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 ± 0.398	17304438	0.995	0.770	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.633 \pm 102.105) \times 10^{-2}$	17304438	0.278	0.470	1.186×10^{-2}	-65.7	1.138×10^{3}
sulfurdioxide total vertical column precision [DU]	0.521 ± 0.661	17304438	0.222	0.331	0.336	4.643×10^{-2}	71.2
sulfurdioxide slant column density corrected [DU]	$(2.628 \pm 50.837) \times 10^{-2}$	17304438	0.276	0.378	1.021×10^{-2}	-22.7	680
sulfurdioxide slant column density cobra [DU]	$(2.528 \pm 41.534) \times 10^{-2}$	17304438	0.276	0.378	1.021×10^{-2}	-22.7	42.9
sulfurdioxide slant column density cobra precision [DU]	0.302 ± 0.134	17304438	0.213	0.140	0.264	8.252×10^{-2}	23.6
sulfurdioxide slant column density window1 [DU]	0.180 ± 0.729	17304438	0.225	0.757	0.185	-117	128
sulfurdioxide slant column density window1 precision [DU]	0.302 ± 0.134	17304438	0.213	0.140	0.264	8.252×10^{-2}	23.6
sulfurdioxide slant column density corrected win1 [DU]	$(6.092 \pm 72.389) \times 10^{-2}$	17304438	2.500×10^{-2}	0.746	3.744×10^{-2}	-117	128
background so2 slant column offset window1 [DU]	-0.119 ± 0.152	17304438	-0.220	0.159	-0.151	-0.868	4.22
sulfurdioxide slant column density window2 [DU]	2.94 ± 9.16	17304438	2.75	11.7	2.79	-1.259×10^{3}	1.313×10^{3}
sulfurdioxide slant column density window2 precision [DU]	8.09 ± 2.23	17304438	7.43	2.48	7.77	2.35	787
sulfurdioxide slant column density corrected win2 [DU]	0.637 ± 8.764	17304438	0.750	11.1	0.646	-1.262×10^{3}	1.312×10^{3}
background so2 slant column offset window2 [DU]	-2.30 ± 3.14	17304438	0.250	3.97	-1.28	-17.7	10.9
sulfurdioxide slant column density window3 [DU]	-13.6 ± 23.8	17304438	-16.2	30.0	-14.0	-1.427×10^{3}	689
sulfurdioxide slant column density window3 precision [DU]	28.1 ± 13.5	17304438	22.5	9.52	24.5	9.58	421
sulfurdioxide slant column density corrected win3 [DU]	-4.73 ± 23.04	17304438	-3.92	28.7	-4.67	-1.425×10^{3}	694
background so2 slant column offset window3 [DU]	8.89 ± 6.59	17304438	2.80	11.2	8.60	-19.9	29.9
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17304438	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.034 \pm 7.947) \times 10^{-2}$	17304438	1.125×10^{-2}	1.736×10^{-2}	1.233×10^{-2}	2.962×10^{-4}	3.76
fitted radiance shift [nm]	$(-2.905 \pm 26.285) \times 10^{-4}$	17304438	-5.000×10^{-4}	1.745×10^{-3}	-2.724×10^{-4}	-8.753×10^{-2}	5.751×10^{-2}
fitted radiance squeeze [1]	$(-1.556 \pm 17.933) \times 10^{-5}$	17304438	-1.000×10^{-5}	2.050×10^{-4}	-9.924×10^{-6}	-2.143×10^{-2}	1.664×10^{-2}
fitted root mean square [1]	$(1.317 \pm 0.550) \times 10^{-3}$	17304438	9.750×10^{-4}	5.543×10^{-4}	1.161×10^{-3}	3.033×10^{-4}	6.227×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.863 ± 0.426	17304438	0.820	0.548	0.811	5.000×10^{-2}	2.85
sulfurdioxide total air mass factor polluted precision [1]	0.107 ± 0.118	17304438	3.500×10^{-2}	9.771×10^{-2}	6.411×10^{-2}	3.108×10^{-3}	1.84
sulfurdioxide clear air mass factor polluted [1]	0.739 ± 0.296	17304438	0.660	0.390	0.713	6.743×10^{-2}	2.46
number of spectral points in retrieval [1]	73.4 ± 0.5	17304438	73.0	1.000	73.0	52.0	74.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	6.000×10^{-2}	0.120	0.230	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.26	−0.873	−0.541	−0.368	−0.220	0.251	0.413	0.608	0.996	2.70
sulfurdioxide total vertical column precision [DU]	0.108	0.145	0.173	0.197	0.228	0.559	0.739	0.957	1.42	3.45
sulfurdioxide slant column density corrected [DU]	−0.872	−0.506	−0.367	−0.274	−0.177	0.201	0.305	0.408	0.572	1.12
sulfurdioxide slant column density cobra [DU]	−0.872	−0.506	−0.367	−0.274	−0.177	0.201	0.305	0.408	0.572	1.12
sulfurdioxide slant column density cobra precision [DU]	0.149	0.175	0.188	0.199	0.213	0.353	0.406	0.459	0.550	0.801
sulfurdioxide slant column density window1 [DU]	−1.74	−0.914	−0.605	−0.404	−0.197	0.560	0.755	0.943	1.23	2.06
sulfurdioxide slant column density window1 precision [DU]	0.149	0.175	0.188	0.199	0.213	0.353	0.406	0.459	0.550	0.801
sulfurdioxide slant column density corrected win1 [DU]	−1.68	−0.970	−0.701	−0.521	−0.330	0.416	0.622	0.826	1.15	2.10
background so2 slant column offset window1 [DU]	−0.354	−0.284	−0.260	−0.242	−0.217	-5.819×10^{-2}	-1.459×10^{-3}	6.416×10^{-2}	0.170	0.417
sulfurdioxide slant column density window2 [DU]	−18.4	−11.6	−8.32	−5.83	−3.00	8.71	11.7	14.4	18.0	25.5
sulfurdioxide slant column density window2 precision [DU]	4.38	5.25	5.76	6.18	6.67	9.15	9.98	10.8	12.0	14.7
sulfurdioxide slant column density corrected win2 [DU]	−20.5	−13.5	−10.2	−7.70	−4.92	6.19	8.96	11.4	14.8	21.8
background so2 slant column offset window2 [DU]	−11.0	−8.84	−7.12	−5.59	−4.00	-2.240×10^{-2}	0.302	0.531	0.898	2.59
sulfurdioxide slant column density window3 [DU]	−71.8	−51.9	−42.7	−36.1	−28.7	1.31	9.26	16.5	26.1	45.2
sulfurdioxide slant column density window3 precision [DU]	13.5	16.1	17.9	19.3	20.8	30.4	35.2	41.3	53.5	86.4
sulfurdioxide slant column density corrected win3 [DU]	−62.6	−42.6	−33.1	−26.4	−19.0	9.74	17.1	23.8	32.9	51.4
background so2 slant column offset window3 [DU]	−2.29	−0.171	0.869	1.76	3.13	14.4	16.2	17.7	19.6	22.5
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]	6.235×10^{-4}	1.107×10^{-3}	1.873×10^{-3}	3.927×10^{-3}	6.586×10^{-3}	2.394×10^{-2}	3.564×10^{-2}	6.045×10^{-2}	0.117	0.333
fitted radiance shift [nm]	-8.287×10^{-3}	-4.135×10^{-3}	-2.709×10^{-3}	-1.891×10^{-3}	-1.193×10^{-3}	5.526×10^{-4}	1.228×10^{-3}	2.097×10^{-3}	3.634×10^{-3}	7.982×10^{-3}
fitted radiance squeeze [1]	-5.122×10^{-4}	-3.059×10^{-4}	-2.247×10^{-4}	-1.705×10^{-4}	-1.143×10^{-4}	9.072×10^{-5}	1.419×10^{-4}	1.890×10^{-4}	2.563×10^{-4}	4.153×10^{-4}
fitted root mean square [1]	6.214×10^{-4}	7.609×10^{-4}	8.336×10^{-4}	8.906×10^{-4}	9.617×10^{-4}	1.516×10^{-3}	1.761×10^{-3}	2.006×10^{-3}	2.354×10^{-3}	3.337×10^{-3}
sulfurdioxide total air mass factor polluted [1]	9.066×10^{-2}	0.254	0.360	0.447	0.556	1.10	1.30	1.47	1.69	2.01
sulfurdioxide total air mass factor polluted precision [1]	1.109×10^{-2}	1.930×10^{-2}	2.493×10^{-2}	3.031×10^{-2}	3.800×10^{-2}	0.136	0.180	0.227	0.319	0.611
sulfurdioxide clear air mass factor polluted [1]	0.223	0.316	0.380	0.442	0.524	0.914	1.01	1.11	1.27	1.65
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]	0.618 ± 0.400	10722977	0.790	0.490	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(3.903 \pm 106.038) \times 10^{-2}$	10722977	0.474	1.154×10^{-2}	-41.4	1.138×10^{3}	-0.221	0.253
sulfurdioxide total vertical column precision [DU]	0.544 ± 0.710	10722977	0.356	0.341	4.643×10^{-2}	71.2	0.225	0.581
sulfurdioxide slant column density corrected [DU]	$(2.798 \pm 49.871) \times 10^{-2}$	10722977	0.377	9.894×10^{-3}	-21.7	680	-0.176	0.201
sulfurdioxide slant column density cobra [DU]	$(2.697 \pm 41.413) \times 10^{-2}$	10722977	0.377	9.894×10^{-3}	-21.7	42.9	-0.176	0.201
sulfurdioxide slant column density cobra precision [DU]	0.304 ± 0.140	10722977	0.149	0.263	9.048×10^{-2}	23.6	0.209	0.358
sulfurdioxide slant column density window1 [DU]	0.178 ± 0.739	10722977	0.759	0.187	-32.2	40.2	-0.198	0.561
sulfurdioxide slant column density window1 precision [DU]	0.304 ± 0.140	10722977	0.149	0.263	9.048×10^{-2}	23.6	0.209	0.358
sulfurdioxide slant column density corrected win1 [DU]	$(6.752 \pm 73.396) \times 10^{-2}$	10722977	0.748	4.099×10^{-2}	-32.2	40.0	-0.327	0.421
background so2 slant column offset window1 [DU]	-0.110 ± 0.169	10722977	0.171	-0.152	-0.868	2.32	-0.220	-4.905×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.51 ± 8.88	10722977	11.5	3.35	-290	688	-2.34	9.18
sulfurdioxide slant column density window2 precision [DU]	7.76 ± 2.00	10722977	2.26	7.47	2.35	202	6.45	8.71
sulfurdioxide slant column density corrected win2 [DU]	0.541 ± 8.321	10722977	10.7	0.580	-298	680	-4.79	5.91
background so2 slant column offset window2 [DU]	-2.97 ± 3.56	10722977	5.54	-2.07	-17.7	10.9	-5.50	3.624×10^{-2}
sulfurdioxide slant column density window3 [DU]	-15.0 ± 22.7	10722977	28.5	-15.5	-1.427×10^{3}	175	-29.4	-0.948
sulfurdioxide slant column density window3 precision [DU]	26.4 ± 12.8	10722977	7.89	23.1	9.58	421	20.0	27.9
sulfurdioxide slant column density corrected win3 [DU]	-4.70 ± 21.72	10722977	27.1	-4.58	-1.425×10^{3}	190	-18.1	8.95
background so2 slant column offset window3 [DU]	10.3 ± 7.0	10722977	12.4	11.5	-17.4	29.9	3.58	16.0
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	10722977	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.694 \pm 9.268) \times 10^{-2}$	10722977	2.690×10^{-2}	1.259×10^{-2}	2.962×10^{-4}	3.76	4.090×10^{-3}	3.099×10^{-2}
fitted radiance shift [nm]	$(-1.527 \pm 25.006) \times 10^{-4}$	10722977	1.561×10^{-3}	-1.623×10^{-4}	-4.429×10^{-2}	3.807×10^{-2}	-9.625×10^{-4}	5.989×10^{-4}
fitted radiance squeeze [1]	$(-3.320 \pm 17.961) \times 10^{-5}$	10722977	2.039×10^{-4}	-2.205×10^{-5}	-1.293×10^{-2}	1.310×10^{-2}	-1.279×10^{-4}	7.601×10^{-5}
fitted root mean square [1]	$(1.328 \pm 0.584) \times 10^{-3}$	10722977	5.849×10^{-4}	1.153×10^{-3}	3.207×10^{-4}	4.671×10^{-2}	9.484×10^{-4}	1.533×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.867 ± 0.457	10722977	0.617	0.796	5.000×10^{-2}	2.85	0.521	1.14
sulfurdioxide total air mass factor polluted precision [1]	0.114 ± 0.135	10722977	0.102	6.452×10^{-2}	3.246×10^{-3}	1.84	3.582×10^{-2}	0.138
sulfurdioxide clear air mass factor polluted [1]	0.728 ± 0.338	10722977	0.468	0.678	7.047×10^{-2}	2.46	0.462	0.930
number of spectral points in retrieval [1]	73.5 ± 0.5	10722977	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]	0.698 ± 0.388	6581461	0.700	1.000	0.0	1.000	0.300	1.000
sulfurdioxide total vertical column [DU]	$(3.192 \pm 95.350) \times 10^{-2}$	6581461	0.464	1.237×10^{-2}	-65.7	869	-0.217	0.247
sulfurdioxide total vertical column precision [DU]	0.483 ± 0.572	6581461	0.292	0.330	5.279×10^{-2}	57.6	0.234	0.525
sulfurdioxide slant column density corrected [DU]	$(2.351 \pm 52.371) \times 10^{-2}$	6581461	0.379	1.072×10^{-2}	-22.7	496	-0.177	0.202
sulfurdioxide slant column density cobra [DU]	$(2.252 \pm 41.730) \times 10^{-2}$	6581461	0.379	1.072×10^{-2}	-22.7	42.6	-0.177	0.202
sulfurdioxide slant column density cobra precision [DU]	0.300 ± 0.124	6581461	0.126	0.266	8.252×10^{-2}	20.8	0.220	0.346
sulfurdioxide slant column density window1 [DU]	0.183 ± 0.711	6581461	0.753	0.182	-117	128	-0.196	0.557
sulfurdioxide slant column density window1 precision [DU]	0.300 ± 0.124	6581461	0.126	0.266	8.252×10^{-2}	20.8	0.220	0.346
sulfurdioxide slant column density corrected win1 [DU]	$(5.016 \pm 70.704) \times 10^{-2}$	6581461	0.743	3.158×10^{-2}	-117	128	-0.336	0.407
background so2 slant column offset window1 [DU]	-0.133 ± 0.120	6581461	0.140	-0.148	-0.848	4.22	-0.211	-7.125×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.01 ± 9.51	6581461	11.9	1.84	-1.259×10^{3}	1.313×10^{3}	-4.05	7.87
sulfurdioxide slant column density window2 precision [DU]	8.63 ± 2.47	6581461	2.66	8.32	2.46	787	7.13	9.78
sulfurdioxide slant column density corrected win2 [DU]	0.794 ± 9.439	6581461	11.8	0.766	-1.262×10^{3}	1.312×10^{3}	-5.14	6.69
background so2 slant column offset window2 [DU]	-1.21 ± 1.82	6581461	2.07	-0.828	-12.3	10.8	-2.15	-8.608×10^{-2}
sulfurdioxide slant column density window3 [DU]	-11.4 ± 25.5	6581461	32.3	-11.3	-506	689	-27.4	4.93
sulfurdioxide slant column density window3 precision [DU]	30.8 ± 14.3	6581461	10.7	27.1	9.85	237	23.0	33.6
sulfurdioxide slant column density corrected win3 [DU]	-4.77 ± 25.03	6581461	31.8	-4.83	-501	694	-20.6	11.2
background so2 slant column offset window3 [DU]	6.61 ± 5.14	6581461	7.70	5.52	-19.9	24.4	2.75	10.5
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	6581461	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.959 \pm 4.922) \times 10^{-2}$	6581461	9.996×10^{-3}	1.211×10^{-2}	9.679×10^{-4}	2.52	8.211×10^{-3}	1.821×10^{-2}
fitted radiance shift [nm]	$(-5.150 \pm 28.101) \times 10^{-4}$	6581461	2.034×10^{-3}	-4.969×10^{-4}	-8.753×10^{-2}	5.751×10^{-2}	-1.586×10^{-3}	4.479×10^{-4}
fitted radiance squeeze [1]	$(1.317 \pm 17.510) \times 10^{-5}$	6581461	2.068×10^{-4}	1.036×10^{-5}	-2.143×10^{-2}	1.664×10^{-2}	-9.206×10^{-5}	1.147×10^{-4}
fitted root mean square [1]	$(1.300 \pm 0.489) \times 10^{-3}$	6581461	5.068×10^{-4}	1.173×10^{-3}	3.033×10^{-4}	6.227×10^{-2}	9.843×10^{-4}	1.491×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.857 ± 0.371	6581461	0.451	0.826	5.000×10^{-2}	2.70	0.613	1.06
sulfurdioxide total air mass factor polluted precision [1]	$(9.587 \pm 8.135) \times 10^{-2}$	6581461	9.240×10^{-2}	6.345×10^{-2}	3.108×10^{-3}	1.65	4.053×10^{-2}	0.133
sulfurdioxide clear air mass factor polluted [1]	0.757 ± 0.211	6581461	0.292	0.746	6.743×10^{-2}	1.93	0.606	0.898
number of spectral points in retrieval [1]	73.4 ± 0.5	6581461	1.000	73.0	52.0	74.0	73.0	74.0

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

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.681 ± 0.390	11394993	0.730	1.000	0.0	1.000	0.270	1.000
sulfurdioxide total vertical column [DU]	$(2.548 \pm 87.563) \times 10^{-2}$	11394993	0.452	1.033×10^{-2}	-65.7	869	-0.213	0.239
sulfurdioxide total vertical column precision [DU]	0.481 ± 0.591	11394993	0.297	0.319	5.998×10^{-2}	43.7	0.225	0.523
sulfurdioxide slant column density corrected [DU]	$(1.745 \pm 40.272) \times 10^{-2}$	11394993	0.371	8.963×10^{-3}	-22.7	496	-0.175	0.196
sulfurdioxide slant column density cobra [DU]	$(1.732 \pm 36.243) \times 10^{-2}$	11394993	0.371	8.963×10^{-3}	-22.7	42.6	-0.175	0.196
sulfurdioxide slant column density cobra precision [DU]	0.299 ± 0.134	11394993	0.143	0.256	8.252×10^{-2}	17.9	0.210	0.353
sulfurdioxide slant column density window1 [DU]	0.171 ± 0.690	11394993	0.749	0.183	-117	70.4	-0.196	0.553
sulfurdioxide slant column density window1 precision [DU]	0.299 ± 0.134	11394993	0.143	0.256	8.252×10^{-2}	17.9	0.210	0.353
sulfurdioxide slant column density corrected win1 [DU]	$(4.800 \pm 68.257) \times 10^{-2}$	11394993	0.739	3.270×10^{-2}	-117	70.2	-0.332	0.406
background so2 slant column offset window1 [DU]	-0.123 ± 0.145	11394993	0.157	-0.152	-0.868	4.22	-0.217	-6.085×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.64 ± 9.10	11394993	11.6	2.44	-1.144×10^{3}	864	-3.29	8.34
sulfurdioxide slant column density window2 precision [DU]	8.09 ± 2.12	11394993	2.47	7.79	2.35	787	6.69	9.16
sulfurdioxide slant column density corrected win2 [DU]	0.670 ± 8.770	11394993	11.2	0.677	-1.145×10^{3}	863	-4.92	6.25
background so2 slant column offset window2 [DU]	-1.97 ± 3.01	11394993	3.27	-0.995	-17.7	10.9	-3.21	5.827×10^{-2}
sulfurdioxide slant column density window3 [DU]	-10.7 ± 24.0	11394993	30.7	-11.1	-480	689	-26.1	4.58
sulfurdioxide slant column density window3 precision [DU]	27.5 ± 11.7	11394993	8.89	24.4	9.58	228	21.0	29.9
sulfurdioxide slant column density corrected win3 [DU]	-2.53 ± 22.97	11394993	29.1	-2.73	-476	694	-17.1	12.0
background so2 slant column offset window3 [DU]	8.17 ± 6.46	11394993	10.6	7.23	-19.9	29.9	2.72	13.3
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	11394993	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.955 \pm 5.066) \times 10^{-2}$	11394993	1.264×10^{-2}	1.209×10^{-2}	3.119×10^{-4}	3.76	7.379×10^{-3}	2.002×10^{-2}
fitted radiance shift [nm]	$(-3.252 \pm 23.364) \times 10^{-4}$	11394993	1.726×10^{-3}	-2.909×10^{-4}	-4.393×10^{-2}	4.139×10^{-2}	-1.214×10^{-3}	5.116×10^{-4}
fitted radiance squeeze [1]	$(-8.006 \pm 177.506) \times 10^{-6}$	11394993	2.020×10^{-4}	-3.460×10^{-6}	-2.143×10^{-2}	1.664×10^{-2}	-1.059×10^{-4}	9.615×10^{-5}
fitted root mean square [1]	$(1.308 \pm 0.547) \times 10^{-3}$	11394993	5.797×10^{-4}	1.138×10^{-3}	3.486×10^{-4}	6.227×10^{-2}	9.476×10^{-4}	1.527×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.866 ± 0.380	11394993	0.476	0.838	5.000×10^{-2}	2.43	0.607	1.08
sulfurdioxide total air mass factor polluted precision [1]	$(9.728 \pm 9.727) \times 10^{-2}$	11394993	8.285×10^{-2}	6.305×10^{-2}	3.754×10^{-3}	1.84	4.097×10^{-2}	0.124
sulfurdioxide clear air mass factor polluted [1]	0.757 ± 0.261	11394993	0.343	0.750	7.057×10^{-2}	2.28	0.575	0.918
number of spectral points in retrieval [1]	73.4 ± 0.5	11394993	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]	0.631 ± 0.410	4135219	0.810	1.000	0.0	1.000	0.190	1.000
sulfurdioxide total vertical column [DU]	$(4.102 \pm 105.205) \times 10^{-2}$	4135219	0.497	1.272×10^{-2}	-37.9	84.3	-0.230	0.267
sulfurdioxide total vertical column precision [DU]	0.565 ± 0.712	4135219	0.359	0.371	4.643×10^{-2}	32.2	0.239	0.598
sulfurdioxide slant column density corrected [DU]	$(3.094 \pm 54.392) \times 10^{-2}$	4135219	0.374	1.060×10^{-2}	-8.90	84.8	-0.174	0.200
sulfurdioxide slant column density cobra [DU]	$(2.926 \pm 45.180) \times 10^{-2}$	4135219	0.374	1.060×10^{-2}	-8.90	36.6	-0.174	0.200
sulfurdioxide slant column density cobra precision [DU]	0.294 ± 0.122	4135219	0.119	0.263	8.618×10^{-2}	15.0	0.216	0.335
sulfurdioxide slant column density window1 [DU]	0.207 ± 0.738	4135219	0.739	0.202	-70.2	53.9	-0.170	0.570
sulfurdioxide slant column density window1 precision [DU]	0.294 ± 0.122	4135219	0.119	0.263	8.618×10^{-2}	15.0	0.216	0.335
sulfurdioxide slant column density corrected win1 [DU]	$(7.011 \pm 73.367) \times 10^{-2}$	4135219	0.729	4.287×10^{-2}	-70.2	53.7	-0.316	0.413
background so2 slant column offset window1 [DU]	-0.136 ± 0.143	4135219	0.144	-0.165	-0.868	1.90	-0.226	-8.189×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.80 ± 9.21	4135219	11.7	2.75	-659	1.313×10^{3}	-3.10	8.64
sulfurdioxide slant column density window2 precision [DU]	8.20 ± 2.51	4135219	2.50	7.84	2.49	644	6.71	9.22
sulfurdioxide slant column density corrected win2 [DU]	0.545 ± 8.847	4135219	11.1	0.551	-660	1.312×10^{3}	-5.02	6.11
background so2 slant column offset window2 [DU]	-2.25 ± 3.05	4135219	4.04	-1.22	-17.6	10.9	-4.07	-3.150×10^{-2}
sulfurdioxide slant column density window3 [DU]	-19.1 ± 23.0	4135219	28.6	-18.9	-384	205	-33.3	-4.73
sulfurdioxide slant column density window3 precision [DU]	30.4 ± 17.3	4135219	11.7	25.4	9.74	261	20.9	32.6
sulfurdioxide slant column density corrected win3 [DU]	-10.0 ± 23.2	4135219	28.8	-9.29	-377	213	-24.1	4.73
background so2 slant column offset window3 [DU]	9.08 ± 6.49	4135219	11.2	9.05	-19.9	29.9	3.35	14.6
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.11	4135219	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.553 \pm 11.626) \times 10^{-2}$	4135219	4.673×10^{-2}	1.686×10^{-2}	2.962×10^{-4}	2.58	6.339×10^{-3}	5.307×10^{-2}
fitted radiance shift [nm]	$(-1.966 \pm 33.149) \times 10^{-4}$	4135219	1.821×10^{-3}	-2.076×10^{-4}	-8.753×10^{-2}	5.751×10^{-2}	-1.138×10^{-3}	6.832×10^{-4}
fitted radiance squeeze [1]	$(-2.027 \pm 17.389) \times 10^{-5}$	4135219	2.040×10^{-4}	-1.530×10^{-5}	-1.395×10^{-2}	1.318×10^{-2}	-1.190×10^{-4}	8.508×10^{-5}
fitted root mean square [1]	$(1.276 \pm 0.503) \times 10^{-3}$	4135219	4.532×10^{-4}	1.157×10^{-3}	3.033×10^{-4}	3.841×10^{-2}	9.728×10^{-4}	1.426×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.840 ± 0.491	4135219	0.639	0.704	5.000×10^{-2}	2.85	0.485	1.12
sulfurdioxide total air mass factor polluted precision [1]	0.126 ± 0.146	4135219	0.138	6.643×10^{-2}	3.108×10^{-3}	1.72	3.045×10^{-2}	0.169
sulfurdioxide clear air mass factor polluted [1]	0.694 ± 0.333	4135219	0.403	0.608	6.743×10^{-2}	2.46	0.456	0.858
number of spectral points in retrieval [1]	73.4 ± 0.5	4135219	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

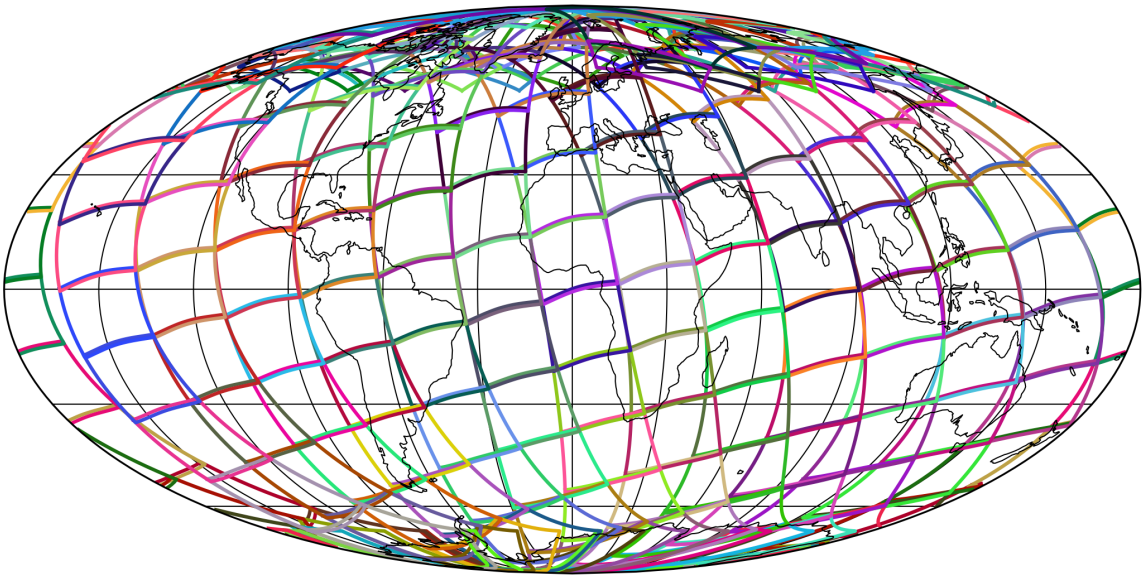

Figure 1: Outline of the granules.

