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]	0.632 ± 0.412	17409195	0.995	0.790	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.527 \pm 88.746) \times 10^{-2}$	17409195	0.263	0.418	9.623×10^{-3}	-92.7	968
sulfurdioxide total vertical column precision [DU]	0.455 ± 0.583	17409195	0.222	0.292	0.307	4.506×10^{-2}	69.7
sulfurdioxide slant column density corrected [DU]	$(1.800 \pm 41.041) \times 10^{-2}$	17409195	0.258	0.372	9.271×10^{-3}	-38.4	541
sulfurdioxide slant column density cobra [DU]	$(1.781 \pm 36.408) \times 10^{-2}$	17409195	0.258	0.372	9.271×10^{-3}	-38.4	94.1
sulfurdioxide slant column density cobra precision [DU]	0.298 ± 0.134	17409195	0.213	0.131	0.258	8.713×10^{-2}	33.7
sulfurdioxide slant column density window1 [DU]	0.112 ± 0.682	17409195	0.125	0.747	0.115	-128	107
sulfurdioxide slant column density window1 precision [DU]	0.298 ± 0.134	17409195	0.213	0.131	0.258	8.713×10^{-2}	33.7
sulfurdioxide slant column density corrected win1 [DU]	$(3.349 \pm 67.215) \times 10^{-2}$	17409195	2.500×10^{-2}	0.730	1.626×10^{-2}	-128	107
background so2 slant column offset window1 [DU]	$(-7.839 \pm 13.636) \times 10^{-2}$	17409195	-0.180	0.169	-0.107	-1.34	4.33
sulfurdioxide slant column density window2 [DU]	1.17 ± 9.07	17409195	0.750	11.3	1.10	-2.057×10^{3}	1.410×10^{3}
sulfurdioxide slant column density window2 precision [DU]	8.13 ± 2.46	17409195	7.43	2.70	7.76	2.10	739
sulfurdioxide slant column density corrected win2 [DU]	0.443 ± 8.925	17409195	0.750	11.1	0.453	-2.060×10^{3}	1.408×10^{3}
background so2 slant column offset window2 [DU]	-0.732 ± 1.801	17409195	0.750	2.56	-0.356	-10.2	6.29
sulfurdioxide slant column density window3 [DU]	-7.49 ± 23.79	17409195	-6.16	29.1	-7.48	-447	685
sulfurdioxide slant column density window3 precision [DU]	27.8 ± 13.4	17409195	21.5	10.3	24.4	8.80	420
sulfurdioxide slant column density corrected win3 [DU]	-4.50 ± 23.50	17409195	-2.80	28.8	-4.21	-446	688
background so2 slant column offset window3 [DU]	2.99 ± 4.88	17409195	7.28	7.39	3.32	-21.6	21.8
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	17409195	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.214 \pm 7.503) \times 10^{-2}$	17409195	2.276×10^{-2}	2.322×10^{-2}	1.464×10^{-2}	2.309×10^{-4}	2.10
fitted radiance shift [nm]	$(-1.033 \pm 25.124) \times 10^{-4}$	17409195	1.000×10^{-4}	1.623×10^{-3}	-1.008×10^{-4}	-7.708×10^{-2}	4.724×10^{-2}
fitted radiance squeeze [1]	$(-4.300 \pm 18.992) \times 10^{-5}$	17409195	-3.000×10^{-5}	2.190×10^{-4}	-3.709×10^{-5}	-2.026×10^{-2}	2.006×10^{-2}
fitted root mean square [1]	$(1.293 \pm 0.529) \times 10^{-3}$	17409195	1.025×10^{-3}	5.225×10^{-4}	1.147×10^{-3}	3.391×10^{-4}	0.149
sulfurdioxide total air mass factor polluted [1]	0.972 ± 0.517	17409195	0.660	0.645	0.856	5.000×10^{-2}	2.82
sulfurdioxide total air mass factor polluted precision [1]	0.119 ± 0.132	17409195	3.500×10^{-2}	0.116	7.728×10^{-2}	2.583×10^{-3}	2.27
sulfurdioxide clear air mass factor polluted [1]	0.805 ± 0.375	17409195	0.620	0.394	0.738	2.983×10^{-2}	2.71
number of spectral points in retrieval [1]	73.4 ± 0.5	17409195	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}	0.210	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−1.91	−0.773	−0.485	−0.331	−0.196	0.221	0.366	0.535	0.859	2.16
sulfurdioxide total vertical column precision [DU]	9.197×10^{-2}	0.121	0.146	0.171	0.206	0.499	0.655	0.838	1.20	2.72
sulfurdioxide slant column density corrected [DU]	−0.868	−0.499	−0.362	−0.271	−0.175	0.197	0.298	0.398	0.553	1.03
sulfurdioxide slant column density cobra [DU]	−0.868	−0.499	−0.362	−0.271	−0.175	0.197	0.298	0.398	0.553	1.03
sulfurdioxide slant column density cobra precision [DU]	0.145	0.172	0.187	0.199	0.213	0.344	0.399	0.453	0.549	0.783
sulfurdioxide slant column density window1 [DU]	−1.68	−0.937	−0.651	−0.460	−0.261	0.486	0.680	0.865	1.14	1.91
sulfurdioxide slant column density window1 precision [DU]	0.145	0.172	0.187	0.199	0.213	0.344	0.399	0.453	0.549	0.783
sulfurdioxide slant column density corrected win1 [DU]	−1.63	−0.961	−0.703	−0.529	−0.343	0.387	0.587	0.782	1.08	1.91
background so2 slant column offset window1 [DU]	−0.316	−0.247	−0.217	−0.198	−0.174	-4.742×10^{-3}	5.168×10^{-2}	0.104	0.178	0.333
sulfurdioxide slant column density window2 [DU]	−20.2	−13.2	−9.81	−7.31	−4.51	6.75	9.62	12.2	15.8	23.6
sulfurdioxide slant column density window2 precision [DU]	4.25	5.08	5.61	6.04	6.57	9.27	10.2	11.1	12.4	15.2
sulfurdioxide slant column density corrected win2 [DU]	−21.1	−13.8	−10.4	−7.88	−5.09	5.97	8.74	11.2	14.7	22.1
background so2 slant column offset window2 [DU]	−5.27	−4.05	−3.32	−2.67	−1.93	0.633	0.909	1.14	1.44	2.84
sulfurdioxide slant column density window3 [DU]	−68.2	−46.4	−36.4	−29.5	−22.0	7.17	14.8	21.8	31.5	51.0
sulfurdioxide slant column density window3 precision [DU]	13.0	15.3	17.2	18.7	20.4	30.8	35.2	40.6	52.3	85.3
sulfurdioxide slant column density corrected win3 [DU]	−65.1	−43.5	−33.4	−26.3	−18.7	10.1	17.5	24.2	33.4	52.6
background so2 slant column offset window3 [DU]	−8.42	−5.09	−3.28	−1.98	−0.562	6.82	7.94	8.91	10.1	12.6
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	4.905×10^{-4}	7.460×10^{-4}	1.231×10^{-3}	2.701×10^{-3}	6.202×10^{-3}	2.942×10^{-2}	4.393×10^{-2}	6.510×10^{-2}	0.111	0.336
fitted radiance shift [nm]	-7.806×10^{-3}	-3.726×10^{-3}	-2.334×10^{-3}	-1.564×10^{-3}	-9.380×10^{-4}	6.850×10^{-4}	1.314×10^{-3}	2.128×10^{-3}	3.592×10^{-3}	7.834×10^{-3}
