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]	0.648 ± 0.399	17310663	0.995	0.770	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.631 \pm 107.721) \times 10^{-2}$	17310663	0.278	0.476	1.154×10^{-2}	-70.1	352
sulfurdioxide total vertical column precision [DU]	0.555 ± 0.783	17310663	0.222	0.362	0.338	4.602×10^{-2}	337
sulfurdioxide slant column density corrected [DU]	$(2.195 \pm 41.477) \times 10^{-2}$	17310663	0.242	0.376	9.802×10^{-3}	-25.9	273
sulfurdioxide slant column density cobra [DU]	$(2.170 \pm 39.170) \times 10^{-2}$	17310663	0.242	0.376	9.802×10^{-3}	-25.9	62.4
sulfurdioxide slant column density cobra precision [DU]	0.303 ± 0.138	17310663	0.213	0.146	0.262	9.006×10^{-2}	22.1
sulfurdioxide slant column density window1 [DU]	0.168 ± 0.717	17310663	0.175	0.752	0.179	-175	62.7
sulfurdioxide slant column density window1 precision [DU]	0.303 ± 0.138	17310663	0.213	0.146	0.262	9.006×10^{-2}	22.1
sulfurdioxide slant column density corrected win1 [DU]	$(4.098 \pm 70.828) \times 10^{-2}$	17310663	-2.500×10^{-2}	0.739	1.994×10^{-2}	-175	62.4
background so2 slant column offset window1 [DU]	-0.127 ± 0.164	17310663	-0.220	0.172	-0.165	-1.49	6.78
sulfurdioxide slant column density window2 [DU]	1.97 ± 9.17	17310663	1.25	11.7	1.81	-1.446×10^{3}	921
sulfurdioxide slant column density window2 precision [DU]	8.12 ± 2.23	17310663	7.43	2.52	7.79	2.34	568
sulfurdioxide slant column density corrected win2 [DU]	-0.474 ± 8.815	17310663	-0.750	11.1	-0.462	-1.447×10^{3}	920
background so2 slant column offset window2 [DU]	-2.45 ± 3.19	17310663	0.250	4.07	-1.45	-18.5	11.1
sulfurdioxide slant column density window3 [DU]	-10.2 ± 23.9	17310663	-10.6	30.2	-10.5	-509	1.454×10^{3}
sulfurdioxide slant column density window3 precision [DU]	28.3 ± 13.6	17310663	22.5	9.71	24.6	9.36	1.666×10^{3}
sulfurdioxide slant column density corrected win3 [DU]	0.754 ± 23.091	17310663	0.560	28.9	0.814	-503	1.457×10^{3}
background so2 slant column offset window3 [DU]	11.0 ± 6.8	17310663	3.92	11.5	10.7	-10.9	32.4
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17310663	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.301 \pm 7.363) \times 10^{-2}$	17310663	1.423×10^{-2}	1.916×10^{-2}	1.374×10^{-2}	1.647×10^{-4}	1.94
fitted radiance shift [nm]	$(-3.819 \pm 26.497) \times 10^{-4}$	17310663	-5.000×10^{-4}	1.770×10^{-3}	-3.636×10^{-4}	-4.843×10^{-2}	7.269×10^{-2}
fitted radiance squeeze [1]	$(-1.674 \pm 18.216) \times 10^{-5}$	17310663	-1.000×10^{-5}	2.047×10^{-4}	-9.977×10^{-6}	-1.921×10^{-2}	2.274×10^{-2}
fitted root mean square [1]	$(1.315 \pm 0.571) \times 10^{-3}$	17310663	9.750×10^{-4}	5.714×10^{-4}	1.150×10^{-3}	2.619×10^{-4}	5.655×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.842 ± 0.420	17310663	0.780	0.549	0.795	5.000×10^{-2}	2.83
sulfurdioxide total air mass factor polluted precision [1]	0.105 ± 0.108	17310663	3.500×10^{-2}	0.100	6.555×10^{-2}	3.328×10^{-3}	1.92
sulfurdioxide clear air mass factor polluted [1]	0.726 ± 0.297	17310663	0.620	0.385	0.699	6.504×10^{-2}	2.55
number of spectral points in retrieval [1]	73.4 ± 0.5	17310663	73.0	1.000	73.0	51.0	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	5.000×10^{-2}	0.120	0.230	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.48	−0.927	−0.561	−0.377	−0.223	0.253	0.420	0.627	1.05	2.96
sulfurdioxide total vertical column precision [DU]	0.107	0.146	0.172	0.195	0.227	0.589	0.796	1.04	1.54	3.95
sulfurdioxide slant column density corrected [DU]	−0.885	−0.508	−0.367	−0.274	−0.176	0.200	0.303	0.407	0.571	1.10
sulfurdioxide slant column density cobra [DU]	−0.885	−0.508	−0.367	−0.274	−0.176	0.200	0.303	0.407	0.571	1.10
sulfurdioxide slant column density cobra precision [DU]	0.145	0.171	0.184	0.196	0.211	0.357	0.411	0.464	0.560	0.816
sulfurdioxide slant column density window1 [DU]	−1.80	−0.931	−0.613	−0.409	−0.202	0.550	0.745	0.931	1.22	2.02
sulfurdioxide slant column density window1 precision [DU]	0.145	0.171	0.184	0.196	0.211	0.357	0.411	0.464	0.560	0.816
sulfurdioxide slant column density corrected win1 [DU]	−1.72	−0.985	−0.714	−0.534	−0.344	0.395	0.601	0.806	1.13	2.07
background so2 slant column offset window1 [DU]	−0.367	−0.301	−0.275	−0.256	−0.233	-6.093×10^{-2}	4.202×10^{-4}	6.968×10^{-2}	0.181	0.457
sulfurdioxide slant column density window2 [DU]	−19.4	−12.6	−9.28	−6.78	−3.96	7.73	10.7	13.4	17.1	24.7
sulfurdioxide slant column density window2 precision [DU]	4.33	5.22	5.76	6.18	6.68	9.20	10.1	10.9	12.1	14.8
sulfurdioxide slant column density corrected win2 [DU]	−21.9	−14.7	−11.3	−8.83	−6.04	5.09	7.87	10.4	13.7	20.9
background so2 slant column offset window2 [DU]	−11.1	−8.98	−7.39	−5.90	−4.17	-9.937×10^{-2}	0.210	0.443	0.770	2.69
sulfurdioxide slant column density window3 [DU]	−69.0	−48.9	−39.6	−32.8	−25.4	4.81	12.8	19.9	29.5	48.4
sulfurdioxide slant column density window3 precision [DU]	13.5	16.1	18.0	19.4	21.0	30.7	35.6	41.8	54.3	86.7
sulfurdioxide slant column density corrected win3 [DU]	−57.2	−37.2	−27.7	−21.0	−13.6	15.3	22.7	29.3	38.4	56.8
background so2 slant column offset window3 [DU]	−1.15	1.82	2.93	3.80	4.99	16.5	18.4	20.1	22.0	25.3
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]	7.302×10^{-4}	1.970×10^{-3}	3.192×10^{-3}	5.133×10^{-3}	7.440×10^{-3}	2.660×10^{-2}	3.954×10^{-2}	6.714×10^{-2}	0.127	0.374
fitted radiance shift [nm]	-8.477×10^{-3}	-4.301×10^{-3}	-2.838×10^{-3}	-2.006×10^{-3}	-1.297×10^{-3}	4.726×10^{-4}	1.161×10^{-3}	2.048×10^{-3}	3.617×10^{-3}	7.989×10^{-3}
fitted radiance squeeze [1]	-5.363×10^{-4}	-3.114×10^{-4}	-2.264×10^{-4}	-1.710×10^{-4}	-1.142×10^{-4}	9.044×10^{-5}	1.417×10^{-4}	1.890×10^{-4}	2.565×10^{-4}	4.146×10^{-4}
fitted root mean square [1]	6.001×10^{-4}	7.426×10^{-4}	8.191×10^{-4}	8.774×10^{-4}	9.492×10^{-4}	1.521×10^{-3}	1.769×10^{-3}	2.016×10^{-3}	2.399×10^{-3}	3.430×10^{-3}
sulfurdioxide total air mass factor polluted [1]	9.173×10^{-2}	0.241	0.342	0.423	0.535	1.08	1.27	1.43	1.65	1.98
sulfurdioxide total air mass factor polluted precision [1]	1.059×10^{-2}	1.814×10^{-2}	2.371×10^{-2}	2.941×10^{-2}	3.749×10^{-2}	0.138	0.183	0.229	0.309	0.521
sulfurdioxide clear air mass factor polluted [1]	0.203	0.301	0.370	0.433	0.514	0.899	0.997	1.09	1.24	1.66
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]	0.630 ± 0.399	10447499	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(3.777 \pm 117.400) \times 10^{-2}$	10447499	0.504	1.109×10^{-2}	-60.7	70.7	-0.237	0.268
sulfurdioxide total vertical column precision [DU]	0.616 ± 0.879	10447499	0.417	0.365	4.602×10^{-2}	26.9	0.235	0.652
sulfurdioxide slant column density corrected [DU]	$(2.119 \pm 39.930) \times 10^{-2}$	10447499	0.380	9.134×10^{-3}	-11.7	54.8	-0.178	0.201
sulfurdioxide slant column density cobra [DU]	$(2.100 \pm 38.998) \times 10^{-2}$	10447499	0.380	9.134×10^{-3}	-11.7	22.5	-0.178	0.201
sulfurdioxide slant column density cobra precision [DU]	0.310 ± 0.148	10447499	0.162	0.265	9.088×10^{-2}	11.2	0.209	0.371
sulfurdioxide slant column density window1 [DU]	0.160 ± 0.737	10447499	0.764	0.178	-60.6	21.8	-0.210	0.554
sulfurdioxide slant column density window1 precision [DU]	0.310 ± 0.148	10447499	0.162	0.265	9.088×10^{-2}	11.2	0.209	0.371
sulfurdioxide slant column density corrected win1 [DU]	$(4.355 \pm 72.844) \times 10^{-2}$	10447499	0.751	2.045×10^{-2}	-60.6	22.1	-0.348	0.403
background so2 slant column offset window1 [DU]	-0.117 ± 0.183	10447499	0.188	-0.167	-1.46	2.53	-0.236	-4.822×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.57 ± 9.00	10447499	11.6	2.40	-293	229	-3.33	8.29
sulfurdioxide slant column density window2 precision [DU]	7.87 ± 2.07	10447499	2.36	7.55	2.34	395	6.50	8.86
sulfurdioxide slant column density corrected win2 [DU]	-0.604 ± 8.475	10447499	10.8	-0.559	-297	228	-5.99	4.83
background so2 slant column offset window2 [DU]	-3.18 ± 3.63	10447499	5.88	-2.32	-18.5	11.1	-5.93	-4.914×10^{-2}
sulfurdioxide slant column density window3 [DU]	-11.8 ± 23.0	10447499	28.9	-12.2	-315	1.454×10^{3}	-26.4	2.53
sulfurdioxide slant column density window3 precision [DU]	26.9 ± 12.9	10447499	8.20	23.4	9.36	1.666×10^{3}	20.3	28.5
sulfurdioxide slant column density corrected win3 [DU]	0.775 ± 22.013	10447499	27.5	0.903	-304	1.457×10^{3}	-12.8	14.6
background so2 slant column offset window3 [DU]	12.6 ± 7.1	10447499	12.6	13.7	-10.9	32.4	5.65	18.2
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	10447499	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(4.271 \pm 9.021) \times 10^{-2}$	10447499	2.968×10^{-2}	1.578×10^{-2}	1.647×10^{-4}	1.94	6.239×10^{-3}	3.591×10^{-2}
fitted radiance shift [nm]	$(-2.511 \pm 25.061) \times 10^{-4}$	10447499	1.535×10^{-3}	-2.576×10^{-4}	-3.870×10^{-2}	3.876×10^{-2}	-1.043×10^{-3}	4.915×10^{-4}
fitted radiance squeeze [1]	$(-3.550 \pm 18.574) \times 10^{-5}$	10447499	2.060×10^{-4}	-2.256×10^{-5}	-1.393×10^{-2}	5.478×10^{-3}	-1.297×10^{-4}	7.625×10^{-5}
fitted root mean square [1]	$(1.347 \pm 0.621) \times 10^{-3}$	10447499	6.242×10^{-4}	1.155×10^{-3}	3.402×10^{-4}	3.344×10^{-2}	9.425×10^{-4}	1.567×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.819 ± 0.446	10447499	0.586	0.751	5.000×10^{-2}	2.83	0.484	1.07
sulfurdioxide total air mass factor polluted precision [1]	0.103 ± 0.116	10447499	9.729×10^{-2}	6.020×10^{-2}	3.328×10^{-3}	1.92	3.352×10^{-2}	0.131
sulfurdioxide clear air mass factor polluted [1]	0.703 ± 0.332	10447499	0.420	0.654	6.504×10^{-2}	2.55	0.457	0.877
number of spectral points in retrieval [1]	73.5 ± 0.5	10447499	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]	0.675 ± 0.396	6863164	0.740	1.000	0.0	1.000	0.260	1.000
sulfurdioxide total vertical column [DU]	$(3.409 \pm 91.033) \times 10^{-2}$	6863164	0.438	1.217×10^{-2}	-70.1	352	-0.205	0.234
sulfurdioxide total vertical column precision [DU]	0.462 ± 0.598	6863164	0.284	0.306	5.108×10^{-2}	337	0.219	0.502
sulfurdioxide slant column density corrected [DU]	$(2.311 \pm 43.727) \times 10^{-2}$	6863164	0.370	1.080×10^{-2}	-25.9	273	-0.172	0.197
sulfurdioxide slant column density cobra [DU]	$(2.276 \pm 39.430) \times 10^{-2}$	6863164	0.370	1.080×10^{-2}	-25.9	62.4	-0.172	0.197
sulfurdioxide slant column density cobra precision [DU]	0.292 ± 0.123	6863164	0.122	0.259	9.006×10^{-2}	22.1	0.214	0.336
sulfurdioxide slant column density window1 [DU]	0.180 ± 0.684	6863164	0.735	0.181	-175	62.7	-0.190	0.545
sulfurdioxide slant column density window1 precision [DU]	0.292 ± 0.123	6863164	0.122	0.259	9.006×10^{-2}	22.1	0.214	0.336
sulfurdioxide slant column density corrected win1 [DU]	$(3.707 \pm 67.642) \times 10^{-2}$	6863164	0.722	1.920×10^{-2}	-175	62.4	-0.338	0.384
background so2 slant column offset window1 [DU]	-0.143 ± 0.128	6863164	0.151	-0.162	-1.49	6.78	-0.228	-7.636×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.06 ± 9.35	6863164	11.7	0.905	-1.446×10^{3}	921	-4.87	6.82
sulfurdioxide slant column density window2 precision [DU]	8.51 ± 2.41	6863164	2.67	8.19	2.39	568	7.01	9.68
sulfurdioxide slant column density corrected win2 [DU]	-0.277 ± 9.304	6863164	11.6	-0.306	-1.447×10^{3}	920	-6.11	5.52
background so2 slant column offset window2 [DU]	-1.34 ± 1.88	6863164	2.17	-0.971	-15.8	11.1	-2.32	-0.148
sulfurdioxide slant column density window3 [DU]	-7.88 ± 25.11	6863164	31.7	-7.76	-509	457	-23.6	8.16
sulfurdioxide slant column density window3 precision [DU]	30.6 ± 14.3	6863164	11.1	26.7	9.75	242	22.5	33.6
sulfurdioxide slant column density corrected win3 [DU]	0.722 ± 24.643	6863164	31.2	0.658	-503	460	-14.8	16.4
background so2 slant column offset window3 [DU]	8.60 ± 5.39	6863164	8.37	7.30	-9.73	30.2	4.53	12.9
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	6863164	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.823 \pm 3.039) \times 10^{-2}$	6863164	1.078×10^{-2}	1.245×10^{-2}	1.038×10^{-3}	1.21	8.267×10^{-3}	1.905×10^{-2}
fitted radiance shift [nm]	$(-5.811 \pm 28.429) \times 10^{-4}$	6863164	2.133×10^{-3}	-5.821×10^{-4}	-4.843×10^{-2}	7.269×10^{-2}	-1.701×10^{-3}	4.320×10^{-4}
fitted radiance squeeze [1]	$(1.182 \pm 17.270) \times 10^{-5}$	6863164	2.030×10^{-4}	9.048×10^{-6}	-1.921×10^{-2}	2.274×10^{-2}	-9.116×10^{-5}	1.118×10^{-4}
fitted root mean square [1]	$(1.267 \pm 0.482) \times 10^{-3}$	6863164	4.984×10^{-4}	1.144×10^{-3}	2.619×10^{-4}	5.655×10^{-2}	9.596×10^{-4}	1.458×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.878 ± 0.375	6863164	0.483	0.852	5.000×10^{-2}	2.59	0.616	1.10
sulfurdioxide total air mass factor polluted precision [1]	0.108 ± 0.093	6863164	0.103	7.379×10^{-2}	5.588×10^{-3}	1.52	4.371×10^{-2}	0.147
sulfurdioxide clear air mass factor polluted [1]	0.761 ± 0.230	6863164	0.333	0.749	0.112	1.92	0.588	0.922
number of spectral points in retrieval [1]	73.4 ± 0.5	6863164	1.000	73.0	51.0	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]	0.673 ± 0.397	11488655	0.750	1.000	0.0	1.000	0.250	1.000
sulfurdioxide total vertical column [DU]	$(2.917 \pm 94.432) \times 10^{-2}$	11488655	0.448	1.024×10^{-2}	-50.6	322	-0.211	0.237
sulfurdioxide total vertical column precision [DU]	0.498 ± 0.686	11488655	0.312	0.313	4.602×10^{-2}	67.6	0.221	0.533
sulfurdioxide slant column density corrected [DU]	$(1.807 \pm 37.859) \times 10^{-2}$	11488655	0.365	8.812×10^{-3}	-25.9	273	-0.172	0.193
sulfurdioxide slant column density cobra [DU]	$(1.798 \pm 36.502) \times 10^{-2}$	11488655	0.365	8.812×10^{-3}	-25.9	62.4	-0.172	0.193
sulfurdioxide slant column density cobra precision [DU]	0.296 ± 0.139	11488655	0.144	0.252	9.006×10^{-2}	22.1	0.206	0.350
sulfurdioxide slant column density window1 [DU]	0.165 ± 0.689	11488655	0.737	0.179	-47.0	62.7	-0.194	0.543
sulfurdioxide slant column density window1 precision [DU]	0.296 ± 0.139	11488655	0.144	0.252	9.006×10^{-2}	22.1	0.206	0.350
sulfurdioxide slant column density corrected win1 [DU]	$(3.274 \pm 68.048) \times 10^{-2}$	11488655	0.725	1.661×10^{-2}	-47.0	62.4	-0.341	0.384
background so2 slant column offset window1 [DU]	-0.133 ± 0.154	11488655	0.167	-0.166	-1.49	6.78	-0.233	-6.602×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.63 ± 9.09	11488655	11.5	1.41	-1.446×10^{3}	543	-4.26	7.28
sulfurdioxide slant column density window2 precision [DU]	8.09 ± 2.17	11488655	2.53	7.78	2.47	568	6.66	9.19
sulfurdioxide slant column density corrected win2 [DU]	-0.424 ± 8.798	11488655	11.1	-0.421	-1.447×10^{3}	542	-5.99	5.14
background so2 slant column offset window2 [DU]	-2.05 ± 2.97	11488655	3.25	-1.15	-18.5	11.1	-3.28	-2.955×10^{-2}
sulfurdioxide slant column density window3 [DU]	-7.25 ± 24.12	11488655	30.7	-7.53	-509	1.454×10^{3}	-22.6	8.10
sulfurdioxide slant column density window3 precision [DU]	27.7 ± 12.2	11488655	9.24	24.4	9.36	1.159×10^{3}	21.0	30.3
sulfurdioxide slant column density corrected win3 [DU]	2.93 ± 23.02	11488655	29.1	2.75	-503	1.457×10^{3}	-11.6	17.5
background so2 slant column offset window3 [DU]	10.2 ± 6.5	11488655	10.6	9.15	-10.9	32.4	4.65	15.3
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	11488655	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.295 \pm 4.131) \times 10^{-2}$	11488655	1.453×10^{-2}	1.322×10^{-2}	1.647×10^{-4}	1.32	7.990×10^{-3}	2.252×10^{-2}
fitted radiance shift [nm]	$(-4.179 \pm 23.989) \times 10^{-4}$	11488655	1.761×10^{-3}	-3.783×10^{-4}	-4.843×10^{-2}	7.269×10^{-2}	-1.324×10^{-3}	4.378×10^{-4}
fitted radiance squeeze [1]	$(-9.031 \pm 178.988) \times 10^{-6}$	11488655	2.000×10^{-4}	-3.722×10^{-6}	-1.921×10^{-2}	1.449×10^{-2}	-1.049×10^{-4}	9.512×10^{-5}
fitted root mean square [1]	$(1.295 \pm 0.565) \times 10^{-3}$	11488655	5.822×10^{-4}	1.116×10^{-3}	3.465×10^{-4}	5.655×10^{-2}	9.295×10^{-4}	1.512×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.854 ± 0.377	11488655	0.483	0.830	5.000×10^{-2}	2.48	0.591	1.07
sulfurdioxide total air mass factor polluted precision [1]	0.100 ± 0.094	11488655	9.075×10^{-2}	6.569×10^{-2}	3.679×10^{-3}	1.92	4.085×10^{-2}	0.132
sulfurdioxide clear air mass factor polluted [1]	0.743 ± 0.256	11488655	0.348	0.734	6.504×10^{-2}	2.35	0.559	0.907
number of spectral points in retrieval [1]	73.4 ± 0.5	11488655	1.000	73.0	53.0	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]	0.641 ± 0.403	4074416	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(4.238 \pm 117.913) \times 10^{-2}$	4074416	0.514	1.327×10^{-2}	-41.4	352	-0.239	0.275
sulfurdioxide total vertical column precision [DU]	0.606 ± 0.845	4074416	0.407	0.379	4.888×10^{-2}	337	0.244	0.651
sulfurdioxide slant column density corrected [DU]	$(2.805 \pm 46.200) \times 10^{-2}$	4074416	0.377	1.084×10^{-2}	-12.4	204	-0.175	0.201
sulfurdioxide slant column density cobra [DU]	$(2.761 \pm 42.393) \times 10^{-2}$	4074416	0.377	1.084×10^{-2}	-12.4	30.3	-0.175	0.201
sulfurdioxide slant column density cobra precision [DU]	0.297 ± 0.125	4074416	0.128	0.263	9.599×10^{-2}	11.0	0.216	0.343
sulfurdioxide slant column density window1 [DU]	0.198 ± 0.723	4074416	0.742	0.196	-175	43.7	-0.177	0.565
sulfurdioxide slant column density window1 precision [DU]	0.297 ± 0.125	4074416	0.128	0.263	9.599×10^{-2}	11.0	0.216	0.343
sulfurdioxide slant column density corrected win1 [DU]	$(5.048 \pm 71.602) \times 10^{-2}$	4074416	0.729	2.333×10^{-2}	-175	43.9	-0.335	0.394
background so2 slant column offset window1 [DU]	-0.147 ± 0.154	4074416	0.155	-0.183	-1.46	2.00	-0.243	-8.888×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.91 ± 9.25	4074416	11.8	1.86	-1.306×10^{3}	921	-3.99	7.77
sulfurdioxide slant column density window2 precision [DU]	8.25 ± 2.43	4074416	2.51	7.89	2.34	545	6.76	9.27
sulfurdioxide slant column density corrected win2 [DU]	-0.588 ± 8.926	4074416	11.2	-0.575	-1.306×10^{3}	920	-6.19	5.02
background so2 slant column offset window2 [DU]	-2.50 ± 3.20	4074416	4.41	-1.47	-18.5	11.1	-4.50	-9.160×10^{-2}
sulfurdioxide slant column density window3 [DU]	-15.8 ± 23.0	4074416	28.7	-15.6	-457	457	-30.1	-1.39
sulfurdioxide slant column density window3 precision [DU]	30.7 ± 17.0	4074416	11.8	25.6	9.82	242	21.3	33.1
sulfurdioxide slant column density corrected win3 [DU]	-4.53 ± 23.19	4074416	28.9	-3.84	-445	460	-18.7	10.3
background so2 slant column offset window3 [DU]	11.3 ± 6.8	4074416	11.8	11.2	-10.5	32.4	5.19	17.0
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.14	4074416	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.529 \pm 10.928) \times 10^{-2}$	4074416	4.667×10^{-2}	1.808×10^{-2}	2.056×10^{-4}	1.94	7.063×10^{-3}	5.373×10^{-2}
fitted radiance shift [nm]	$(-2.732 \pm 33.110) \times 10^{-4}$	4074416	1.868×10^{-3}	-3.014×10^{-4}	-4.156×10^{-2}	3.876×10^{-2}	-1.245×10^{-3}	6.232×10^{-4}
fitted radiance squeeze [1]	$(-1.931 \pm 17.687) \times 10^{-5}$	4074416	2.048×10^{-4}	-1.385×10^{-5}	-1.364×10^{-2}	2.274×10^{-2}	-1.181×10^{-4}	8.672×10^{-5}
fitted root mean square [1]	$(1.280 \pm 0.514) \times 10^{-3}$	4074416	4.676×10^{-4}	1.154×10^{-3}	2.619×10^{-4}	5.016×10^{-2}	9.680×10^{-4}	1.436×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.814 ± 0.483	4074416	0.632	0.688	5.000×10^{-2}	2.83	0.460	1.09
sulfurdioxide total air mass factor polluted precision [1]	0.119 ± 0.135	4074416	0.129	6.644×10^{-2}	3.791×10^{-3}	1.68	3.065×10^{-2}	0.160
sulfurdioxide clear air mass factor polluted [1]	0.685 ± 0.336	4074416	0.391	0.621	7.369×10^{-2}	2.55	0.447	0.838
number of spectral points in retrieval [1]	73.4 ± 0.5	4074416	1.000	73.0	51.0	74.0	73.0	74.0

3 Granule outlines

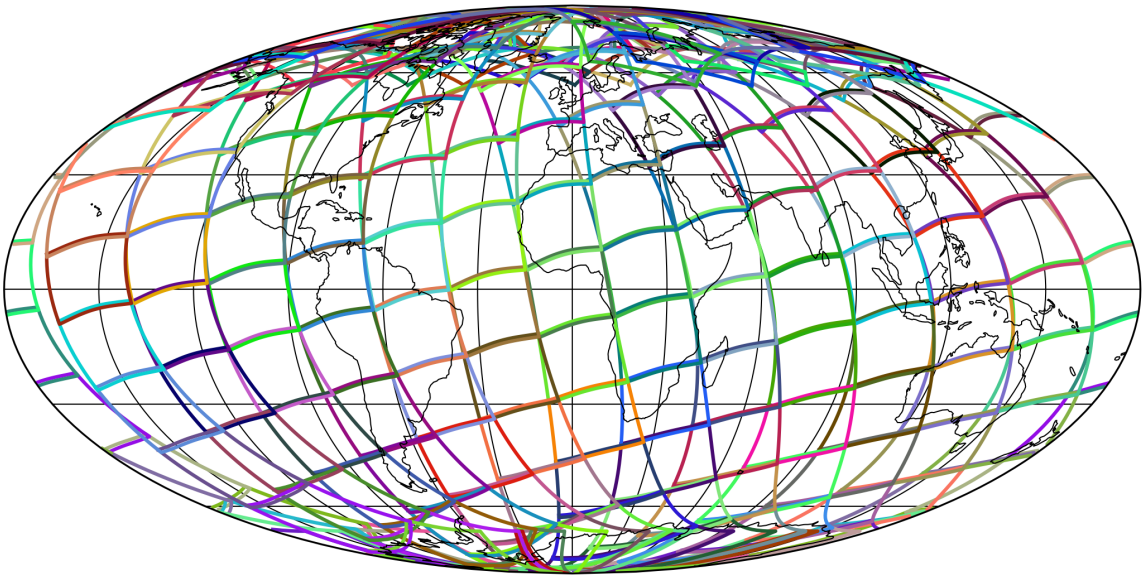

Figure 1: Outline of the granules.

