PyCAMA report generated by tropl2-proc

tropl2-proc

2025-04-03 (05:01)

1 Short Introduction

1.1 The list of parameters

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

2 Definitions

The averages shown here are *unweighed* averages:

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

with N the number of observations in the dataset.

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

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

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

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

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

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

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

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

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

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

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

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

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

Table 1: Parameterlist and basic statistics for the analysis

Variable	mean $\pm\sigma$	Count	Mode	IQR	Median	Minimum	Maximum
qa value [1]	0.655 ± 0.400	18528330	0.995	0.770	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(4.044 \pm 118.536) \times 10^{-2}$	18528330	0.278	0.492	1.215×10^{-2}	-133	267
sulfurdioxide total vertical column precision [DU]	0.598 ± 0.859	18528330	0.197	0.404	0.353	4.677×10^{-2}	214
sulfurdioxide slant column density corrected [DU]	$(2.281 \pm 41.331) \times 10^{-2}$	18528330	0.250	0.373	1.008×10^{-2}	-39.3	285
sulfurdioxide slant column density cobra [DU]	$(2.250 \pm 38.919) \times 10^{-2}$	18528330	0.250	0.373	1.008×10^{-2}	-39.3	45.5
sulfurdioxide slant column density cobra precision [DU]	0.305 ± 0.147	18528330	0.213	0.160	0.258	8.040×10^{-2}	28.8
sulfurdioxide slant column density window1 [DU]	0.180 ± 0.731	18528330	0.225	0.756	0.199	-47.3	53.0
sulfurdioxide slant column density window1 precision [DU]	0.305 ± 0.147	18528330	0.213	0.160	0.258	8.040×10^{-2}	28.8
sulfurdioxide slant column density corrected win1 [DU]	$(4.175 \pm 72.063) \times 10^{-2}$	18528330	-2.500×10^{-2}	0.740	1.672×10^{-2}	-47.3	53.1
background so2 slant column offset window1 [DU]	-0.139 ± 0.202	18528330	-0.260	0.210	-0.187	-1.35	2.99
sulfurdioxide slant column density window2 [DU]	2.94 ± 9.22	18528330	1.75	11.7	2.68	-2.019×10^{3}	840
sulfurdioxide slant column density window2 precision [DU]	8.15 ± 2.24	18528330	7.43	2.54	7.83	2.16	727
sulfurdioxide slant column density corrected win2 [DU]	0.273 ± 8.794	18528330	-0.250	11.2	0.297	-2.022×10^{3}	838
background so2 slant column offset window2 [DU]	-2.67 ± 3.21	18528330	-0.250	3.89	-1.60	-21.8	9.28
sulfurdioxide slant column density window3 [DU]	-12.7 ± 24.3	18528330	-15.1	30.8	-13.0	-1.069×10^{3}	1.830×10^{3}
sulfurdioxide slant column density window3 precision [DU]	28.0 ± 13.0	18528330	22.5	9.54	24.5	8.84	2.762×10^{3}
sulfurdioxide slant column density corrected win3 [DU]	1.41 ± 23.23	18528330	0.560	29.2	1.37	-1.061×10^{3}	1.841×10^{3}
background so2 slant column offset window3 [DU]	14.1 ± 7.1	18528330	7.28	12.2	13.7	-8.72	34.7
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	18528330	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.316 \pm 9.035) \times 10^{-2}$	18528330	1.800×10^{-2}	1.695×10^{-2}	1.499×10^{-2}	2.054×10^{-4}	2.04
fitted radiance shift [nm]	$(-3.609 \pm 25.829) \times 10^{-4}$	18528330	-5.000×10^{-4}	1.826×10^{-3}	-3.479×10^{-4}	-4.289×10^{-2}	8.424×10^{-2}
fitted radiance squeeze [1]	$(-3.805 \pm 19.720) \times 10^{-5}$	18528330	-1.000×10^{-5}	2.092×10^{-4}	-2.185×10^{-5}	-1.564×10^{-2}	1.439×10^{-2}
fitted root mean square [1]	$(1.331 \pm 0.616) \times 10^{-3}$	18528330	9.750×10^{-4}	6.198×10^{-4}	1.138×10^{-3}	2.967×10^{-4}	6.445×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.809 ± 0.408	18528330	0.700	0.527	0.768	5.000×10^{-2}	2.78
sulfurdioxide total air mass factor polluted precision [1]	0.105 ± 0.115	18528330	3.500×10^{-2}	0.101	6.046×10^{-2}	2.718×10^{-3}	1.97
sulfurdioxide clear air mass factor polluted [1]	0.695 ± 0.275	18528330	0.660	0.370	0.672	5.118×10^{-2}	2.49
number of spectral points in retrieval [1]	73.4 ± 0.5	18528330	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]	−2.80	−1.01	−0.598	−0.395	−0.229	0.262	0.444	0.676	1.16	3.31
sulfurdioxide total vertical column precision [DU]	9.946×10^{-2}	0.141	0.170	0.195	0.229	0.633	0.864	1.16	1.78	4.24
sulfurdioxide slant column density corrected [DU]	−0.902	−0.512	−0.366	−0.272	−0.174	0.199	0.303	0.408	0.581	1.15
sulfurdioxide slant column density cobra [DU]	−0.902	−0.512	−0.366	−0.272	−0.174	0.199	0.303	0.408	0.581	1.15
sulfurdioxide slant column density cobra precision [DU]	0.141	0.167	0.181	0.192	0.206	0.367	0.423	0.474	0.562	0.857
sulfurdioxide slant column density window1 [DU]	−1.91	−0.952	−0.611	−0.399	−0.186	0.570	0.765	0.954	1.24	2.08
sulfurdioxide slant column density window1 precision [DU]	0.141	0.167	0.181	0.192	0.206	0.367	0.423	0.474	0.562	0.857
sulfurdioxide slant column density corrected win1 [DU]	−1.77	−0.994	−0.717	−0.536	−0.346	0.393	0.604	0.816	1.16	2.18
background so2 slant column offset window1 [DU]	−0.438	−0.329	−0.310	−0.293	−0.271	-6.169×10^{-2}	1.887×10^{-2}	0.102	0.228	0.570
sulfurdioxide slant column density window2 [DU]	−18.2	−11.6	−8.30	−5.84	−3.06	8.66	11.7	14.5	18.3	26.2
sulfurdioxide slant column density window2 precision [DU]	4.35	5.25	5.79	6.21	6.70	9.24	10.1	10.9	12.1	14.7
sulfurdioxide slant column density corrected win2 [DU]	−21.1	−14.0	−10.6	−8.09	−5.29	5.86	8.63	11.1	14.4	21.4
background so2 slant column offset window2 [DU]	−11.9	−9.49	−7.55	−5.98	−4.25	−0.367	-8.263×10^{-2}	0.170	0.548	2.09
sulfurdioxide slant column density window3 [DU]	−71.9	−52.0	−42.6	−35.7	−28.1	2.63	10.7	17.9	27.5	46.5
sulfurdioxide slant column density window3 precision [DU]	13.5	16.1	18.0	19.4	20.9	30.5	35.1	40.9	52.7	83.6
sulfurdioxide slant column density corrected win3 [DU]	−56.3	−36.6	−27.2	−20.5	−13.2	16.1	23.6	30.3	39.4	57.9
background so2 slant column offset window3 [DU]	1.21	4.33	5.59	6.57	7.86	20.1	22.2	23.8	25.6	28.6
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	1.036×10^{-3}	1.812×10^{-3}	3.115×10^{-3}	5.221×10^{-3}	8.123×10^{-3}	2.507×10^{-2}	3.437×10^{-2}	5.388×10^{-2}	0.105	0.432
fitted radiance shift [nm]	-8.162×10^{-3}	-4.199×10^{-3}	-2.807×10^{-3}	-2.007×10^{-3}	-1.307×10^{-3}	5.190×10^{-4}	1.211×10^{-3}	2.072×10^{-3}	3.577×10^{-3}	7.729×10^{-3}
fitted radiance squeeze [1]	-6.683×10^{-4}	-3.718×10^{-4}	-2.608×10^{-4}	-1.945×10^{-4}	-1.311×10^{-4}	7.811×10^{-5}	1.280×10^{-4}	1.735×10^{-4}	2.376×10^{-4}	3.867×10^{-4}
fitted root mean square [1]	5.935×10^{-4}	7.335×10^{-4}	8.075×10^{-4}	8.643×10^{-4}	9.349×10^{-4}	1.555×10^{-3}	1.824×10^{-3}	2.093×10^{-3}	2.518×10^{-3}	3.584×10^{-3}
sulfurdioxide total air mass factor polluted [1]	8.198×10^{-2}	0.217	0.311	0.400	0.517	1.04	1.20	1.36	1.57	1.96
sulfurdioxide total air mass factor polluted precision [1]	9.500×10^{-3}	1.610×10^{-2}	2.218×10^{-2}	2.813×10^{-2}	3.553×10^{-2}	0.137	0.186	0.238	0.327	0.544
sulfurdioxide clear air mass factor polluted [1]	0.189	0.277	0.347	0.415	0.500	0.871	0.971	1.05	1.16	1.45
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]	0.632 ± 0.401	10407118	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(5.502 \pm 143.179) \times 10^{-2}$	10407118	0.553	1.343×10^{-2}	-133	250	-0.256	0.297
sulfurdioxide total vertical column precision [DU]	0.717 ± 1.039	10407118	0.527	0.404	4.677×10^{-2}	214	0.246	0.772
sulfurdioxide slant column density corrected [DU]	$(2.781 \pm 44.799) \times 10^{-2}$	10407118	0.386	1.054×10^{-2}	-39.3	122	-0.179	0.206
sulfurdioxide slant column density cobra [DU]	$(2.734 \pm 42.399) \times 10^{-2}$	10407118	0.386	1.054×10^{-2}	-39.3	31.3	-0.179	0.206
sulfurdioxide slant column density cobra precision [DU]	0.320 ± 0.164	10407118	0.185	0.269	8.346×10^{-2}	28.8	0.207	0.392
sulfurdioxide slant column density window1 [DU]	0.175 ± 0.789	10407118	0.783	0.197	-24.4	41.3	-0.202	0.581
sulfurdioxide slant column density window1 precision [DU]	0.320 ± 0.164	10407118	0.185	0.269	8.346×10^{-2}	28.8	0.207	0.392
sulfurdioxide slant column density corrected win1 [DU]	$(5.523 \pm 77.929) \times 10^{-2}$	10407118	0.768	2.152×10^{-2}	-24.4	41.3	-0.353	0.416
background so2 slant column offset window1 [DU]	-0.119 ± 0.231	10407118	0.230	-0.182	-0.850	2.99	-0.270	-4.037×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.66 ± 9.19	10407118	11.8	3.35	-265	275	-2.42	9.42
sulfurdioxide slant column density window2 precision [DU]	8.00 ± 2.08	10407118	2.45	7.70	2.16	458	6.60	9.05
sulfurdioxide slant column density corrected win2 [DU]	0.184 ± 8.552	10407118	11.0	0.237	-276	266	-5.27	5.69
background so2 slant column offset window2 [DU]	-3.47 ± 3.72	10407118	5.79	-2.44	-21.8	9.15	-6.15	-0.354
sulfurdioxide slant column density window3 [DU]	-14.9 ± 23.3	10407118	29.5	-15.2	-1.069×10^{3}	1.830×10^{3}	-29.8	-0.266
sulfurdioxide slant column density window3 precision [DU]	26.7 ± 12.3	10407118	8.30	23.5	8.84	2.762×10^{3}	20.4	28.7
sulfurdioxide slant column density corrected win3 [DU]	1.34 ± 22.23	10407118	27.9	1.41	-1.061×10^{3}	1.841×10^{3}	-12.5	15.4
background so2 slant column offset window3 [DU]	16.3 ± 7.1	10407118	13.0	17.2	-5.19	34.7	9.37	22.3
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	10407118	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(4.303 \pm 11.616) \times 10^{-2}$	10407118	2.393×10^{-2}	1.354×10^{-2}	2.054×10^{-4}	1.99	5.659×10^{-3}	2.959×10^{-2}
fitted radiance shift [nm]	$(-2.190 \pm 24.496) \times 10^{-4}$	10407118	1.657×10^{-3}	-2.319×10^{-4}	-4.289×10^{-2}	8.424×10^{-2}	-1.080×10^{-3}	5.763×10^{-4}
fitted radiance squeeze [1]	$(-6.066 \pm 21.476) \times 10^{-5}$	10407118	2.217×10^{-4}	-3.378×10^{-5}	-6.494×10^{-3}	1.016×10^{-2}	-1.534×10^{-4}	6.825×10^{-5}
fitted root mean square [1]	$(1.396 \pm 0.694) \times 10^{-3}$	10407118	7.146×10^{-4}	1.171×10^{-3}	2.967×10^{-4}	4.669×10^{-2}	9.358×10^{-4}	1.650×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.761 ± 0.422	10407118	0.567	0.706	5.000×10^{-2}	2.78	0.441	1.01
sulfurdioxide total air mass factor polluted precision [1]	0.105 ± 0.132	10407118	9.693×10^{-2}	5.559×10^{-2}	2.718×10^{-3}	1.97	3.066×10^{-2}	0.128
sulfurdioxide clear air mass factor polluted [1]	0.646 ± 0.296	10407118	0.420	0.609	5.118×10^{-2}	2.49	0.415	0.835
number of spectral points in retrieval [1]	73.5 ± 0.5	10407118	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]	0.685 ± 0.397	8121212	0.730	1.000	0.0	1.000	0.270	1.000
sulfurdioxide total vertical column [DU]	$(2.176 \pm 76.024) \times 10^{-2}$	8121212	0.430	1.077×10^{-2}	-59.5	267	-0.202	0.228
sulfurdioxide total vertical column precision [DU]	0.446 ± 0.506	8121212	0.287	0.310	4.816×10^{-2}	44.0	0.215	0.502
sulfurdioxide slant column density corrected [DU]	$(1.639 \pm 36.398) \times 10^{-2}$	8121212	0.357	9.525×10^{-3}	-21.8	285	-0.168	0.189
sulfurdioxide slant column density cobra [DU]	$(1.629 \pm 33.932) \times 10^{-2}$	8121212	0.357	9.525×10^{-3}	-21.8	45.5	-0.168	0.189
sulfurdioxide slant column density cobra precision [DU]	0.284 ± 0.120	8121212	0.127	0.248	8.040×10^{-2}	28.6	0.206	0.333
sulfurdioxide slant column density window1 [DU]	0.188 ± 0.648	8121212	0.724	0.201	-47.3	53.0	-0.168	0.557
sulfurdioxide slant column density window1 precision [DU]	0.284 ± 0.120	8121212	0.127	0.248	8.040×10^{-2}	28.6	0.206	0.333
sulfurdioxide slant column density corrected win1 [DU]	$(2.447 \pm 63.721) \times 10^{-2}$	8121212	0.706	1.102×10^{-2}	-47.3	53.1	-0.338	0.368
background so2 slant column offset window1 [DU]	-0.163 ± 0.153	8121212	0.185	-0.191	-1.35	2.37	-0.273	-8.839×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.02 ± 9.18	8121212	11.5	1.85	-2.019×10^{3}	840	-3.83	7.67
sulfurdioxide slant column density window2 precision [DU]	8.35 ± 2.41	8121212	2.65	8.00	2.32	727	6.84	9.49
sulfurdioxide slant column density corrected win2 [DU]	0.386 ± 9.093	8121212	11.4	0.378	-2.022×10^{3}	838	-5.32	6.08
background so2 slant column offset window2 [DU]	-1.63 ± 1.97	8121212	2.26	-1.19	-16.4	9.28	-2.64	-0.381
sulfurdioxide slant column density window3 [DU]	-9.86 ± 25.15	8121212	31.9	-9.92	-532	635	-25.7	6.19
sulfurdioxide slant column density window3 precision [DU]	29.7 ± 13.8	8121212	10.7	26.0	9.76	249	21.9	32.6
sulfurdioxide slant column density corrected win3 [DU]	1.50 ± 24.45	8121212	31.1	1.31	-524	641	-14.0	17.1
background so2 slant column offset window3 [DU]	11.4 ± 6.1	8121212	10.1	9.71	-8.72	29.7	6.52	16.7
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	8121212	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.051 \pm 3.233) \times 10^{-2}$	8121212	1.181×10^{-2}	1.589×10^{-2}	5.303×10^{-4}	2.04	1.073×10^{-2}	2.253×10^{-2}
fitted radiance shift [nm]	$(-5.427 \pm 27.336) \times 10^{-4}$	8121212	2.029×10^{-3}	-5.235×10^{-4}	-4.017×10^{-2}	4.037×10^{-2}	-1.606×10^{-3}	4.235×10^{-4}
fitted radiance squeeze [1]	$(-9.090 \pm 167.716) \times 10^{-6}$	8121212	1.970×10^{-4}	-7.846×10^{-6}	-1.564×10^{-2}	1.439×10^{-2}	-1.069×10^{-4}	9.013×10^{-5}
fitted root mean square [1]	$(1.247 \pm 0.486) \times 10^{-3}$	8121212	5.064×10^{-4}	1.109×10^{-3}	3.320×10^{-4}	6.445×10^{-2}	9.339×10^{-4}	1.440×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.870 ± 0.381	8121212	0.463	0.834	5.000×10^{-2}	2.69	0.614	1.08
sulfurdioxide total air mass factor polluted precision [1]	0.105 ± 0.090	8121212	0.104	6.768×10^{-2}	5.733×10^{-3}	1.37	4.173×10^{-2}	0.146
sulfurdioxide clear air mass factor polluted [1]	0.757 ± 0.232	8121212	0.320	0.724	9.909×10^{-2}	2.22	0.589	0.909
number of spectral points in retrieval [1]	73.4 ± 0.5	8121212	1.000	73.0	52.0	74.0	73.0	74.0

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

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.697 ± 0.393	12841689	0.720	1.000	0.0	1.000	0.280	1.000
sulfurdioxide total vertical column [DU]	$(2.759 \pm 93.287) \times 10^{-2}$	12841689	0.459	1.024×10^{-2}	-114	267	-0.217	0.242
sulfurdioxide total vertical column precision [DU]	0.517 ± 0.650	12841689	0.343	0.326	5.260×10^{-2}	83.8	0.221	0.564
sulfurdioxide slant column density corrected [DU]	$(1.713 \pm 37.398) \times 10^{-2}$	12841689	0.359	8.563×10^{-3}	-39.3	285	-0.169	0.190
sulfurdioxide slant column density cobra [DU]	$(1.704 \pm 35.794) \times 10^{-2}$	12841689	0.359	8.563×10^{-3}	-39.3	45.5	-0.169	0.190
sulfurdioxide slant column density cobra precision [DU]	0.292 ± 0.138	12841689	0.141	0.246	8.475×10^{-2}	28.8	0.203	0.344
sulfurdioxide slant column density window1 [DU]	0.187 ± 0.681	12841689	0.729	0.203	-47.3	51.3	-0.168	0.561
sulfurdioxide slant column density window1 precision [DU]	0.292 ± 0.138	12841689	0.141	0.246	8.475×10^{-2}	28.8	0.203	0.344
sulfurdioxide slant column density corrected win1 [DU]	$(3.066 \pm 67.129) \times 10^{-2}$	12841689	0.713	1.249×10^{-2}	-47.3	51.1	-0.339	0.374
background so2 slant column offset window1 [DU]	-0.157 ± 0.173	12841689	0.191	-0.193	-1.35	2.41	-0.273	-8.251×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.40 ± 9.01	12841689	11.4	2.16	-513	840	-3.45	7.98
sulfurdioxide slant column density window2 precision [DU]	8.10 ± 2.18	12841689	2.54	7.76	2.16	727	6.66	9.20
sulfurdioxide slant column density corrected win2 [DU]	0.230 ± 8.744	12841689	11.1	0.243	-514	838	-5.33	5.80
background so2 slant column offset window2 [DU]	-2.17 ± 2.79	12841689	3.05	-1.34	-21.5	9.28	-3.37	-0.313
sulfurdioxide slant column density window3 [DU]	-9.62 ± 24.47	12841689	31.2	-9.82	-532	635	-25.2	6.01
sulfurdioxide slant column density window3 precision [DU]	27.8 ± 12.3	12841689	9.44	24.5	9.05	249	21.0	30.4
sulfurdioxide slant column density corrected win3 [DU]	3.54 ± 23.30	12841689	29.6	3.37	-524	641	-11.3	18.4
background so2 slant column offset window3 [DU]	13.2 ± 6.7	12841689	11.2	12.1	-8.72	34.7	7.53	18.7
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	12841689	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.187 \pm 5.101) \times 10^{-2}$	12841689	1.317×10^{-2}	1.487×10^{-2}	5.334×10^{-4}	1.82	9.225×10^{-3}	2.240×10^{-2}
fitted radiance shift [nm]	$(-3.649 \pm 24.345) \times 10^{-4}$	12841689	1.803×10^{-3}	-3.393×10^{-4}	-3.839×10^{-2}	3.930×10^{-2}	-1.296×10^{-3}	5.068×10^{-4}
fitted radiance squeeze [1]	$(-2.070 \pm 18.126) \times 10^{-5}$	12841689	1.982×10^{-4}	-1.118×10^{-5}	-1.564×10^{-2}	1.439×10^{-2}	-1.126×10^{-4}	8.554×10^{-5}
fitted root mean square [1]	$(1.276 \pm 0.564) \times 10^{-3}$	12841689	5.481×10^{-4}	1.097×10^{-3}	3.320×10^{-4}	4.669×10^{-2}	9.201×10^{-4}	1.468×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.817 ± 0.364	12841689	0.472	0.794	5.000×10^{-2}	2.59	0.563	1.04
sulfurdioxide total air mass factor polluted precision [1]	0.100 ± 0.098	12841689	9.147×10^{-2}	6.090×10^{-2}	2.721×10^{-3}	1.37	3.844×10^{-2}	0.130
sulfurdioxide clear air mass factor polluted [1]	0.712 ± 0.241	12841689	0.333	0.695	5.118×10^{-2}	2.22	0.542	0.876
number of spectral points in retrieval [1]	73.5 ± 0.5	12841689	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]	0.601 ± 0.408	4020205	0.820	0.490	0.0	1.000	0.180	1.000
sulfurdioxide total vertical column [DU]	$(5.646 \pm 148.619) \times 10^{-2}$	4020205	0.541	1.407×10^{-2}	-133	250	-0.248	0.293
sulfurdioxide total vertical column precision [DU]	0.718 ± 1.112	4020205	0.497	0.403	4.677×10^{-2}	214	0.247	0.744
sulfurdioxide slant column density corrected [DU]	$(2.985 \pm 44.983) \times 10^{-2}$	4020205	0.381	1.159×10^{-2}	-21.8	122	-0.176	0.205
sulfurdioxide slant column density cobra [DU]	$(2.924 \pm 41.497) \times 10^{-2}$	4020205	0.381	1.159×10^{-2}	-21.8	31.5	-0.176	0.205
sulfurdioxide slant column density cobra precision [DU]	0.310 ± 0.150	4020205	0.164	0.267	8.040×10^{-2}	28.6	0.210	0.374
sulfurdioxide slant column density window1 [DU]	0.187 ± 0.763	4020205	0.765	0.204	-35.1	53.0	-0.184	0.581
sulfurdioxide slant column density window1 precision [DU]	0.310 ± 0.150	4020205	0.164	0.267	8.040×10^{-2}	28.6	0.210	0.374
sulfurdioxide slant column density corrected win1 [DU]	$(5.271 \pm 75.282) \times 10^{-2}$	4020205	0.749	1.935×10^{-2}	-35.1	53.1	-0.345	0.403
background so2 slant column offset window1 [DU]	-0.135 ± 0.224	4020205	0.215	-0.194	-0.977	2.79	-0.277	-6.242×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.33 ± 9.44	4020205	11.9	3.11	-2.019×10^{3}	751	-2.74	9.20
sulfurdioxide slant column density window2 precision [DU]	8.23 ± 2.40	4020205	2.52	7.93	2.25	558	6.77	9.28
sulfurdioxide slant column density corrected win2 [DU]	0.333 ± 8.884	4020205	11.1	0.376	-2.022×10^{3}	750	-5.20	5.92
background so2 slant column offset window2 [DU]	-3.00 ± 3.47	4020205	4.79	-1.70	-21.8	9.28	-5.16	-0.370
sulfurdioxide slant column density window3 [DU]	-19.3 ± 22.6	4020205	28.4	-19.0	-1.069×10^{3}	1.830×10^{3}	-33.4	-4.96
sulfurdioxide slant column density window3 precision [DU]	29.3 ± 15.4	4020205	10.5	25.1	8.84	2.762×10^{3}	20.9	31.5
sulfurdioxide slant column density corrected win3 [DU]	-4.41 ± 22.73	4020205	28.3	-3.81	-1.061×10^{3}	1.841×10^{3}	-18.3	10.1
background so2 slant column offset window3 [DU]	14.9 ± 7.4	4020205	13.1	14.9	-8.72	34.7	8.15	21.3
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.17	4020205	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.169 \pm 13.620) \times 10^{-2}$	4020205	4.780×10^{-2}	1.865×10^{-2}	2.054×10^{-4}	2.04	6.356×10^{-3}	5.416×10^{-2}
fitted radiance shift [nm]	$(-3.075 \pm 30.864) \times 10^{-4}$	4020205	1.932×10^{-3}	-3.230×10^{-4}	-4.289×10^{-2}	4.009×10^{-2}	-1.310×10^{-3}	6.224×10^{-4}
fitted radiance squeeze [1]	$(-5.643 \pm 20.647) \times 10^{-5}$	4020205	2.187×10^{-4}	-3.617×10^{-5}	-1.515×10^{-2}	1.411×10^{-2}	-1.521×10^{-4}	6.657×10^{-5}
fitted root mean square [1]	$(1.350 \pm 0.642) \times 10^{-3}$	4020205	6.146×10^{-4}	1.172×10^{-3}	2.967×10^{-4}	4.919×10^{-2}	9.488×10^{-4}	1.563×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.797 ± 0.497	4020205	0.647	0.679	5.000×10^{-2}	2.78	0.430	1.08
sulfurdioxide total air mass factor polluted precision [1]	0.122 ± 0.151	4020205	0.133	6.113×10^{-2}	3.274×10^{-3}	1.97	2.969×10^{-2}	0.163
sulfurdioxide clear air mass factor polluted [1]	0.656 ± 0.324	4020205	0.428	0.601	5.771×10^{-2}	2.39	0.408	0.836
number of spectral points in retrieval [1]	73.4 ± 0.5	4020205	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

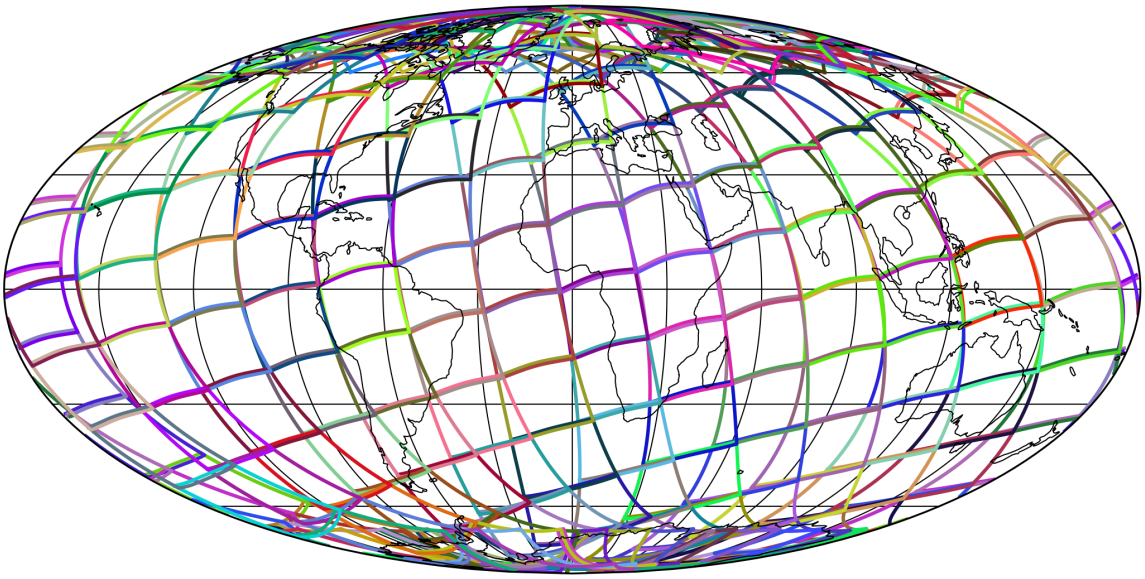

Figure 1: Outline of the granules.

