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]	0.634 ± 0.412	17421592	0.995	0.790	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.855 \pm 111.233) \times 10^{-2}$	17421592	0.249	0.445	1.010×10^{-2}	-137	801
sulfurdioxide total vertical column precision [DU]	0.523 ± 0.783	17421592	0.222	0.338	0.326	4.788×10^{-2}	278
sulfurdioxide slant column density corrected [DU]	$(1.856 \pm 39.737) \times 10^{-2}$	17421592	0.250	0.376	9.301×10^{-3}	-36.2	327
sulfurdioxide slant column density cobra [DU]	$(1.836 \pm 36.806) \times 10^{-2}$	17421592	0.250	0.376	9.301×10^{-3}	-36.2	141
sulfurdioxide slant column density cobra precision [DU]	0.298 ± 0.127	17421592	0.213	0.124	0.261	8.453×10^{-2}	34.6
sulfurdioxide slant column density window1 [DU]	0.107 ± 0.683	17421592	0.125	0.751	0.110	-117	128
sulfurdioxide slant column density window1 precision [DU]	0.298 ± 0.127	17421592	0.213	0.124	0.261	8.453×10^{-2}	34.6
sulfurdioxide slant column density corrected win1 [DU]	$(1.566 \pm 67.388) \times 10^{-2}$	17421592	-2.500×10^{-2}	0.736	-1.346×10^{-3}	-117	128
background so2 slant column offset window1 [DU]	$(-9.103 \pm 13.477) \times 10^{-2}$	17421592	-0.140	0.159	-0.120	-1.07	1.53
sulfurdioxide slant column density window2 [DU]	1.76 ± 9.06	17421592	1.25	11.3	1.73	-1.237×10^{3}	1.695×10^{3}
sulfurdioxide slant column density window2 precision [DU]	8.13 ± 2.41	17421592	7.43	2.64	7.77	2.11	691
sulfurdioxide slant column density corrected win2 [DU]	0.175 ± 8.944	17421592	0.750	11.1	0.186	-1.239×10^{3}	1.695×10^{3}
background so2 slant column offset window2 [DU]	-1.58 ± 2.23	17421592	0.250	3.01	-1.25	-12.6	17.4
sulfurdioxide slant column density window3 [DU]	-7.67 ± 23.88	17421592	-8.40	29.4	-7.83	-523	238
sulfurdioxide slant column density window3 precision [DU]	28.2 ± 13.6	17421592	22.5	10.2	24.6	9.48	663
sulfurdioxide slant column density corrected win3 [DU]	0.172 ± 23.451	17421592	0.560	28.9	0.318	-510	244
background so2 slant column offset window3 [DU]	7.84 ± 5.06	17421592	11.8	8.19	8.01	-10.6	28.6
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	17421592	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.320 \pm 8.044) \times 10^{-2}$	17421592	1.800×10^{-2}	2.299×10^{-2}	1.530×10^{-2}	2.400×10^{-4}	2.00
fitted radiance shift [nm]	$(-8.303 \pm 255.948) \times 10^{-5}$	17421592	1.000×10^{-4}	1.662×10^{-3}	-7.444×10^{-5}	-9.592×10^{-2}	9.043×10^{-2}
fitted radiance squeeze [1]	$(-4.116 \pm 18.759) \times 10^{-5}$	17421592	-3.000×10^{-5}	2.167×10^{-4}	-3.502×10^{-5}	-1.984×10^{-2}	2.303×10^{-2}
fitted root mean square [1]	$(1.297 \pm 0.516) \times 10^{-3}$	17421592	1.025×10^{-3}	5.078×10^{-4}	1.156×10^{-3}	2.589×10^{-4}	9.868×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.926 ± 0.519	17421592	0.660	0.620	0.822	5.000×10^{-2}	2.80
sulfurdioxide total air mass factor polluted precision [1]	0.116 ± 0.129	17421592	3.500×10^{-2}	0.114	7.231×10^{-2}	3.289×10^{-3}	2.07
sulfurdioxide clear air mass factor polluted [1]	0.781 ± 0.375	17421592	0.620	0.437	0.711	8.285×10^{-2}	2.68
number of spectral points in retrieval [1]	73.4 ± 0.5	17421592	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	2.000×10^{-2}	8.000×10^{-2}	0.210	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.37	−0.867	−0.531	−0.357	−0.209	0.236	0.394	0.586	0.964	2.68
sulfurdioxide total vertical column precision [DU]	9.563×10^{-2}	0.126	0.152	0.178	0.214	0.552	0.720	0.935	1.43	3.82
sulfurdioxide slant column density corrected [DU]	−0.857	−0.499	−0.364	−0.273	−0.177	0.199	0.300	0.399	0.553	1.02
sulfurdioxide slant column density cobra [DU]	−0.857	−0.499	−0.364	−0.273	−0.177	0.199	0.300	0.399	0.553	1.02
sulfurdioxide slant column density cobra precision [DU]	0.148	0.177	0.191	0.203	0.217	0.341	0.394	0.447	0.543	0.756
sulfurdioxide slant column density window1 [DU]	−1.68	−0.947	−0.662	−0.470	−0.269	0.482	0.676	0.861	1.14	1.91
sulfurdioxide slant column density window1 precision [DU]	0.148	0.177	0.191	0.203	0.217	0.341	0.394	0.447	0.543	0.756
sulfurdioxide slant column density corrected win1 [DU]	−1.64	−0.984	−0.727	−0.551	−0.364	0.371	0.572	0.766	1.06	1.90
background so2 slant column offset window1 [DU]	−0.324	−0.253	−0.223	−0.207	−0.183	-2.416×10^{-2}	3.408×10^{-2}	8.648×10^{-2}	0.166	0.339
sulfurdioxide slant column density window2 [DU]	−19.9	−12.7	−9.29	−6.76	−3.93	7.41	10.3	12.8	16.3	23.9
sulfurdioxide slant column density window2 precision [DU]	4.27	5.12	5.65	6.08	6.60	9.24	10.1	11.1	12.4	15.3
sulfurdioxide slant column density corrected win2 [DU]	−21.6	−14.2	−10.7	−8.18	−5.37	5.72	8.51	11.0	14.5	22.0
background so2 slant column offset window2 [DU]	−6.74	−5.44	−4.59	−3.86	−3.00	1.053×10^{-2}	0.318	0.563	0.899	3.06
sulfurdioxide slant column density window3 [DU]	−67.9	−46.5	−36.7	−29.8	−22.3	7.06	14.8	22.0	31.7	51.2
sulfurdioxide slant column density window3 precision [DU]	13.4	15.8	17.7	19.1	20.7	30.9	35.7	41.4	53.4	86.6
sulfurdioxide slant column density corrected win3 [DU]	−59.6	−38.5	−28.6	−21.6	−14.1	14.7	22.2	28.9	38.3	57.5
background so2 slant column offset window3 [DU]	−2.59	−0.122	1.31	2.44	3.76	12.0	13.2	14.2	15.4	18.0
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]	4.638×10^{-4}	7.494×10^{-4}	1.140×10^{-3}	2.622×10^{-3}	6.723×10^{-3}	2.971×10^{-2}	4.361×10^{-2}	6.466×10^{-2}	0.113	0.345
fitted radiance shift [nm]	-7.985×10^{-3}	-3.831×10^{-3}	-2.385×10^{-3}	-1.587×10^{-3}	-9.346×10^{-4}	7.271×10^{-4}	1.369×10^{-3}	2.211×10^{-3}	3.729×10^{-3}	7.993×10^{-3}
fitted radiance squeeze [1]	-5.469×10^{-4}	-3.470×10^{-4}	-2.632×10^{-4}	-2.061×10^{-4}	-1.463×10^{-4}	7.048×10^{-5}	1.237×10^{-4}	1.729×10^{-4}	2.433×10^{-4}	4.125×10^{-4}
fitted root mean square [1]	6.015×10^{-4}	7.537×10^{-4}	8.374×10^{-4}	8.990×10^{-4}	9.711×10^{-4}	1.479×10^{-3}	1.718×10^{-3}	1.954×10^{-3}	2.289×10^{-3}	3.132×10^{-3}
sulfurdioxide total air mass factor polluted [1]	6.682×10^{-2}	0.248	0.361	0.447	0.558	1.18	1.47	1.74	2.02	2.31
sulfurdioxide total air mass factor polluted precision [1]	9.639×10^{-3}	1.859×10^{-2}	2.437×10^{-2}	2.996×10^{-2}	3.750×10^{-2}	0.151	0.195	0.245	0.343	0.659
sulfurdioxide clear air mass factor polluted [1]	0.226	0.317	0.374	0.433	0.515	0.952	1.07	1.27	1.58	2.00
number of spectral points in retrieval [1]	73.0	73.0	73.0	73.0	73.0	74.0	74.0	74.0	74.0	74.0

Table 3: Parameterlist and basic statistics for the analysis for observations in the northern hemisphere

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.581 ± 0.423	12046006	0.870	0.490	0.0	1.000	0.130	1.000
sulfurdioxide total vertical column [DU]	$(2.165 \pm 101.743) \times 10^{-2}$	12046006	0.410	8.111×10^{-3}	-137	432	-0.194	0.215
sulfurdioxide total vertical column precision [DU]	0.490 ± 0.742	12046006	0.325	0.297	4.788×10^{-2}	278	0.195	0.520
sulfurdioxide slant column density corrected [DU]	$(1.449 \pm 33.988) \times 10^{-2}$	12046006	0.357	7.716×10^{-3}	-8.92	51.2	-0.169	0.188
sulfurdioxide slant column density cobra [DU]	$(1.443 \pm 33.563) \times 10^{-2}$	12046006	0.357	7.716×10^{-3}	-8.92	49.5	-0.169	0.188
sulfurdioxide slant column density cobra precision [DU]	0.282 ± 0.117	12046006	0.108	0.248	8.453×10^{-2}	13.9	0.209	0.317
sulfurdioxide slant column density window1 [DU]	$(9.375 \pm 64.365) \times 10^{-2}$	12046006	0.719	0.103	-11.7	95.2	-0.262	0.458
sulfurdioxide slant column density window1 precision [DU]	0.282 ± 0.117	12046006	0.108	0.248	8.453×10^{-2}	13.9	0.209	0.317
sulfurdioxide slant column density corrected win1 [DU]	$(1.062 \pm 62.946) \times 10^{-2}$	12046006	0.700	-2.695×10^{-3}	-11.7	95.1	-0.348	0.352
background so2 slant column offset window1 [DU]	$(-8.313 \pm 14.509) \times 10^{-2}$	12046006	0.191	-0.116	-0.565	1.53	-0.190	6.846×10^{-4}
sulfurdioxide slant column density window2 [DU]	1.80 ± 8.39	12046006	10.8	1.82	-621	134	-3.57	7.20
sulfurdioxide slant column density window2 precision [DU]	7.64 ± 2.07	12046006	2.30	7.36	2.11	280	6.30	8.60
sulfurdioxide slant column density corrected win2 [DU]	0.113 ± 8.249	12046006	10.5	0.147	-621	131	-5.11	5.36
background so2 slant column offset window2 [DU]	-1.69 ± 2.32	12046006	3.36	-1.50	-10.3	17.4	-3.25	0.106
sulfurdioxide slant column density window3 [DU]	-7.87 ± 22.20	12046006	27.4	-8.20	-271	220	-21.7	5.72
sulfurdioxide slant column density window3 precision [DU]	26.4 ± 13.2	12046006	8.22	22.9	9.48	663	19.7	28.0
sulfurdioxide slant column density corrected win3 [DU]	0.152 ± 21.683	12046006	26.8	0.269	-268	220	-13.1	13.7
background so2 slant column offset window3 [DU]	8.02 ± 5.24	12046006	8.91	9.17	-10.6	22.1	3.36	12.3
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.20	12046006	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.603 \pm 9.017) \times 10^{-2}$	12046006	2.938×10^{-2}	1.297×10^{-2}	2.400×10^{-4}	2.00	3.393×10^{-3}	3.278×10^{-2}
fitted radiance shift [nm]	$(4.648 \pm 253.276) \times 10^{-5}$	12046006	1.545×10^{-3}	2.778×10^{-5}	-4.165×10^{-2}	4.348×10^{-2}	-7.435×10^{-4}	8.011×10^{-4}
fitted radiance squeeze [1]	$(-6.712 \pm 17.754) \times 10^{-5}$	12046006	2.104×10^{-4}	-5.420×10^{-5}	-1.313×10^{-2}	2.303×10^{-2}	-1.649×10^{-4}	4.549×10^{-5}
fitted root mean square [1]	$(1.236 \pm 0.486) \times 10^{-3}$	12046006	4.513×10^{-4}	1.107×10^{-3}	2.589×10^{-4}	3.358×10^{-2}	9.379×10^{-4}	1.389×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.973 ± 0.573	12046006	0.787	0.857	5.000×10^{-2}	2.80	0.531	1.32
sulfurdioxide total air mass factor polluted precision [1]	0.127 ± 0.139	12046006	0.127	8.324×10^{-2}	3.289×10^{-3}	2.07	3.926×10^{-2}	0.166
sulfurdioxide clear air mass factor polluted [1]	0.810 ± 0.425	12046006	0.524	0.722	8.285×10^{-2}	2.68	0.482	1.01
number of spectral points in retrieval [1]	73.5 ± 0.5	12046006	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]	0.755 ± 0.358	5375586	0.570	1.000	0.0	1.000	0.430	1.000
sulfurdioxide total vertical column [DU]	$(4.401 \pm 129.993) \times 10^{-2}$	5375586	0.537	1.597×10^{-2}	-109	801	-0.248	0.289
sulfurdioxide total vertical column precision [DU]	0.597 ± 0.863	5375586	0.344	0.384	5.061×10^{-2}	133	0.269	0.613
sulfurdioxide slant column density corrected [DU]	$(2.768 \pm 50.275) \times 10^{-2}$	5375586	0.423	1.354×10^{-2}	-36.2	327	-0.196	0.228
sulfurdioxide slant column density cobra [DU]	$(2.716 \pm 43.185) \times 10^{-2}$	5375586	0.423	1.354×10^{-2}	-36.2	141	-0.196	0.228
sulfurdioxide slant column density cobra precision [DU]	0.334 ± 0.143	5375586	0.149	0.297	0.108	34.6	0.240	0.389
sulfurdioxide slant column density window1 [DU]	0.136 ± 0.764	5375586	0.830	0.128	-117	128	-0.286	0.544
sulfurdioxide slant column density window1 precision [DU]	0.334 ± 0.143	5375586	0.149	0.297	0.108	34.6	0.240	0.389
sulfurdioxide slant column density corrected win1 [DU]	$(2.694 \pm 76.398) \times 10^{-2}$	5375586	0.827	2.176×10^{-3}	-117	128	-0.404	0.423
background so2 slant column offset window1 [DU]	-0.109 ± 0.106	5375586	0.101	-0.124	-1.07	1.53	-0.169	-6.769×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.66 ± 10.39	5375586	12.8	1.49	-1.237×10^{3}	1.695×10^{3}	-4.84	7.97
sulfurdioxide slant column density window2 precision [DU]	9.24 ± 2.75	5375586	2.90	8.86	2.73	691	7.59	10.5
sulfurdioxide slant column density corrected win2 [DU]	0.316 ± 10.332	5375586	12.7	0.291	-1.239×10^{3}	1.695×10^{3}	-6.07	6.67
background so2 slant column offset window2 [DU]	-1.34 ± 2.00	5375586	2.23	-0.970	-12.6	17.1	-2.37	-0.140
sulfurdioxide slant column density window3 [DU]	-7.23 ± 27.26	5375586	34.5	-6.76	-523	238	-24.2	10.4
sulfurdioxide slant column density window3 precision [DU]	32.2 ± 13.6	5375586	10.7	28.8	10.4	247	24.6	35.3
sulfurdioxide slant column density corrected win3 [DU]	0.216 ± 26.997	5375586	34.3	0.459	-510	244	-16.7	17.6
background so2 slant column offset window3 [DU]	7.44 ± 4.58	5375586	6.01	6.50	-7.39	28.6	4.30	10.3
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.26	5375586	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.688 \pm 5.192) \times 10^{-2}$	5375586	1.447×10^{-2}	1.794×10^{-2}	9.956×10^{-4}	1.90	1.201×10^{-2}	2.648×10^{-2}
fitted radiance shift [nm]	$(-3.733 \pm 25.950) \times 10^{-4}$	5375586	1.852×10^{-3}	-3.515×10^{-4}	-9.592×10^{-2}	9.043×10^{-2}	-1.335×10^{-3}	5.163×10^{-4}
fitted radiance squeeze [1]	$(1.700 \pm 19.625) \times 10^{-5}$	5375586	2.274×10^{-4}	1.234×10^{-5}	-1.984×10^{-2}	1.896×10^{-2}	-9.957×10^{-5}	1.278×10^{-4}
fitted root mean square [1]	$(1.431 \pm 0.554) \times 10^{-3}$	5375586	6.048×10^{-4}	1.278×10^{-3}	3.583×10^{-4}	9.868×10^{-2}	1.064×10^{-3}	1.669×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.819 ± 0.349	5375586	0.402	0.778	5.000×10^{-2}	2.63	0.599	1.00
sulfurdioxide total air mass factor polluted precision [1]	$(9.218 \pm 9.756) \times 10^{-2}$	5375586	8.053×10^{-2}	5.566×10^{-2}	4.816×10^{-3}	1.69	3.582×10^{-2}	0.116
sulfurdioxide clear air mass factor polluted [1]	0.714 ± 0.209	5375586	0.295	0.697	9.155×10^{-2}	1.48	0.572	0.867
number of spectral points in retrieval [1]	73.4 ± 0.5	5375586	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]	0.659 ± 0.398	11282731	0.760	1.000	0.0	1.000	0.240	1.000
sulfurdioxide total vertical column [DU]	$(2.641 \pm 107.368) \times 10^{-2}$	11282731	0.442	1.006×10^{-2}	-137	676	-0.209	0.234
sulfurdioxide total vertical column precision [DU]	0.502 ± 0.762	11282731	0.307	0.315	5.741×10^{-2}	59.6	0.218	0.525
sulfurdioxide slant column density corrected [DU]	$(1.659 \pm 38.379) \times 10^{-2}$	11282731	0.380	9.180×10^{-3}	-15.6	289	-0.179	0.201
sulfurdioxide slant column density cobra [DU]	$(1.647 \pm 36.290) \times 10^{-2}$	11282731	0.380	9.180×10^{-3}	-15.6	53.2	-0.179	0.201
sulfurdioxide slant column density cobra precision [DU]	0.303 ± 0.130	11282731	0.137	0.266	8.453×10^{-2}	34.6	0.217	0.353
sulfurdioxide slant column density window1 [DU]	0.102 ± 0.686	11282731	0.763	0.113	-117	52.4	-0.274	0.489
sulfurdioxide slant column density window1 precision [DU]	0.303 ± 0.130	11282731	0.137	0.266	8.453×10^{-2}	34.6	0.217	0.353
sulfurdioxide slant column density corrected win1 [DU]	$(1.653 \pm 67.477) \times 10^{-2}$	11282731	0.746	2.412×10^{-3}	-117	52.4	-0.366	0.380
background so2 slant column offset window1 [DU]	$(-8.573 \pm 14.318) \times 10^{-2}$	11282731	0.170	-0.120	-1.07	1.53	-0.184	-1.411×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.80 ± 9.07	11282731	11.4	1.71	-1.237×10^{3}	1.081×10^{3}	-3.96	7.46
sulfurdioxide slant column density window2 precision [DU]	8.14 ± 2.28	11282731	2.58	7.78	2.39	691	6.66	9.24
sulfurdioxide slant column density corrected win2 [DU]	0.227 ± 8.935	11282731	11.2	0.223	-1.239×10^{3}	1.079×10^{3}	-5.36	5.80
background so2 slant column offset window2 [DU]	-1.57 ± 2.31	11282731	3.17	-1.08	-12.6	17.4	-3.10	6.736×10^{-2}
sulfurdioxide slant column density window3 [DU]	-5.13 ± 23.88	11282731	29.9	-5.55	-312	224	-20.1	9.75
sulfurdioxide slant column density window3 precision [DU]	27.5 ± 11.8	11282731	9.43	24.3	9.48	203	20.8	30.2
sulfurdioxide slant column density corrected win3 [DU]	2.49 ± 23.19	11282731	28.9	2.29	-302	229	-12.0	16.9
background so2 slant column offset window3 [DU]	7.62 ± 5.15	11282731	8.31	7.26	-10.6	28.6	3.54	11.8
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.26	11282731	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.219 \pm 4.795) \times 10^{-2}$	11282731	1.624×10^{-2}	1.419×10^{-2}	2.830×10^{-4}	2.00	7.520×10^{-3}	2.376×10^{-2}
fitted radiance shift [nm]	$(-9.679 \pm 225.918) \times 10^{-5}$	11282731	1.635×10^{-3}	-7.504×10^{-5}	-4.527×10^{-2}	3.417×10^{-2}	-9.322×10^{-4}	7.027×10^{-4}
fitted radiance squeeze [1]	$(-3.647 \pm 19.088) \times 10^{-5}$	11282731	2.201×10^{-4}	-2.897×10^{-5}	-1.551×10^{-2}	2.303×10^{-2}	-1.427×10^{-4}	7.741×10^{-5}
fitted root mean square [1]	$(1.318 \pm 0.525) \times 10^{-3}$	11282731	5.652×10^{-4}	1.170×10^{-3}	3.368×10^{-4}	8.758×10^{-2}	9.723×10^{-4}	1.538×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.922 ± 0.465	11282731	0.533	0.851	5.000×10^{-2}	2.60	0.611	1.14
sulfurdioxide total air mass factor polluted precision [1]	0.109 ± 0.123	11282731	9.367×10^{-2}	6.945×10^{-2}	3.289×10^{-3}	2.07	4.054×10^{-2}	0.134
sulfurdioxide clear air mass factor polluted [1]	0.805 ± 0.363	11282731	0.392	0.751	8.285×10^{-2}	2.47	0.566	0.958
number of spectral points in retrieval [1]	73.4 ± 0.5	11282731	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]	0.626 ± 0.430	4253351	0.860	1.000	0.0	1.000	0.140	1.000
sulfurdioxide total vertical column [DU]	$(3.327 \pm 120.529) \times 10^{-2}$	4253351	0.452	1.060×10^{-2}	-109	801	-0.210	0.242
sulfurdioxide total vertical column precision [DU]	0.555 ± 0.807	4253351	0.378	0.352	4.788×10^{-2}	278	0.205	0.583
sulfurdioxide slant column density corrected [DU]	$(2.354 \pm 43.646) \times 10^{-2}$	4253351	0.361	9.684×10^{-3}	-36.2	327	-0.169	0.192
sulfurdioxide slant column density cobra [DU]	$(2.310 \pm 37.853) \times 10^{-2}$	4253351	0.361	9.684×10^{-3}	-36.2	141	-0.169	0.192
sulfurdioxide slant column density cobra precision [DU]	0.282 ± 0.119	4253351	9.268×10^{-2}	0.249	8.921×10^{-2}	31.1	0.215	0.307
sulfurdioxide slant column density window1 [DU]	0.135 ± 0.671	4253351	0.717	0.124	-75.3	128	-0.234	0.483
sulfurdioxide slant column density window1 precision [DU]	0.282 ± 0.119	4253351	9.268×10^{-2}	0.249	8.921×10^{-2}	31.1	0.215	0.307
sulfurdioxide slant column density corrected win1 [DU]	$(1.736 \pm 66.488) \times 10^{-2}$	4253351	0.705	-4.124×10^{-3}	-75.3	128	-0.351	0.353
background so2 slant column offset window1 [DU]	-0.118 ± 0.113	4253351	0.126	-0.137	-0.806	1.53	-0.193	-6.685×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.41 ± 9.15	4253351	11.3	1.47	-770	1.695×10^{3}	-4.21	7.08
sulfurdioxide slant column density window2 precision [DU]	8.21 ± 2.73	4253351	2.72	7.80	2.11	495	6.57	9.29
sulfurdioxide slant column density corrected win2 [DU]	0.140 ± 9.076	4253351	11.1	0.169	-772	1.695×10^{3}	-5.38	5.68
background so2 slant column offset window2 [DU]	-1.27 ± 2.02	4253351	2.56	-0.970	-12.4	17.4	-2.49	6.531×10^{-2}
sulfurdioxide slant column density window3 [DU]	-12.6 ± 23.5	4253351	28.6	-12.0	-523	238	-26.5	2.09
sulfurdioxide slant column density window3 precision [DU]	30.2 ± 16.9	4253351	12.4	25.4	9.54	663	20.8	33.2
sulfurdioxide slant column density corrected win3 [DU]	-5.10 ± 23.74	4253351	29.0	-4.22	-510	244	-19.2	9.82
background so2 slant column offset window3 [DU]	7.46 ± 4.90	4253351	7.95	7.62	-10.6	27.8	3.55	11.5
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.10	4253351	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.902 \pm 11.980) \times 10^{-2}$	4253351	5.026×10^{-2}	2.381×10^{-2}	2.400×10^{-4}	1.90	7.837×10^{-3}	5.809×10^{-2}
fitted radiance shift [nm]	$(-5.984 \pm 316.889) \times 10^{-5}$	4253351	1.685×10^{-3}	-8.221×10^{-5}	-9.592×10^{-2}	9.043×10^{-2}	-9.338×10^{-4}	7.514×10^{-4}
fitted radiance squeeze [1]	$(-3.862 \pm 17.857) \times 10^{-5}$	4253351	2.064×10^{-4}	-3.561×10^{-5}	-1.984×10^{-2}	1.896×10^{-2}	-1.401×10^{-4}	6.629×10^{-5}
fitted root mean square [1]	$(1.231 \pm 0.477) \times 10^{-3}$	4253351	3.938×10^{-4}	1.115×10^{-3}	3.341×10^{-4}	9.868×10^{-2}	9.566×10^{-4}	1.350×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.910 ± 0.591	4253351	0.725	0.717	5.000×10^{-2}	2.80	0.478	1.20
sulfurdioxide total air mass factor polluted precision [1]	0.129 ± 0.142	4253351	0.155	7.657×10^{-2}	3.547×10^{-3}	1.85	3.026×10^{-2}	0.185
sulfurdioxide clear air mass factor polluted [1]	0.723 ± 0.380	4253351	0.436	0.619	8.793×10^{-2}	2.68	0.455	0.891
number of spectral points in retrieval [1]	73.4 ± 0.5	4253351	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

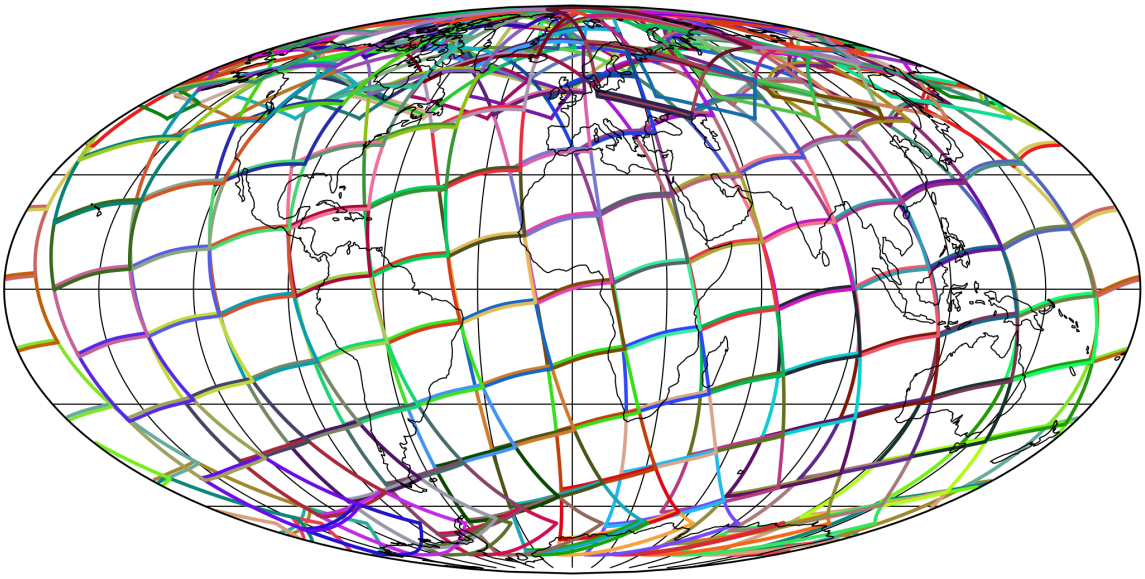


Figure 1: Outline of the granules.

