PyCAMA report generated by tropl2-proc

tropl2-proc

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1 Short Introduction

1.1 The list of parameters

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

2 Definitions

The averages shown here are *unweighed* averages:

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

with N the number of observations in the dataset.

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

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

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

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

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

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

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

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

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

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

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

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

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

Table 1: Parameterlist and basic statistics for the analysis

Variable	mean $\pm\sigma$	Count	Mode	IQR	Median	Minimum	Maximum
qa value [1]	0.627 ± 0.411	17341097	0.995	0.800	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.032 \pm 99.527) \times 10^{-2}$	17341097	0.278	0.456	1.054×10^{-2}	-101	844
sulfurdioxide total vertical column precision [DU]	0.518 ± 0.684	17341097	0.222	0.356	0.326	4.710×10^{-2}	111
sulfurdioxide slant column density corrected [DU]	$(1.805 \pm 41.902) \times 10^{-2}$	17341097	0.267	0.374	9.353×10^{-3}	-37.2	614
sulfurdioxide slant column density cobra [DU]	$(1.786 \pm 36.005) \times 10^{-2}$	17341097	0.267	0.374	9.353×10^{-3}	-37.2	36.9
sulfurdioxide slant column density cobra precision [DU]	0.297 ± 0.127	17341097	0.213	0.130	0.262	8.712×10^{-2}	41.6
sulfurdioxide slant column density window1 [DU]	0.116 ± 0.679	17341097	0.125	0.748	0.119	-81.9	83.6
sulfurdioxide slant column density window1 precision [DU]	0.297 ± 0.127	17341097	0.213	0.130	0.262	8.712×10^{-2}	41.6
sulfurdioxide slant column density corrected win1 [DU]	$(3.789 \pm 67.112) \times 10^{-2}$	17341097	2.500×10^{-2}	0.736	2.072×10^{-2}	-81.9	83.7
background so2 slant column offset window1 [DU]	$(-7.763 \pm 13.058) \times 10^{-2}$	17341097	-0.140	0.146	-0.101	-1.39	3.04
sulfurdioxide slant column density window2 [DU]	1.27 ± 9.00	17341097	0.750	11.4	1.21	-1.001×10^{3}	2.551×10^{3}
sulfurdioxide slant column density window2 precision [DU]	8.06 ± 2.34	17341097	7.43	2.61	7.72	2.25	509
sulfurdioxide slant column density corrected win2 [DU]	-0.669 ± 8.771	17341097	-0.750	11.0	-0.653	-1.004×10^{3}	2.550×10^{3}
background so2 slant column offset window2 [DU]	-1.94 ± 2.45	17341097	0.250	3.56	-1.24	-13.9	5.37
sulfurdioxide slant column density window3 [DU]	-4.87 ± 23.66	17341097	-6.16	29.2	-5.13	-594	375
sulfurdioxide slant column density window3 precision [DU]	28.1 ± 13.5	17341097	21.5	9.91	24.5	8.79	245
sulfurdioxide slant column density corrected win3 [DU]	2.86 ± 23.11	17341097	3.92	28.4	3.06	-588	377
background so2 slant column offset window3 [DU]	7.74 ± 5.62	17341097	3.92	9.51	7.59	-12.4	31.4
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17341097	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(2.988 \pm 6.388) \times 10^{-2}$	17341097	1.423×10^{-2}	1.908×10^{-2}	1.419×10^{-2}	2.428×10^{-4}	2.64
fitted radiance shift [nm]	$(-1.721 \pm 25.928) \times 10^{-4}$	17341097	1.000×10^{-4}	1.665×10^{-3}	-1.574×10^{-4}	-5.109×10^{-2}	6.618×10^{-2}
fitted radiance squeeze [1]	$(-2.734 \pm 17.999) \times 10^{-5}$	17341097	-1.000×10^{-5}	2.066×10^{-4}	-2.327×10^{-5}	-1.641×10^{-2}	2.379×10^{-2}
fitted root mean square [1]	$(1.294 \pm 0.517) \times 10^{-3}$	17341097	1.025×10^{-3}	5.285×10^{-4}	1.156×10^{-3}	3.027×10^{-4}	9.301×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.893 ± 0.486	17341097	0.900	0.613	0.817	5.000×10^{-2}	2.86
sulfurdioxide total air mass factor polluted precision [1]	0.115 ± 0.129	17341097	4.500×10^{-2}	0.110	6.801×10^{-2}	3.017×10^{-3}	1.94
sulfurdioxide clear air mass factor polluted [1]	0.752 ± 0.334	17341097	0.620	0.417	0.719	6.567×10^{-2}	2.55
number of spectral points in retrieval [1]	73.4 ± 0.5	17341097	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	3.000×10^{-2}	9.000×10^{-2}	0.200	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.23	−0.888	−0.542	−0.364	−0.214	0.242	0.403	0.601	0.993	2.55
sulfurdioxide total vertical column precision [DU]	0.103	0.135	0.160	0.185	0.219	0.575	0.768	0.990	1.42	3.22
sulfurdioxide slant column density corrected [DU]	−0.851	−0.499	−0.364	−0.272	−0.176	0.198	0.299	0.399	0.552	1.01
sulfurdioxide slant column density cobra [DU]	−0.851	−0.499	−0.364	−0.272	−0.176	0.198	0.299	0.399	0.552	1.01
sulfurdioxide slant column density cobra precision [DU]	0.144	0.173	0.188	0.200	0.215	0.345	0.393	0.443	0.539	0.756
sulfurdioxide slant column density window1 [DU]	−1.67	−0.938	−0.651	−0.459	−0.258	0.490	0.684	0.869	1.15	1.91
sulfurdioxide slant column density window1 precision [DU]	0.144	0.173	0.188	0.200	0.215	0.345	0.393	0.443	0.539	0.756
sulfurdioxide slant column density corrected win1 [DU]	−1.62	−0.963	−0.705	−0.529	−0.342	0.394	0.595	0.791	1.09	1.91
background so2 slant column offset window1 [DU]	−0.322	−0.236	−0.205	−0.186	−0.165	-1.840×10^{-2}	3.541×10^{-2}	8.964×10^{-2}	0.170	0.352
sulfurdioxide slant column density window2 [DU]	−20.0	−13.1	−9.77	−7.27	−4.46	6.92	9.78	12.3	15.8	23.2
sulfurdioxide slant column density window2 precision [DU]	4.25	5.09	5.61	6.04	6.56	9.17	10.1	10.9	12.2	14.9
sulfurdioxide slant column density corrected win2 [DU]	−21.9	−14.8	−11.4	−8.93	−6.16	4.83	7.57	10.0	13.4	20.5
background so2 slant column offset window2 [DU]	−8.32	−6.62	−5.60	−4.70	−3.56	-4.740×10^{-3}	0.305	0.544	0.877	1.94
sulfurdioxide slant column density window3 [DU]	−64.4	−43.1	−33.5	−26.8	−19.5	9.70	17.5	24.7	34.3	53.5
sulfurdioxide slant column density window3 precision [DU]	13.2	15.8	17.9	19.3	20.8	30.8	35.3	40.9	52.9	86.2
sulfurdioxide slant column density corrected win3 [DU]	−56.5	−35.3	−25.5	−18.6	−11.2	17.2	24.5	31.2	40.3	59.0
background so2 slant column offset window3 [DU]	−3.52	−0.795	0.672	1.74	3.05	12.6	14.0	15.0	16.3	18.4
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	7.391×10^{-4}	1.343×10^{-3}	2.088×10^{-3}	4.214×10^{-3}	7.372×10^{-3}	2.645×10^{-2}	3.786×10^{-2}	5.635×10^{-2}	0.105	0.331
fitted radiance shift [nm]	-8.187×10^{-3}	-3.920×10^{-3}	-2.476×10^{-3}	-1.679×10^{-3}	-1.030×10^{-3}	6.353×10^{-4}	1.266×10^{-3}	2.109×10^{-3}	3.655×10^{-3}	8.084×10^{-3}
fitted radiance squeeze [1]	-5.066×10^{-4}	-3.164×10^{-4}	-2.380×10^{-4}	-1.846×10^{-4}	-1.284×10^{-4}	7.823×10^{-5}	1.303×10^{-4}	1.787×10^{-4}	2.485×10^{-4}	4.150×10^{-4}
fitted root mean square [1]	5.975×10^{-4}	7.429×10^{-4}	8.269×10^{-4}	8.891×10^{-4}	9.627×10^{-4}	1.491×10^{-3}	1.713×10^{-3}	1.931×10^{-3}	2.266×10^{-3}	3.172×10^{-3}
sulfurdioxide total air mass factor polluted [1]	9.225×10^{-2}	0.240	0.336	0.422	0.535	1.15	1.39	1.63	1.91	2.17
sulfurdioxide total air mass factor polluted precision [1]	9.855×10^{-3}	1.726×10^{-2}	2.311×10^{-2}	2.873×10^{-2}	3.713×10^{-2}	0.147	0.195	0.251	0.367	0.655
sulfurdioxide clear air mass factor polluted [1]	0.216	0.304	0.362	0.422	0.511	0.928	1.02	1.14	1.36	1.90
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 ± 0.419	11541615	0.860	0.490	0.0	1.000	0.140	1.000
sulfurdioxide total vertical column [DU]	$(2.911 \pm 101.347) \times 10^{-2}$	11541615	0.437	8.751×10^{-3}	-101	352	-0.207	0.230
sulfurdioxide total vertical column precision [DU]	0.523 ± 0.752	11541615	0.358	0.312	4.761×10^{-2}	36.6	0.206	0.564
sulfurdioxide slant column density corrected [DU]	$(1.600 \pm 36.610) \times 10^{-2}$	11541615	0.361	7.882×10^{-3}	-8.70	202	-0.171	0.190
sulfurdioxide slant column density cobra [DU]	$(1.587 \pm 34.410) \times 10^{-2}$	11541615	0.361	7.882×10^{-3}	-8.70	35.1	-0.171	0.190
sulfurdioxide slant column density cobra precision [DU]	0.287 ± 0.122	11541615	0.121	0.252	8.712×10^{-2}	33.3	0.209	0.330
sulfurdioxide slant column density window1 [DU]	0.102 ± 0.661	11541615	0.728	0.111	-81.9	44.3	-0.258	0.470
sulfurdioxide slant column density window1 precision [DU]	0.287 ± 0.122	11541615	0.121	0.252	8.712×10^{-2}	33.3	0.209	0.330
sulfurdioxide slant column density corrected win1 [DU]	$(3.441 \pm 64.969) \times 10^{-2}$	11541615	0.712	1.835×10^{-2}	-81.9	44.3	-0.333	0.379
background so2 slant column offset window1 [DU]	$(-6.800 \pm 14.299) \times 10^{-2}$	11541615	0.176	-9.863×10^{-2}	-0.511	1.85	-0.169	6.689×10^{-3}
sulfurdioxide slant column density window2 [DU]	1.52 ± 8.43	11541615	10.9	1.49	-130	628	-3.96	6.95
sulfurdioxide slant column density window2 precision [DU]	7.62 ± 2.03	11541615	2.28	7.33	2.25	271	6.29	8.57
sulfurdioxide slant column density corrected win2 [DU]	-0.757 ± 8.129	11541615	10.4	-0.710	-129	624	-5.95	4.48
background so2 slant column offset window2 [DU]	-2.27 ± 2.69	11541615	4.38	-1.74	-13.9	5.37	-4.31	6.308×10^{-2}
sulfurdioxide slant column density window3 [DU]	-5.38 ± 22.07	11541615	27.3	-5.85	-189	375	-19.2	8.07
sulfurdioxide slant column density window3 precision [DU]	26.5 ± 13.4	11541615	7.81	23.0	8.79	245	20.0	27.8
sulfurdioxide slant column density corrected win3 [DU]	3.10 ± 21.39	11541615	26.4	3.22	-182	377	-10.0	16.4
background so2 slant column offset window3 [DU]	8.48 ± 5.94	11541615	10.4	9.88	-12.4	22.4	3.02	13.4
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.18	11541615	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.324 \pm 7.341) \times 10^{-2}$	11541615	2.295×10^{-2}	1.300×10^{-2}	2.428×10^{-4}	2.64	5.020×10^{-3}	2.797×10^{-2}
fitted radiance shift [nm]	$(-3.913 \pm 259.162) \times 10^{-5}$	11541615	1.513×10^{-3}	-4.180×10^{-5}	-4.625×10^{-2}	3.841×10^{-2}	-8.140×10^{-4}	6.994×10^{-4}
fitted radiance squeeze [1]	$(-4.964 \pm 17.177) \times 10^{-5}$	11541615	2.009×10^{-4}	-3.954×10^{-5}	-1.080×10^{-2}	8.692×10^{-3}	-1.441×10^{-4}	5.680×10^{-5}
fitted root mean square [1]	$(1.257 \pm 0.509) \times 10^{-3}$	11541615	4.870×10^{-4}	1.118×10^{-3}	3.027×10^{-4}	6.774×10^{-2}	9.396×10^{-4}	1.427×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.918 ± 0.534	11541615	0.714	0.815	5.000×10^{-2}	2.86	0.511	1.22
sulfurdioxide total air mass factor polluted precision [1]	0.126 ± 0.143	11541615	0.126	7.405×10^{-2}	3.017×10^{-3}	1.94	3.670×10^{-2}	0.162
sulfurdioxide clear air mass factor polluted [1]	0.754 ± 0.380	11541615	0.492	0.696	6.567×10^{-2}	2.55	0.462	0.954
number of spectral points in retrieval [1]	73.5 ± 0.5	11541615	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]	0.725 ± 0.375	5799482	0.630	1.000	0.0	1.000	0.370	1.000
sulfurdioxide total vertical column [DU]	$(3.272 \pm 95.801) \times 10^{-2}$	5799482	0.497	1.465×10^{-2}	-77.2	844	-0.231	0.266
sulfurdioxide total vertical column precision [DU]	0.508 ± 0.523	5799482	0.349	0.353	4.710×10^{-2}	111	0.244	0.593
sulfurdioxide slant column density corrected [DU]	$(2.215 \pm 50.816) \times 10^{-2}$	5799482	0.401	1.255×10^{-2}	-37.2	614	-0.186	0.215
sulfurdioxide slant column density cobra [DU]	$(2.181 \pm 38.981) \times 10^{-2}$	5799482	0.401	1.255×10^{-2}	-37.2	36.9	-0.186	0.215
sulfurdioxide slant column density cobra precision [DU]	0.317 ± 0.135	5799482	0.140	0.285	9.007×10^{-2}	41.6	0.229	0.369
sulfurdioxide slant column density window1 [DU]	0.142 ± 0.713	5799482	0.791	0.137	-72.0	83.6	-0.258	0.533
sulfurdioxide slant column density window1 precision [DU]	0.317 ± 0.135	5799482	0.140	0.285	9.007×10^{-2}	41.6	0.229	0.369
sulfurdioxide slant column density corrected win1 [DU]	$(4.480 \pm 71.181) \times 10^{-2}$	5799482	0.787	2.601×10^{-2}	-72.0	83.7	-0.361	0.425
background so2 slant column offset window1 [DU]	$(-9.678 \pm 9.871) \times 10^{-2}$	5799482	9.658×10^{-2}	-0.103	-1.39	3.04	-0.153	-5.625×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.769 ± 10.006	5799482	12.3	0.589	-1.001×10^{3}	2.551×10^{3}	-5.50	6.84
sulfurdioxide slant column density window2 precision [DU]	8.95 ± 2.63	5799482	2.88	8.64	2.30	509	7.35	10.2
sulfurdioxide slant column density corrected win2 [DU]	-0.495 ± 9.924	5799482	12.2	-0.520	-1.004×10^{3}	2.550×10^{3}	-6.63	5.62
background so2 slant column offset window2 [DU]	-1.26 ± 1.71	5799482	2.00	-0.830	-11.7	4.59	-2.09	-8.963×10^{-2}
sulfurdioxide slant column density window3 [DU]	-3.86 ± 26.50	5799482	33.2	-3.38	-594	245	-20.1	13.1
sulfurdioxide slant column density window3 precision [DU]	31.2 ± 13.1	5799482	10.5	28.2	9.63	236	23.8	34.4
sulfurdioxide slant column density corrected win3 [DU]	2.40 ± 26.19	5799482	32.9	2.64	-588	247	-13.8	19.1
background so2 slant column offset window3 [DU]	6.26 ± 4.58	5799482	6.29	5.18	-7.78	31.4	3.08	9.38
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	5799482	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.319 \pm 3.754) \times 10^{-2}$	5799482	1.398×10^{-2}	1.551×10^{-2}	9.364×10^{-4}	1.32	1.073×10^{-2}	2.471×10^{-2}
fitted radiance shift [nm]	$(-4.367 \pm 25.748) \times 10^{-4}$	5799482	1.877×10^{-3}	-4.452×10^{-4}	-5.109×10^{-2}	6.618×10^{-2}	-1.418×10^{-3}	4.588×10^{-4}
fitted radiance squeeze [1]	$(1.703 \pm 18.761) \times 10^{-5}$	5799482	2.163×10^{-4}	1.194×10^{-5}	-1.641×10^{-2}	2.379×10^{-2}	-9.410×10^{-5}	1.222×10^{-4}
fitted root mean square [1]	$(1.368 \pm 0.524) \times 10^{-3}$	5799482	5.807×10^{-4}	1.241×10^{-3}	3.124×10^{-4}	9.301×10^{-2}	1.020×10^{-3}	1.601×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.842 ± 0.368	5799482	0.469	0.819	5.000×10^{-2}	2.60	0.580	1.05
sulfurdioxide total air mass factor polluted precision [1]	$(9.327 \pm 9.112) \times 10^{-2}$	5799482	8.399×10^{-2}	5.944×10^{-2}	4.655×10^{-3}	1.69	3.780×10^{-2}	0.122
sulfurdioxide clear air mass factor polluted [1]	0.746 ± 0.216	5799482	0.303	0.746	8.566×10^{-2}	1.77	0.593	0.896
number of spectral points in retrieval [1]	73.4 ± 0.5	5799482	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]	0.654 ± 0.399	11324388	0.770	1.000	0.0	1.000	0.230	1.000
sulfurdioxide total vertical column [DU]	$(2.926 \pm 100.782) \times 10^{-2}$	11324388	0.450	1.002×10^{-2}	-101	709	-0.213	0.238
sulfurdioxide total vertical column precision [DU]	0.513 ± 0.720	11324388	0.329	0.313	5.674×10^{-2}	39.1	0.220	0.550
sulfurdioxide slant column density corrected [DU]	$(1.560 \pm 40.392) \times 10^{-2}$	11324388	0.372	8.793×10^{-3}	-16.3	614	-0.176	0.196
sulfurdioxide slant column density cobra [DU]	$(1.550 \pm 35.432) \times 10^{-2}$	11324388	0.372	8.793×10^{-3}	-16.3	34.3	-0.176	0.196
sulfurdioxide slant column density cobra precision [DU]	0.298 ± 0.129	11324388	0.140	0.260	8.712×10^{-2}	41.6	0.212	0.352
sulfurdioxide slant column density window1 [DU]	0.112 ± 0.676	11324388	0.748	0.121	-72.0	83.6	-0.258	0.490
sulfurdioxide slant column density window1 precision [DU]	0.298 ± 0.129	11324388	0.140	0.260	8.712×10^{-2}	41.6	0.212	0.352
sulfurdioxide slant column density corrected win1 [DU]	$(3.115 \pm 66.744) \times 10^{-2}$	11324388	0.736	1.749×10^{-2}	-72.0	83.7	-0.346	0.390
background so2 slant column offset window1 [DU]	$(-8.079 \pm 12.783) \times 10^{-2}$	11324388	0.140	-0.104	-1.39	3.04	-0.165	-2.484×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.12 ± 8.98	11324388	11.4	1.00	-764	2.551×10^{3}	-4.63	6.74
sulfurdioxide slant column density window2 precision [DU]	8.05 ± 2.21	11324388	2.55	7.73	2.30	509	6.60	9.15
sulfurdioxide slant column density corrected win2 [DU]	-0.660 ± 8.777	11324388	11.0	-0.656	-765	2.550×10^{3}	-6.18	4.86
background so2 slant column offset window2 [DU]	-1.78 ± 2.44	11324388	3.33	-1.01	-13.9	5.37	-3.26	6.989×10^{-2}
sulfurdioxide slant column density window3 [DU]	-2.14 ± 23.73	11324388	29.7	-2.55	-594	203	-17.0	12.7
sulfurdioxide slant column density window3 precision [DU]	27.3 ± 11.6	11324388	9.00	24.3	9.29	235	21.0	30.0
sulfurdioxide slant column density corrected win3 [DU]	5.08 ± 22.92	11324388	28.6	4.93	-588	205	-9.22	19.4
background so2 slant column offset window3 [DU]	7.22 ± 5.61	11324388	9.32	6.48	-12.4	31.4	2.70	12.0
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	11324388	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.135 \pm 3.978) \times 10^{-2}$	11324388	1.404×10^{-2}	1.391×10^{-2}	3.841×10^{-4}	2.64	8.510×10^{-3}	2.255×10^{-2}
fitted radiance shift [nm]	$(-1.916 \pm 22.687) \times 10^{-4}$	11324388	1.631×10^{-3}	-1.641×10^{-4}	-5.109×10^{-2}	6.618×10^{-2}	-1.028×10^{-3}	6.036×10^{-4}
fitted radiance squeeze [1]	$(-1.871 \pm 17.923) \times 10^{-5}$	11324388	2.049×10^{-4}	-1.518×10^{-5}	-1.549×10^{-2}	2.147×10^{-2}	-1.192×10^{-4}	8.572×10^{-5}
fitted root mean square [1]	$(1.297 \pm 0.521) \times 10^{-3}$	11324388	5.764×10^{-4}	1.149×10^{-3}	3.027×10^{-4}	9.301×10^{-2}	9.523×10^{-4}	1.529×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.884 ± 0.442	11324388	0.548	0.846	5.000×10^{-2}	2.39	0.571	1.12
sulfurdioxide total air mass factor polluted precision [1]	0.103 ± 0.110	11324388	8.749×10^{-2}	6.531×10^{-2}	3.156×10^{-3}	1.67	4.014×10^{-2}	0.128
sulfurdioxide clear air mass factor polluted [1]	0.781 ± 0.332	11324388	0.391	0.765	6.750×10^{-2}	2.39	0.554	0.944
number of spectral points in retrieval [1]	73.4 ± 0.5	11324388	1.000	73.0	70.0	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]	0.624 ± 0.426	4185083	0.850	1.000	0.0	1.000	0.150	1.000
sulfurdioxide total vertical column [DU]	$(3.046 \pm 96.120) \times 10^{-2}$	4185083	0.469	1.138×10^{-2}	-77.2	844	-0.218	0.251
sulfurdioxide total vertical column precision [DU]	0.509 ± 0.576	4185083	0.369	0.351	4.710×10^{-2}	111	0.223	0.593
sulfurdioxide slant column density corrected [DU]	$(2.213 \pm 44.158) \times 10^{-2}$	4185083	0.368	9.953×10^{-3}	-37.2	349	-0.172	0.196
sulfurdioxide slant column density cobra [DU]	$(2.174 \pm 35.960) \times 10^{-2}$	4185083	0.368	9.953×10^{-3}	-37.2	36.9	-0.172	0.196
sulfurdioxide slant column density cobra precision [DU]	0.287 ± 0.118	4185083	0.106	0.256	9.388×10^{-2}	26.4	0.216	0.322
sulfurdioxide slant column density window1 [DU]	0.146 ± 0.660	4185083	0.728	0.139	-68.2	66.9	-0.224	0.504
sulfurdioxide slant column density window1 precision [DU]	0.287 ± 0.118	4185083	0.106	0.256	9.388×10^{-2}	26.4	0.216	0.322
sulfurdioxide slant column density corrected win1 [DU]	$(5.103 \pm 65.409) \times 10^{-2}$	4185083	0.718	3.010×10^{-2}	-68.2	66.8	-0.323	0.395
background so2 slant column offset window1 [DU]	$(-9.469 \pm 12.439) \times 10^{-2}$	4185083	0.136	-0.120	-0.511	1.90	-0.175	-3.855×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.08 ± 9.15	4185083	11.5	1.12	-1.001×10^{3}	882	-4.66	6.83
sulfurdioxide slant column density window2 precision [DU]	8.22 ± 2.63	4185083	2.72	7.83	2.25	499	6.62	9.34
sulfurdioxide slant column density corrected win2 [DU]	-0.671 ± 8.923	4185083	11.1	-0.643	-1.004×10^{3}	882	-6.19	4.87
background so2 slant column offset window2 [DU]	-1.75 ± 2.31	4185083	3.19	-1.09	-13.9	5.37	-3.19	5.967×10^{-3}
sulfurdioxide slant column density window3 [DU]	-10.1 ± 23.3	4185083	28.4	-9.65	-343	375	-24.0	4.36
sulfurdioxide slant column density window3 precision [DU]	30.6 ± 17.0	4185083	12.3	25.8	9.18	245	21.0	33.4
sulfurdioxide slant column density corrected win3 [DU]	-2.33 ± 23.55	4185083	28.8	-1.36	-340	377	-16.3	12.5
background so2 slant column offset window3 [DU]	7.73 ± 5.51	4185083	9.31	7.68	-12.4	25.0	3.13	12.4
sulfurdioxide slant column cobra flag [1]	2.00 ± 0.08	4185083	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.015 \pm 9.194) \times 10^{-2}$	4185083	4.284×10^{-2}	1.970×10^{-2}	2.428×10^{-4}	2.43	6.730×10^{-3}	4.957×10^{-2}
fitted radiance shift [nm]	$(-1.181 \pm 32.804) \times 10^{-4}$	4185083	1.776×10^{-3}	-1.280×10^{-4}	-4.625×10^{-2}	4.817×10^{-2}	-1.043×10^{-3}	7.336×10^{-4}
fitted radiance squeeze [1]	$(-3.381 \pm 17.691) \times 10^{-5}$	4185083	2.050×10^{-4}	-3.022×10^{-5}	-1.641×10^{-2}	2.379×10^{-2}	-1.342×10^{-4}	7.087×10^{-5}
fitted root mean square [1]	$(1.252 \pm 0.477) \times 10^{-3}$	4185083	4.311×10^{-4}	1.139×10^{-3}	3.124×10^{-4}	4.567×10^{-2}	9.659×10^{-4}	1.397×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.878 ± 0.535	4185083	0.653	0.719	5.000×10^{-2}	2.86	0.494	1.15
sulfurdioxide total air mass factor polluted precision [1]	0.138 ± 0.162	4185083	0.155	7.374×10^{-2}	4.363×10^{-3}	1.94	3.086×10^{-2}	0.186
sulfurdioxide clear air mass factor polluted [1]	0.688 ± 0.314	4185083	0.377	0.624	8.566×10^{-2}	2.55	0.468	0.845
number of spectral points in retrieval [1]	73.4 ± 0.5	4185083	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

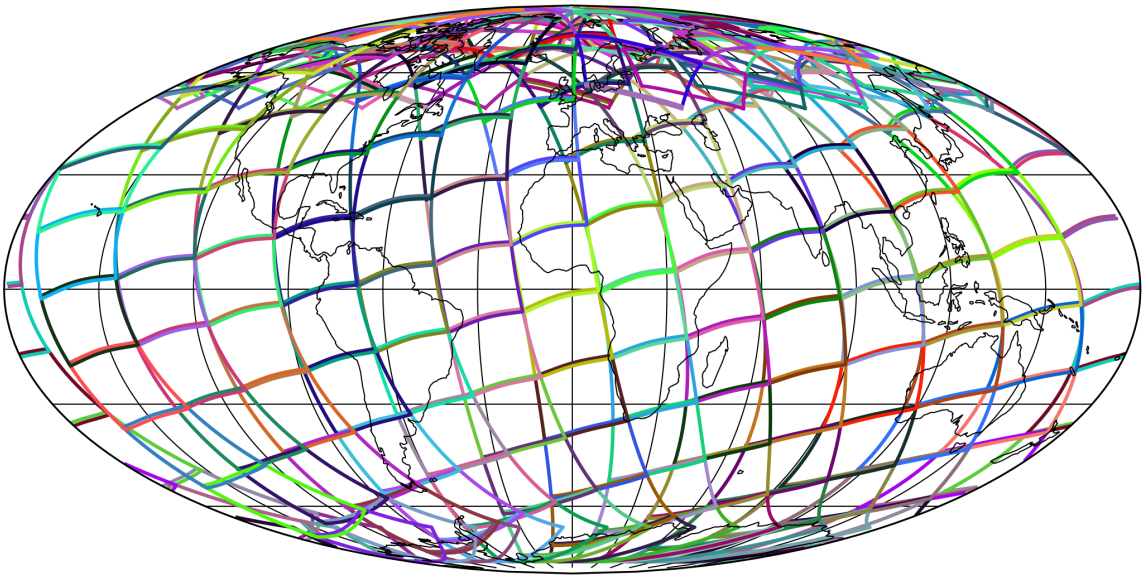

Figure 1: Outline of the granules.

