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]	0.644 ± 0.412	17309111	0.995	0.790	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(4.513 \pm 151.475) \times 10^{-2}$	17309111	0.249	0.472	1.092×10^{-2}	-132	135
sulfurdioxide total vertical column precision [DU]	0.661 ± 1.126	17309111	0.222	0.405	0.335	4.367×10^{-2}	135
sulfurdioxide slant column density corrected [DU]	$(1.962 \pm 37.712) \times 10^{-2}$	17309111	0.235	0.356	9.065×10^{-3}	-44.0	56.0
sulfurdioxide slant column density cobra [DU]	$(1.947 \pm 36.810) \times 10^{-2}$	17309111	0.235	0.356	9.065×10^{-3}	-44.0	40.5
sulfurdioxide slant column density cobra precision [DU]	0.292 ± 0.145	17309111	0.213	0.145	0.242	7.757×10^{-2}	40.3
sulfurdioxide slant column density window1 [DU]	0.185 ± 0.704	17309111	0.225	0.731	0.203	-56.8	118
sulfurdioxide slant column density window1 precision [DU]	0.292 ± 0.145	17309111	0.213	0.145	0.242	7.757×10^{-2}	40.3
sulfurdioxide slant column density corrected win1 [DU]	$(3.101 \pm 68.944) \times 10^{-2}$	17309111	-2.500×10^{-2}	0.710	1.200×10^{-2}	-56.8	119
background so2 slant column offset window1 [DU]	-0.154 ± 0.200	17309111	-0.300	0.206	-0.197	-0.982	5.15
sulfurdioxide slant column density window2 [DU]	1.42 ± 8.96	17309111	0.750	11.3	1.20	-987	901
sulfurdioxide slant column density window2 precision [DU]	8.04 ± 2.20	17309111	7.43	2.57	7.71	2.36	620
sulfurdioxide slant column density corrected win2 [DU]	-0.493 ± 8.717	17309111	-0.750	11.0	-0.459	-987	901
background so2 slant column offset window2 [DU]	-1.92 ± 2.74	17309111	0.250	3.55	-1.05	-20.2	12.1
sulfurdioxide slant column density window3 [DU]	-7.08 ± 24.10	17309111	-7.28	30.5	-7.23	-394	738
sulfurdioxide slant column density window3 precision [DU]	27.7 ± 12.8	17309111	22.5	9.47	24.4	9.48	745
sulfurdioxide slant column density corrected win3 [DU]	5.05 ± 23.06	17309111	6.16	29.1	5.06	-378	745
background so2 slant column offset window3 [DU]	12.1 ± 7.3	17309111	7.28	11.9	11.7	-9.99	51.8
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17309111	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.185 \pm 7.221) \times 10^{-2}$	17309111	1.539×10^{-2}	1.695×10^{-2}	1.631×10^{-2}	2.323×10^{-4}	2.45
fitted radiance shift [nm]	$(-3.777 \pm 25.109) \times 10^{-4}$	17309111	-5.000×10^{-4}	1.802×10^{-3}	-3.657×10^{-4}	-6.248×10^{-2}	4.851×10^{-2}
fitted radiance squeeze [1]	$(-2.350 \pm 19.270) \times 10^{-5}$	17309111	-1.000×10^{-5}	2.050×10^{-4}	-1.309×10^{-5}	-2.179×10^{-2}	1.629×10^{-2}
fitted root mean square [1]	$(1.280 \pm 0.600) \times 10^{-3}$	17309111	9.250×10^{-4}	5.874×10^{-4}	1.088×10^{-3}	3.151×10^{-4}	0.128
sulfurdioxide total air mass factor polluted [1]	0.812 ± 0.449	17309111	0.820	0.553	0.762	5.000×10^{-2}	2.93
sulfurdioxide total air mass factor polluted precision [1]	0.114 ± 0.132	17309111	3.500×10^{-2}	0.115	6.409×10^{-2}	2.500×10^{-3}	1.76
sulfurdioxide clear air mass factor polluted [1]	0.704 ± 0.336	17309111	0.580	0.398	0.663	4.113×10^{-2}	2.88
number of spectral points in retrieval [1]	73.5 ± 0.5	17309111	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	4.000×10^{-2}	0.1000	0.210	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−3.54	−1.07	−0.598	−0.385	−0.221	0.251	0.432	0.673	1.23	4.13
sulfurdioxide total vertical column precision [DU]	9.686×10^{-2}	0.132	0.159	0.184	0.217	0.622	0.910	1.33	2.21	5.46
sulfurdioxide slant column density corrected [DU]	−0.877	−0.490	−0.351	−0.260	−0.167	0.189	0.288	0.388	0.550	1.07
sulfurdioxide slant column density cobra [DU]	−0.877	−0.490	−0.351	−0.260	−0.167	0.189	0.288	0.388	0.550	1.07
sulfurdioxide slant column density cobra precision [DU]	0.138	0.163	0.175	0.185	0.199	0.344	0.408	0.469	0.563	0.822
sulfurdioxide slant column density window1 [DU]	−1.81	−0.898	−0.575	−0.372	−0.169	0.562	0.749	0.930	1.21	2.00
sulfurdioxide slant column density window1 precision [DU]	0.138	0.163	0.175	0.185	0.199	0.344	0.408	0.469	0.563	0.822
sulfurdioxide slant column density corrected win1 [DU]	−1.72	−0.961	−0.695	−0.521	−0.338	0.372	0.570	0.768	1.09	2.03
background so2 slant column offset window1 [DU]	−0.500	−0.356	−0.324	−0.305	−0.282	-7.606×10^{-2}	4.818×10^{-3}	8.944×10^{-2}	0.203	0.489
sulfurdioxide slant column density window2 [DU]	−19.3	−12.7	−9.50	−7.09	−4.37	6.96	9.92	12.6	16.3	24.2
sulfurdioxide slant column density window2 precision [DU]	4.30	5.16	5.67	6.09	6.58	9.15	10.00	10.8	12.0	14.6
sulfurdioxide slant column density corrected win2 [DU]	−21.8	−14.7	−11.3	−8.78	−6.00	5.04	7.79	10.2	13.6	20.6
background so2 slant column offset window2 [DU]	−9.33	−7.11	−5.93	−4.85	−3.52	3.661×10^{-2}	0.301	0.539	0.954	2.36
sulfurdioxide slant column density window3 [DU]	−66.4	−46.4	−36.9	−29.9	−22.3	8.16	16.1	23.2	32.7	51.5
sulfurdioxide slant column density window3 precision [DU]	13.7	16.0	17.7	19.1	20.7	30.2	34.6	40.4	52.0	82.9
sulfurdioxide slant column density corrected win3 [DU]	−52.4	−32.8	−23.5	−16.7	−9.40	19.7	27.1	33.7	42.7	61.0
background so2 slant column offset window3 [DU]	−1.38	1.13	2.59	4.14	6.18	18.0	20.2	22.0	24.1	27.4
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]	1.490×10^{-3}	3.617×10^{-3}	5.693×10^{-3}	7.552×10^{-3}	9.879×10^{-3}	2.683×10^{-2}	3.544×10^{-2}	5.339×10^{-2}	0.104	0.333
fitted radiance shift [nm]	-7.927×10^{-3}	-4.118×10^{-3}	-2.781×10^{-3}	-2.005×10^{-3}	-1.316×10^{-3}	4.861×10^{-4}	1.172×10^{-3}	2.016×10^{-3}	3.468×10^{-3}	7.487×10^{-3}
fitted radiance squeeze [1]	-6.065×10^{-4}	-3.382×10^{-4}	-2.391×10^{-4}	-1.782×10^{-4}	-1.187×10^{-4}	8.636×10^{-5}	1.373×10^{-4}	1.853×10^{-4}	2.561×10^{-4}	4.317×10^{-4}
fitted root mean square [1]	5.864×10^{-4}	7.164×10^{-4}	7.854×10^{-4}	8.385×10^{-4}	9.042×10^{-4}	1.492×10^{-3}	1.753×10^{-3}	2.011×10^{-3}	2.414×10^{-3}	3.442×10^{-3}
sulfurdioxide total air mass factor polluted [1]	5.000×10^{-2}	0.170	0.275	0.375	0.494	1.05	1.24	1.44	1.69	2.10
sulfurdioxide total air mass factor polluted precision [1]	7.541×10^{-3}	1.399×10^{-2}	2.073×10^{-2}	2.655×10^{-2}	3.463×10^{-2}	0.149	0.202	0.258	0.358	0.627
sulfurdioxide clear air mass factor polluted [1]	0.159	0.257	0.331	0.399	0.480	0.878	0.972	1.06	1.23	2.00
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]	0.631 ± 0.414	8257805	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(7.327 \pm 204.008) \times 10^{-2}$	8257805	0.613	1.414×10^{-2}	-132	135	-0.283	0.330
sulfurdioxide total vertical column precision [DU]	0.935 ± 1.477	8257805	0.704	0.452	4.797×10^{-2}	50.0	0.253	0.958
sulfurdioxide slant column density corrected [DU]	$(2.585 \pm 42.751) \times 10^{-2}$	8257805	0.383	1.028×10^{-2}	-10.5	56.0	-0.179	0.205
sulfurdioxide slant column density cobra [DU]	$(2.562 \pm 41.651) \times 10^{-2}$	8257805	0.383	1.028×10^{-2}	-10.5	23.3	-0.179	0.205
sulfurdioxide slant column density cobra precision [DU]	0.321 ± 0.168	8257805	0.184	0.265	8.317×10^{-2}	4.90	0.206	0.390
sulfurdioxide slant column density window1 [DU]	0.201 ± 0.790	8257805	0.781	0.222	-15.5	38.8	-0.175	0.607
sulfurdioxide slant column density window1 precision [DU]	0.321 ± 0.168	8257805	0.184	0.265	8.317×10^{-2}	4.90	0.206	0.390
sulfurdioxide slant column density corrected win1 [DU]	$(4.384 \pm 77.851) \times 10^{-2}$	8257805	0.764	1.674×10^{-2}	-15.2	39.1	-0.358	0.406
background so2 slant column offset window1 [DU]	-0.157 ± 0.228	8257805	0.210	-0.210	-0.728	5.15	-0.293	-8.292×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.09 ± 9.26	8257805	11.8	1.79	-408	341	-3.96	7.81
sulfurdioxide slant column density window2 precision [DU]	8.21 ± 2.21	8257805	2.71	7.89	2.38	283	6.69	9.40
sulfurdioxide slant column density corrected win2 [DU]	-0.597 ± 8.904	8257805	11.3	-0.551	-408	333	-6.23	5.08
background so2 slant column offset window2 [DU]	-2.68 ± 3.15	8257805	5.10	-1.87	-20.2	12.1	-5.17	-6.955×10^{-2}
sulfurdioxide slant column density window3 [DU]	-9.63 ± 23.89	8257805	30.2	-9.60	-208	167	-24.7	5.55
sulfurdioxide slant column density window3 precision [DU]	28.0 ± 12.9	8257805	9.53	24.6	9.48	262	20.9	30.5
sulfurdioxide slant column density corrected win3 [DU]	5.40 ± 22.95	8257805	28.9	5.50	-193	179	-8.95	19.9
background so2 slant column offset window3 [DU]	15.0 ± 6.8	8257805	11.9	15.2	-3.37	51.8	8.75	20.7
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	8257805	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(4.470 \pm 9.856) \times 10^{-2}$	8257805	2.637×10^{-2}	1.754×10^{-2}	2.323×10^{-4}	2.45	9.148×10^{-3}	3.552×10^{-2}
fitted radiance shift [nm]	$(-2.139 \pm 25.212) \times 10^{-4}$	8257805	1.747×10^{-3}	-2.112×10^{-4}	-3.834×10^{-2}	4.266×10^{-2}	-1.103×10^{-3}	6.438×10^{-4}
fitted radiance squeeze [1]	$(-2.230 \pm 22.201) \times 10^{-5}$	8257805	2.248×10^{-4}	-7.106×10^{-6}	-2.179×10^{-2}	1.072×10^{-2}	-1.235×10^{-4}	1.013×10^{-4}
fitted root mean square [1]	$(1.399 \pm 0.712) \times 10^{-3}$	8257805	7.303×10^{-4}	1.162×10^{-3}	3.257×10^{-4}	2.853×10^{-2}	9.322×10^{-4}	1.663×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.688 ± 0.414	8257805	0.546	0.636	5.000×10^{-2}	2.93	0.381	0.926
sulfurdioxide total air mass factor polluted precision [1]	0.106 ± 0.153	8257805	9.560×10^{-2}	5.033×10^{-2}	2.500×10^{-3}	1.76	2.622×10^{-2}	0.122
sulfurdioxide clear air mass factor polluted [1]	0.590 ± 0.277	8257805	0.417	0.550	4.113×10^{-2}	2.31	0.375	0.792
number of spectral points in retrieval [1]	73.5 ± 0.5	8257805	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]	0.655 ± 0.409	9051306	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(1.946 \pm 76.767) \times 10^{-2}$	9051306	0.387	8.831×10^{-3}	-93.9	87.0	-0.183	0.204
sulfurdioxide total vertical column precision [DU]	0.411 ± 0.549	9051306	0.248	0.276	4.367×10^{-2}	135	0.197	0.445
sulfurdioxide slant column density corrected [DU]	$(1.394 \pm 32.428) \times 10^{-2}$	9051306	0.334	8.079×10^{-3}	-44.0	53.3	-0.158	0.176
sulfurdioxide slant column density cobra [DU]	$(1.386 \pm 31.745) \times 10^{-2}$	9051306	0.334	8.079×10^{-3}	-44.0	40.5	-0.158	0.176
sulfurdioxide slant column density cobra precision [DU]	0.265 ± 0.112	9051306	0.116	0.228	7.757×10^{-2}	40.3	0.194	0.310
sulfurdioxide slant column density window1 [DU]	0.172 ± 0.614	9051306	0.690	0.188	-56.8	118	-0.164	0.526
sulfurdioxide slant column density window1 precision [DU]	0.265 ± 0.112	9051306	0.116	0.228	7.757×10^{-2}	40.3	0.194	0.310
sulfurdioxide slant column density corrected win1 [DU]	$(1.930 \pm 59.644) \times 10^{-2}$	9051306	0.666	8.168×10^{-3}	-56.8	119	-0.322	0.344
background so2 slant column offset window1 [DU]	-0.152 ± 0.169	9051306	0.202	-0.188	-0.982	1.76	-0.273	-7.074×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.816 ± 8.626	9051306	10.9	0.707	-987	901	-4.70	6.21
sulfurdioxide slant column density window2 precision [DU]	7.88 ± 2.18	9051306	2.42	7.56	2.36	620	6.49	8.91
sulfurdioxide slant column density corrected win2 [DU]	-0.398 ± 8.542	9051306	10.8	-0.380	-987	901	-5.79	5.01
background so2 slant column offset window2 [DU]	-1.21 ± 2.06	9051306	2.38	-0.686	-18.5	12.0	-2.28	9.200×10^{-2}
sulfurdioxide slant column density window3 [DU]	-4.76 ± 24.06	9051306	30.4	-5.06	-394	738	-20.0	10.4
sulfurdioxide slant column density window3 precision [DU]	27.5 ± 12.8	9051306	9.39	24.1	9.64	745	20.5	29.9
sulfurdioxide slant column density corrected win3 [DU]	4.73 ± 23.15	9051306	29.2	4.65	-378	745	-9.81	19.4
background so2 slant column offset window3 [DU]	9.49 ± 6.79	9051306	11.9	8.46	-9.99	32.6	3.63	15.5
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	9051306	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.011 \pm 2.868) \times 10^{-2}$	9051306	1.321×10^{-2}	1.559×10^{-2}	8.715×10^{-4}	2.11	1.034×10^{-2}	2.354×10^{-2}
fitted radiance shift [nm]	$(-5.271 \pm 24.921) \times 10^{-4}$	9051306	1.808×10^{-3}	-5.112×10^{-4}	-6.248×10^{-2}	4.851×10^{-2}	-1.485×10^{-3}	3.235×10^{-4}
fitted radiance squeeze [1]	$(-2.460 \pm 16.137) \times 10^{-5}$	9051306	1.895×10^{-4}	-1.780×10^{-5}	-1.606×10^{-2}	1.629×10^{-2}	-1.151×10^{-4}	7.438×10^{-5}
fitted root mean square [1]	$(1.172 \pm 0.448) \times 10^{-3}$	9051306	4.680×10^{-4}	1.040×10^{-3}	3.151×10^{-4}	0.128	8.844×10^{-4}	1.352×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.925 ± 0.450	9051306	0.559	0.852	5.000×10^{-2}	2.79	0.607	1.17
sulfurdioxide total air mass factor polluted precision [1]	0.122 ± 0.109	9051306	0.127	8.163×10^{-2}	5.925×10^{-3}	1.41	4.182×10^{-2}	0.169
sulfurdioxide clear air mass factor polluted [1]	0.808 ± 0.351	9051306	0.359	0.751	0.132	2.88	0.582	0.941
number of spectral points in retrieval [1]	73.4 ± 0.5	9051306	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]	0.680 ± 0.402	12422717	0.750	1.000	0.0	1.000	0.250	1.000
sulfurdioxide total vertical column [DU]	$(2.912 \pm 113.037) \times 10^{-2}$	12422717	0.432	9.431×10^{-3}	-93.9	101	-0.204	0.228
sulfurdioxide total vertical column precision [DU]	0.530 ± 0.837	12422717	0.312	0.301	5.125×10^{-2}	86.0	0.211	0.523
sulfurdioxide slant column density corrected [DU]	$(1.582 \pm 34.379) \times 10^{-2}$	12422717	0.342	8.005×10^{-3}	-44.0	56.0	-0.162	0.181
sulfurdioxide slant column density cobra [DU]	$(1.573 \pm 33.797) \times 10^{-2}$	12422717	0.342	8.005×10^{-3}	-44.0	38.6	-0.162	0.181
sulfurdioxide slant column density cobra precision [DU]	0.278 ± 0.132	12422717	0.129	0.233	7.757×10^{-2}	40.3	0.195	0.324
sulfurdioxide slant column density window1 [DU]	0.184 ± 0.660	12422717	0.704	0.201	-56.8	118	-0.157	0.546
sulfurdioxide slant column density window1 precision [DU]	0.278 ± 0.132	12422717	0.129	0.233	7.757×10^{-2}	40.3	0.195	0.324
sulfurdioxide slant column density corrected win1 [DU]	$(2.475 \pm 64.631) \times 10^{-2}$	12422717	0.684	9.021×10^{-3}	-56.8	119	-0.329	0.355
background so2 slant column offset window1 [DU]	-0.160 ± 0.186	12422717	0.199	-0.197	-0.850	3.37	-0.281	-8.136×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.11 ± 8.73	12422717	11.1	0.915	-561	861	-4.54	6.52
sulfurdioxide slant column density window2 precision [DU]	7.90 ± 2.11	12422717	2.47	7.56	2.36	620	6.49	8.96
sulfurdioxide slant column density corrected win2 [DU]	-0.451 ± 8.540	12422717	10.9	-0.434	-560	861	-5.88	4.99
background so2 slant column offset window2 [DU]	-1.56 ± 2.44	12422717	2.88	-0.871	-20.2	12.1	-2.81	7.130×10^{-2}
sulfurdioxide slant column density window3 [DU]	-4.25 ± 23.87	12422717	30.4	-4.55	-394	386	-19.5	10.9
sulfurdioxide slant column density window3 precision [DU]	27.2 ± 12.3	12422717	9.24	23.9	9.62	264	20.5	29.7
sulfurdioxide slant column density corrected win3 [DU]	7.07 ± 22.61	12422717	28.8	6.81	-378	402	-7.39	21.4
background so2 slant column offset window3 [DU]	11.3 ± 6.9	12422717	11.1	10.7	-9.99	51.4	5.87	16.9
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.17	12422717	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.198 \pm 3.384) \times 10^{-2}$	12422717	1.341×10^{-2}	1.569×10^{-2}	2.323×10^{-4}	1.70	1.028×10^{-2}	2.369×10^{-2}
fitted radiance shift [nm]	$(-3.962 \pm 23.897) \times 10^{-4}$	12422717	1.789×10^{-3}	-3.699×10^{-4}	-3.747×10^{-2}	4.851×10^{-2}	-1.322×10^{-3}	4.664×10^{-4}
fitted radiance squeeze [1]	$(-2.101 \pm 17.948) \times 10^{-5}$	12422717	1.948×10^{-4}	-1.113×10^{-5}	-2.179×10^{-2}	1.629×10^{-2}	-1.113×10^{-4}	8.355×10^{-5}
fitted root mean square [1]	$(1.224 \pm 0.556) \times 10^{-3}$	12422717	5.130×10^{-4}	1.049×10^{-3}	3.151×10^{-4}	0.128	8.875×10^{-4}	1.401×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.835 ± 0.403	12422717	0.488	0.801	5.000×10^{-2}	2.60	0.559	1.05
sulfurdioxide total air mass factor polluted precision [1]	0.110 ± 0.106	12422717	0.108	6.786×10^{-2}	2.788×10^{-3}	1.31	3.950×10^{-2}	0.148
sulfurdioxide clear air mass factor polluted [1]	0.725 ± 0.277	12422717	0.358	0.703	5.937×10^{-2}	2.62	0.533	0.891
number of spectral points in retrieval [1]	73.5 ± 0.5	12422717	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]	0.584 ± 0.421	3751286	0.860	0.490	0.0	1.000	0.140	1.000
sulfurdioxide total vertical column [DU]	$(7.210 \pm 199.274) \times 10^{-2}$	3751286	0.574	1.340×10^{-2}	-132	135	-0.263	0.311
sulfurdioxide total vertical column precision [DU]	0.887 ± 1.454	3751286	0.670	0.428	4.367×10^{-2}	48.9	0.236	0.906
sulfurdioxide slant column density corrected [DU]	$(2.621 \pm 43.329) \times 10^{-2}$	3751286	0.383	1.079×10^{-2}	-17.0	53.3	-0.178	0.205
sulfurdioxide slant column density cobra [DU]	$(2.594 \pm 41.875) \times 10^{-2}$	3751286	0.383	1.079×10^{-2}	-17.0	40.5	-0.178	0.205
sulfurdioxide slant column density cobra precision [DU]	0.315 ± 0.160	3751286	0.162	0.266	8.836×10^{-2}	27.0	0.209	0.372
sulfurdioxide slant column density window1 [DU]	0.192 ± 0.769	3751286	0.782	0.213	-33.2	88.1	-0.186	0.597
sulfurdioxide slant column density window1 precision [DU]	0.315 ± 0.160	3751286	0.162	0.266	8.836×10^{-2}	27.0	0.209	0.372
sulfurdioxide slant column density corrected win1 [DU]	$(3.841 \pm 75.183) \times 10^{-2}$	3751286	0.755	1.633×10^{-2}	-33.2	87.9	-0.356	0.399
background so2 slant column offset window1 [DU]	-0.154 ± 0.219	3751286	0.210	-0.210	-0.982	3.92	-0.290	-8.003×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.86 ± 9.34	3751286	11.8	1.68	-987	901	-4.14	7.67
sulfurdioxide slant column density window2 precision [DU]	8.33 ± 2.40	3751286	2.64	8.03	2.38	461	6.82	9.47
sulfurdioxide slant column density corrected win2 [DU]	-0.553 ± 9.068	3751286	11.4	-0.486	-987	901	-6.21	5.17
background so2 slant column offset window2 [DU]	-2.42 ± 3.05	3751286	4.78	-1.39	-20.2	12.1	-4.78	1.415×10^{-3}
sulfurdioxide slant column density window3 [DU]	-14.2 ± 23.3	3751286	29.3	-13.8	-274	573	-28.7	0.631
sulfurdioxide slant column density window3 precision [DU]	29.3 ± 14.5	3751286	9.92	25.6	9.48	745	21.5	31.4
sulfurdioxide slant column density corrected win3 [DU]	-0.968 ± 23.506	3751286	29.4	-0.280	-271	573	-15.4	14.1
background so2 slant column offset window3 [DU]	13.3 ± 7.9	3751286	13.4	13.5	-9.98	51.8	6.56	20.0
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.28	3751286	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.584 \pm 11.881) \times 10^{-2}$	3751286	3.946×10^{-2}	2.047×10^{-2}	3.513×10^{-4}	2.45	8.628×10^{-3}	4.809×10^{-2}
fitted radiance shift [nm]	$(-3.248 \pm 28.799) \times 10^{-4}$	3751286	1.824×10^{-3}	-3.561×10^{-4}	-4.013×10^{-2}	4.266×10^{-2}	-1.295×10^{-3}	5.288×10^{-4}
fitted radiance squeeze [1]	$(-2.781 \pm 21.037) \times 10^{-5}$	3751286	2.248×10^{-4}	-1.795×10^{-5}	-1.249×10^{-2}	1.419×10^{-2}	-1.336×10^{-4}	9.114×10^{-5}
fitted root mean square [1]	$(1.367 \pm 0.643) \times 10^{-3}$	3751286	6.482×10^{-4}	1.176×10^{-3}	3.442×10^{-4}	6.878×10^{-2}	9.530×10^{-4}	1.601×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.781 ± 0.558	3751286	0.713	0.615	5.000×10^{-2}	2.93	0.370	1.08
sulfurdioxide total air mass factor polluted precision [1]	0.130 ± 0.189	3751286	0.137	5.283×10^{-2}	2.500×10^{-3}	1.76	2.423×10^{-2}	0.161
sulfurdioxide clear air mass factor polluted [1]	0.675 ± 0.471	3751286	0.452	0.555	4.143×10^{-2}	2.88	0.371	0.823
number of spectral points in retrieval [1]	73.4 ± 0.5	3751286	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

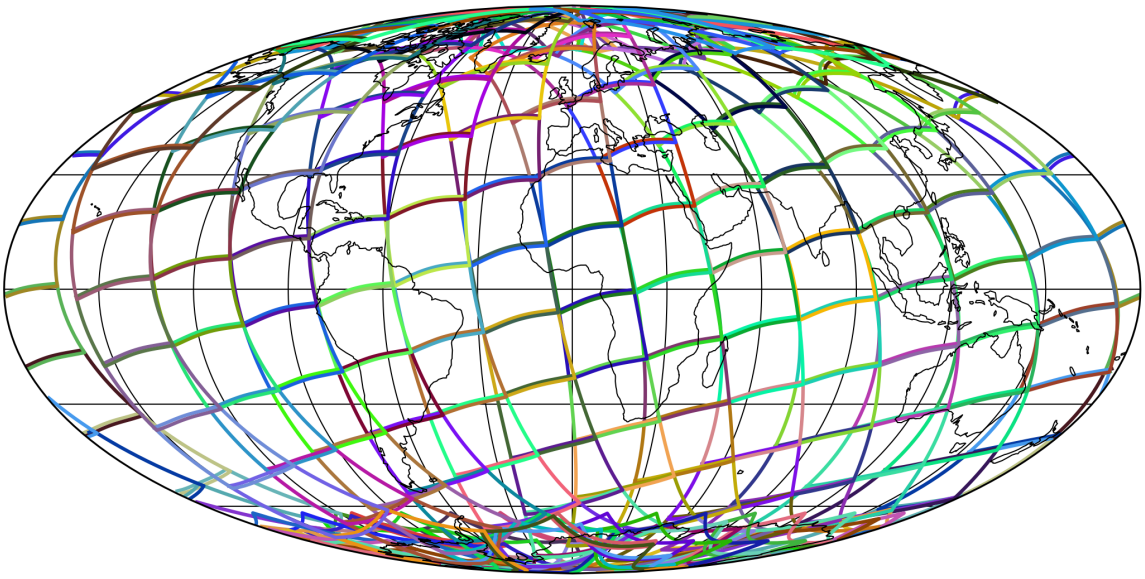

Figure 1: Outline of the granules.

