PyCAMA report generated by tropl2-proc

tropl2-proc

2025-05-15 (03:40)

1 Short Introduction

1.1 The list of parameters

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

2 Definitions

The averages shown here are *unweighed* averages:

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

with N the number of observations in the dataset.

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

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

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

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

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

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

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

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

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

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

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

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

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

Table 1: Parameterlist and basic statistics for the analysis

Variable	mean $\pm\sigma$	Count	Mode	IQR	Median	Minimum	Maximum
qa value [1]	0.635 ± 0.408	17345790	0.995	0.790	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.245 \pm 97.131) \times 10^{-2}$	17345790	0.278	0.456	1.048×10^{-2}	-61.1	865
sulfurdioxide total vertical column precision [DU]	0.504 ± 0.612	17345790	0.222	0.338	0.329	4.325×10^{-2}	71.5
sulfurdioxide slant column density corrected [DU]	$(2.334 \pm 56.598) \times 10^{-2}$	17345790	0.258	0.374	9.330×10^{-3}	-30.6	643
sulfurdioxide slant column density cobra [DU]	$(2.224 \pm 46.319) \times 10^{-2}$	17345790	0.258	0.374	9.330×10^{-3}	-30.6	96.1
sulfurdioxide slant column density cobra precision [DU]	0.298 ± 0.128	17345790	0.213	0.131	0.263	8.551×10^{-2}	32.7
sulfurdioxide slant column density window1 [DU]	0.112 ± 0.749	17345790	0.125	0.746	0.113	-267	144
sulfurdioxide slant column density window1 precision [DU]	0.298 ± 0.128	17345790	0.213	0.131	0.263	8.551×10^{-2}	32.7
sulfurdioxide slant column density corrected win1 [DU]	$(2.655 \pm 74.159) \times 10^{-2}$	17345790	-2.500×10^{-2}	0.733	7.029×10^{-3}	-267	144
background so2 slant column offset window1 [DU]	$(-8.560 \pm 13.338) \times 10^{-2}$	17345790	-0.180	0.149	-0.107	-0.932	3.25
sulfurdioxide slant column density window2 [DU]	1.01 ± 9.00	17345790	0.750	11.3	0.947	-1.488×10^{3}	1.064×10^{3}
sulfurdioxide slant column density window2 precision [DU]	8.10 ± 2.38	17345790	7.43	2.68	7.75	2.24	704
sulfurdioxide slant column density corrected win2 [DU]	-0.677 ± 8.812	17345790	-0.750	11.0	-0.674	-1.490×10^{3}	1.063×10^{3}
background so2 slant column offset window2 [DU]	-1.68 ± 2.35	17345790	0.250	3.48	-1.05	-11.5	4.94
sulfurdioxide slant column density window3 [DU]	-5.12 ± 23.80	17345790	-6.16	29.3	-5.41	-1.560×10^{3}	705
sulfurdioxide slant column density window3 precision [DU]	28.6 ± 13.8	17345790	22.5	10.2	24.9	9.29	1.581×10^{3}
sulfurdioxide slant column density corrected win3 [DU]	0.493 ± 23.246	17345790	0.560	28.6	0.647	-1.562×10^{3}	711
background so2 slant column offset window3 [DU]	5.62 ± 5.55	17345790	10.6	9.55	5.59	-14.6	20.8
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17345790	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.370 \pm 8.116) \times 10^{-2}$	17345790	1.217×10^{-2}	2.165×10^{-2}	1.444×10^{-2}	2.483×10^{-4}	2.67
fitted radiance shift [nm]	$(-1.249 \pm 26.271) \times 10^{-4}$	17345790	1.000×10^{-4}	1.665×10^{-3}	-1.182×10^{-4}	-6.224×10^{-2}	5.454×10^{-2}
fitted radiance squeeze [1]	$(-2.279 \pm 18.010) \times 10^{-5}$	17345790	-1.000×10^{-5}	2.074×10^{-4}	-1.917×10^{-5}	-1.666×10^{-2}	2.009×10^{-2}
fitted root mean square [1]	$(1.293 \pm 0.514) \times 10^{-3}$	17345790	1.025×10^{-3}	5.262×10^{-4}	1.157×10^{-3}	2.210×10^{-4}	0.115
sulfurdioxide total air mass factor polluted [1]	0.894 ± 0.478	17345790	0.780	0.563	0.812	5.000×10^{-2}	3.11
sulfurdioxide total air mass factor polluted precision [1]	0.115 ± 0.129	17345790	3.500×10^{-2}	0.110	6.823×10^{-2}	2.913×10^{-3}	2.06
sulfurdioxide clear air mass factor polluted [1]	0.751 ± 0.328	17345790	0.780	0.400	0.721	6.830×10^{-2}	2.66
number of spectral points in retrieval [1]	73.4 ± 0.5	17345790	73.0	1.000	73.0	52.0	156

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	3.000×10^{-2}	0.1000	0.210	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.16	−0.862	−0.533	−0.361	−0.214	0.242	0.402	0.594	0.970	2.53
sulfurdioxide total vertical column precision [DU]	9.780×10^{-2}	0.132	0.161	0.188	0.222	0.560	0.738	0.948	1.38	3.09
sulfurdioxide slant column density corrected [DU]	−0.858	−0.501	−0.364	−0.273	−0.176	0.198	0.300	0.400	0.555	1.03
sulfurdioxide slant column density cobra [DU]	−0.858	−0.501	−0.364	−0.273	−0.176	0.198	0.300	0.400	0.555	1.03
sulfurdioxide slant column density cobra precision [DU]	0.143	0.172	0.188	0.200	0.215	0.346	0.398	0.449	0.541	0.755
sulfurdioxide slant column density window1 [DU]	−1.70	−0.948	−0.658	−0.464	−0.263	0.483	0.677	0.861	1.14	1.91
sulfurdioxide slant column density window1 precision [DU]	0.143	0.172	0.188	0.200	0.215	0.346	0.398	0.449	0.541	0.755
sulfurdioxide slant column density corrected win1 [DU]	−1.65	−0.980	−0.719	−0.542	−0.355	0.378	0.579	0.774	1.07	1.90
background so2 slant column offset window1 [DU]	−0.362	−0.247	−0.211	−0.192	−0.173	-2.378×10^{-2}	2.927×10^{-2}	8.071×10^{-2}	0.158	0.341
sulfurdioxide slant column density window2 [DU]	−20.3	−13.4	−10.0	−7.51	−4.70	6.63	9.49	12.1	15.6	23.1
sulfurdioxide slant column density window2 precision [DU]	4.24	5.08	5.60	6.04	6.56	9.24	10.1	11.0	12.2	15.0
sulfurdioxide slant column density corrected win2 [DU]	−21.9	−14.8	−11.5	−8.96	−6.19	4.82	7.58	10.1	13.5	20.7
background so2 slant column offset window2 [DU]	−7.71	−6.16	−5.21	−4.38	−3.29	0.198	0.497	0.711	1.01	2.20
sulfurdioxide slant column density window3 [DU]	−64.8	−43.6	−34.0	−27.2	−19.8	9.53	17.4	24.6	34.4	53.7
sulfurdioxide slant column density window3 precision [DU]	13.4	16.0	18.0	19.5	21.0	31.3	35.9	41.9	54.4	87.8
sulfurdioxide slant column density corrected win3 [DU]	−58.9	−37.8	−28.0	−21.1	−13.7	14.9	22.3	29.0	38.3	57.2
background so2 slant column offset window3 [DU]	−5.54	−2.79	−1.46	−0.399	0.928	10.5	11.8	12.7	13.8	15.8
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	7.164×10^{-4}	1.325×10^{-3}	2.503×10^{-3}	4.379×10^{-3}	7.548×10^{-3}	2.920×10^{-2}	4.195×10^{-2}	6.432×10^{-2}	0.117	0.394
fitted radiance shift [nm]	-8.229×10^{-3}	-3.949×10^{-3}	-2.468×10^{-3}	-1.651×10^{-3}	-9.883×10^{-4}	6.772×10^{-4}	1.332×10^{-3}	2.209×10^{-3}	3.798×10^{-3}	8.277×10^{-3}
fitted radiance squeeze [1]	-5.037×10^{-4}	-3.124×10^{-4}	-2.339×10^{-4}	-1.806×10^{-4}	-1.244×10^{-4}	8.297×10^{-5}	1.355×10^{-4}	1.846×10^{-4}	2.553×10^{-4}	4.234×10^{-4}
fitted root mean square [1]	5.949×10^{-4}	7.410×10^{-4}	8.271×10^{-4}	8.900×10^{-4}	9.639×10^{-4}	1.490×10^{-3}	1.718×10^{-3}	1.940×10^{-3}	2.264×10^{-3}	3.122×10^{-3}
sulfurdioxide total air mass factor polluted [1]	9.607×10^{-2}	0.250	0.356	0.442	0.557	1.12	1.37	1.62	1.90	2.19
sulfurdioxide total air mass factor polluted precision [1]	1.020×10^{-2}	1.872×10^{-2}	2.456×10^{-2}	3.041×10^{-2}	3.836×10^{-2}	0.148	0.198	0.251	0.360	0.637
sulfurdioxide clear air mass factor polluted [1]	0.212	0.306	0.368	0.427	0.518	0.918	1.01	1.12	1.37	1.87
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]	0.578 ± 0.416	11607831	0.850	0.490	0.0	1.000	0.150	1.000
sulfurdioxide total vertical column [DU]	$(3.171 \pm 102.099) \times 10^{-2}$	11607831	0.435	8.951×10^{-3}	-46.7	203	-0.205	0.230
sulfurdioxide total vertical column precision [DU]	0.511 ± 0.684	11607831	0.336	0.312	4.325×10^{-2}	59.4	0.208	0.544
sulfurdioxide slant column density corrected [DU]	$(2.300 \pm 57.667) \times 10^{-2}$	11607831	0.360	8.052×10^{-3}	-7.52	151	-0.170	0.190
sulfurdioxide slant column density cobra [DU]	$(2.172 \pm 48.082) \times 10^{-2}$	11607831	0.360	8.052×10^{-3}	-7.52	96.1	-0.170	0.190
sulfurdioxide slant column density cobra precision [DU]	0.286 ± 0.122	11607831	0.117	0.251	8.551×10^{-2}	18.2	0.208	0.326
sulfurdioxide slant column density window1 [DU]	$(9.947 \pm 75.299) \times 10^{-2}$	11607831	0.723	0.105	-267	105	-0.262	0.461
sulfurdioxide slant column density window1 precision [DU]	0.286 ± 0.122	11607831	0.117	0.251	8.551×10^{-2}	18.2	0.208	0.326
sulfurdioxide slant column density corrected win1 [DU]	$(2.432 \pm 74.228) \times 10^{-2}$	11607831	0.707	4.975×10^{-3}	-267	104	-0.344	0.363
background so2 slant column offset window1 [DU]	$(-7.516 \pm 14.664) \times 10^{-2}$	11607831	0.181	-0.103	-0.932	2.54	-0.178	2.995×10^{-3}
sulfurdioxide slant column density window2 [DU]	1.21 ± 8.39	11607831	10.8	1.17	-214	544	-4.23	6.58
sulfurdioxide slant column density window2 precision [DU]	7.61 ± 2.04	11607831	2.32	7.32	2.24	212	6.25	8.57
sulfurdioxide slant column density corrected win2 [DU]	-0.787 ± 8.133	11607831	10.4	-0.756	-215	541	-5.98	4.42
background so2 slant column offset window2 [DU]	-1.99 ± 2.58	11607831	4.26	-1.50	-11.5	4.94	-3.99	0.276
sulfurdioxide slant column density window3 [DU]	-5.55 ± 22.10	11607831	27.3	-6.06	-180	207	-19.4	7.88
sulfurdioxide slant column density window3 precision [DU]	26.8 ± 13.5	11607831	8.08	23.1	9.29	317	20.1	28.2
sulfurdioxide slant column density corrected win3 [DU]	0.694 ± 21.404	11607831	26.5	0.769	-173	207	-12.5	14.0
background so2 slant column offset window3 [DU]	6.25 ± 5.88	11607831	10.5	7.83	-14.6	20.0	0.667	11.2
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.18	11607831	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.821 \pm 9.187) \times 10^{-2}$	11607831	2.615×10^{-2}	1.331×10^{-2}	2.483×10^{-4}	2.15	5.008×10^{-3}	3.116×10^{-2}
fitted radiance shift [nm]	$(9.638 \pm 2607.300) \times 10^{-6}$	11607831	1.518×10^{-3}	-2.725×10^{-6}	-4.394×10^{-2}	4.685×10^{-2}	-7.712×10^{-4}	7.467×10^{-4}
fitted radiance squeeze [1]	$(-4.552 \pm 17.140) \times 10^{-5}$	11607831	2.000×10^{-4}	-3.545×10^{-5}	-8.073×10^{-3}	1.280×10^{-2}	-1.394×10^{-4}	6.061×10^{-5}
fitted root mean square [1]	$(1.249 \pm 0.505) \times 10^{-3}$	11607831	4.743×10^{-4}	1.111×10^{-3}	2.210×10^{-4}	8.852×10^{-2}	9.366×10^{-4}	1.411×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.919 ± 0.532	11607831	0.683	0.811	5.000×10^{-2}	3.11	0.523	1.21
sulfurdioxide total air mass factor polluted precision [1]	0.129 ± 0.147	11607831	0.131	7.479×10^{-2}	2.913×10^{-3}	2.06	3.775×10^{-2}	0.168
sulfurdioxide clear air mass factor polluted [1]	0.752 ± 0.376	11607831	0.482	0.694	6.830×10^{-2}	2.66	0.464	0.946
number of spectral points in retrieval [1]	73.4 ± 0.5	11607831	1.000	73.0	52.0	156	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]	0.750 ± 0.364	5737959	0.580	1.000	0.0	1.000	0.420	1.000
sulfurdioxide total vertical column [DU]	$(3.395 \pm 86.209) \times 10^{-2}$	5737959	0.501	1.410×10^{-2}	-61.1	865	-0.233	0.268
sulfurdioxide total vertical column precision [DU]	0.489 ± 0.431	5737959	0.332	0.363	5.031×10^{-2}	71.5	0.253	0.585
sulfurdioxide slant column density corrected [DU]	$(2.404 \pm 54.372) \times 10^{-2}$	5737959	0.407	1.226×10^{-2}	-30.6	643	-0.189	0.218
sulfurdioxide slant column density cobra [DU]	$(2.329 \pm 42.530) \times 10^{-2}$	5737959	0.407	1.226×10^{-2}	-30.6	85.4	-0.189	0.218
sulfurdioxide slant column density cobra precision [DU]	0.323 ± 0.137	5737959	0.147	0.290	9.490×10^{-2}	32.7	0.233	0.380
sulfurdioxide slant column density window1 [DU]	0.138 ± 0.741	5737959	0.795	0.132	-109	144	-0.265	0.530
sulfurdioxide slant column density window1 precision [DU]	0.323 ± 0.137	5737959	0.147	0.290	9.490×10^{-2}	32.7	0.233	0.380
sulfurdioxide slant column density corrected win1 [DU]	$(3.108 \pm 74.018) \times 10^{-2}$	5737959	0.792	1.171×10^{-2}	-109	144	-0.378	0.413
background so2 slant column offset window1 [DU]	-0.107 ± 0.098	5737959	9.422×10^{-2}	-0.111	-0.907	3.25	-0.160	-6.609×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.600 ± 10.118	5737959	12.5	0.424	-1.488×10^{3}	1.064×10^{3}	-5.74	6.75
sulfurdioxide slant column density window2 precision [DU]	9.09 ± 2.68	5737959	2.89	8.79	2.37	704	7.48	10.4
sulfurdioxide slant column density corrected win2 [DU]	-0.455 ± 10.044	5737959	12.4	-0.475	-1.490×10^{3}	1.063×10^{3}	-6.67	5.74
background so2 slant column offset window2 [DU]	-1.06 ± 1.65	5737959	2.05	-0.651	-10.7	4.59	-1.94	0.110
sulfurdioxide slant column density window3 [DU]	-4.25 ± 26.90	5737959	34.0	-3.75	-1.560×10^{3}	705	-20.9	13.1
sulfurdioxide slant column density window3 precision [DU]	32.1 ± 13.7	5737959	10.5	28.9	9.94	1.581×10^{3}	24.5	35.0
sulfurdioxide slant column density corrected win3 [DU]	$(8.581 \pm 2658.071) \times 10^{-2}$	5737959	33.7	0.335	-1.562×10^{3}	711	-16.5	17.1
background so2 slant column offset window3 [DU]	4.34 ± 4.55	5737959	6.34	3.25	-11.1	20.8	1.18	7.52
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.27	5737959	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.457 \pm 5.209) \times 10^{-2}$	5737959	1.668×10^{-2}	1.605×10^{-2}	1.329×10^{-3}	2.67	1.057×10^{-2}	2.726×10^{-2}
fitted radiance shift [nm]	$(-3.971 \pm 26.460) \times 10^{-4}$	5737959	1.867×10^{-3}	-4.106×10^{-4}	-6.224×10^{-2}	5.454×10^{-2}	-1.379×10^{-3}	4.879×10^{-4}
fitted radiance squeeze [1]	$(2.318 \pm 18.832) \times 10^{-5}$	5737959	2.209×10^{-4}	1.751×10^{-5}	-1.666×10^{-2}	2.009×10^{-2}	-9.053×10^{-5}	1.304×10^{-4}
fitted root mean square [1]	$(1.382 \pm 0.520) \times 10^{-3}$	5737959	5.847×10^{-4}	1.262×10^{-3}	3.575×10^{-4}	0.115	1.036×10^{-3}	1.620×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.842 ± 0.339	5737959	0.405	0.814	5.000×10^{-2}	2.68	0.615	1.02
sulfurdioxide total air mass factor polluted precision [1]	$(8.773 \pm 7.276) \times 10^{-2}$	5737959	7.801×10^{-2}	5.849×10^{-2}	5.402×10^{-3}	1.49	3.912×10^{-2}	0.117
sulfurdioxide clear air mass factor polluted [1]	0.749 ± 0.199	5737959	0.282	0.756	8.523×10^{-2}	1.74	0.610	0.892
number of spectral points in retrieval [1]	73.4 ± 0.5	5737959	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]	0.668 ± 0.393	11277917	0.750	1.000	0.0	1.000	0.250	1.000
sulfurdioxide total vertical column [DU]	$(2.883 \pm 96.581) \times 10^{-2}$	11277917	0.467	1.050×10^{-2}	-41.8	865	-0.220	0.247
sulfurdioxide total vertical column precision [DU]	0.507 ± 0.611	11277917	0.329	0.329	5.404×10^{-2}	59.4	0.230	0.559
sulfurdioxide slant column density corrected [DU]	$(1.754 \pm 48.538) \times 10^{-2}$	11277917	0.374	8.956×10^{-3}	-14.1	643	-0.177	0.198
sulfurdioxide slant column density cobra [DU]	$(1.723 \pm 41.247) \times 10^{-2}$	11277917	0.374	8.956×10^{-3}	-14.1	93.2	-0.177	0.198
sulfurdioxide slant column density cobra precision [DU]	0.300 ± 0.130	11277917	0.143	0.263	8.551×10^{-2}	21.8	0.213	0.356
sulfurdioxide slant column density window1 [DU]	0.108 ± 0.716	11277917	0.752	0.118	-82.5	97.0	-0.263	0.489
sulfurdioxide slant column density window1 precision [DU]	0.300 ± 0.130	11277917	0.143	0.263	8.551×10^{-2}	21.8	0.213	0.356
sulfurdioxide slant column density corrected win1 [DU]	$(2.008 \pm 70.601) \times 10^{-2}$	11277917	0.739	6.817×10^{-3}	-82.5	96.8	-0.359	0.381
background so2 slant column offset window1 [DU]	$(-8.794 \pm 13.450) \times 10^{-2}$	11277917	0.144	-0.110	-0.809	2.78	-0.174	-3.010×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.882 ± 8.982	11277917	11.4	0.769	-939	1.064×10^{3}	-4.87	6.50
sulfurdioxide slant column density window2 precision [DU]	8.10 ± 2.24	11277917	2.63	7.78	2.24	704	6.62	9.25
sulfurdioxide slant column density corrected win2 [DU]	-0.658 ± 8.808	11277917	11.1	-0.655	-940	1.063×10^{3}	-6.21	4.89
background so2 slant column offset window2 [DU]	-1.54 ± 2.35	11277917	3.30	-0.811	-11.5	4.94	-3.04	0.263
sulfurdioxide slant column density window3 [DU]	-2.43 ± 23.98	11277917	30.0	-2.83	-521	391	-17.5	12.5
sulfurdioxide slant column density window3 precision [DU]	27.6 ± 11.6	11277917	9.33	24.6	9.73	228	21.1	30.5
sulfurdioxide slant column density corrected win3 [DU]	2.72 ± 23.13	11277917	28.9	2.57	-522	396	-11.7	17.2
background so2 slant column offset window3 [DU]	5.15 ± 5.52	11277917	9.38	4.47	-14.6	20.8	0.615	10.00
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	11277917	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.253 \pm 4.639) \times 10^{-2}$	11277917	1.601×10^{-2}	1.371×10^{-2}	4.569×10^{-4}	2.08	8.472×10^{-3}	2.448×10^{-2}
fitted radiance shift [nm]	$(-1.658 \pm 22.499) \times 10^{-4}$	11277917	1.600×10^{-3}	-1.489×10^{-4}	-4.154×10^{-2}	5.454×10^{-2}	-9.895×10^{-4}	6.109×10^{-4}
fitted radiance squeeze [1]	$(-1.448 \pm 18.081) \times 10^{-5}$	11277917	2.065×10^{-4}	-1.087×10^{-5}	-1.666×10^{-2}	1.457×10^{-2}	-1.157×10^{-4}	9.083×10^{-5}
fitted root mean square [1]	$(1.305 \pm 0.521) \times 10^{-3}$	11277917	5.852×10^{-4}	1.161×10^{-3}	3.400×10^{-4}	6.673×10^{-2}	9.559×10^{-4}	1.541×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.860 ± 0.422	11277917	0.500	0.819	5.000×10^{-2}	2.39	0.570	1.07
sulfurdioxide total air mass factor polluted precision [1]	0.100 ± 0.112	11277917	8.210×10^{-2}	6.192×10^{-2}	2.954×10^{-3}	2.06	3.938×10^{-2}	0.121
sulfurdioxide clear air mass factor polluted [1]	0.769 ± 0.321	11277917	0.372	0.754	8.012×10^{-2}	2.37	0.555	0.927
number of spectral points in retrieval [1]	73.4 ± 0.5	11277917	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]	0.618 ± 0.426	4224962	0.850	1.000	0.0	1.000	0.150	1.000
sulfurdioxide total vertical column [DU]	$(3.069 \pm 88.992) \times 10^{-2}$	4224962	0.434	9.439×10^{-3}	-61.1	137	-0.203	0.231
sulfurdioxide total vertical column precision [DU]	0.475 ± 0.550	4224962	0.329	0.329	4.325×10^{-2}	45.6	0.208	0.537
sulfurdioxide slant column density corrected [DU]	$(2.658 \pm 61.245) \times 10^{-2}$	4224962	0.365	8.817×10^{-3}	-30.6	140	-0.172	0.193
sulfurdioxide slant column density cobra [DU]	$(2.470 \pm 48.516) \times 10^{-2}$	4224962	0.365	8.817×10^{-3}	-30.6	88.5	-0.172	0.193
sulfurdioxide slant column density cobra precision [DU]	0.287 ± 0.121	4224962	0.106	0.254	9.436×10^{-2}	32.7	0.214	0.320
sulfurdioxide slant column density window1 [DU]	0.135 ± 0.755	4224962	0.715	0.124	-267	144	-0.233	0.481
sulfurdioxide slant column density window1 precision [DU]	0.287 ± 0.121	4224962	0.106	0.254	9.436×10^{-2}	32.7	0.214	0.320
sulfurdioxide slant column density corrected win1 [DU]	$(3.208 \pm 75.078) \times 10^{-2}$	4224962	0.705	8.037×10^{-3}	-267	144	-0.339	0.366
background so2 slant column offset window1 [DU]	-0.103 ± 0.121	4224962	0.135	-0.123	-0.907	3.25	-0.180	-4.503×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.816 ± 9.142	4224962	11.4	0.834	-1.264×10^{3}	1.030×10^{3}	-4.87	6.50
sulfurdioxide slant column density window2 precision [DU]	8.23 ± 2.69	4224962	2.74	7.83	2.49	615	6.60	9.34
sulfurdioxide slant column density corrected win2 [DU]	-0.662 ± 8.953	4224962	11.0	-0.666	-1.264×10^{3}	1.030×10^{3}	-6.17	4.83
background so2 slant column offset window2 [DU]	-1.48 ± 2.20	4224962	3.06	-0.882	-11.5	4.94	-2.85	0.212
sulfurdioxide slant column density window3 [DU]	-10.2 ± 23.3	4224962	28.3	-9.80	-1.560×10^{3}	705	-24.1	4.21
sulfurdioxide slant column density window3 precision [DU]	31.3 ± 17.5	4224962	12.9	26.1	9.29	1.581×10^{3}	21.4	34.2
sulfurdioxide slant column density corrected win3 [DU]	-4.68 ± 23.49	4224962	28.7	-3.81	-1.562×10^{3}	711	-18.6	10.1
background so2 slant column offset window3 [DU]	5.49 ± 5.47	4224962	9.31	5.56	-14.6	20.8	0.918	10.2
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.13	4224962	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.827 \pm 12.081) \times 10^{-2}$	4224962	4.809×10^{-2}	2.059×10^{-2}	2.483×10^{-4}	2.67	7.039×10^{-3}	5.513×10^{-2}
fitted radiance shift [nm]	$(-2.431 \pm 336.981) \times 10^{-5}$	4224962	1.858×10^{-3}	-3.604×10^{-5}	-6.224×10^{-2}	4.404×10^{-2}	-9.944×10^{-4}	8.633×10^{-4}
fitted radiance squeeze [1]	$(-2.957 \pm 17.495) \times 10^{-5}$	4224962	2.044×10^{-4}	-2.712×10^{-5}	-1.513×10^{-2}	2.009×10^{-2}	-1.302×10^{-4}	7.425×10^{-5}
fitted root mean square [1]	$(1.239 \pm 0.473) \times 10^{-3}$	4224962	4.182×10^{-4}	1.129×10^{-3}	2.941×10^{-4}	0.115	9.611×10^{-4}	1.379×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.929 ± 0.537	4224962	0.667	0.774	5.000×10^{-2}	3.11	0.545	1.21
sulfurdioxide total air mass factor polluted precision [1]	0.145 ± 0.156	4224962	0.164	9.289×10^{-2}	3.504×10^{-3}	1.69	3.528×10^{-2}	0.199
sulfurdioxide clear air mass factor polluted [1]	0.708 ± 0.320	4224962	0.374	0.653	7.643×10^{-2}	2.66	0.483	0.857
number of spectral points in retrieval [1]	73.4 ± 0.6	4224962	1.000	73.0	52.0	156	73.0	74.0

3 Granule outlines

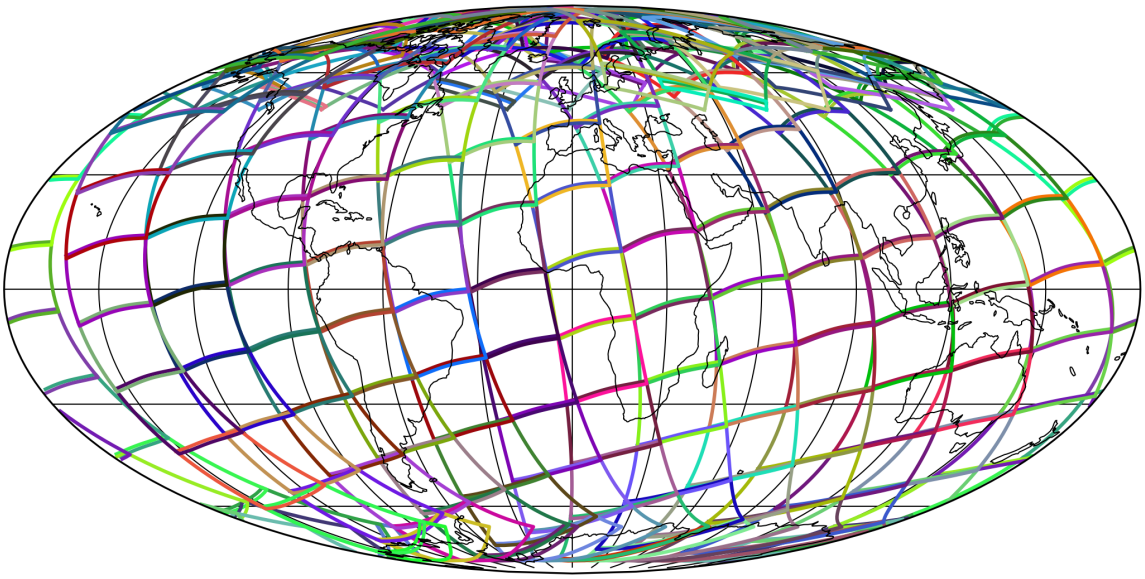


Figure 1: Outline of the granules.