4 Input data monitoring

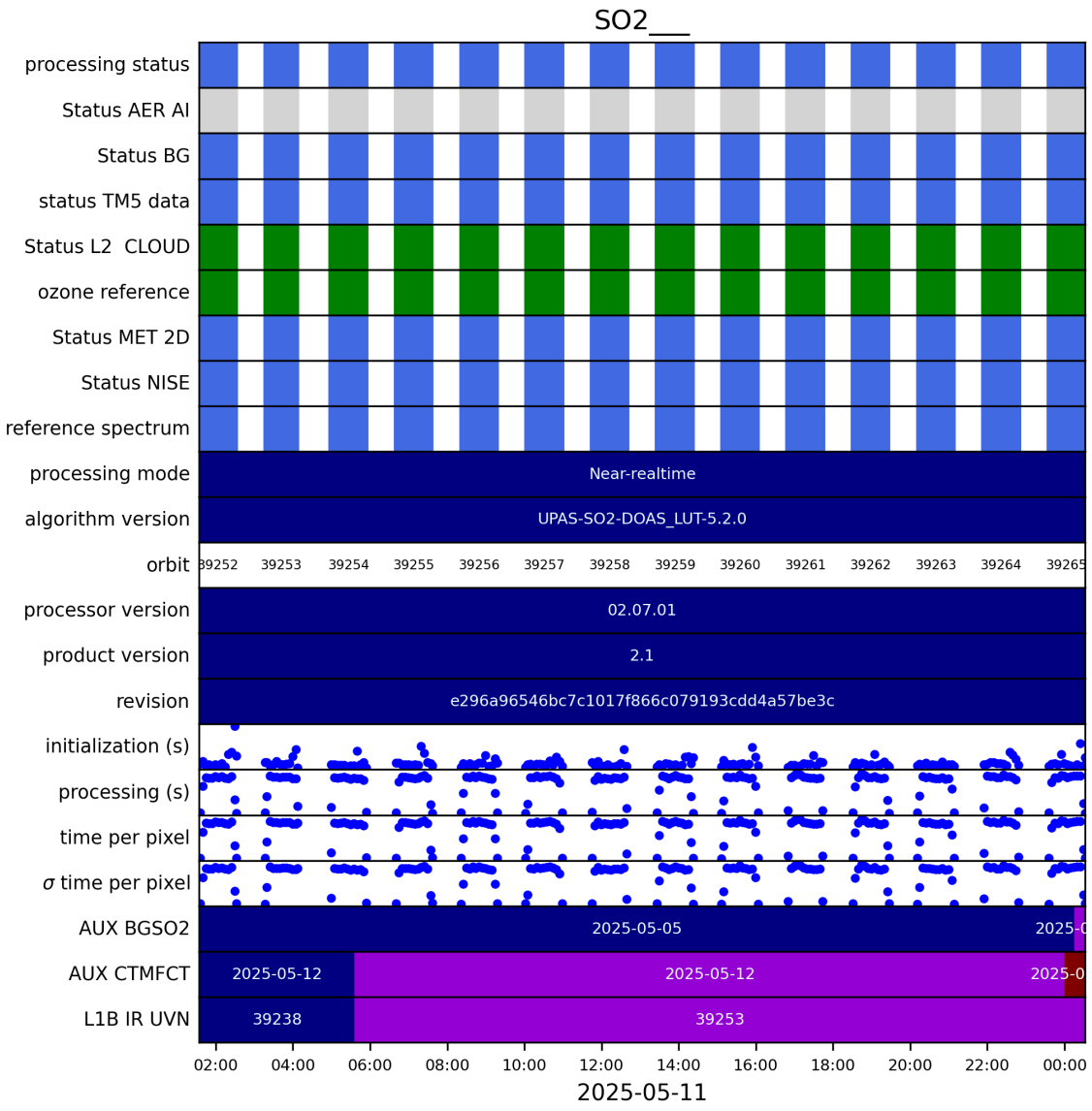

Figure 2: Input data per granule

5 Warnings and errors

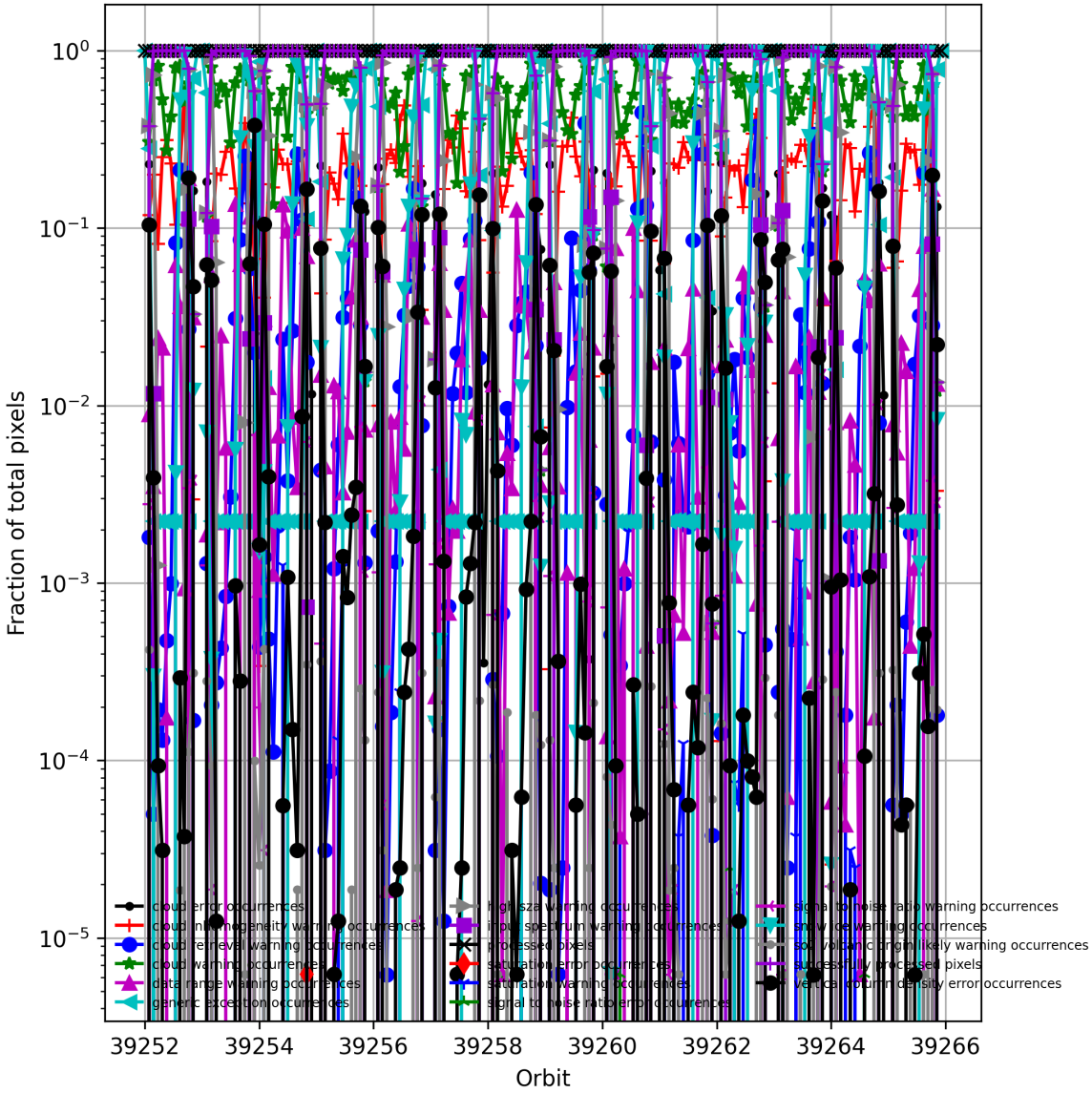

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

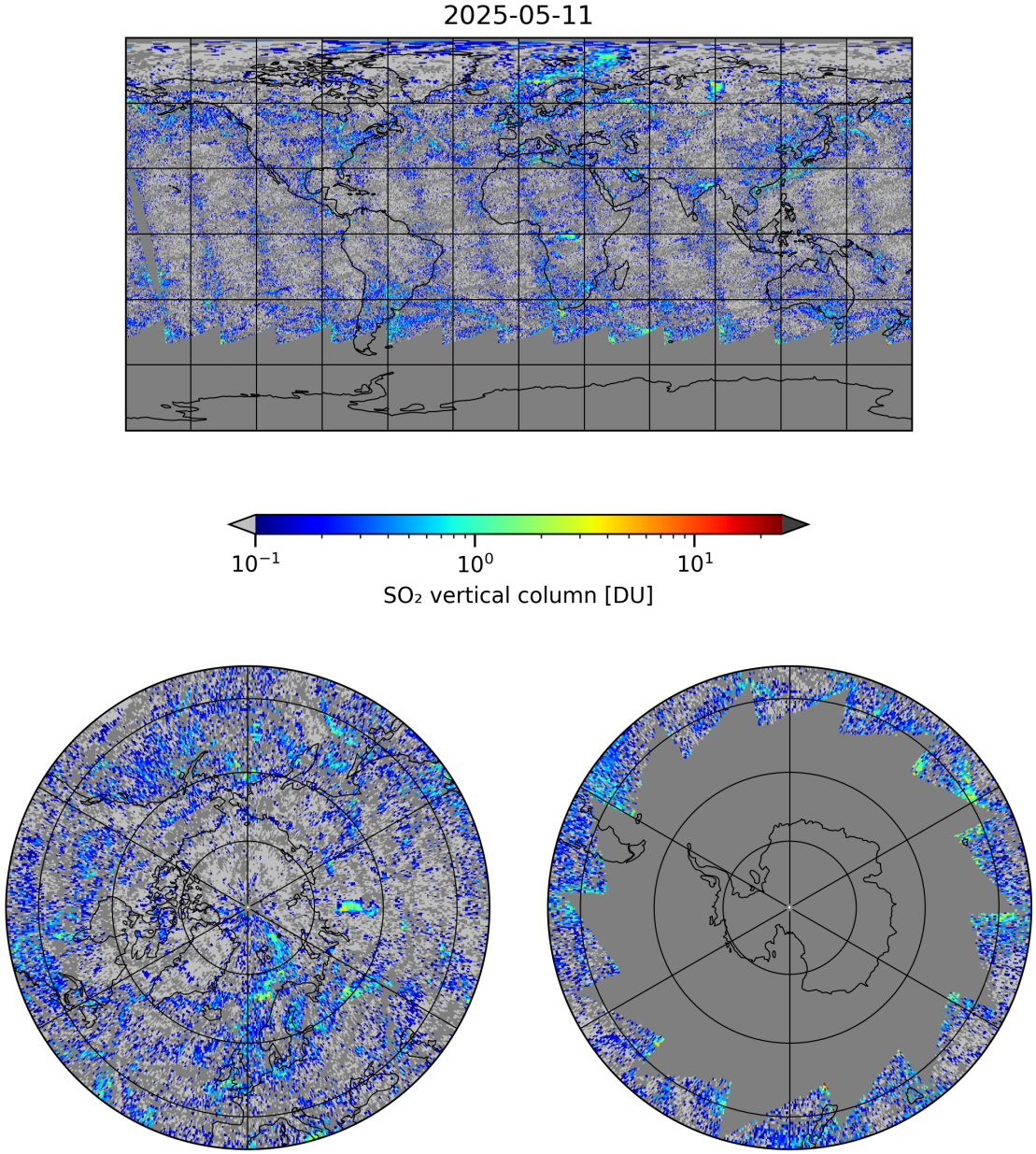

Figure 4: Map of "SO_2 vertical column" for 2025-05-11 to 2025-05-12

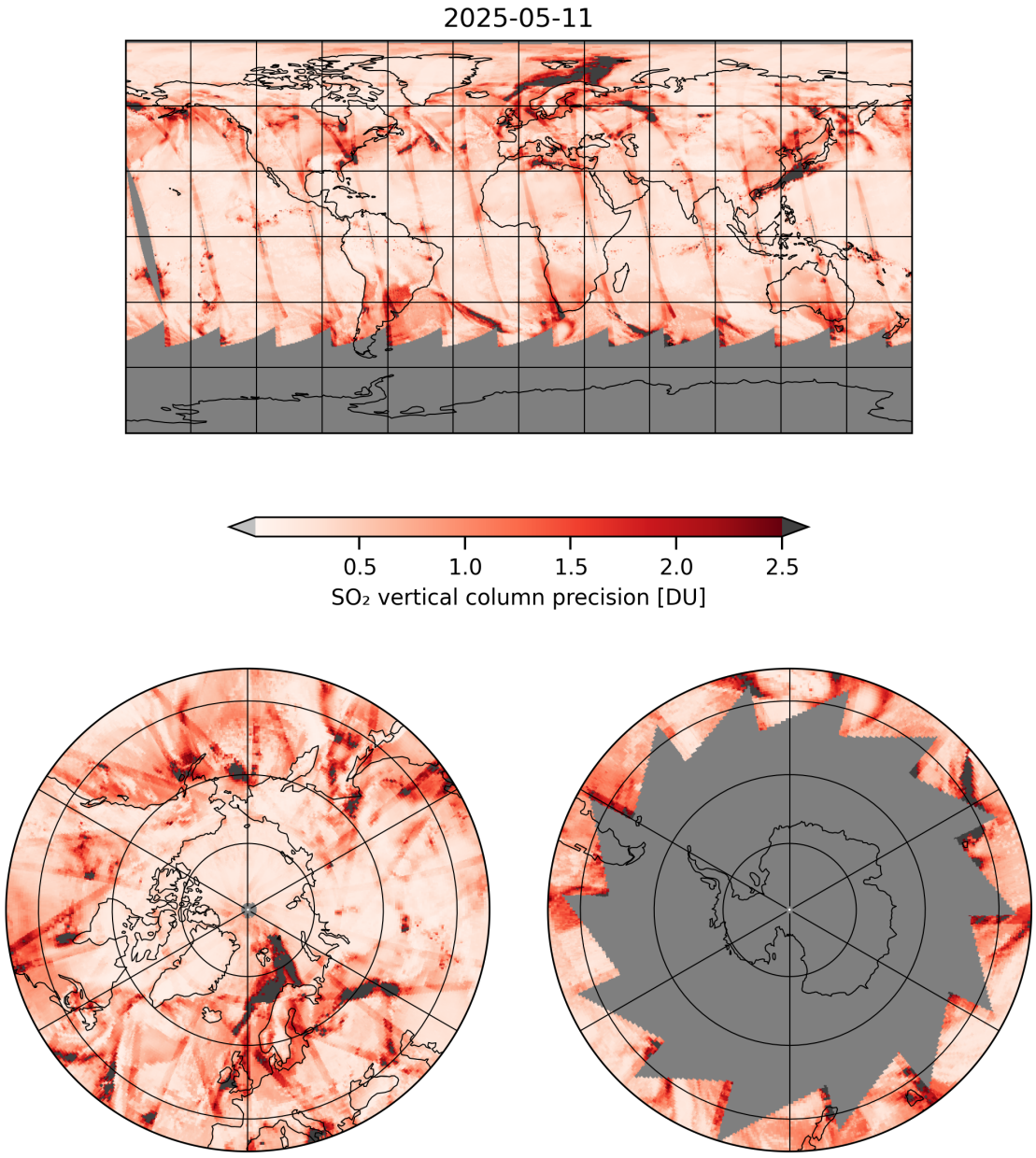

Figure 5: Map of "SO_2 vertical column precision" for 2025-05-11 to 2025-05-12

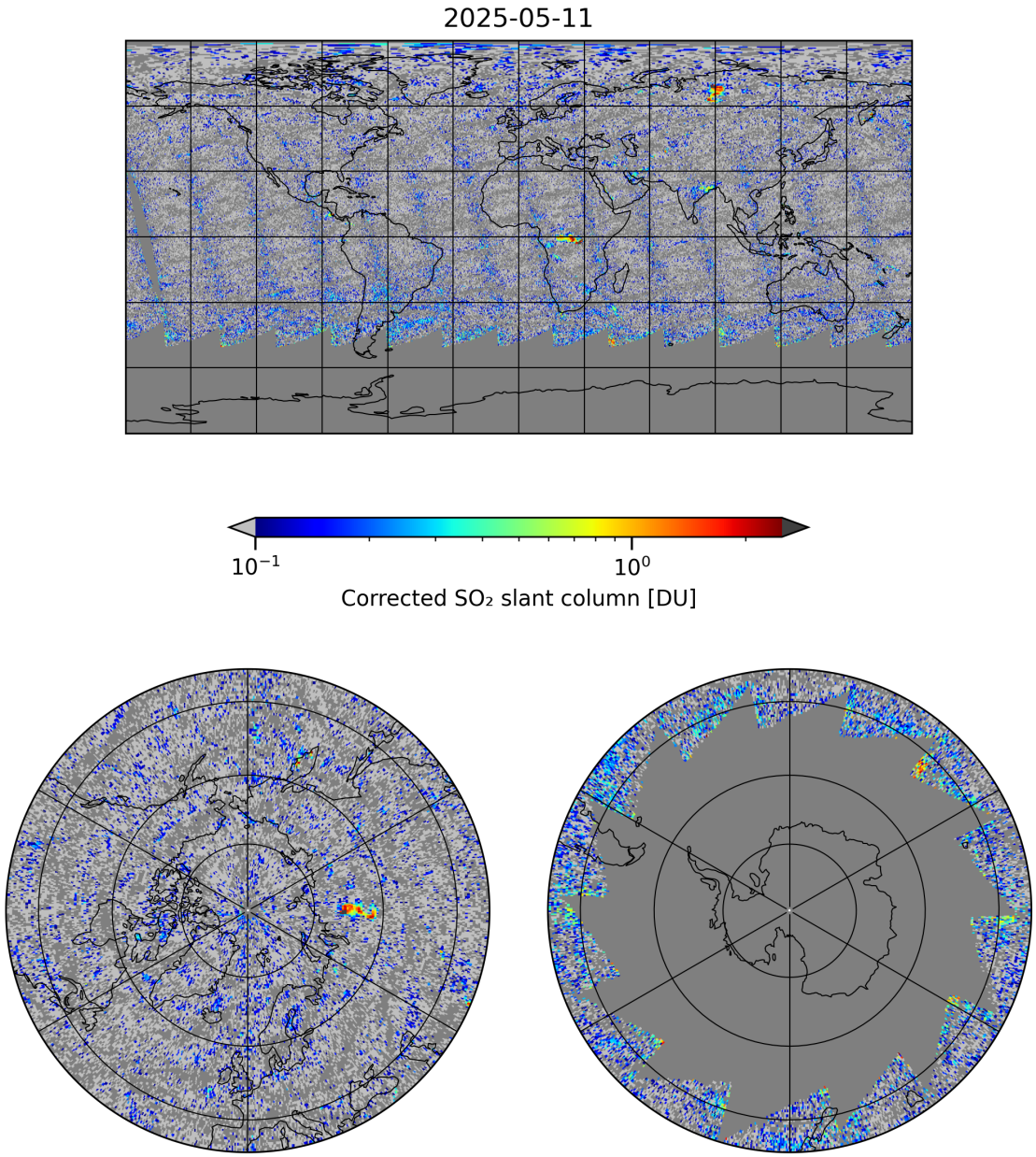

Figure 6: Map of “Corrected SO_2 slant column” for 2025-05-11 to 2025-05-12

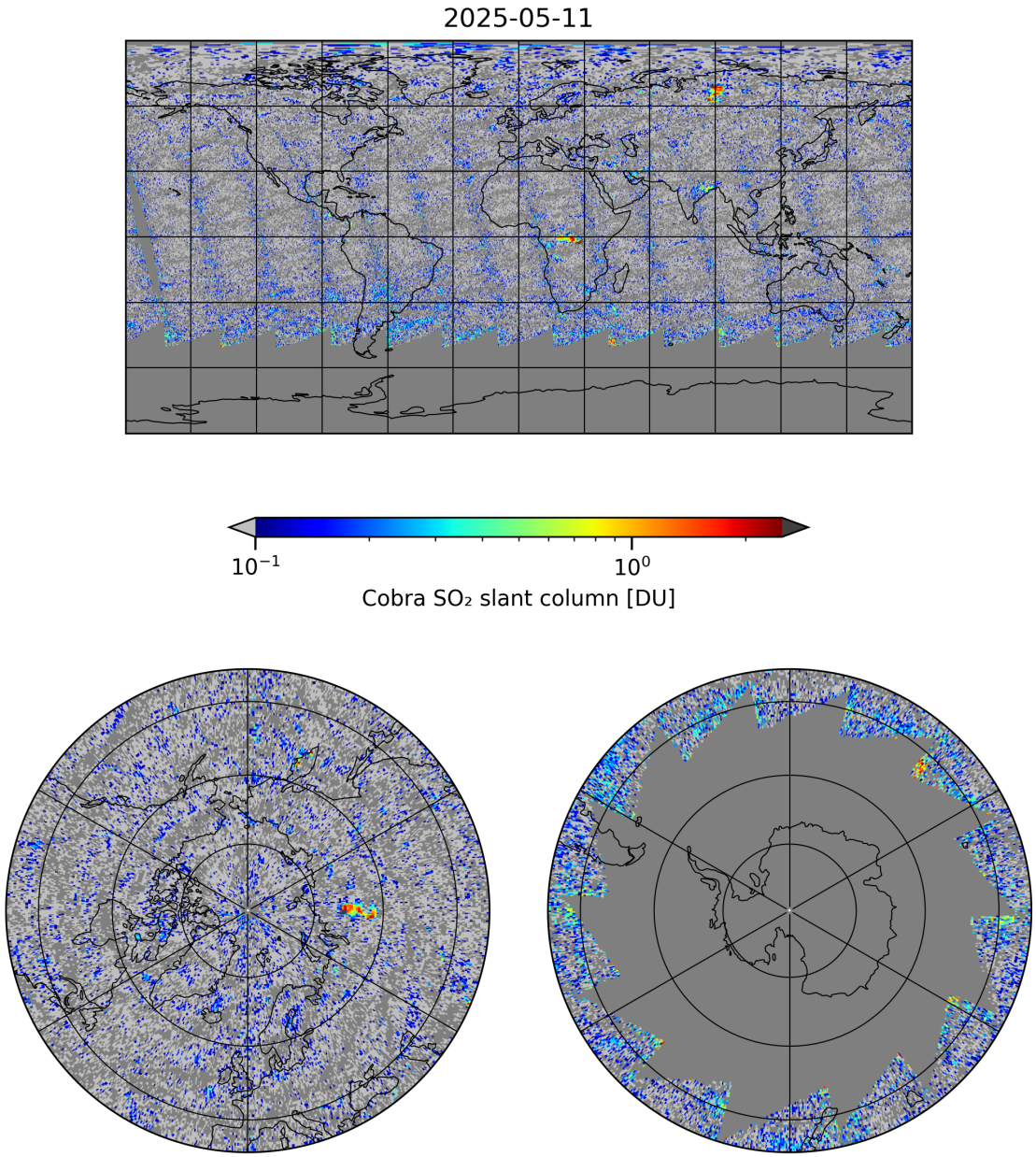

Figure 7: Map of "Cobra SO_2 slant column" for 2025-05-11 to 2025-05-12

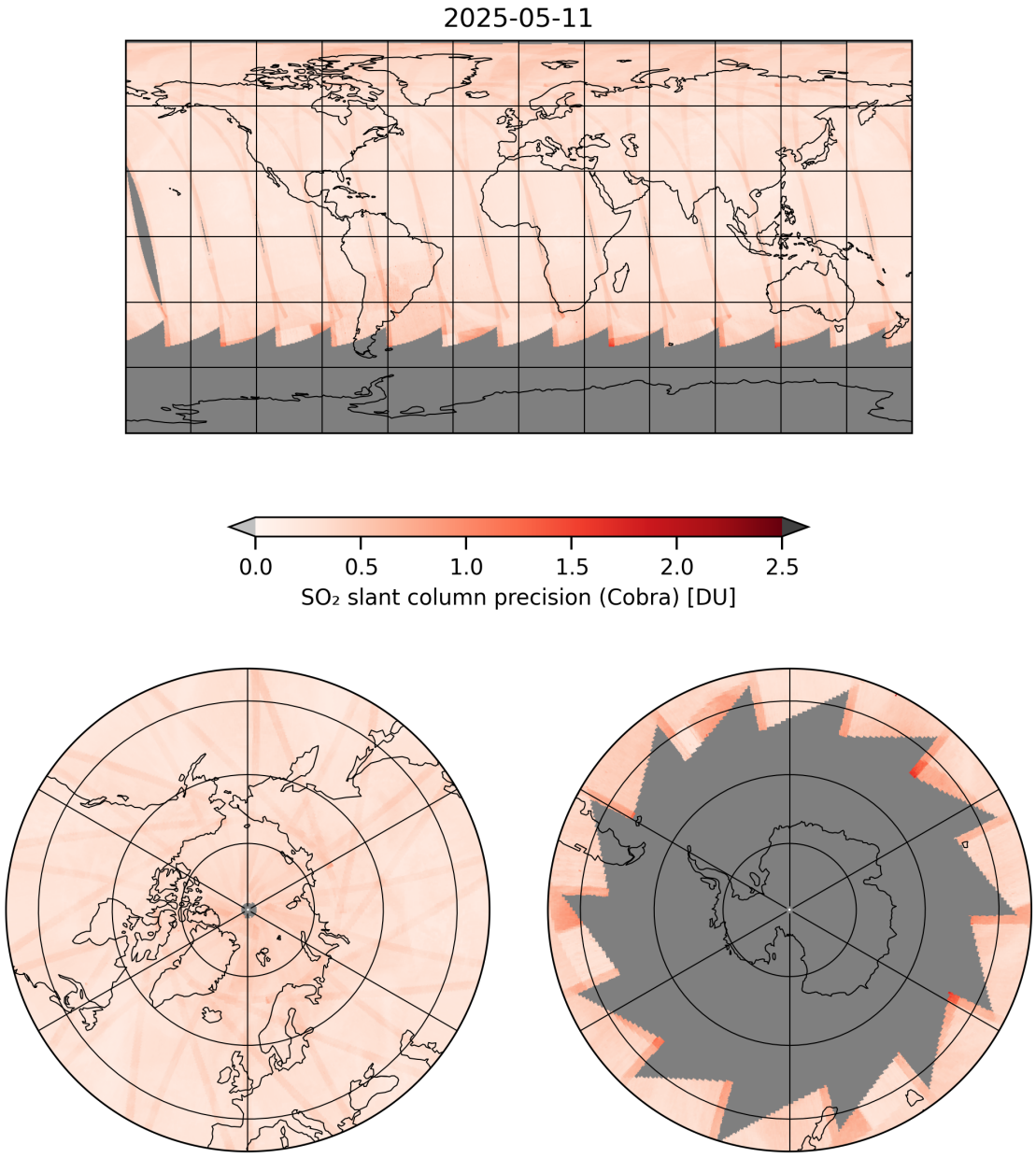

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-05-11 to 2025-05-12

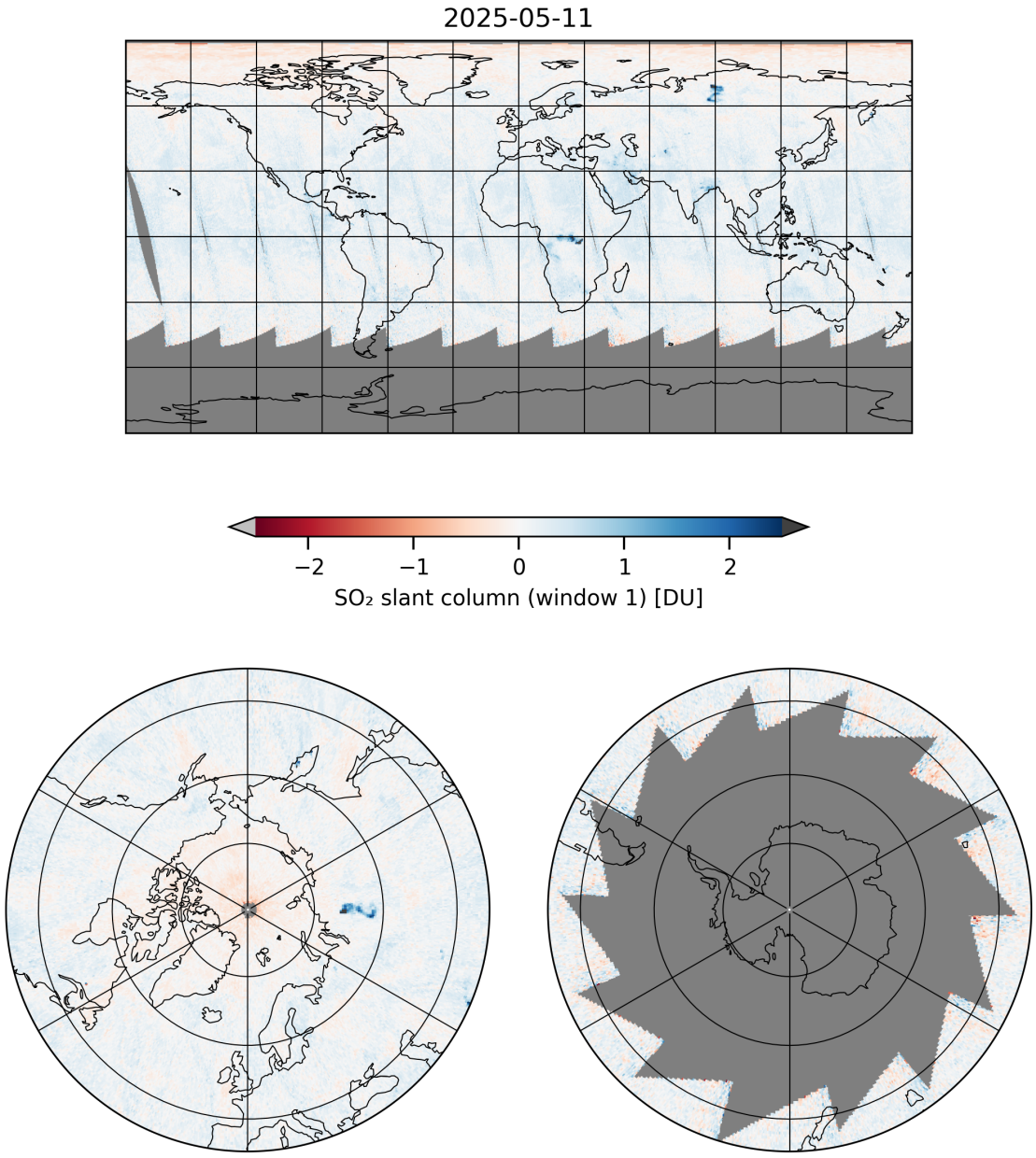

Figure 9: Map of "SO_2 slant column (window 1)" for 2025-05-11 to 2025-05-12

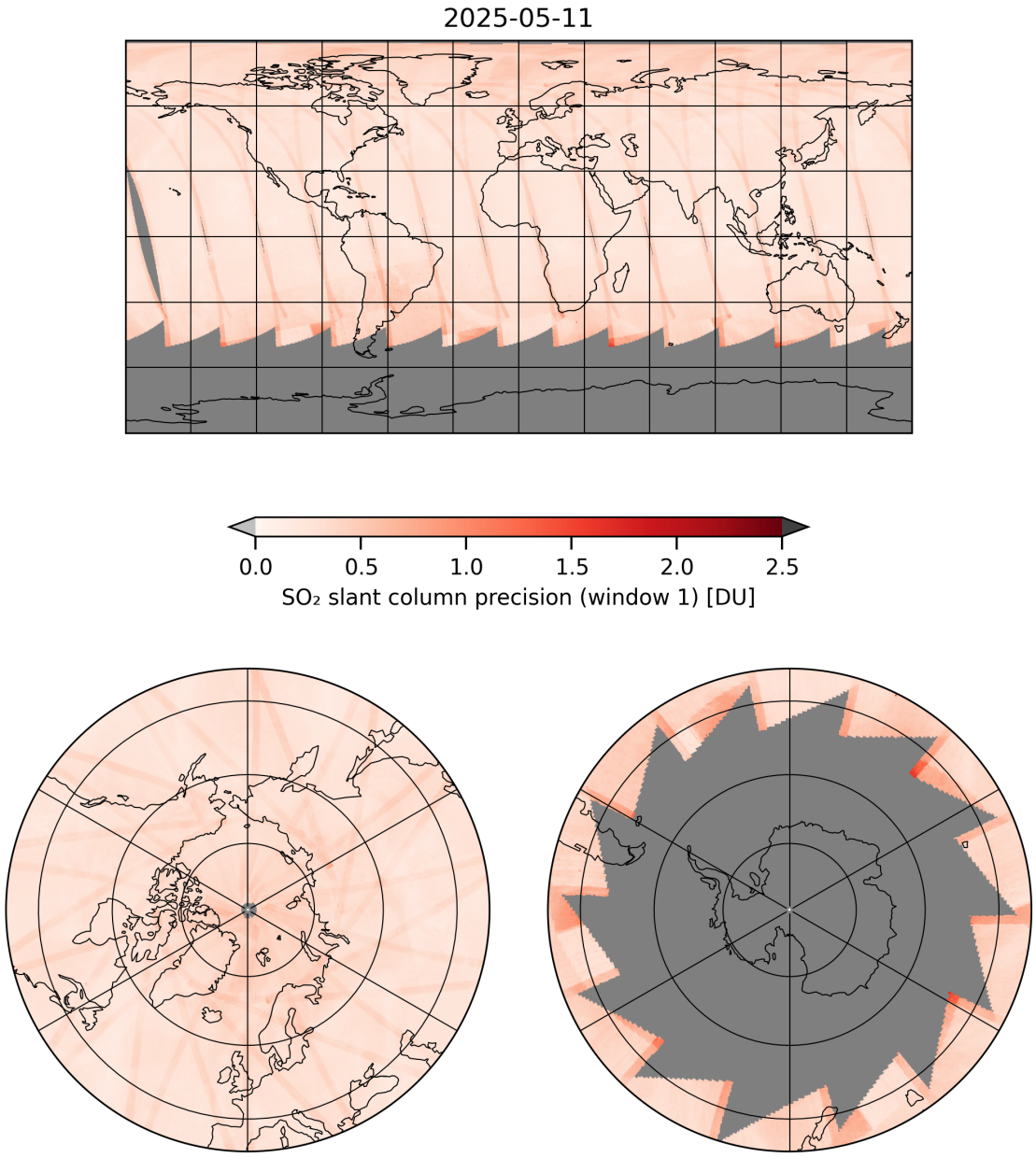

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-05-11 to 2025-05-12

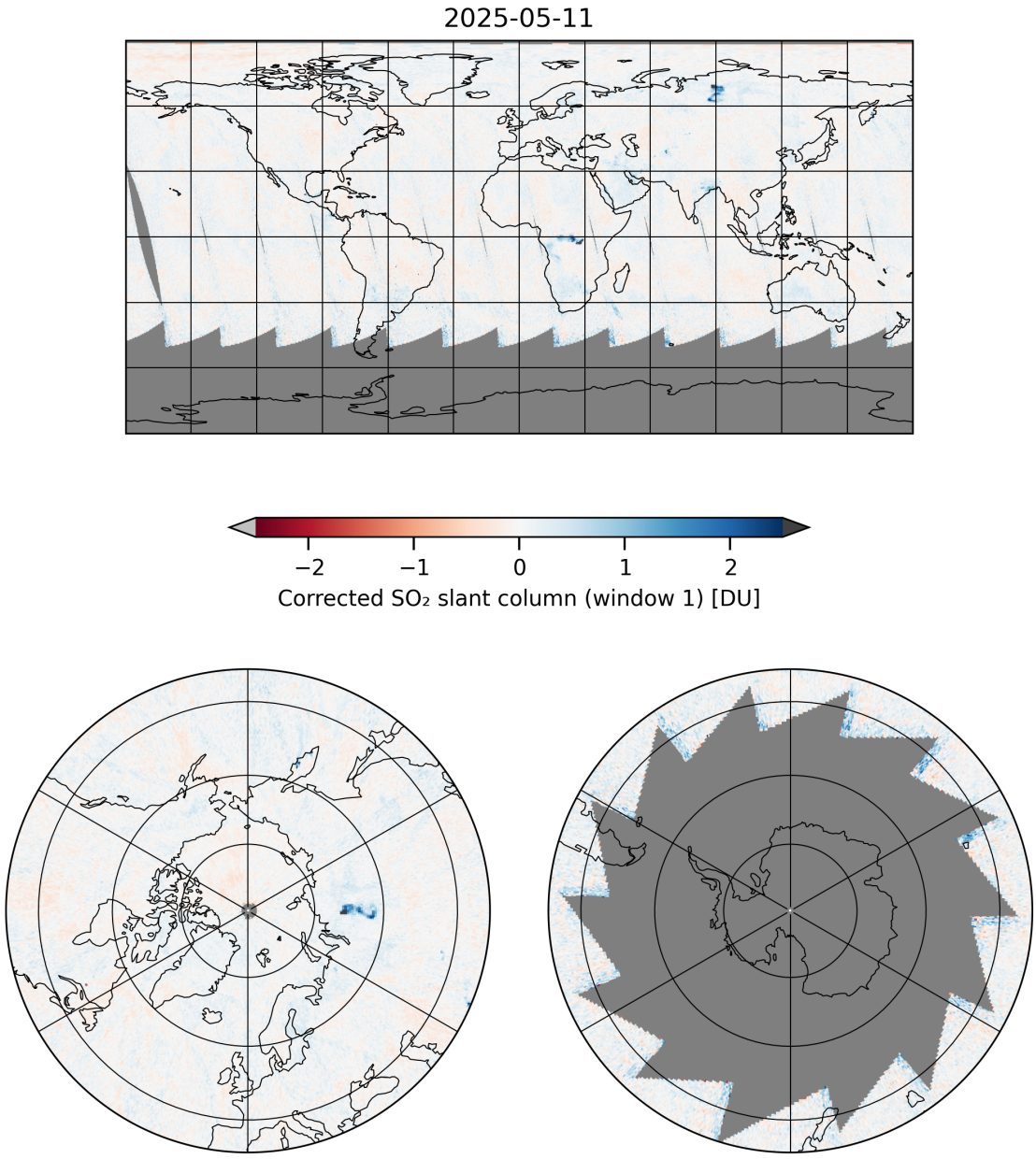

Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-05-11 to 2025-05-12

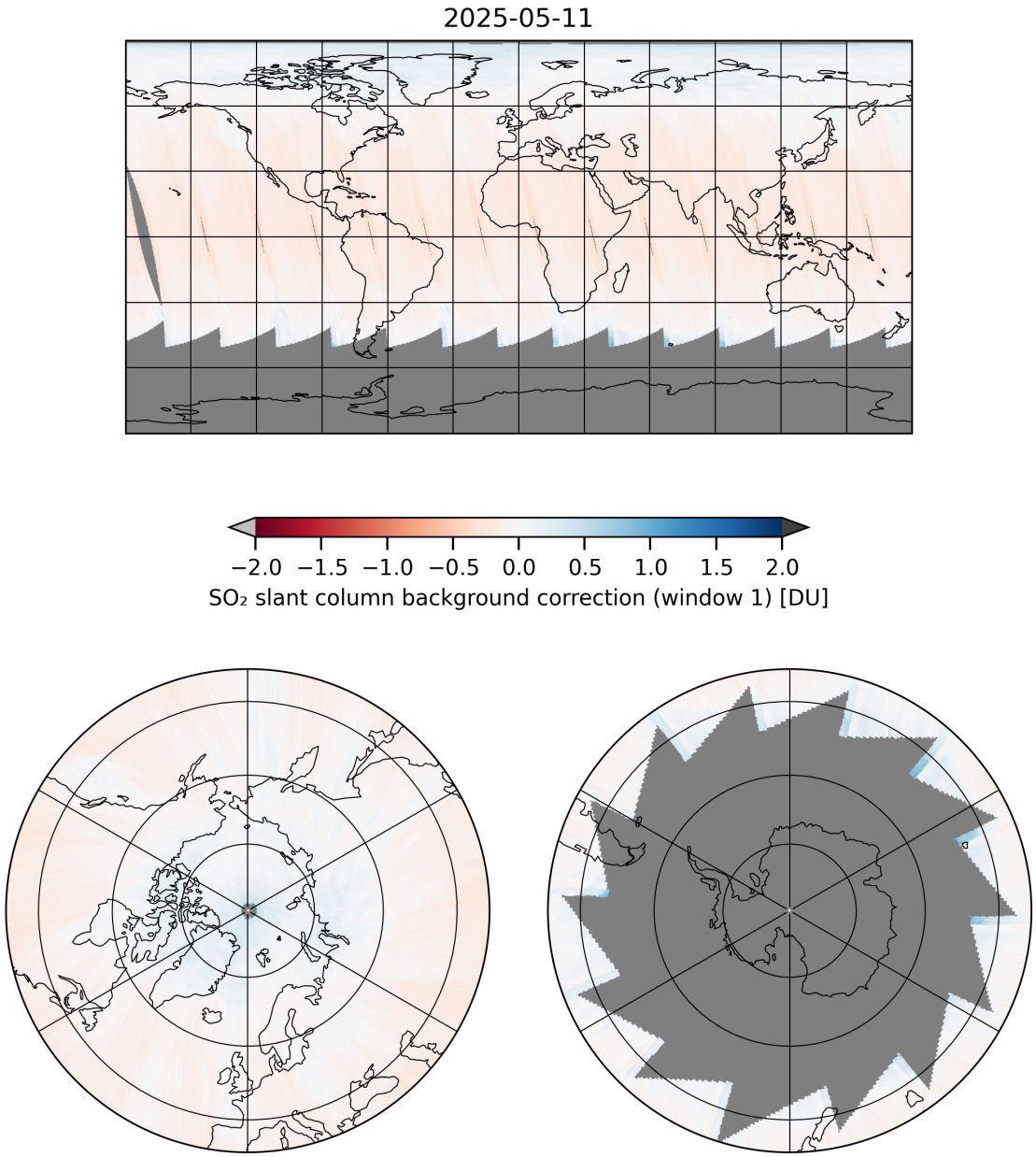

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-05-11 to 2025-05-12

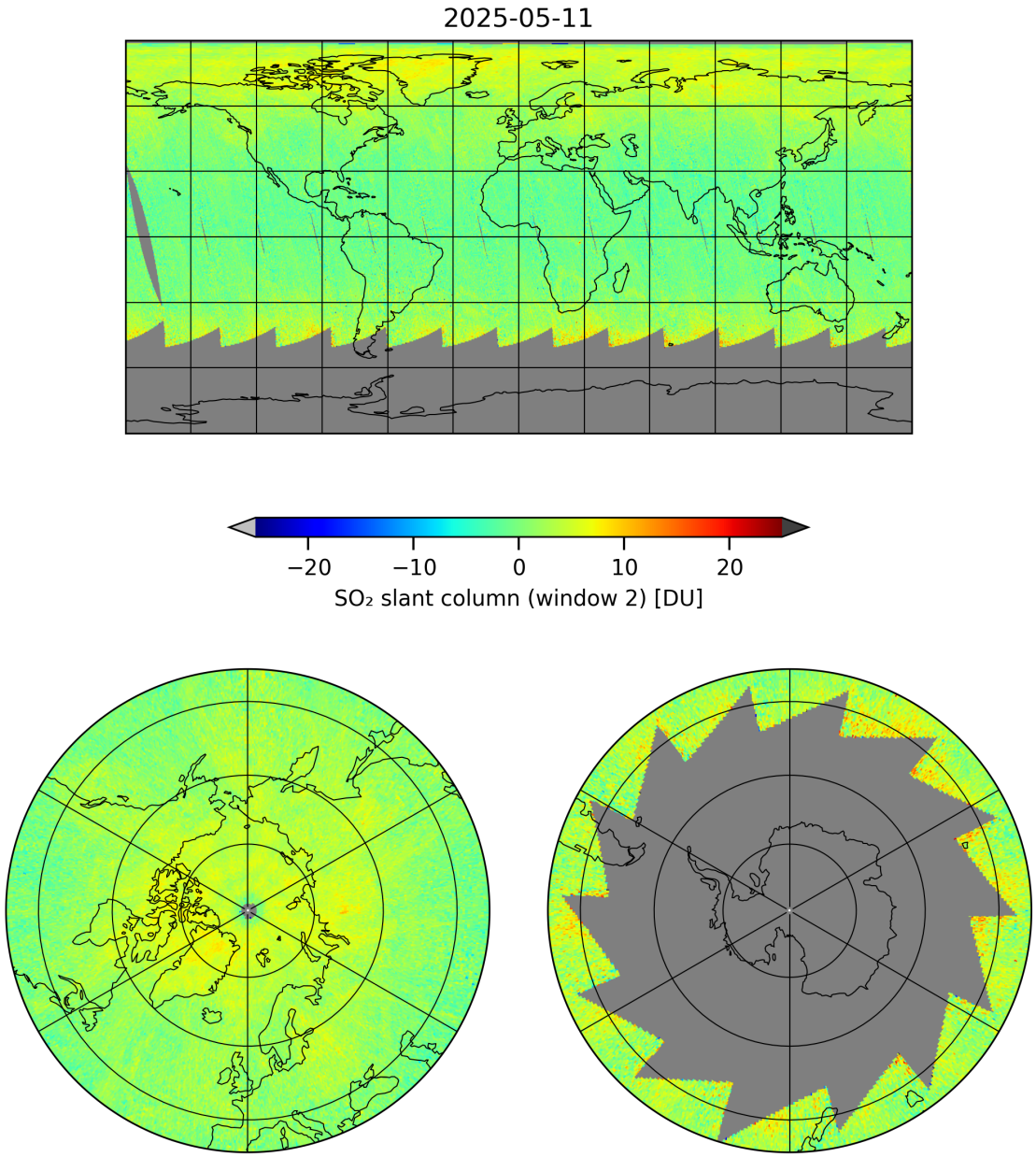

Figure 13: Map of "SO_2 slant column (window 2)" for 2025-05-11 to 2025-05-12

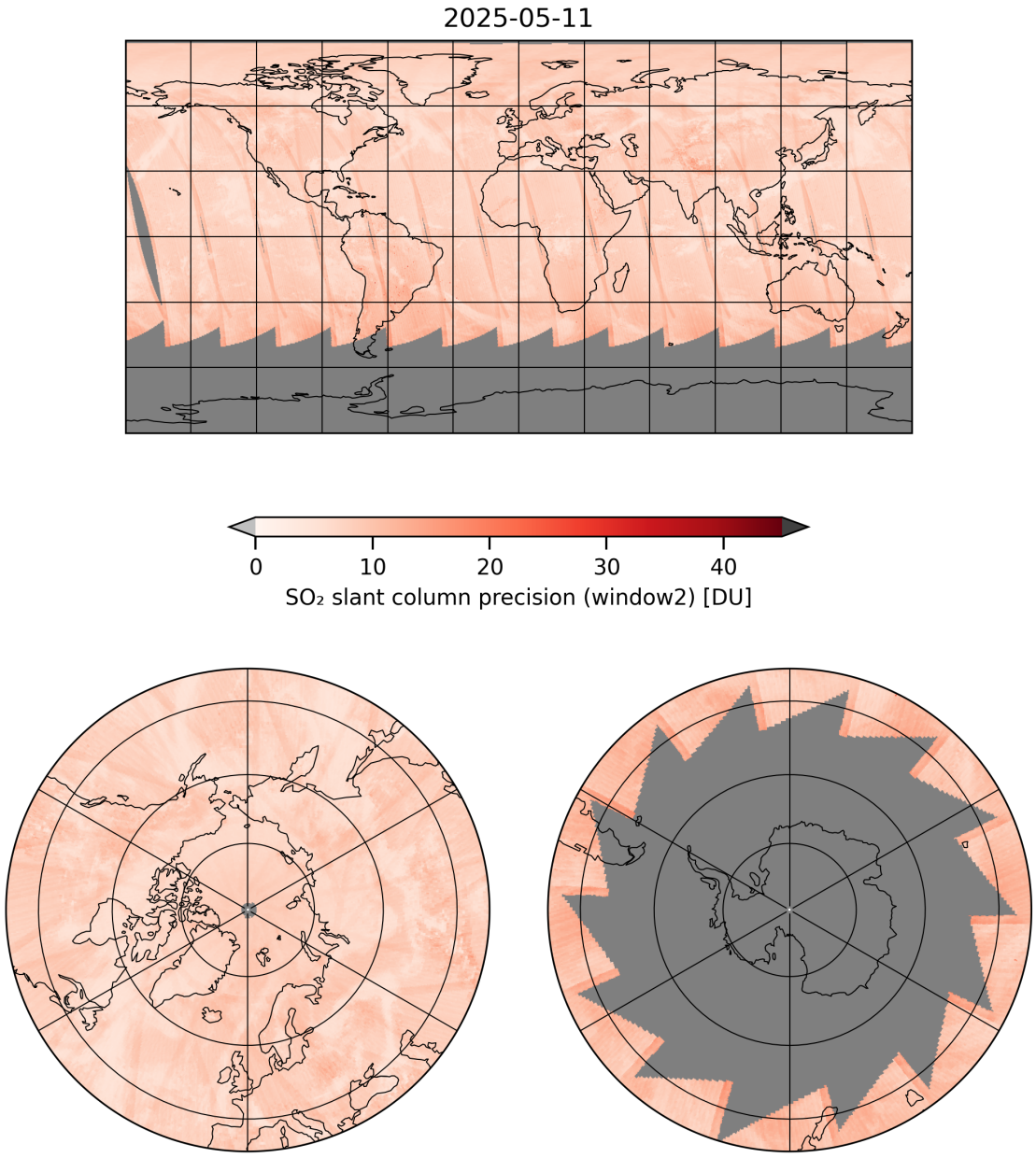

Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-05-11 to 2025-05-12

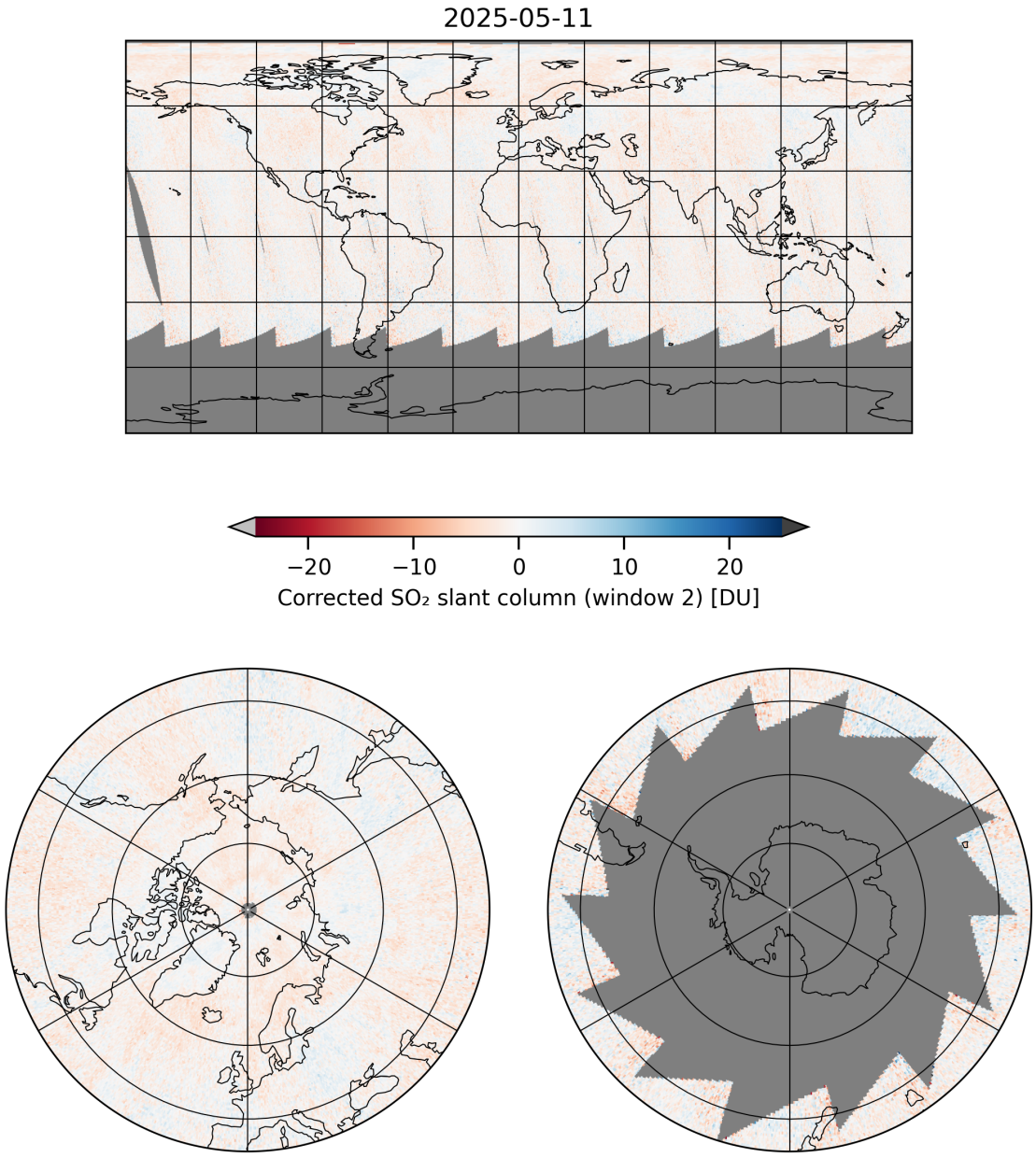

Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2025-05-11 to 2025-05-12

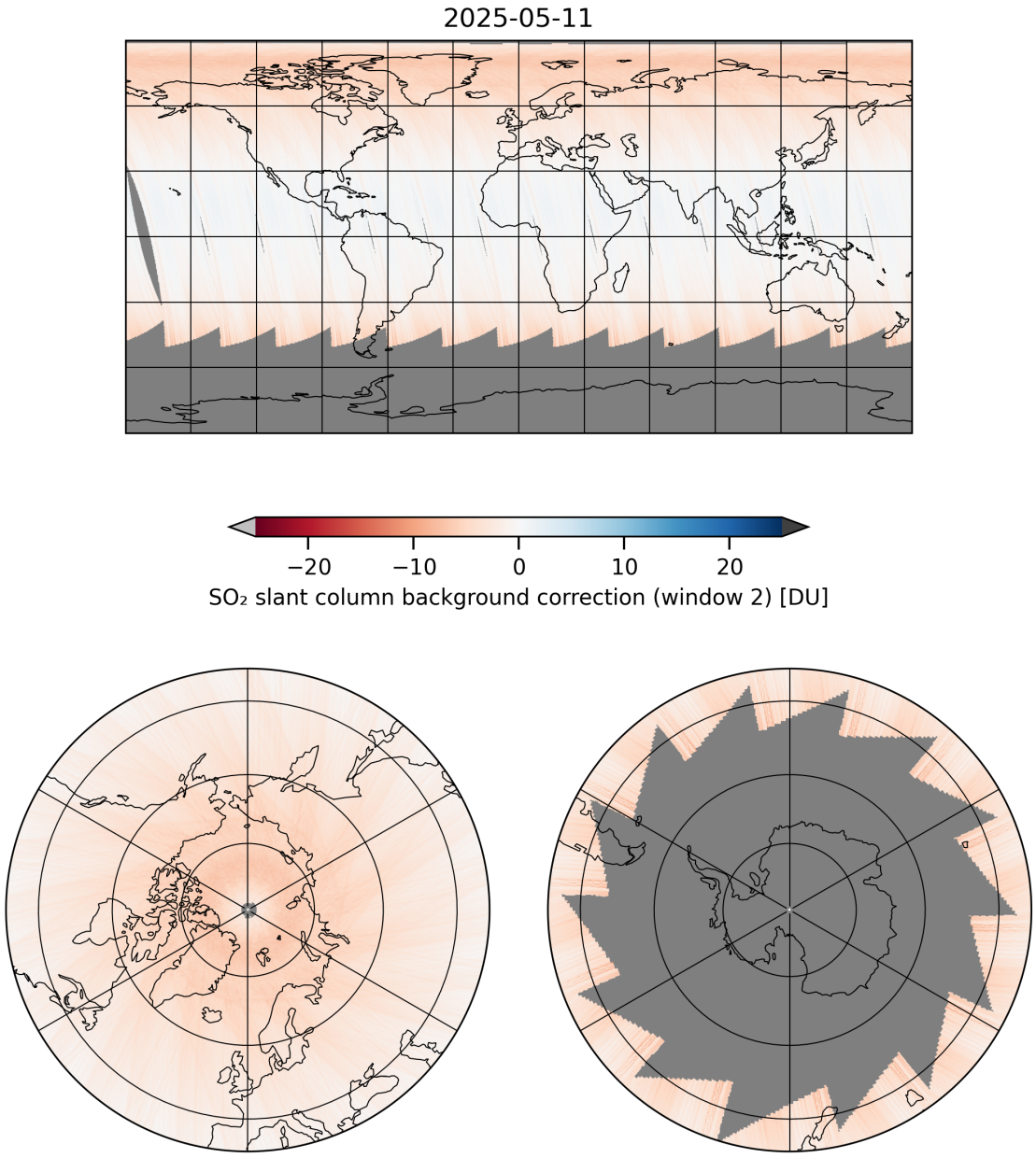

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-05-11 to 2025-05-12

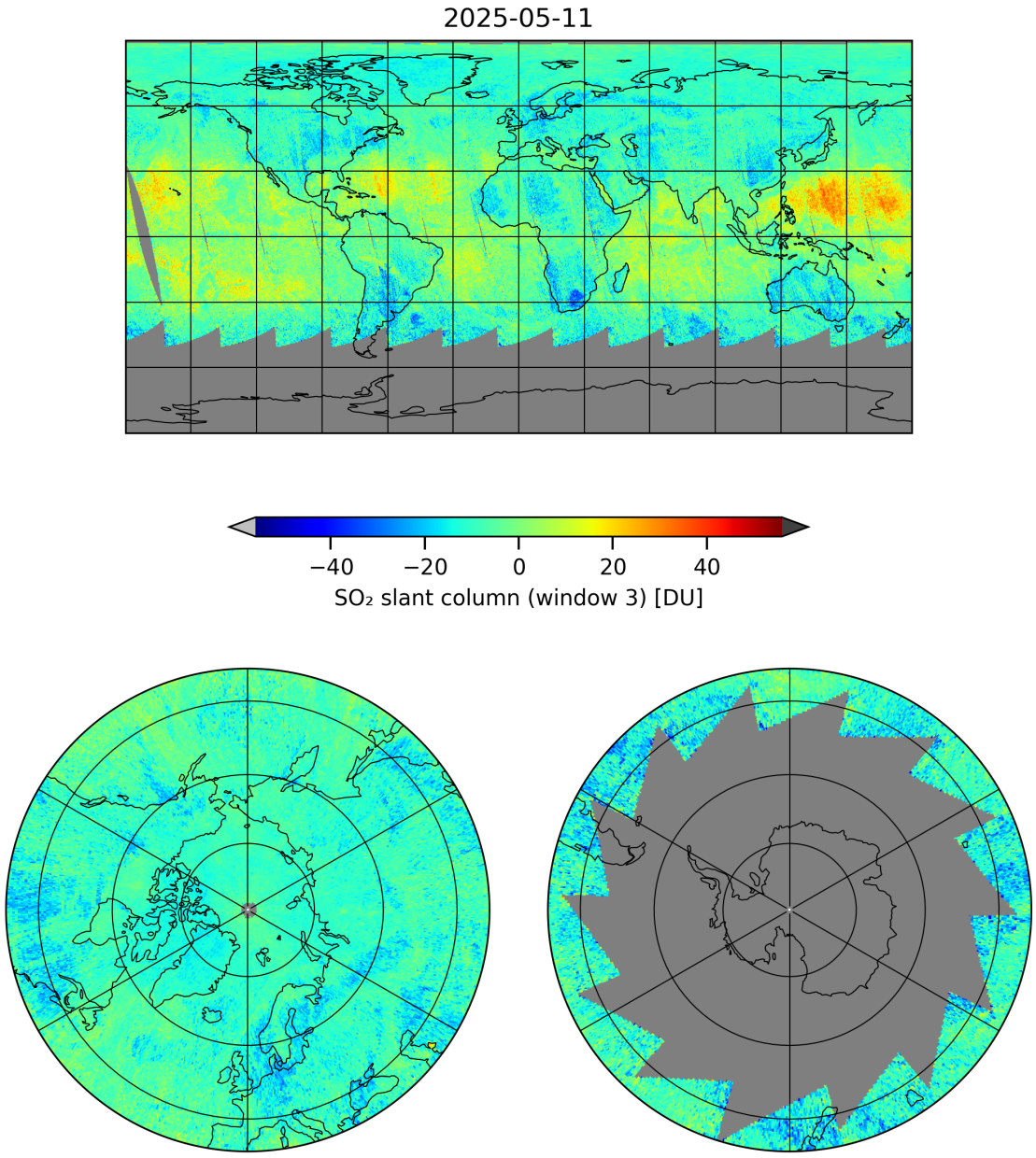

Figure 17: Map of "SO_2 slant column (window 3)" for 2025-05-11 to 2025-05-12

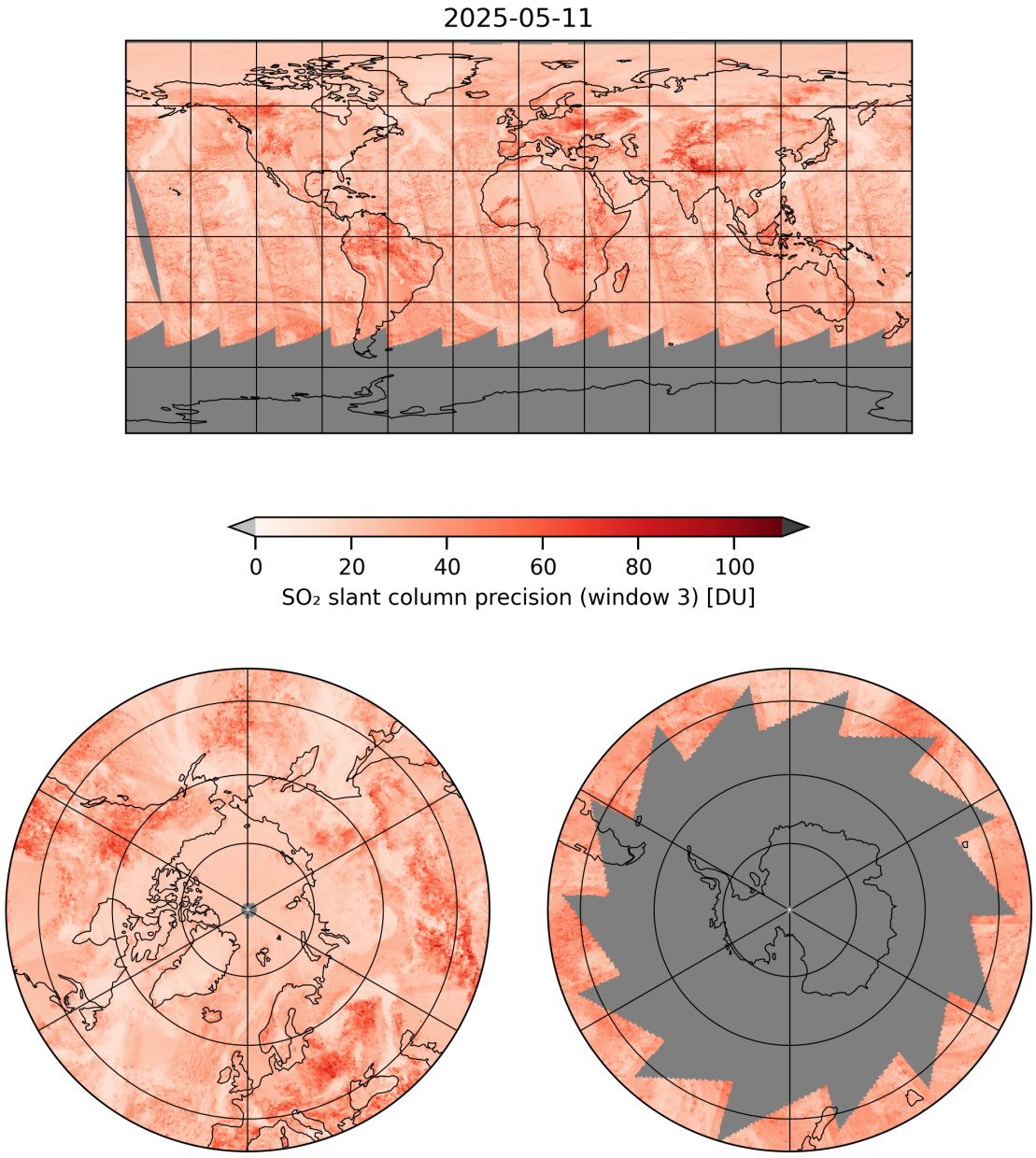

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-05-11 to 2025-05-12

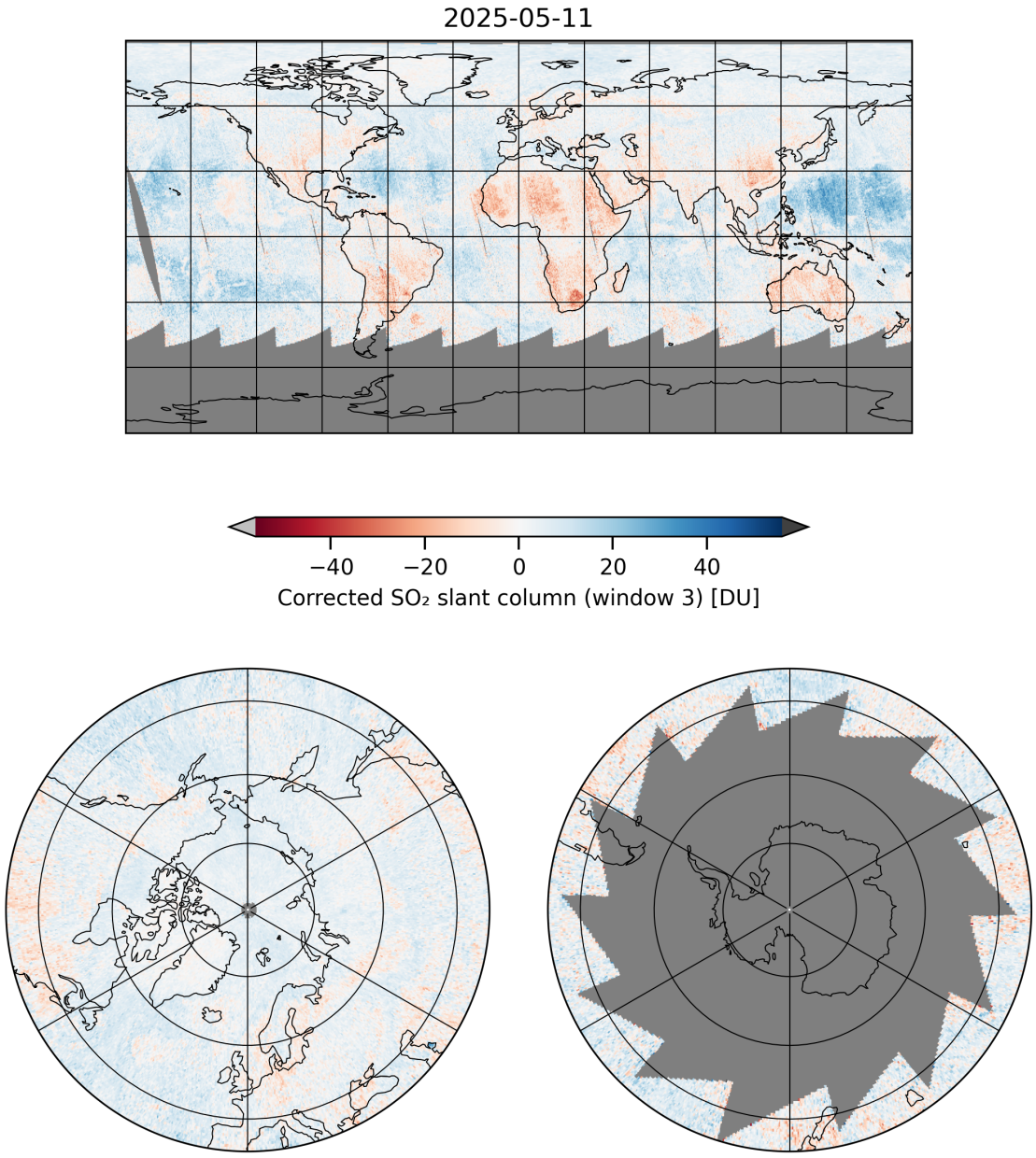

Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-05-11 to 2025-05-12

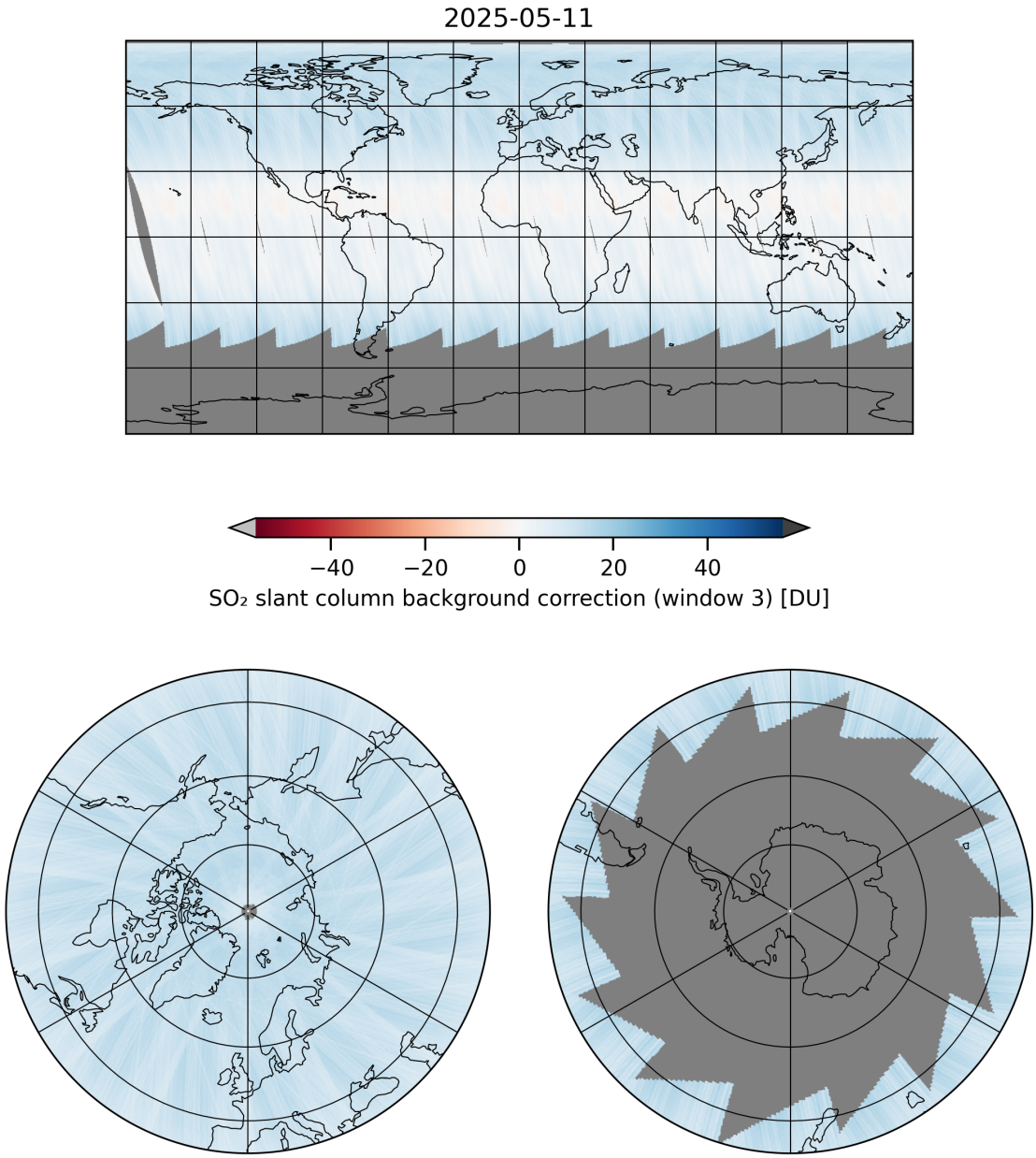

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-05-11 to 2025-05-12

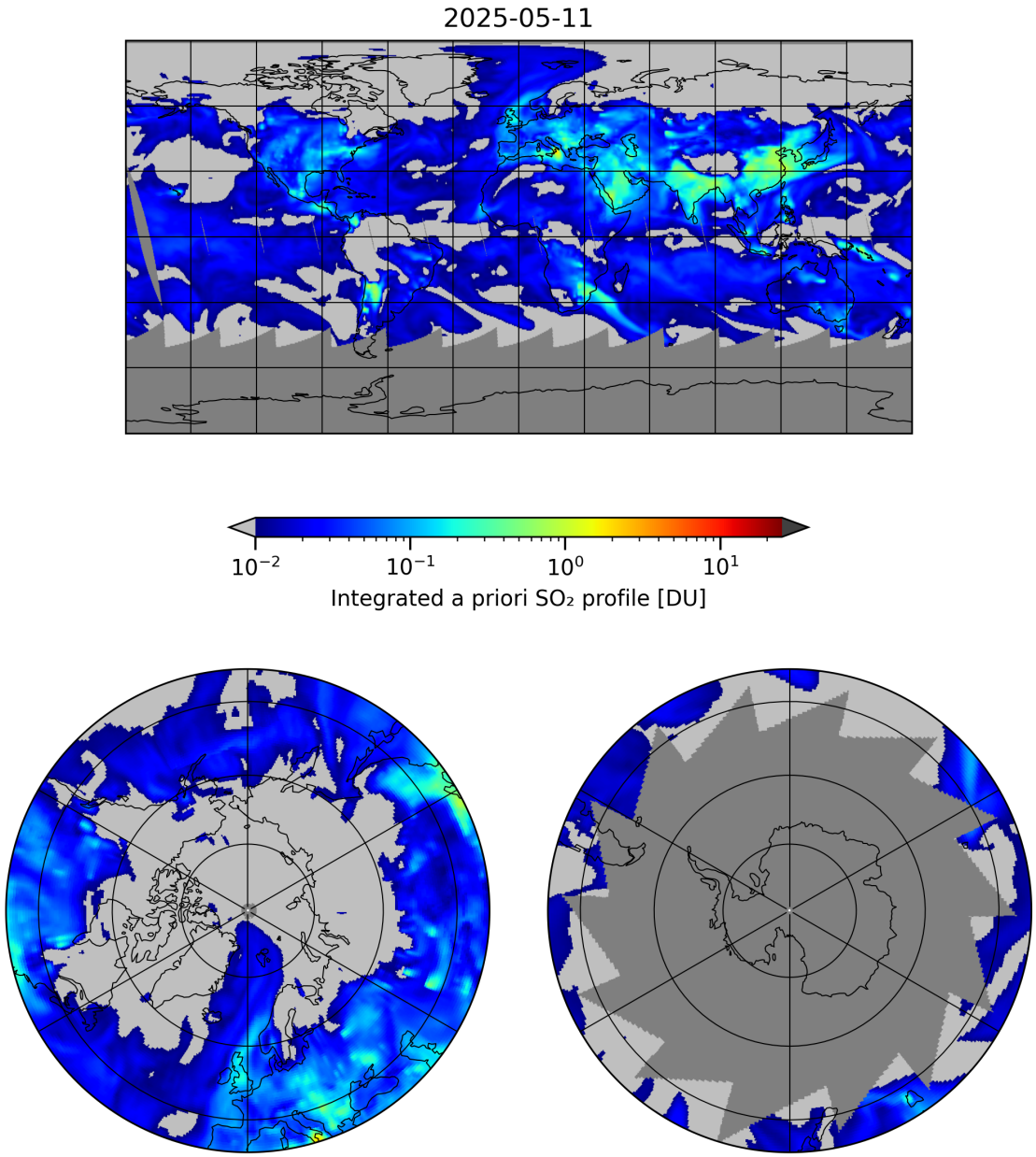

Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-05-11 to 2025-05-12

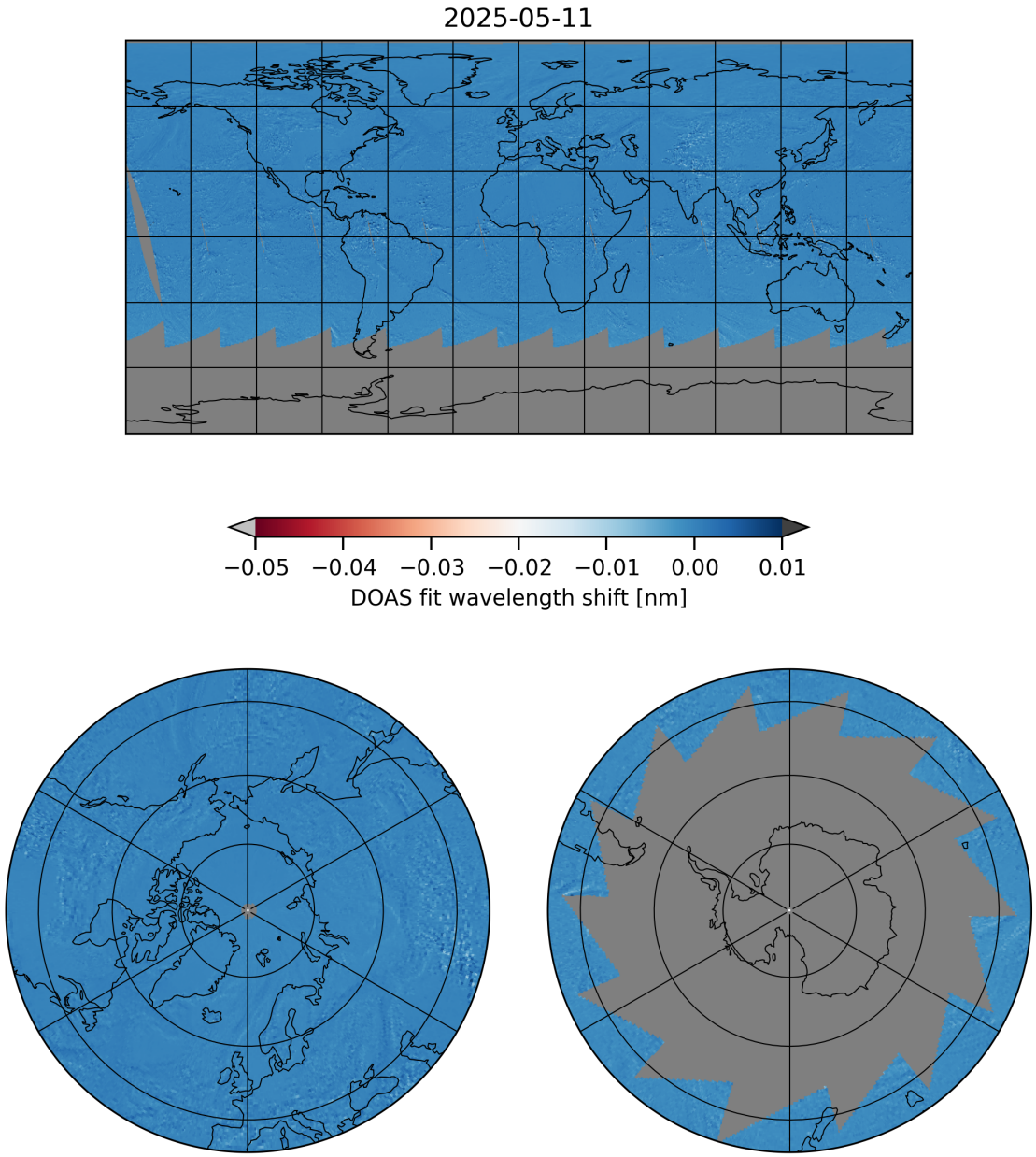

Figure 22: Map of “DOAS fit wavelength shift” for 2025-05-11 to 2025-05-12

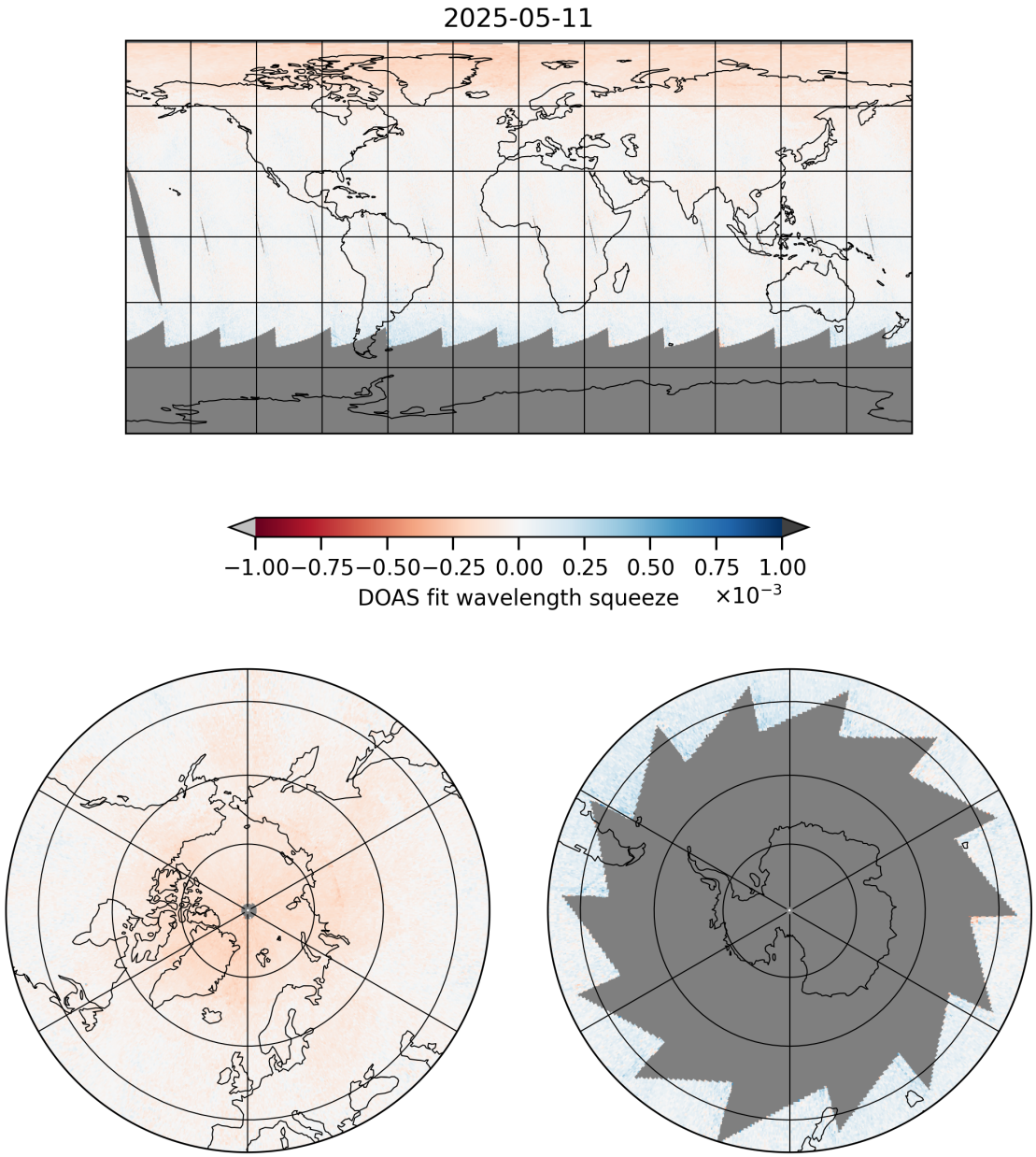

Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-05-11 to 2025-05-12

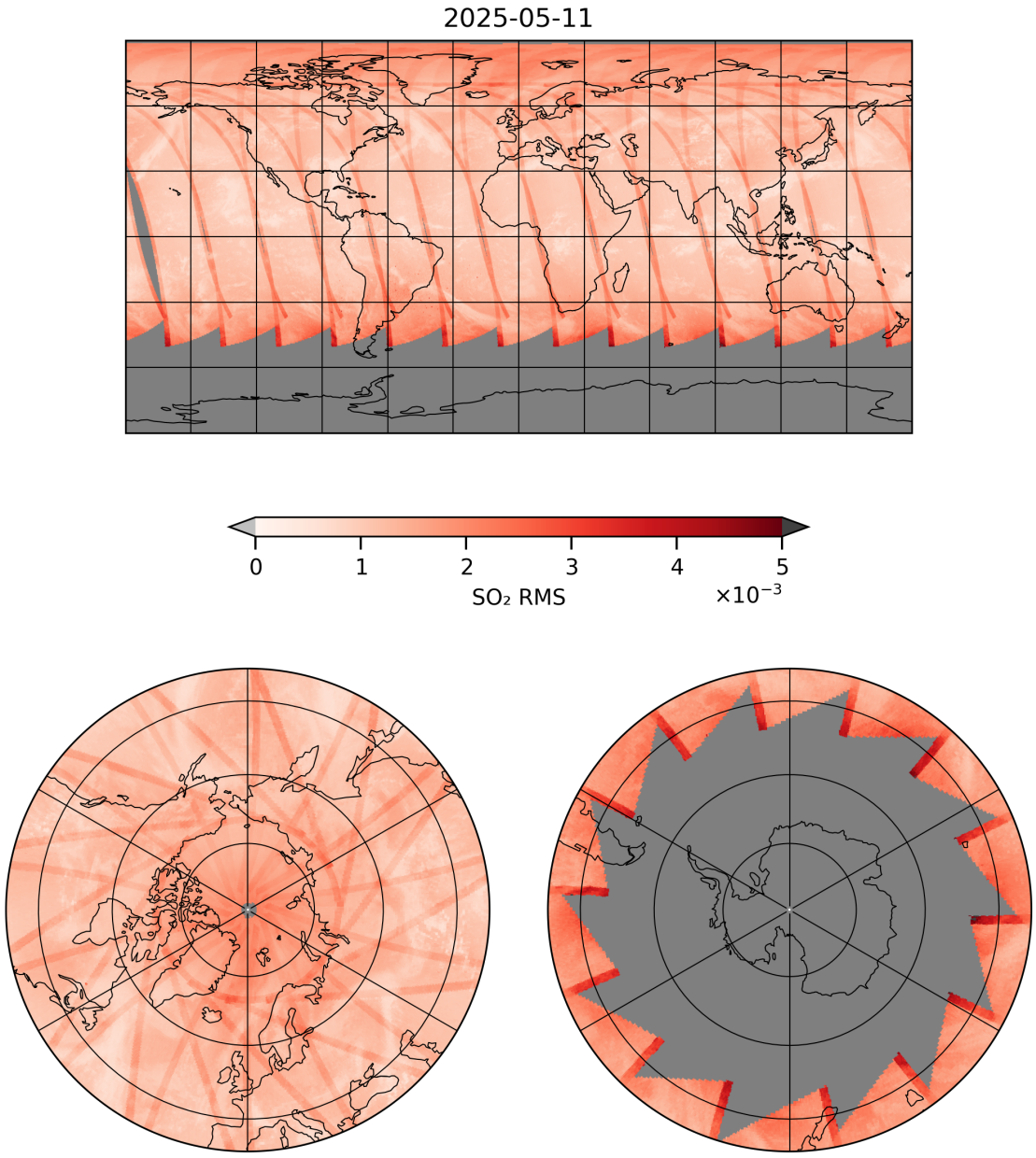

Figure 24: Map of "SO_2 RMS" for 2025-05-11 to 2025-05-12

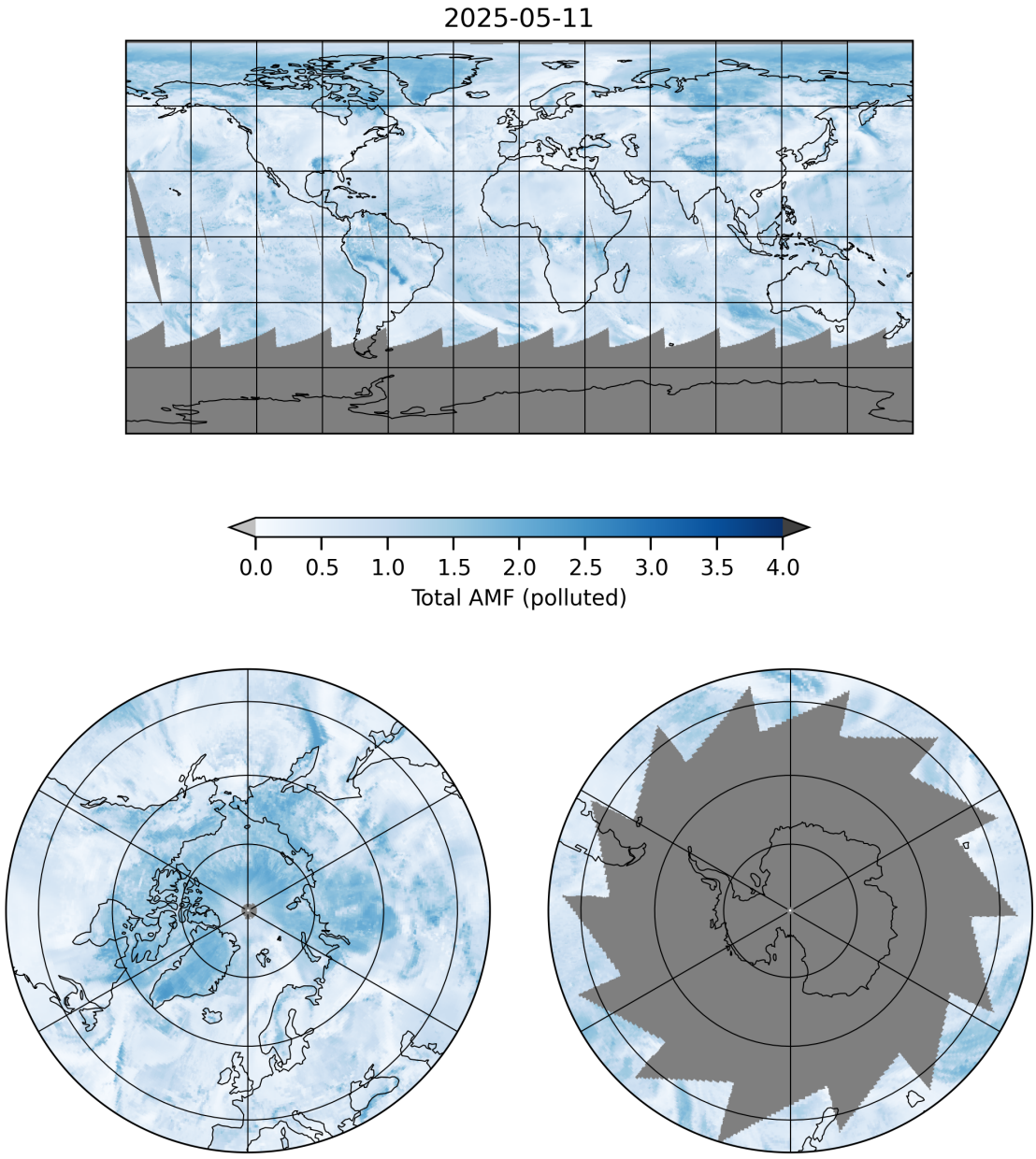

Figure 25: Map of “Total AMF (polluted)” for 2025-05-11 to 2025-05-12

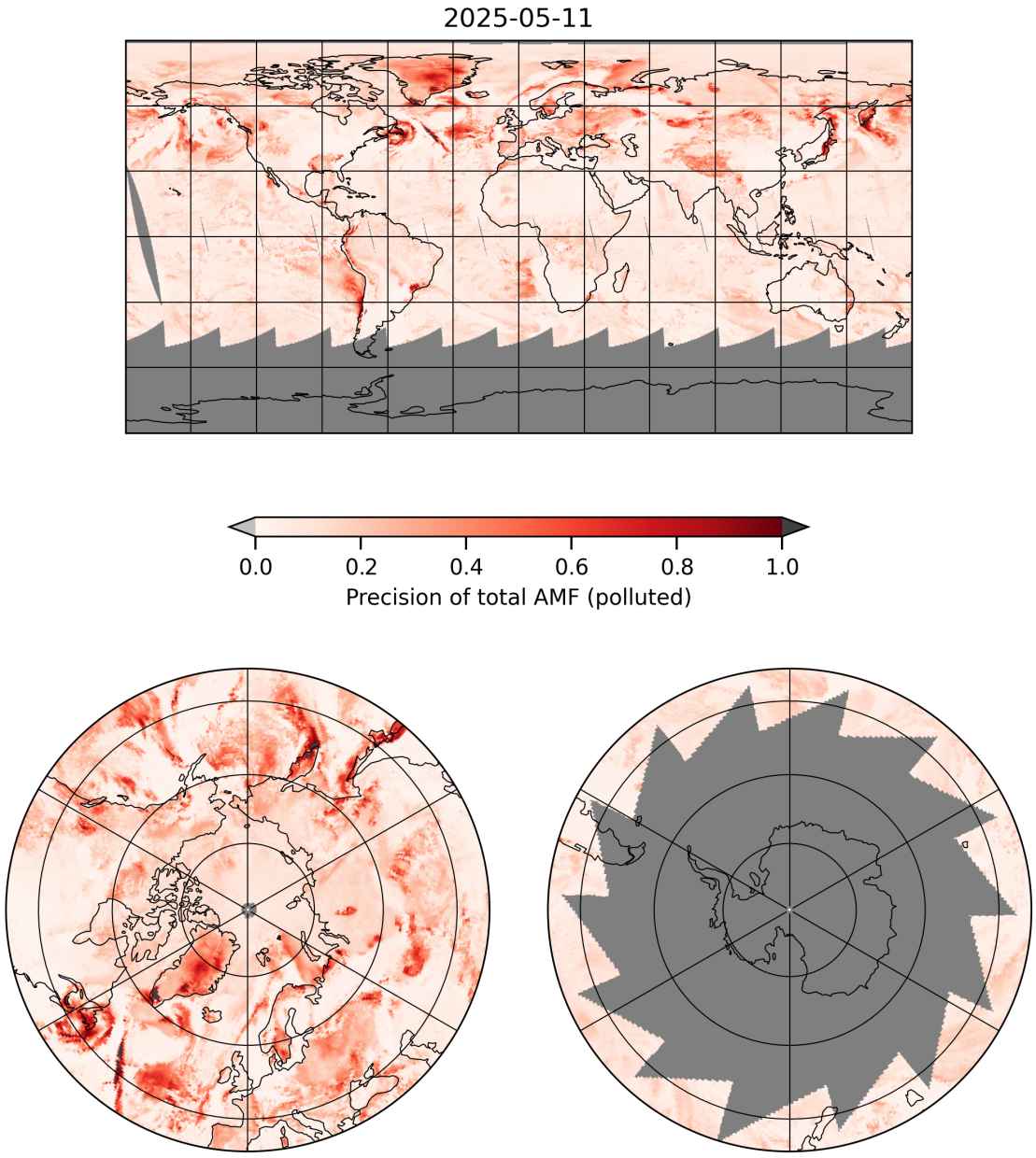

Figure 26: Map of “Precision of total AMF (polluted)” for 2025-05-11 to 2025-05-12

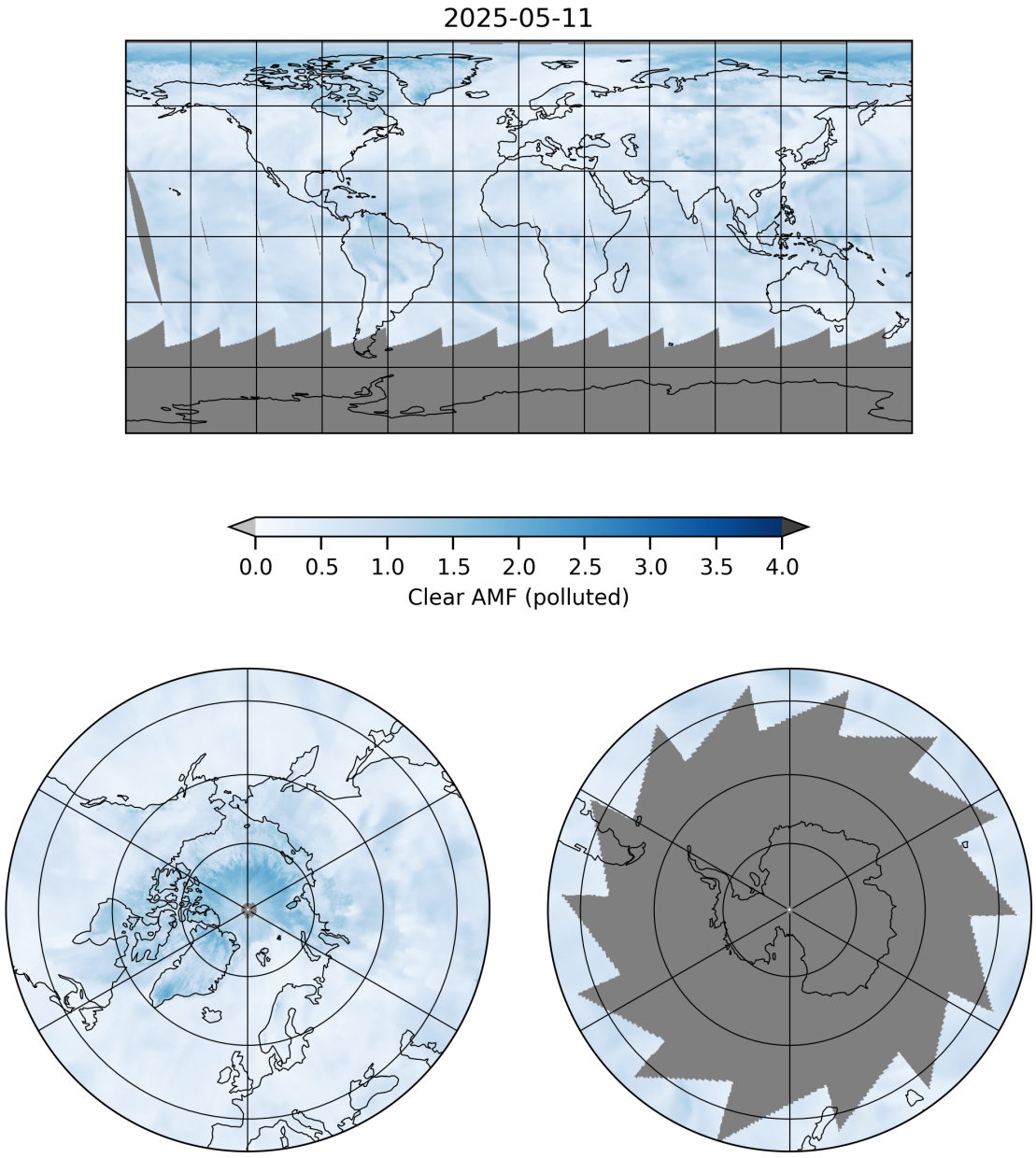

Figure 27: Map of “Clear AMF (polluted)” for 2025-05-11 to 2025-05-12

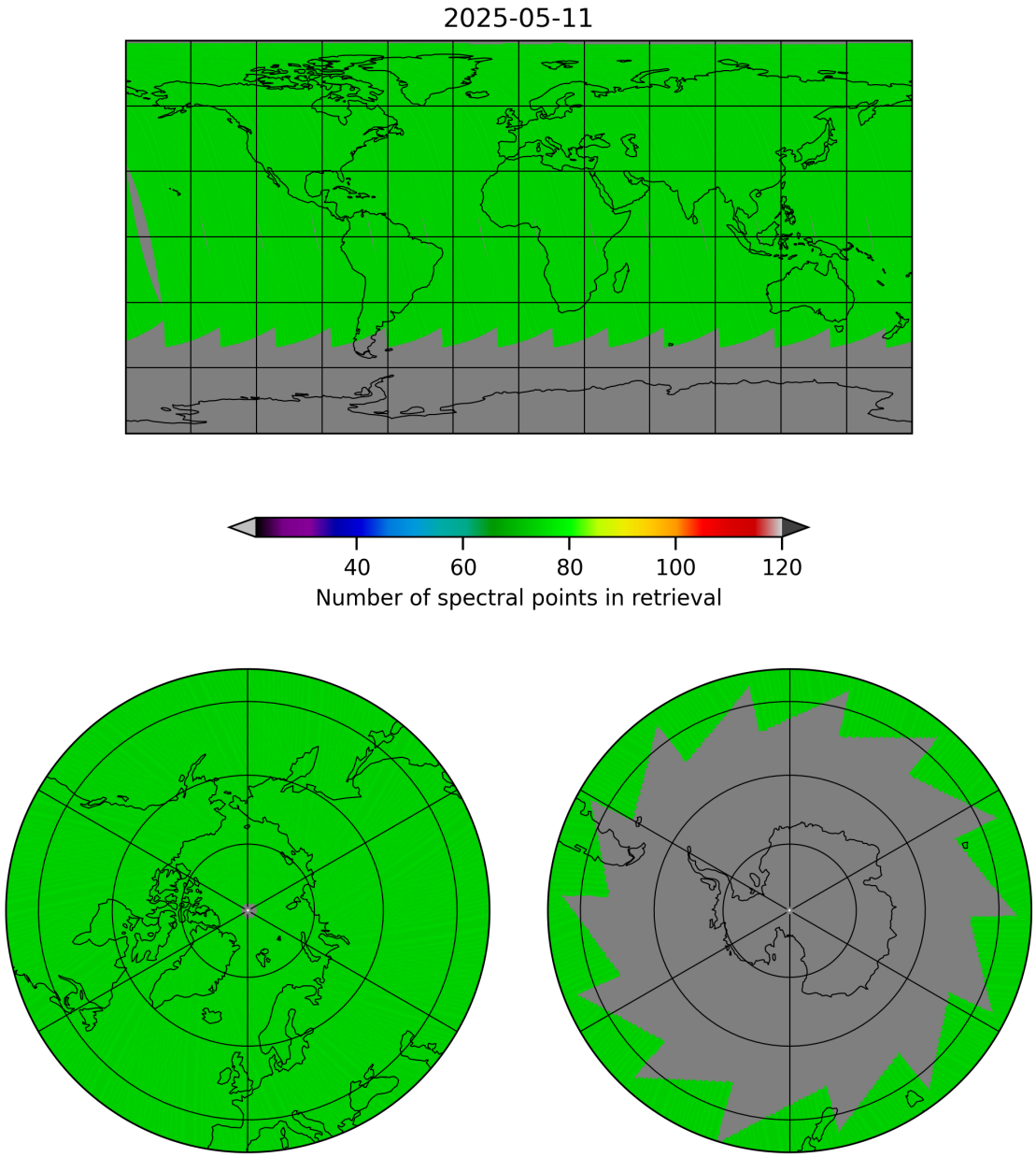

Figure 28: Map of “Number of spectral points in retrieval” for 2025-05-11 to 2025-05-12

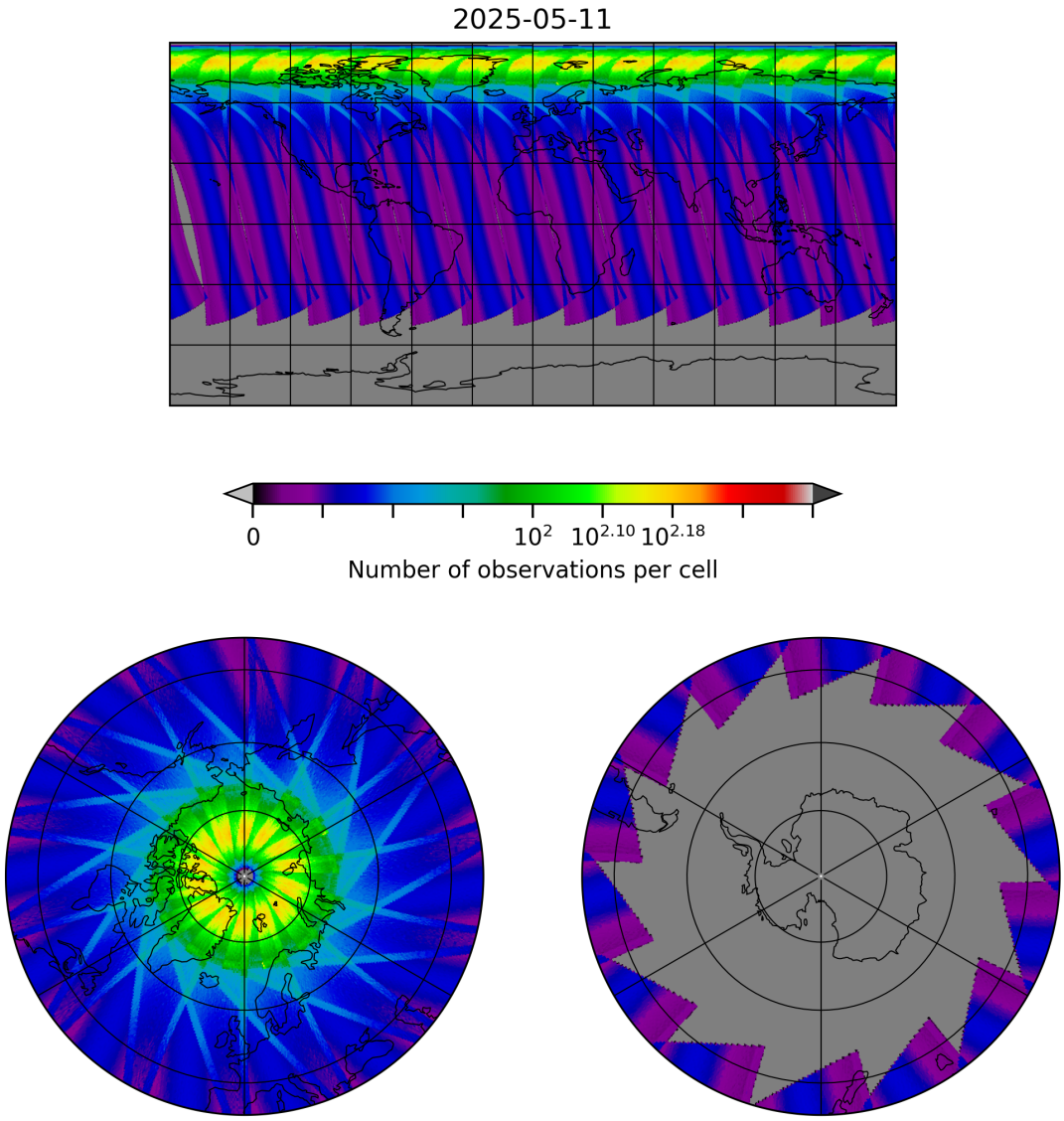

Figure 29: Map of the number of observations for 2025-05-11 to 2025-05-12

7 Zonal average

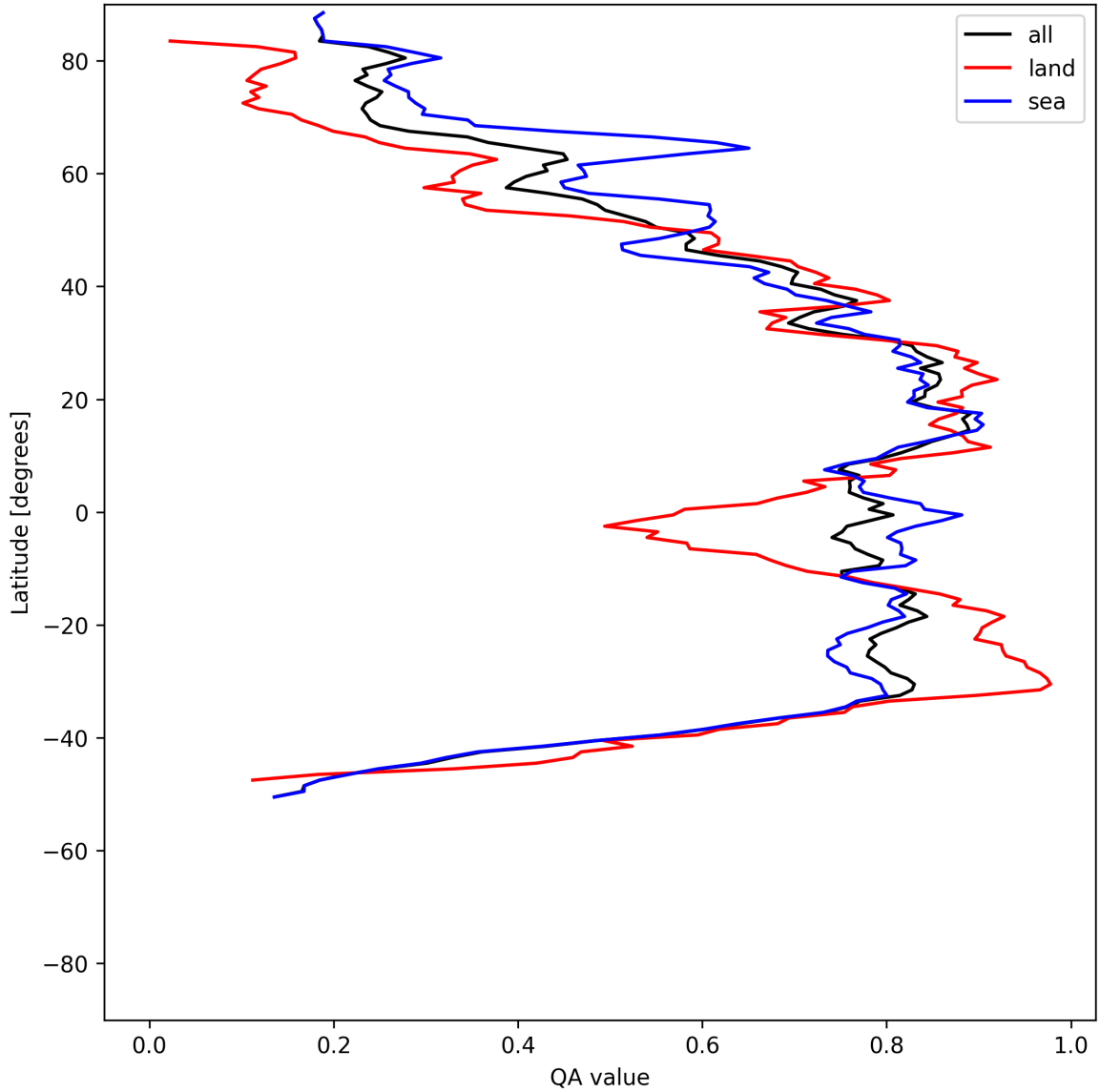

Figure 30: Zonal average of “QA value” for 2025-05-11 to 2025-05-12.

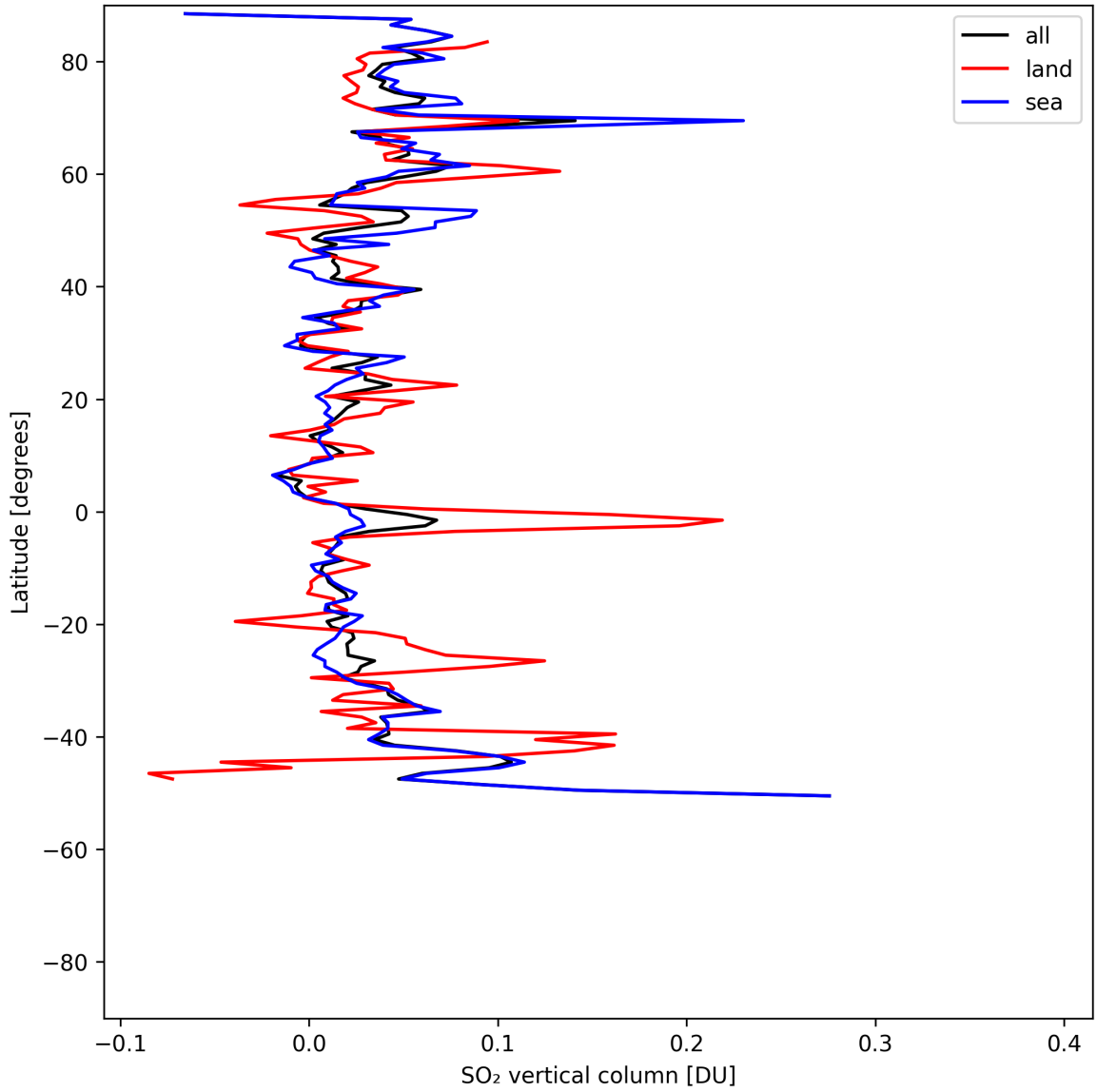

Figure 31: Zonal average of "SO_2 vertical column" for 2025-05-11 to 2025-05-12.

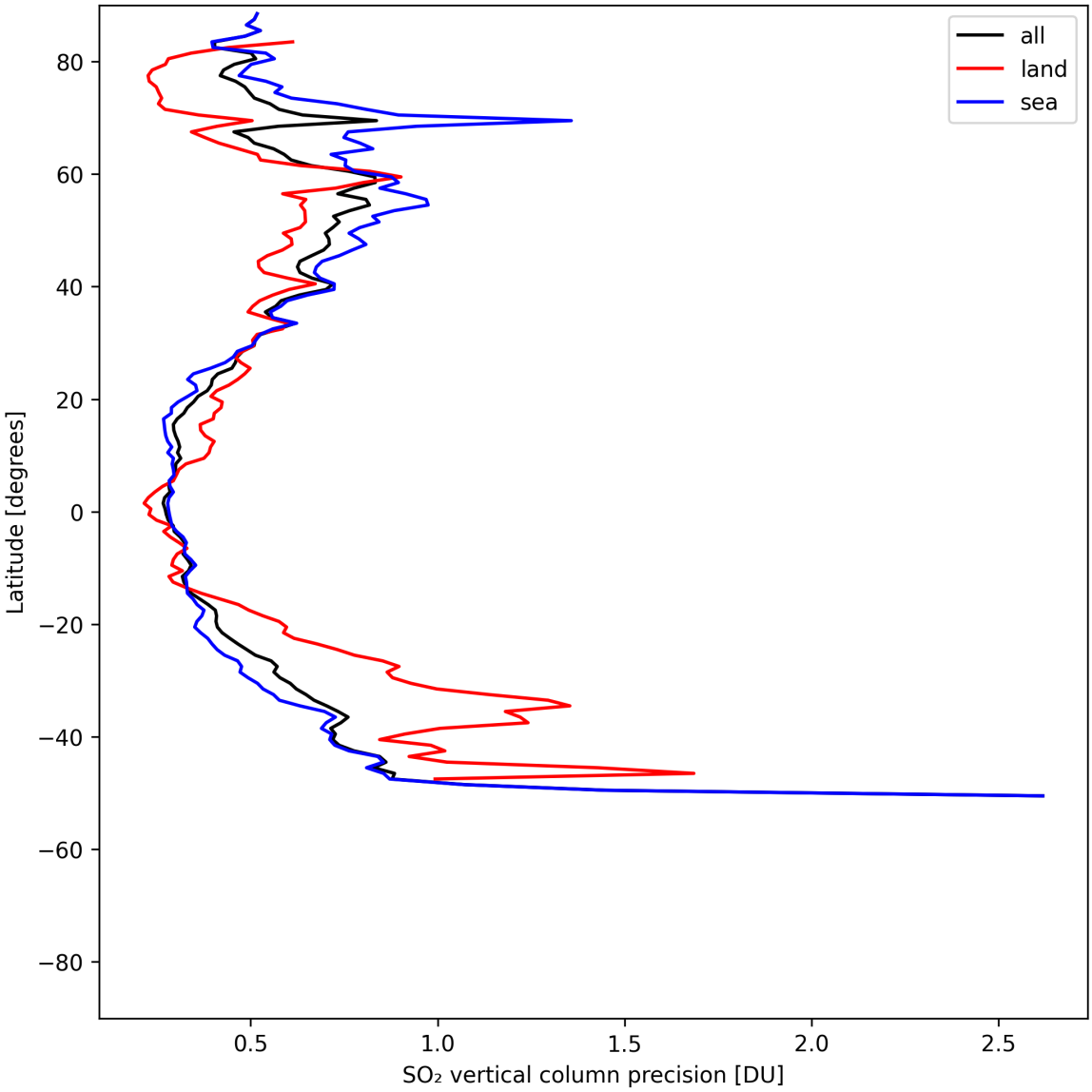

Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-05-11 to 2025-05-12.

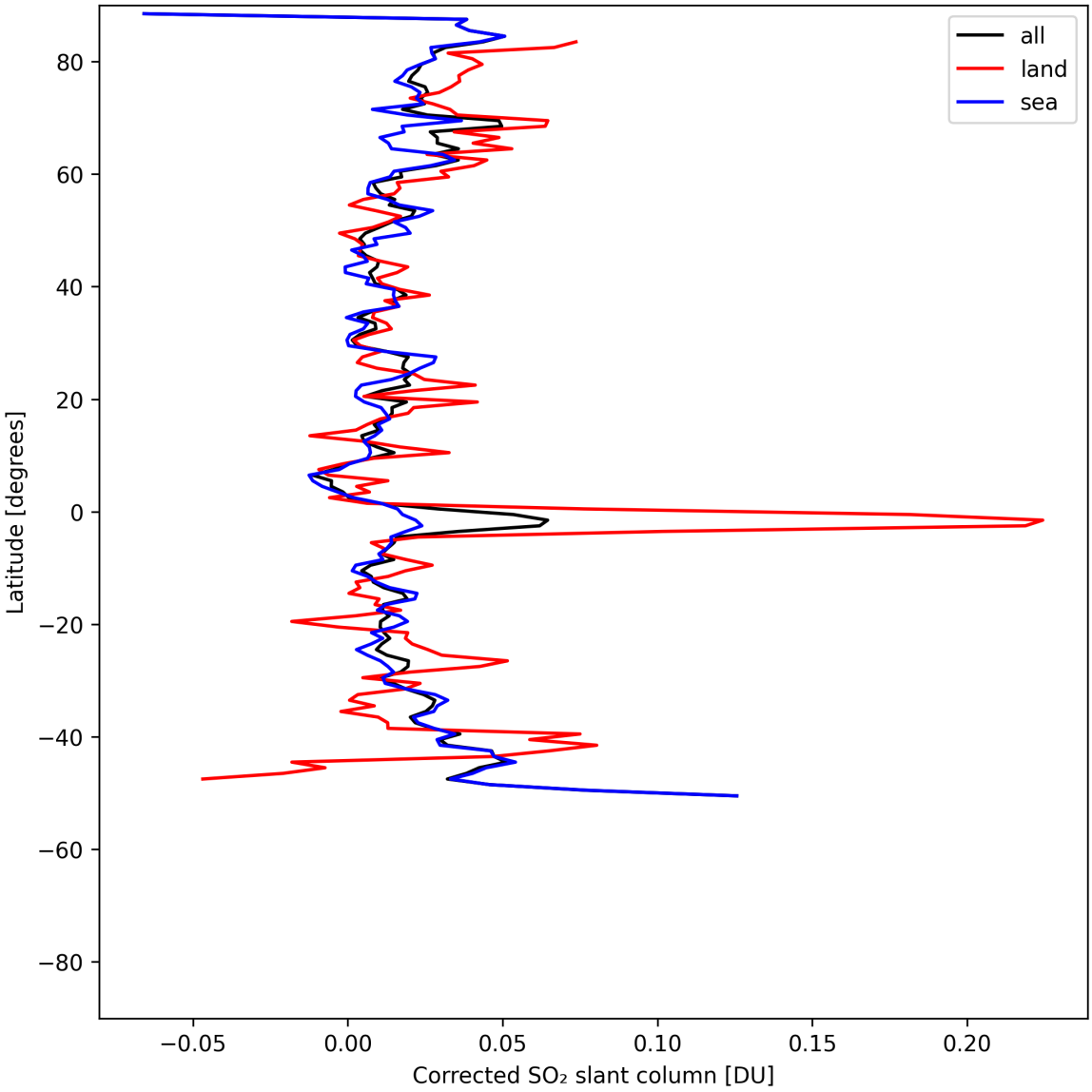

Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-05-11 to 2025-05-12.

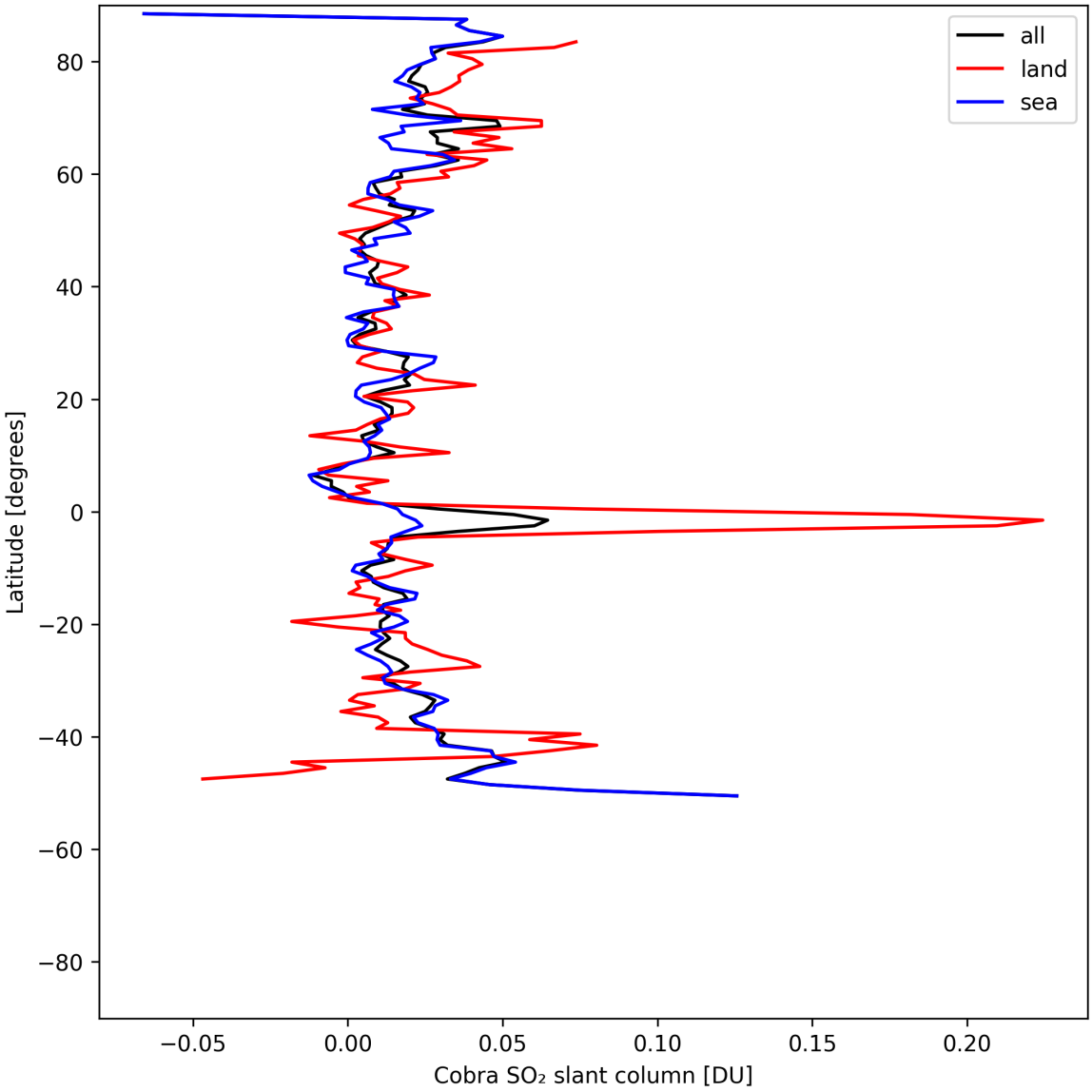

Figure 34: Zonal average of “Cobra SO_2 slant column” for 2025-05-11 to 2025-05-12.

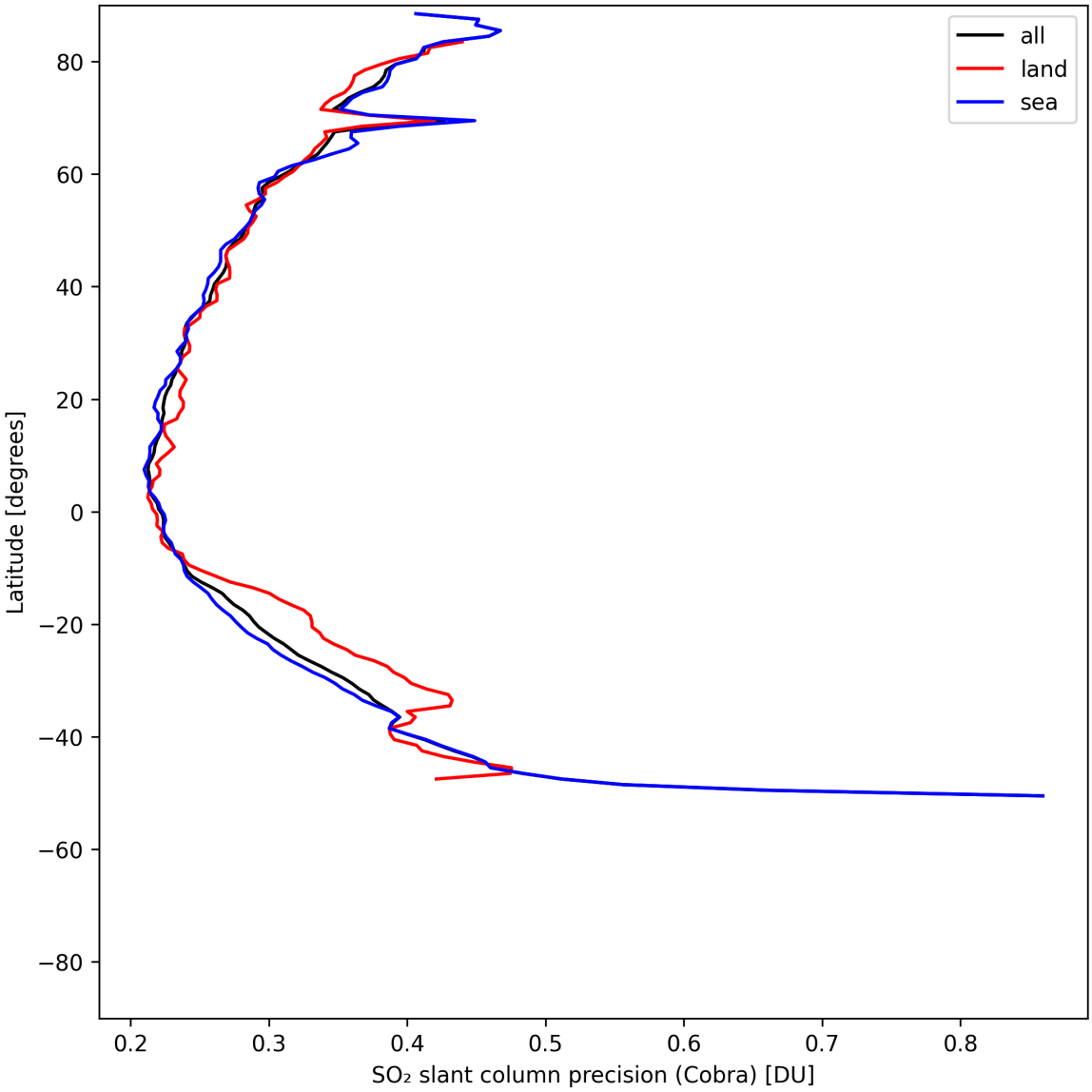

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-05-11 to 2025-05-12.

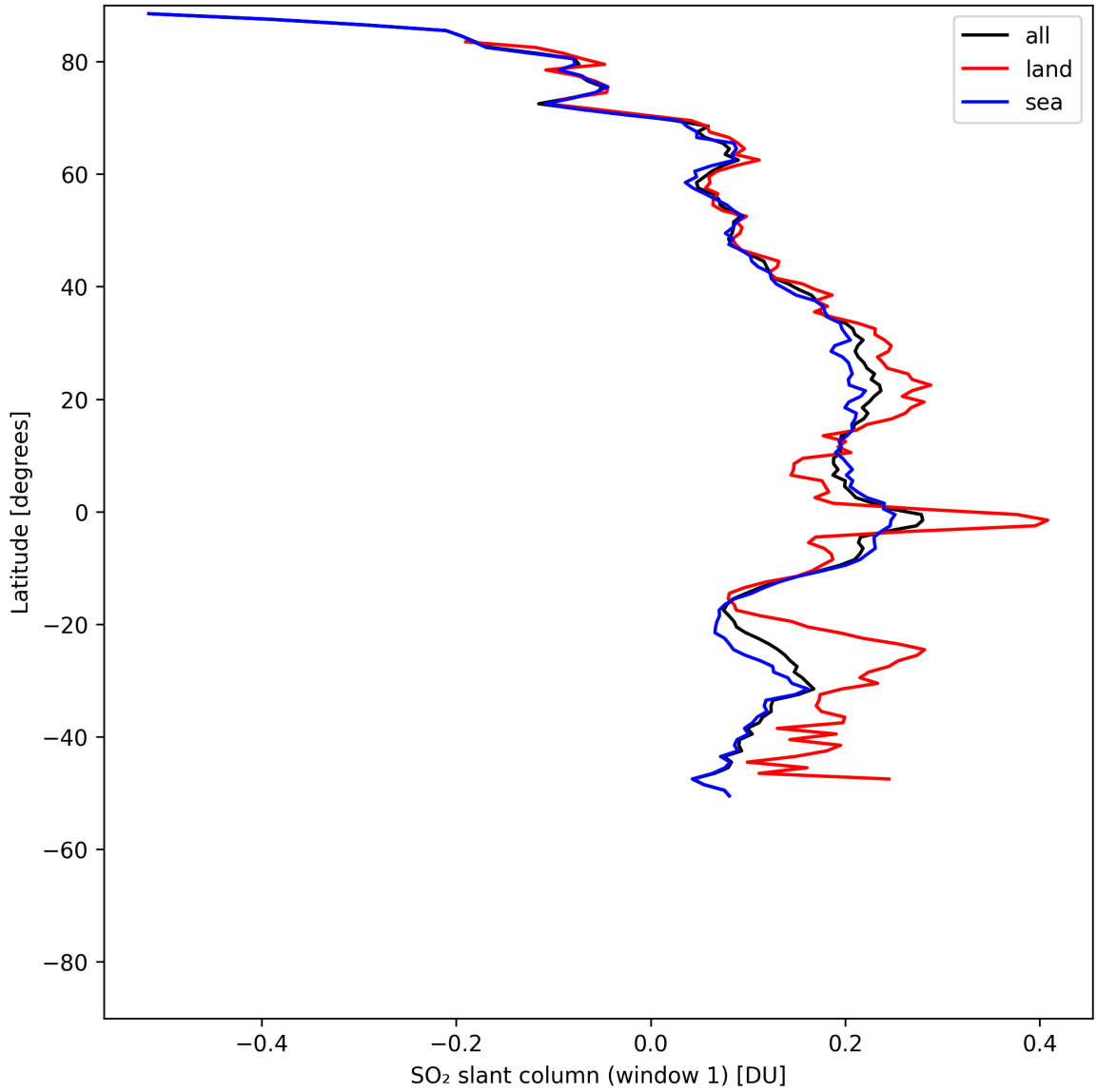

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-05-11 to 2025-05-12.