4 Input data monitoring

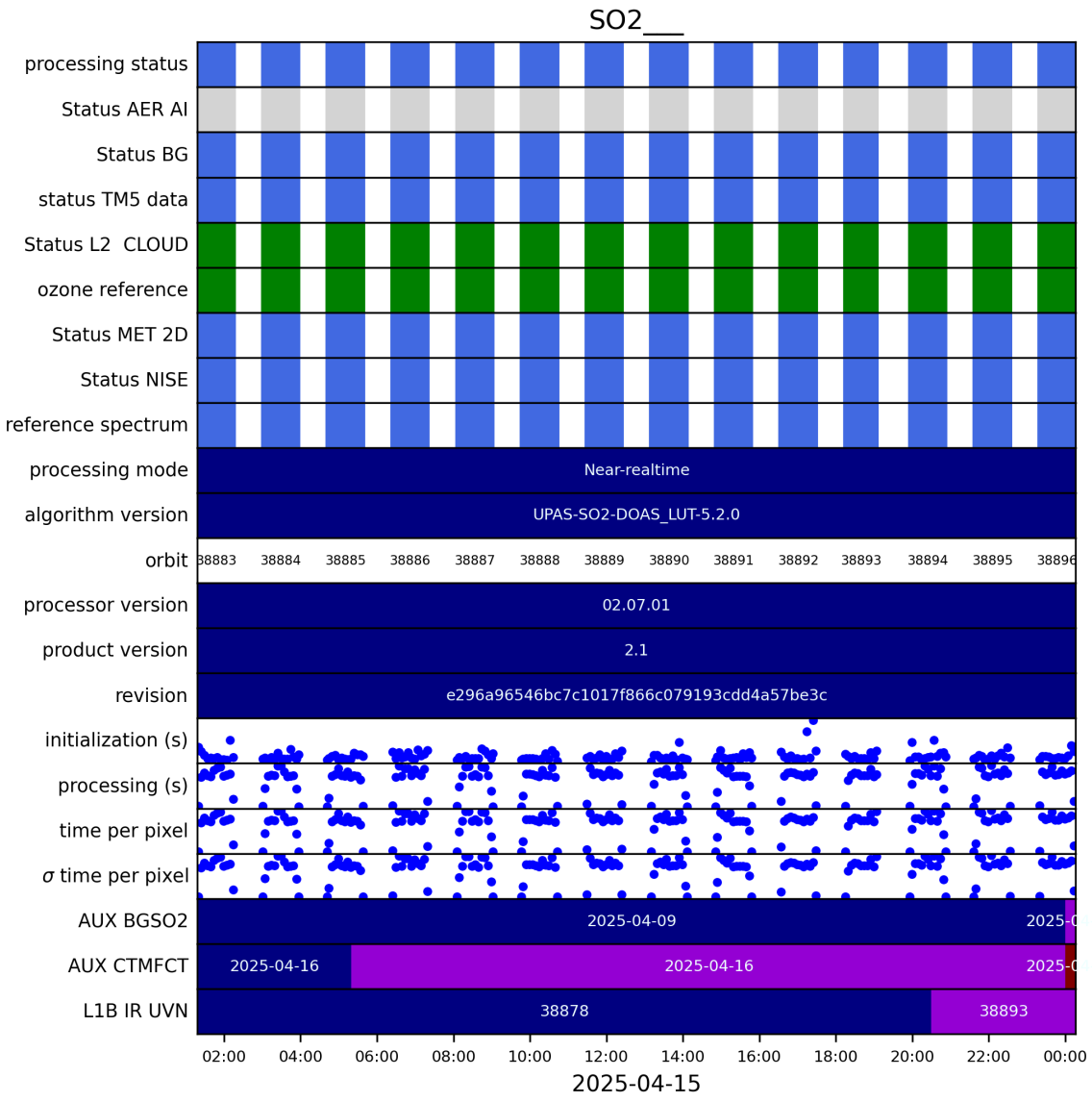

Figure 2: Input data per granule

5 Warnings and errors

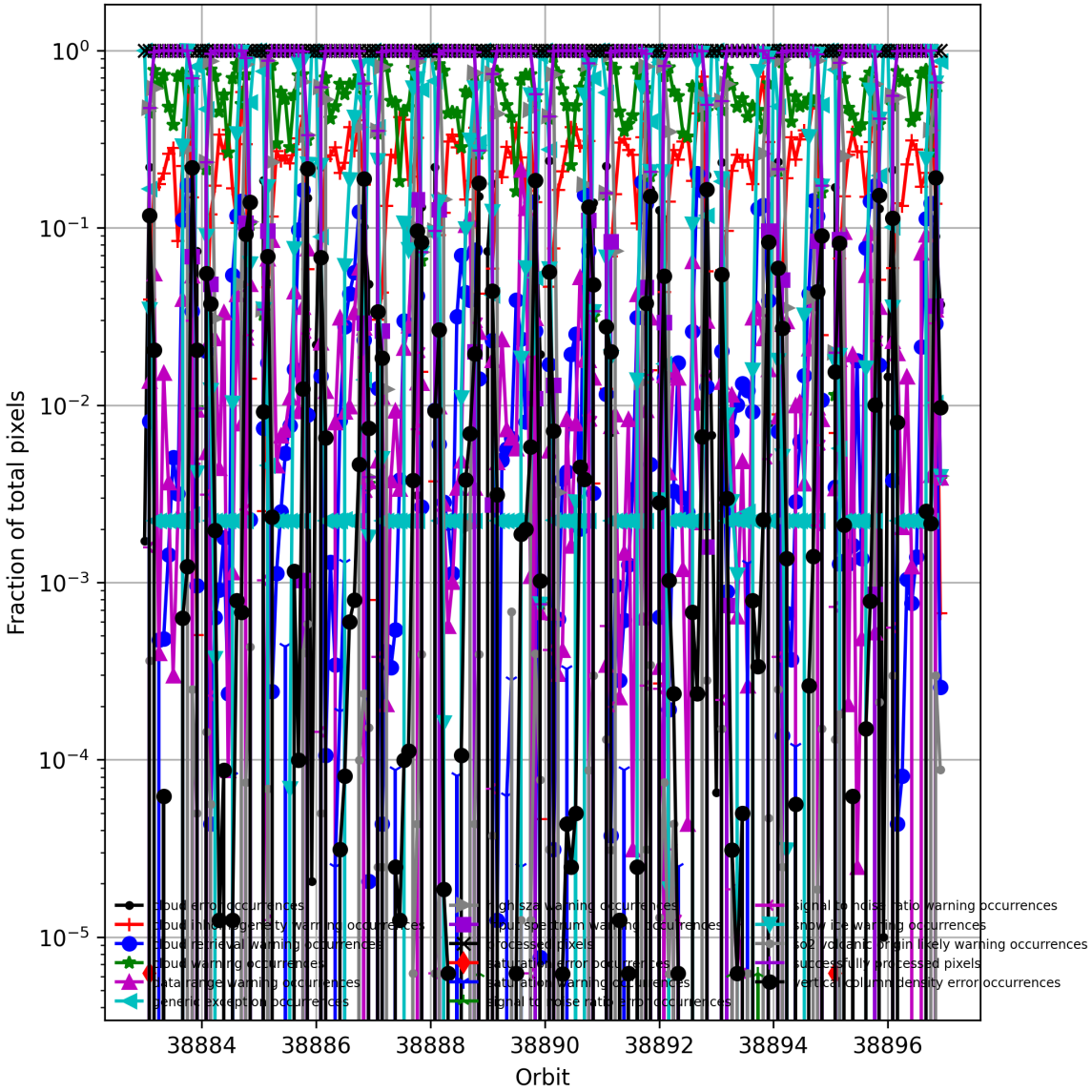

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

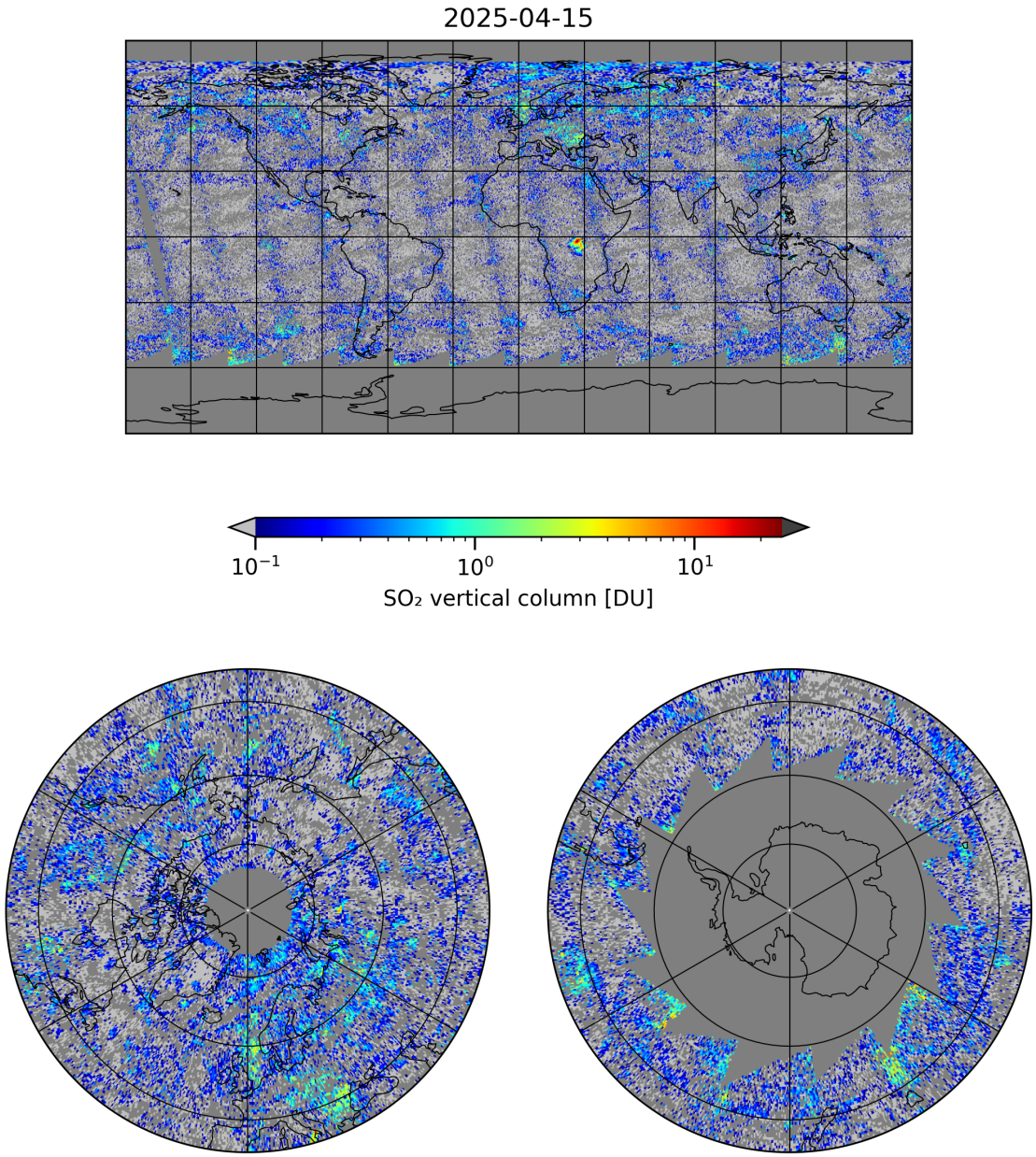

Figure 4: Map of "SO_2 vertical column" for 2025-04-15 to 2025-04-16

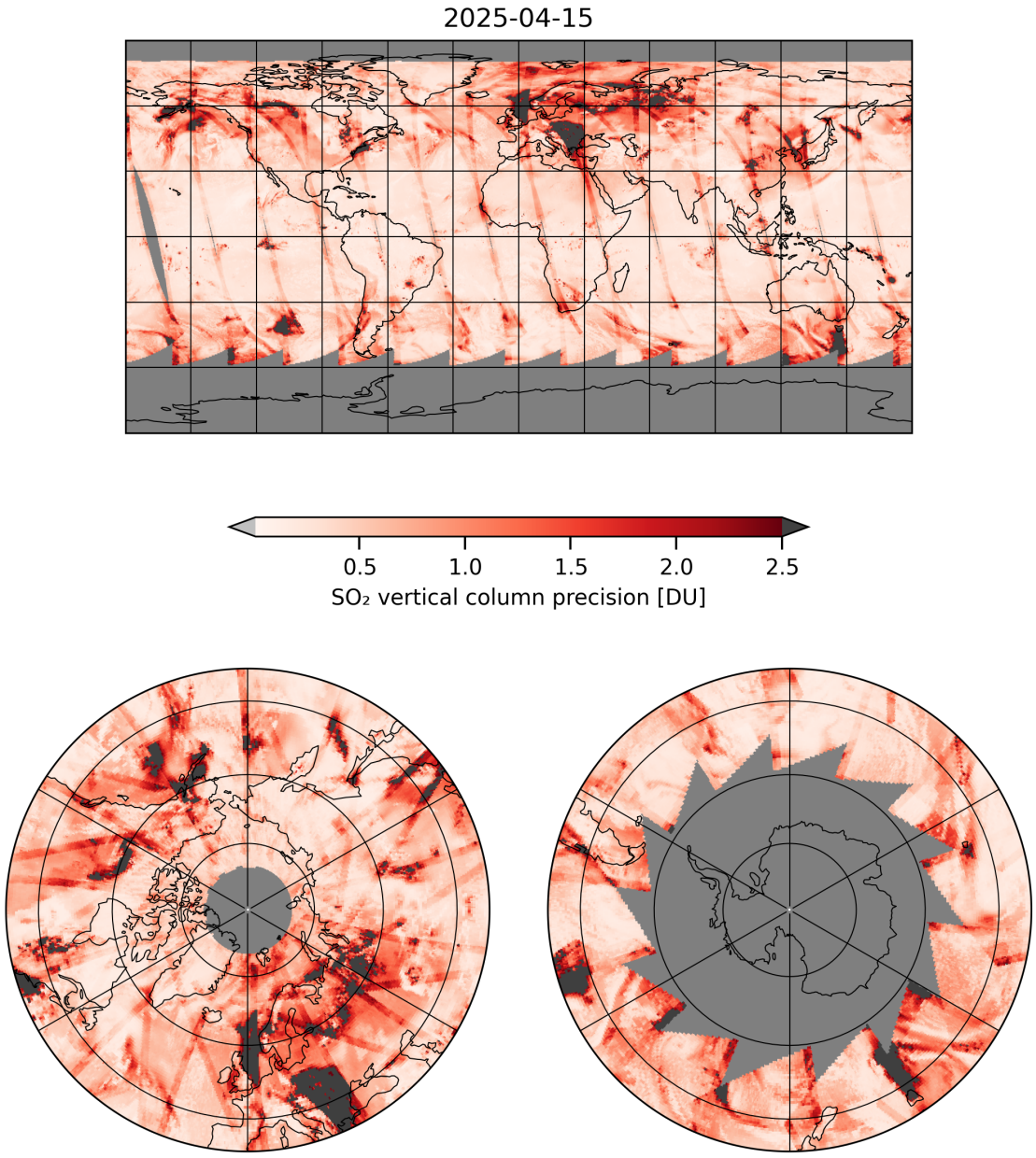

Figure 5: Map of "SO_2 vertical column precision" for 2025-04-15 to 2025-04-16

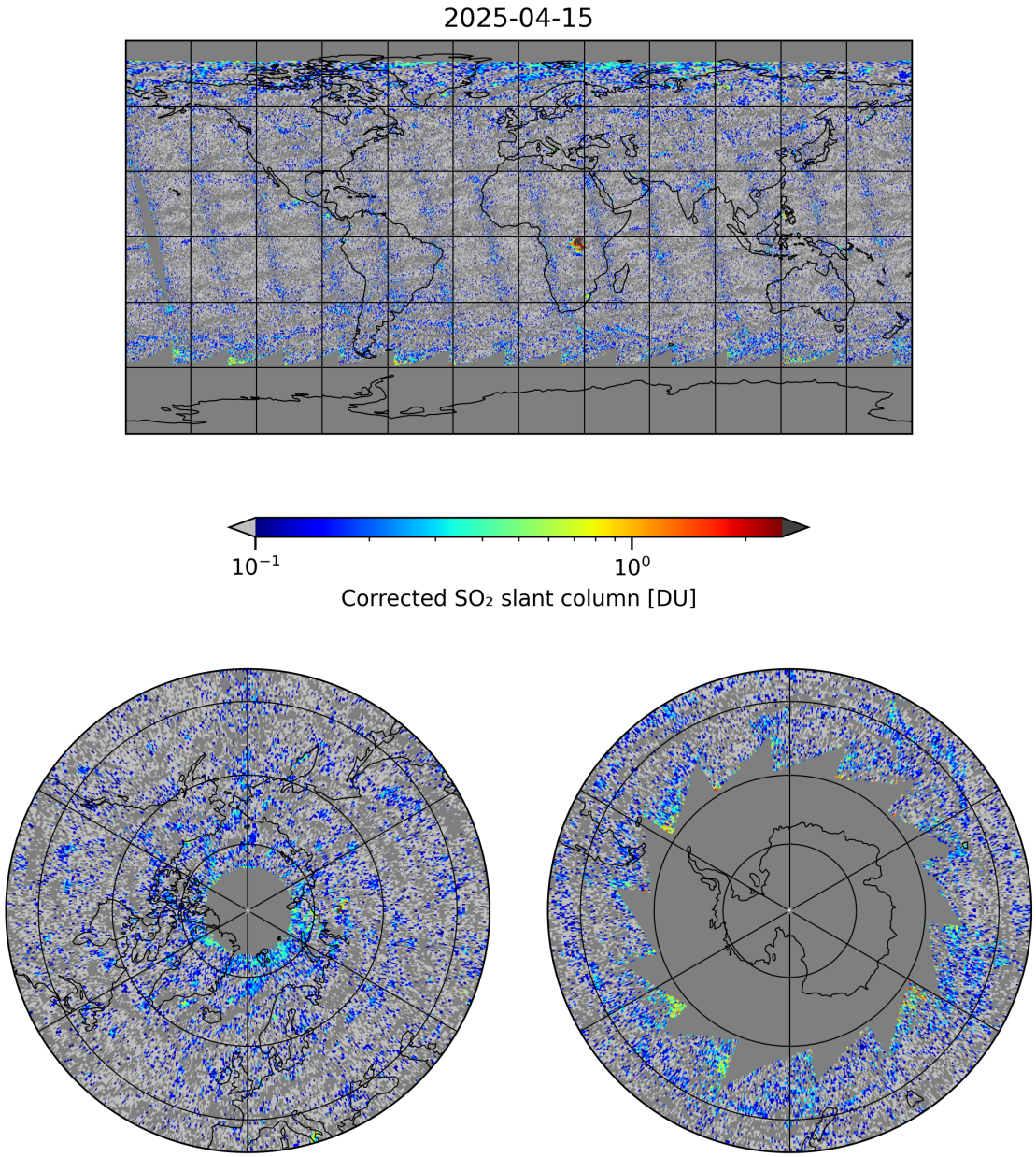

Figure 6: Map of “Corrected SO_2 slant column” for 2025-04-15 to 2025-04-16

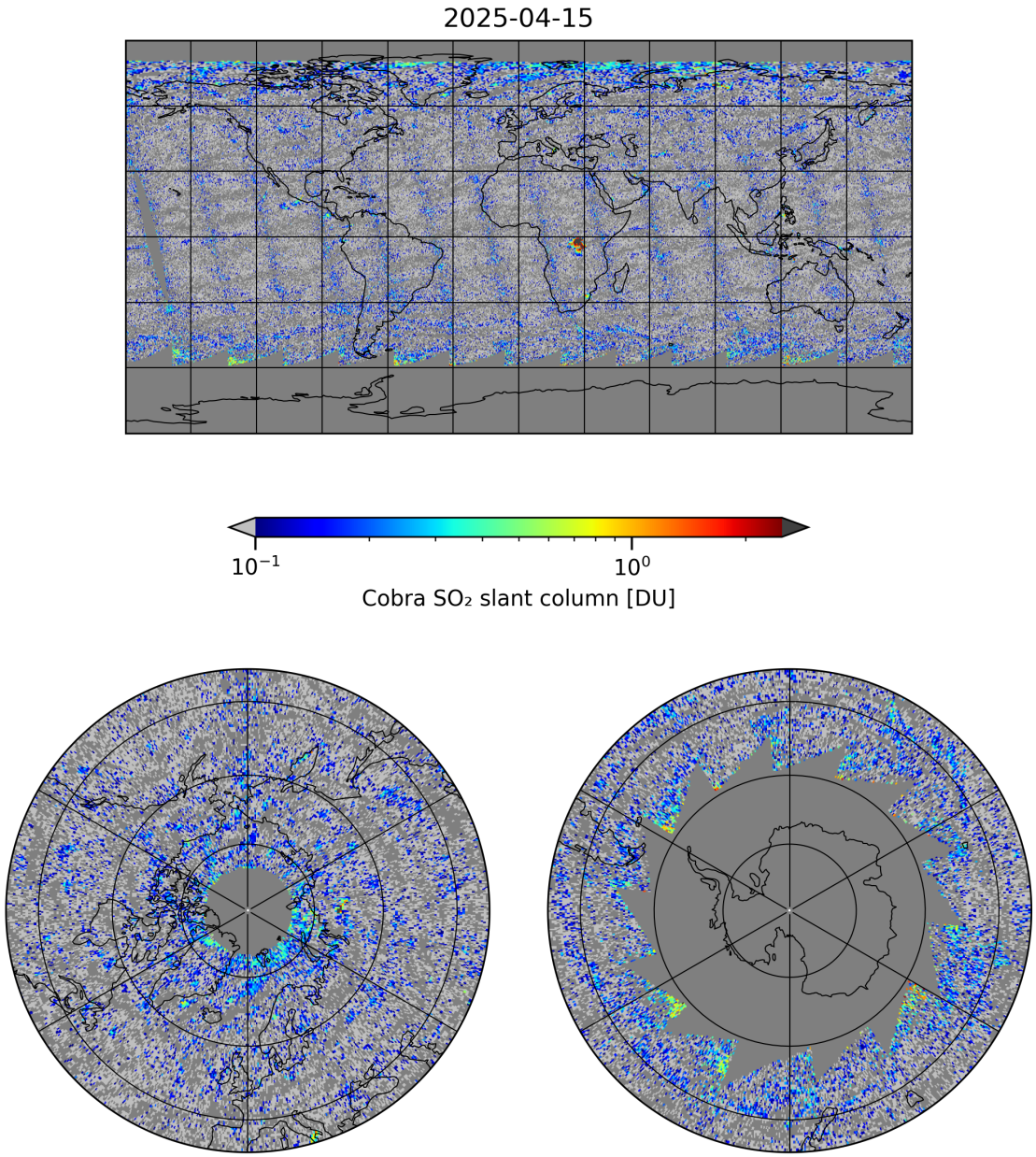

Figure 7: Map of "Cobra SO_2 slant column" for 2025-04-15 to 2025-04-16

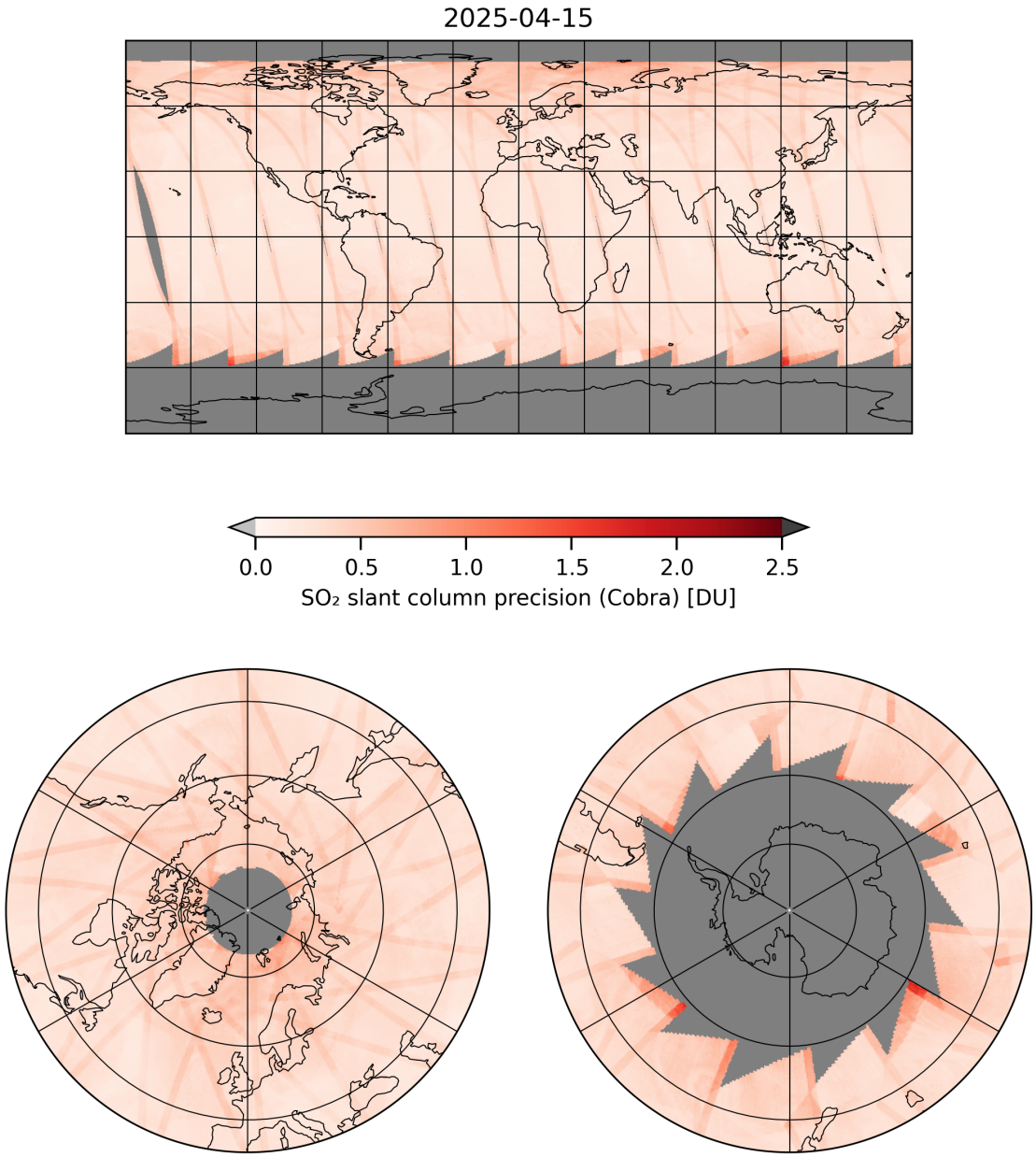

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-04-15 to 2025-04-16

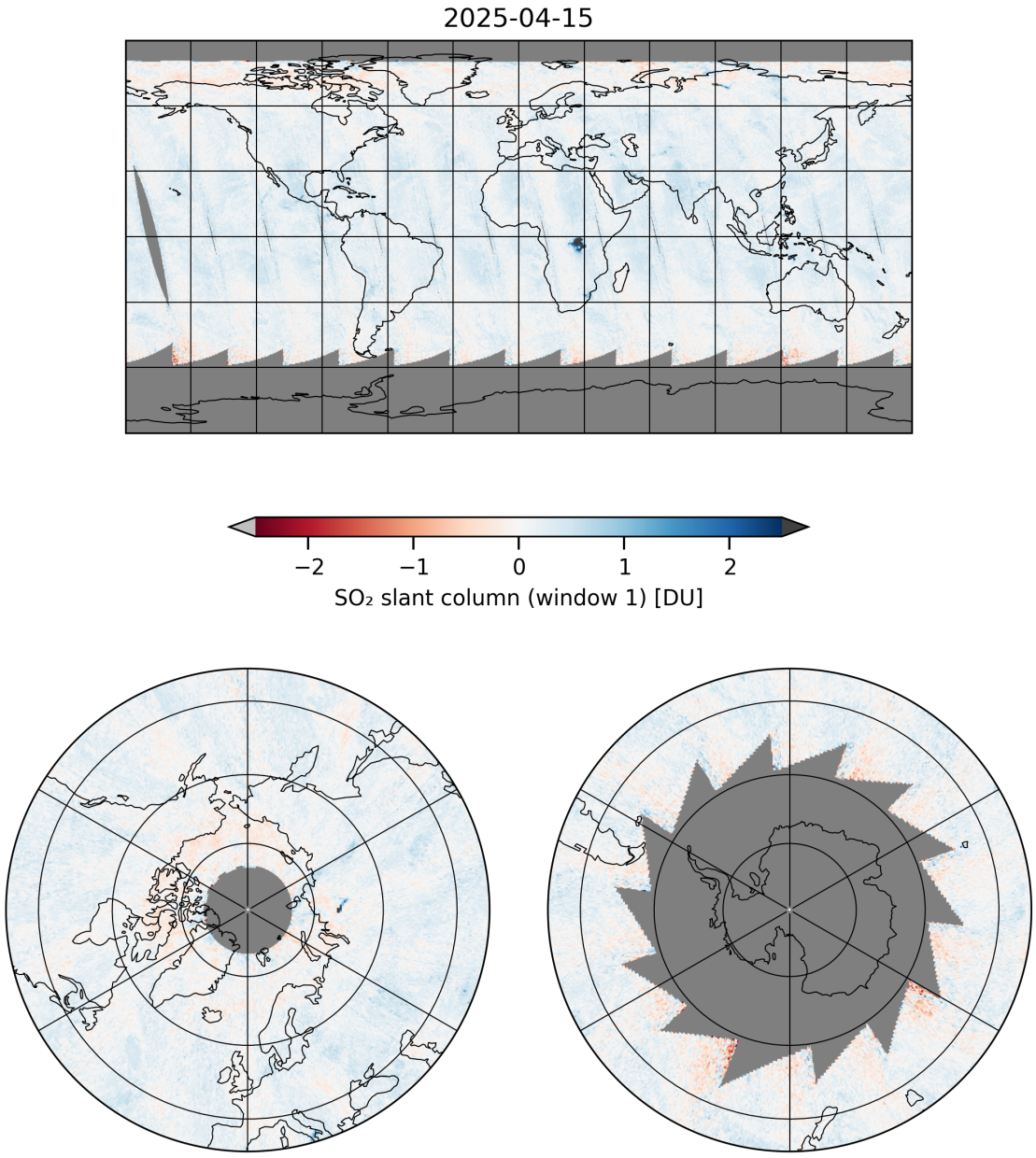

Figure 9: Map of "SO_2 slant column (window 1)" for 2025-04-15 to 2025-04-16

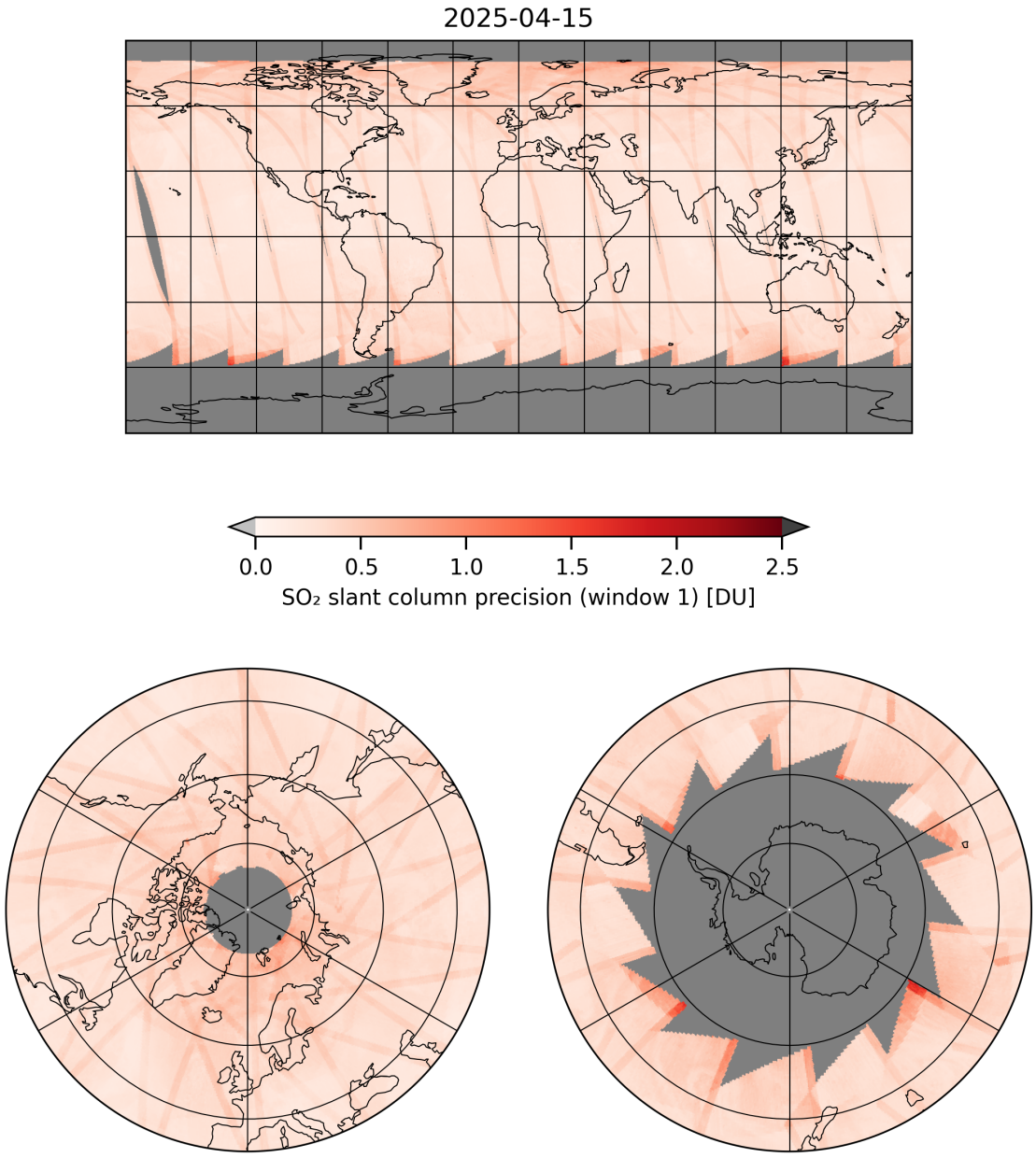

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-04-15 to 2025-04-16

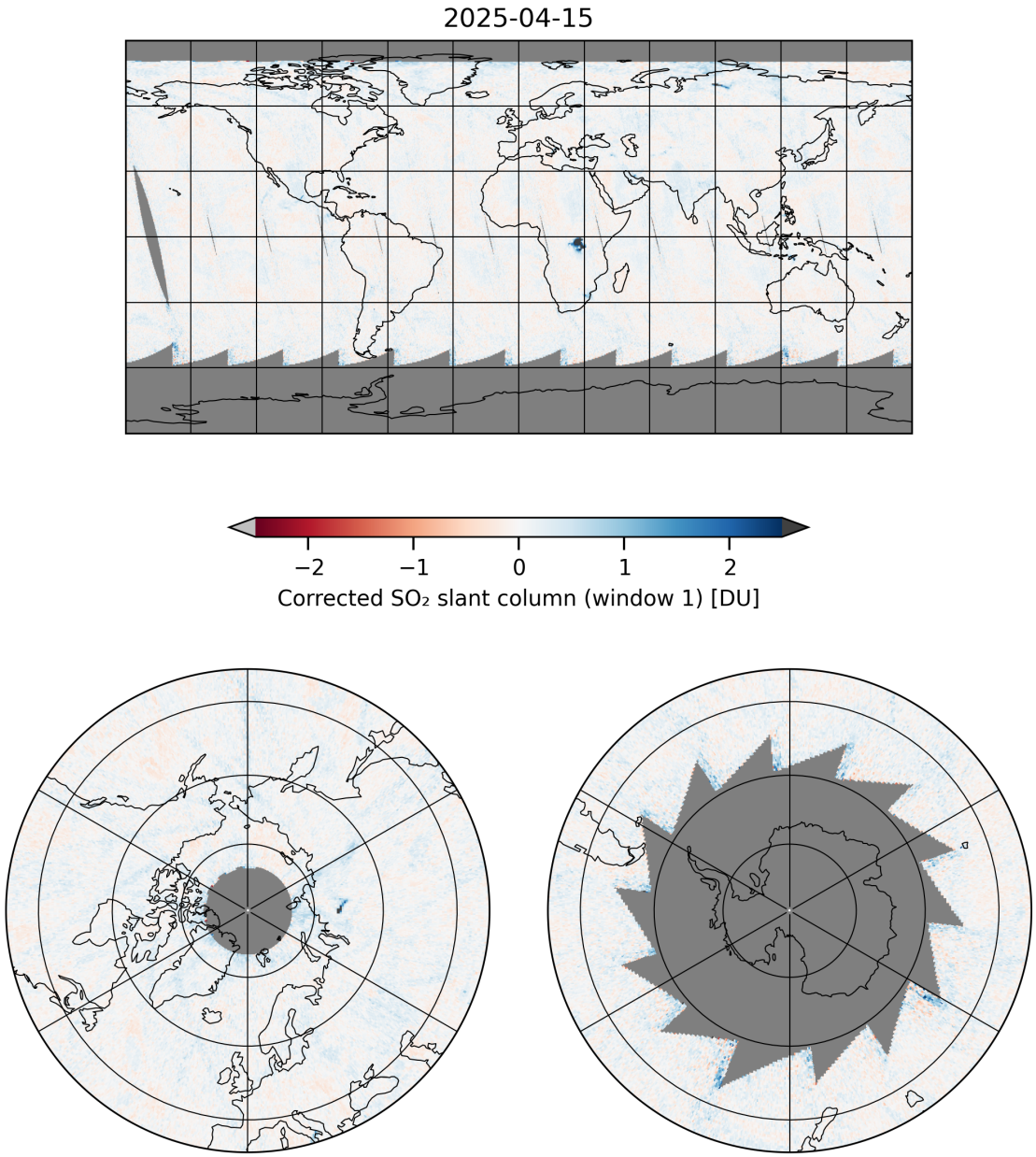

Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-04-15 to 2025-04-16

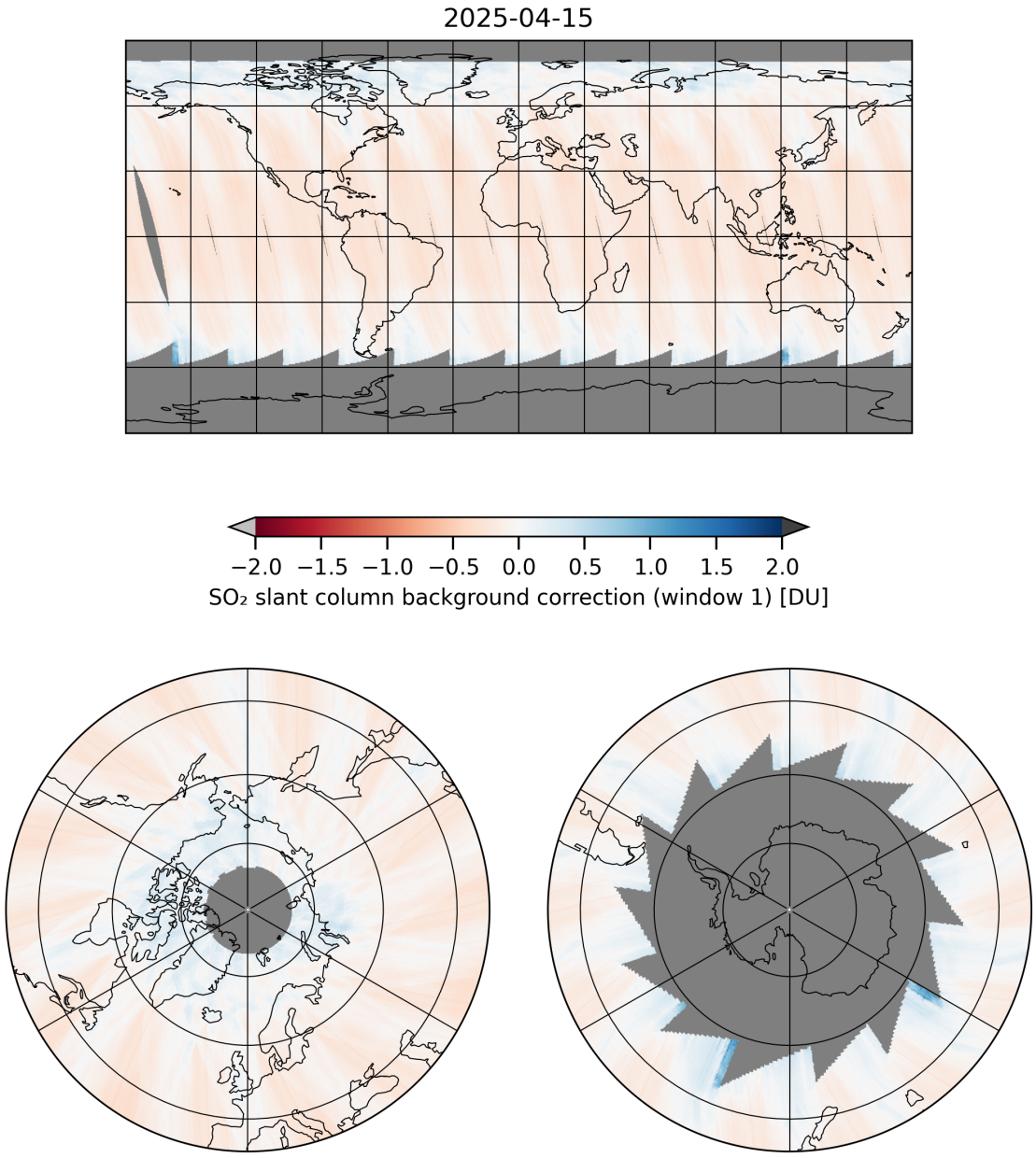

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-04-15 to 2025-04-16

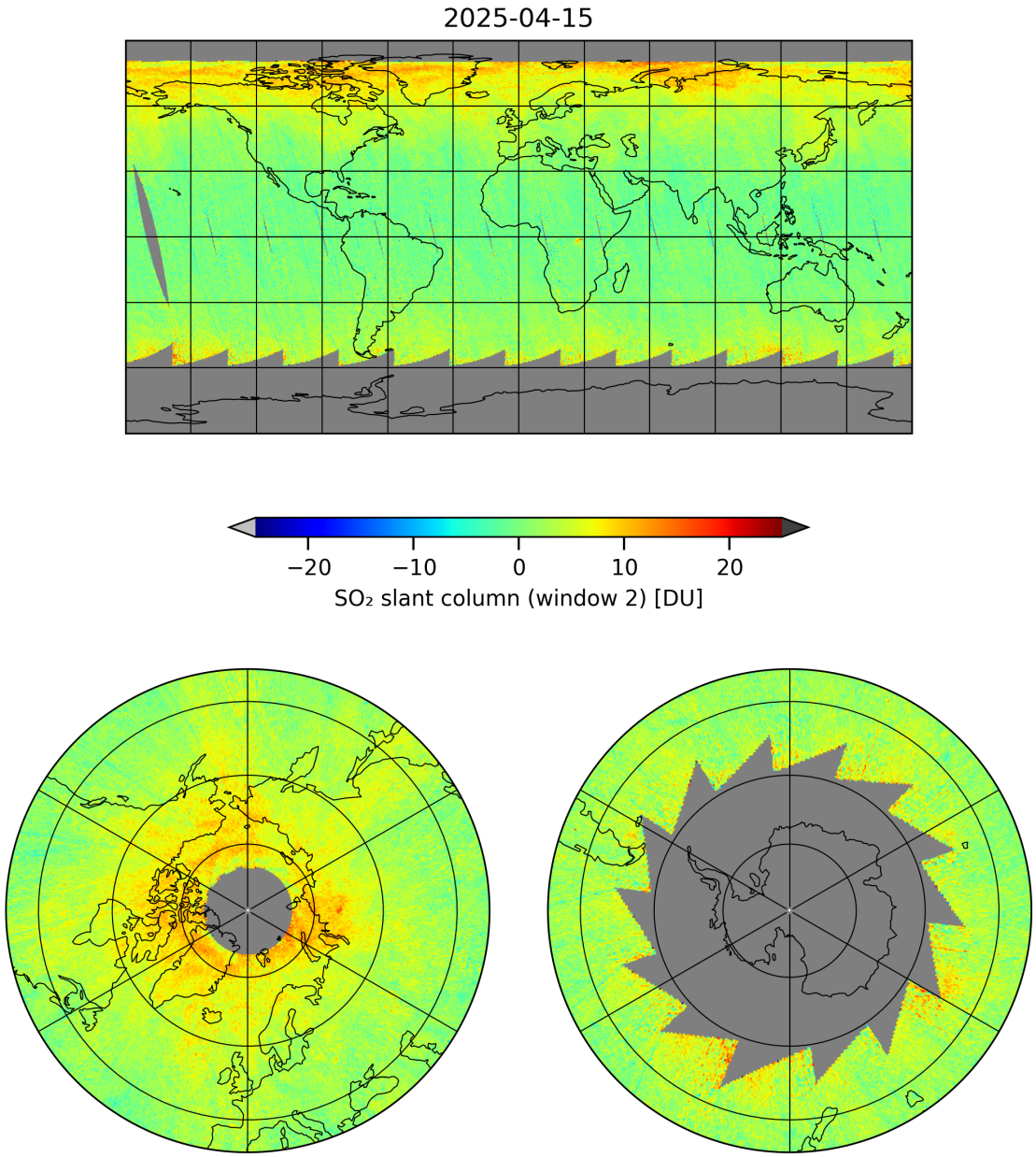

Figure 13: Map of "SO_2 slant column (window 2)" for 2025-04-15 to 2025-04-16

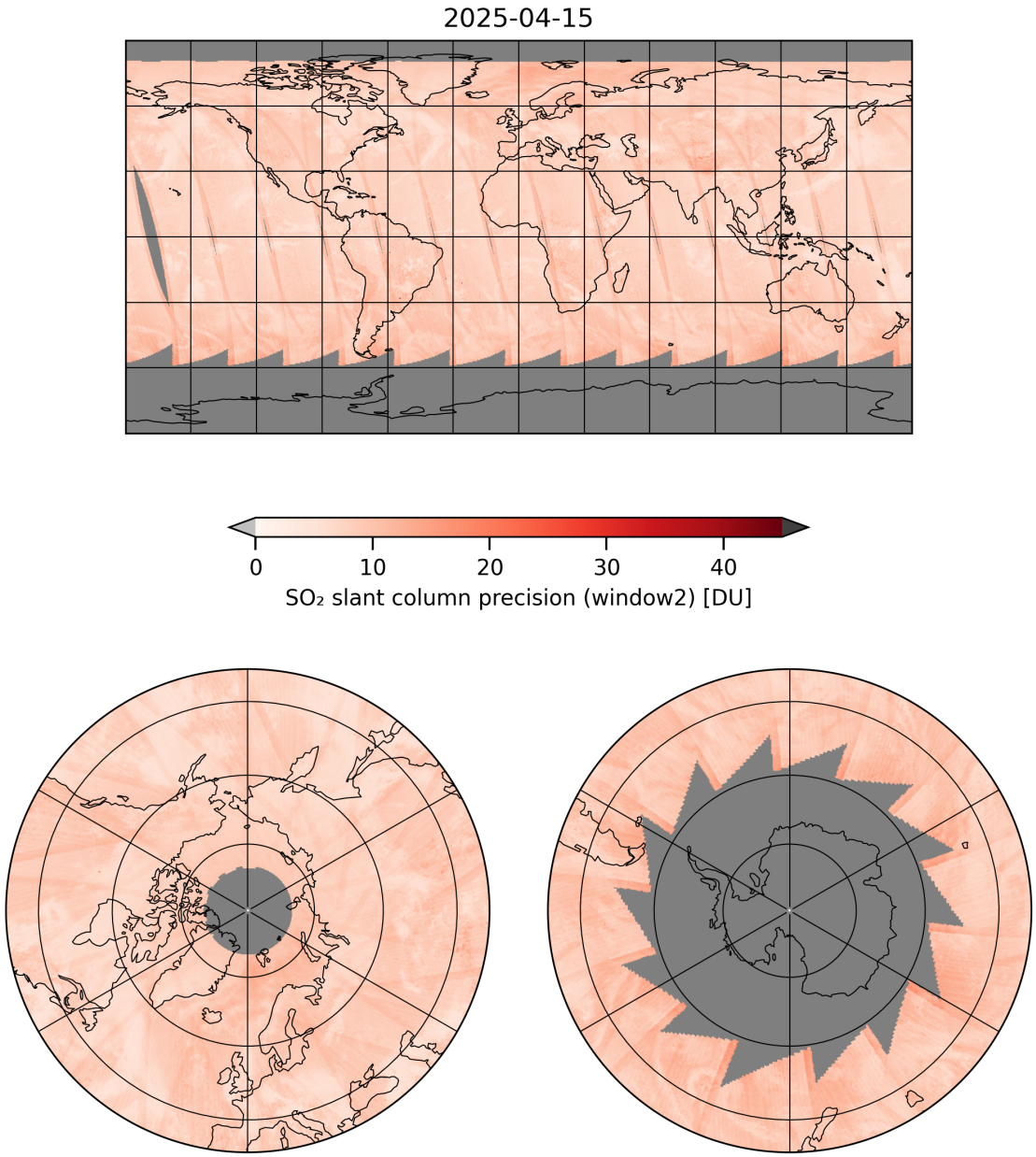

Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-04-15 to 2025-04-16

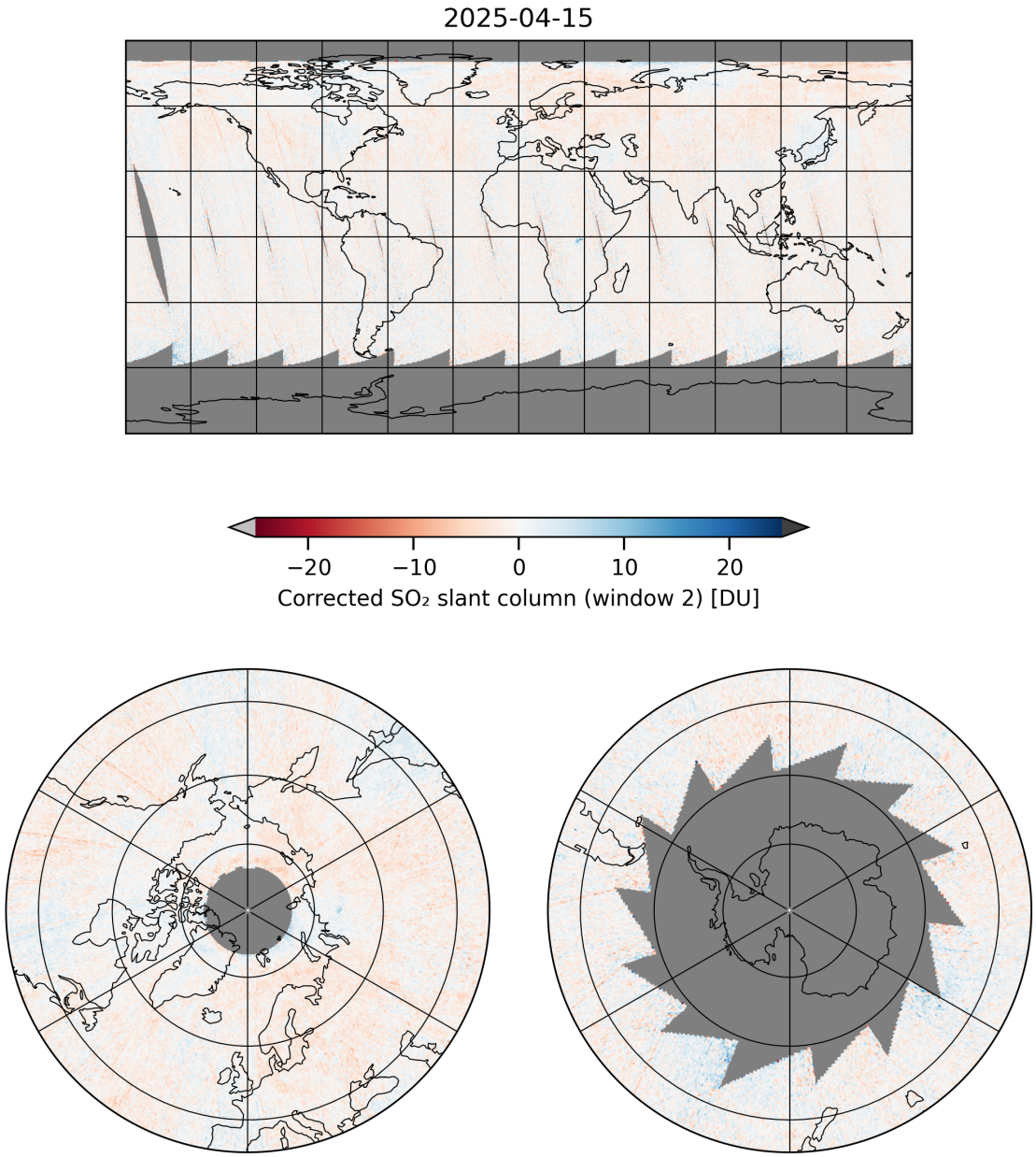

Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2025-04-15 to 2025-04-16

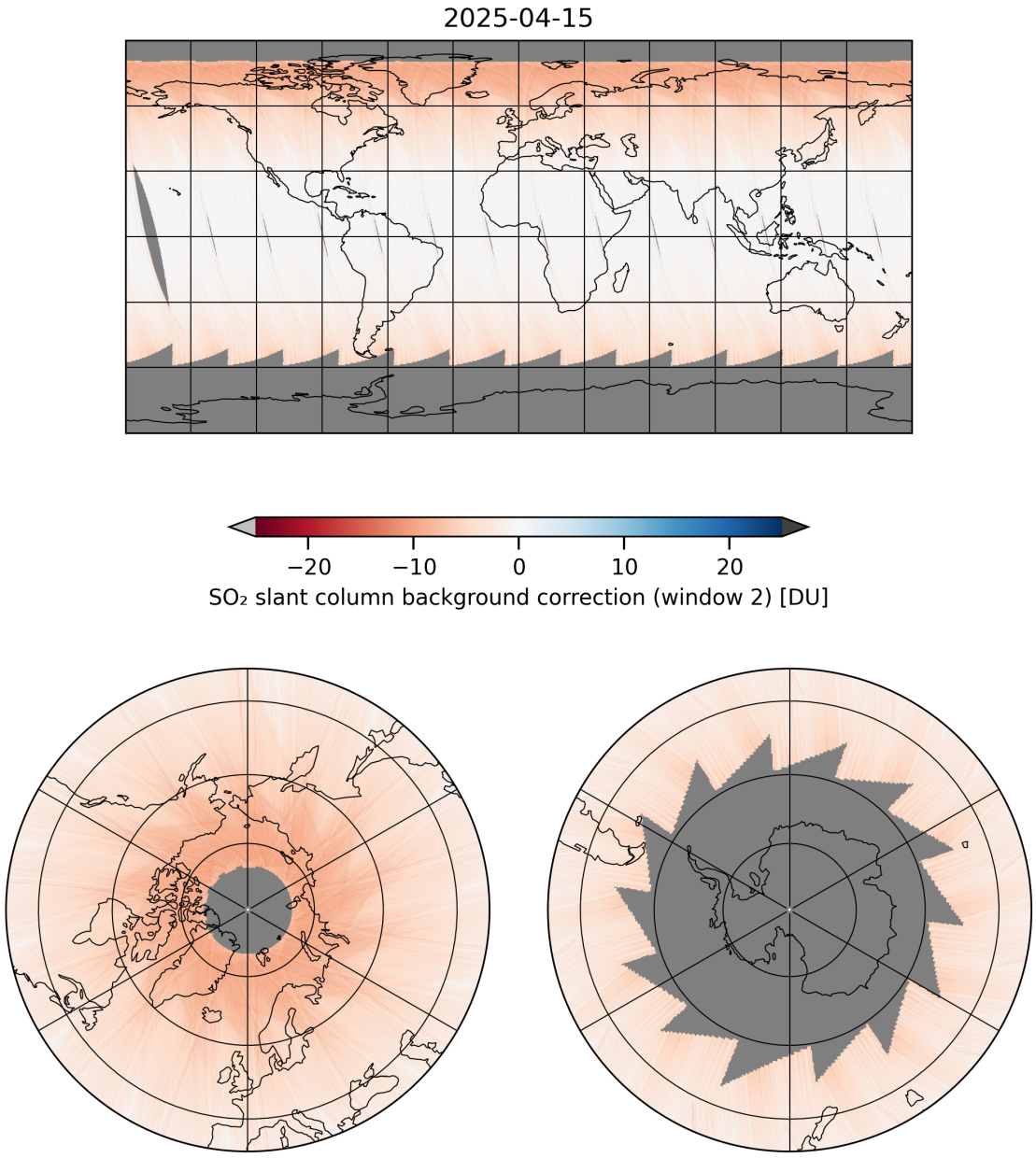

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-04-15 to 2025-04-16

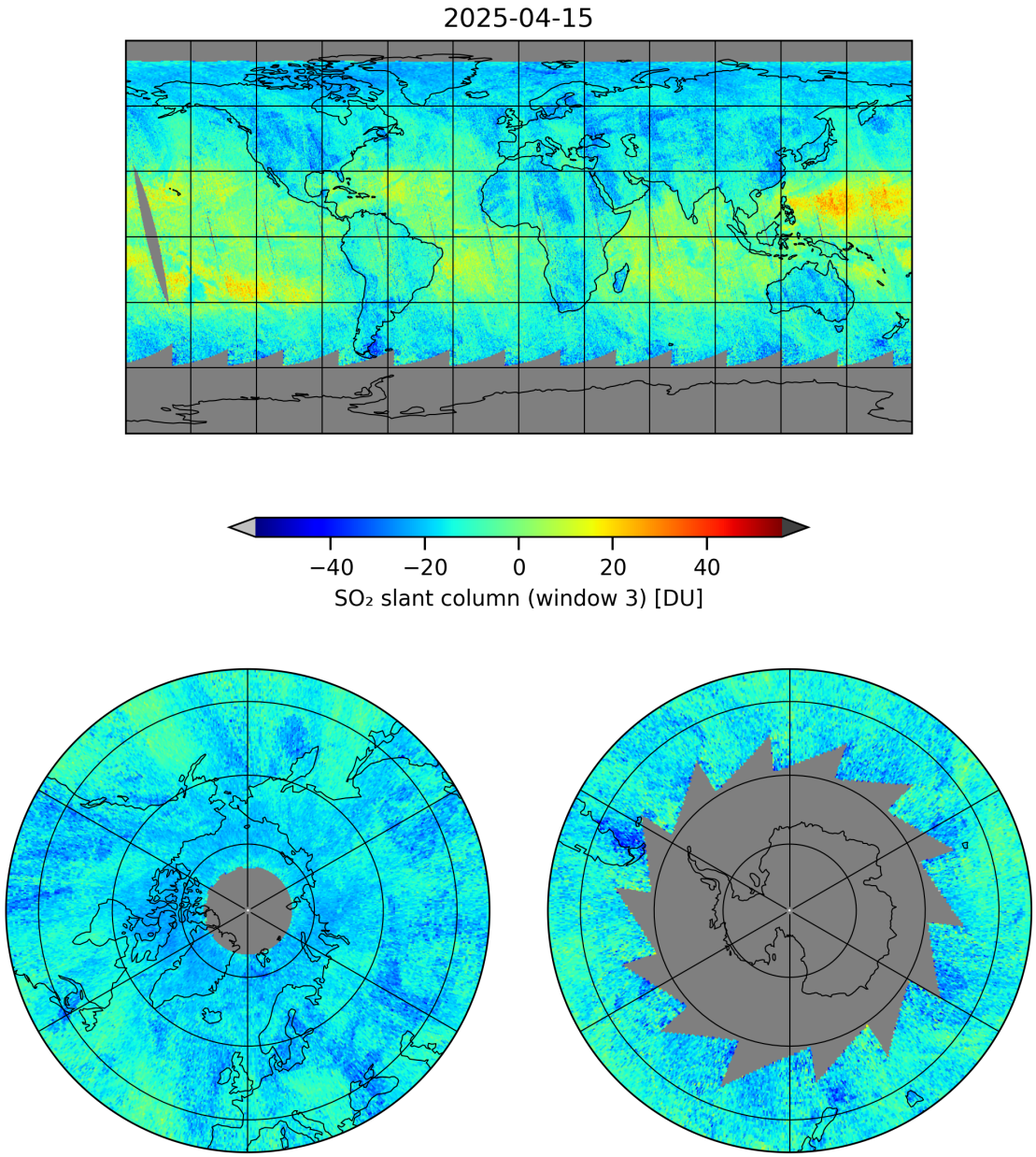

Figure 17: Map of "SO_2 slant column (window 3)" for 2025-04-15 to 2025-04-16

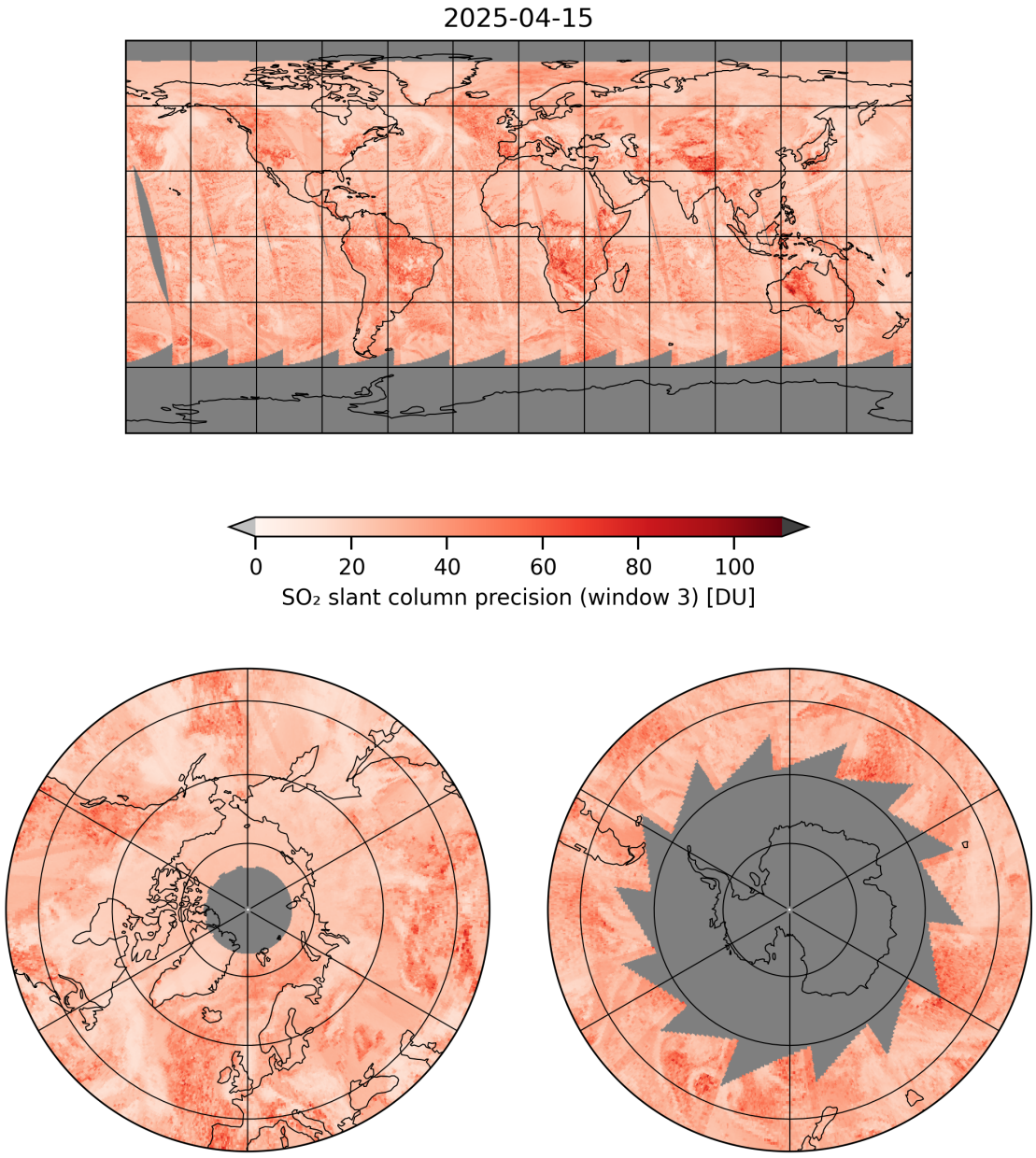

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-04-15 to 2025-04-16

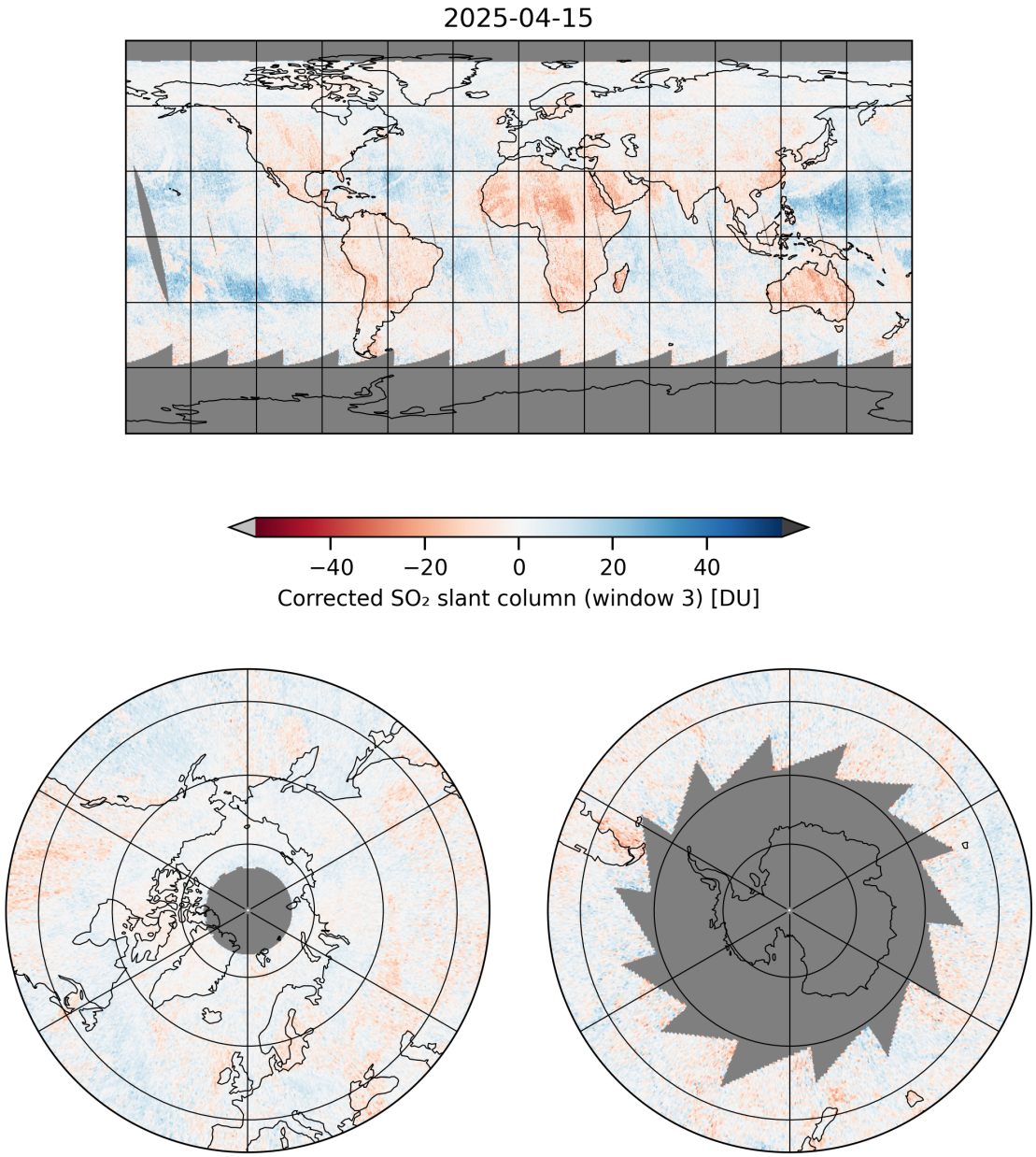

Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-04-15 to 2025-04-16

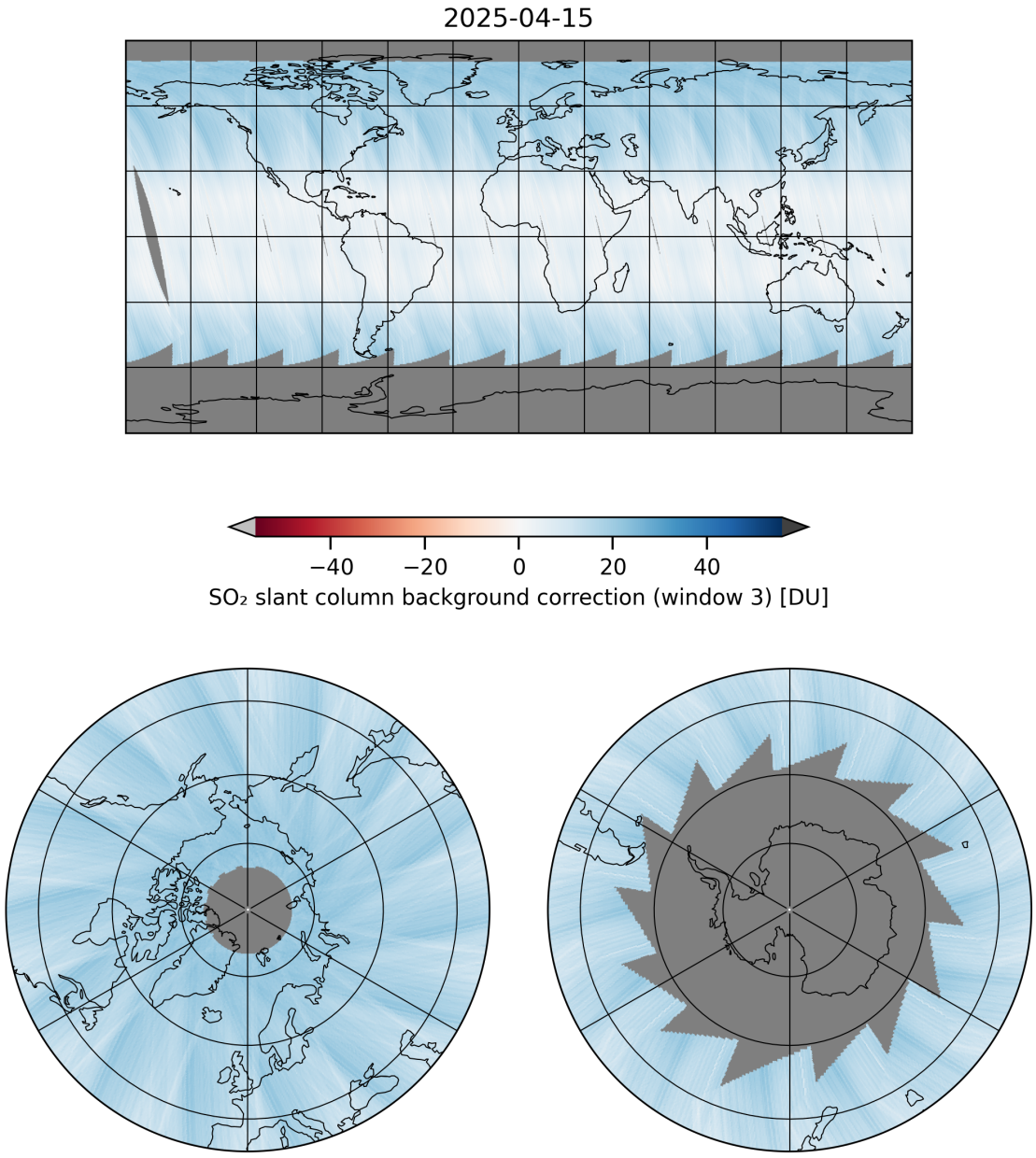

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-04-15 to 2025-04-16

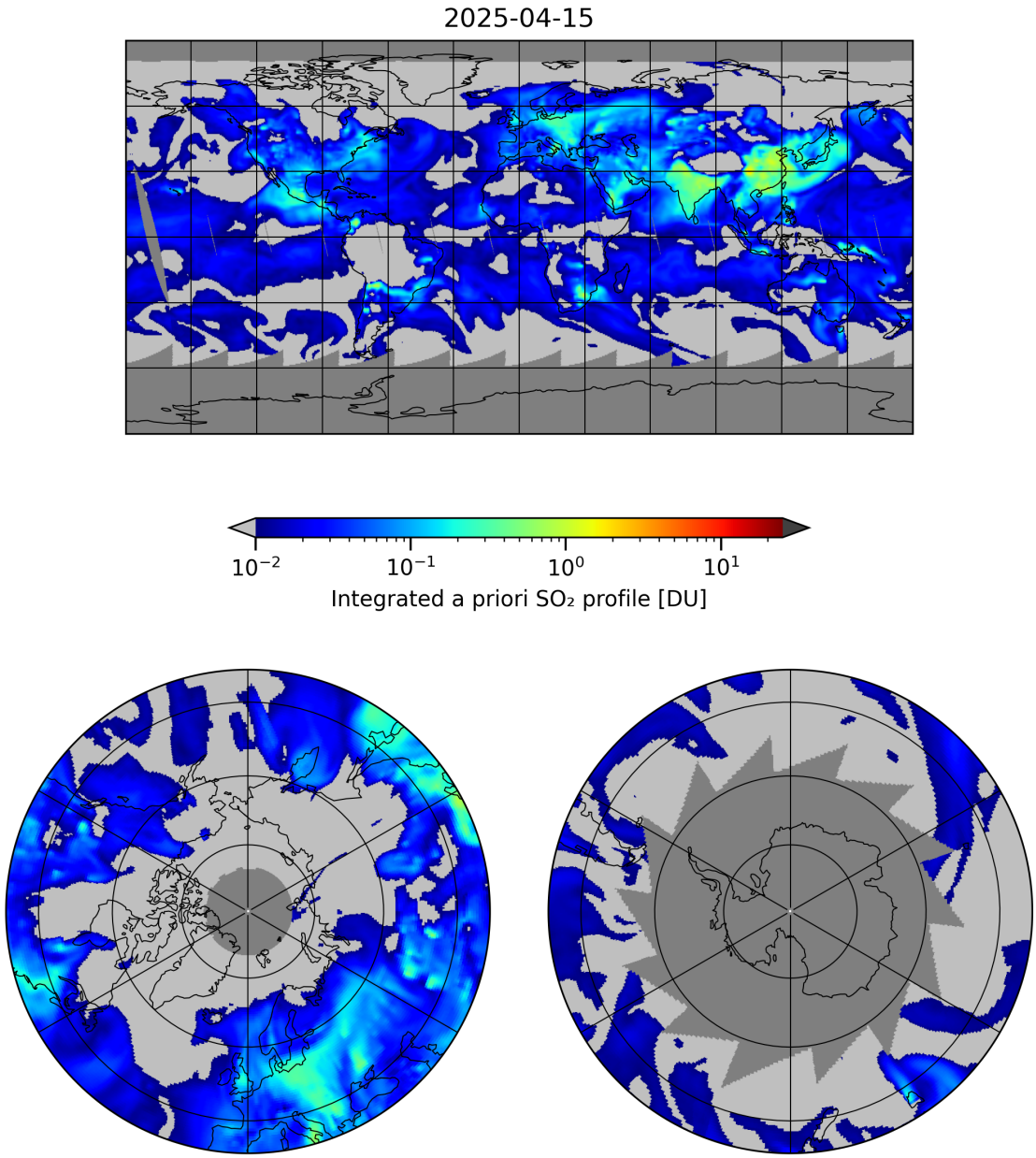

Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-04-15 to 2025-04-16

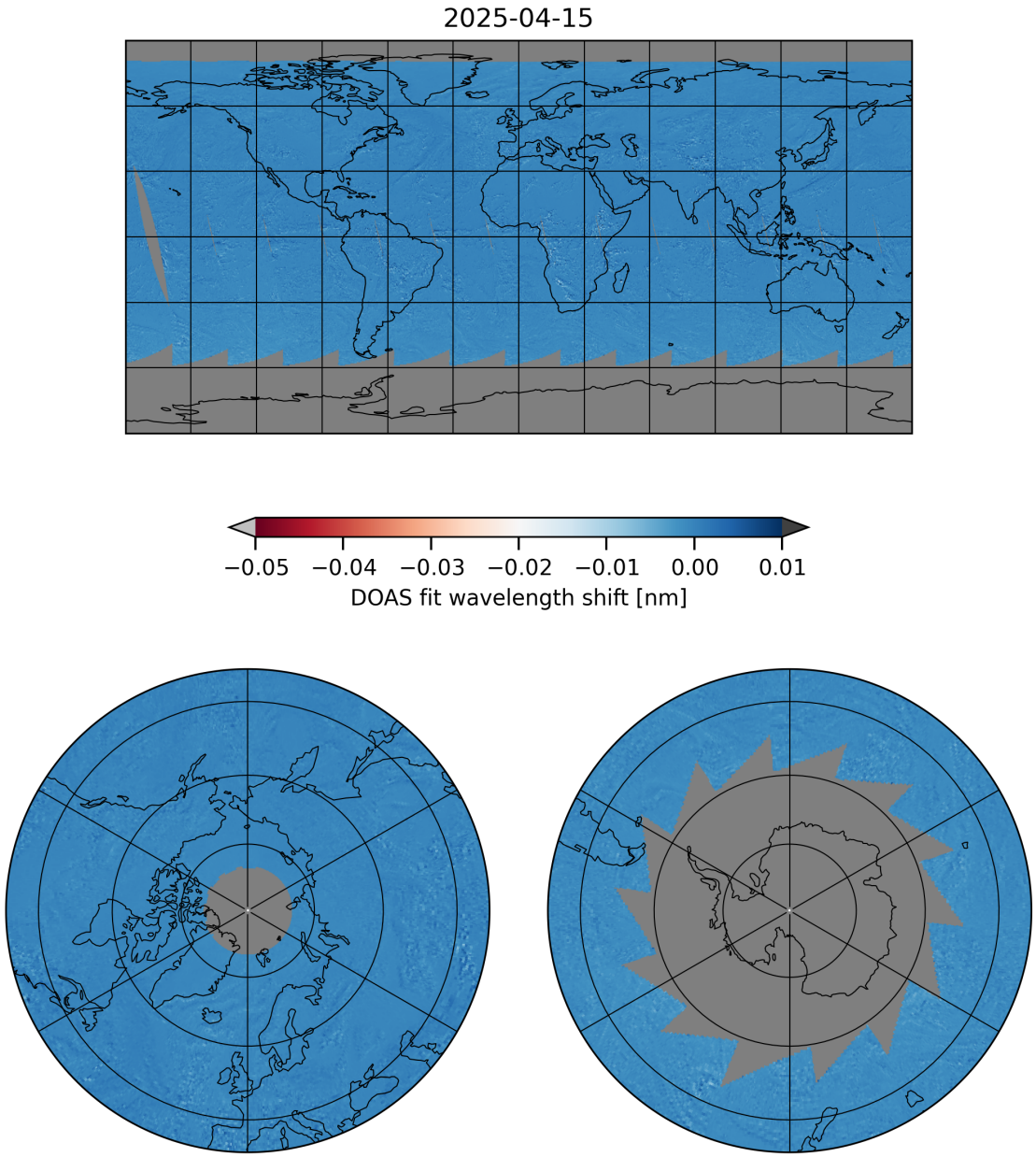

Figure 22: Map of “DOAS fit wavelength shift” for 2025-04-15 to 2025-04-16

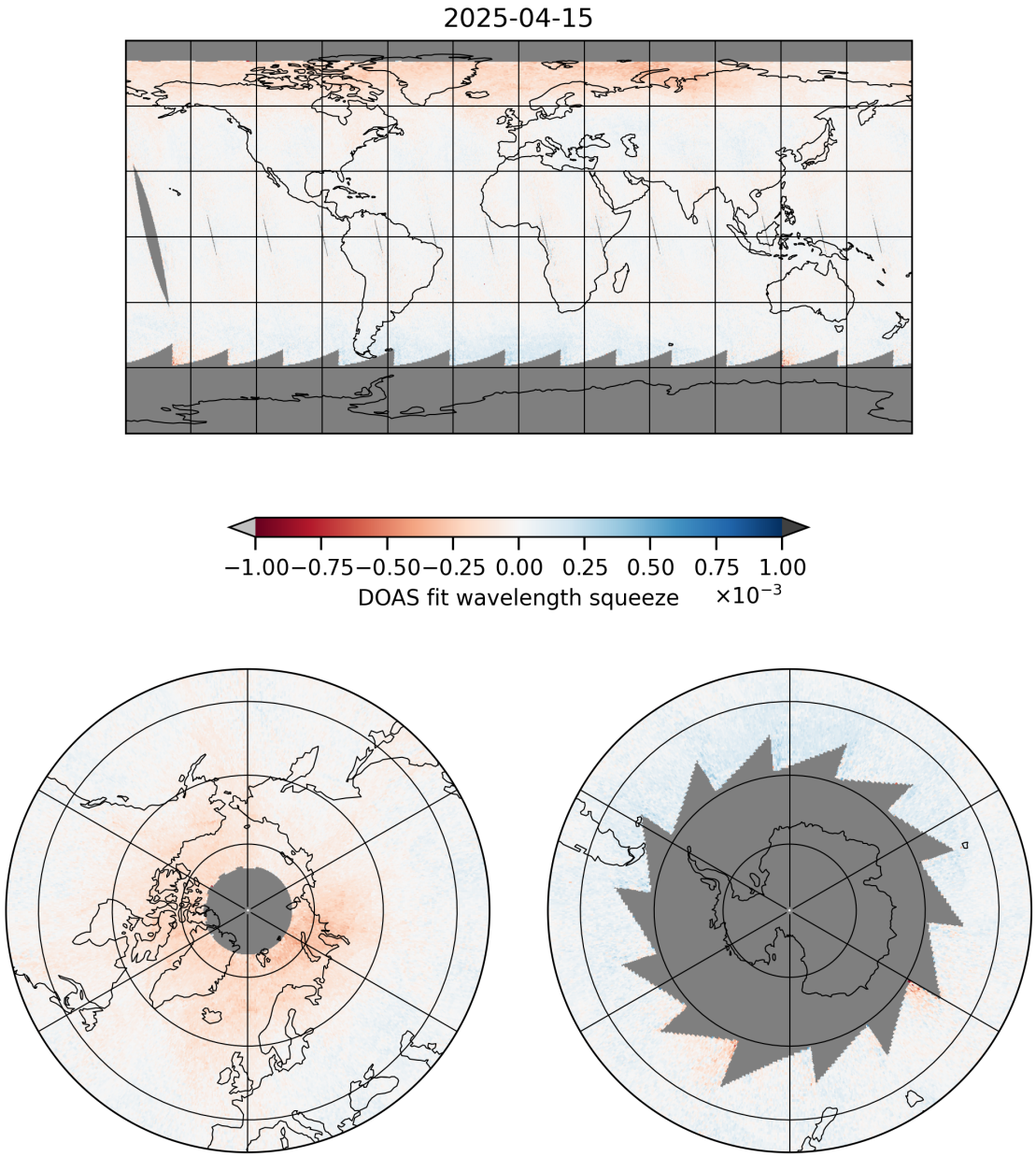

Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-04-15 to 2025-04-16

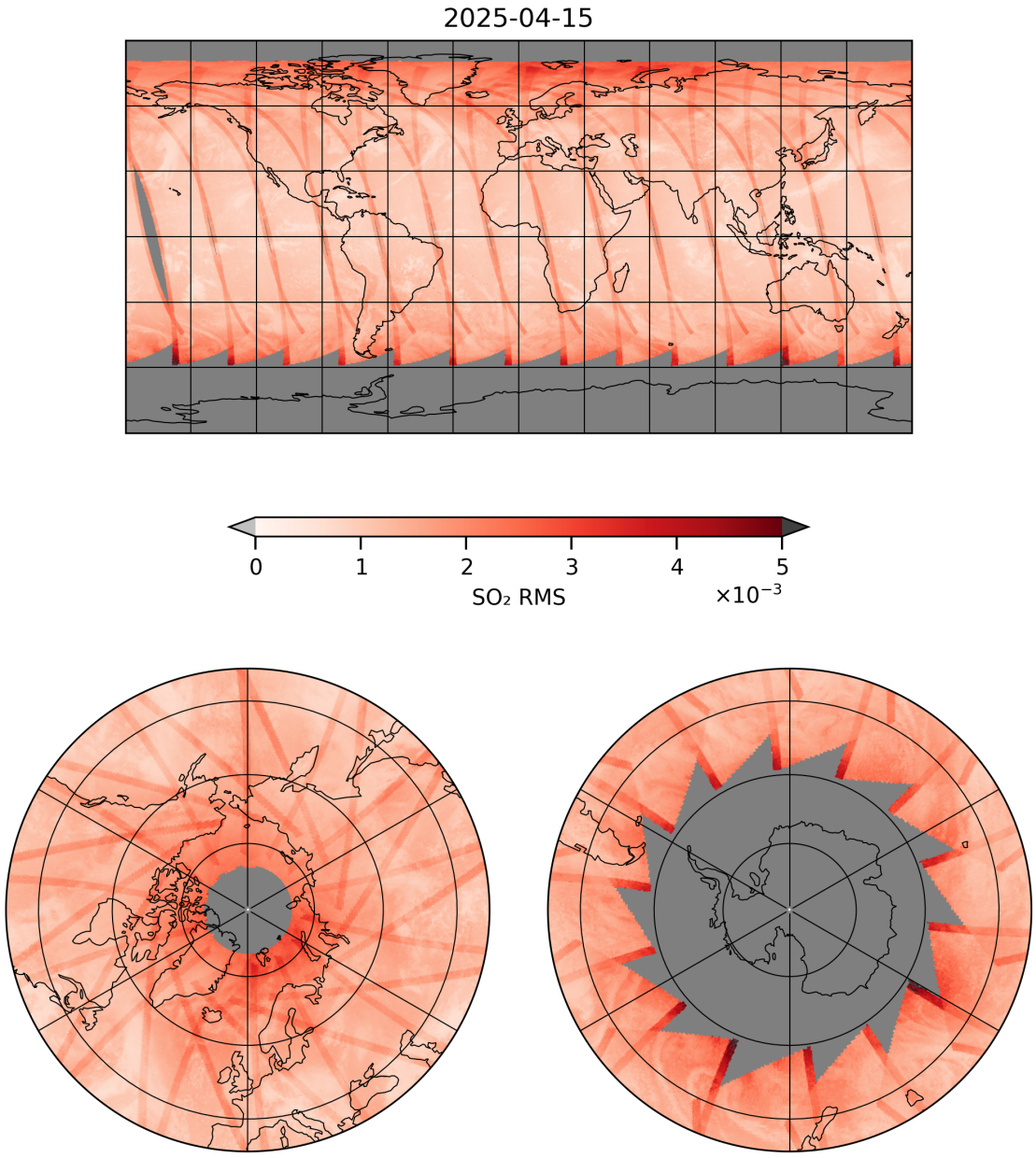

Figure 24: Map of "SO_2 RMS" for 2025-04-15 to 2025-04-16

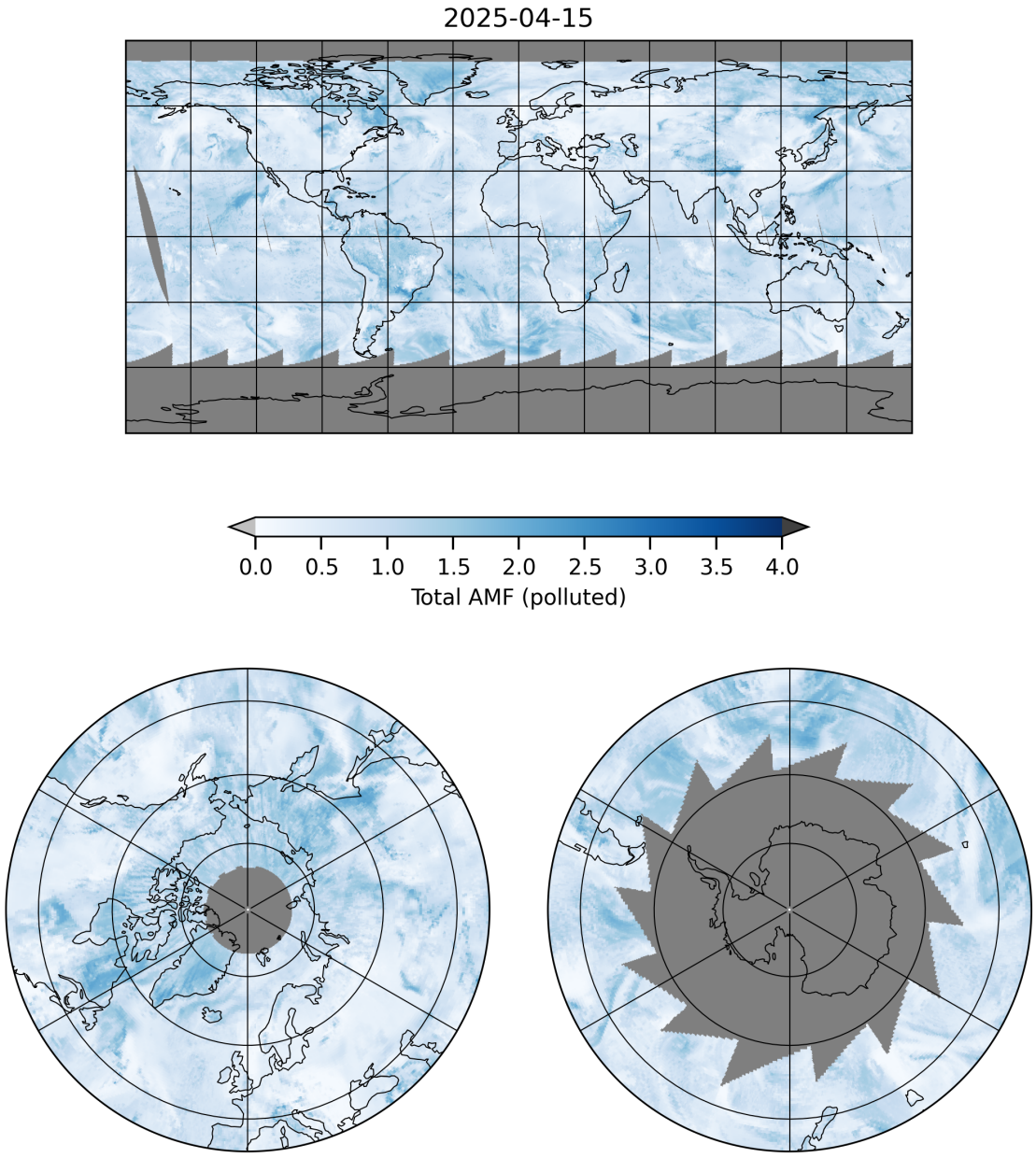

Figure 25: Map of “Total AMF (polluted)” for 2025-04-15 to 2025-04-16

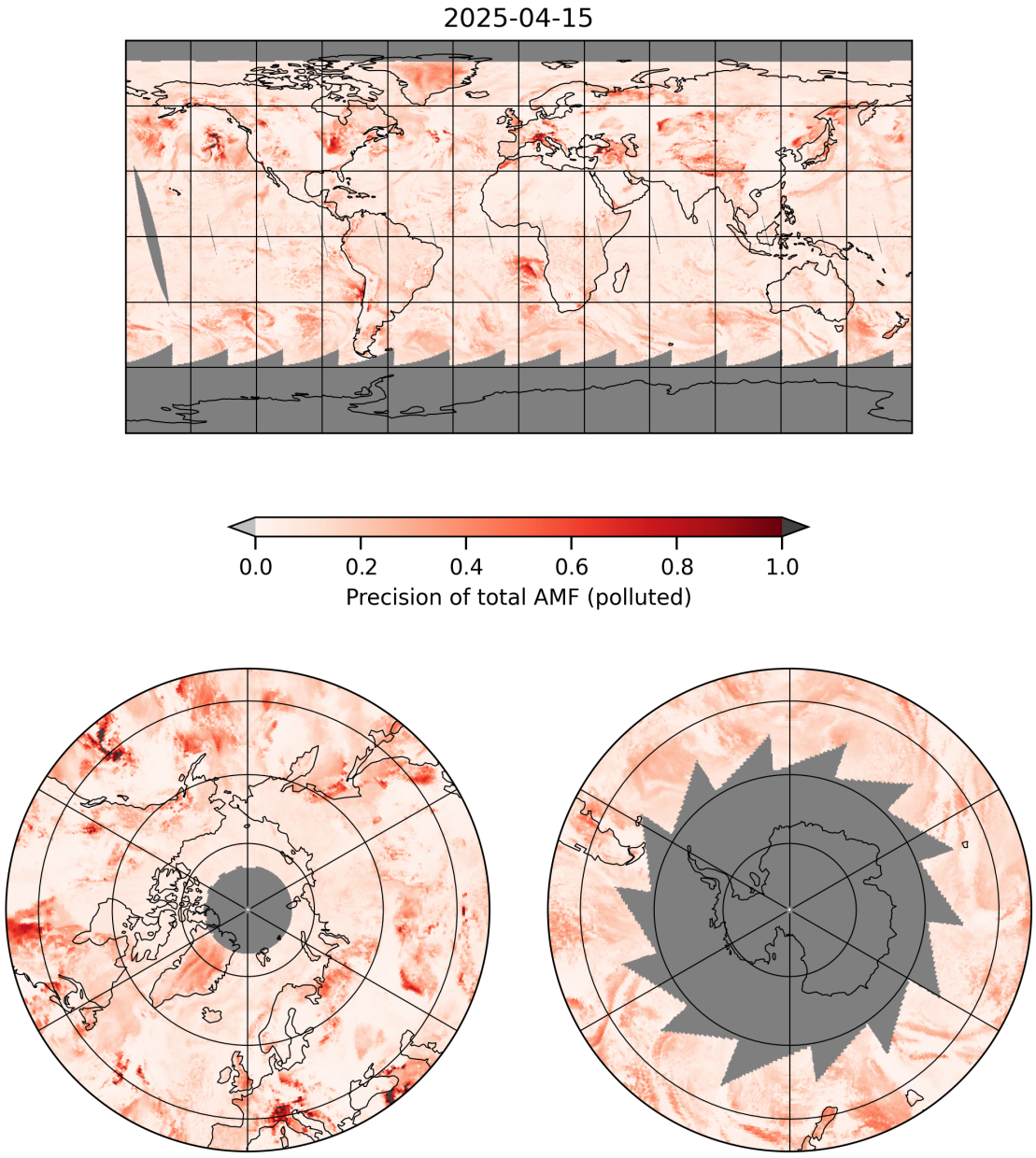

Figure 26: Map of “Precision of total AMF (polluted)” for 2025-04-15 to 2025-04-16

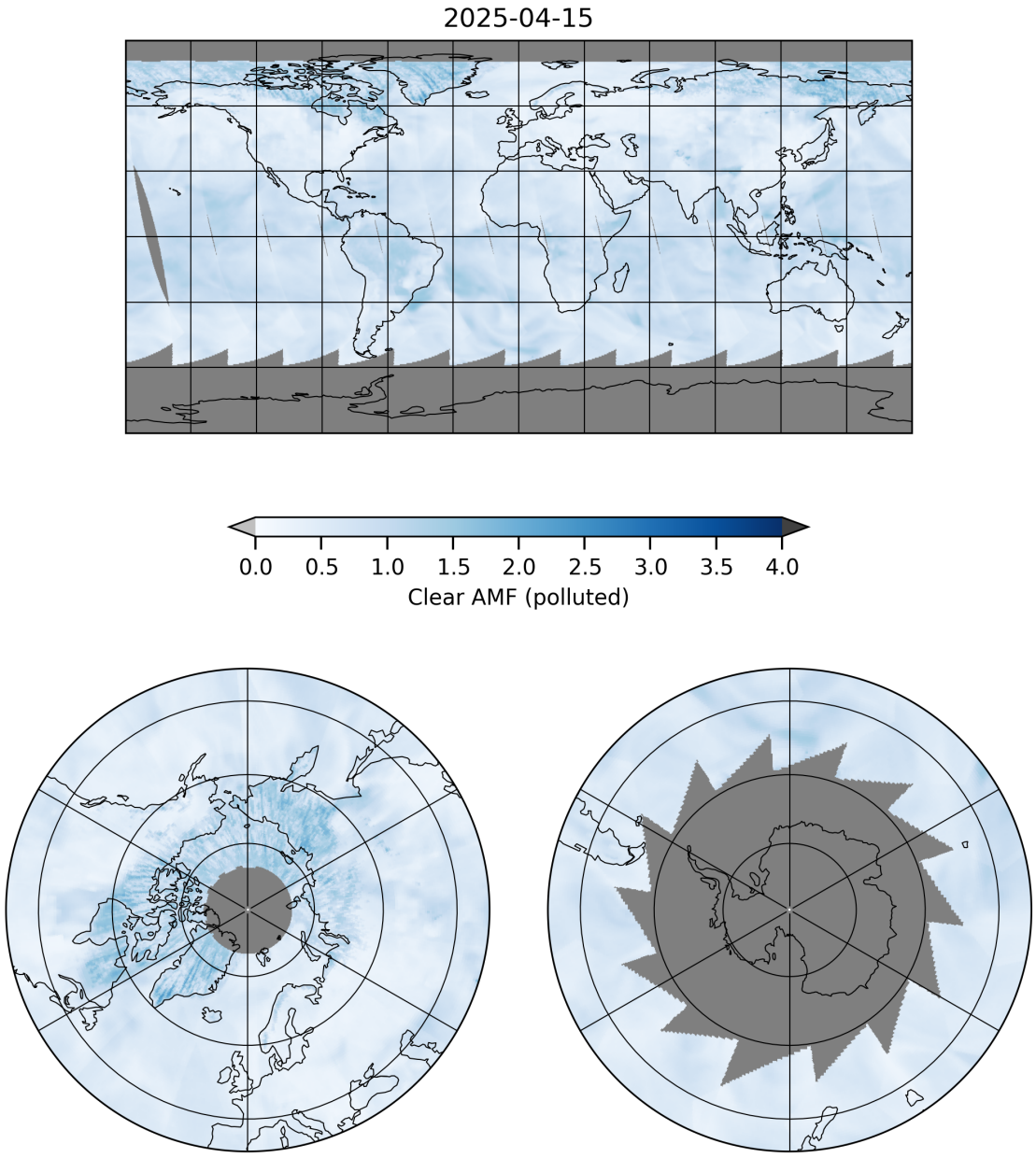

Figure 27: Map of “Clear AMF (polluted)” for 2025-04-15 to 2025-04-16

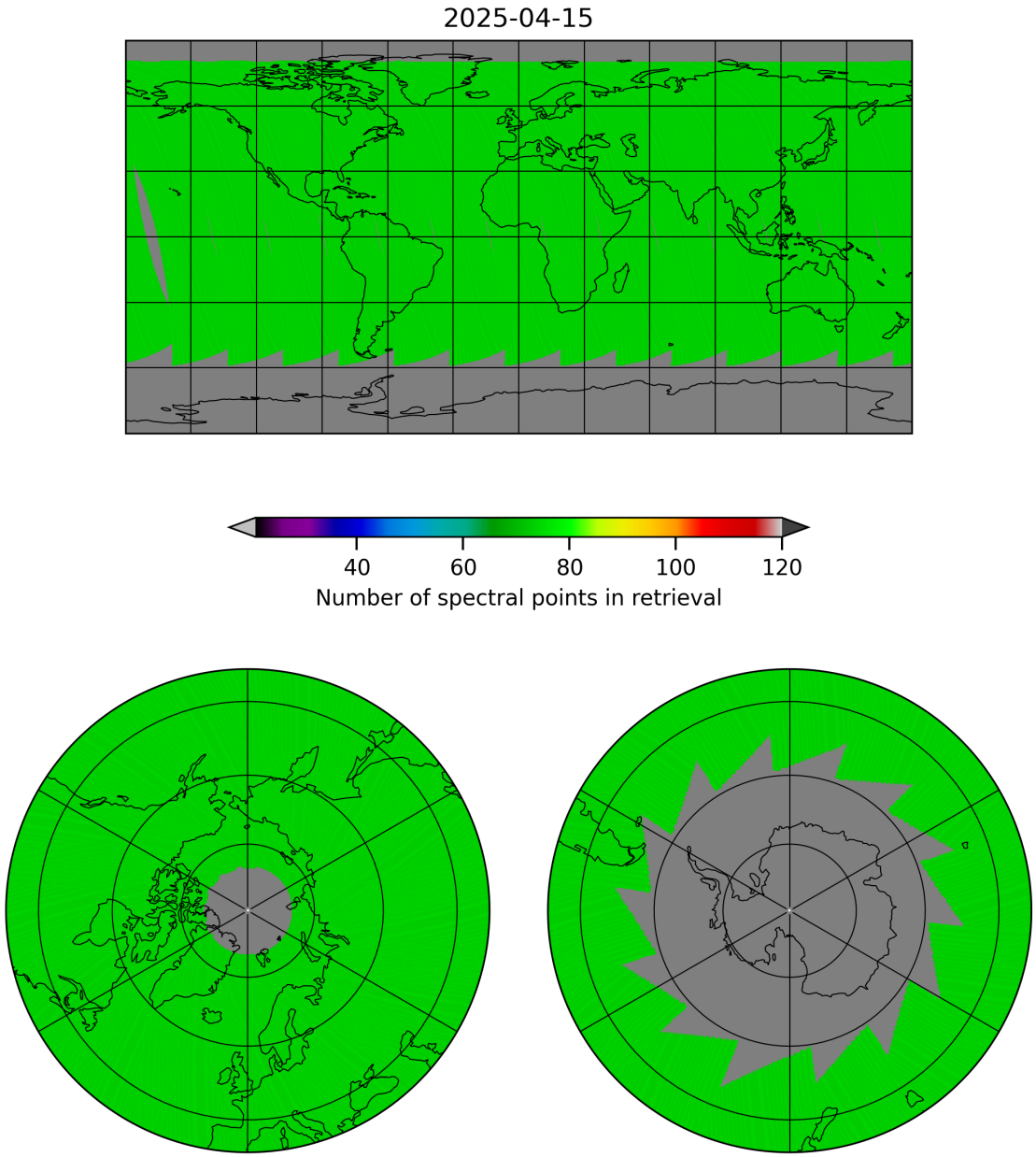

Figure 28: Map of “Number of spectral points in retrieval” for 2025-04-15 to 2025-04-16

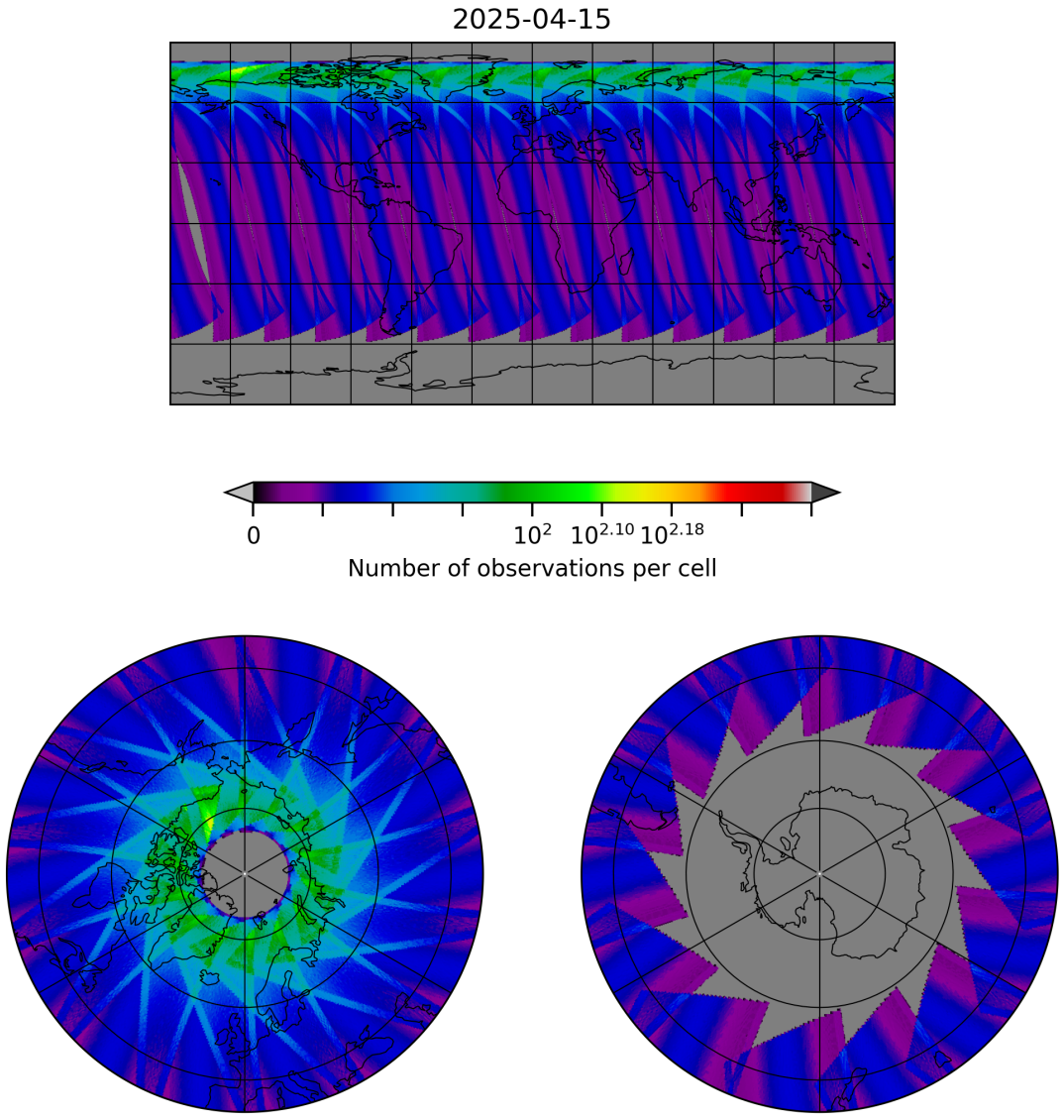

Figure 29: Map of the number of observations for 2025-04-15 to 2025-04-16

7 Zonal average

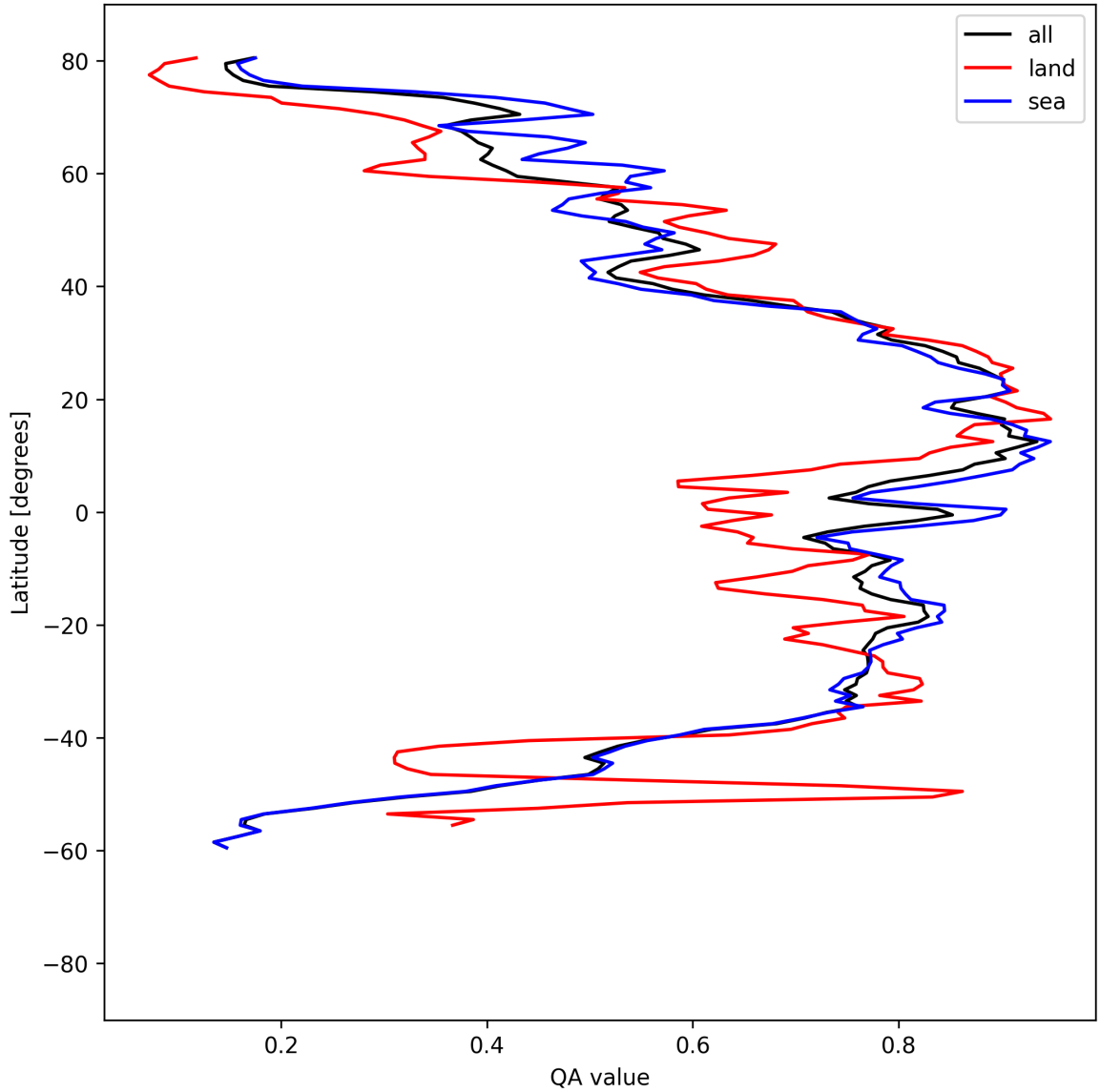

Figure 30: Zonal average of “QA value” for 2025-04-15 to 2025-04-16.

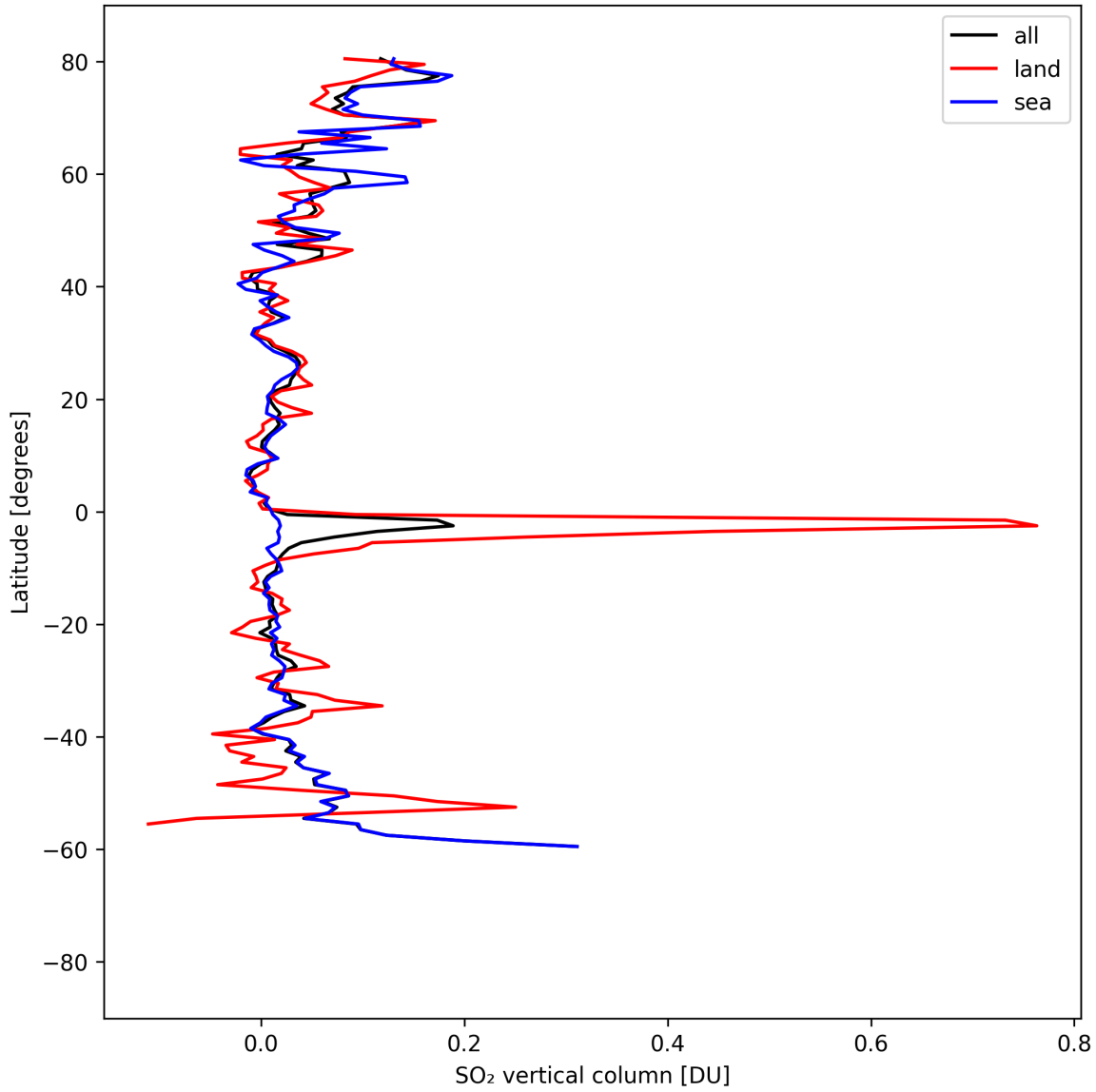

Figure 31: Zonal average of "SO_2 vertical column" for 2025-04-15 to 2025-04-16.

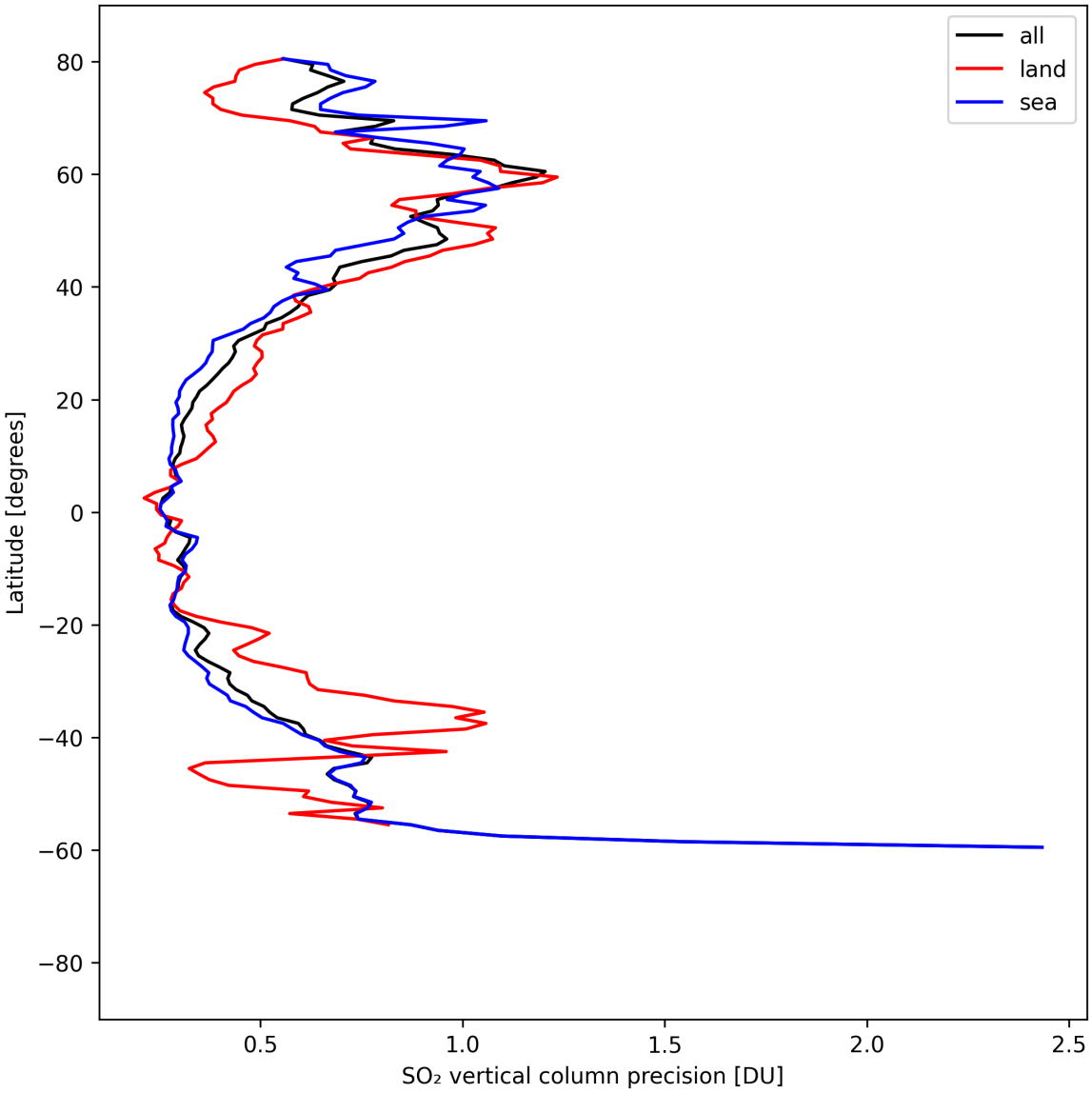

Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-04-15 to 2025-04-16.

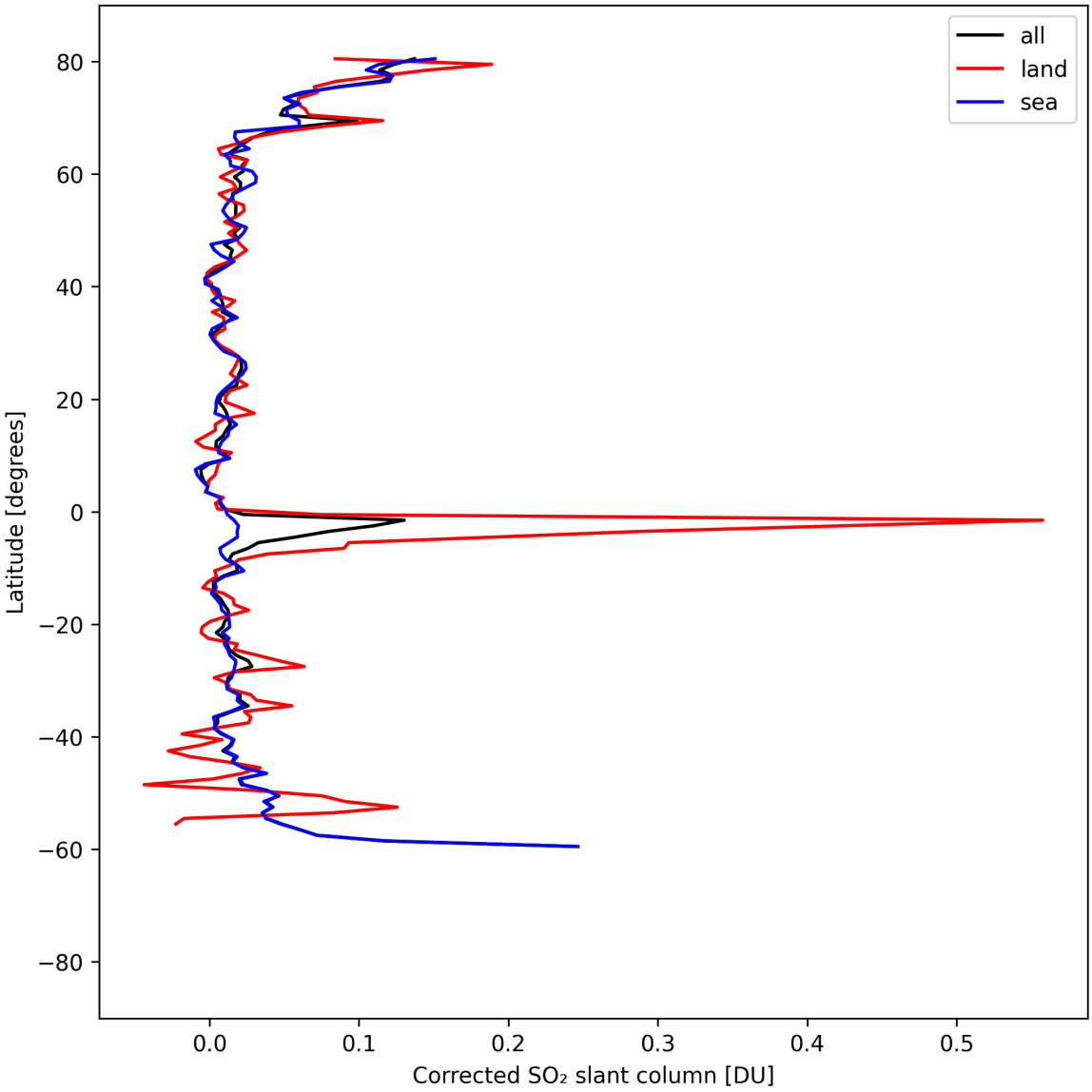

Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-04-15 to 2025-04-16.

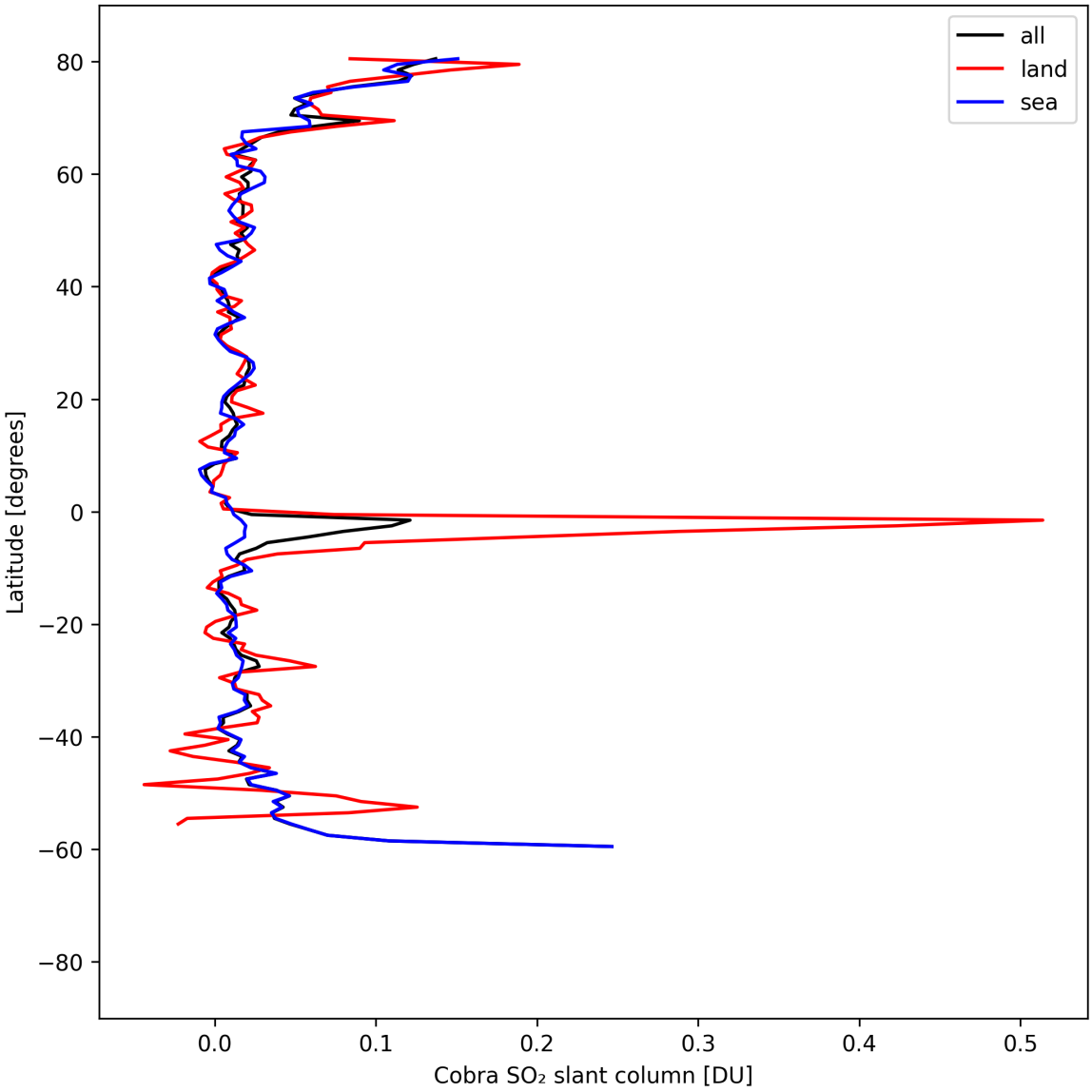

Figure 34: Zonal average of "Cobra SO_2 slant column" for 2025-04-15 to 2025-04-16.

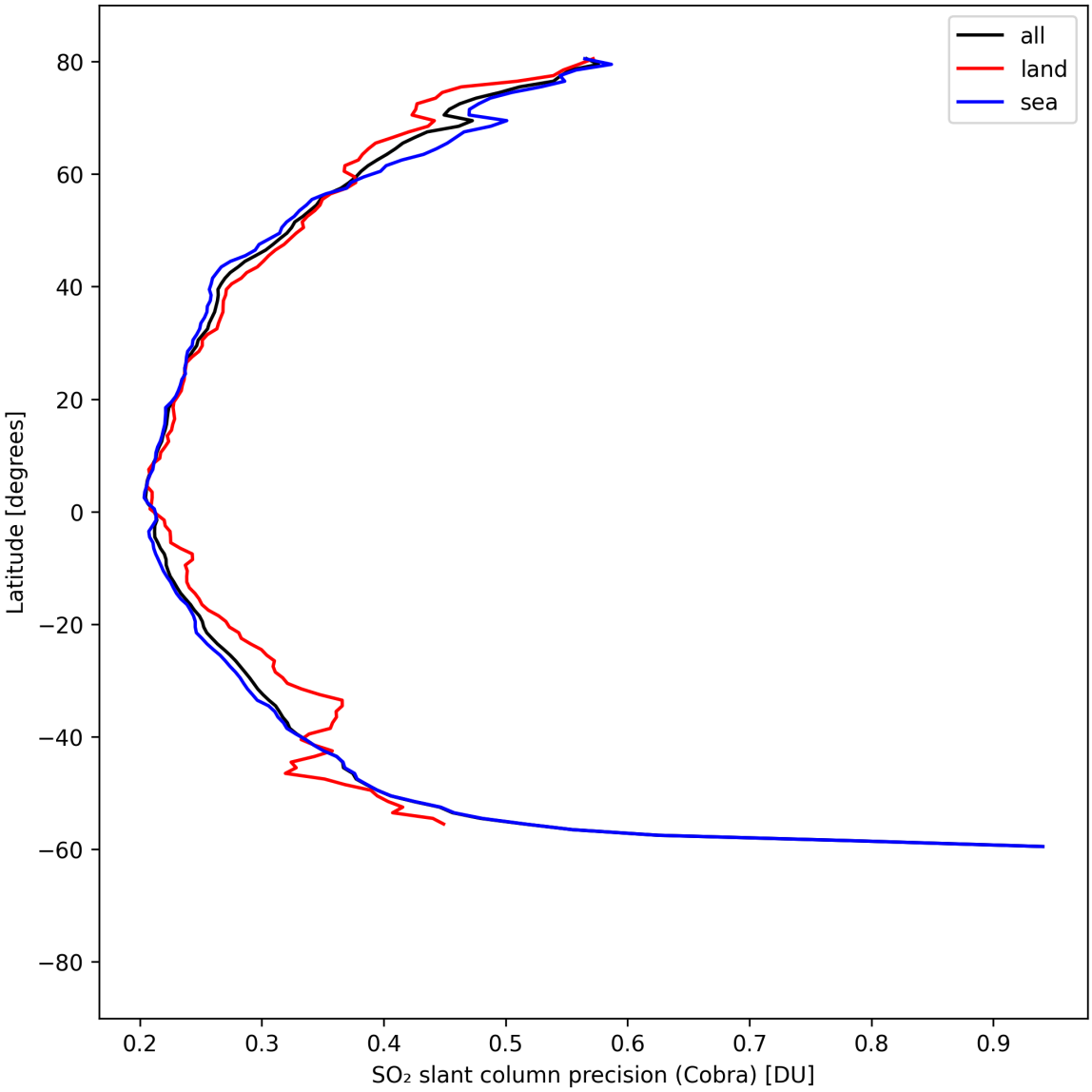

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-04-15 to 2025-04-16.

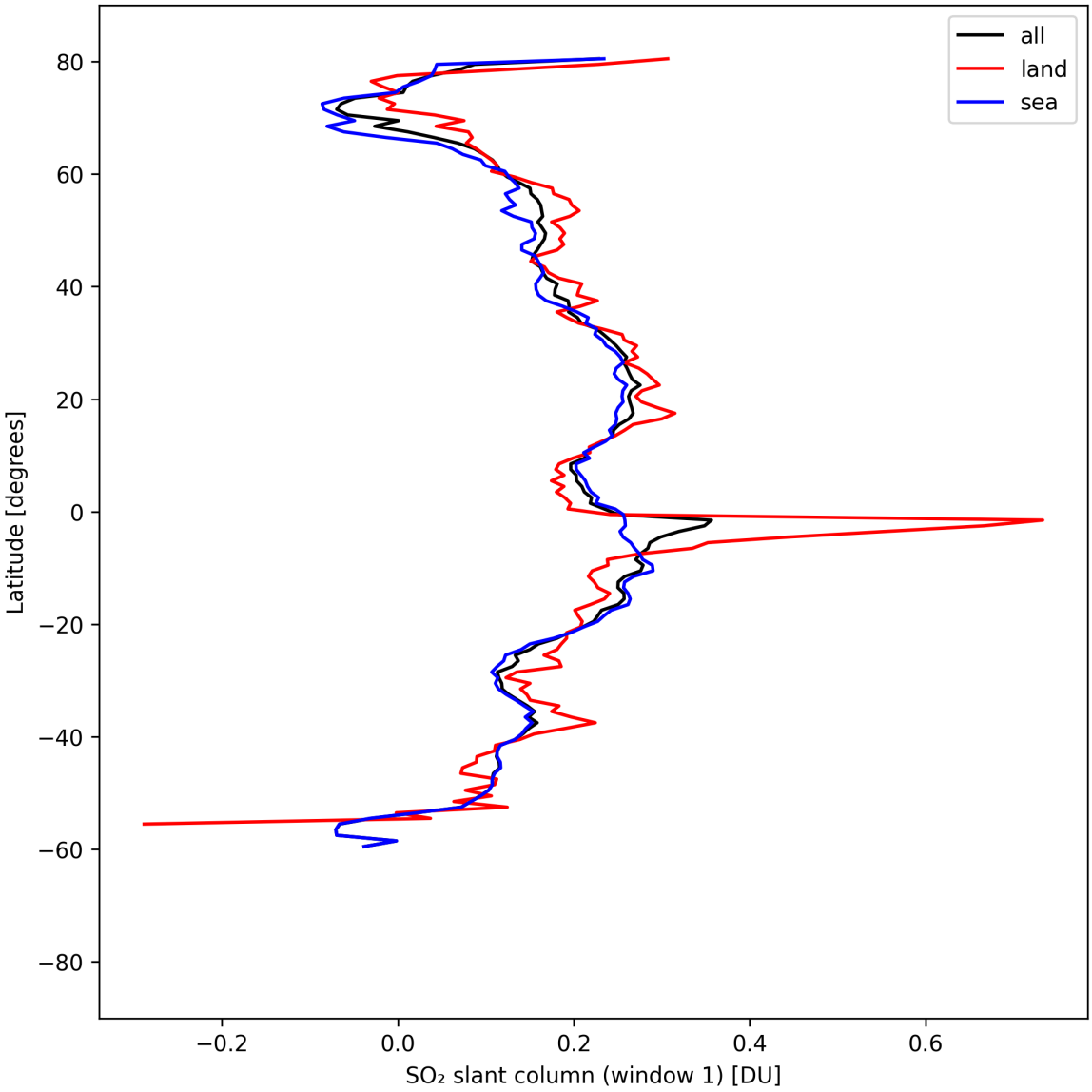

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-04-15 to 2025-04-16.