4 Input data monitoring

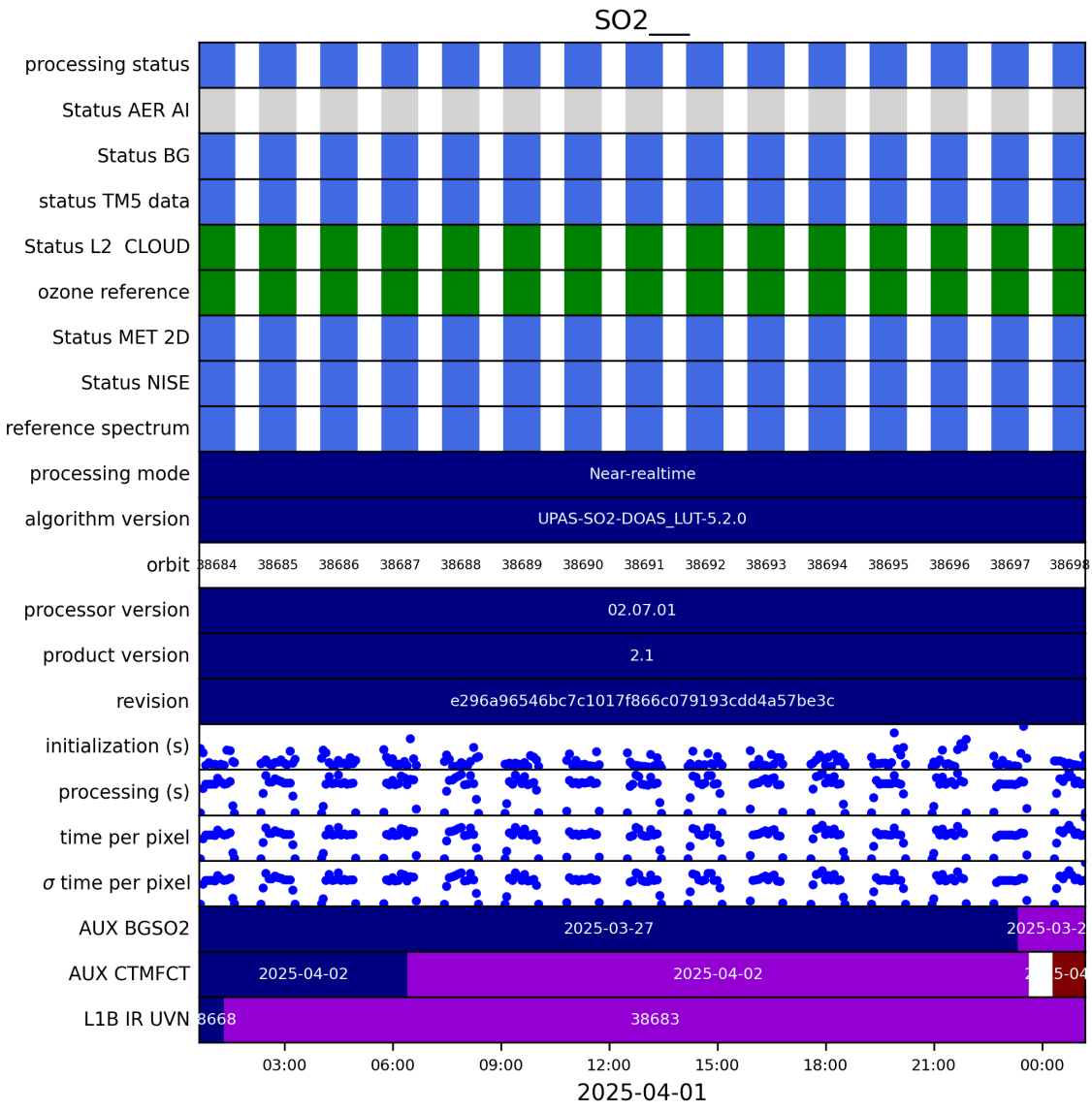

Figure 2: Input data per granule

5 Warnings and errors

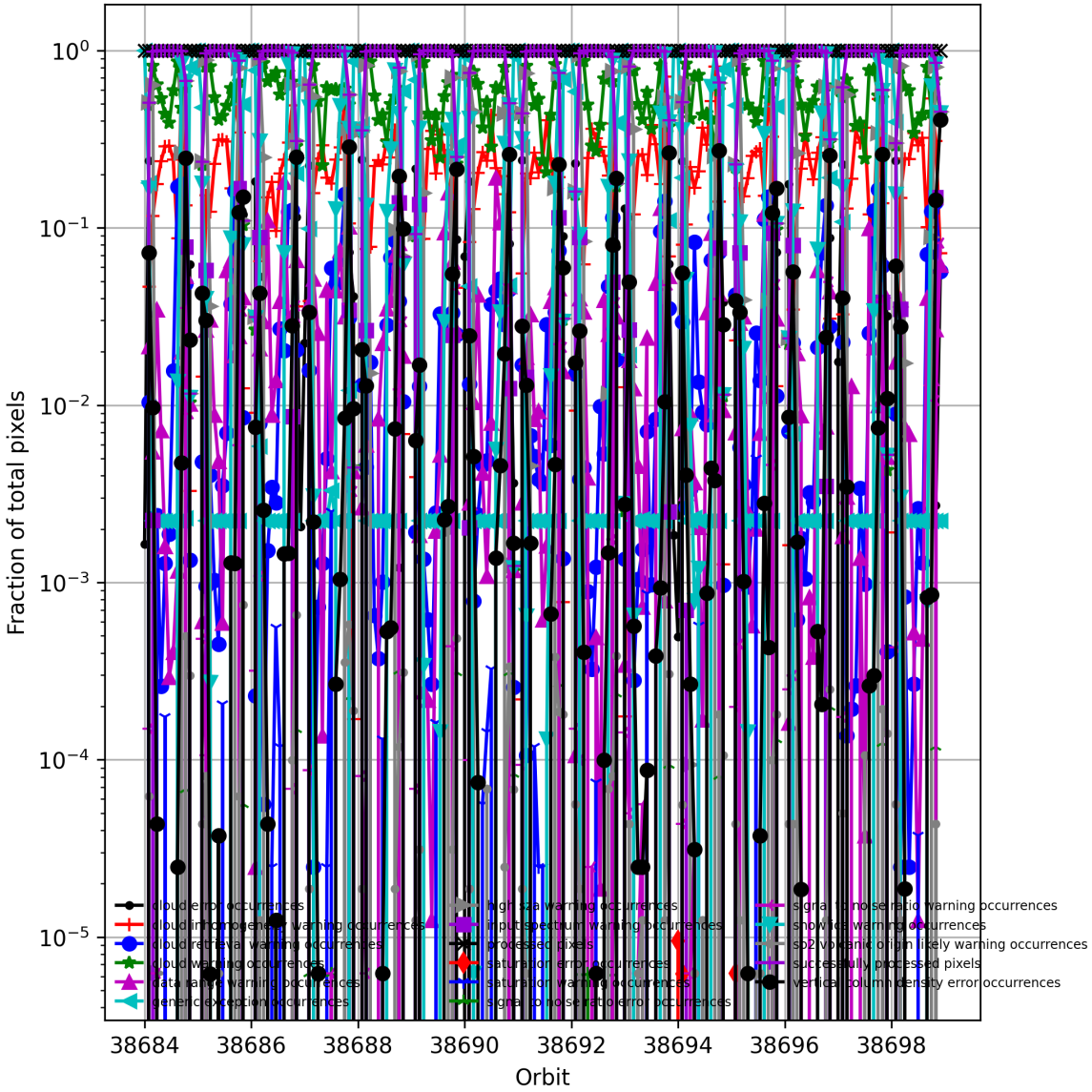

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

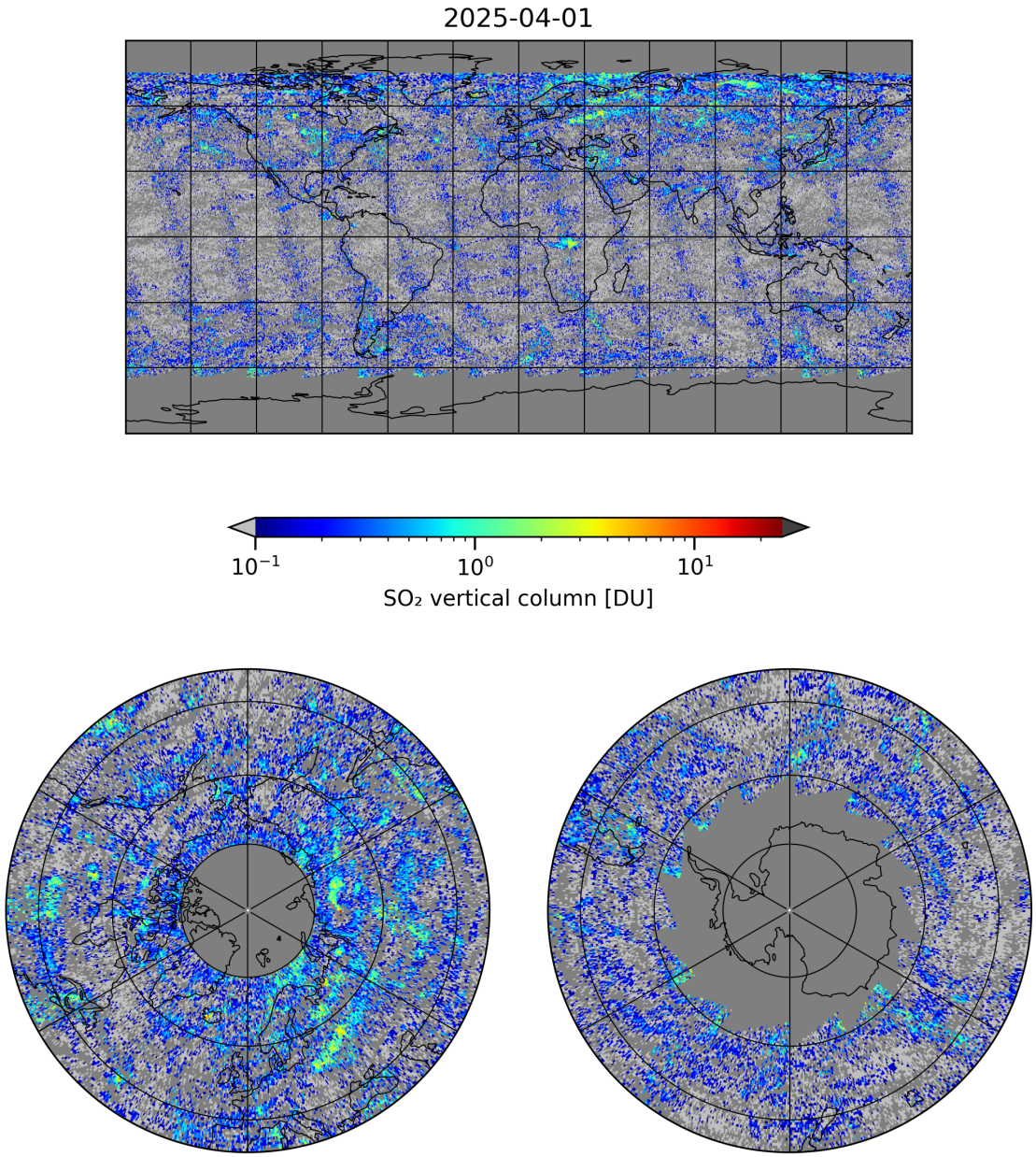

Figure 4: Map of "SO_2 vertical column" for 2025-04-01 to 2025-04-02

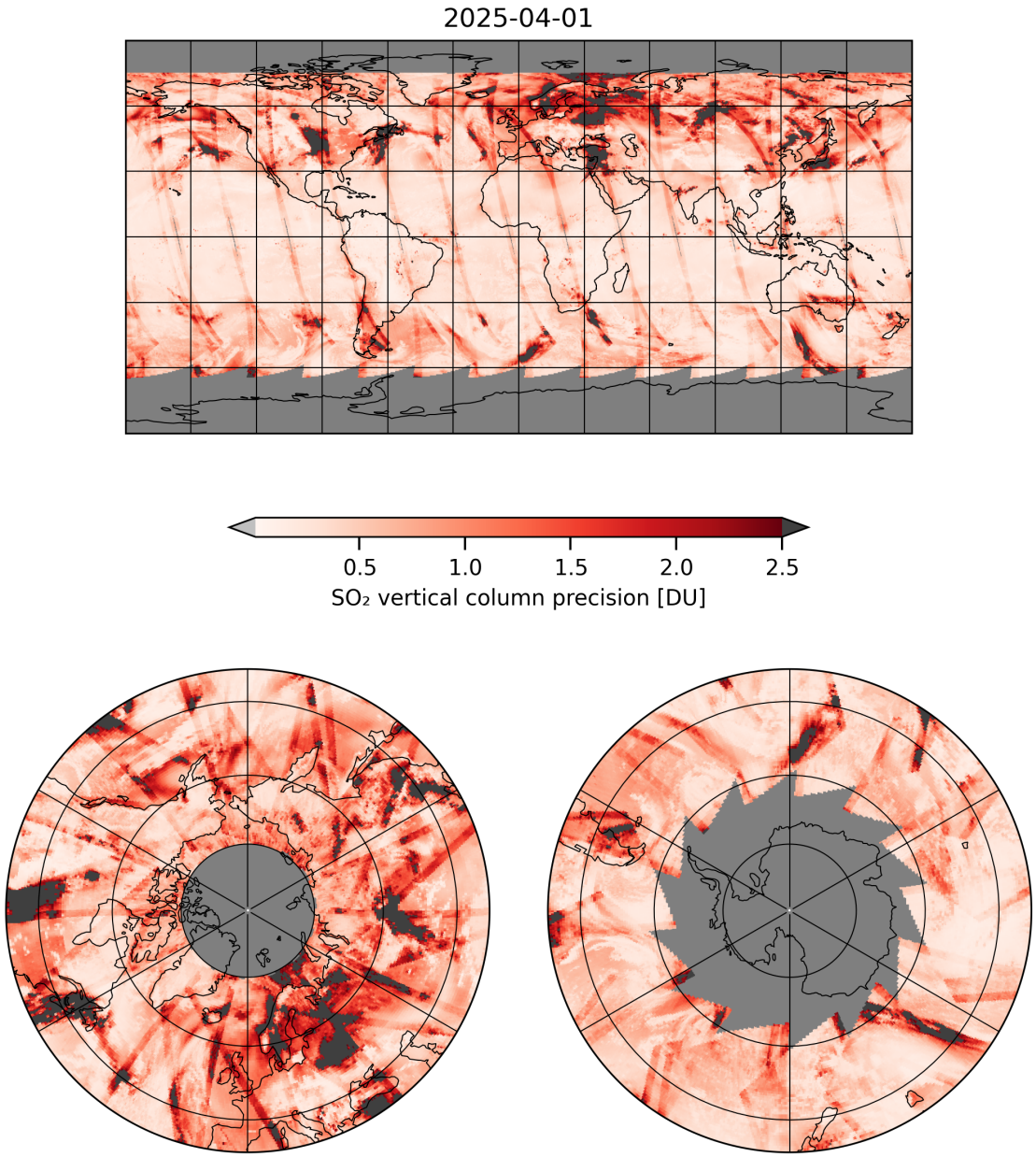

Figure 5: Map of "SO_2 vertical column precision" for 2025-04-01 to 2025-04-02

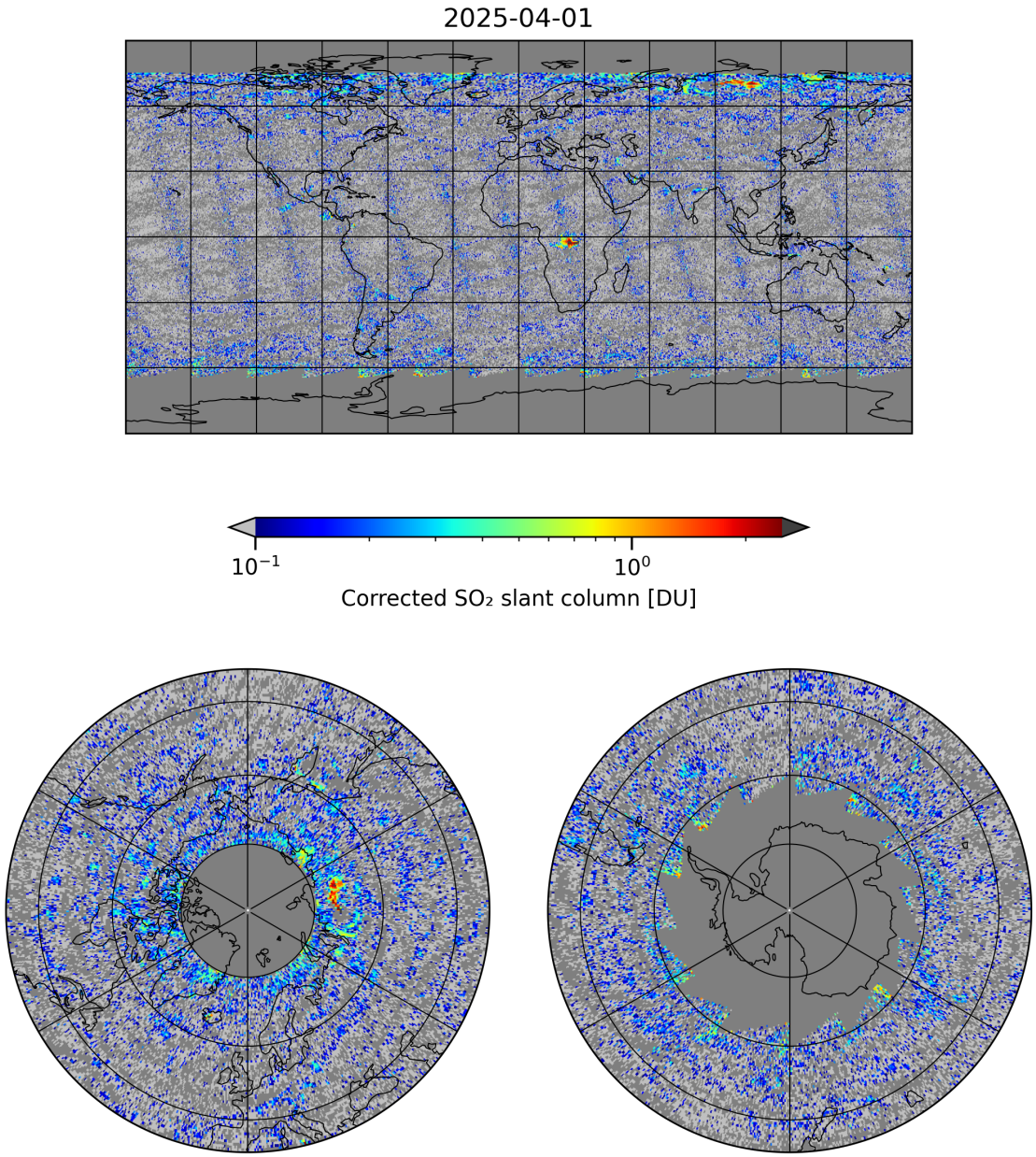

Figure 6: Map of “Corrected SO_2 slant column” for 2025-04-01 to 2025-04-02

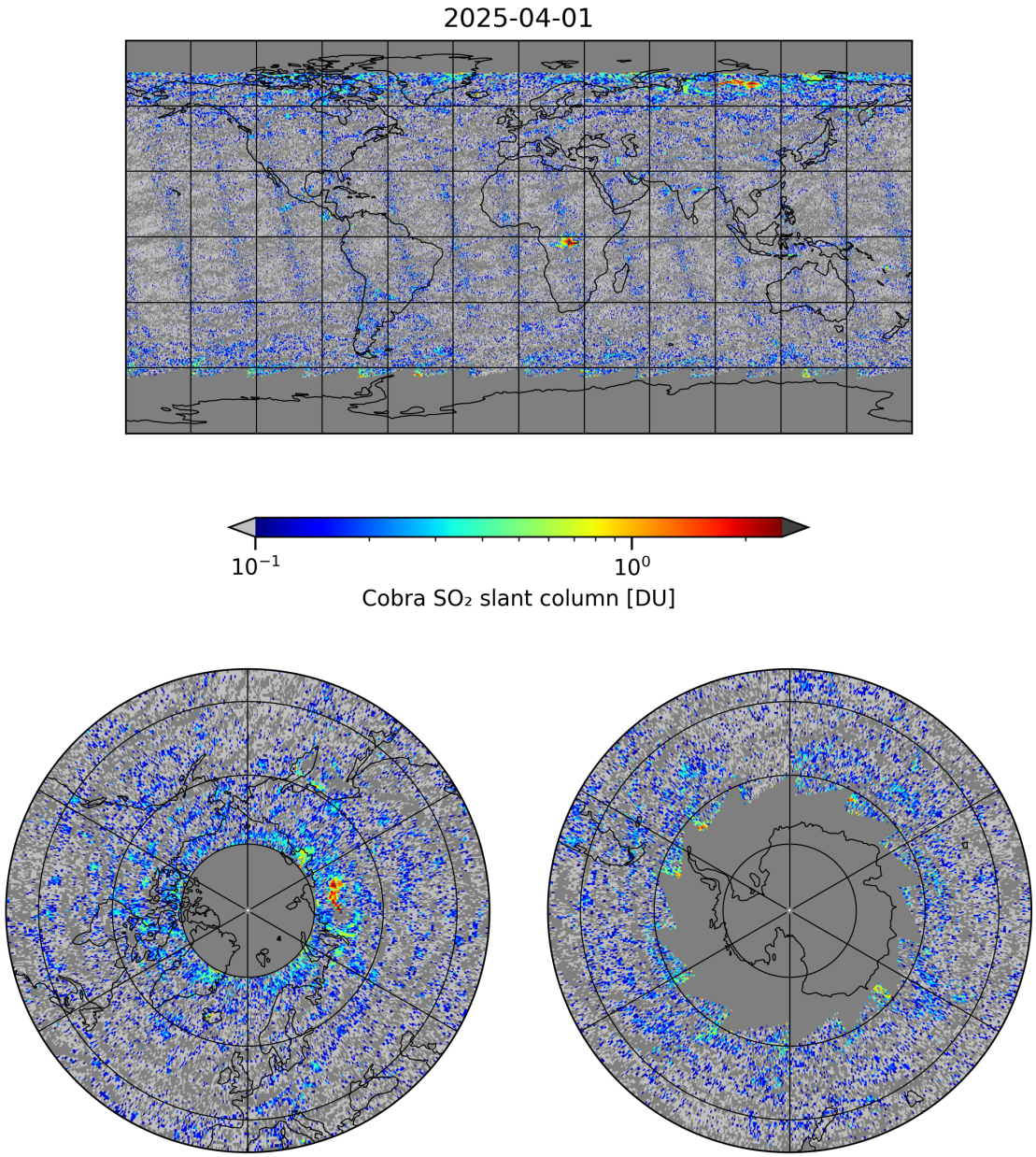

Figure 7: Map of "Cobra SO_2 slant column" for 2025-04-01 to 2025-04-02

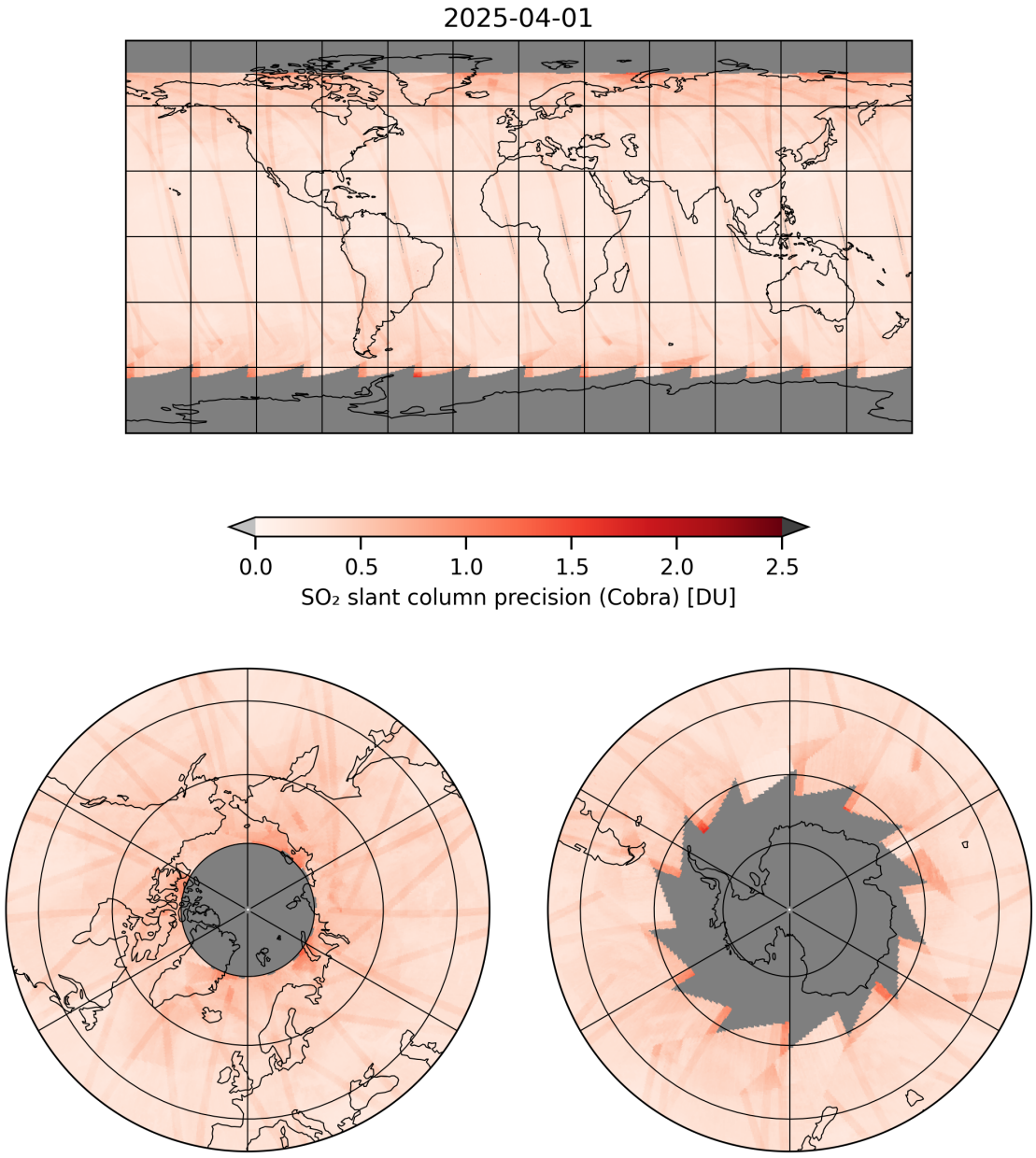

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-04-01 to 2025-04-02

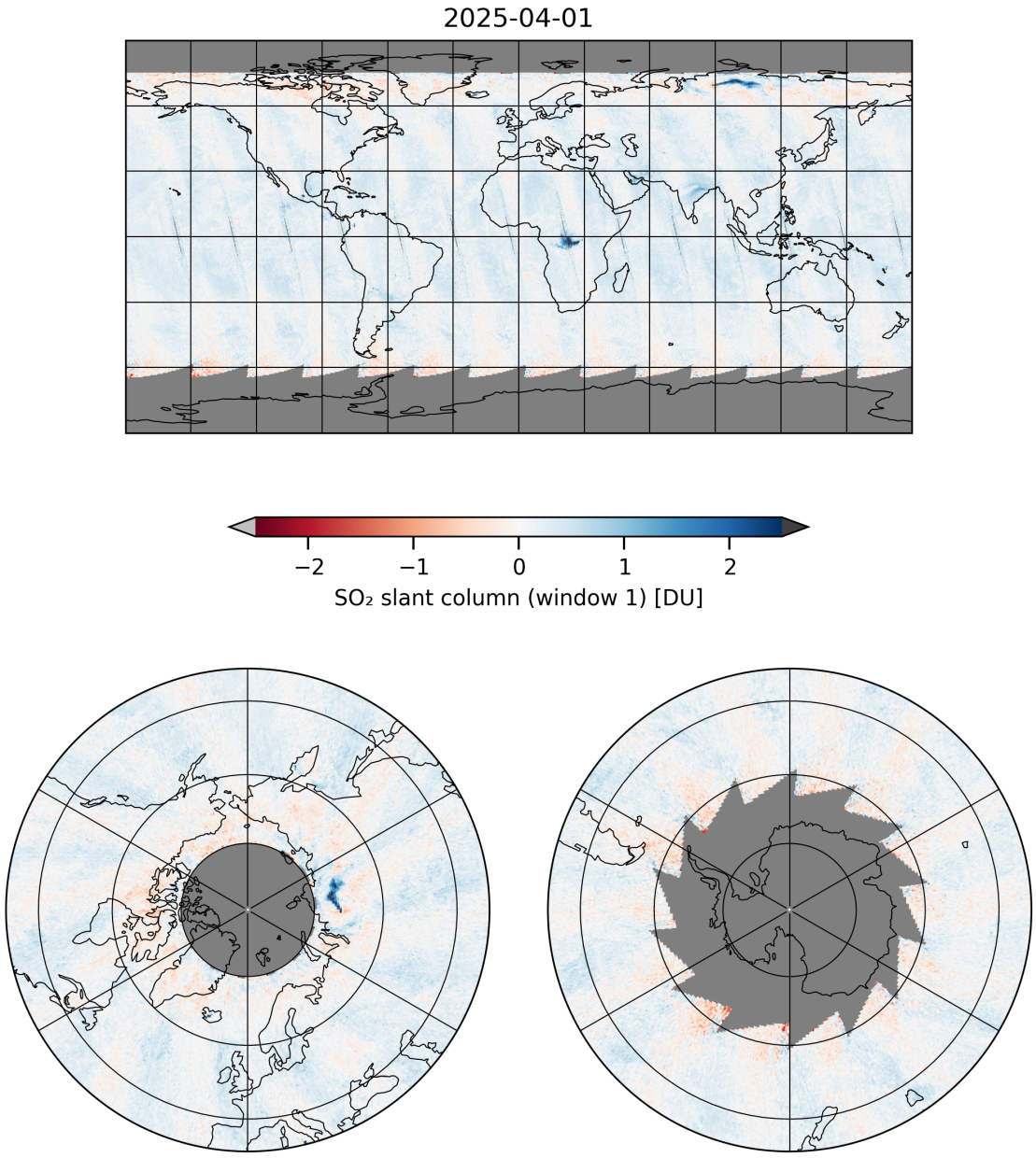

Figure 9: Map of "SO_2 slant column (window 1)" for 2025-04-01 to 2025-04-02

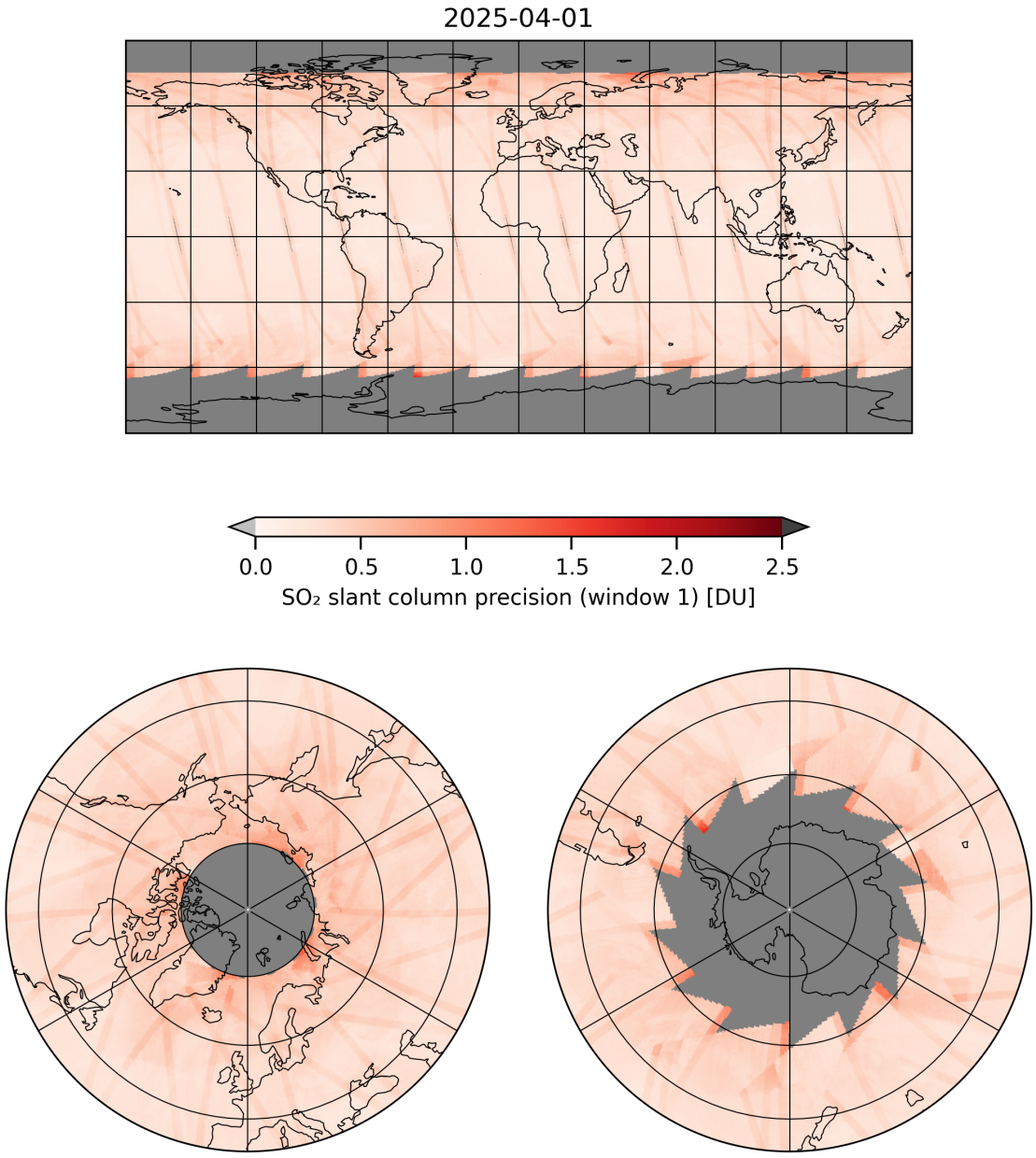

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-04-01 to 2025-04-02

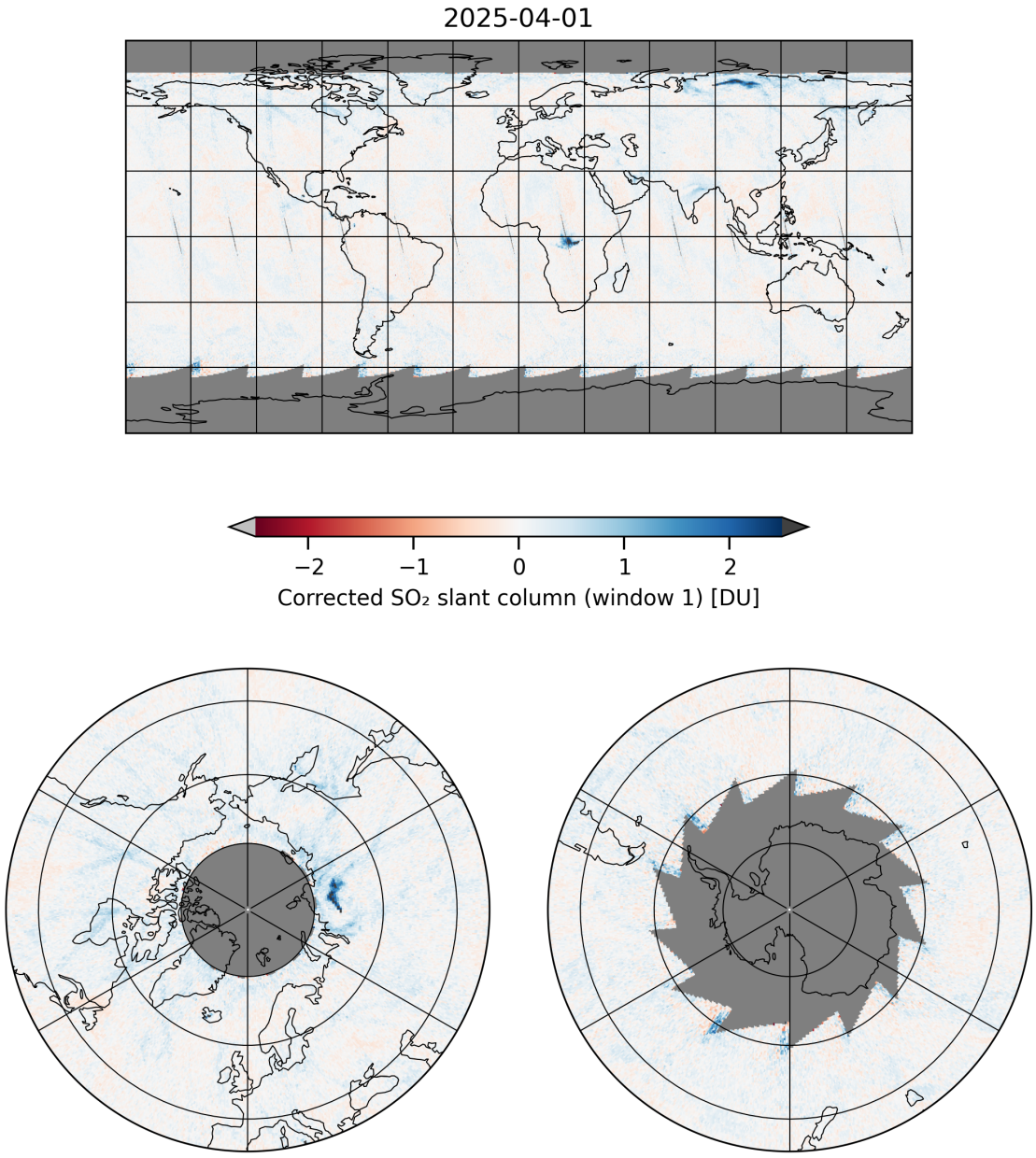

Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-04-01 to 2025-04-02

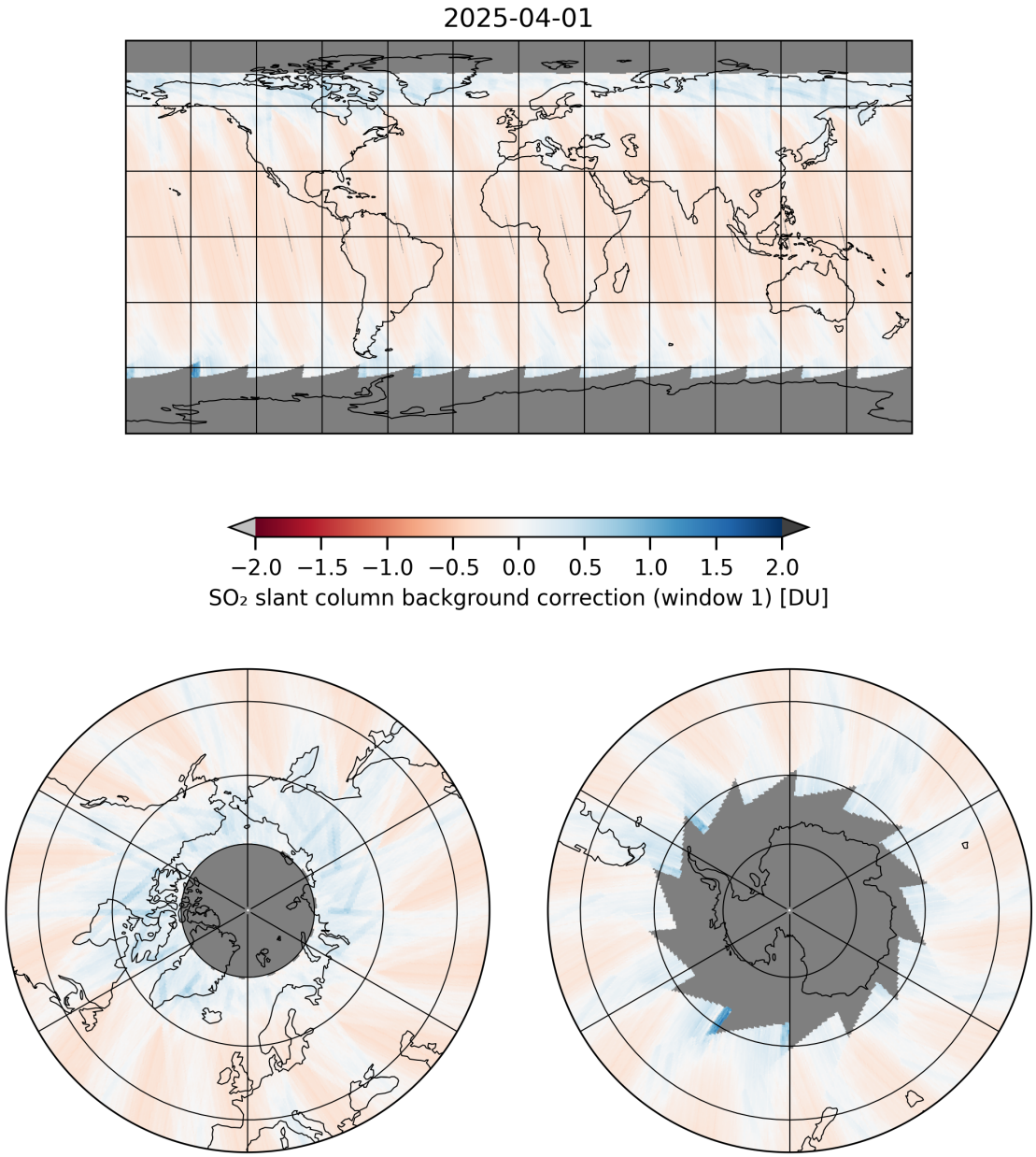

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-04-01 to 2025-04-02

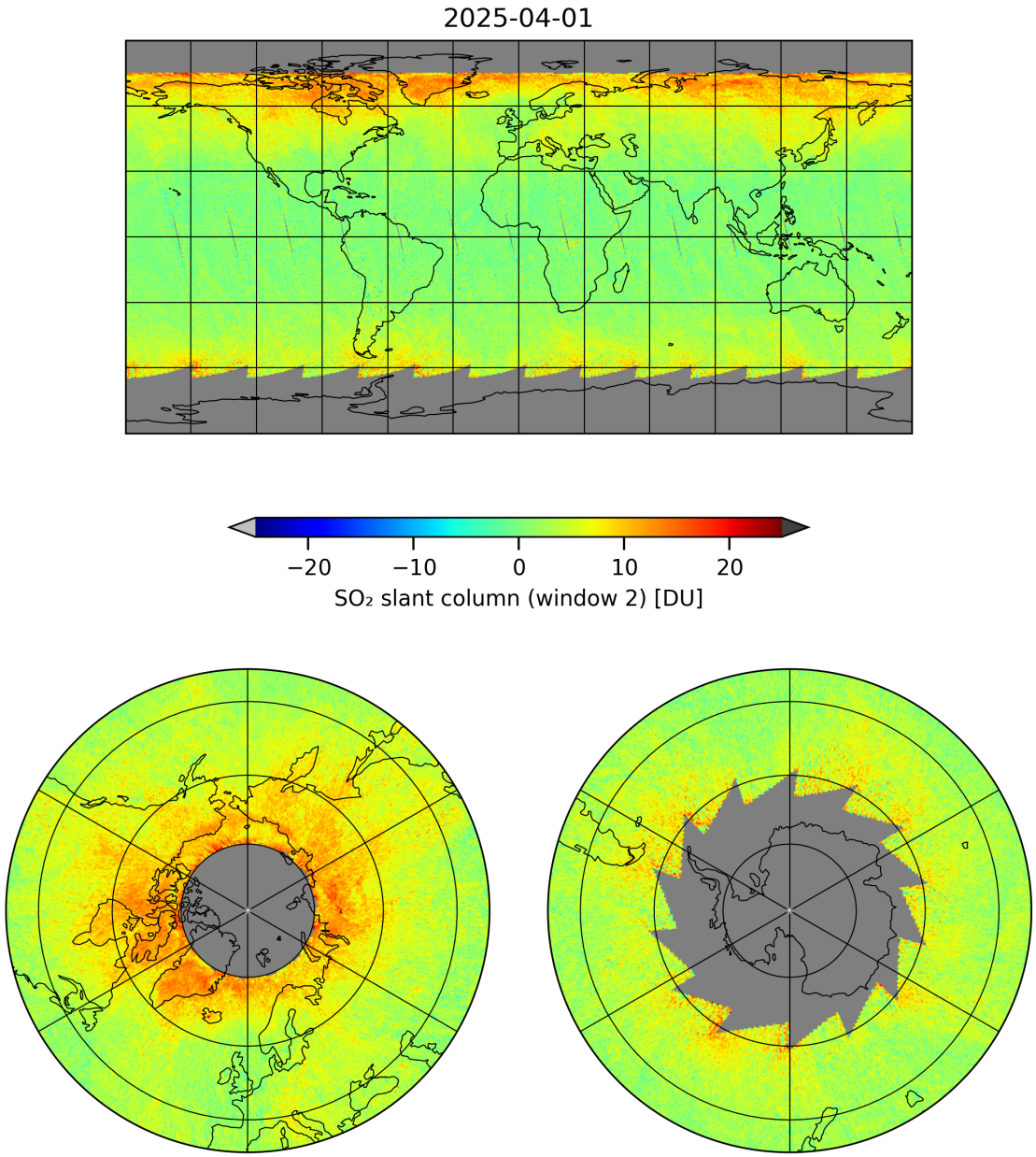

Figure 13: Map of "SO_2 slant column (window 2)" for 2025-04-01 to 2025-04-02

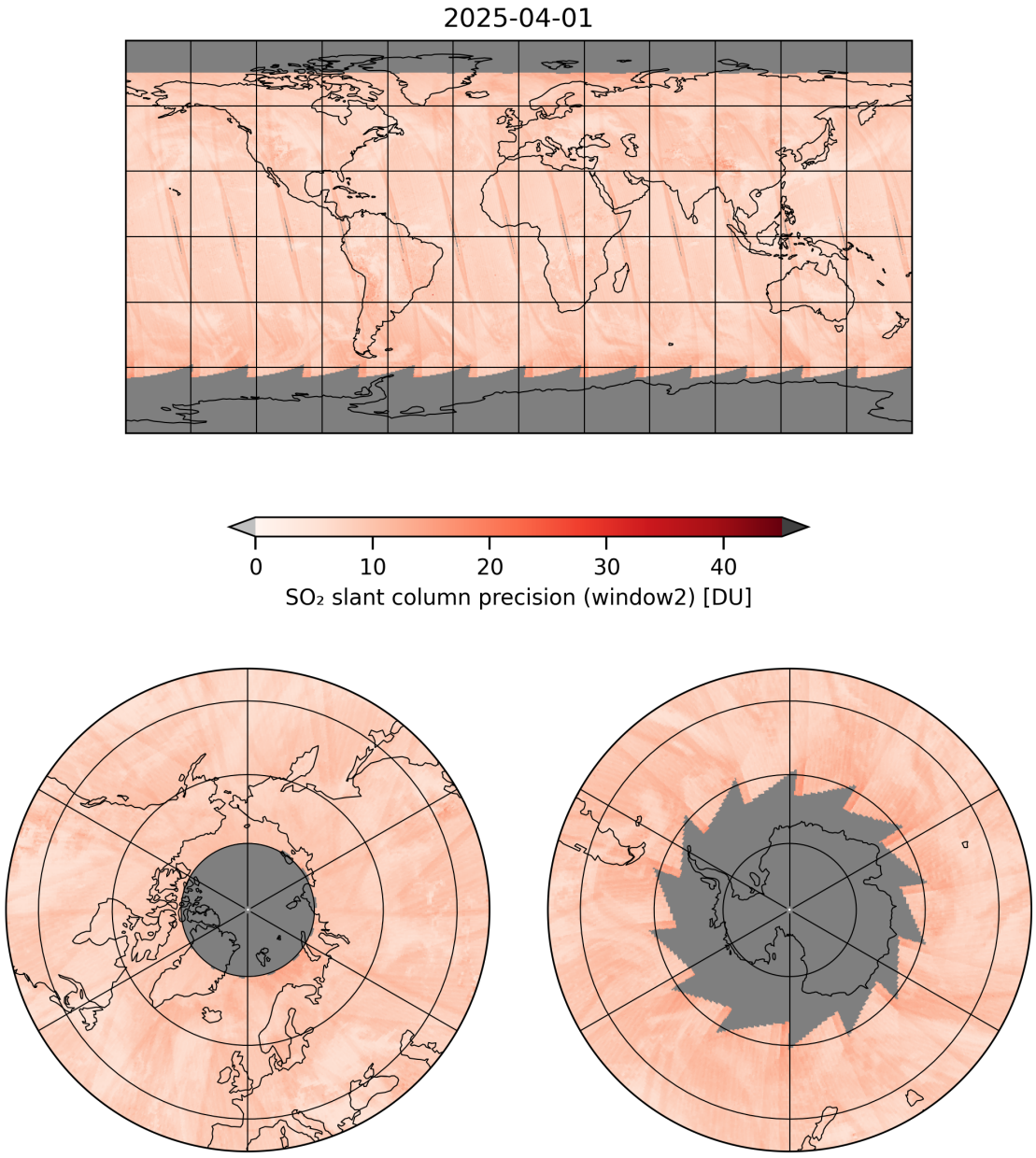

Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-04-01 to 2025-04-02

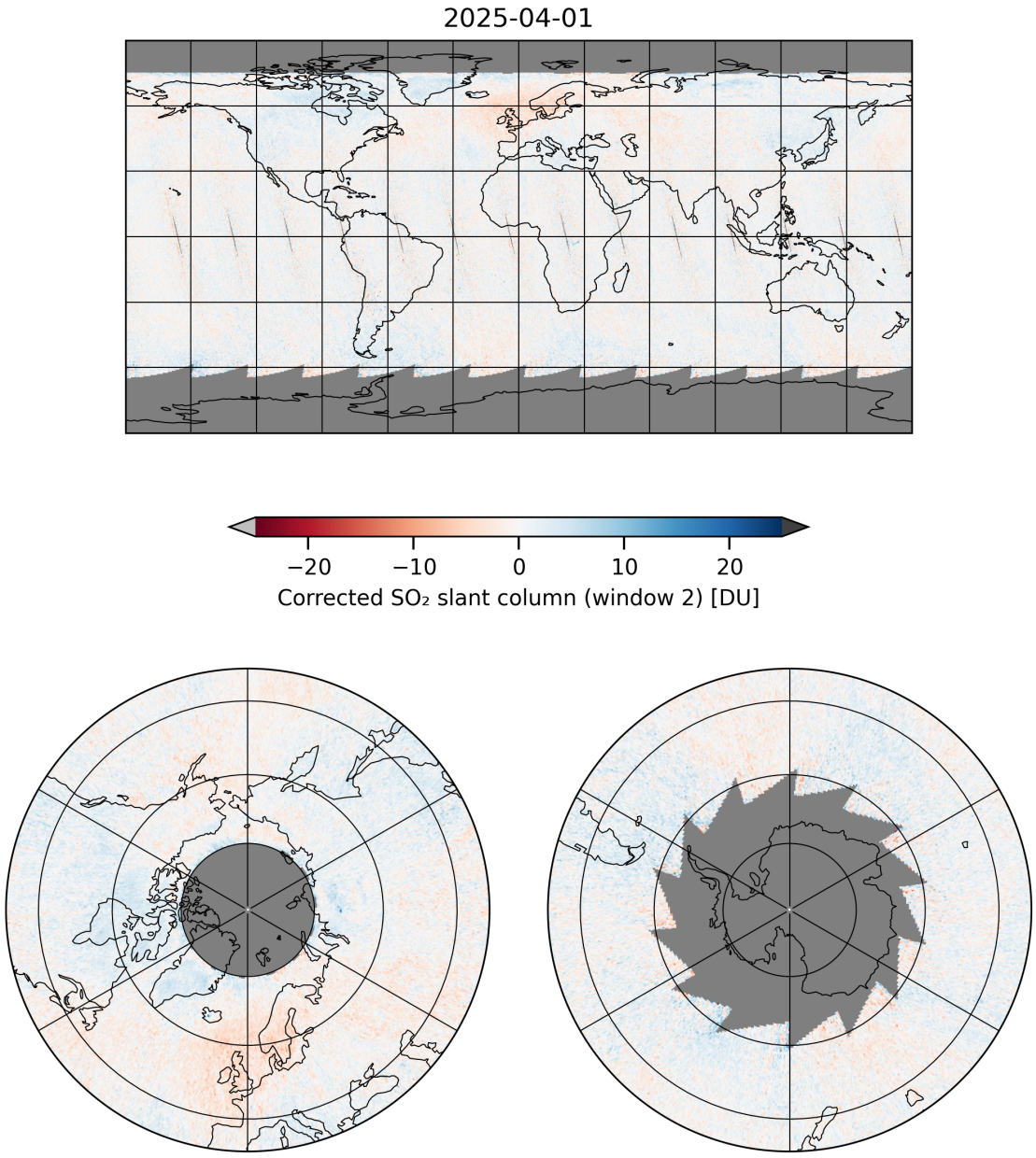

Figure 15: Map of “Corrected SO_2 slant column (window 2)” for 2025-04-01 to 2025-04-02