4 Input data monitoring

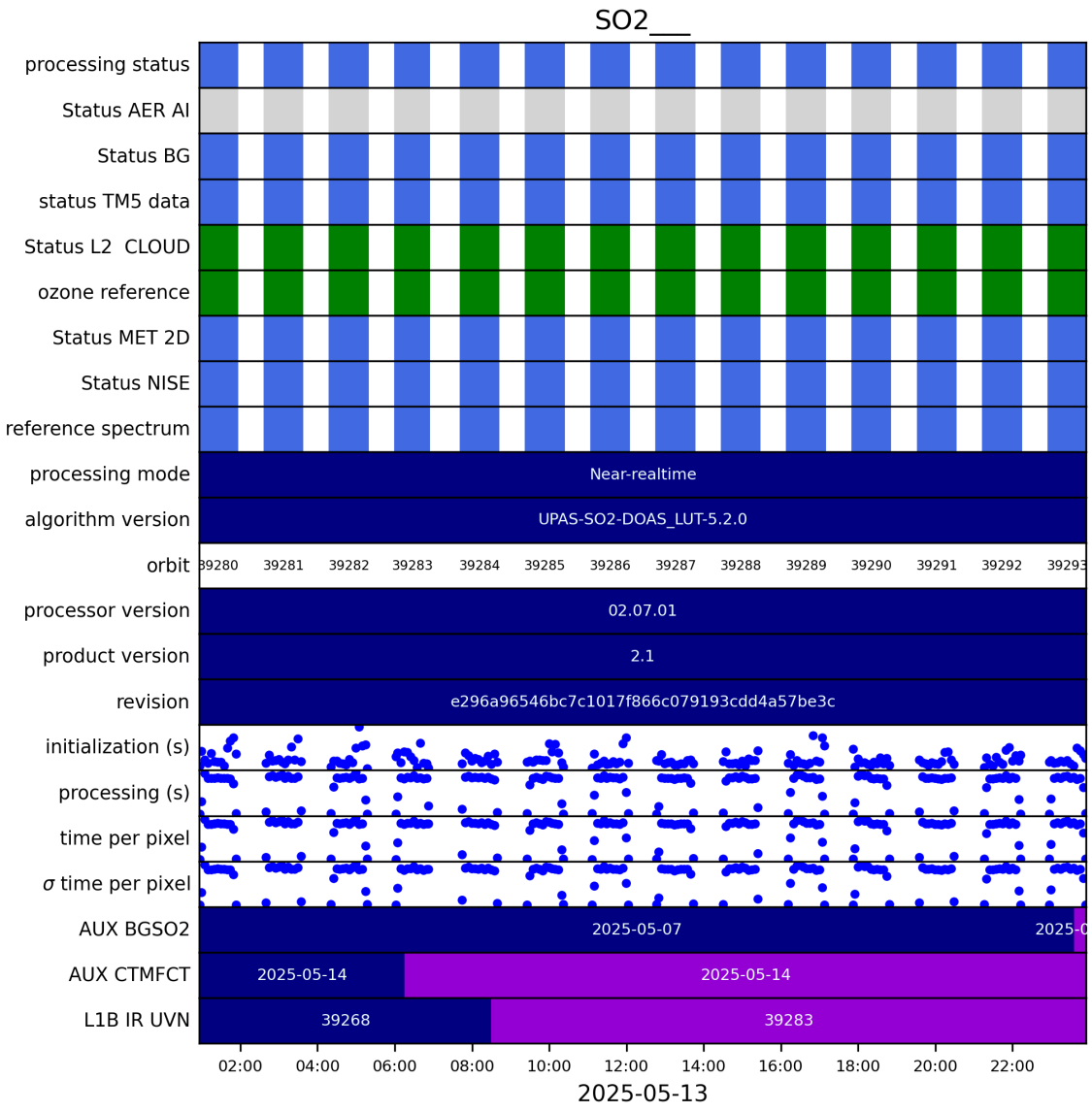


Figure 2: Input data per granule

5 Warnings and errors

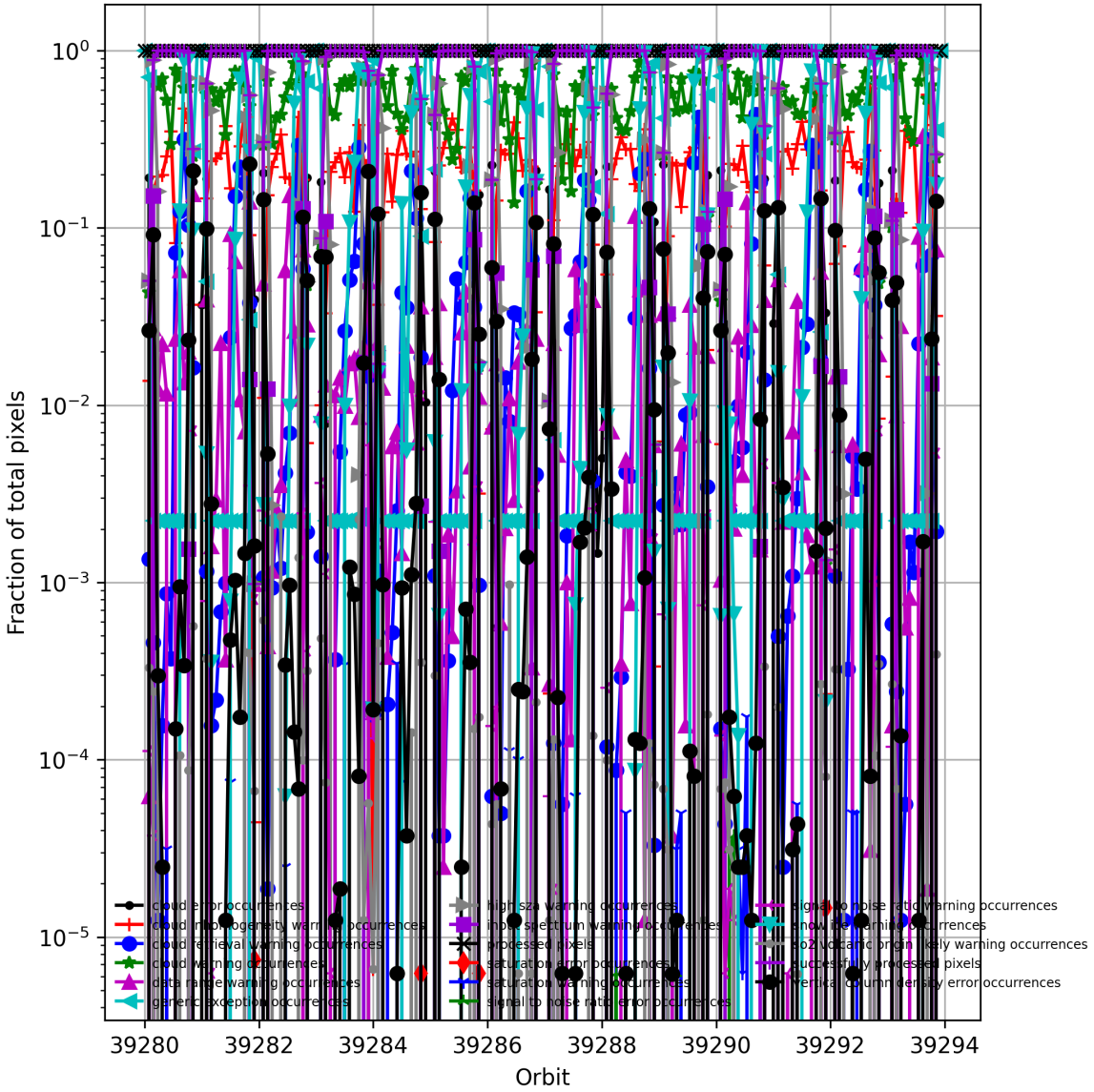


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

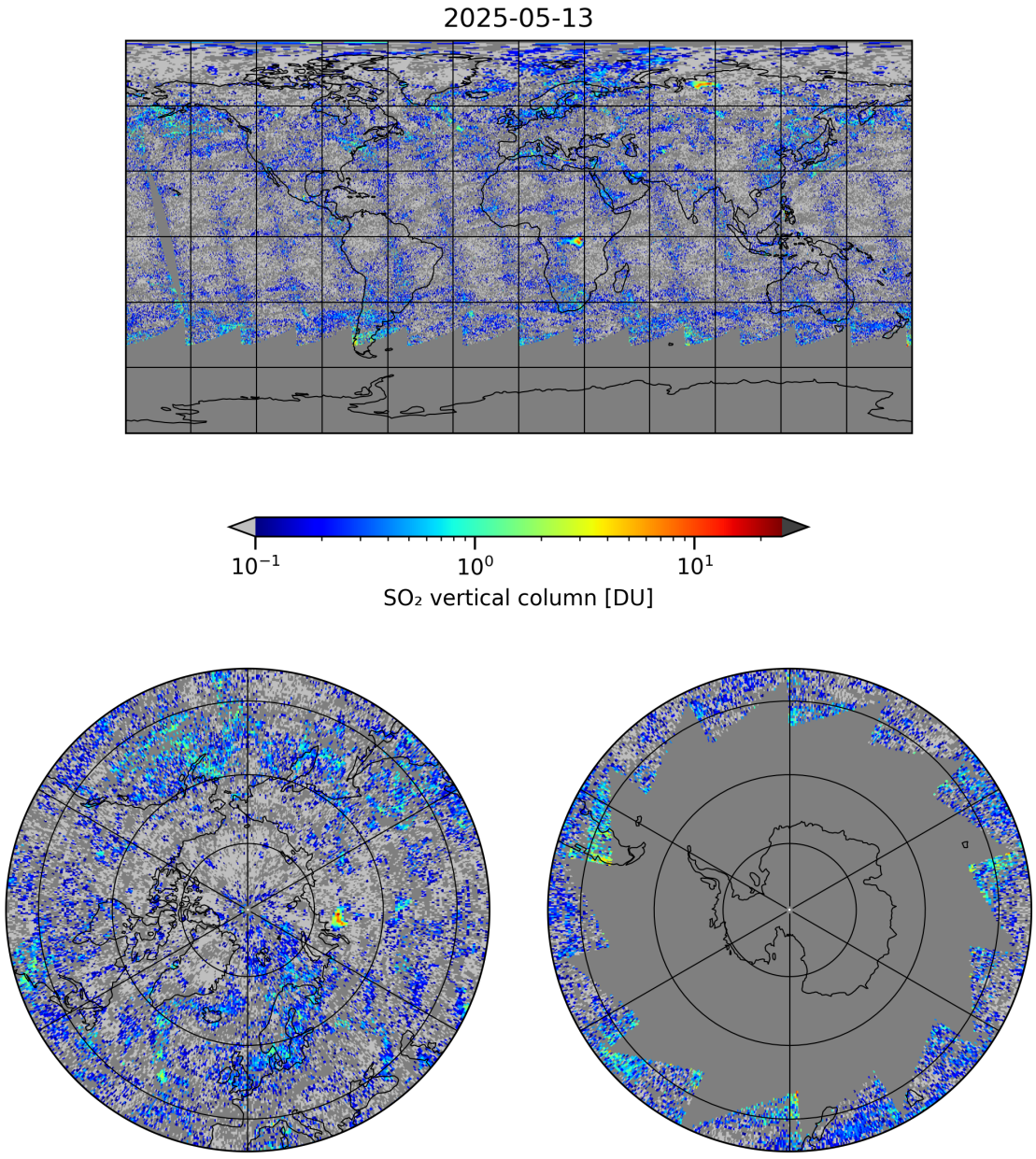


Figure 4: Map of "SO_2 vertical column" for 2025-05-13 to 2025-05-13

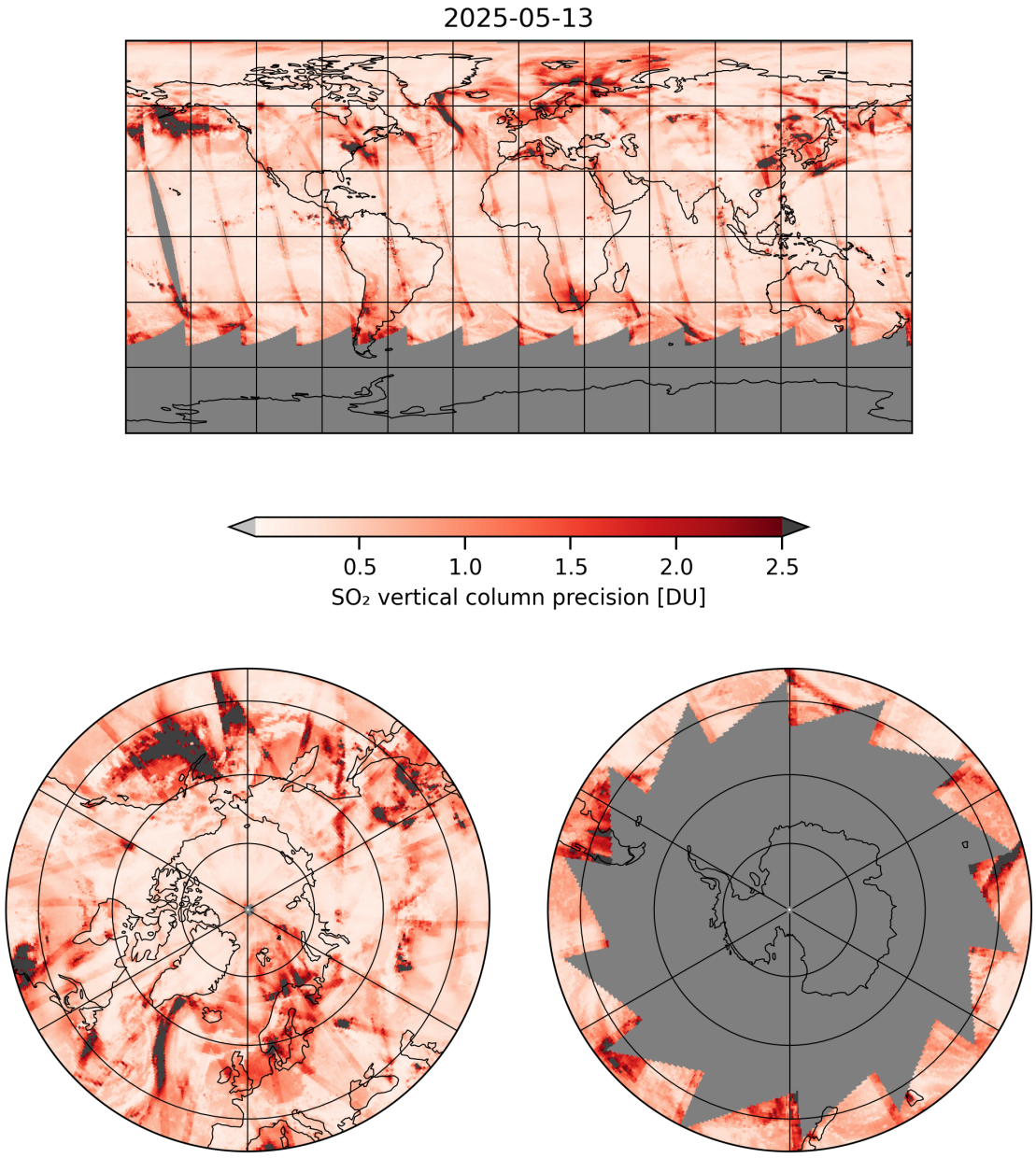


Figure 5: Map of "SO_2 vertical column precision" for 2025-05-13 to 2025-05-13

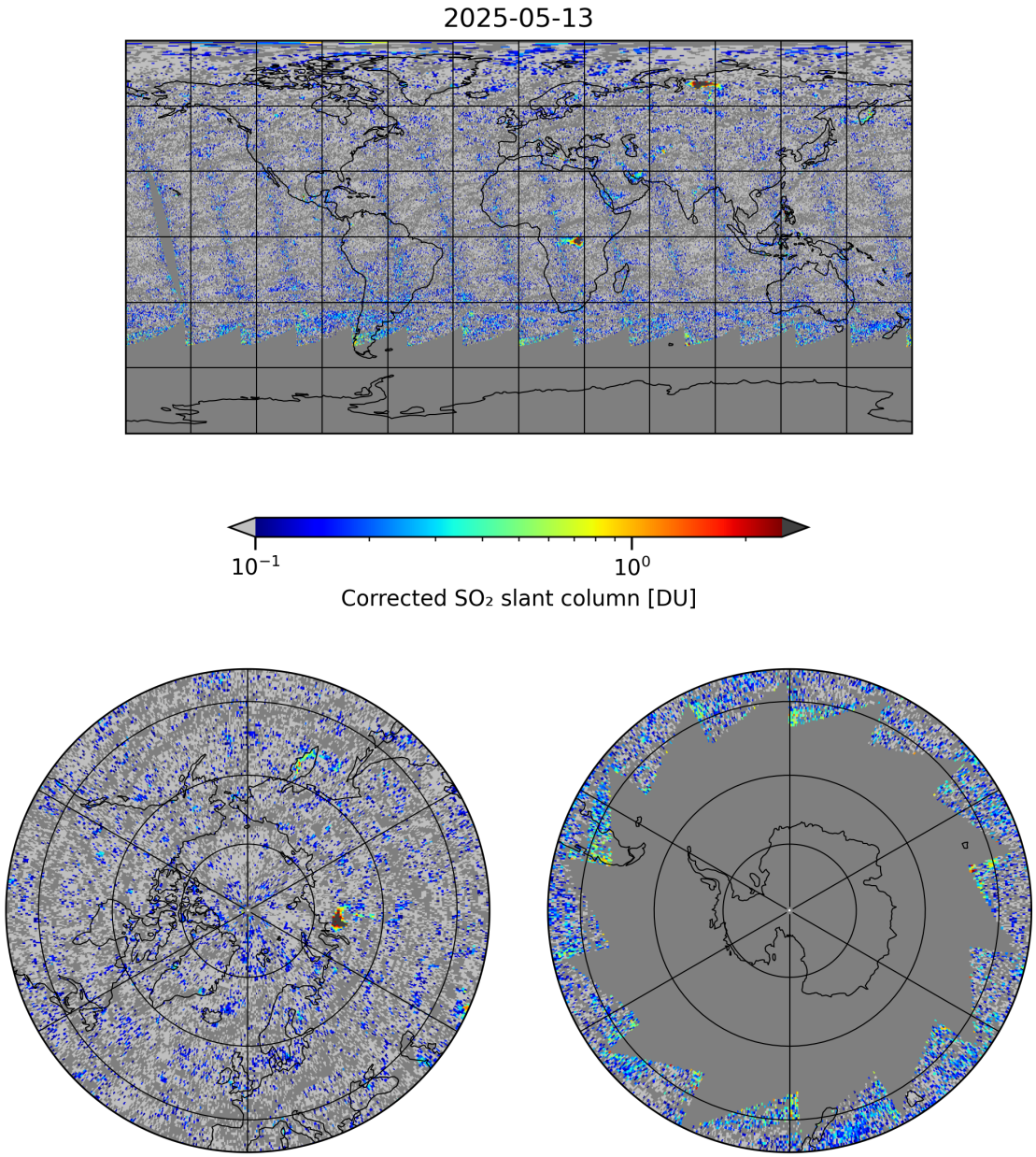


Figure 6: Map of “Corrected SO_2 slant column” for 2025-05-13 to 2025-05-13

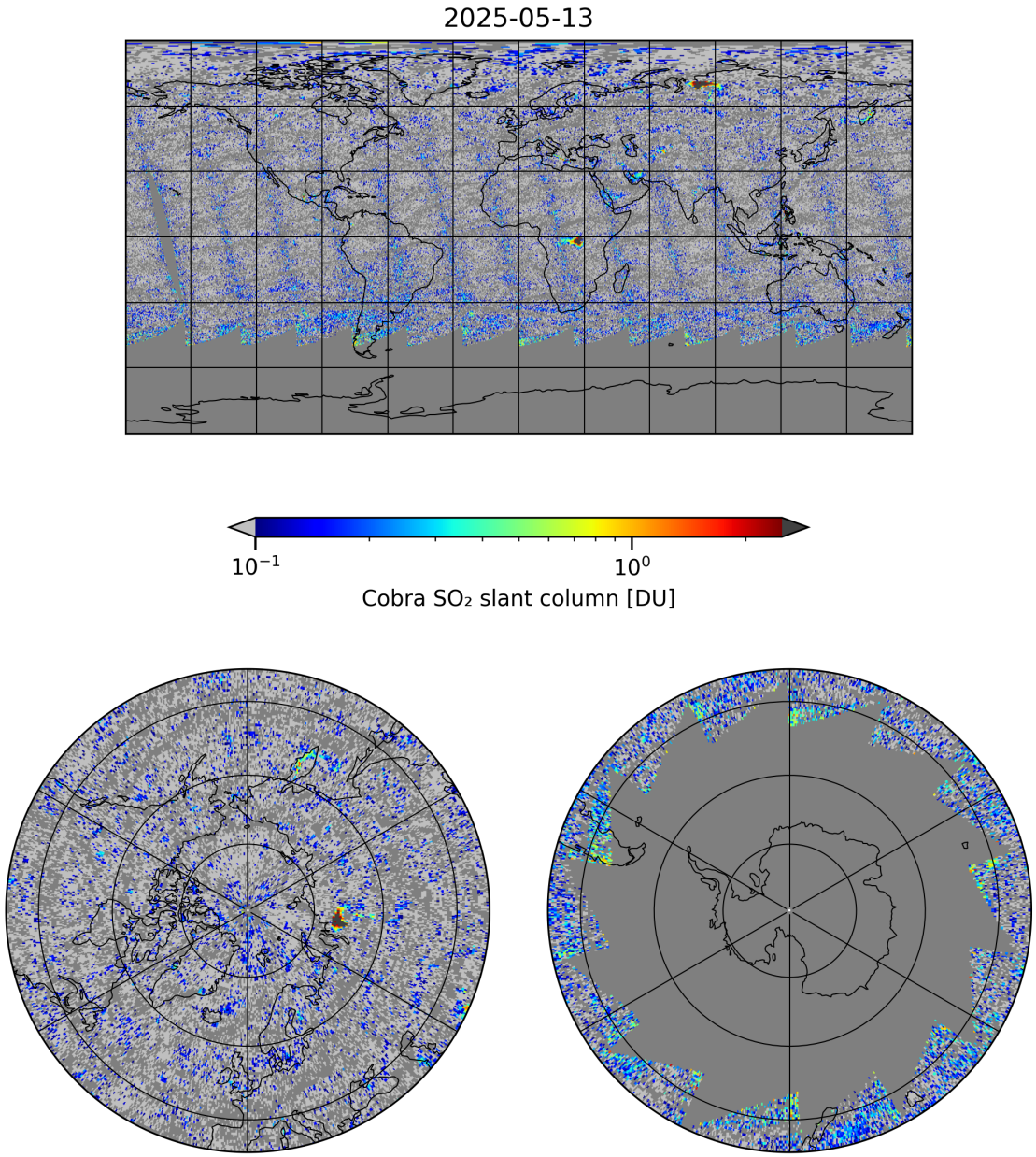


Figure 7: Map of “Cobra SO_2 slant column” for 2025-05-13 to 2025-05-13

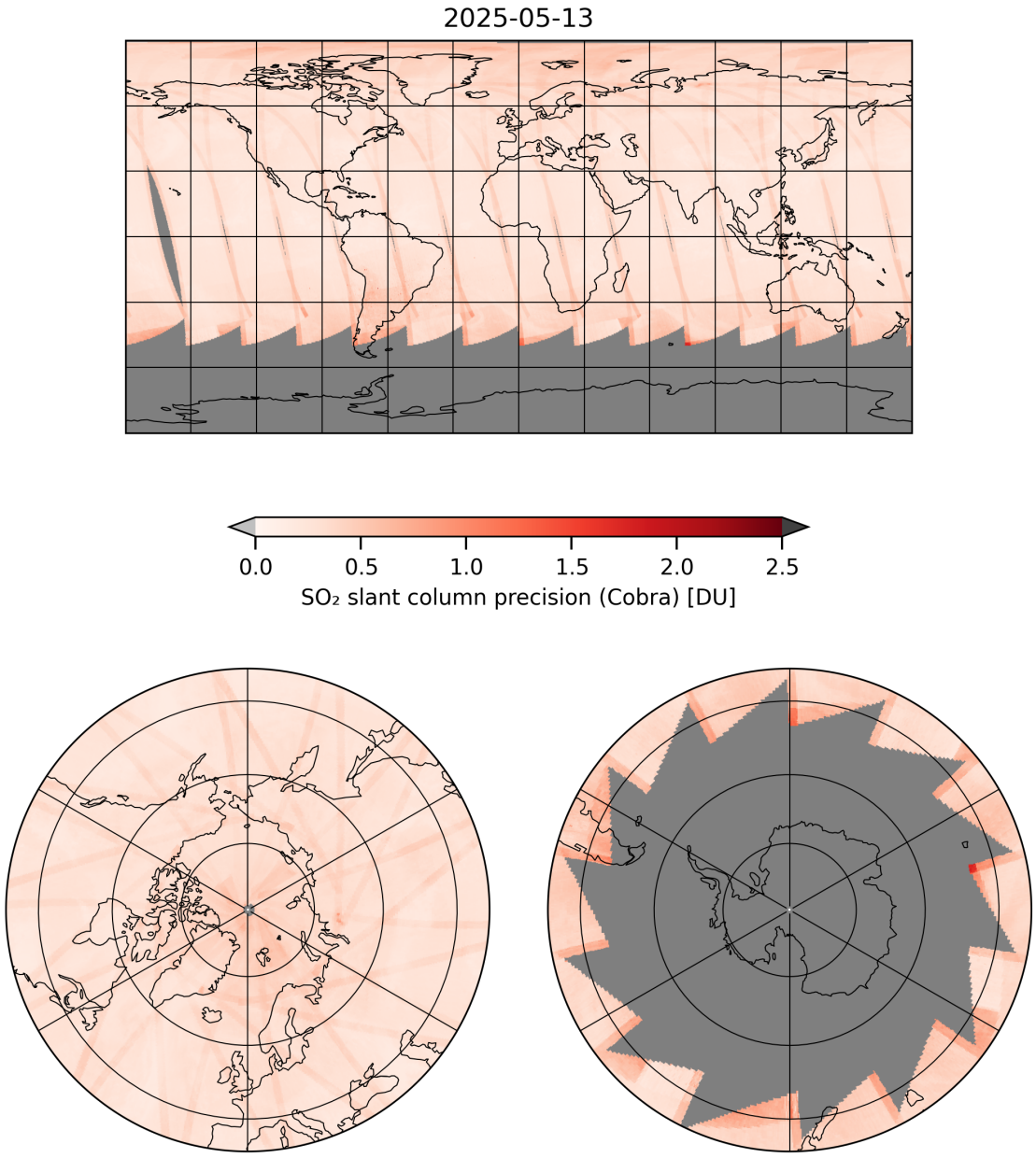


Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-05-13 to 2025-05-13

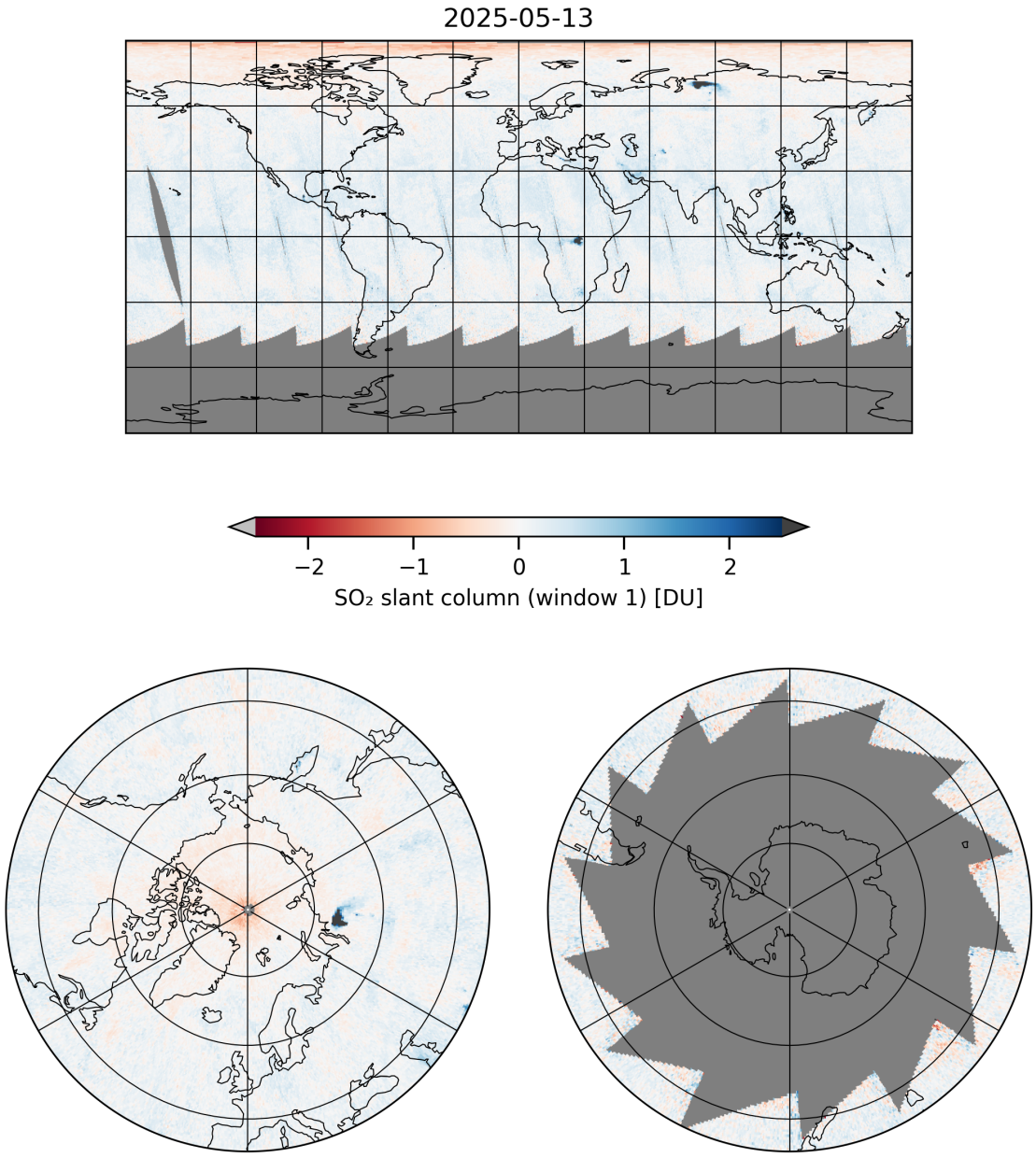


Figure 9: Map of "SO_2 slant column (window 1)" for 2025-05-13 to 2025-05-13

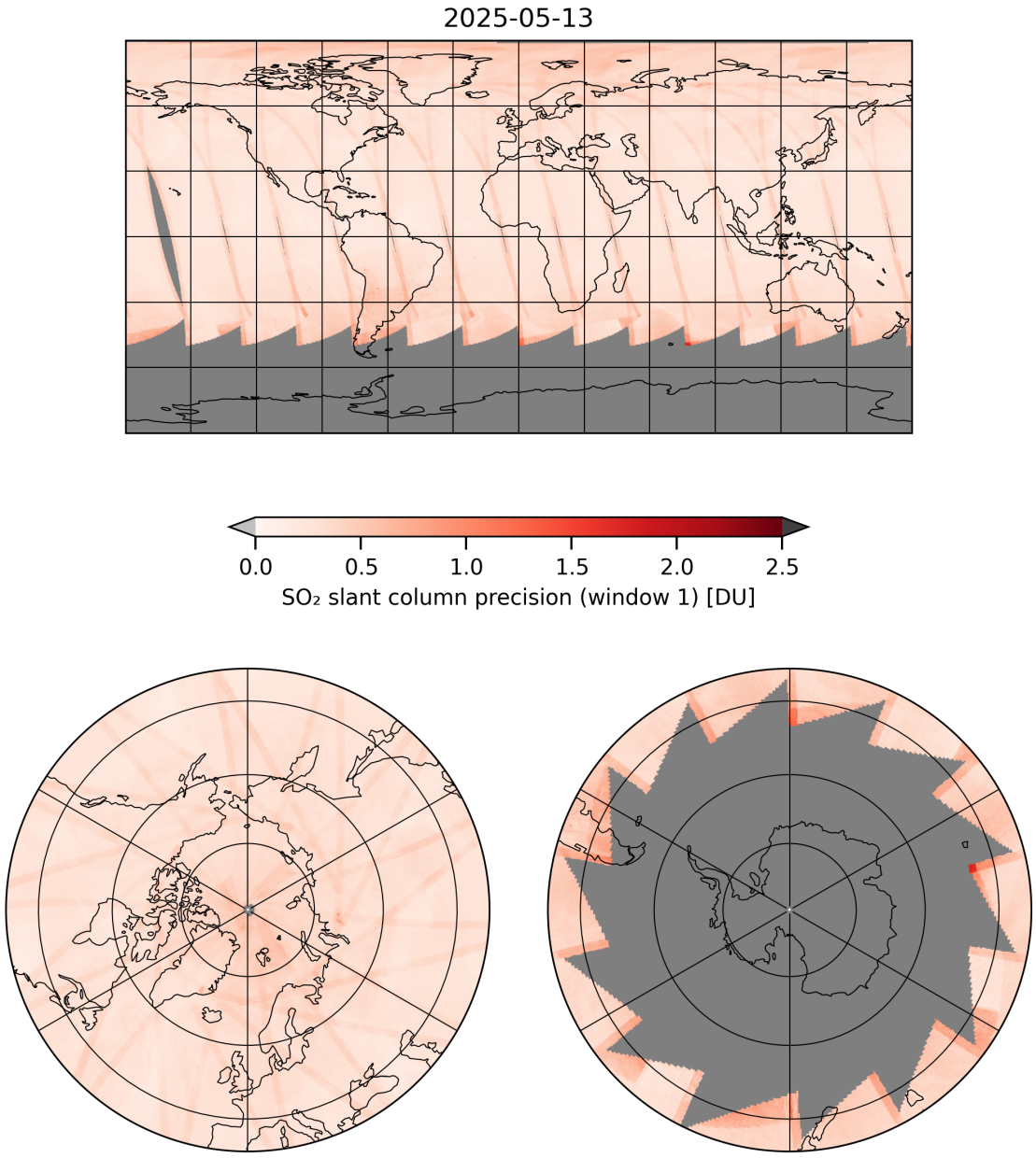


Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-05-13 to 2025-05-13

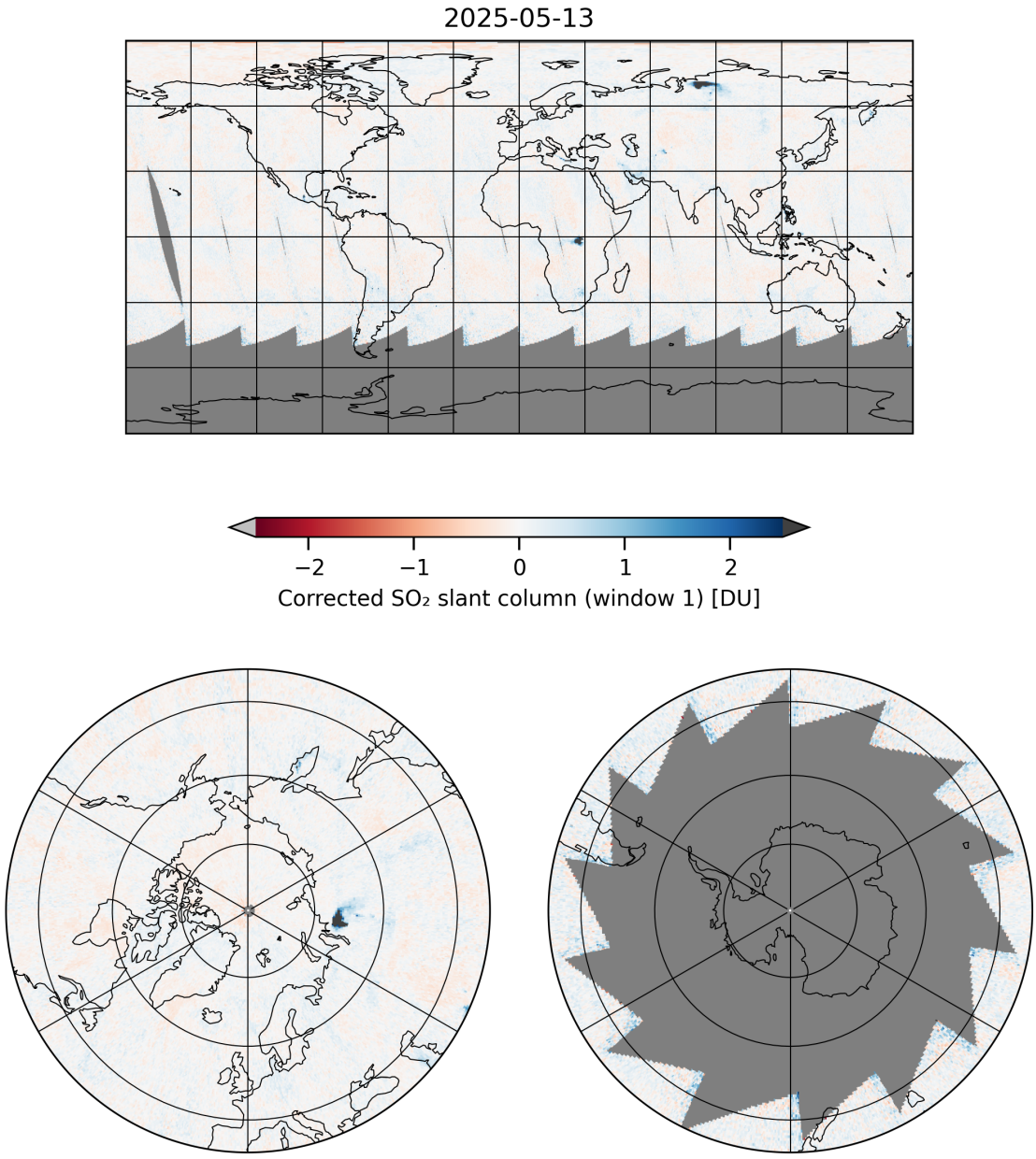


Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-05-13 to 2025-05-13

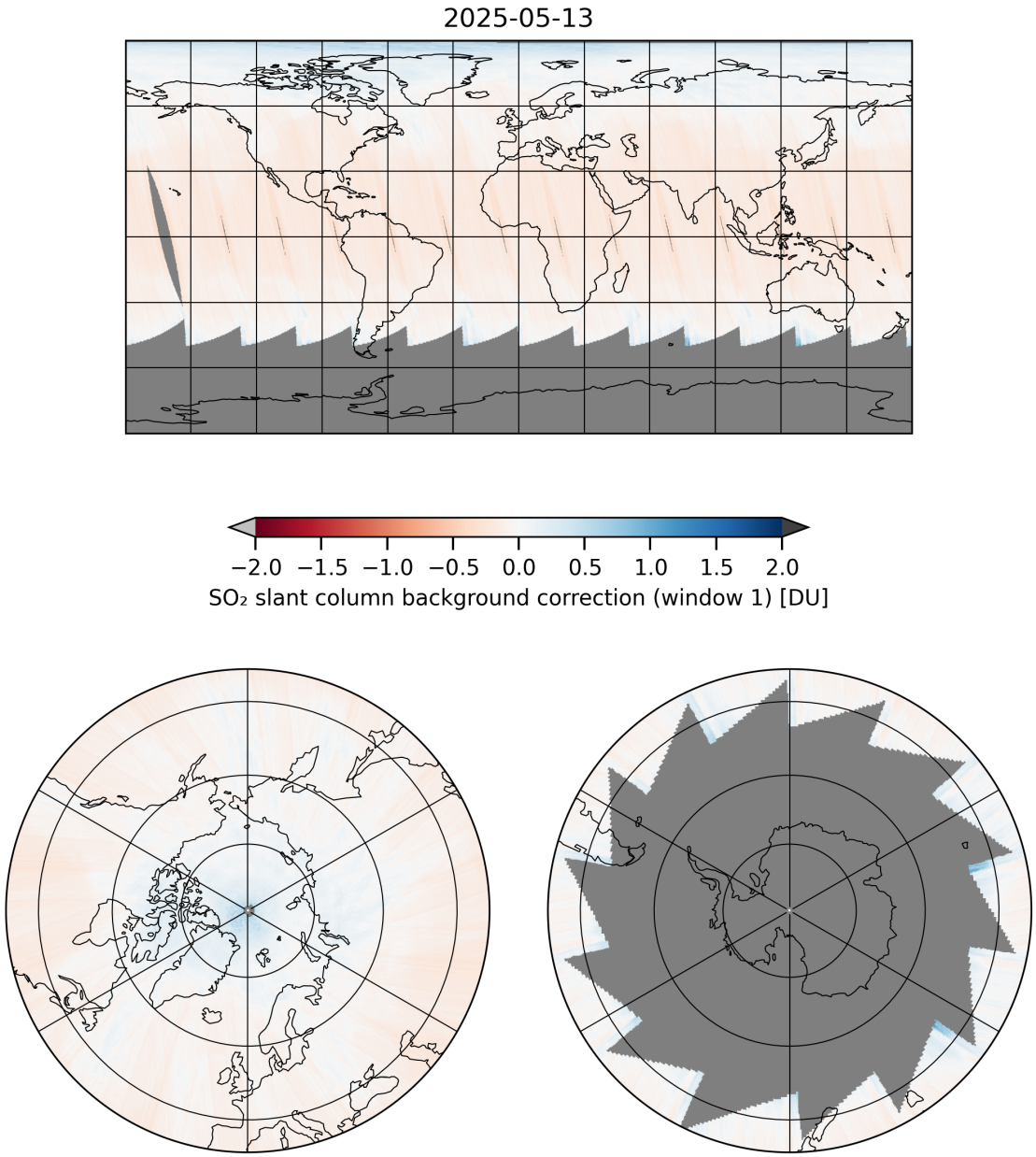


Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-05-13 to 2025-05-13

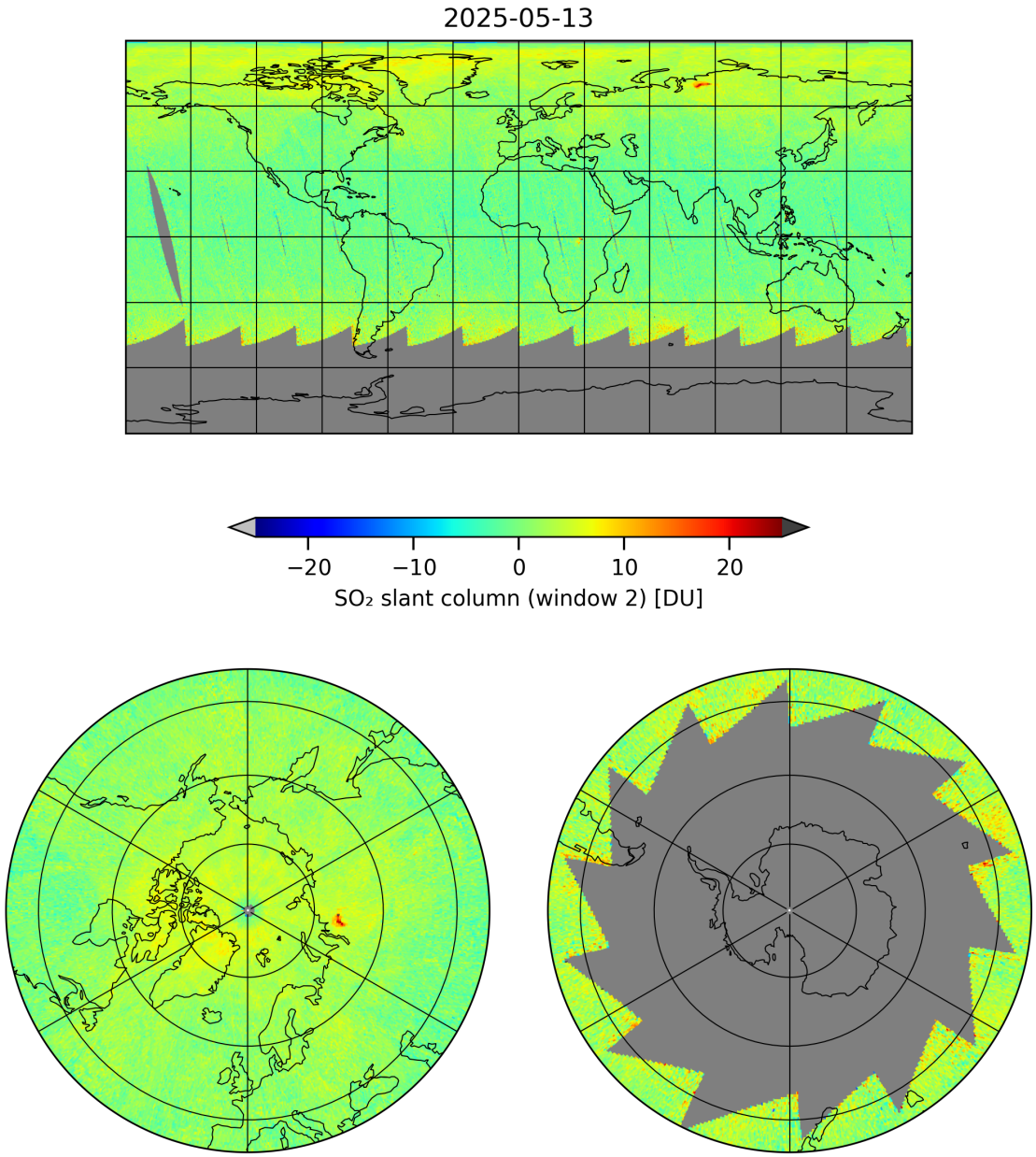


Figure 13: Map of "SO_2 slant column (window 2)" for 2025-05-13 to 2025-05-13

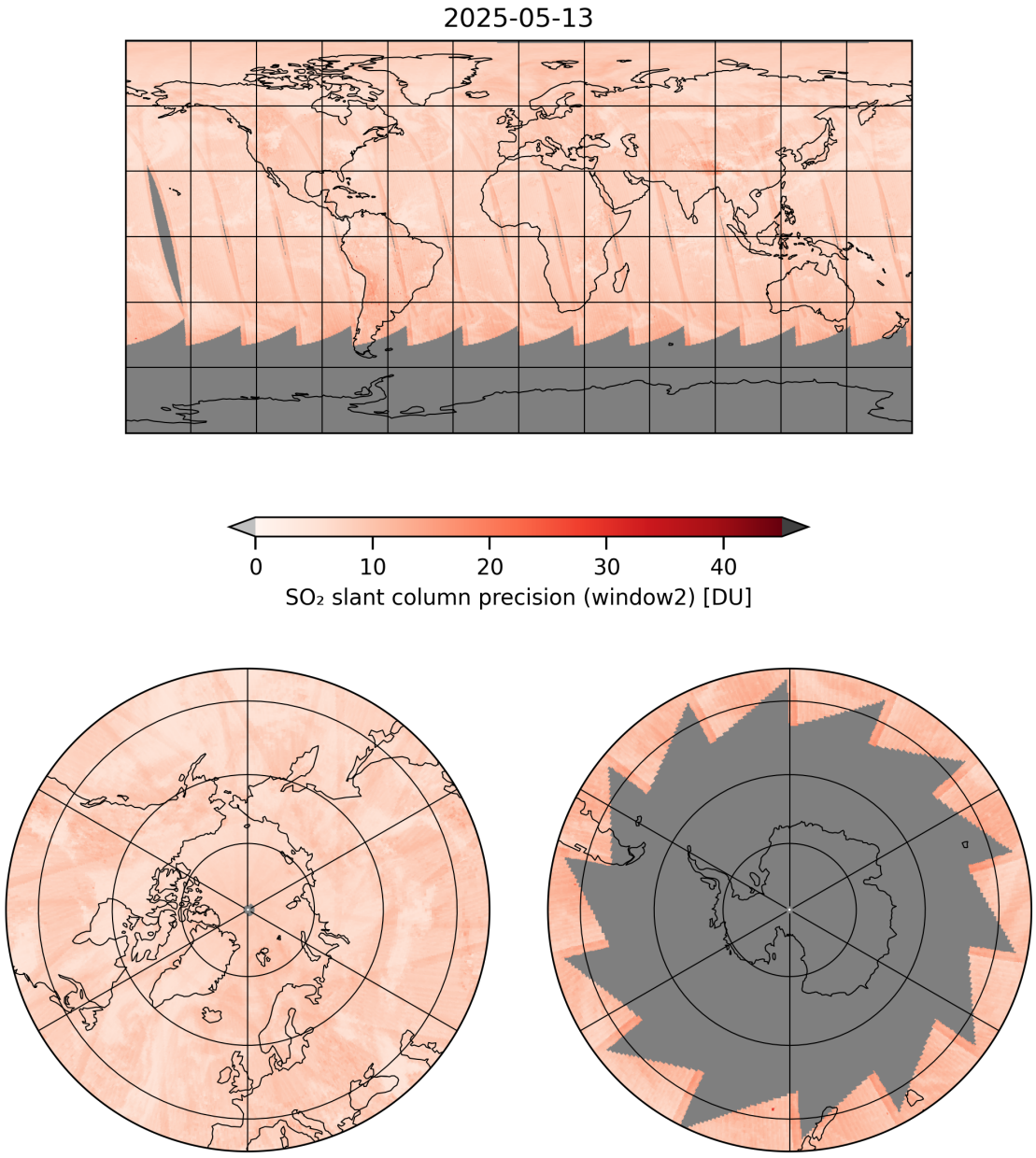


Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-05-13 to 2025-05-13

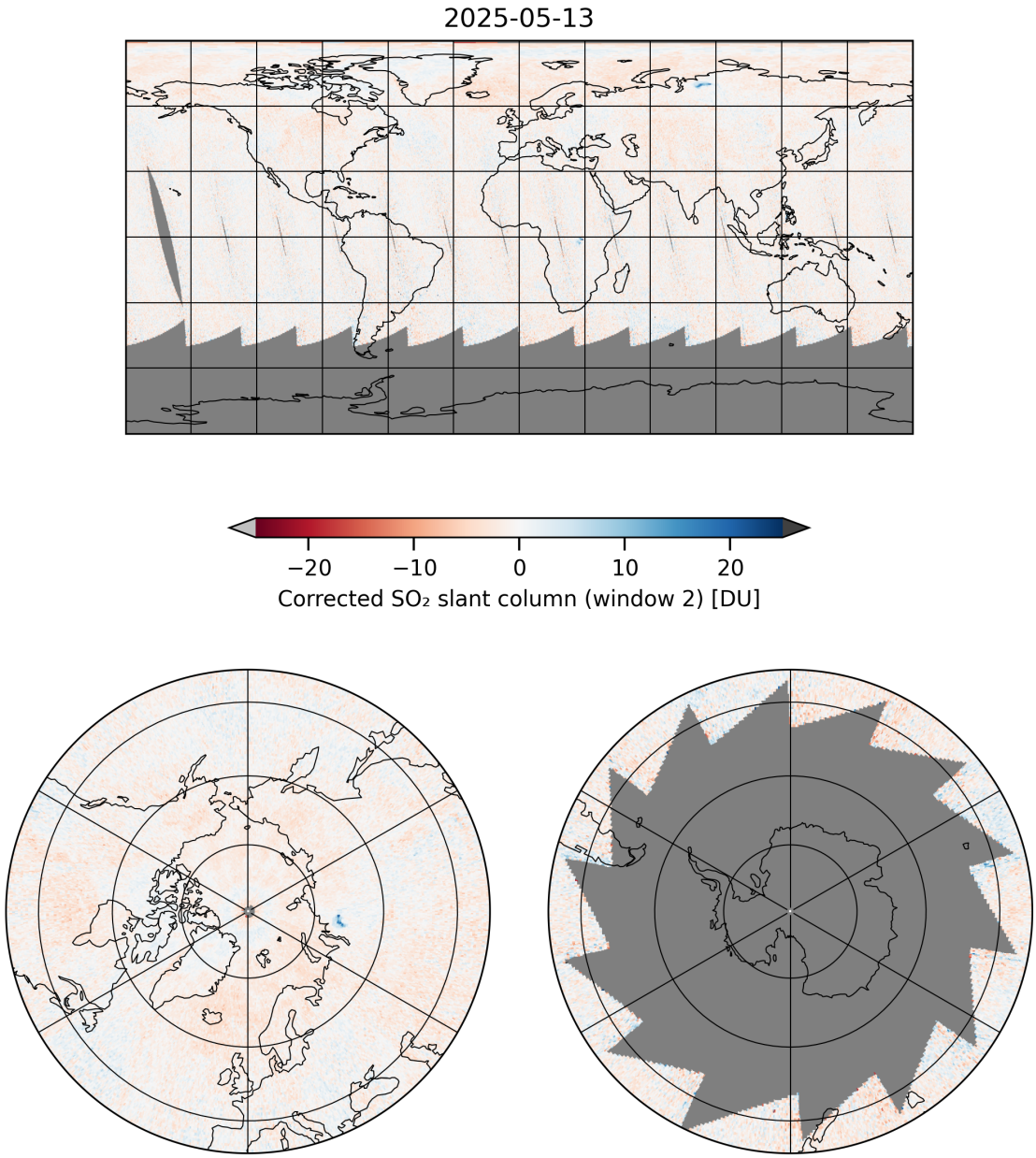


Figure 15: Map of “Corrected SO_2 slant column (window 2)” for 2025-05-13 to 2025-05-13