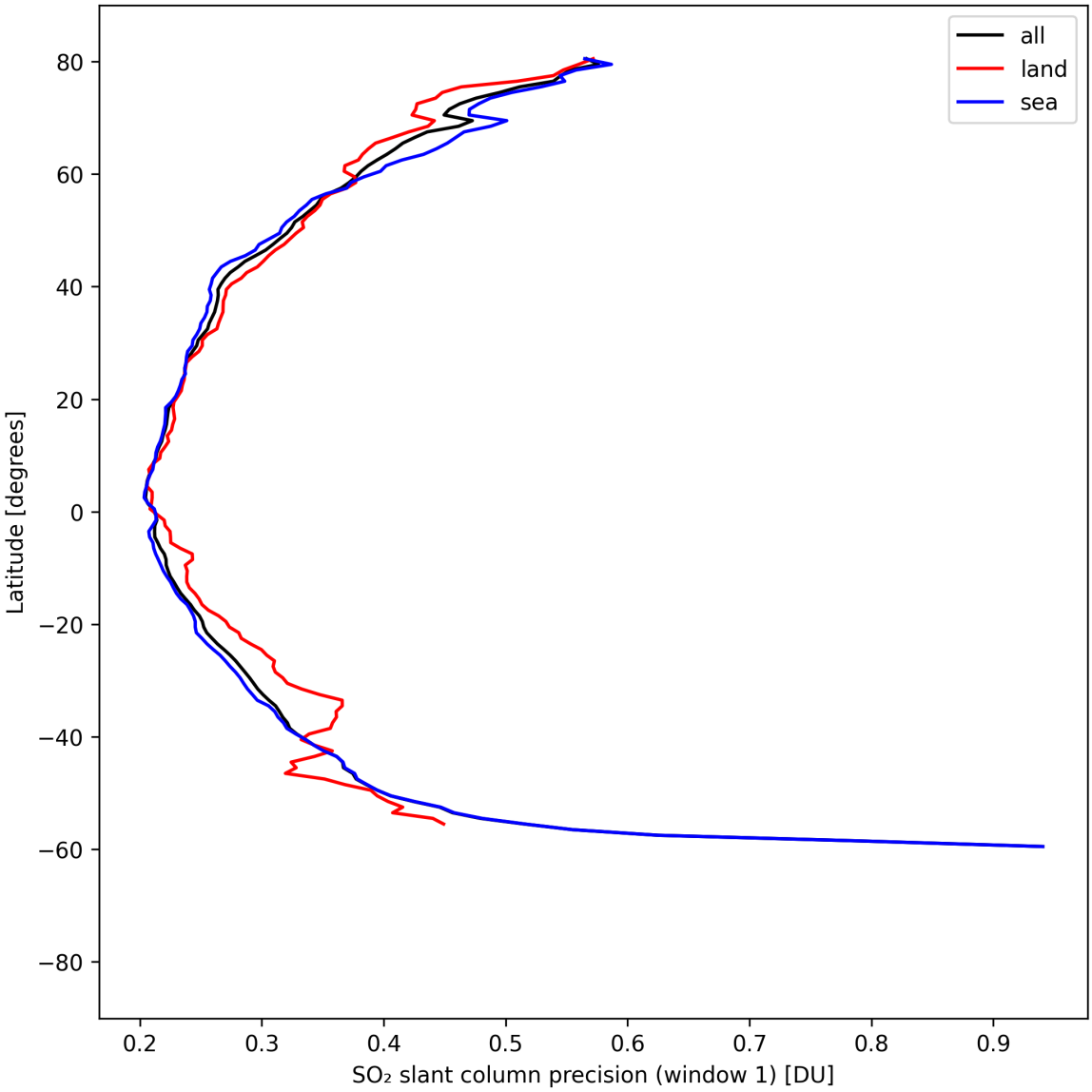

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-04-15 to 2025-04-16.

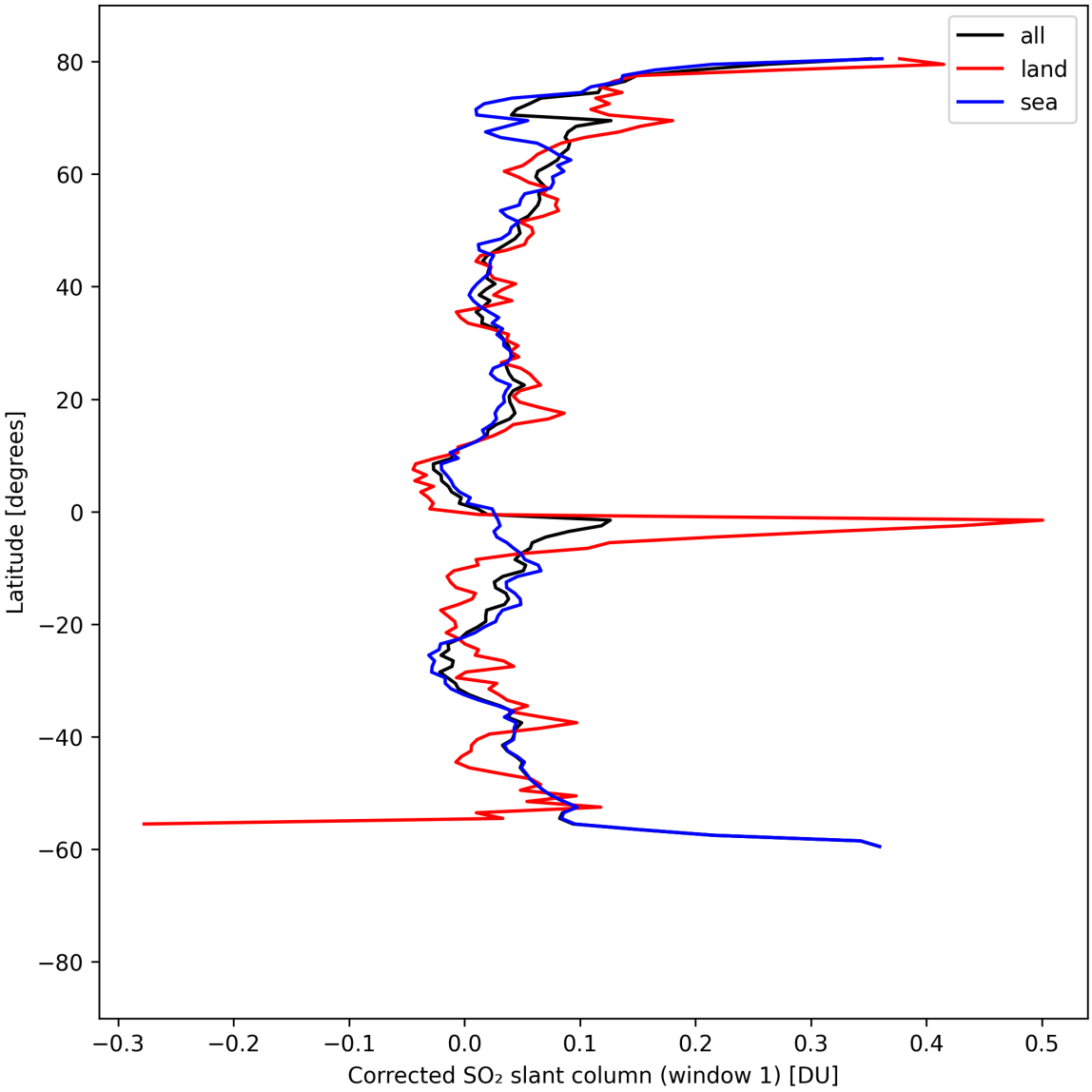

Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-04-15 to 2025-04-16.

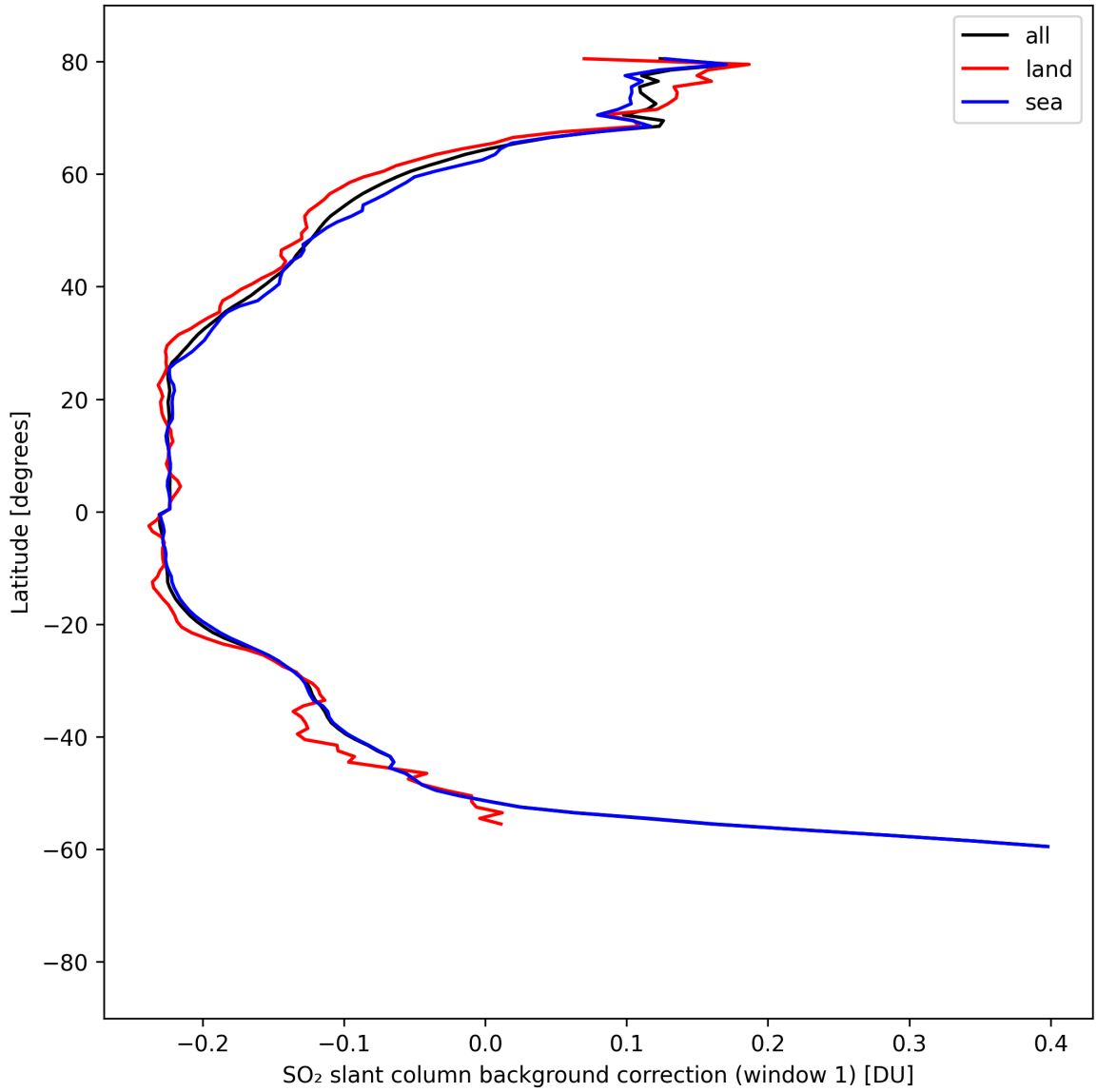

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-04-15 to 2025-04-16.

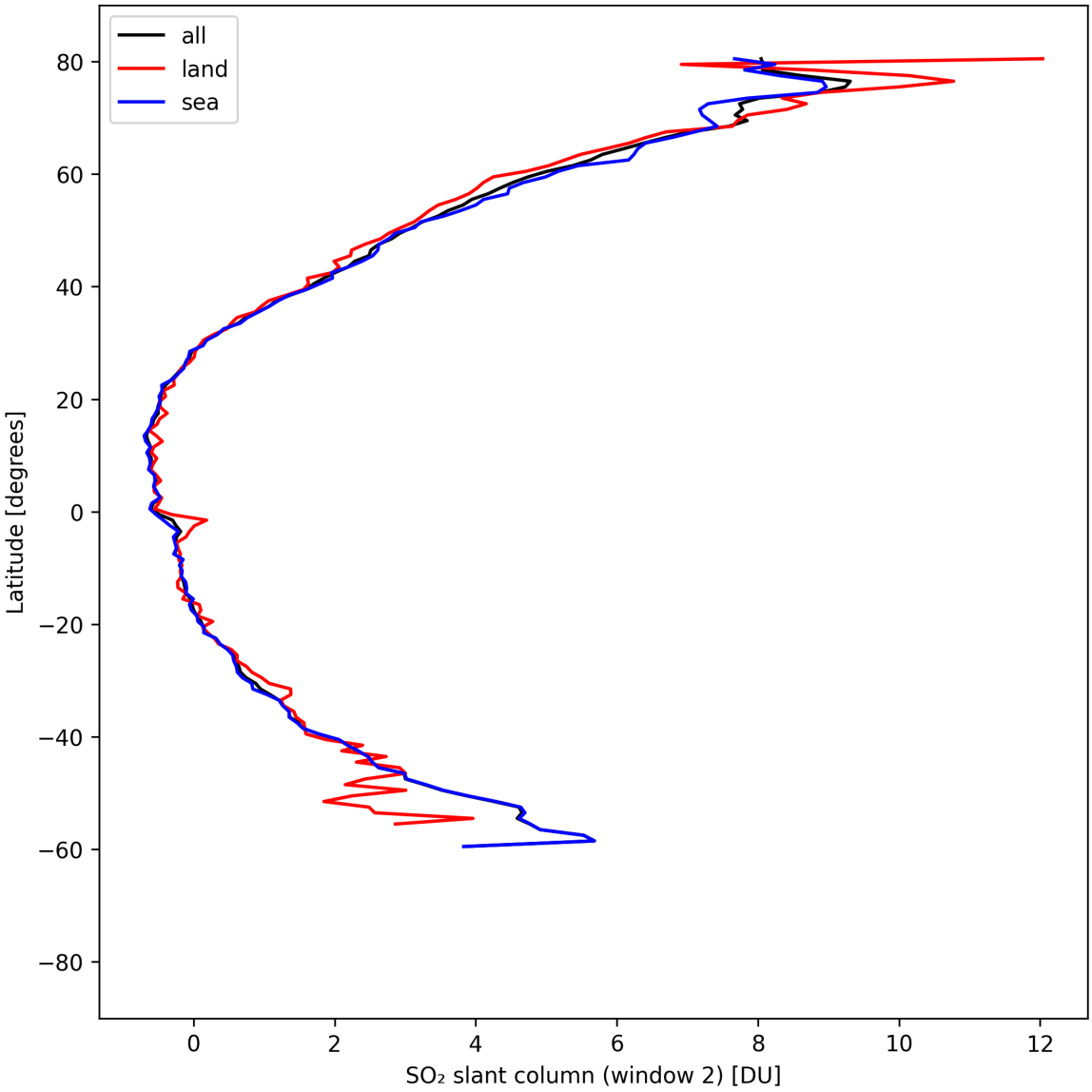

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-04-15 to 2025-04-16.

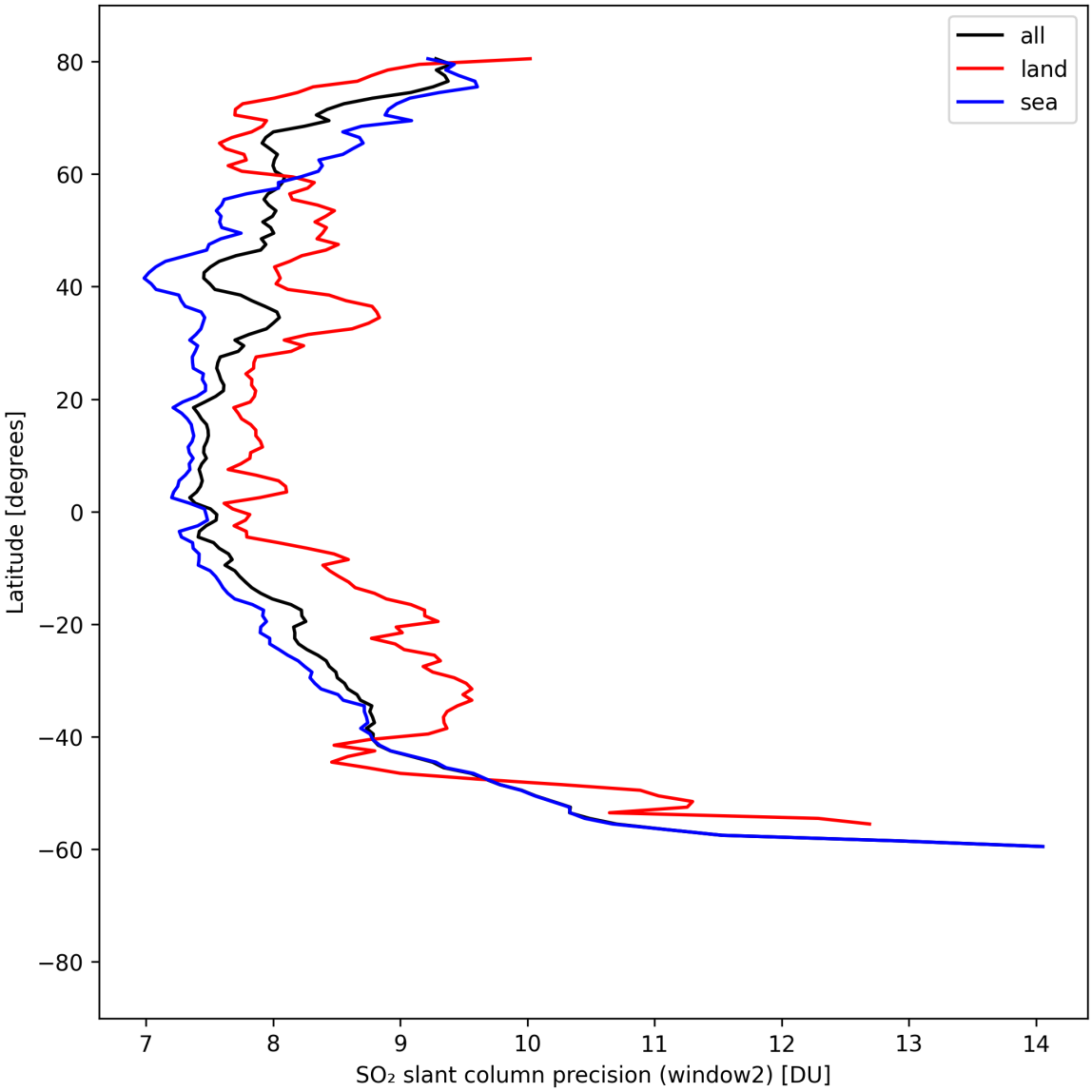

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-04-15 to 2025-04-16.

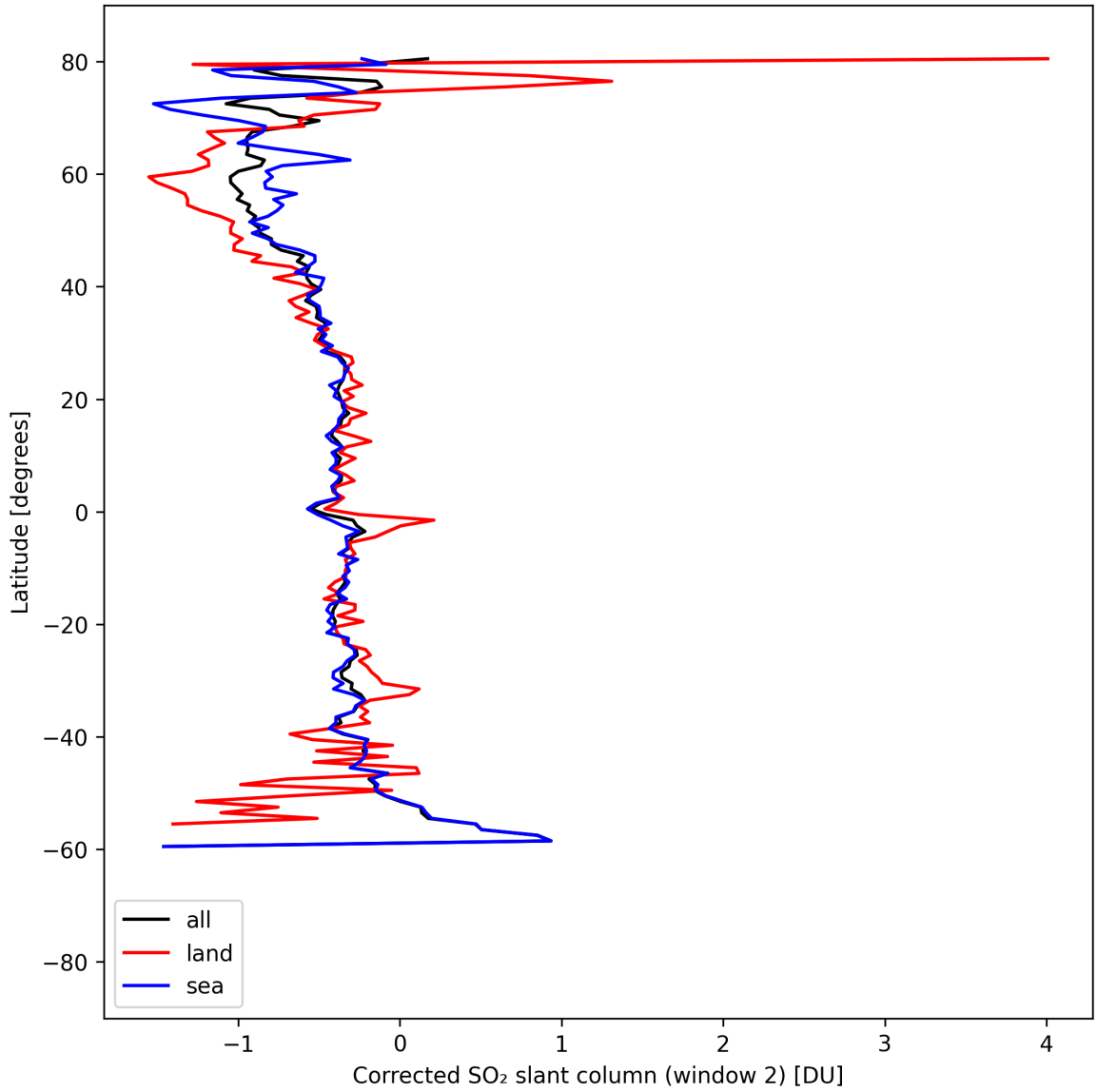

Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-04-15 to 2025-04-16.

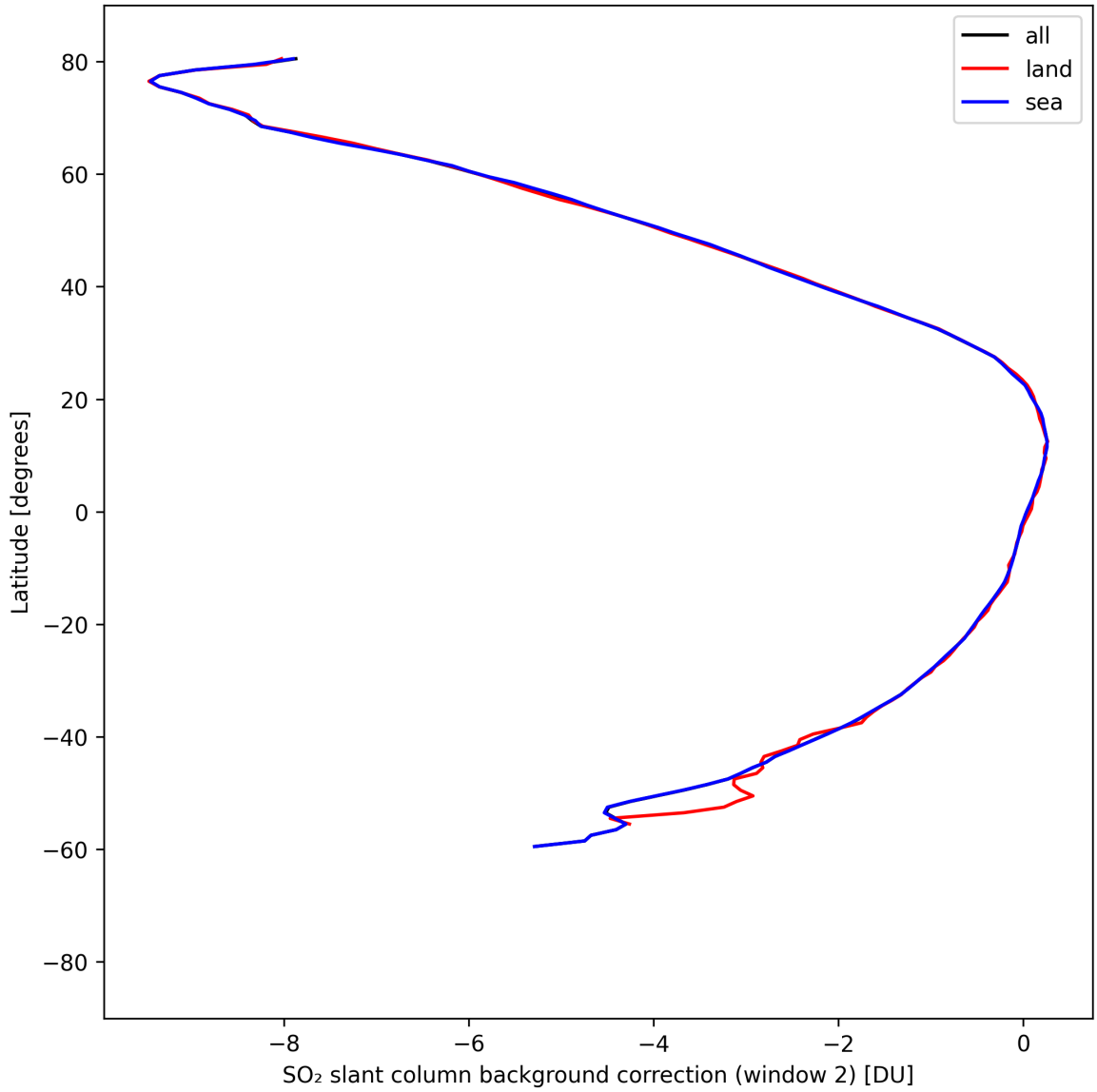

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-04-15 to 2025-04-16.

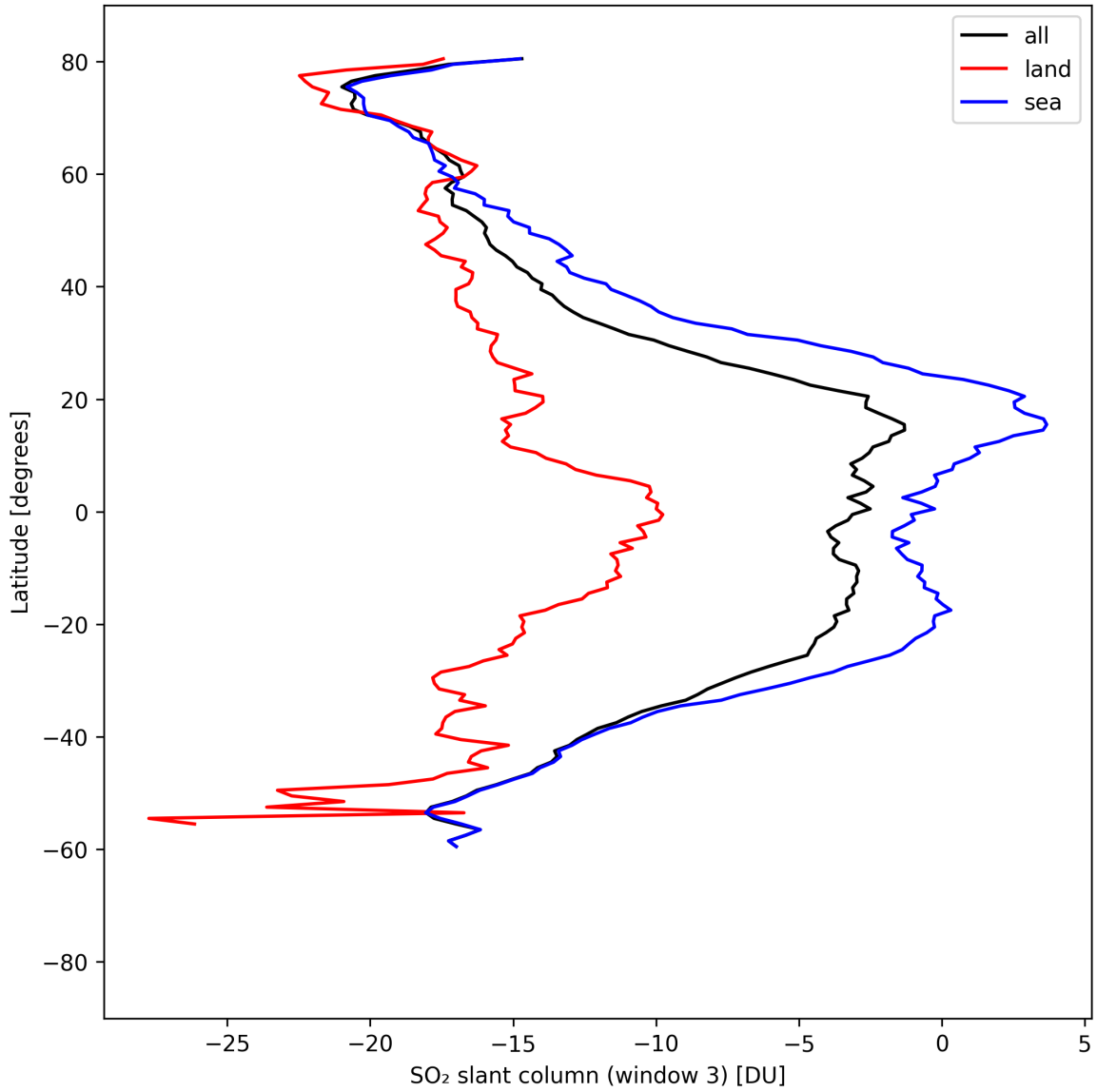

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-04-15 to 2025-04-16.

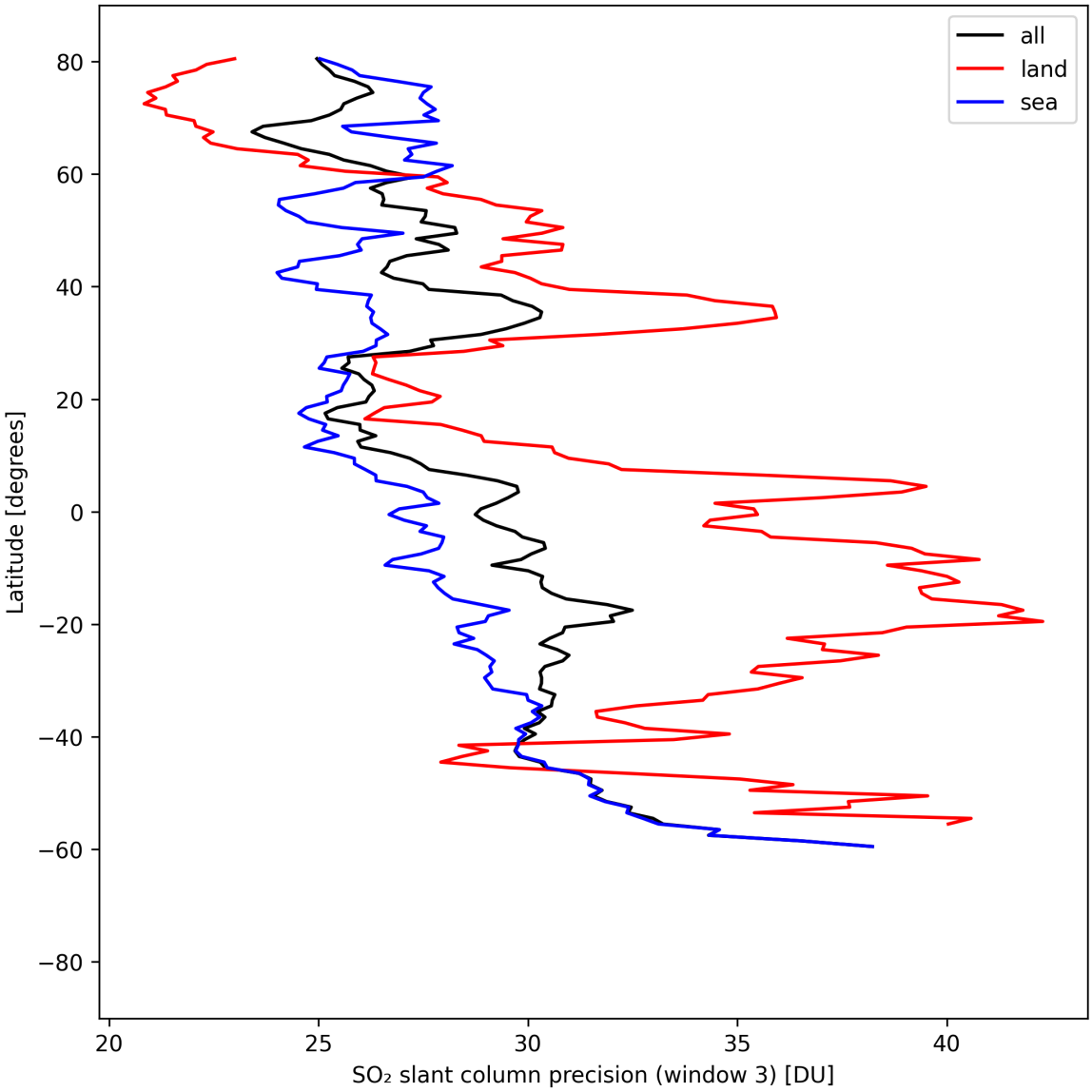

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-04-15 to 2025-04-16.

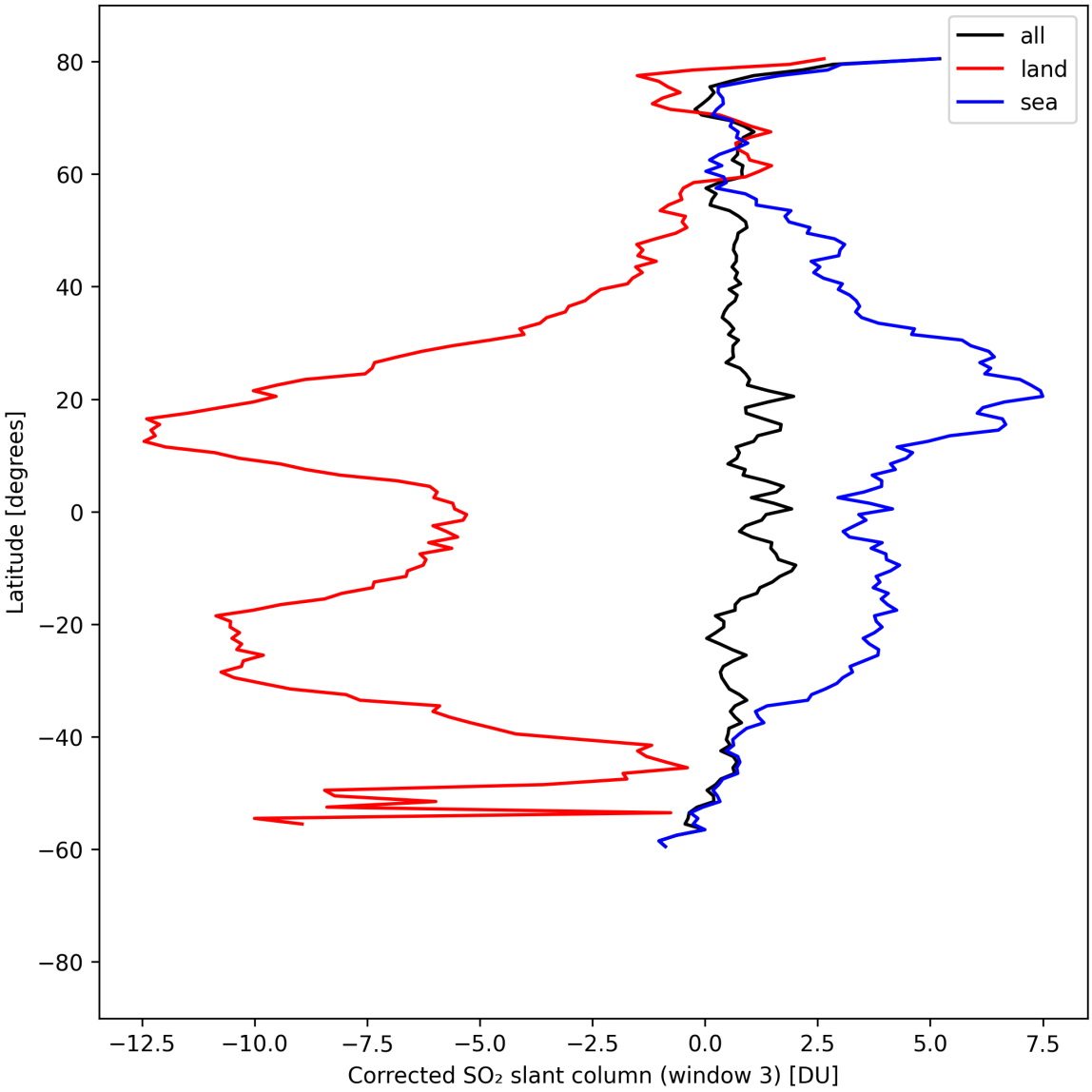

Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-04-15 to 2025-04-16.

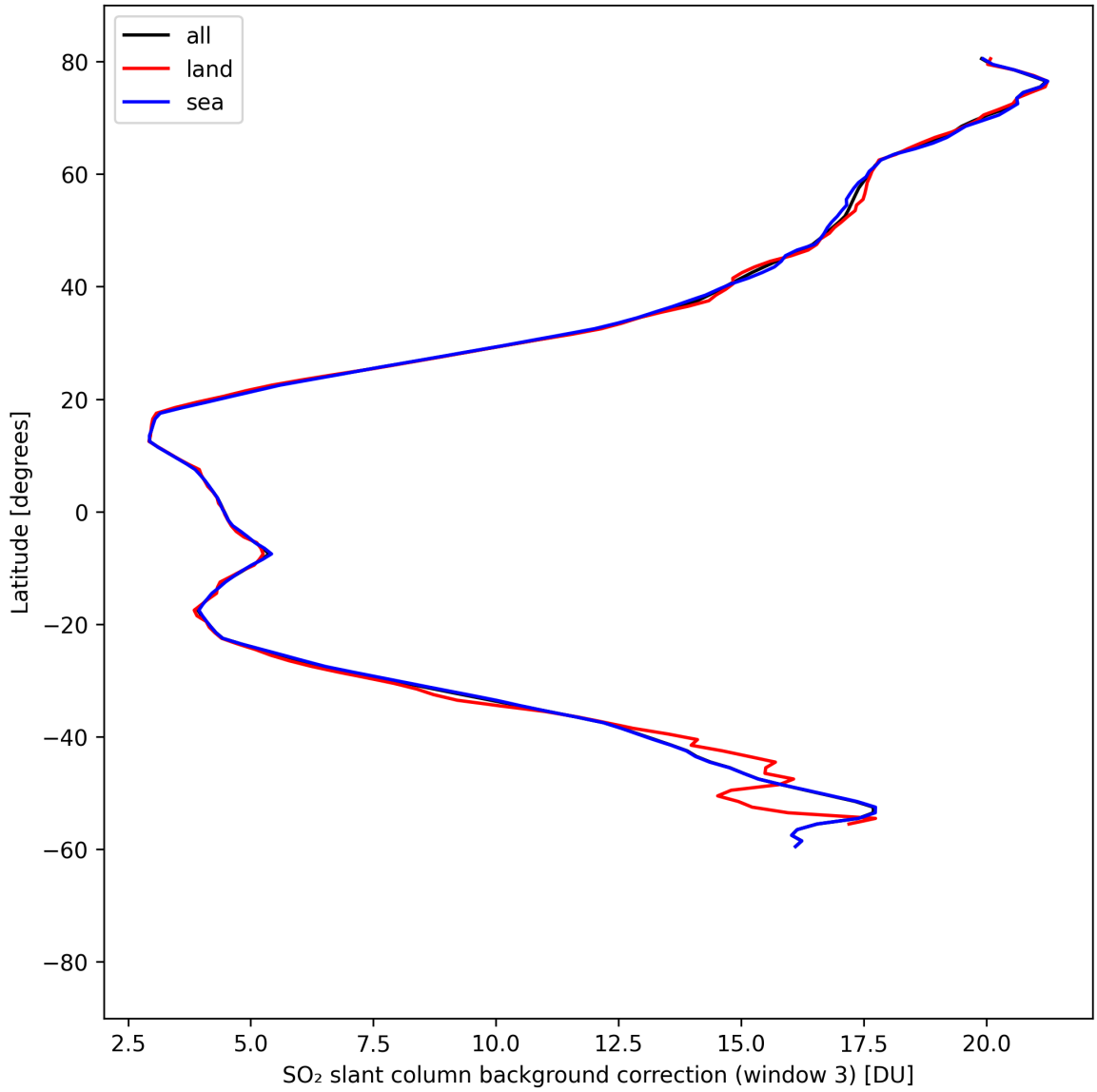

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-04-15 to 2025-04-16.

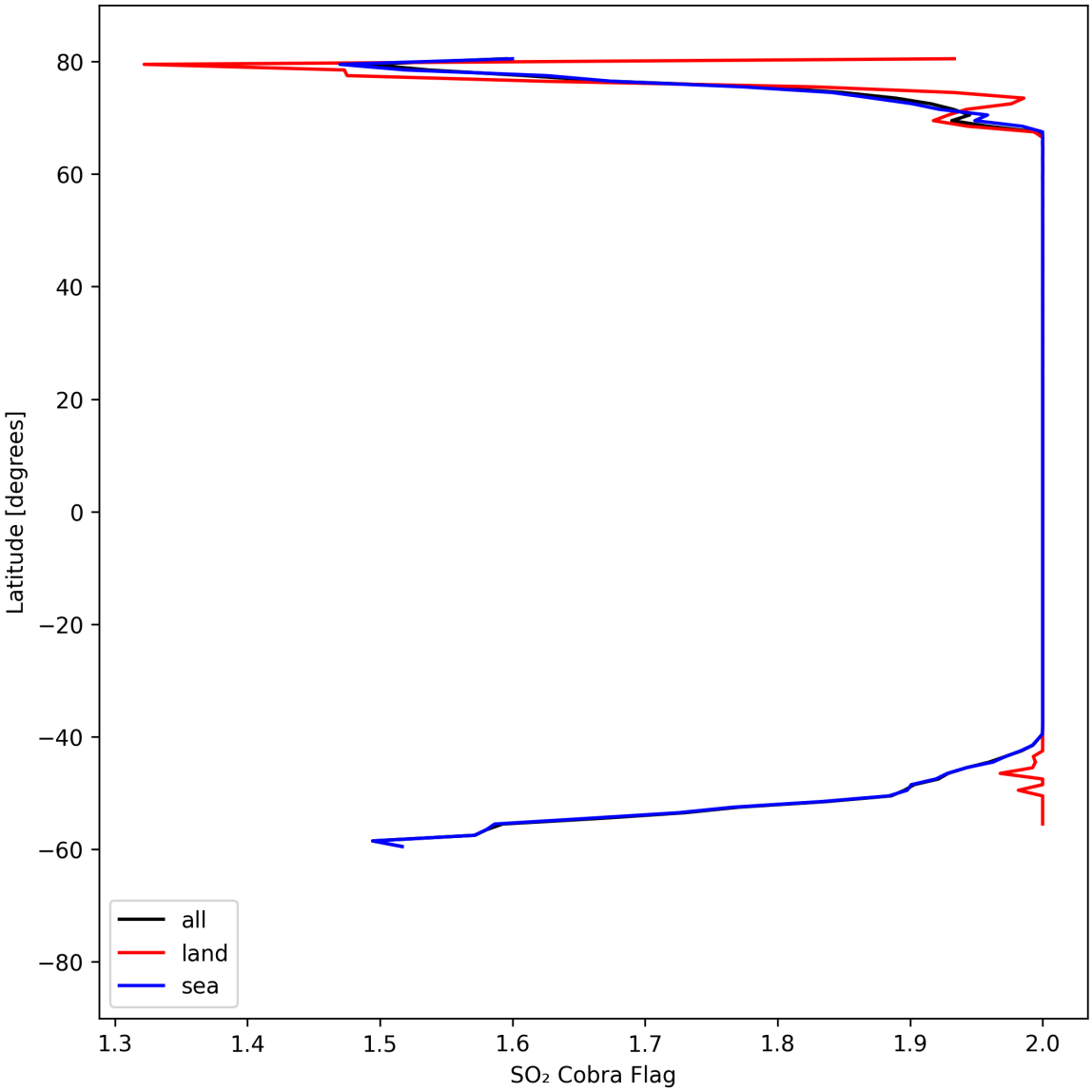

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-04-15 to 2025-04-16.

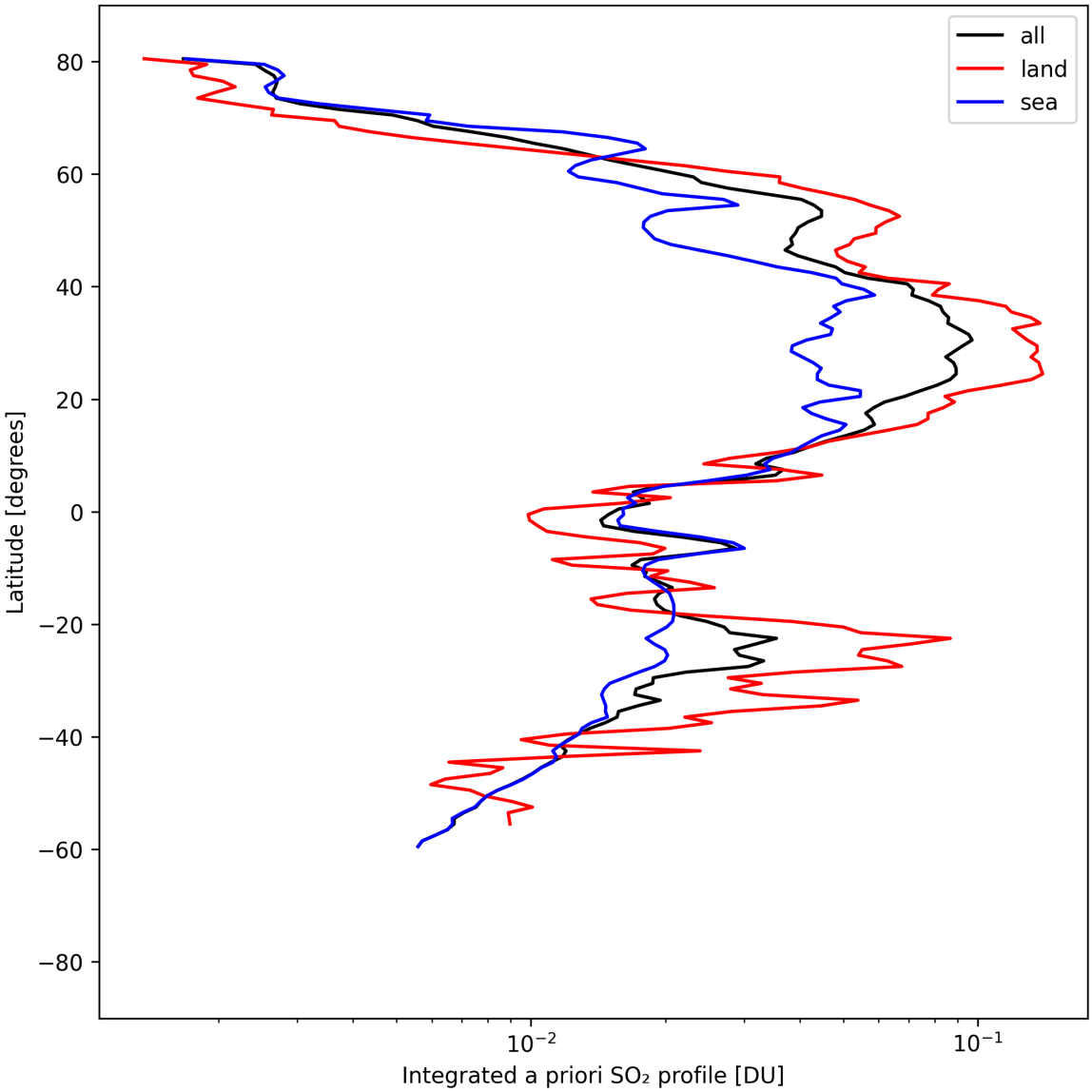

Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-04-15 to 2025-04-16.

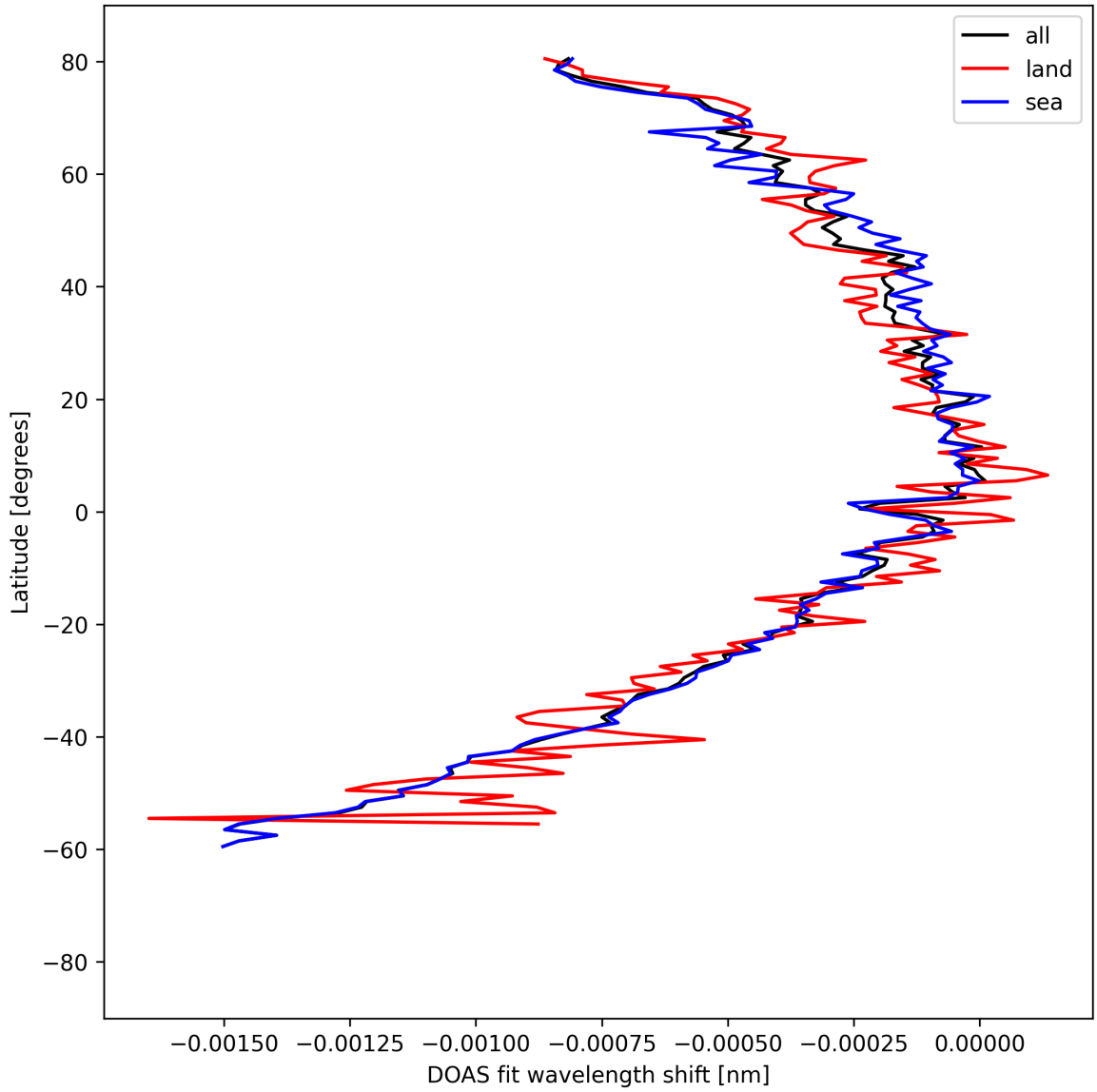

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-04-15 to 2025-04-16.

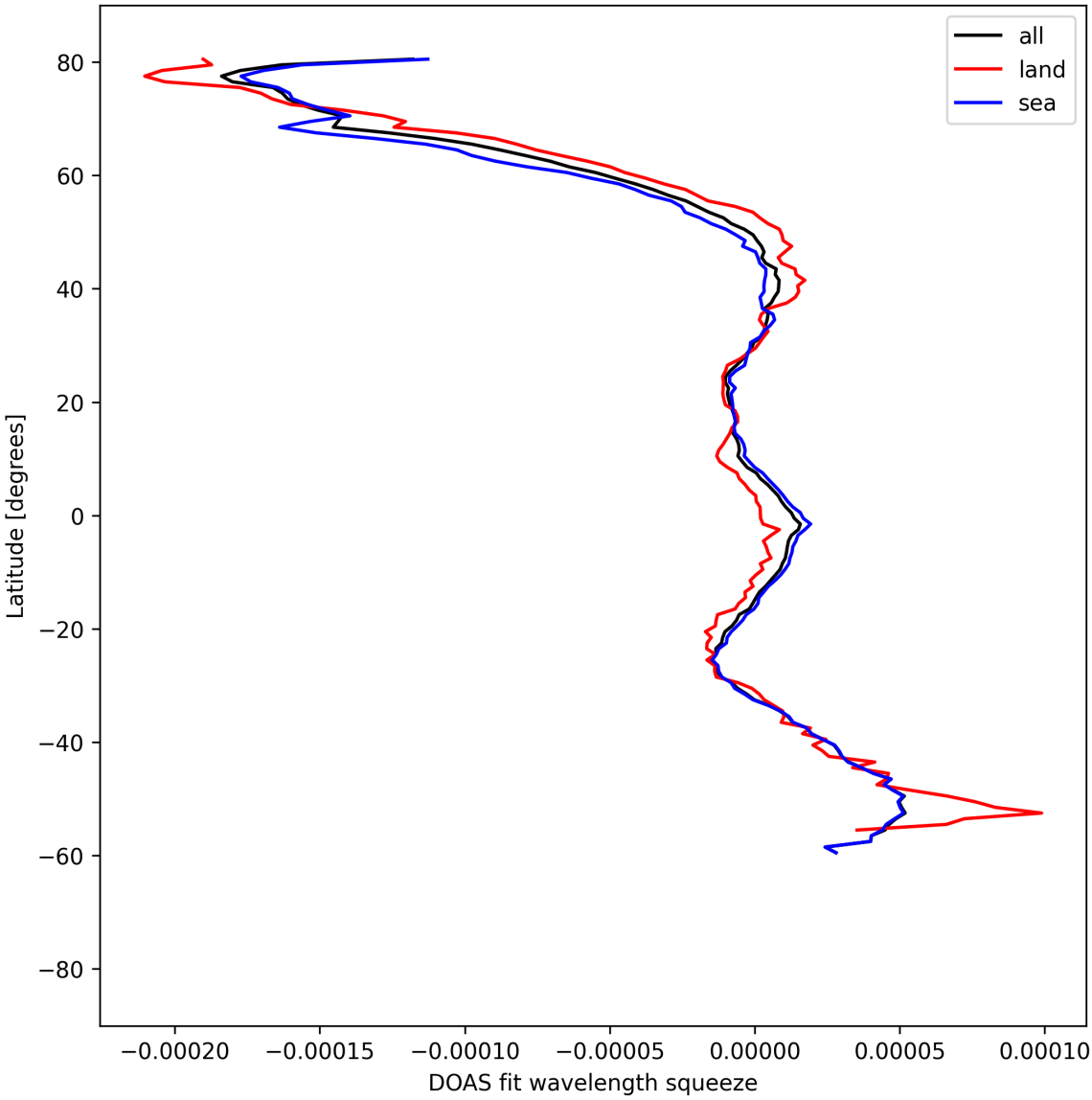

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-04-15 to 2025-04-16.