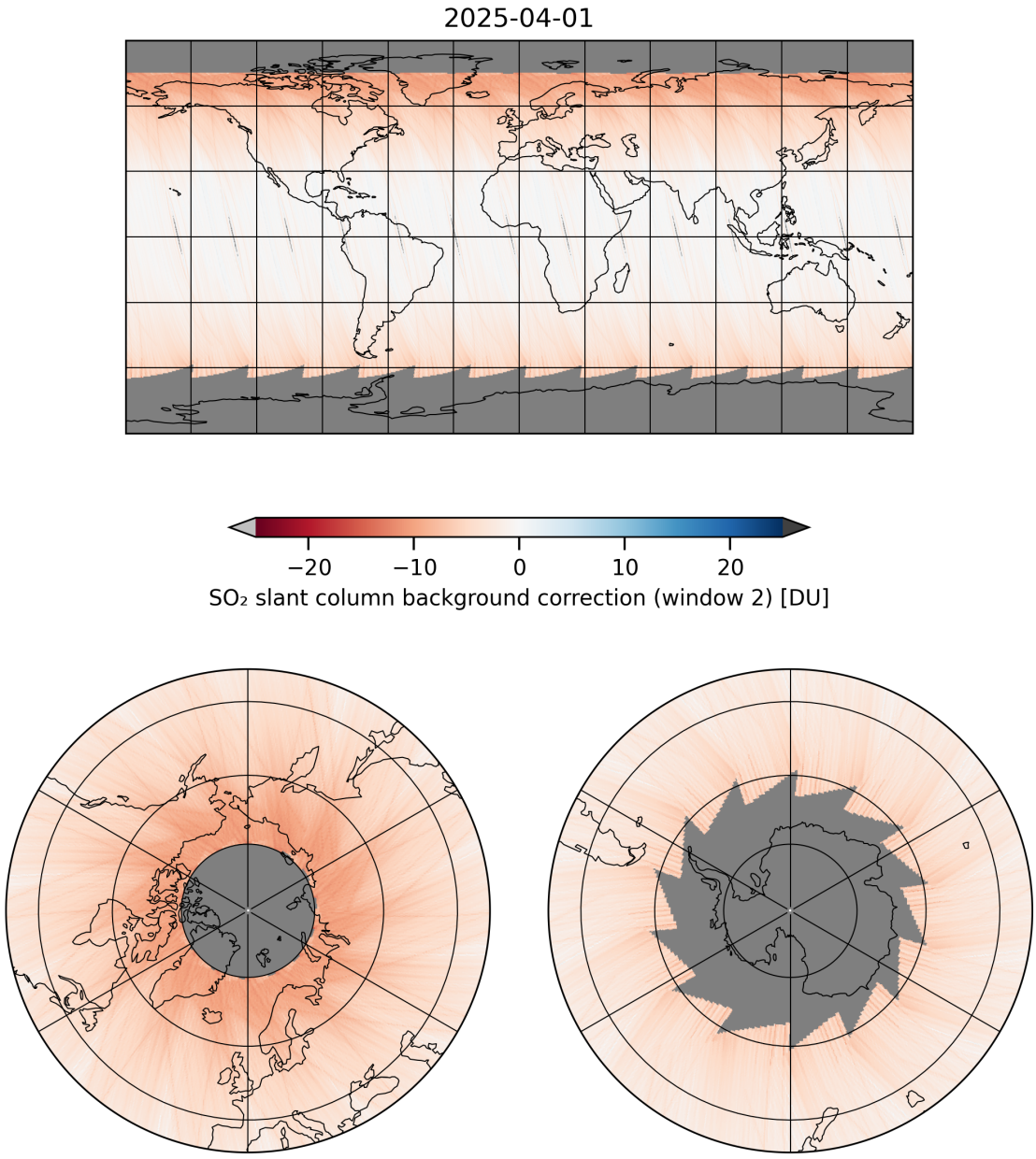

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-04-01 to 2025-04-02

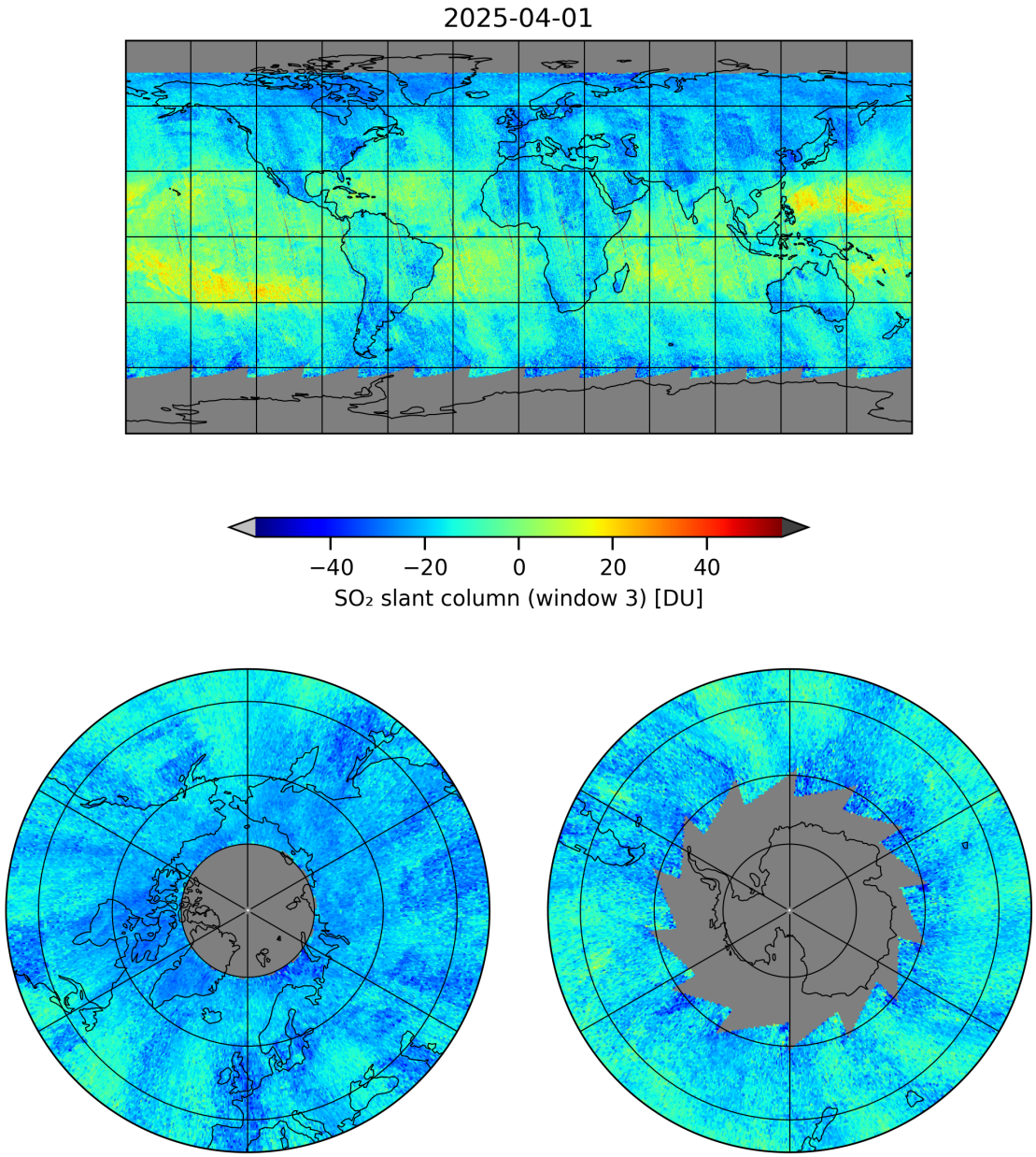

Figure 17: Map of "SO_2 slant column (window 3)" for 2025-04-01 to 2025-04-02

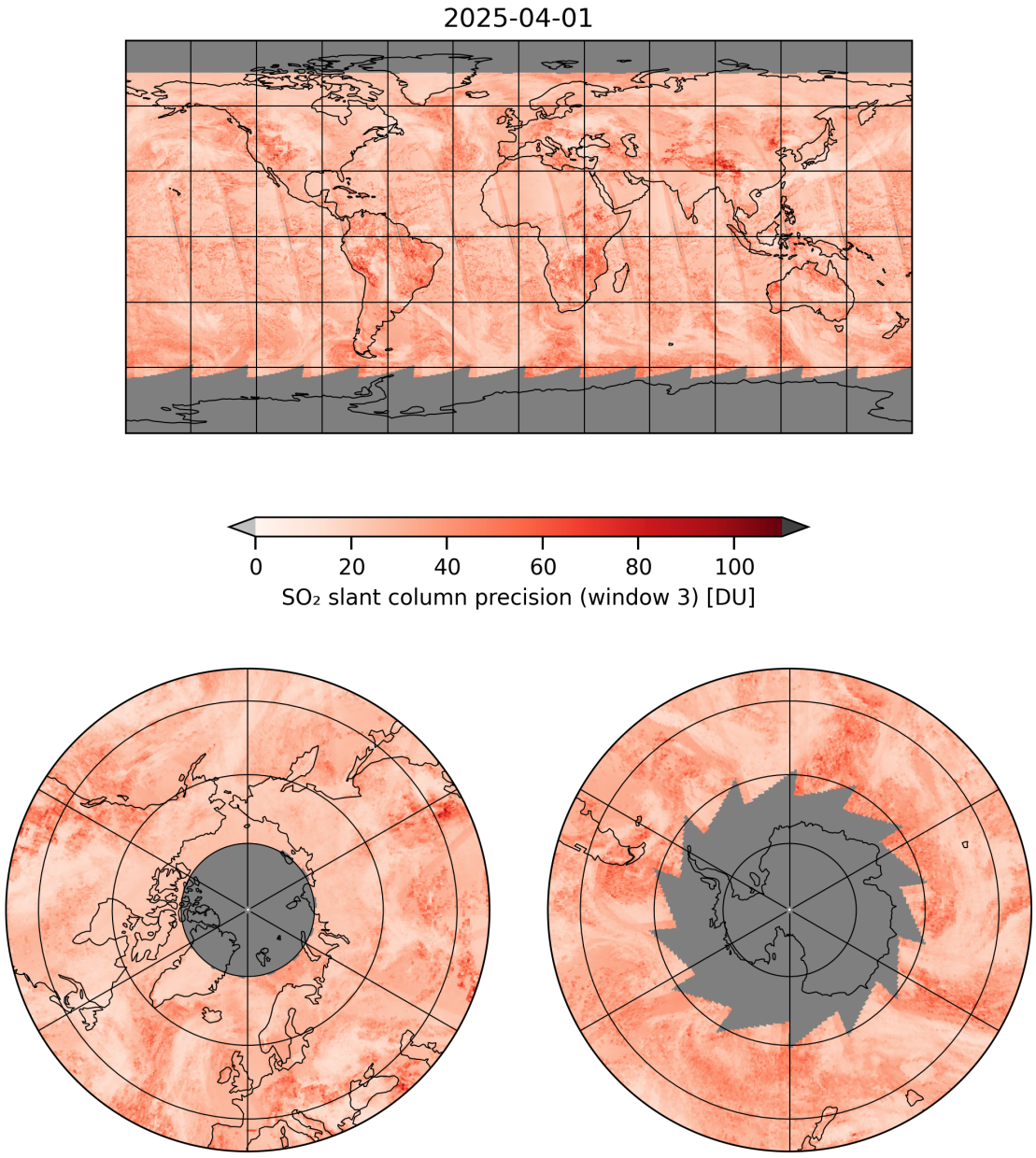

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-04-01 to 2025-04-02

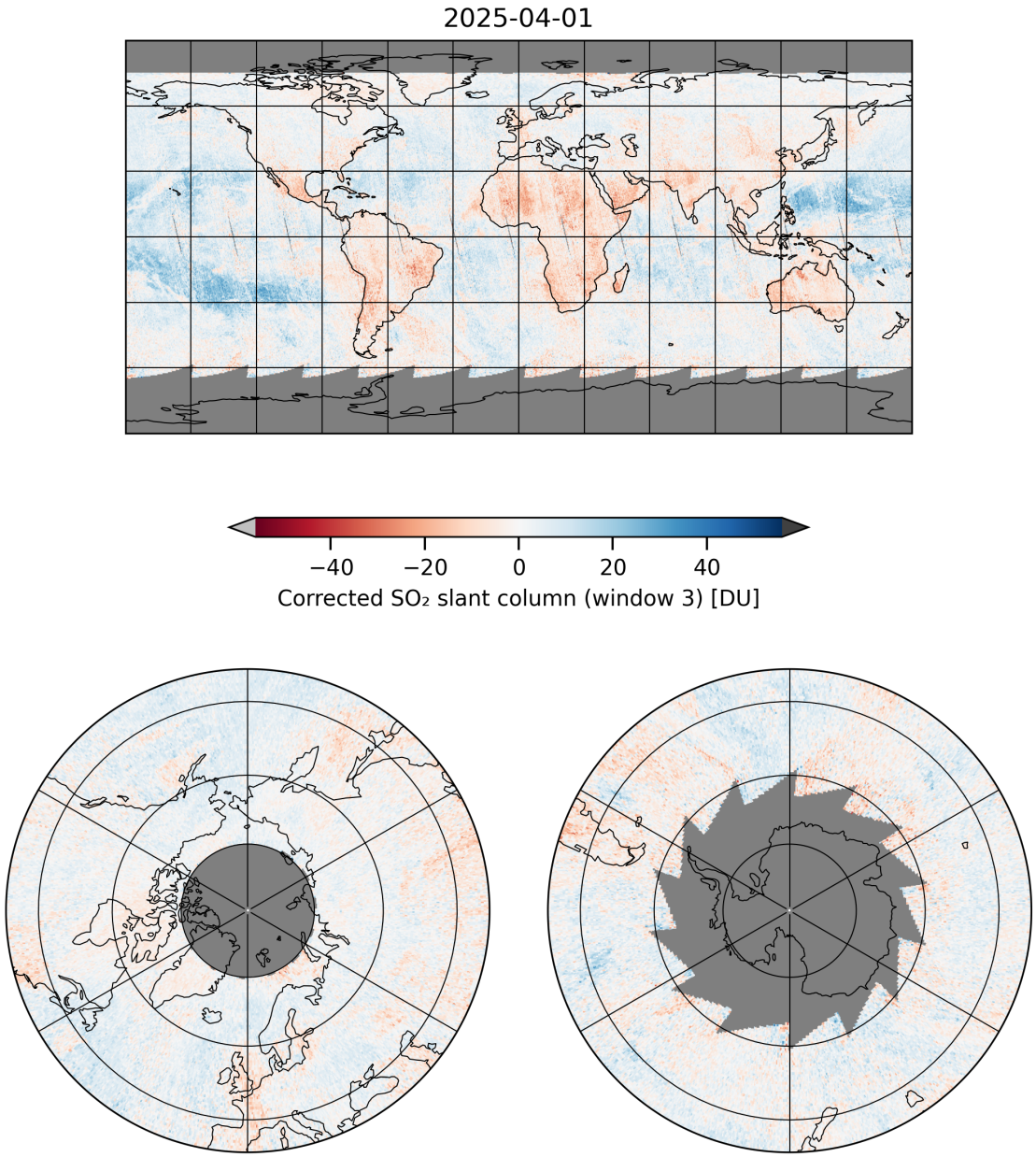

Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-04-01 to 2025-04-02

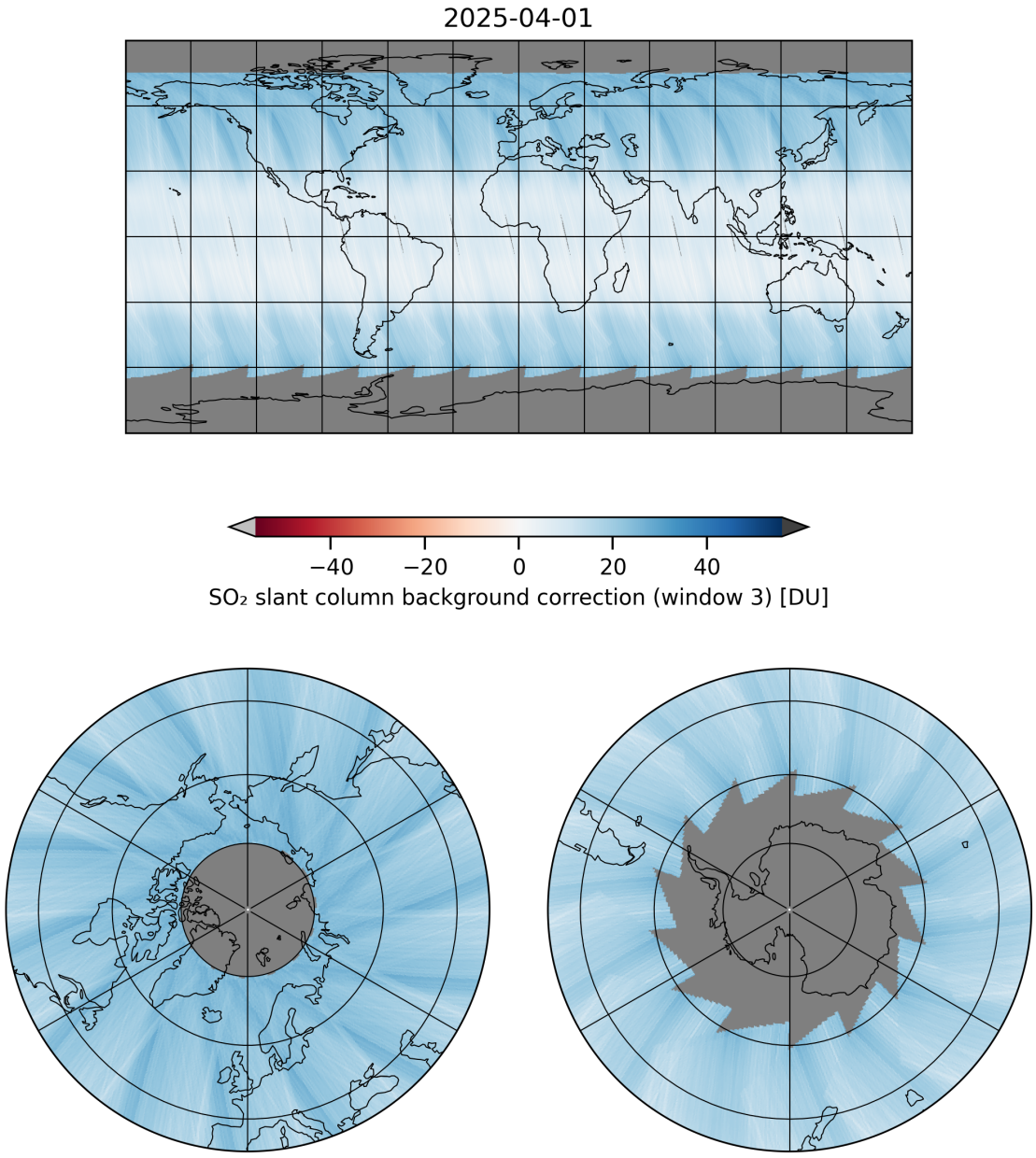

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-04-01 to 2025-04-02

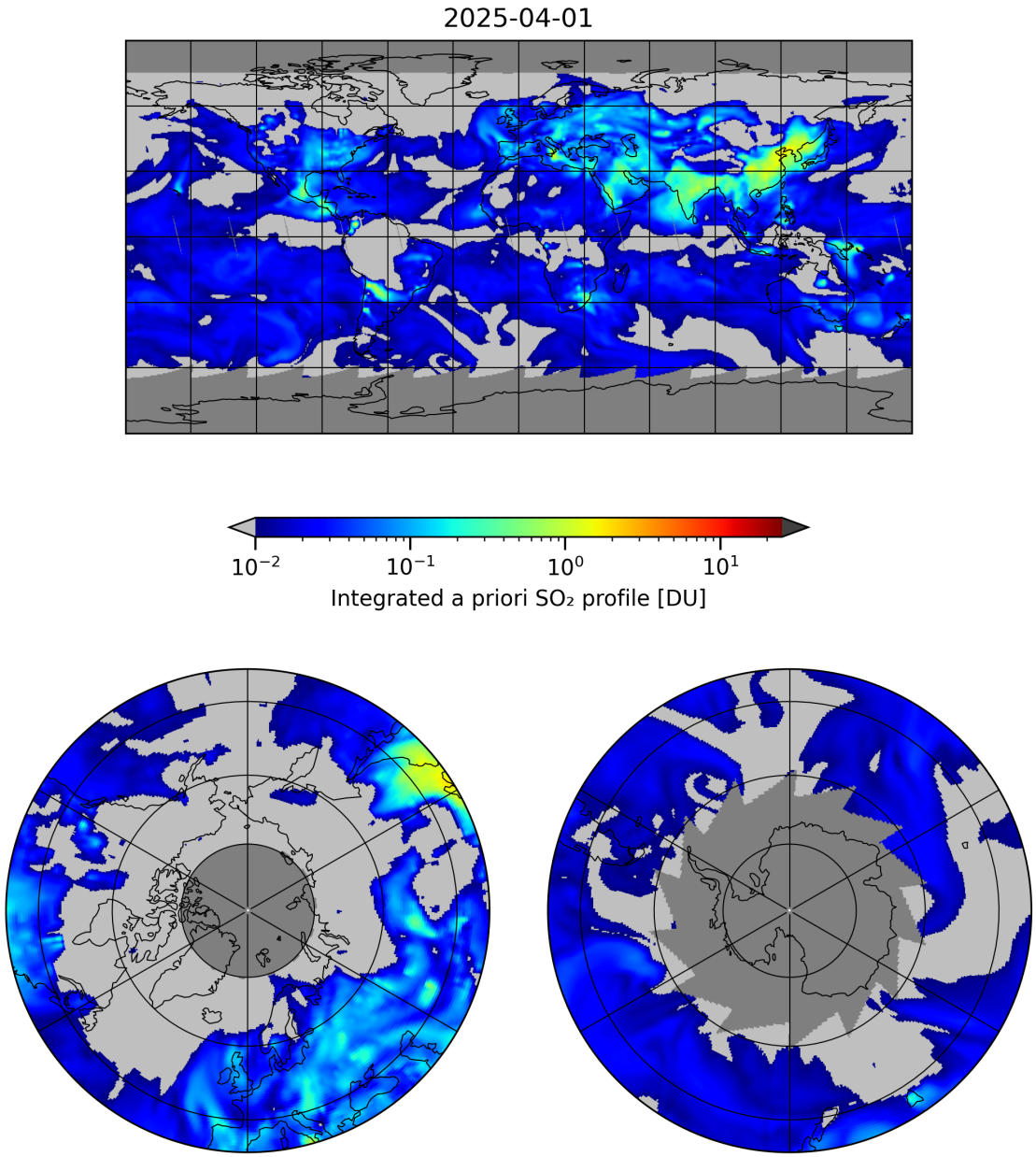

Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-04-01 to 2025-04-02

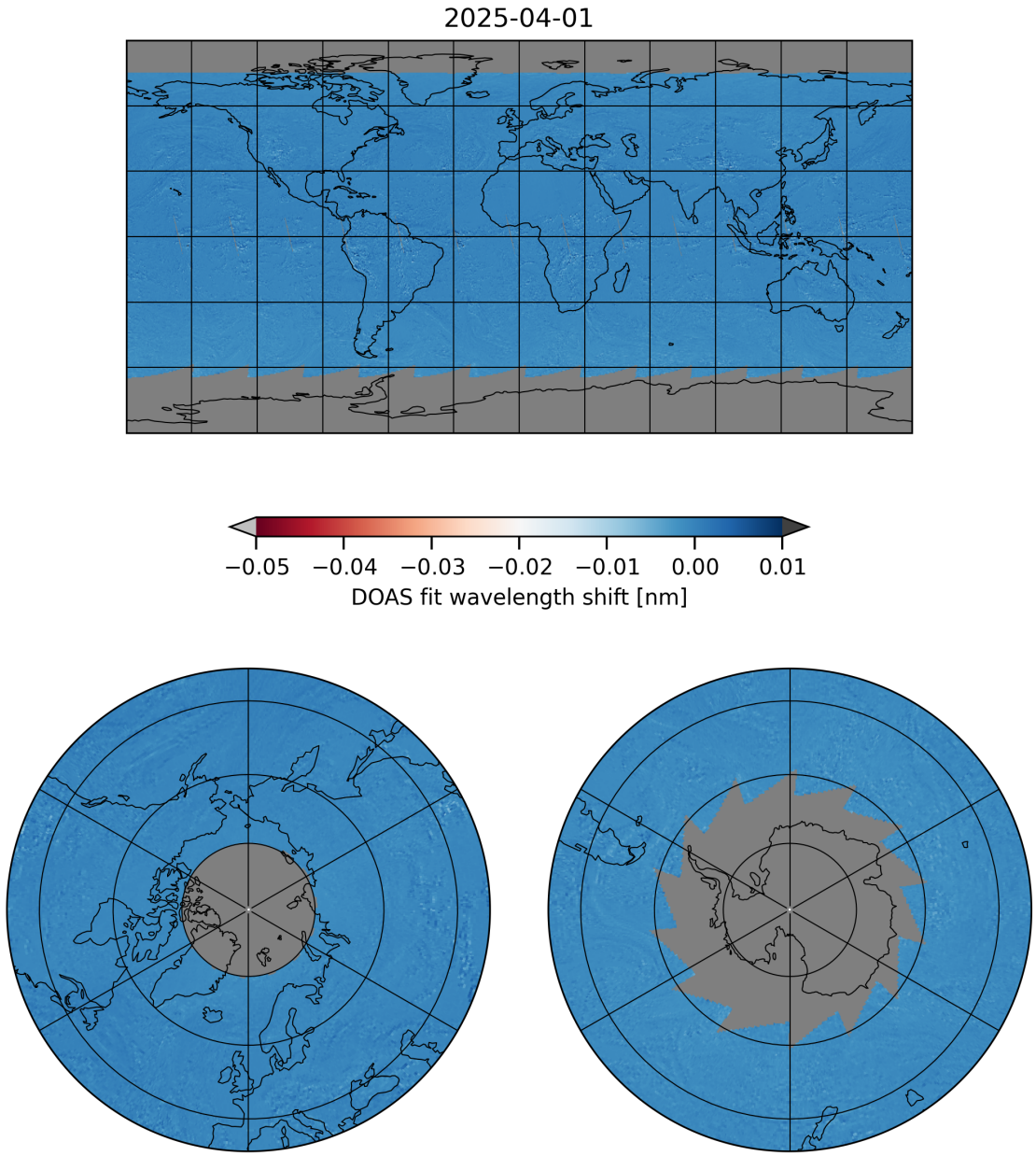

Figure 22: Map of “DOAS fit wavelength shift” for 2025-04-01 to 2025-04-02

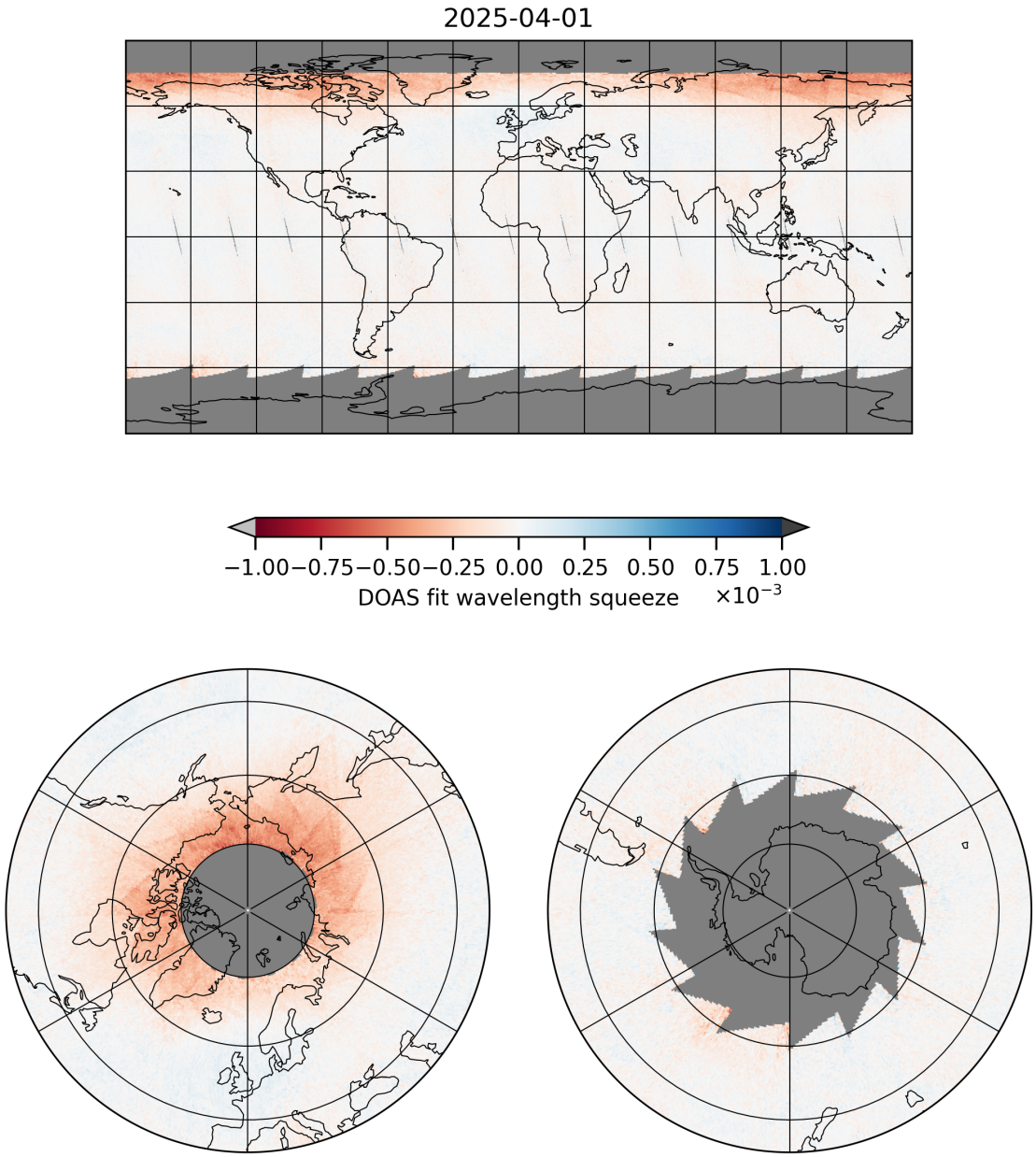

Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-04-01 to 2025-04-02

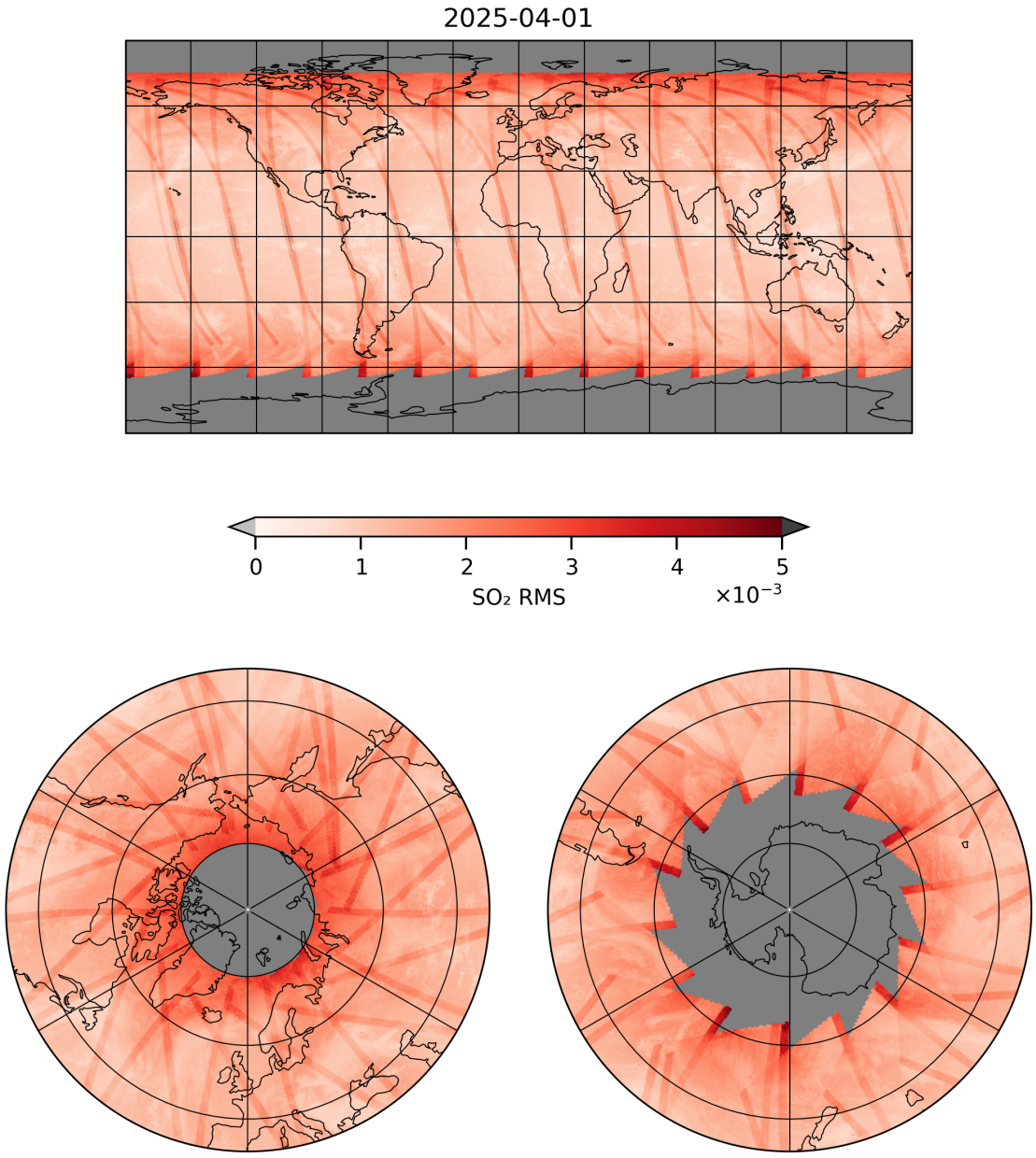

Figure 24: Map of "SO_2 RMS" for 2025-04-01 to 2025-04-02

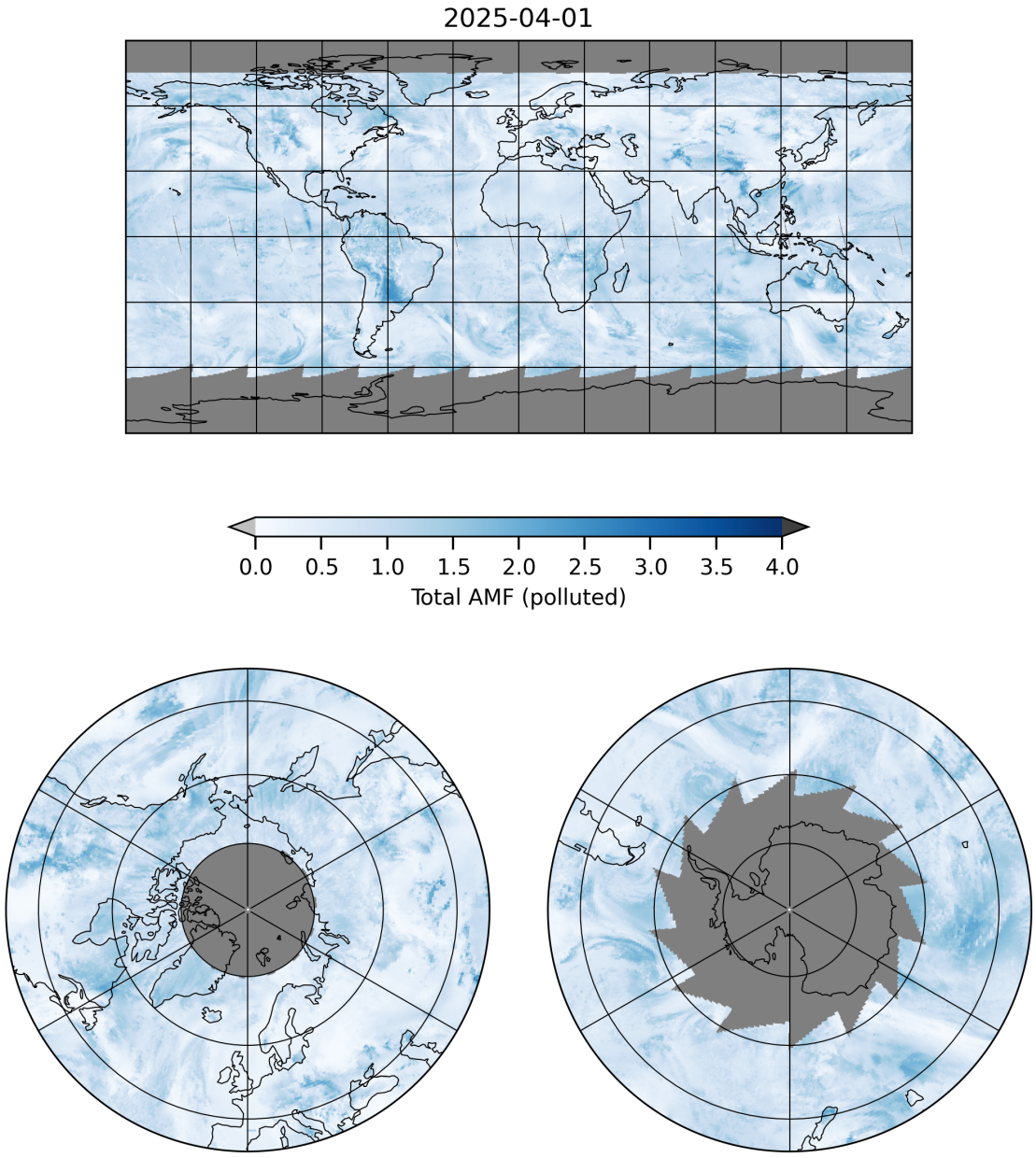

Figure 25: Map of “Total AMF (polluted)” for 2025-04-01 to 2025-04-02

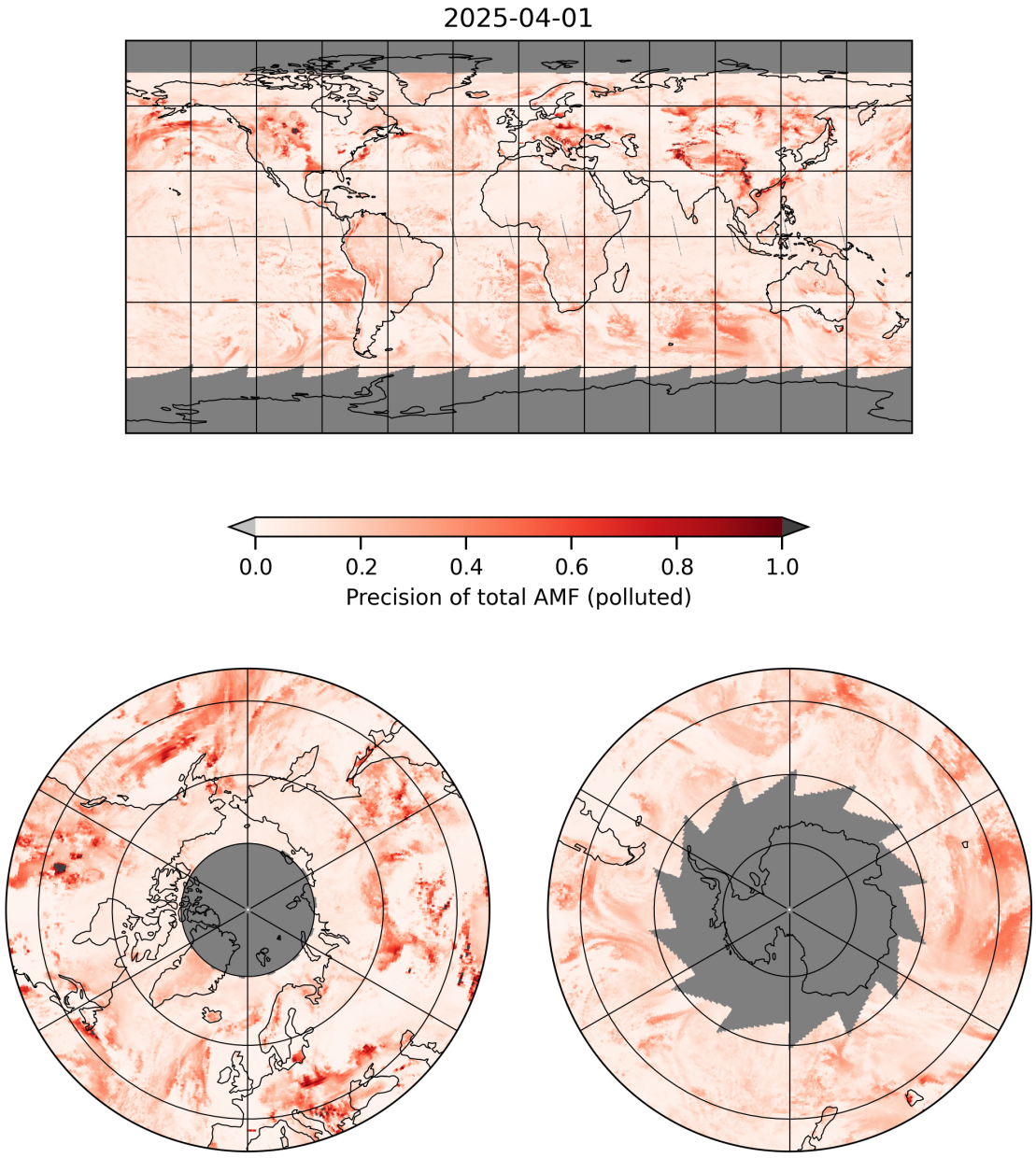

Figure 26: Map of “Precision of total AMF (polluted)” for 2025-04-01 to 2025-04-02

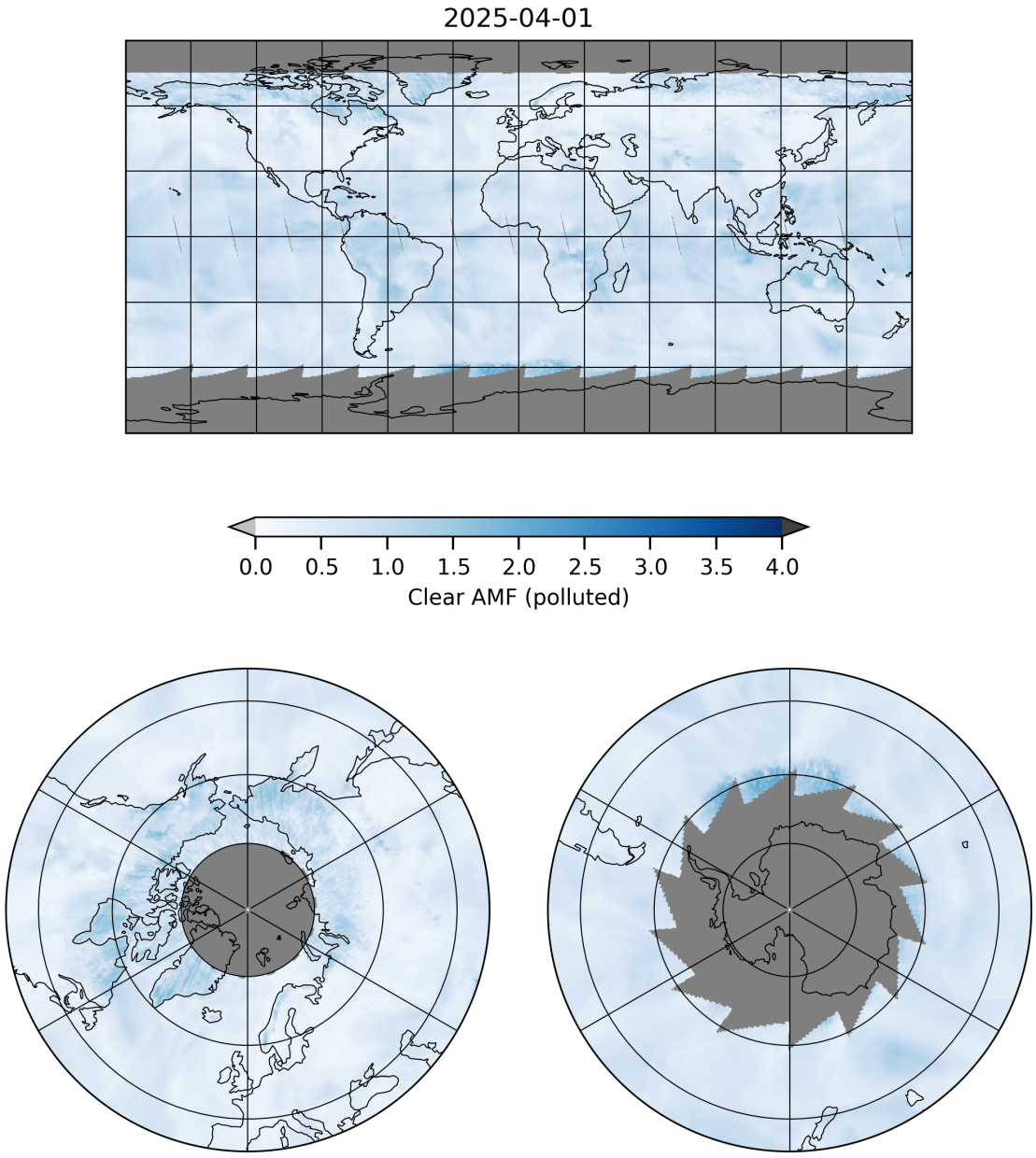

Figure 27: Map of “Clear AMF (polluted)” for 2025-04-01 to 2025-04-02

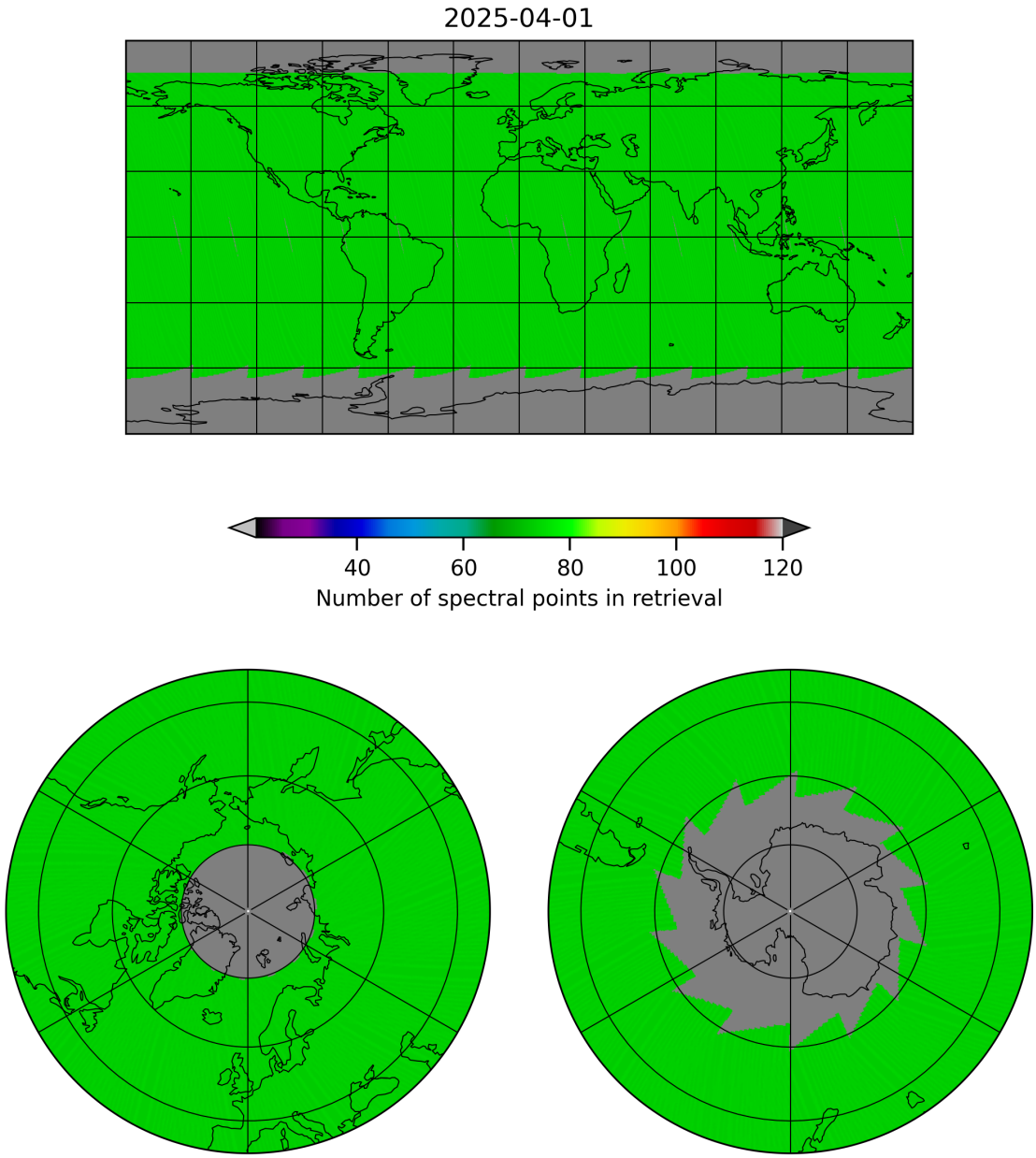

Figure 28: Map of “Number of spectral points in retrieval” for 2025-04-01 to 2025-04-02

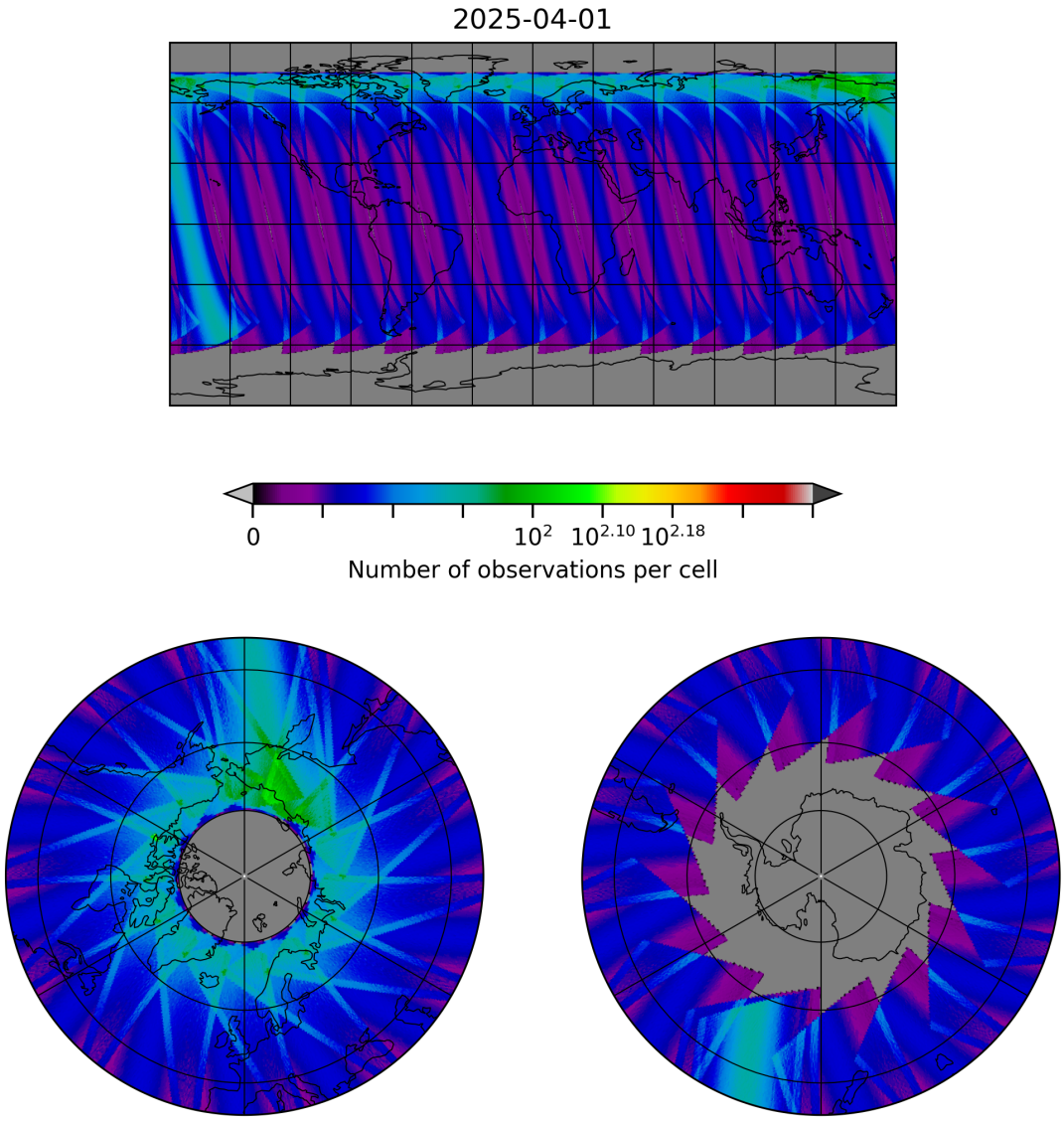

Figure 29: Map of the number of observations for 2025-04-01 to 2025-04-02

7 Zonal average

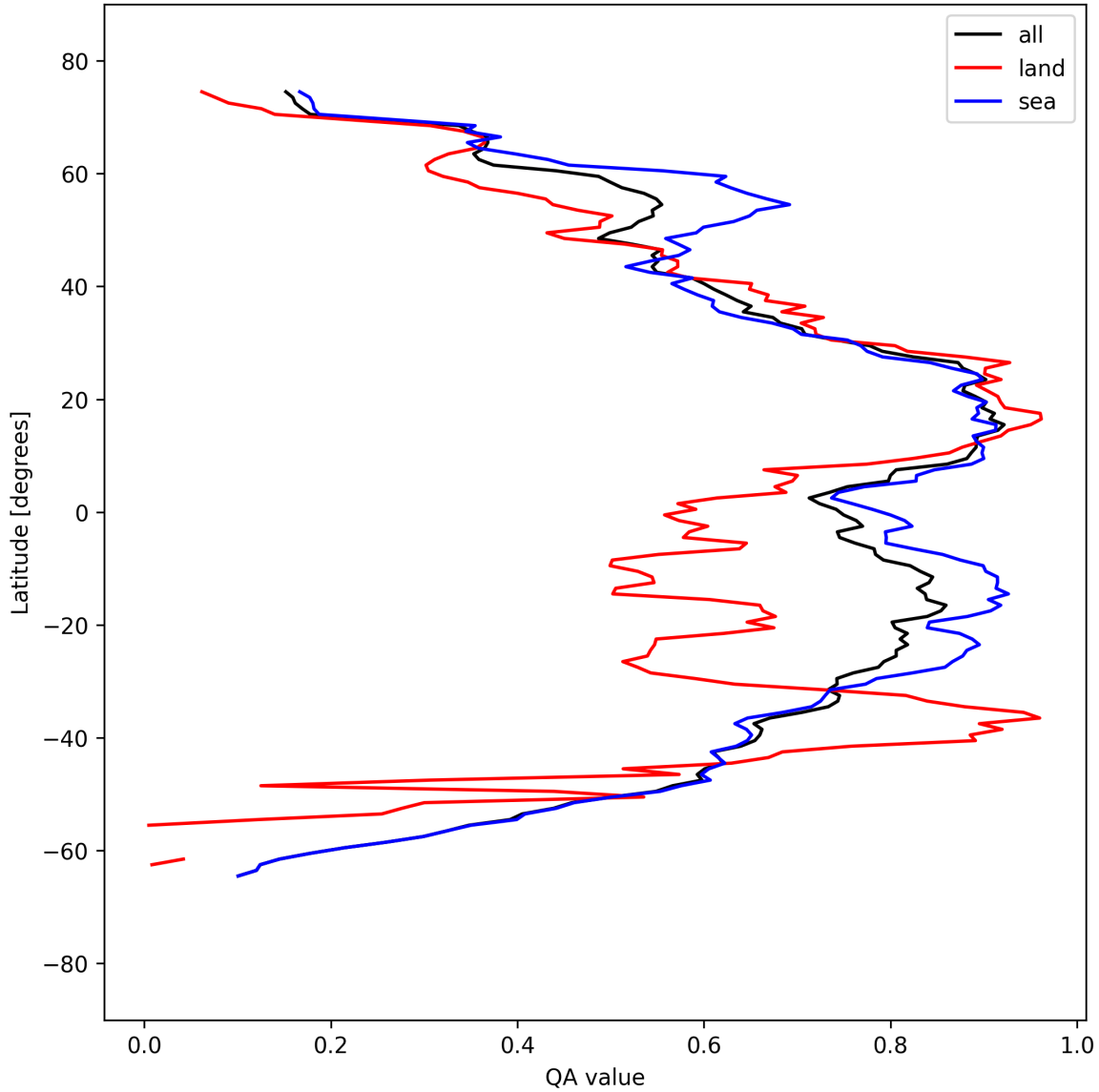

Figure 30: Zonal average of “QA value” for 2025-04-01 to 2025-04-02.

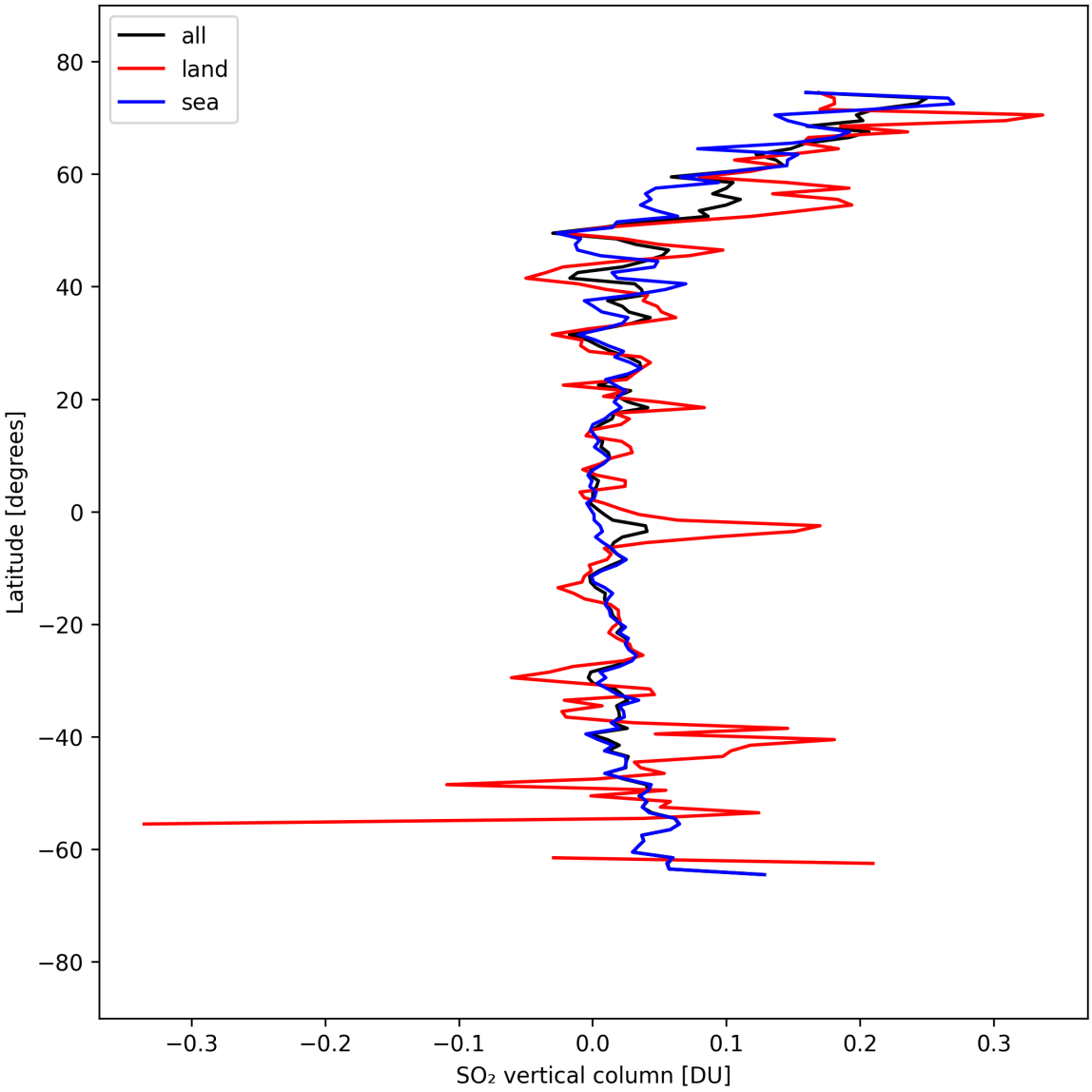

Figure 31: Zonal average of "SO_2 vertical column" for 2025-04-01 to 2025-04-02.

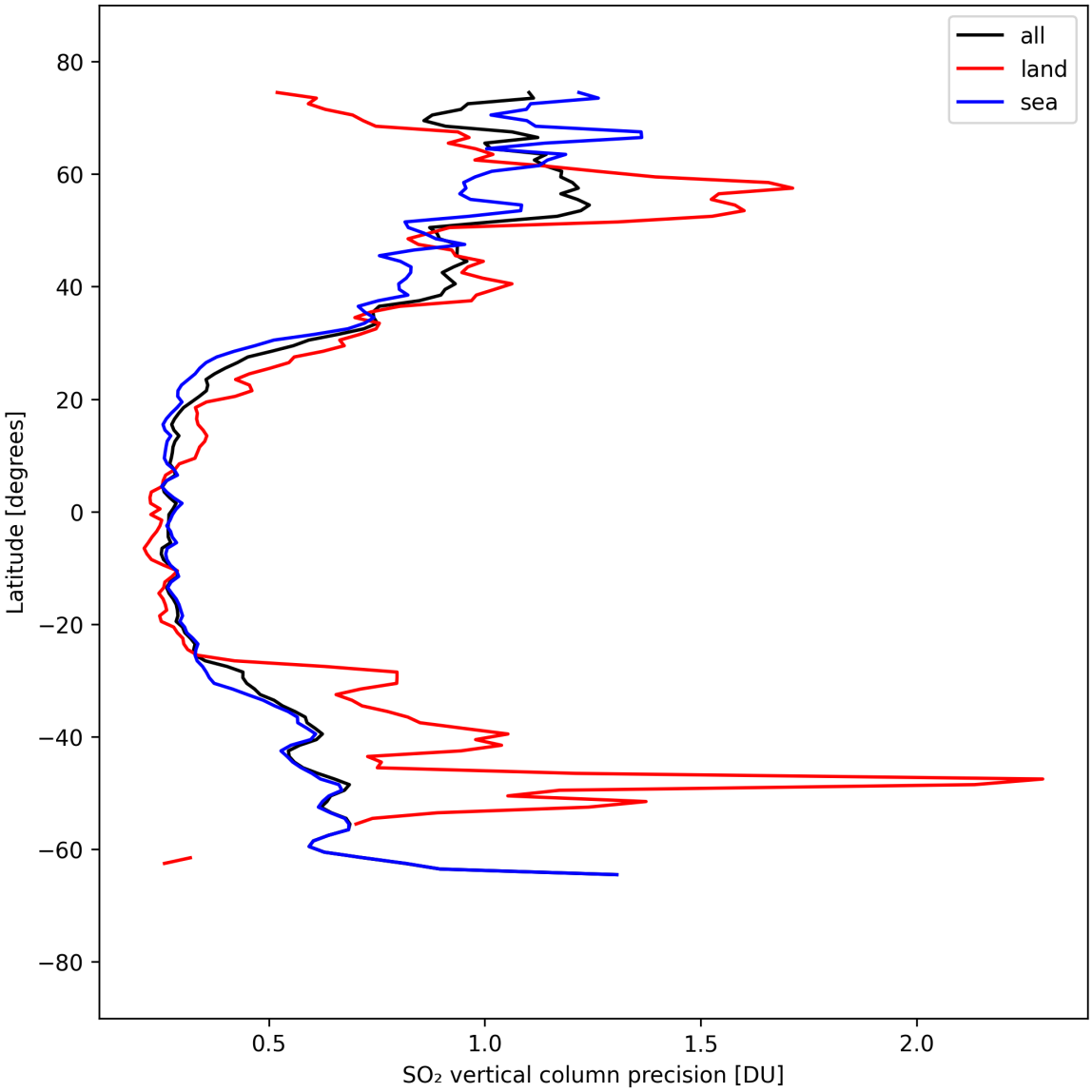

Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-04-01 to 2025-04-02.

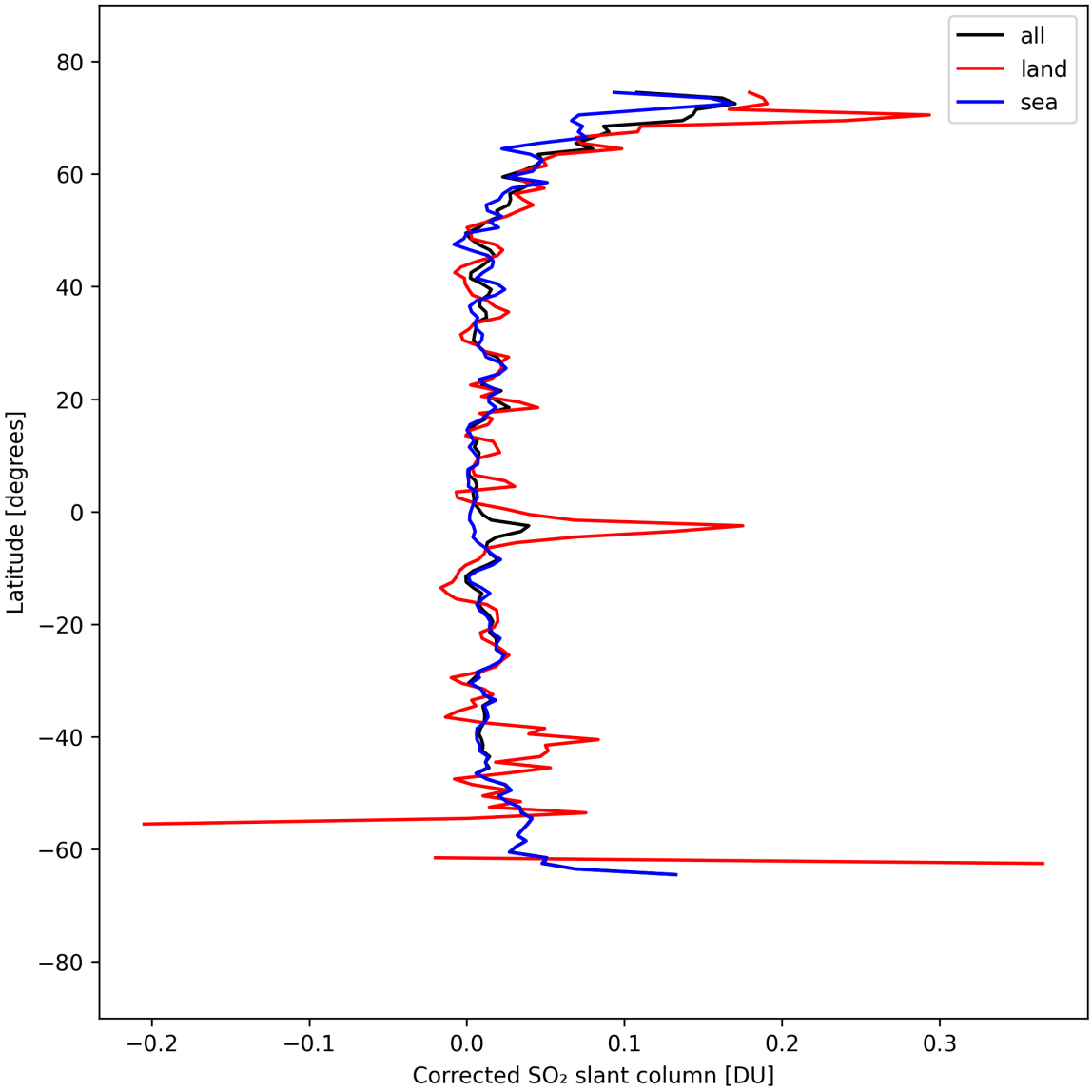

Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-04-01 to 2025-04-02.

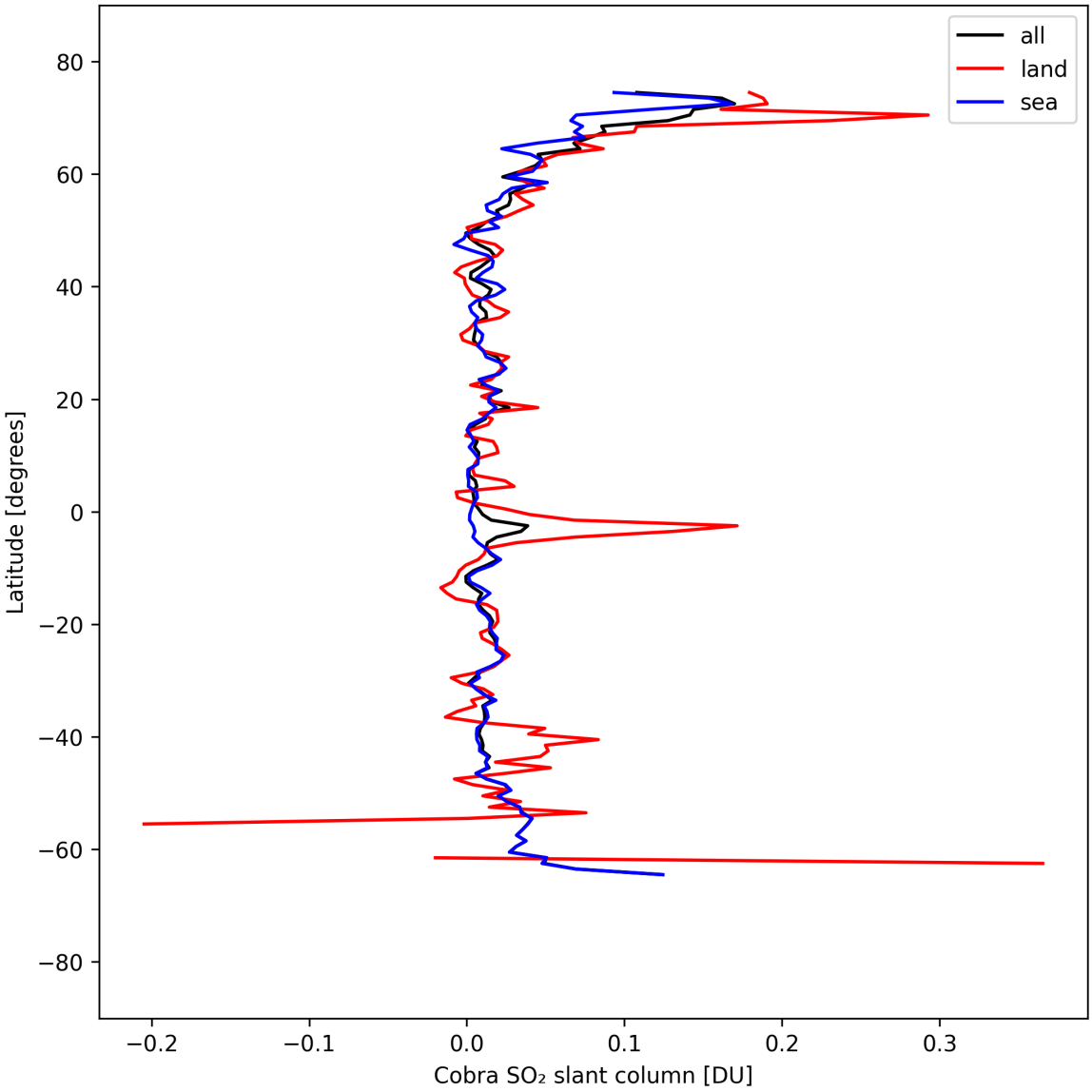

Figure 34: Zonal average of “Cobra SO_2 slant column” for 2025-04-01 to 2025-04-02.

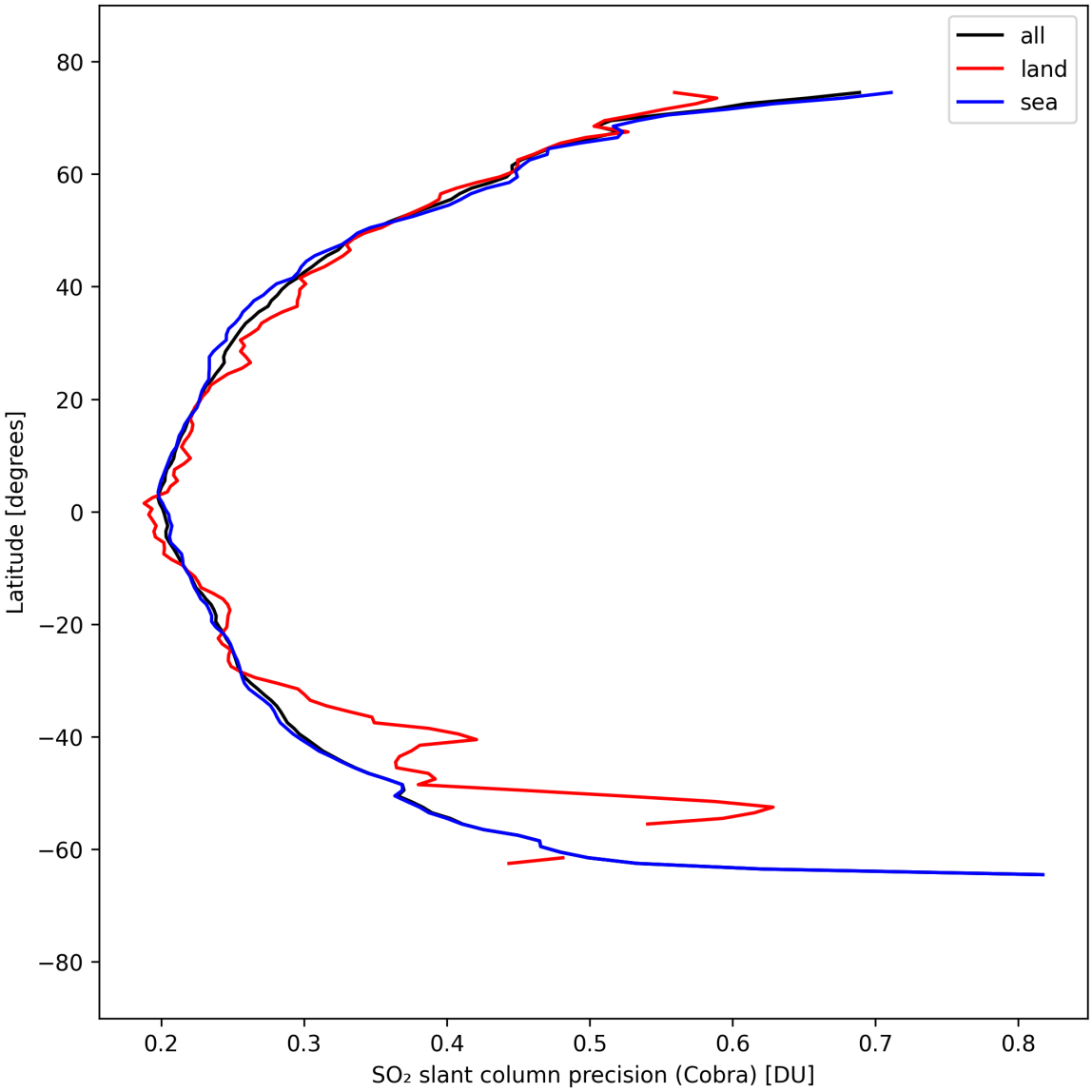

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-04-01 to 2025-04-02.

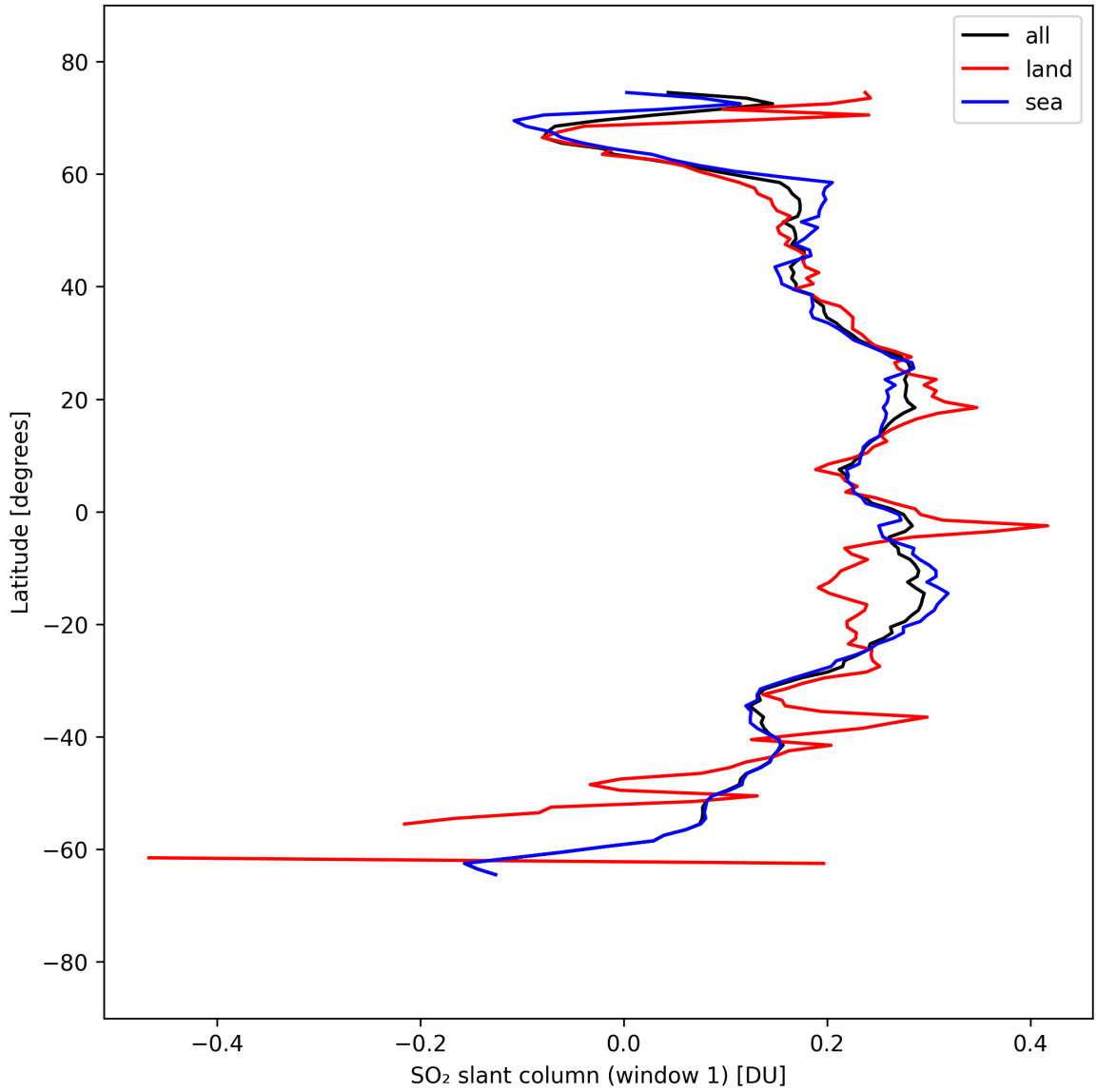

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-04-01 to 2025-04-02.

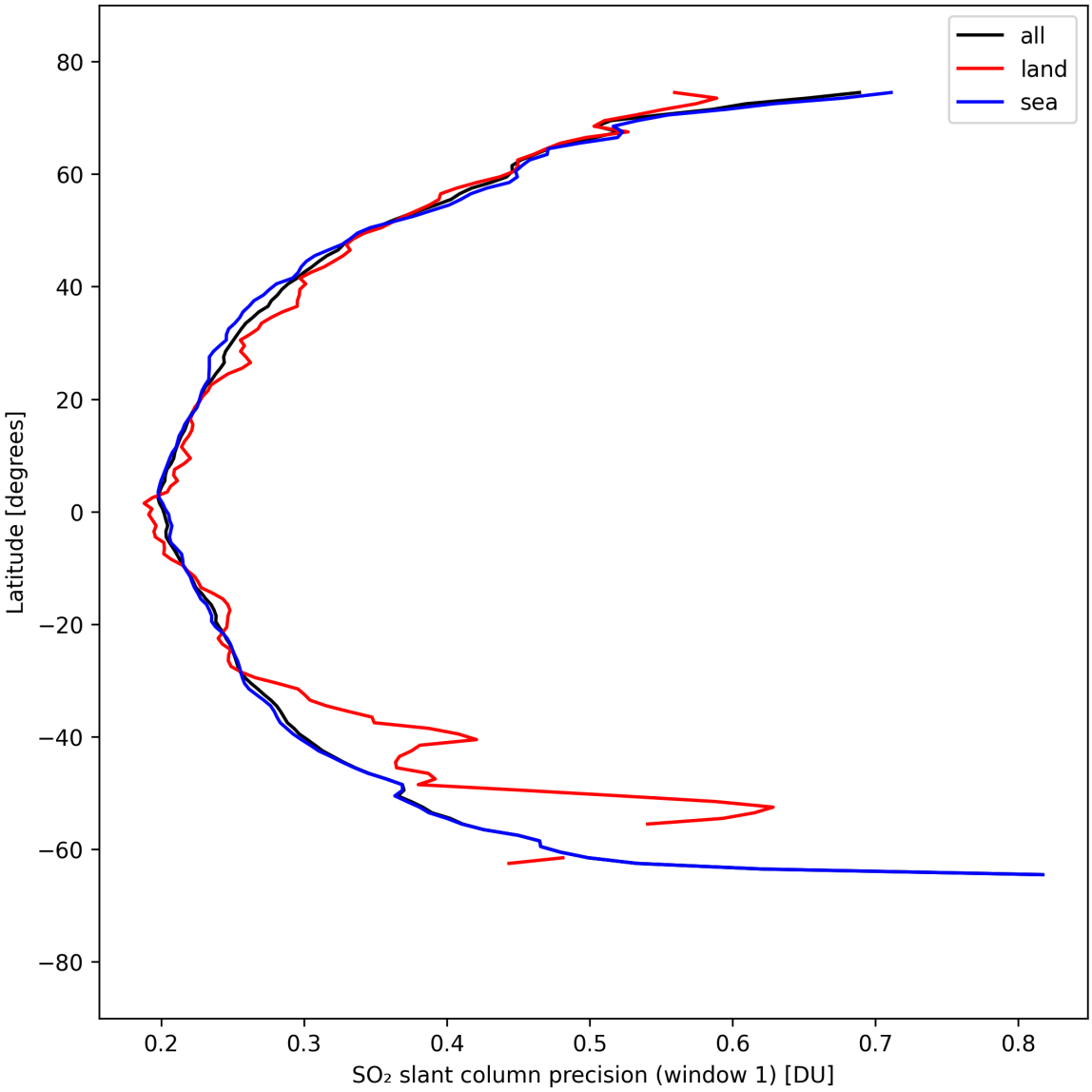

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-04-01 to 2025-04-02.