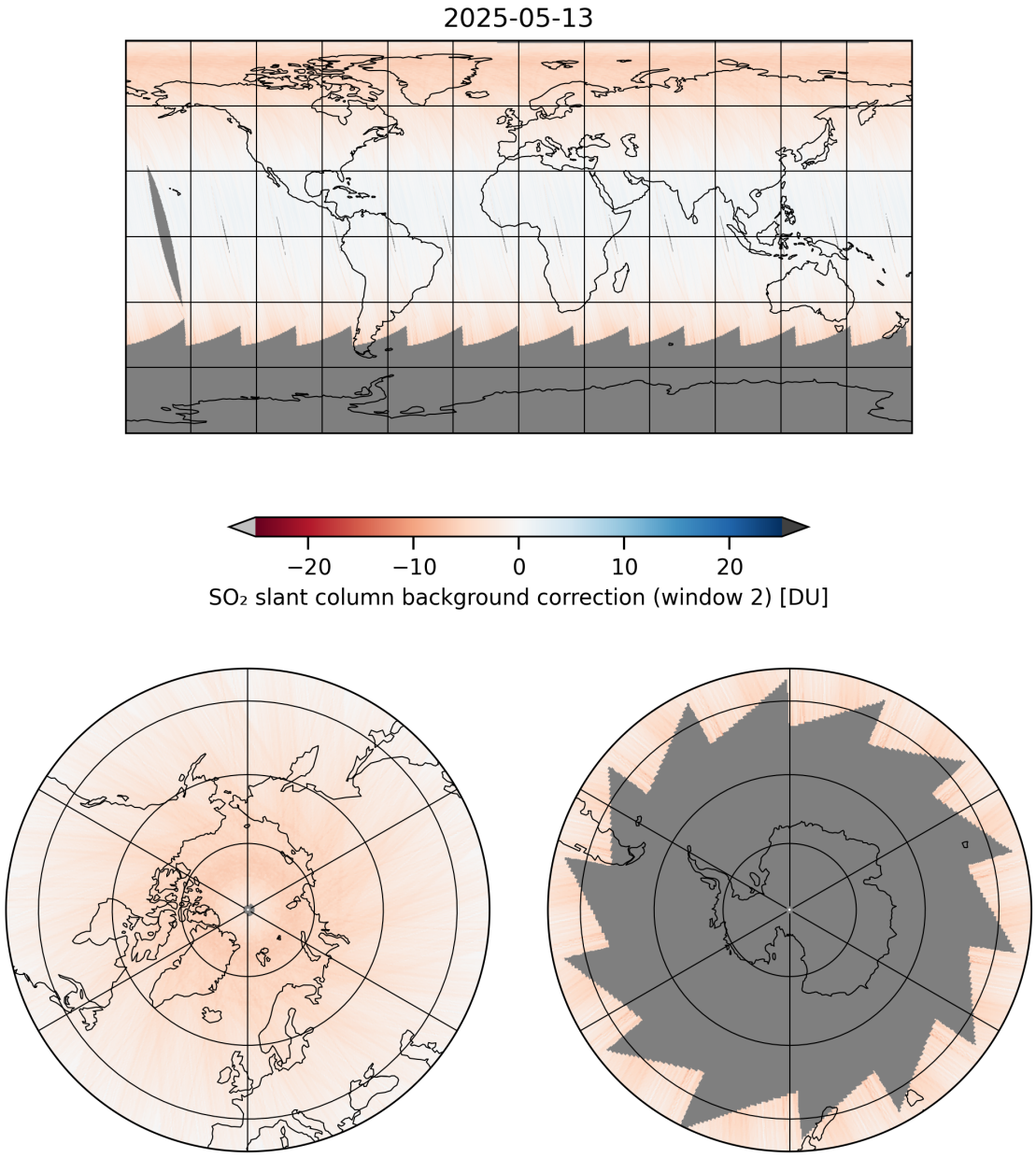


Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-05-13 to 2025-05-13

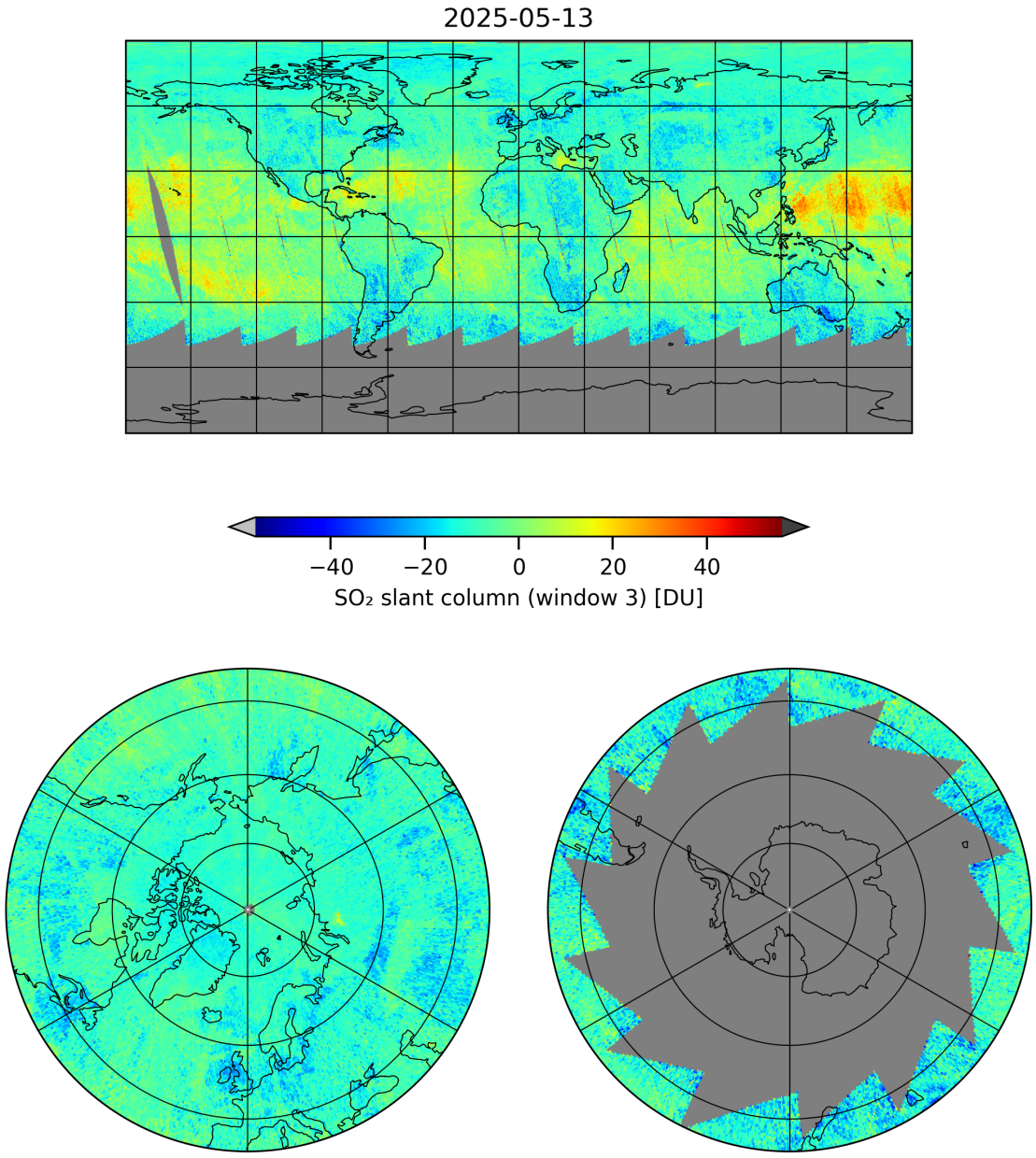


Figure 17: Map of "SO_2 slant column (window 3)" for 2025-05-13 to 2025-05-13

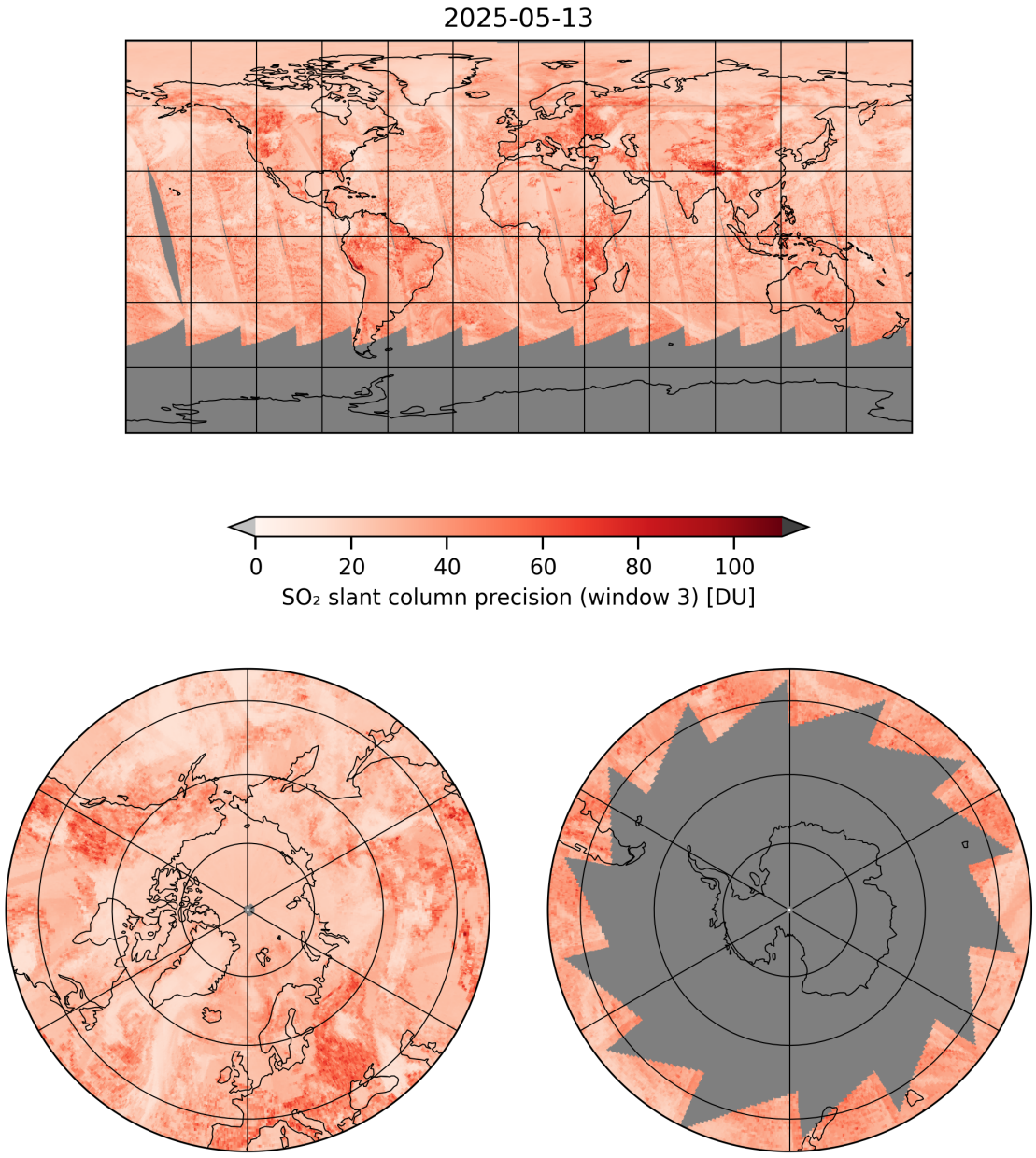


Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-05-13 to 2025-05-13

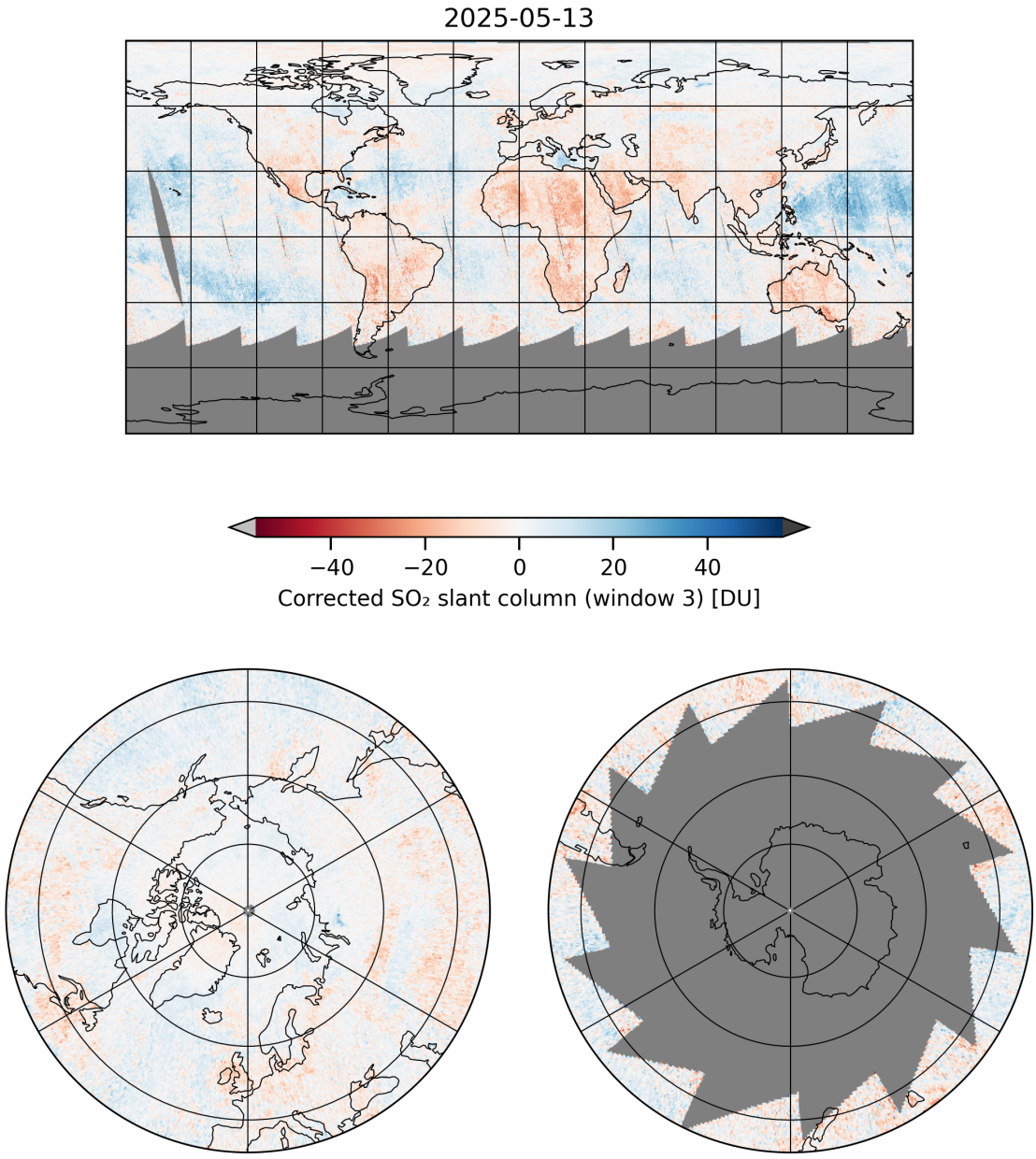


Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-05-13 to 2025-05-13

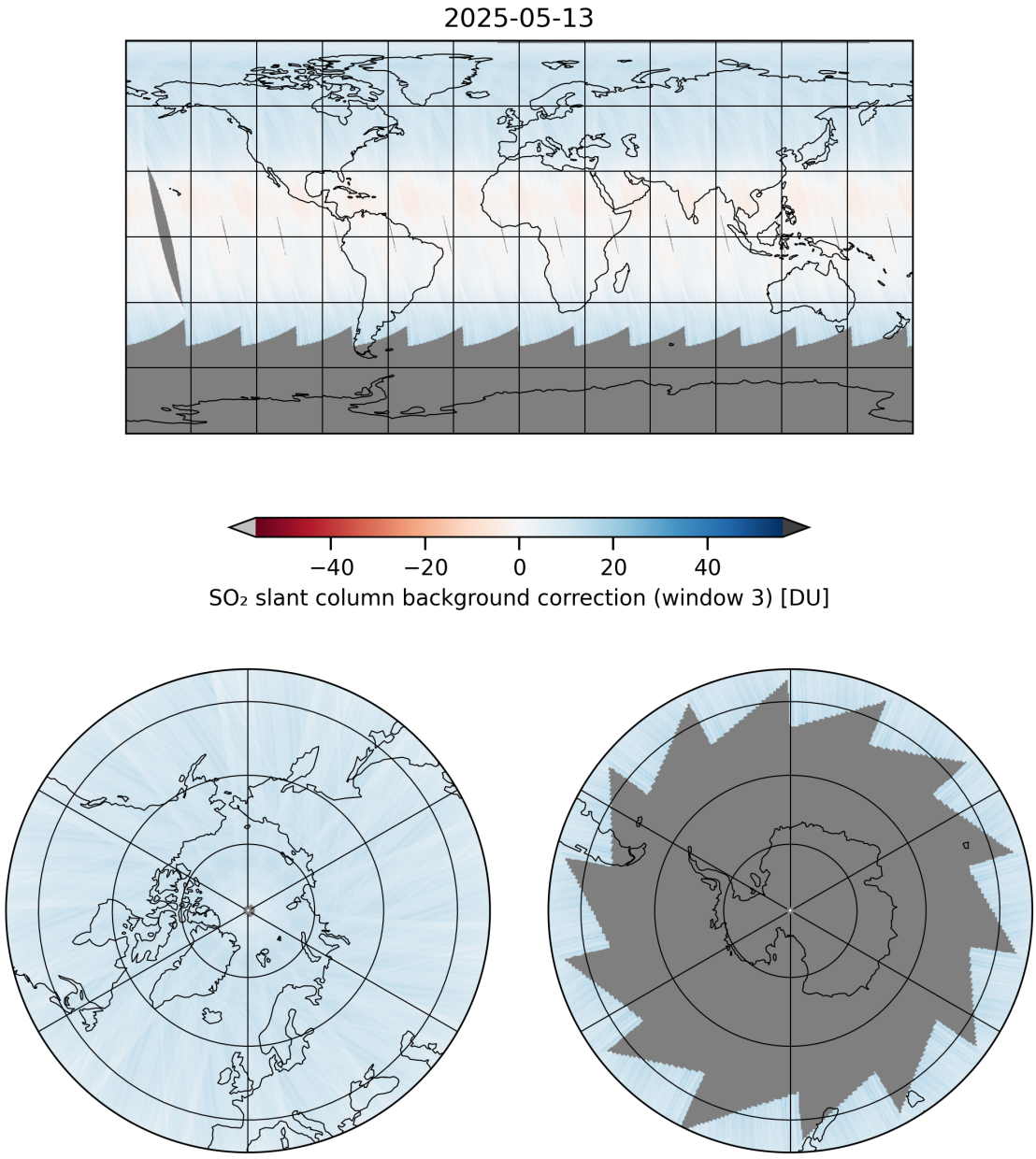


Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-05-13 to 2025-05-13

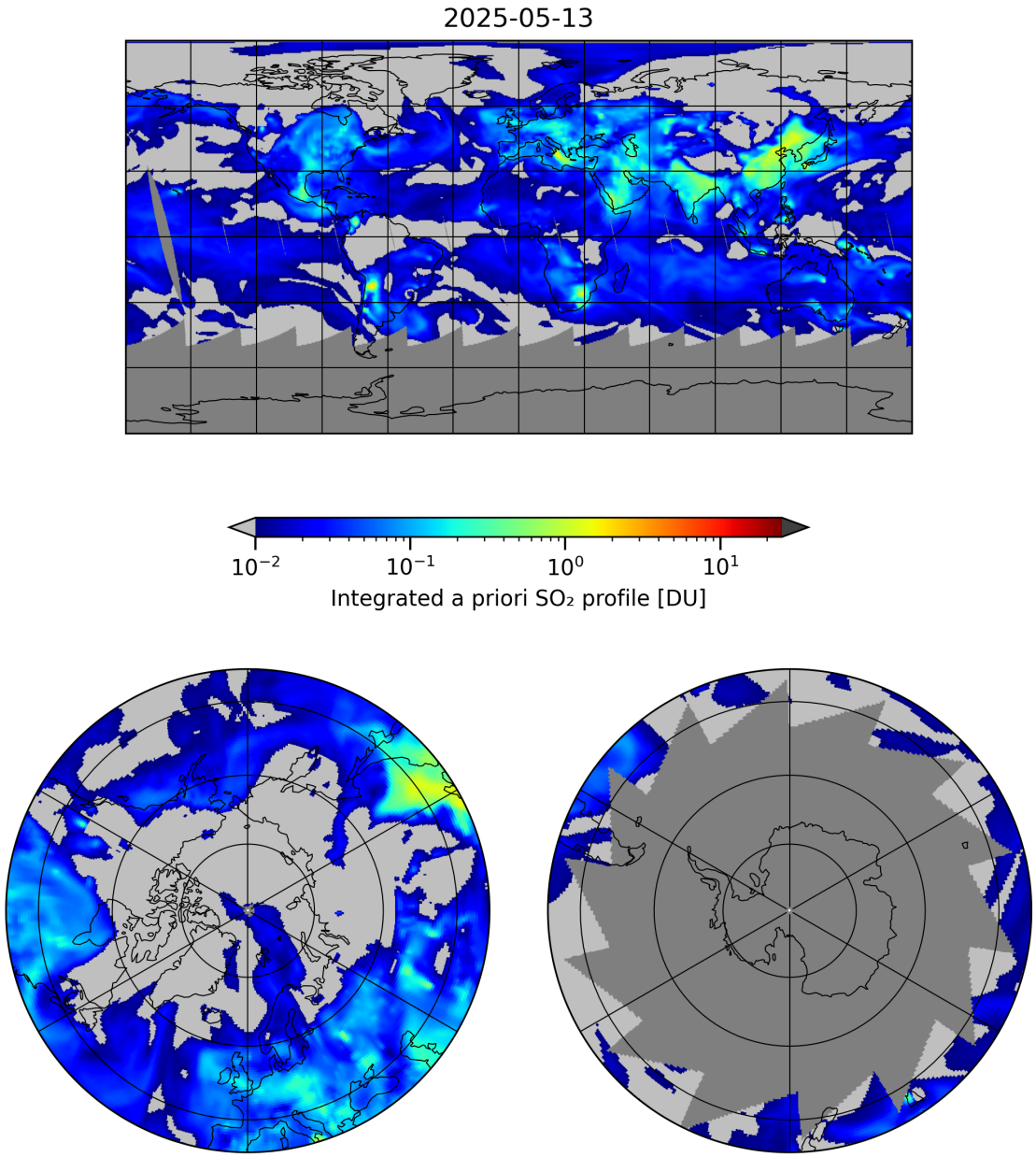


Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-05-13 to 2025-05-13

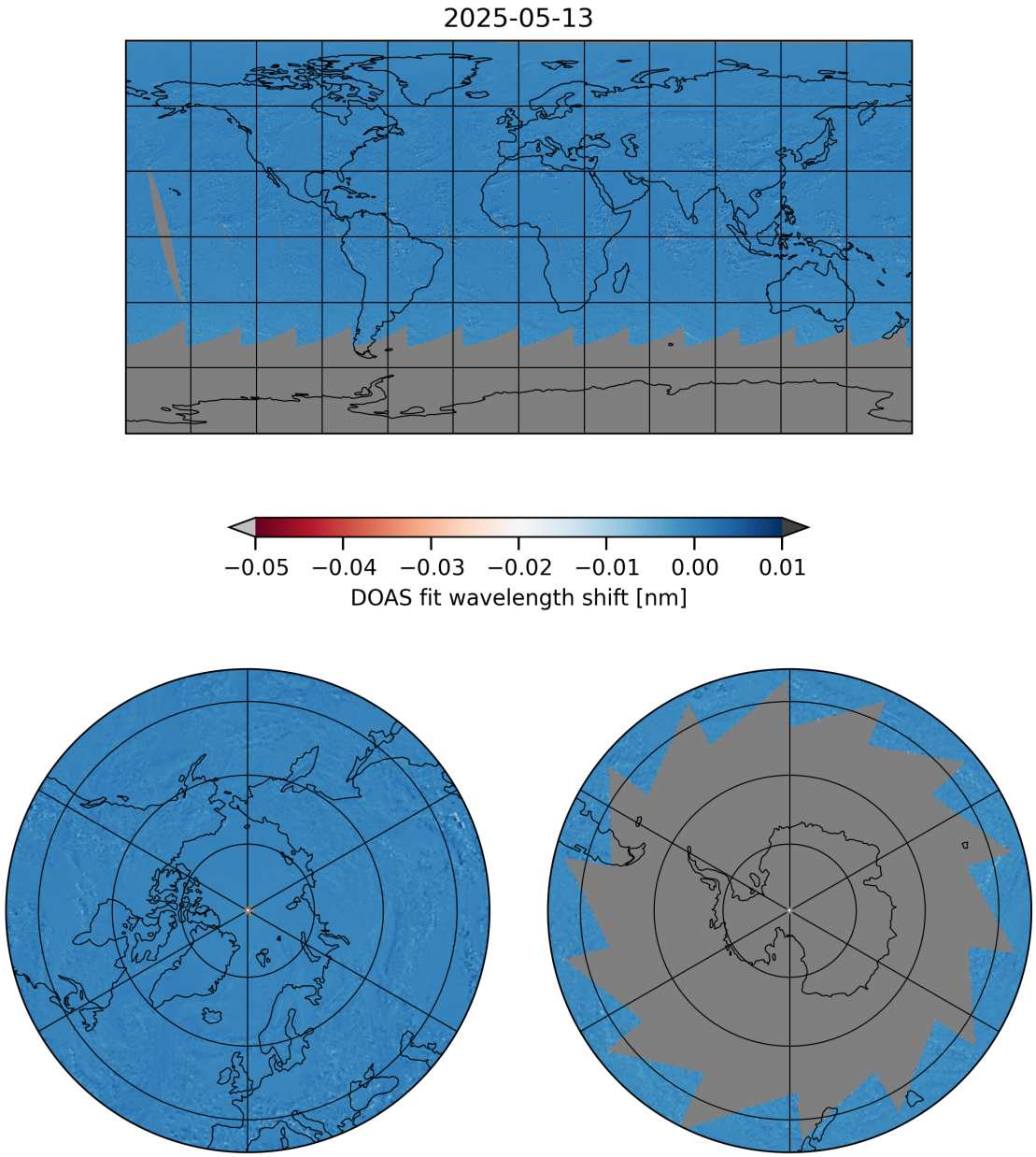


Figure 22: Map of “DOAS fit wavelength shift” for 2025-05-13 to 2025-05-13

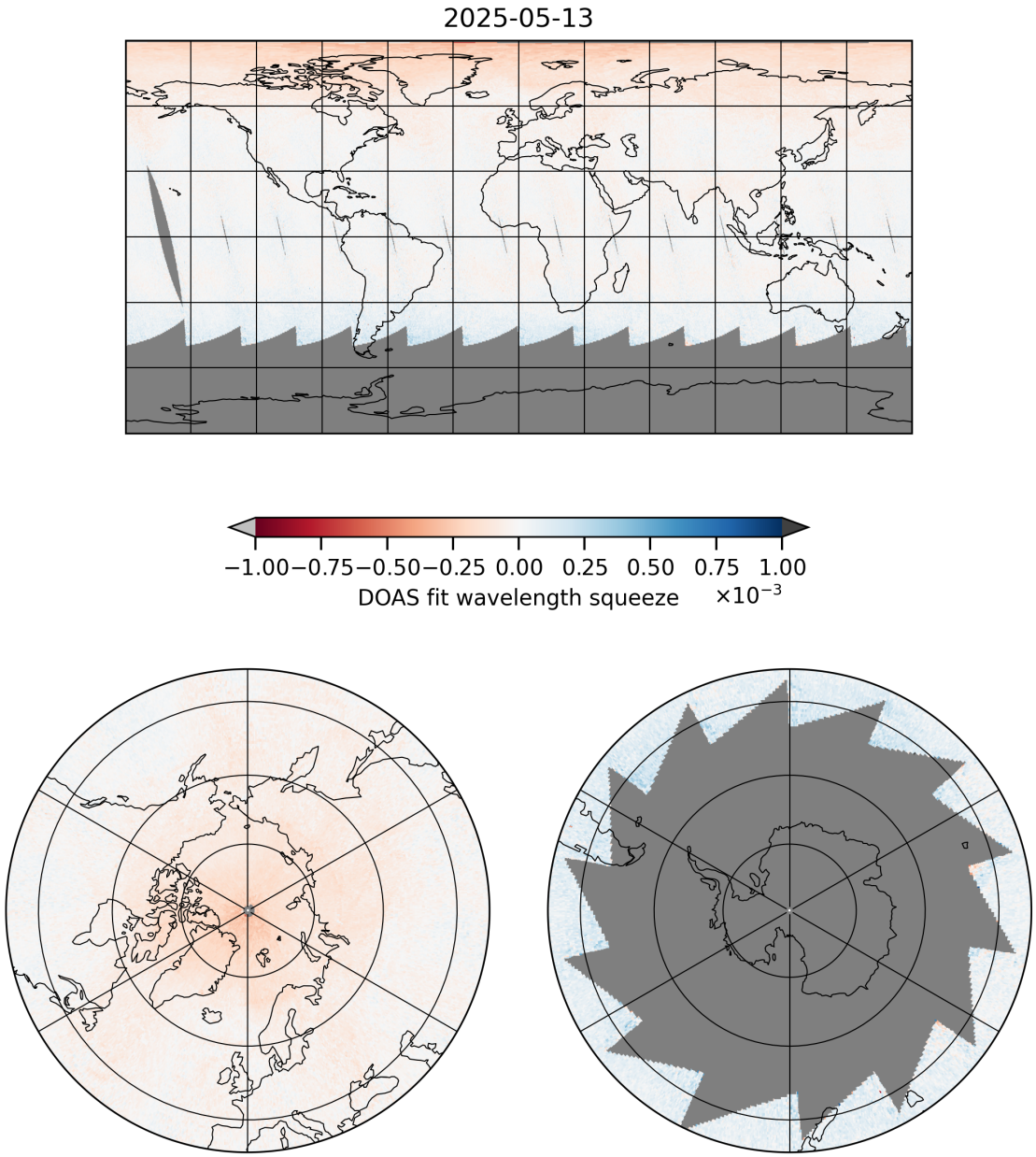


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-05-13 to 2025-05-13

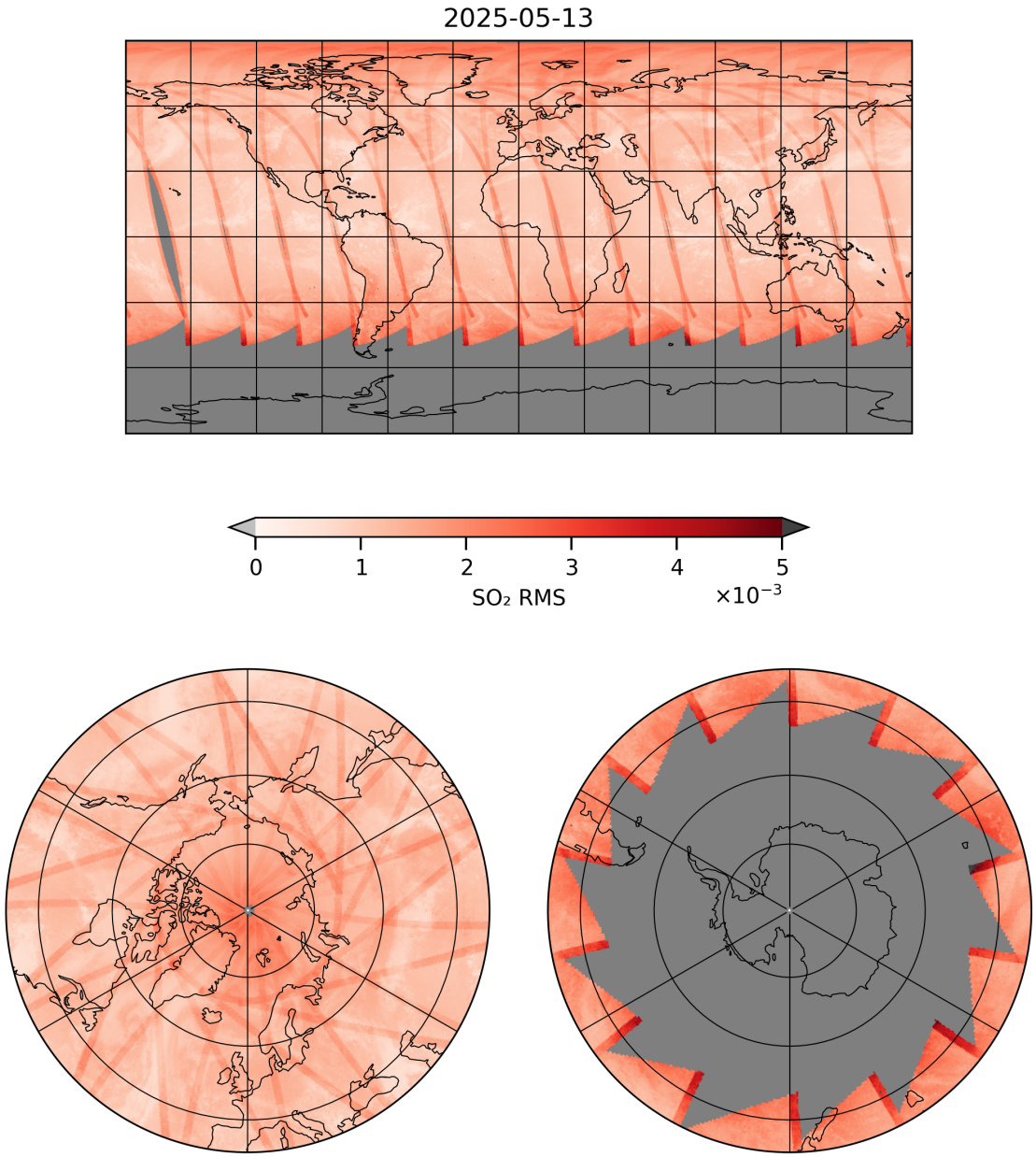


Figure 24: Map of "SO_2 RMS" for 2025-05-13 to 2025-05-13

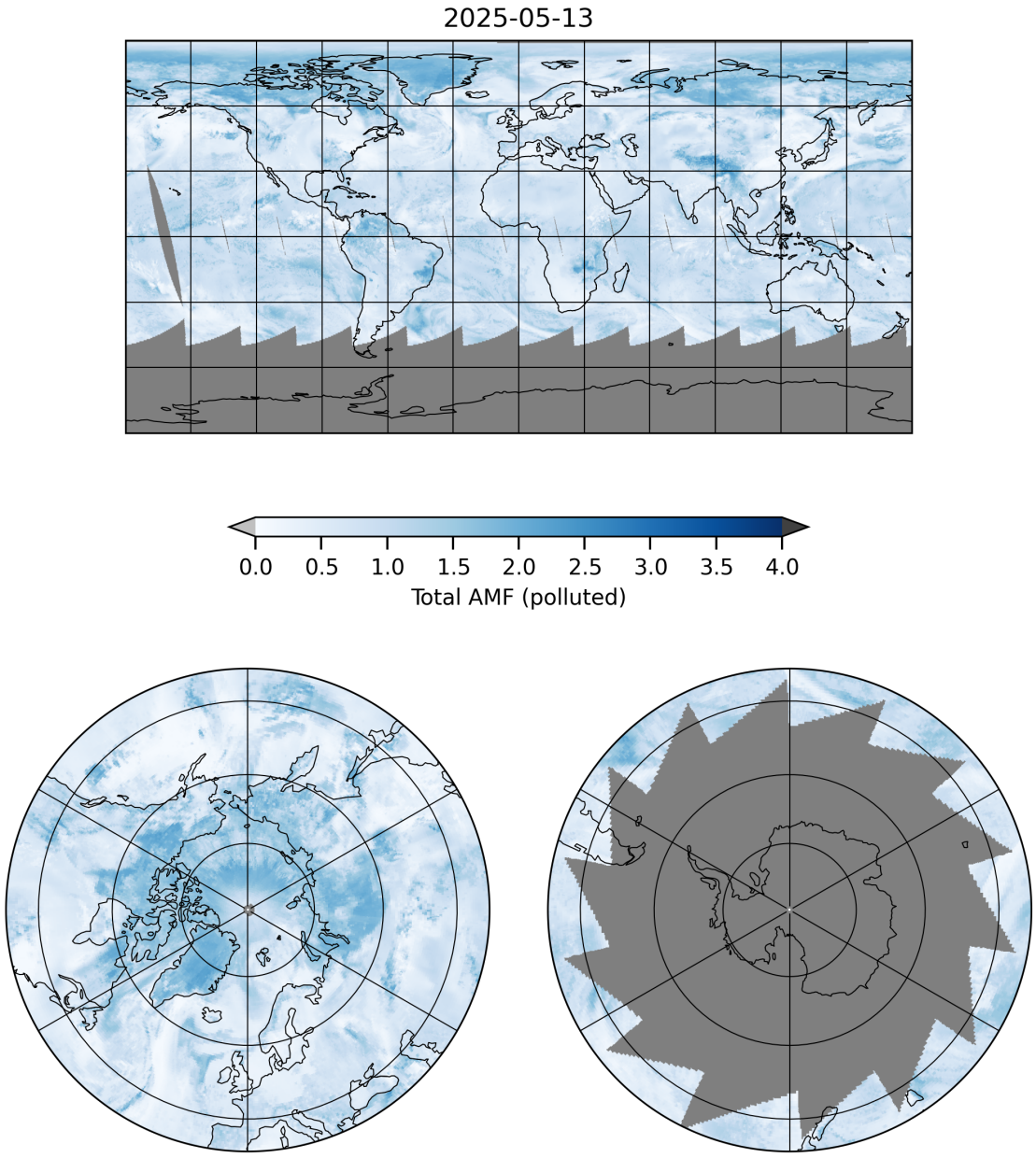


Figure 25: Map of “Total AMF (polluted)” for 2025-05-13 to 2025-05-13

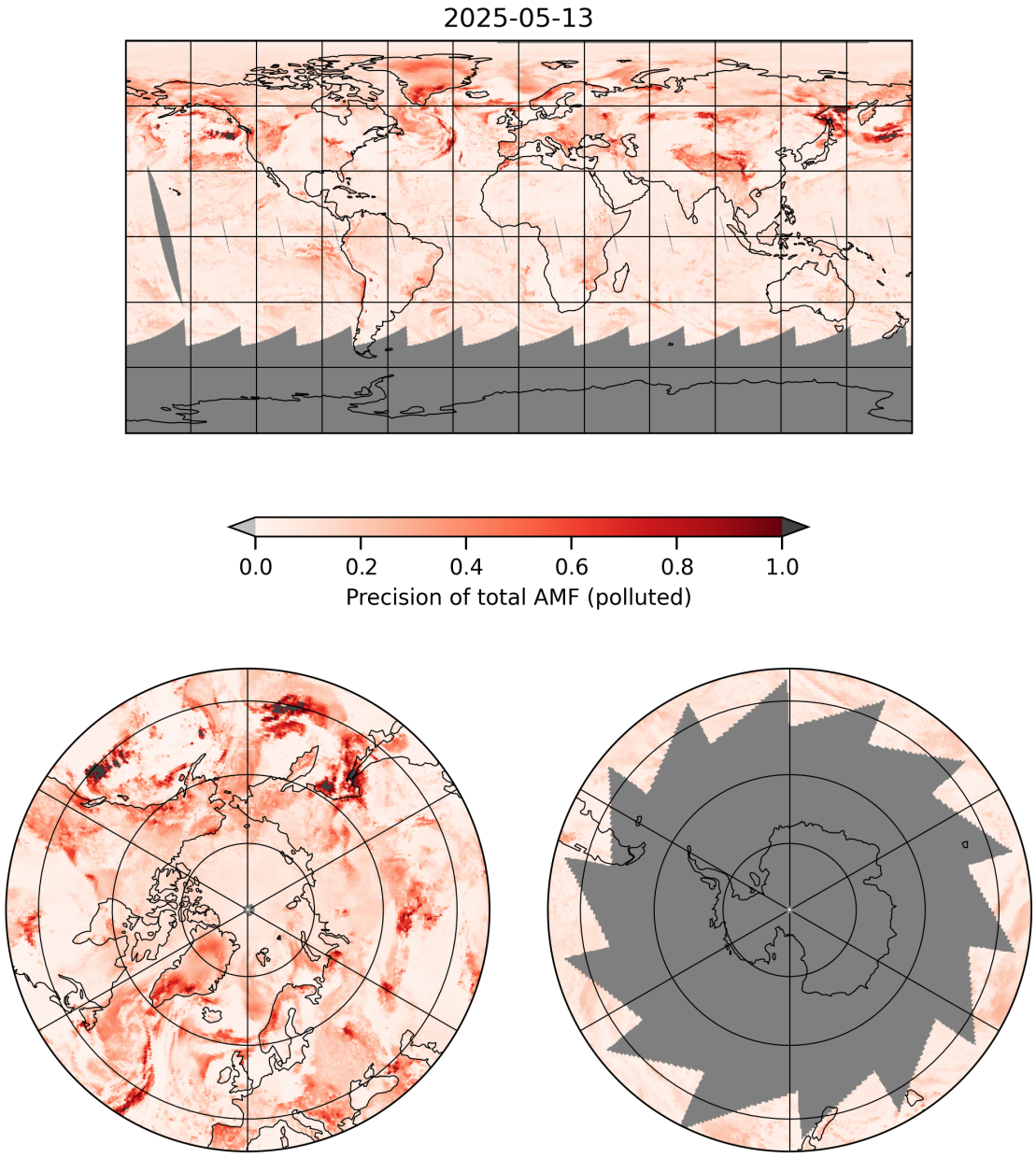


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-05-13 to 2025-05-13

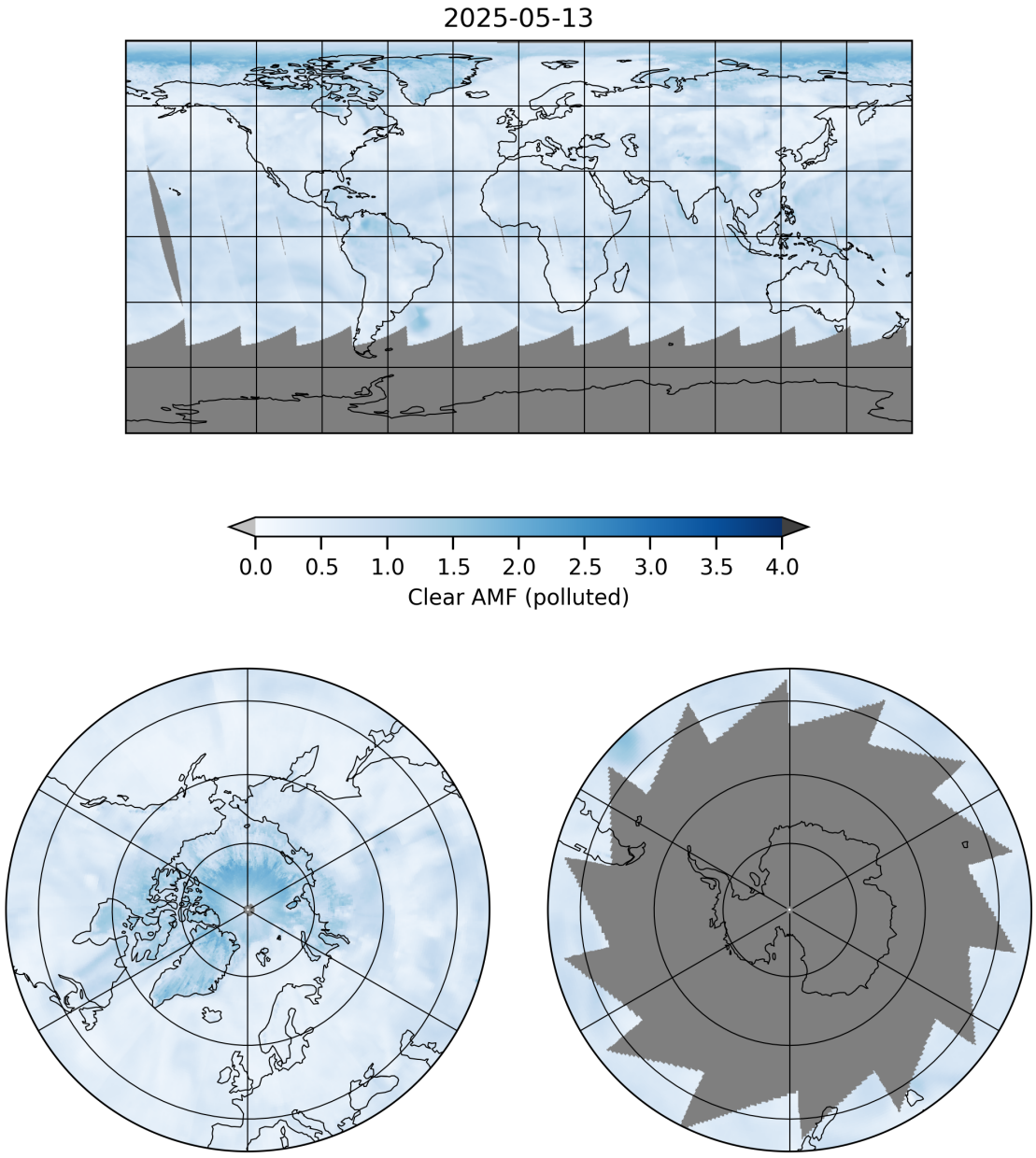


Figure 27: Map of “Clear AMF (polluted)” for 2025-05-13 to 2025-05-13

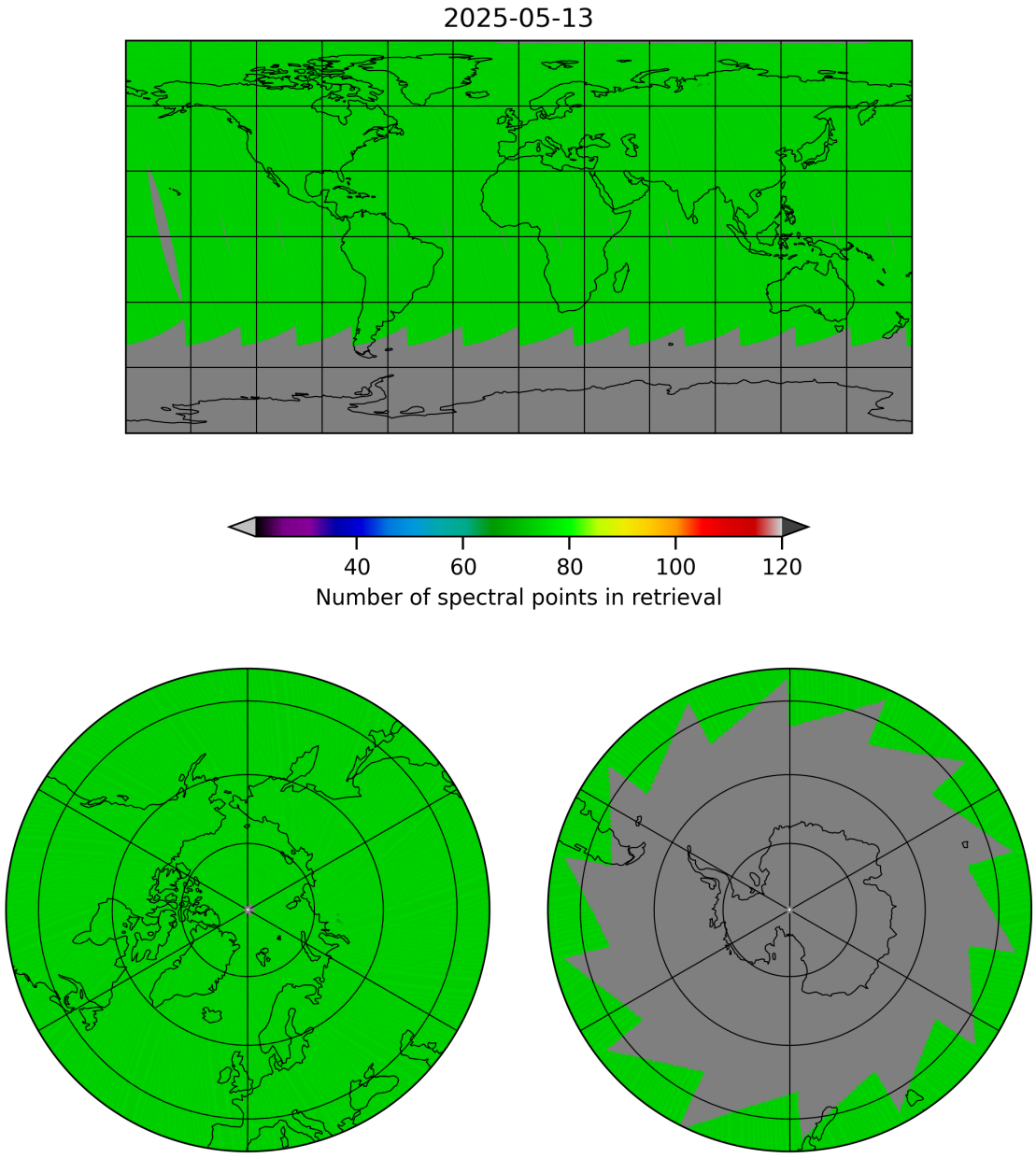


Figure 28: Map of “Number of spectral points in retrieval” for 2025-05-13 to 2025-05-13

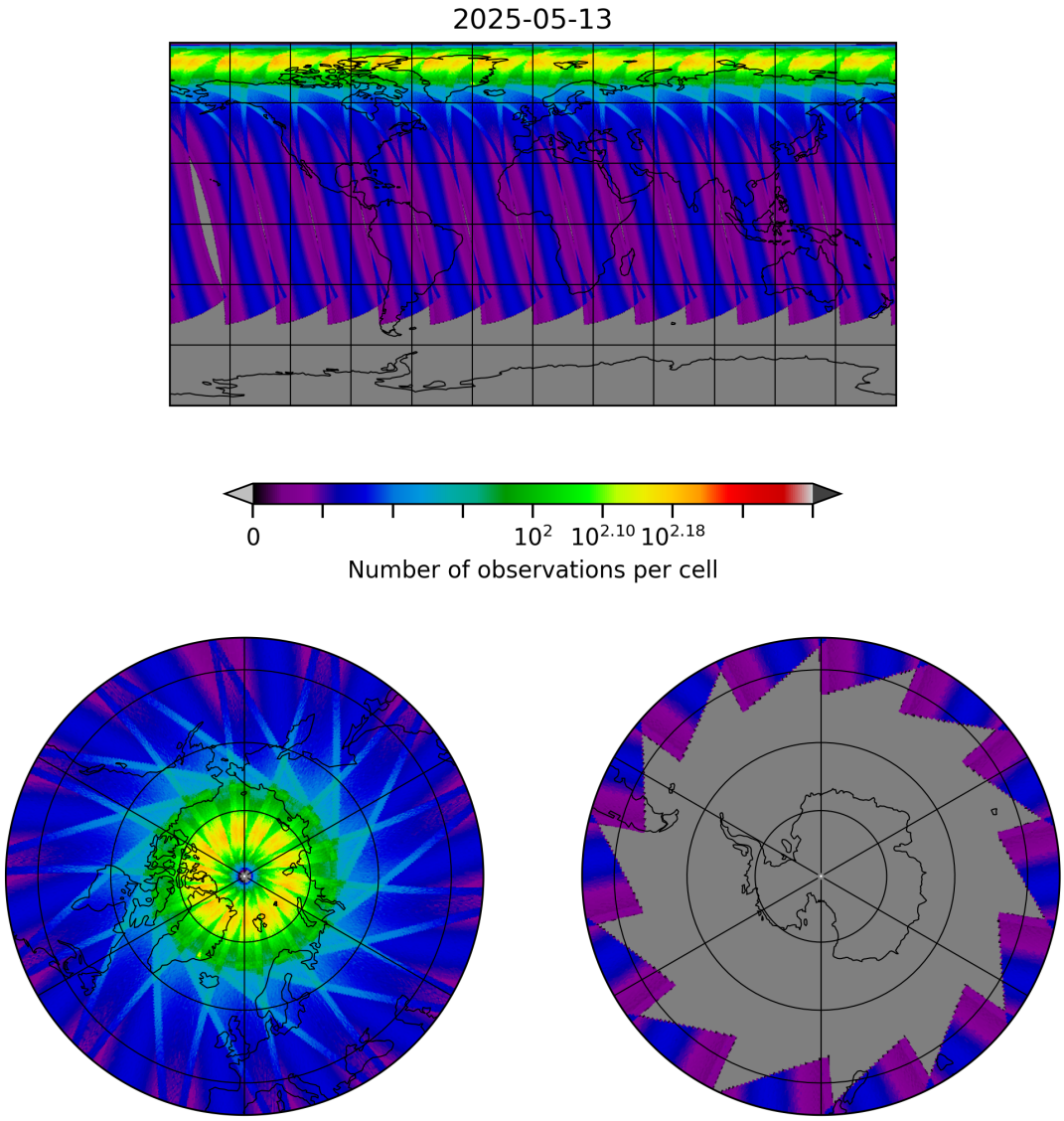


Figure 29: Map of the number of observations for 2025-05-13 to 2025-05-13

7 Zonal average

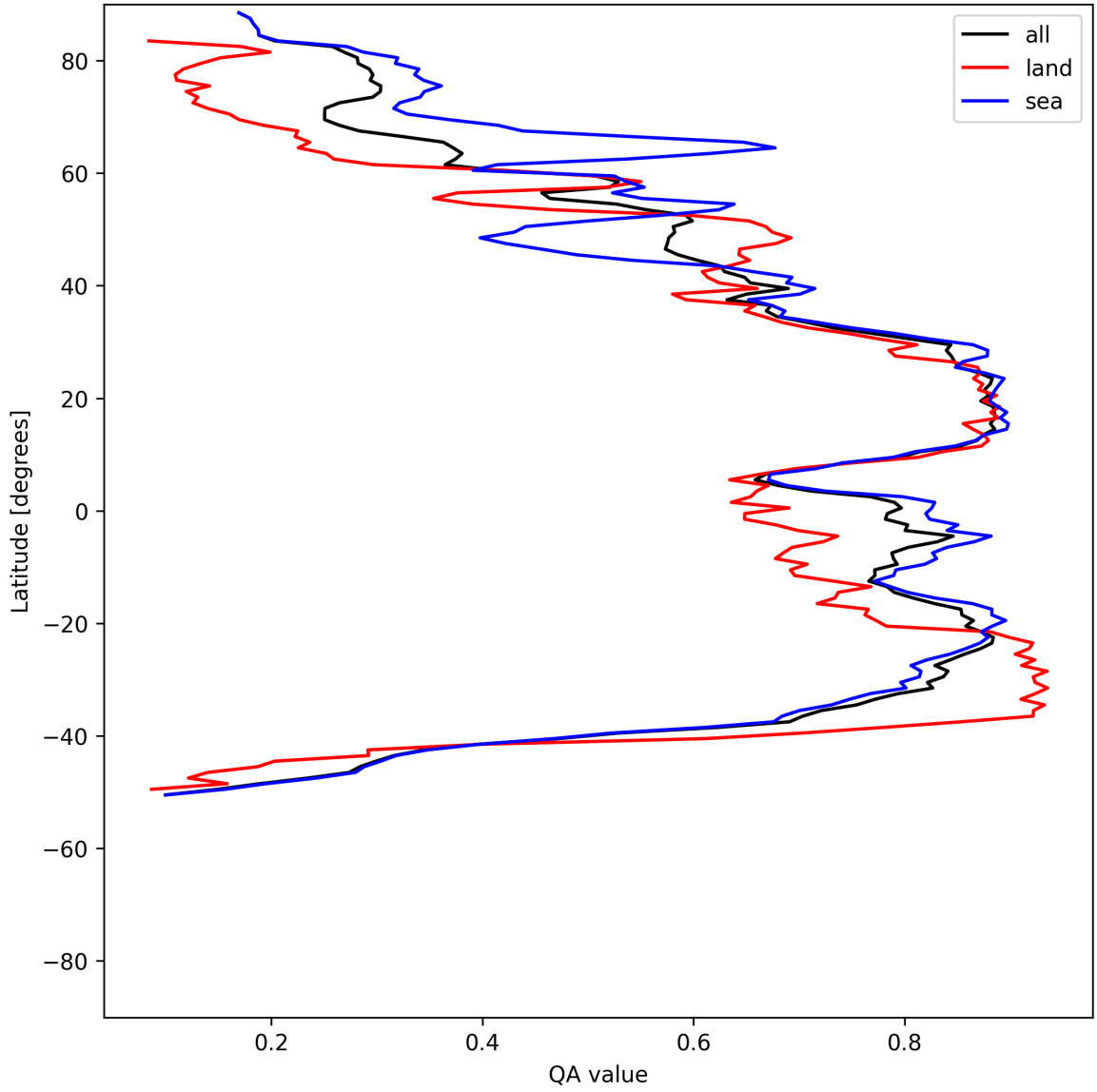


Figure 30: Zonal average of “QA value” for 2025-05-13 to 2025-05-13.

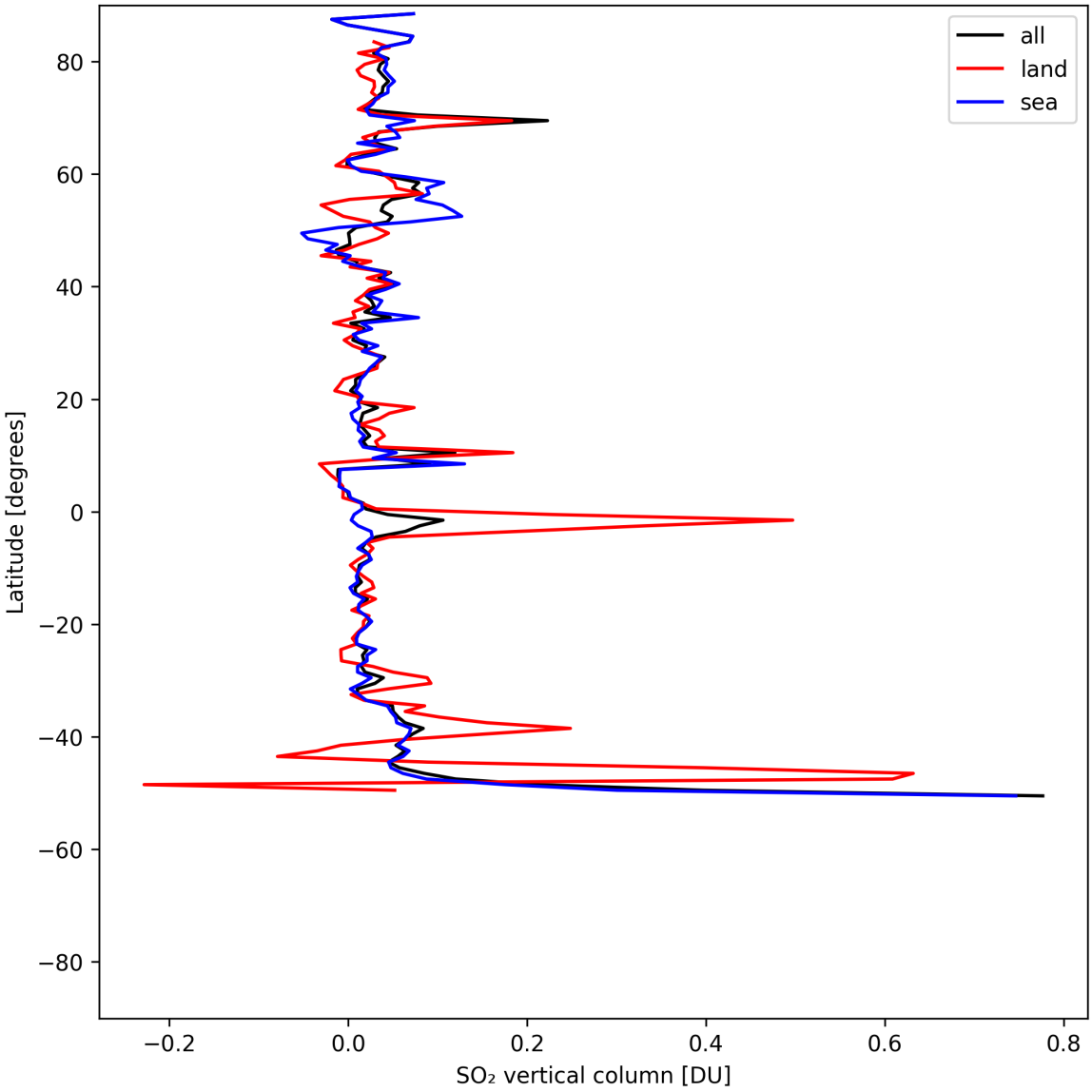


Figure 31: Zonal average of "SO_2 vertical column" for 2025-05-13 to 2025-05-13.

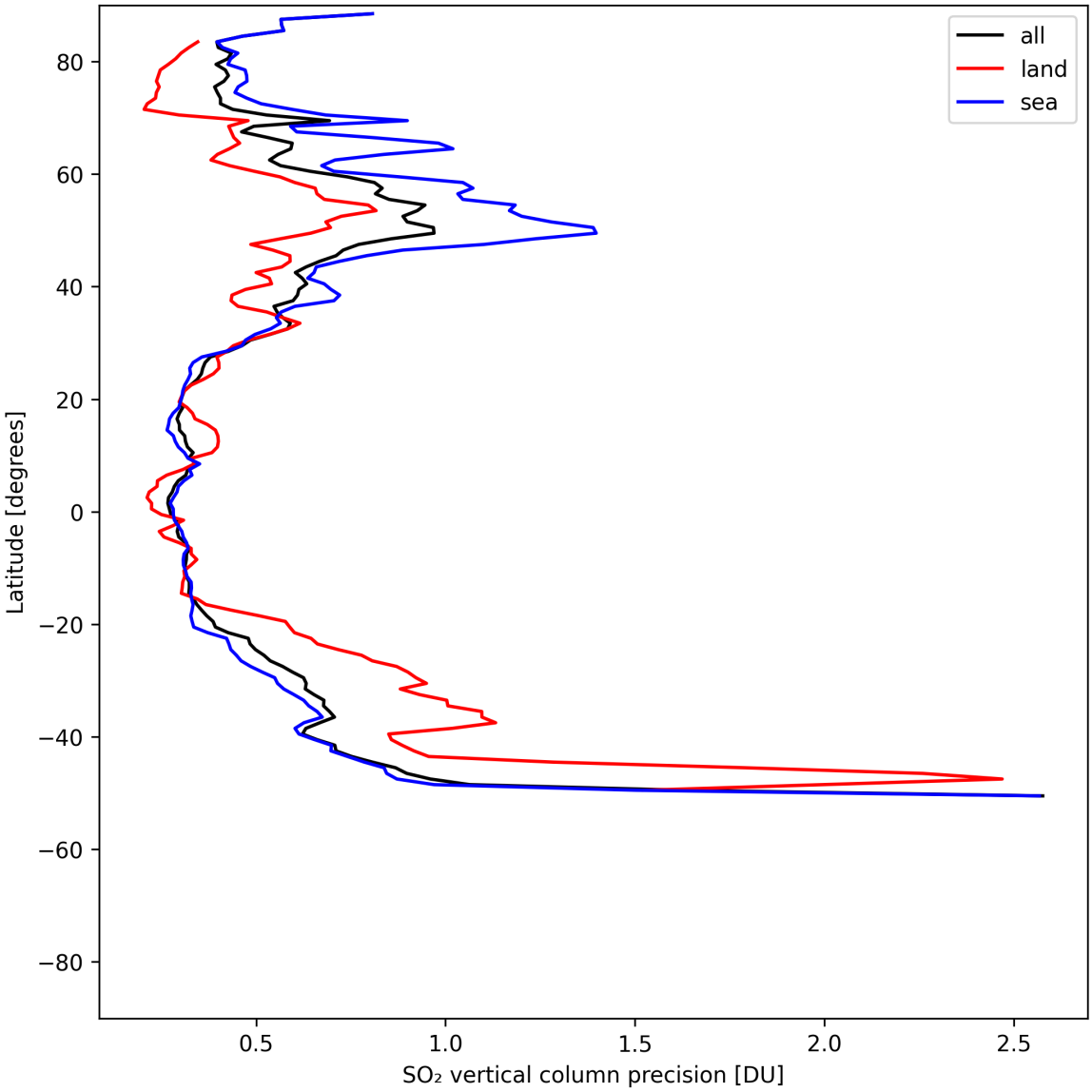


Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-05-13 to 2025-05-13.

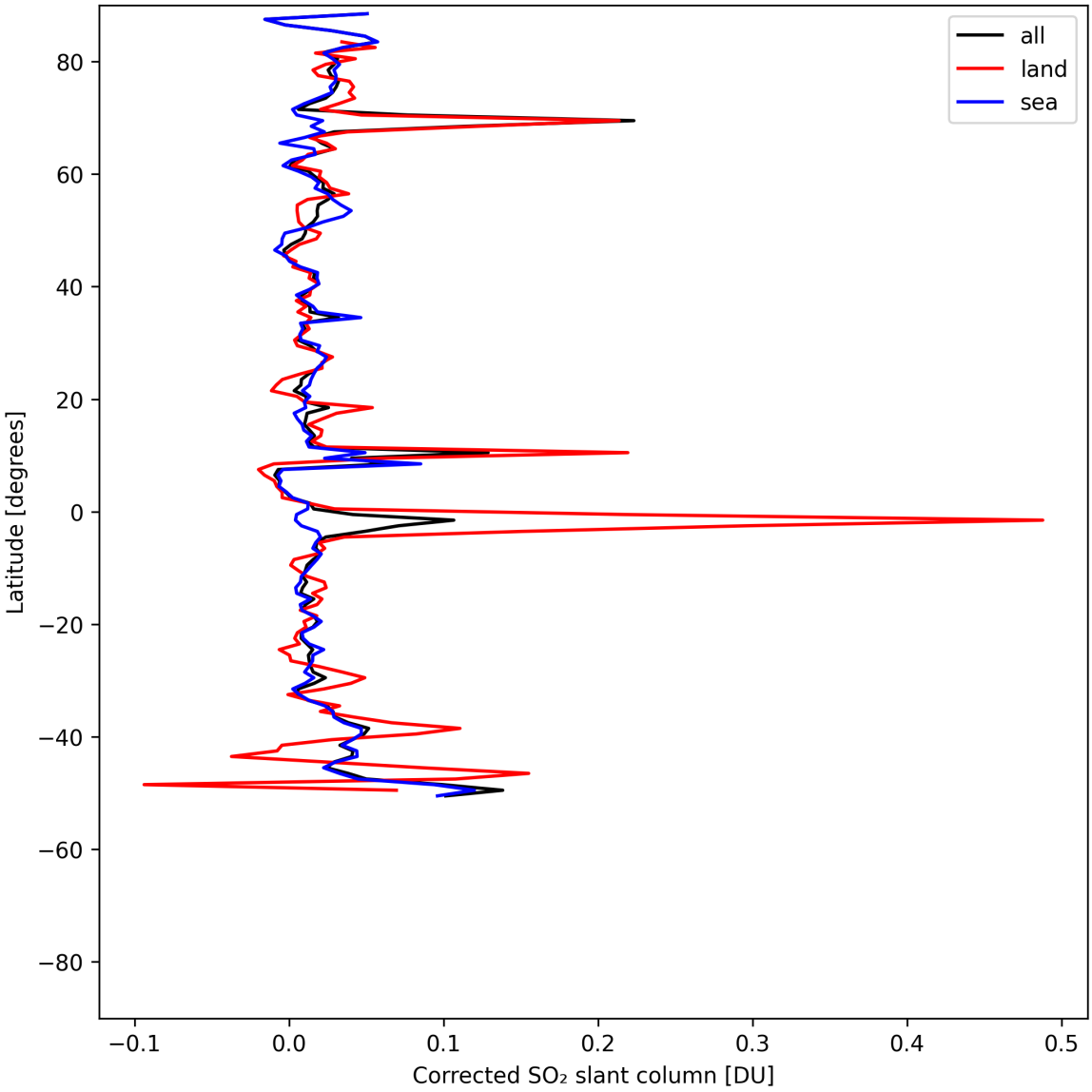


Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-05-13 to 2025-05-13.

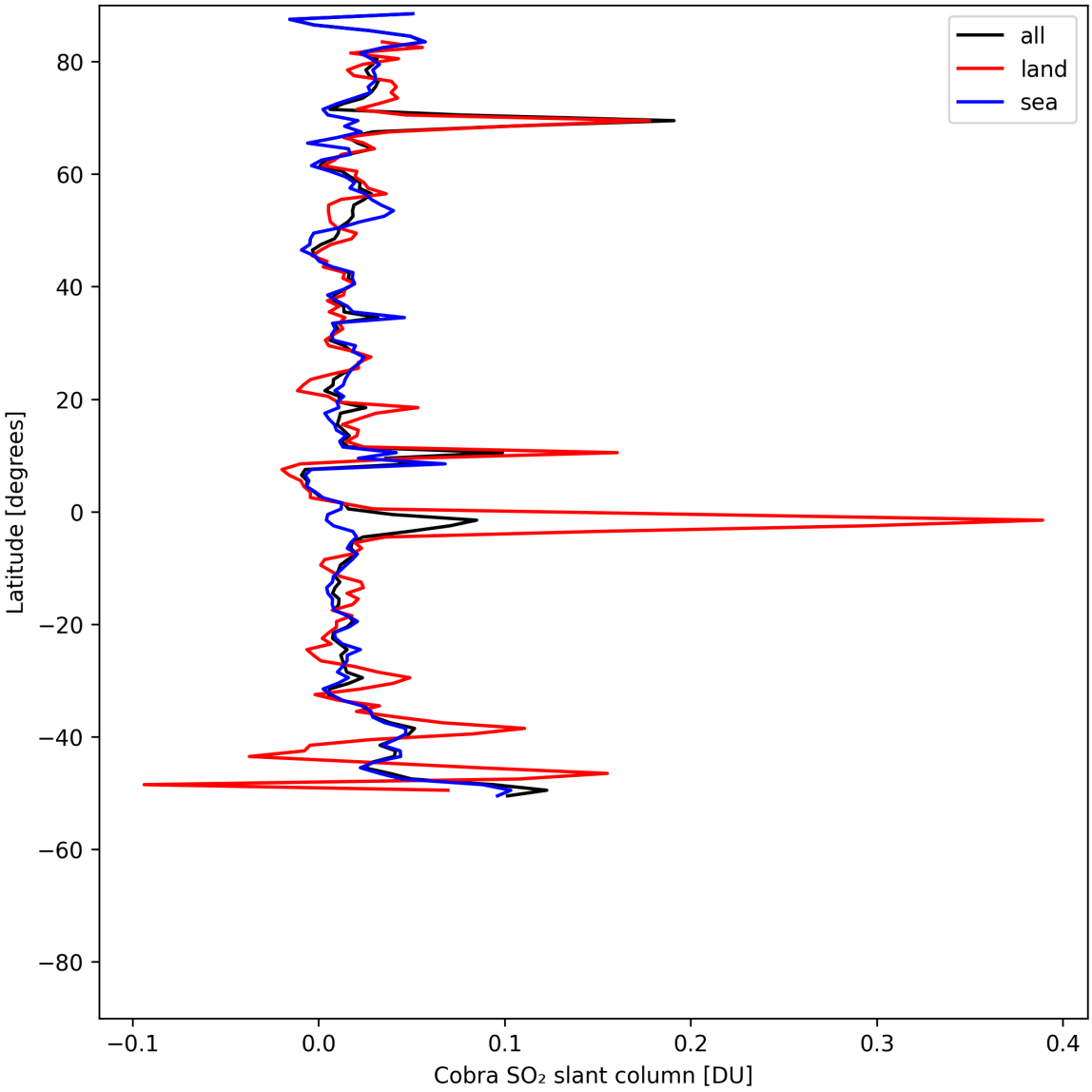


Figure 34: Zonal average of "Cobra SO_2 slant column" for 2025-05-13 to 2025-05-13.

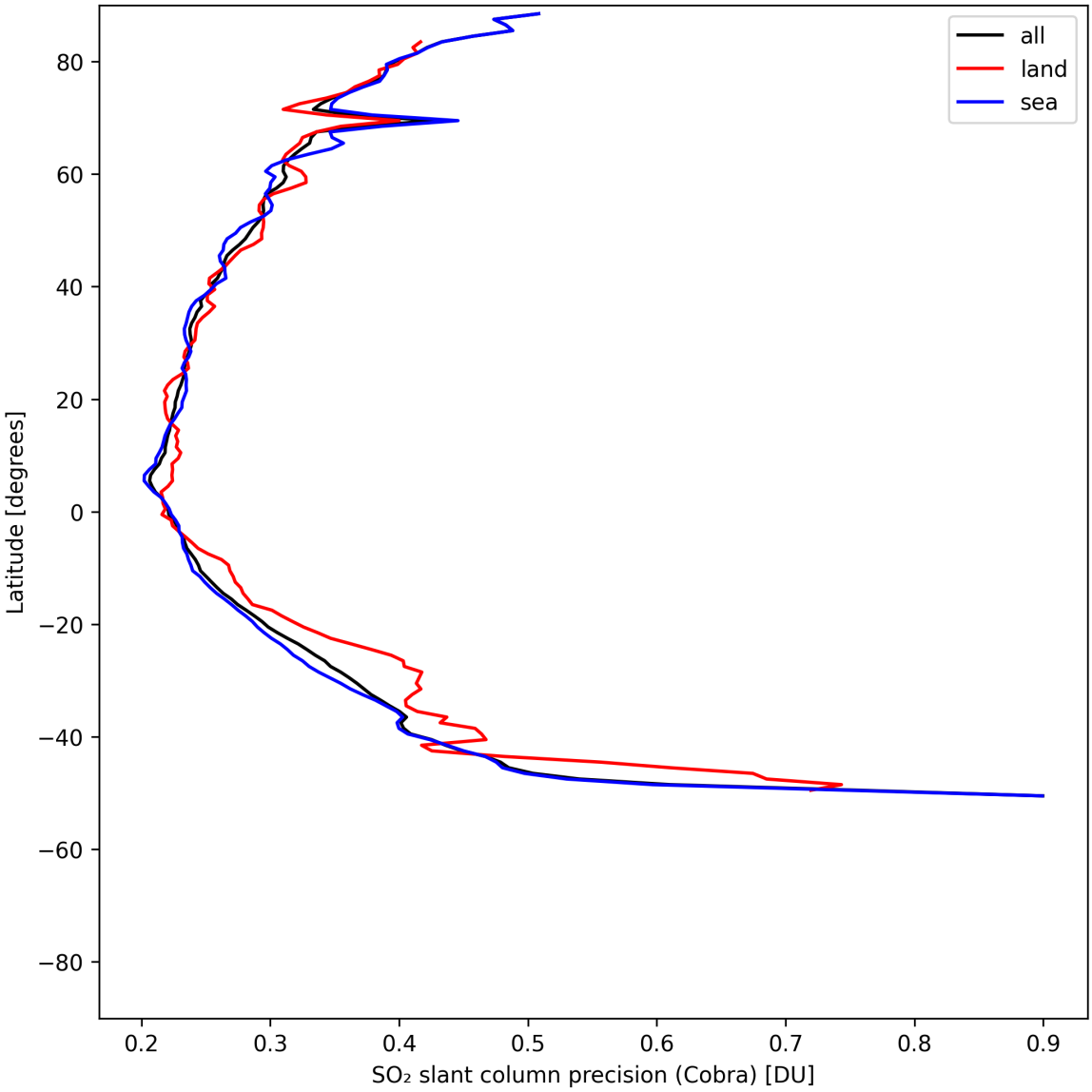


Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-05-13 to 2025-05-13.

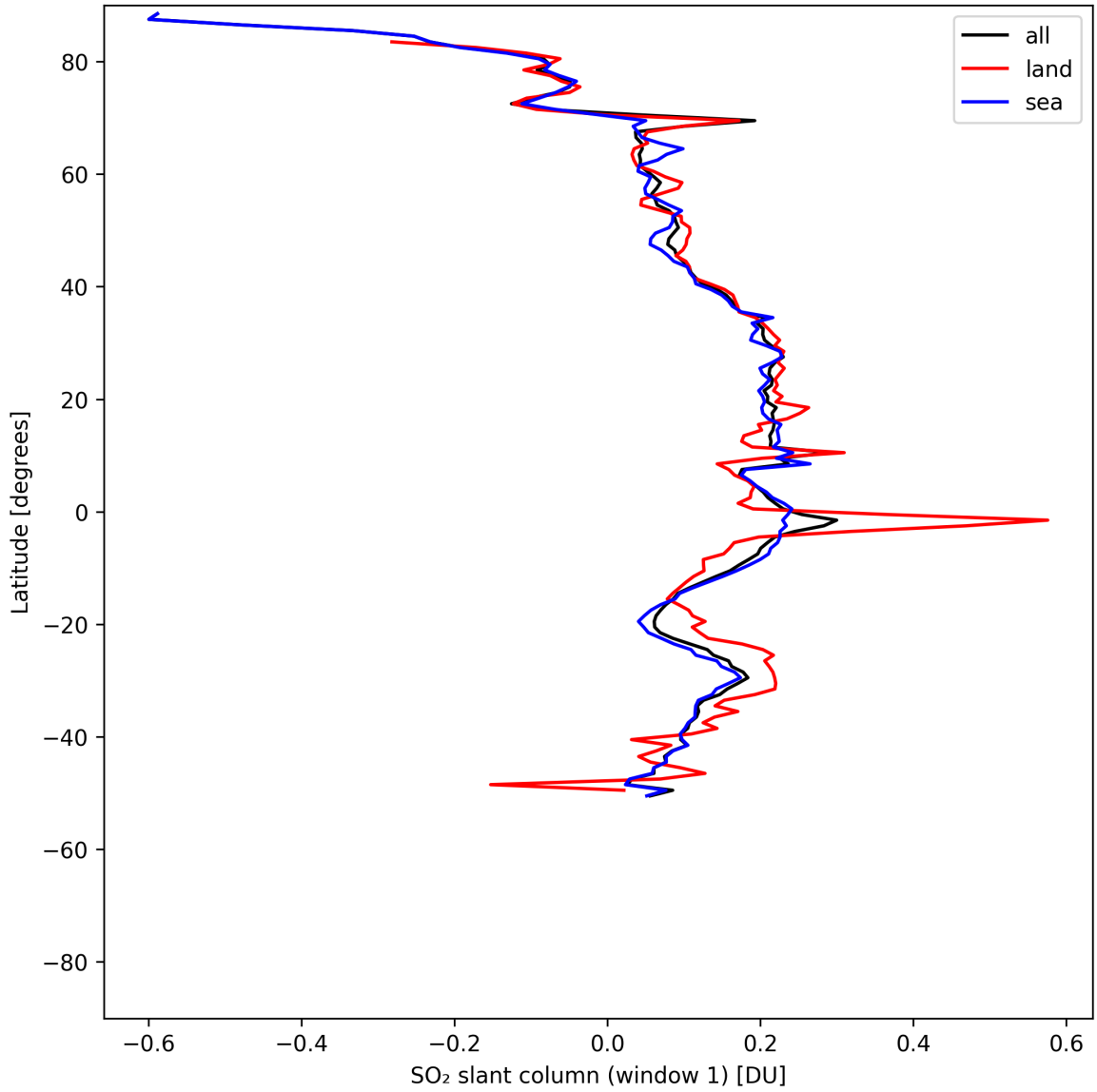


Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-05-13 to 2025-05-13.