fitted radiance squeeze [1]	-5.474×10^{-4}	-3.504×10^{-4}	-2.673×10^{-4}	-2.100×10^{-4}	-1.496×10^{-4}	6.939×10^{-5}	1.232×10^{-4}	1.729×10^{-4}	2.444×10^{-4}	4.173×10^{-4}
fitted root mean square [1]	5.969×10^{-4}	7.408×10^{-4}	8.253×10^{-4}	8.875×10^{-4}	9.602×10^{-4}	1.483×10^{-3}	1.728×10^{-3}	1.963×10^{-3}	2.294×10^{-3}	3.179×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.106	0.292	0.403	0.496	0.608	1.25	1.55	1.79	2.02	2.32
sulfurdioxide total air mass factor polluted precision [1]	1.148×10^{-2}	2.078×10^{-2}	2.727×10^{-2}	3.268×10^{-2}	4.023×10^{-2}	0.156	0.198	0.244	0.331	0.697
sulfurdioxide clear air mass factor polluted [1]	0.251	0.345	0.408	0.470	0.555	0.948	1.08	1.29	1.66	2.03
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]	0.572 ± 0.420	12183892	0.860	0.490	0.0	1.000	0.140	1.000
sulfurdioxide total vertical column [DU]	$(1.839 \pm 74.821) \times 10^{-2}$	12183892	0.375	8.146×10^{-3}	-40.7	95.7	-0.177	0.198
sulfurdioxide total vertical column precision [DU]	0.416 ± 0.563	12183892	0.253	0.271	4.506×10^{-2}	24.2	0.186	0.439
sulfurdioxide slant column density corrected [DU]	$(1.489 \pm 32.726) \times 10^{-2}$	12183892	0.349	8.156×10^{-3}	-8.30	37.9	-0.165	0.184
sulfurdioxide slant column density cobra [DU]	$(1.488 \pm 32.645) \times 10^{-2}$	12183892	0.349	8.156×10^{-3}	-8.30	25.3	-0.165	0.184
sulfurdioxide slant column density cobra precision [DU]	0.277 ± 0.117	12183892	0.106	0.241	8.713×10^{-2}	26.2	0.205	0.311
sulfurdioxide slant column density window1 [DU]	$(9.822 \pm 63.139) \times 10^{-2}$	12183892	0.709	0.106	-62.2	37.1	-0.253	0.456
sulfurdioxide slant column density window1 precision [DU]	0.277 ± 0.117	12183892	0.106	0.241	8.713×10^{-2}	26.2	0.205	0.311
sulfurdioxide slant column density corrected win1 [DU]	$(2.444 \pm 61.704) \times 10^{-2}$	12183892	0.689	1.068×10^{-2}	-62.2	37.0	-0.329	0.360
background so2 slant column offset window1 [DU]	$(-7.377 \pm 14.419) \times 10^{-2}$	12183892	0.200	-0.102	-0.708	2.23	-0.184	1.608×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.05 ± 8.30	12183892	10.6	1.05	-426	358	-4.27	6.36
sulfurdioxide slant column density window2 precision [DU]	7.60 ± 2.04	12183892	2.29	7.31	2.10	261	6.26	8.55
sulfurdioxide slant column density corrected win2 [DU]	0.390 ± 8.151	12183892	10.4	0.427	-427	358	-4.80	5.61
background so2 slant column offset window2 [DU]	-0.663 ± 1.807	12183892	2.68	-0.323	-10.2	6.29	-1.92	0.755
sulfurdioxide slant column density window3 [DU]	-7.18 ± 21.92	12183892	27.0	-7.42	-225	170	-20.8	6.25
sulfurdioxide slant column density window3 precision [DU]	25.9 ± 12.9	12183892	8.05	22.6	8.80	303	19.4	27.4
sulfurdioxide slant column density corrected win3 [DU]	-4.30 ± 21.60	12183892	26.7	-4.08	-224	174	-17.5	9.22
background so2 slant column offset window3 [DU]	2.88 ± 5.03	12183892	8.06	3.88	-21.6	15.9	-1.11	6.95
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	12183892	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.435 \pm 8.569) \times 10^{-2}$	12183892	2.628×10^{-2}	1.145×10^{-2}	2.309×10^{-4}	2.10	3.518×10^{-3}	2.980×10^{-2}
fitted radiance shift [nm]	$(3.591 \pm 249.402) \times 10^{-5}$	12183892	1.512×10^{-3}	1.303×10^{-5}	-4.131×10^{-2}	4.310×10^{-2}	-7.399×10^{-4}	7.716×10^{-4}
fitted radiance squeeze [1]	$(-7.009 \pm 17.689) \times 10^{-5}$	12183892	2.116×10^{-4}	-5.736×10^{-5}	-1.522×10^{-2}	1.195×10^{-2}	-1.688×10^{-4}	4.286×10^{-5}
fitted root mean square [1]	$(1.218 \pm 0.481) \times 10^{-3}$	12183892	4.382×10^{-4}	1.088×10^{-3}	3.391×10^{-4}	5.272×10^{-2}	9.252×10^{-4}	1.363×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.03 ± 0.57	12183892	0.817	0.909	5.000×10^{-2}	2.82	0.611	1.43
sulfurdioxide total air mass factor polluted precision [1]	0.135 ± 0.148	12183892	0.132	9.305×10^{-2}	3.532×10^{-3}	2.27	4.315×10^{-2}	0.175
sulfurdioxide clear air mass factor polluted [1]	0.835 ± 0.423	12183892	0.468	0.743	7.266×10^{-2}	2.71	0.536	1.00
number of spectral points in retrieval [1]	73.5 ± 0.5	12183892	1.000	73.0	53.0	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]	0.772 ± 0.353	5225303	0.550	1.000	0.0	1.000	0.450	1.000
sulfurdioxide total vertical column [DU]	$(4.134 \pm 114.817) \times 10^{-2}$	5225303	0.542	1.453×10^{-2}	-92.7	968	-0.253	0.290
sulfurdioxide total vertical column precision [DU]	0.544 ± 0.618	5225303	0.341	0.393	5.087×10^{-2}	69.7	0.279	0.619
sulfurdioxide slant column density corrected [DU]	$(2.525 \pm 55.801) \times 10^{-2}$	5225303	0.434	1.248×10^{-2}	-38.4	541	-0.202	0.232
sulfurdioxide slant column density cobra [DU]	$(2.463 \pm 43.940) \times 10^{-2}$	5225303	0.434	1.248×10^{-2}	-38.4	94.1	-0.202	0.232
sulfurdioxide slant column density cobra precision [DU]	0.347 ± 0.158	5225303	0.162	0.310	0.103	33.7	0.243	0.406
sulfurdioxide slant column density window1 [DU]	0.144 ± 0.785	5225303	0.846	0.140	-128	107	-0.282	0.564
sulfurdioxide slant column density window1 precision [DU]	0.347 ± 0.158	5225303	0.162	0.310	0.103	33.7	0.243	0.406
sulfurdioxide slant column density corrected win1 [DU]	$(5.459 \pm 78.539) \times 10^{-2}$	5225303	0.843	3.221×10^{-2}	-128	107	-0.382	0.461
background so2 slant column offset window1 [DU]	$(-8.915 \pm 11.534) \times 10^{-2}$	5225303	0.102	-0.112	-1.34	4.33	-0.151	-4.910×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.46 ± 10.64	5225303	13.0	1.24	-2.057×10^{3}	1.410×10^{3}	-5.17	7.84