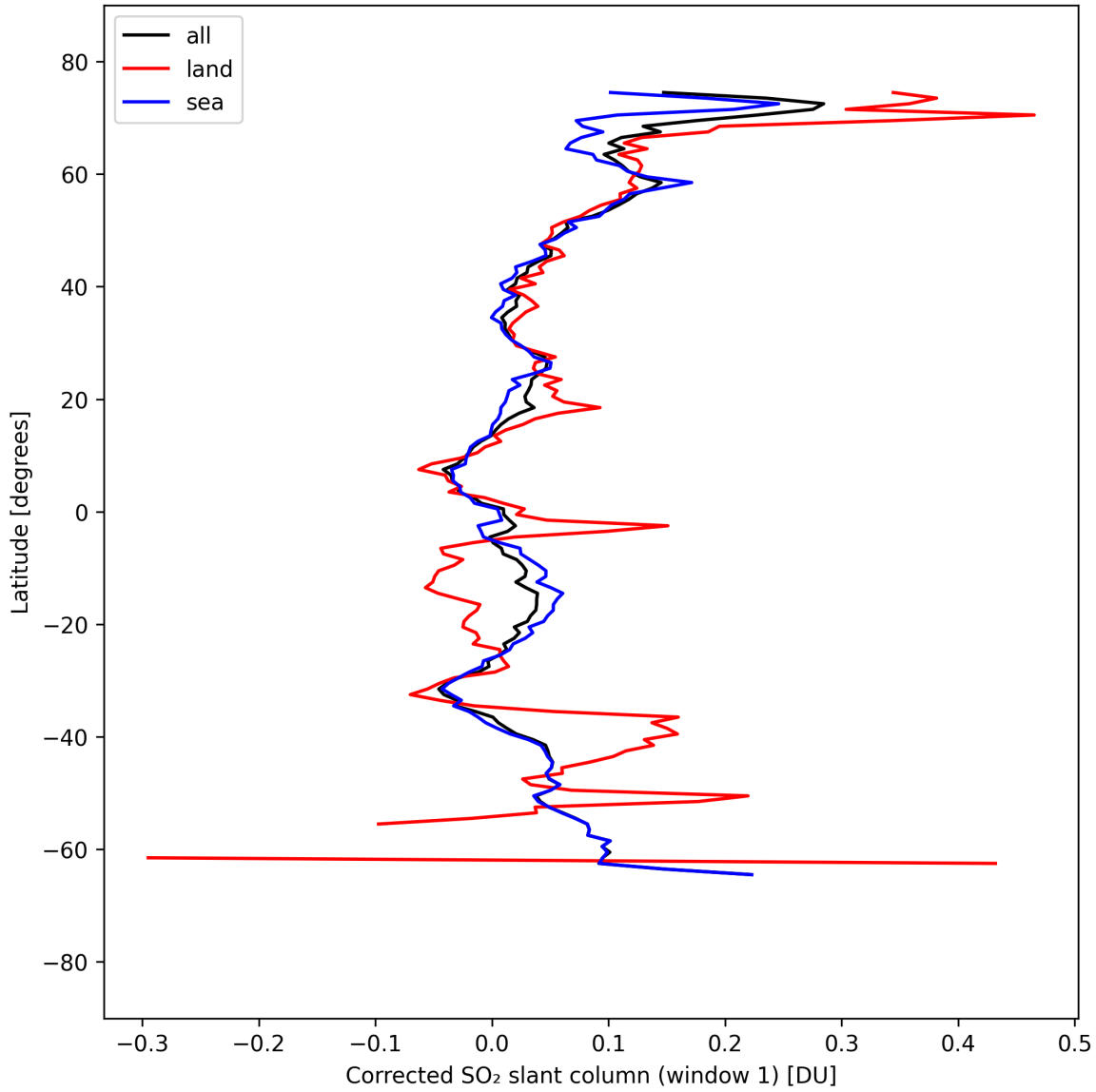

Figure 38: Zonal average of “Corrected SO_2 slant column (window 1)” for 2025-04-01 to 2025-04-02.

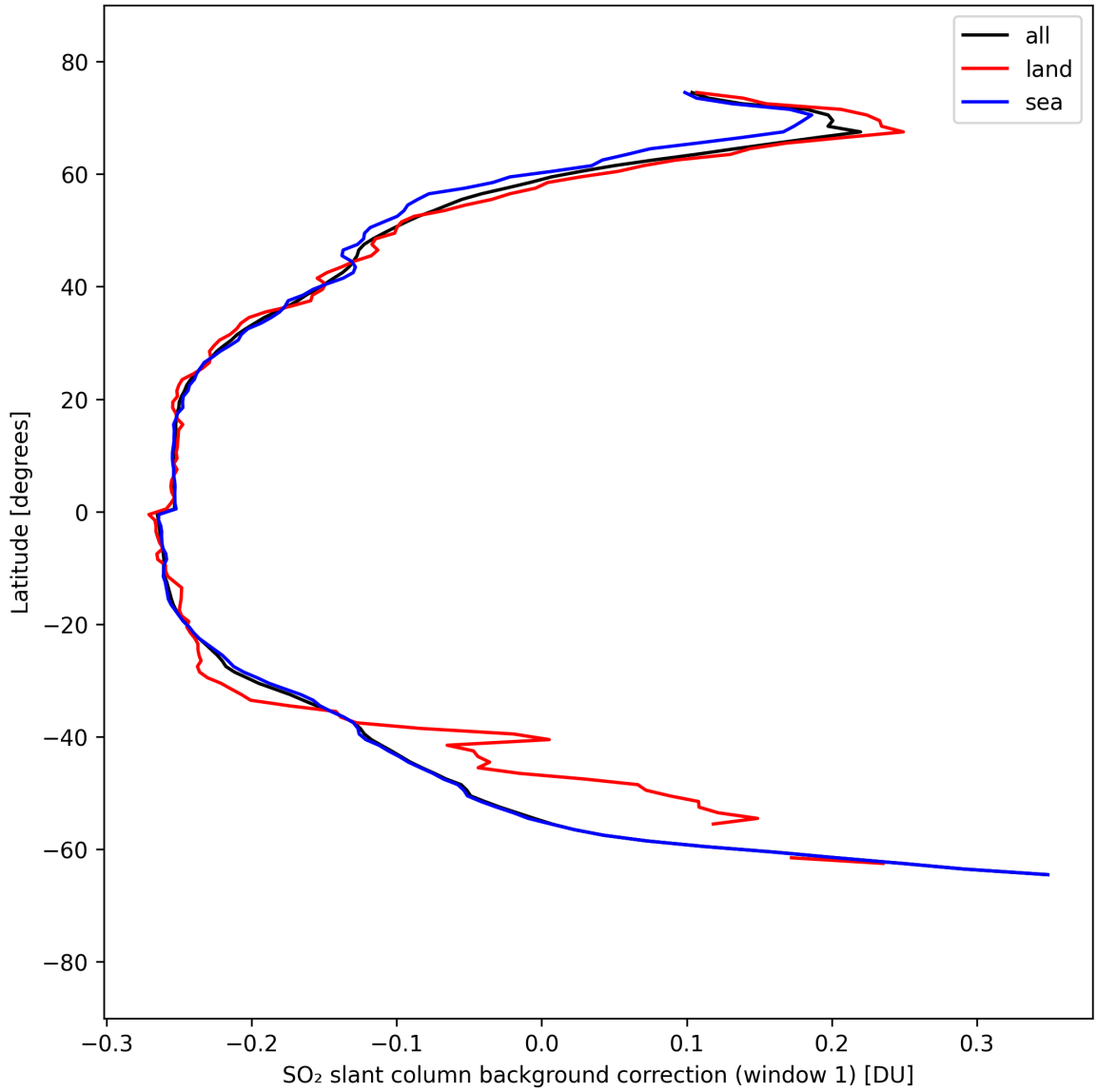

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-04-01 to 2025-04-02.

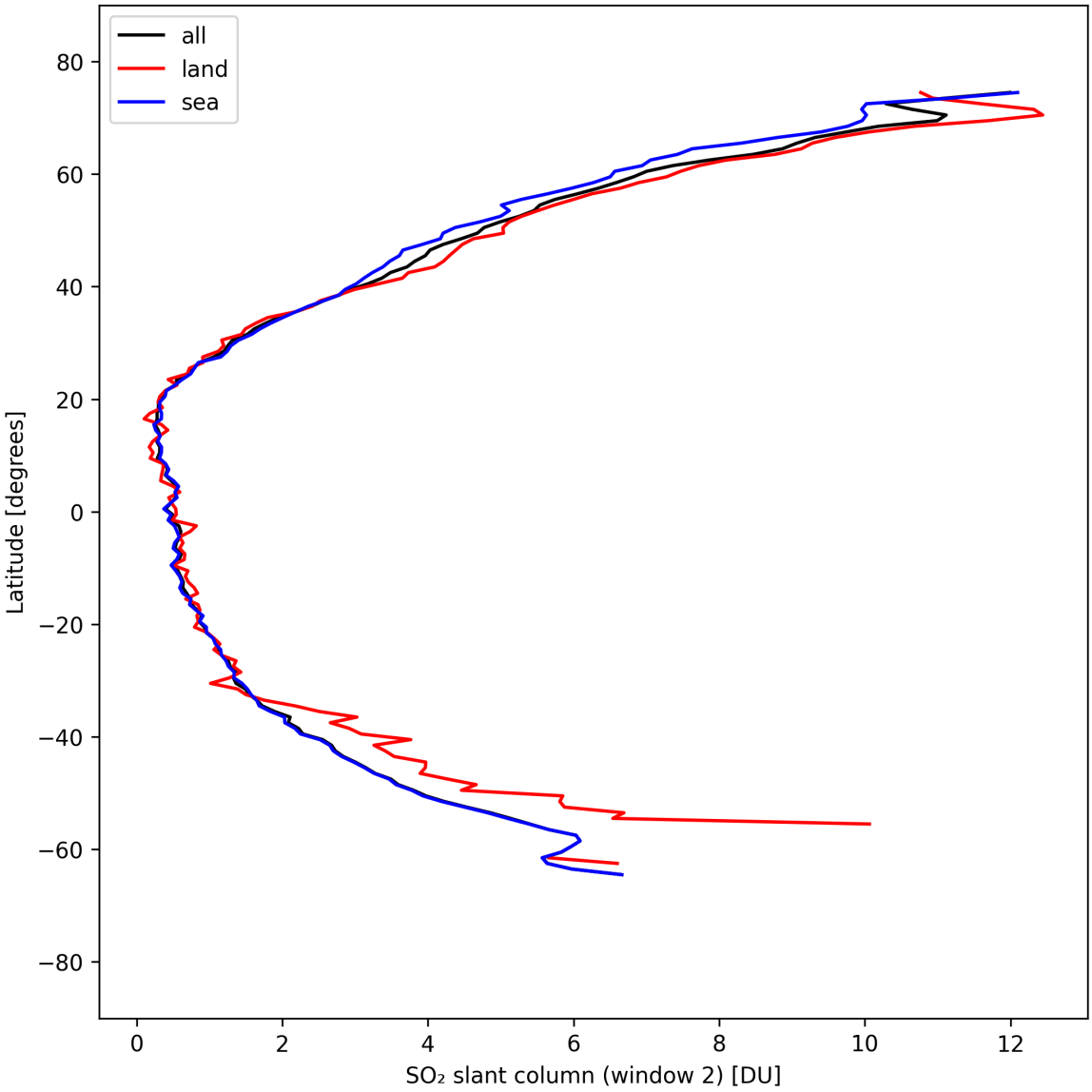

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-04-01 to 2025-04-02.

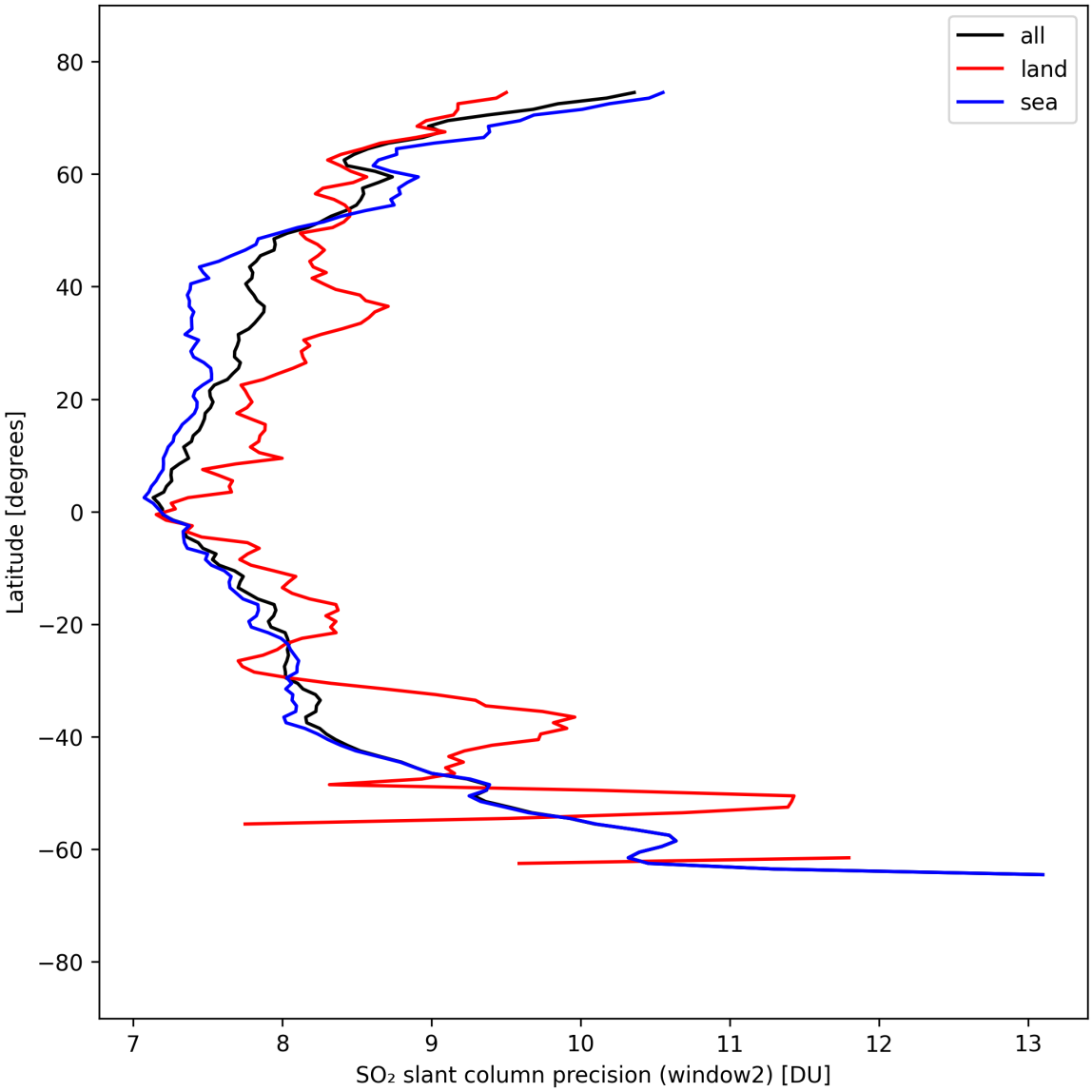

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-04-01 to 2025-04-02.

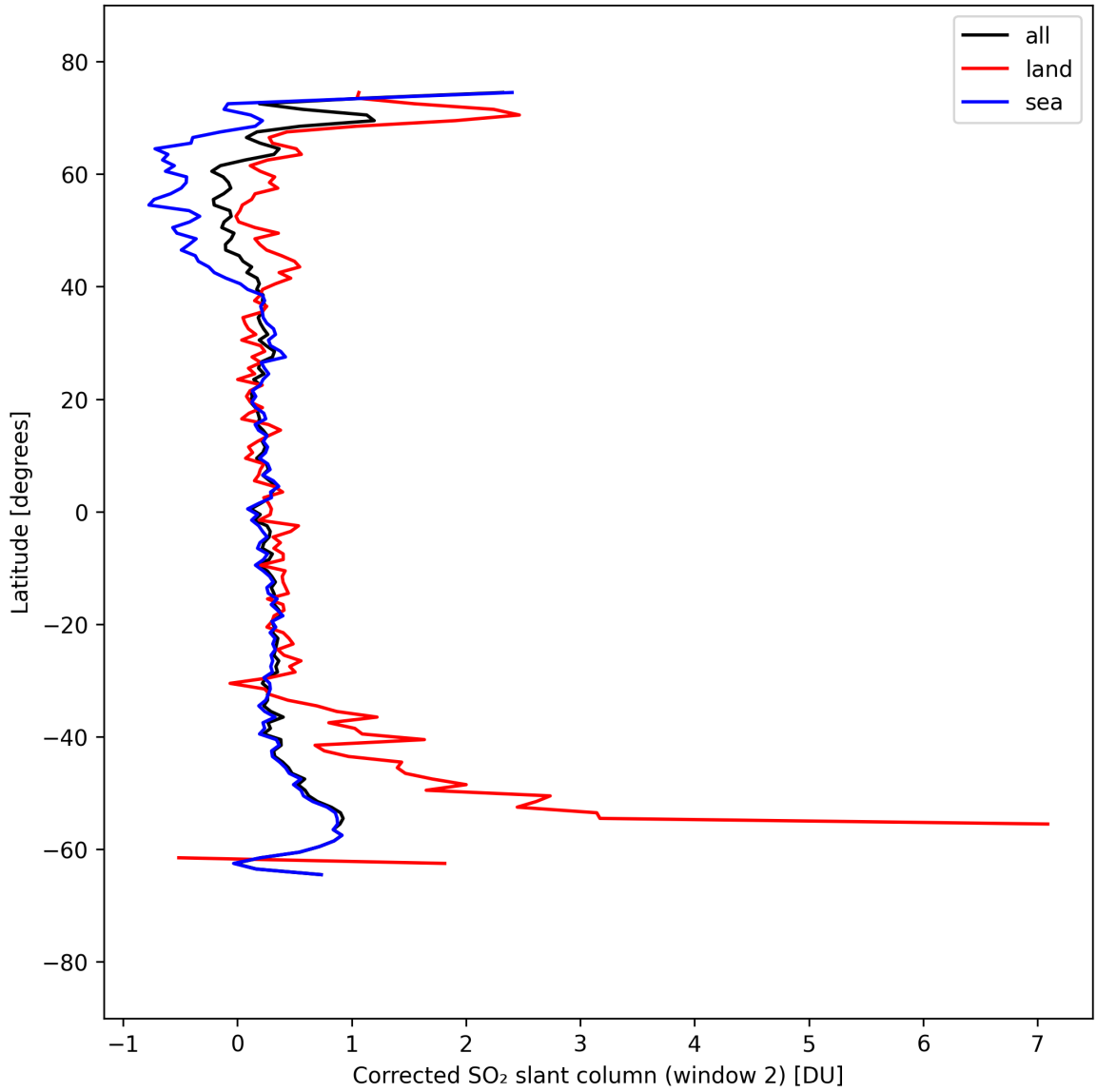

Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-04-01 to 2025-04-02.

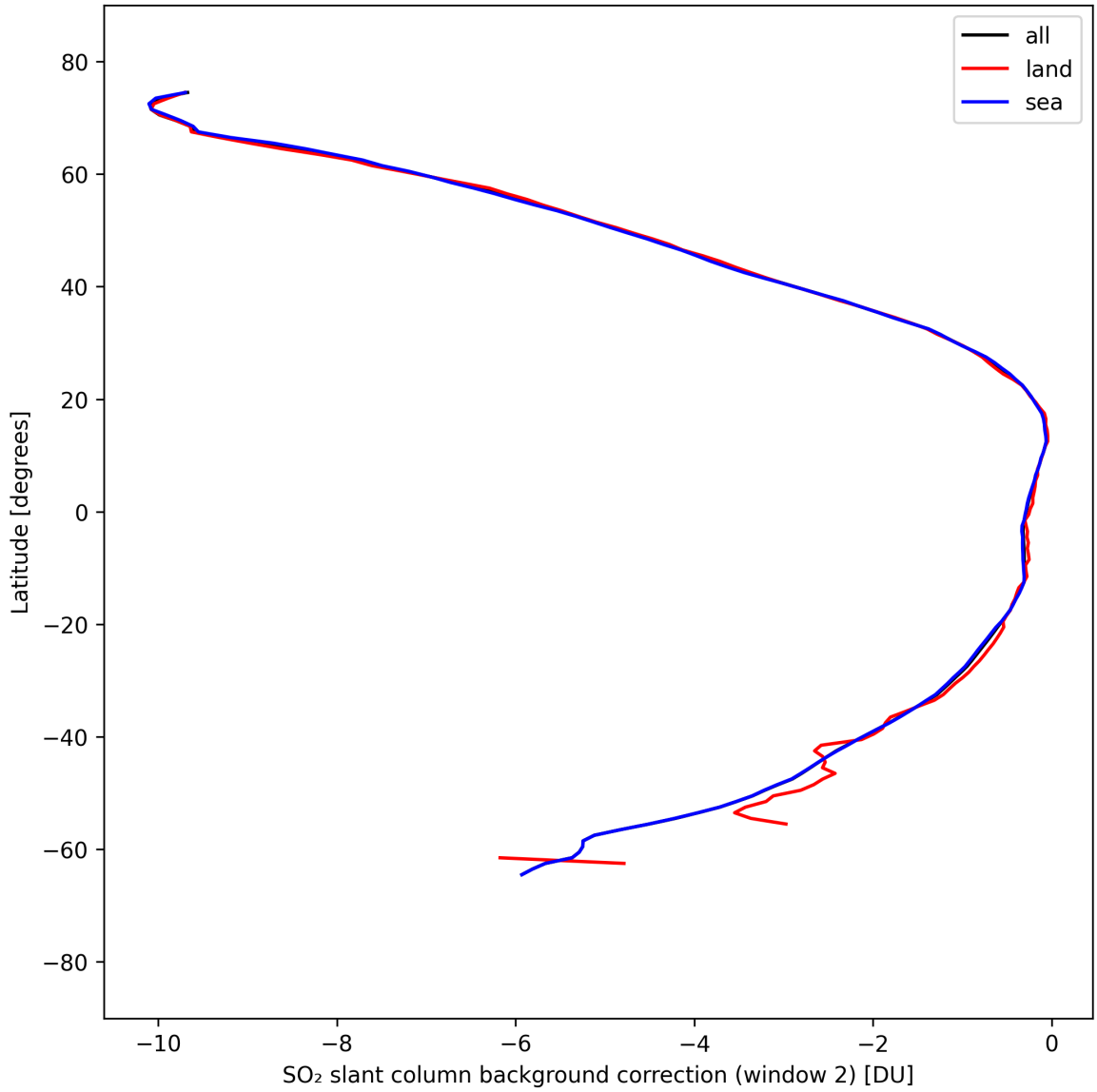

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-04-01 to 2025-04-02.

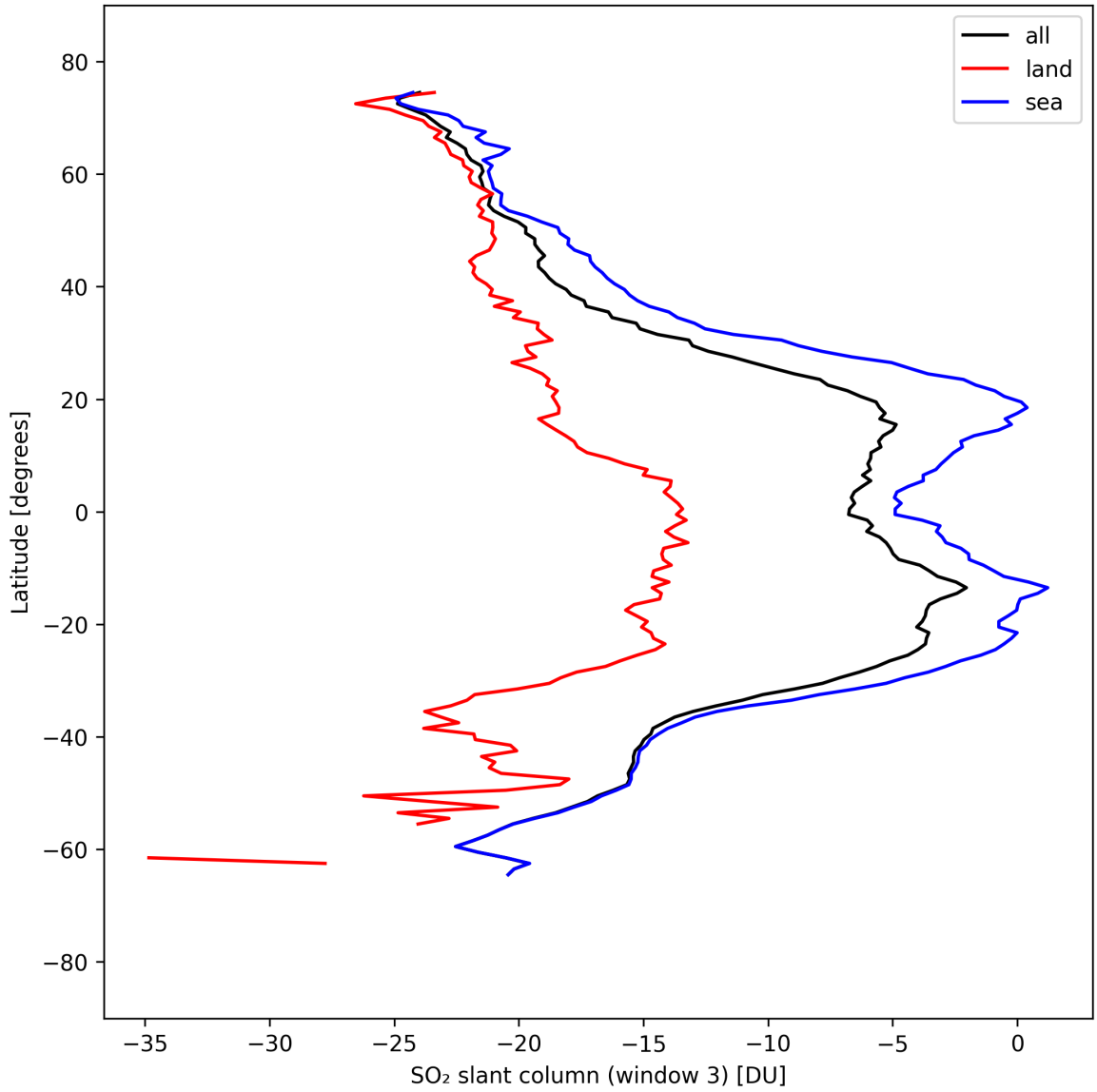

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-04-01 to 2025-04-02.

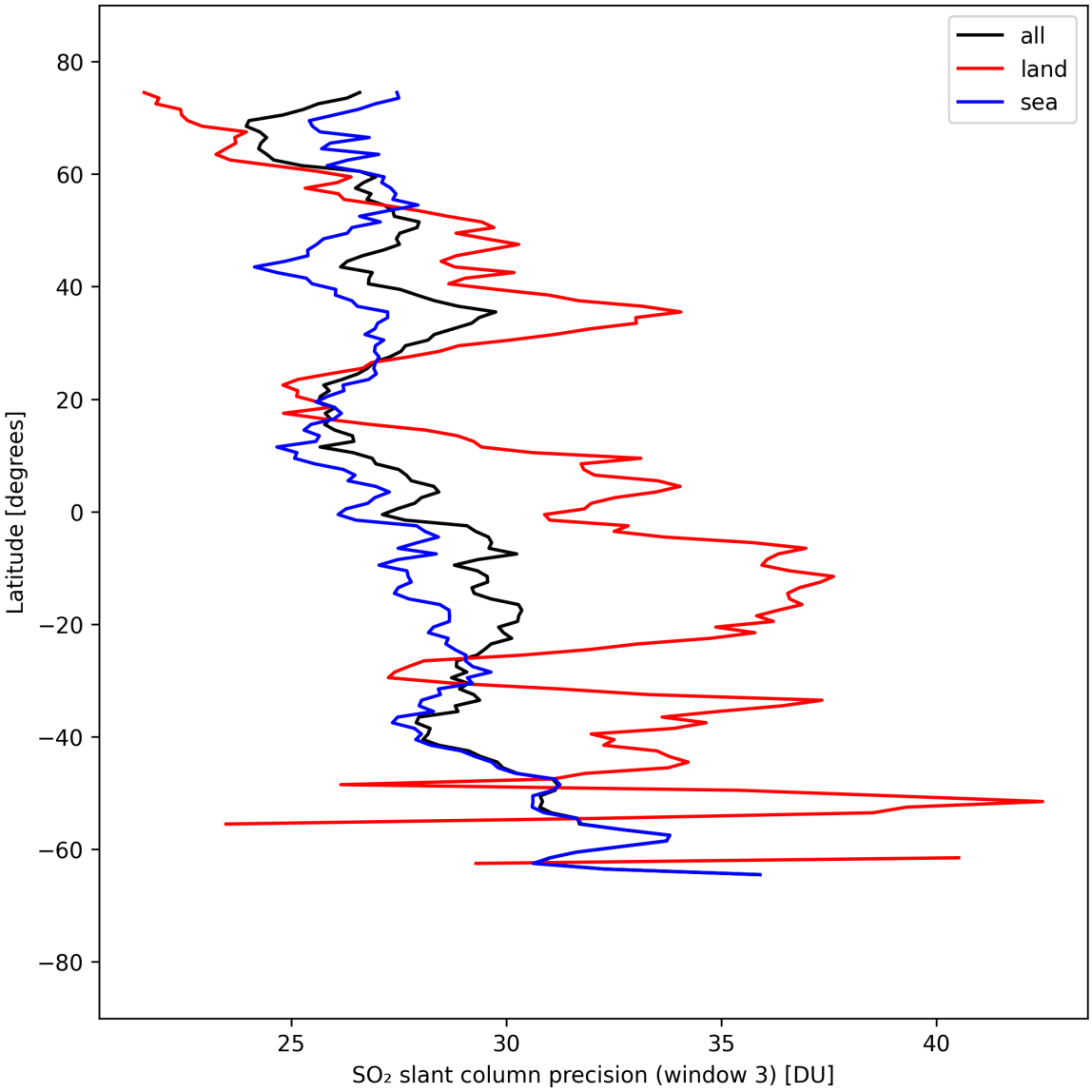

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-04-01 to 2025-04-02.

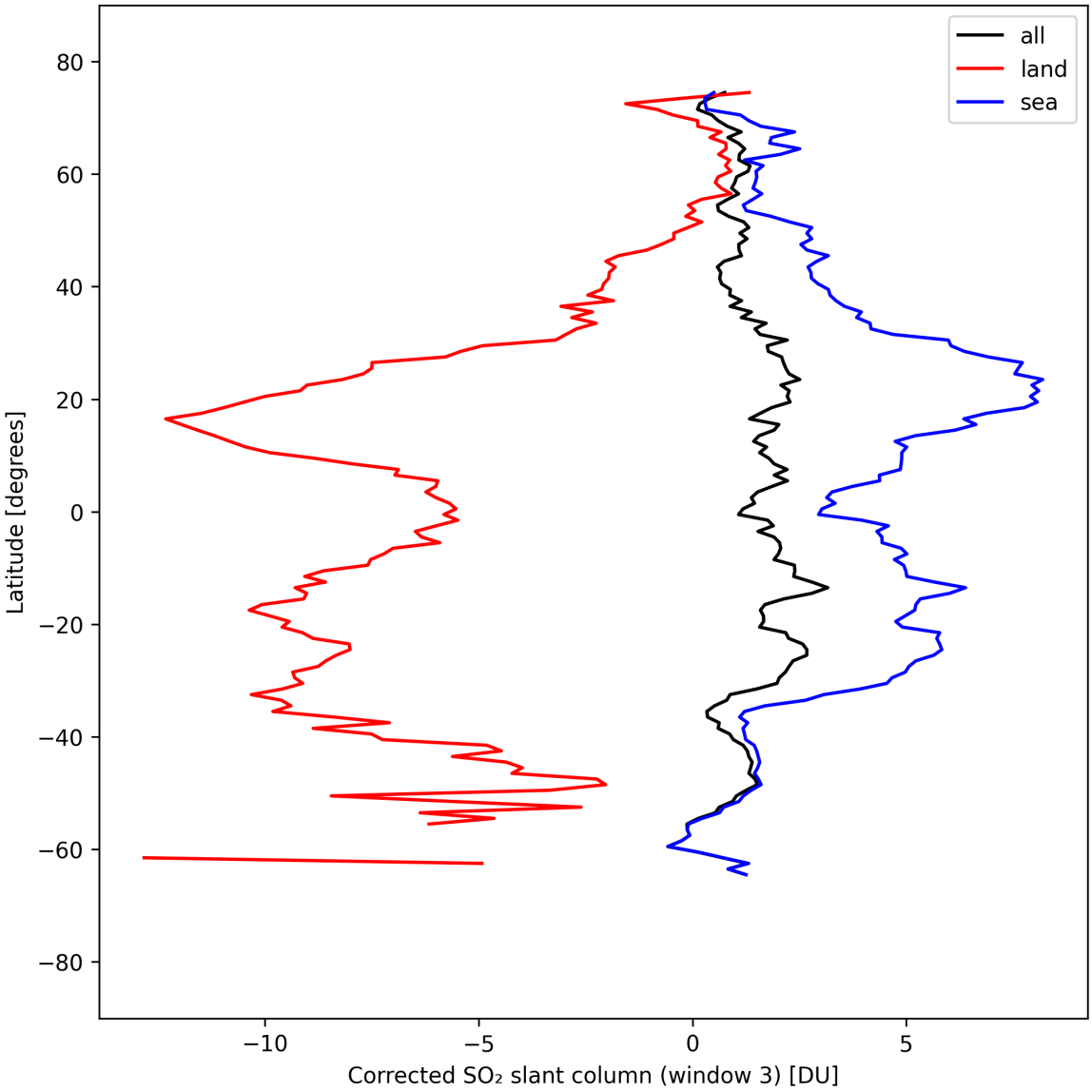

Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-04-01 to 2025-04-02.

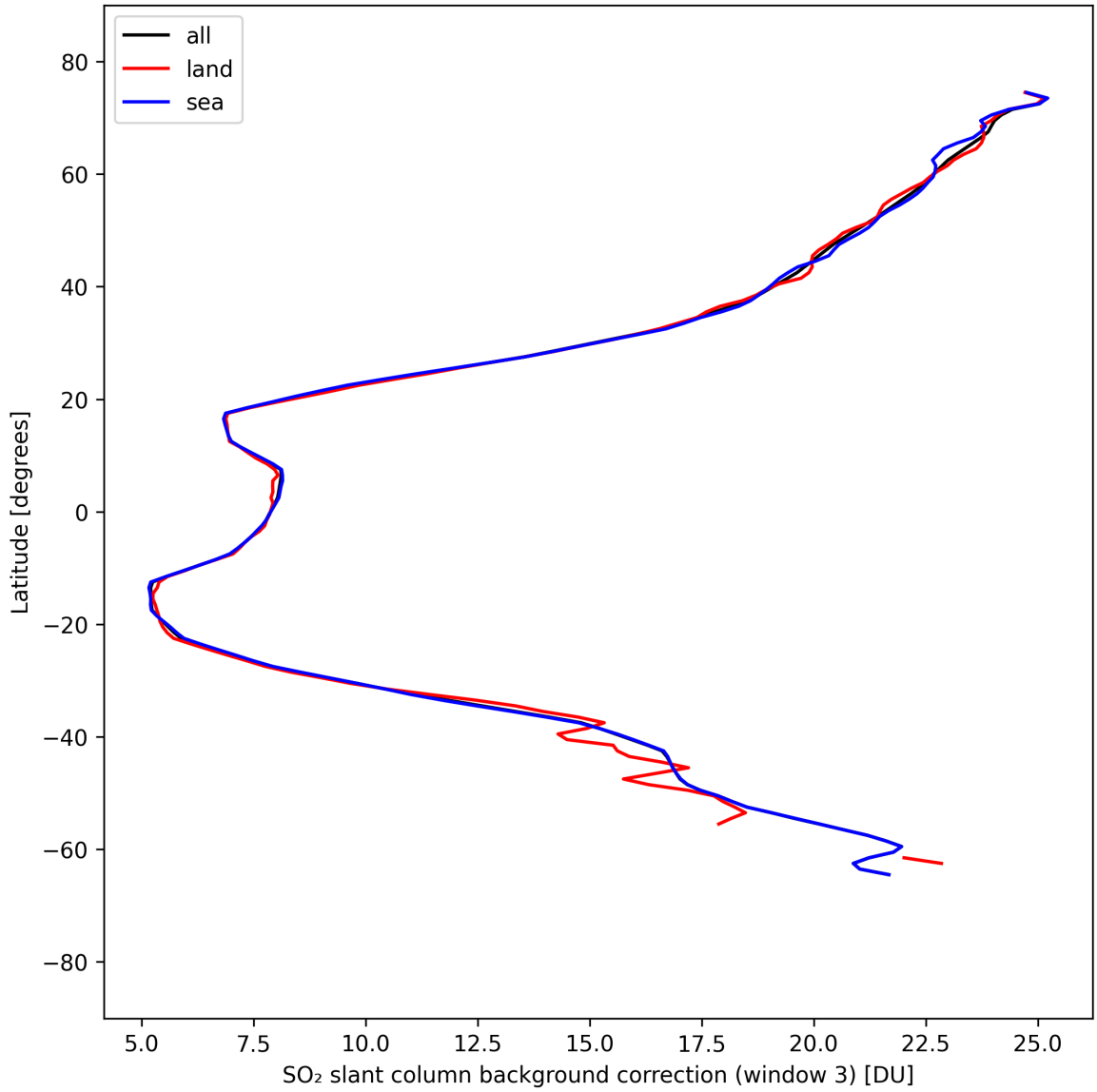

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-04-01 to 2025-04-02.

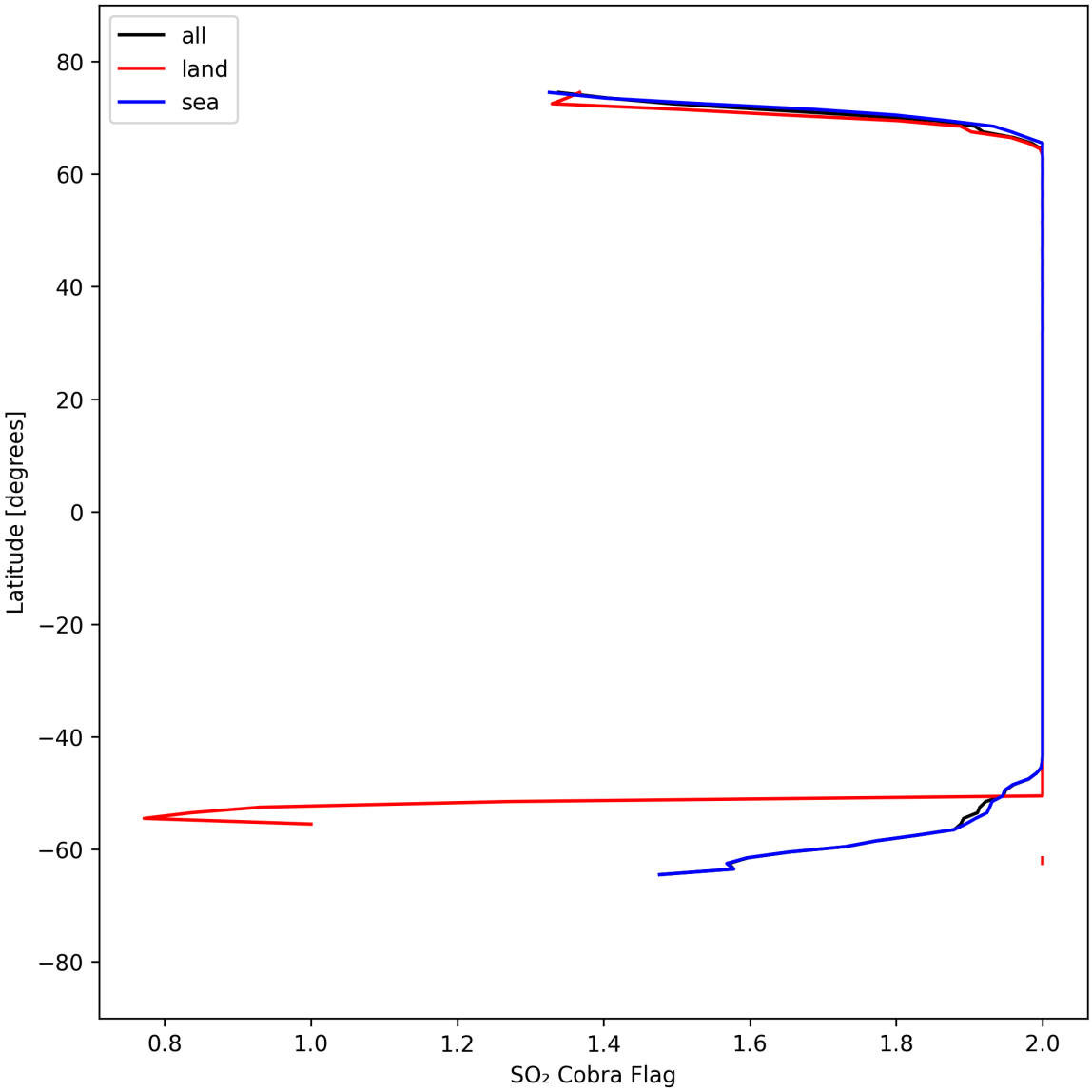

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-04-01 to 2025-04-02.

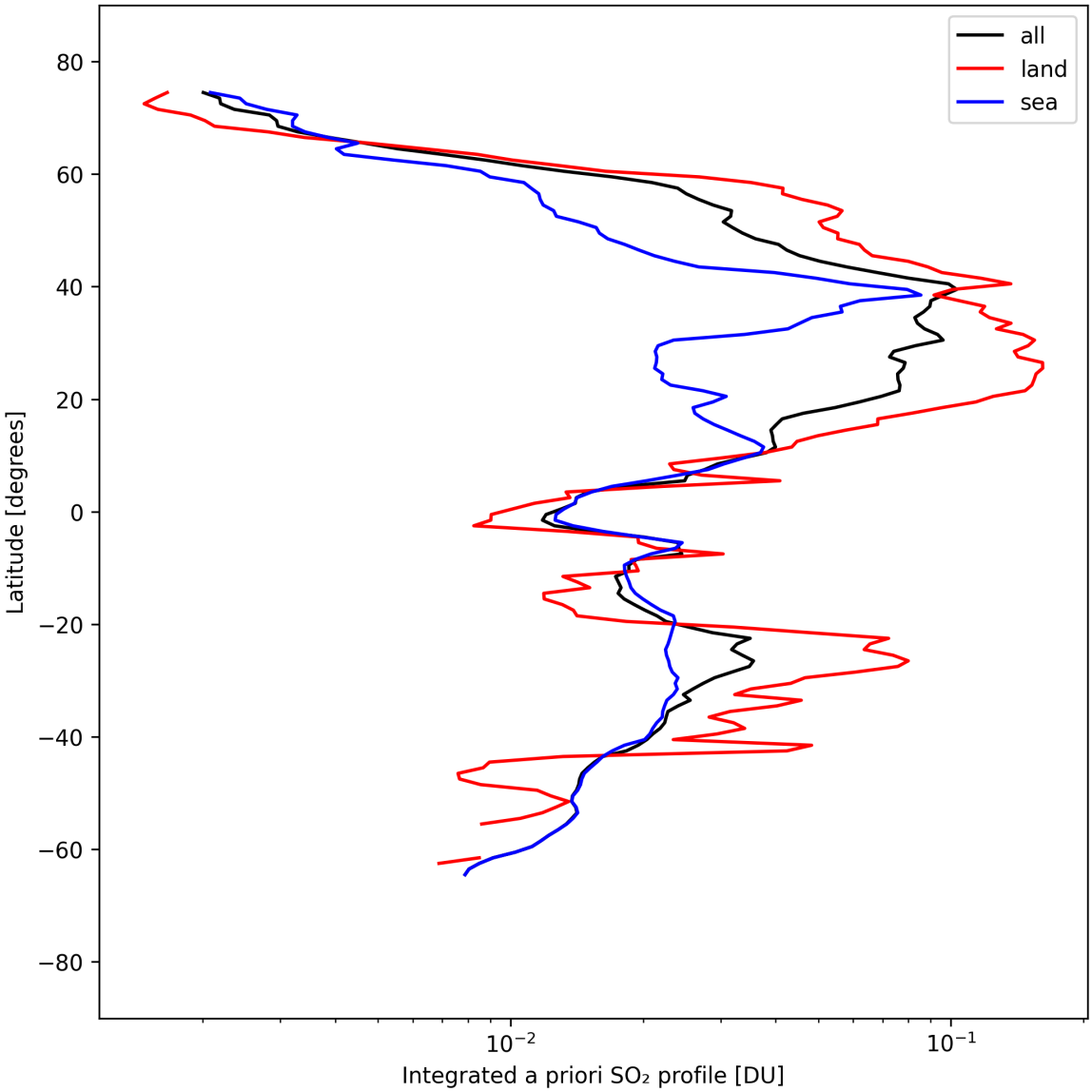

Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-04-01 to 2025-04-02.

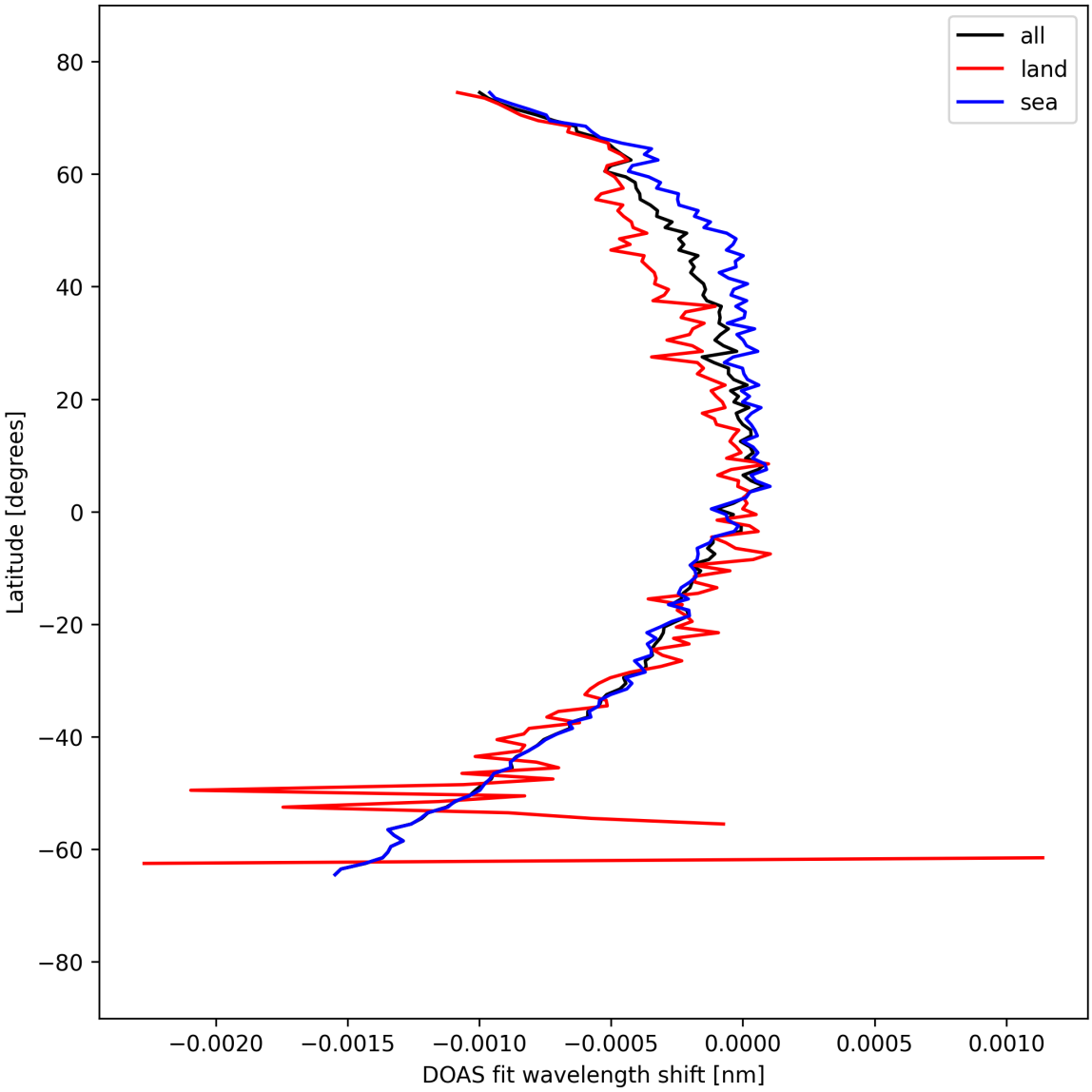

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-04-01 to 2025-04-02.

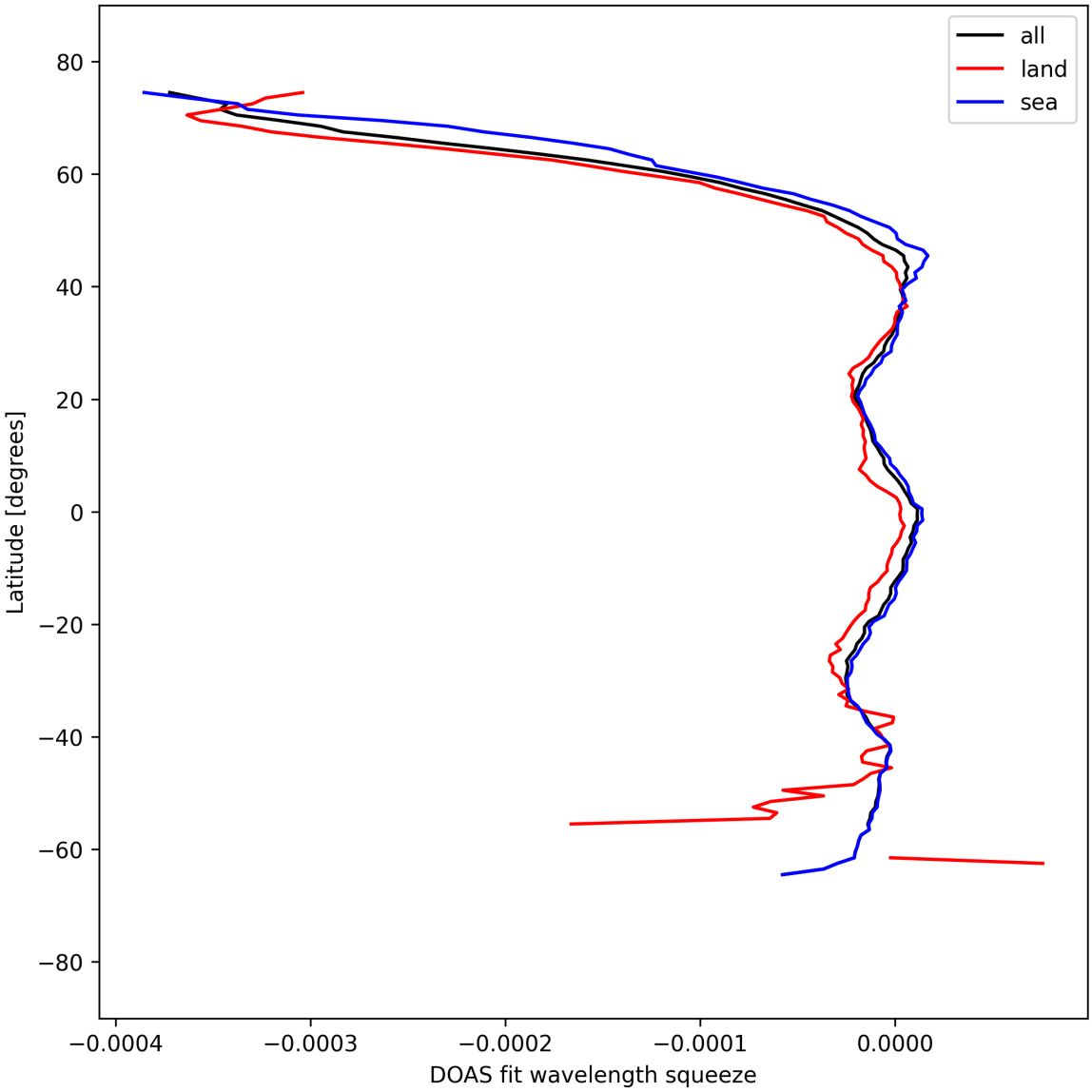

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-04-01 to 2025-04-02.

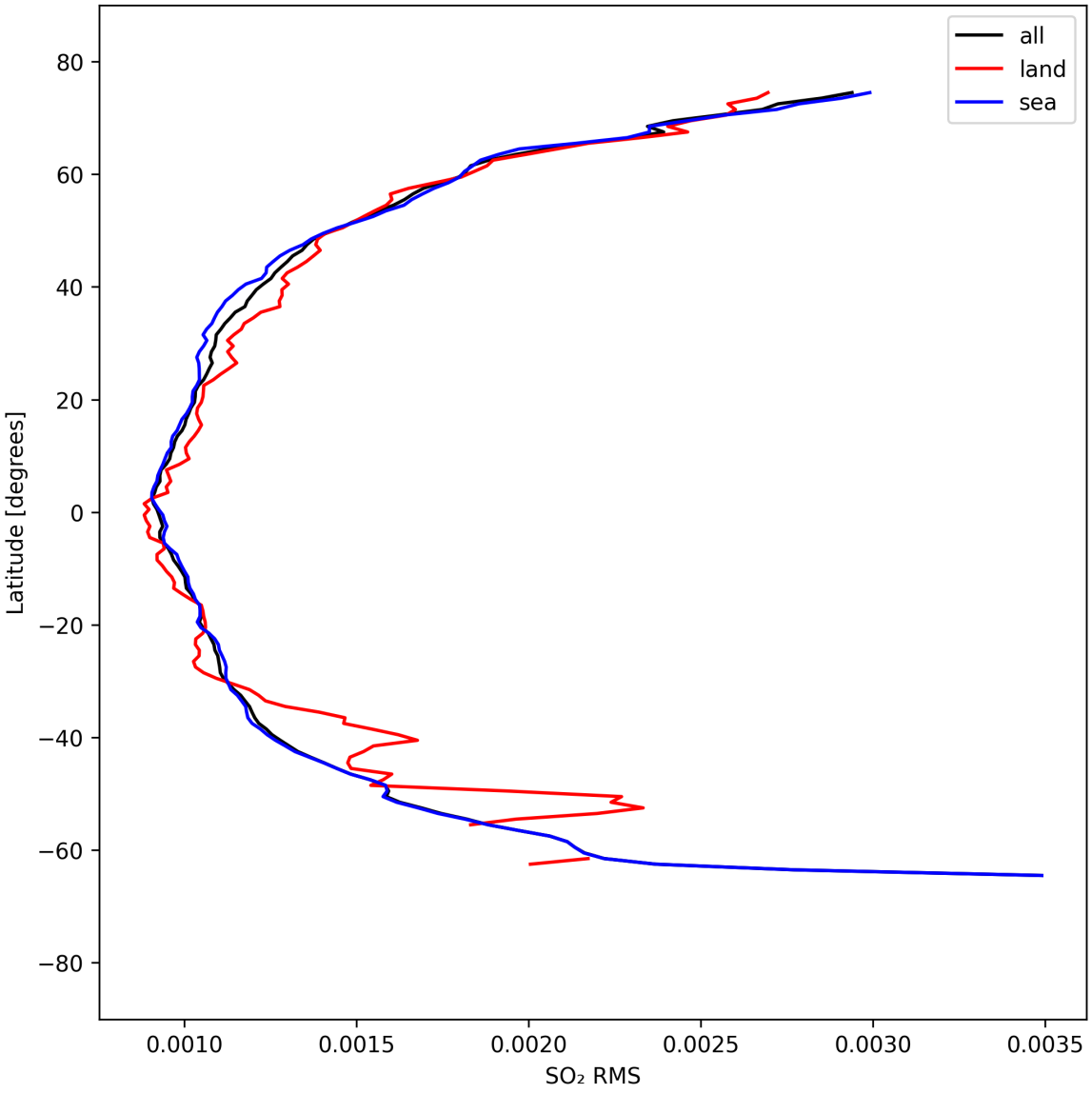

Figure 52: Zonal average of "SO_2 RMS" for 2025-04-01 to 2025-04-02.