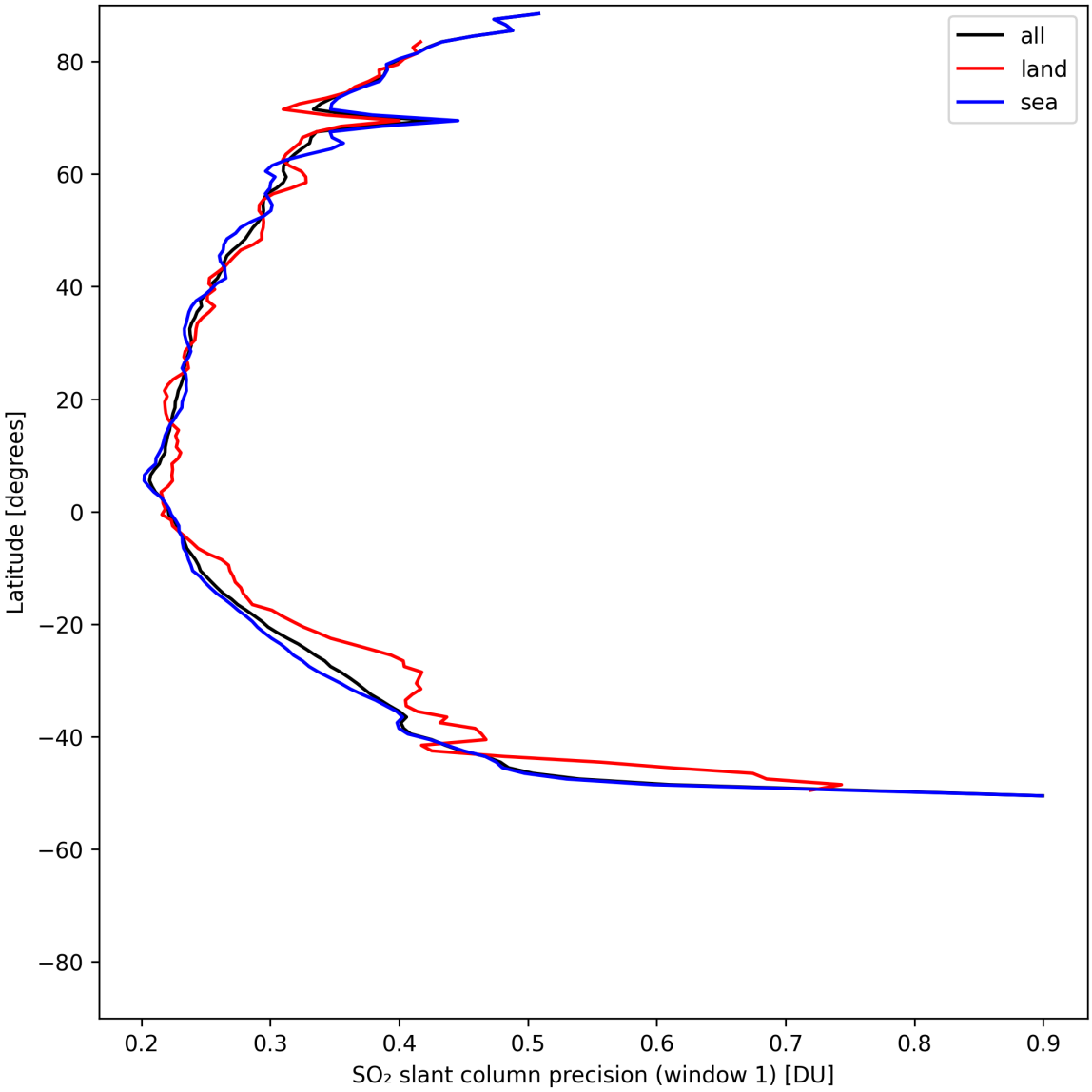


Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-05-13 to 2025-05-13.

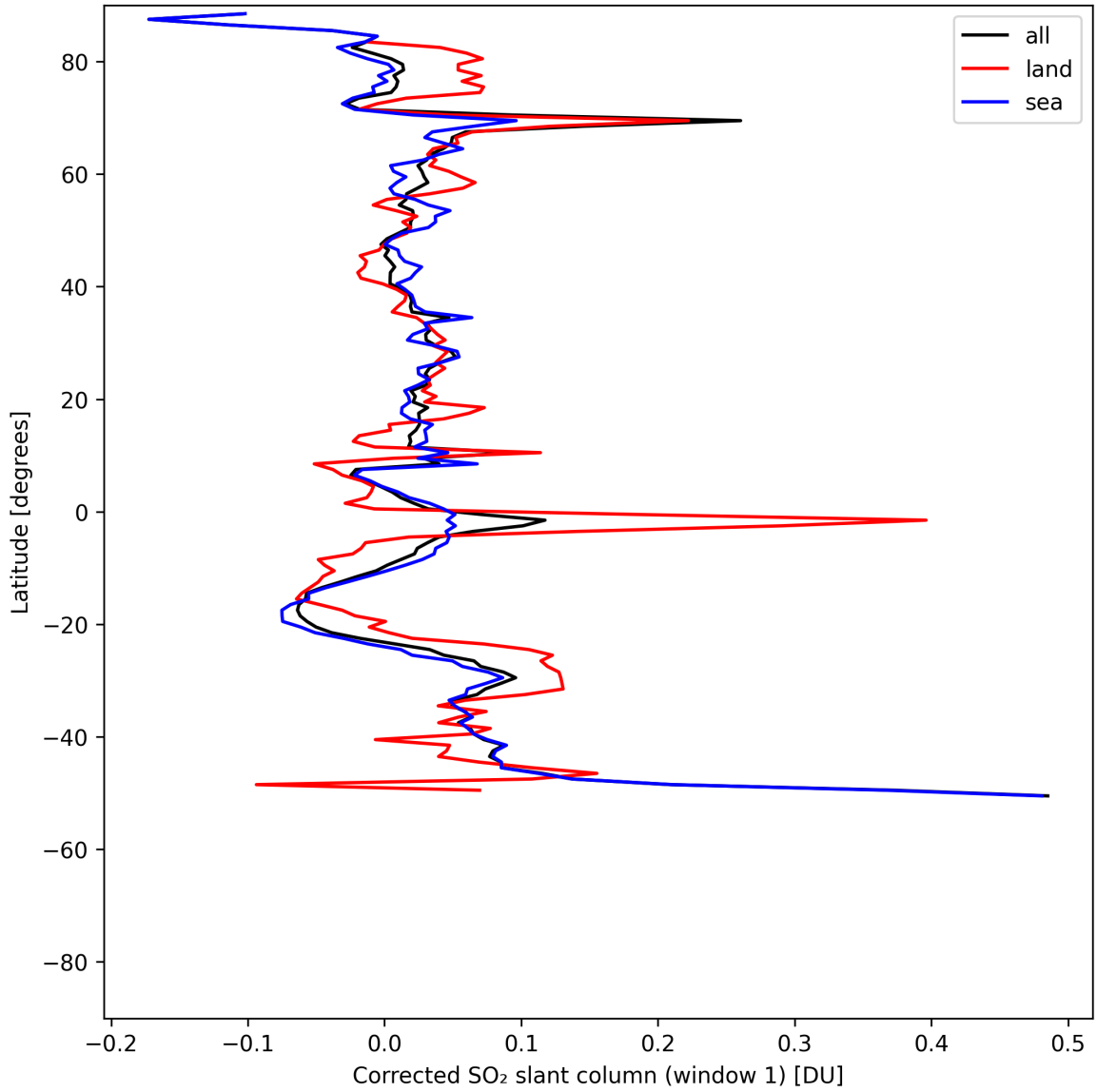


Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-05-13 to 2025-05-13.

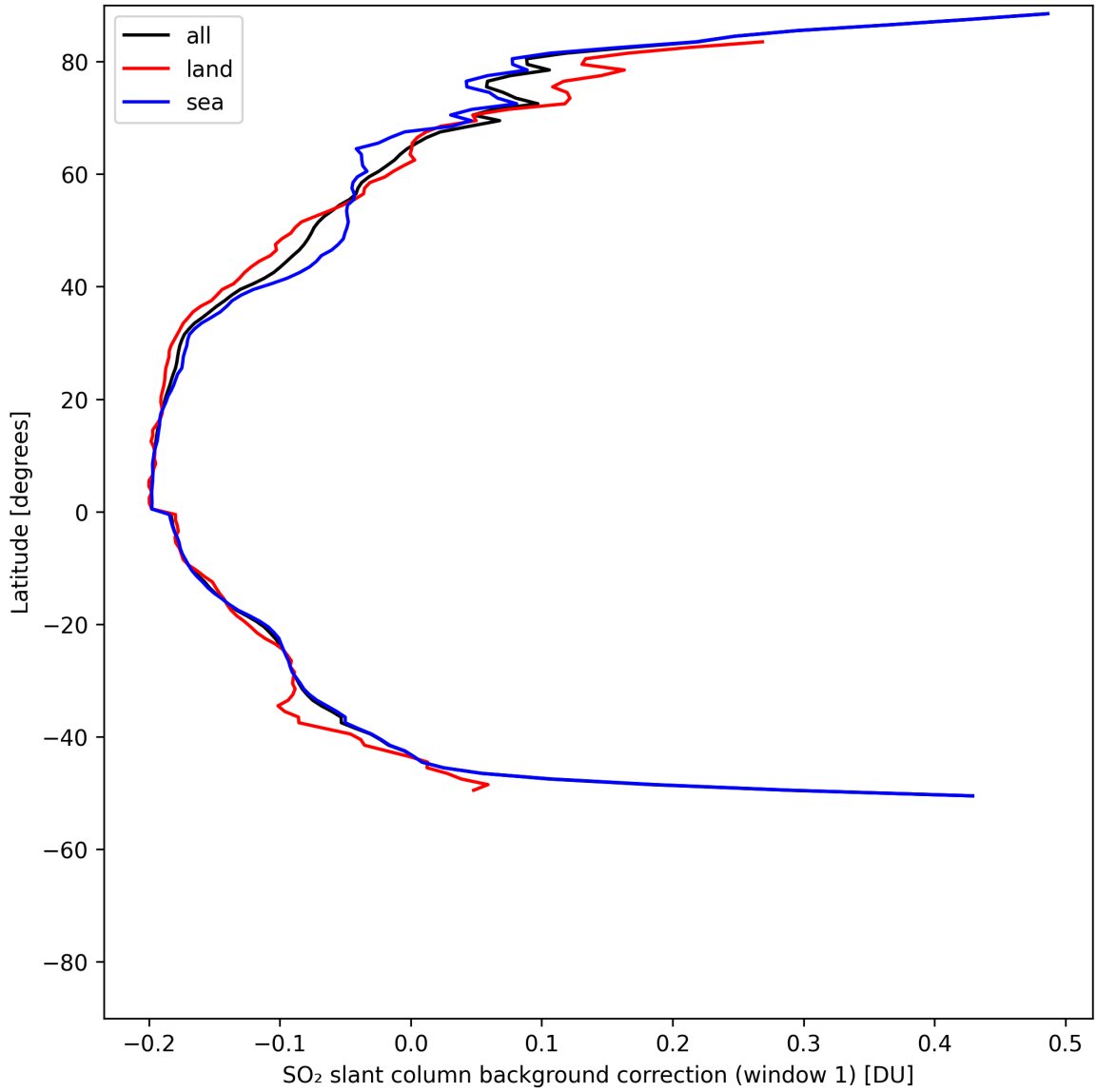


Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-05-13 to 2025-05-13.

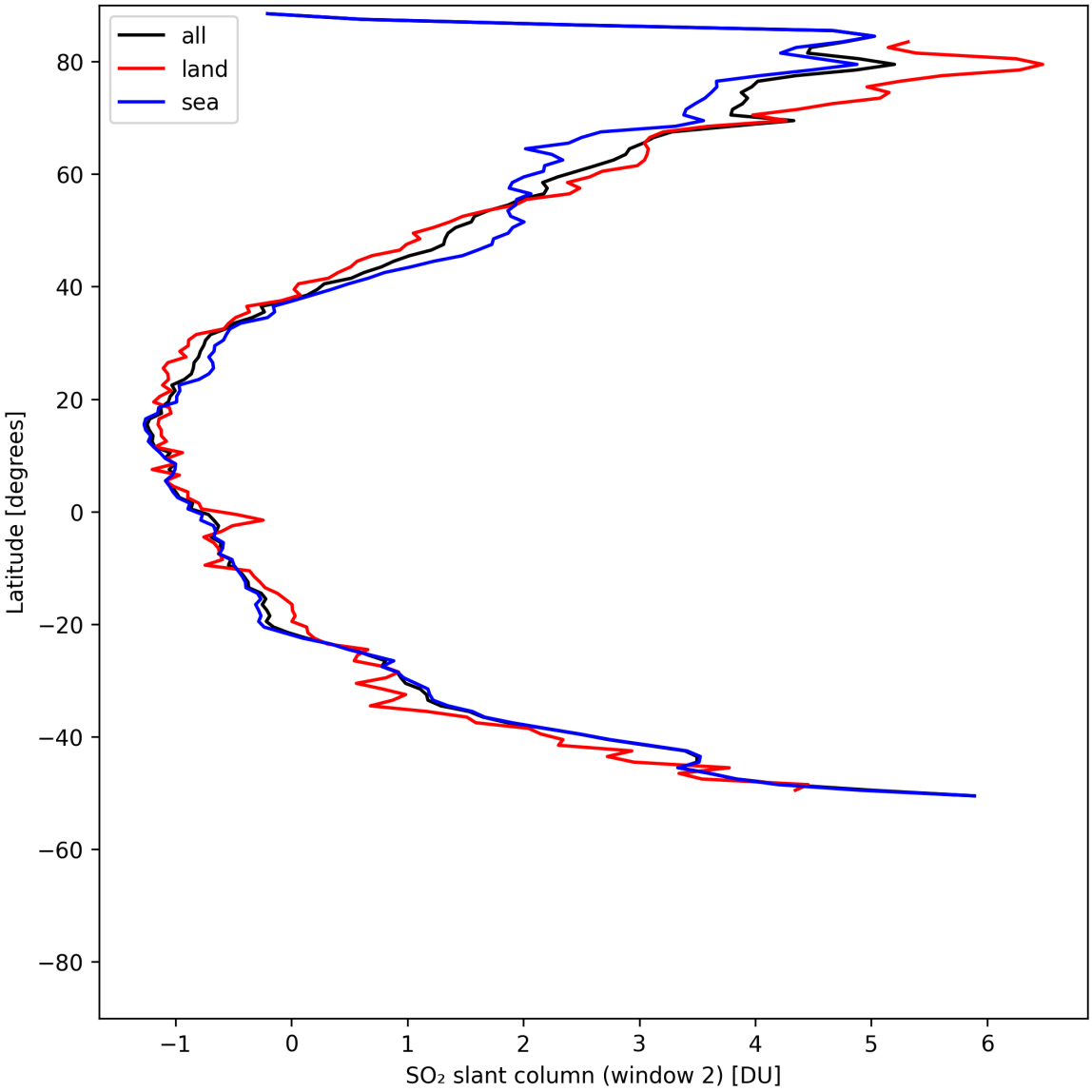


Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-05-13 to 2025-05-13.

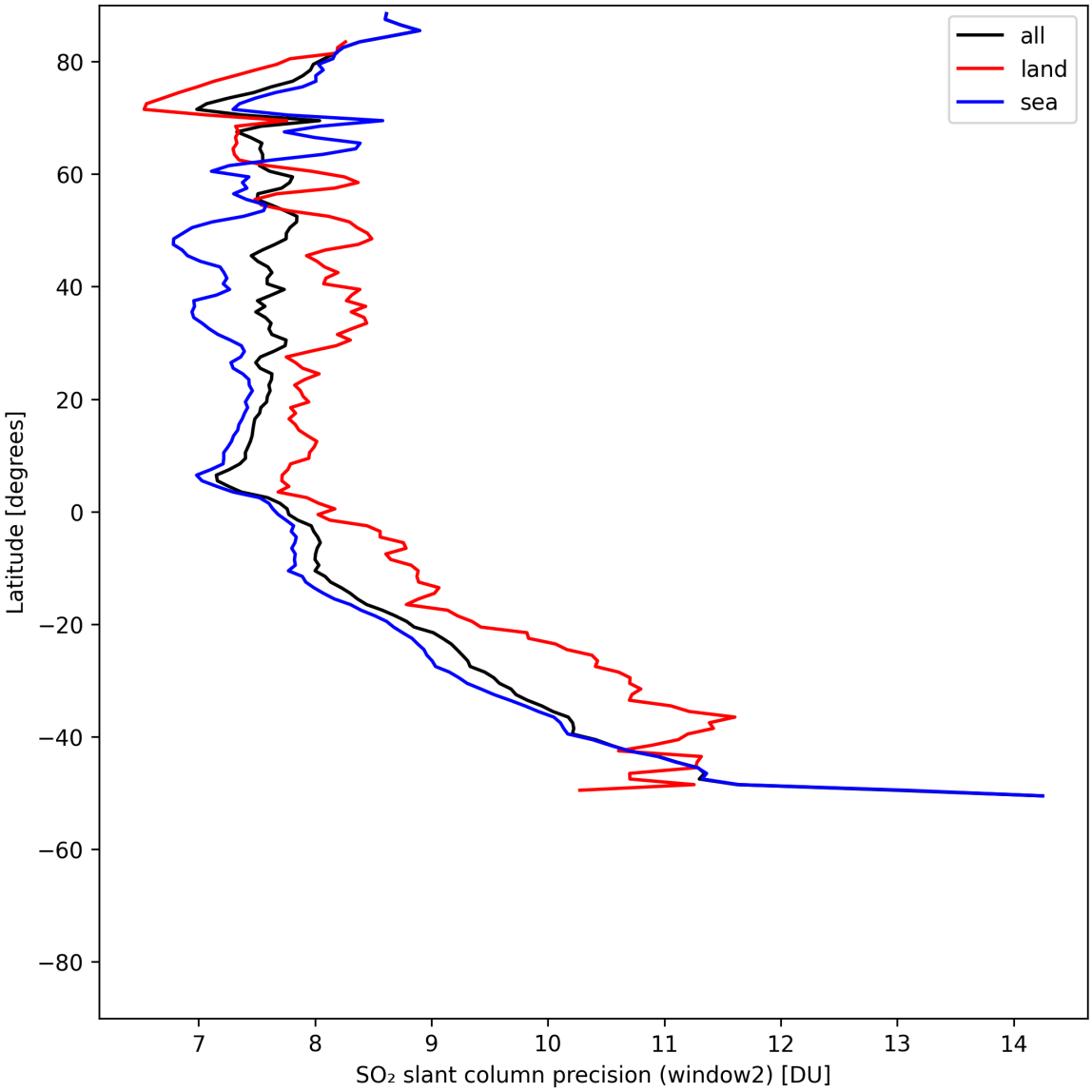


Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-05-13 to 2025-05-13.

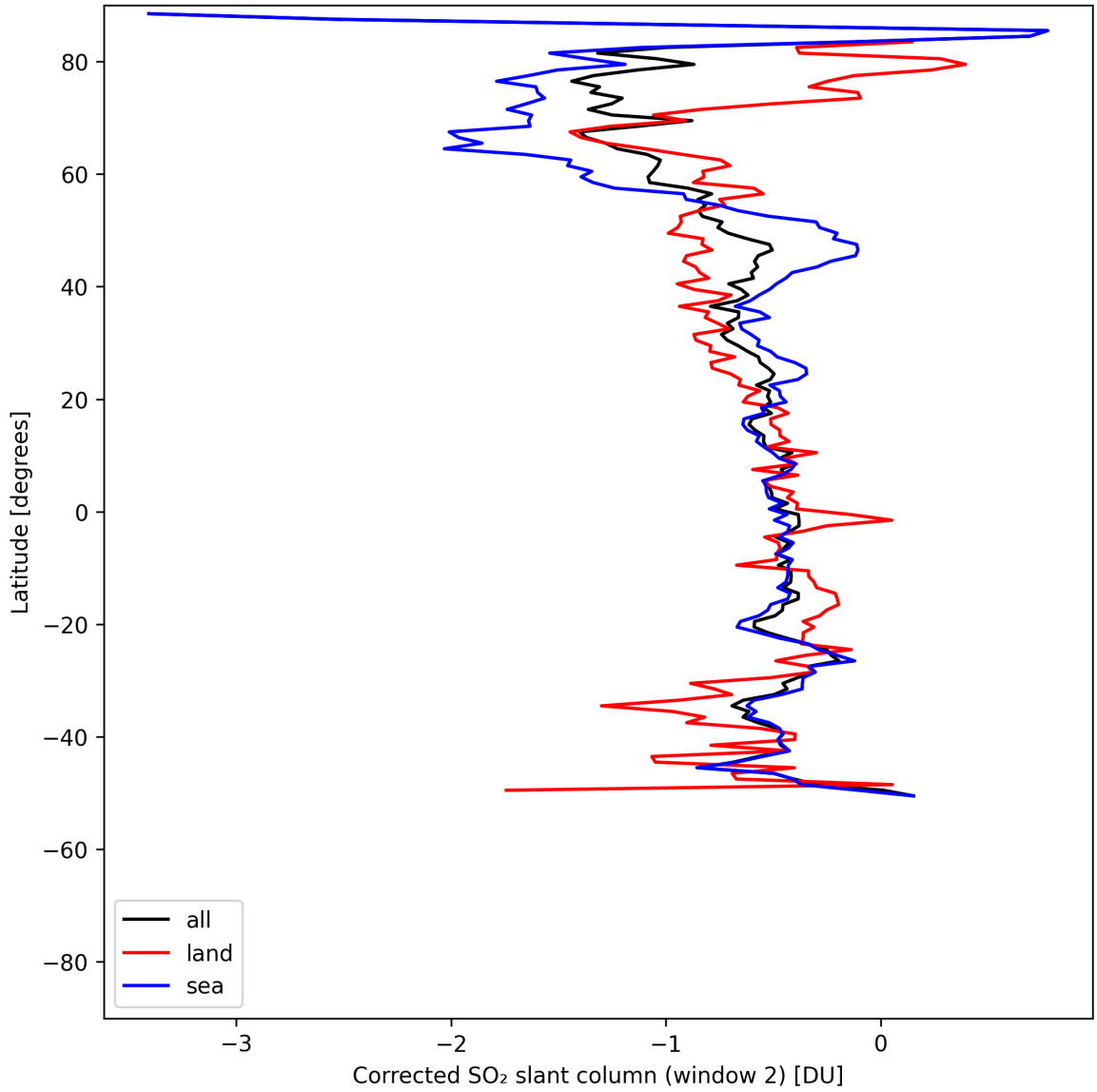


Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-05-13 to 2025-05-13.

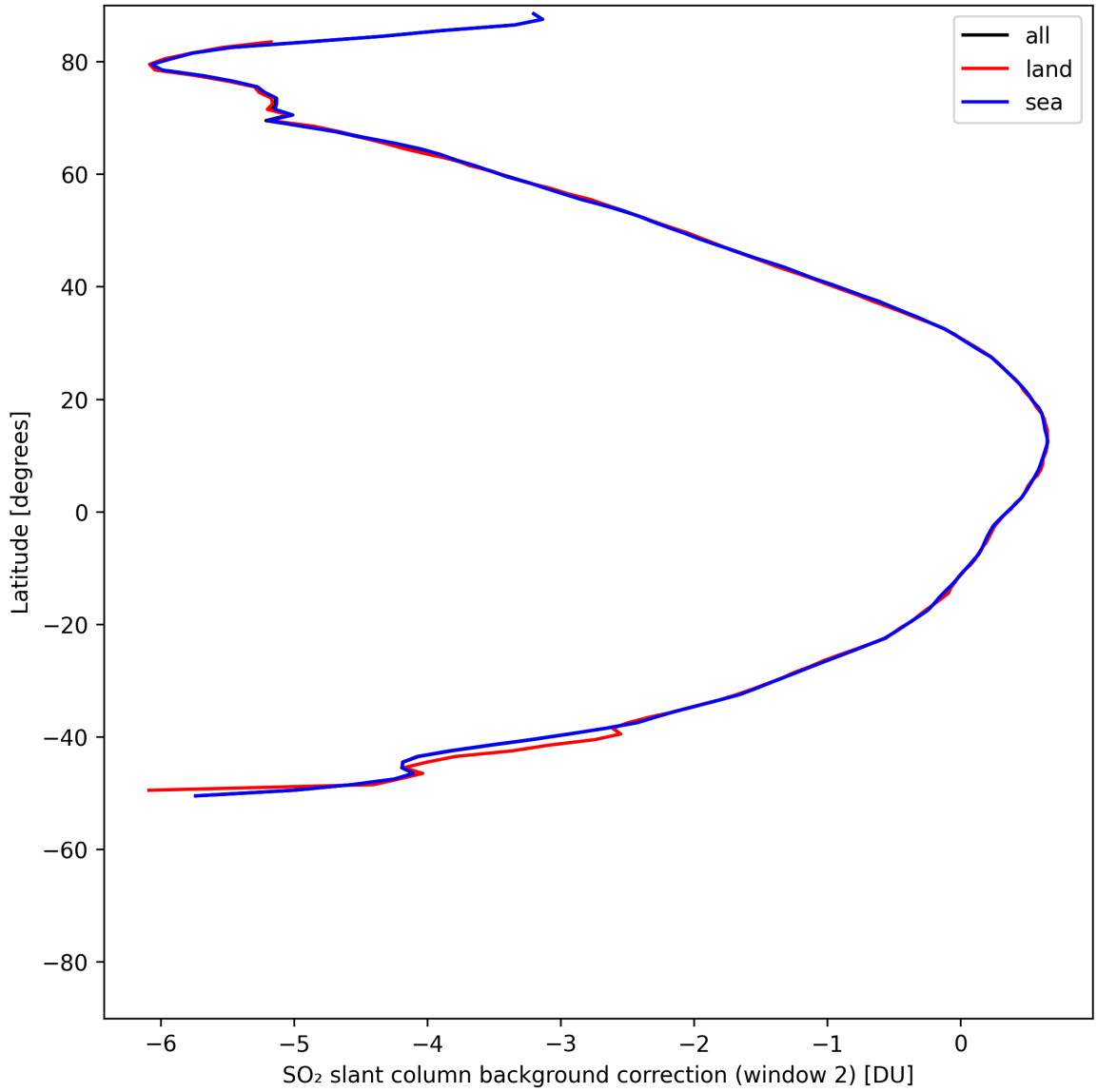


Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-05-13 to 2025-05-13.

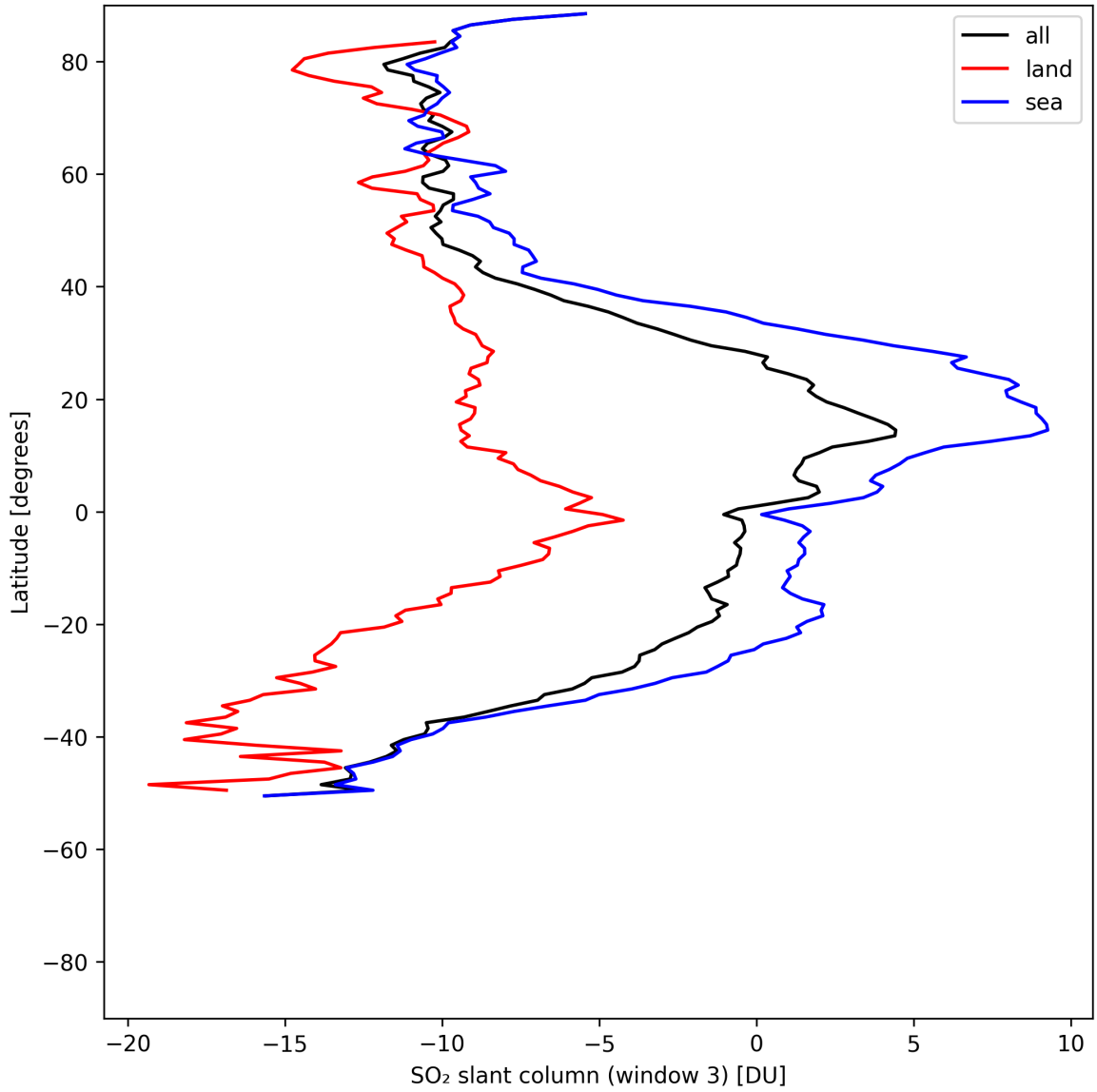


Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-05-13 to 2025-05-13.

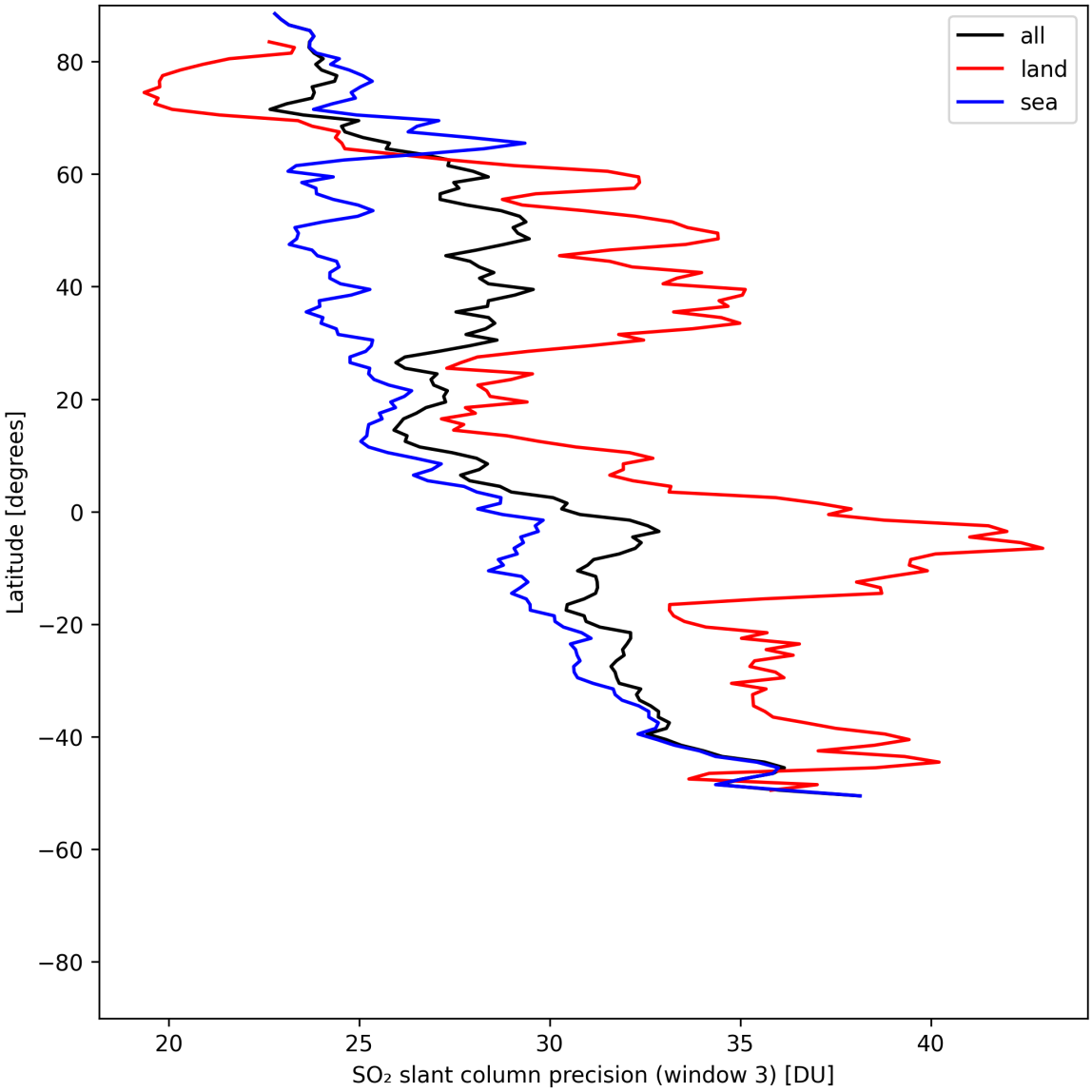


Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-05-13 to 2025-05-13.

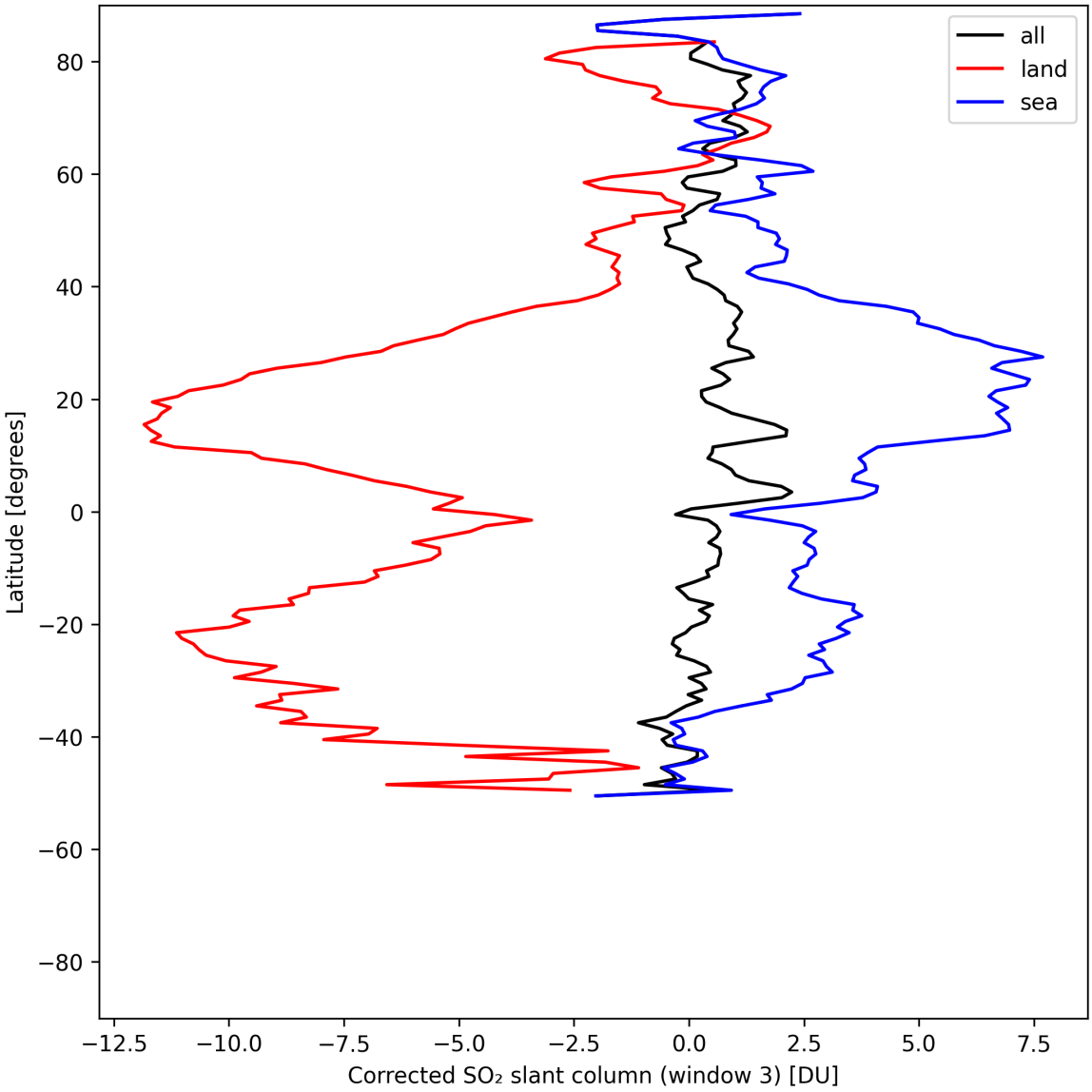


Figure 46: Zonal average of “Corrected SO_2 slant column (window 3)” for 2025-05-13 to 2025-05-13.

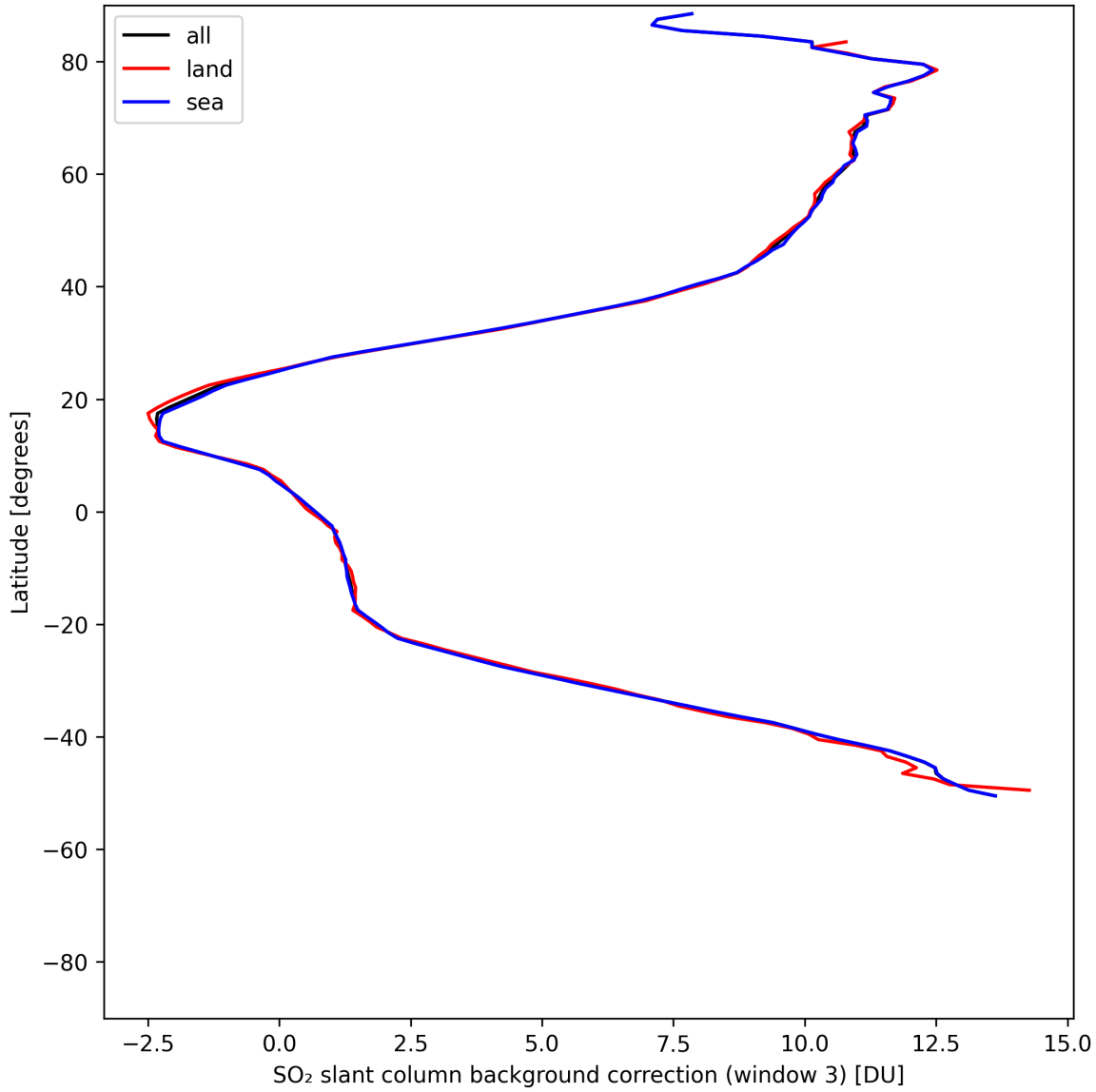


Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-05-13 to 2025-05-13.

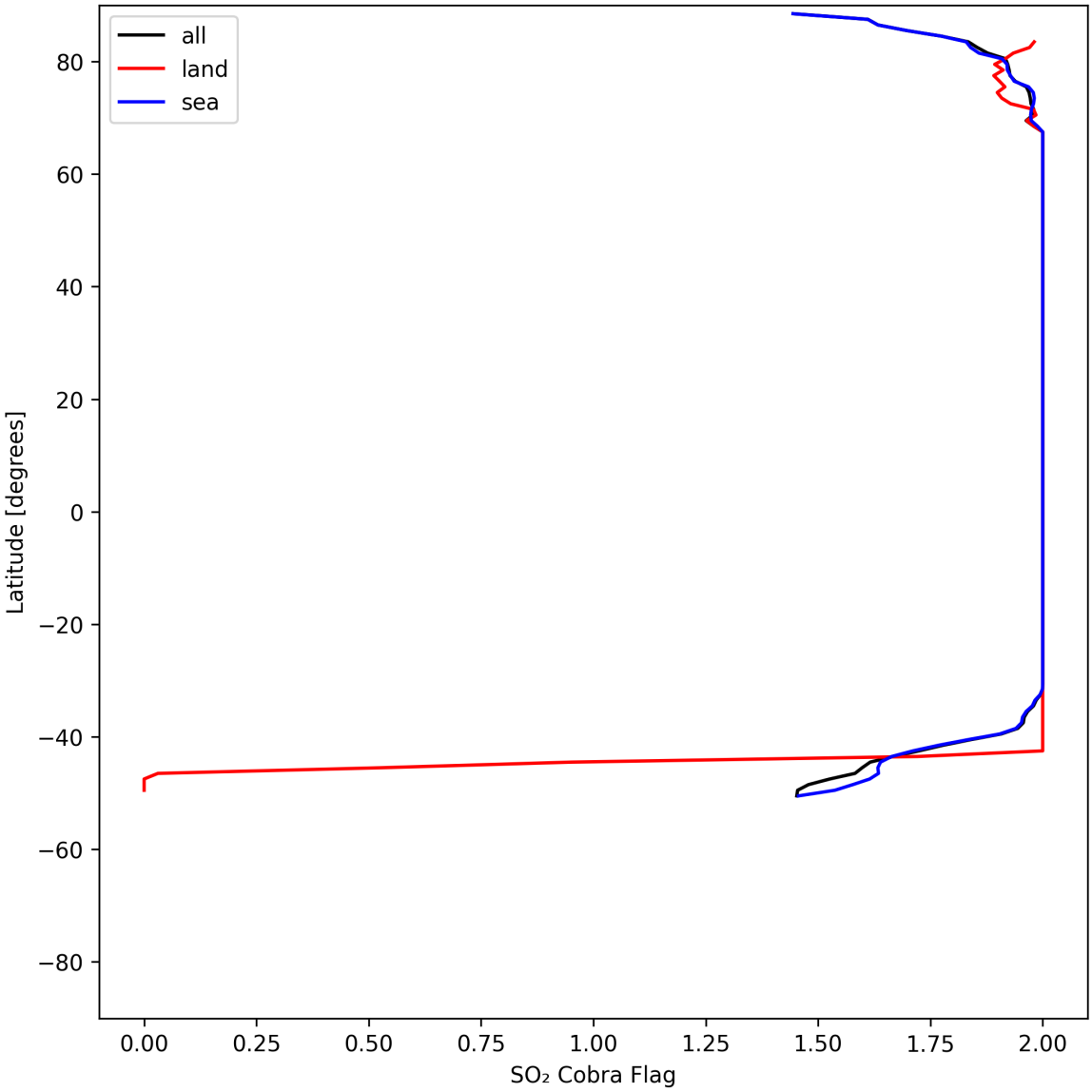


Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-05-13 to 2025-05-13.

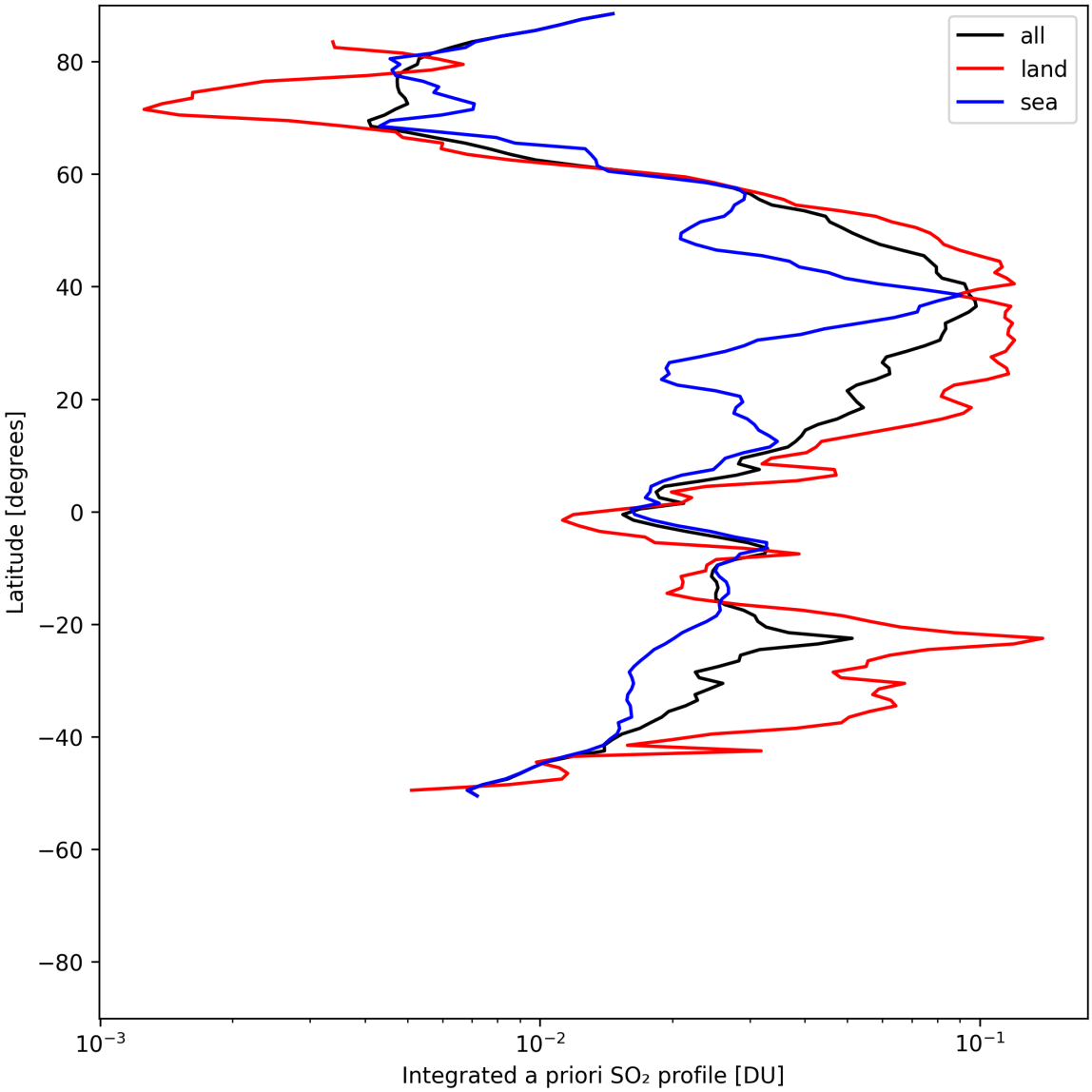


Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-05-13 to 2025-05-13.

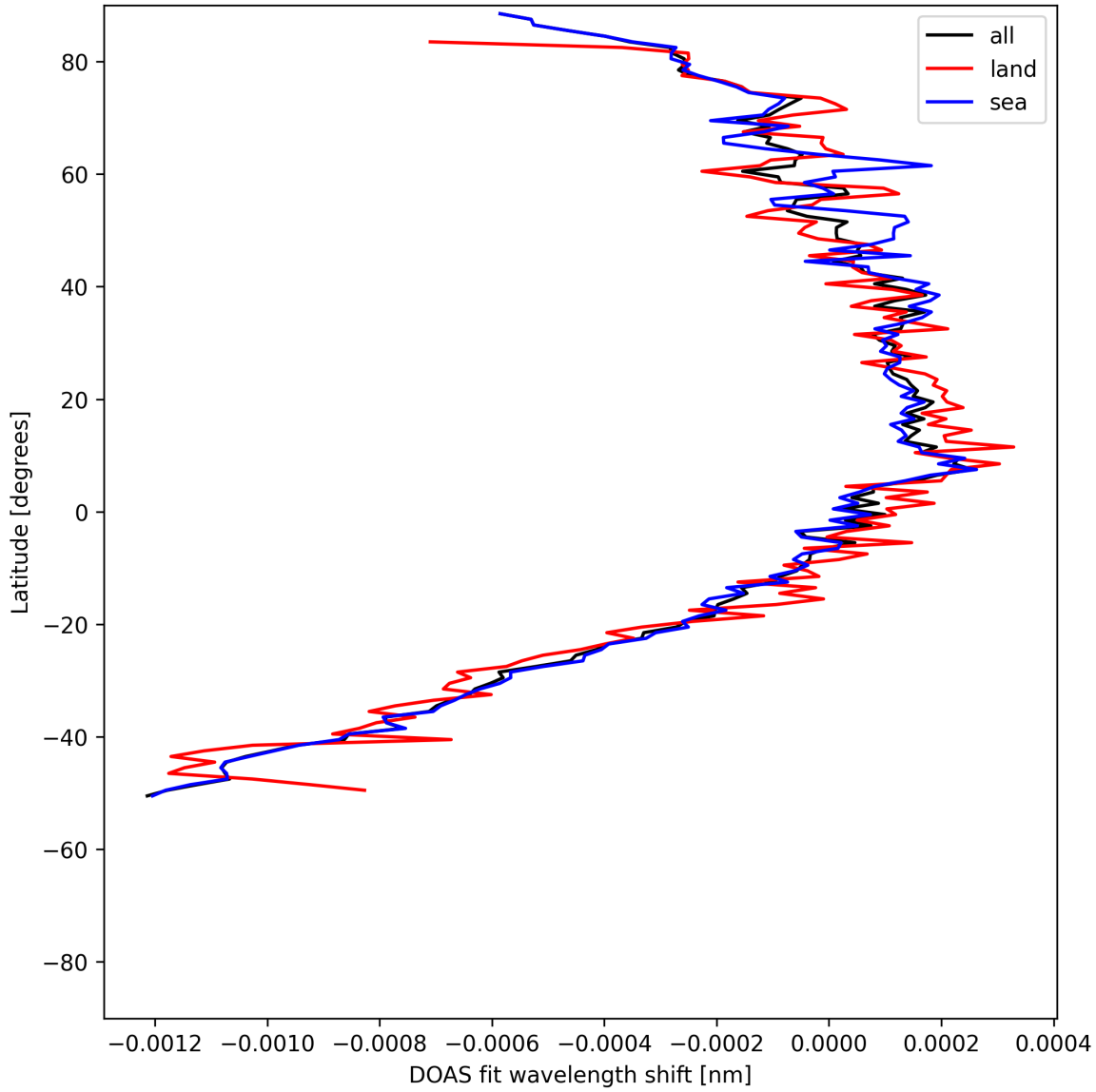


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-05-13 to 2025-05-13.

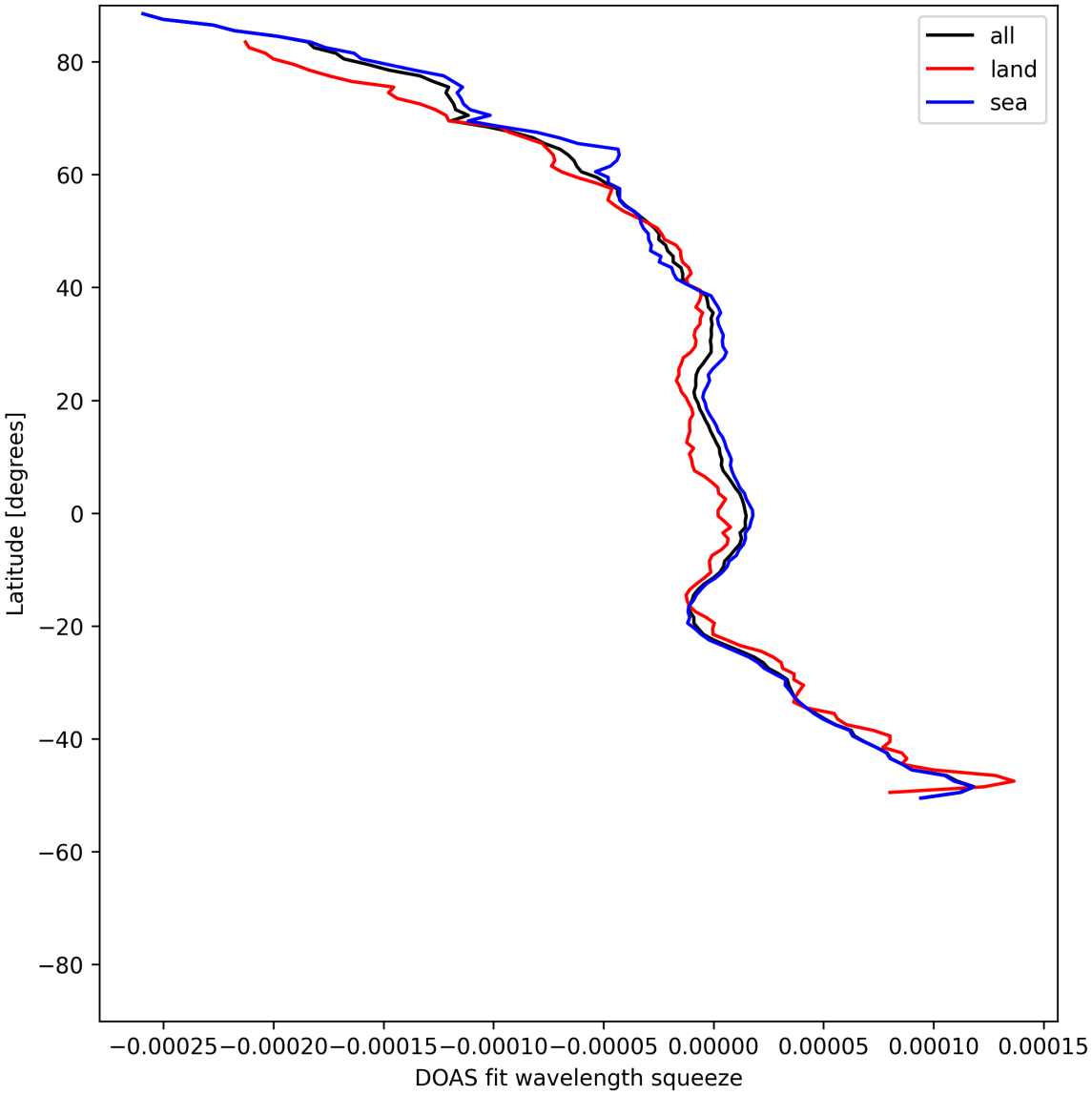


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-05-13 to 2025-05-13.