4 Input data monitoring

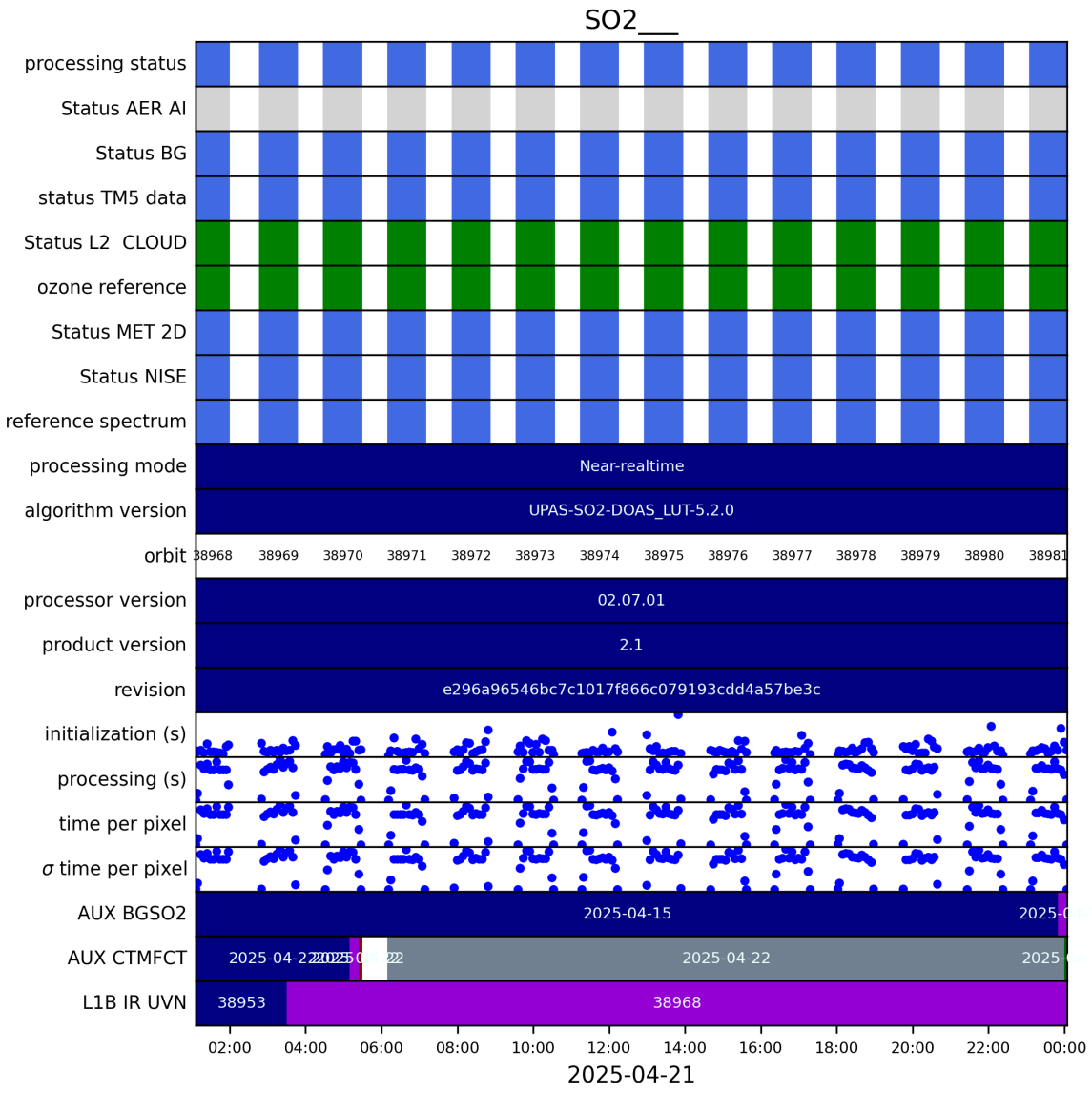

Figure 2: Input data per granule

5 Warnings and errors

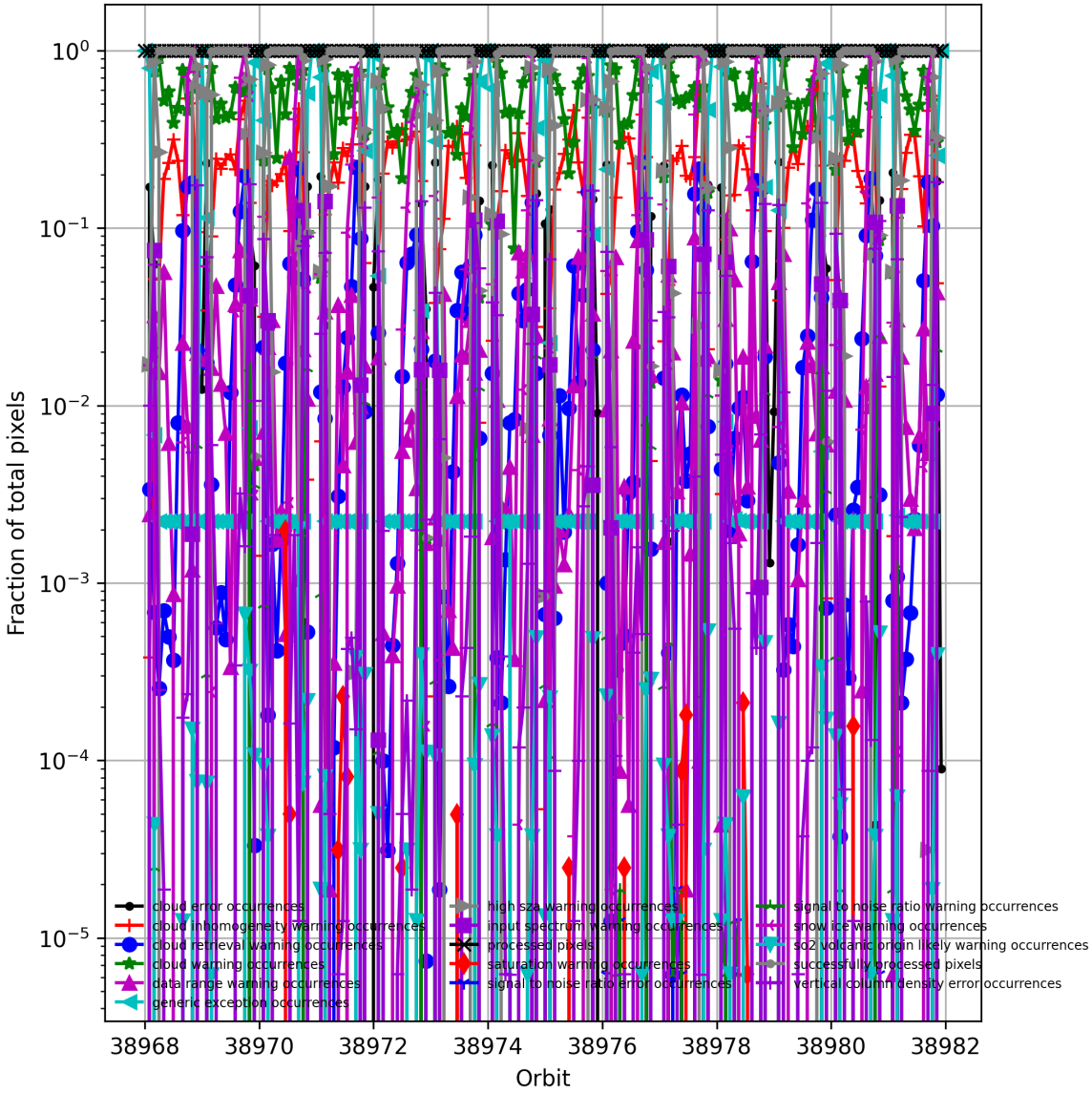

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

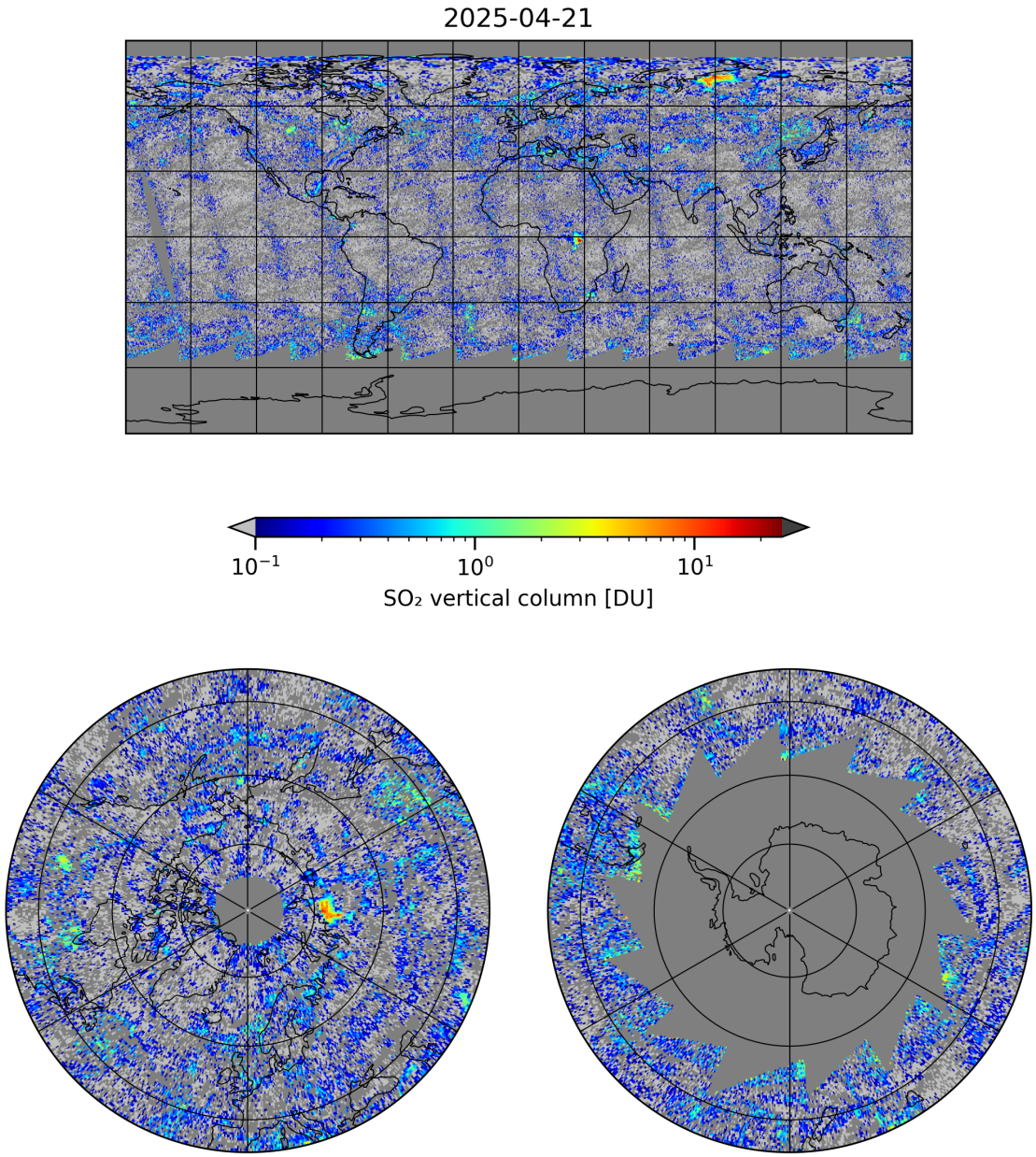

Figure 4: Map of "SO_2 vertical column" for 2025-04-21 to 2025-04-22

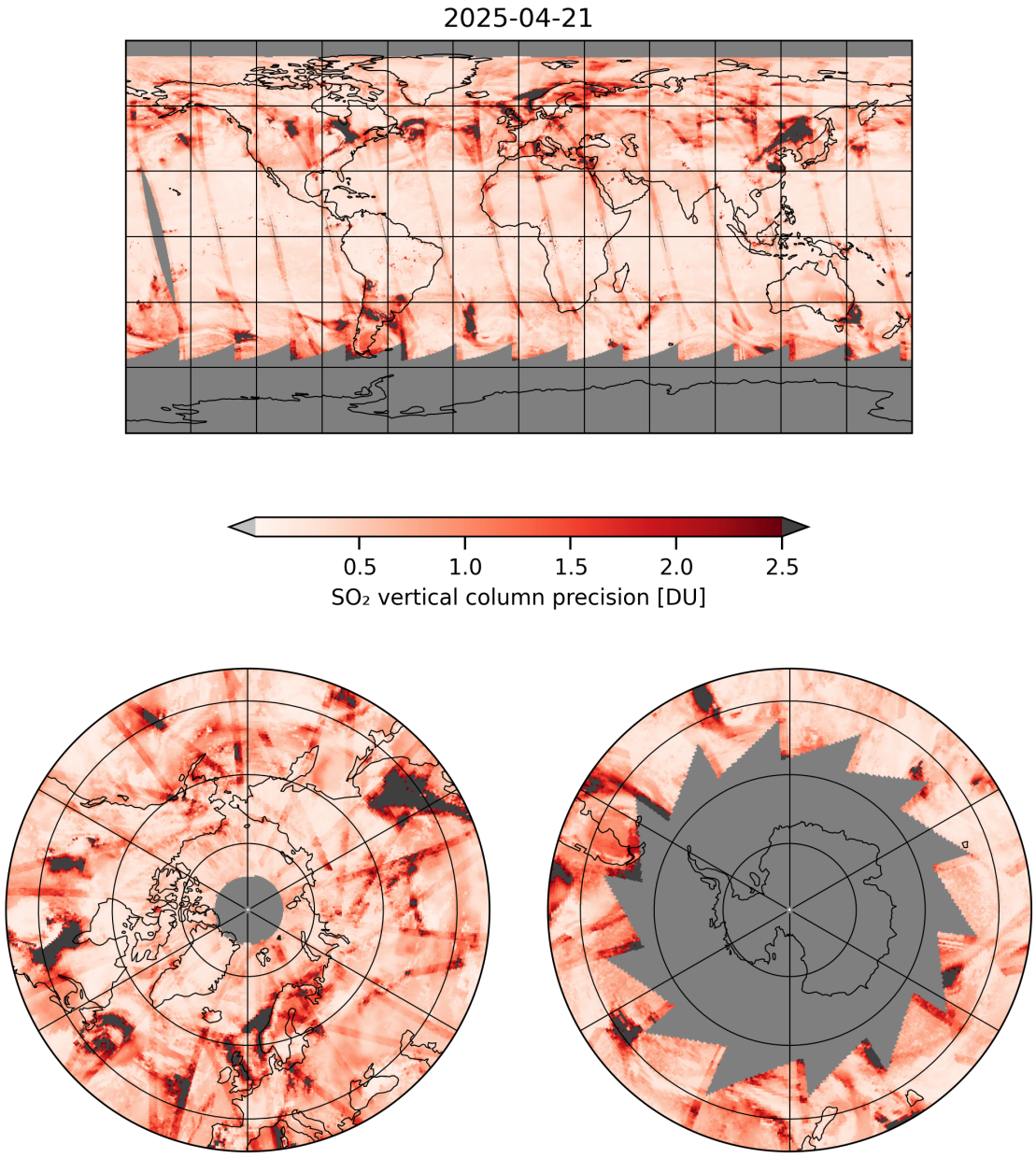

Figure 5: Map of "SO_2 vertical column precision" for 2025-04-21 to 2025-04-22

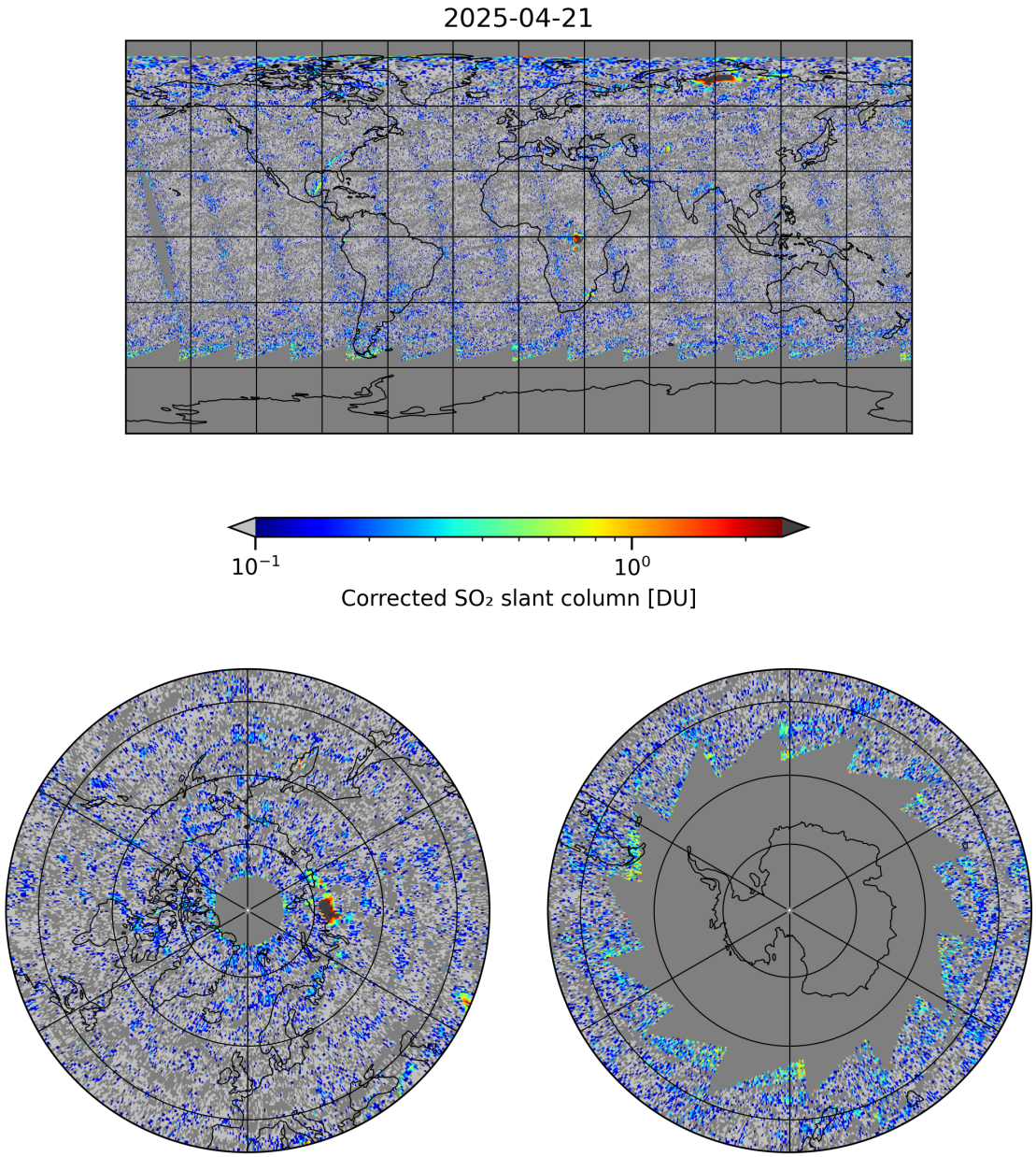

Figure 6: Map of “Corrected SO_2 slant column” for 2025-04-21 to 2025-04-22

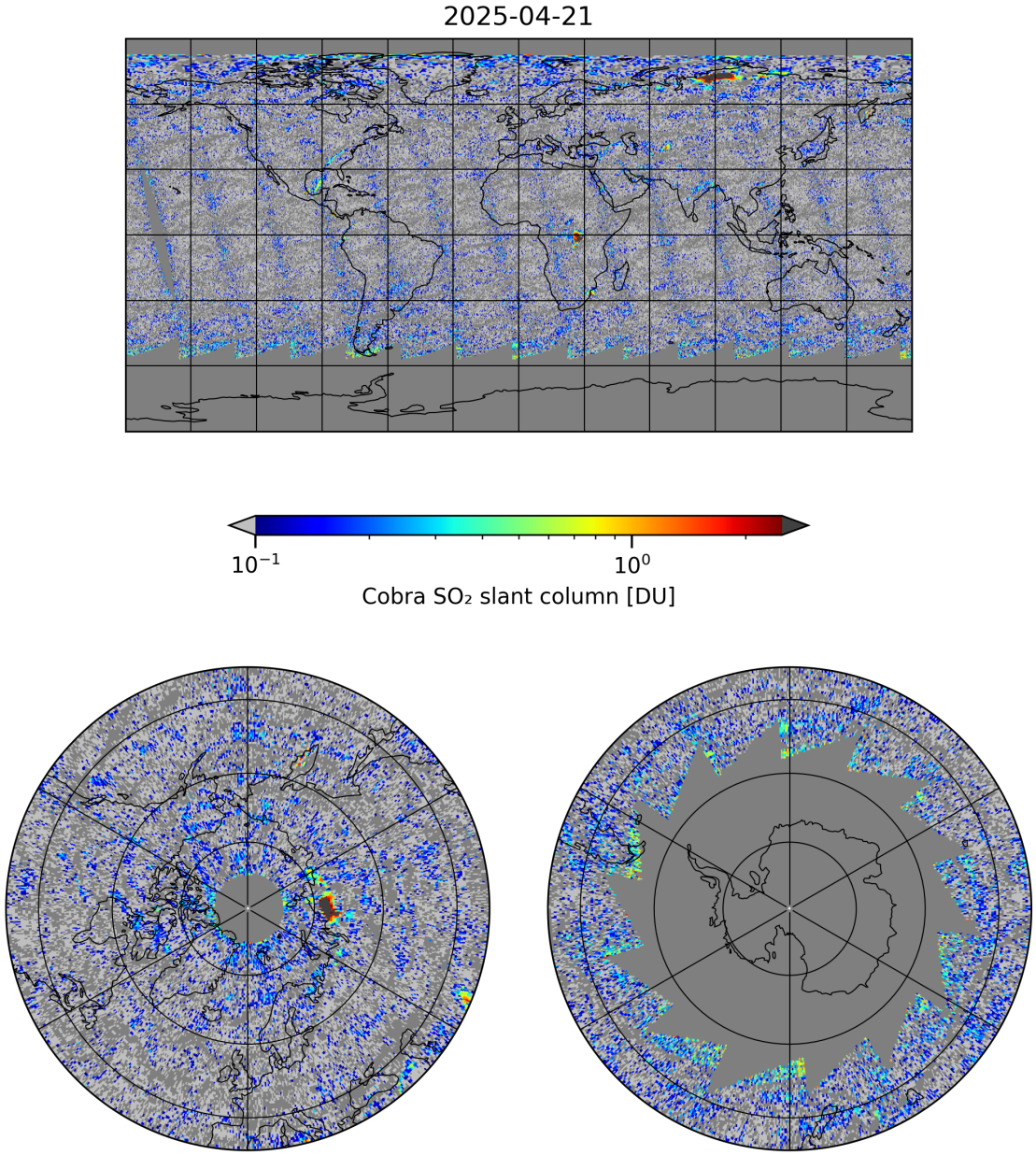

Figure 7: Map of "Cobra SO_2 slant column" for 2025-04-21 to 2025-04-22

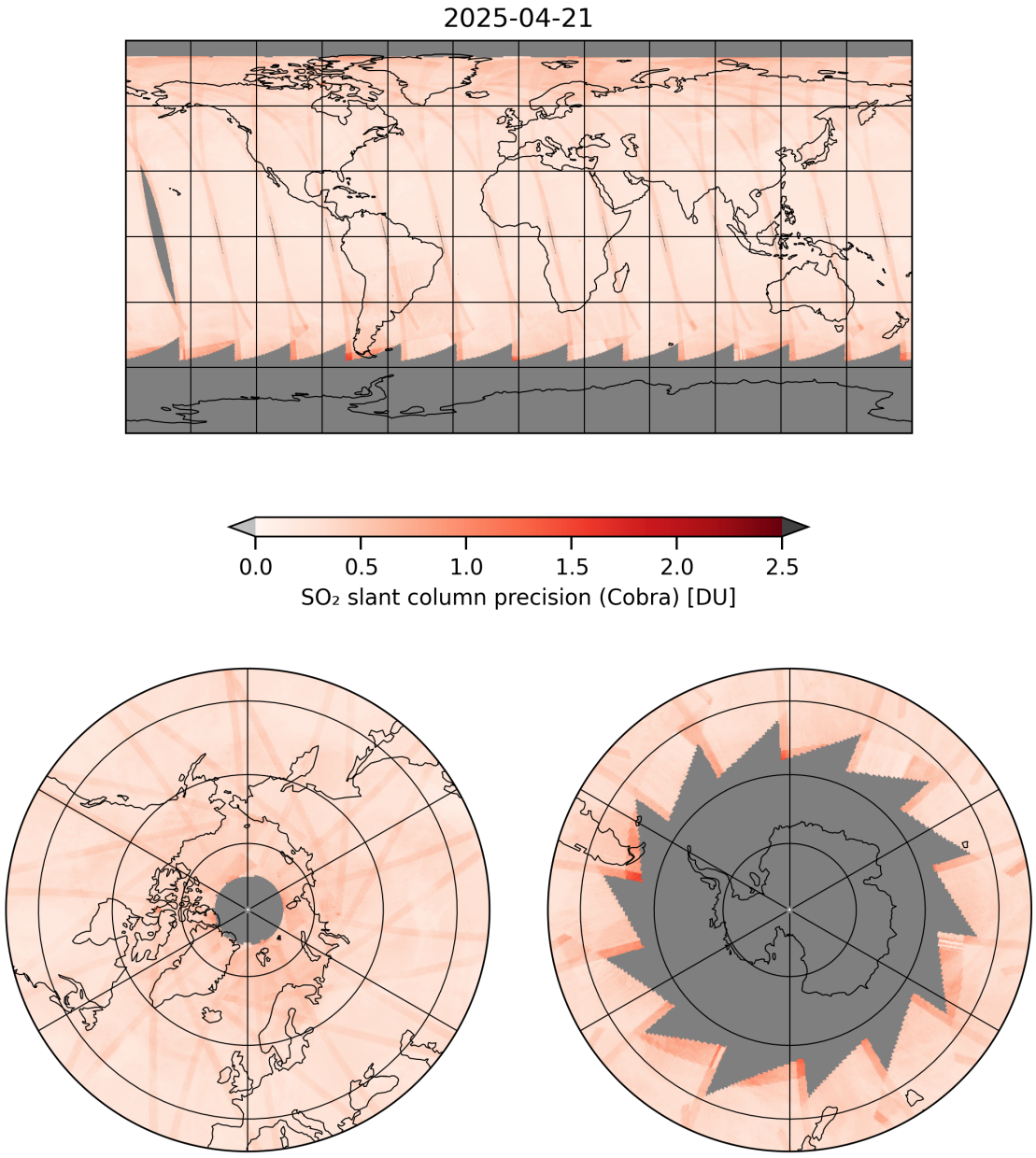

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-04-21 to 2025-04-22

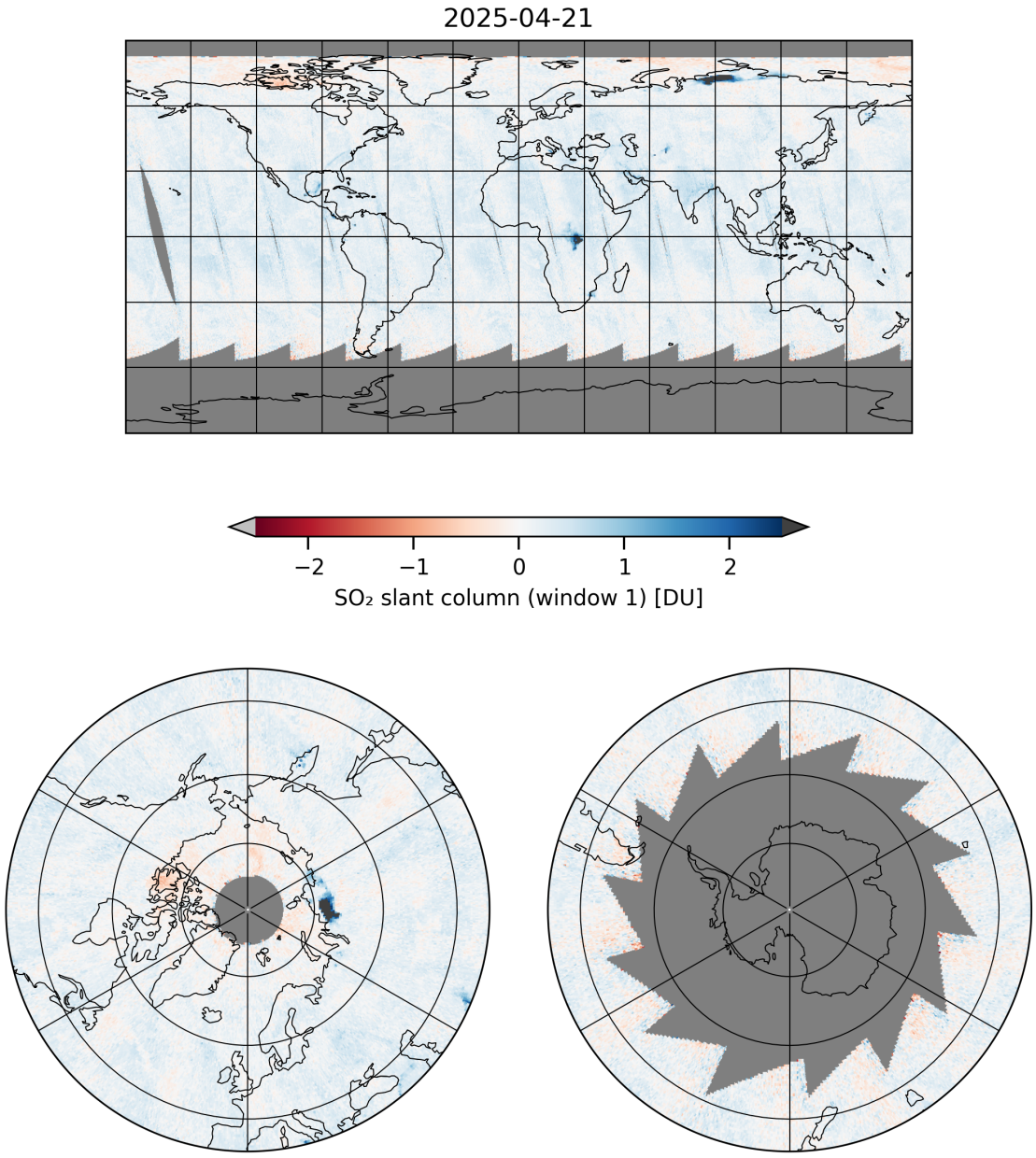

Figure 9: Map of "SO_2 slant column (window 1)" for 2025-04-21 to 2025-04-22

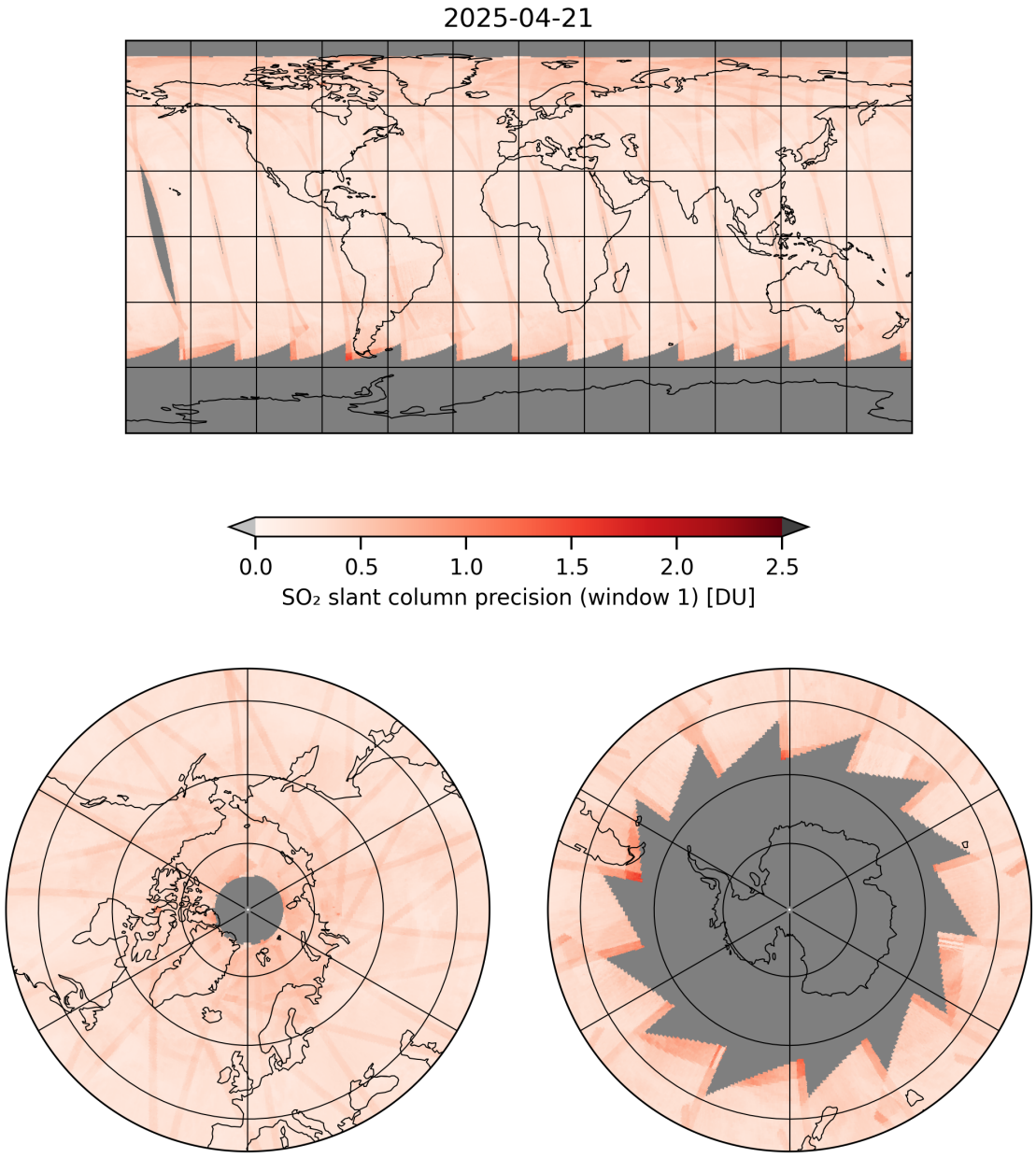

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-04-21 to 2025-04-22

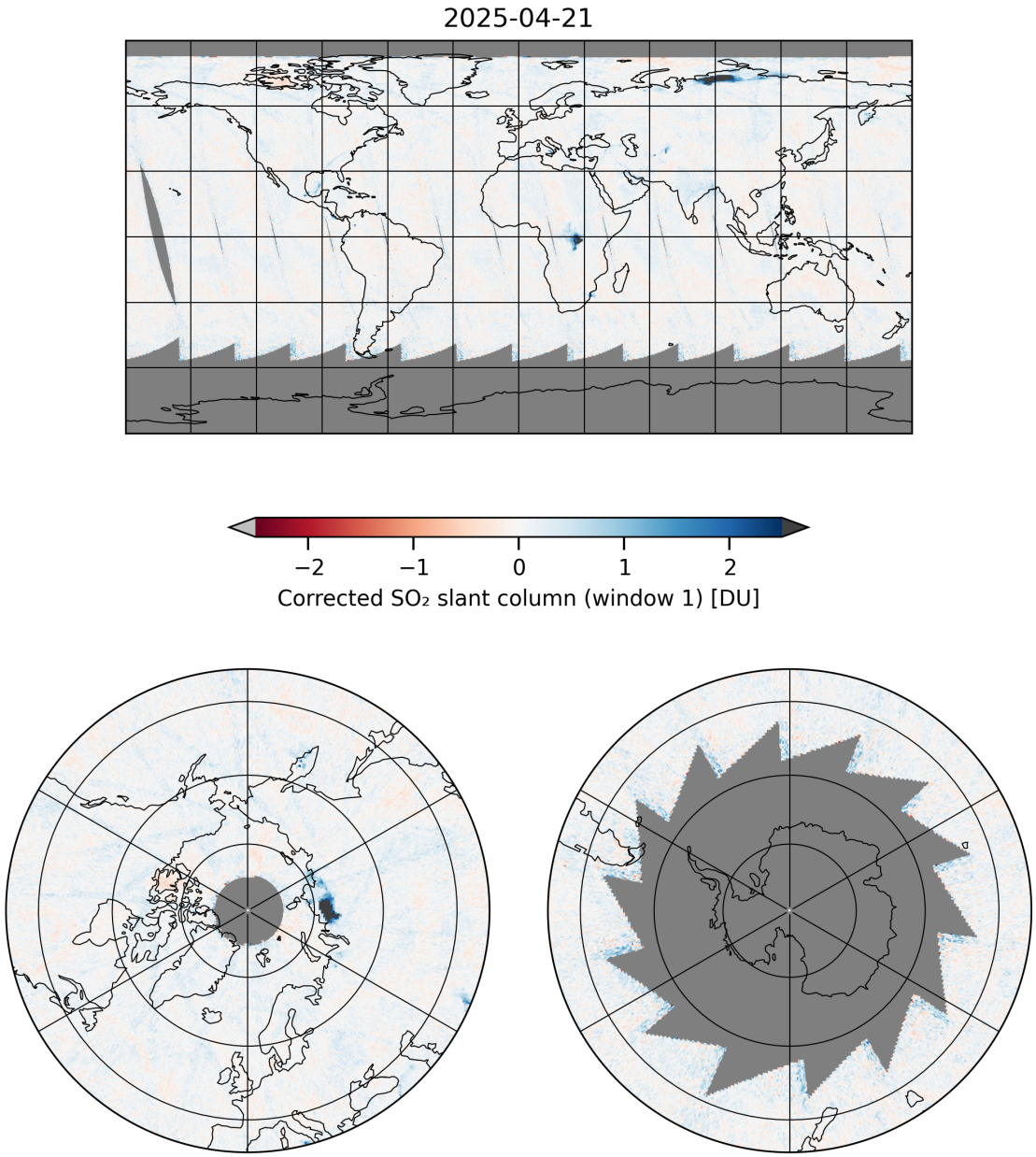

Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-04-21 to 2025-04-22

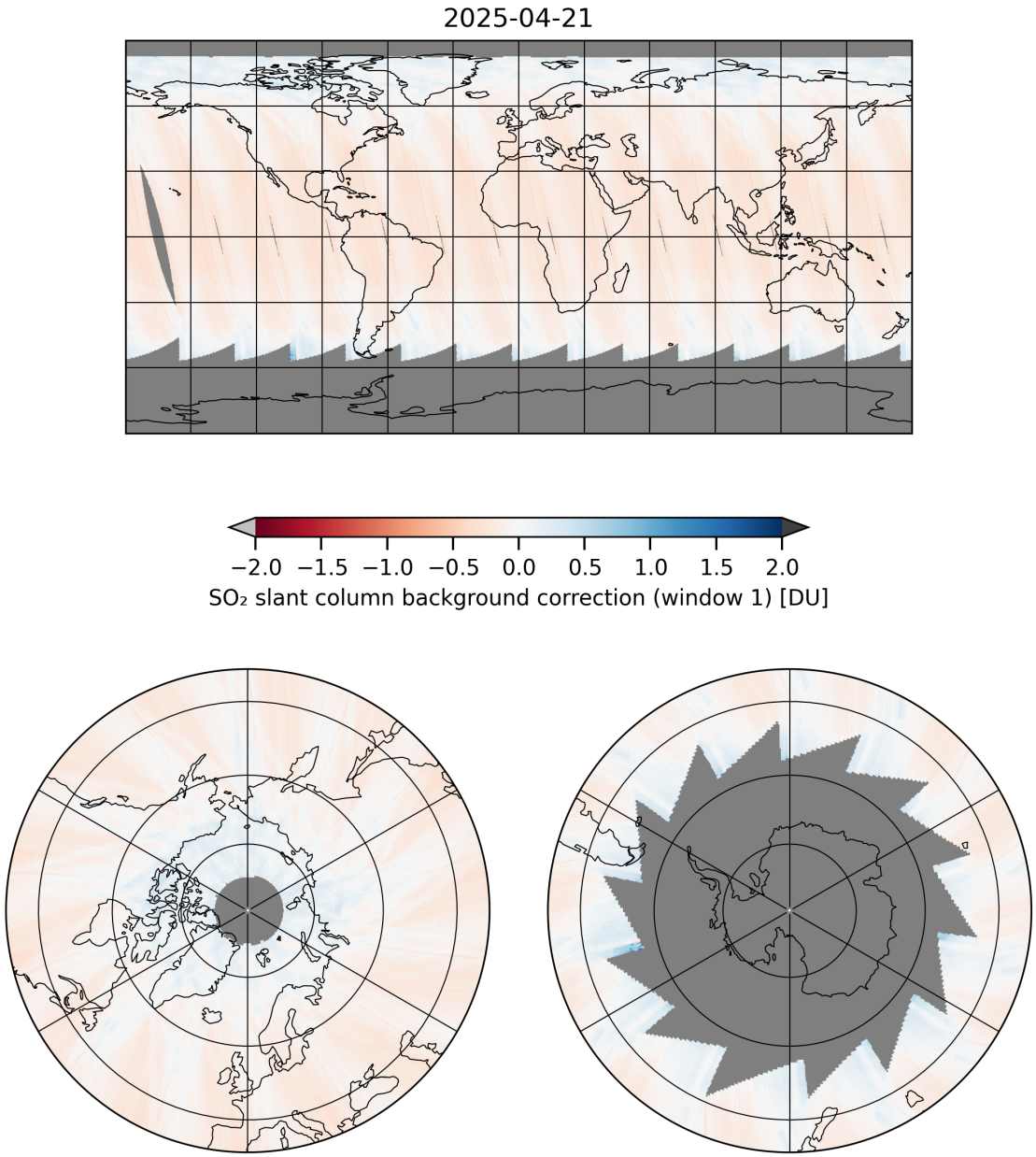

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-04-21 to 2025-04-22

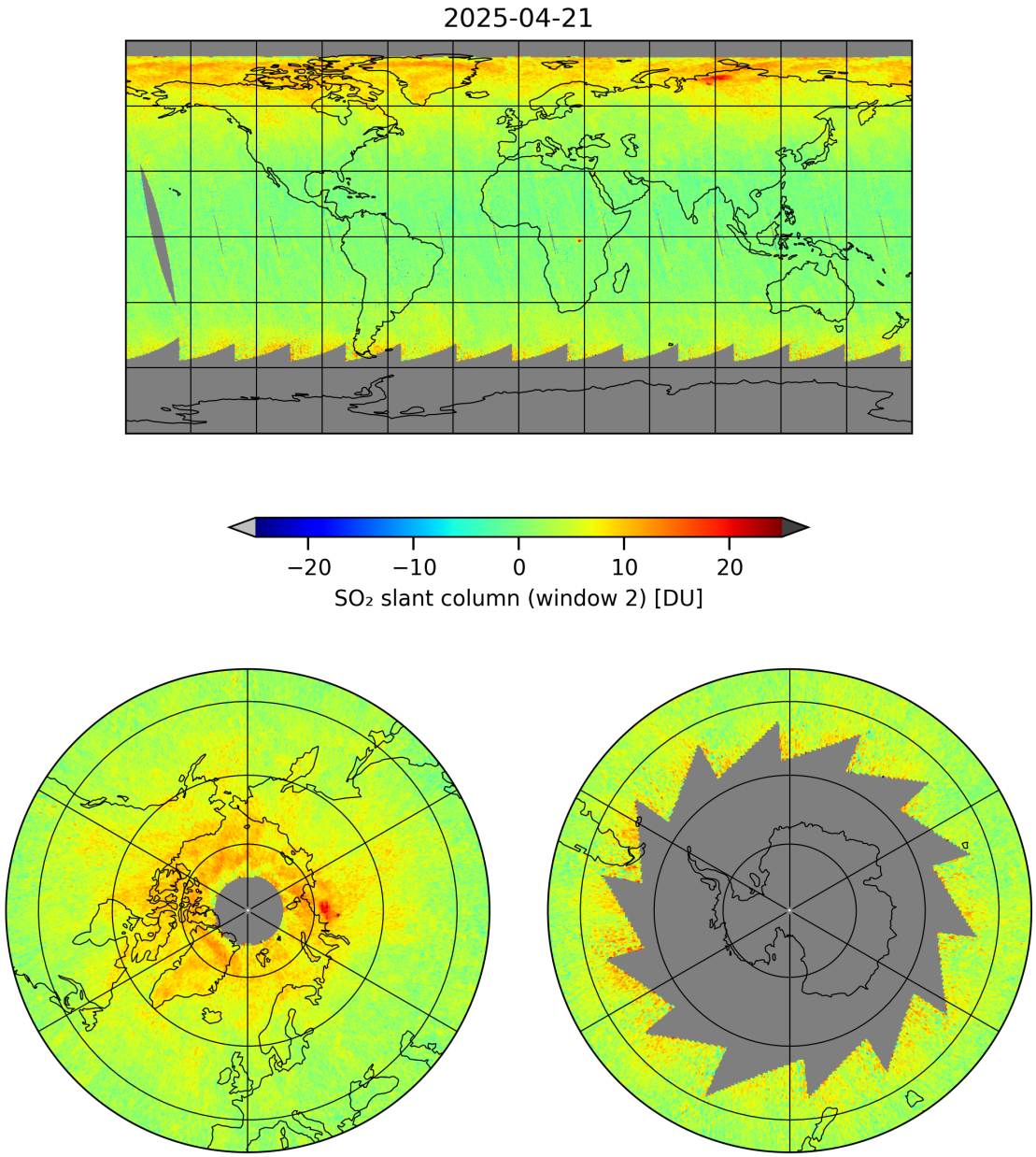

Figure 13: Map of "SO_2 slant column (window 2)" for 2025-04-21 to 2025-04-22

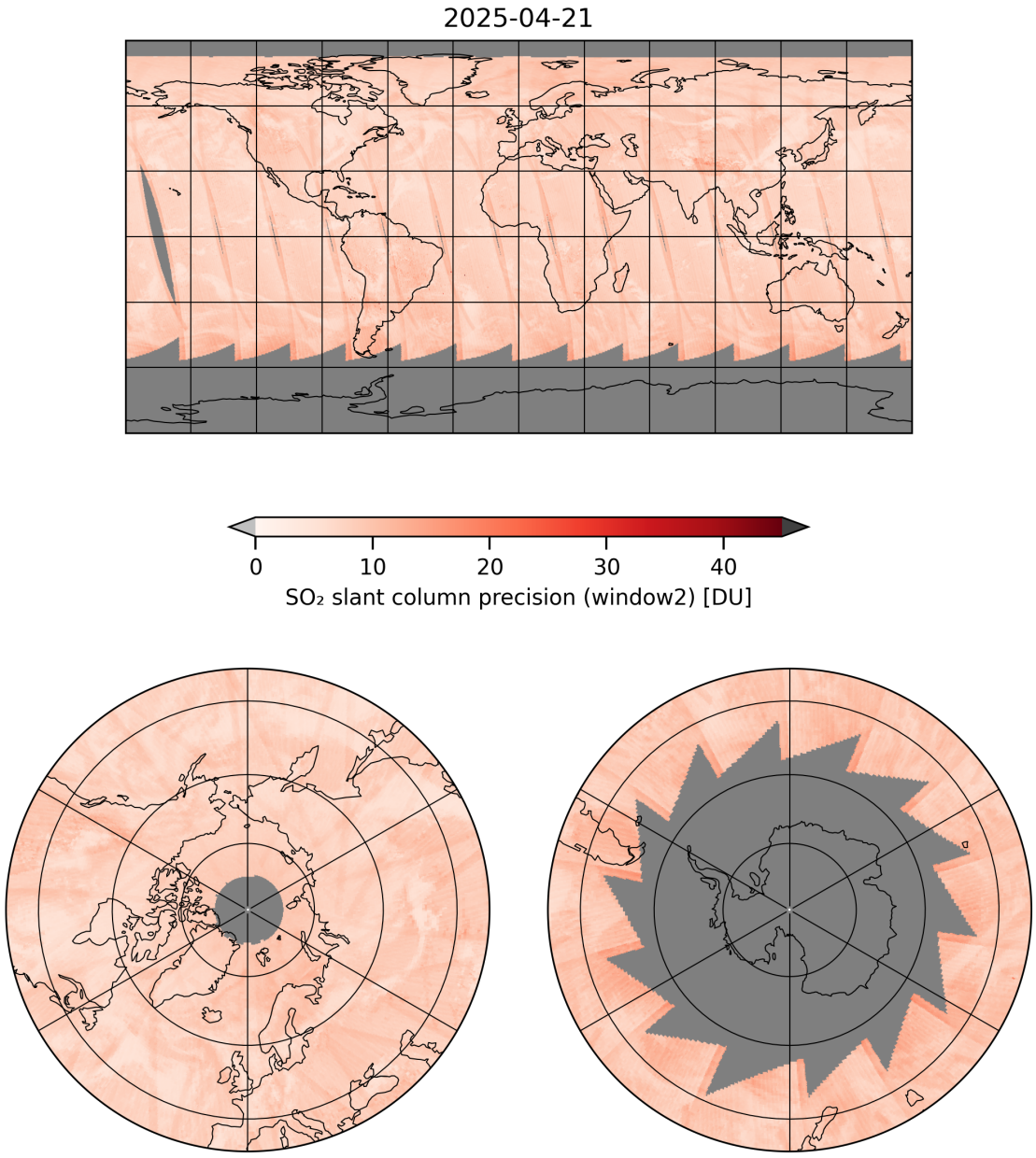

Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-04-21 to 2025-04-22

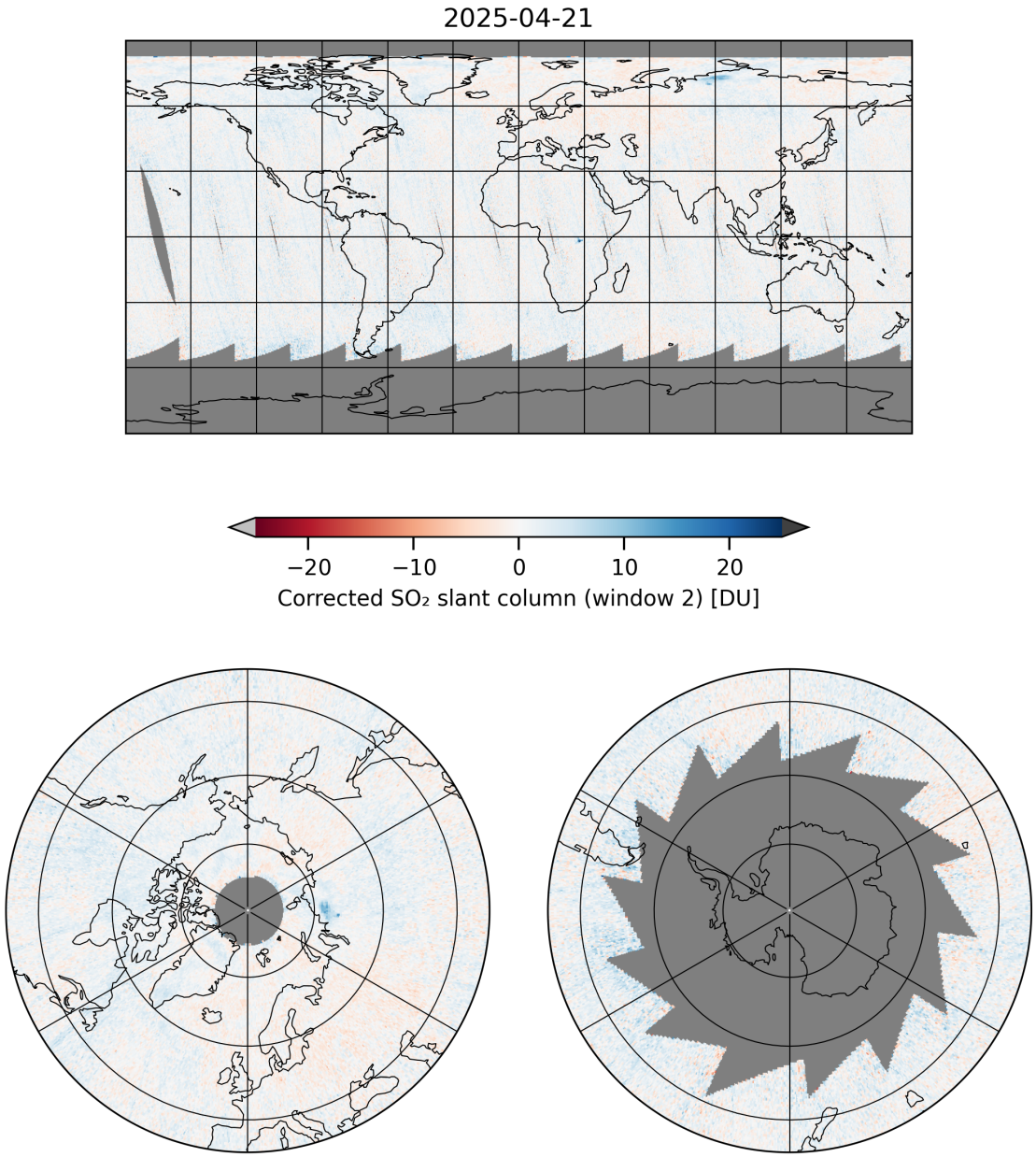

Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2025-04-21 to 2025-04-22

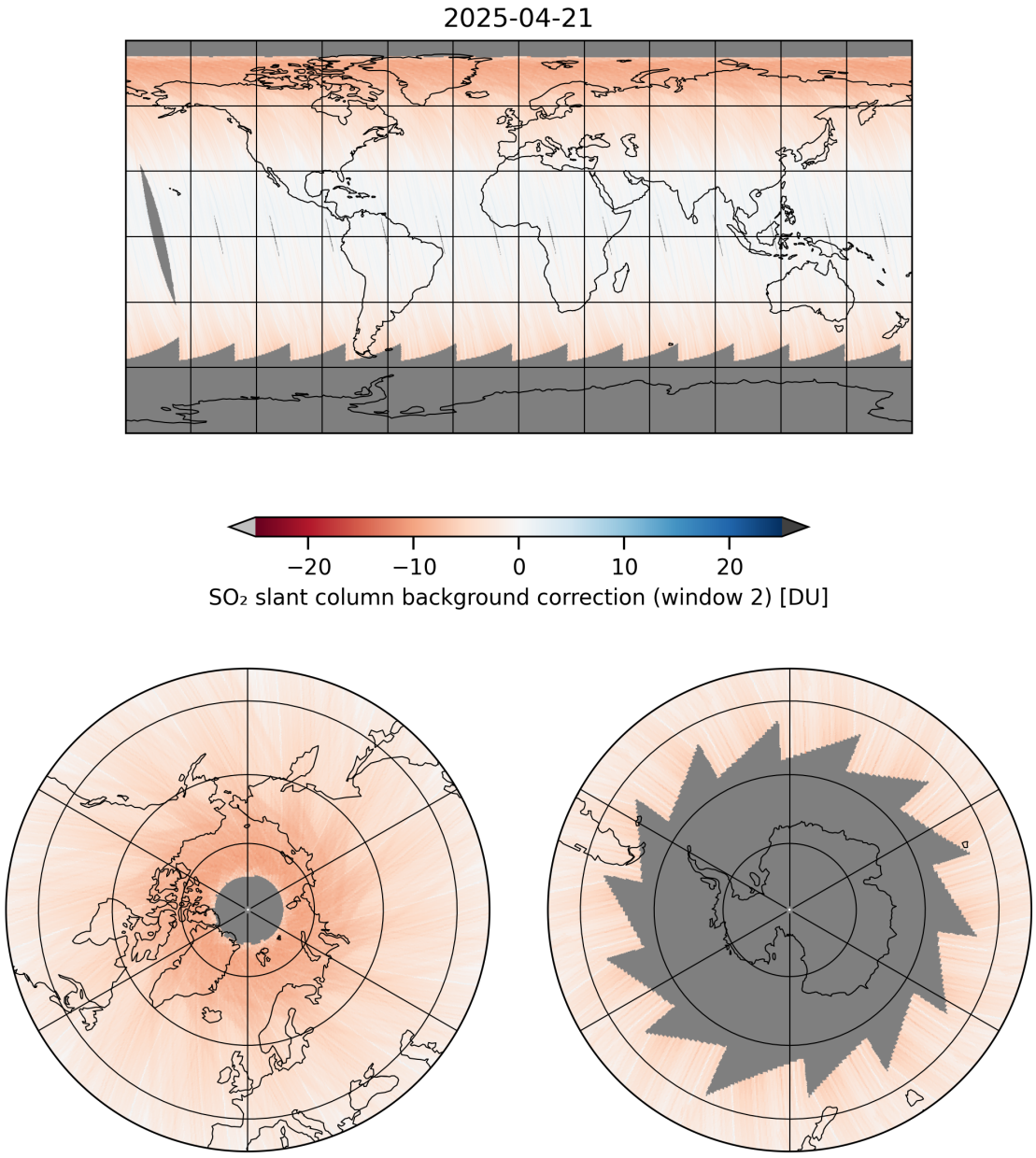

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-04-21 to 2025-04-22

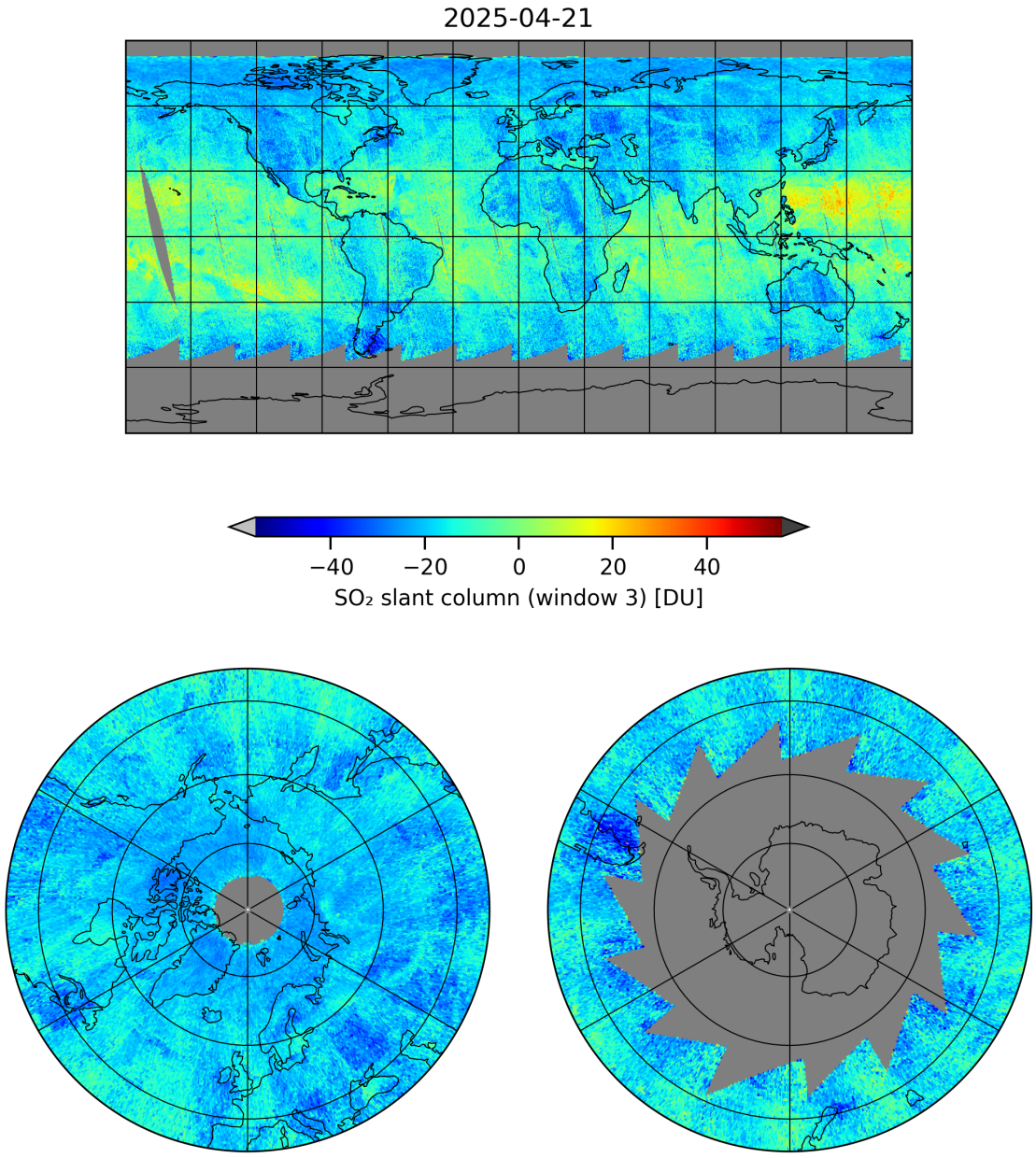

Figure 17: Map of "SO_2 slant column (window 3)" for 2025-04-21 to 2025-04-22

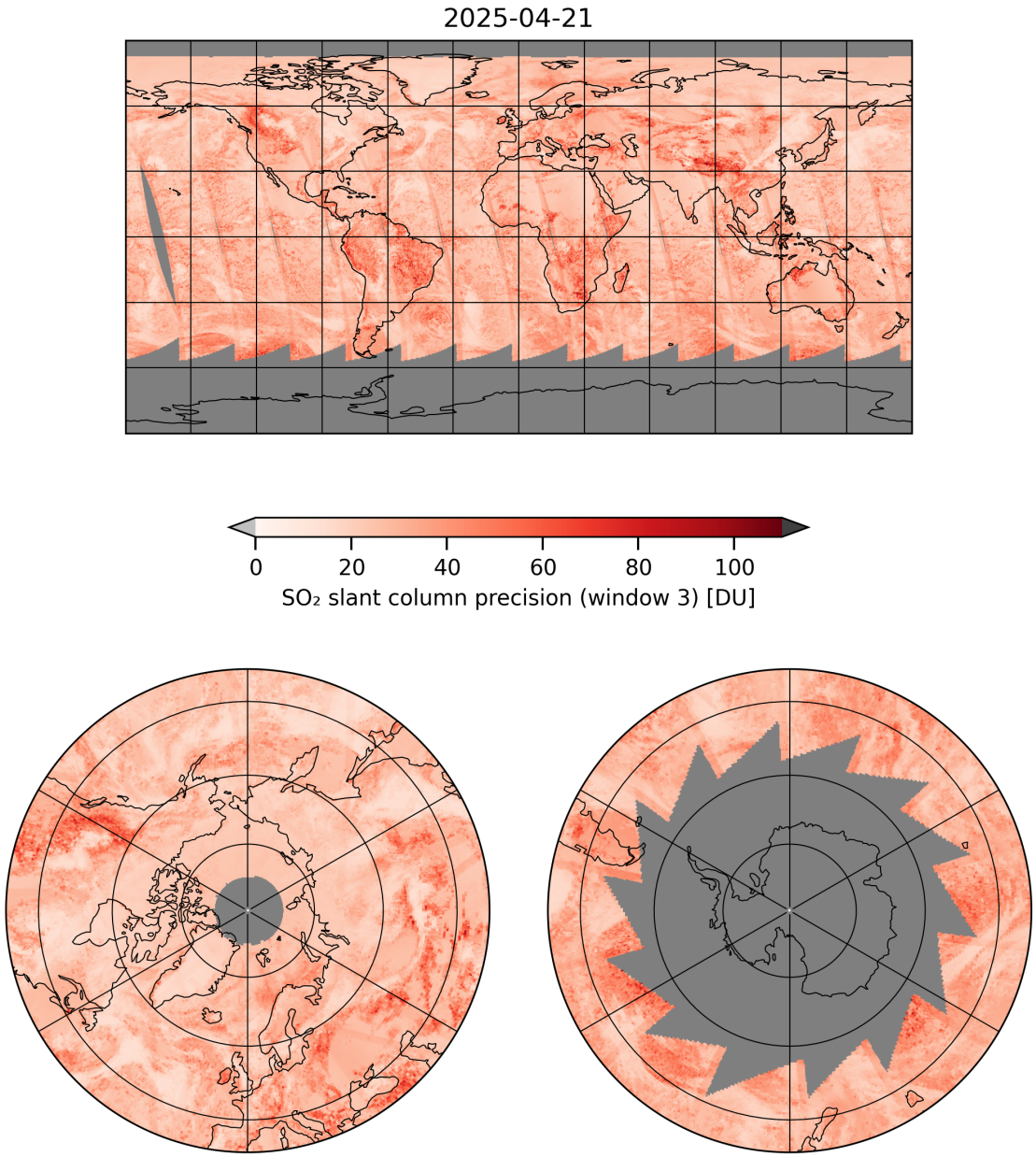

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-04-21 to 2025-04-22

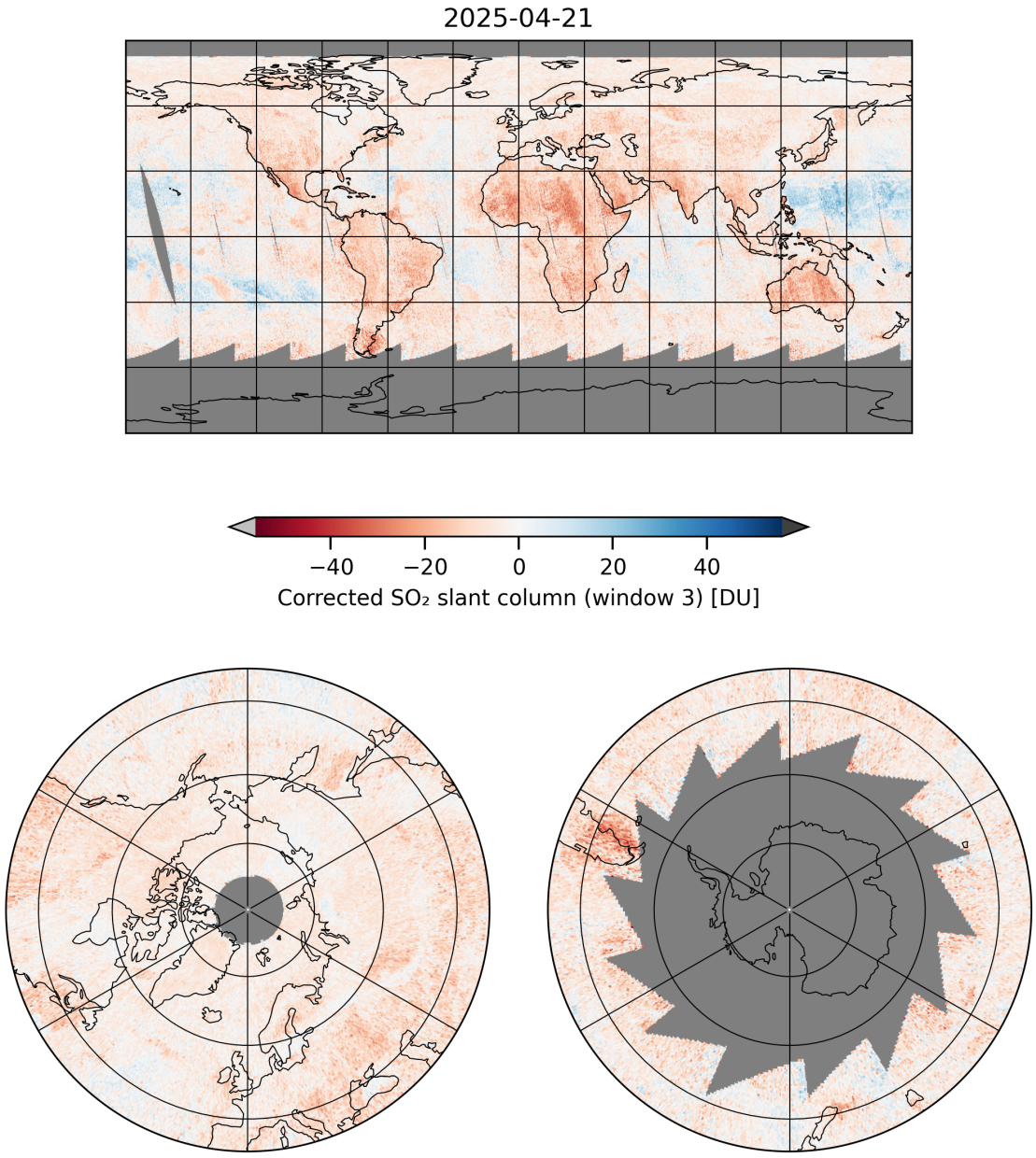

Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-04-21 to 2025-04-22