sulfurdioxide slant column density window2 precision [DU]	9.37 ± 2.86	5225303	2.95	9.02	2.11	739	7.71	10.7
sulfurdioxide slant column density corrected win2 [DU]	0.567 ± 10.510	5225303	12.9	0.530	-2.060×10^{3}	1.408×10^{3}	-5.88	6.97
background so2 slant column offset window2 [DU]	-0.892 ± 1.774	5225303	2.33	-0.402	-9.77	5.62	-1.95	0.381
sulfurdioxide slant column density window3 [DU]	-8.20 ± 27.63	5225303	35.0	-7.67	-447	685	-25.4	9.65
sulfurdioxide slant column density window3 precision [DU]	32.4 ± 13.5	5225303	10.3	29.3	9.96	420	25.0	35.2
sulfurdioxide slant column density corrected win3 [DU]	-4.96 ± 27.42	5225303	34.8	-4.61	-446	688	-22.1	12.7
background so2 slant column offset window3 [DU]	3.24 ± 4.51	5225303	5.96	2.53	-19.3	21.8	0.272	6.23
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.28	5225303	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.699 \pm 4.000) \times 10^{-2}$	5225303	1.667×10^{-2}	1.899×10^{-2}	7.351×10^{-4}	1.27	1.239×10^{-2}	2.906×10^{-2}
fitted radiance shift [nm]	$(-4.279 \pm 25.251) \times 10^{-4}$	5225303	1.770×10^{-3}	-4.191×10^{-4}	-7.708×10^{-2}	4.724×10^{-2}	-1.348×10^{-3}	4.219×10^{-4}
fitted radiance squeeze [1]	$(2.015 \pm 20.375) \times 10^{-5}$	5225303	2.315×10^{-4}	1.550×10^{-5}	-2.026×10^{-2}	2.006×10^{-2}	-9.845×10^{-5}	1.330×10^{-4}
fitted root mean square [1]	$(1.469 \pm 0.590) \times 10^{-3}$	5225303	6.436×10^{-4}	1.322×10^{-3}	3.525×10^{-4}	0.149	1.079×10^{-3}	1.722×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.827 ± 0.334	5225303	0.391	0.783	5.000×10^{-2}	2.65	0.603	0.994
sulfurdioxide total air mass factor polluted precision [1]	$(8.289 \pm 7.024) \times 10^{-2}$	5225303	7.226×10^{-2}	5.416×10^{-2}	2.583×10^{-3}	1.19	3.660×10^{-2}	0.109
sulfurdioxide clear air mass factor polluted [1]	0.737 ± 0.211	5225303	0.284	0.730	2.983×10^{-2}	1.72	0.587	0.871
number of spectral points in retrieval [1]	73.4 ± 0.5	5225303	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]	0.634 ± 0.403	11257801	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(2.425 \pm 83.206) \times 10^{-2}$	11257801	0.415	9.815×10^{-3}	-92.7	183	-0.195	0.220
sulfurdioxide total vertical column precision [DU]	0.444 ± 0.562	11257801	0.273	0.300	4.646×10^{-2}	69.7	0.207	0.481
sulfurdioxide slant column density corrected [DU]	$(1.767 \pm 37.188) \times 10^{-2}$	11257801	0.373	9.416×10^{-3}	-28.3	94.1	-0.176	0.198
sulfurdioxide slant column density cobra [DU]	$(1.759 \pm 36.705) \times 10^{-2}$	11257801	0.373	9.416×10^{-3}	-28.3	94.1	-0.176	0.198
sulfurdioxide slant column density cobra precision [DU]	0.301 ± 0.137	11257801	0.147	0.260	8.713×10^{-2}	33.7	0.210	0.357
sulfurdioxide slant column density window1 [DU]	0.110 ± 0.688	11257801	0.753	0.118	-70.3	107	-0.262	0.491
sulfurdioxide slant column density window1 precision [DU]	0.301 ± 0.137	11257801	0.147	0.260	8.713×10^{-2}	33.7	0.210	0.357
sulfurdioxide slant column density corrected win1 [DU]	$(3.606 \pm 67.765) \times 10^{-2}$	11257801	0.736	1.909×10^{-2}	-70.3	107	-0.343	0.393
background so2 slant column offset window1 [DU]	$(-7.435 \pm 14.364) \times 10^{-2}$	11257801	0.179	-0.109	-1.34	4.33	-0.174	4.327×10^{-3}
sulfurdioxide slant column density window2 [DU]	1.24 ± 8.97	11257801	11.2	1.11	-1.656×10^{3}	1.217×10^{3}	-4.46	6.77
sulfurdioxide slant column density window2 precision [DU]	8.06 ± 2.31	11257801	2.68	7.70	2.10	739	6.53	9.21
sulfurdioxide slant column density corrected win2 [DU]	0.465 ± 8.817	11257801	11.0	0.469	-1.658×10^{3}	1.219×10^{3}	-5.05	5.97
background so2 slant column offset window2 [DU]	-0.774 ± 1.890	11257801	2.77	-0.275	-10.2	6.29	-2.11	0.661
sulfurdioxide slant column density window3 [DU]	-4.90 ± 23.57	11257801	29.1	-5.21	-242	162	-19.5	9.61
sulfurdioxide slant column density window3 precision [DU]	26.7 ± 11.4	11257801	9.39	23.8	8.80	212	20.2	29.6
sulfurdioxide slant column density corrected win3 [DU]	-2.13 ± 23.03	11257801	28.4	-2.22	-239	170	-16.3	12.1
background so2 slant column offset window3 [DU]	2.77 ± 4.90	11257801	7.39	2.75	-21.6	21.8	-0.774	6.62
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	11257801	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.183 \pm 4.559) \times 10^{-2}$	11257801	1.702×10^{-2}	1.339×10^{-2}	3.223×10^{-4}	2.02	6.813×10^{-3}	2.384×10^{-2}
fitted radiance shift [nm]	$(-1.280 \pm 21.498) \times 10^{-4}$	11257801	1.562×10^{-3}	-1.093×10^{-4}	-7.708×10^{-2}	4.307×10^{-2}	-9.236×10^{-4}	6.383×10^{-4}
fitted radiance squeeze [1]	$(-3.656 \pm 19.175) \times 10^{-5}$	11257801	2.191×10^{-4}	-2.940×10^{-5}	-2.026×10^{-2}	2.006×10^{-2}	-1.426×10^{-4}	7.641×10^{-5}
fitted root mean square [1]	$(1.306 \pm 0.543) \times 10^{-3}$	11257801	5.895×10^{-4}	1.150×10^{-3}	3.391×10^{-4}	9.852×10^{-2}	9.485×10^{-4}	1.538×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.975 ± 0.489	11257801	0.591	0.876	5.000×10^{-2}	2.60	0.643	1.23
sulfurdioxide total air mass factor polluted precision [1]	0.115 ± 0.134	11257801	9.863×10^{-2}	7.370×10^{-2}	3.303×10^{-3}	2.14	4.224×10^{-2}	0.141
sulfurdioxide clear air mass factor polluted [1]	0.836 ± 0.383	11257801	0.366	0.773	5.332×10^{-2}	2.61	0.595	0.961
number of spectral points in retrieval [1]	73.4 ± 0.5	11257801	1.000	73.0	52.0	74.0	73.0	74.0

