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]	0.635 ± 0.400	17303319	0.995	0.780	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.361 \pm 108.625) \times 10^{-2}$	17303319	0.278	0.464	1.126×10^{-2}	-91.2	1.780×10^{3}
sulfurdioxide total vertical column precision [DU]	0.521 ± 0.689	17303319	0.197	0.343	0.331	4.535×10^{-2}	122
sulfurdioxide slant column density corrected [DU]	$(2.279 \pm 44.402) \times 10^{-2}$	17303319	0.242	0.375	9.824×10^{-3}	-42.0	247
sulfurdioxide slant column density cobra [DU]	$(2.195 \pm 38.962) \times 10^{-2}$	17303319	0.242	0.375	9.824×10^{-3}	-42.0	56.6
sulfurdioxide slant column density cobra precision [DU]	0.301 ± 0.134	17303319	0.213	0.141	0.261	8.723×10^{-2}	27.4
sulfurdioxide slant column density window1 [DU]	0.161 ± 0.712	17303319	0.175	0.753	0.169	-71.3	103
sulfurdioxide slant column density window1 precision [DU]	0.301 ± 0.134	17303319	0.213	0.141	0.261	8.723×10^{-2}	27.4
sulfurdioxide slant column density corrected win1 [DU]	$(3.789 \pm 70.579) \times 10^{-2}$	17303319	-2.500×10^{-2}	0.742	1.633×10^{-2}	-71.3	103
background so2 slant column offset window1 [DU]	-0.123 ± 0.154	17303319	-0.220	0.161	-0.156	-1.32	2.63
sulfurdioxide slant column density window2 [DU]	2.61 ± 9.12	17303319	2.25	11.6	2.46	-1.061×10^{3}	1.105×10^{3}
sulfurdioxide slant column density window2 precision [DU]	8.06 ± 2.21	17303319	7.43	2.50	7.74	2.29	573
sulfurdioxide slant column density corrected win2 [DU]	0.414 ± 8.720	17303319	0.750	11.0	0.426	-1.072×10^{3}	1.105×10^{3}
background so2 slant column offset window2 [DU]	-2.20 ± 3.13	17303319	0.250	3.94	-1.18	-16.7	10.8
sulfurdioxide slant column density window3 [DU]	-11.1 ± 23.7	17303319	-12.9	29.8	-11.6	-2.085×10^{3}	449
sulfurdioxide slant column density window3 precision [DU]	28.0 ± 13.3	17303319	22.5	9.69	24.3	9.54	270
sulfurdioxide slant column density corrected win3 [DU]	-2.11 ± 22.90	17303319	-2.80	28.6	-2.09	-2.080×10^{3}	456
background so2 slant column offset window3 [DU]	9.03 ± 6.61	17303319	1.68	11.4	8.70	-16.0	43.5
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17303319	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.067 \pm 8.053) \times 10^{-2}$	17303319	1.125×10^{-2}	1.706×10^{-2}	1.247×10^{-2}	2.296×10^{-4}	3.74
fitted radiance shift [nm]	$(-3.146 \pm 25.909) \times 10^{-4}$	17303319	-5.000×10^{-4}	1.770×10^{-3}	-3.014×10^{-4}	-4.336×10^{-2}	0.110
fitted radiance squeeze [1]	$(-1.532 \pm 17.974) \times 10^{-5}$	17303319	-1.000×10^{-5}	2.040×10^{-4}	-9.543×10^{-6}	-1.872×10^{-2}	6.427×10^{-2}
fitted root mean square [1]	$(1.311 \pm 0.553) \times 10^{-3}$	17303319	9.750×10^{-4}	5.600×10^{-4}	1.151×10^{-3}	3.435×10^{-4}	6.503×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.868 ± 0.429	17303319	0.740	0.571	0.817	5.000×10^{-2}	2.94
sulfurdioxide total air mass factor polluted precision [1]	0.108 ± 0.112	17303319	3.500×10^{-2}	0.103	6.643×10^{-2}	2.877×10^{-3}	1.69
sulfurdioxide clear air mass factor polluted [1]	0.737 ± 0.293	17303319	0.740	0.391	0.716	5.144×10^{-2}	2.74
number of spectral points in retrieval [1]	73.4 ± 0.5	17303319	73.0	1.000	73.0	52.0	156

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	5.000×10^{-2}	0.120	0.220	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.26	−0.880	−0.541	−0.366	−0.217	0.247	0.408	0.604	0.995	2.67
sulfurdioxide total vertical column precision [DU]	0.106	0.141	0.167	0.191	0.223	0.566	0.750	0.971	1.44	3.40
sulfurdioxide slant column density corrected [DU]	−0.871	−0.504	−0.365	−0.273	−0.176	0.199	0.302	0.404	0.566	1.08
sulfurdioxide slant column density cobra [DU]	−0.871	−0.504	−0.365	−0.273	−0.176	0.199	0.302	0.404	0.566	1.08
sulfurdioxide slant column density cobra precision [DU]	0.148	0.173	0.186	0.197	0.212	0.353	0.405	0.457	0.549	0.793
sulfurdioxide slant column density window1 [DU]	−1.77	−0.928	−0.617	−0.417	−0.211	0.542	0.737	0.923	1.21	2.01
sulfurdioxide slant column density window1 precision [DU]	0.148	0.173	0.186	0.197	0.212	0.353	0.405	0.457	0.549	0.793
sulfurdioxide slant column density corrected win1 [DU]	−1.70	−0.985	−0.717	−0.538	−0.349	0.393	0.599	0.801	1.12	2.04
background so2 slant column offset window1 [DU]	−0.358	−0.291	−0.267	−0.248	−0.222	-6.143×10^{-2}	-3.929×10^{-3}	6.236×10^{-2}	0.171	0.420
sulfurdioxide slant column density window2 [DU]	−18.6	−11.9	−8.59	−6.10	−3.29	8.35	11.3	14.0	17.6	25.2
sulfurdioxide slant column density window2 precision [DU]	4.36	5.21	5.72	6.14	6.63	9.13	9.97	10.8	12.0	14.6
sulfurdioxide slant column density corrected win2 [DU]	−20.6	−13.7	−10.4	−7.88	−5.11	5.94	8.69	11.1	14.5	21.4
background so2 slant column offset window2 [DU]	−10.9	−8.74	−7.04	−5.54	−3.86	8.064×10^{-2}	0.393	0.632	0.983	2.80
sulfurdioxide slant column density window3 [DU]	−68.9	−49.2	−40.0	−33.5	−26.2	3.67	11.6	18.8	28.4	47.5
sulfurdioxide slant column density window3 precision [DU]	13.6	16.0	17.8	19.2	20.7	30.4	35.2	41.3	53.3	85.0
sulfurdioxide slant column density corrected win3 [DU]	−59.4	−39.6	−30.3	−23.6	−16.3	12.2	19.6	26.2	35.3	53.9
background so2 slant column offset window3 [DU]	−2.39	6.883×10^{-3}	1.01	1.86	3.14	14.5	16.5	17.9	19.8	22.6
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]	6.035×10^{-4}	1.100×10^{-3}	1.854×10^{-3}	3.914×10^{-3}	6.673×10^{-3}	2.373×10^{-2}	3.582×10^{-2}	6.008×10^{-2}	0.117	0.345
fitted radiance shift [nm]	-8.191×10^{-3}	-4.148×10^{-3}	-2.733×10^{-3}	-1.924×10^{-3}	-1.231×10^{-3}	5.399×10^{-4}	1.220×10^{-3}	2.084×10^{-3}	3.605×10^{-3}	7.851×10^{-3}
fitted radiance squeeze [1]	-5.142×10^{-4}	-3.053×10^{-4}	-2.235×10^{-4}	-1.694×10^{-4}	-1.134×10^{-4}	9.059×10^{-5}	1.415×10^{-4}	1.886×10^{-4}	2.557×10^{-4}	4.141×10^{-4}
fitted root mean square [1]	6.146×10^{-4}	7.535×10^{-4}	8.260×10^{-4}	8.825×10^{-4}	9.530×10^{-4}	1.513×10^{-3}	1.759×10^{-3}	2.005×10^{-3}	2.362×10^{-3}	3.335×10^{-3}
sulfurdioxide total air mass factor polluted [1]	9.260×10^{-2}	0.244	0.349	0.436	0.556	1.13	1.31	1.47	1.67	2.00
sulfurdioxide total air mass factor polluted precision [1]	1.087×10^{-2}	1.851×10^{-2}	2.460×10^{-2}	3.057×10^{-2}	3.821×10^{-2}	0.141	0.184	0.230	0.310	0.571
sulfurdioxide clear air mass factor polluted [1]	0.218	0.317	0.378	0.440	0.522	0.913	1.02	1.11	1.25	1.61
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]	0.603 ± 0.401	10676732	0.790	0.490	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(3.593 \pm 101.953) \times 10^{-2}$	10676732	0.473	1.028×10^{-2}	-51.6	66.7	-0.222	0.251
sulfurdioxide total vertical column precision [DU]	0.551 ± 0.736	10676732	0.374	0.339	4.597×10^{-2}	22.6	0.223	0.598
sulfurdioxide slant column density corrected [DU]	$(2.449 \pm 44.993) \times 10^{-2}$	10676732	0.375	8.877×10^{-3}	-11.6	52.4	-0.176	0.199
sulfurdioxide slant column density cobra [DU]	$(2.346 \pm 40.611) \times 10^{-2}$	10676732	0.375	8.877×10^{-3}	-11.6	21.1	-0.176	0.199
sulfurdioxide slant column density cobra precision [DU]	0.303 ± 0.140	10676732	0.150	0.260	8.723×10^{-2}	6.22	0.208	0.359
sulfurdioxide slant column density window1 [DU]	0.157 ± 0.738	10676732	0.756	0.169	-71.3	27.6	-0.214	0.542
sulfurdioxide slant column density window1 precision [DU]	0.303 ± 0.140	10676732	0.150	0.260	8.723×10^{-2}	6.22	0.208	0.359
sulfurdioxide slant column density corrected win1 [DU]	$(4.337 \pm 73.088) \times 10^{-2}$	10676732	0.746	1.807×10^{-2}	-71.3	27.8	-0.348	0.398
background so2 slant column offset window1 [DU]	-0.114 ± 0.170	10676732	0.173	-0.156	-0.786	2.63	-0.225	-5.167×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.18 ± 8.87	10676732	11.5	3.01	-1.061×10^{3}	184	-2.64	8.82
sulfurdioxide slant column density window2 precision [DU]	7.74 ± 2.01	10676732	2.29	7.45	2.30	439	6.41	8.71
sulfurdioxide slant column density corrected win2 [DU]	0.300 ± 8.297	10676732	10.6	0.346	-1.072×10^{3}	175	-5.00	5.65
background so2 slant column offset window2 [DU]	-2.88 ± 3.56	10676732	5.58	-1.99	-16.7	10.8	-5.44	0.133
sulfurdioxide slant column density window3 [DU]	-12.6 ± 22.5	10676732	28.3	-13.1	-198	147	-26.9	1.36
sulfurdioxide slant column density window3 precision [DU]	26.4 ± 12.6	10676732	8.03	23.0	9.54	242	19.9	28.0
sulfurdioxide slant column density corrected win3 [DU]	-2.11 ± 21.56	10676732	26.9	-2.03	-195	148	-15.5	11.4
background so2 slant column offset window3 [DU]	10.5 ± 7.0	10676732	12.6	11.7	-16.0	43.5	3.59	16.2
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	10676732	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.832 \pm 9.638) \times 10^{-2}$	10676732	2.757×10^{-2}	1.307×10^{-2}	2.296×10^{-4}	3.74	4.114×10^{-3}	3.169×10^{-2}
fitted radiance shift [nm]	$(-1.852 \pm 24.599) \times 10^{-4}$	10676732	1.577×10^{-3}	-1.969×10^{-4}	-4.336×10^{-2}	4.124×10^{-2}	-1.004×10^{-3}	5.740×10^{-4}
fitted radiance squeeze [1]	$(-3.324 \pm 17.981) \times 10^{-5}$	10676732	2.030×10^{-4}	-2.180×10^{-5}	-1.512×10^{-2}	1.115×10^{-2}	-1.273×10^{-4}	7.578×10^{-5}
fitted root mean square [1]	$(1.324 \pm 0.591) \times 10^{-3}$	10676732	5.913×10^{-4}	1.144×10^{-3}	3.435×10^{-4}	5.633×10^{-2}	9.408×10^{-4}	1.532×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.866 ± 0.459	10676732	0.639	0.801	5.000×10^{-2}	2.94	0.513	1.15
sulfurdioxide total air mass factor polluted precision [1]	0.111 ± 0.126	10676732	0.104	6.653×10^{-2}	2.877×10^{-3}	1.69	3.641×10^{-2}	0.141
sulfurdioxide clear air mass factor polluted [1]	0.726 ± 0.332	10676732	0.468	0.684	5.144×10^{-2}	2.74	0.462	0.930
number of spectral points in retrieval [1]	73.5 ± 0.5	10676732	1.000	73.0	52.0	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]	0.686 ± 0.394	6626587	0.730	1.000	0.0	1.000	0.270	1.000
sulfurdioxide total vertical column [DU]	$(2.987 \pm 118.587) \times 10^{-2}$	6626587	0.450	1.280×10^{-2}	-91.2	1.780×10^{3}	-0.210	0.240
sulfurdioxide total vertical column precision [DU]	0.473 ± 0.603	6626587	0.299	0.320	4.535×10^{-2}	122	0.223	0.522
sulfurdioxide slant column density corrected [DU]	$(2.004 \pm 43.433) \times 10^{-2}$	6626587	0.375	1.135×10^{-2}	-42.0	247	-0.175	0.201
sulfurdioxide slant column density cobra [DU]	$(1.951 \pm 36.147) \times 10^{-2}$	6626587	0.375	1.135×10^{-2}	-42.0	56.6	-0.175	0.201
sulfurdioxide slant column density cobra precision [DU]	0.296 ± 0.122	6626587	0.126	0.262	9.633×10^{-2}	27.4	0.217	0.343
sulfurdioxide slant column density window1 [DU]	0.168 ± 0.668	6626587	0.747	0.170	-36.8	103	-0.206	0.541
sulfurdioxide slant column density window1 precision [DU]	0.296 ± 0.122	6626587	0.126	0.262	9.633×10^{-2}	27.4	0.217	0.343
sulfurdioxide slant column density corrected win1 [DU]	$(2.907 \pm 66.329) \times 10^{-2}$	6626587	0.736	1.348×10^{-2}	-36.8	103	-0.350	0.386
background so2 slant column offset window1 [DU]	-0.138 ± 0.122	6626587	0.143	-0.155	-1.32	1.56	-0.218	-7.570×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.70 ± 9.44	6626587	11.8	1.54	-889	1.105×10^{3}	-4.31	7.52
sulfurdioxide slant column density window2 precision [DU]	8.58 ± 2.41	6626587	2.69	8.26	2.29	573	7.06	9.75
sulfurdioxide slant column density corrected win2 [DU]	0.596 ± 9.357	6626587	11.7	0.569	-889	1.105×10^{3}	-5.30	6.45
background so2 slant column offset window2 [DU]	-1.10 ± 1.82	6626587	2.04	-0.725	-12.4	10.5	-2.02	2.426×10^{-2}
sulfurdioxide slant column density window3 [DU]	-8.82 ± 25.33	6626587	32.0	-8.75	-2.085×10^{3}	449	-24.7	7.34
sulfurdioxide slant column density window3 precision [DU]	30.6 ± 14.0	6626587	10.9	26.9	9.98	270	22.7	33.6
sulfurdioxide slant column density corrected win3 [DU]	-2.11 ± 24.90	6626587	31.6	-2.20	-2.080×10^{3}	456	-17.8	13.7
background so2 slant column offset window3 [DU]	6.72 ± 5.14	6626587	7.79	5.59	-13.2	24.5	2.77	10.6
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	6626587	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.834 \pm 4.147) \times 10^{-2}$	6626587	9.562×10^{-3}	1.205×10^{-2}	1.279×10^{-3}	2.90	8.311×10^{-3}	1.787×10^{-2}
fitted radiance shift [nm]	$(-5.231 \pm 27.765) \times 10^{-4}$	6626587	2.074×10^{-3}	-5.159×10^{-4}	-3.995×10^{-2}	0.110	-1.609×10^{-3}	4.641×10^{-4}
fitted radiance squeeze [1]	$(1.354 \pm 17.581) \times 10^{-5}$	6626587	2.054×10^{-4}	1.059×10^{-5}	-1.872×10^{-2}	6.427×10^{-2}	-9.095×10^{-5}	1.145×10^{-4}
fitted root mean square [1]	$(1.289 \pm 0.485) \times 10^{-3}$	6626587	5.116×10^{-4}	1.162×10^{-3}	3.603×10^{-4}	6.503×10^{-2}	9.736×10^{-4}	1.485×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.873 ± 0.376	6626587	0.477	0.838	5.000×10^{-2}	2.75	0.621	1.10
sulfurdioxide total air mass factor polluted precision [1]	0.101 ± 0.087	6626587	0.101	6.625×10^{-2}	3.674×10^{-3}	1.52	4.062×10^{-2}	0.142
sulfurdioxide clear air mass factor polluted [1]	0.755 ± 0.212	6626587	0.288	0.740	0.109	2.04	0.605	0.893
number of spectral points in retrieval [1]	73.4 ± 0.5	6626587	1.000	73.0	52.0	156	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]	0.660 ± 0.398	11432012	0.770	1.000	0.0	1.000	0.230	1.000
sulfurdioxide total vertical column [DU]	$(2.683 \pm 93.922) \times 10^{-2}$	11432012	0.443	1.013×10^{-2}	-91.2	122	-0.209	0.234
sulfurdioxide total vertical column precision [DU]	0.485 ± 0.655	11432012	0.302	0.313	5.790×10^{-2}	50.3	0.219	0.521
sulfurdioxide slant column density corrected [DU]	$(1.717 \pm 36.381) \times 10^{-2}$	11432012	0.367	8.917×10^{-3}	-42.0	55.7	-0.173	0.194
sulfurdioxide slant column density cobra [DU]	$(1.709 \pm 35.904) \times 10^{-2}$	11432012	0.367	8.917×10^{-3}	-42.0	29.2	-0.173	0.194
sulfurdioxide slant column density cobra precision [DU]	0.296 ± 0.133	11432012	0.144	0.252	8.723×10^{-2}	14.8	0.207	0.351
sulfurdioxide slant column density window1 [DU]	0.155 ± 0.687	11432012	0.741	0.169	-37.8	103	-0.207	0.535
sulfurdioxide slant column density window1 precision [DU]	0.296 ± 0.133	11432012	0.144	0.252	8.723×10^{-2}	14.8	0.207	0.351
sulfurdioxide slant column density corrected win1 [DU]	$(2.827 \pm 67.927) \times 10^{-2}$	11432012	0.731	1.272×10^{-2}	-37.8	103	-0.348	0.383
background so2 slant column offset window1 [DU]	-0.127 ± 0.147	11432012	0.157	-0.158	-1.32	2.63	-0.222	-6.496×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.31 ± 9.05	11432012	11.5	2.10	-766	748	-3.57	7.96
sulfurdioxide slant column density window2 precision [DU]	8.04 ± 2.13	11432012	2.51	7.73	2.29	536	6.63	9.13
sulfurdioxide slant column density corrected win2 [DU]	0.448 ± 8.699	11432012	11.1	0.455	-766	747	-5.09	5.98
background so2 slant column offset window2 [DU]	-1.86 ± 2.99	11432012	3.21	-0.896	-16.7	10.8	-3.06	0.156
sulfurdioxide slant column density window3 [DU]	-8.27 ± 23.86	11432012	30.4	-8.74	-1.460×10^{3}	449	-23.6	6.80
sulfurdioxide slant column density window3 precision [DU]	27.3 ± 11.9	11432012	9.10	24.2	9.54	235	20.8	29.9
sulfurdioxide slant column density corrected win3 [DU]	$(-1.166 \pm 2280.025) \times 10^{-2}$	11432012	28.8	-0.269	-1.455×10^{3}	456	-14.5	14.3
background so2 slant column offset window3 [DU]	8.26 ± 6.46	11432012	10.7	7.34	-16.0	43.5	2.74	13.4
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	11432012	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.016 \pm 4.388) \times 10^{-2}$	11432012	1.260×10^{-2}	1.232×10^{-2}	2.962×10^{-4}	3.63	7.564×10^{-3}	2.016×10^{-2}
fitted radiance shift [nm]	$(-3.523 \pm 23.504) \times 10^{-4}$	11432012	1.757×10^{-3}	-3.203×10^{-4}	-3.995×10^{-2}	3.789×10^{-2}	-1.256×10^{-3}	5.004×10^{-4}
fitted radiance squeeze [1]	$(-8.453 \pm 177.259) \times 10^{-6}$	11432012	2.005×10^{-4}	-3.597×10^{-6}	-1.796×10^{-2}	1.625×10^{-2}	-1.052×10^{-4}	9.523×10^{-5}
fitted root mean square [1]	$(1.298 \pm 0.551) \times 10^{-3}$	11432012	5.818×10^{-4}	1.123×10^{-3}	3.435×10^{-4}	4.909×10^{-2}	9.357×10^{-4}	1.518×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.876 ± 0.389	11432012	0.501	0.843	5.000×10^{-2}	2.58	0.612	1.11
sulfurdioxide total air mass factor polluted precision [1]	0.101 ± 0.098	11432012	9.104×10^{-2}	6.614×10^{-2}	3.078×10^{-3}	1.52	4.094×10^{-2}	0.132
sulfurdioxide clear air mass factor polluted [1]	0.755 ± 0.258	11432012	0.342	0.745	6.453×10^{-2}	2.62	0.574	0.917
number of spectral points in retrieval [1]	73.4 ± 0.5	11432012	1.000	73.0	52.0	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]	0.632 ± 0.405	4106910	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(3.481 \pm 98.613) \times 10^{-2}$	4106910	0.494	1.226×10^{-2}	-51.6	197	-0.229	0.265
sulfurdioxide total vertical column precision [DU]	0.557 ± 0.688	4106910	0.392	0.365	4.535×10^{-2}	122	0.233	0.626
sulfurdioxide slant column density corrected [DU]	$(2.479 \pm 45.316) \times 10^{-2}$	4106910	0.374	1.038×10^{-2}	-24.6	247	-0.174	0.199
sulfurdioxide slant column density cobra [DU]	$(2.409 \pm 38.108) \times 10^{-2}$	4106910	0.374	1.038×10^{-2}	-24.6	56.6	-0.174	0.199
sulfurdioxide slant column density cobra precision [DU]	0.295 ± 0.127	4106910	0.121	0.262	9.278×10^{-2}	27.4	0.216	0.337
sulfurdioxide slant column density window1 [DU]	0.186 ± 0.688	4106910	0.742	0.185	-36.8	66.1	-0.187	0.555
sulfurdioxide slant column density window1 precision [DU]	0.295 ± 0.127	4106910	0.121	0.262	9.278×10^{-2}	27.4	0.216	0.337
sulfurdioxide slant column density corrected win1 [DU]	$(4.516 \pm 68.212) \times 10^{-2}$	4106910	0.731	2.089×10^{-2}	-36.8	66.6	-0.338	0.393
background so2 slant column offset window1 [DU]	-0.141 ± 0.145	4106910	0.150	-0.170	-0.991	2.29	-0.233	-8.314×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.52 ± 9.20	4106910	11.7	2.46	-889	933	-3.37	8.34
sulfurdioxide slant column density window2 precision [DU]	8.18 ± 2.40	4106910	2.50	7.84	2.31	458	6.71	9.21
sulfurdioxide slant column density corrected win2 [DU]	0.347 ± 8.823	4106910	11.1	0.359	-889	932	-5.20	5.90
background so2 slant column offset window2 [DU]	-2.18 ± 3.06	4106910	4.09	-1.16	-16.6	10.8	-4.00	8.232×10^{-2}
sulfurdioxide slant column density window3 [DU]	-16.6 ± 23.0	4106910	28.6	-16.4	-2.085×10^{3}	166	-30.7	-2.15
sulfurdioxide slant column density window3 precision [DU]	30.3 ± 16.5	4106910	11.9	25.4	9.90	270	20.9	32.8
sulfurdioxide slant column density corrected win3 [DU]	-7.26 ± 23.17	4106910	28.8	-6.55	-2.080×10^{3}	174	-21.3	7.49
background so2 slant column offset window3 [DU]	9.30 ± 6.56	4106910	11.5	9.21	-16.0	42.8	3.38	14.9
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.14	4106910	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.585 \pm 12.619) \times 10^{-2}$	4106910	4.223×10^{-2}	1.563×10^{-2}	2.296×10^{-4}	3.74	6.432×10^{-3}	4.866×10^{-2}
fitted radiance shift [nm]	$(-2.129 \pm 31.895) \times 10^{-4}$	4106910	1.861×10^{-3}	-2.409×10^{-4}	-4.336×10^{-2}	0.110	-1.180×10^{-3}	6.809×10^{-4}
fitted radiance squeeze [1]	$(-1.889 \pm 17.737) \times 10^{-5}$	4106910	2.040×10^{-4}	-1.392×10^{-5}	-1.872×10^{-2}	6.427×10^{-2}	-1.175×10^{-4}	8.651×10^{-5}
fitted root mean square [1]	$(1.278 \pm 0.509) \times 10^{-3}$	4106910	4.641×10^{-4}	1.154×10^{-3}	3.694×10^{-4}	6.503×10^{-2}	9.688×10^{-4}	1.433×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.842 ± 0.486	4106910	0.662	0.731	5.000×10^{-2}	2.82	0.472	1.13
sulfurdioxide total air mass factor polluted precision [1]	0.123 ± 0.137	4106910	0.138	6.767×10^{-2}	3.674×10^{-3}	1.69	3.099×10^{-2}	0.169
sulfurdioxide clear air mass factor polluted [1]	0.693 ± 0.329	4106910	0.423	0.615	7.702×10^{-2}	2.74	0.450	0.873
number of spectral points in retrieval [1]	73.4 ± 0.5	4106910	1.000	73.0	52.0	156	73.0	74.0

3 Granule outlines

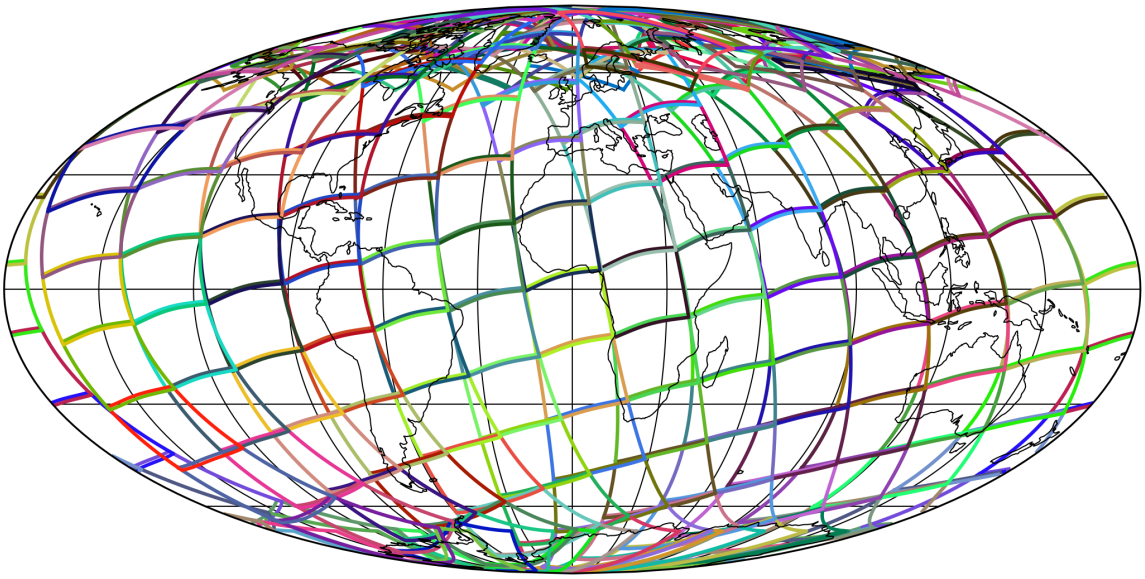

Figure 1: Outline of the granules.