4 Input data monitoring

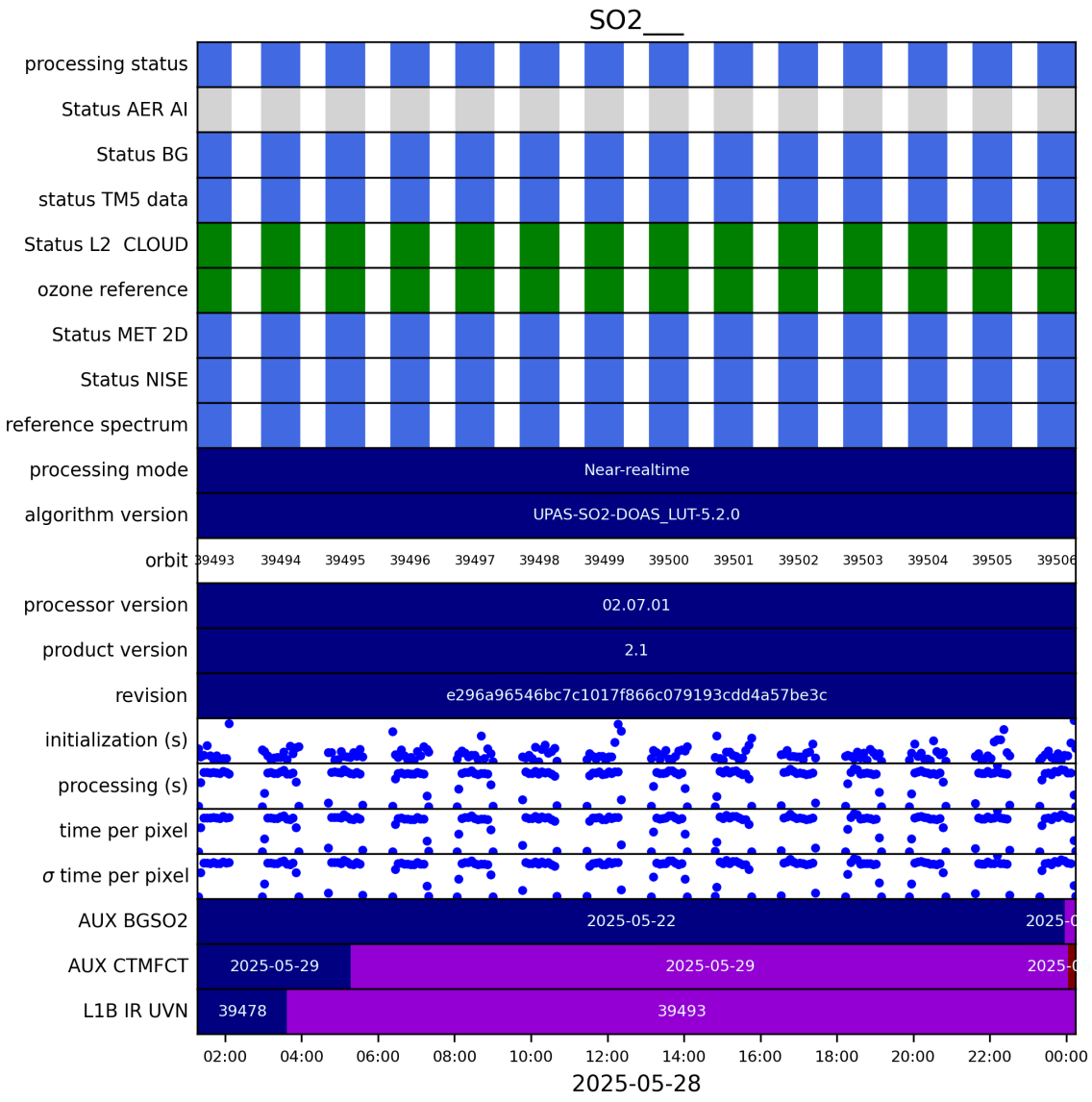


Figure 2: Input data per granule

5 Warnings and errors

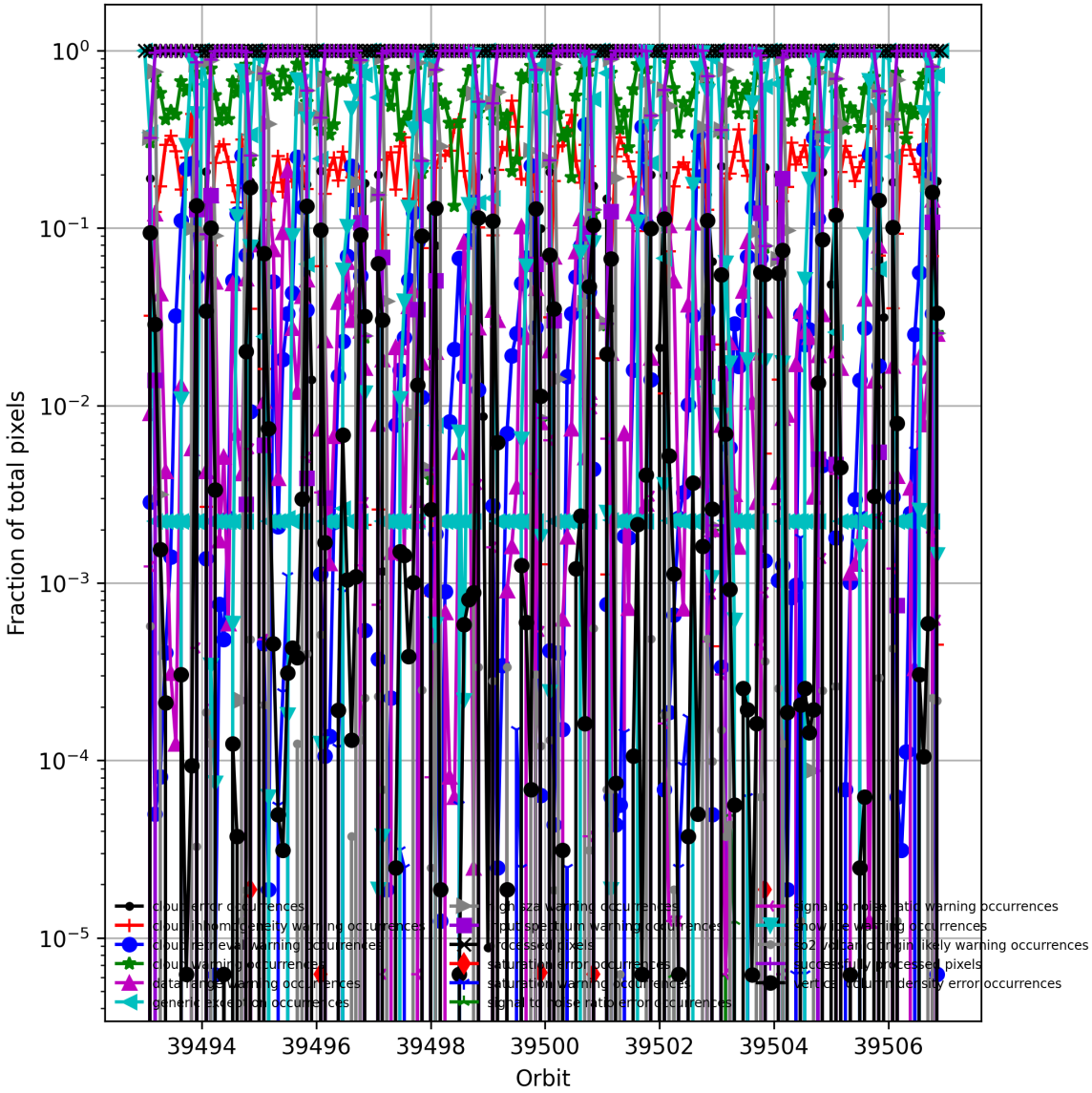


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

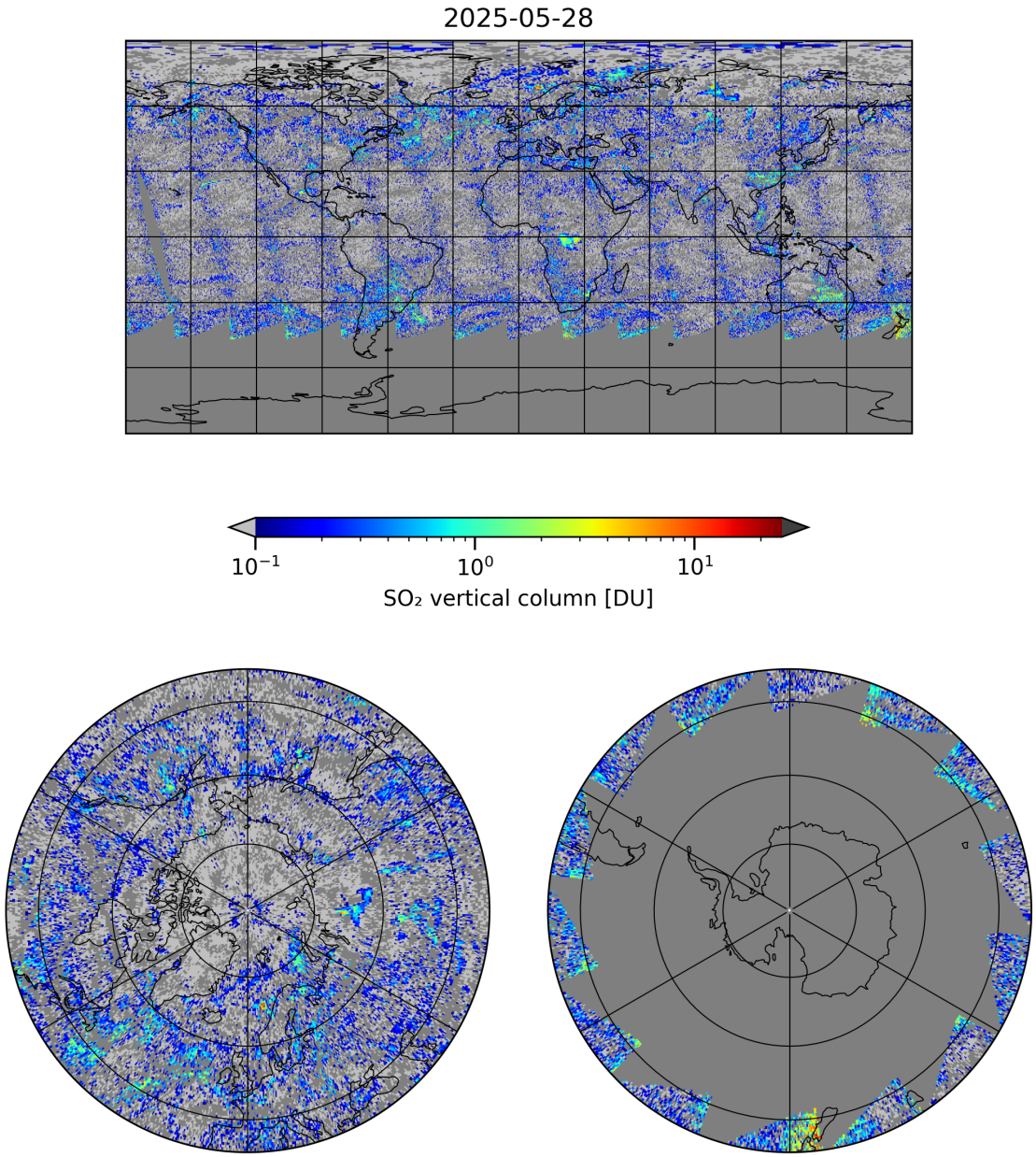


Figure 4: Map of "SO_2 vertical column" for 2025-05-28 to 2025-05-29

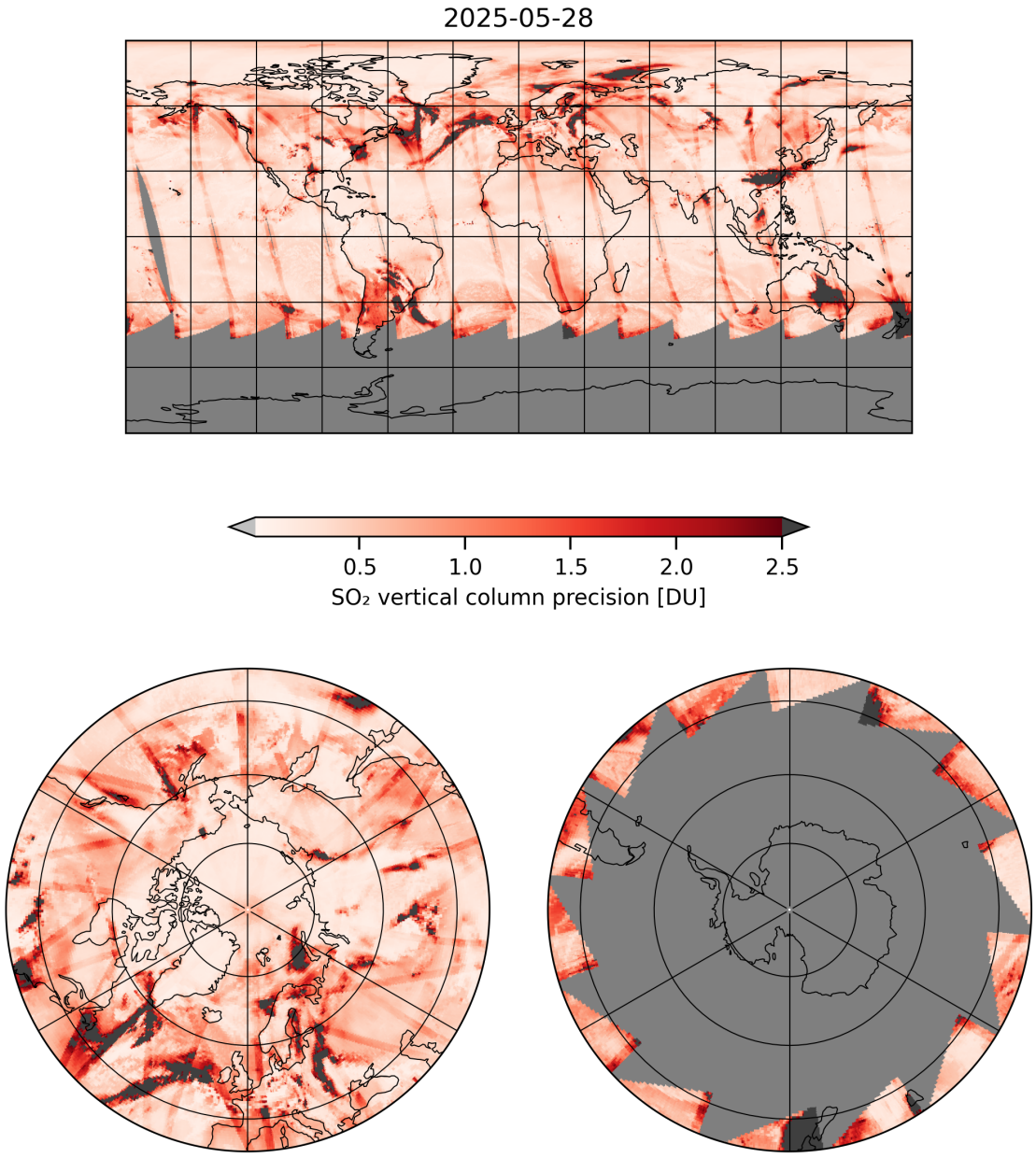


Figure 5: Map of "SO_2 vertical column precision" for 2025-05-28 to 2025-05-29

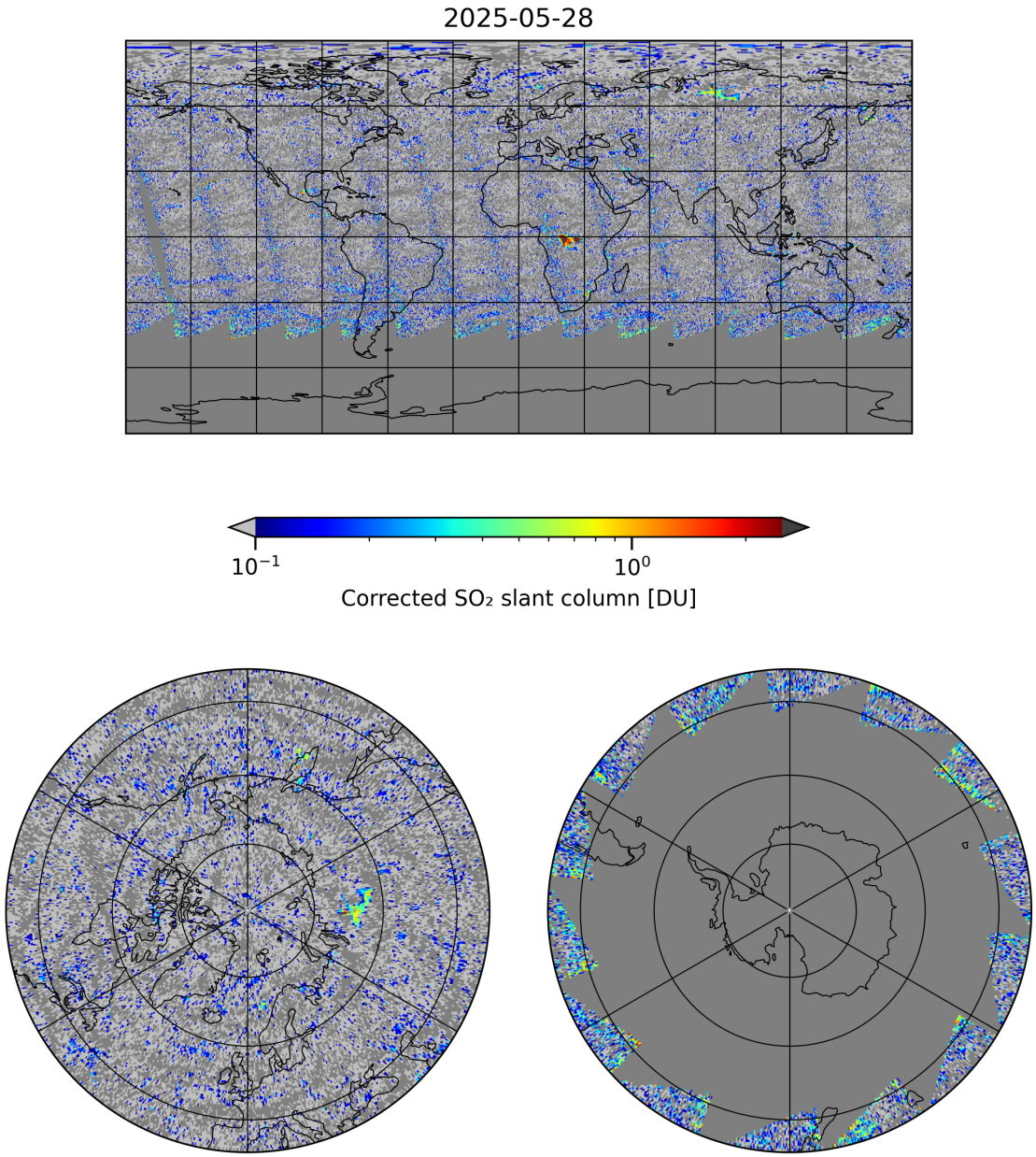


Figure 6: Map of "Corrected SO_2 slant column" for 2025-05-28 to 2025-05-29

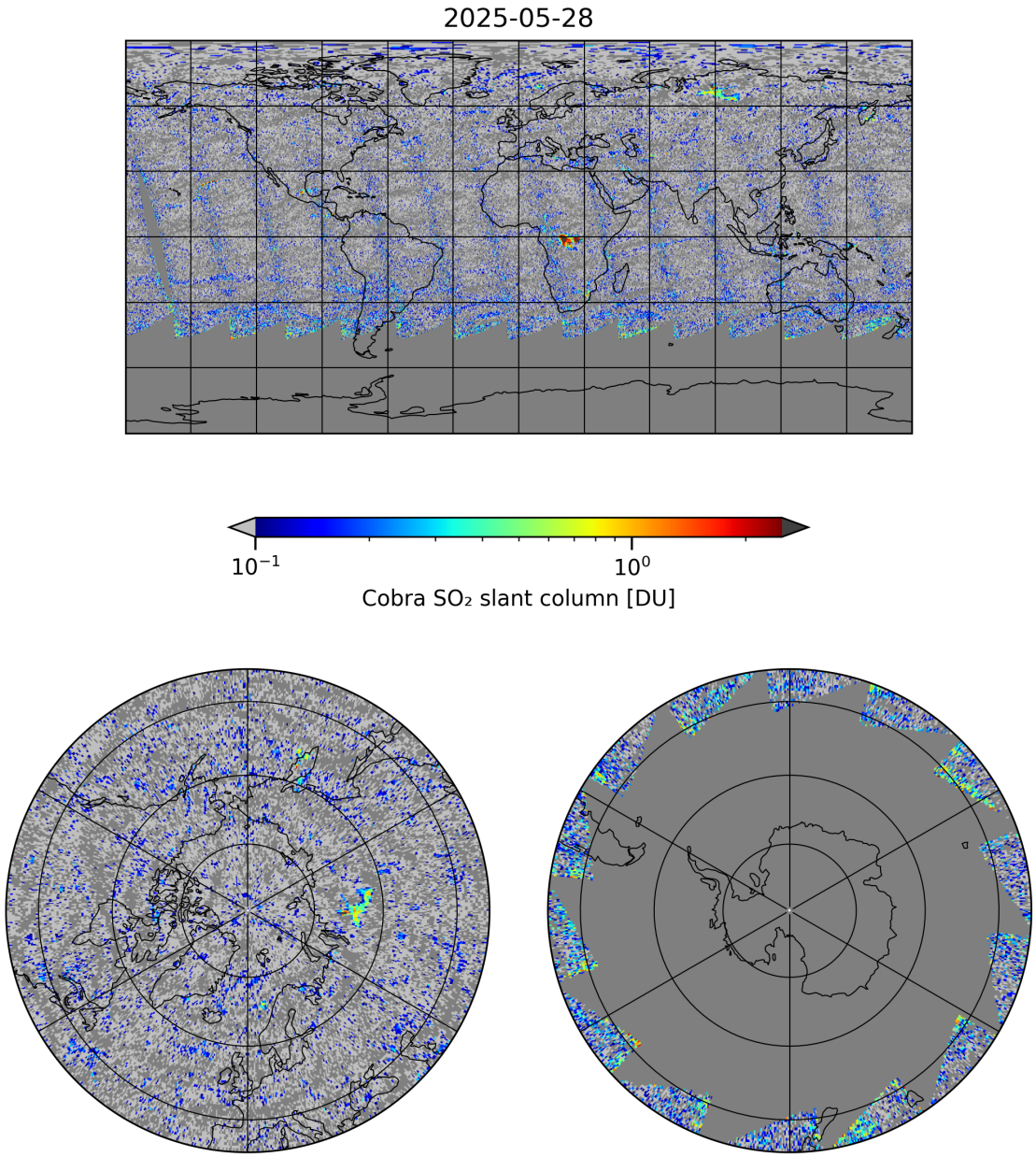


Figure 7: Map of "Cobra SO_2 slant column" for 2025-05-28 to 2025-05-29

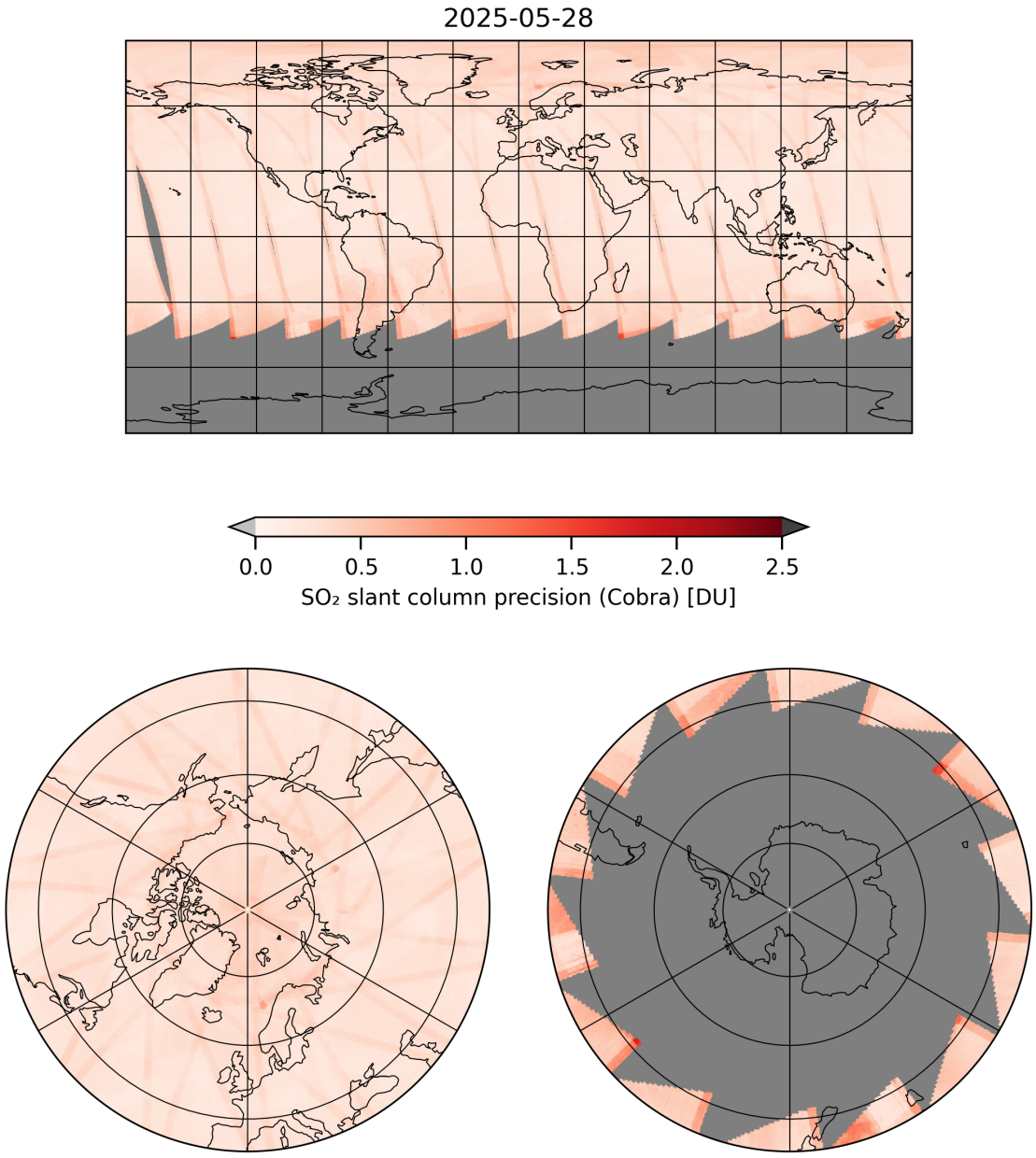


Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-05-28 to 2025-05-29

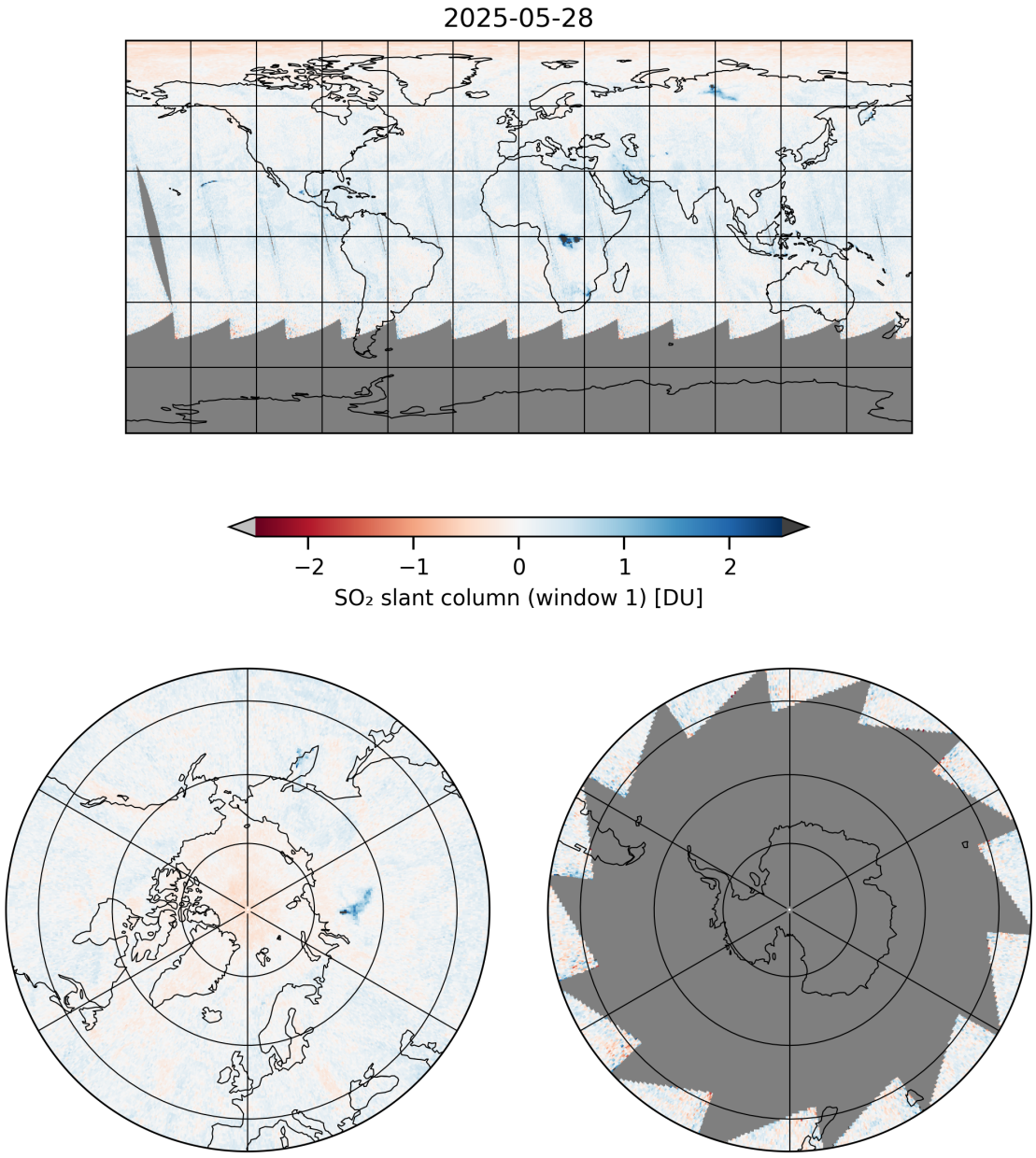


Figure 9: Map of "SO_2 slant column (window 1)" for 2025-05-28 to 2025-05-29

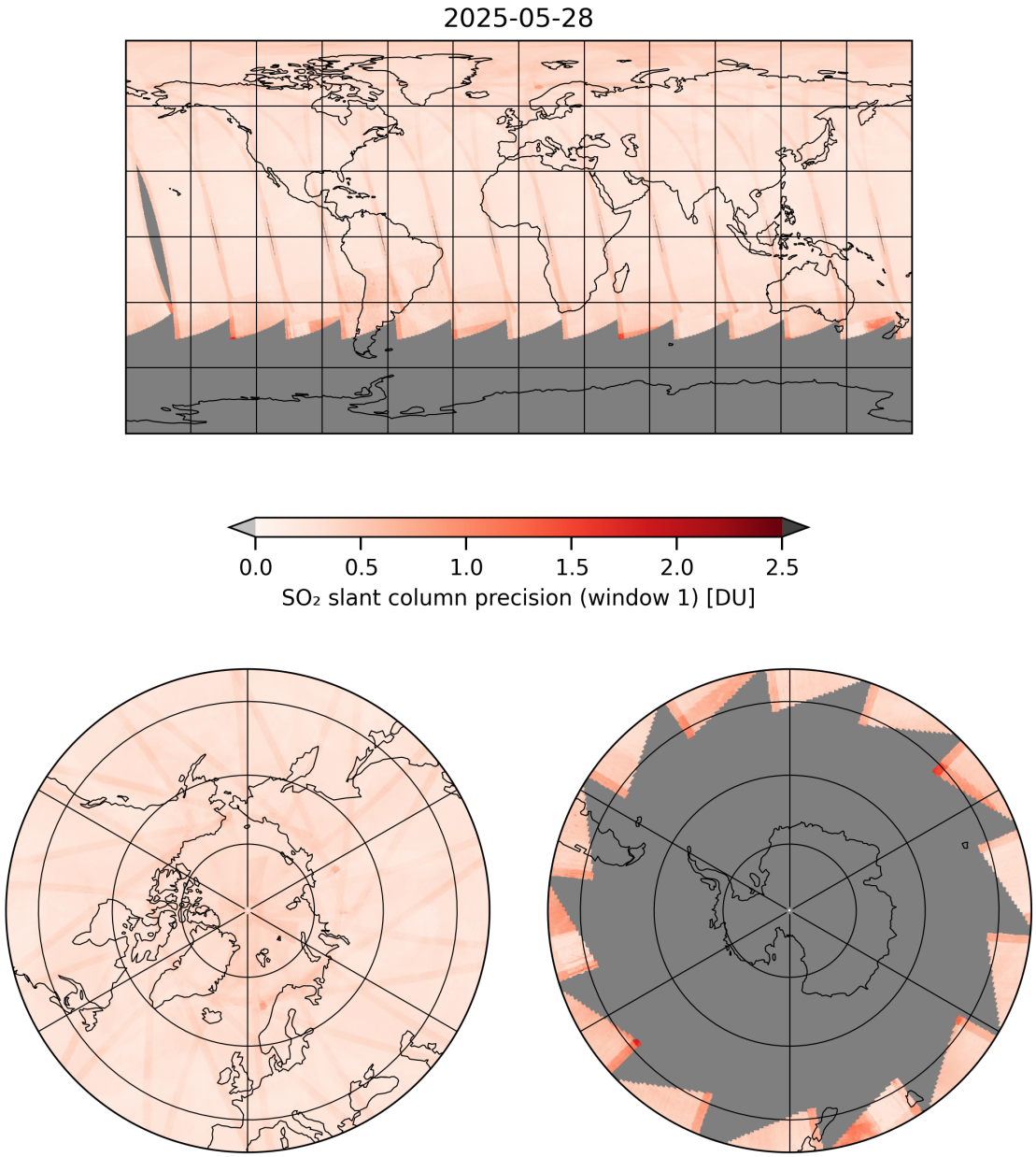


Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-05-28 to 2025-05-29

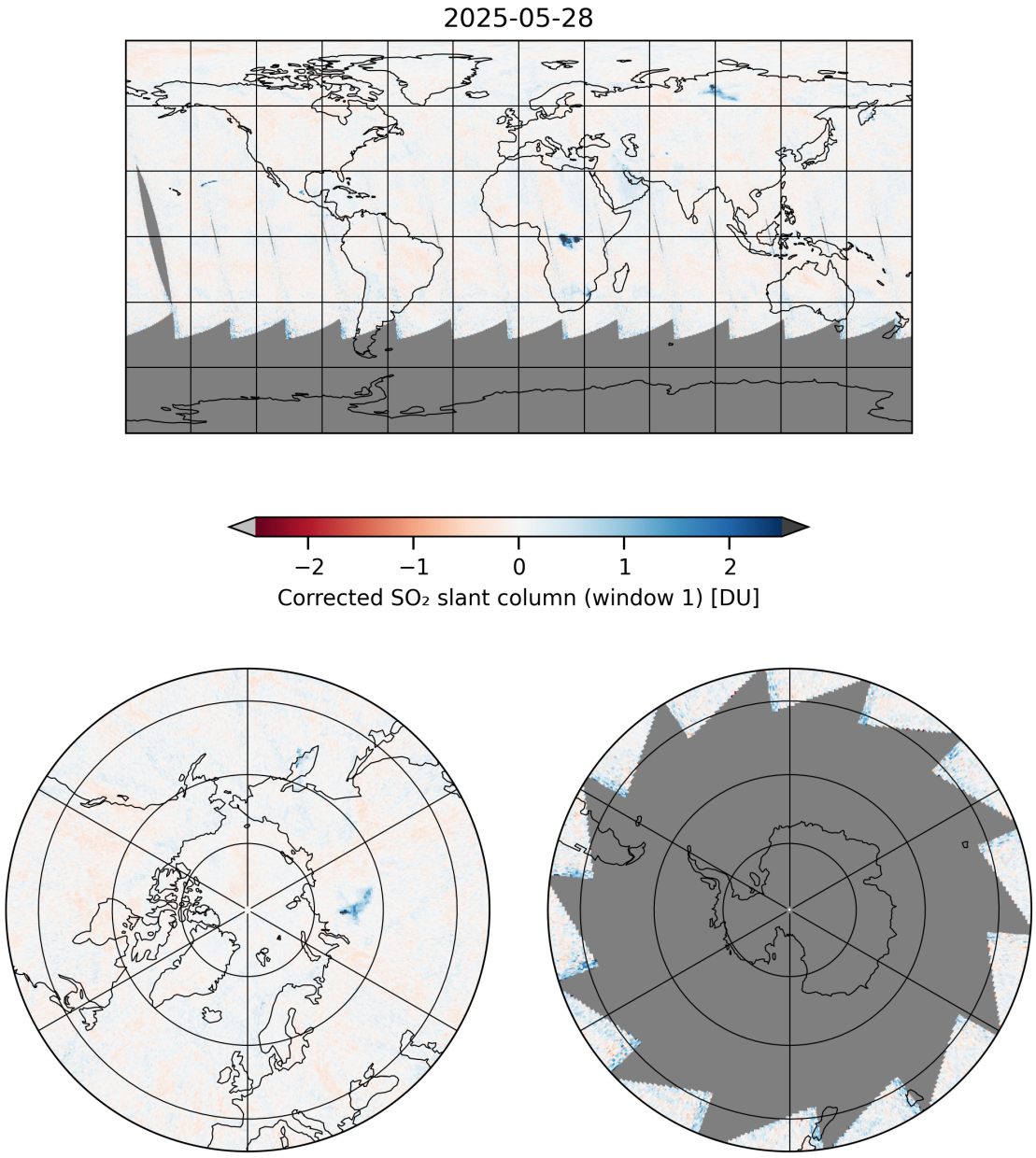


Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-05-28 to 2025-05-29

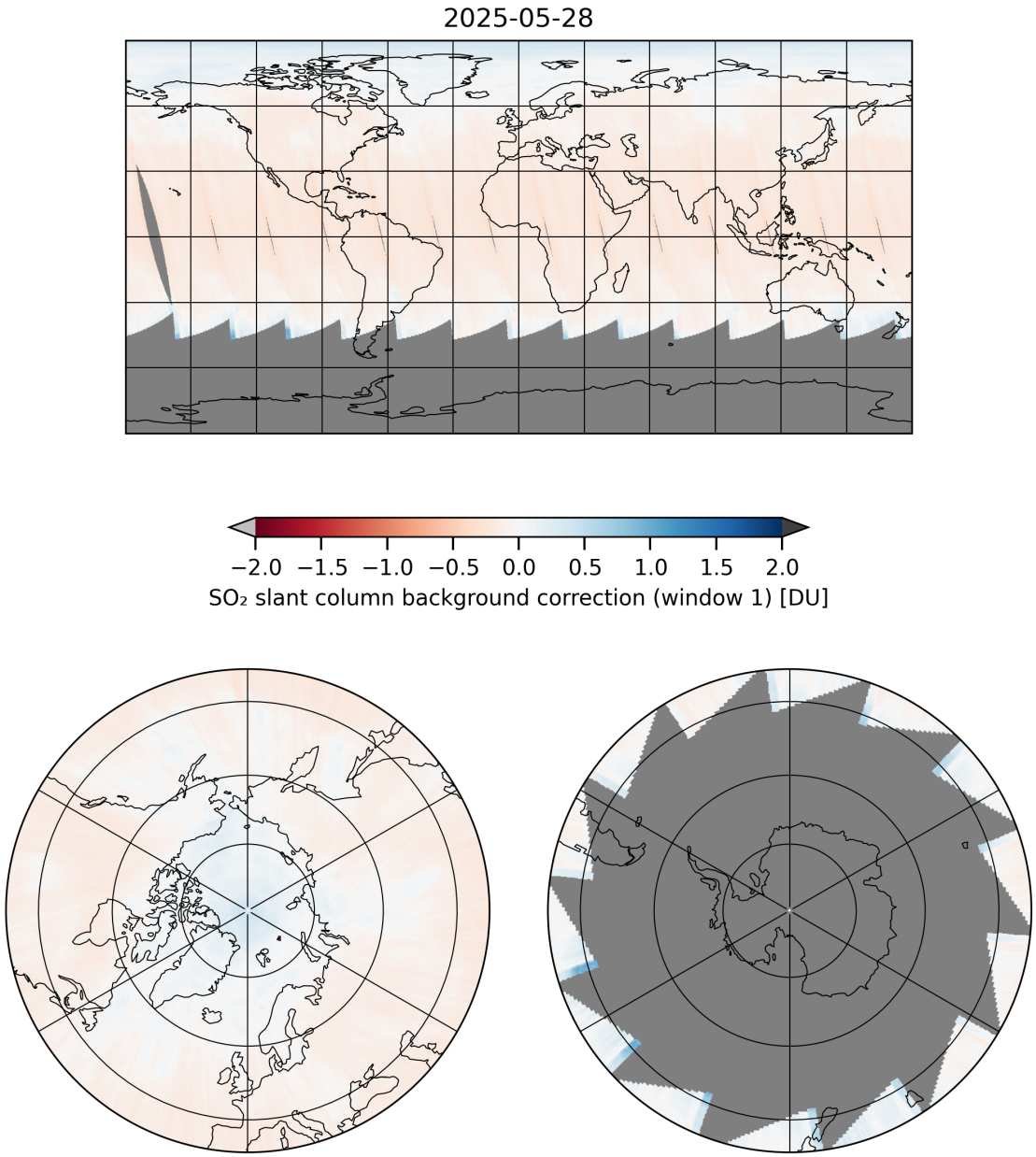


Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-05-28 to 2025-05-29

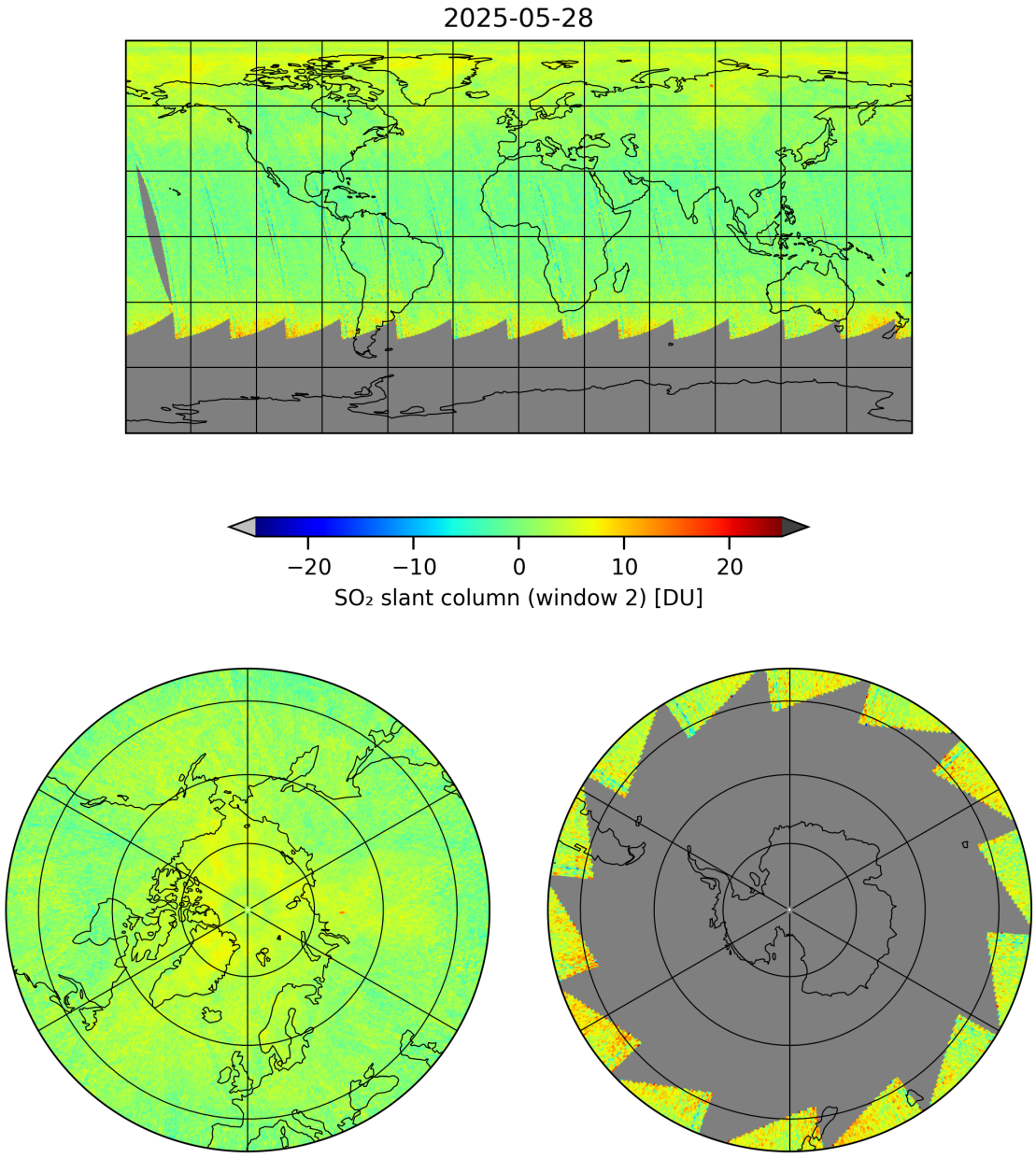


Figure 13: Map of "SO_2 slant column (window 2)" for 2025-05-28 to 2025-05-29

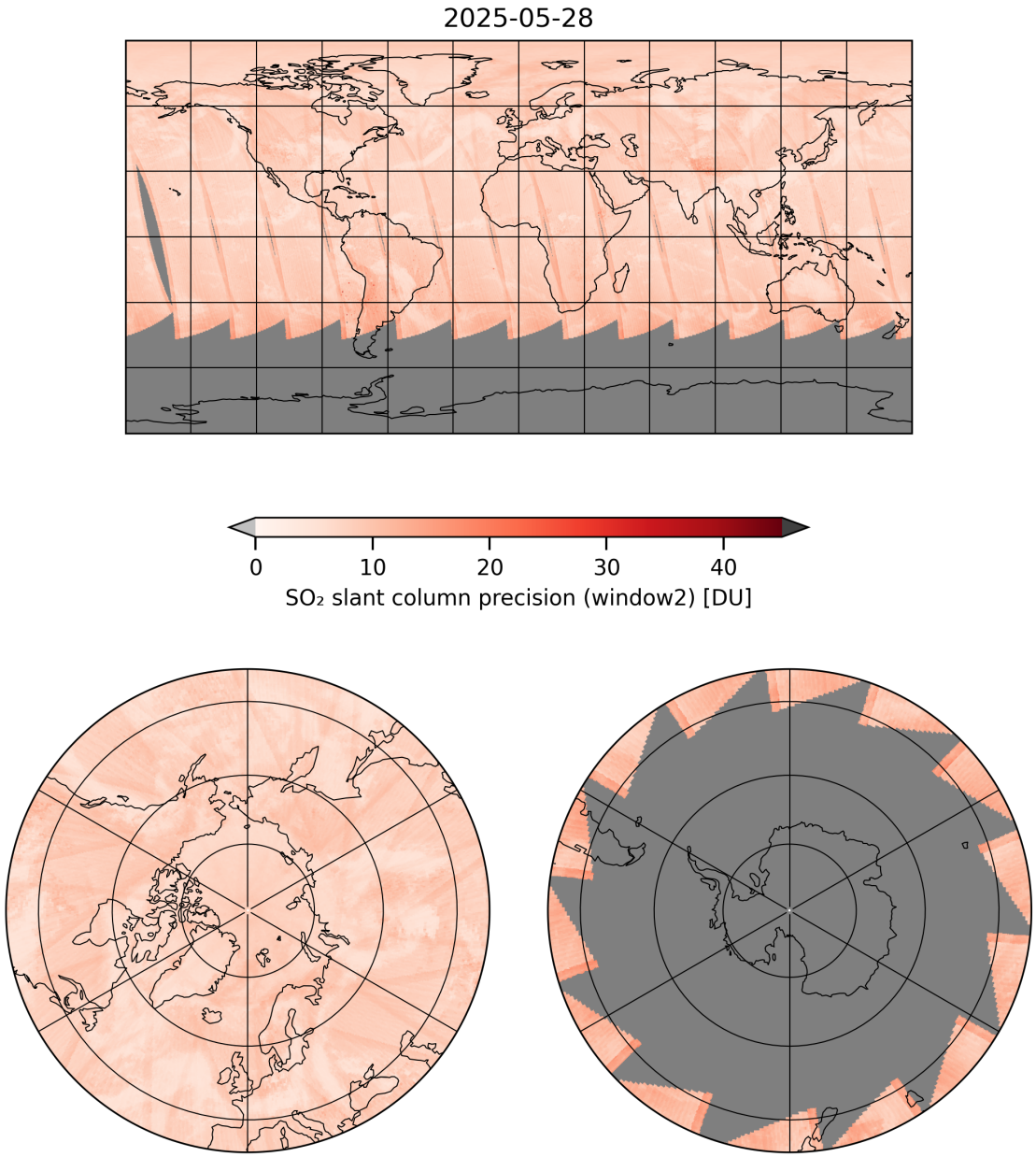


Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-05-28 to 2025-05-29

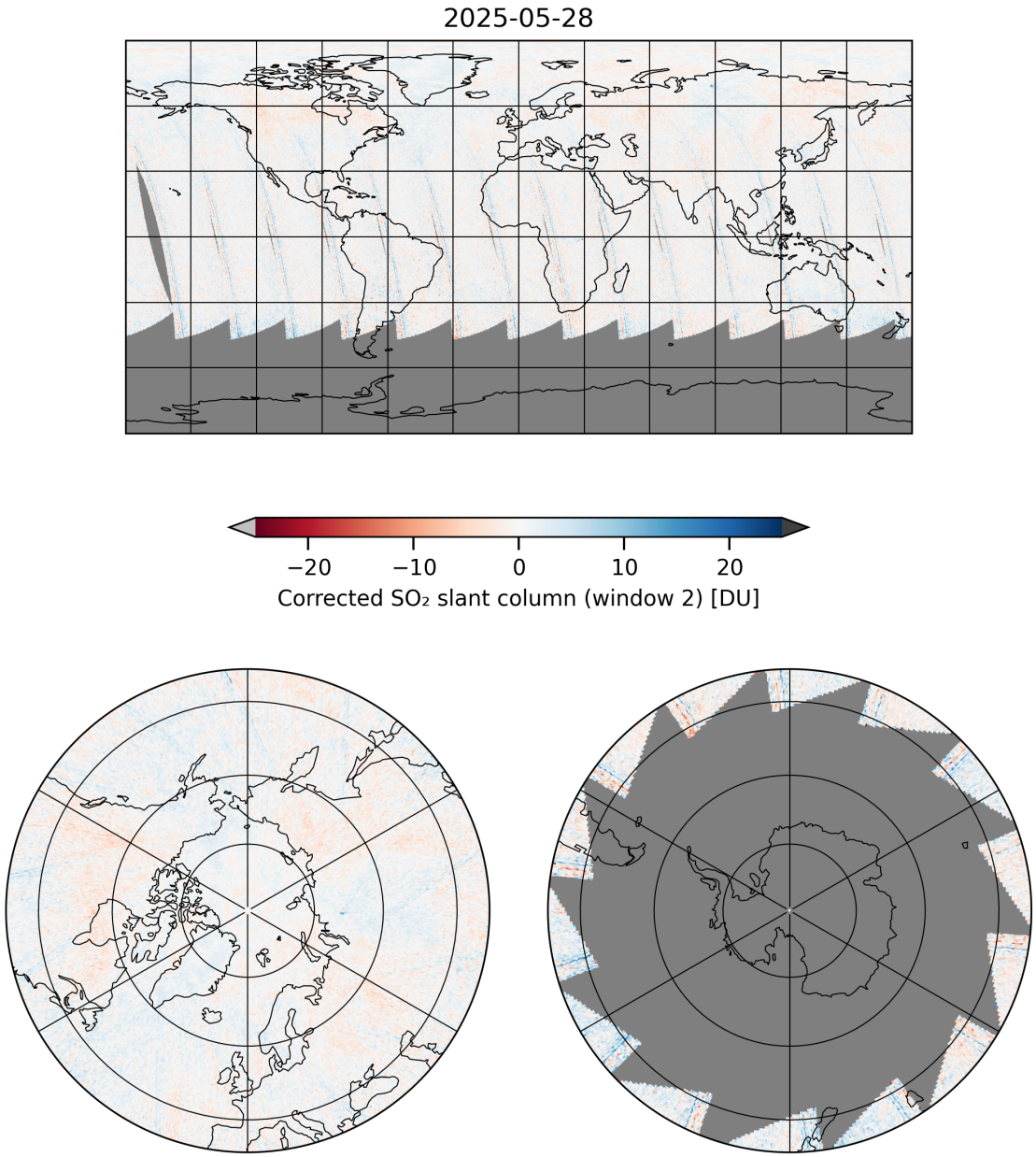


Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2025-05-28 to 2025-05-29

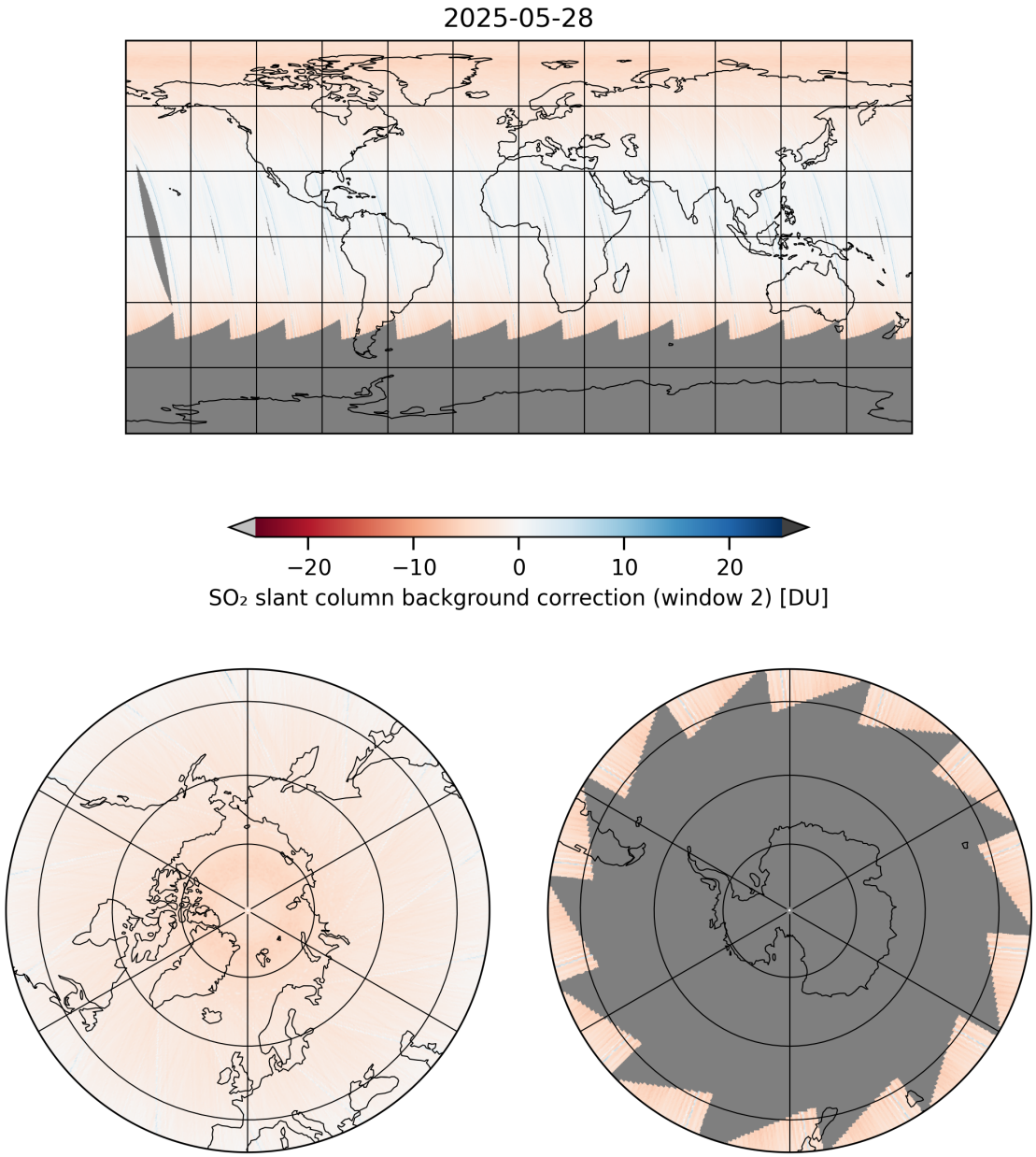


Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-05-28 to 2025-05-29

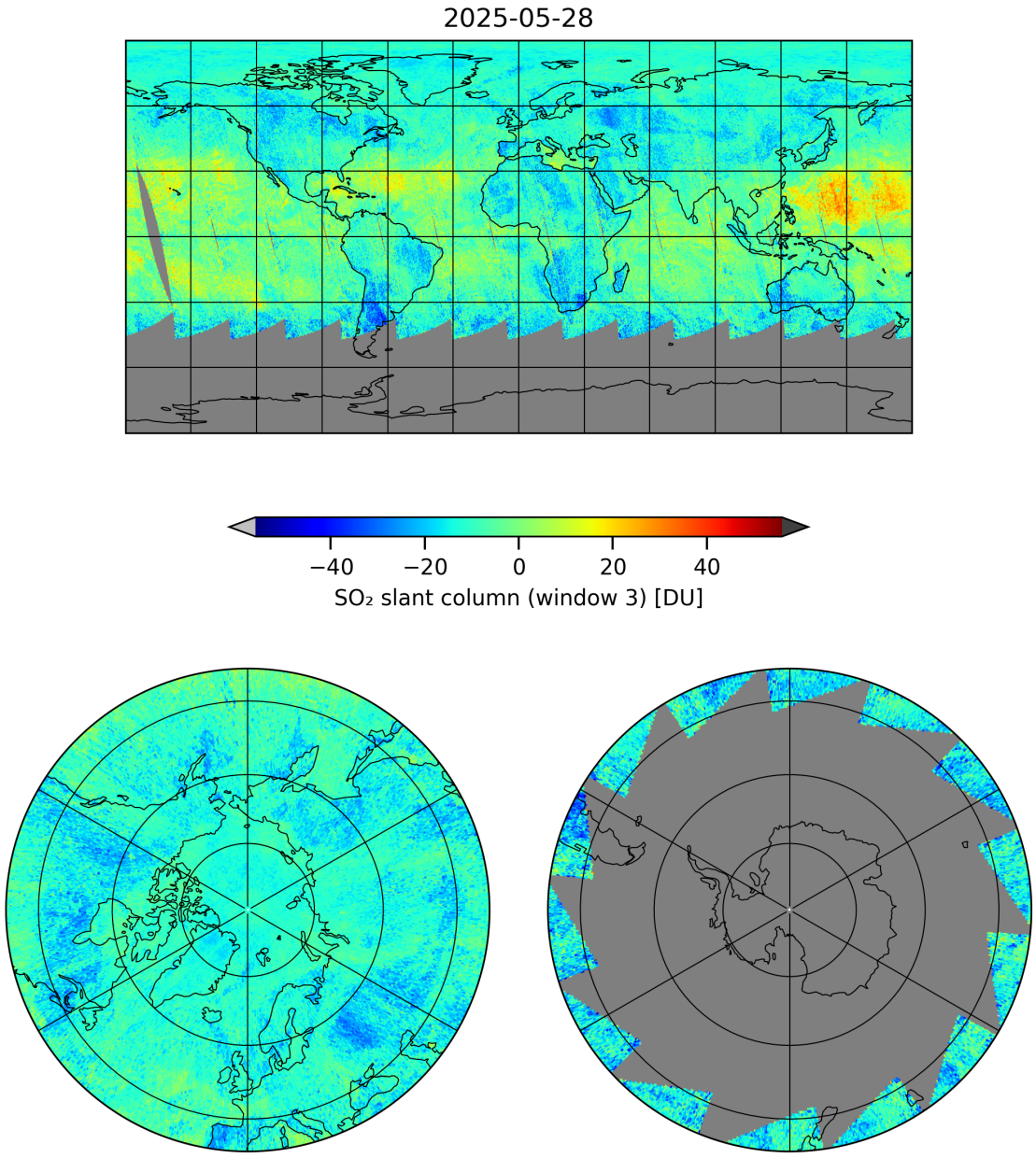


Figure 17: Map of "SO_2 slant column (window 3)" for 2025-05-28 to 2025-05-29

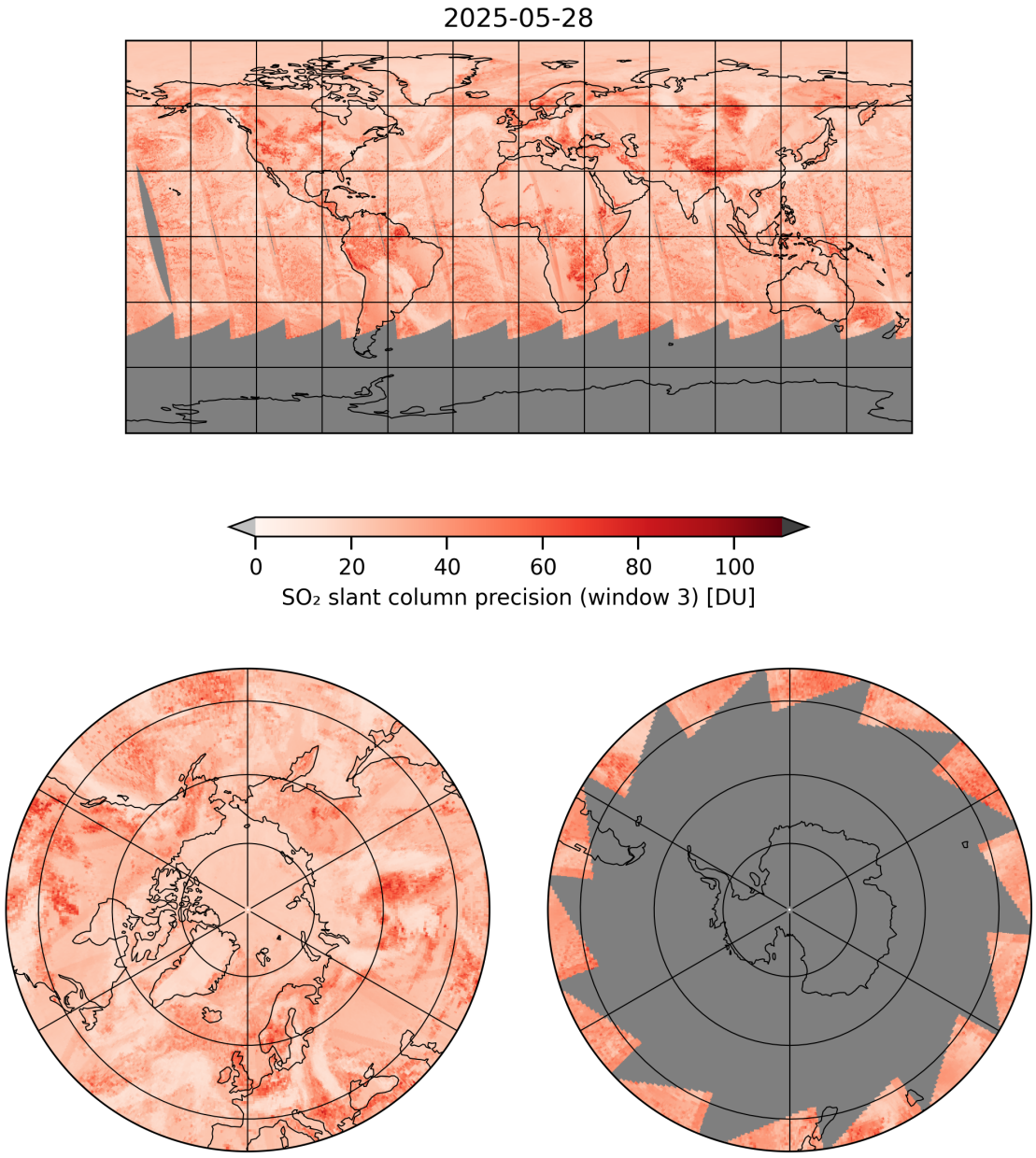


Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-05-28 to 2025-05-29

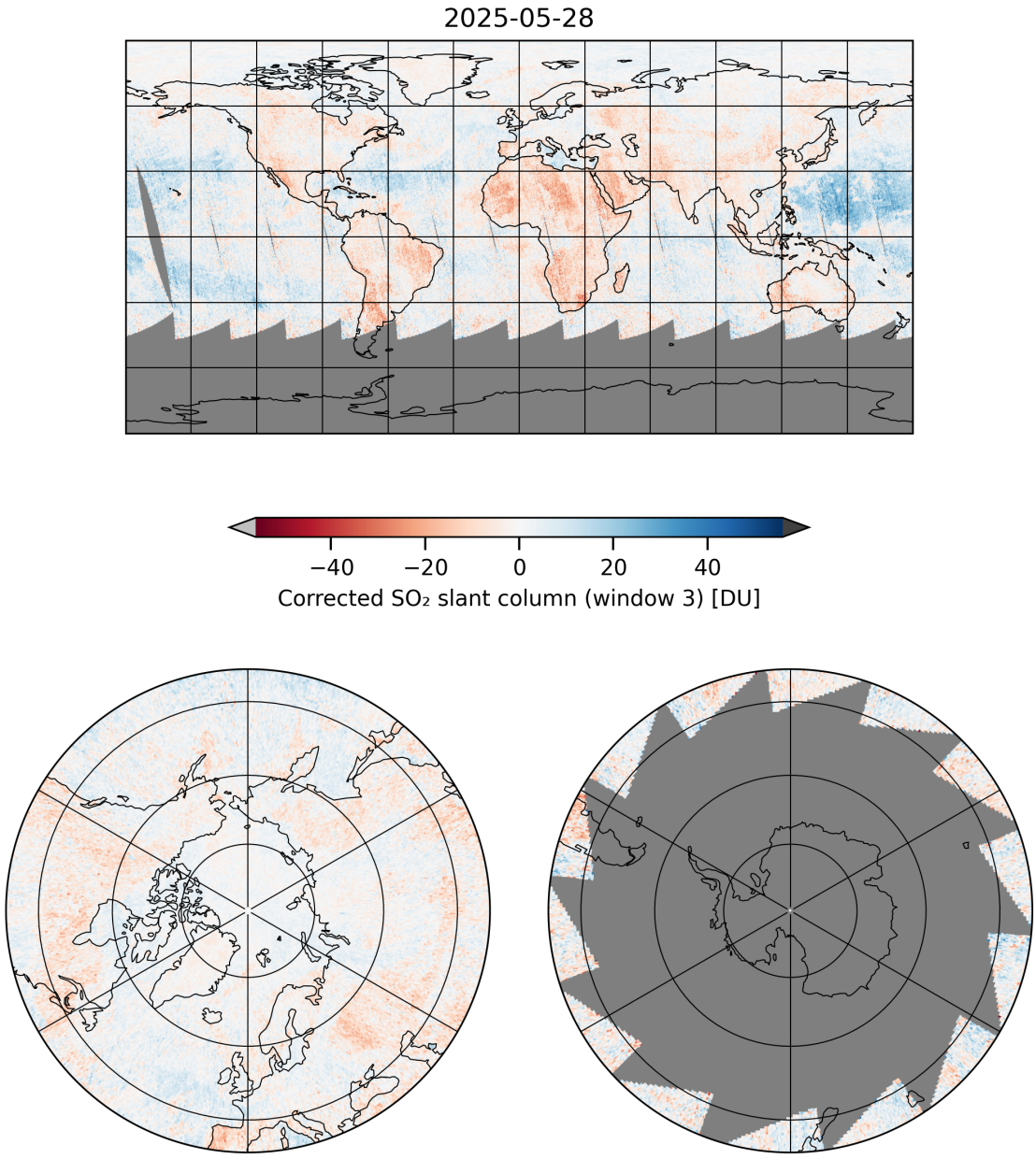


Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-05-28 to 2025-05-29

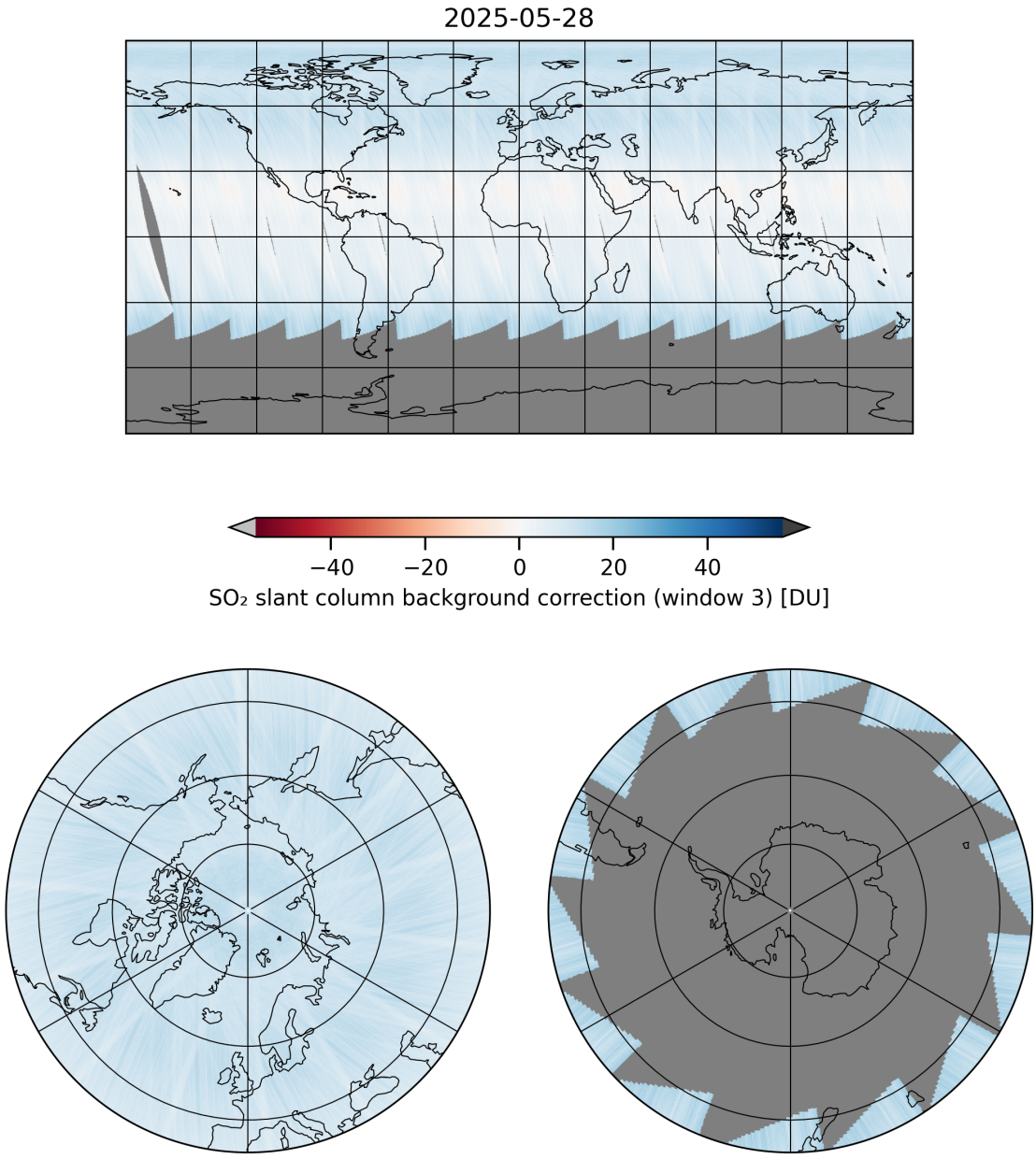


Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-05-28 to 2025-05-29

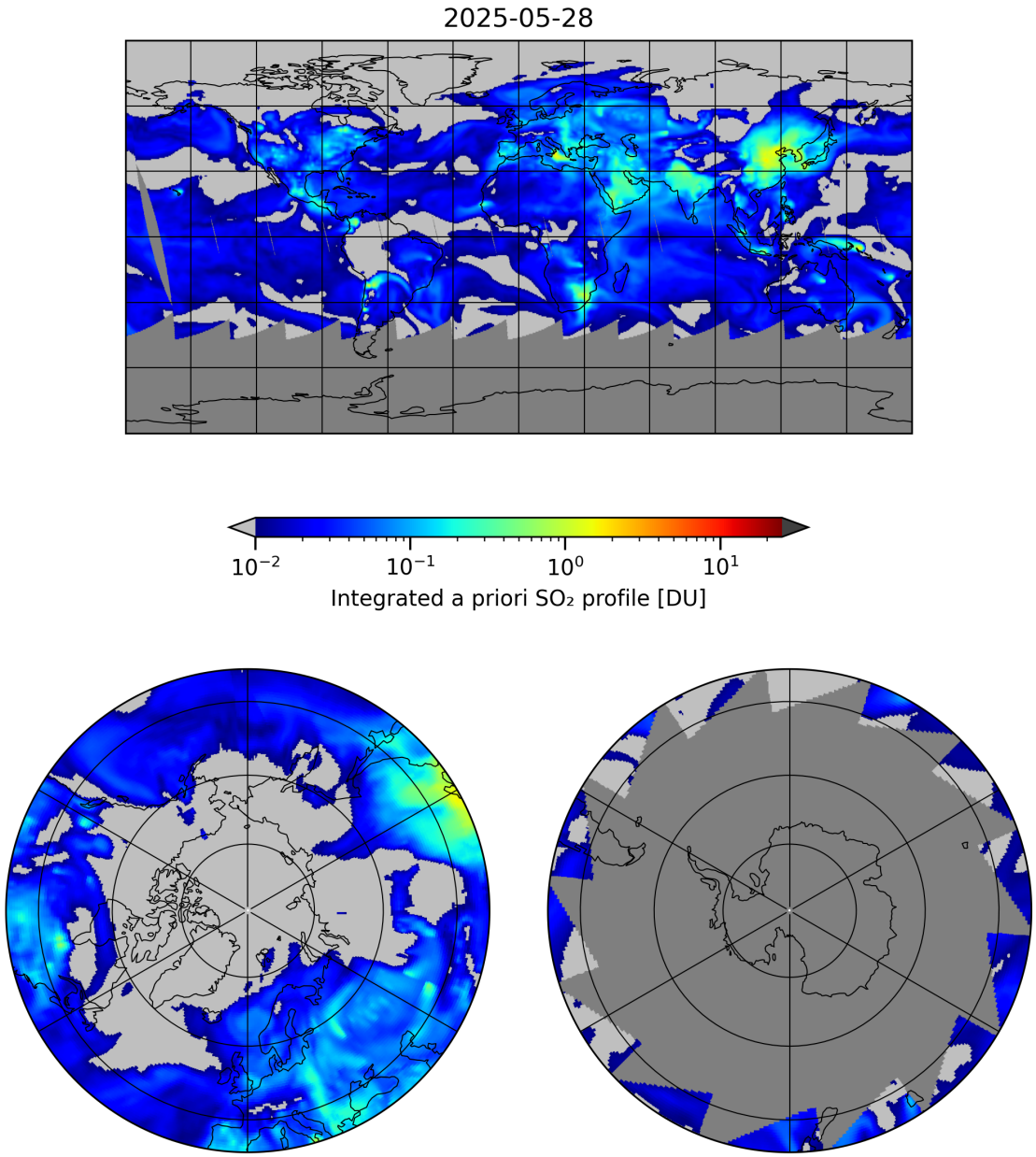


Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-05-28 to 2025-05-29

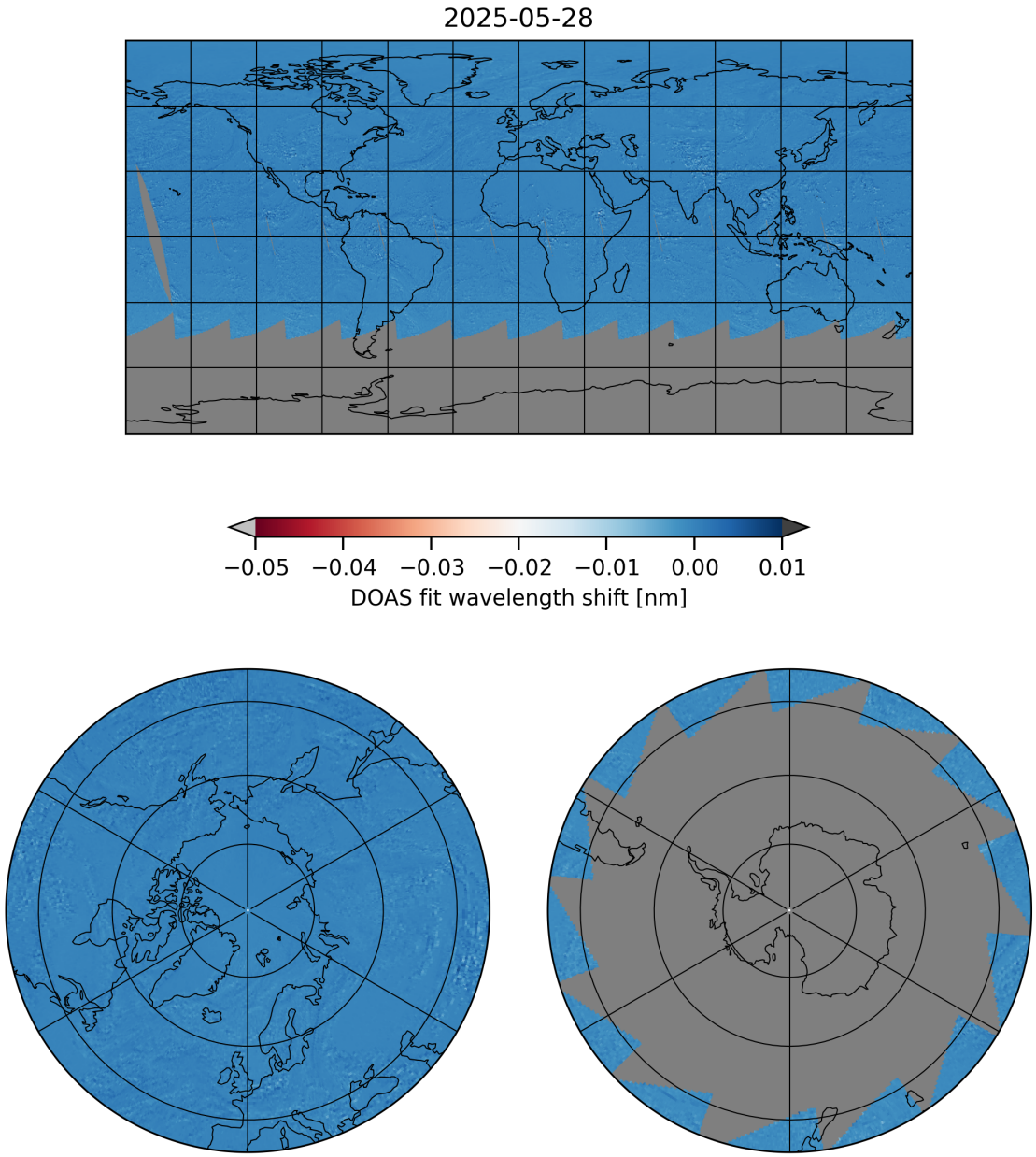


Figure 22: Map of “DOAS fit wavelength shift” for 2025-05-28 to 2025-05-29

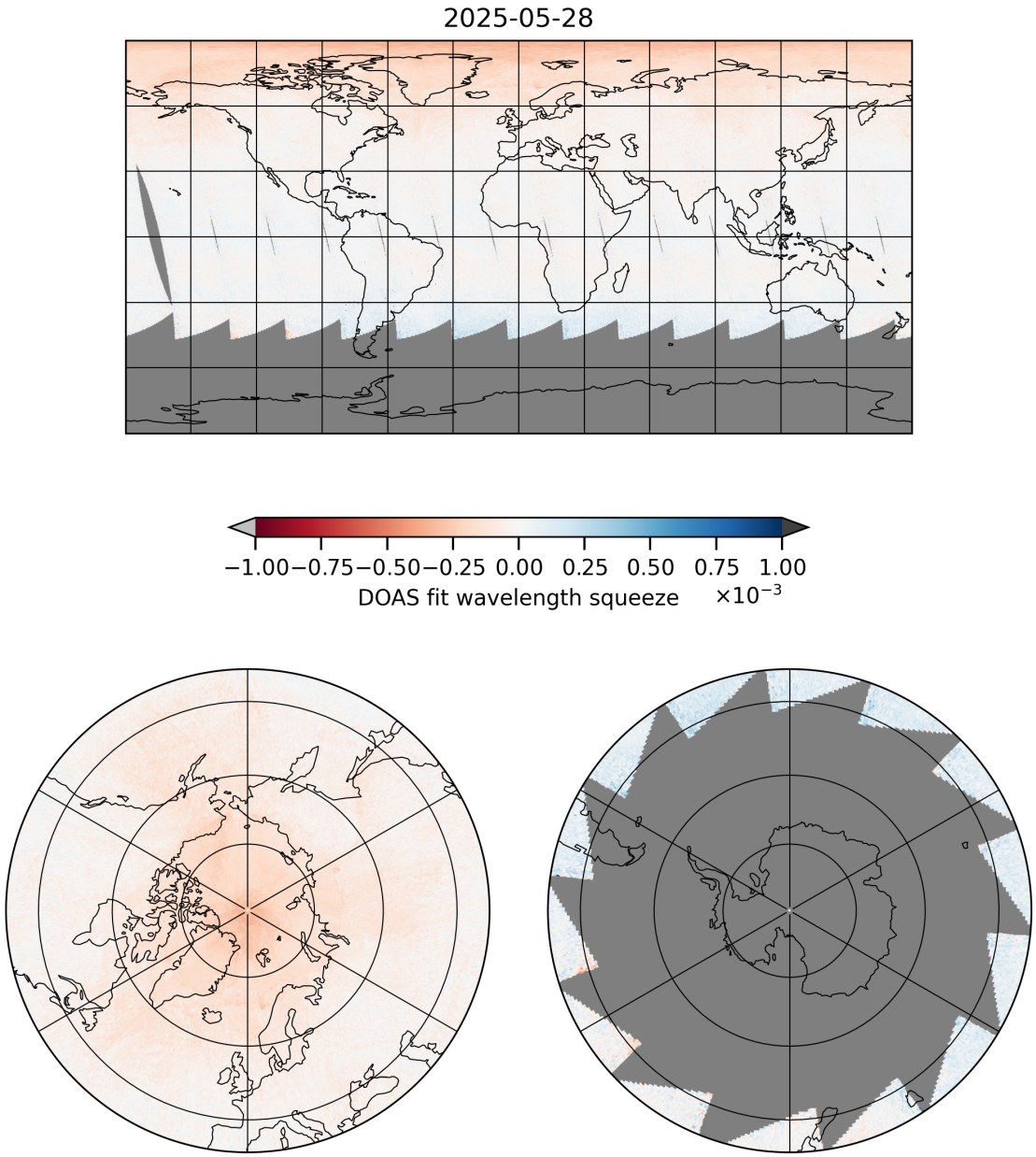


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-05-28 to 2025-05-29

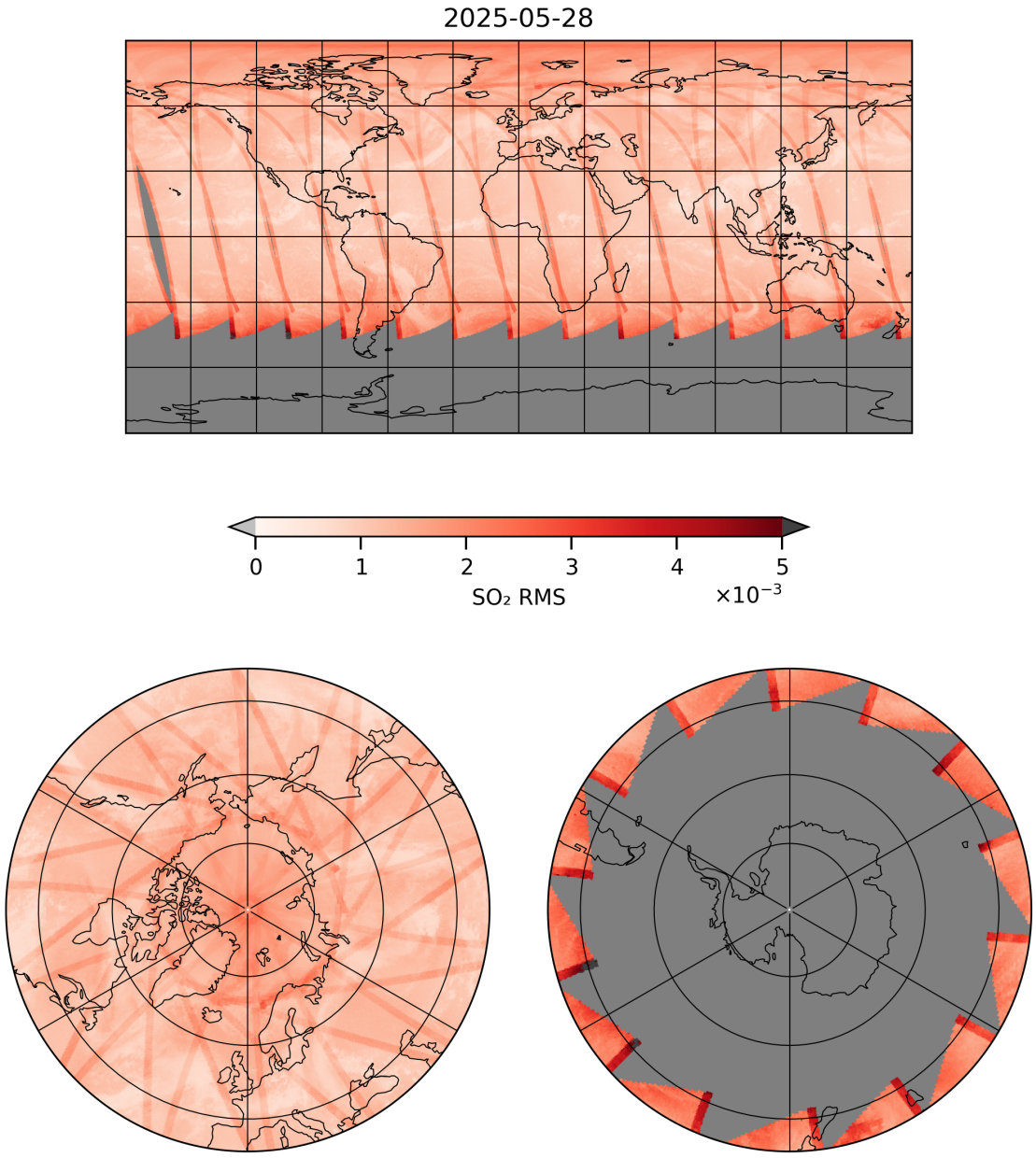


Figure 24: Map of "SO_2 RMS" for 2025-05-28 to 2025-05-29

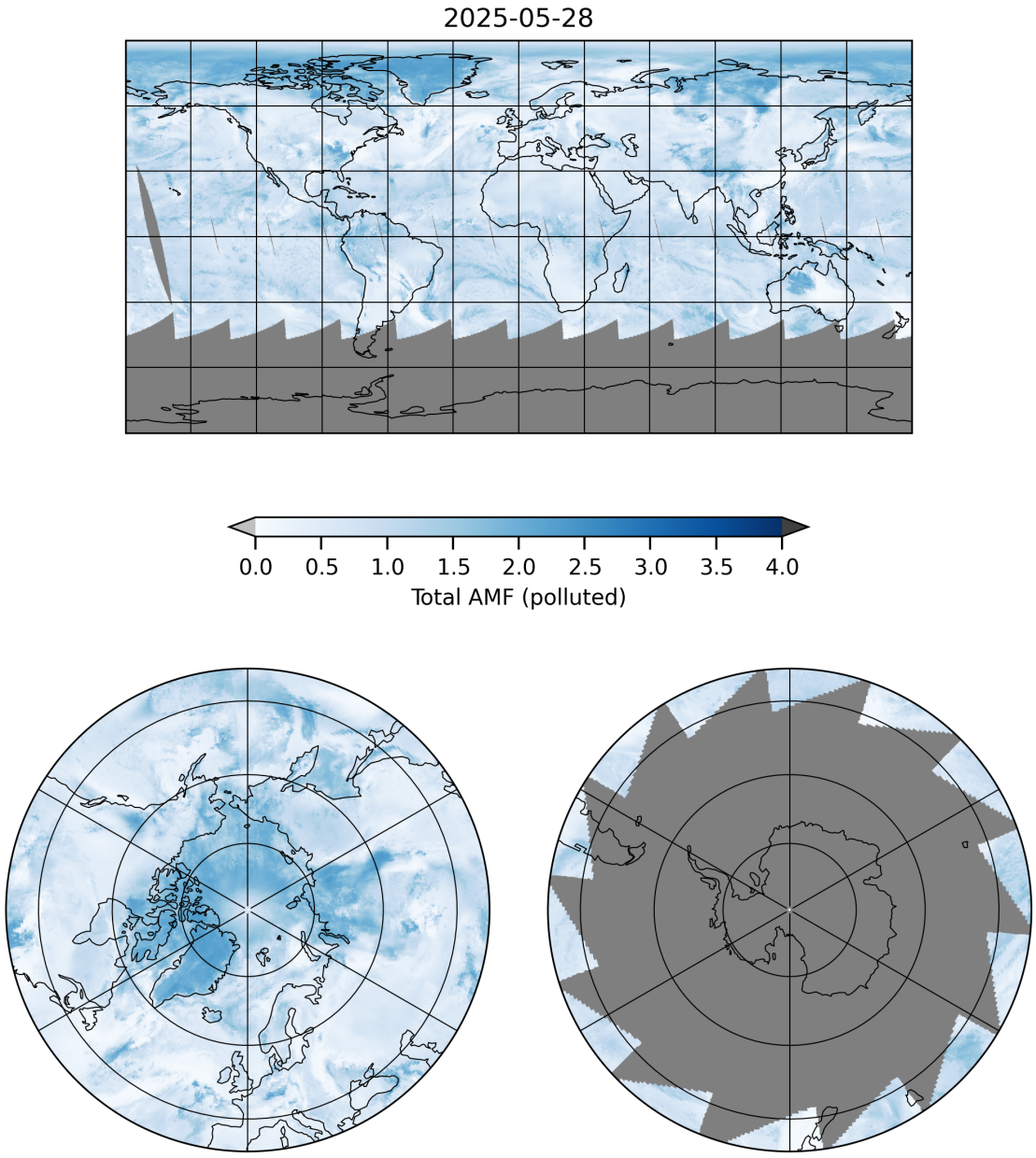


Figure 25: Map of “Total AMF (polluted)” for 2025-05-28 to 2025-05-29

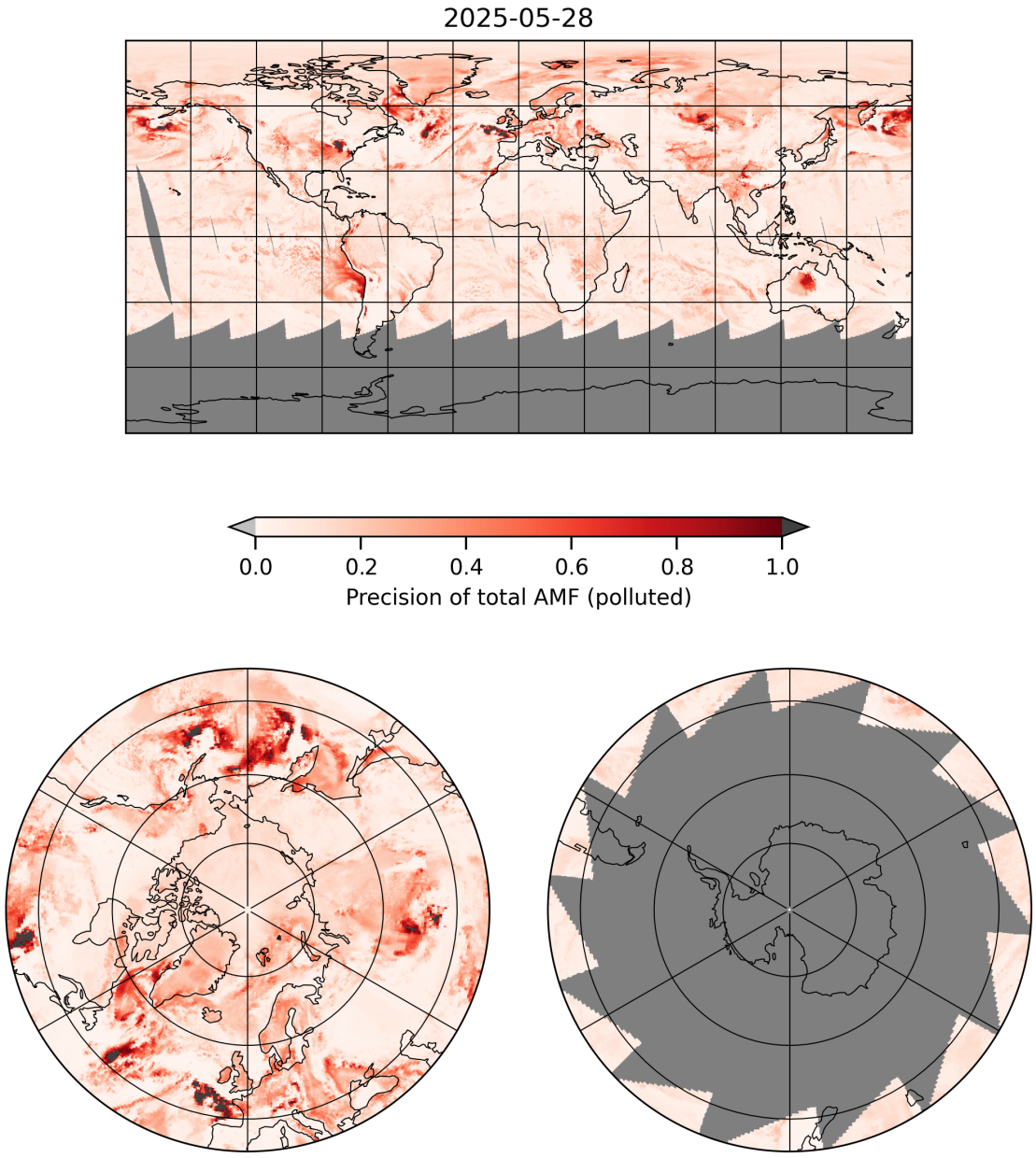


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-05-28 to 2025-05-29

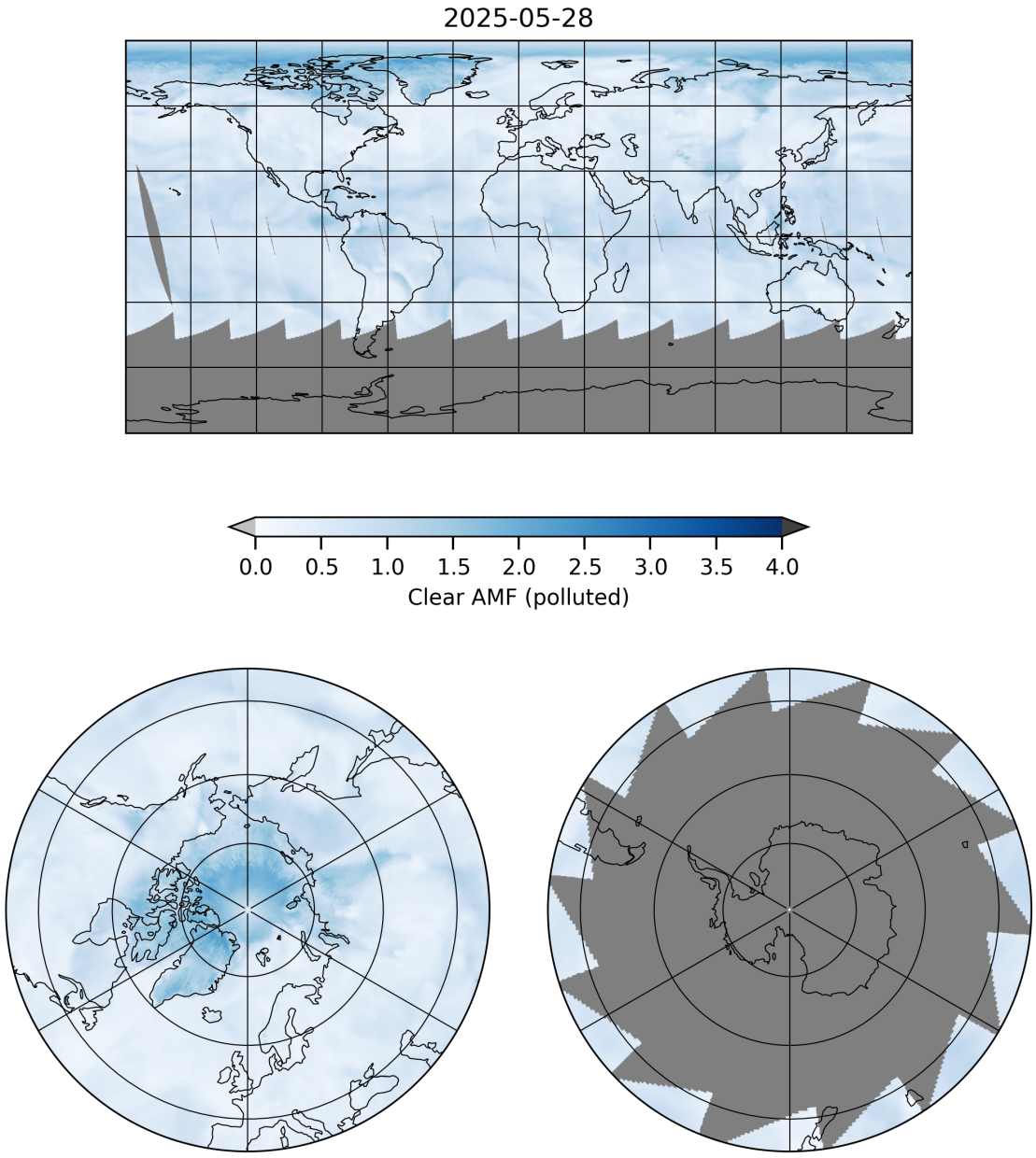


Figure 27: Map of “Clear AMF (polluted)” for 2025-05-28 to 2025-05-29

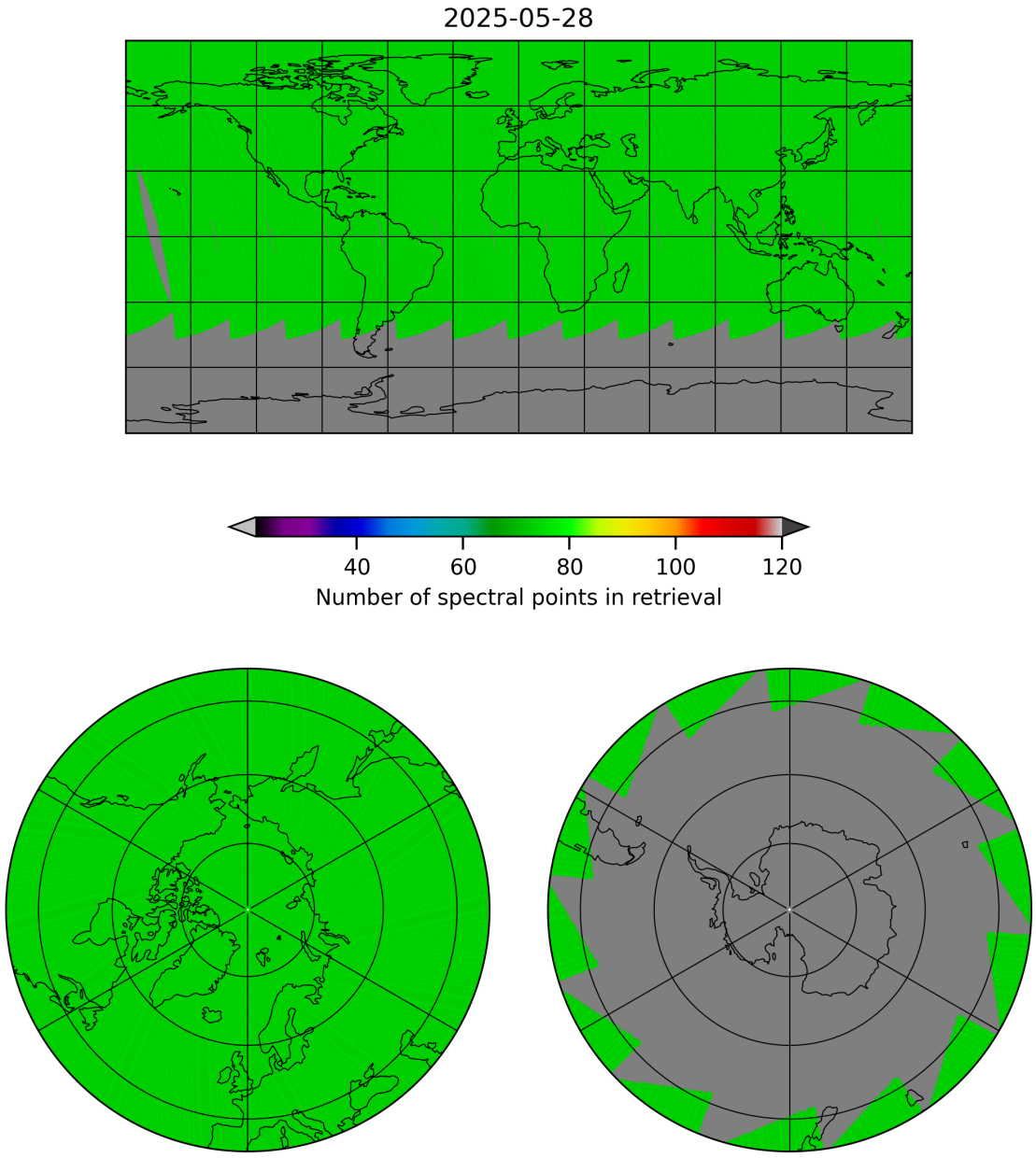


Figure 28: Map of “Number of spectral points in retrieval” for 2025-05-28 to 2025-05-29

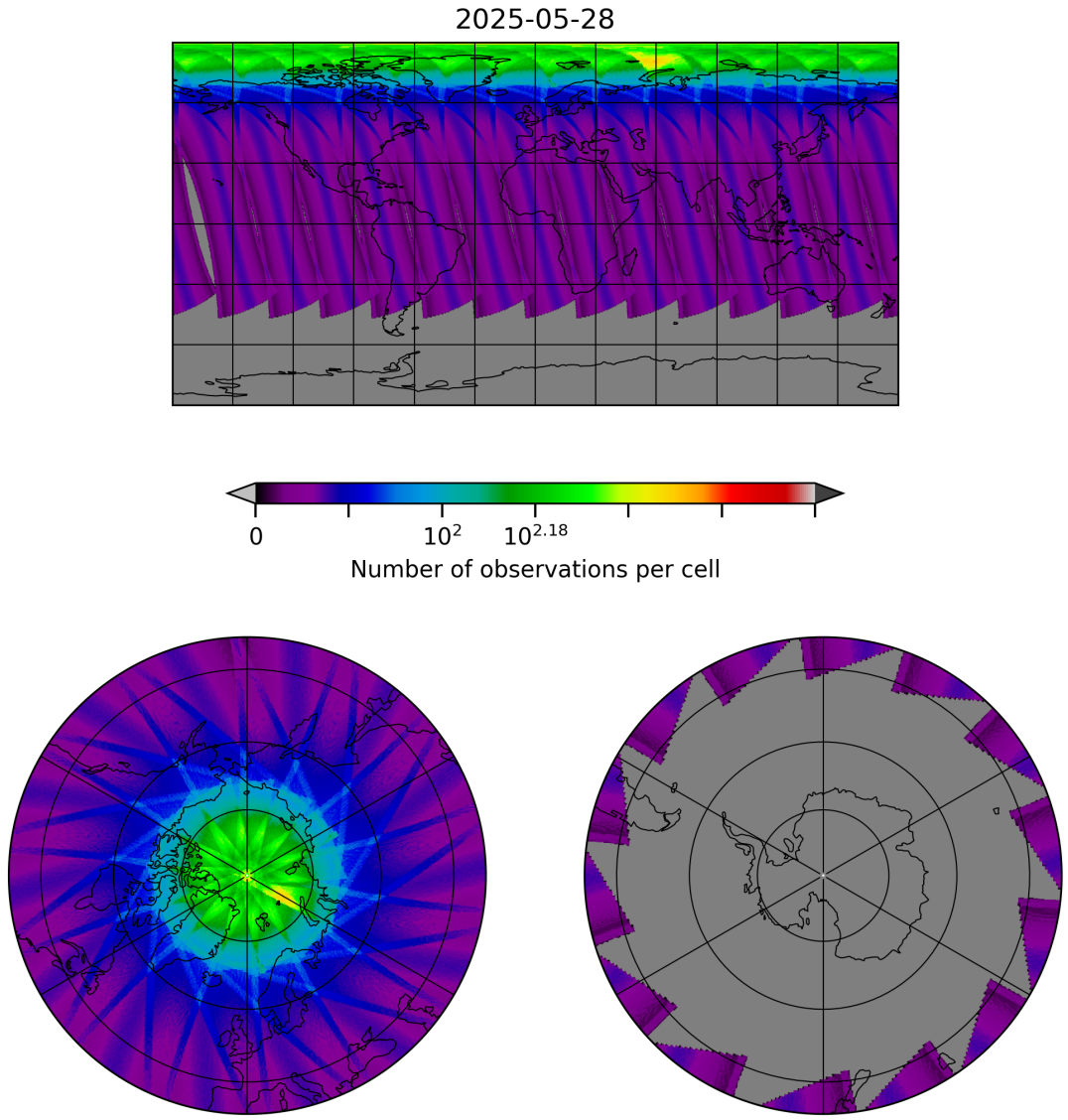


Figure 29: Map of the number of observations for 2025-05-28 to 2025-05-29

7 Zonal average

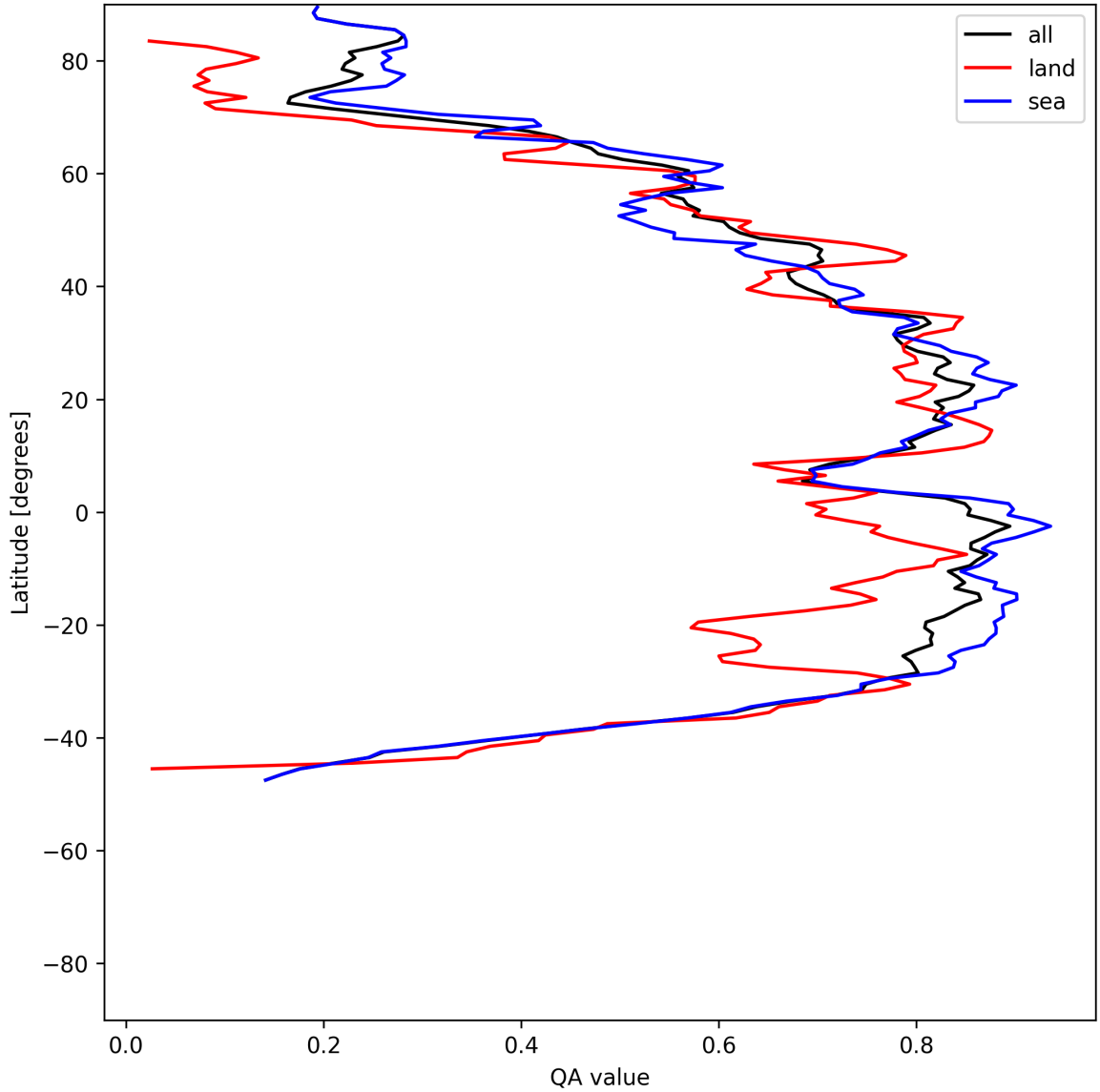


Figure 30: Zonal average of “QA value” for 2025-05-28 to 2025-05-29.

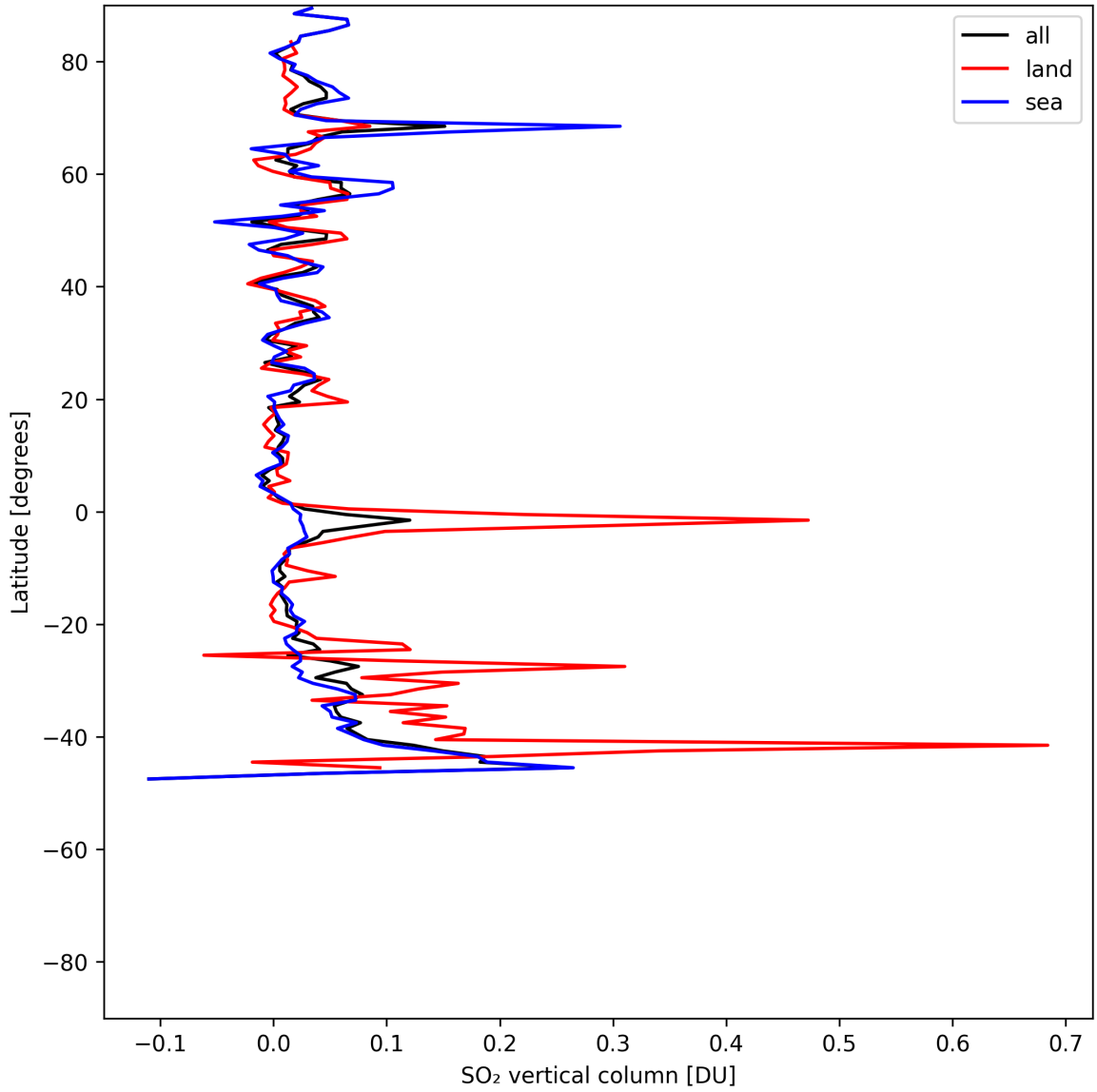


Figure 31: Zonal average of "SO_2 vertical column" for 2025-05-28 to 2025-05-29.

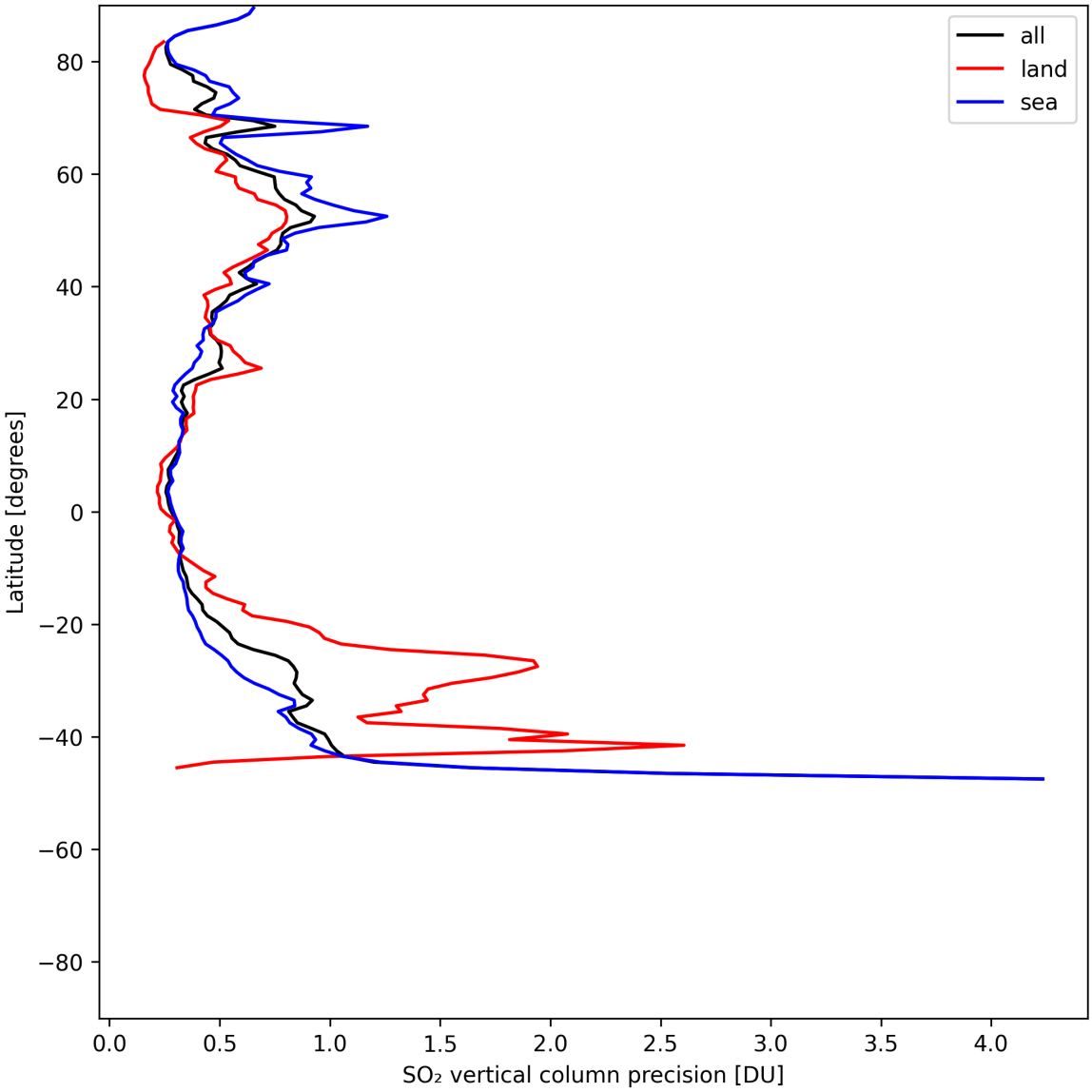


Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-05-28 to 2025-05-29.

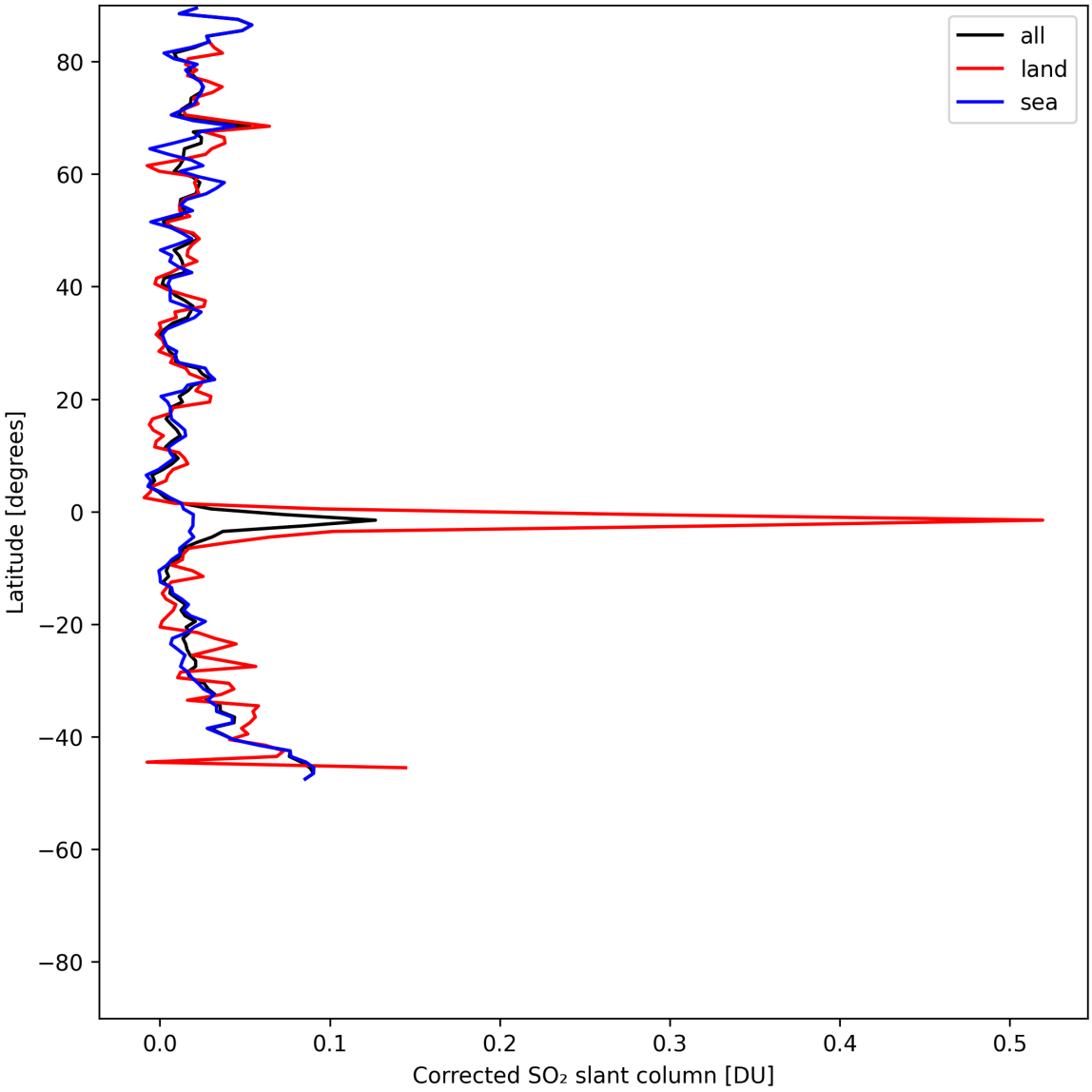


Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-05-28 to 2025-05-29.

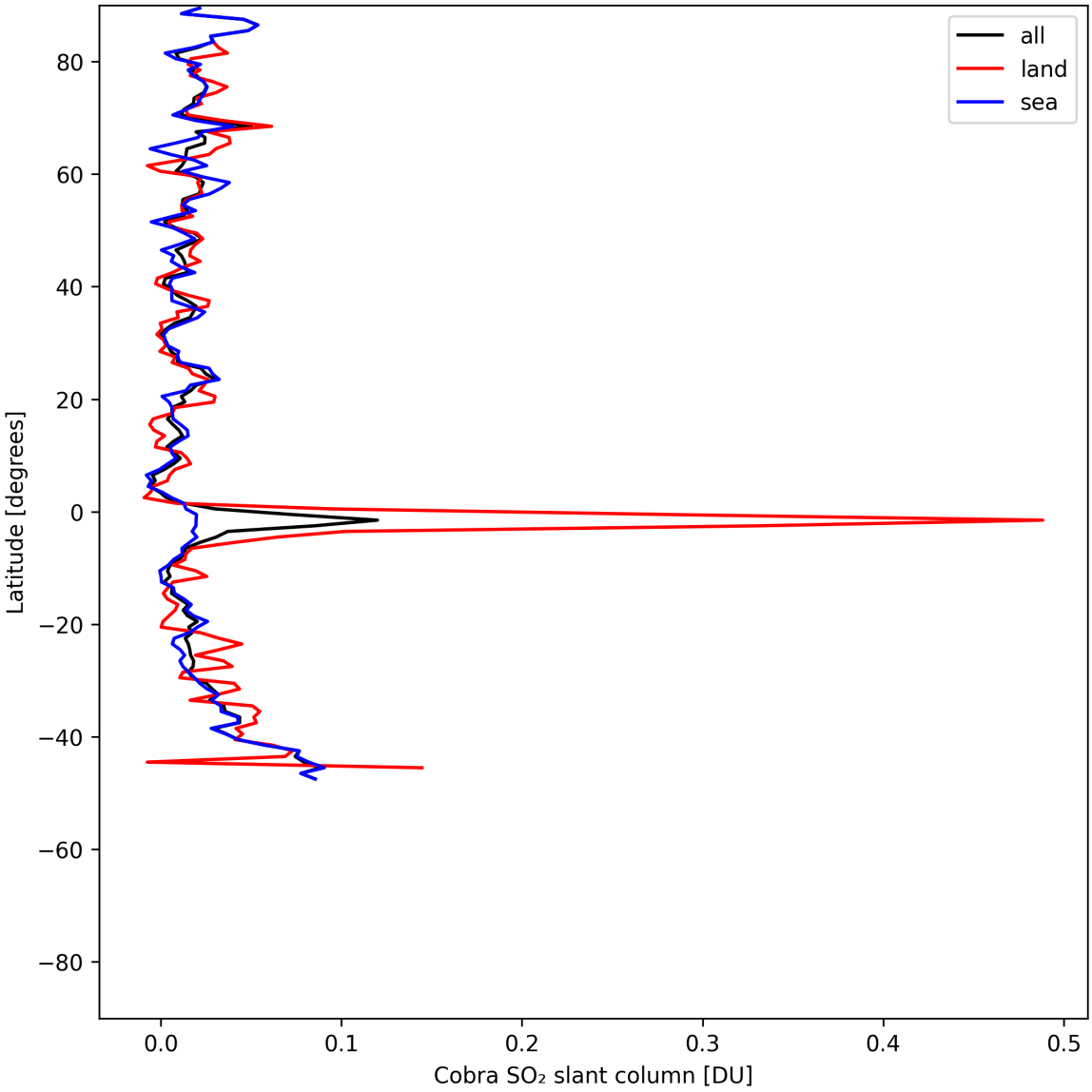


Figure 34: Zonal average of "Cobra SO_2 slant column" for 2025-05-28 to 2025-05-29.

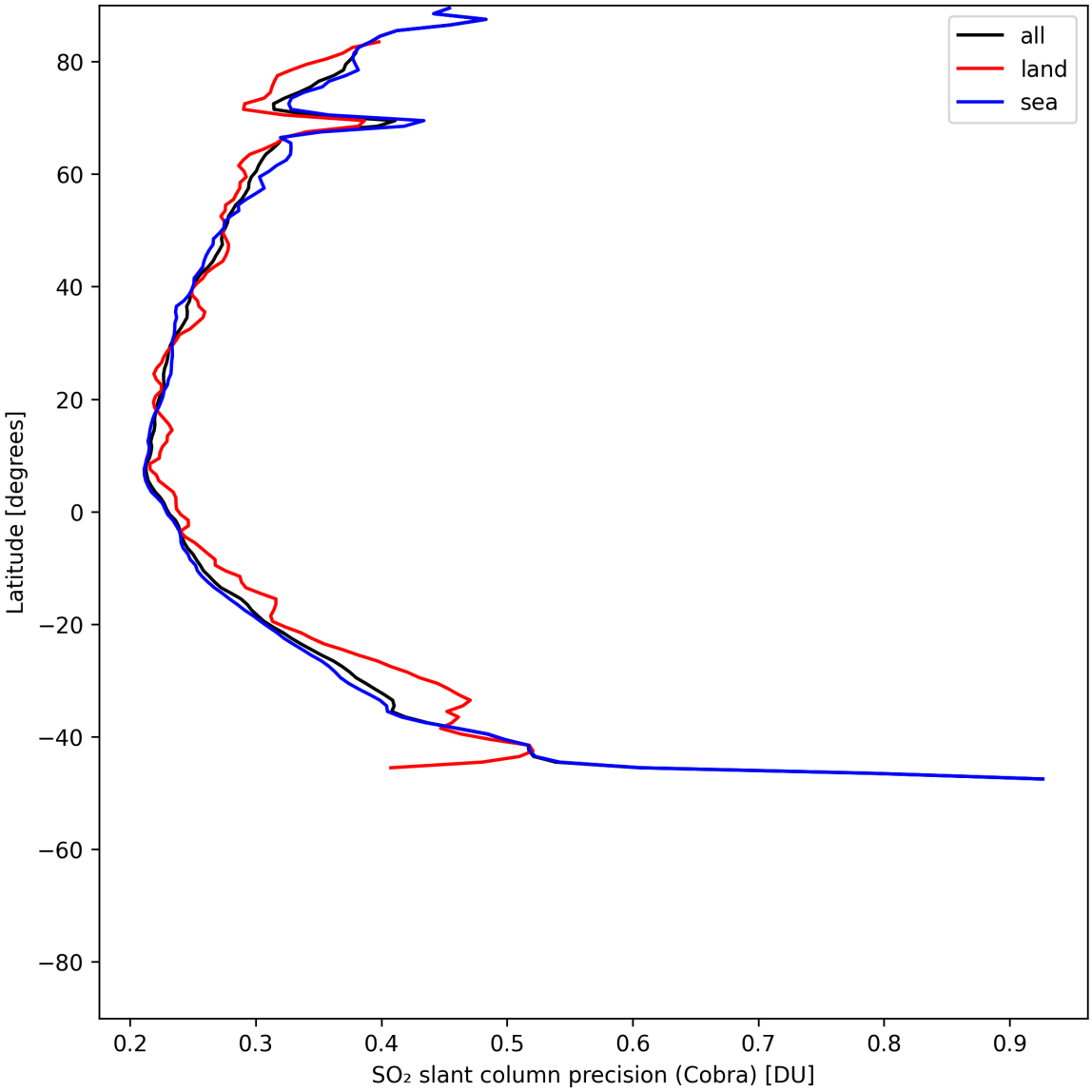


Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-05-28 to 2025-05-29.

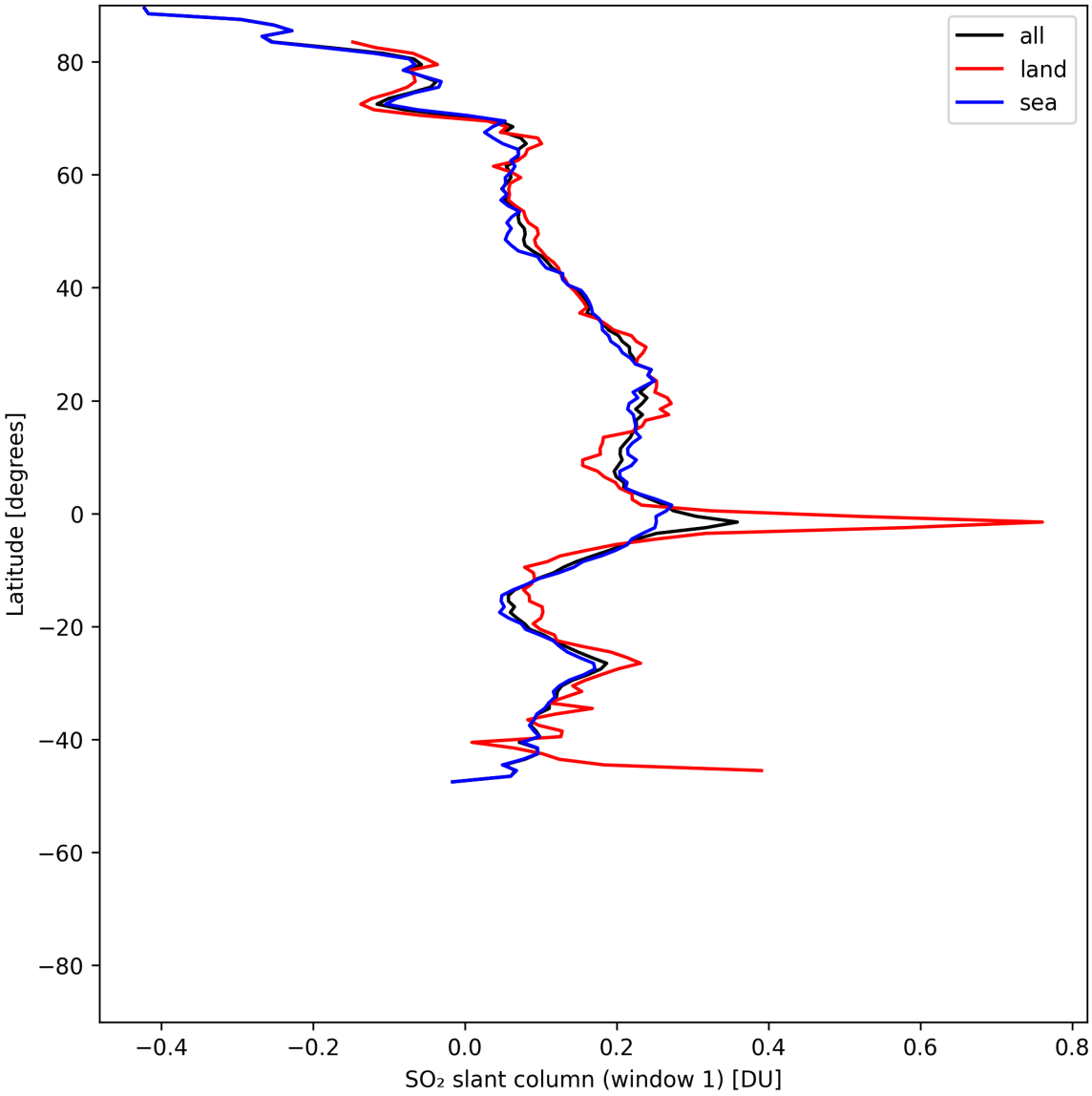


Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-05-28 to 2025-05-29.