Table 6: Parameterlist and basic statistics for the analysis for observations over land

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.680 ± 0.416	4266856	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(2.599 \pm 91.996) \times 10^{-2}$	4266856	0.424	9.483×10^{-3}	-84.2	968	-0.198	0.226
sulfurdioxide total vertical column precision [DU]	0.449 ± 0.512	4266856	0.312	0.324	4.506×10^{-2}	53.2	0.208	0.520
sulfurdioxide slant column density corrected [DU]	$(1.947 \pm 49.607) \times 10^{-2}$	4266856	0.364	9.042×10^{-3}	-38.4	541	-0.171	0.193
sulfurdioxide slant column density cobra [DU]	$(1.899 \pm 35.647) \times 10^{-2}$	4266856	0.364	9.042×10^{-3}	-38.4	33.0	-0.171	0.193
sulfurdioxide slant column density cobra precision [DU]	0.287 ± 0.128	4266856	9.645×10^{-2}	0.250	9.139×10^{-2}	26.2	0.216	0.312
sulfurdioxide slant column density window1 [DU]	0.137 ± 0.661	4266856	0.726	0.131	-128	77.1	-0.231	0.494
sulfurdioxide slant column density window1 precision [DU]	0.287 ± 0.128	4266856	9.645×10^{-2}	0.250	9.139×10^{-2}	26.2	0.216	0.312
sulfurdioxide slant column density corrected win1 [DU]	$(3.318 \pm 65.337) \times 10^{-2}$	4266856	0.712	1.558×10^{-2}	-128	76.9	-0.335	0.377
background so2 slant column offset window1 [DU]	-0.104 ± 0.120	4266856	0.139	-0.125	-0.983	1.76	-0.185	-4.569×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.858 ± 9.437	4266856	11.5	0.857	-2.057×10^{3}	1.410×10^{3}	-4.92	6.60
sulfurdioxide slant column density window2 precision [DU]	8.40 ± 2.81	4266856	2.77	8.00	2.15	705	6.76	9.53
sulfurdioxide slant column density corrected win2 [DU]	0.449 ± 9.322	4266856	11.3	0.467	-2.060×10^{3}	1.408×10^{3}	-5.20	6.10
background so2 slant column offset window2 [DU]	-0.409 ± 1.587	4266856	2.08	-9.518×10^{-2}	-10.2	6.29	-1.37	0.715
sulfurdioxide slant column density window3 [DU]	-12.5 ± 24.1	4266856	29.5	-11.9	-447	685	-27.0	2.53
sulfurdioxide slant column density window3 precision [DU]	30.9 ± 17.1	4266856	12.3	26.2	9.29	336	21.6	33.9
sulfurdioxide slant column density corrected win3 [DU]	-9.92 ± 24.38	4266856	30.1	-9.02	-446	688	-24.6	5.53
background so2 slant column offset window3 [DU]	2.63 ± 4.86	4266856	7.33	2.97	-21.6	21.8	-0.837	6.49
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.11	4266856	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.573 \pm 10.936) \times 10^{-2}$	4266856	5.142×10^{-2}	2.366×10^{-2}	2.309×10^{-4}	2.10	7.040×10^{-3}	5.846×10^{-2}
fitted radiance shift [nm]	$(-6.559 \pm 321.439) \times 10^{-5}$	4266856	1.657×10^{-3}	-9.651×10^{-5}	-5.609×10^{-2}	4.724×10^{-2}	-9.364×10^{-4}	7.206×10^{-4}
fitted radiance squeeze [1]	$(-3.972 \pm 18.432) \times 10^{-5}$	4266856	2.140×10^{-4}	-3.699×10^{-5}	-1.522×10^{-2}	1.665×10^{-2}	-1.452×10^{-4}	6.884×10^{-5}
fitted root mean square [1]	$(1.252 \pm 0.477) \times 10^{-3}$	4266856	4.054×10^{-4}	1.130×10^{-3}	3.577×10^{-4}	5.724×10^{-2}	9.724×10^{-4}	1.378×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.949 ± 0.553	4266856	0.665	0.780	5.000×10^{-2}	2.82	0.554	1.22
sulfurdioxide total air mass factor polluted precision [1]	0.123 ± 0.125	4266856	0.145	7.612×10^{-2}	2.583×10^{-3}	2.27	3.363×10^{-2}	0.179
sulfurdioxide clear air mass factor polluted [1]	0.755 ± 0.357	4266856	0.370	0.672	2.983×10^{-2}	2.71	0.511	0.881
number of spectral points in retrieval [1]	73.4 ± 0.5	4266856	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