4 Input data monitoring

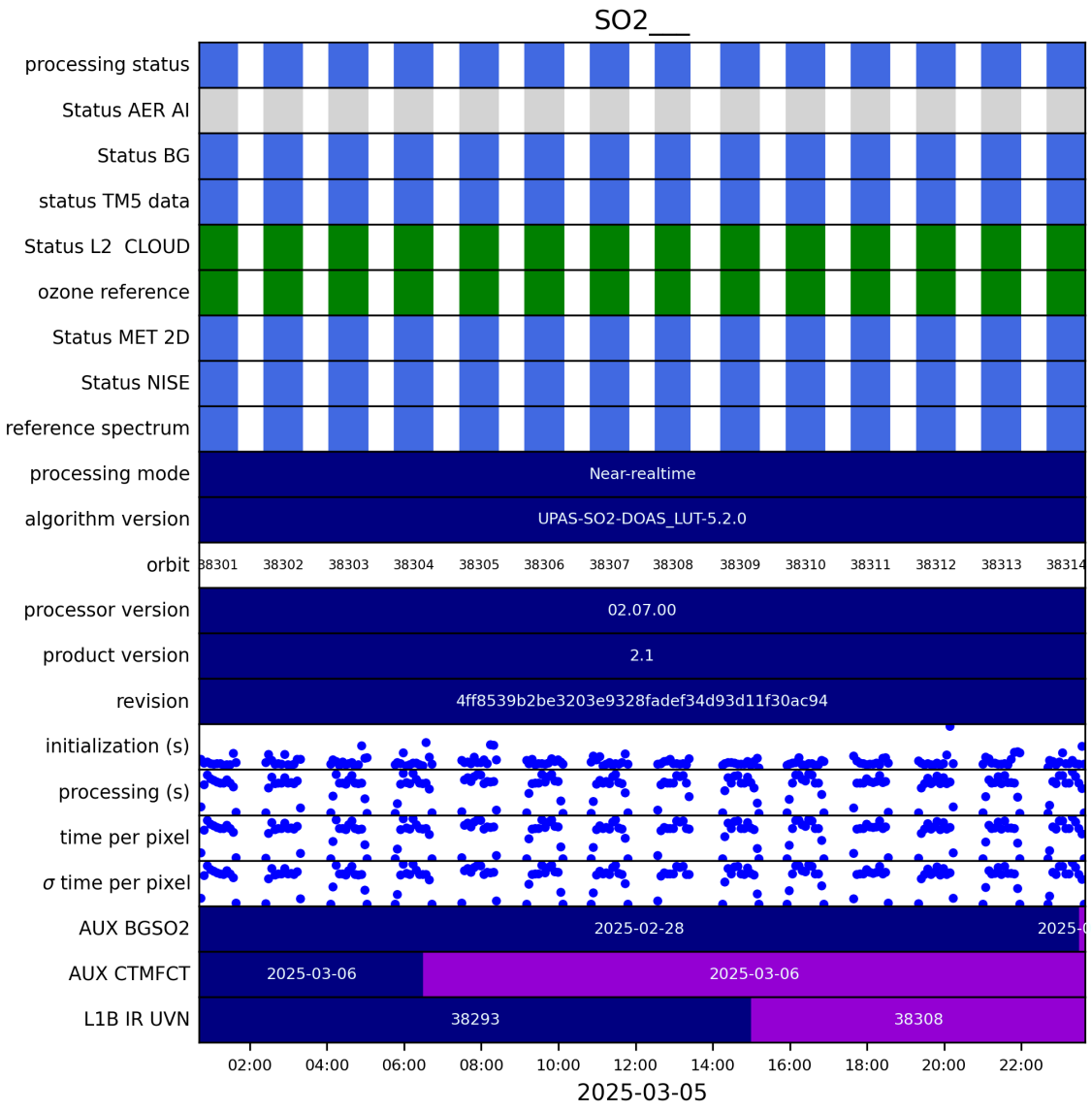

Figure 2: Input data per granule

5 Warnings and errors

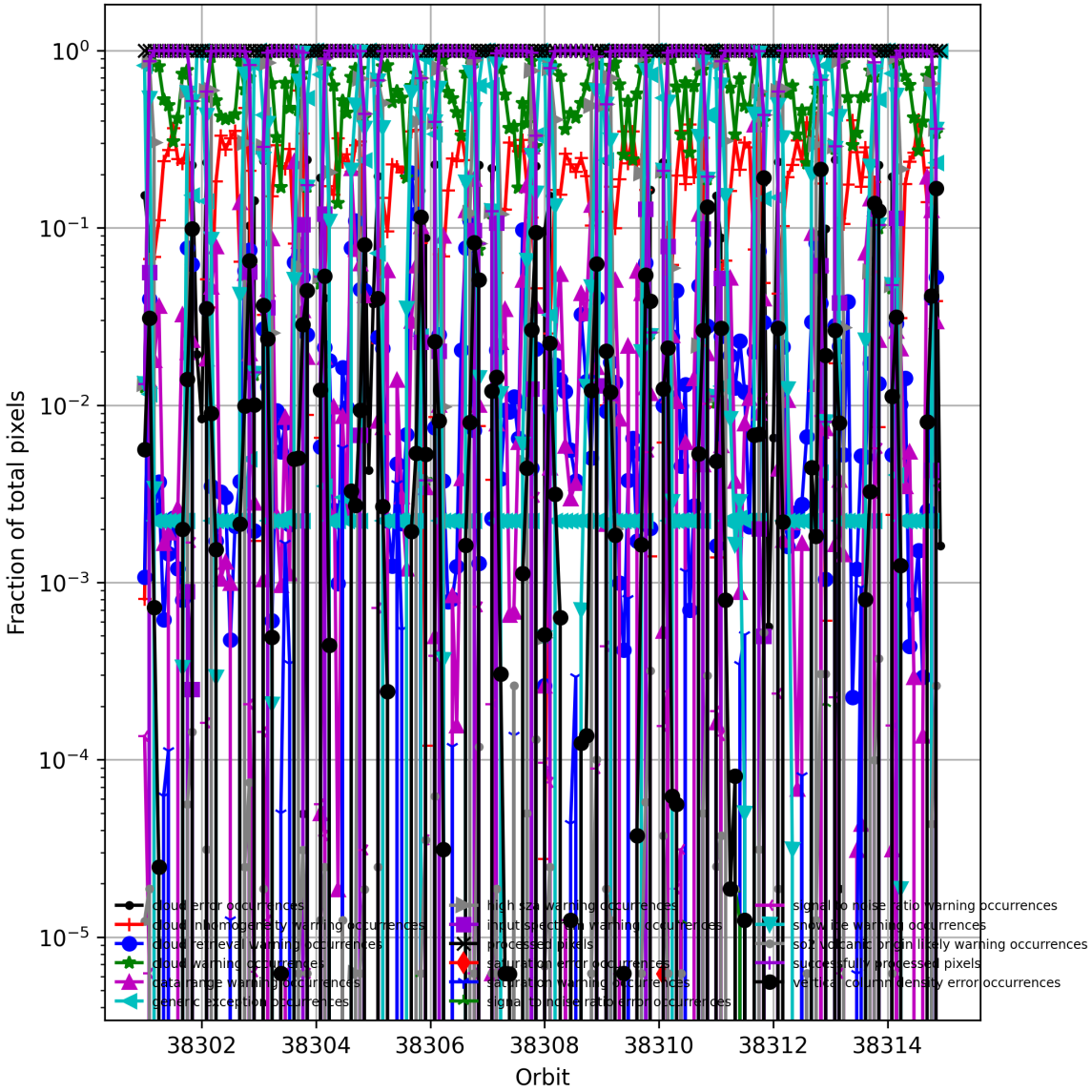

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

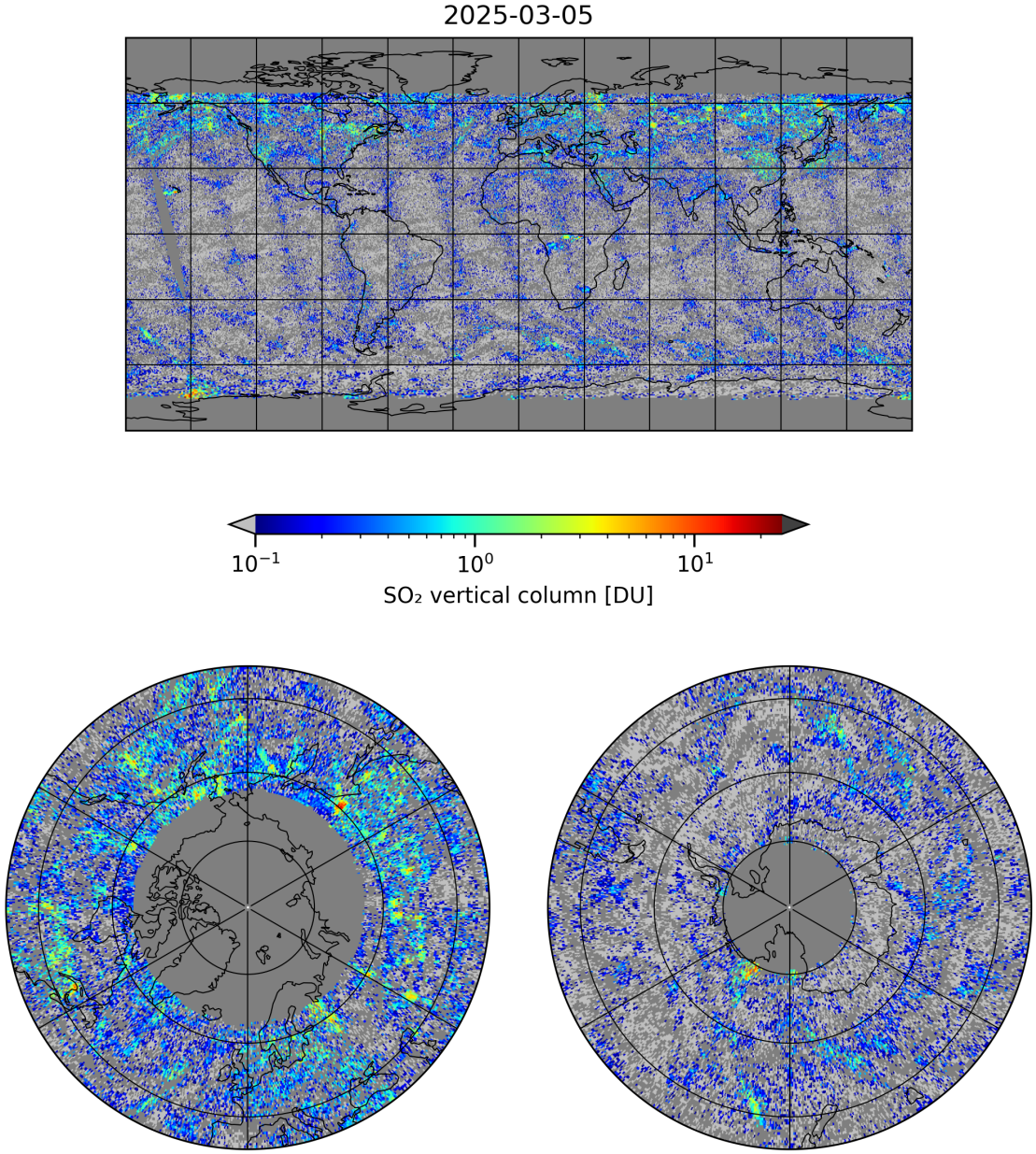

Figure 4: Map of "SO_2 vertical column" for 2025-03-05 to 2025-03-05

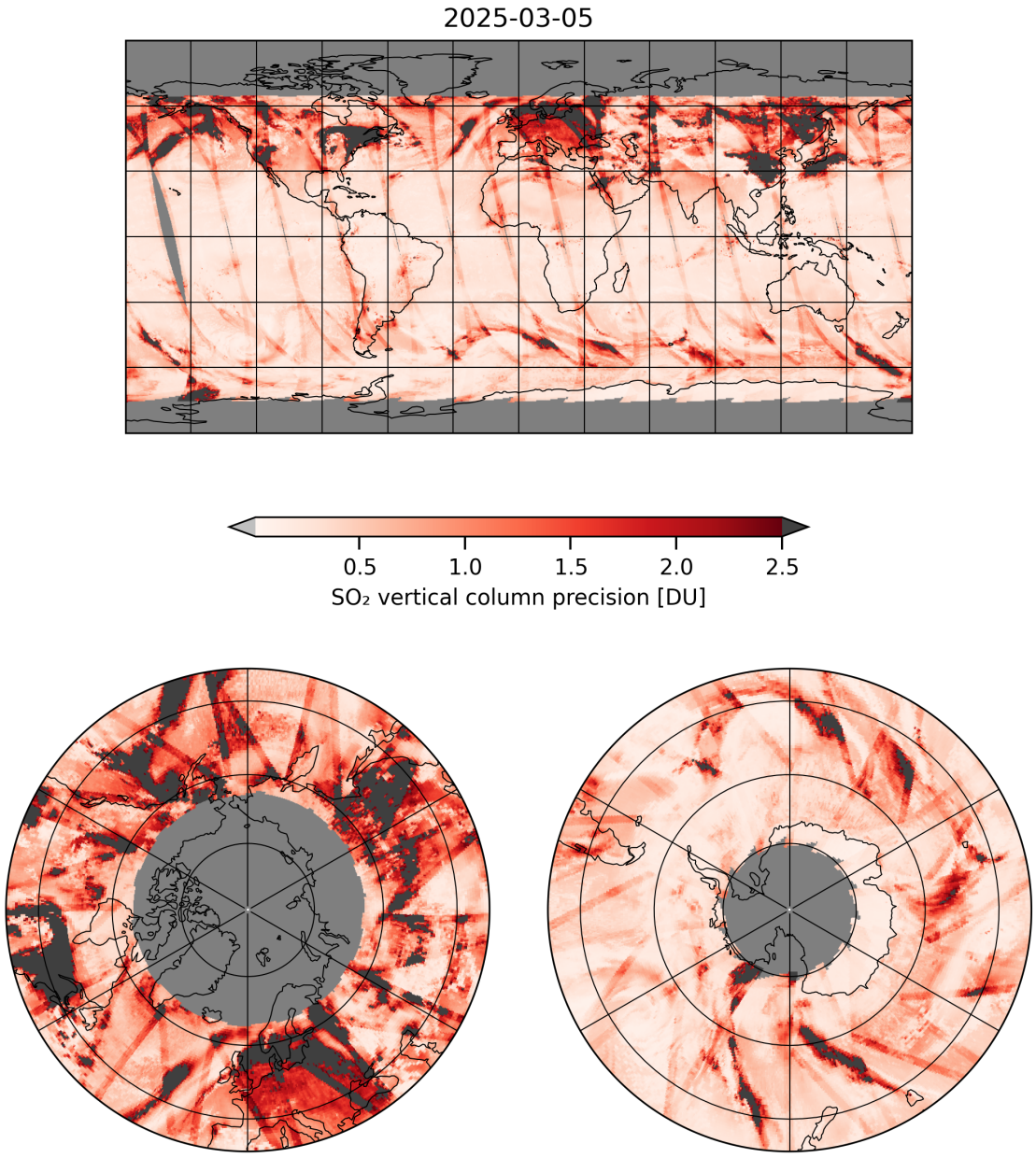

Figure 5: Map of "SO_2 vertical column precision" for 2025-03-05 to 2025-03-05

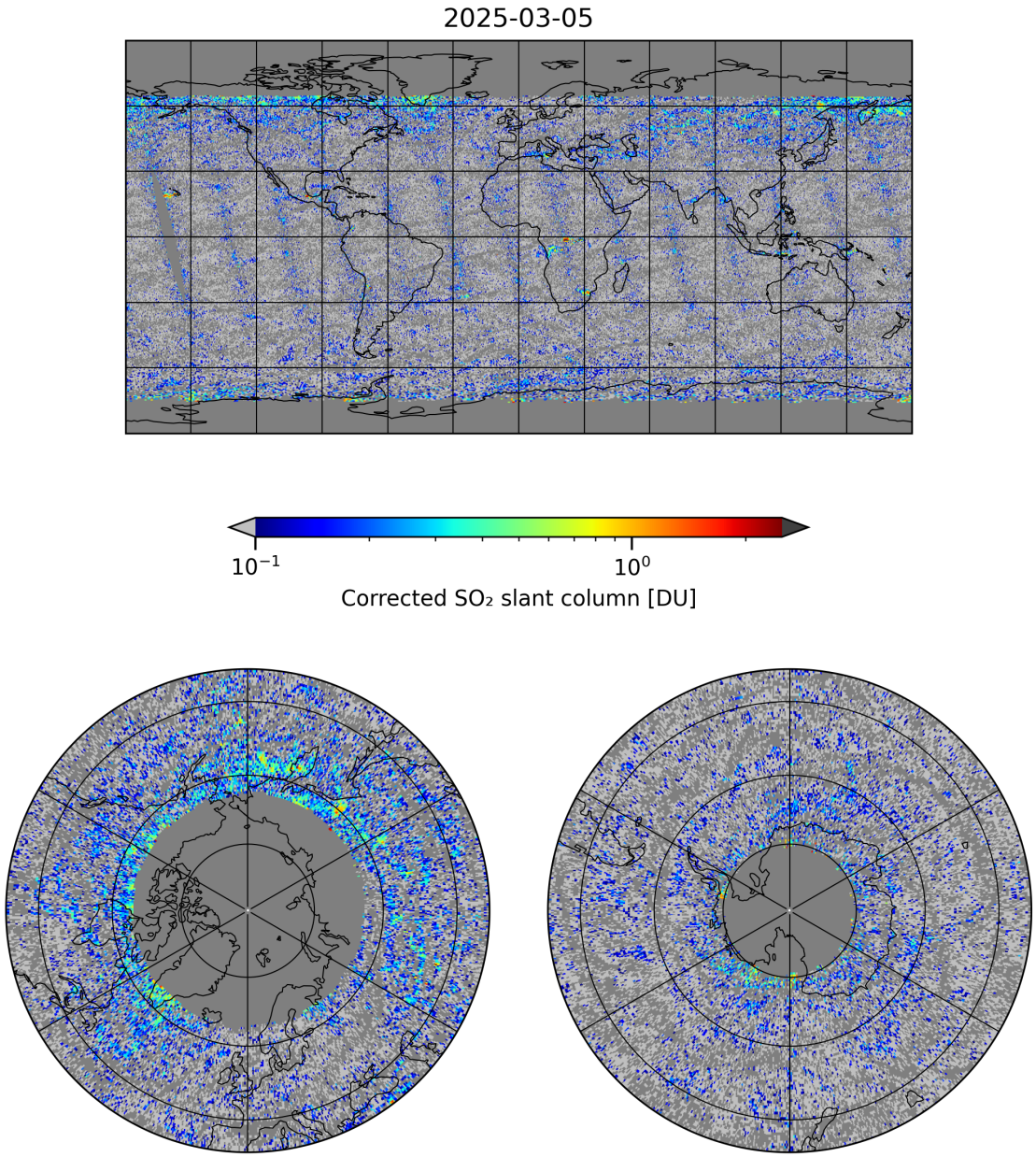

Figure 6: Map of “Corrected SO_2 slant column” for 2025-03-05 to 2025-03-05

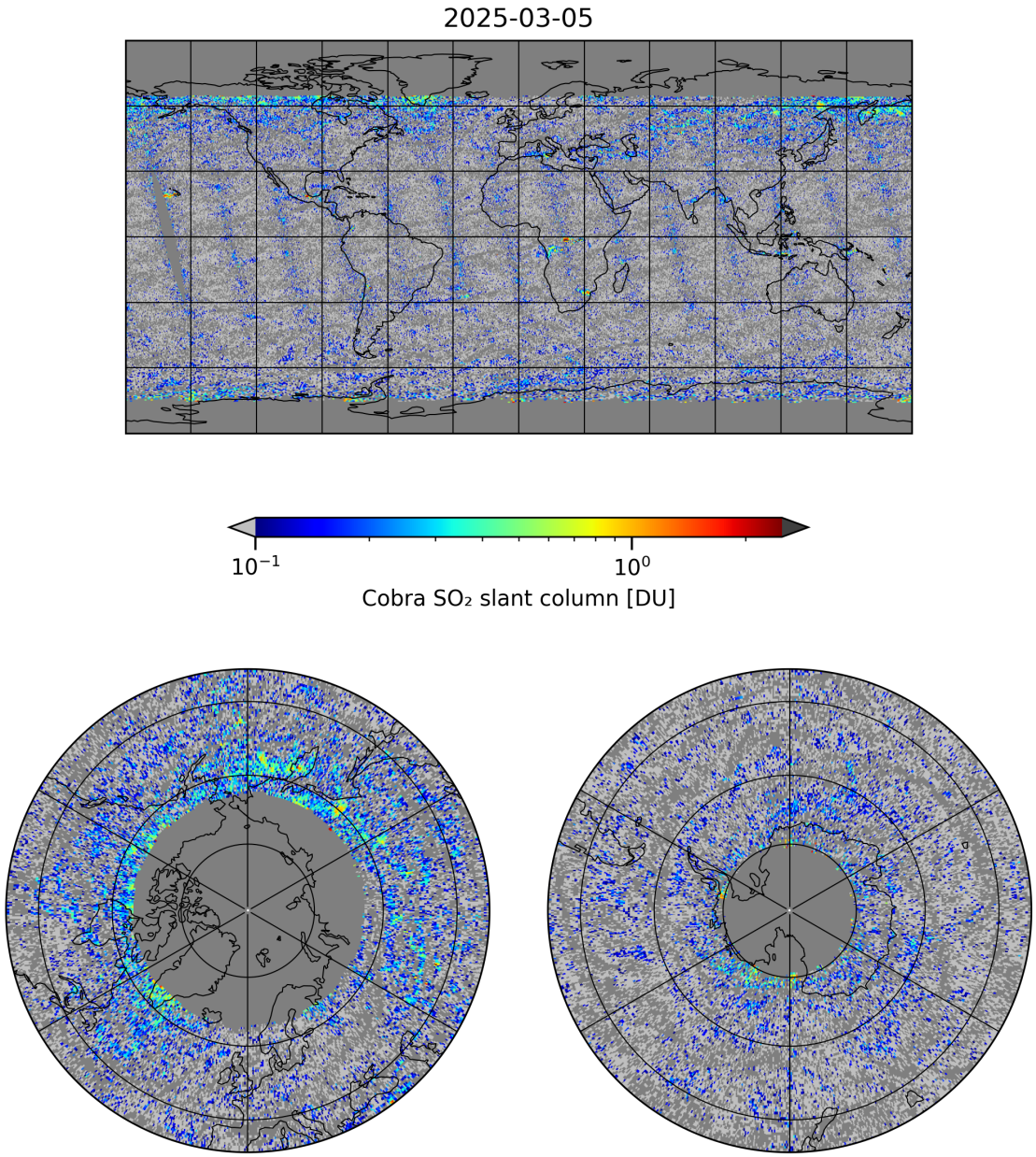

Figure 7: Map of "Cobra SO_2 slant column" for 2025-03-05 to 2025-03-05

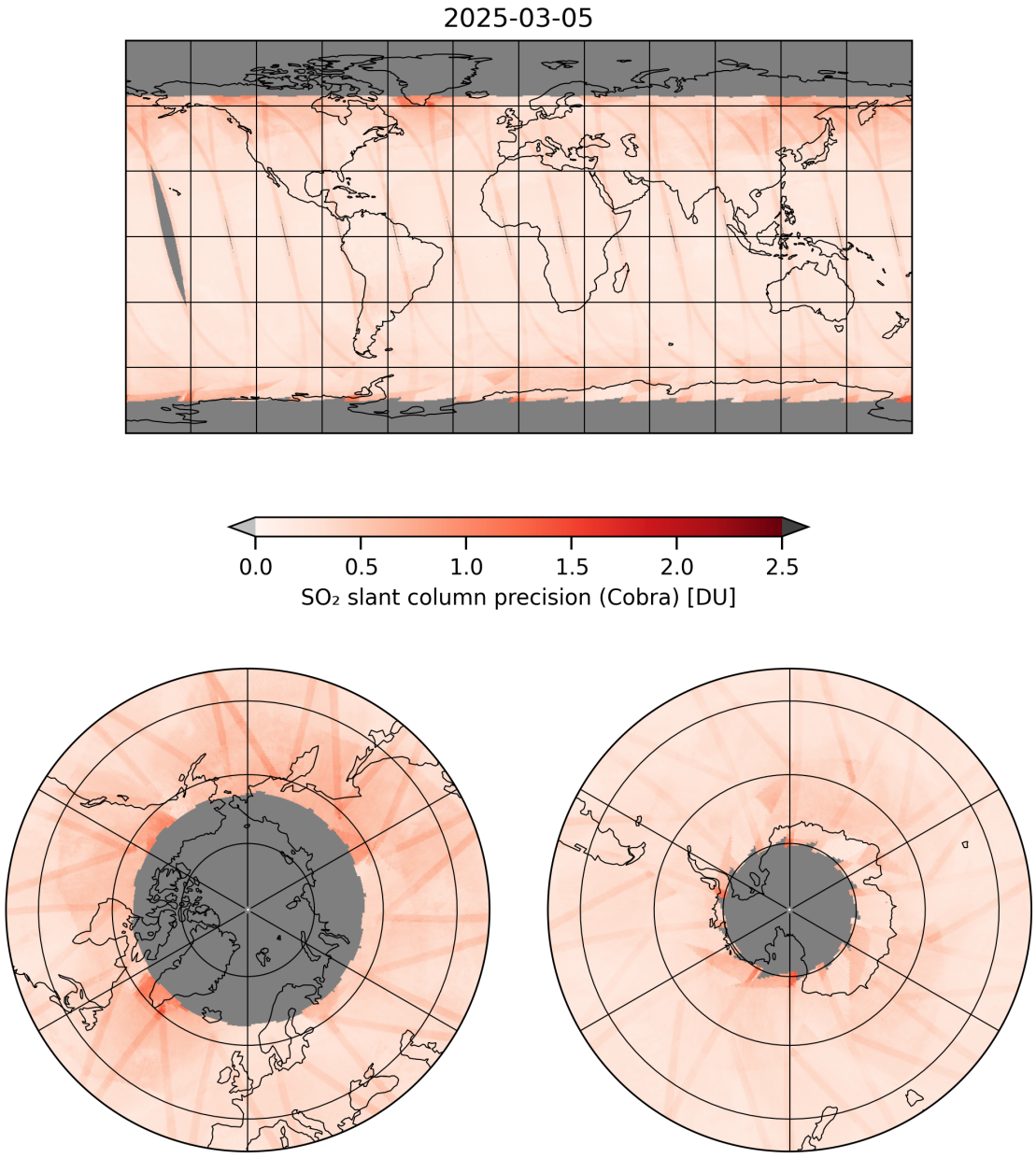

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-03-05 to 2025-03-05

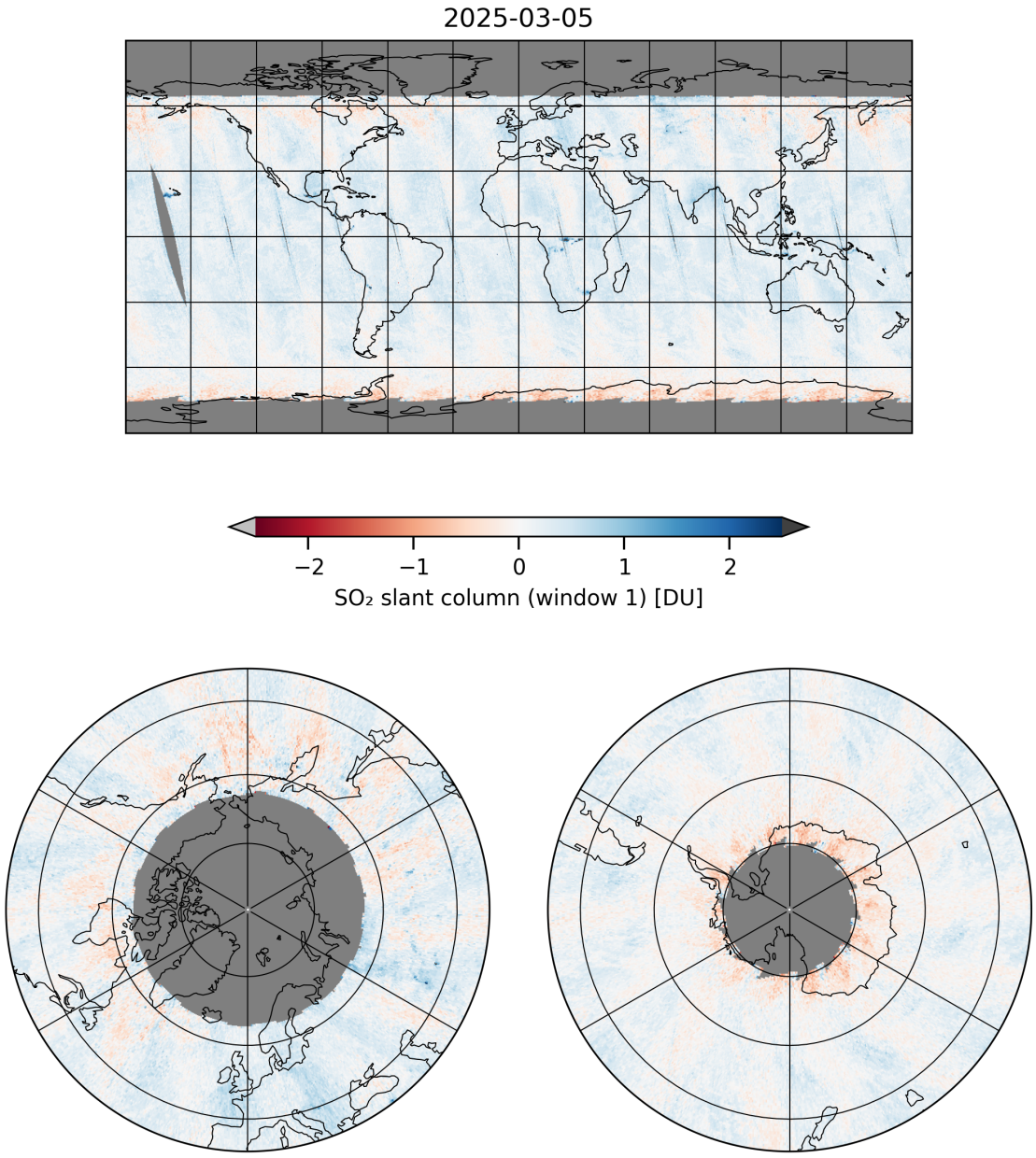

Figure 9: Map of "SO_2 slant column (window 1)" for 2025-03-05 to 2025-03-05

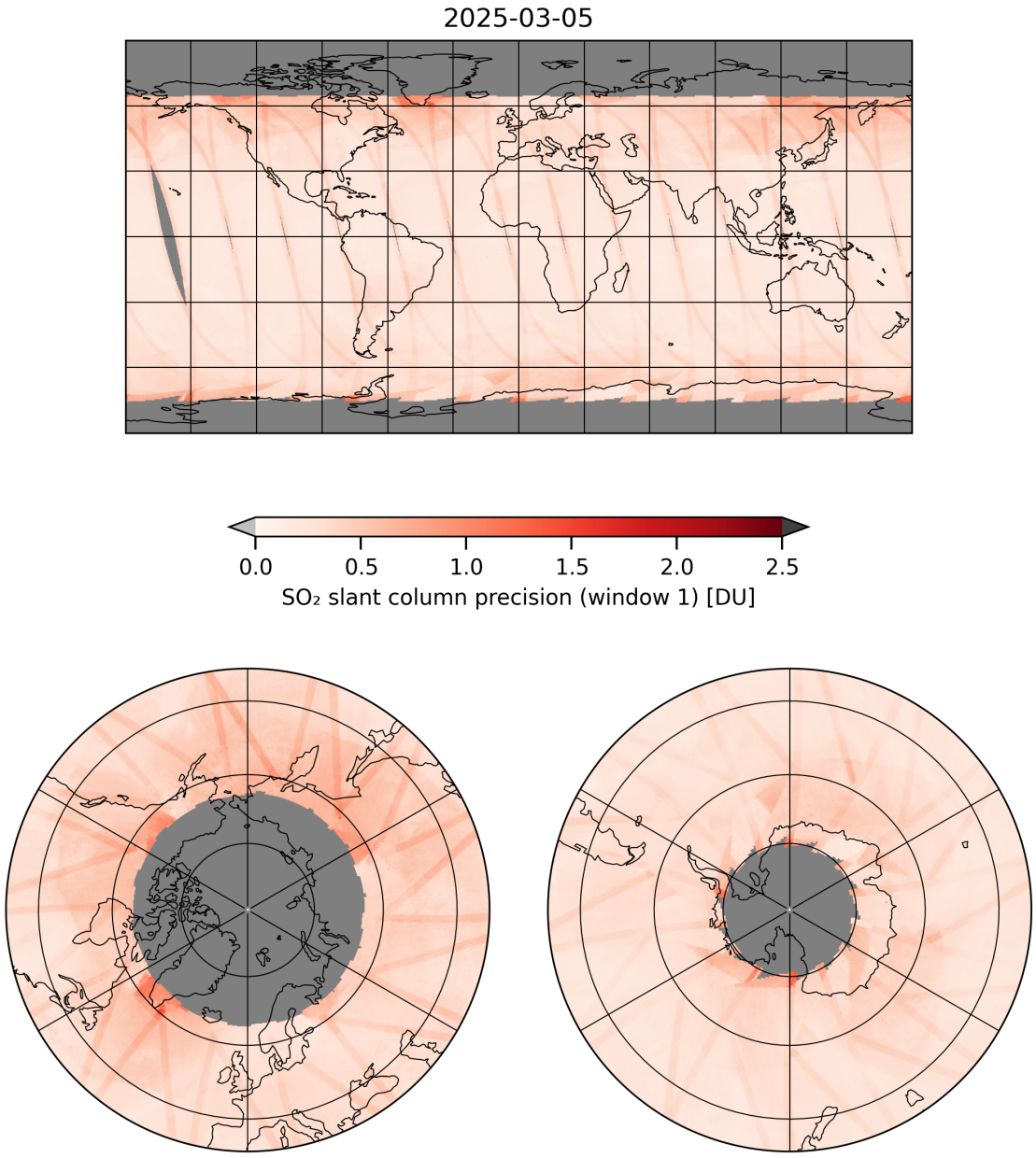

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-03-05 to 2025-03-05

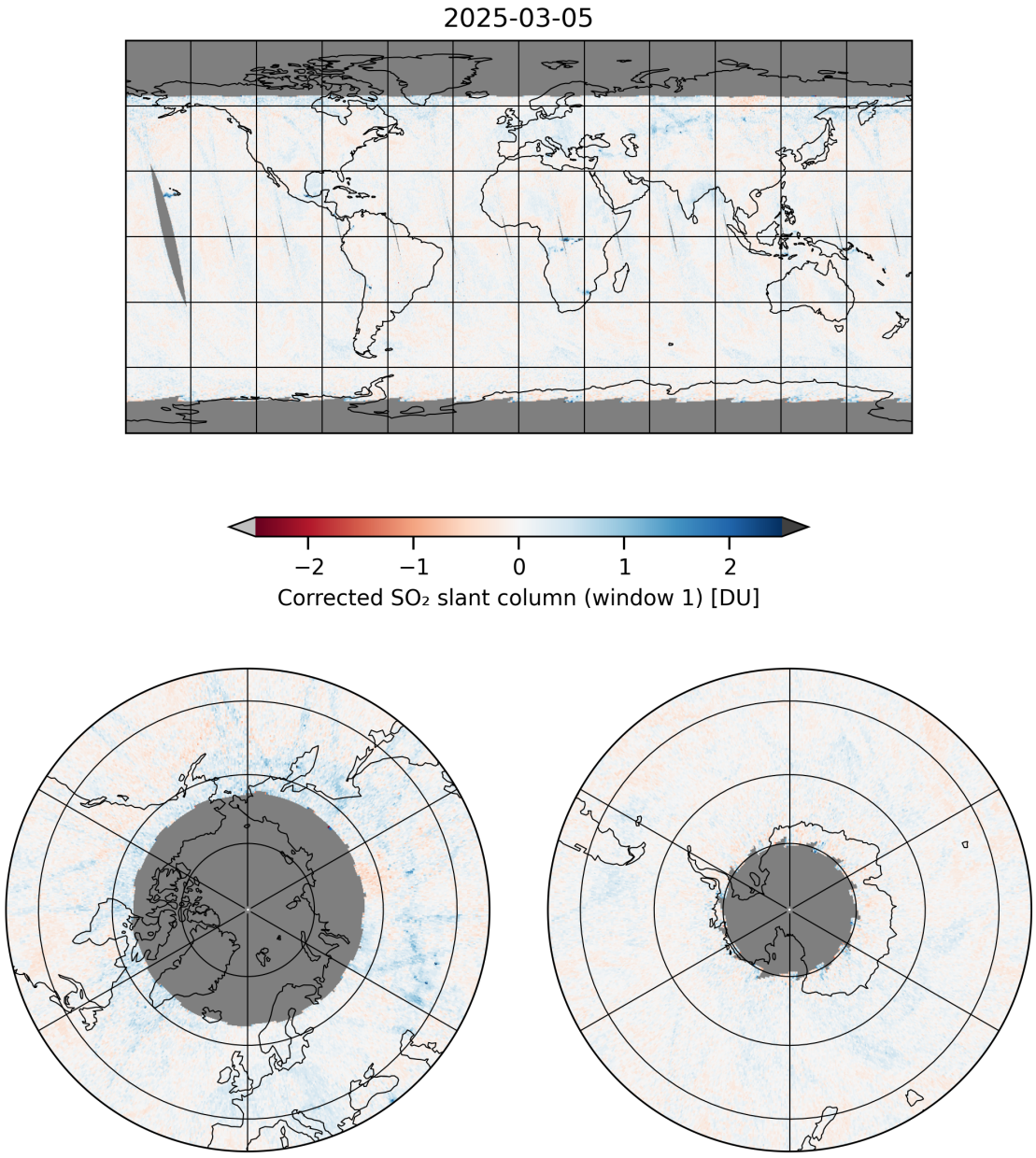

Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-03-05 to 2025-03-05

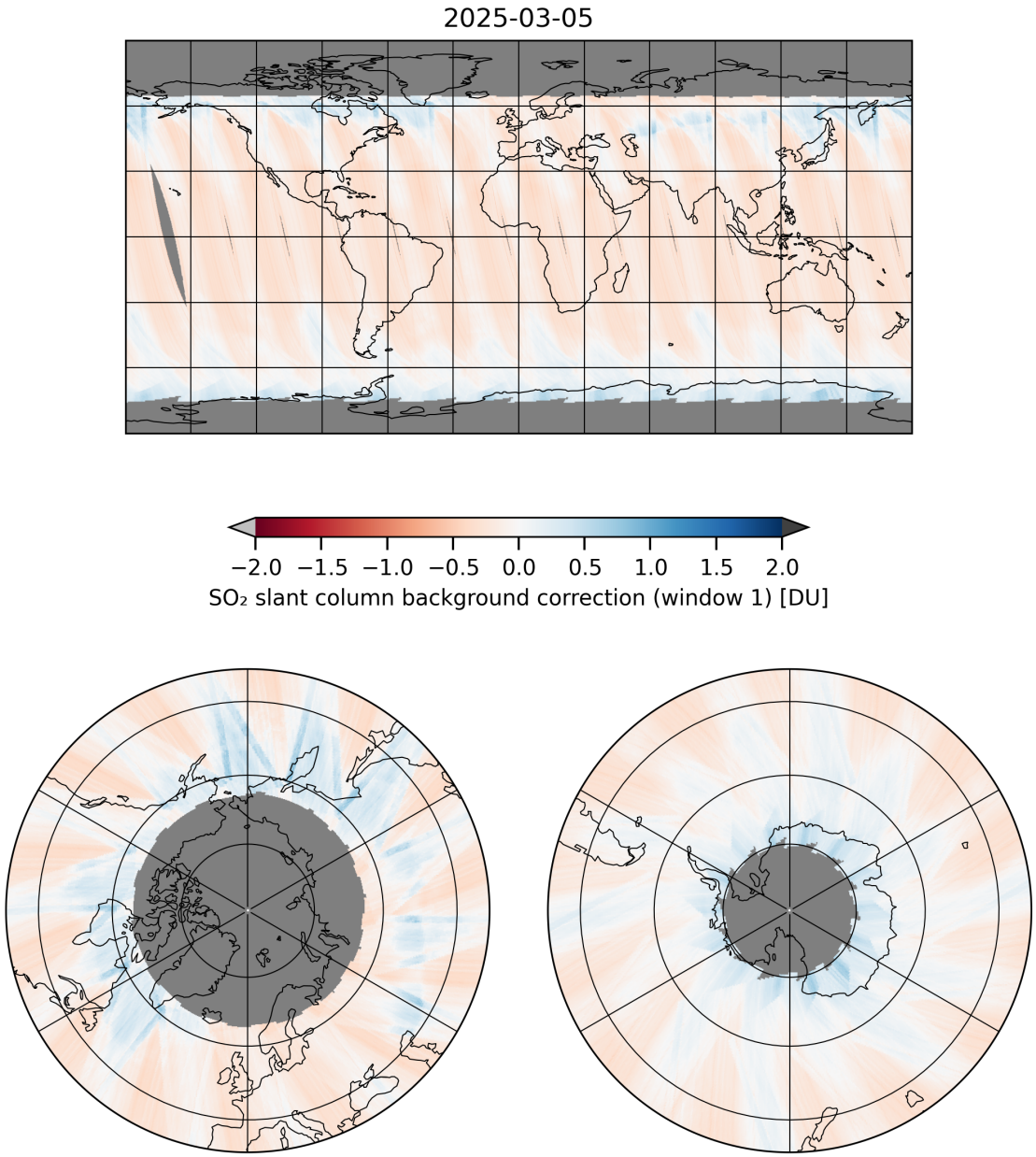

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-03-05 to 2025-03-05

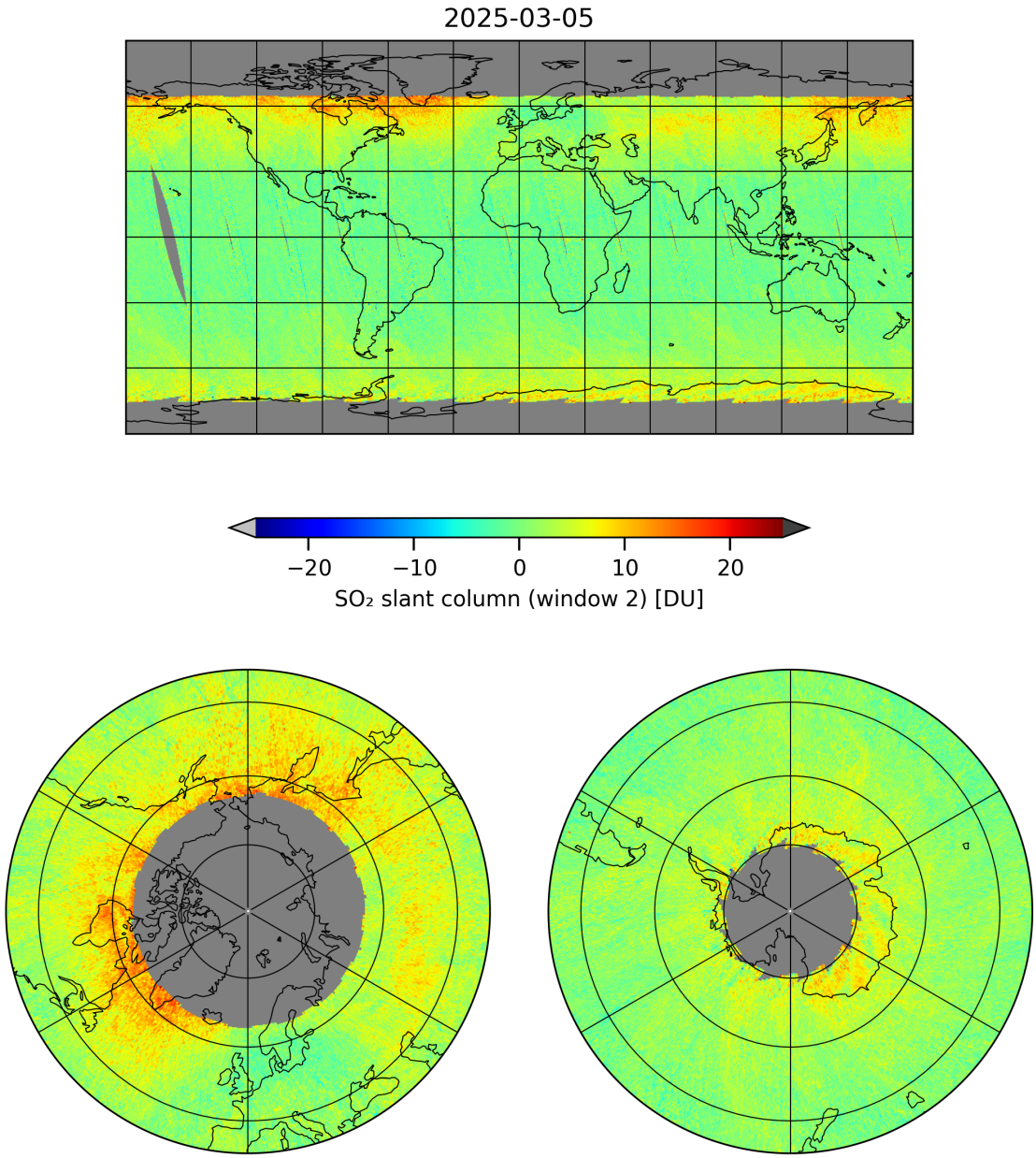

Figure 13: Map of "SO_2 slant column (window 2)" for 2025-03-05 to 2025-03-05

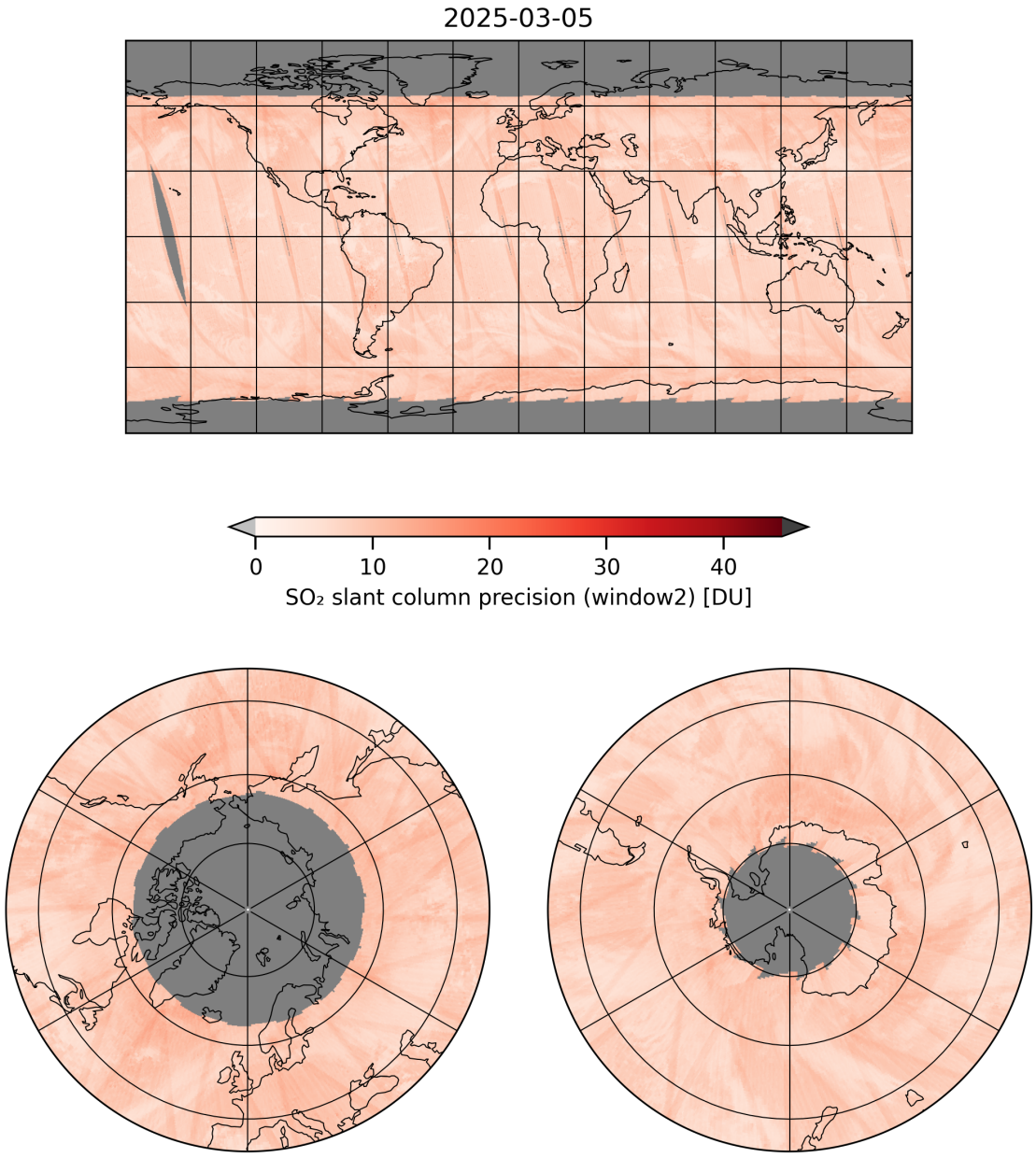

Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-03-05 to 2025-03-05

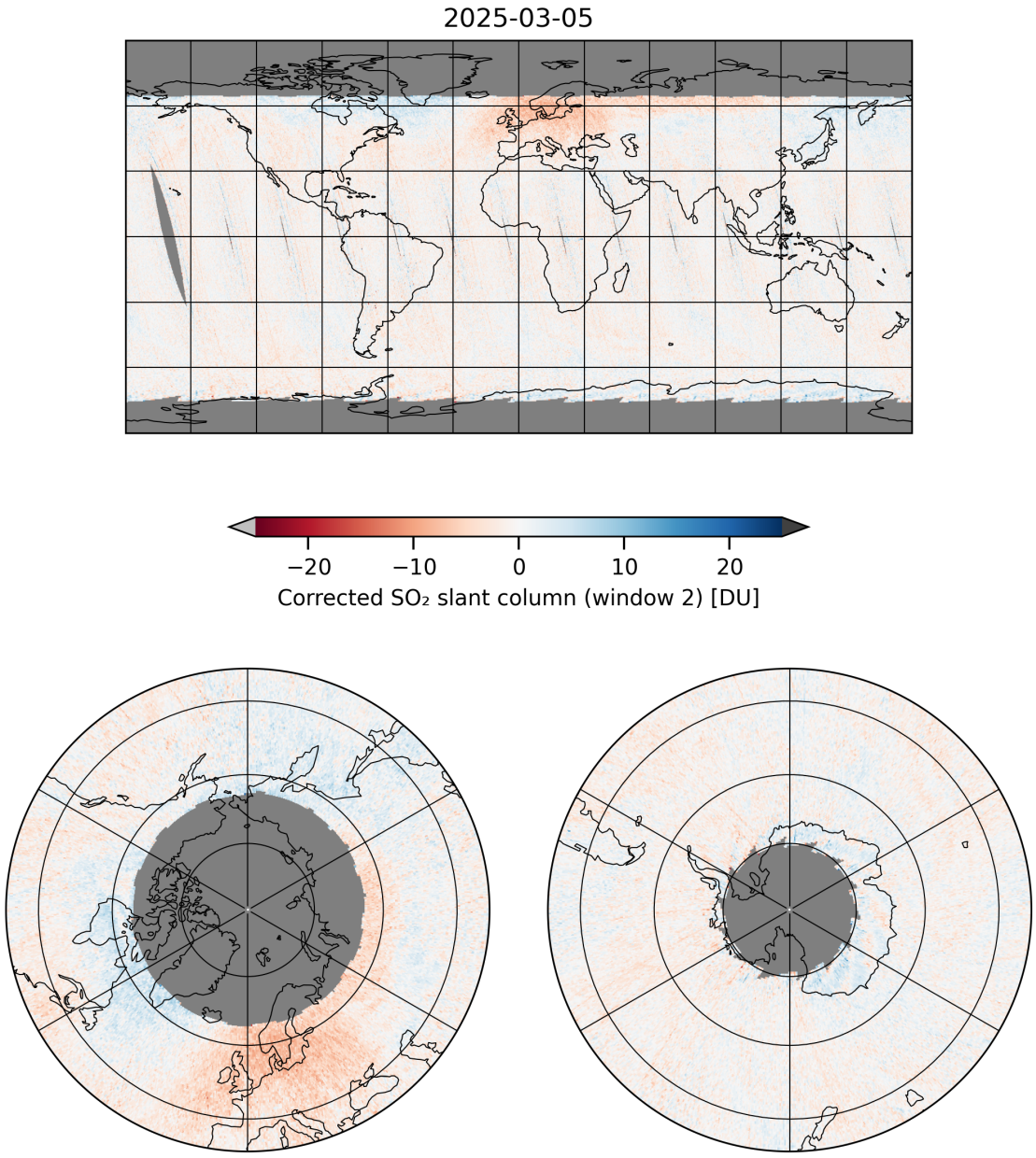

Figure 15: Map of “Corrected SO_2 slant column (window 2)” for 2025-03-05 to 2025-03-05

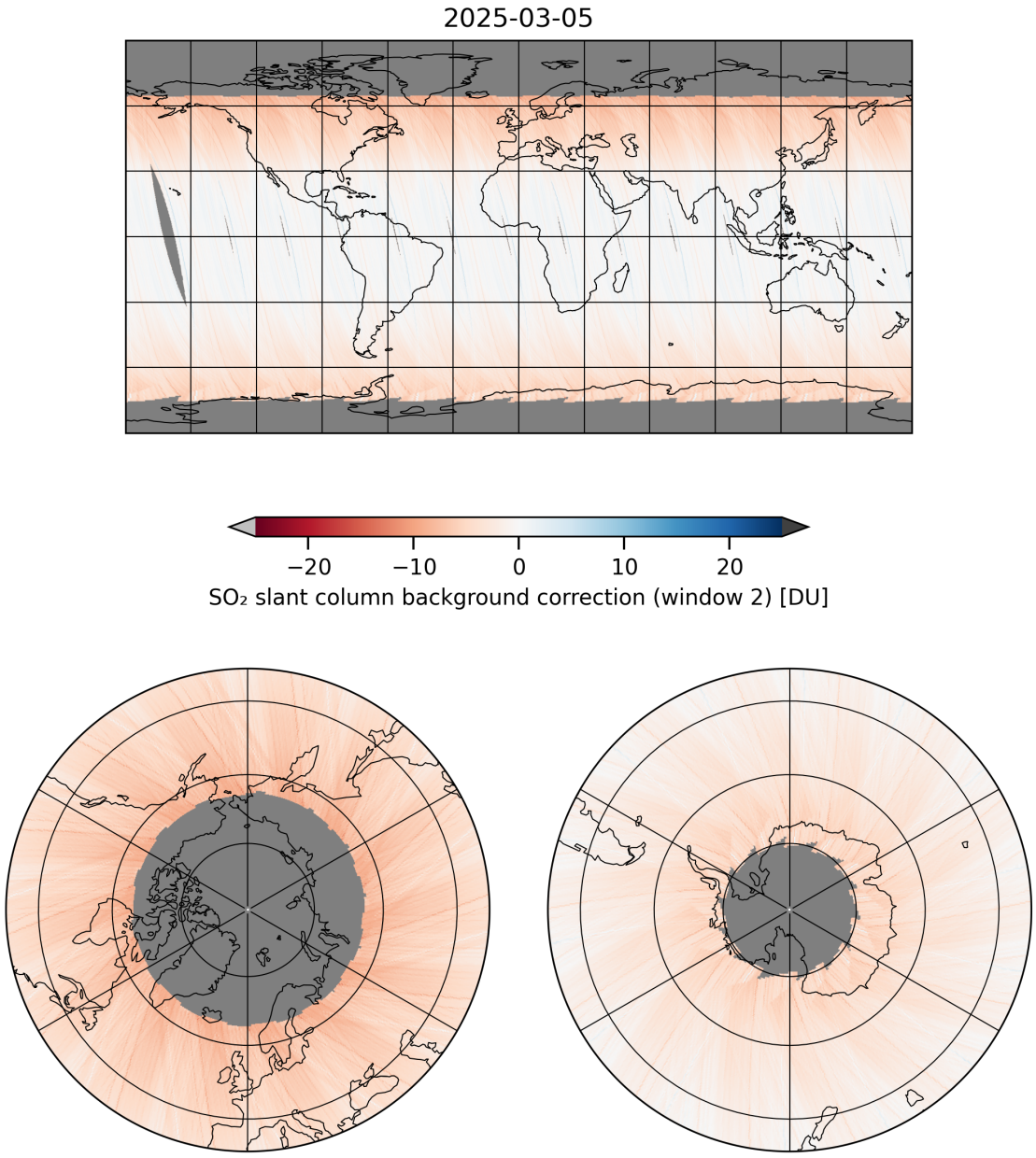

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-03-05 to 2025-03-05

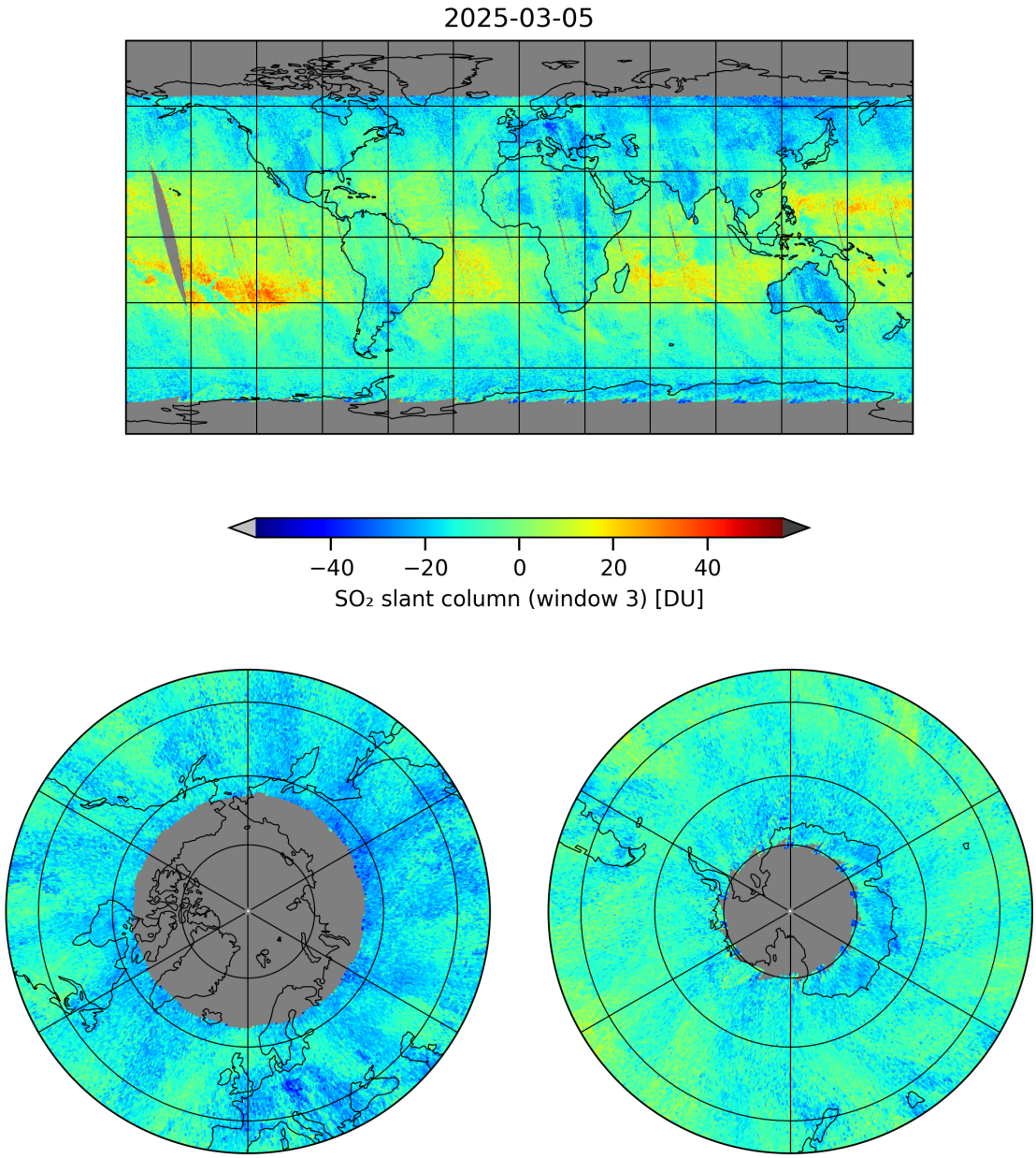

Figure 17: Map of "SO_2 slant column (window 3)" for 2025-03-05 to 2025-03-05

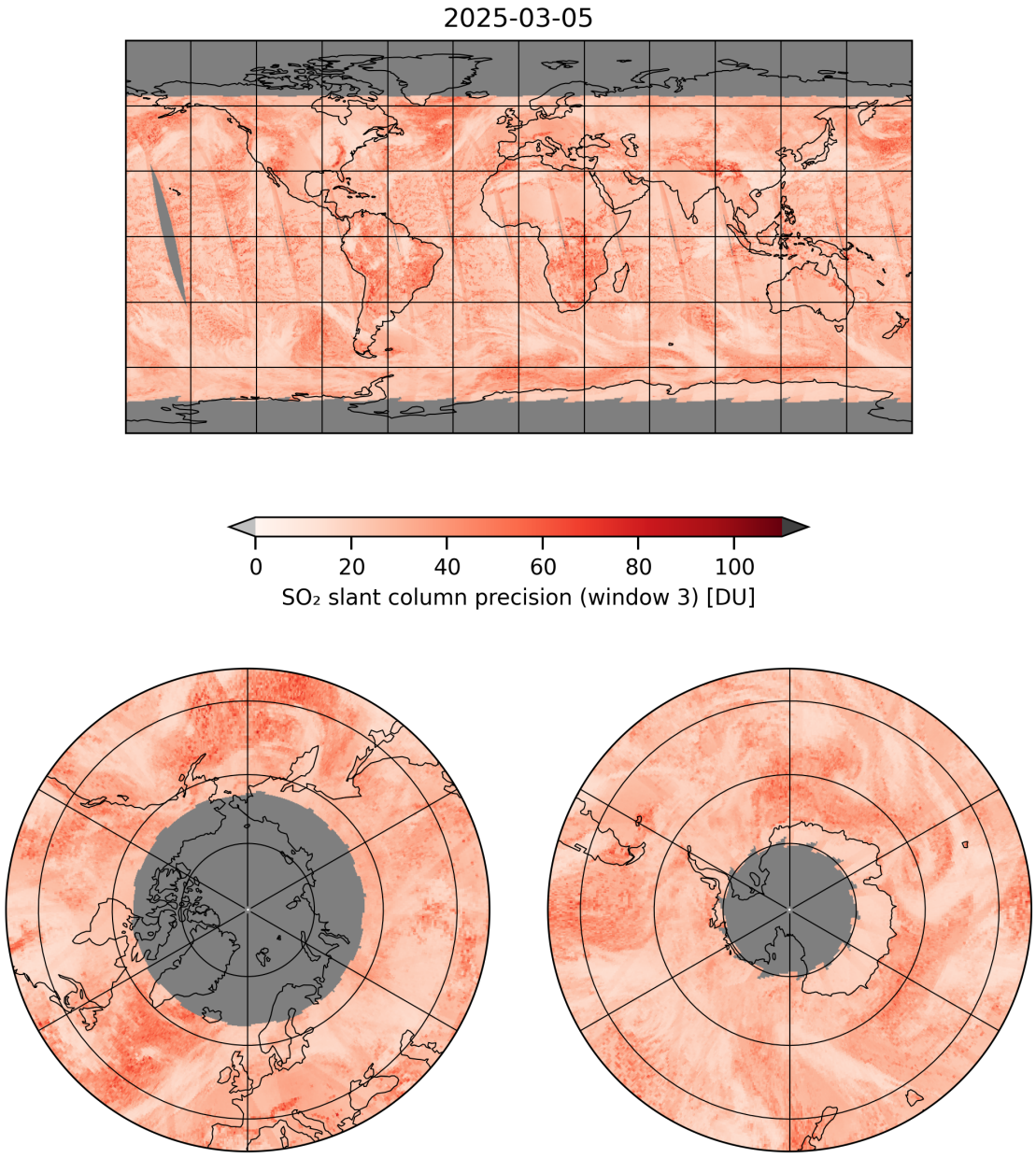

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-03-05 to 2025-03-05

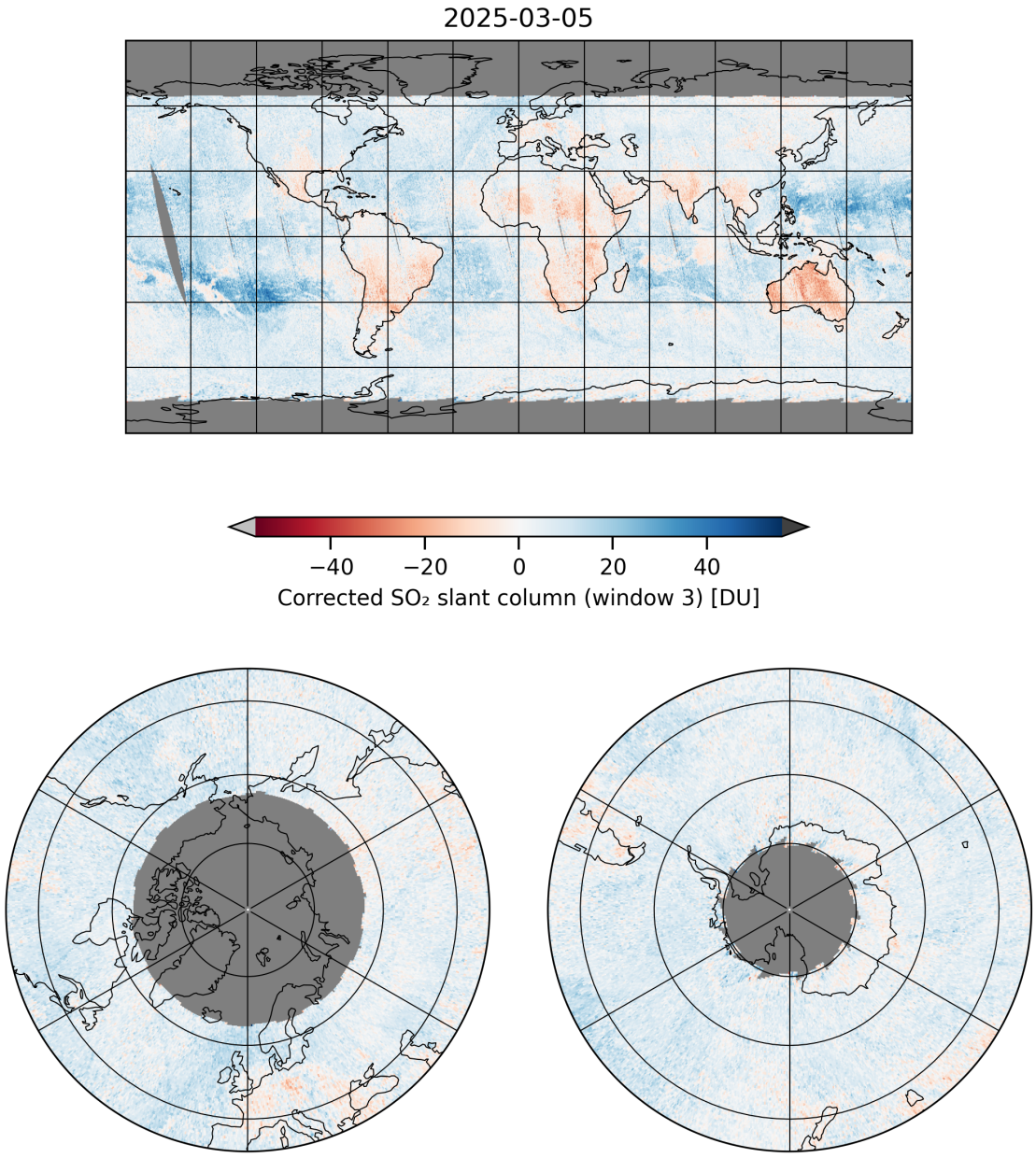

Figure 19: Map of “Corrected SO_2 slant column (window 3)” for 2025-03-05 to 2025-03-05