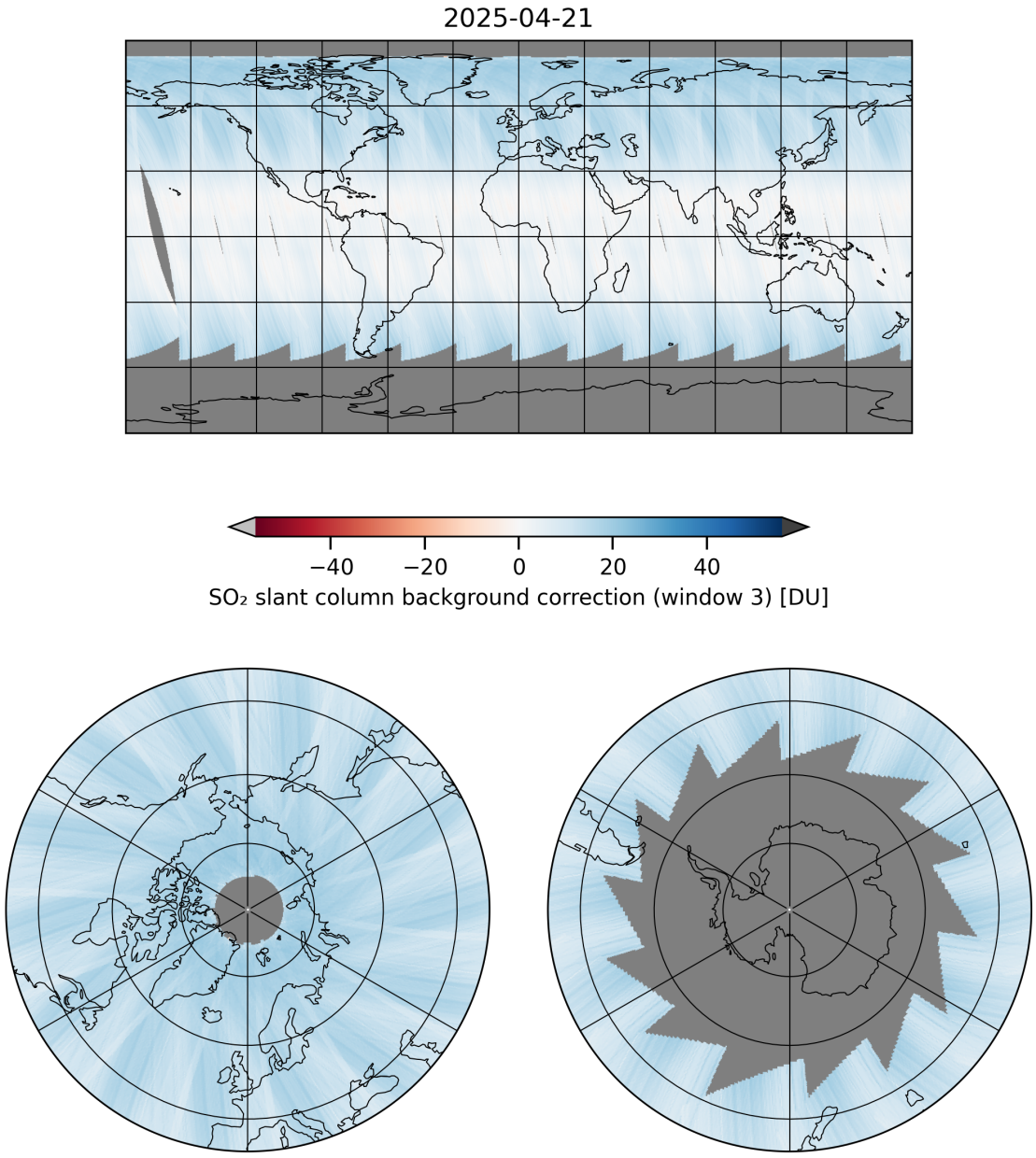

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-04-21 to 2025-04-22

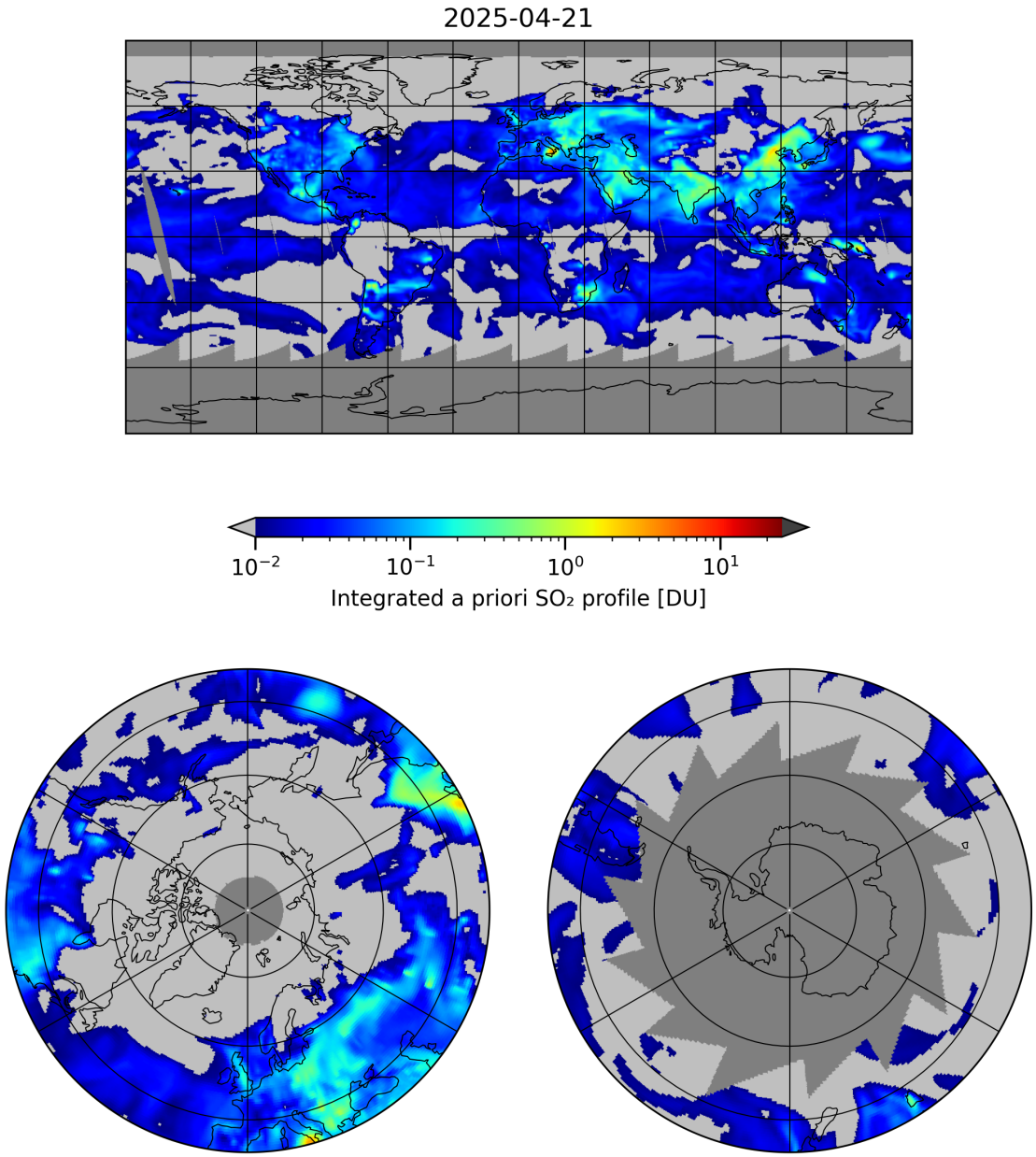

Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-04-21 to 2025-04-22

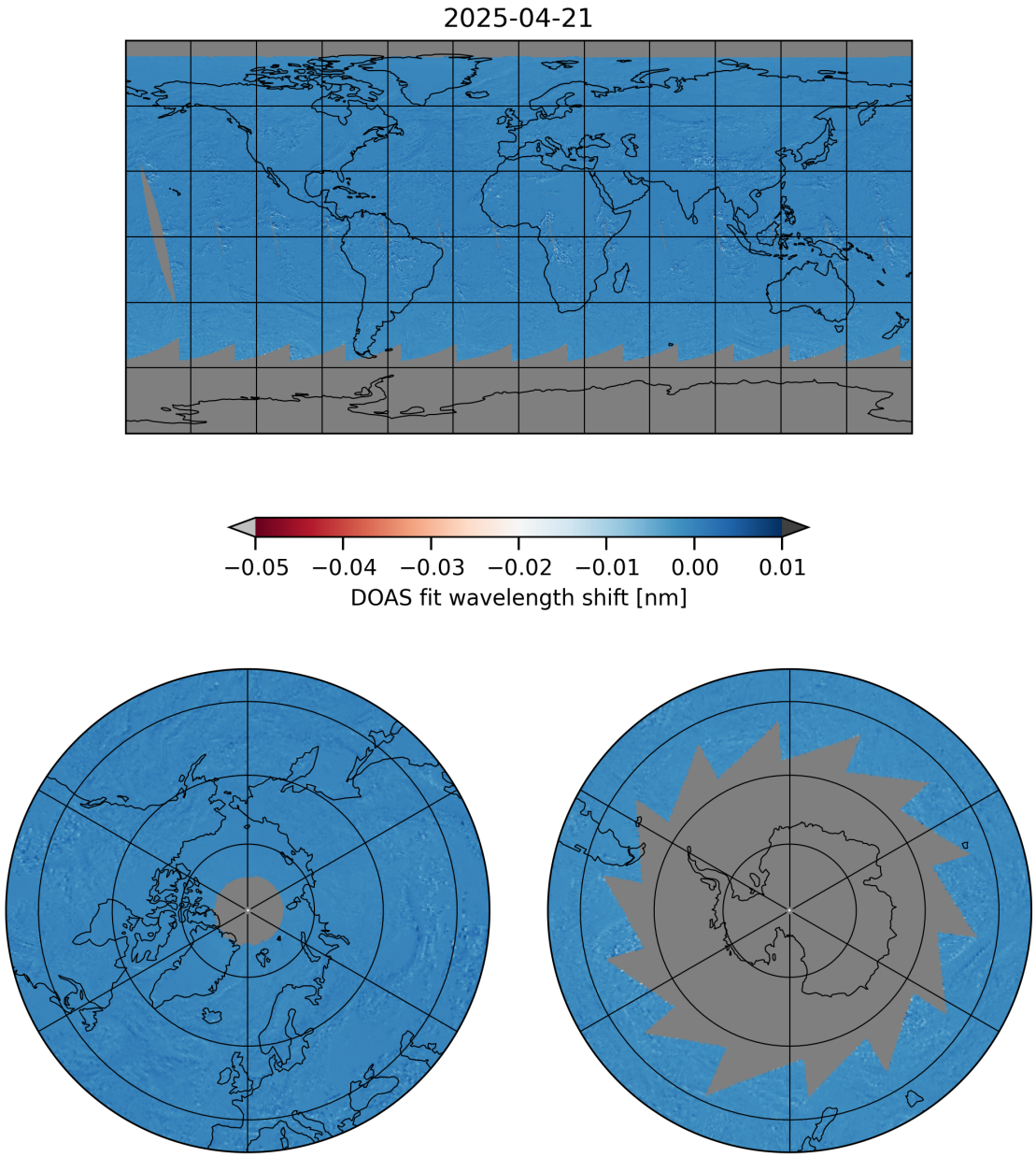

Figure 22: Map of “DOAS fit wavelength shift” for 2025-04-21 to 2025-04-22

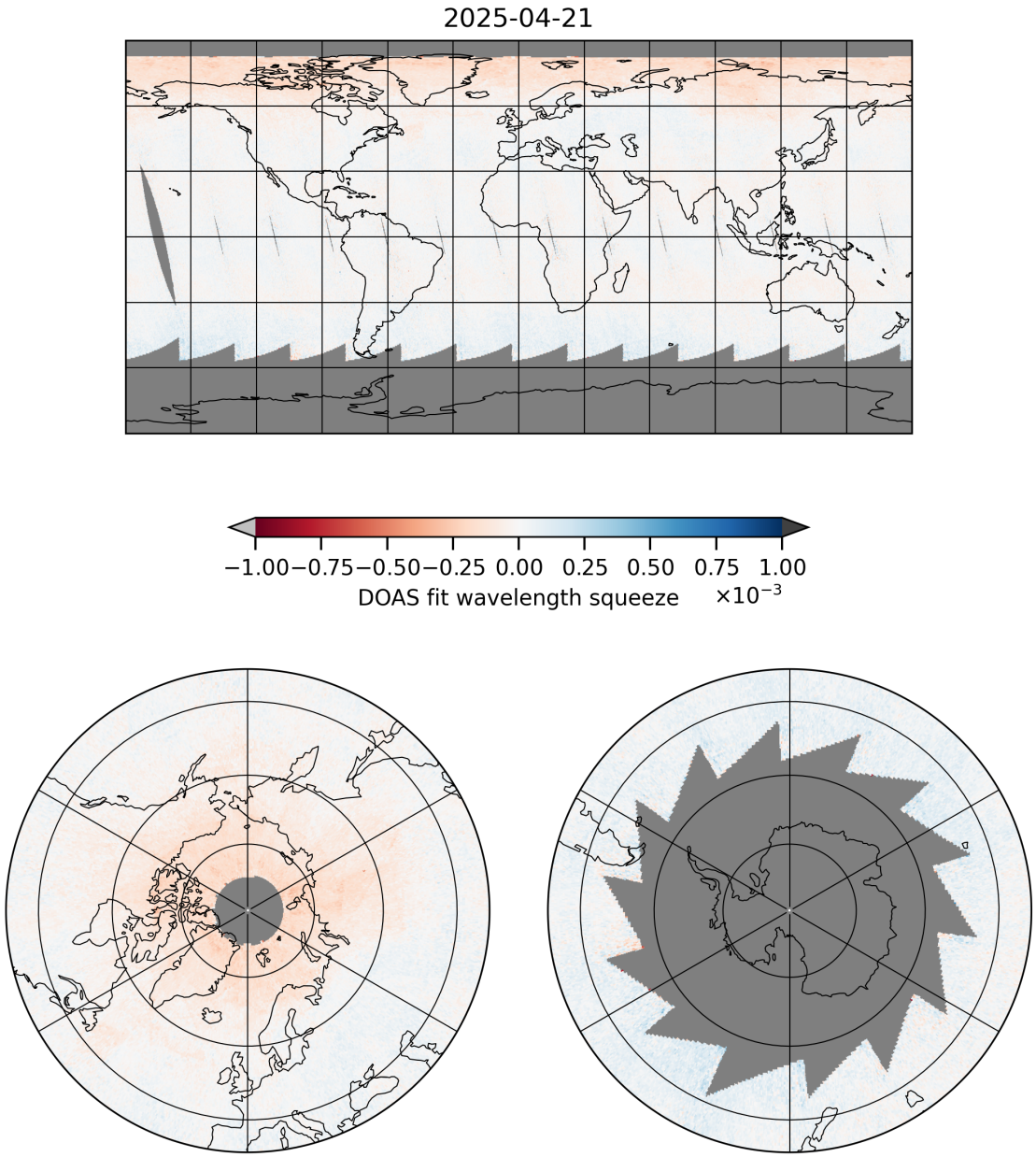

Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-04-21 to 2025-04-22

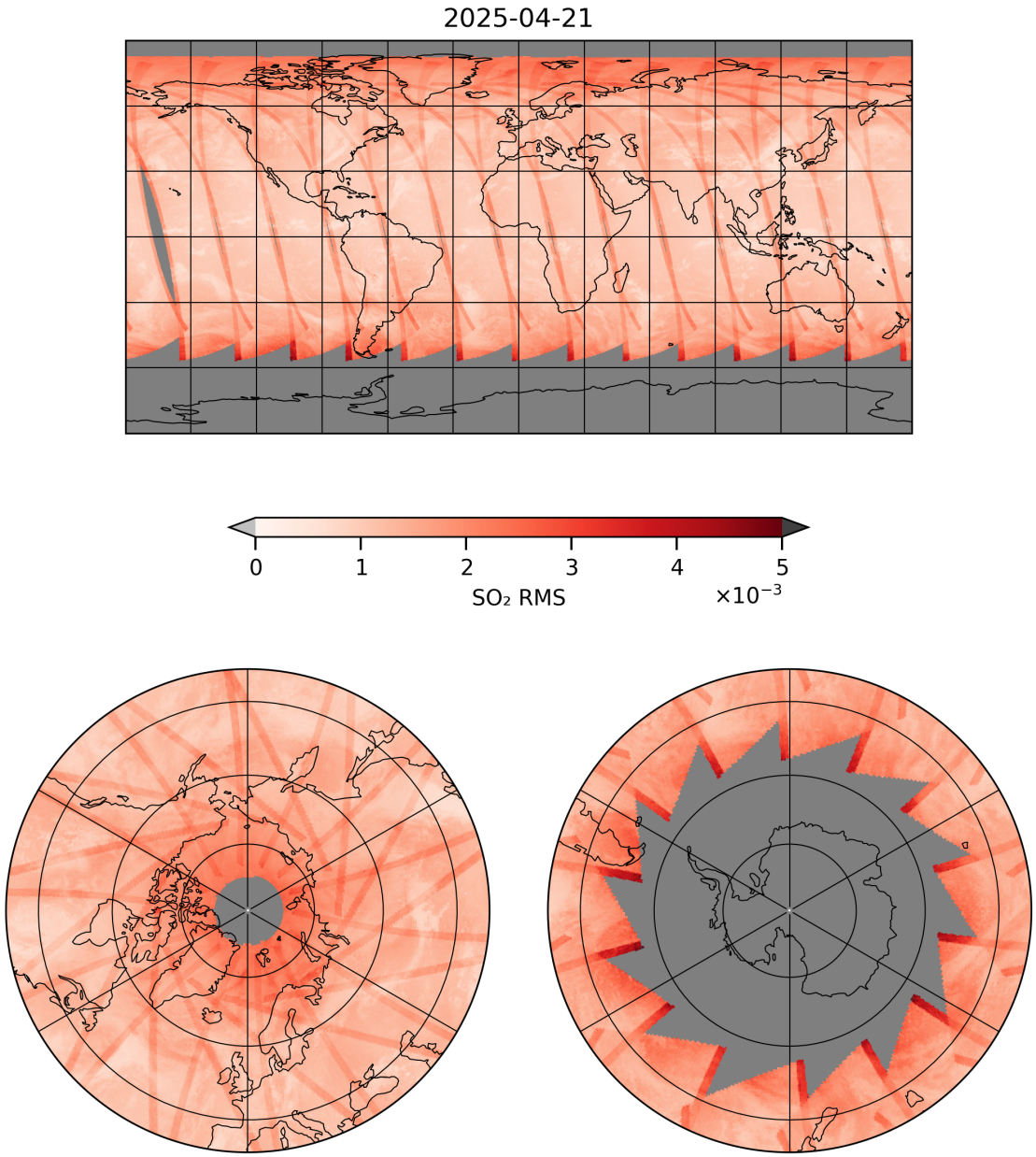

Figure 24: Map of "SO_2 RMS" for 2025-04-21 to 2025-04-22

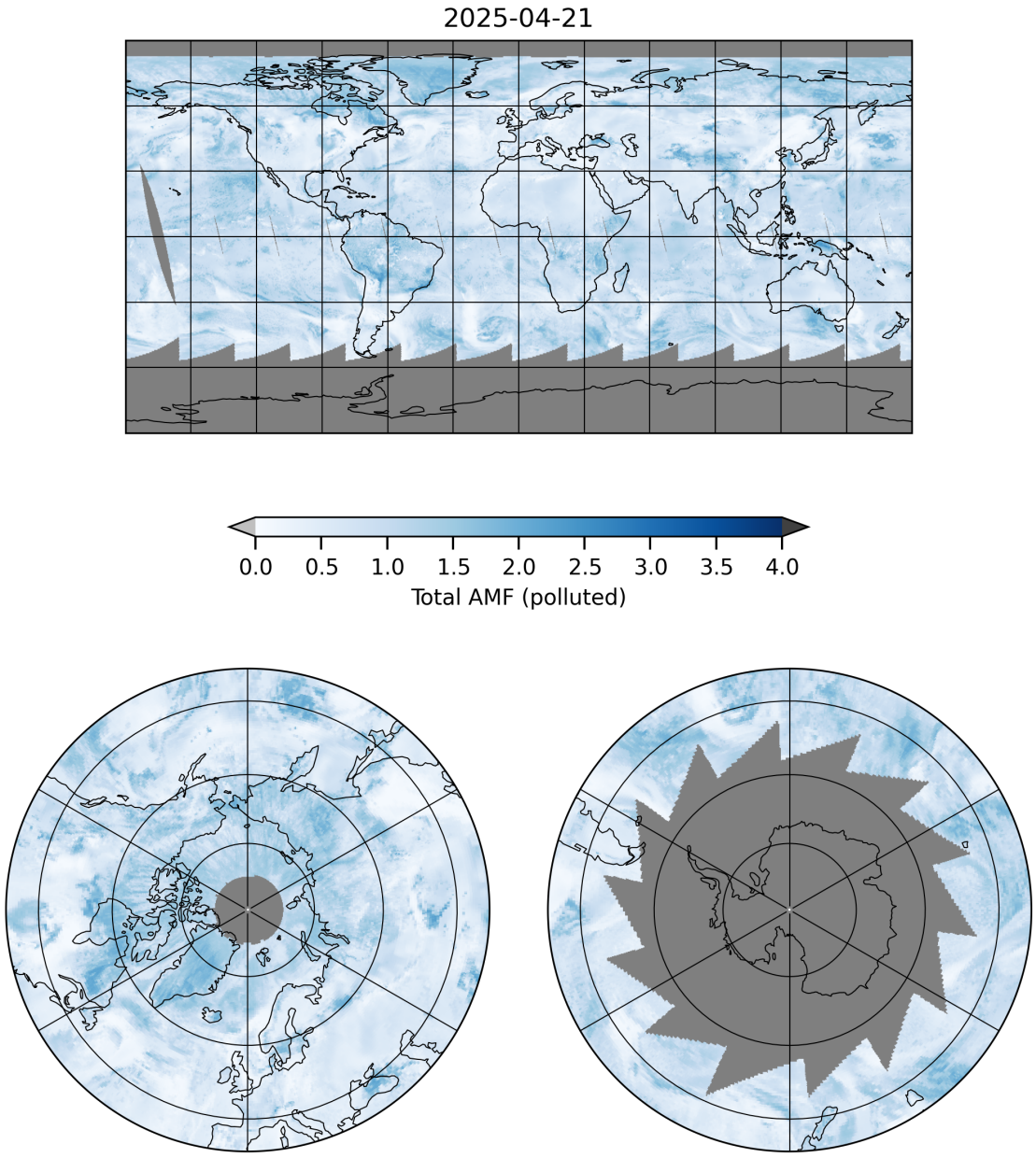

Figure 25: Map of “Total AMF (polluted)” for 2025-04-21 to 2025-04-22

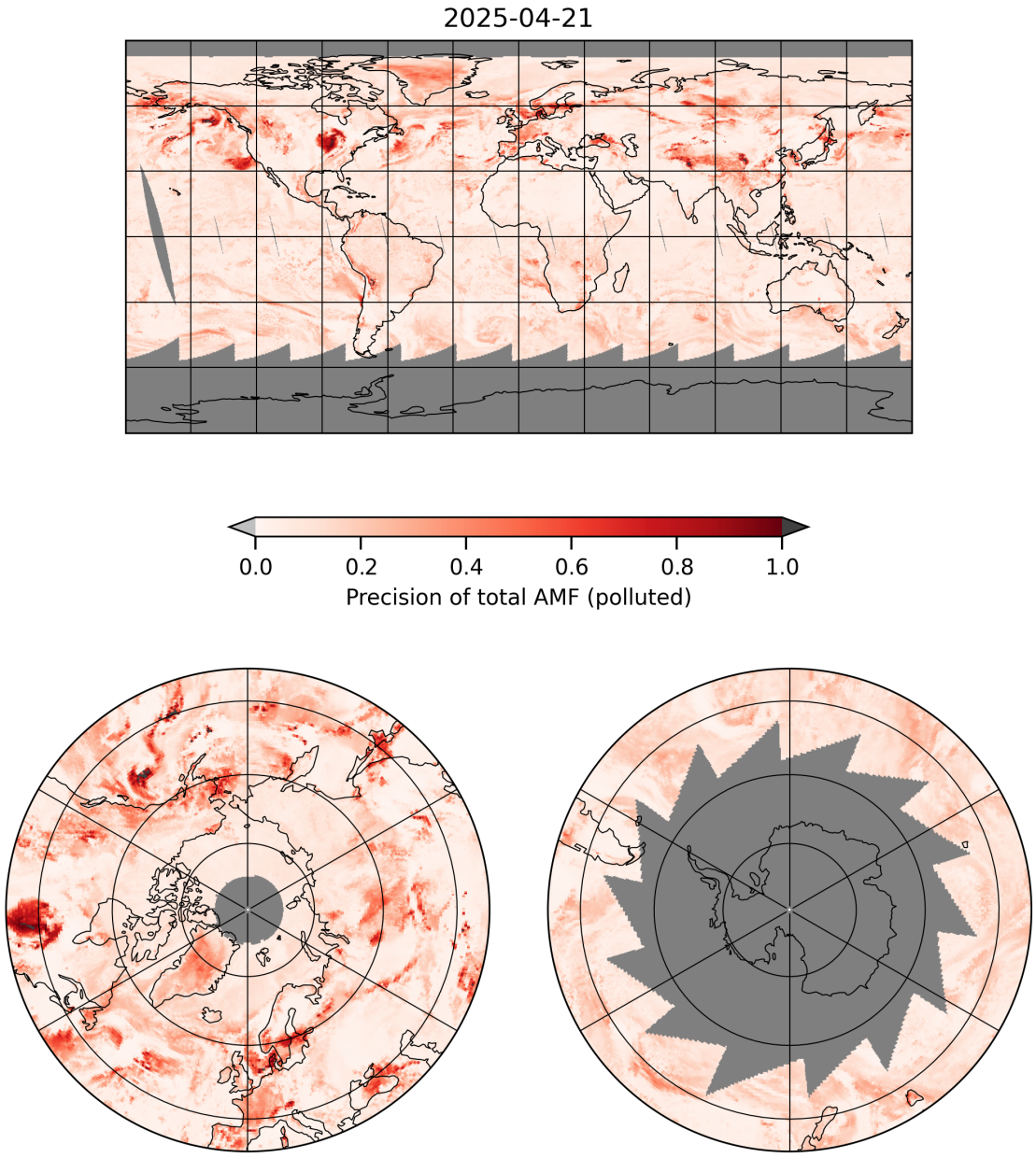

Figure 26: Map of “Precision of total AMF (polluted)” for 2025-04-21 to 2025-04-22

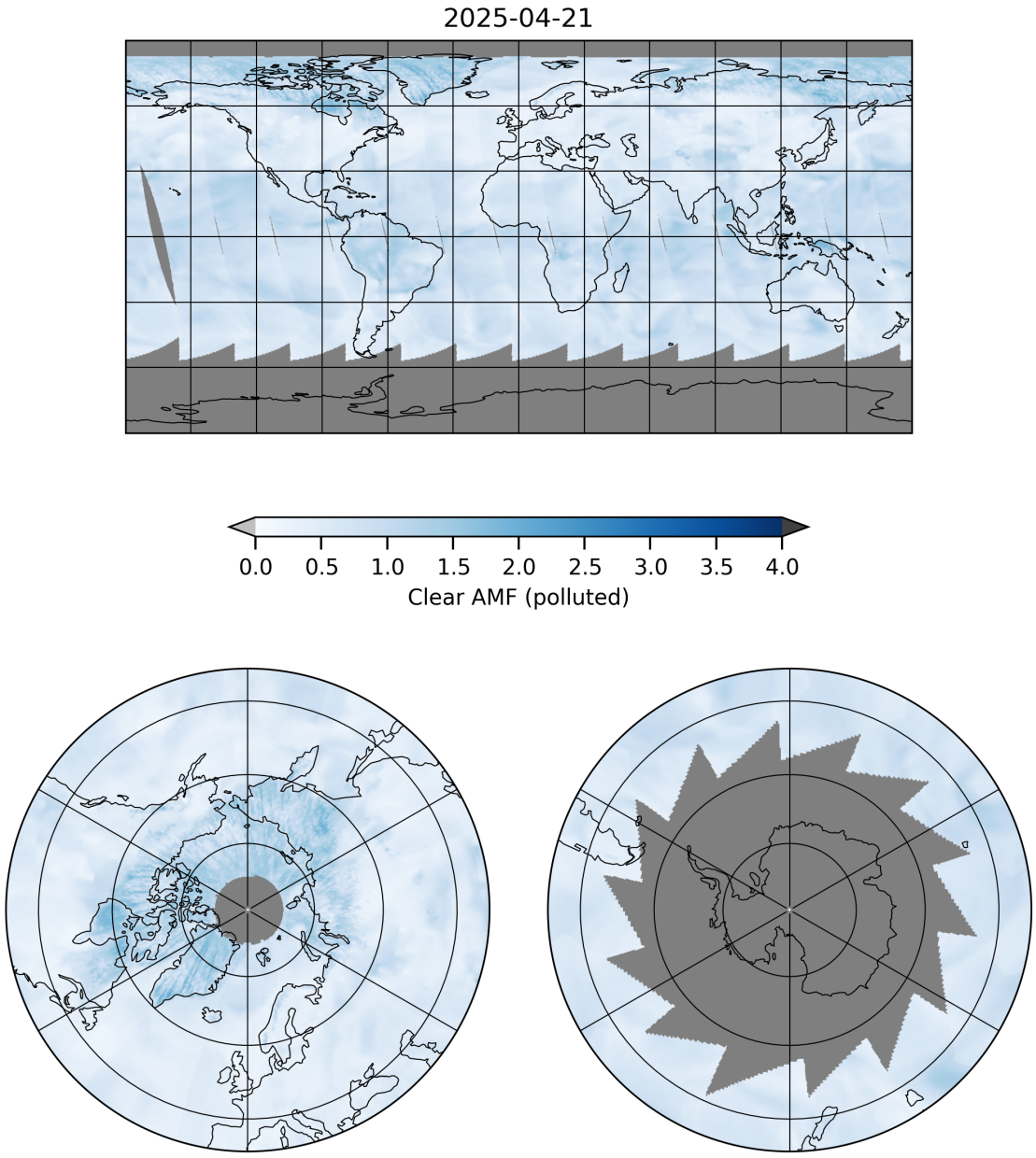

Figure 27: Map of “Clear AMF (polluted)” for 2025-04-21 to 2025-04-22

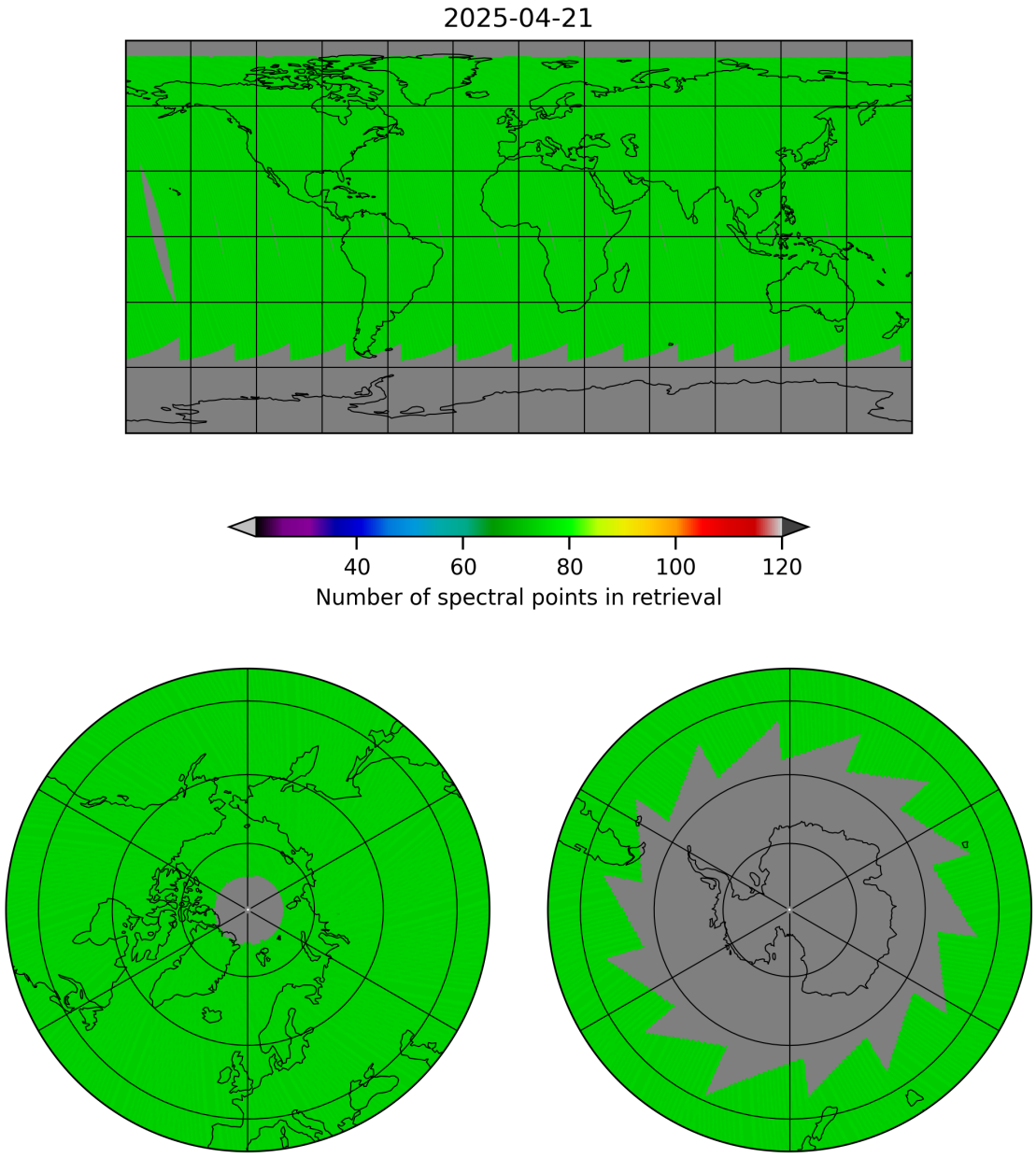

Figure 28: Map of “Number of spectral points in retrieval” for 2025-04-21 to 2025-04-22

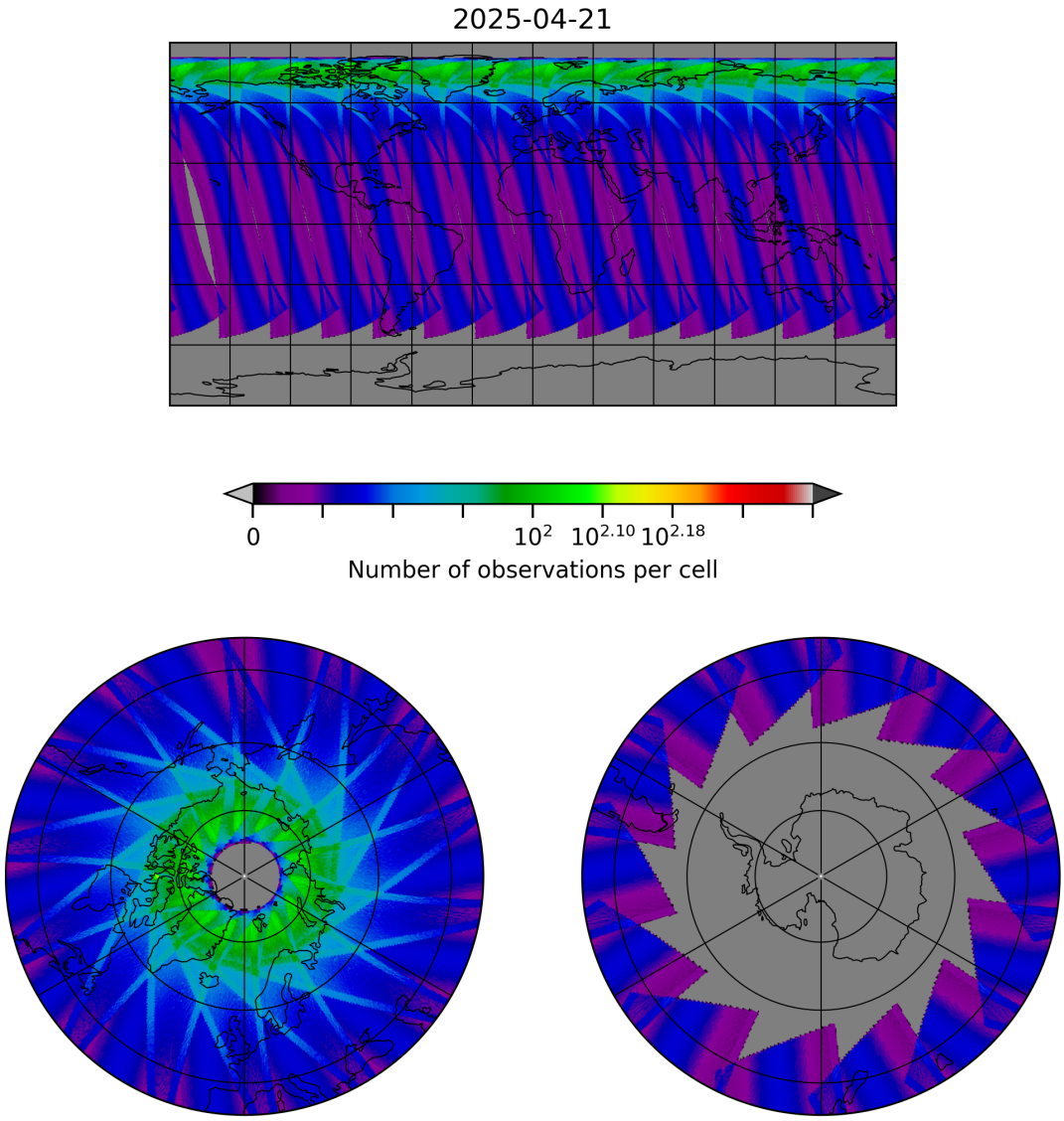

Figure 29: Map of the number of observations for 2025-04-21 to 2025-04-22

7 Zonal average

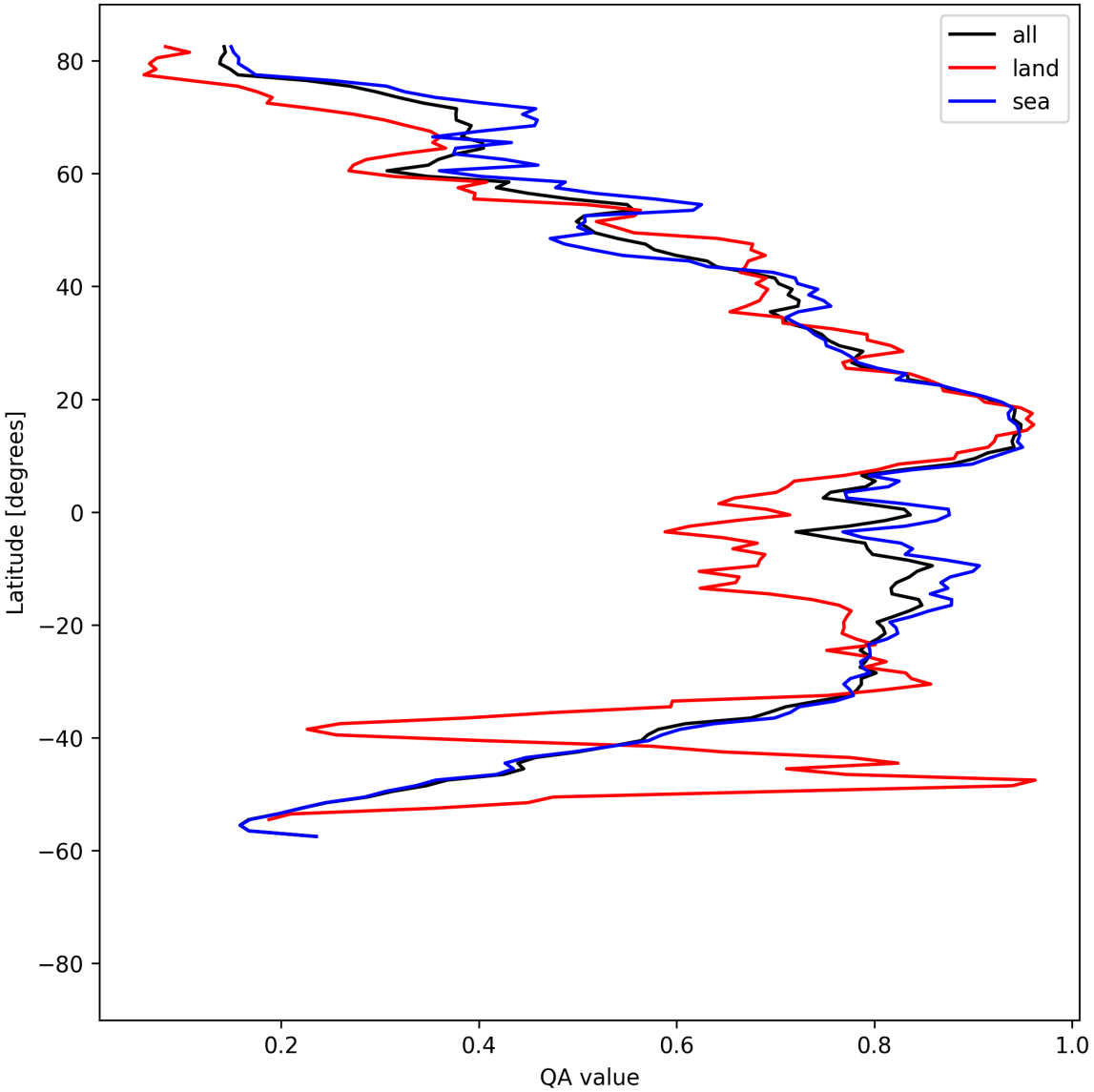

Figure 30: Zonal average of “QA value” for 2025-04-21 to 2025-04-22.

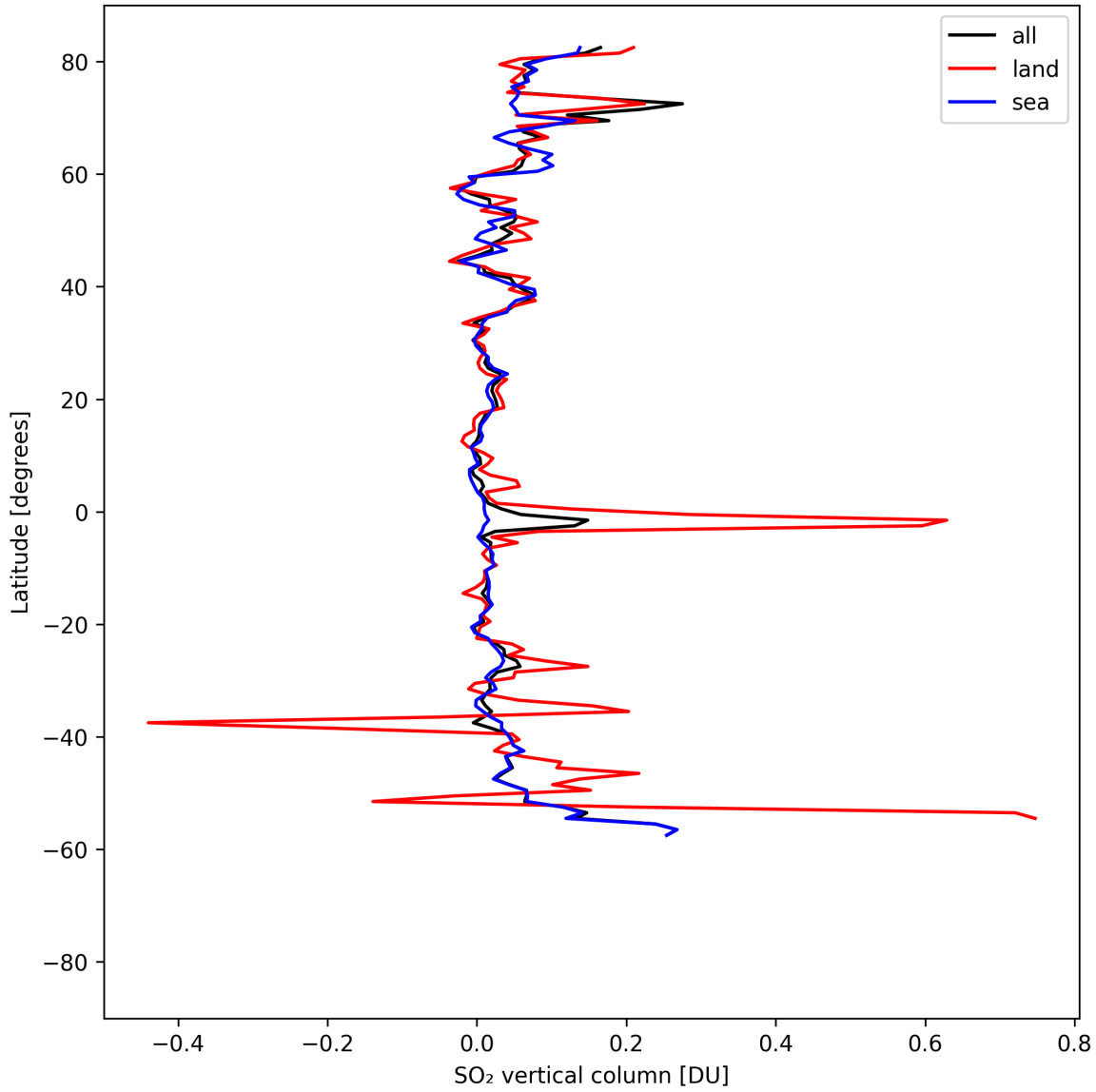

Figure 31: Zonal average of "SO_2 vertical column" for 2025-04-21 to 2025-04-22.

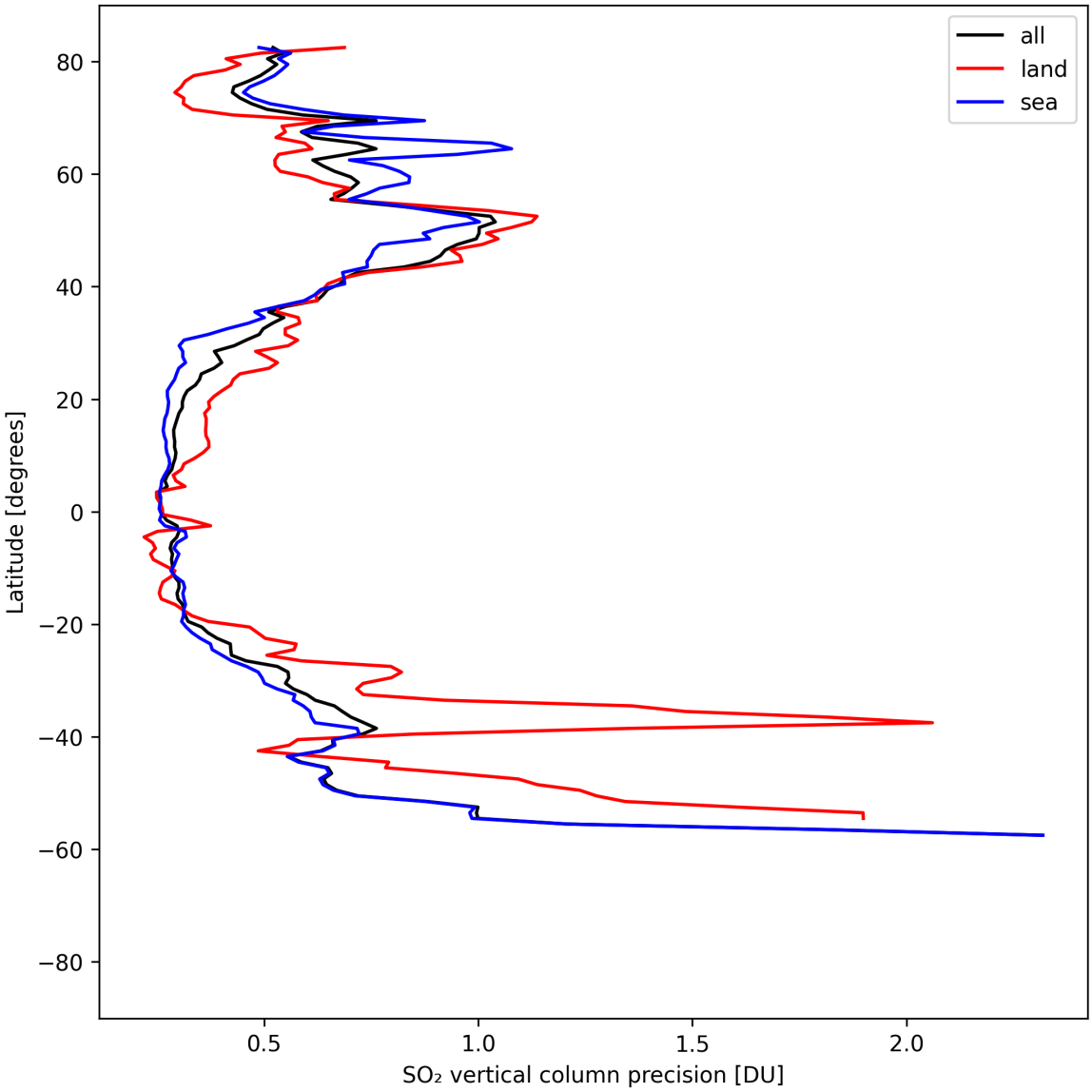

Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-04-21 to 2025-04-22.

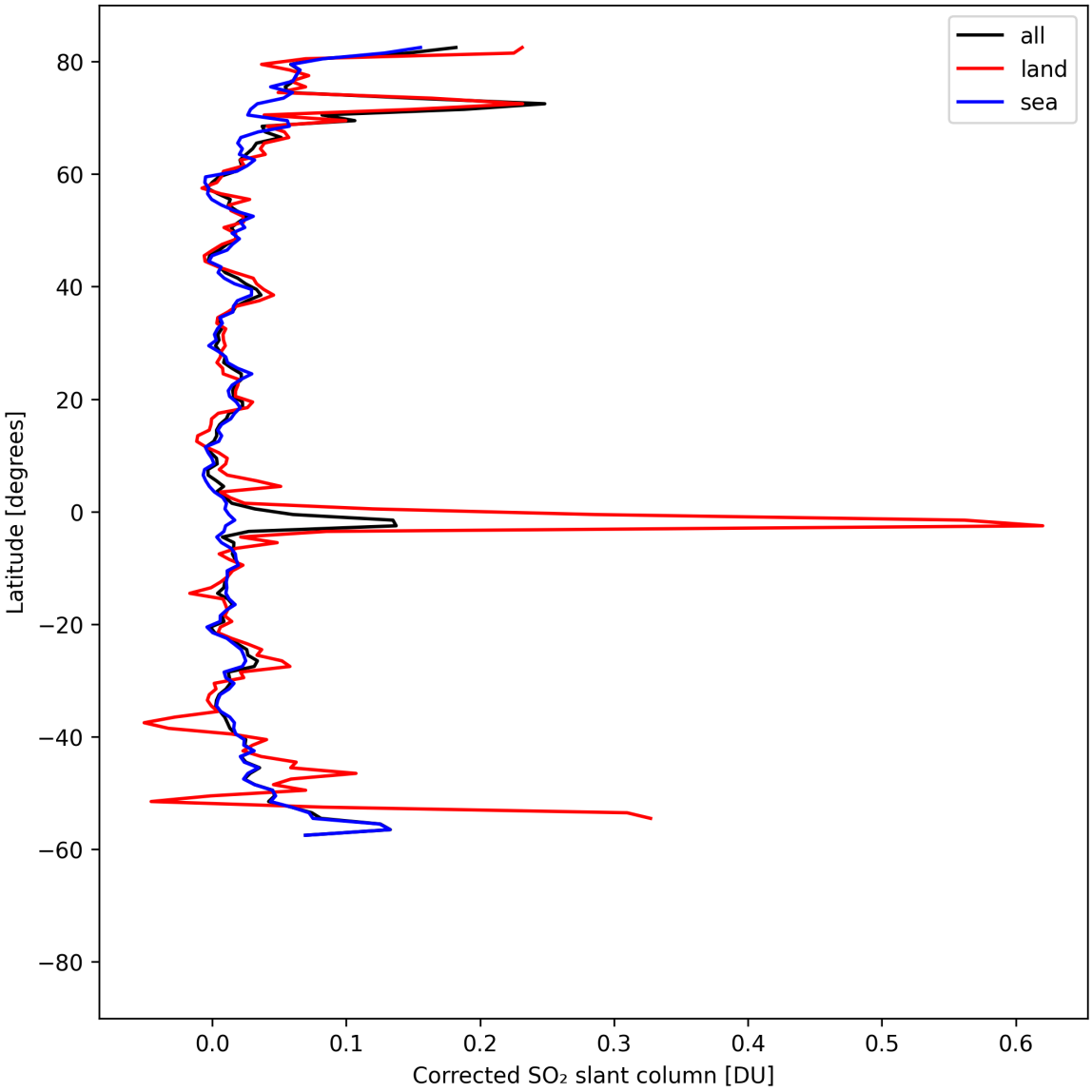

Figure 33: Zonal average of "Corrected SO_2 slant column" for 2025-04-21 to 2025-04-22.

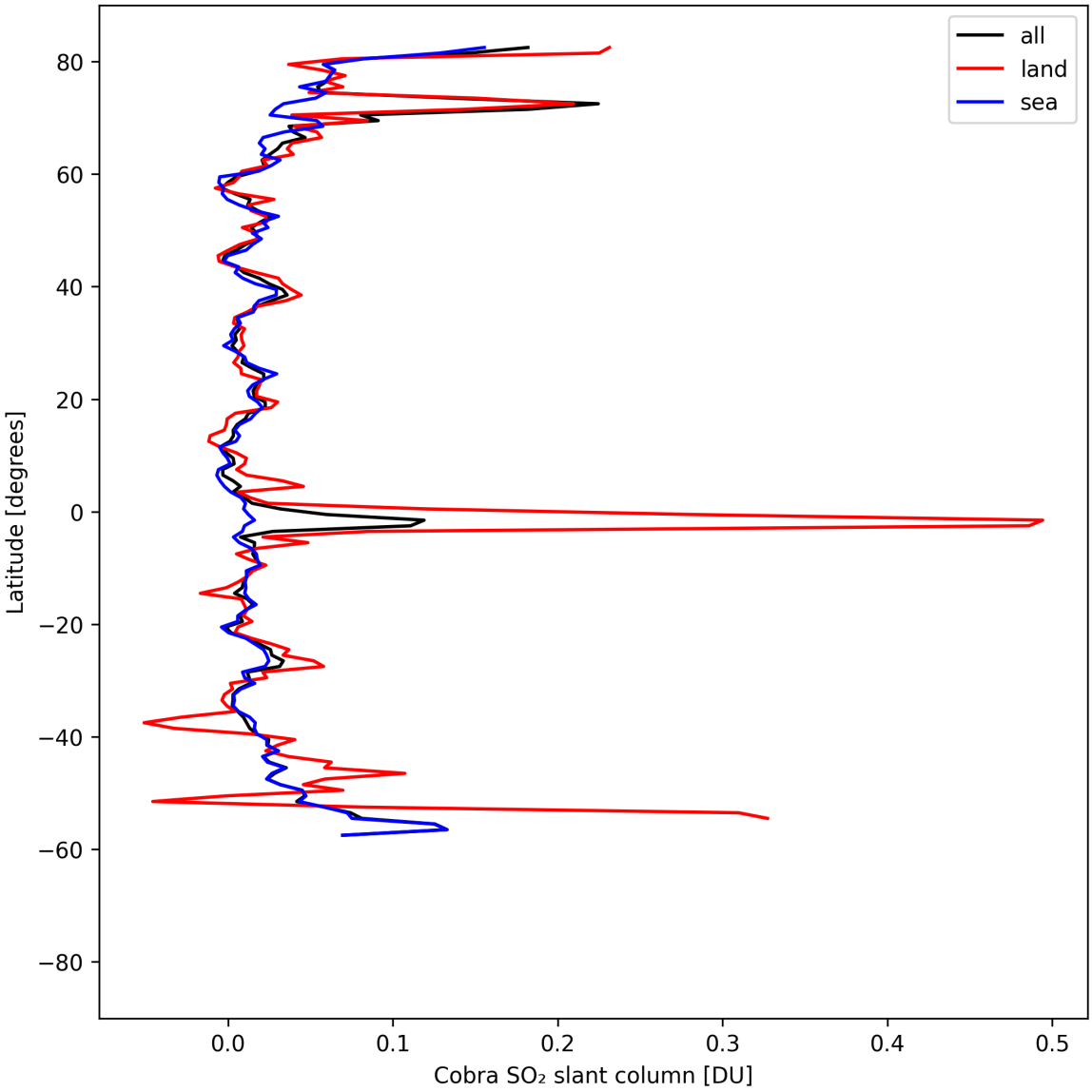

Figure 34: Zonal average of “Cobra SO_2 slant column” for 2025-04-21 to 2025-04-22.

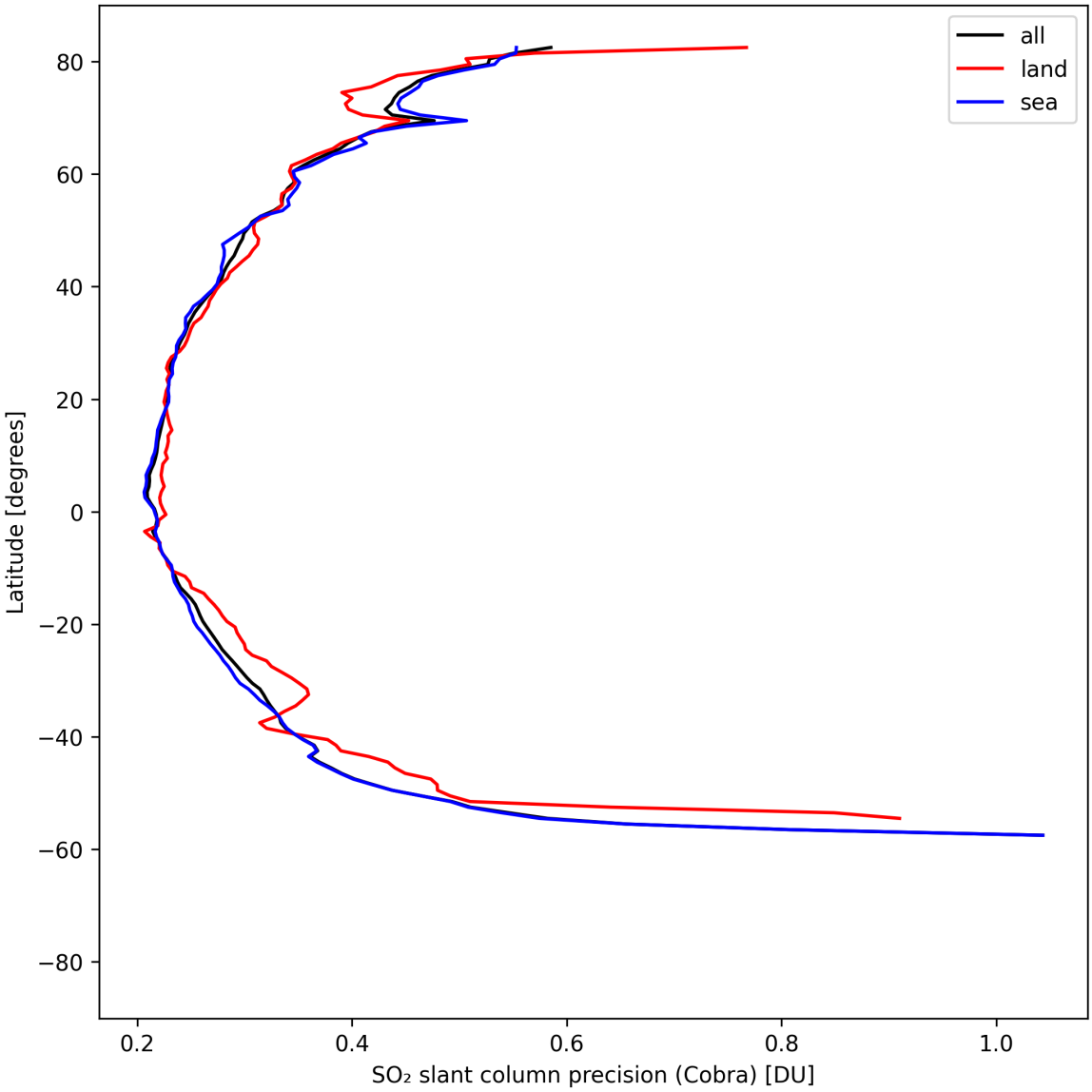

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-04-21 to 2025-04-22.

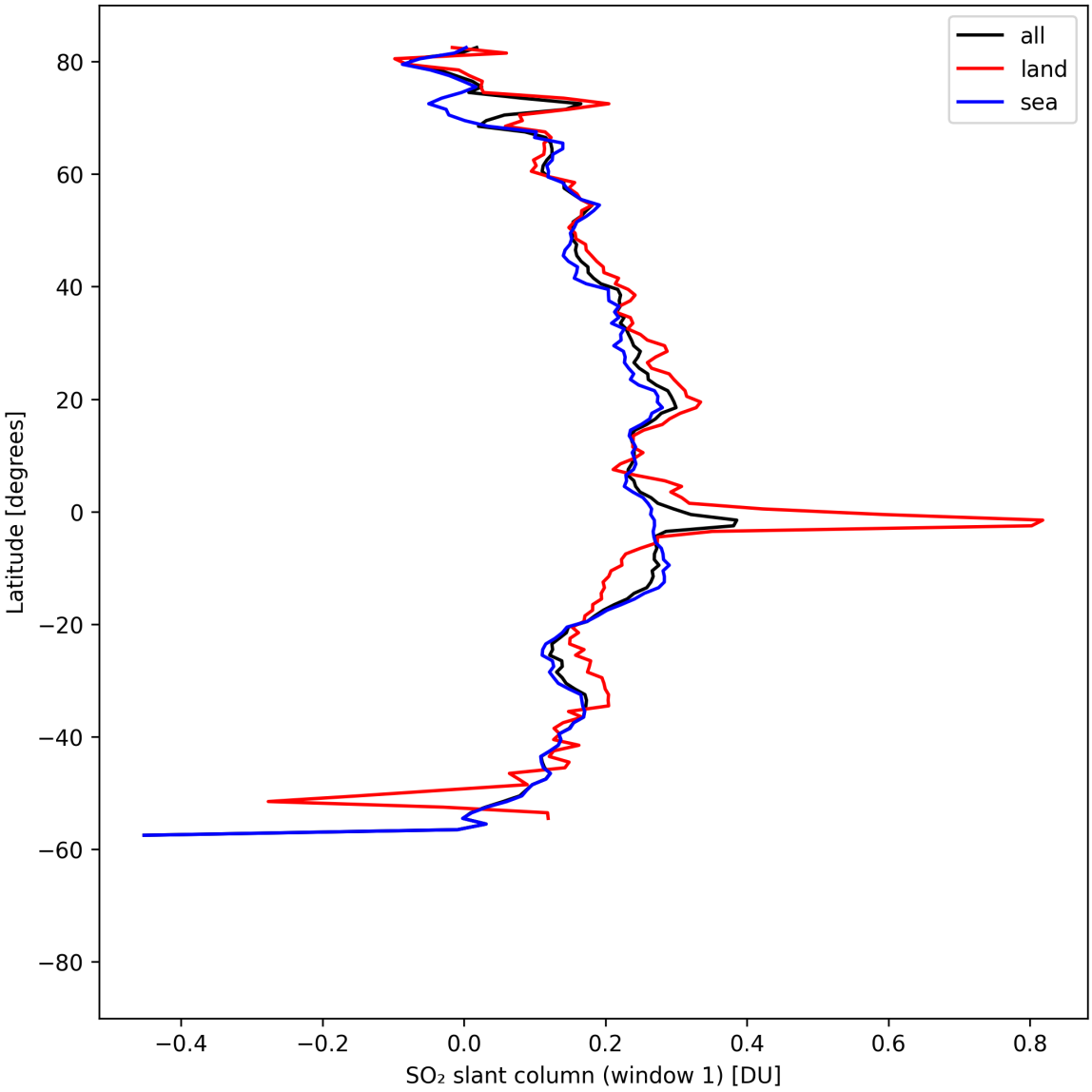

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-04-21 to 2025-04-22.