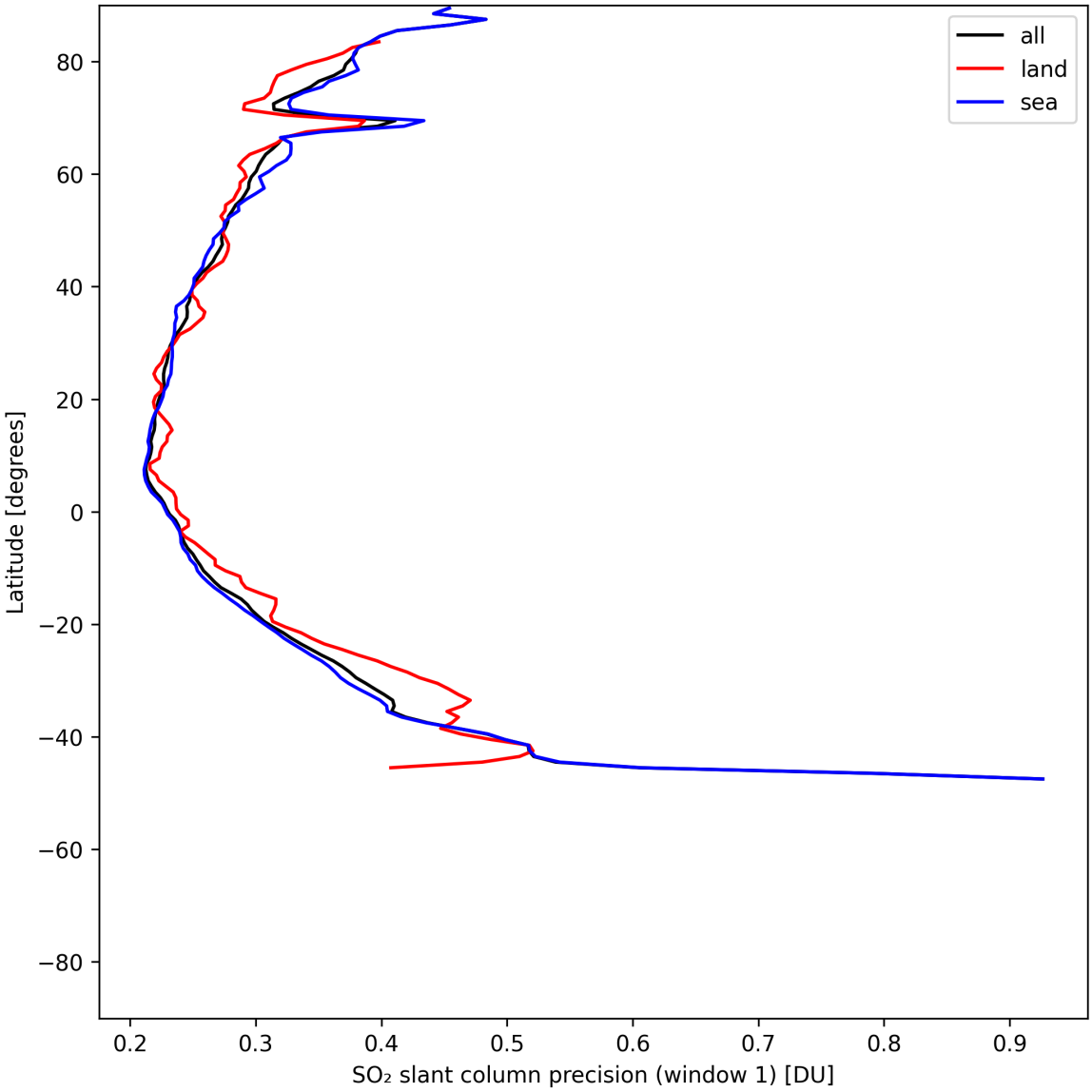


Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-05-28 to 2025-05-29.

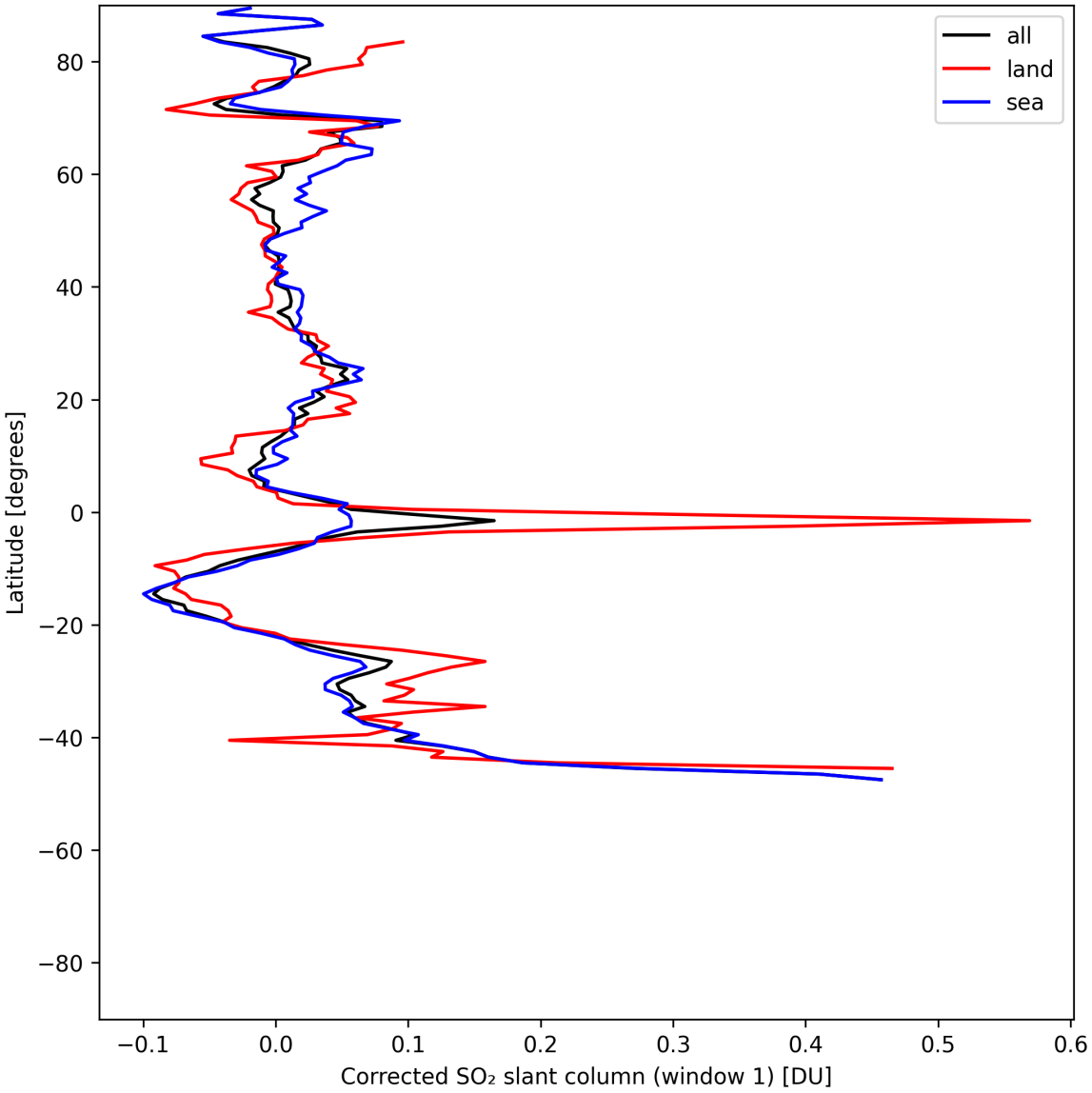


Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-05-28 to 2025-05-29.

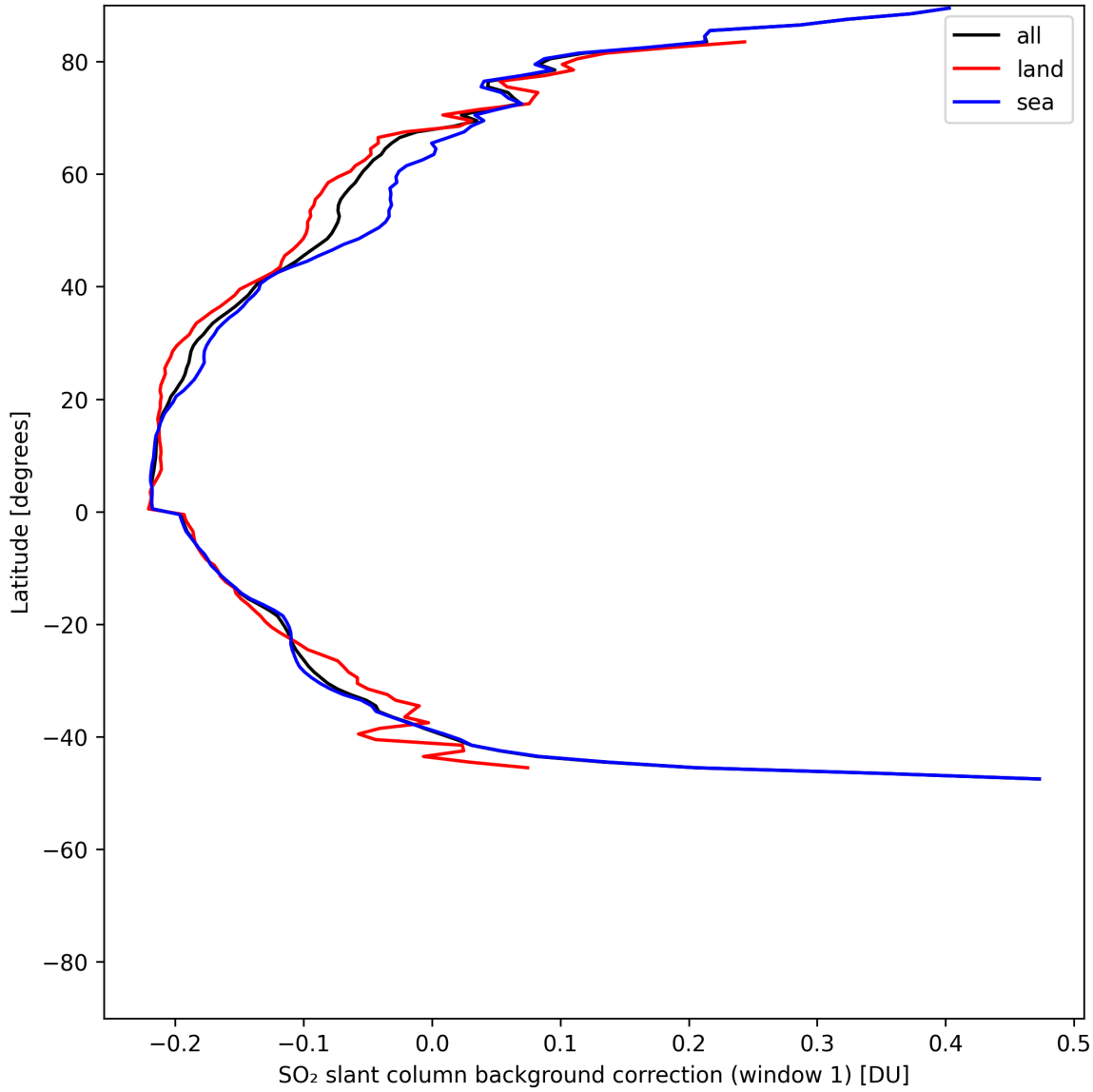


Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-05-28 to 2025-05-29.

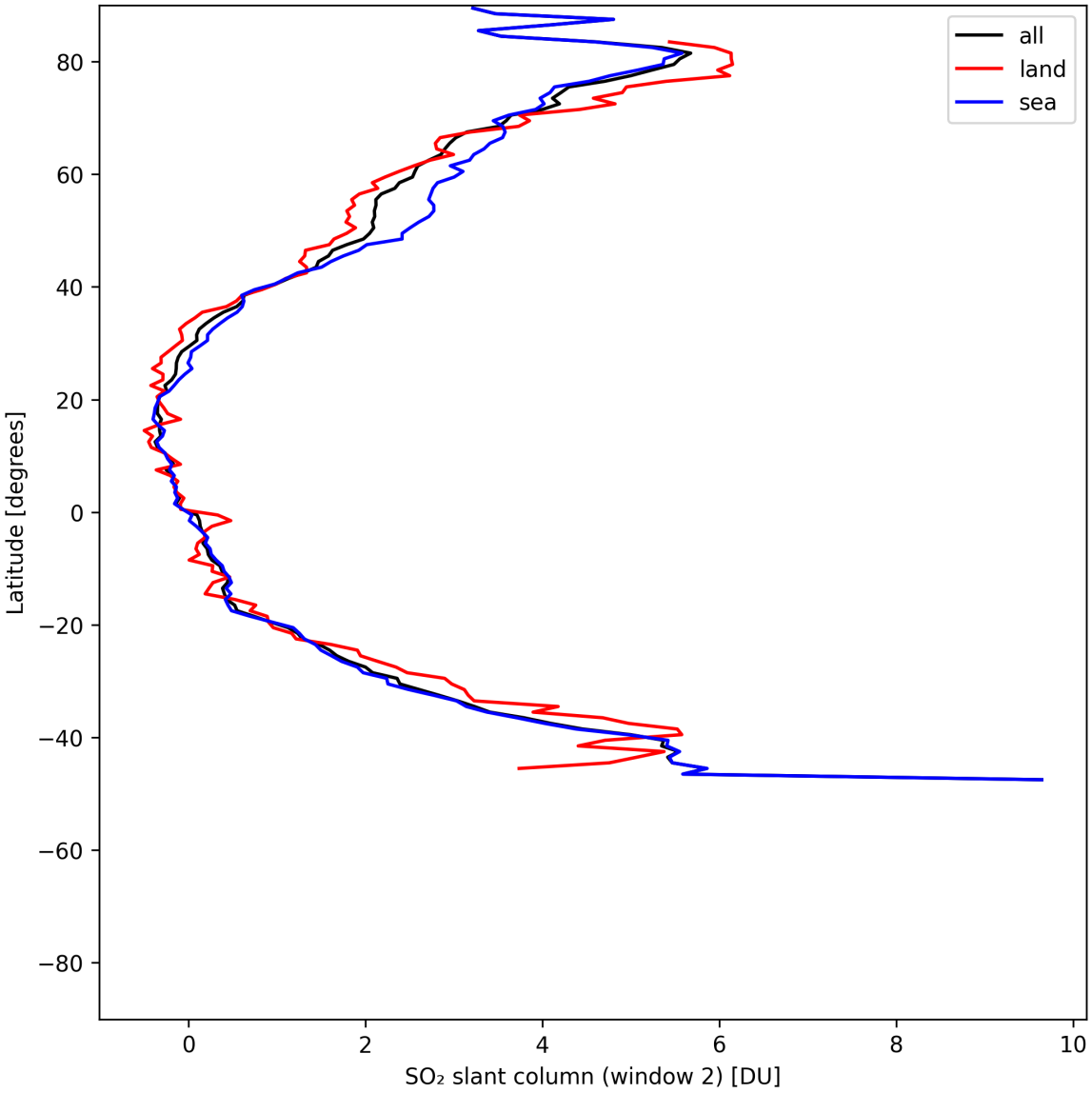


Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-05-28 to 2025-05-29.

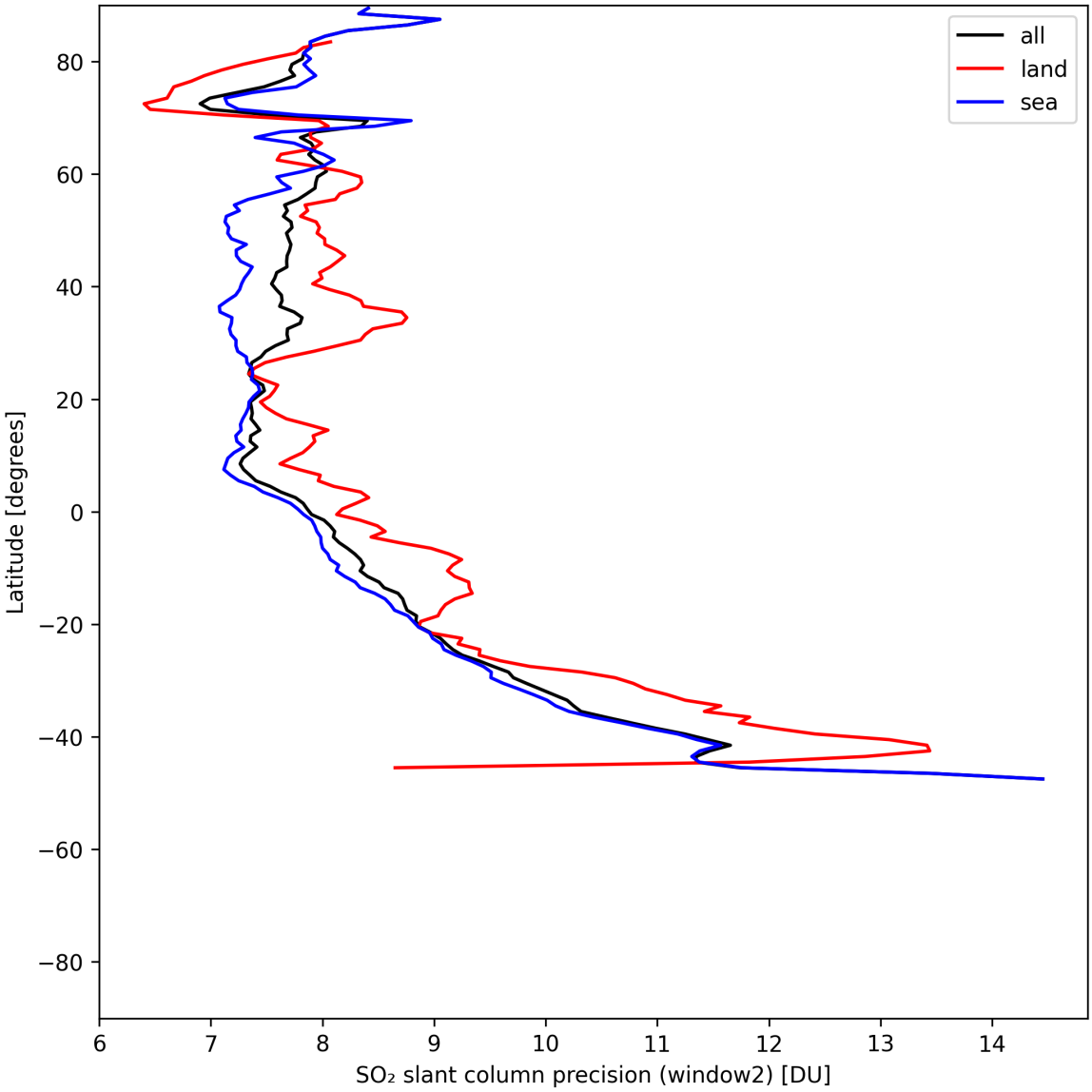


Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-05-28 to 2025-05-29.

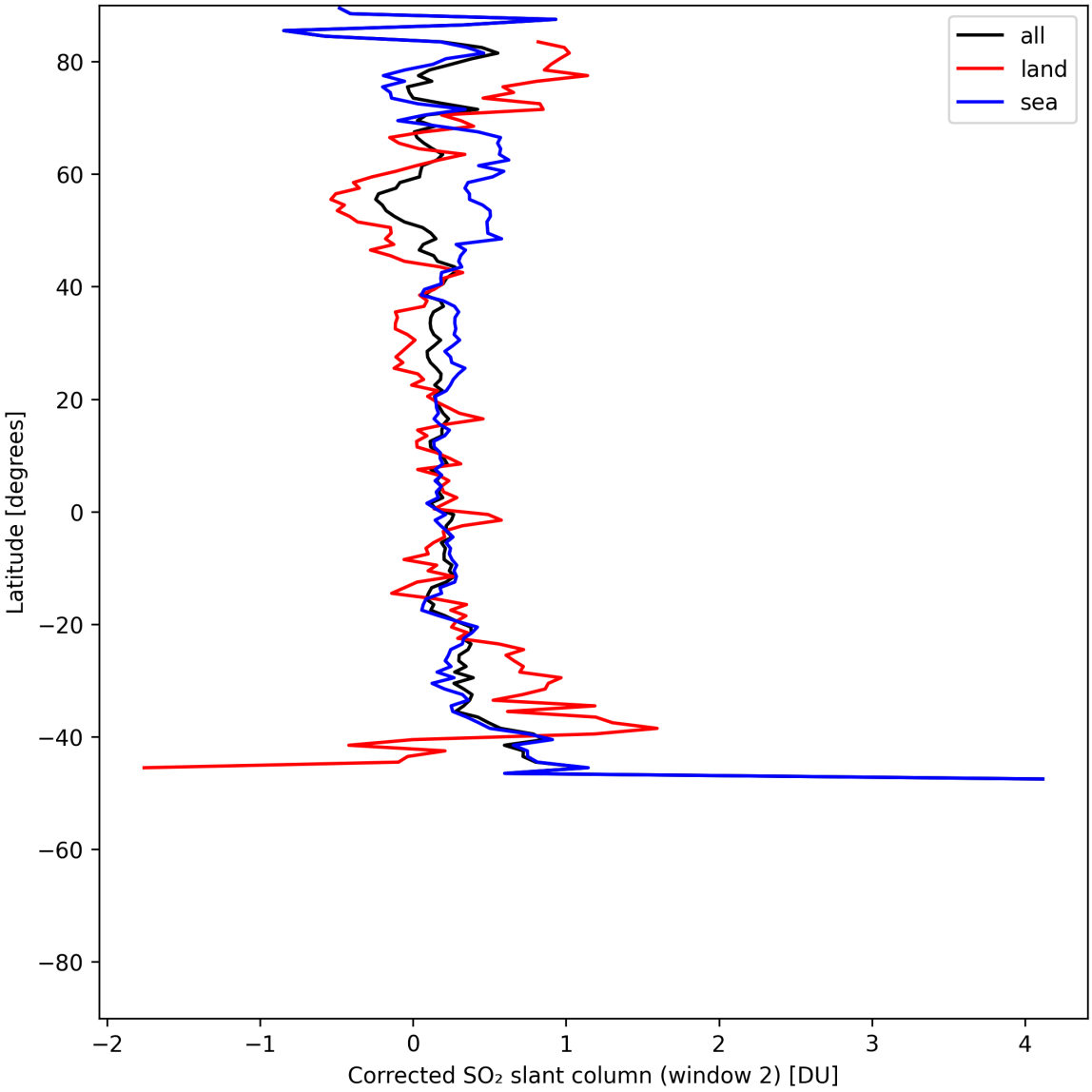


Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-05-28 to 2025-05-29.

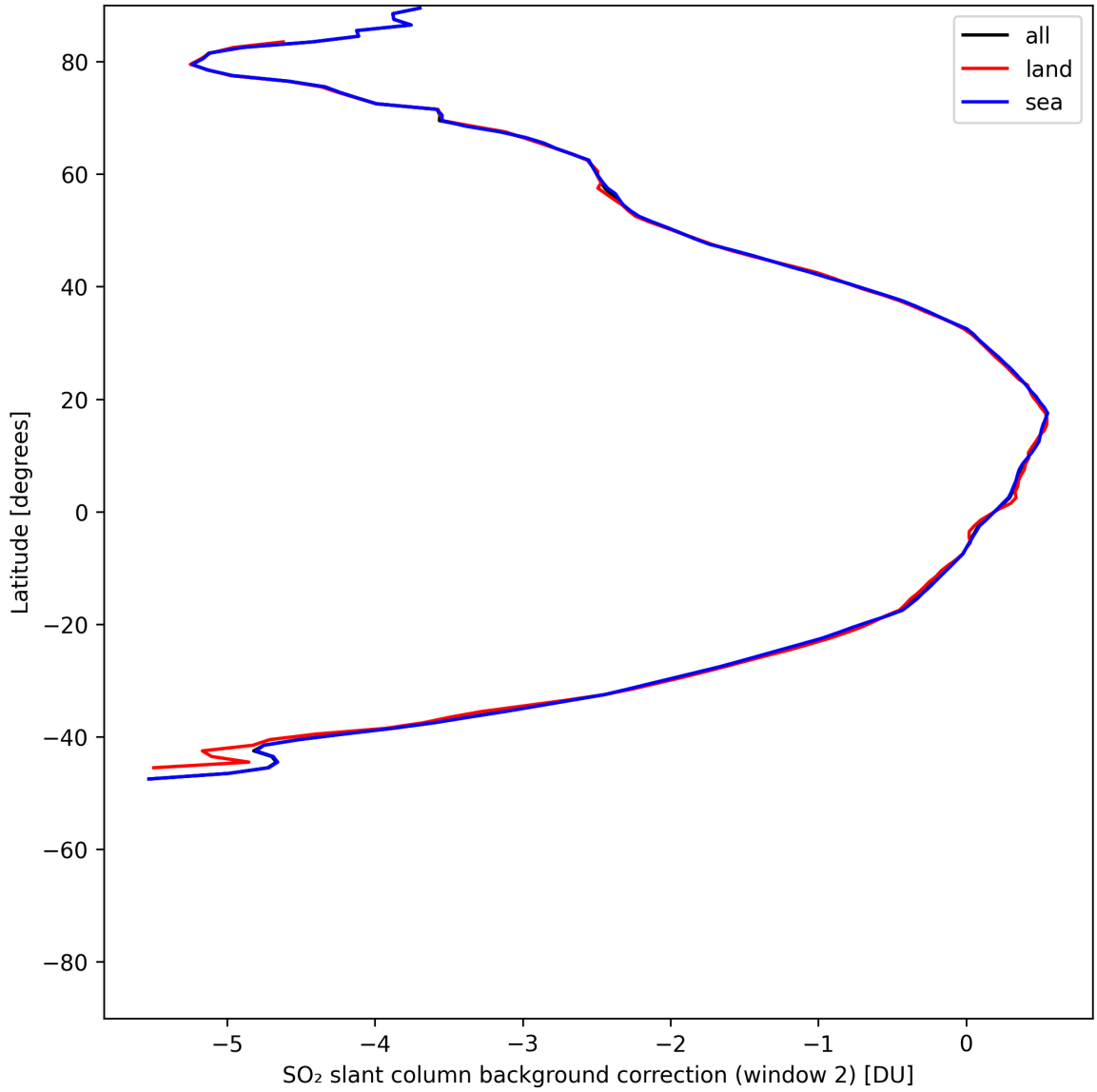


Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-05-28 to 2025-05-29.

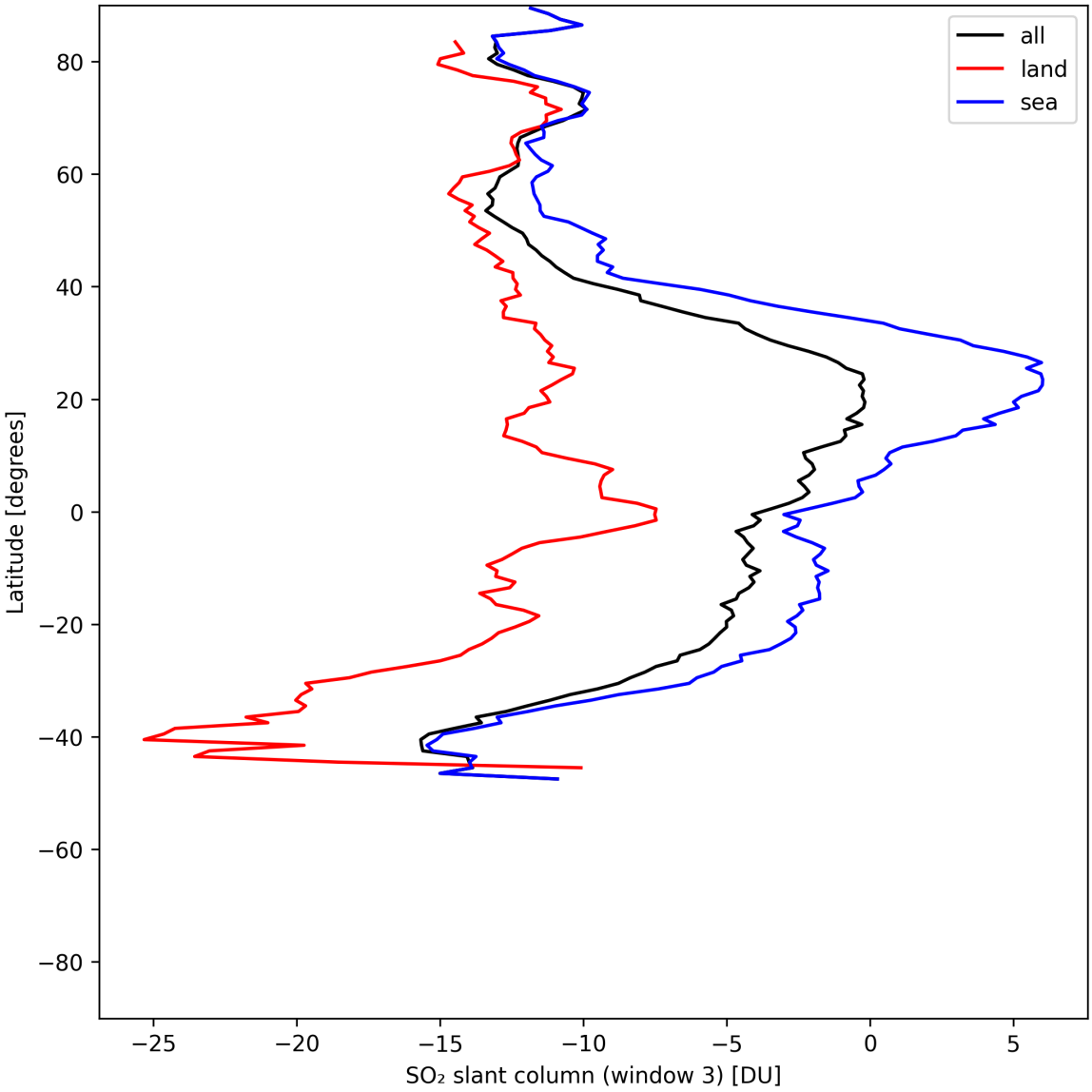


Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-05-28 to 2025-05-29.

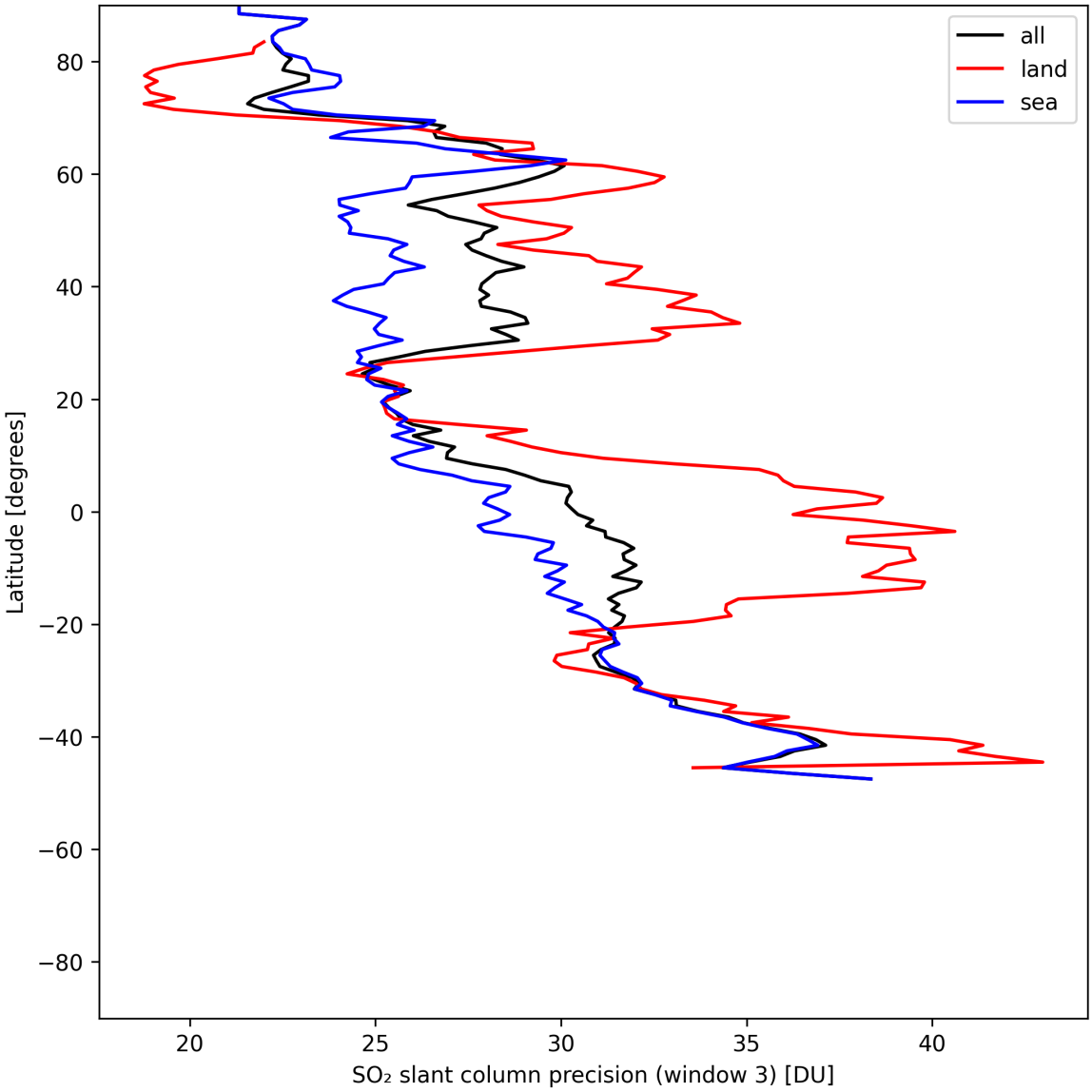


Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-05-28 to 2025-05-29.

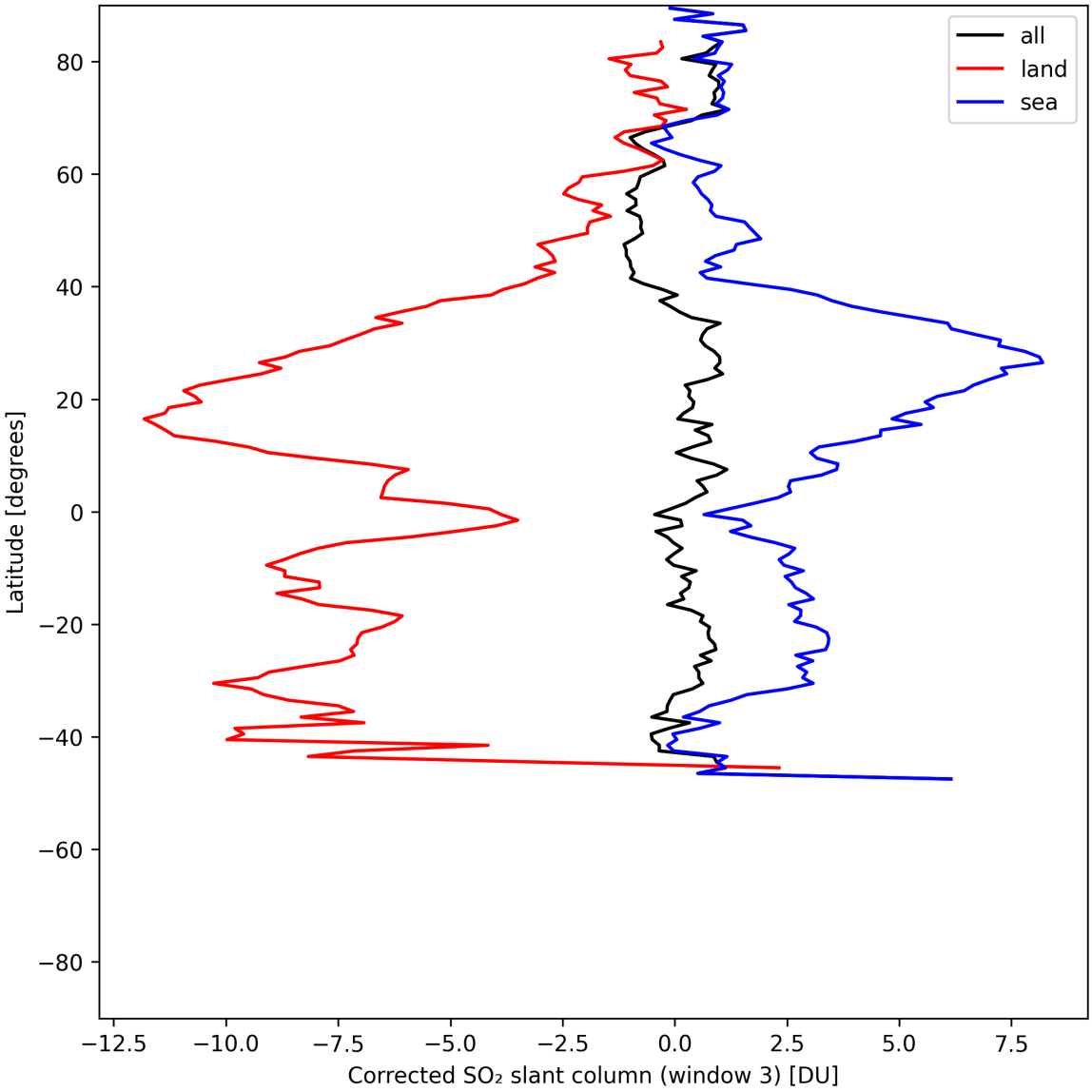


Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-05-28 to 2025-05-29.

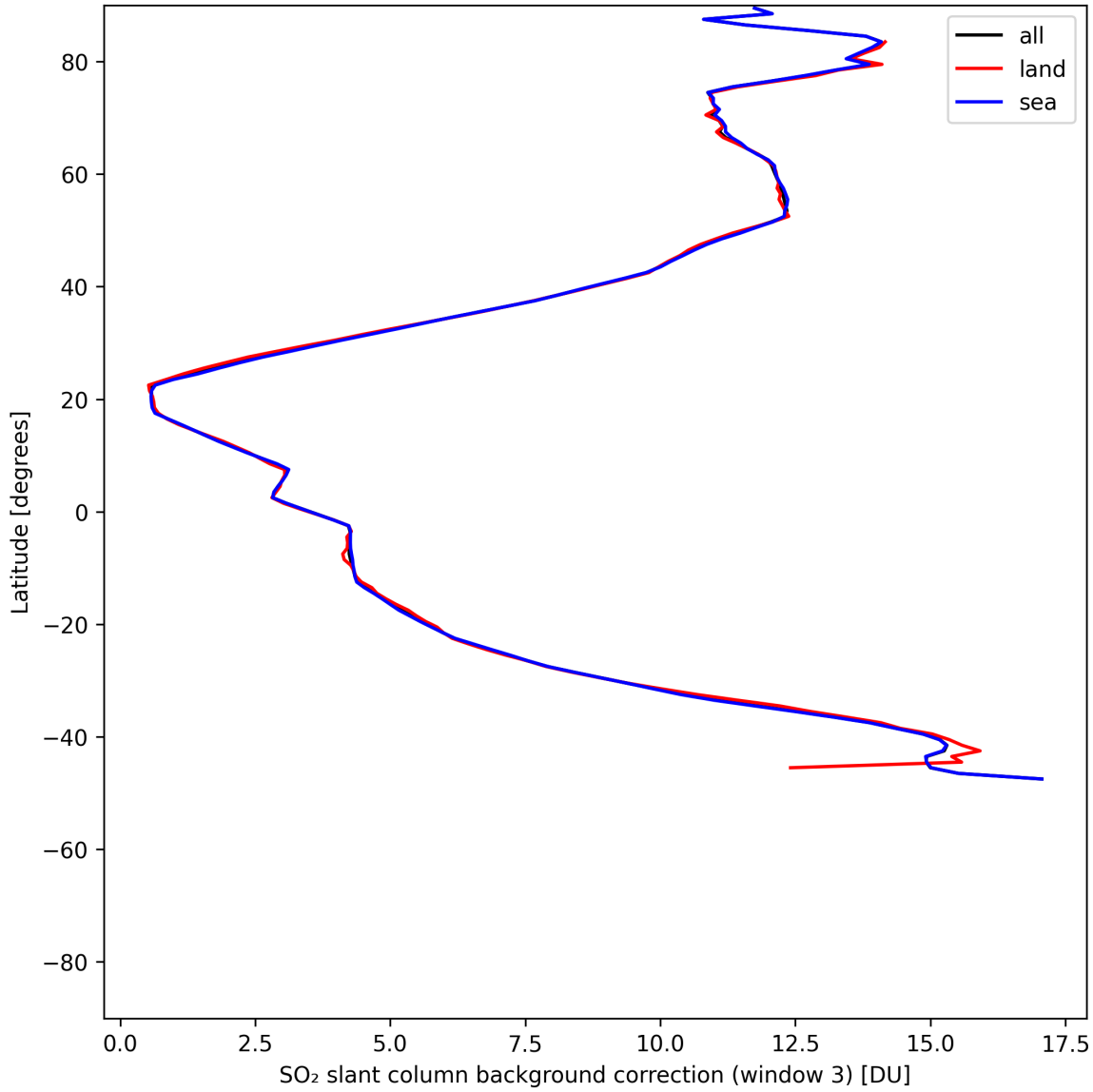


Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-05-28 to 2025-05-29.

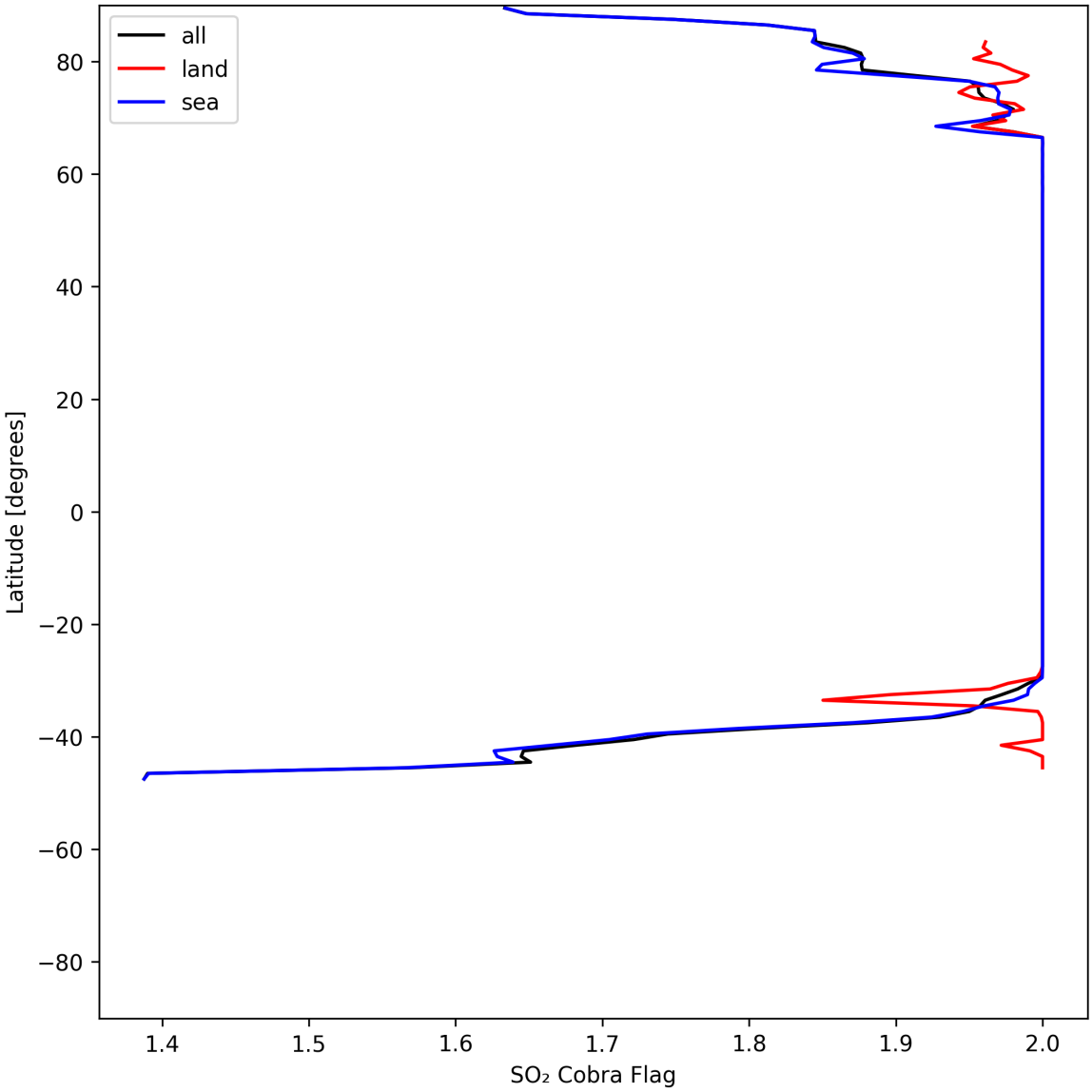


Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-05-28 to 2025-05-29.

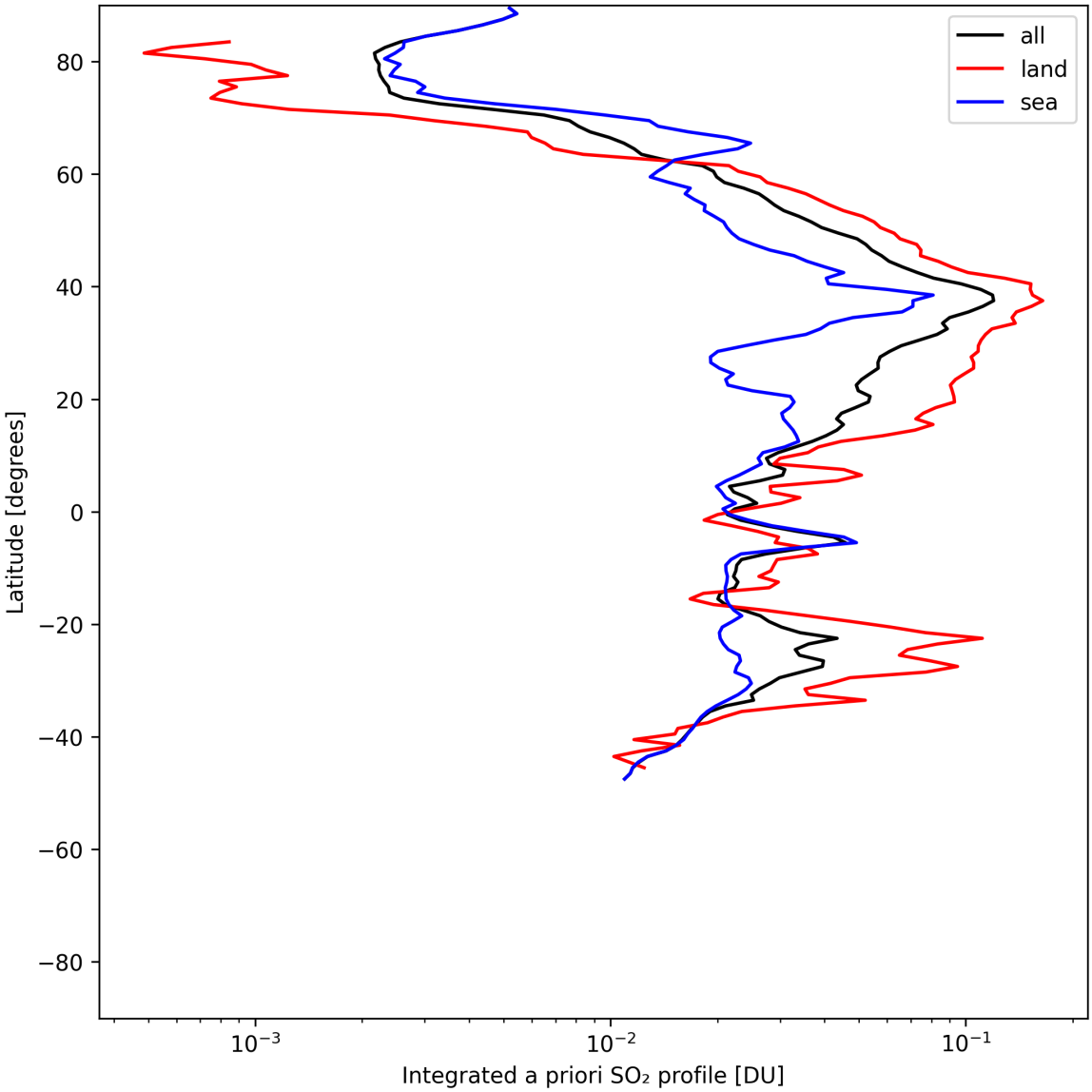


Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-05-28 to 2025-05-29.

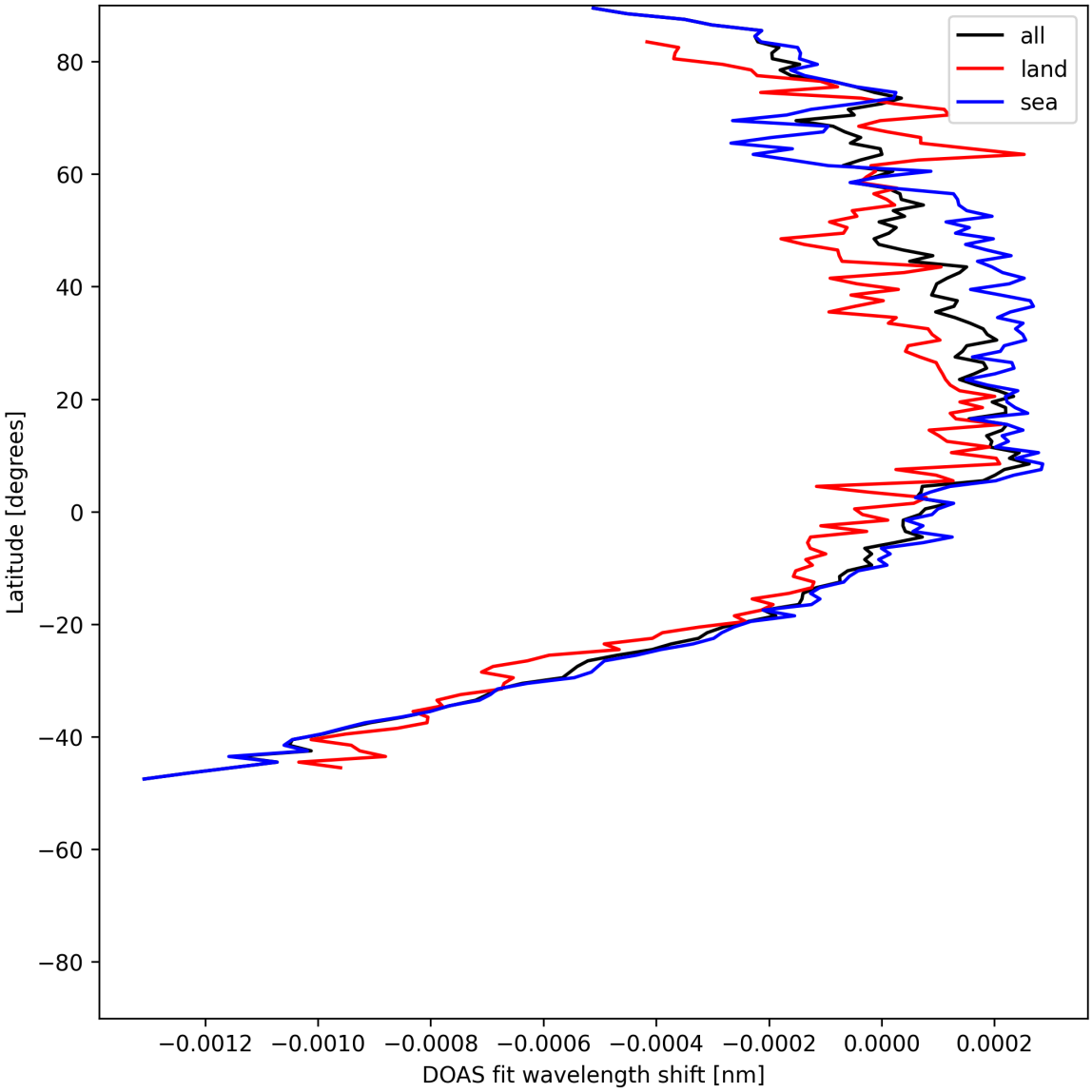


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-05-28 to 2025-05-29.

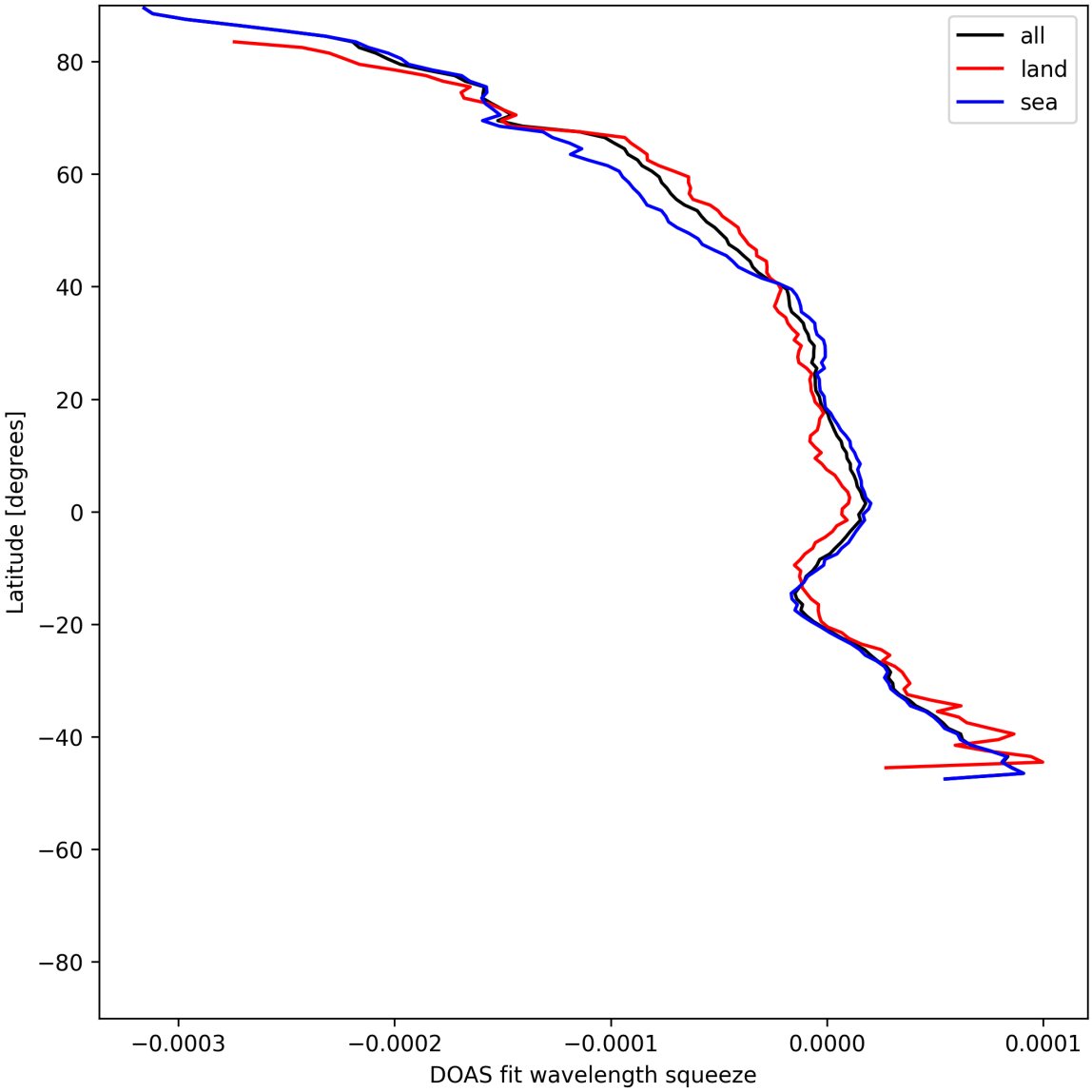


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-05-28 to 2025-05-29.