4 Input data monitoring

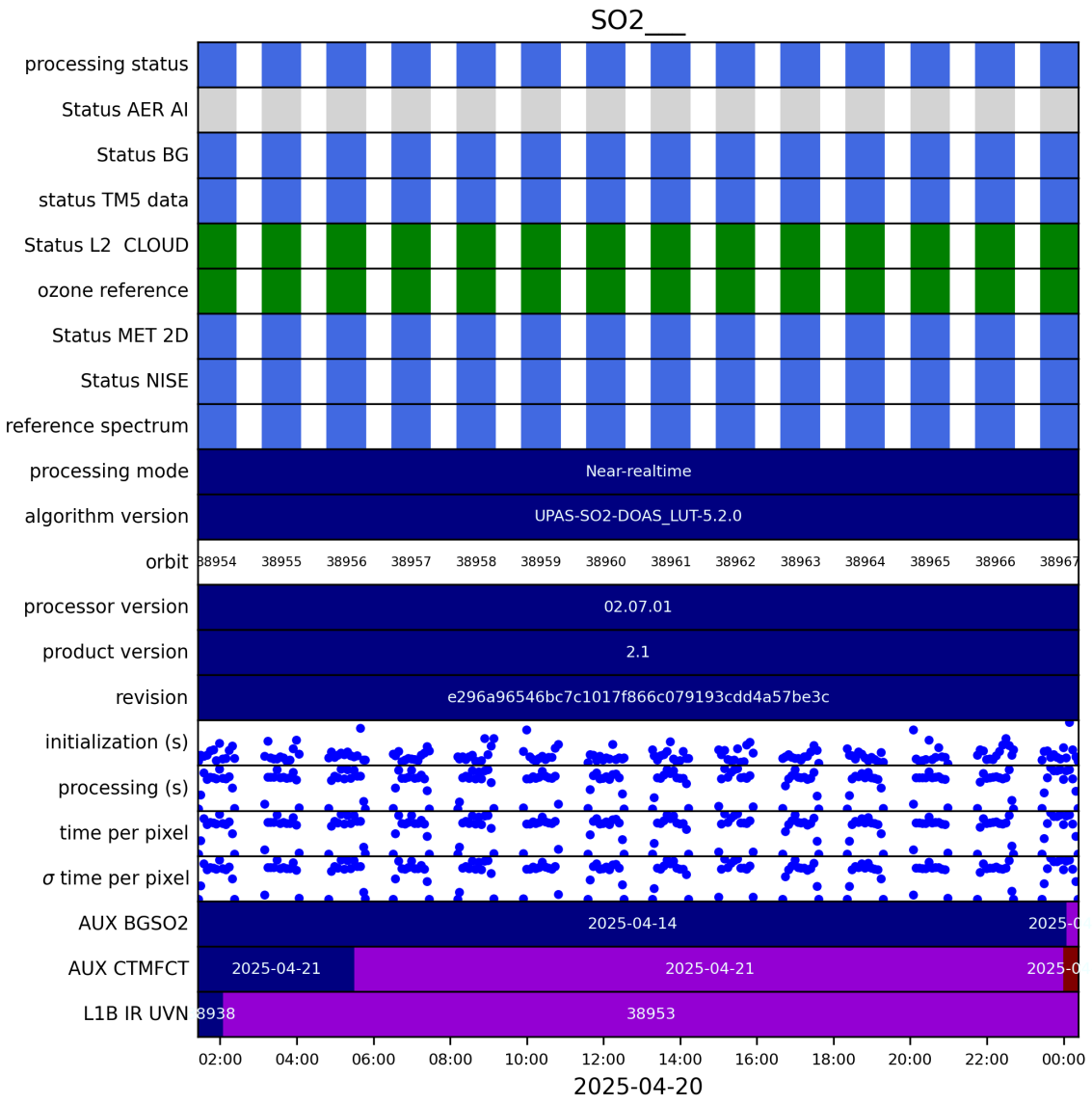

Figure 2: Input data per granule

5 Warnings and errors

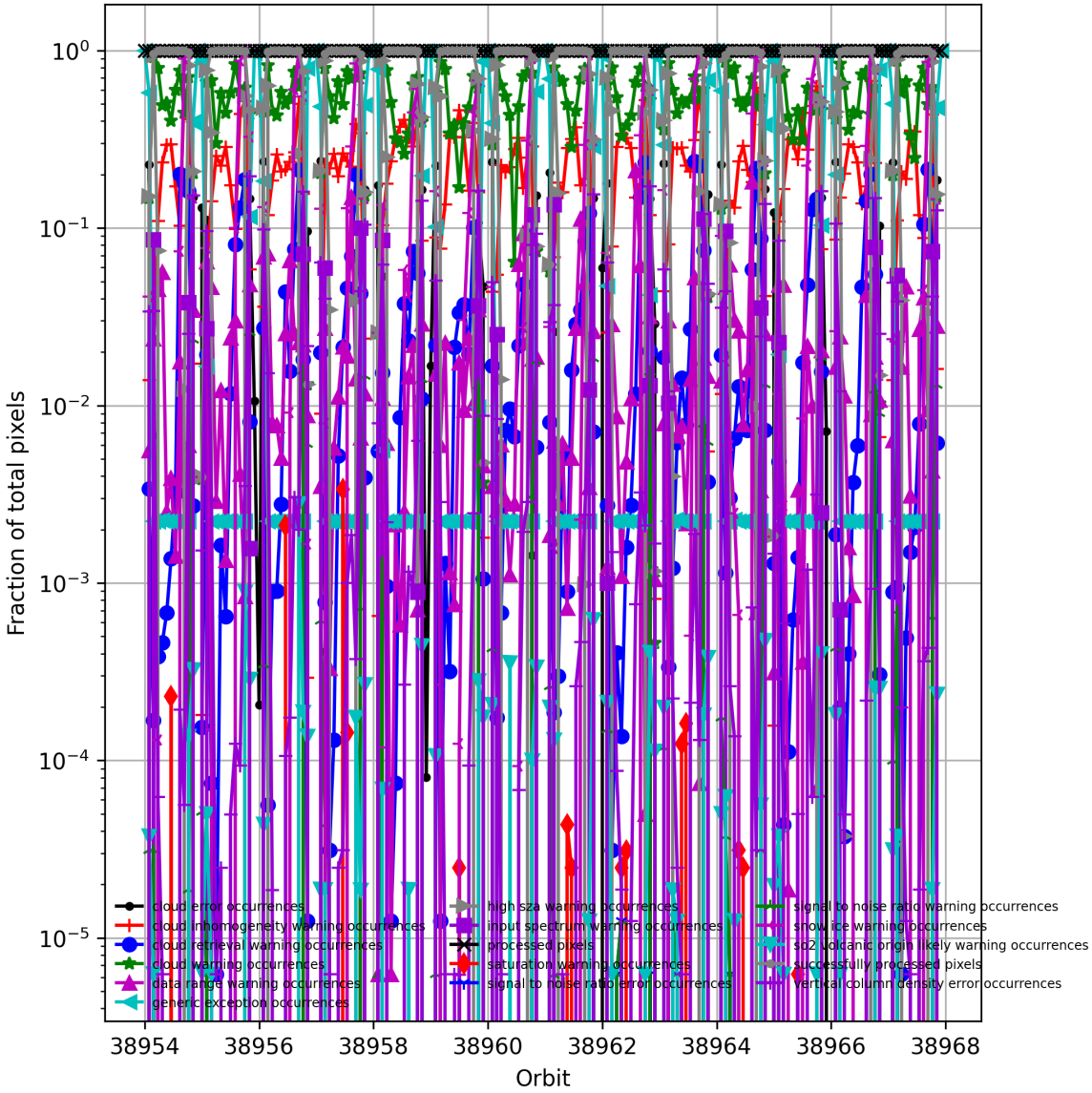

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

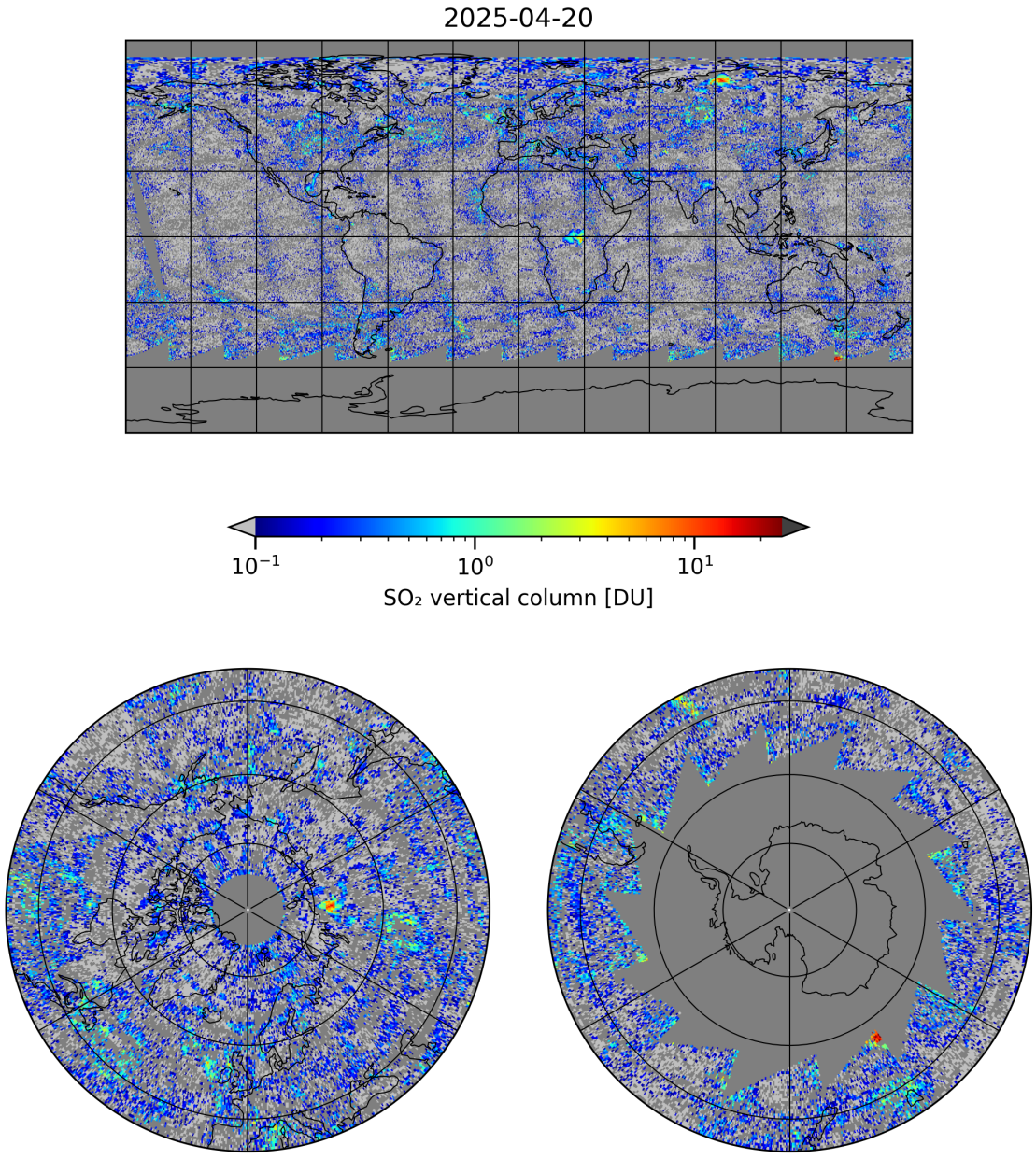

Figure 4: Map of "SO_2 vertical column" for 2025-04-20 to 2025-04-21

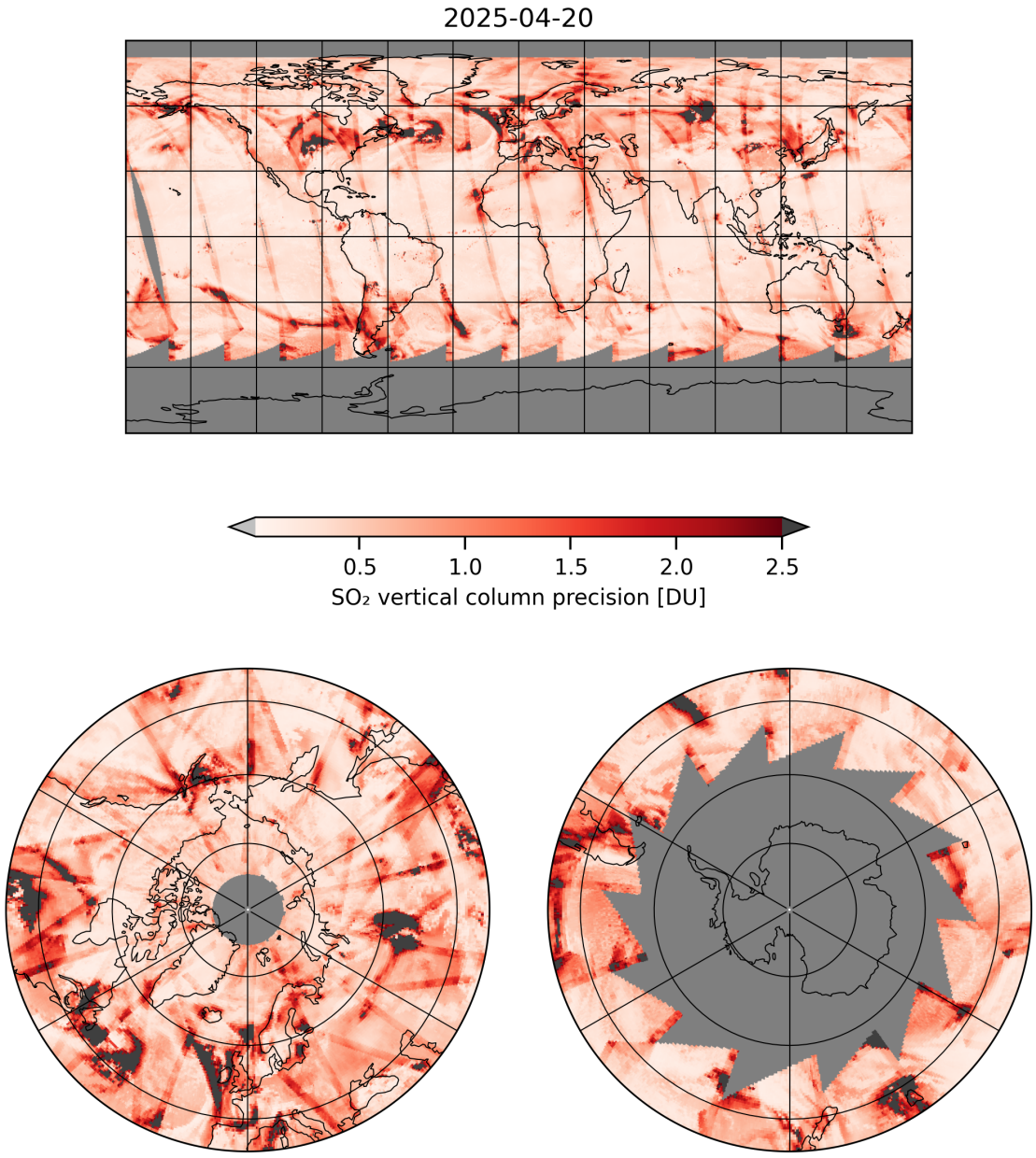

Figure 5: Map of "SO_2 vertical column precision" for 2025-04-20 to 2025-04-21

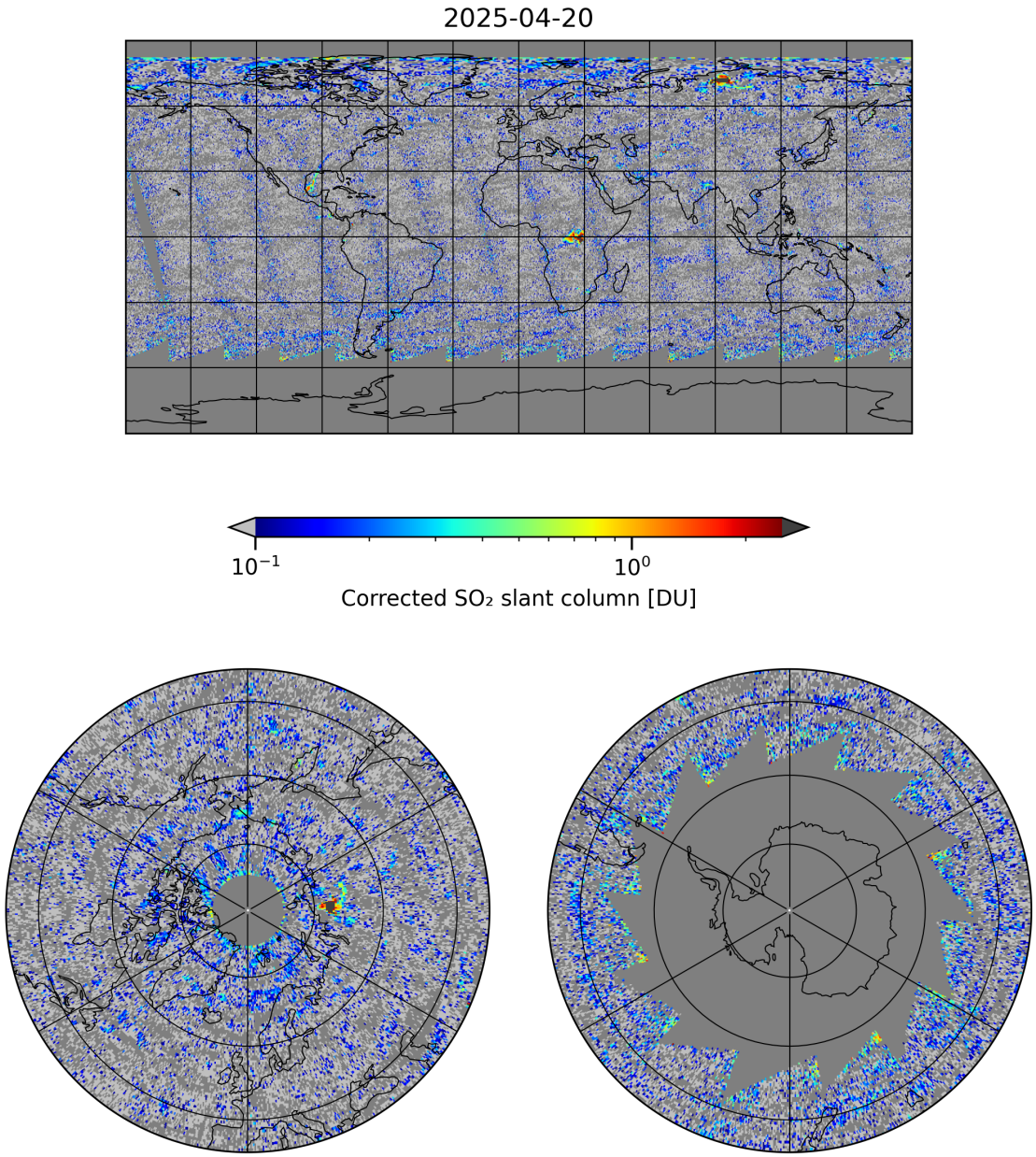

Figure 6: Map of “Corrected SO_2 slant column” for 2025-04-20 to 2025-04-21

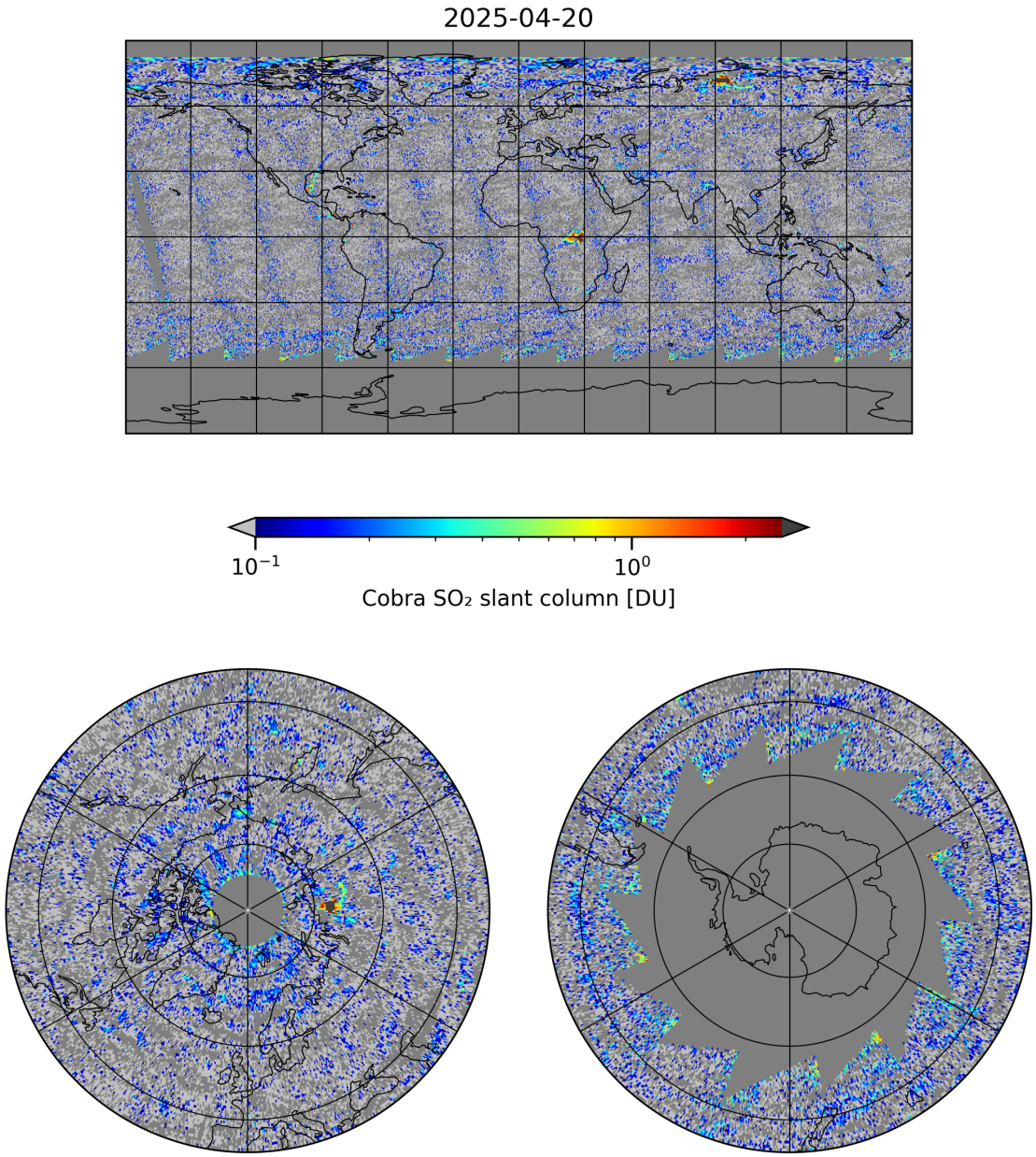

Figure 7: Map of “Cobra SO_2 slant column” for 2025-04-20 to 2025-04-21

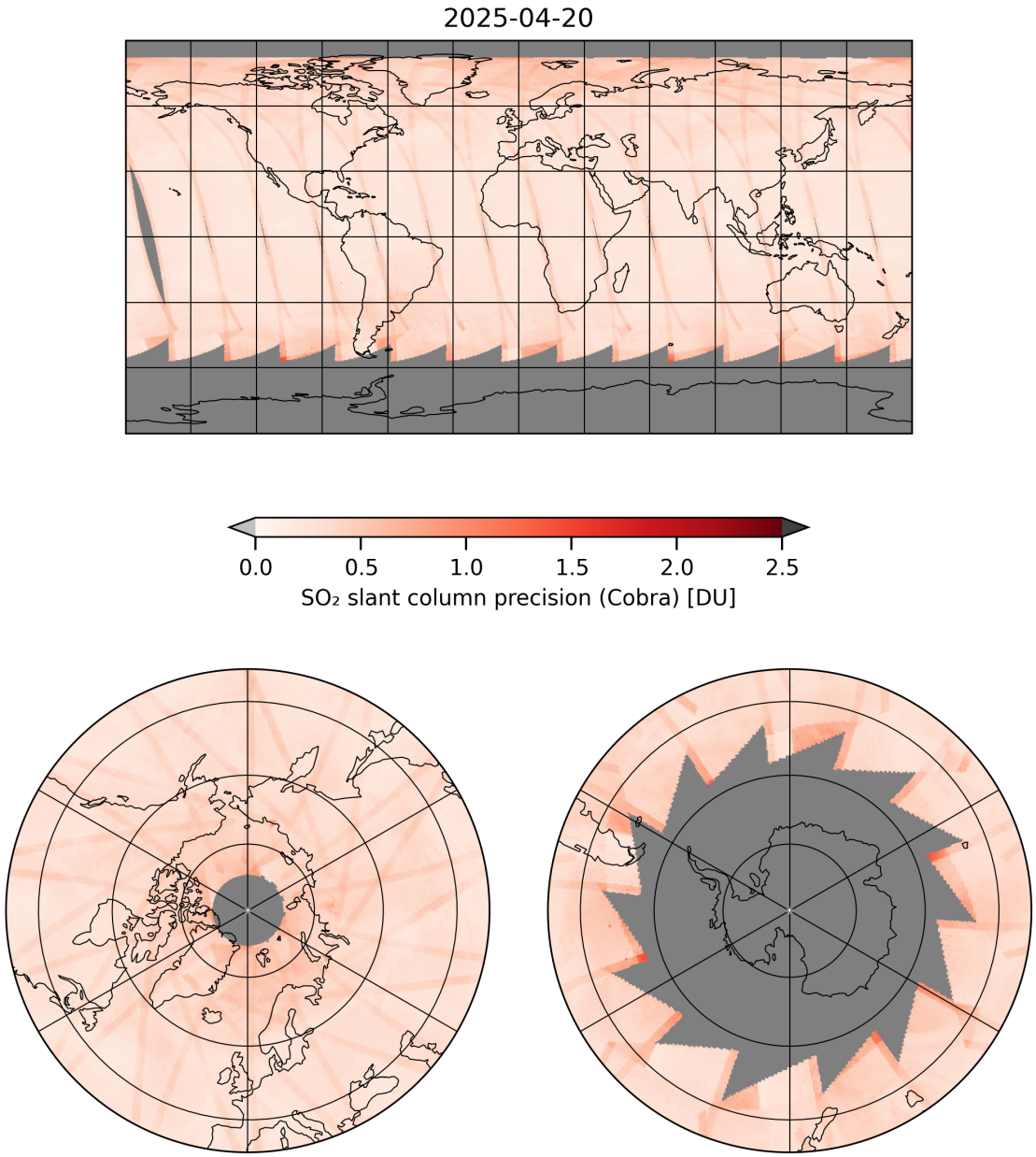

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-04-20 to 2025-04-21

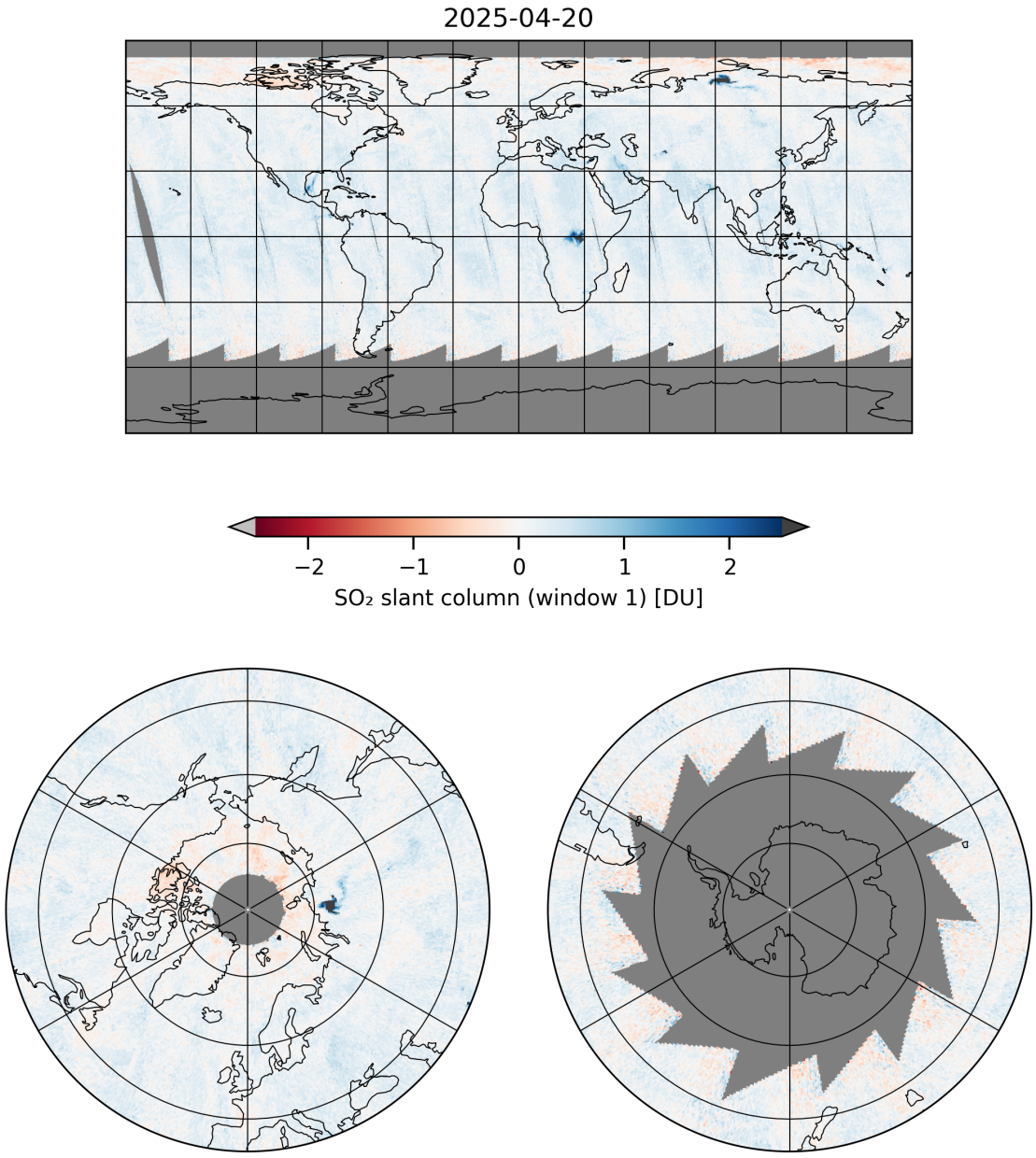

Figure 9: Map of "SO_2 slant column (window 1)" for 2025-04-20 to 2025-04-21

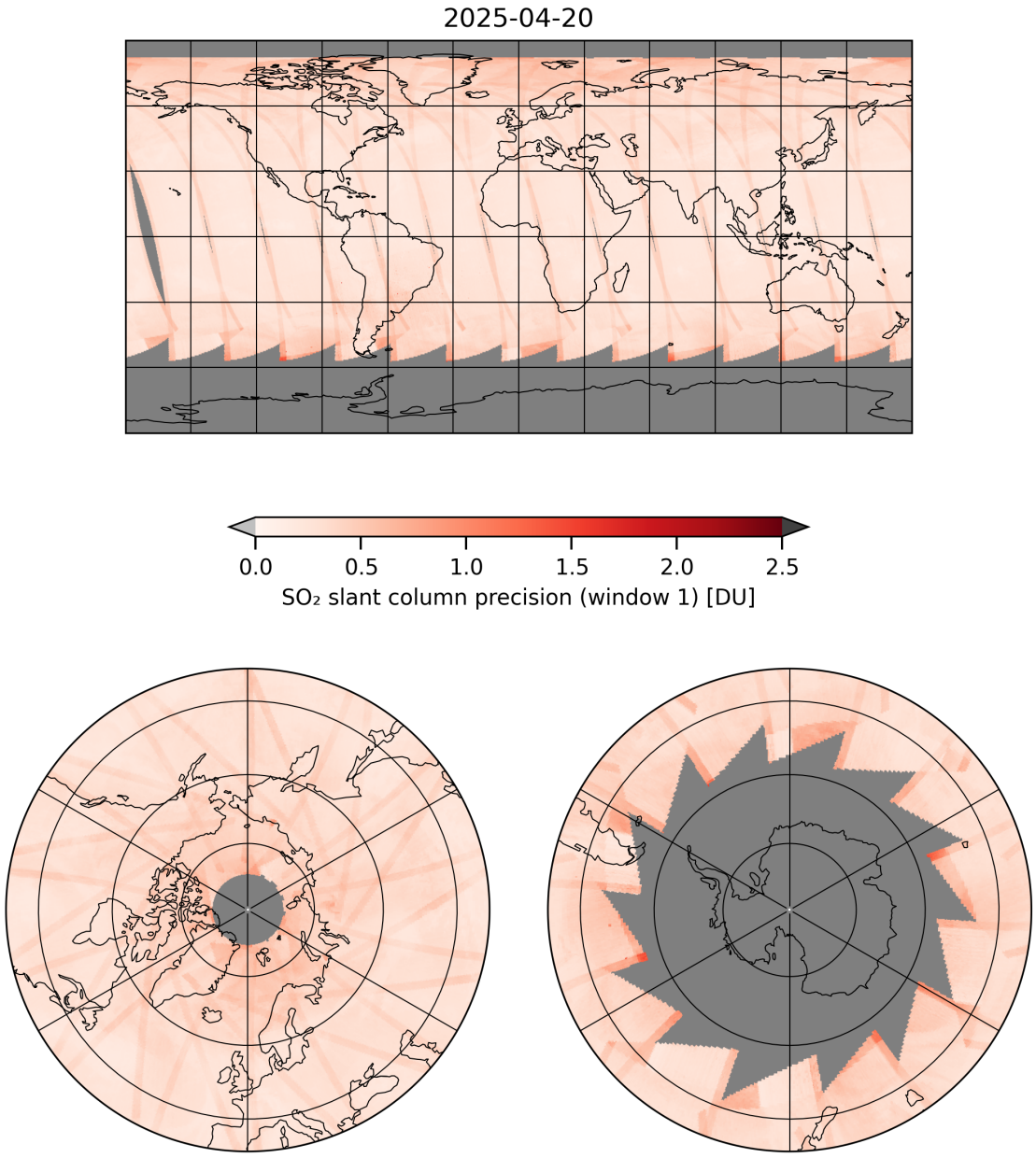

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-04-20 to 2025-04-21

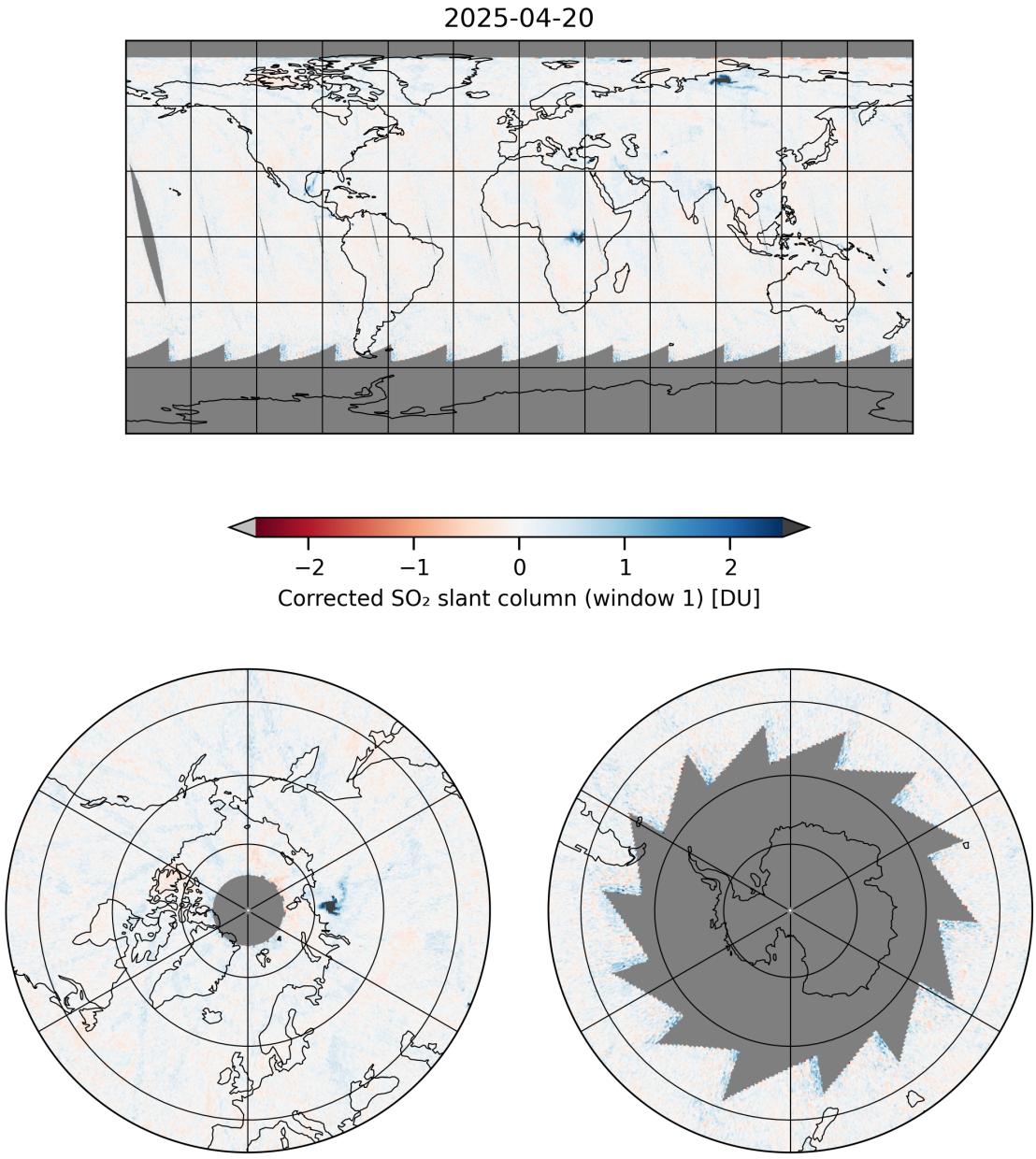

Figure 11: Map of "Corrected SO_2 slant column (window 1)" for 2025-04-20 to 2025-04-21