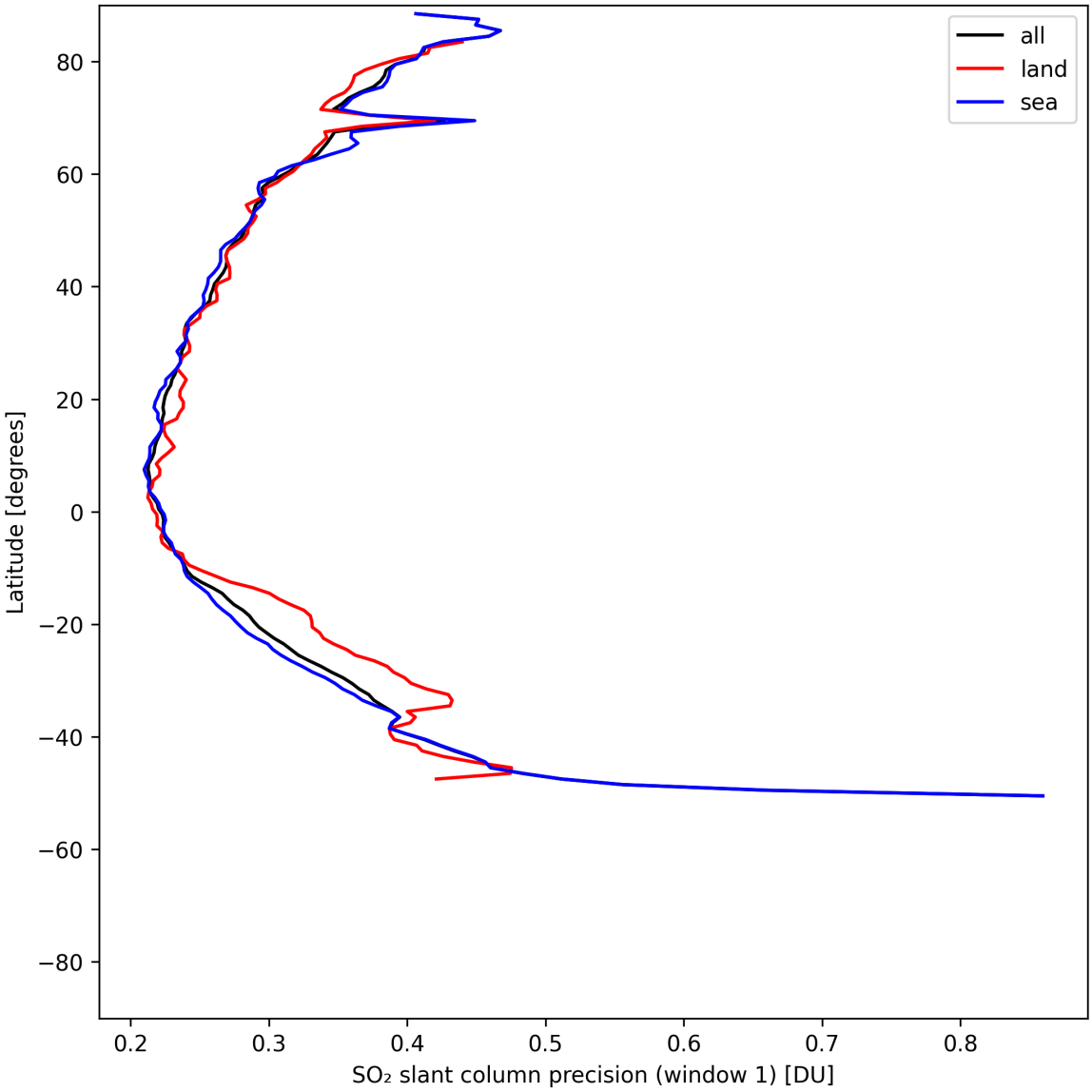

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-05-11 to 2025-05-12.

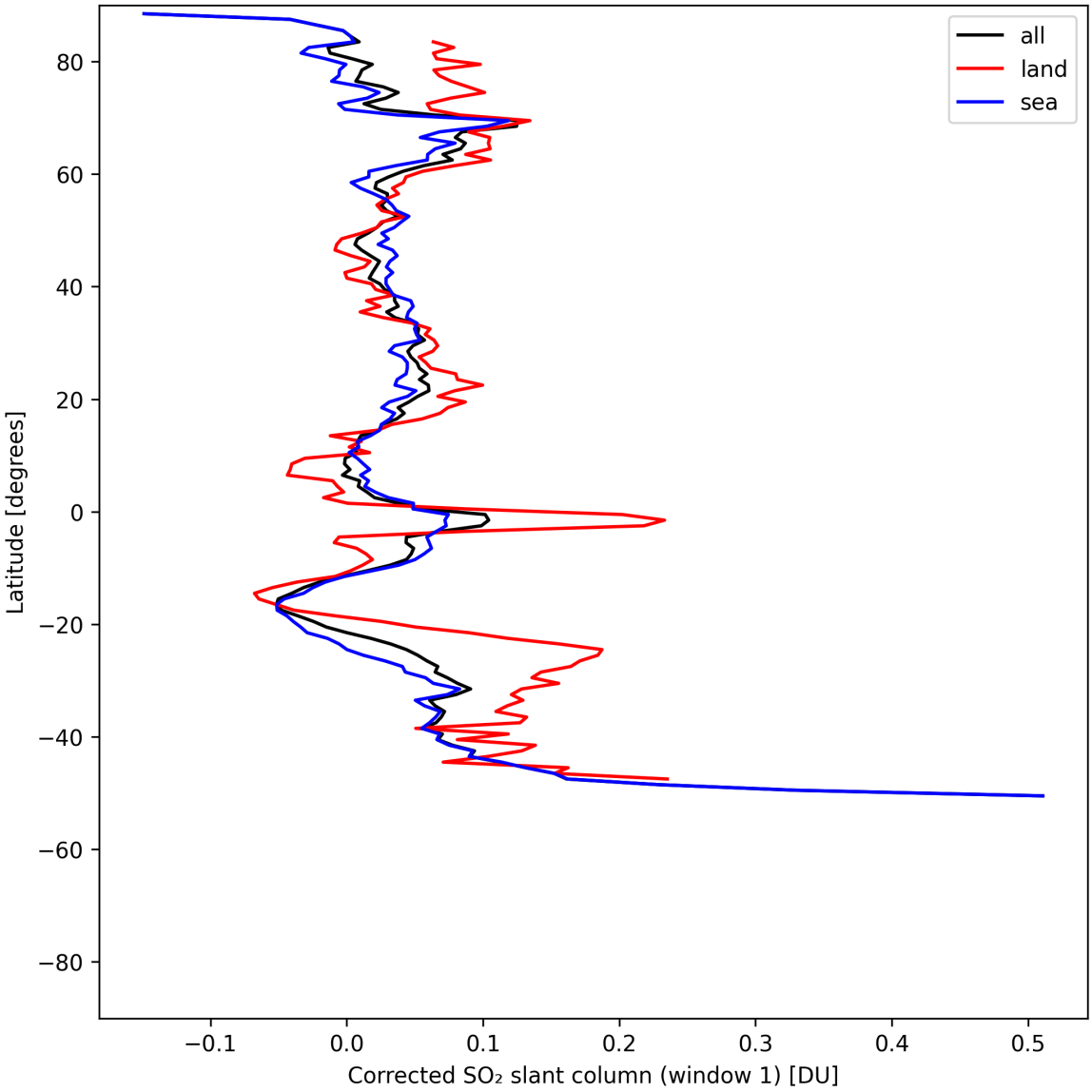

Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-05-11 to 2025-05-12.

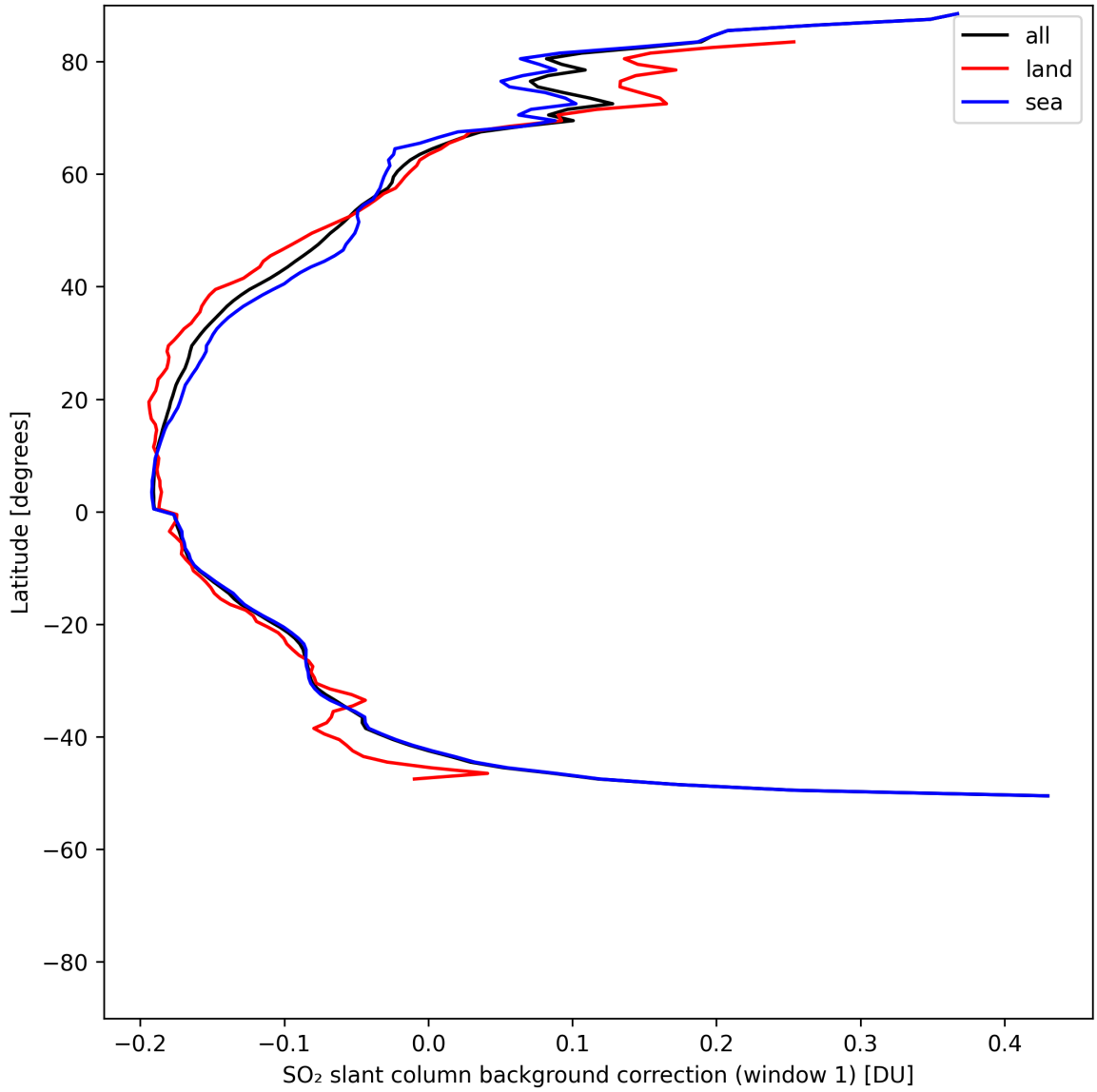

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-05-11 to 2025-05-12.

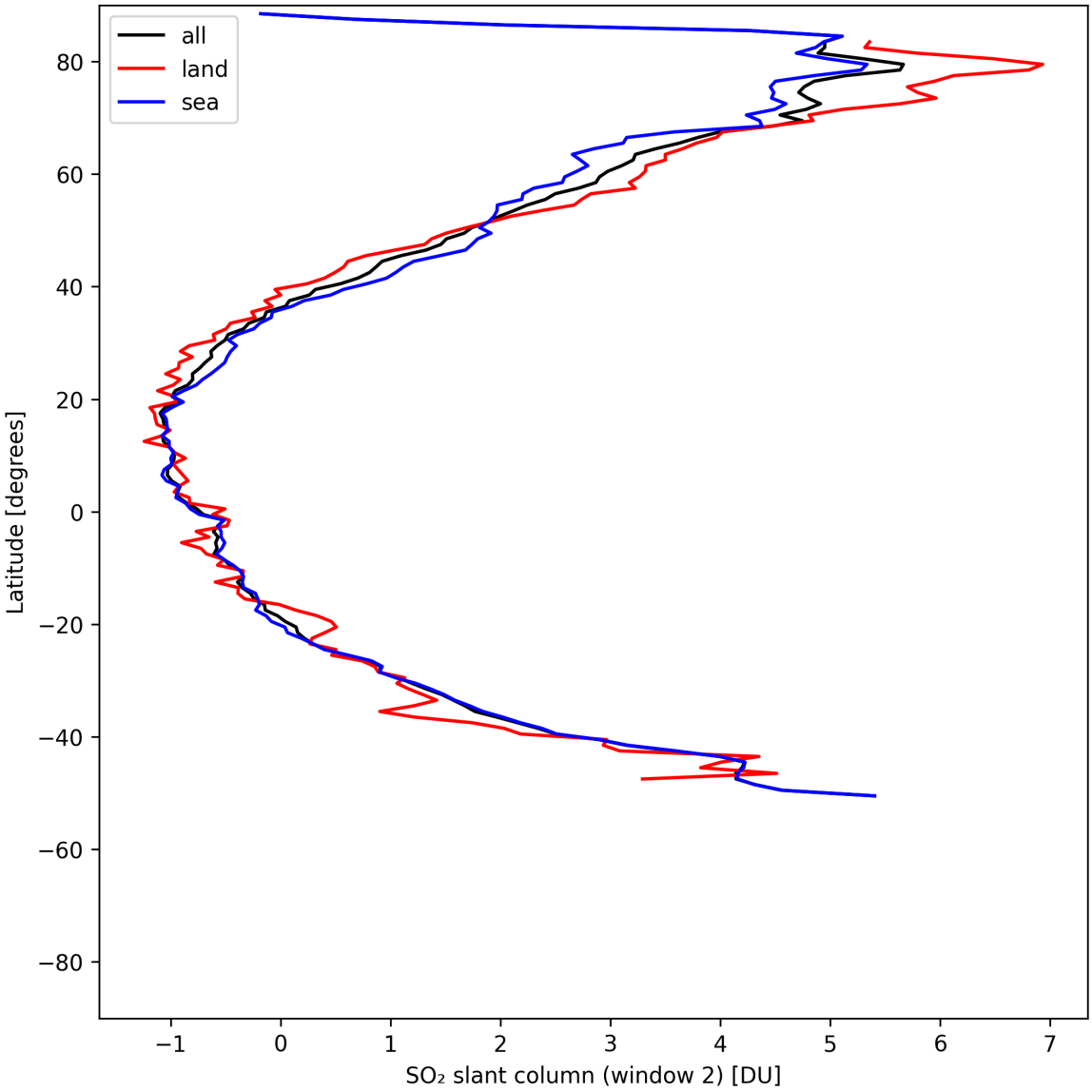

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-05-11 to 2025-05-12.

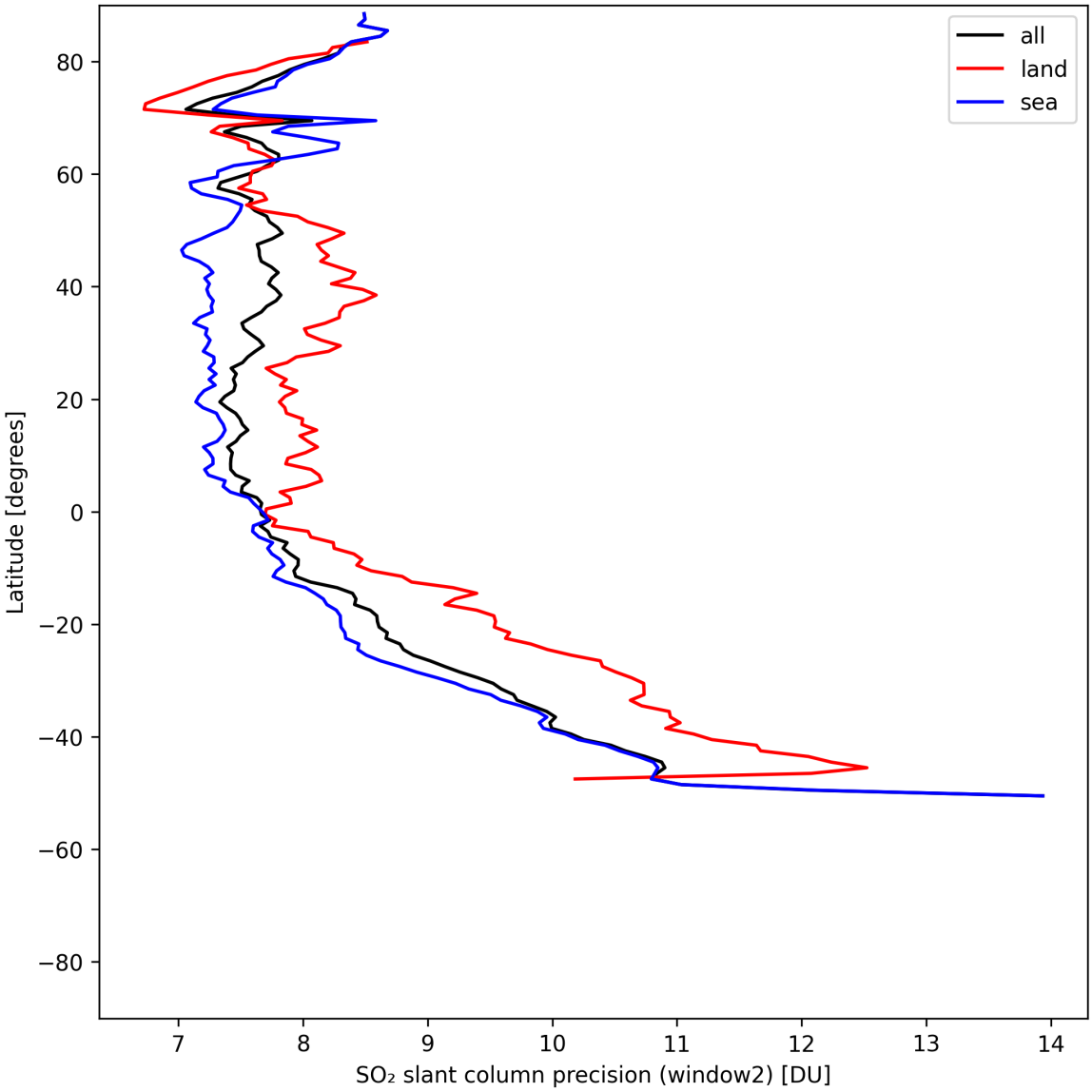

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-05-11 to 2025-05-12.

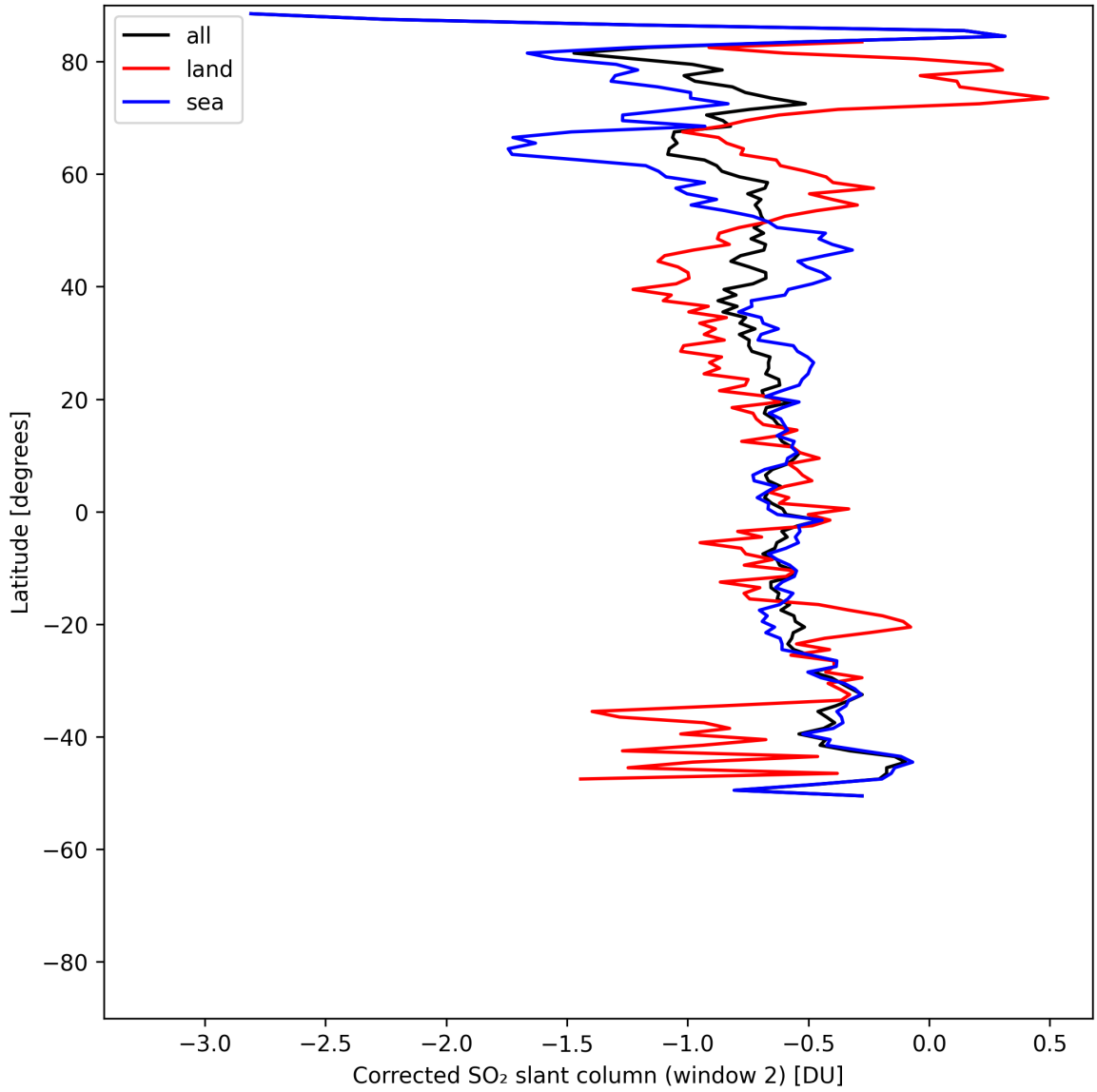

Figure 42: Zonal average of “Corrected SO_2 slant column (window 2)” for 2025-05-11 to 2025-05-12.

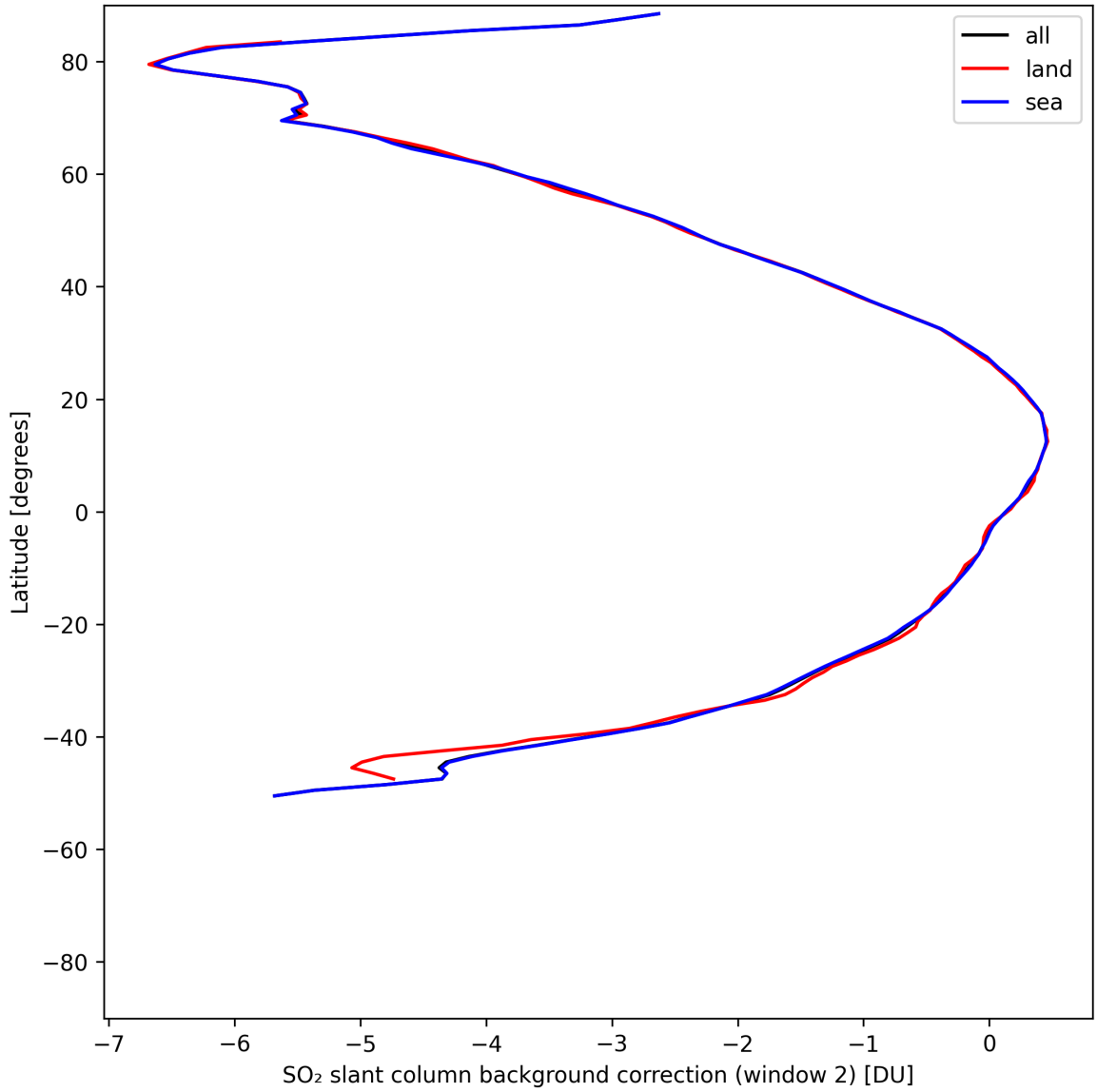

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-05-11 to 2025-05-12.

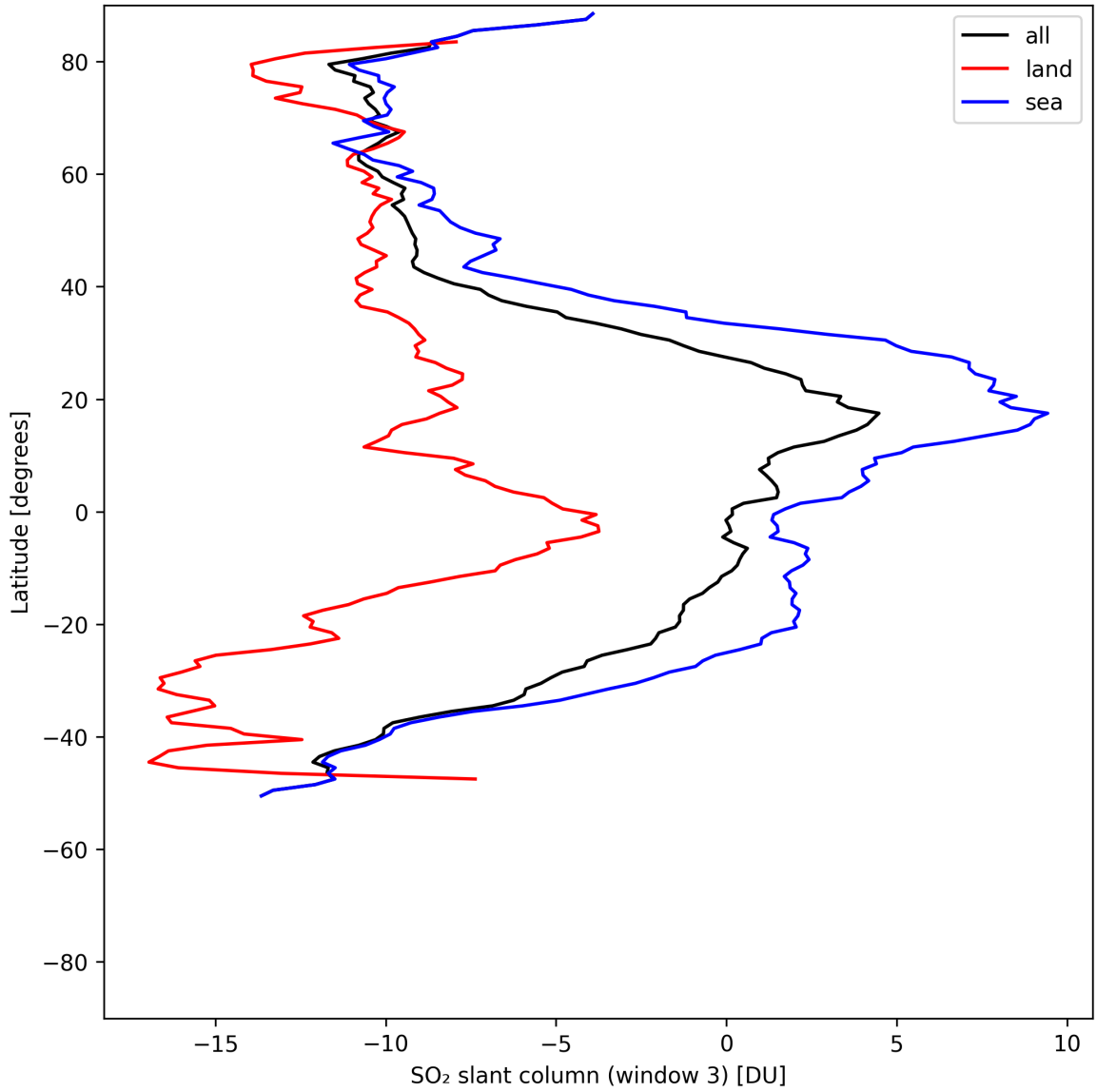

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-05-11 to 2025-05-12.

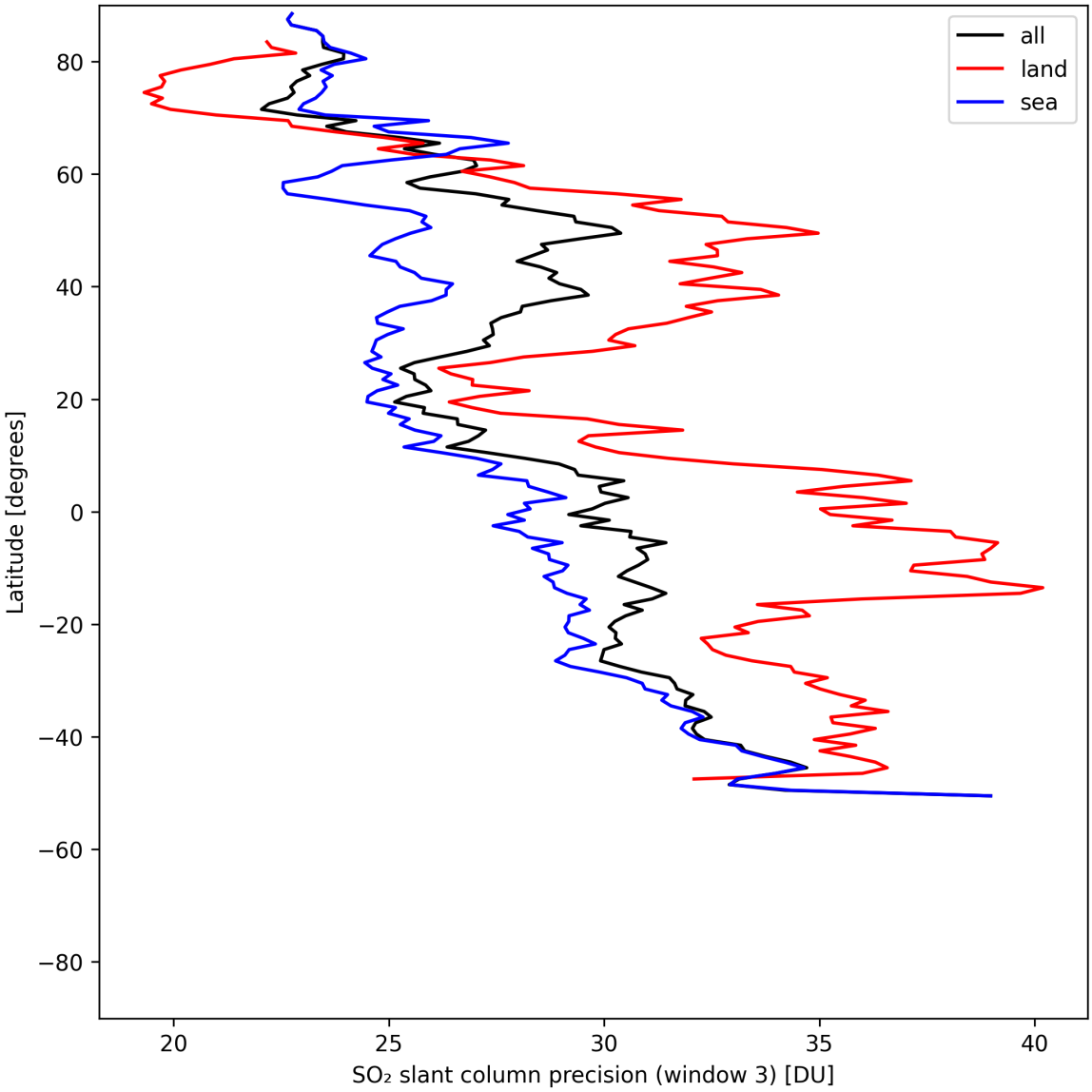

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-05-11 to 2025-05-12.

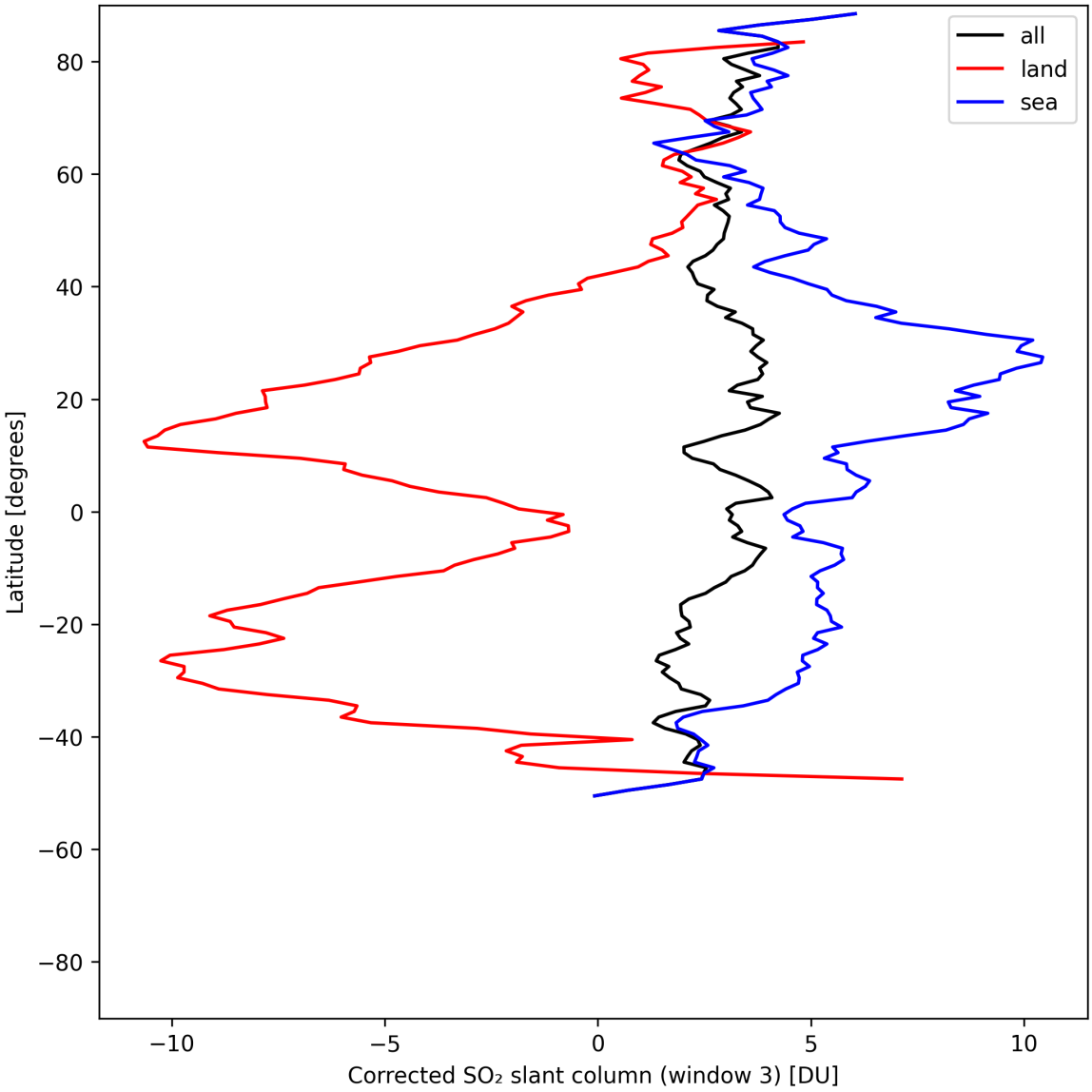

Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-05-11 to 2025-05-12.

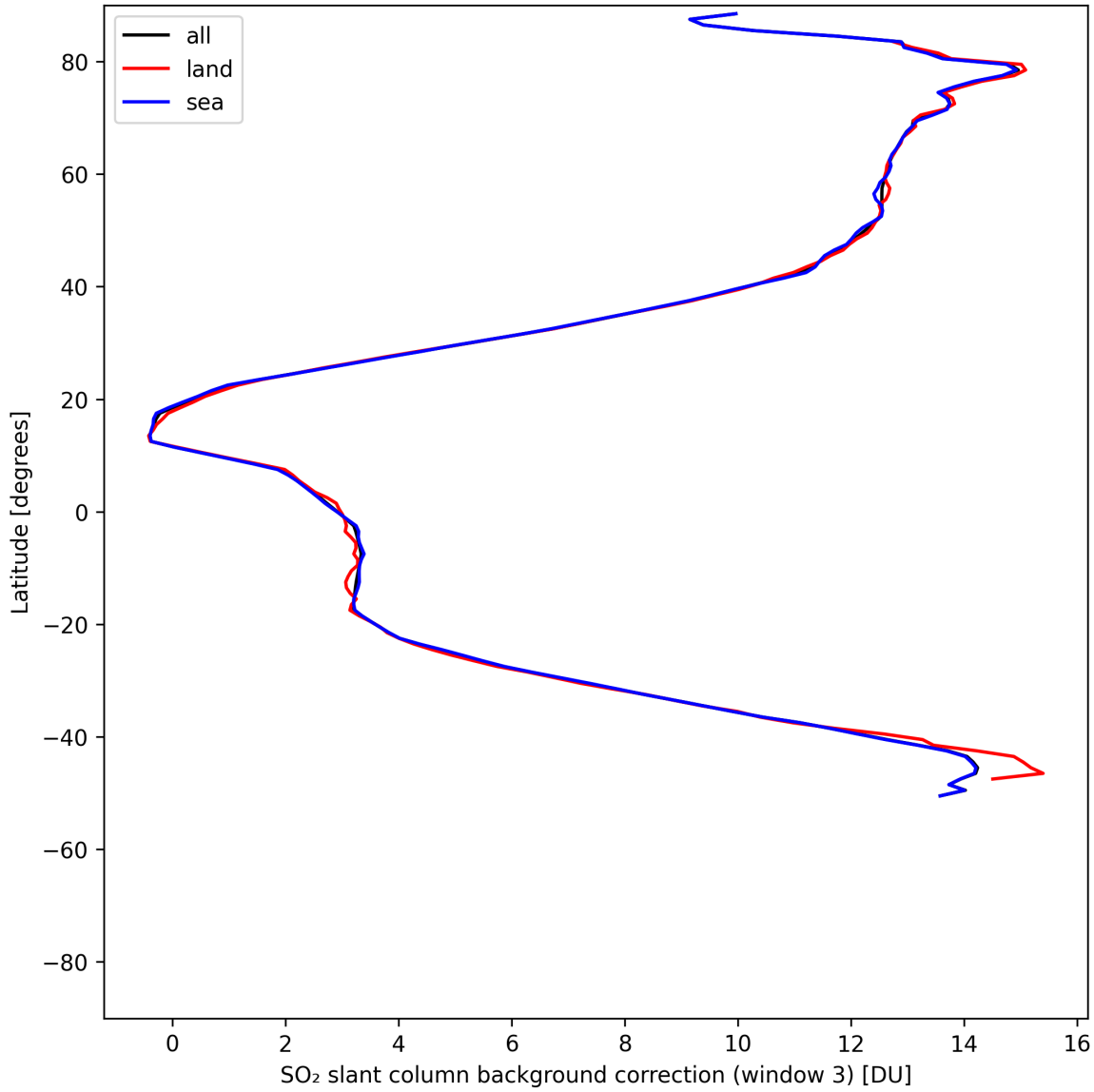

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-05-11 to 2025-05-12.

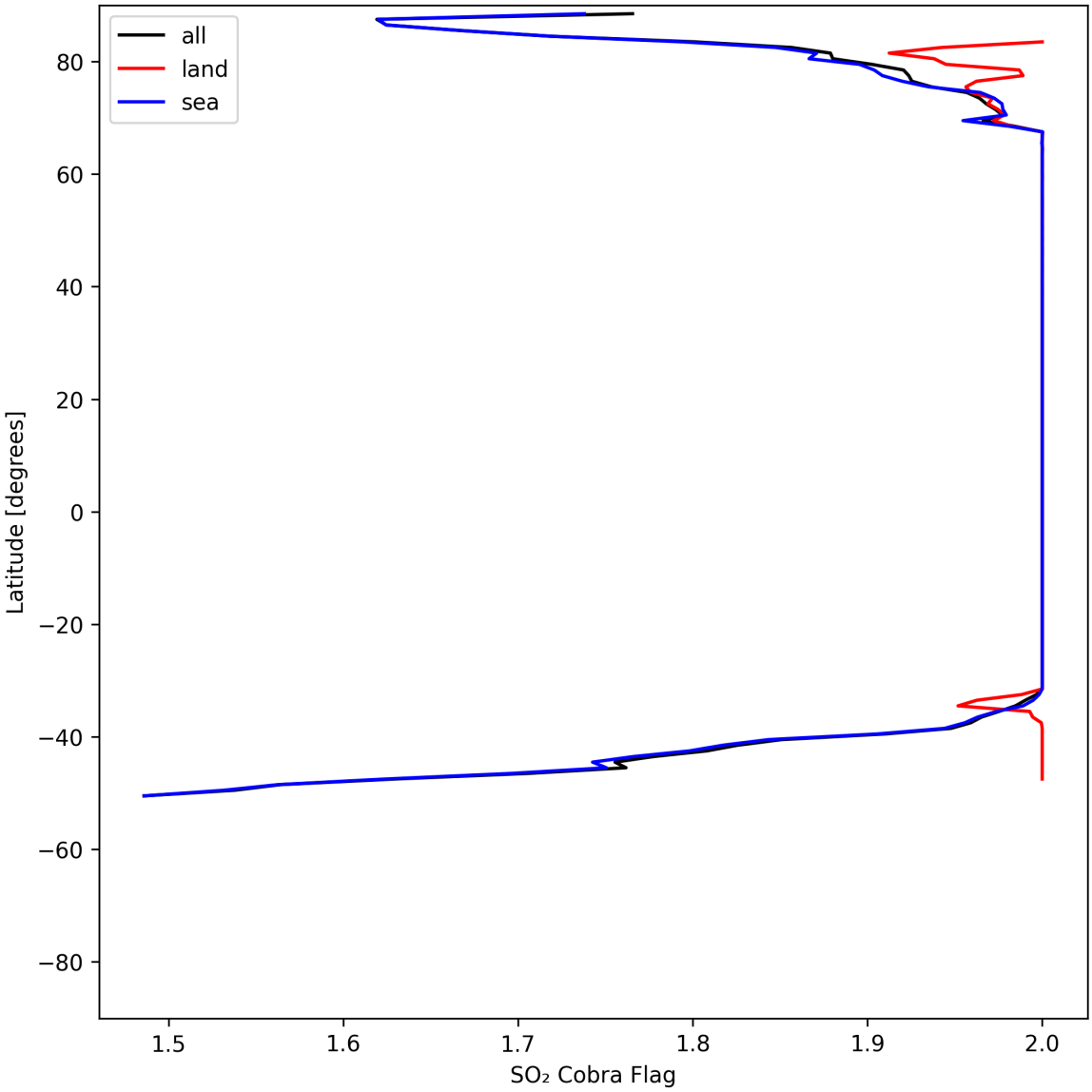

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-05-11 to 2025-05-12.

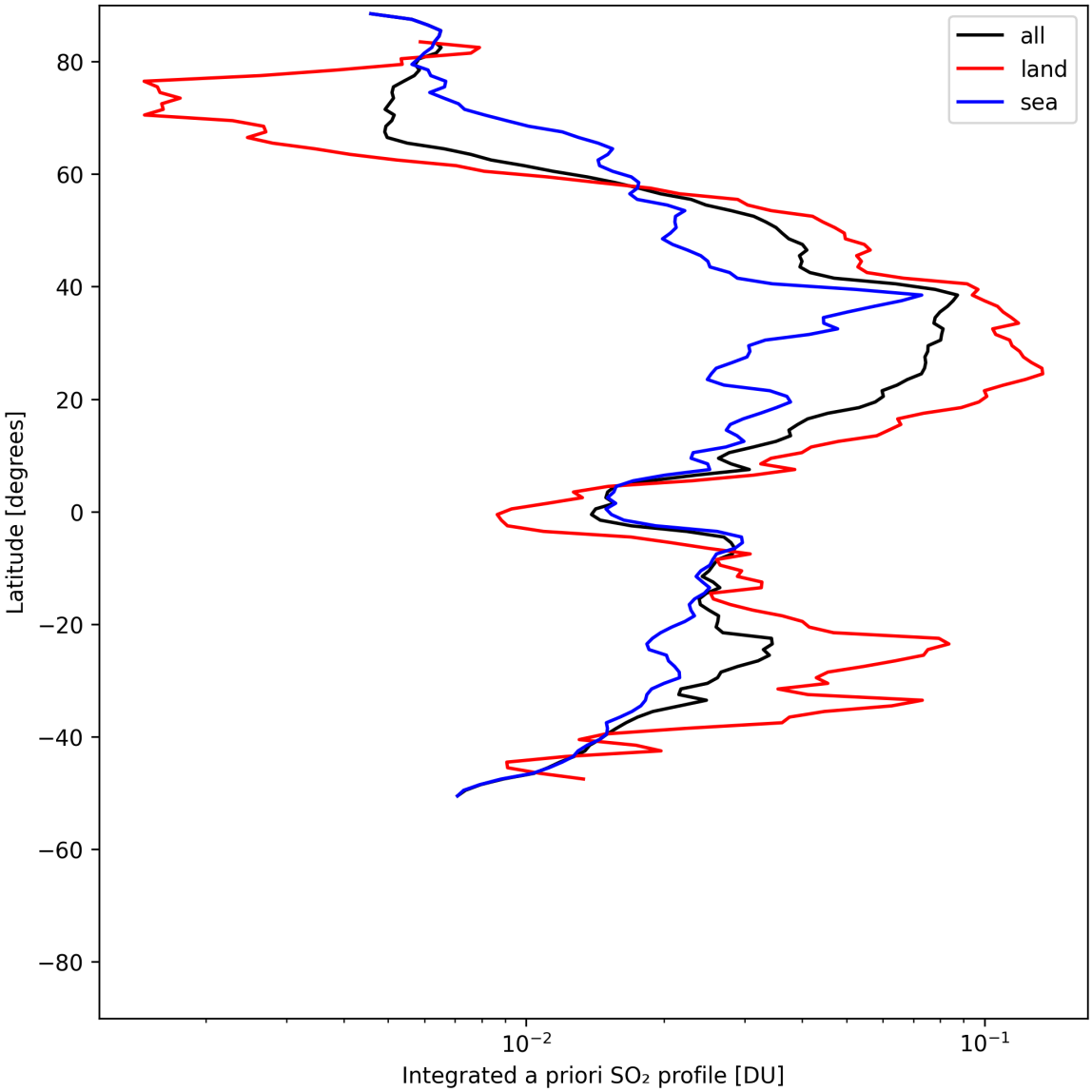

Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-05-11 to 2025-05-12.

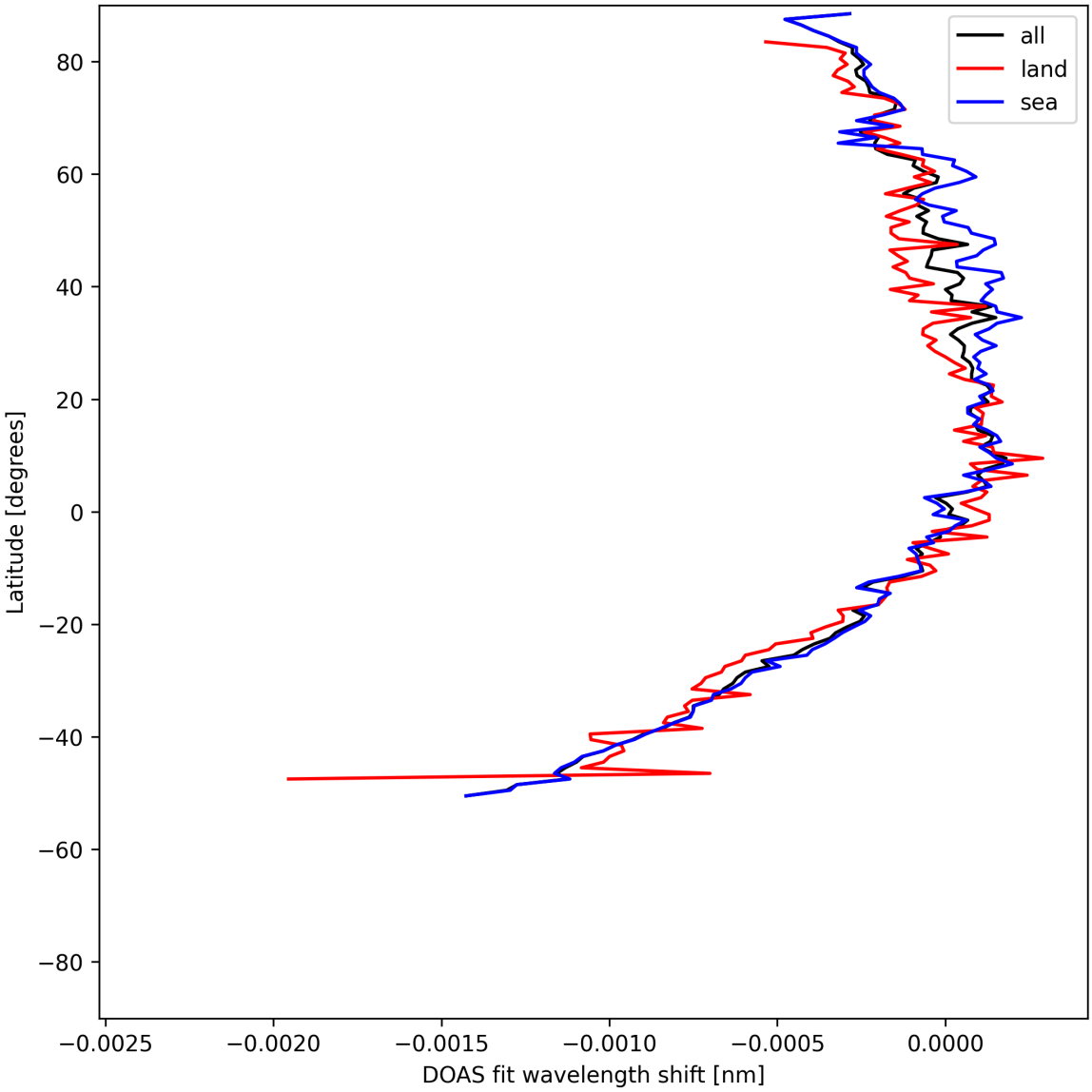

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-05-11 to 2025-05-12.

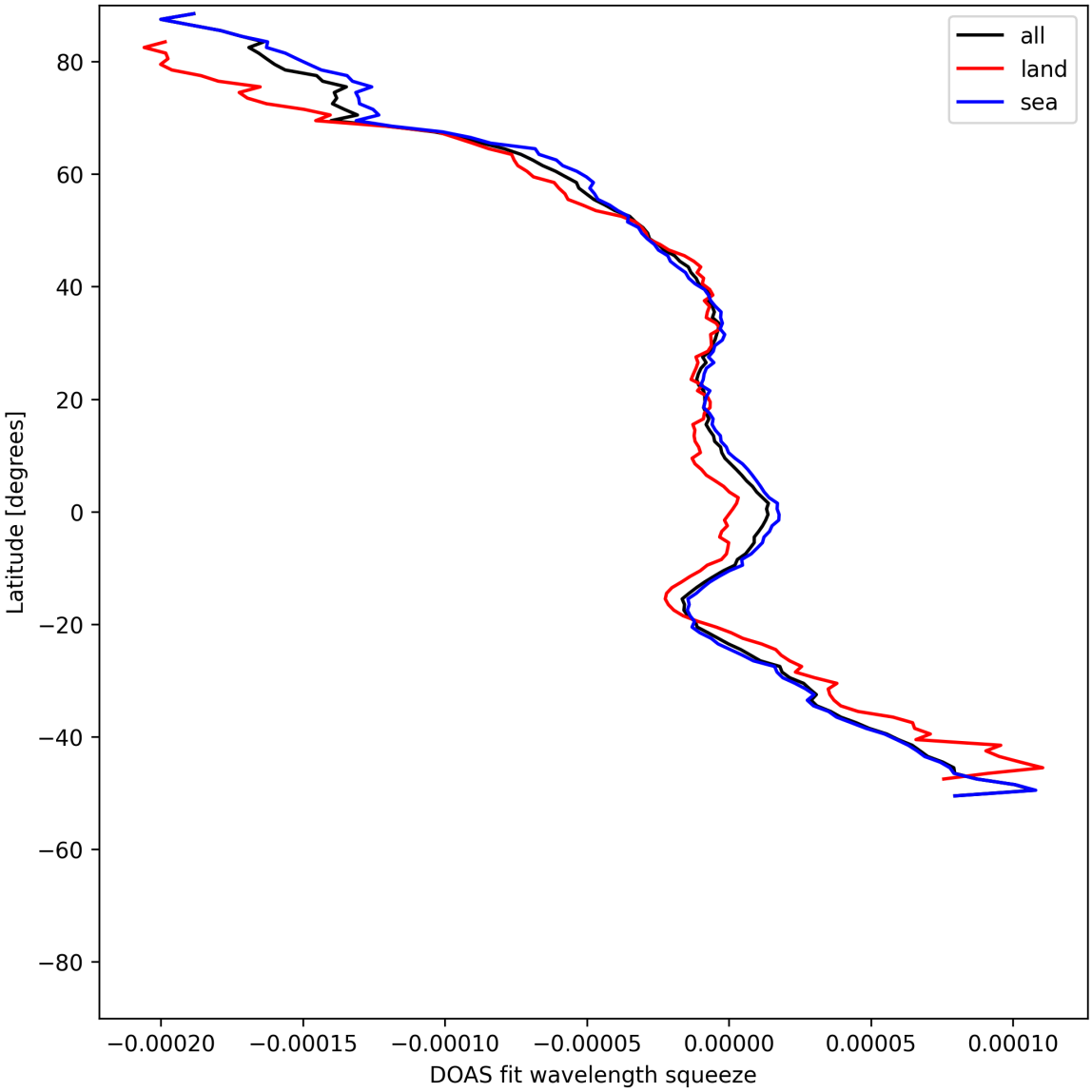

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-05-11 to 2025-05-12.