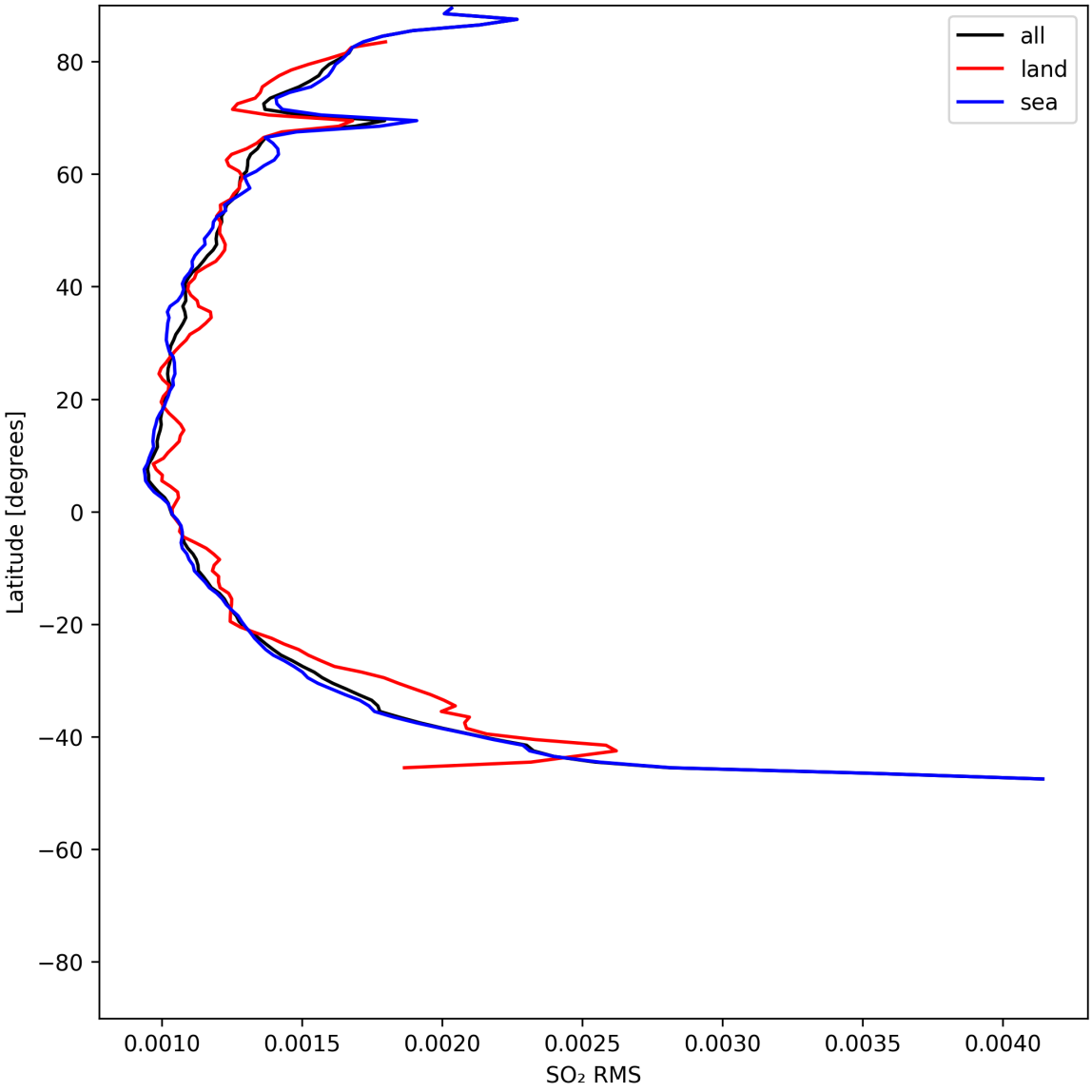


Figure 52: Zonal average of "SO_2 RMS" for 2025-05-28 to 2025-05-29.

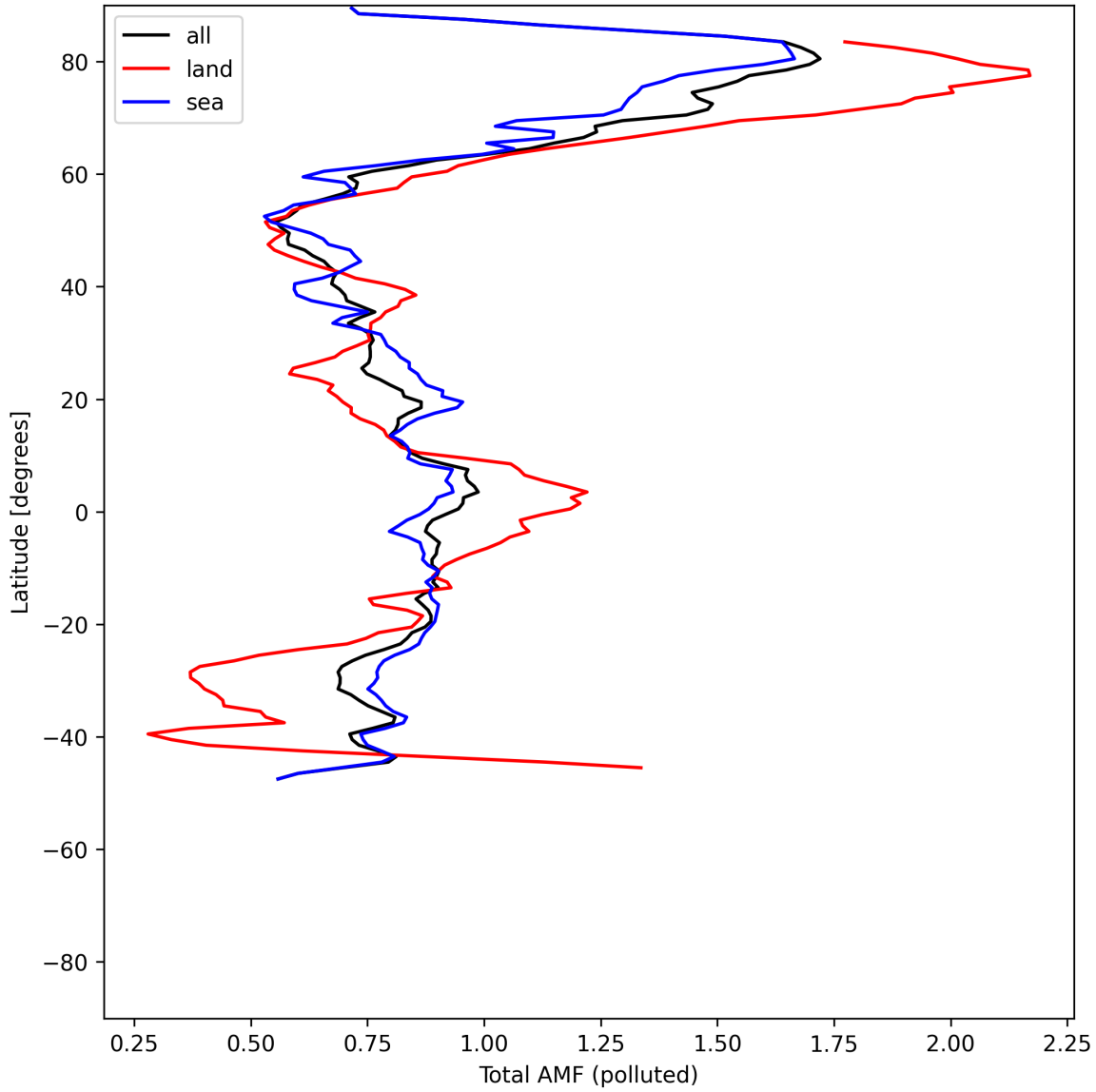


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-05-28 to 2025-05-29.

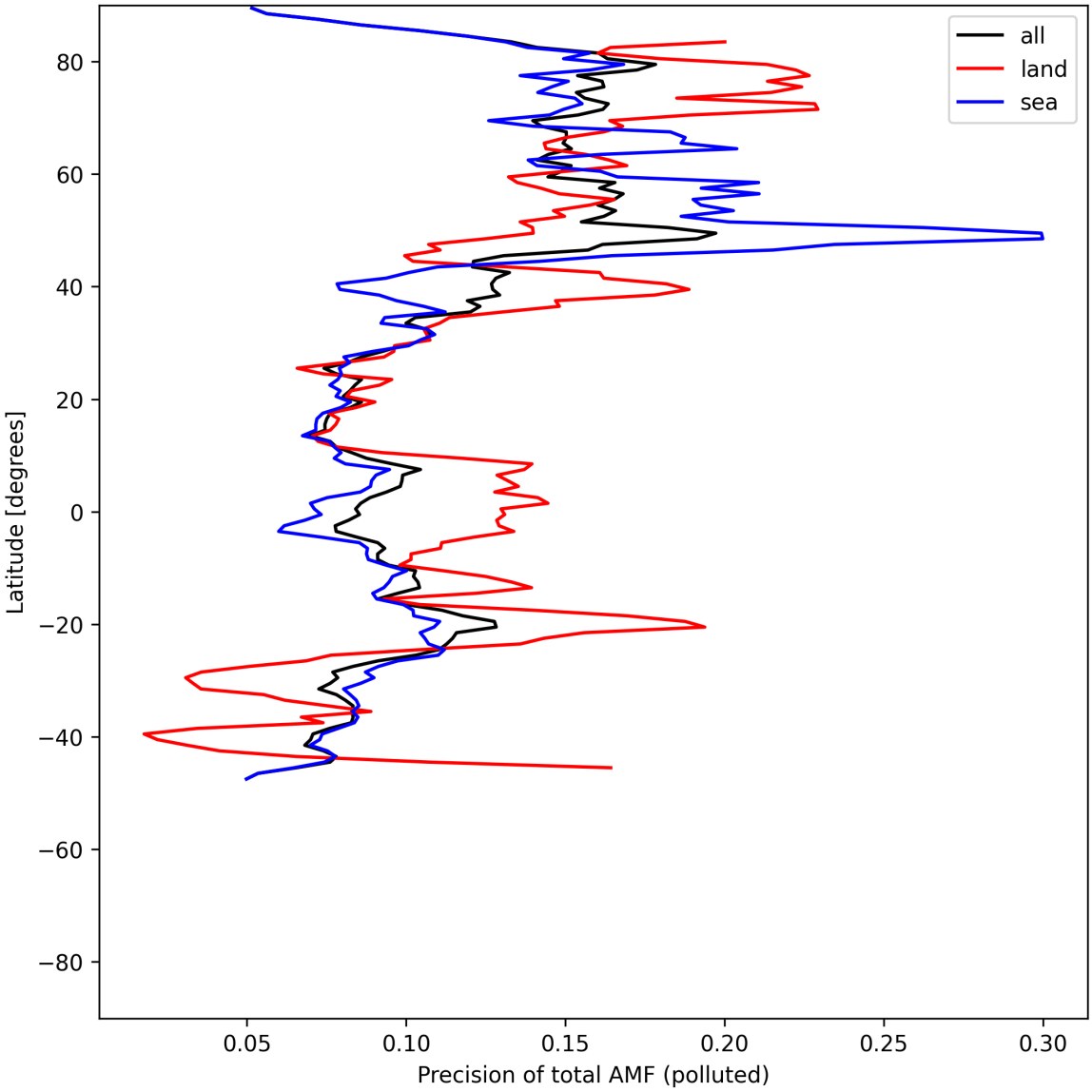


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-05-28 to 2025-05-29.

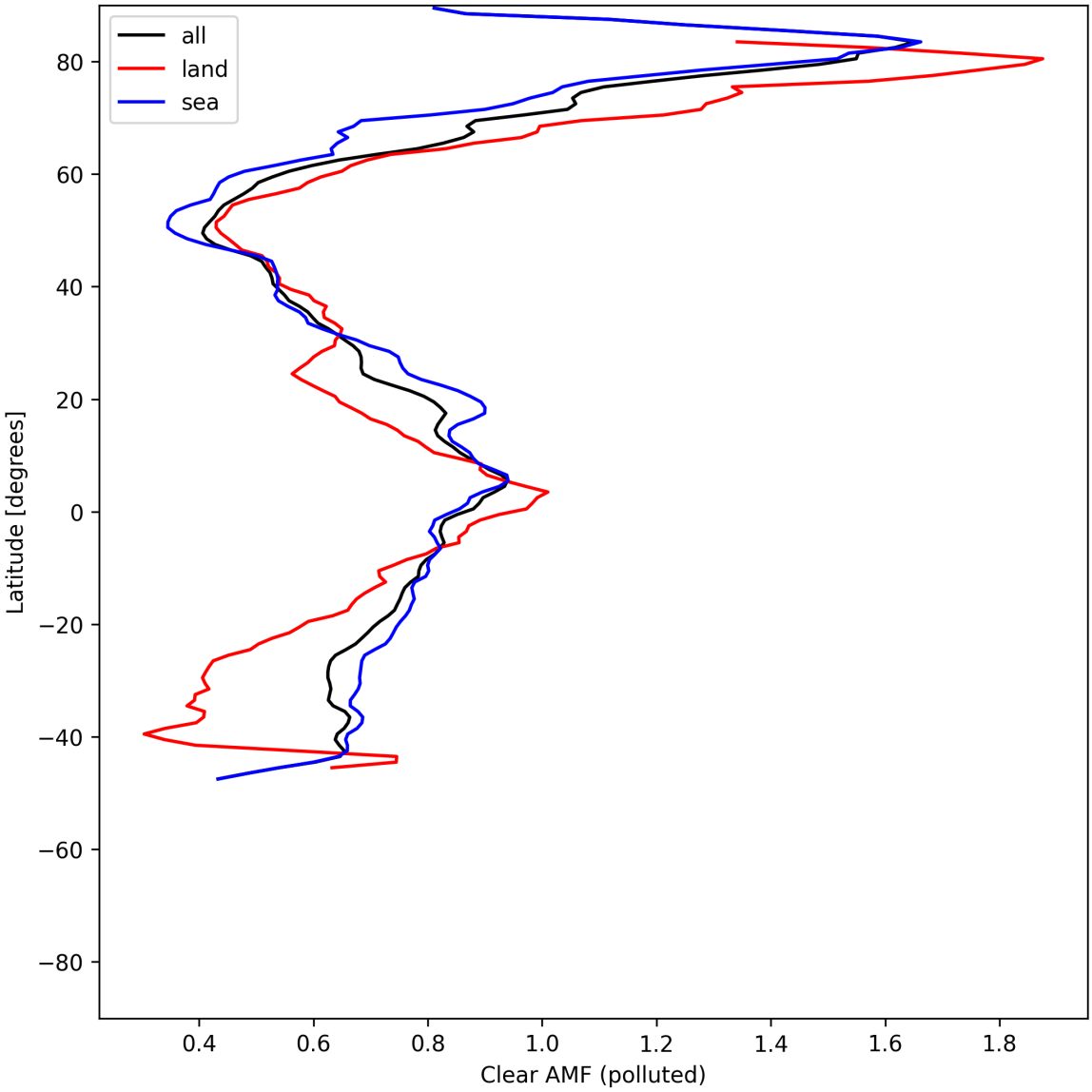


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-05-28 to 2025-05-29.

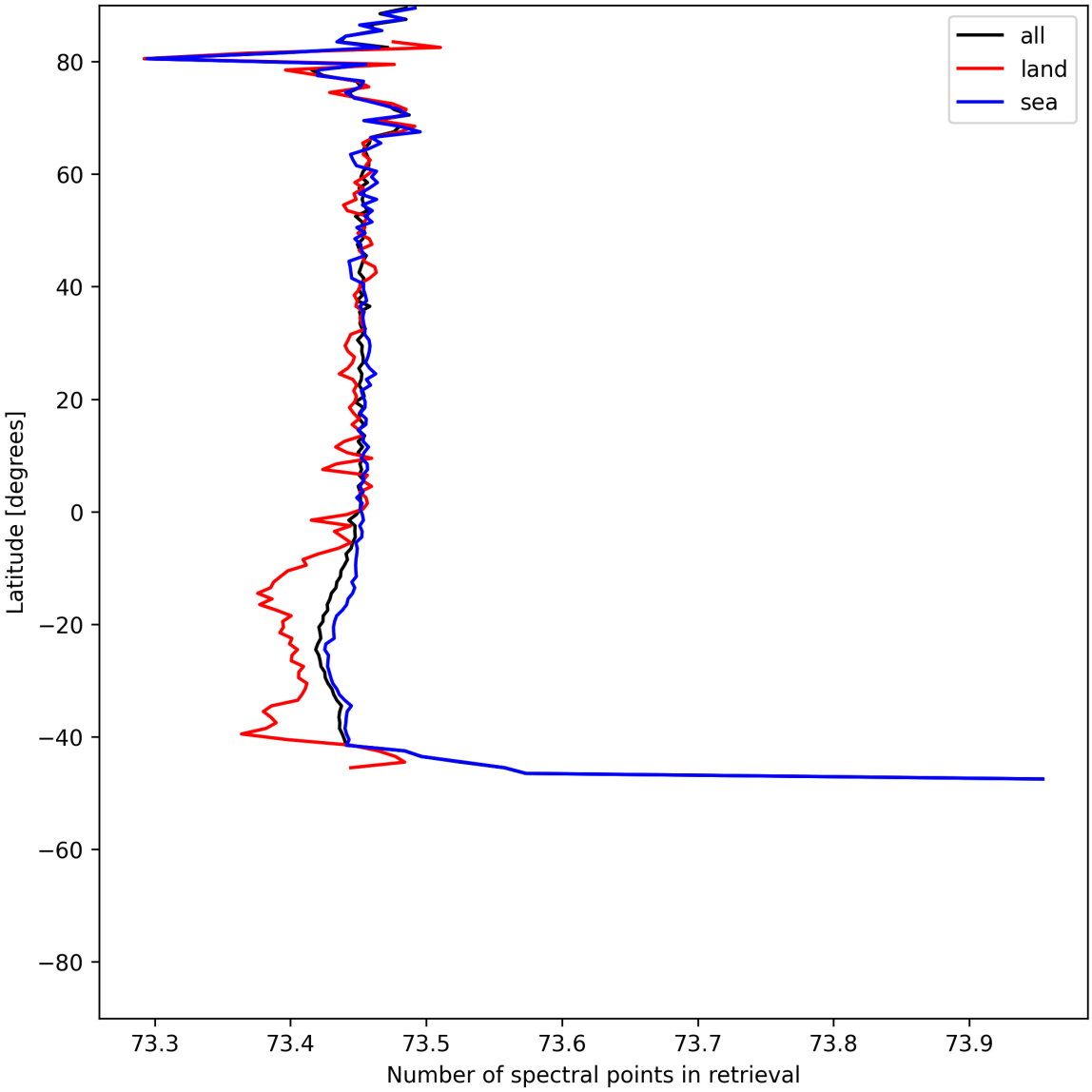


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-05-28 to 2025-05-29.

8 Histograms

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

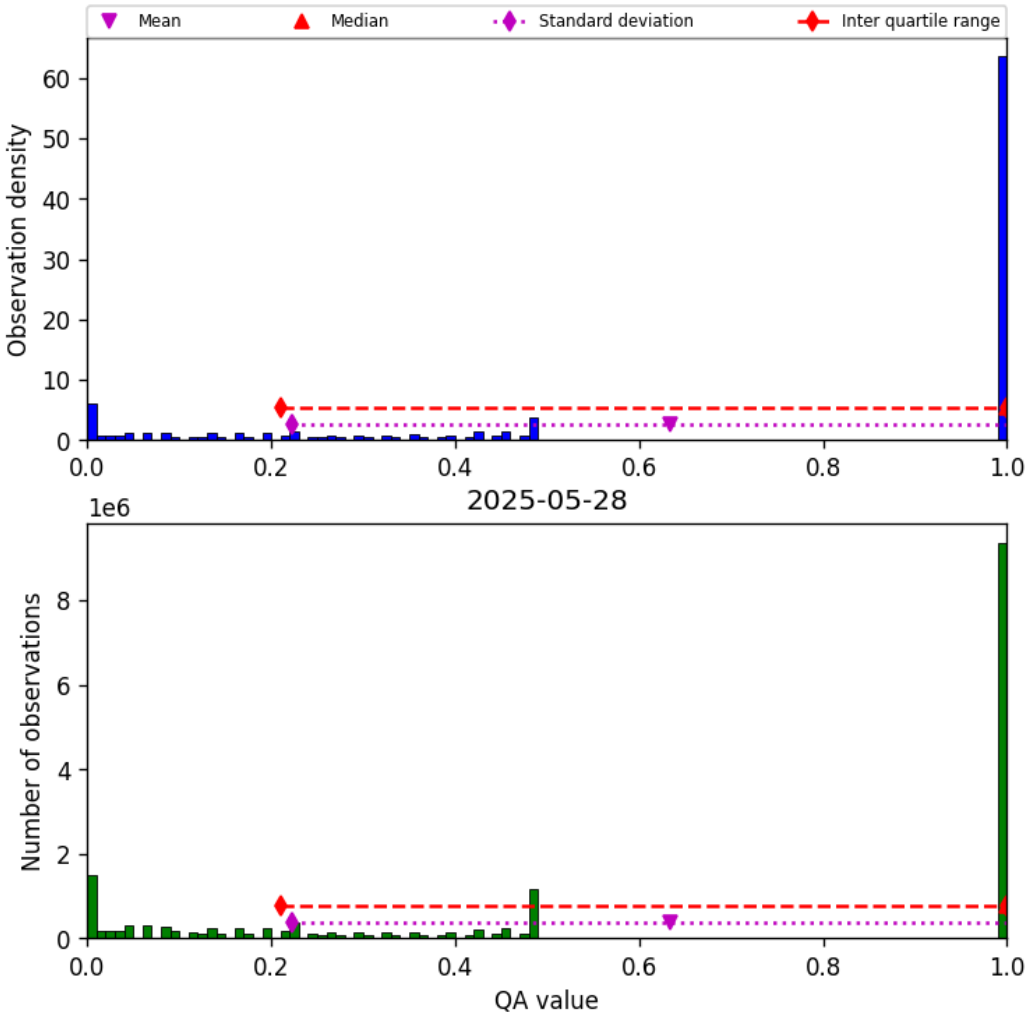


Figure 57: Histogram of “QA value” for 2025-05-28 to 2025-05-29

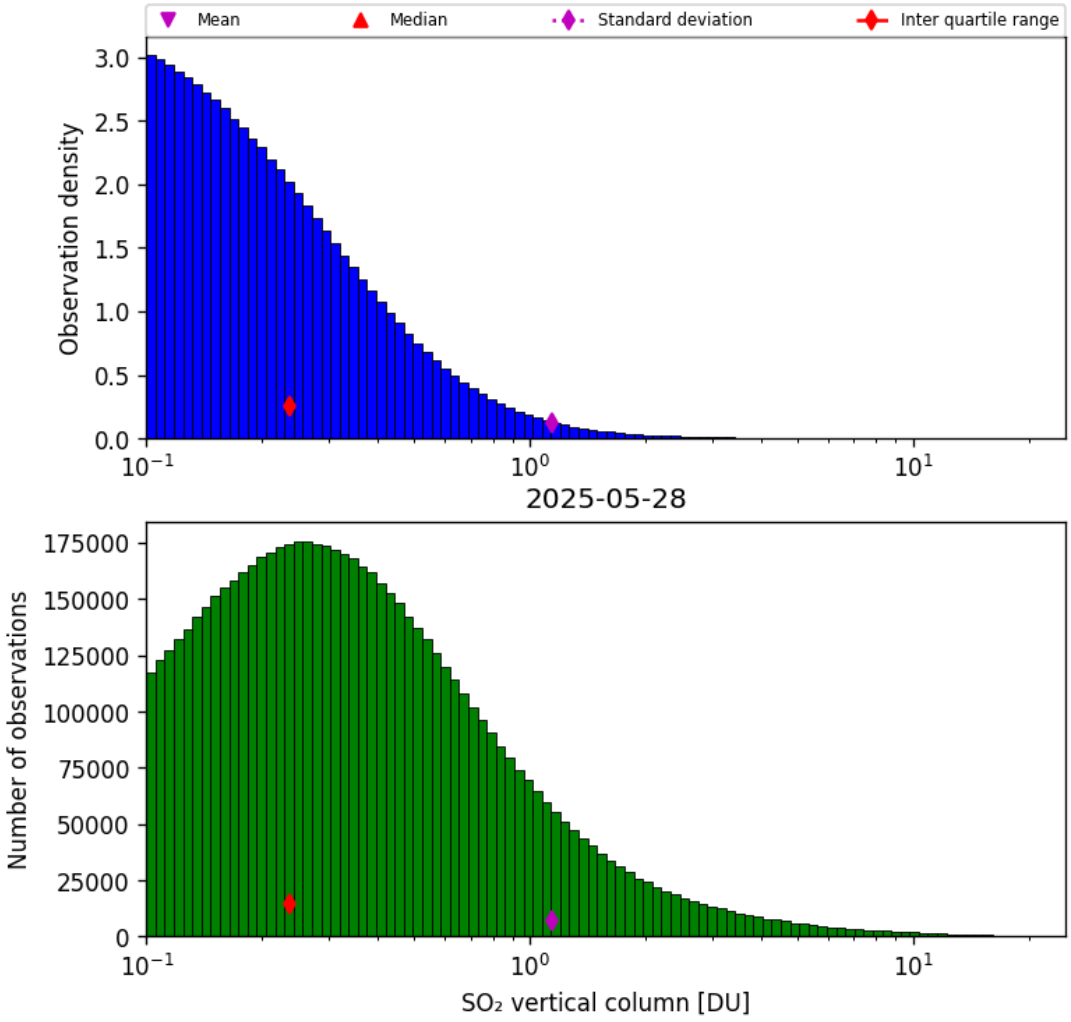


Figure 58: Histogram of "SO_2 vertical column" for 2025-05-28 to 2025-05-29

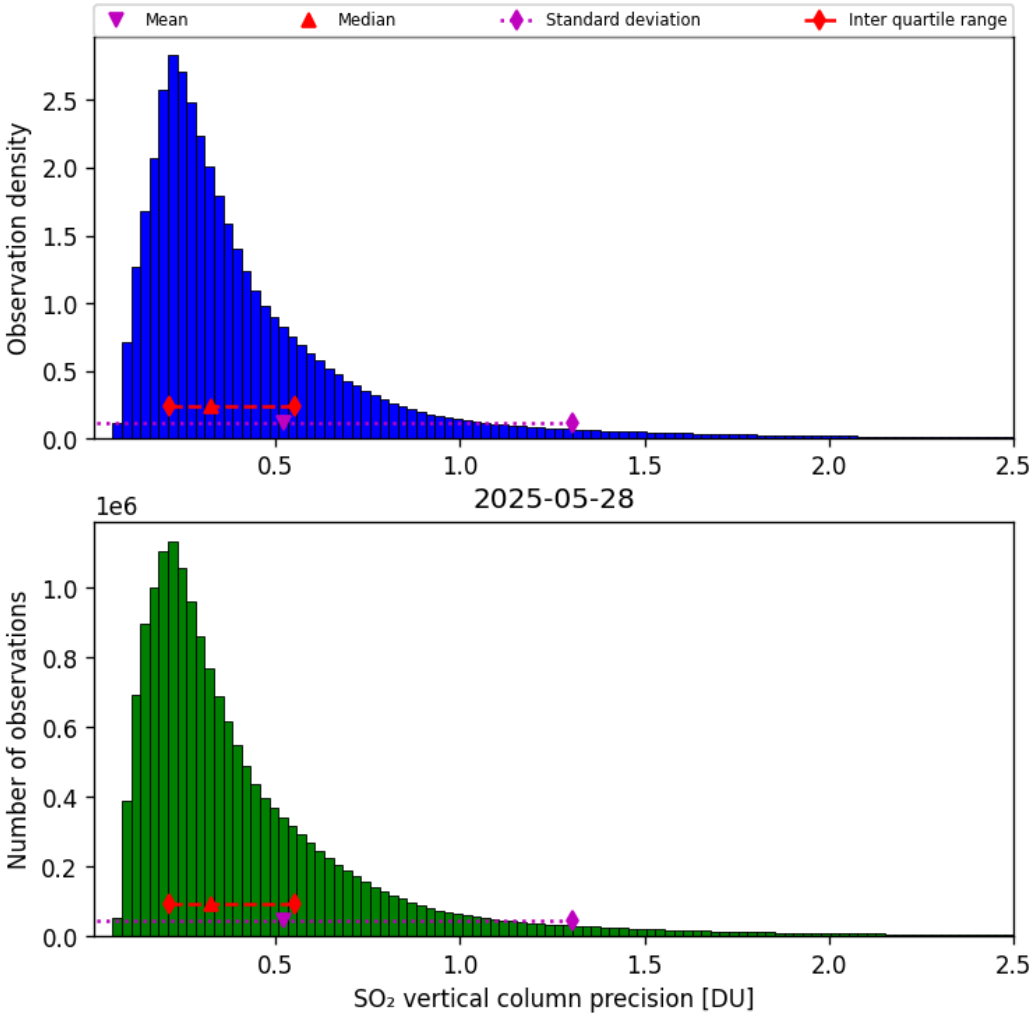


Figure 59: Histogram of "SO_2 vertical column precision" for 2025-05-28 to 2025-05-29