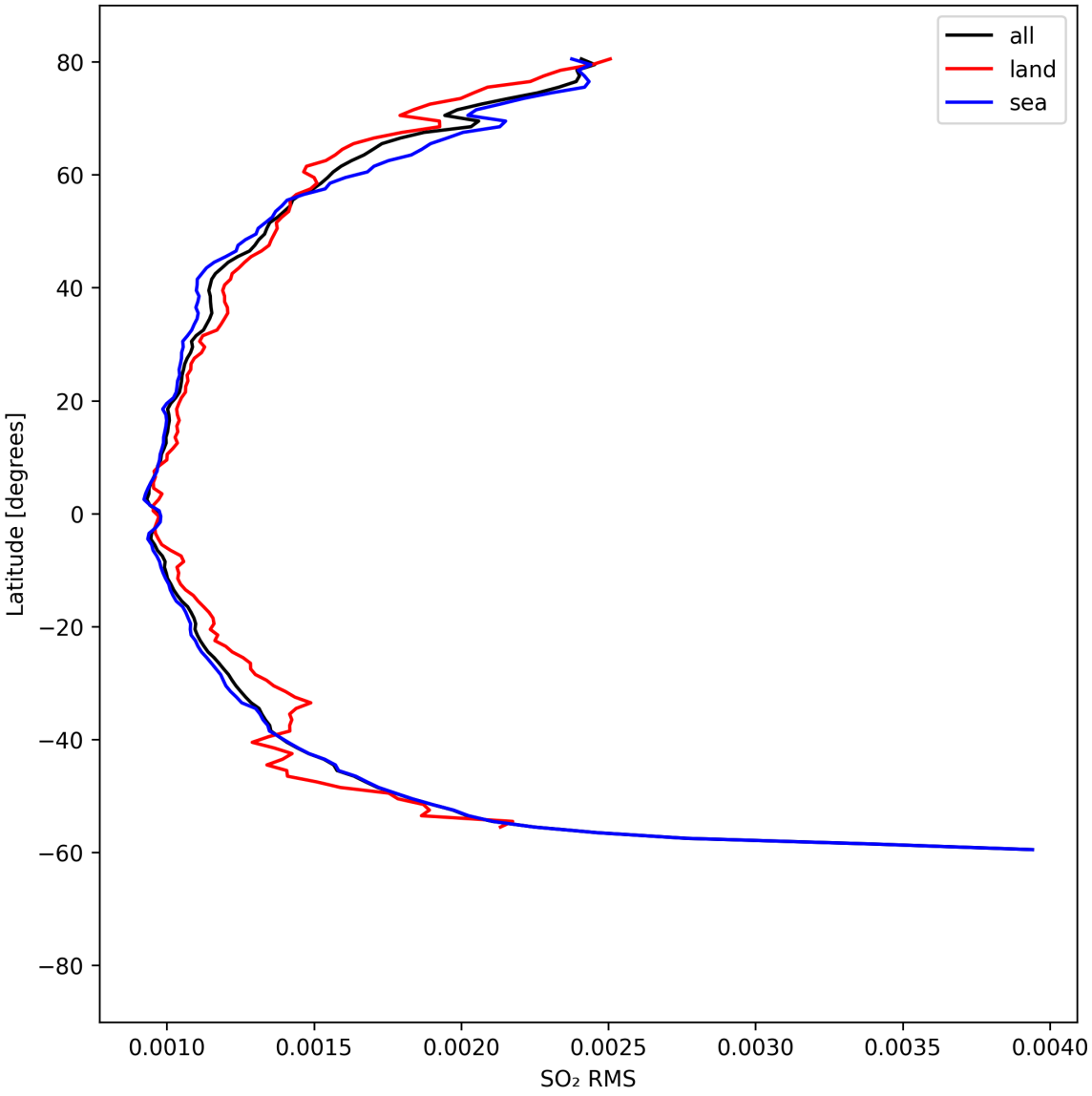

Figure 52: Zonal average of "SO_2 RMS" for 2025-04-15 to 2025-04-16.

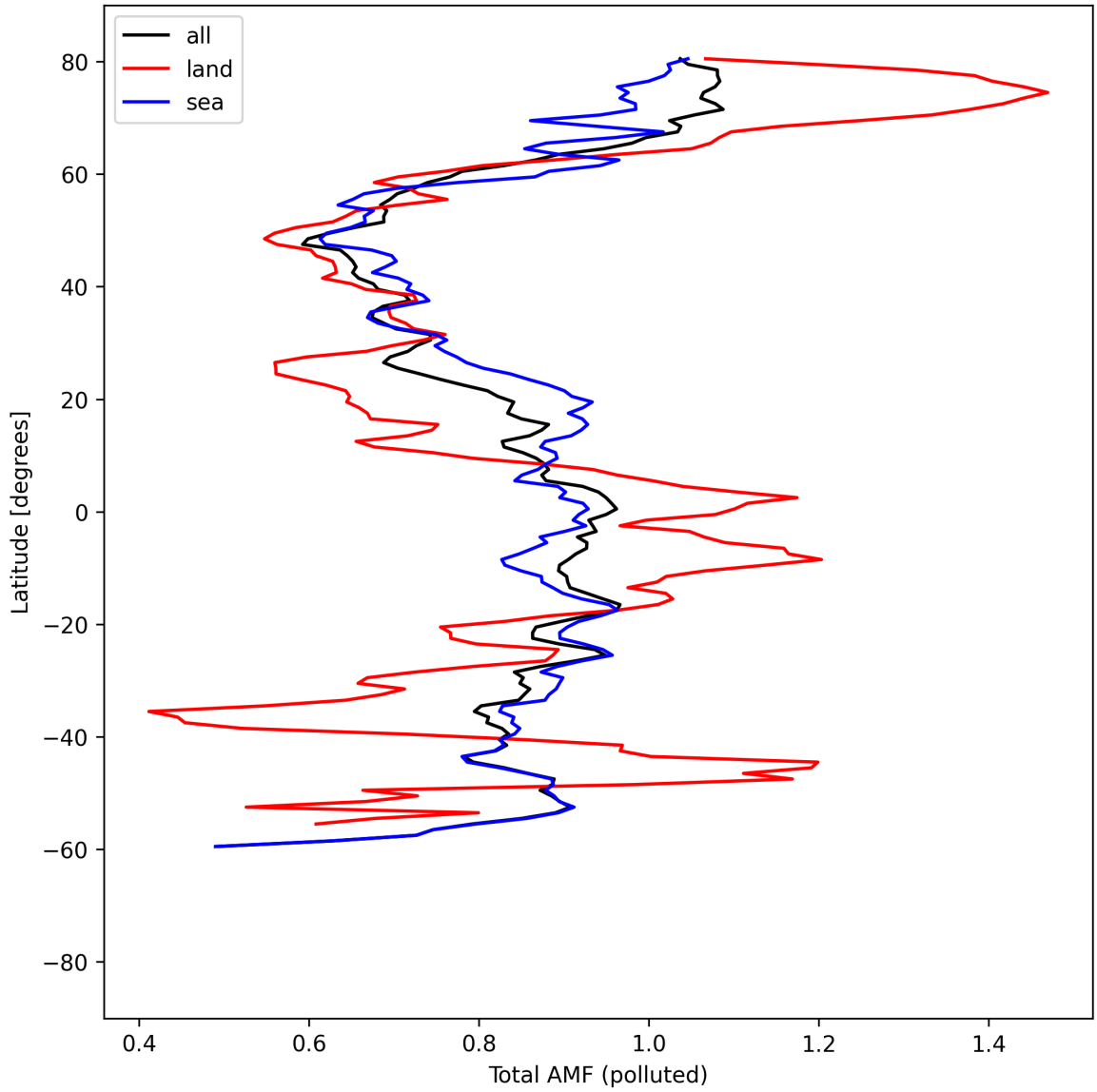

Figure 53: Zonal average of “Total AMF (polluted)” for 2025-04-15 to 2025-04-16.

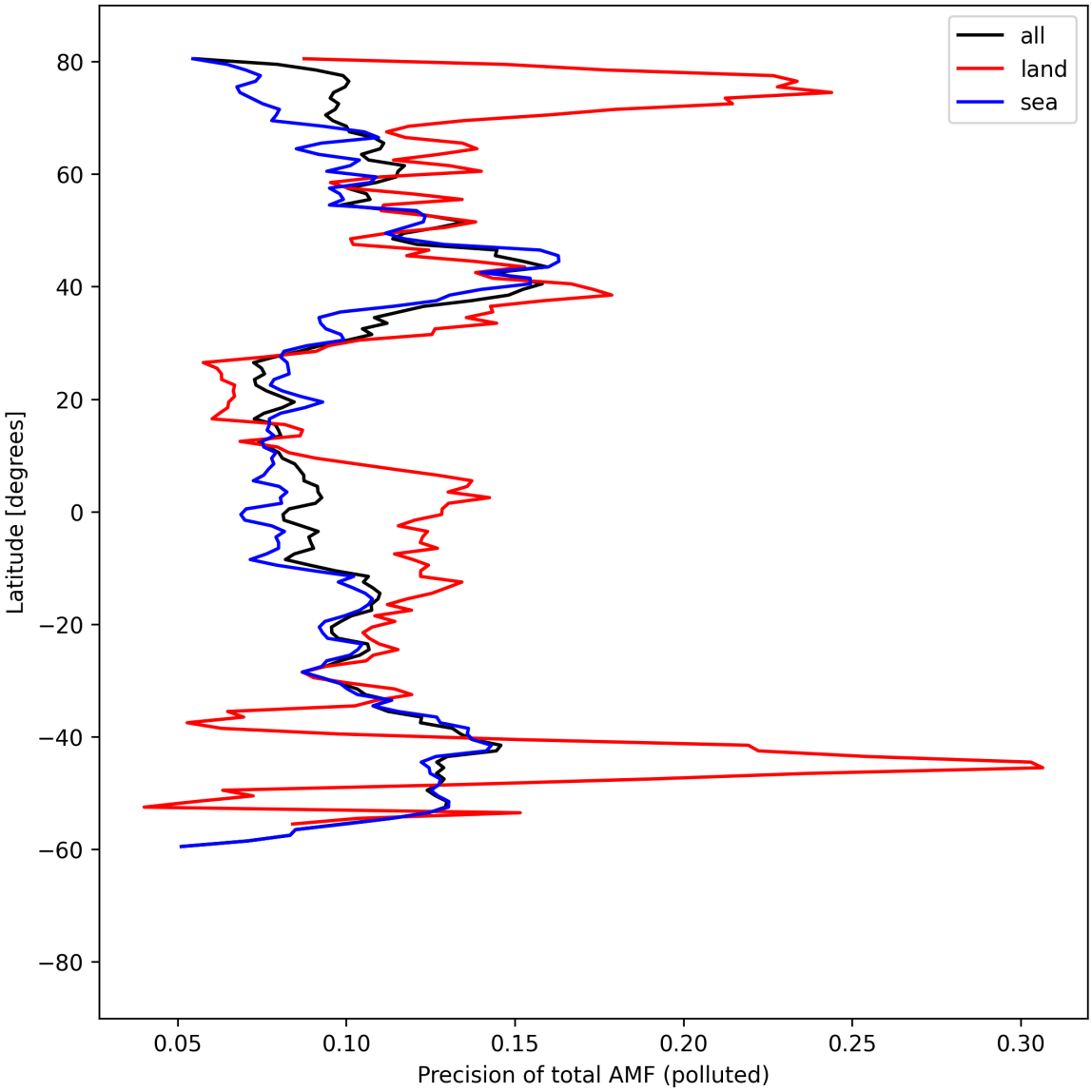

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-04-15 to 2025-04-16.

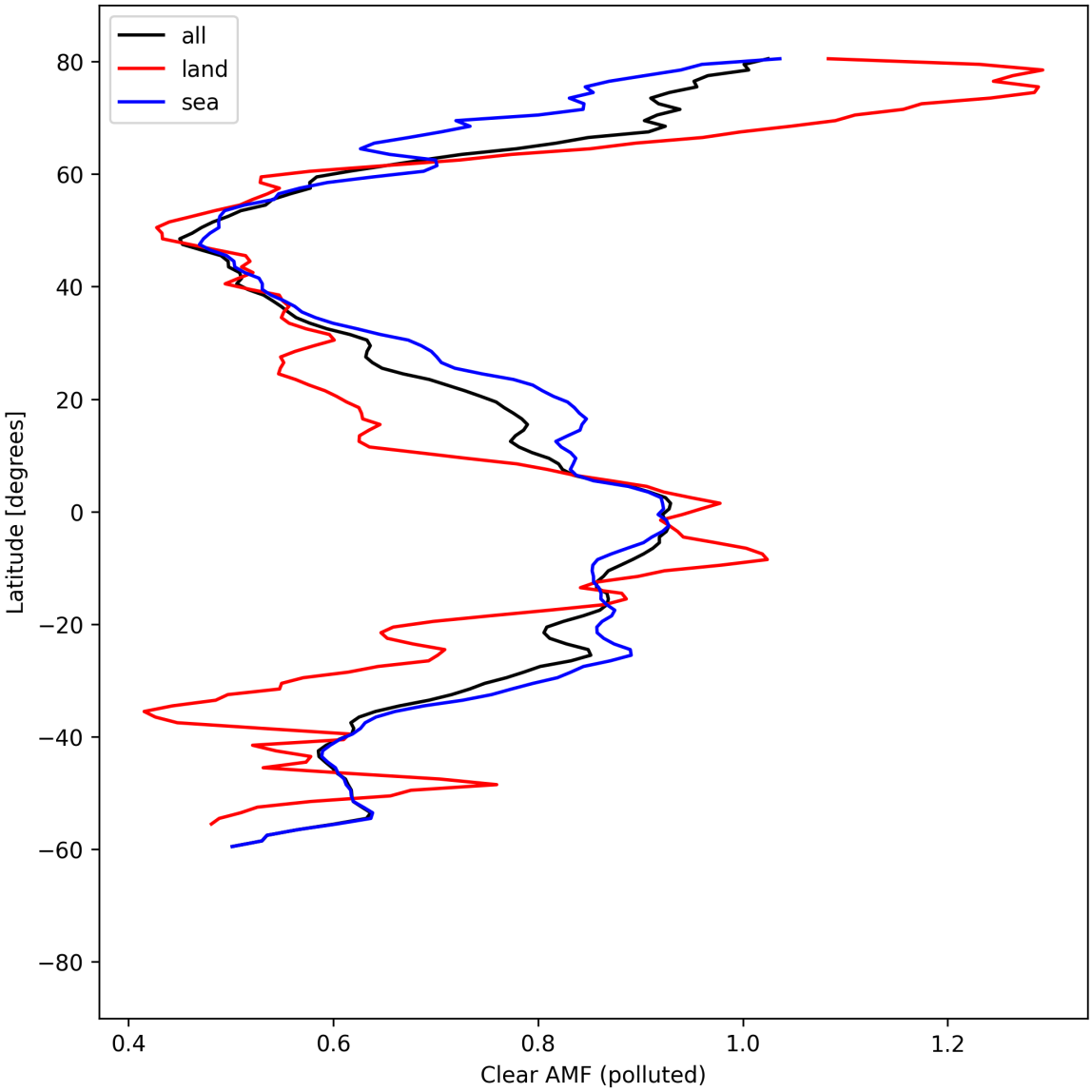

Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-04-15 to 2025-04-16.

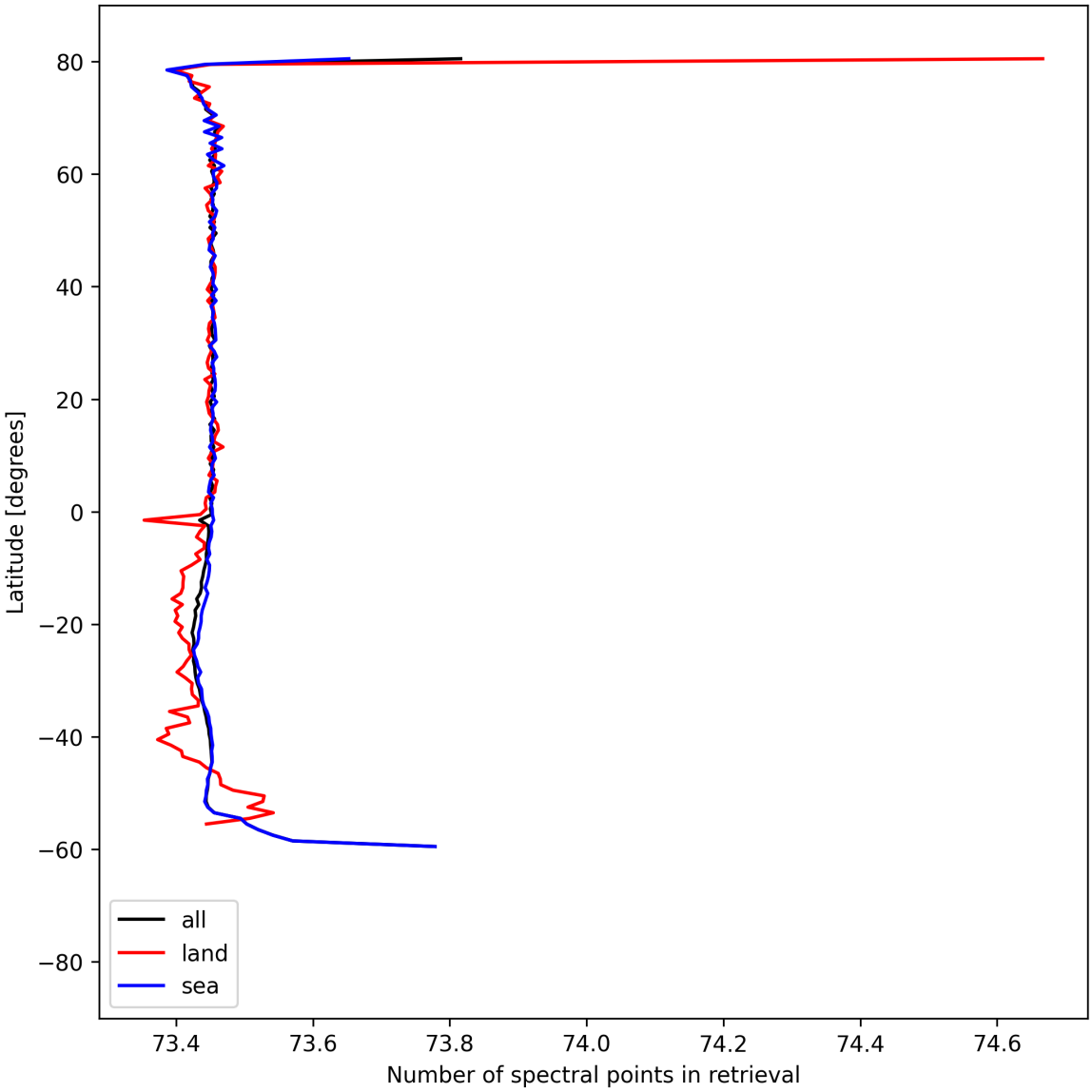

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-04-15 to 2025-04-16.

8 Histograms

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

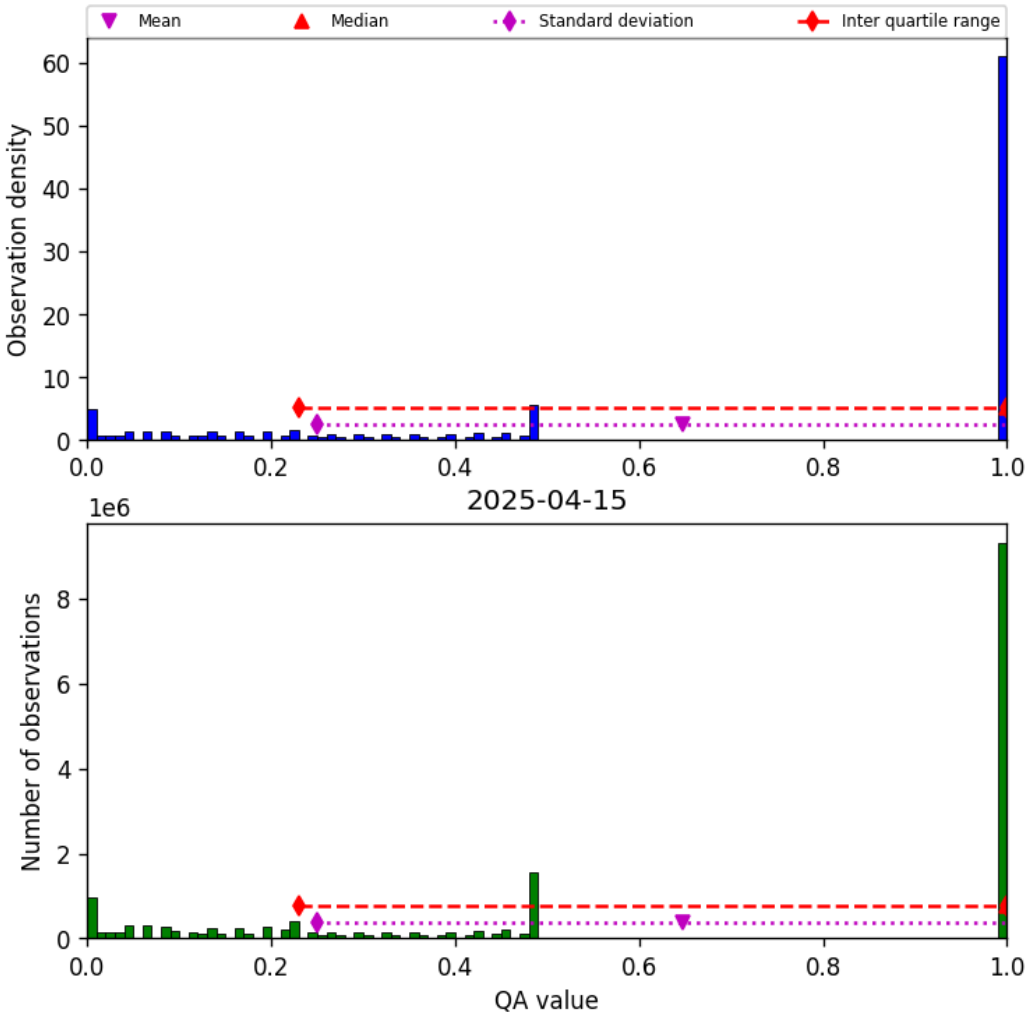

Figure 57: Histogram of “QA value” for 2025-04-15 to 2025-04-16

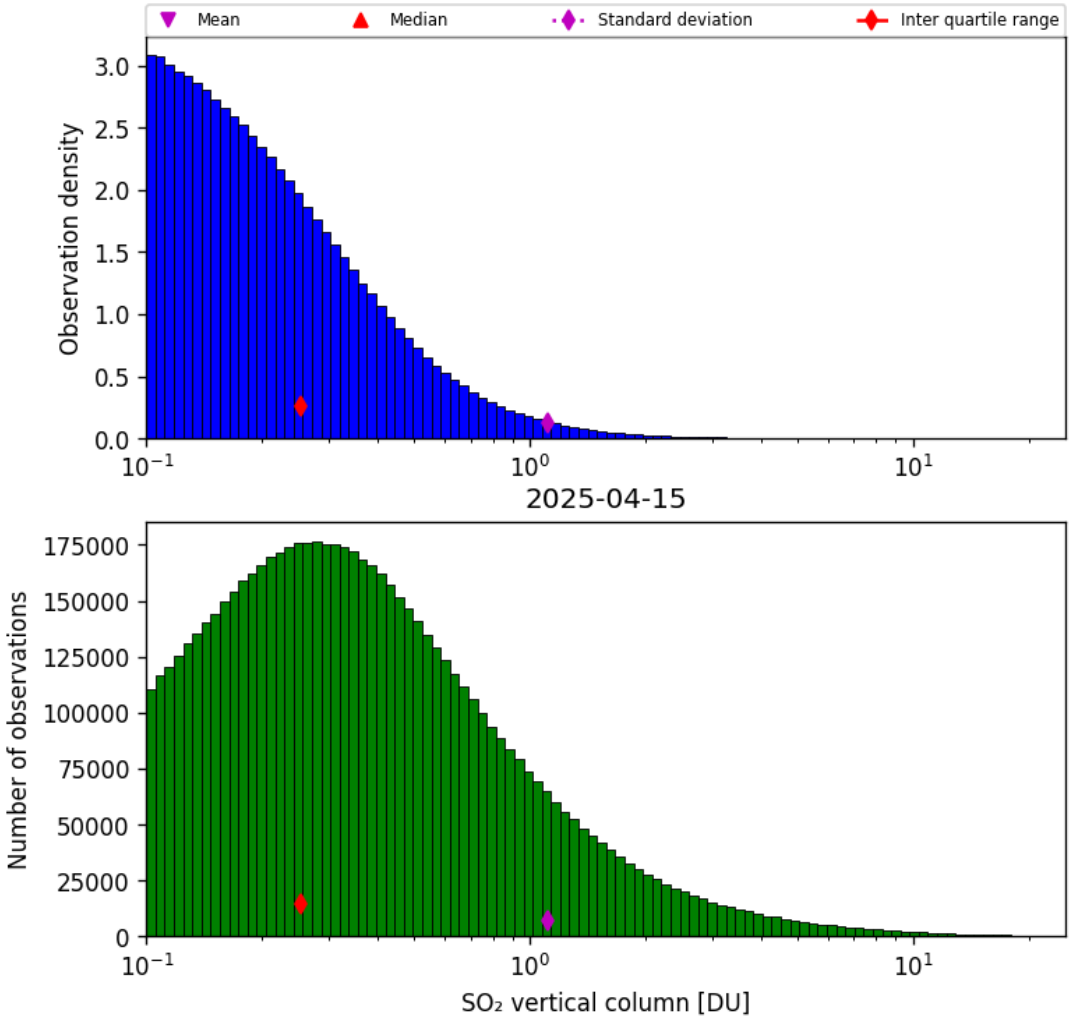

Figure 58: Histogram of "SO_2 vertical column" for 2025-04-15 to 2025-04-16

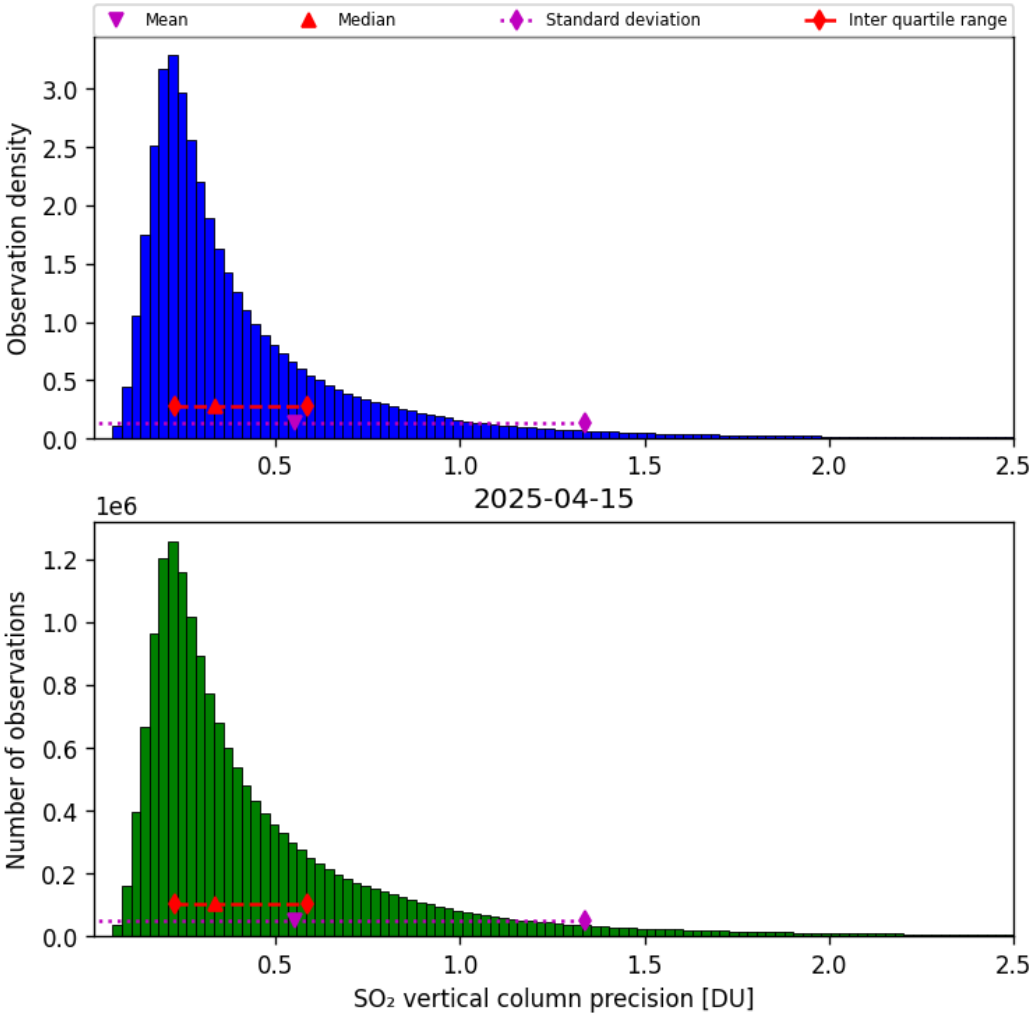

Figure 59: Histogram of "SO_2 vertical column precision" for 2025-04-15 to 2025-04-16