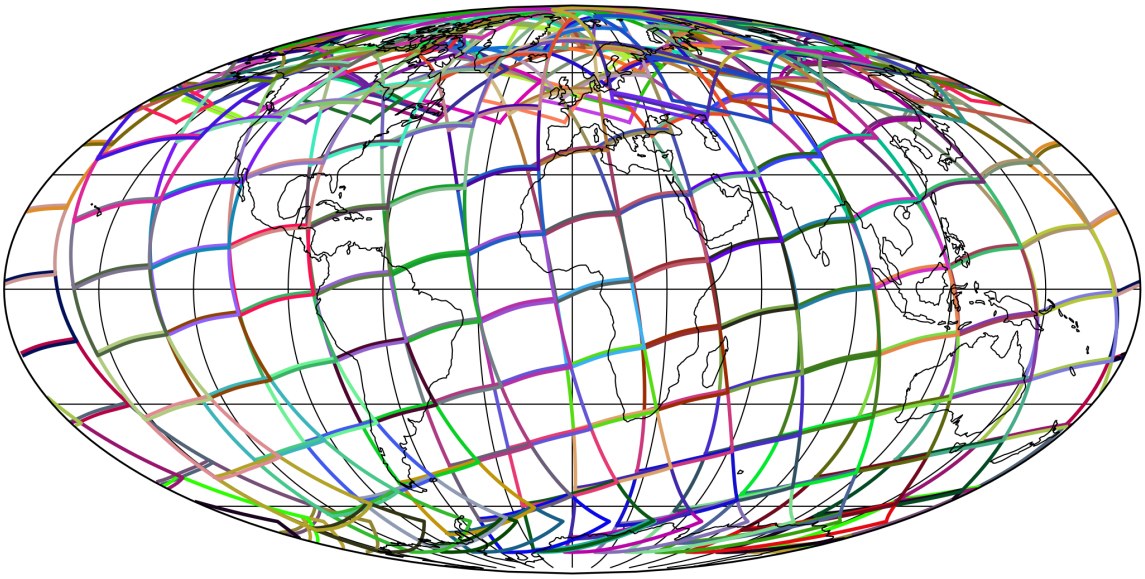


Figure 1: Outline of the granules.