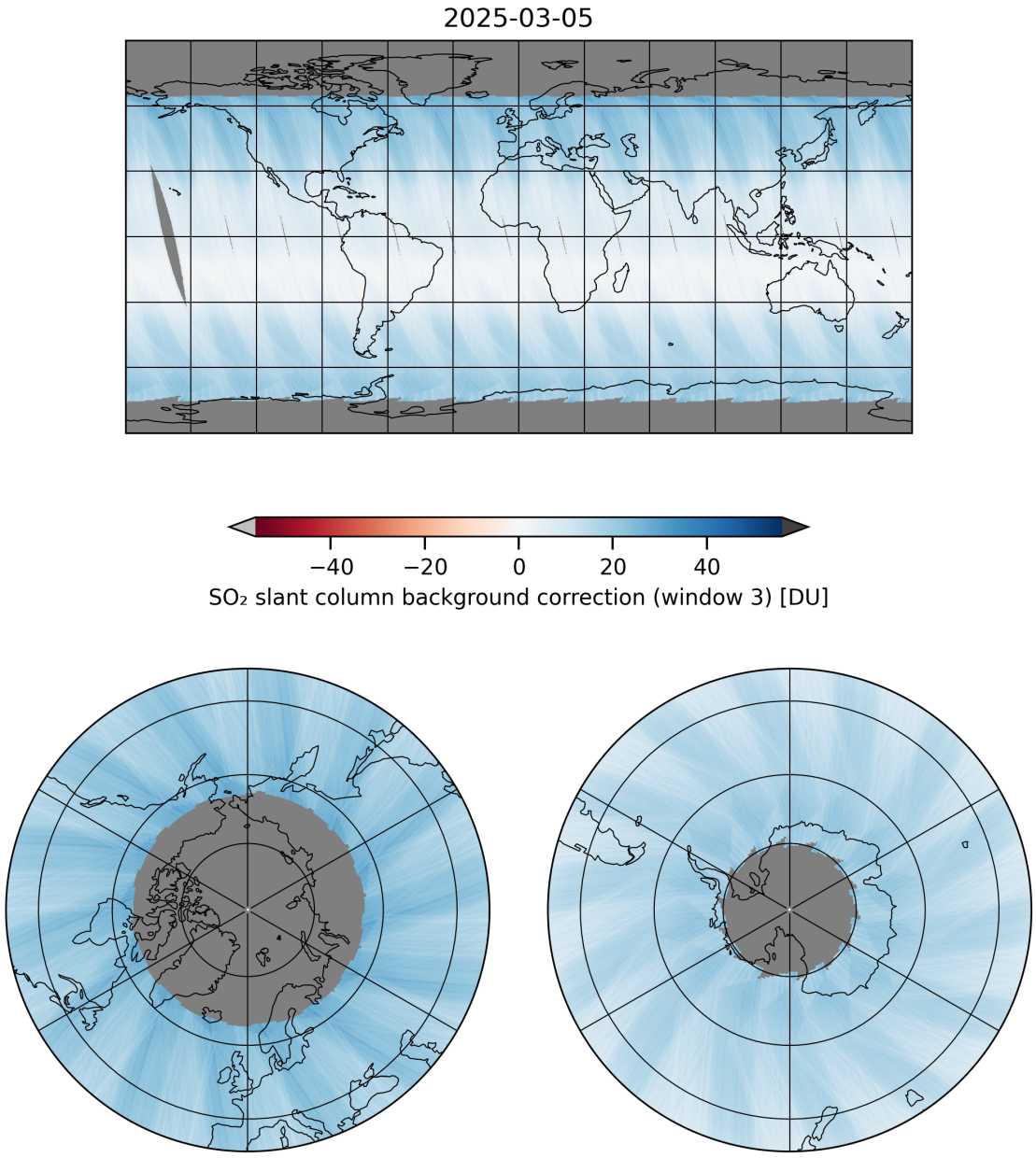

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-03-05 to 2025-03-05

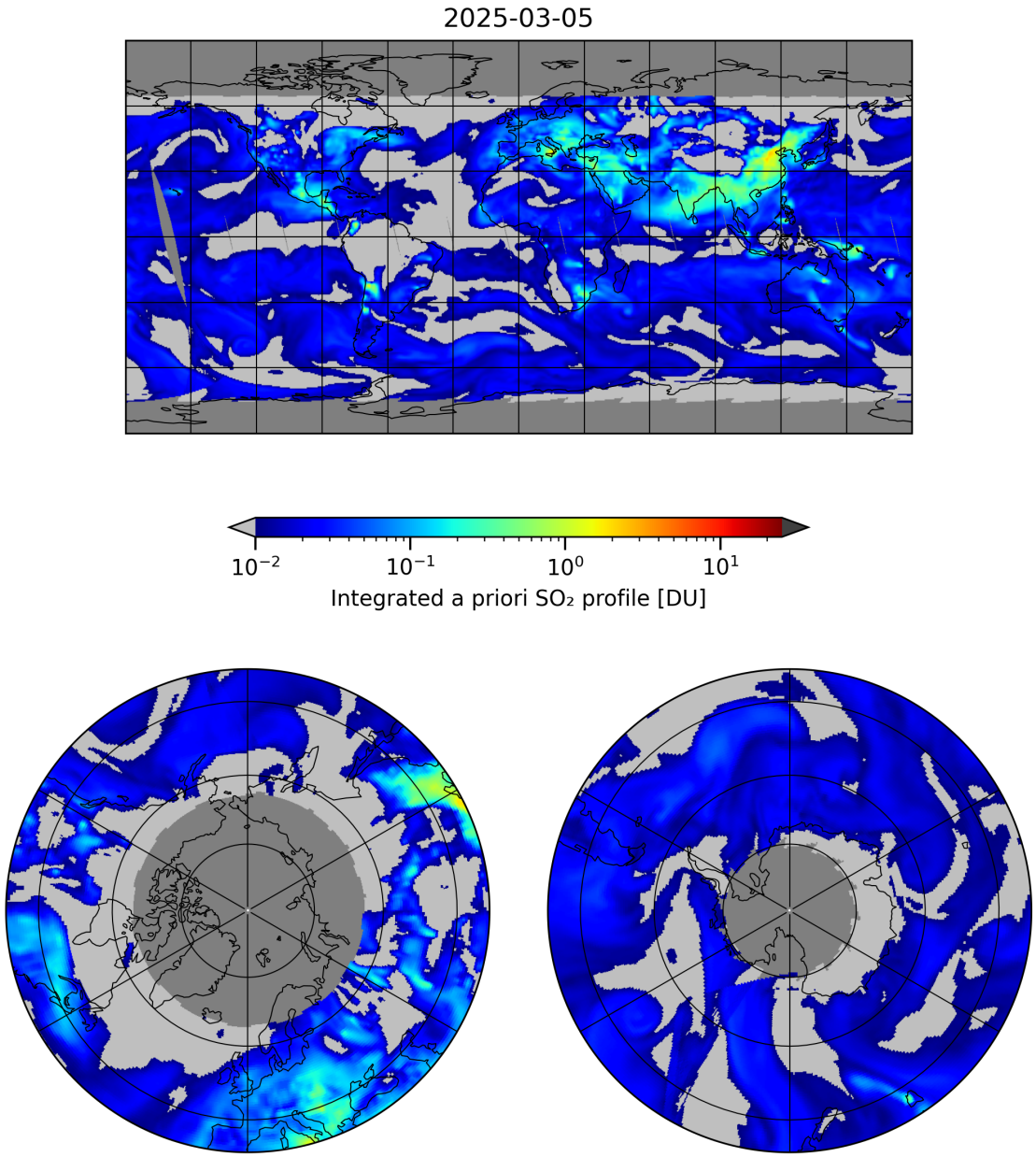

Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-03-05 to 2025-03-05

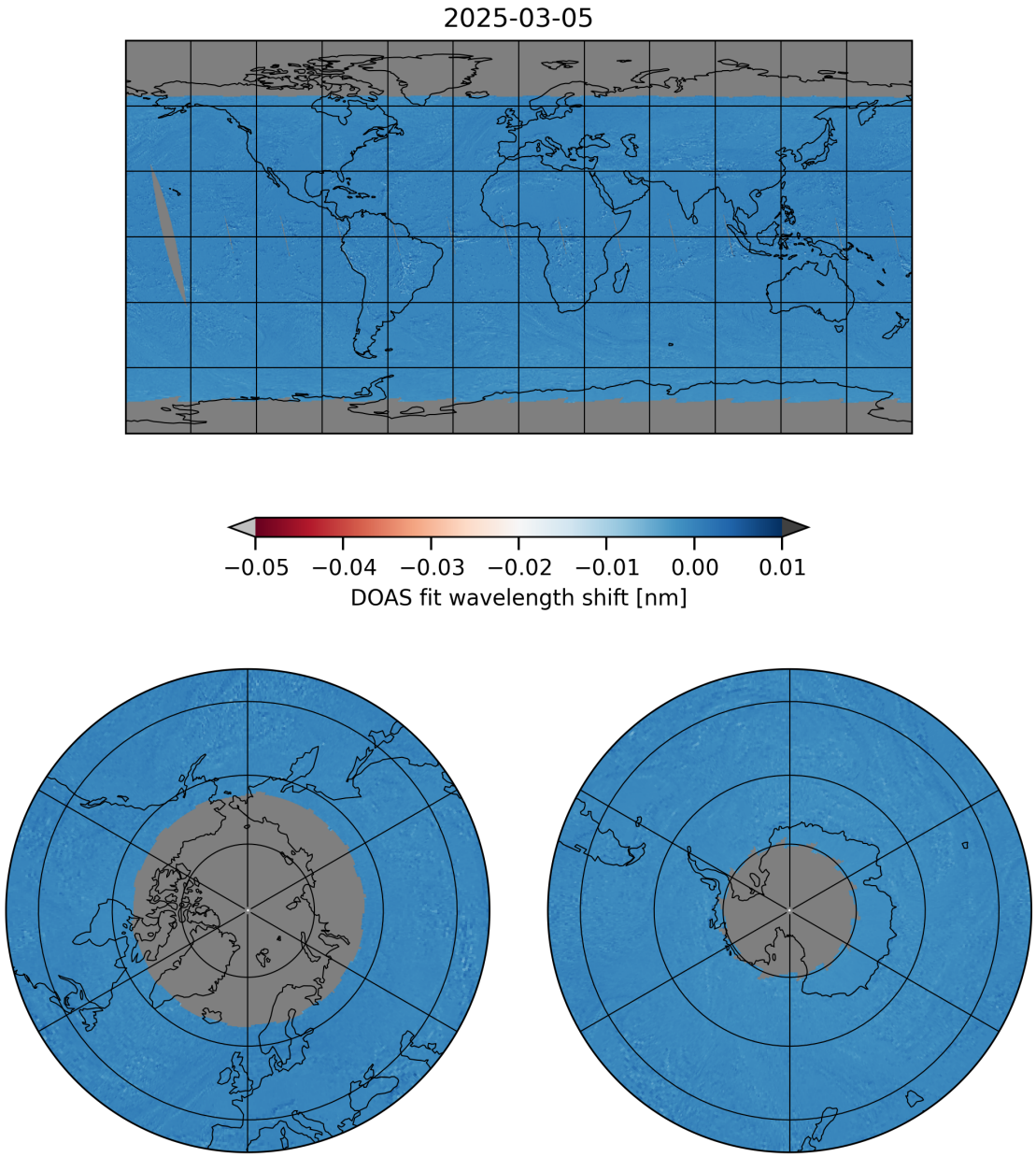

Figure 22: Map of “DOAS fit wavelength shift” for 2025-03-05 to 2025-03-05

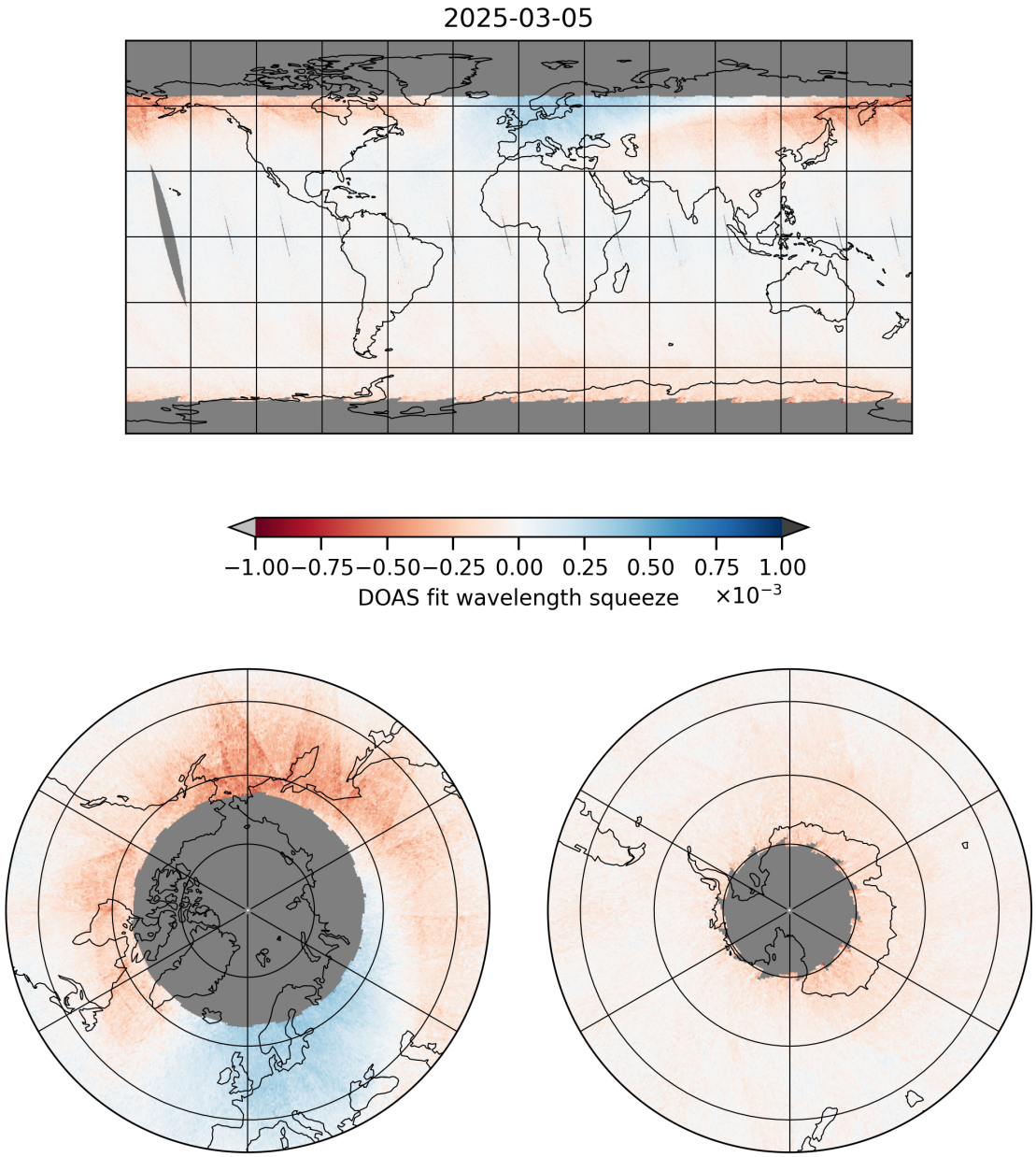

Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-03-05 to 2025-03-05

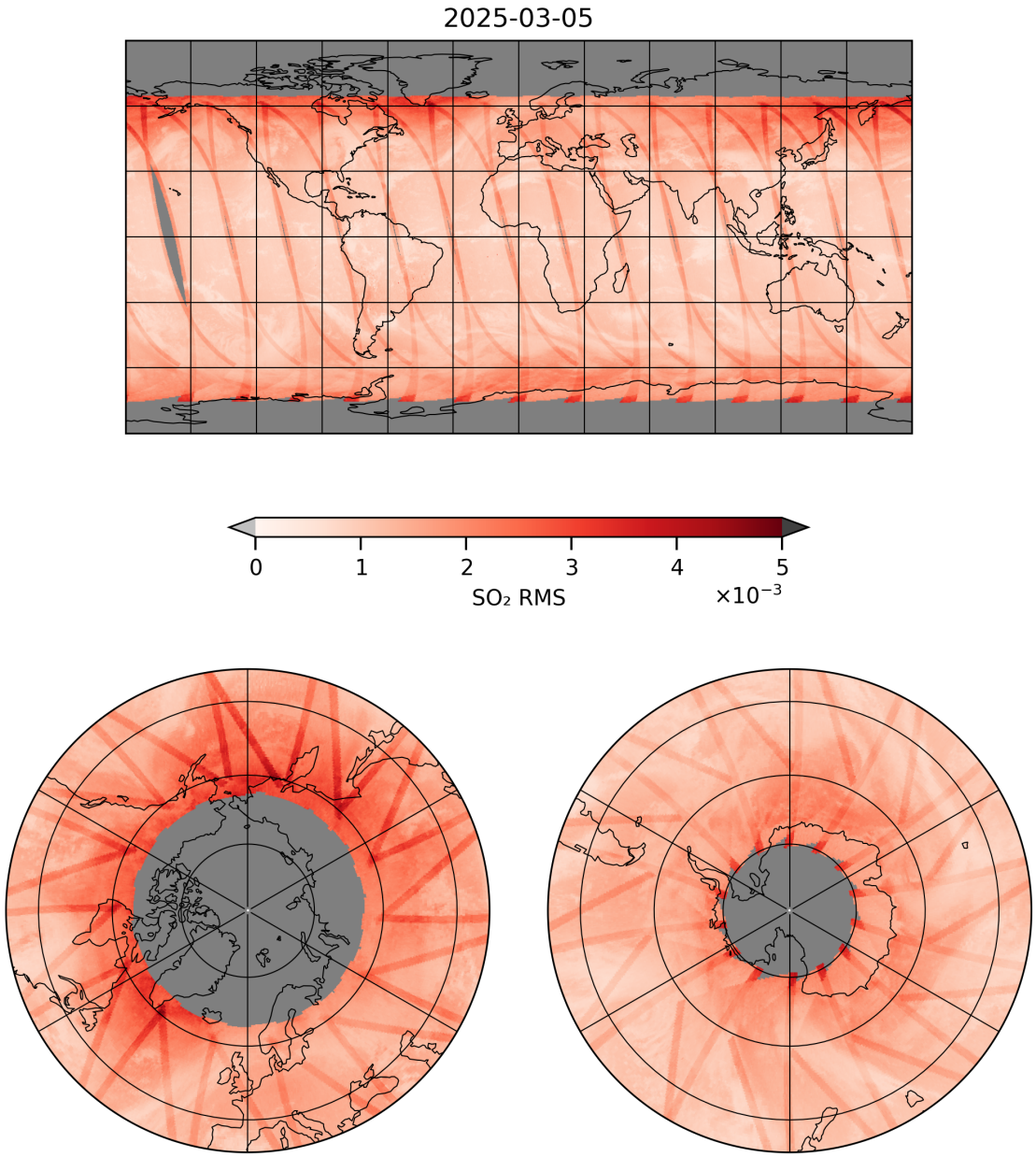

Figure 24: Map of "SO_2 RMS" for 2025-03-05 to 2025-03-05

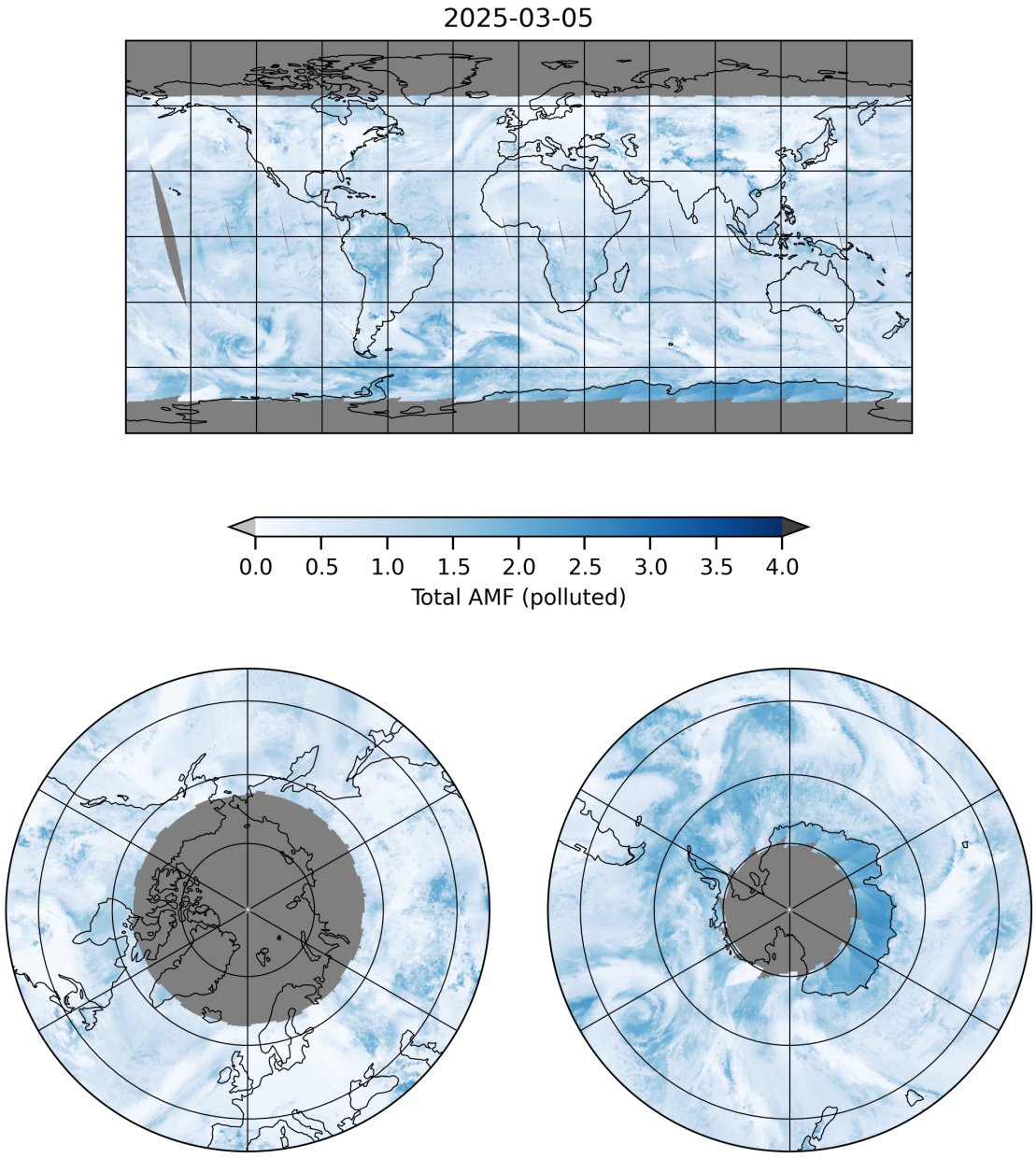

Figure 25: Map of “Total AMF (polluted)” for 2025-03-05 to 2025-03-05

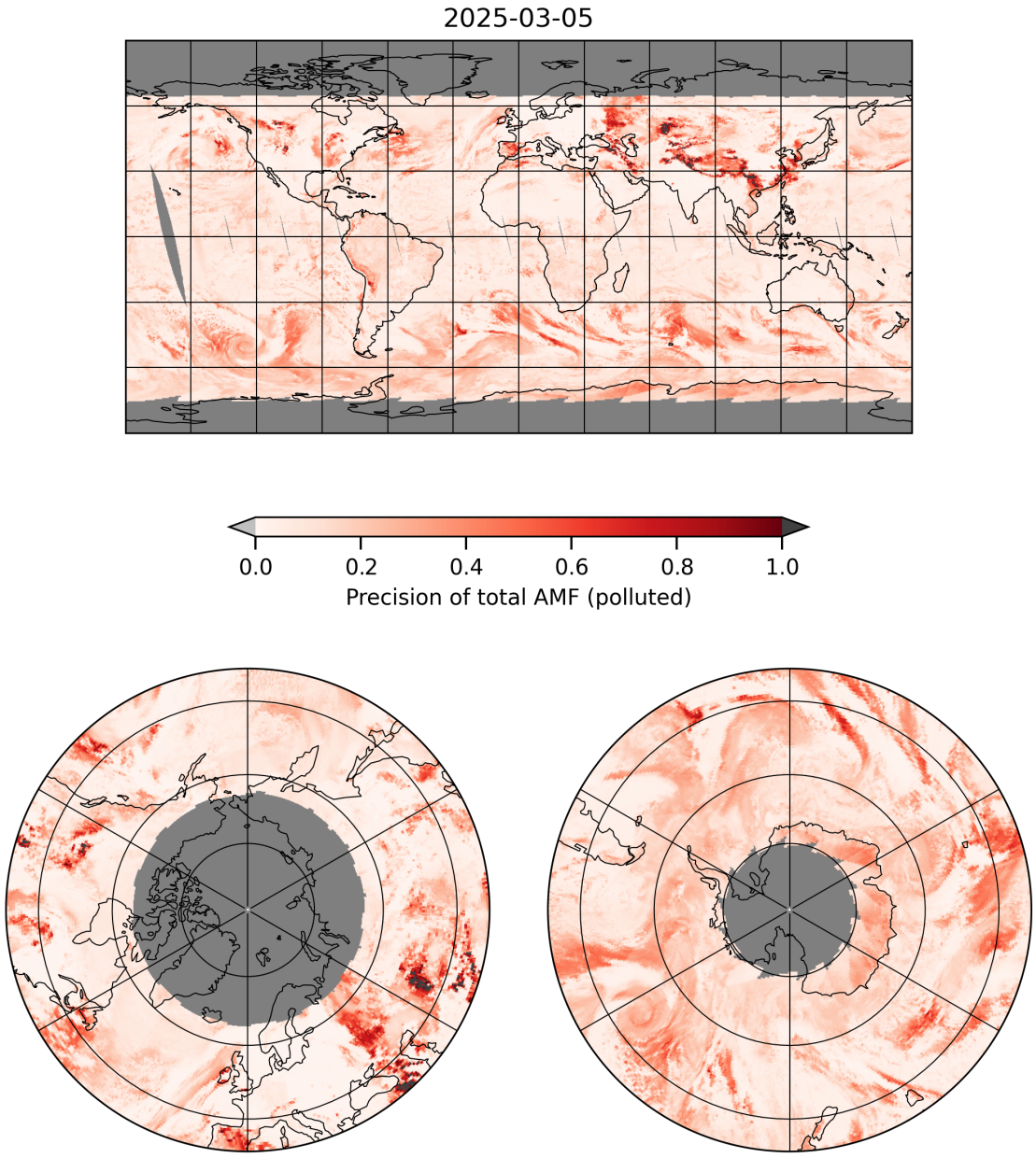

Figure 26: Map of “Precision of total AMF (polluted)” for 2025-03-05 to 2025-03-05

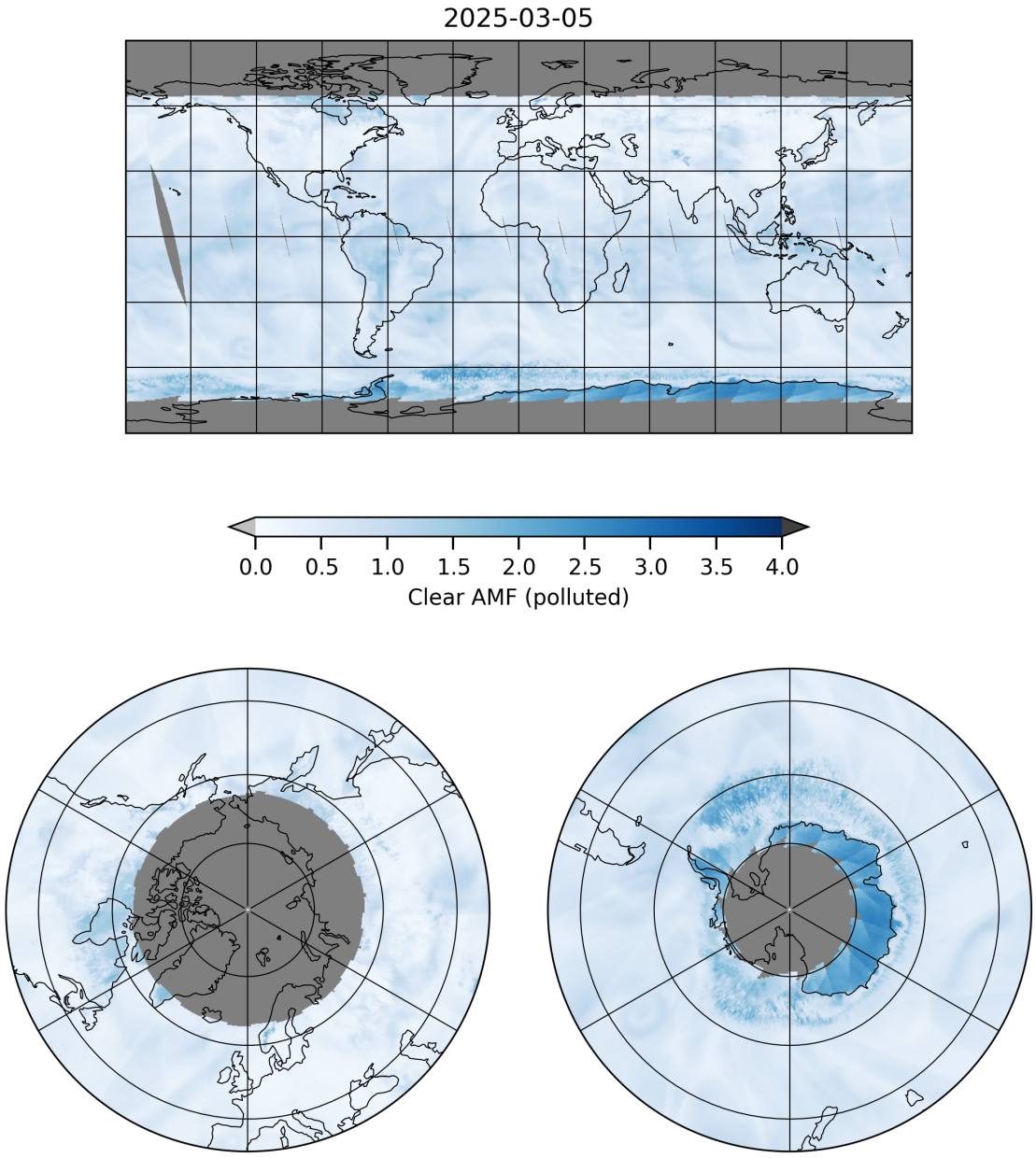

Figure 27: Map of “Clear AMF (polluted)” for 2025-03-05 to 2025-03-05

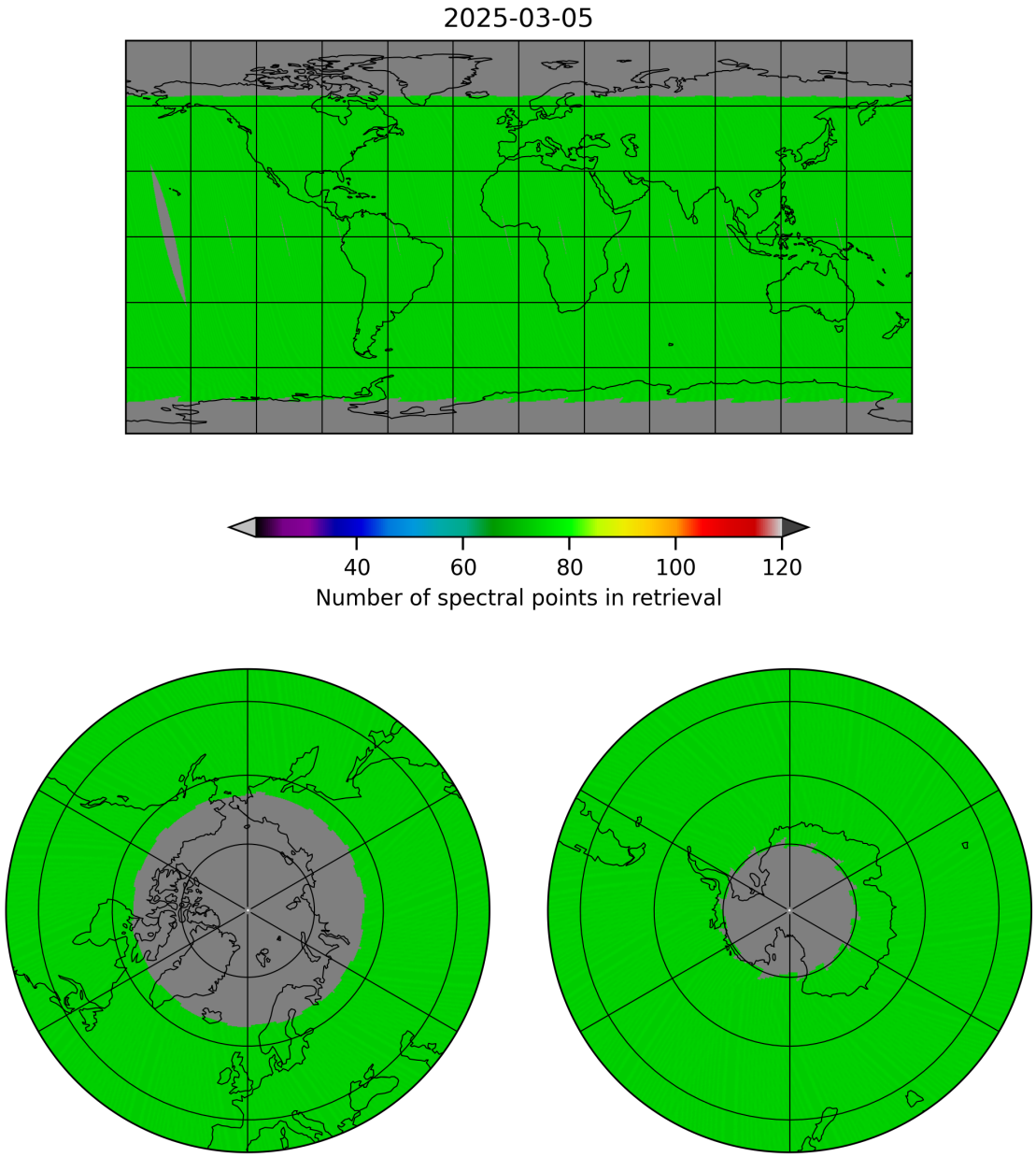

Figure 28: Map of “Number of spectral points in retrieval” for 2025-03-05 to 2025-03-05

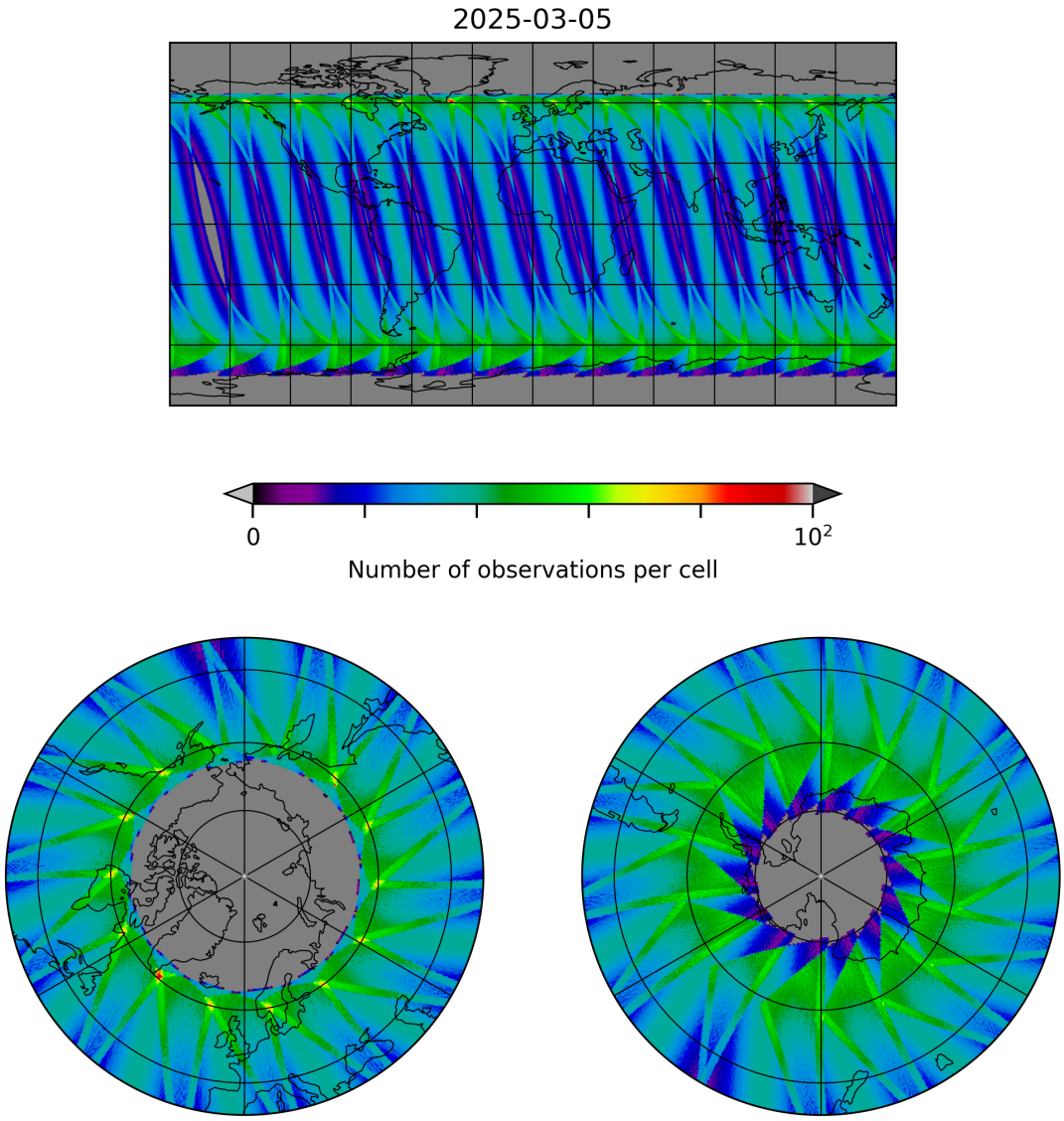

Figure 29: Map of the number of observations for 2025-03-05 to 2025-03-05

7 Zonal average

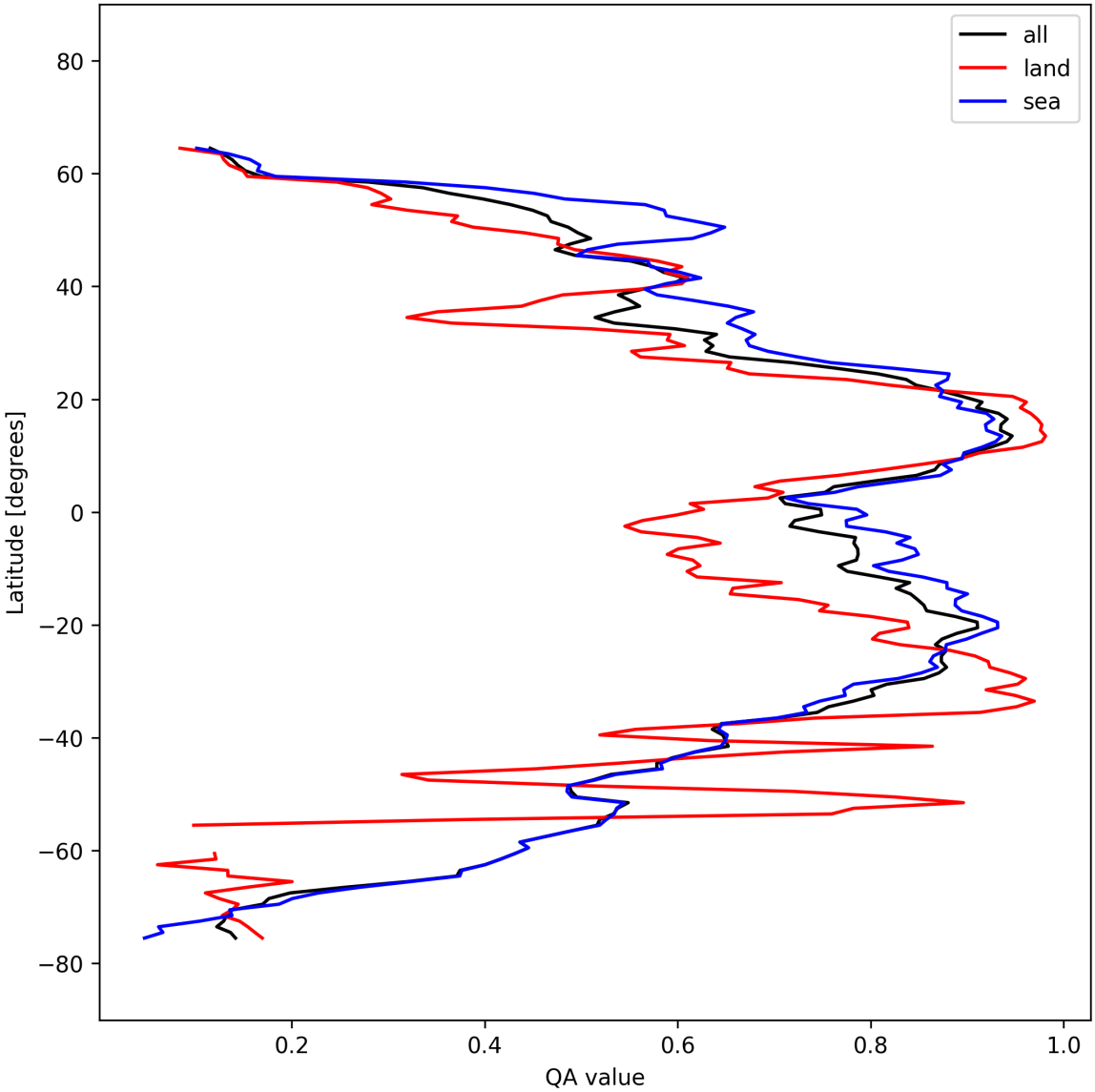

Figure 30: Zonal average of “QA value” for 2025-03-05 to 2025-03-05.

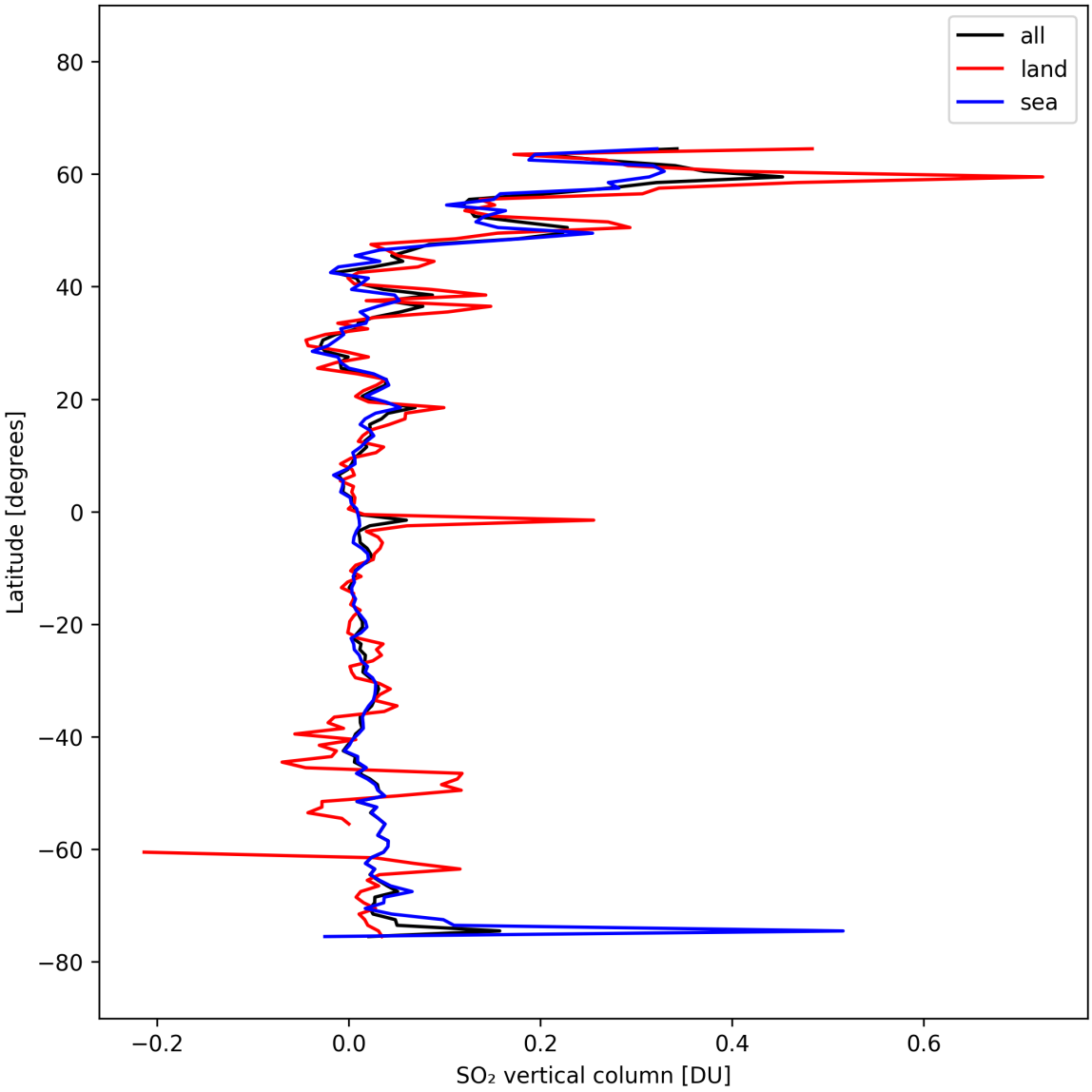

Figure 31: Zonal average of "SO_2 vertical column" for 2025-03-05 to 2025-03-05.

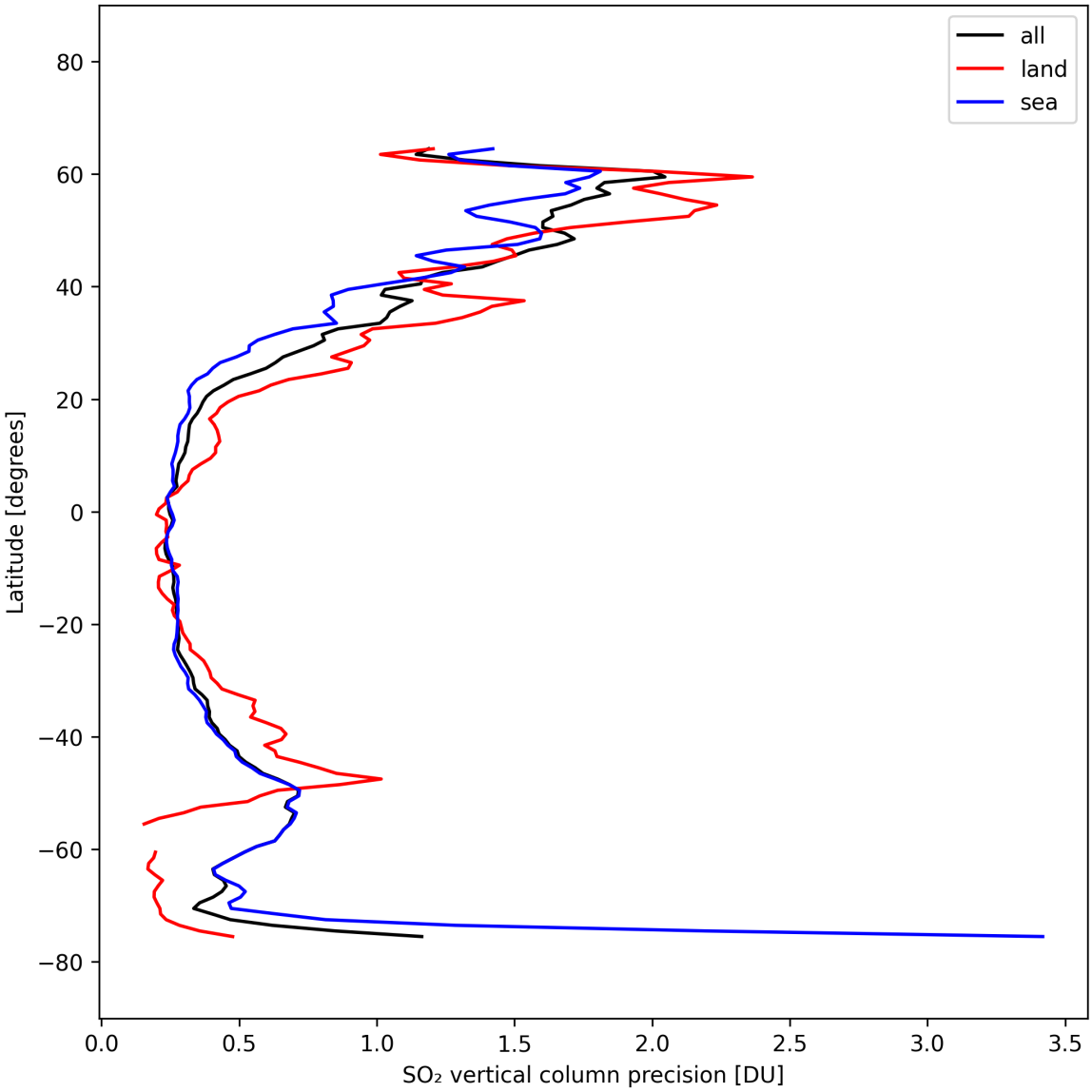

Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-03-05 to 2025-03-05.

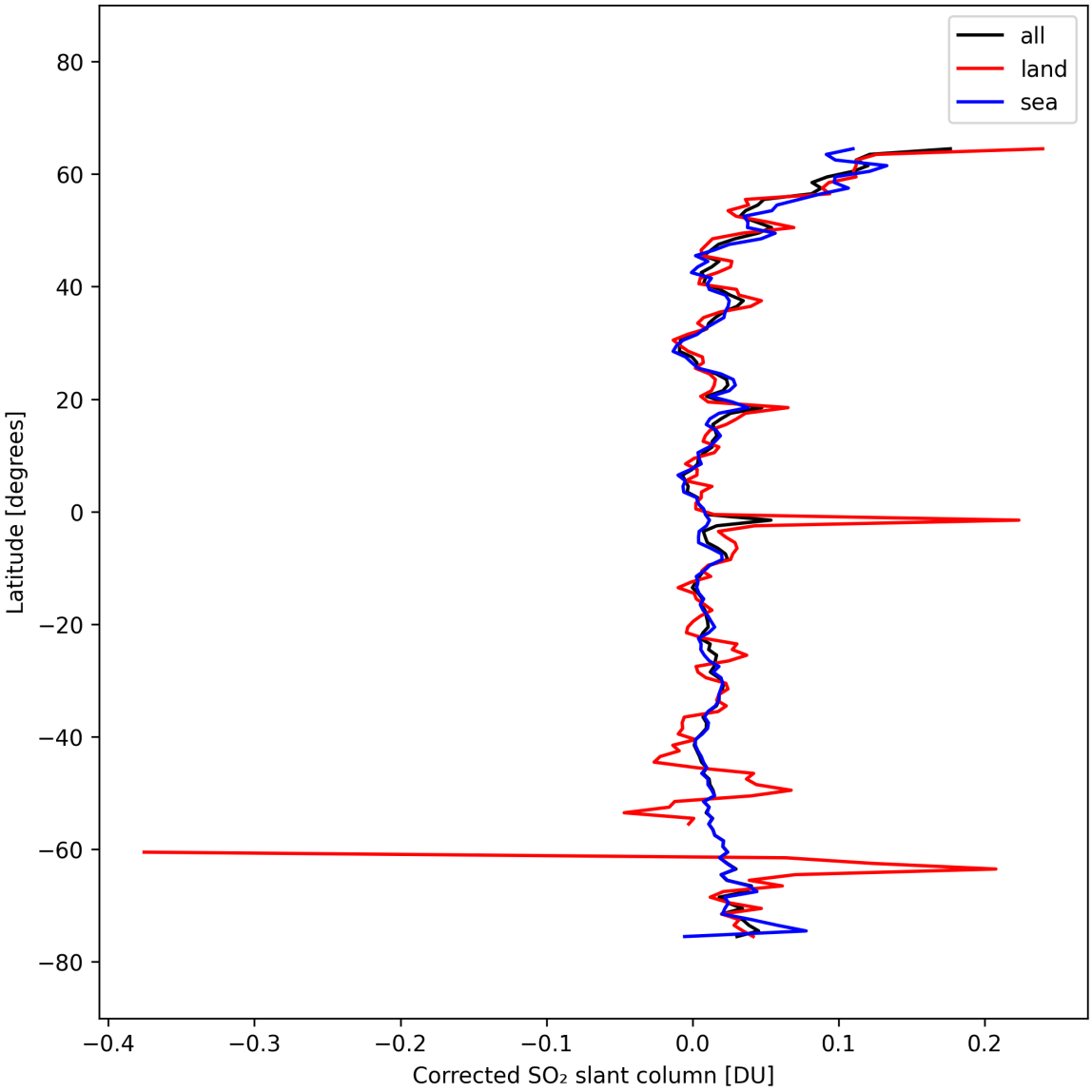

Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-03-05 to 2025-03-05.

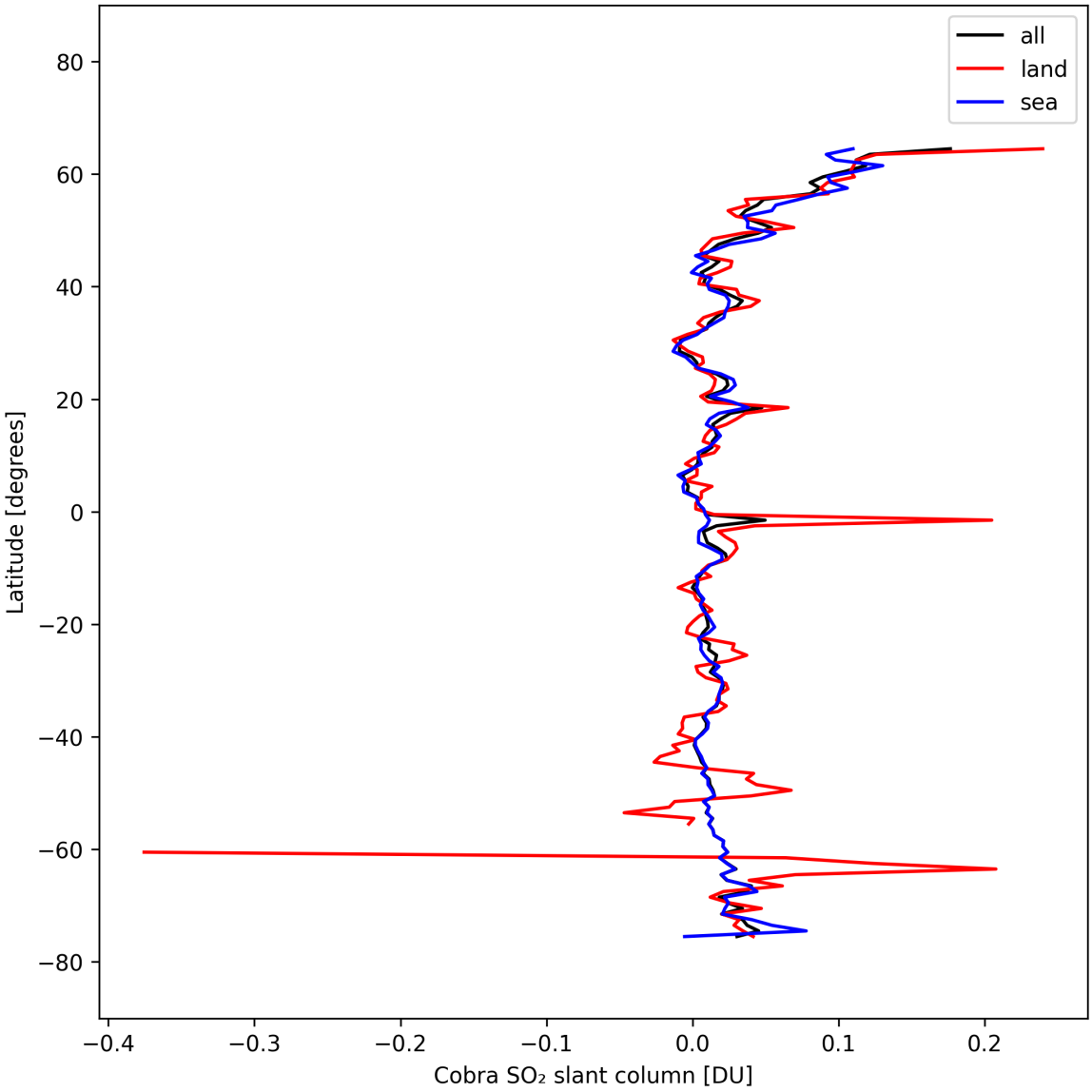

Figure 34: Zonal average of "Cobra SO_2 slant column" for 2025-03-05 to 2025-03-05.

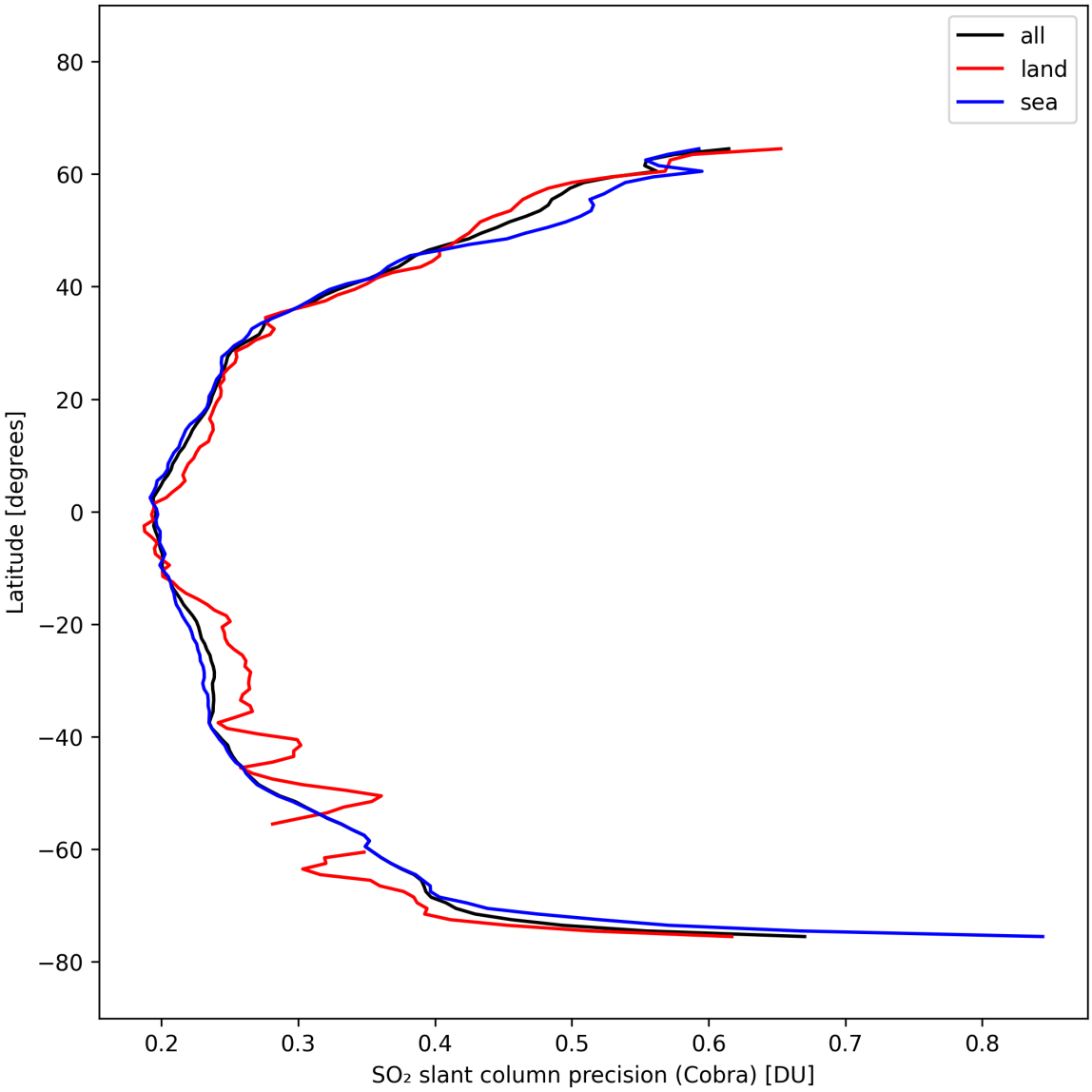

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-03-05 to 2025-03-05.

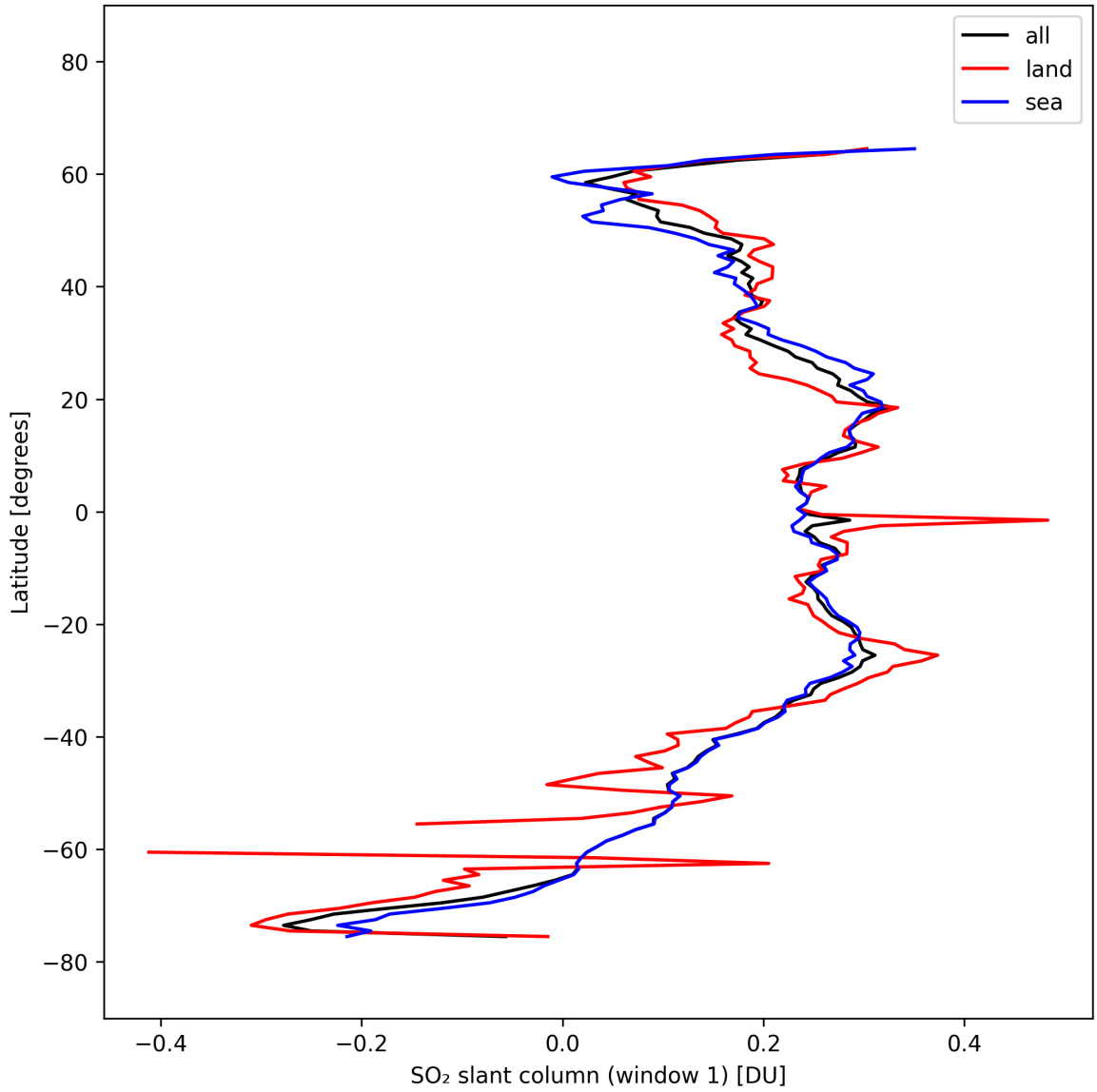

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-03-05 to 2025-03-05.