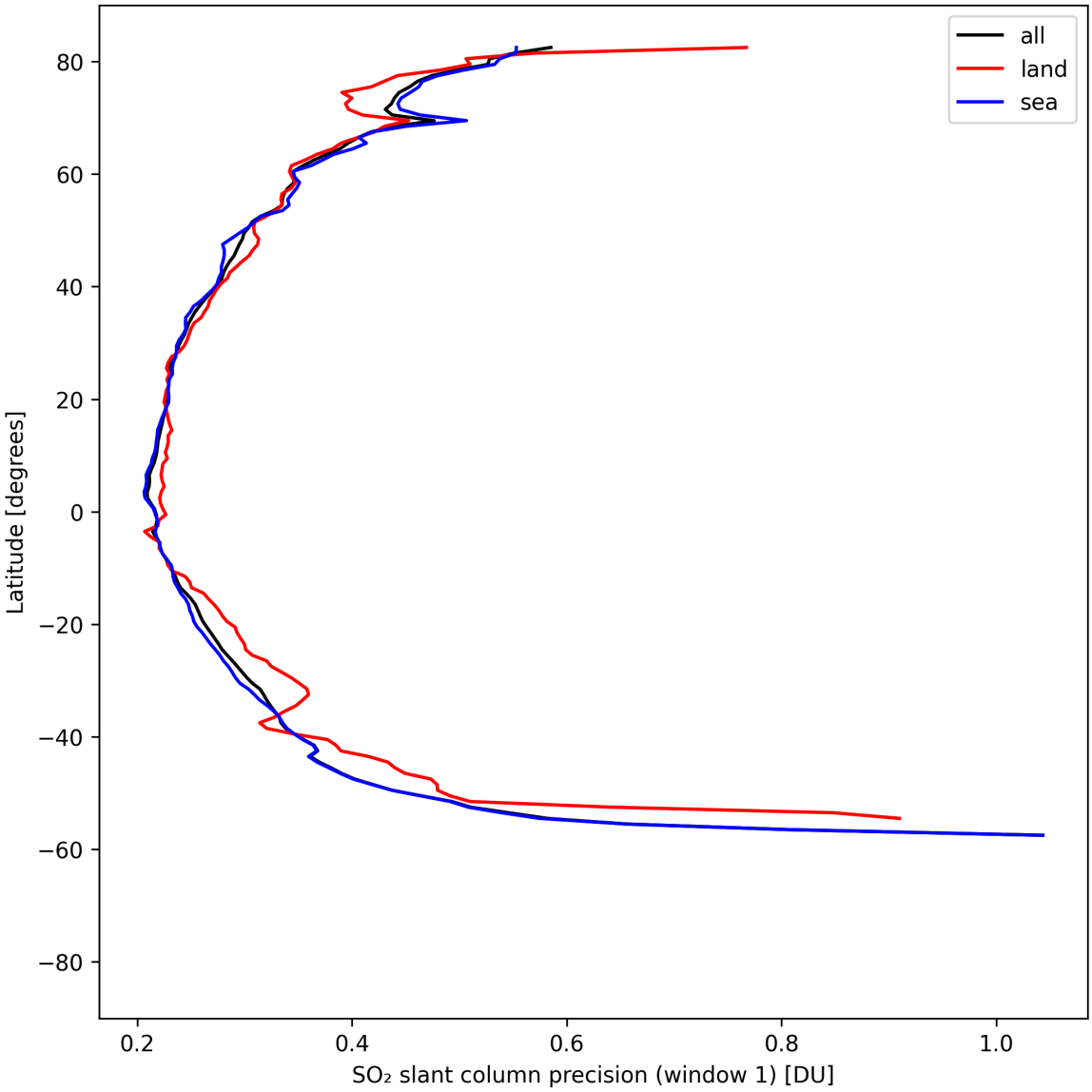

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-04-21 to 2025-04-22.

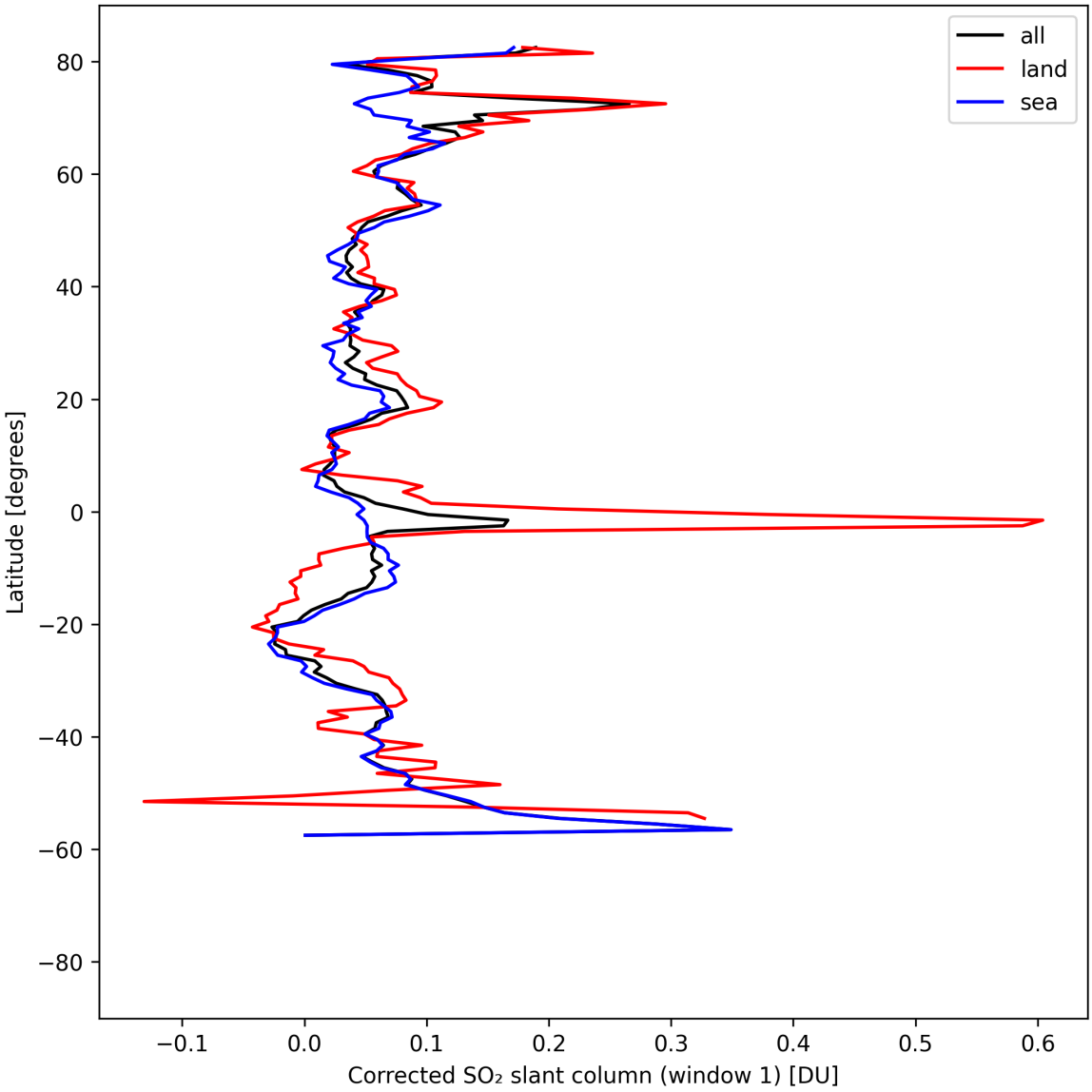

Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-04-21 to 2025-04-22.

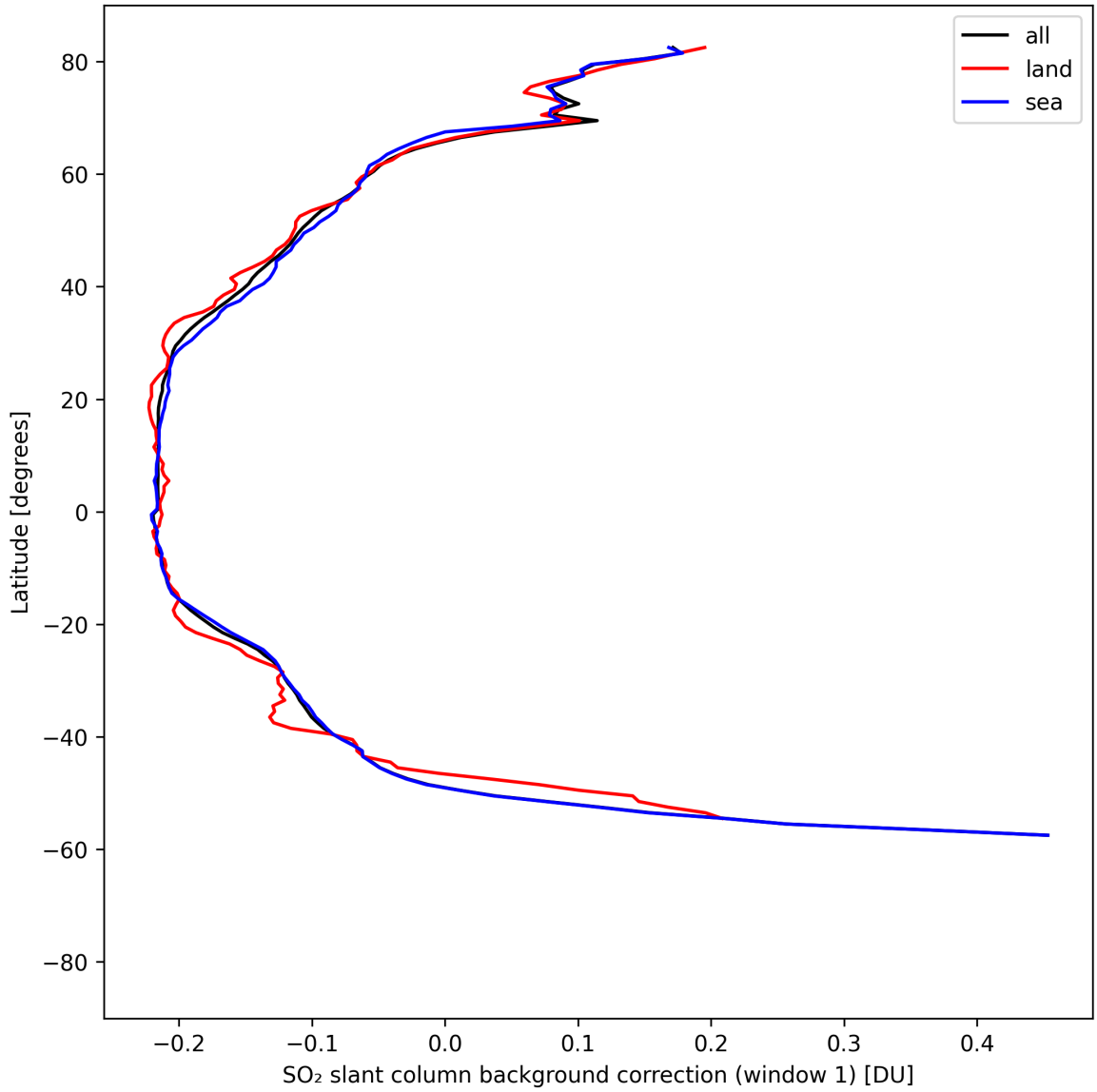

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-04-21 to 2025-04-22.

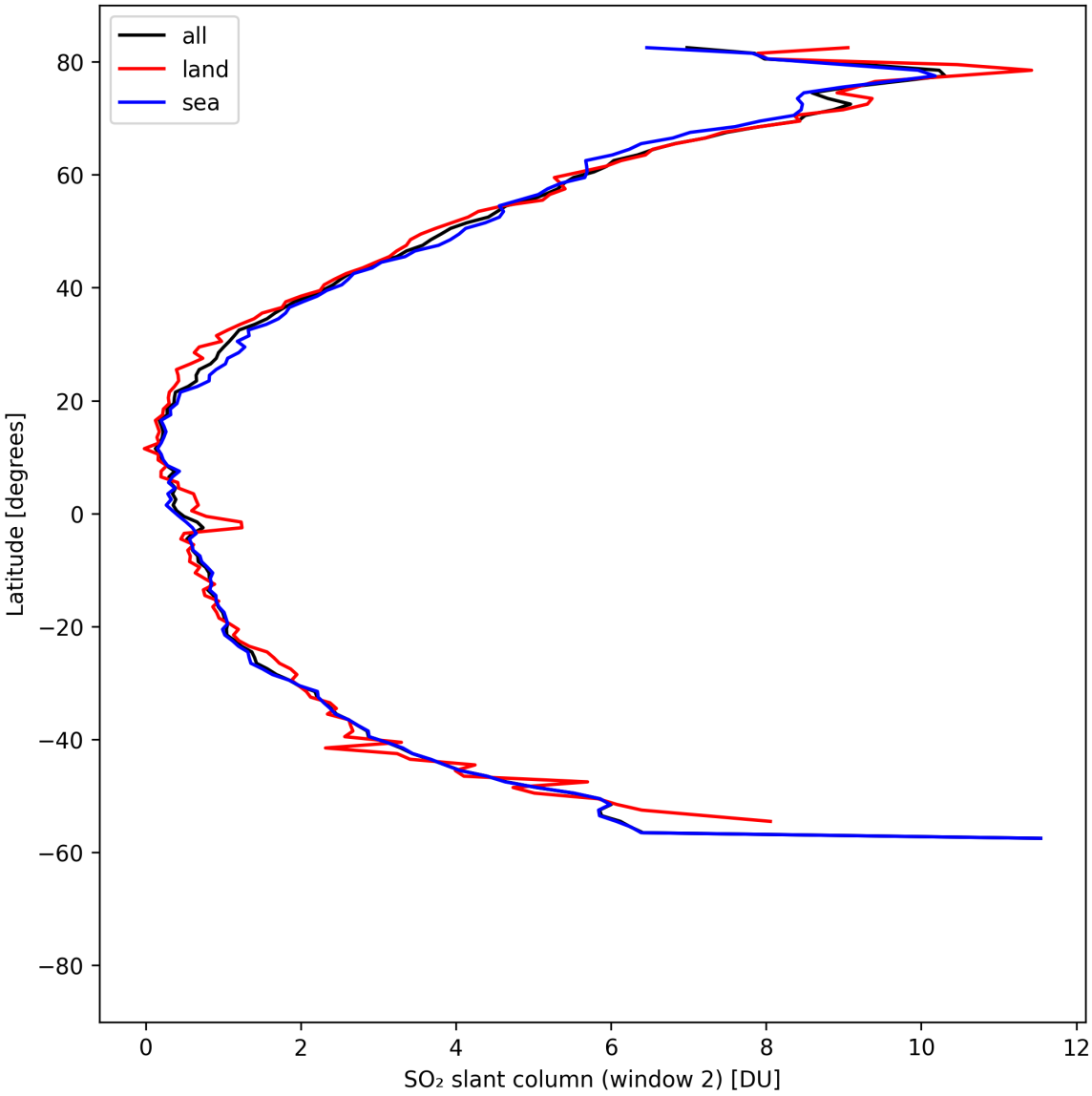

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-04-21 to 2025-04-22.

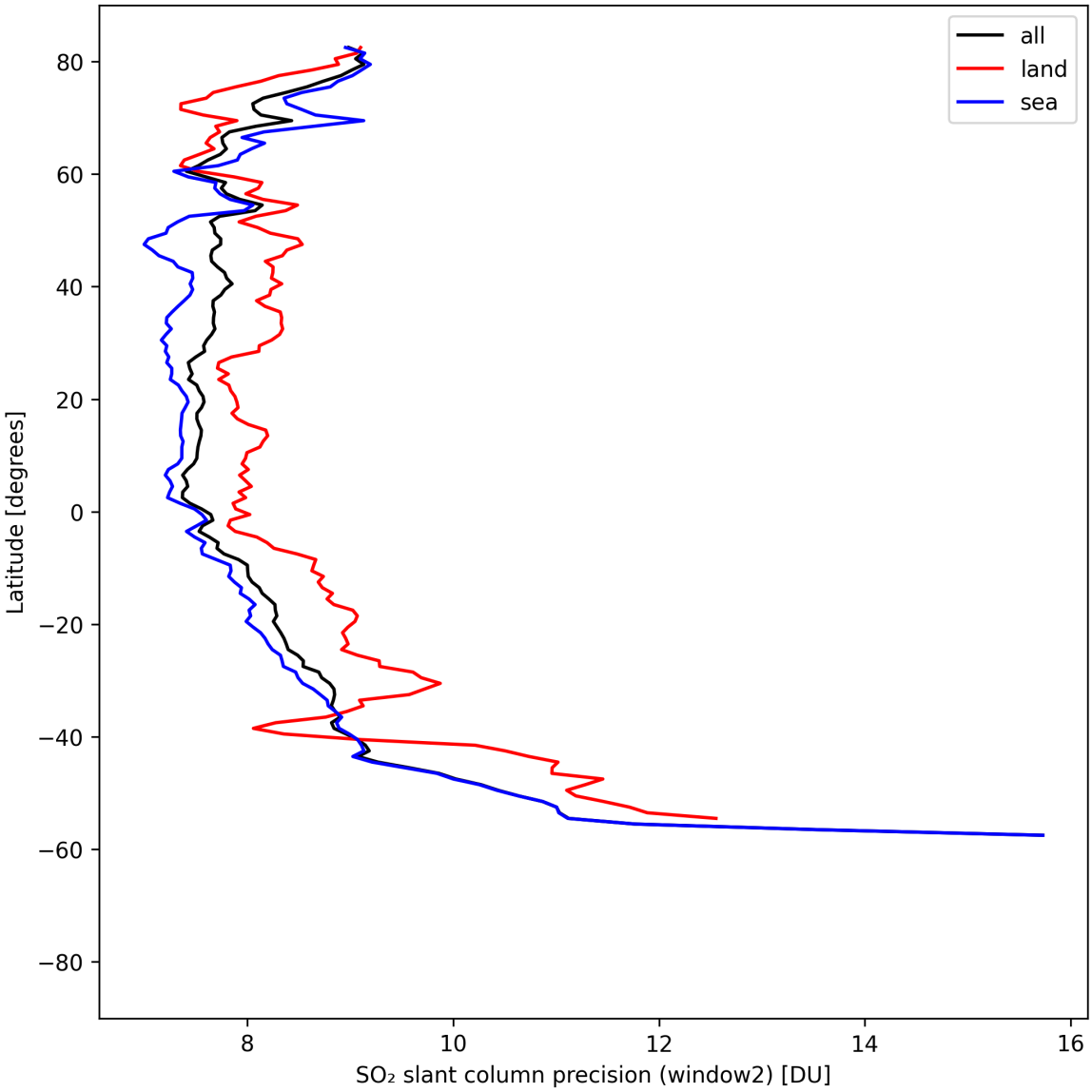

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-04-21 to 2025-04-22.

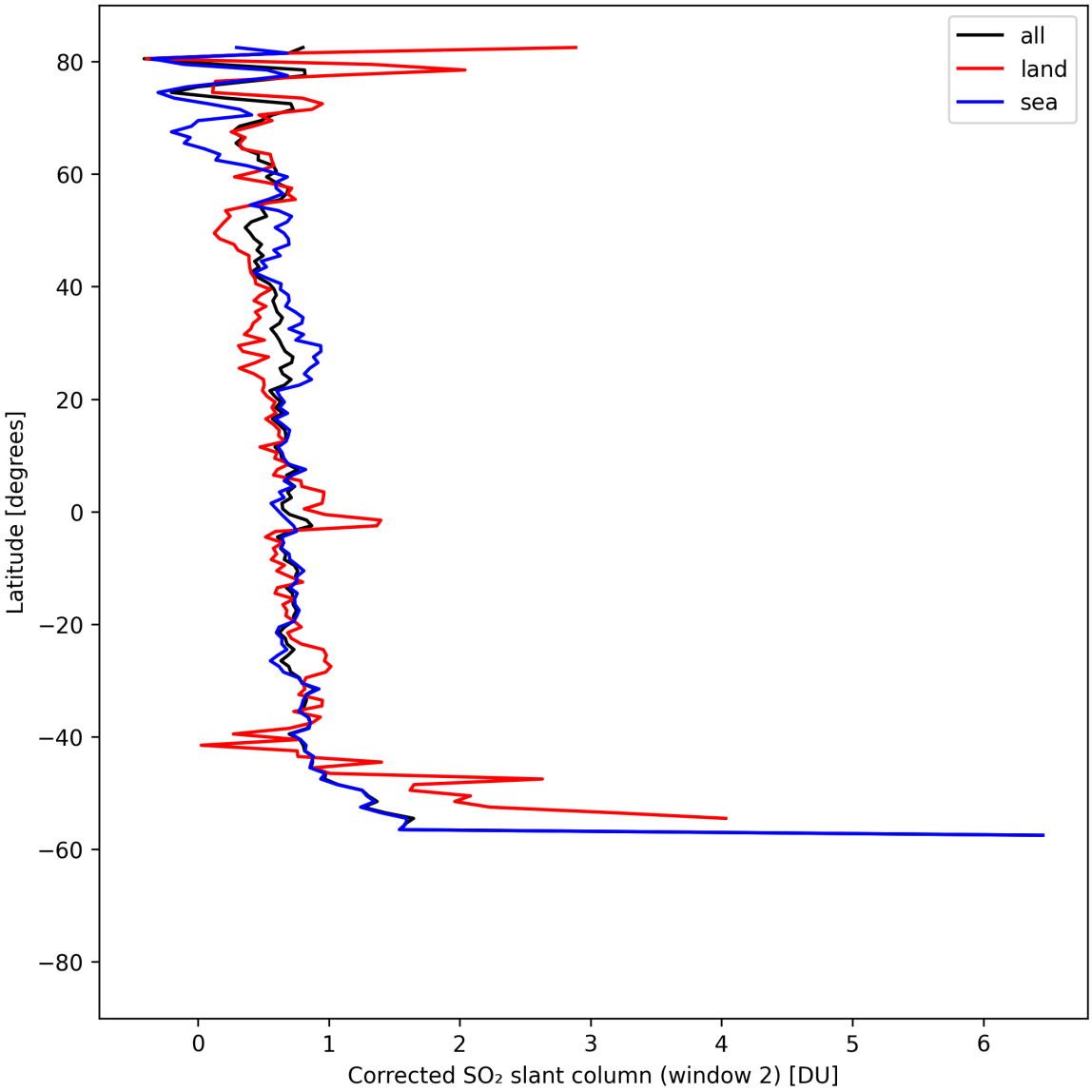

Figure 42: Zonal average of “Corrected SO_2 slant column (window 2)” for 2025-04-21 to 2025-04-22.

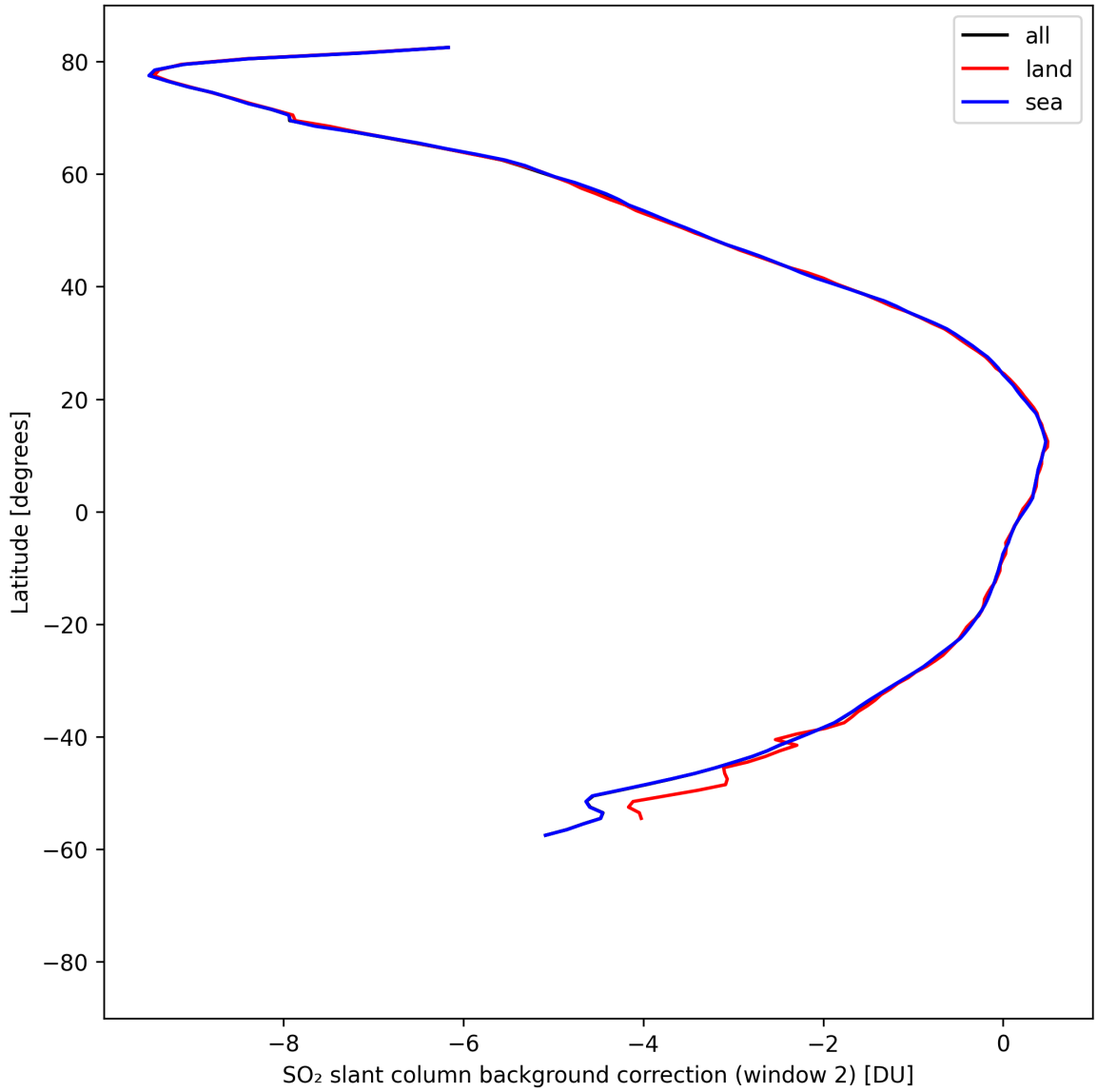

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-04-21 to 2025-04-22.

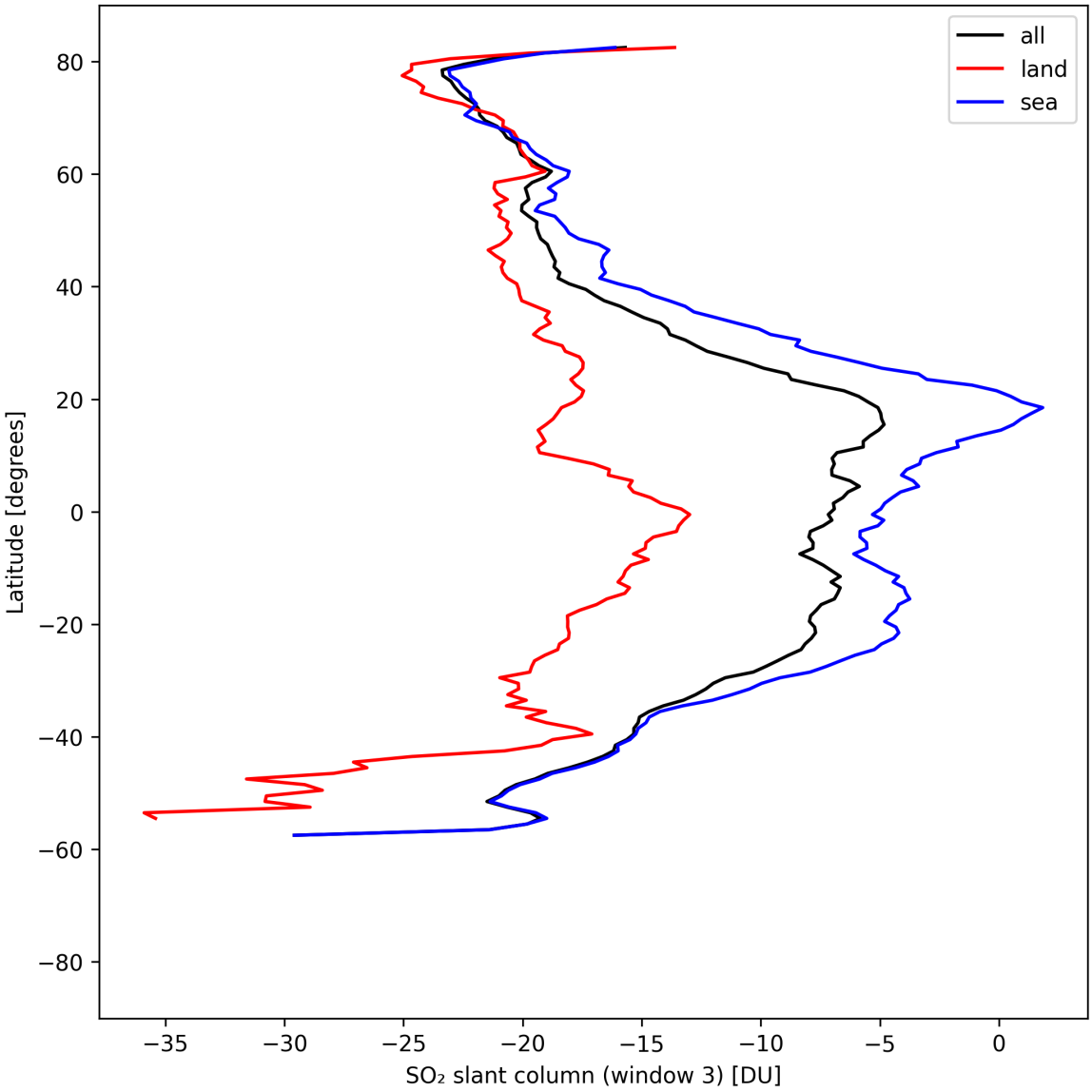

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-04-21 to 2025-04-22.

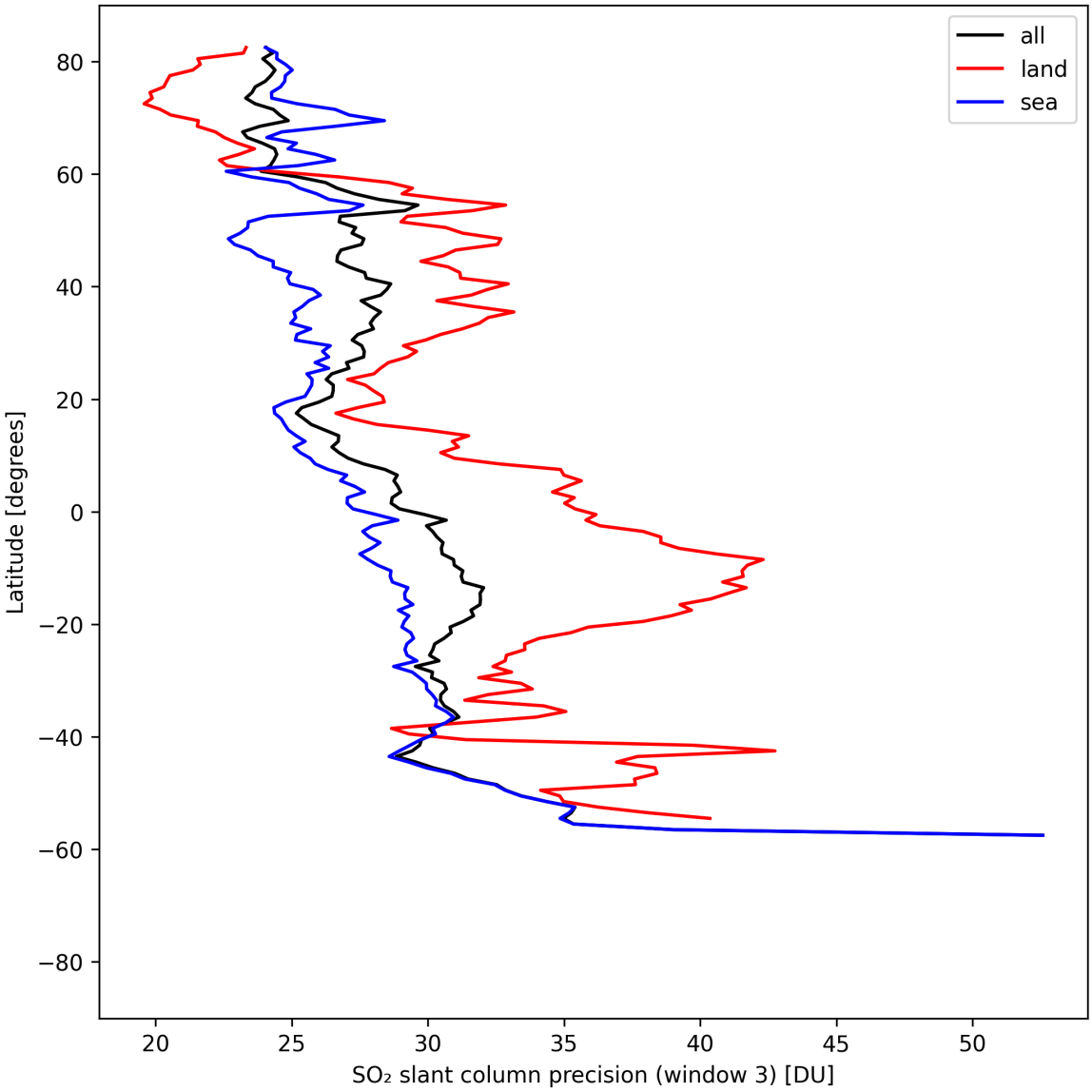

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-04-21 to 2025-04-22.

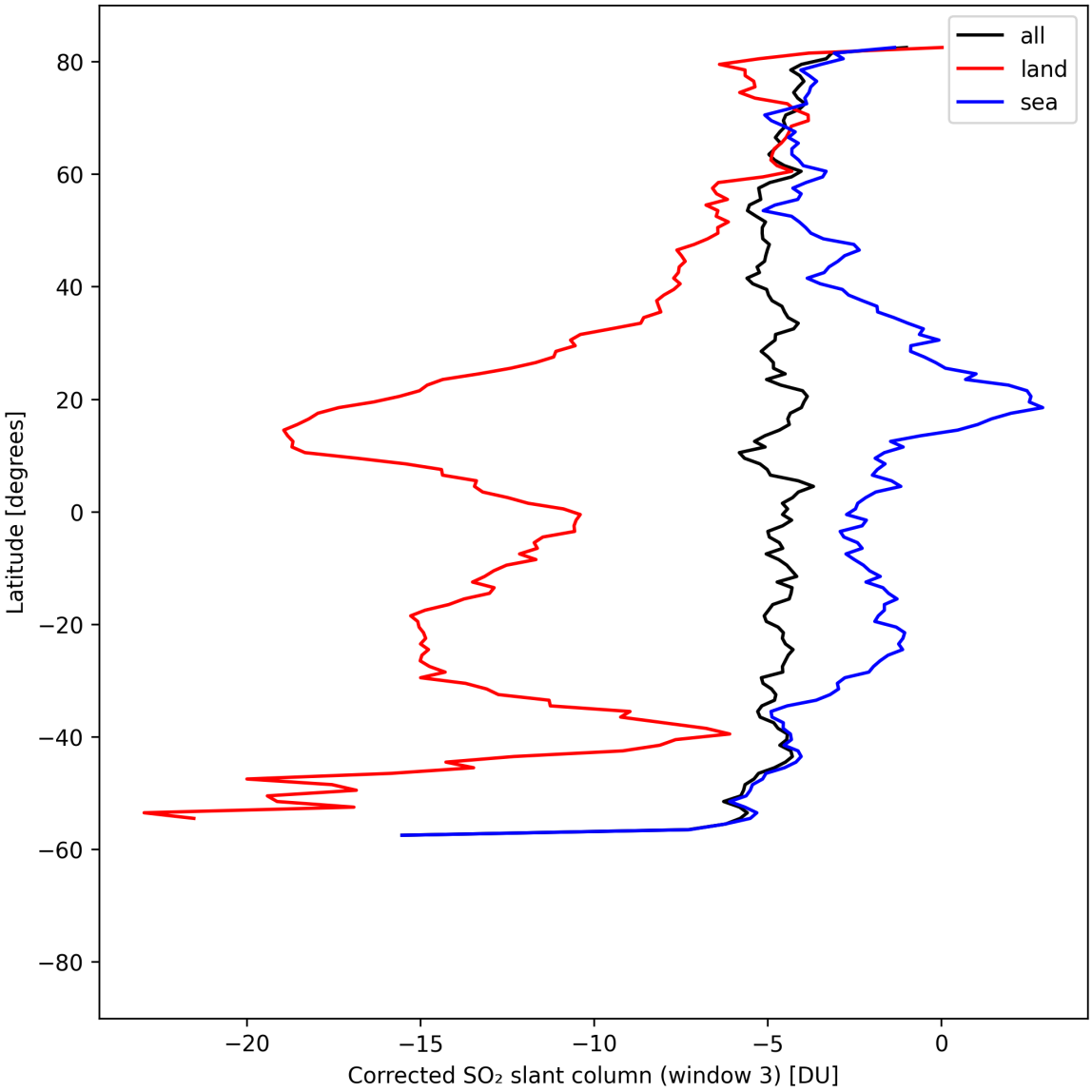

Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-04-21 to 2025-04-22.

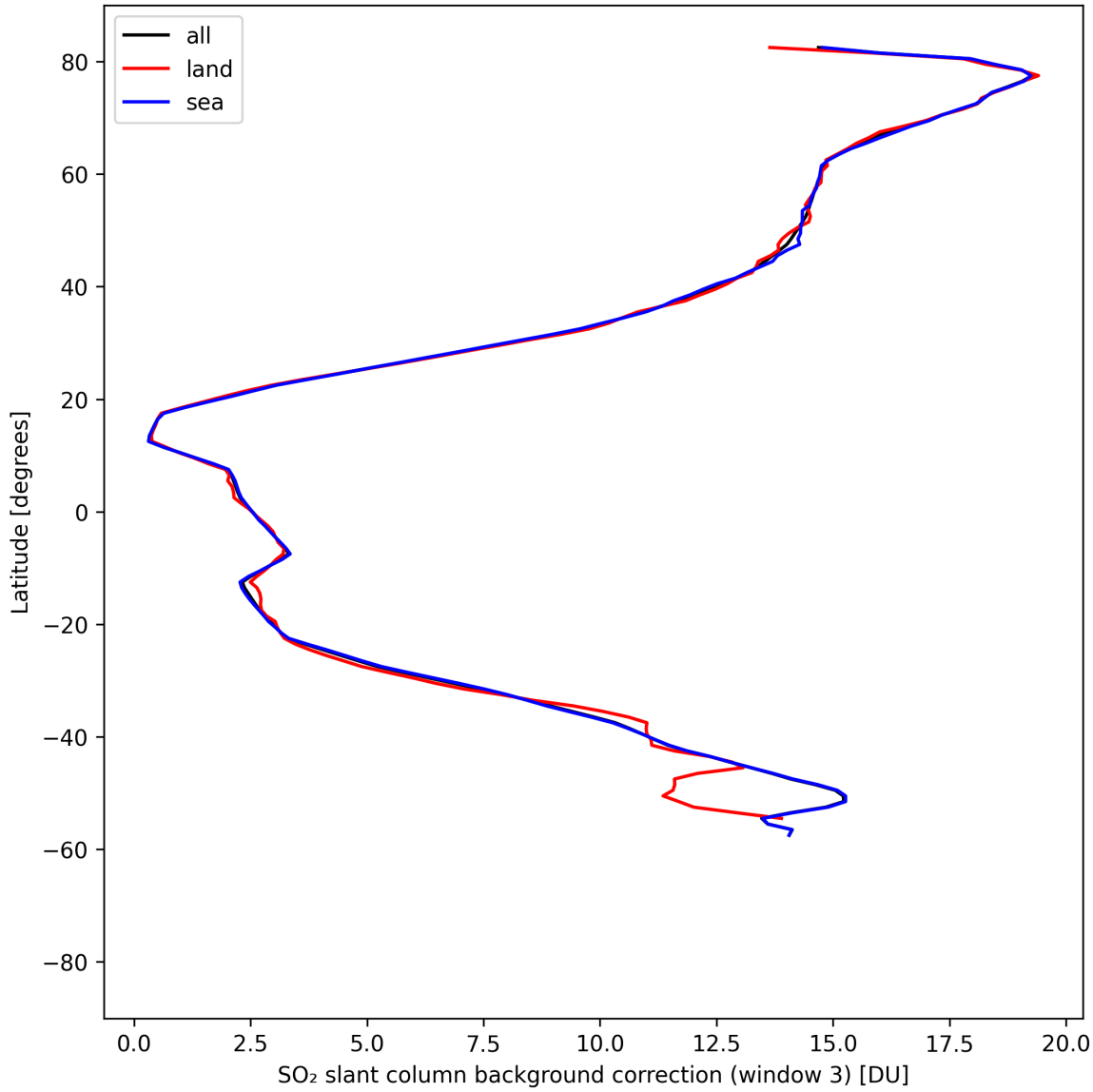

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-04-21 to 2025-04-22.

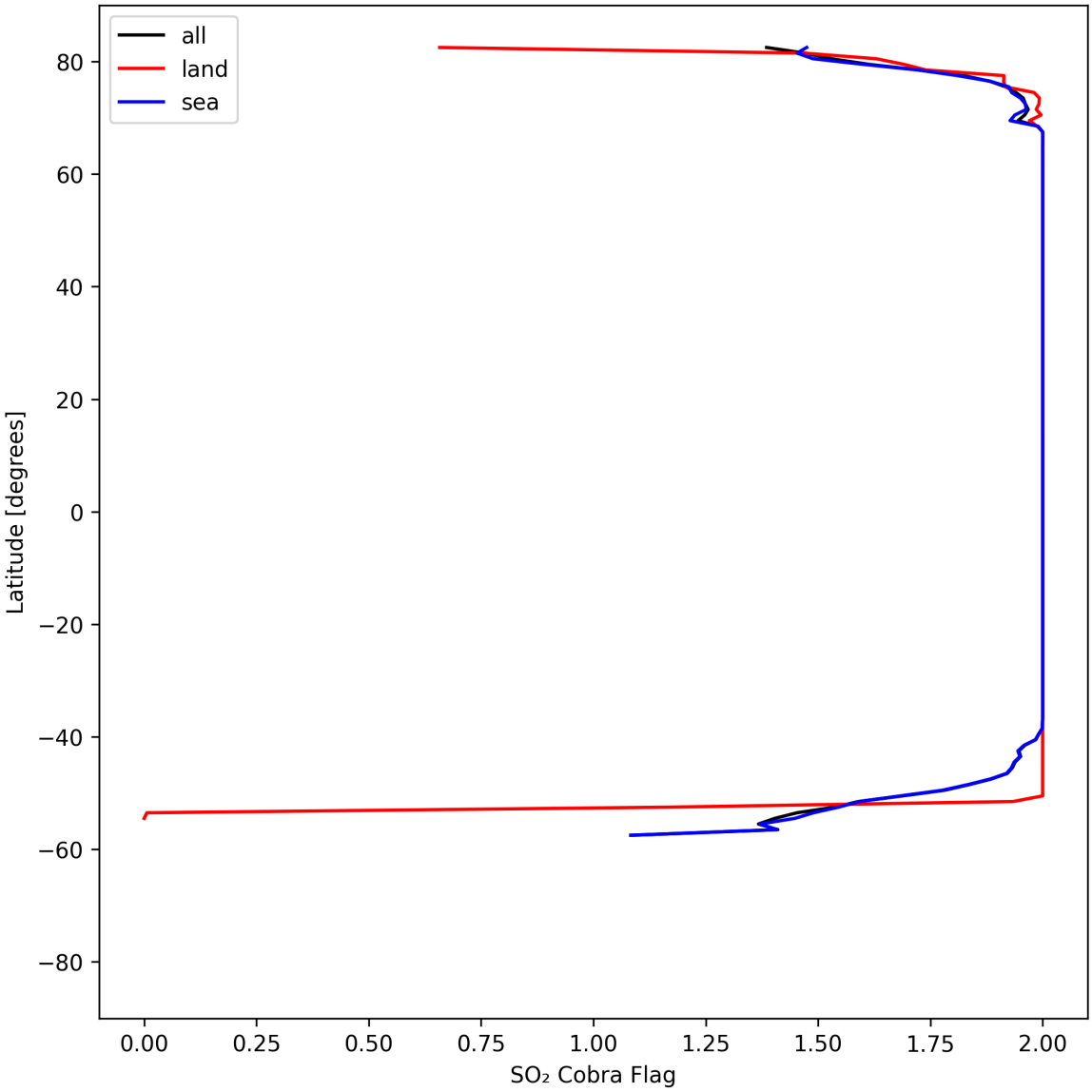

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-04-21 to 2025-04-22.

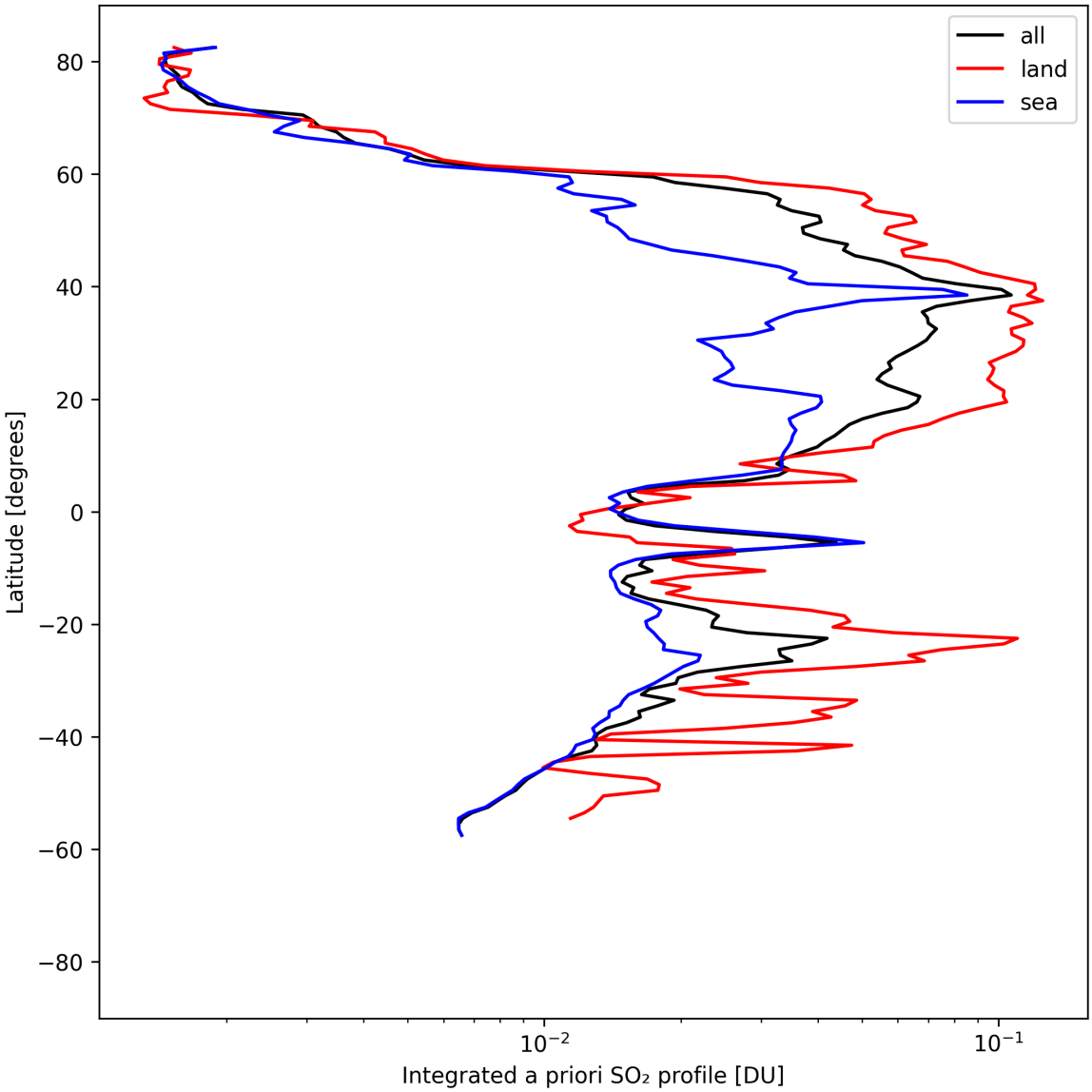

Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-04-21 to 2025-04-22.

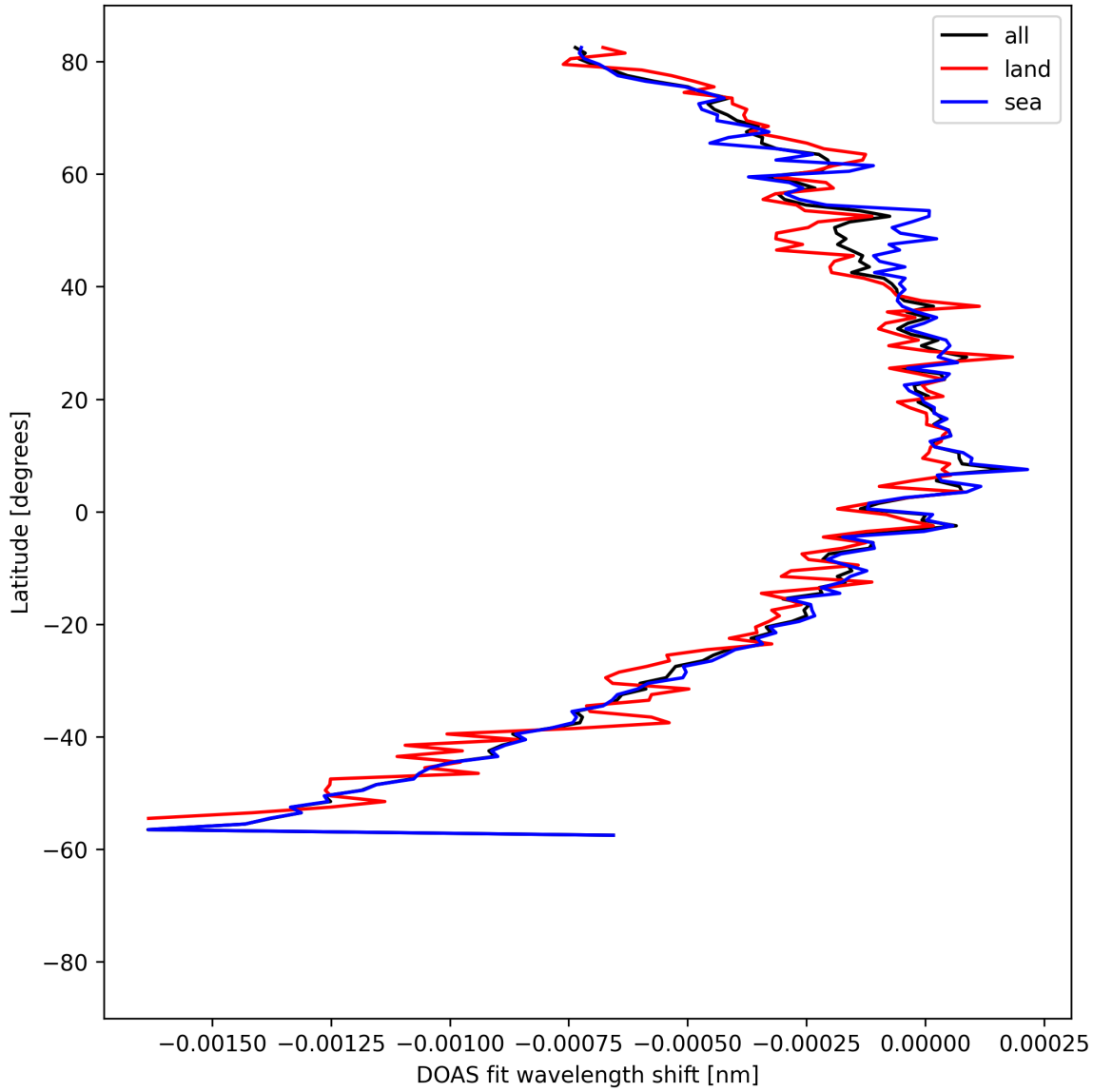

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-04-21 to 2025-04-22.

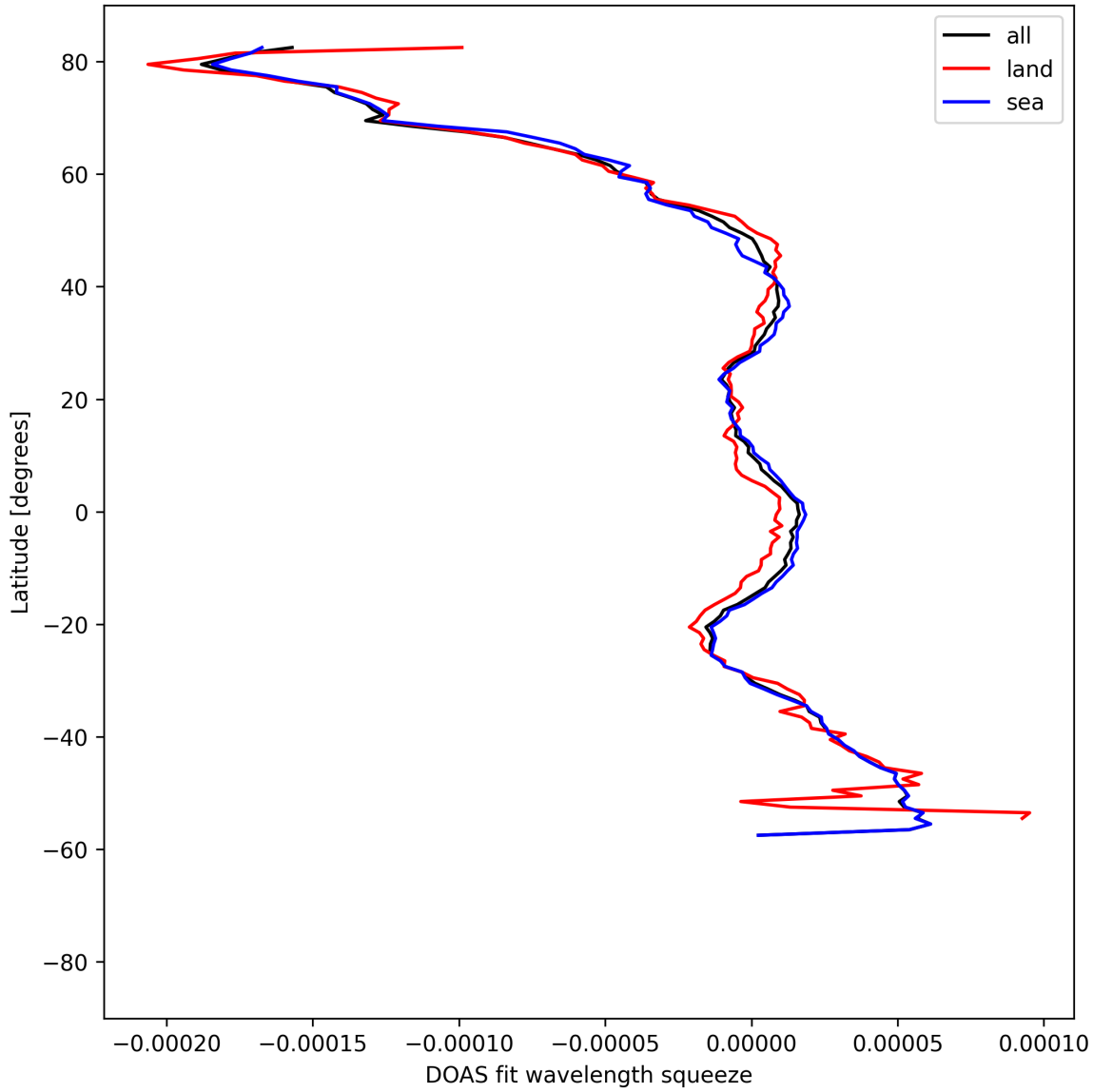

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-04-21 to 2025-04-22.