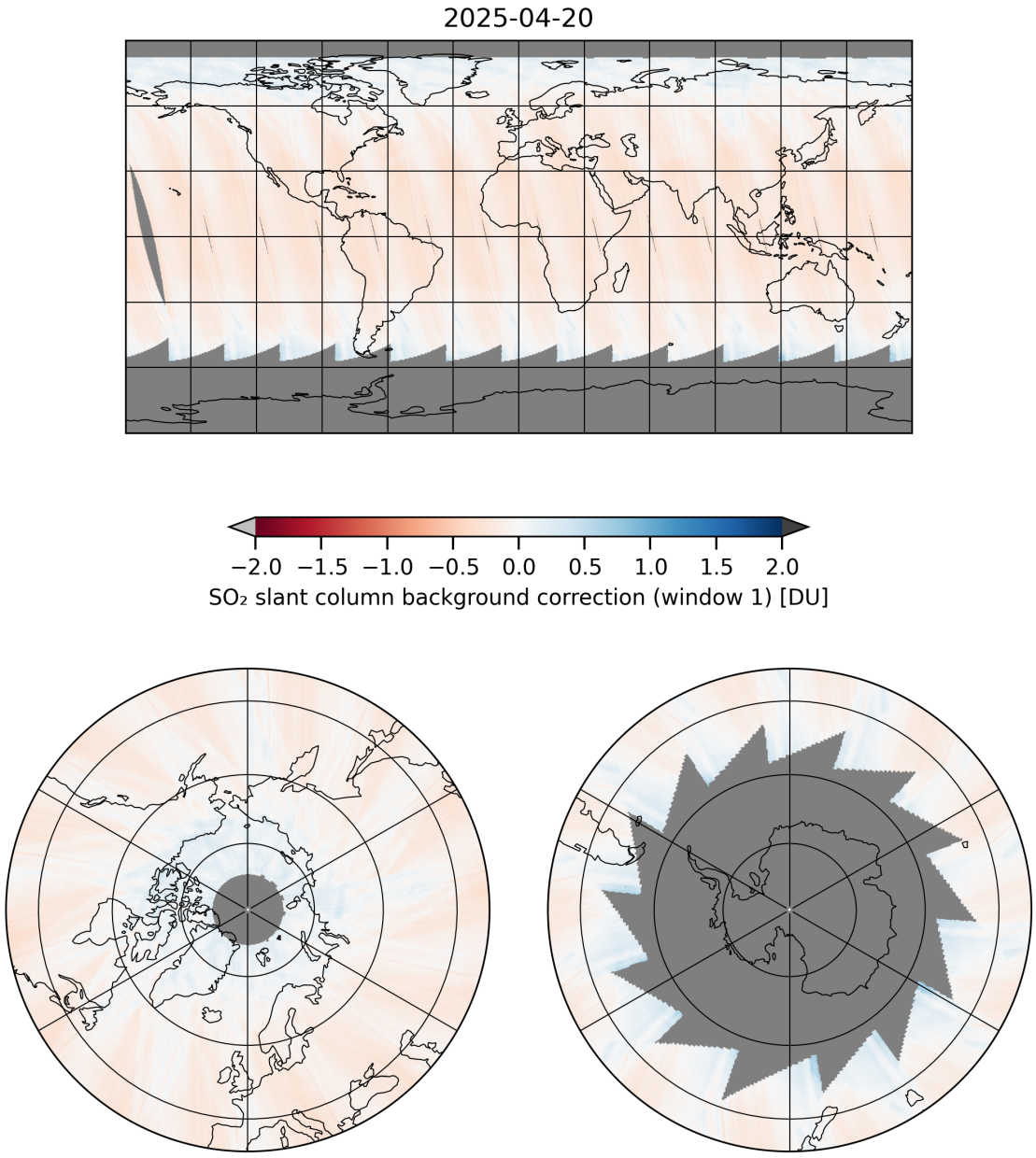

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-04-20 to 2025-04-21

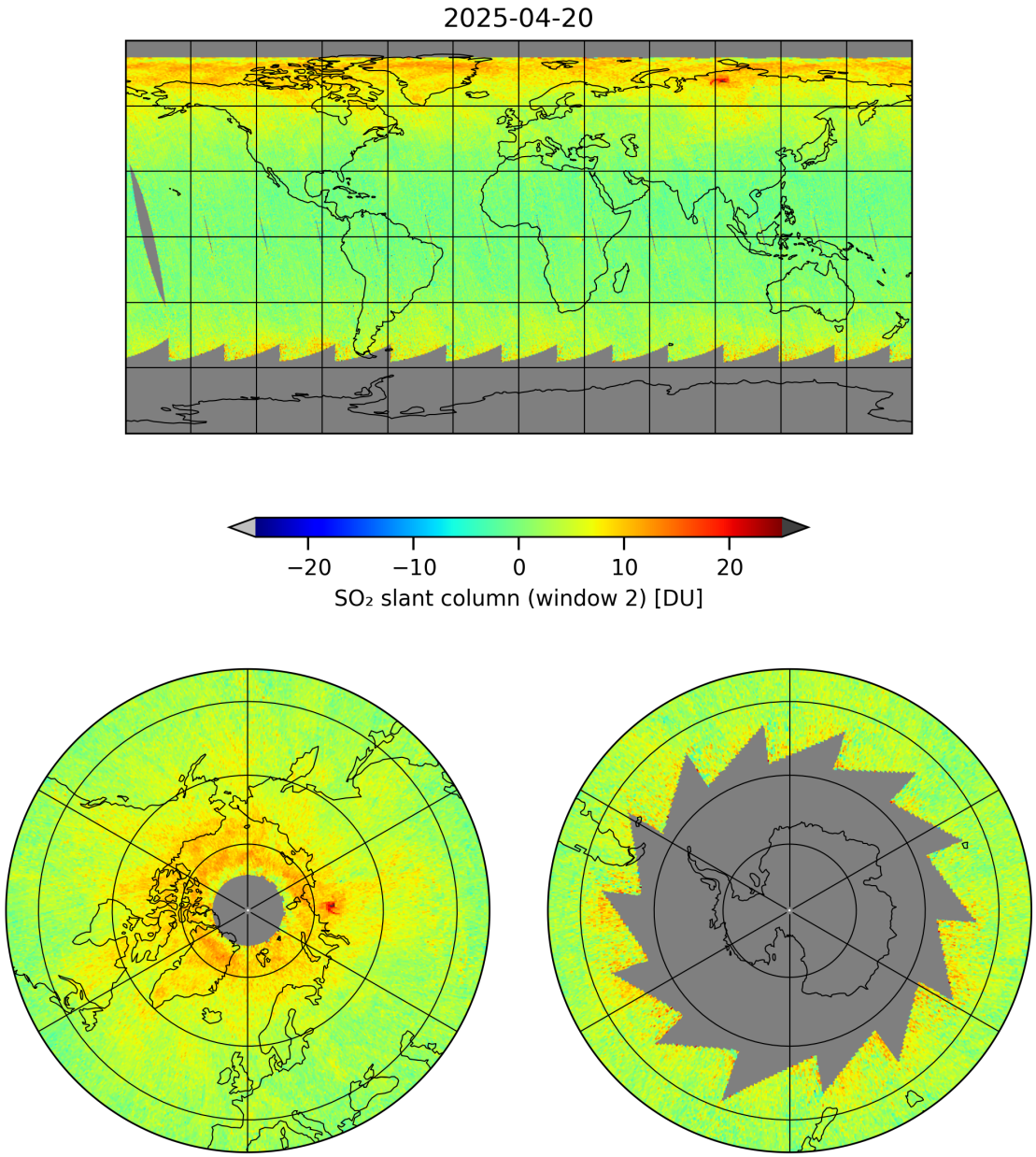

Figure 13: Map of "SO_2 slant column (window 2)" for 2025-04-20 to 2025-04-21

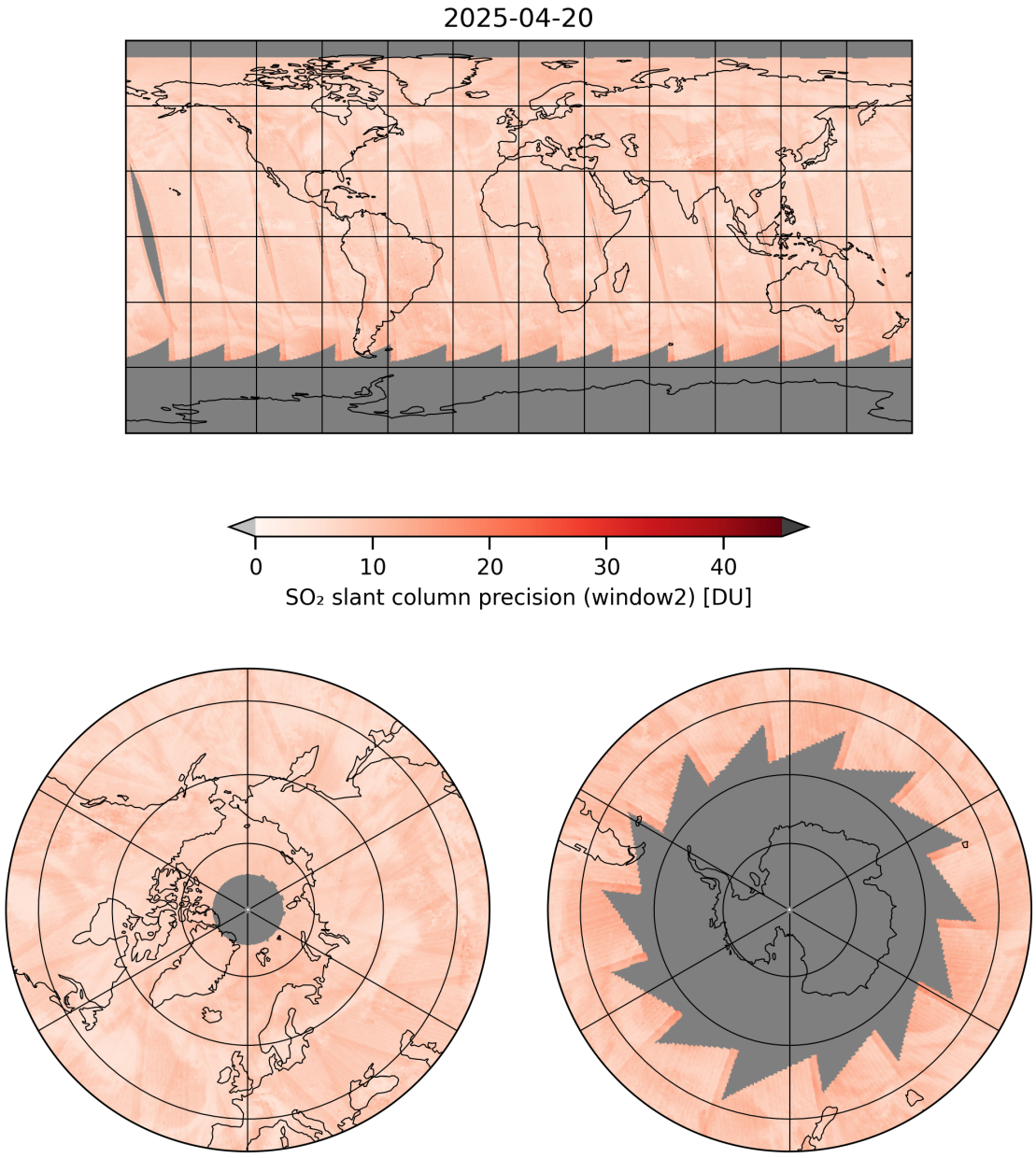

Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-04-20 to 2025-04-21

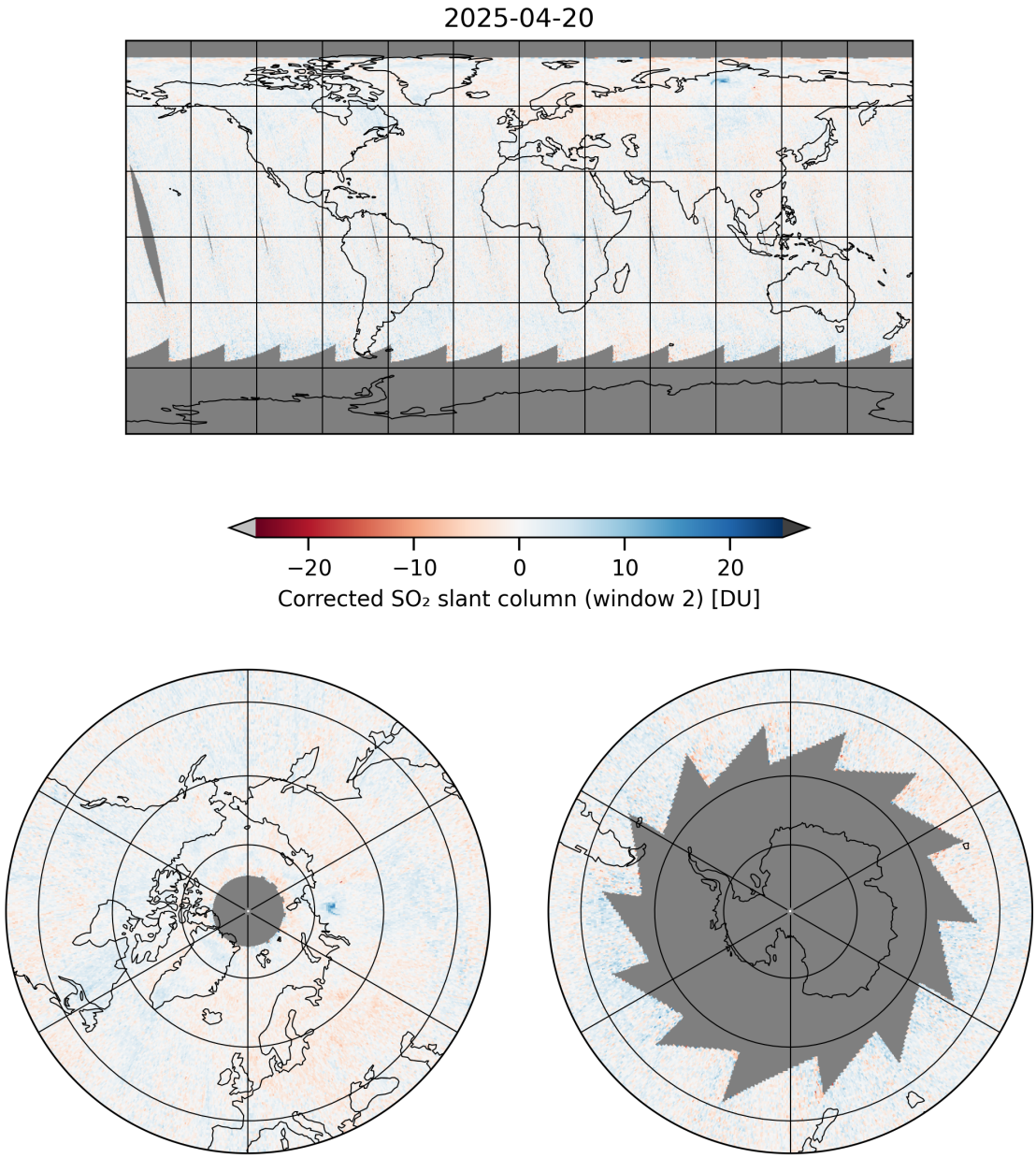

Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2025-04-20 to 2025-04-21

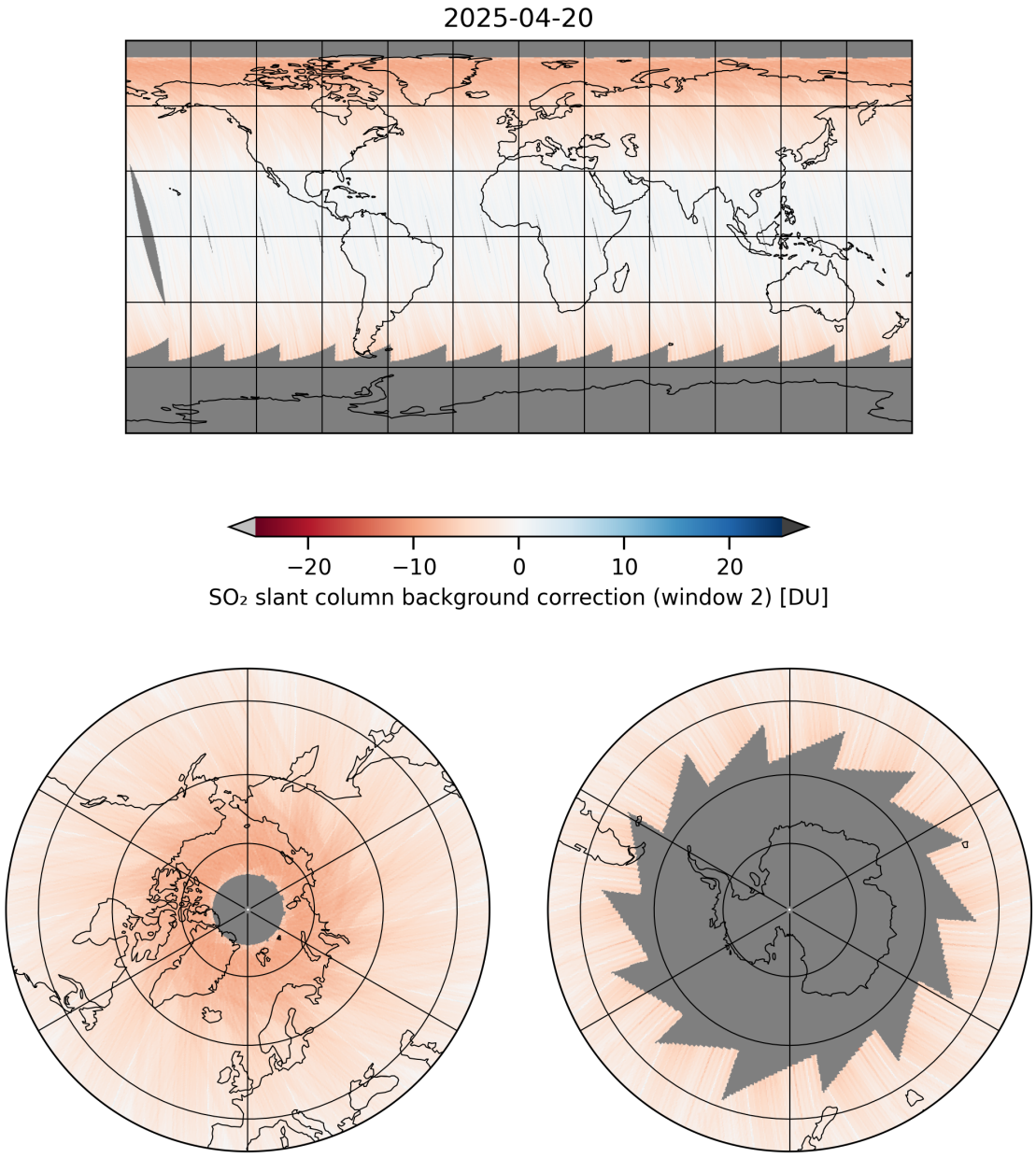

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-04-20 to 2025-04-21

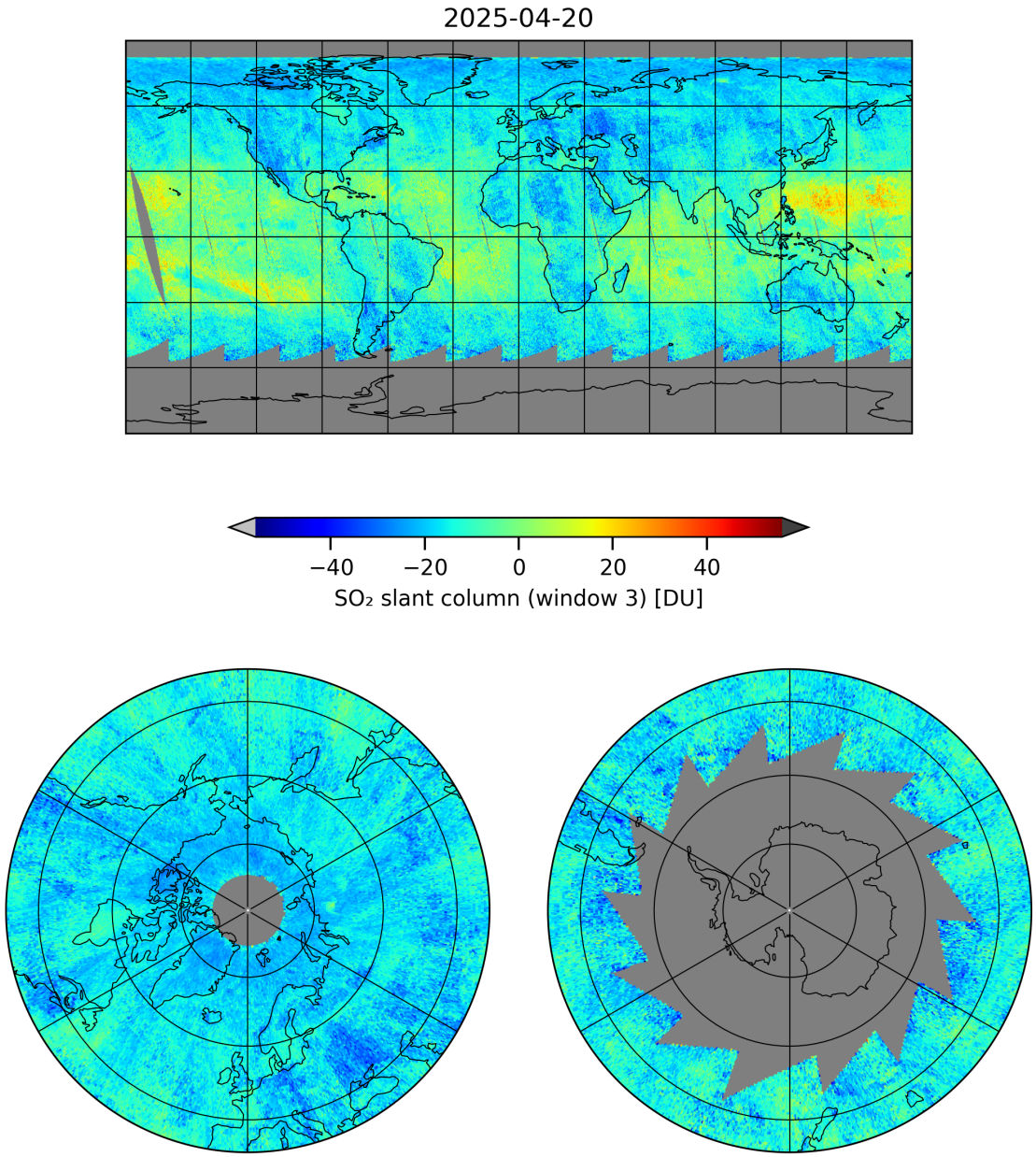

Figure 17: Map of "SO_2 slant column (window 3)" for 2025-04-20 to 2025-04-21

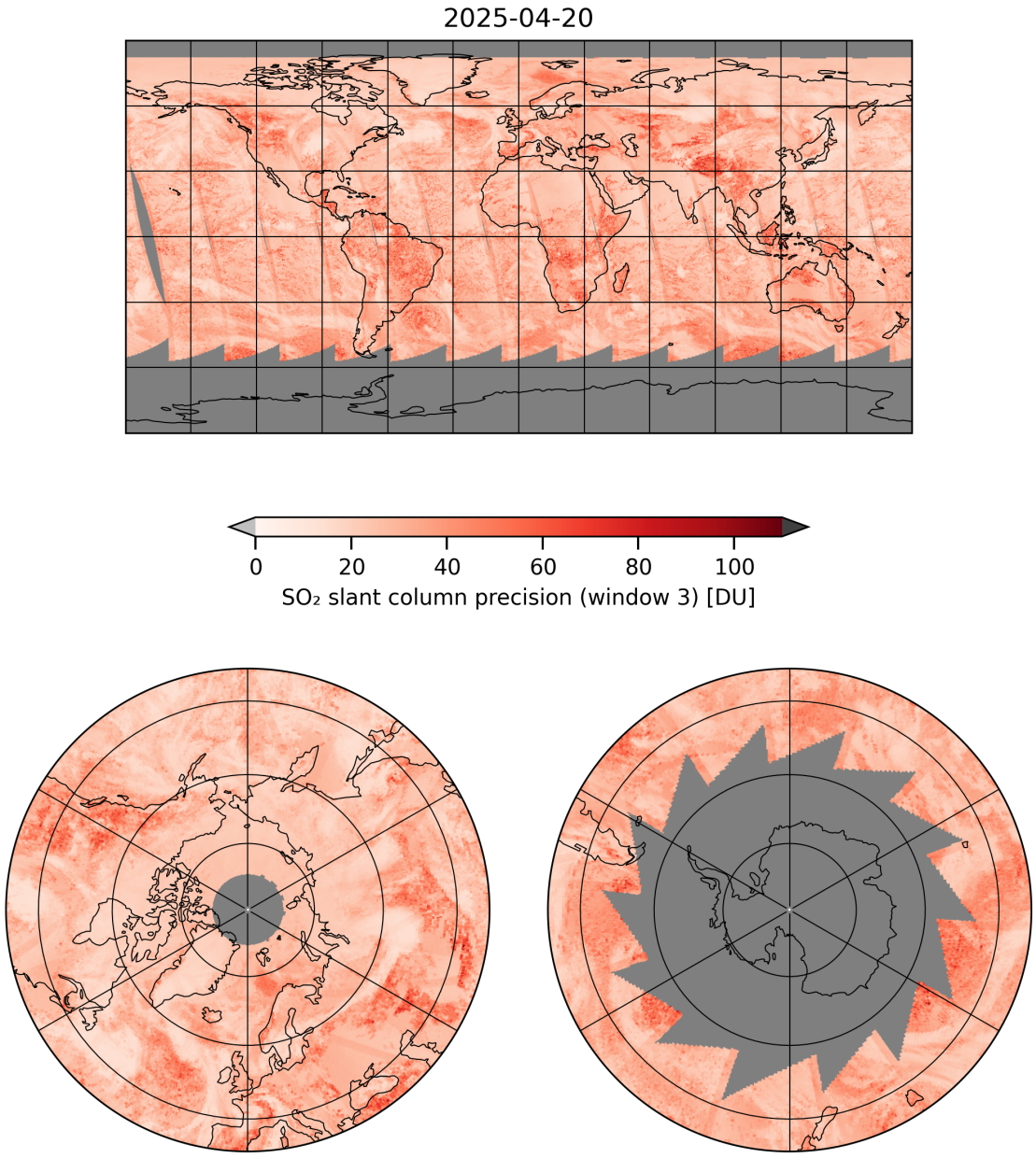

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-04-20 to 2025-04-21

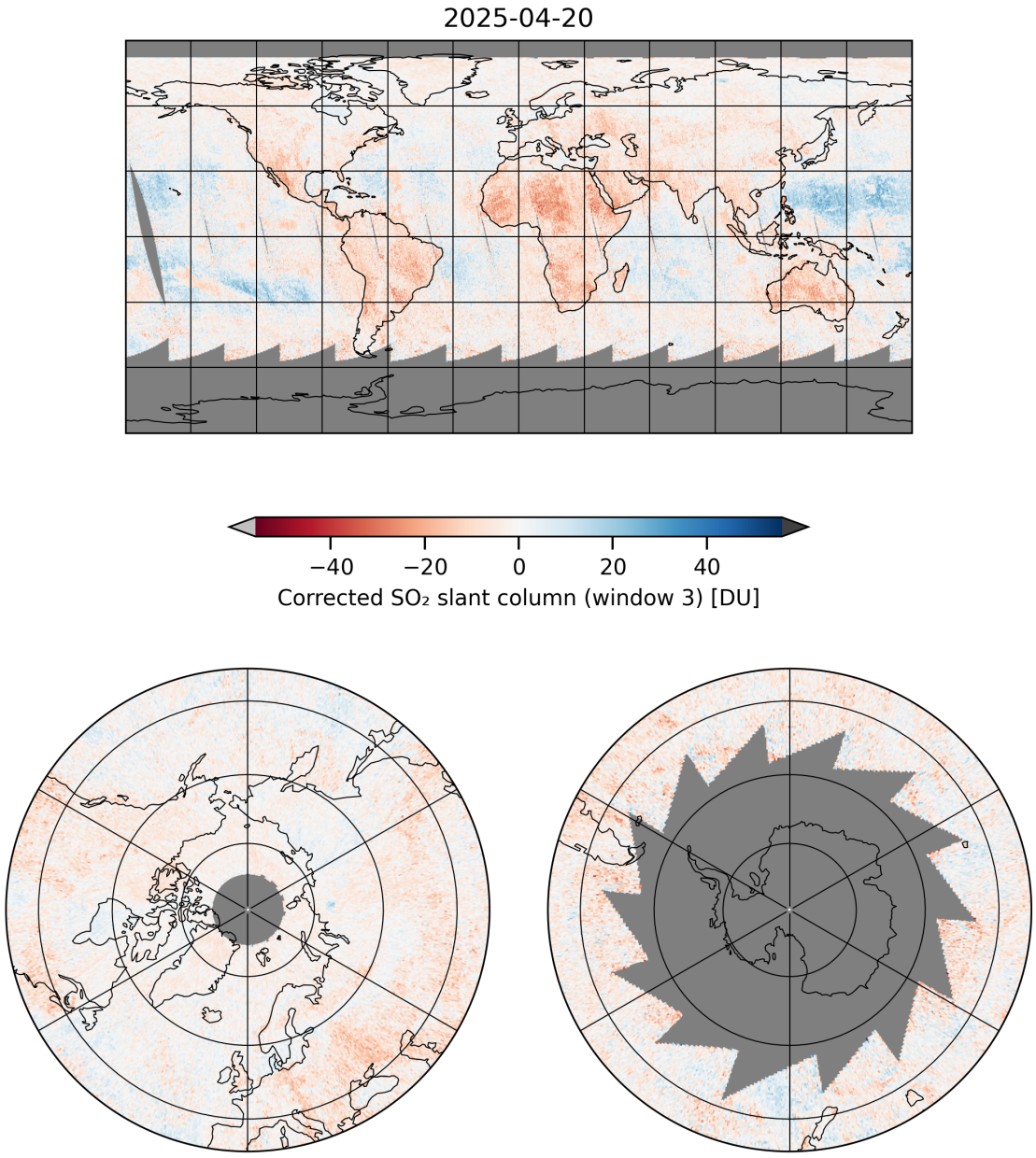

Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-04-20 to 2025-04-21

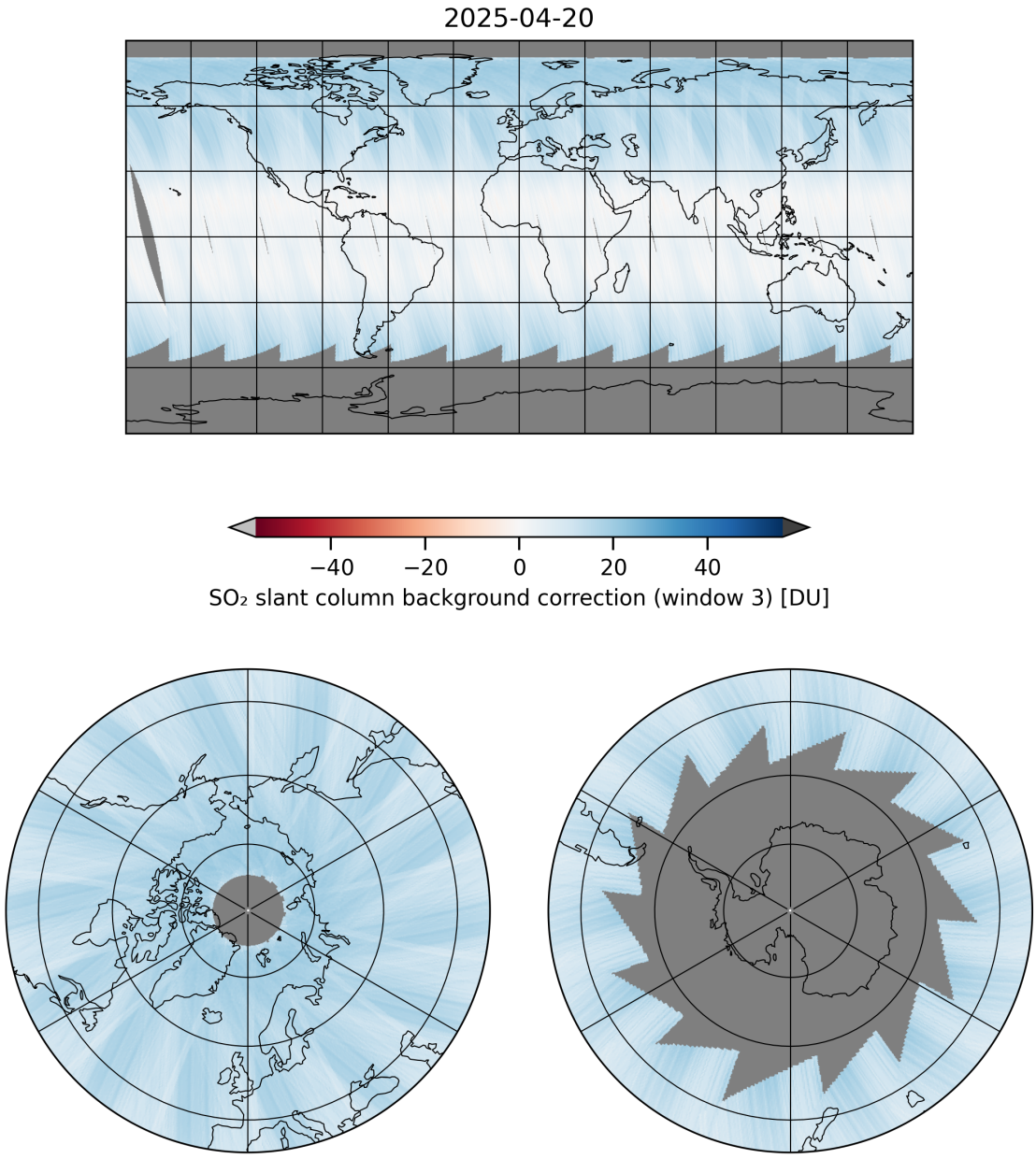

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-04-20 to 2025-04-21

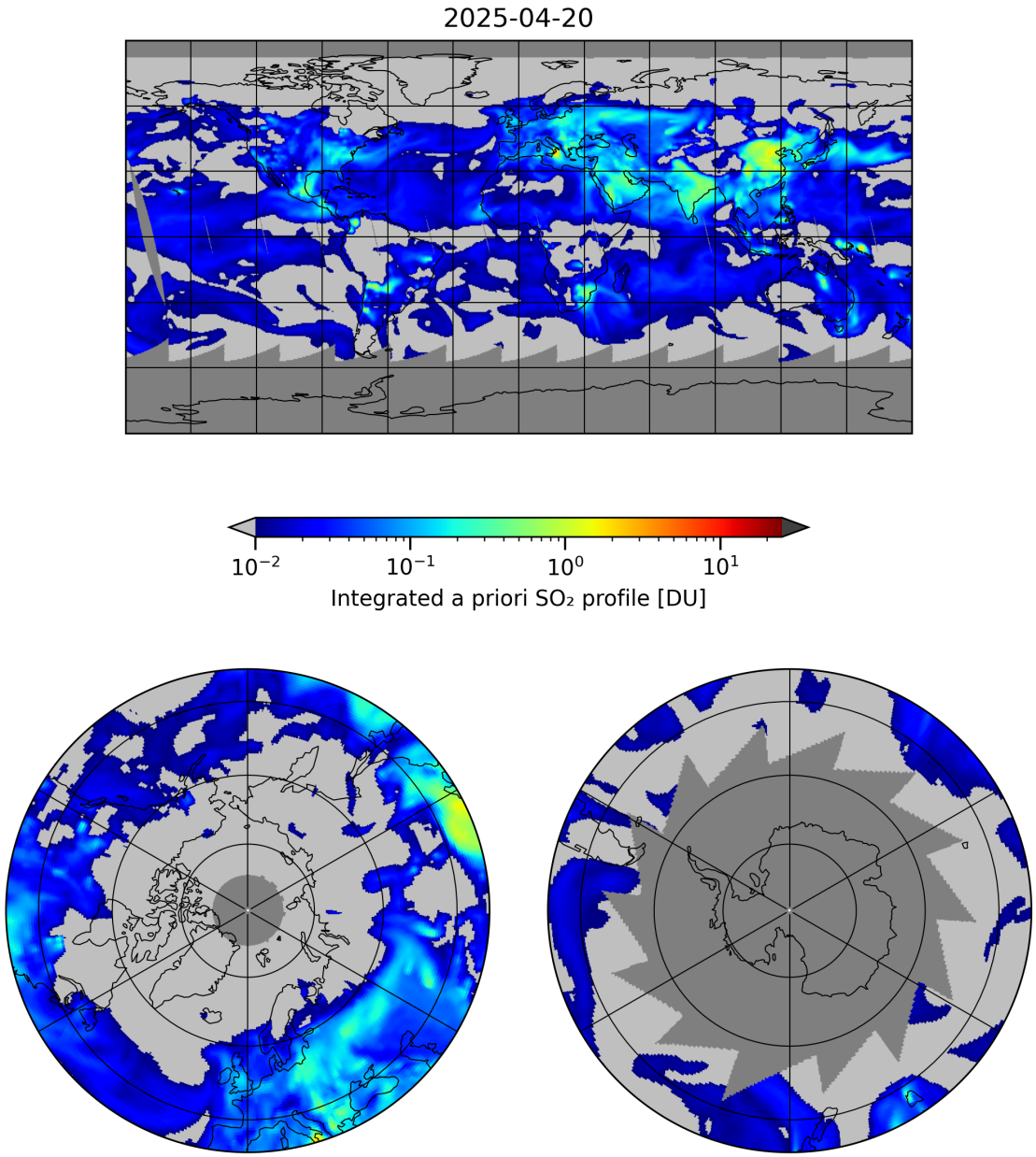

Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-04-20 to 2025-04-21

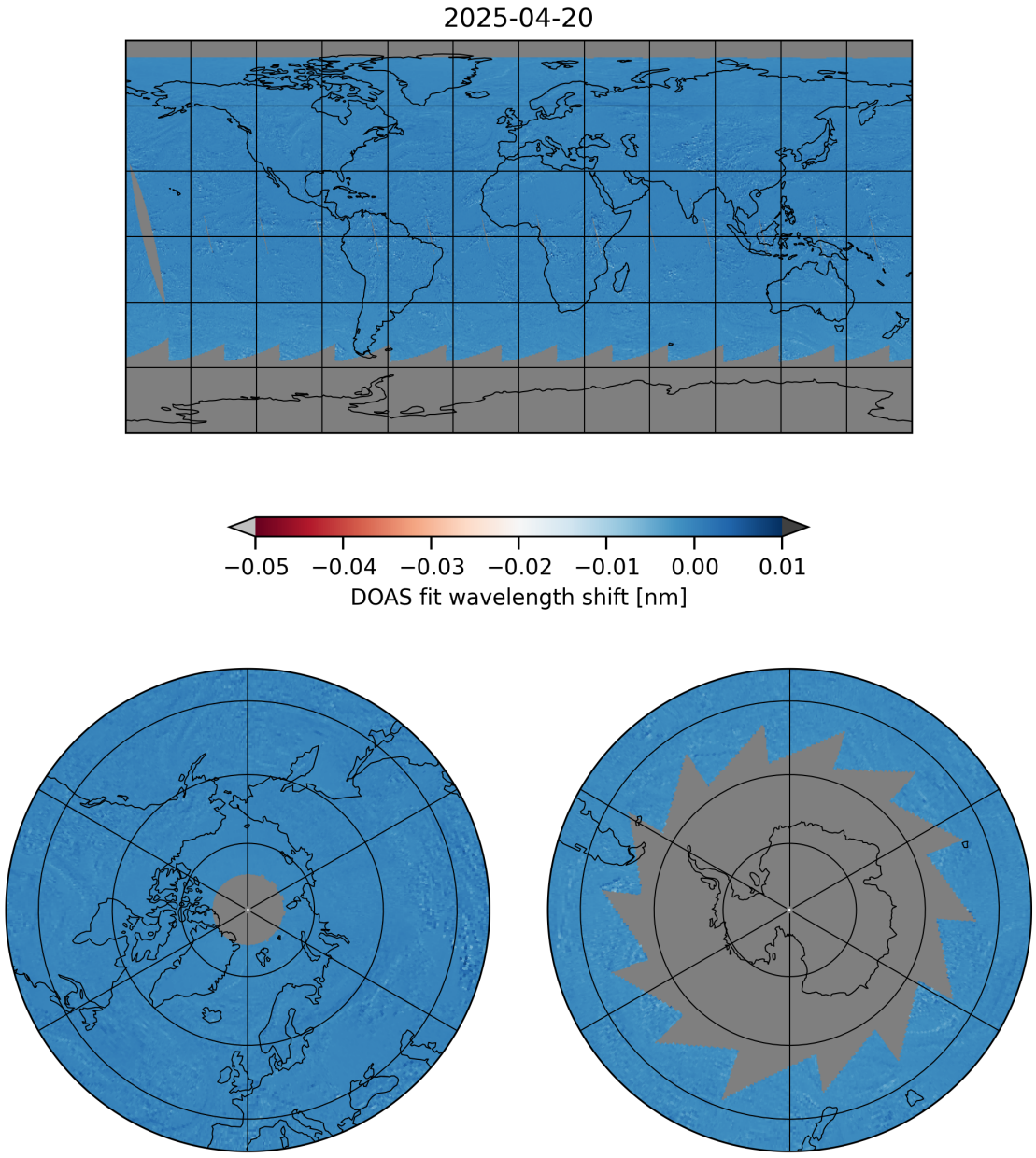

Figure 22: Map of “DOAS fit wavelength shift” for 2025-04-20 to 2025-04-21

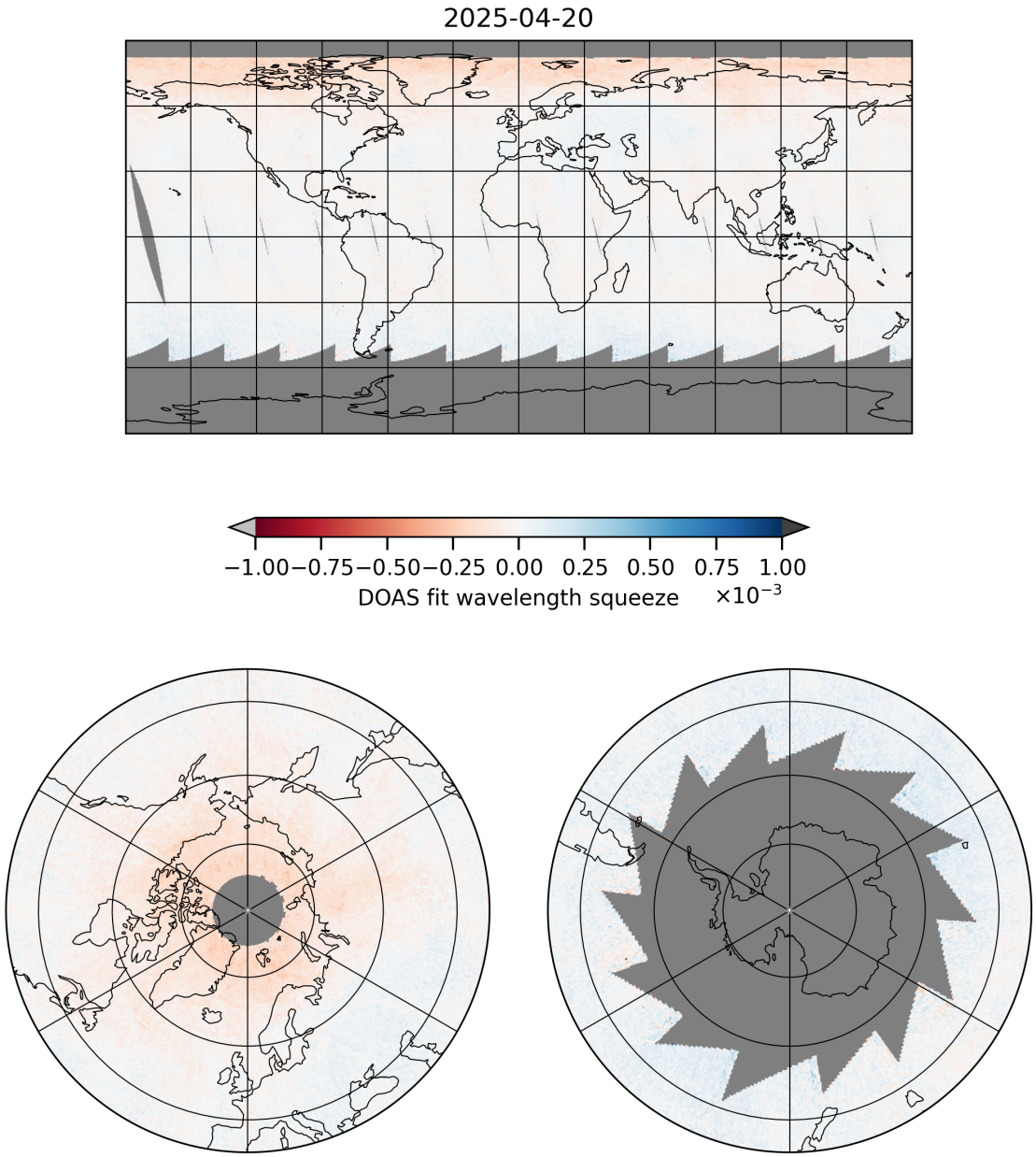

Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-04-20 to 2025-04-21

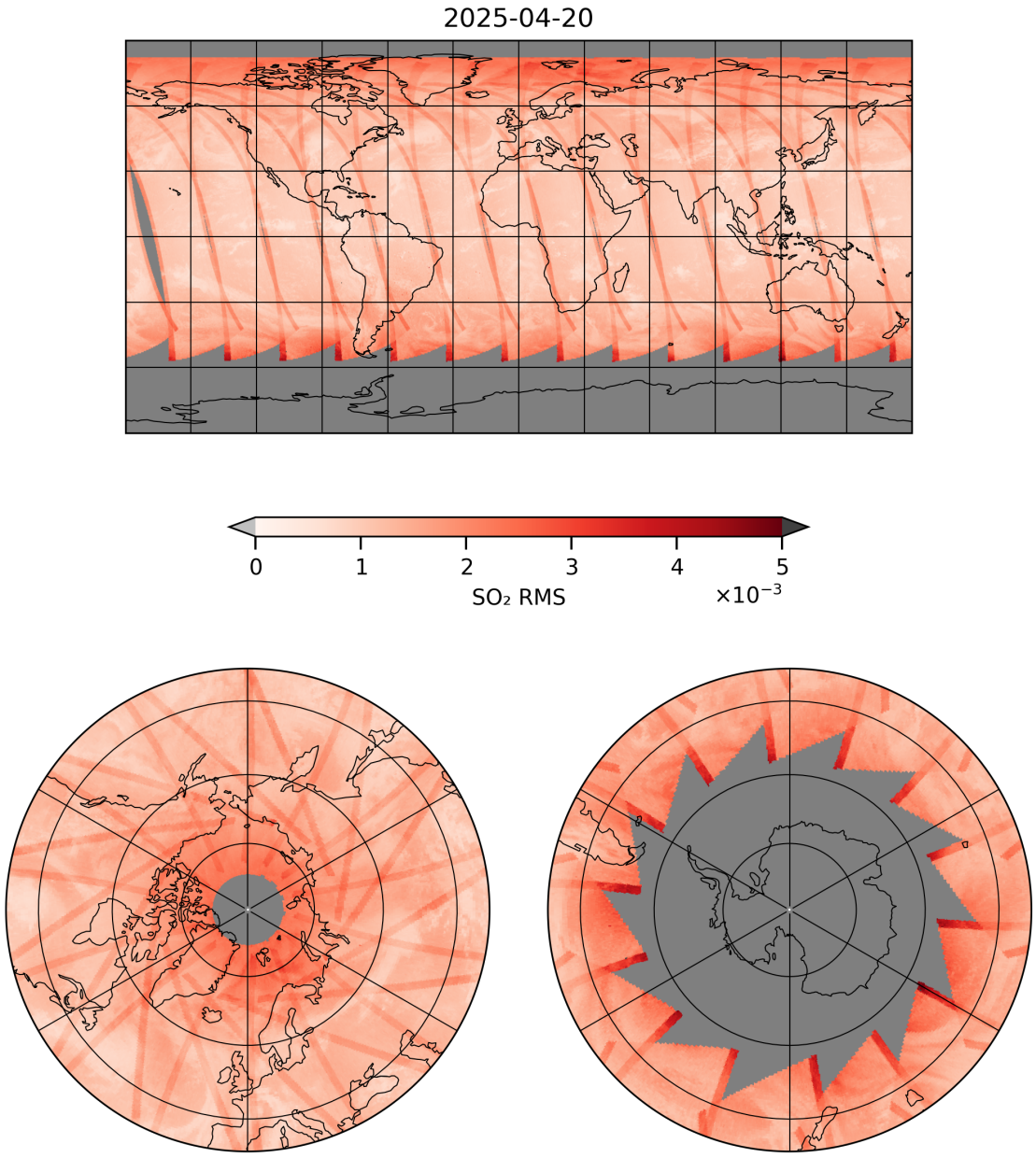

Figure 24: Map of "SO_2 RMS" for 2025-04-20 to 2025-04-21

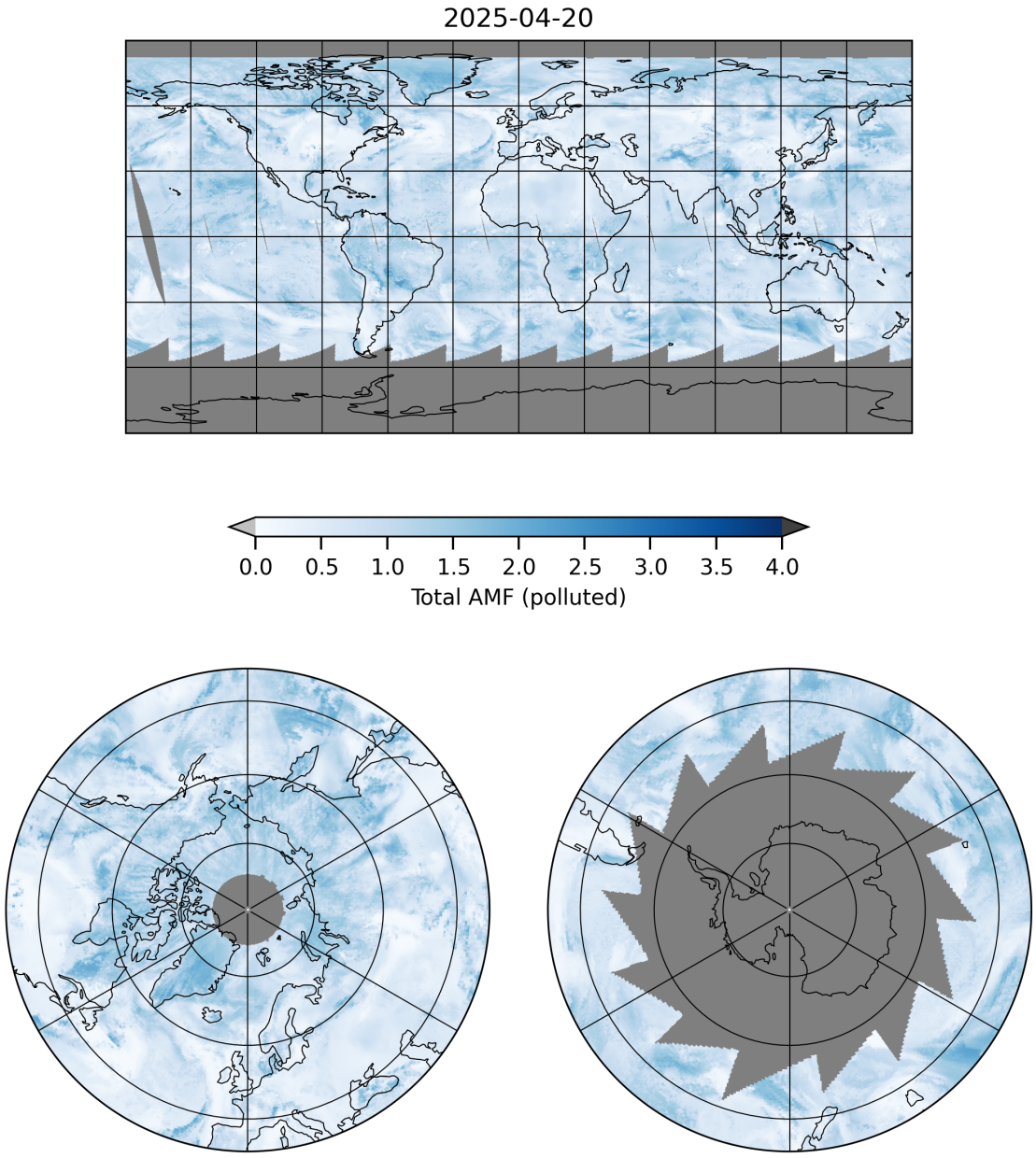

Figure 25: Map of “Total AMF (polluted)” for 2025-04-20 to 2025-04-21

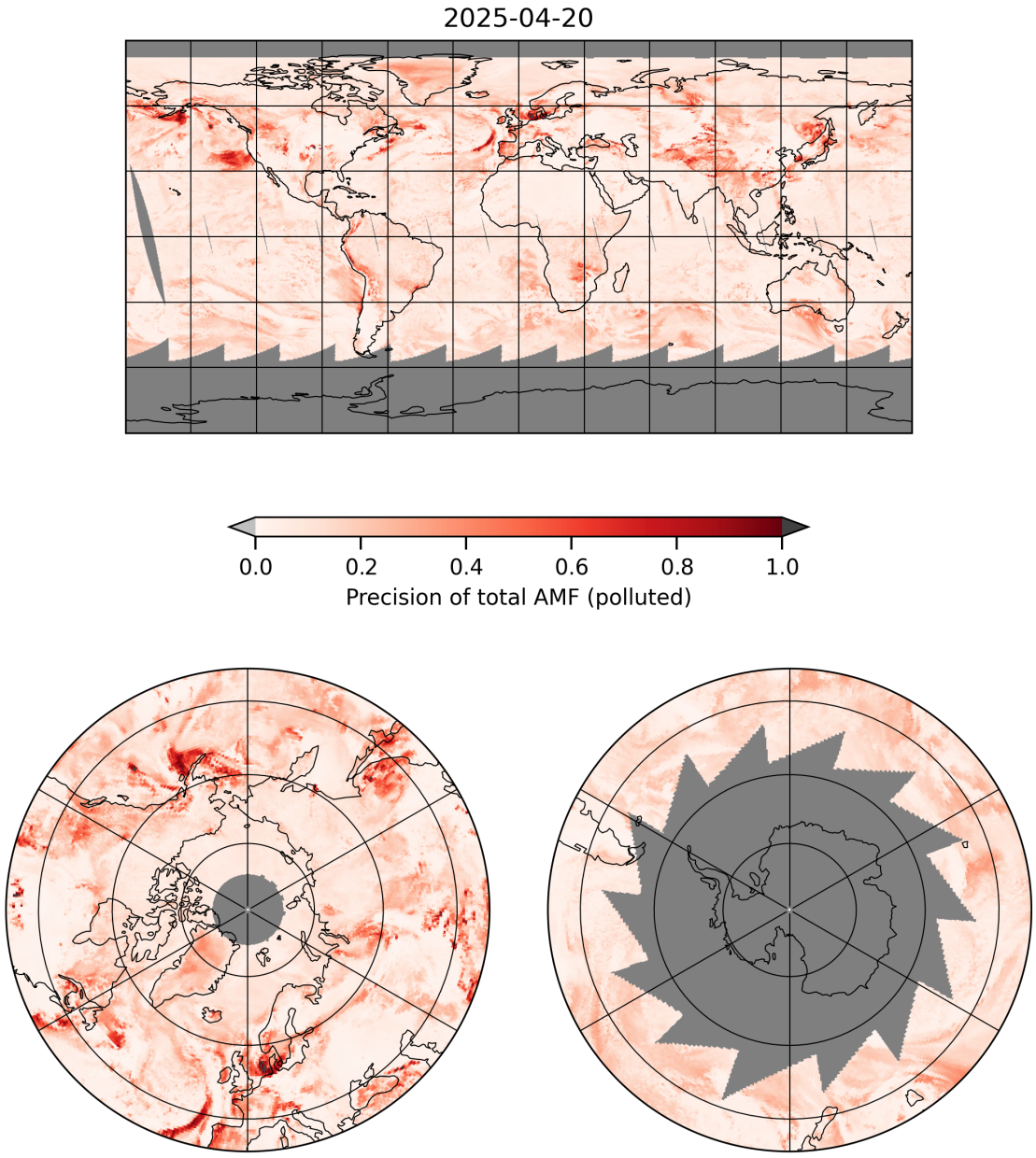

Figure 26: Map of “Precision of total AMF (polluted)” for 2025-04-20 to 2025-04-21

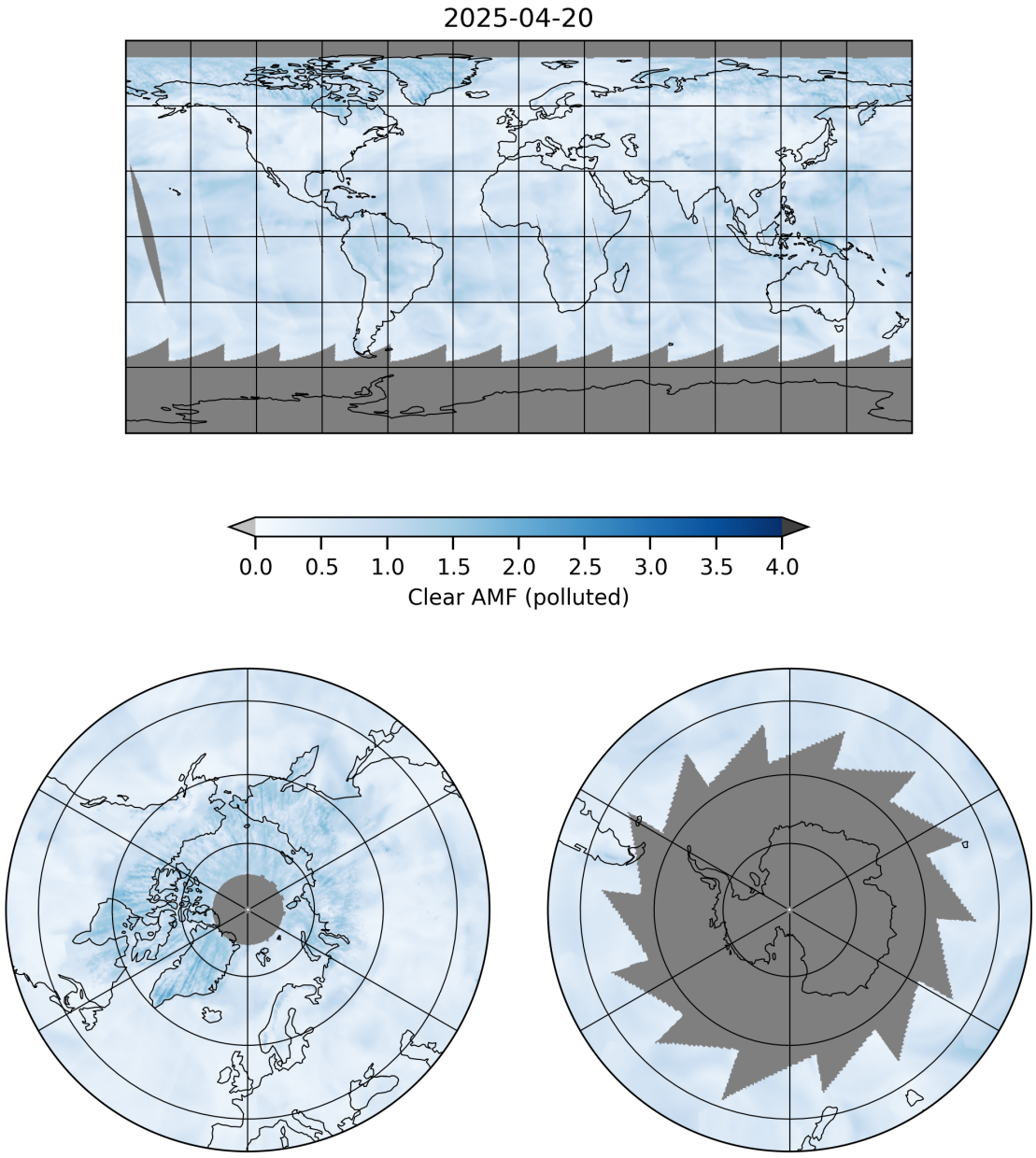

Figure 27: Map of “Clear AMF (polluted)” for 2025-04-20 to 2025-04-21

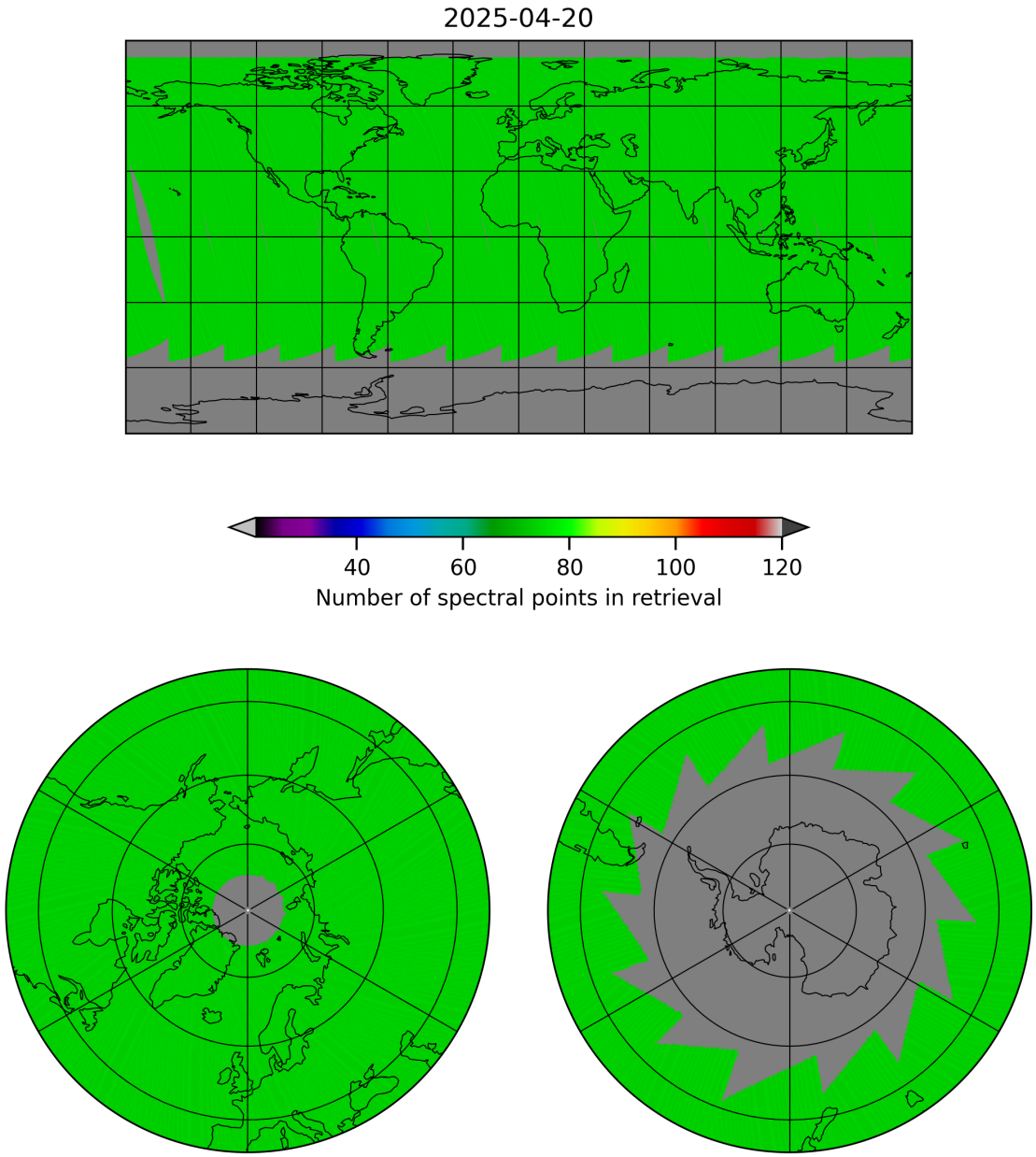

Figure 28: Map of “Number of spectral points in retrieval” for 2025-04-20 to 2025-04-21

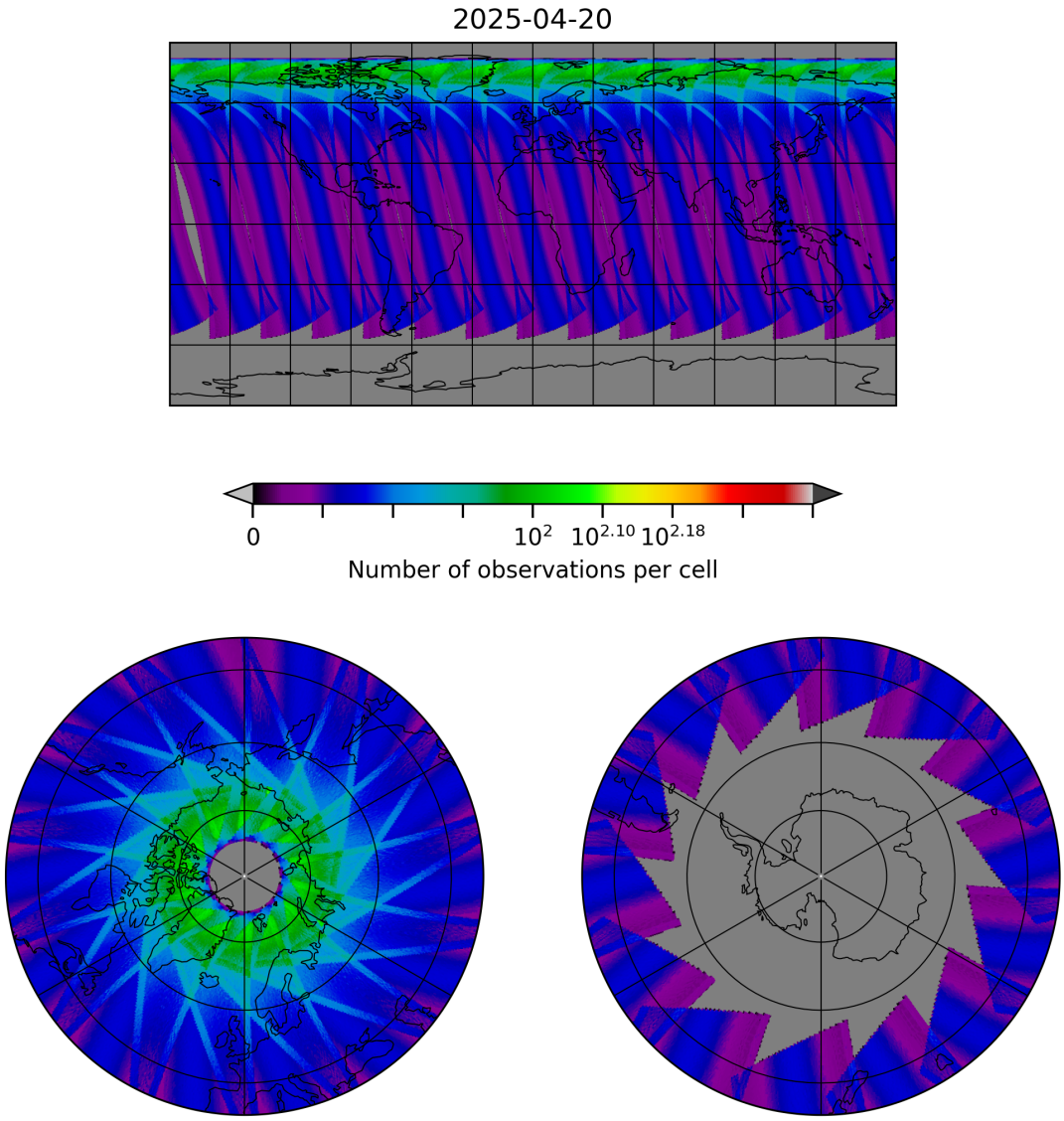

Figure 29: Map of the number of observations for 2025-04-20 to 2025-04-21

7 Zonal average

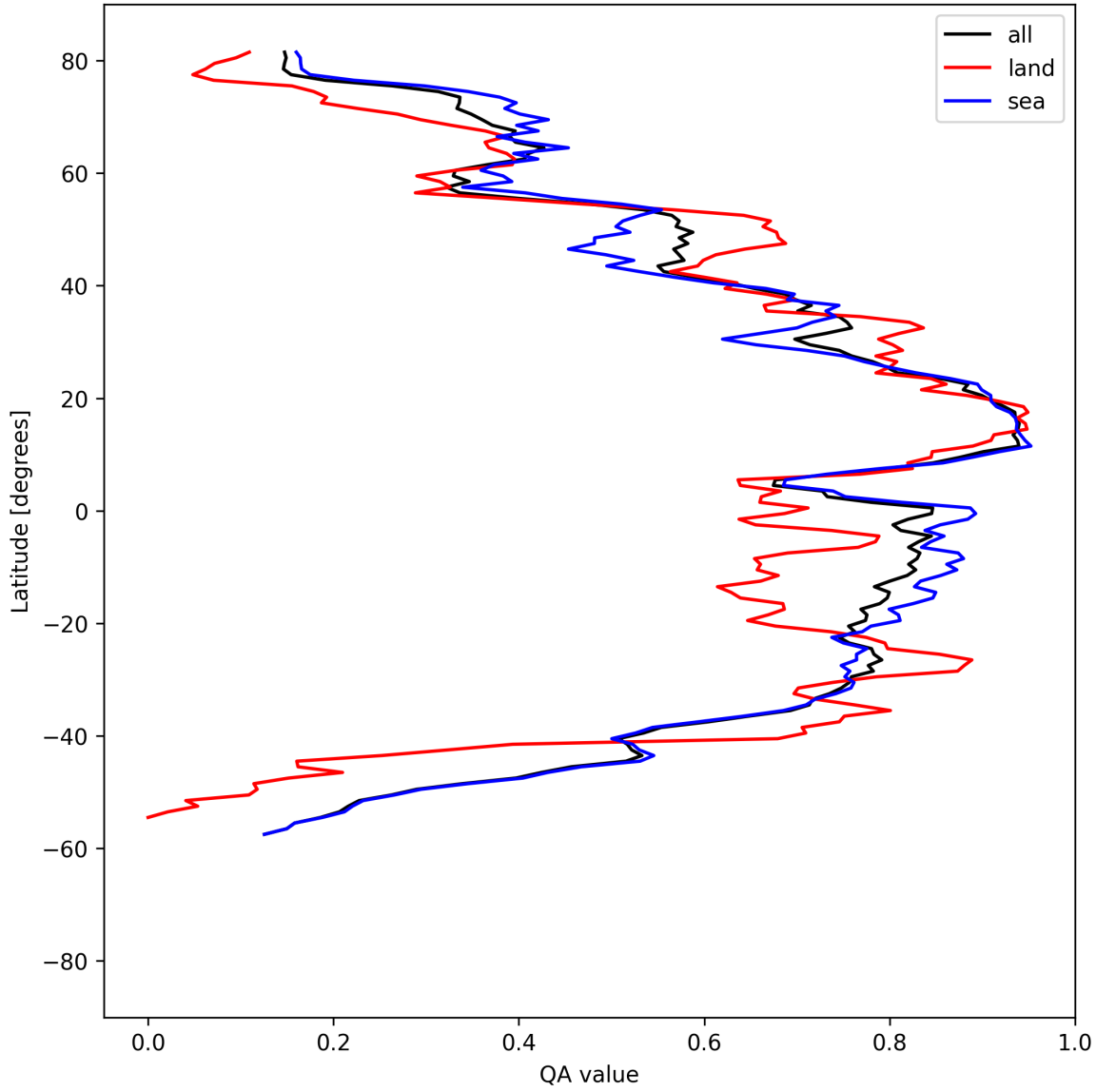

Figure 30: Zonal average of “QA value” for 2025-04-20 to 2025-04-21.

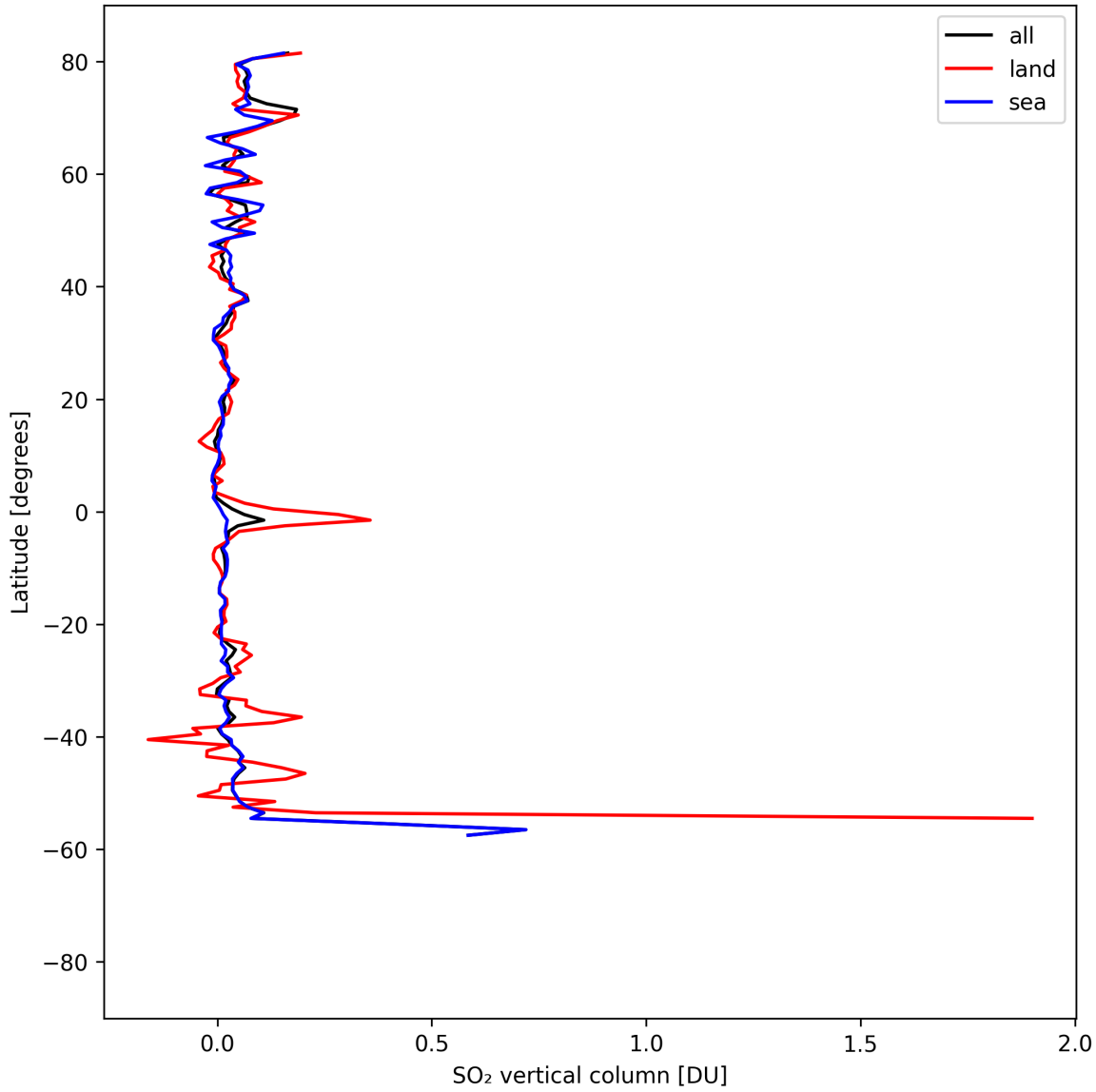

Figure 31: Zonal average of "SO_2 vertical column" for 2025-04-20 to 2025-04-21.

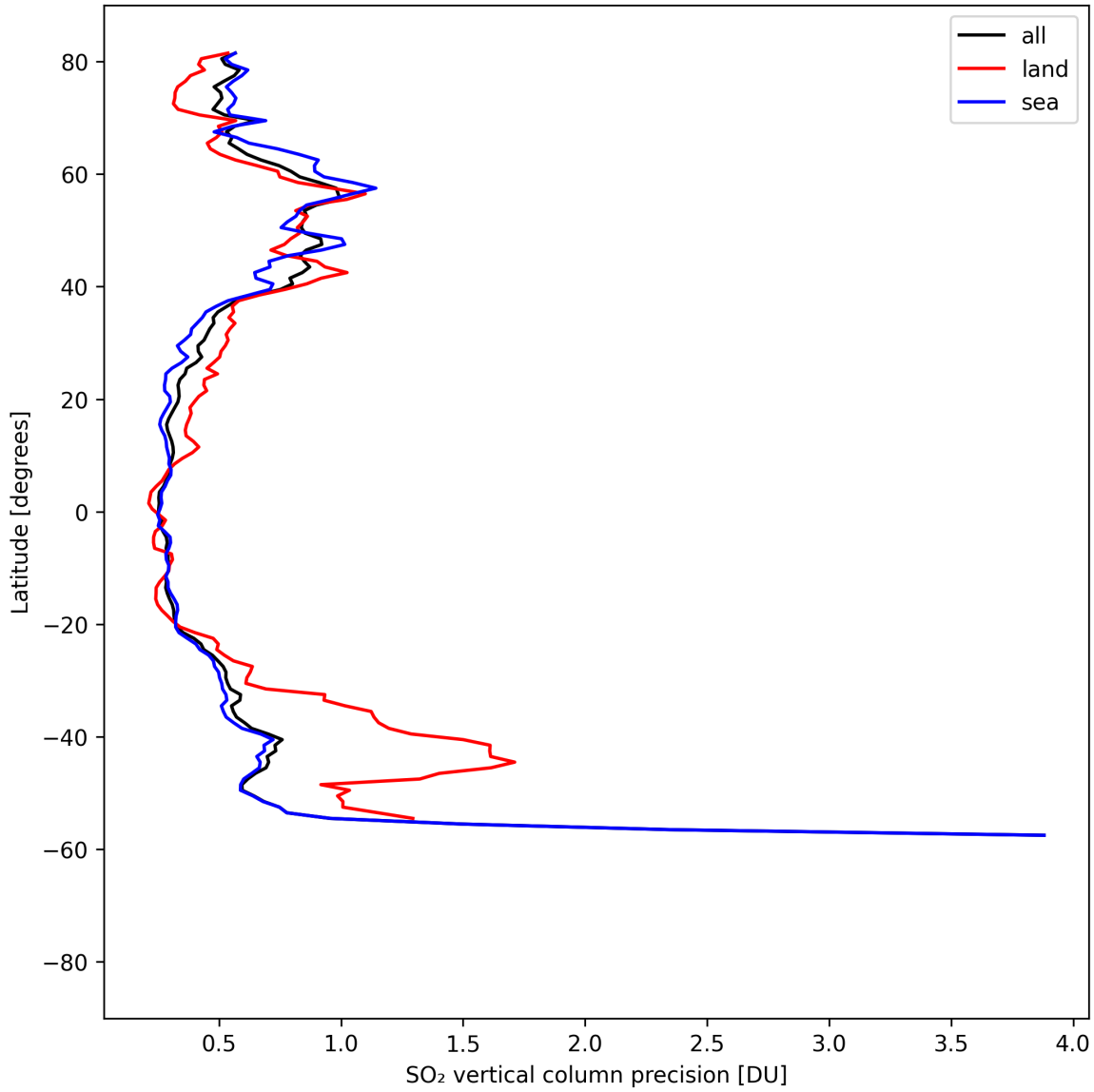

Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-04-20 to 2025-04-21.

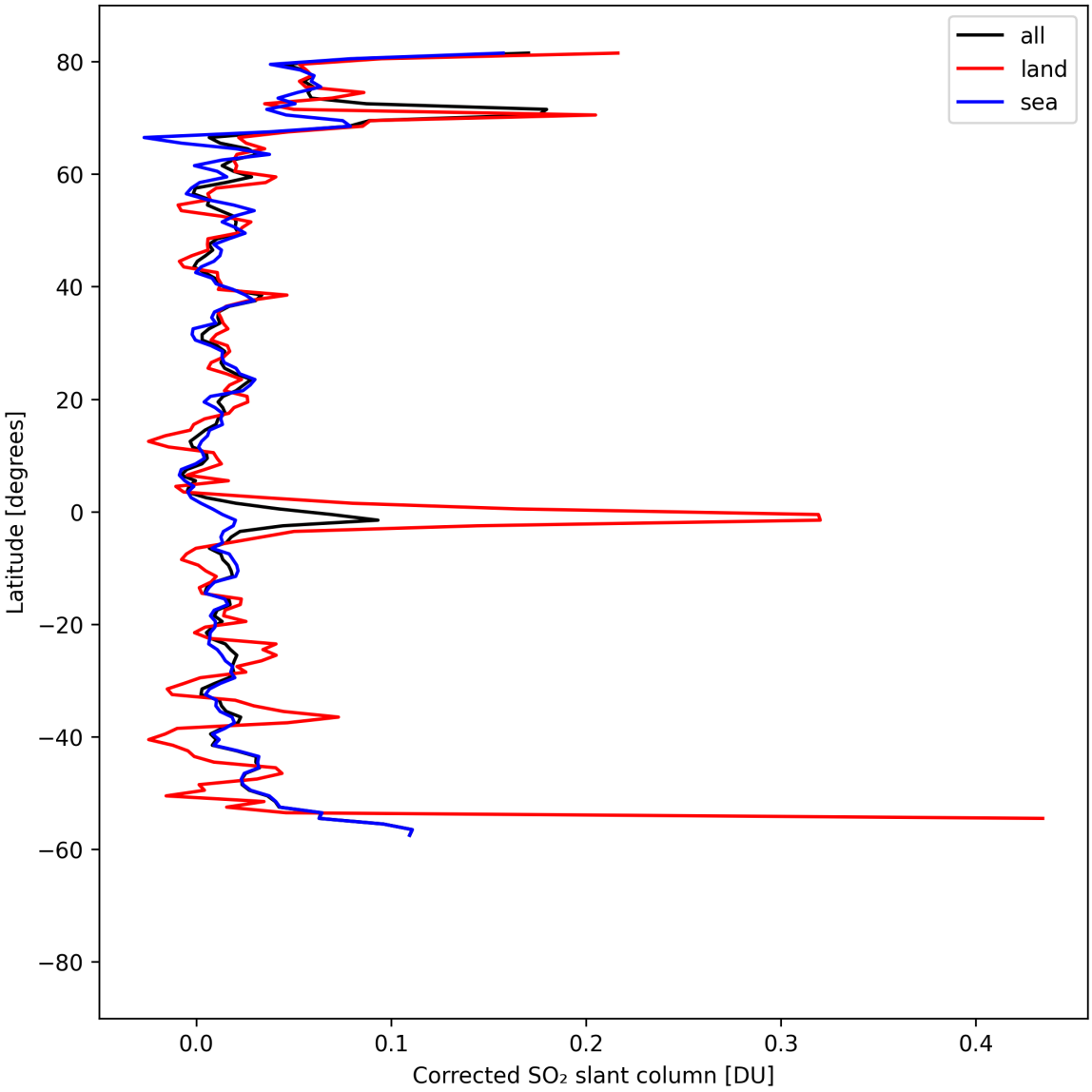

Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-04-20 to 2025-04-21.

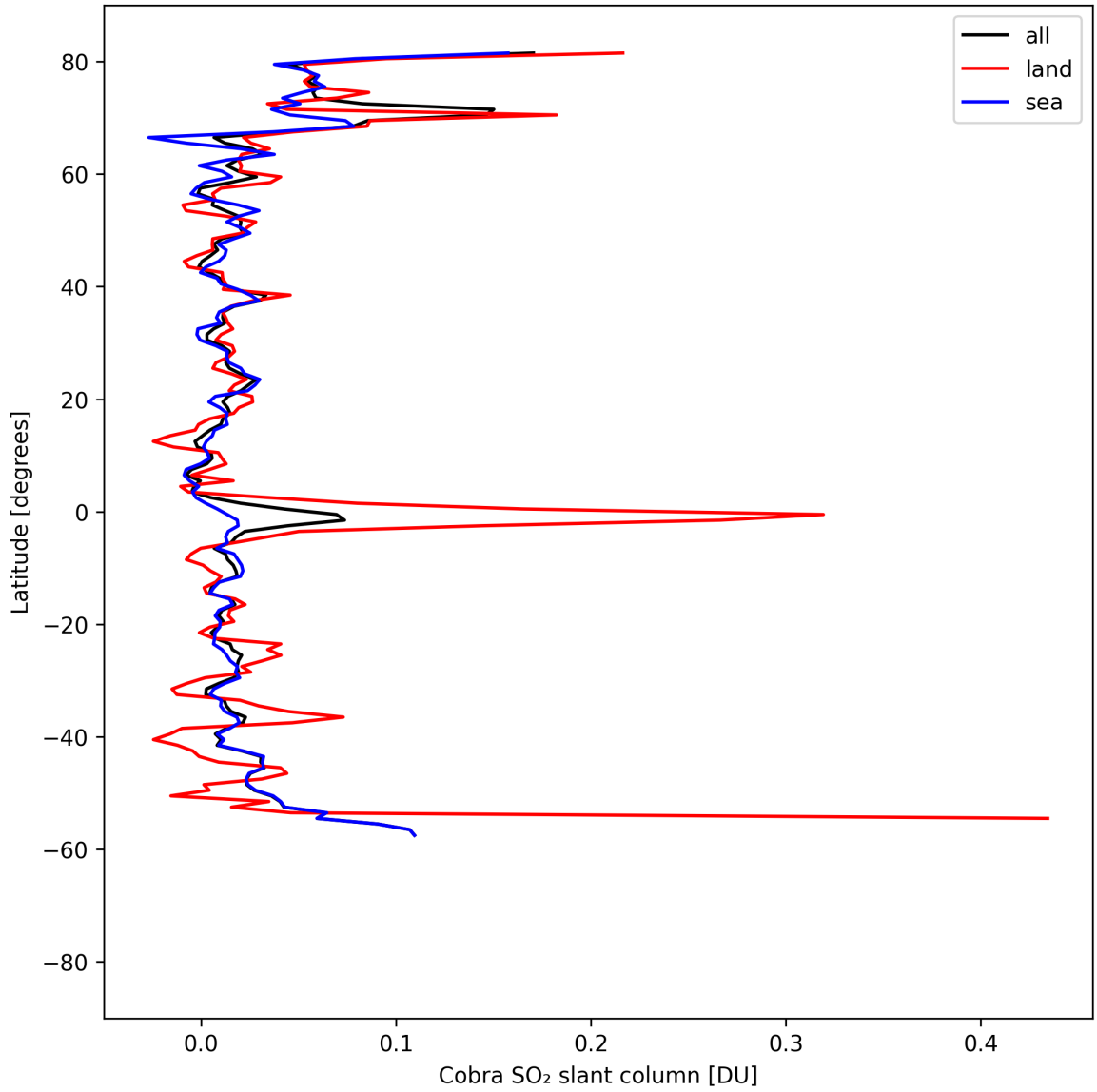

Figure 34: Zonal average of “Cobra SO_2 slant column” for 2025-04-20 to 2025-04-21.

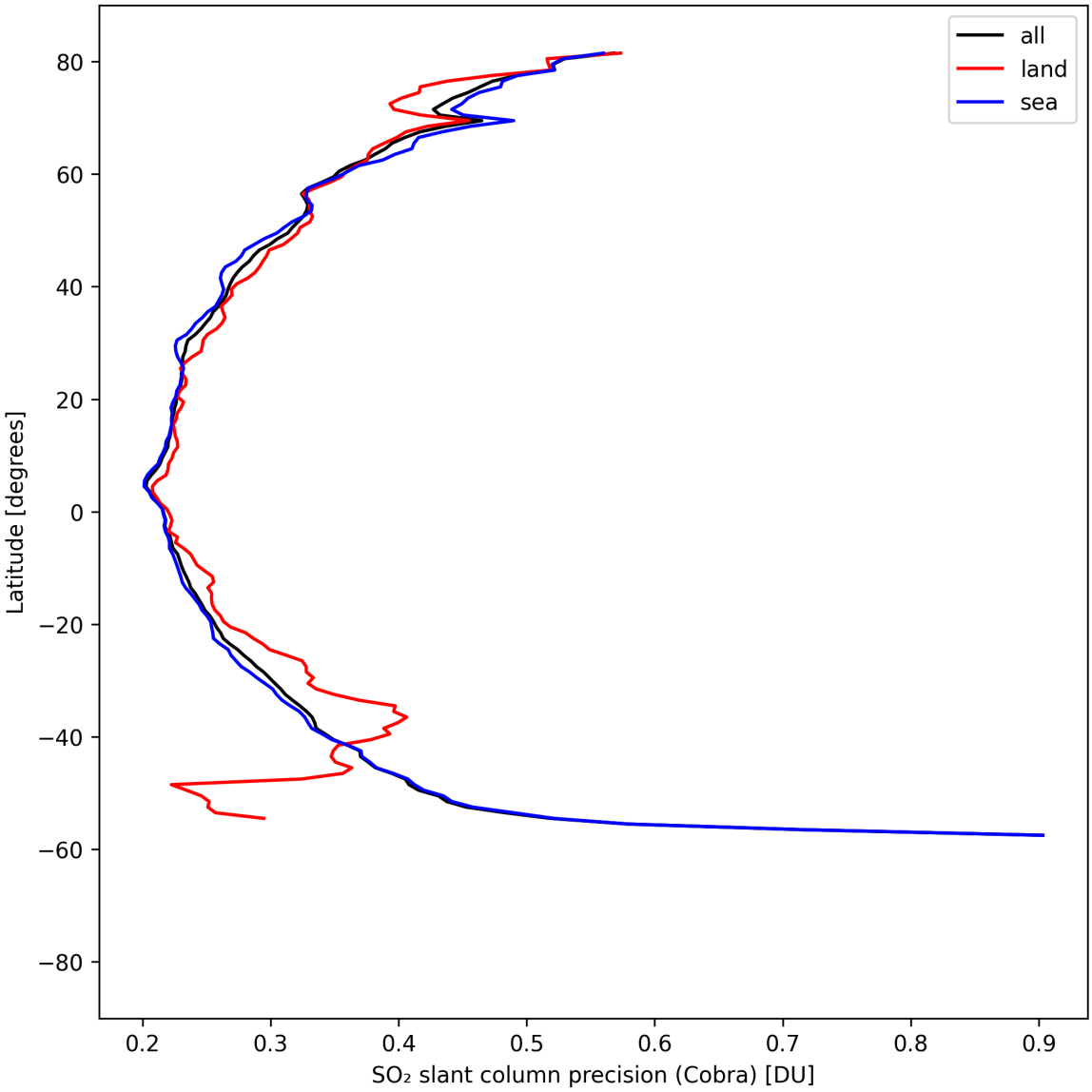

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-04-20 to 2025-04-21.

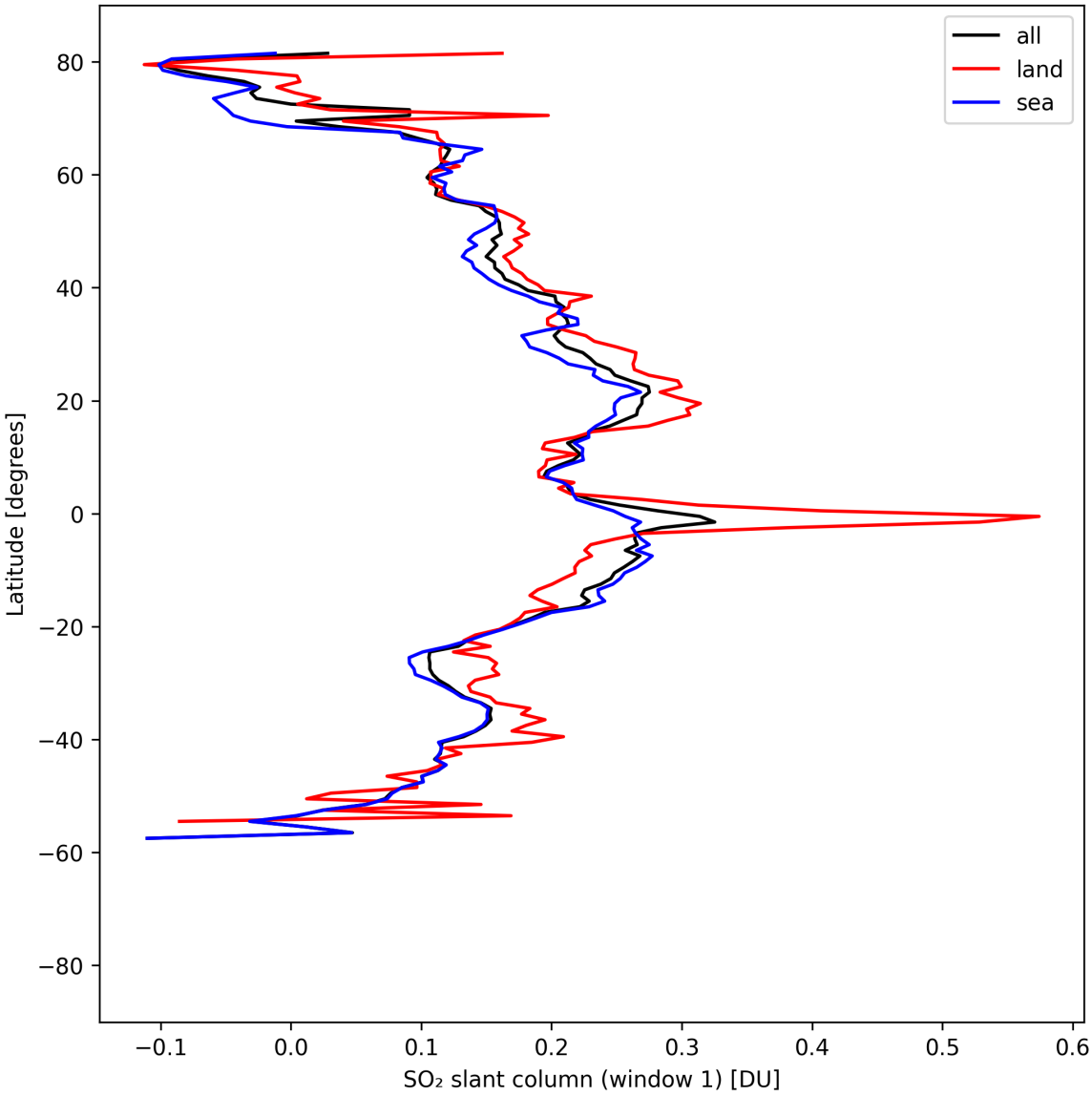

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-04-20 to 2025-04-21.