4 Input data monitoring

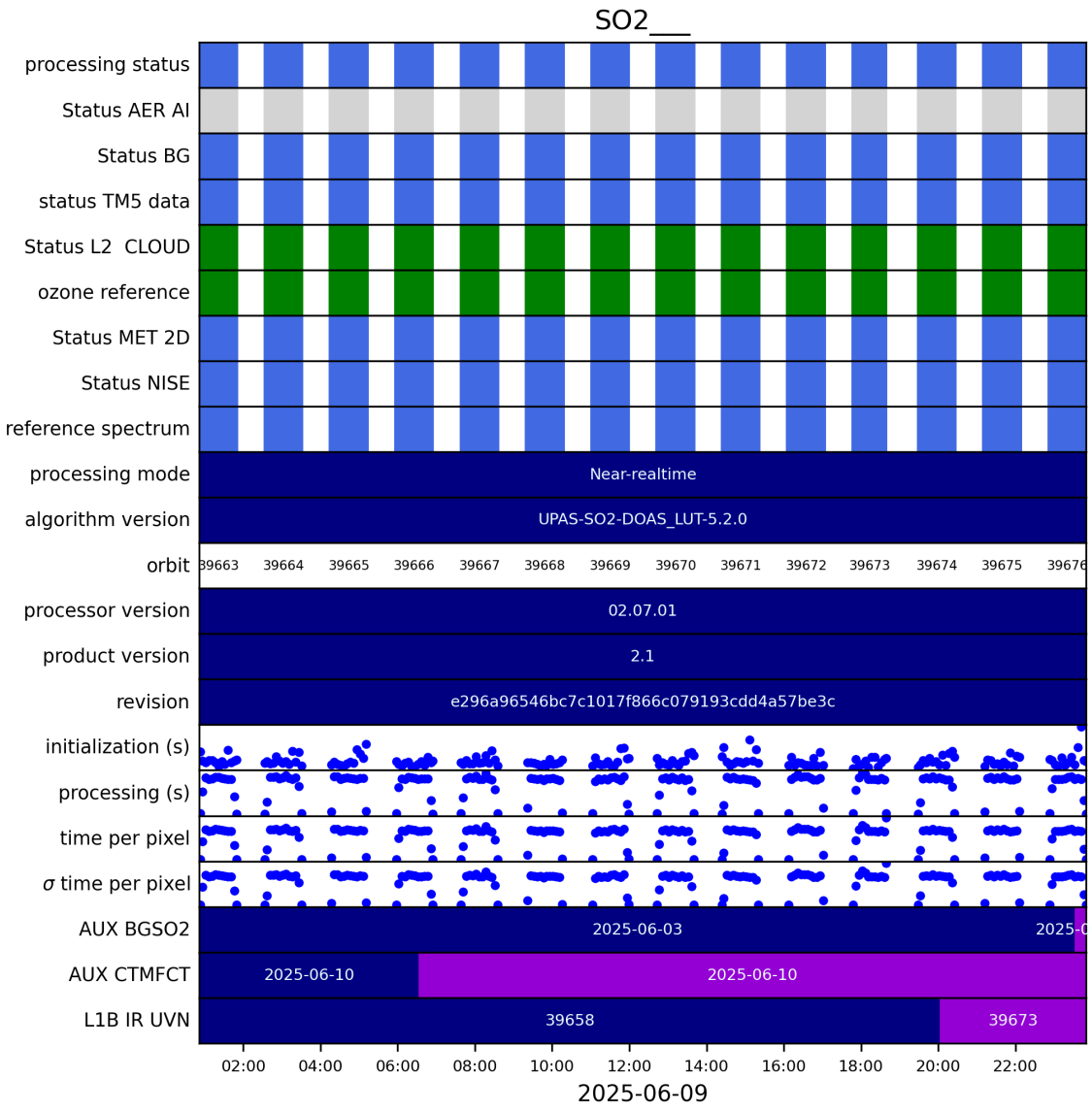


Figure 2: Input data per granule

5 Warnings and errors

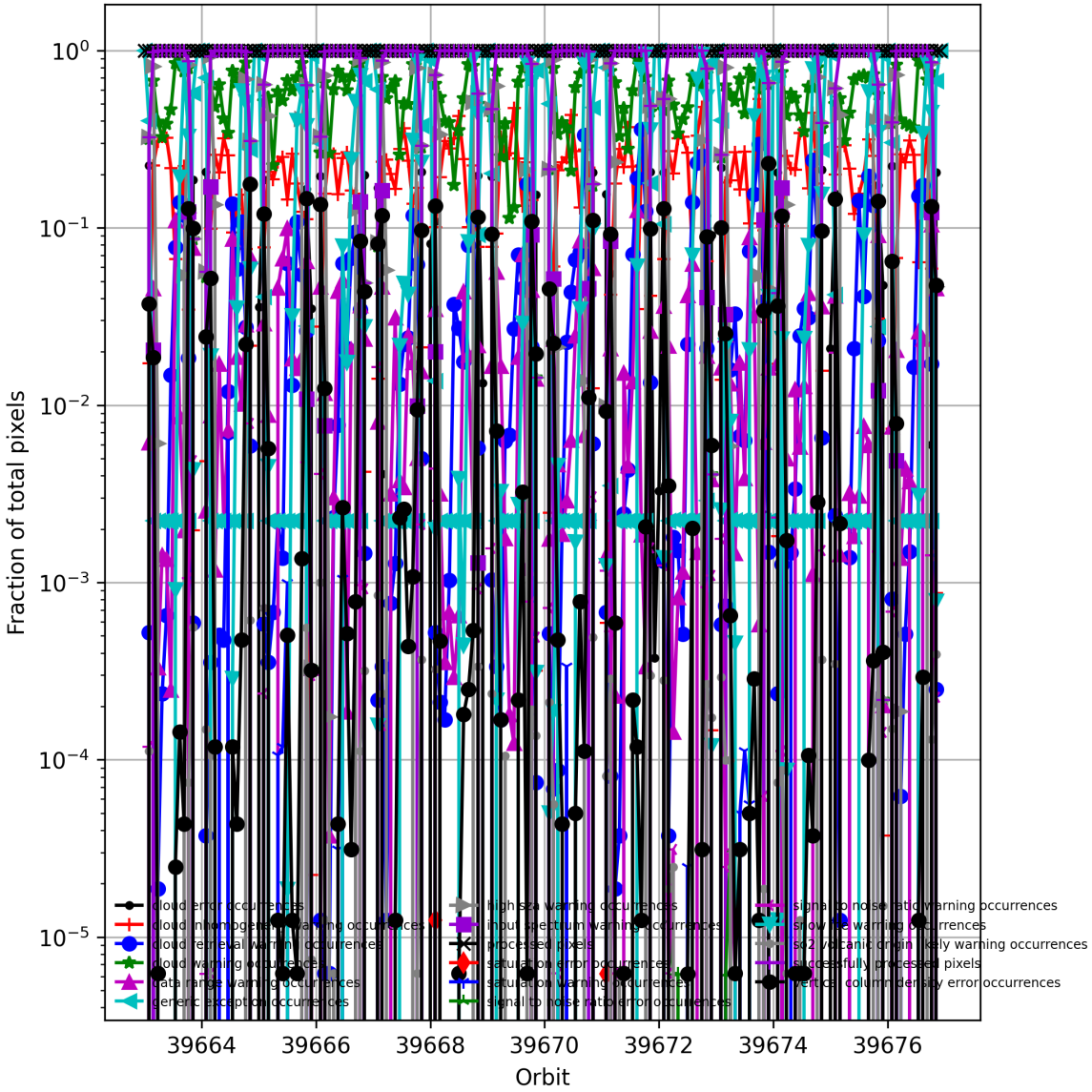