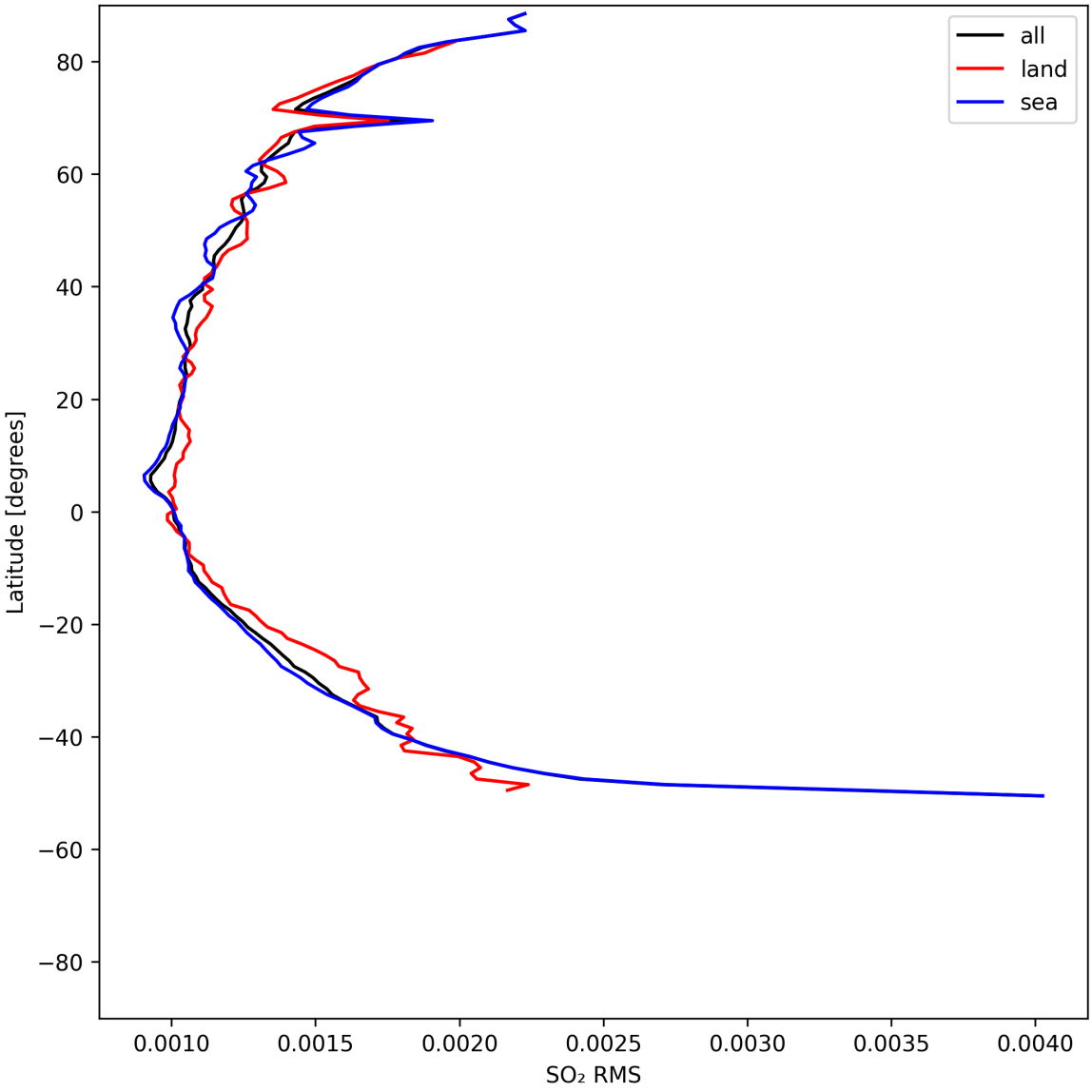


Figure 52: Zonal average of "SO_2 RMS" for 2025-05-13 to 2025-05-13.

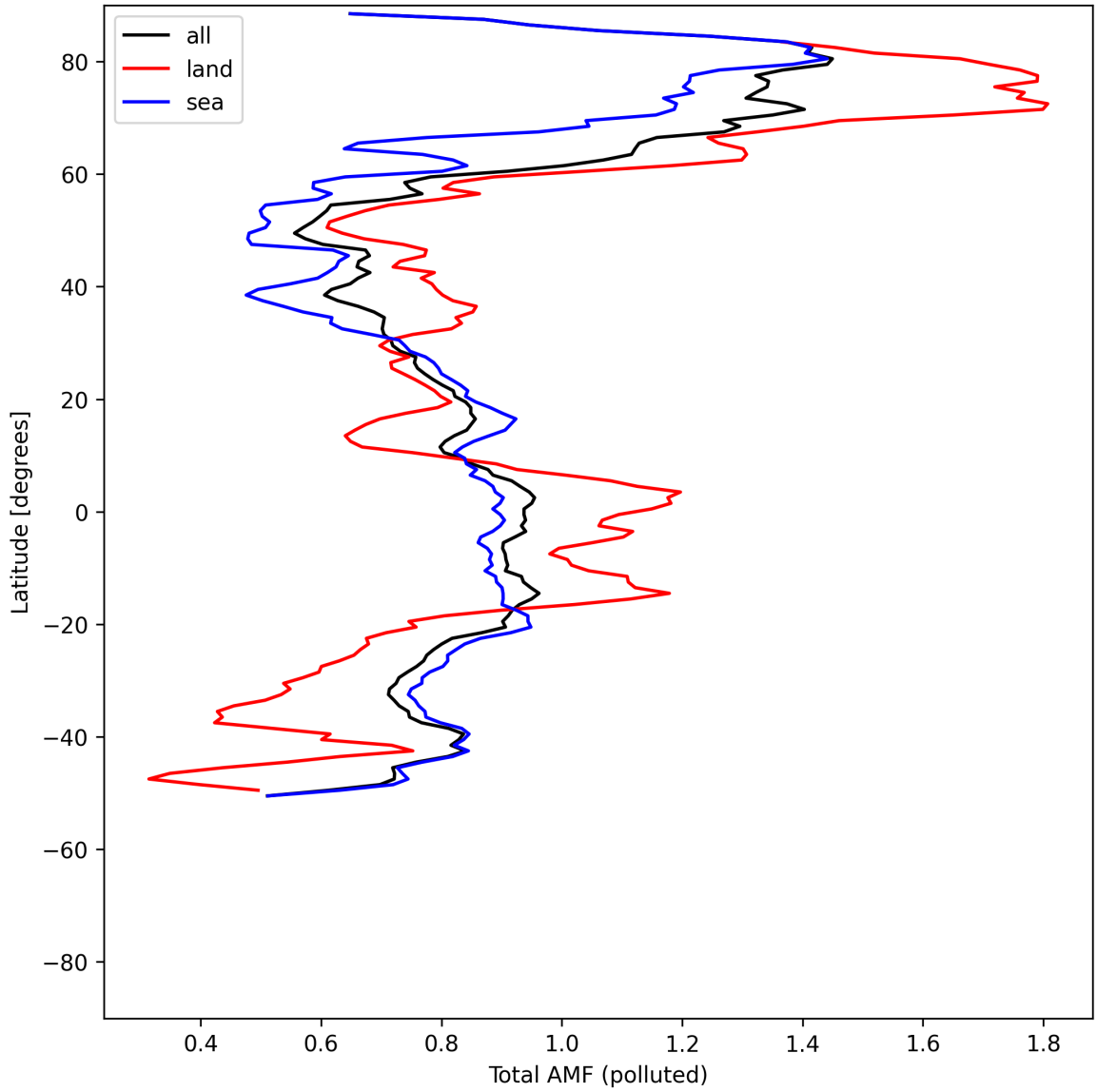


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-05-13 to 2025-05-13.

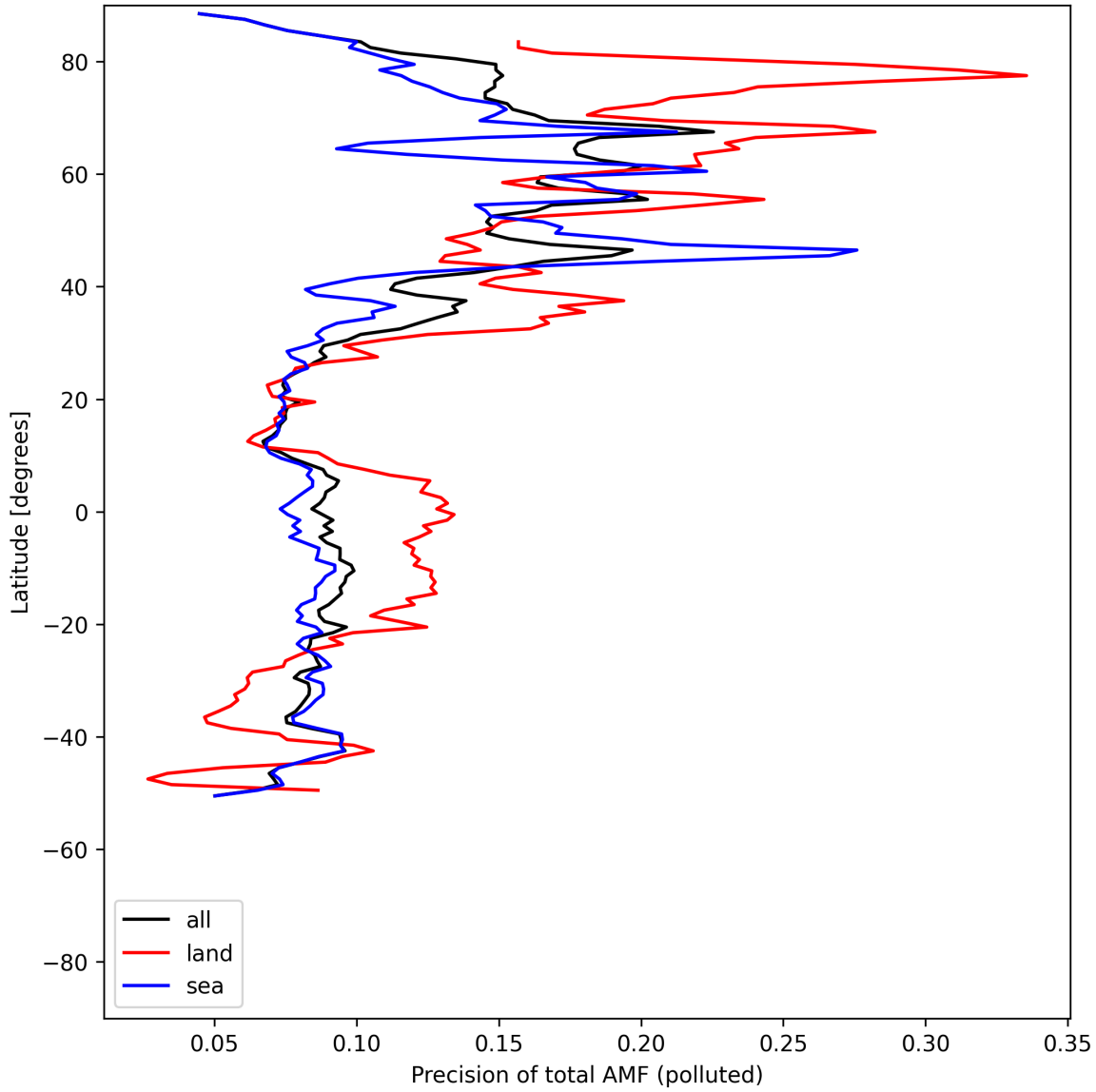


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-05-13 to 2025-05-13.

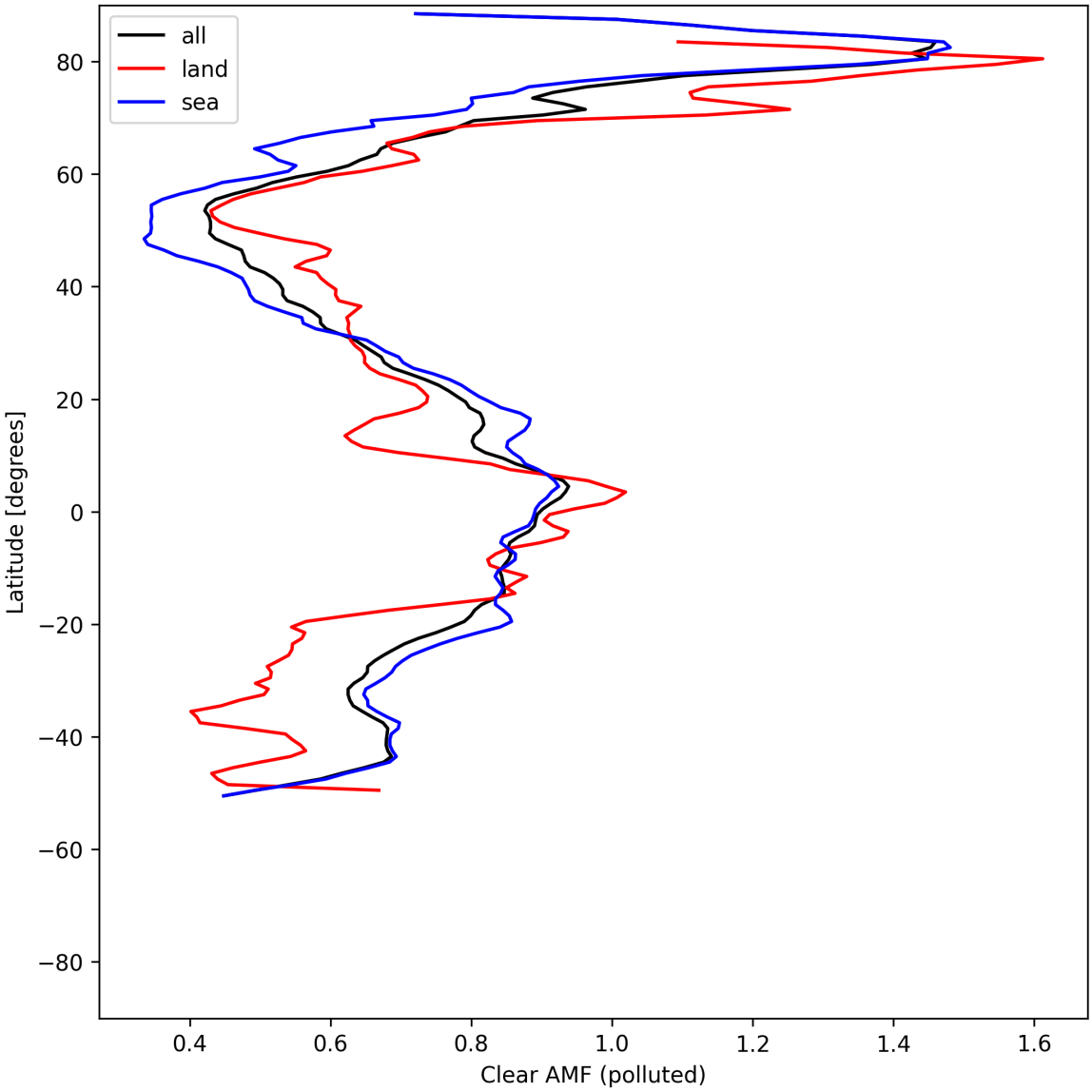


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-05-13 to 2025-05-13.

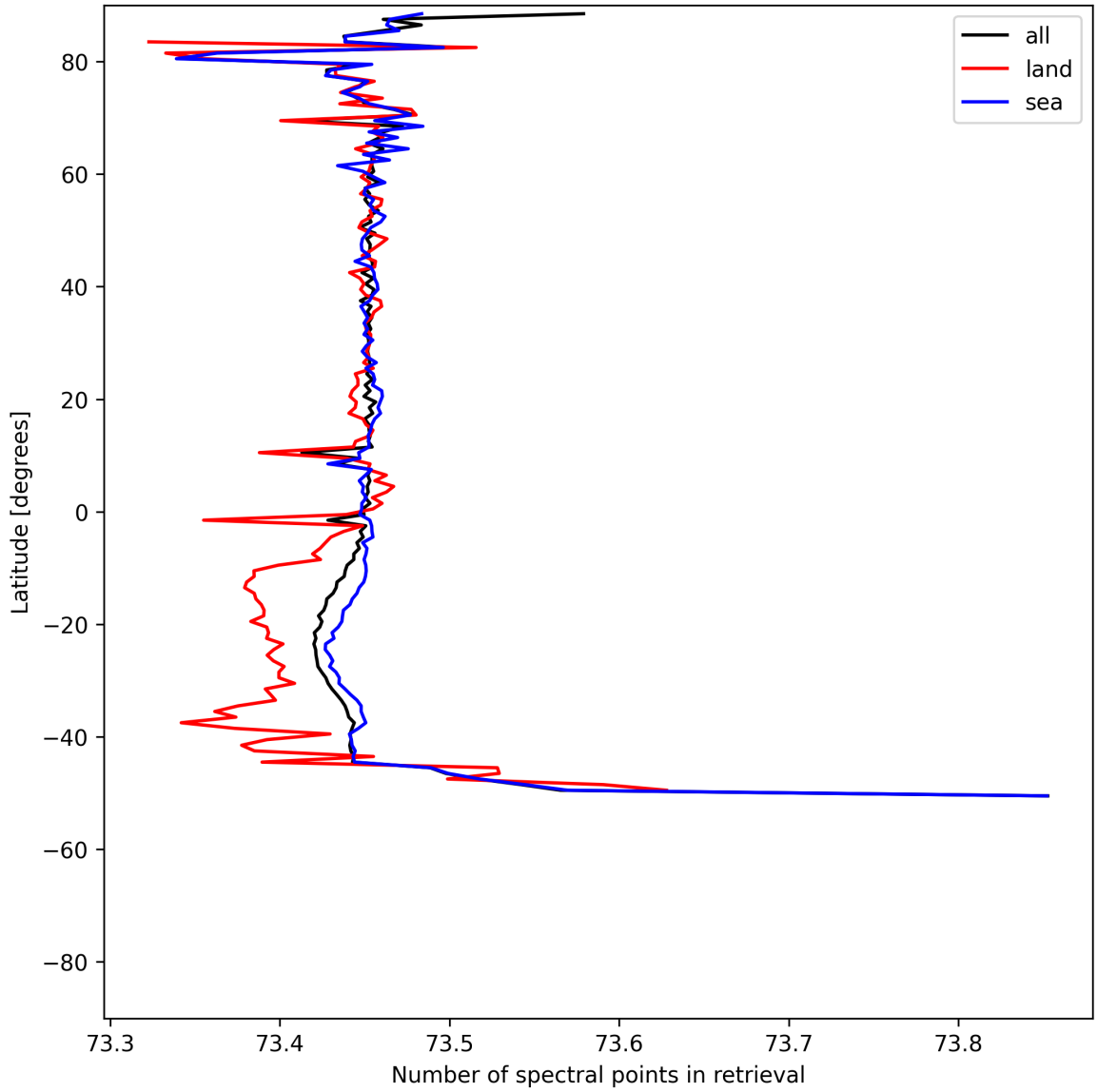


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-05-13 to 2025-05-13.

8 Histograms

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

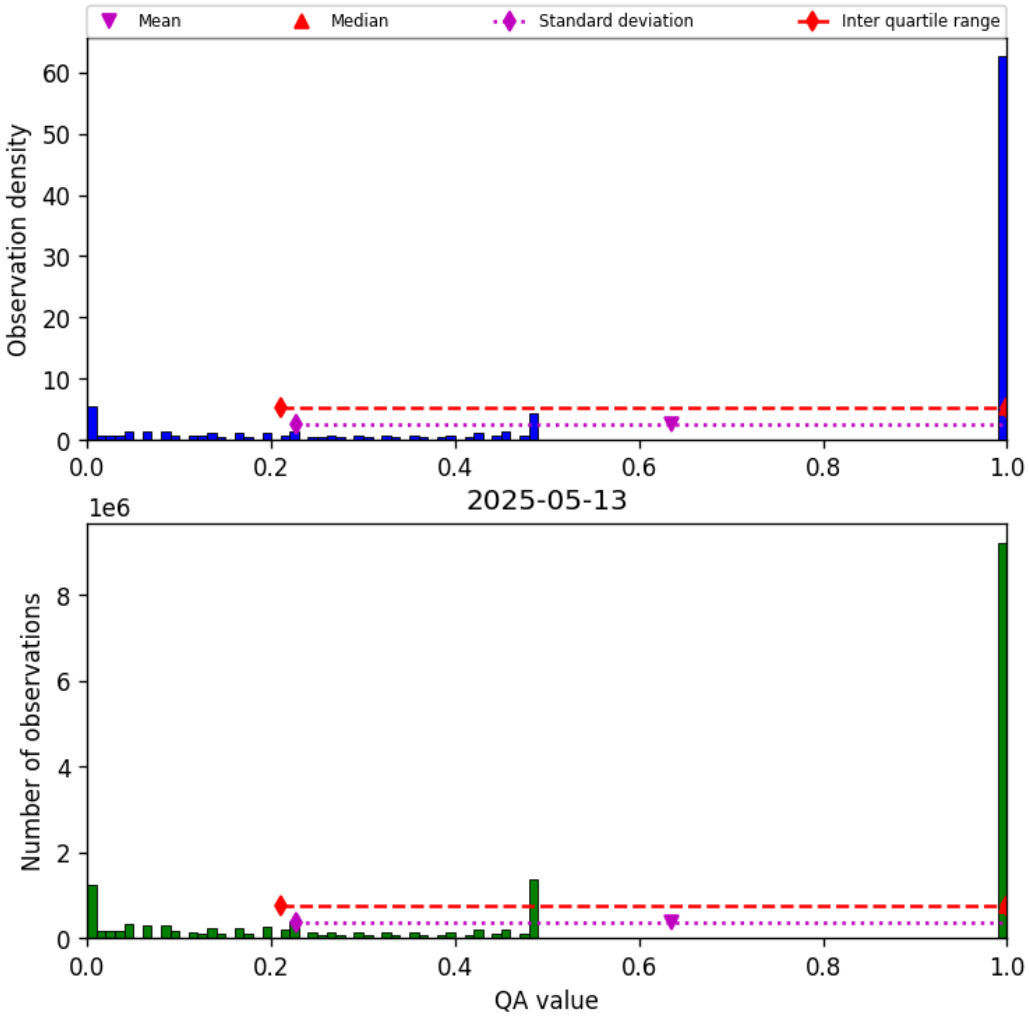


Figure 57: Histogram of “QA value” for 2025-05-13 to 2025-05-13

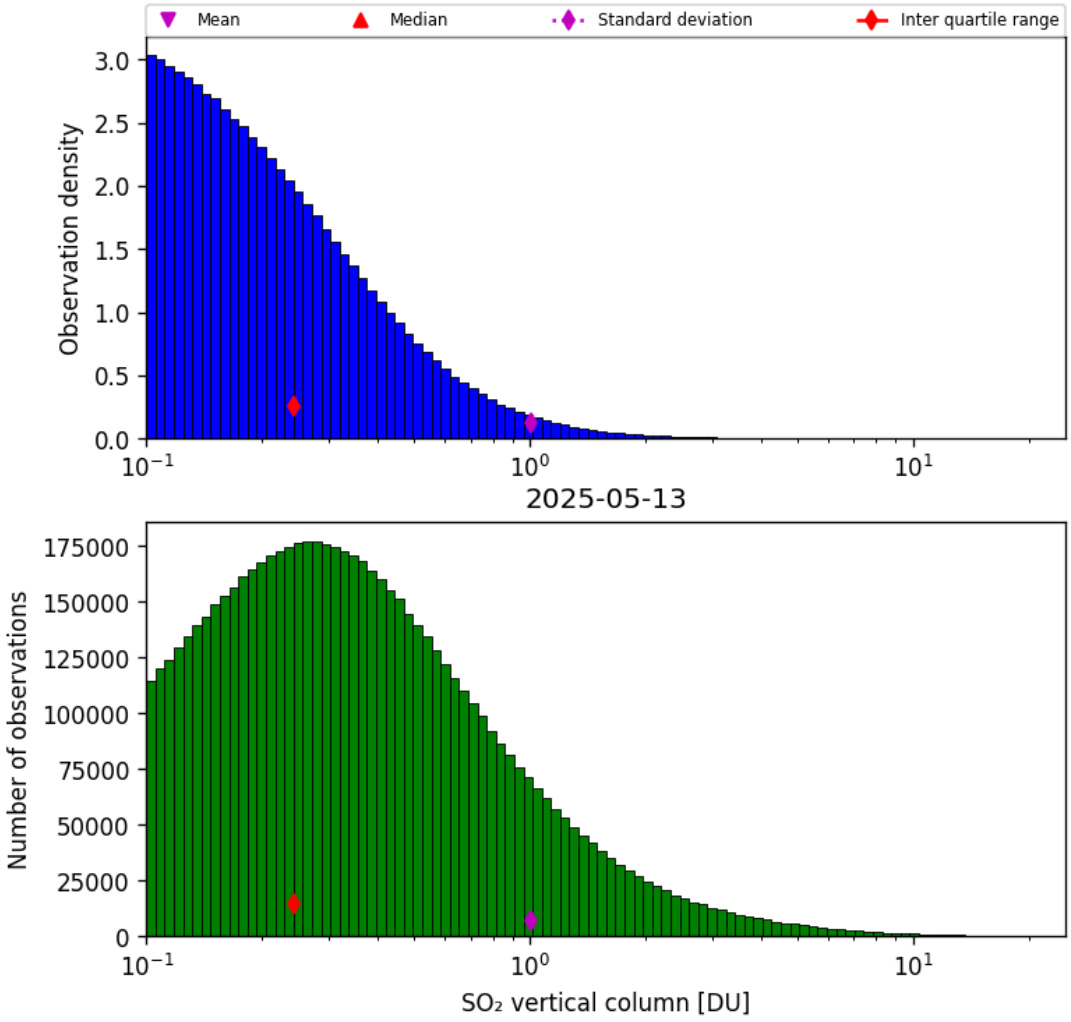


Figure 58: Histogram of "SO_2 vertical column" for 2025-05-13 to 2025-05-13

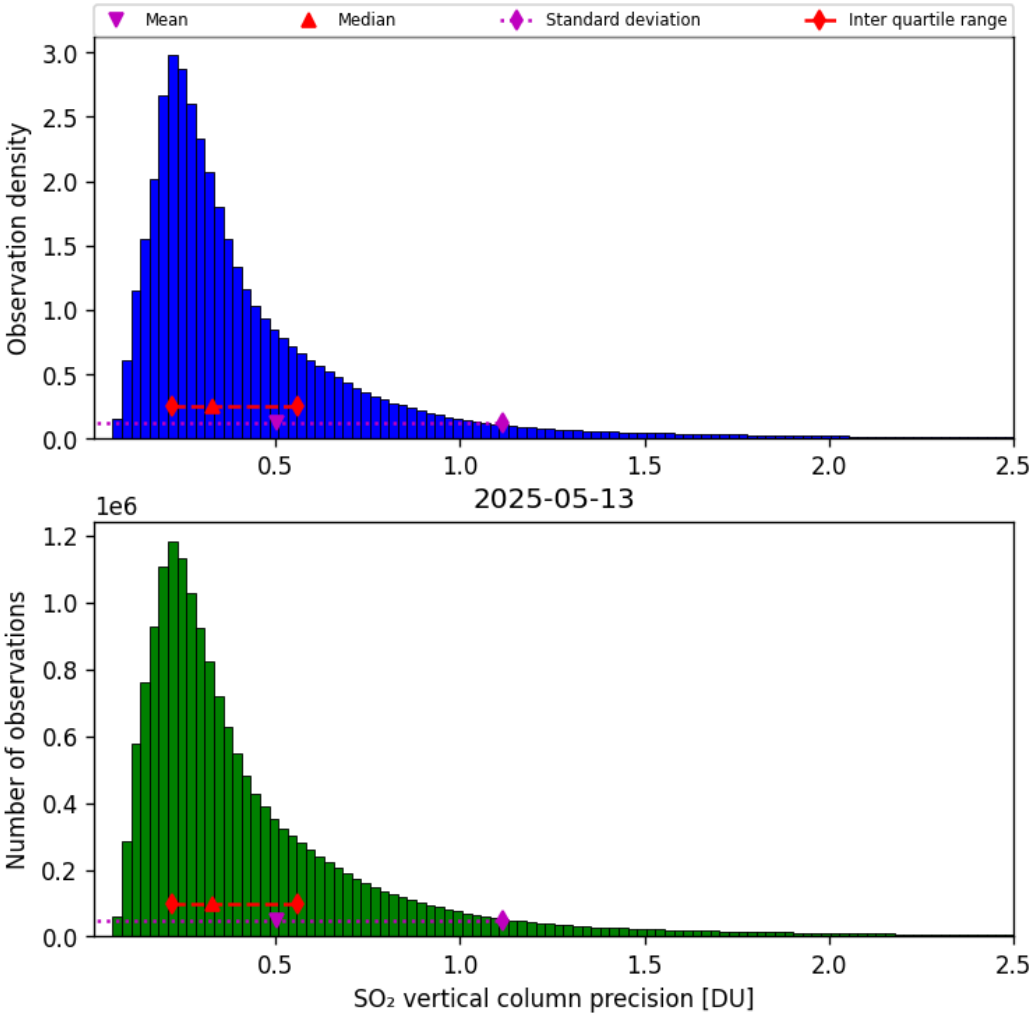


Figure 59: Histogram of "SO_2 vertical column precision" for 2025-05-13 to 2025-05-13