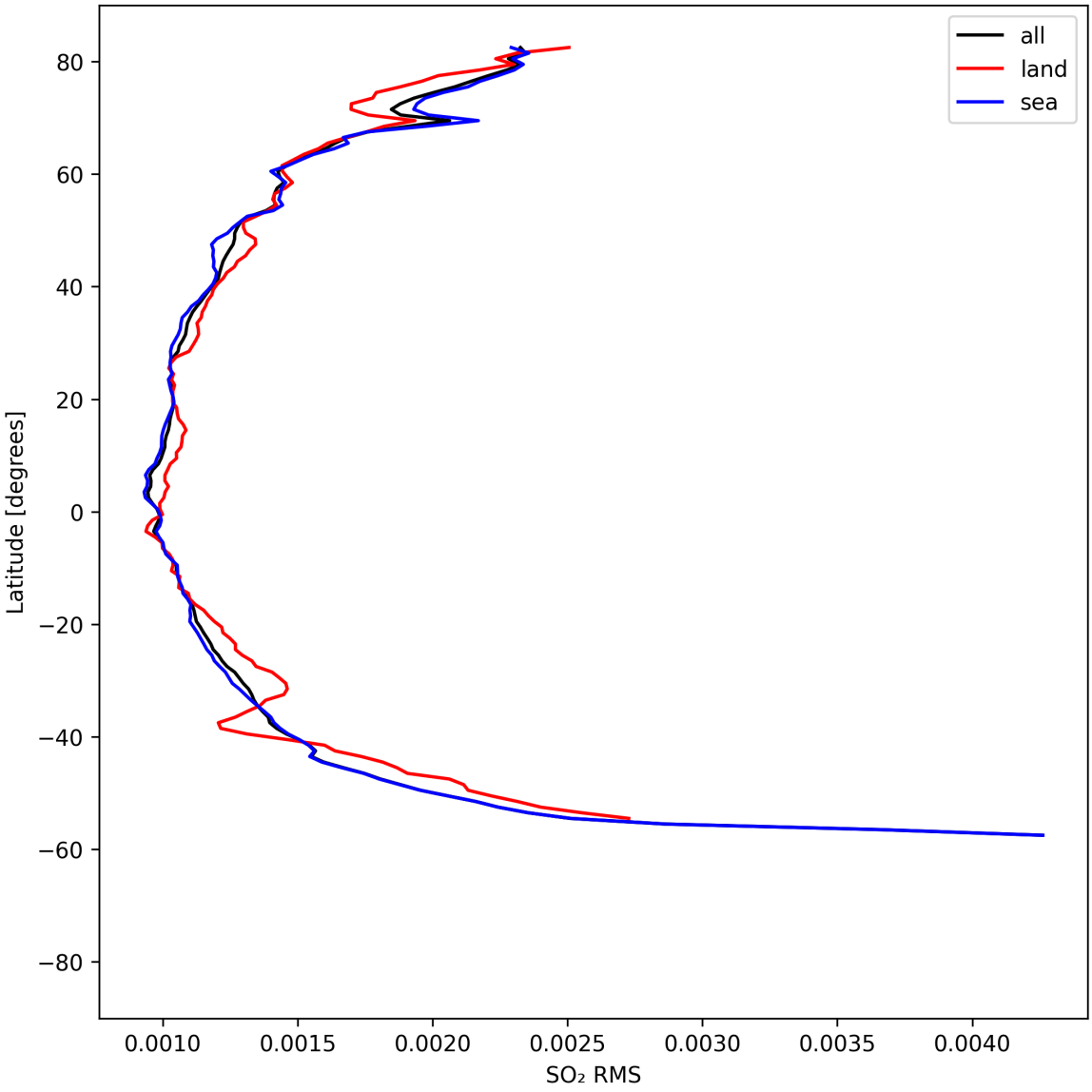

Figure 52: Zonal average of "SO_2 RMS" for 2025-04-21 to 2025-04-22.

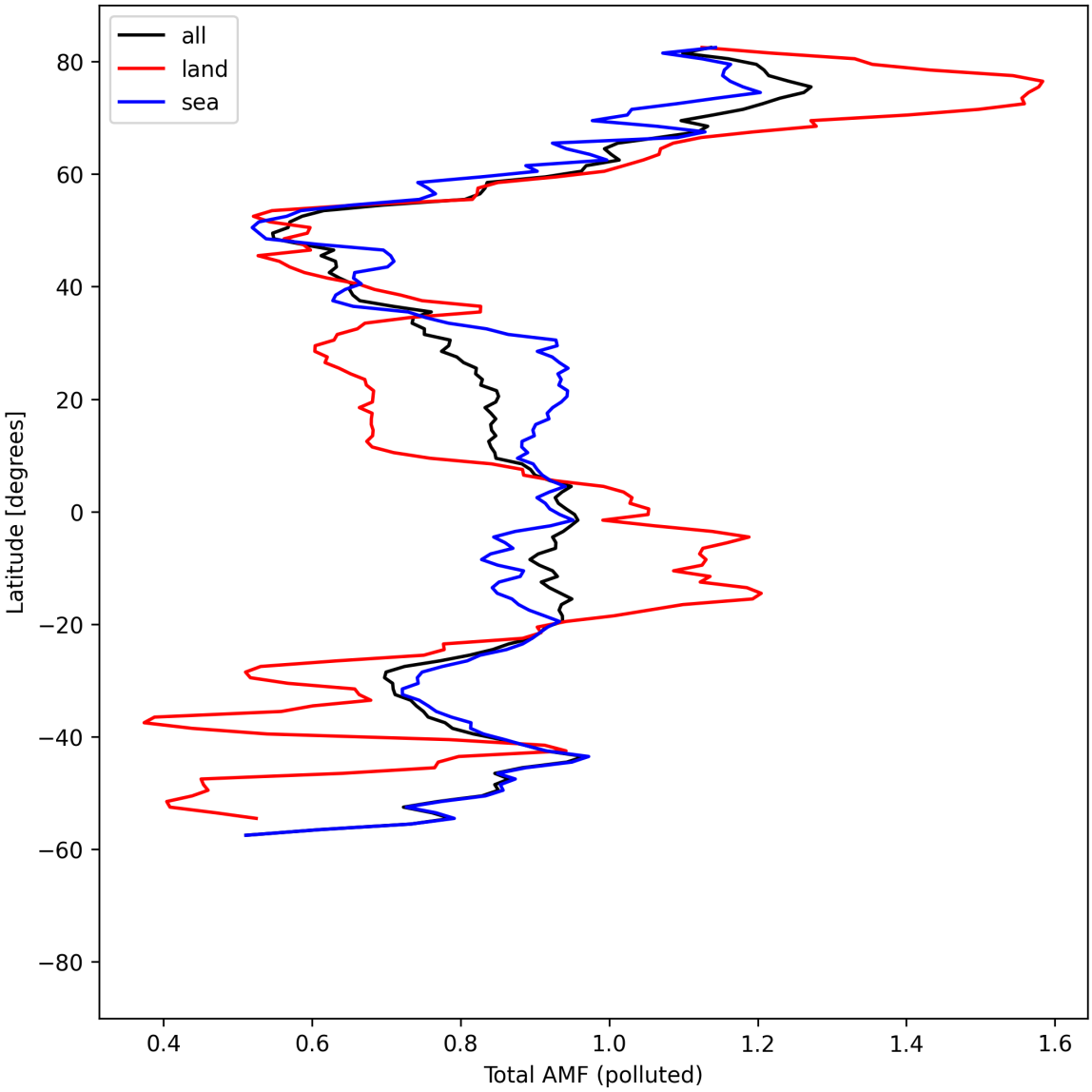

Figure 53: Zonal average of “Total AMF (polluted)” for 2025-04-21 to 2025-04-22.

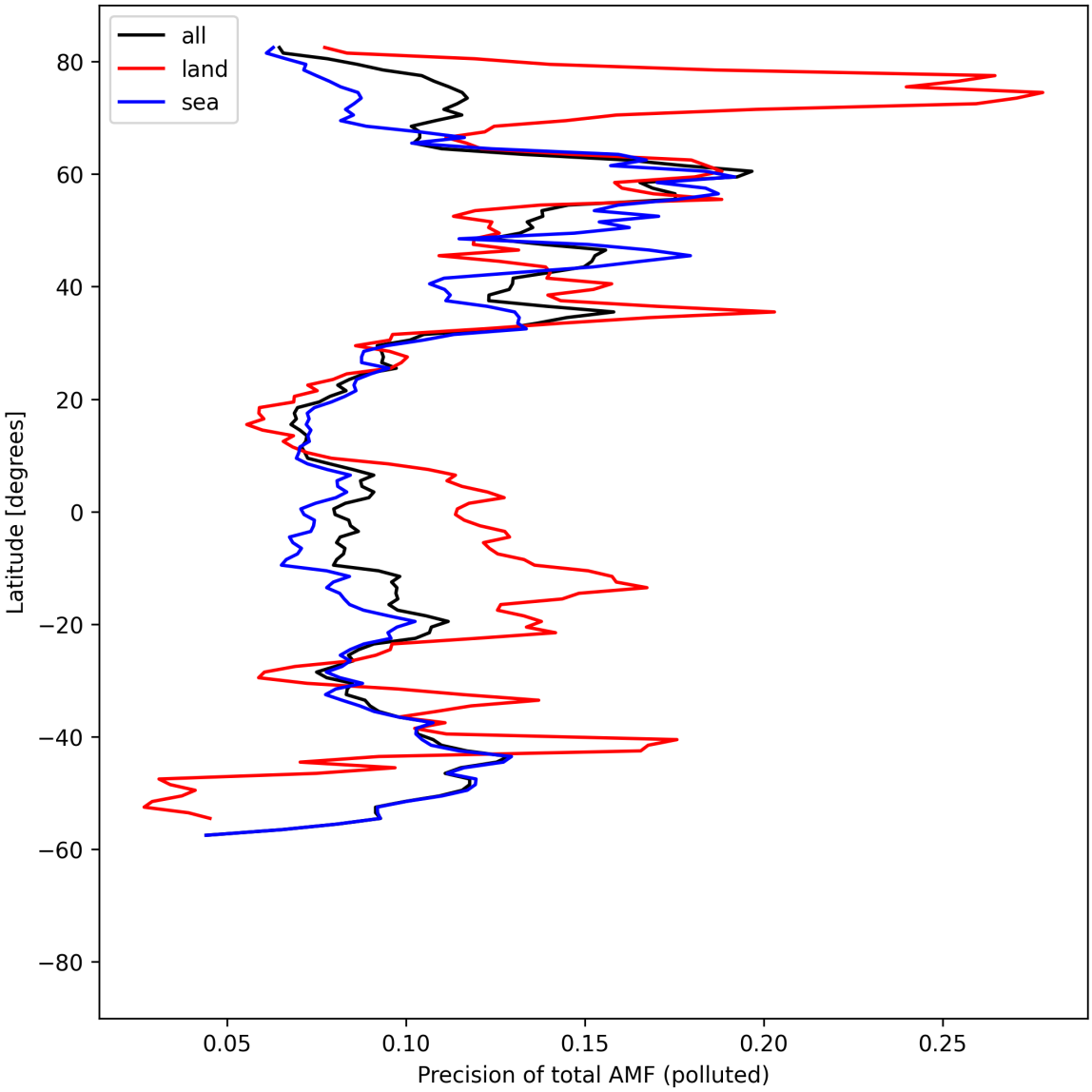

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-04-21 to 2025-04-22.

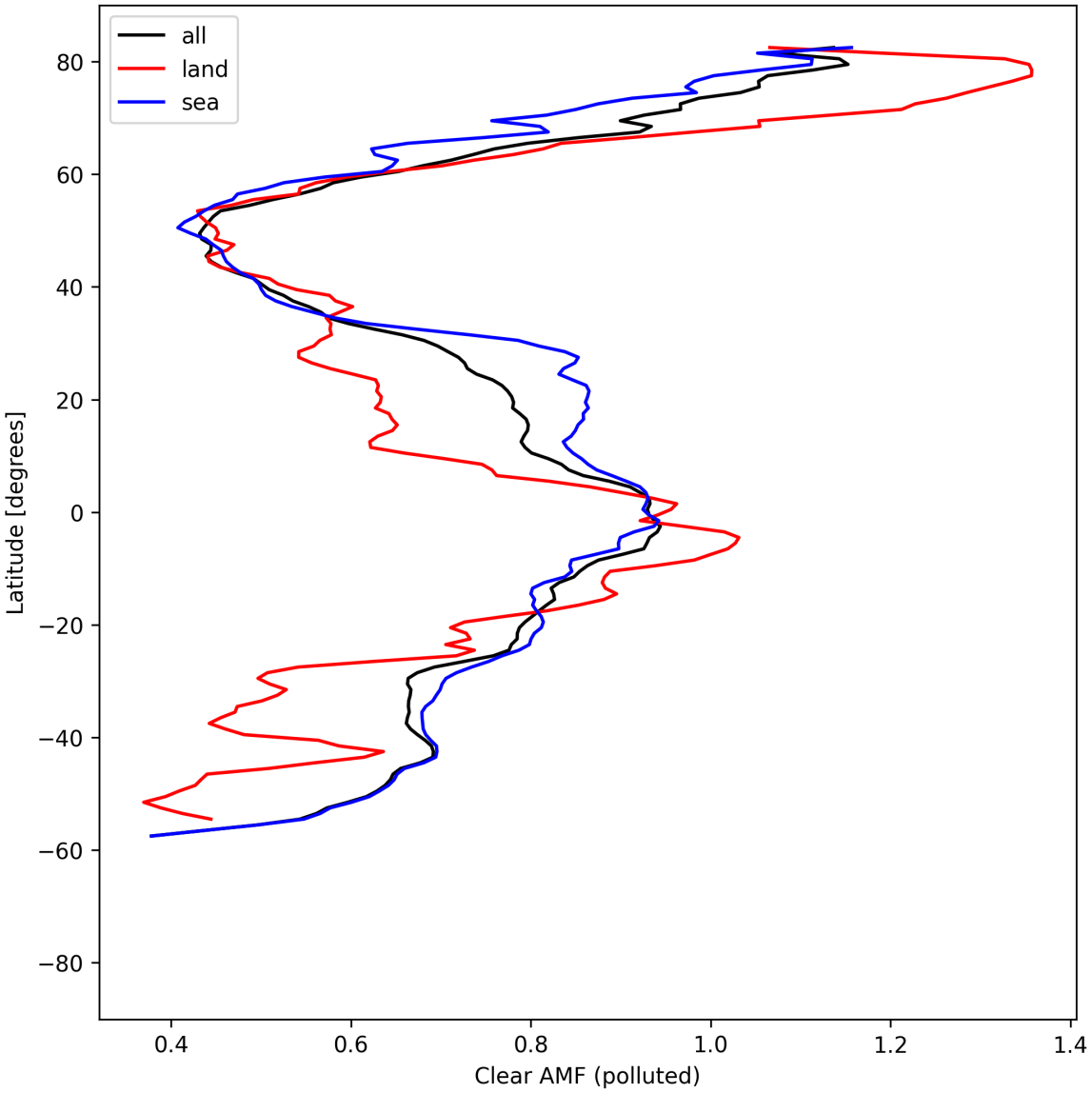

Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-04-21 to 2025-04-22.

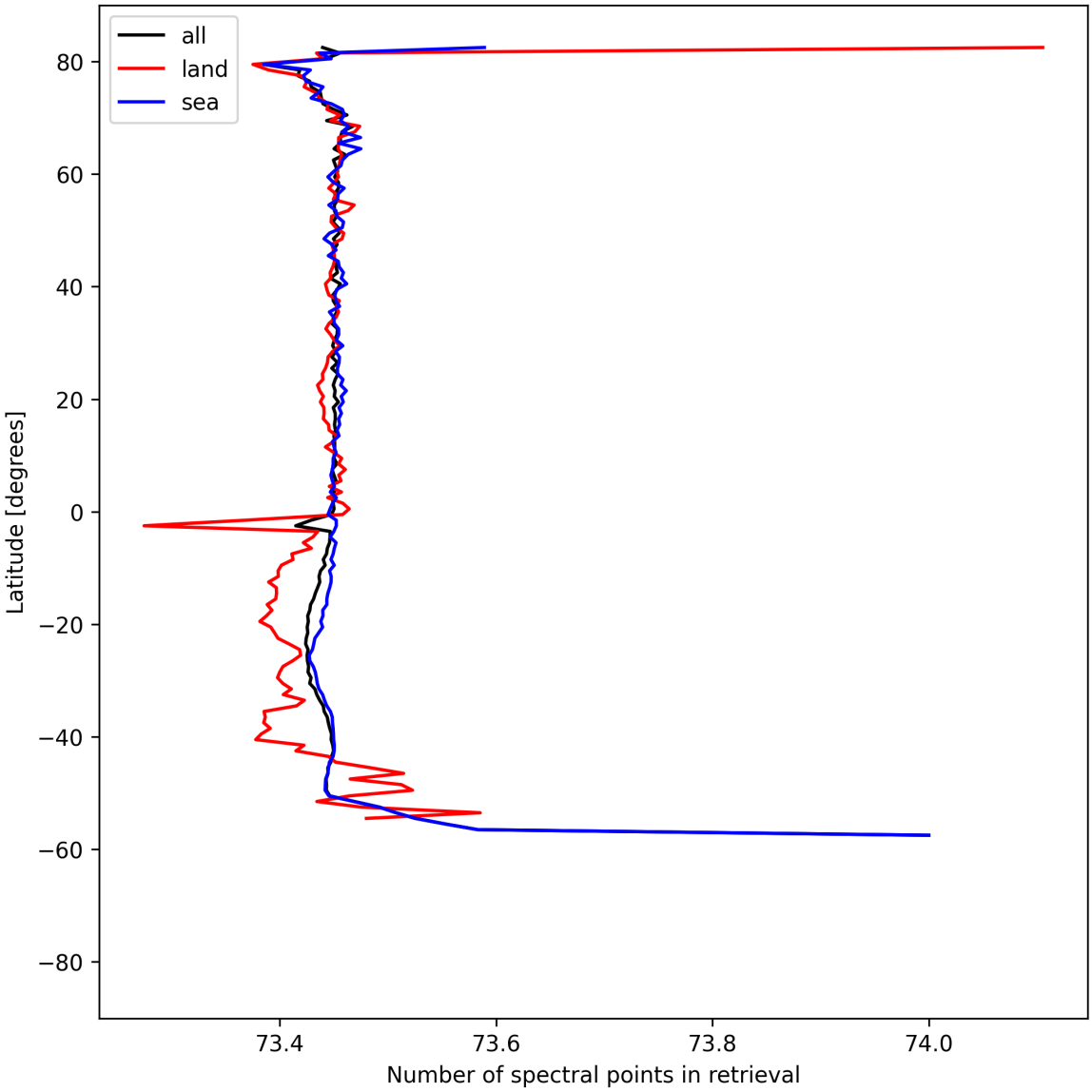

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-04-21 to 2025-04-22.

8 Histograms

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

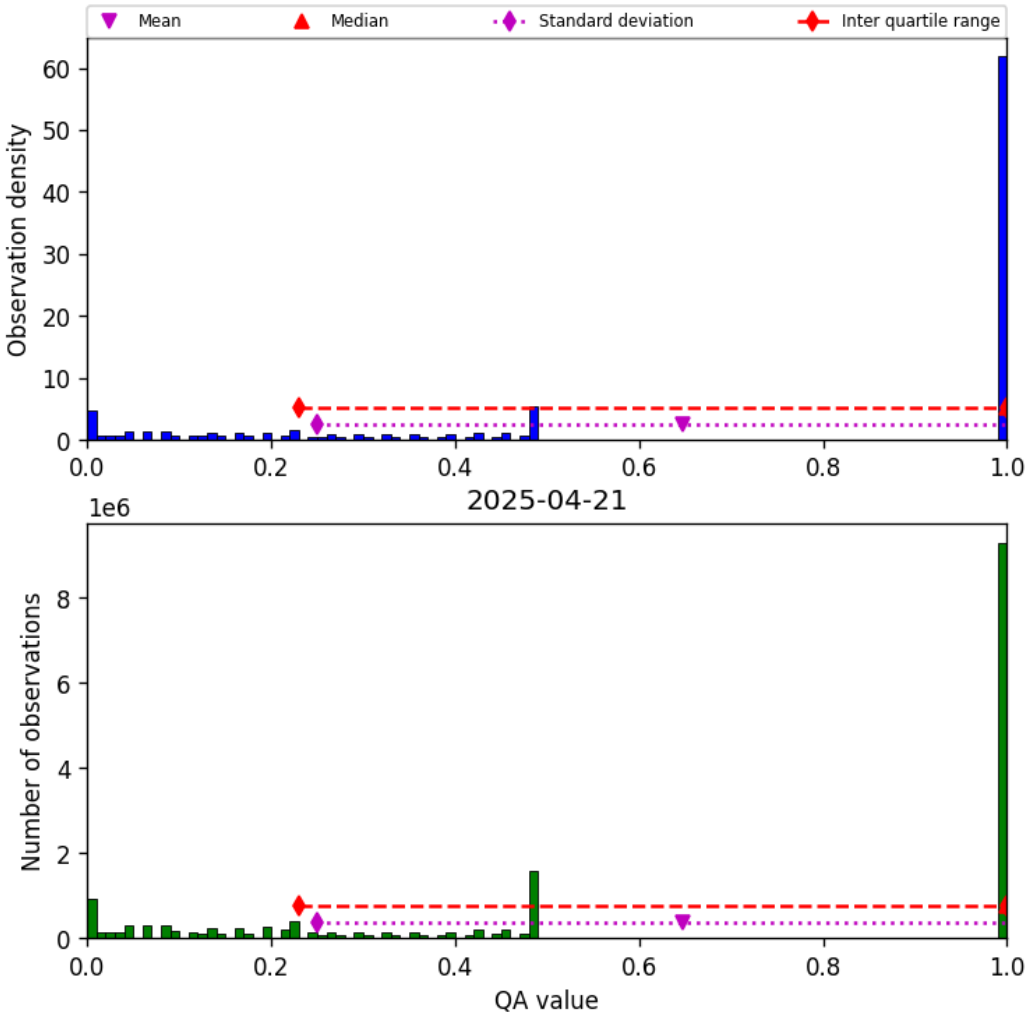

Figure 57: Histogram of “QA value” for 2025-04-21 to 2025-04-22

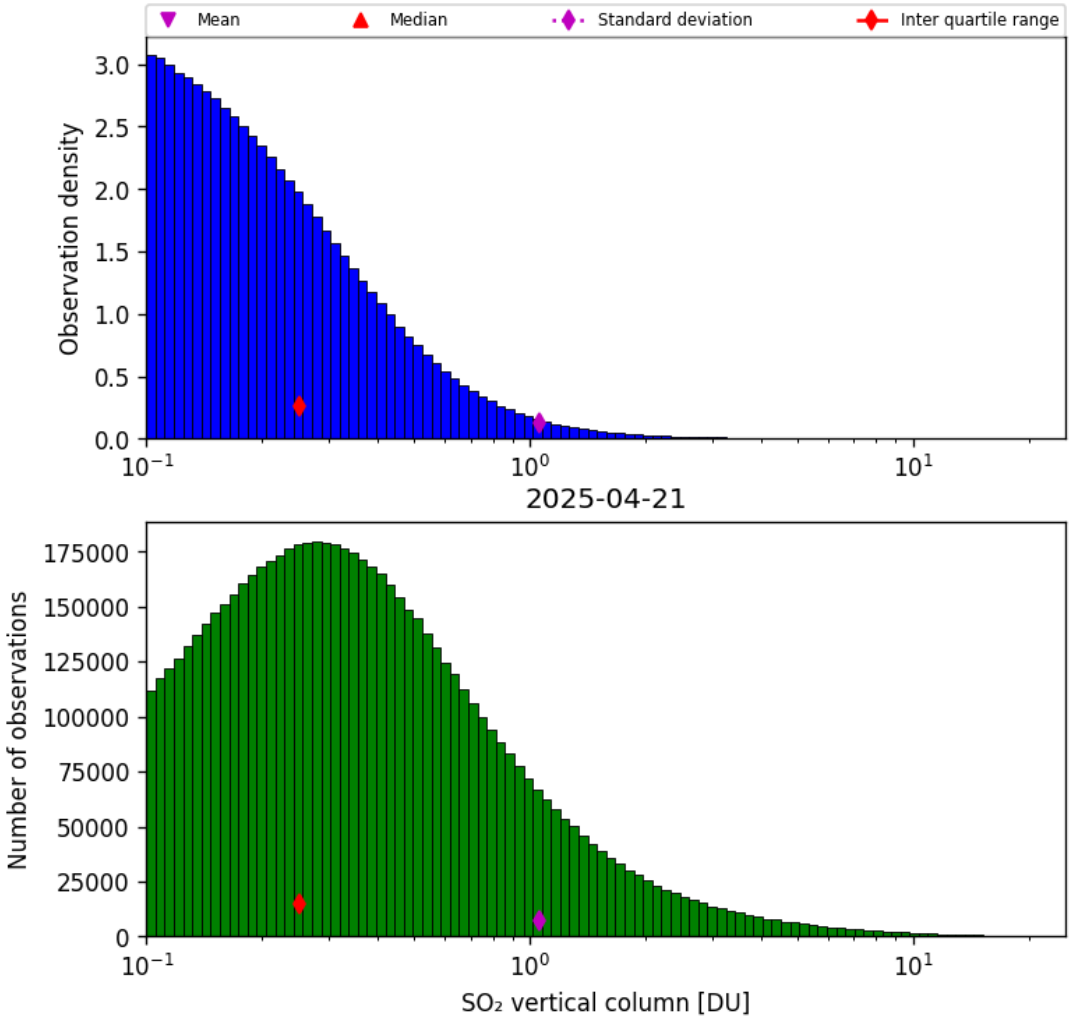

Figure 58: Histogram of "SO_2 vertical column" for 2025-04-21 to 2025-04-22

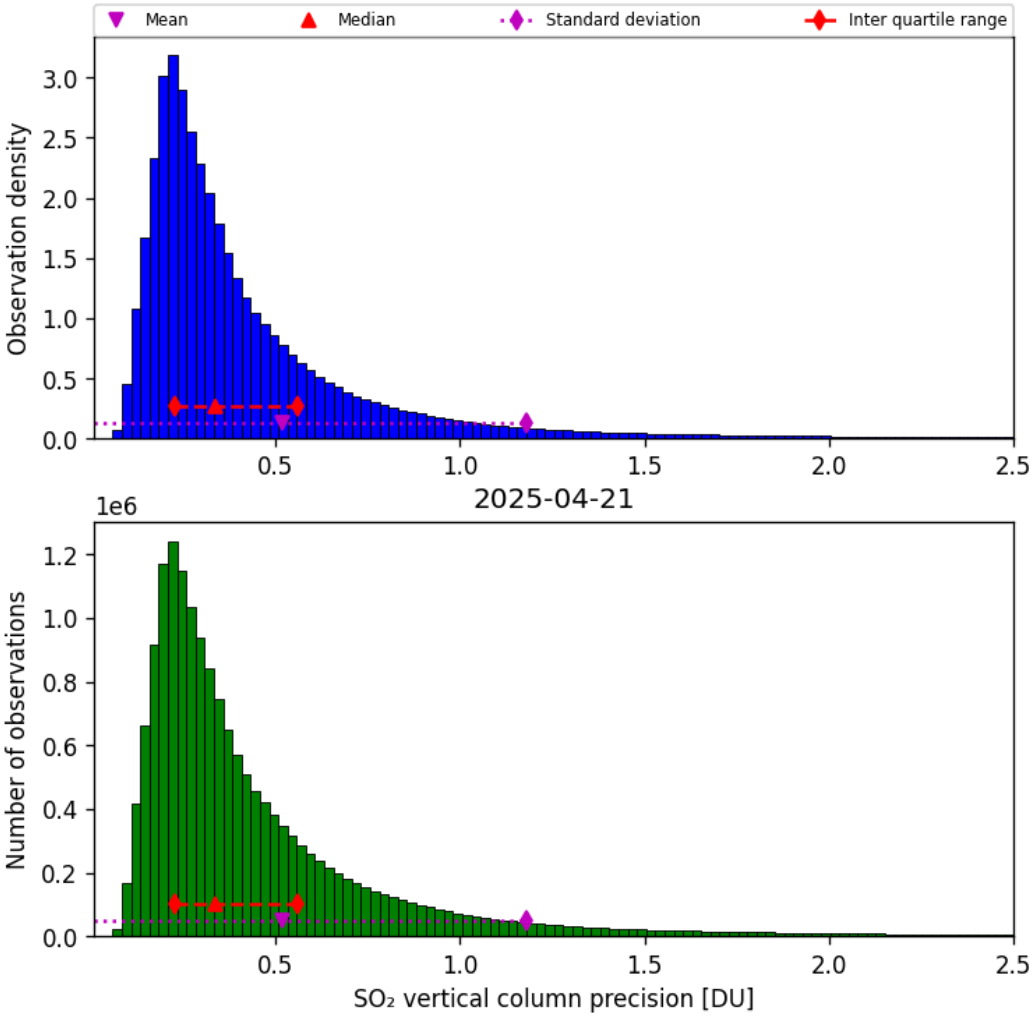

Figure 59: Histogram of "SO_2 vertical column precision" for 2025-04-21 to 2025-04-22