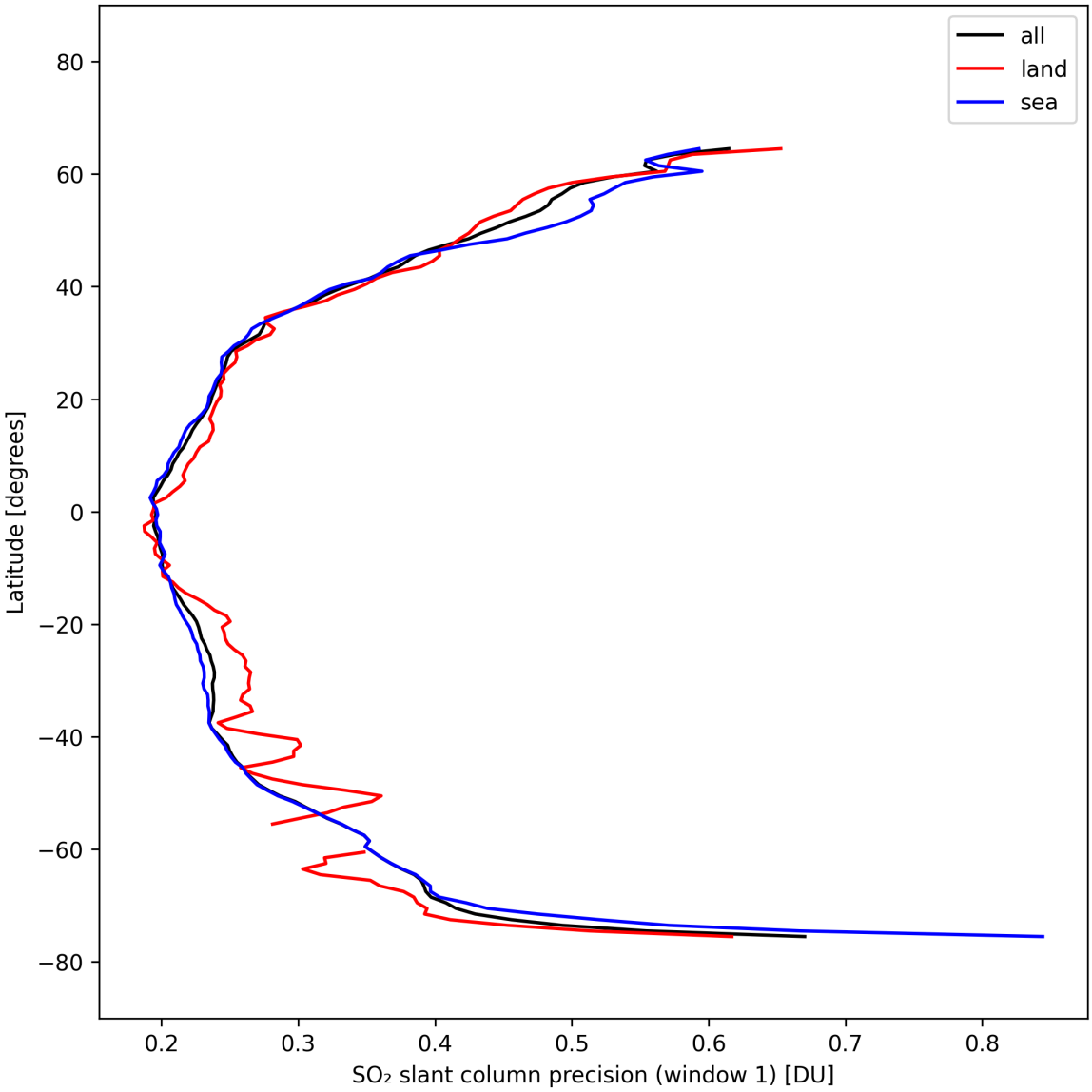

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-03-05 to 2025-03-05.

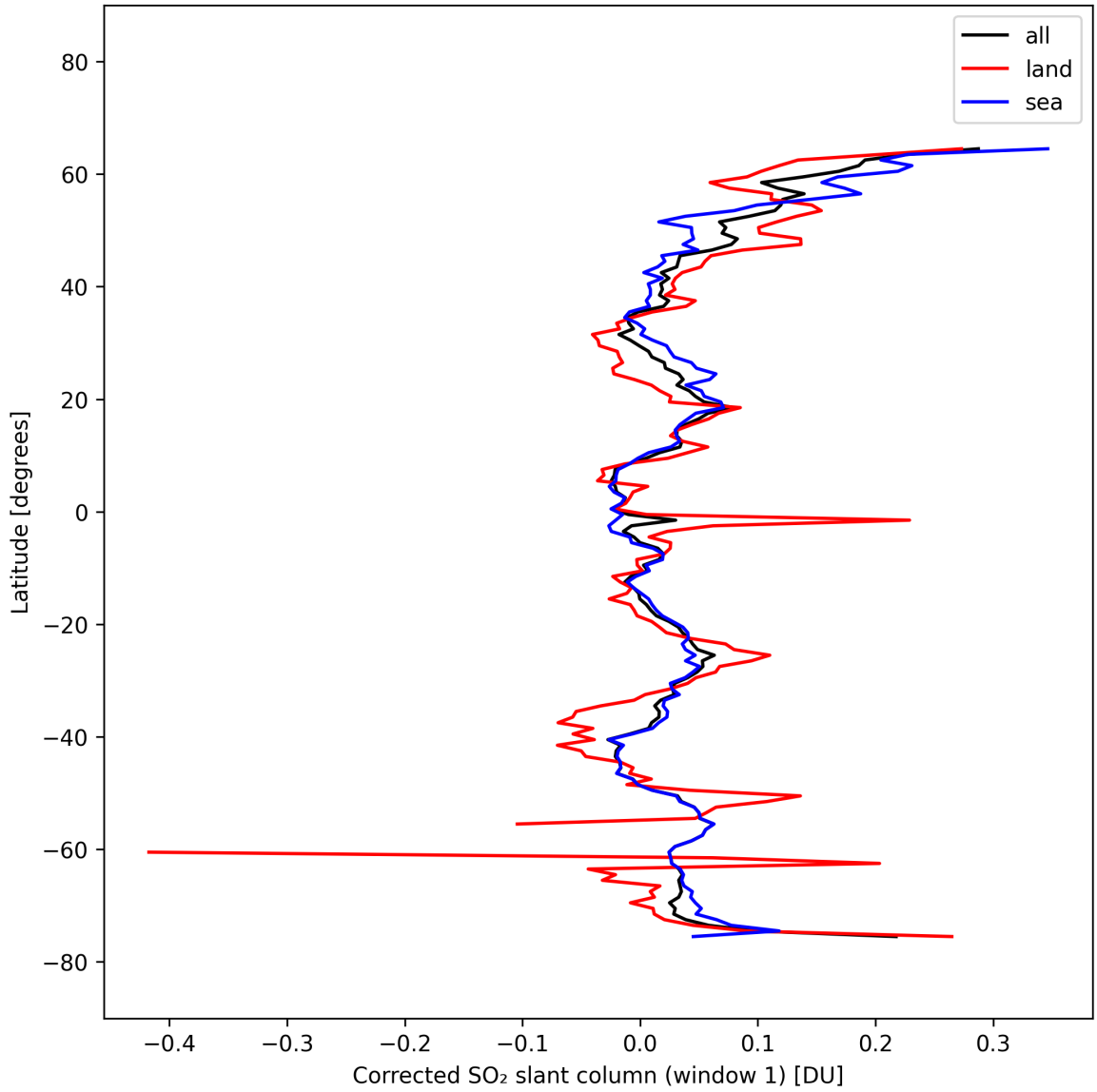

Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-03-05 to 2025-03-05.

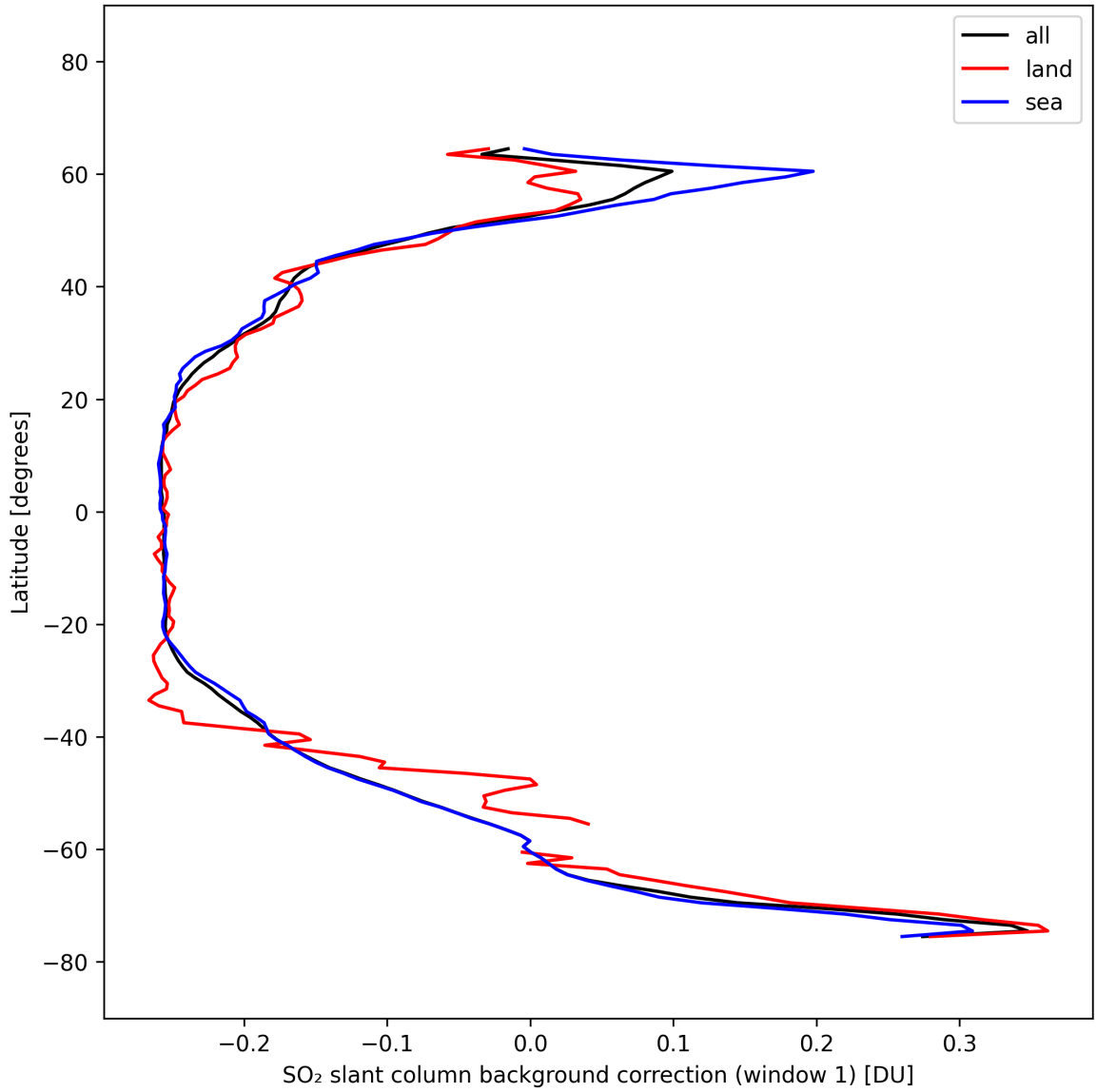

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-03-05 to 2025-03-05.

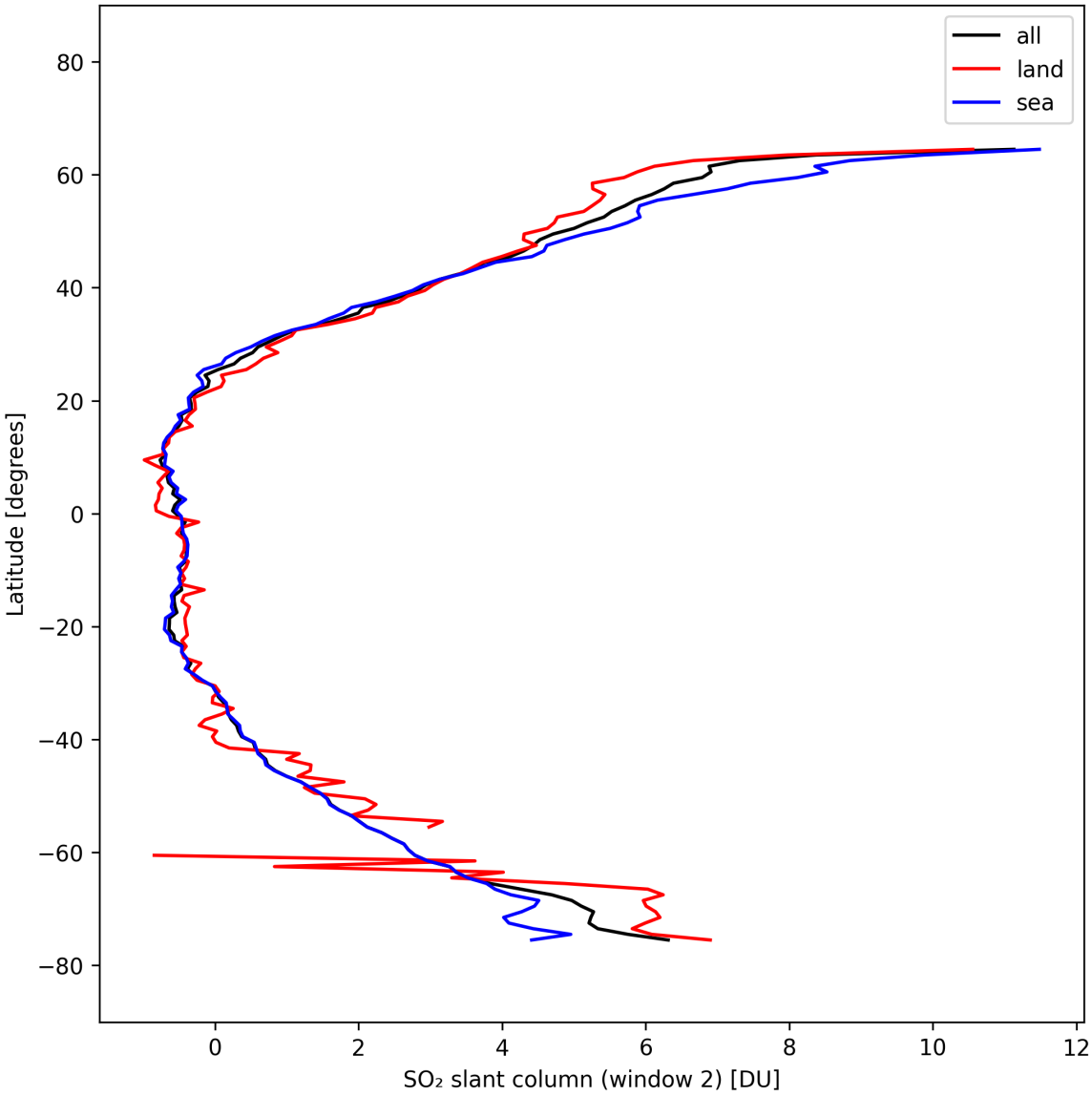

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-03-05 to 2025-03-05.

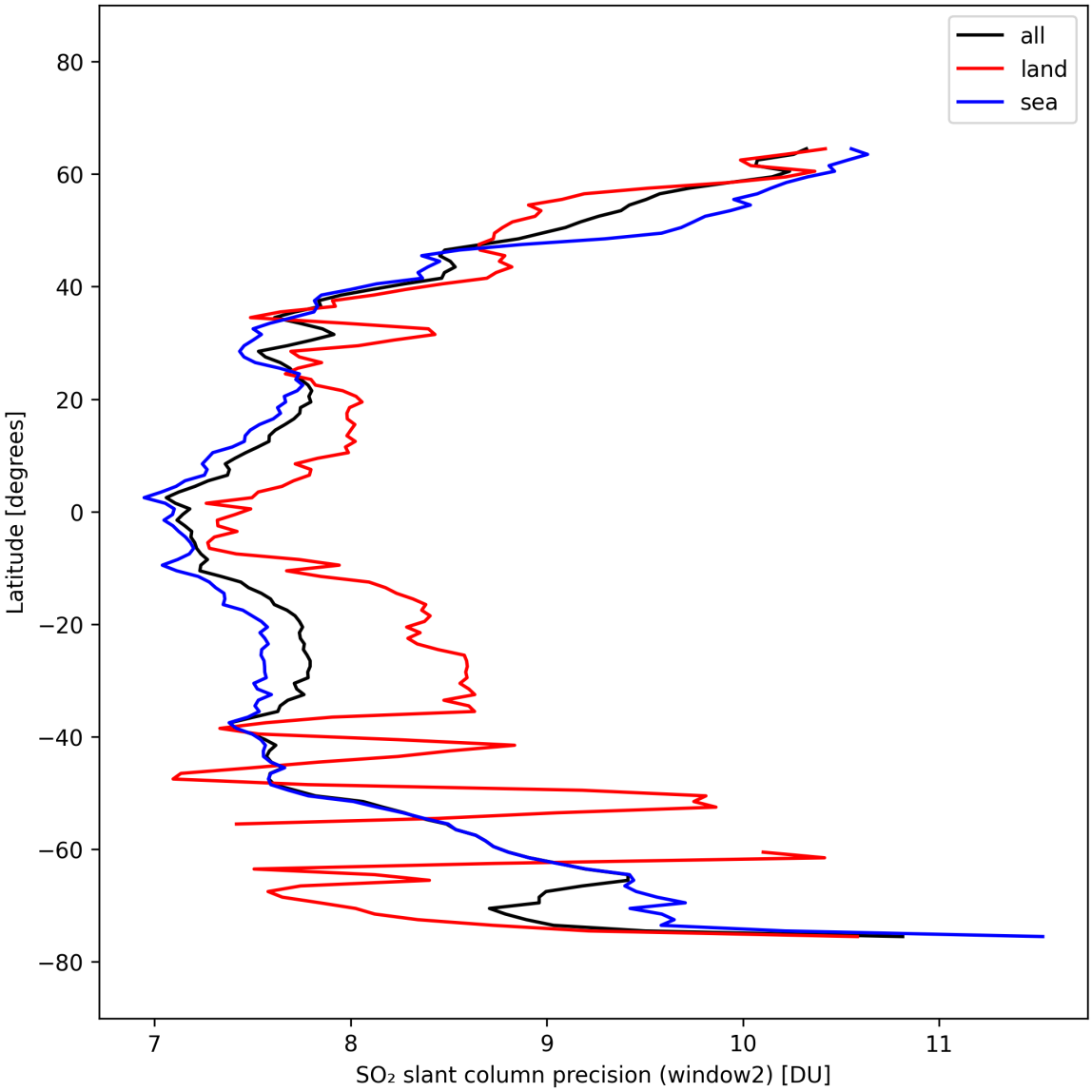

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-03-05 to 2025-03-05.

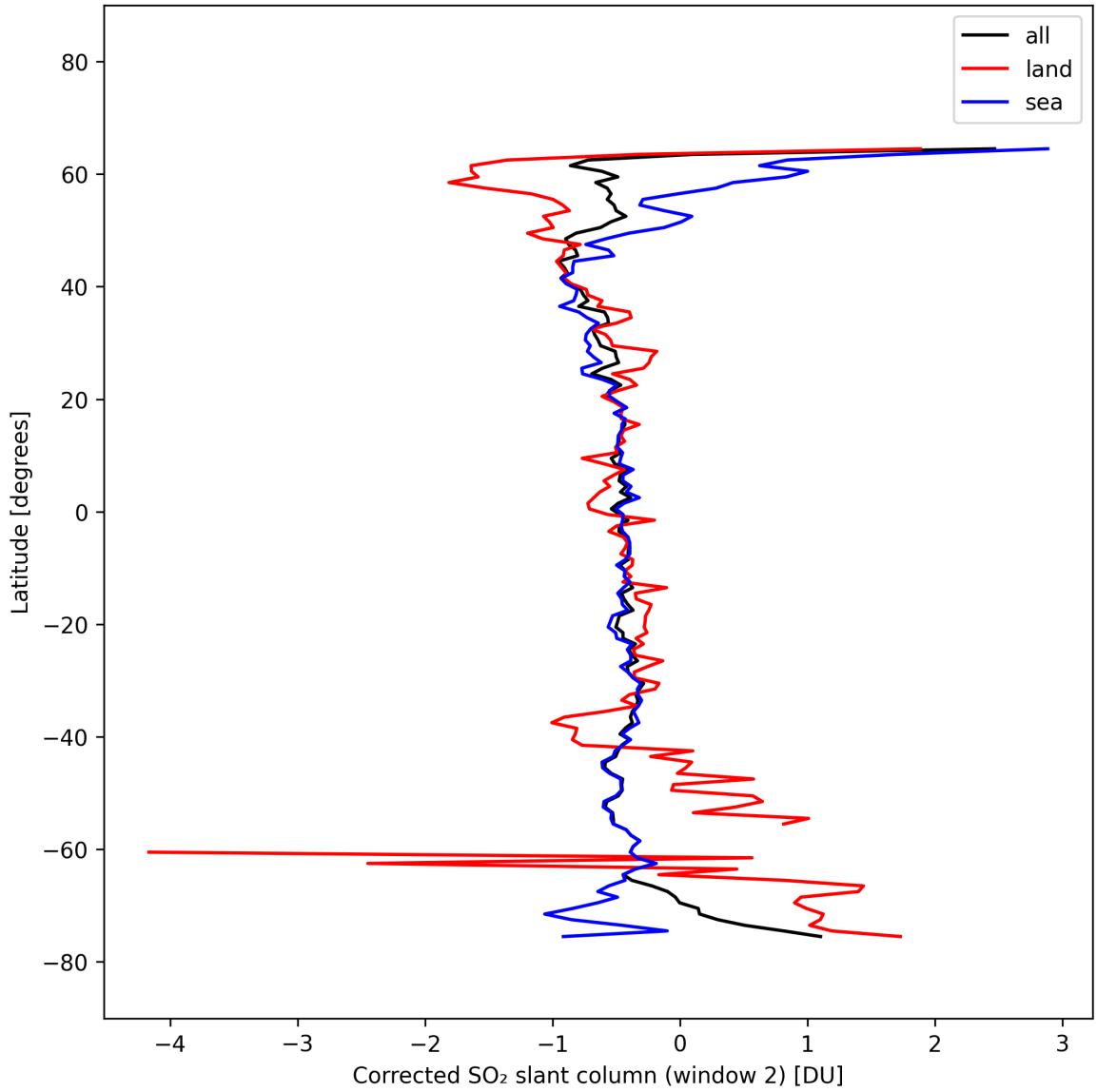

Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-03-05 to 2025-03-05.

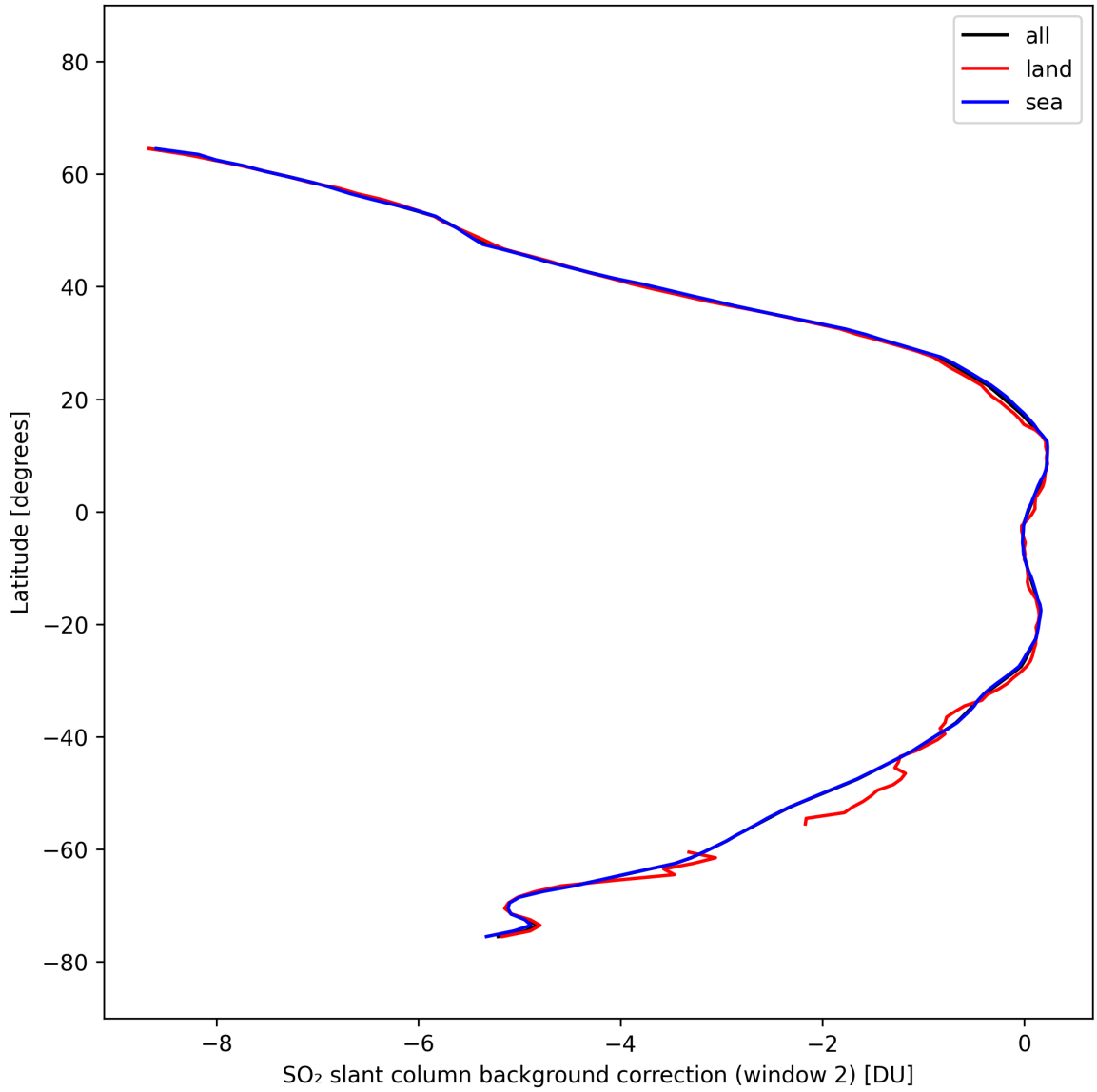

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-03-05 to 2025-03-05.

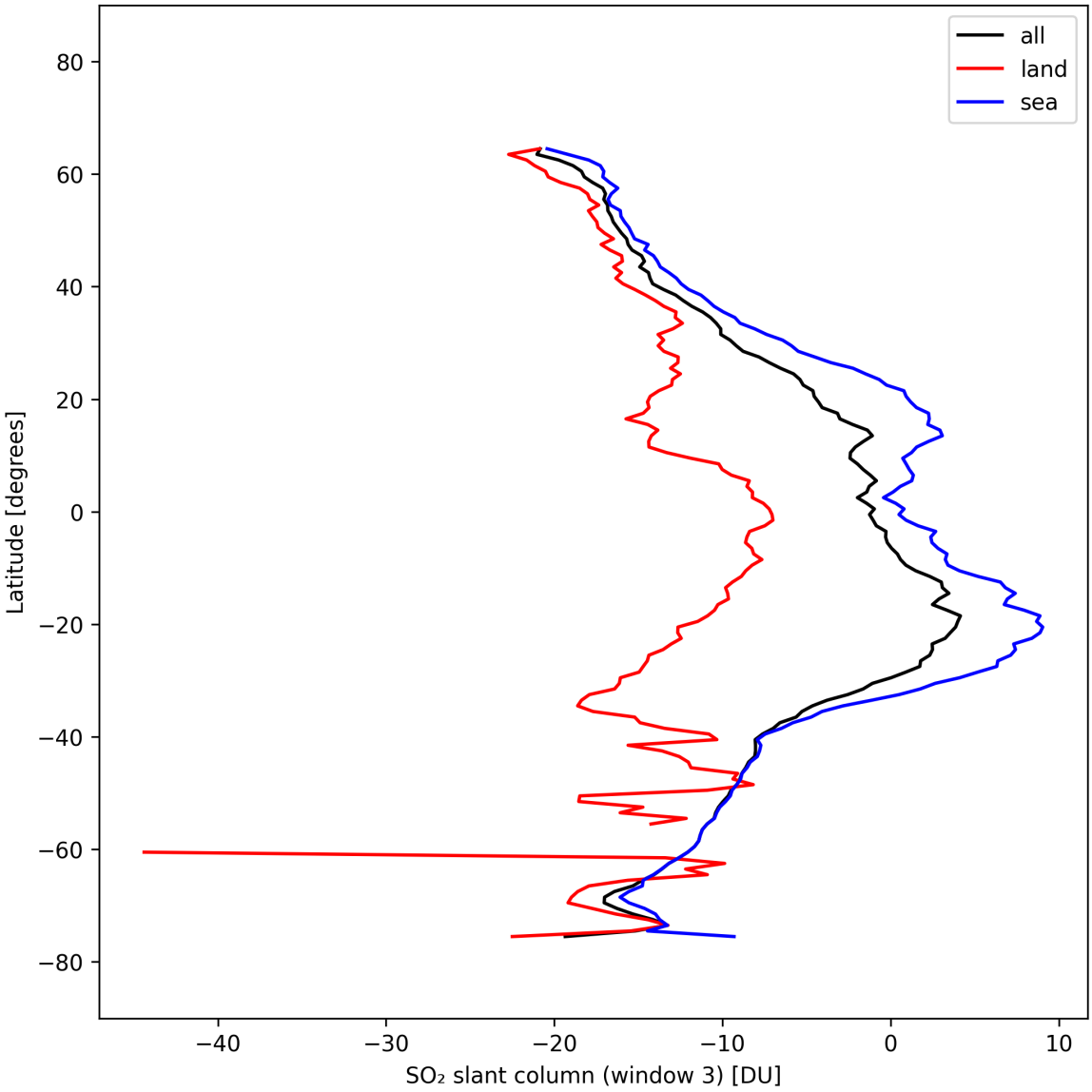

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-03-05 to 2025-03-05.

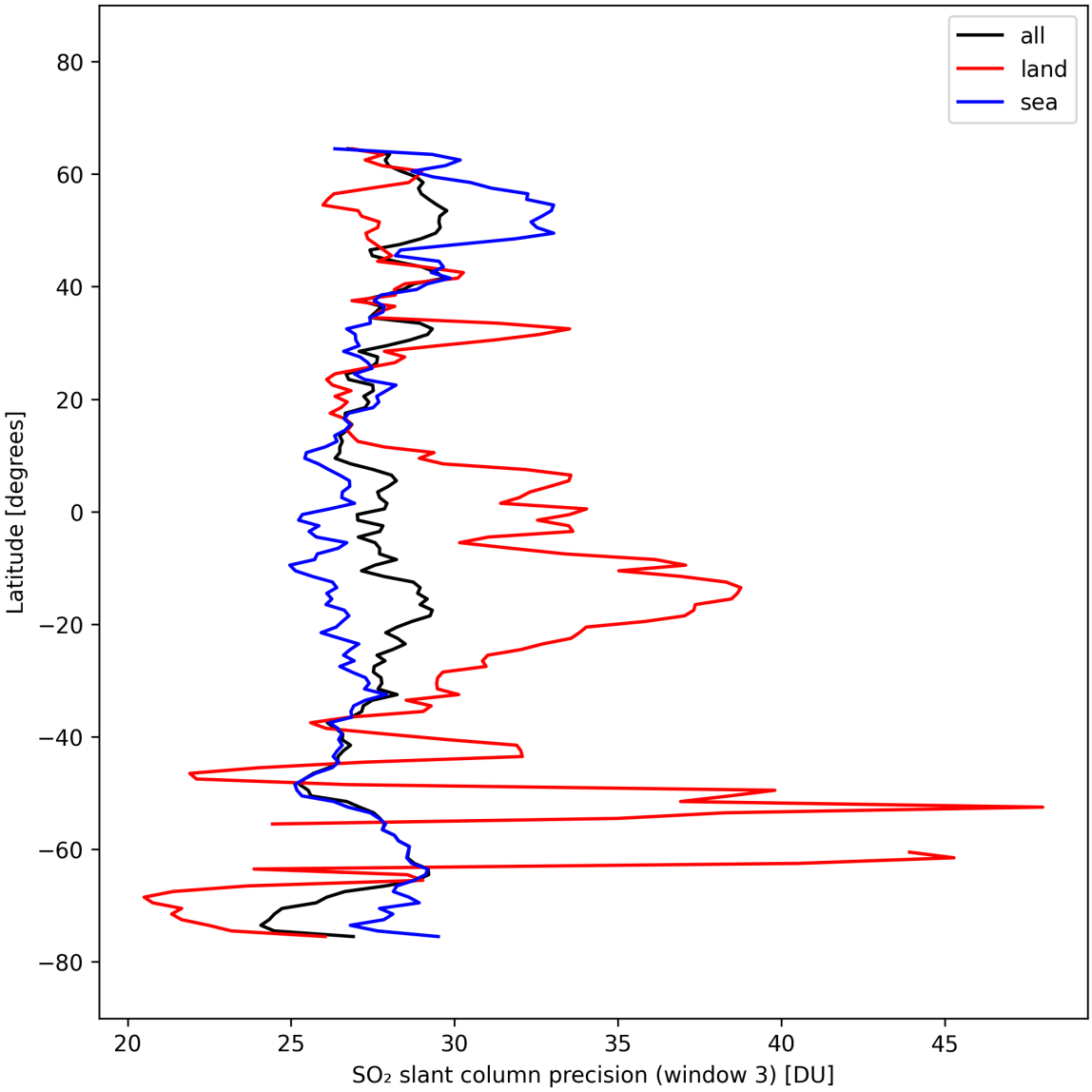

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-03-05 to 2025-03-05.

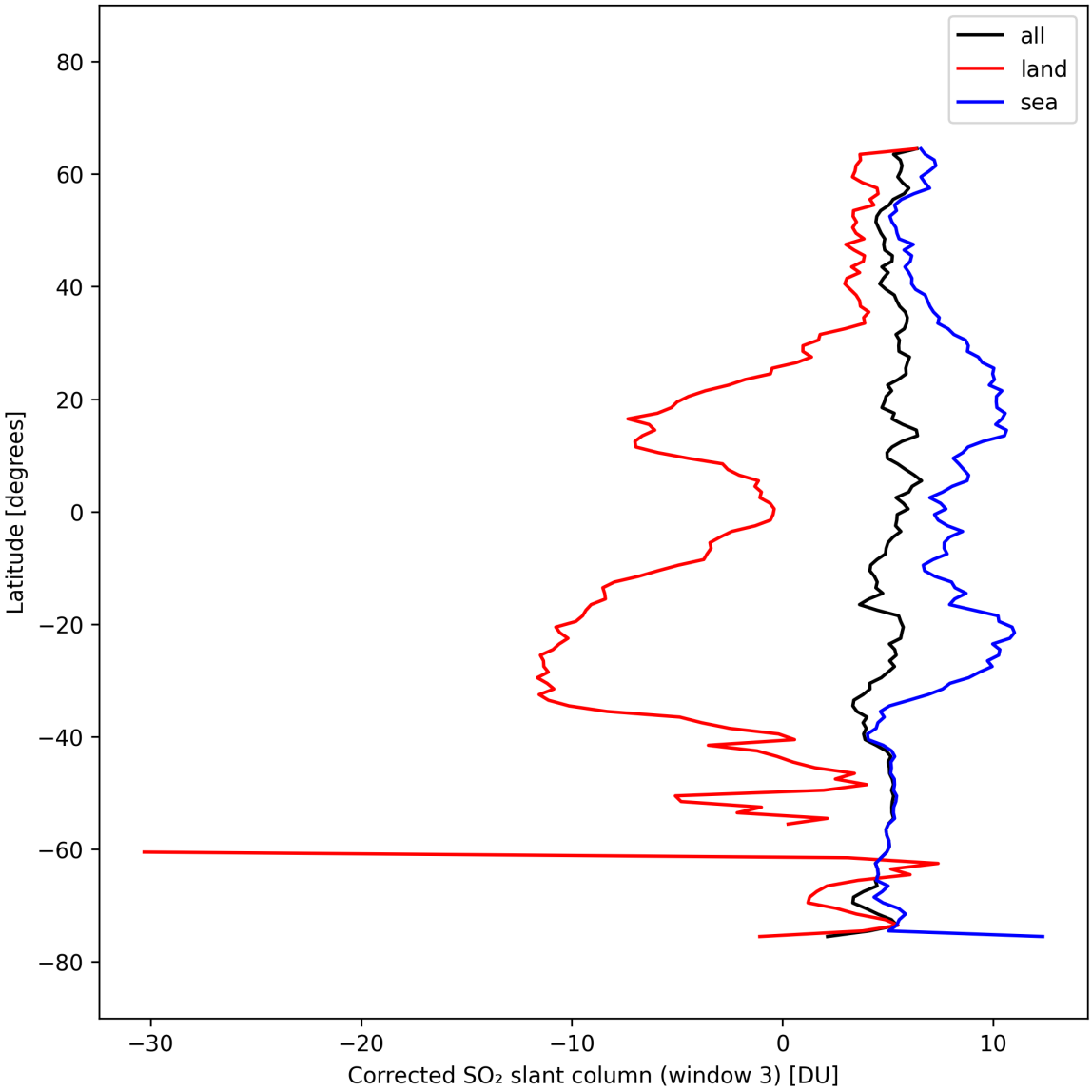

Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-03-05 to 2025-03-05.

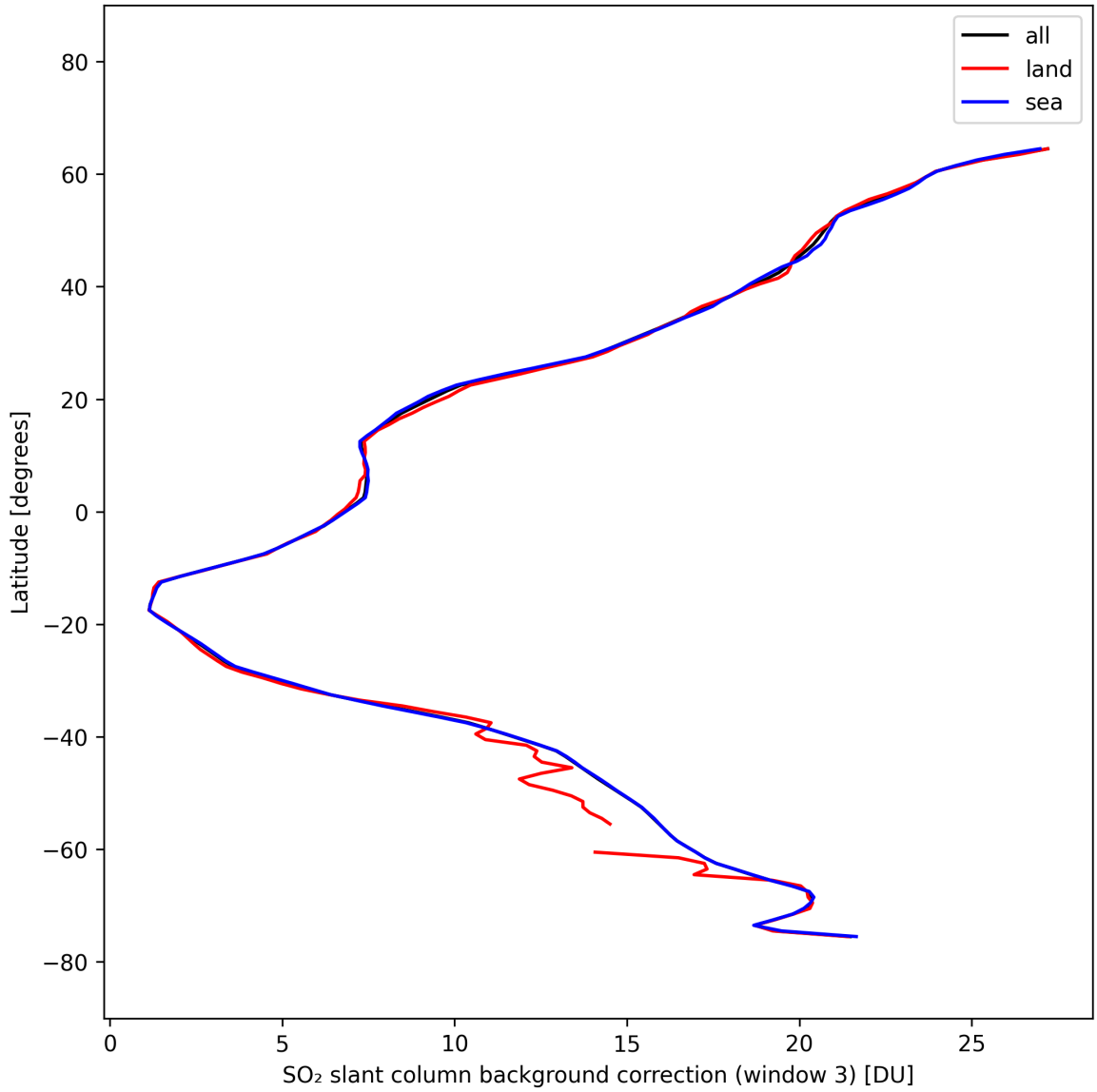

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-03-05 to 2025-03-05.

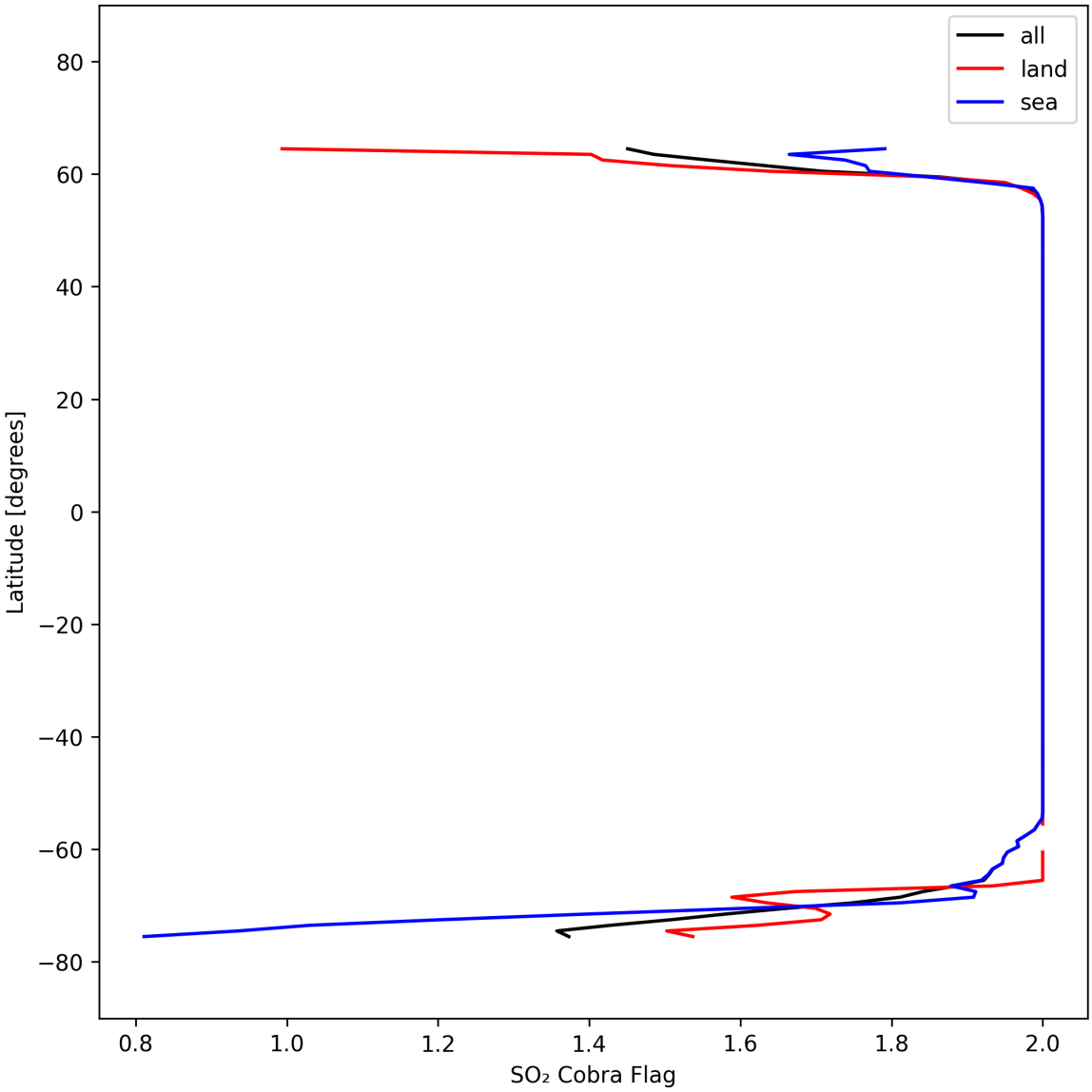

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-03-05 to 2025-03-05.

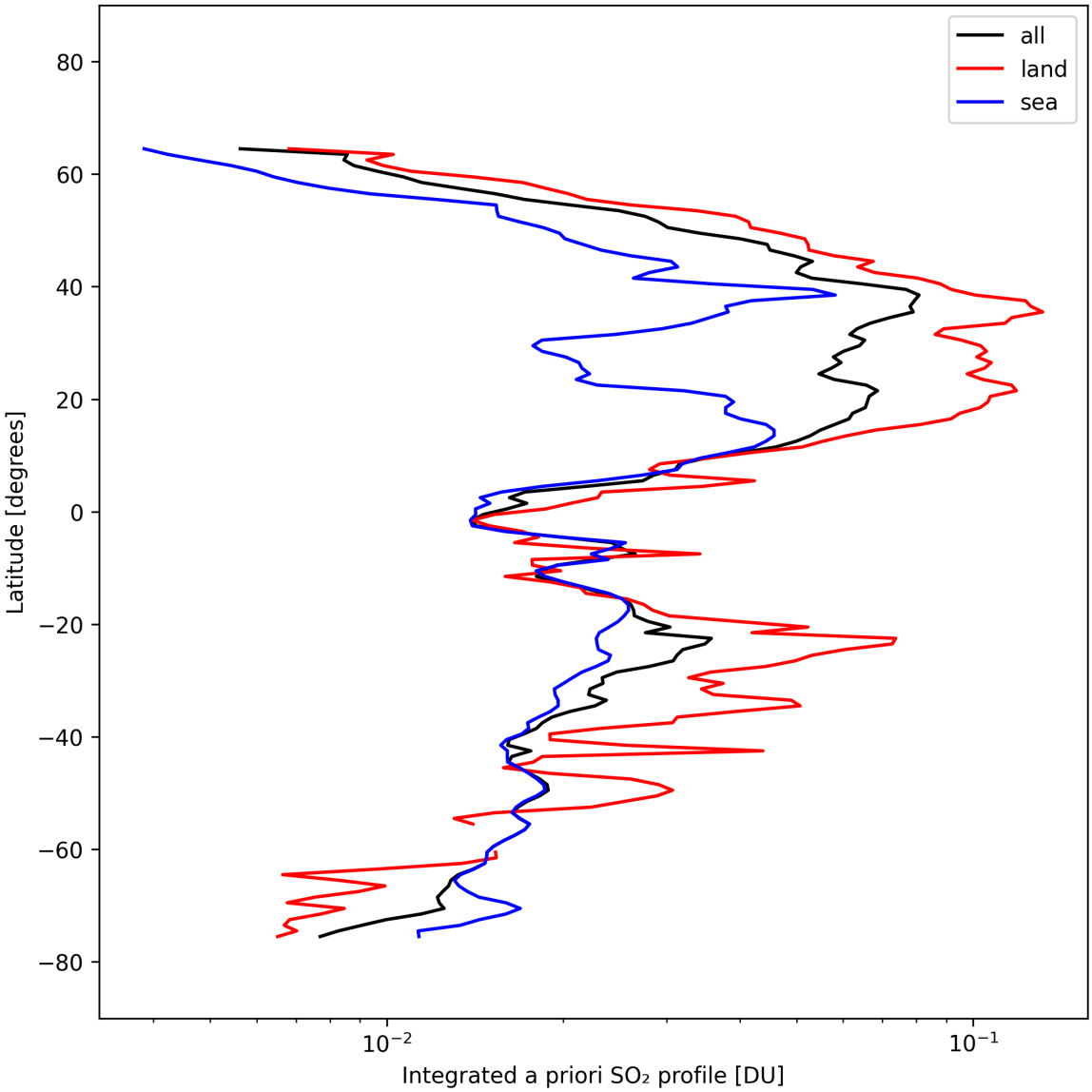

Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-03-05 to 2025-03-05.

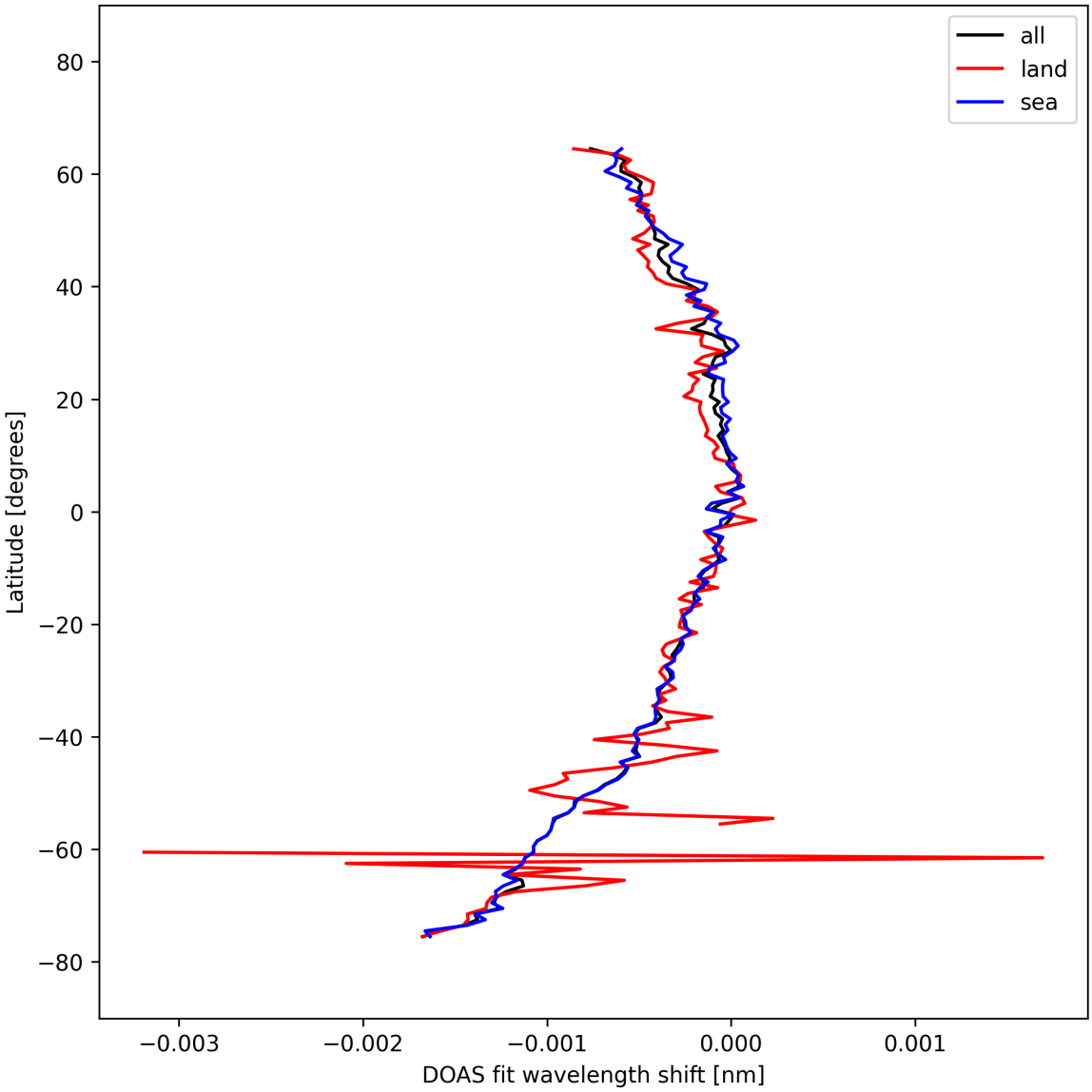

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-03-05 to 2025-03-05.

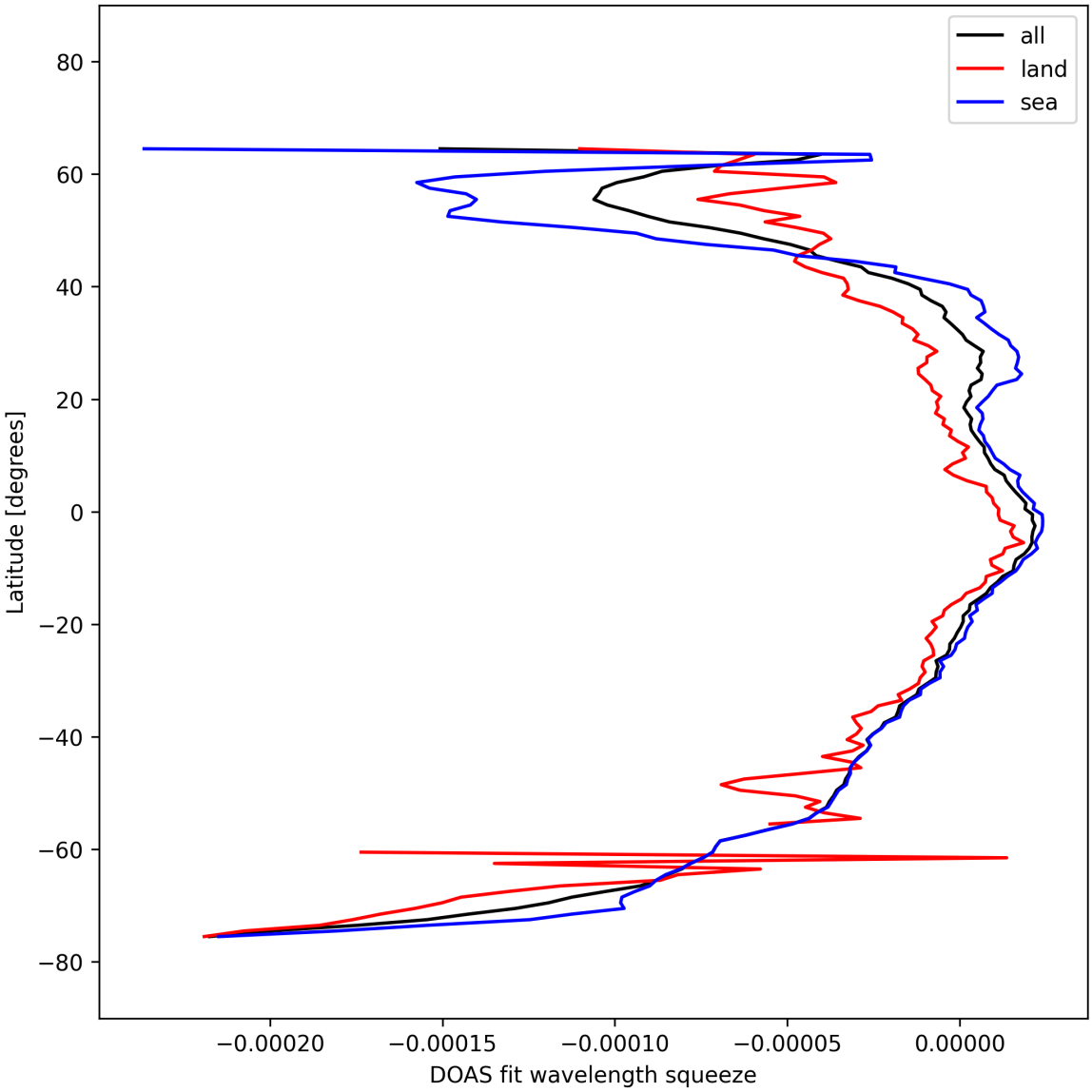

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-03-05 to 2025-03-05.