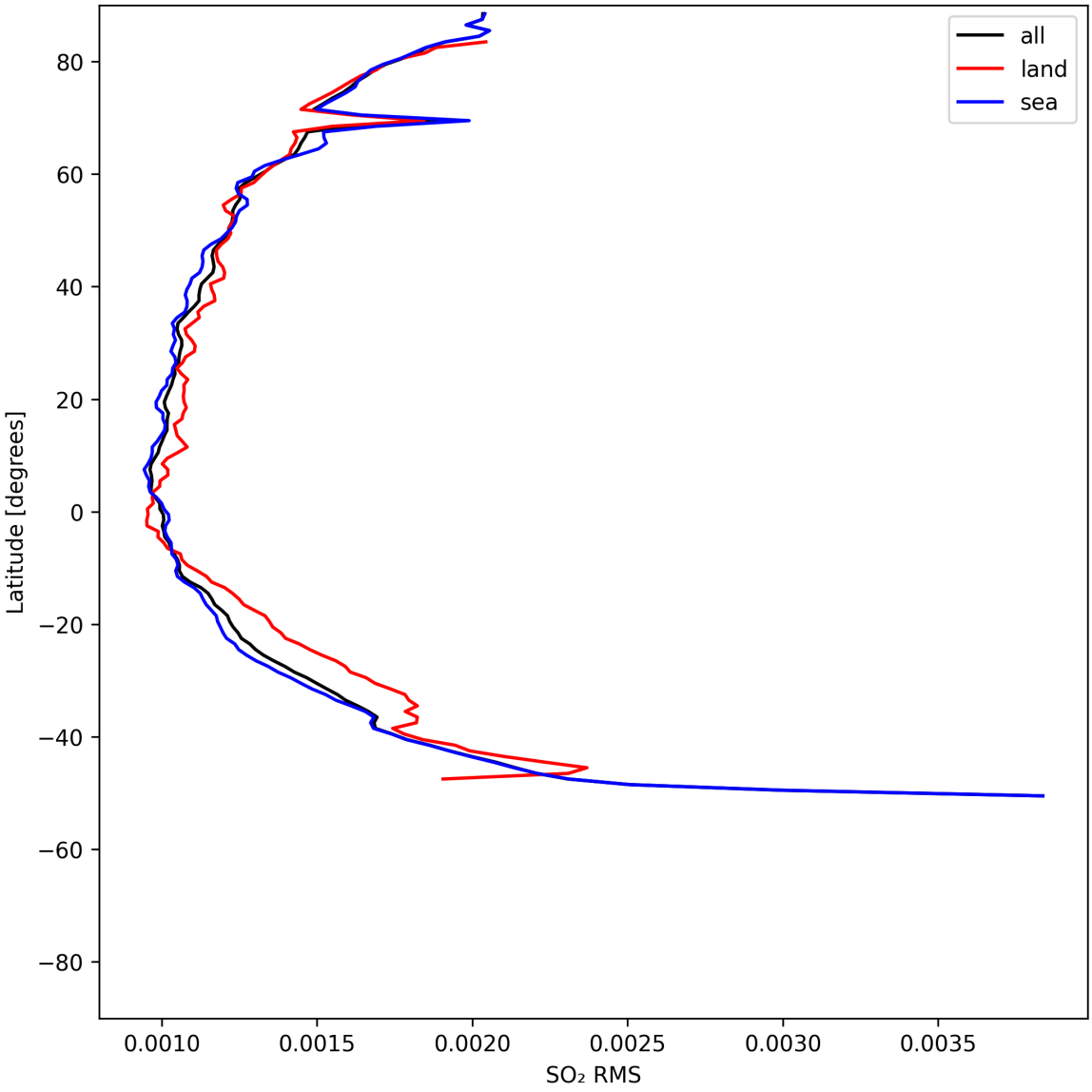

Figure 52: Zonal average of "SO_2 RMS" for 2025-05-11 to 2025-05-12.

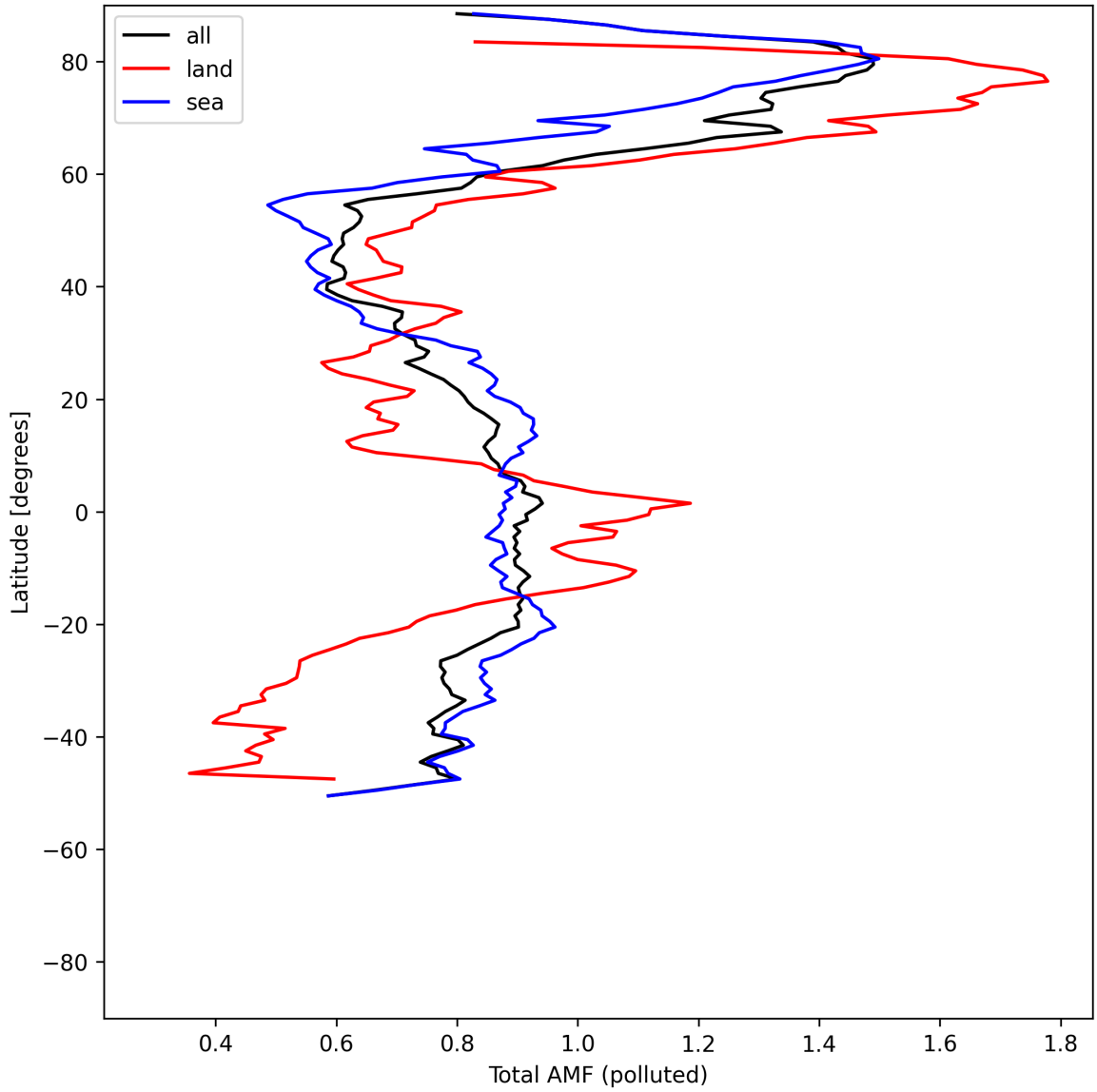

Figure 53: Zonal average of “Total AMF (polluted)” for 2025-05-11 to 2025-05-12.

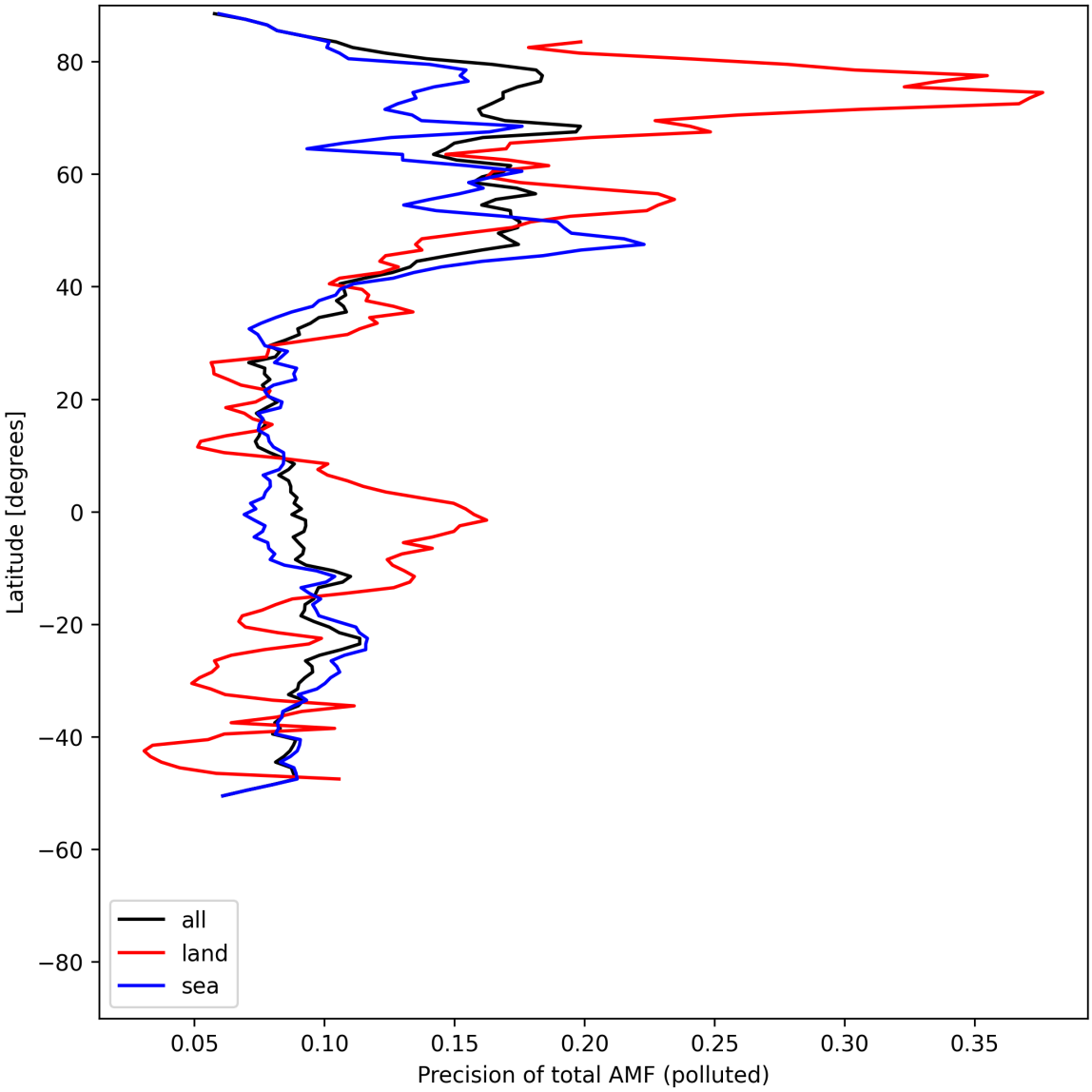

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-05-11 to 2025-05-12.

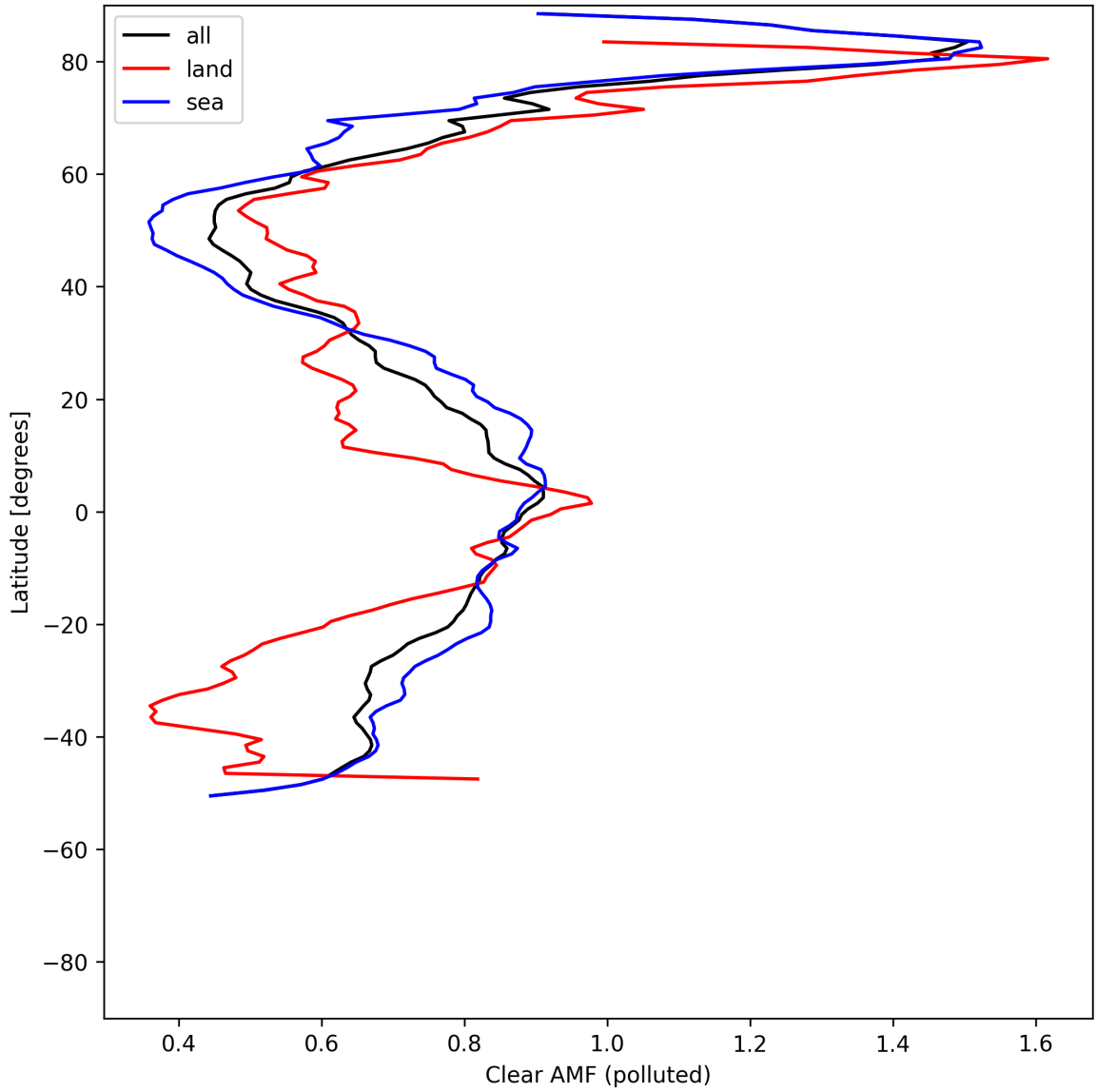

Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-05-11 to 2025-05-12.

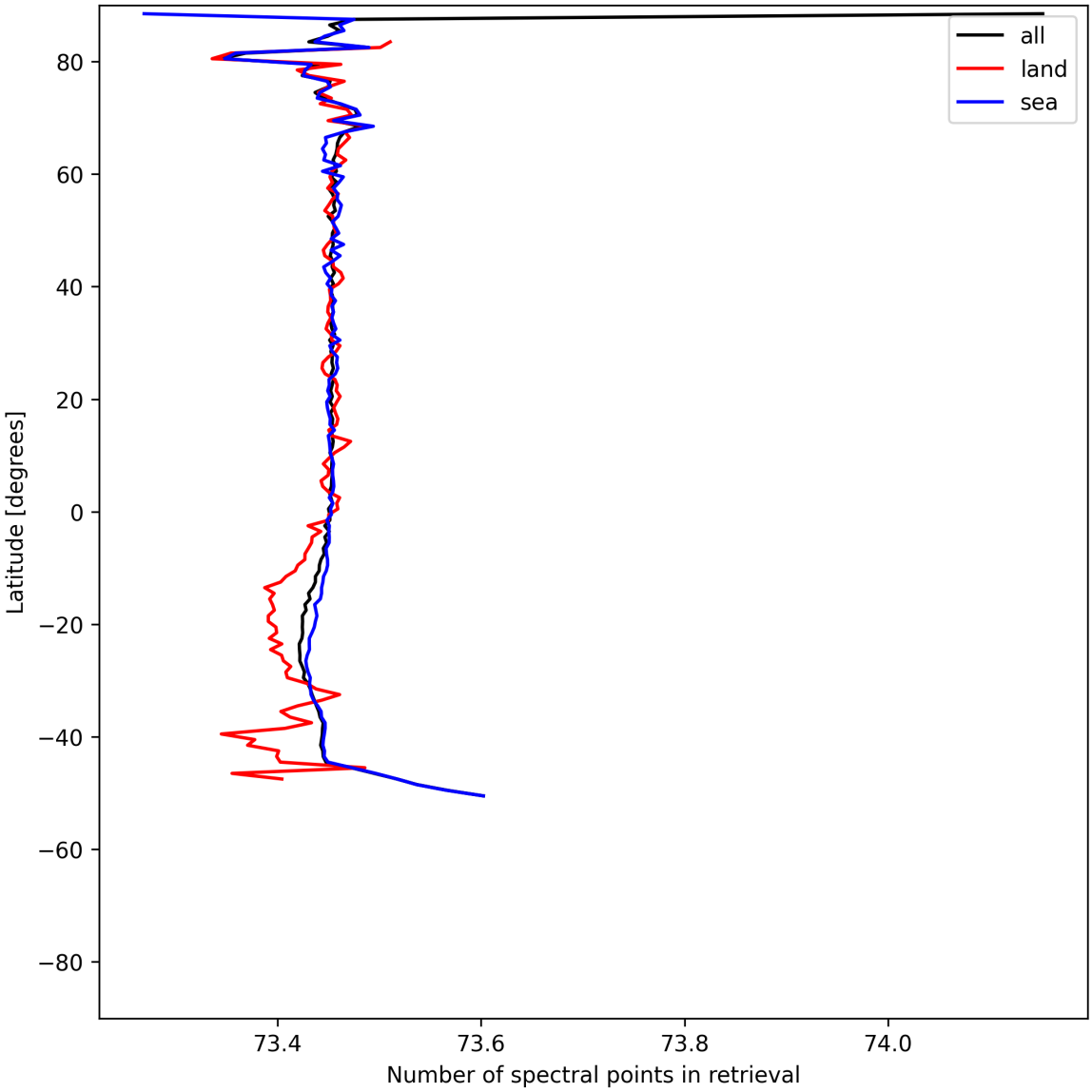

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-05-11 to 2025-05-12.

8 Histograms

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

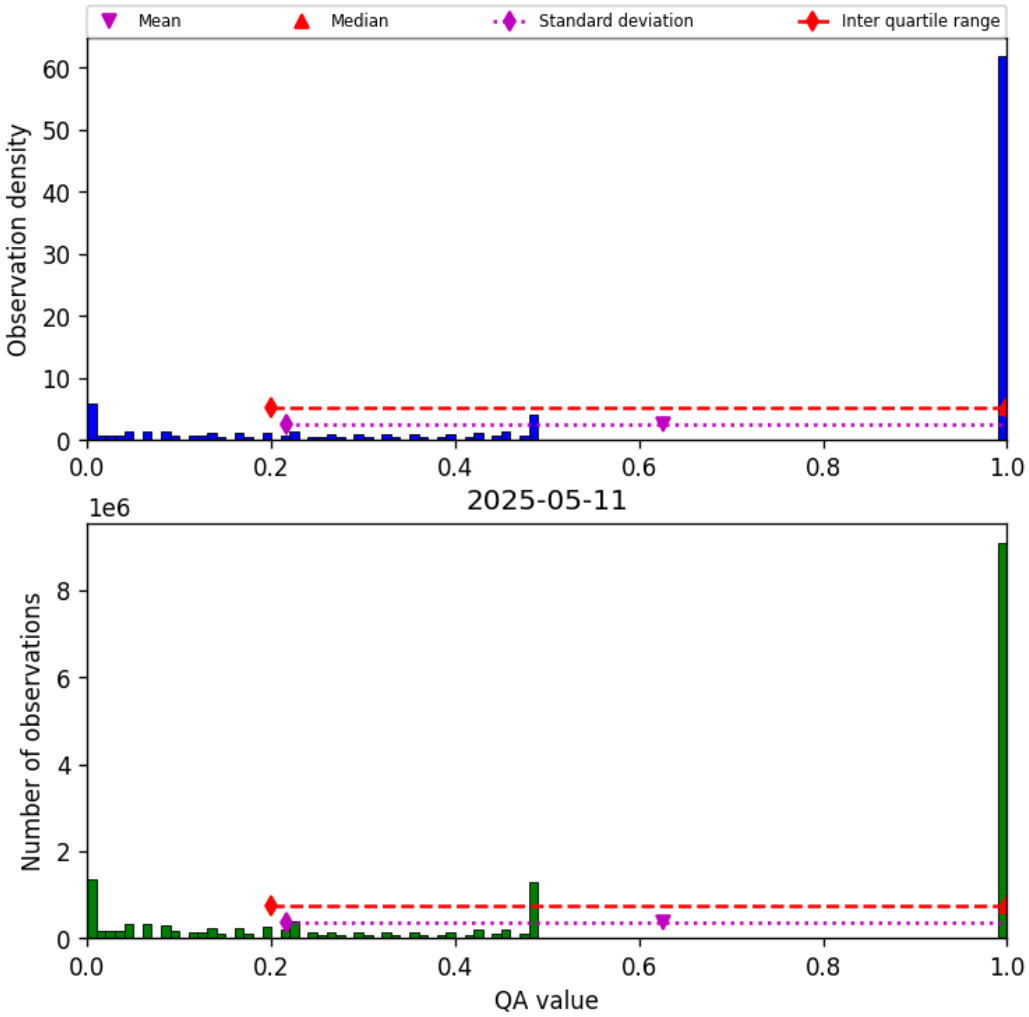

Figure 57: Histogram of “QA value” for 2025-05-11 to 2025-05-12

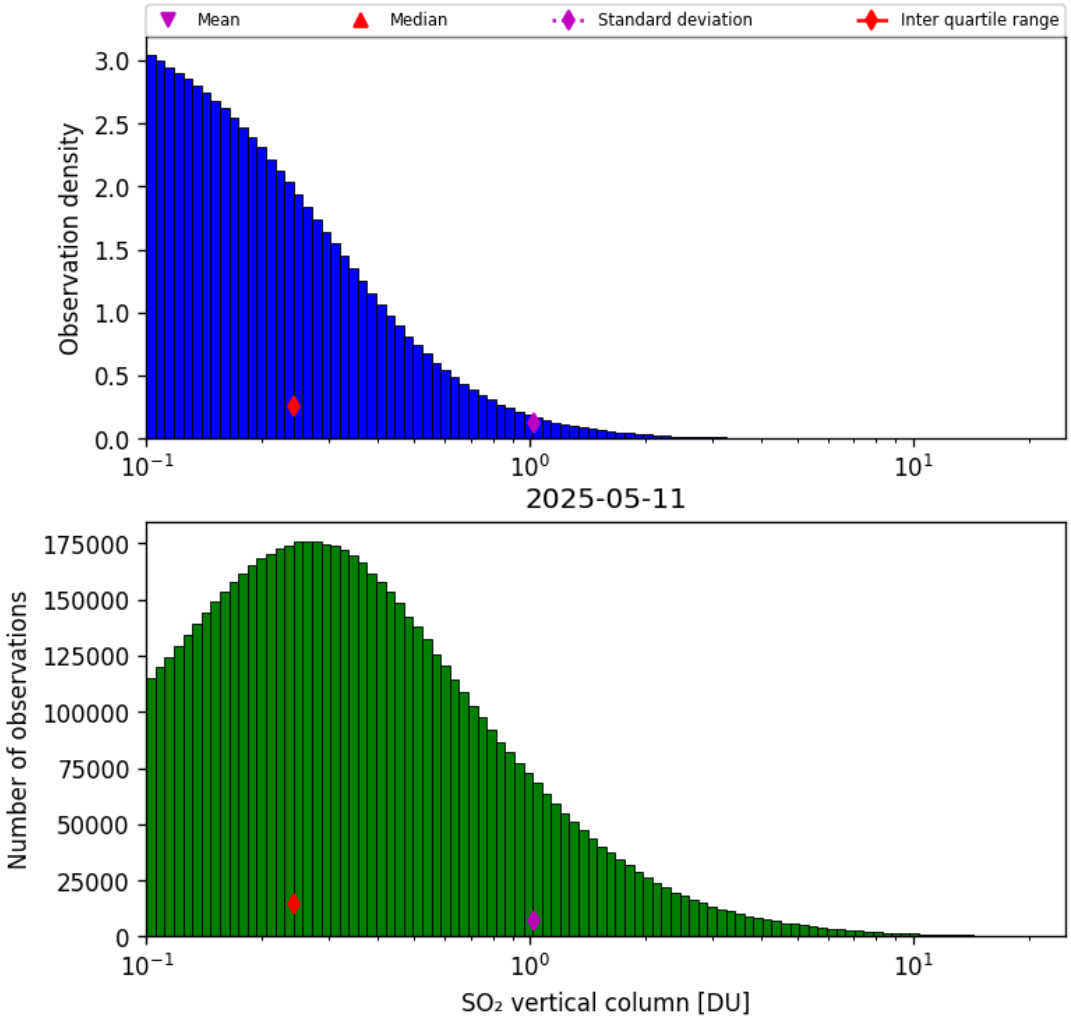

Figure 58: Histogram of "SO_2 vertical column" for 2025-05-11 to 2025-05-12

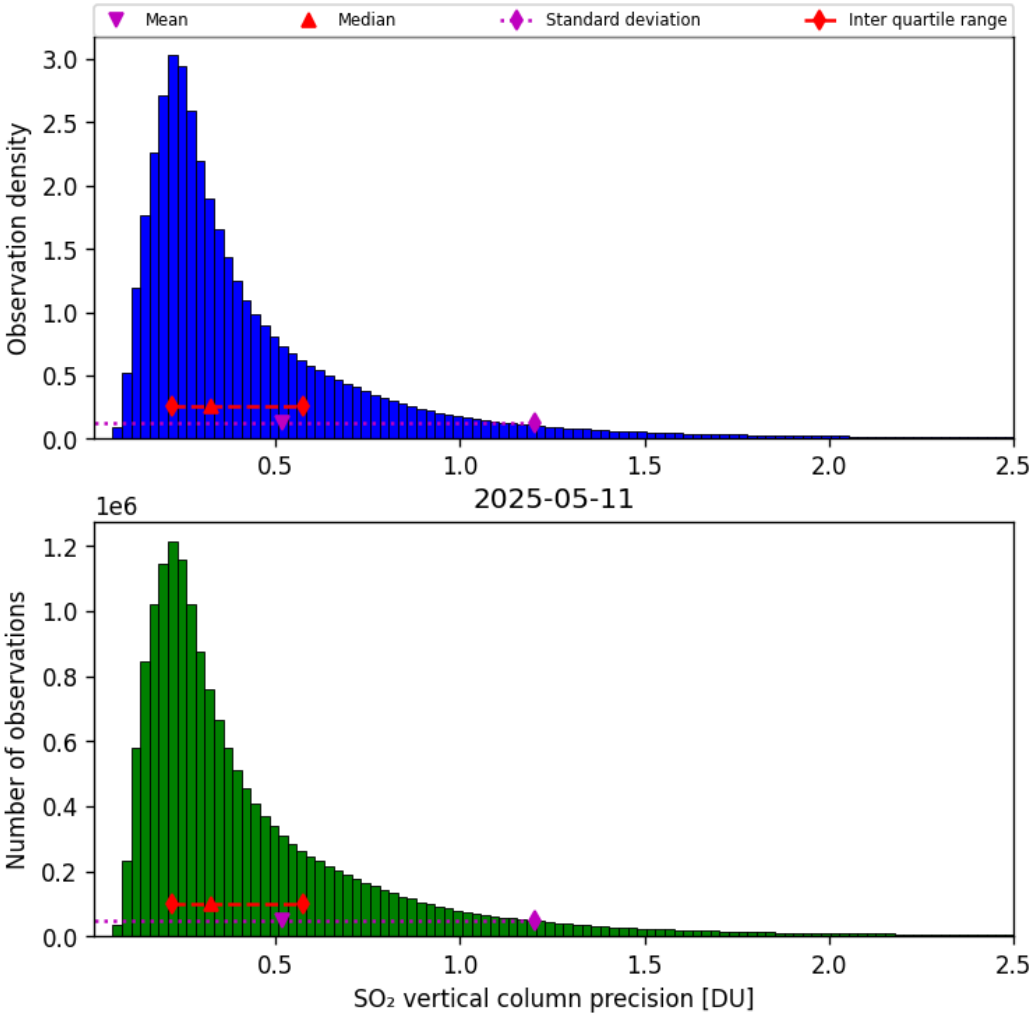

Figure 59: Histogram of "SO_2 vertical column precision" for 2025-05-11 to 2025-05-12