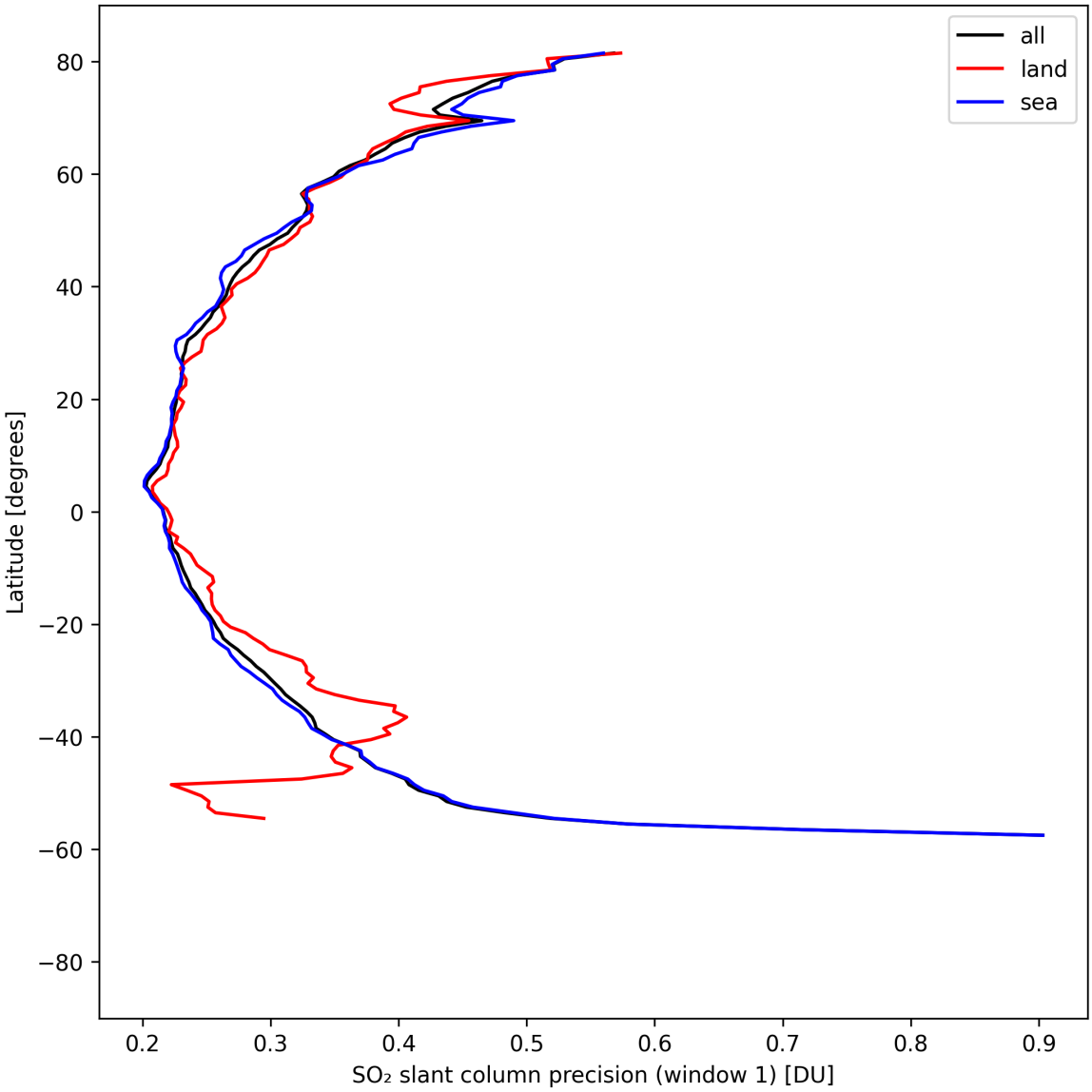

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-04-20 to 2025-04-21.

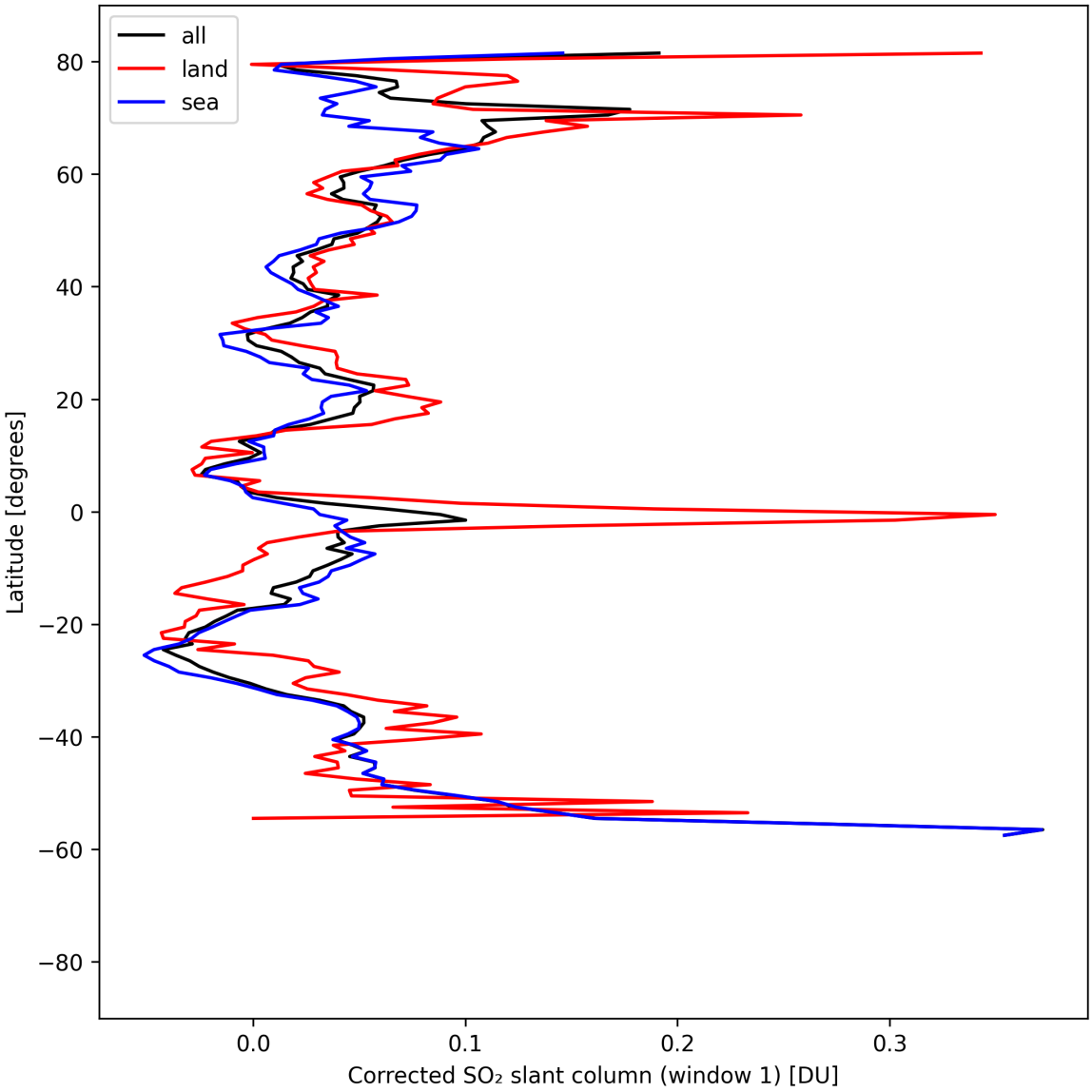

Figure 38: Zonal average of “Corrected SO_2 slant column (window 1)” for 2025-04-20 to 2025-04-21.

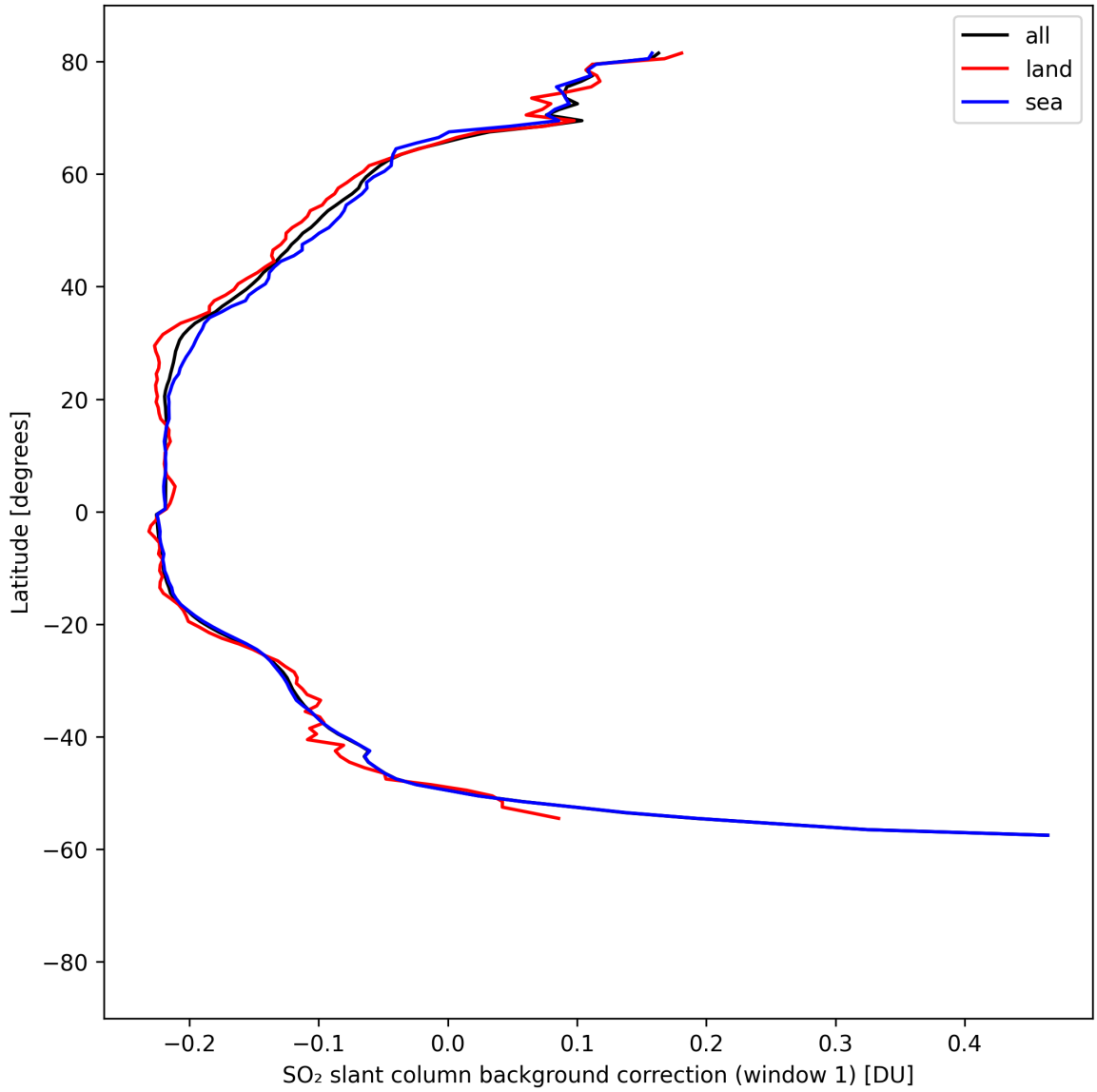

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-04-20 to 2025-04-21.

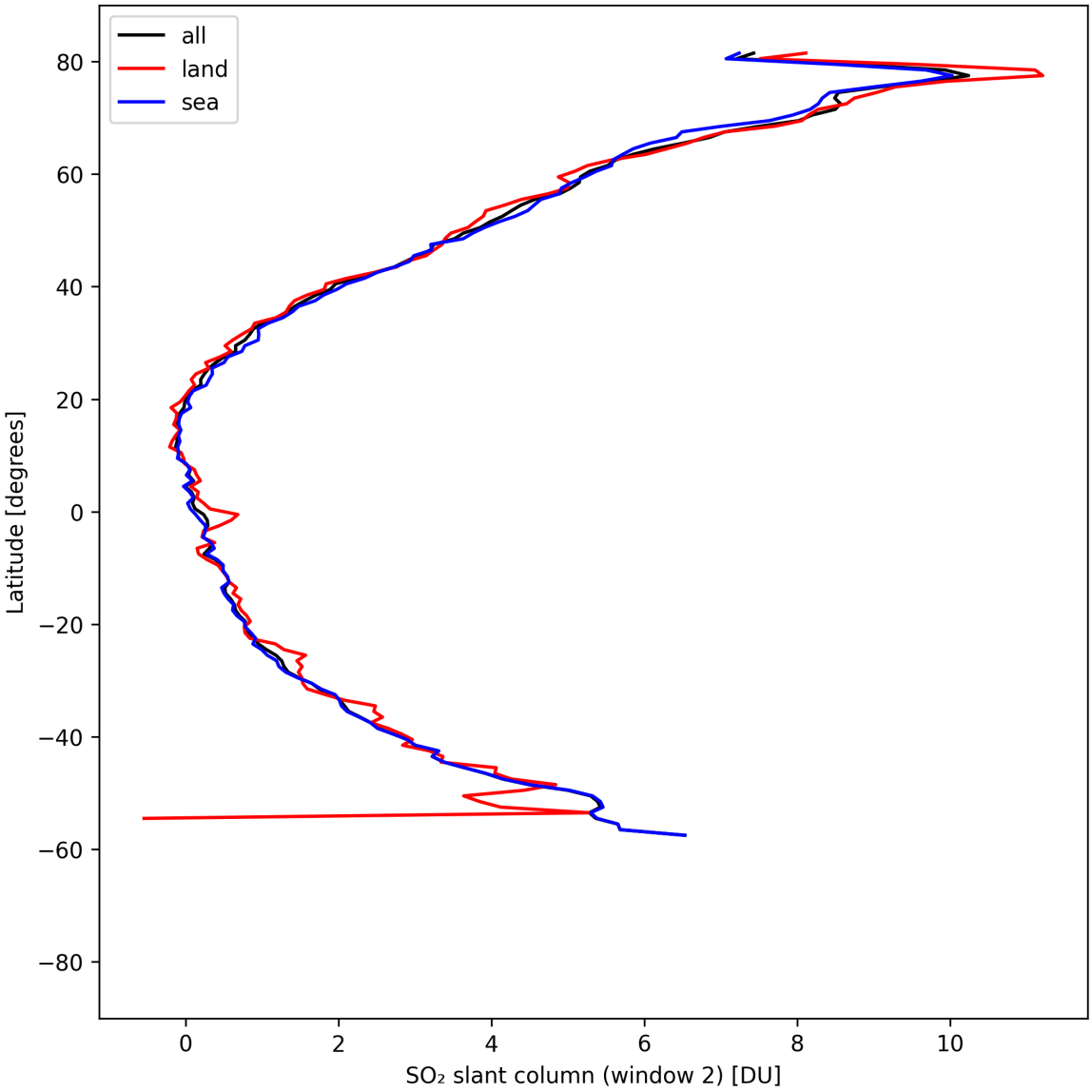

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-04-20 to 2025-04-21.

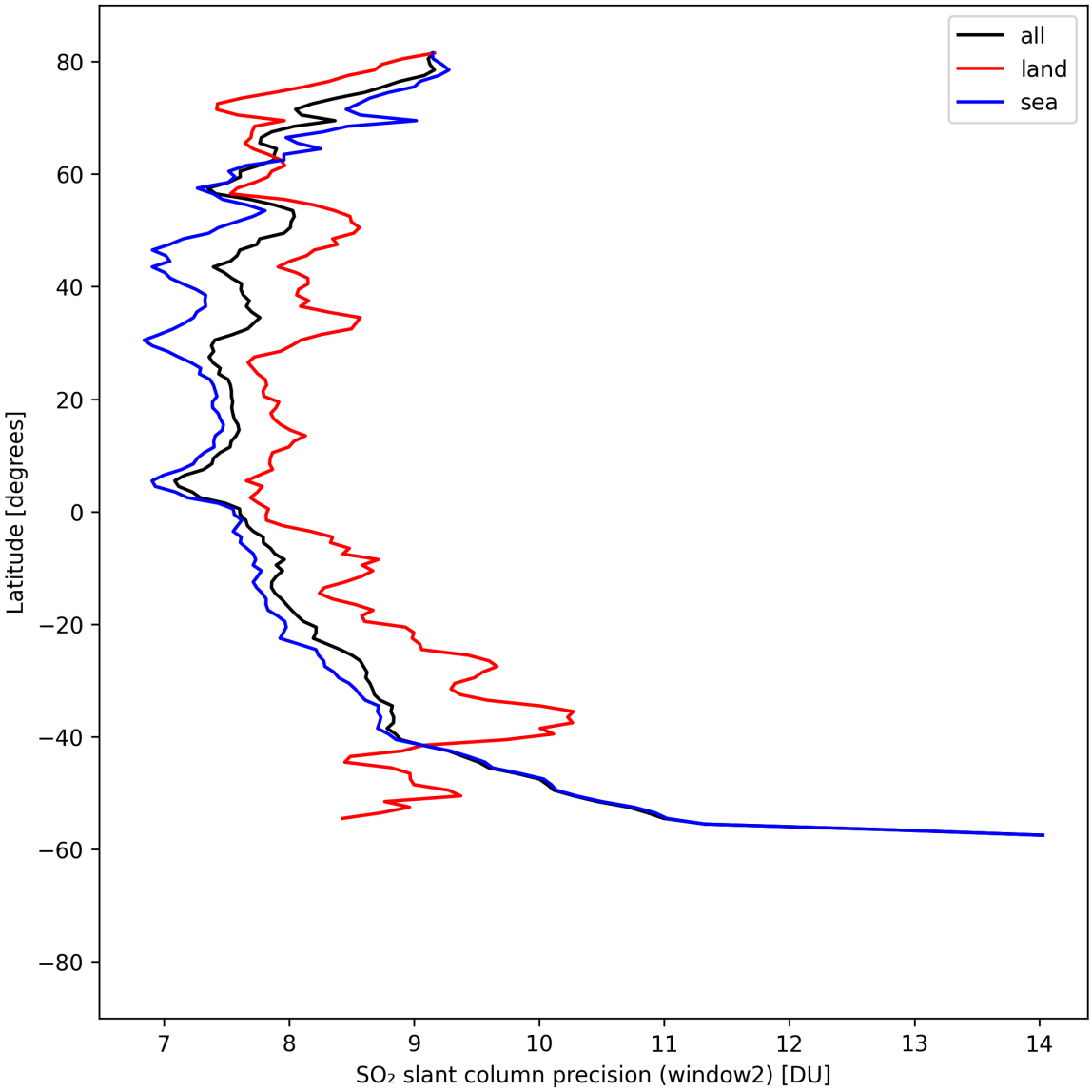

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-04-20 to 2025-04-21.

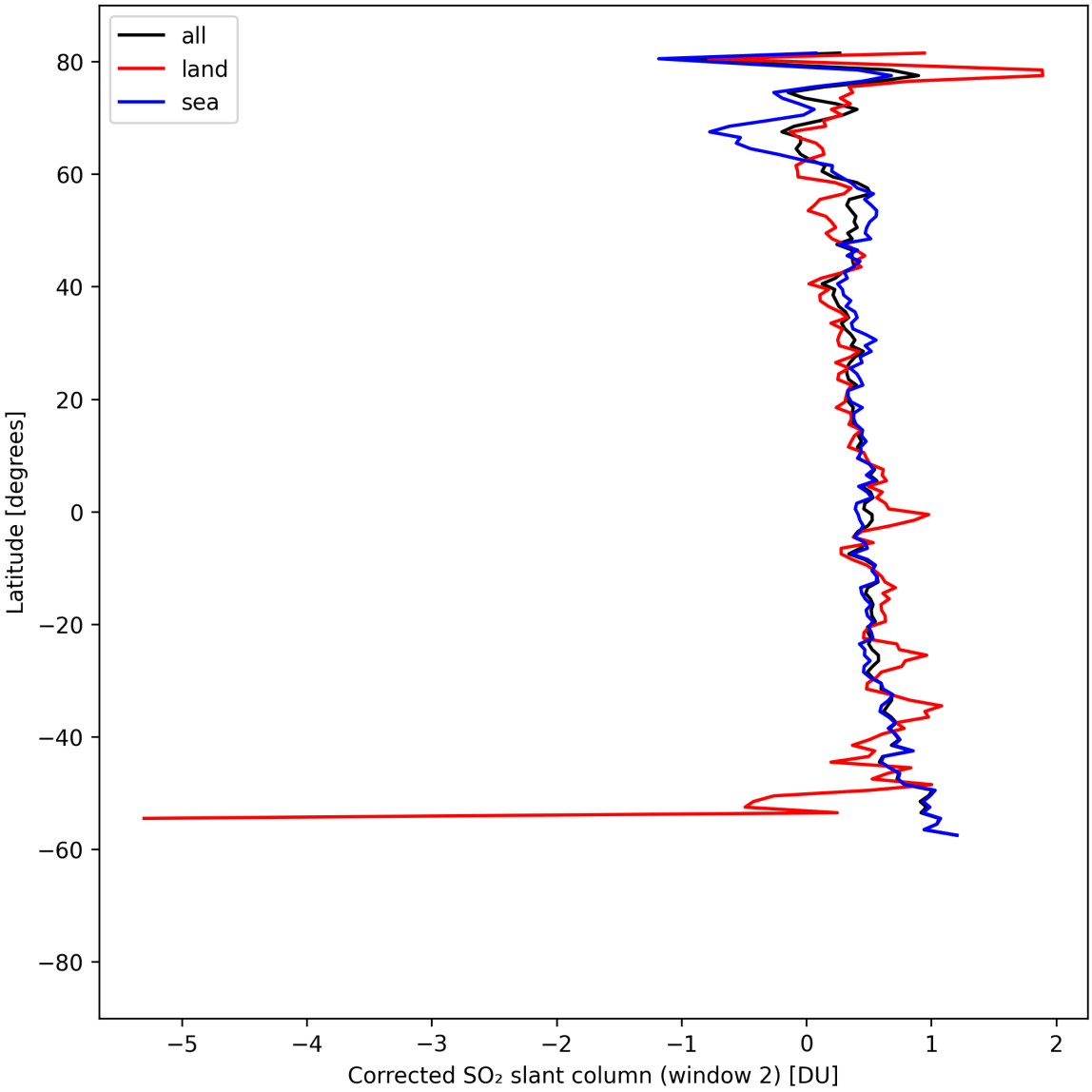

Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-04-20 to 2025-04-21.

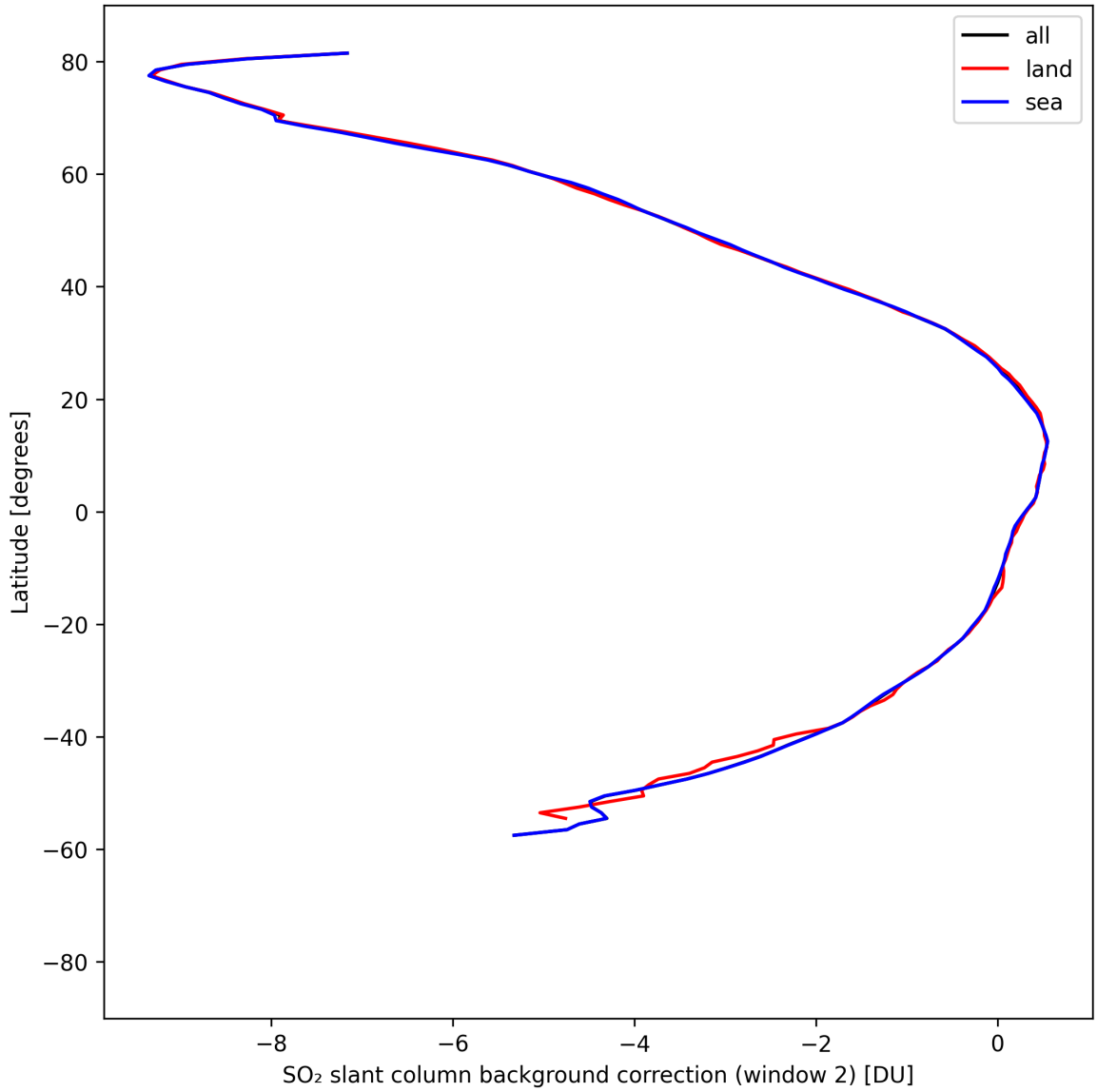

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-04-20 to 2025-04-21.

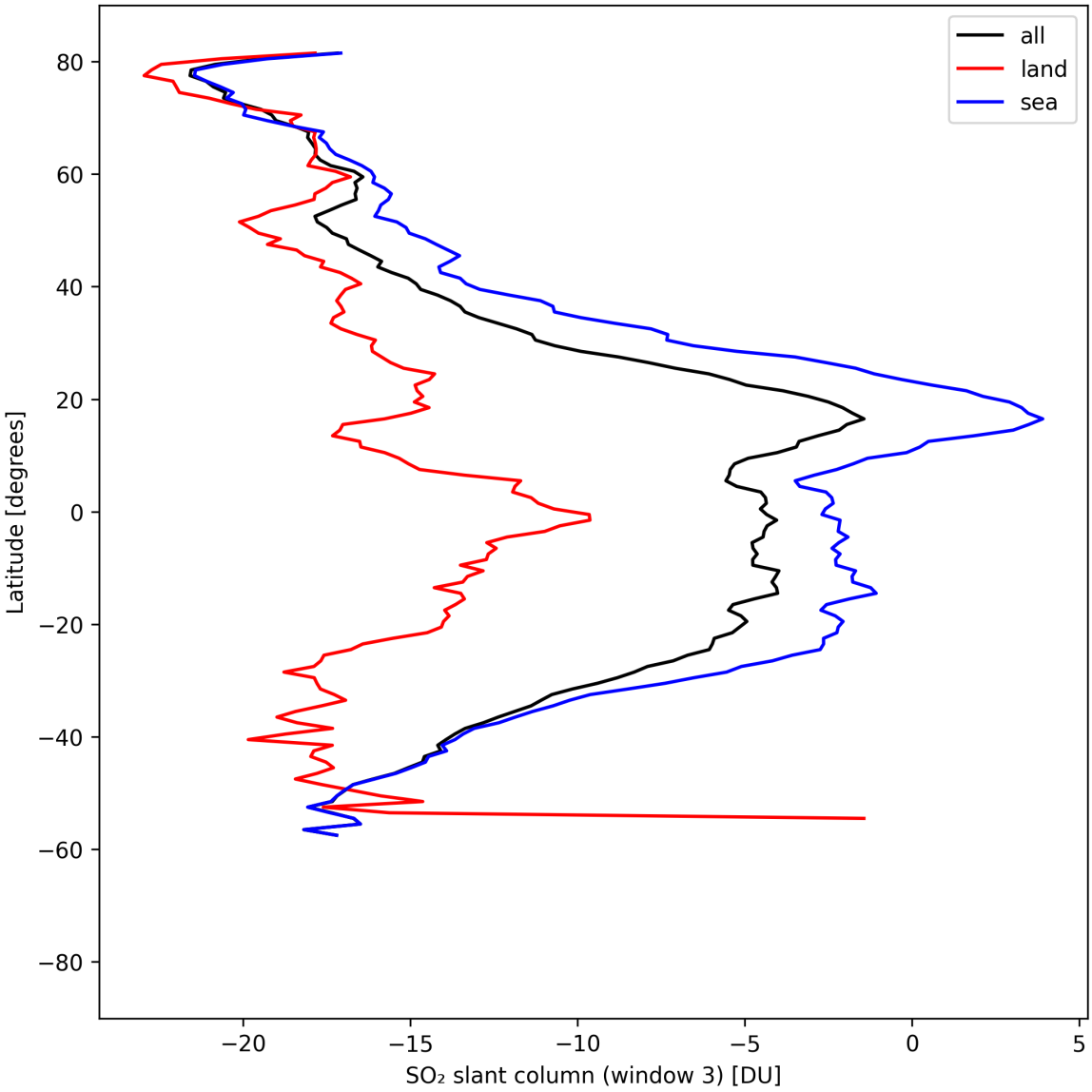

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-04-20 to 2025-04-21.

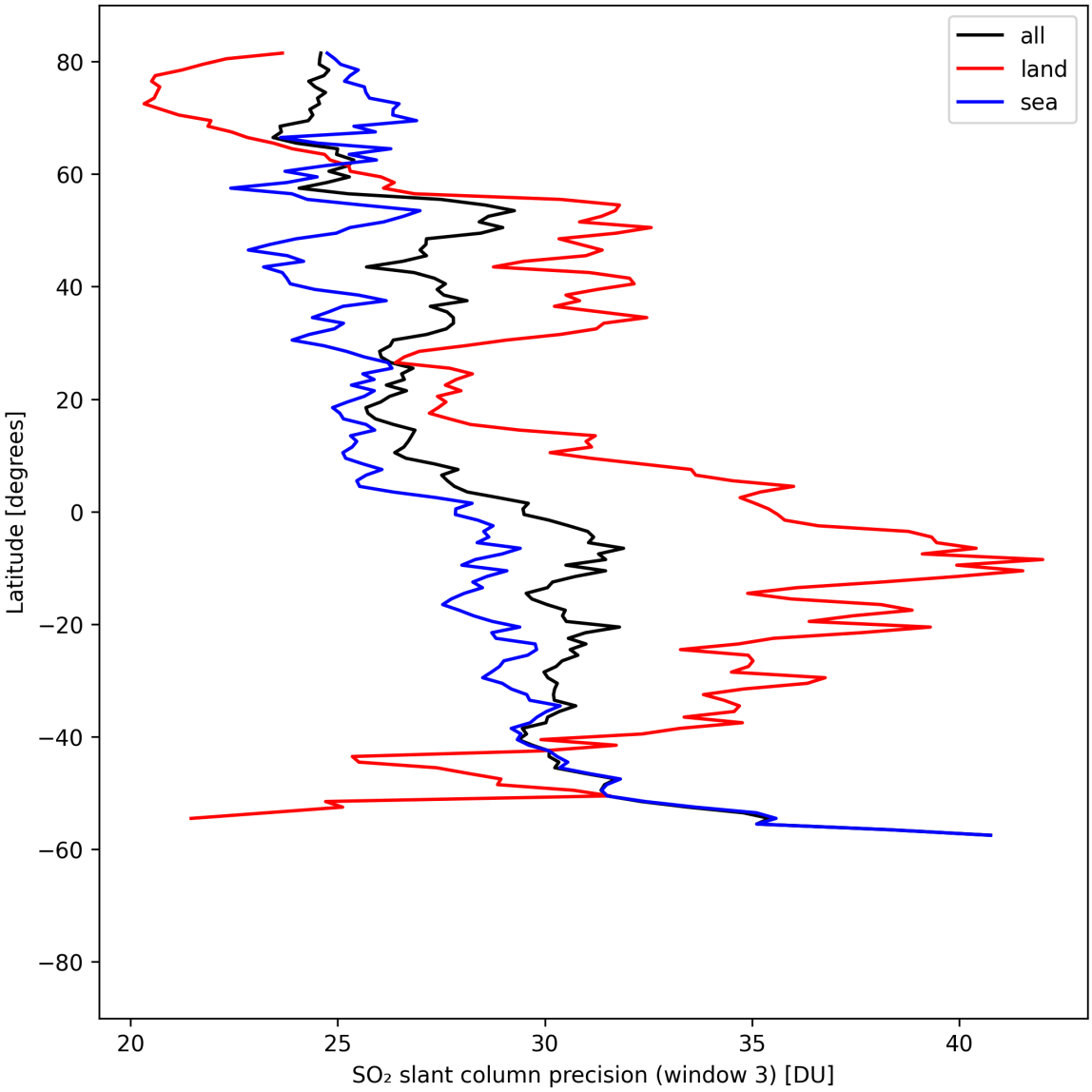

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-04-20 to 2025-04-21.

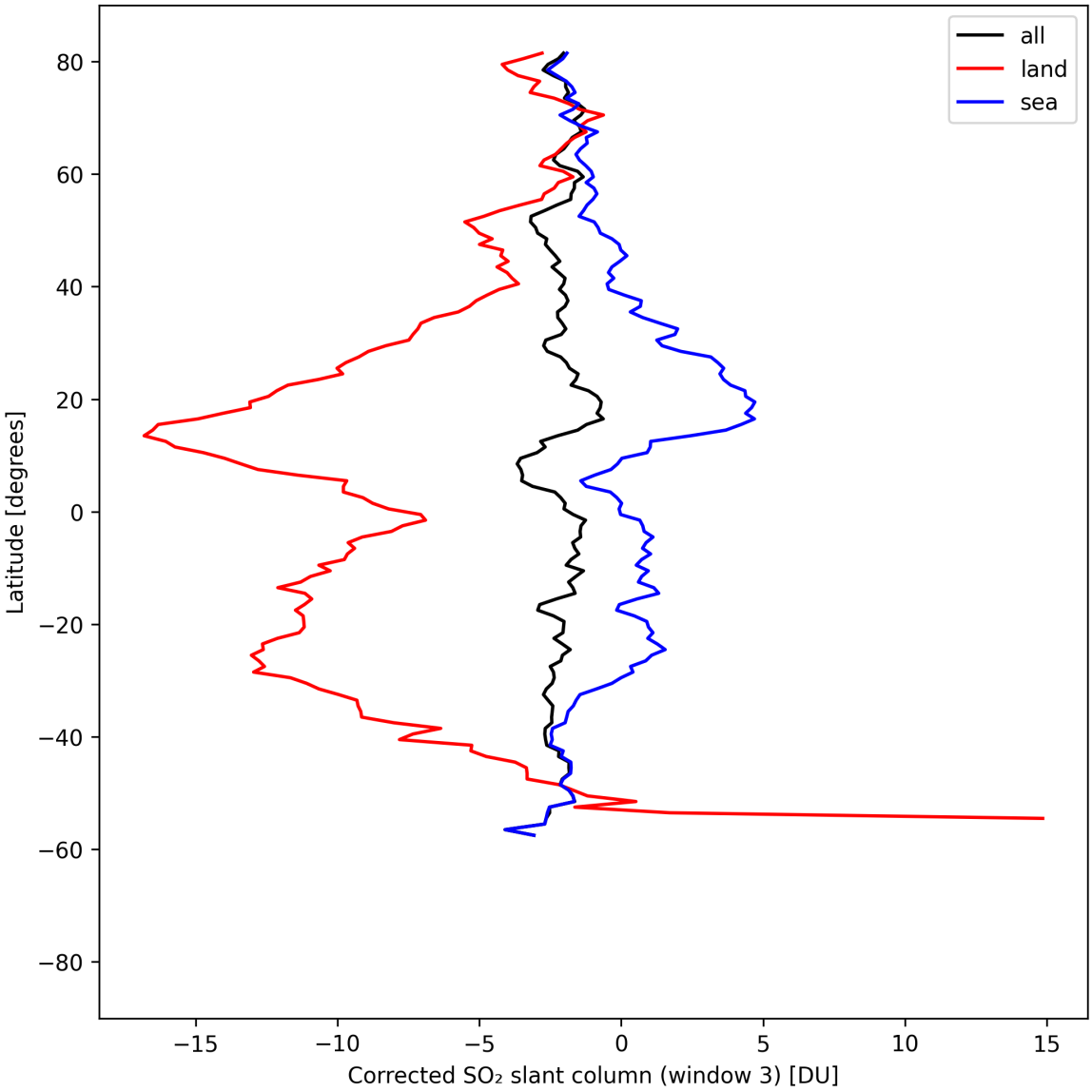

Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-04-20 to 2025-04-21.

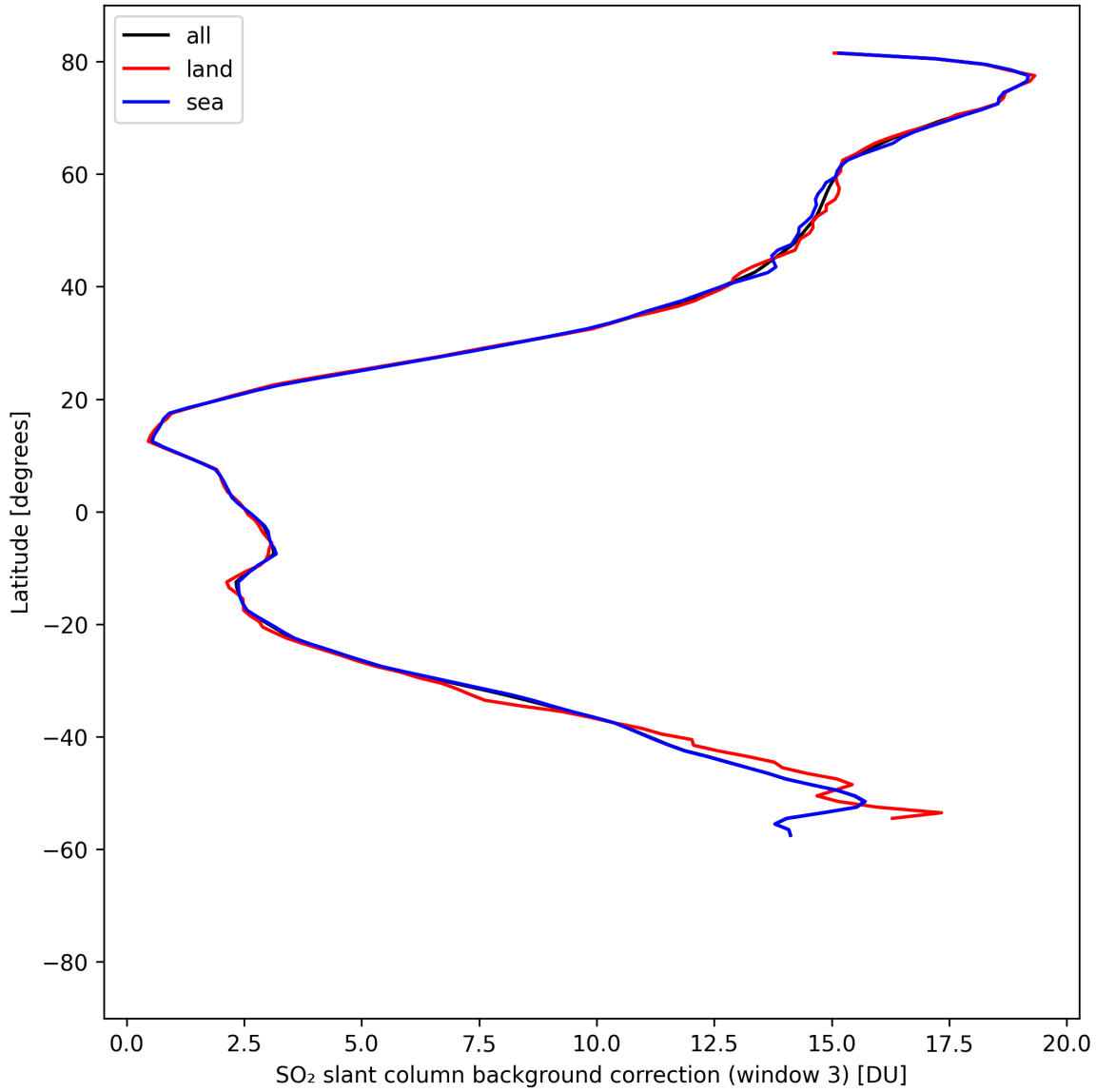

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-04-20 to 2025-04-21.

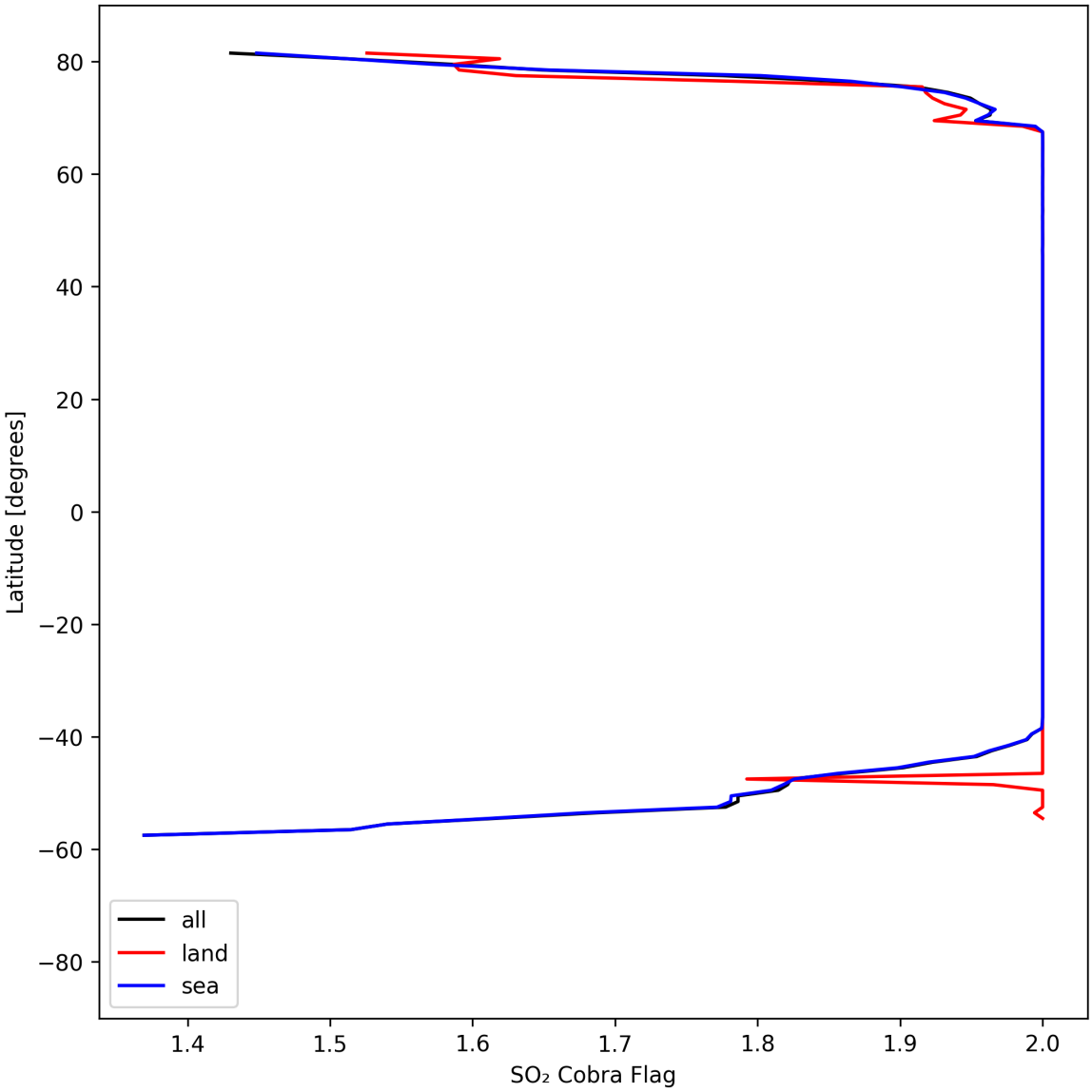

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-04-20 to 2025-04-21.

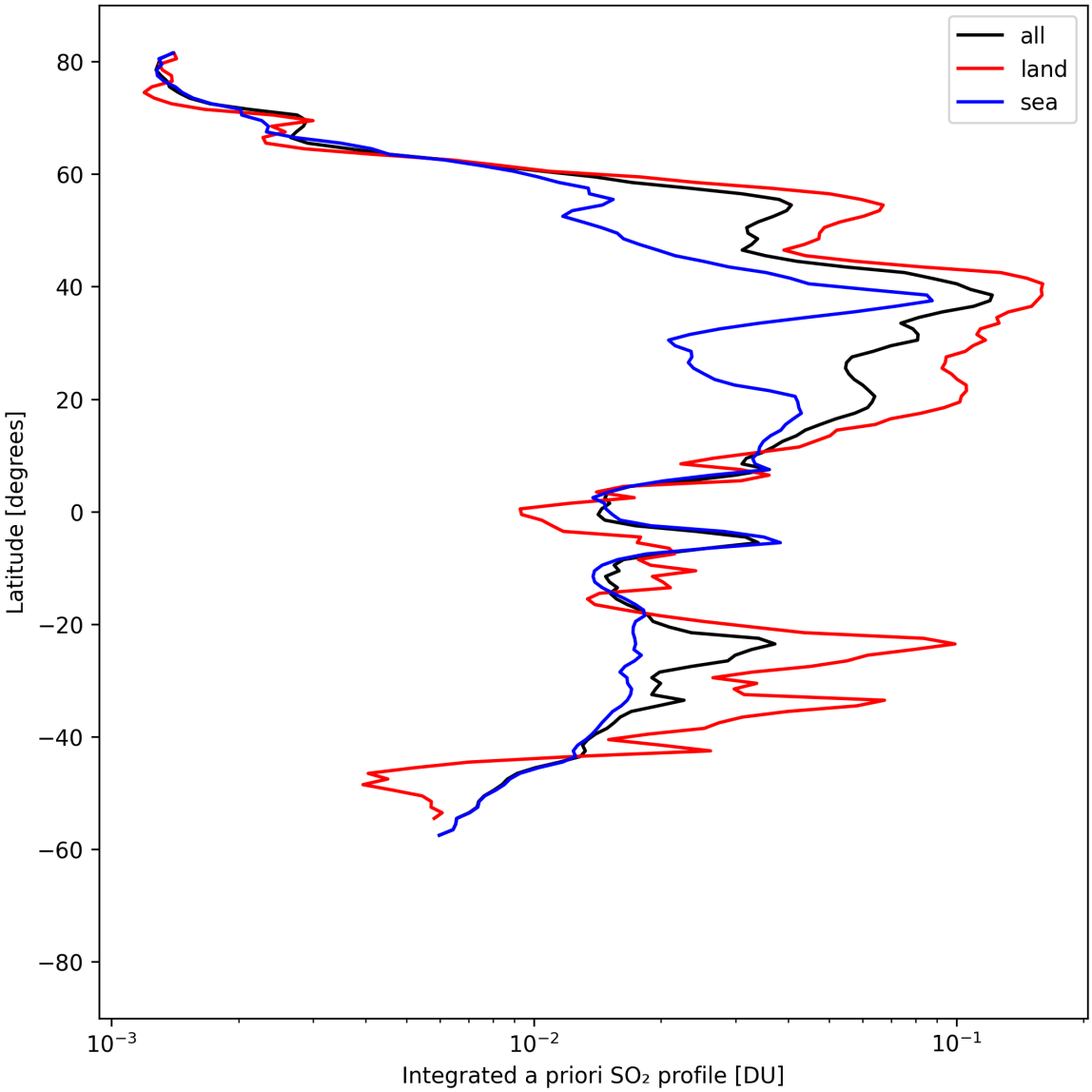

Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-04-20 to 2025-04-21.

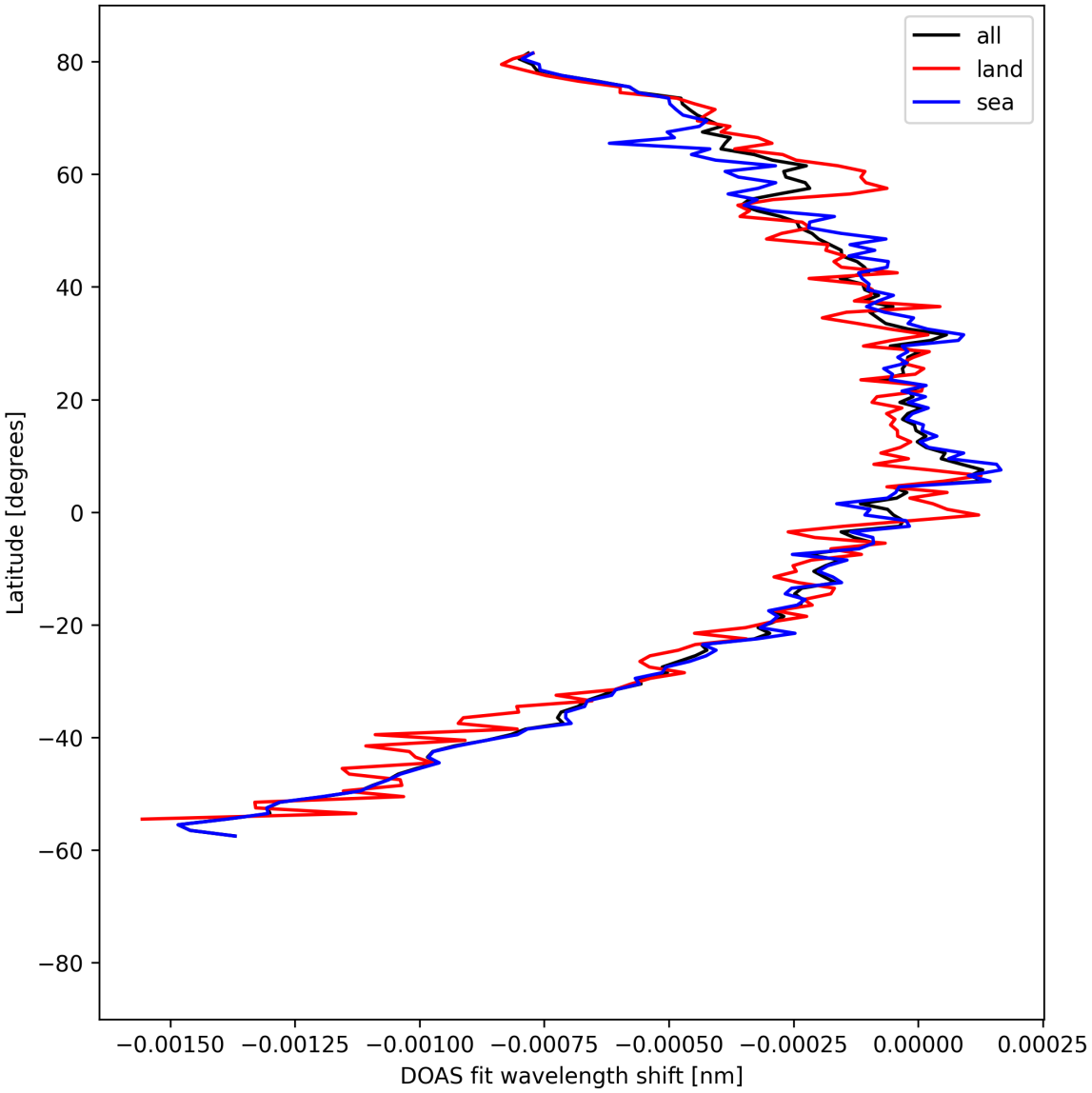

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-04-20 to 2025-04-21.

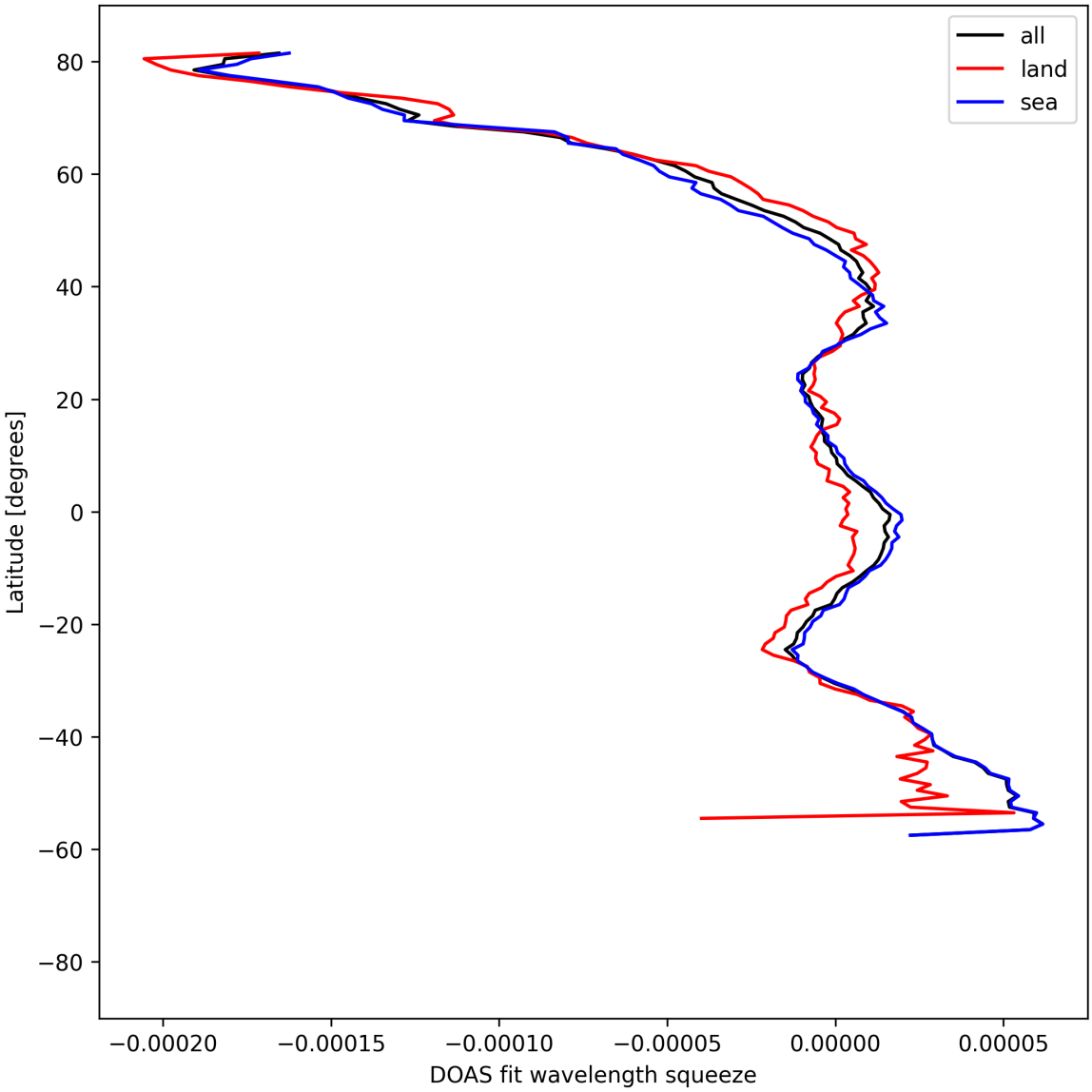

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-04-20 to 2025-04-21.