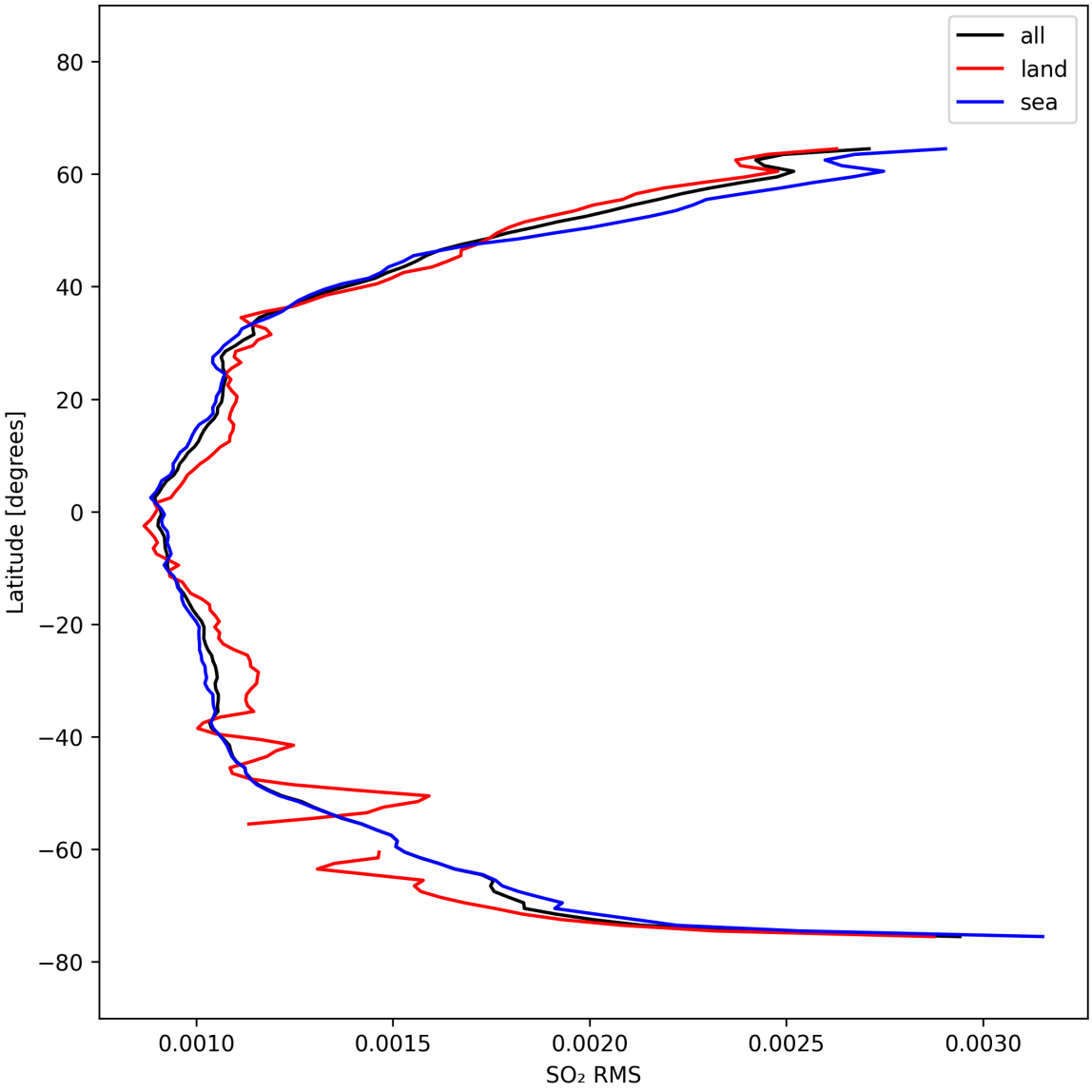

Figure 52: Zonal average of "SO_2 RMS" for 2025-03-05 to 2025-03-05.

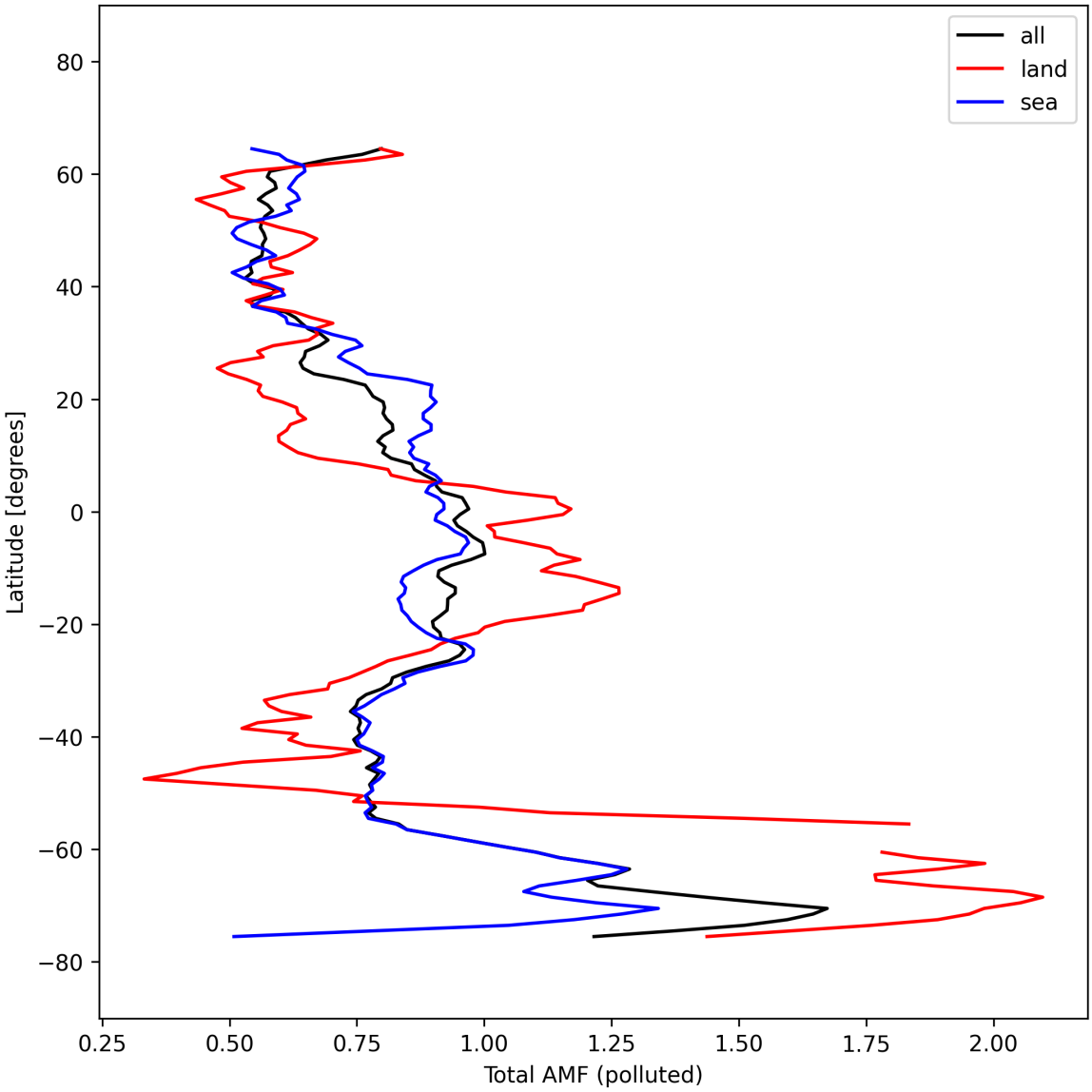

Figure 53: Zonal average of “Total AMF (polluted)” for 2025-03-05 to 2025-03-05.

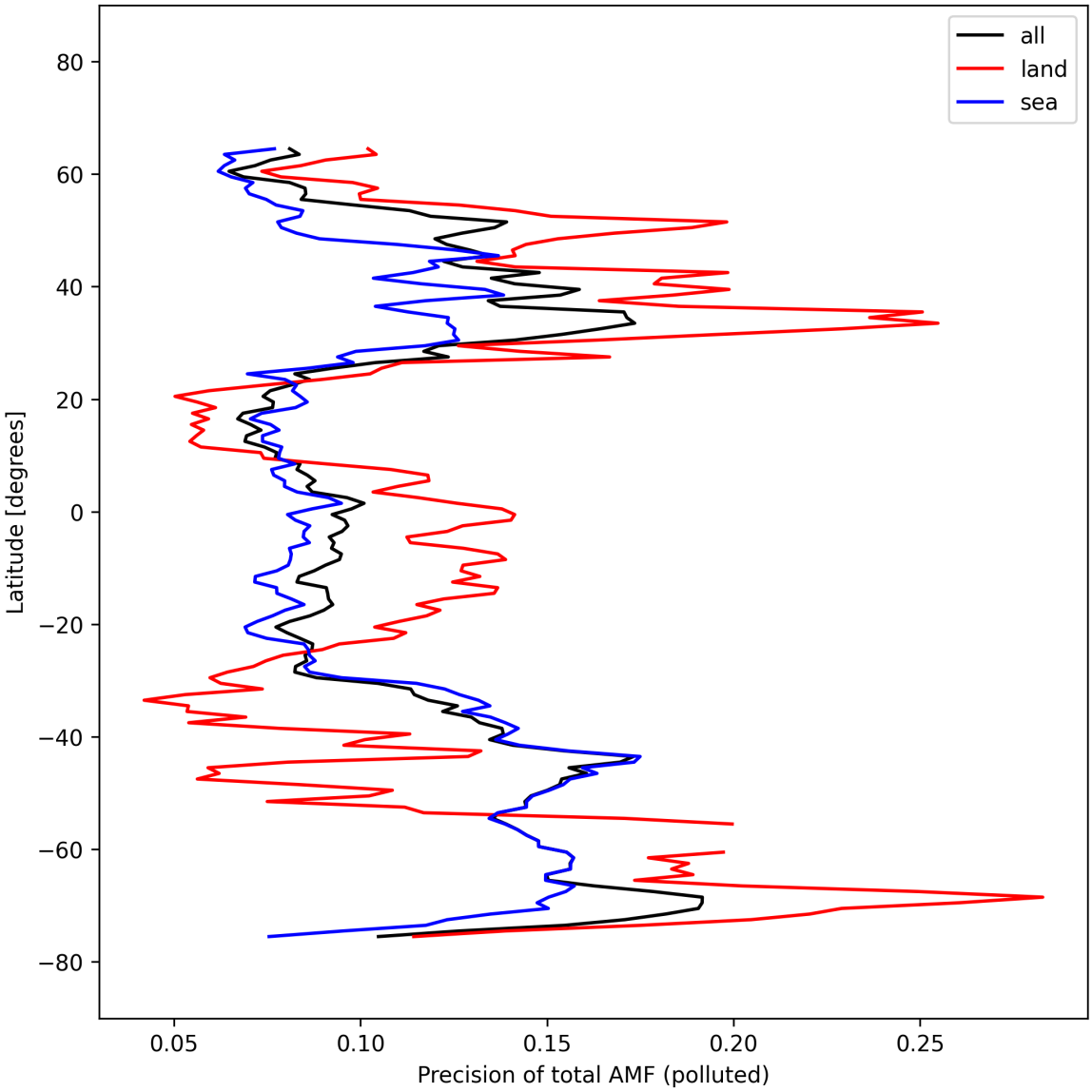

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-03-05 to 2025-03-05.

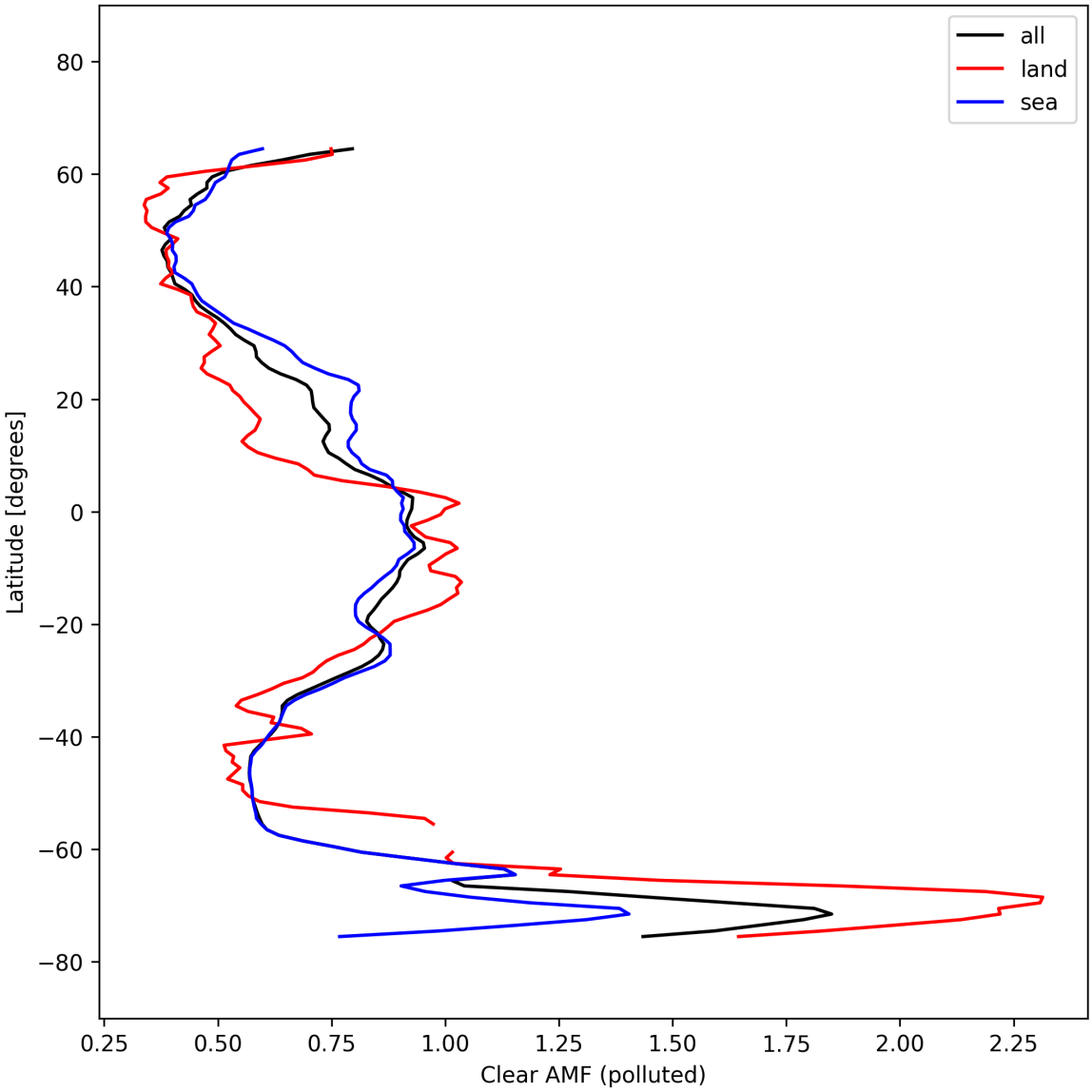

Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-03-05 to 2025-03-05.

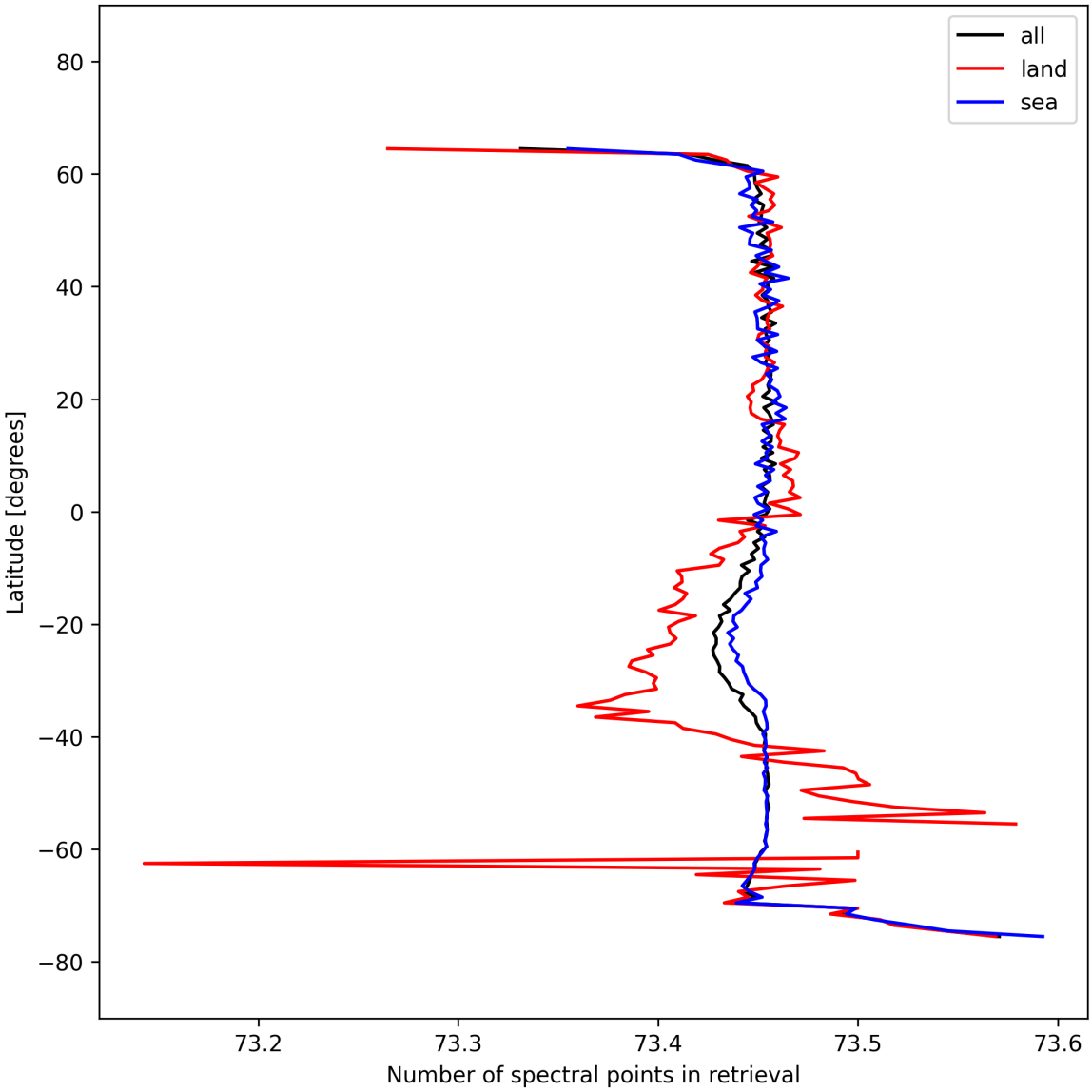

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-03-05 to 2025-03-05.

8 Histograms

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

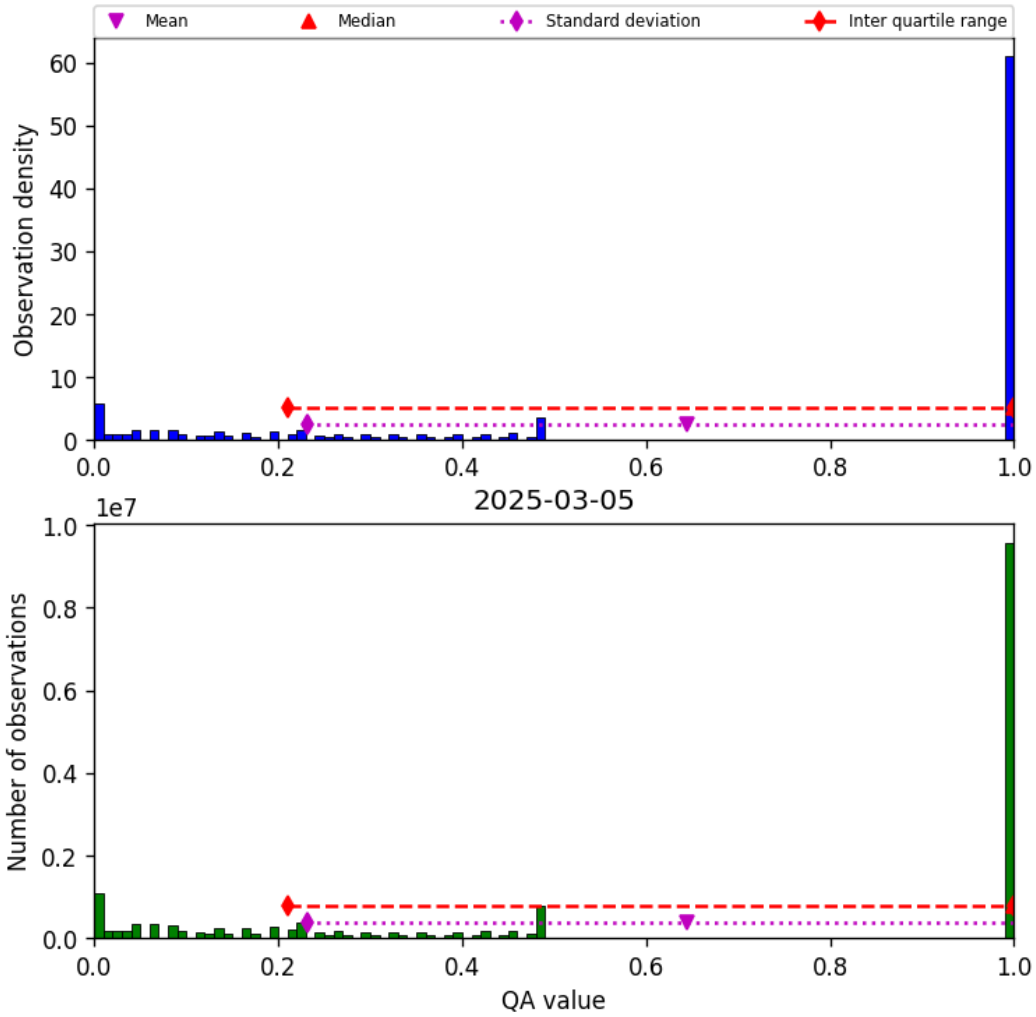

Figure 57: Histogram of “QA value” for 2025-03-05 to 2025-03-05

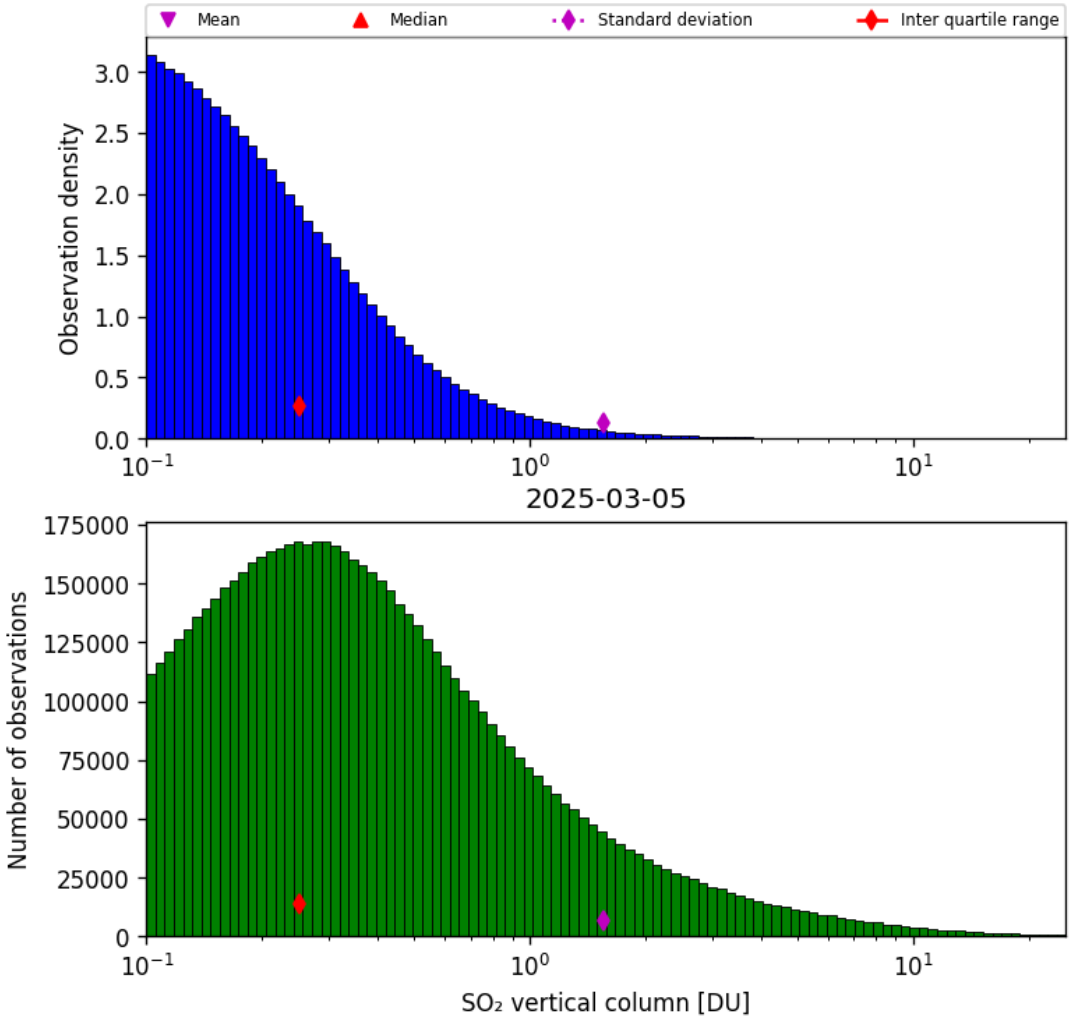

Figure 58: Histogram of "SO_2 vertical column" for 2025-03-05 to 2025-03-05

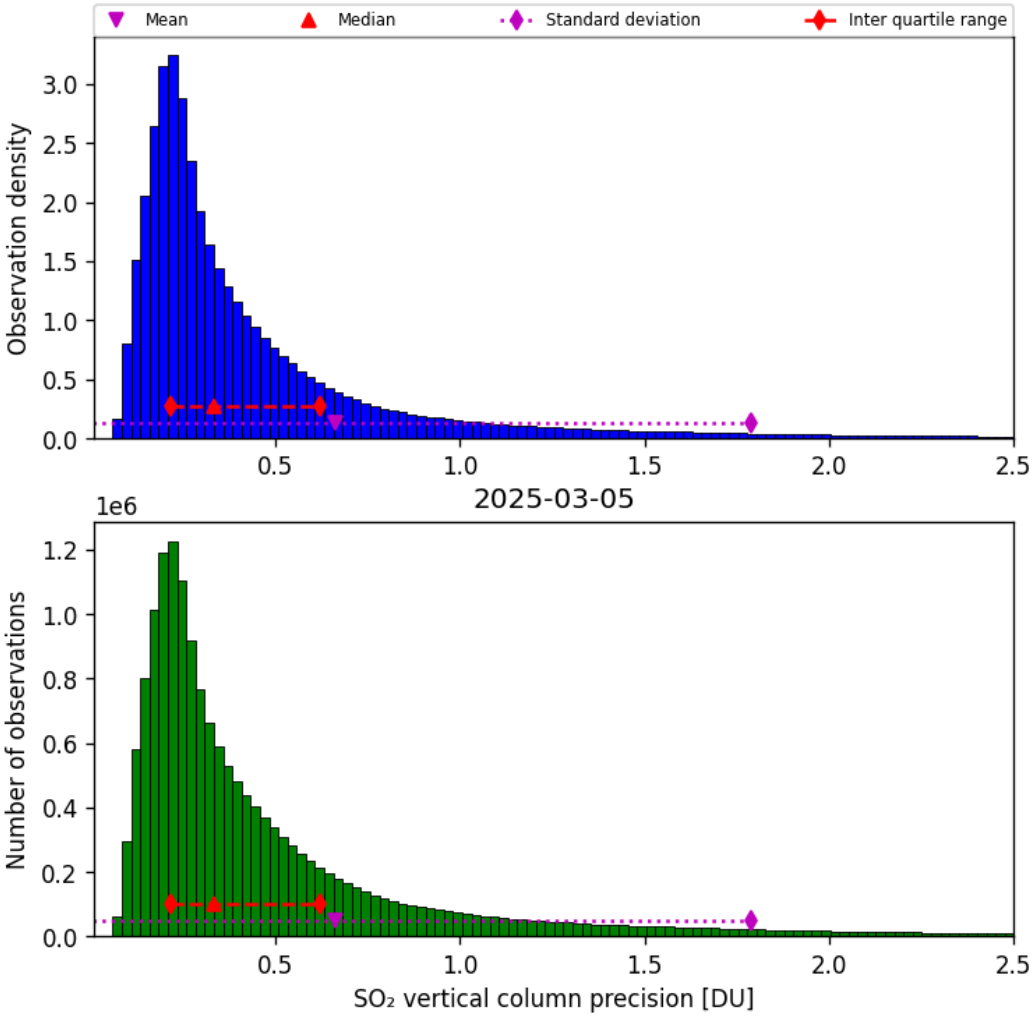

Figure 59: Histogram of "SO_2 vertical column precision" for 2025-03-05 to 2025-03-05