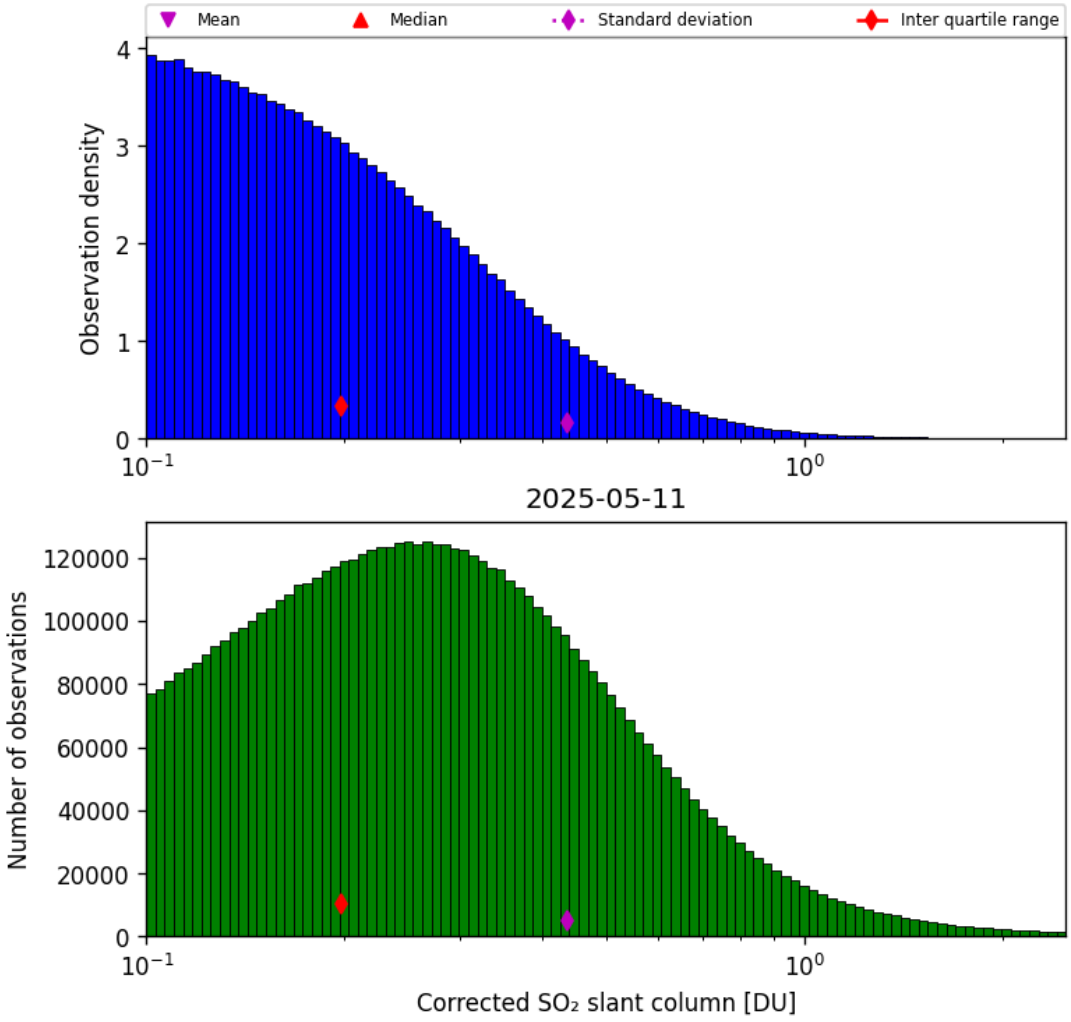

Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-05-11 to 2025-05-12

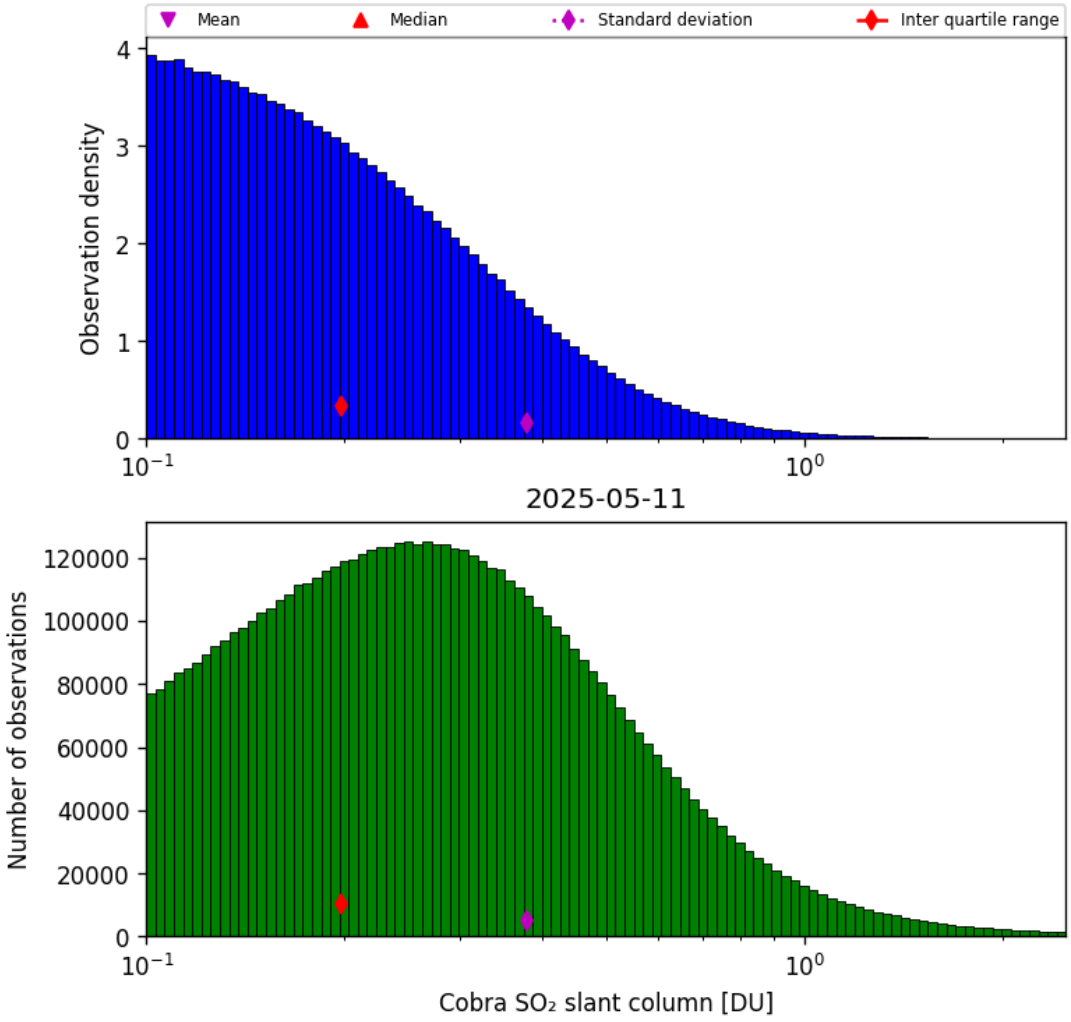

Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-05-11 to 2025-05-12

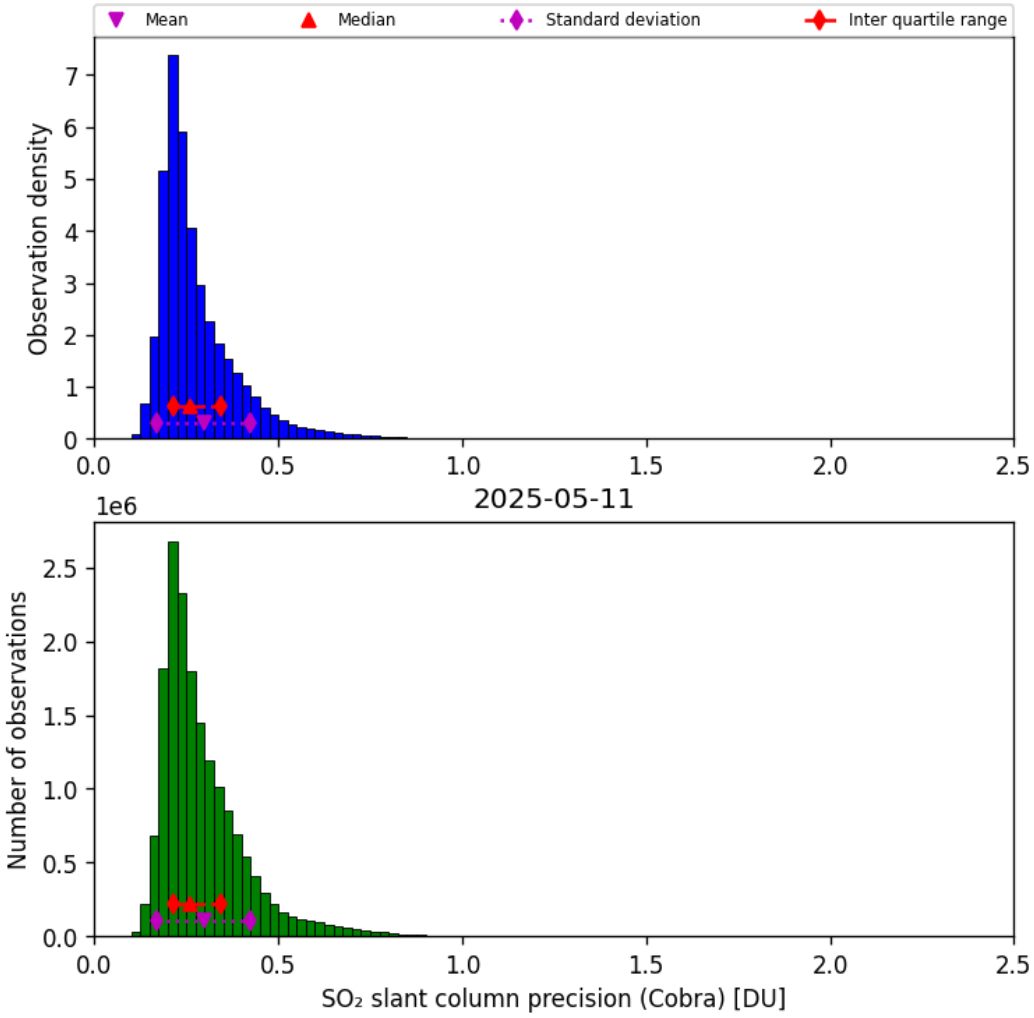

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-05-11 to 2025-05-12

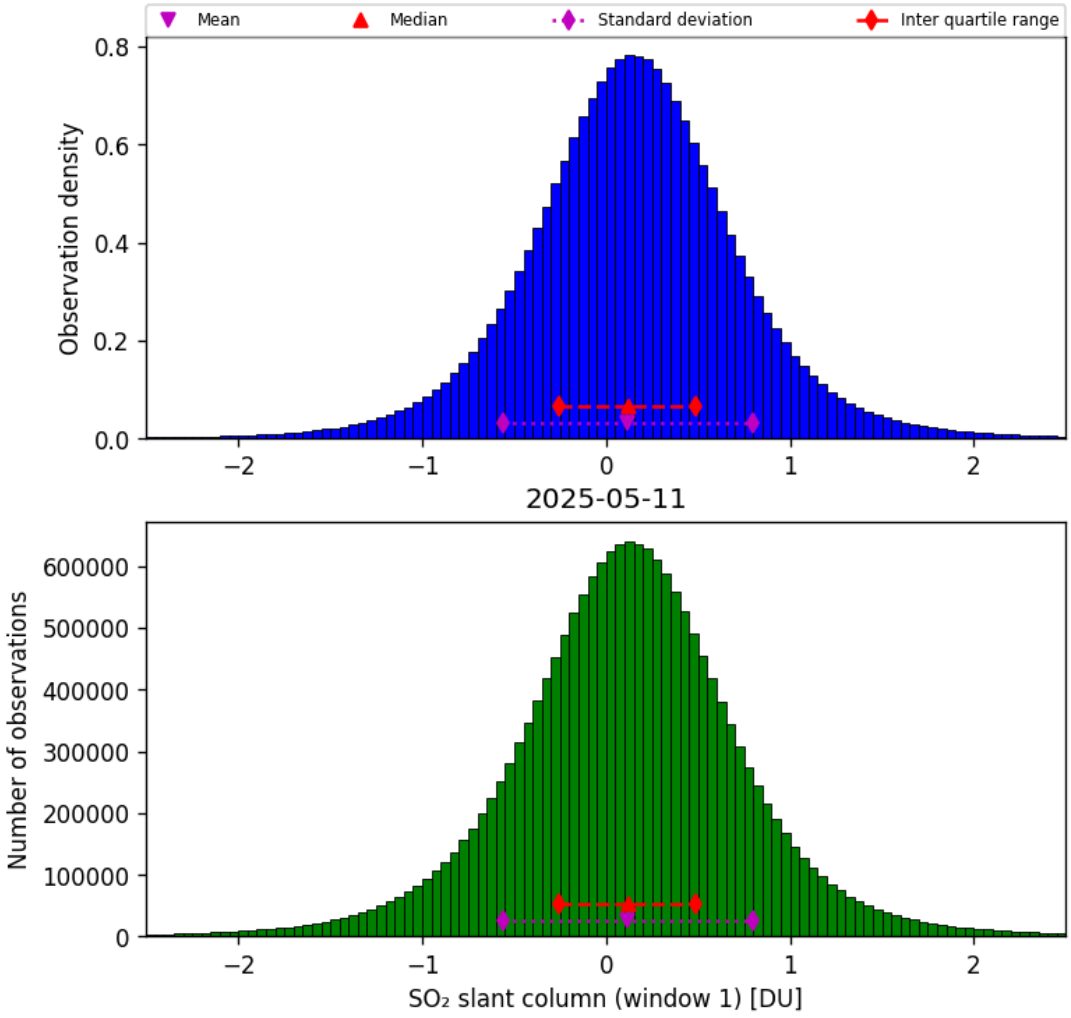

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-05-11 to 2025-05-12

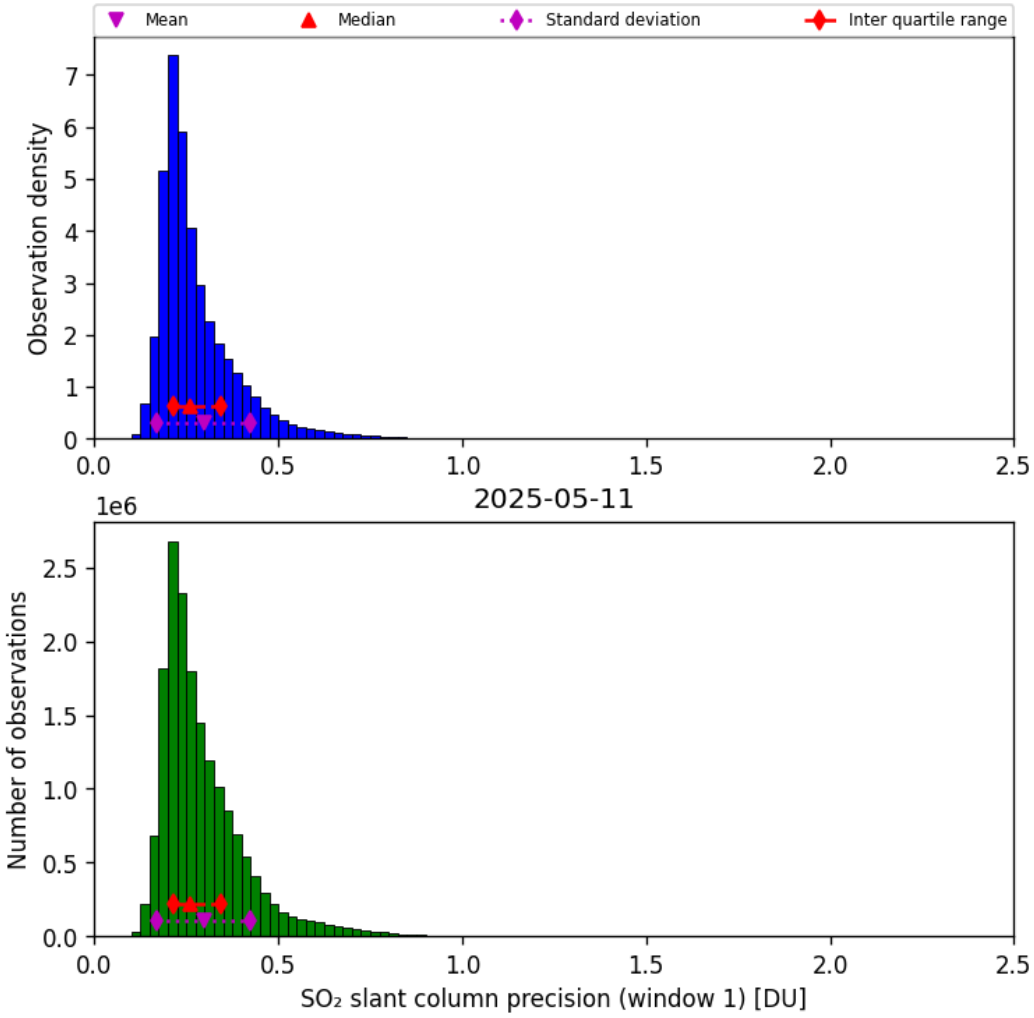

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-05-11 to 2025-05-12

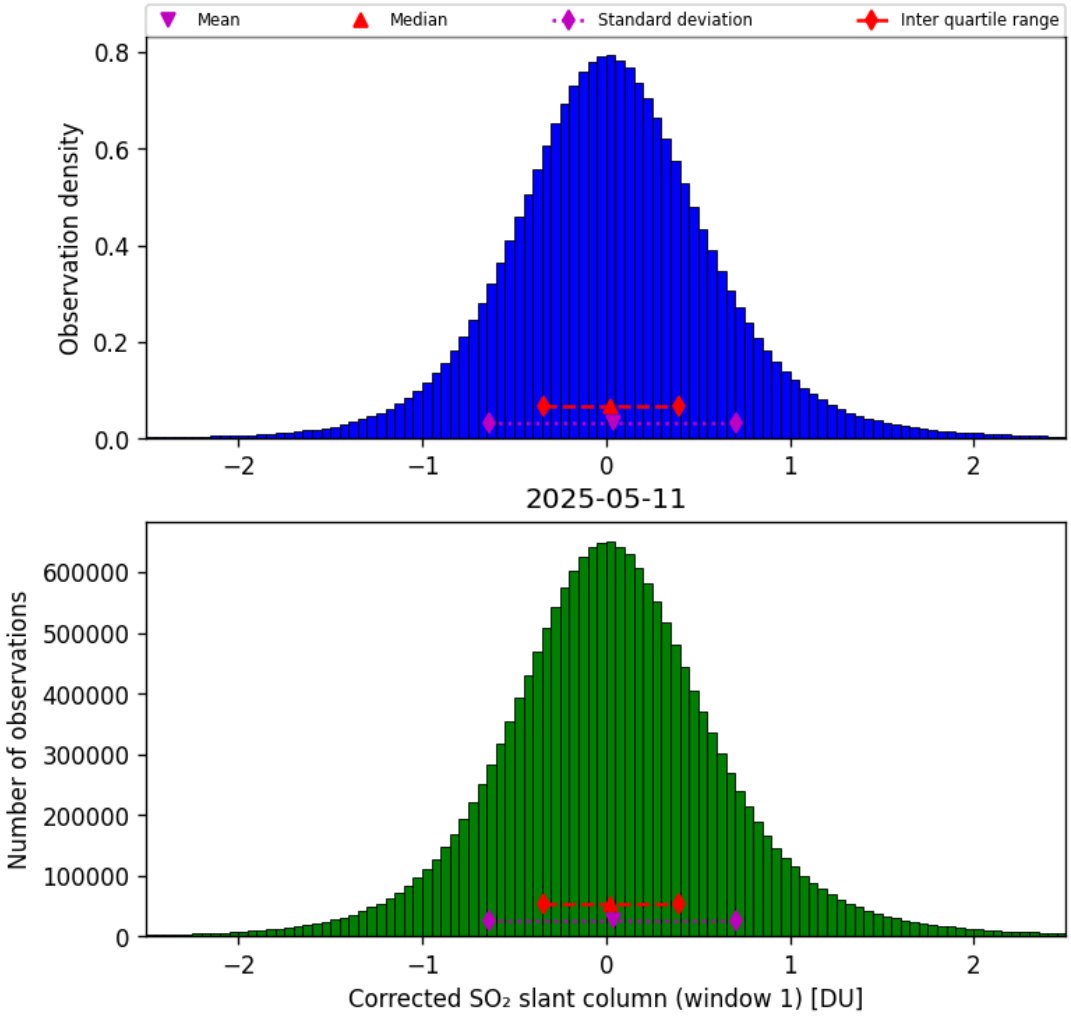

Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-05-11 to 2025-05-12

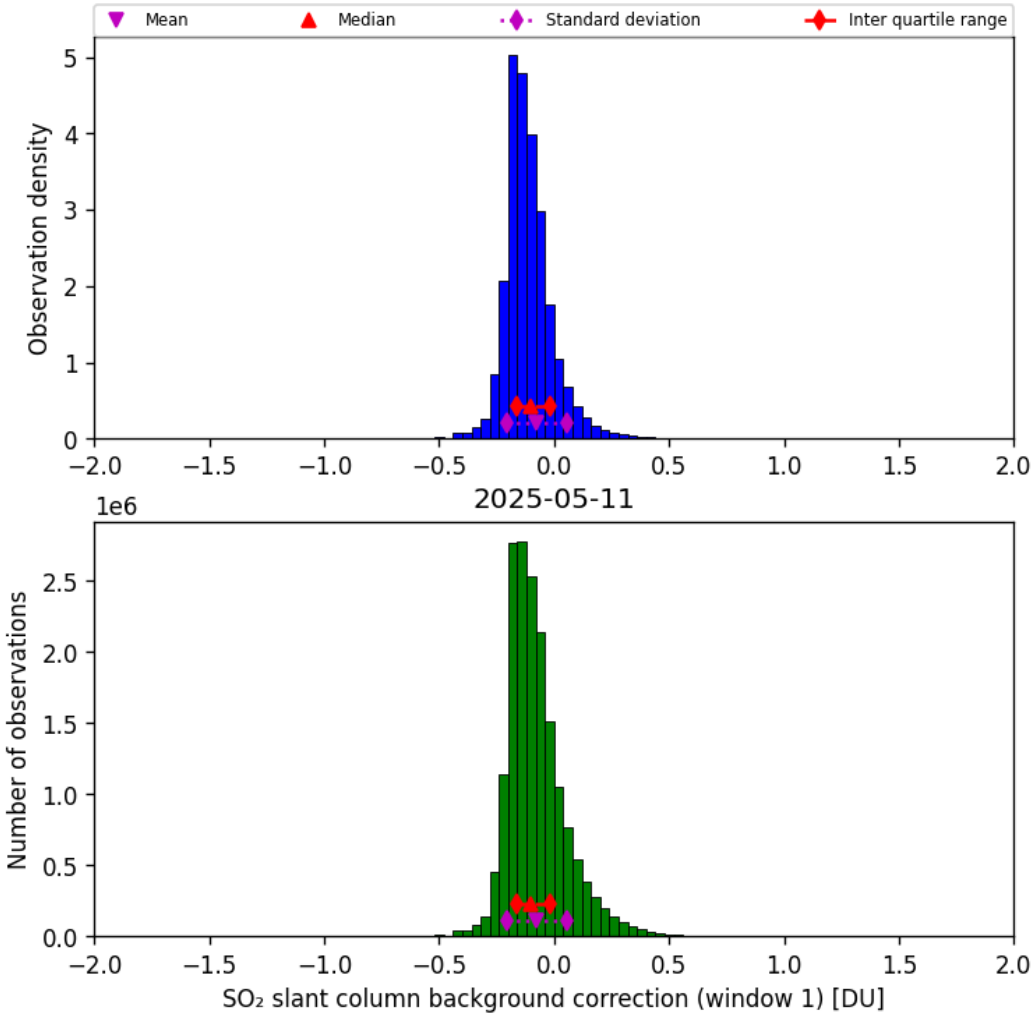

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-05-11 to 2025-05-12

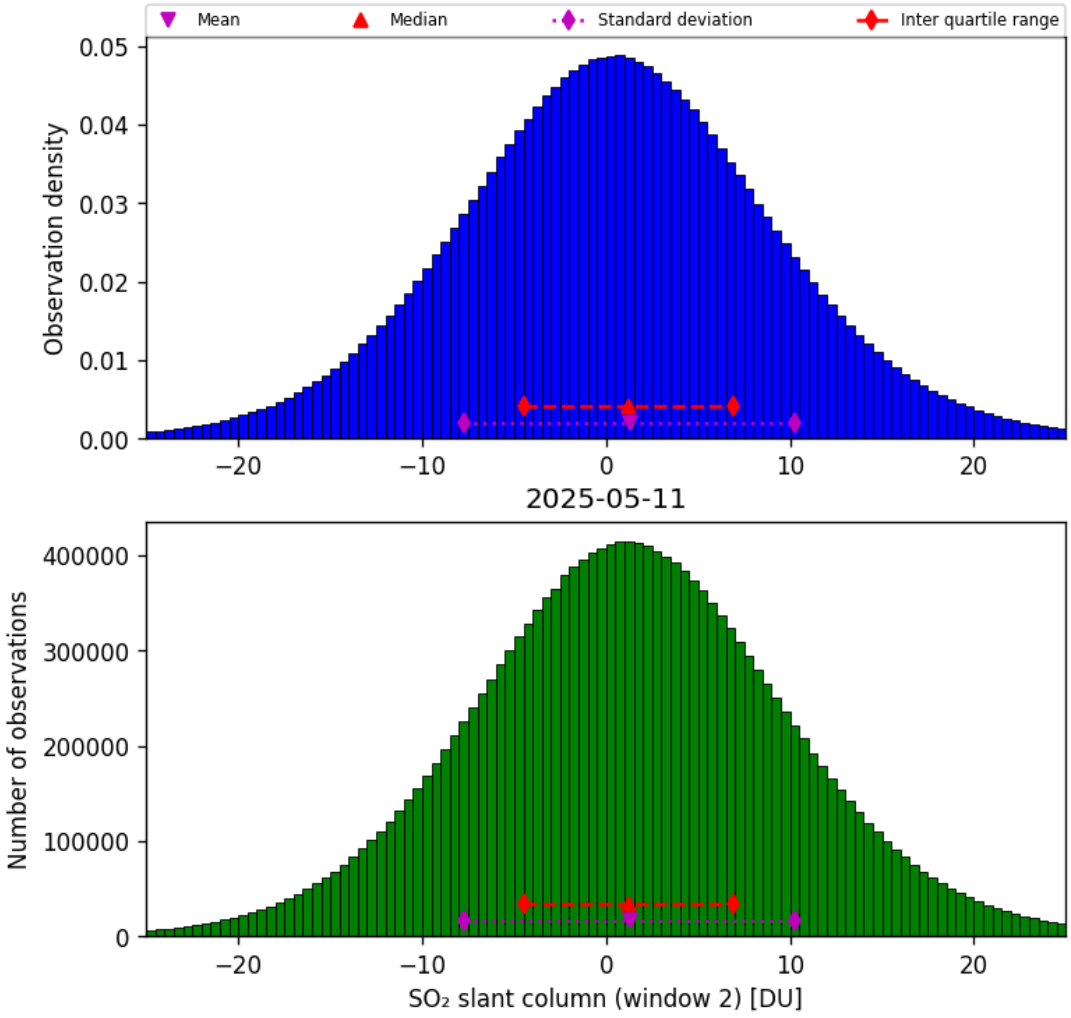

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-05-11 to 2025-05-12

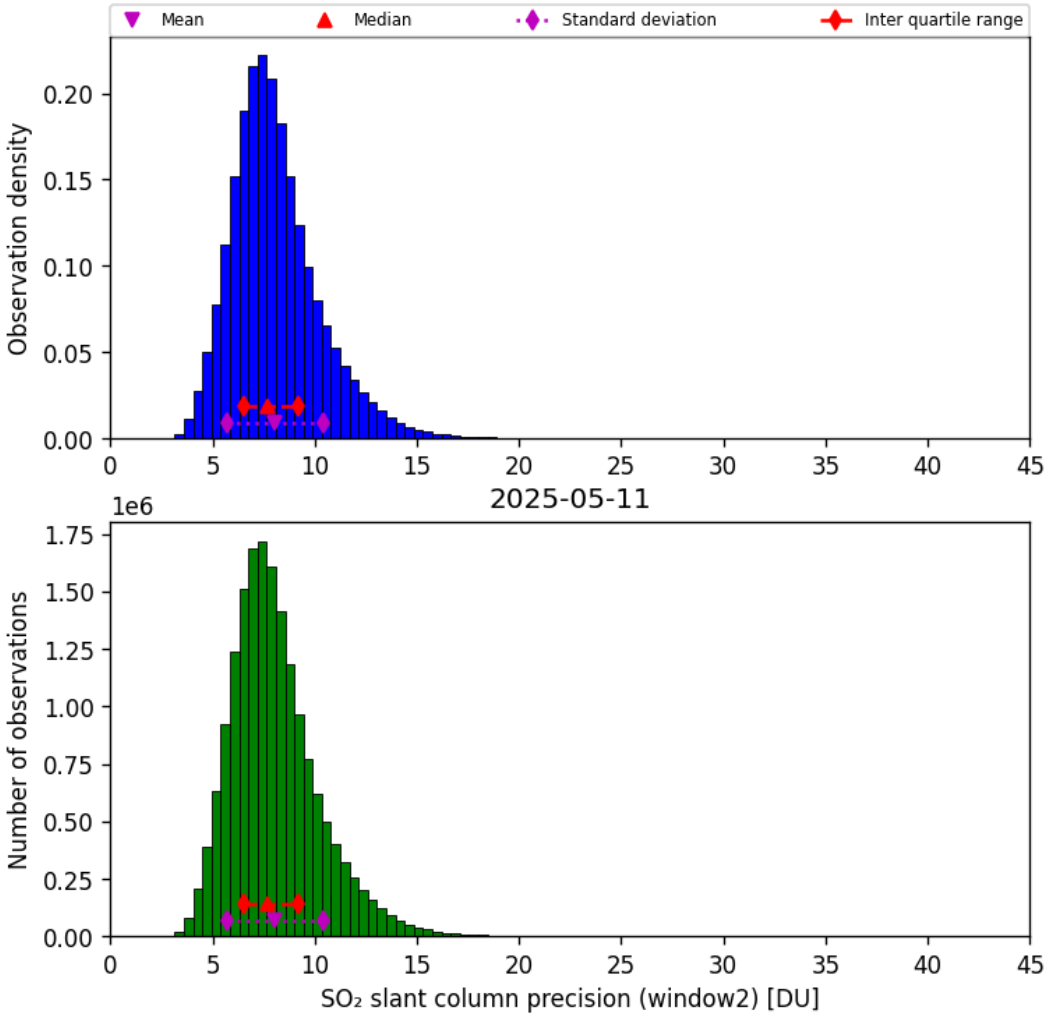

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-05-11 to 2025-05-12

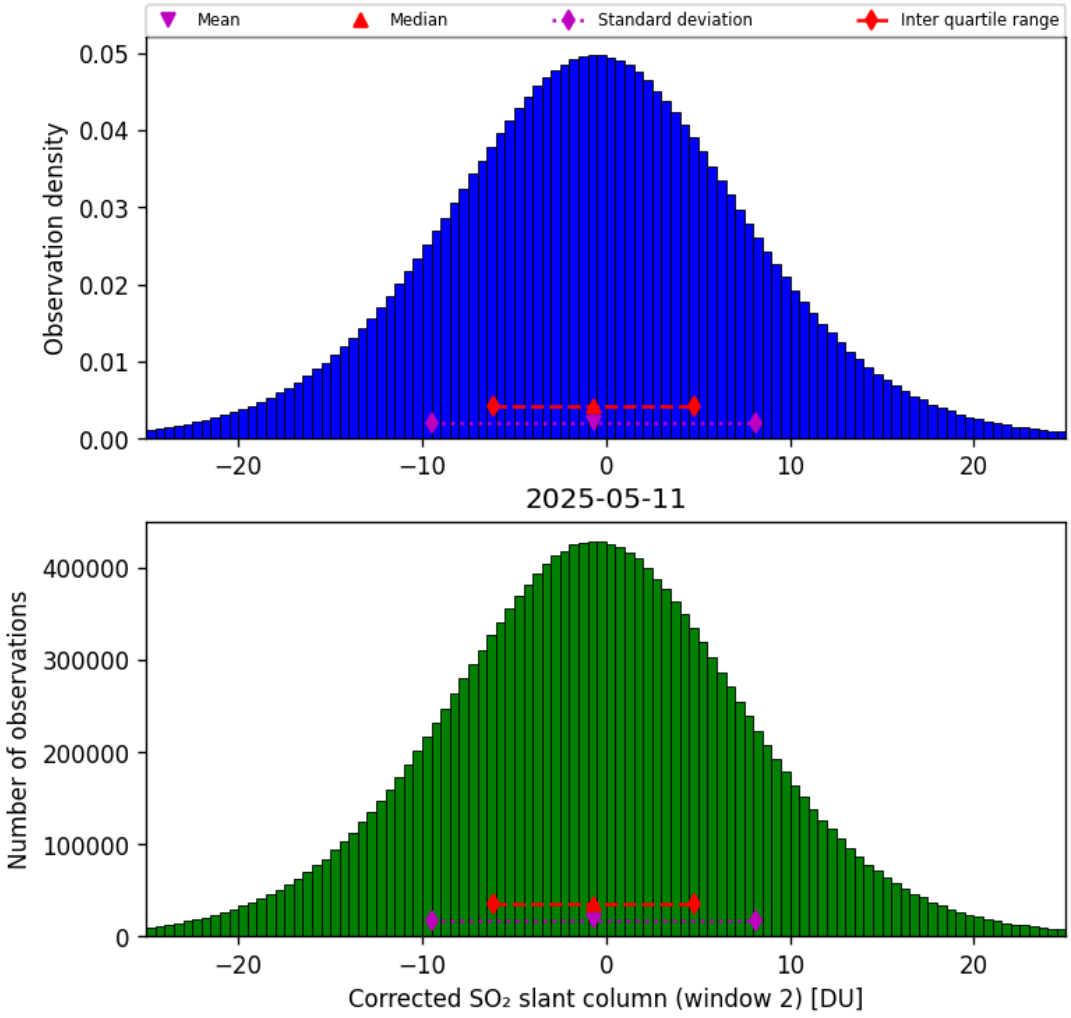

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-05-11 to 2025-05-12

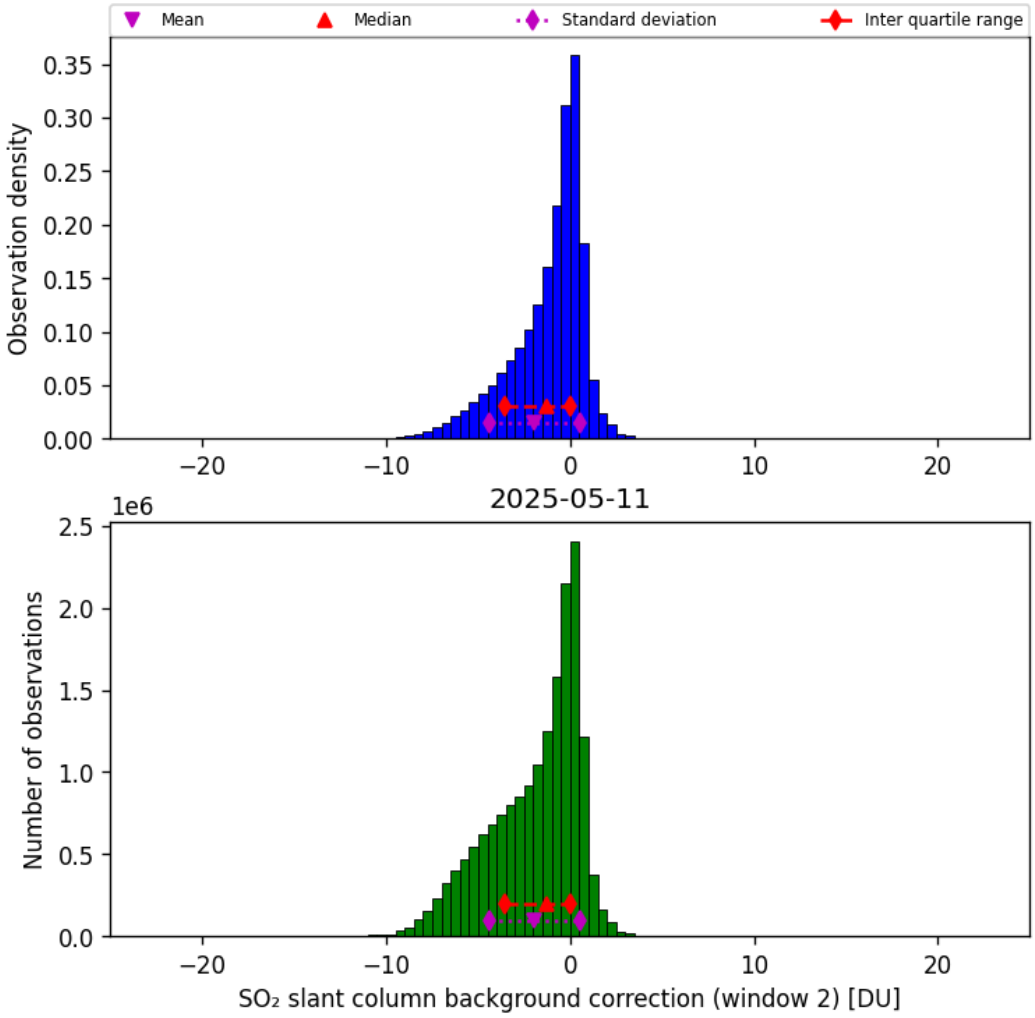

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-05-11 to 2025-05-12

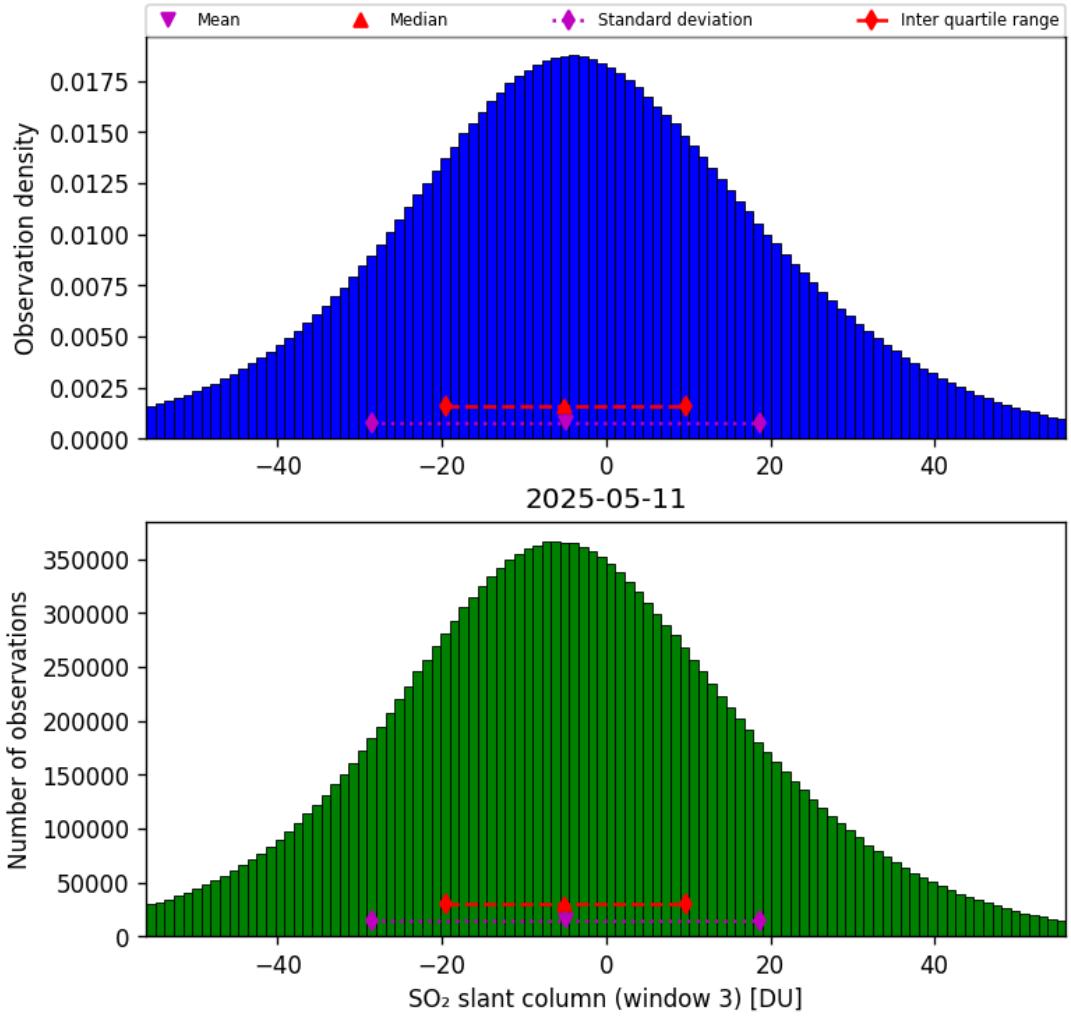

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-05-11 to 2025-05-12

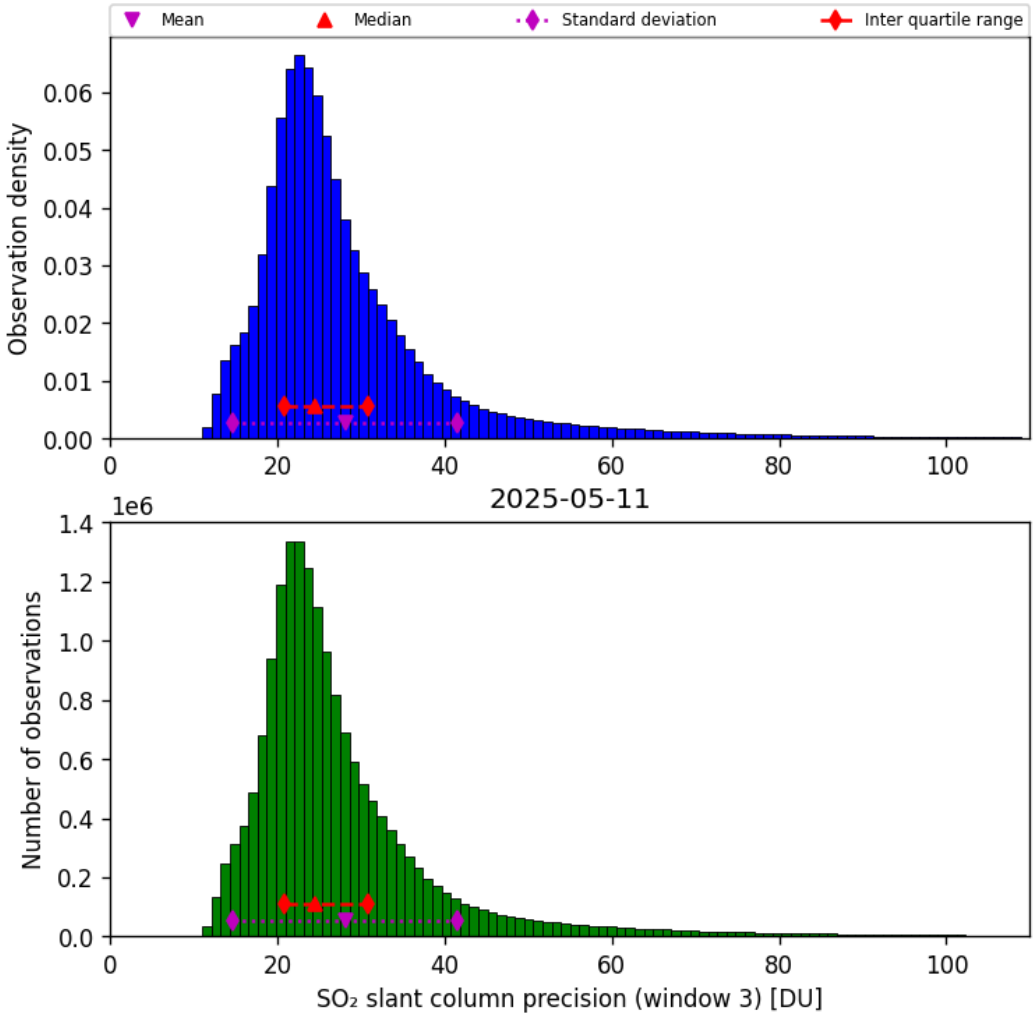

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-05-11 to 2025-05-12

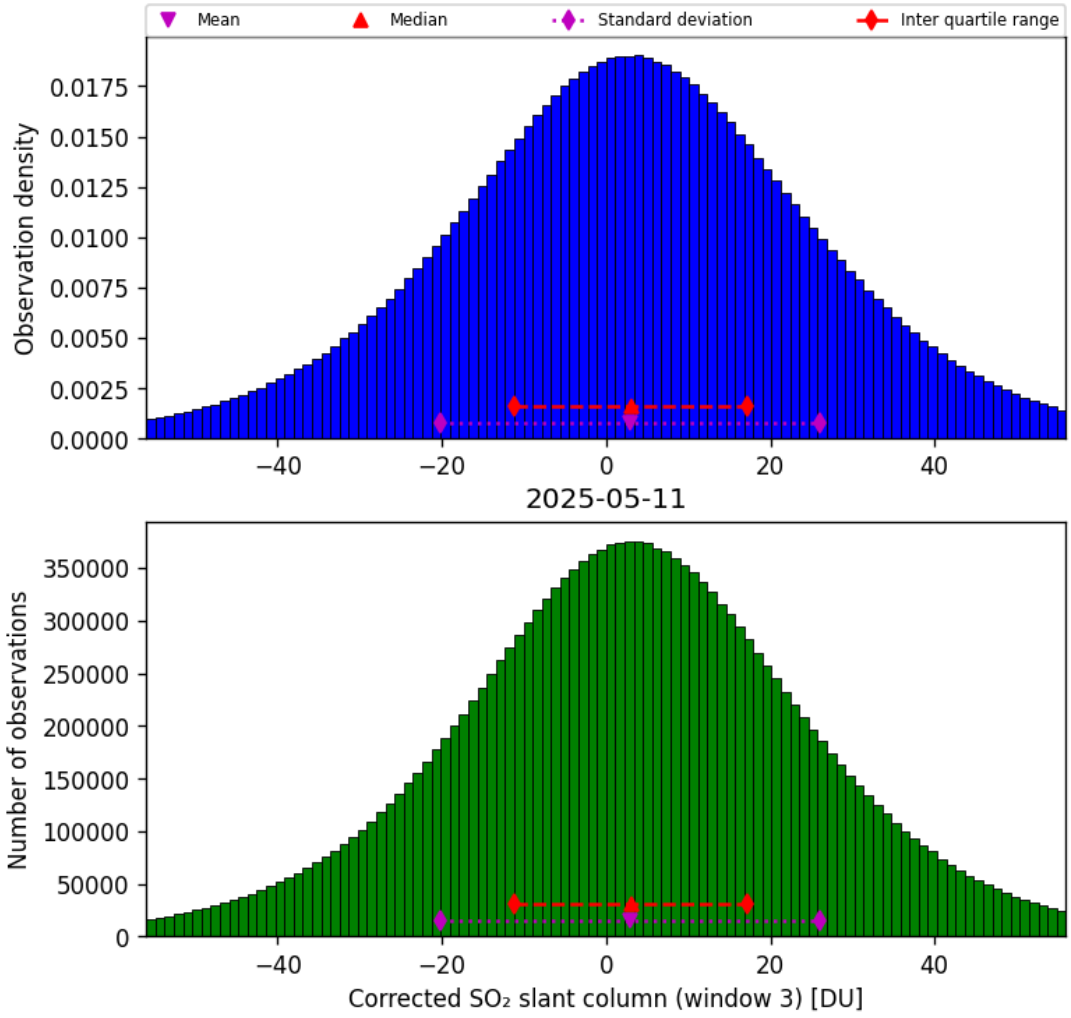

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-05-11 to 2025-05-12

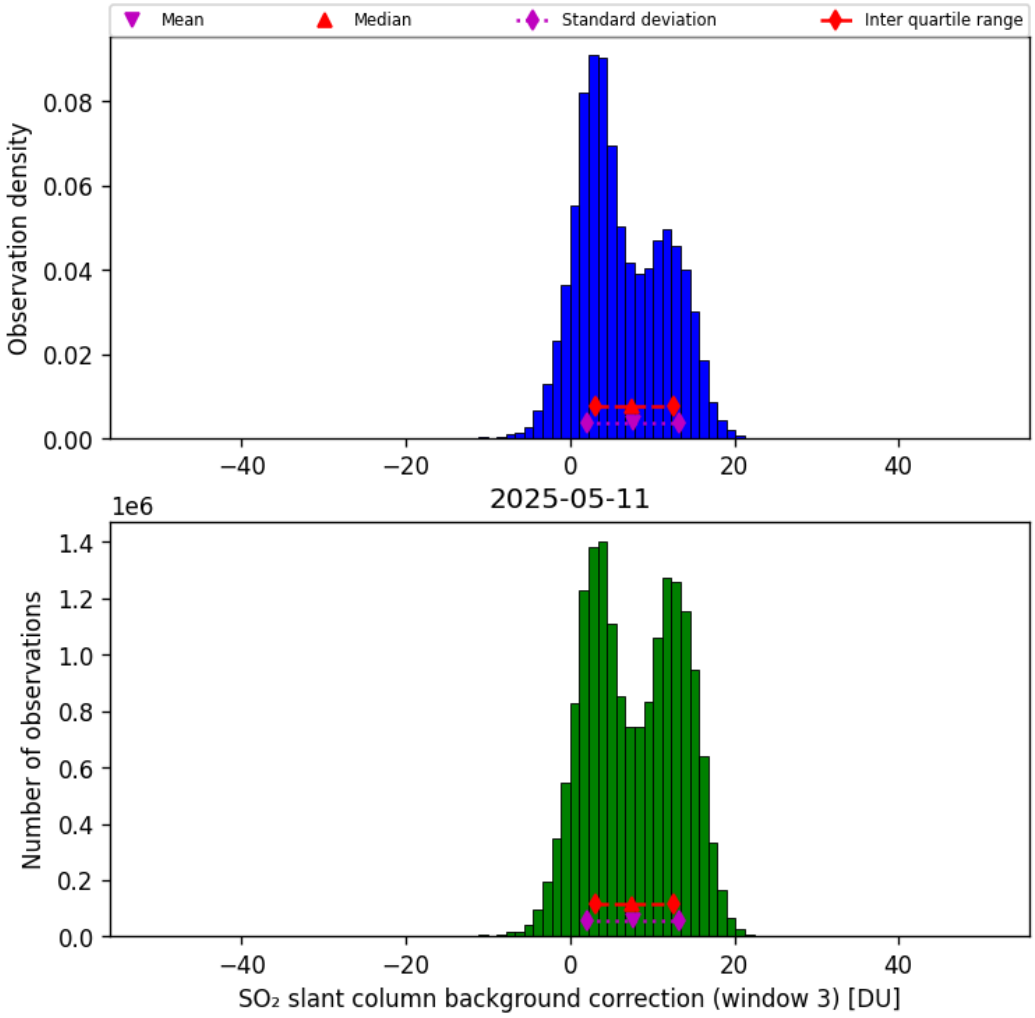

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-05-11 to 2025-05-12

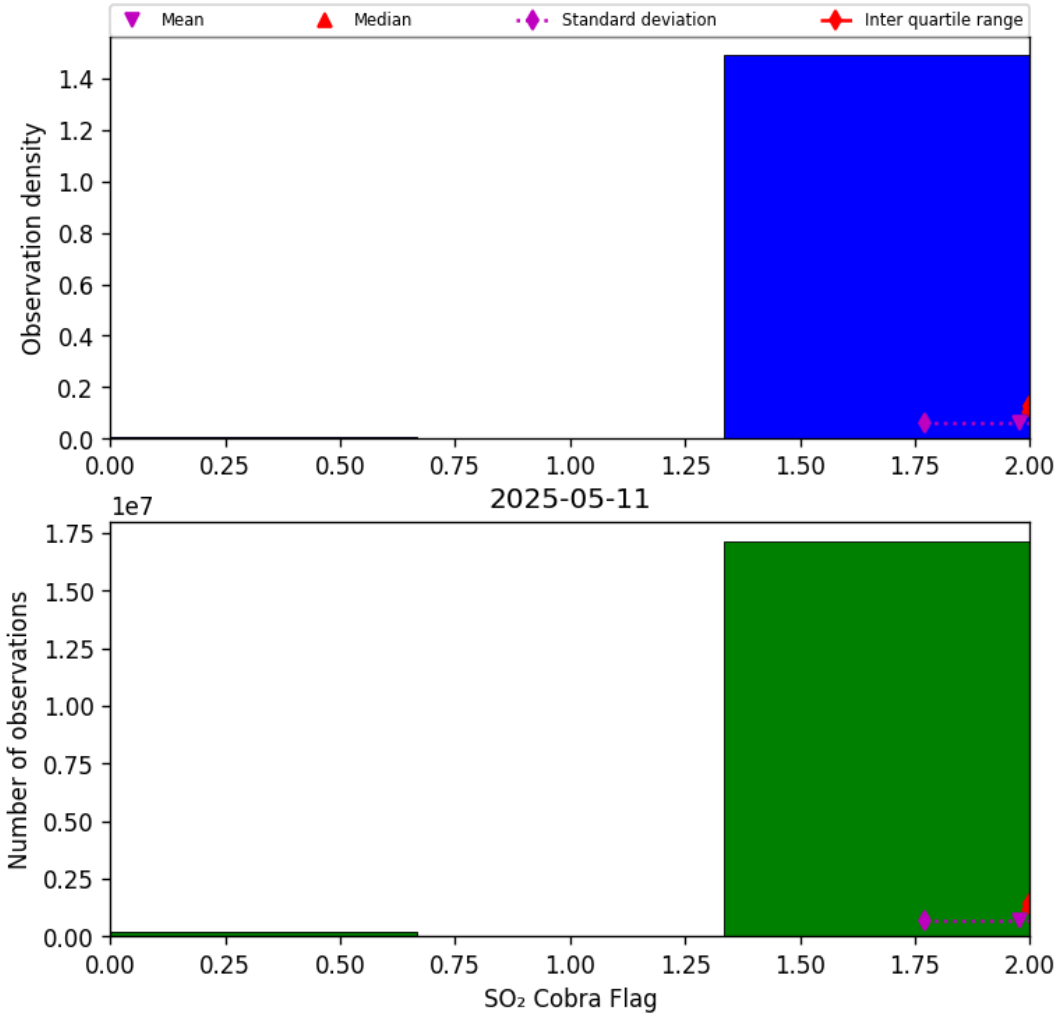

Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-05-11 to 2025-05-12

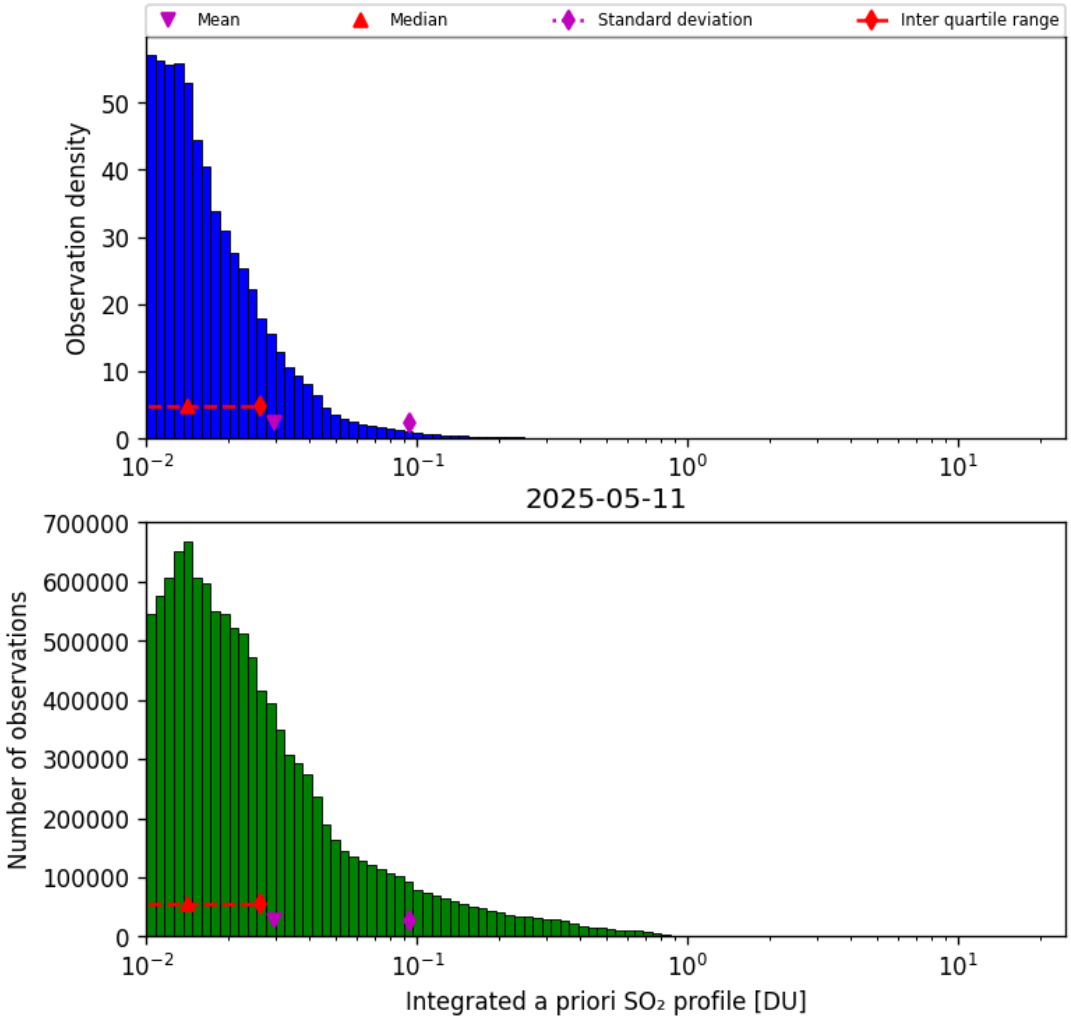

Figure 76: Histogram of “Integrated a priori SO_2 profile” for 2025-05-11 to 2025-05-12

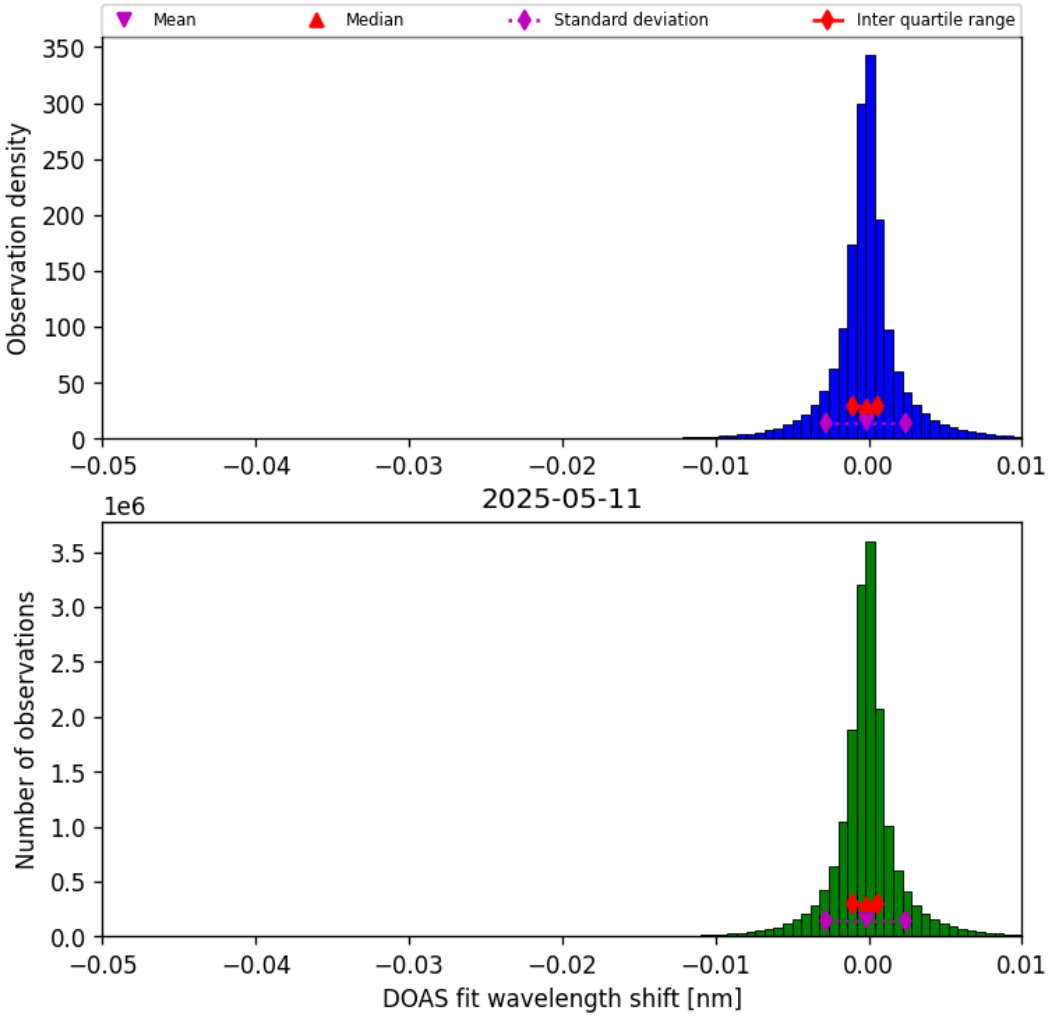

Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-05-11 to 2025-05-12

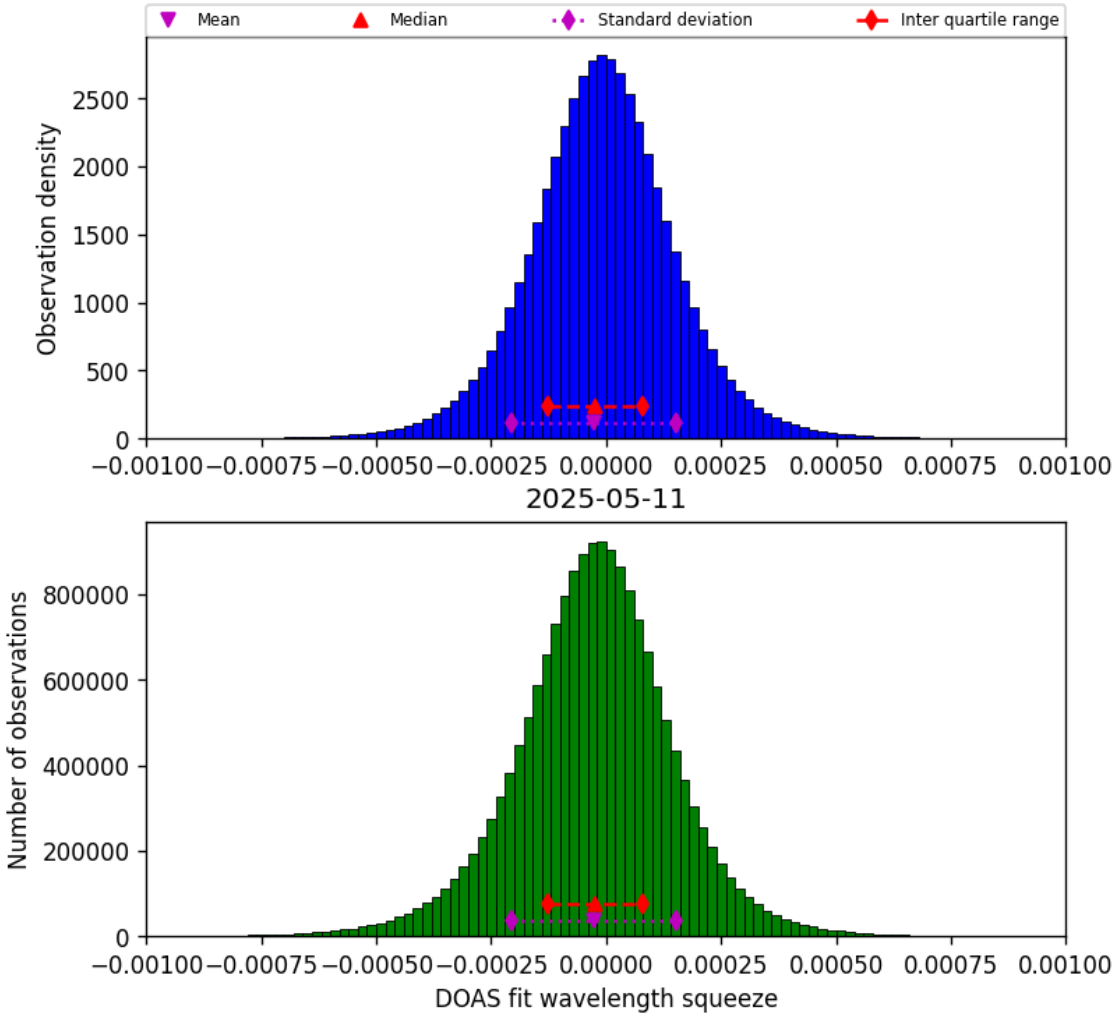

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-05-11 to 2025-05-12

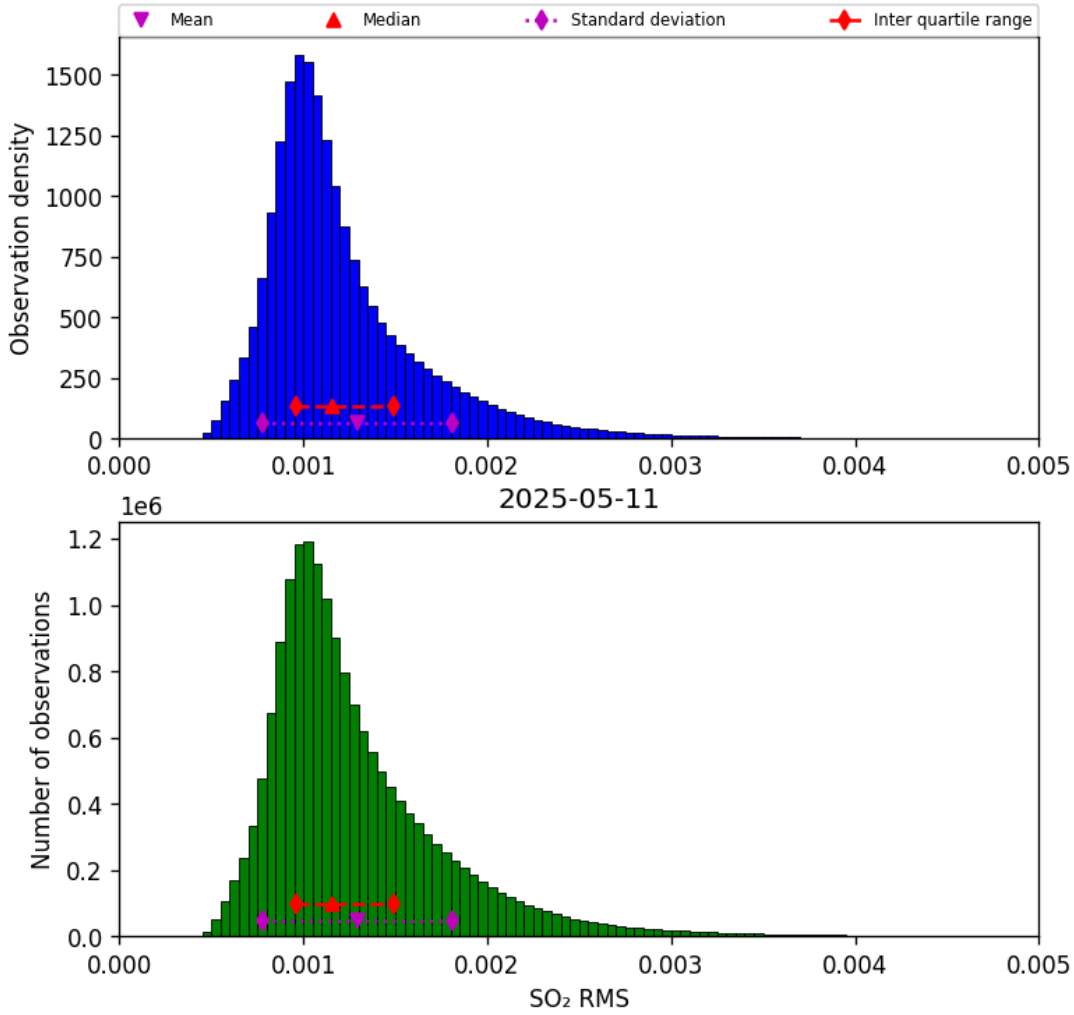

Figure 79: Histogram of "SO_2 RMS" for 2025-05-11 to 2025-05-12

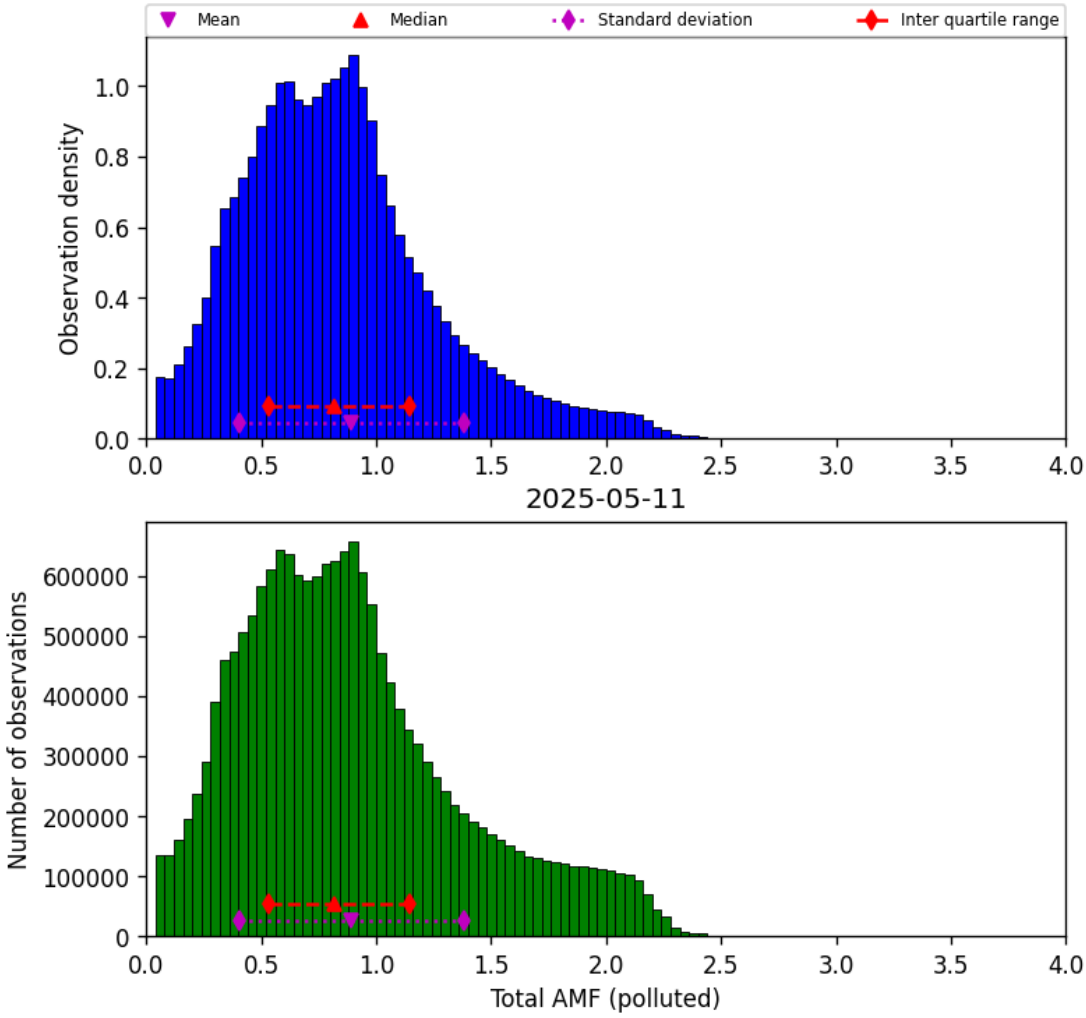

Figure 80: Histogram of “Total AMF (polluted)” for 2025-05-11 to 2025-05-12

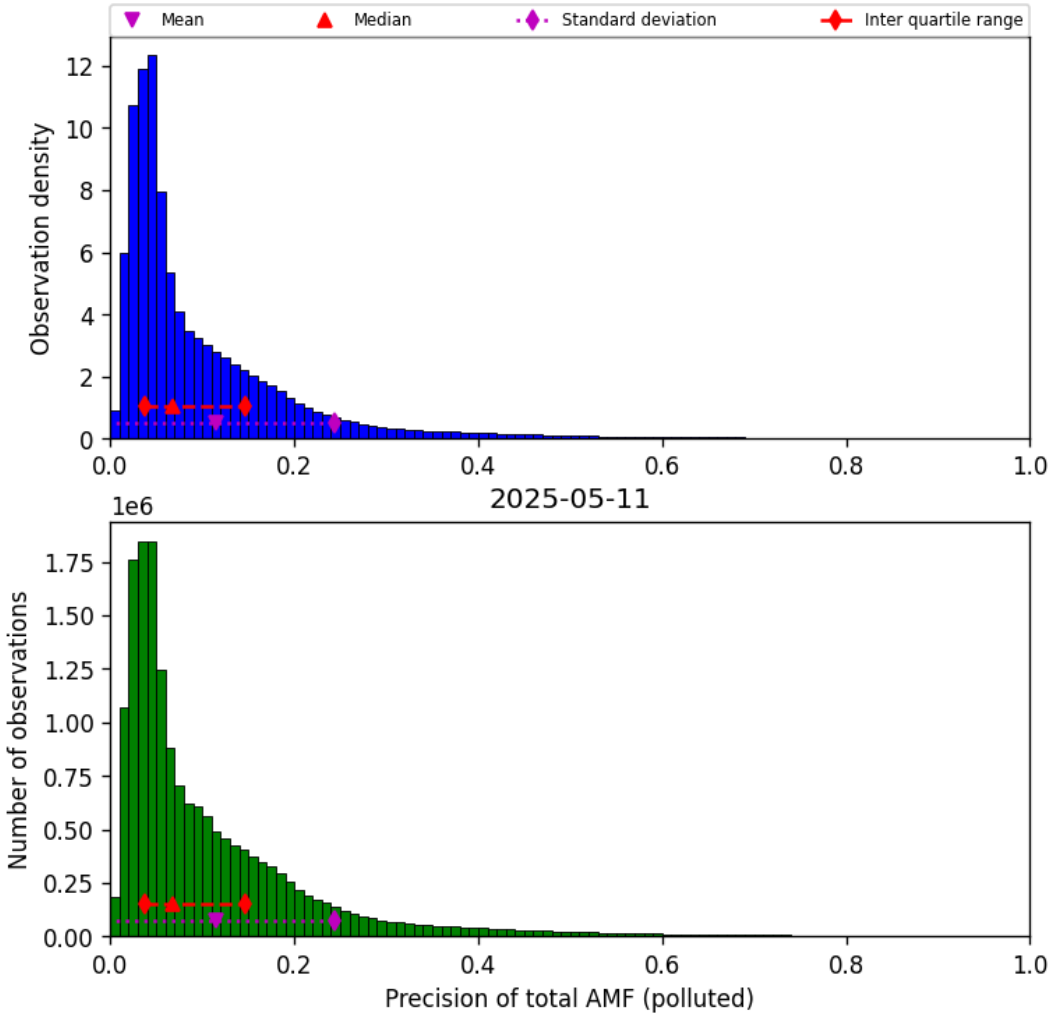

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-05-11 to 2025-05-12

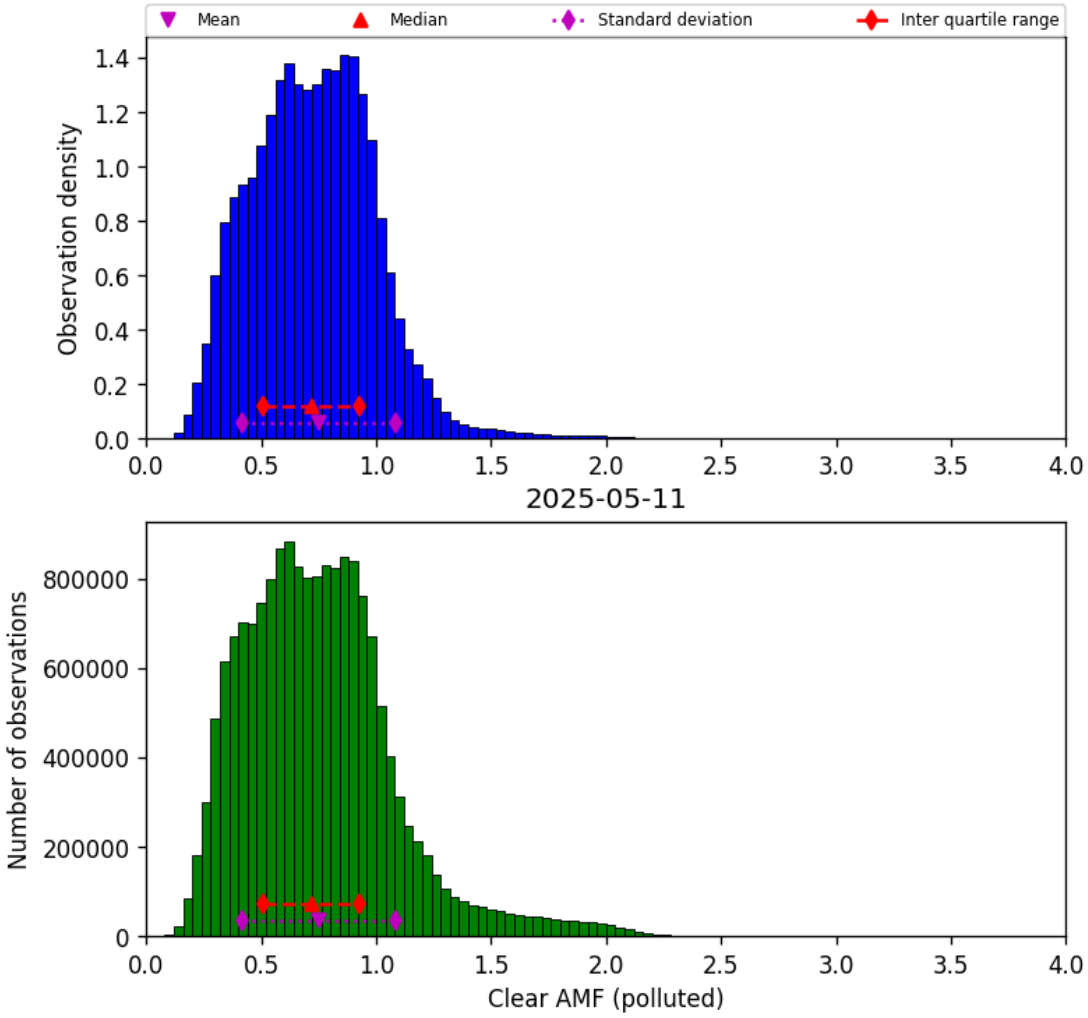

Figure 82: Histogram of “Clear AMF (polluted)” for 2025-05-11 to 2025-05-12

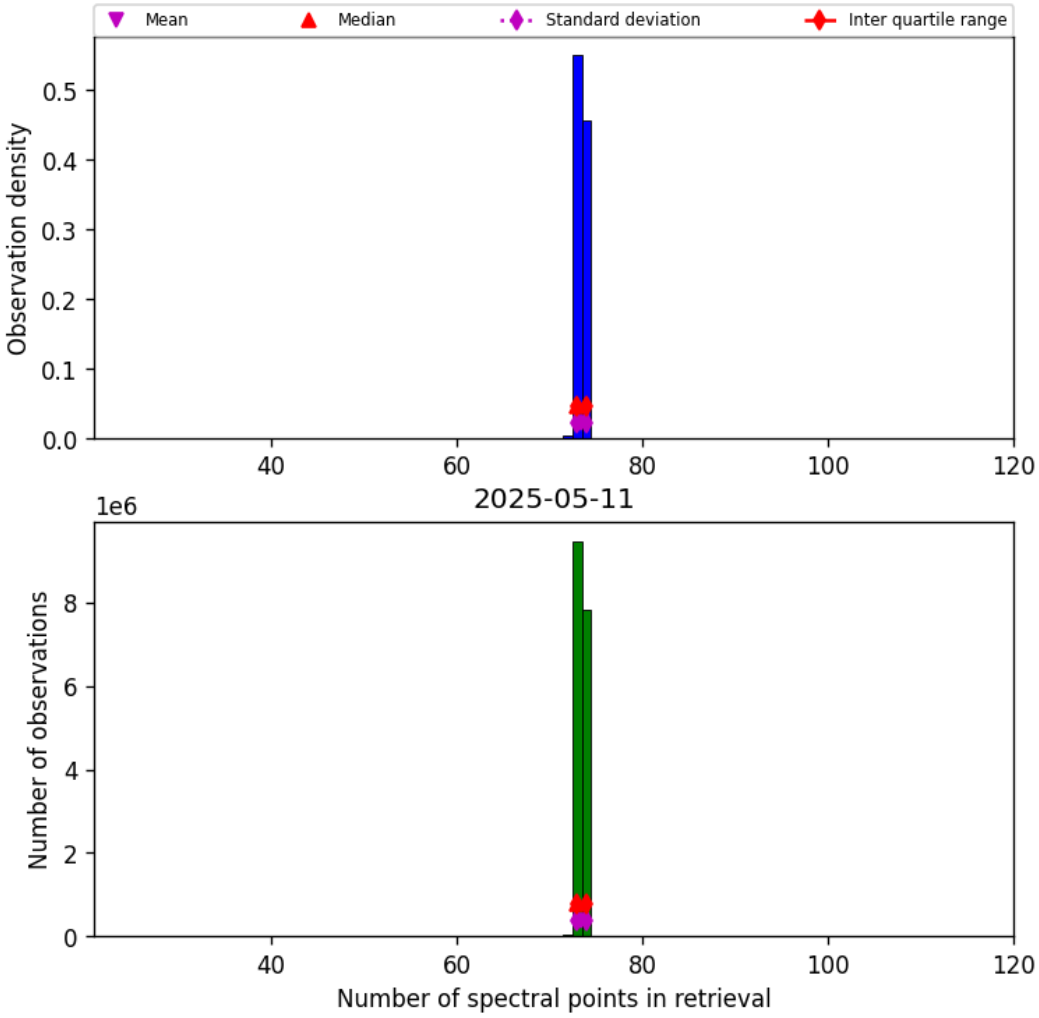

Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-05-11 to 2025-05-12

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.