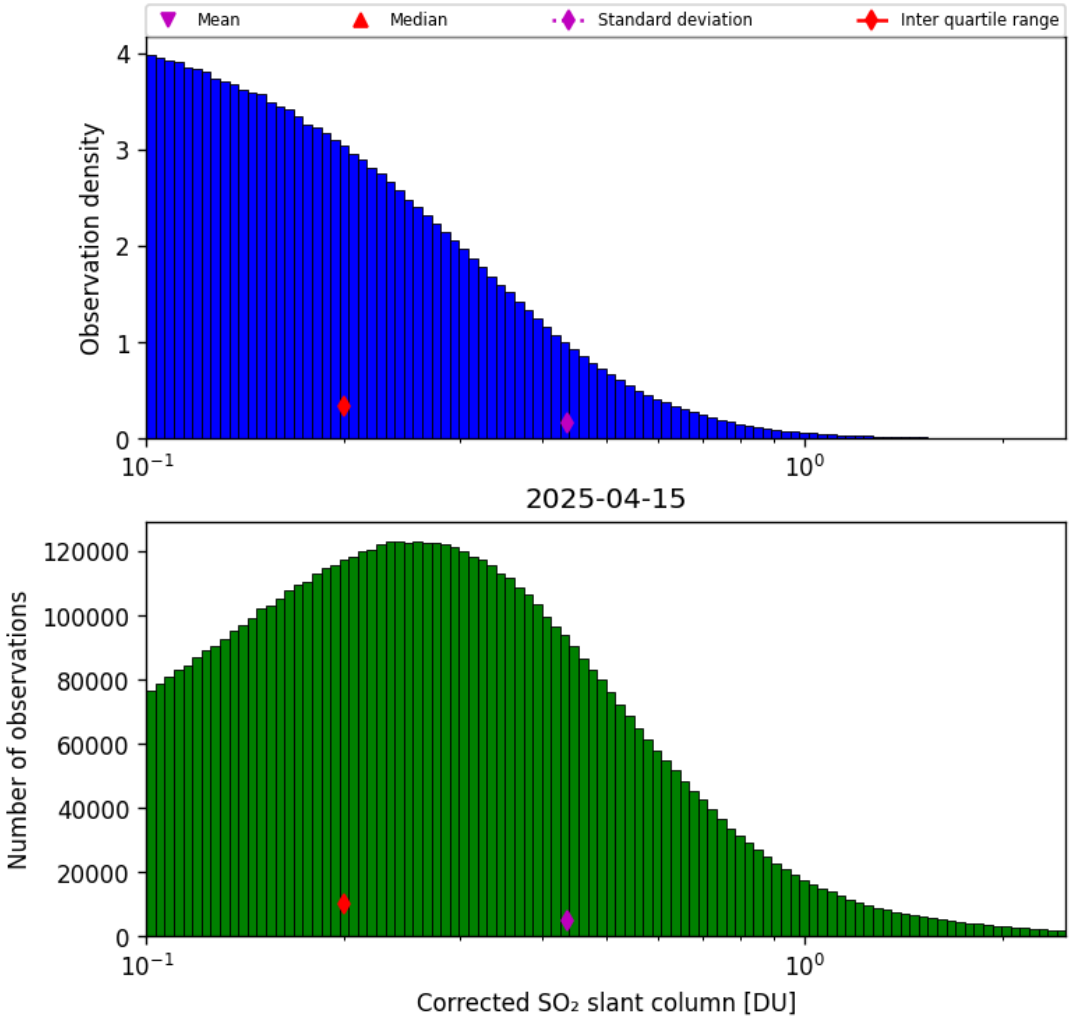

Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-04-15 to 2025-04-16

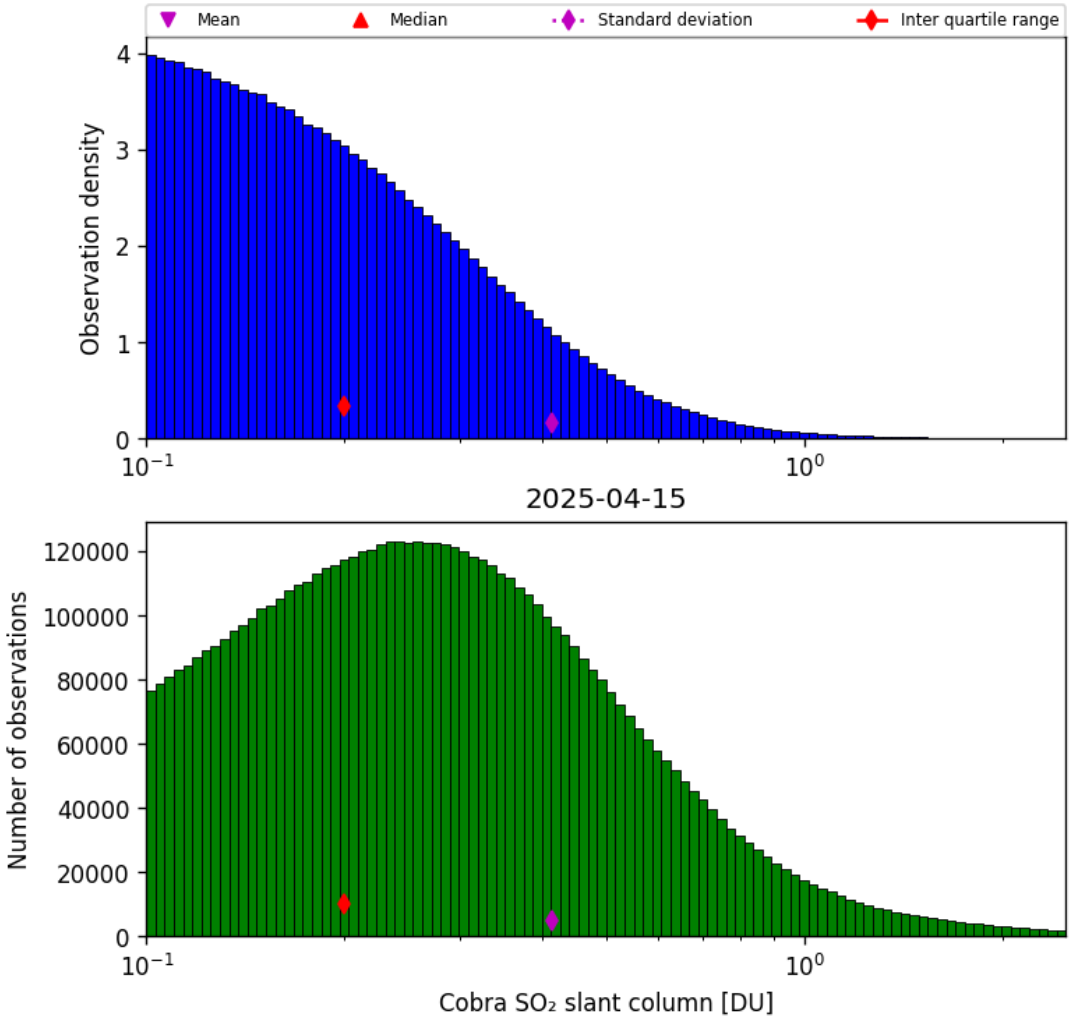

Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-04-15 to 2025-04-16

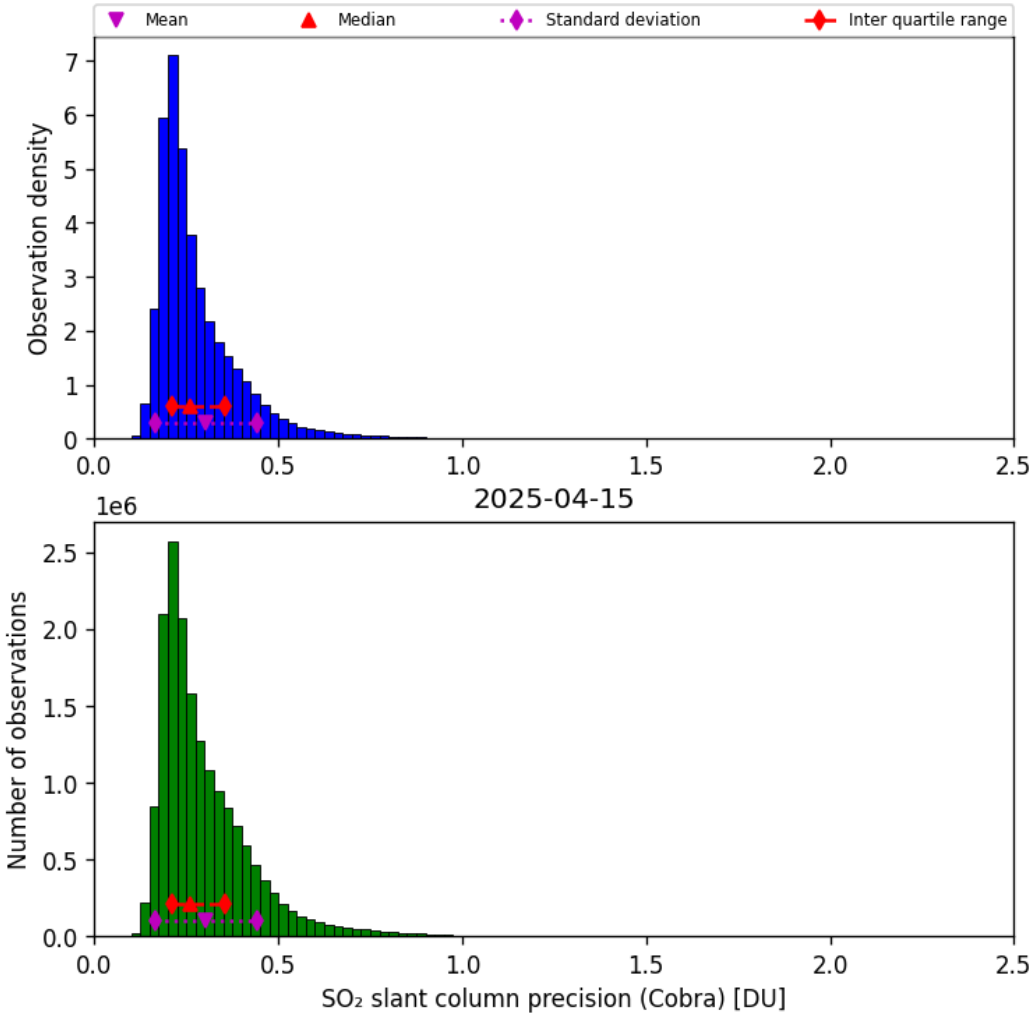

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-04-15 to 2025-04-16

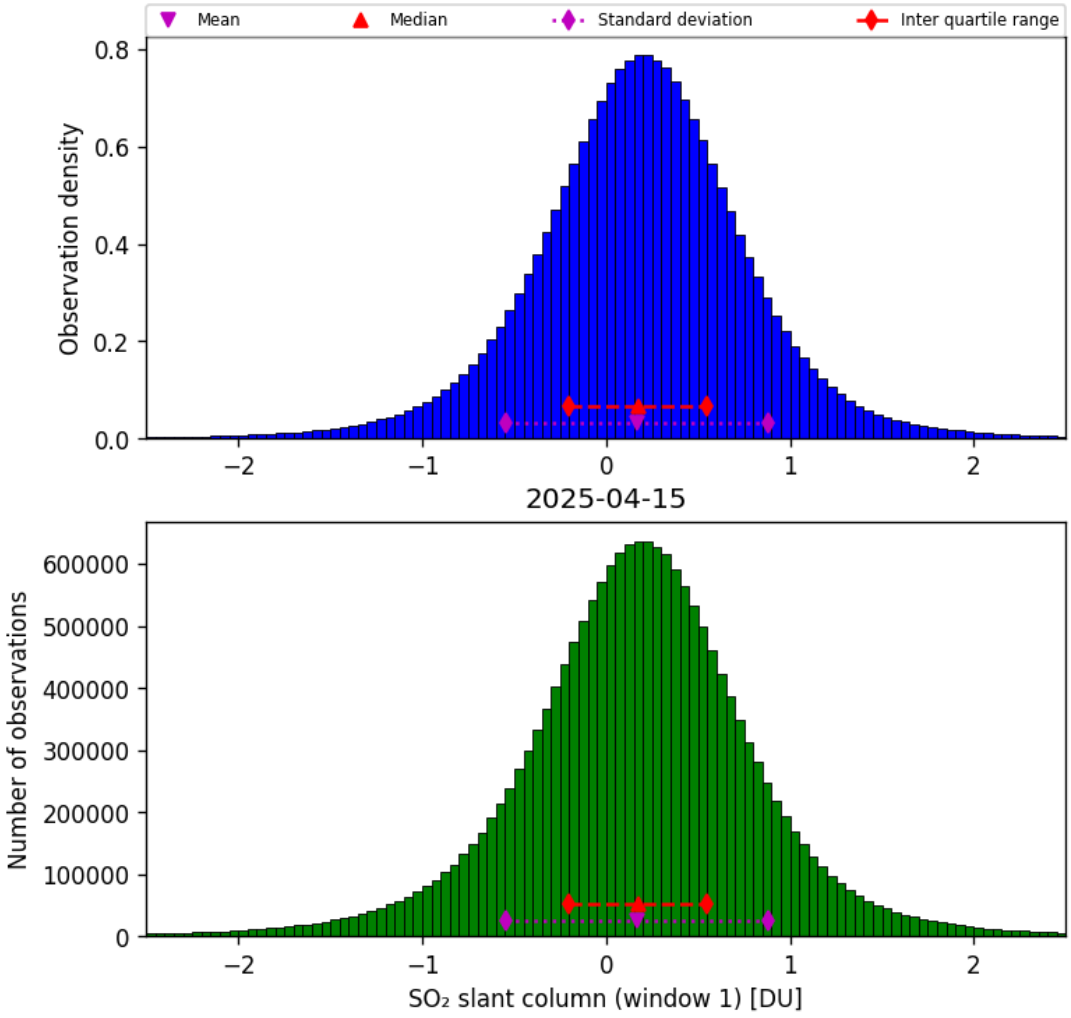

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-04-15 to 2025-04-16

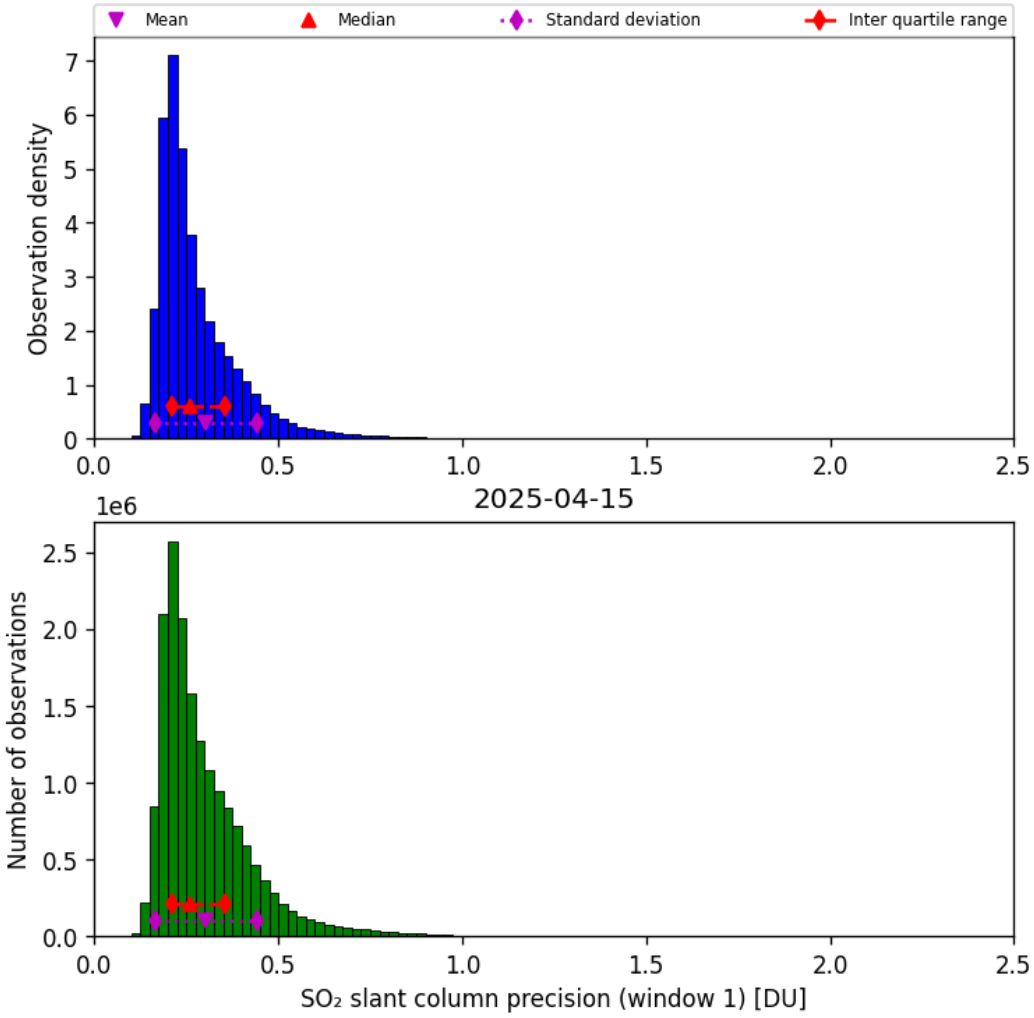

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-04-15 to 2025-04-16

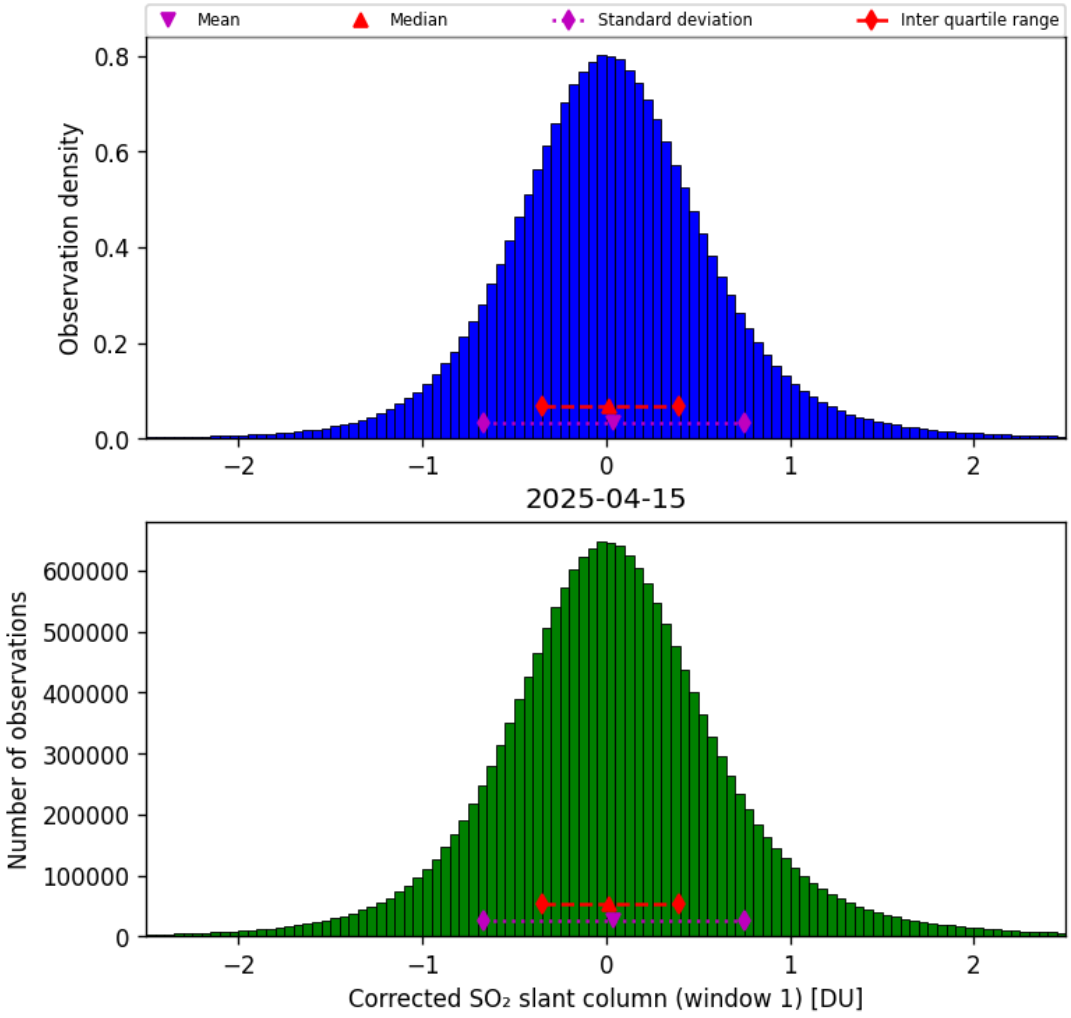

Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-04-15 to 2025-04-16

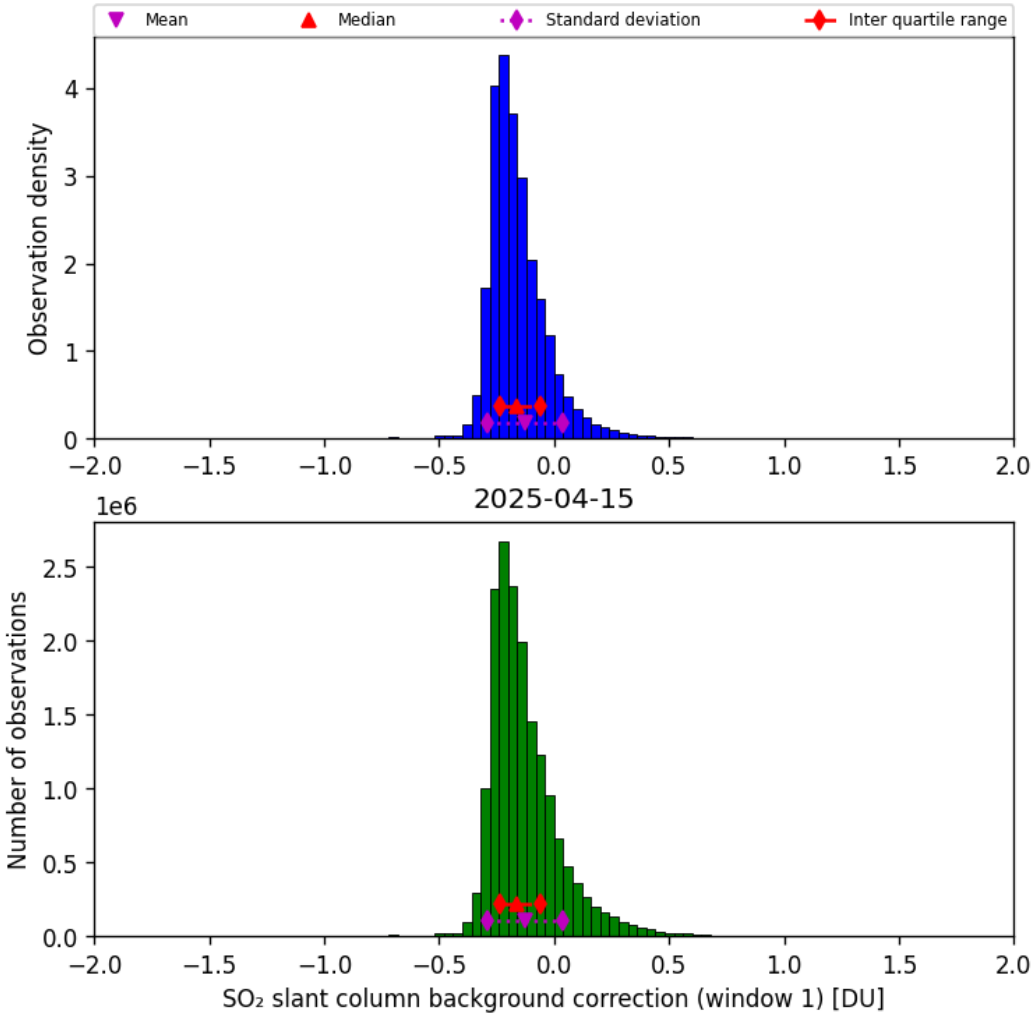

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-04-15 to 2025-04-16

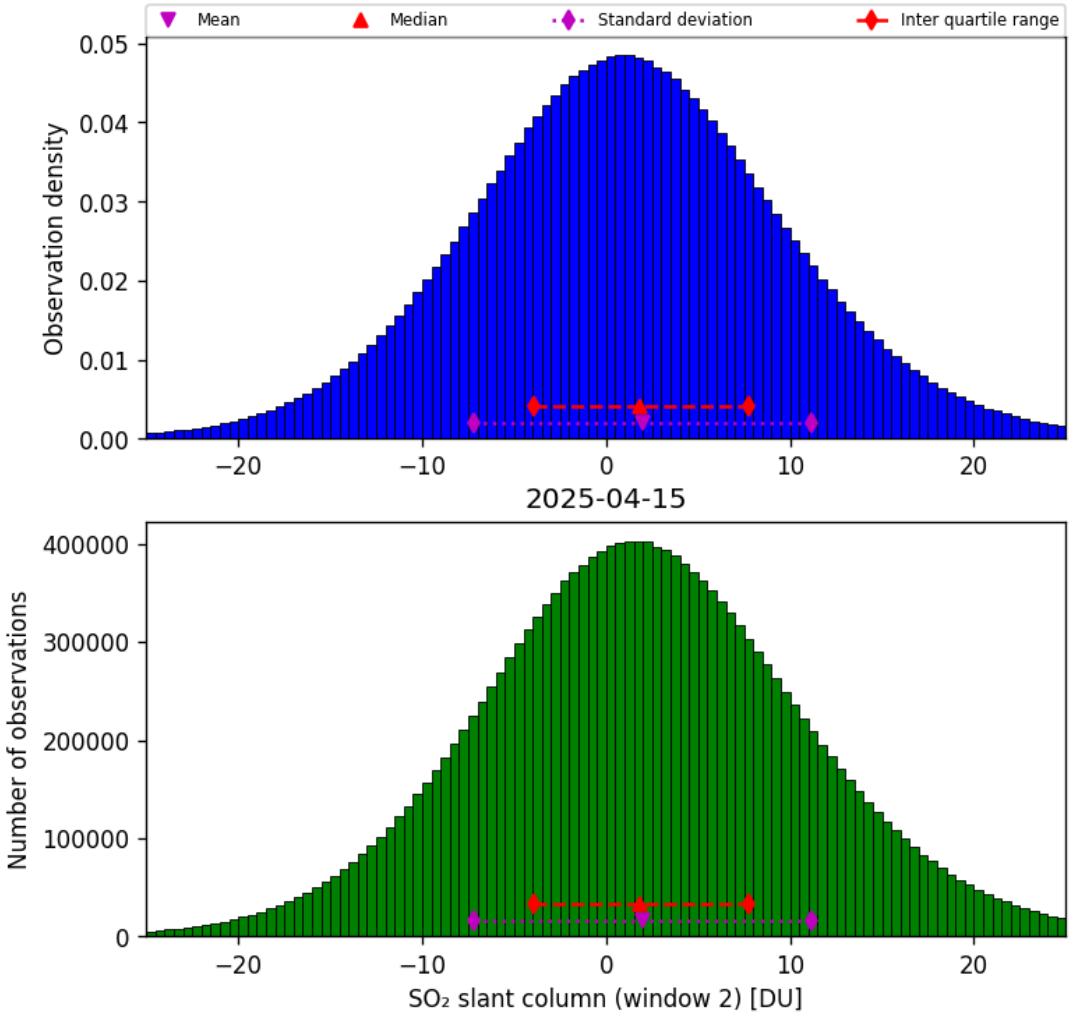

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-04-15 to 2025-04-16

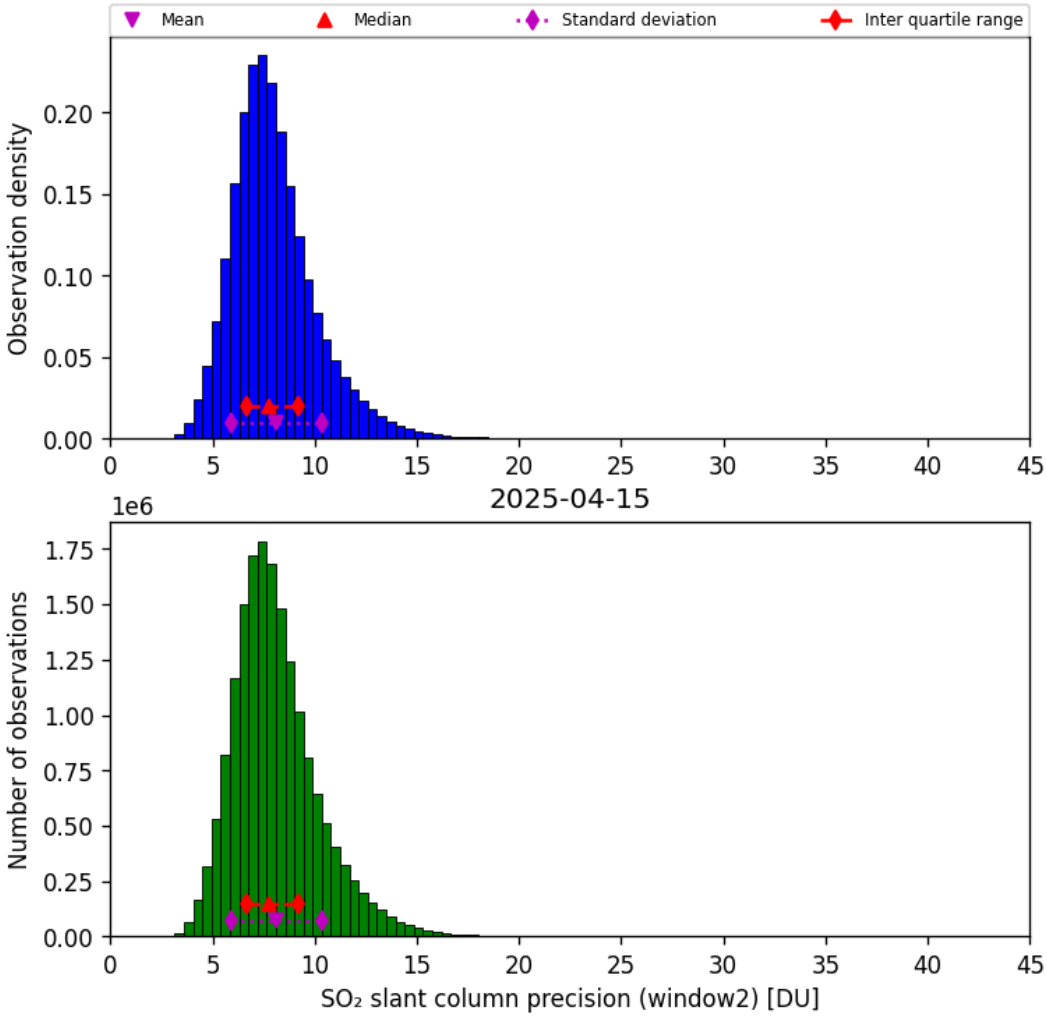

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-04-15 to 2025-04-16

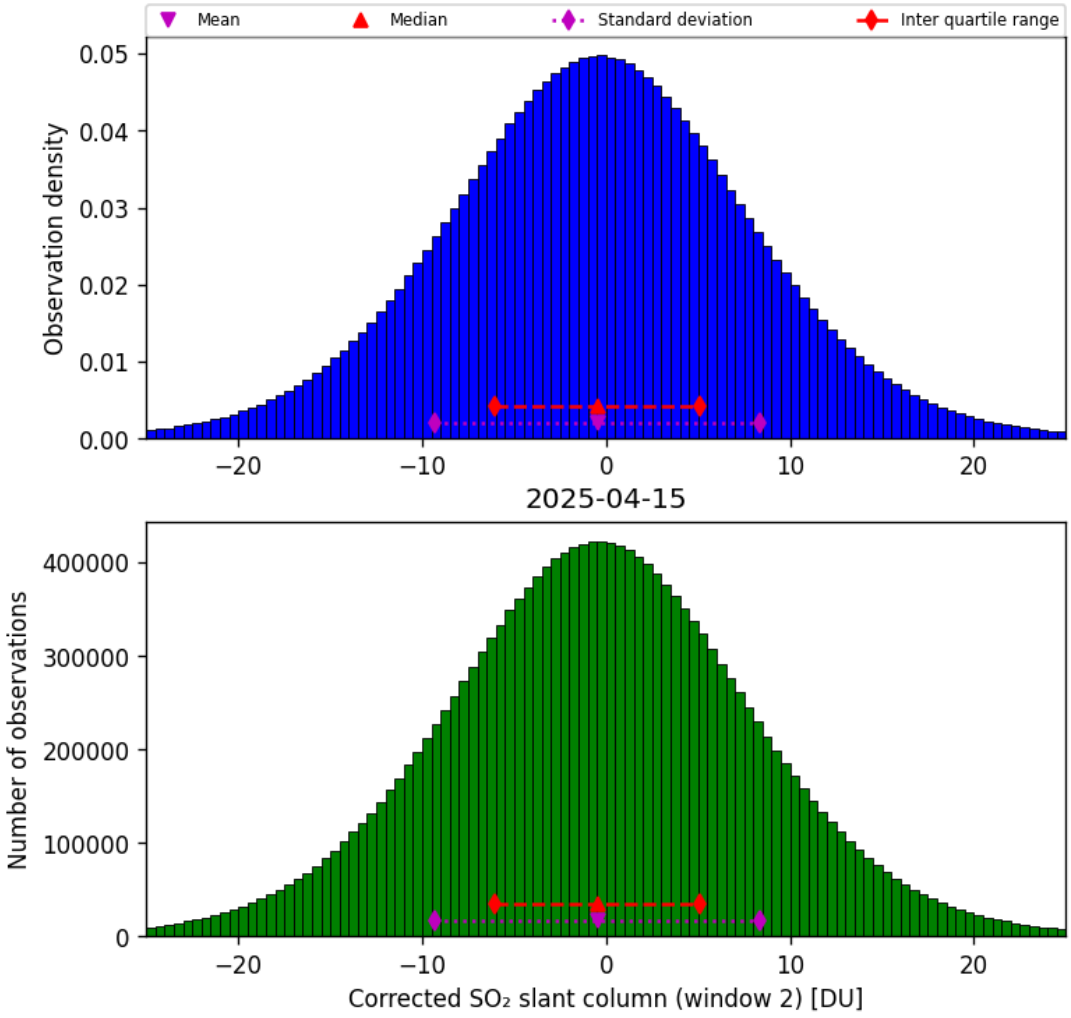

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-04-15 to 2025-04-16

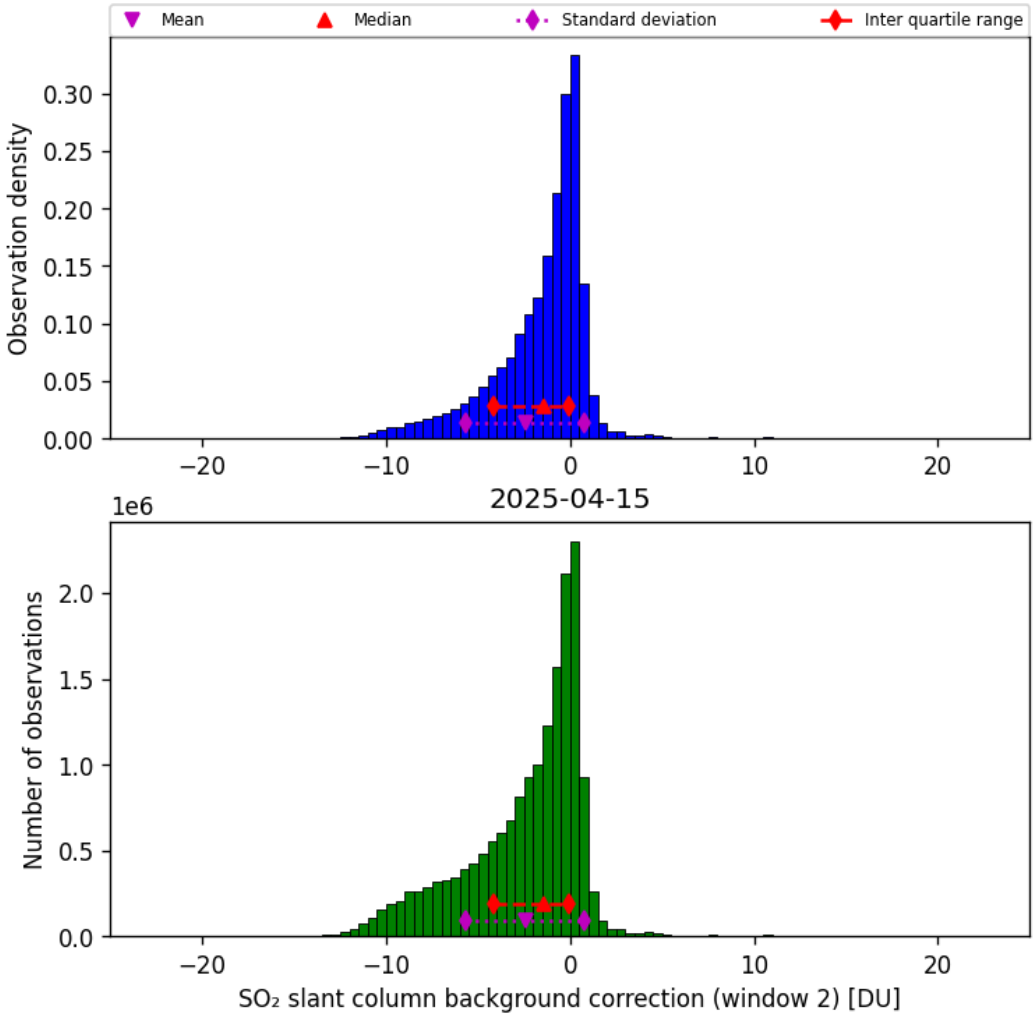

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-04-15 to 2025-04-16

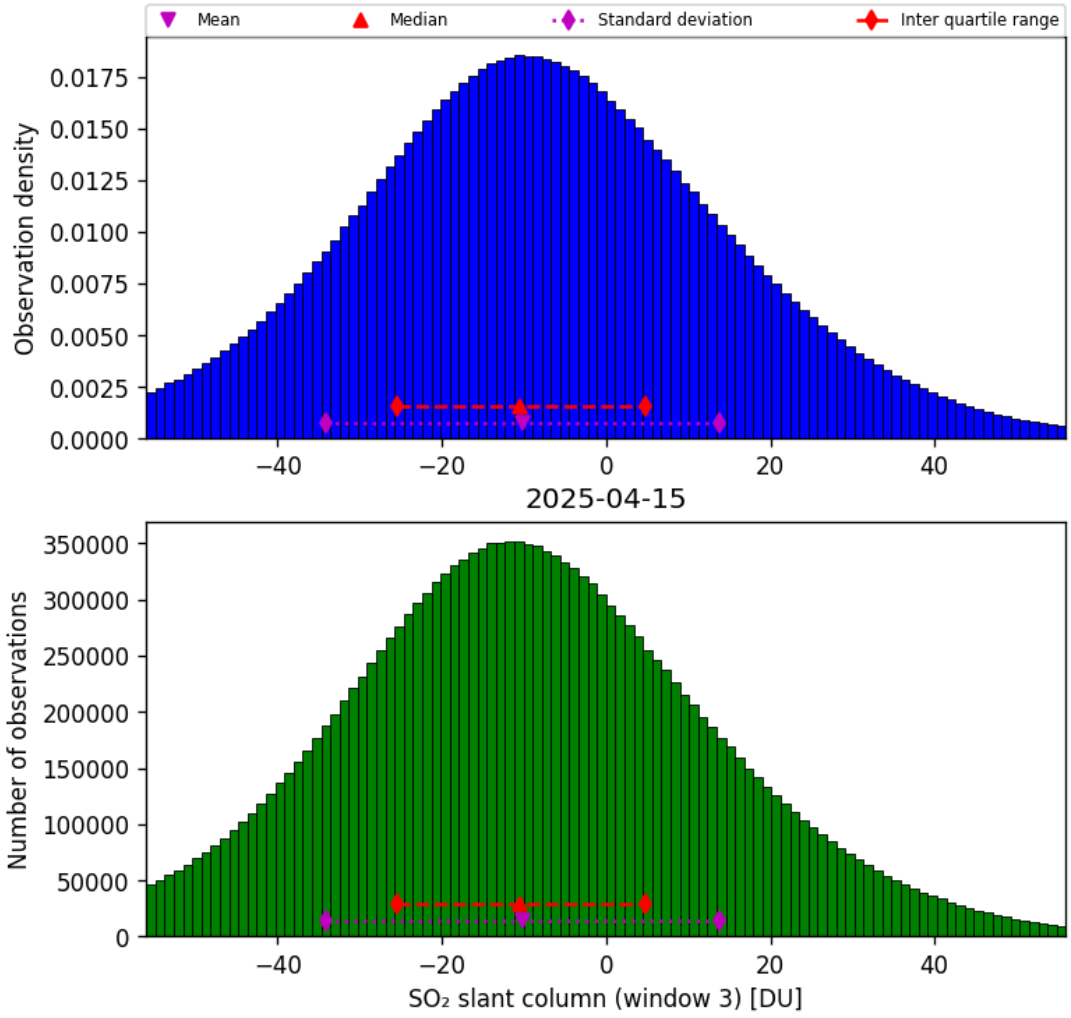

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-04-15 to 2025-04-16

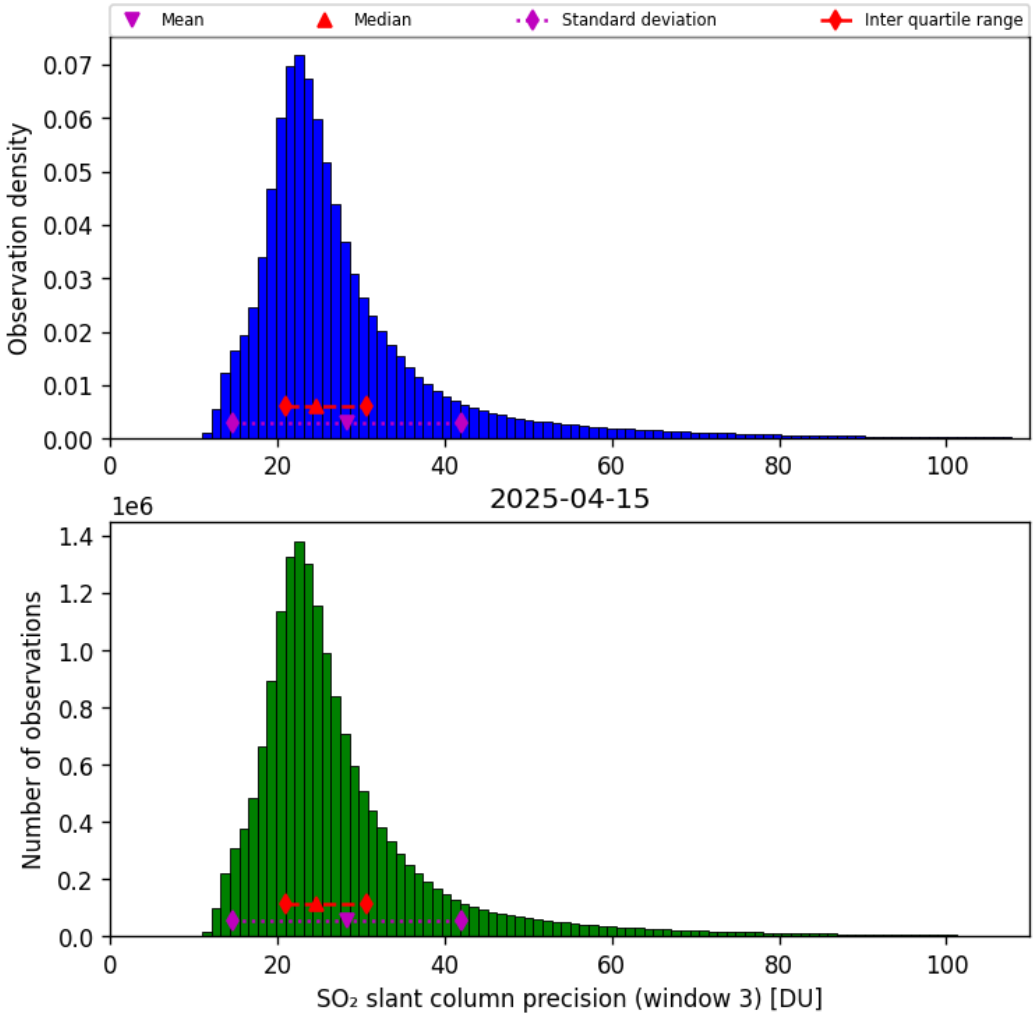

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-04-15 to 2025-04-16

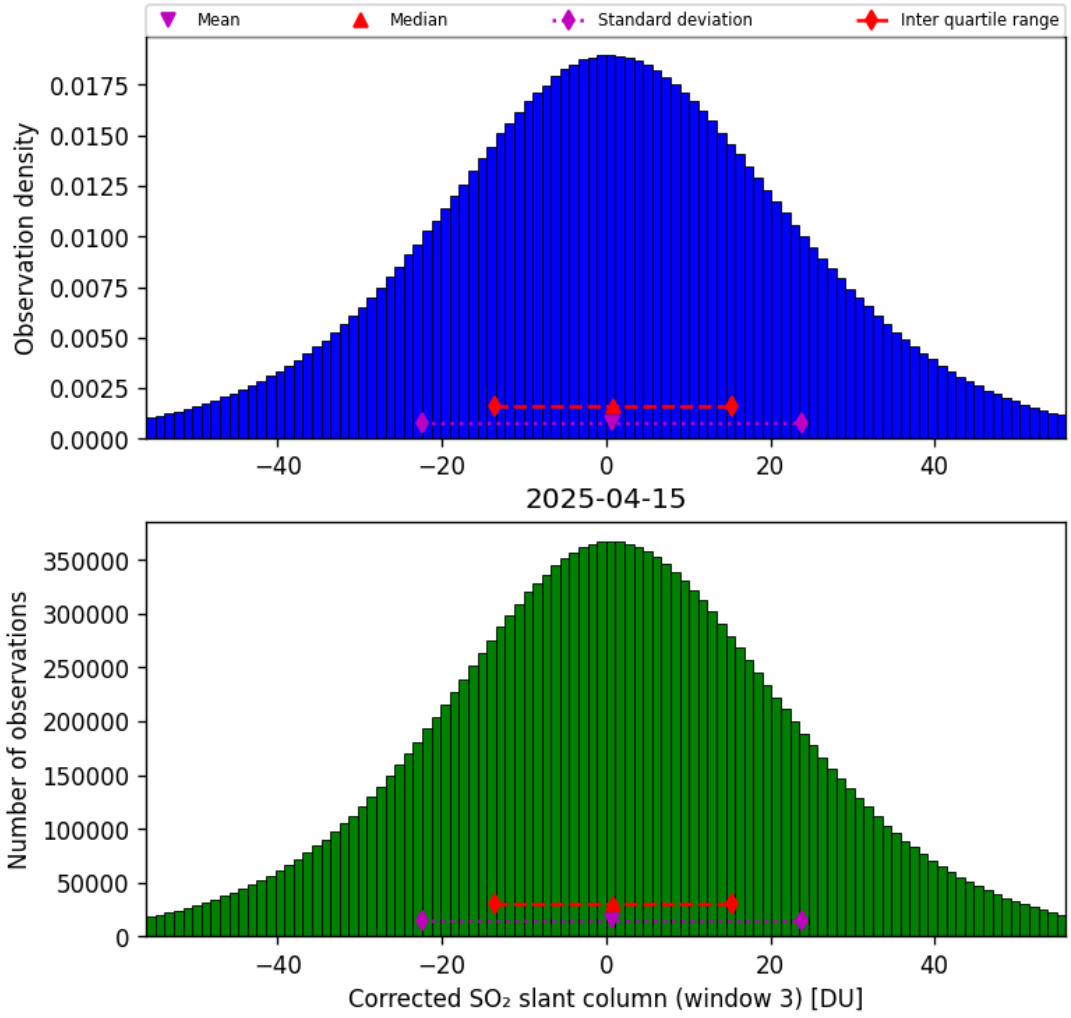

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-04-15 to 2025-04-16

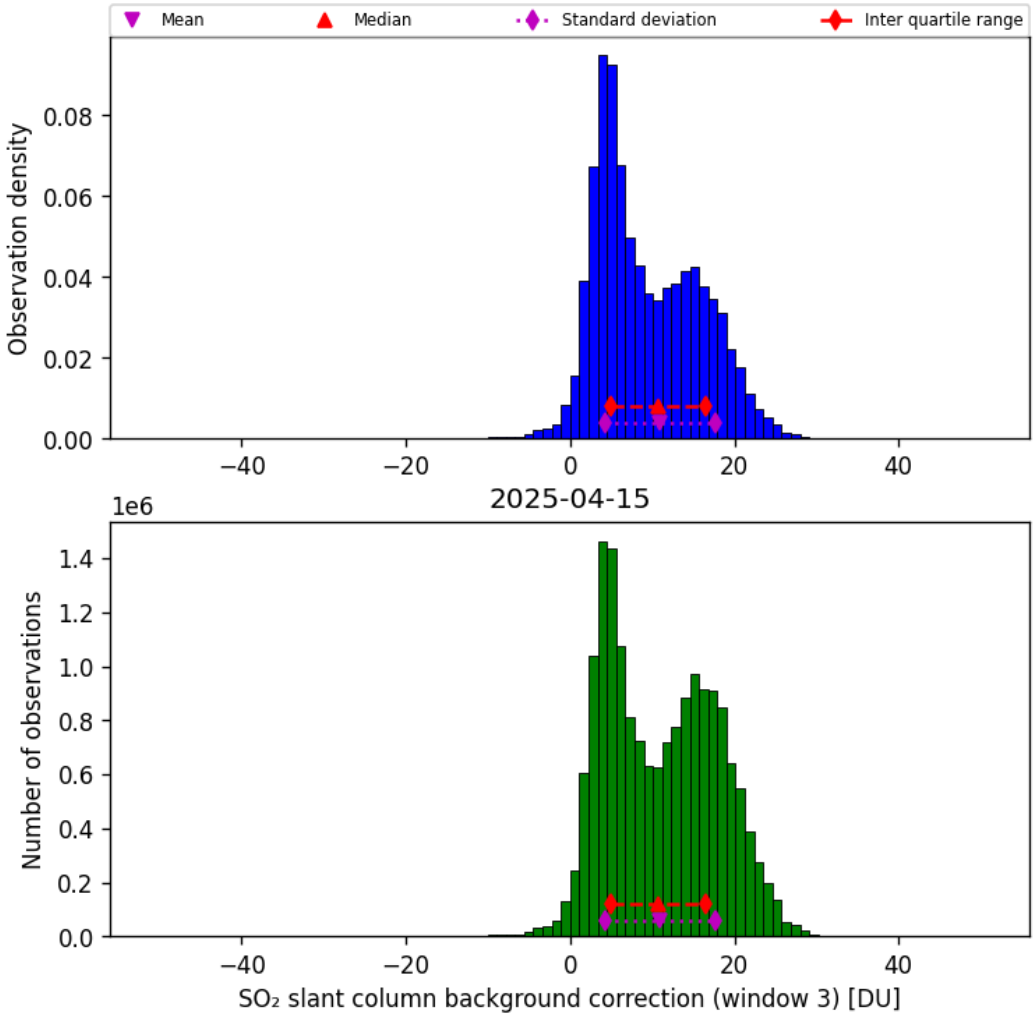

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-04-15 to 2025-04-16

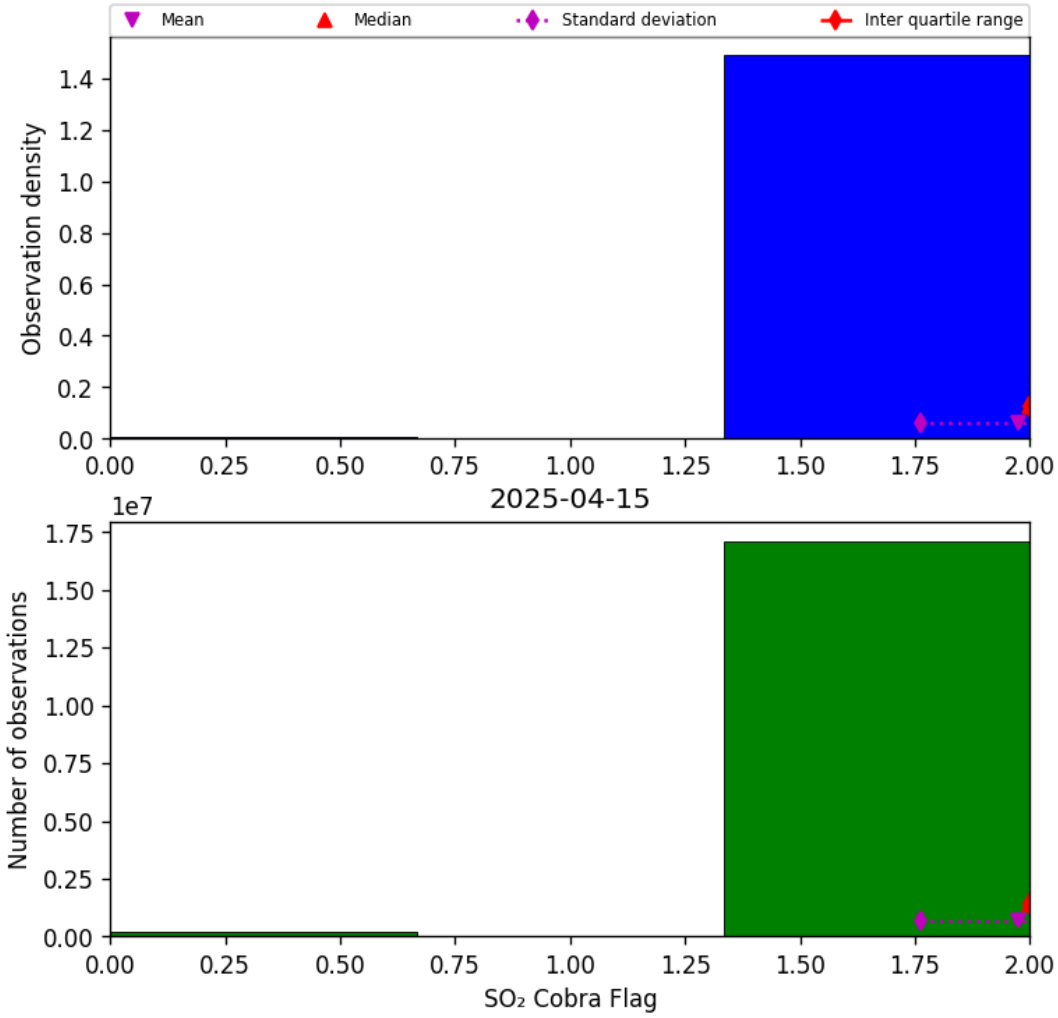

Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-04-15 to 2025-04-16

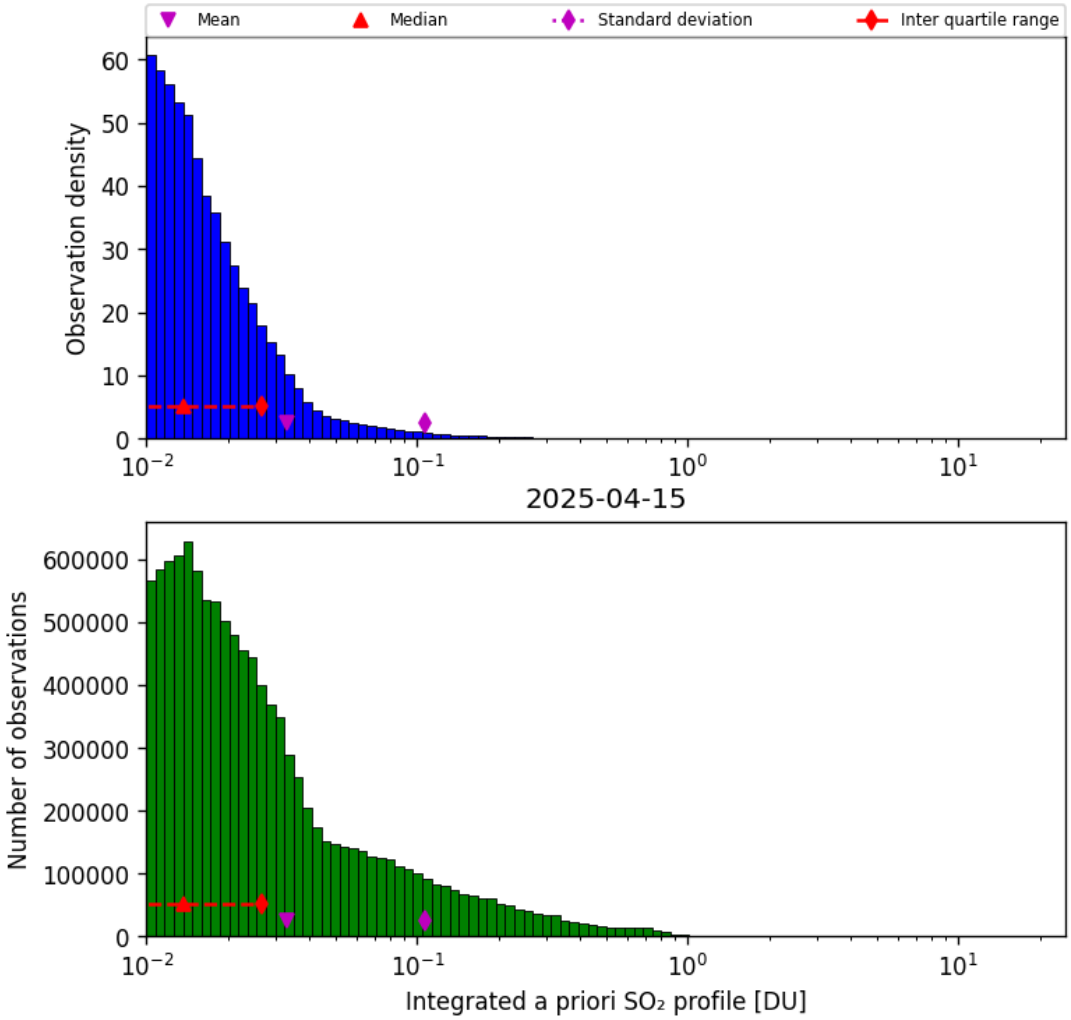

Figure 76: Histogram of "Integrated a priori SO_2 profile" for 2025-04-15 to 2025-04-16

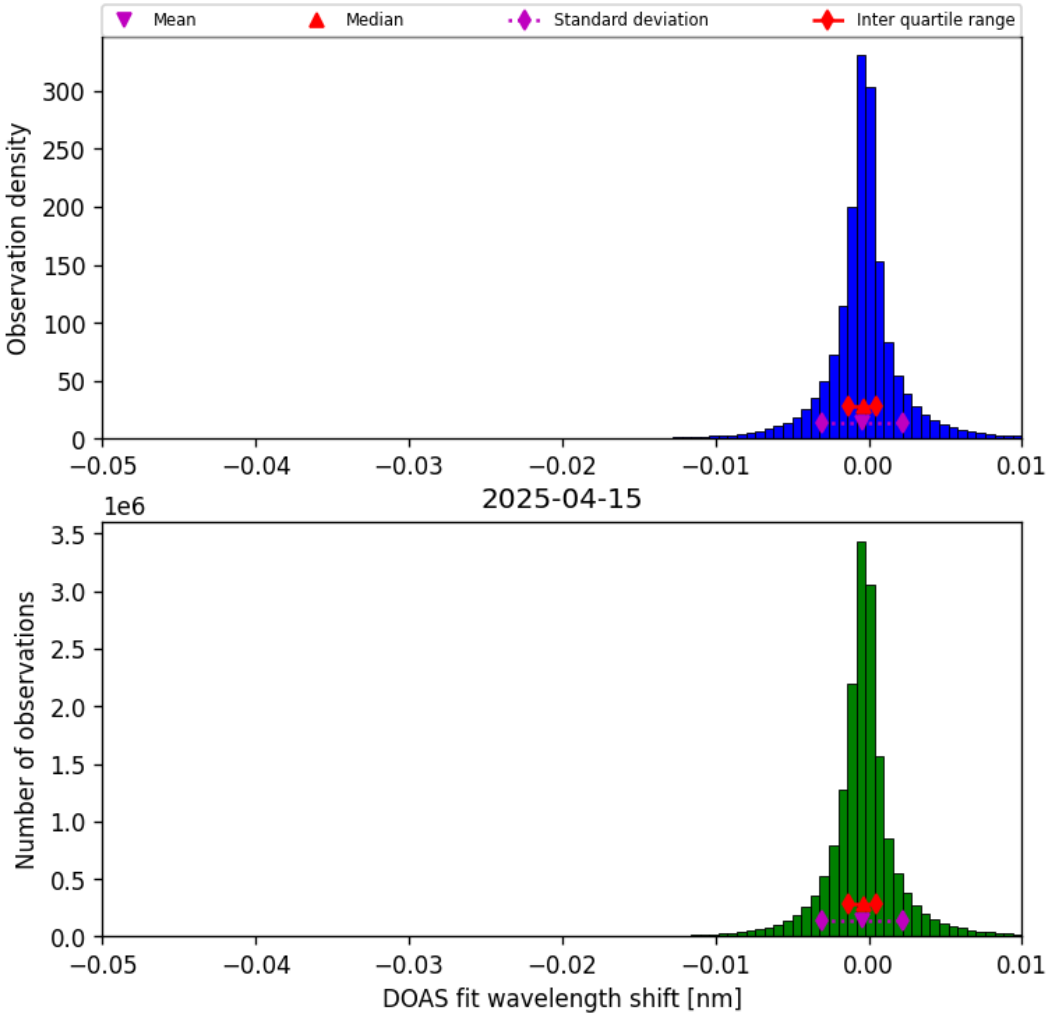

Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-04-15 to 2025-04-16

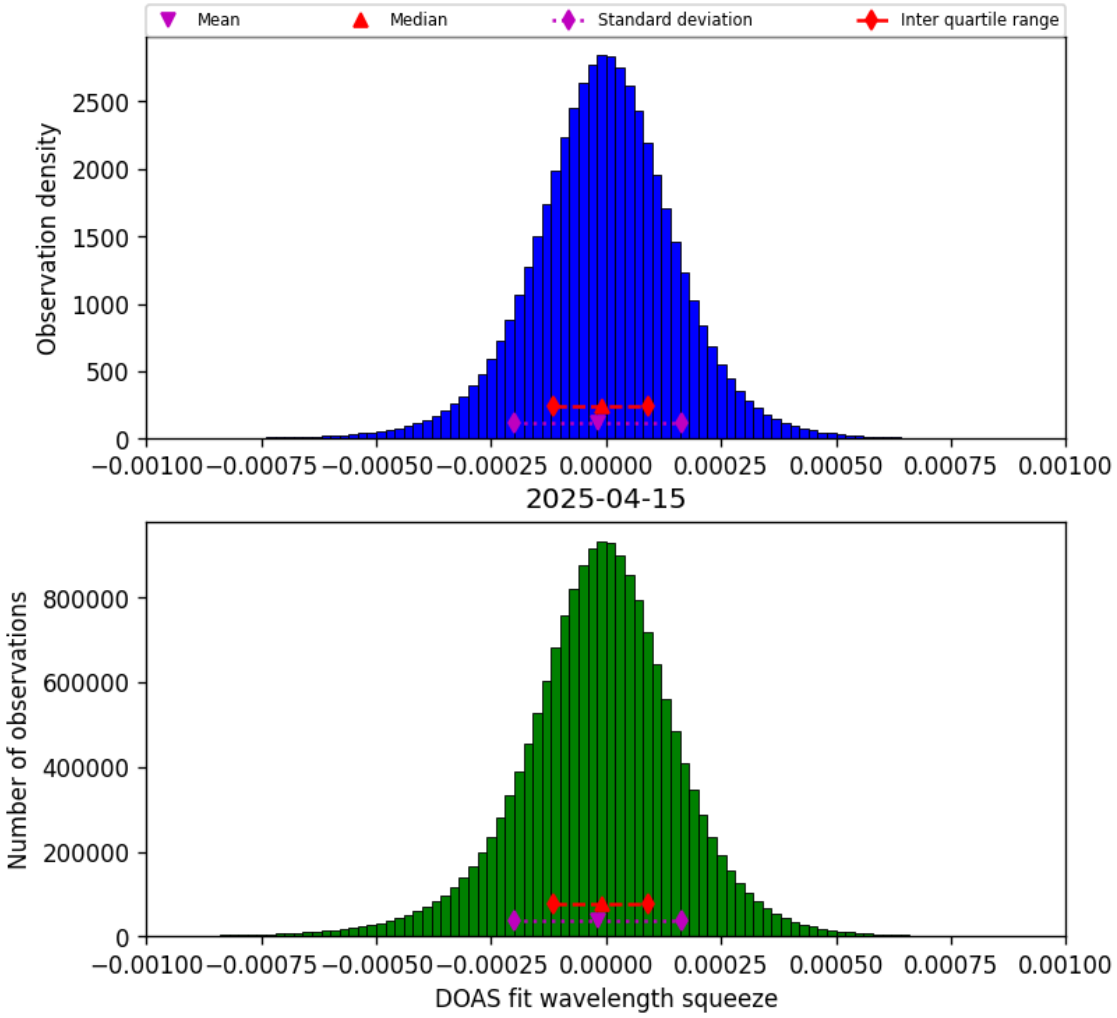

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-04-15 to 2025-04-16

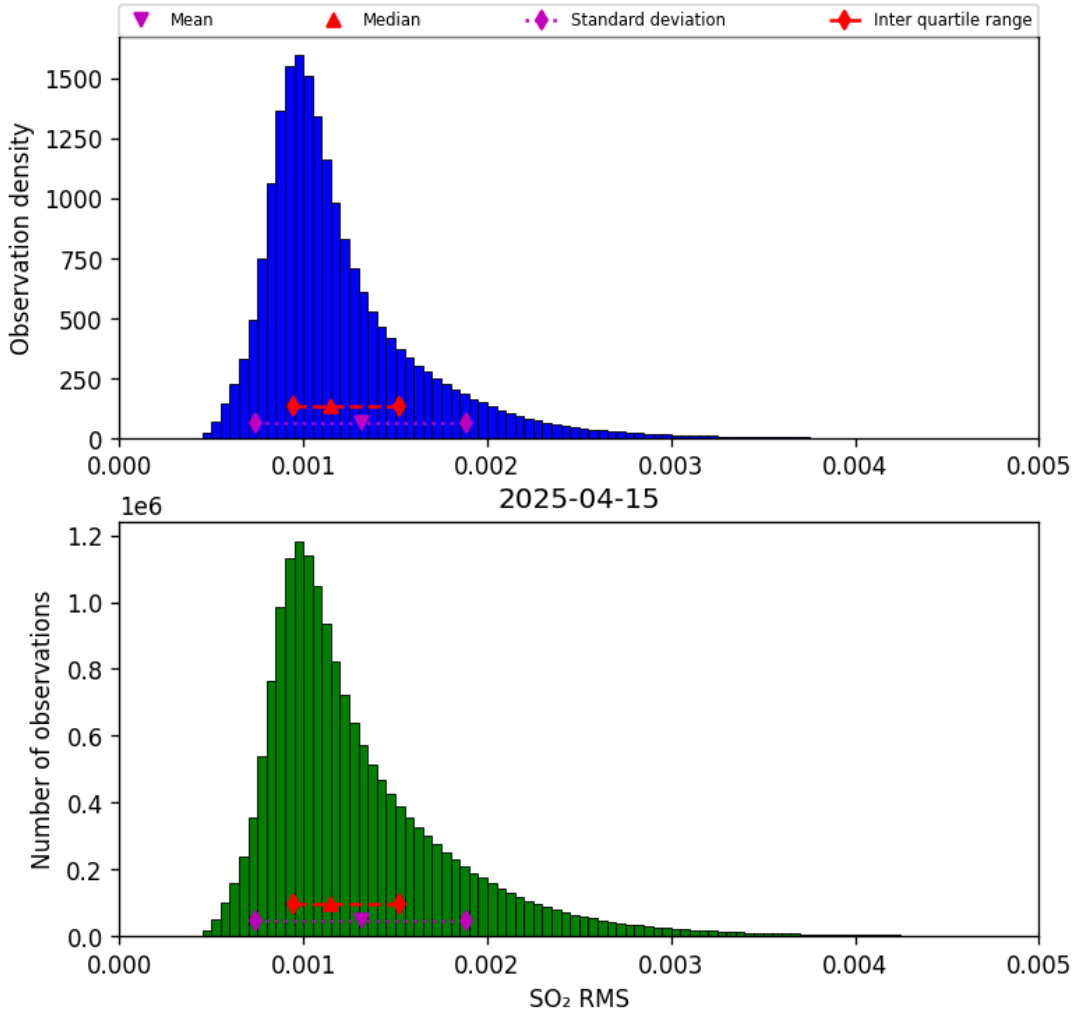

Figure 79: Histogram of "SO_2 RMS" for 2025-04-15 to 2025-04-16

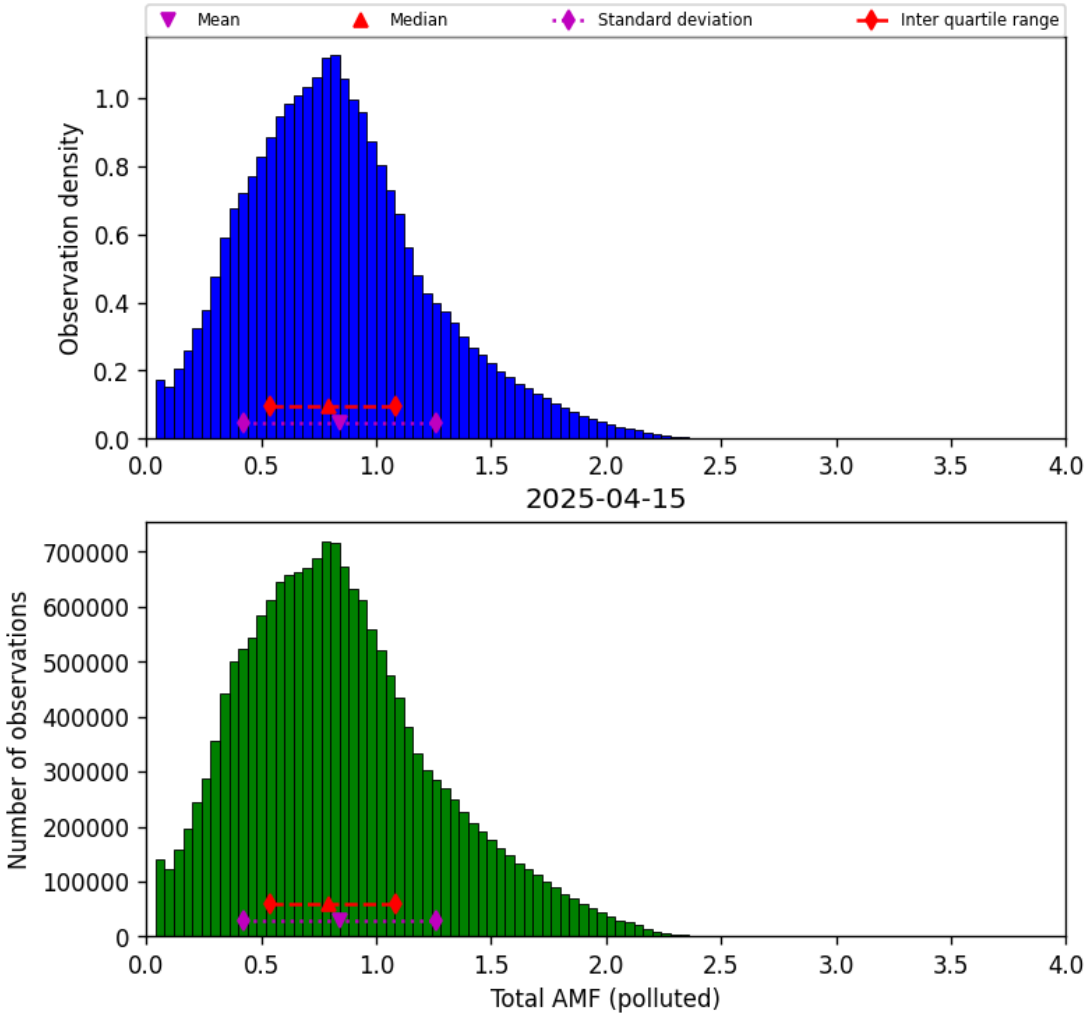

Figure 80: Histogram of “Total AMF (polluted)” for 2025-04-15 to 2025-04-16

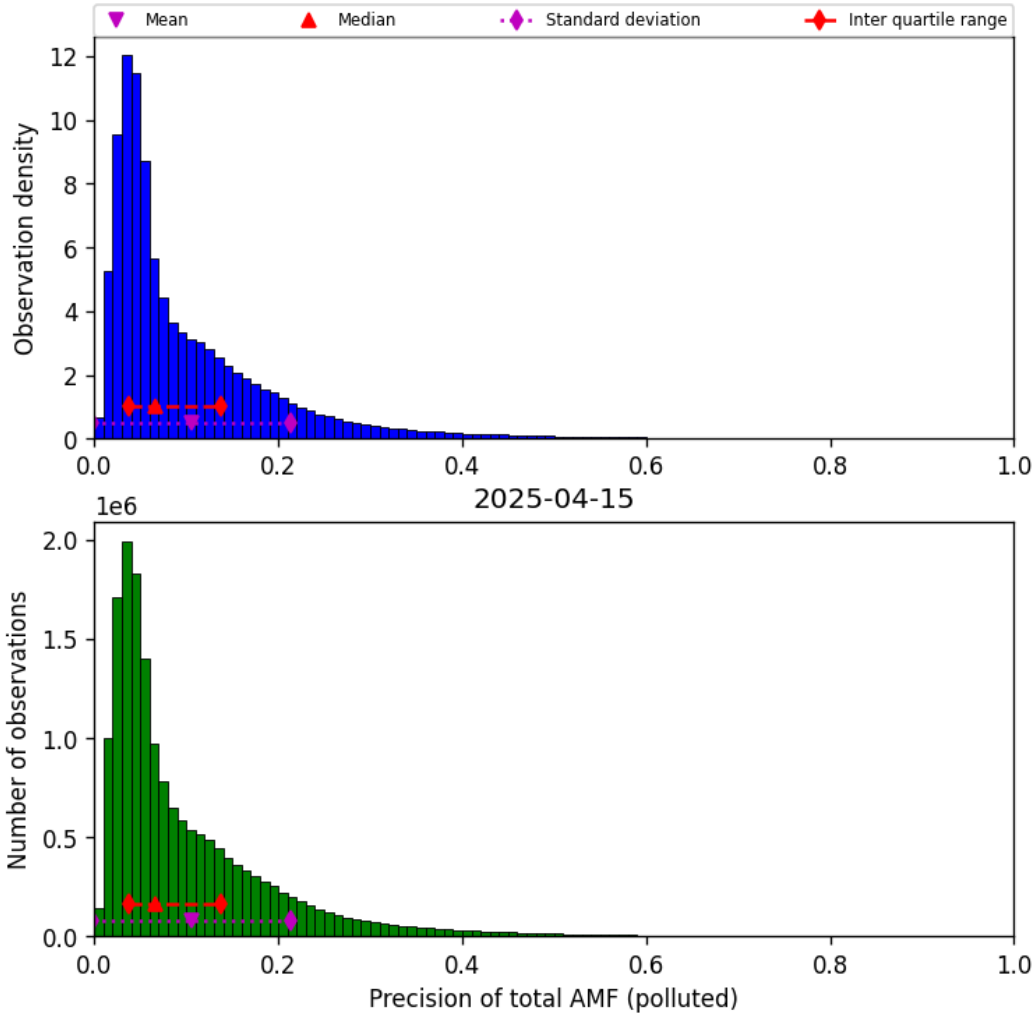

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-04-15 to 2025-04-16

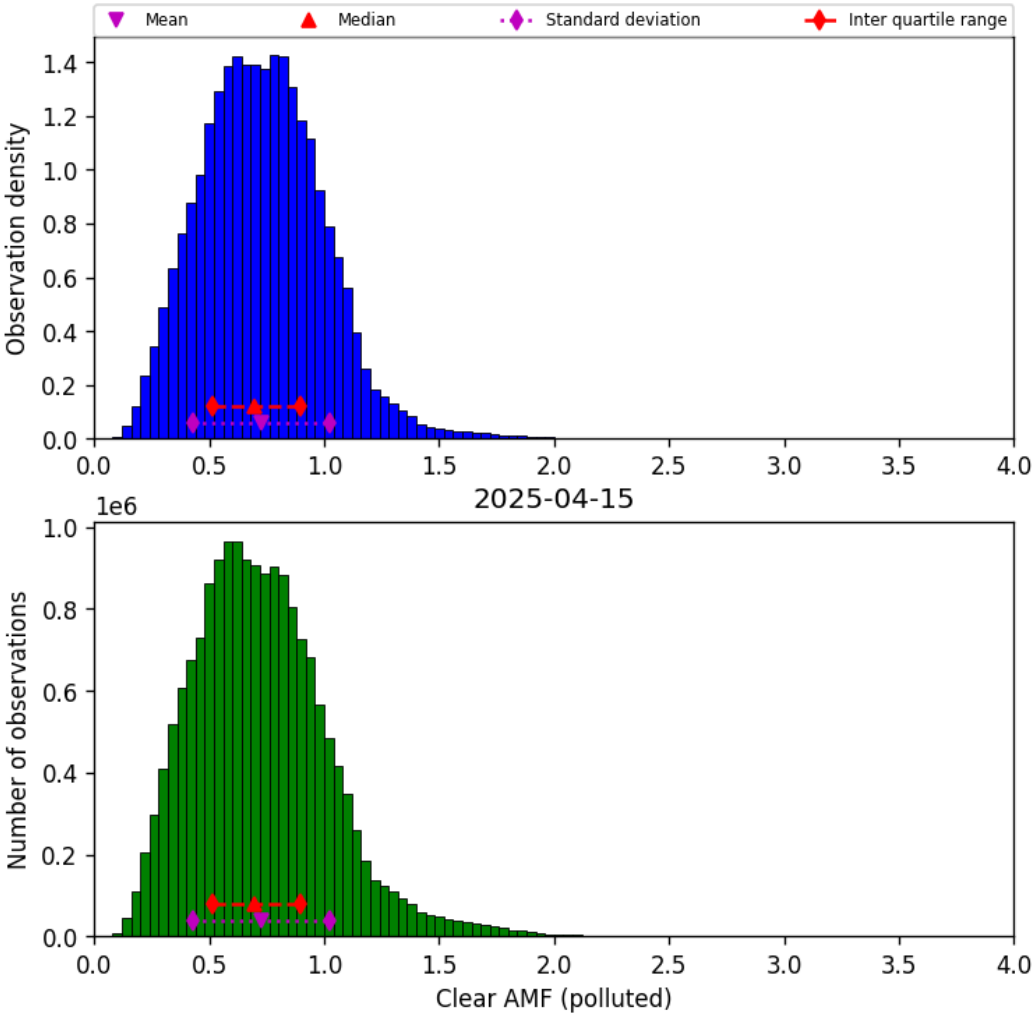

Figure 82: Histogram of “Clear AMF (polluted)” for 2025-04-15 to 2025-04-16

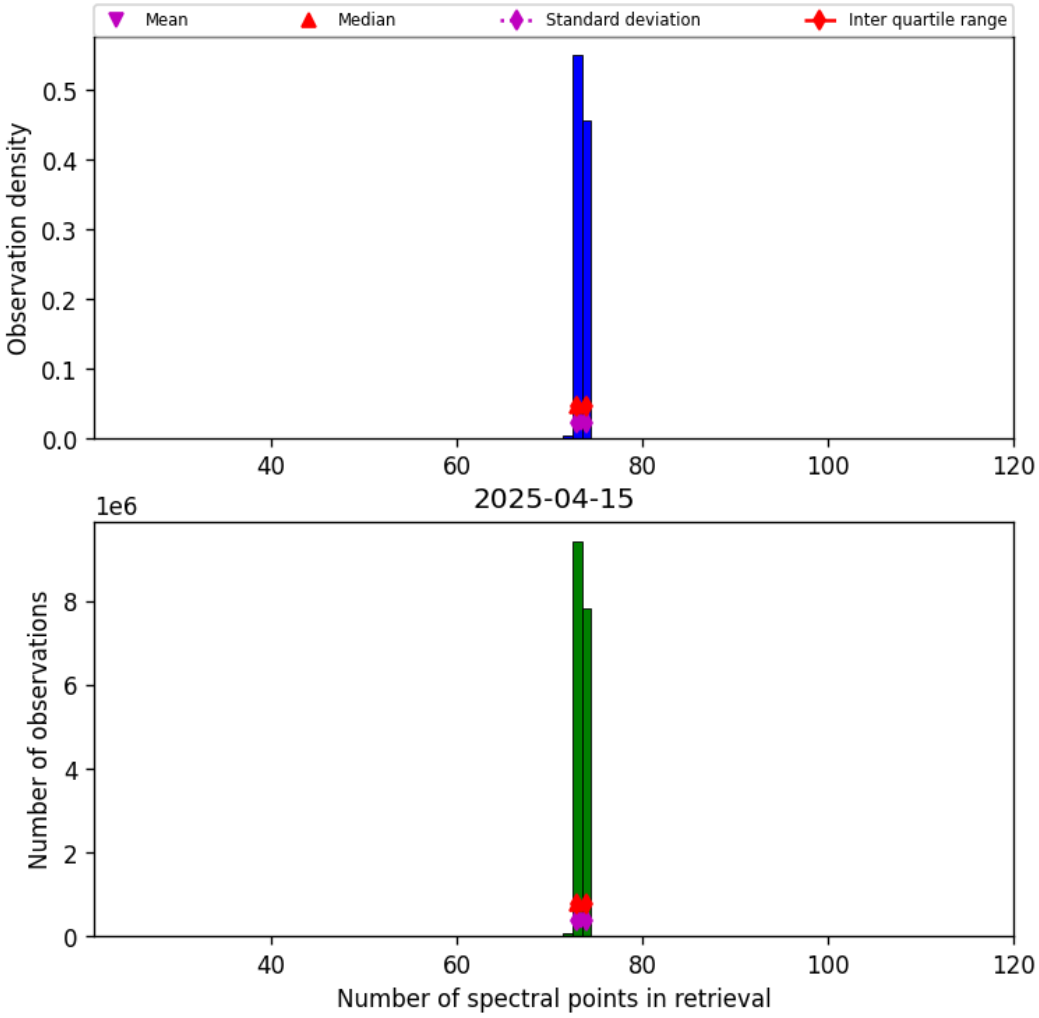

Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-04-15 to 2025-04-16

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.