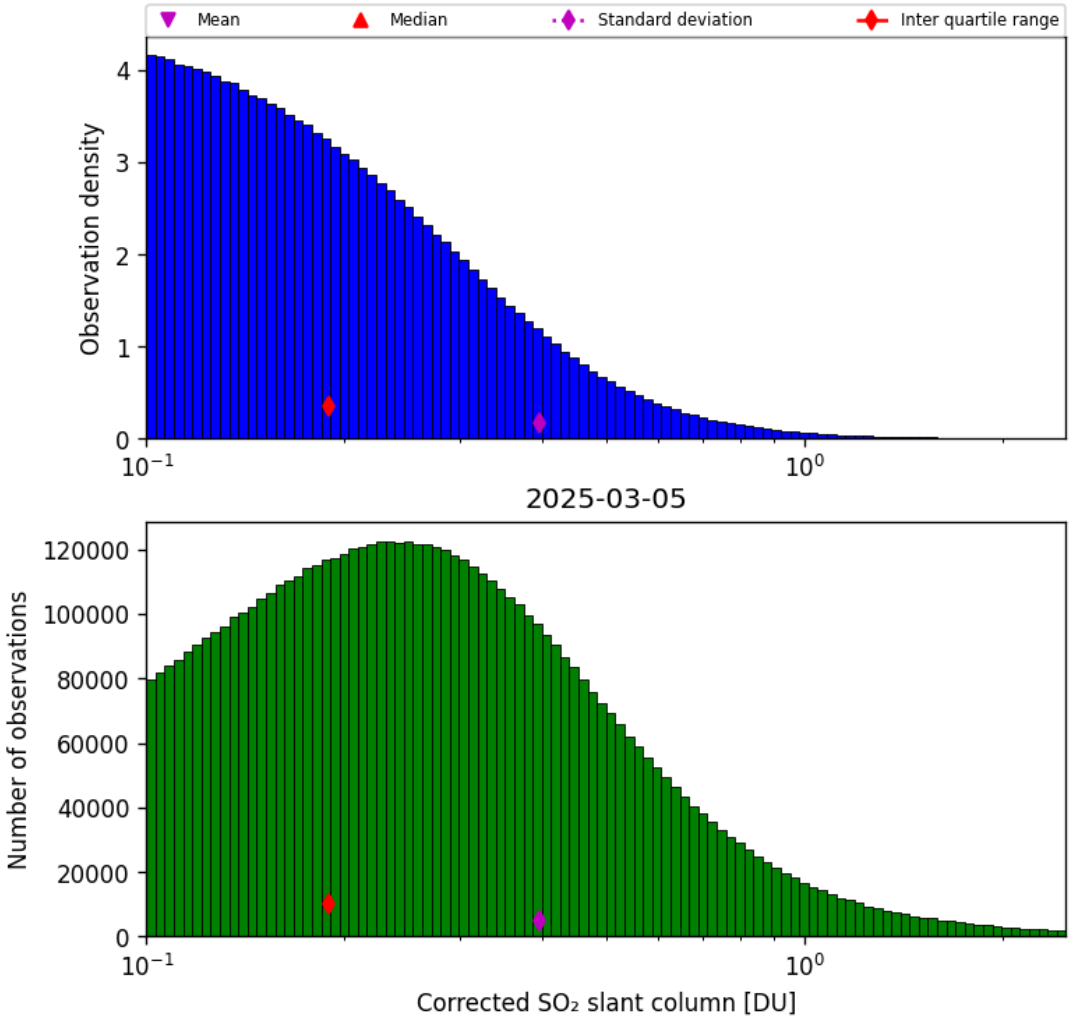

Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-03-05 to 2025-03-05

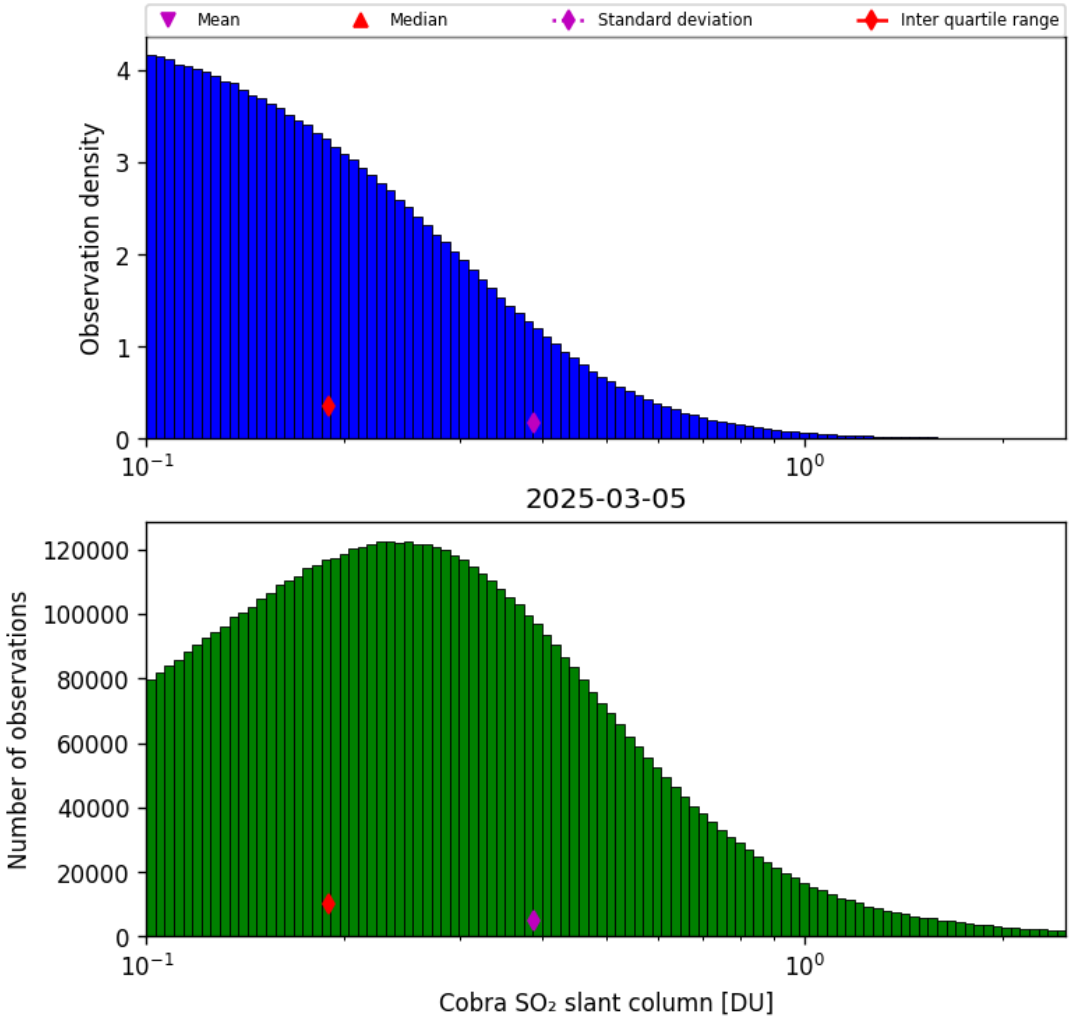

Figure 61: Histogram of “Cobra SO_2 slant column” for 2025-03-05 to 2025-03-05

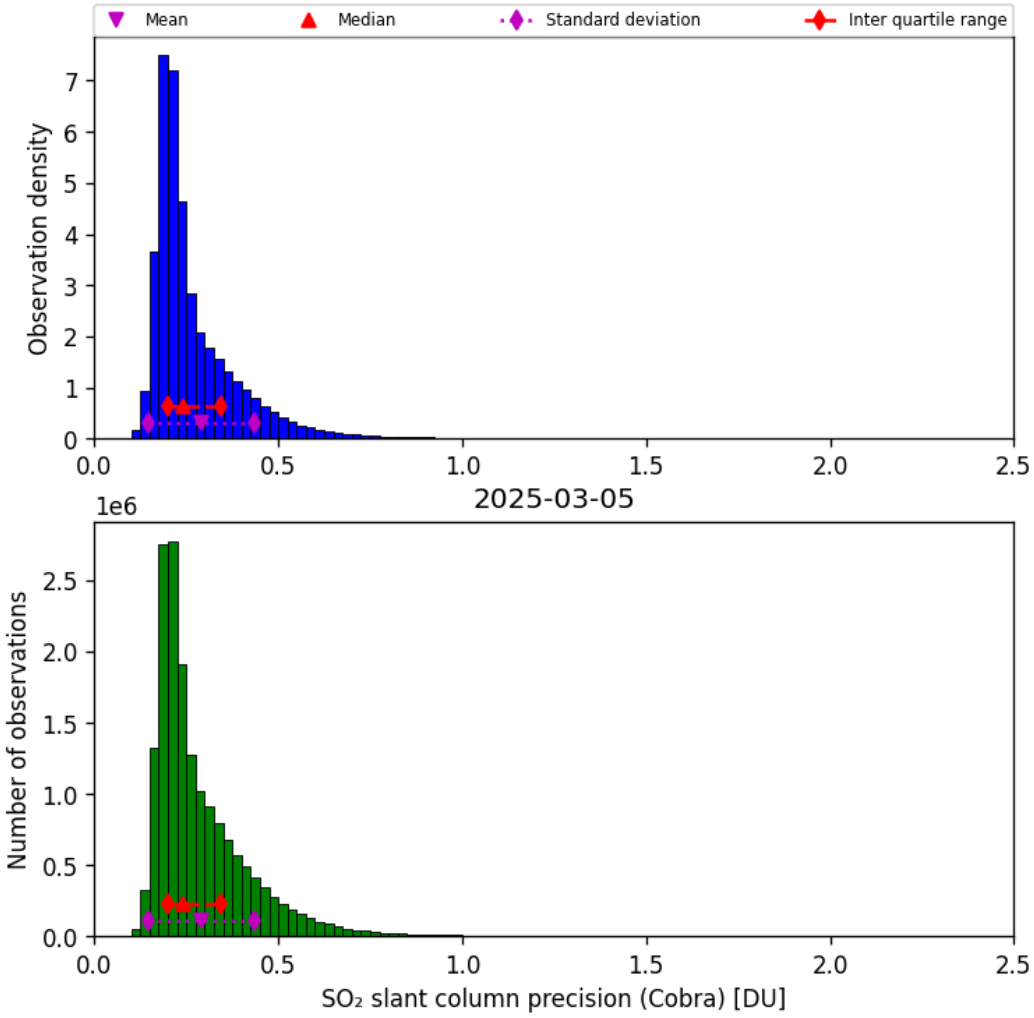

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-03-05 to 2025-03-05

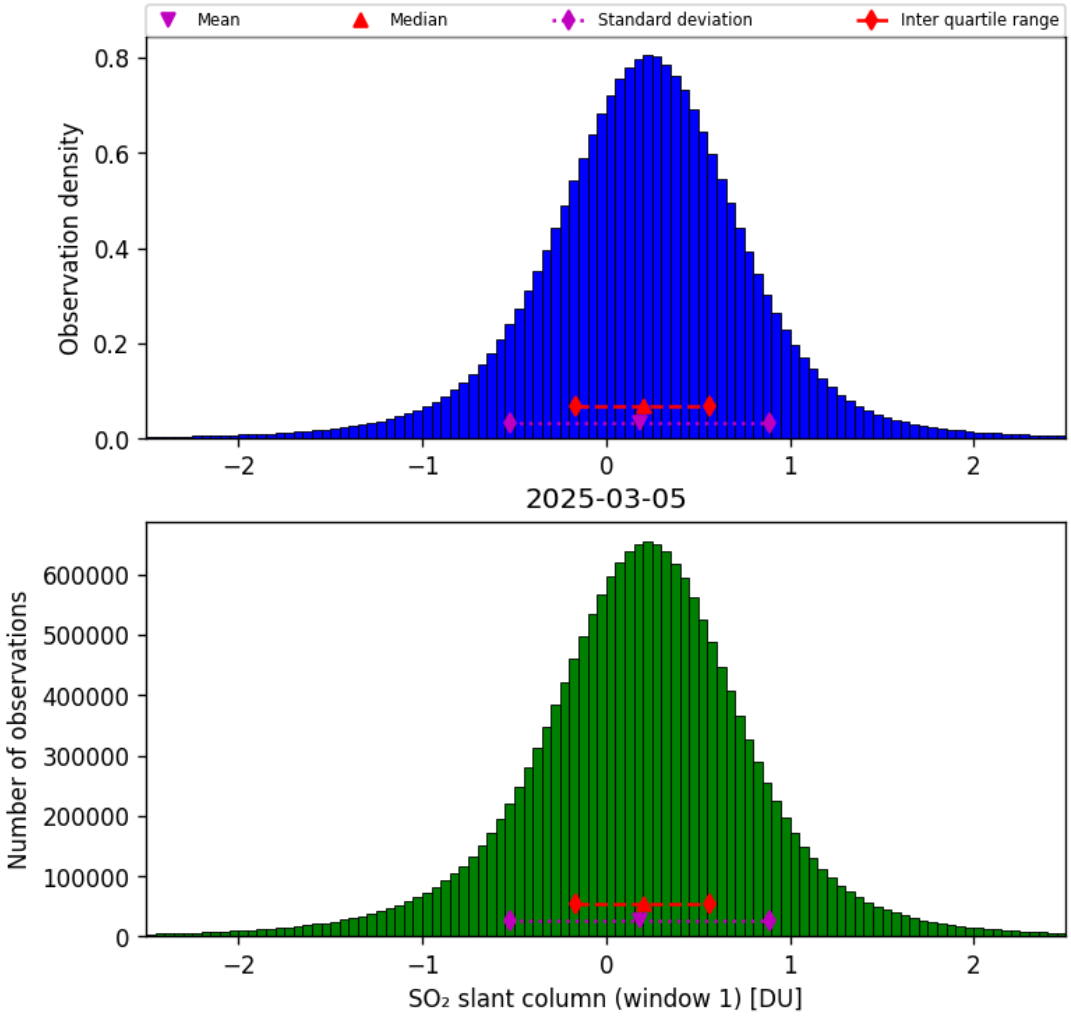

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-03-05 to 2025-03-05

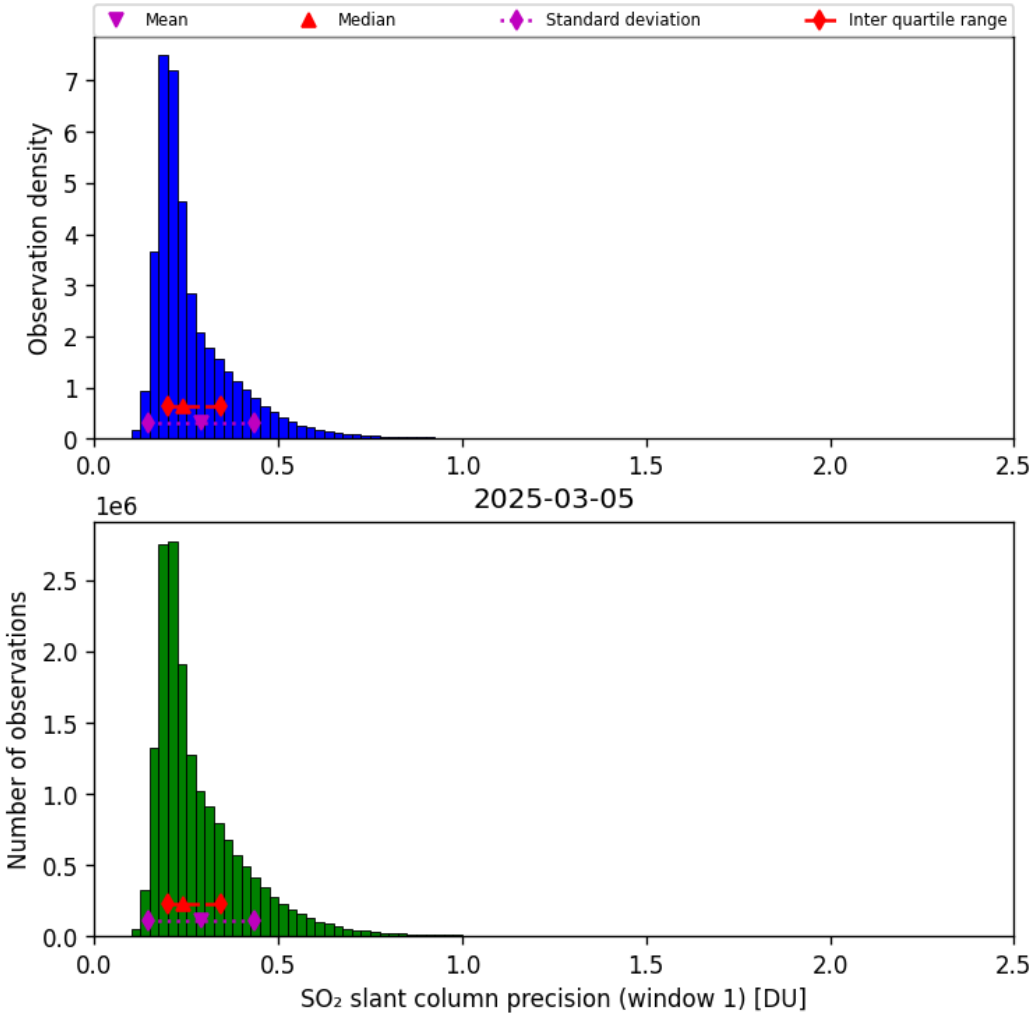

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-03-05 to 2025-03-05

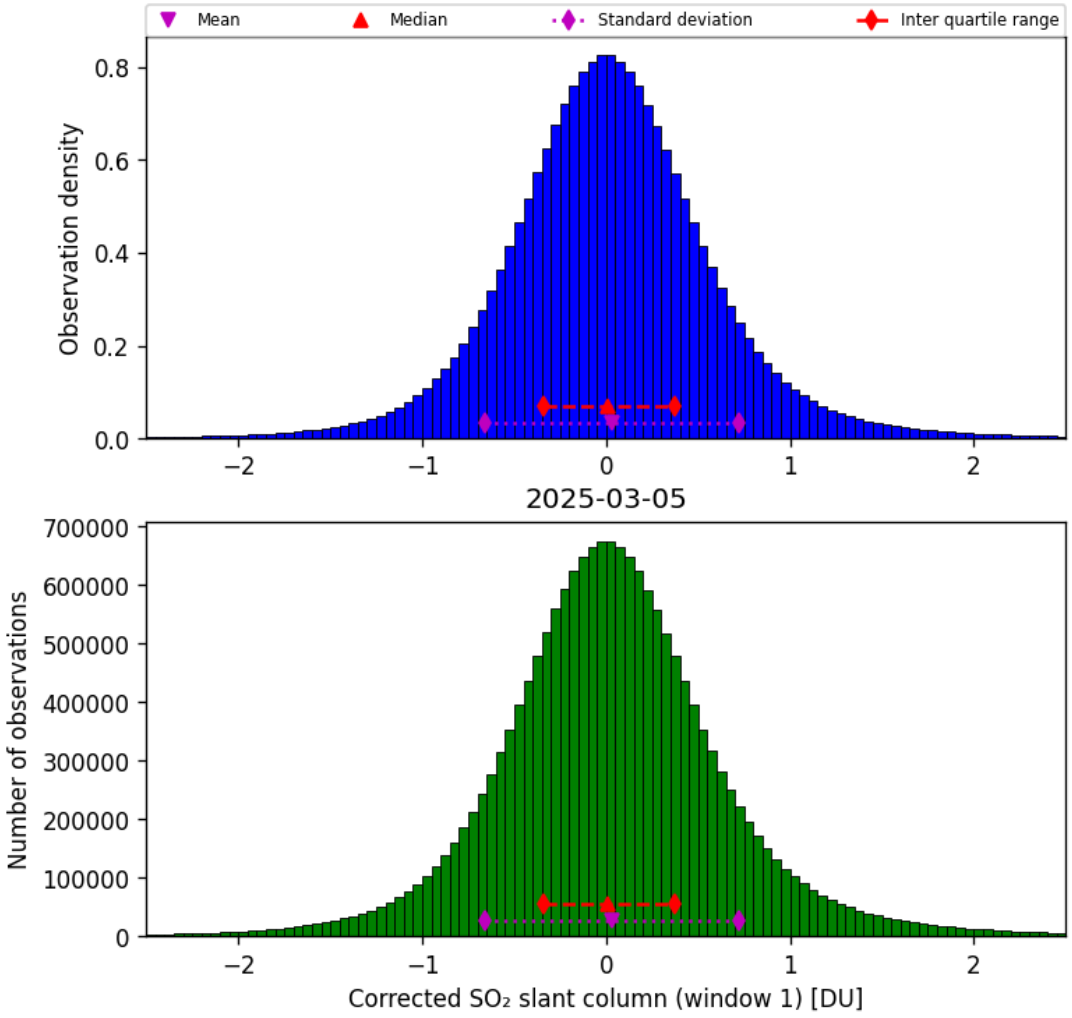

Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-03-05 to 2025-03-05

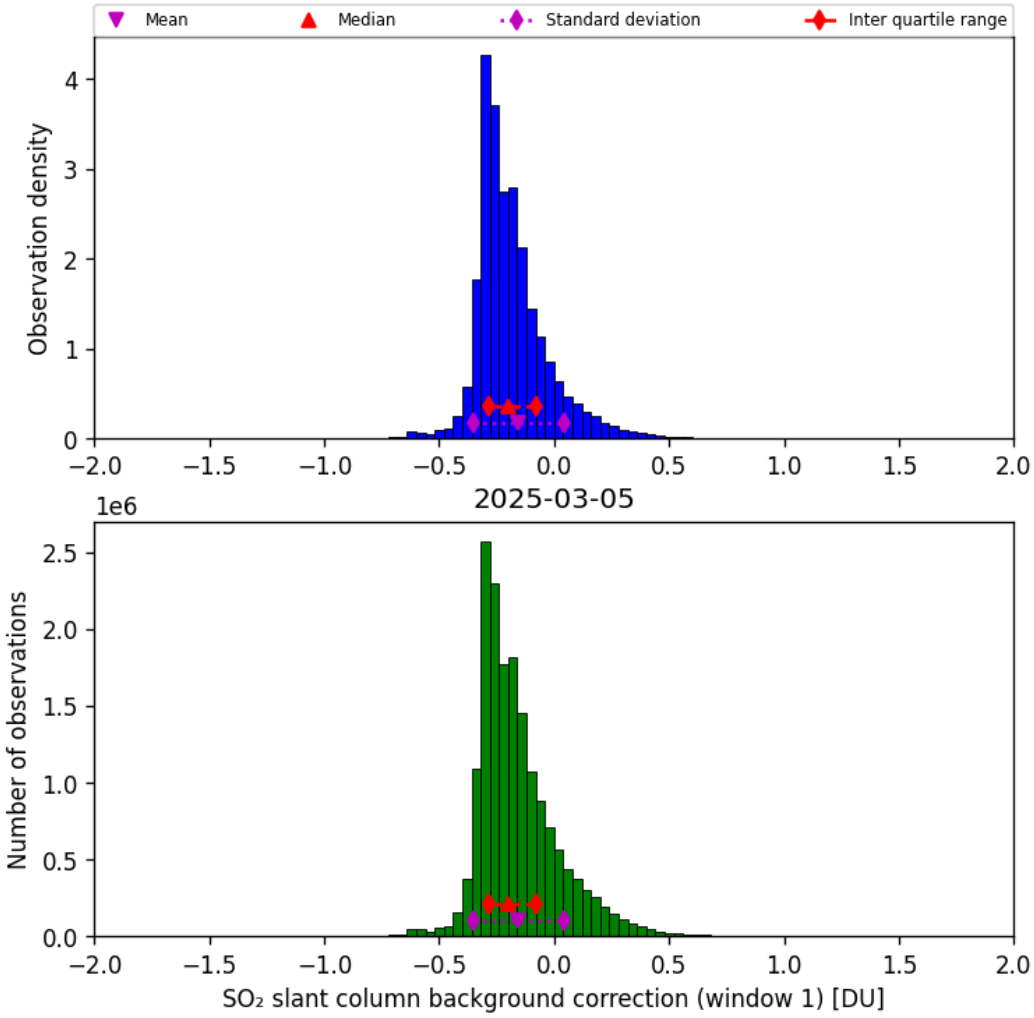

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-03-05 to 2025-03-05

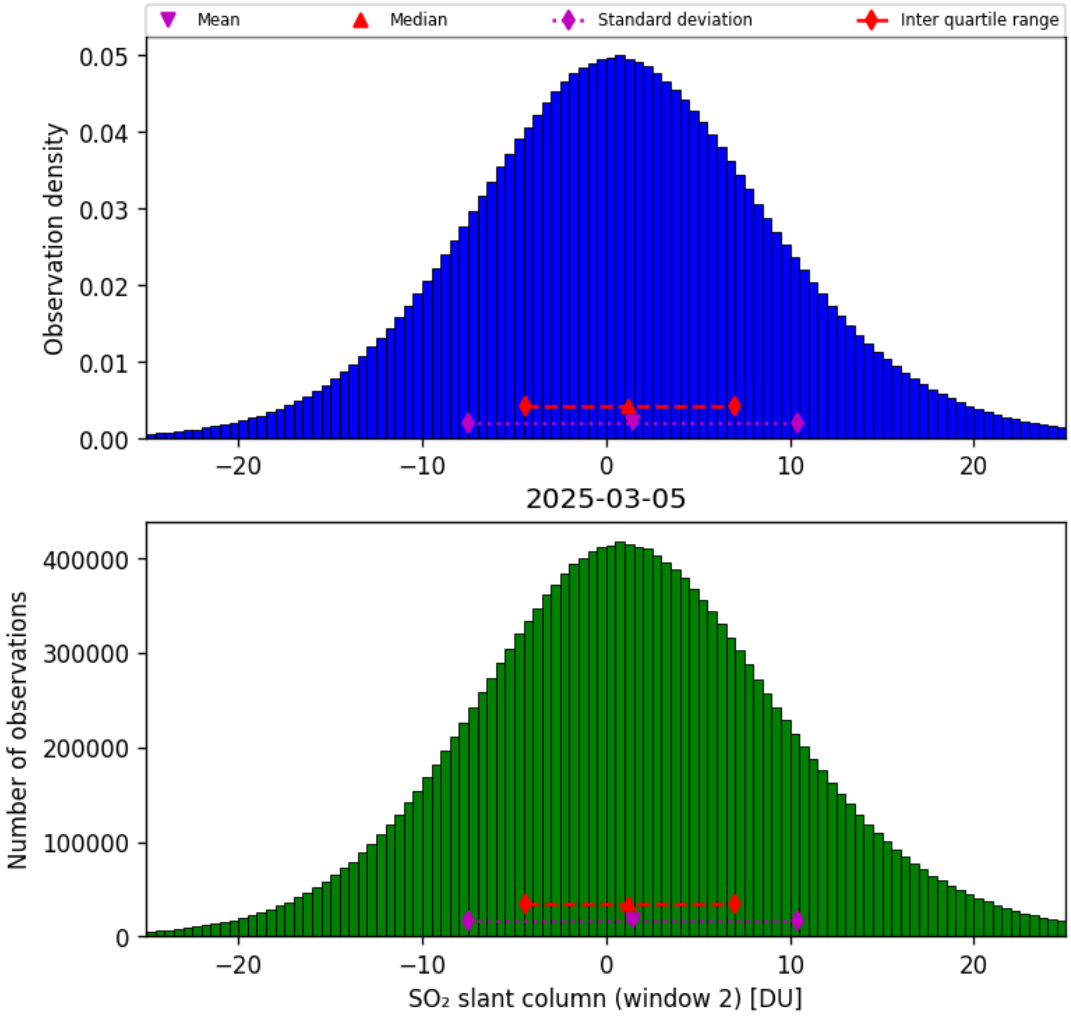

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-03-05 to 2025-03-05

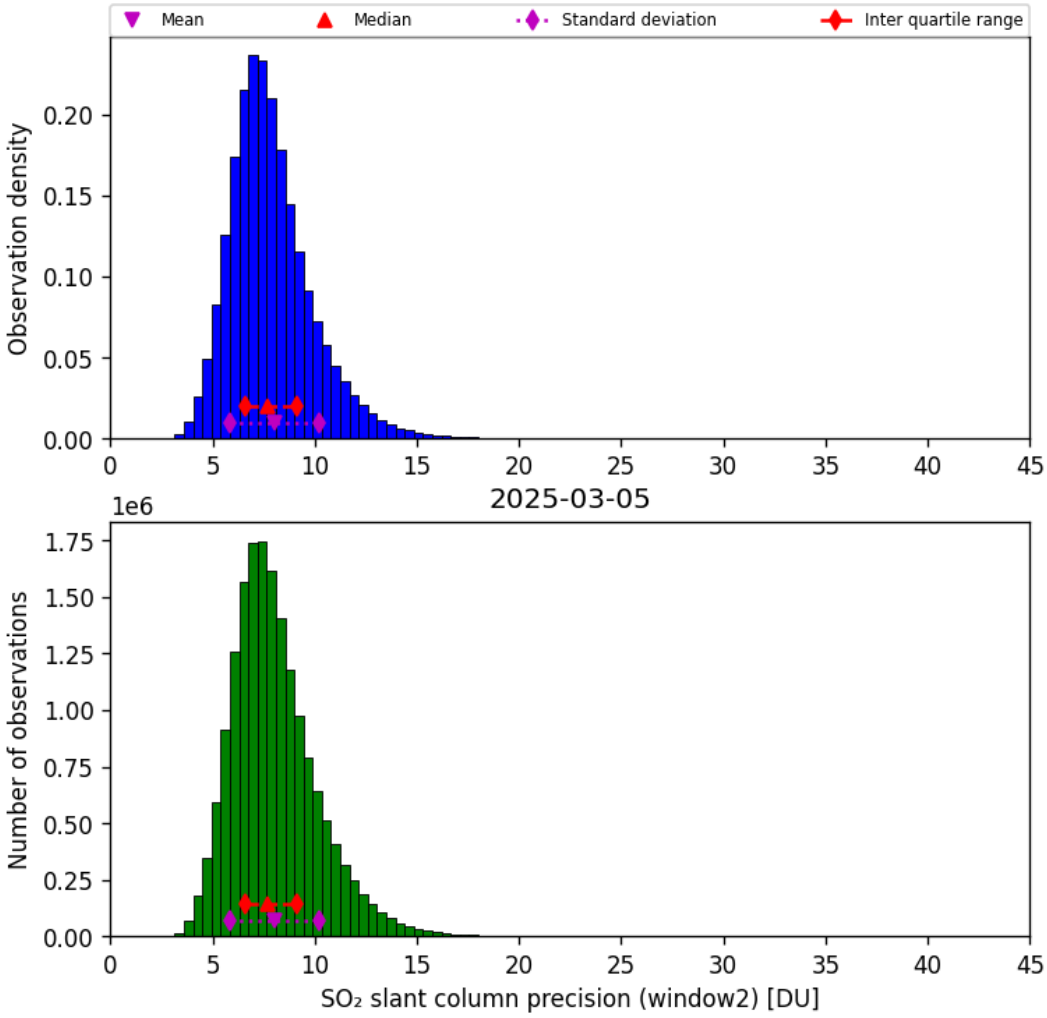

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-03-05 to 2025-03-05

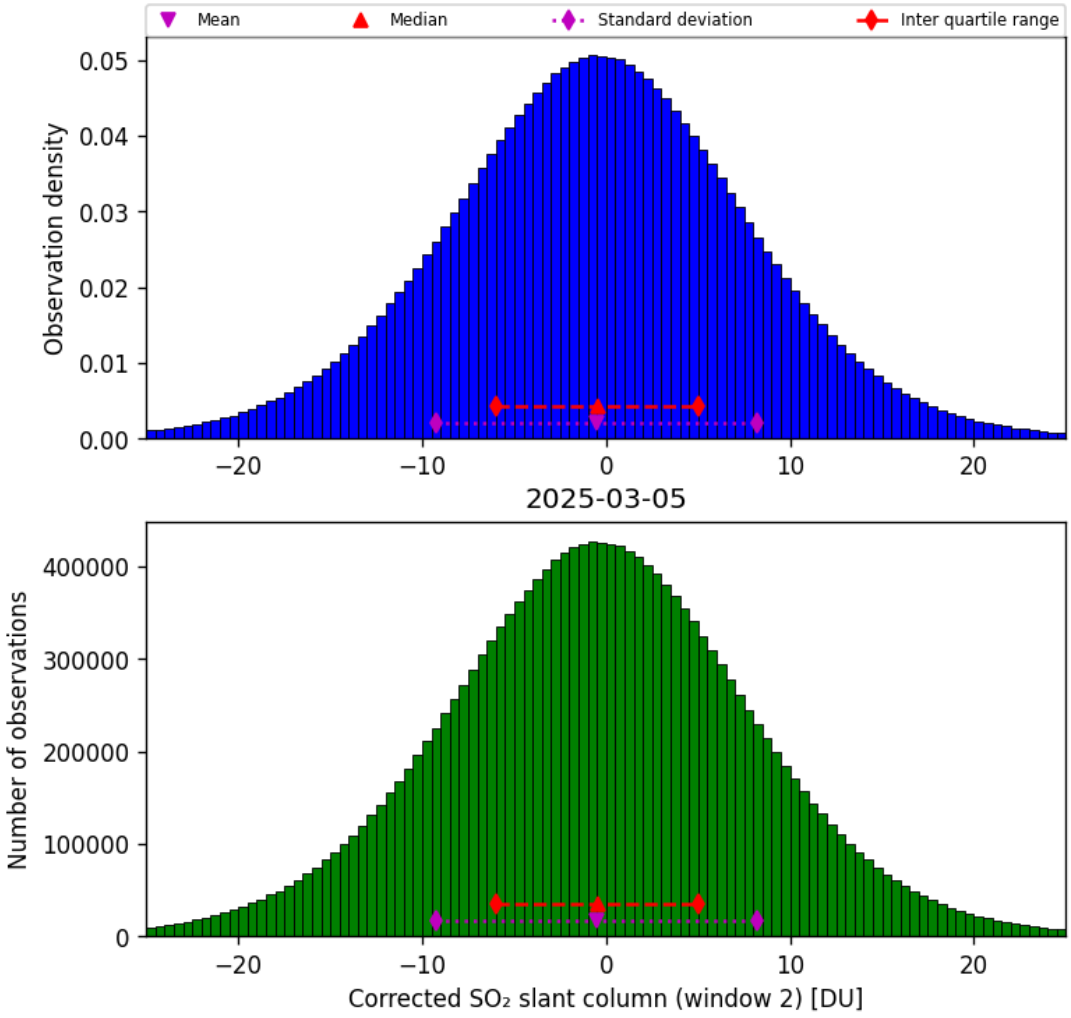

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-03-05 to 2025-03-05

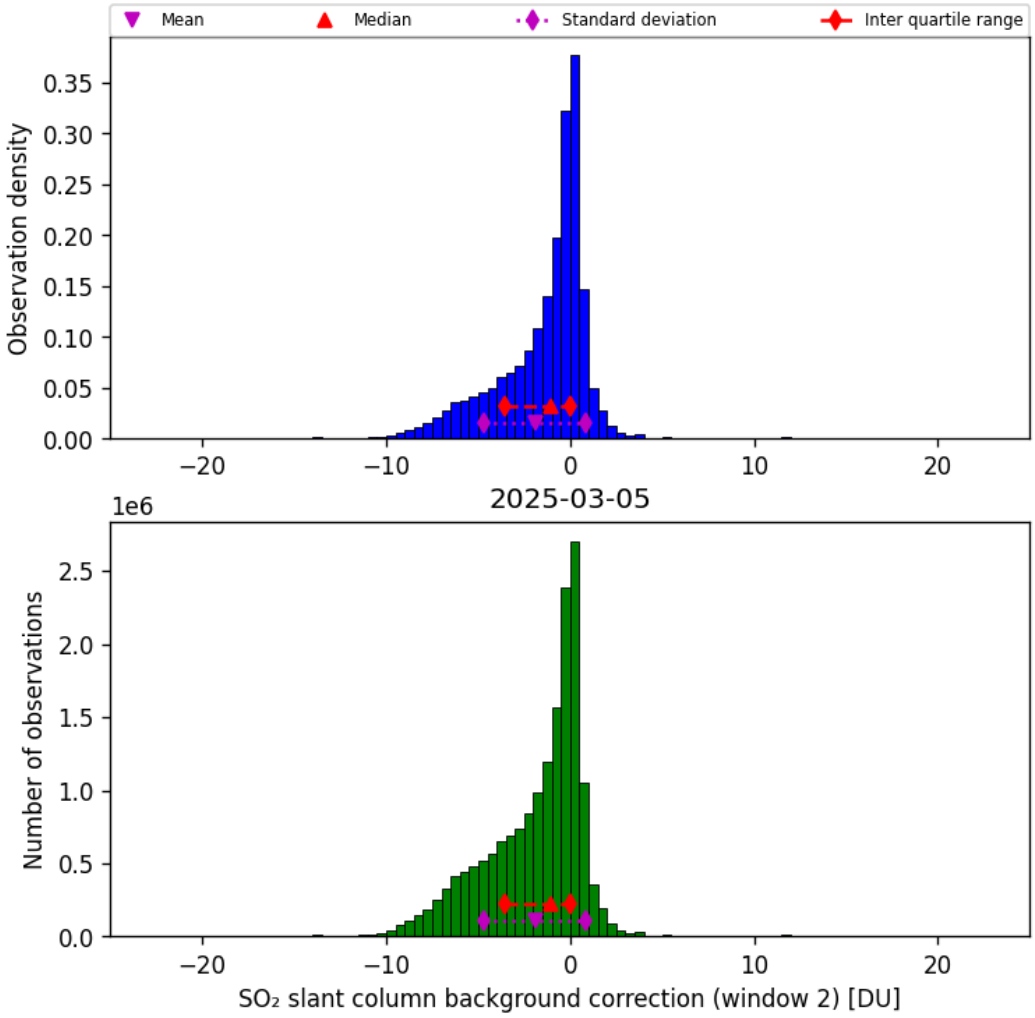

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-03-05 to 2025-03-05

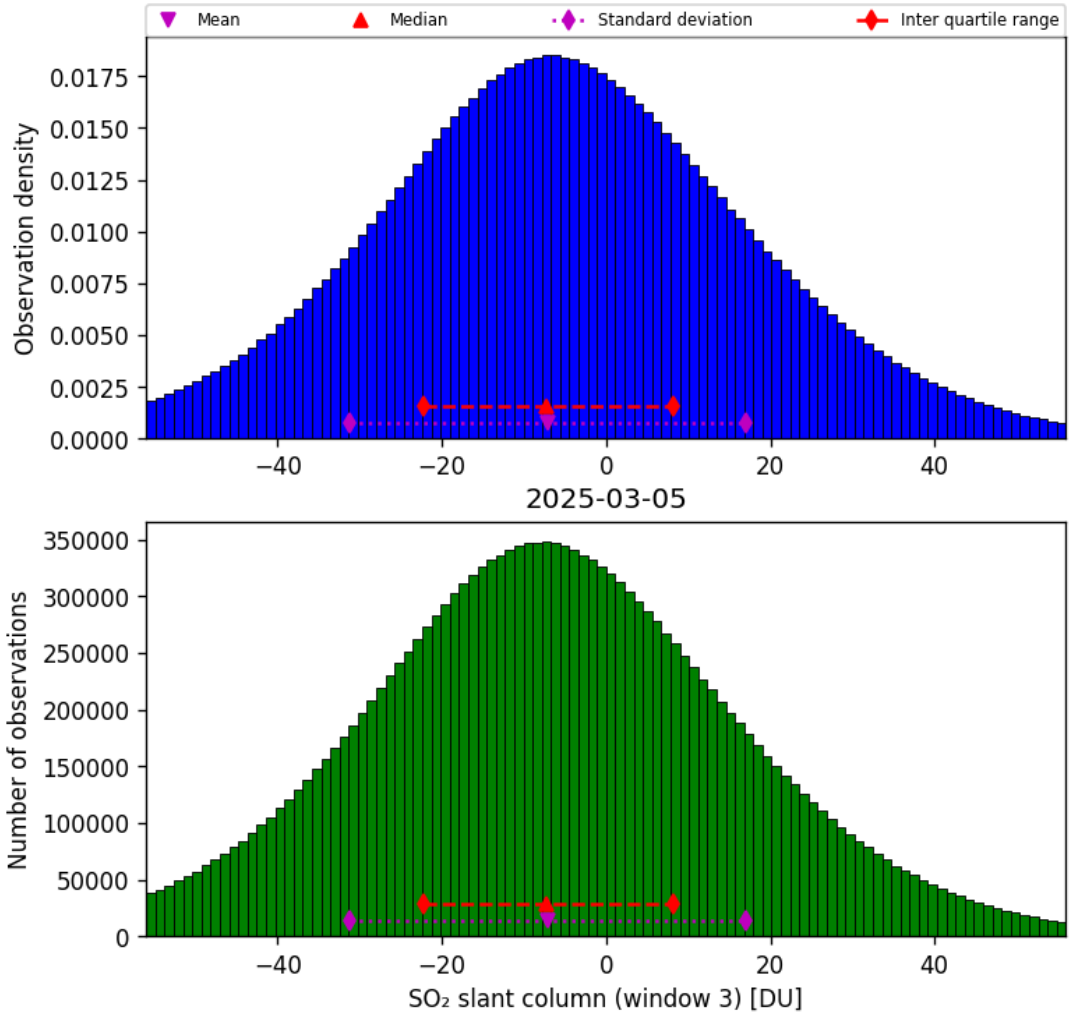

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-03-05 to 2025-03-05

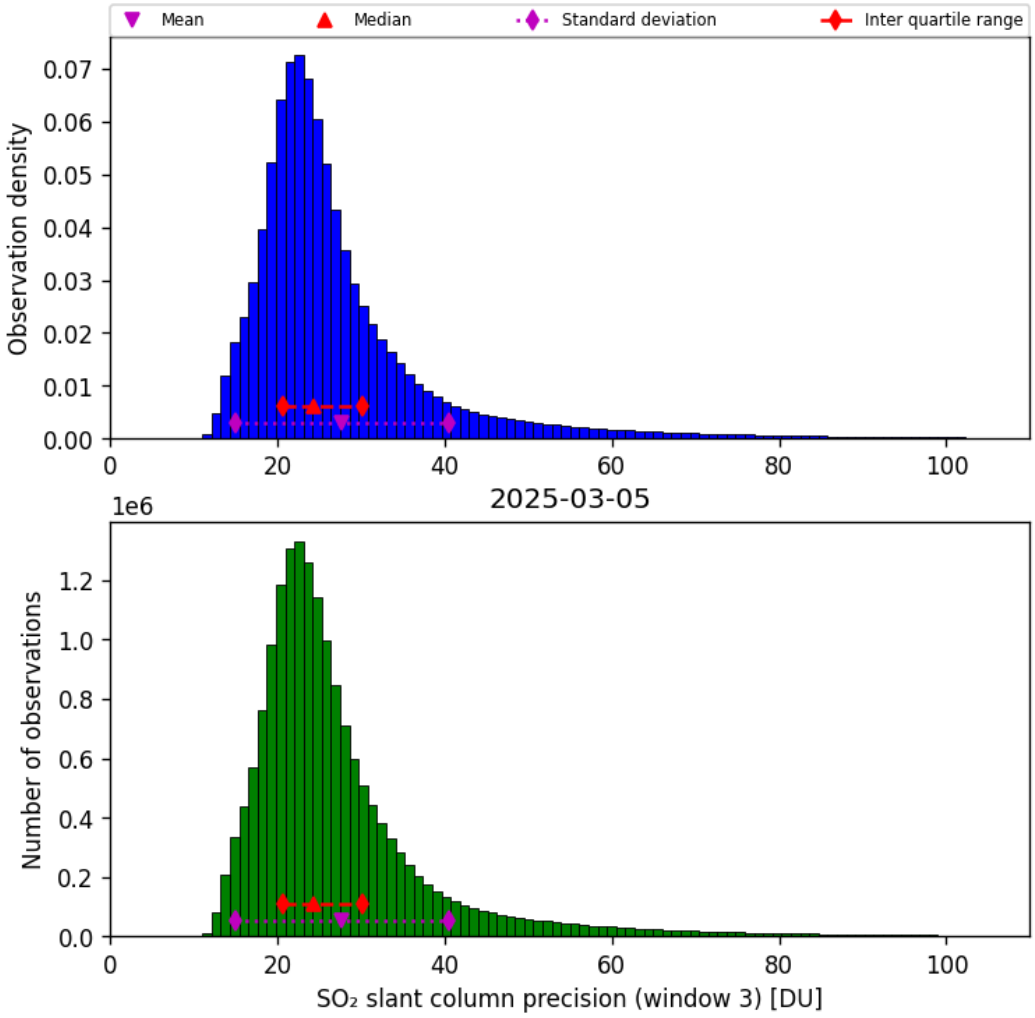

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-03-05 to 2025-03-05

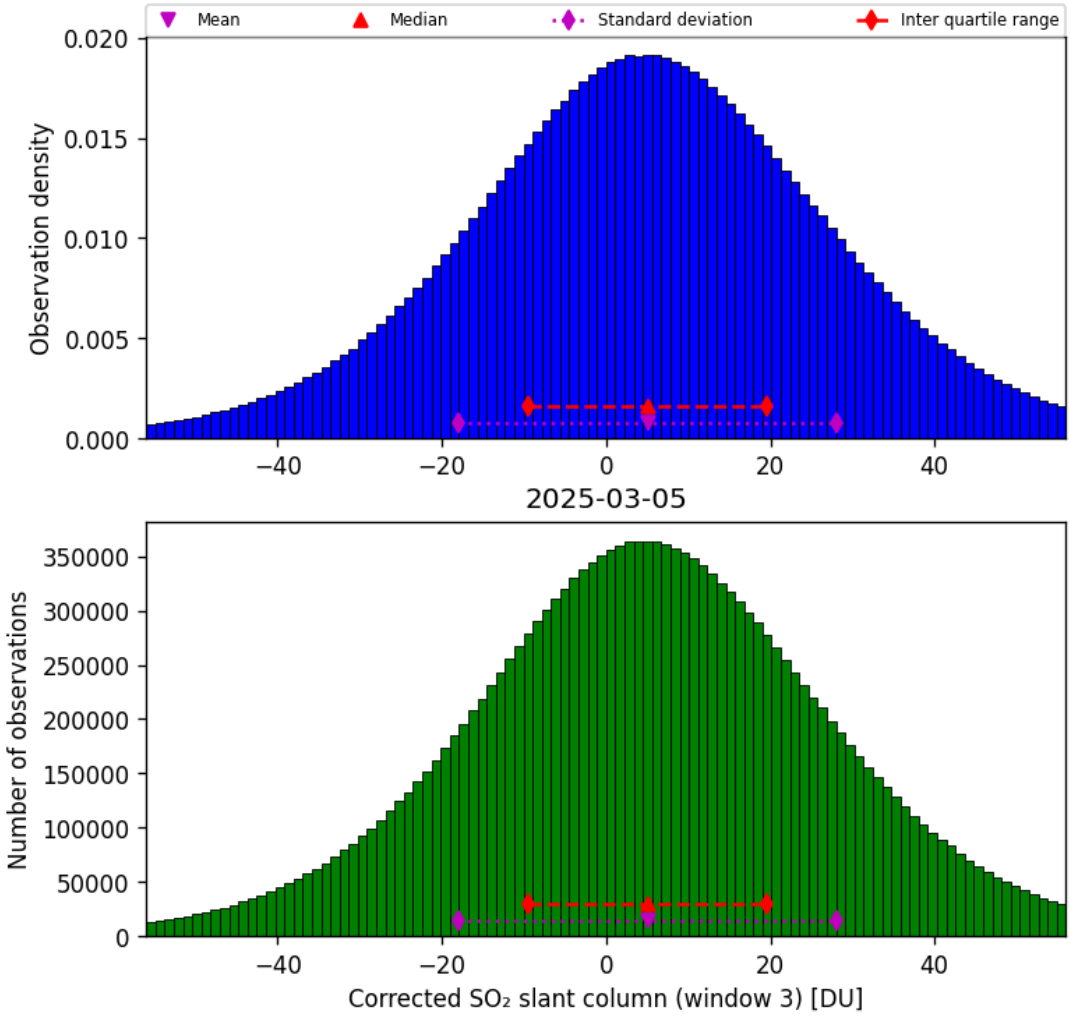

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-03-05 to 2025-03-05

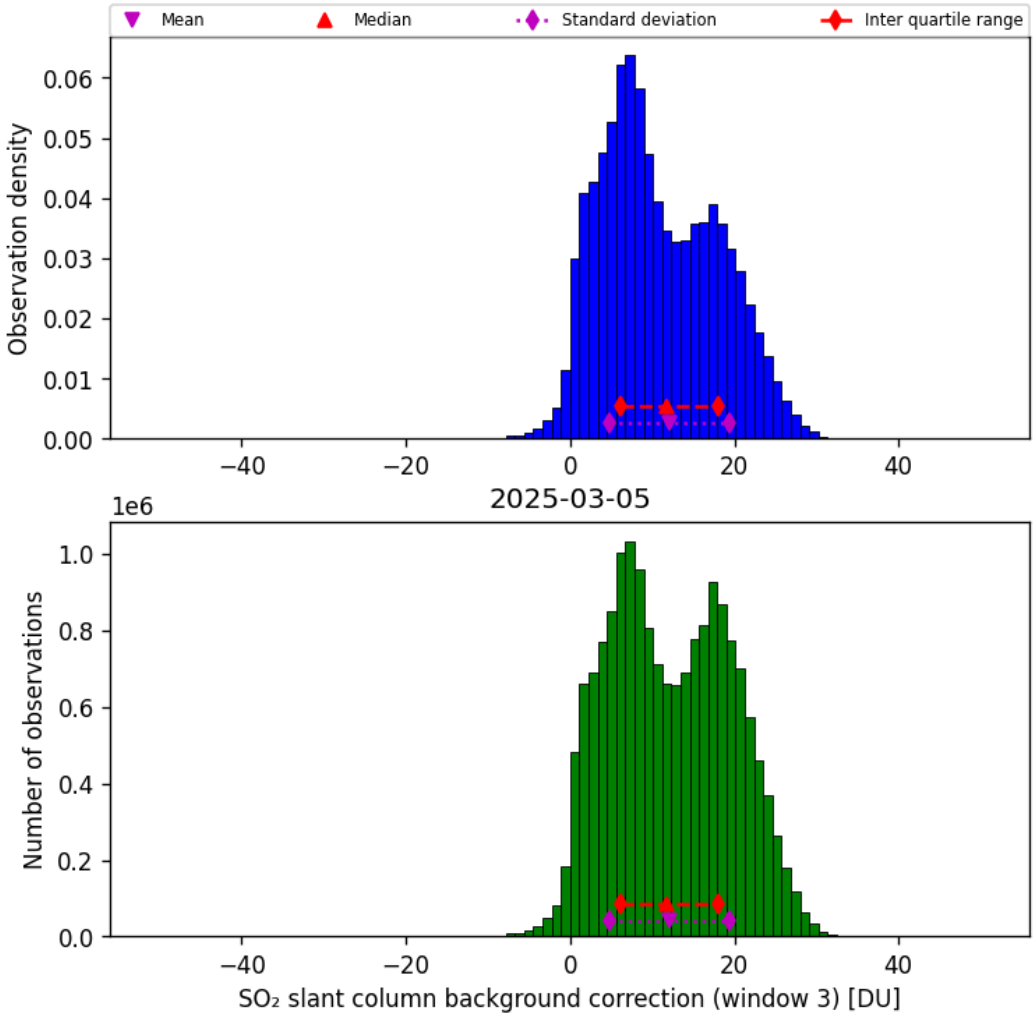

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-03-05 to 2025-03-05

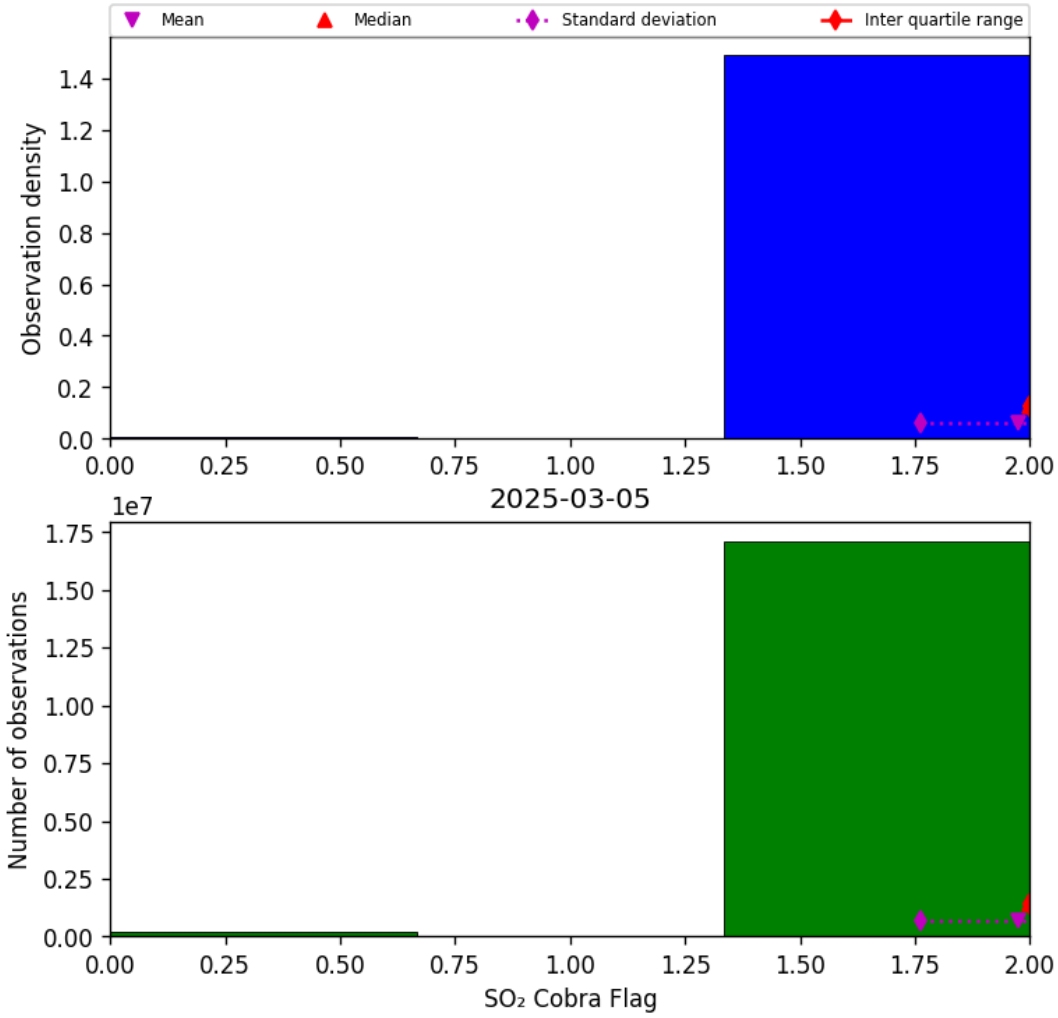

Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-03-05 to 2025-03-05

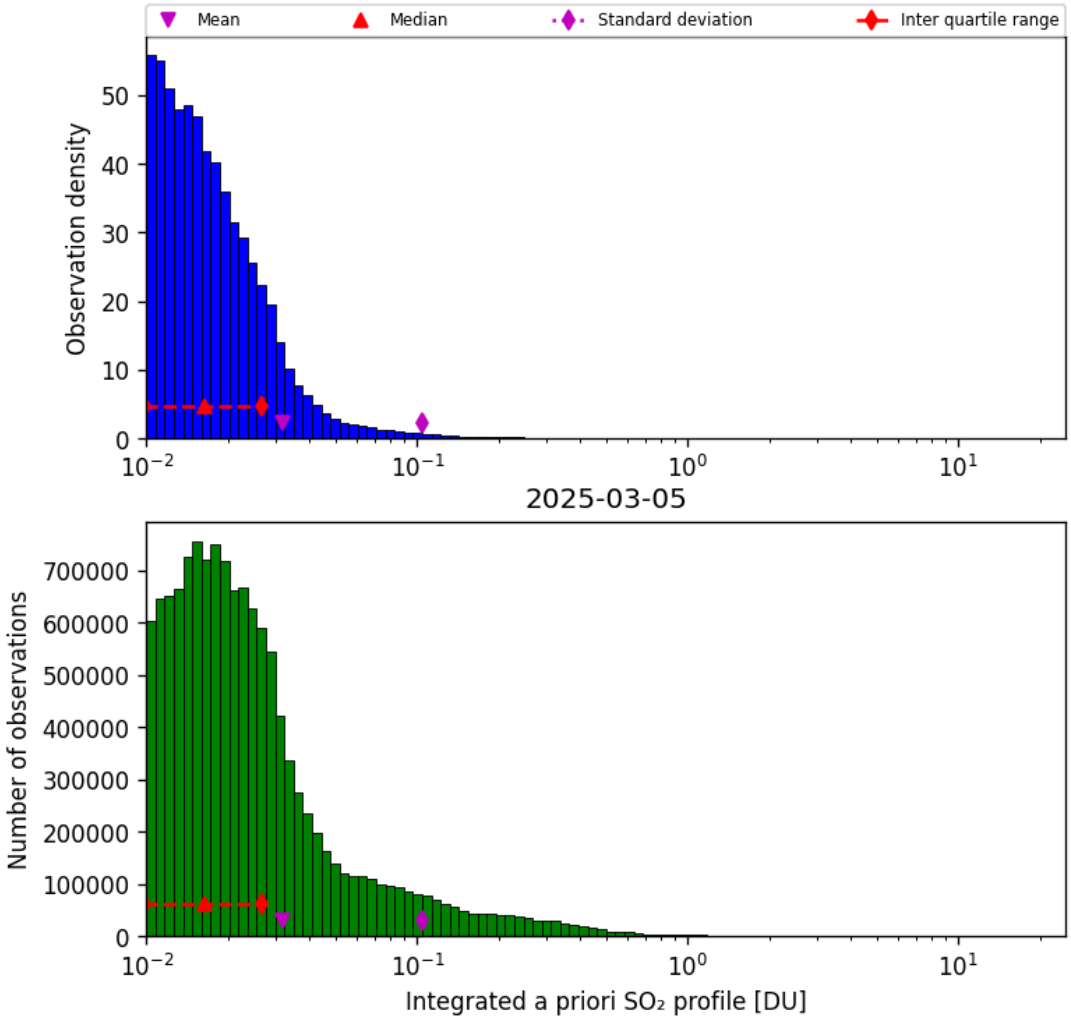

Figure 76: Histogram of “Integrated a priori SO_2 profile” for 2025-03-05 to 2025-03-05

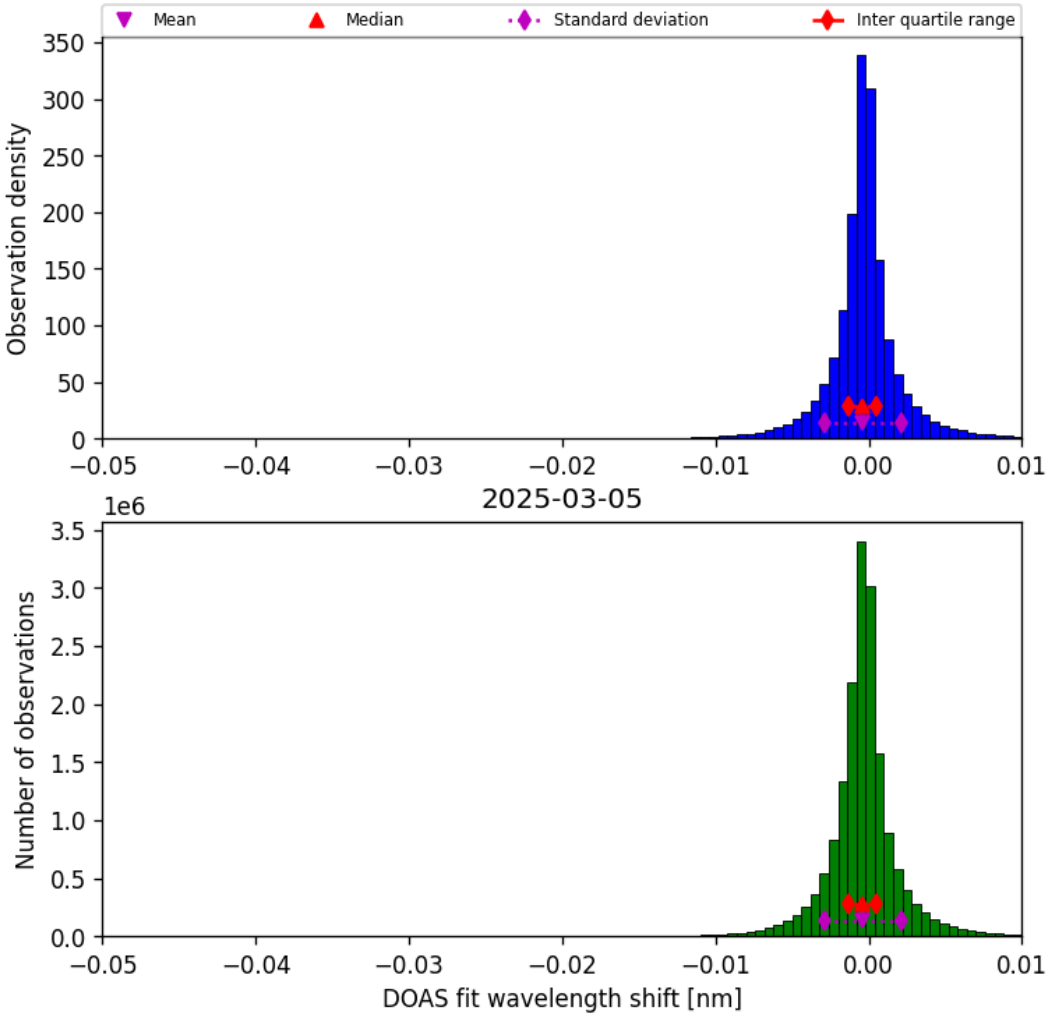

Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-03-05 to 2025-03-05

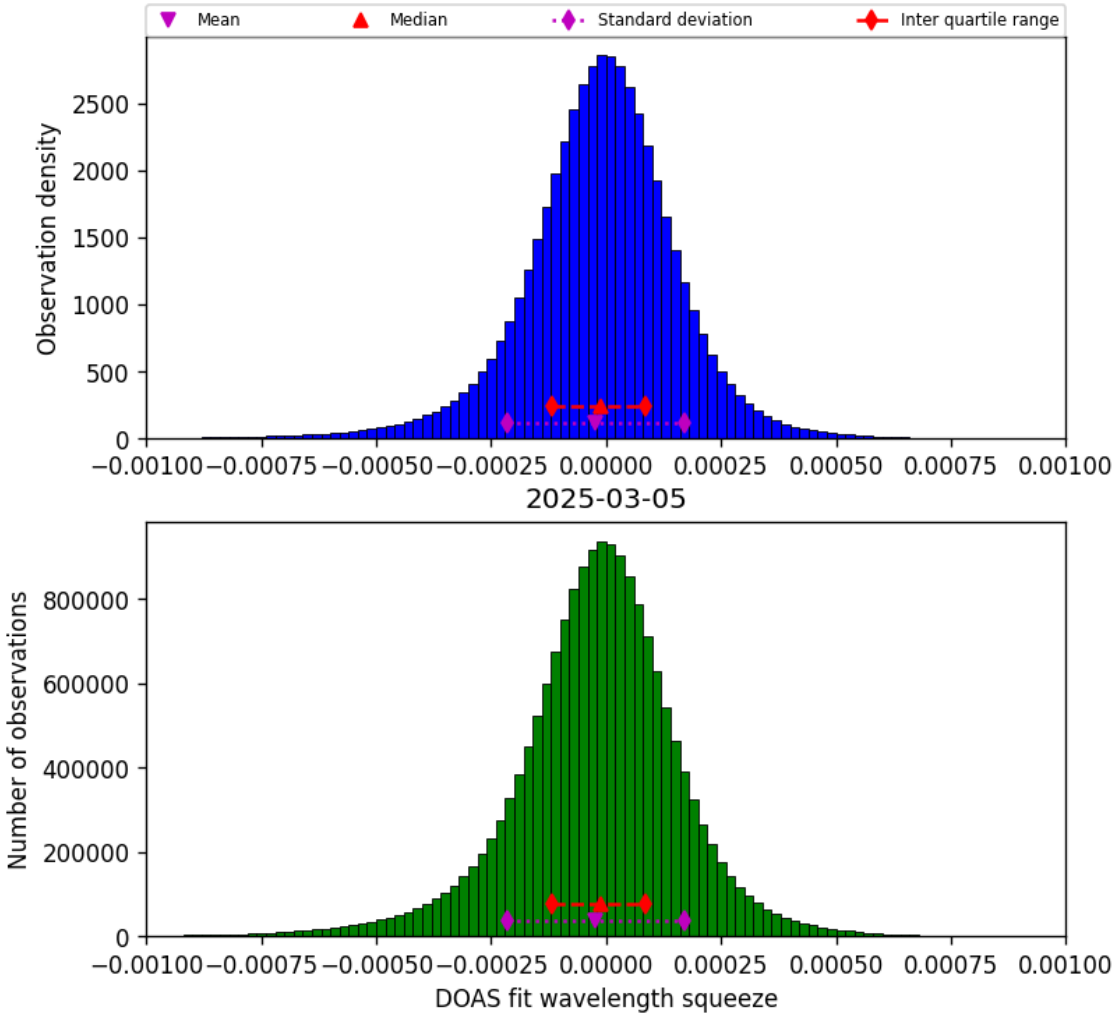

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-03-05 to 2025-03-05

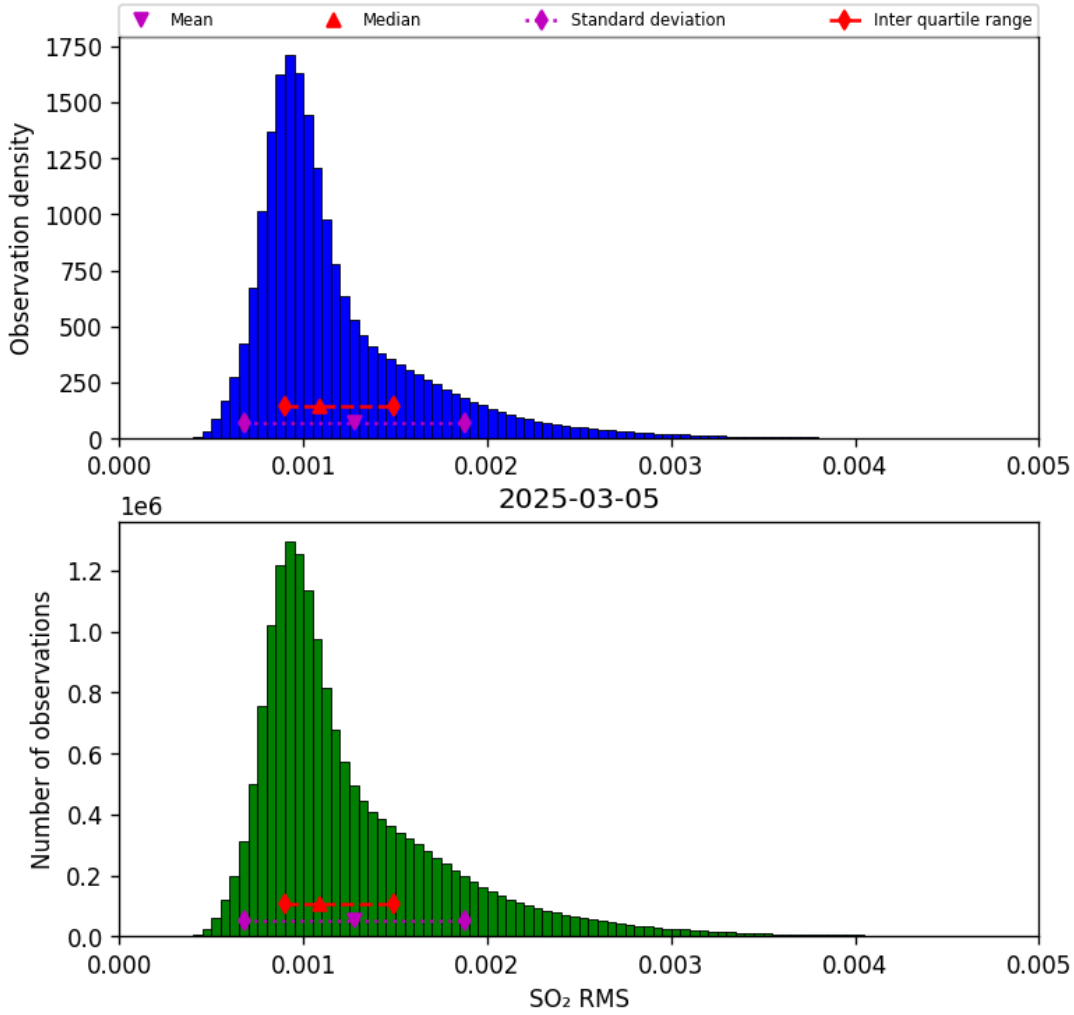

Figure 79: Histogram of "SO_2 RMS" for 2025-03-05 to 2025-03-05

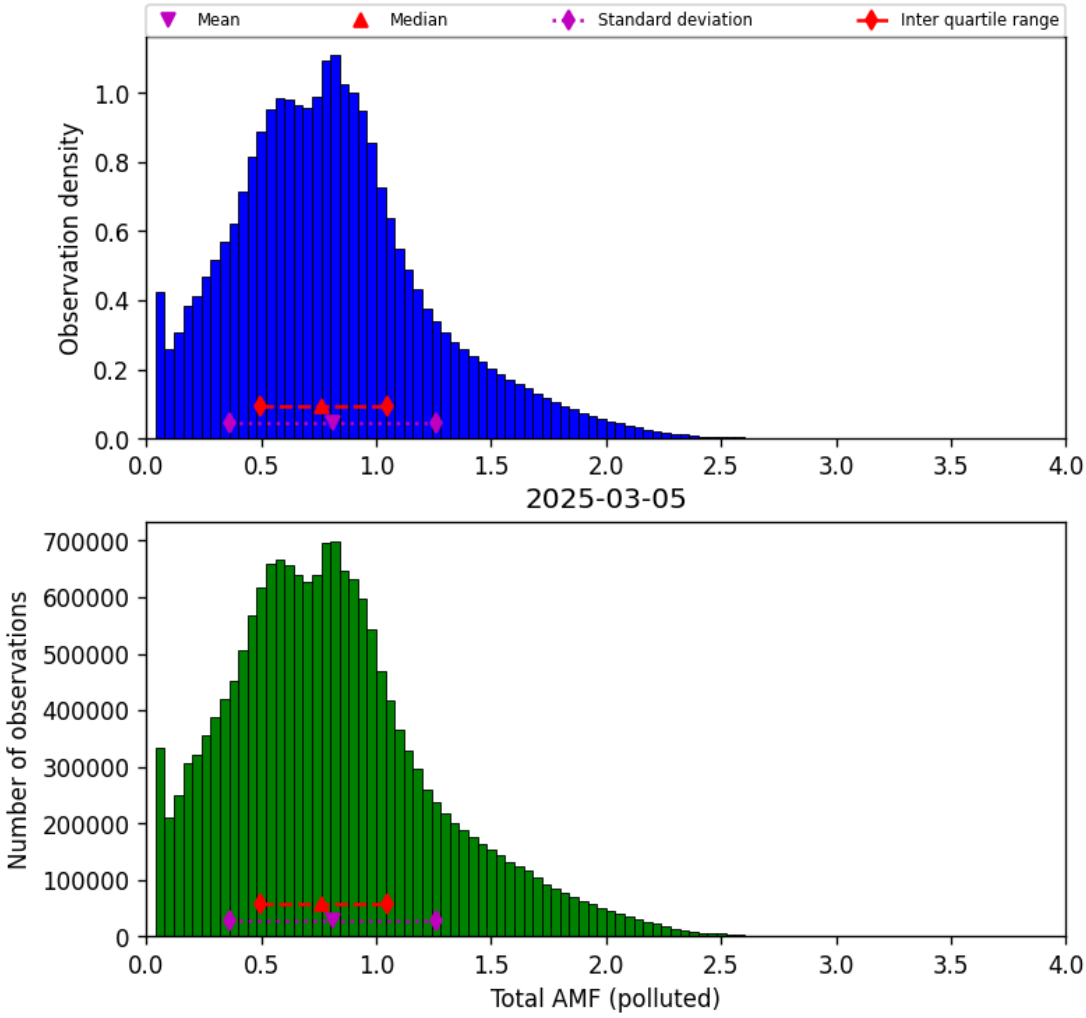

Figure 80: Histogram of “Total AMF (polluted)” for 2025-03-05 to 2025-03-05

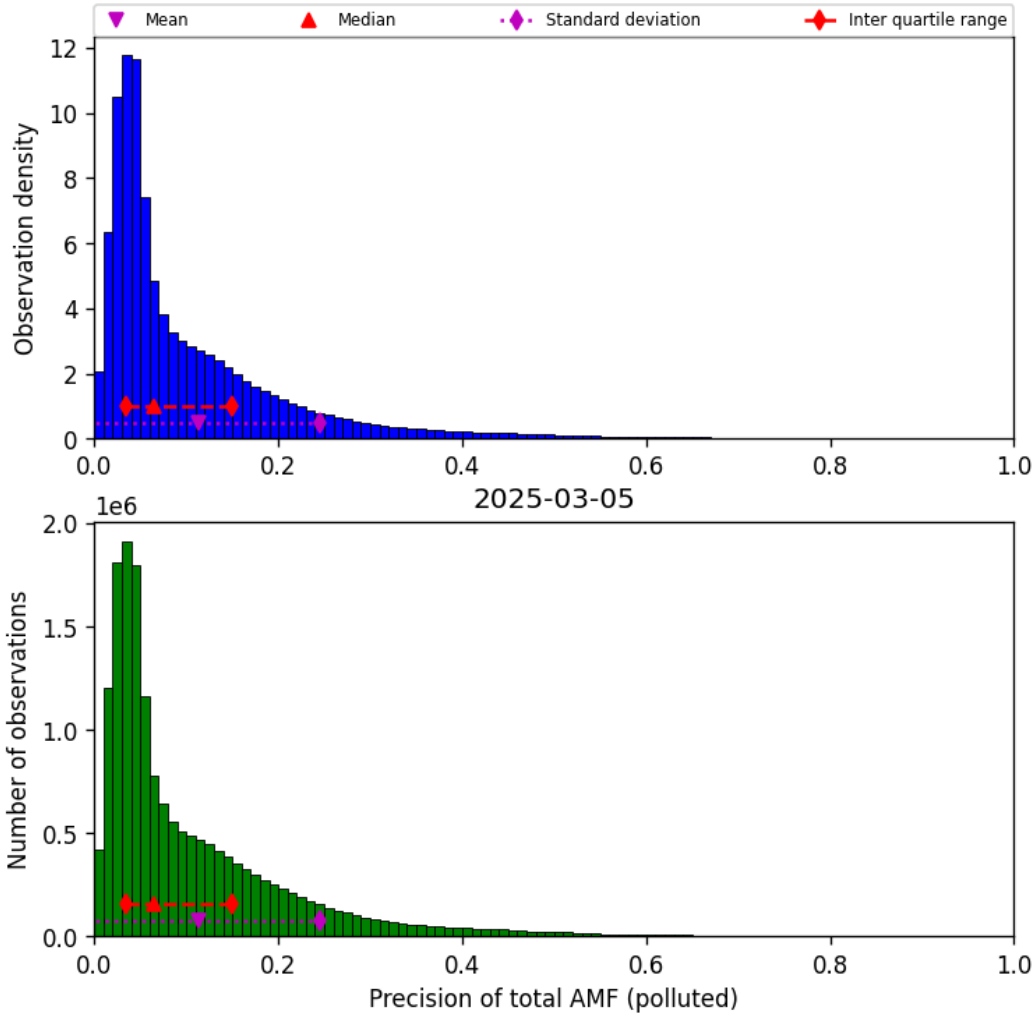

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-03-05 to 2025-03-05

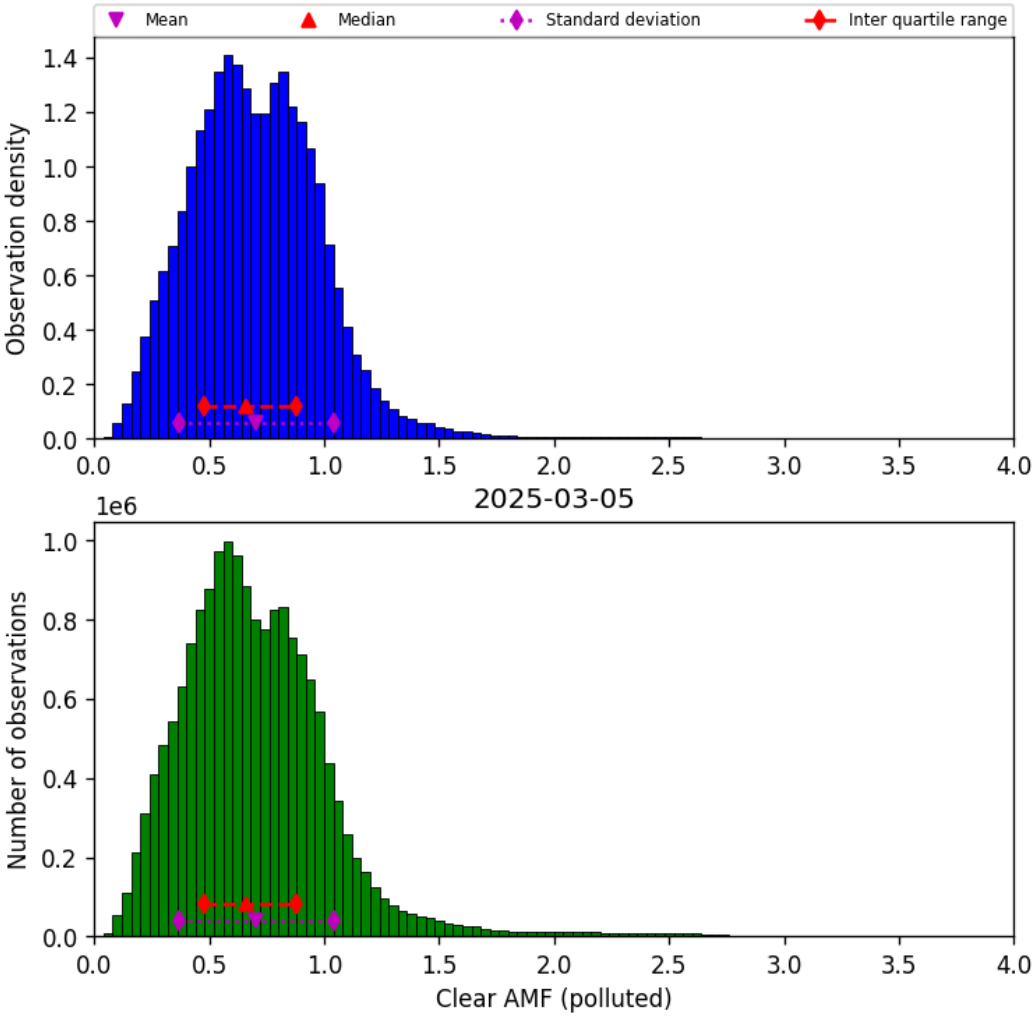

Figure 82: Histogram of “Clear AMF (polluted)” for 2025-03-05 to 2025-03-05

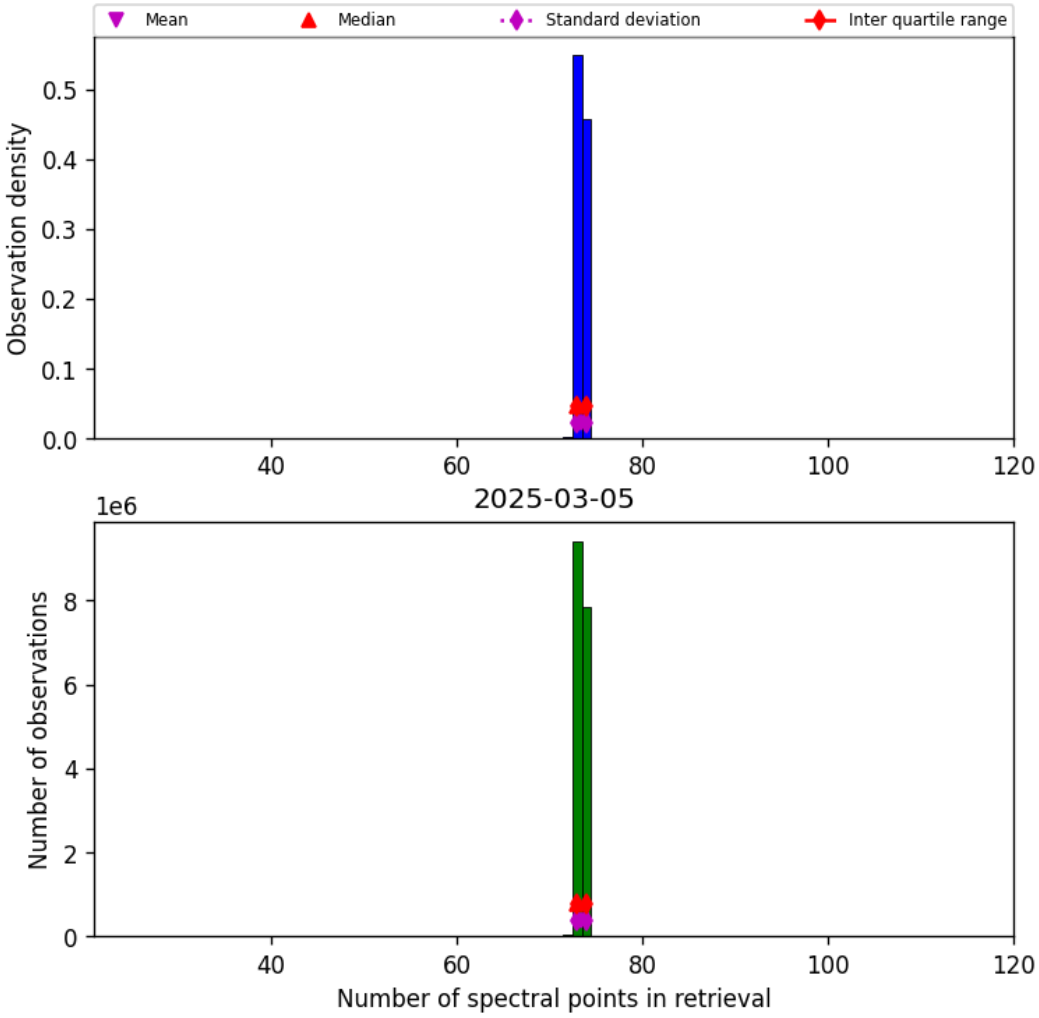

Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-03-05 to 2025-03-05

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.