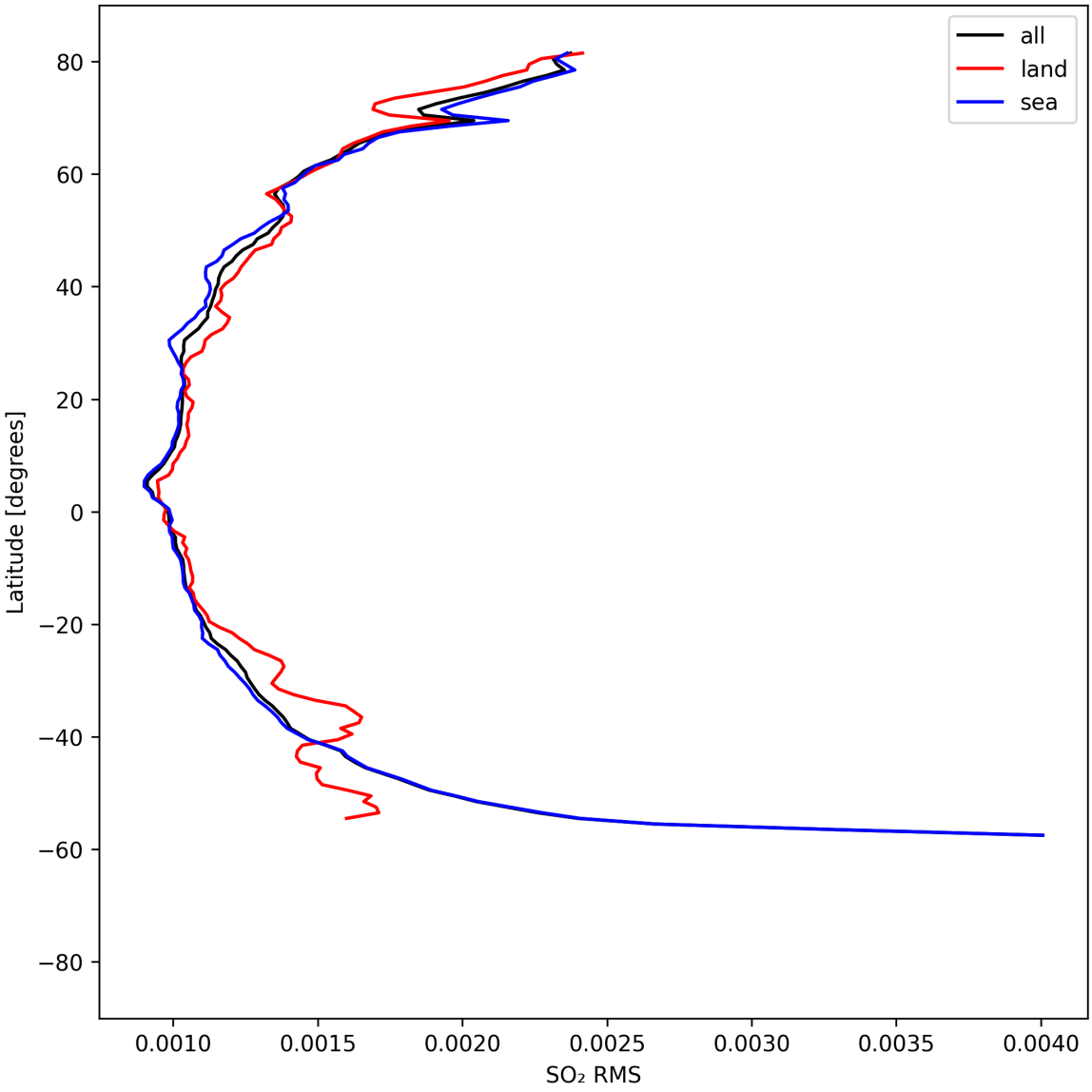

Figure 52: Zonal average of "SO_2 RMS" for 2025-04-20 to 2025-04-21.

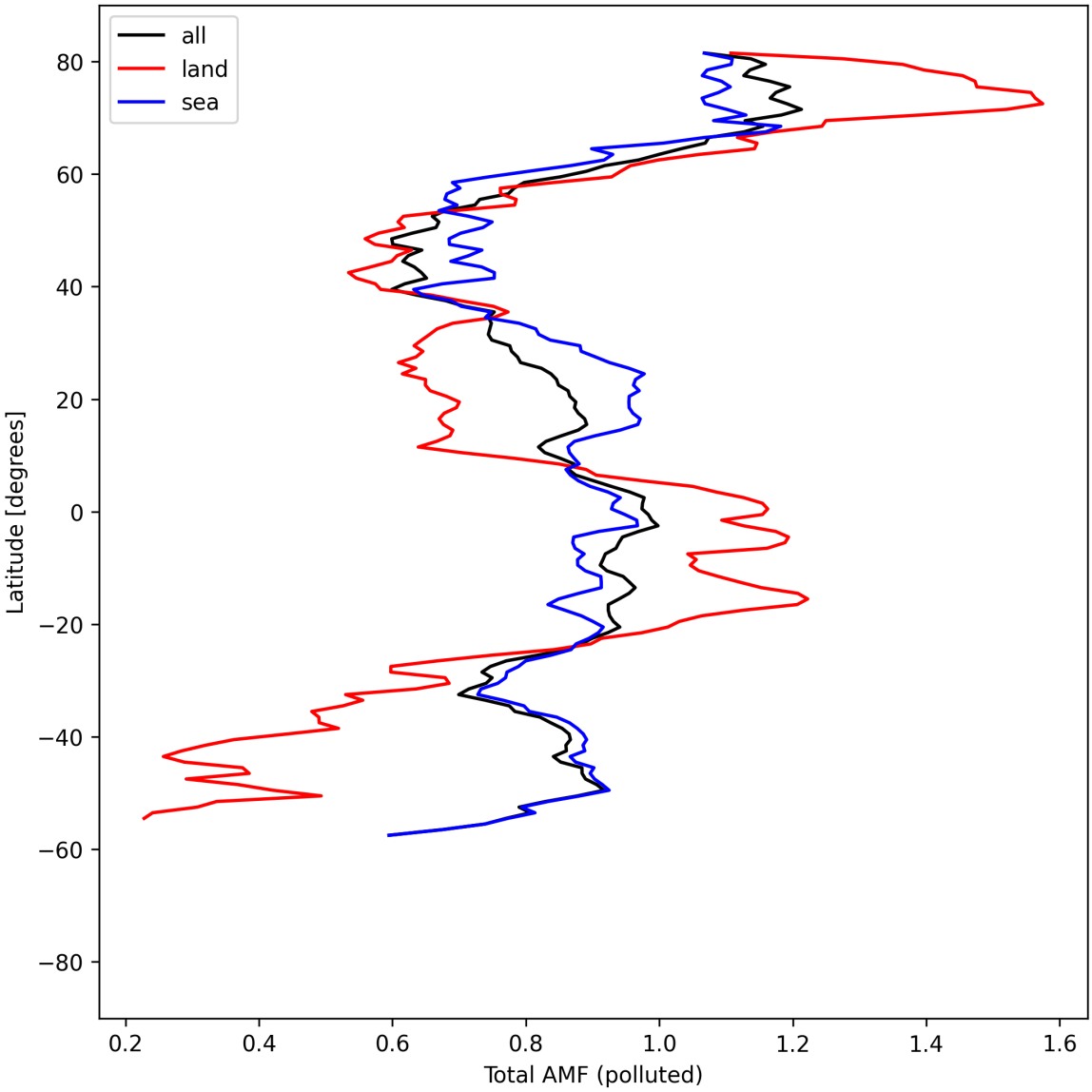

Figure 53: Zonal average of “Total AMF (polluted)” for 2025-04-20 to 2025-04-21.

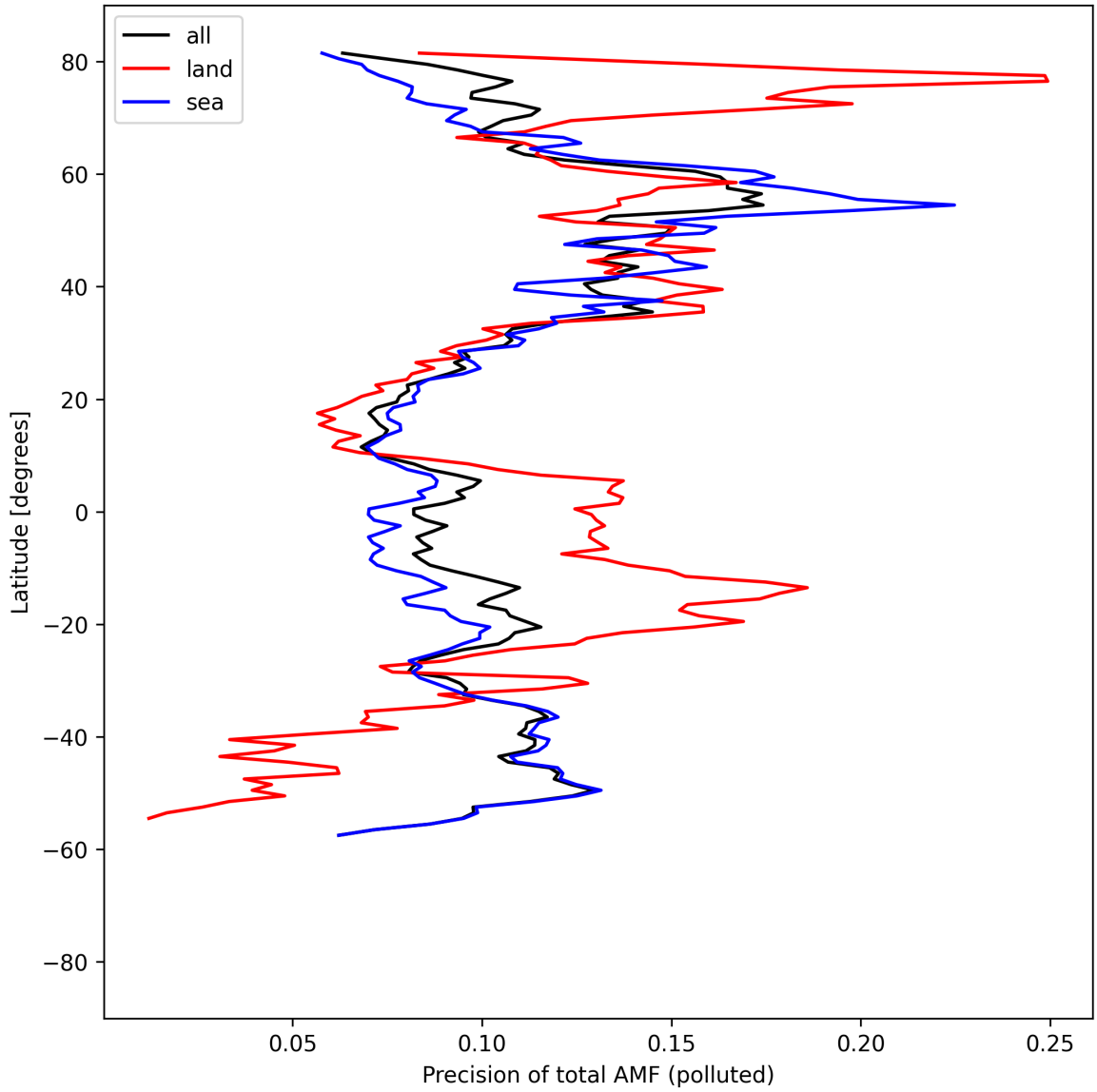

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-04-20 to 2025-04-21.

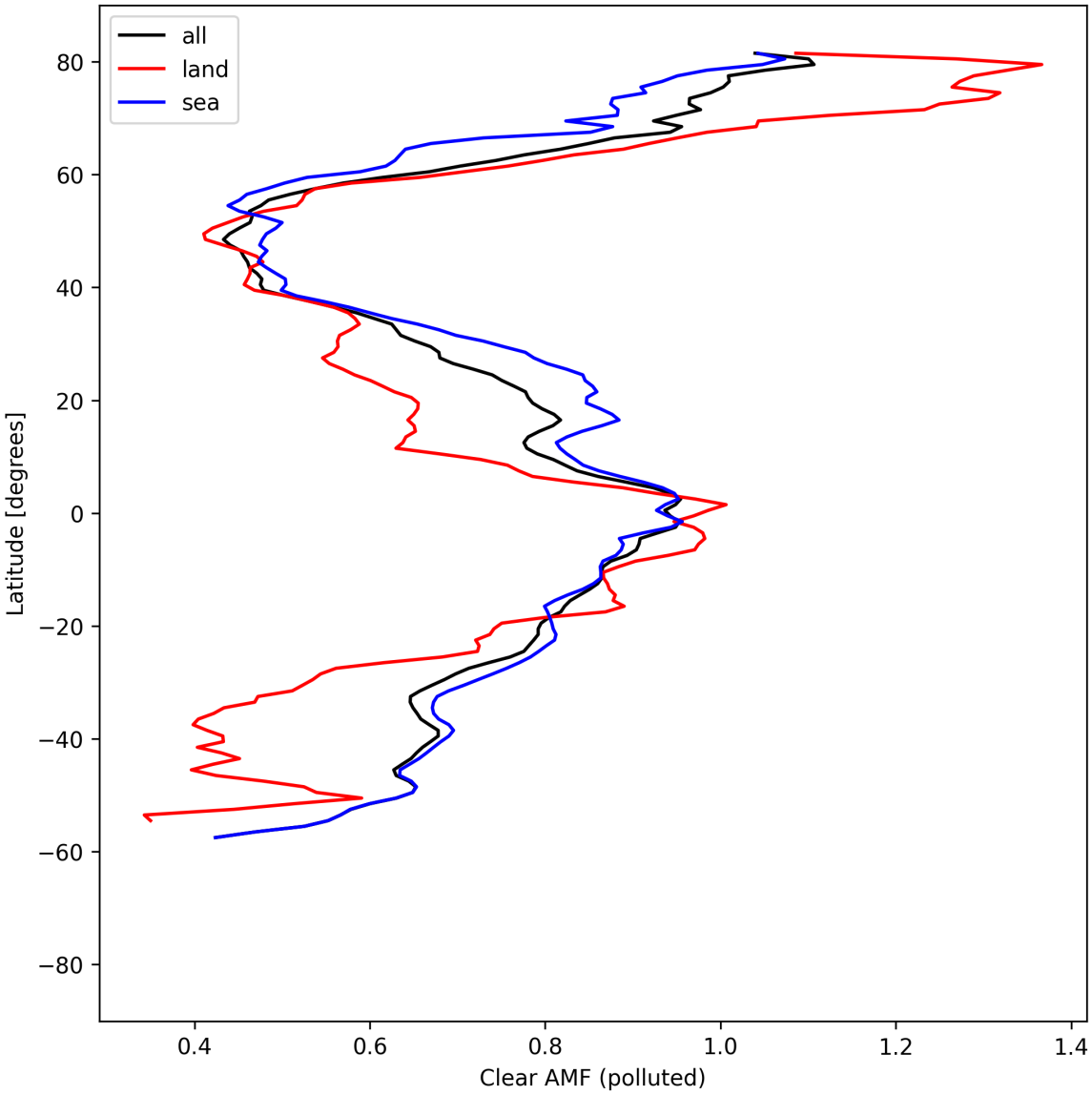

Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-04-20 to 2025-04-21.

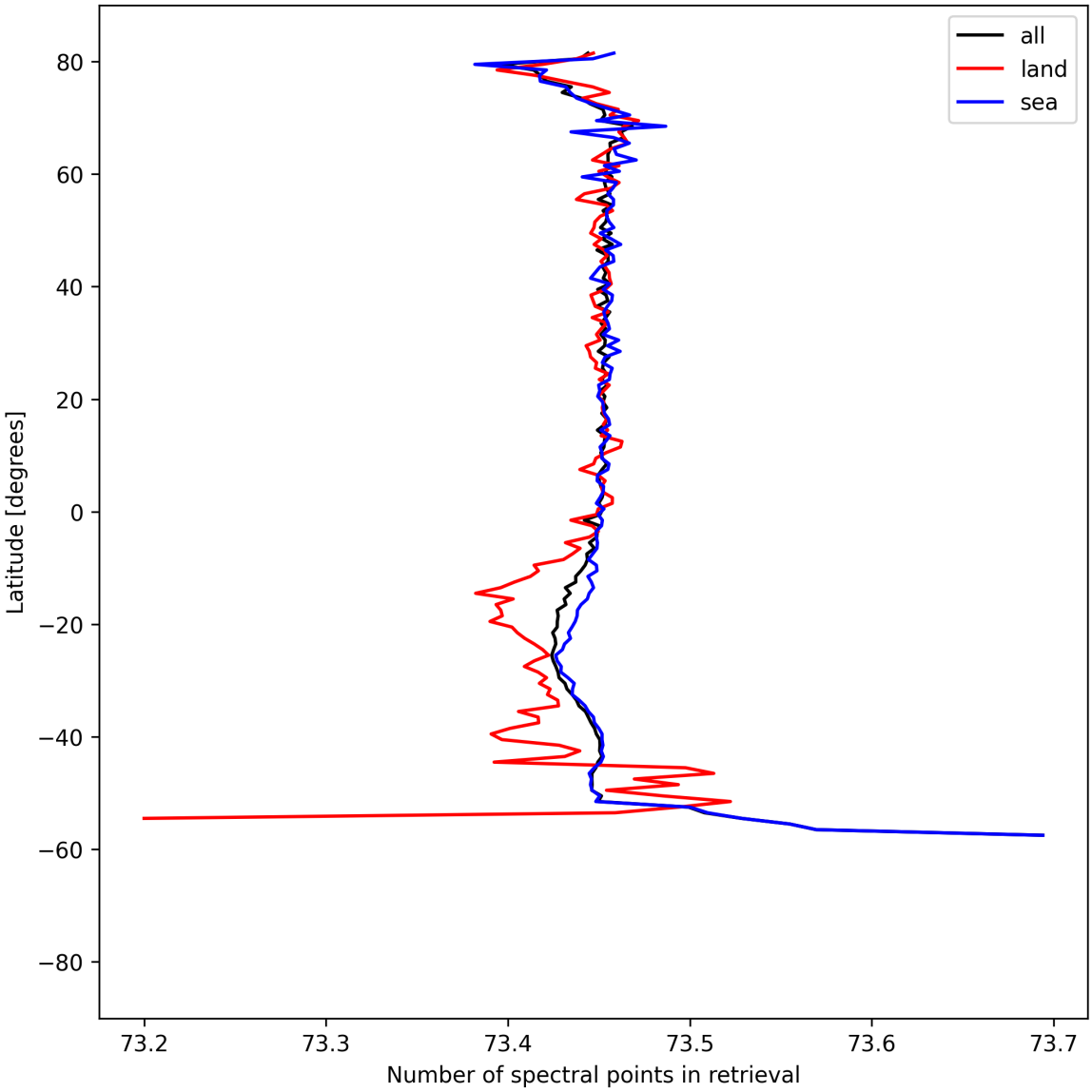

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-04-20 to 2025-04-21.

8 Histograms

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

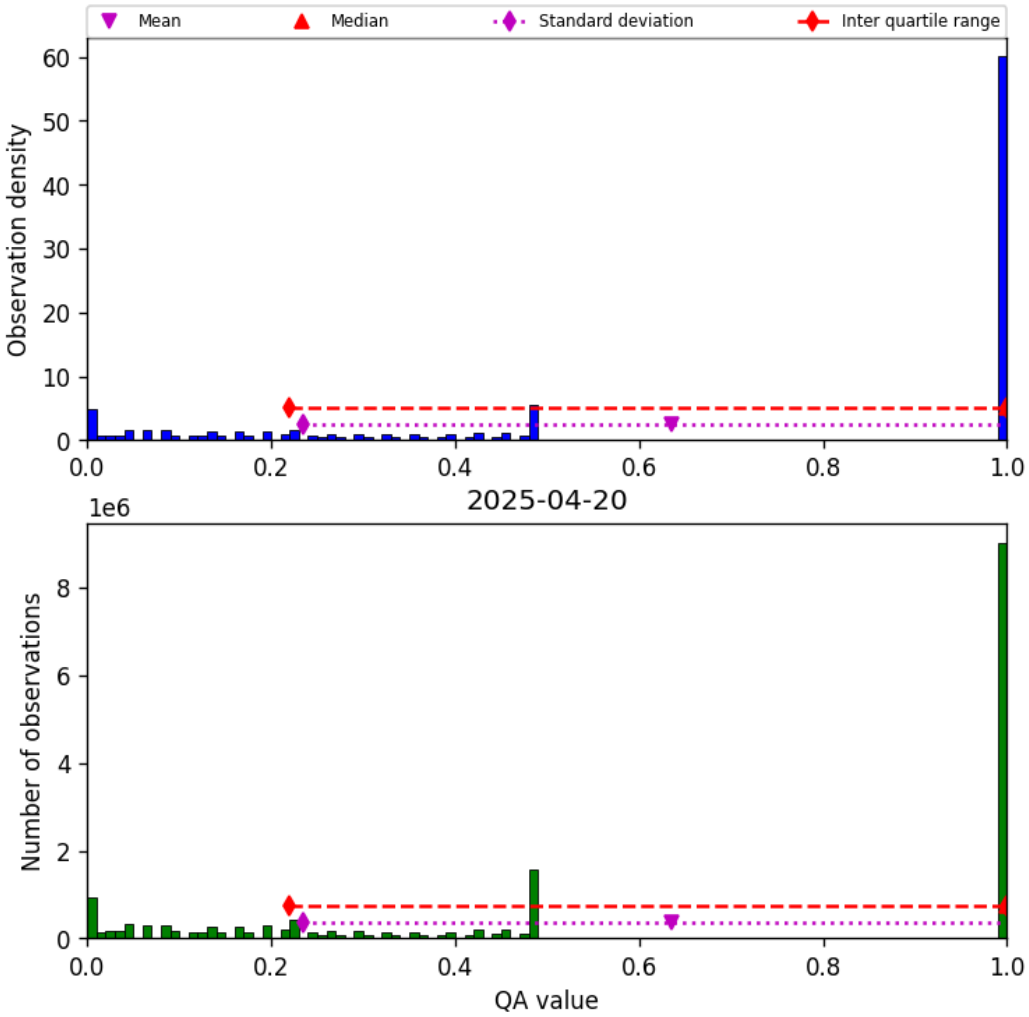

Figure 57: Histogram of “QA value” for 2025-04-20 to 2025-04-21

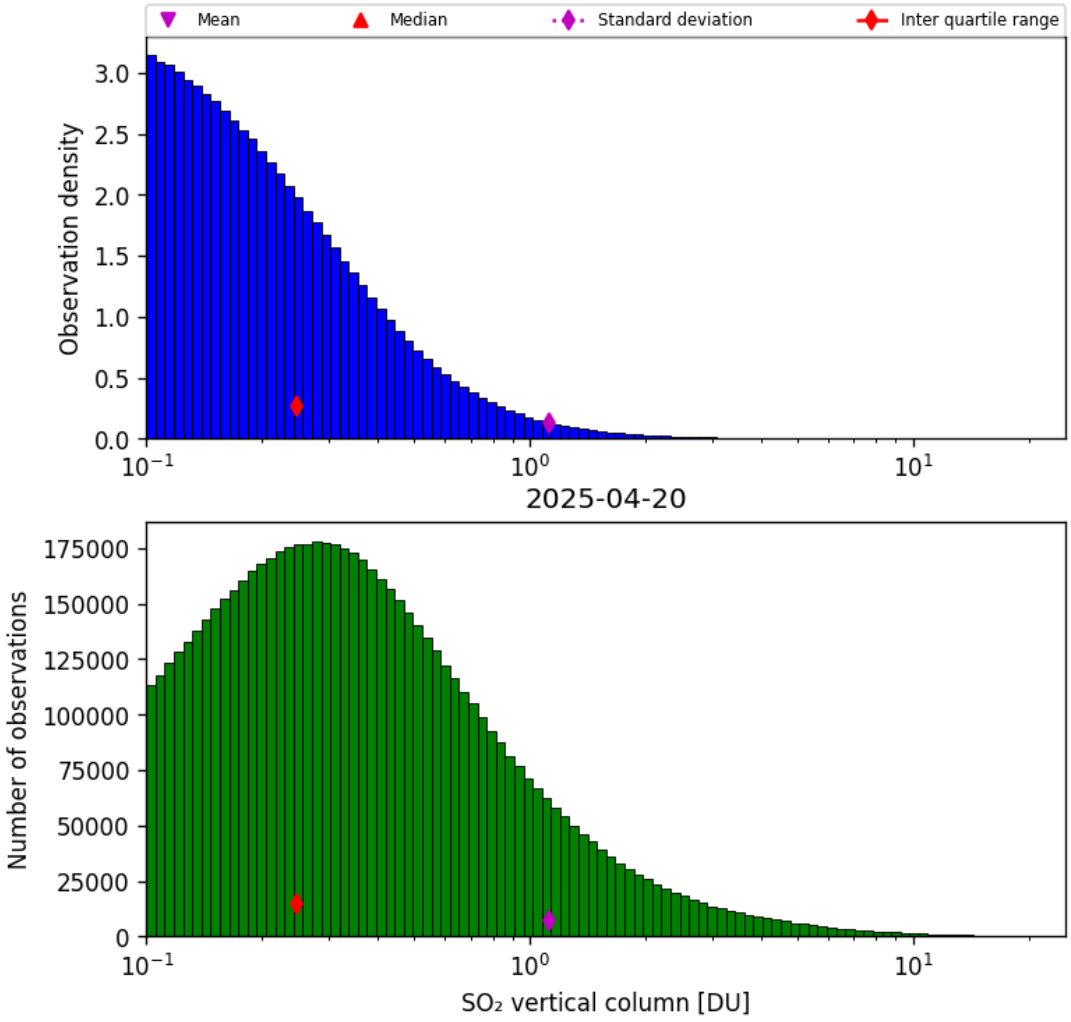

Figure 58: Histogram of "SO_2 vertical column" for 2025-04-20 to 2025-04-21

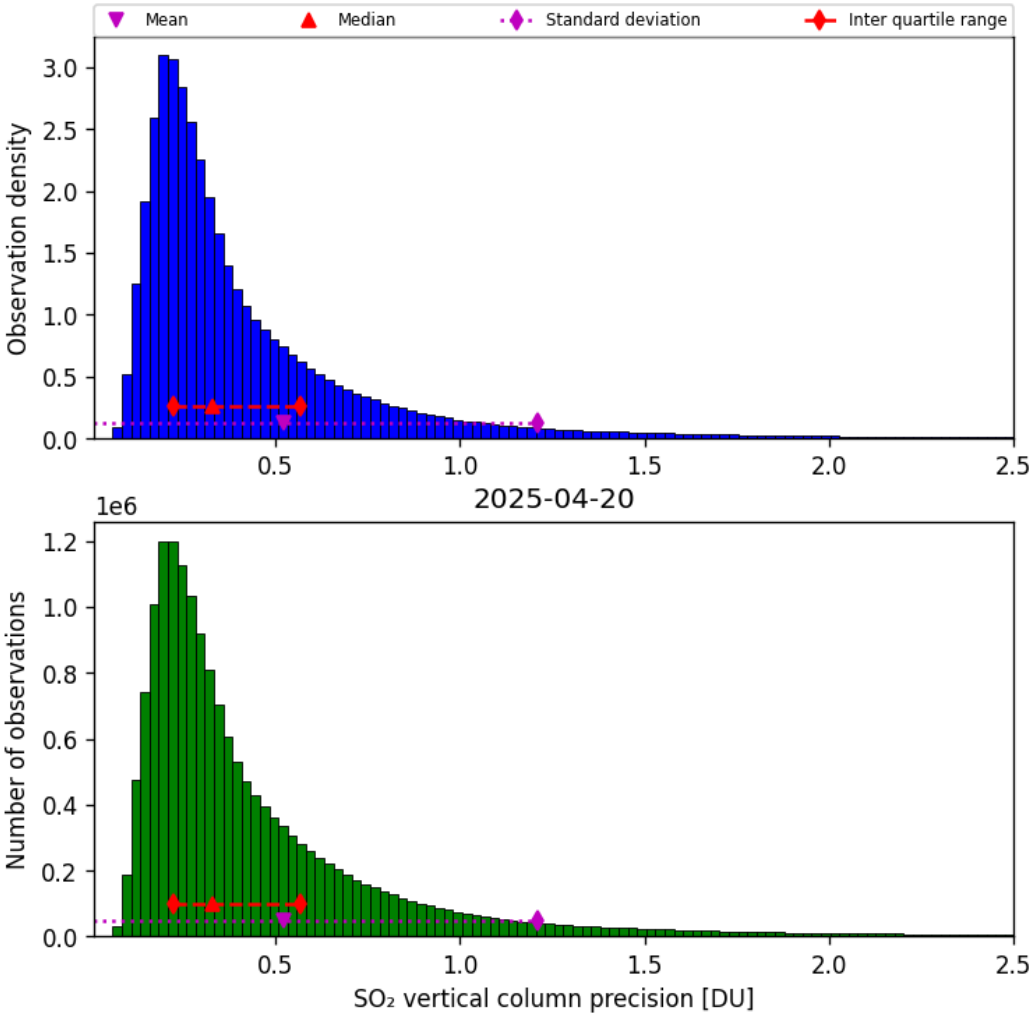

Figure 59: Histogram of "SO_2 vertical column precision" for 2025-04-20 to 2025-04-21