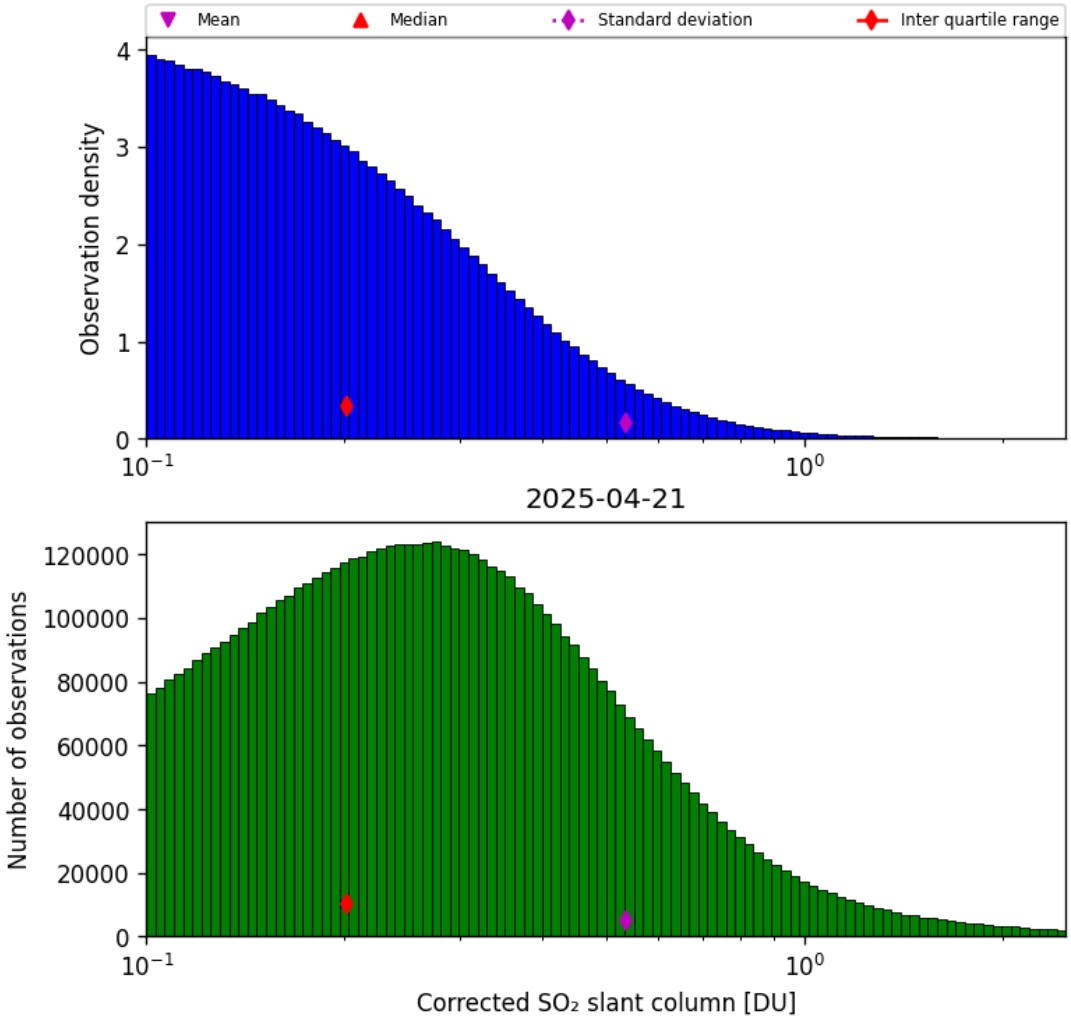

Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-04-21 to 2025-04-22

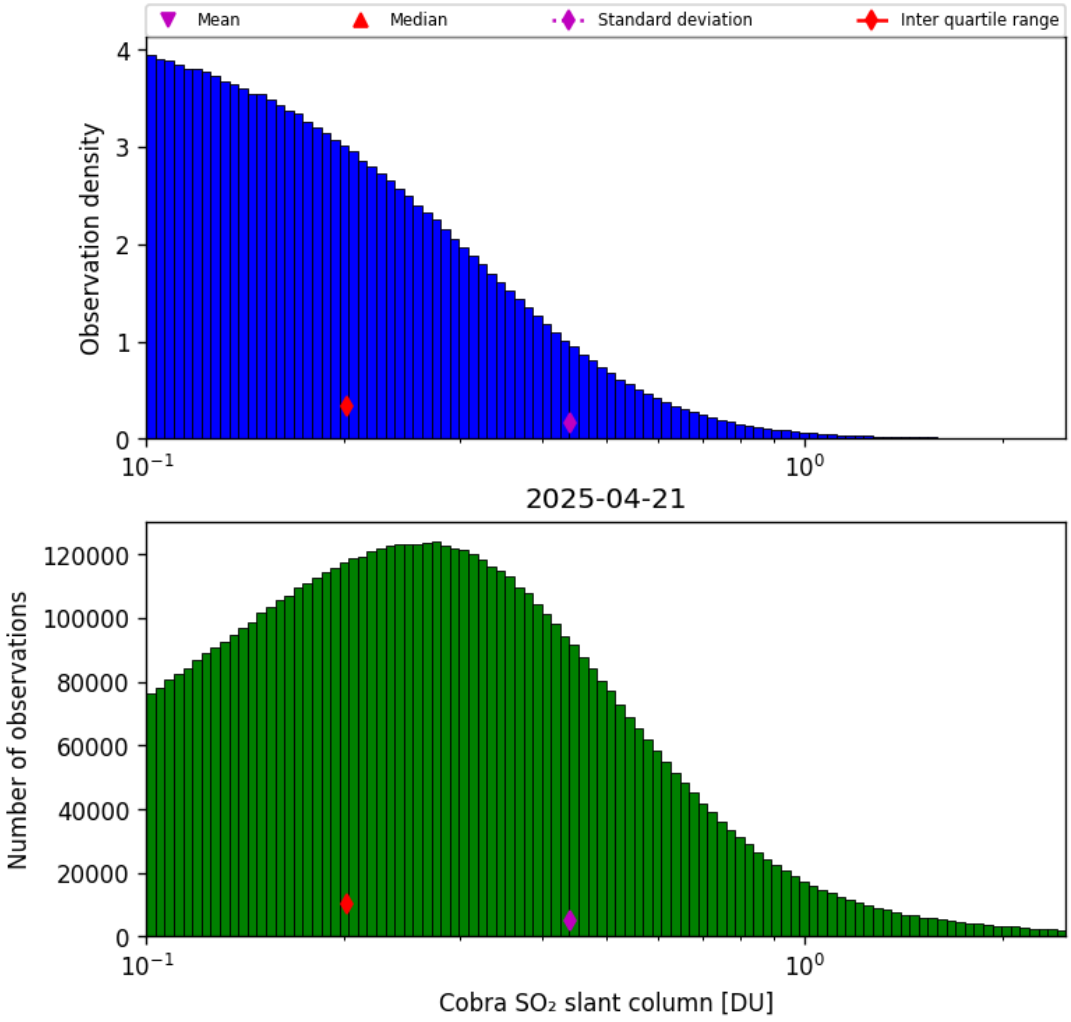

Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-04-21 to 2025-04-22

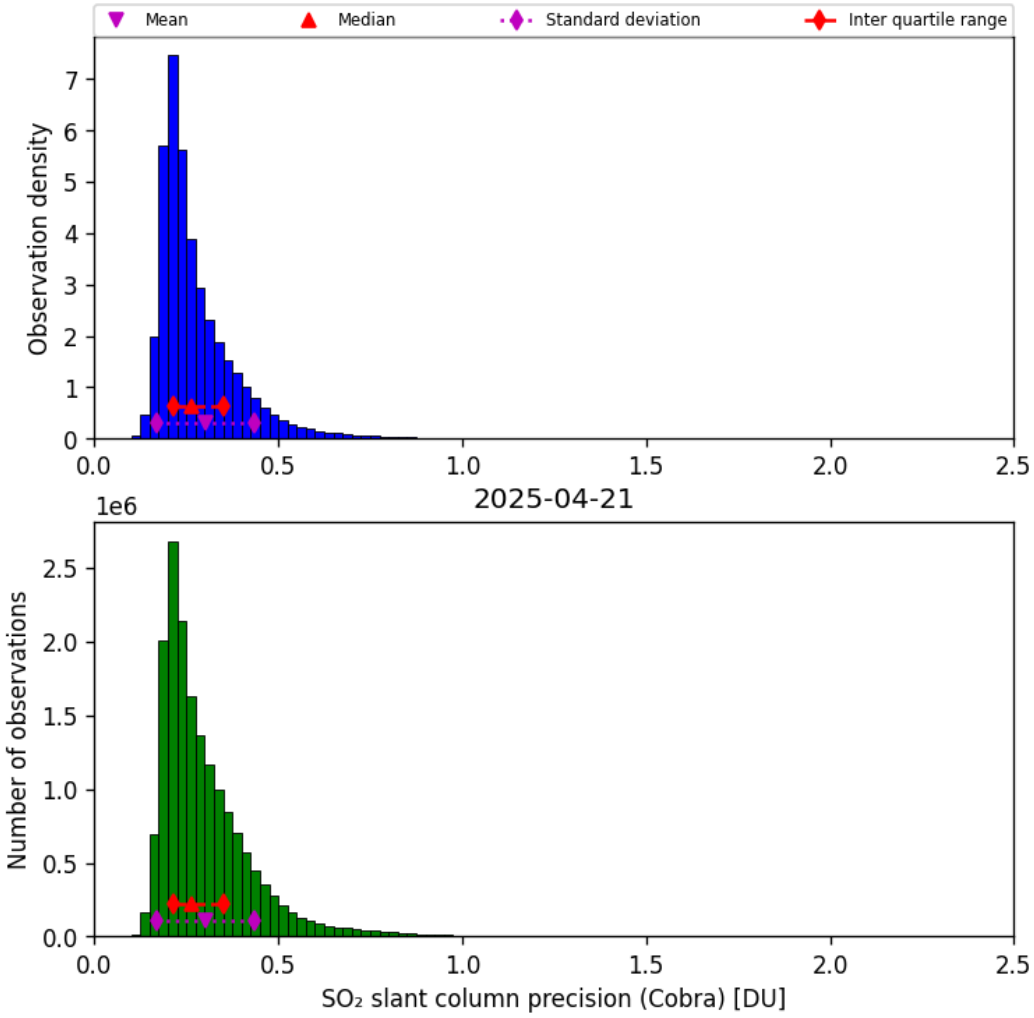

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-04-21 to 2025-04-22

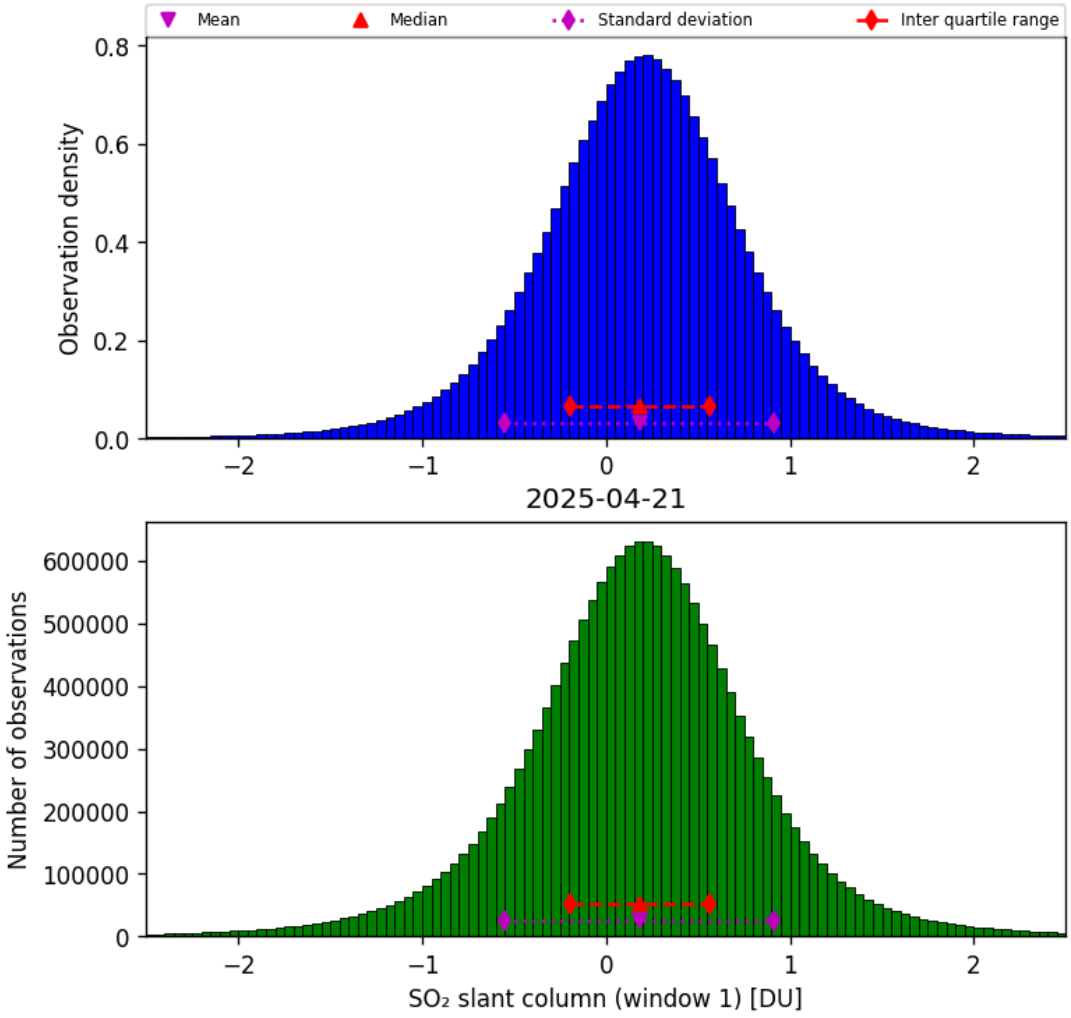

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-04-21 to 2025-04-22

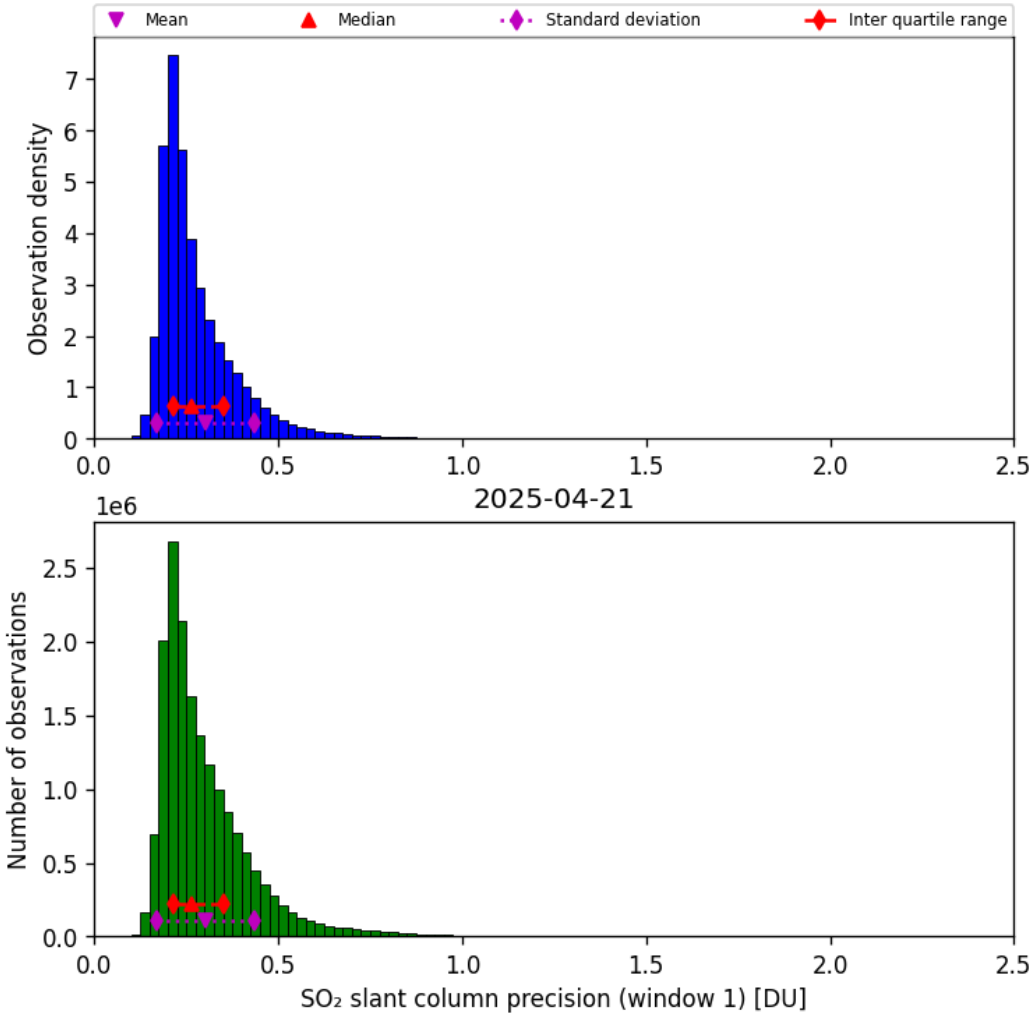

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-04-21 to 2025-04-22

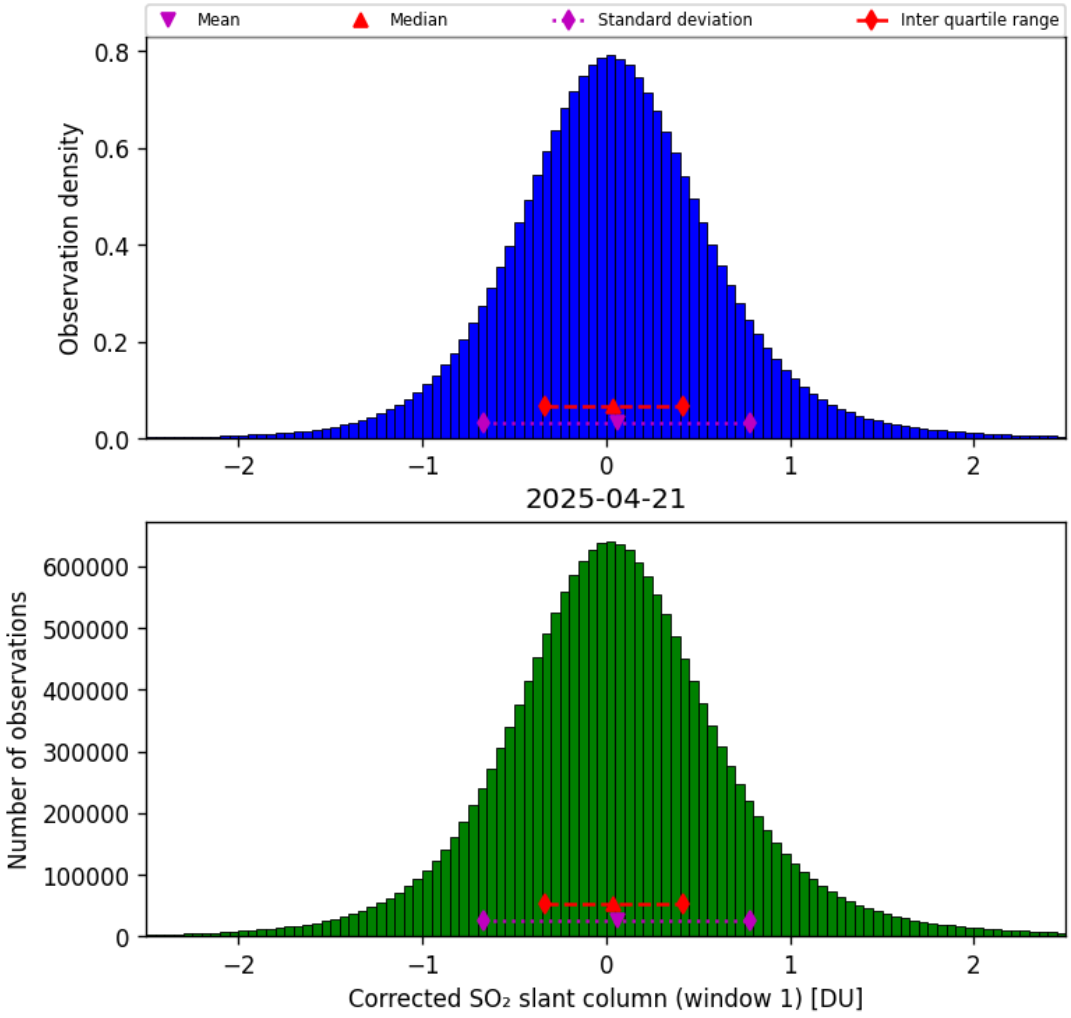

Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-04-21 to 2025-04-22

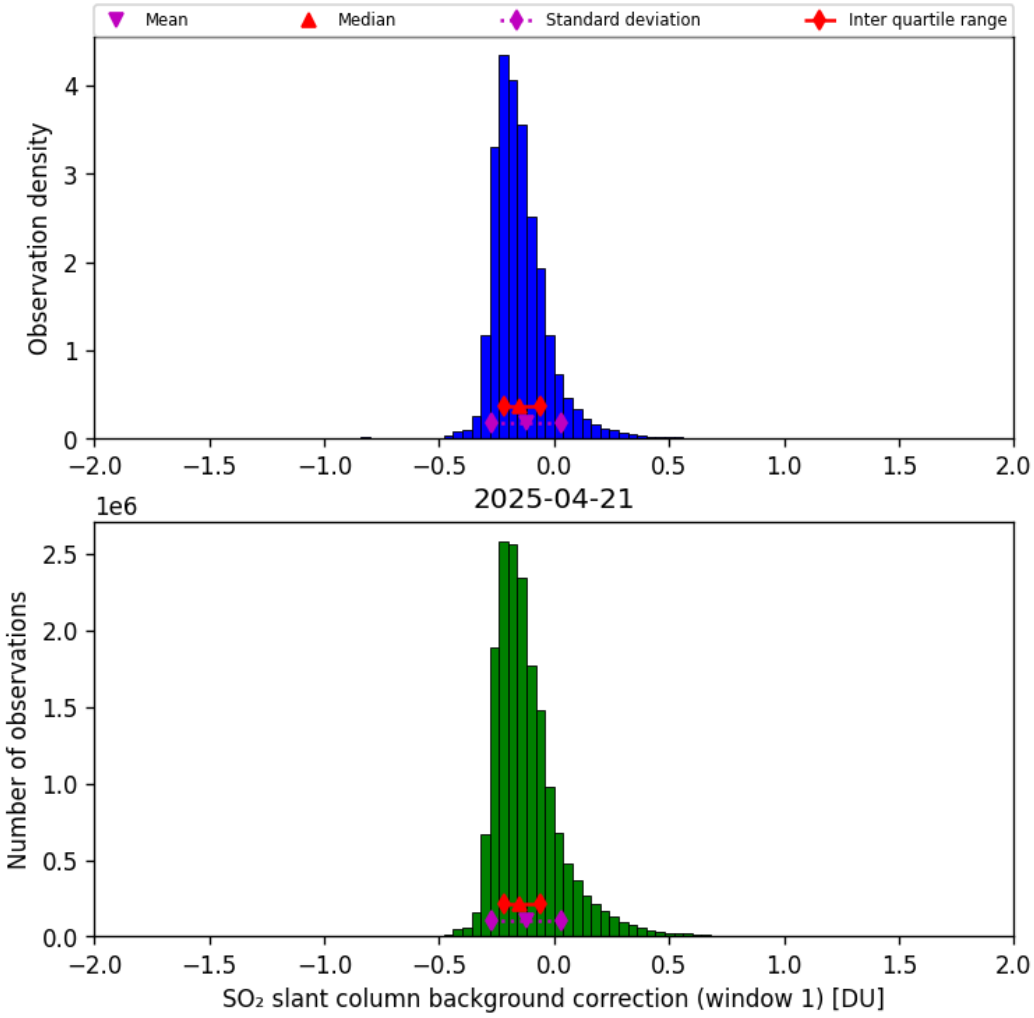

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-04-21 to 2025-04-22

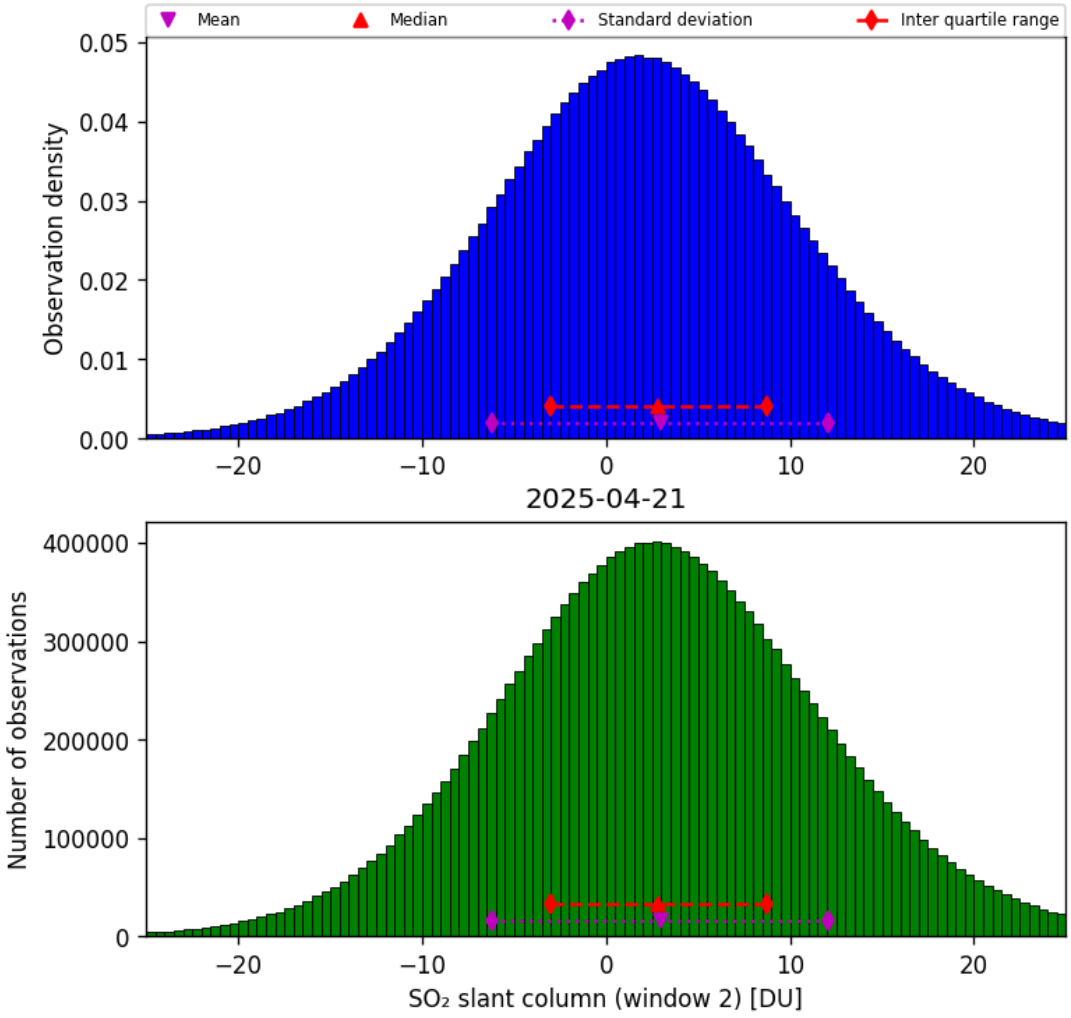

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-04-21 to 2025-04-22

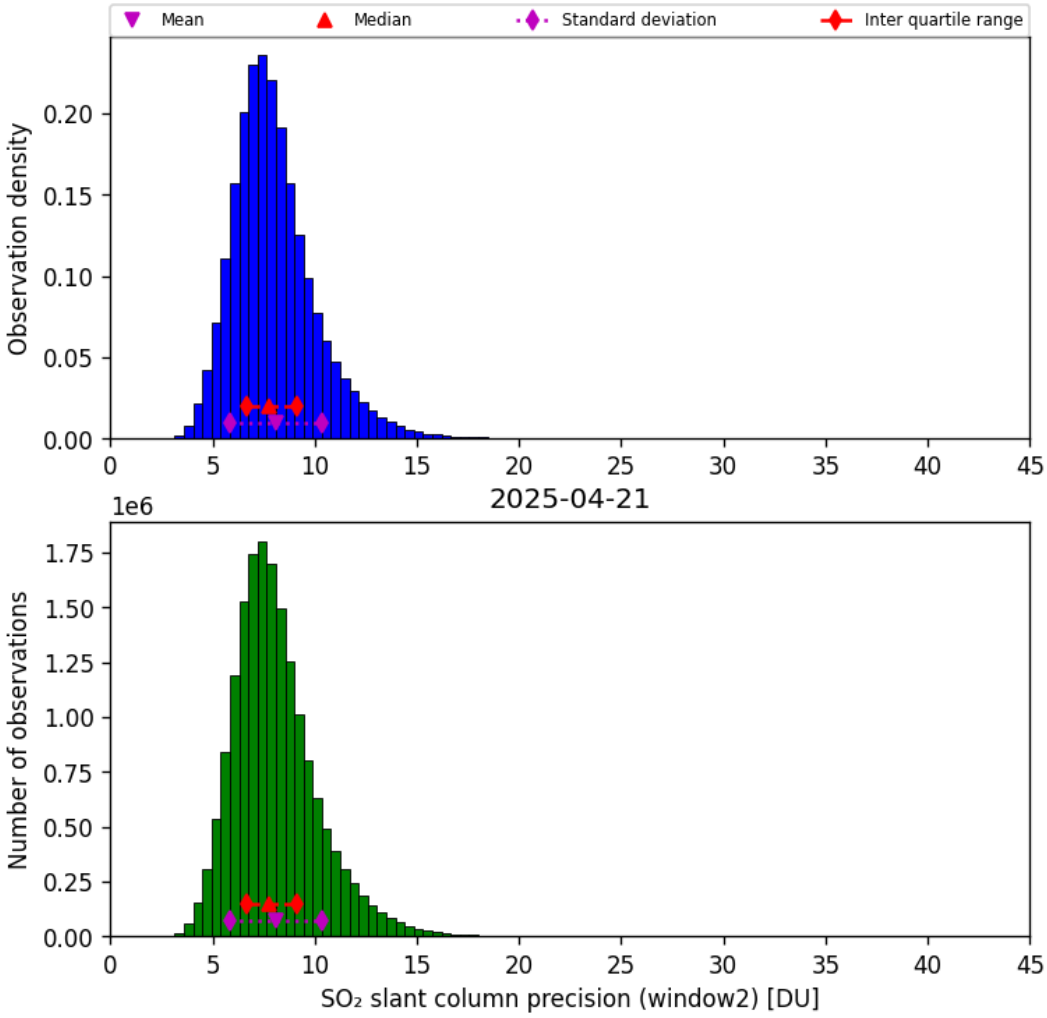

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-04-21 to 2025-04-22

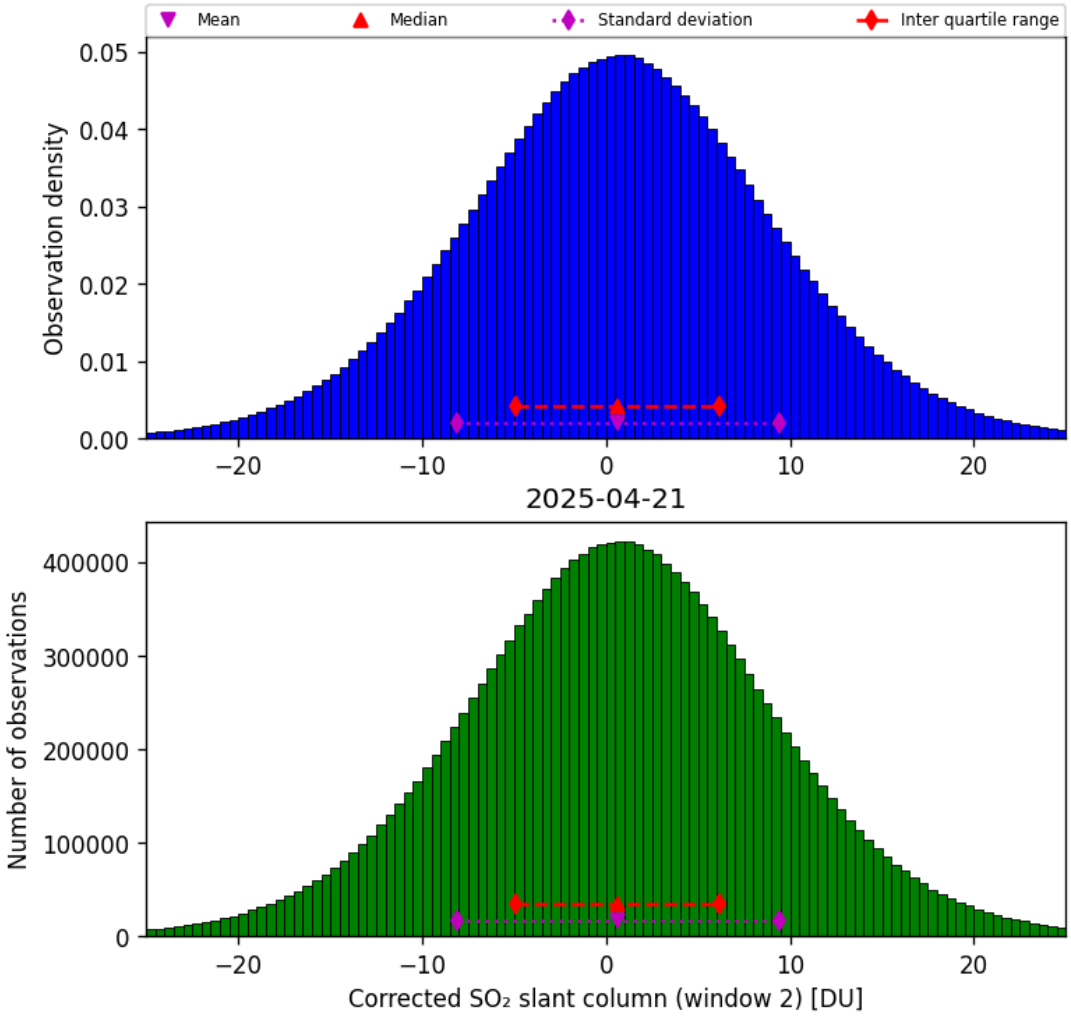

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-04-21 to 2025-04-22

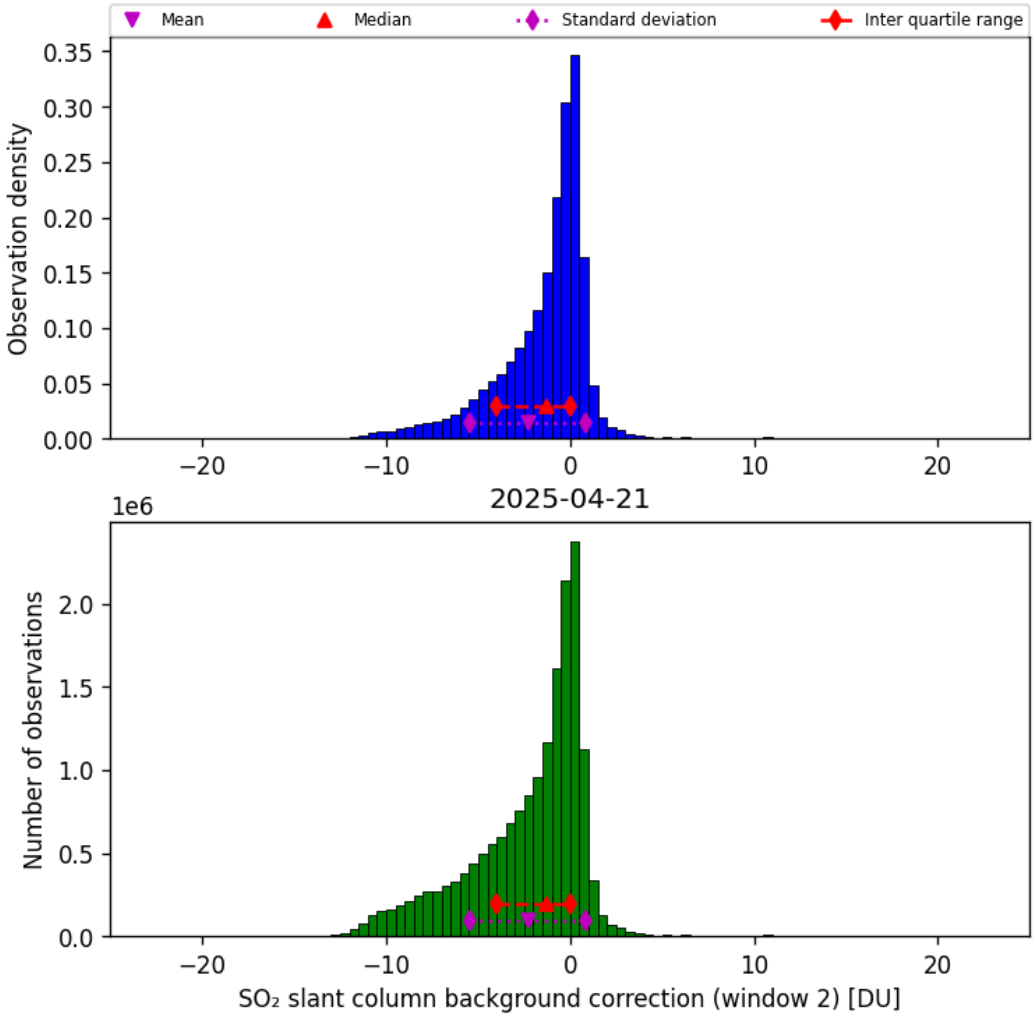

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-04-21 to 2025-04-22

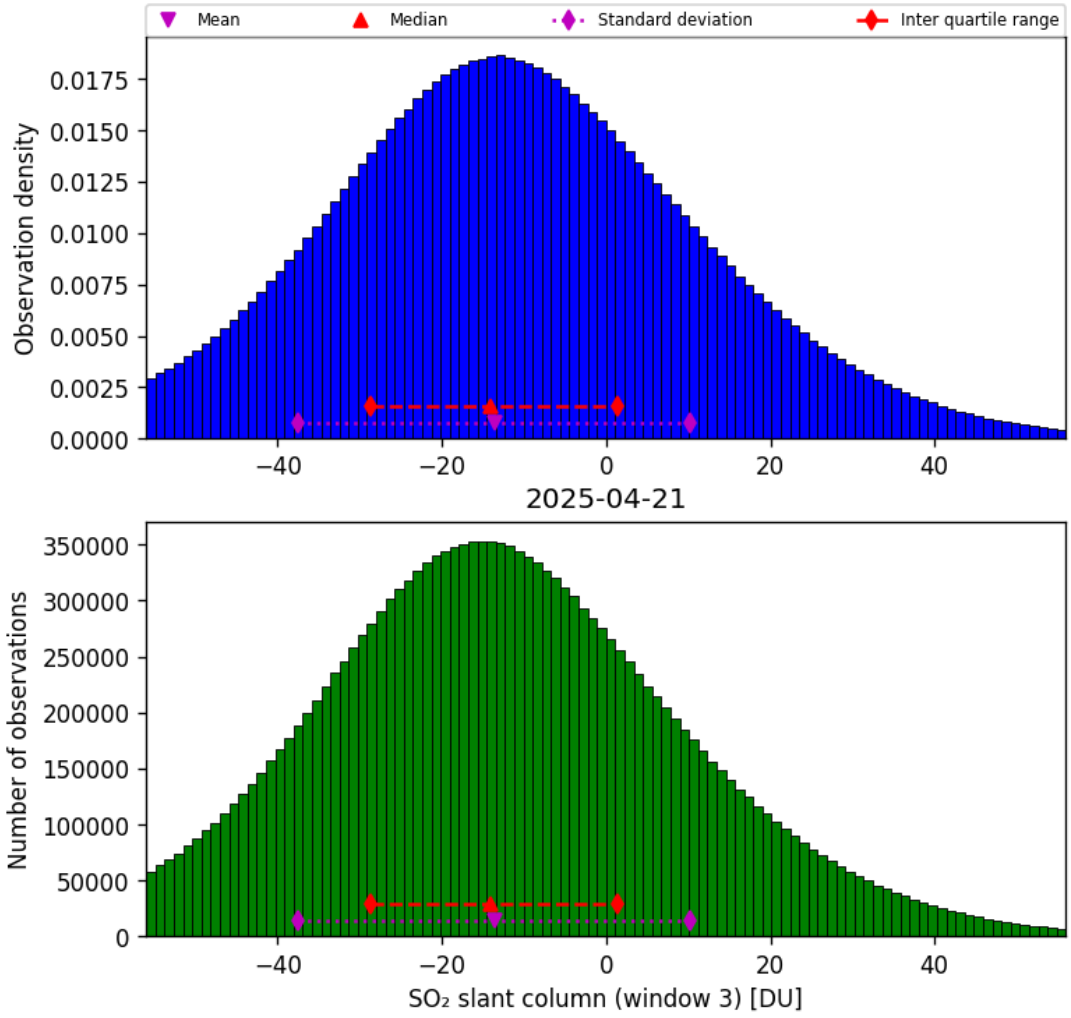

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-04-21 to 2025-04-22

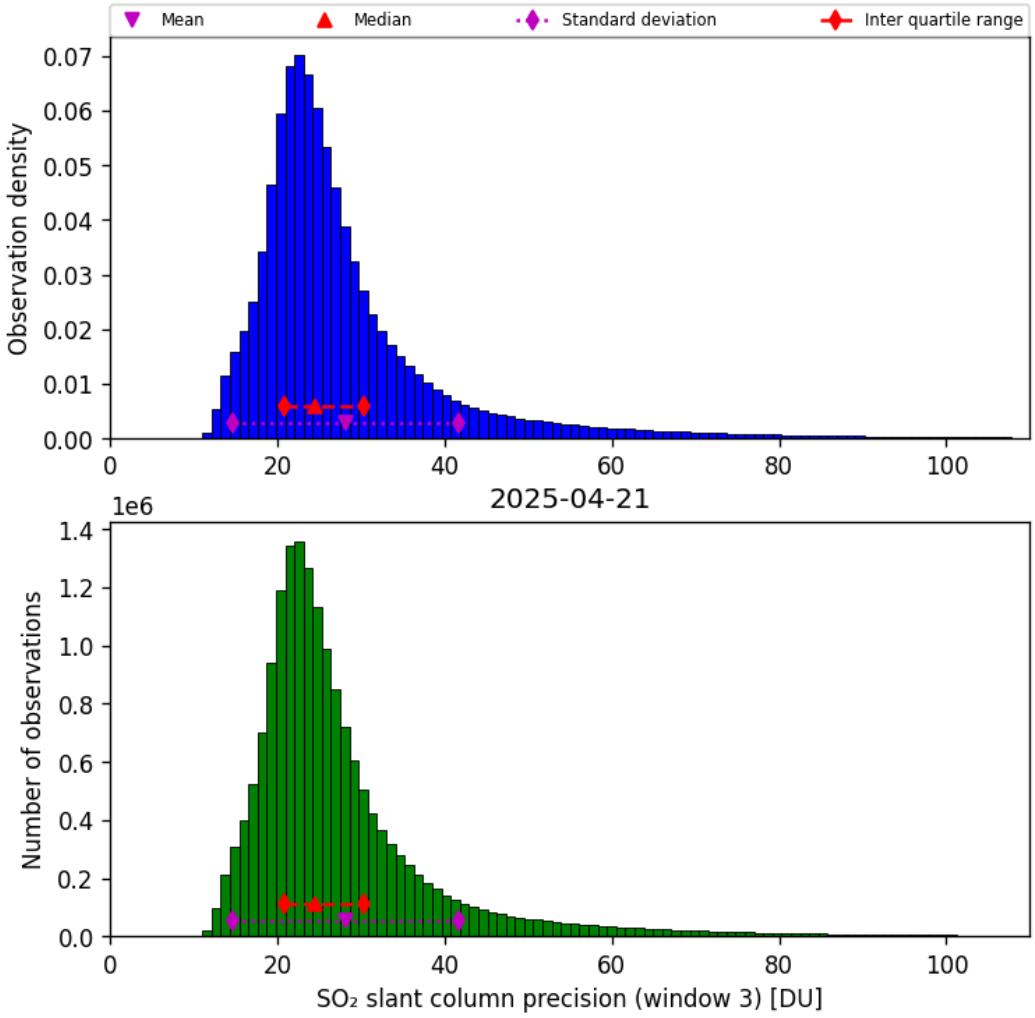

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-04-21 to 2025-04-22

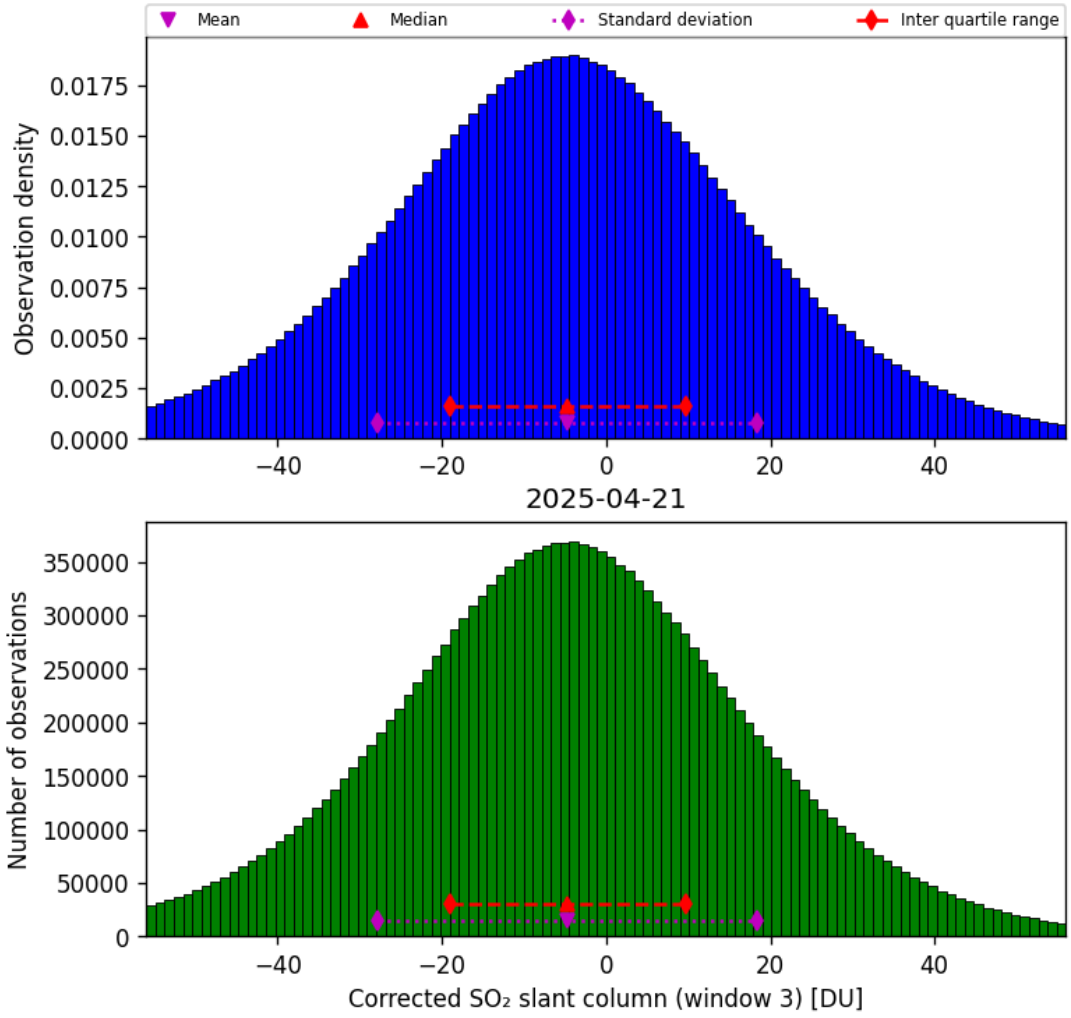

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-04-21 to 2025-04-22

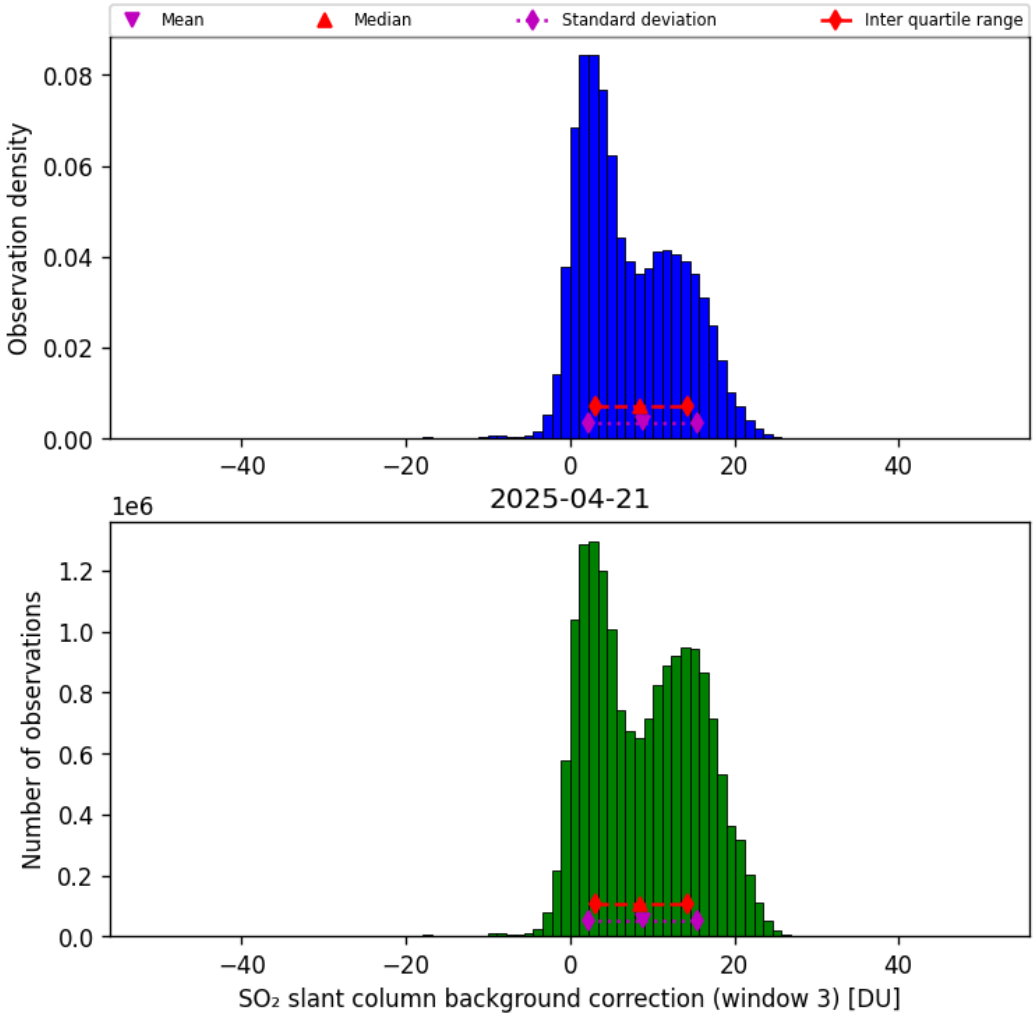

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-04-21 to 2025-04-22

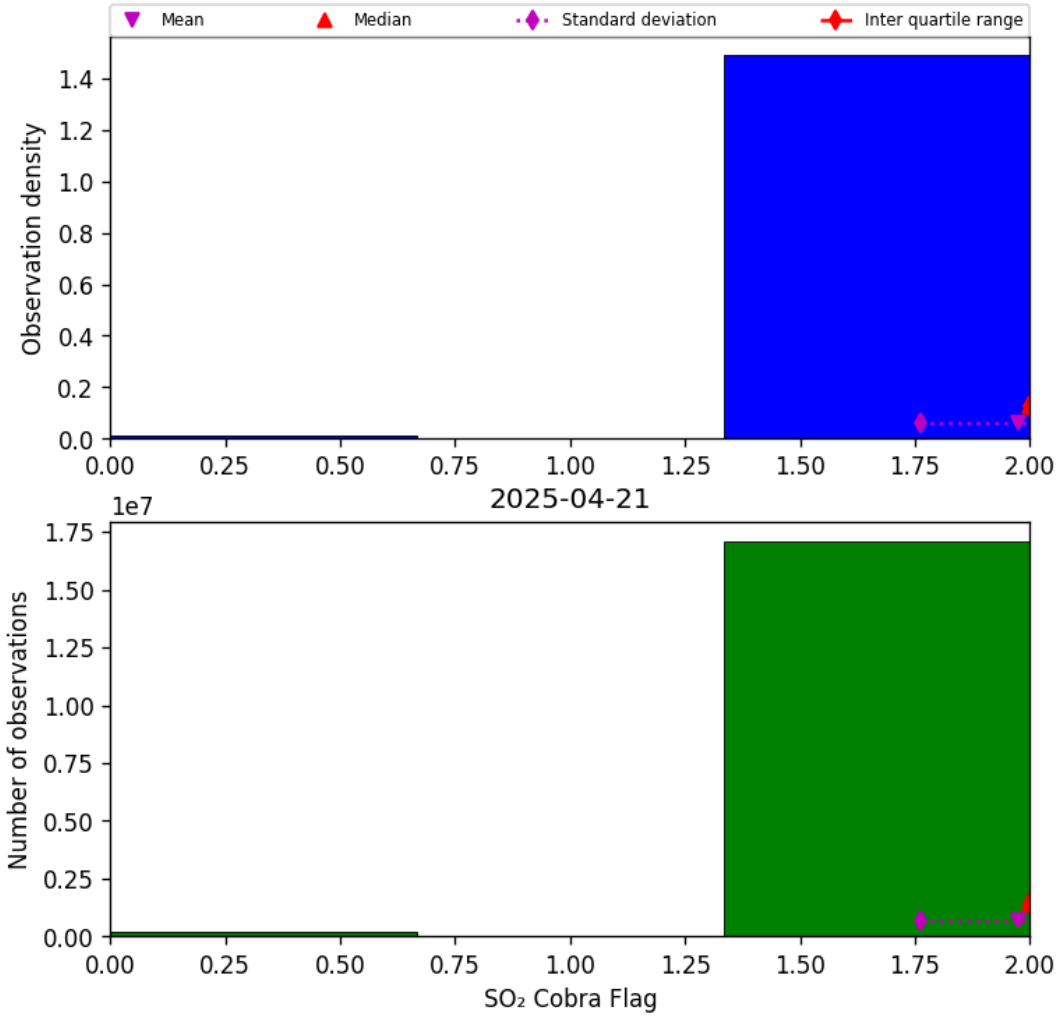

Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-04-21 to 2025-04-22

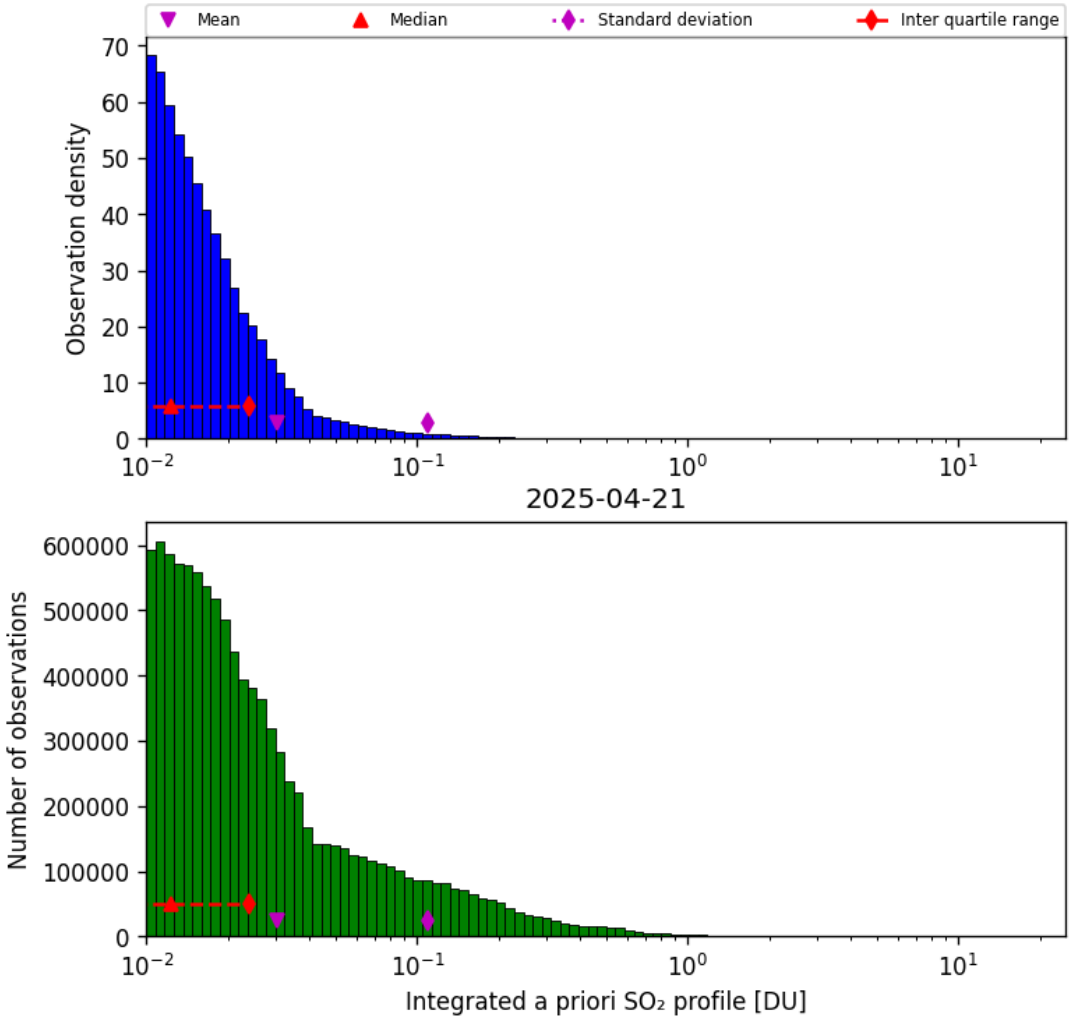

Figure 76: Histogram of "Integrated a priori SO_2 profile" for 2025-04-21 to 2025-04-22

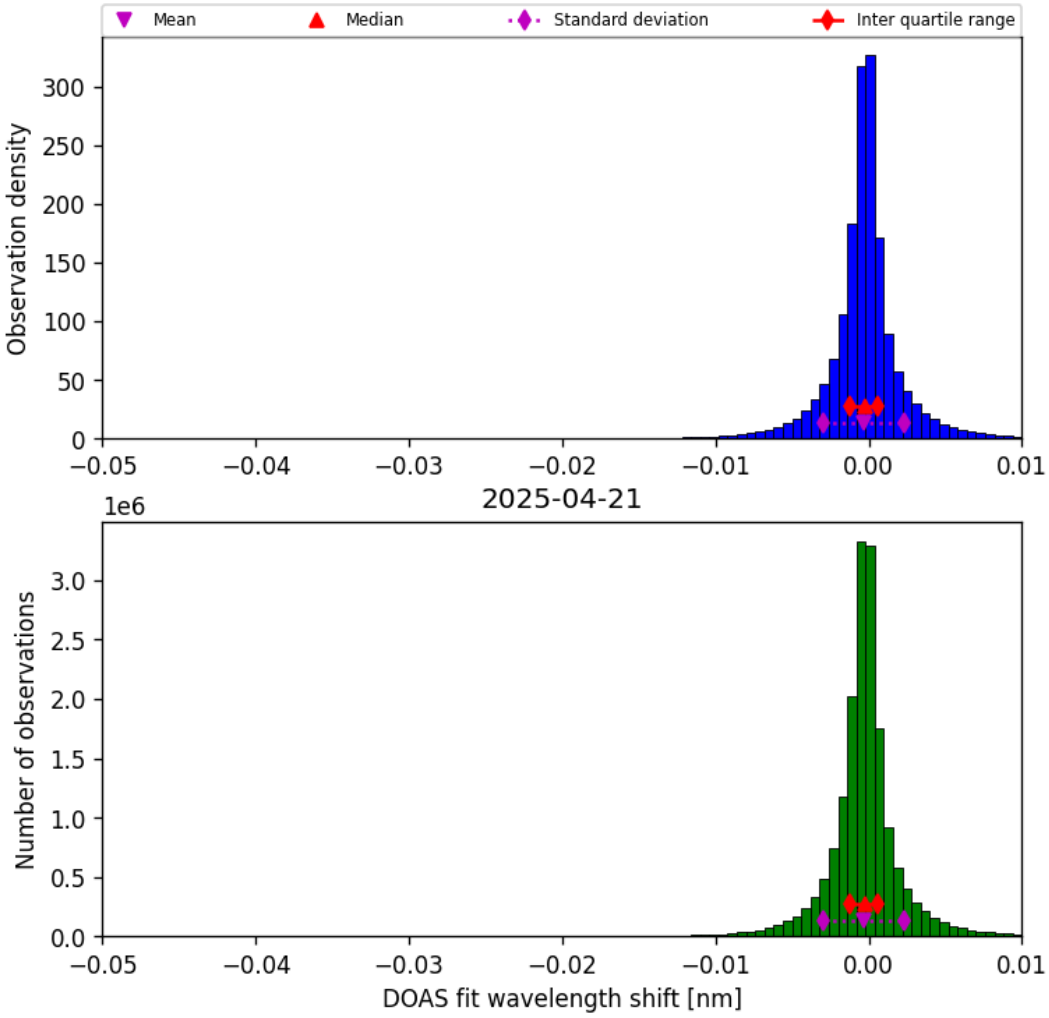

Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-04-21 to 2025-04-22

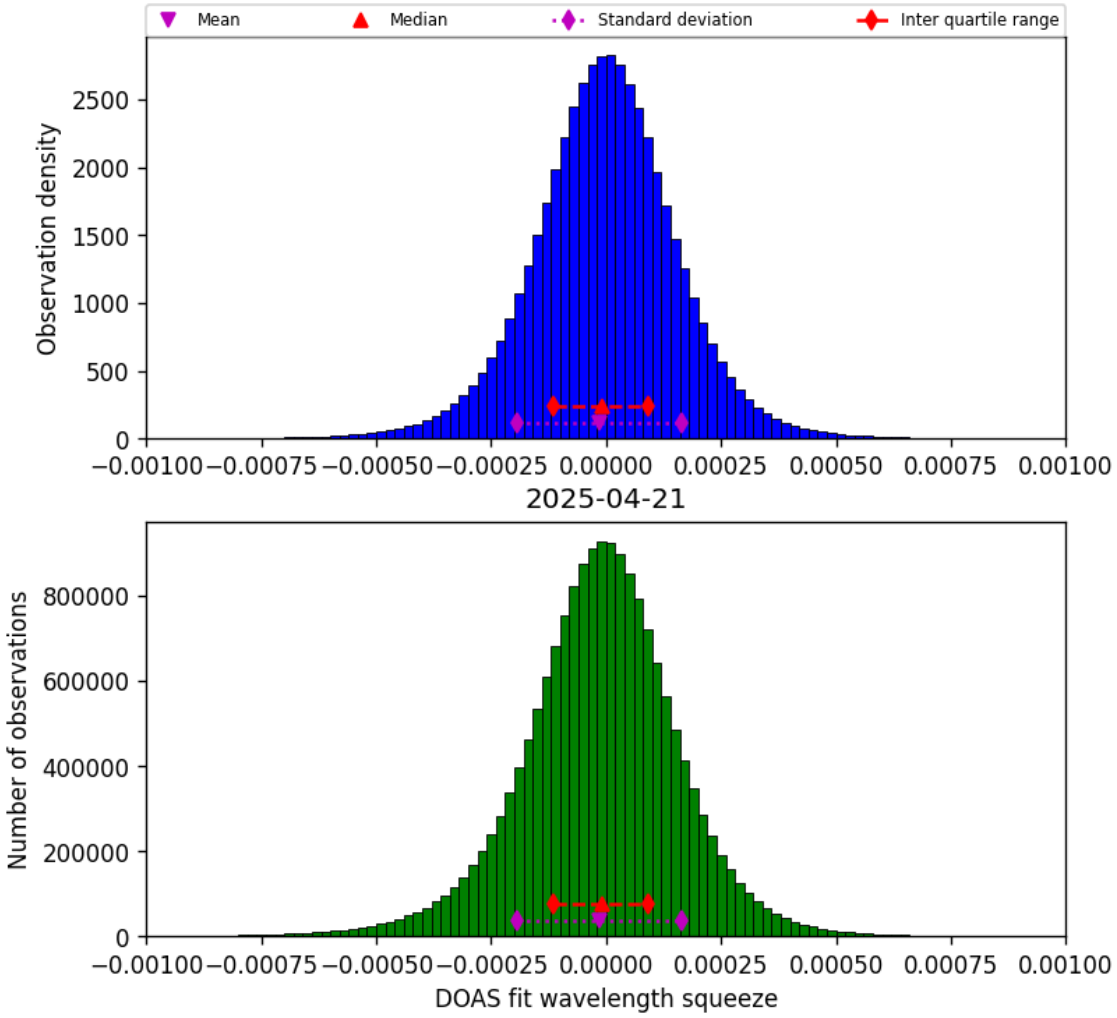

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-04-21 to 2025-04-22

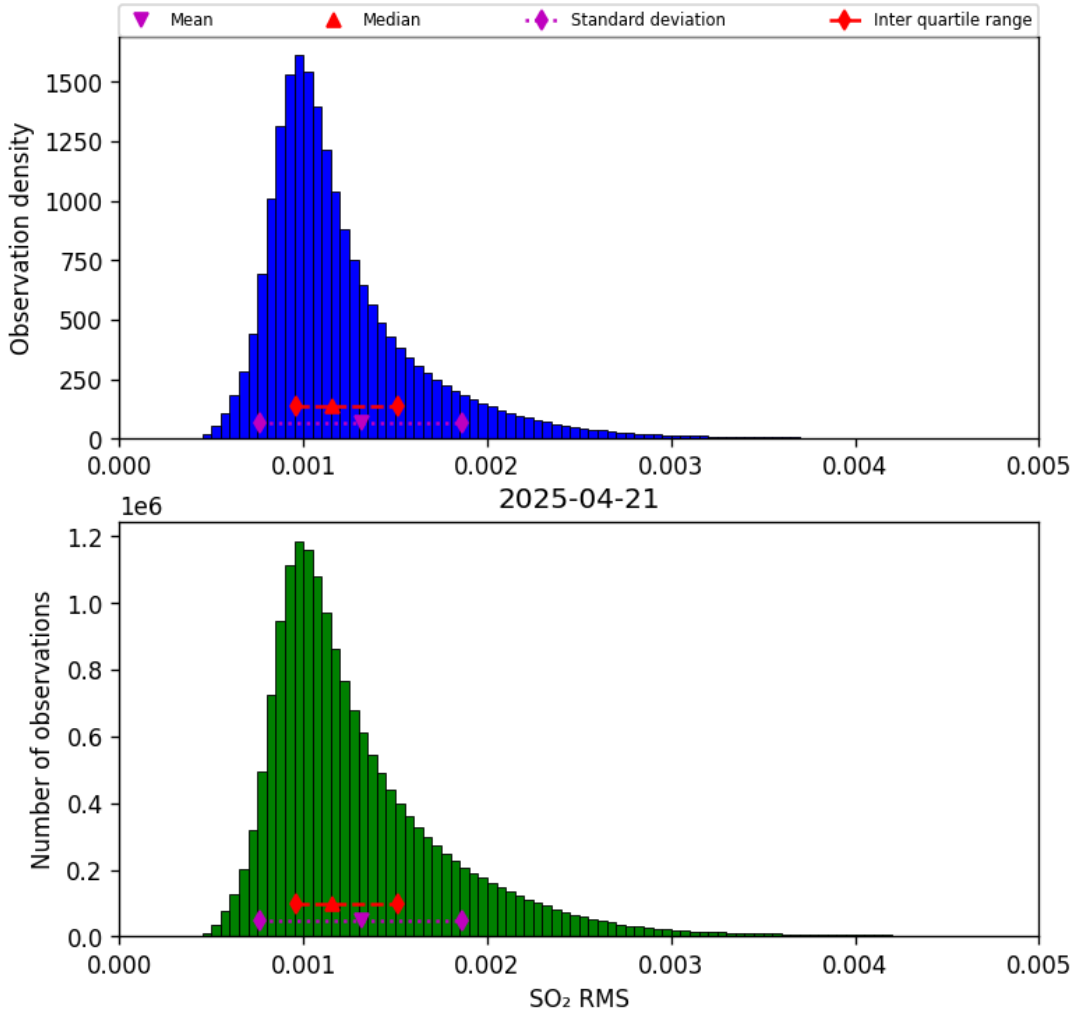

Figure 79: Histogram of "SO_2 RMS" for 2025-04-21 to 2025-04-22

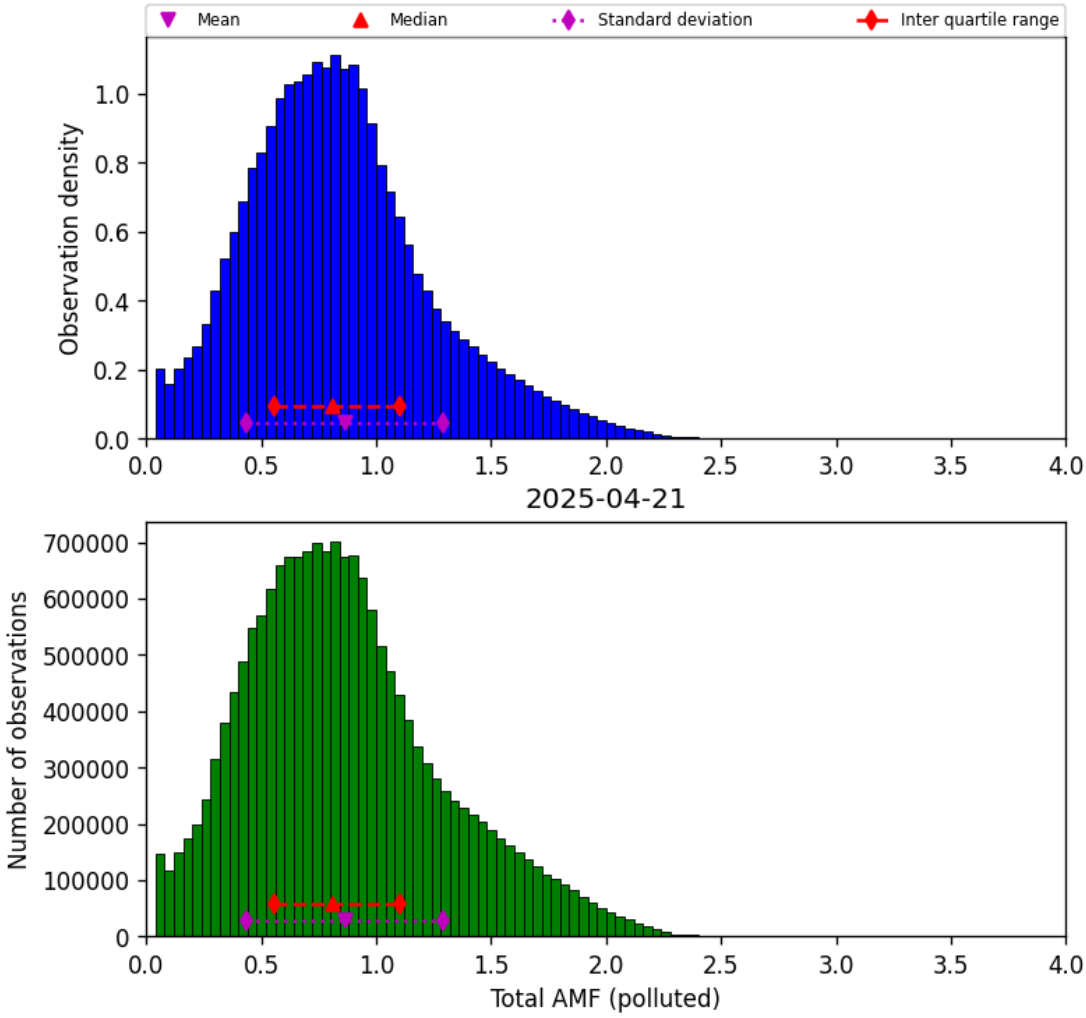

Figure 80: Histogram of “Total AMF (polluted)” for 2025-04-21 to 2025-04-22

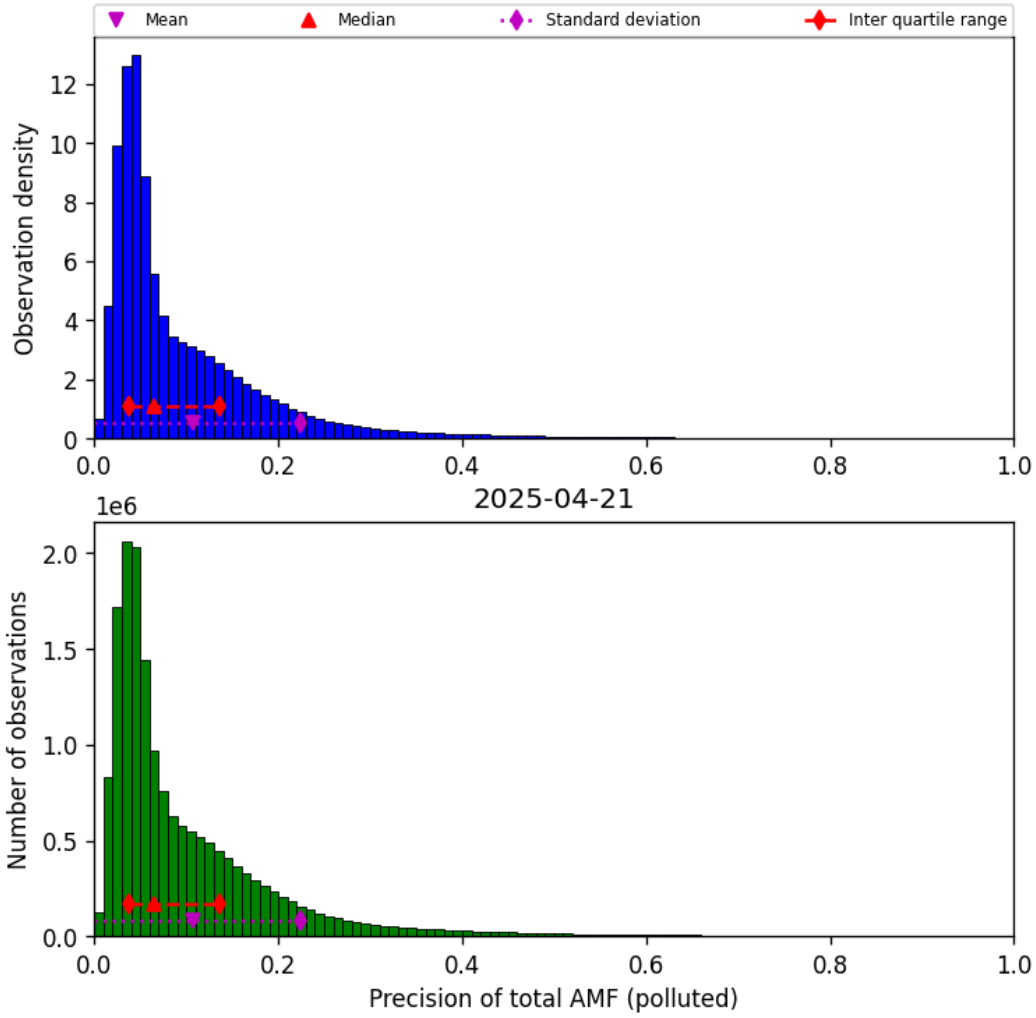

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-04-21 to 2025-04-22

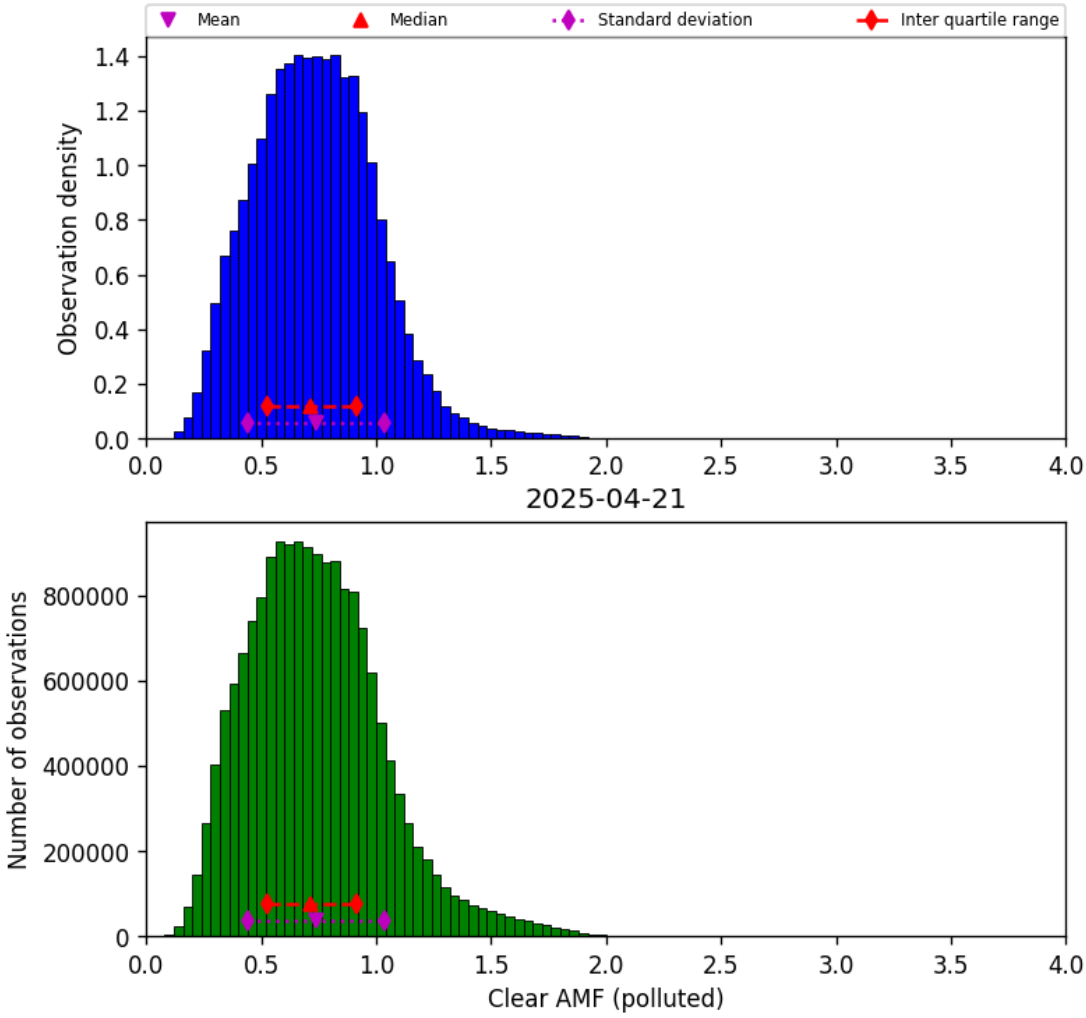

Figure 82: Histogram of “Clear AMF (polluted)” for 2025-04-21 to 2025-04-22

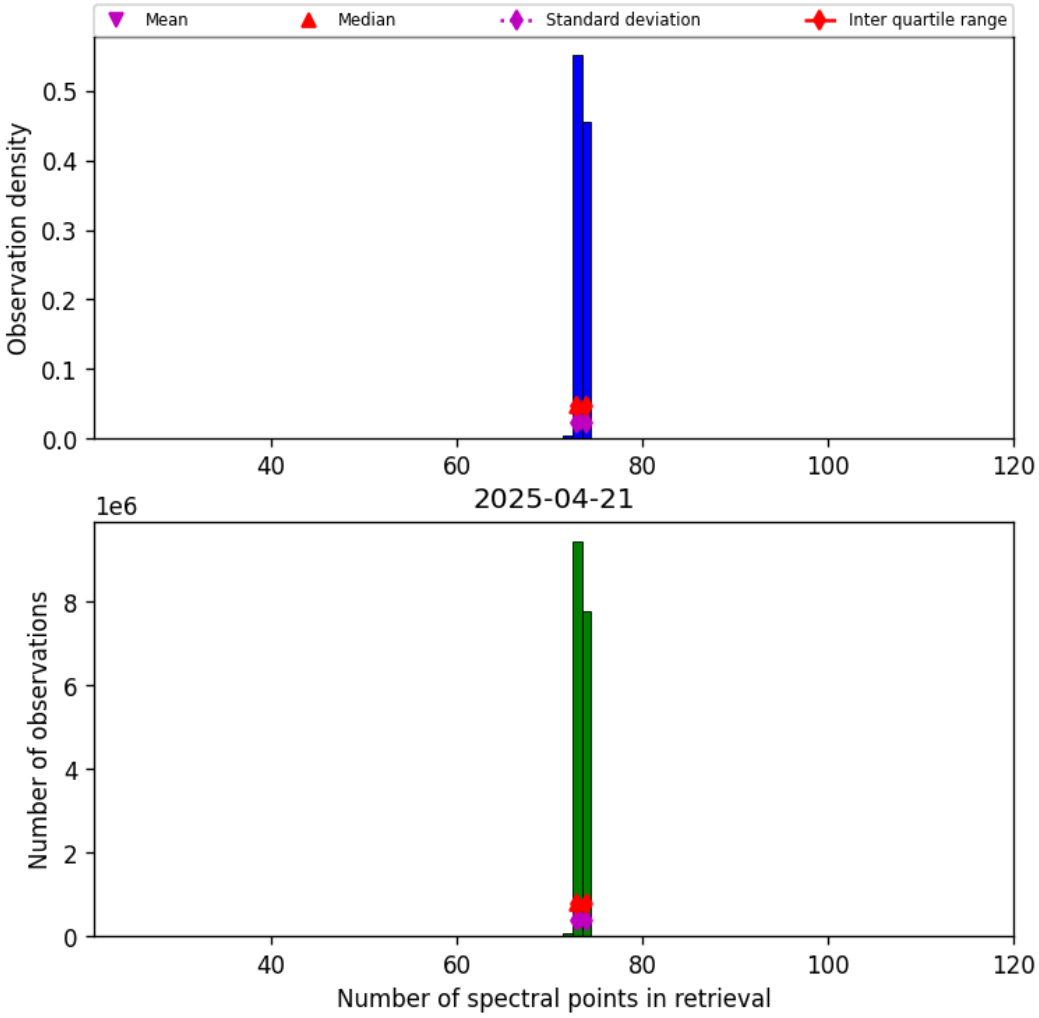

Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-04-21 to 2025-04-22

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.