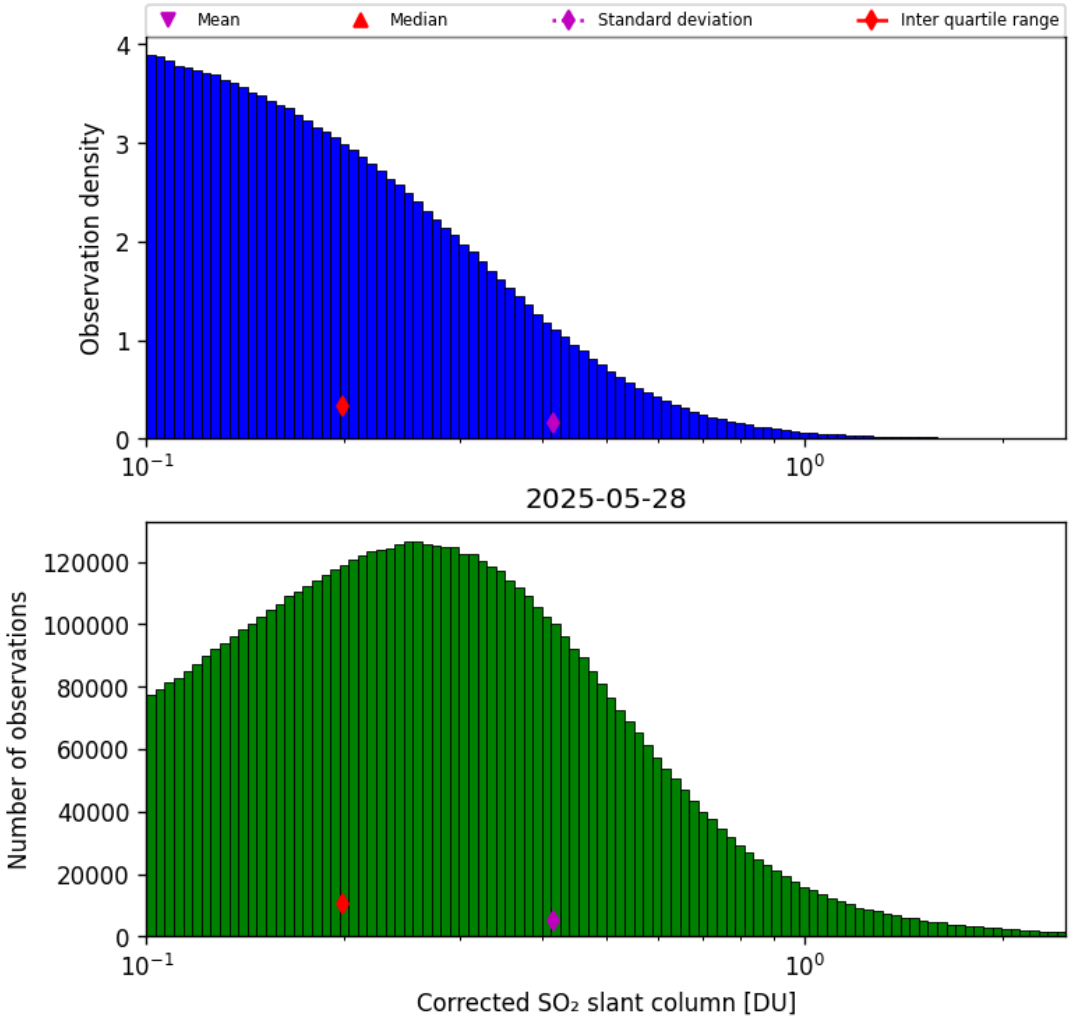


Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-05-28 to 2025-05-29

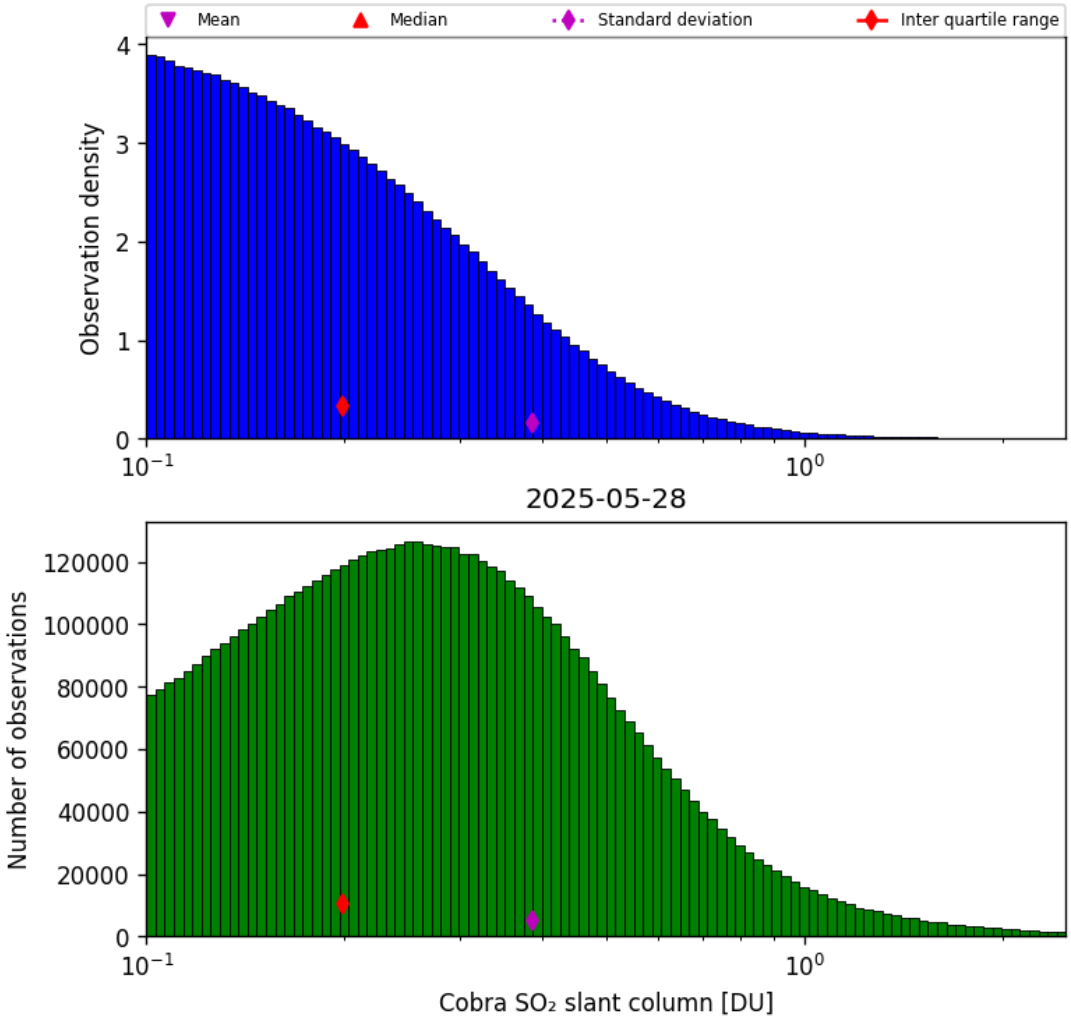


Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-05-28 to 2025-05-29

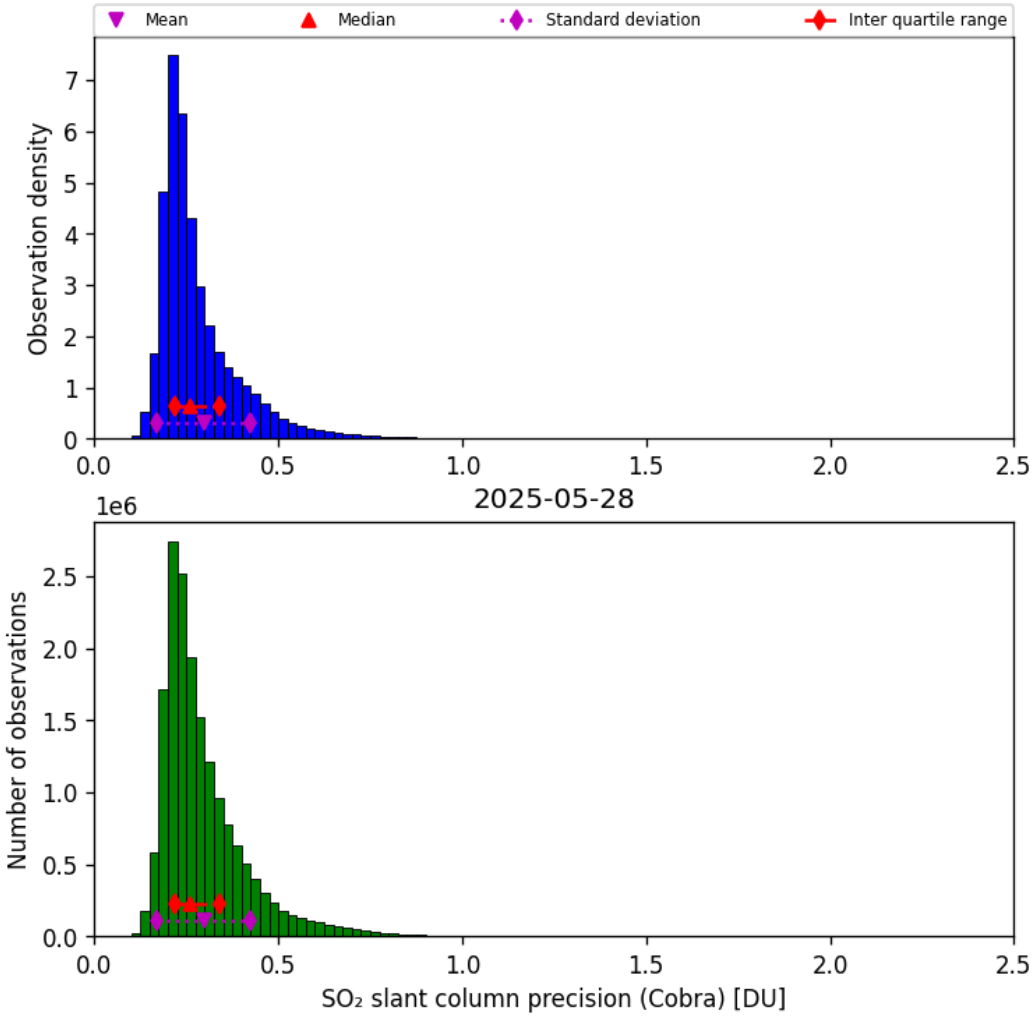


Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-05-28 to 2025-05-29

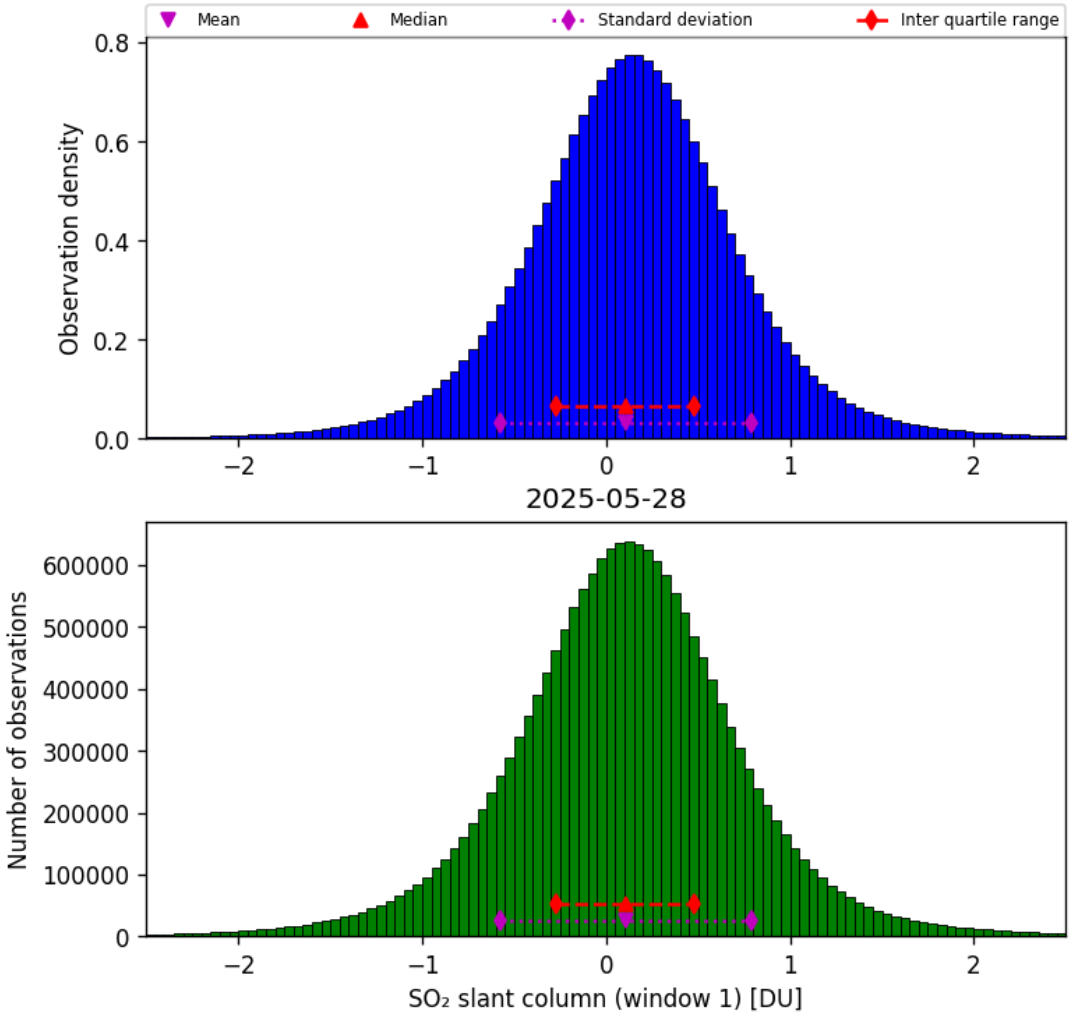


Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-05-28 to 2025-05-29

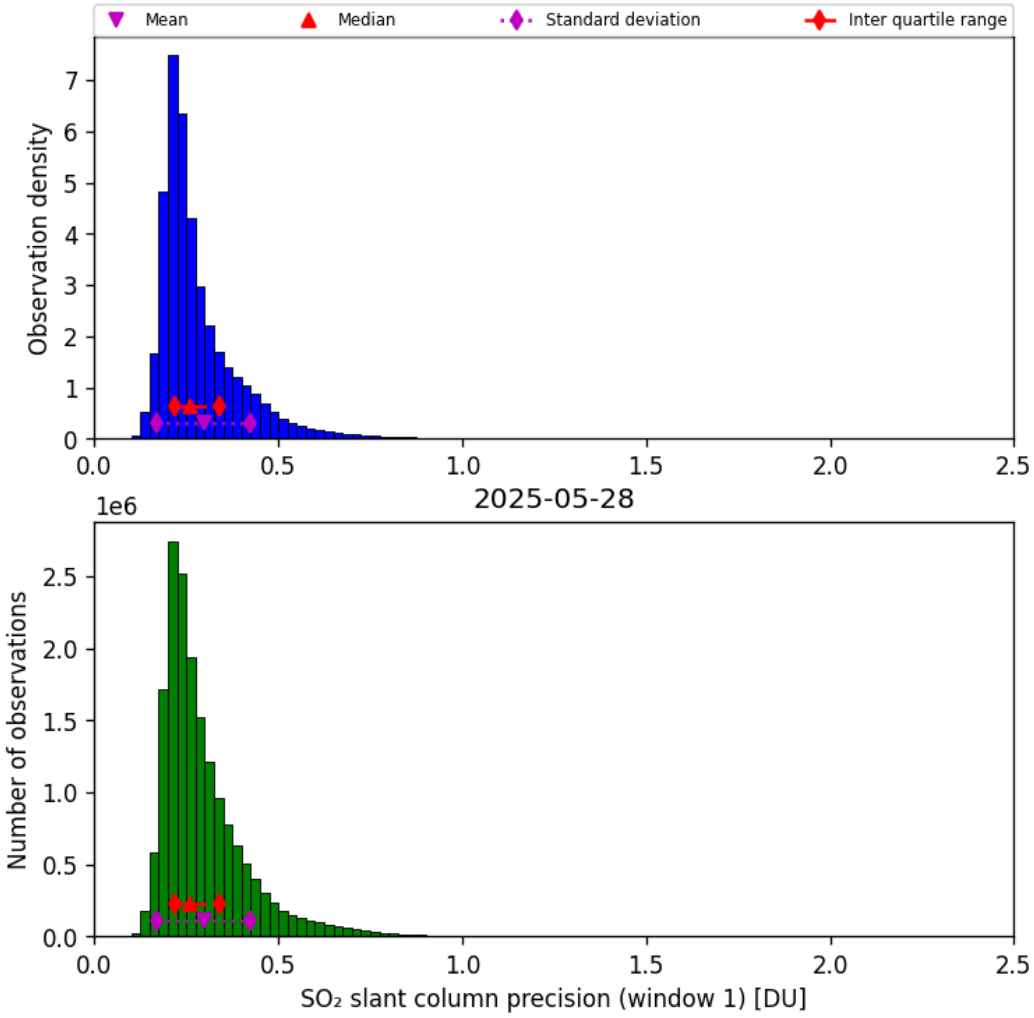


Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-05-28 to 2025-05-29

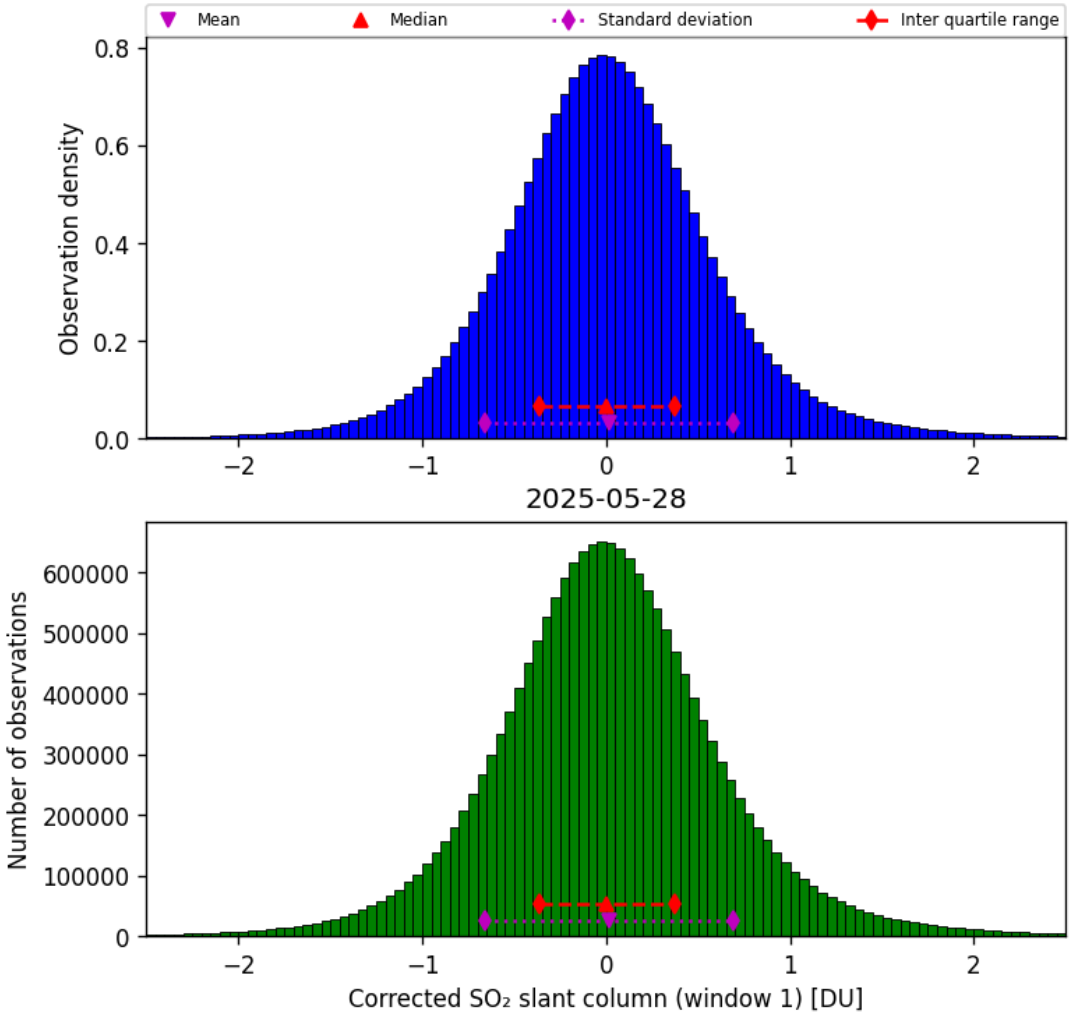


Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-05-28 to 2025-05-29

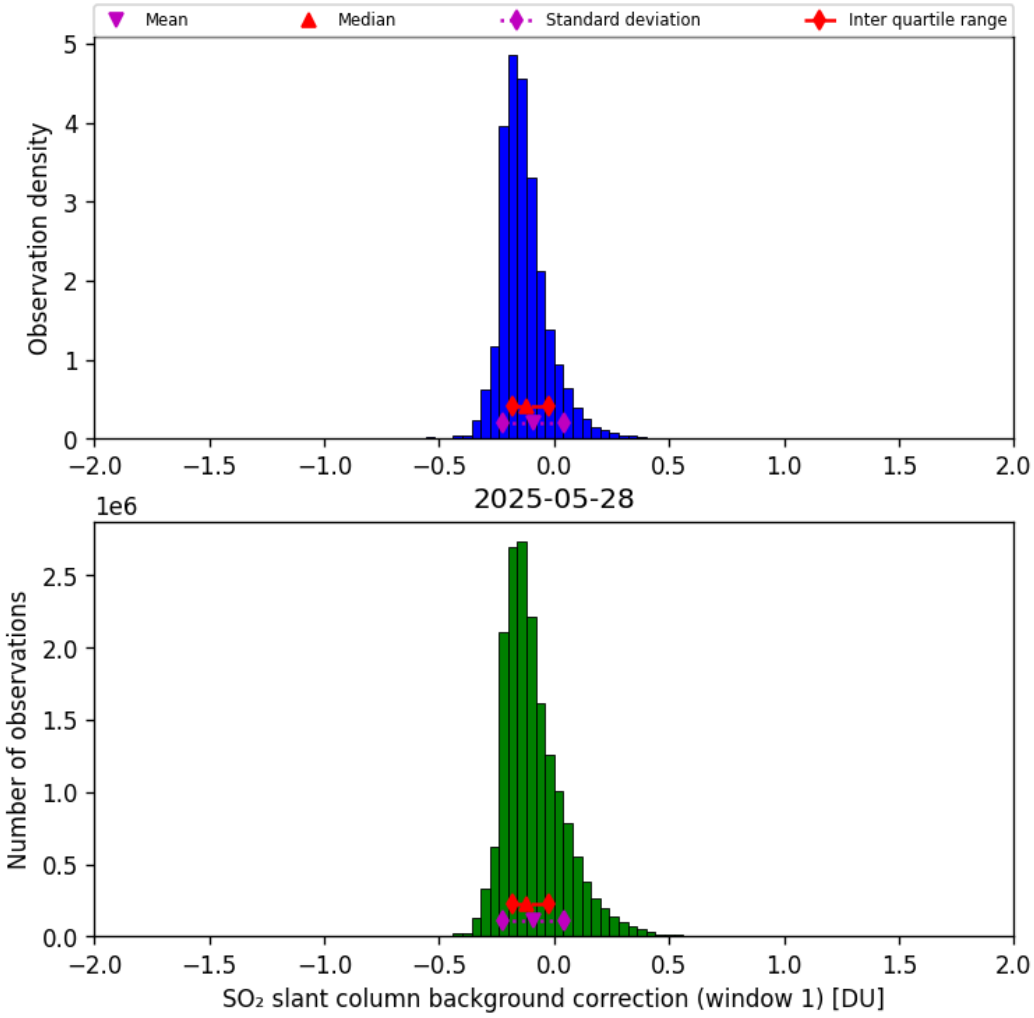


Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-05-28 to 2025-05-29

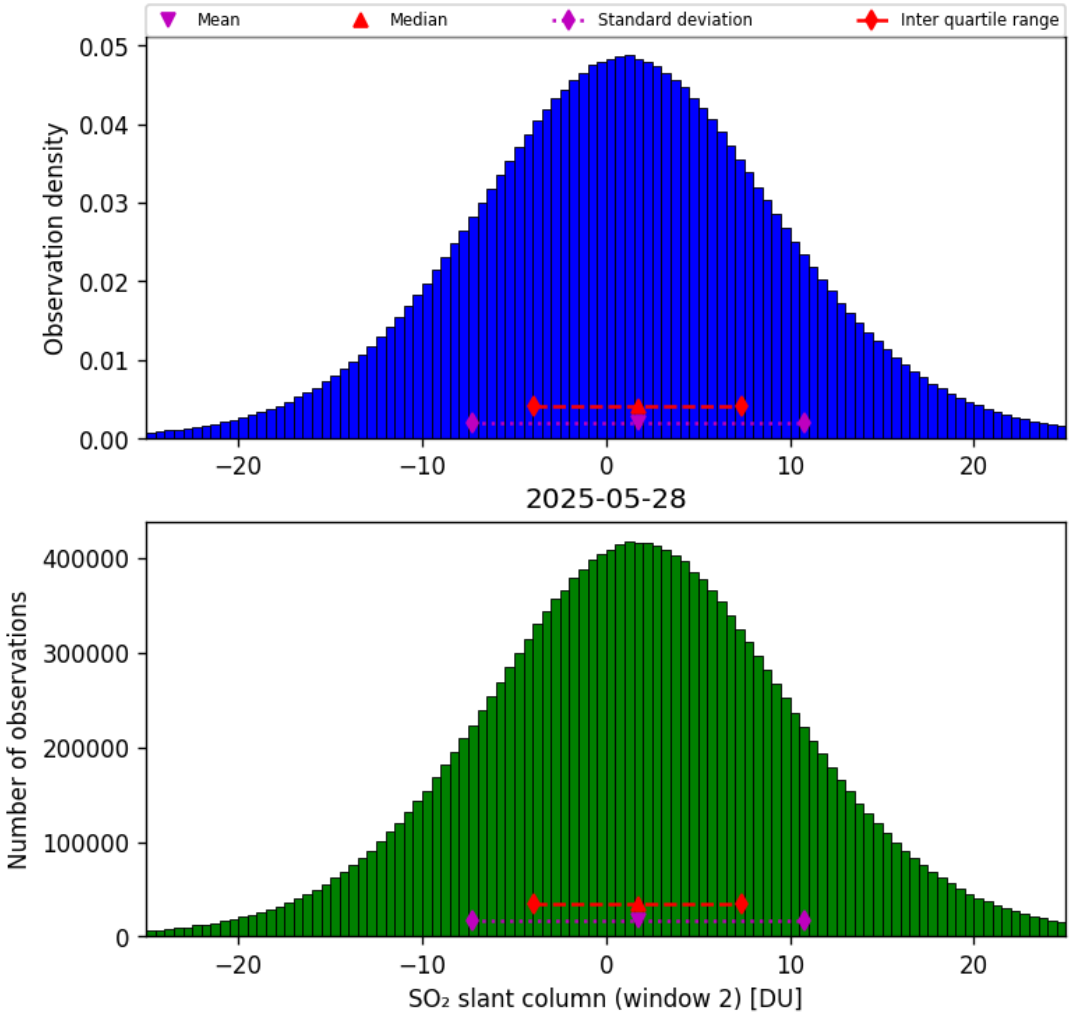


Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-05-28 to 2025-05-29

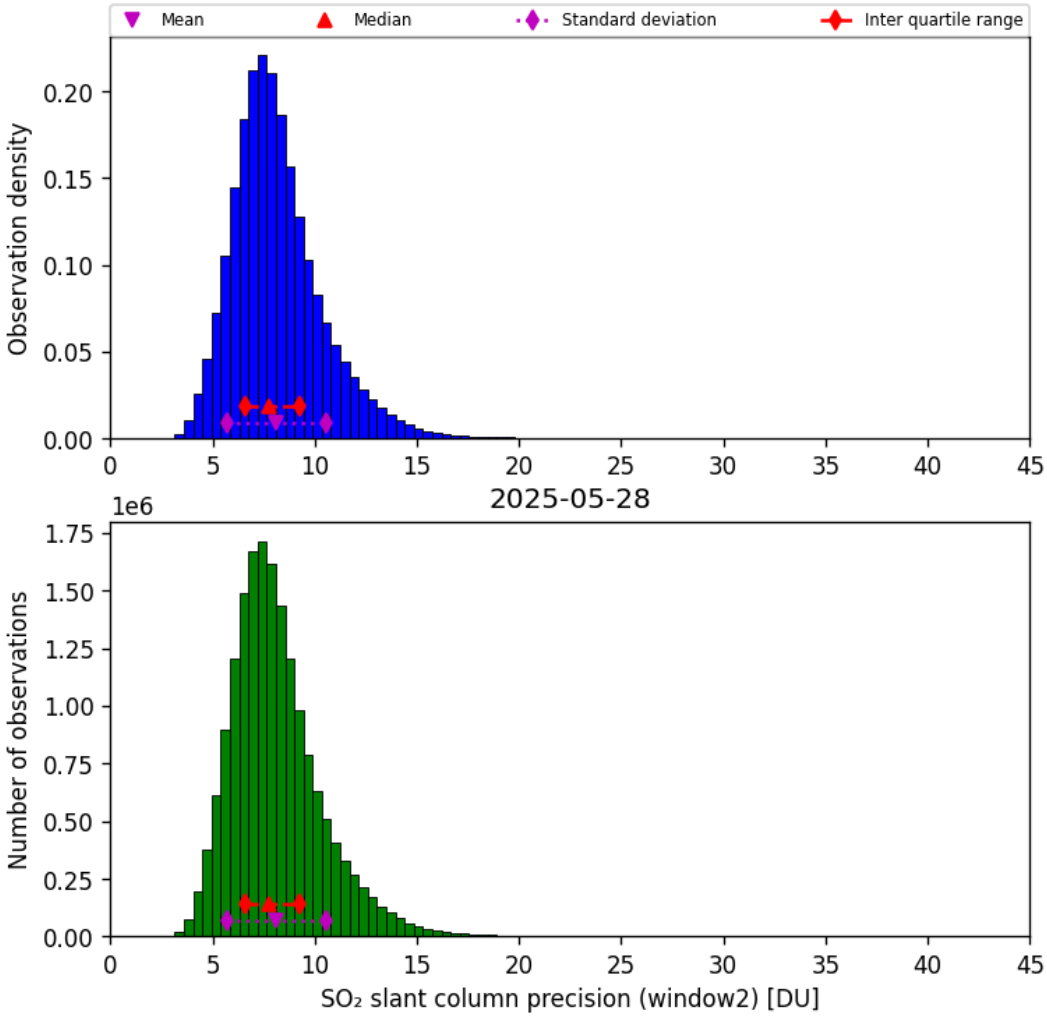


Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-05-28 to 2025-05-29

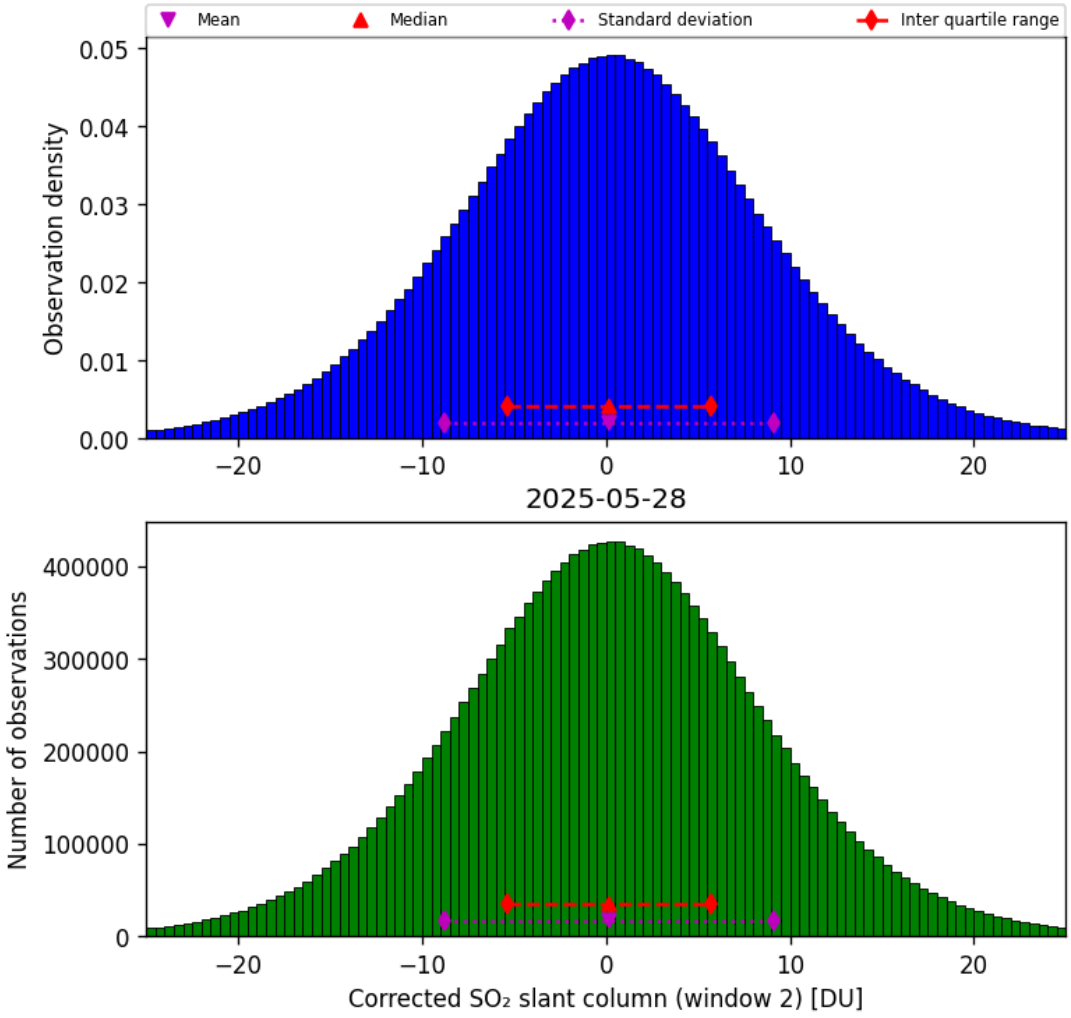


Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-05-28 to 2025-05-29

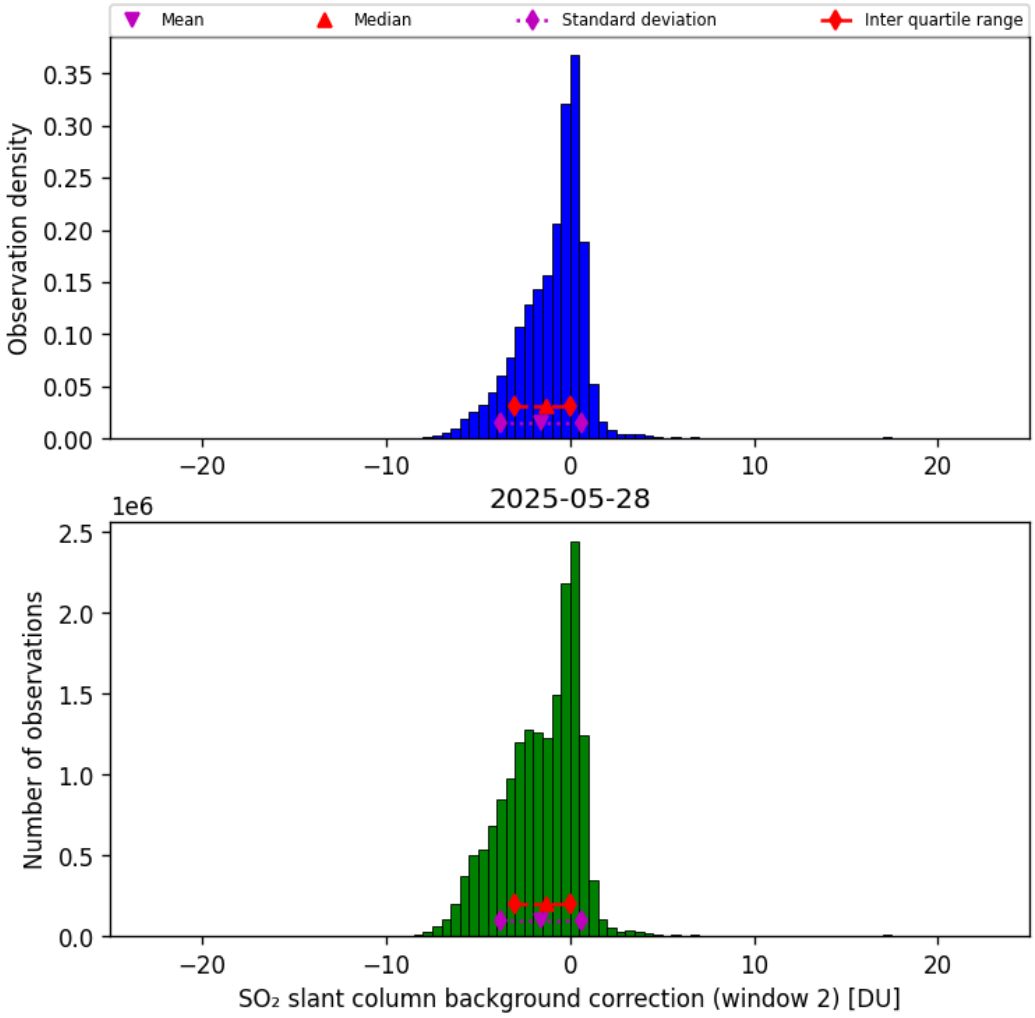


Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-05-28 to 2025-05-29

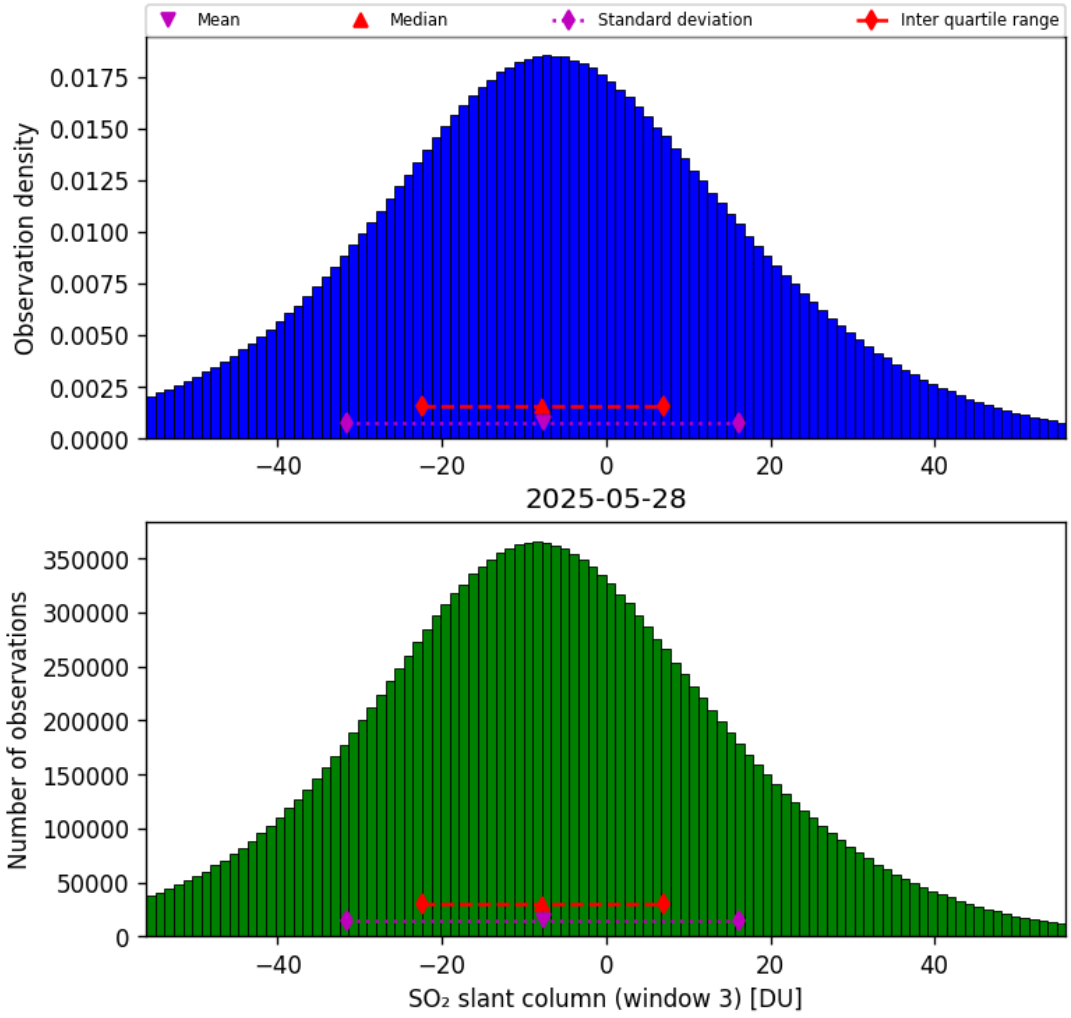


Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-05-28 to 2025-05-29

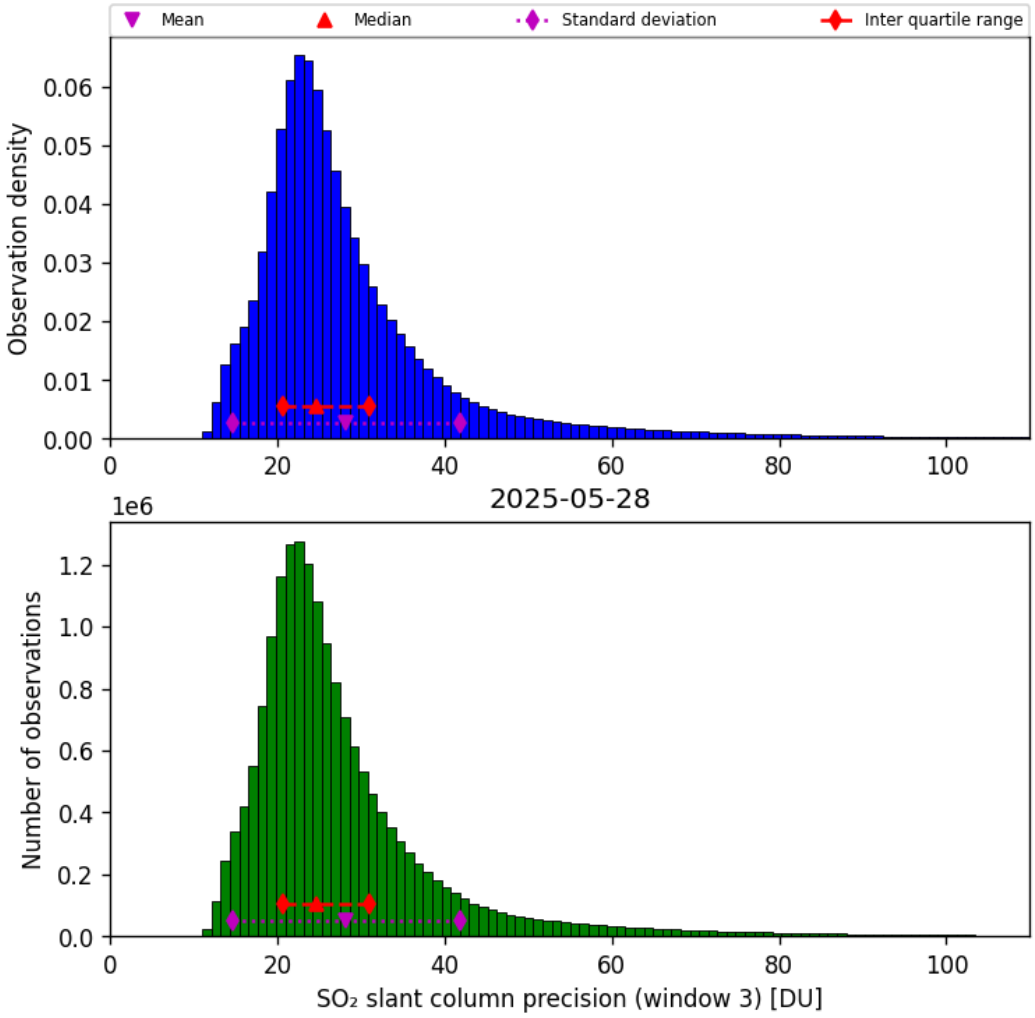


Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-05-28 to 2025-05-29

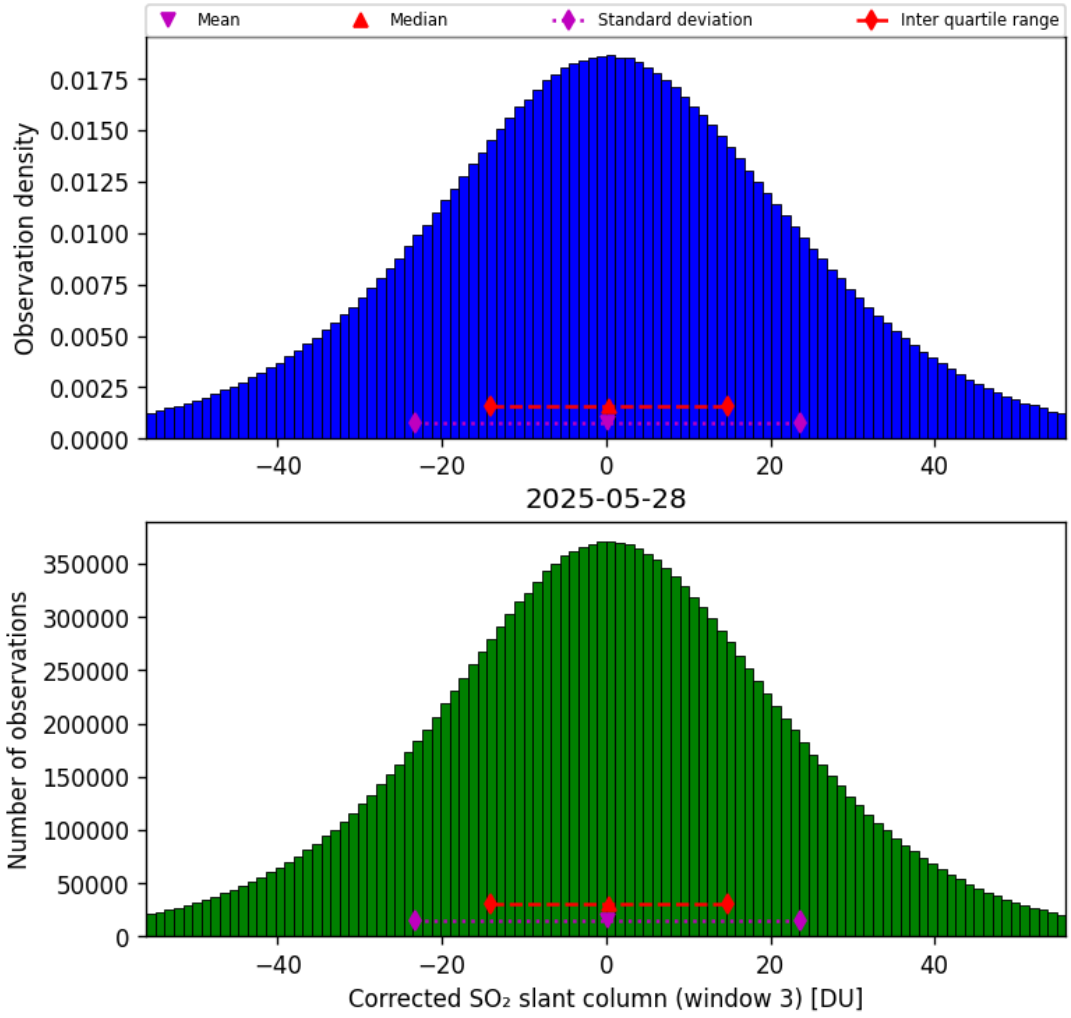


Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-05-28 to 2025-05-29

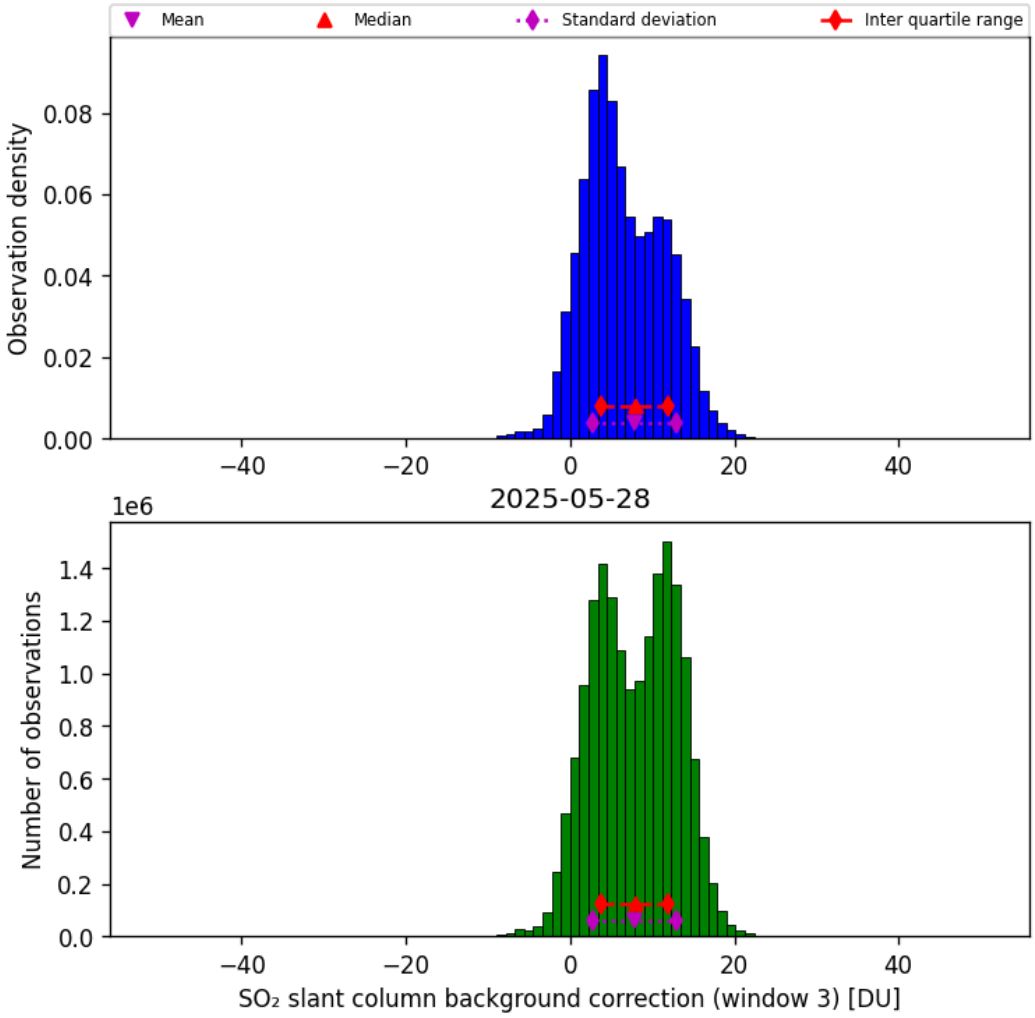


Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-05-28 to 2025-05-29

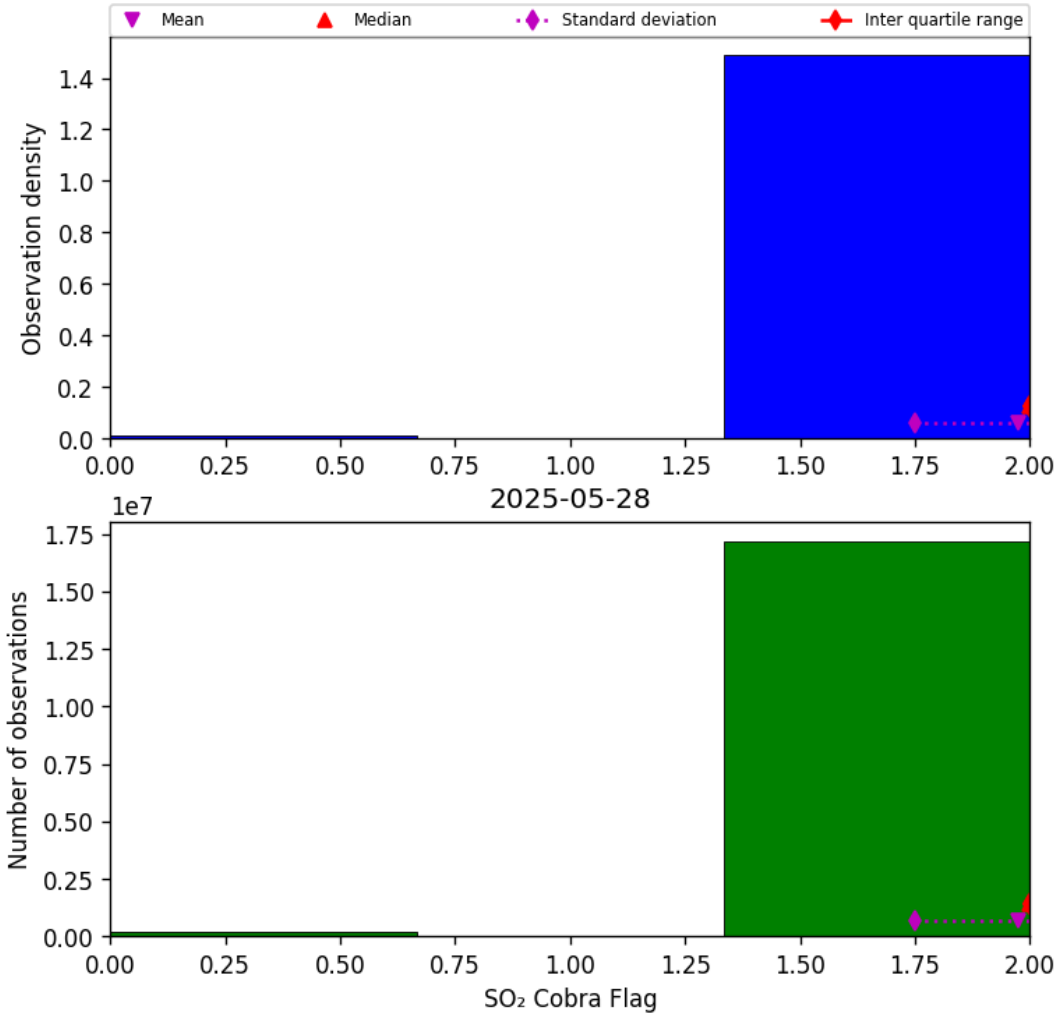


Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-05-28 to 2025-05-29

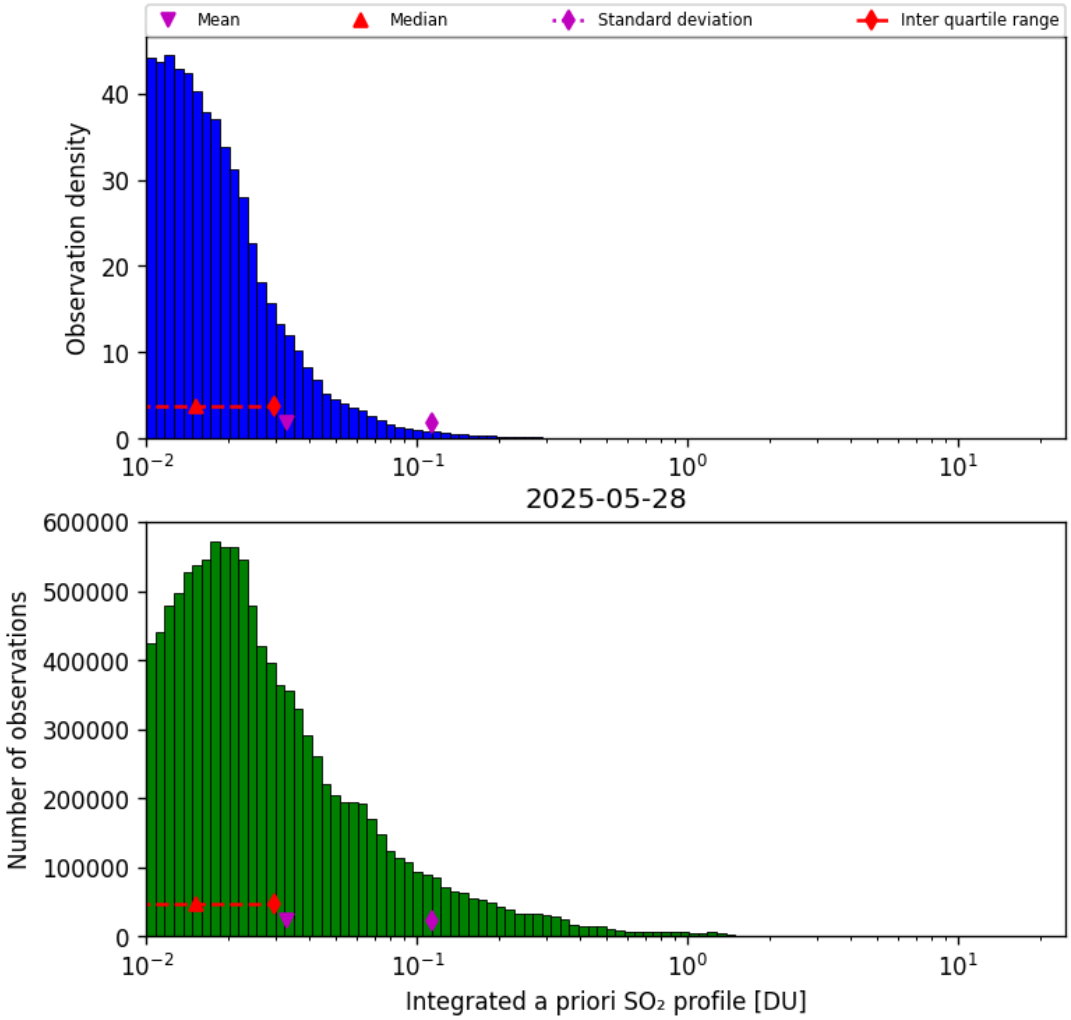


Figure 76: Histogram of "Integrated a priori SO_2 profile" for 2025-05-28 to 2025-05-29

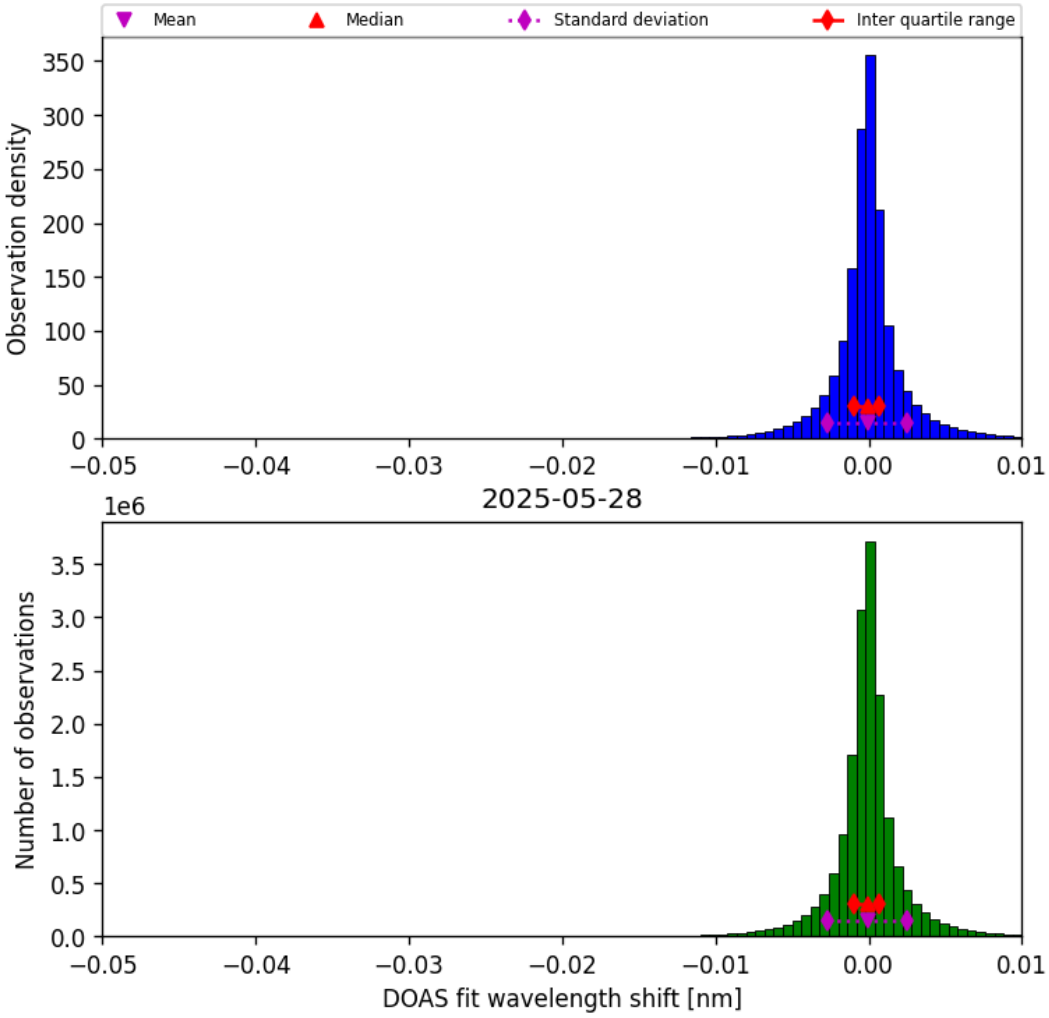


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-05-28 to 2025-05-29

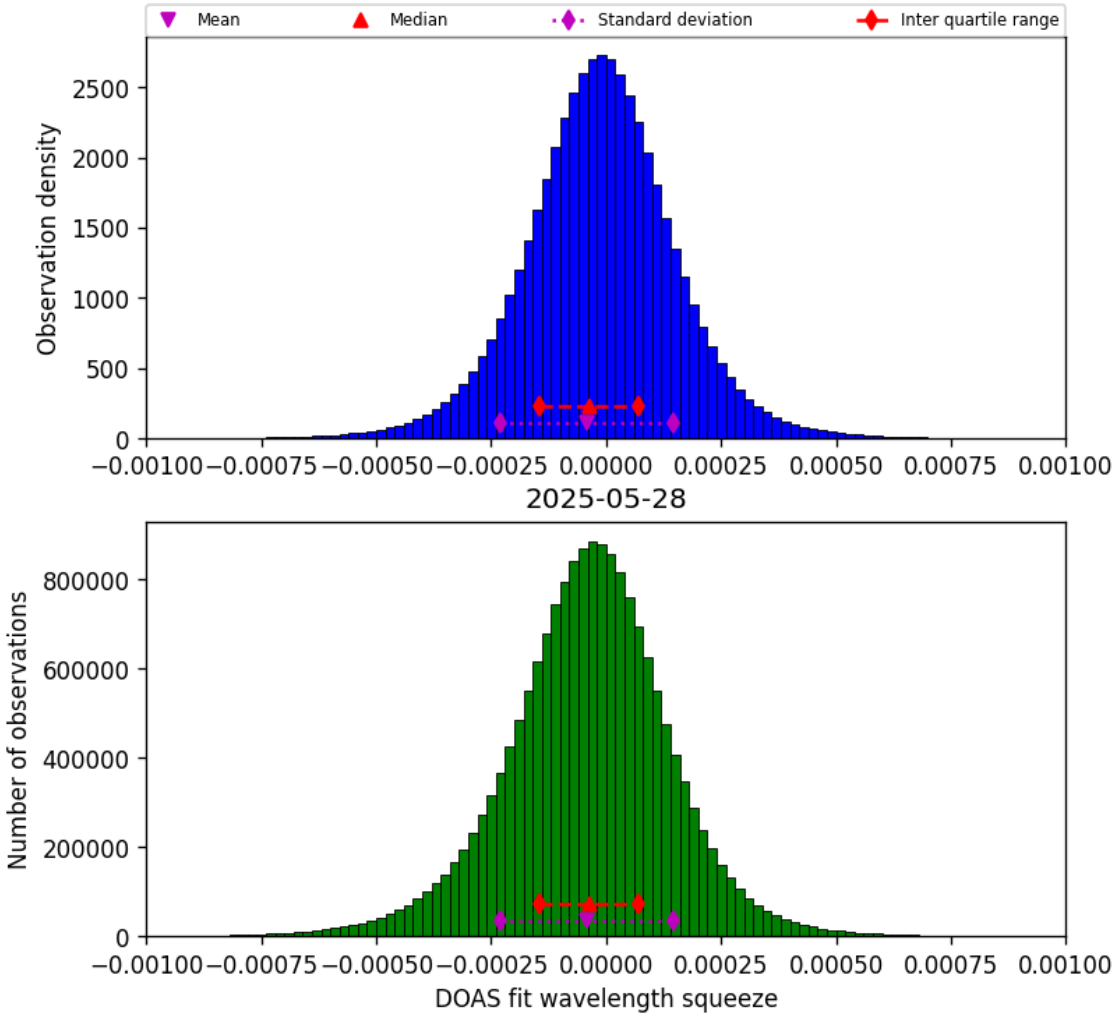


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-05-28 to 2025-05-29

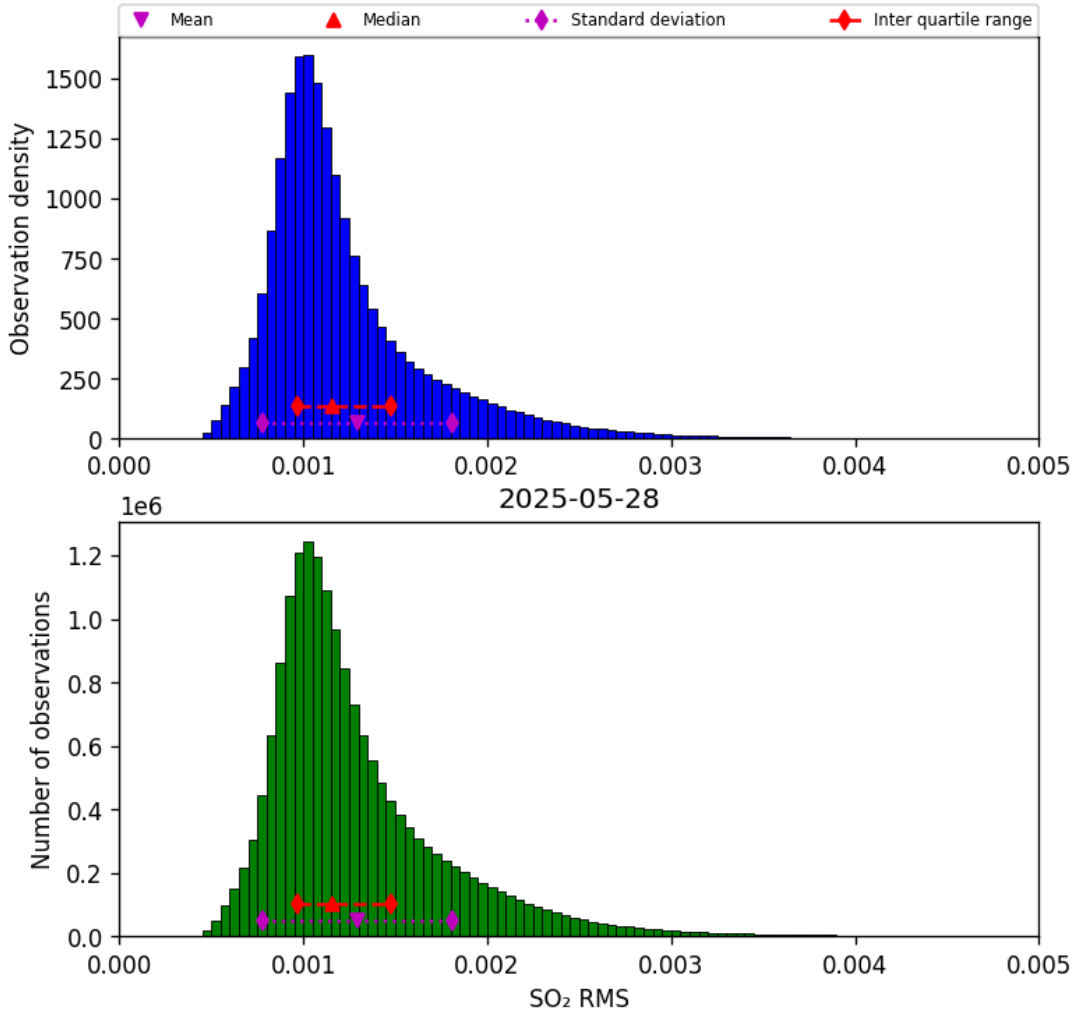


Figure 79: Histogram of "SO_2 RMS" for 2025-05-28 to 2025-05-29

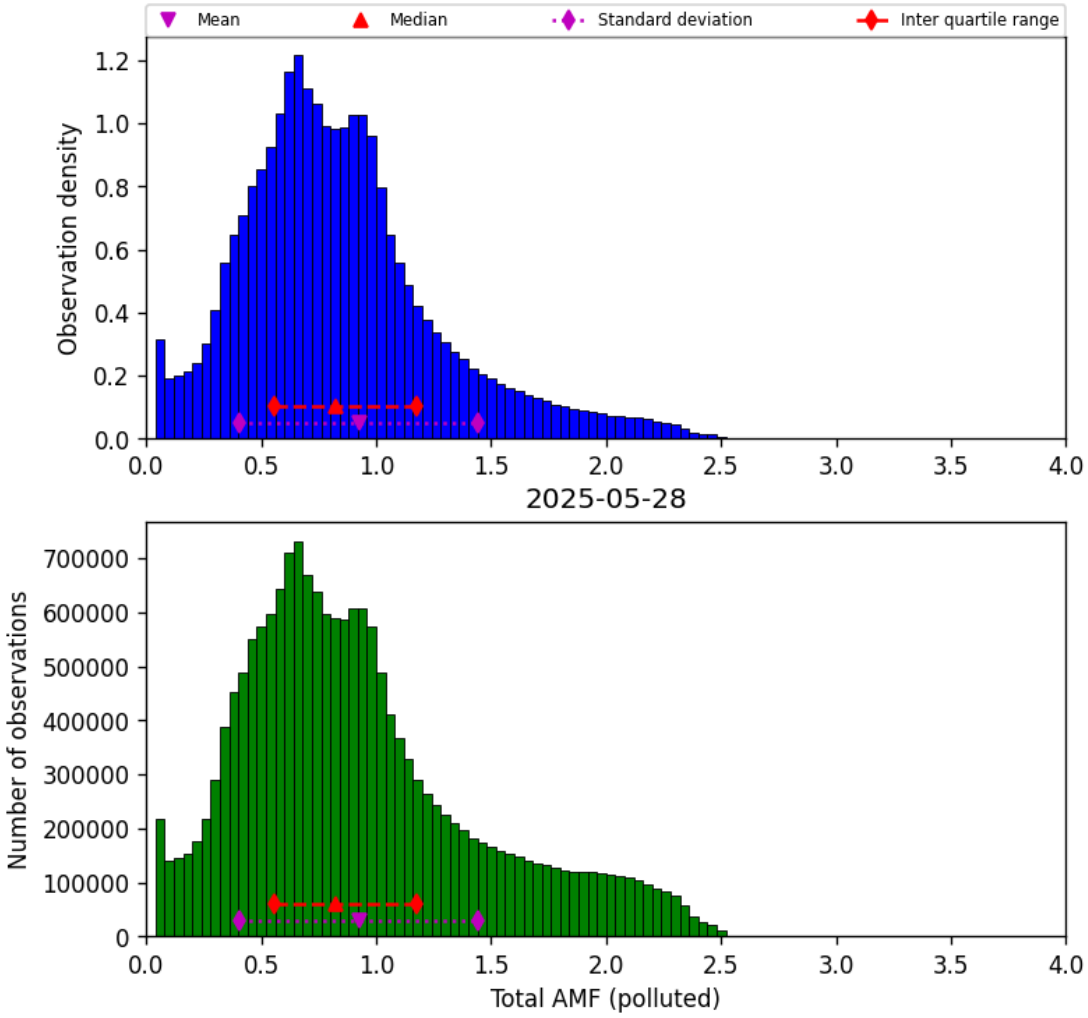


Figure 80: Histogram of “Total AMF (polluted)” for 2025-05-28 to 2025-05-29

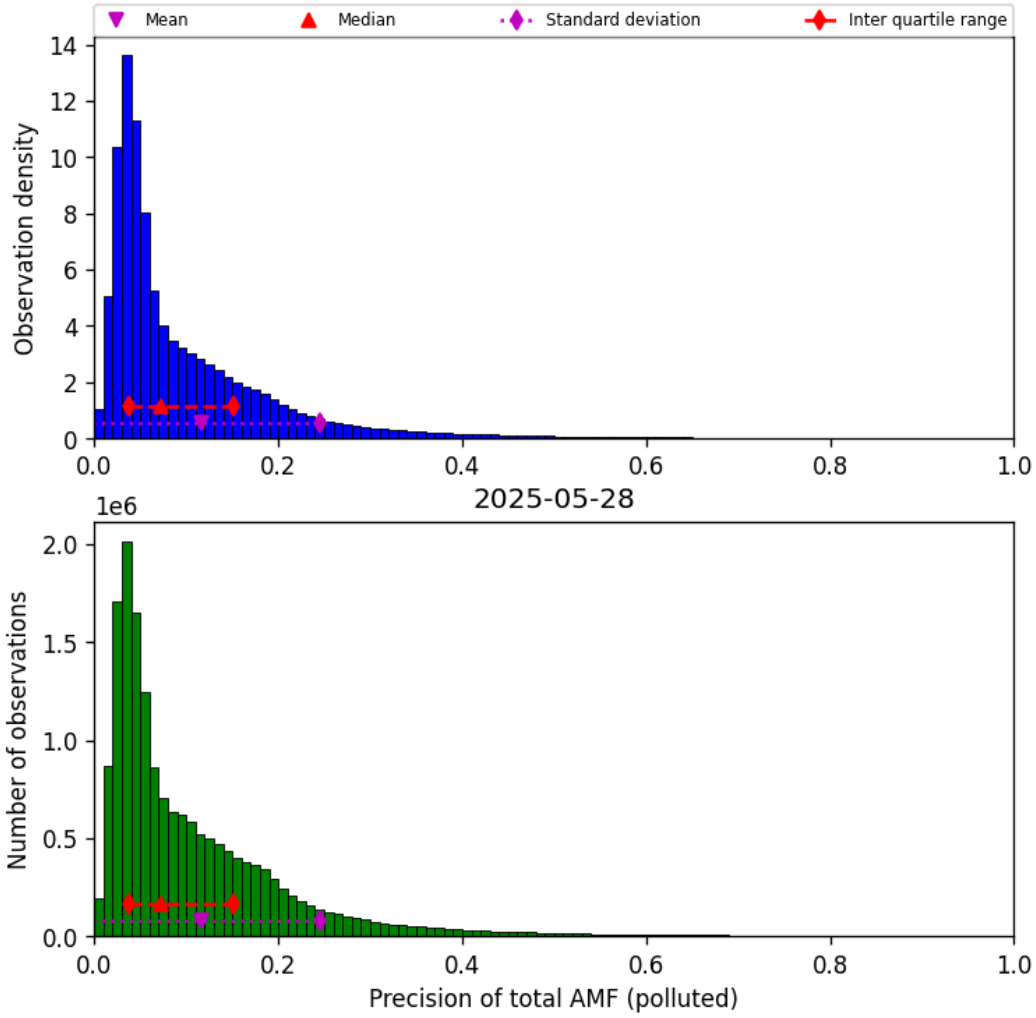


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-05-28 to 2025-05-29

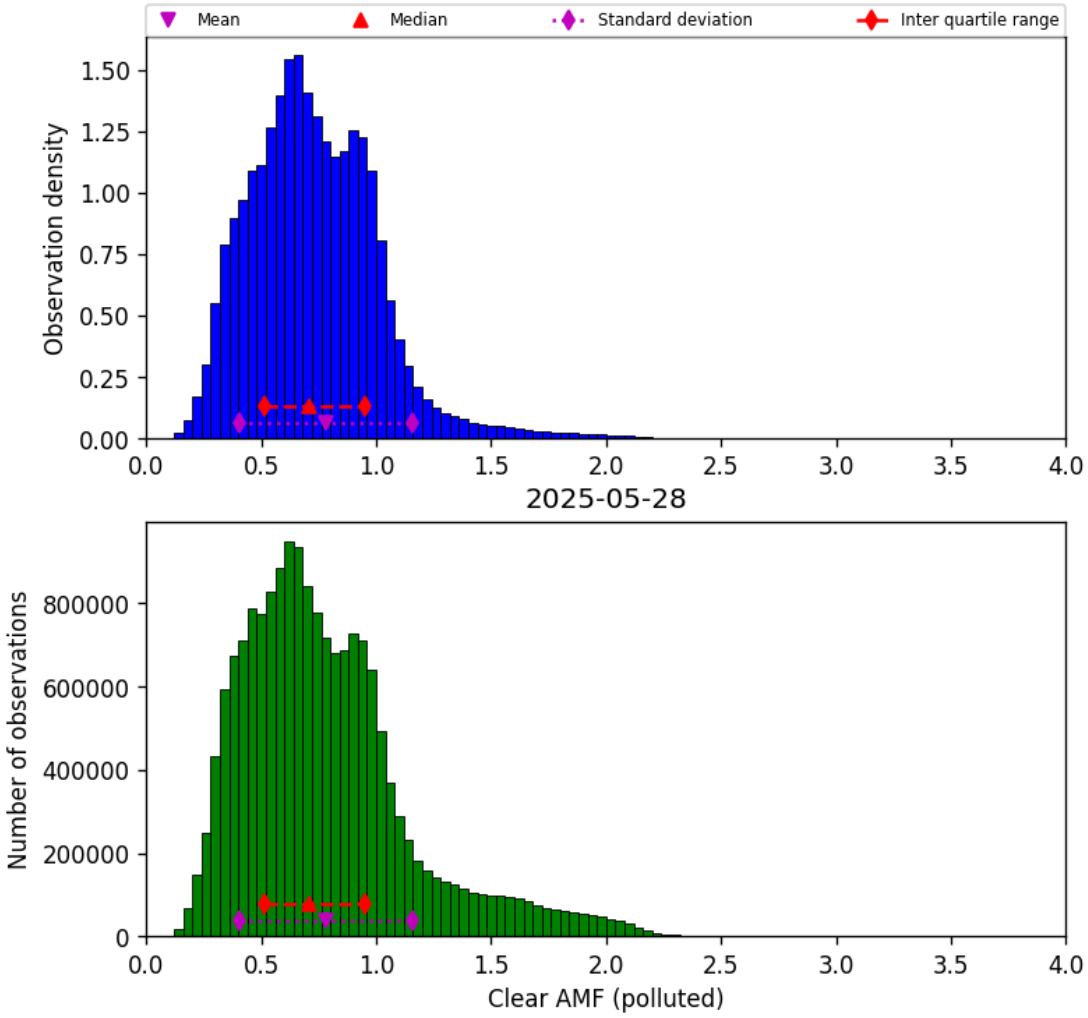


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-05-28 to 2025-05-29

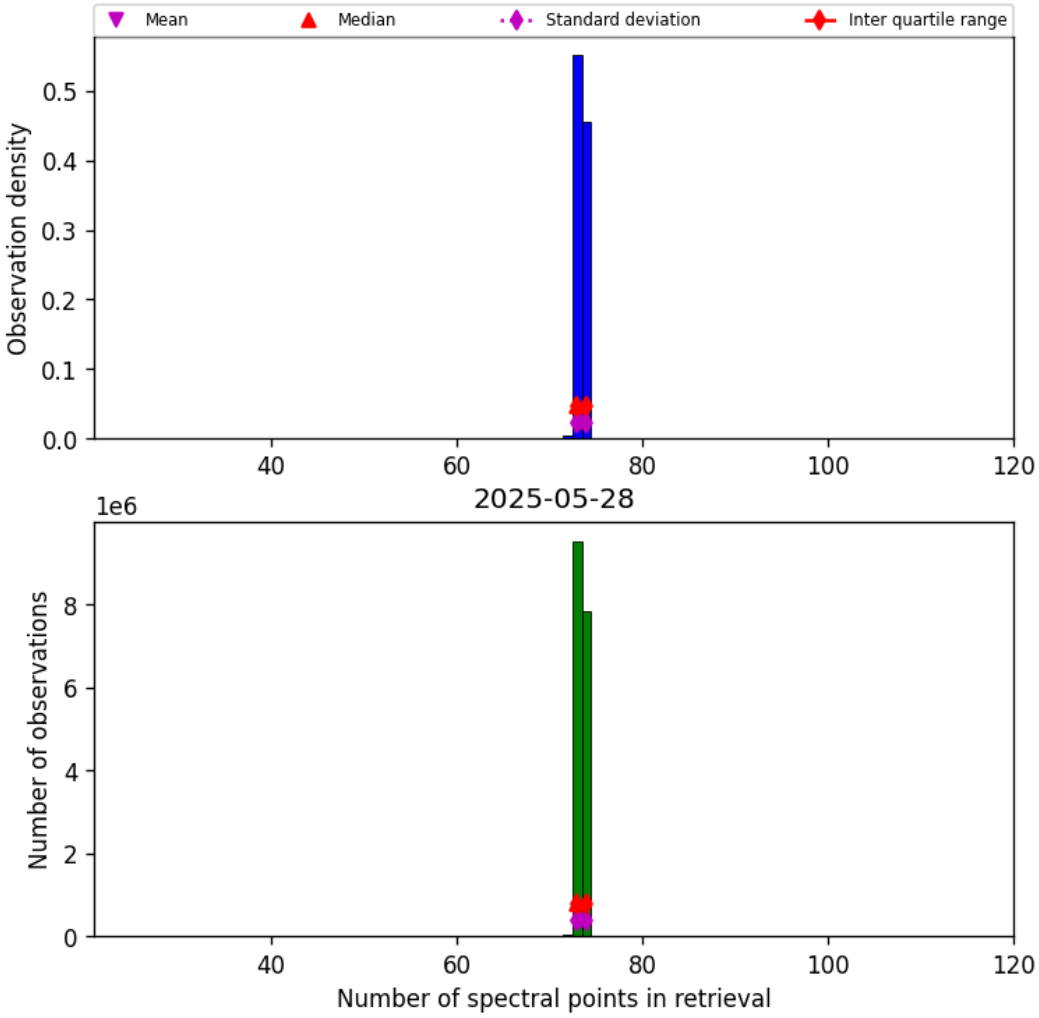


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-05-28 to 2025-05-29

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.