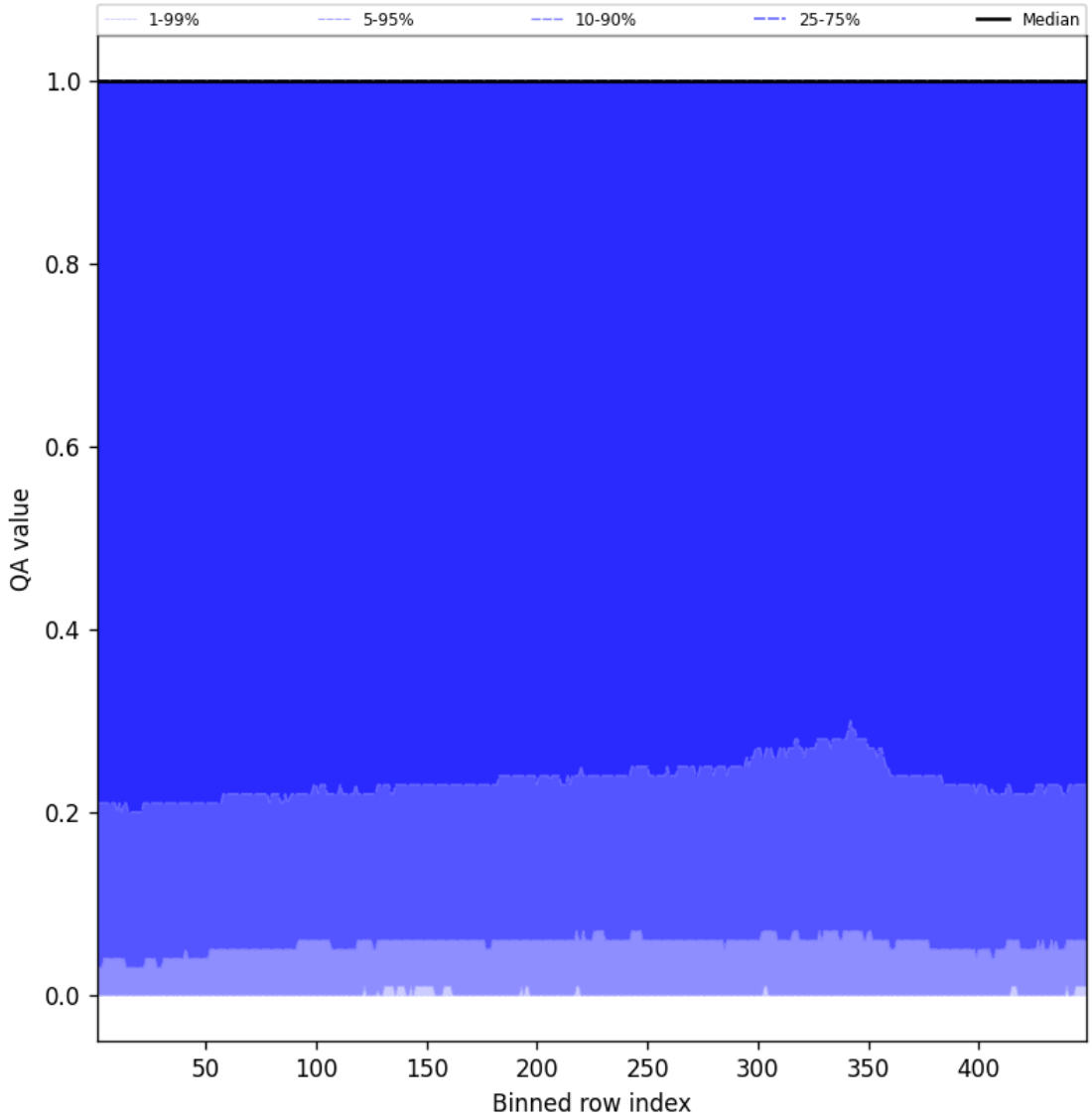

Figure 84: Along track statistics of “QA value” for 2025-04-15 to 2025-04-16

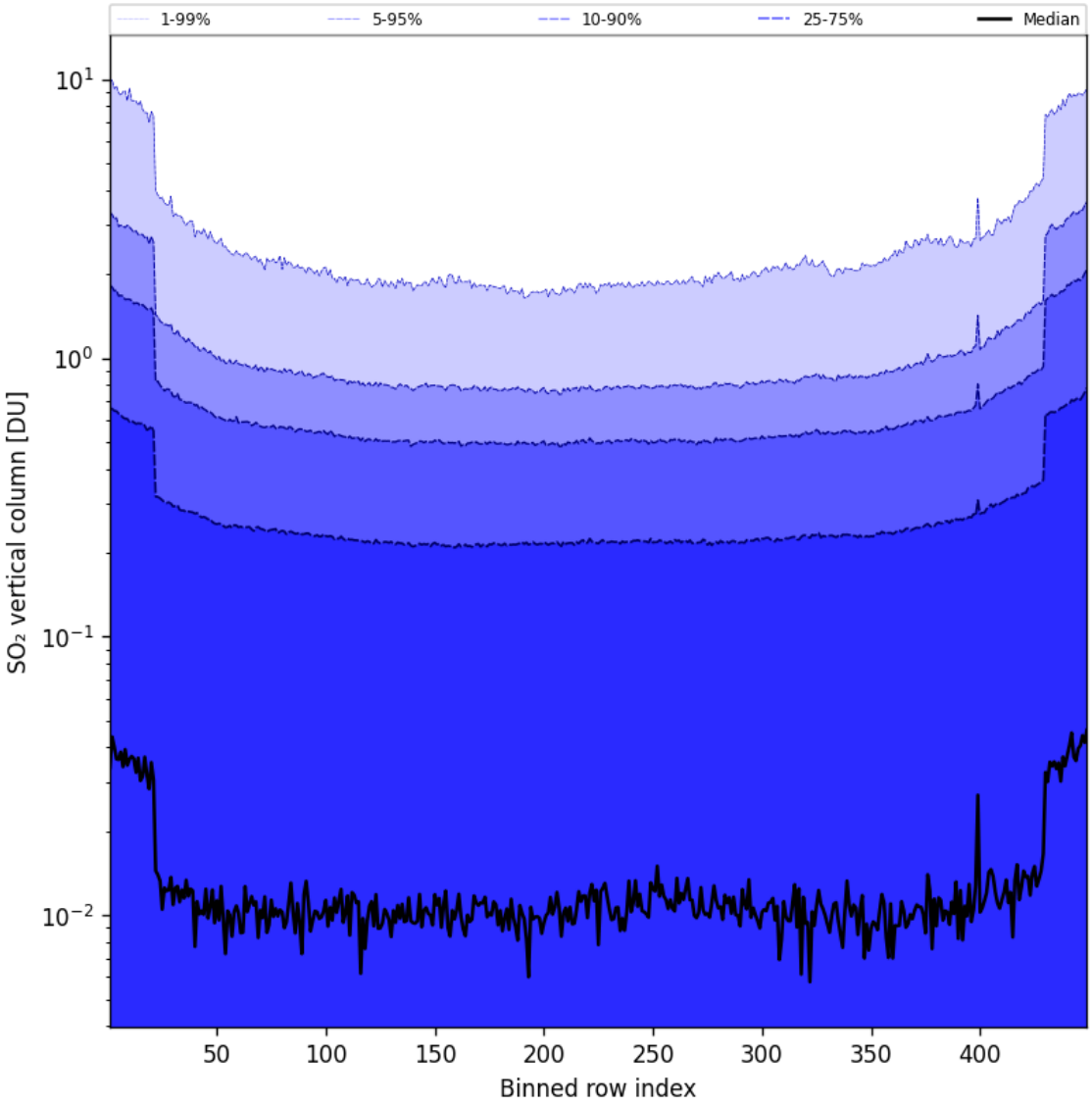

Figure 85: Along track statistics of "SO_2 vertical column" for 2025-04-15 to 2025-04-16

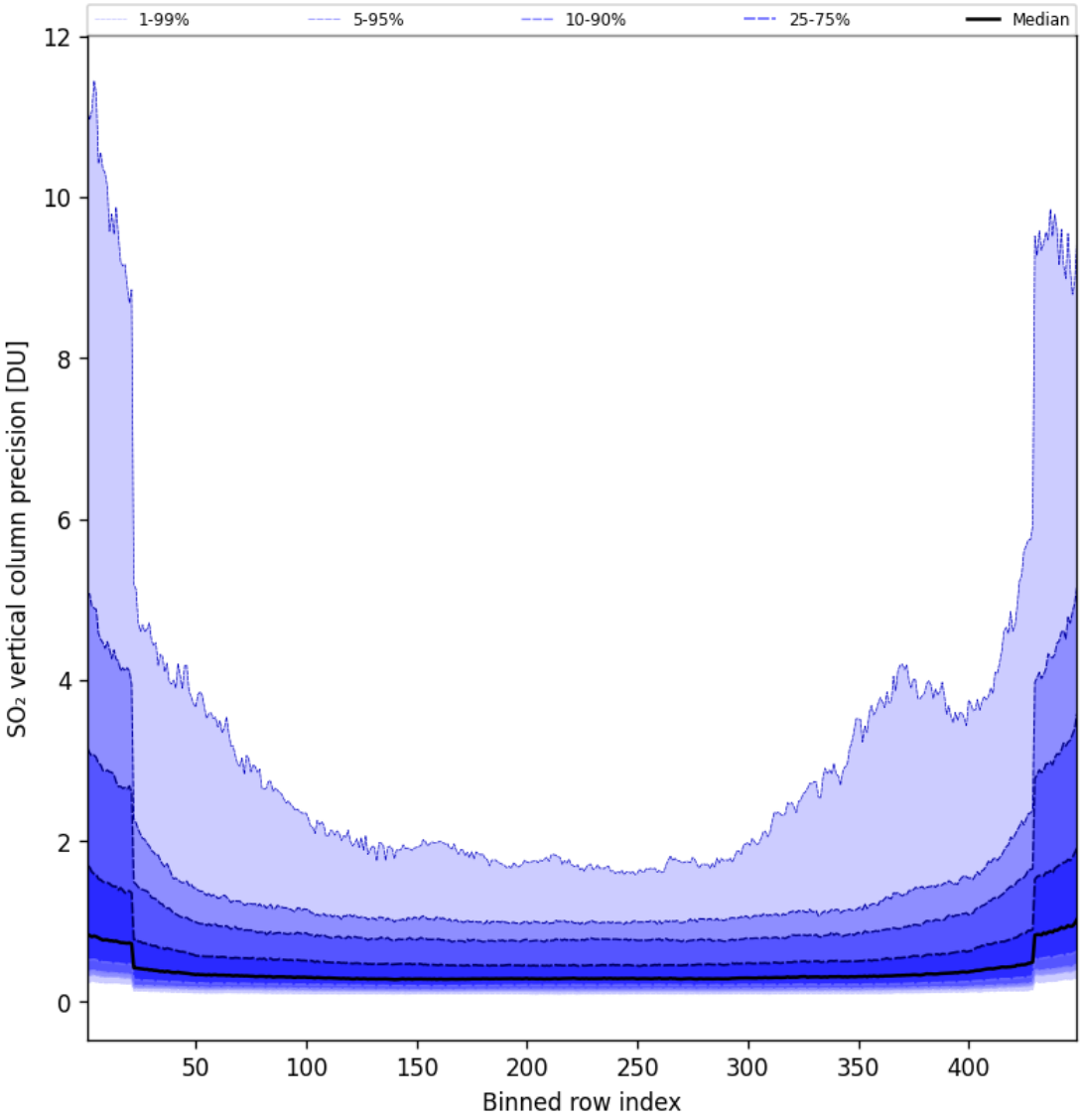

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-04-15 to 2025-04-16

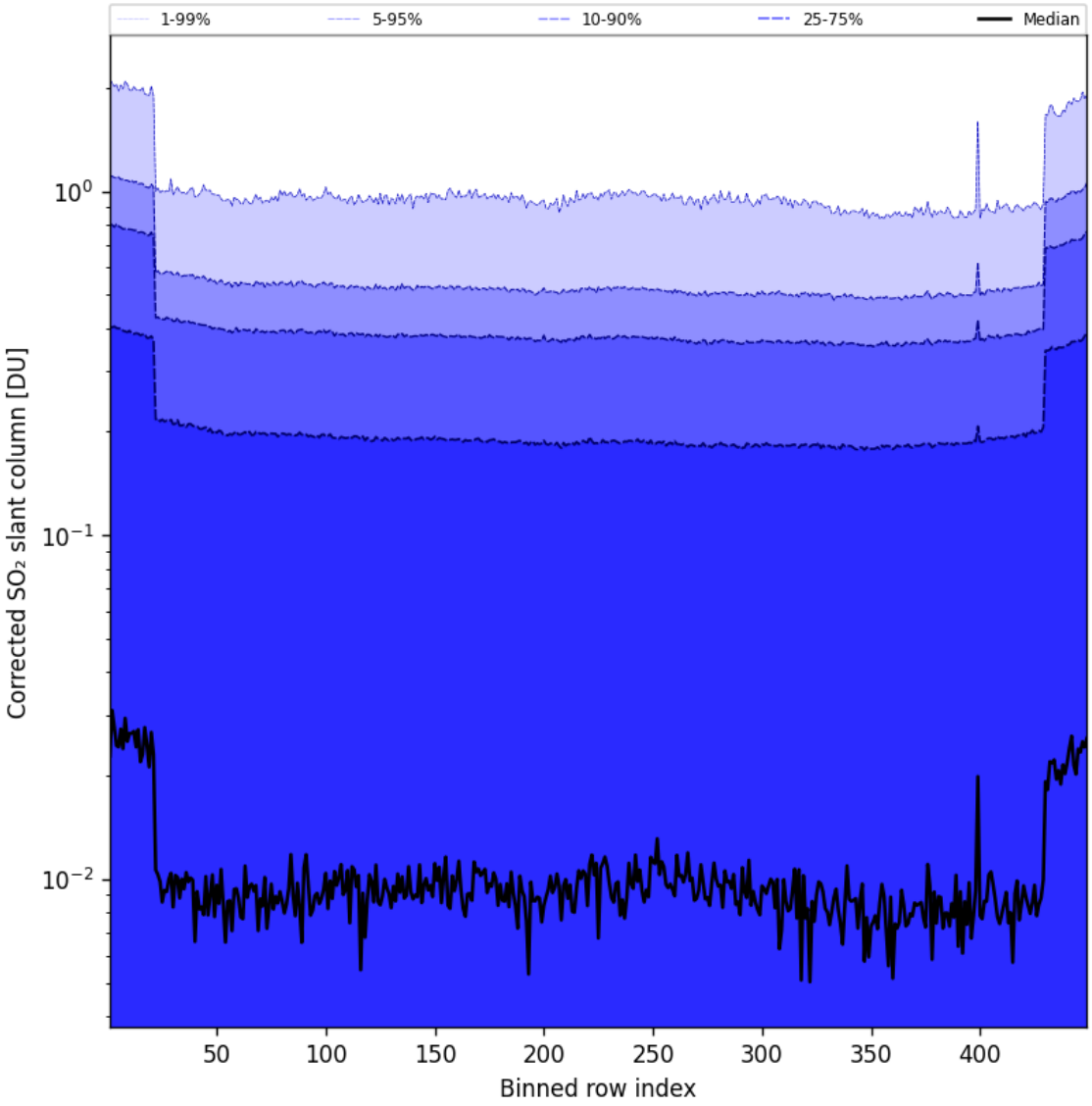

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-04-15 to 2025-04-16

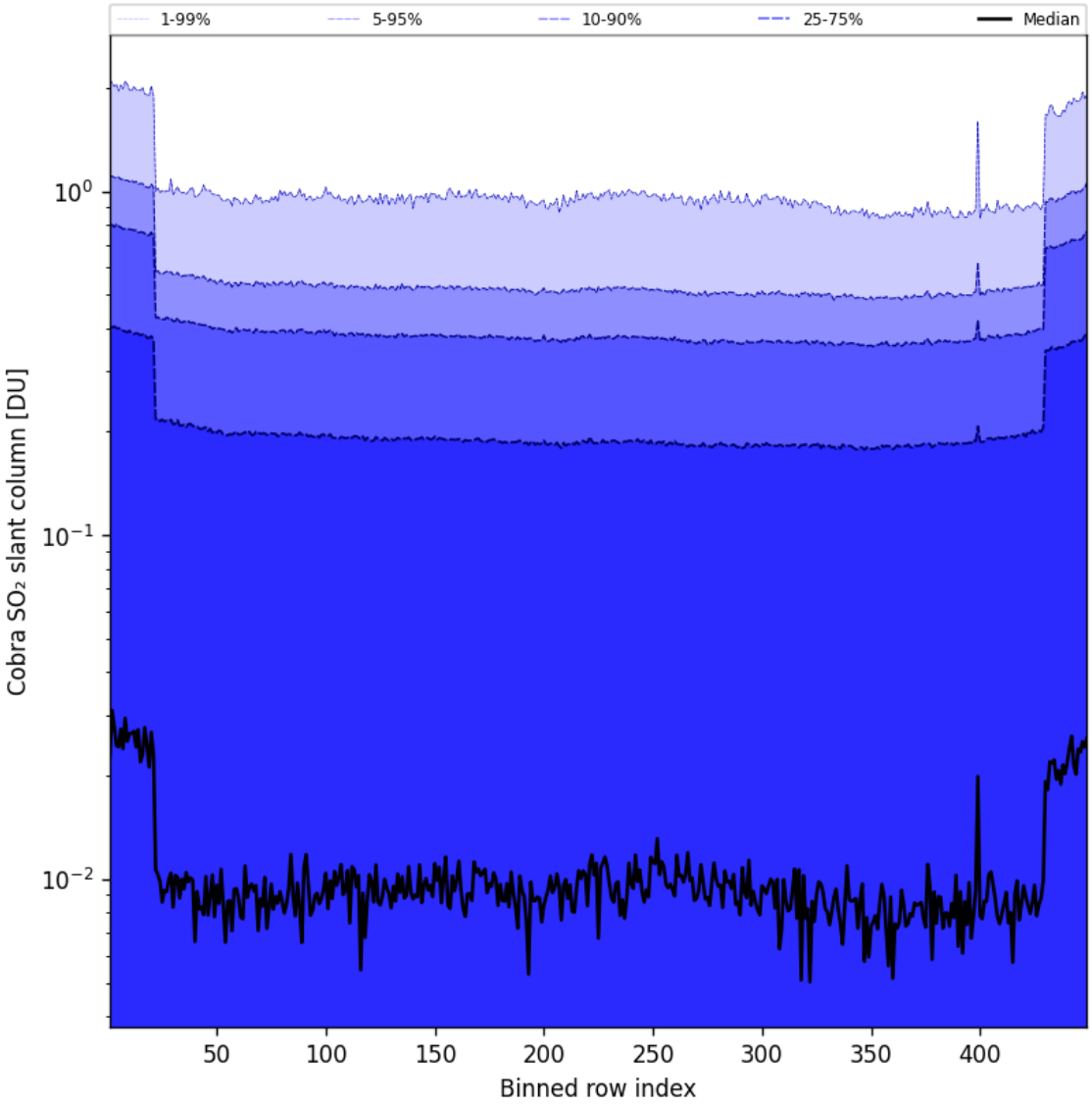

Figure 88: Along track statistics of “Cobra SO_2 slant column” for 2025-04-15 to 2025-04-16

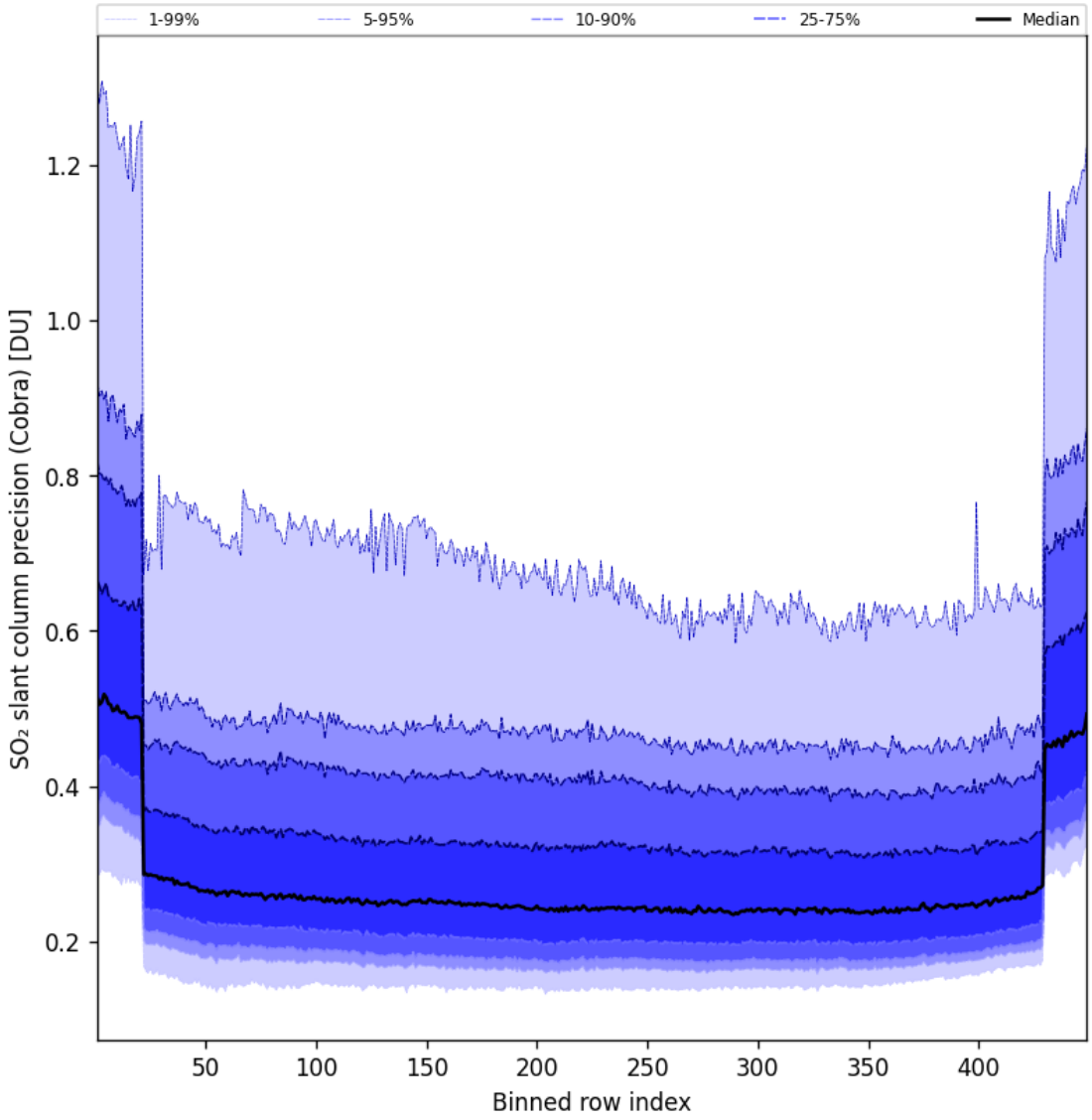

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-04-15 to 2025-04-16

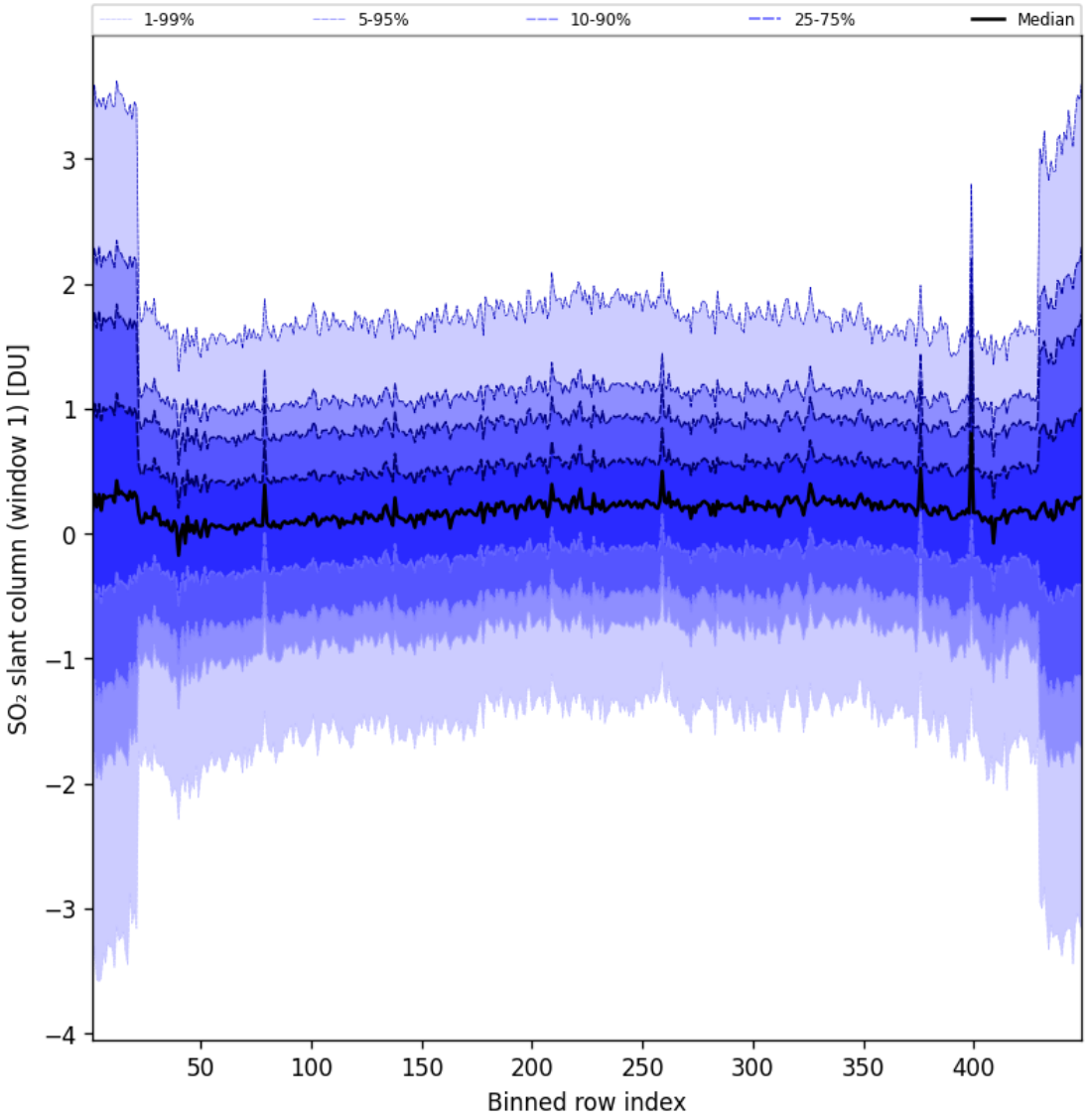

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-04-15 to 2025-04-16

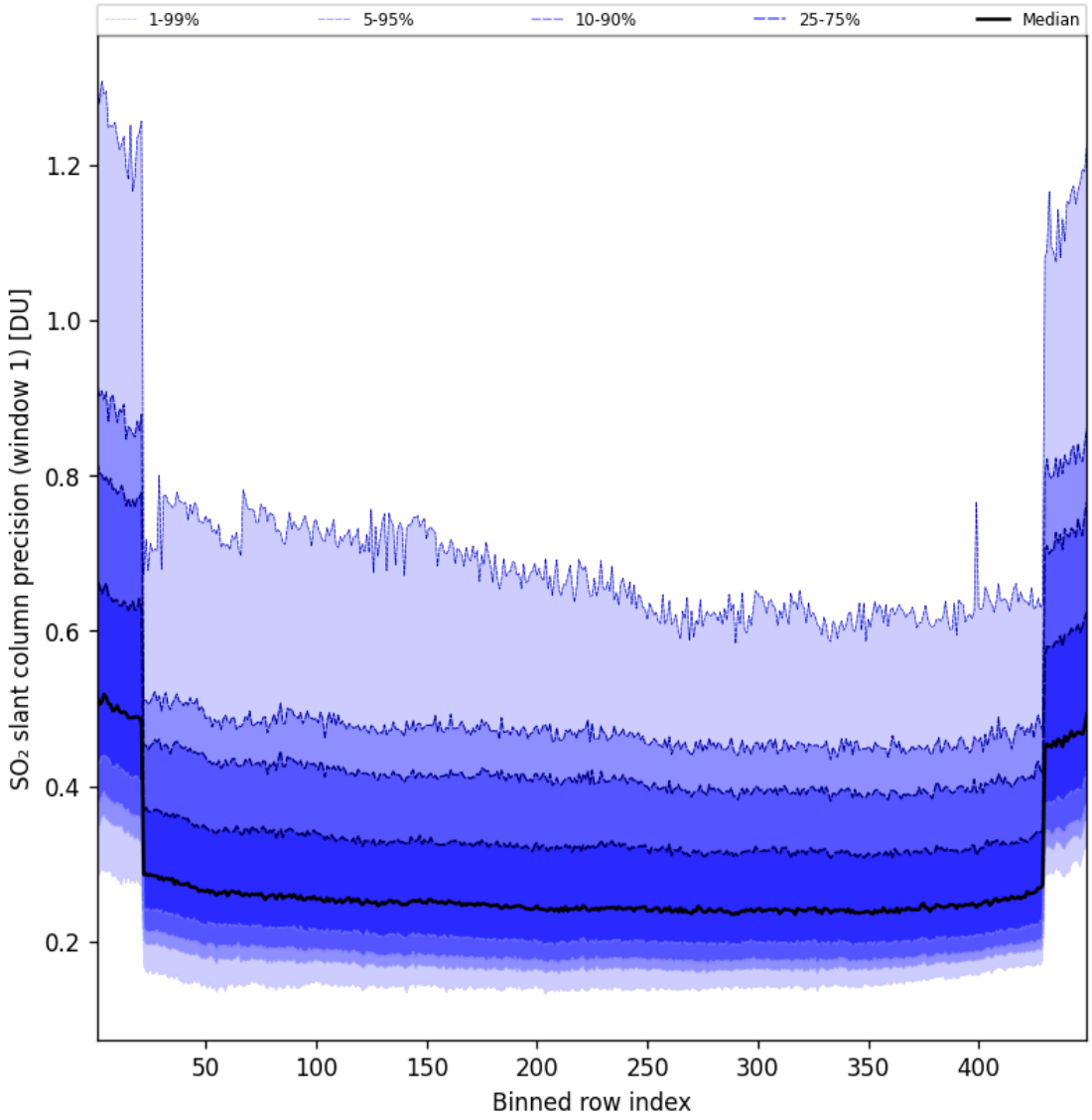

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-04-15 to 2025-04-16

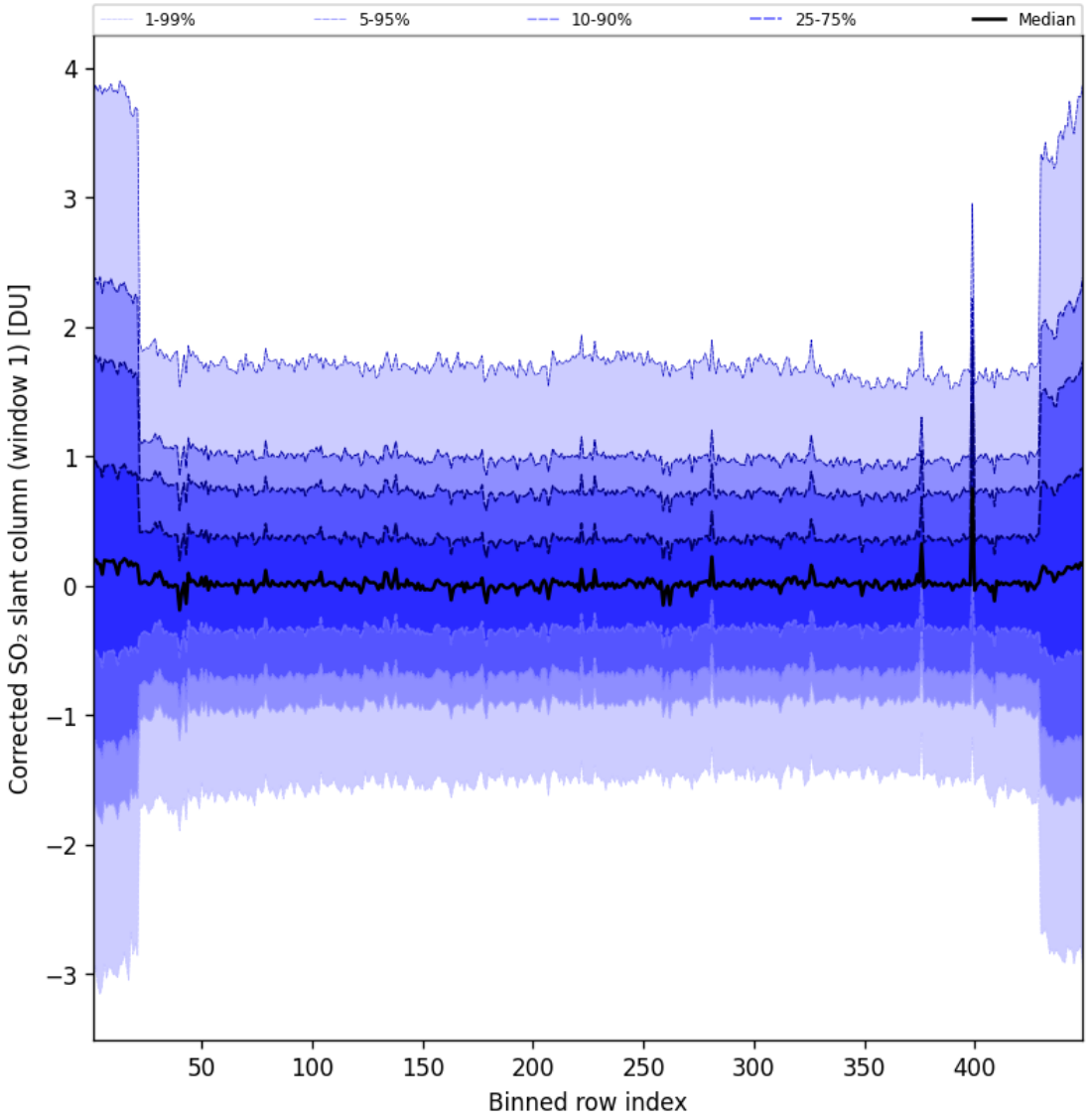

Figure 92: Along track statistics of "Corrected SO_2 slant column (window 1)" for 2025-04-15 to 2025-04-16

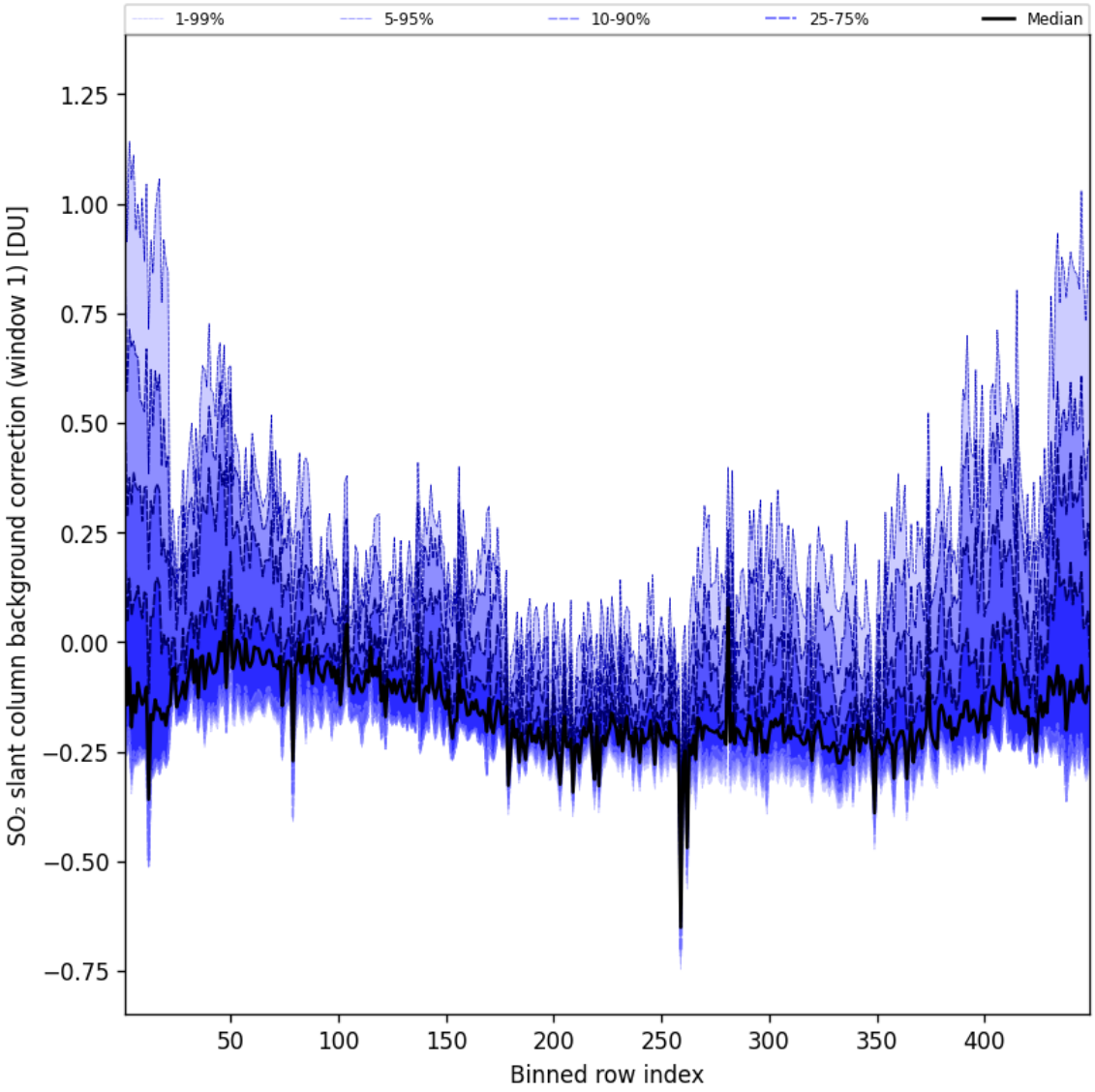

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-04-15 to 2025-04-16

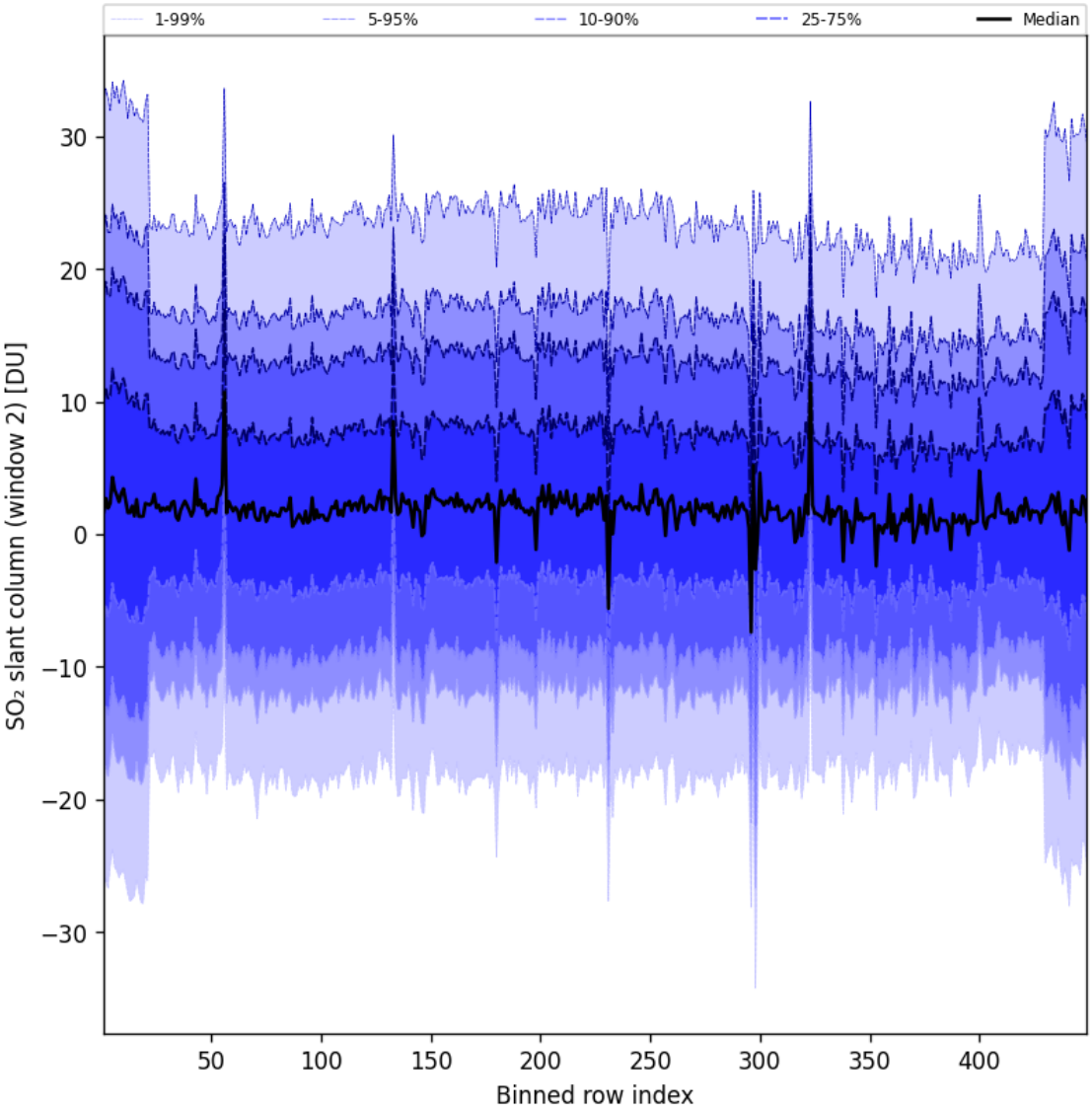

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-04-15 to 2025-04-16

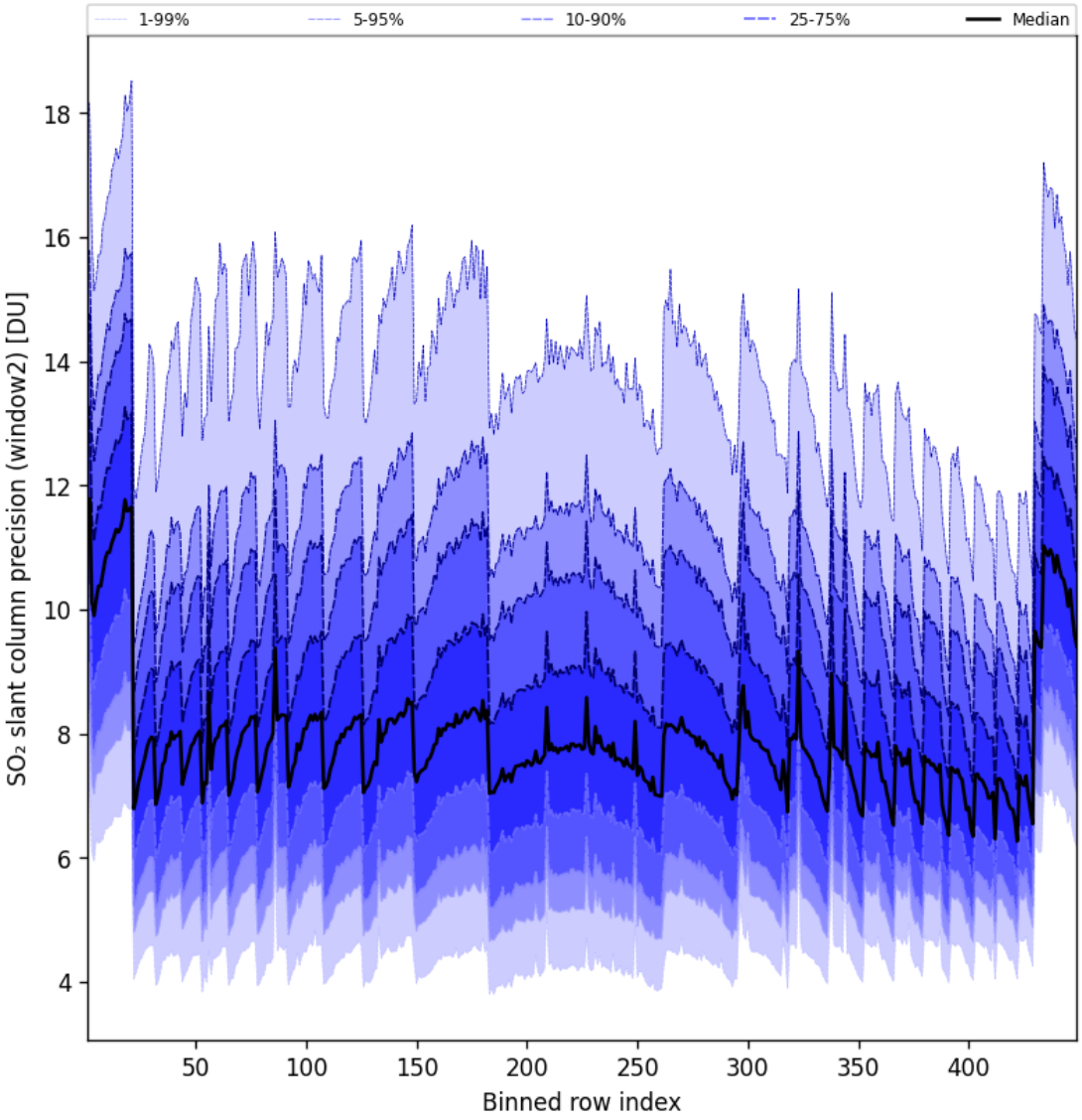

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-04-15 to 2025-04-16

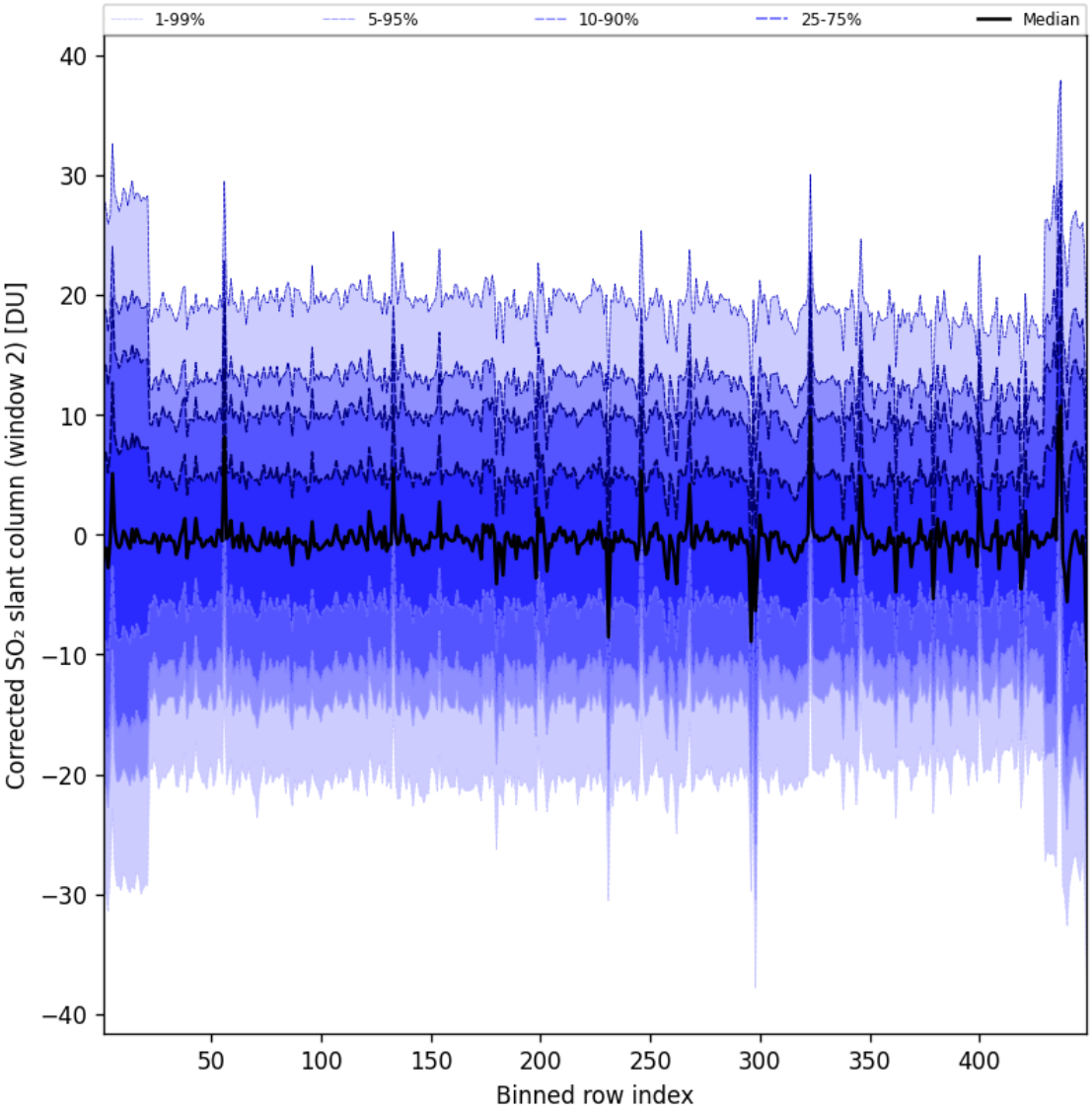

Figure 96: Along track statistics of "Corrected SO_2 slant column (window 2)" for 2025-04-15 to 2025-04-16