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

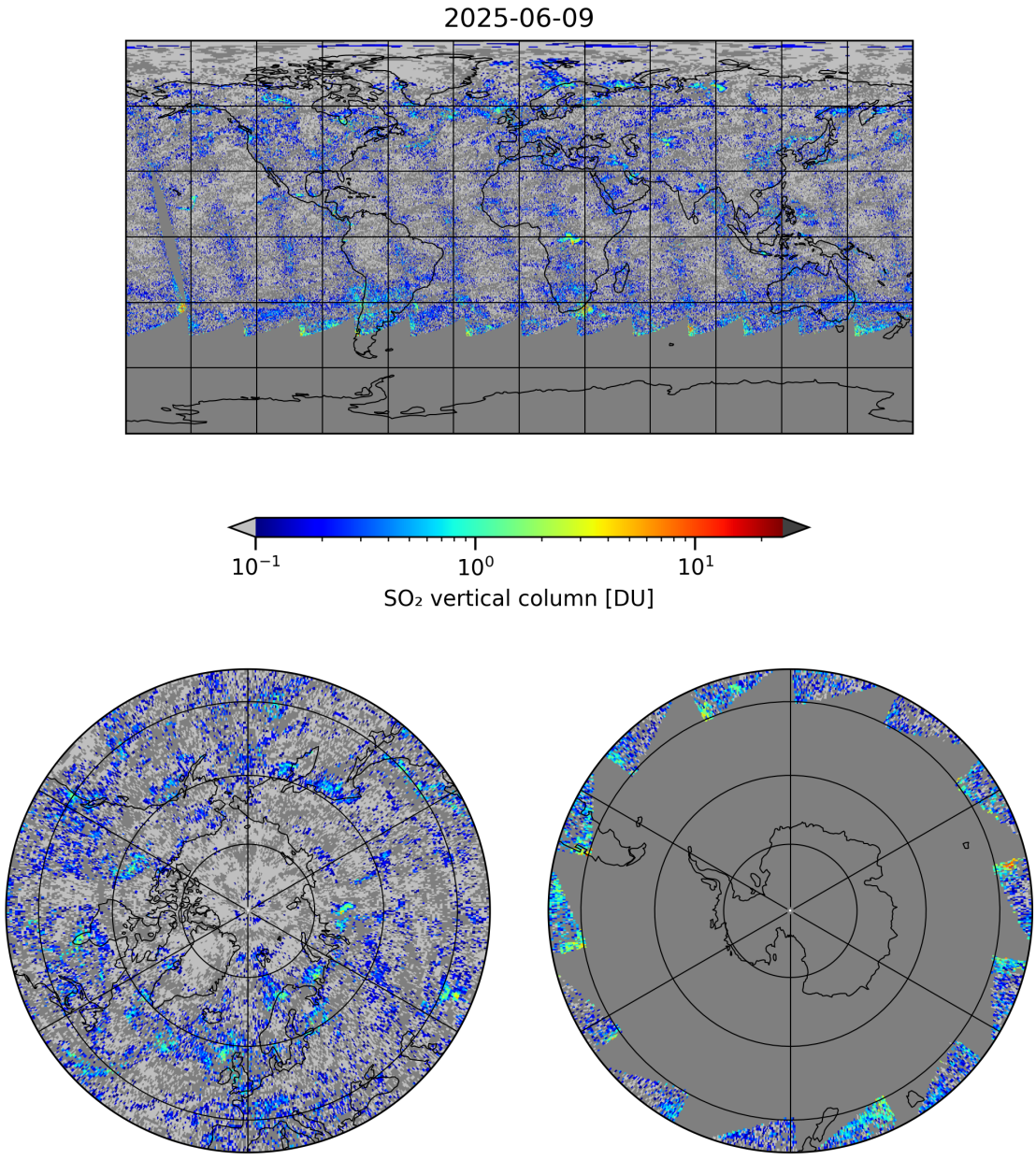


Figure 4: Map of "SO_2 vertical column" for 2025-06-09 to 2025-06-09

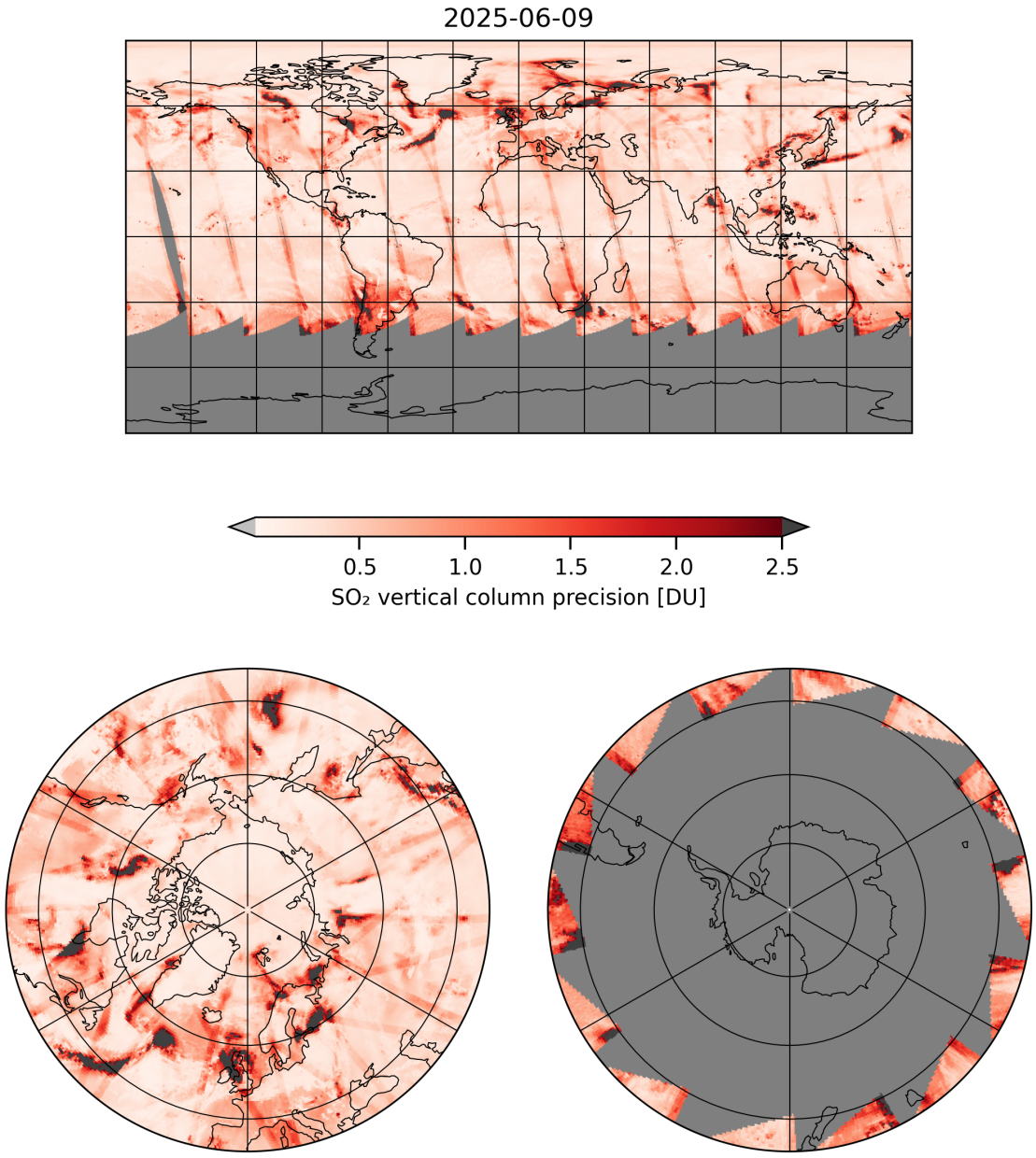