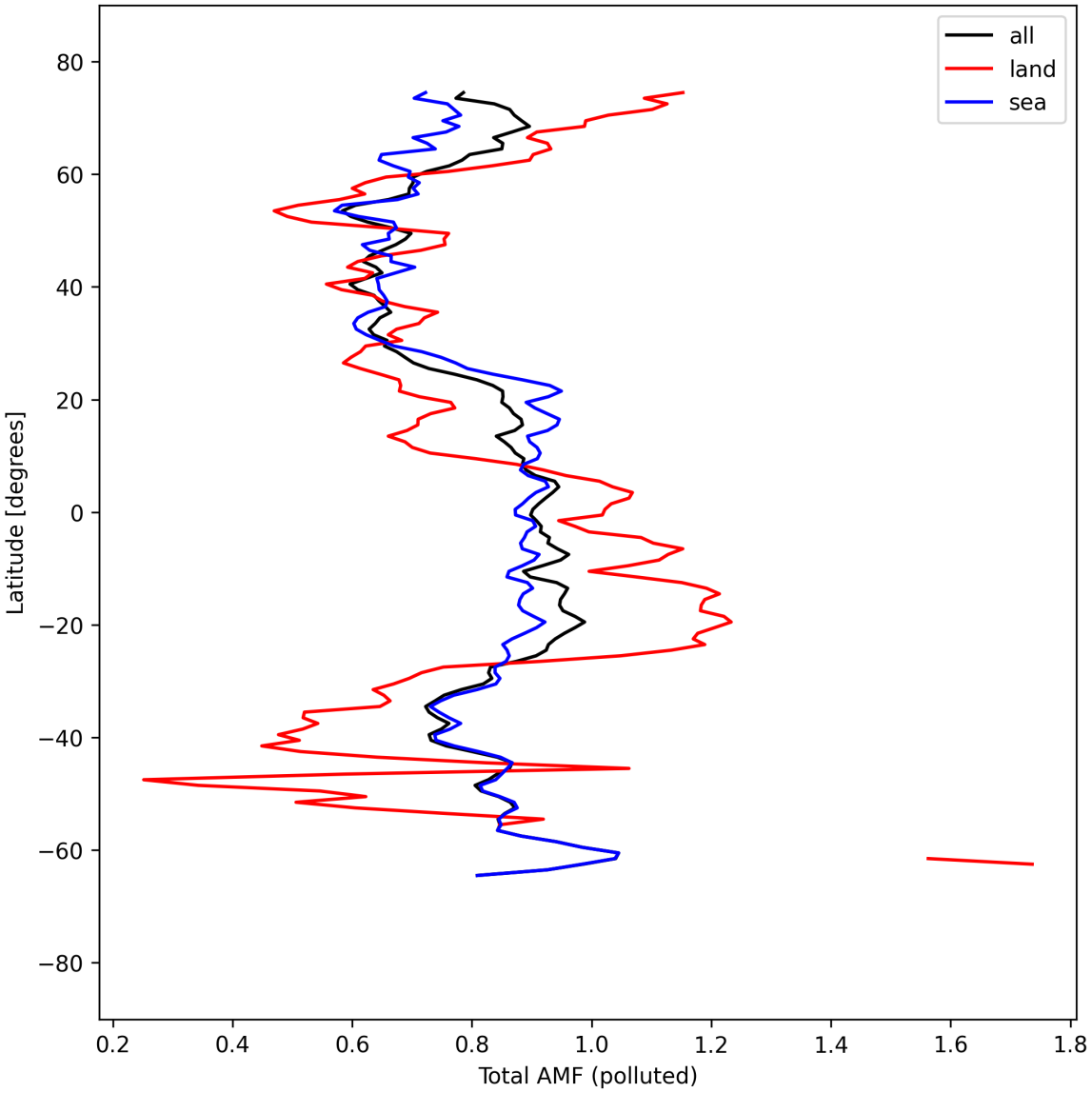

Figure 53: Zonal average of “Total AMF (polluted)” for 2025-04-01 to 2025-04-02.

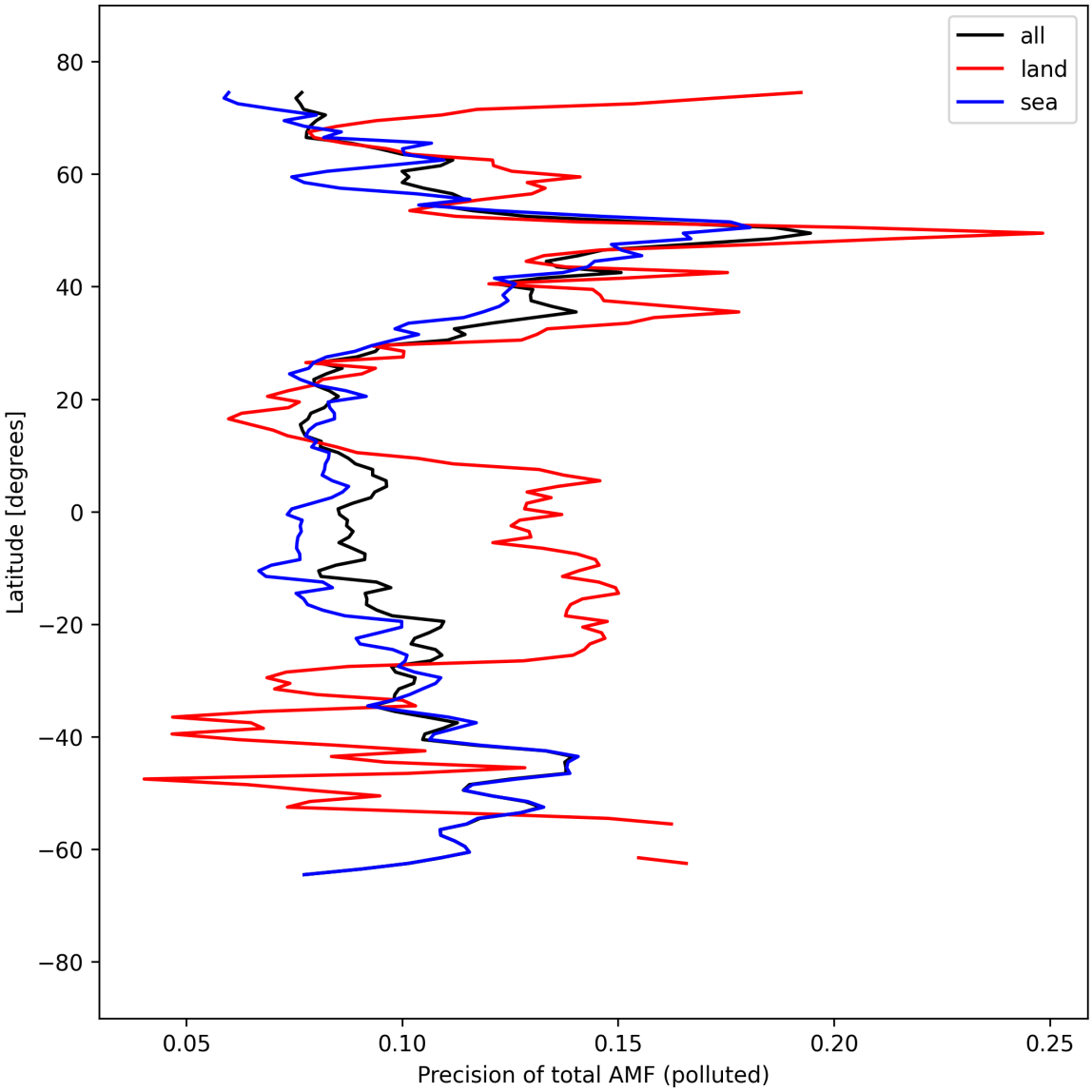

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-04-01 to 2025-04-02.

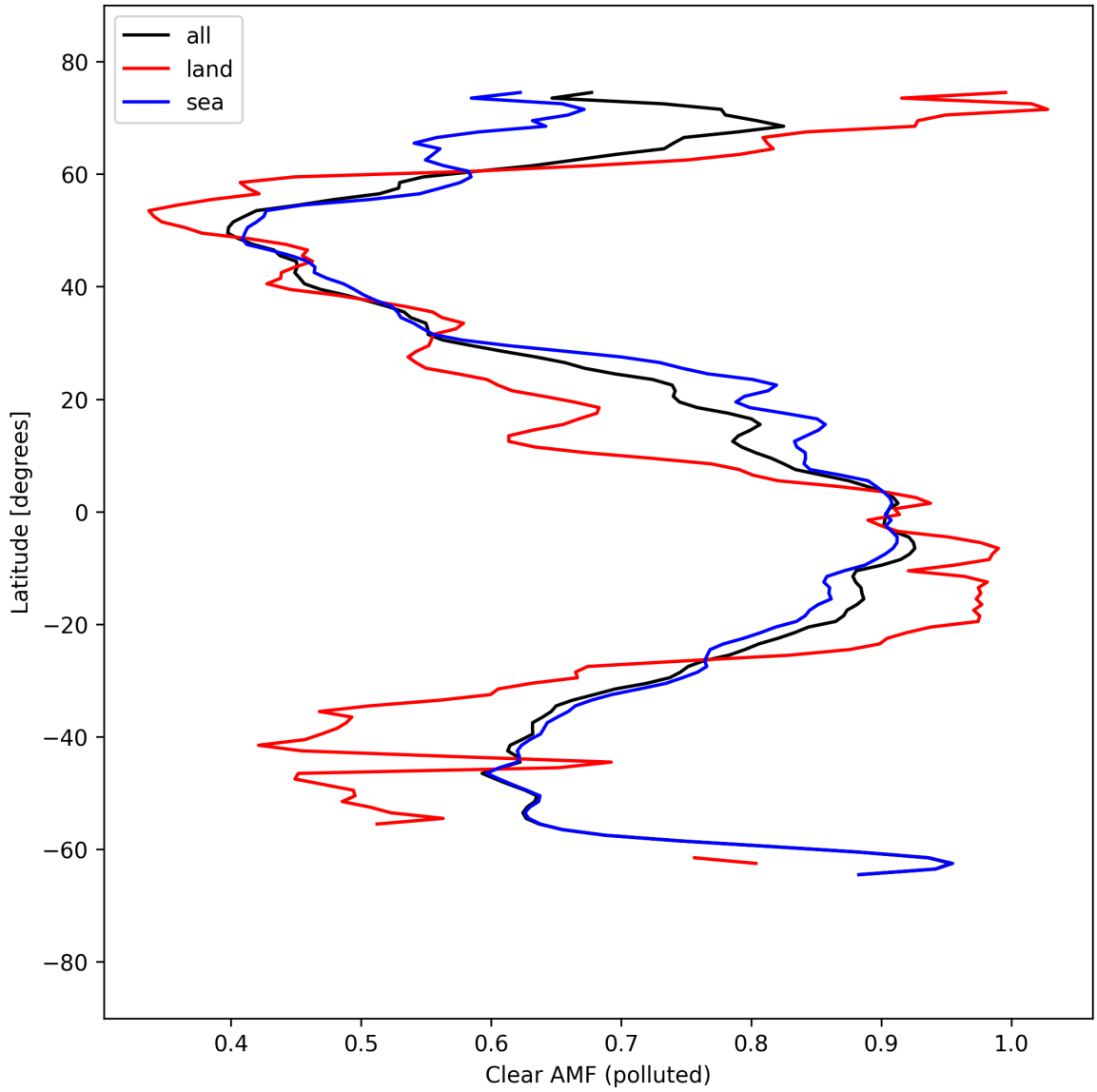

Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-04-01 to 2025-04-02.

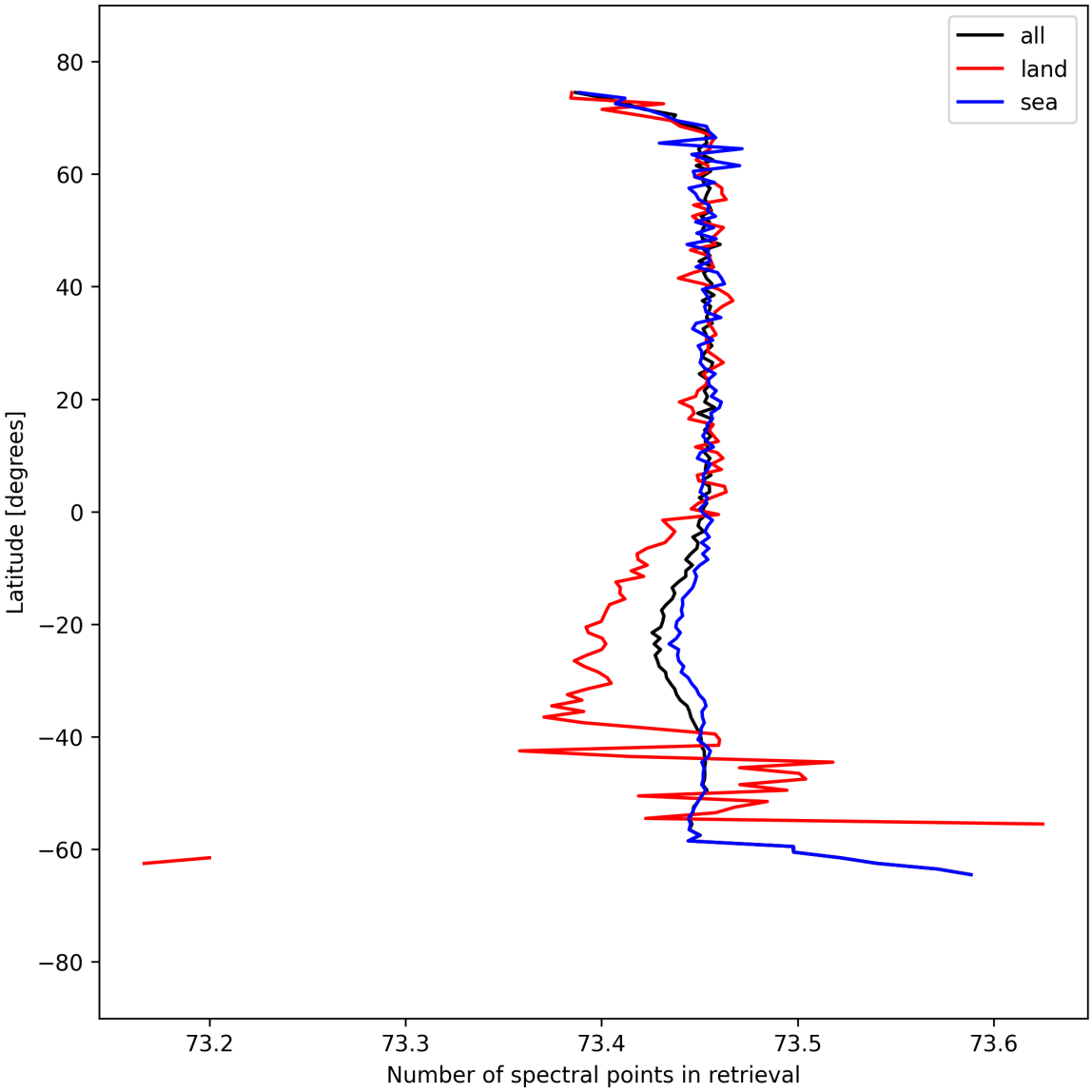

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-04-01 to 2025-04-02.

8 Histograms

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

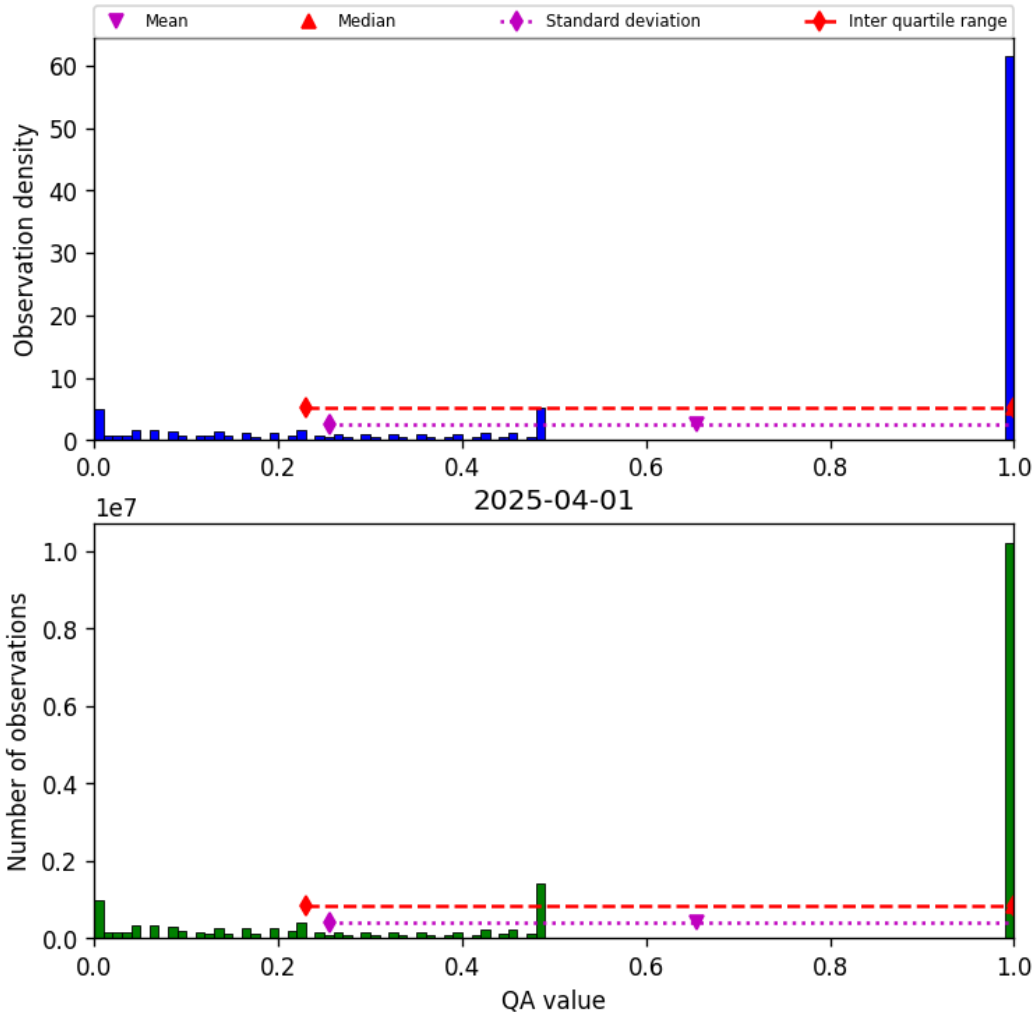

Figure 57: Histogram of “QA value” for 2025-04-01 to 2025-04-02

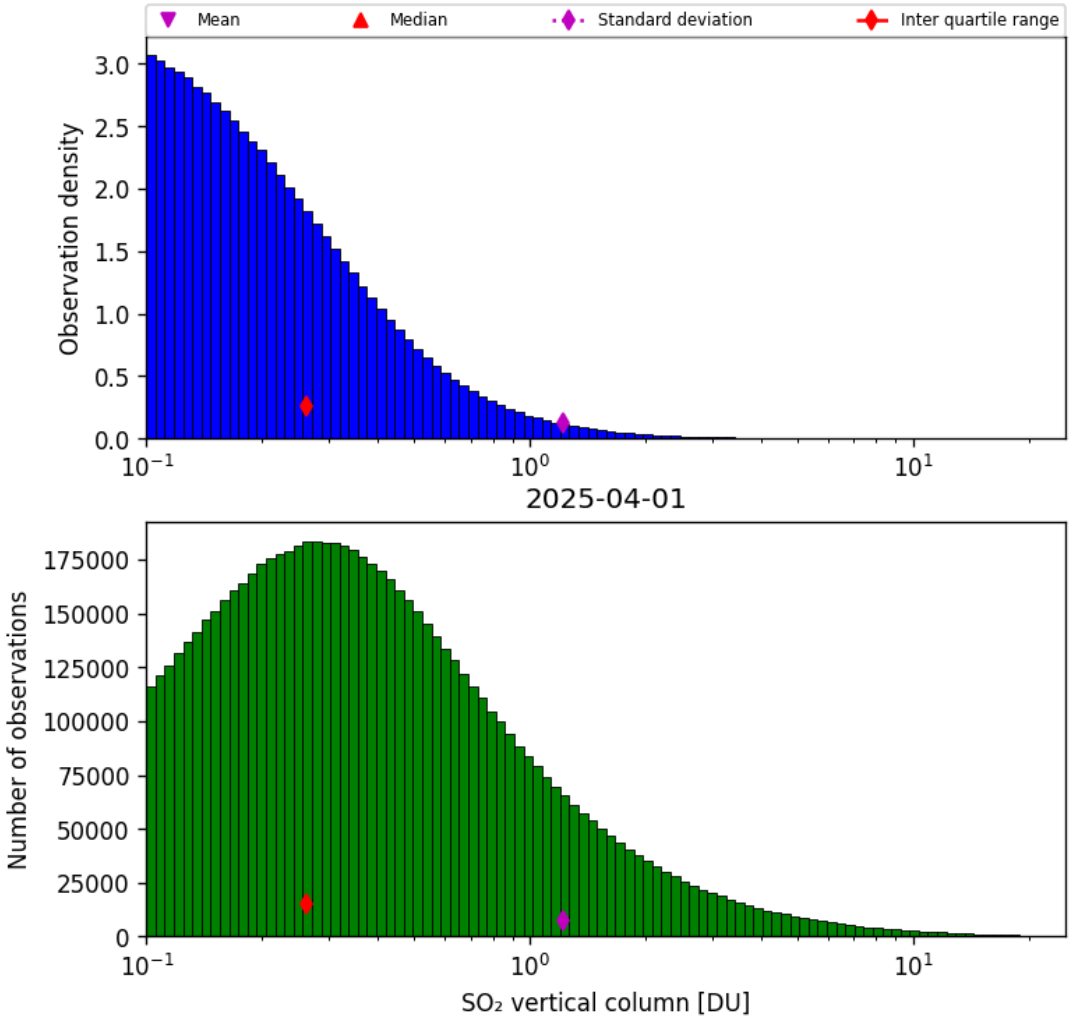

Figure 58: Histogram of "SO_2 vertical column" for 2025-04-01 to 2025-04-02

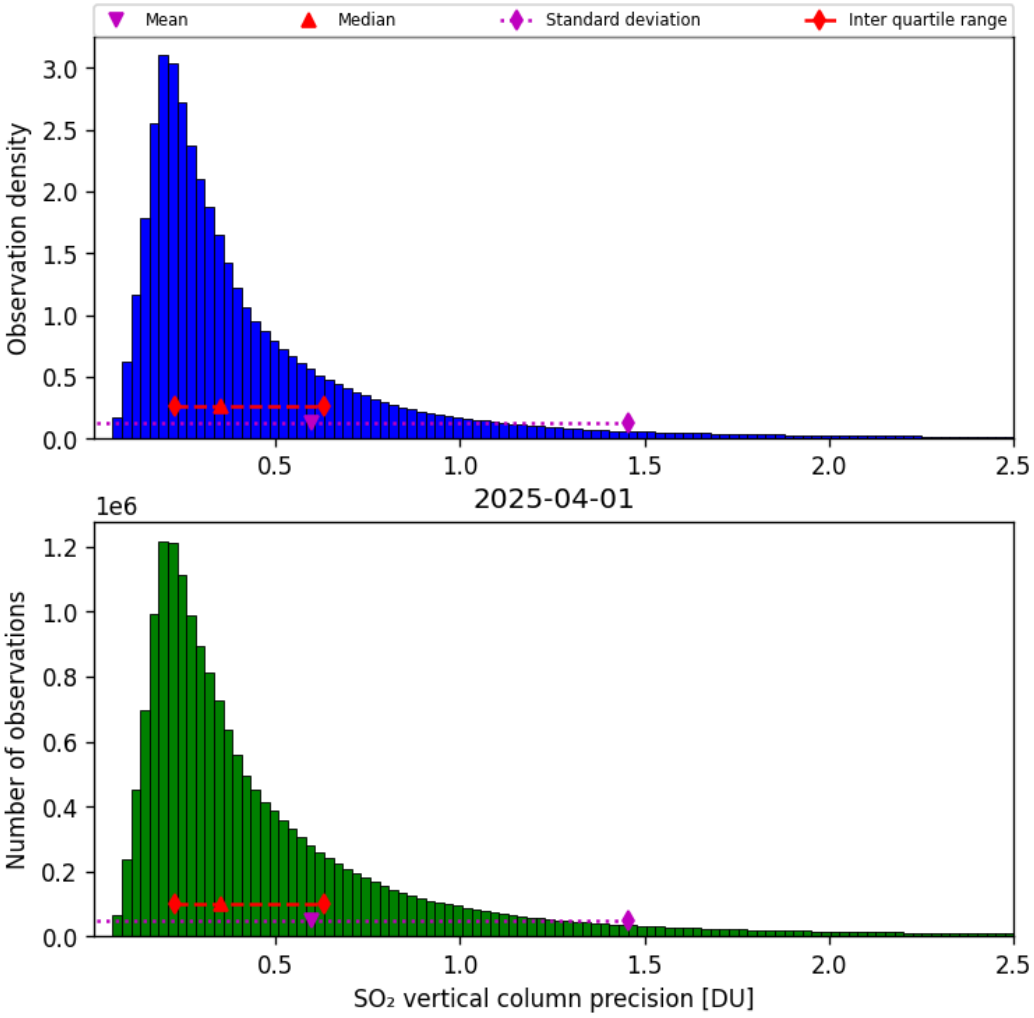

Figure 59: Histogram of "SO_2 vertical column precision" for 2025-04-01 to 2025-04-02

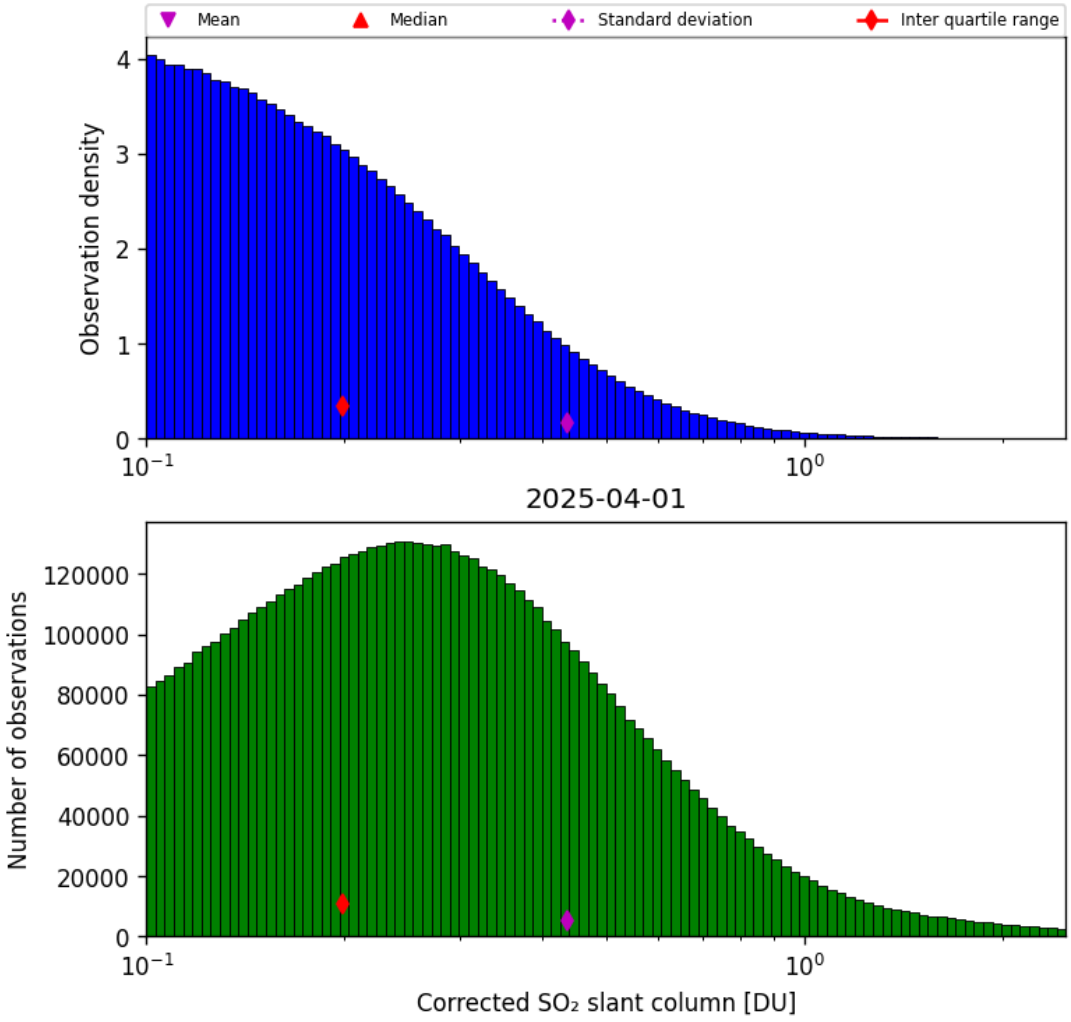

Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-04-01 to 2025-04-02

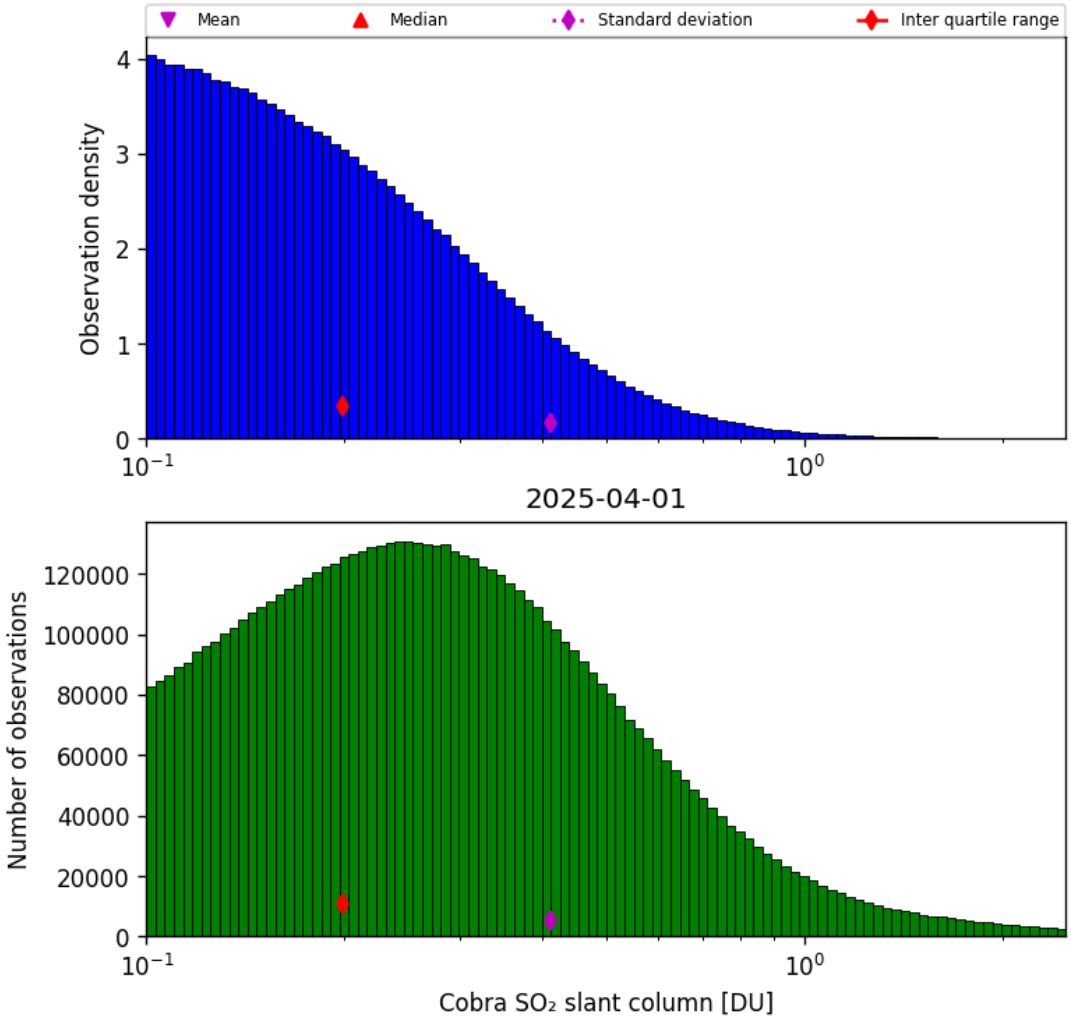

Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-04-01 to 2025-04-02

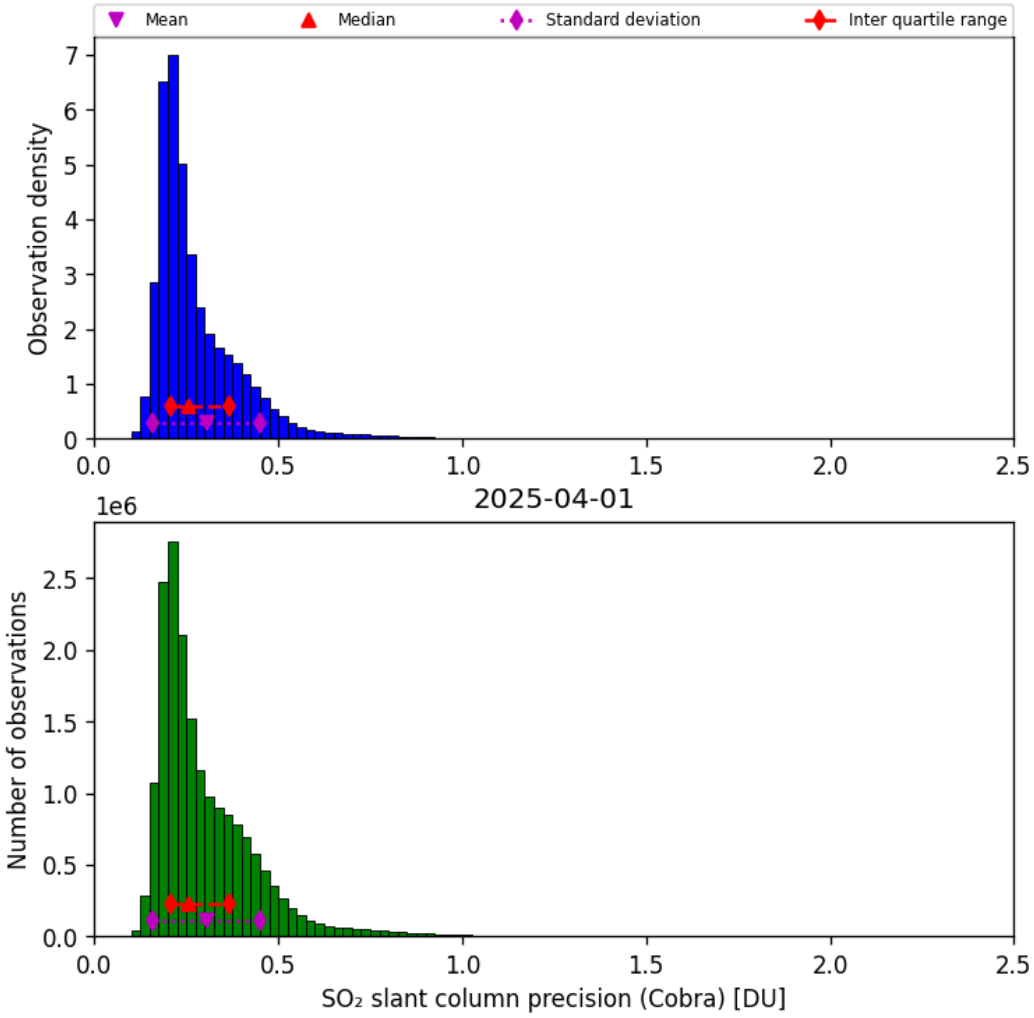

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-04-01 to 2025-04-02

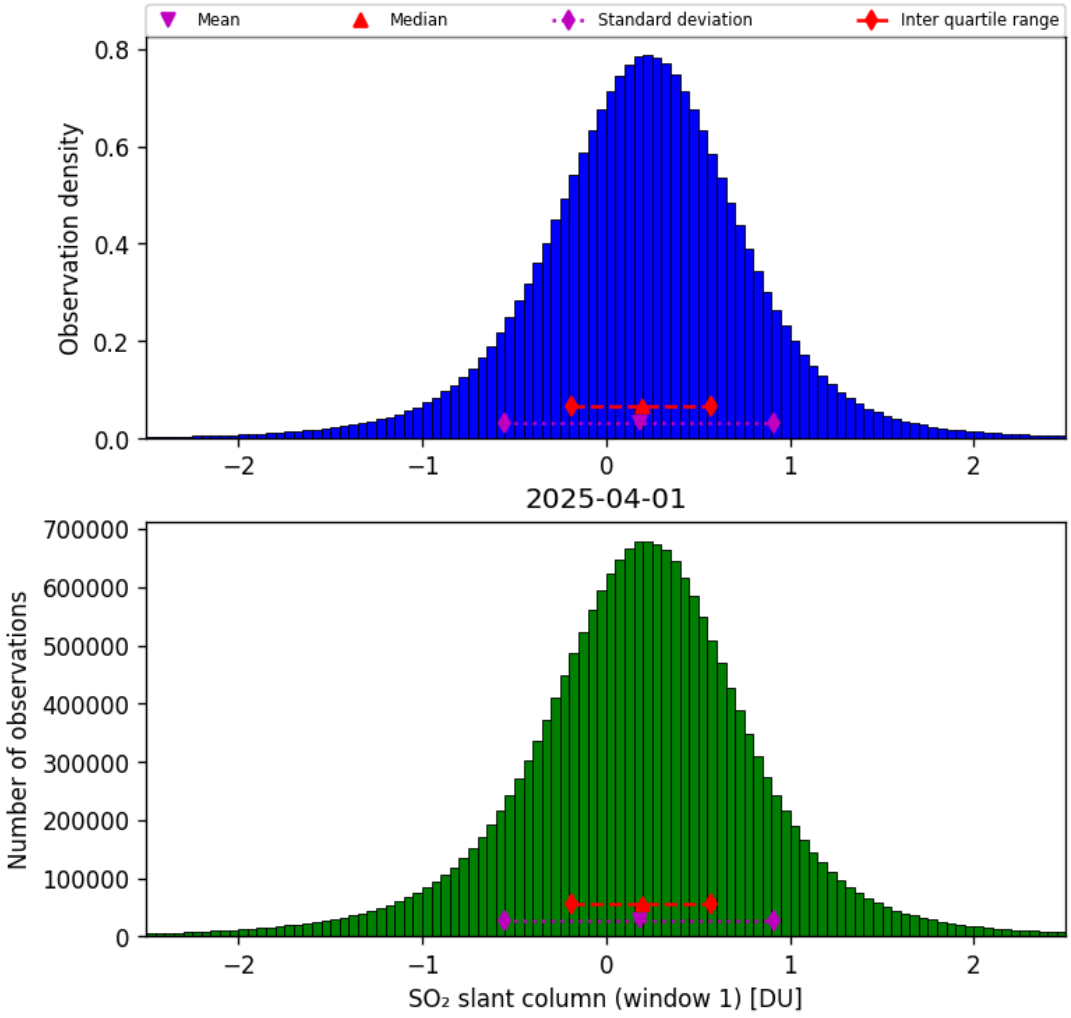

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-04-01 to 2025-04-02

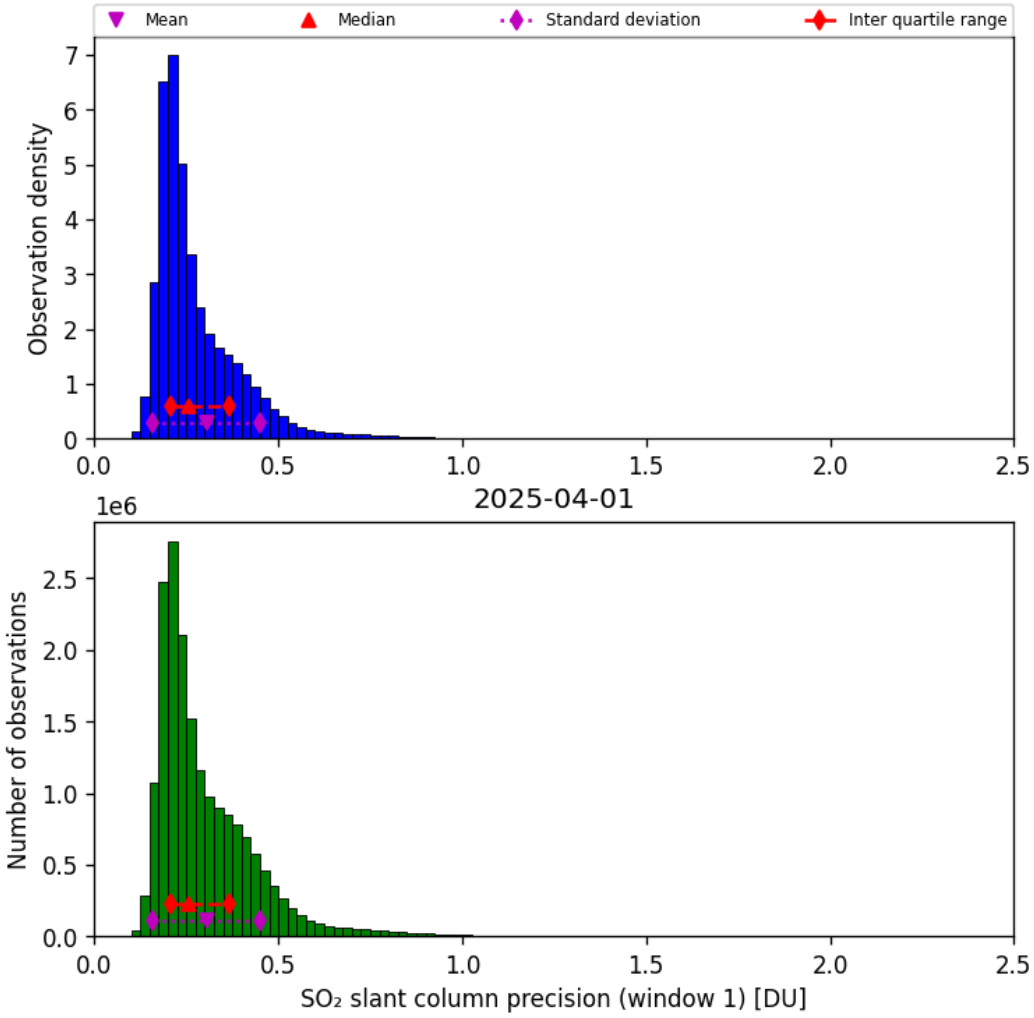

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-04-01 to 2025-04-02

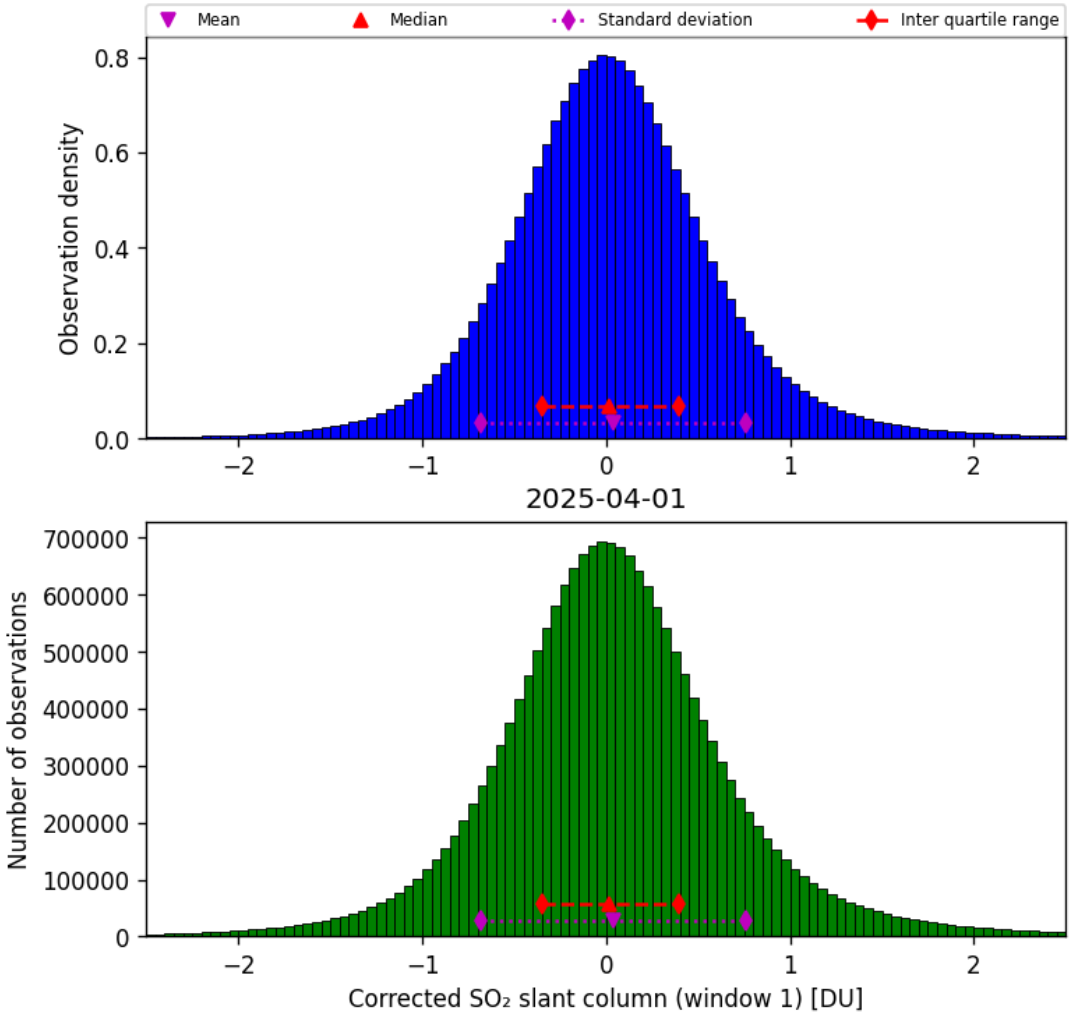

Figure 65: Histogram of “Corrected SO_2 slant column (window 1)” for 2025-04-01 to 2025-04-02

