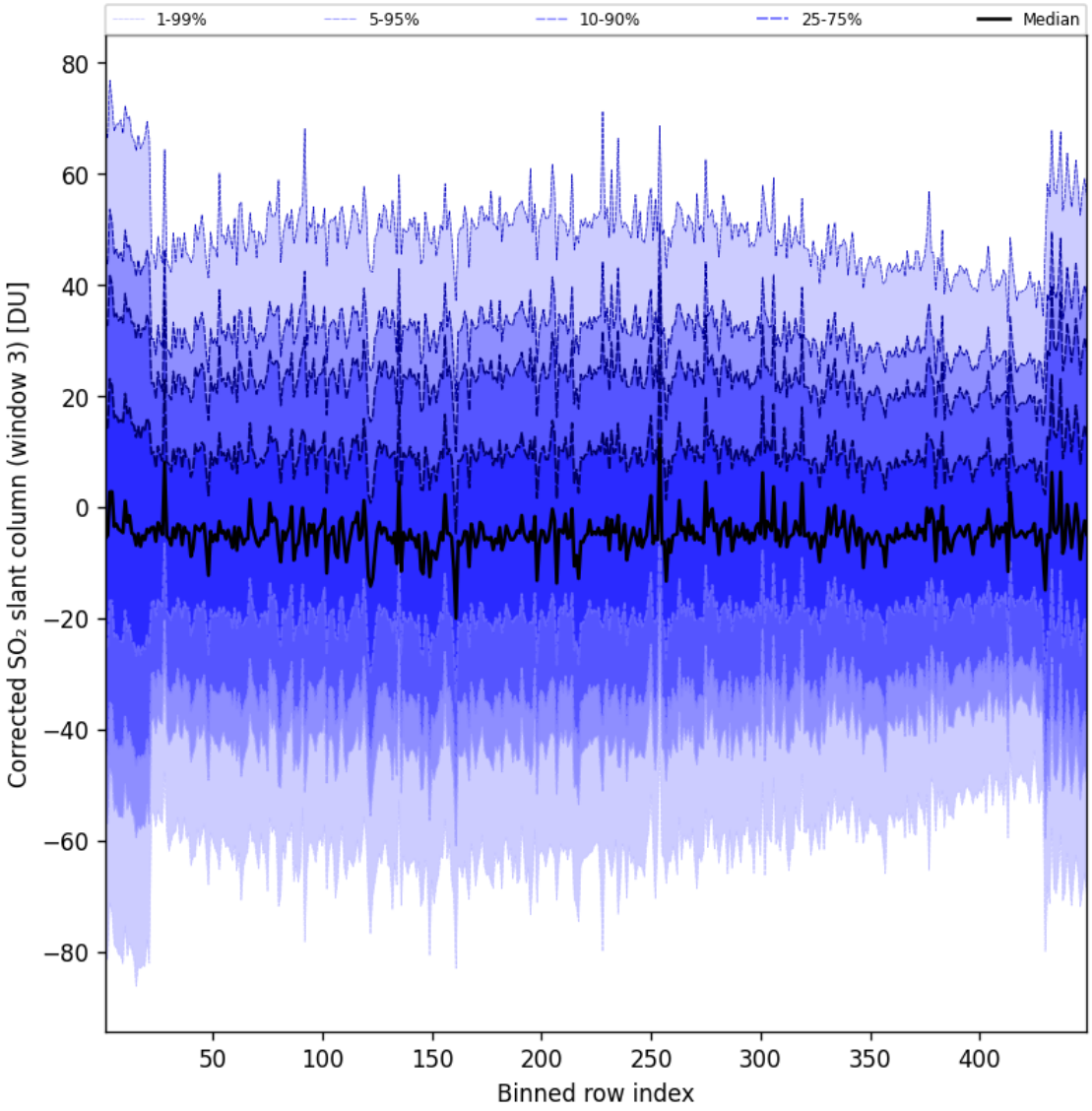


Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-04-11 to 2025-04-11

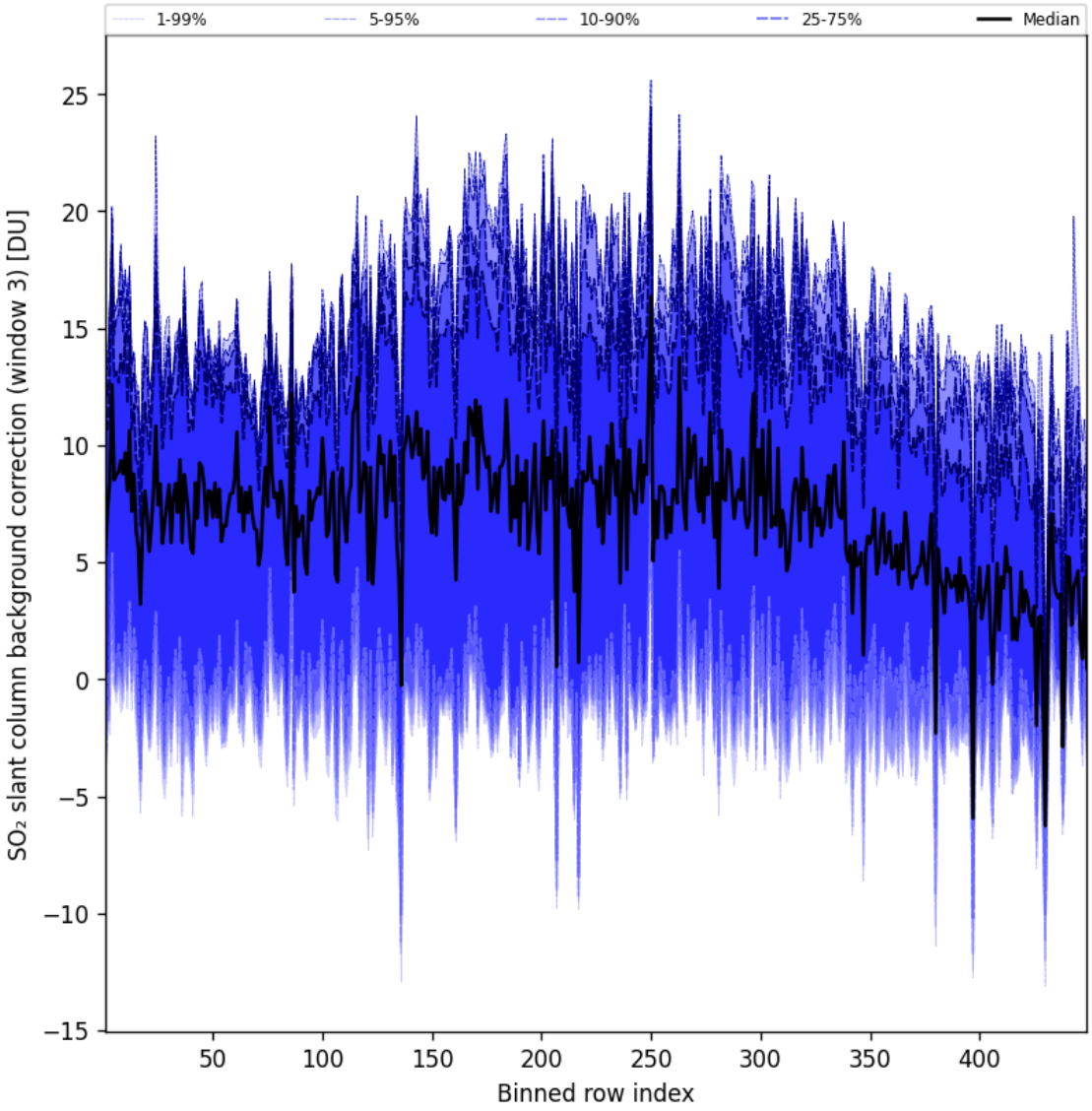


Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-04-11 to 2025-04-11

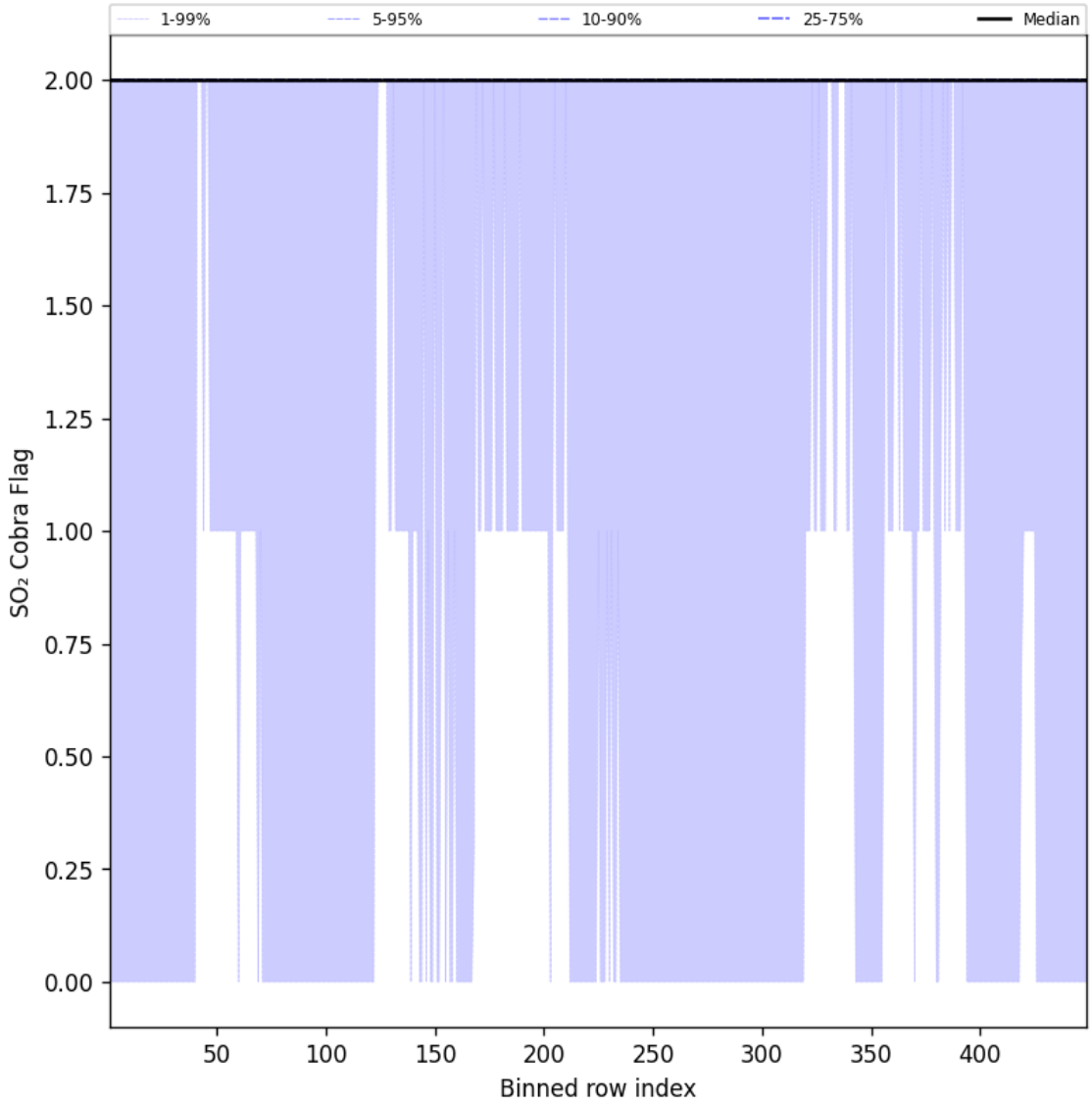


Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-04-11 to 2025-04-11

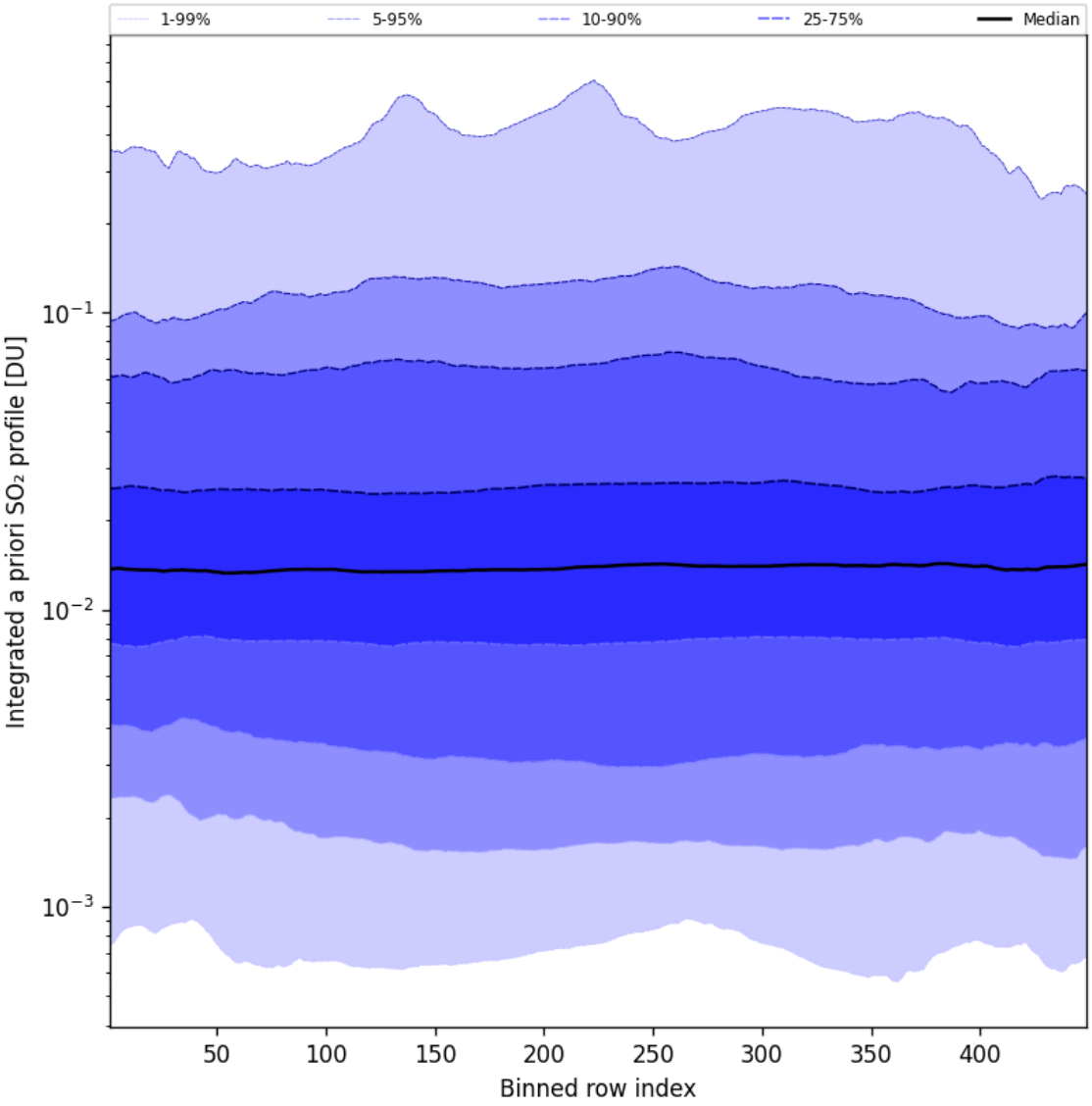


Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-04-11 to 2025-04-11

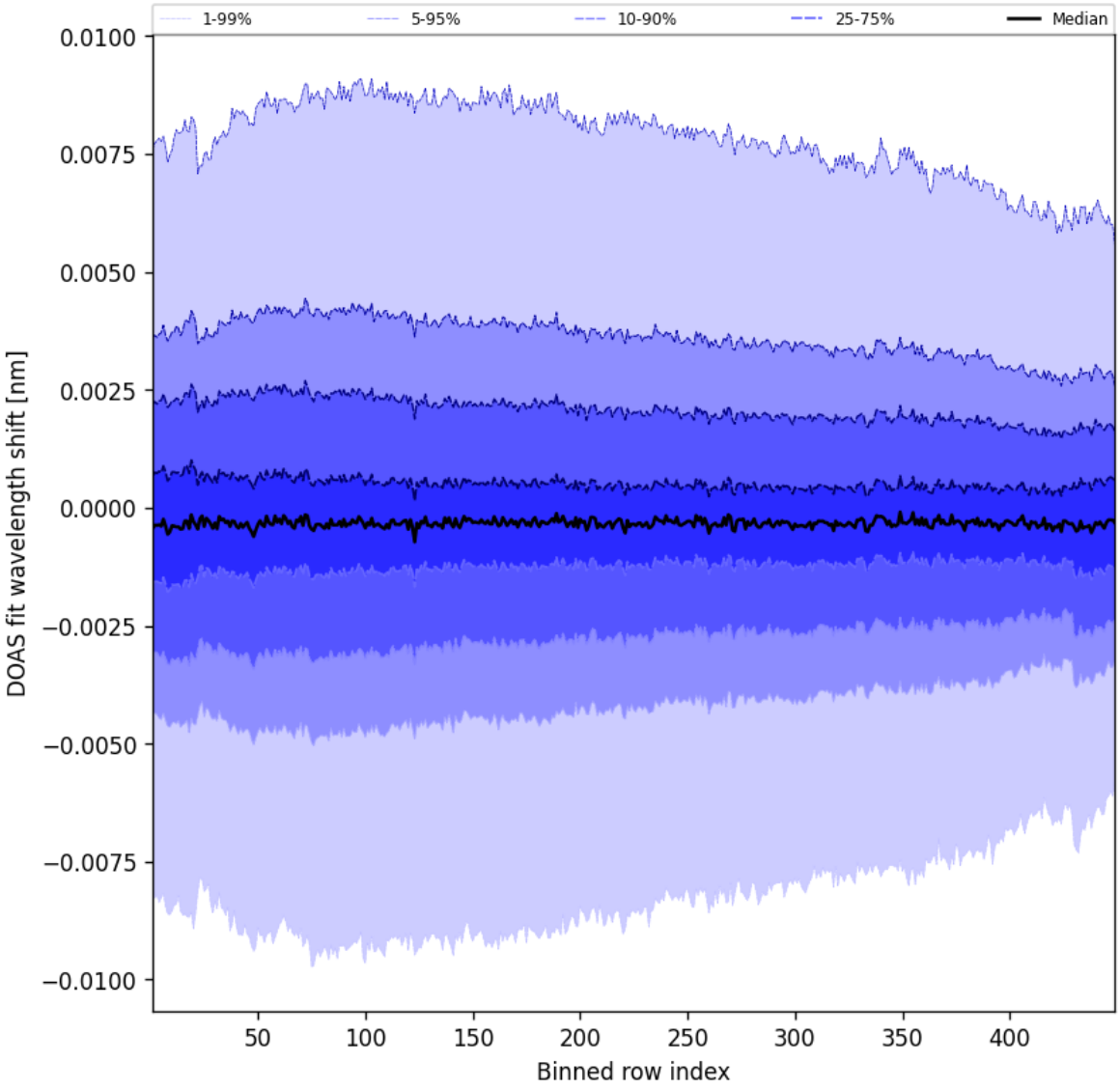
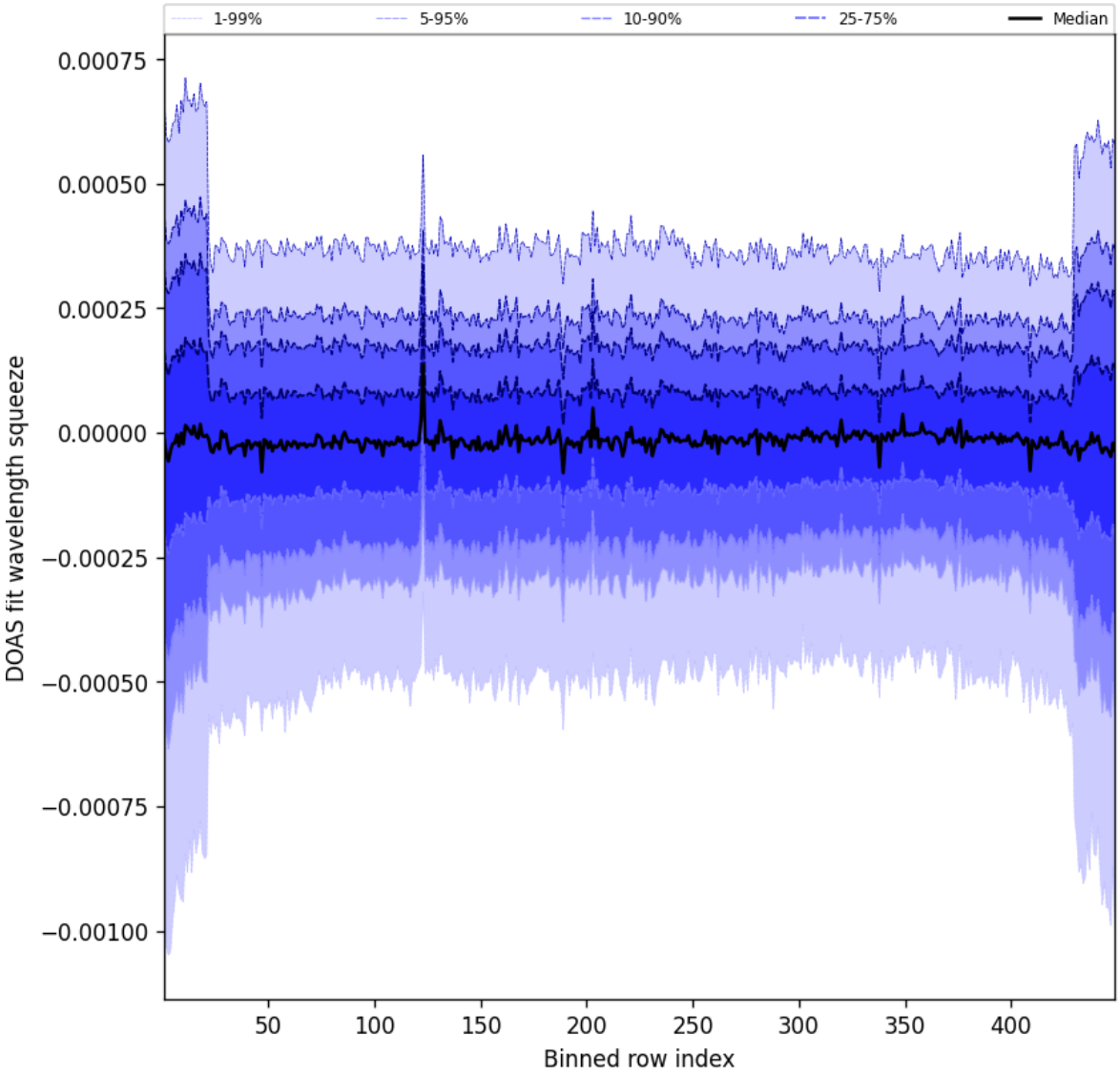