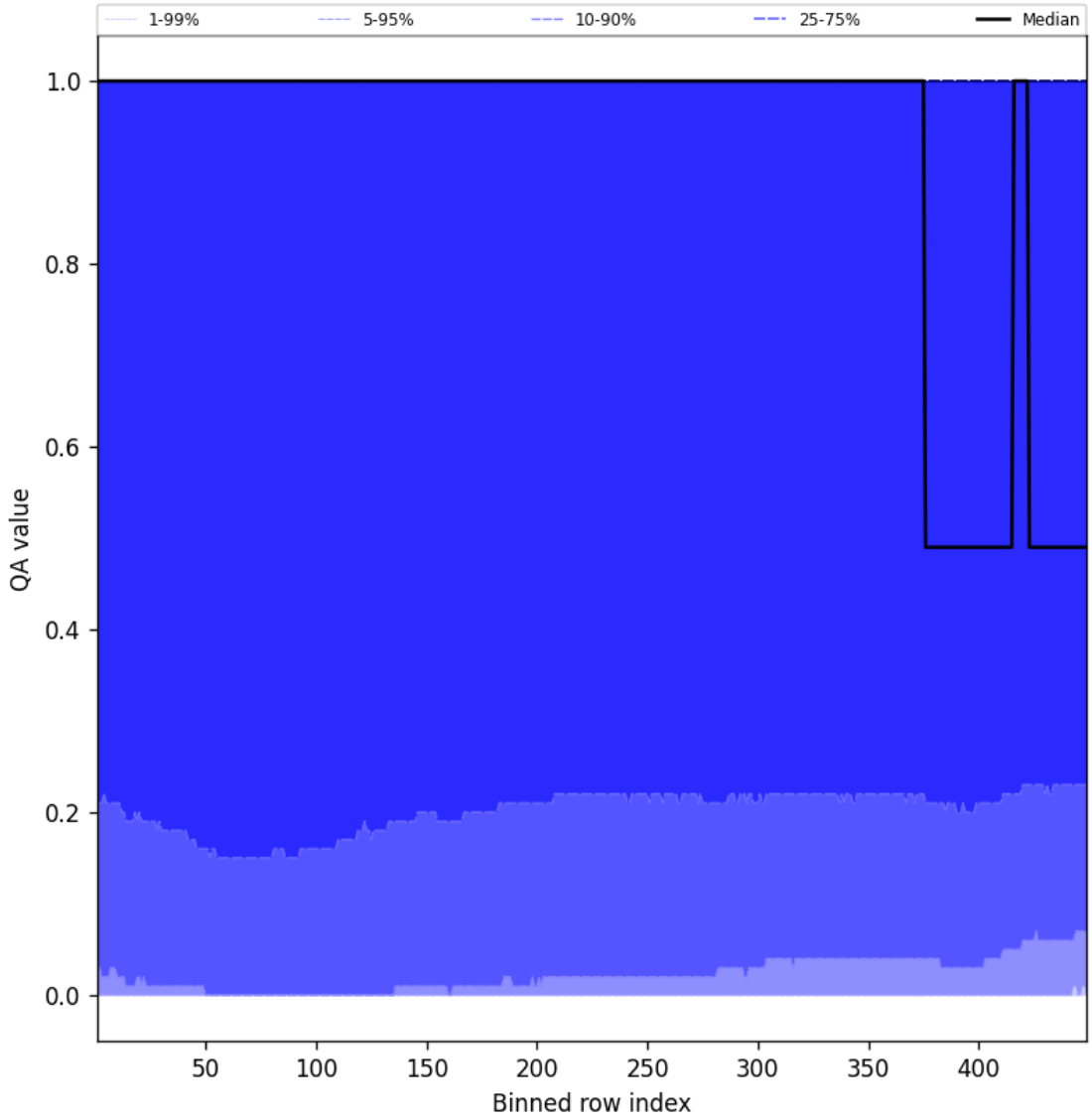


Figure 84: Along track statistics of “QA value” for 2025-05-28 to 2025-05-29

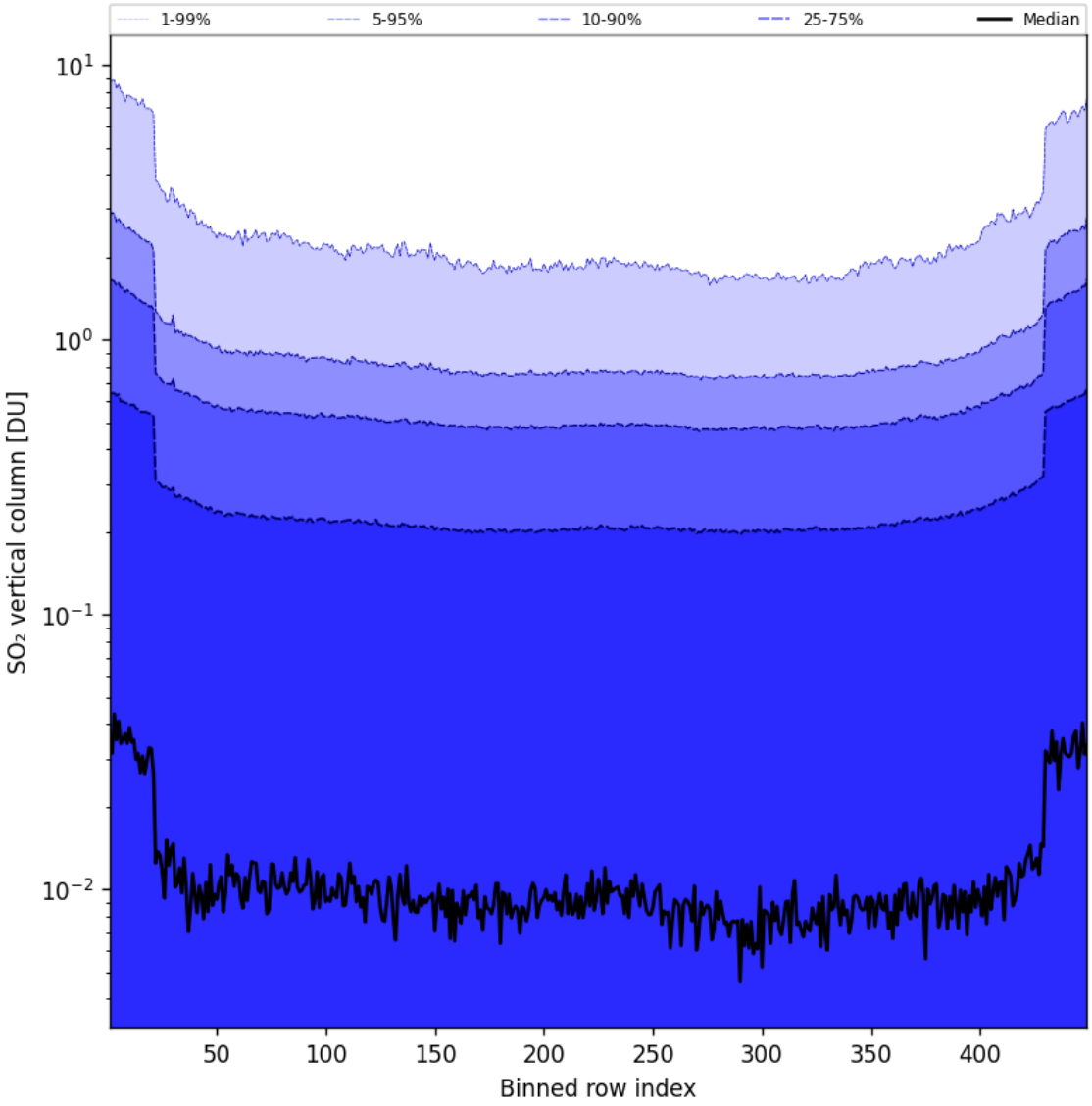


Figure 85: Along track statistics of "SO_2 vertical column" for 2025-05-28 to 2025-05-29

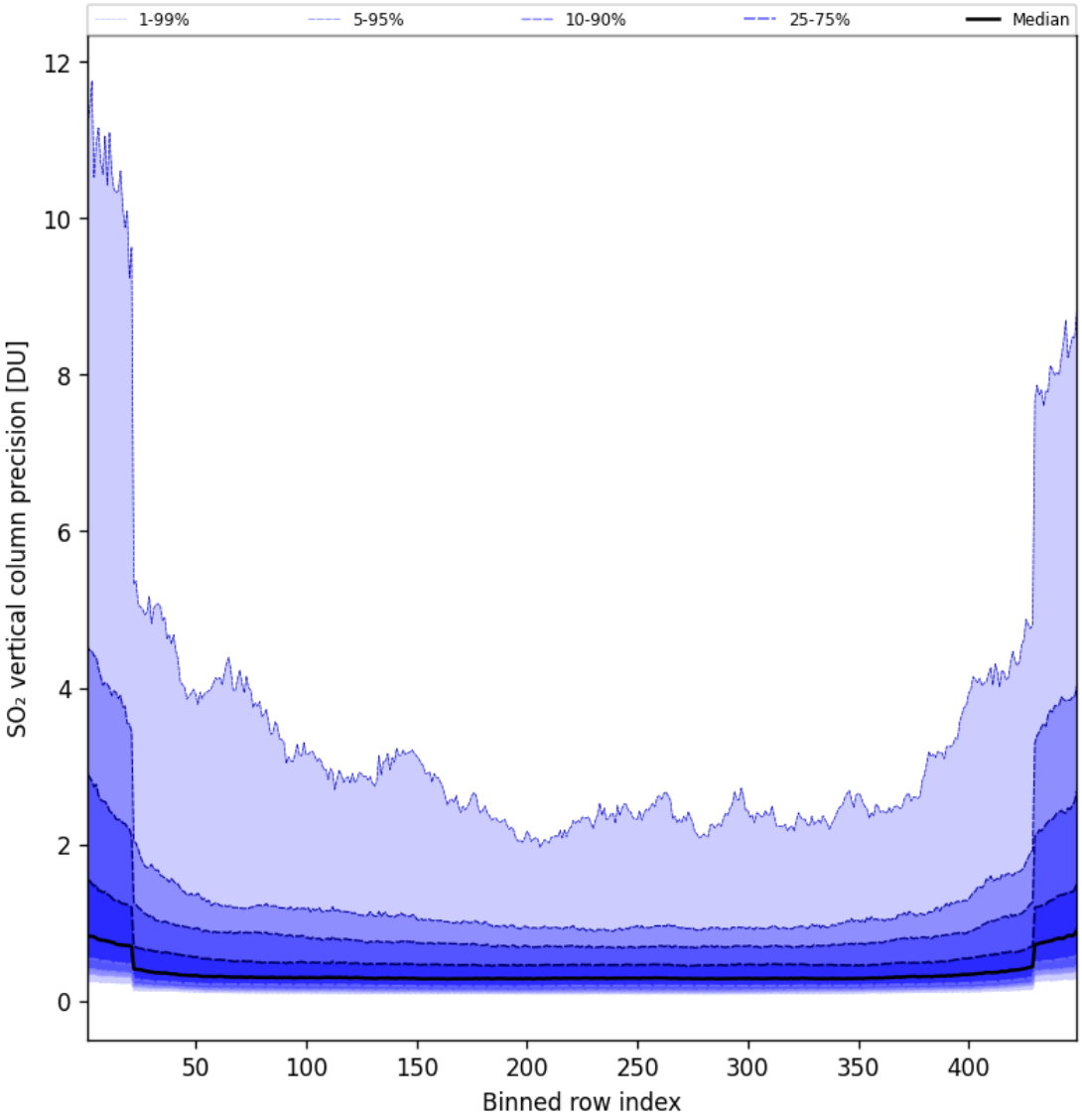


Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-05-28 to 2025-05-29

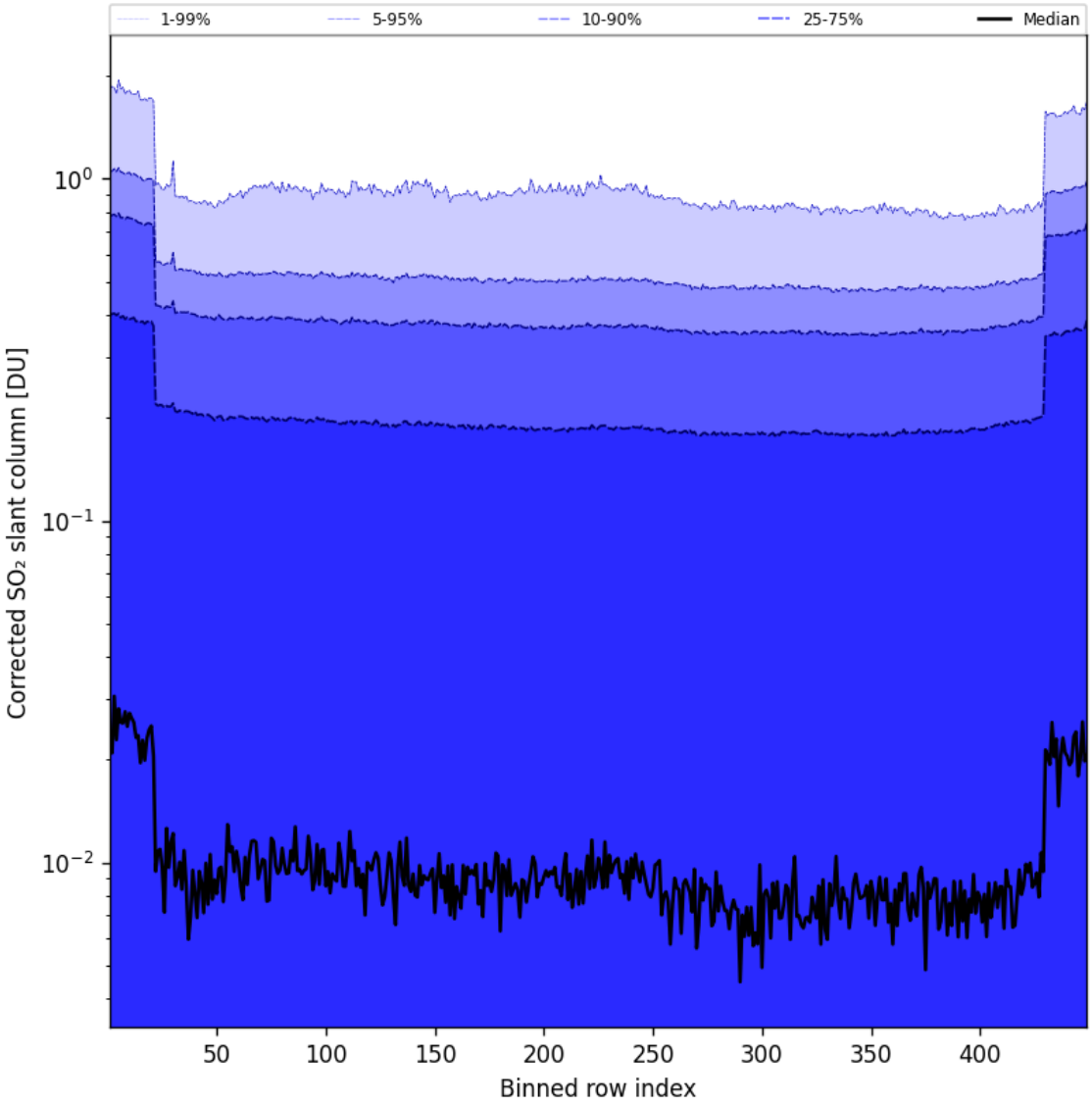


Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-05-28 to 2025-05-29

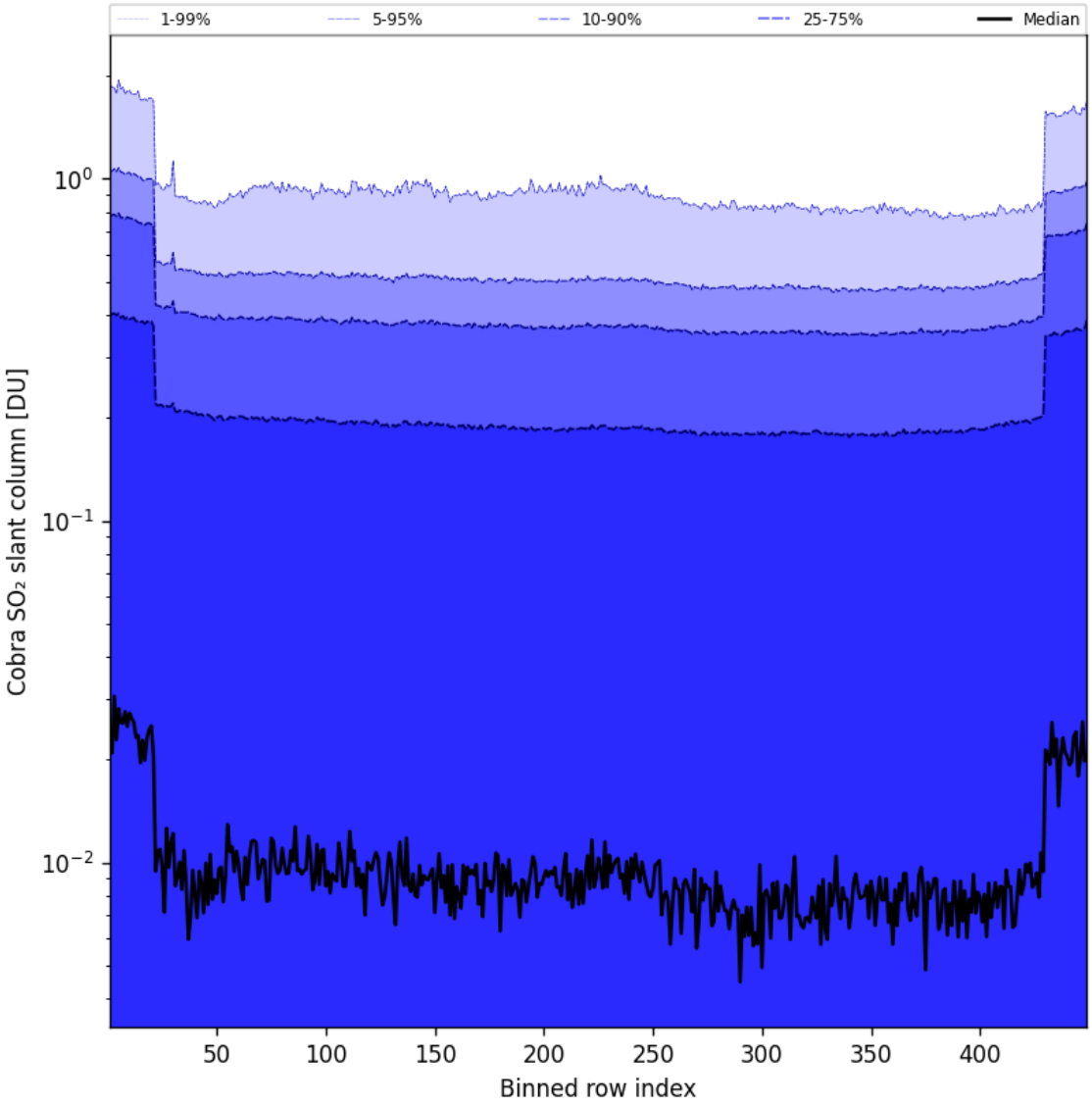


Figure 88: Along track statistics of "Cobra SO_2 slant column" for 2025-05-28 to 2025-05-29

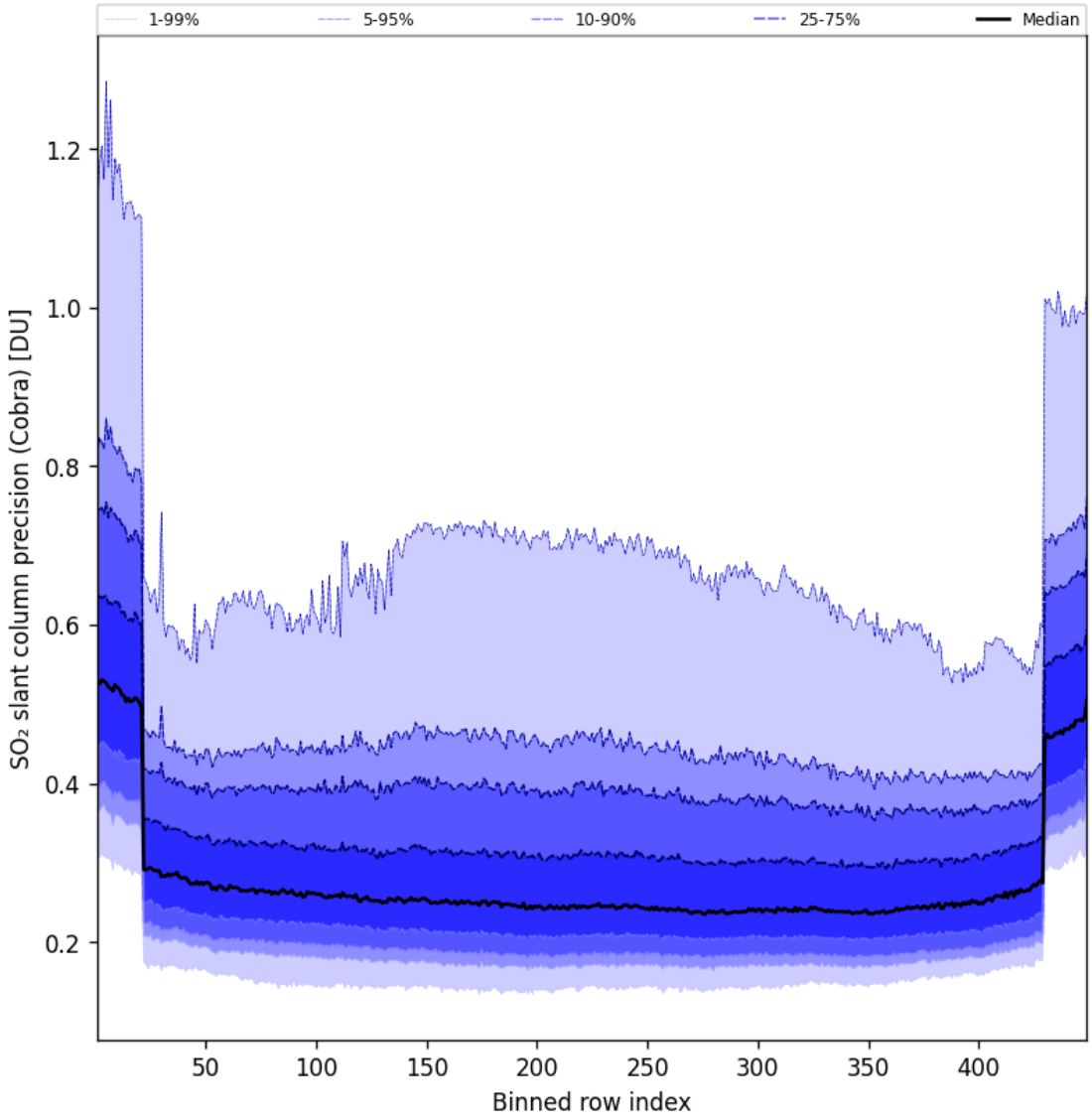


Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-05-28 to 2025-05-29

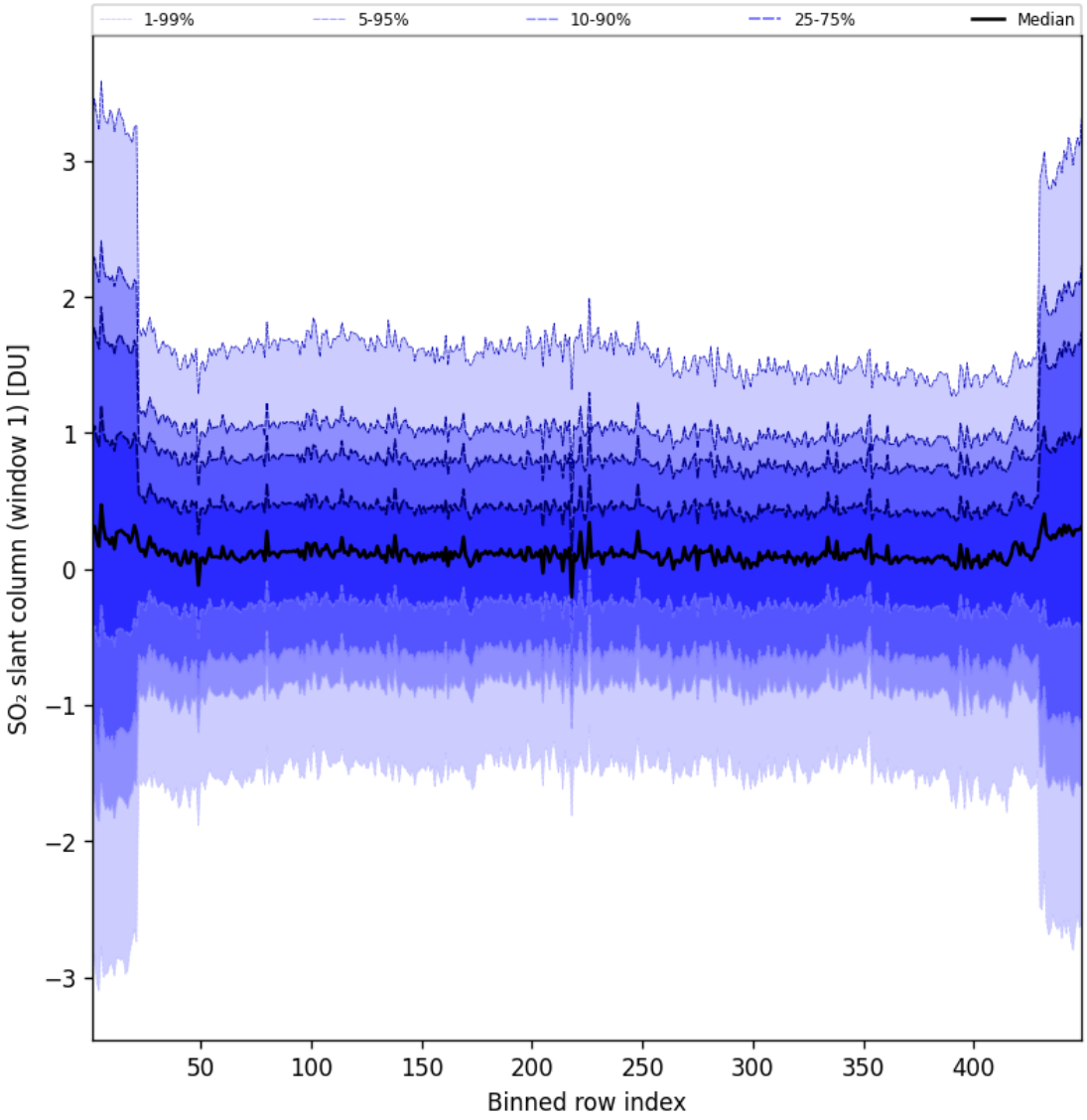


Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-05-28 to 2025-05-29

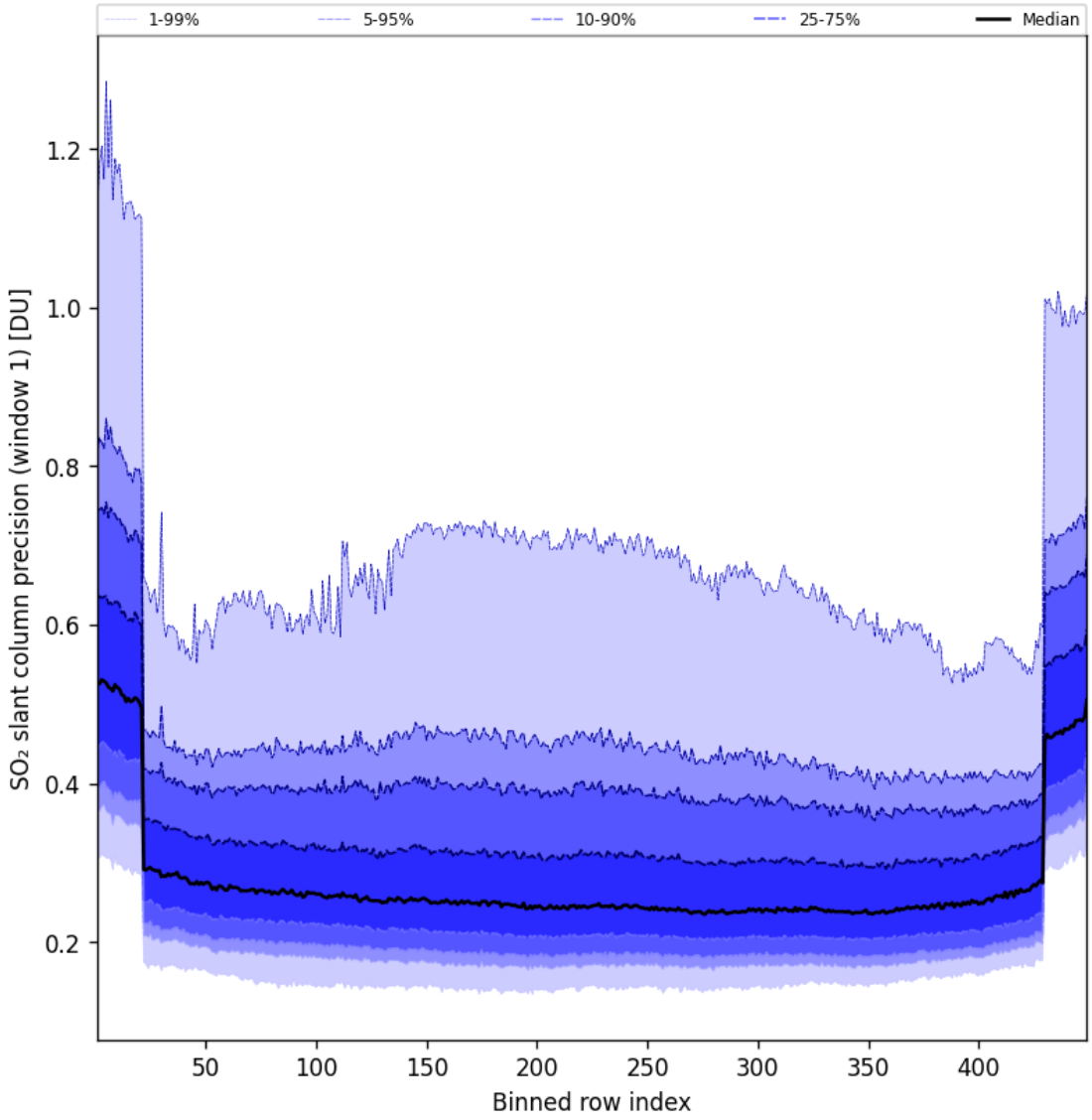


Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-05-28 to 2025-05-29

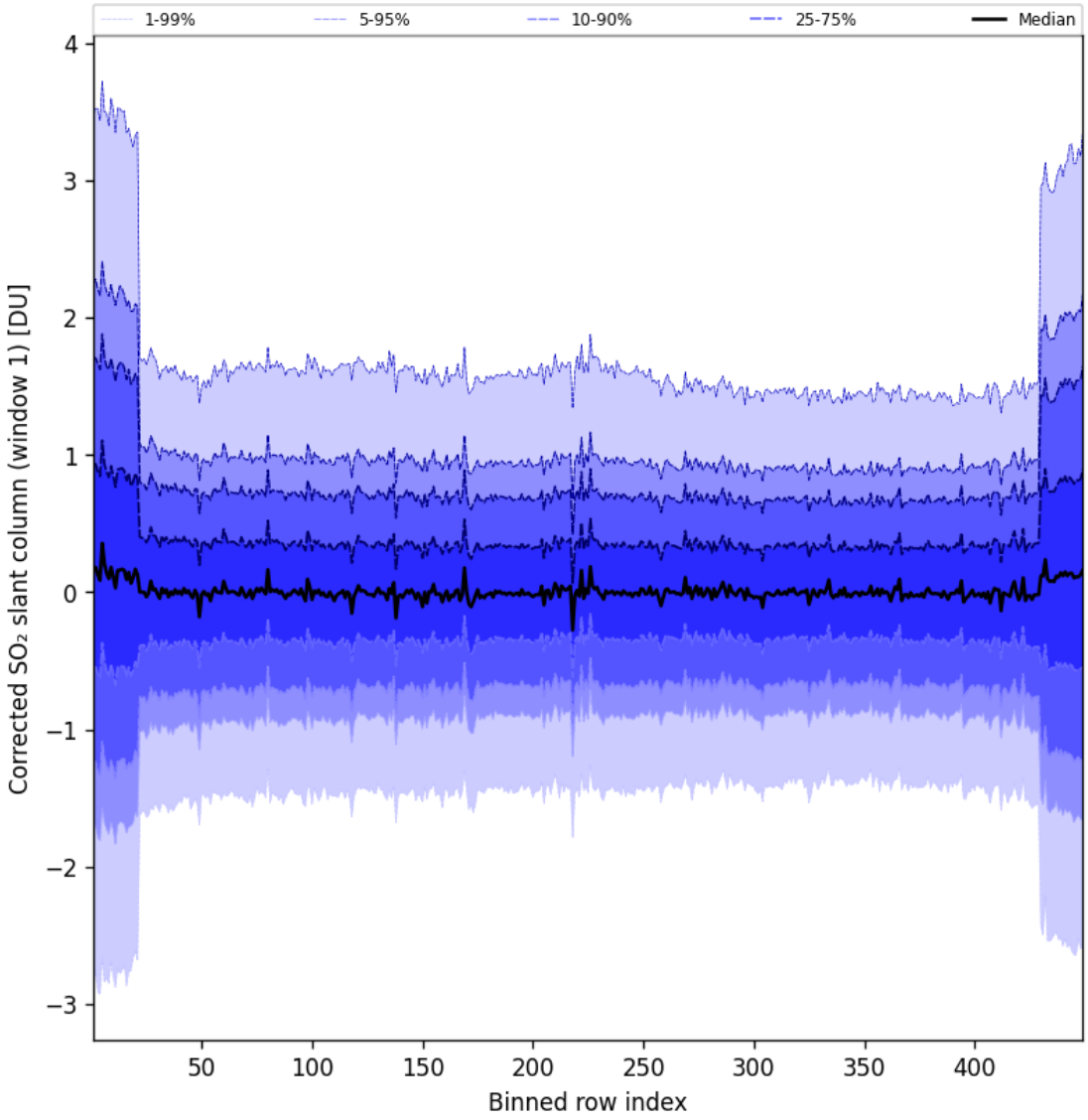


Figure 92: Along track statistics of "Corrected SO_2 slant column (window 1)" for 2025-05-28 to 2025-05-29

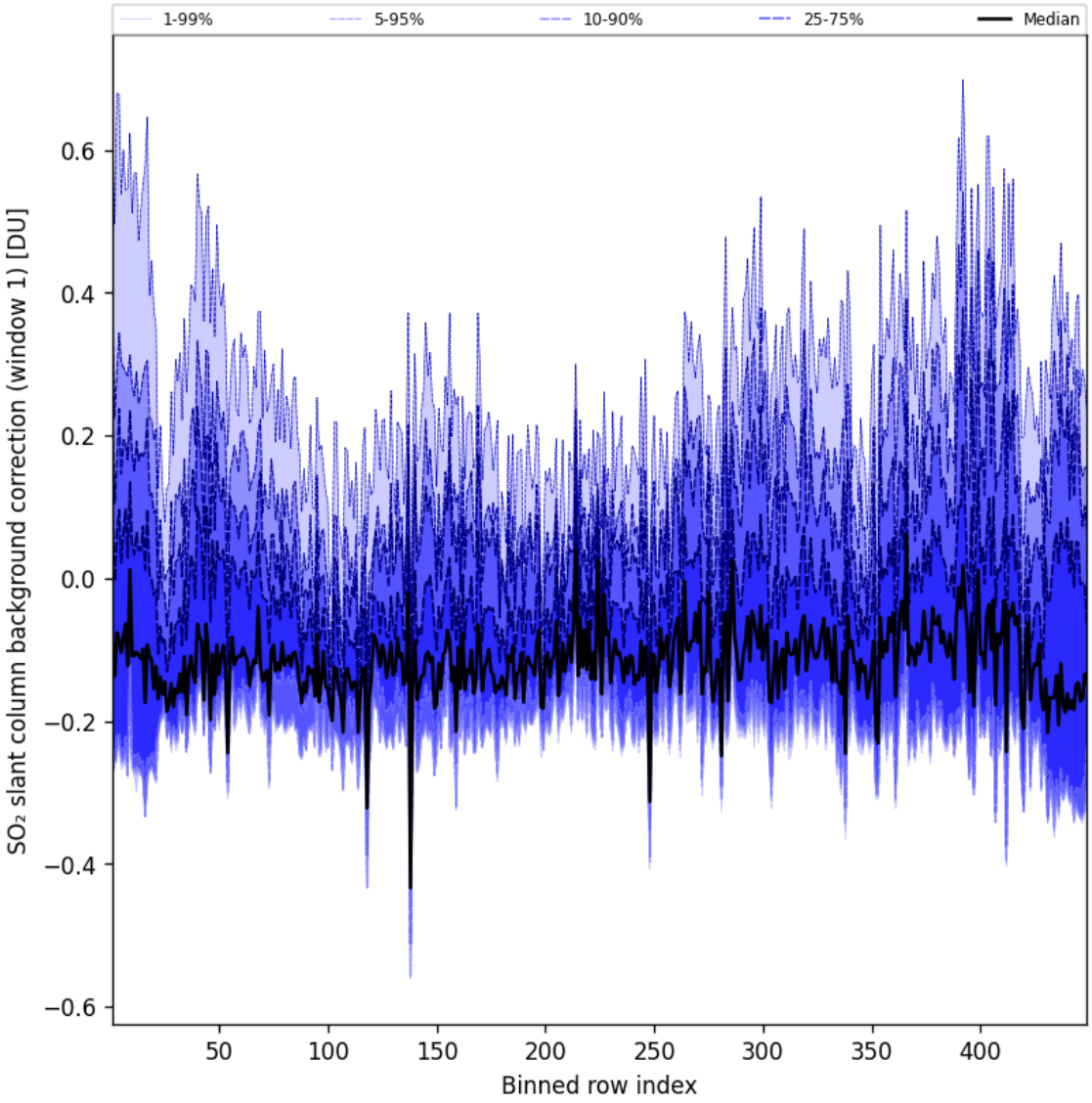


Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-05-28 to 2025-05-29

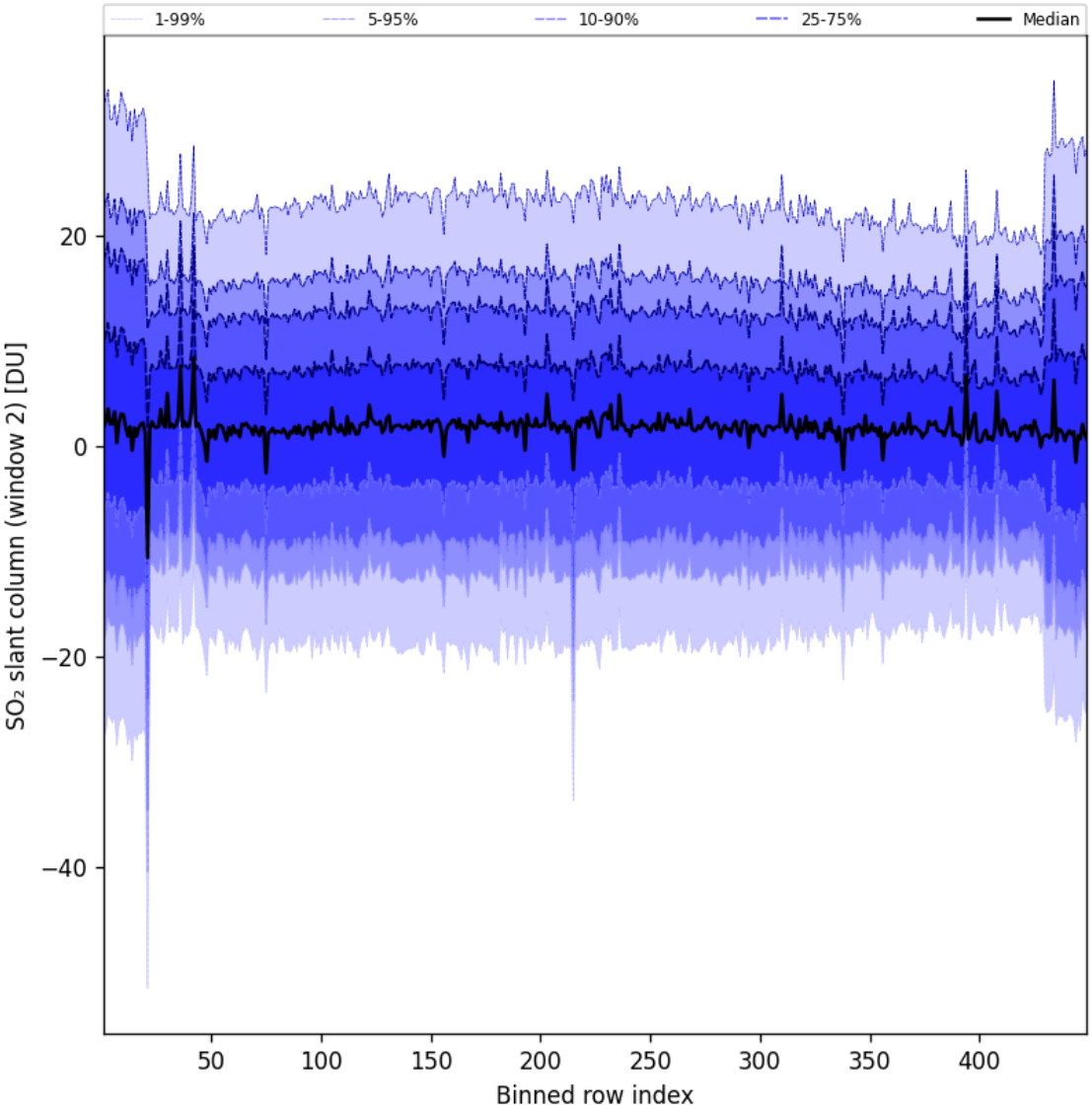


Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-05-28 to 2025-05-29

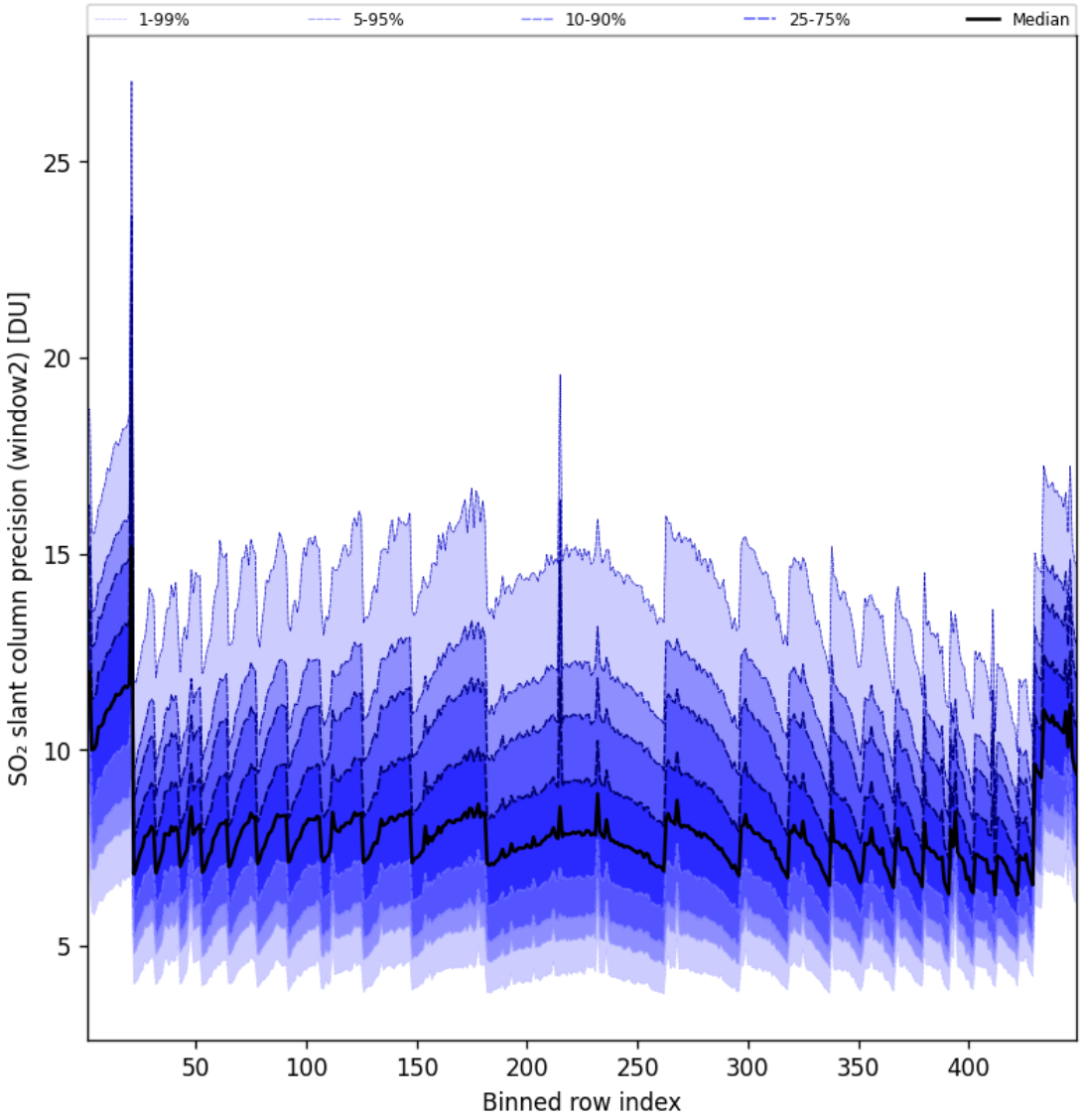


Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-05-28 to 2025-05-29

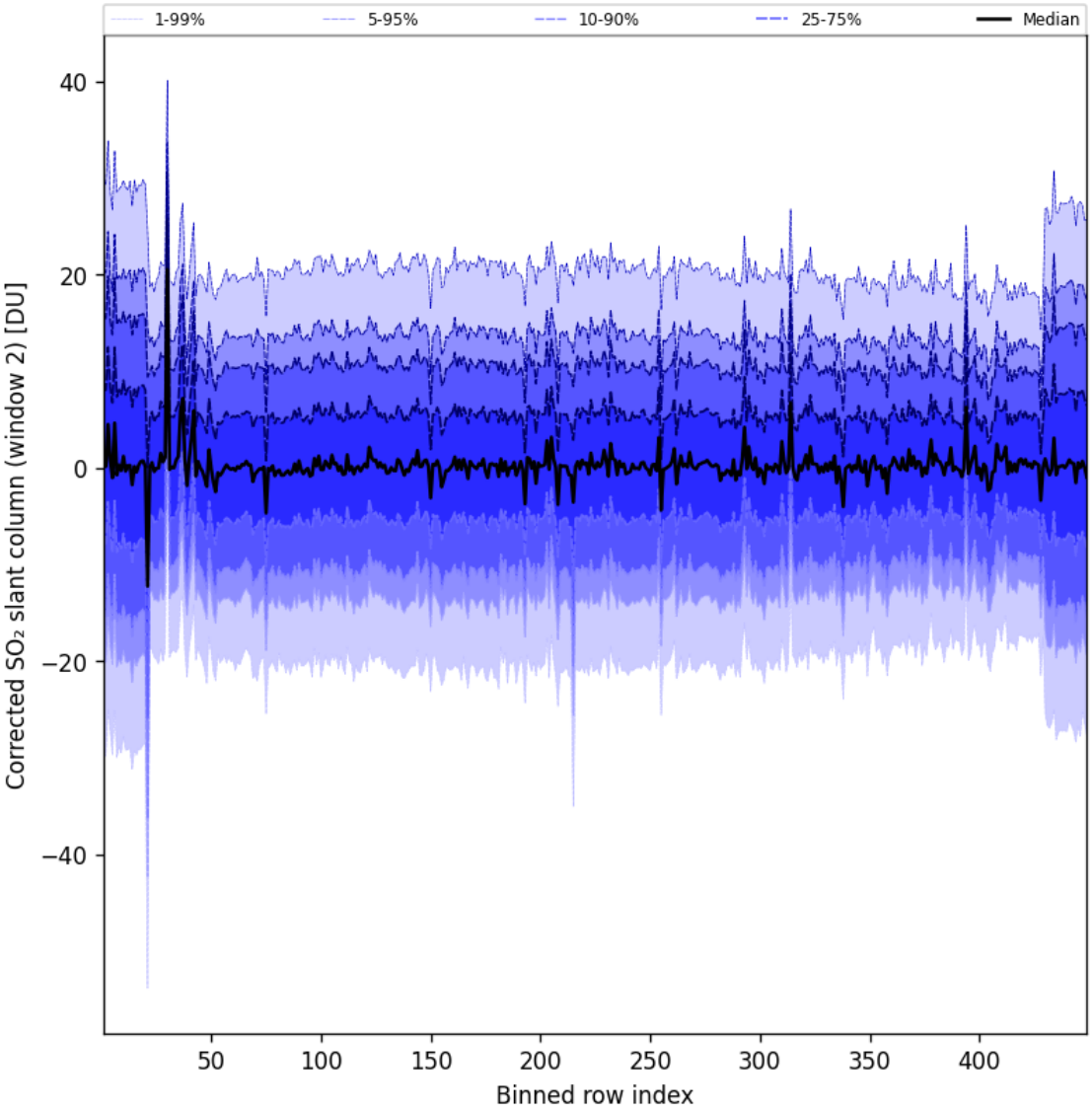


Figure 96: Along track statistics of "Corrected SO_2 slant column (window 2)" for 2025-05-28 to 2025-05-29