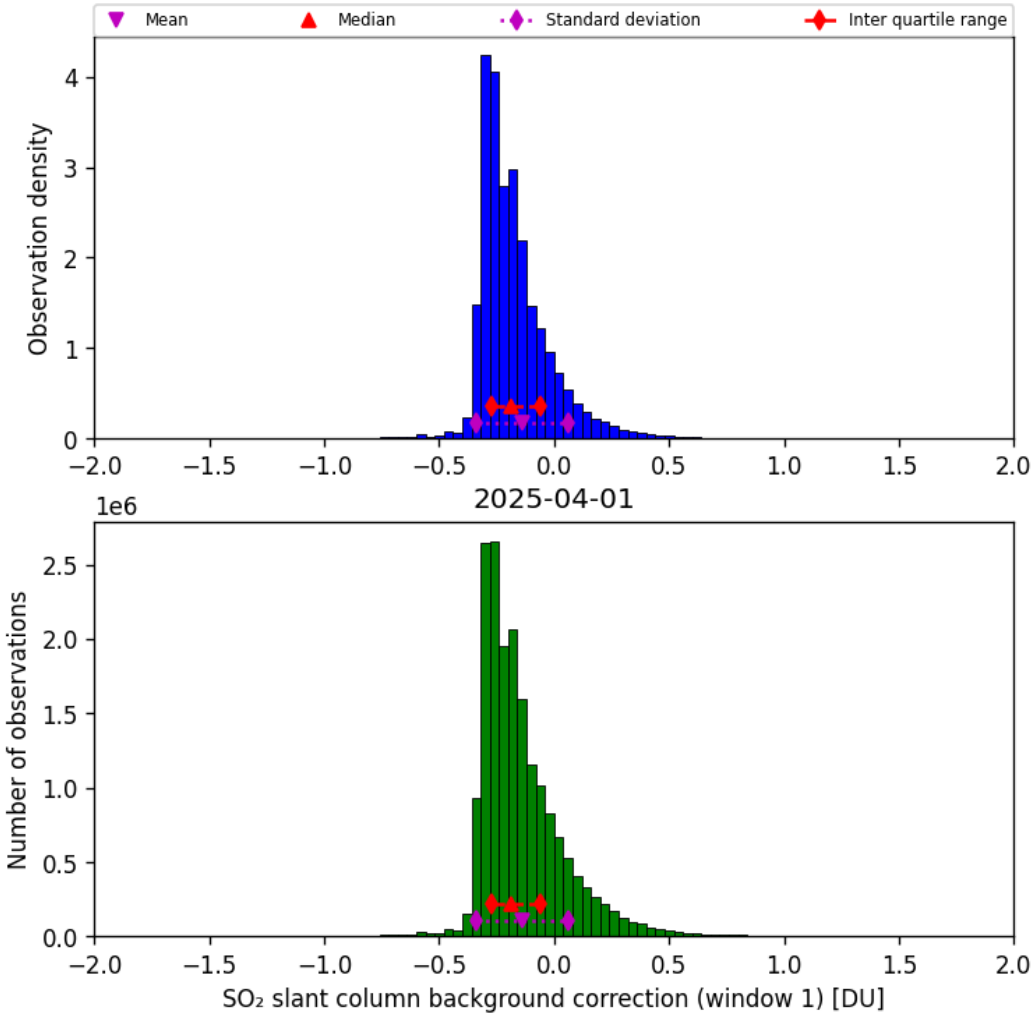

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-04-01 to 2025-04-02

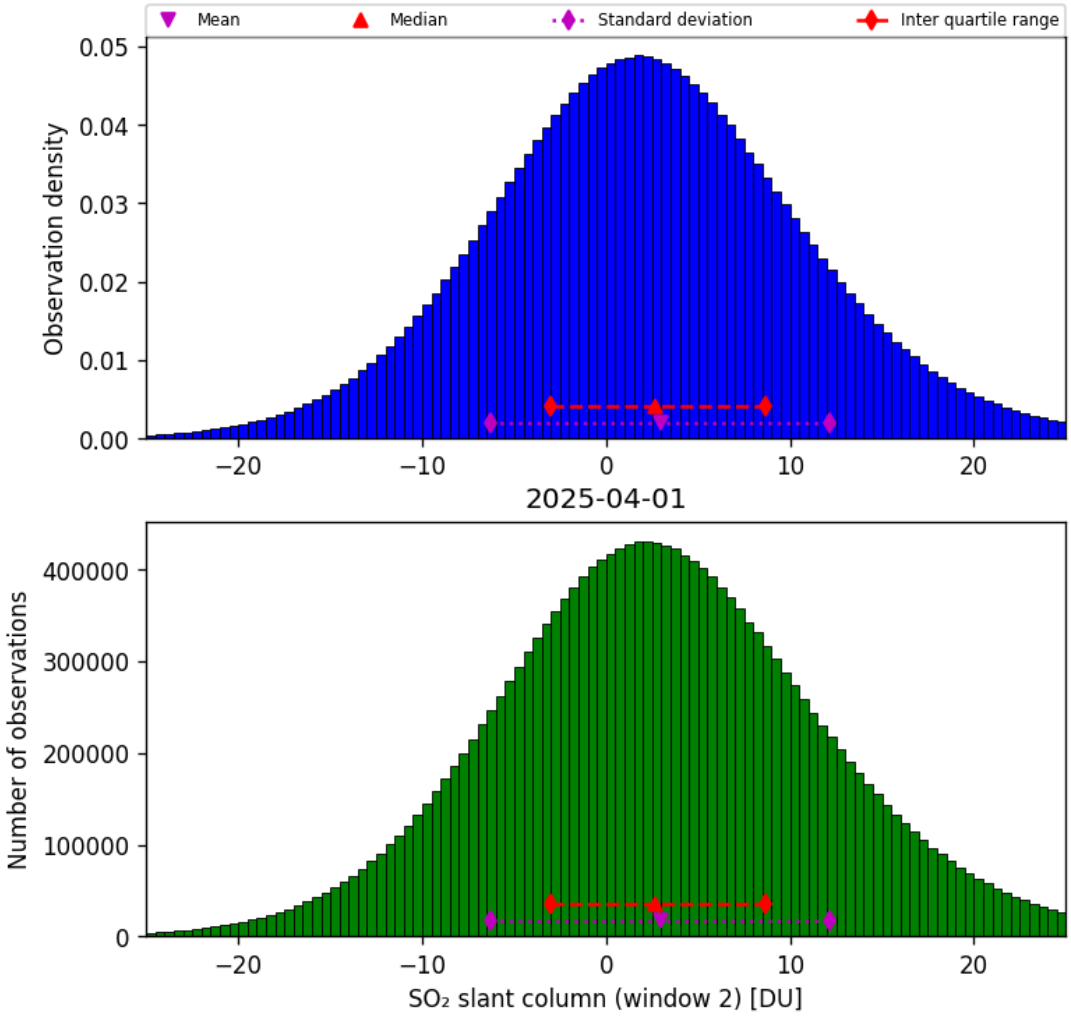

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-04-01 to 2025-04-02

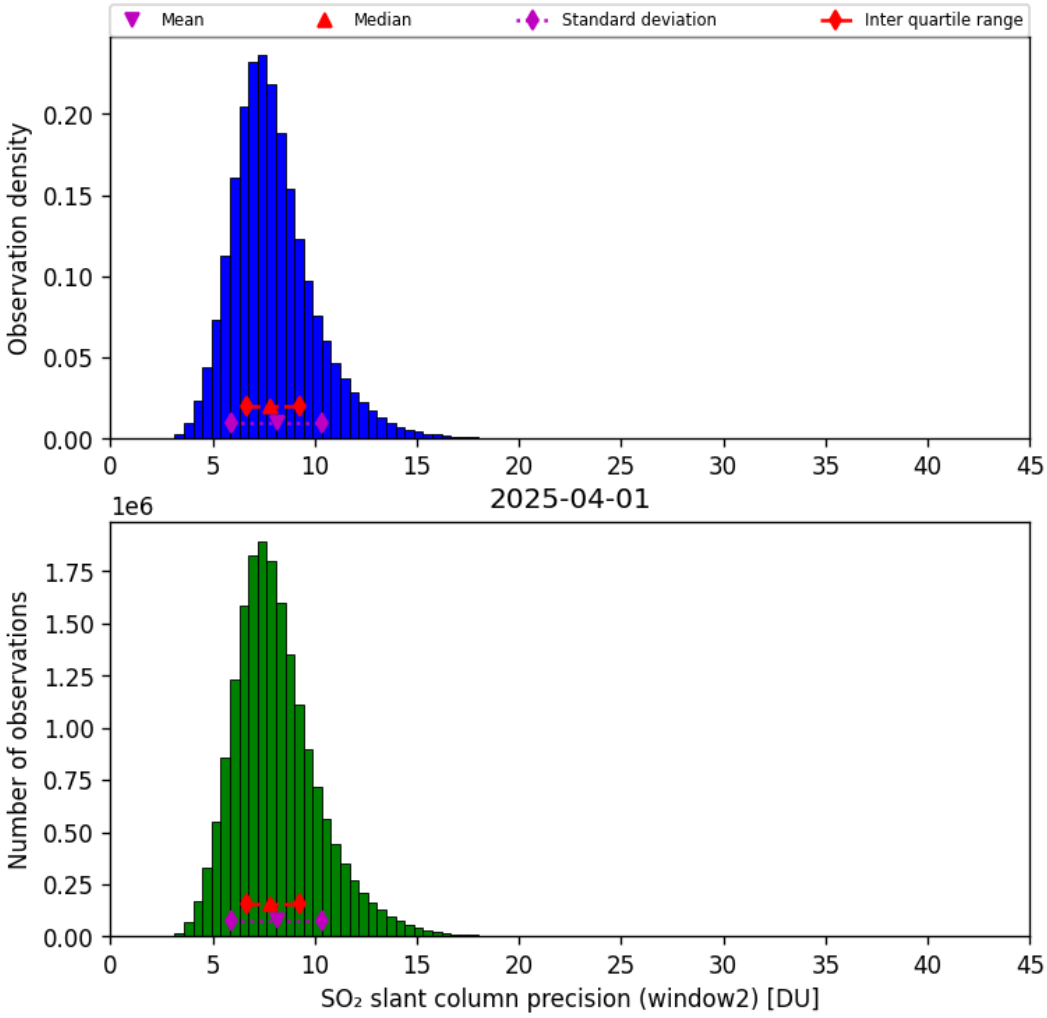

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-04-01 to 2025-04-02

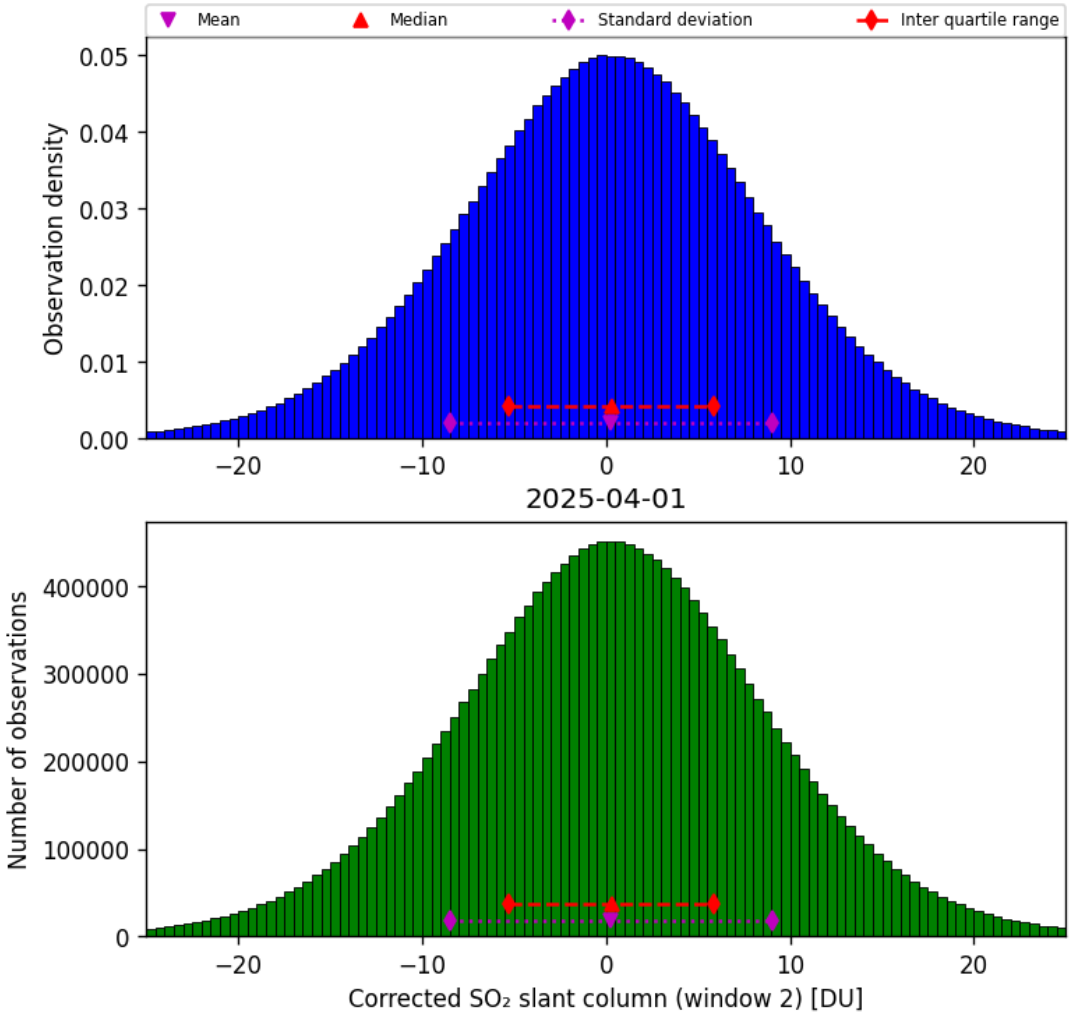

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-04-01 to 2025-04-02

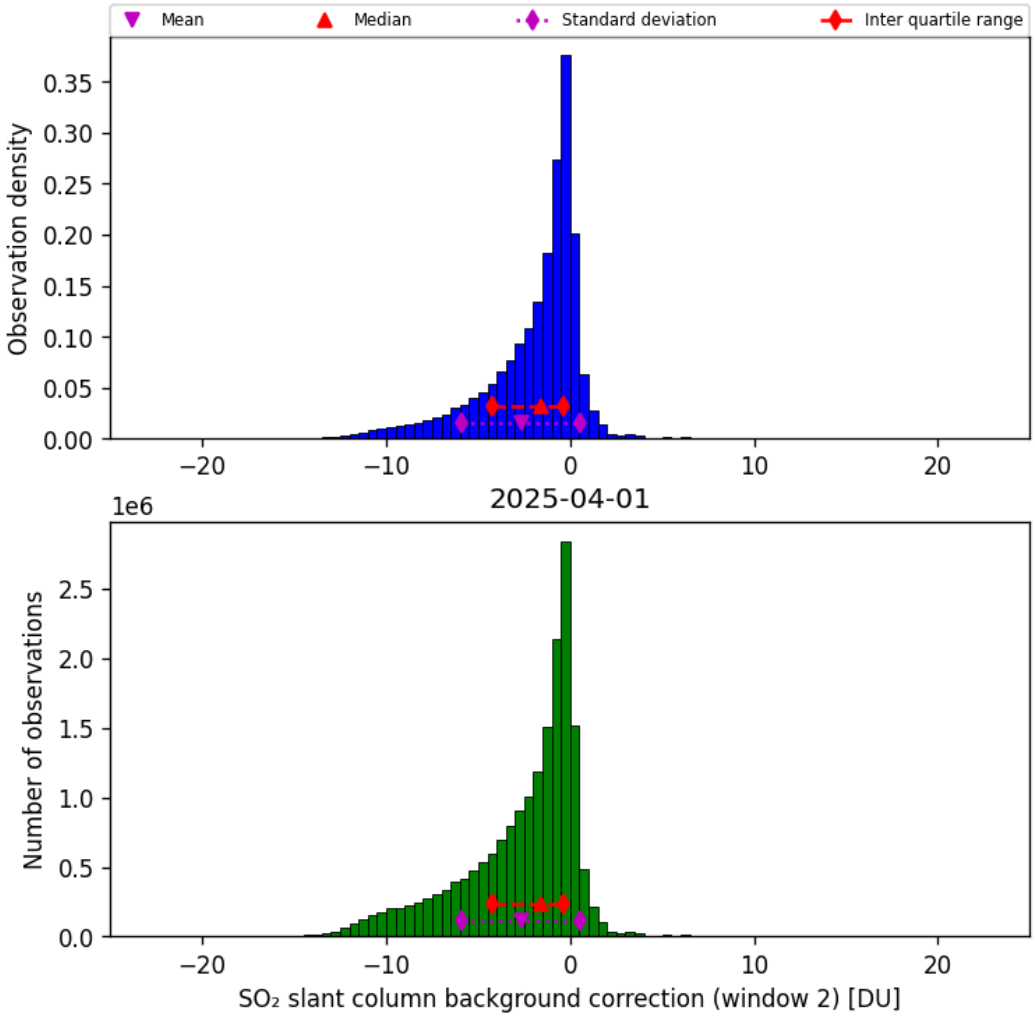

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-04-01 to 2025-04-02

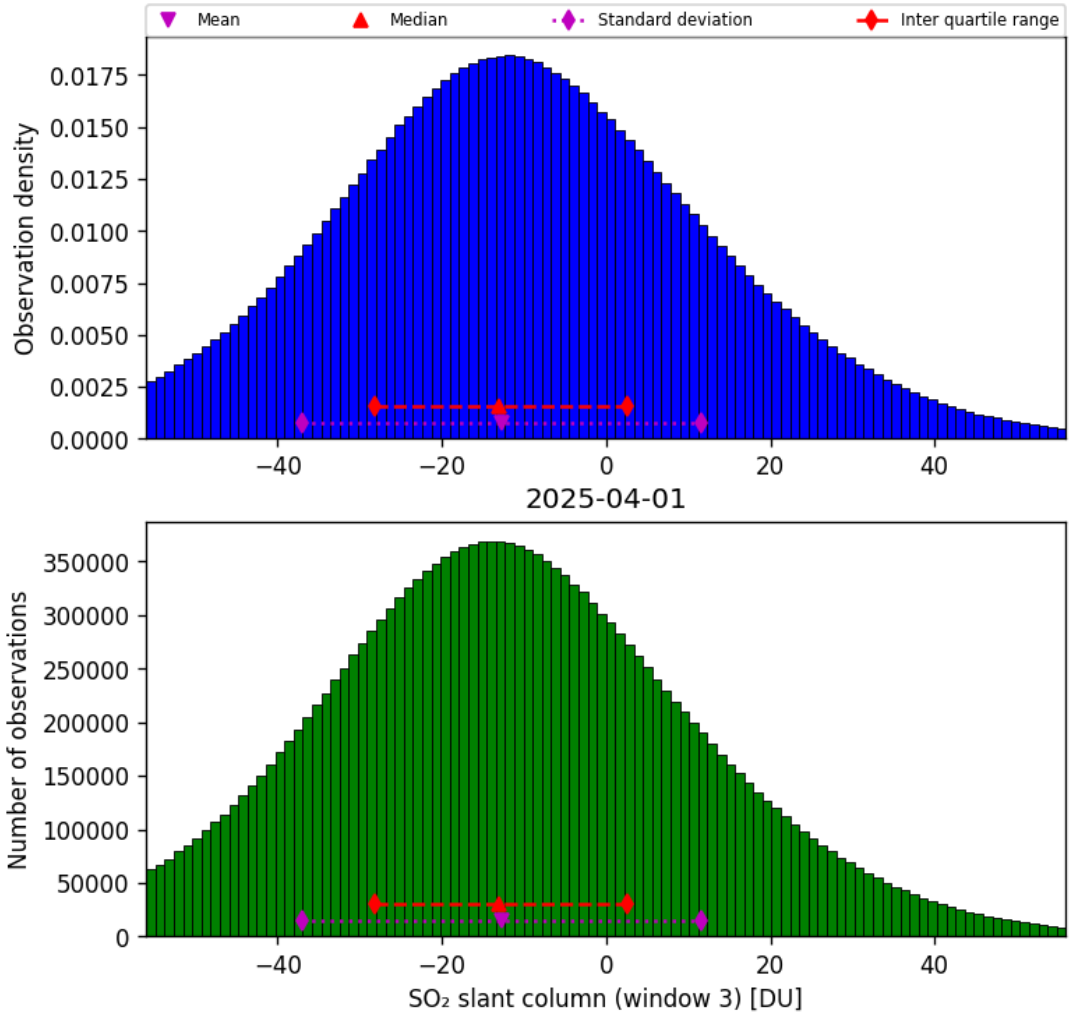

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-04-01 to 2025-04-02

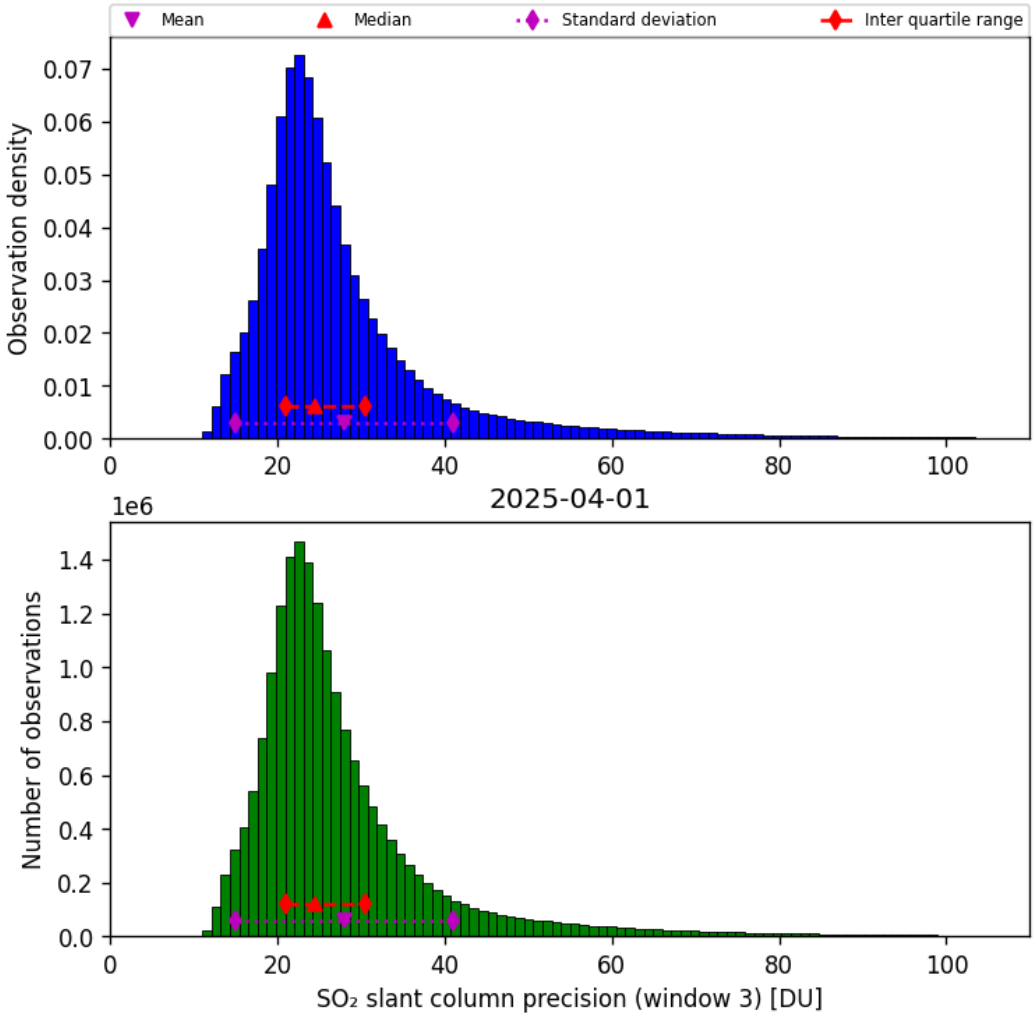

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-04-01 to 2025-04-02

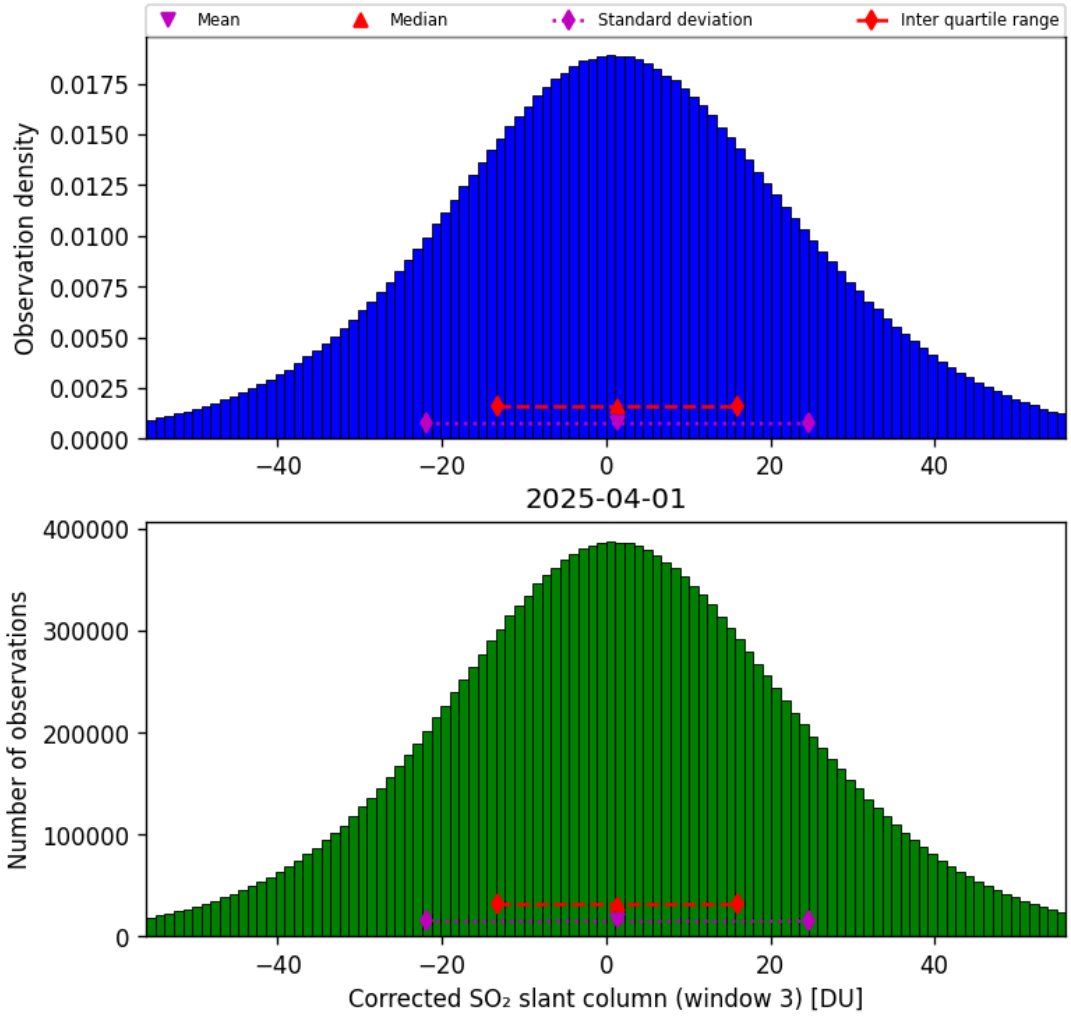

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-04-01 to 2025-04-02

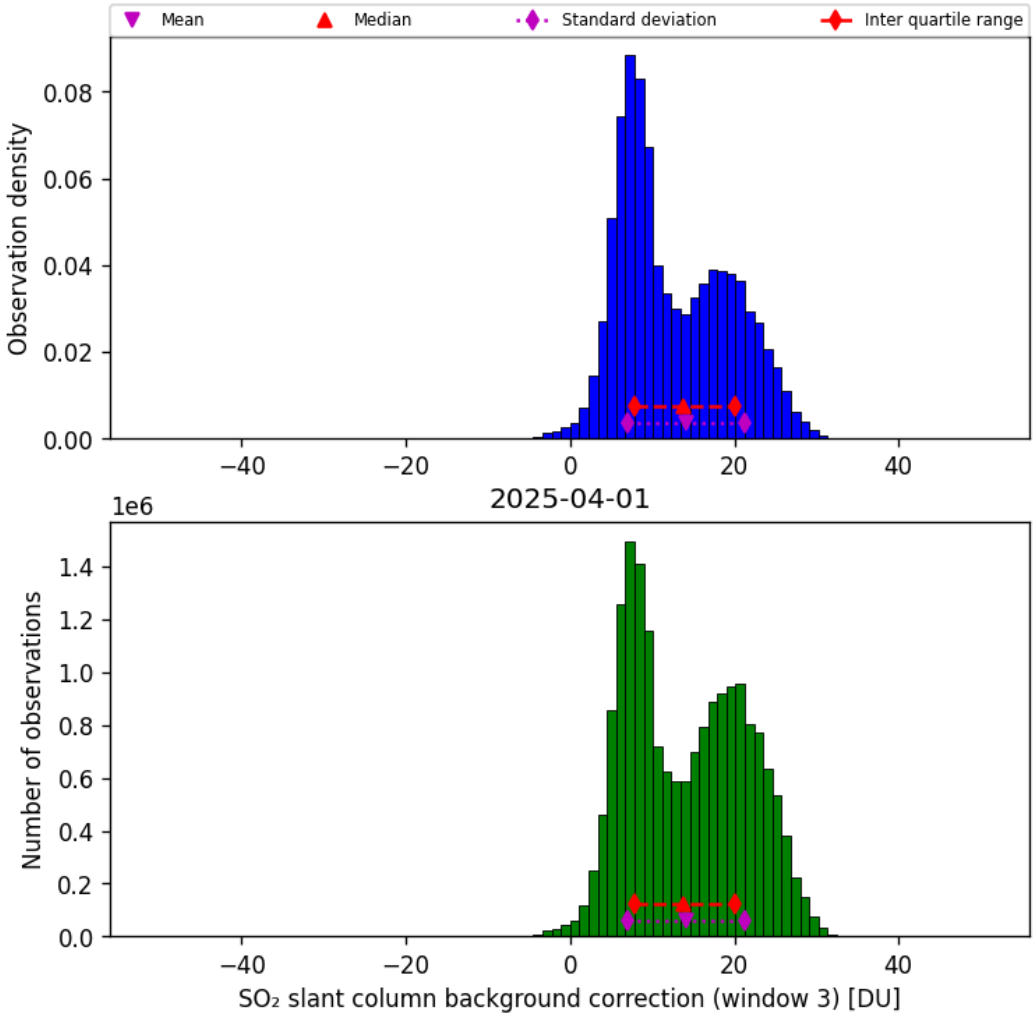

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-04-01 to 2025-04-02

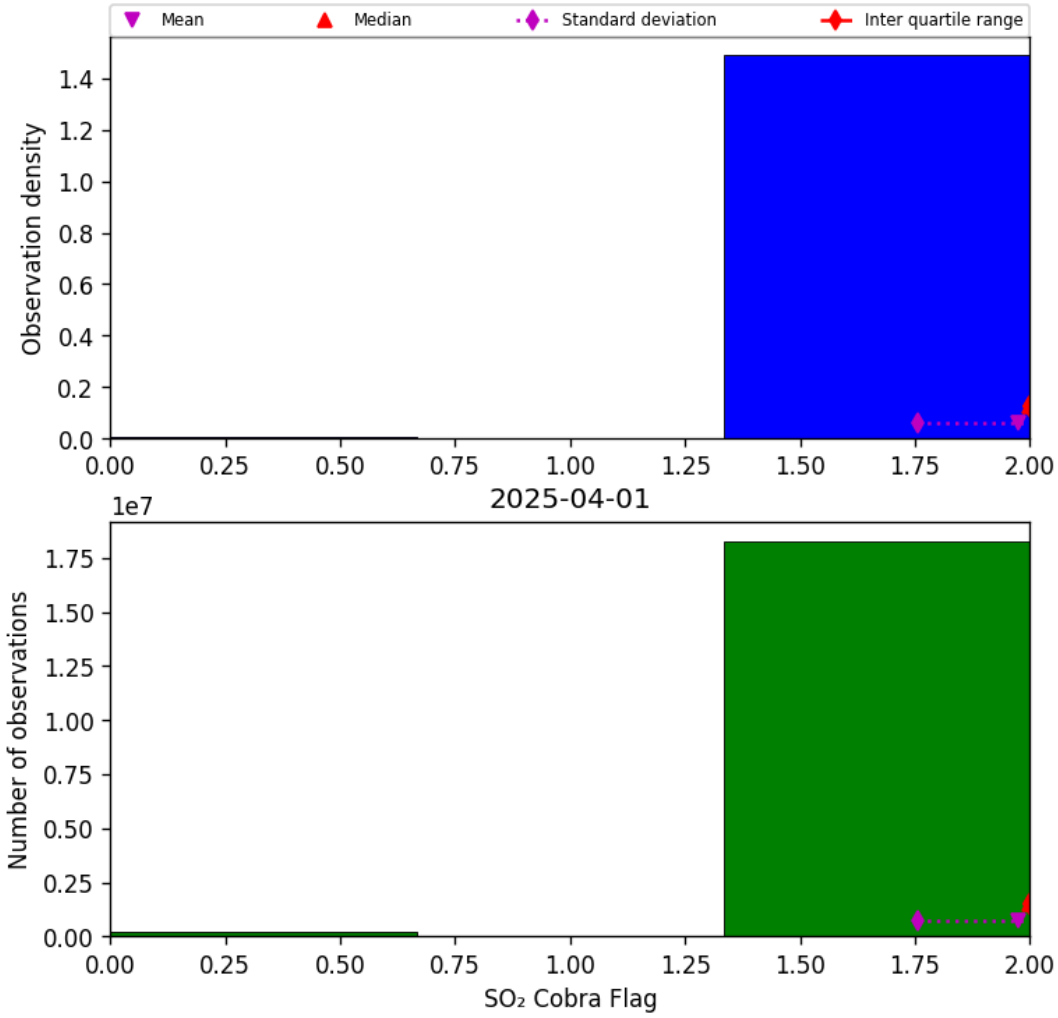

Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-04-01 to 2025-04-02

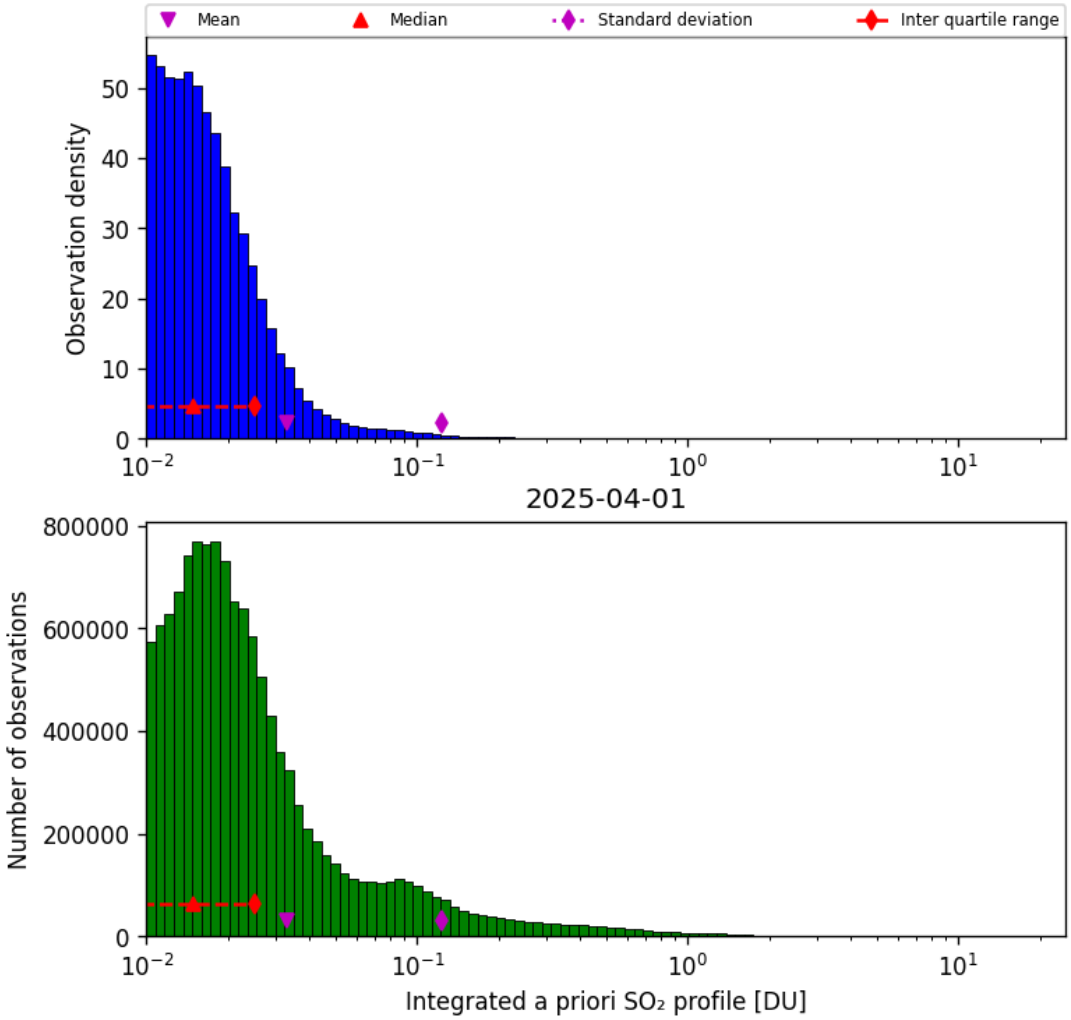

Figure 76: Histogram of “Integrated a priori SO_2 profile” for 2025-04-01 to 2025-04-02

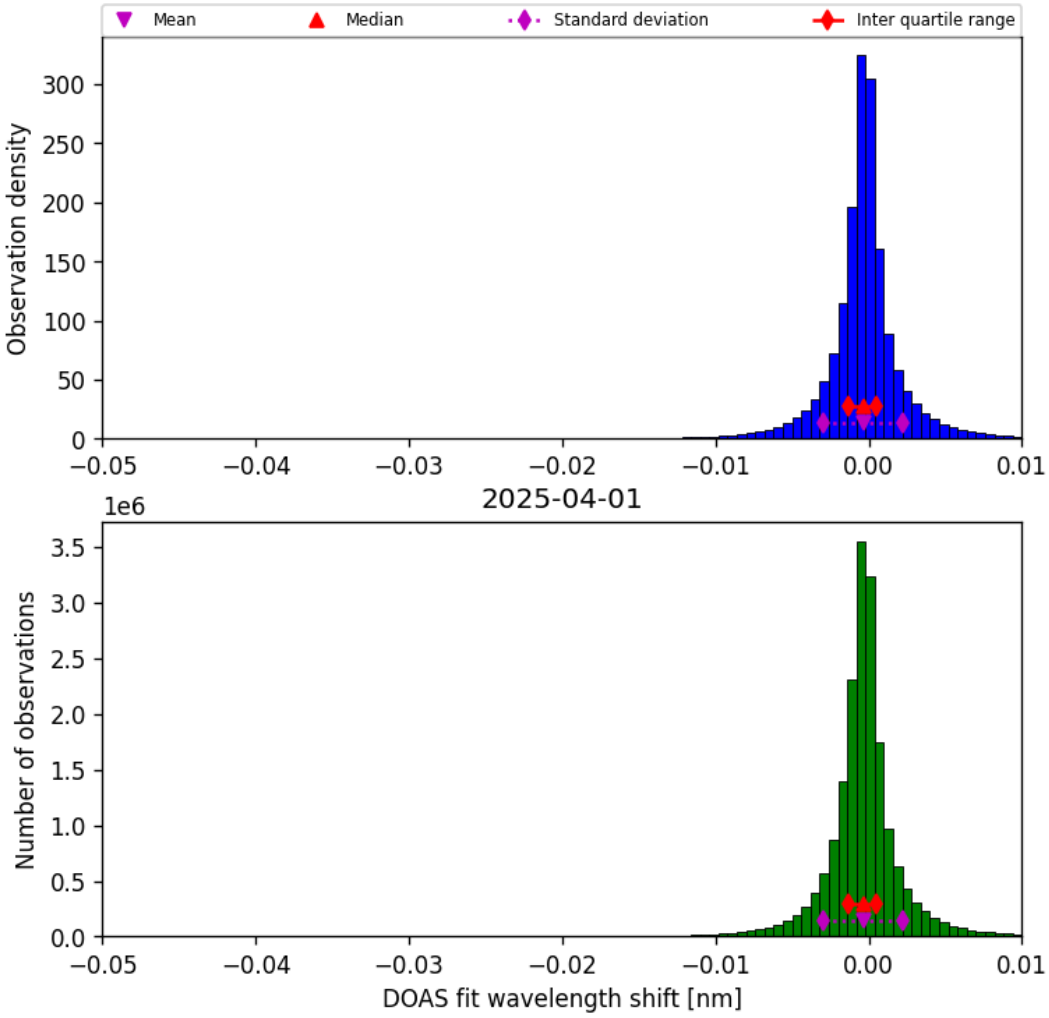

Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-04-01 to 2025-04-02

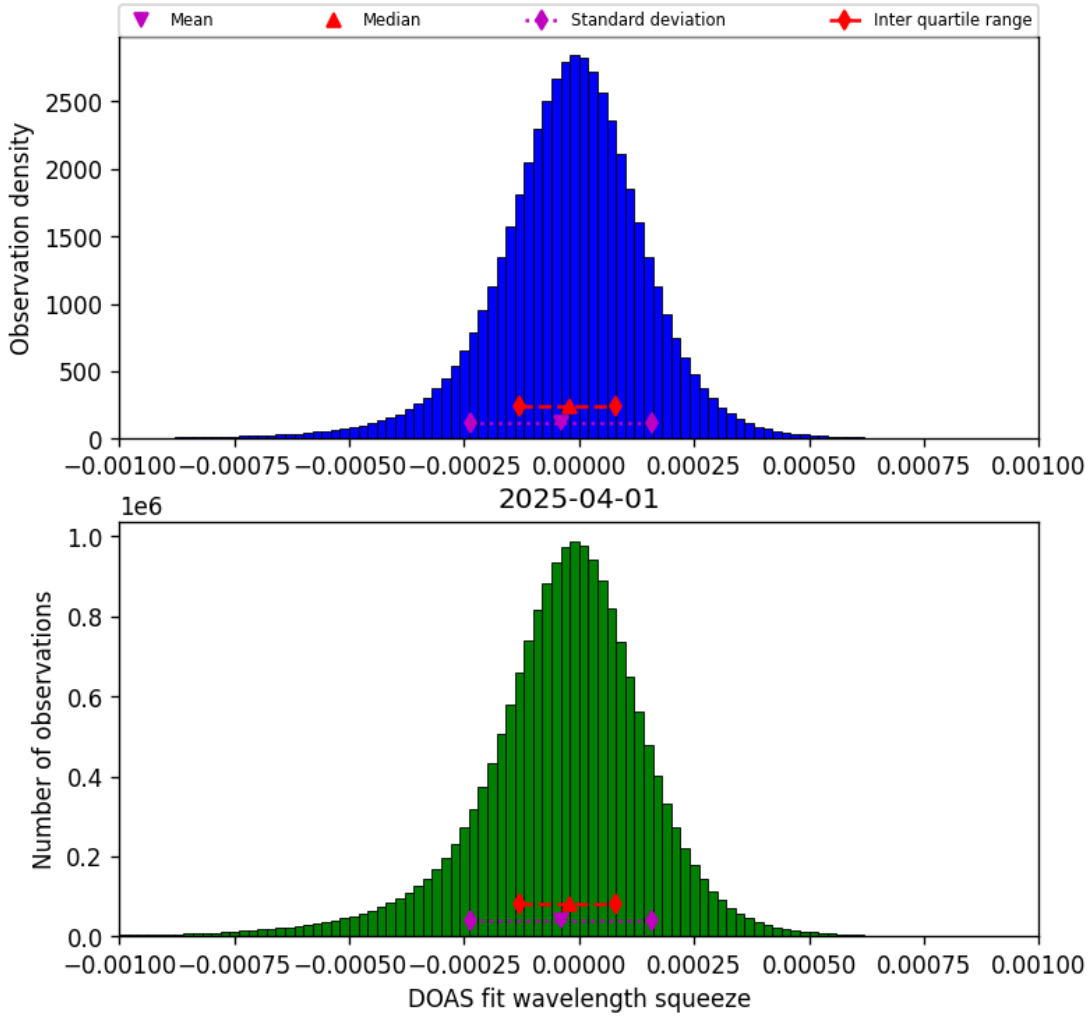

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-04-01 to 2025-04-02

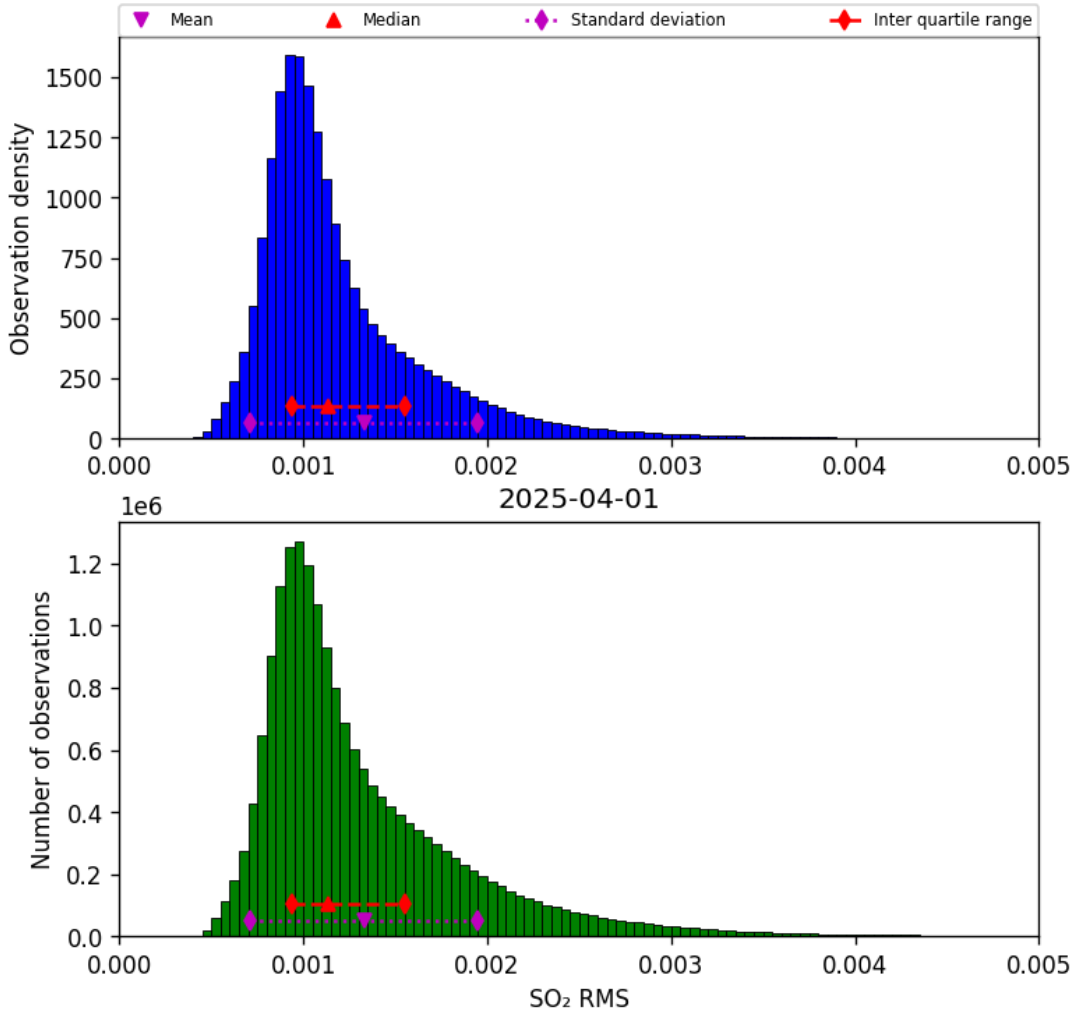

Figure 79: Histogram of "SO_2 RMS" for 2025-04-01 to 2025-04-02

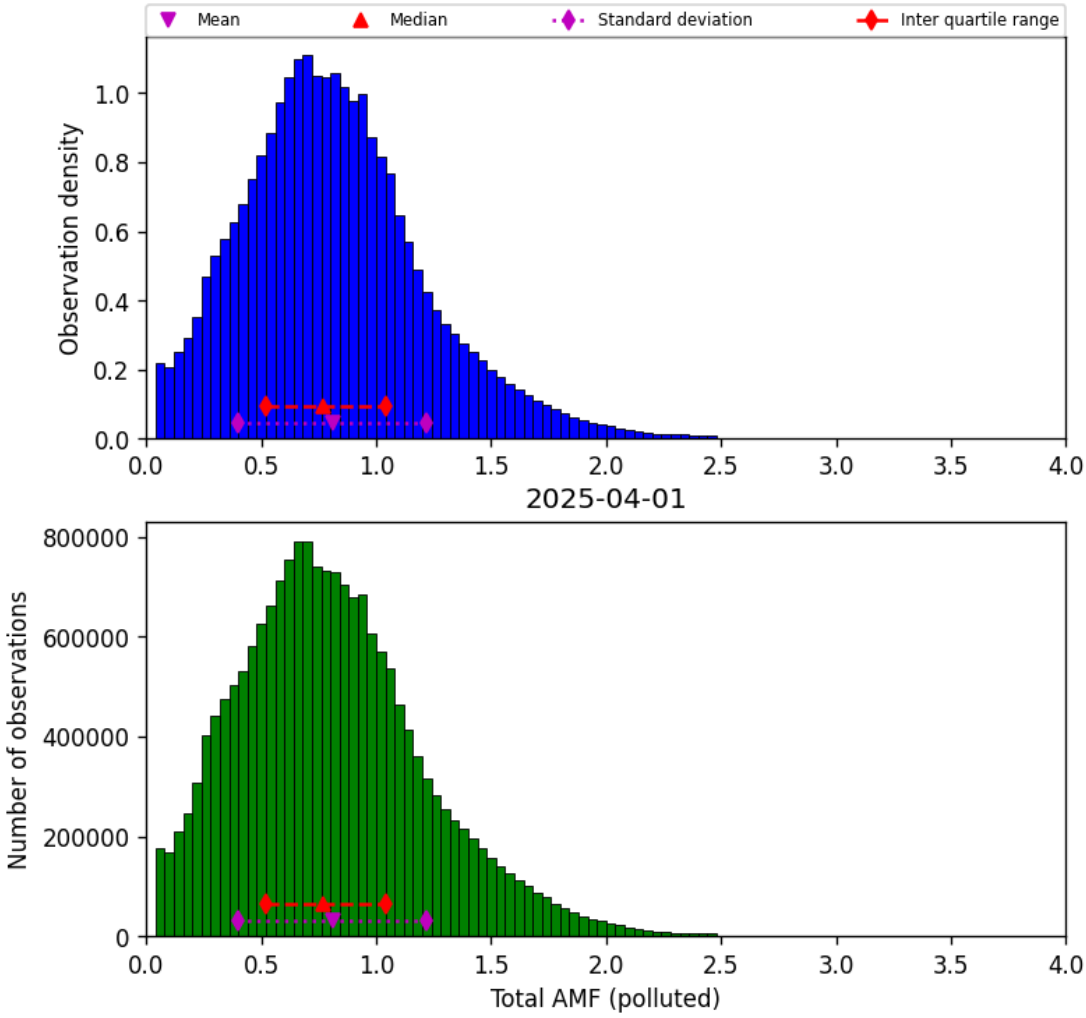

Figure 80: Histogram of “Total AMF (polluted)” for 2025-04-01 to 2025-04-02

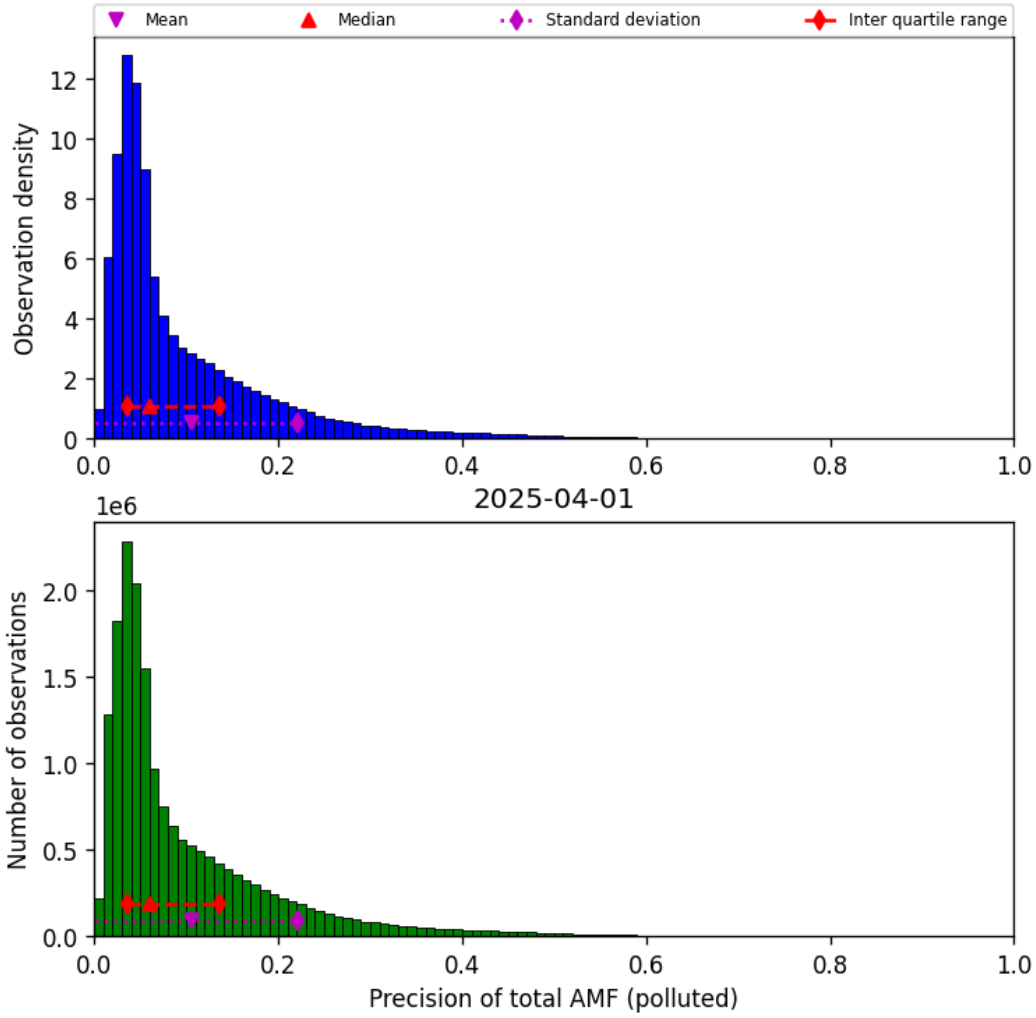

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-04-01 to 2025-04-02

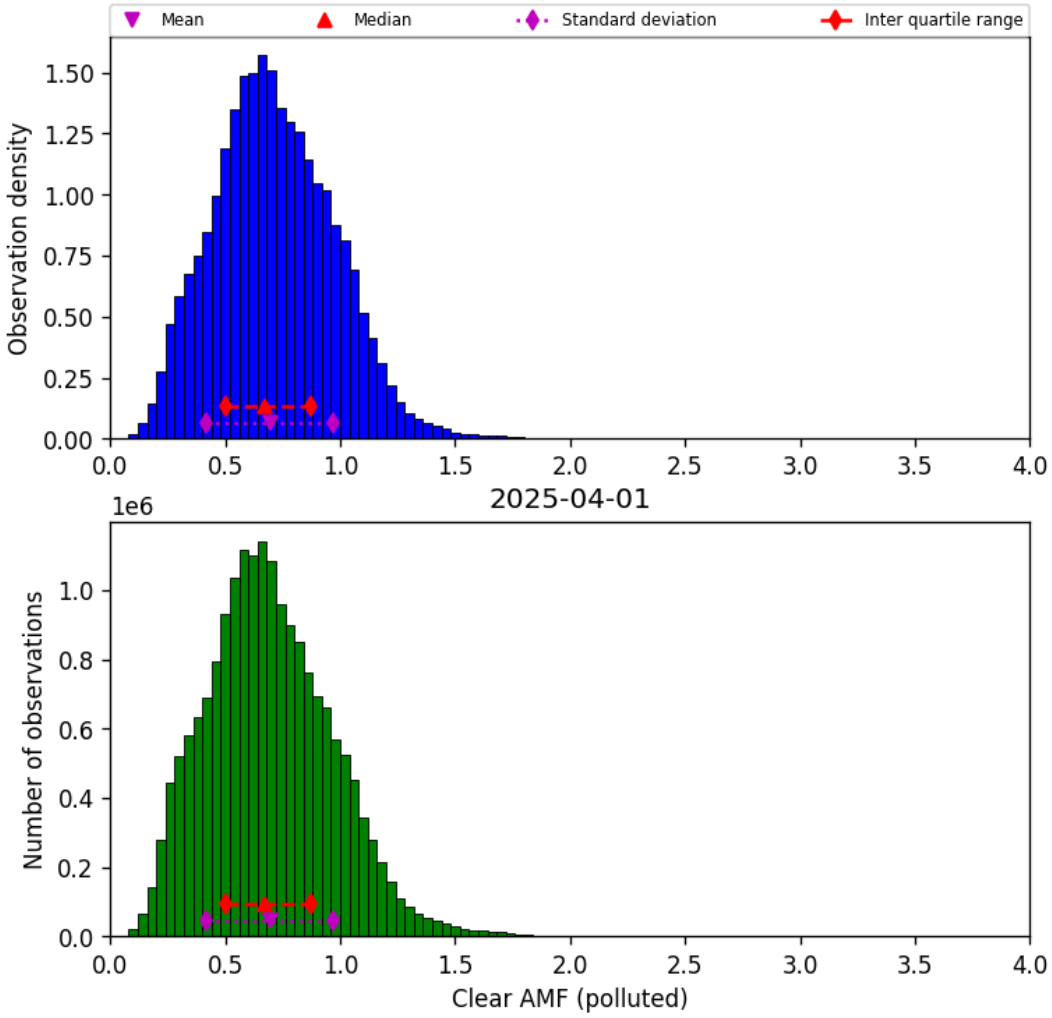

Figure 82: Histogram of “Clear AMF (polluted)” for 2025-04-01 to 2025-04-02

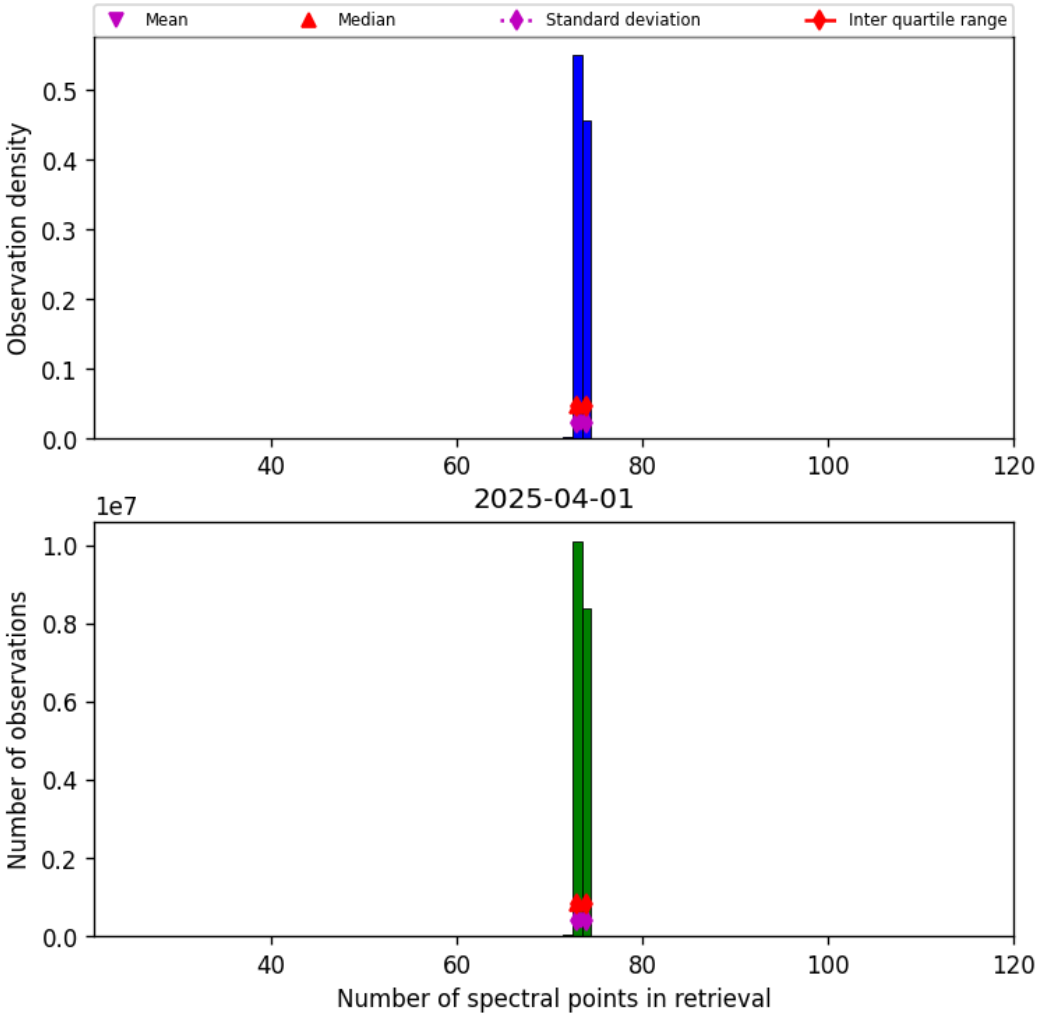

Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-04-01 to 2025-04-02

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.