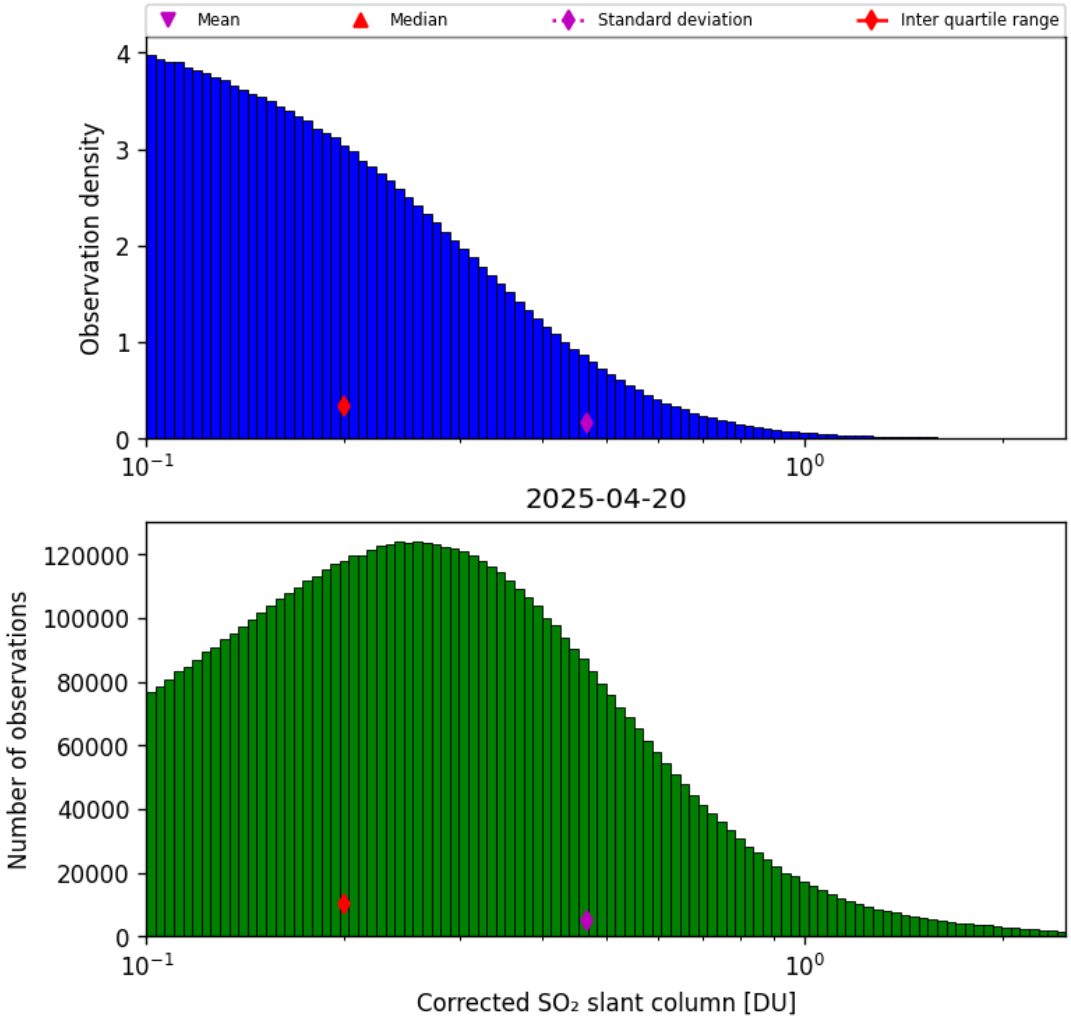

Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-04-20 to 2025-04-21

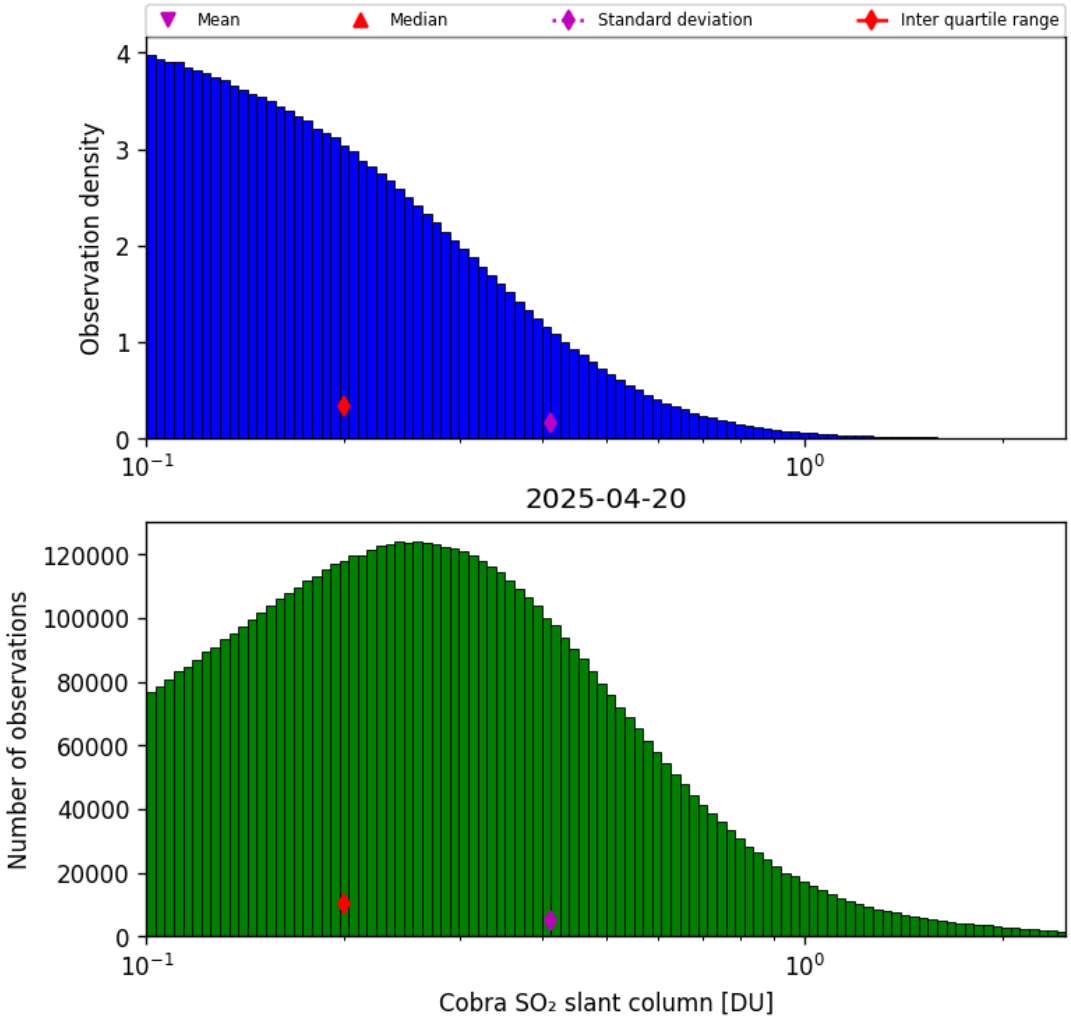

Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-04-20 to 2025-04-21

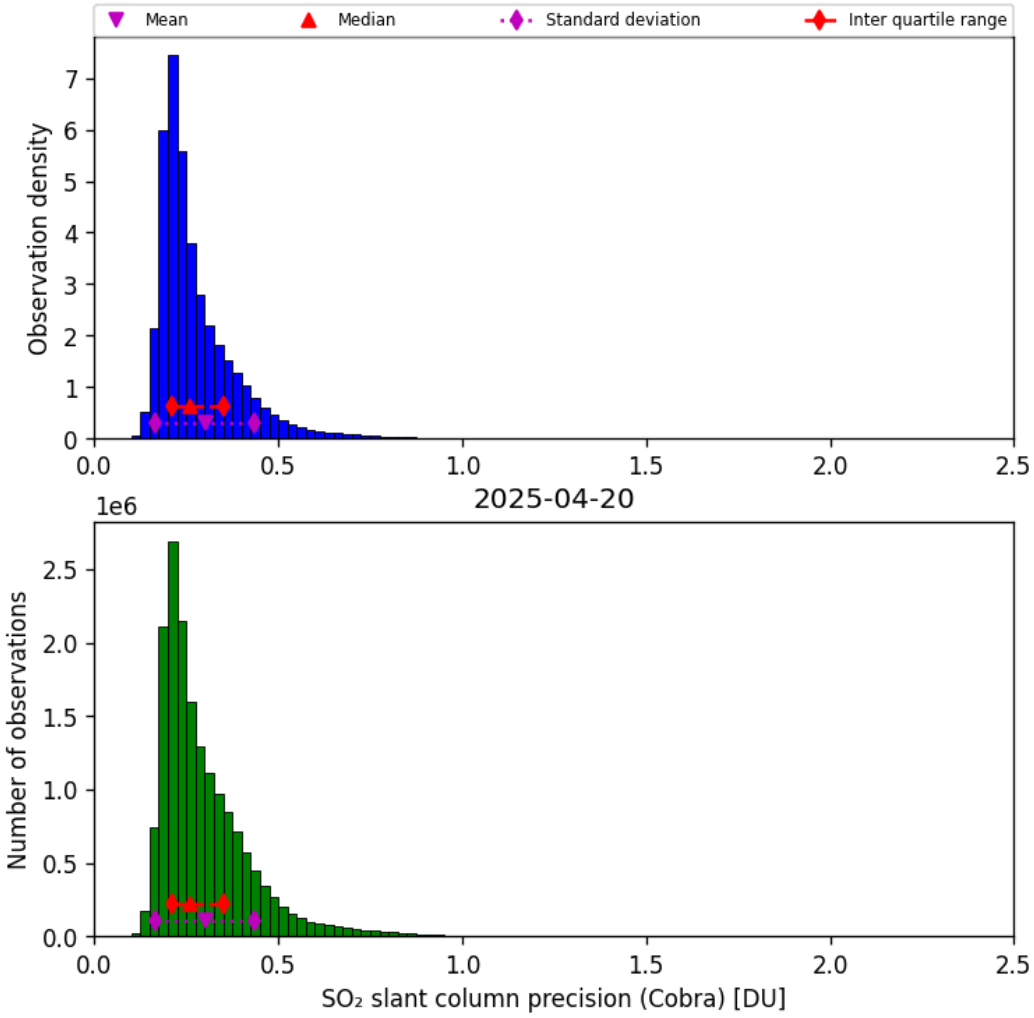

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-04-20 to 2025-04-21

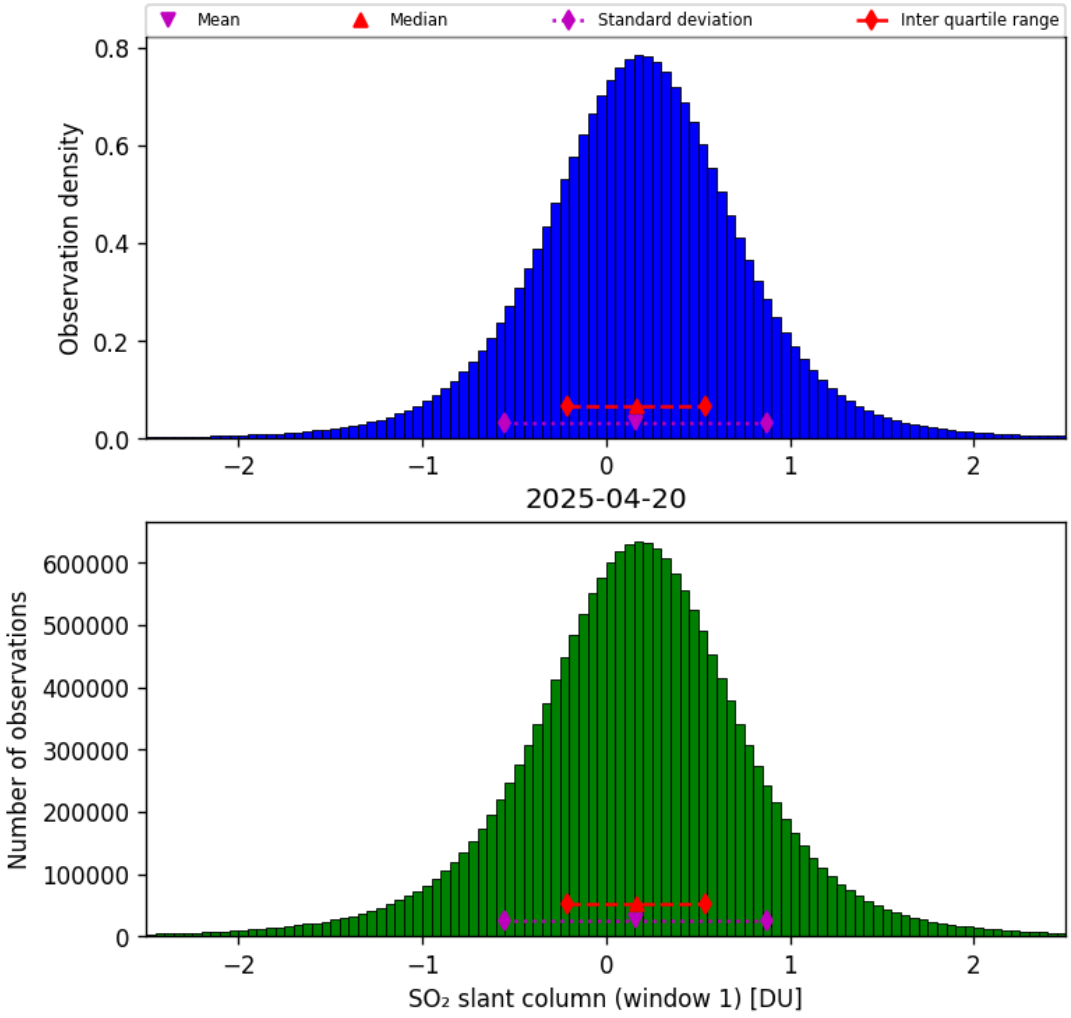

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-04-20 to 2025-04-21

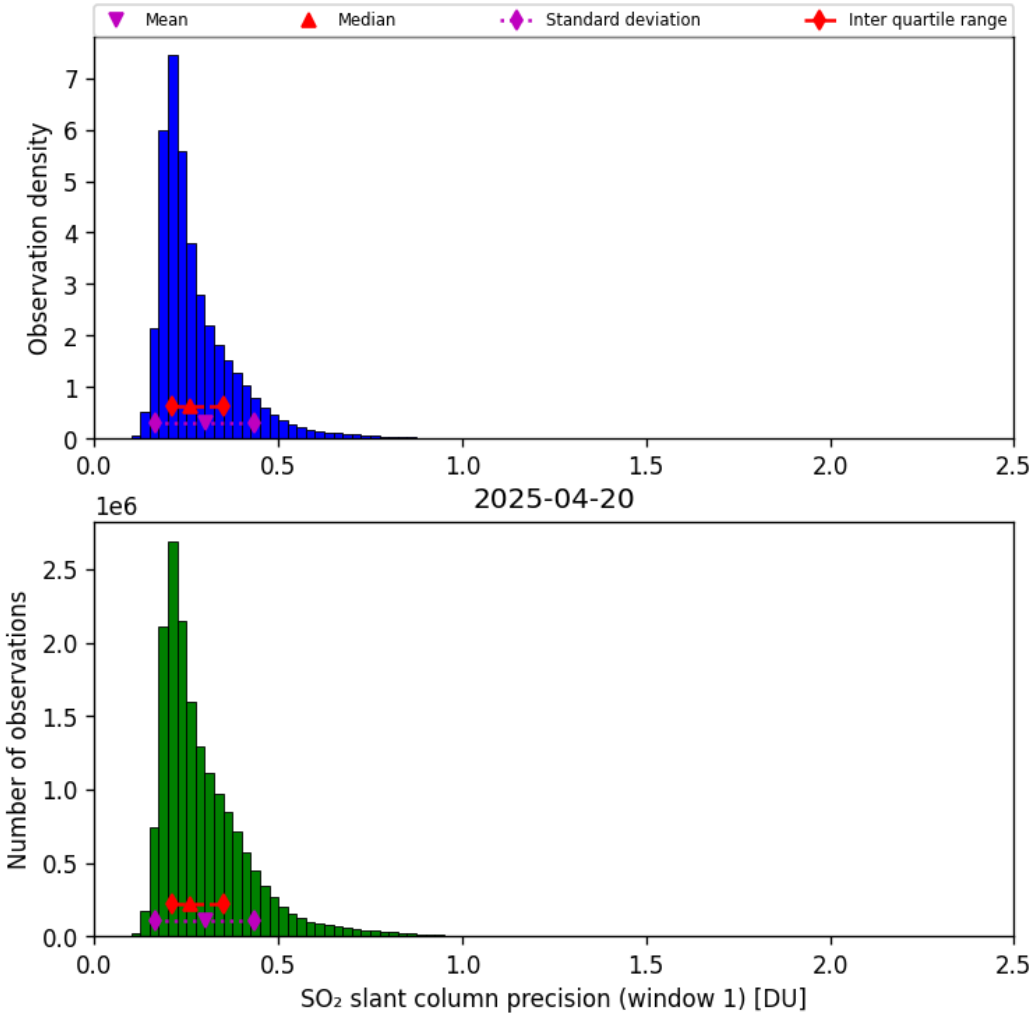

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-04-20 to 2025-04-21

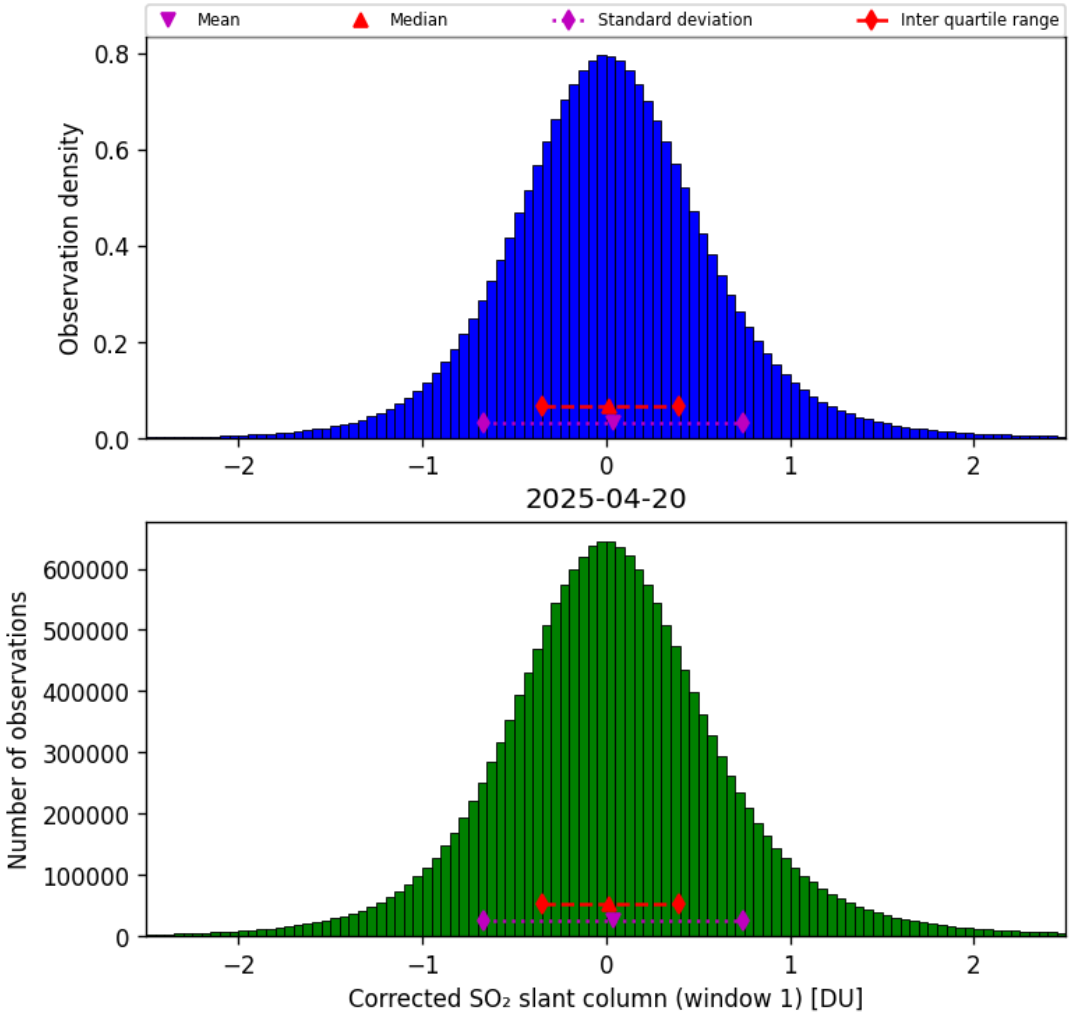

Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-04-20 to 2025-04-21

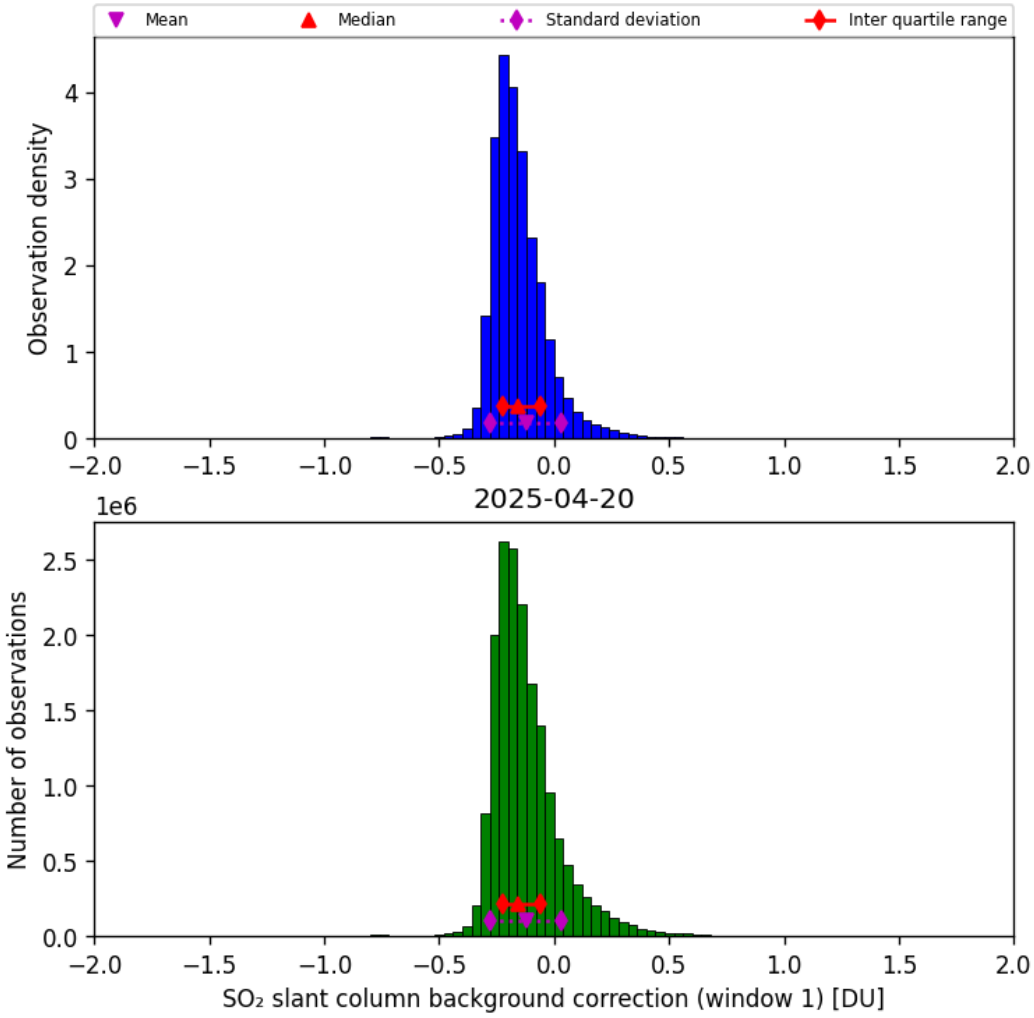

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-04-20 to 2025-04-21

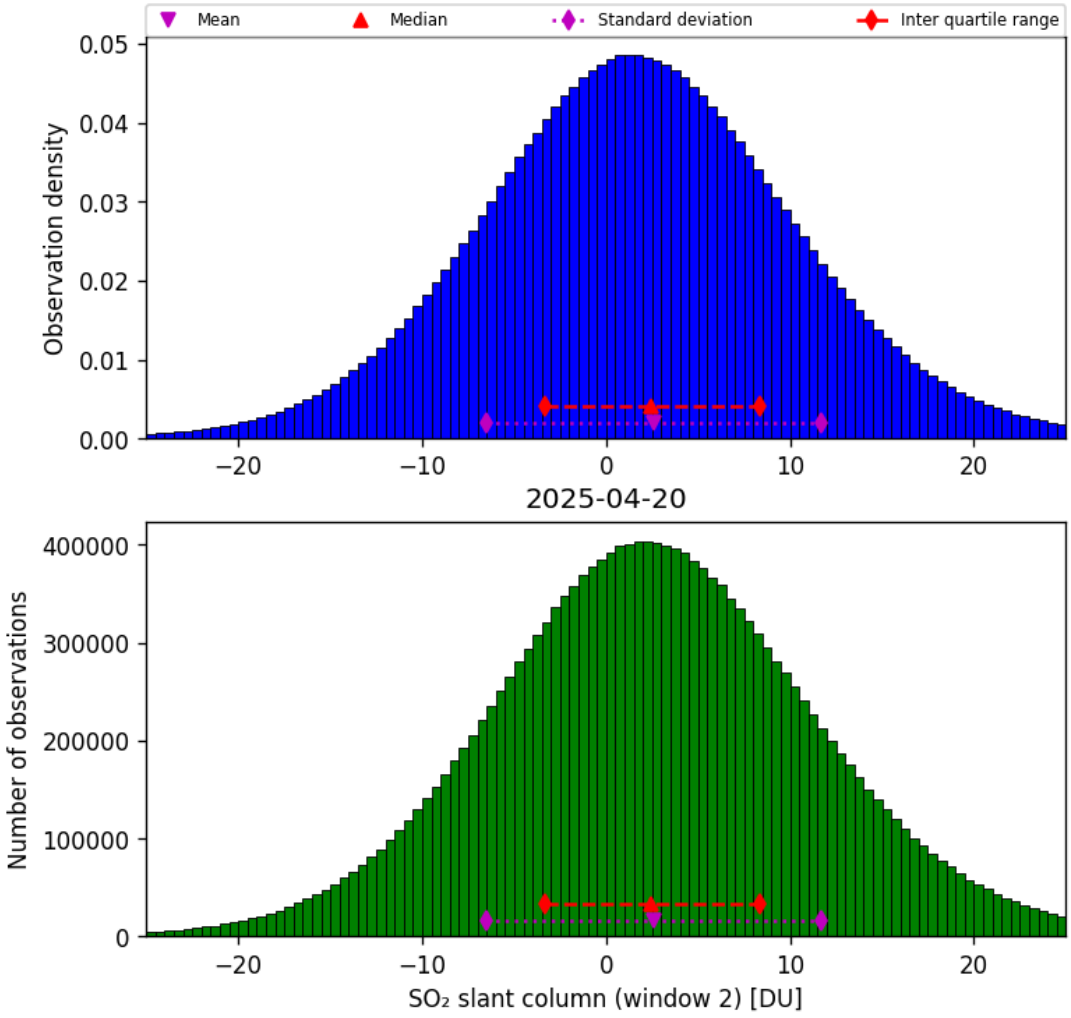

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-04-20 to 2025-04-21

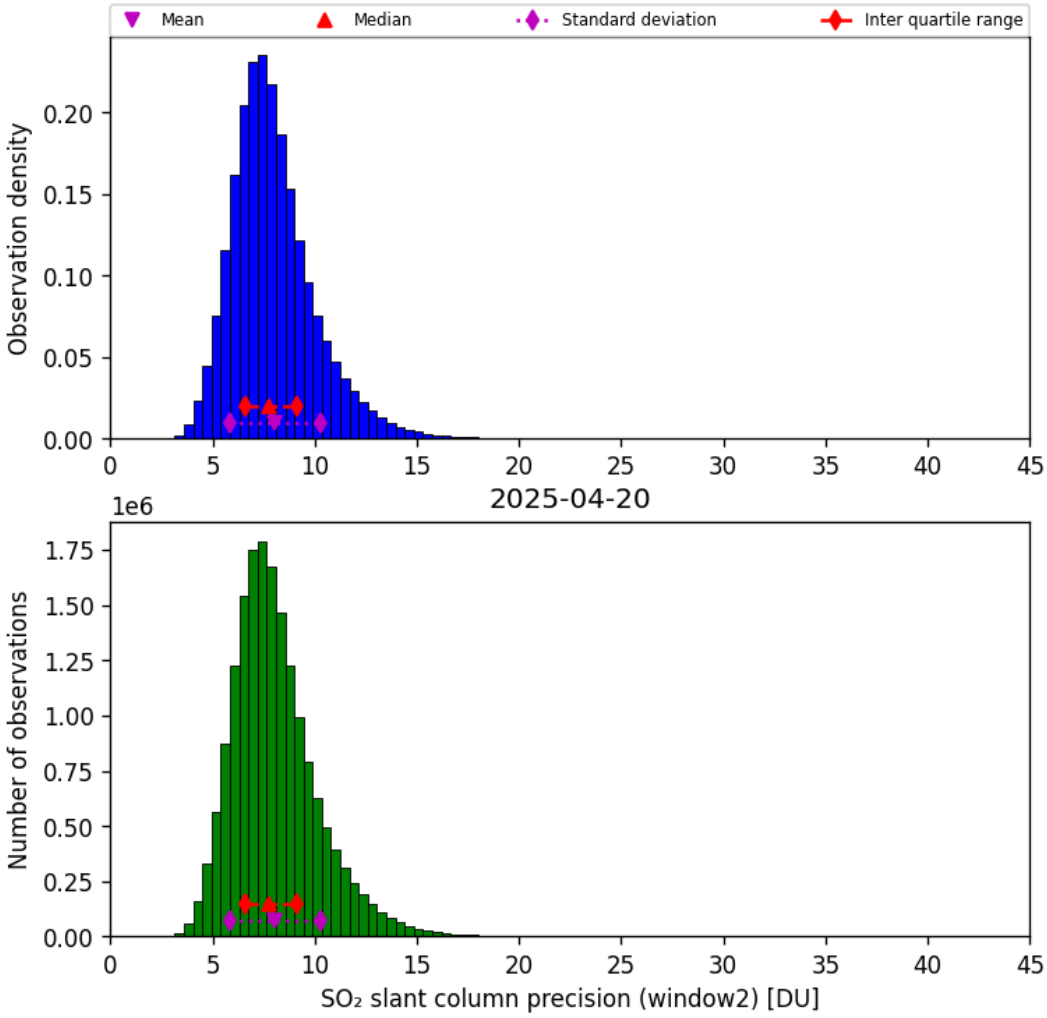

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-04-20 to 2025-04-21

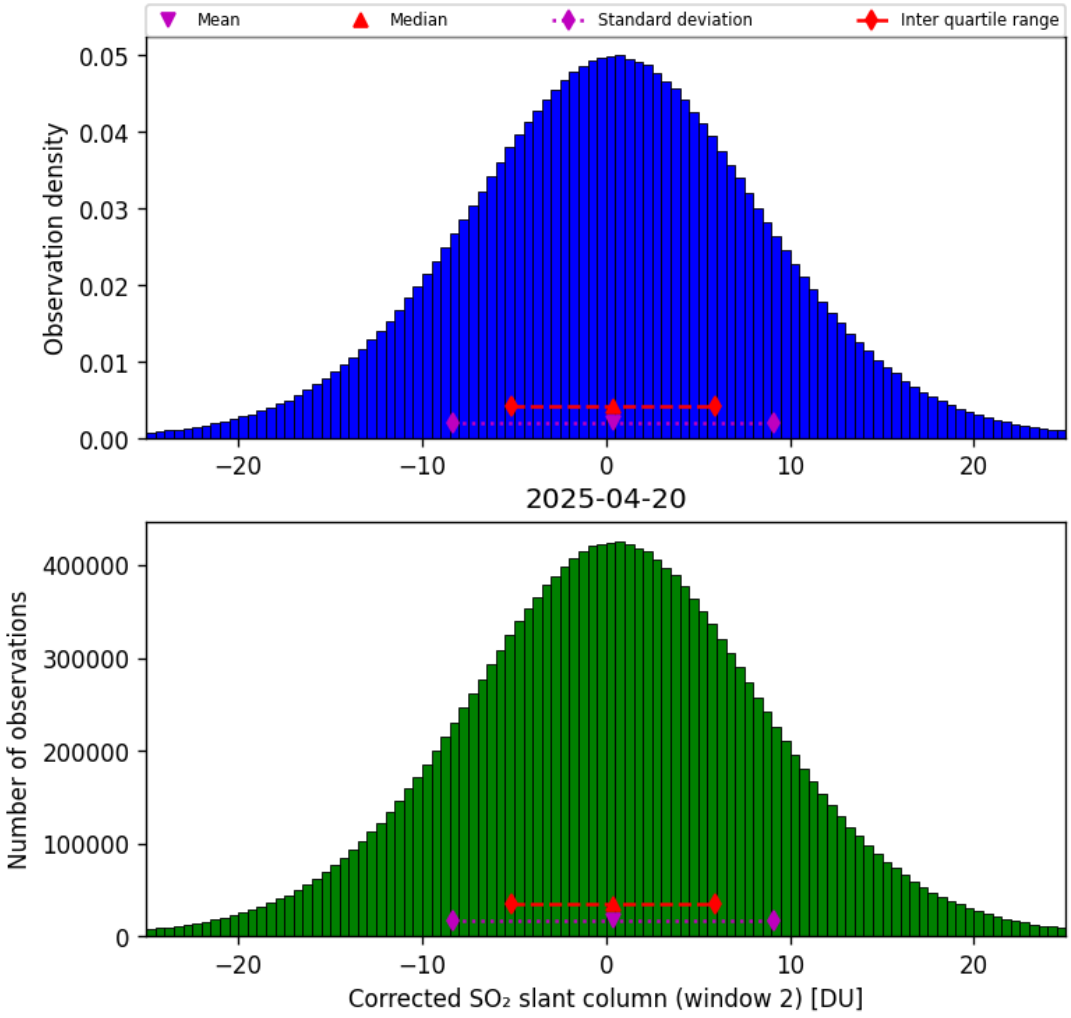

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-04-20 to 2025-04-21

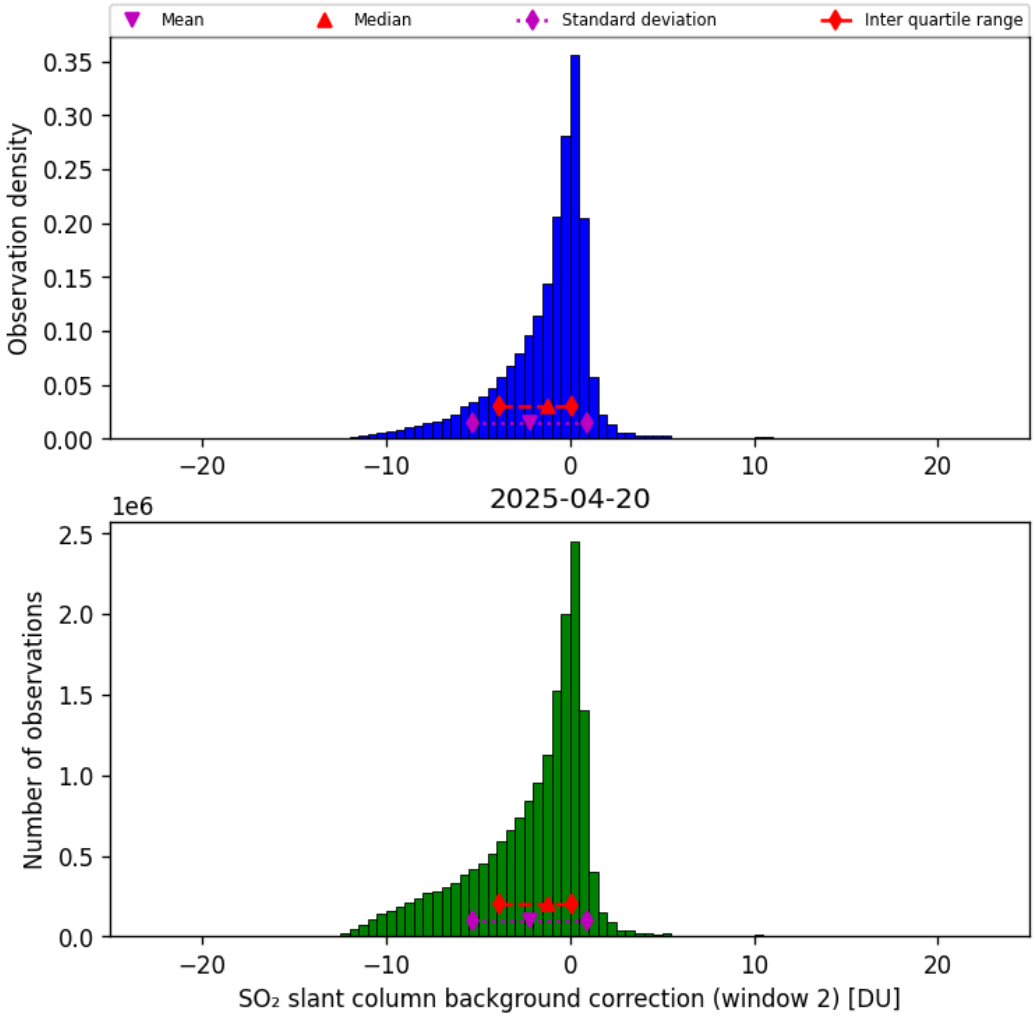

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-04-20 to 2025-04-21

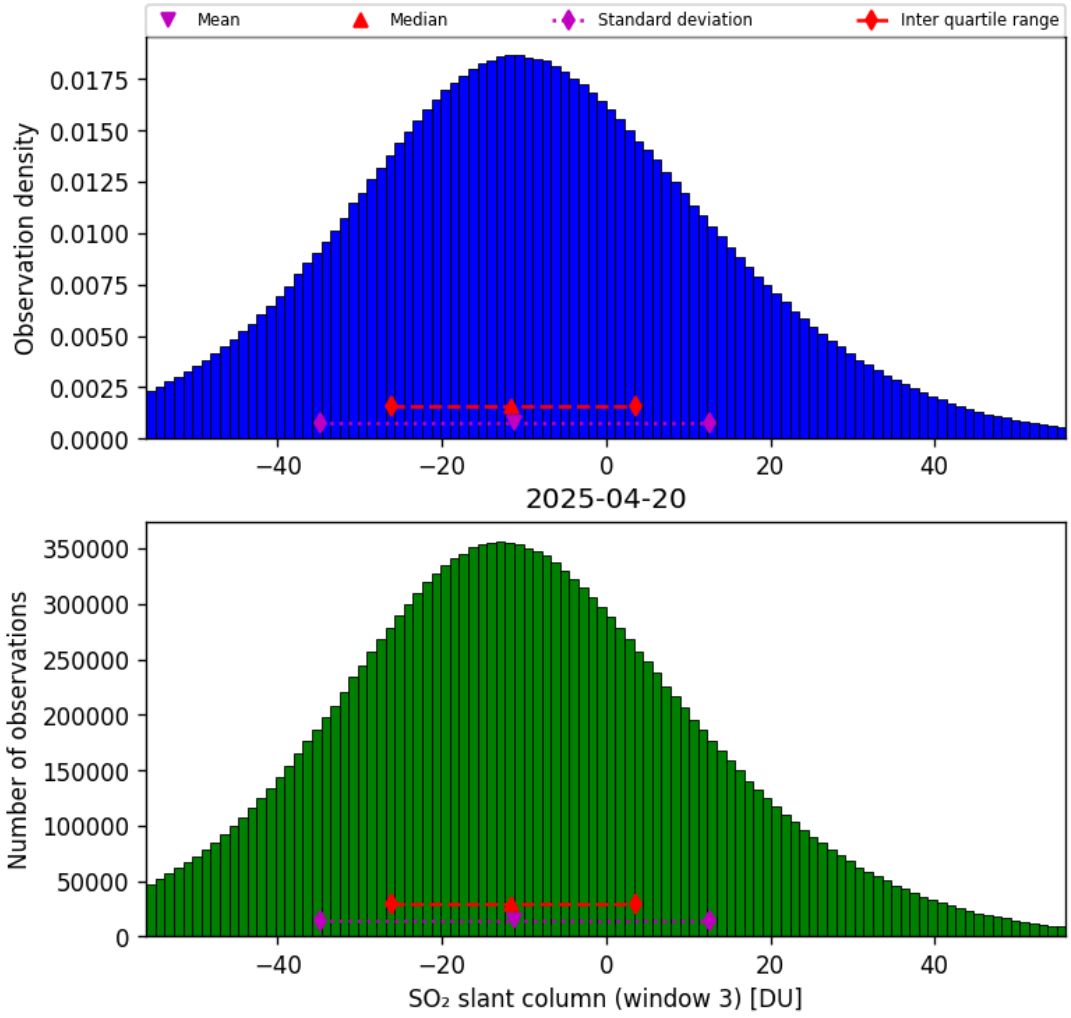

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-04-20 to 2025-04-21

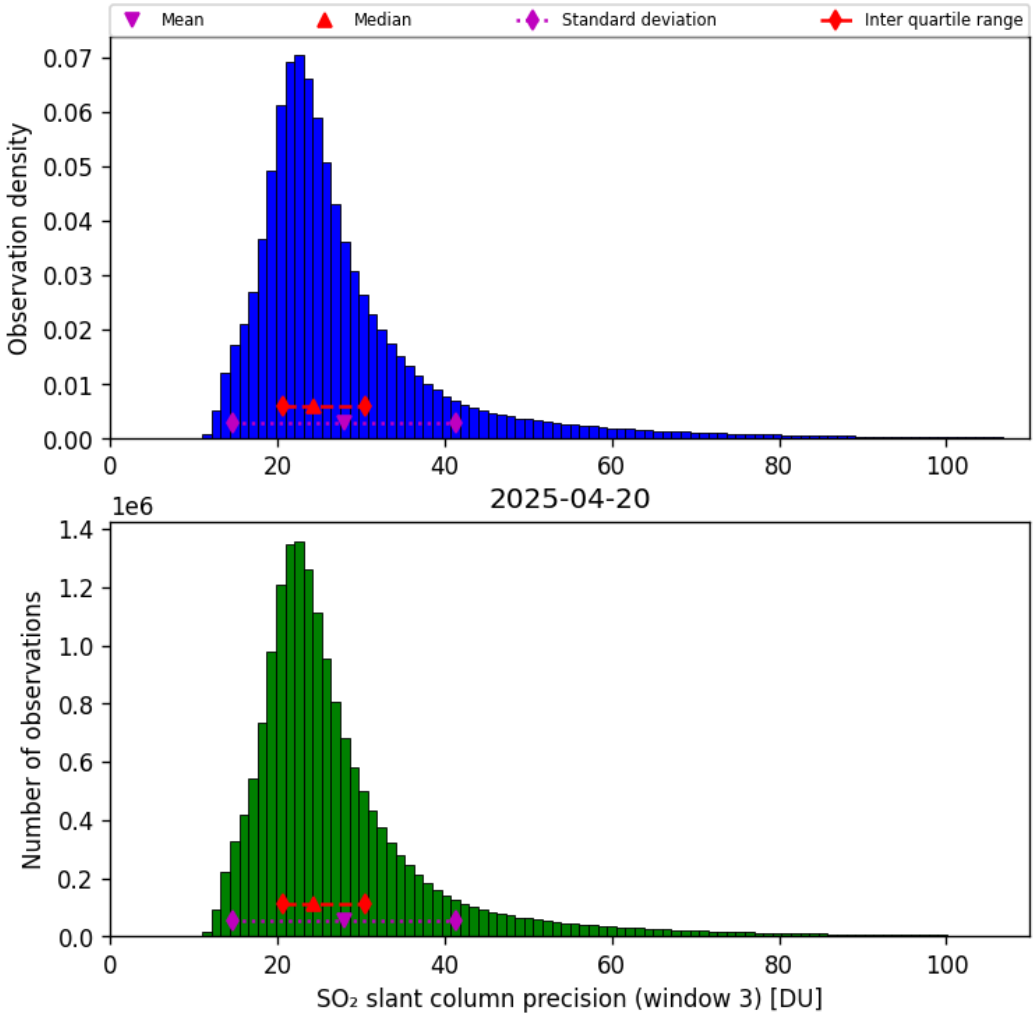

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-04-20 to 2025-04-21

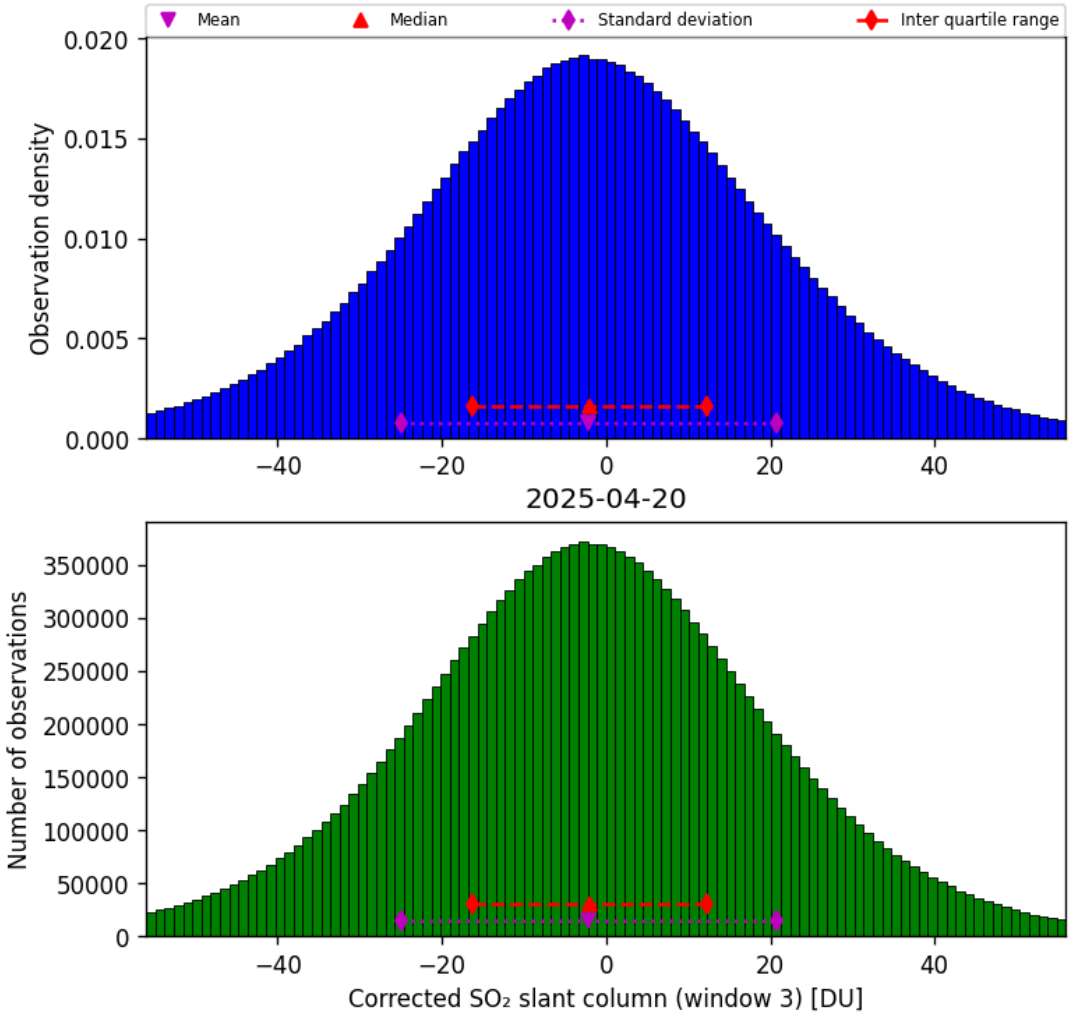

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-04-20 to 2025-04-21

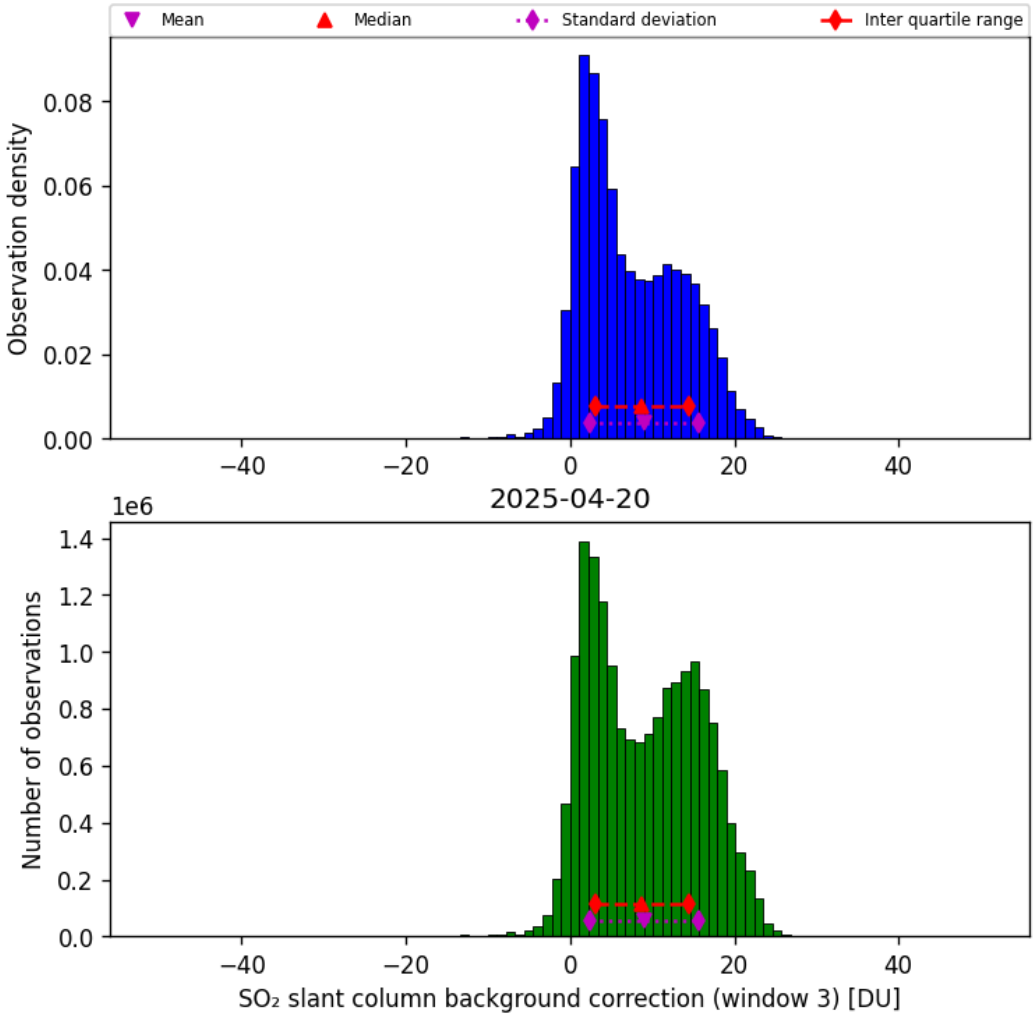

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-04-20 to 2025-04-21

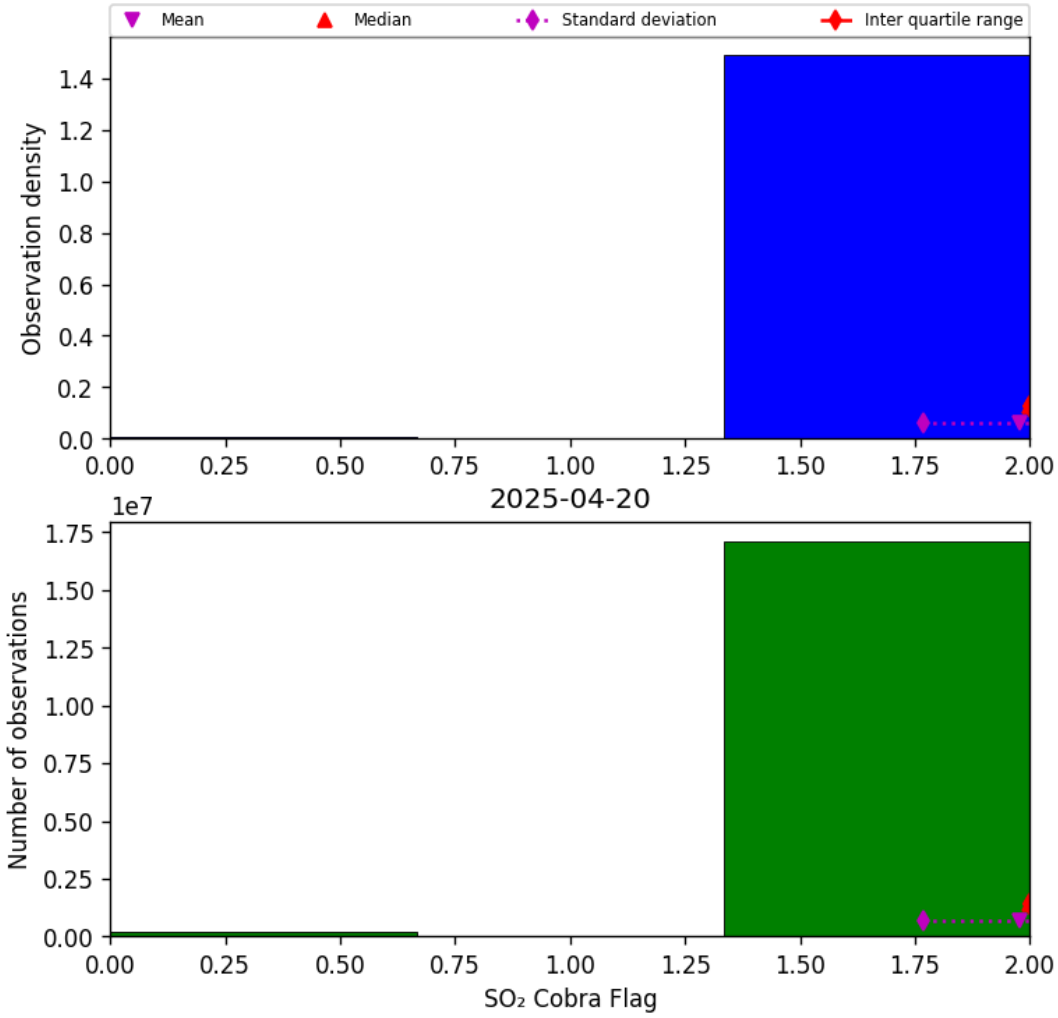

Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-04-20 to 2025-04-21

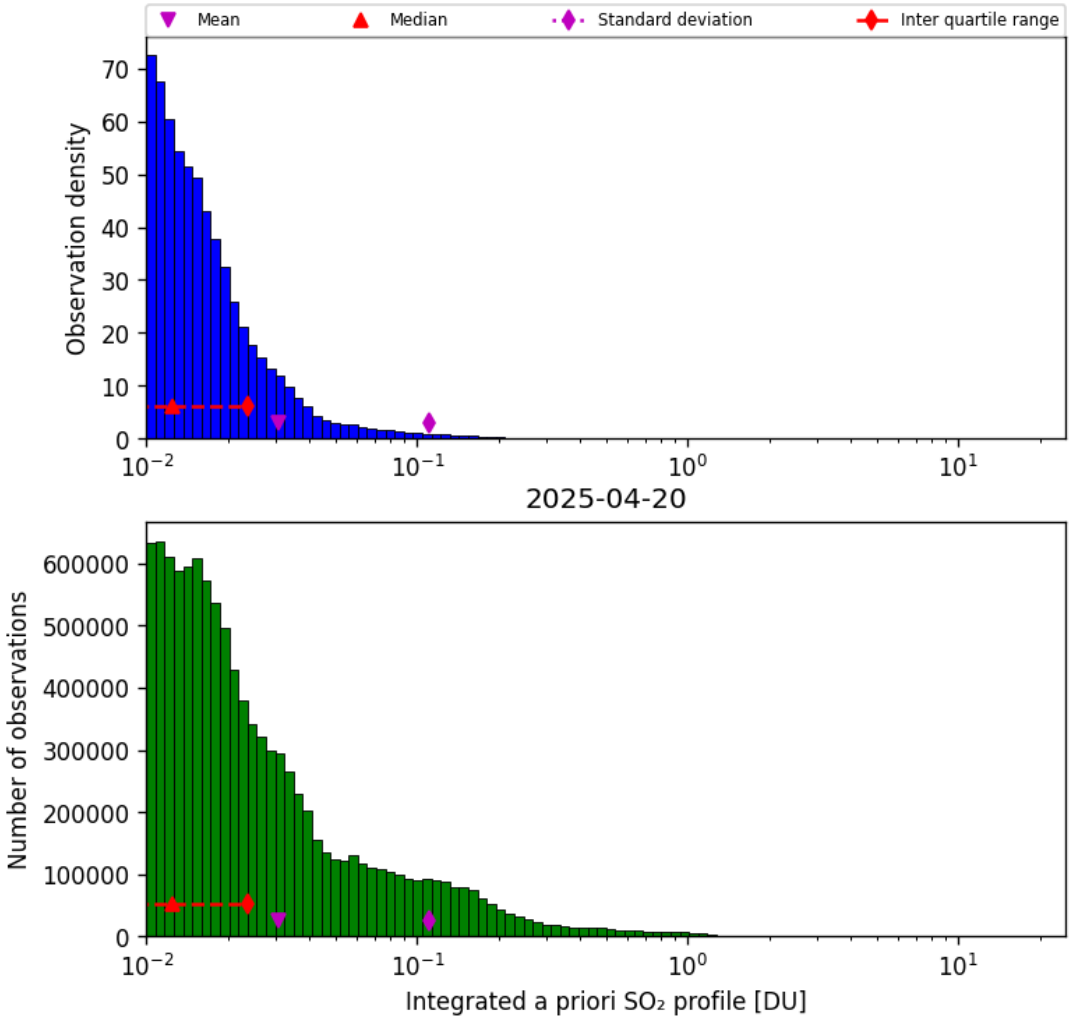

Figure 76: Histogram of "Integrated a priori SO_2 profile" for 2025-04-20 to 2025-04-21

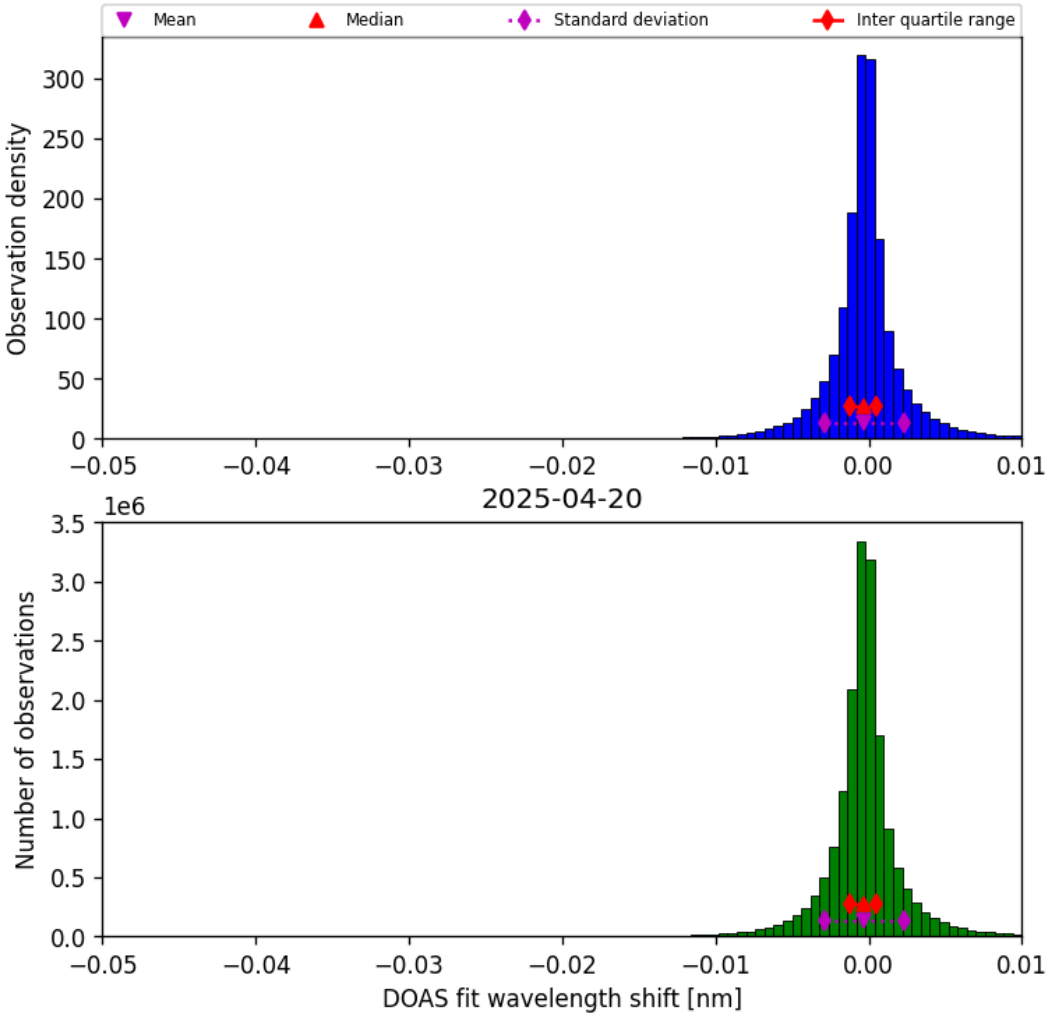

Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-04-20 to 2025-04-21

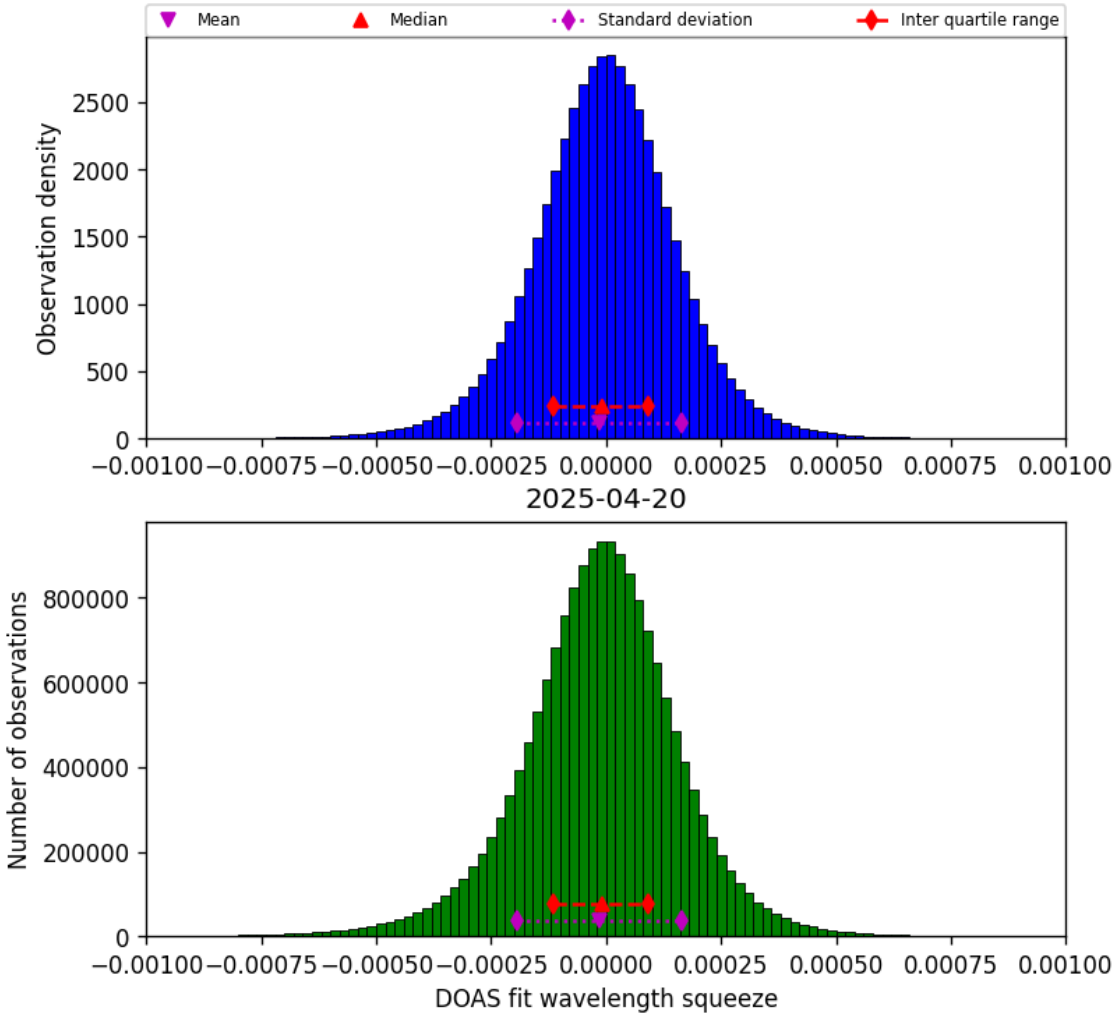

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-04-20 to 2025-04-21

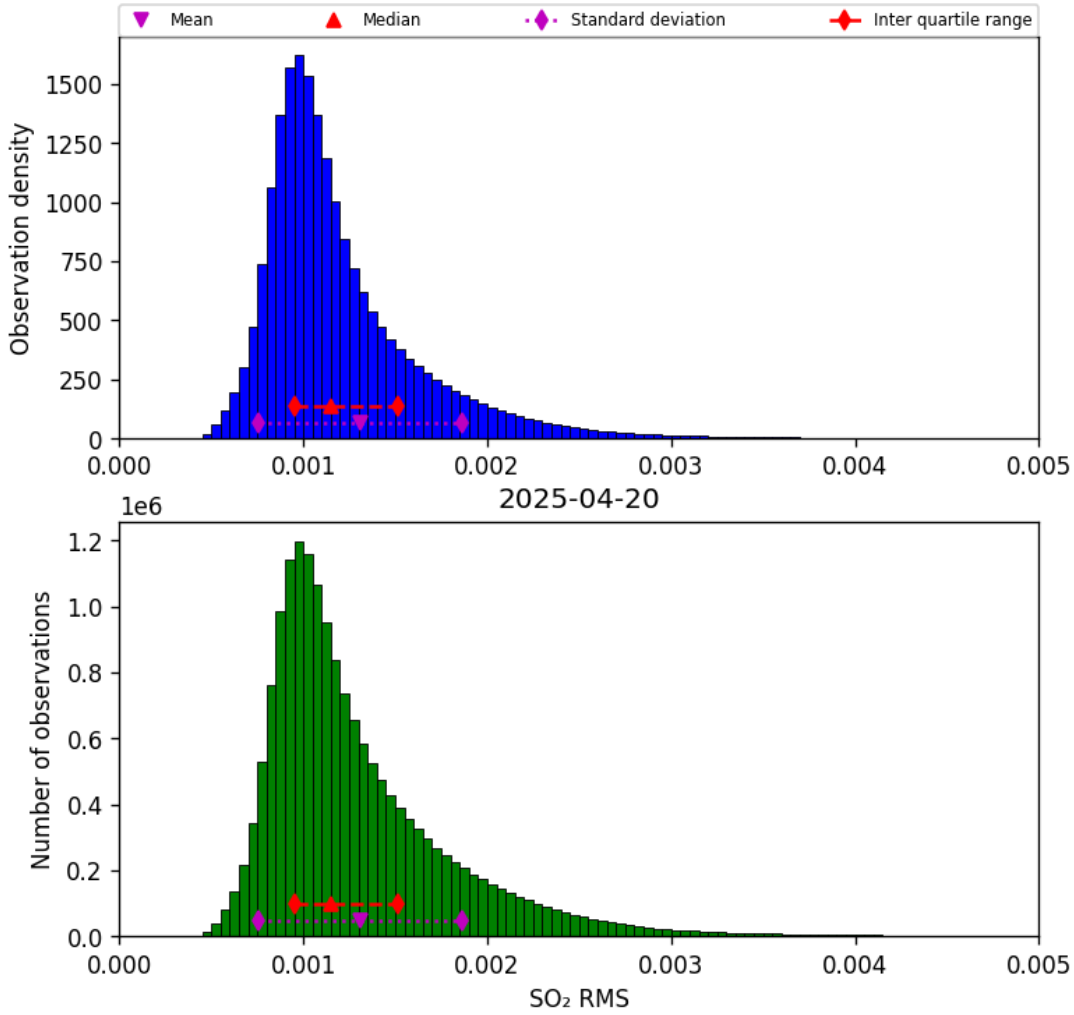

Figure 79: Histogram of "SO_2 RMS" for 2025-04-20 to 2025-04-21

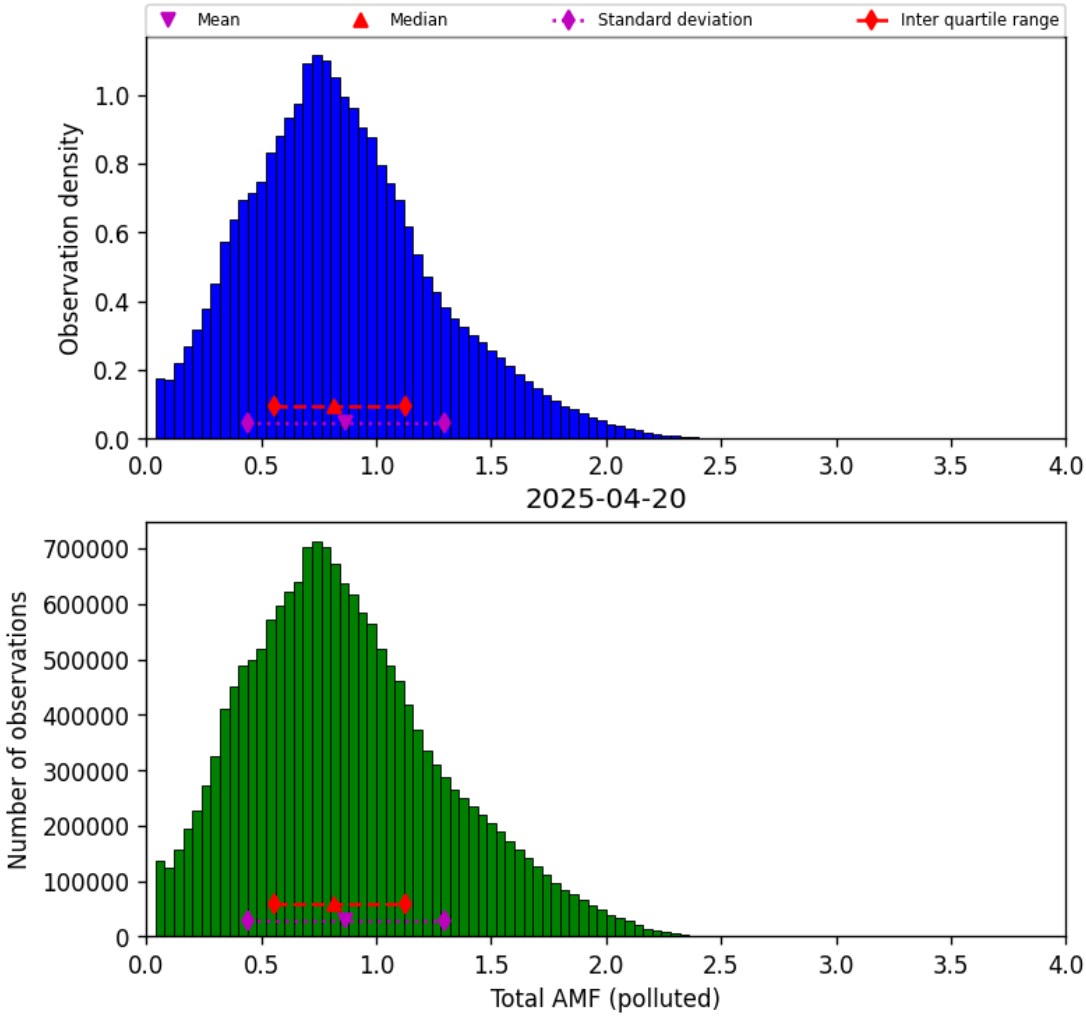

Figure 80: Histogram of “Total AMF (polluted)” for 2025-04-20 to 2025-04-21

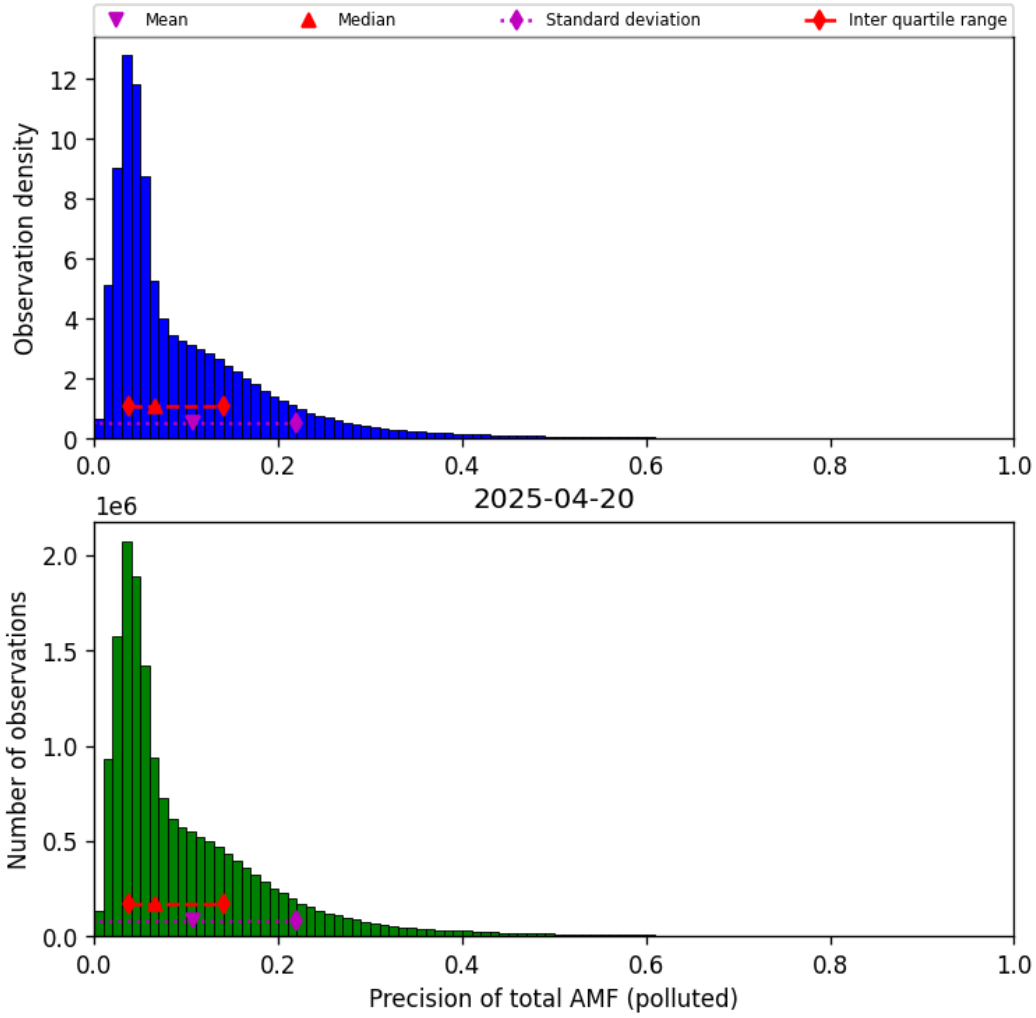

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-04-20 to 2025-04-21

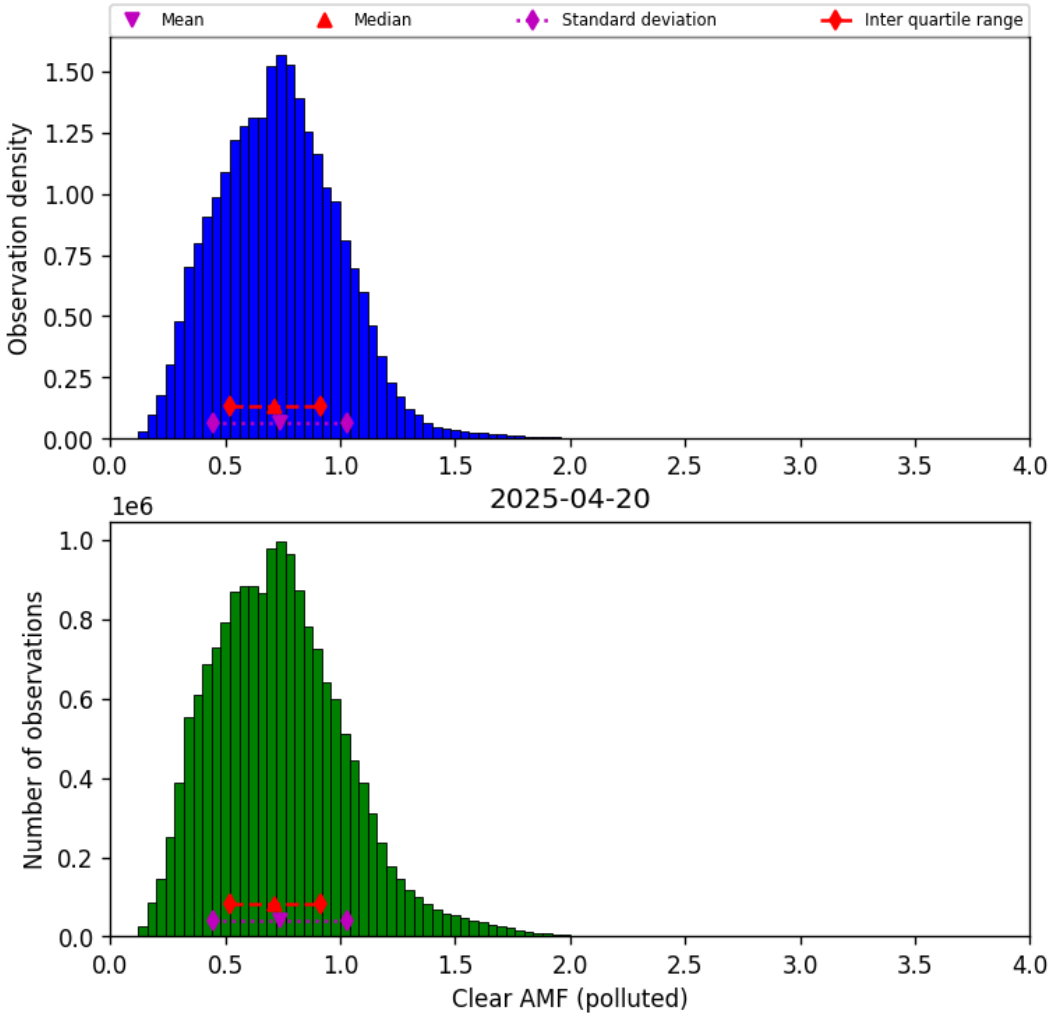

Figure 82: Histogram of “Clear AMF (polluted)” for 2025-04-20 to 2025-04-21

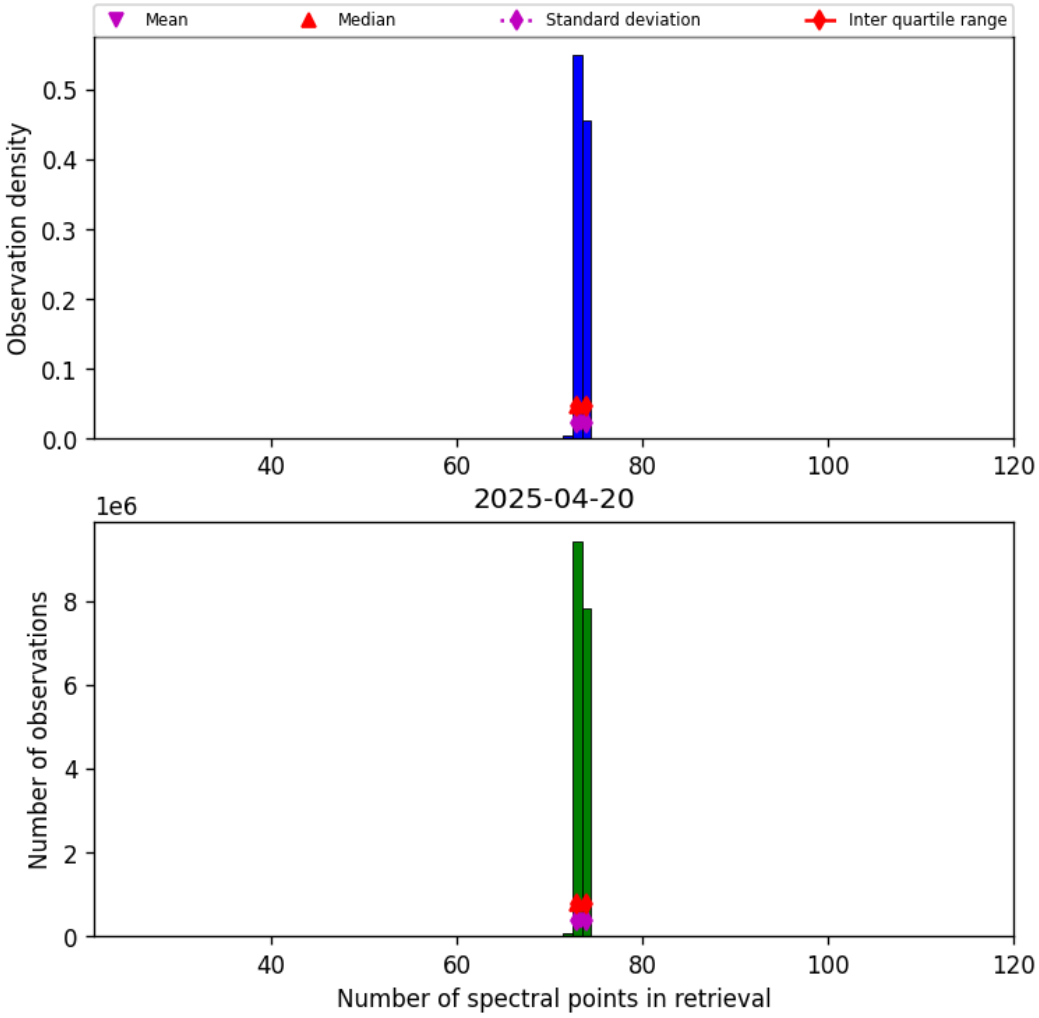

Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-04-20 to 2025-04-21

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.