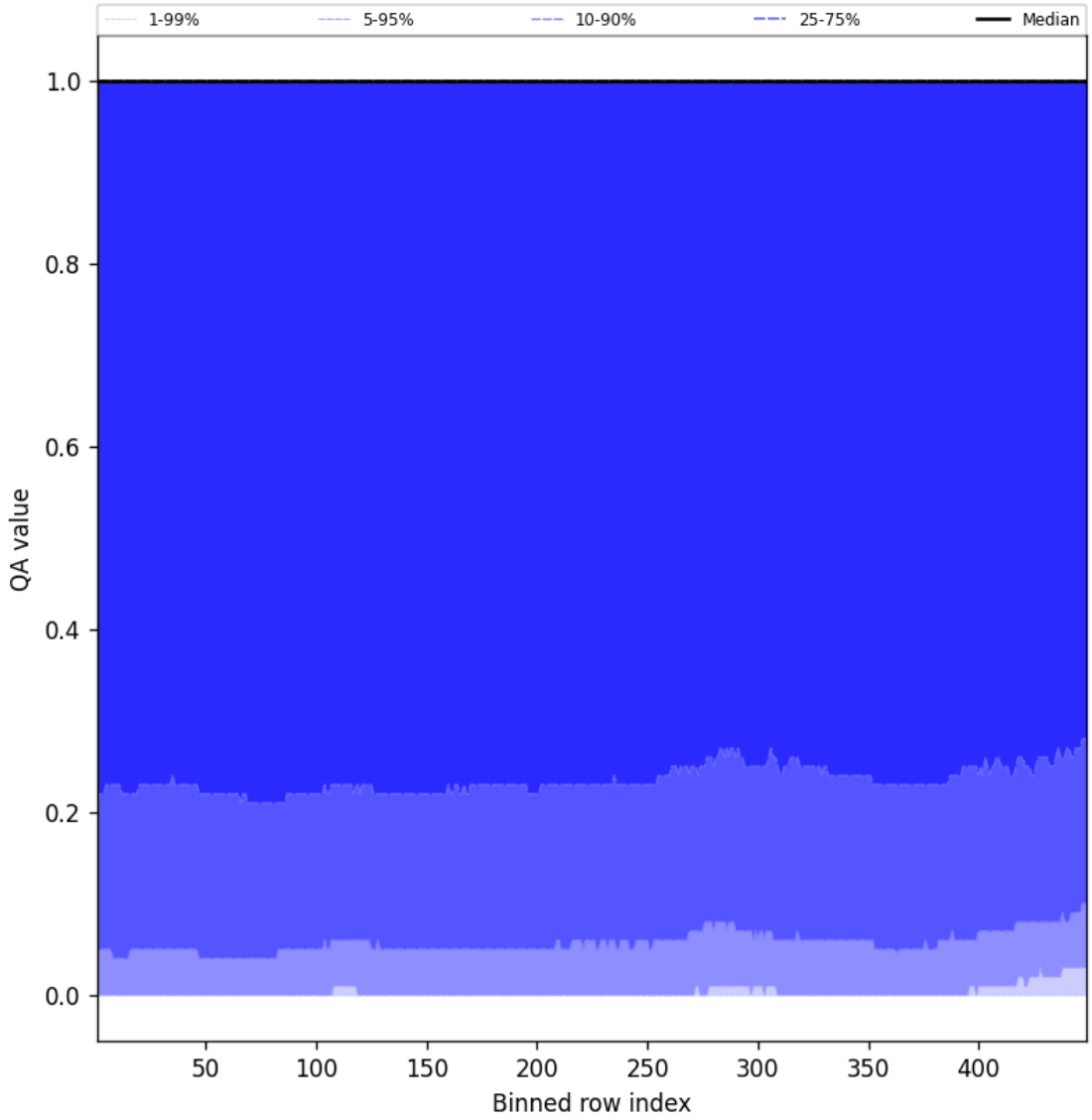

Figure 84: Along track statistics of “QA value” for 2025-04-21 to 2025-04-22

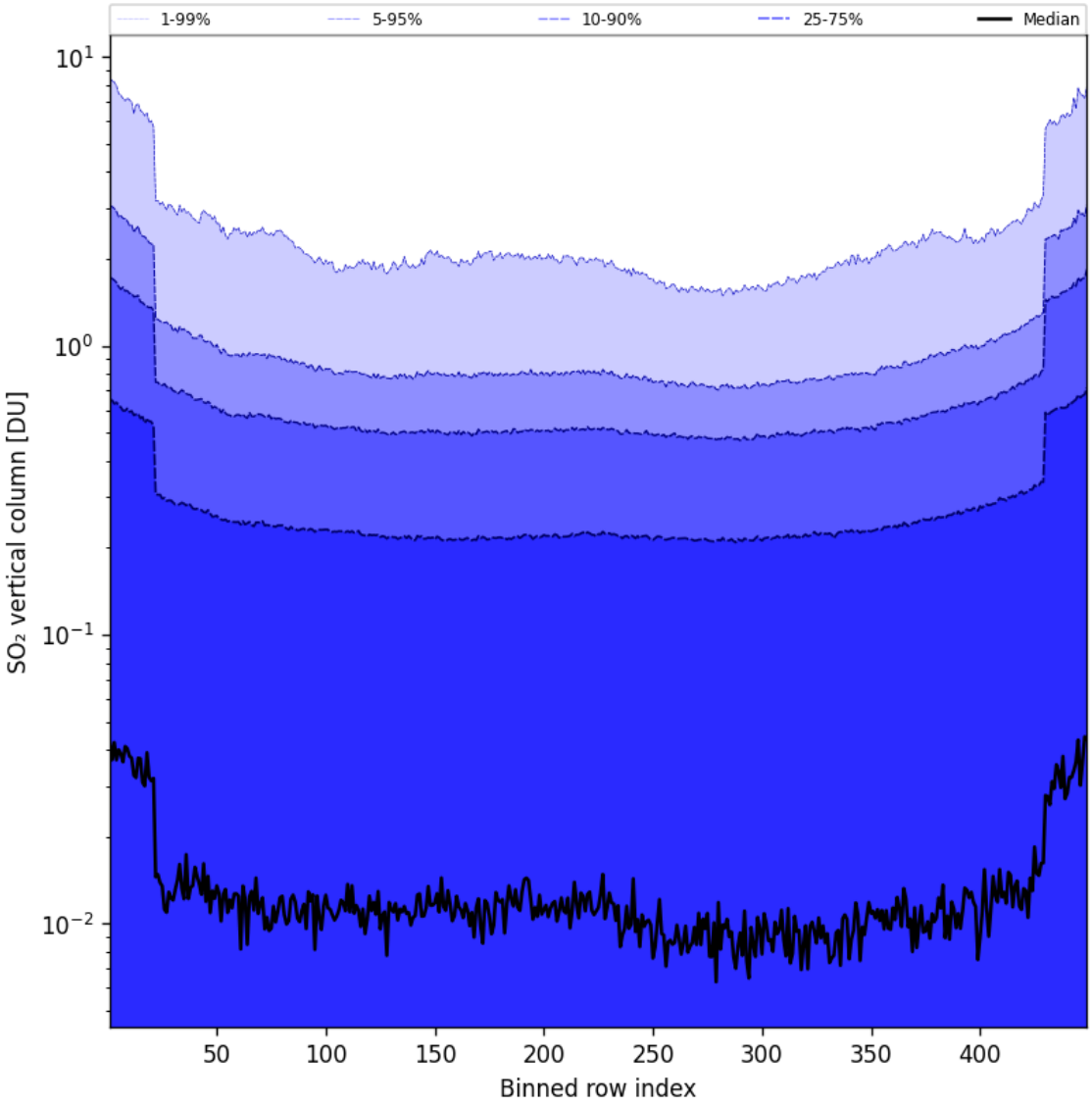

Figure 85: Along track statistics of "SO_2 vertical column" for 2025-04-21 to 2025-04-22

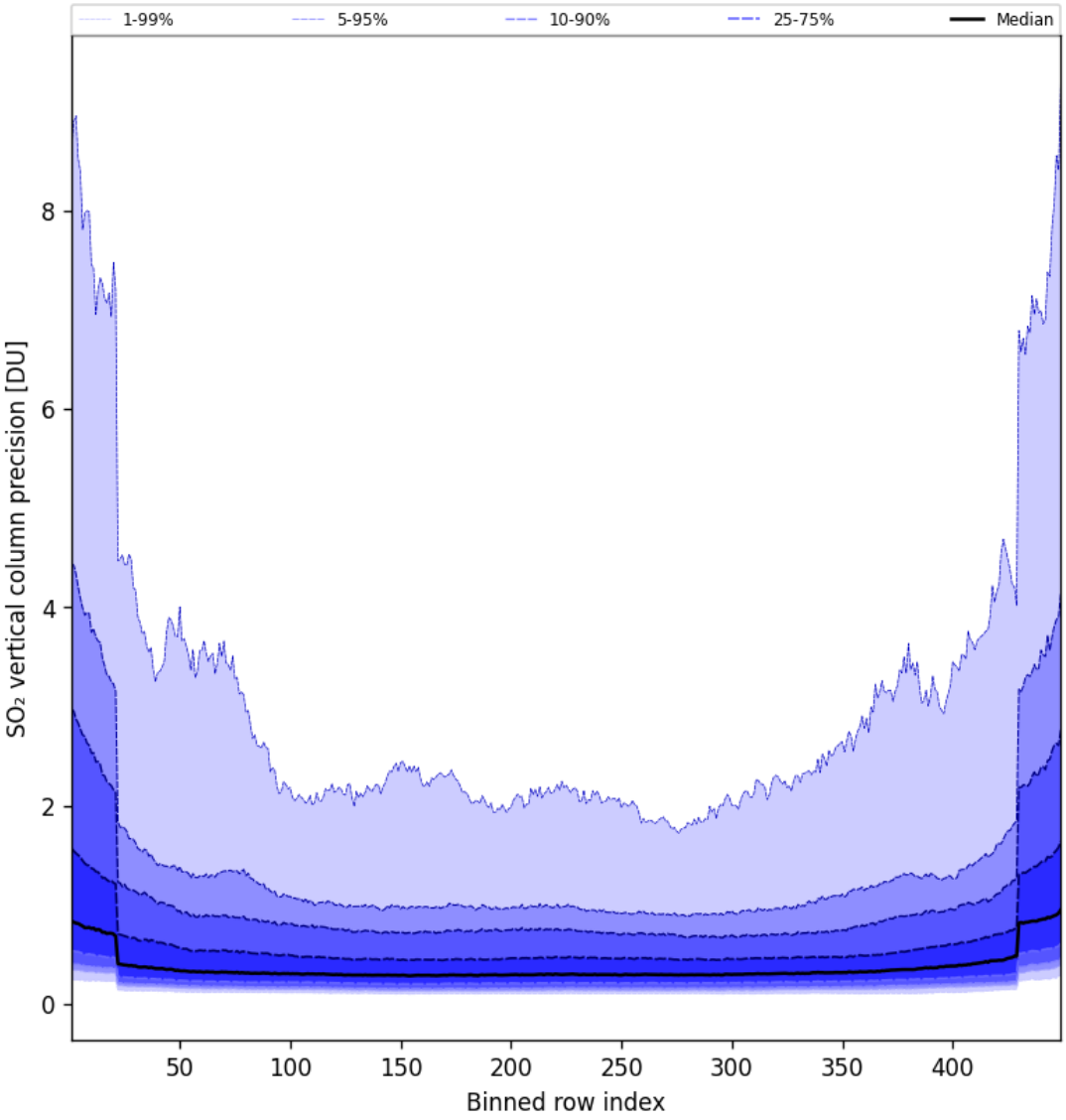

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-04-21 to 2025-04-22

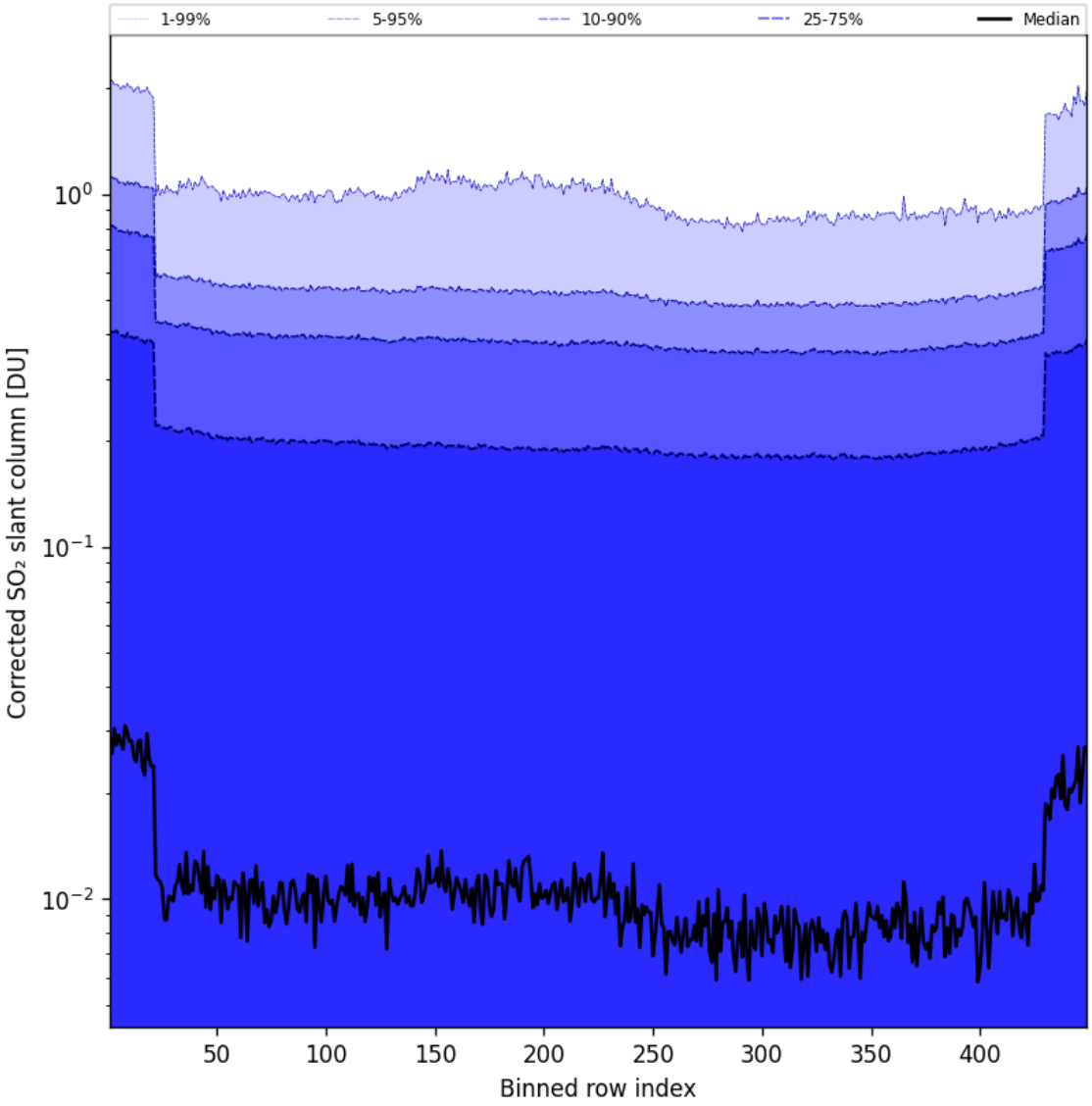

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-04-21 to 2025-04-22

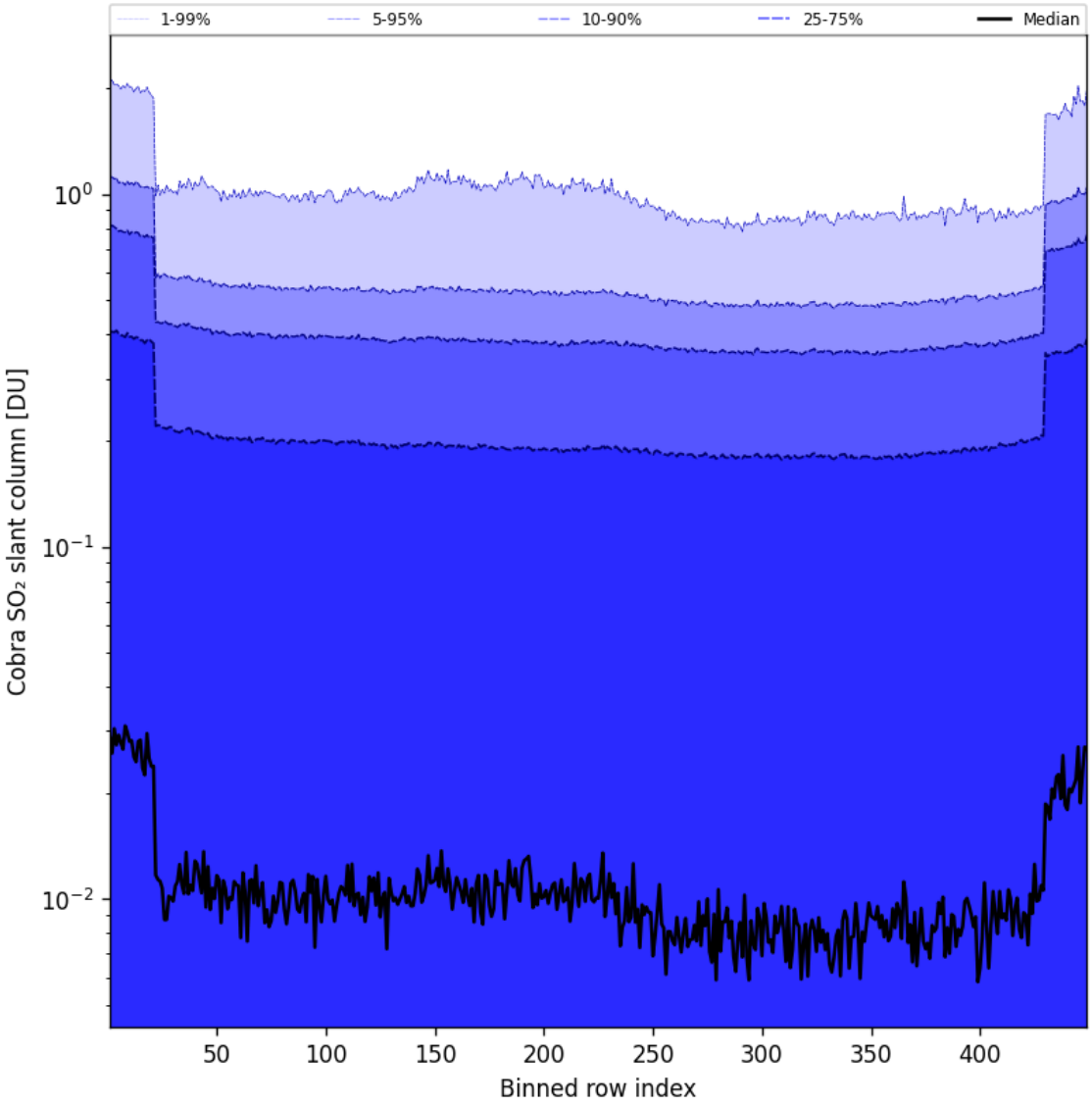

Figure 88: Along track statistics of “Cobra SO_2 slant column” for 2025-04-21 to 2025-04-22

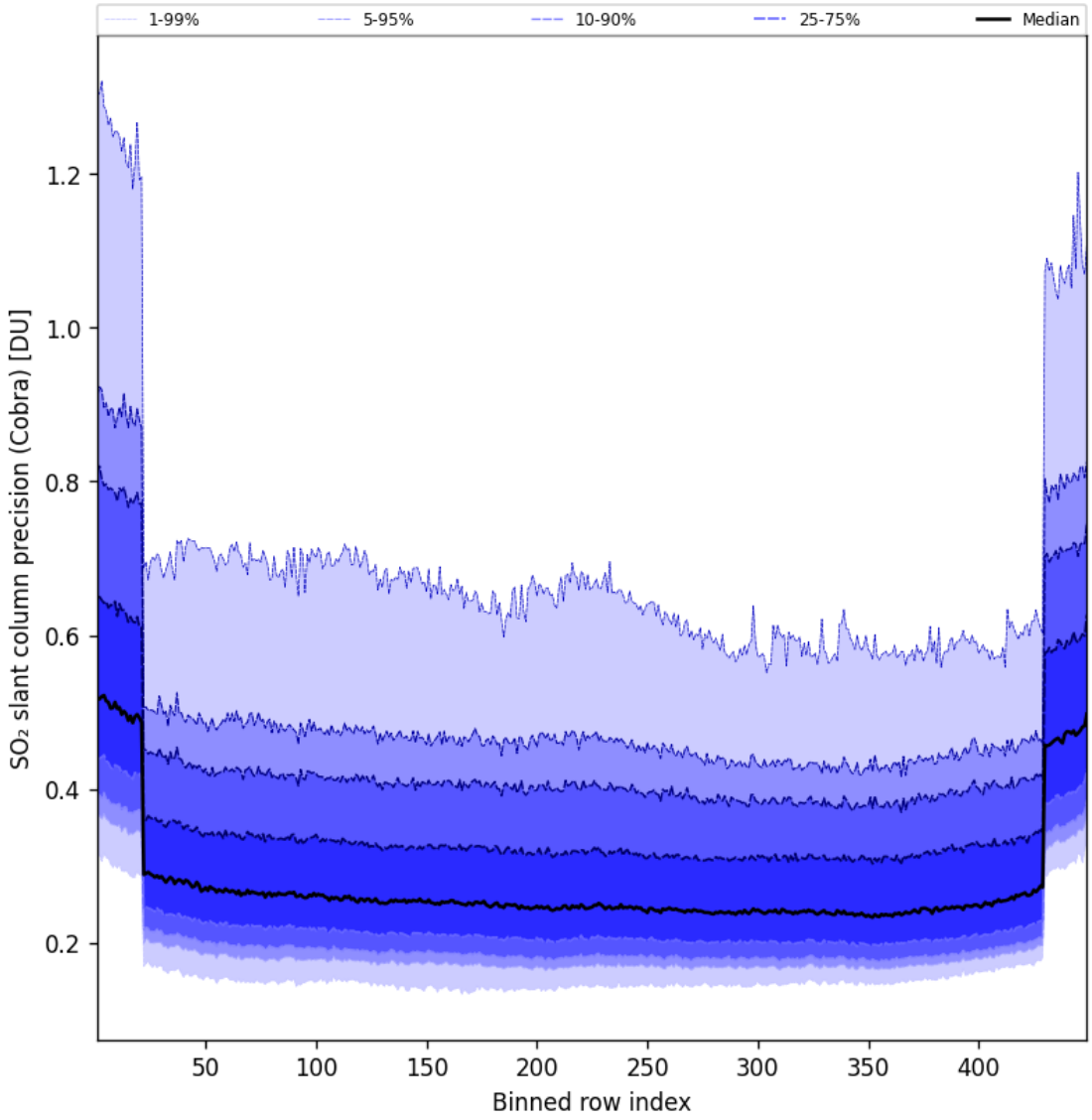

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-04-21 to 2025-04-22

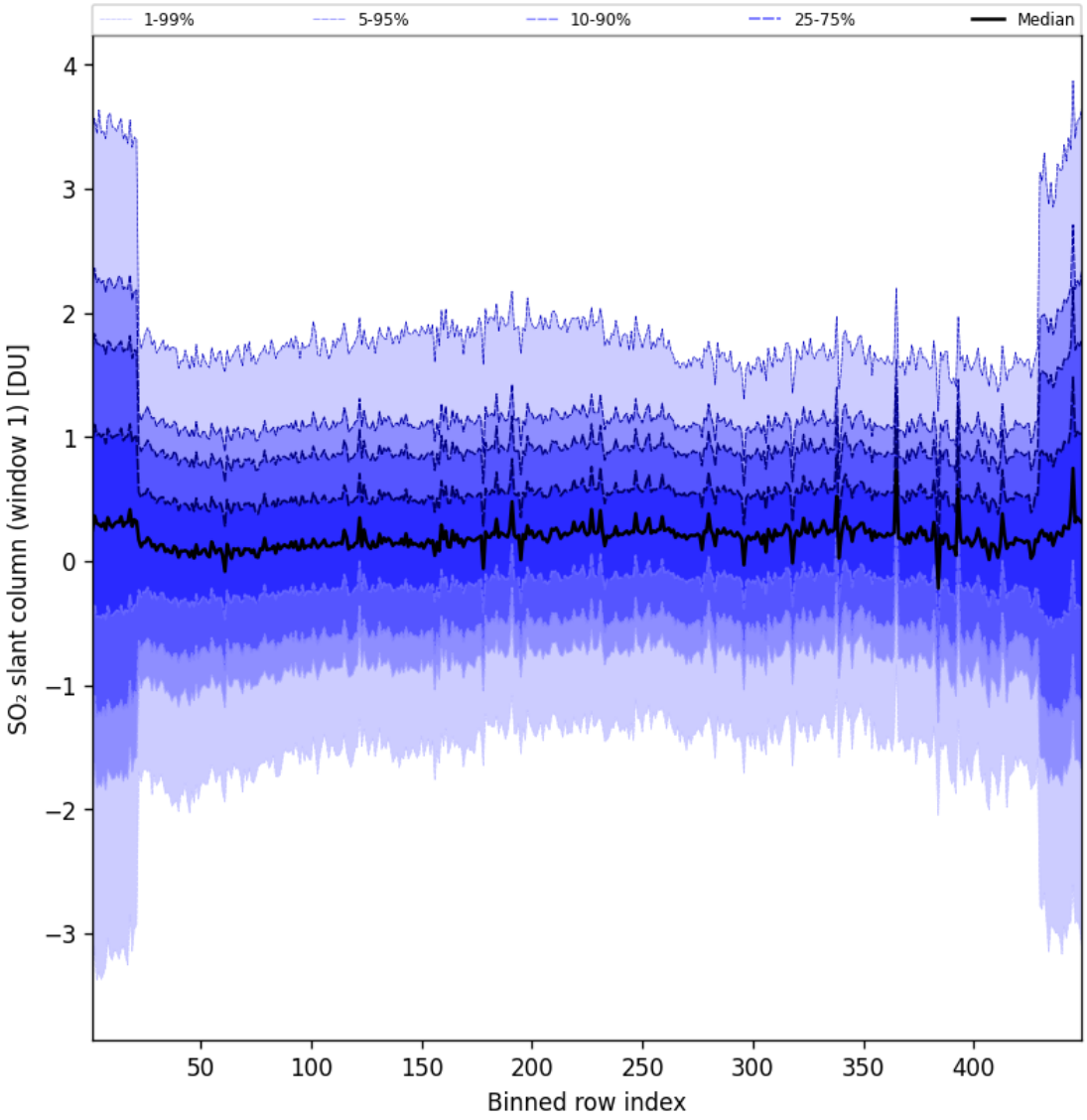

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-04-21 to 2025-04-22

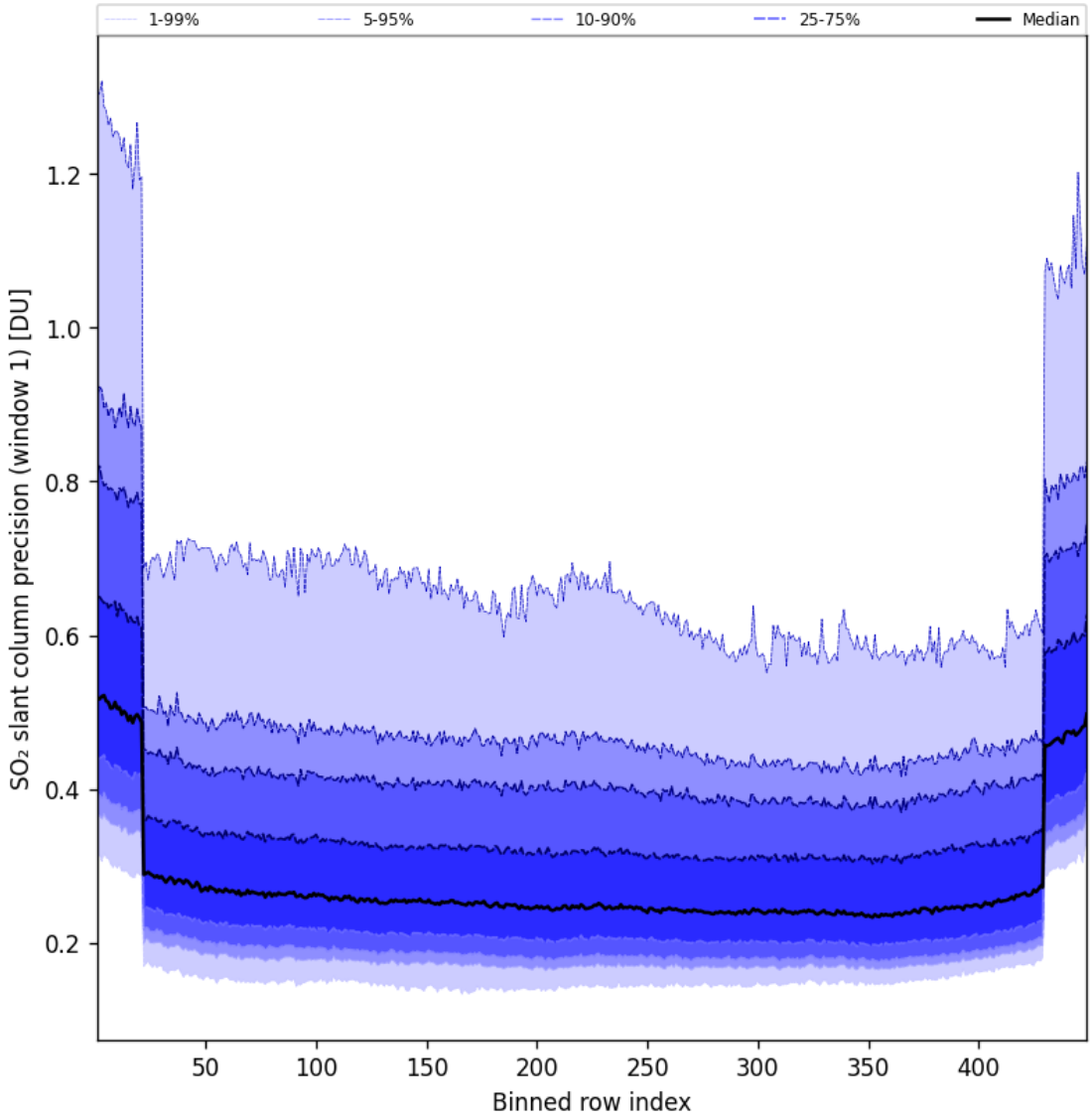

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-04-21 to 2025-04-22

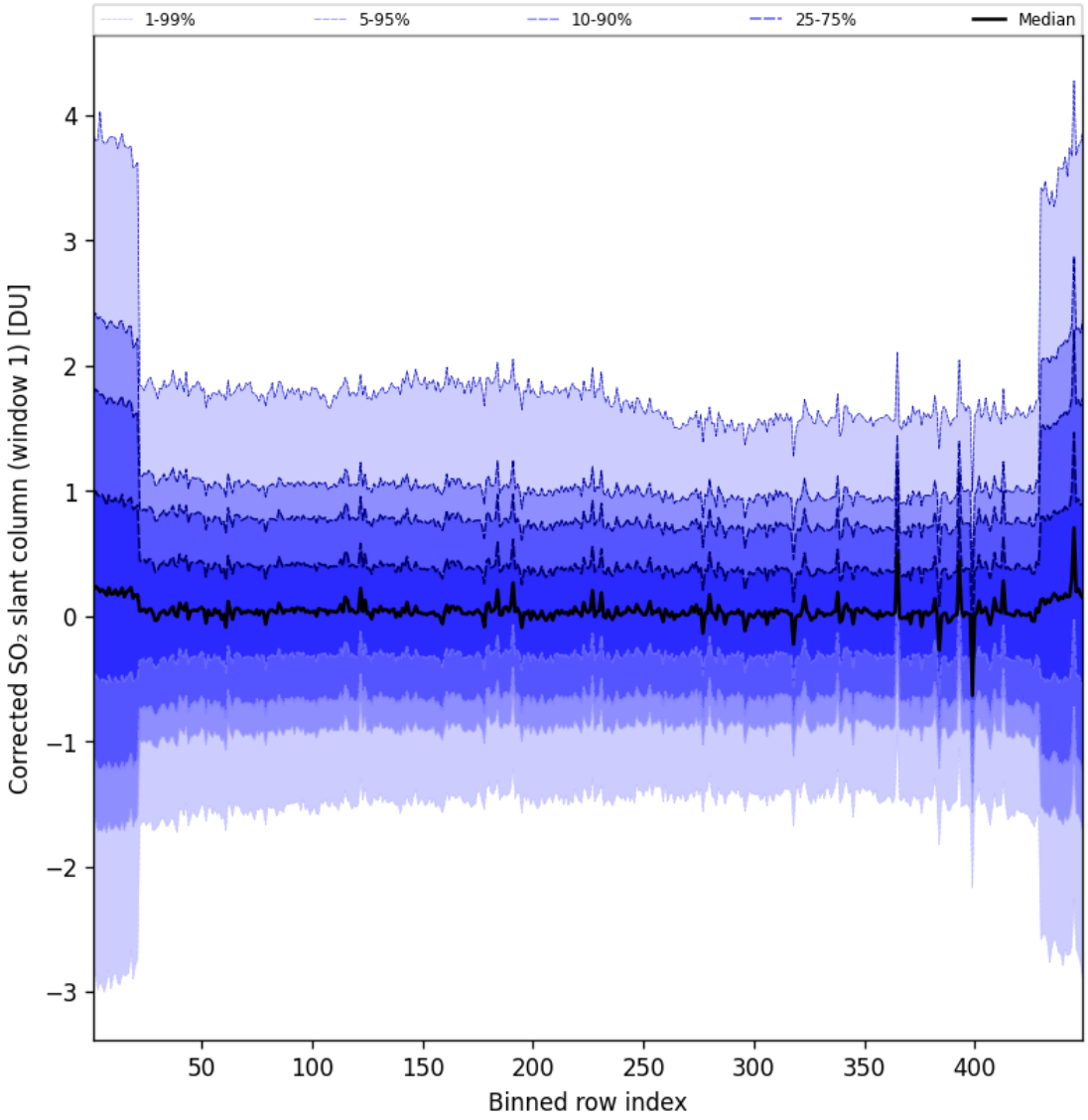

Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-04-21 to 2025-04-22

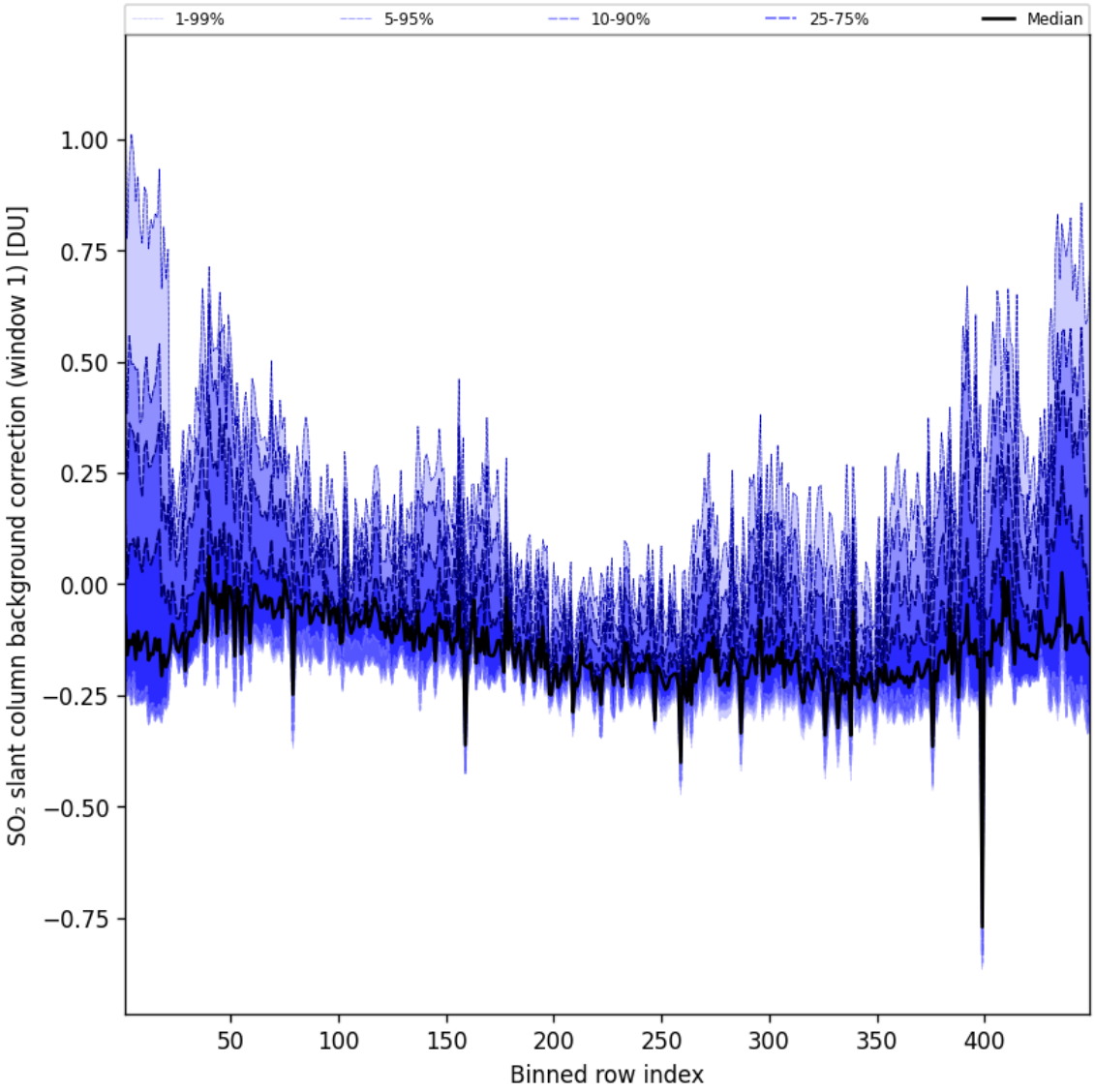

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-04-21 to 2025-04-22

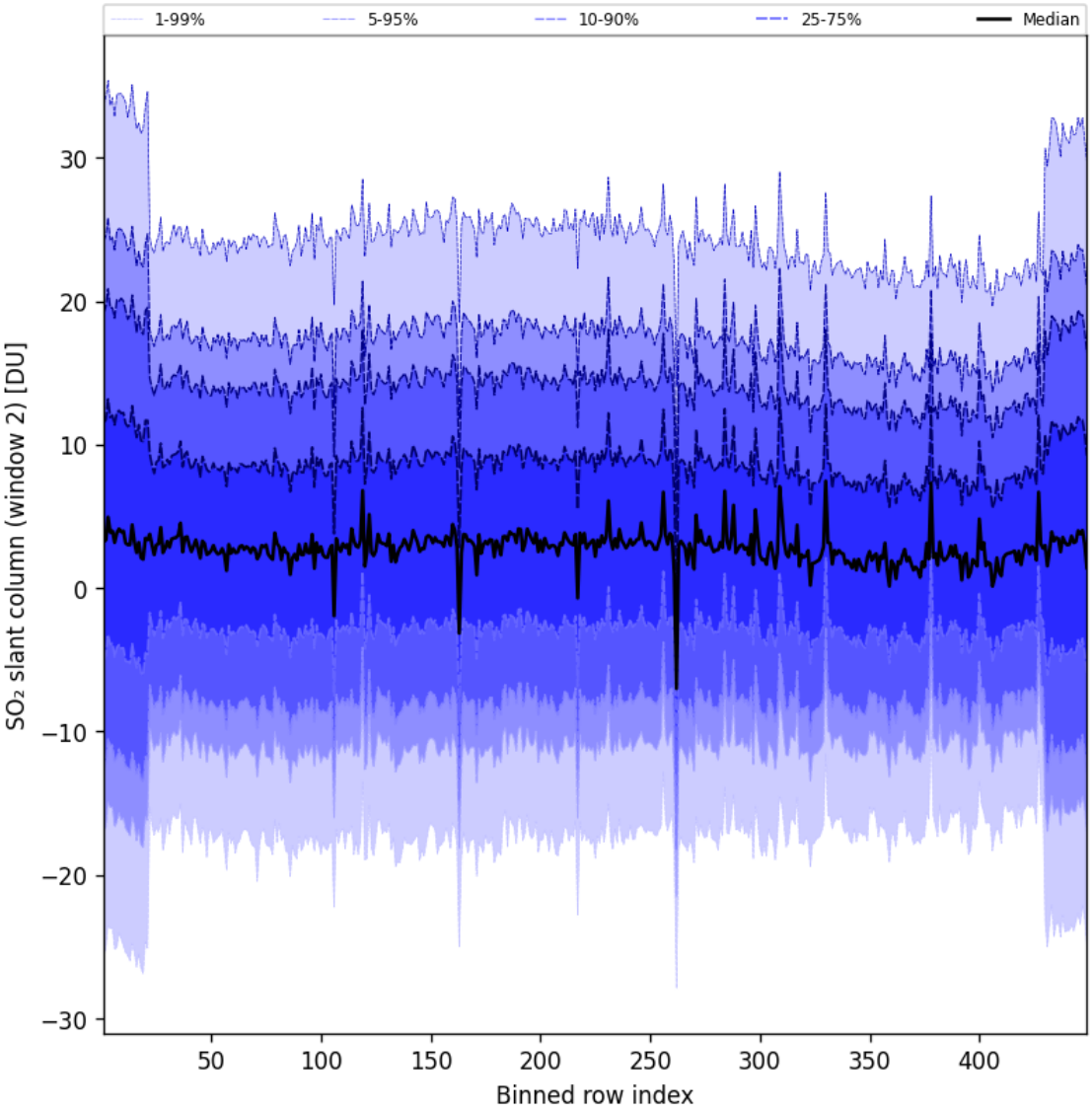

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-04-21 to 2025-04-22

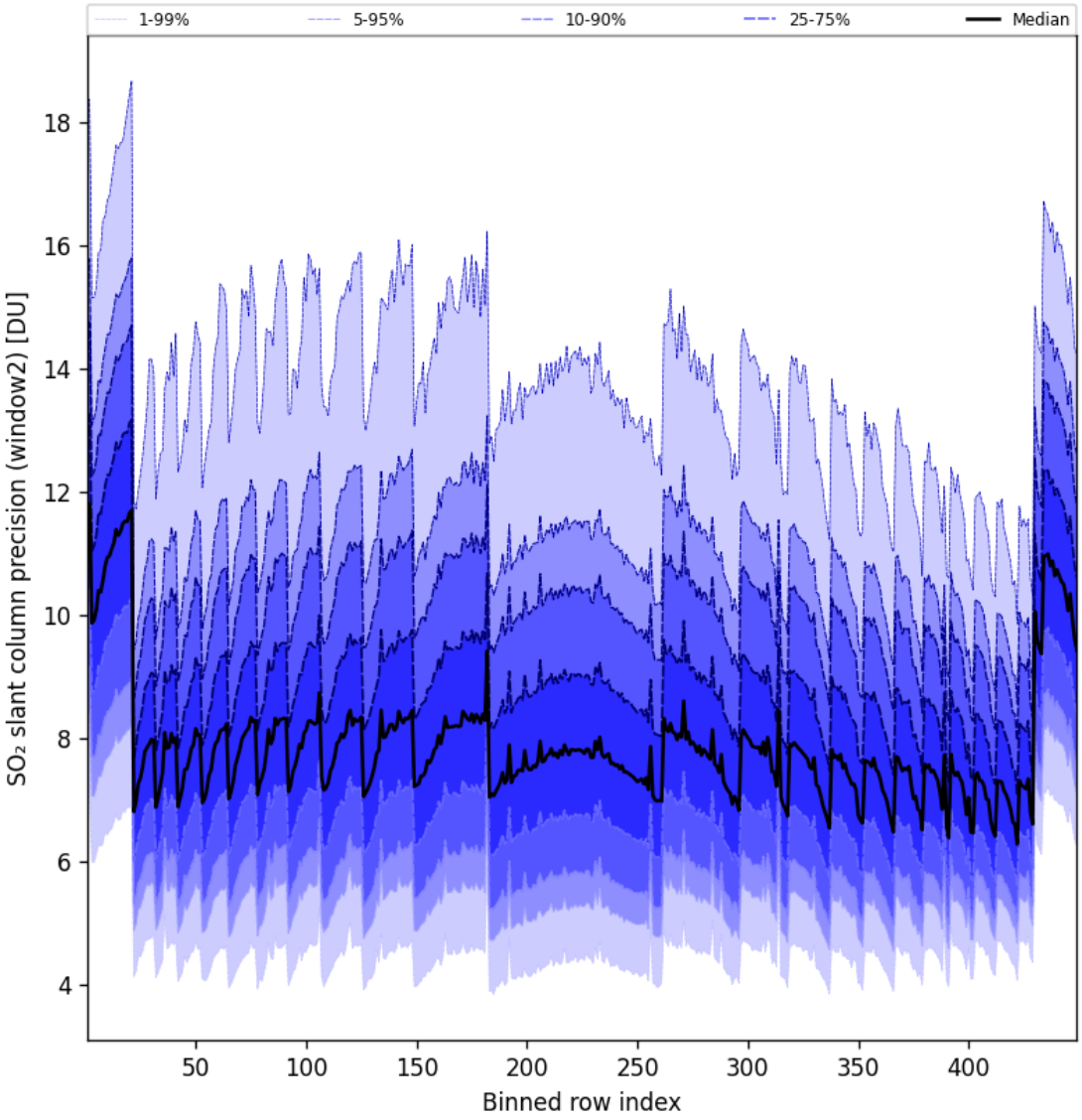

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-04-21 to 2025-04-22

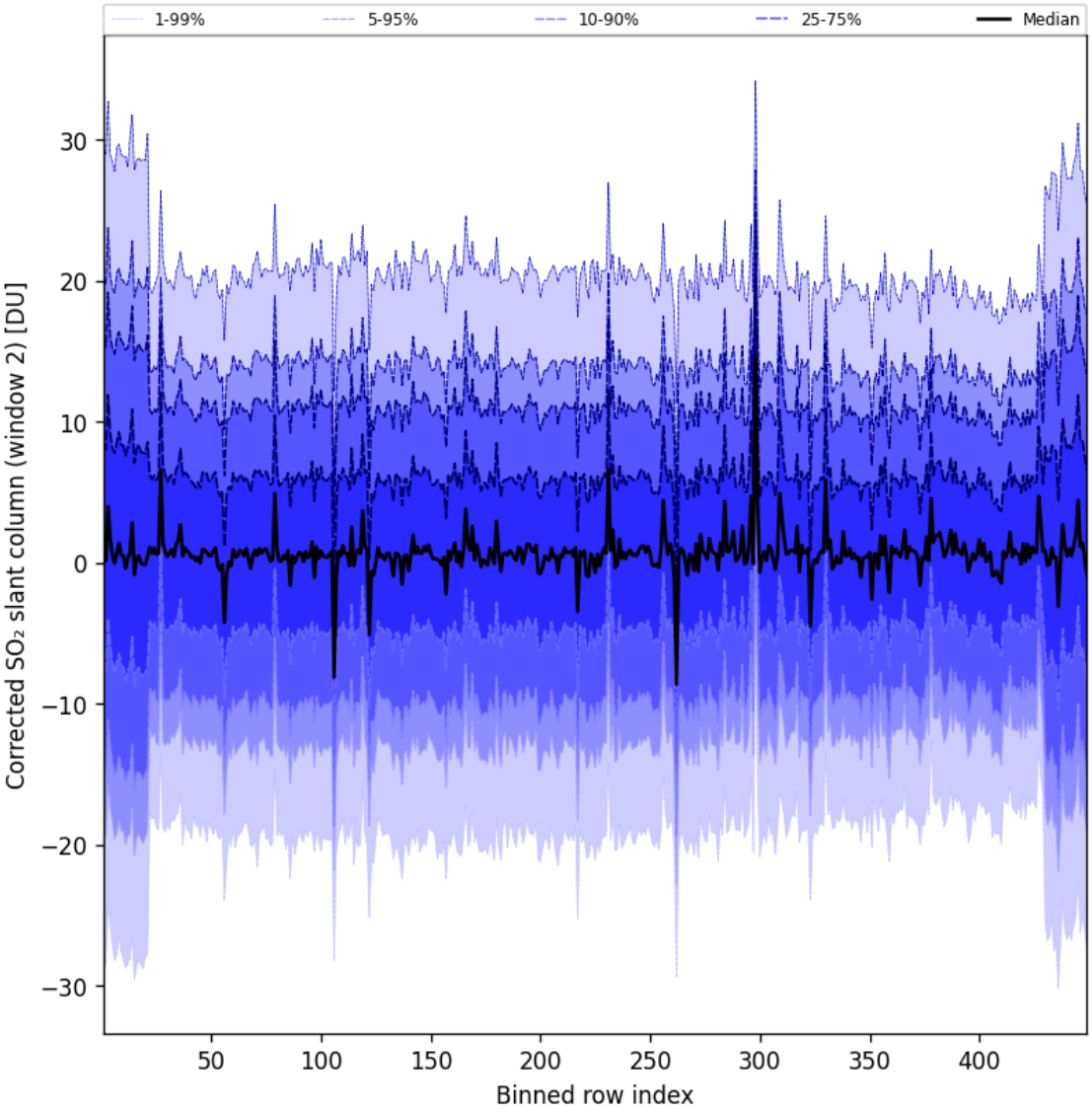

Figure 96: Along track statistics of “Corrected SO_2 slant column (window 2)” for 2025-04-21 to 2025-04-22