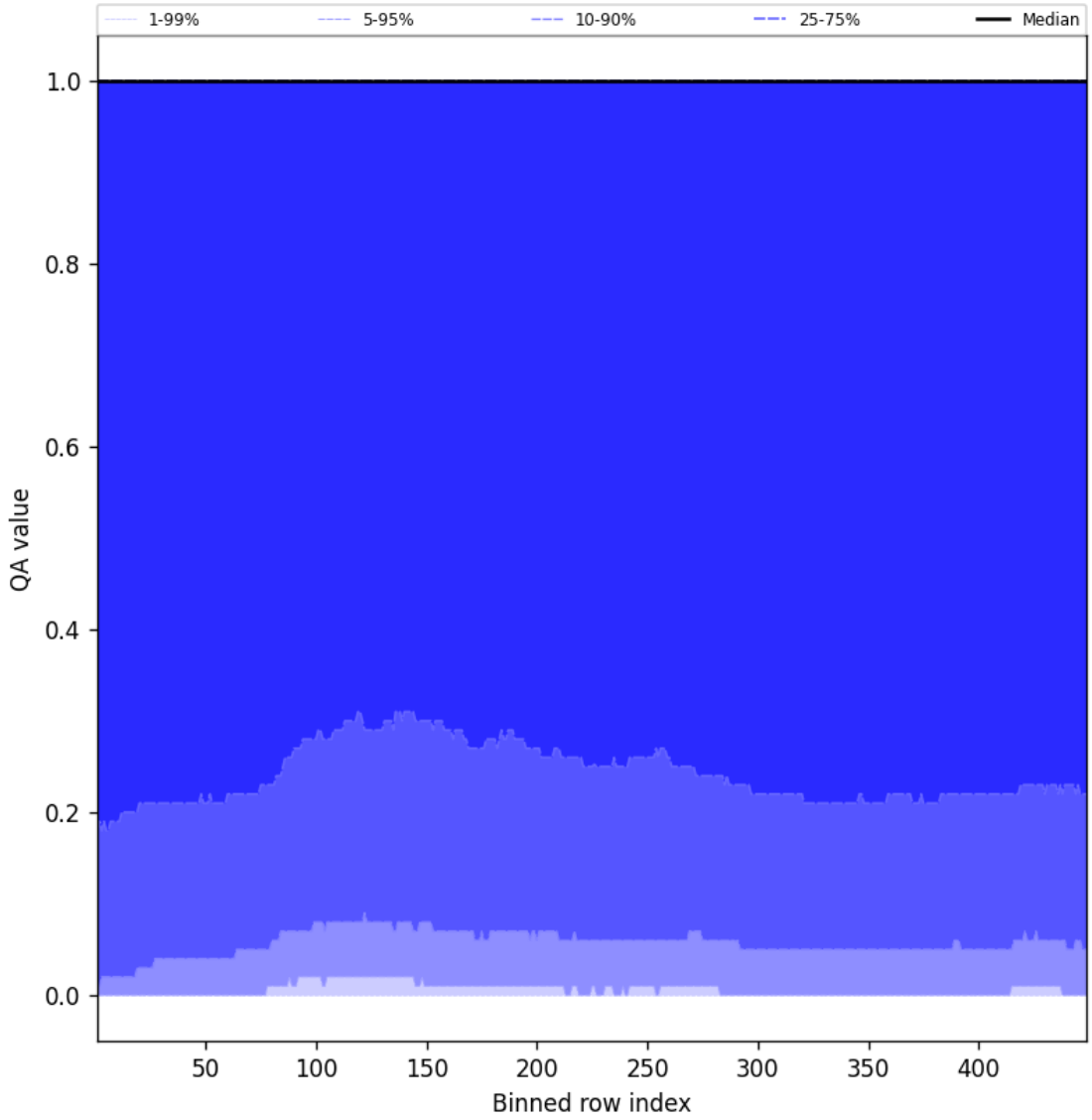

Figure 84: Along track statistics of “QA value” for 2025-04-01 to 2025-04-02

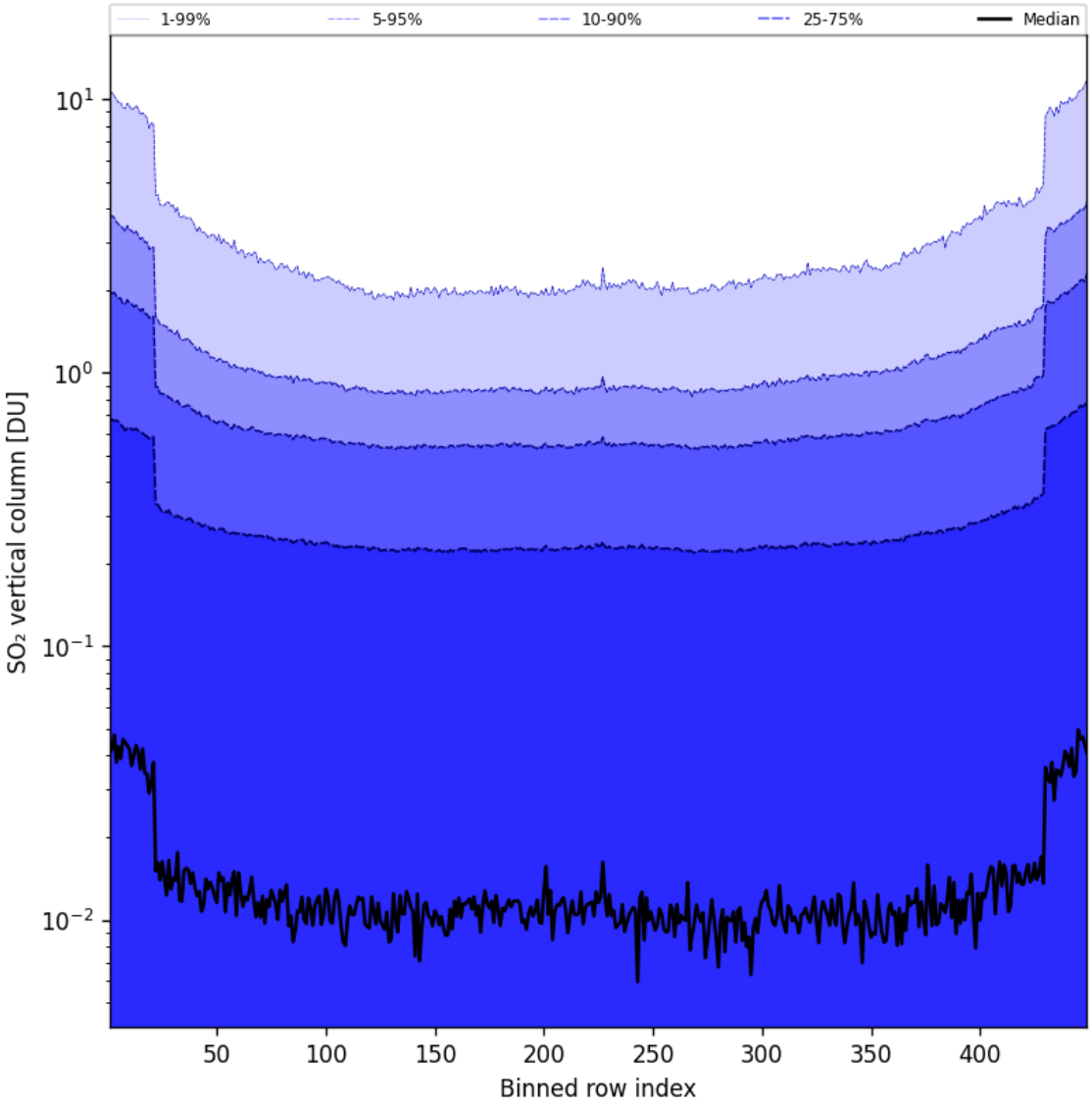

Figure 85: Along track statistics of "SO_2 vertical column" for 2025-04-01 to 2025-04-02

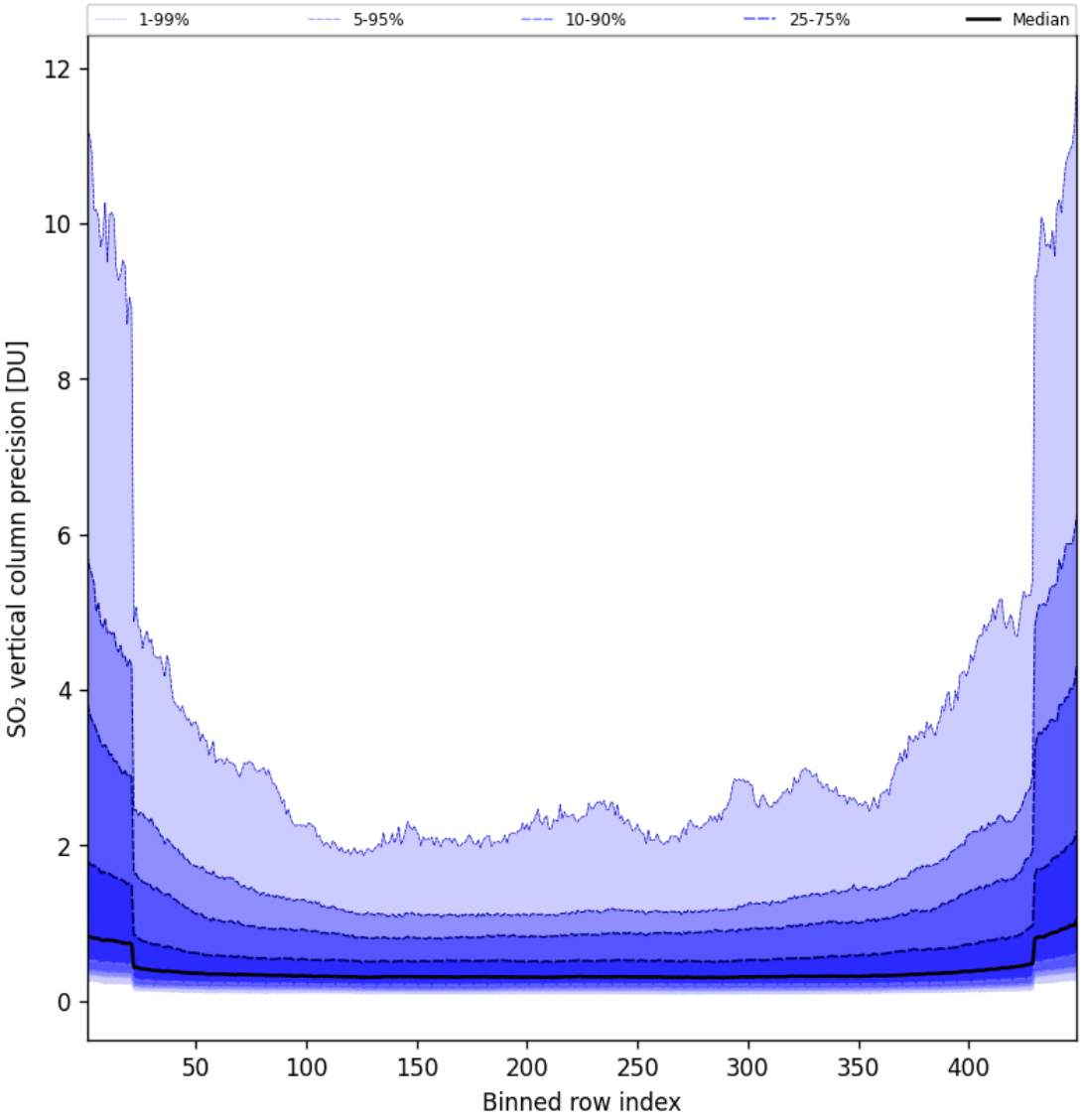

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-04-01 to 2025-04-02

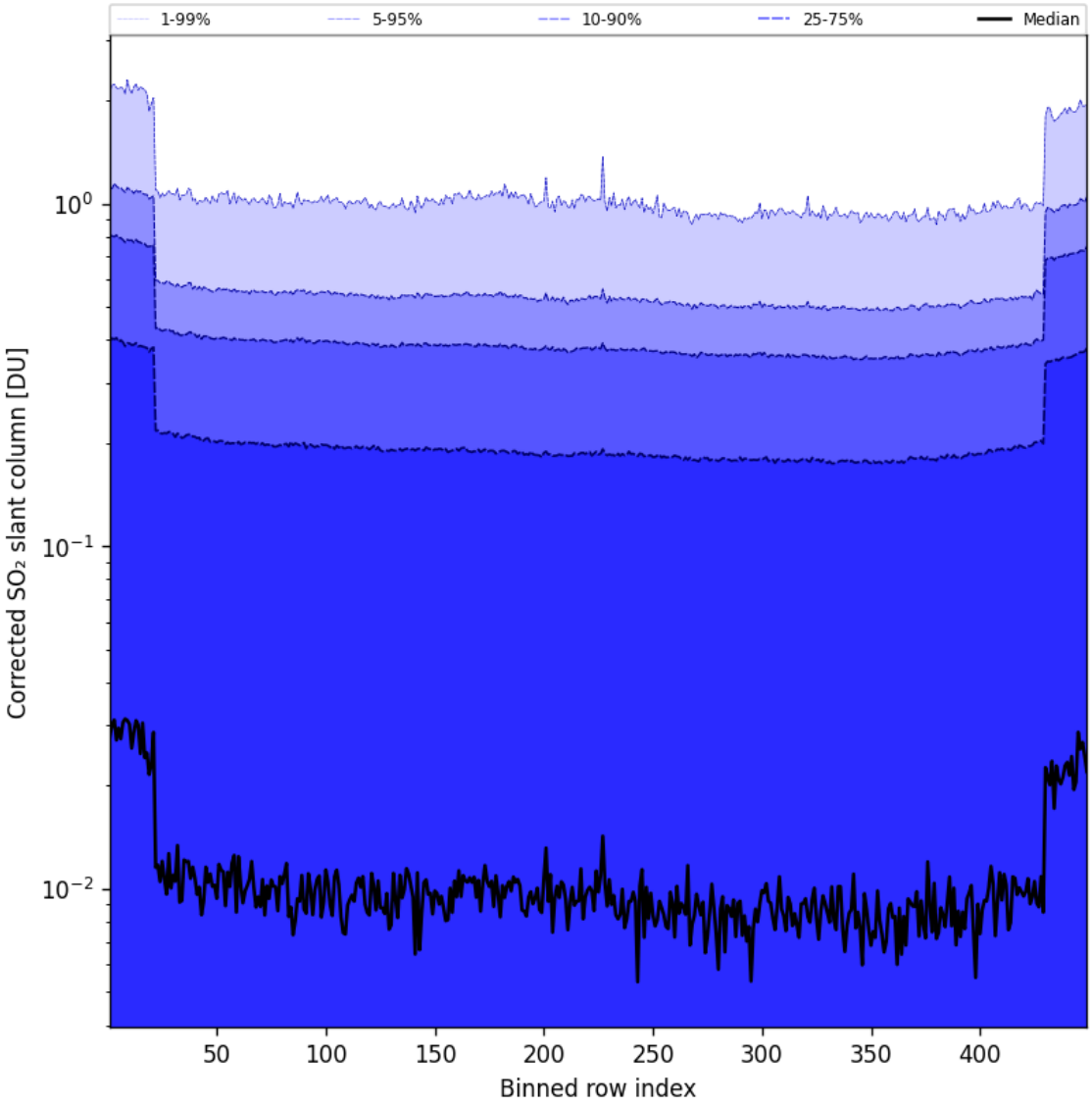

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-04-01 to 2025-04-02

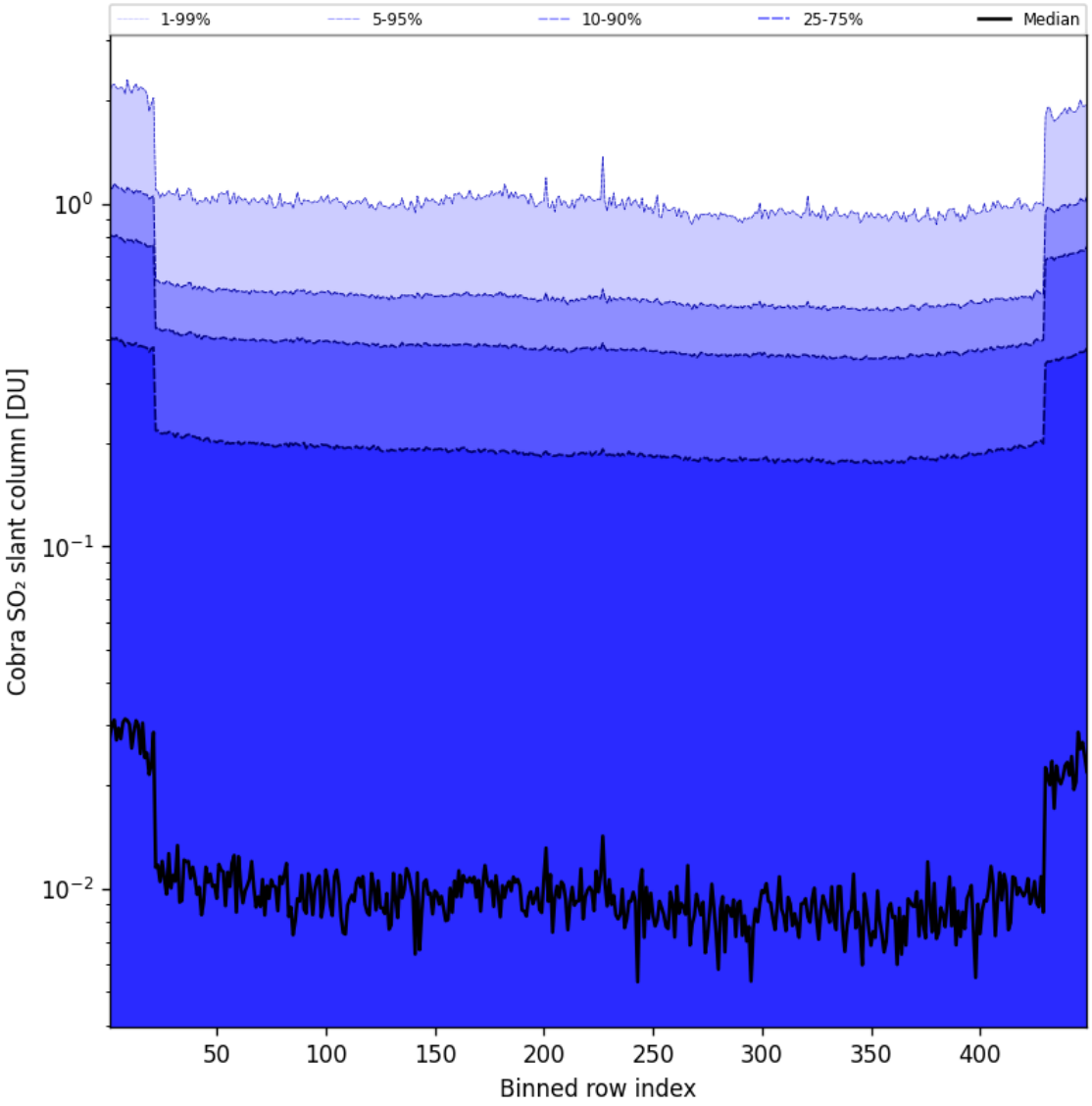

Figure 88: Along track statistics of "Cobra SO_2 slant column" for 2025-04-01 to 2025-04-02

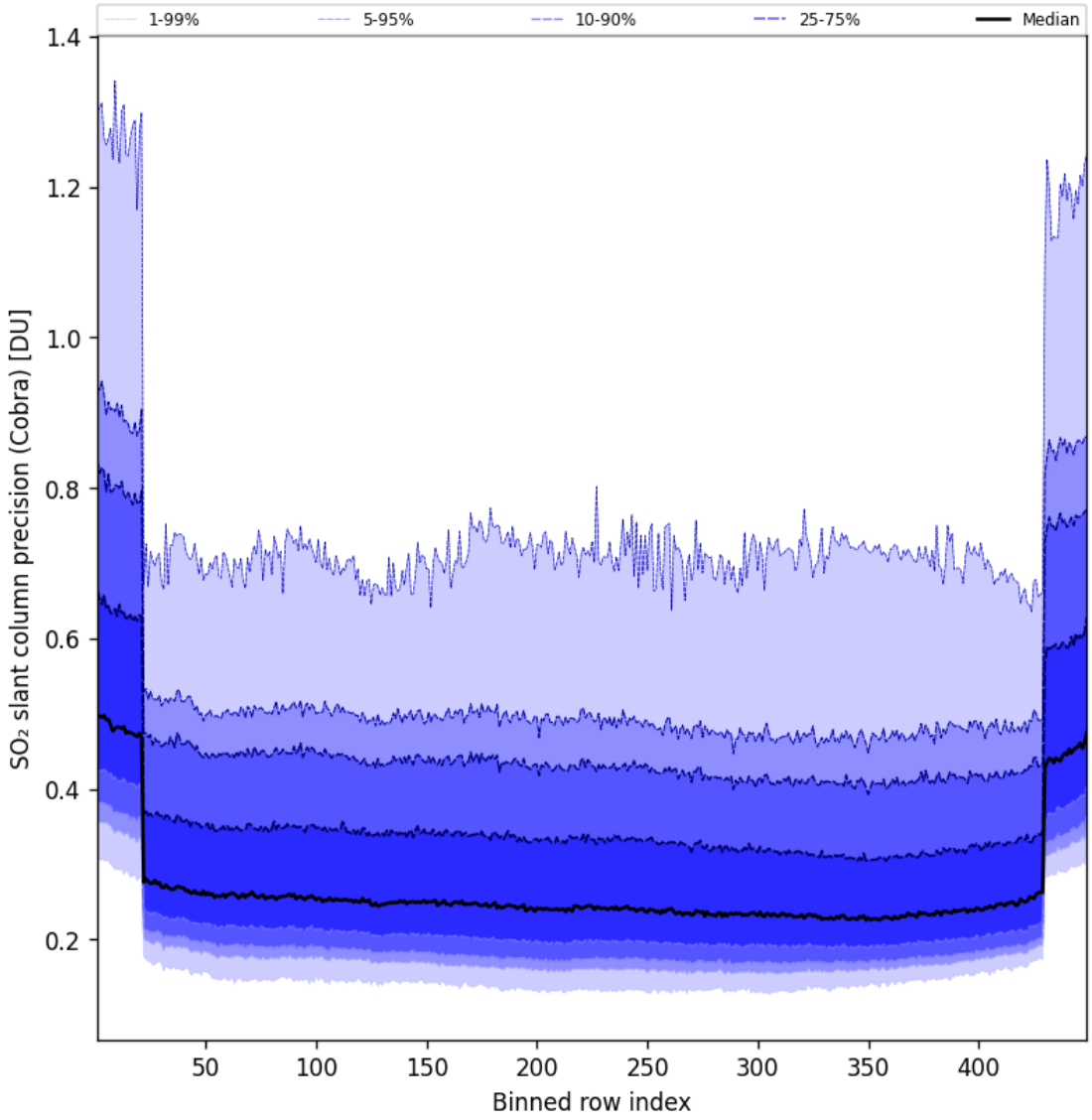

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-04-01 to 2025-04-02

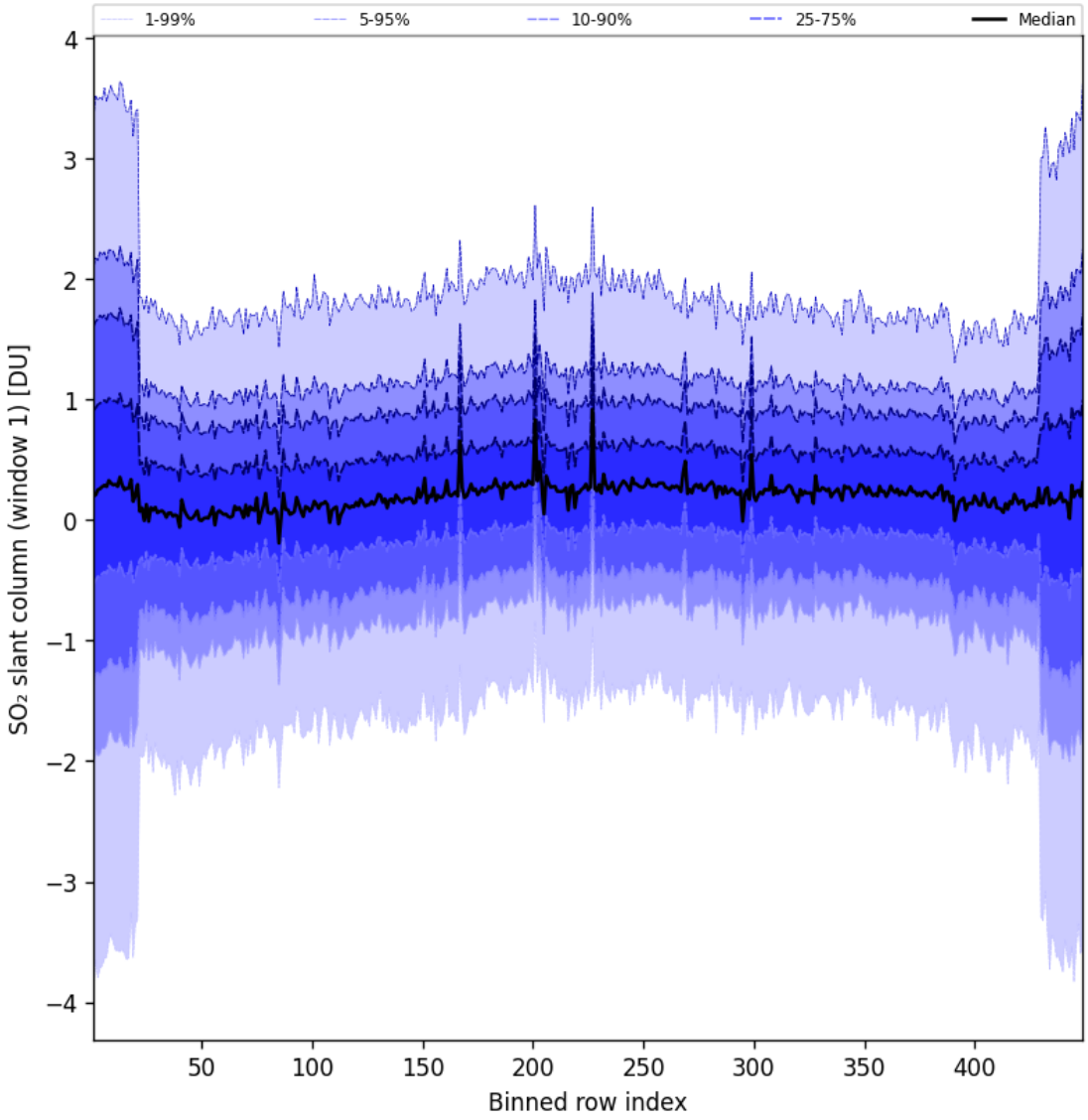

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-04-01 to 2025-04-02

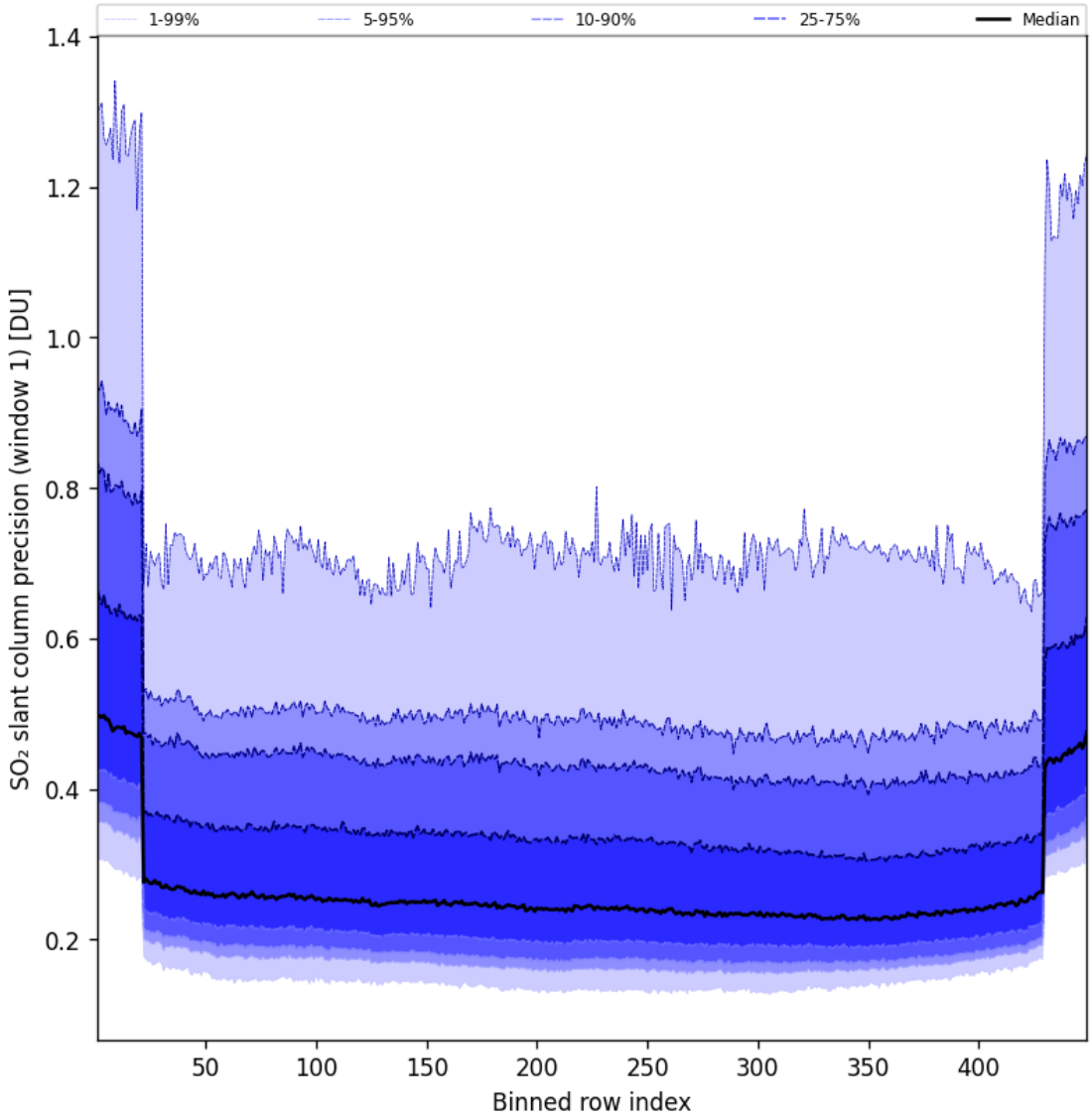

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-04-01 to 2025-04-02

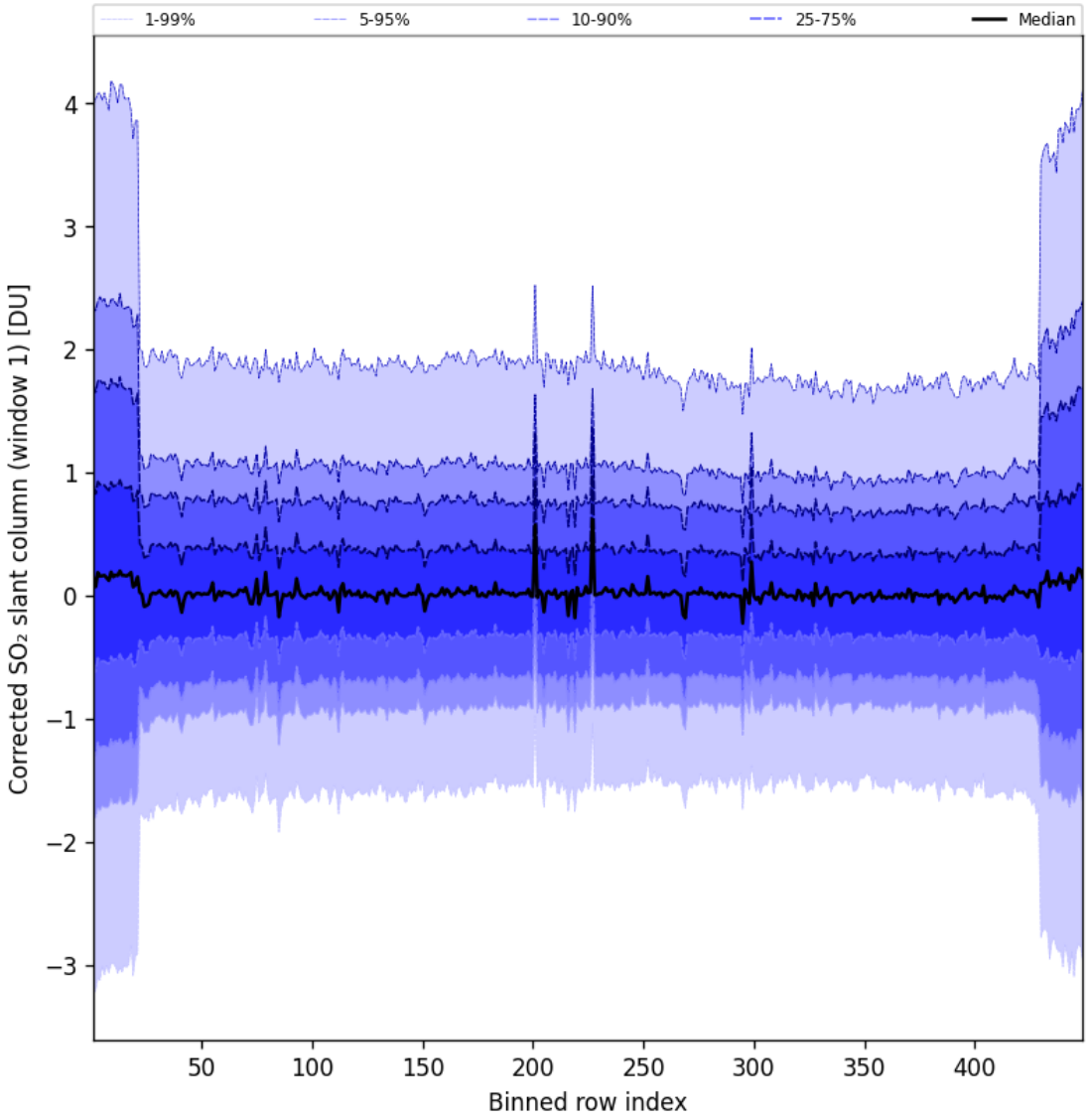

Figure 92: Along track statistics of "Corrected SO_2 slant column (window 1)" for 2025-04-01 to 2025-04-02

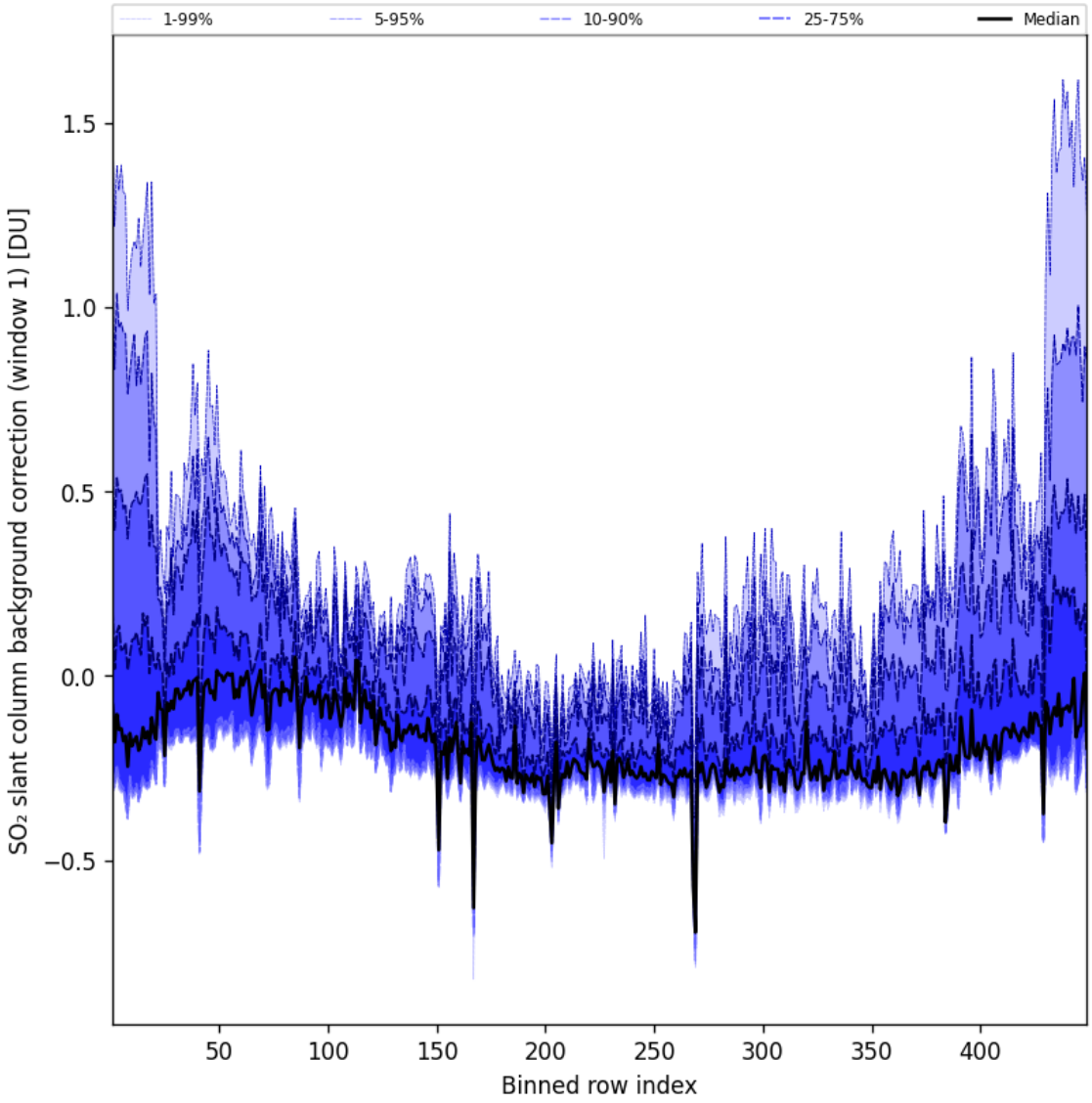

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-04-01 to 2025-04-02

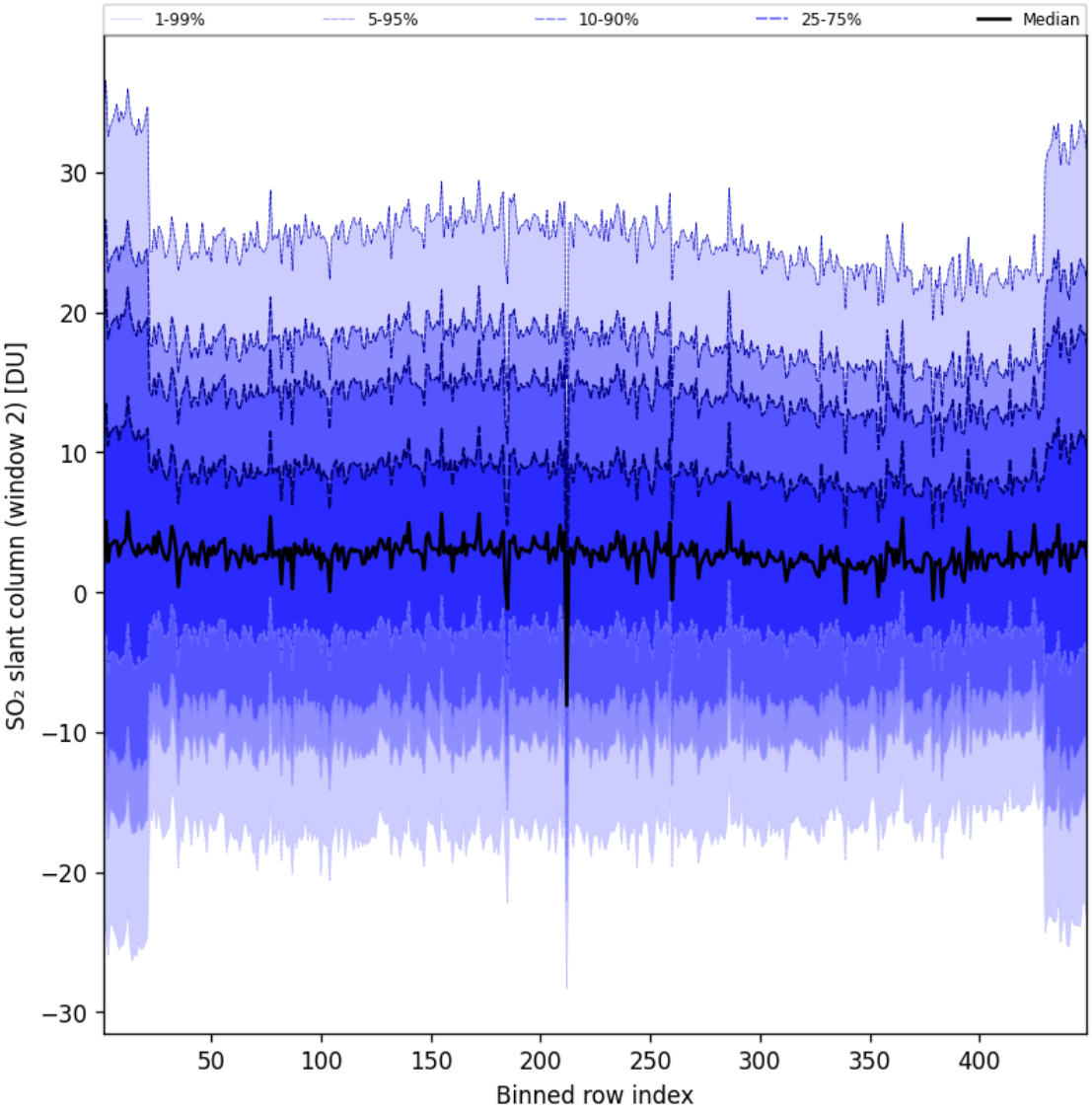

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-04-01 to 2025-04-02

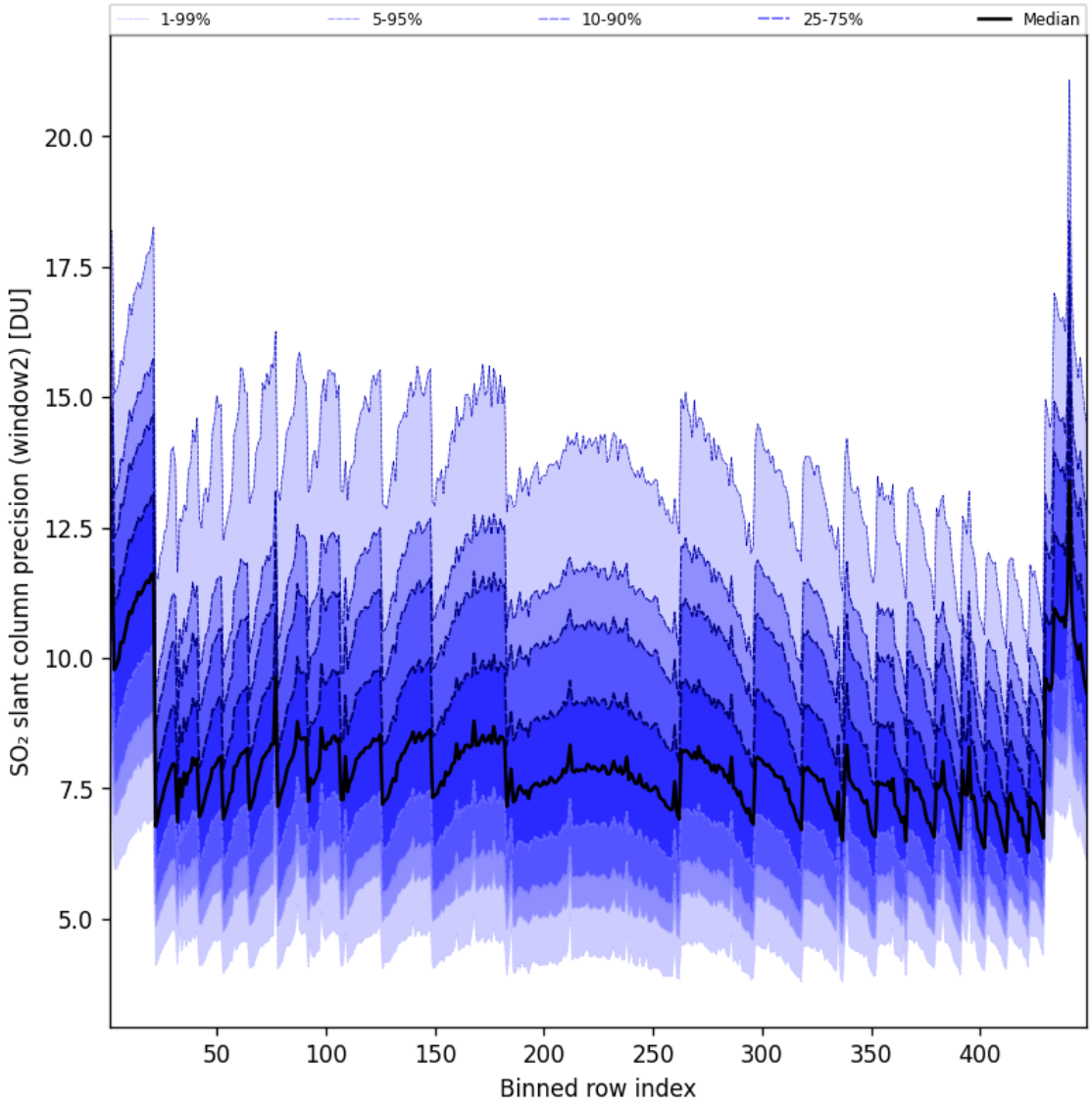

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-04-01 to 2025-04-02

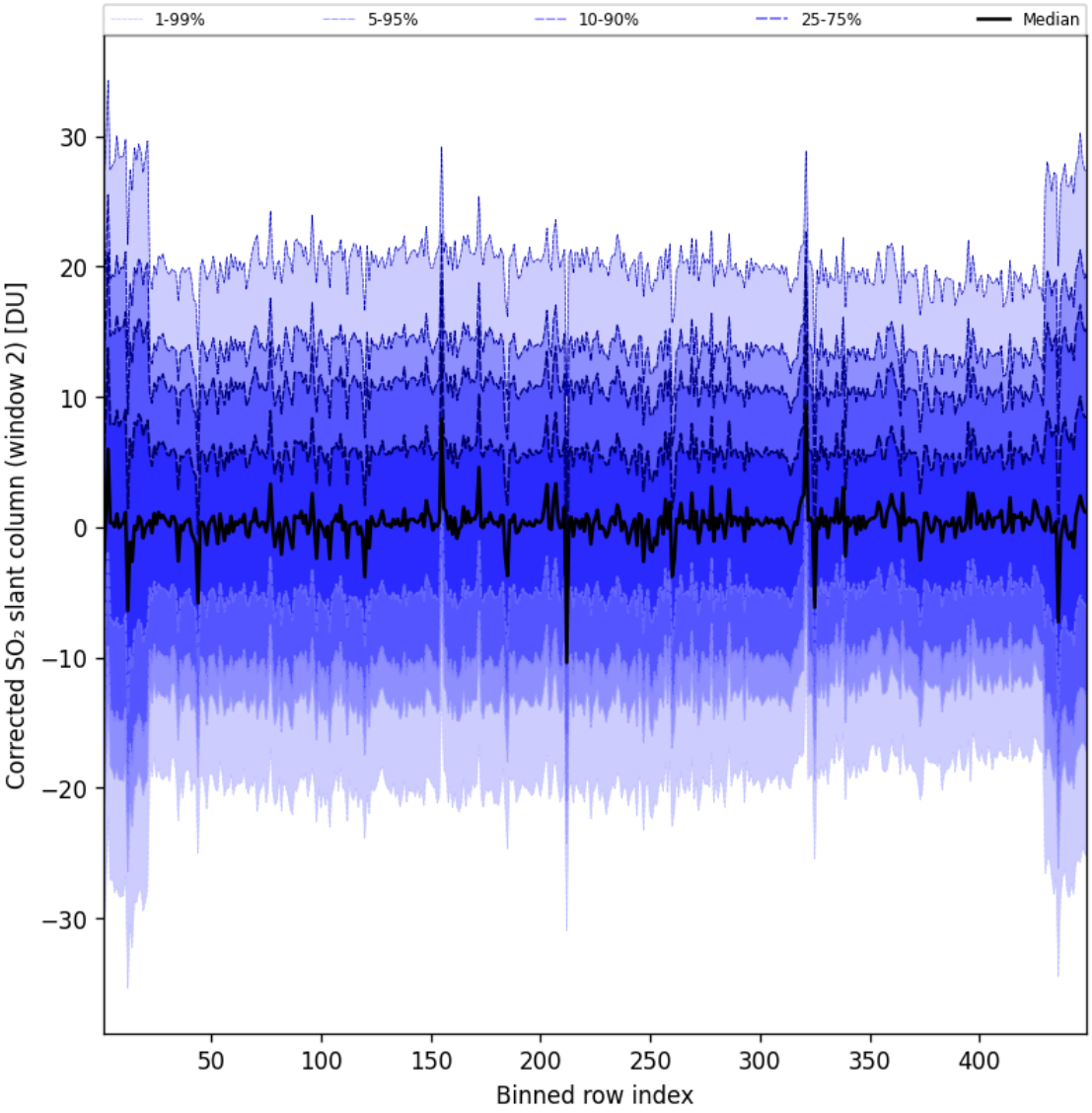

Figure 96: Along track statistics of “Corrected SO_2 slant column (window 2)” for 2025-04-01 to 2025-04-02