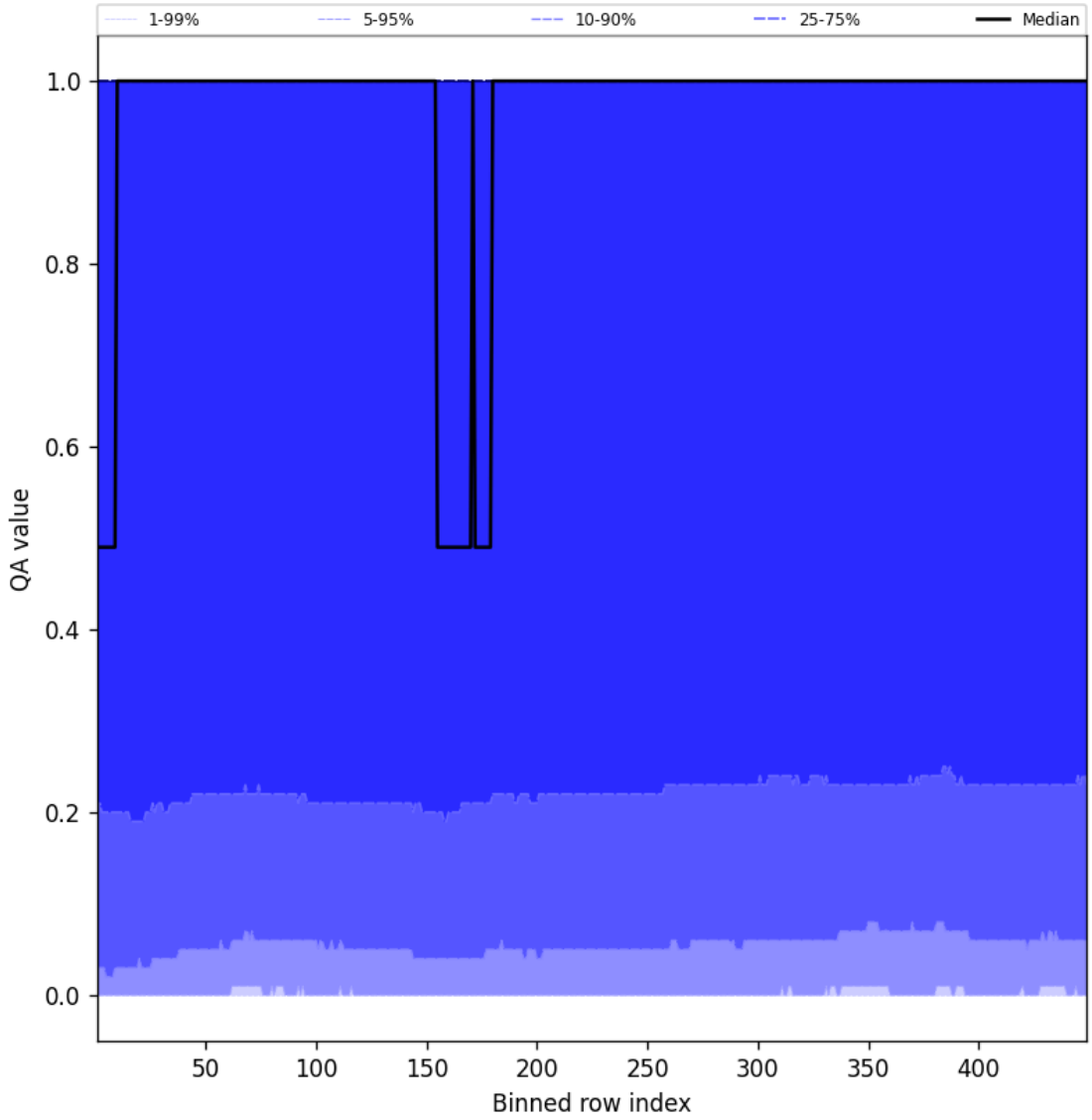

Figure 84: Along track statistics of “QA value” for 2025-04-20 to 2025-04-21

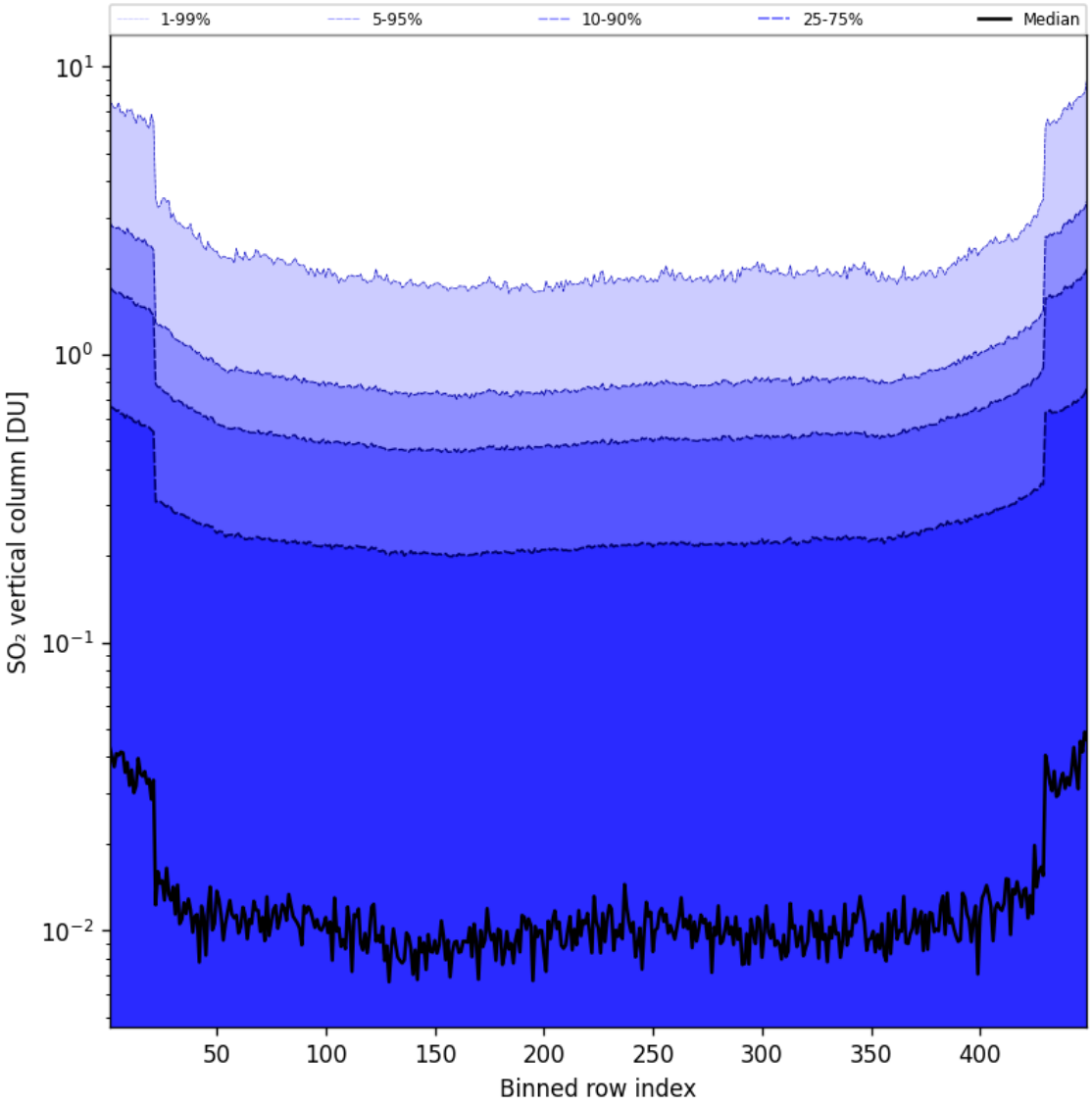

Figure 85: Along track statistics of "SO_2 vertical column" for 2025-04-20 to 2025-04-21

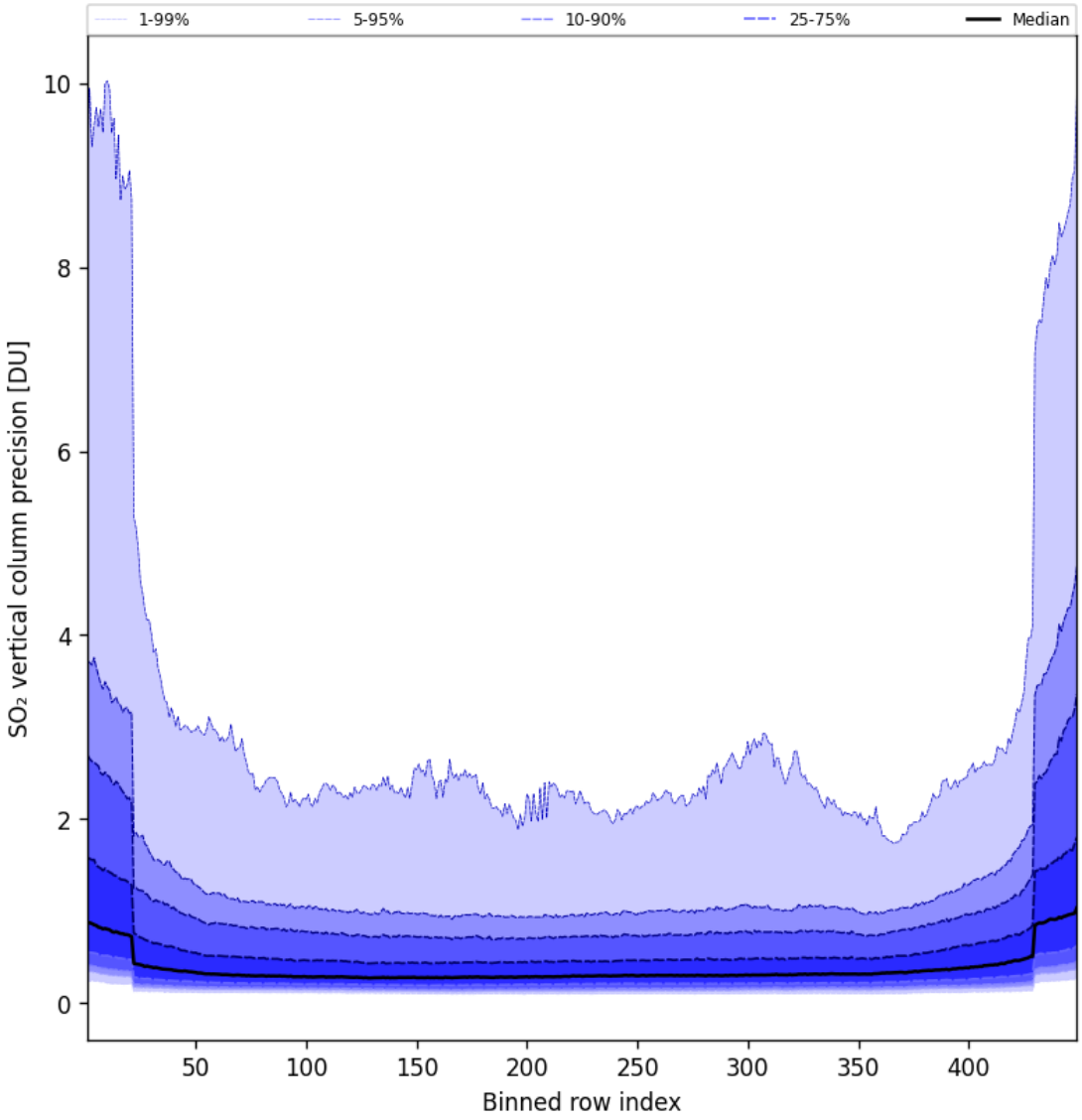

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-04-20 to 2025-04-21

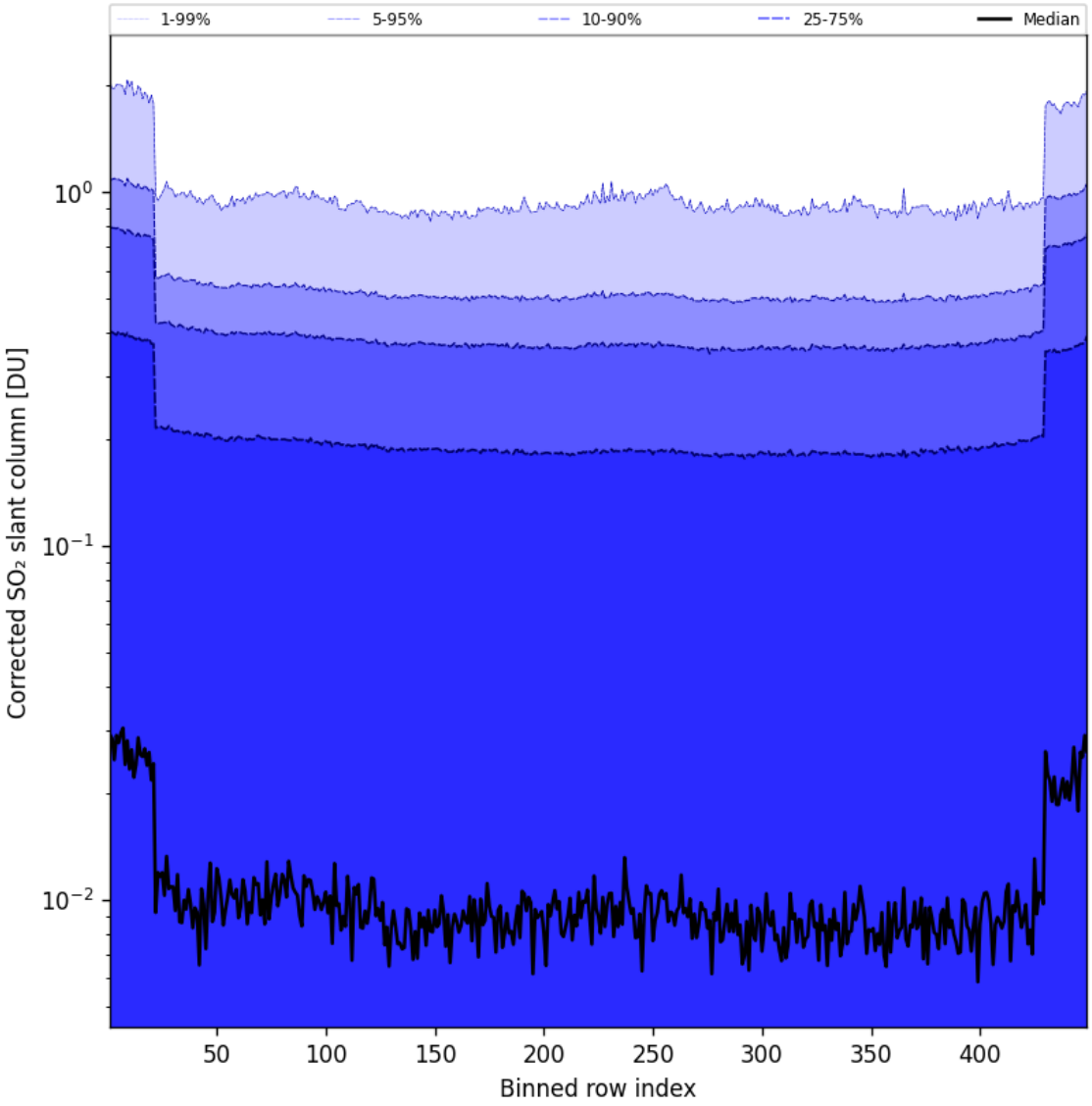

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-04-20 to 2025-04-21

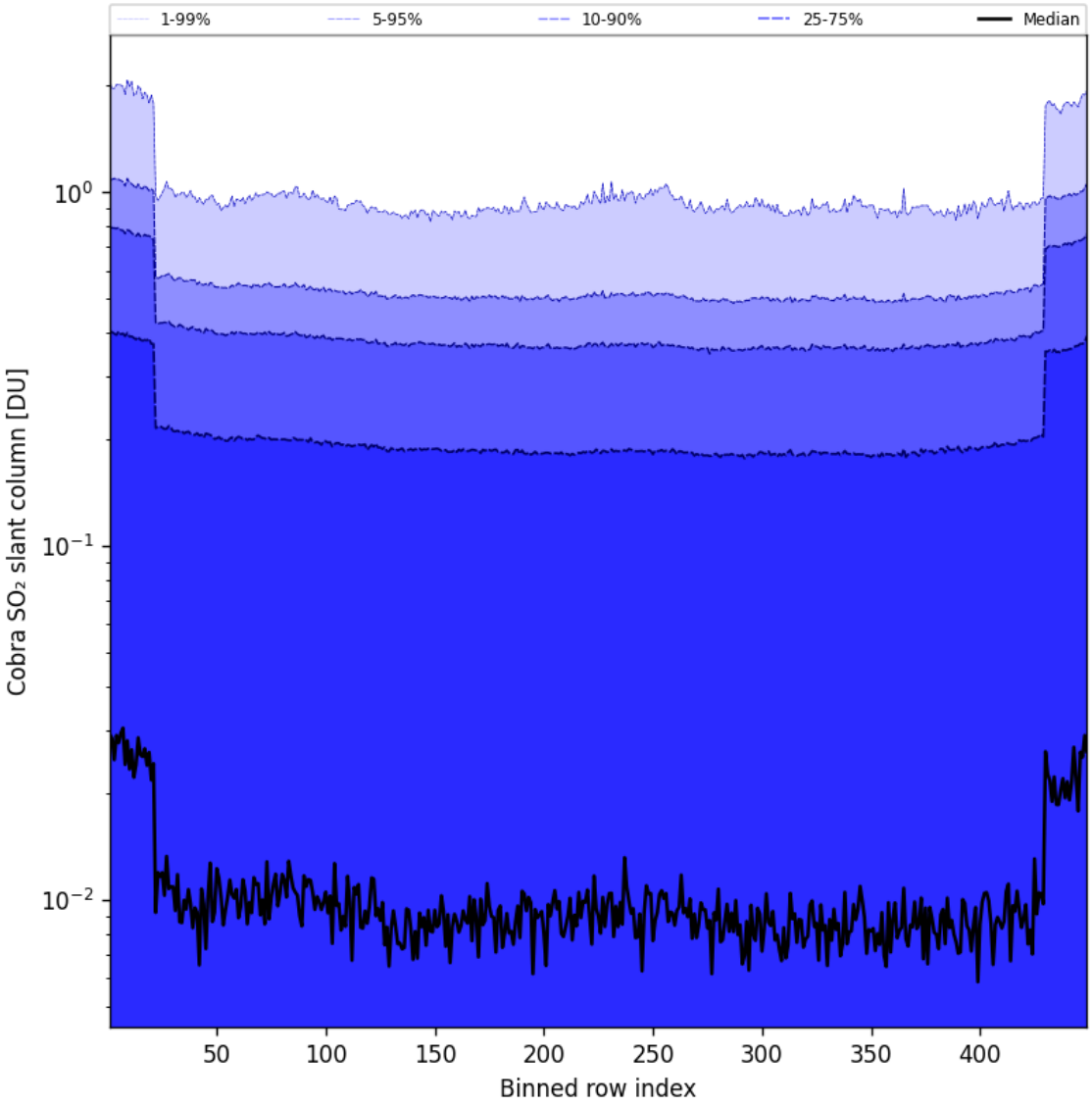

Figure 88: Along track statistics of “Cobra SO_2 slant column” for 2025-04-20 to 2025-04-21

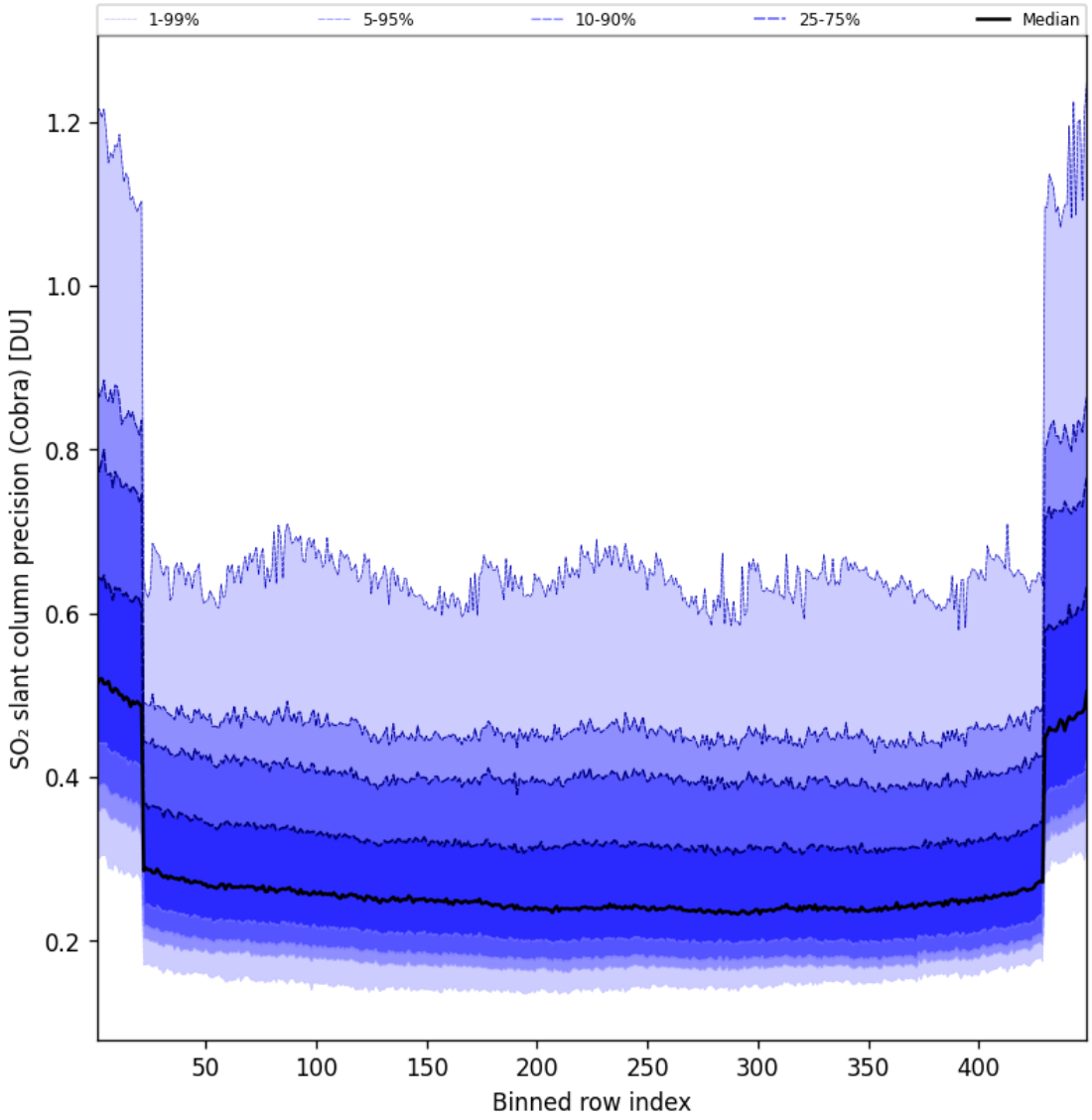

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-04-20 to 2025-04-21

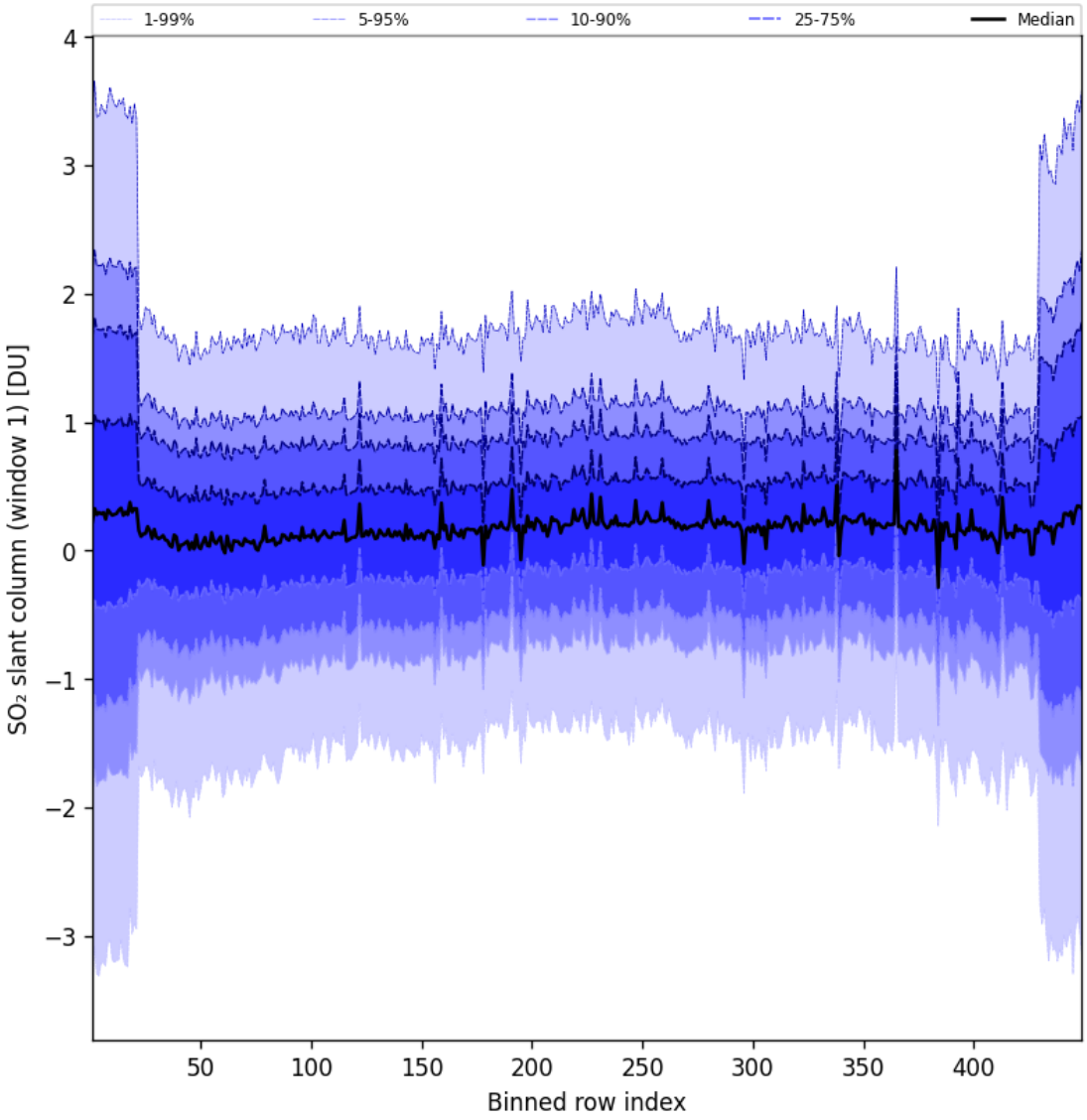

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-04-20 to 2025-04-21

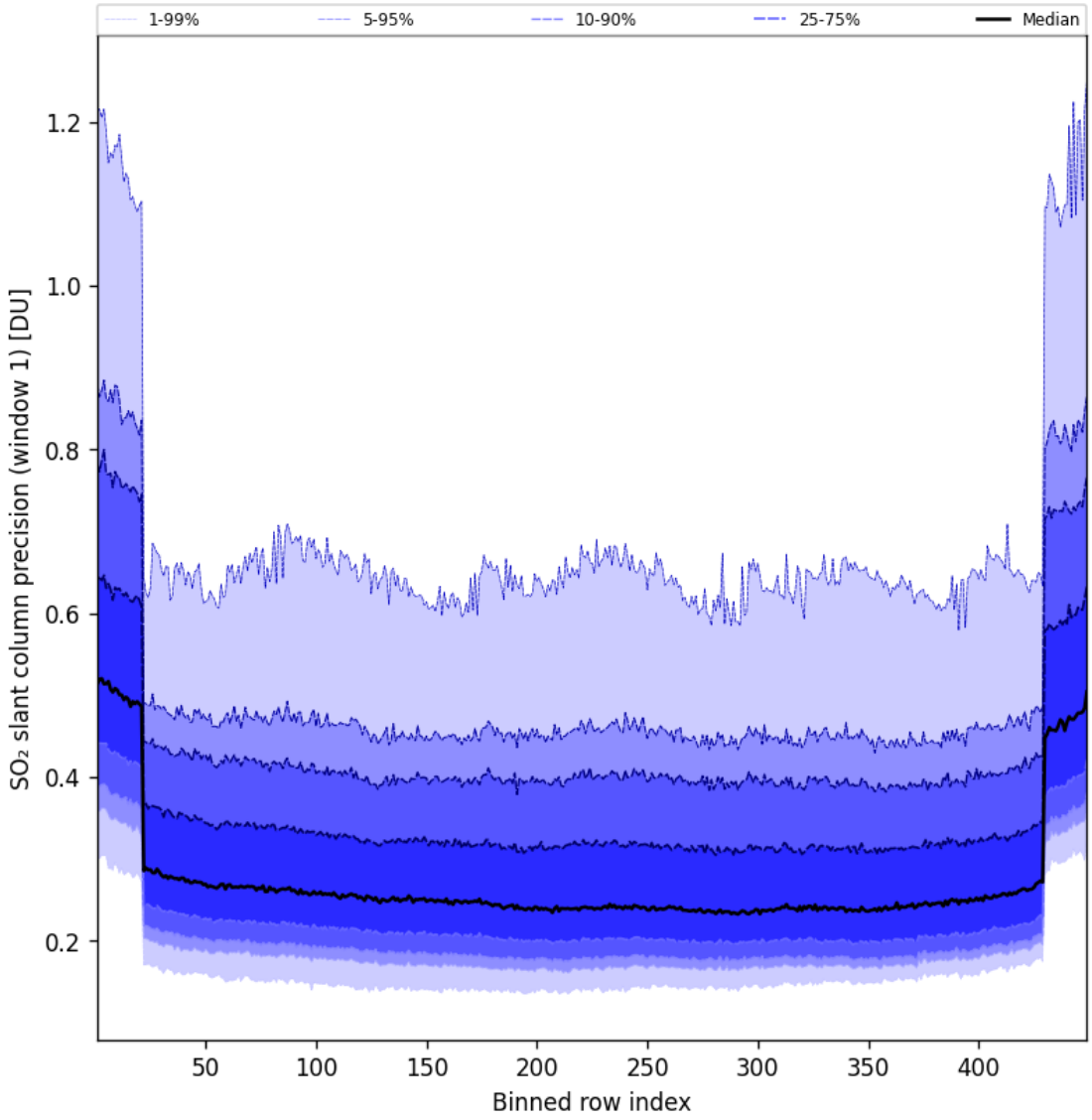

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-04-20 to 2025-04-21

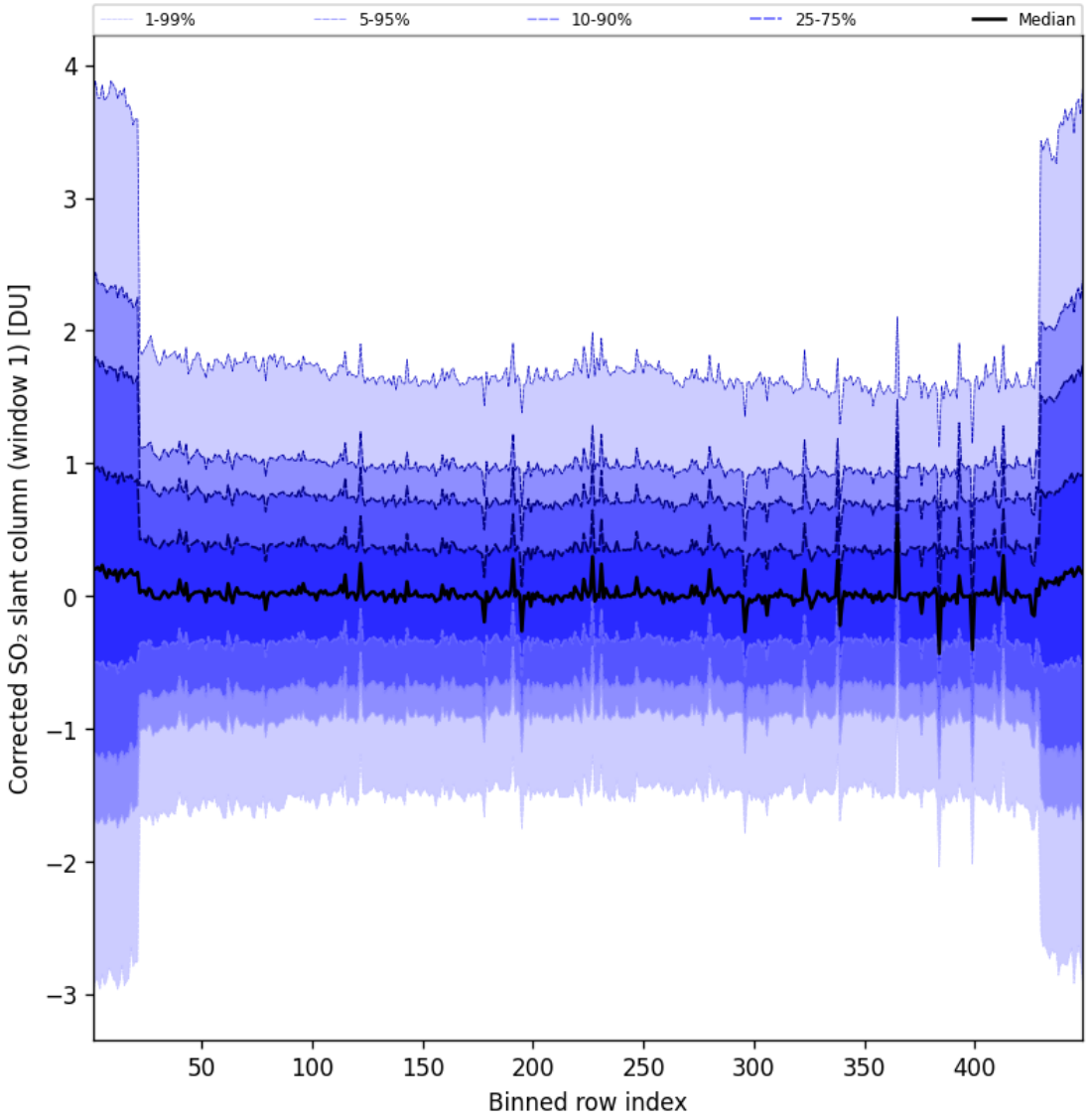

Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-04-20 to 2025-04-21

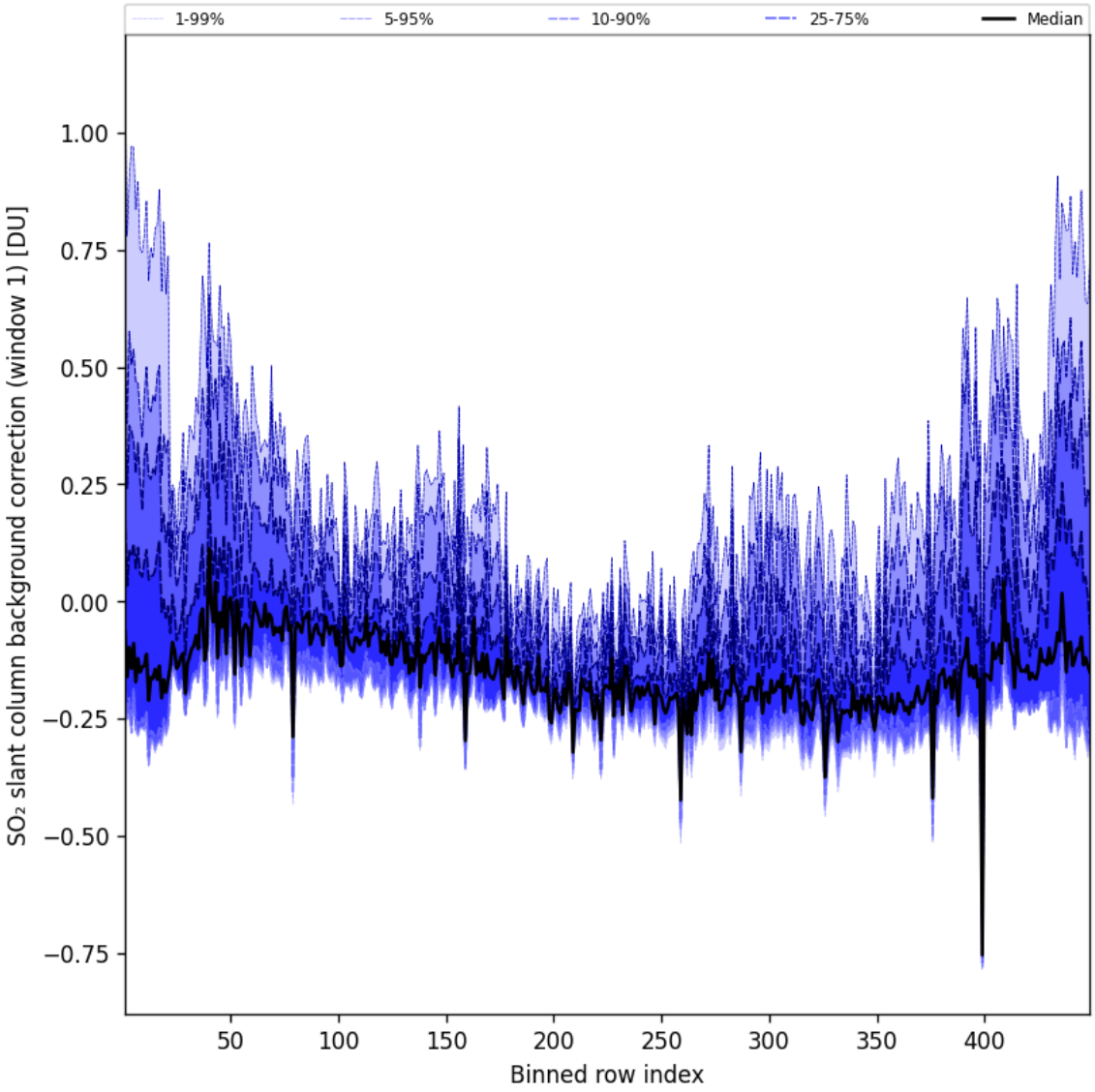

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-04-20 to 2025-04-21

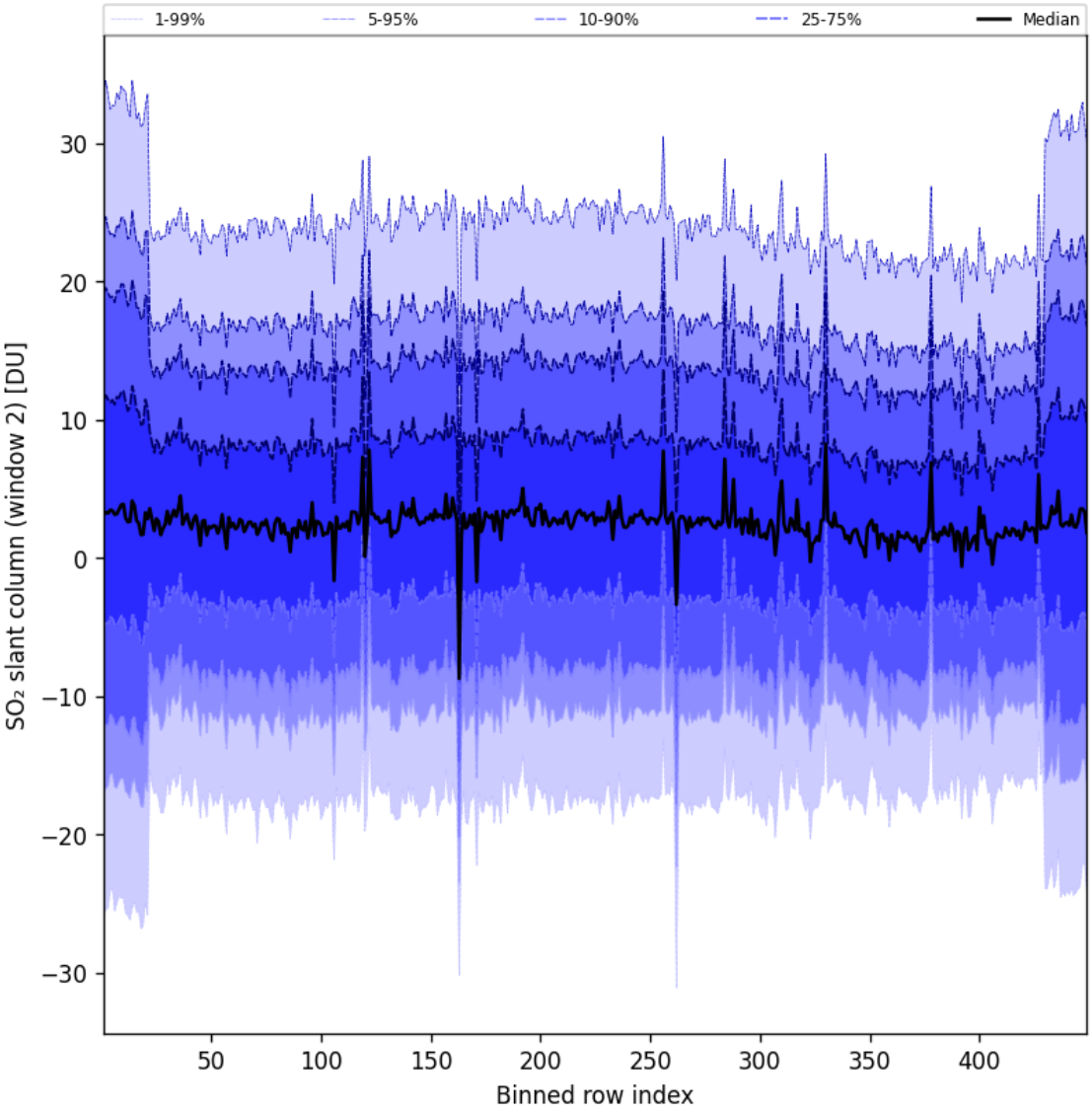

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-04-20 to 2025-04-21

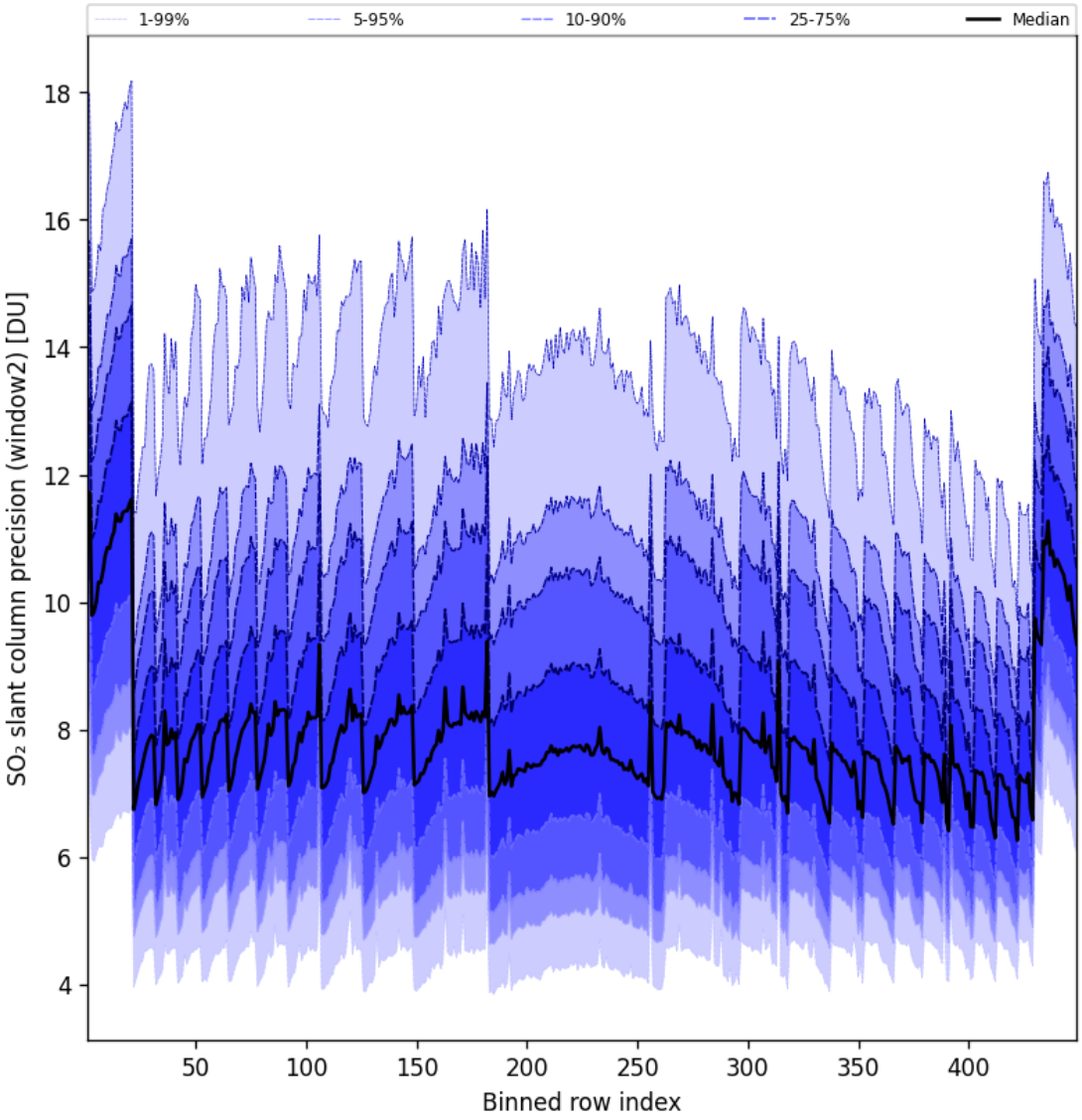

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-04-20 to 2025-04-21

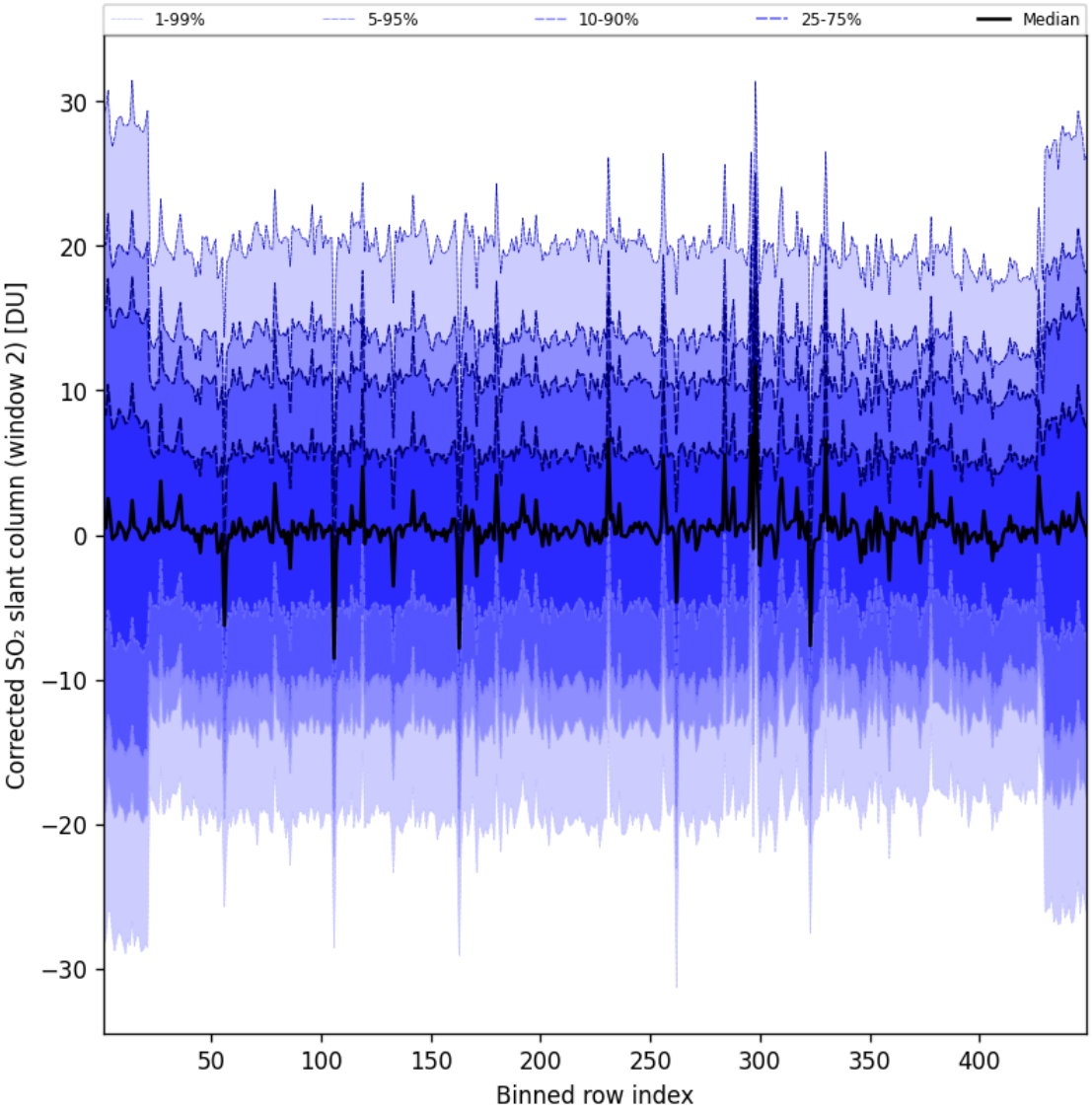

Figure 96: Along track statistics of “Corrected SO_2 slant column (window 2)” for 2025-04-20 to 2025-04-21