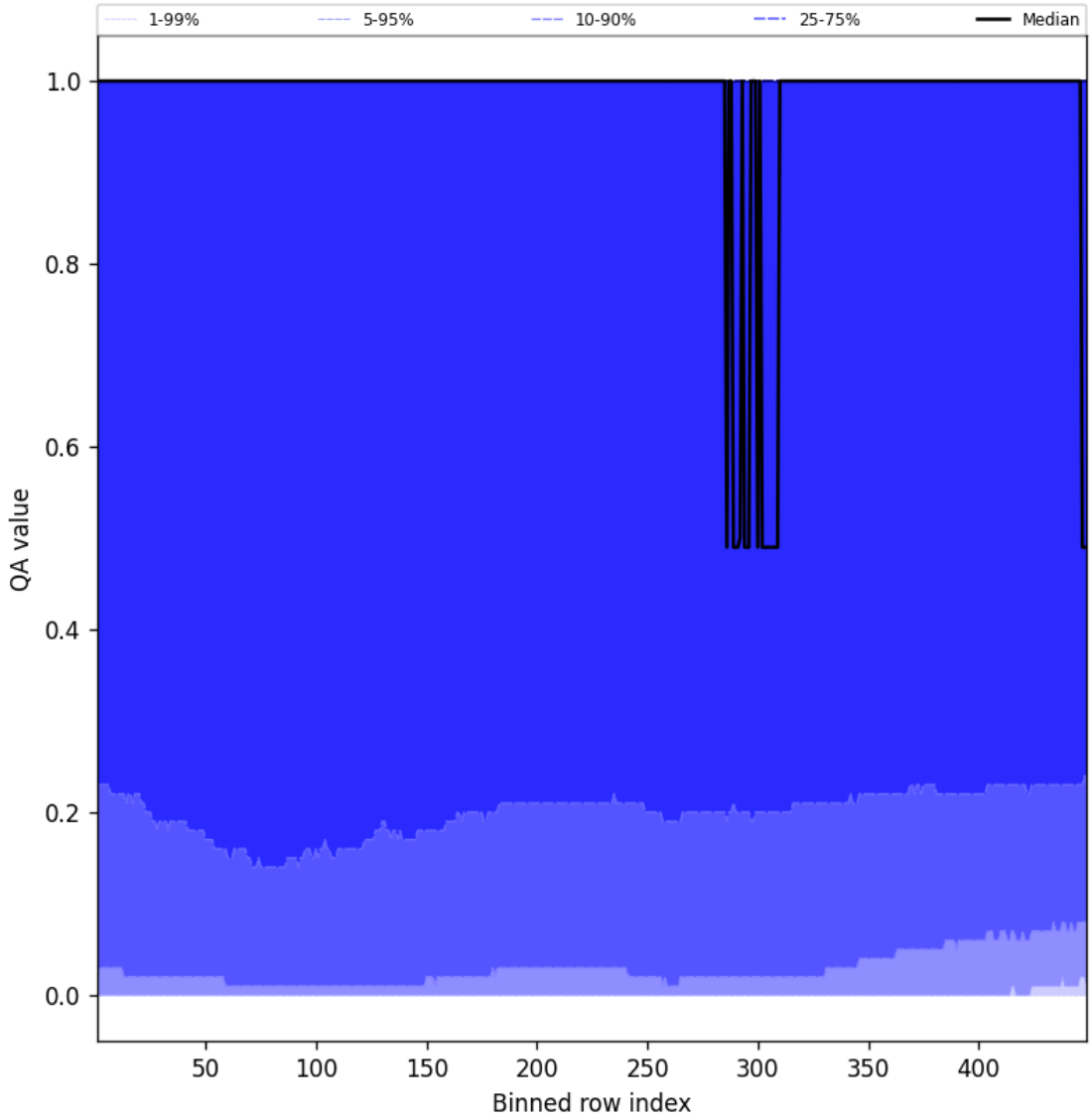

Figure 84: Along track statistics of “QA value” for 2025-05-11 to 2025-05-12

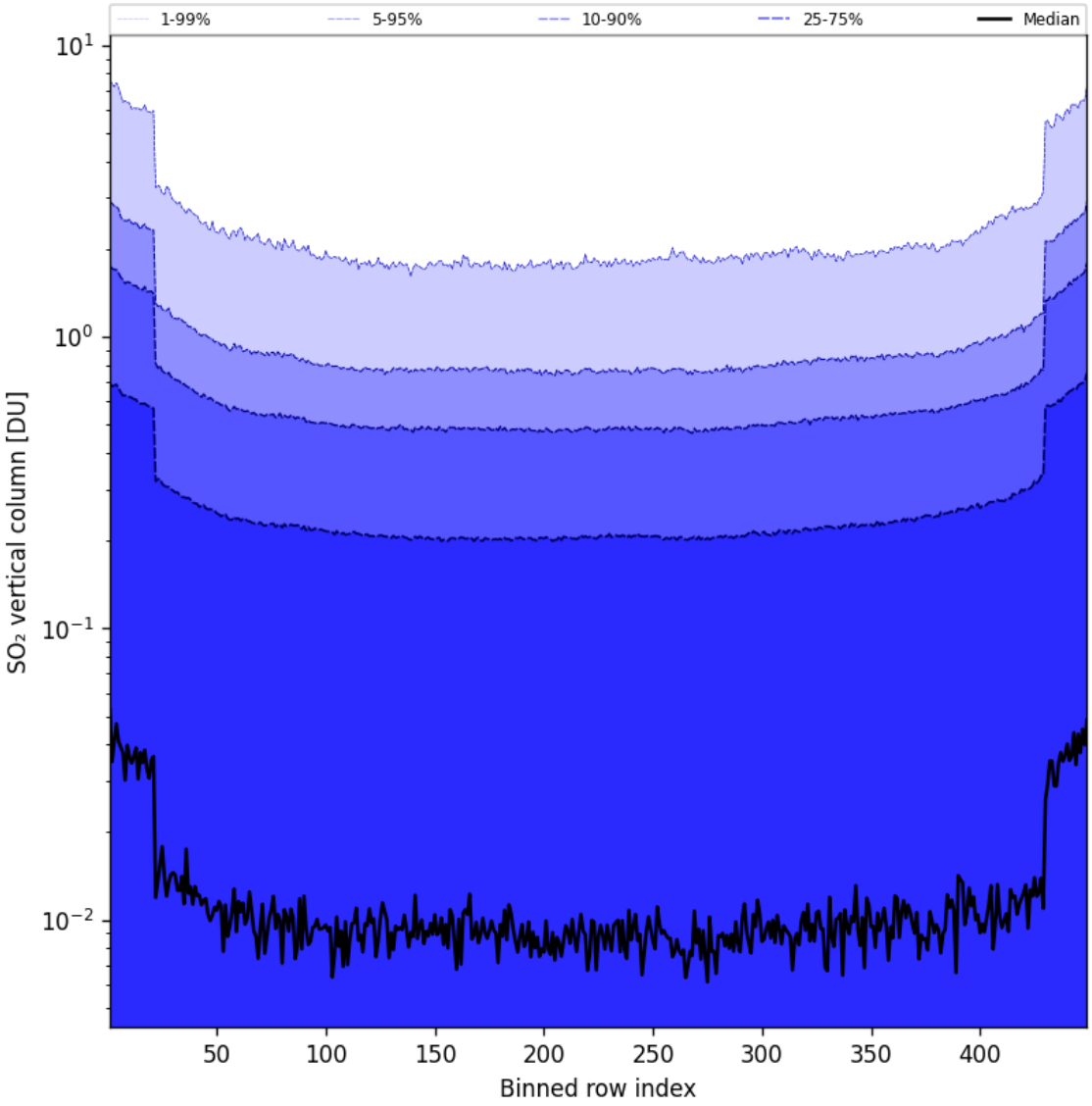

Figure 85: Along track statistics of "SO_2 vertical column" for 2025-05-11 to 2025-05-12

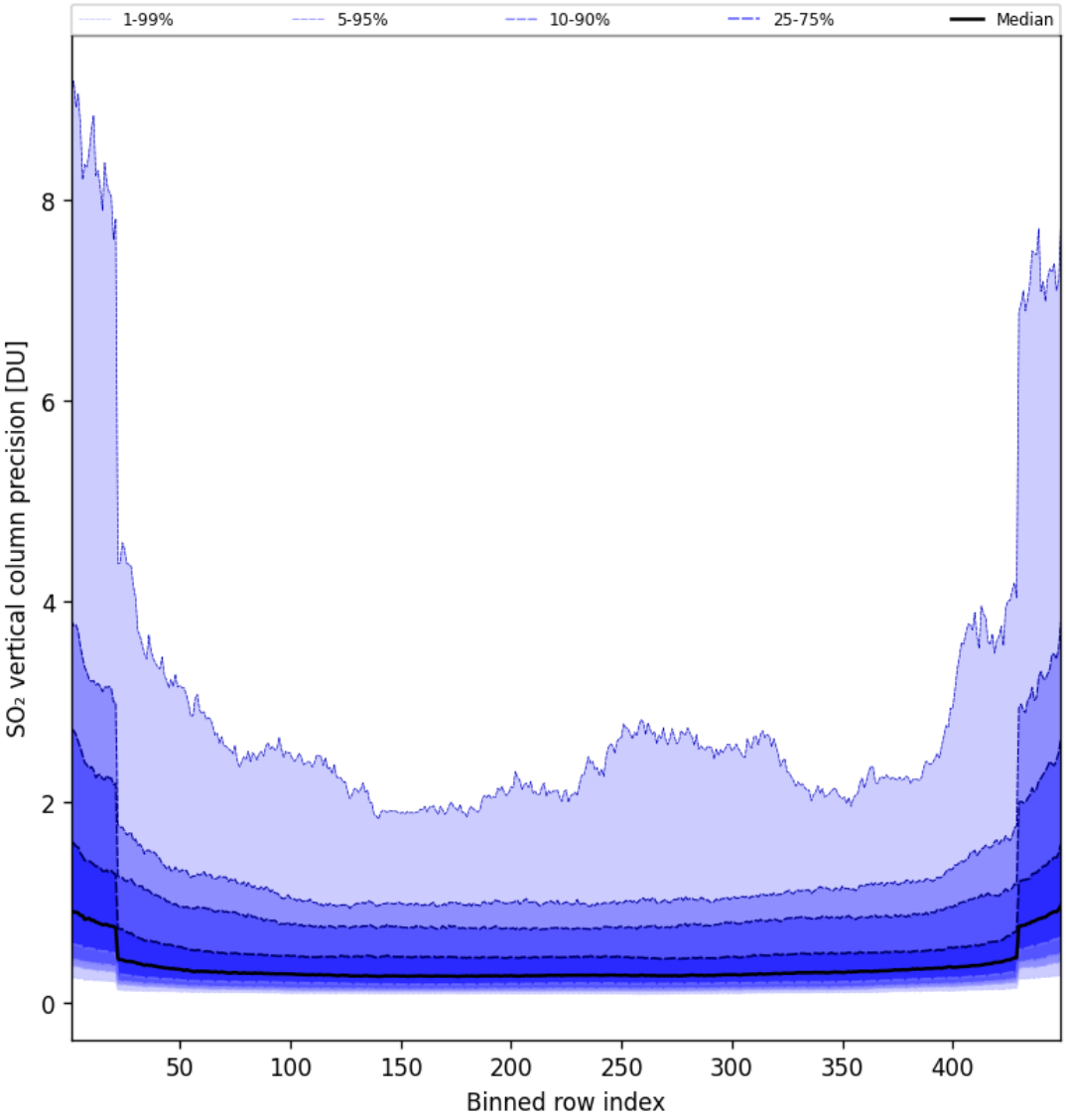

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-05-11 to 2025-05-12

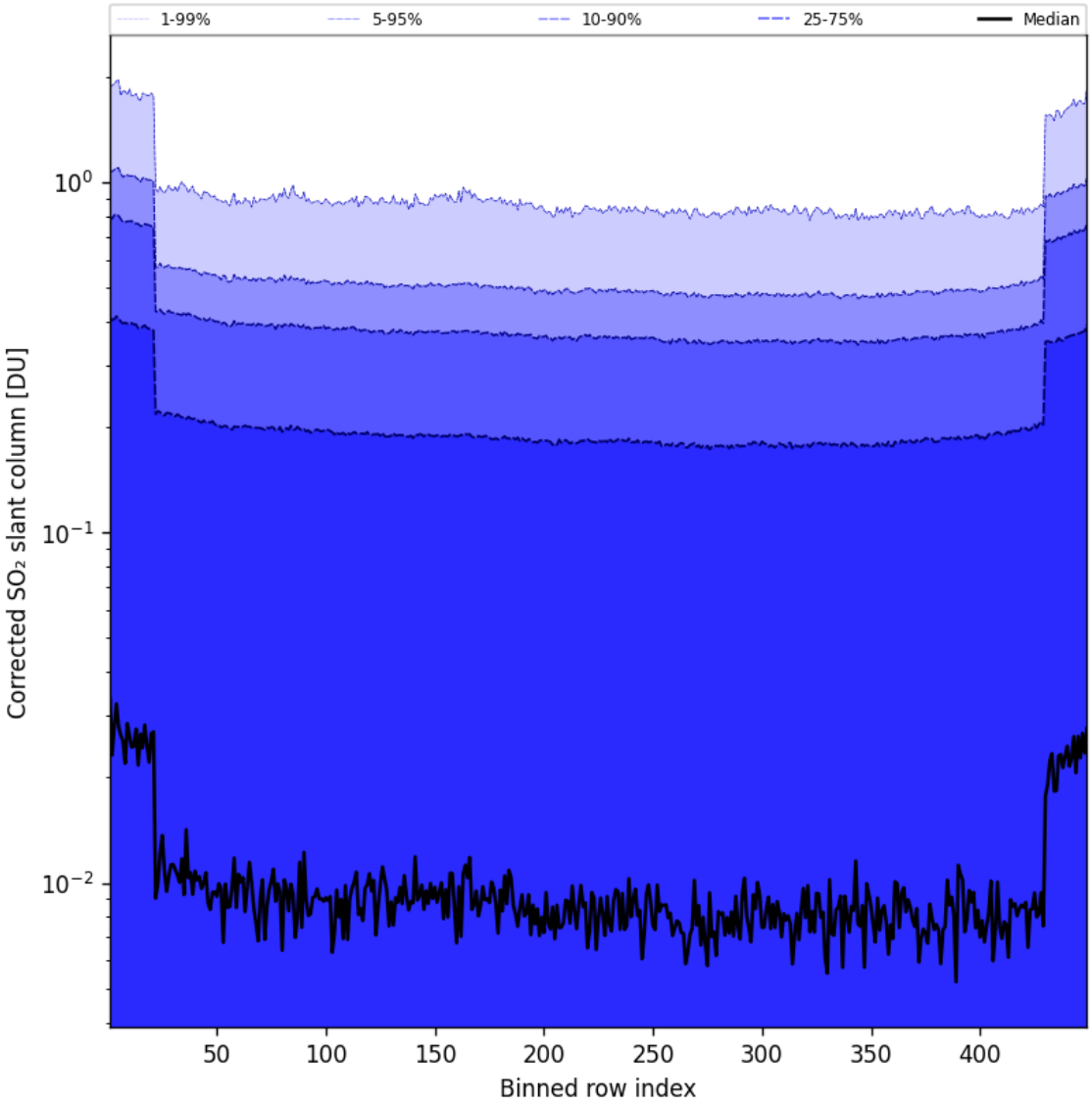

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-05-11 to 2025-05-12

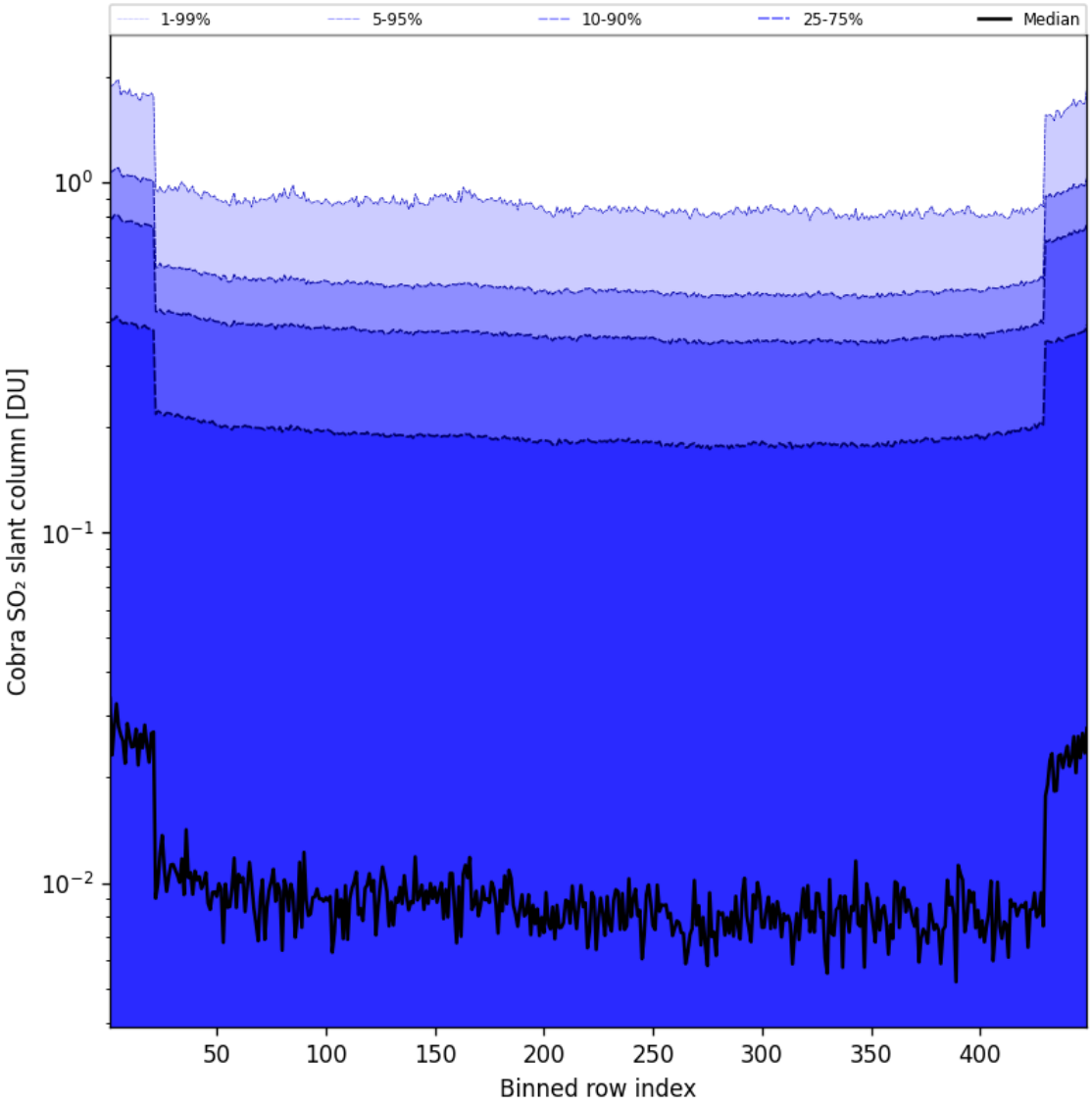

Figure 88: Along track statistics of “Cobra SO_2 slant column” for 2025-05-11 to 2025-05-12

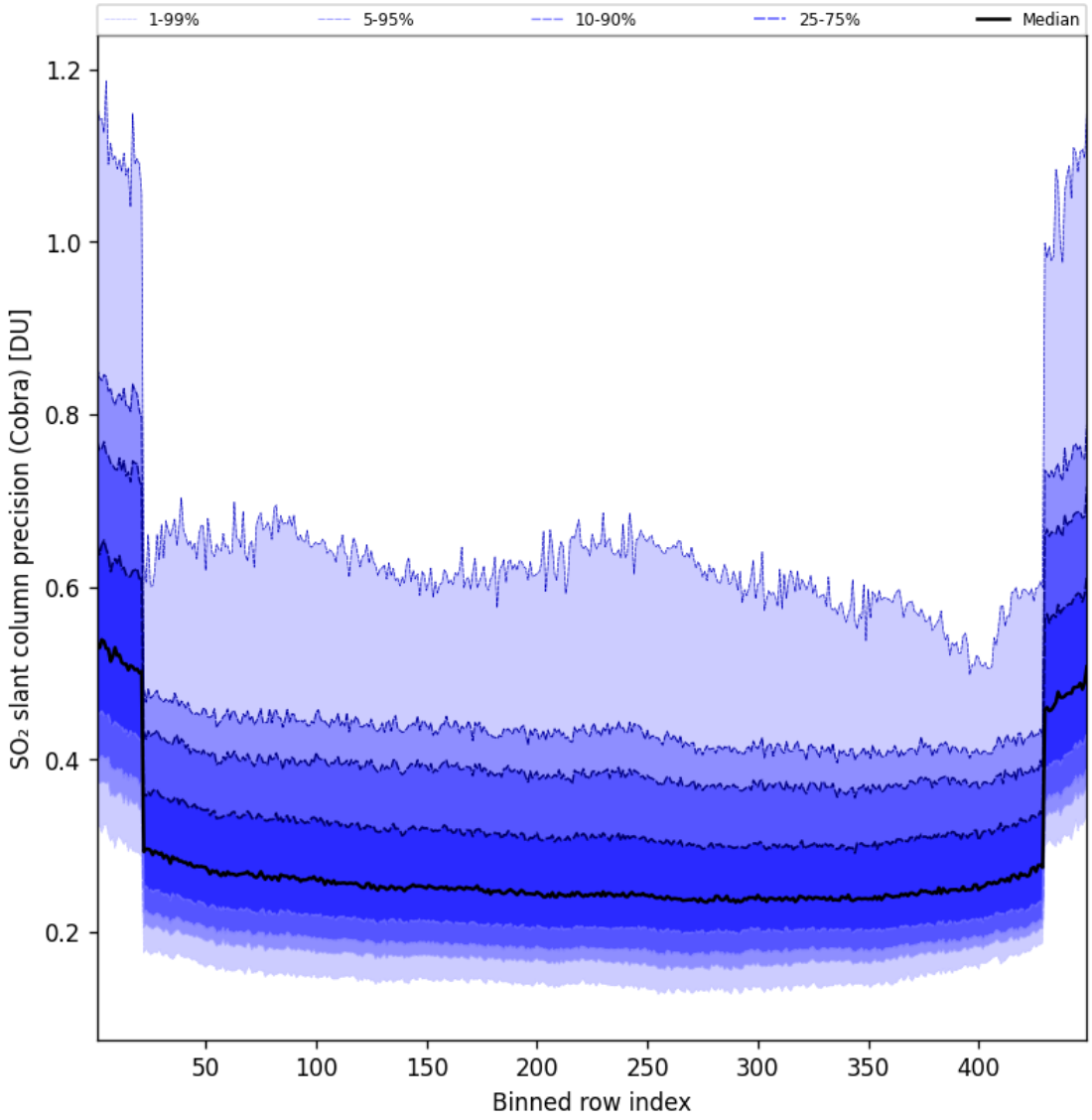

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-05-11 to 2025-05-12

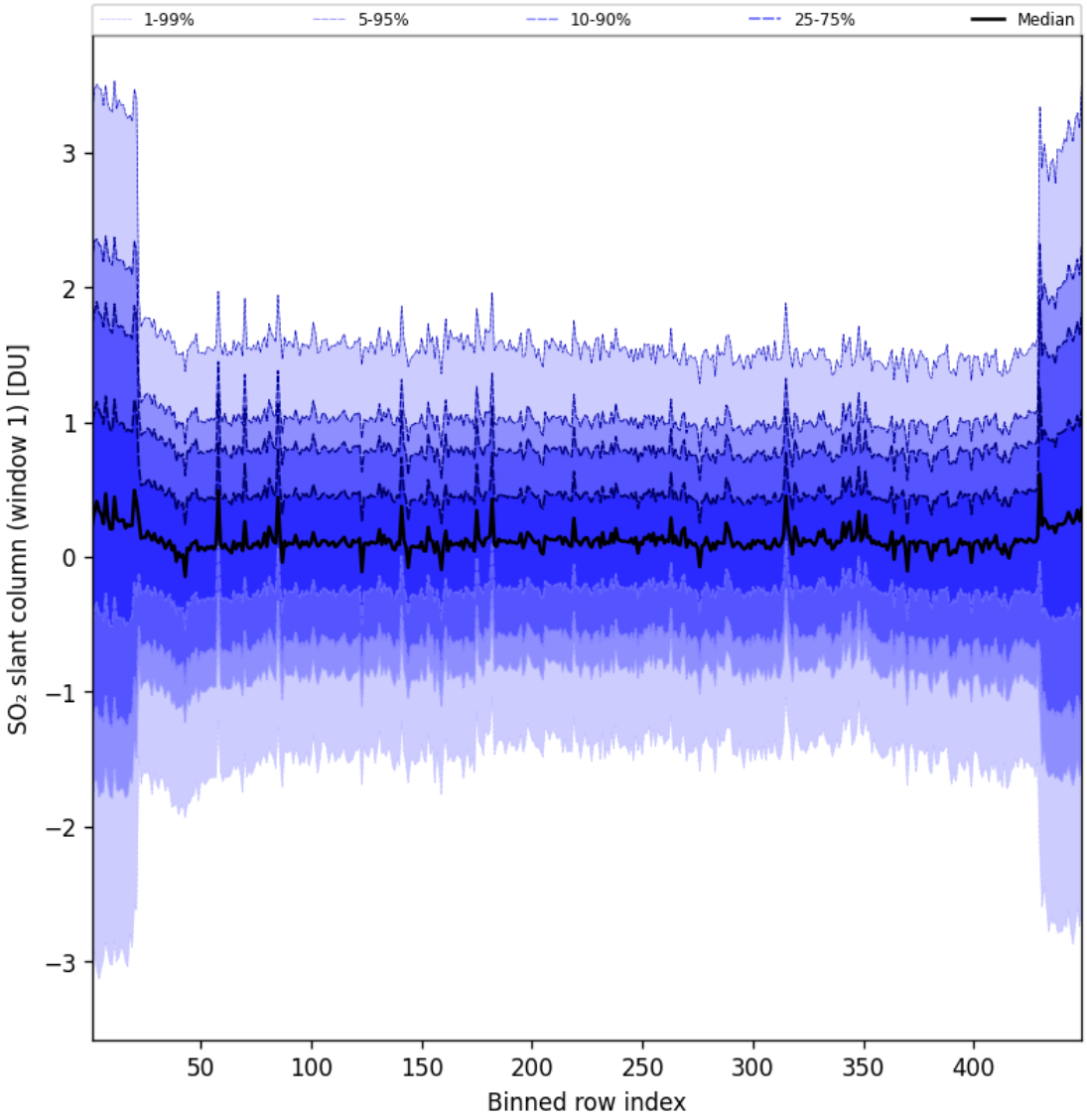

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-05-11 to 2025-05-12

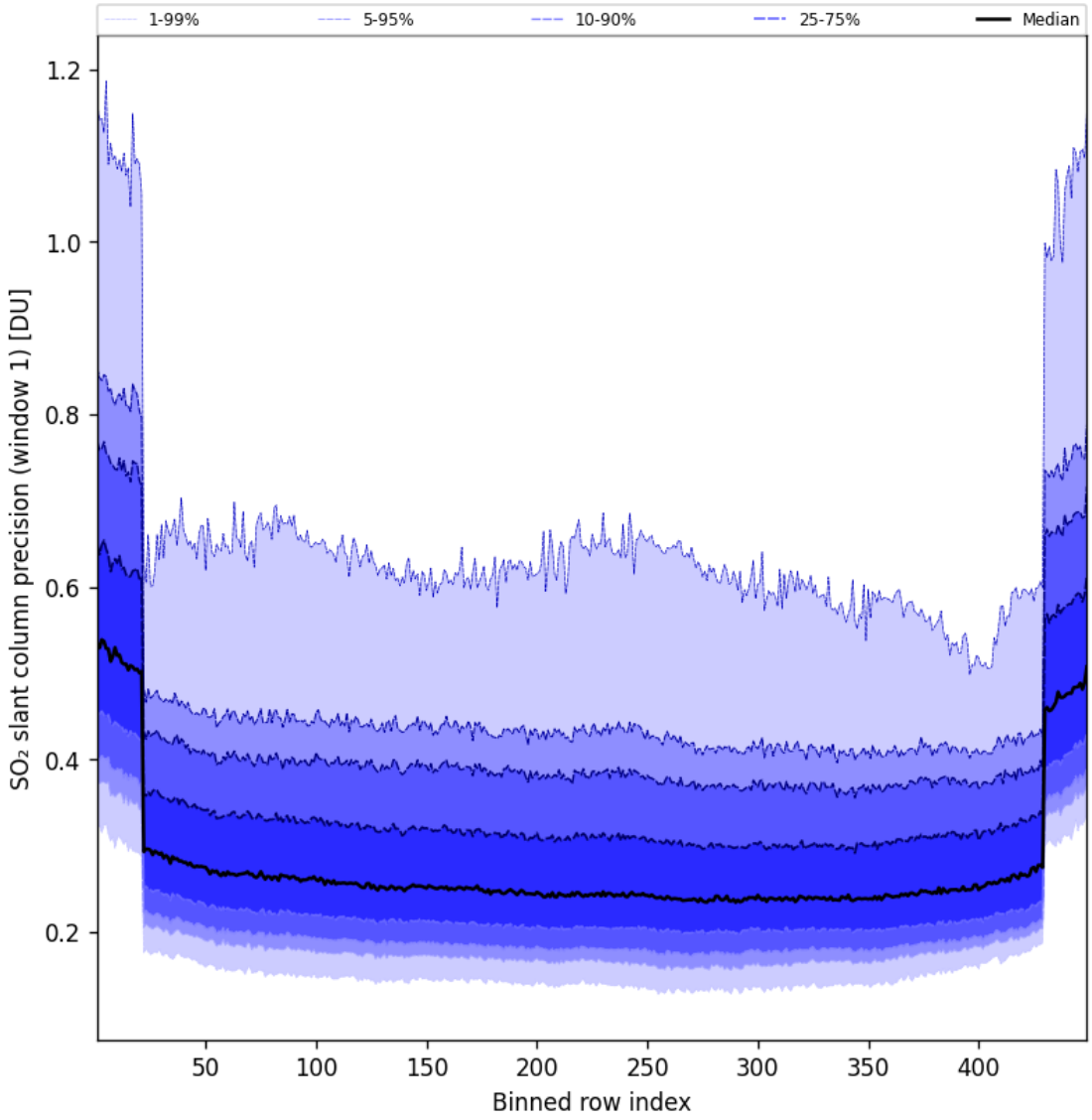

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-05-11 to 2025-05-12

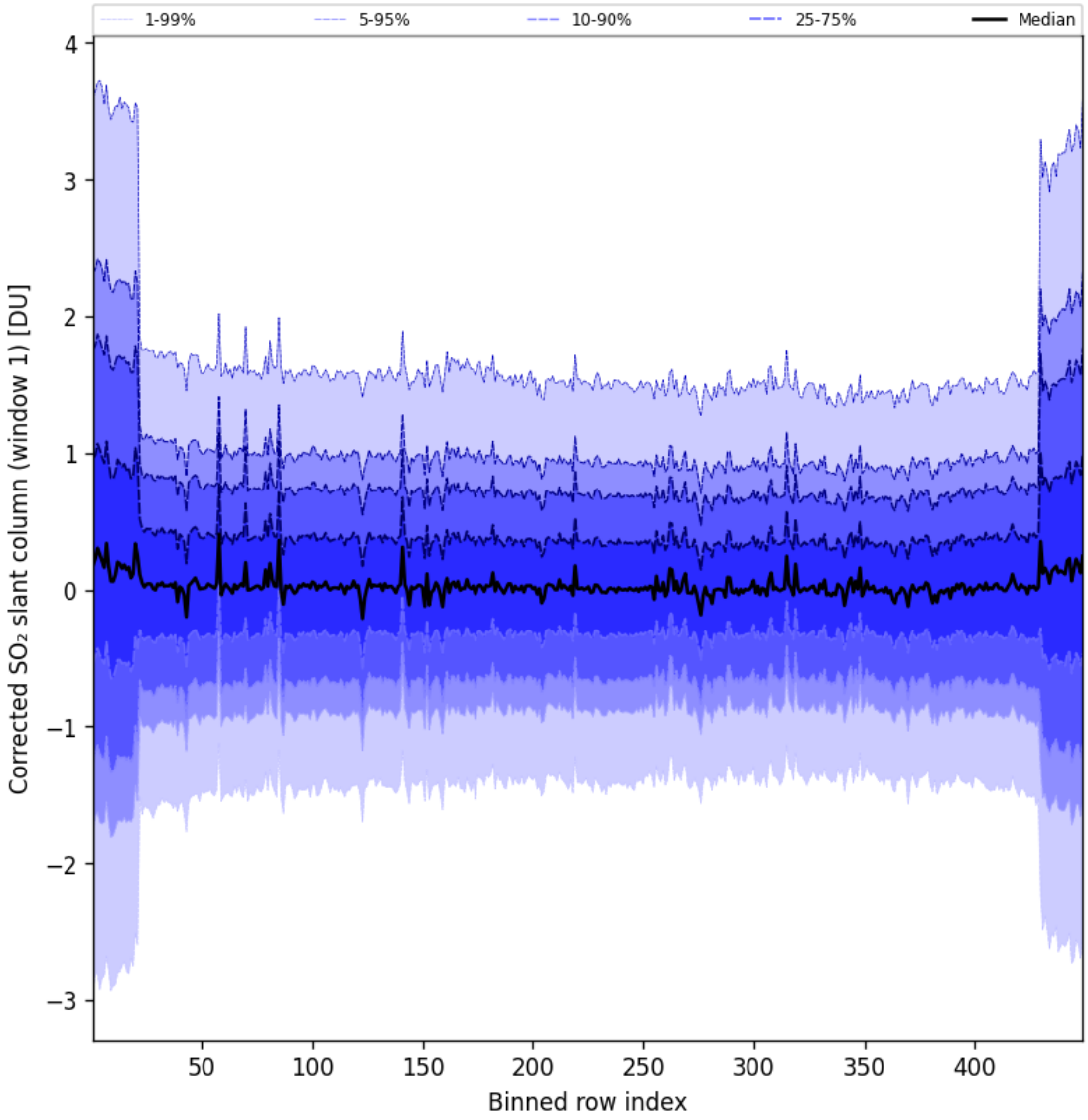

Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-05-11 to 2025-05-12

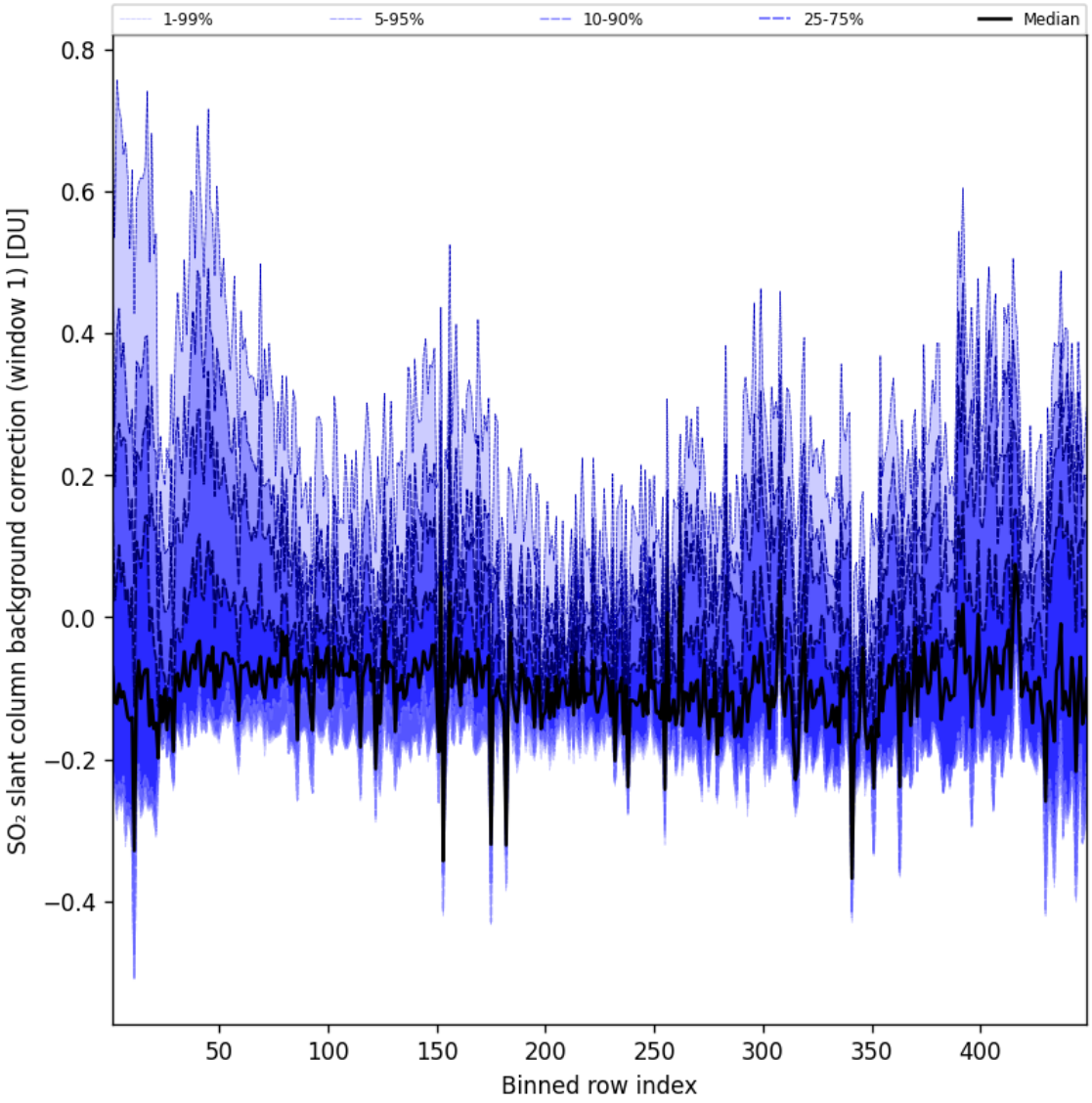

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-05-11 to 2025-05-12

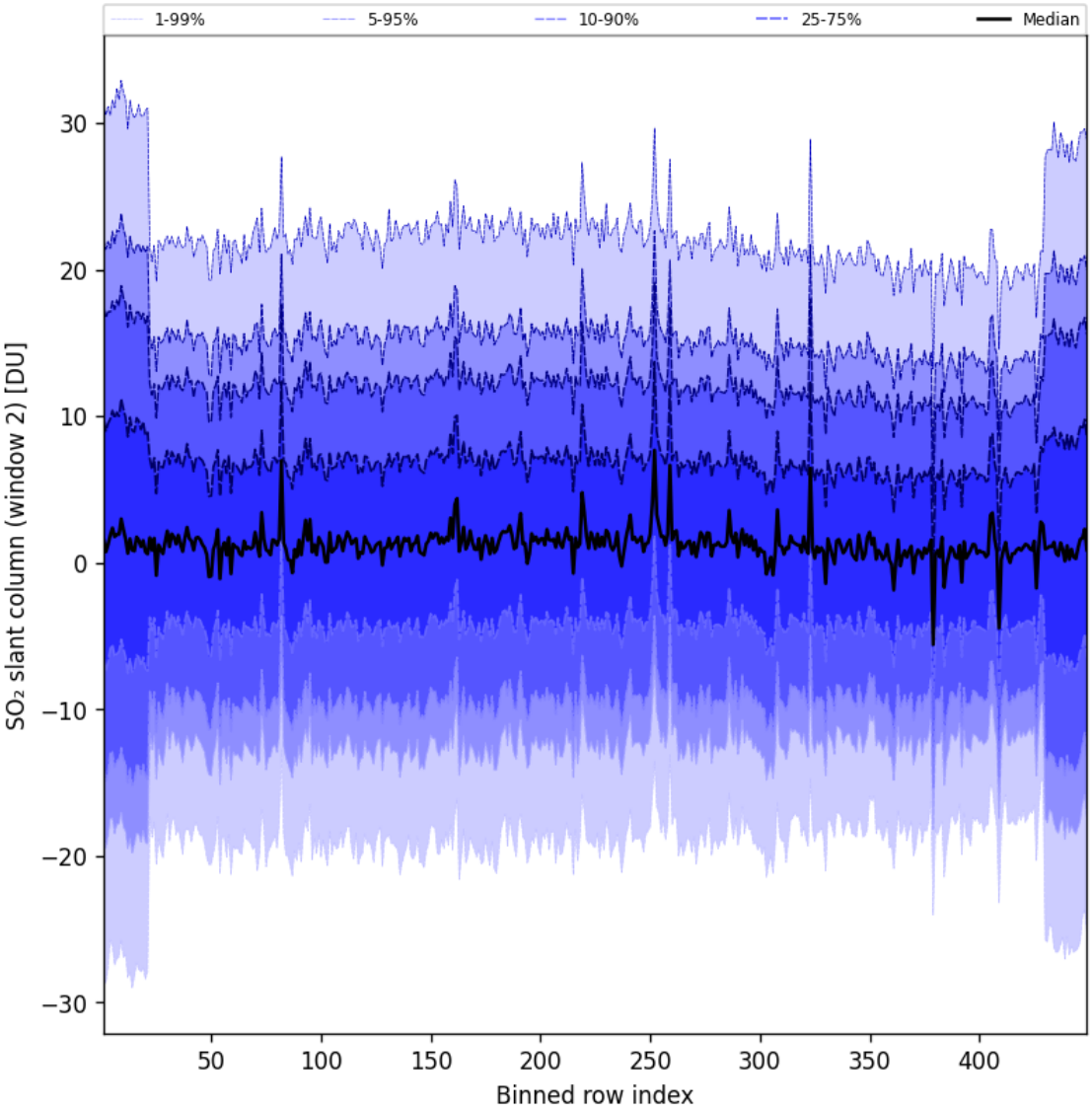

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-05-11 to 2025-05-12

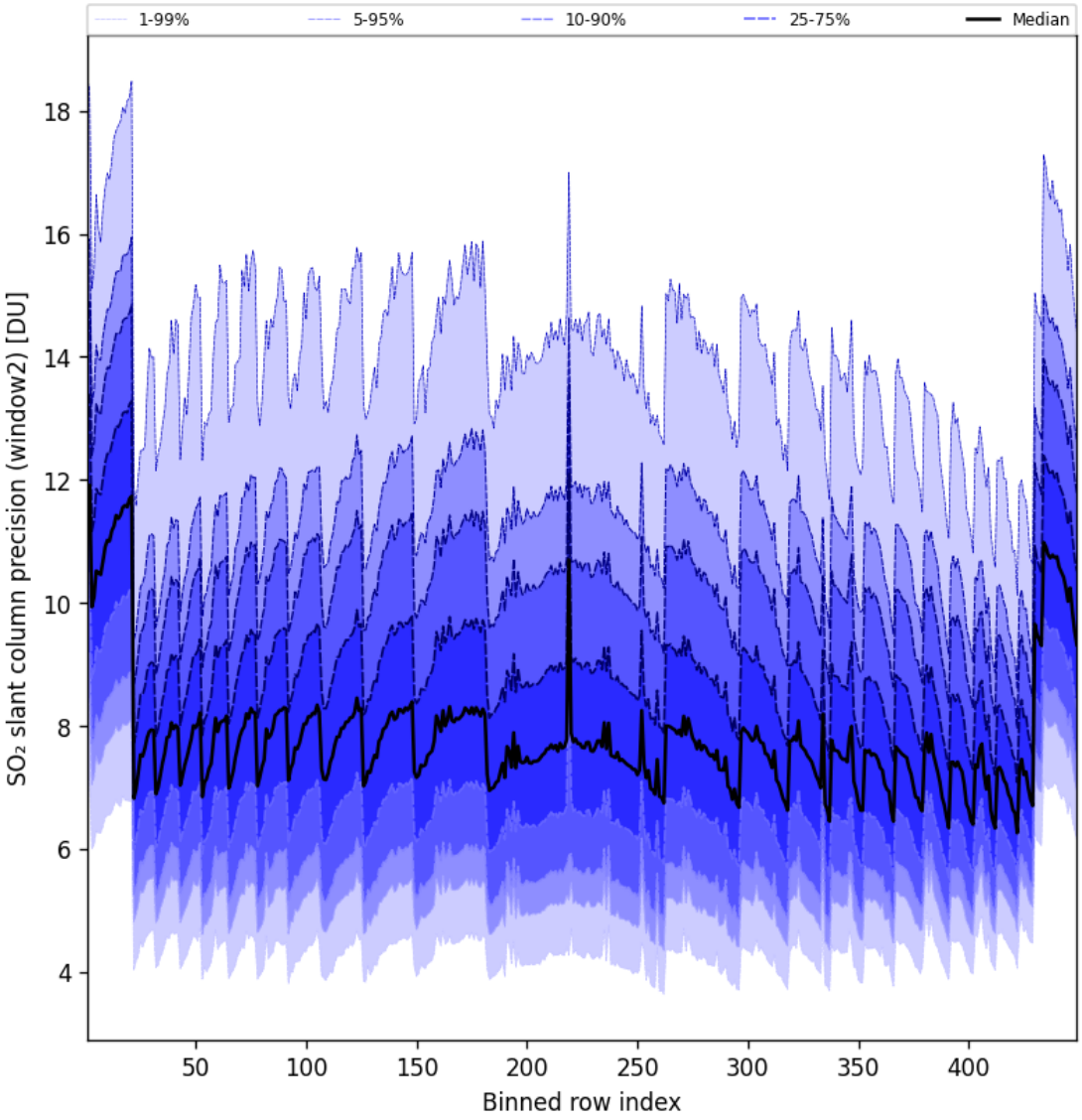

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-05-11 to 2025-05-12

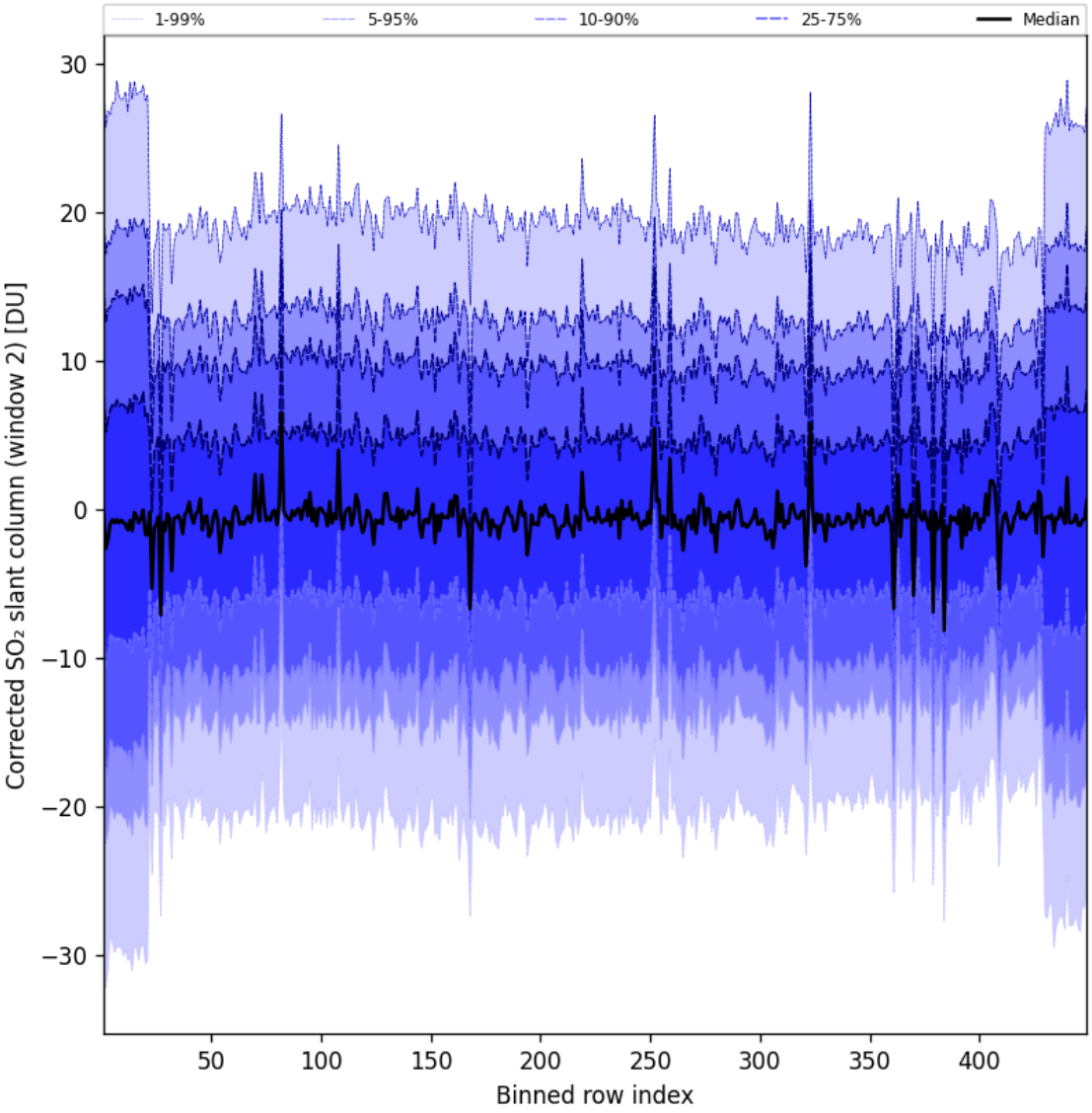

Figure 96: Along track statistics of "Corrected SO_2 slant column (window 2)" for 2025-05-11 to 2025-05-12