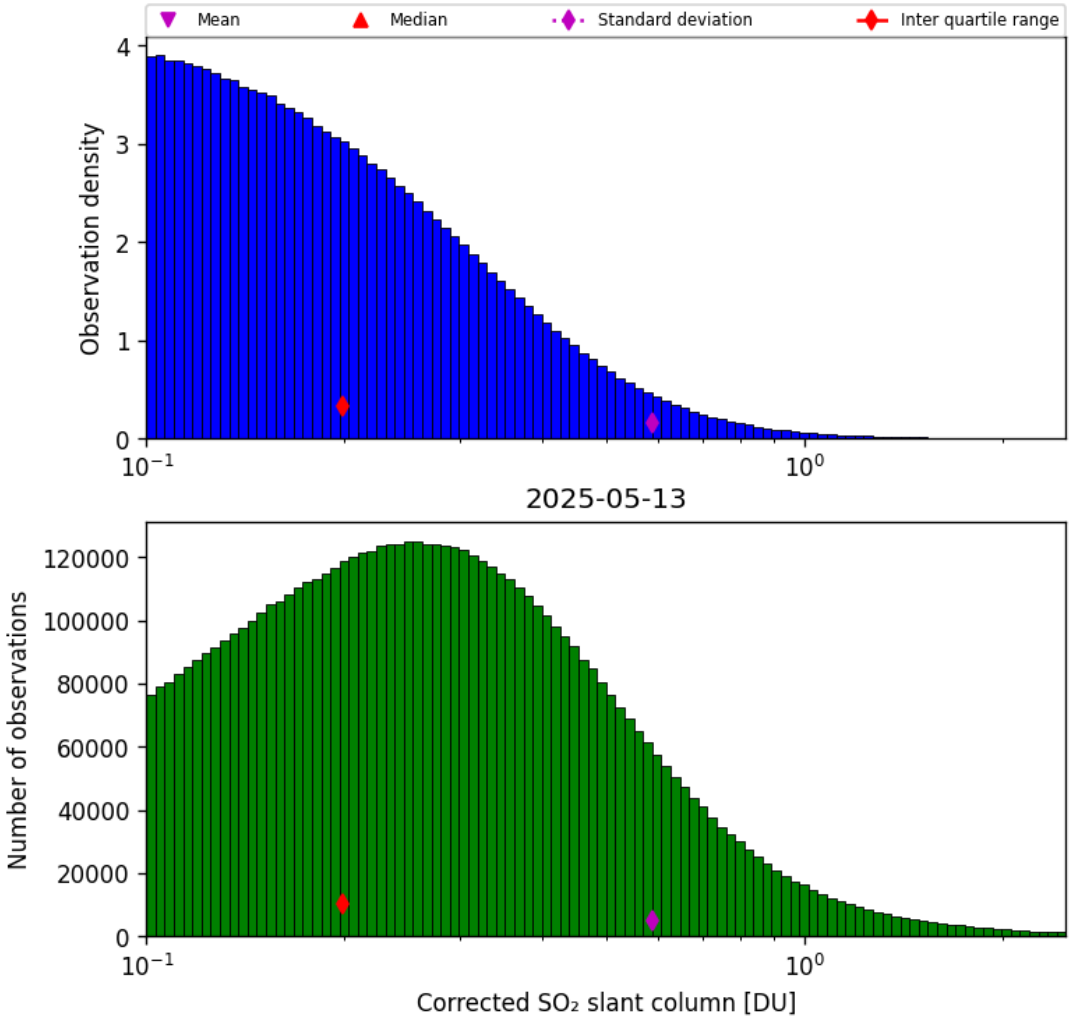


Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-05-13 to 2025-05-13

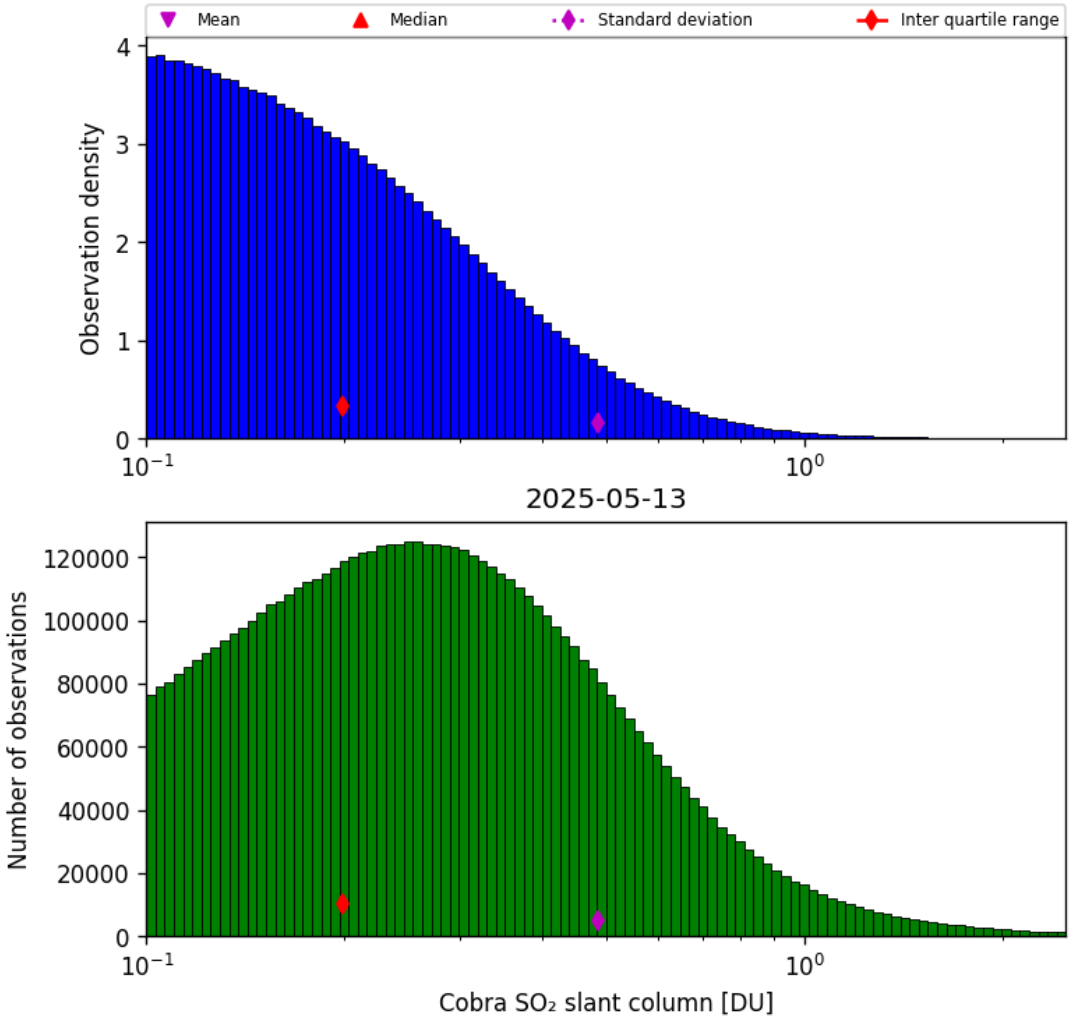


Figure 61: Histogram of “Cobra SO_2 slant column” for 2025-05-13 to 2025-05-13

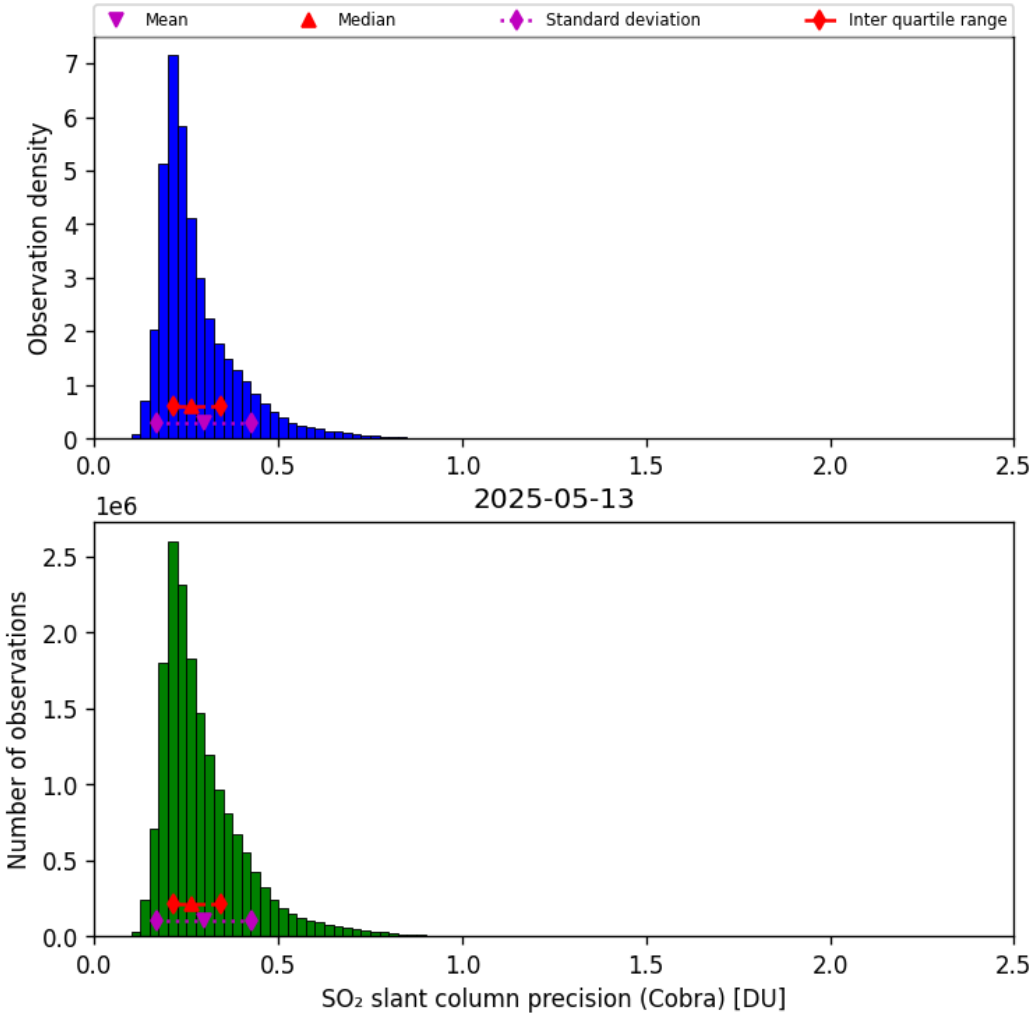


Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-05-13 to 2025-05-13

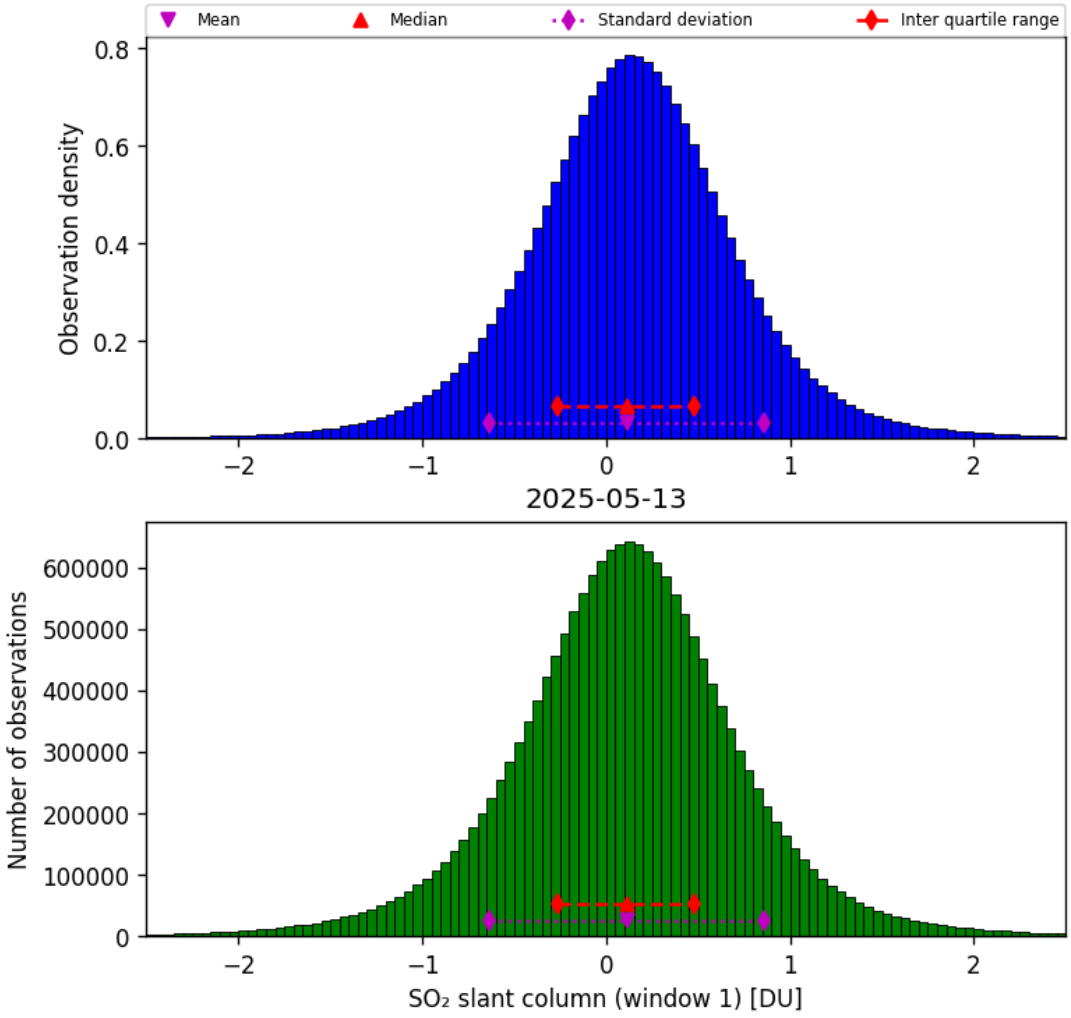


Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-05-13 to 2025-05-13

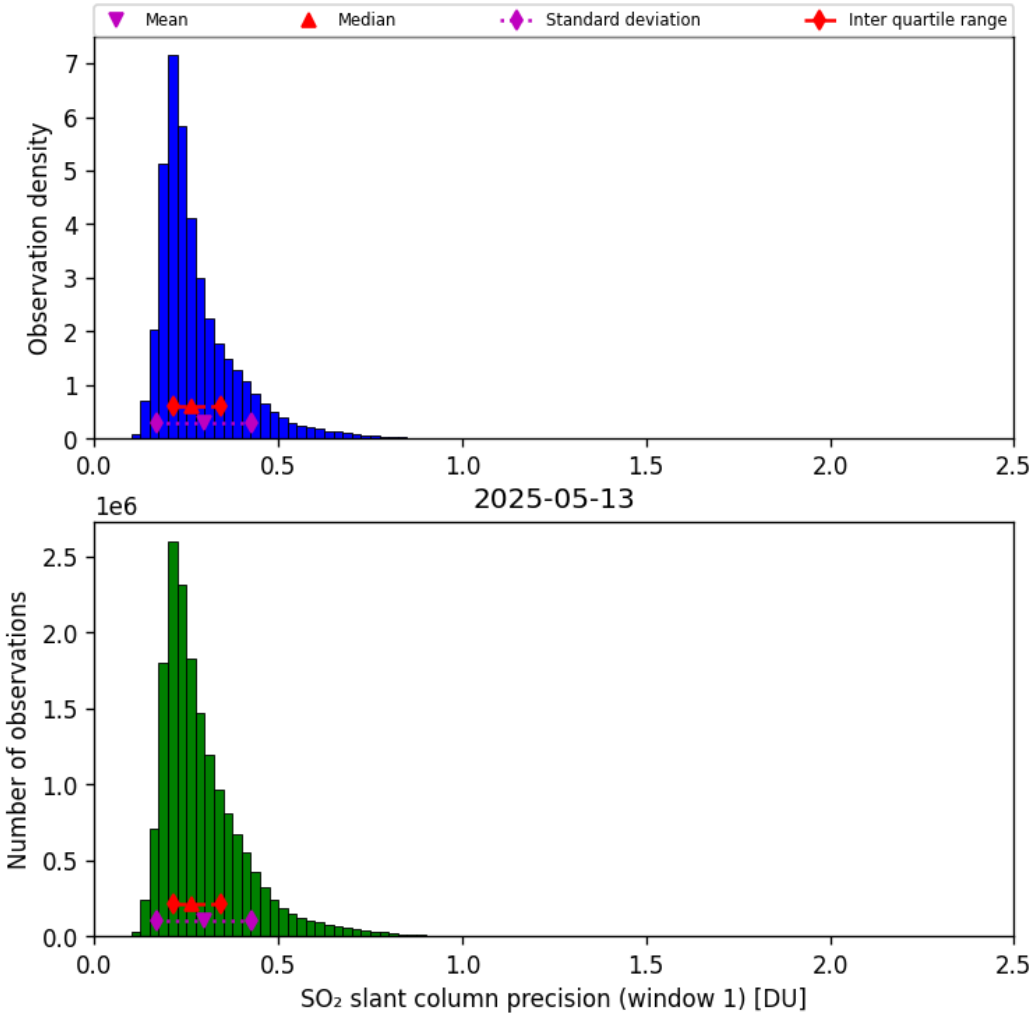


Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-05-13 to 2025-05-13

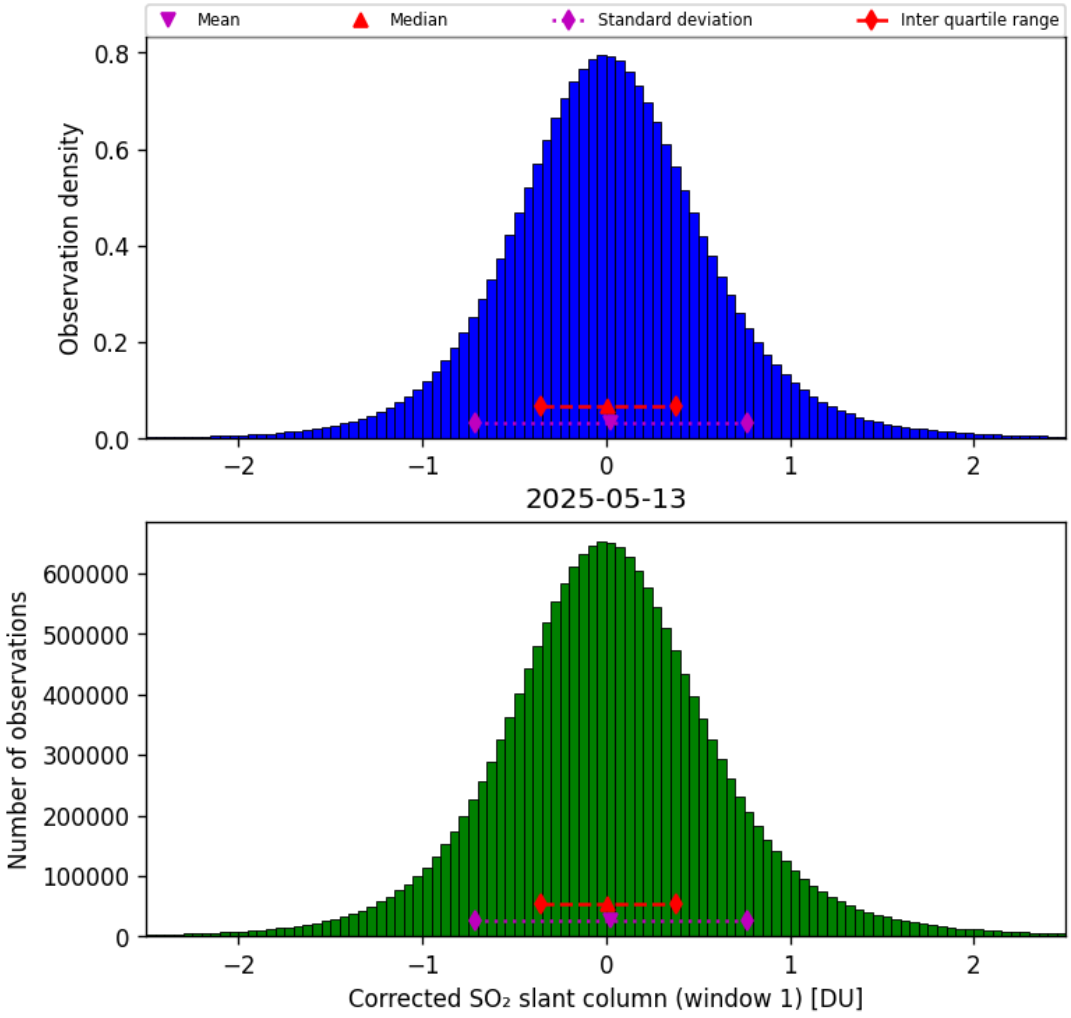


Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-05-13 to 2025-05-13

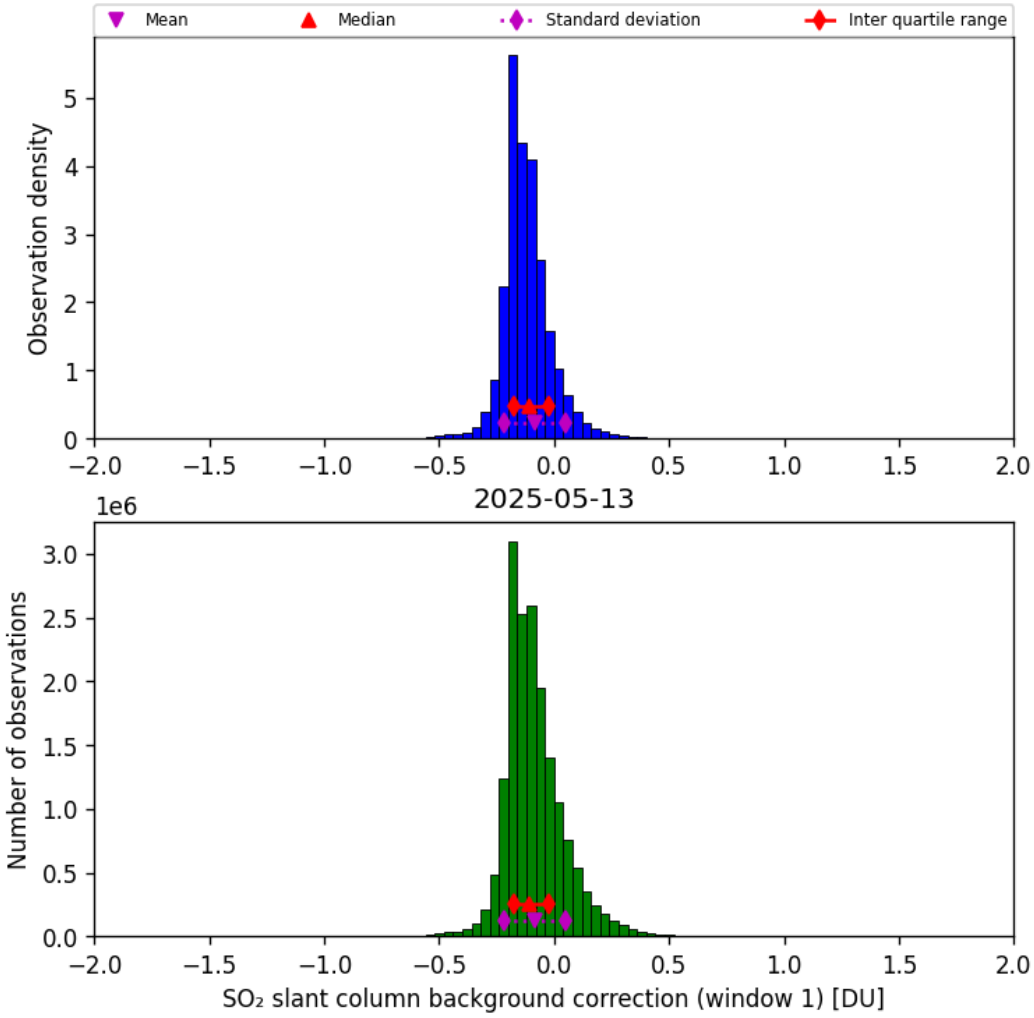


Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-05-13 to 2025-05-13

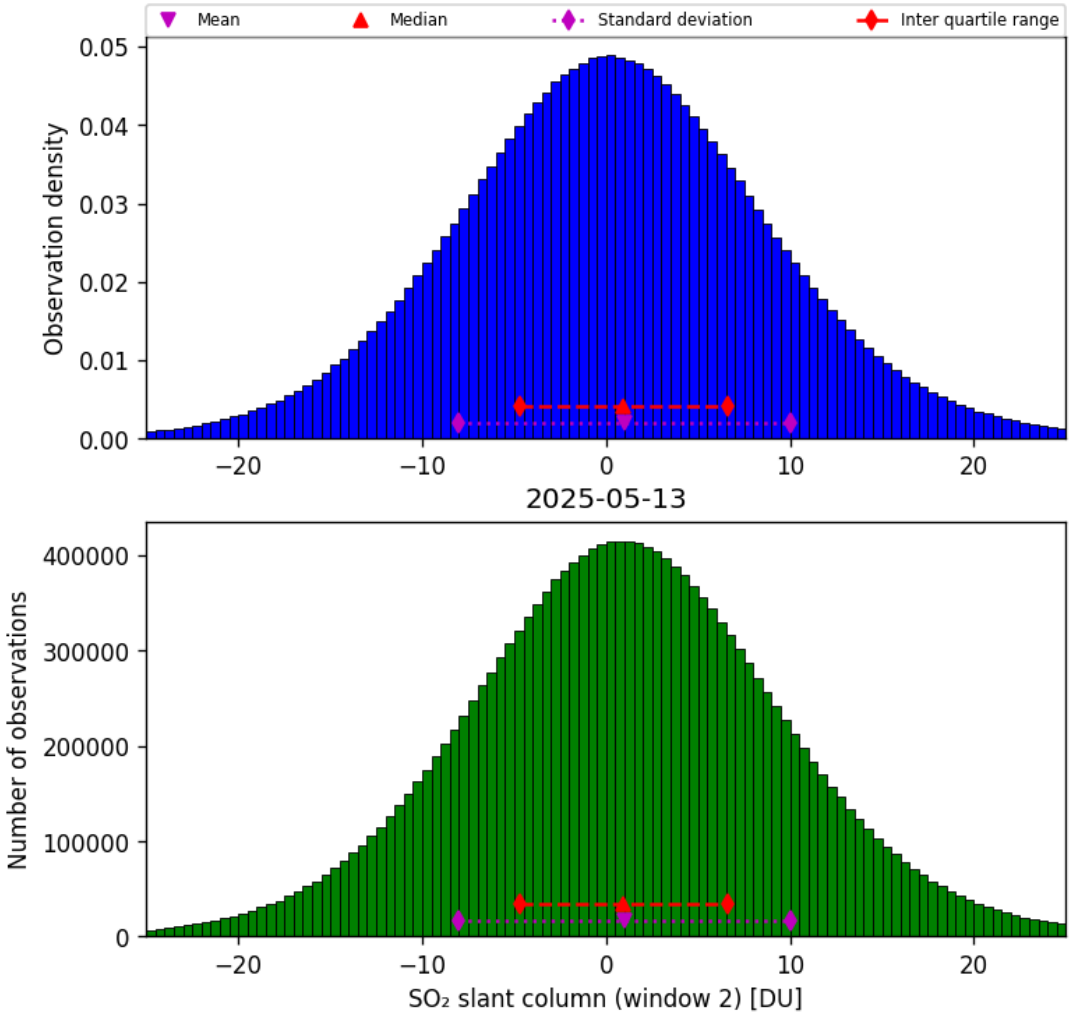


Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-05-13 to 2025-05-13

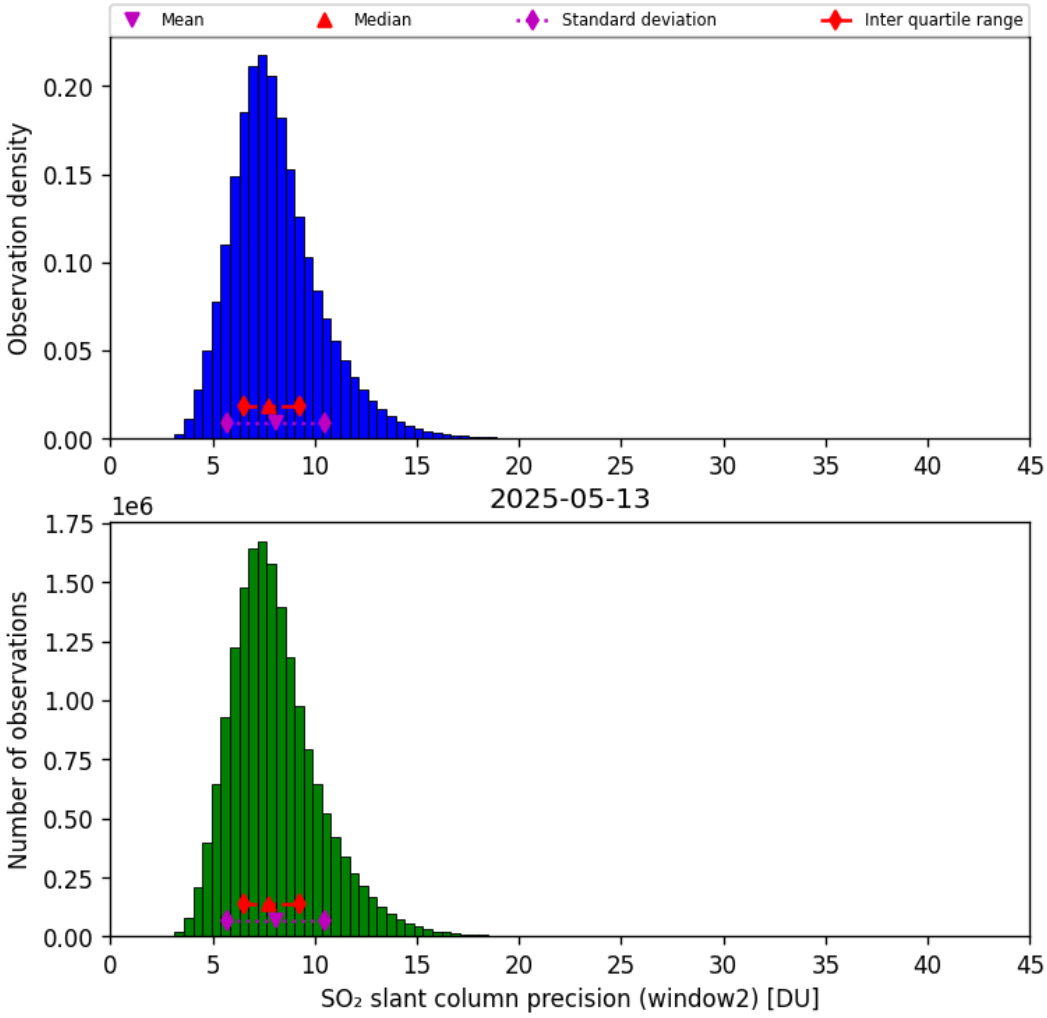


Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-05-13 to 2025-05-13

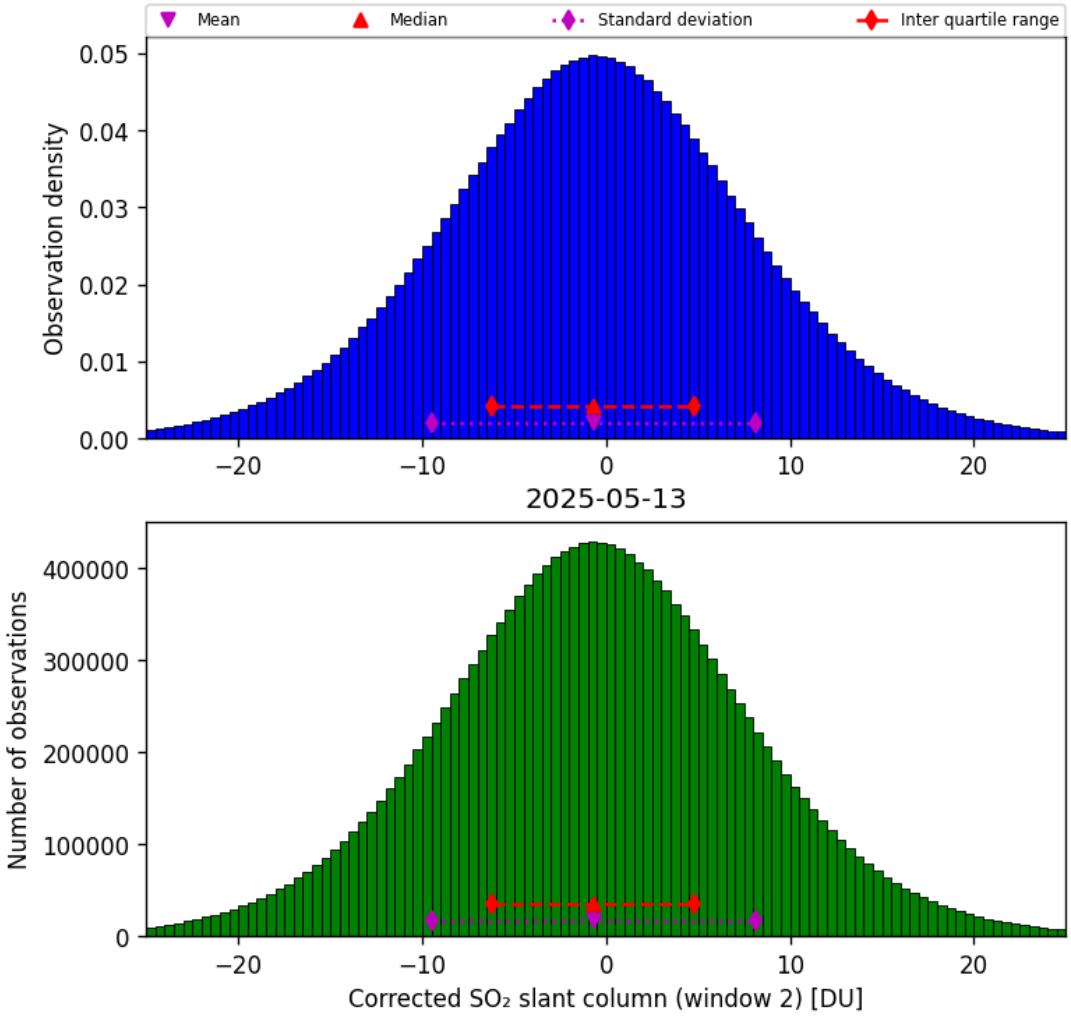


Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-05-13 to 2025-05-13

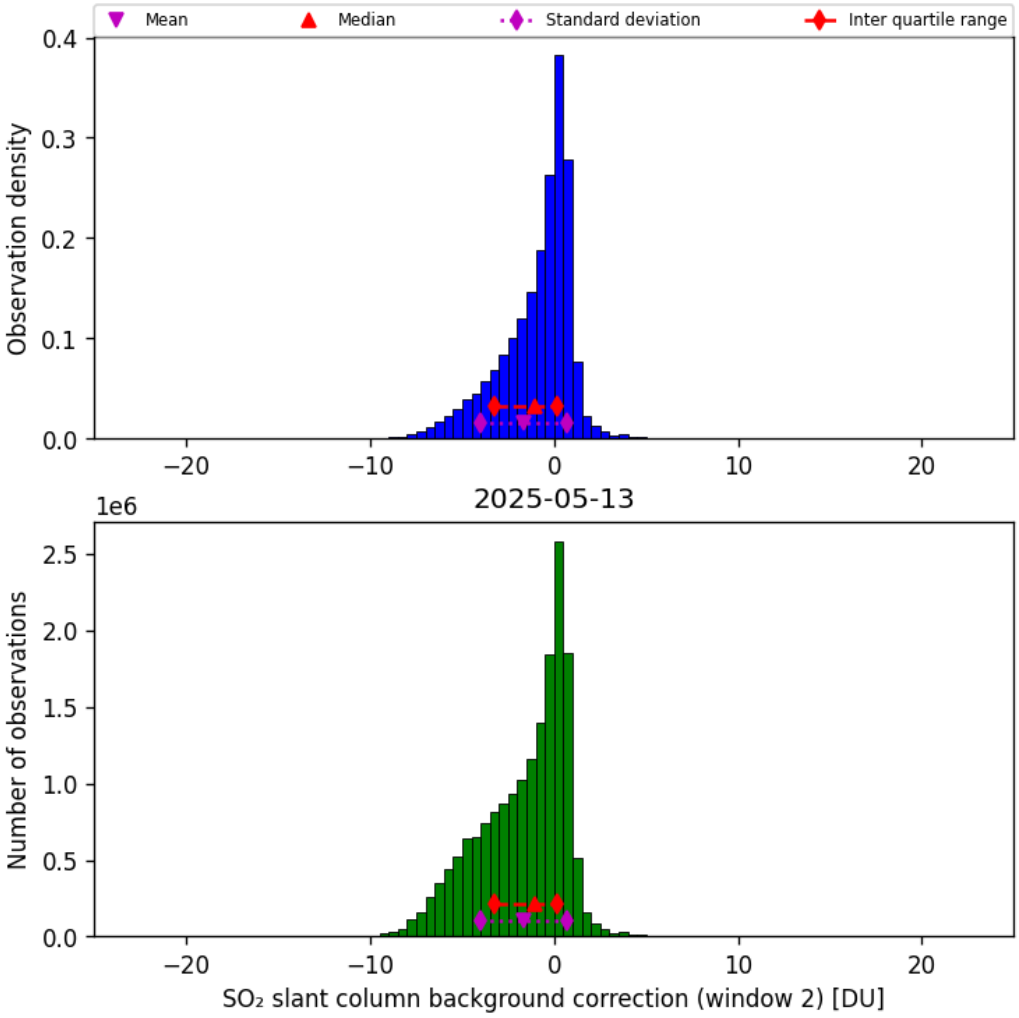


Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-05-13 to 2025-05-13

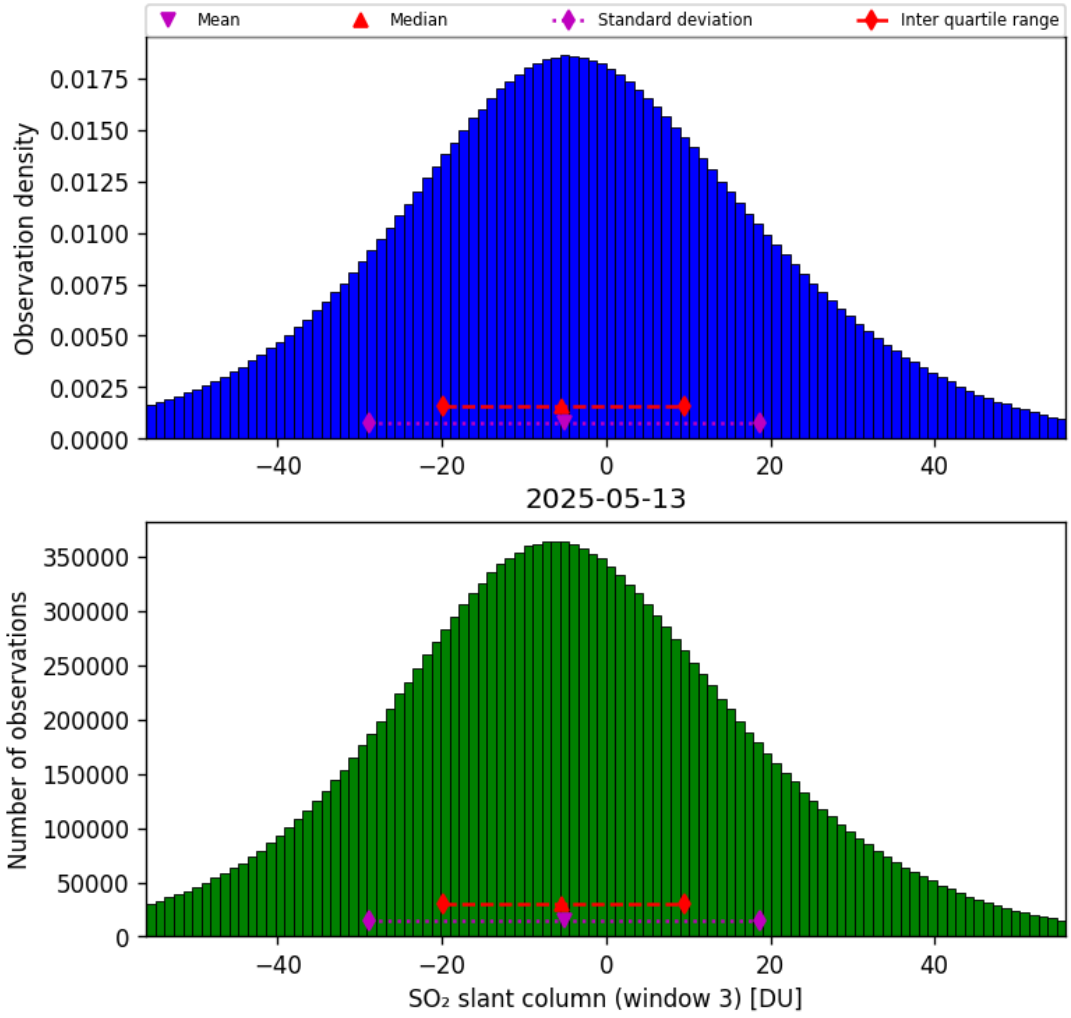


Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-05-13 to 2025-05-13

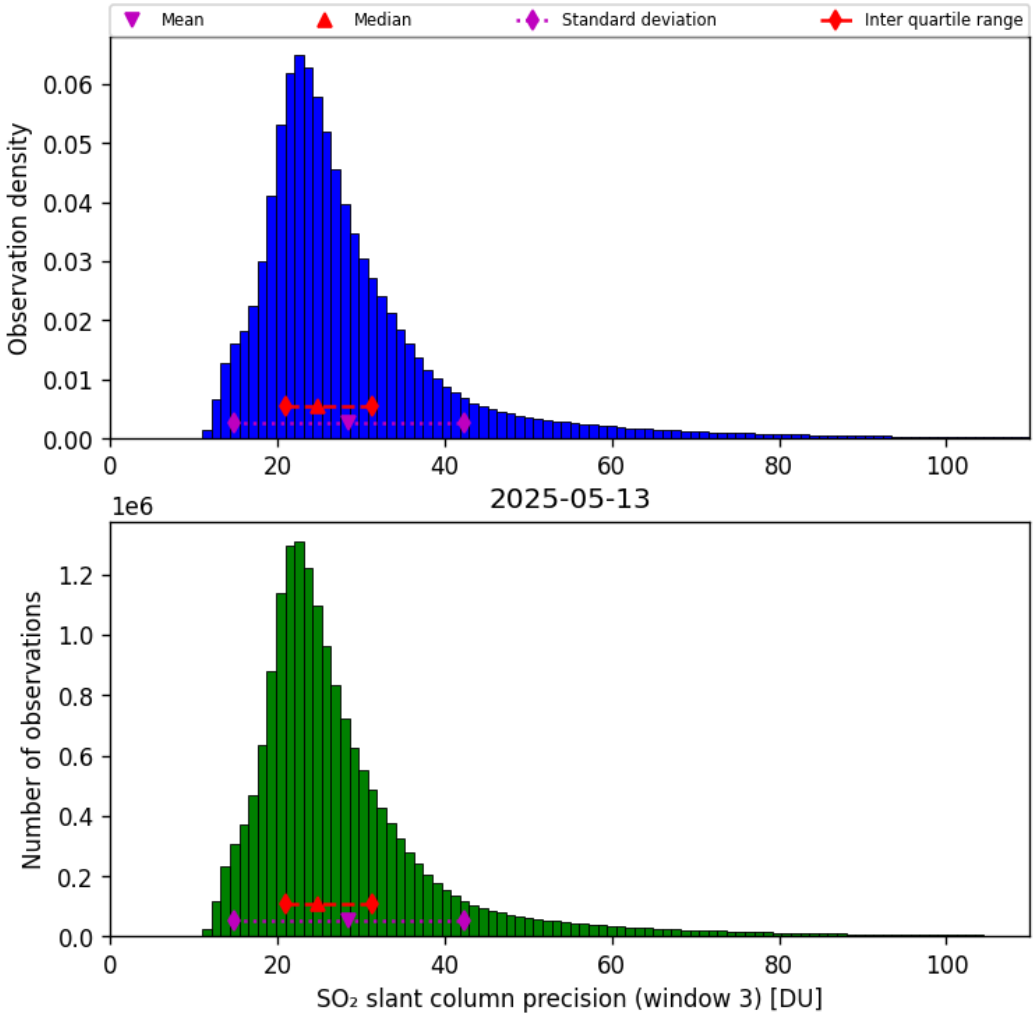


Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-05-13 to 2025-05-13

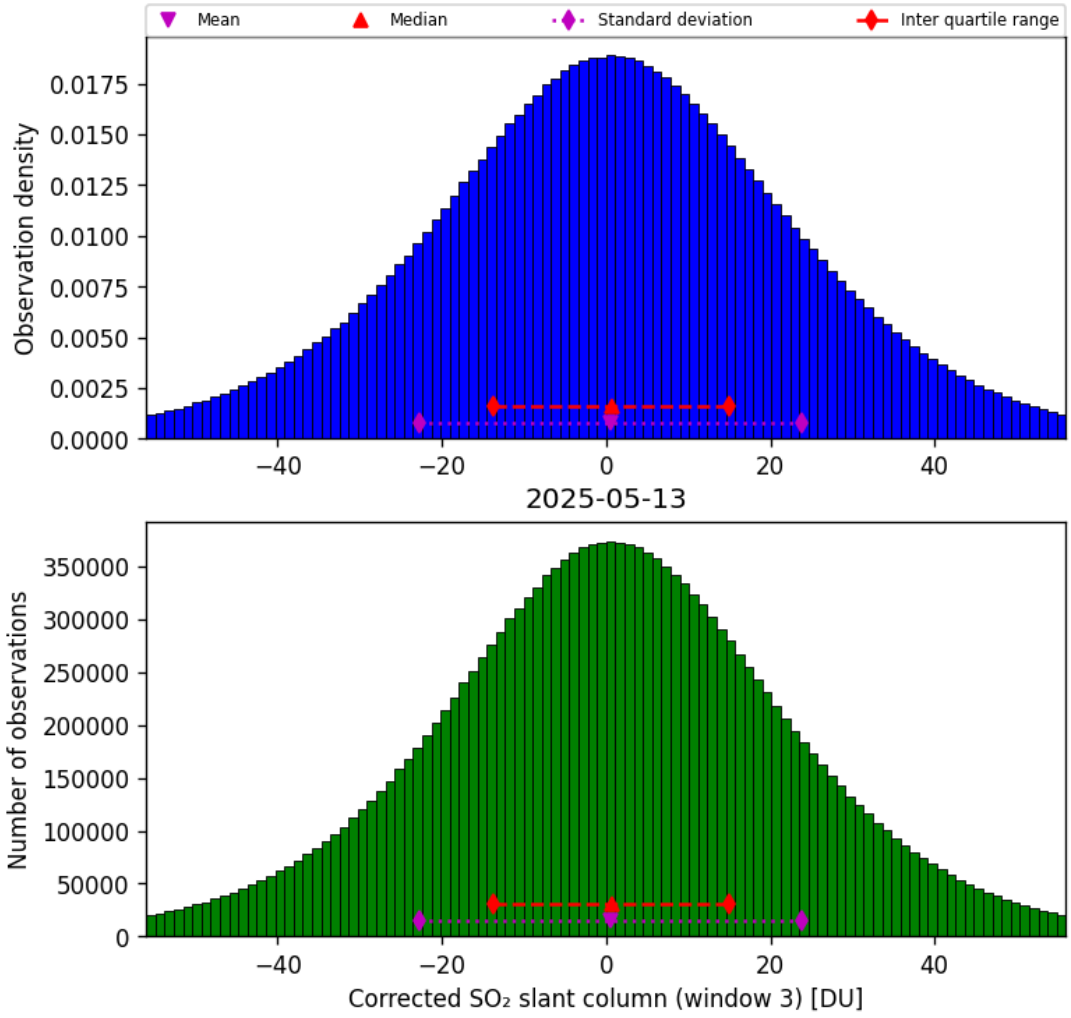


Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-05-13 to 2025-05-13

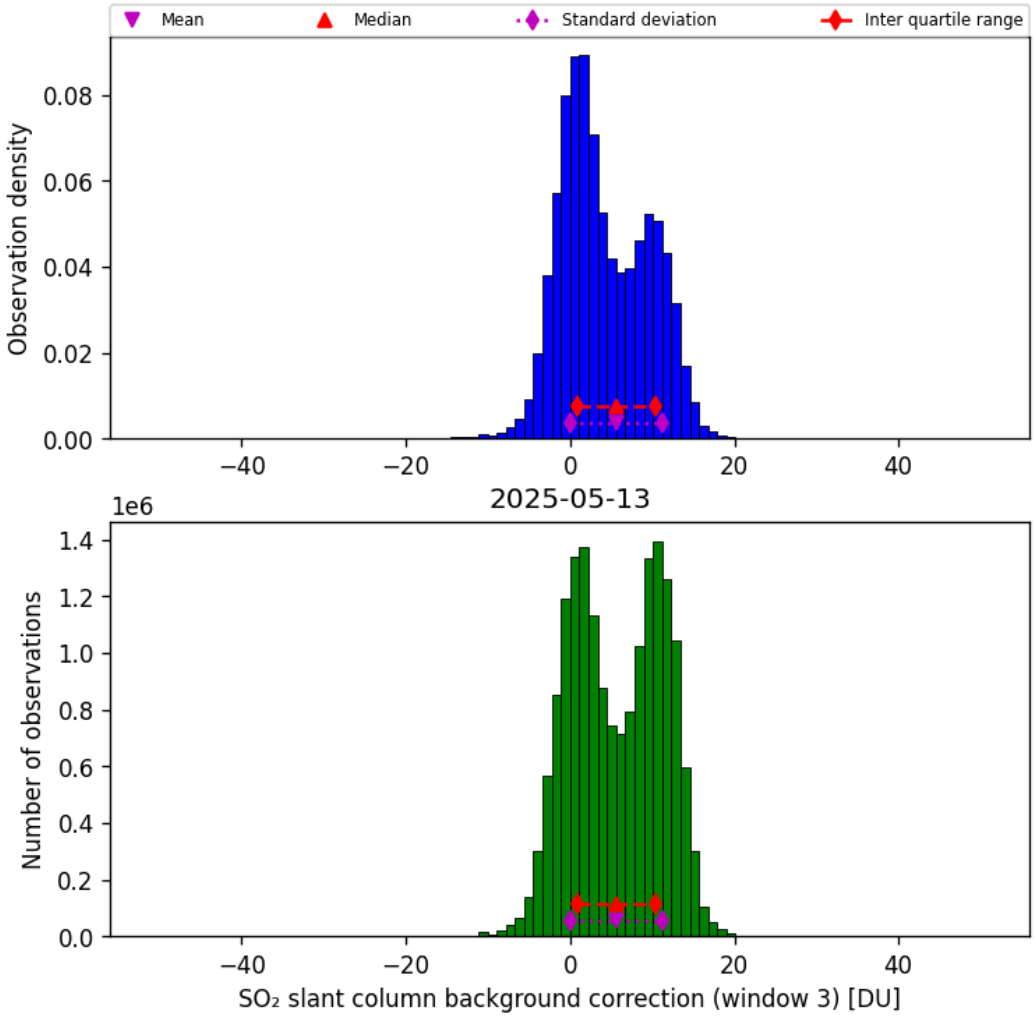


Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-05-13 to 2025-05-13

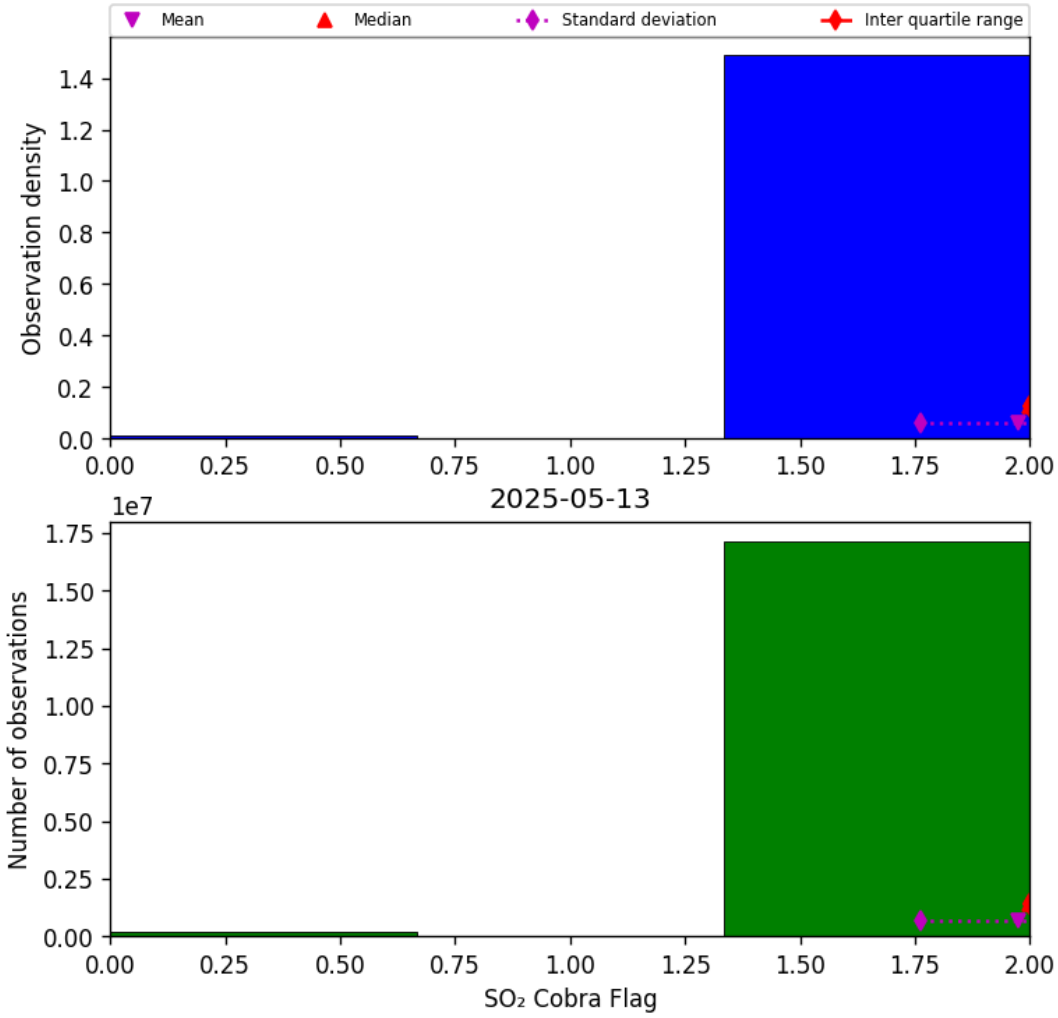


Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-05-13 to 2025-05-13

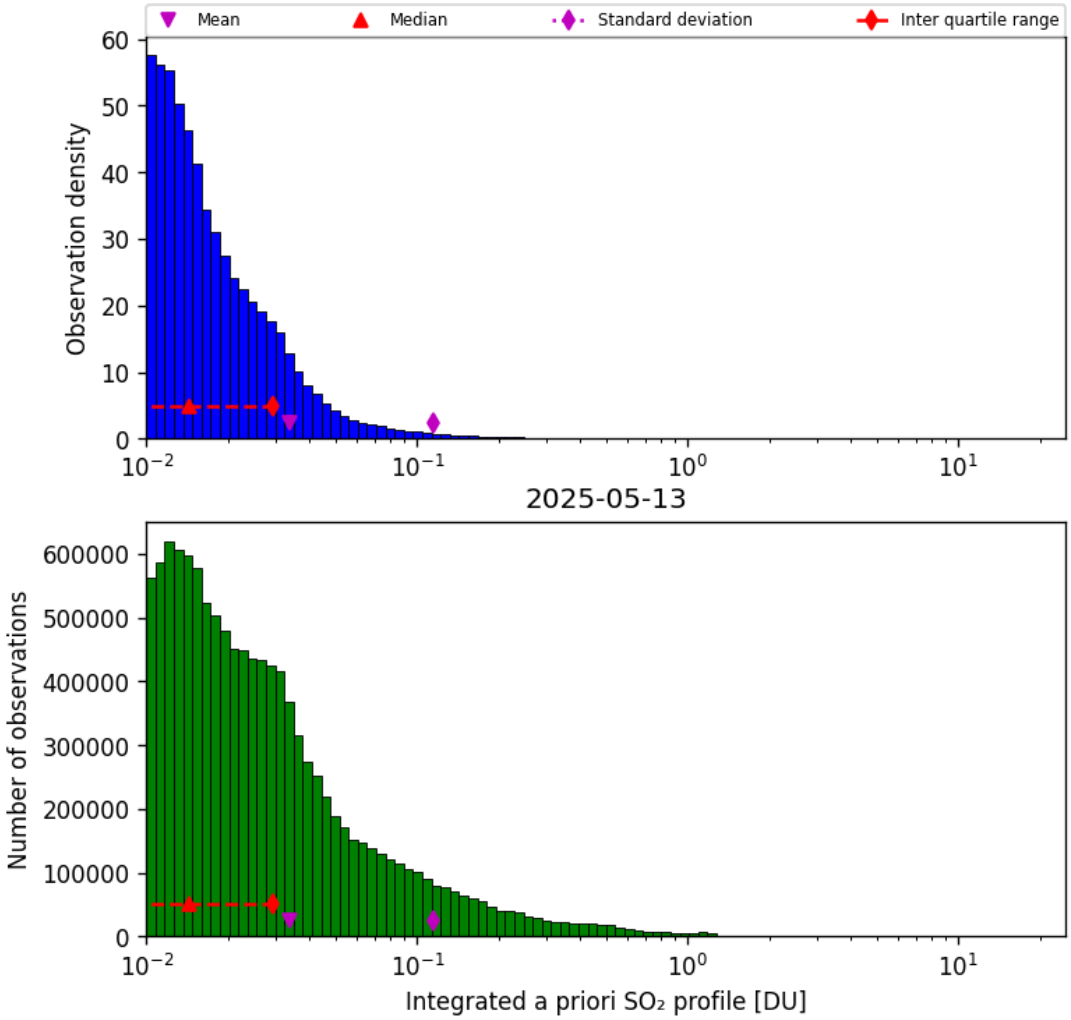


Figure 76: Histogram of “Integrated a priori SO_2 profile” for 2025-05-13 to 2025-05-13

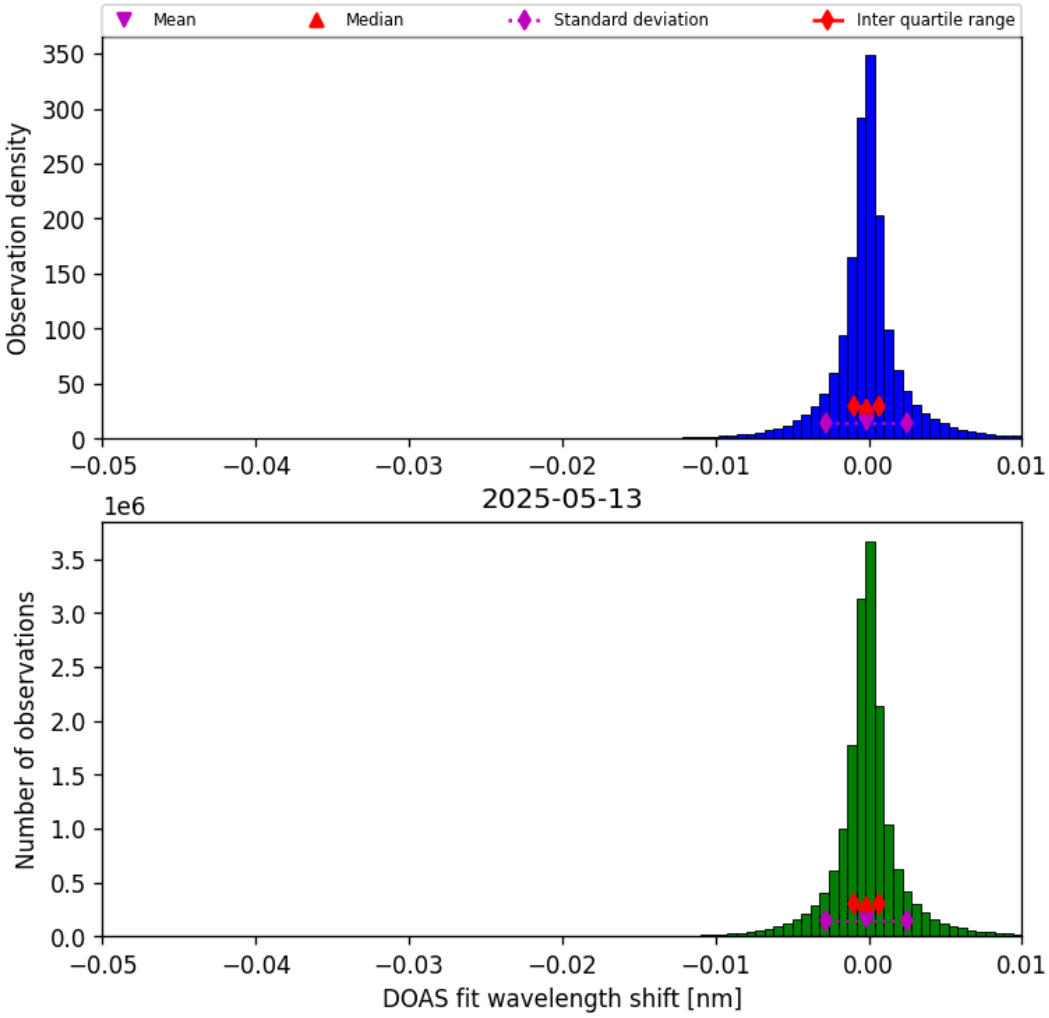


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-05-13 to 2025-05-13

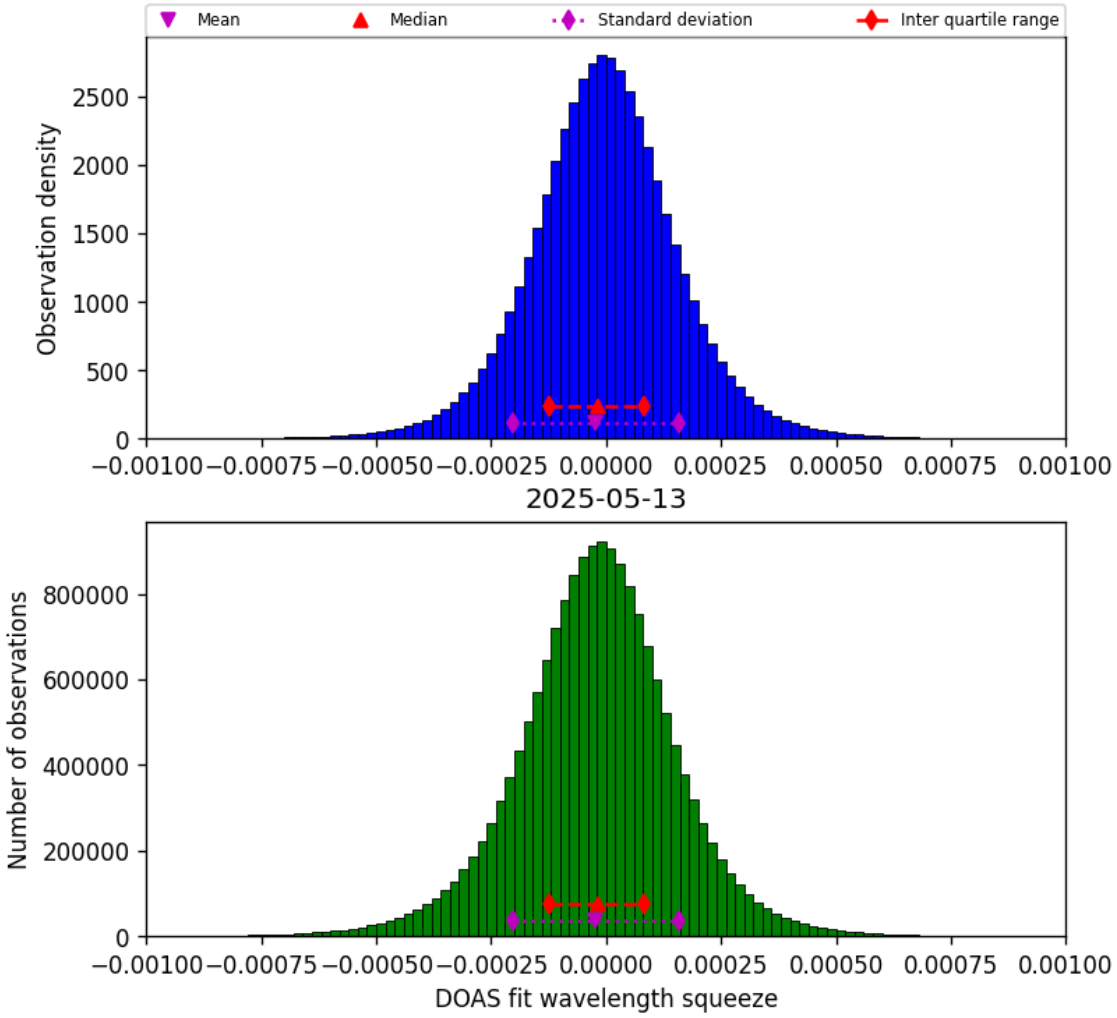


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-05-13 to 2025-05-13

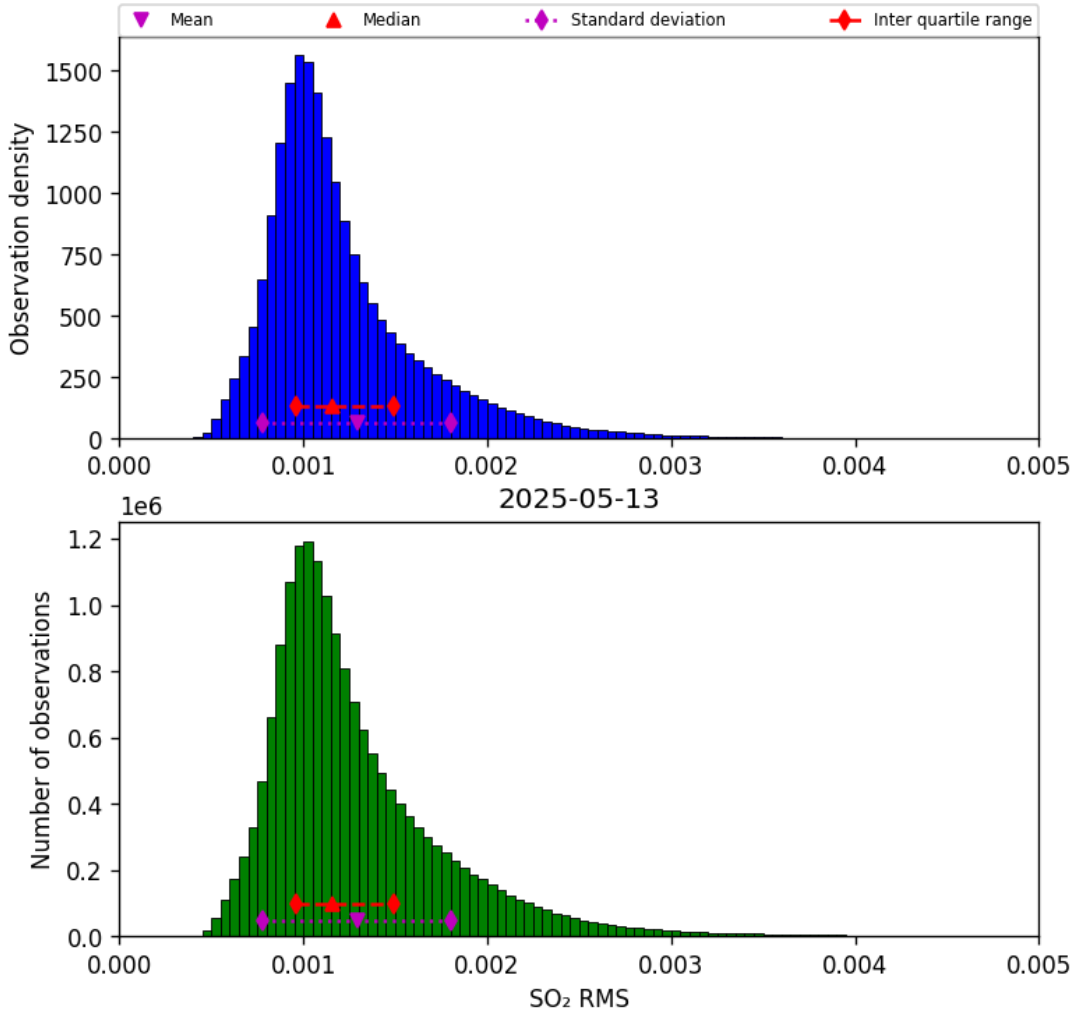


Figure 79: Histogram of "SO_2 RMS" for 2025-05-13 to 2025-05-13

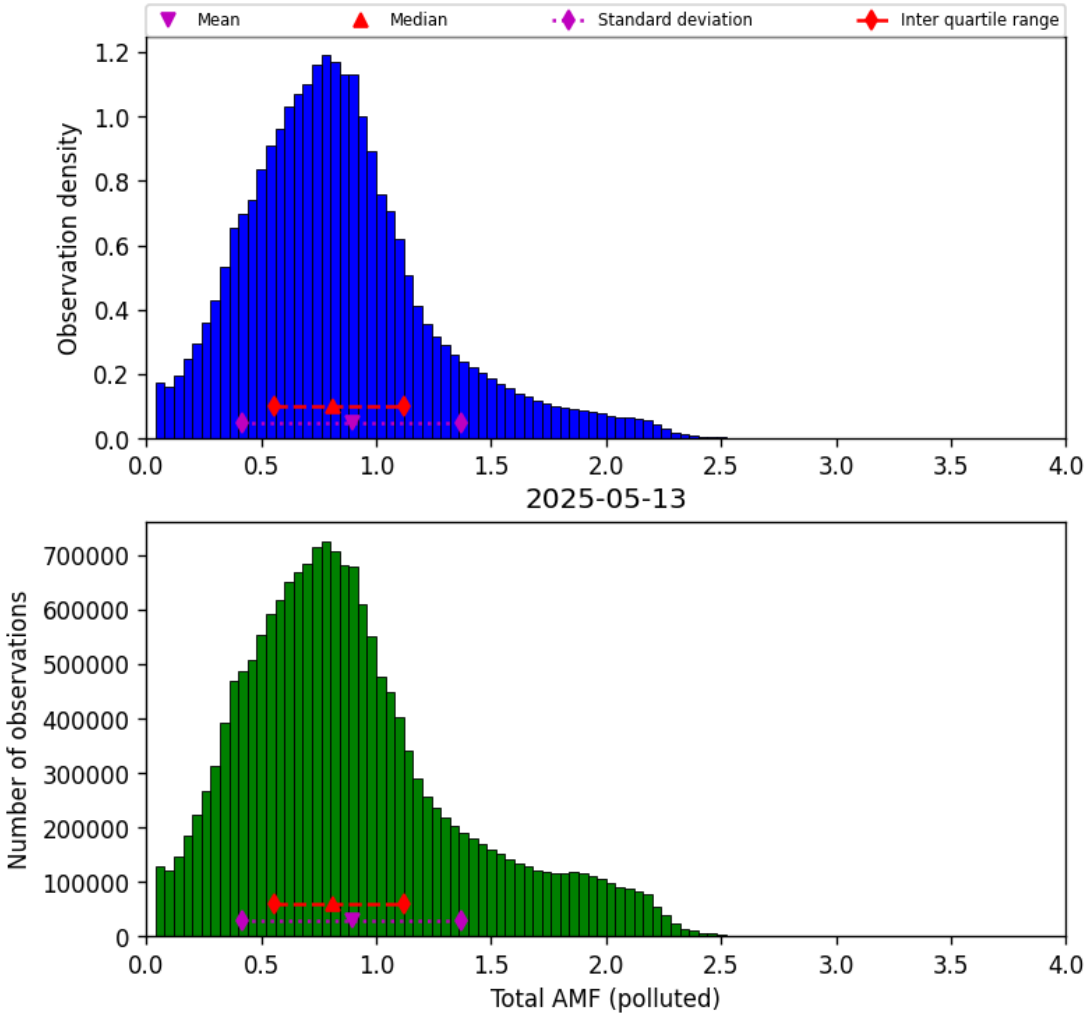


Figure 80: Histogram of “Total AMF (polluted)” for 2025-05-13 to 2025-05-13

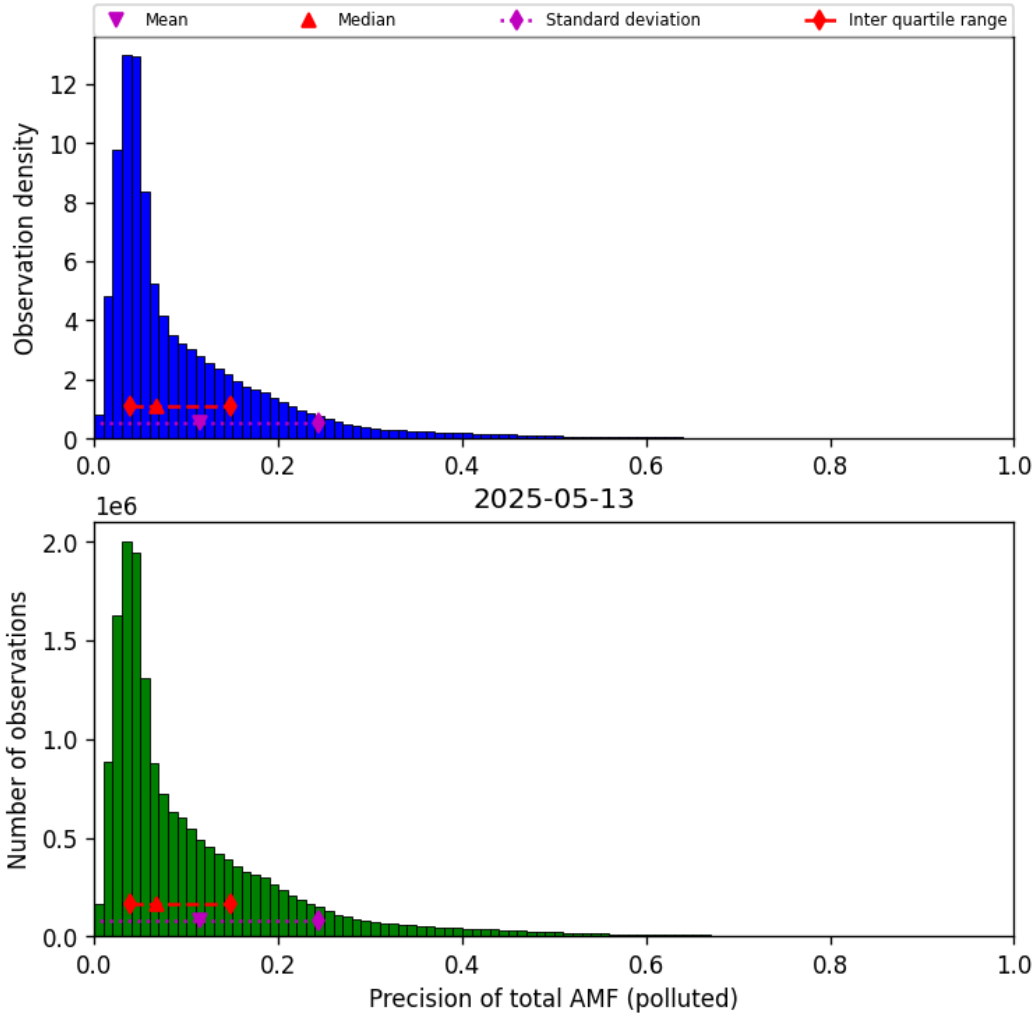


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-05-13 to 2025-05-13

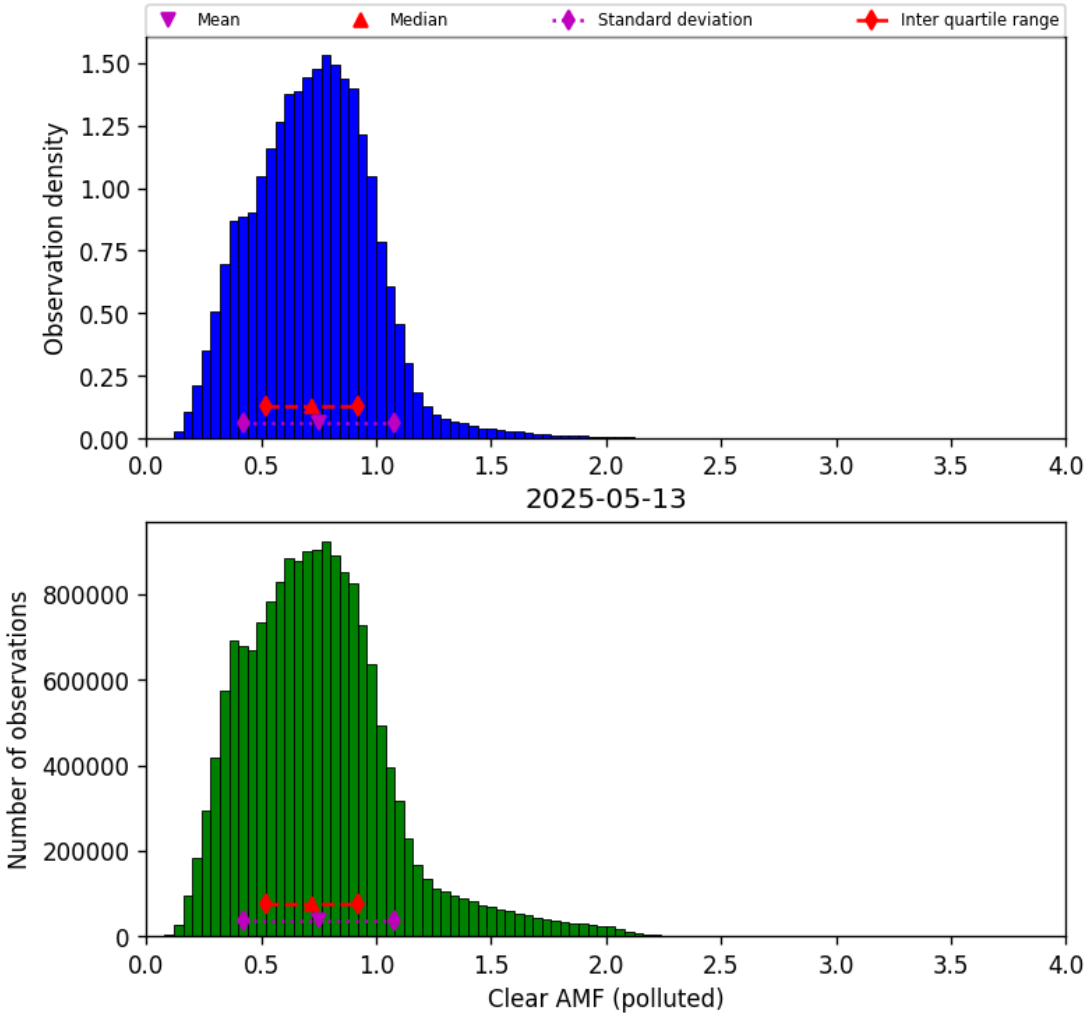


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-05-13 to 2025-05-13

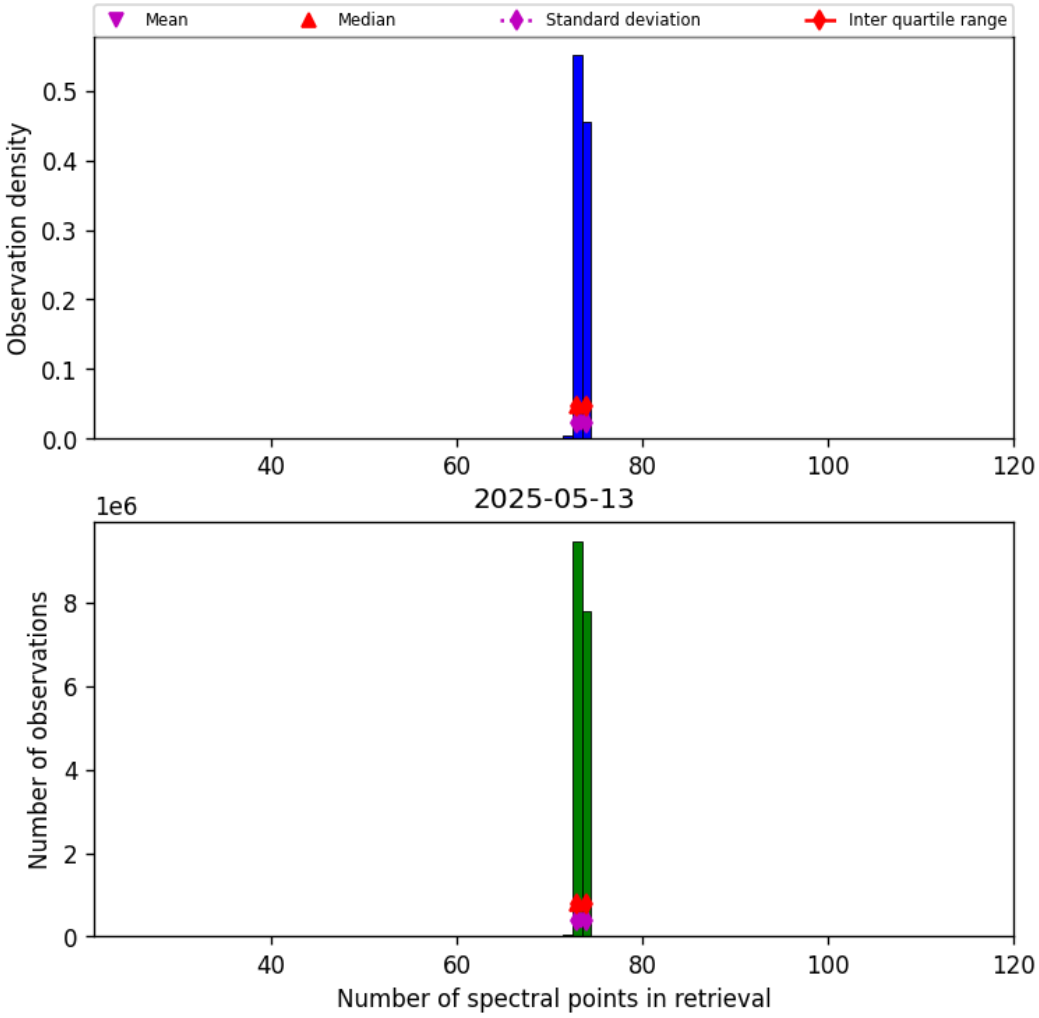


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-05-13 to 2025-05-13

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.