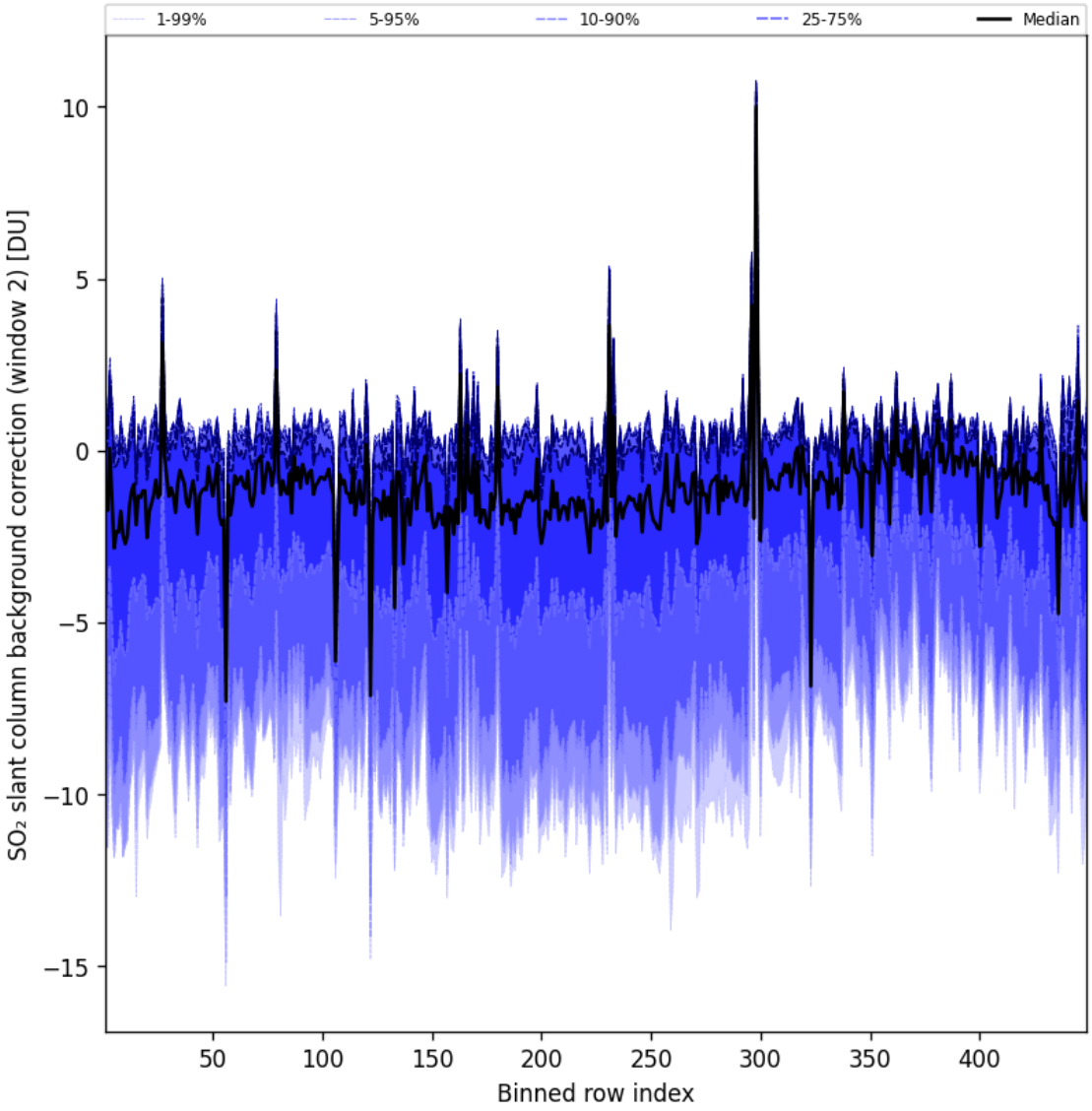

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-04-20 to 2025-04-21

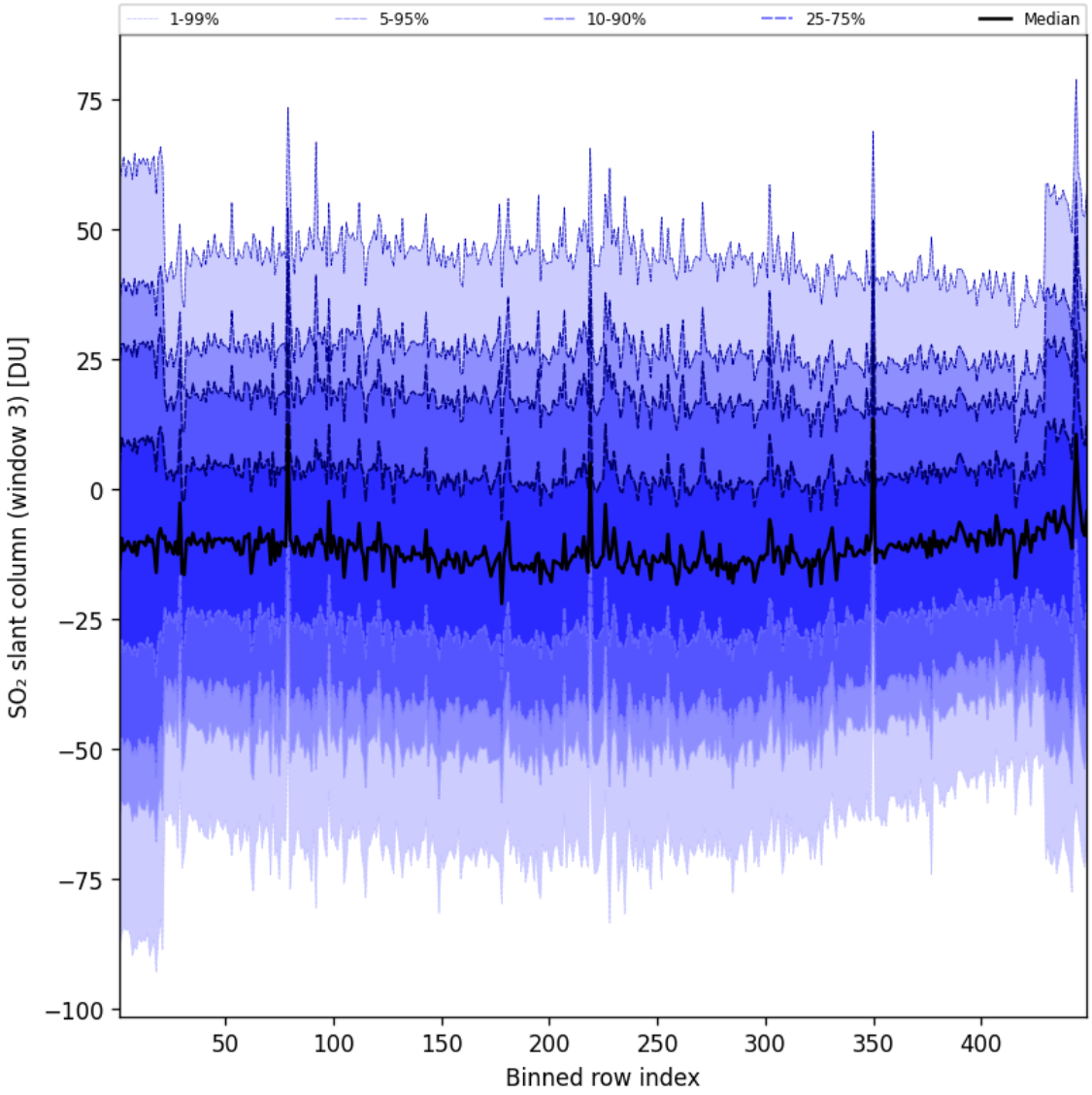

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-04-20 to 2025-04-21

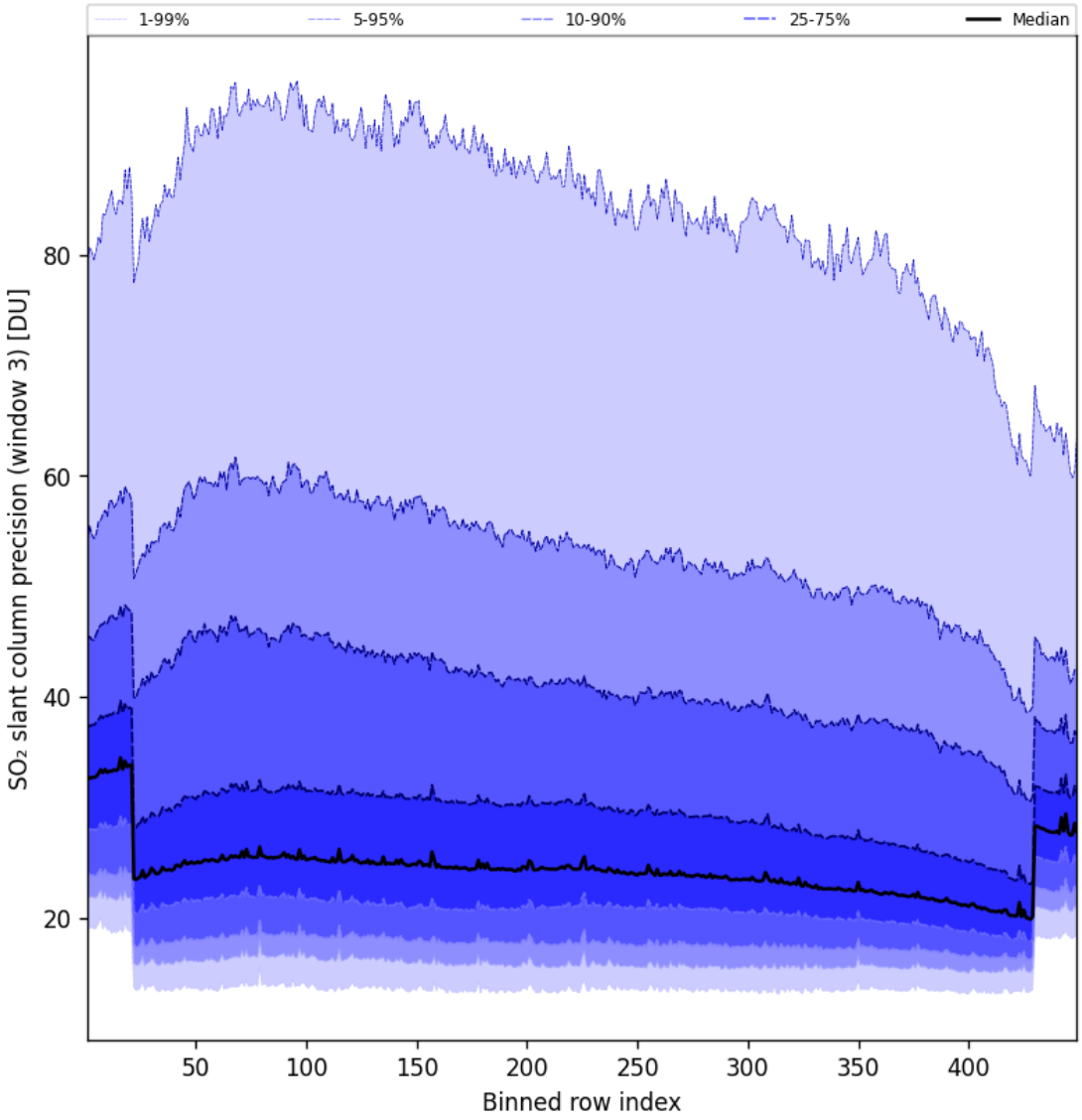

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-04-20 to 2025-04-21

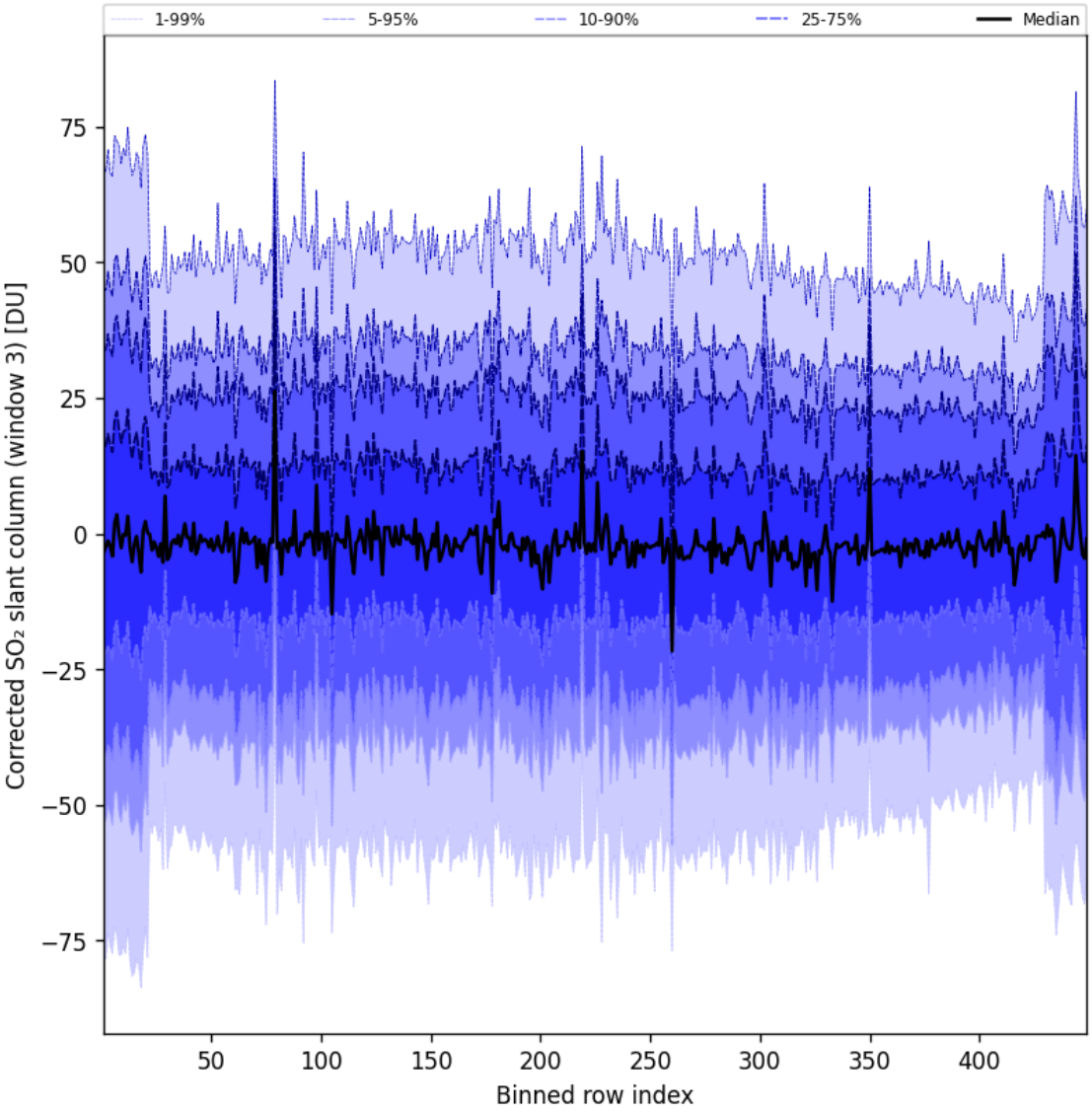

Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-04-20 to 2025-04-21

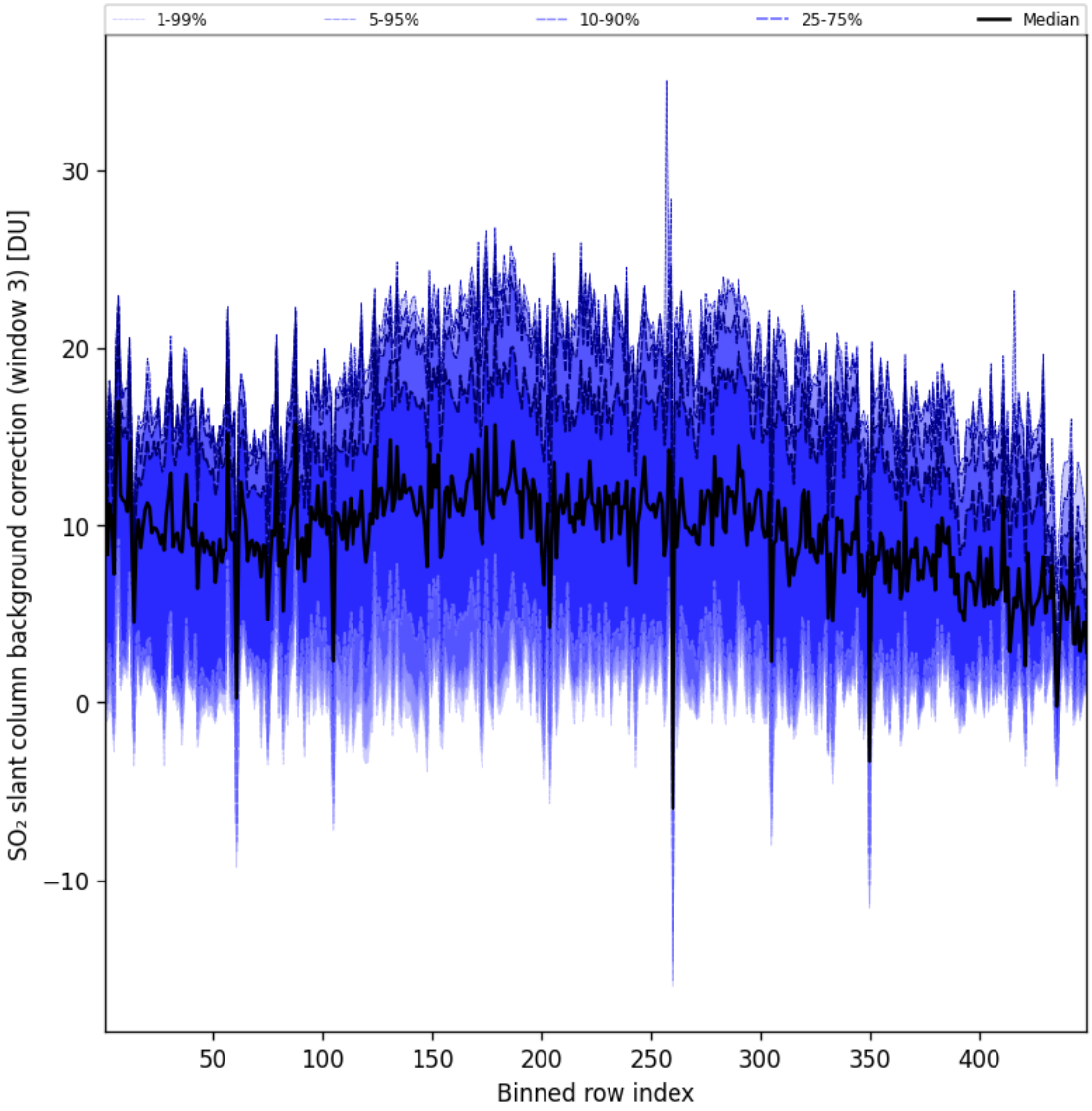

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-04-20 to 2025-04-21

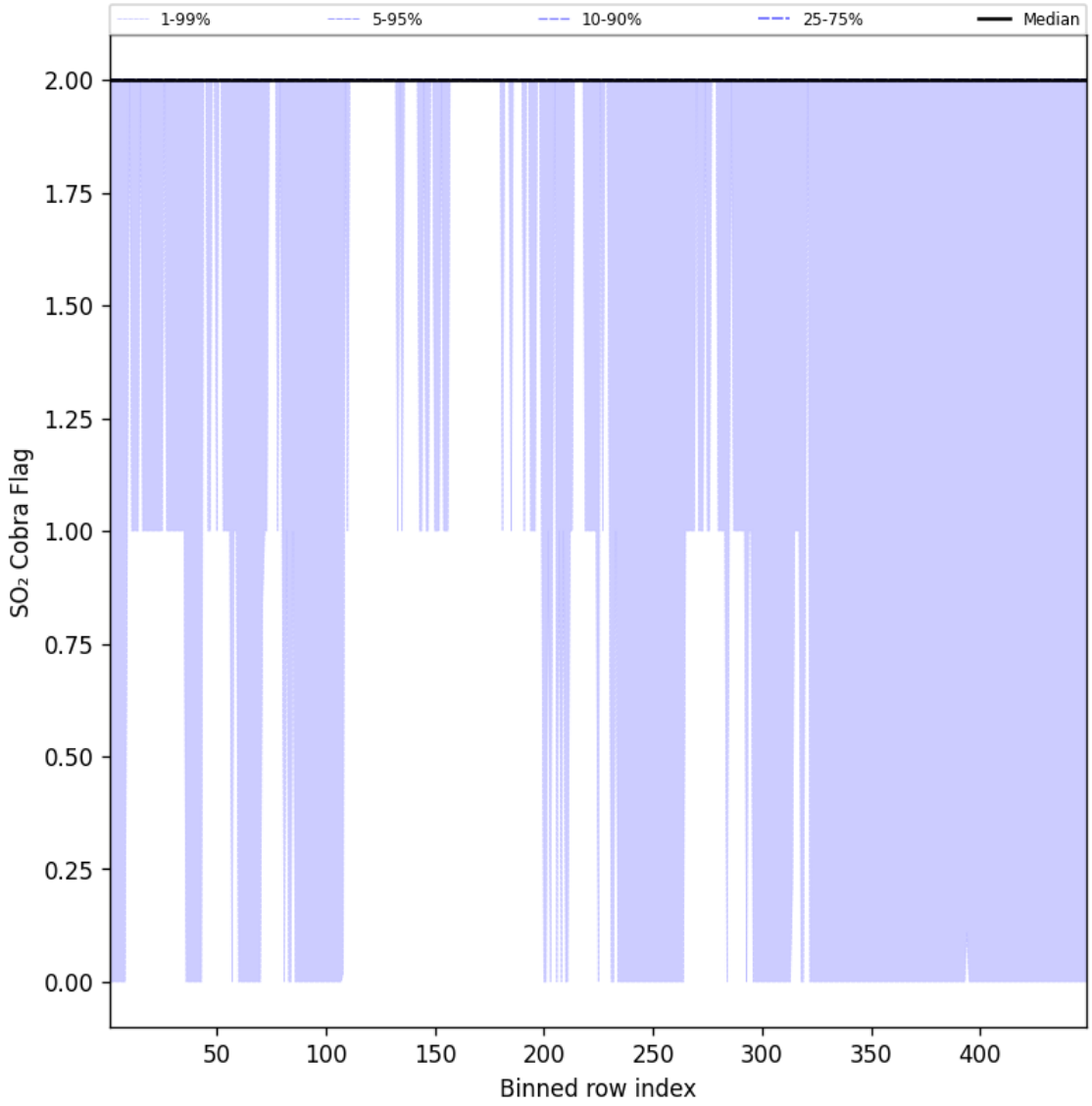

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-04-20 to 2025-04-21

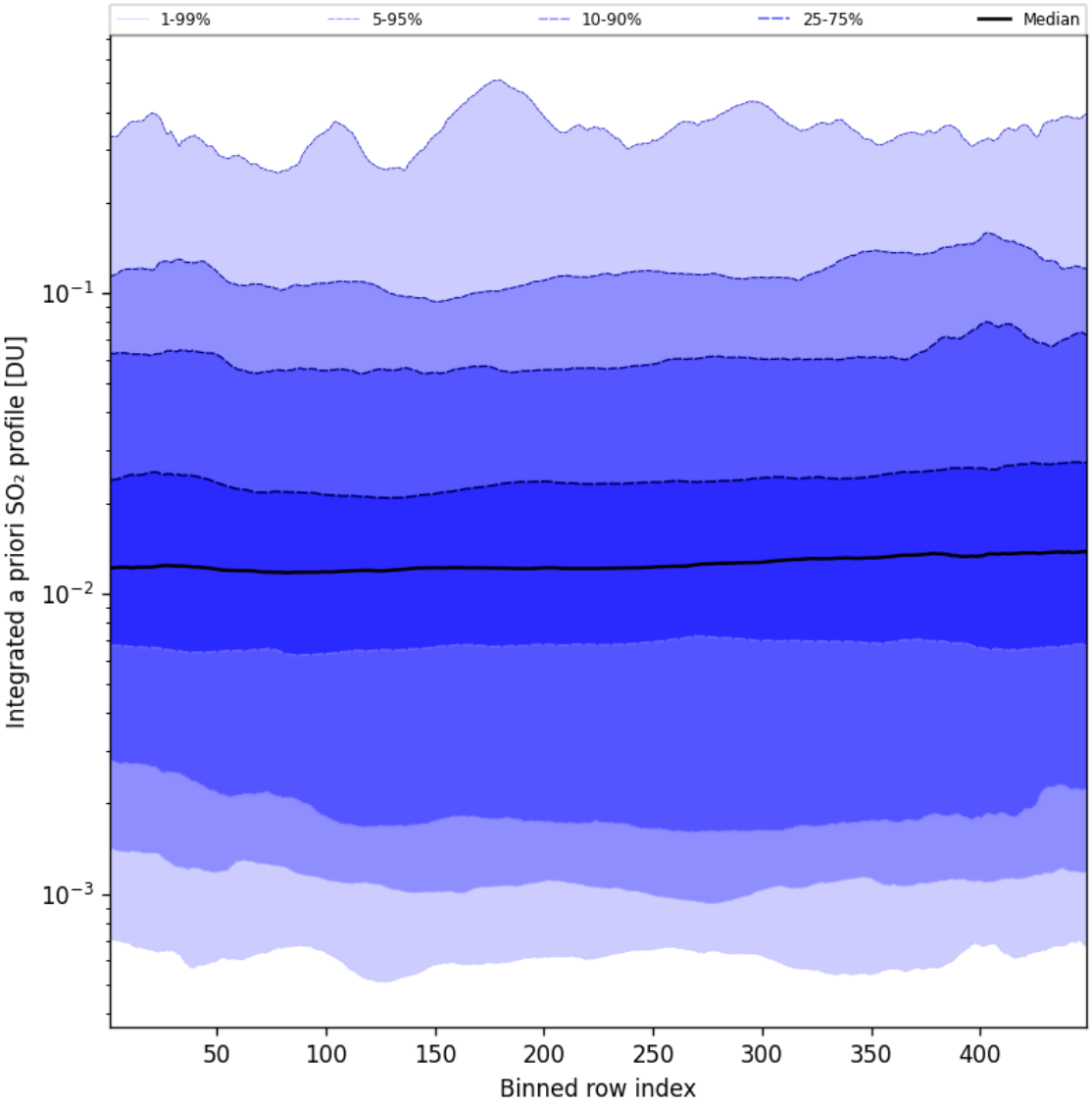

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-04-20 to 2025-04-21

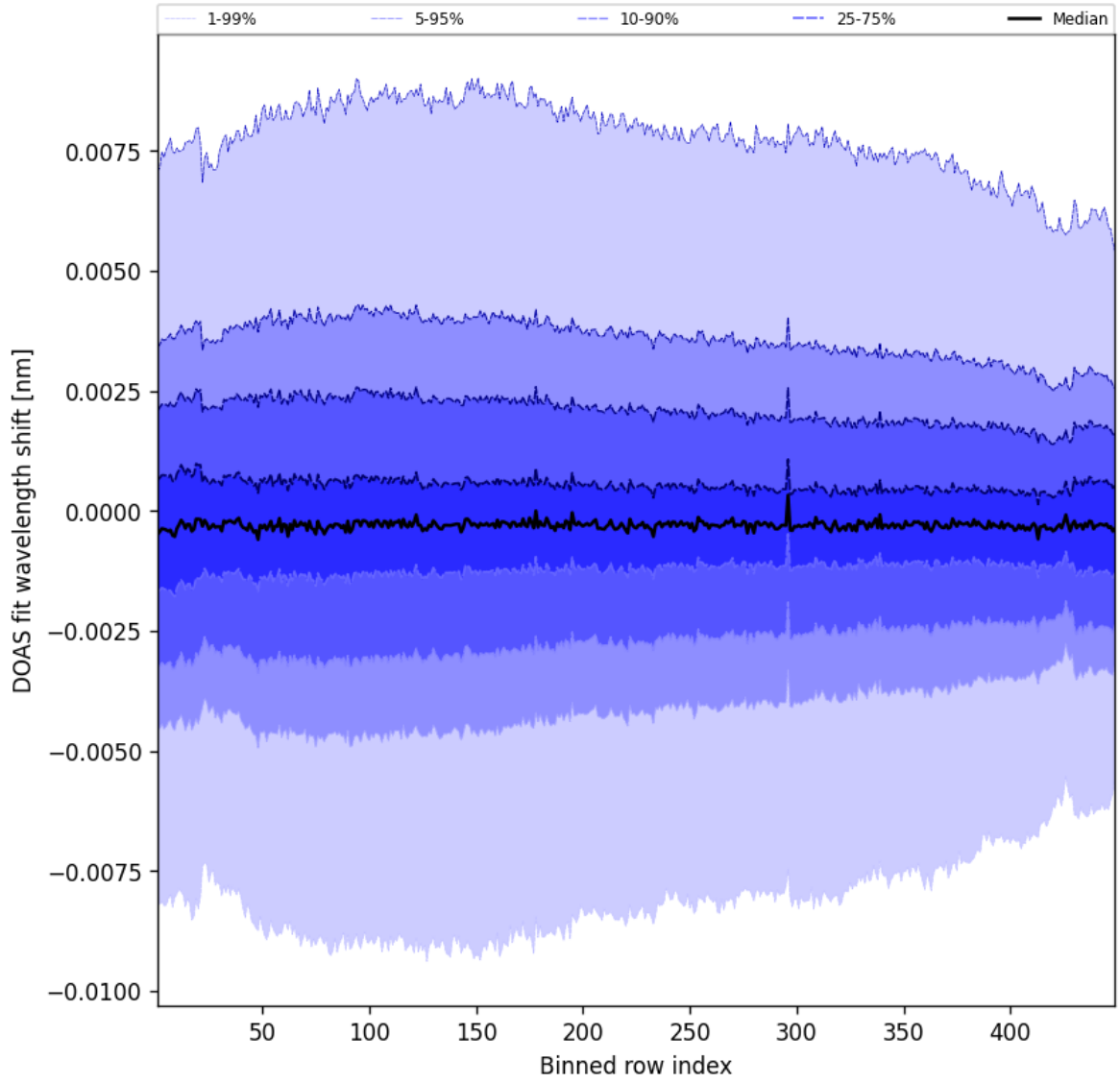

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-04-20 to 2025-04-21

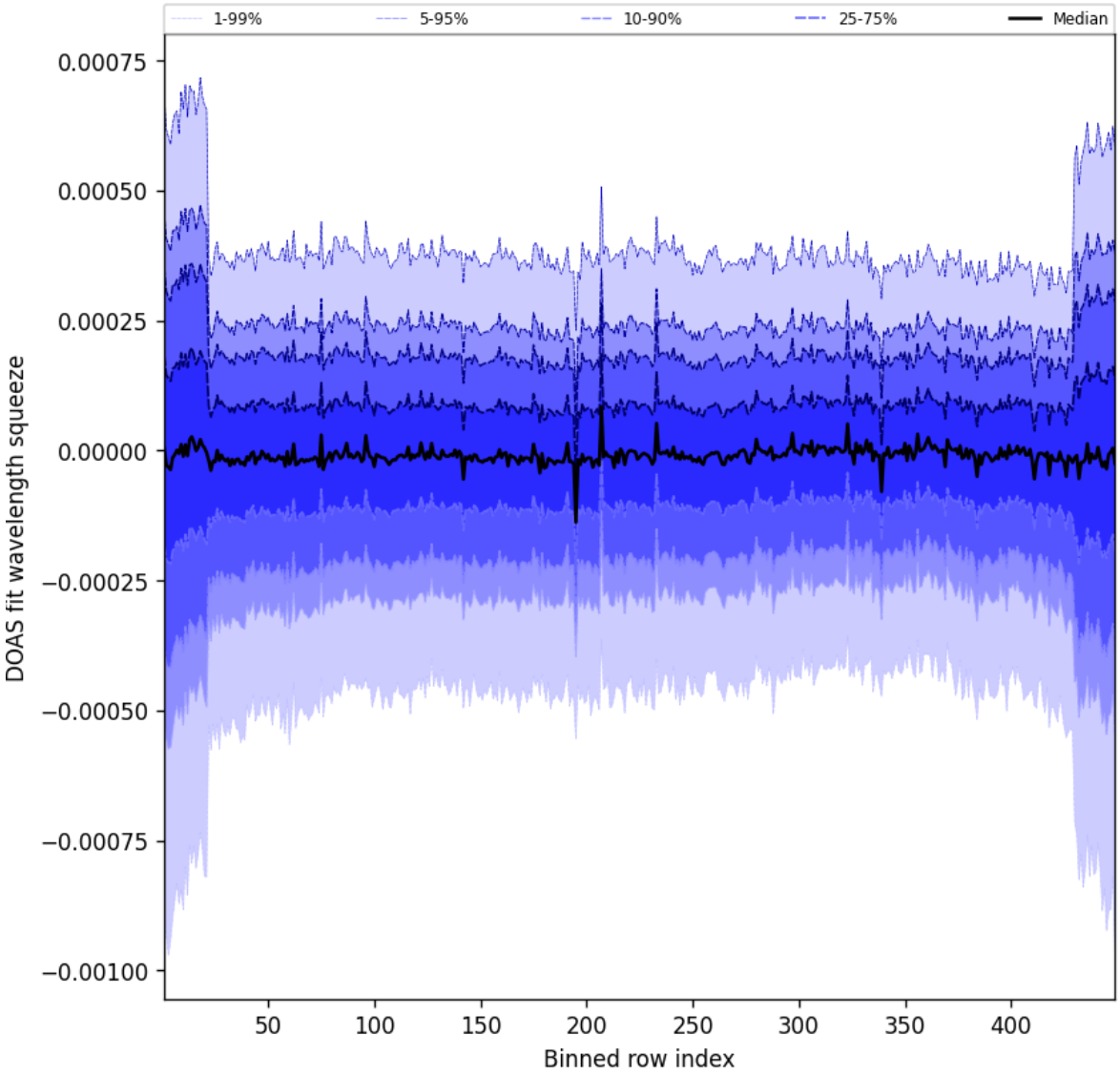

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-04-20 to 2025-04-21

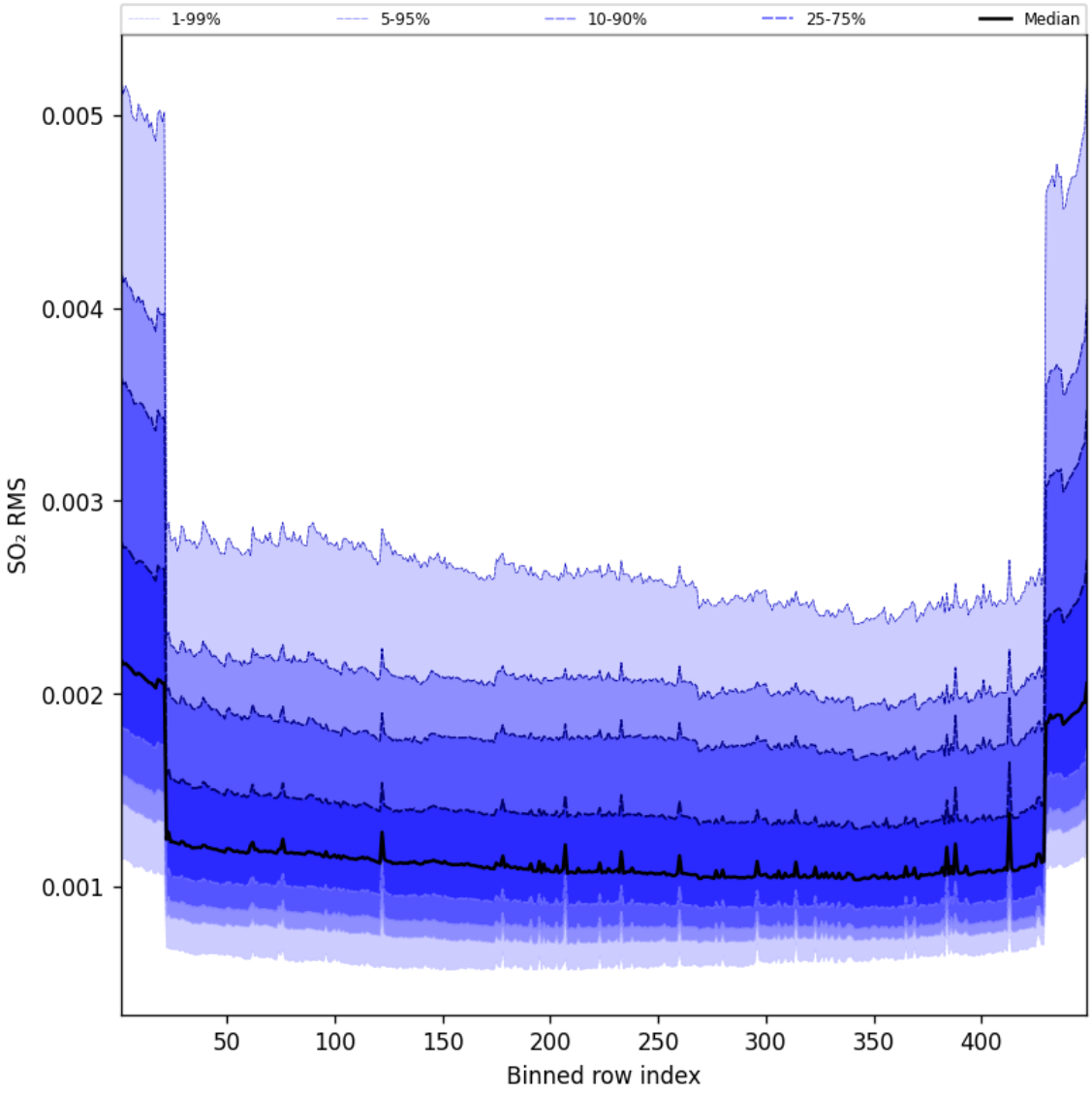

Figure 106: Along track statistics of "SO_2 RMS" for 2025-04-20 to 2025-04-21

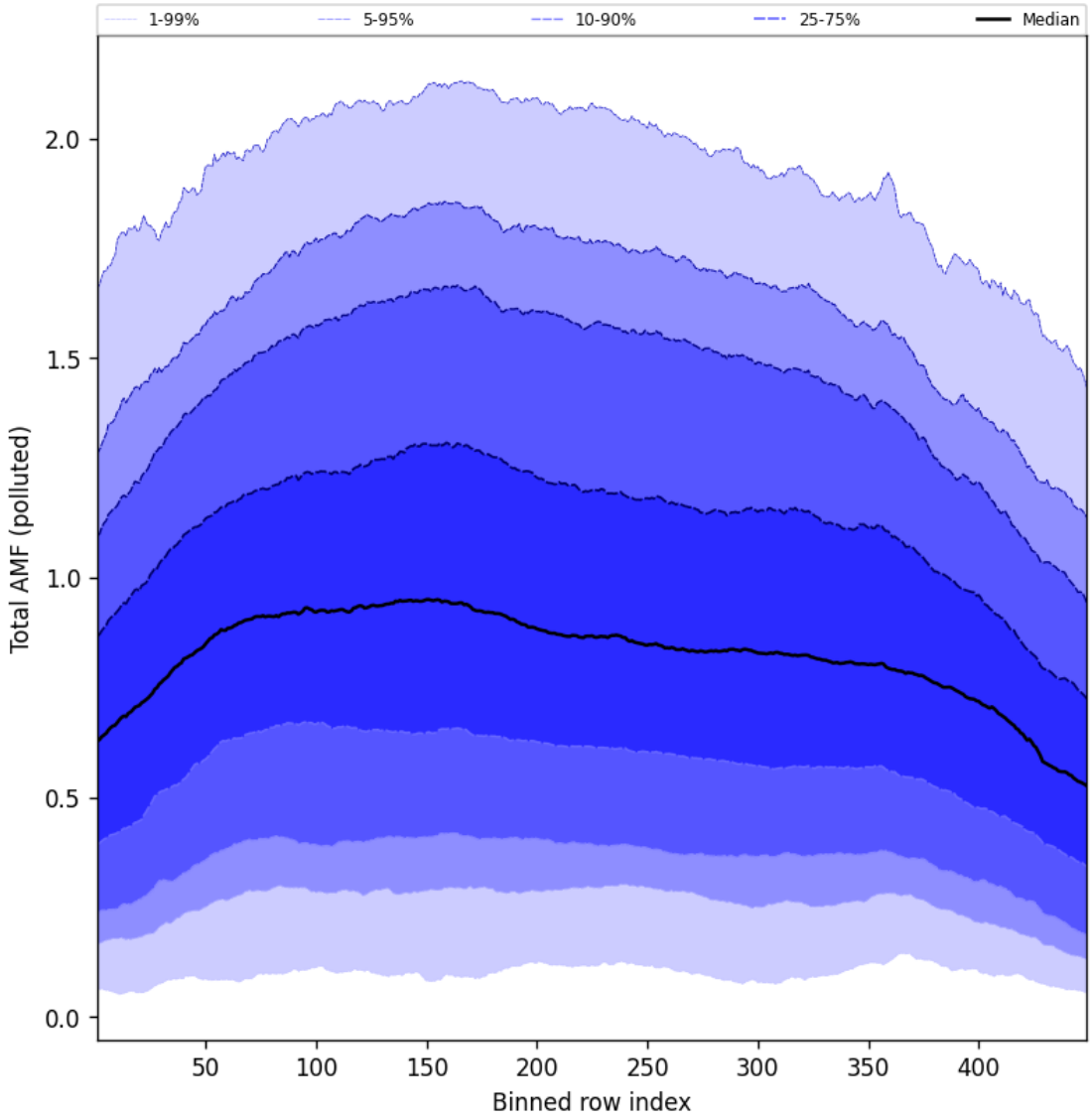

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-04-20 to 2025-04-21

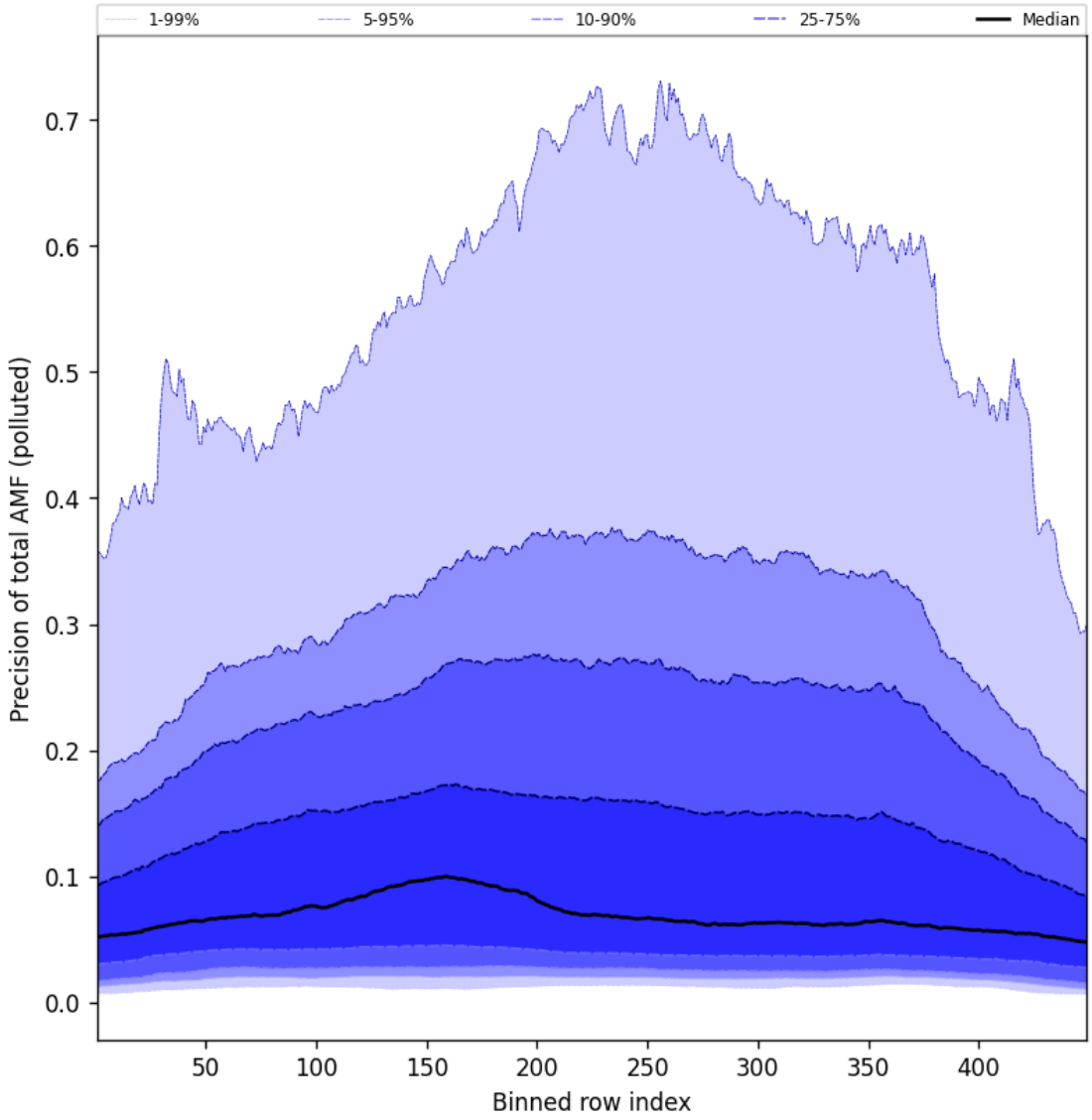

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-04-20 to 2025-04-21

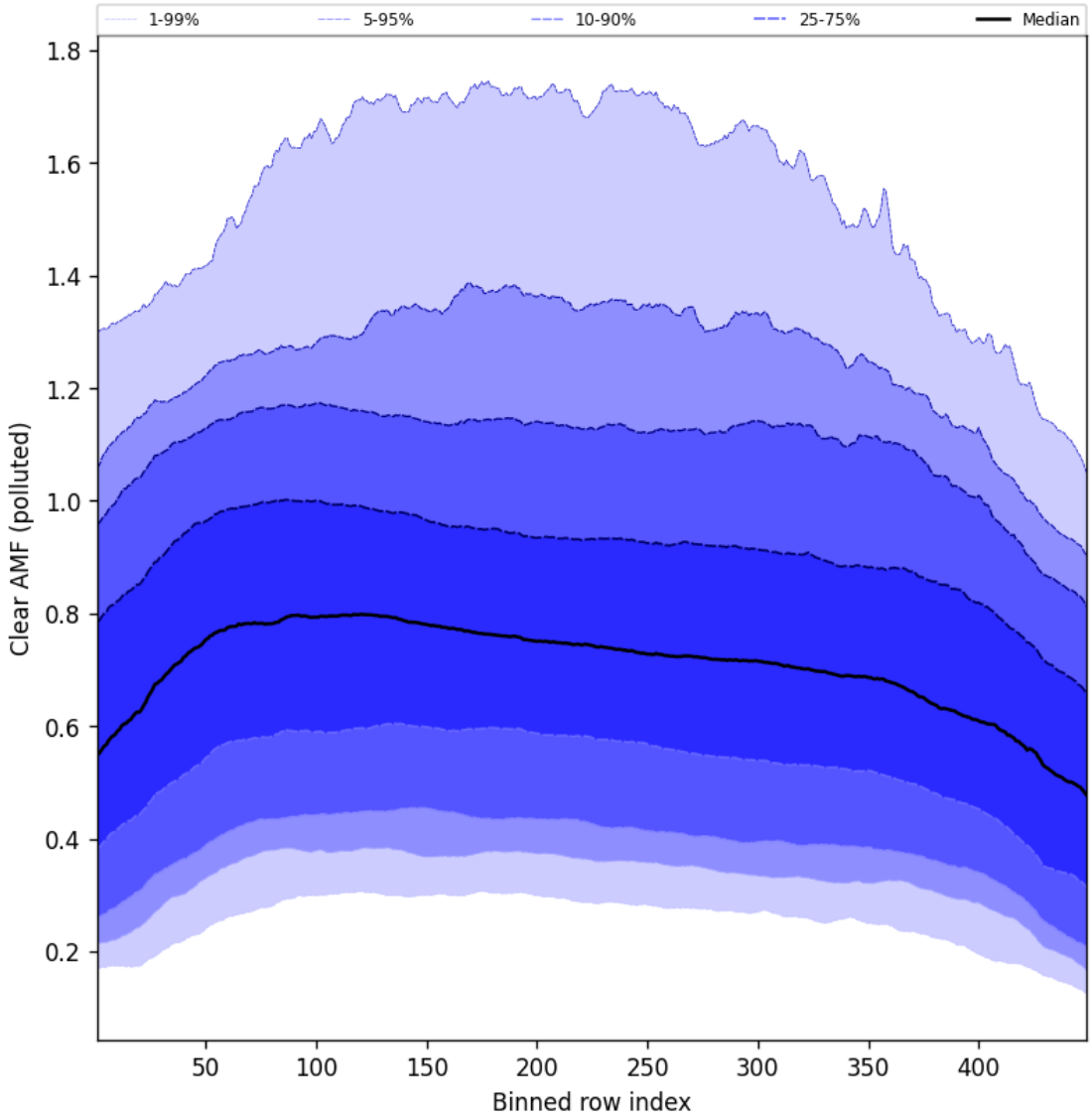

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-04-20 to 2025-04-21

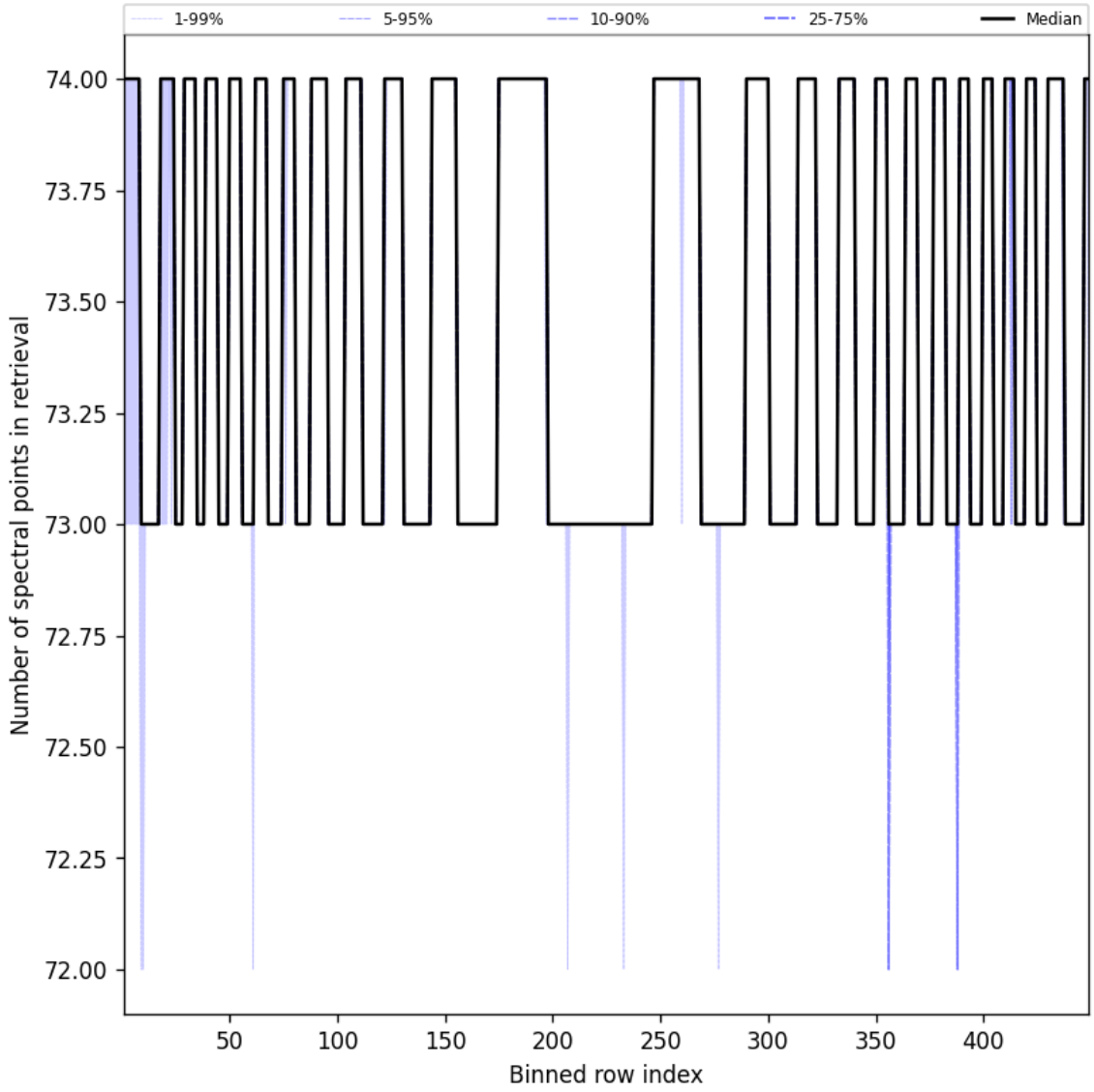

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-04-20 to 2025-04-21

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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