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-04-11 to 2025-04-11



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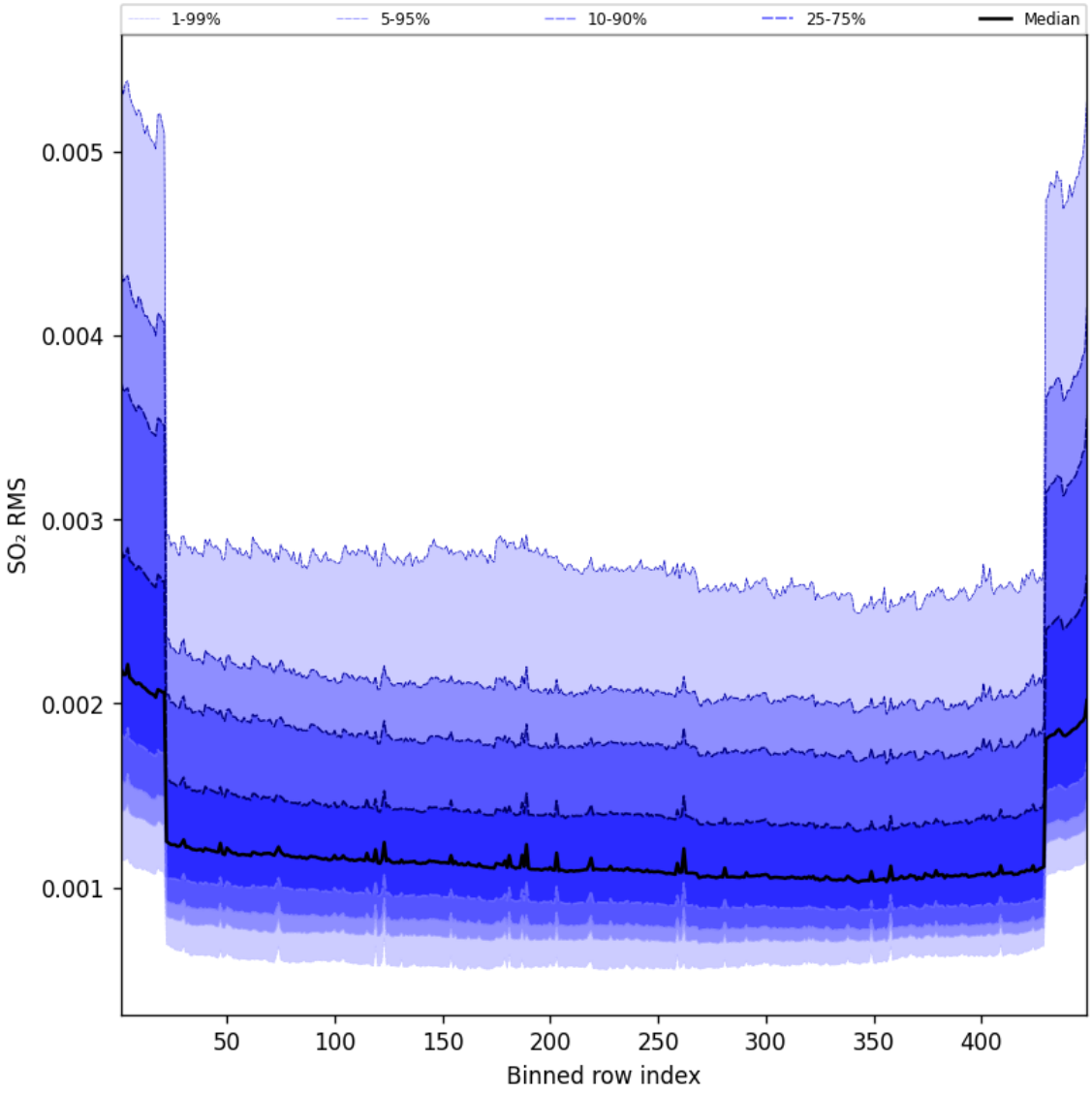