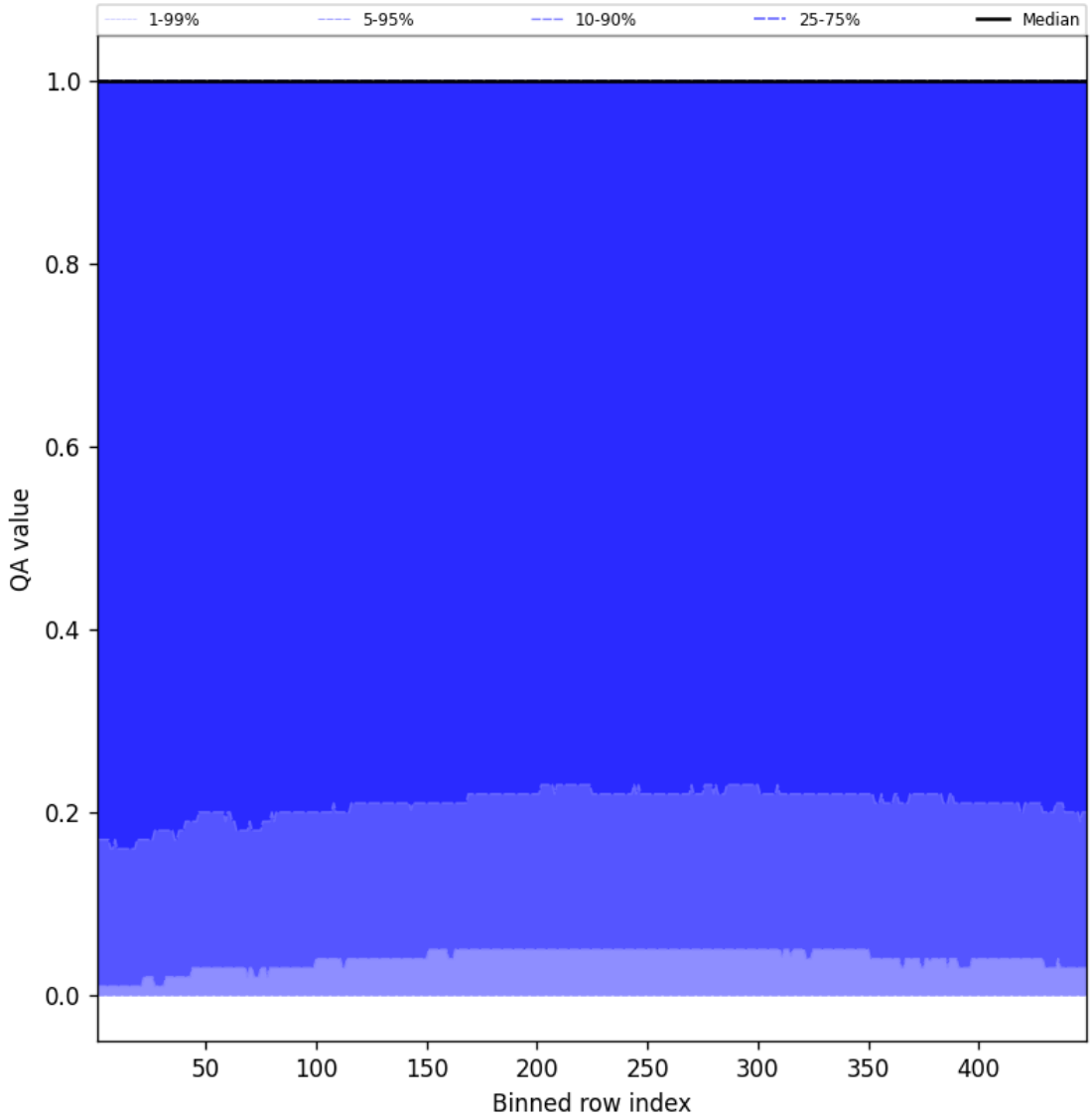

Figure 84: Along track statistics of “QA value” for 2025-03-05 to 2025-03-05

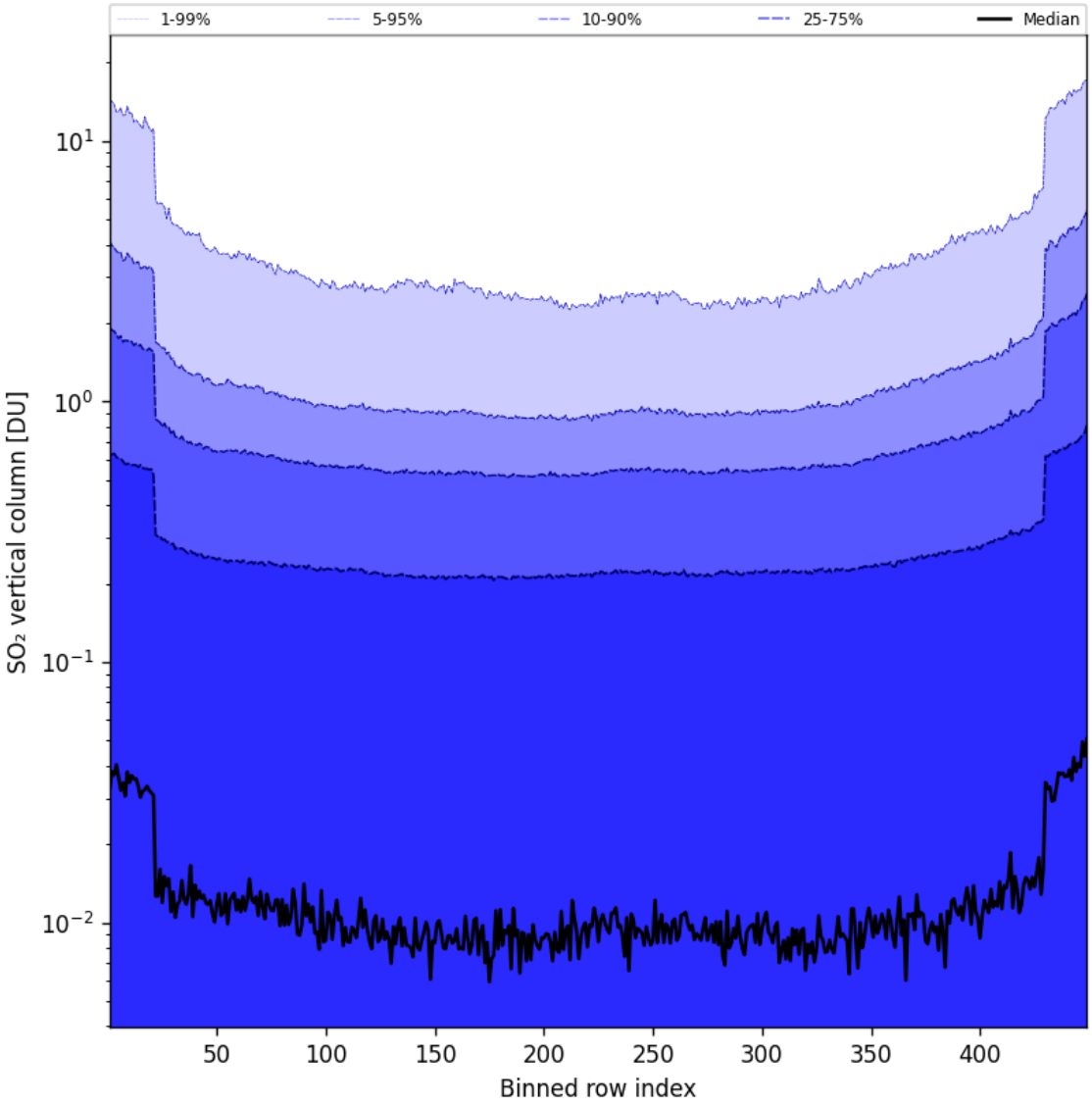

Figure 85: Along track statistics of "SO_2 vertical column" for 2025-03-05 to 2025-03-05

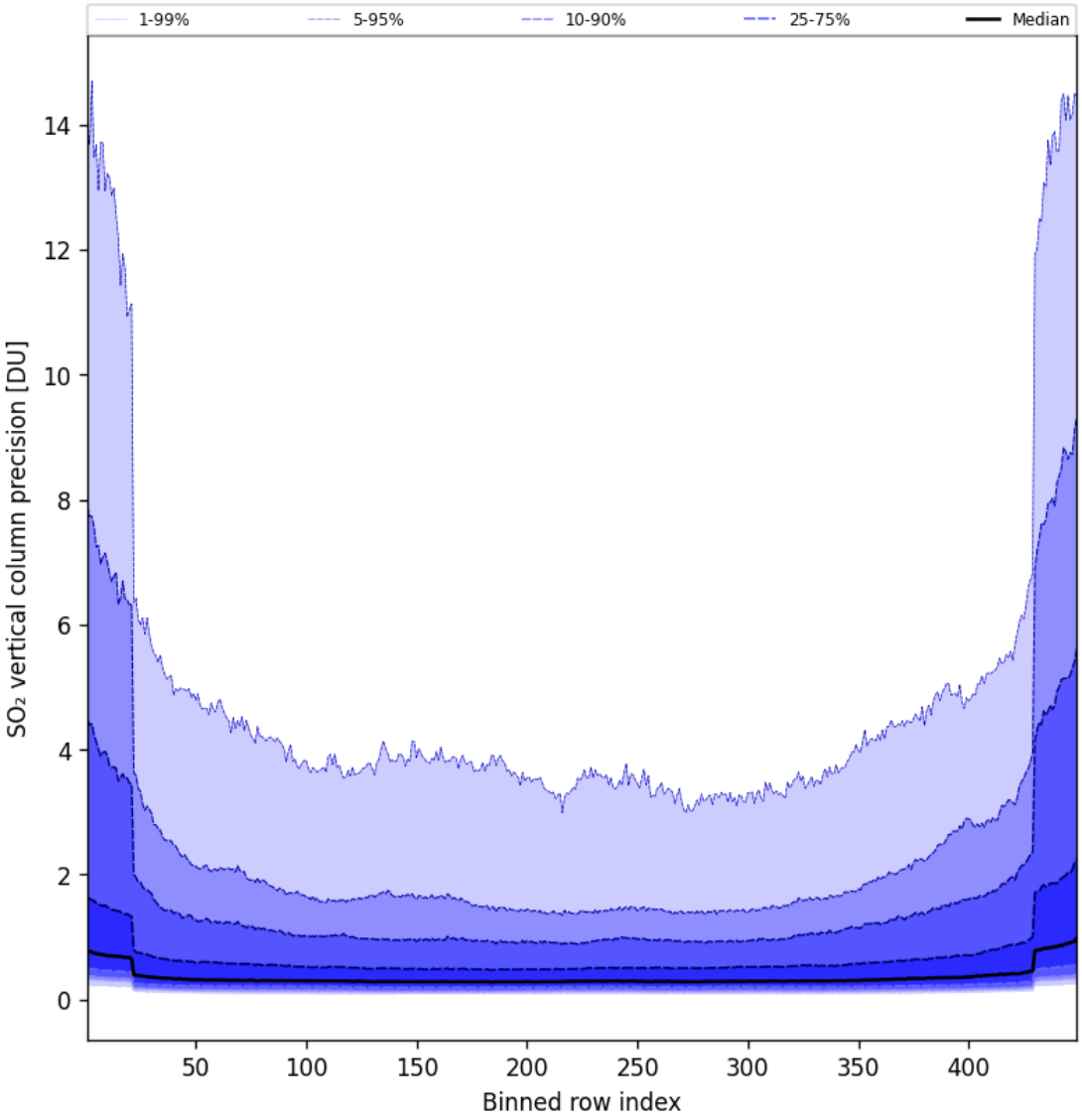

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-03-05 to 2025-03-05

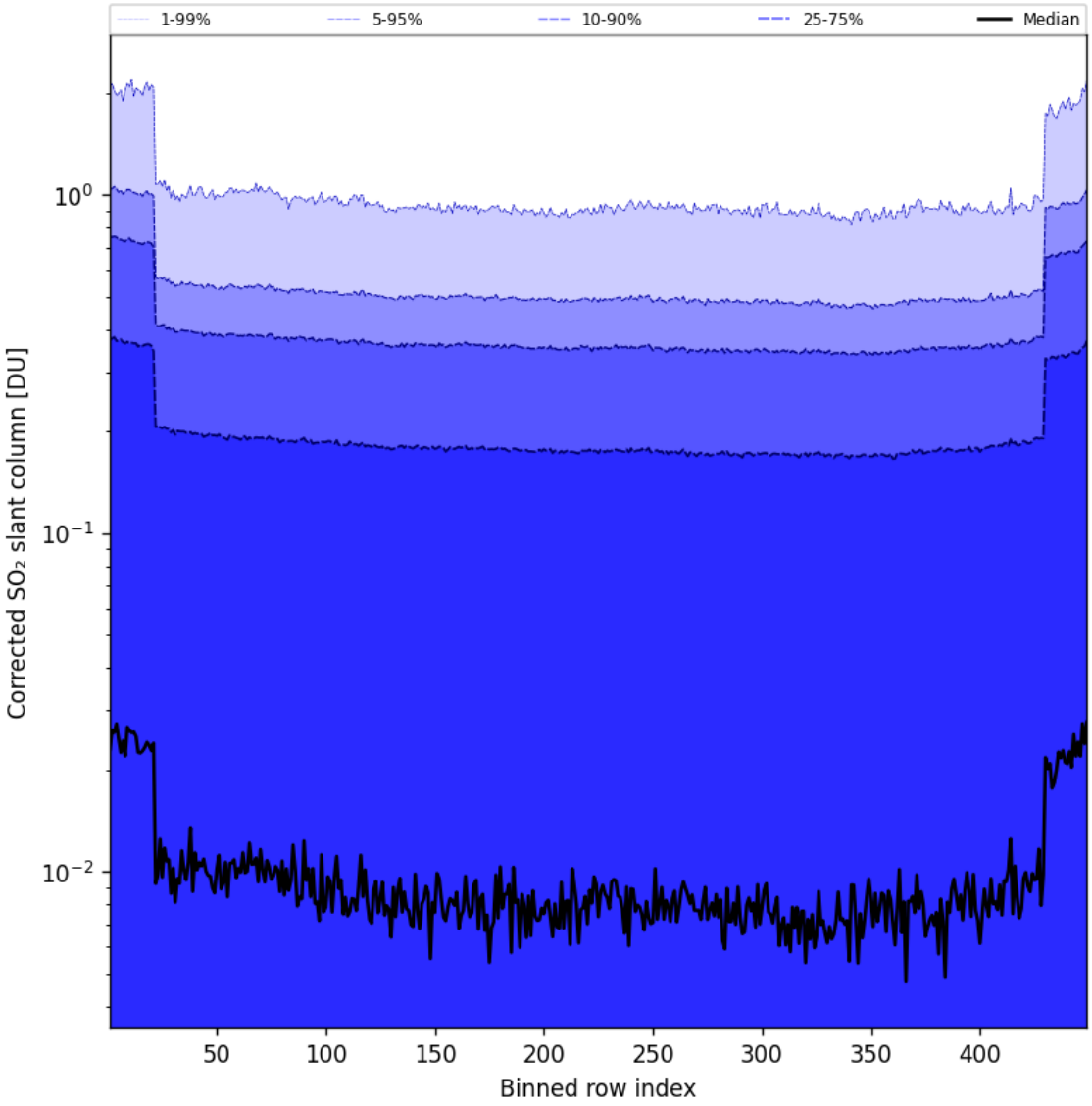

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-03-05 to 2025-03-05

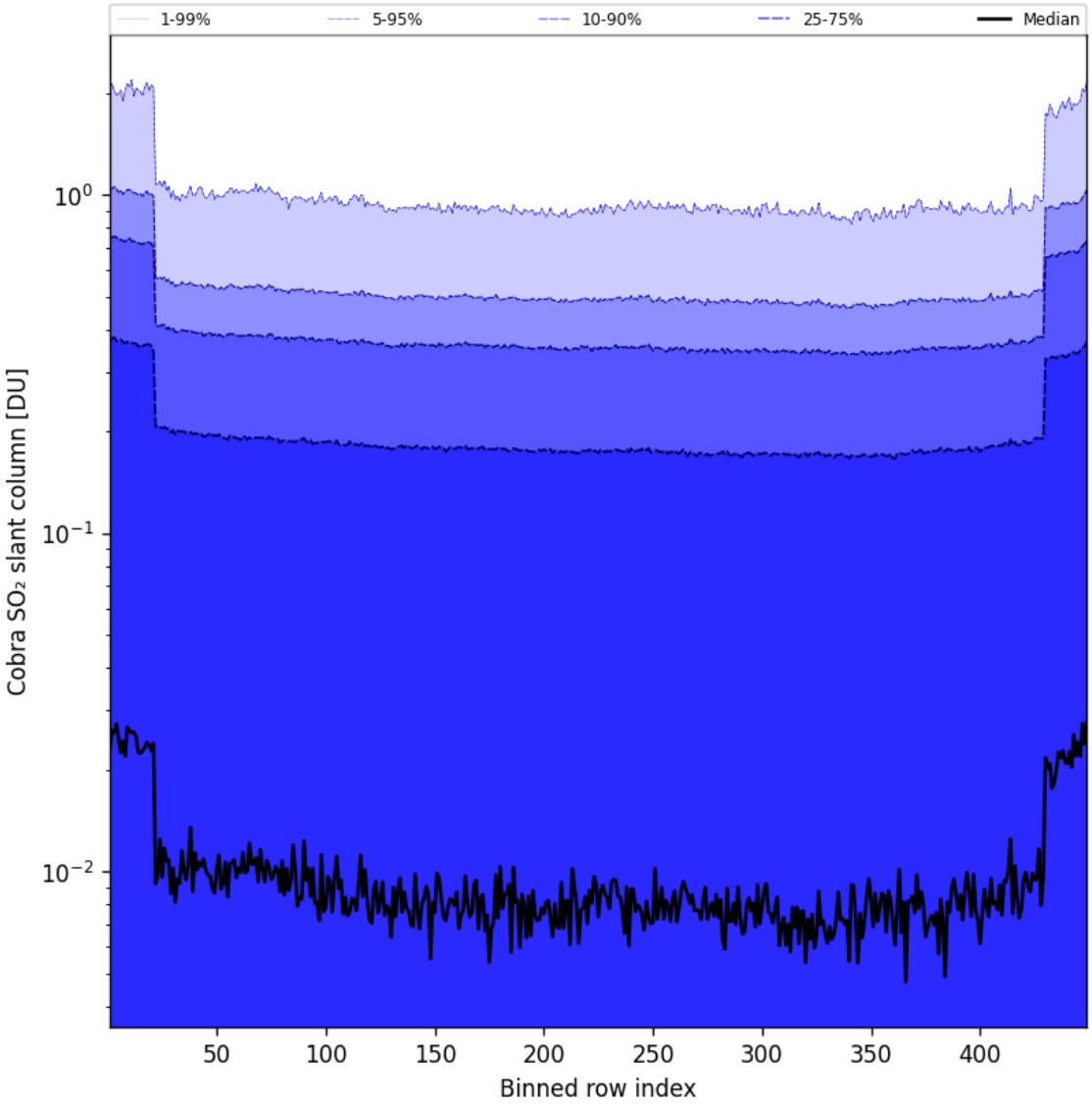

Figure 88: Along track statistics of "Cobra SO_2 slant column" for 2025-03-05 to 2025-03-05

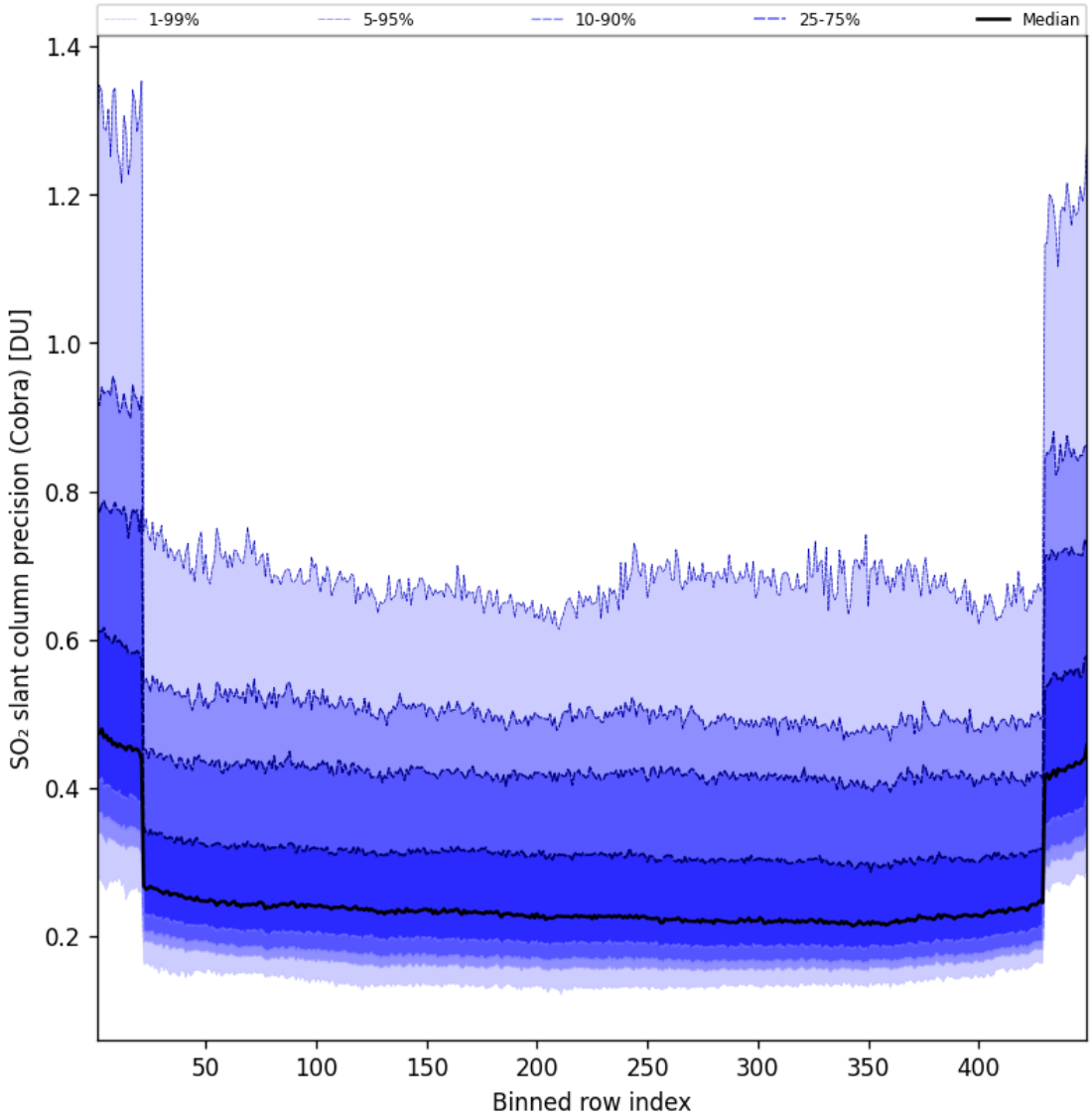

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-03-05 to 2025-03-05

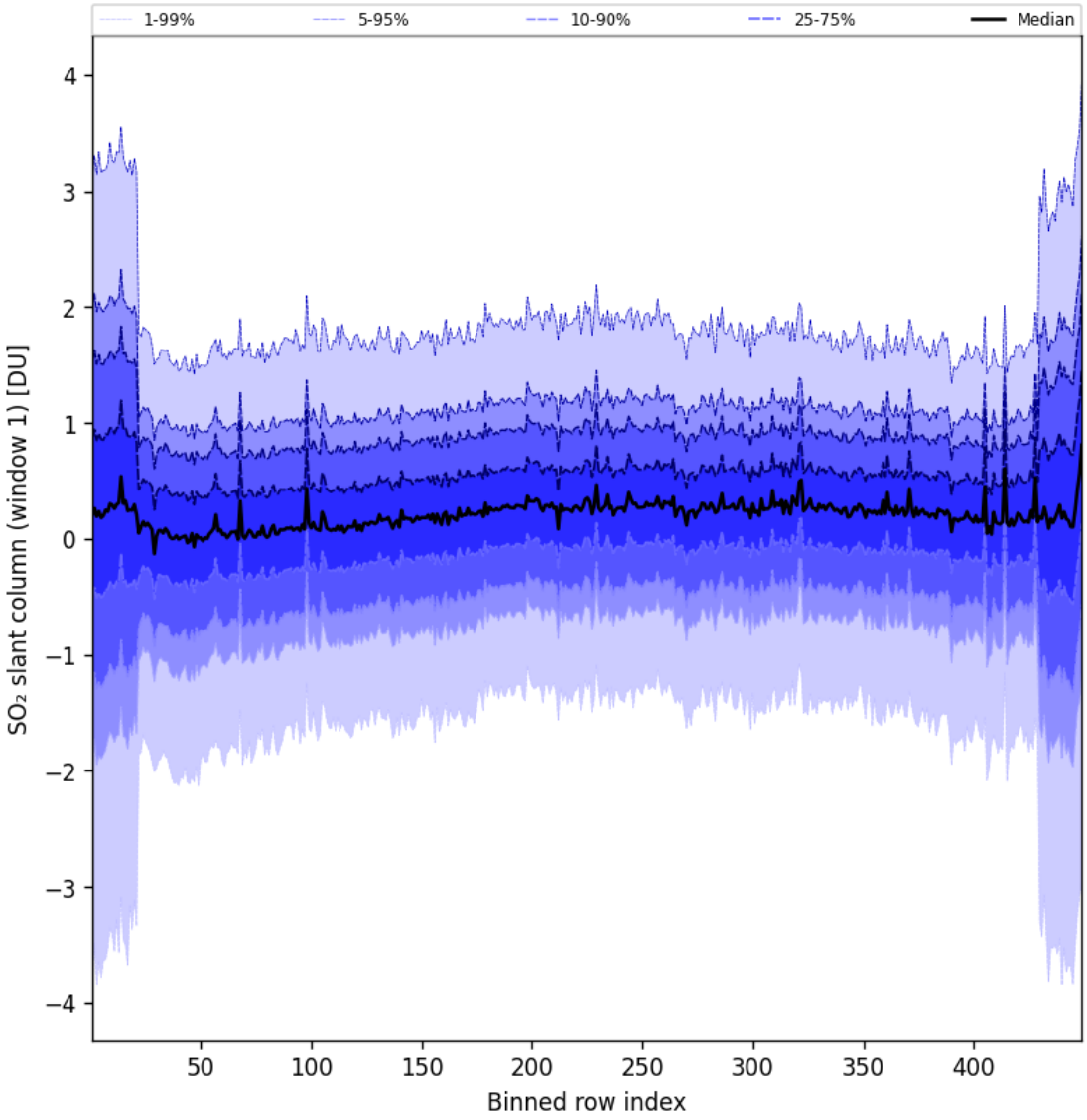

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-03-05 to 2025-03-05

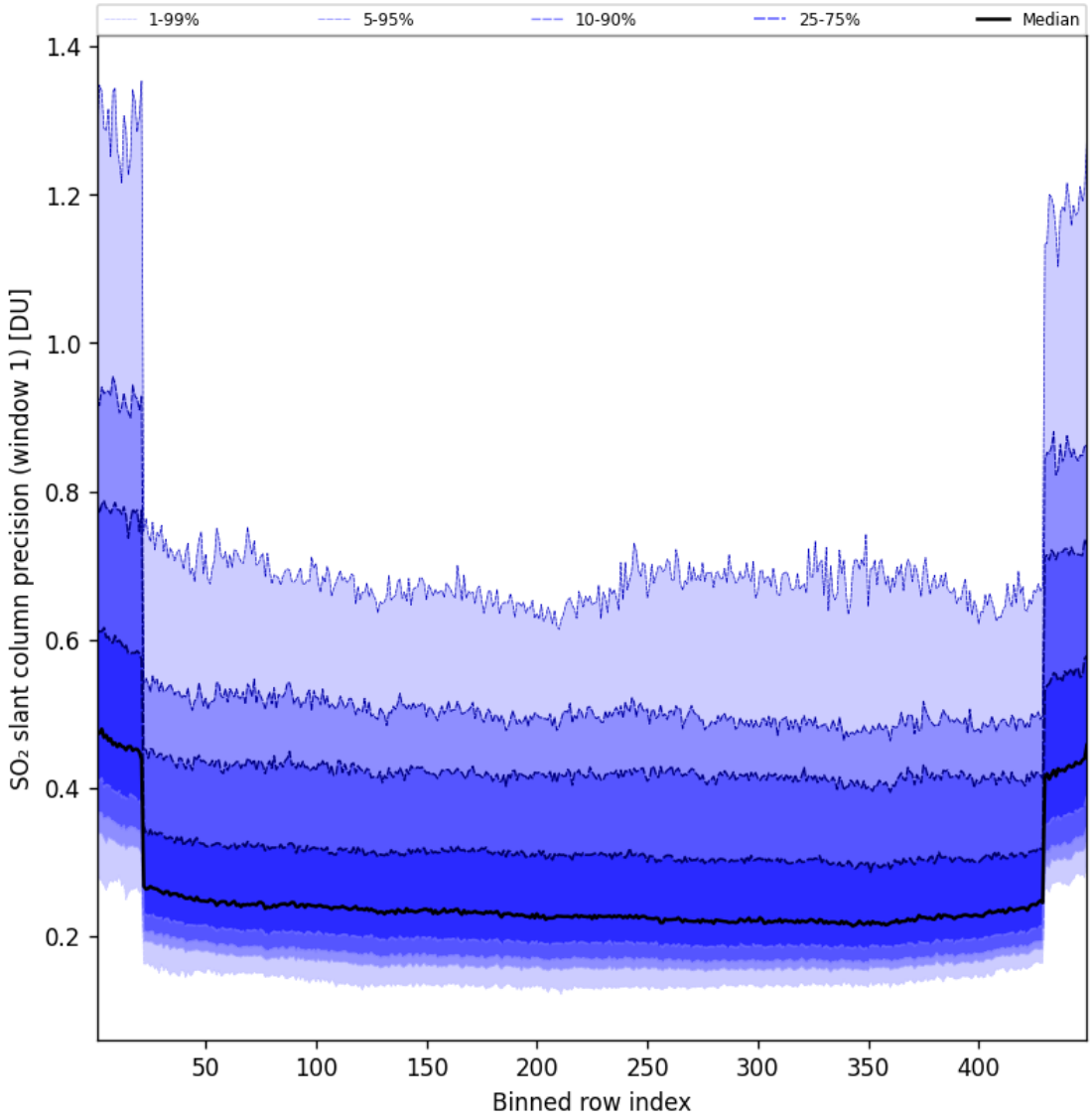

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-03-05 to 2025-03-05

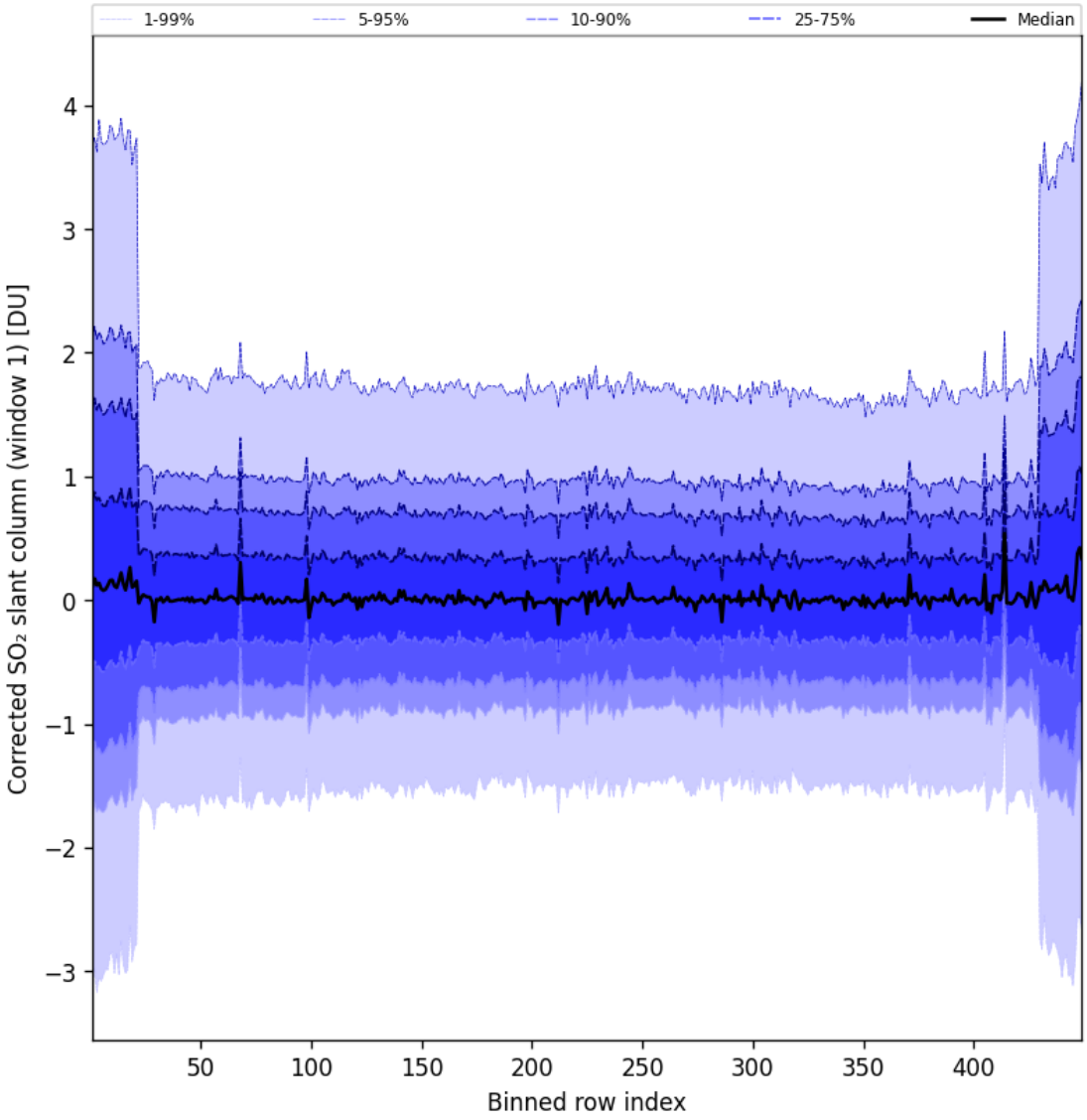

Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-03-05 to 2025-03-05

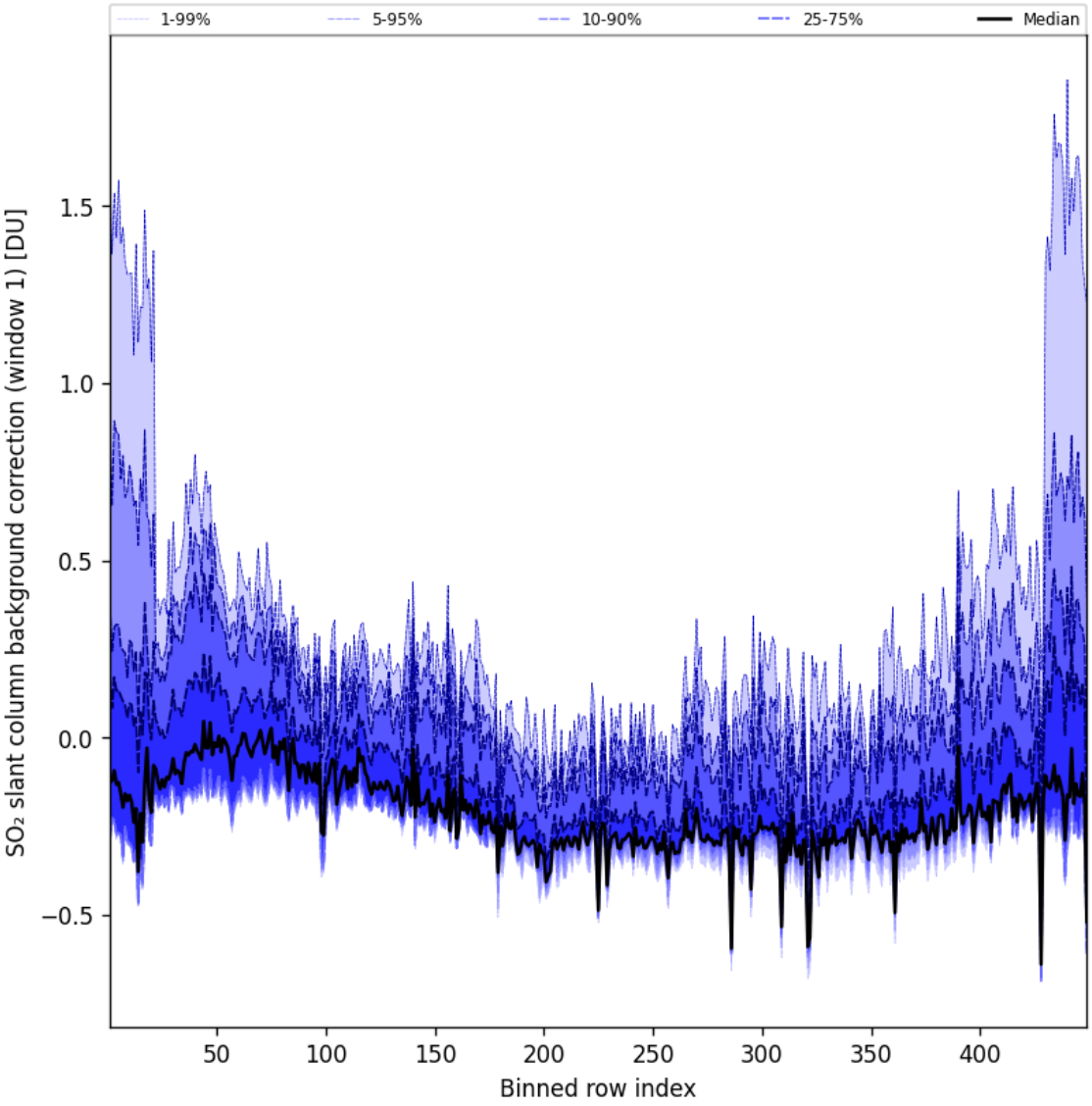

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-03-05 to 2025-03-05

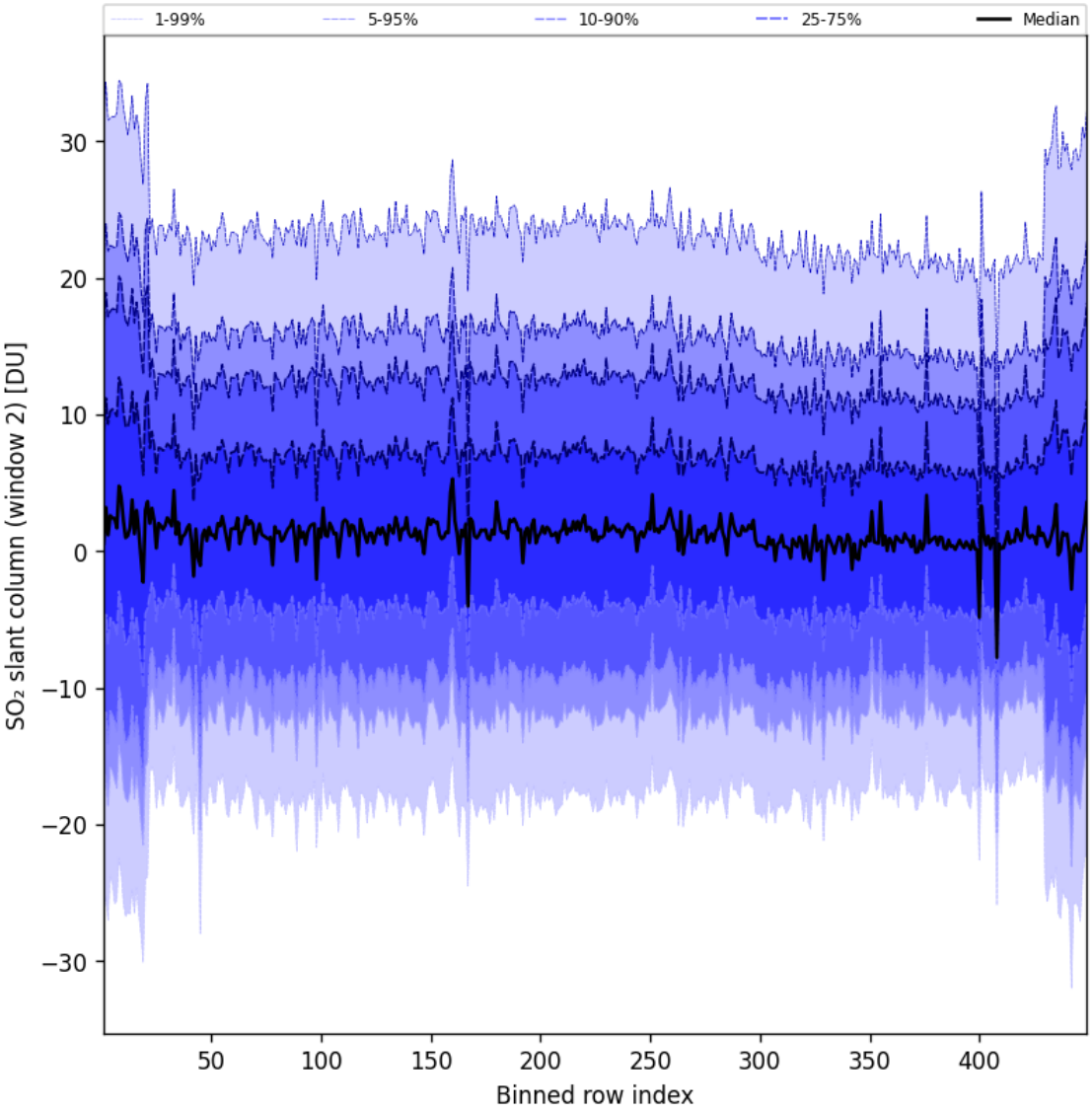

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-03-05 to 2025-03-05

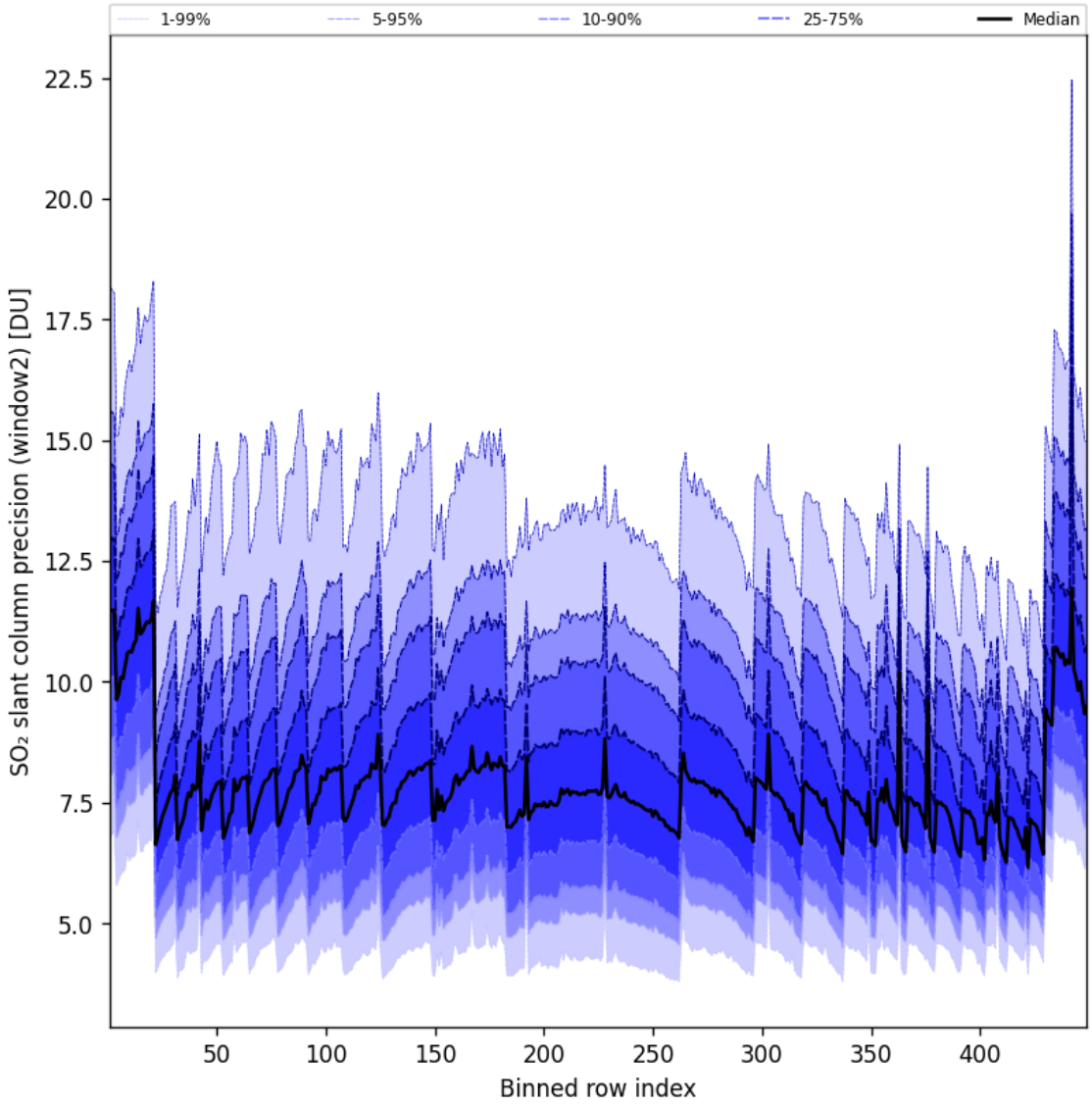

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-03-05 to 2025-03-05

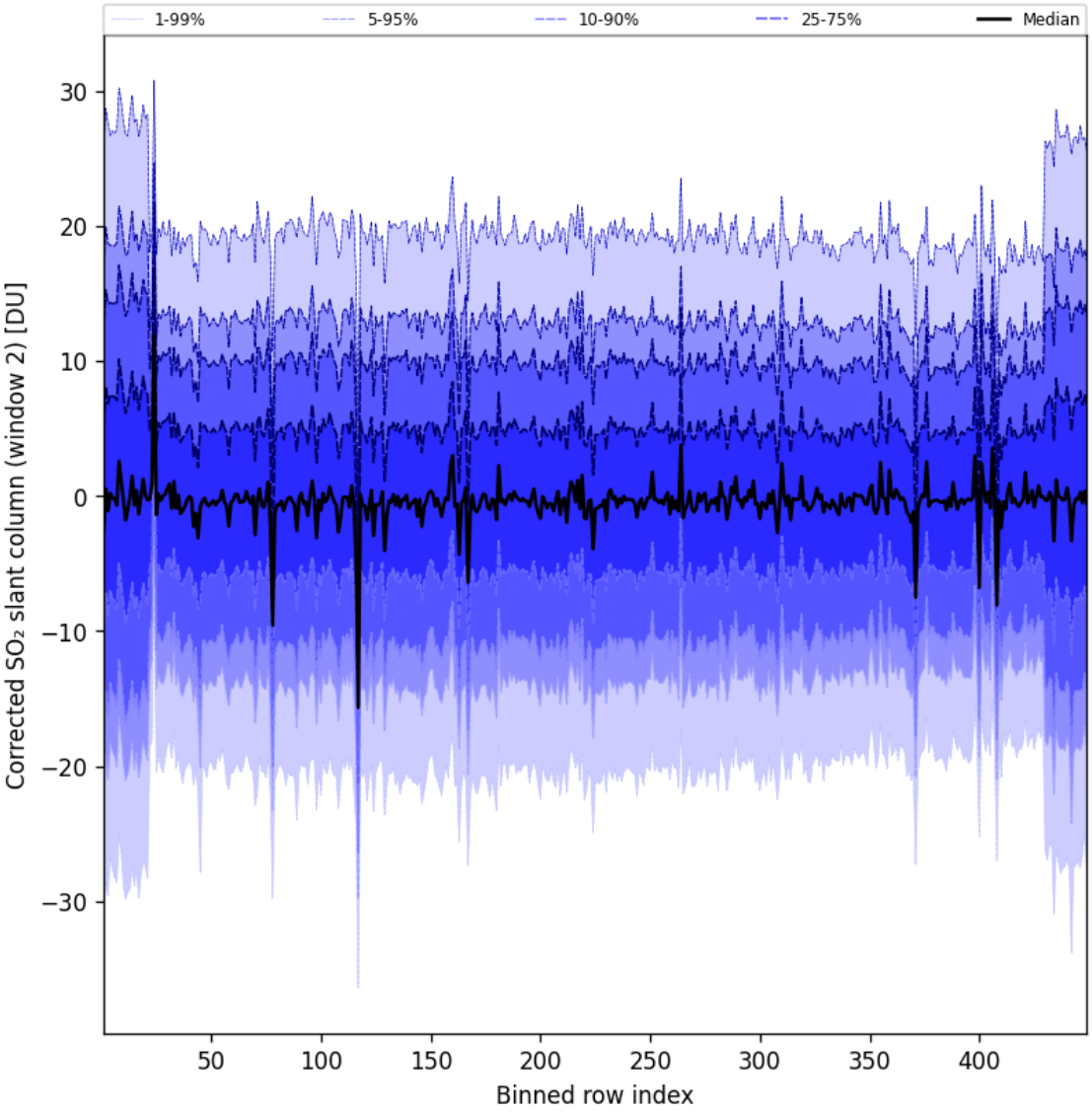

Figure 96: Along track statistics of “Corrected SO_2 slant column (window 2)” for 2025-03-05 to 2025-03-05