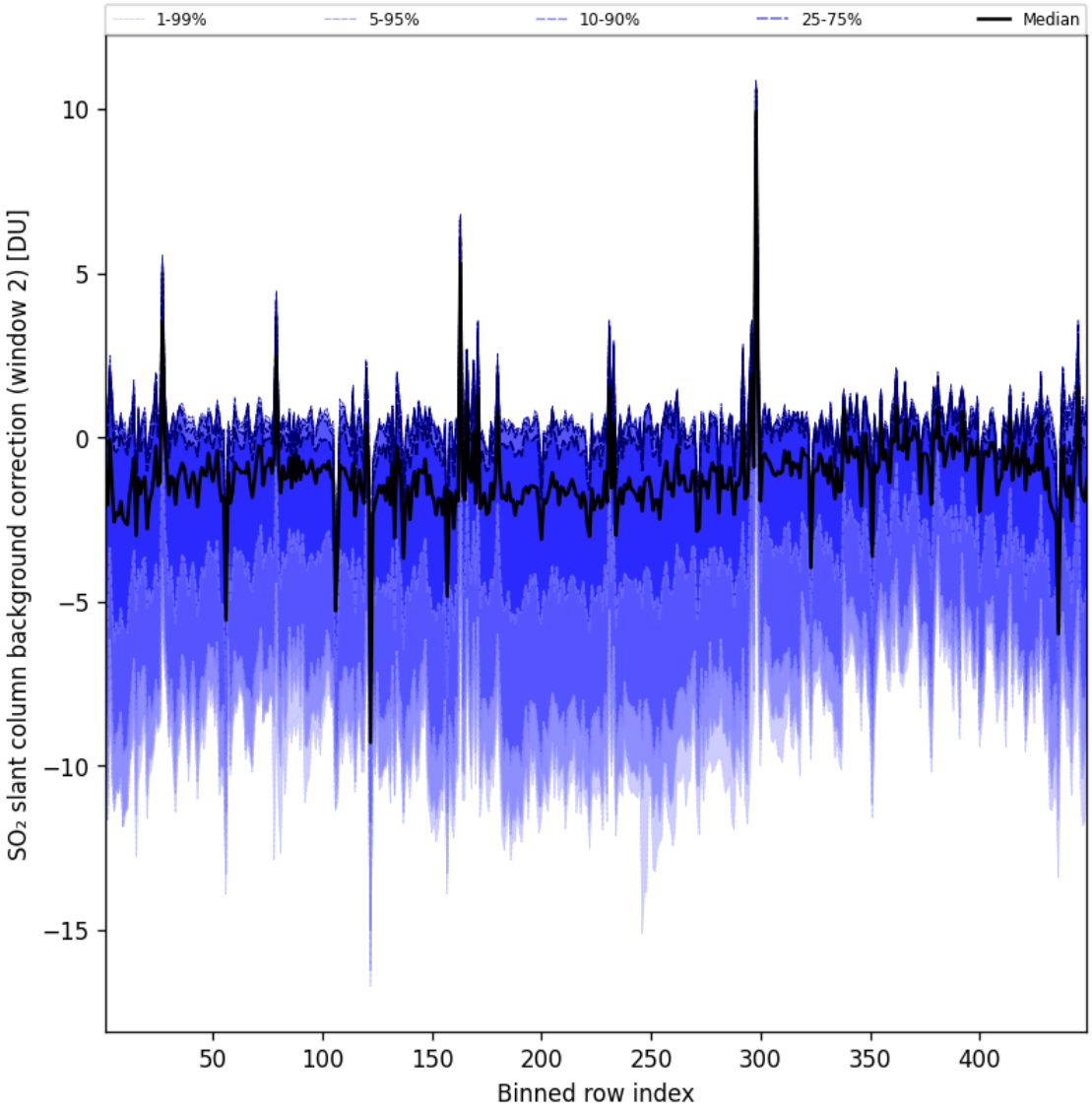

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-04-21 to 2025-04-22

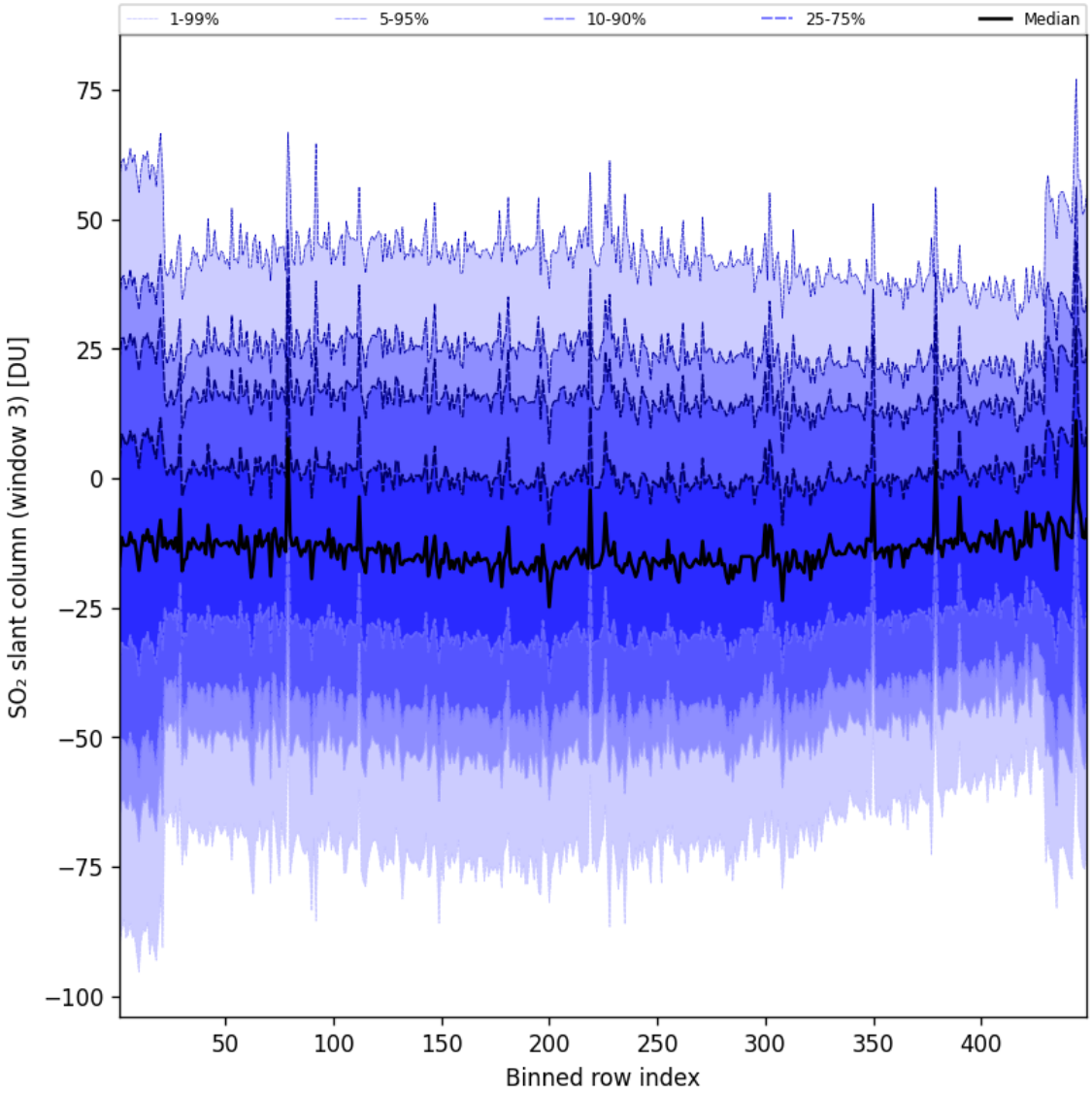

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-04-21 to 2025-04-22

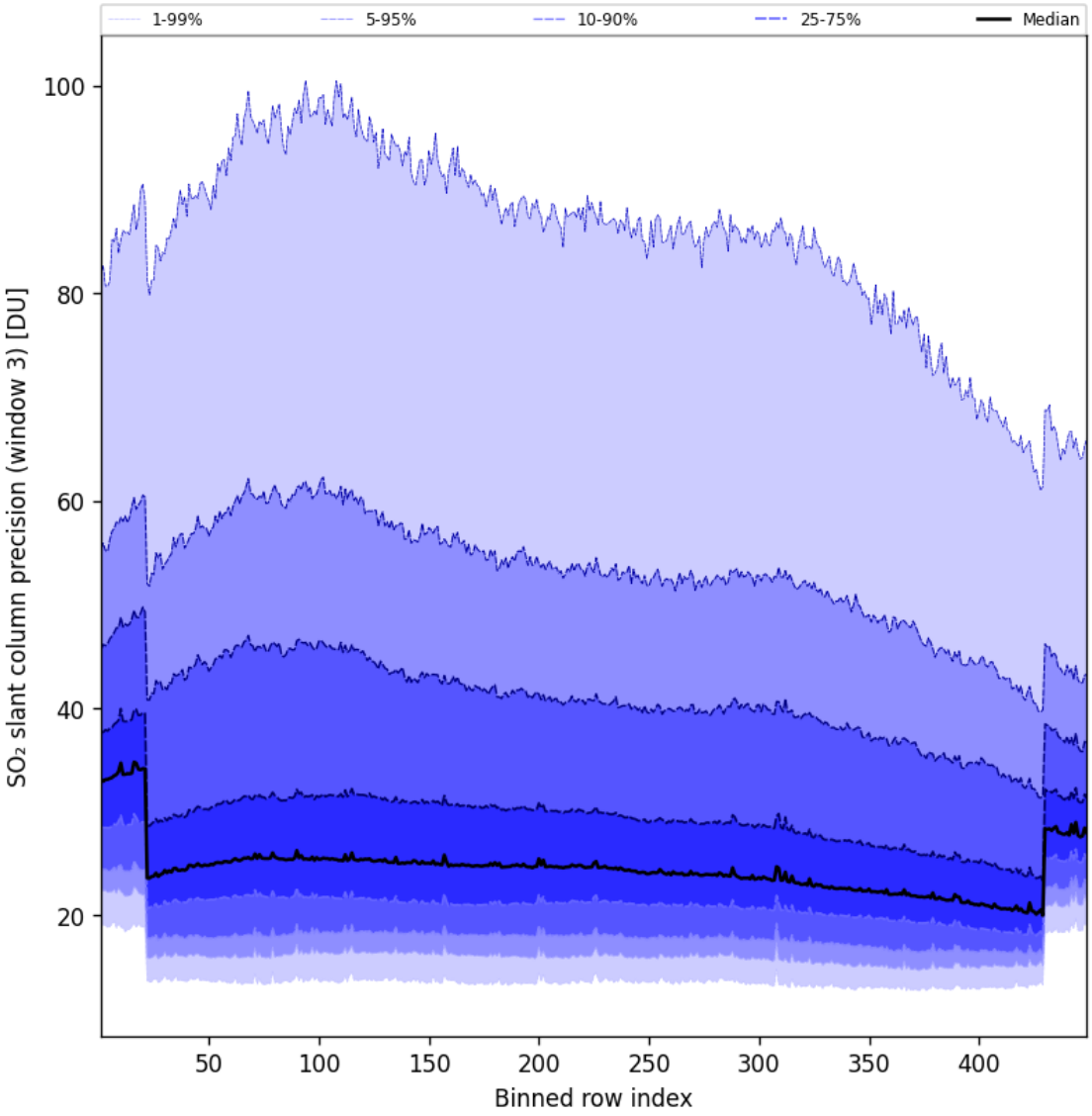

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-04-21 to 2025-04-22

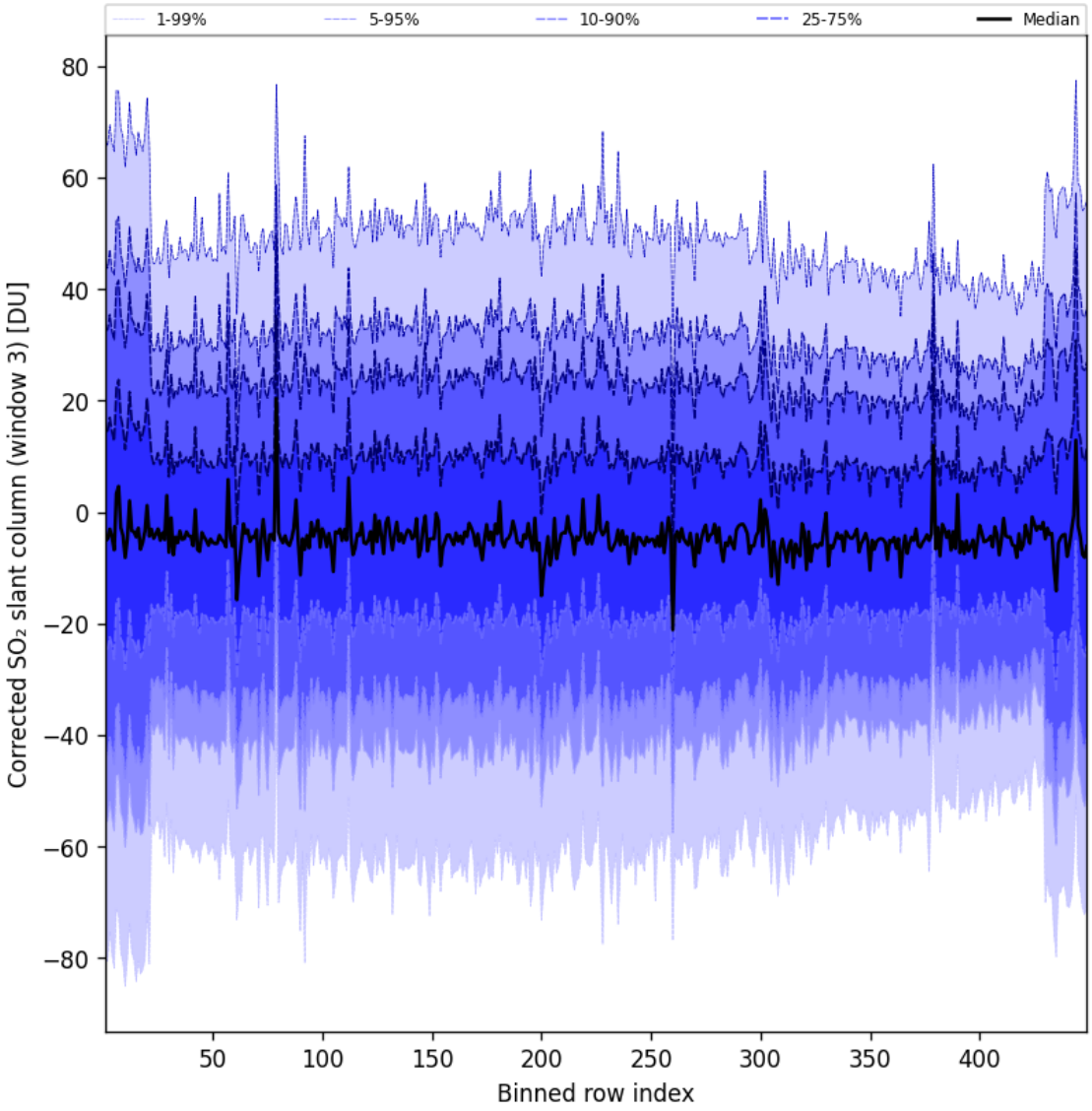

Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-04-21 to 2025-04-22

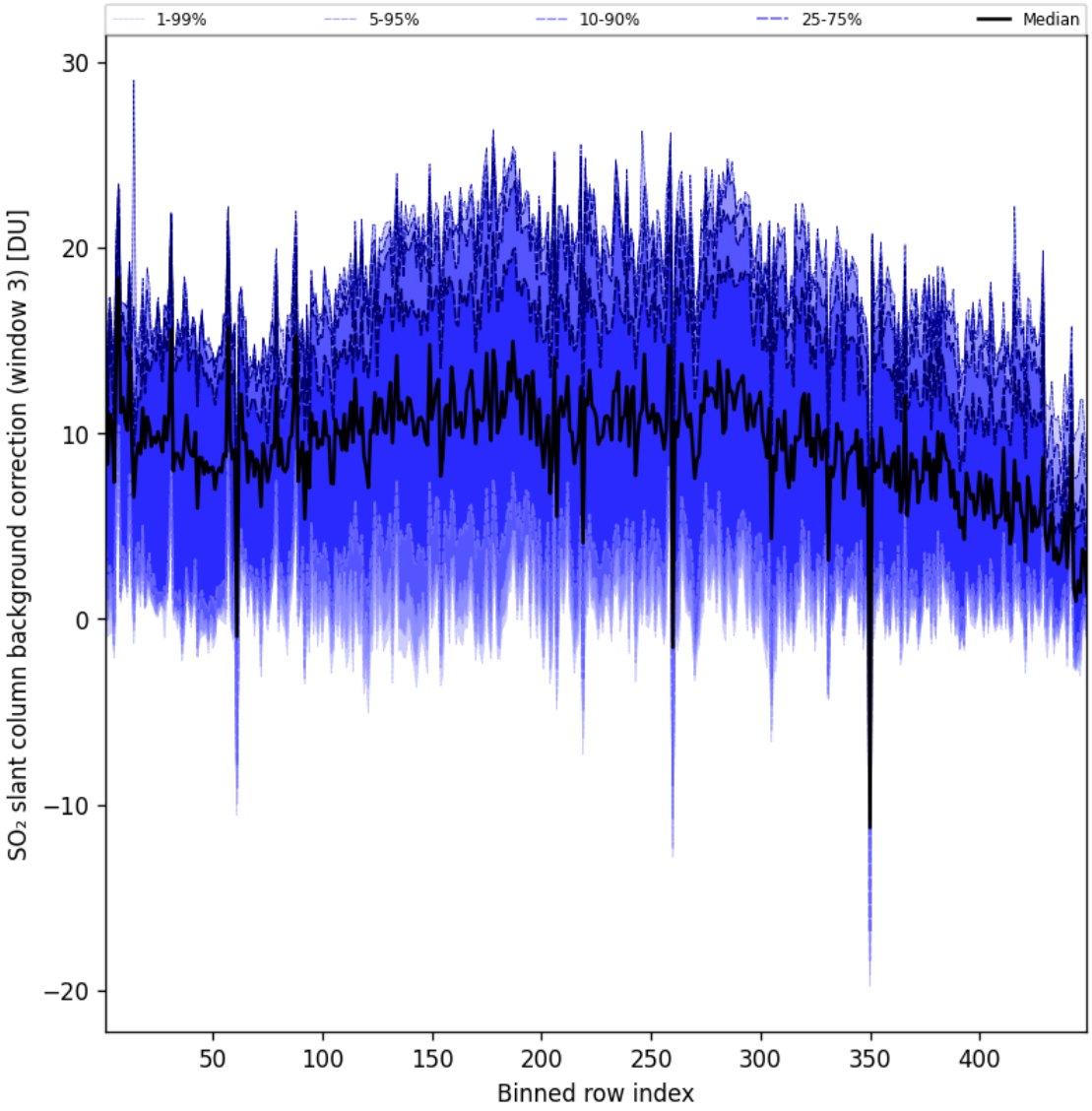

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-04-21 to 2025-04-22

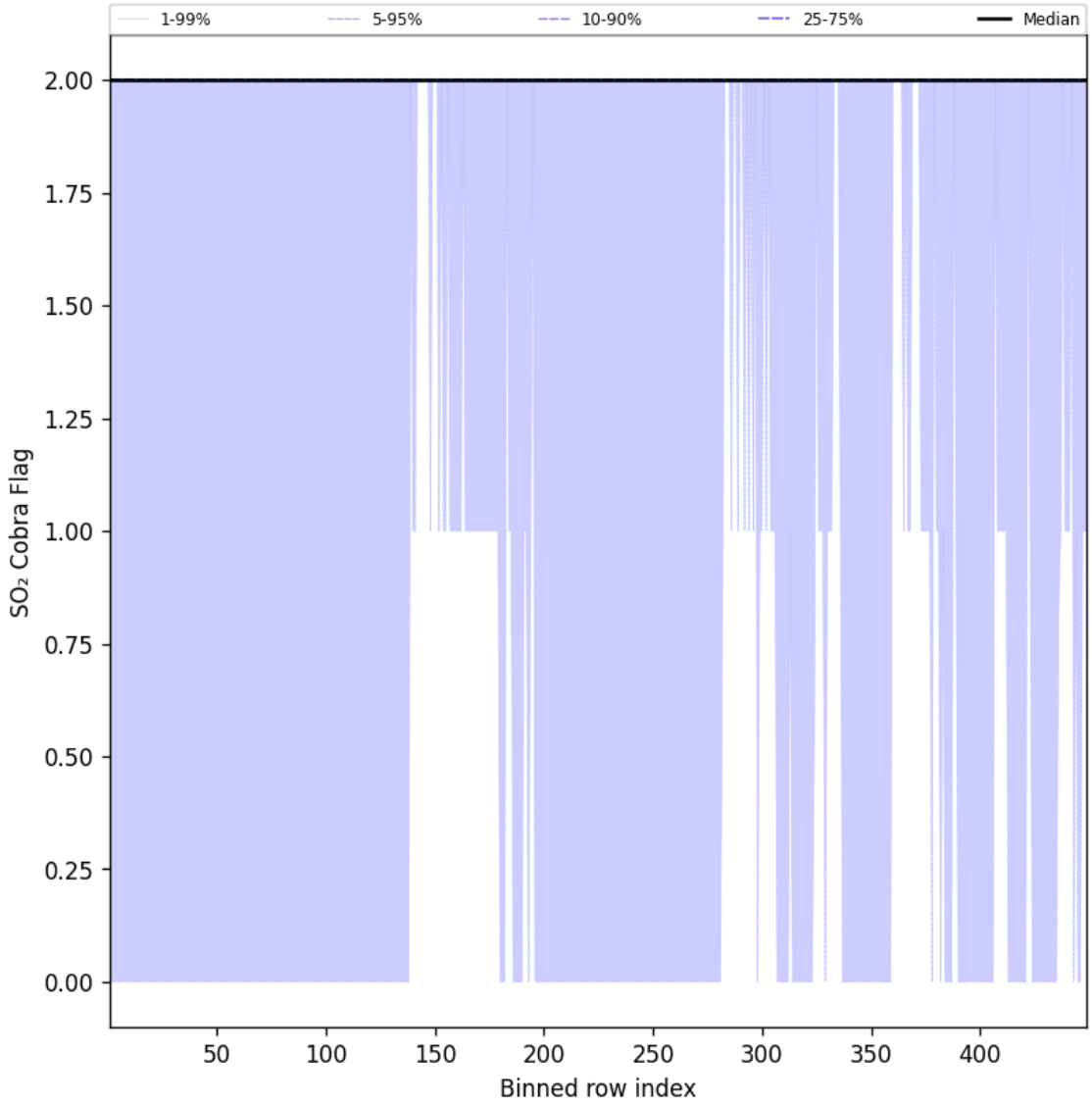

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-04-21 to 2025-04-22

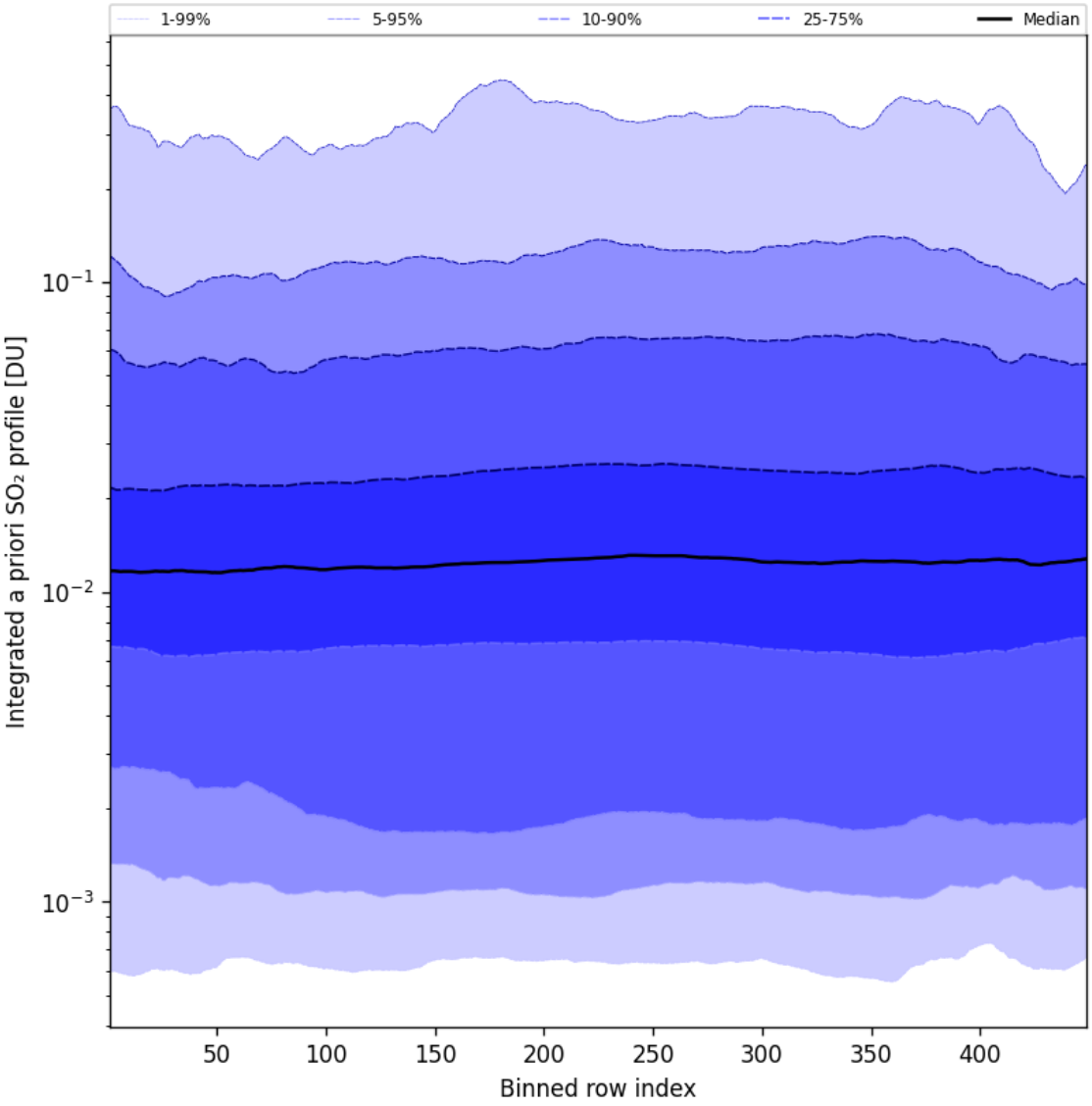

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-04-21 to 2025-04-22

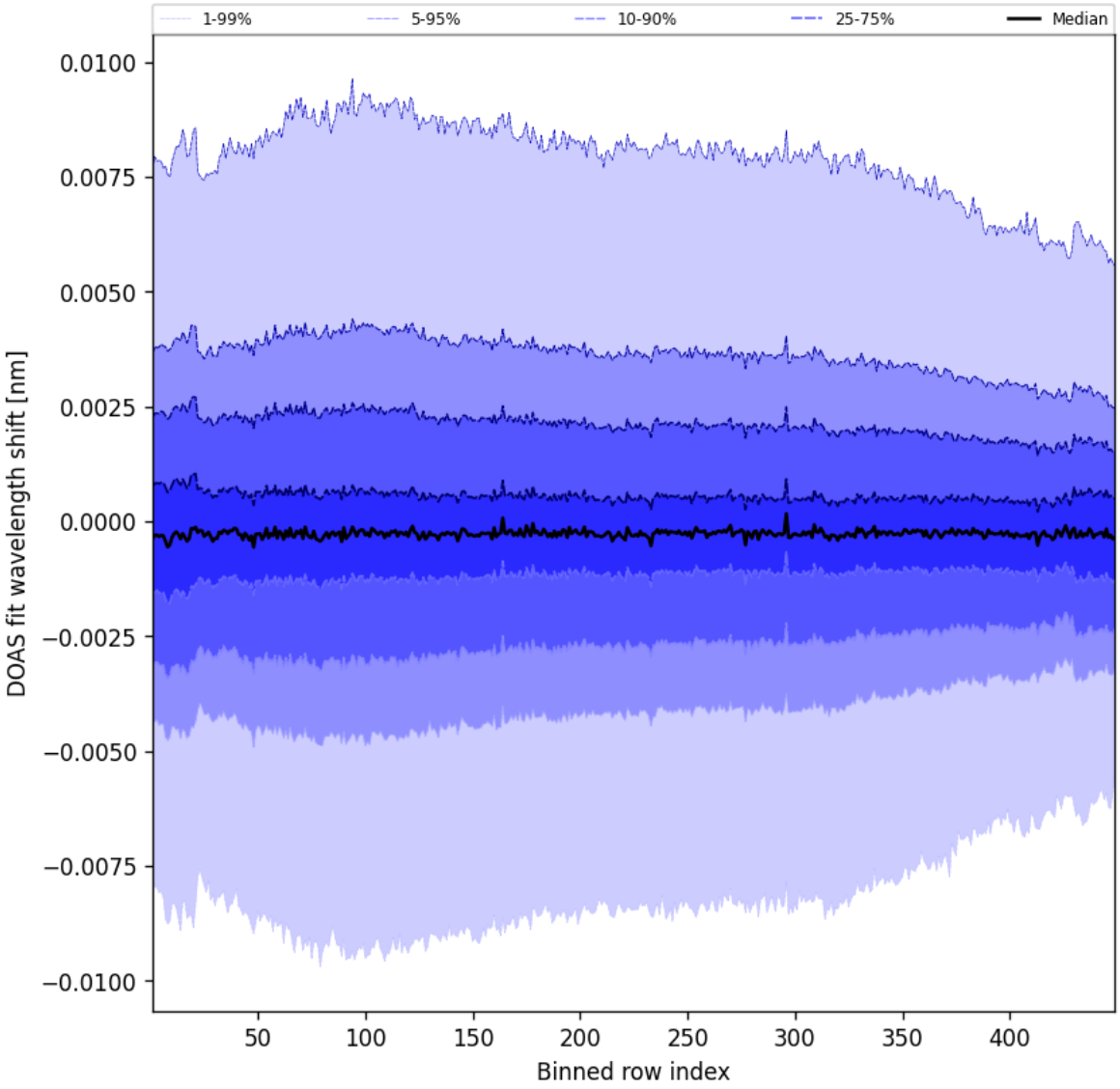

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-04-21 to 2025-04-22

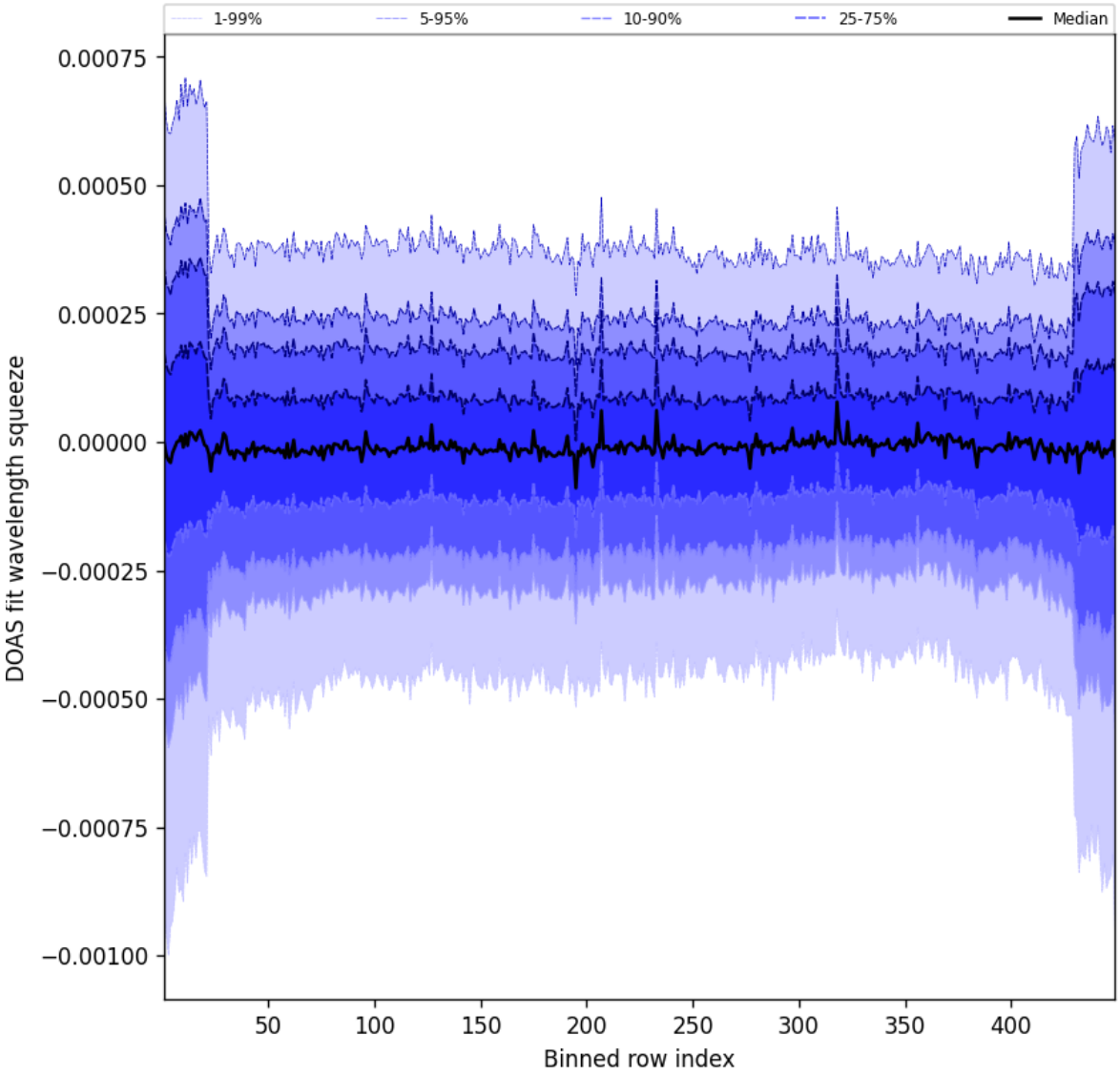

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-04-21 to 2025-04-22

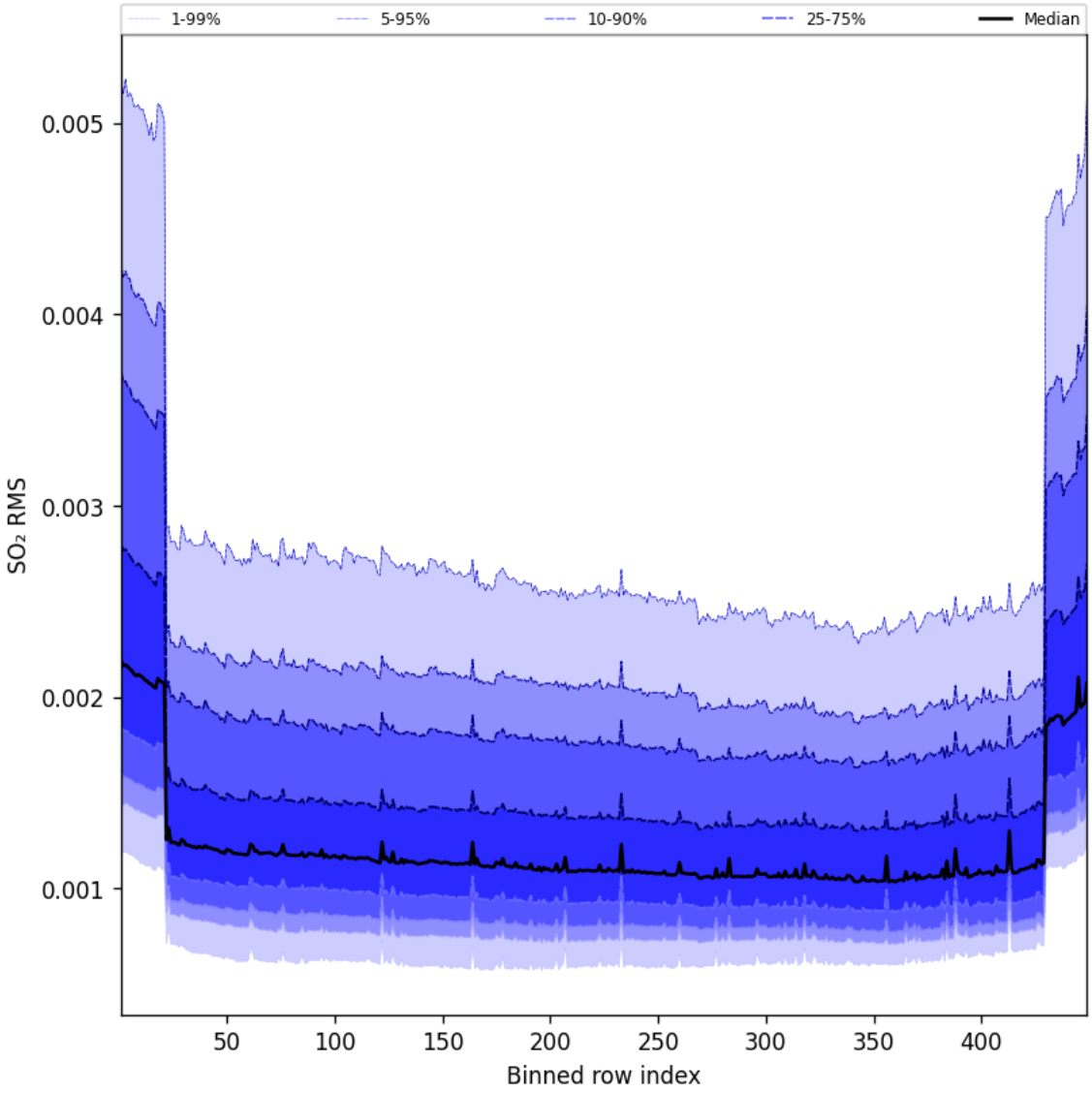

Figure 106: Along track statistics of "SO_2 RMS" for 2025-04-21 to 2025-04-22

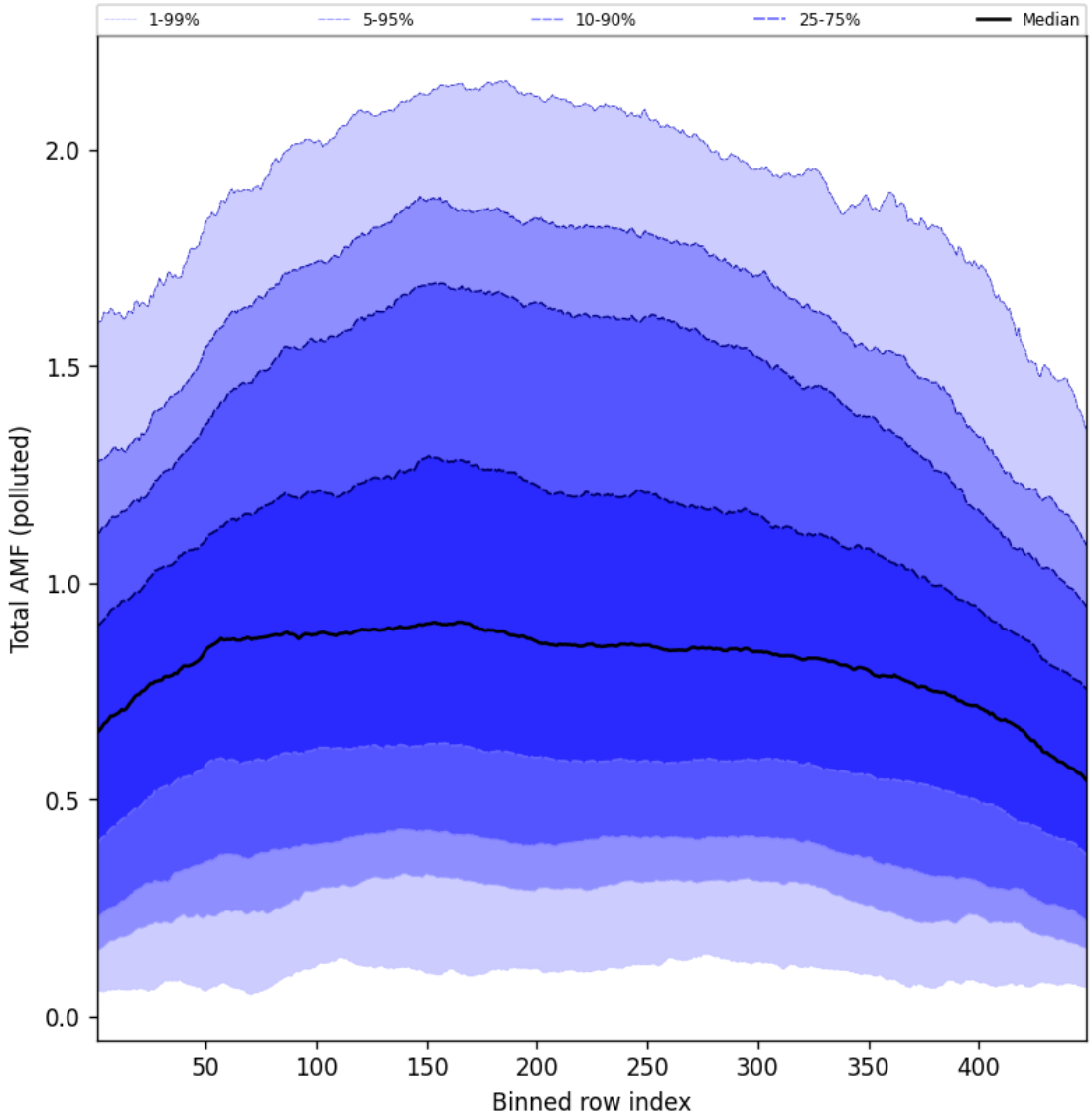

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-04-21 to 2025-04-22

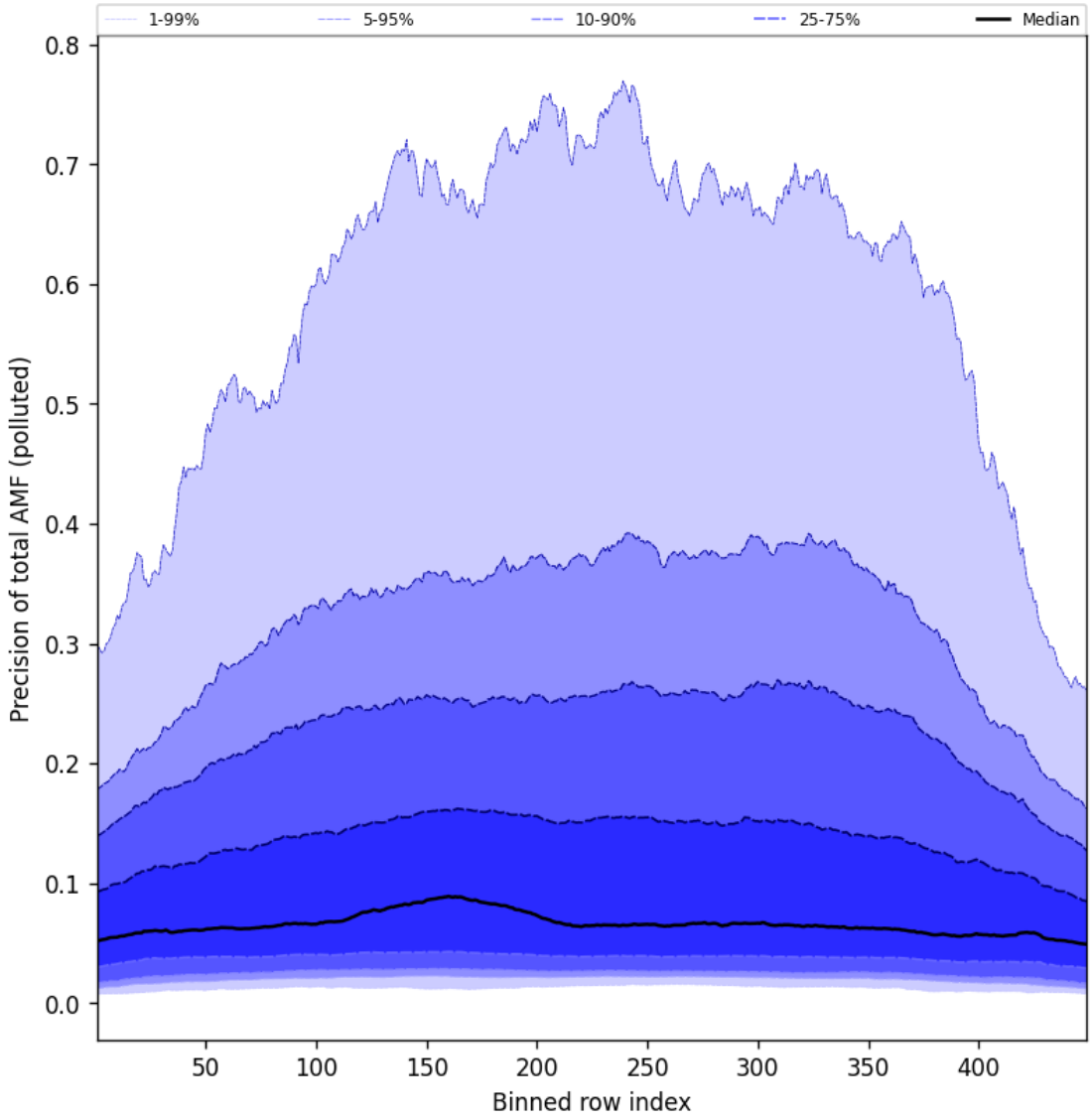

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-04-21 to 2025-04-22

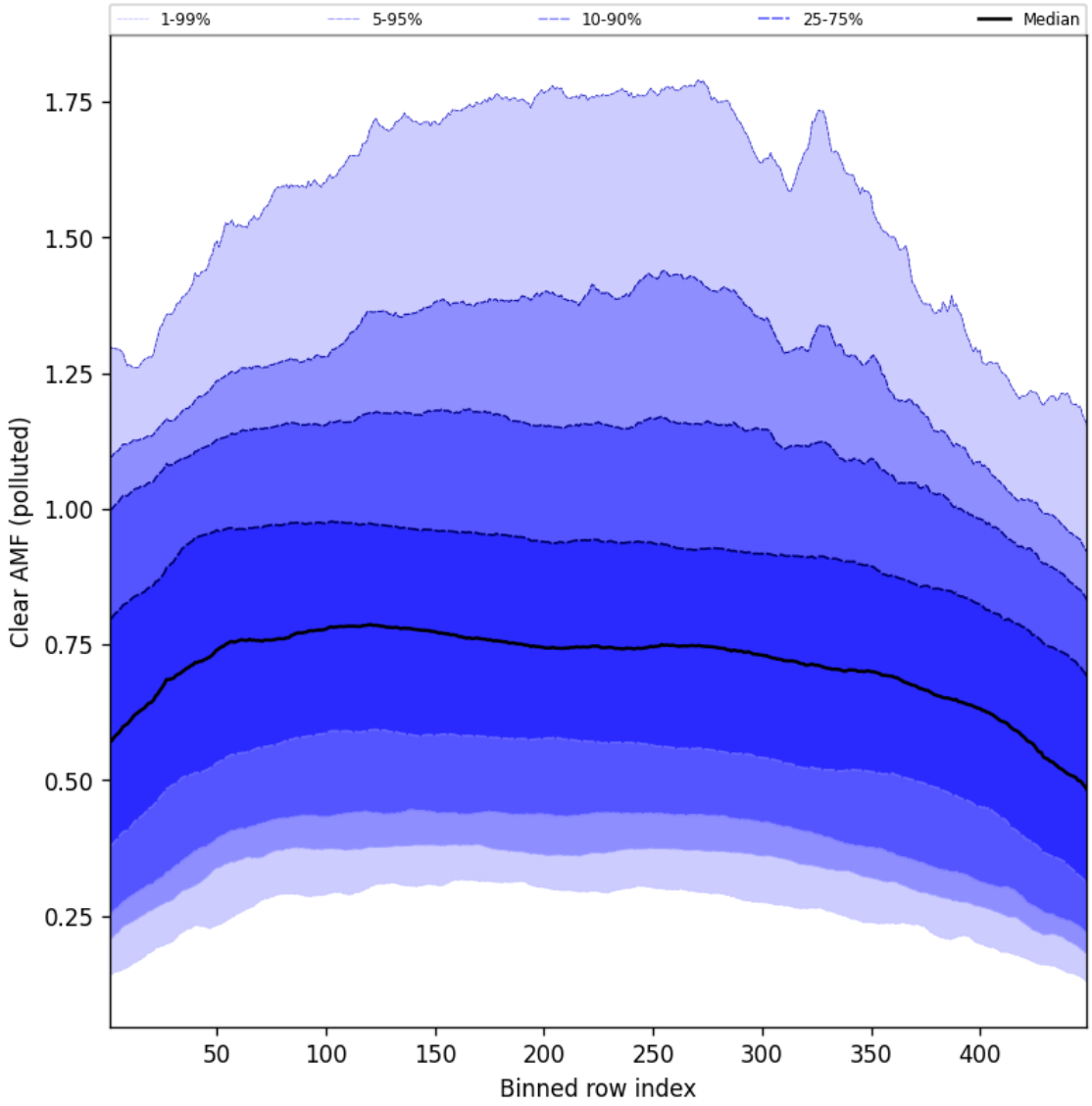

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-04-21 to 2025-04-22

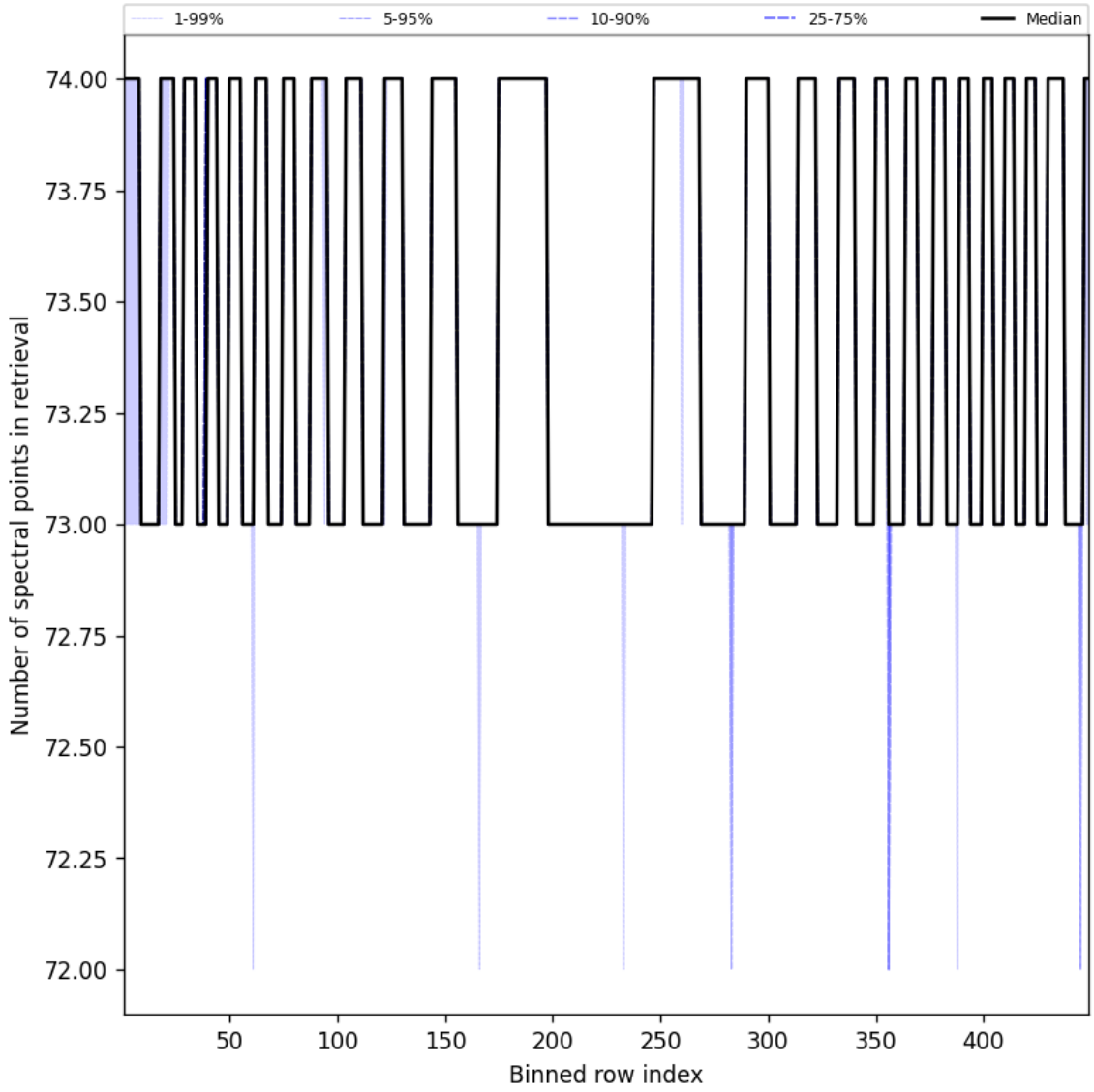

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-04-21 to 2025-04-22

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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