Figure 106: Along track statistics of "SO_2 RMS" for 2025-04-11 to 2025-04-11

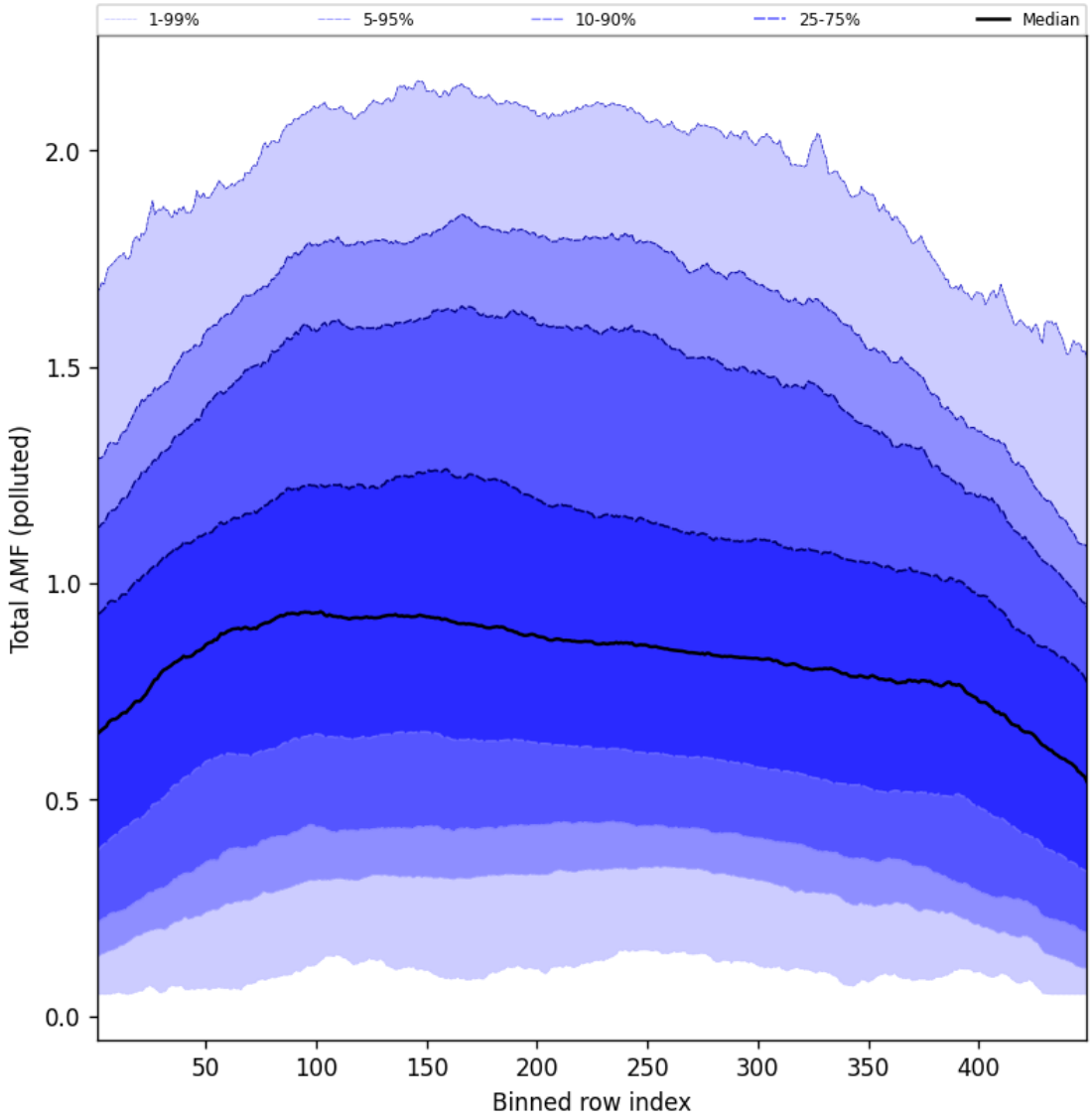

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-04-11 to 2025-04-11

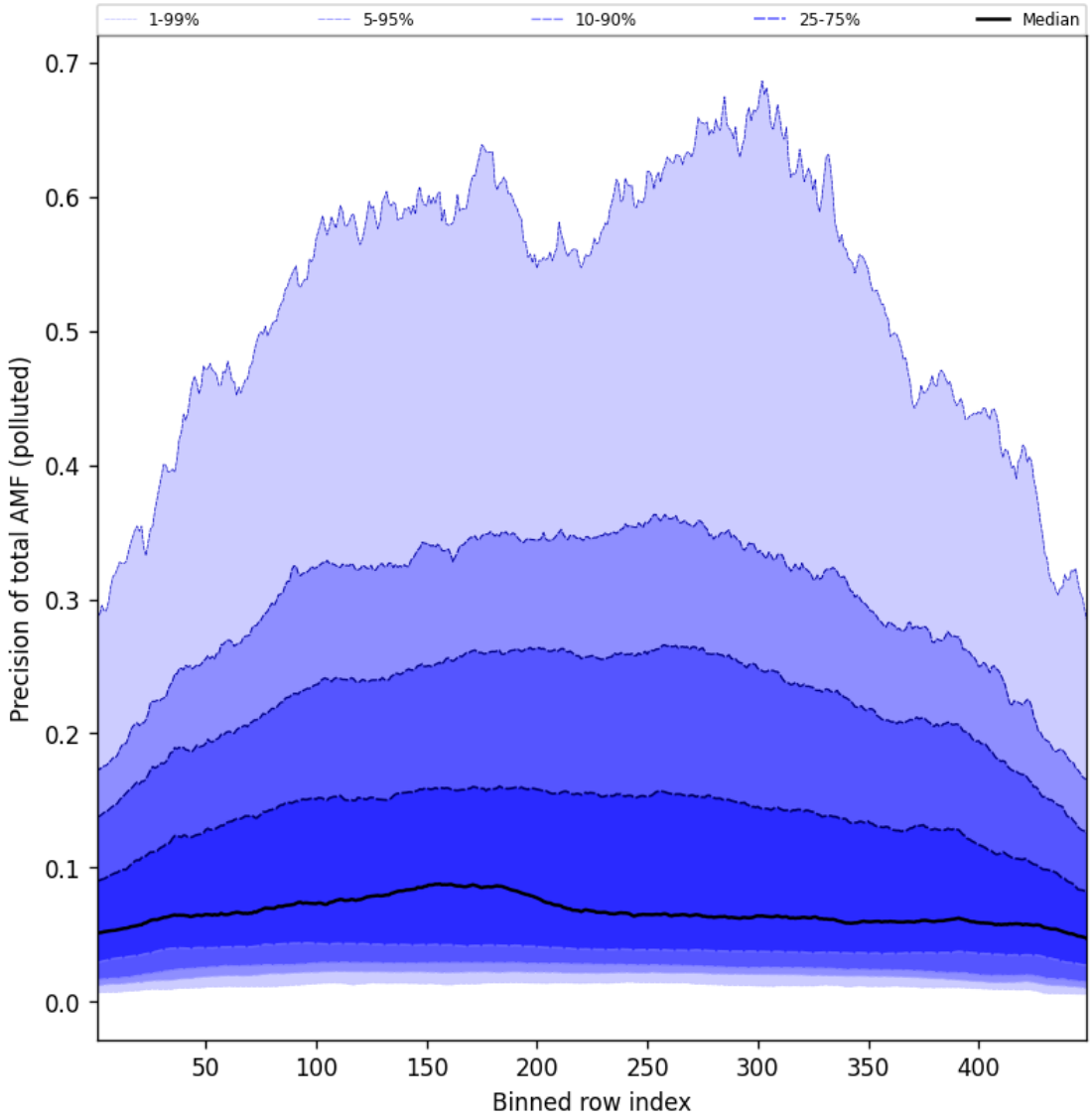

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-04-11 to 2025-04-11