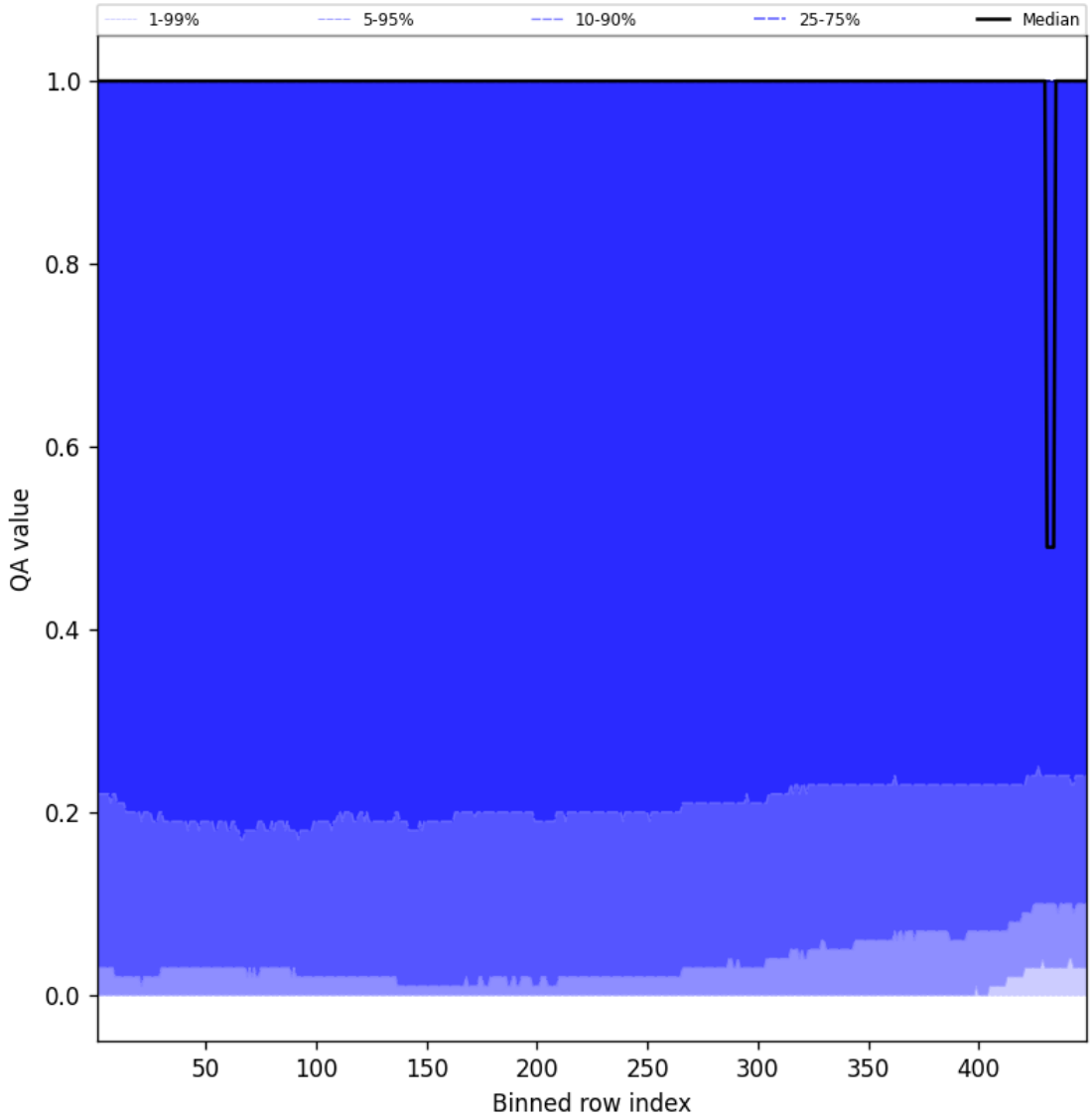


Figure 84: Along track statistics of “QA value” for 2025-05-13 to 2025-05-13

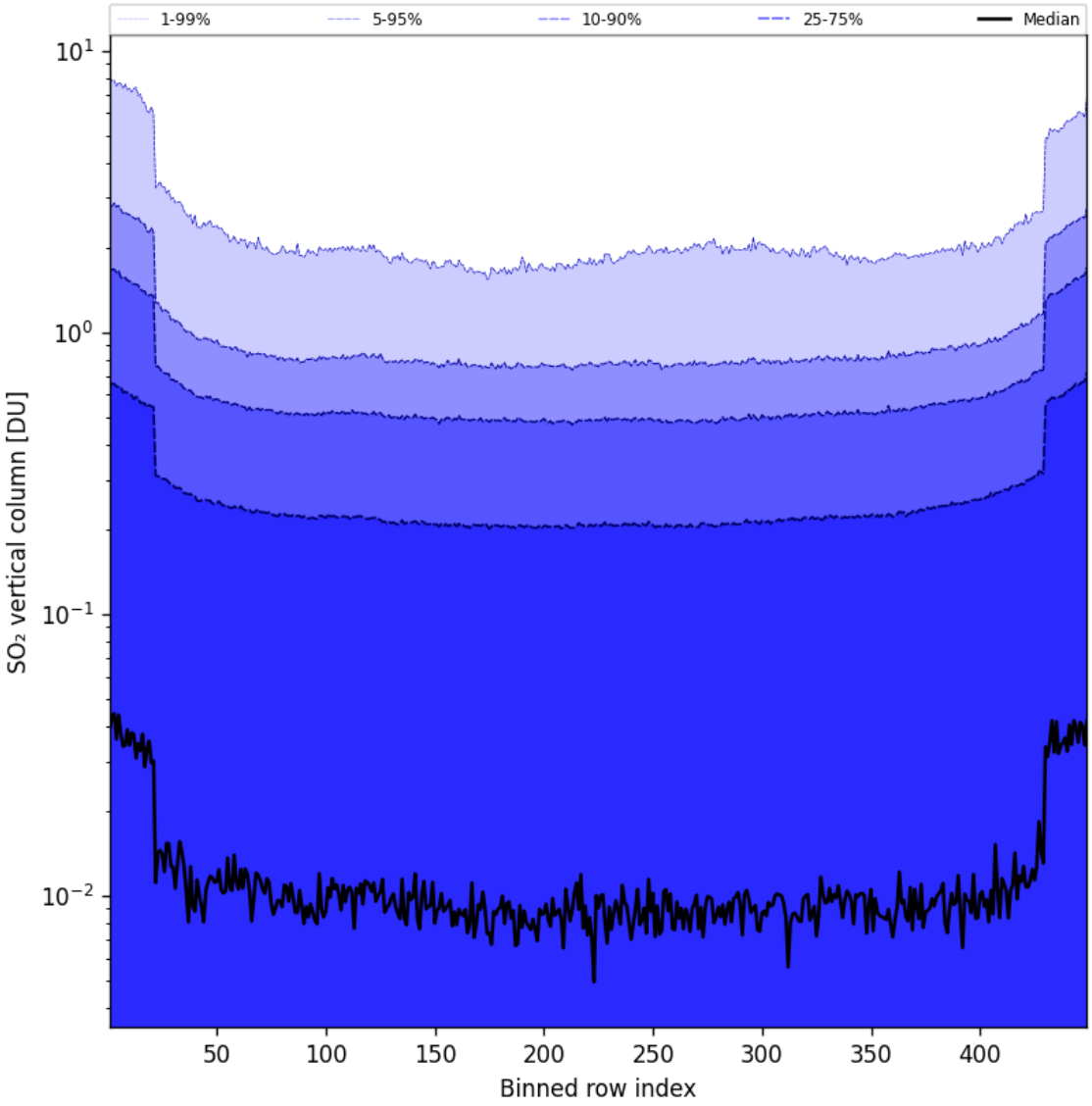


Figure 85: Along track statistics of "SO_2 vertical column" for 2025-05-13 to 2025-05-13

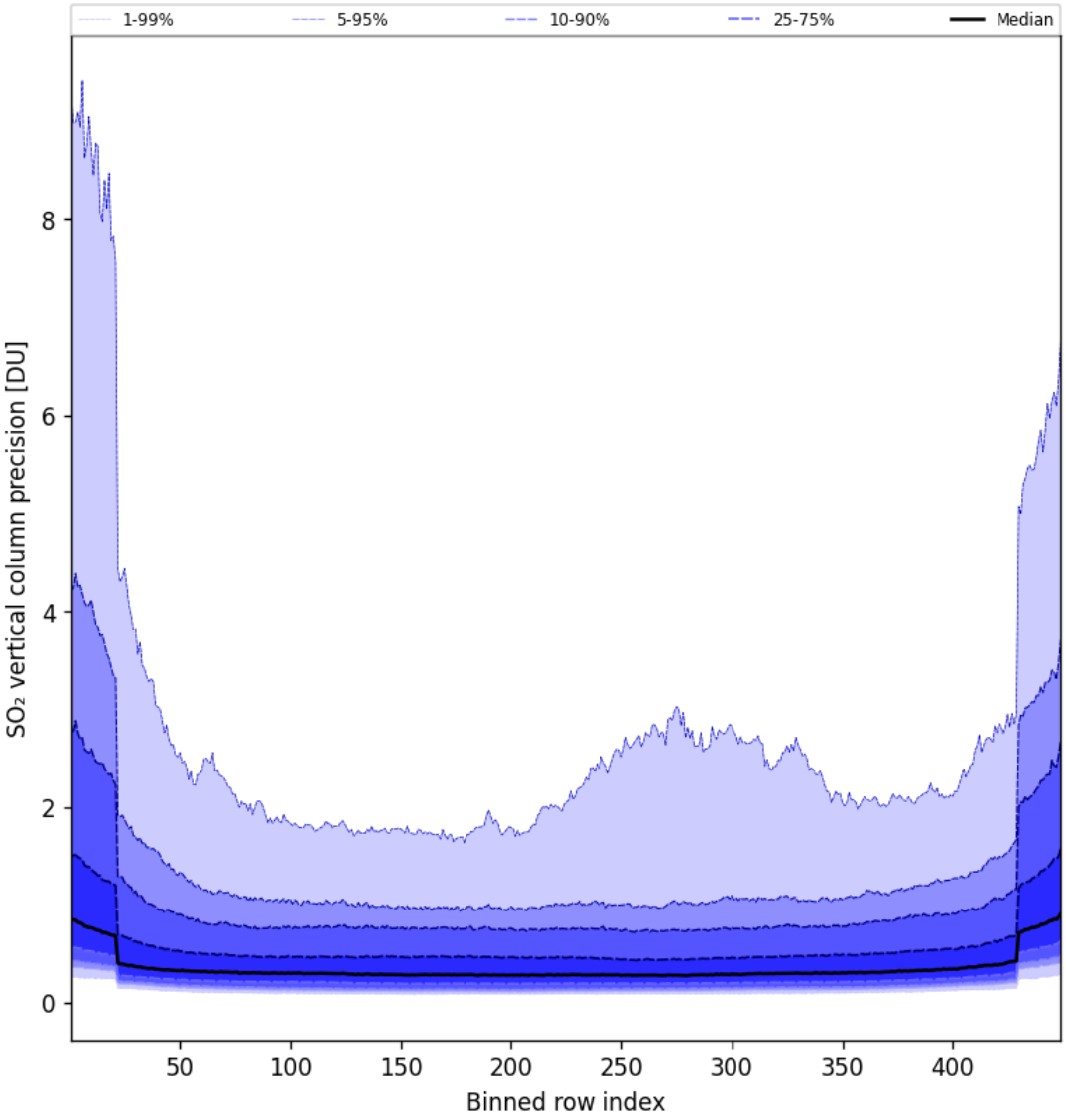


Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-05-13 to 2025-05-13

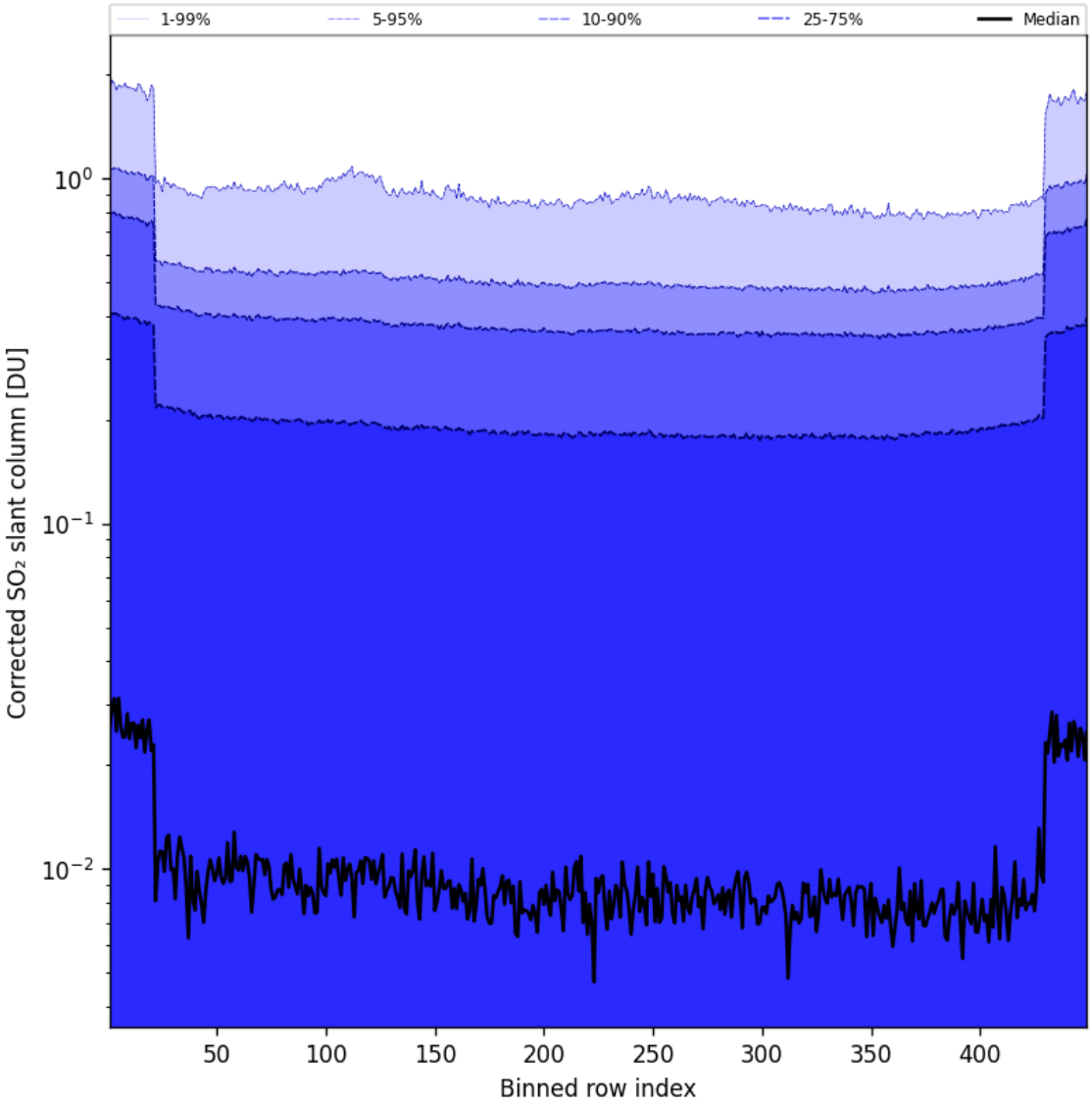


Figure 87: Along track statistics of “Corrected SO_2 slant column” for 2025-05-13 to 2025-05-13

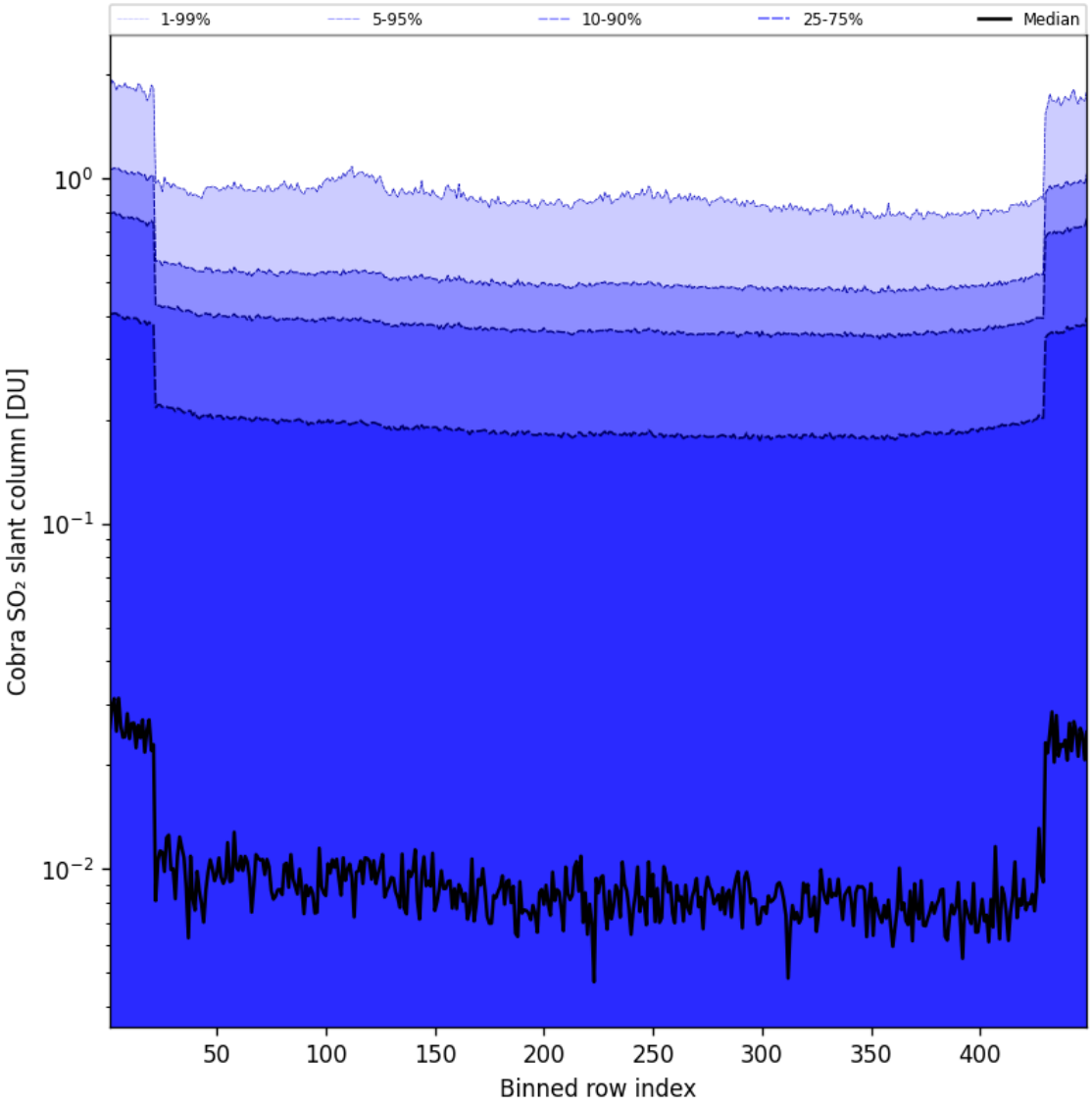


Figure 88: Along track statistics of “Cobra SO_2 slant column” for 2025-05-13 to 2025-05-13

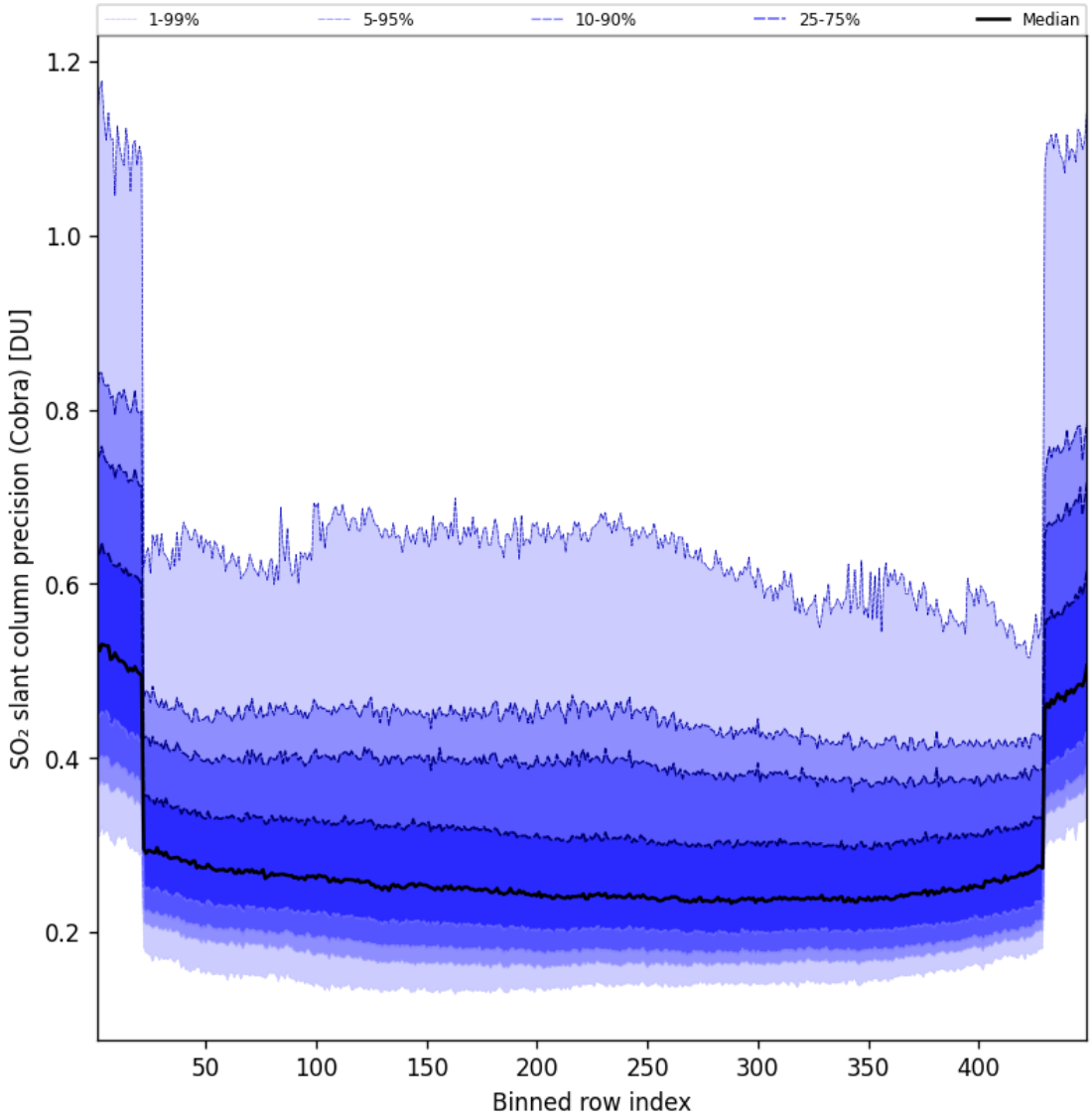


Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-05-13 to 2025-05-13

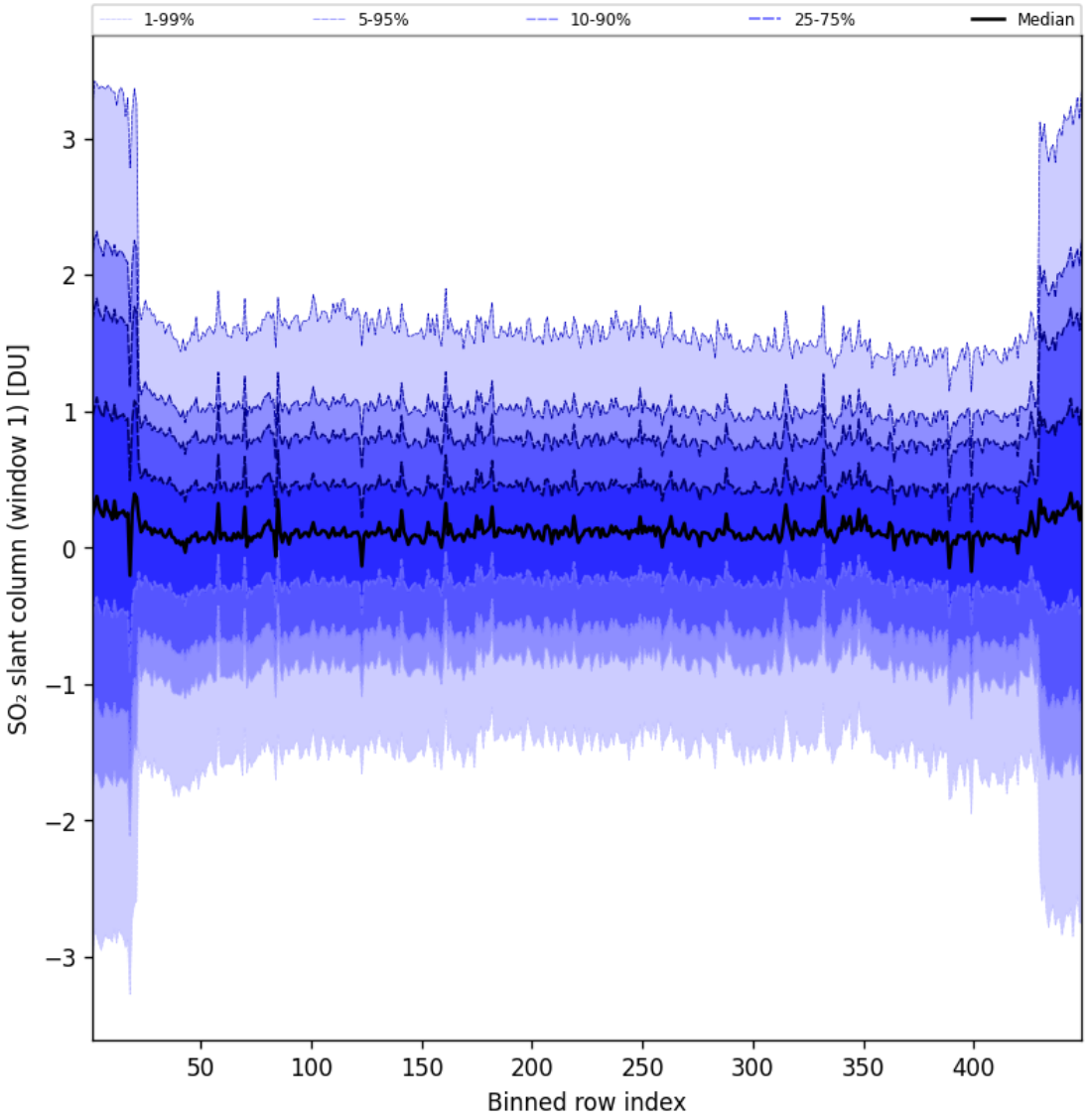


Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-05-13 to 2025-05-13

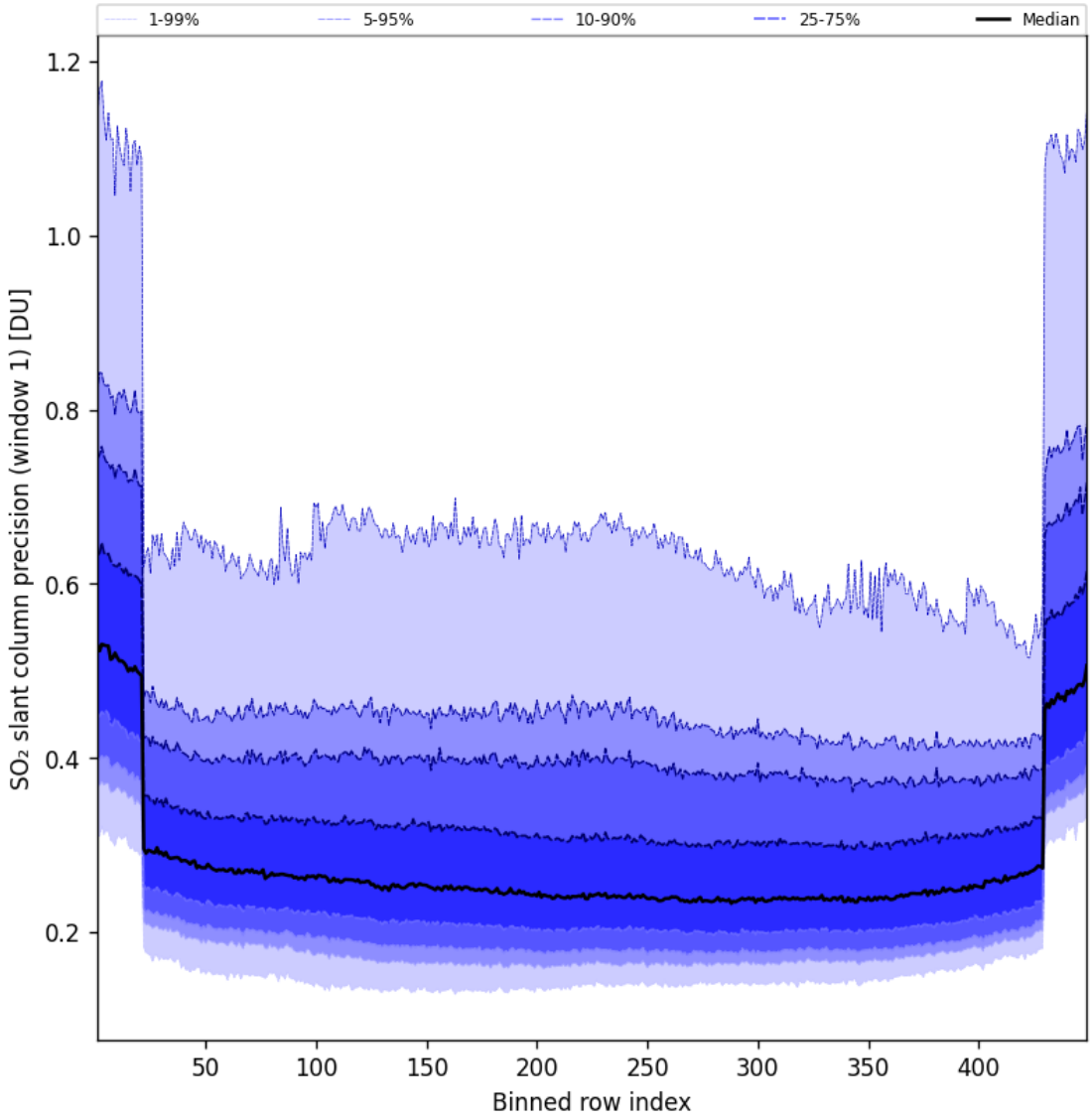


Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-05-13 to 2025-05-13

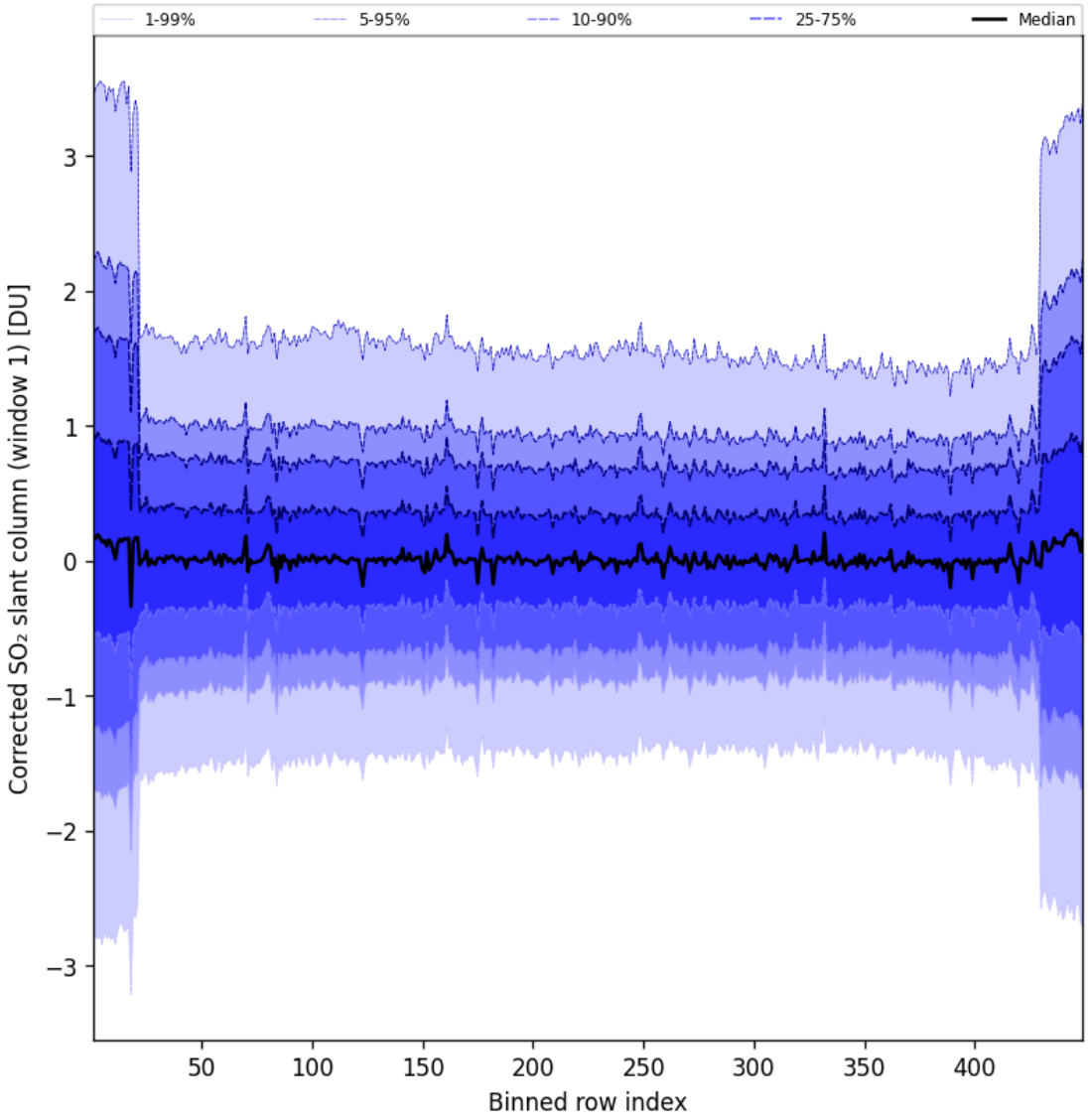


Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-05-13 to 2025-05-13

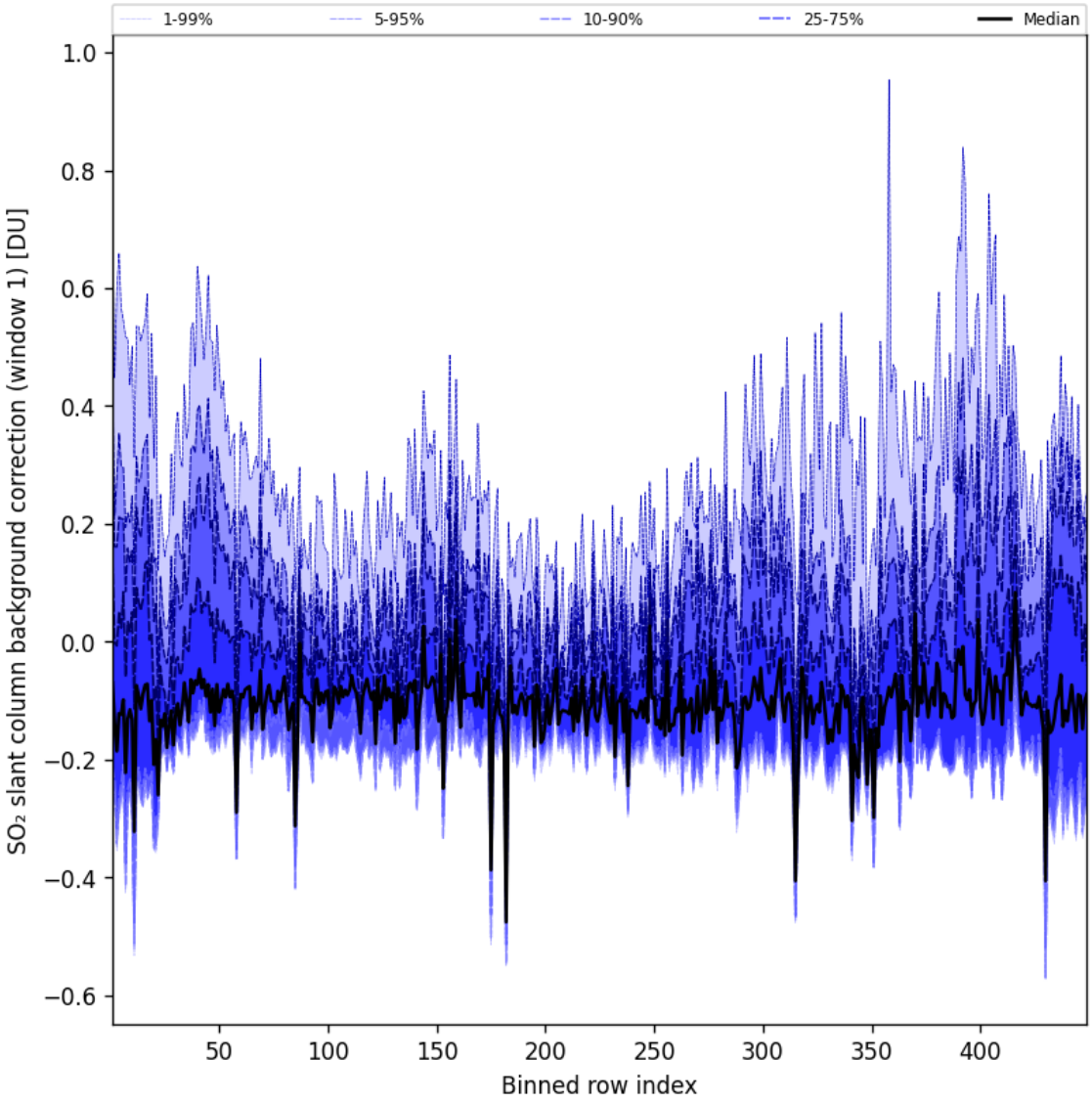


Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-05-13 to 2025-05-13

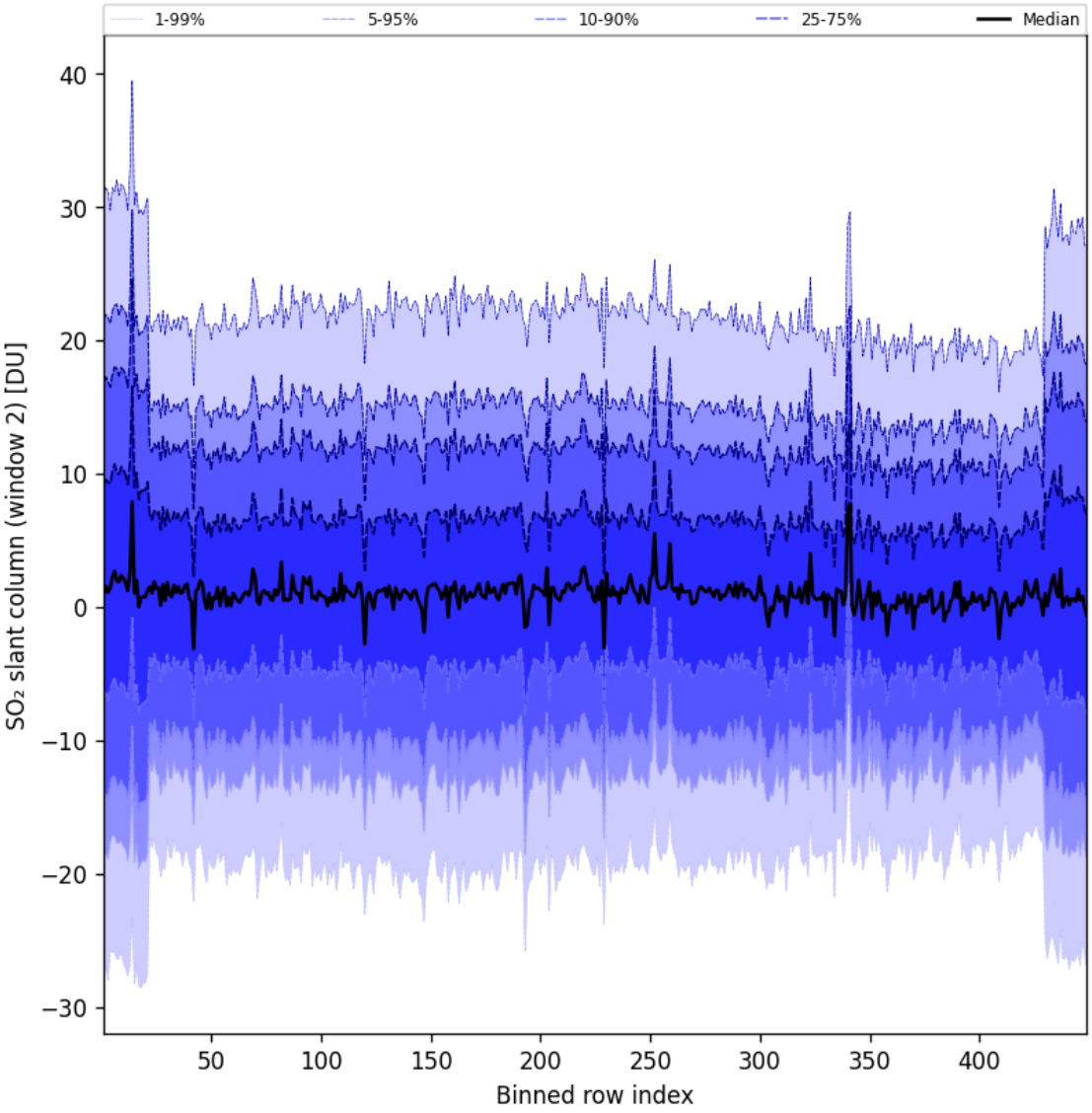


Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-05-13 to 2025-05-13

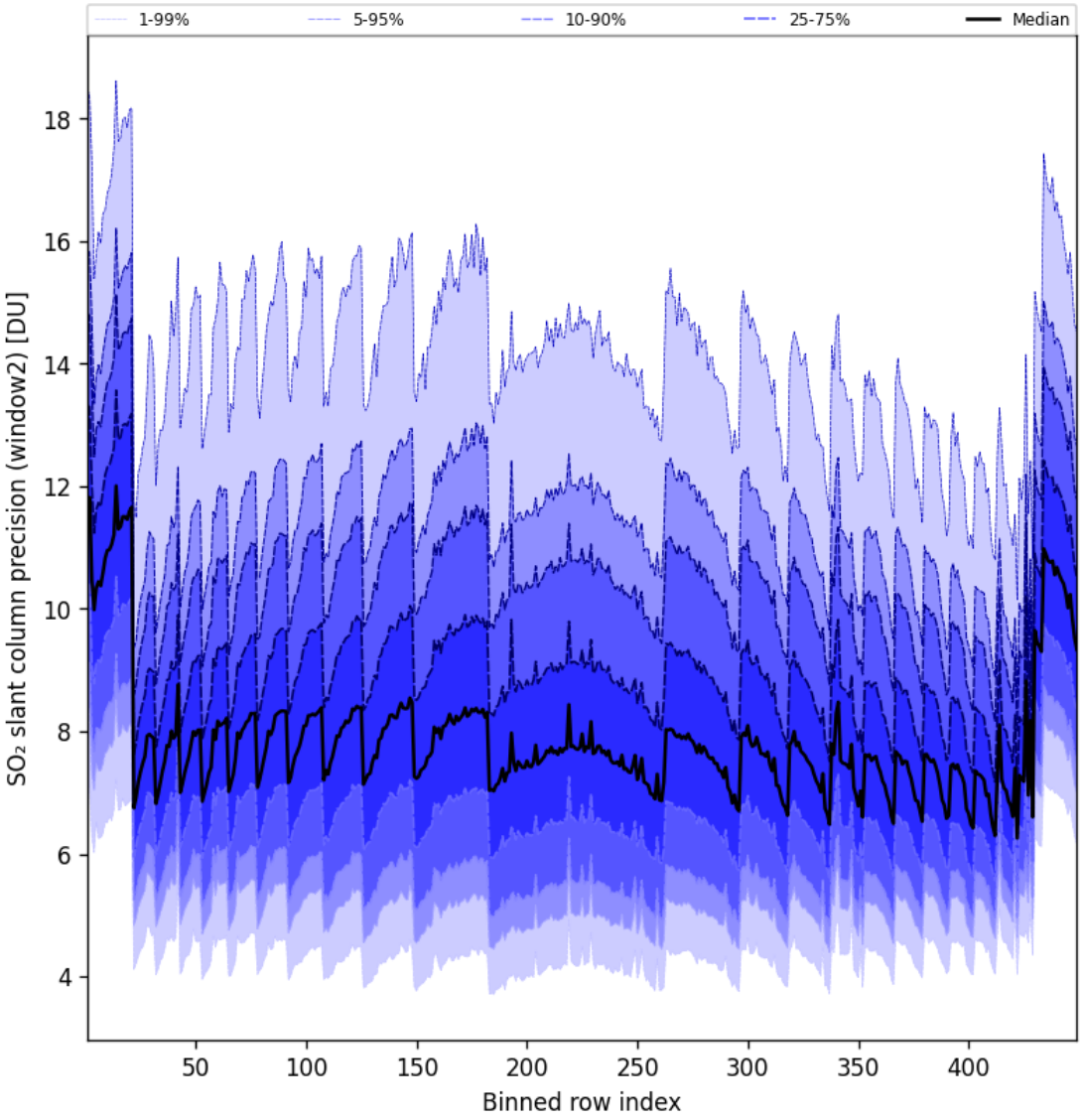


Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-05-13 to 2025-05-13

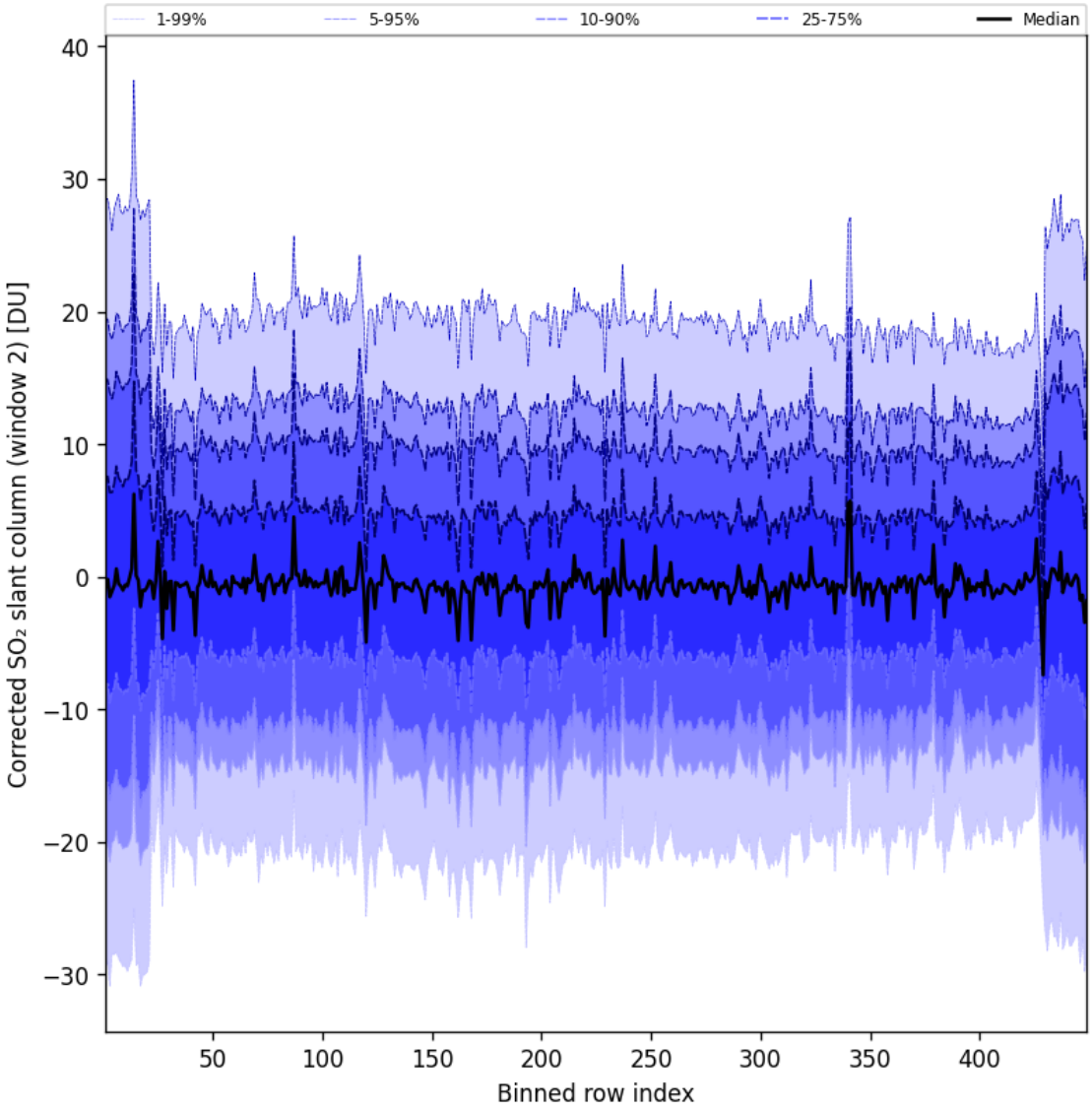


Figure 96: Along track statistics of "Corrected SO_2 slant column (window 2)" for 2025-05-13 to 2025-05-13