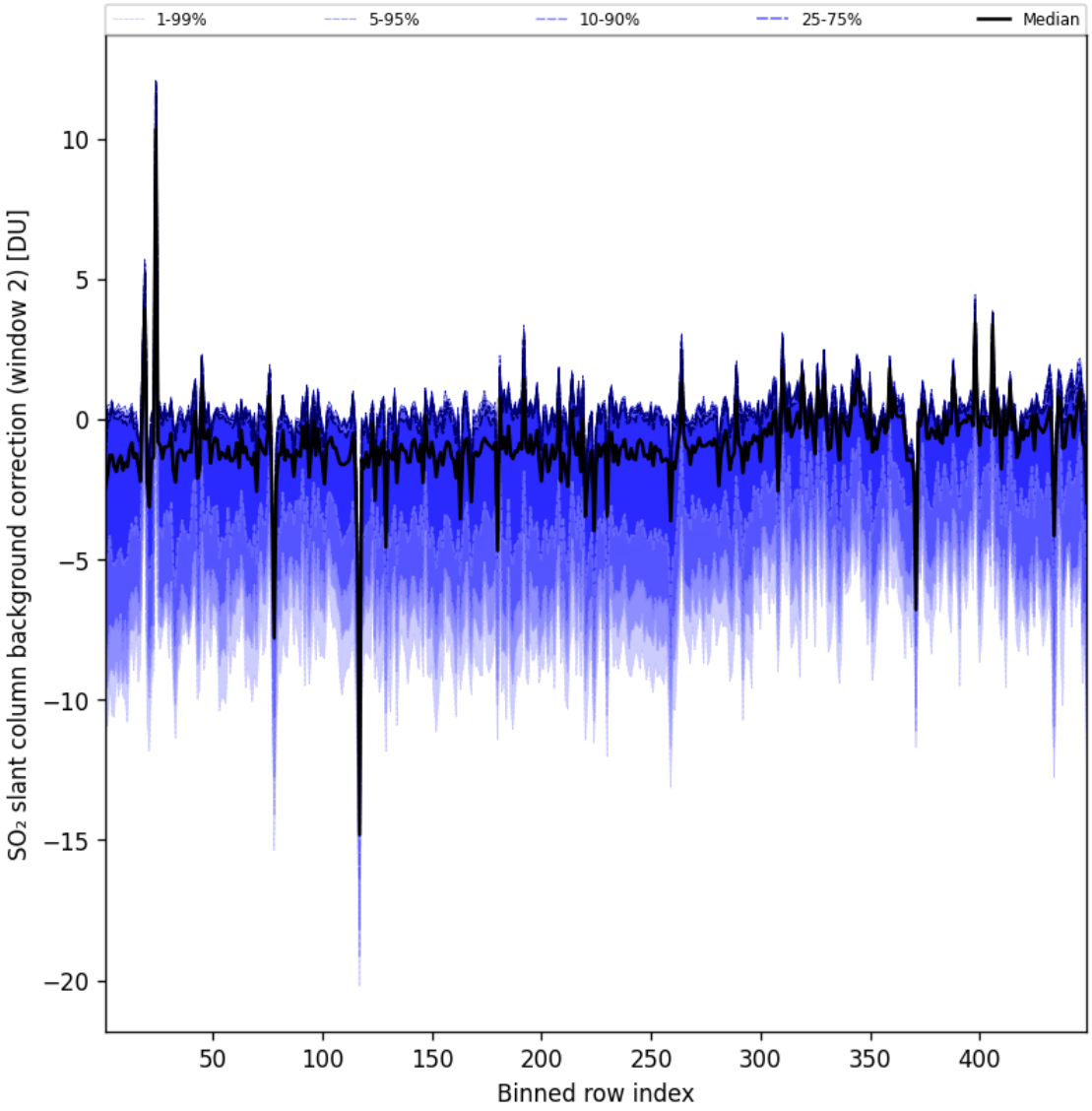

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-03-05 to 2025-03-05

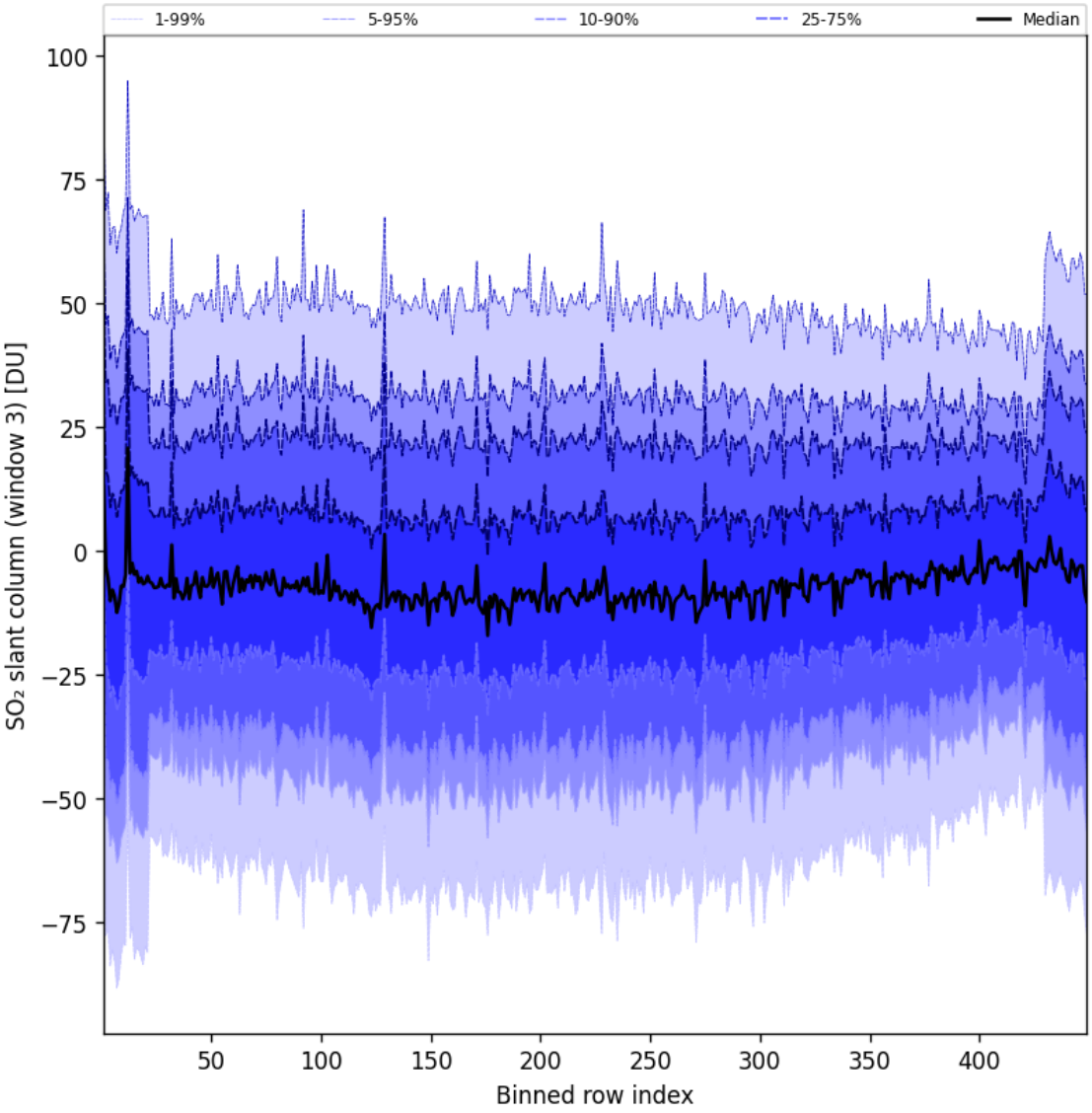

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-03-05 to 2025-03-05

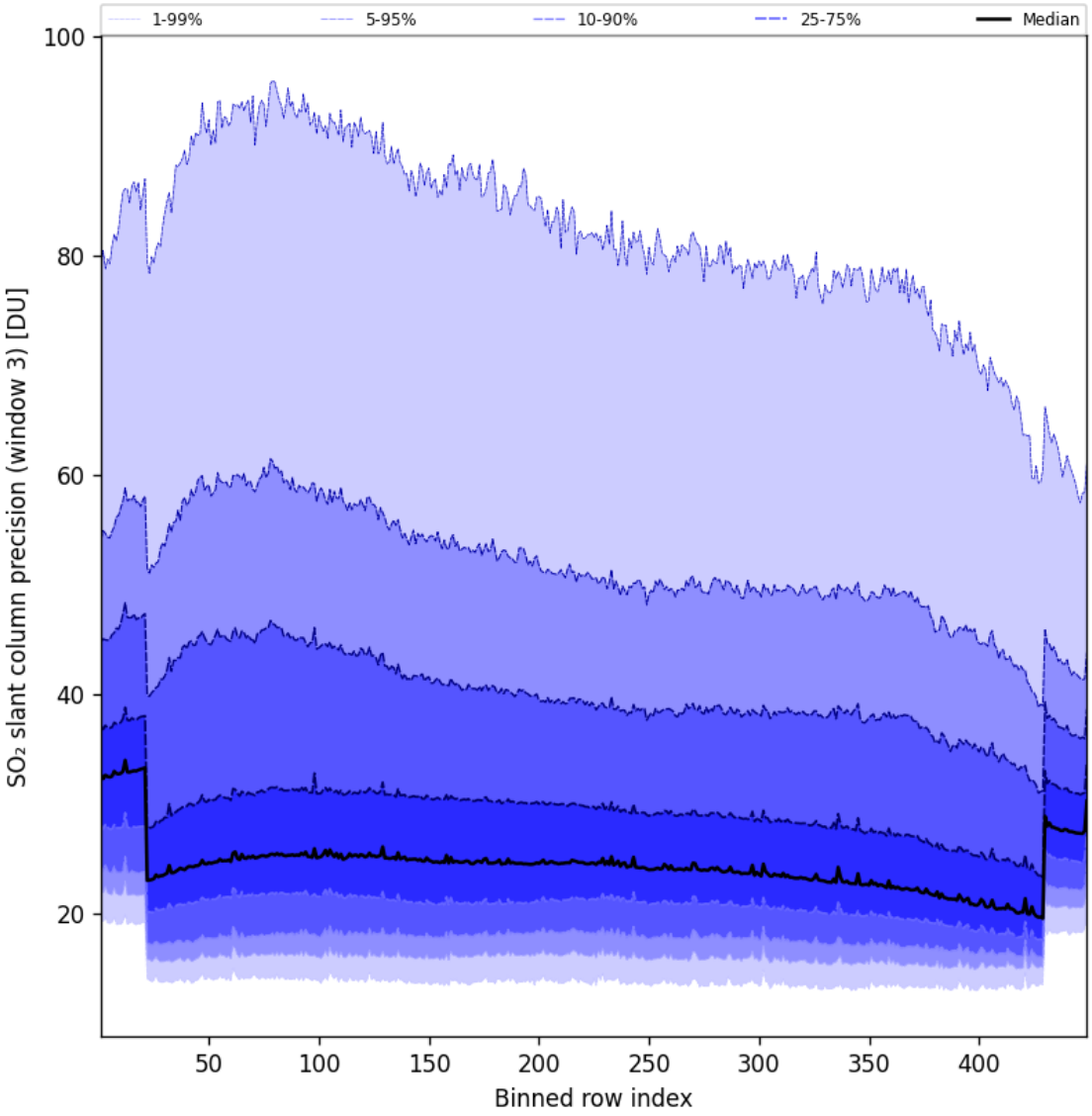

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-03-05 to 2025-03-05

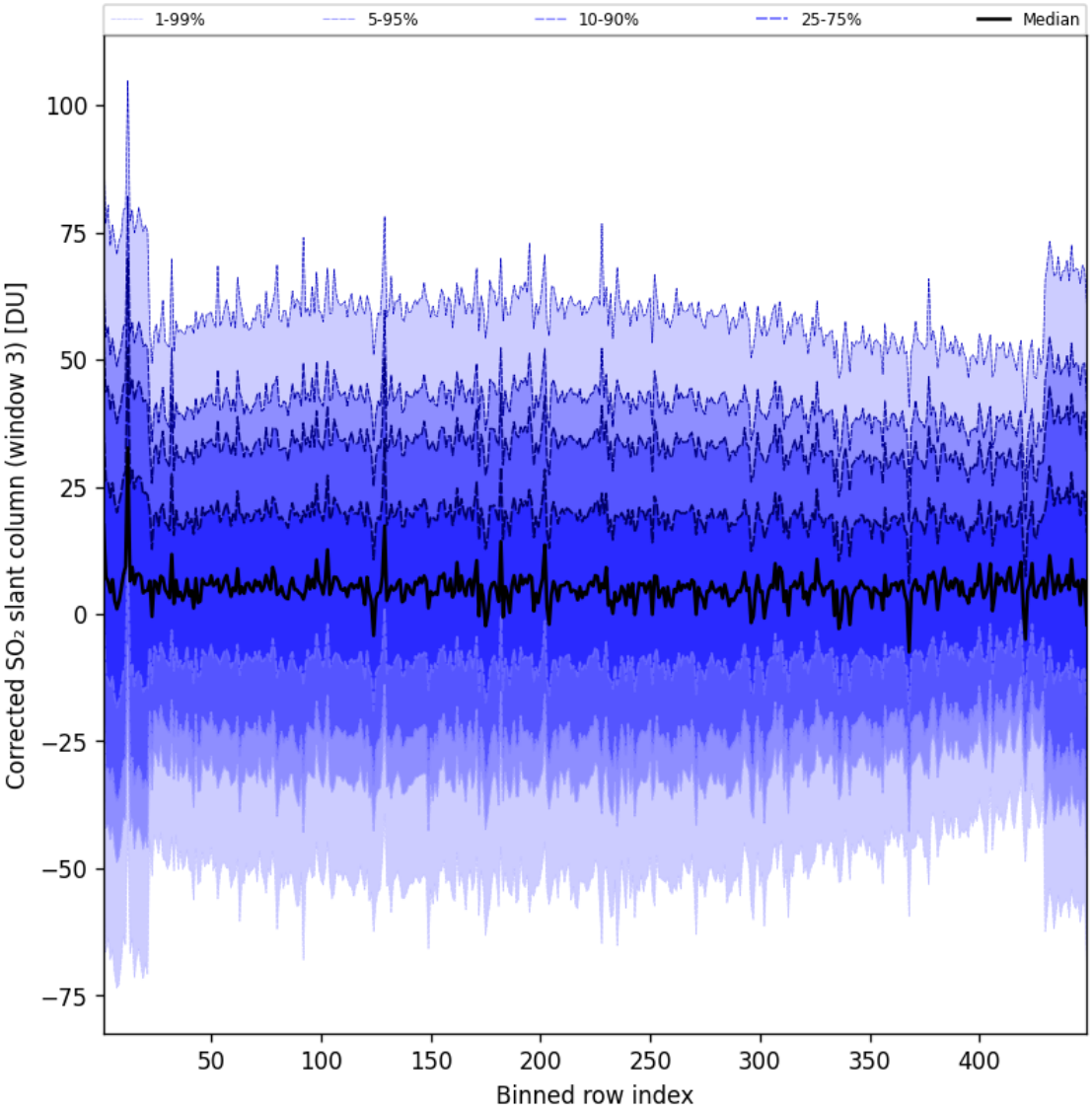

Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-03-05 to 2025-03-05

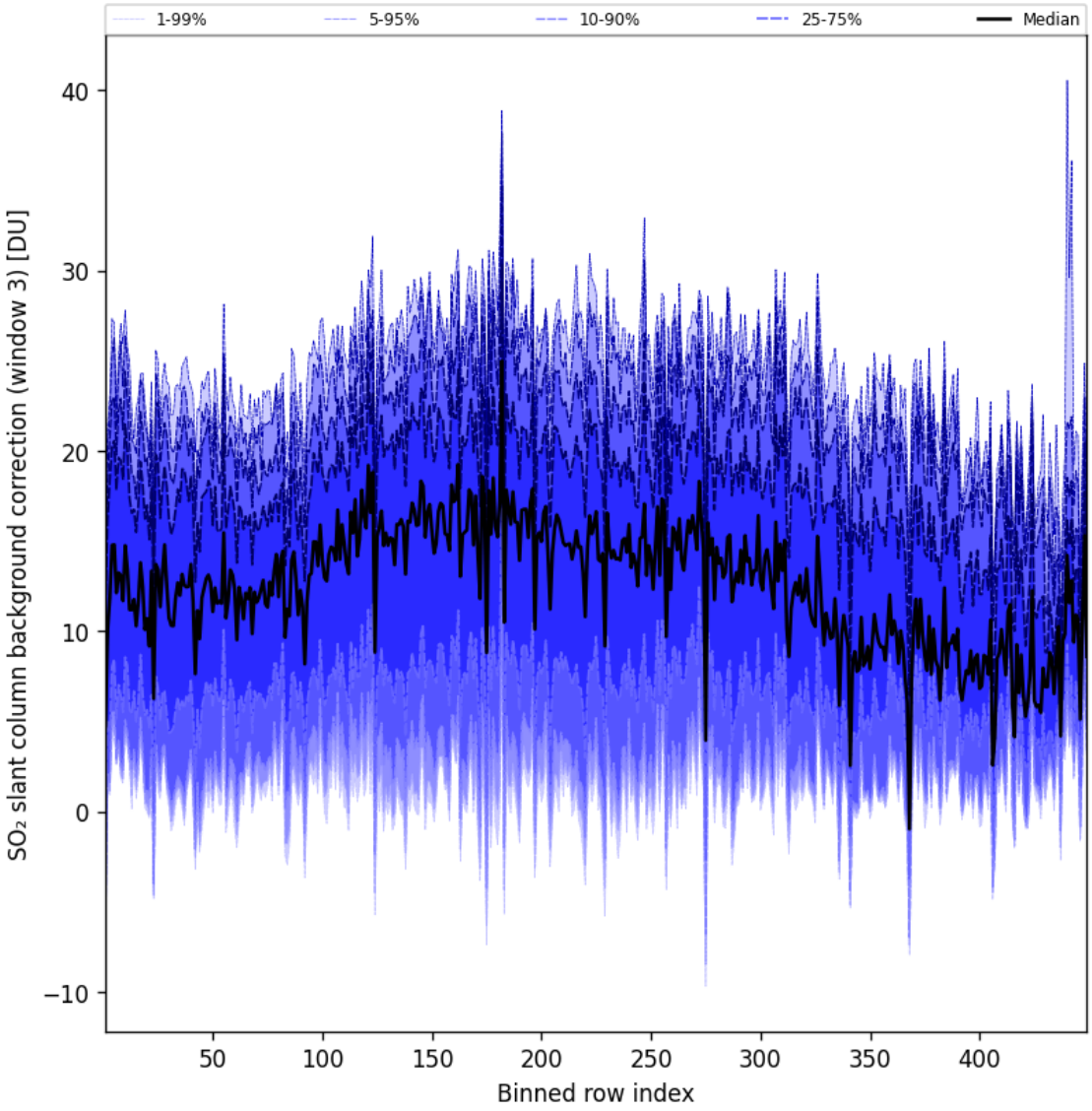

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-03-05 to 2025-03-05

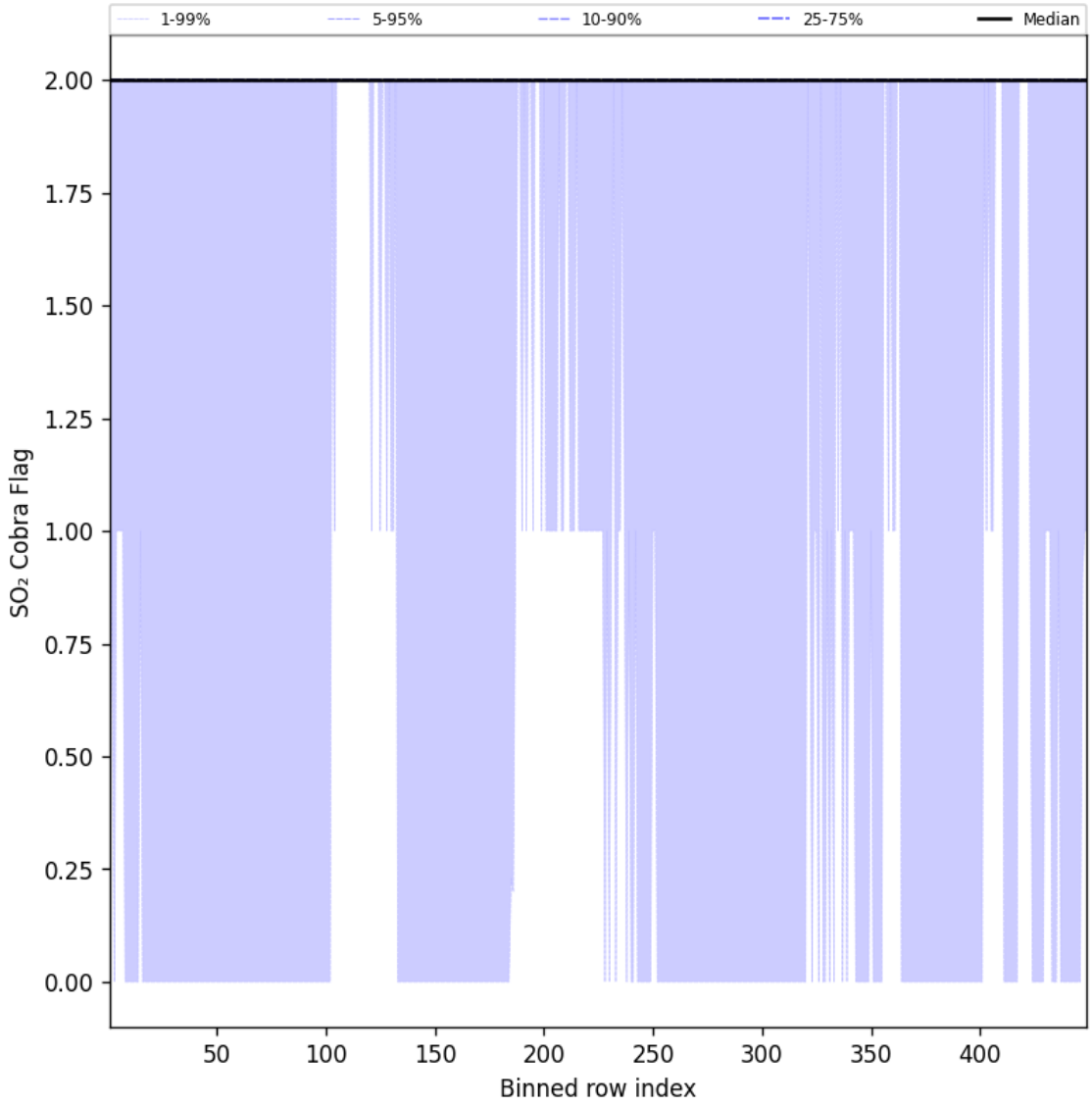

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-03-05 to 2025-03-05

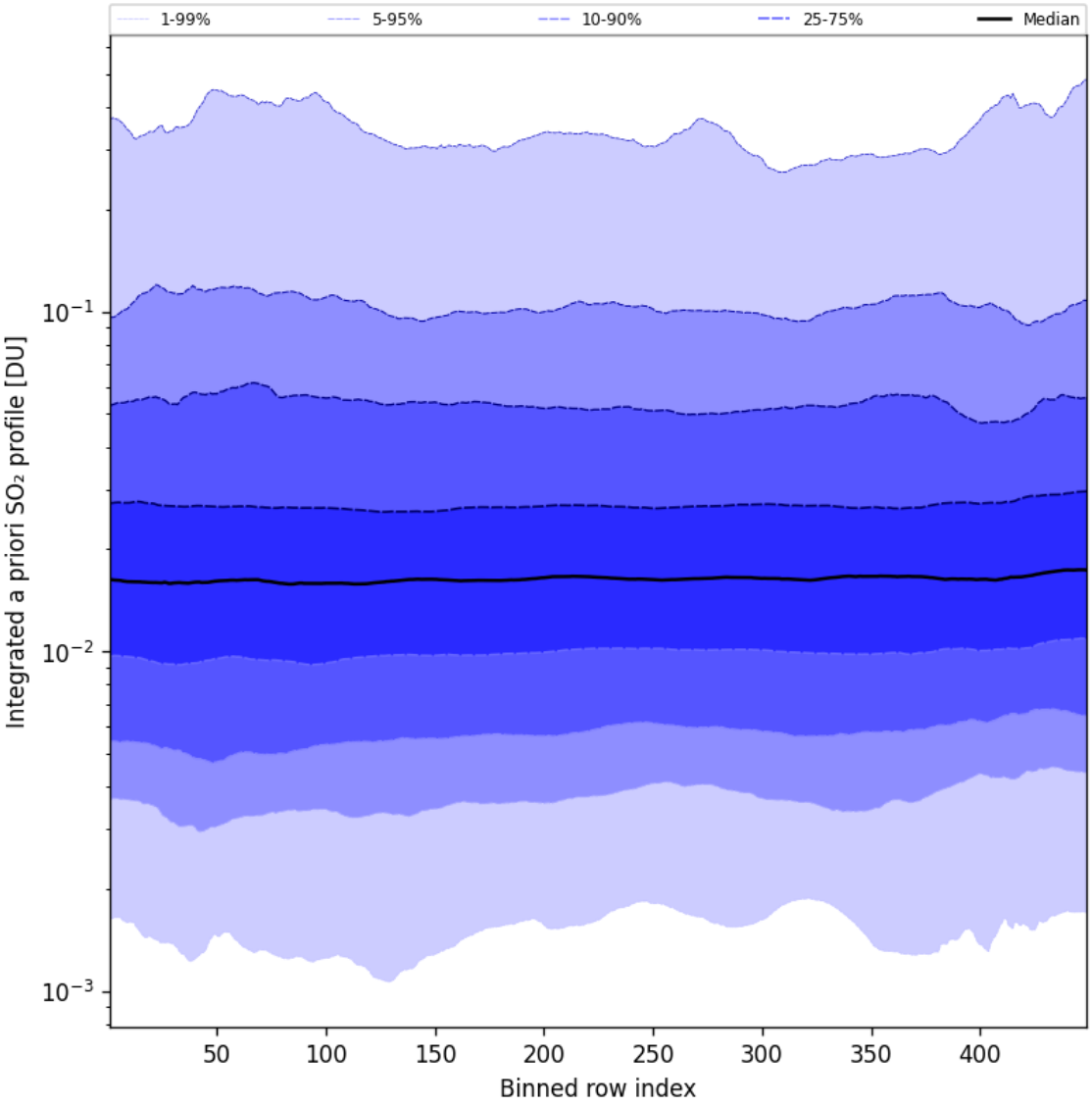

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-03-05 to 2025-03-05

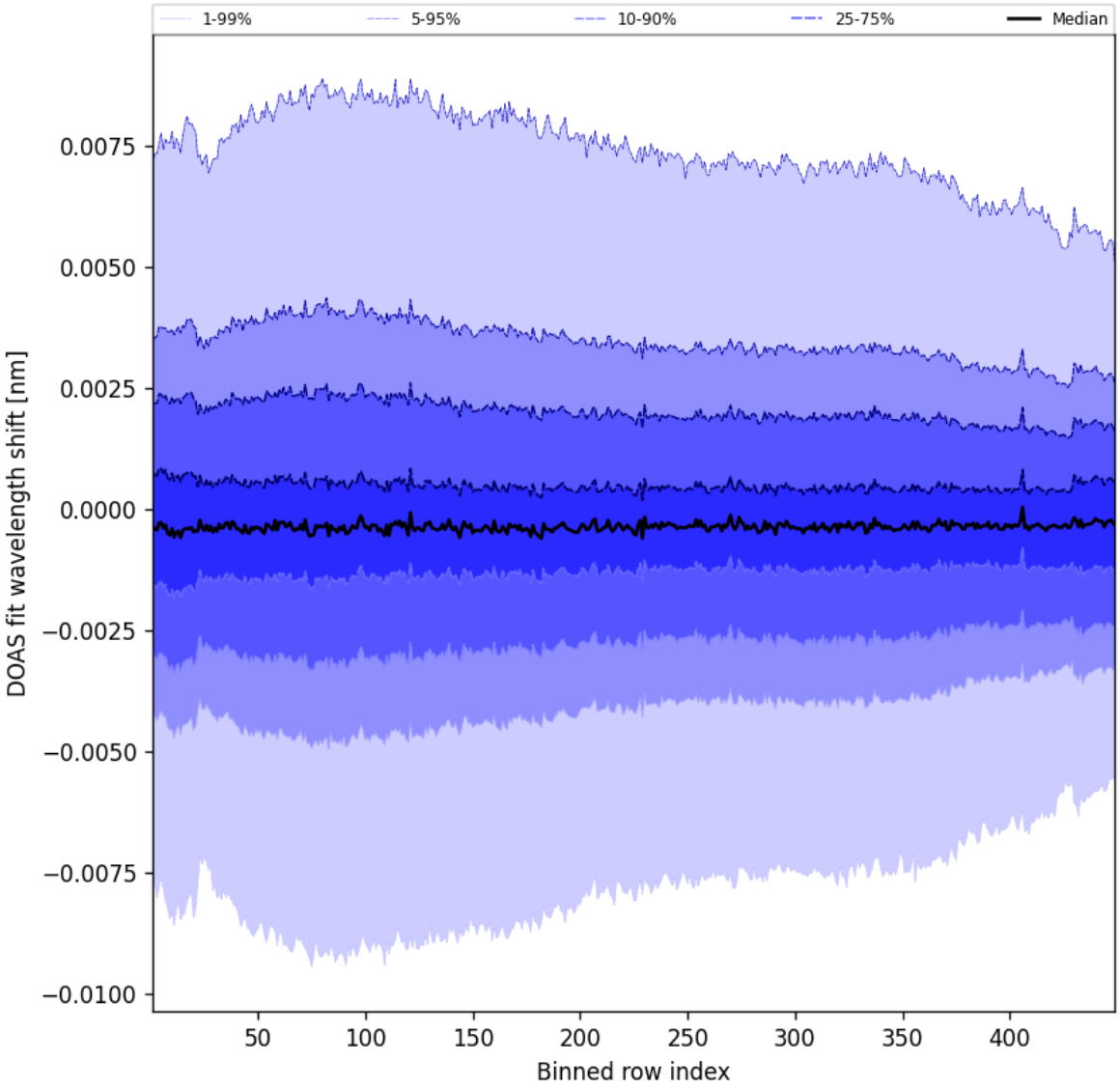

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-03-05 to 2025-03-05

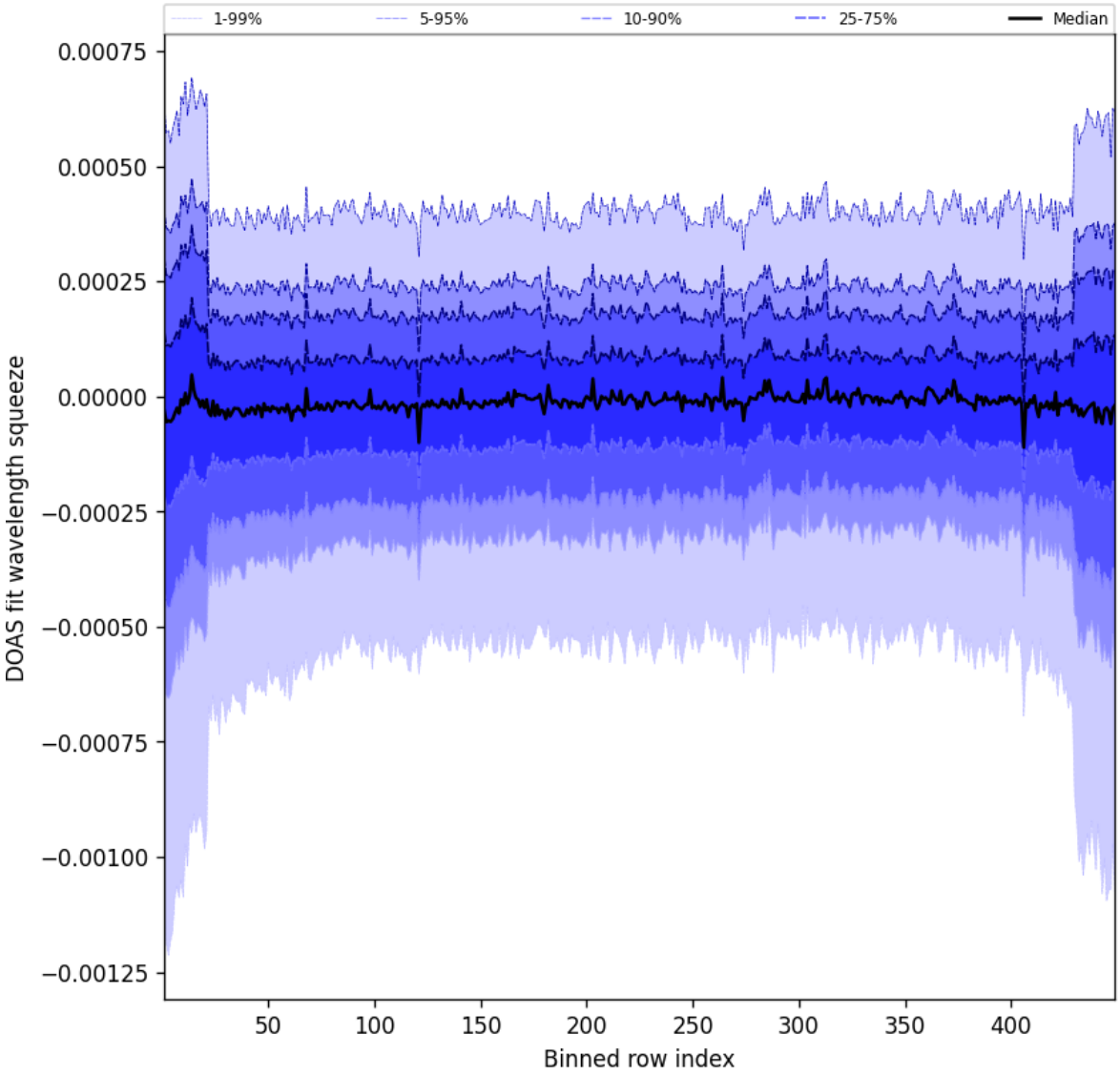

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-03-05 to 2025-03-05

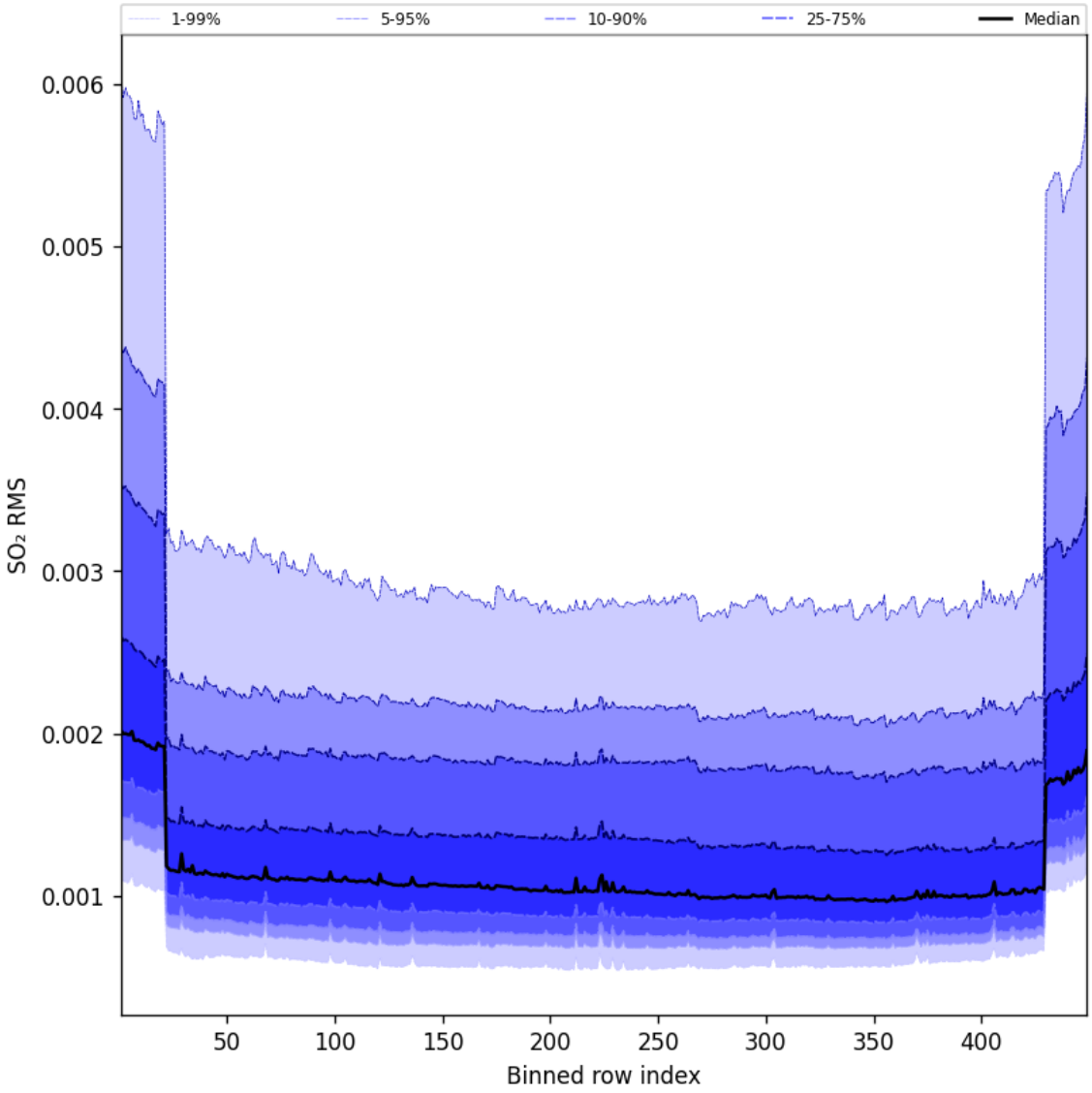

Figure 106: Along track statistics of "SO_2 RMS" for 2025-03-05 to 2025-03-05

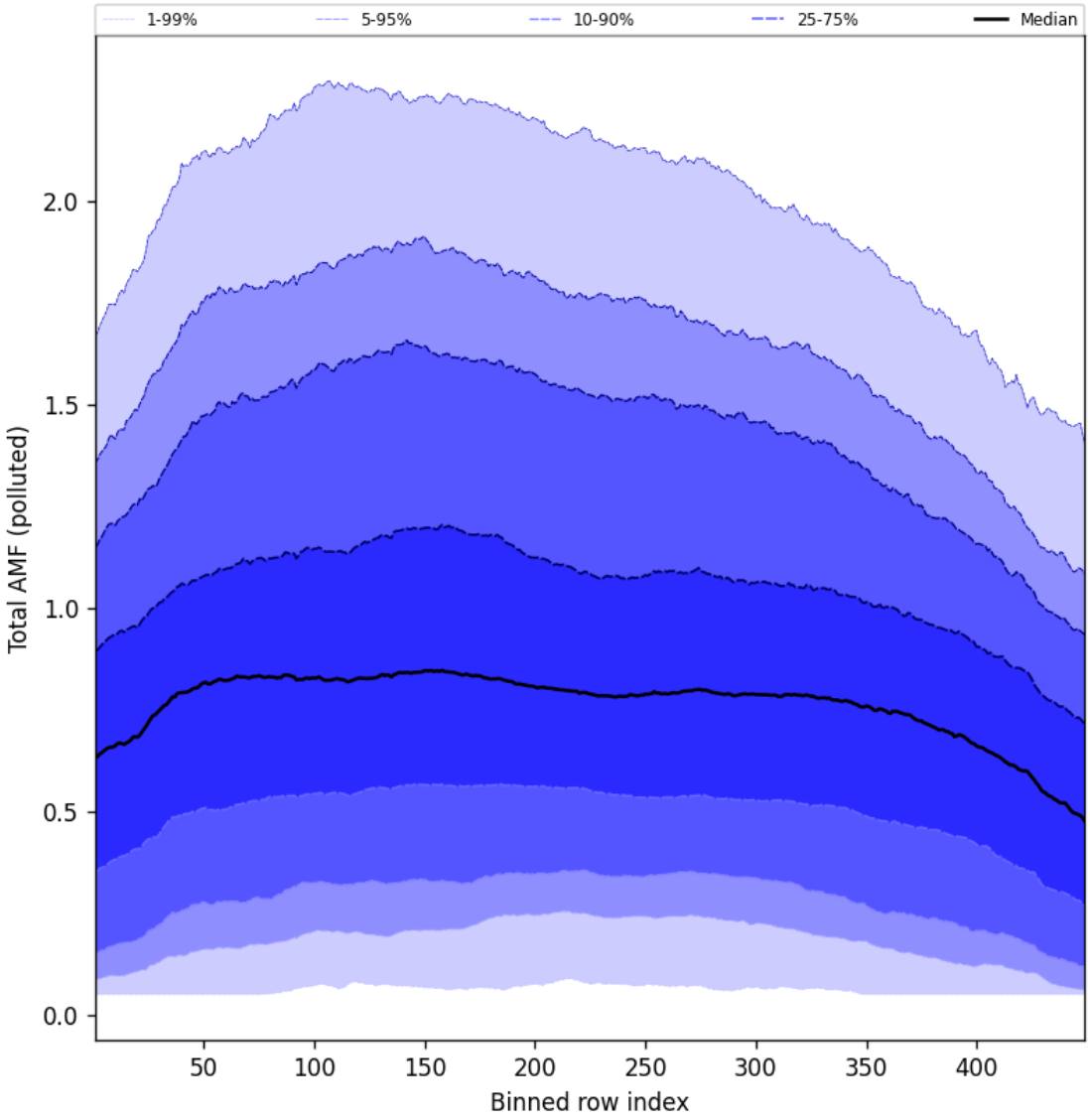

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-03-05 to 2025-03-05

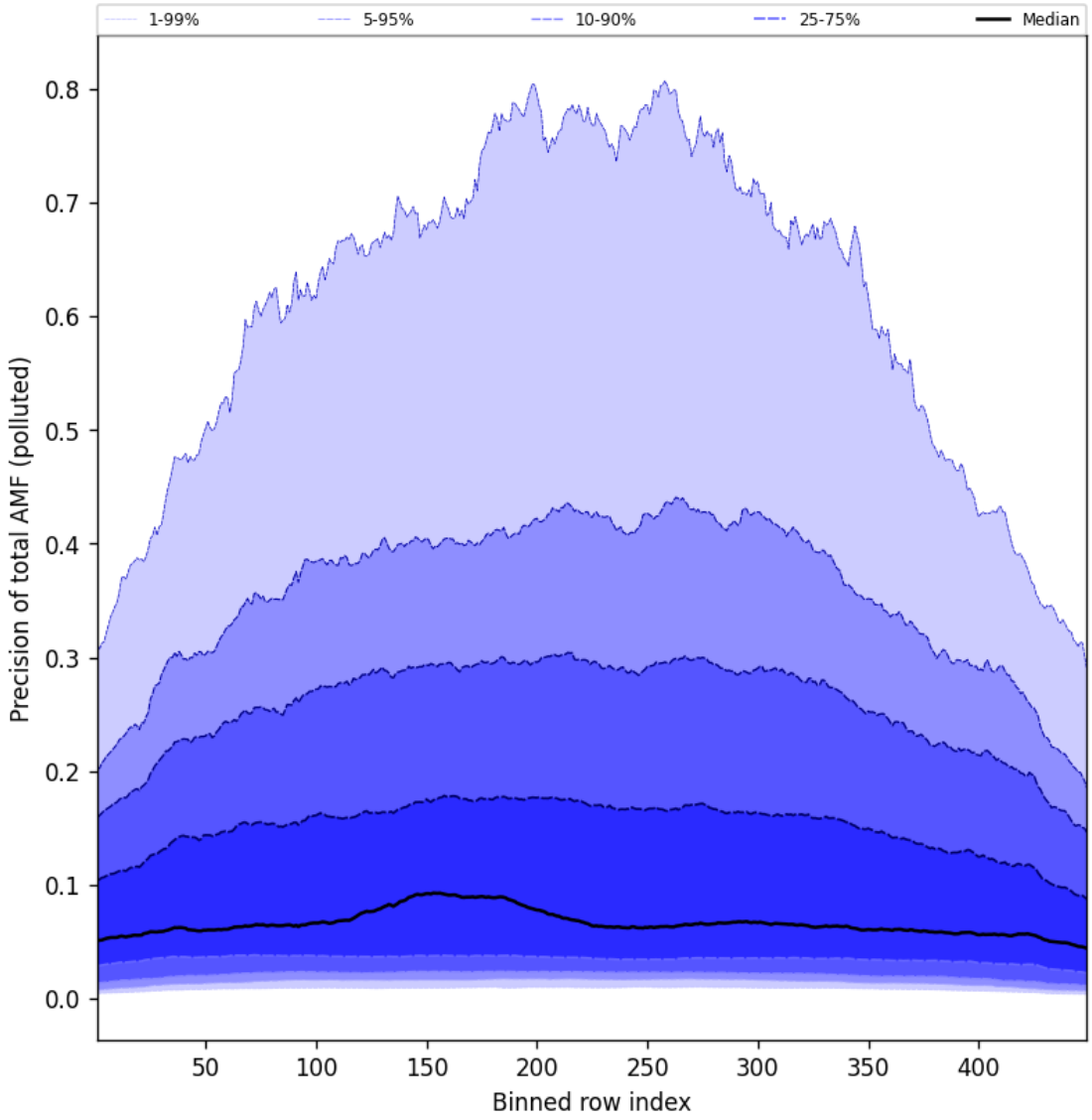

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-03-05 to 2025-03-05

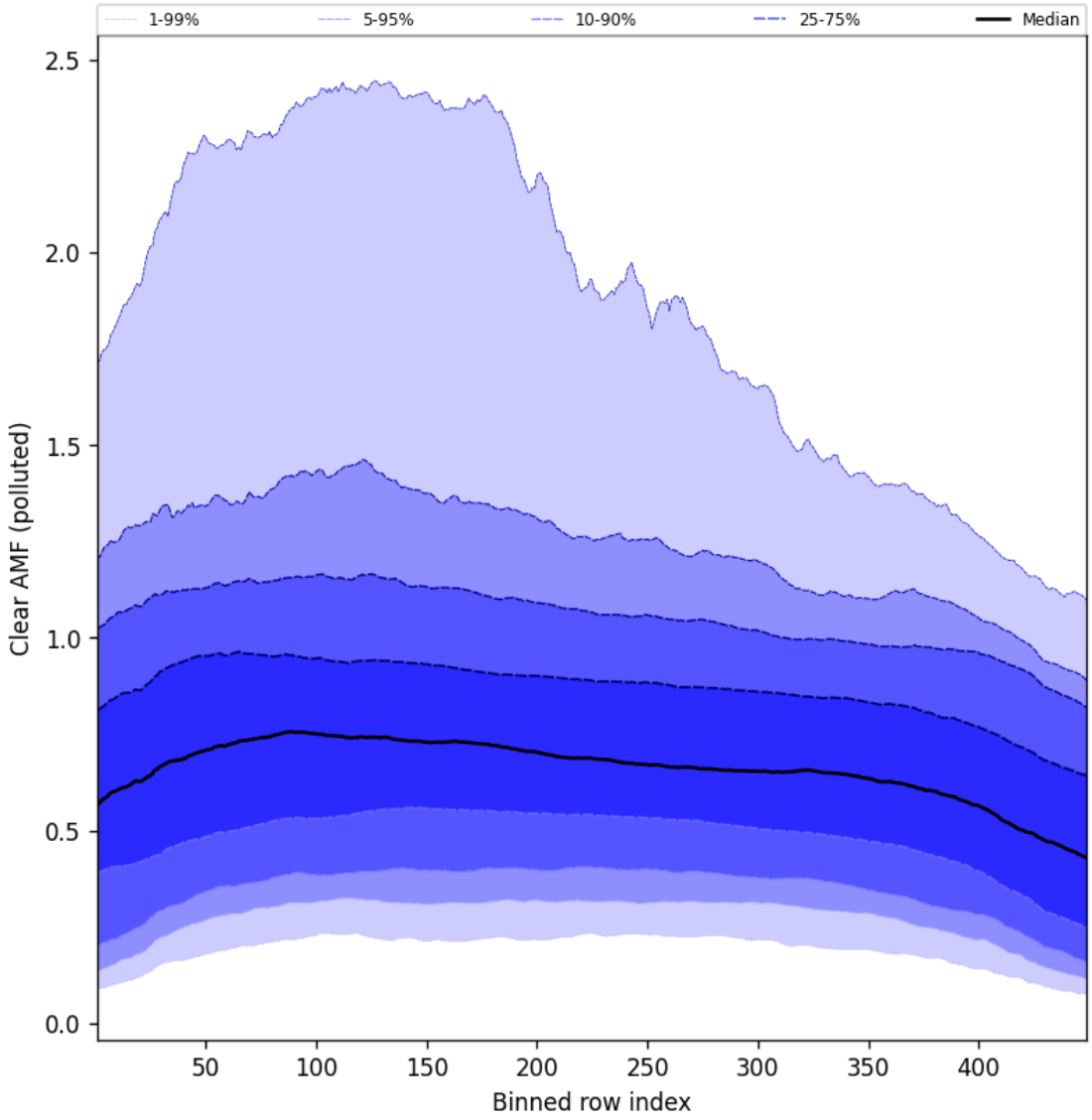

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-03-05 to 2025-03-05

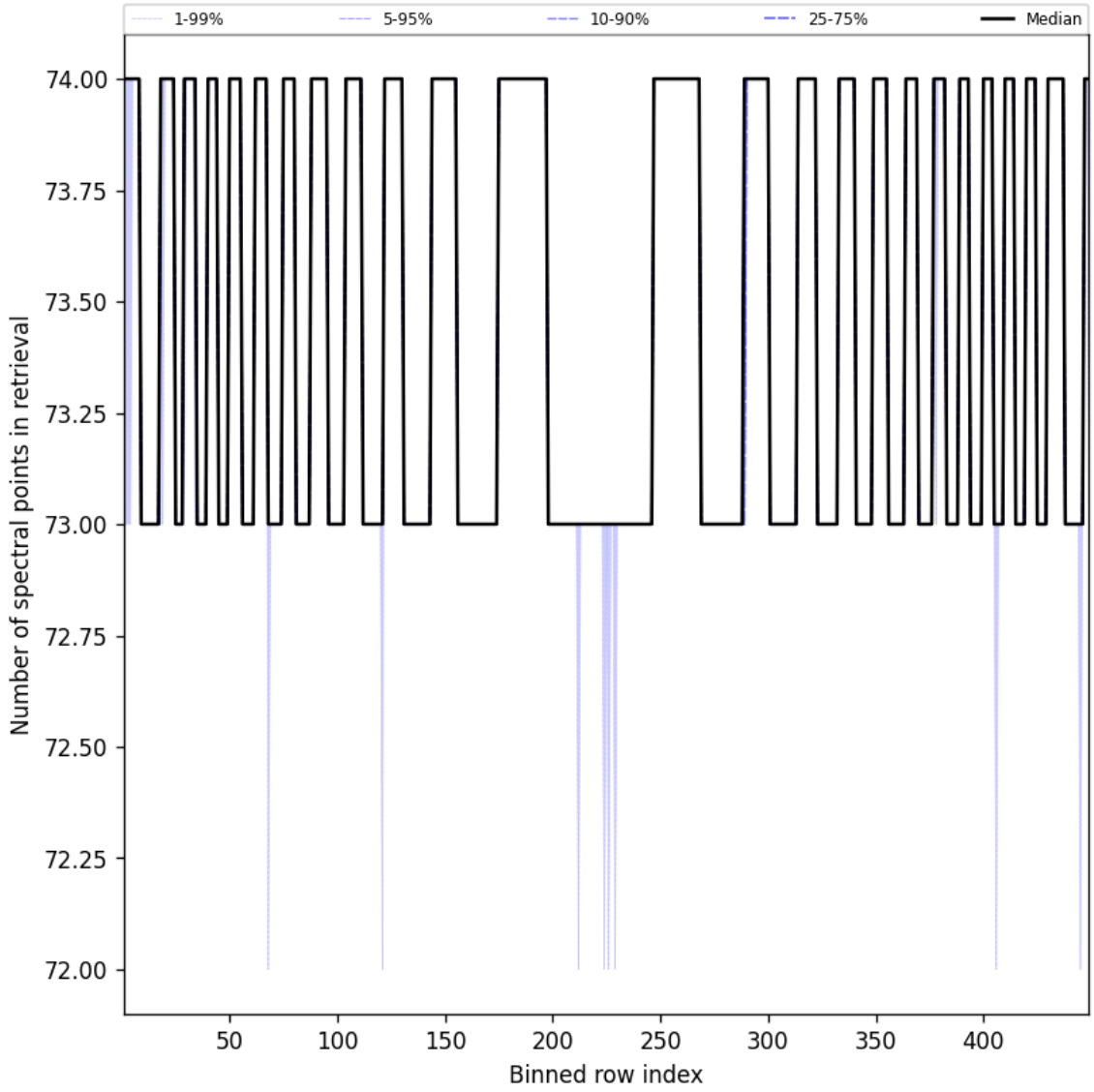

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-03-05 to 2025-03-05

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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