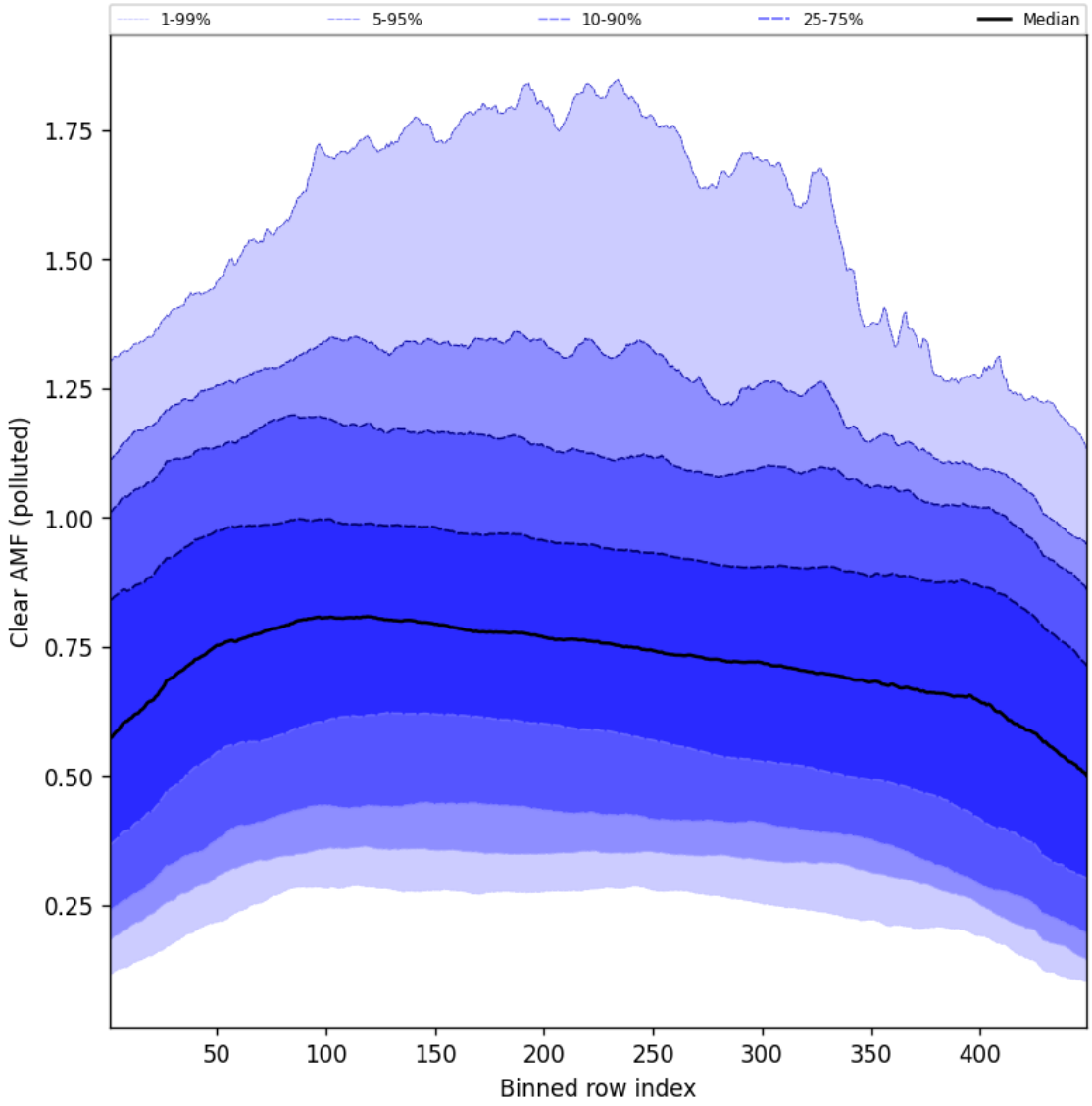

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-04-11 to 2025-04-11

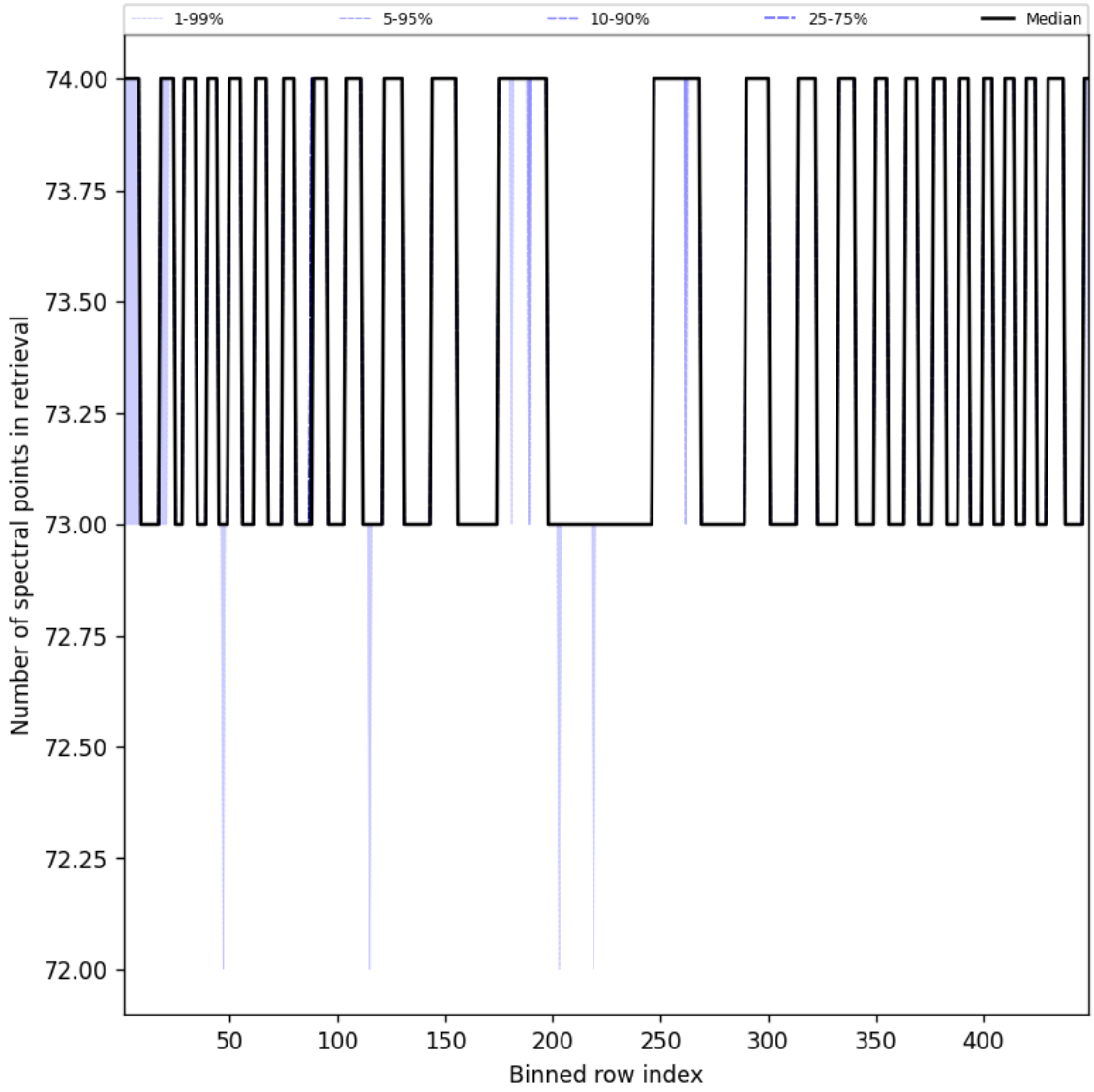

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-04-11 to 2025-04-11

10 Coincidence density

To investigate the relation between parameters scatter density plots are produced. These include some 'hidden' parameters, latitude and the solar- and viewing geometries, in addition to all configured parameters. All combinations of pairs of parameters are included *once*, in one direction alone.

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