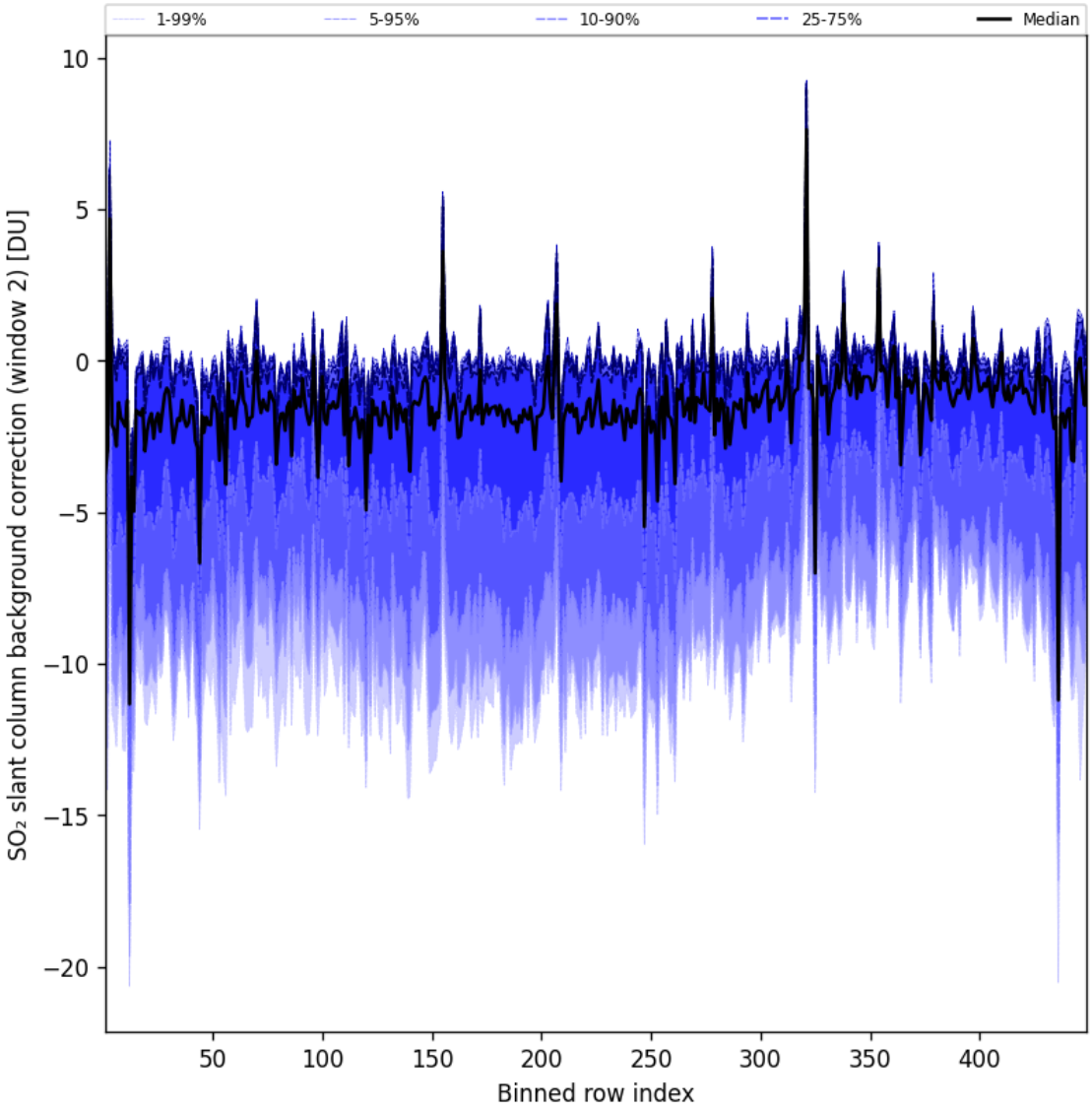

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-04-01 to 2025-04-02

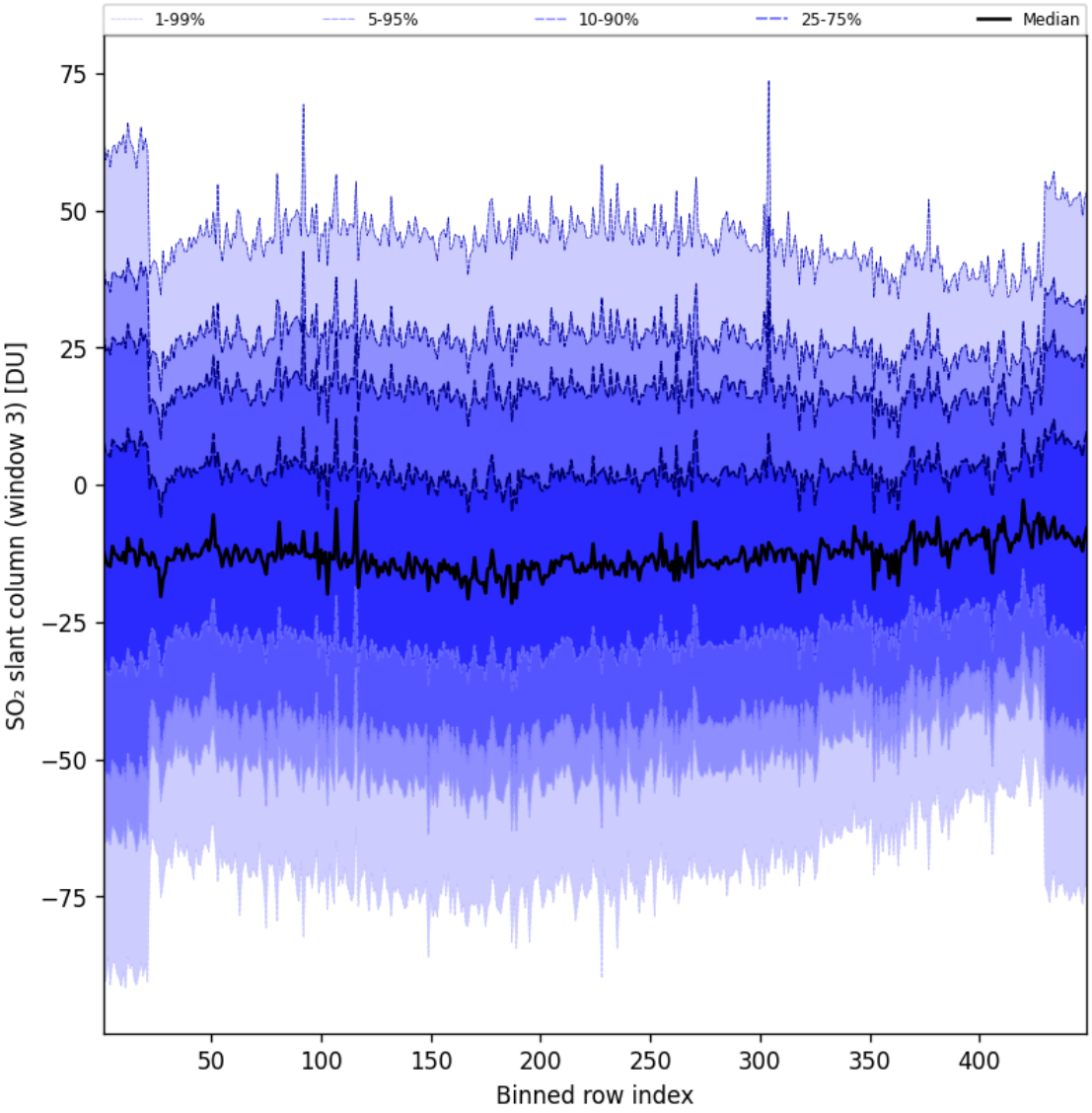

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-04-01 to 2025-04-02

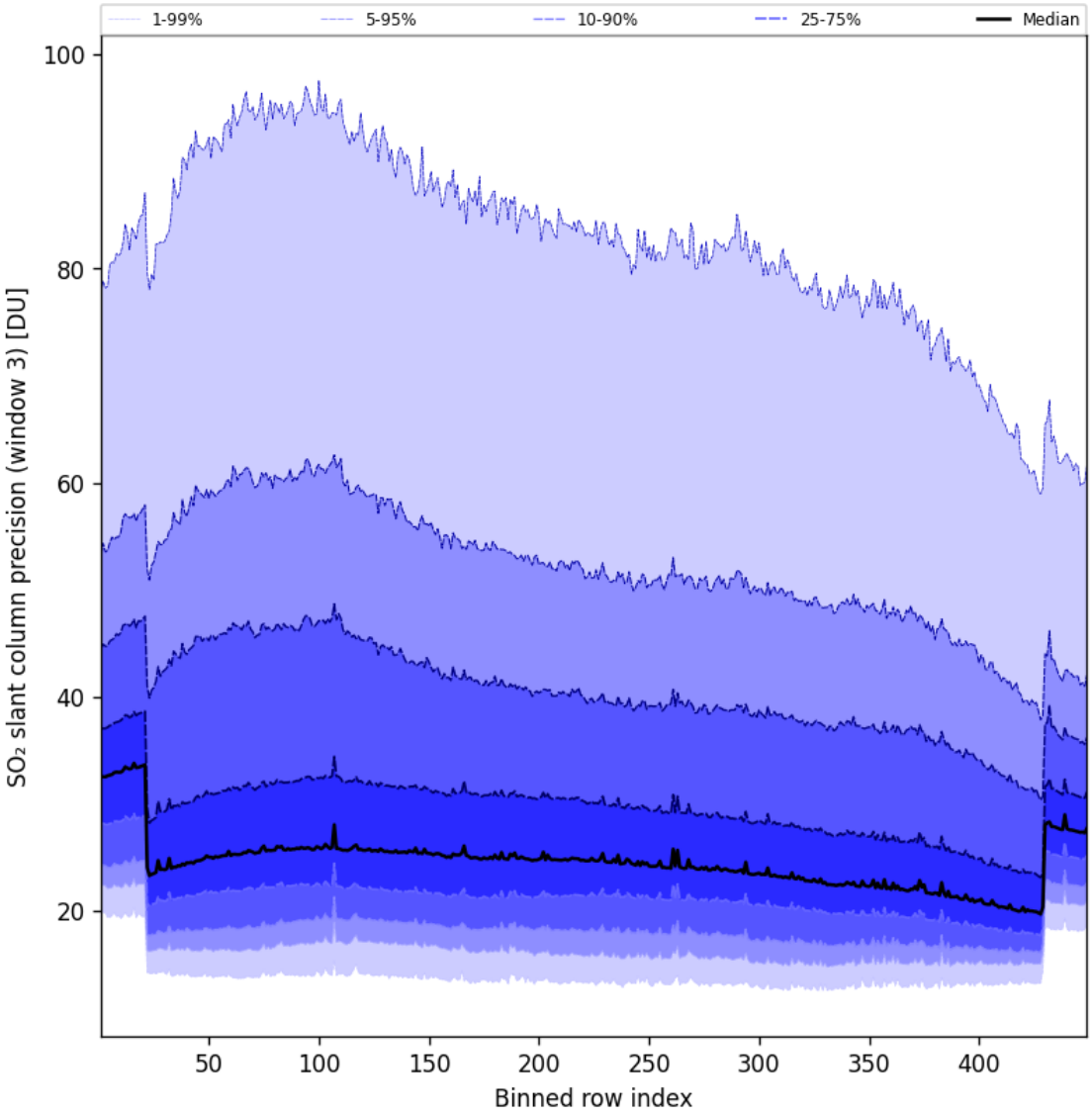

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-04-01 to 2025-04-02

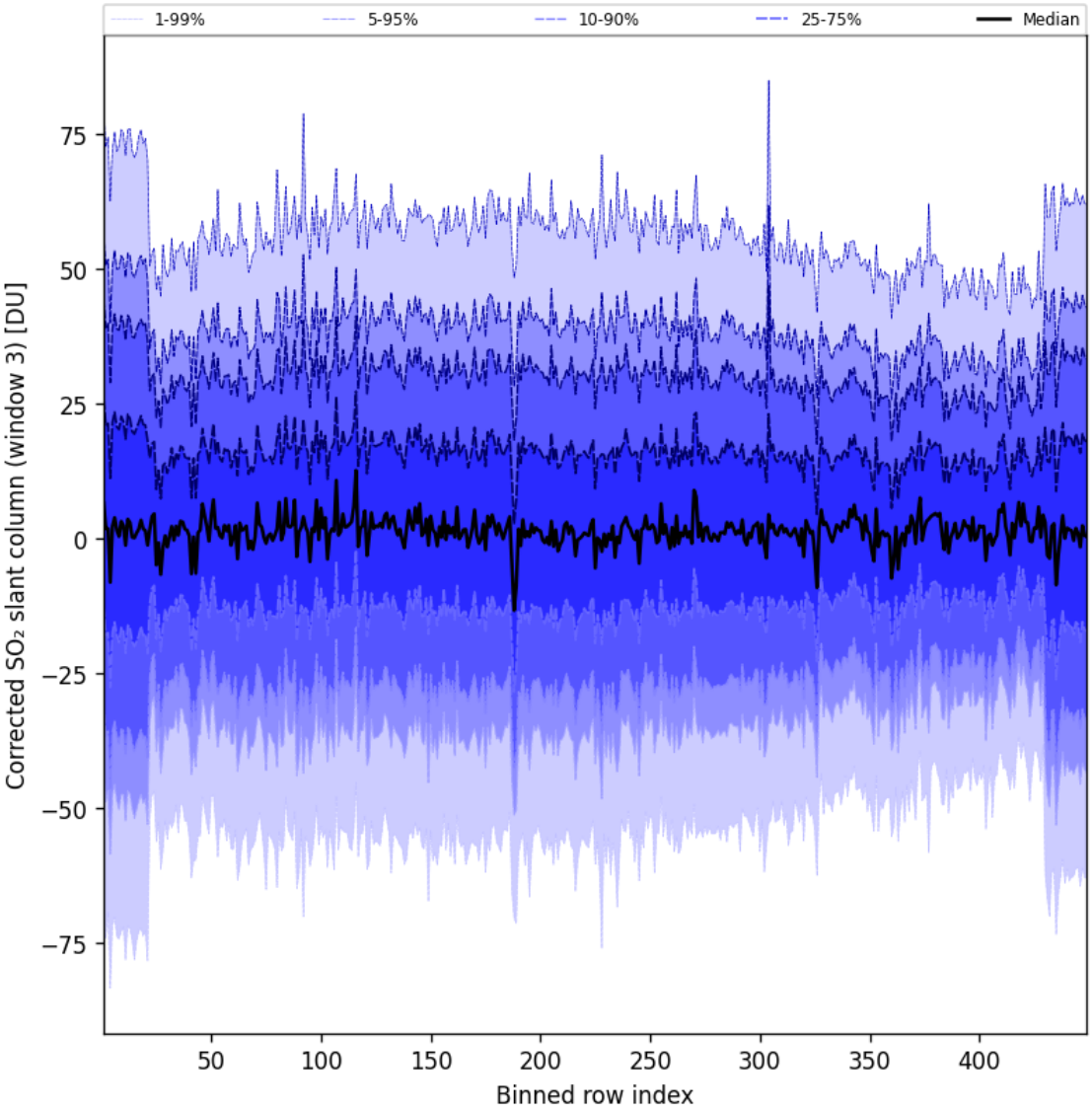

Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-04-01 to 2025-04-02

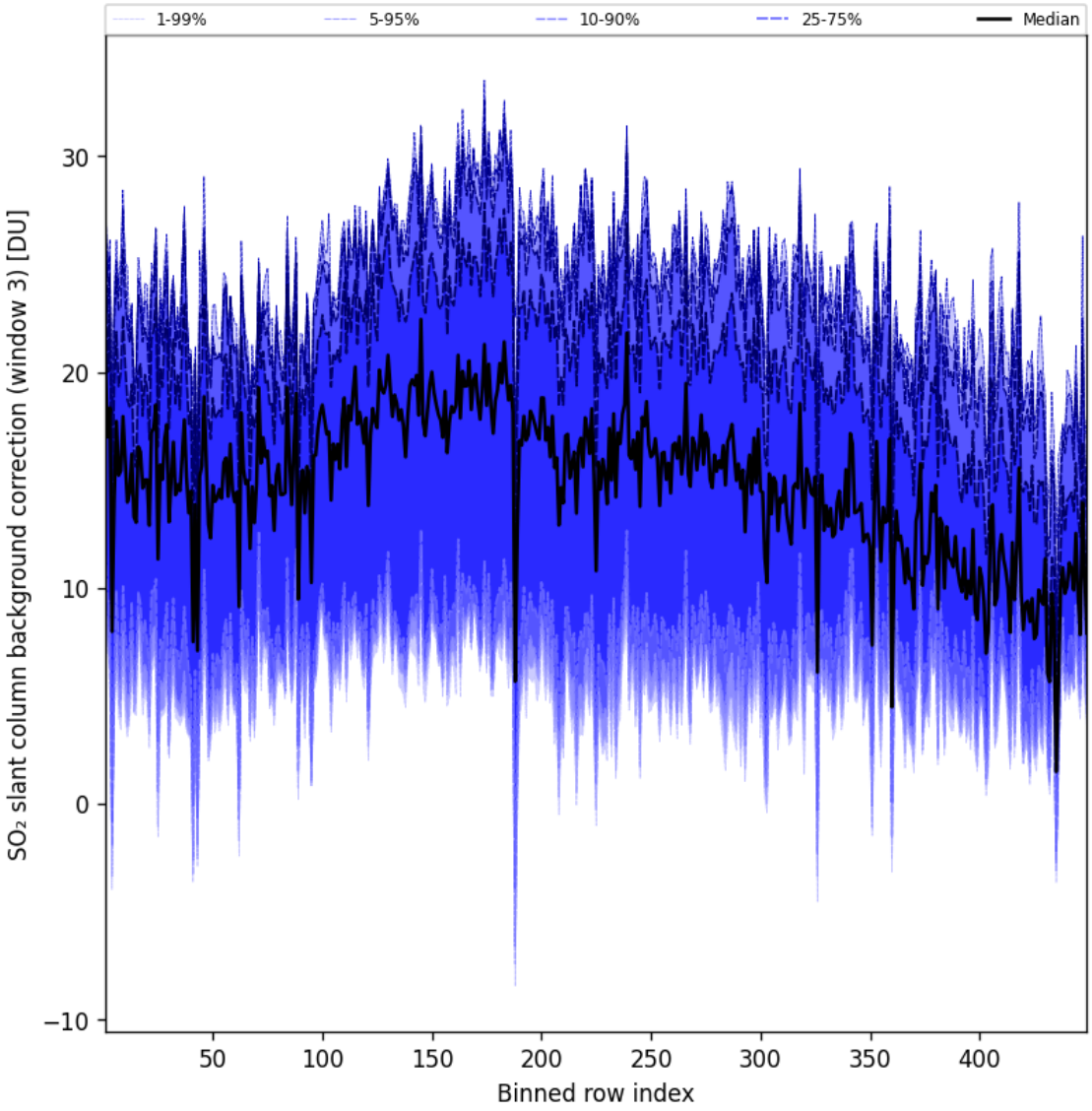

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-04-01 to 2025-04-02

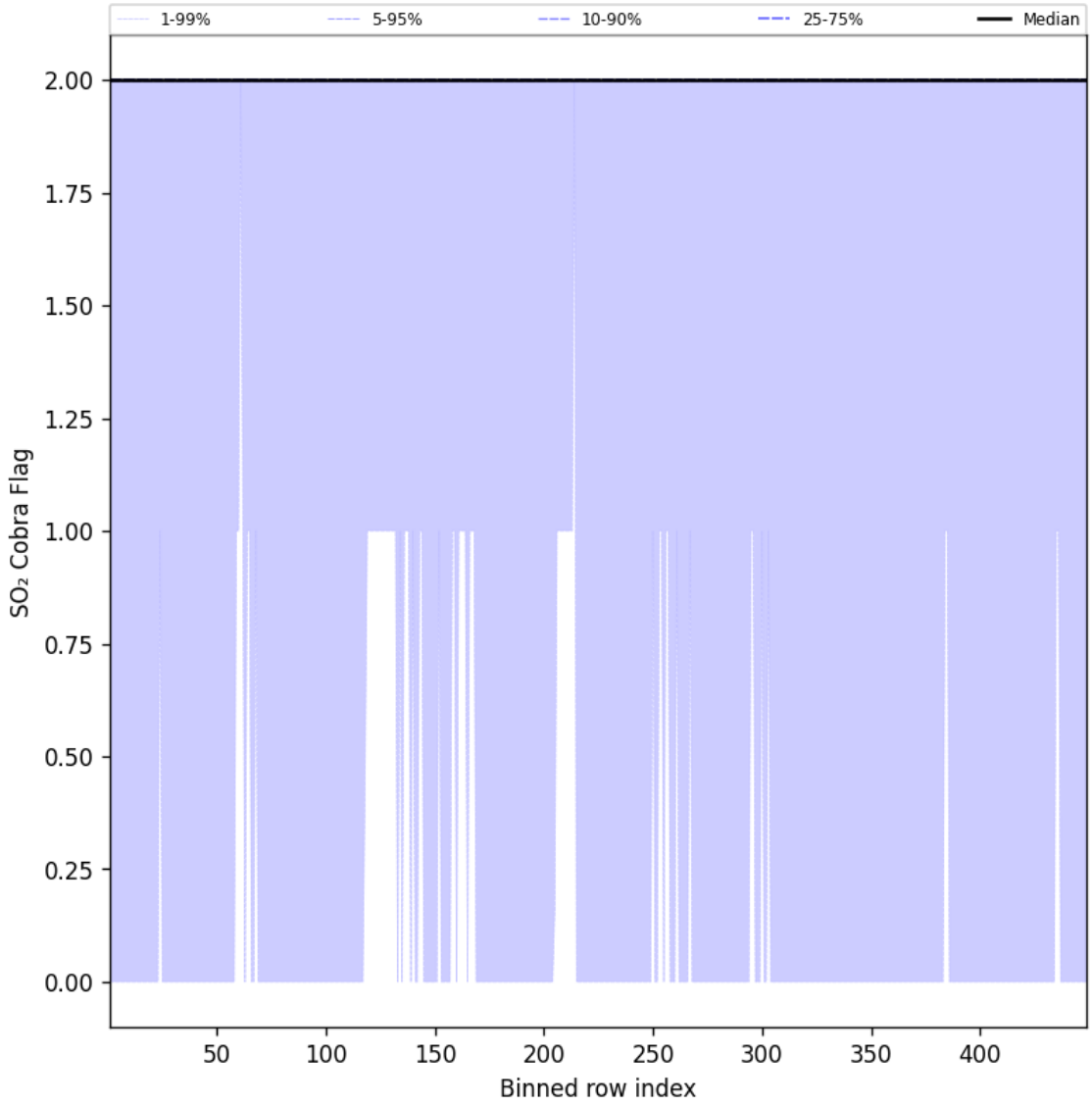

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-04-01 to 2025-04-02

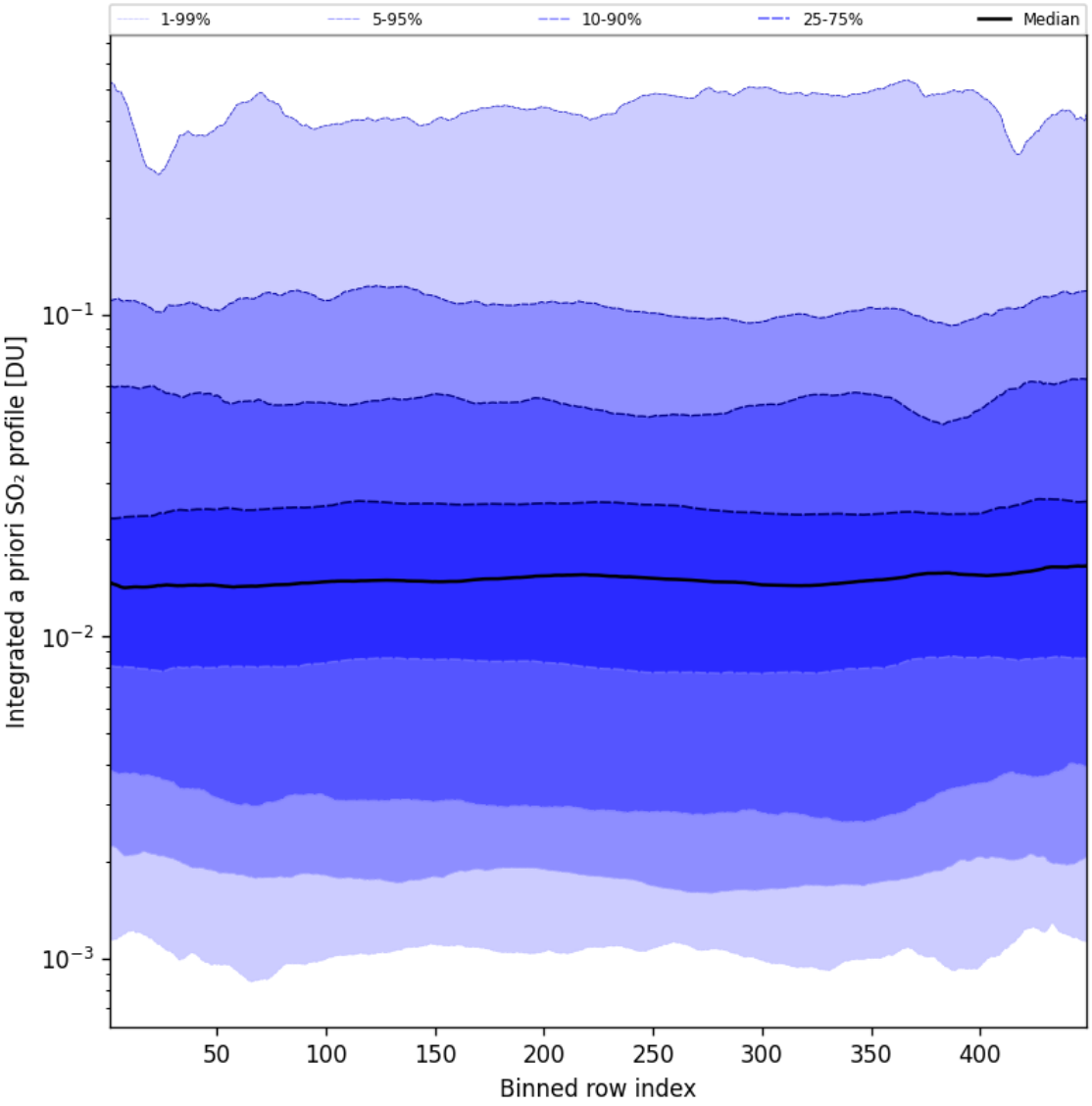

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-04-01 to 2025-04-02

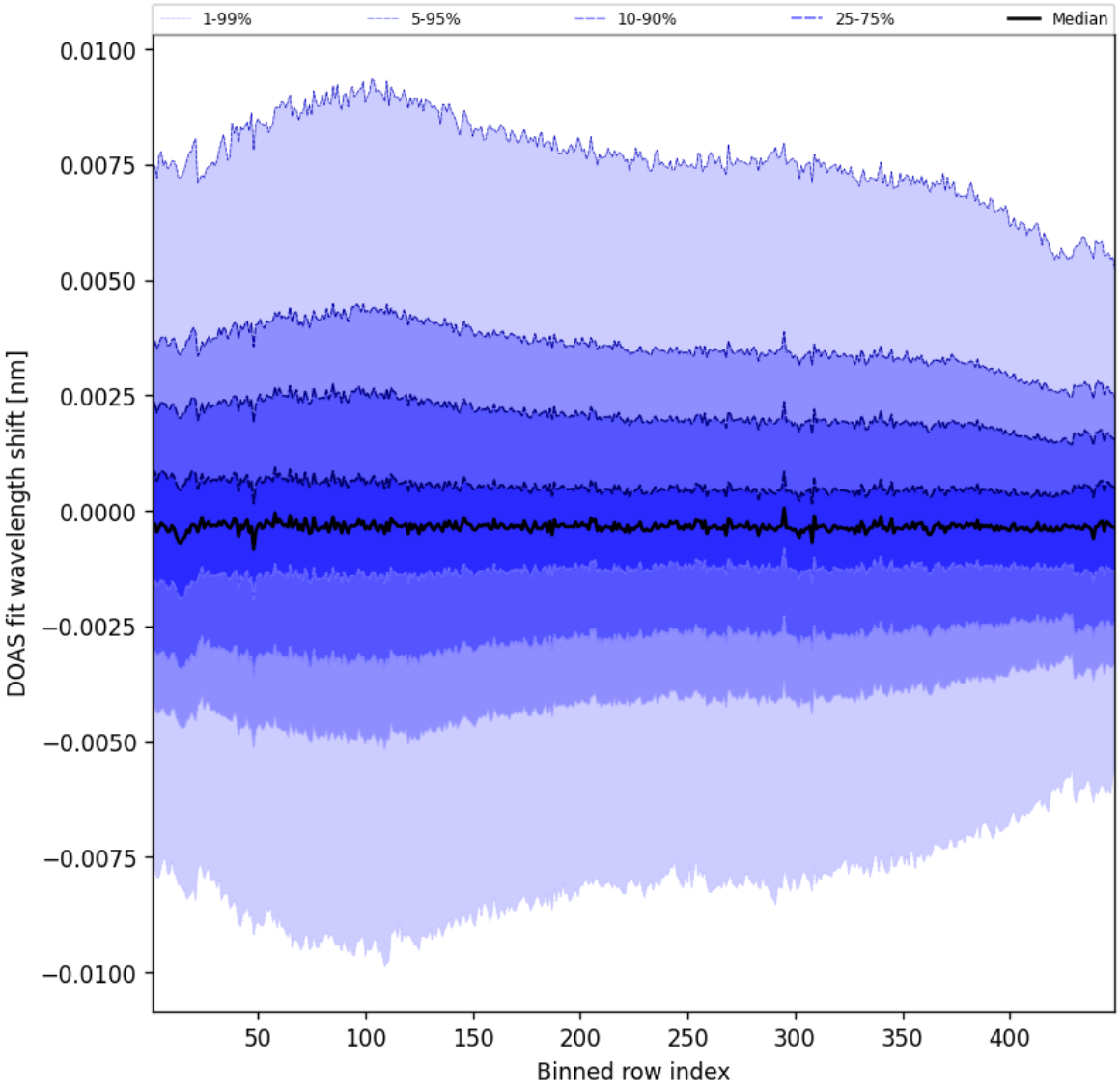

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-04-01 to 2025-04-02

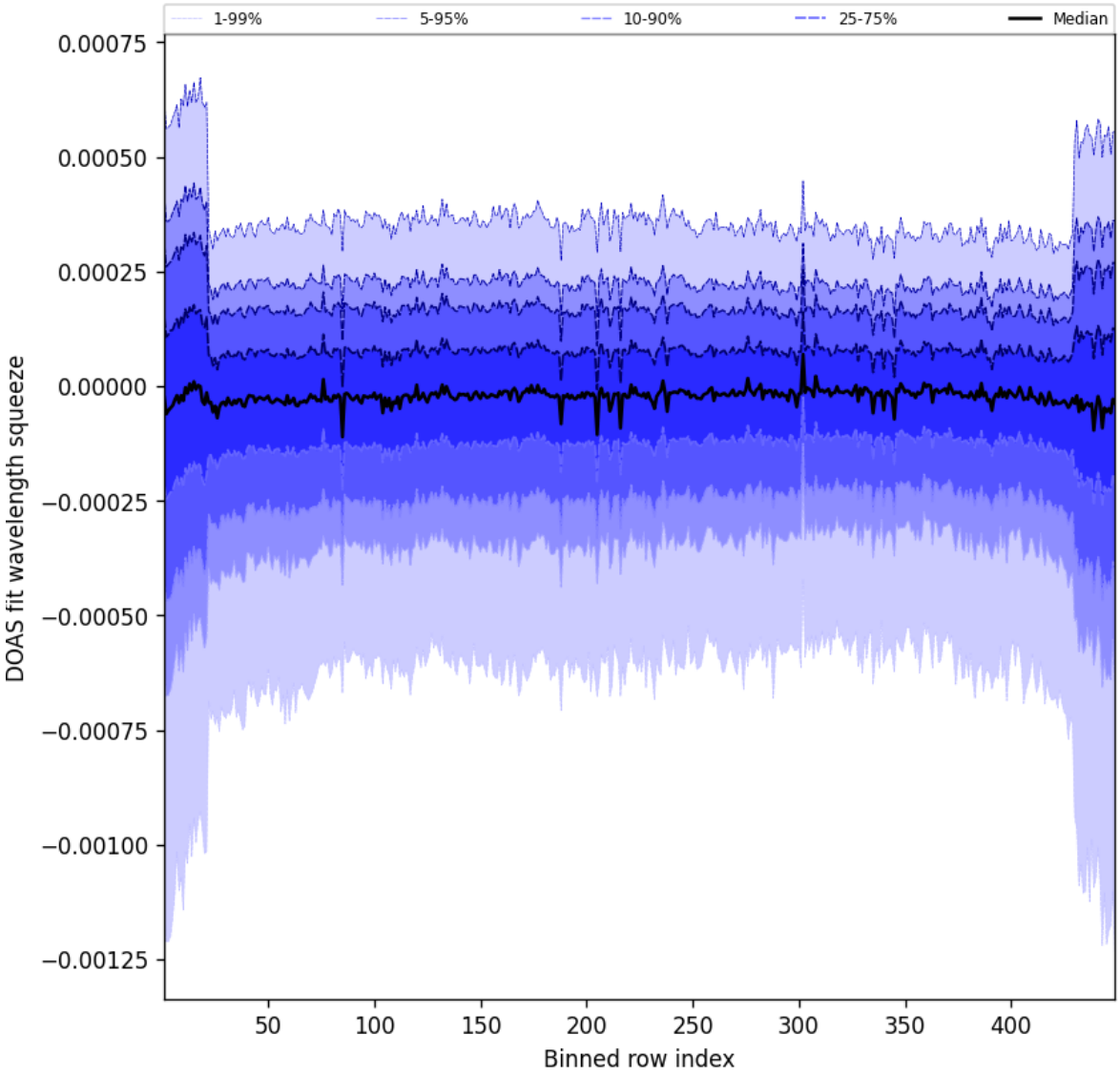

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-04-01 to 2025-04-02

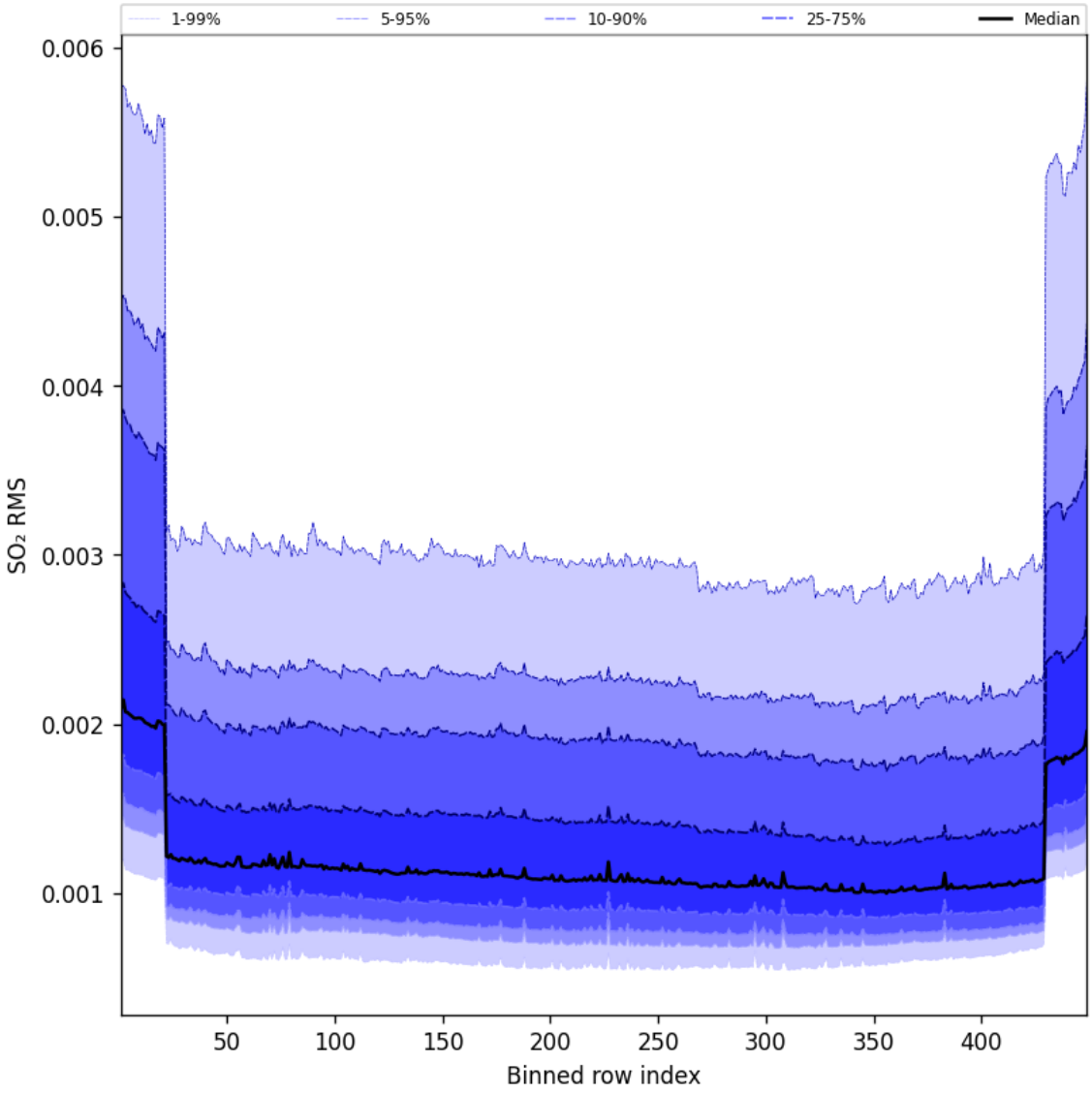

Figure 106: Along track statistics of "SO_2 RMS" for 2025-04-01 to 2025-04-02

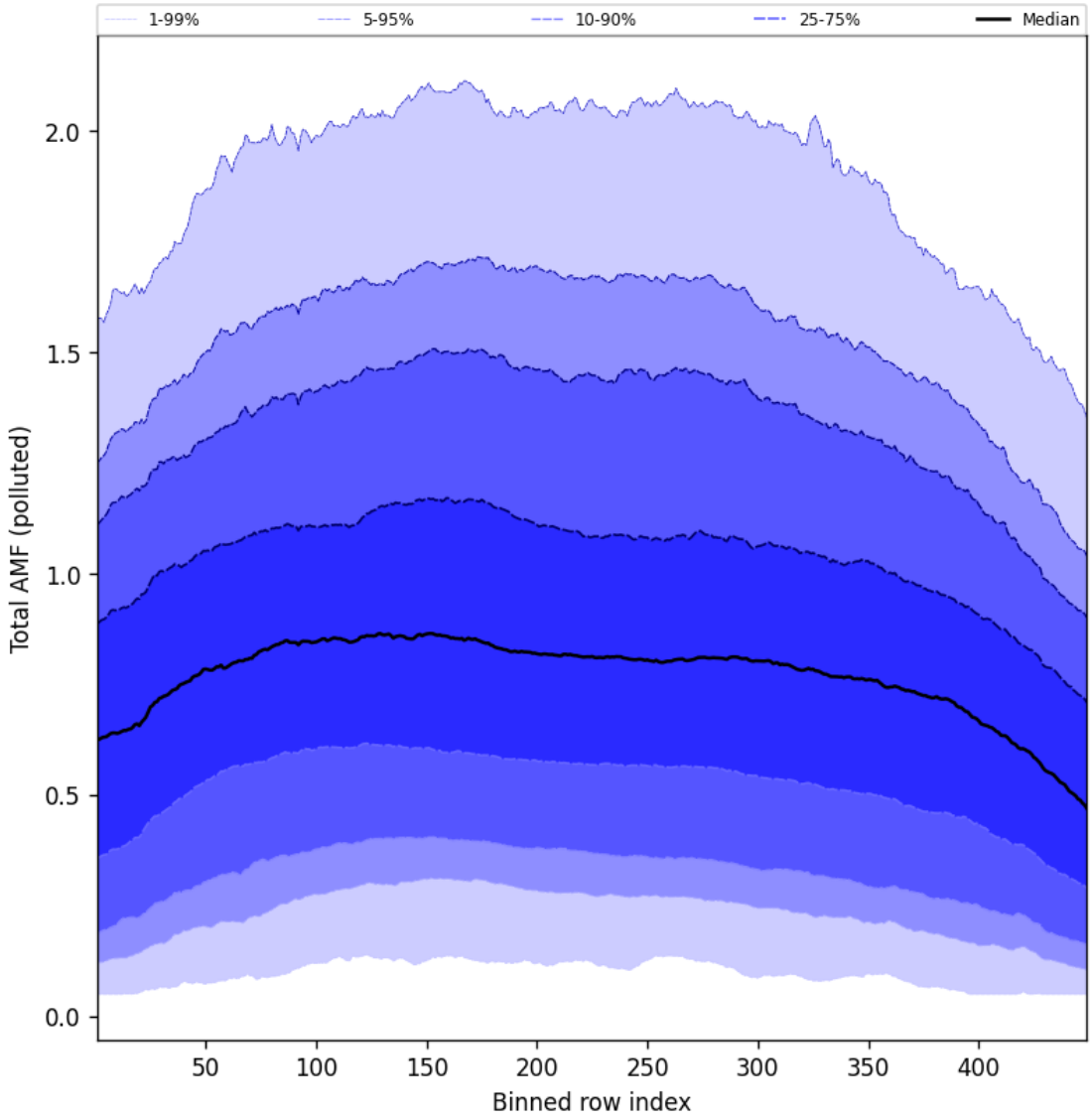

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-04-01 to 2025-04-02

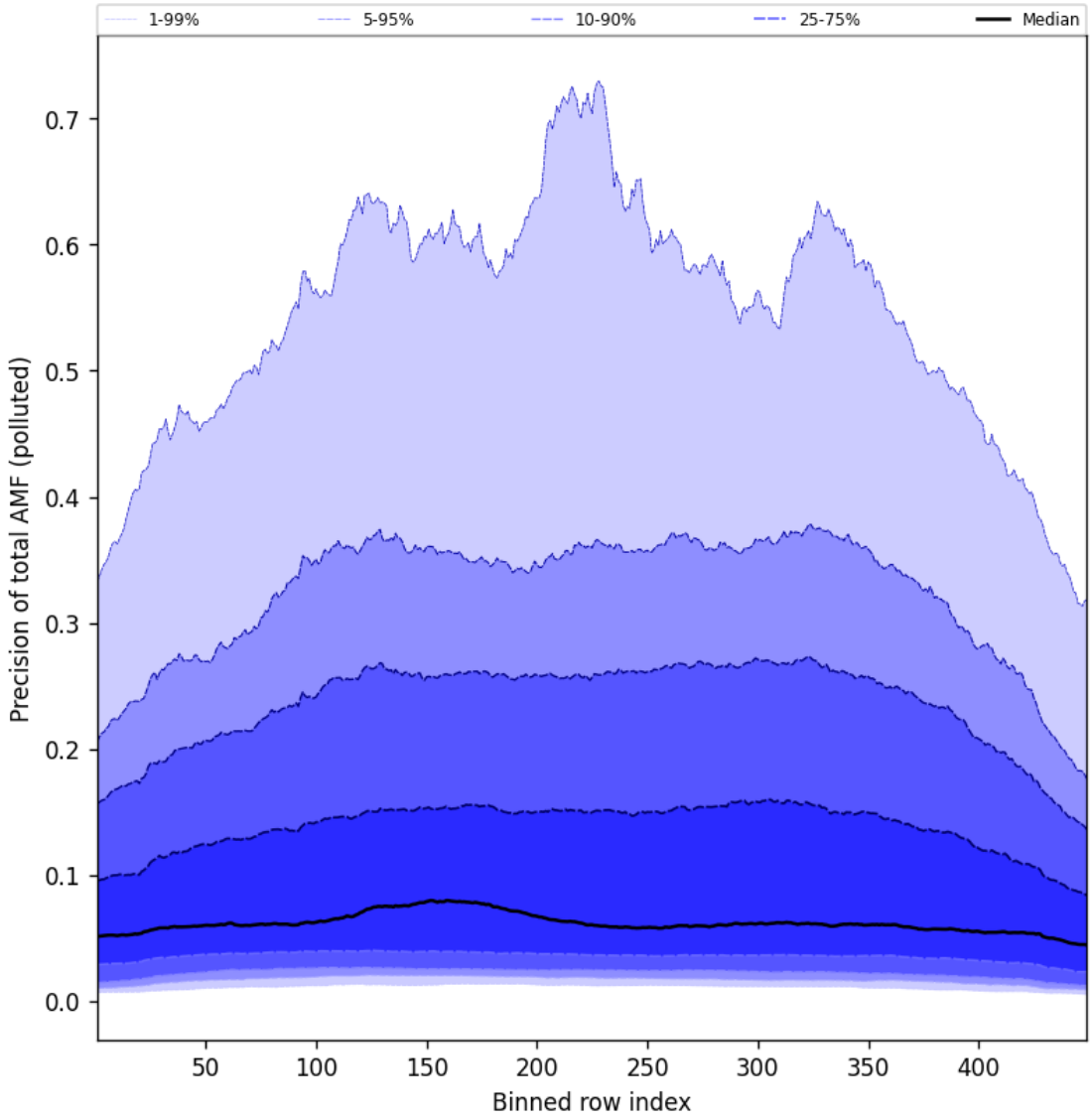

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-04-01 to 2025-04-02

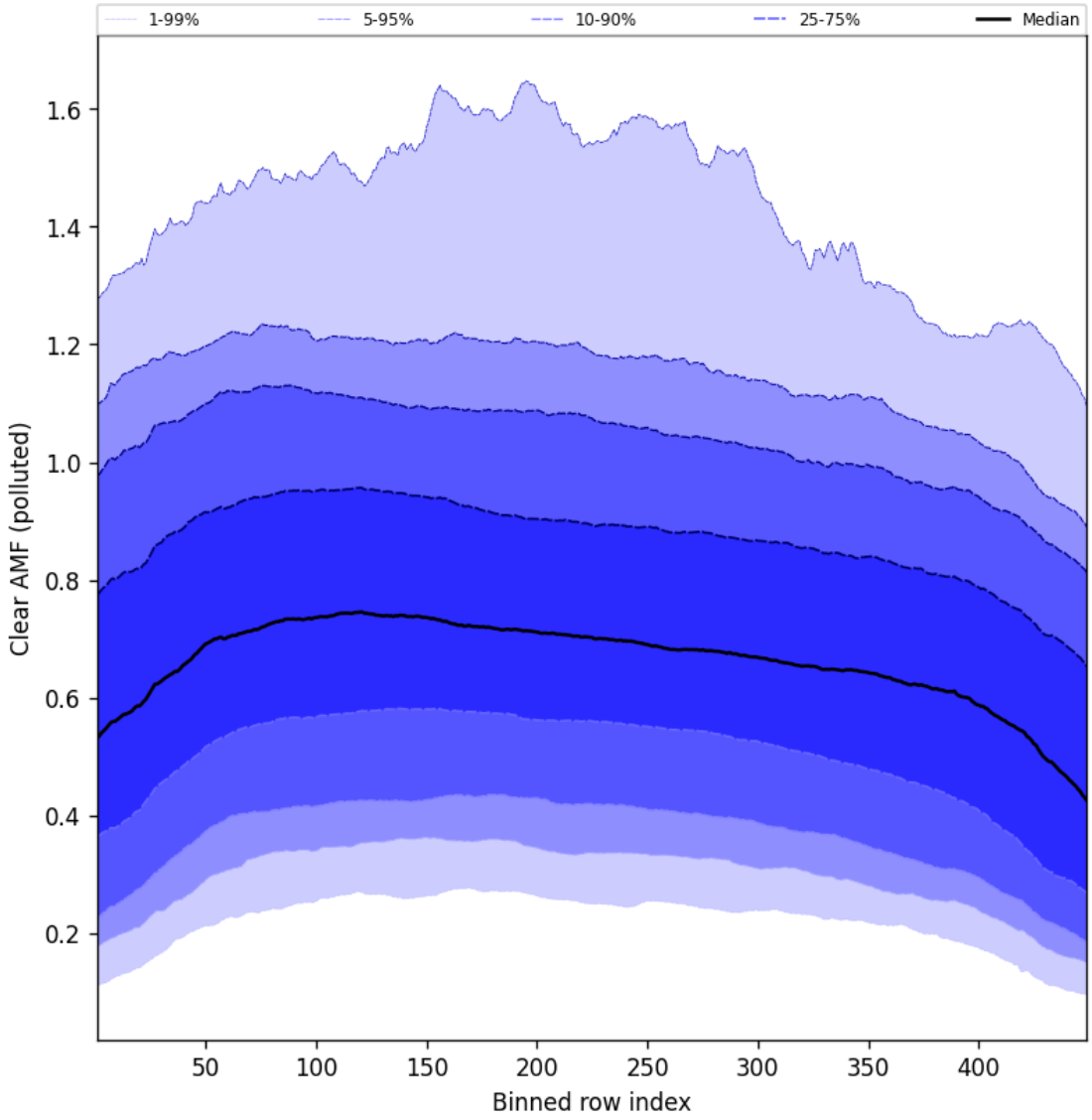

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-04-01 to 2025-04-02

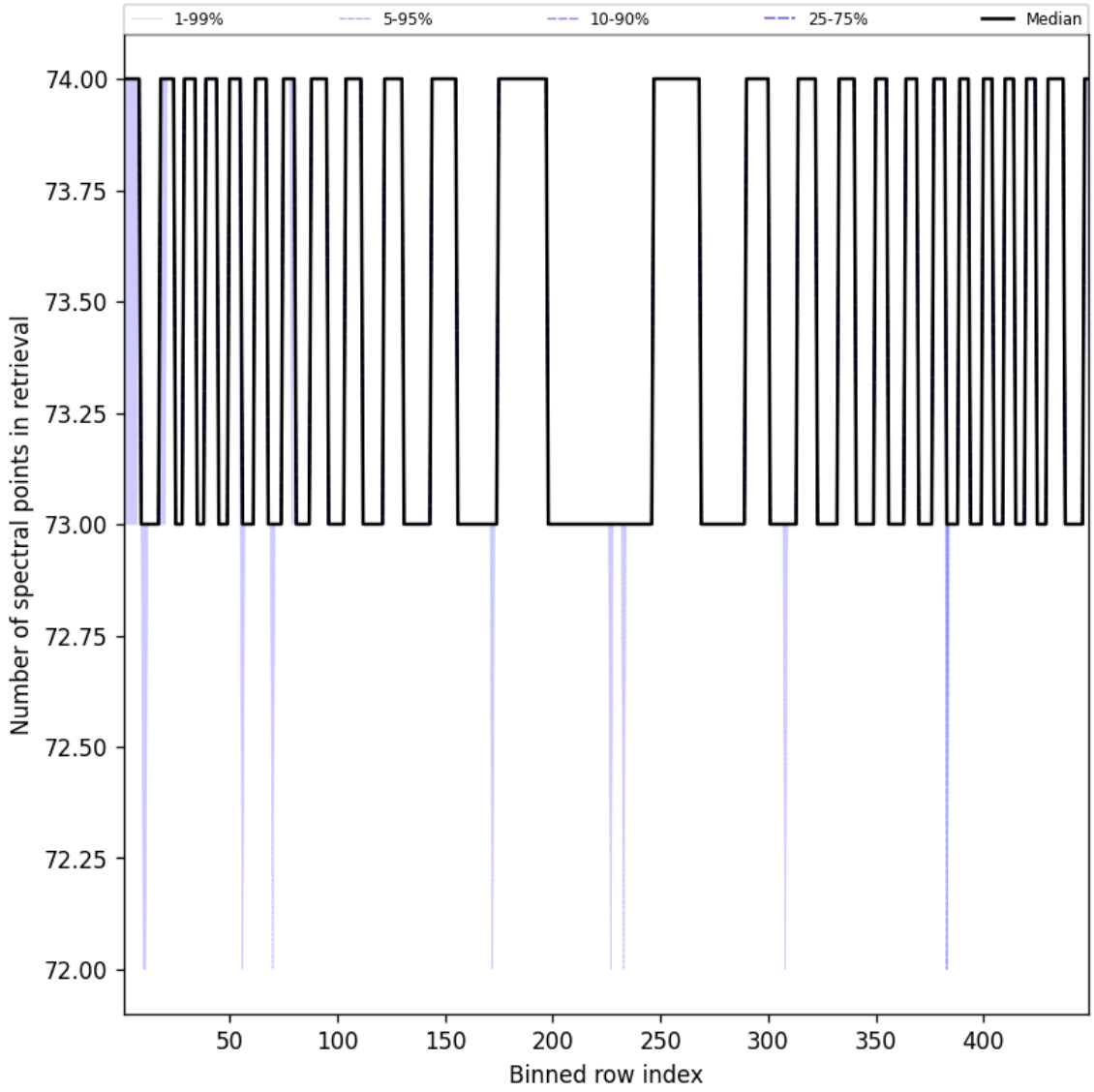

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-04-01 to 2025-04-02

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.

Contents

1 Short Introduction **1**
1.1 The list of parameters . . . 1

2 Definitions **1**

3 Granule outlines **8**

4 Input data monitoring **9**

5 Warnings and errors **10**

6 World maps **11**

7 Zonal average **37**

8 Histograms **64**

9 Along track statistics **91**

10 Coincidence density **118**

11 Copyright information of 'PyCAMA' **118**

List of Figures

1 Outline of the granules. . . . 8
2 Input data per granule . . . 9
3 Fraction of pixels with specific warnings and errors during processing . . . 10
4 Map of "SO_2 vertical column" for 2025-04-01 to 2025-04-02 . . . 11
5 Map of "SO_2 vertical column precision" for 2025-04-01 to 2025-04-02 . . . 12
6 Map of "Corrected SO_2 slant column" for 2025-04-01 to 2025-04-02 . . . 13
7 Map of "Cobra SO_2 slant column" for 2025-04-01 to 2025-04-02 . . . 14
8 Map of "SO_2 slant column precision (Cobra)" for 2025-04-01 to 2025-04-02 . . . 15
9 Map of "SO_2 slant column (window 1)" for 2025-04-01 to 2025-04-02 . . . 16
10 Map of "SO_2 slant column precision (window 1)" for 2025-04-01 to 2025-04-02 . . . 17
11 Map of "Corrected SO_2 slant column (window 1)" for 2025-04-01 to 2025-04-02 . . . 18
12 Map of "SO_2 slant column background correction (window 1)" for 2025-04-01 to 2025-04-02 . . . 19
13 Map of "SO_2 slant column (window 2)" for 2025-04-01 to 2025-04-02 . . . 20
14 Map of "SO_2 slant column precision (window2)" for 2025-04-01 to 2025-04-02 . . . 21
15 Map of "Corrected SO_2 slant column (window 2)" for 2025-04-01 to 2025-04-02 . . . 22
16 Map of "SO_2 slant column background correction (window 2)" for 2025-04-01 to 2025-04-02 . . . 23
17 Map of "SO_2 slant column (window 3)" for 2025-04-01 to 2025-04-02 . . . 24
18 Map of "SO_2 slant column precision (window 3)" for 2025-04-01 to 2025-04-02 . . . 25
19 Map of "Corrected SO_2 slant column (window 3)" for 2025-04-01 to 2025-04-02 . . . 26
20 Map of "SO_2 slant column background correction (window 3)" for 2025-04-01 to 2025-04-02 . . . 27
21 Map of "Integrated a priori SO_2 profile" for 2025-04-01 to 2025-04-02 . . . 28
22 Map of "DOAS fit wavelength shift" for 2025-04-01 to 2025-04-02 . . . 29
23 Map of "DOAS fit wavelength squeeze" for 2025-04-01 to 2025-04-02 . . . 30
24 Map of "SO_2 RMS" for 2025-04-01 to 2025-04-02 . . . 31
25 Map of "Total AMF (polluted)" for 2025-04-01 to 2025-04-02 . . . 32
26 Map of "Precision of total AMF (polluted)" for 2025-04-01 to 2025-04-02 . . . 33
27 Map of "Clear AMF (polluted)" for 2025-04-01 to 2025-04-02 . . . 34
28 Map of "Number of spectral points in retrieval" for 2025-04-01 to 2025-04-02 . . . 35
29 Map of the number of observations for 2025-04-01 to 2025-04-02 . . . 36

30 Zonal average of “QA value” for 2025-04-01 to 2025-04-02. 37
31 Zonal average of “SO_2 vertical column” for 2025-04-01 to 2025-04-02. 38
32 Zonal average of “SO_2 vertical column precision” for 2025-04-01 to 2025-04-02. 39
33 Zonal average of “Corrected SO_2 slant column” for 2025-04-01 to 2025-04-02. 40
34 Zonal average of “Cobra SO_2 slant column” for 2025-04-01 to 2025-04-02. 41
35 Zonal average of “SO_2 slant column precision (Cobra)” for 2025-04-01 to 2025-04-02. 42
36 Zonal average of “SO_2 slant column (window 1)” for 2025-04-01 to 2025-04-02. 43
37 Zonal average of “SO_2 slant column precision (window 1)” for 2025-04-01 to 2025-04-02. 44
38 Zonal average of “Corrected SO_2 slant column (window 1)” for 2025-04-01 to 2025-04-02. 45
39 Zonal average of “SO_2 slant column background correction (window 1)” for 2025-04-01 to 2025-04-02. . . 46
40 Zonal average of “SO_2 slant column (window 2)” for 2025-04-01 to 2025-04-02. 47
41 Zonal average of “SO_2 slant column precision (window2)” for 2025-04-01 to 2025-04-02. 48
42 Zonal average of “Corrected SO_2 slant column (window 2)” for 2025-04-01 to 2025-04-02. 49
43 Zonal average of “SO_2 slant column background correction (window 2)” for 2025-04-01 to 2025-04-02. . . 50
44 Zonal average of “SO_2 slant column (window 3)” for 2025-04-01 to 2025-04-02. 51
45 Zonal average of “SO_2 slant column precision (window 3)” for 2025-04-01 to 2025-04-02. 52
46 Zonal average of “Corrected SO_2 slant column (window 3)” for 2025-04-01 to 2025-04-02. 53
47 Zonal average of “SO_2 slant column background correction (window 3)” for 2025-04-01 to 2025-04-02. . . 54
48 Zonal average of “SO_2 Cobra Flag” for 2025-04-01 to 2025-04-02. 55
49 Zonal average of “Integrated a priori SO_2 profile” for 2025-04-01 to 2025-04-02. 56
50 Zonal average of “DOAS fit wavelength shift” for 2025-04-01 to 2025-04-02. 57
51 Zonal average of “DOAS fit wavelength squeeze” for 2025-04-01 to 2025-04-02. 58
52 Zonal average of “SO_2 RMS” for 2025-04-01 to 2025-04-02. 59
53 Zonal average of “Total AMF (polluted)” for 2025-04-01 to 2025-04-02. 60
54 Zonal average of “Precision of total AMF (polluted)” for 2025-04-01 to 2025-04-02. 61
55 Zonal average of “Clear AMF (polluted)” for 2025-04-01 to 2025-04-02. 62
56 Zonal average of “Number of spectral points in retrieval” for 2025-04-01 to 2025-04-02. 63
57 Histogram of “QA value” for 2025-04-01 to 2025-04-02 64
58 Histogram of “SO_2 vertical column” for 2025-04-01 to 2025-04-02 65
59 Histogram of “SO_2 vertical column precision” for 2025-04-01 to 2025-04-02 66
60 Histogram of “Corrected SO_2 slant column” for 2025-04-01 to 2025-04-02 67
61 Histogram of “Cobra SO_2 slant column” for 2025-04-01 to 2025-04-02 68
62 Histogram of “SO_2 slant column precision (Cobra)” for 2025-04-01 to 2025-04-02 69
63 Histogram of “SO_2 slant column (window 1)” for 2025-04-01 to 2025-04-02 70
64 Histogram of “SO_2 slant column precision (window 1)” for 2025-04-01 to 2025-04-02 71
65 Histogram of “Corrected SO_2 slant column (window 1)” for 2025-04-01 to 2025-04-02 72
66 Histogram of “SO_2 slant column background correction (window 1)” for 2025-04-01 to 2025-04-02 73
67 Histogram of “SO_2 slant column (window 2)” for 2025-04-01 to 2025-04-02 74
68 Histogram of “SO_2 slant column precision (window2)” for 2025-04-01 to 2025-04-02 75
69 Histogram of “Corrected SO_2 slant column (window 2)” for 2025-04-01 to 2025-04-02 76
70 Histogram of “SO_2 slant column background correction (window 2)” for 2025-04-01 to 2025-04-02 77
71 Histogram of “SO_2 slant column (window 3)” for 2025-04-01 to 2025-04-02 78
72 Histogram of “SO_2 slant column precision (window 3)” for 2025-04-01 to 2025-04-02 79
73 Histogram of “Corrected SO_2 slant column (window 3)” for 2025-04-01 to 2025-04-02 80
74 Histogram of “SO_2 slant column background correction (window 3)” for 2025-04-01 to 2025-04-02 81
75 Histogram of “SO_2 Cobra Flag” for 2025-04-01 to 2025-04-02 82
76 Histogram of “Integrated a priori SO_2 profile” for 2025-04-01 to 2025-04-02 83
77 Histogram of “DOAS fit wavelength shift” for 2025-04-01 to 2025-04-02 84
78 Histogram of “DOAS fit wavelength squeeze” for 2025-04-01 to 2025-04-02 85
79 Histogram of “SO_2 RMS” for 2025-04-01 to 2025-04-02 86
80 Histogram of “Total AMF (polluted)” for 2025-04-01 to 2025-04-02 87
81 Histogram of “Precision of total AMF (polluted)” for 2025-04-01 to 2025-04-02 88
82 Histogram of “Clear AMF (polluted)” for 2025-04-01 to 2025-04-02 89
83 Histogram of “Number of spectral points in retrieval” for 2025-04-01 to 2025-04-02 90
84 Along track statistics of “QA value” for 2025-04-01 to 2025-04-02 91
85 Along track statistics of “SO_2 vertical column” for 2025-04-01 to 2025-04-02 92
86 Along track statistics of “SO_2 vertical column precision” for 2025-04-01 to 2025-04-02 93
87 Along track statistics of “Corrected SO_2 slant column” for 2025-04-01 to 2025-04-02 94
88 Along track statistics of “Cobra SO_2 slant column” for 2025-04-01 to 2025-04-02 95
89 Along track statistics of “SO_2 slant column precision (Cobra)” for 2025-04-01 to 2025-04-02 96
90 Along track statistics of “SO_2 slant column (window 1)” for 2025-04-01 to 2025-04-02 97
91 Along track statistics of “SO_2 slant column precision (window 1)” for 2025-04-01 to 2025-04-02 98

92 Along track statistics of "Corrected SO_2 slant column (window 1)" for 2025-04-01 to 2025-04-02 99
93 Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-04-01 to 2025-04-02 100
94 Along track statistics of "SO_2 slant column (window 2)" for 2025-04-01 to 2025-04-02 101
95 Along track statistics of "SO_2 slant column precision (window2)" for 2025-04-01 to 2025-04-02 102
96 Along track statistics of "Corrected SO_2 slant column (window 2)" for 2025-04-01 to 2025-04-02 103
97 Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-04-01 to 2025-04-02 104
98 Along track statistics of "SO_2 slant column (window 3)" for 2025-04-01 to 2025-04-02 105
99 Along track statistics of "SO_2 slant column precision (window 3)" for 2025-04-01 to 2025-04-02 106
100 Along track statistics of "Corrected SO_2 slant column (window 3)" for 2025-04-01 to 2025-04-02 107
101 Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-04-01 to 2025-04-02 108
102 Along track statistics of "SO_2 Cobra Flag" for 2025-04-01 to 2025-04-02 109
103 Along track statistics of "Integrated a priori SO_2 profile" for 2025-04-01 to 2025-04-02 110
104 Along track statistics of "DOAS fit wavelength shift" for 2025-04-01 to 2025-04-02 111
105 Along track statistics of "DOAS fit wavelength squeeze" for 2025-04-01 to 2025-04-02 112
106 Along track statistics of "SO_2 RMS" for 2025-04-01 to 2025-04-02 113
107 Along track statistics of "Total AMF (polluted)" for 2025-04-01 to 2025-04-02 114
108 Along track statistics of "Precision of total AMF (polluted)" for 2025-04-01 to 2025-04-02 115
109 Along track statistics of "Clear AMF (polluted)" for 2025-04-01 to 2025-04-02 116
110 Along track statistics of "Number of spectral points in retrieval" for 2025-04-01 to 2025-04-02 117

List of Tables

1 Parameterlist and basic statistics for the analysis 2
2 Percentile ranges 3
3 Parameterlist and basic statistics for the analysis for observations in the northern hemisphere 4
4 Parameterlist and basic statistics for the analysis for observations in the southern hemisphere 5
5 Parameterlist and basic statistics for the analysis for observations over water 6
6 Parameterlist and basic statistics for the analysis for observations over land 7

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Maarten Sneep (maarten.sneep@knmi.nl).