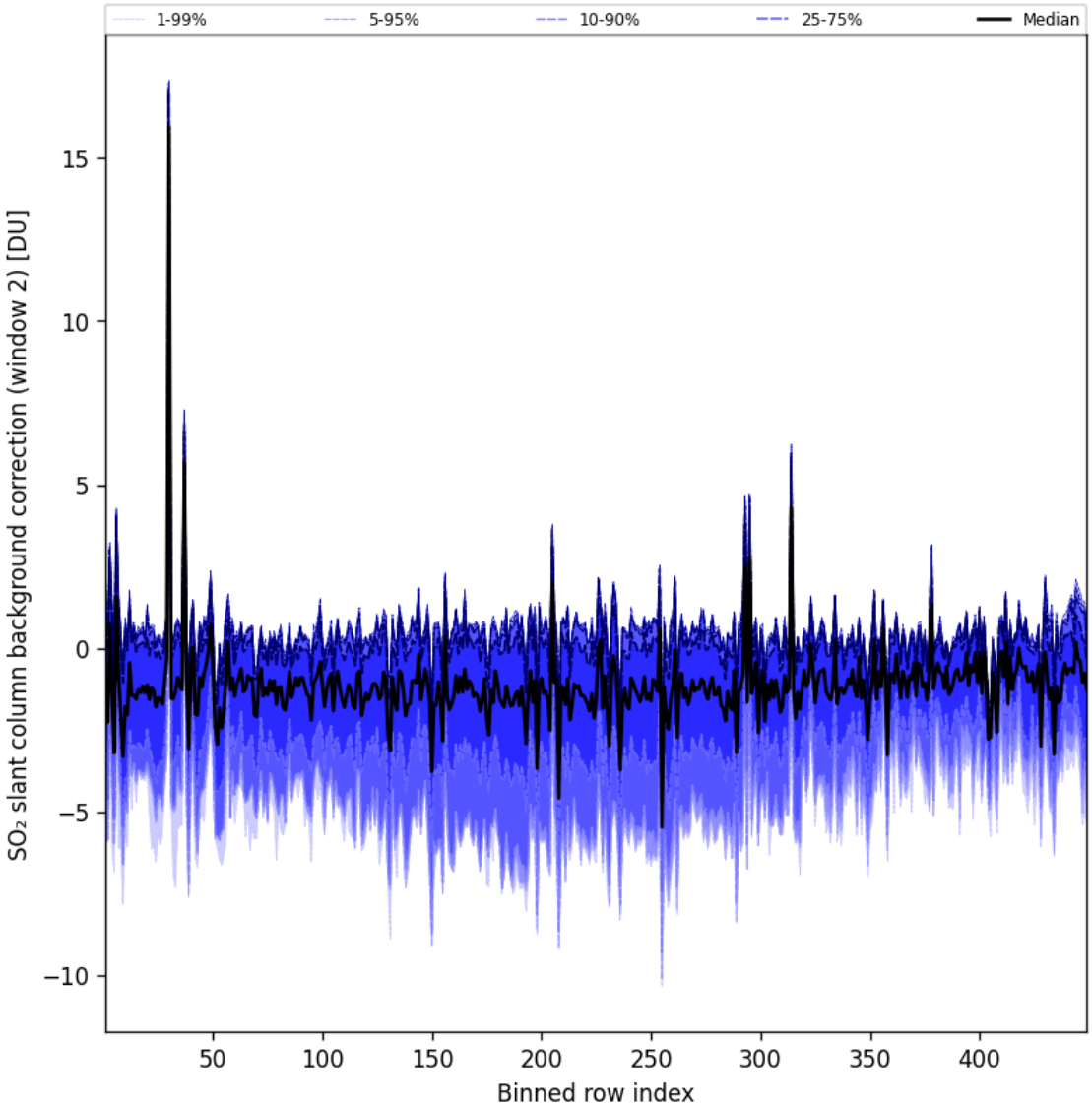


Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-05-28 to 2025-05-29

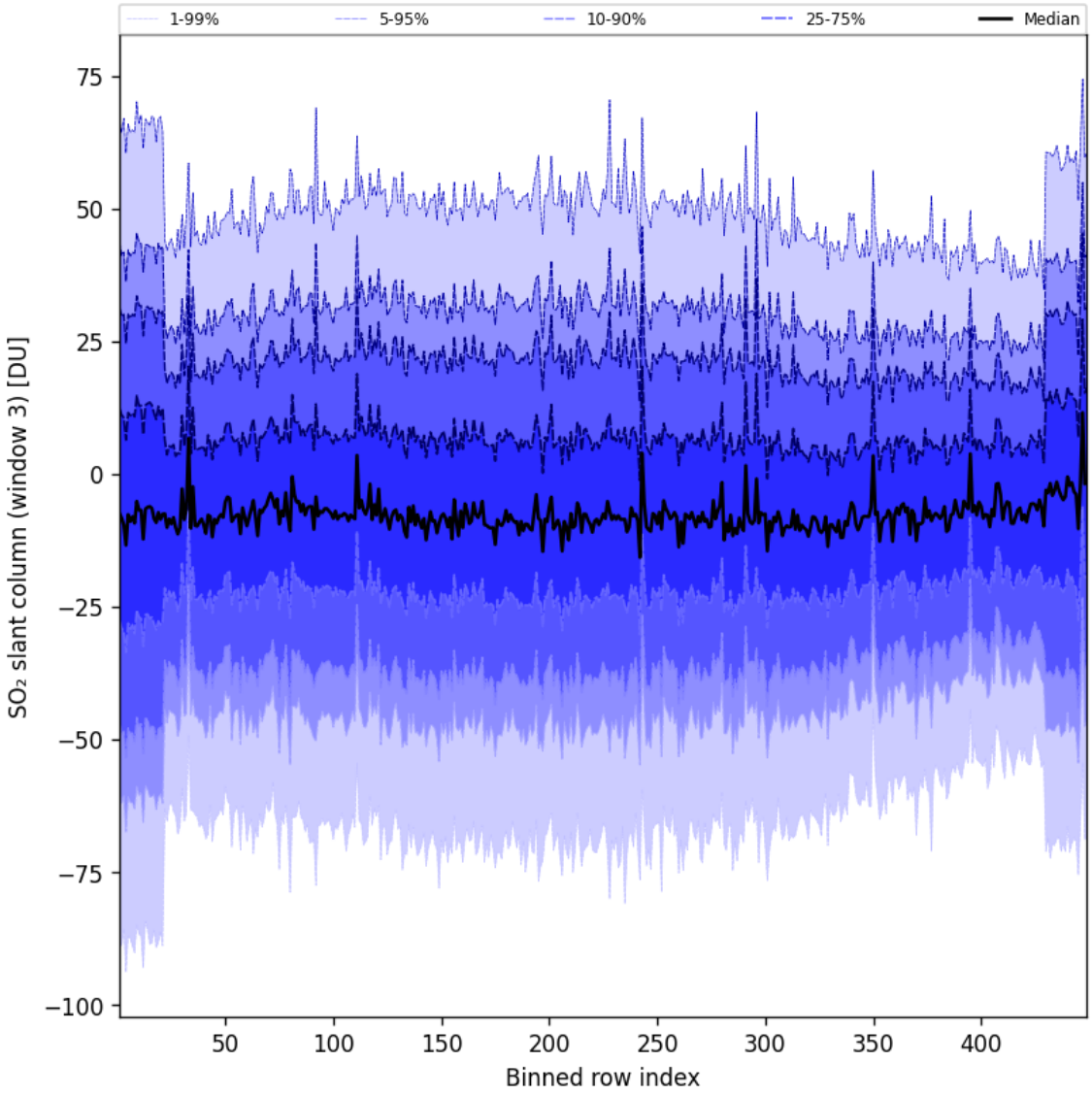


Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-05-28 to 2025-05-29

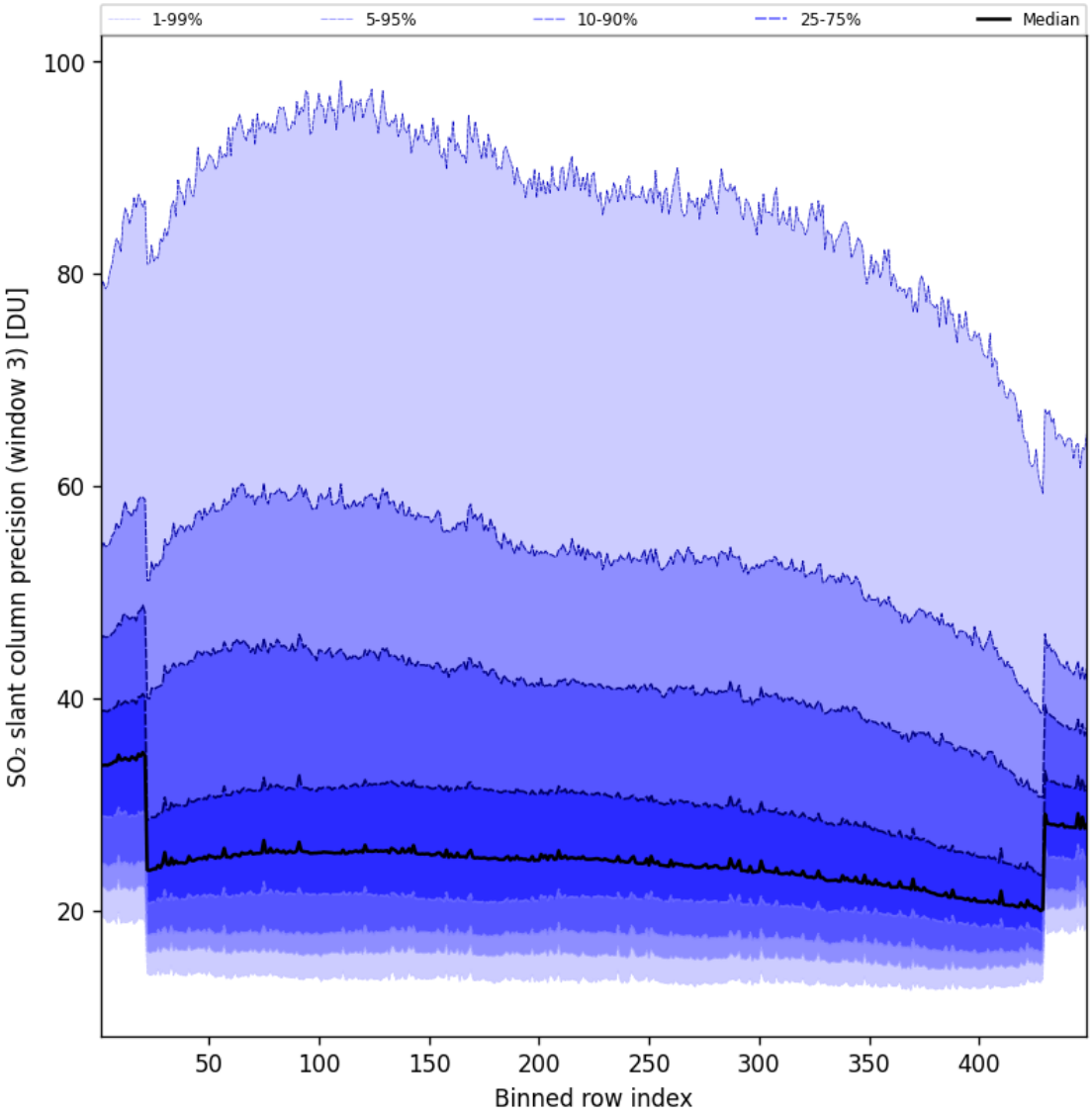


Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-05-28 to 2025-05-29

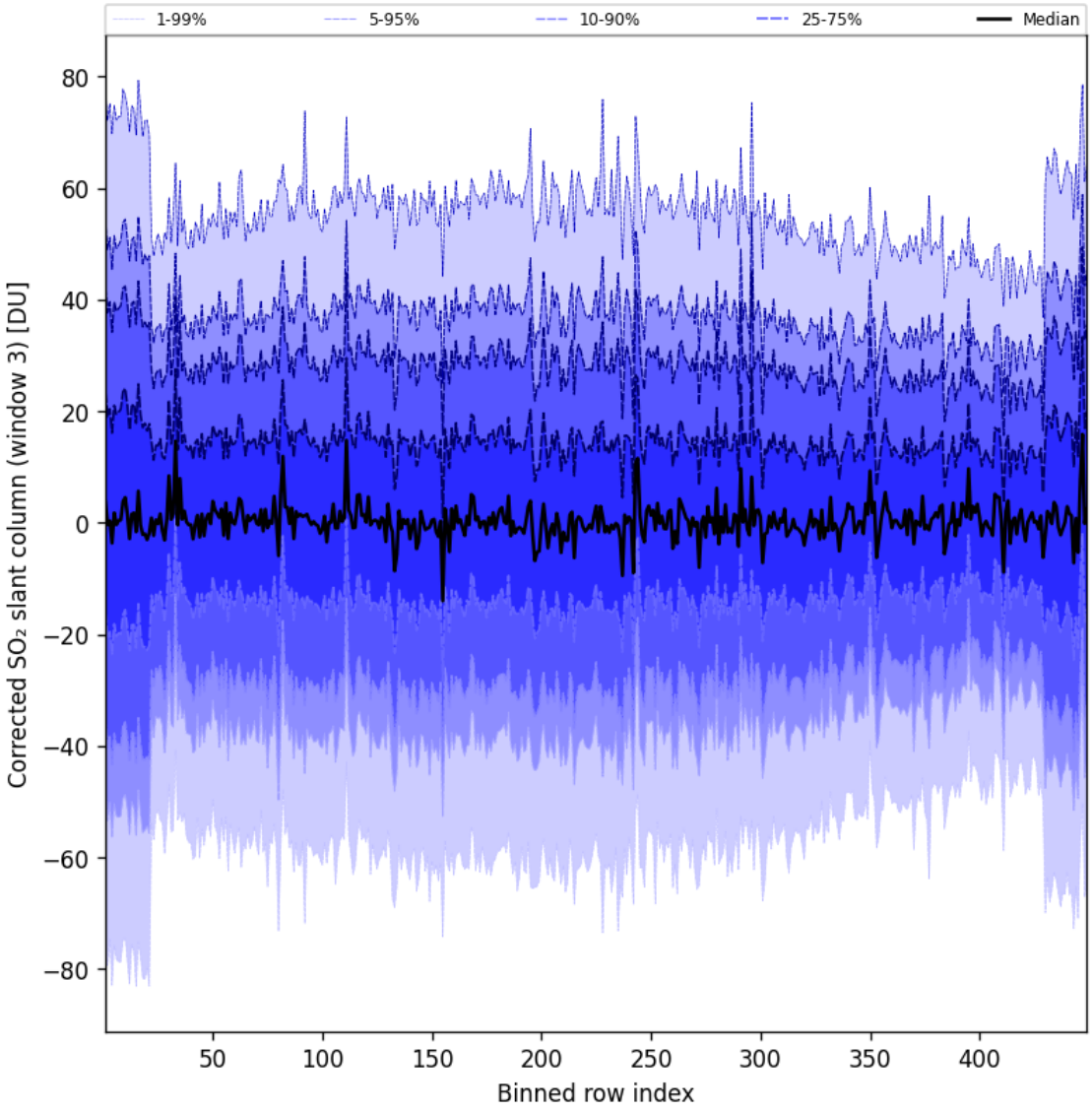


Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-05-28 to 2025-05-29

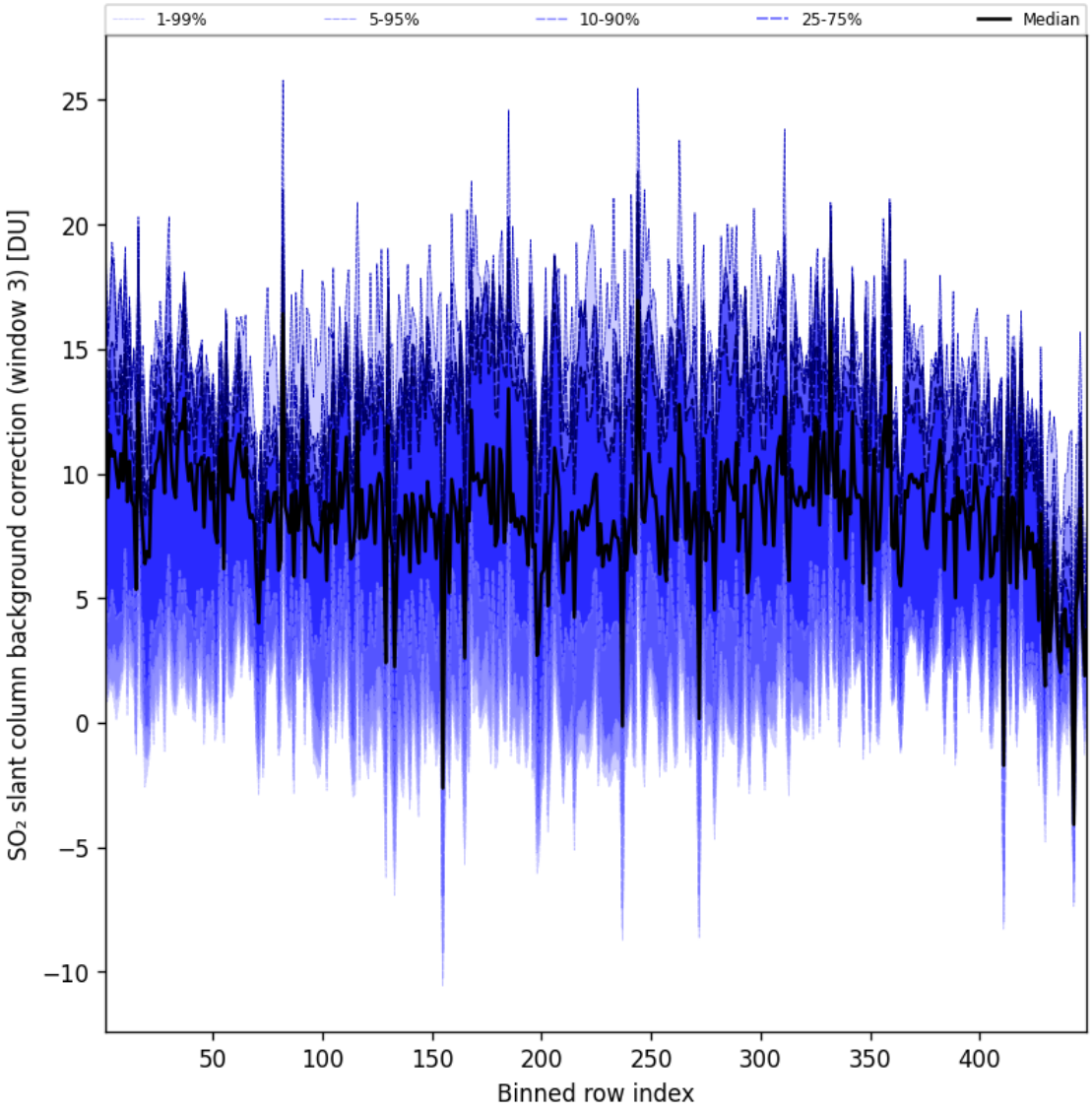


Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-05-28 to 2025-05-29

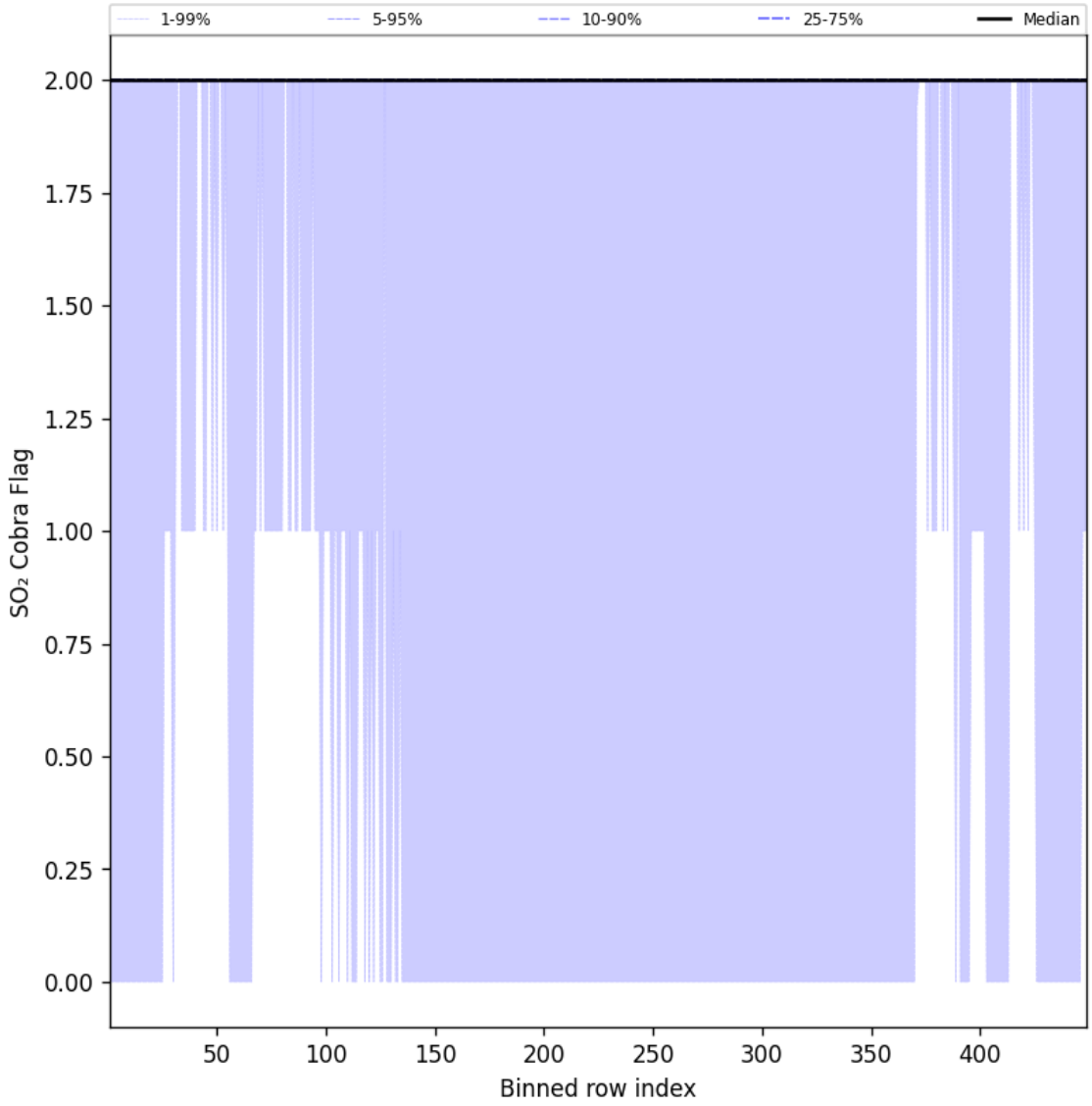


Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-05-28 to 2025-05-29

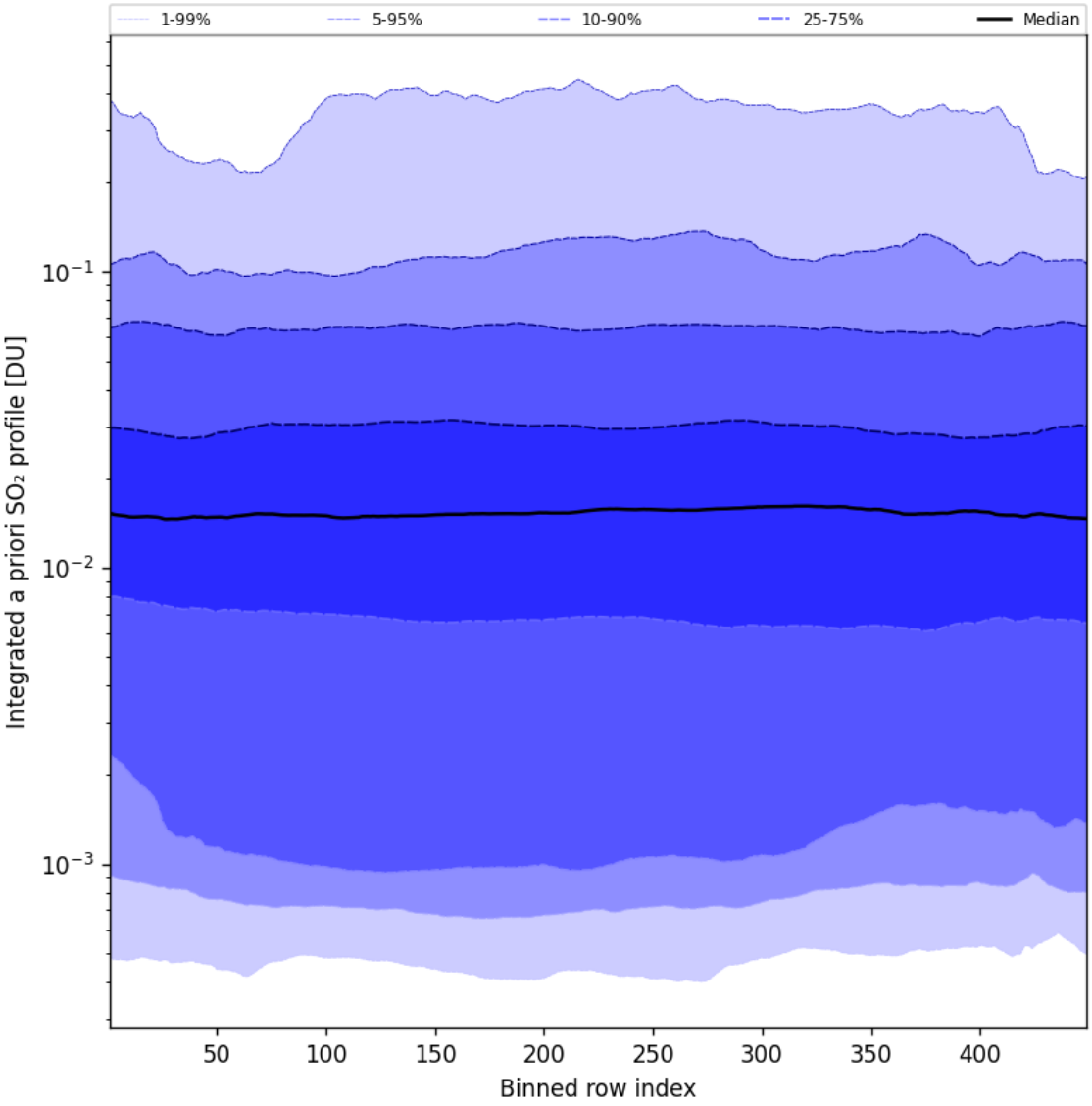
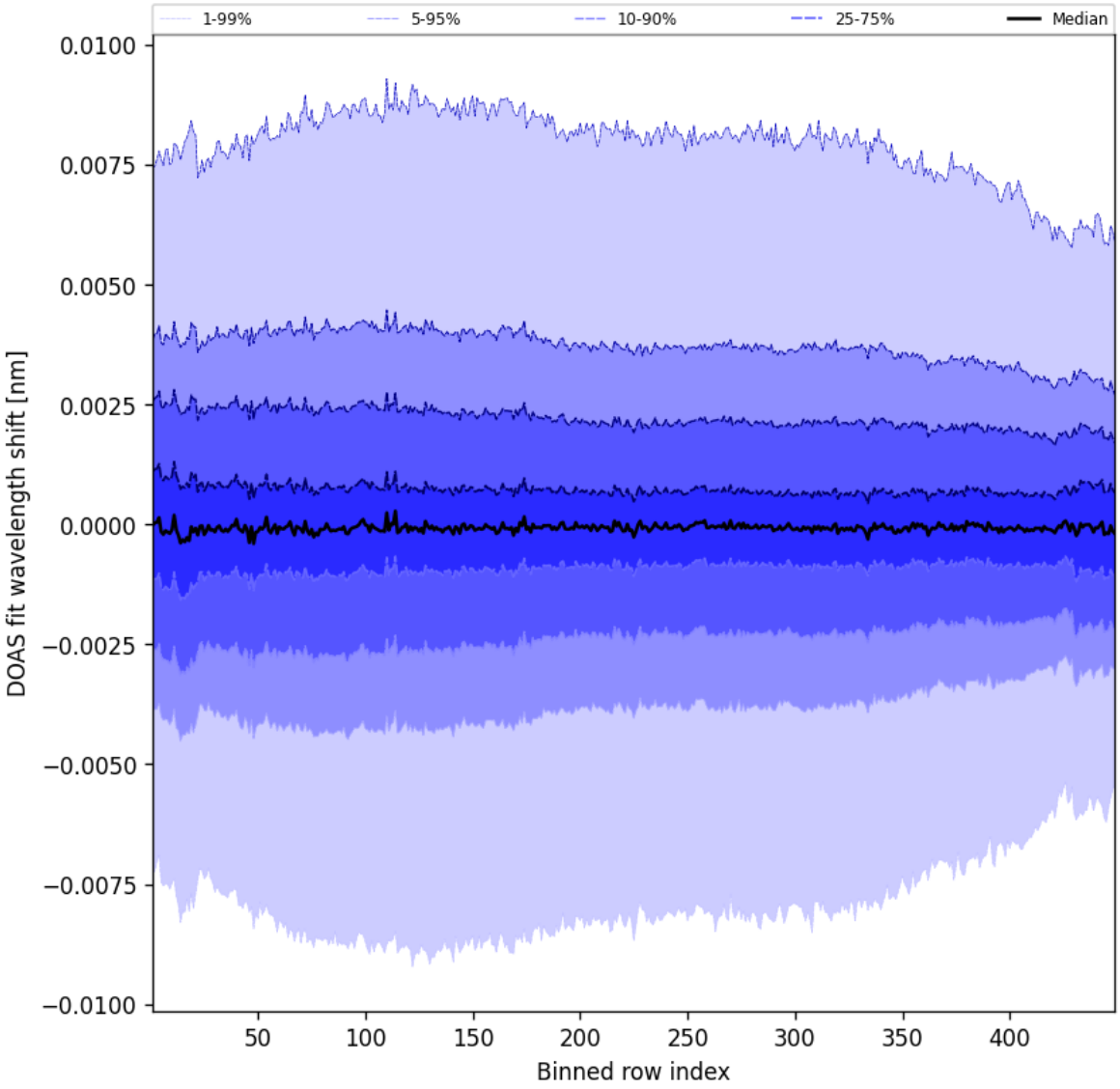


Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-05-28 to 2025-05-29



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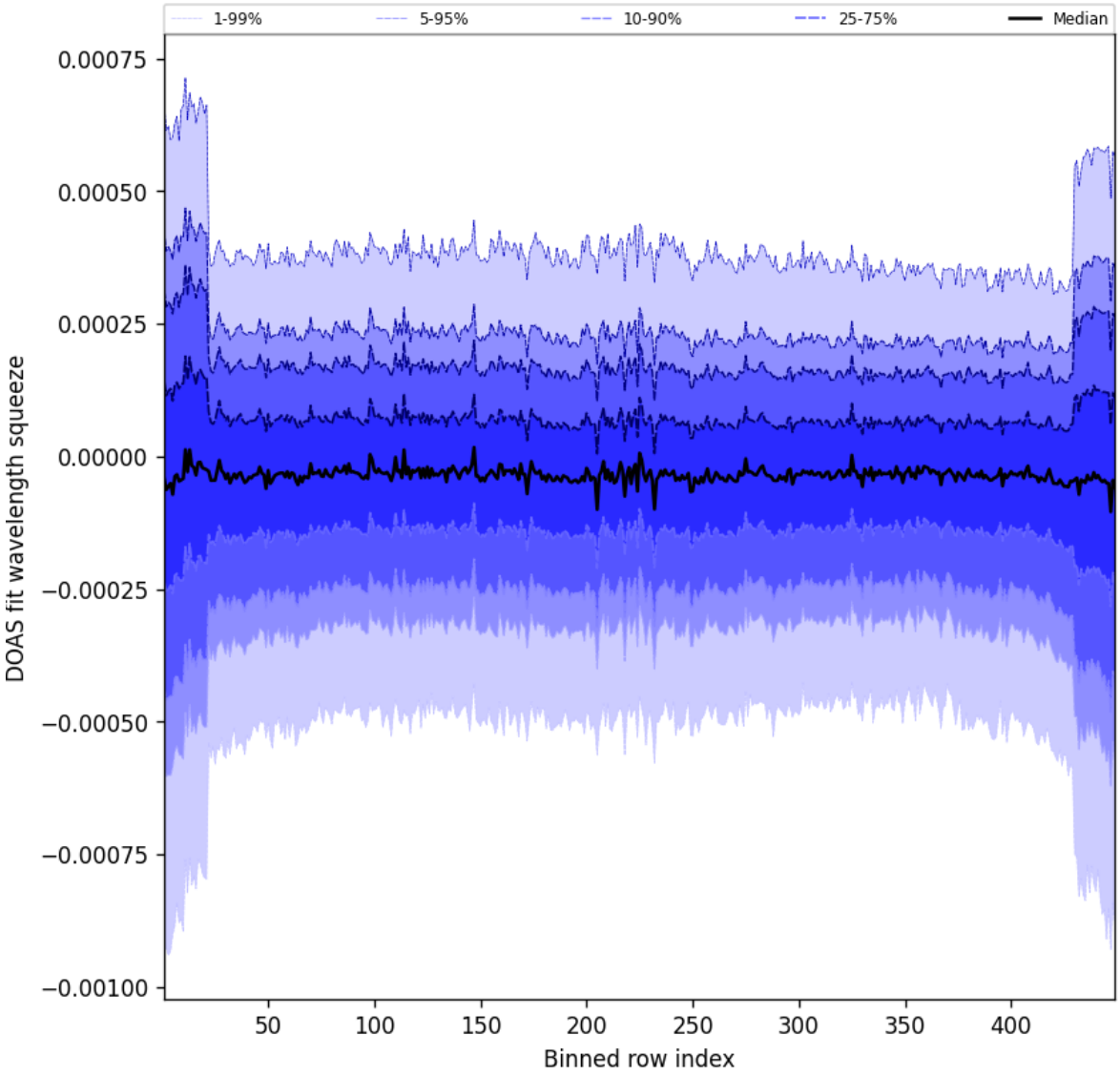

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-05-28 to 2025-05-29

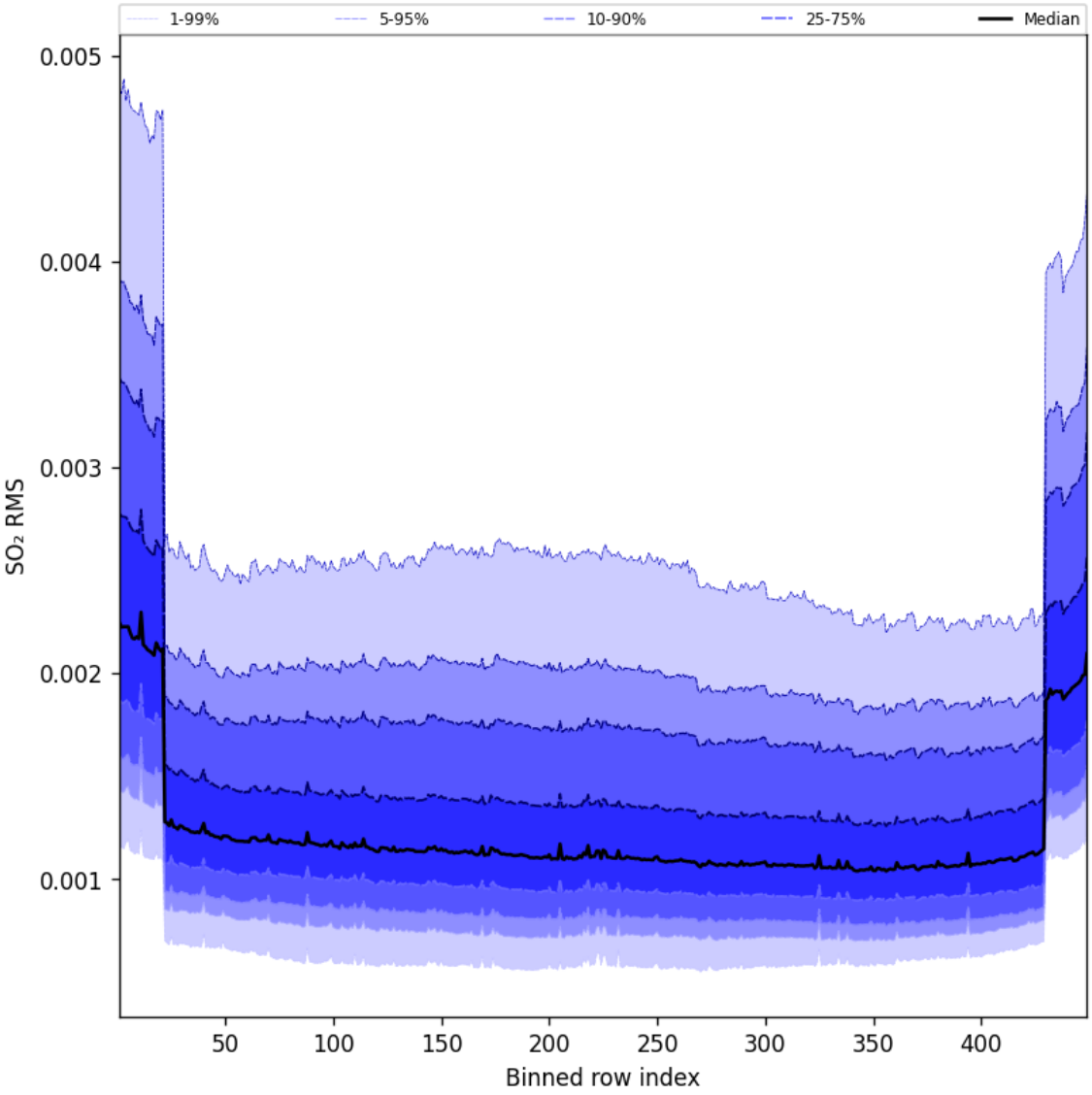

Figure 106: Along track statistics of "SO_2 RMS" for 2025-05-28 to 2025-05-29

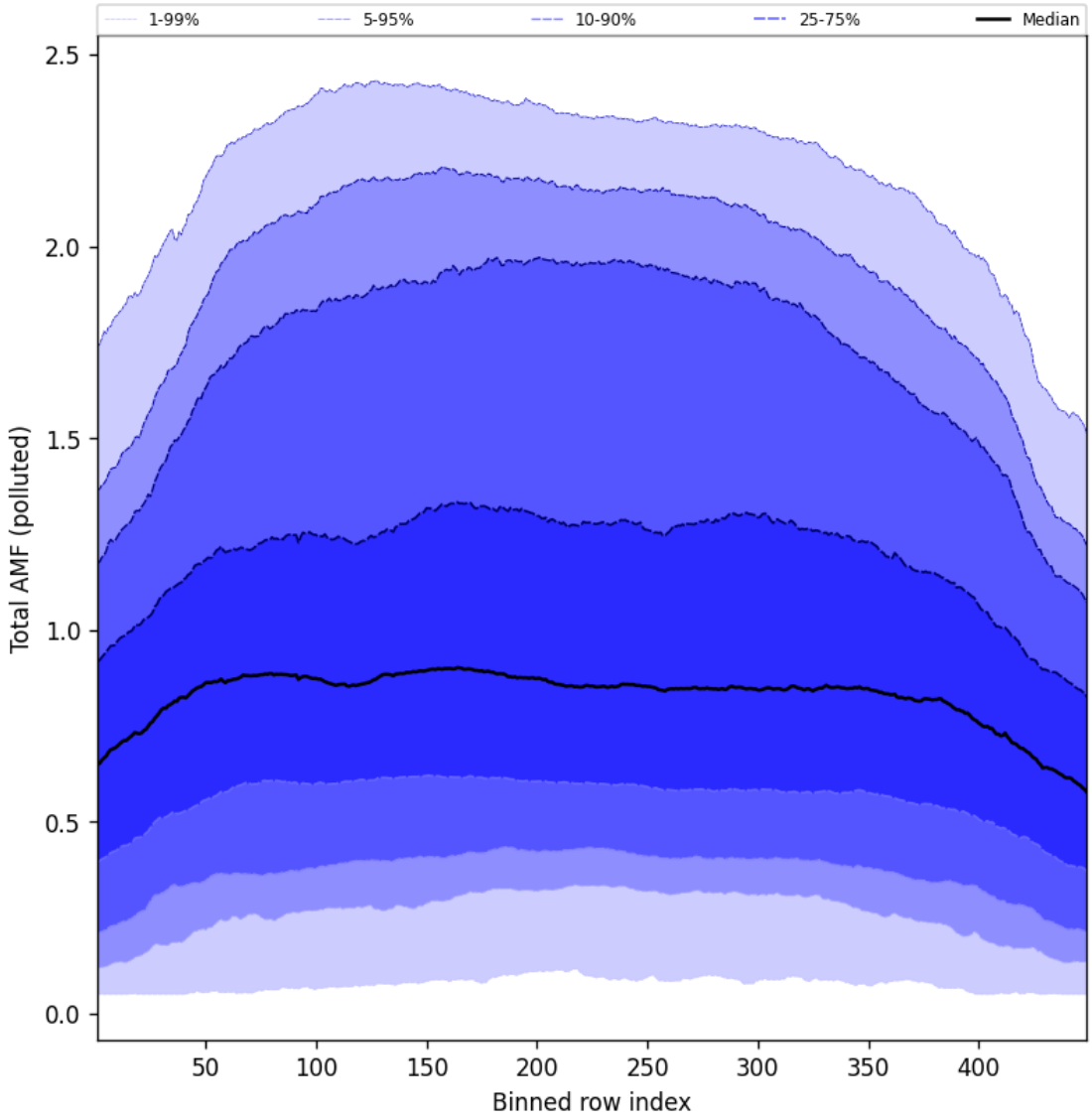

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-05-28 to 2025-05-29

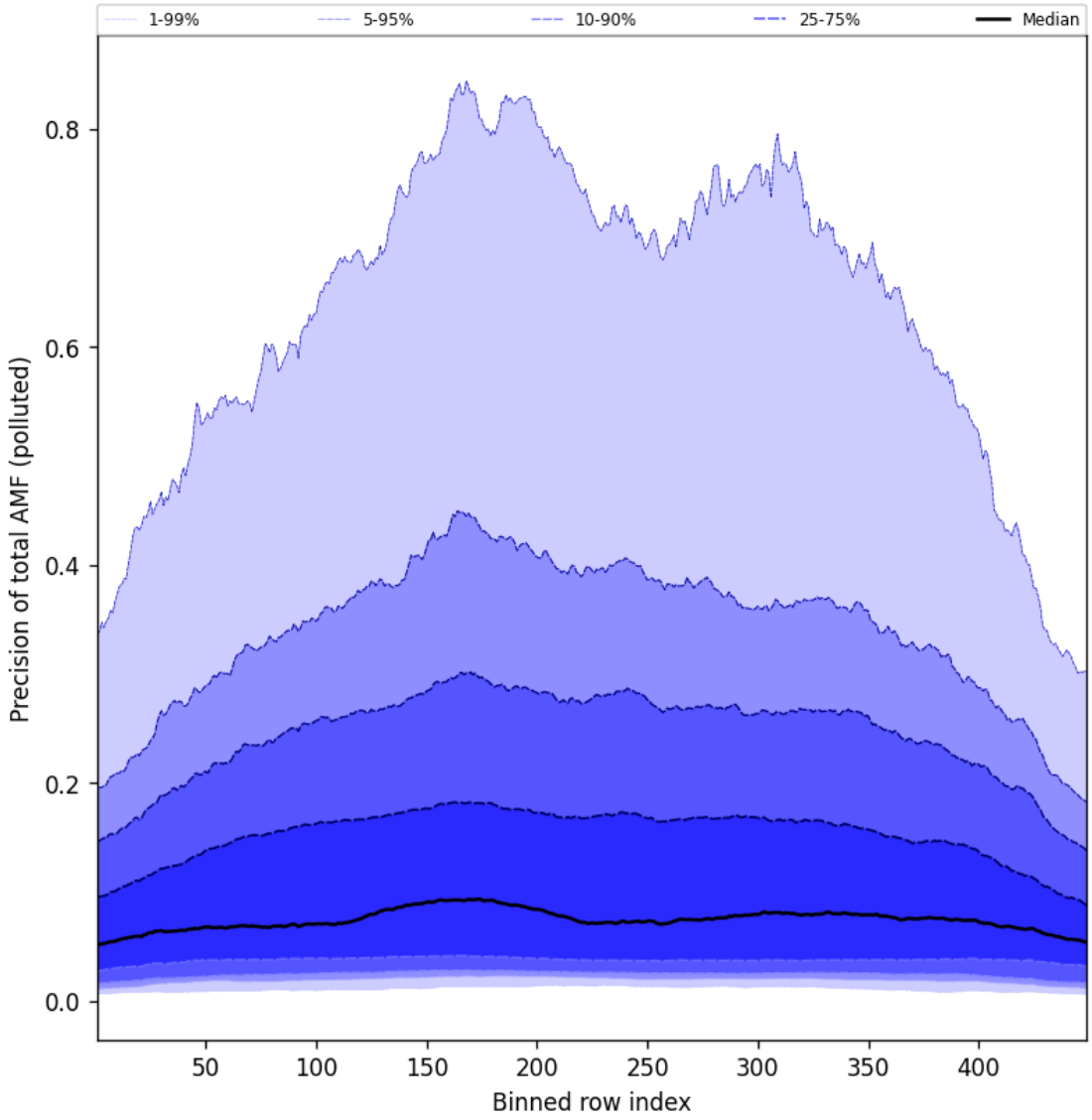

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-05-28 to 2025-05-29

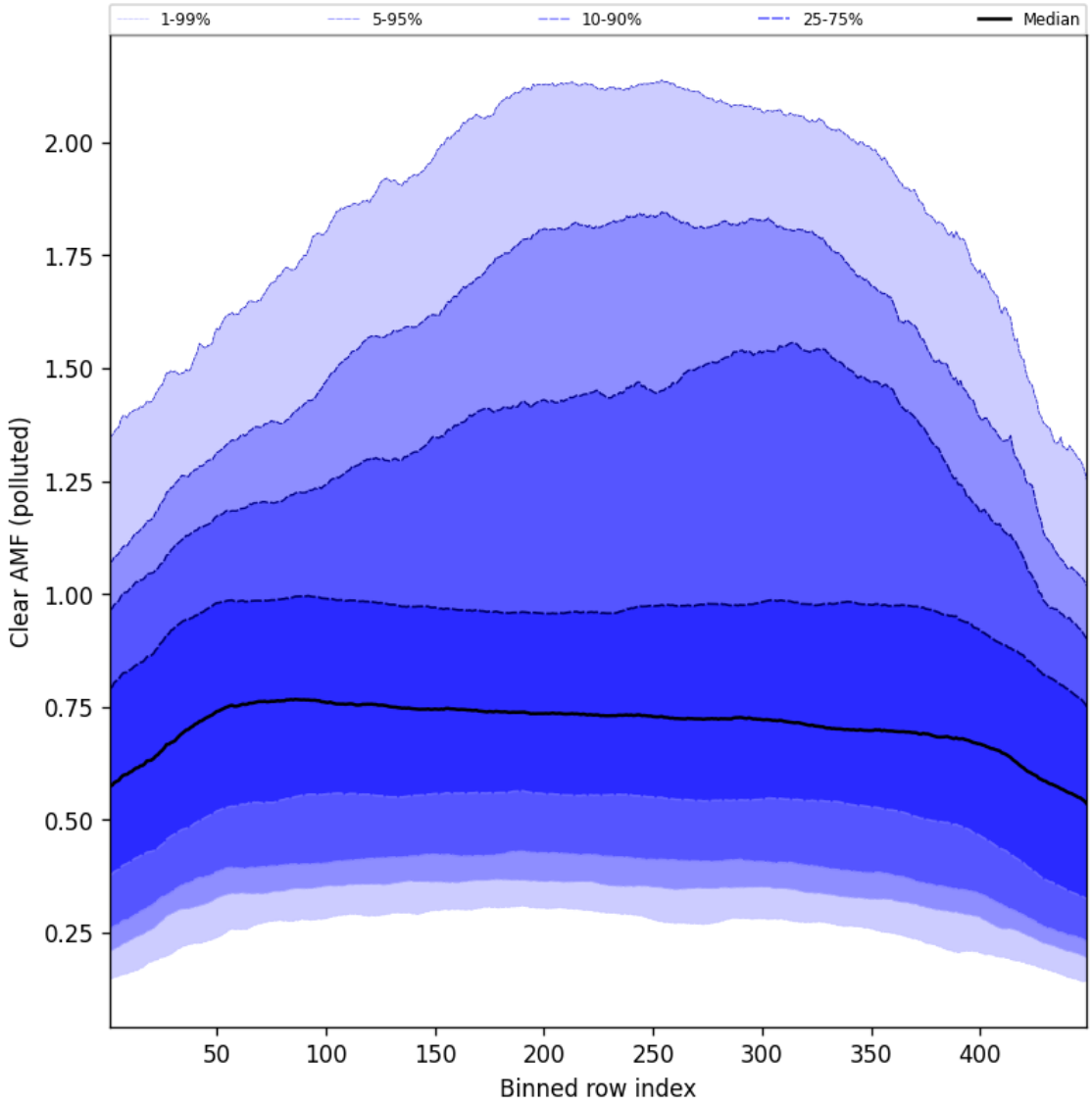

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-05-28 to 2025-05-29

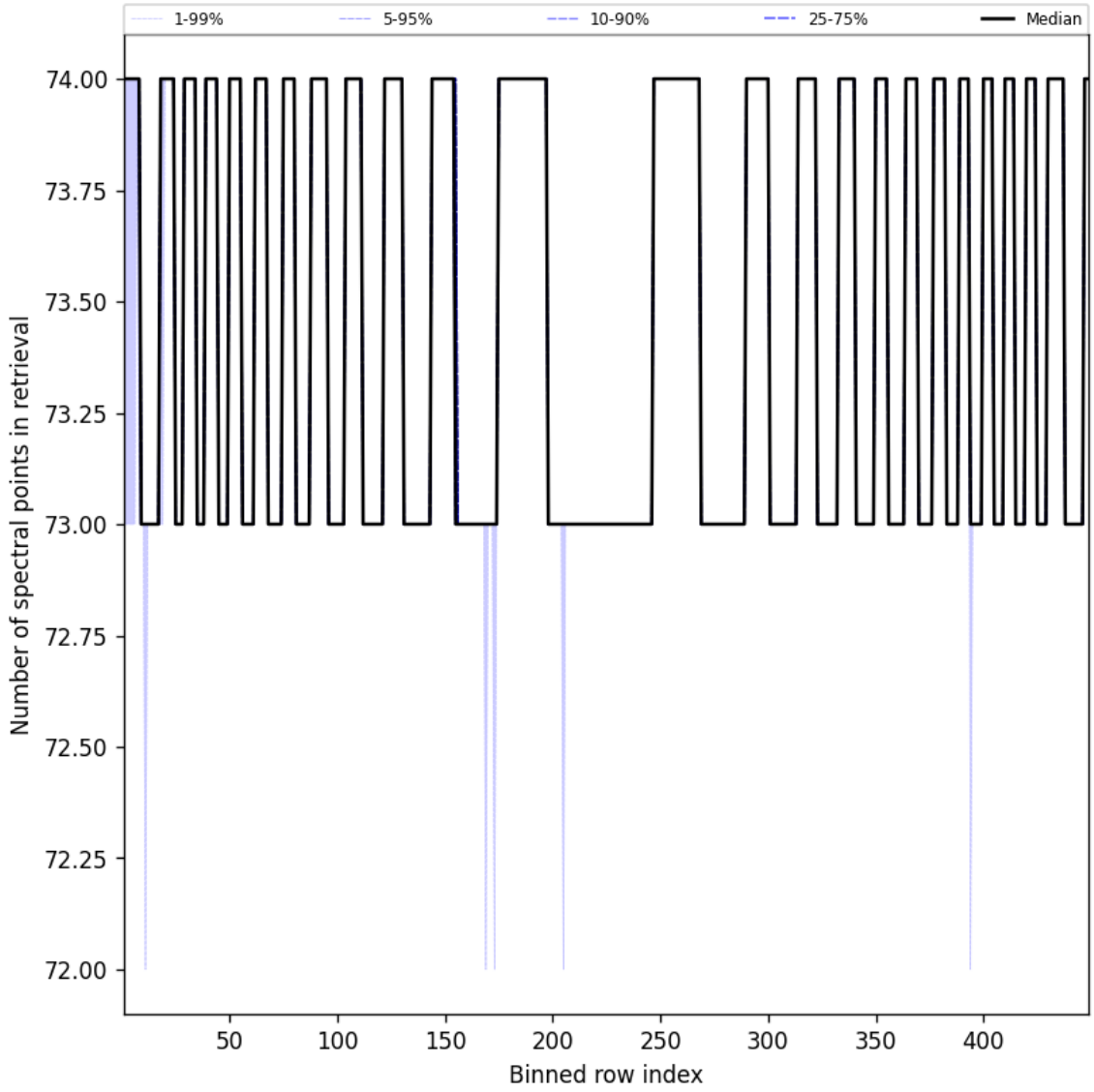

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-05-28 to 2025-05-29

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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