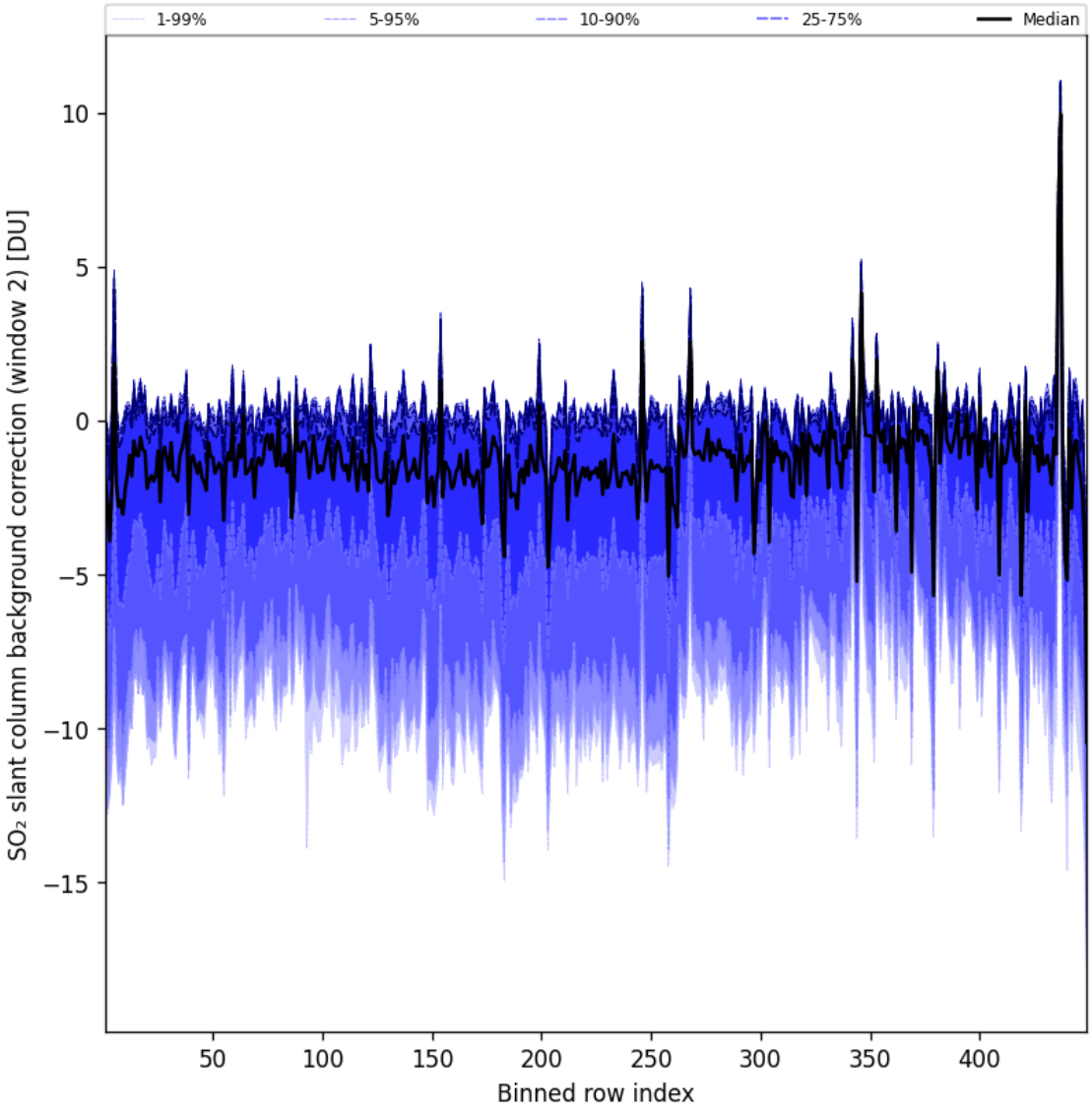

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-04-15 to 2025-04-16

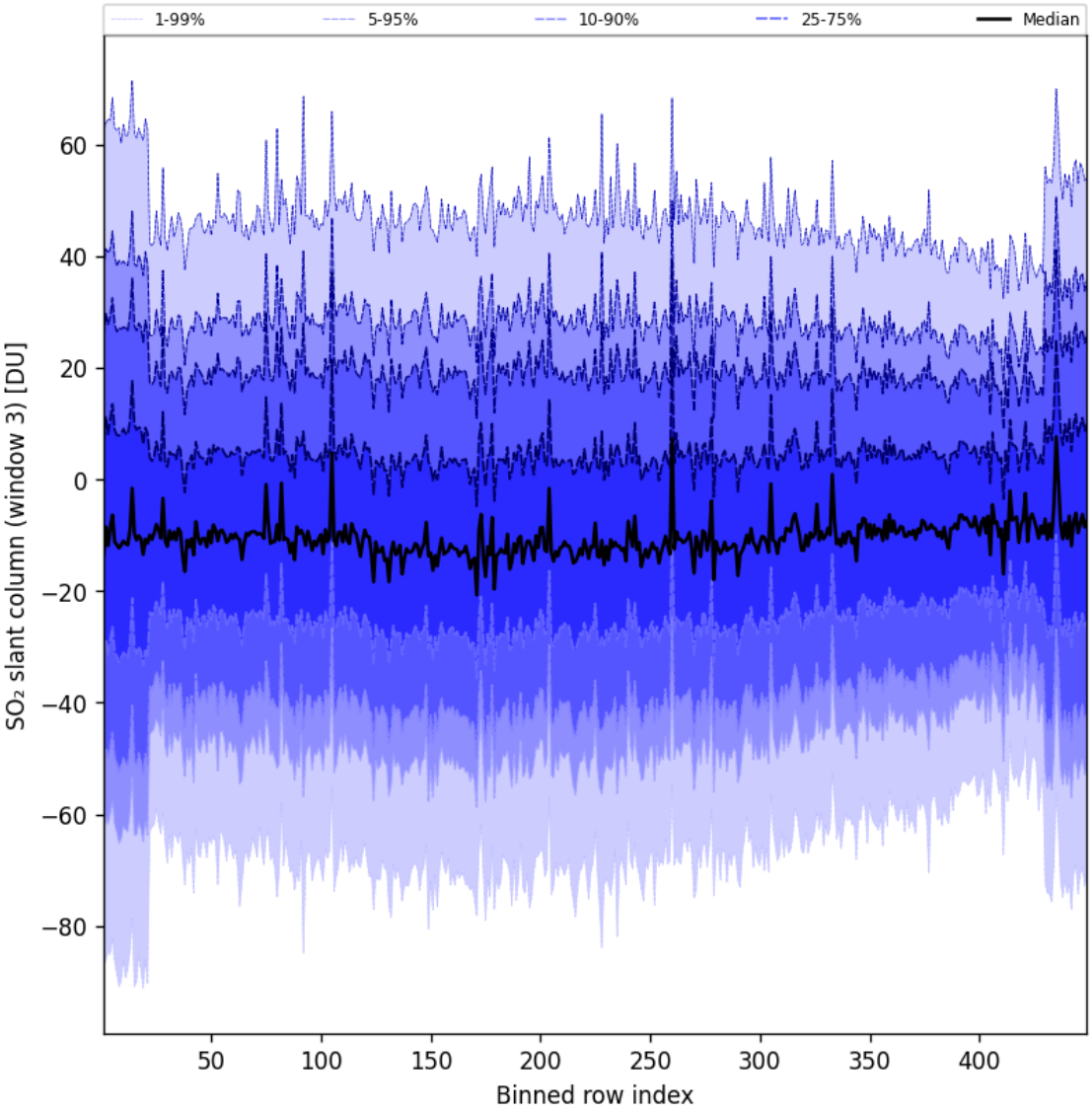

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-04-15 to 2025-04-16

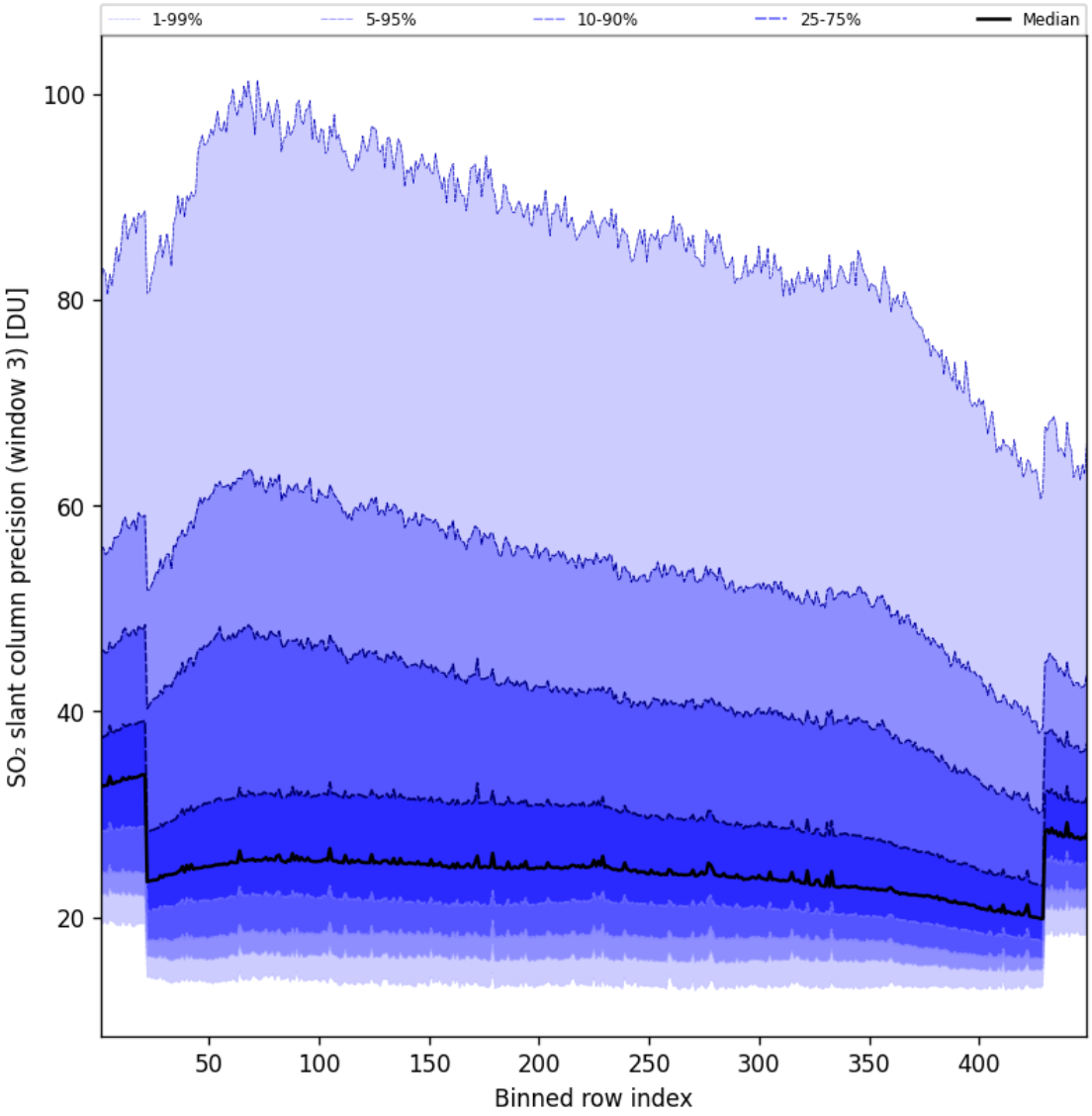

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-04-15 to 2025-04-16

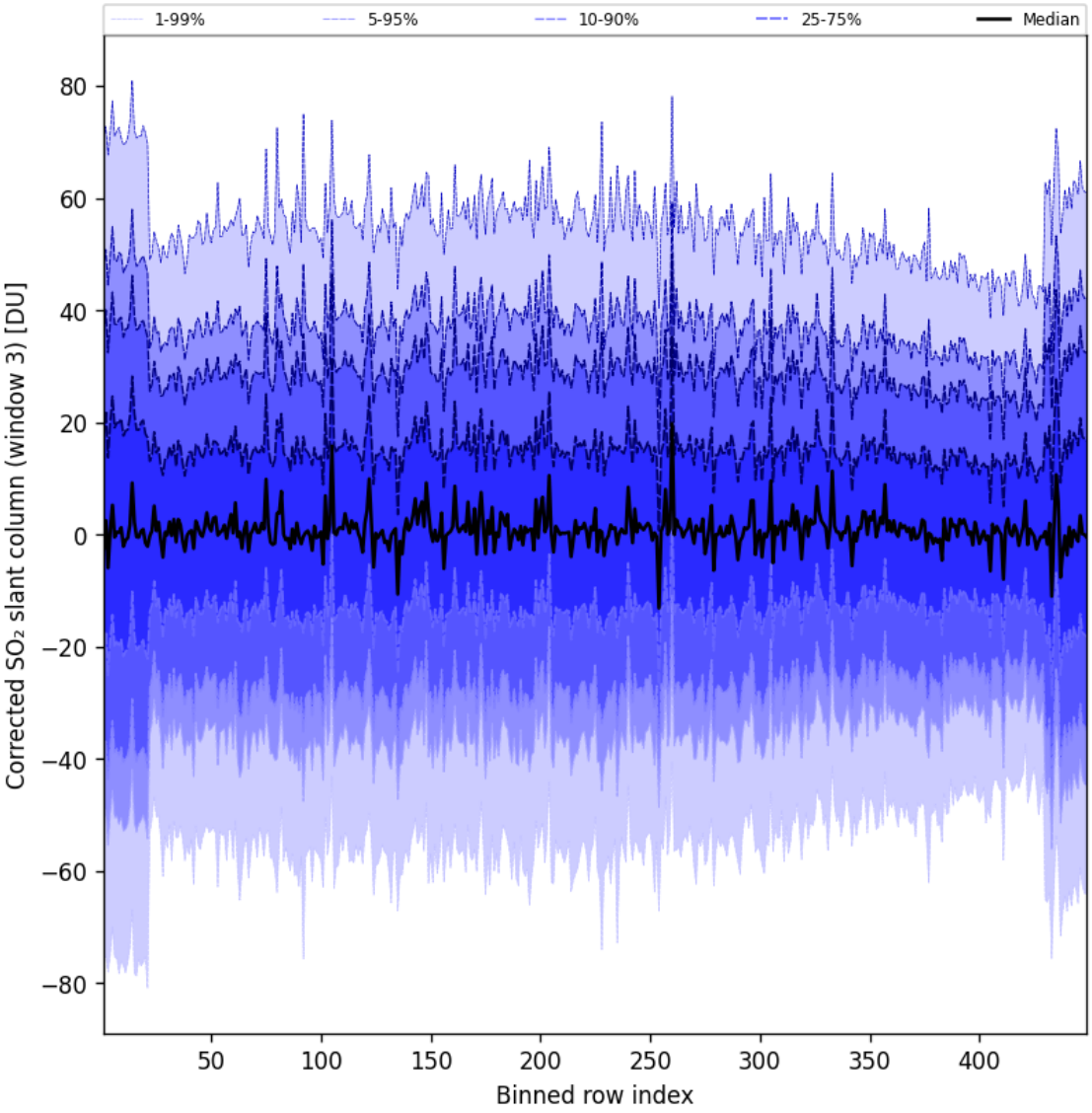

Figure 100: Along track statistics of "Corrected SO_2 slant column (window 3)" for 2025-04-15 to 2025-04-16

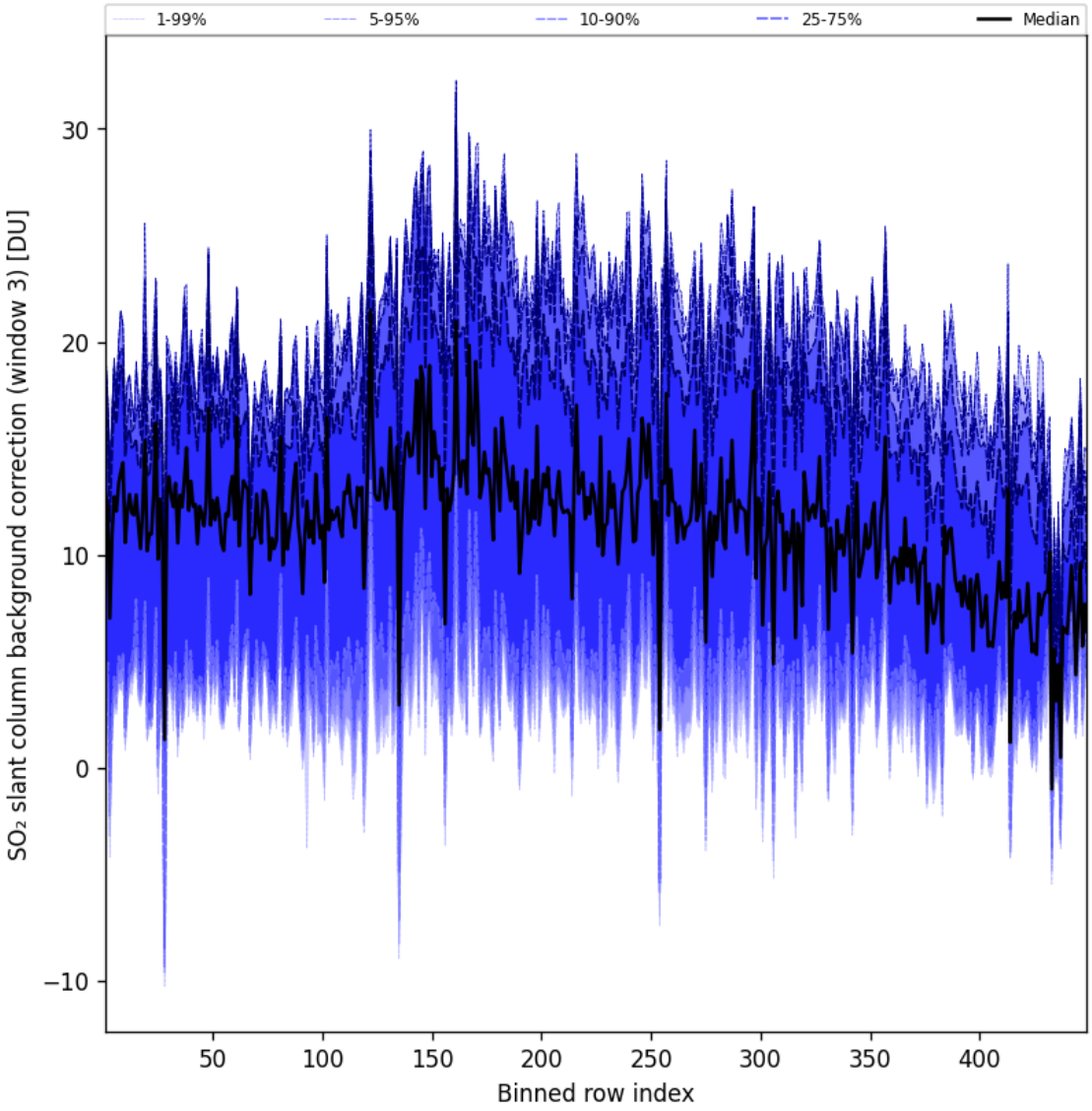

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-04-15 to 2025-04-16

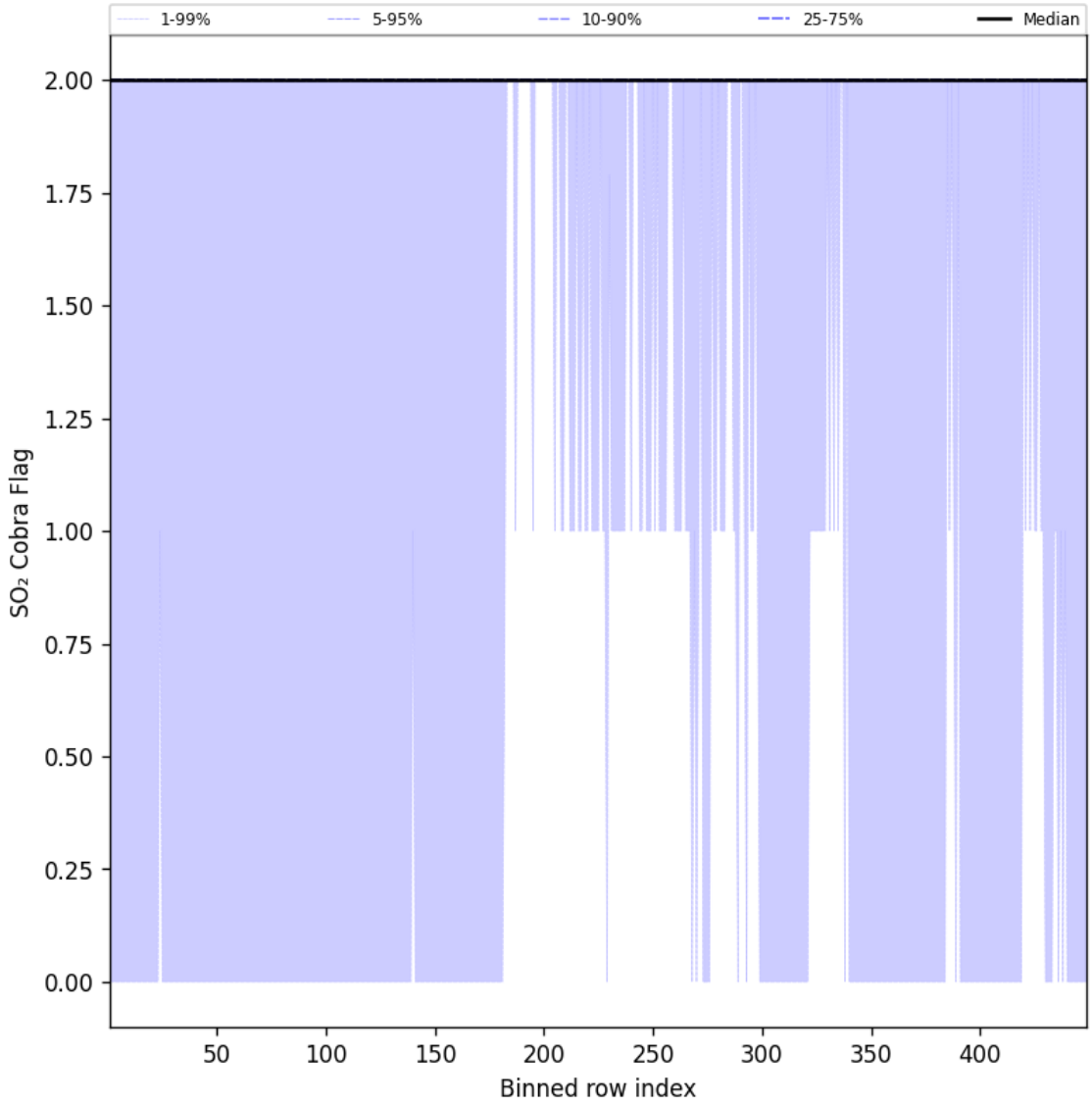

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-04-15 to 2025-04-16

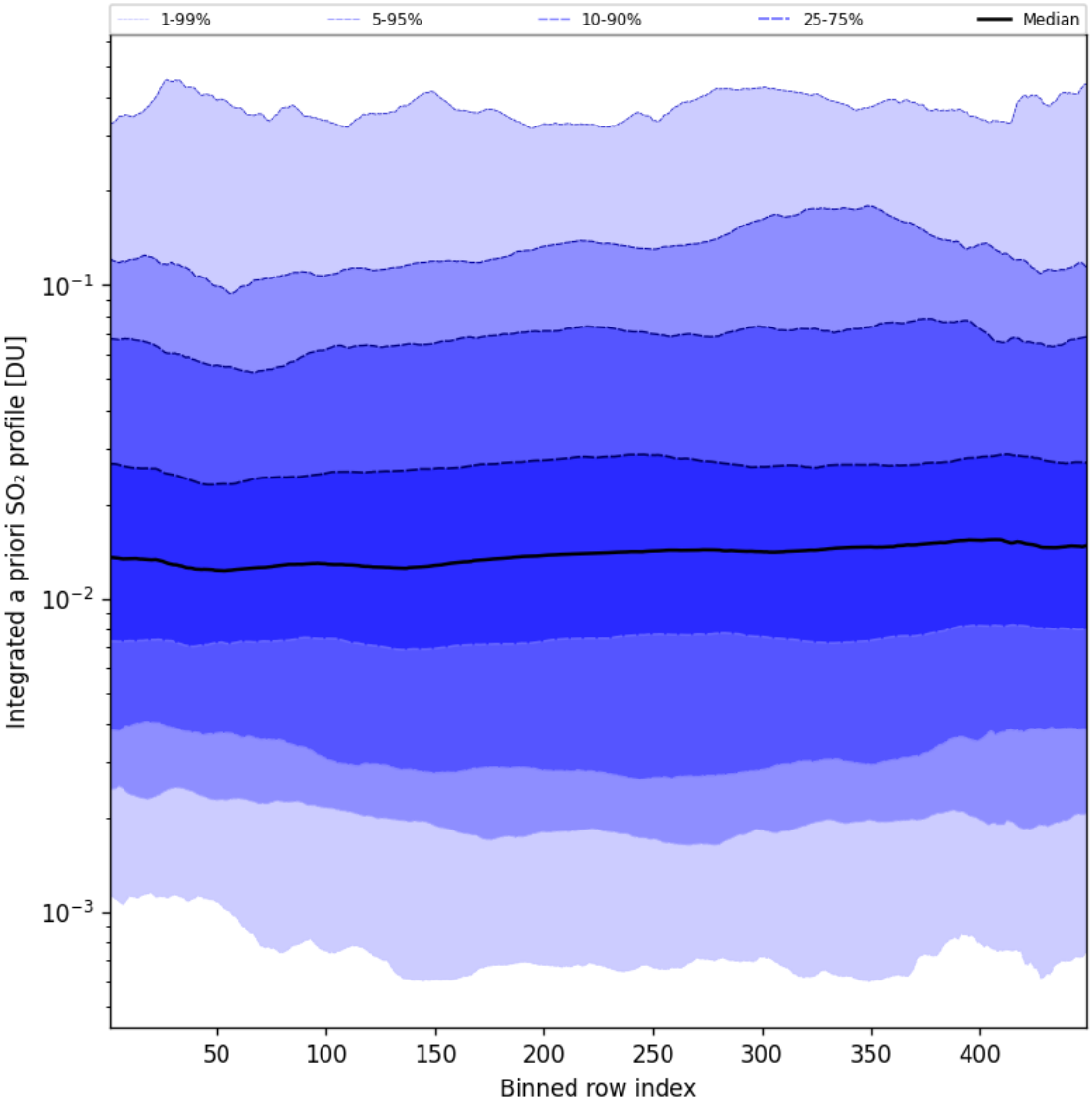

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-04-15 to 2025-04-16

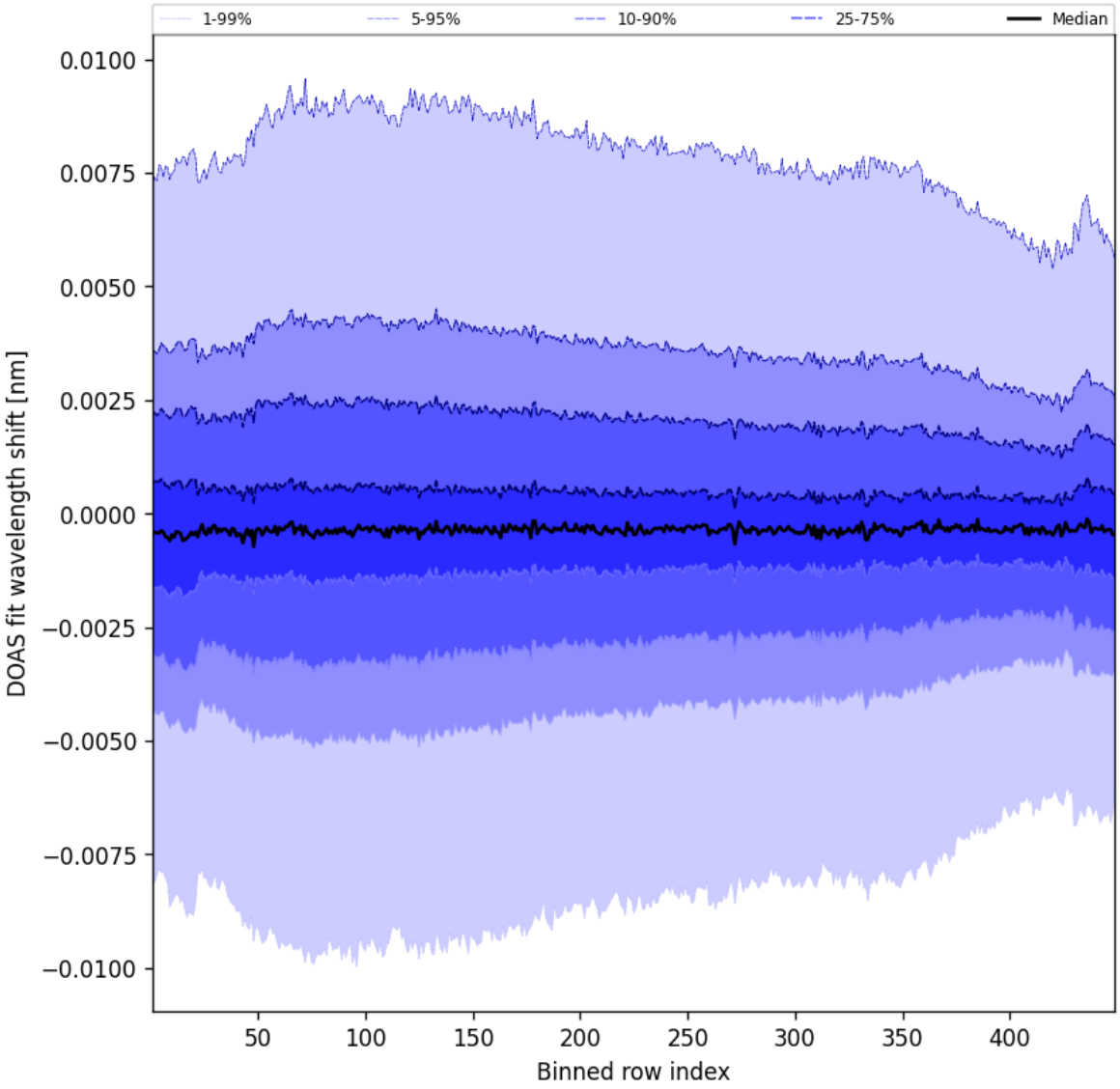

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-04-15 to 2025-04-16

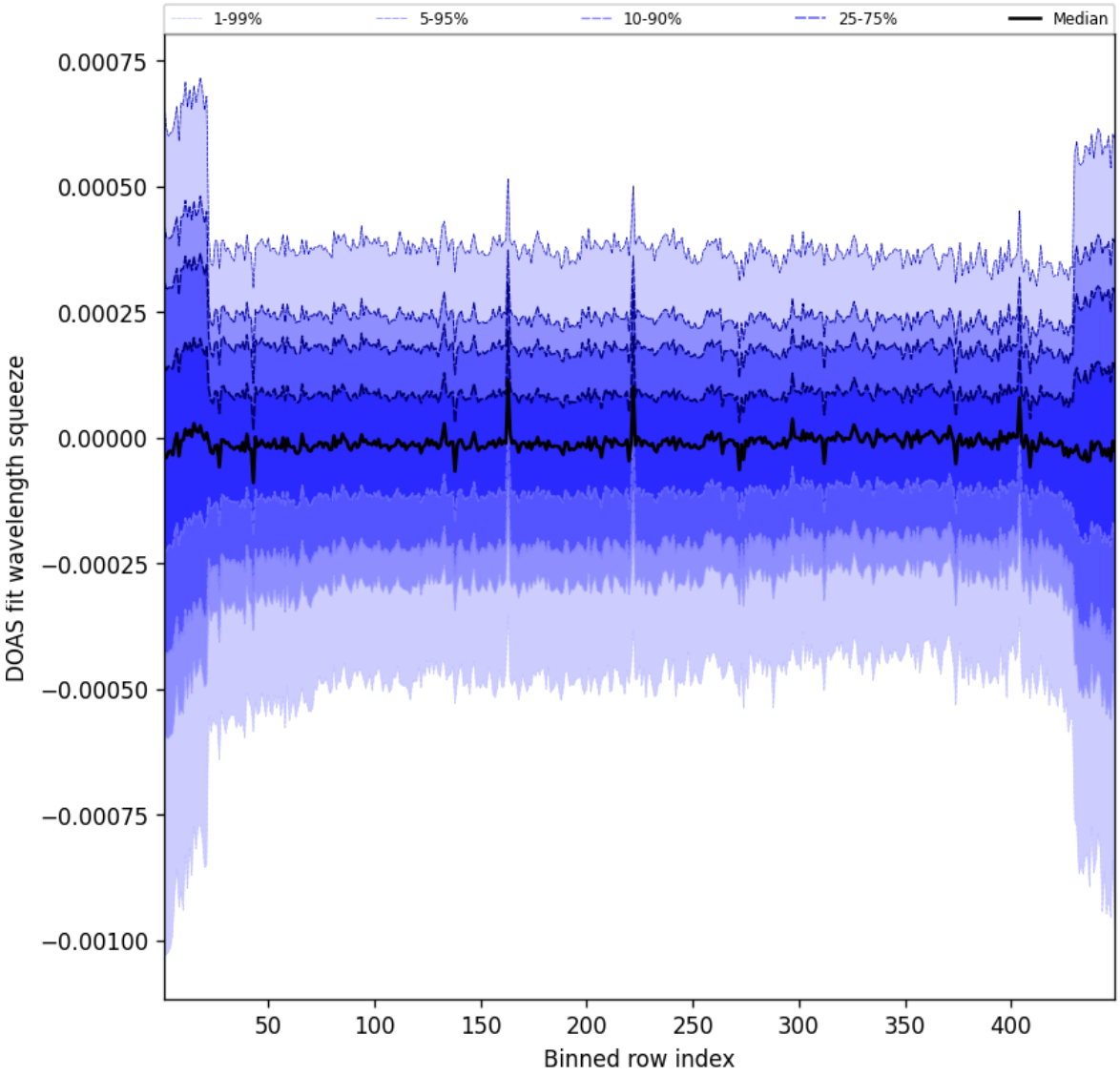

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-04-15 to 2025-04-16

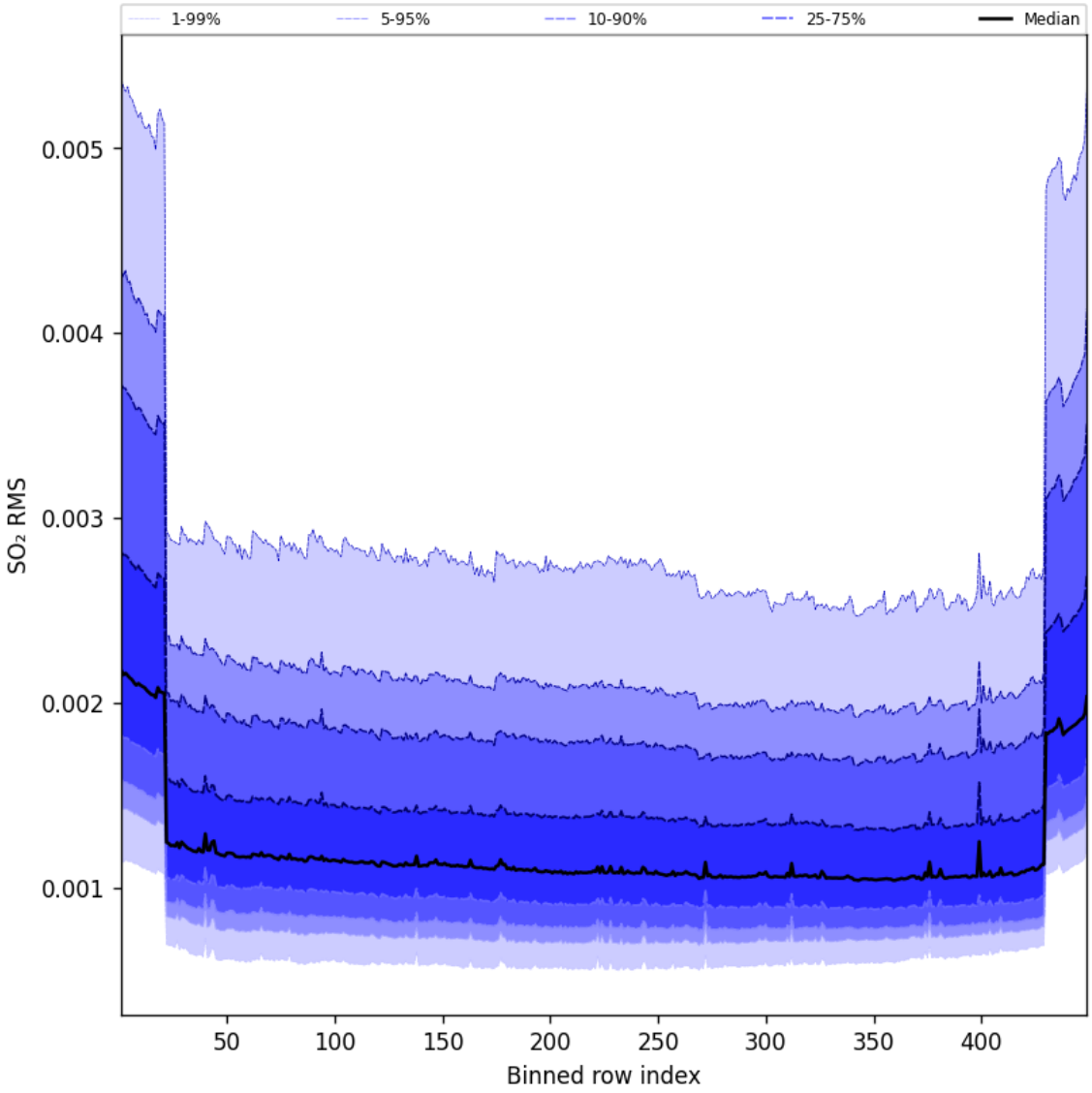

Figure 106: Along track statistics of "SO_2 RMS" for 2025-04-15 to 2025-04-16

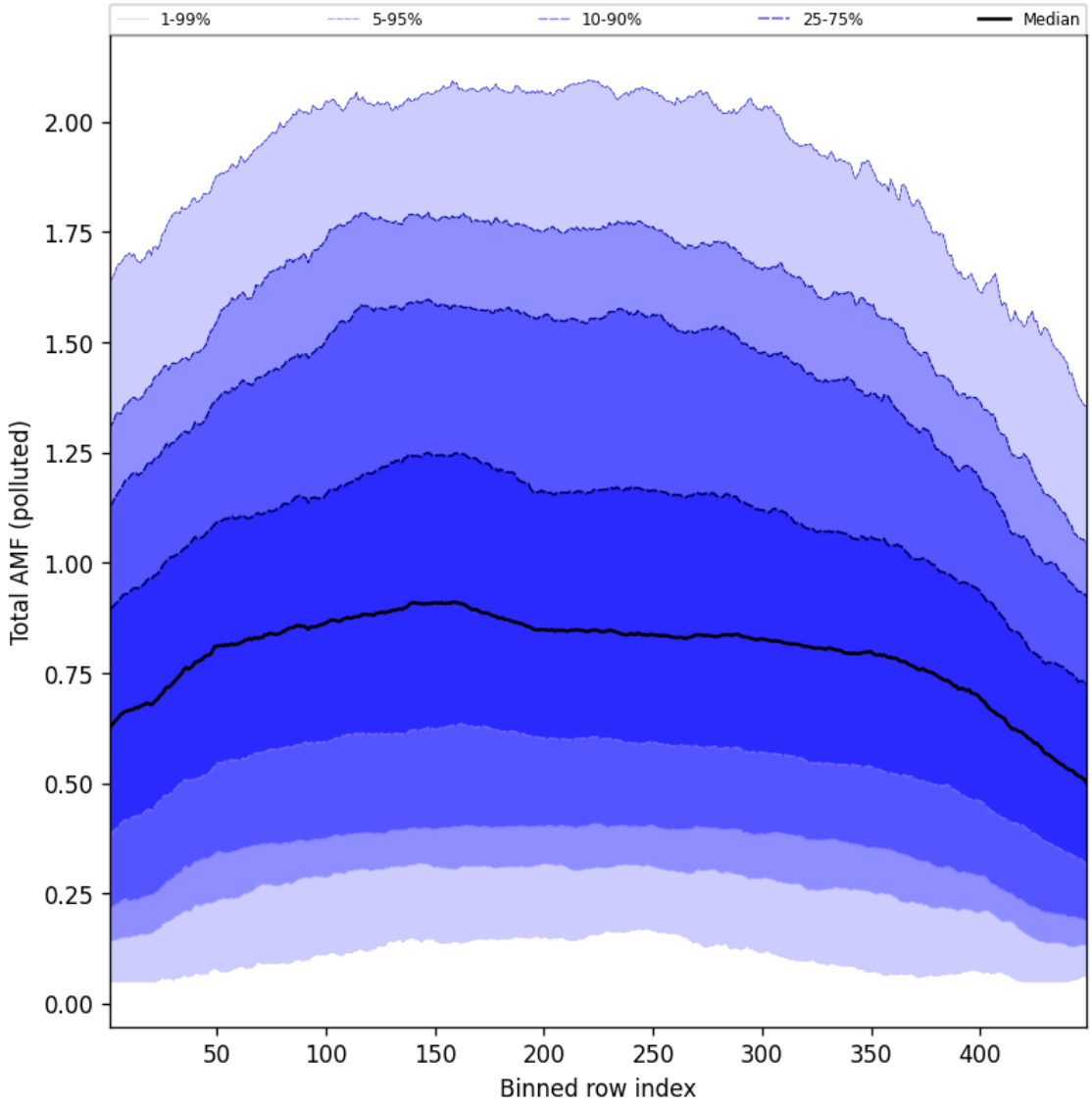

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-04-15 to 2025-04-16

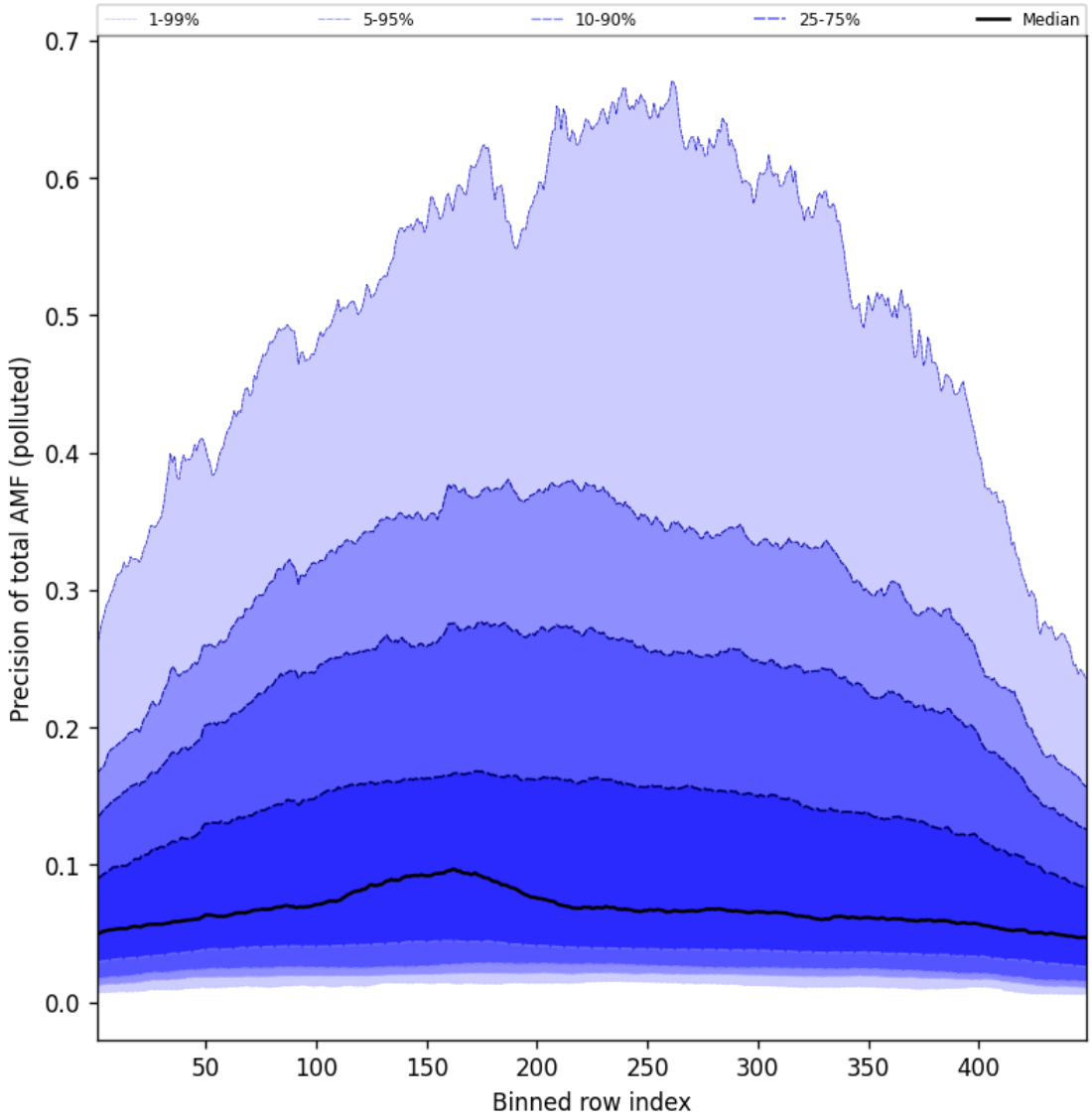

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-04-15 to 2025-04-16

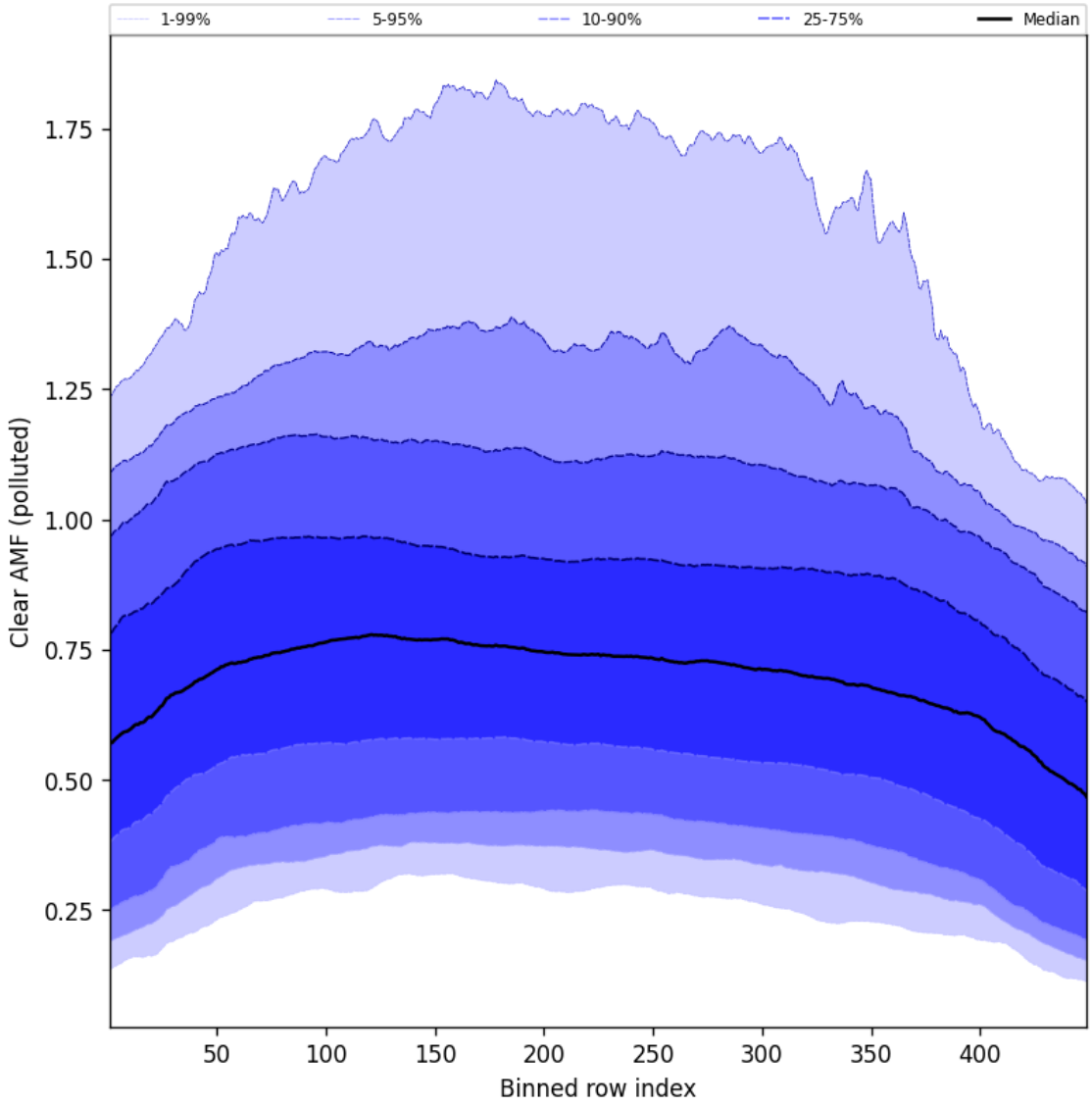

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-04-15 to 2025-04-16

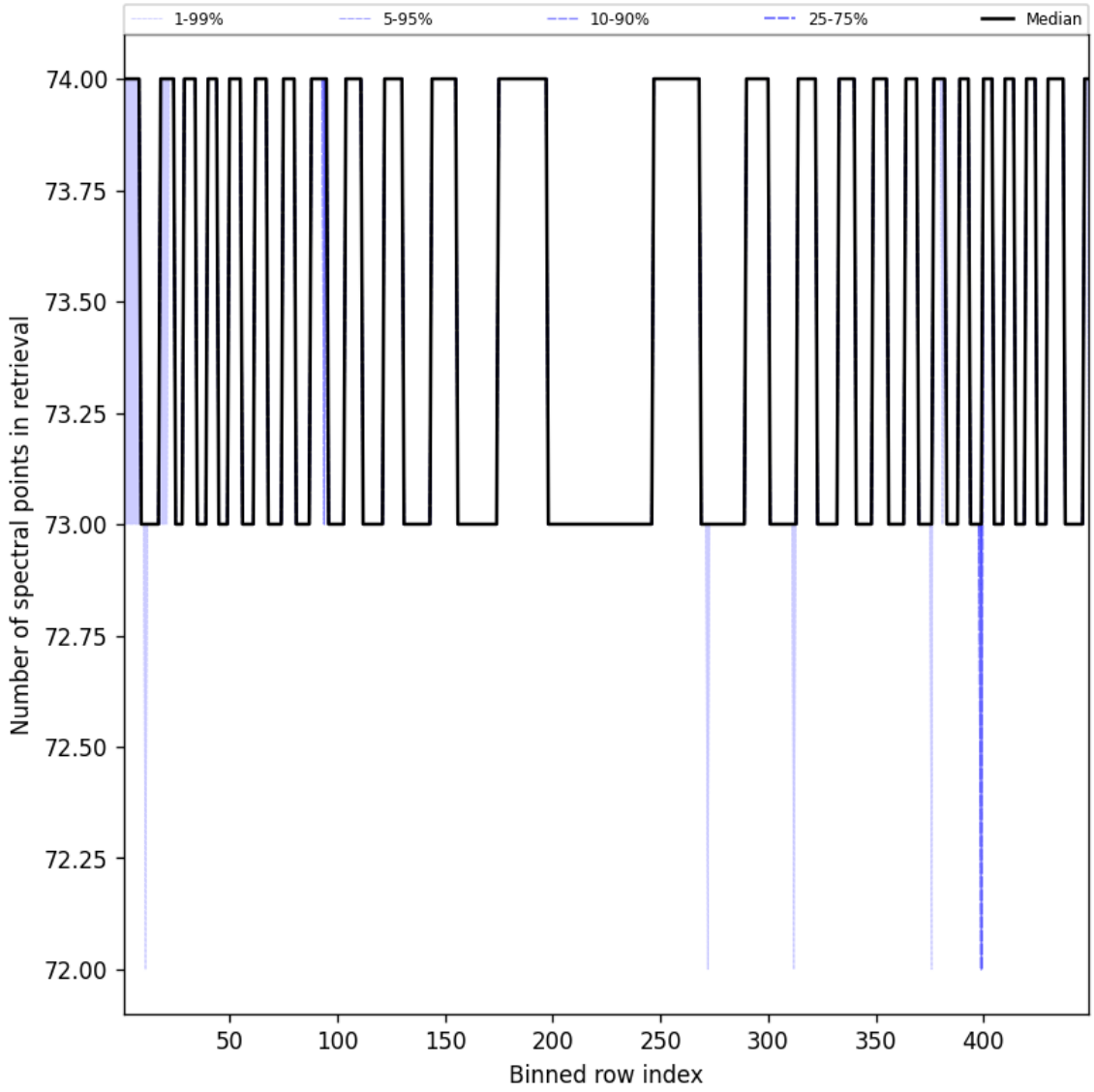

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-04-15 to 2025-04-16

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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