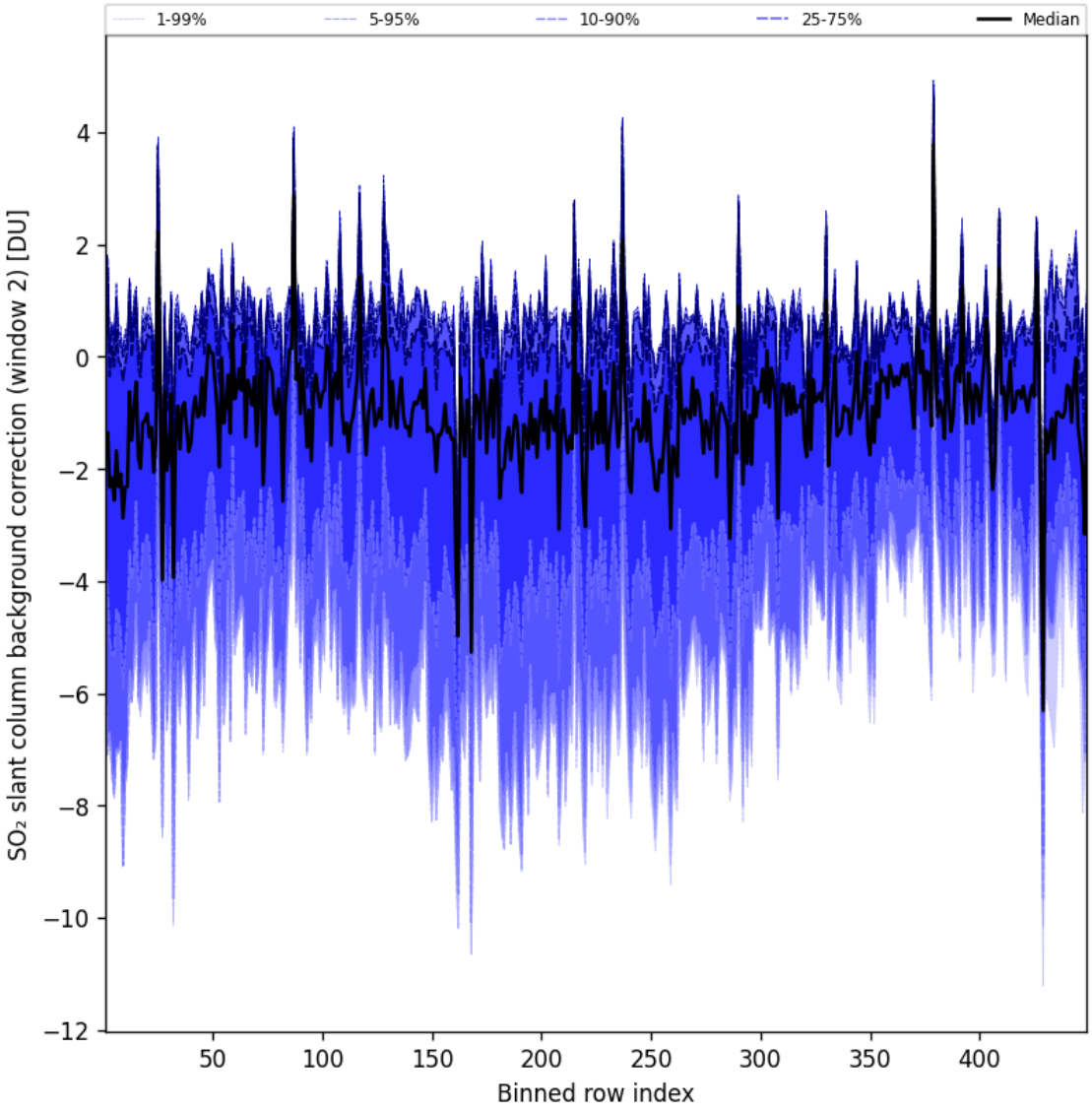


Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-05-13 to 2025-05-13

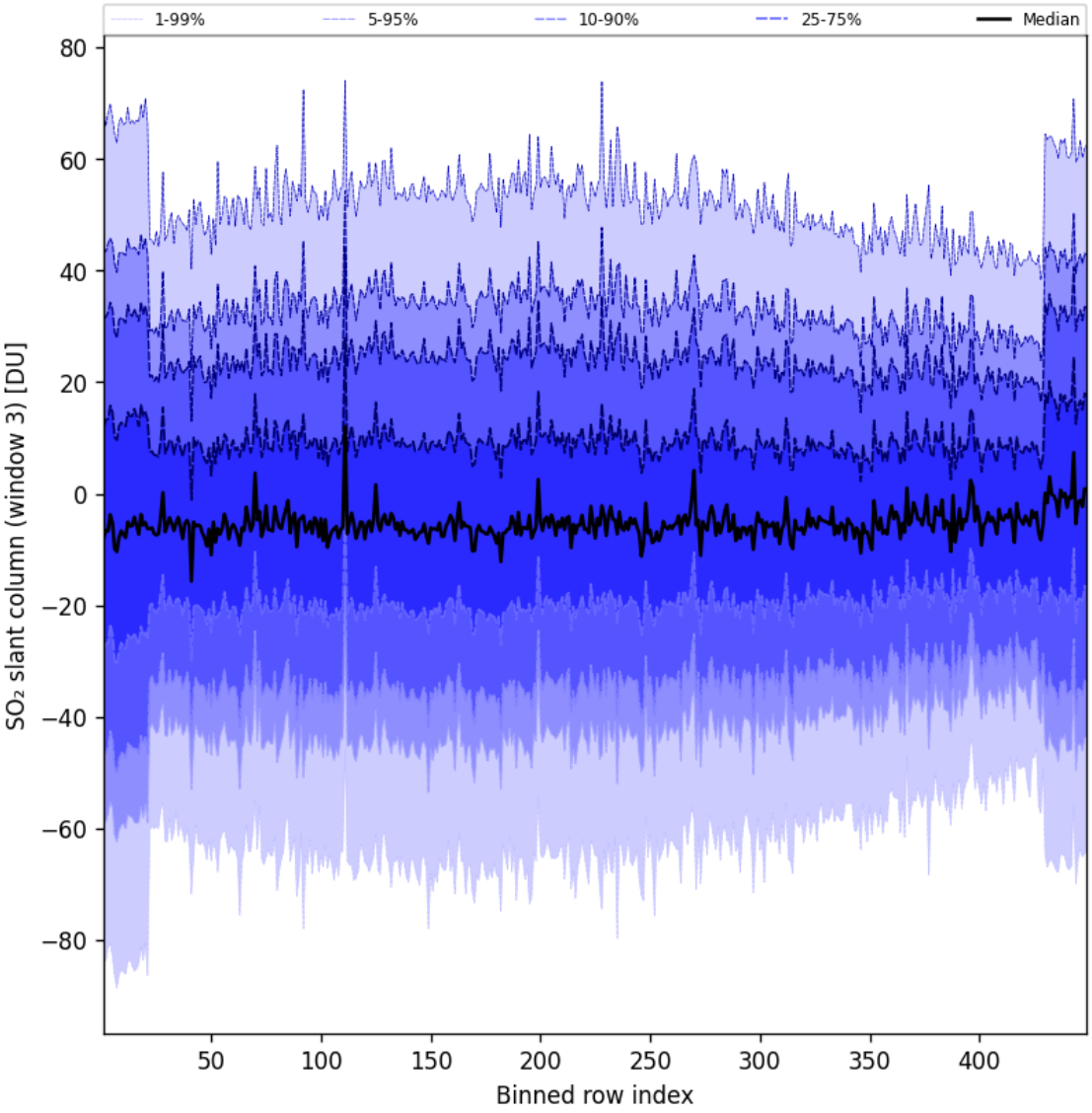


Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-05-13 to 2025-05-13

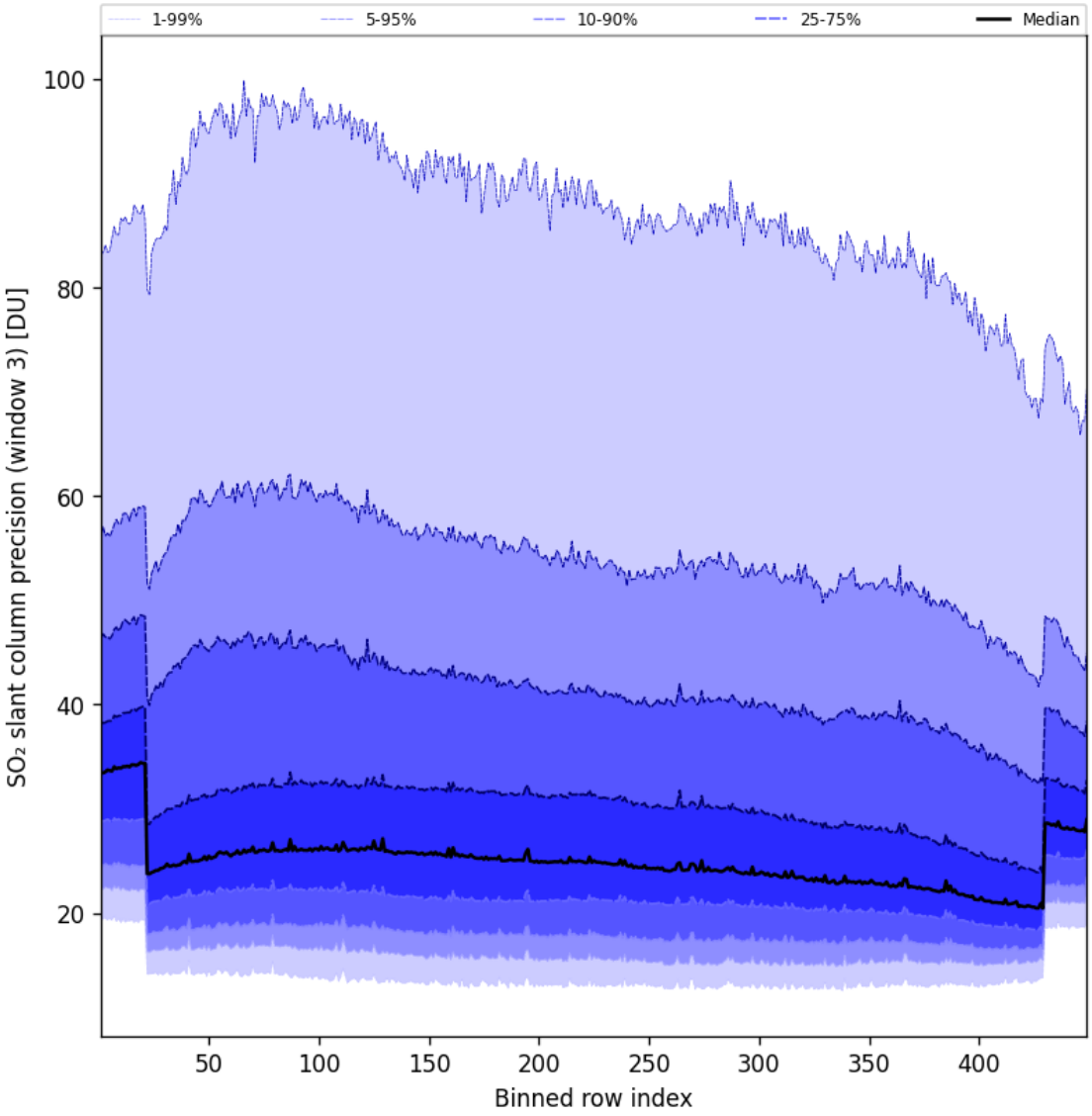


Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-05-13 to 2025-05-13

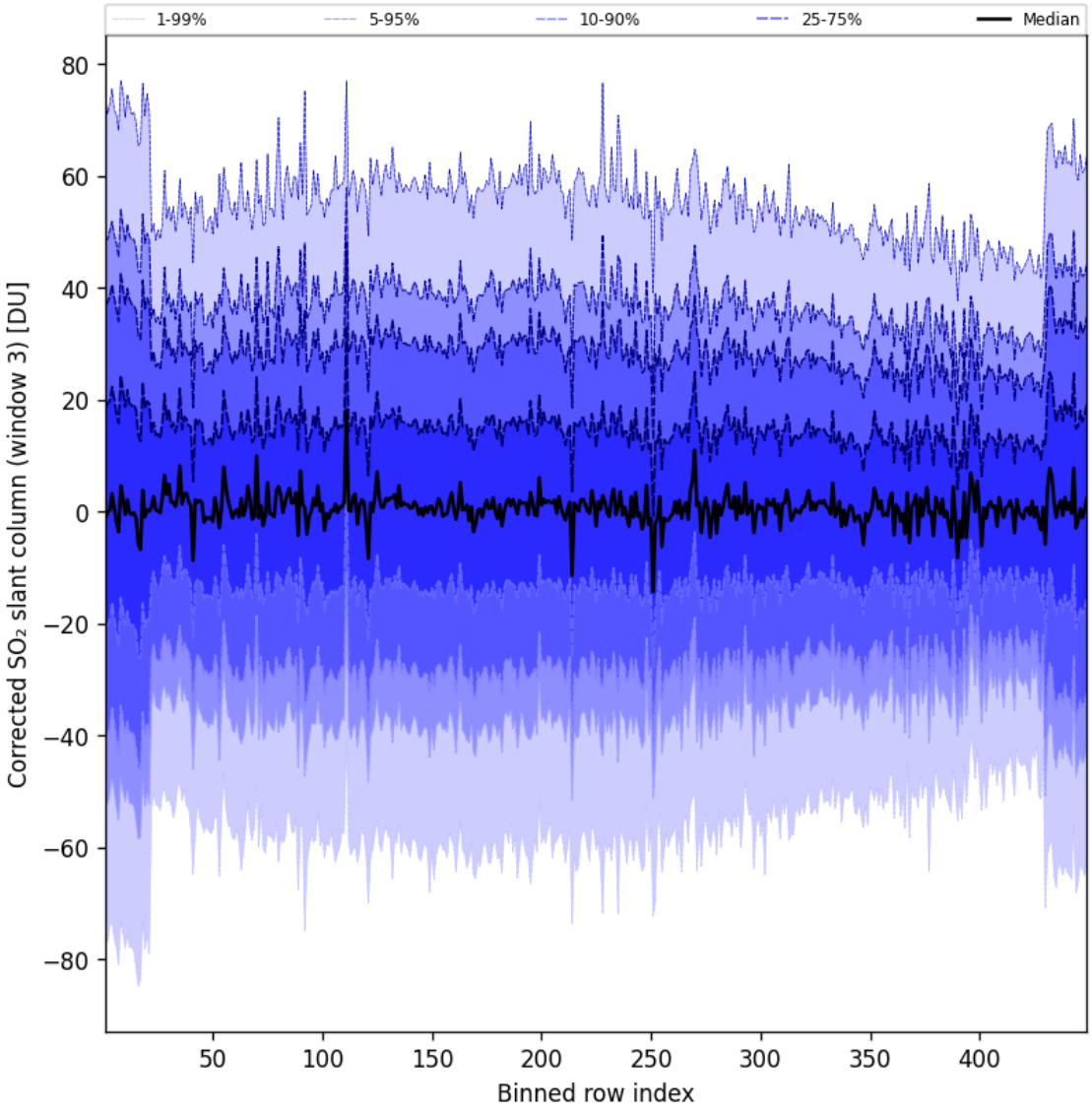


Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-05-13 to 2025-05-13

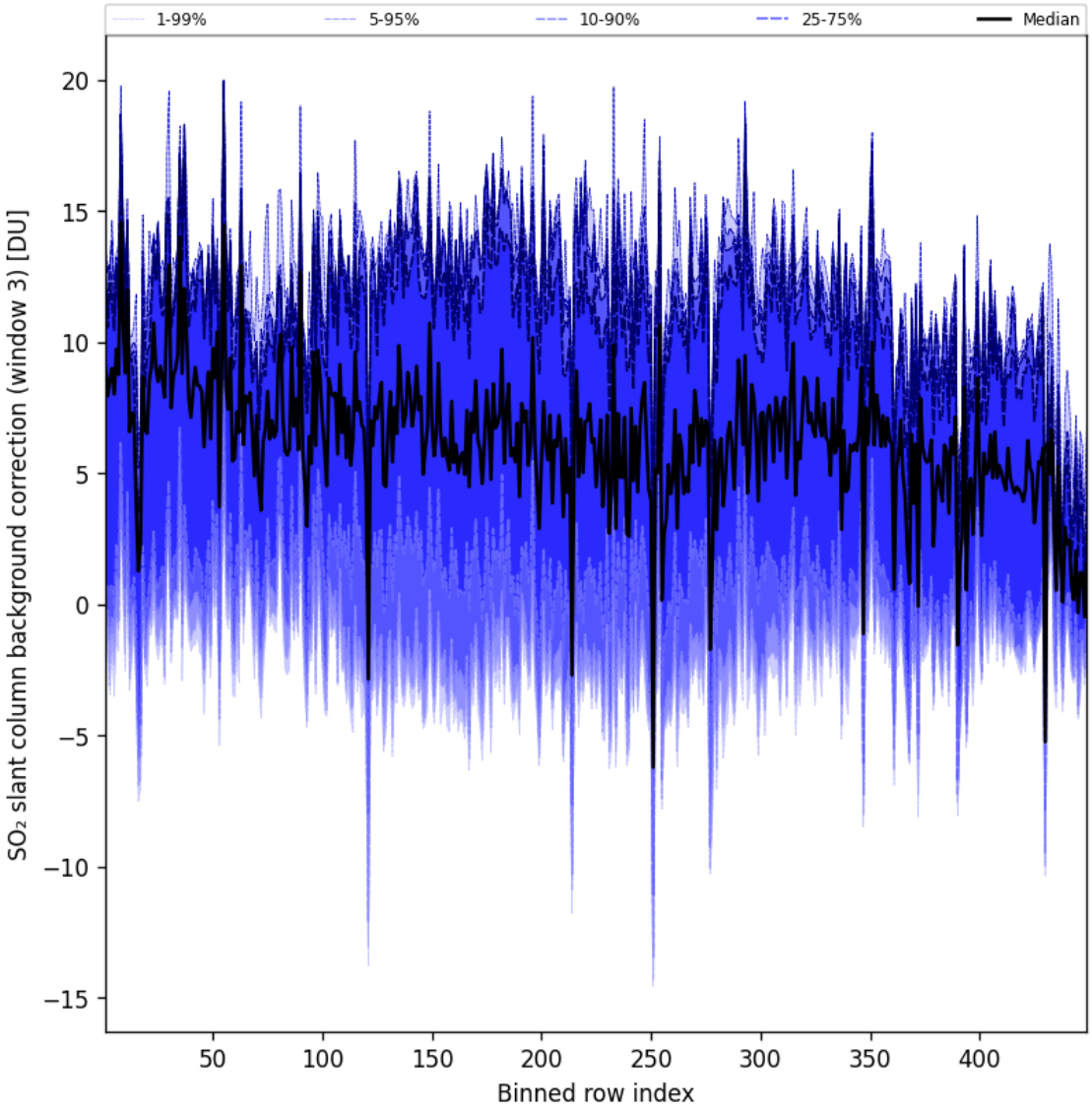


Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-05-13 to 2025-05-13

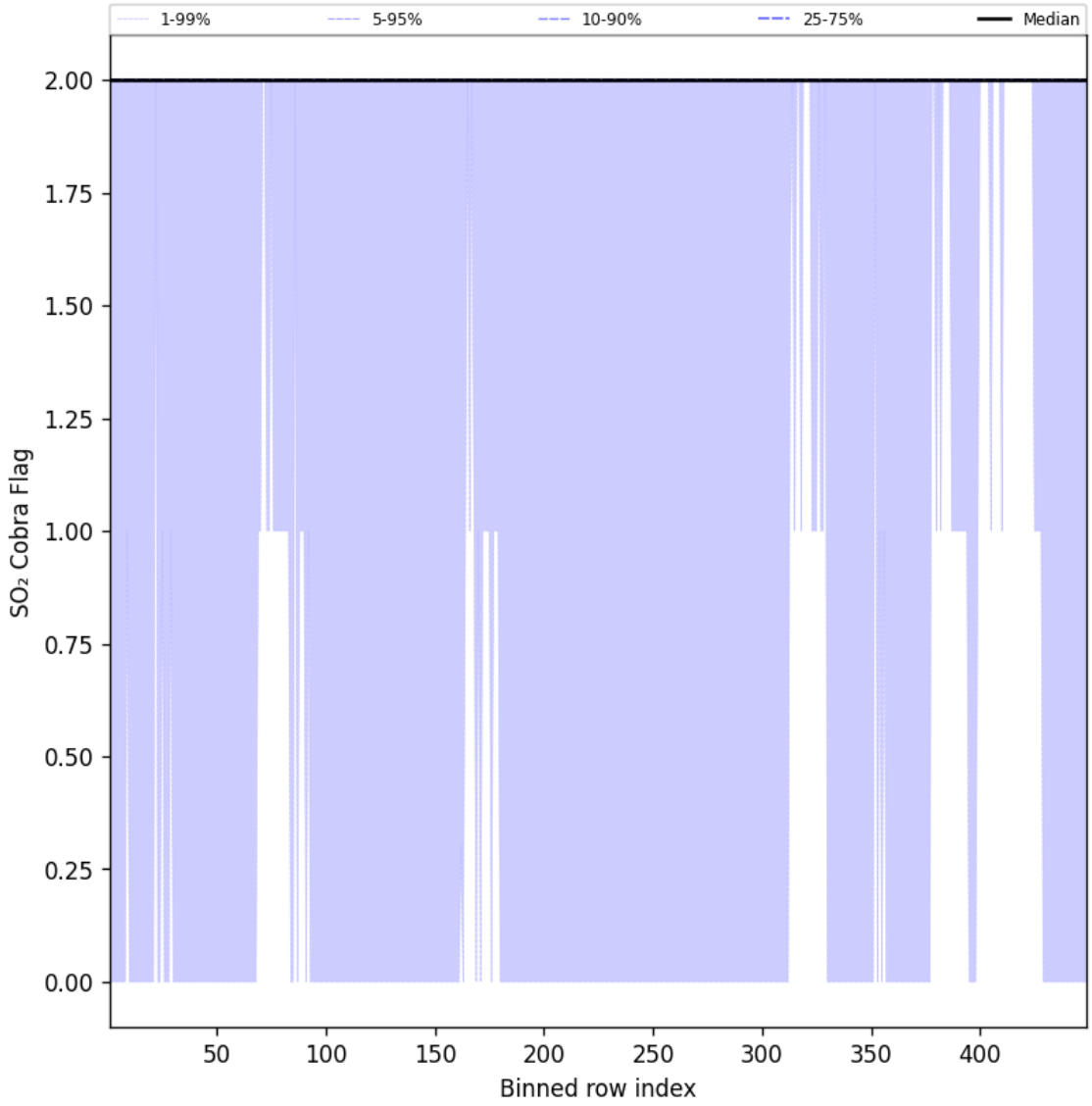


Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-05-13 to 2025-05-13

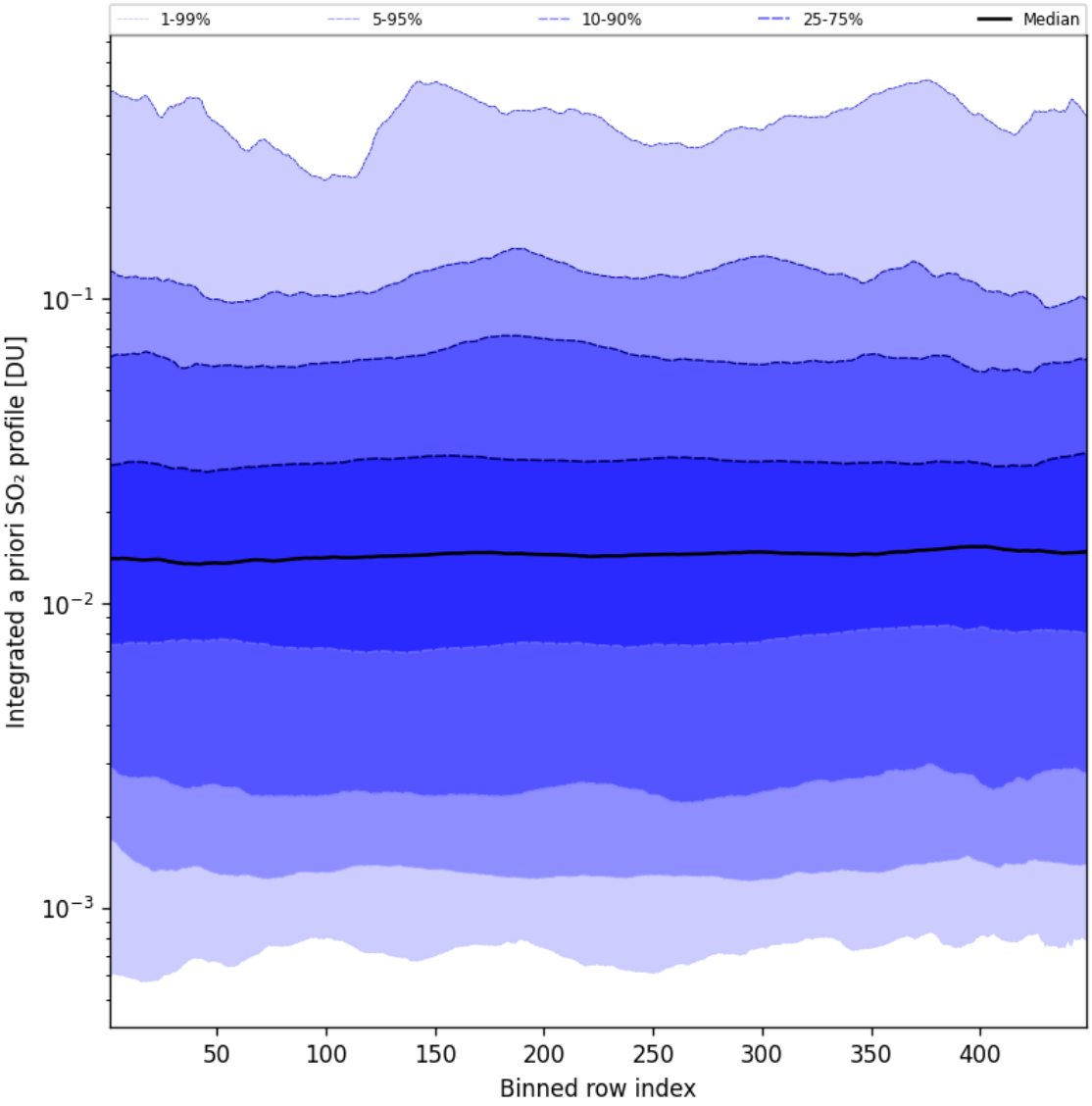
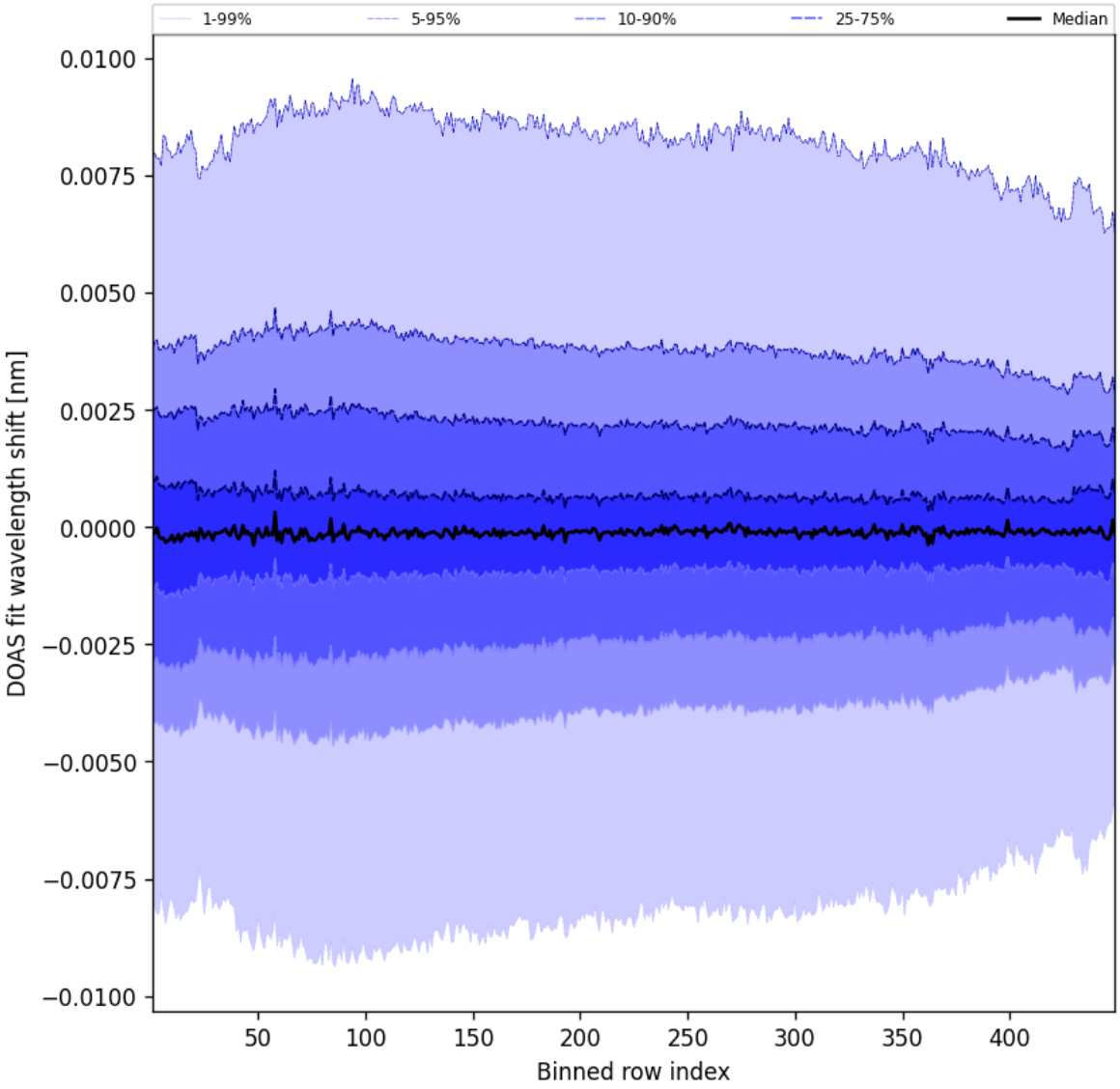


Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-05-13 to 2025-05-13



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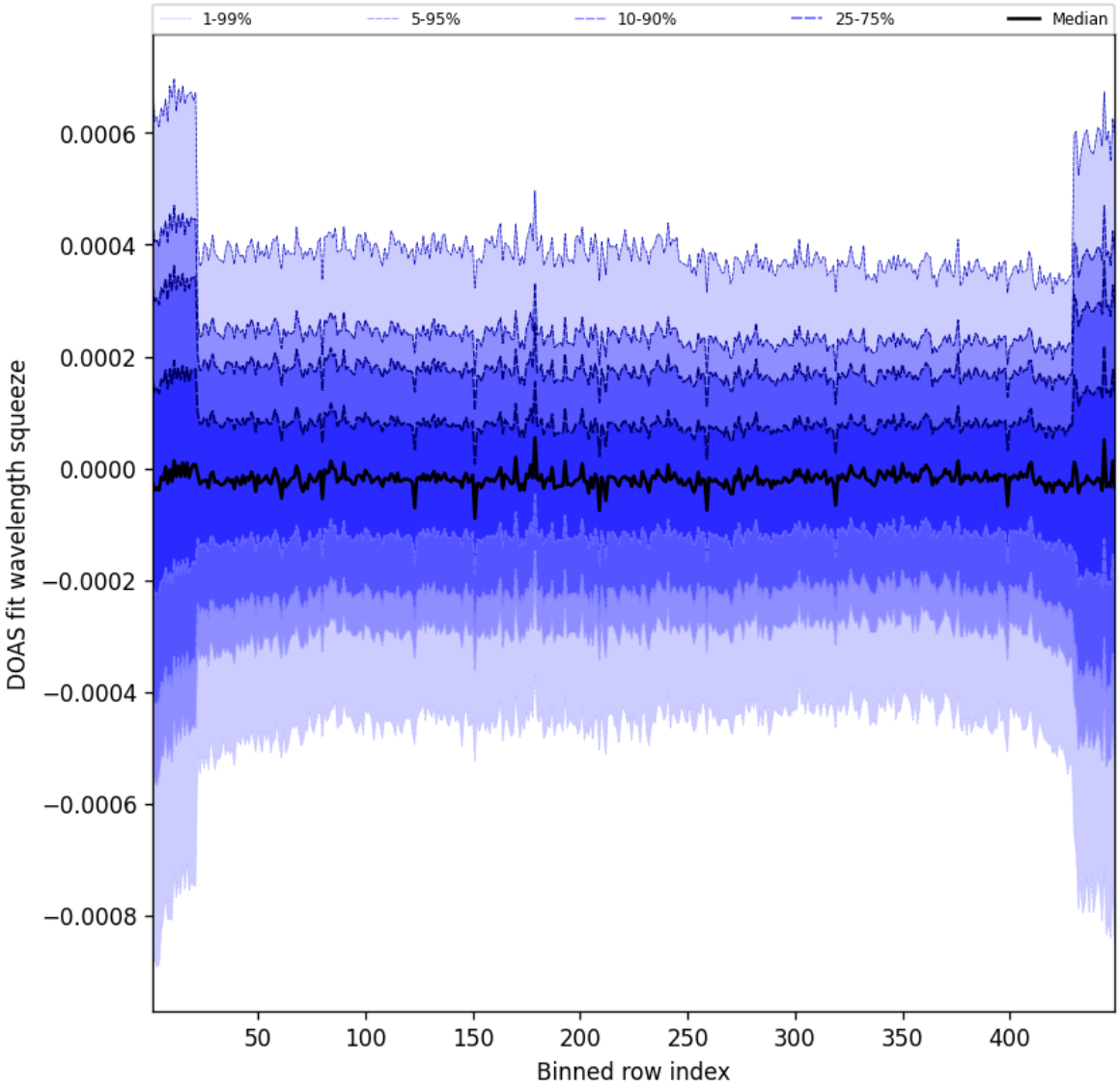

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-05-13 to 2025-05-13

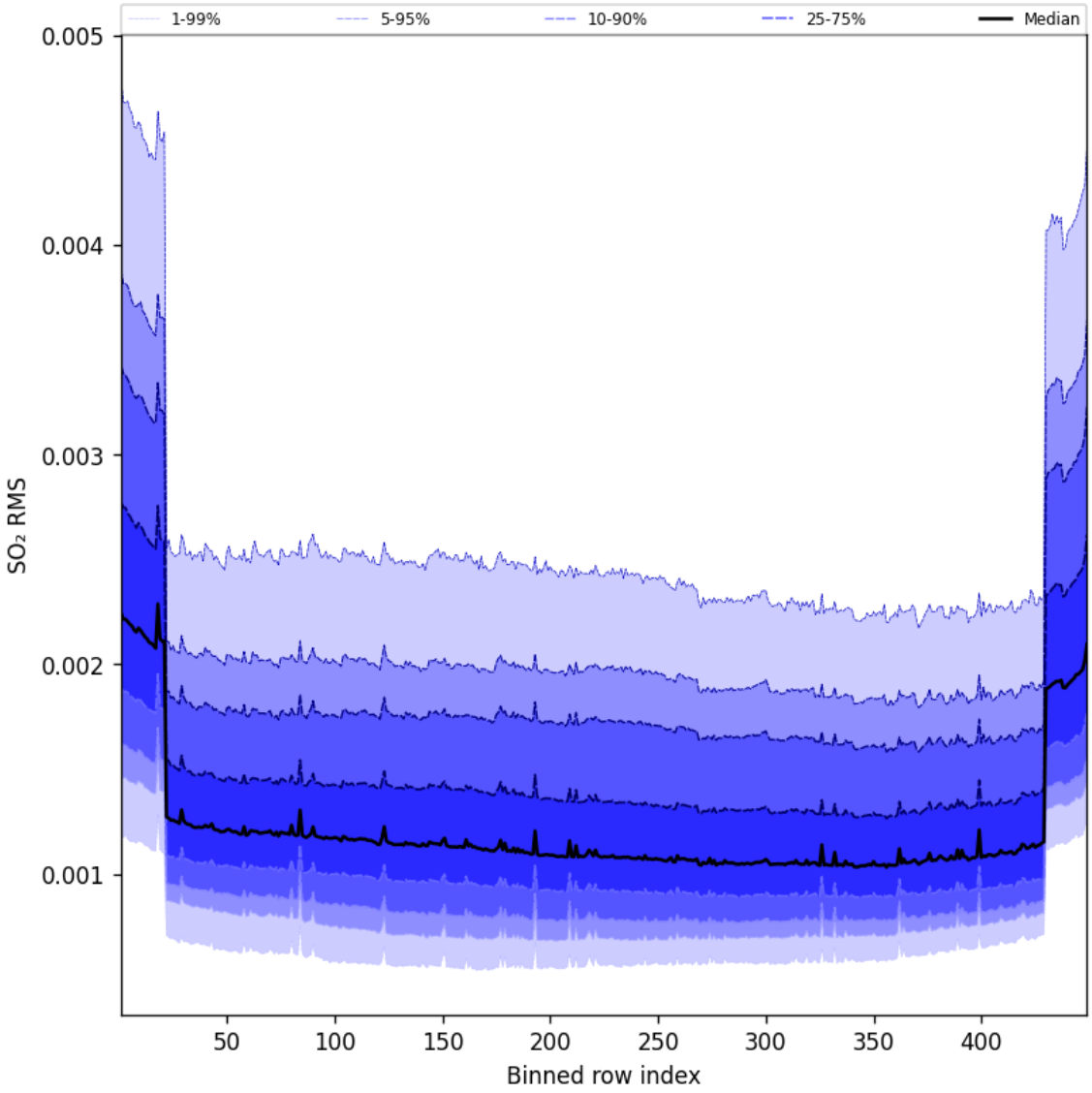

Figure 106: Along track statistics of "SO_2 RMS" for 2025-05-13 to 2025-05-13

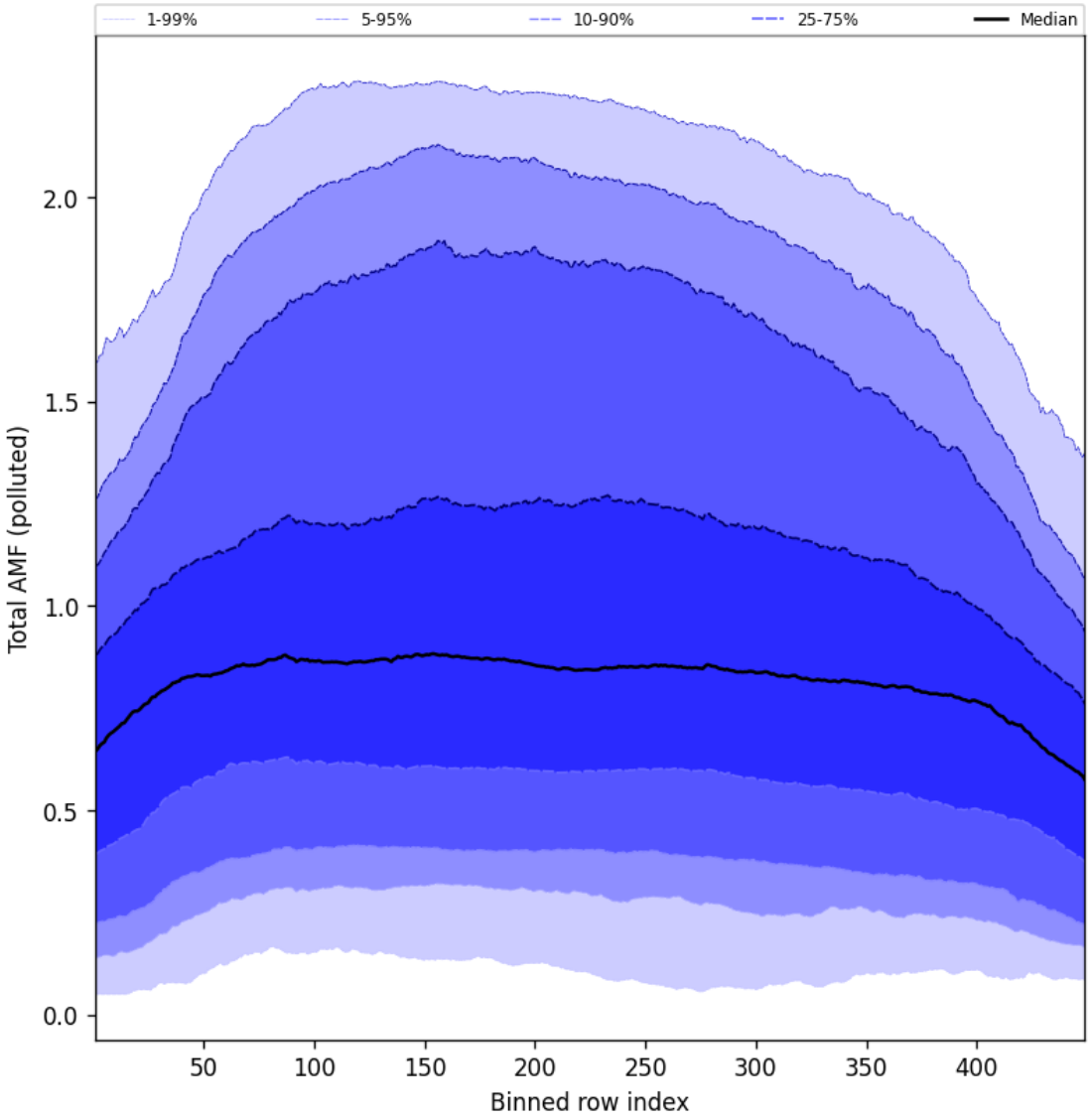

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-05-13 to 2025-05-13

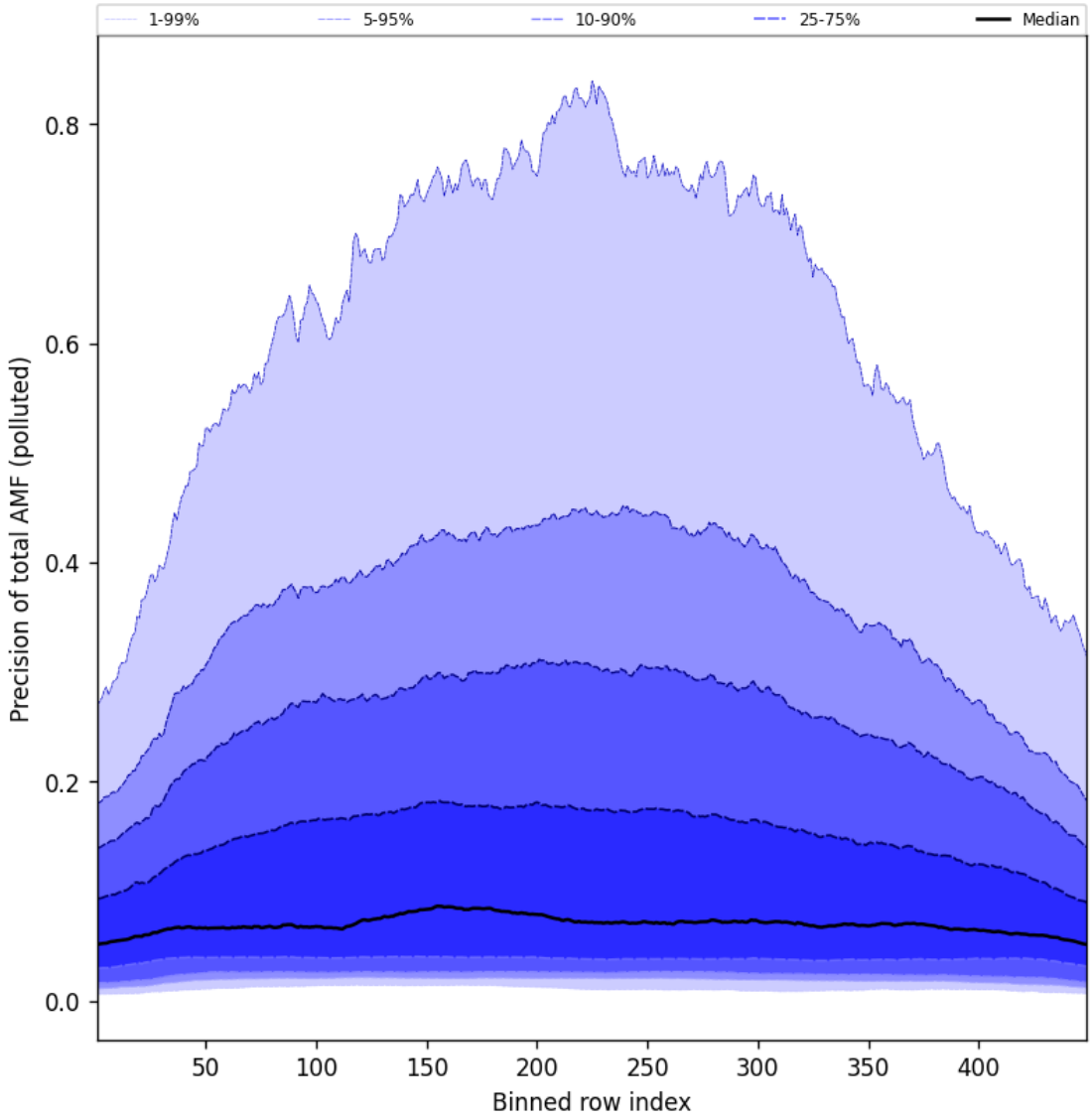

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-05-13 to 2025-05-13

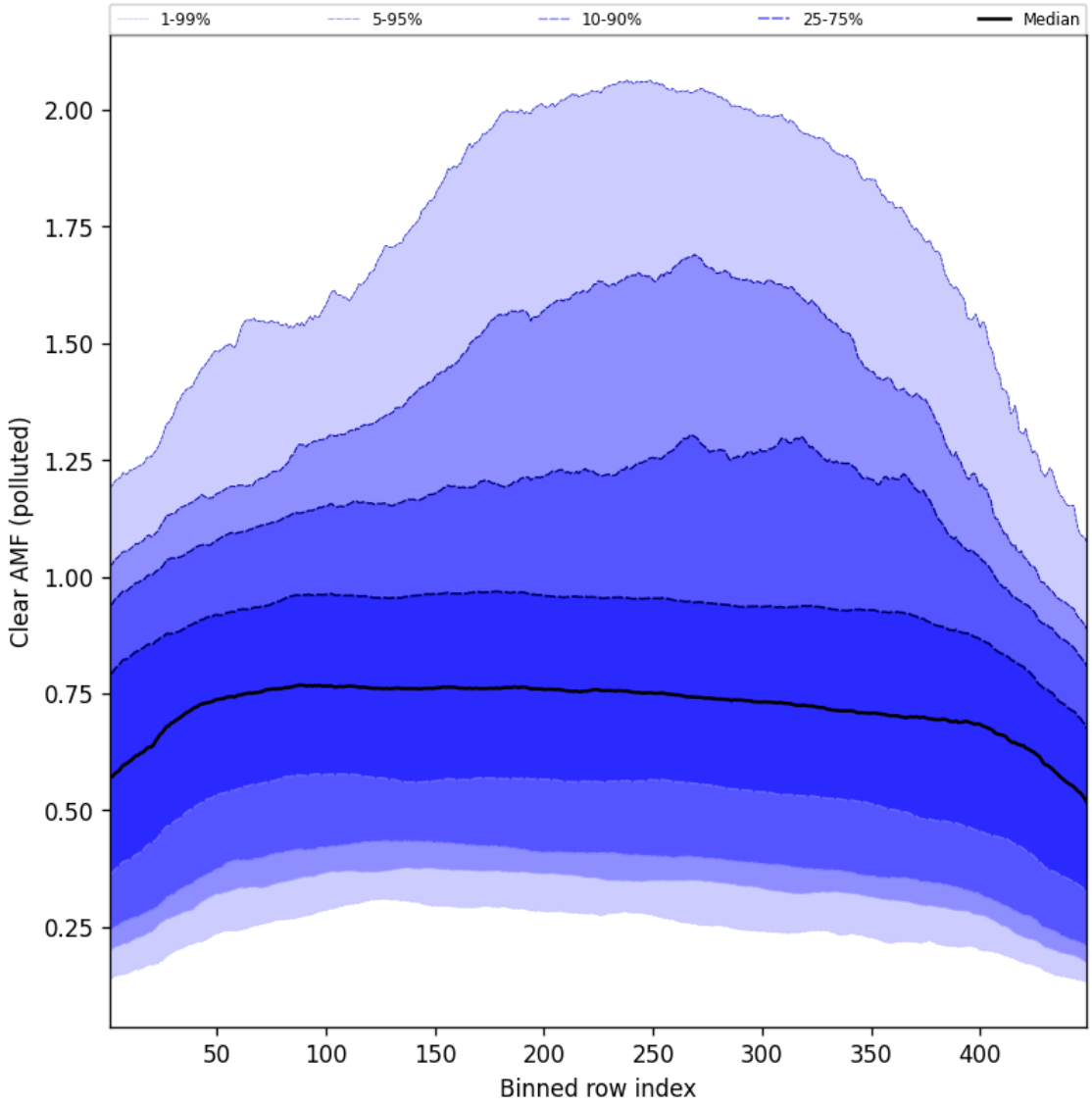

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-05-13 to 2025-05-13

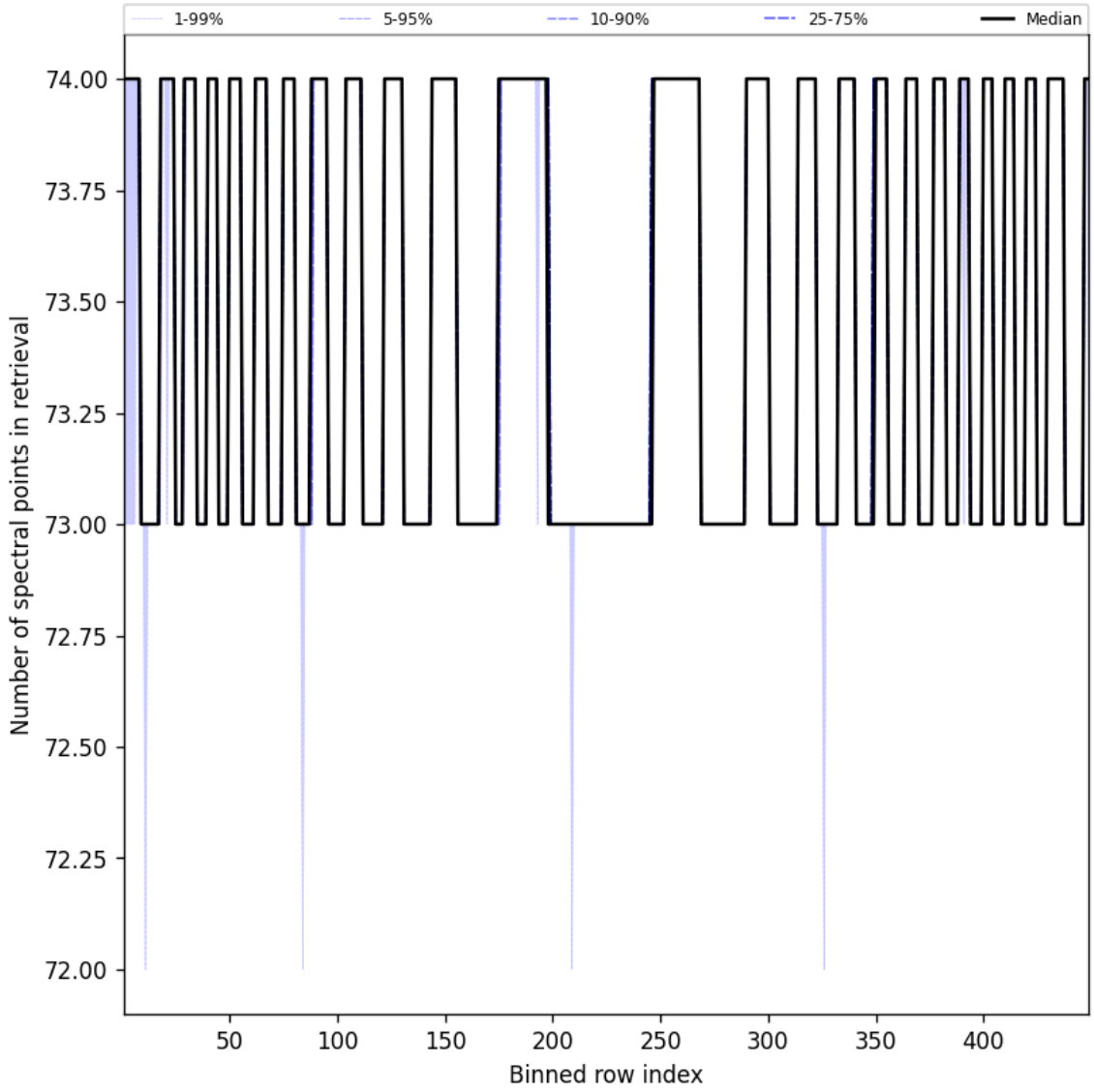

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-05-13 to 2025-05-13

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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