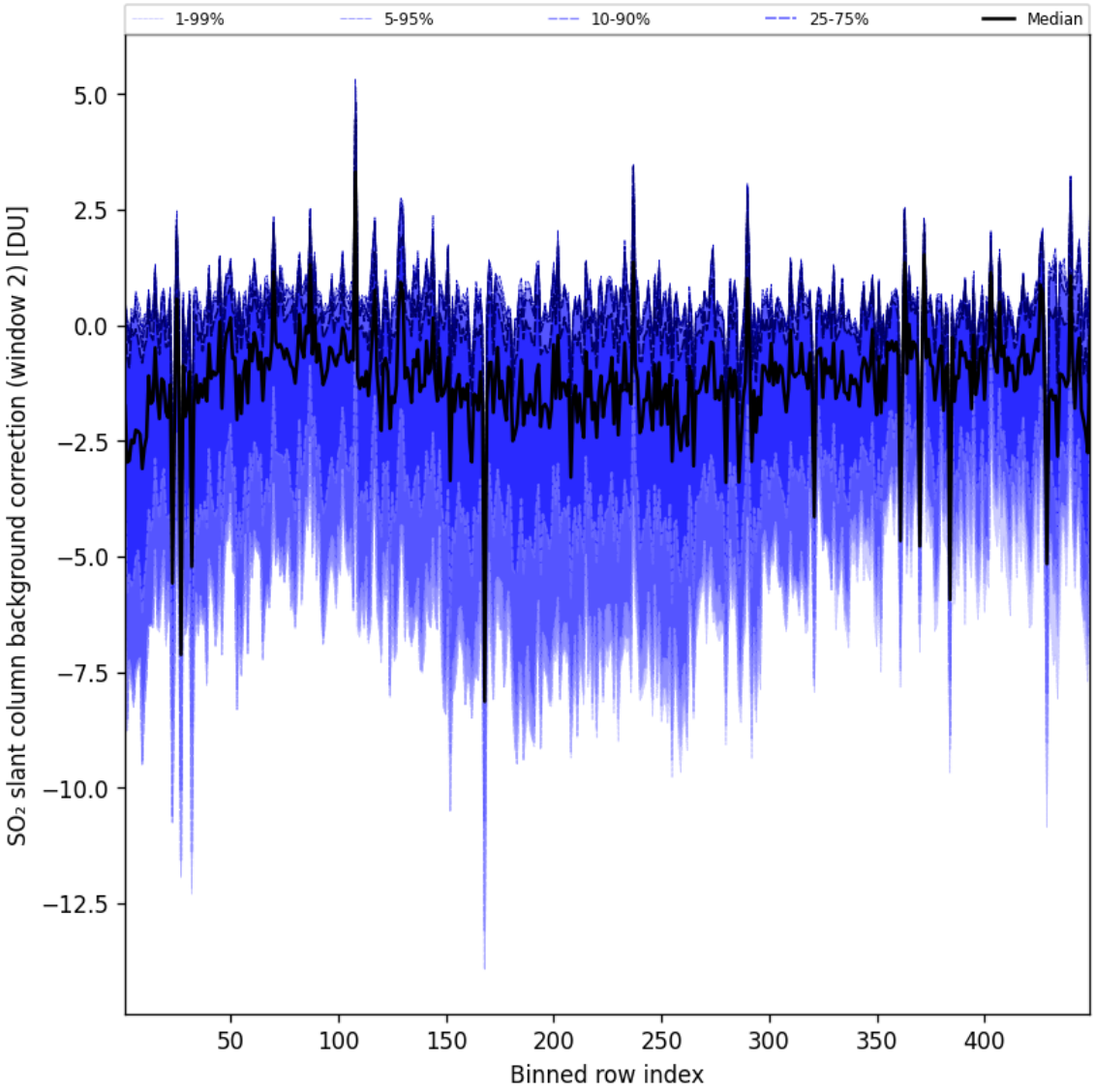

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-05-11 to 2025-05-12

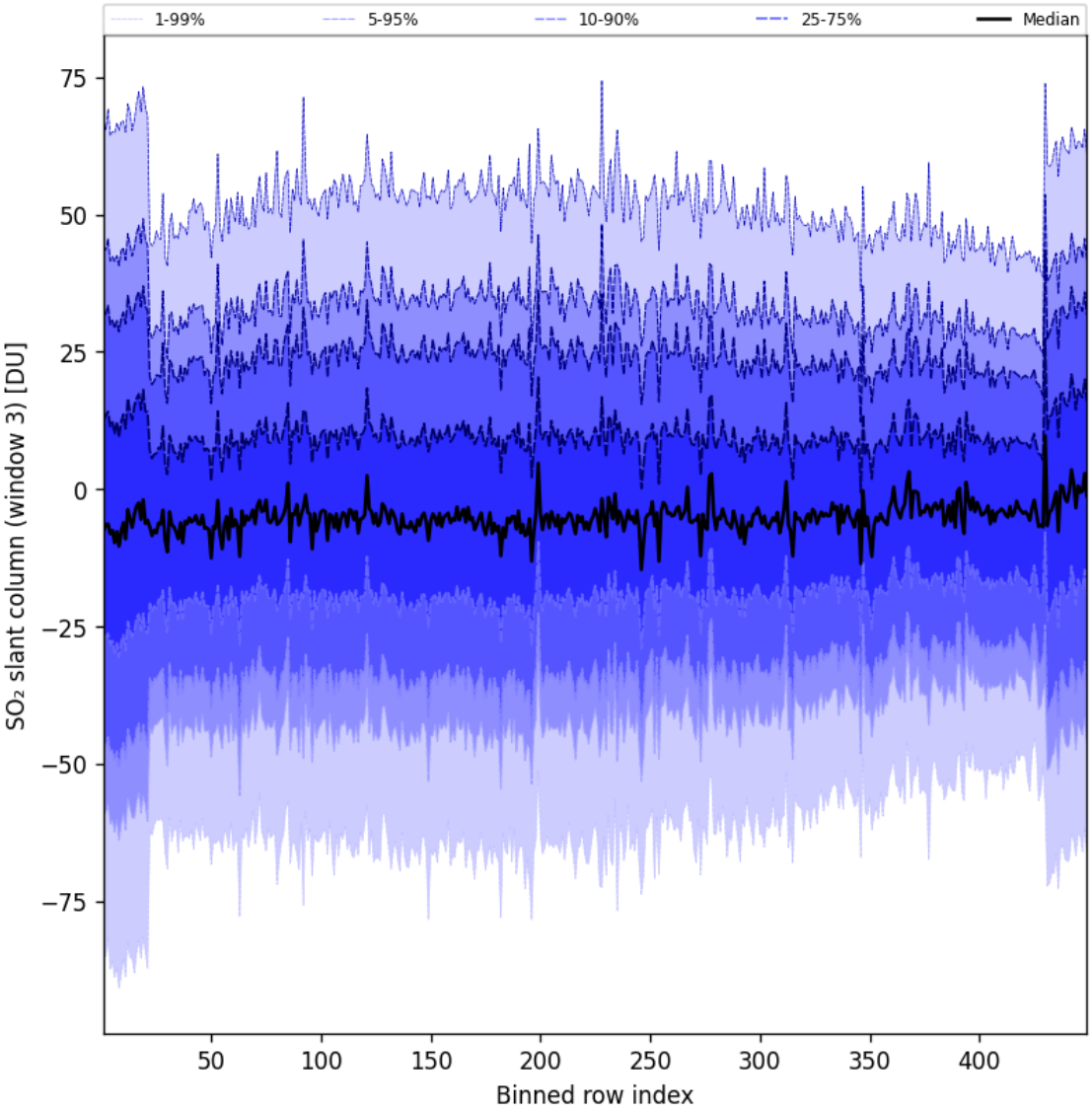

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-05-11 to 2025-05-12

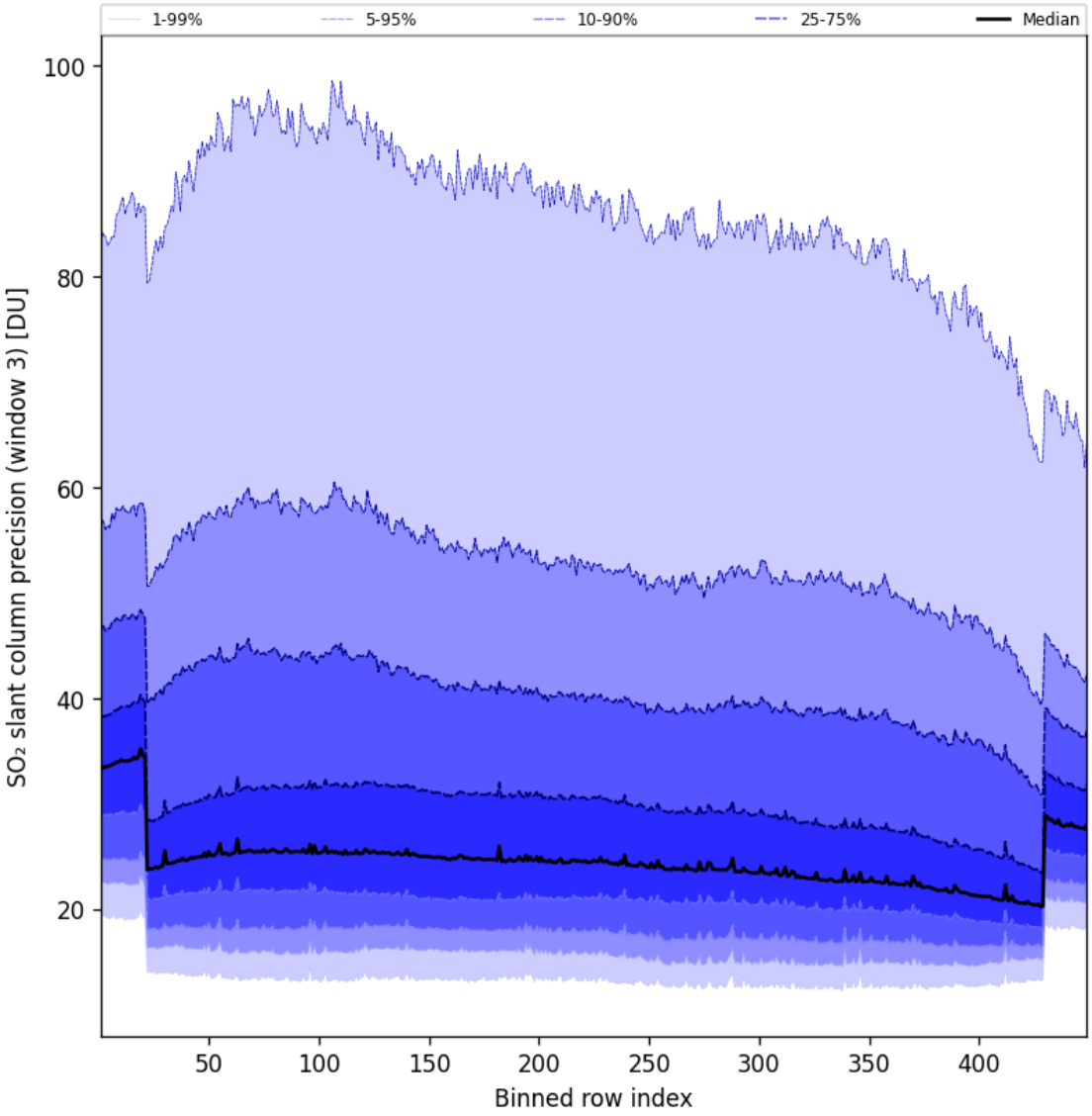

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-05-11 to 2025-05-12

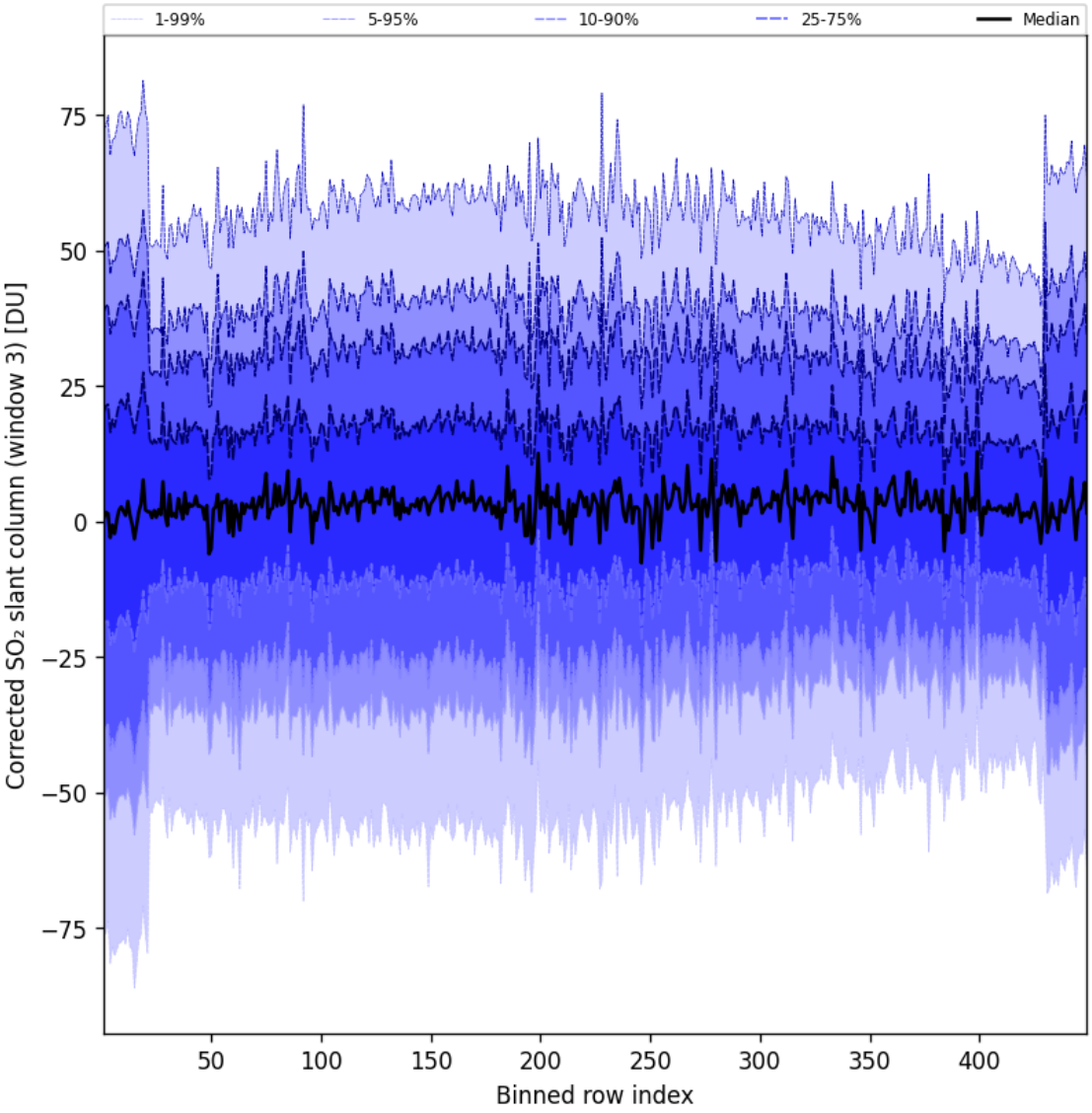

Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-05-11 to 2025-05-12

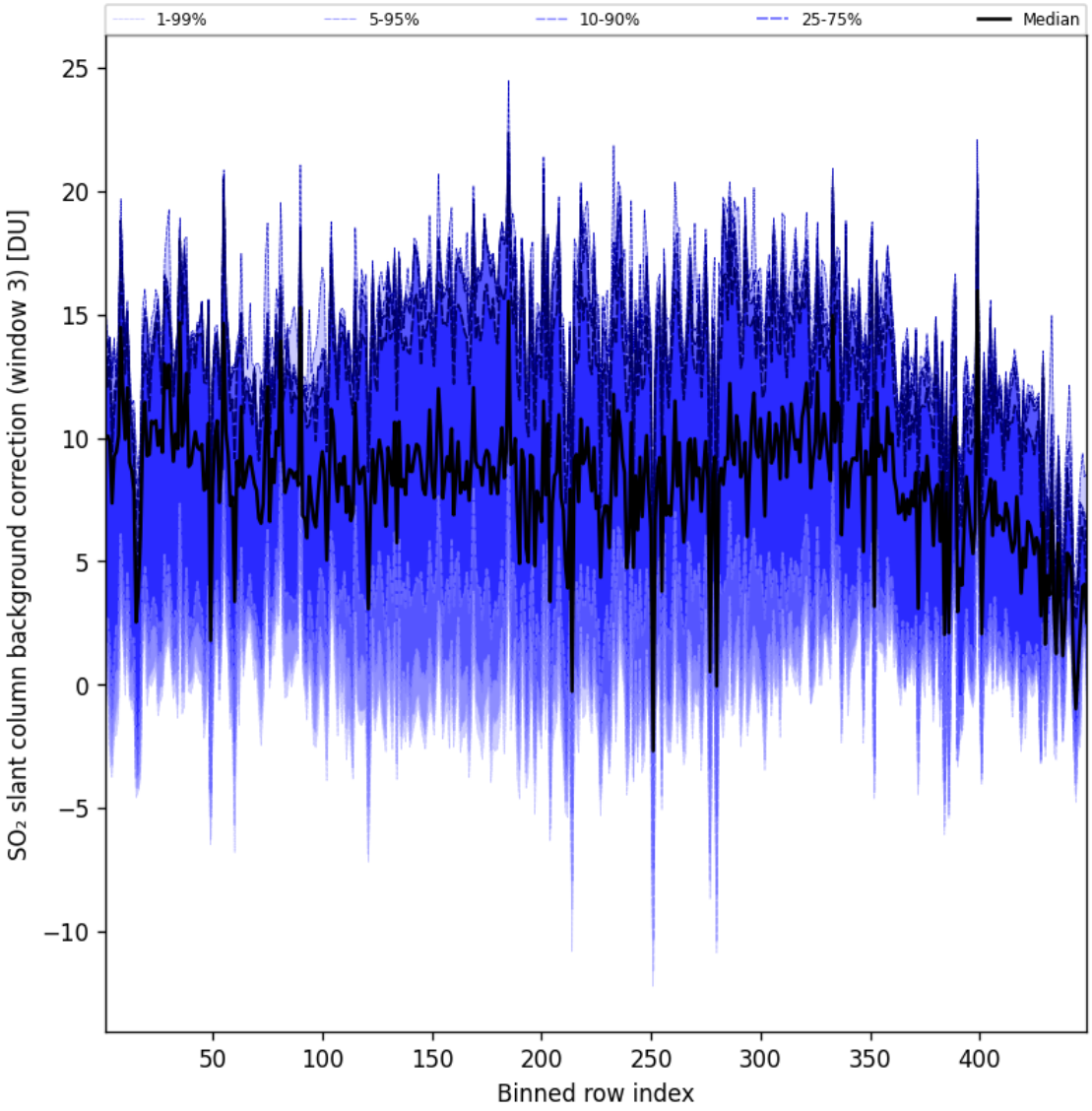

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-05-11 to 2025-05-12

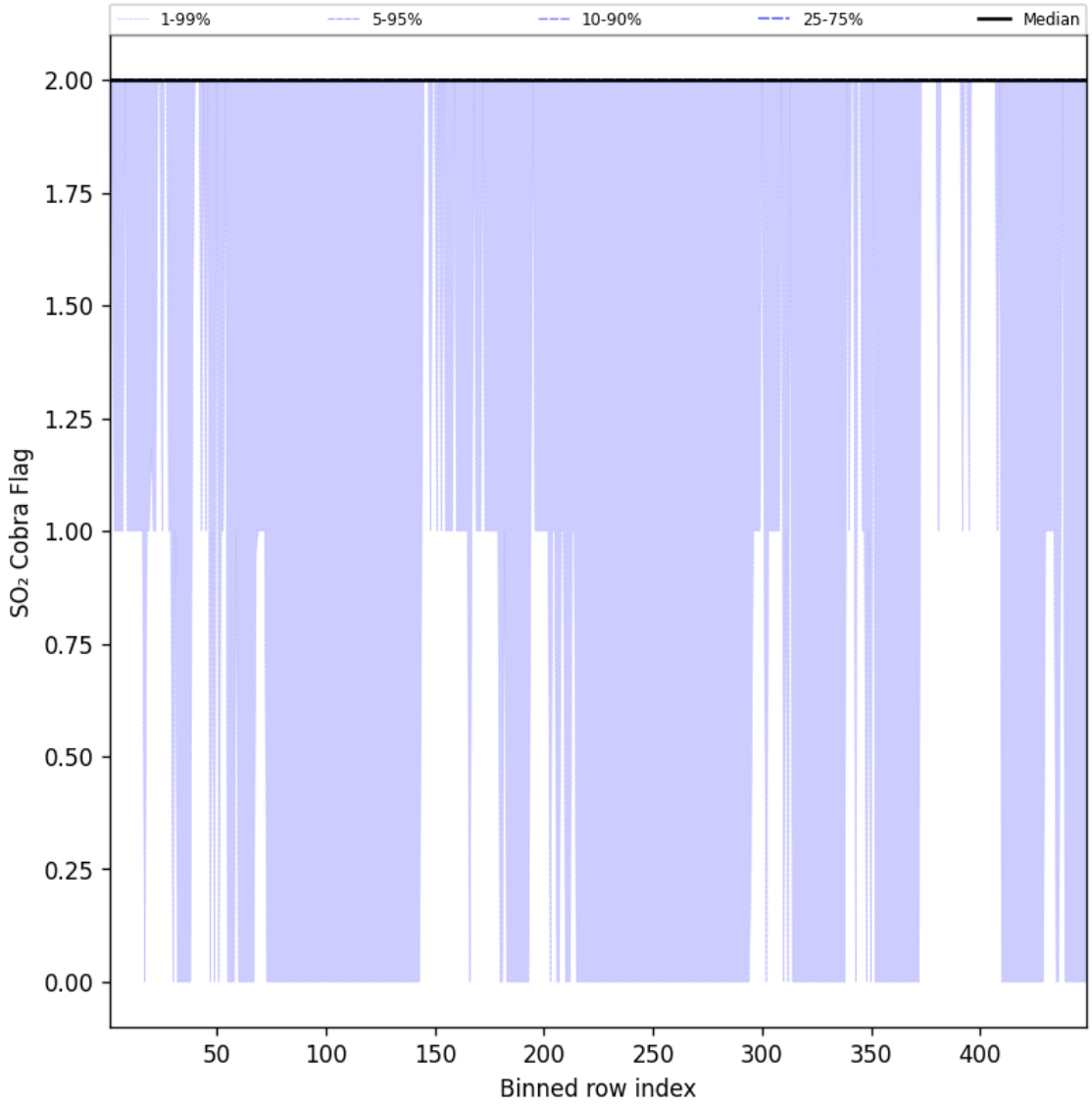

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-05-11 to 2025-05-12

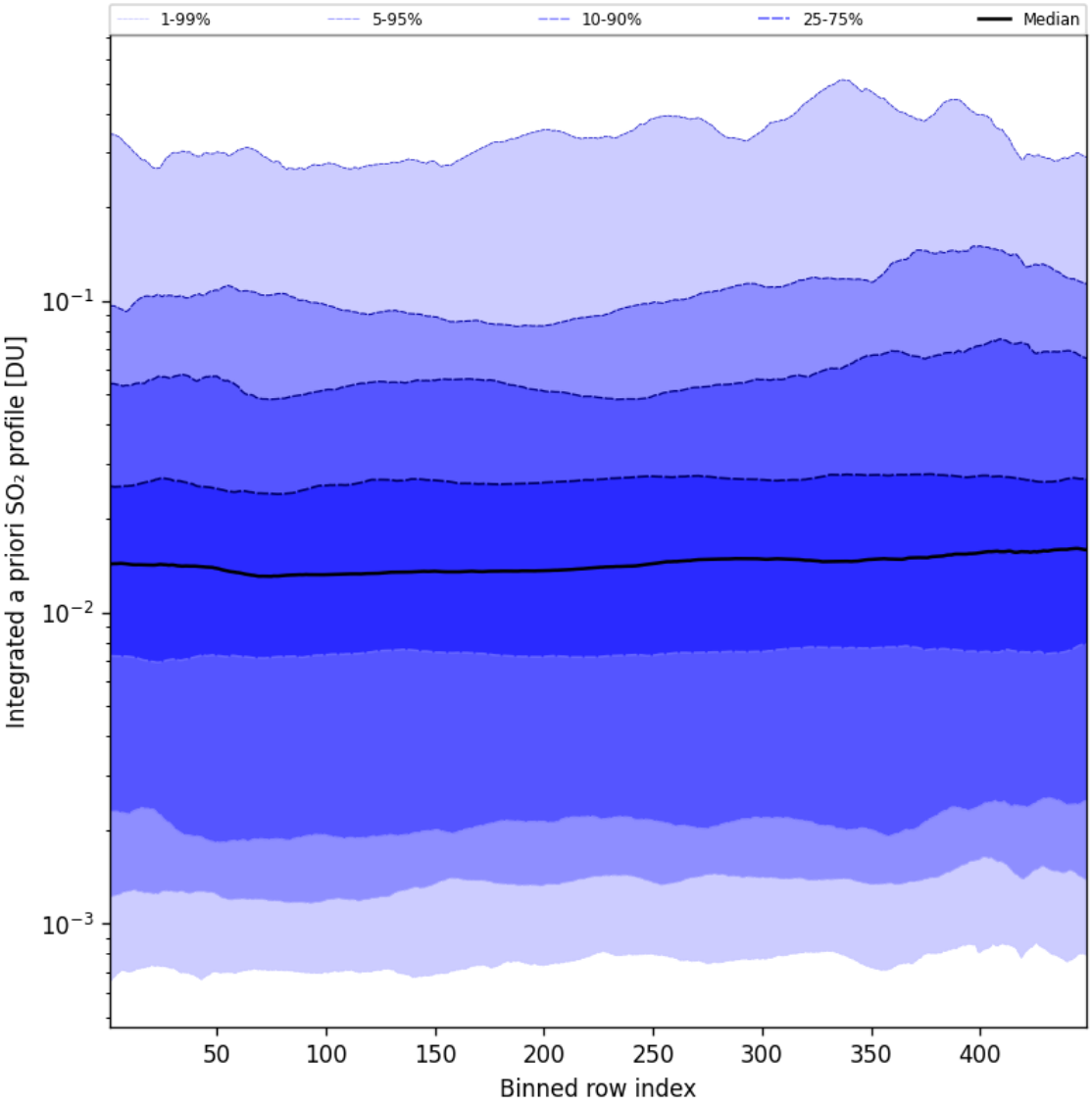

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-05-11 to 2025-05-12

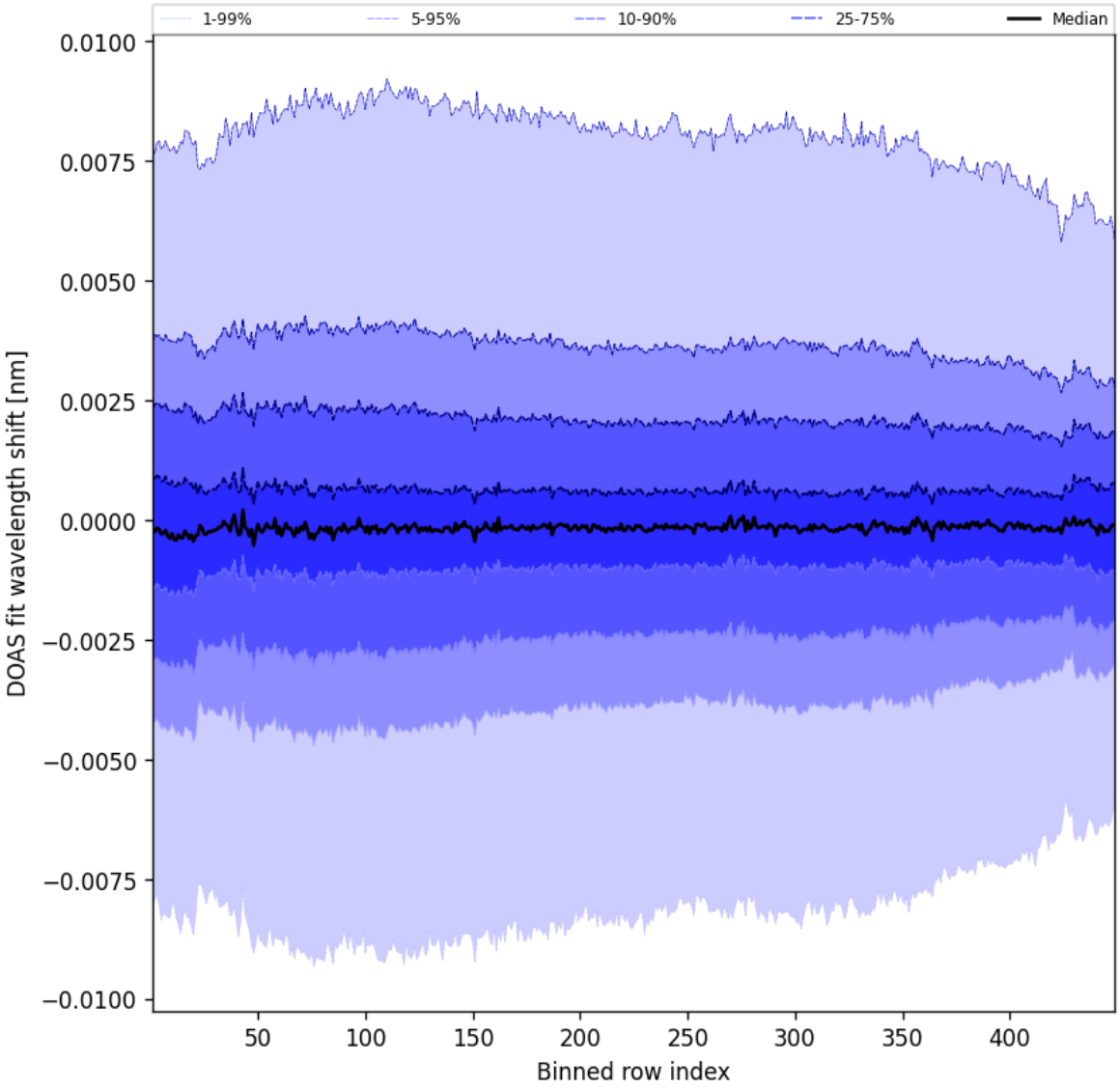

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-05-11 to 2025-05-12

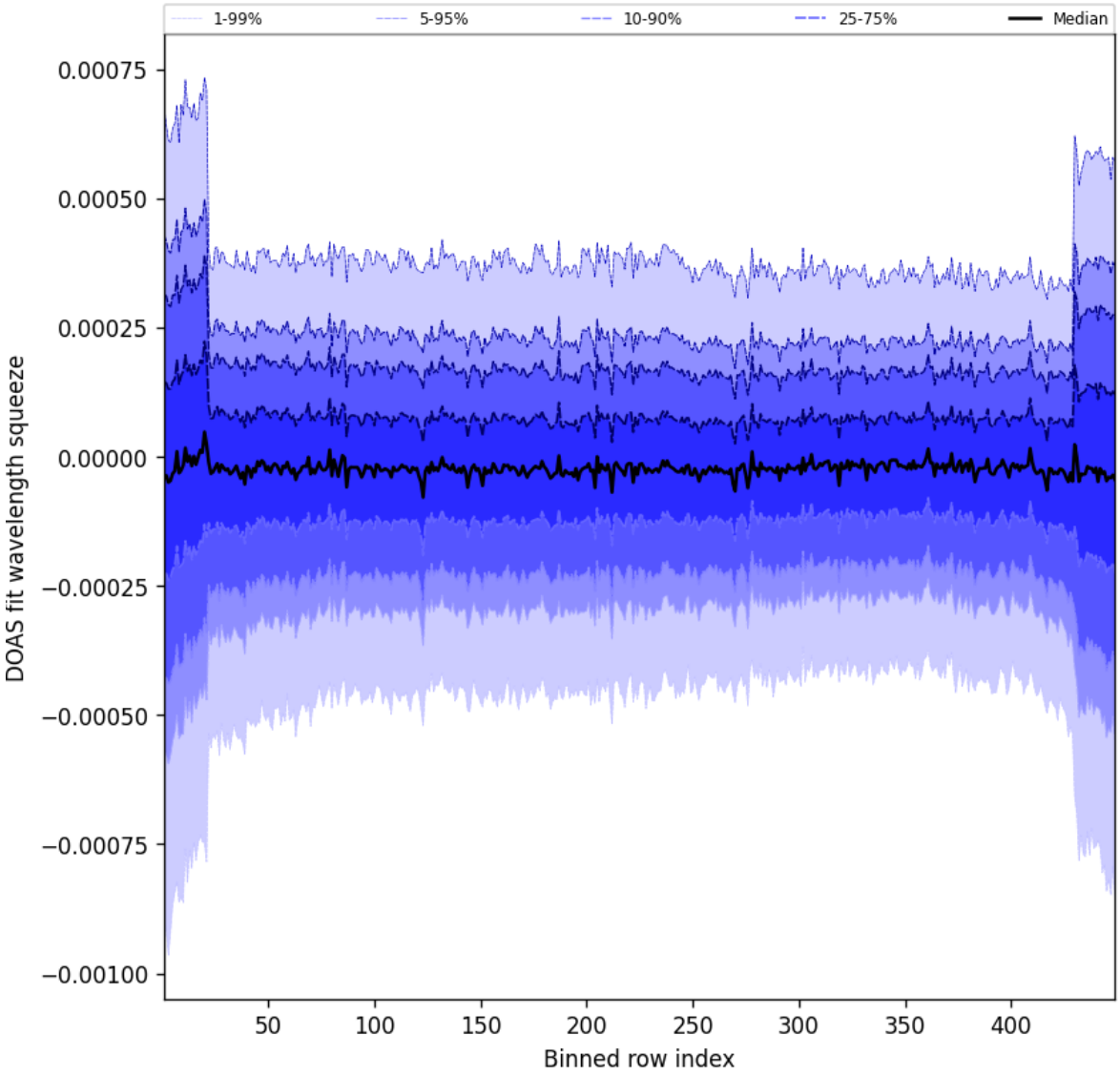

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-05-11 to 2025-05-12

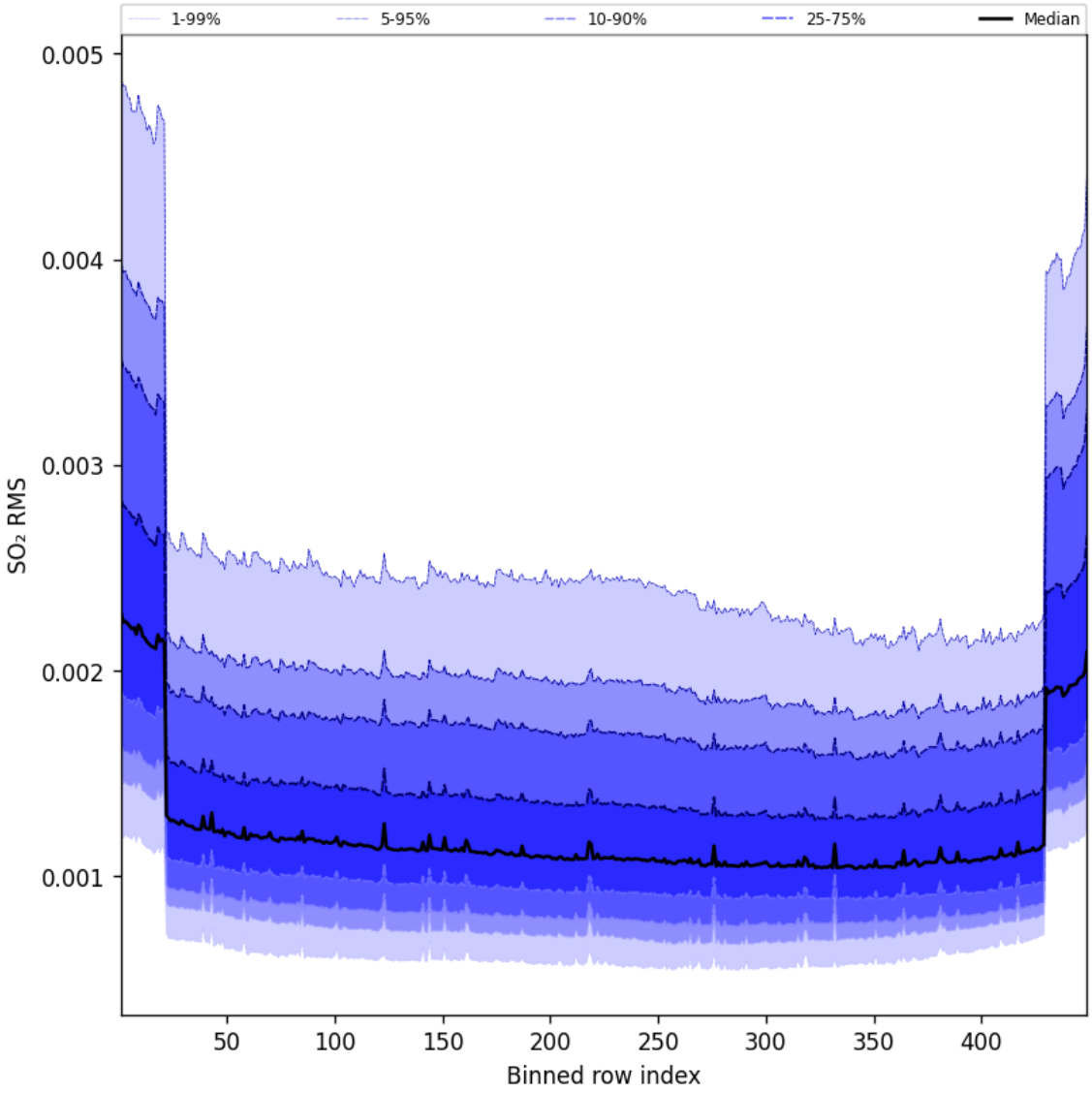

Figure 106: Along track statistics of "SO_2 RMS" for 2025-05-11 to 2025-05-12

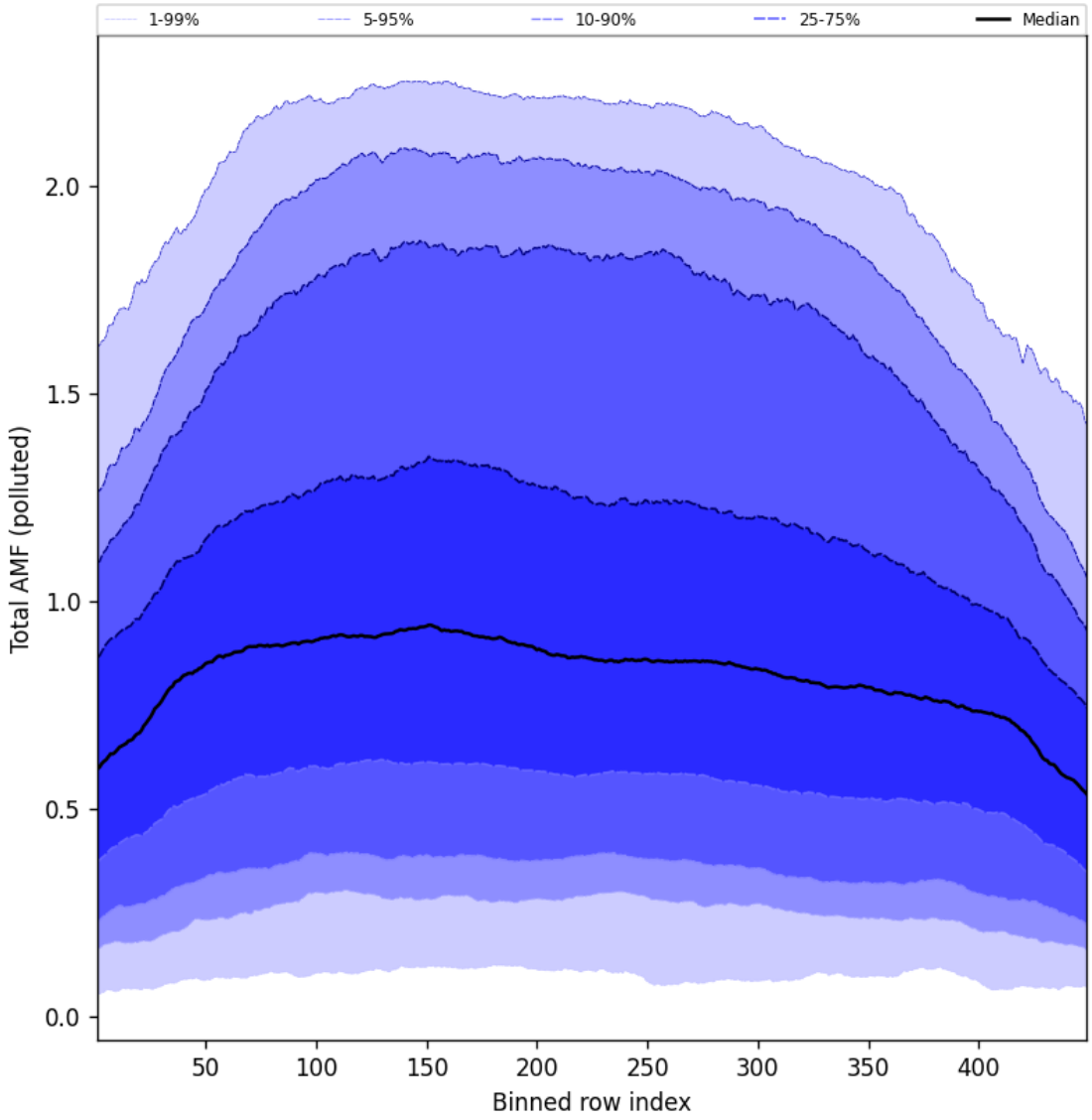

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-05-11 to 2025-05-12

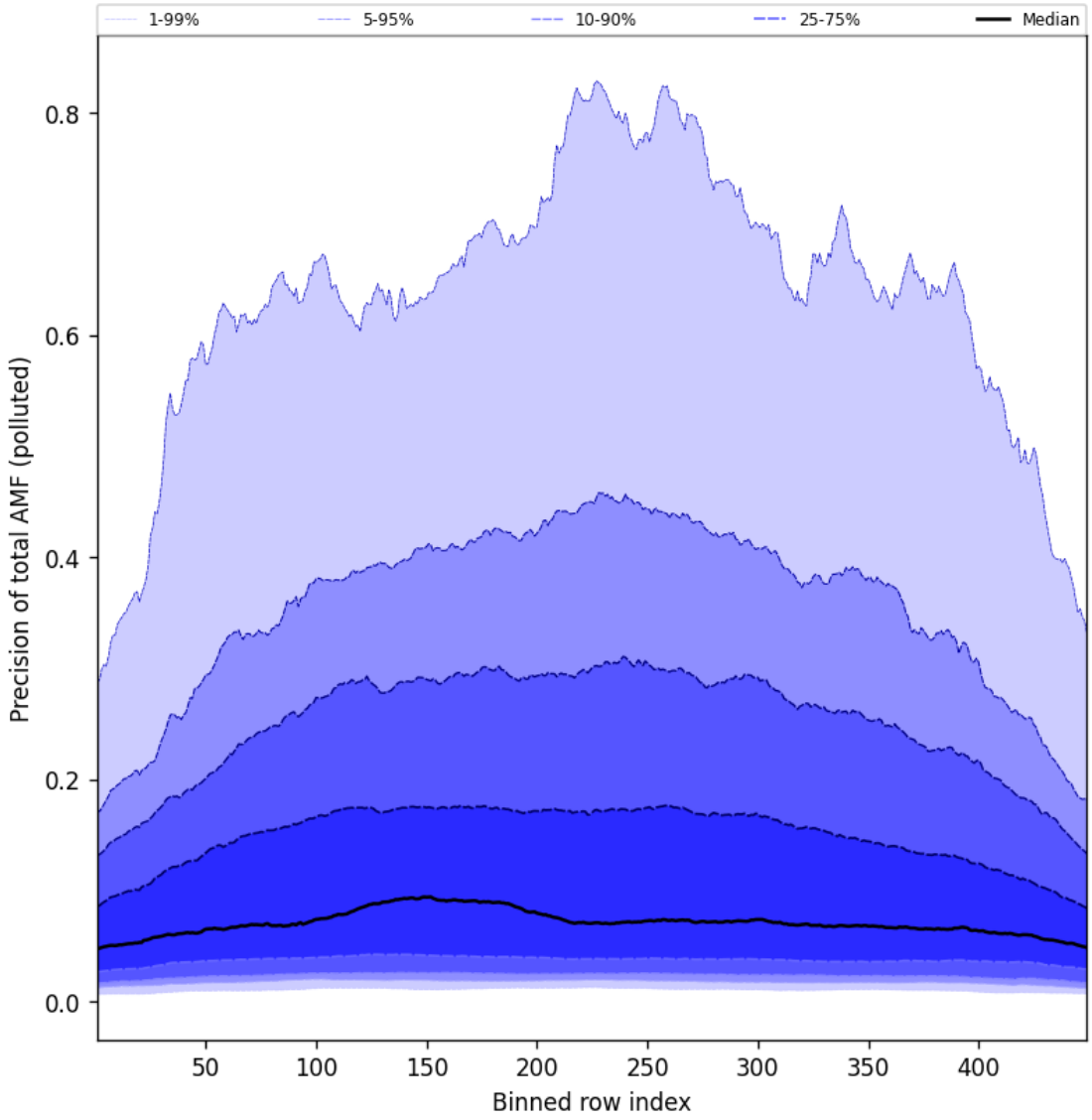

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-05-11 to 2025-05-12

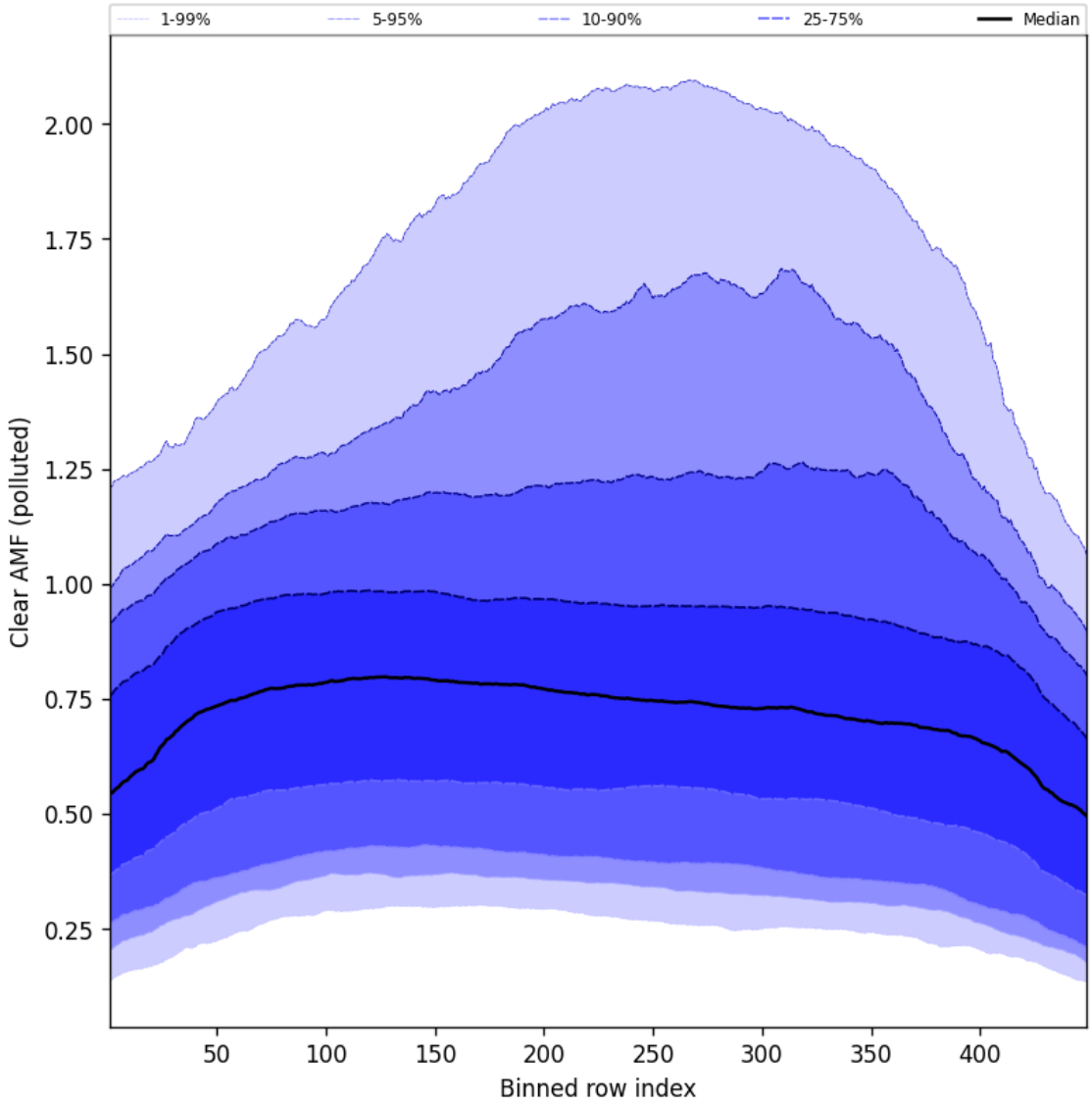

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-05-11 to 2025-05-12

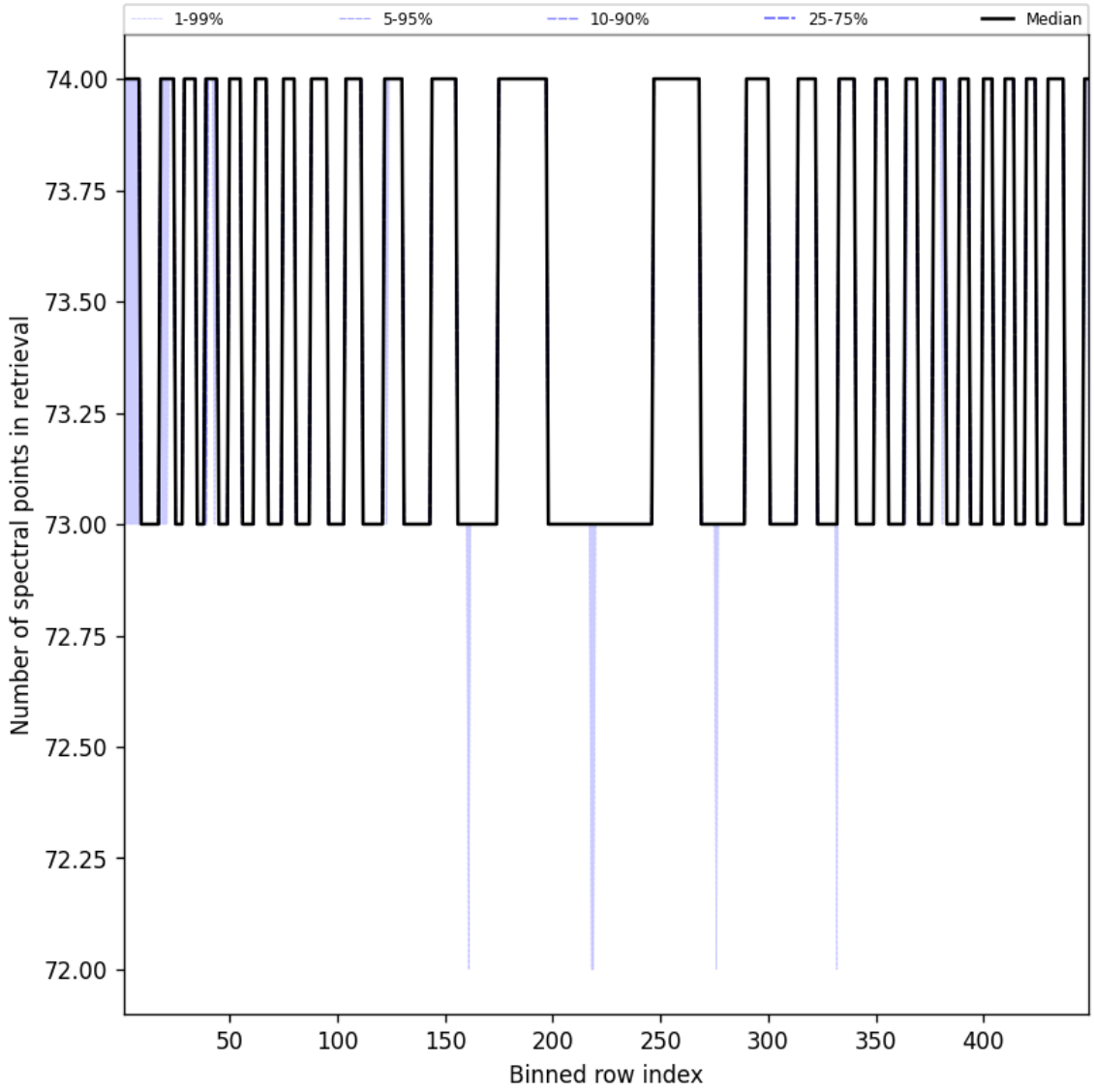

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-05-11 to 2025-05-12

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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