Figure 5: Map of "SO_2 vertical column precision" for 2025-06-09 to 2025-06-09

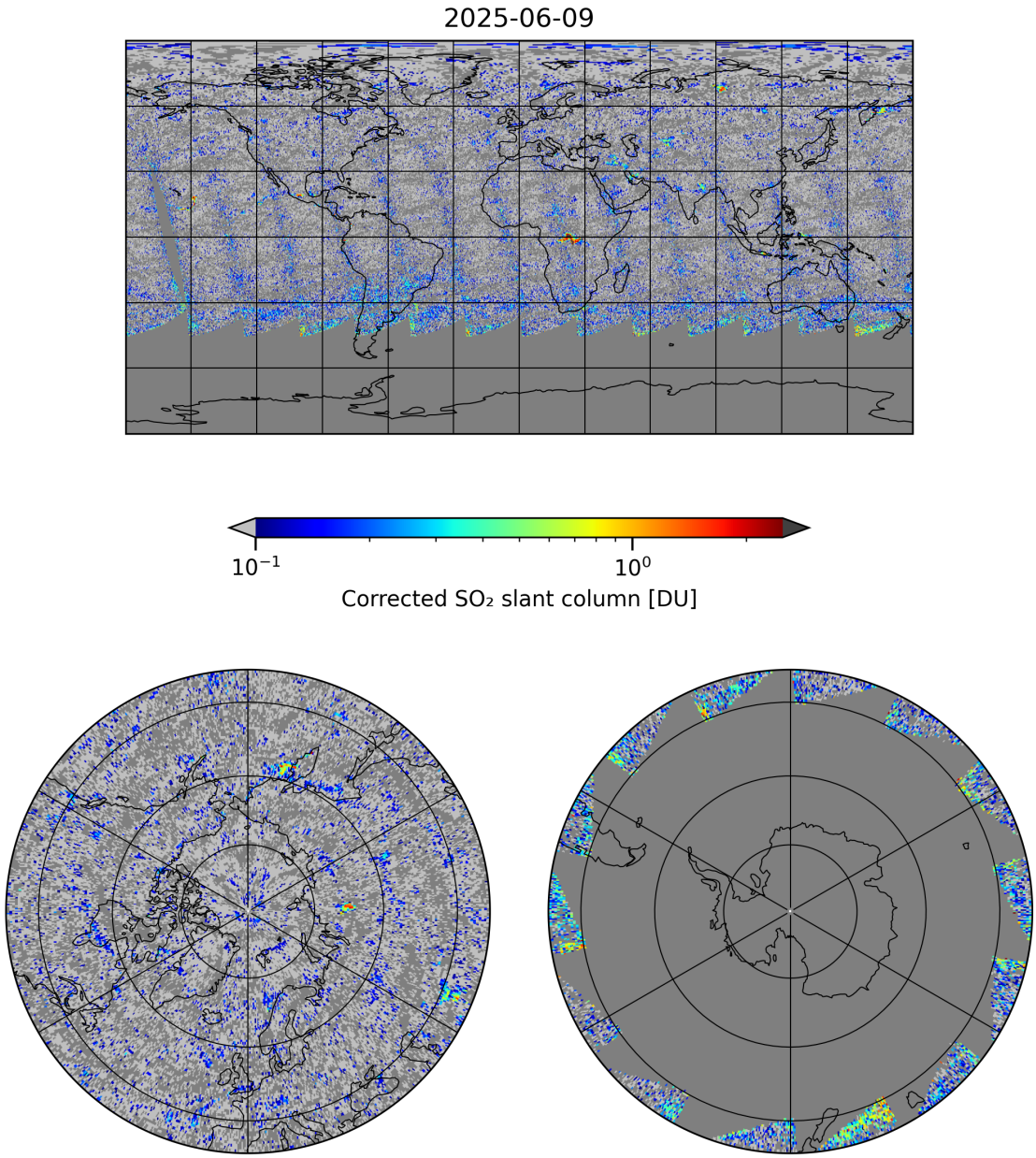


Figure 6: Map of “Corrected SO_2 slant column” for 2025-06-09 to 2025-06-09

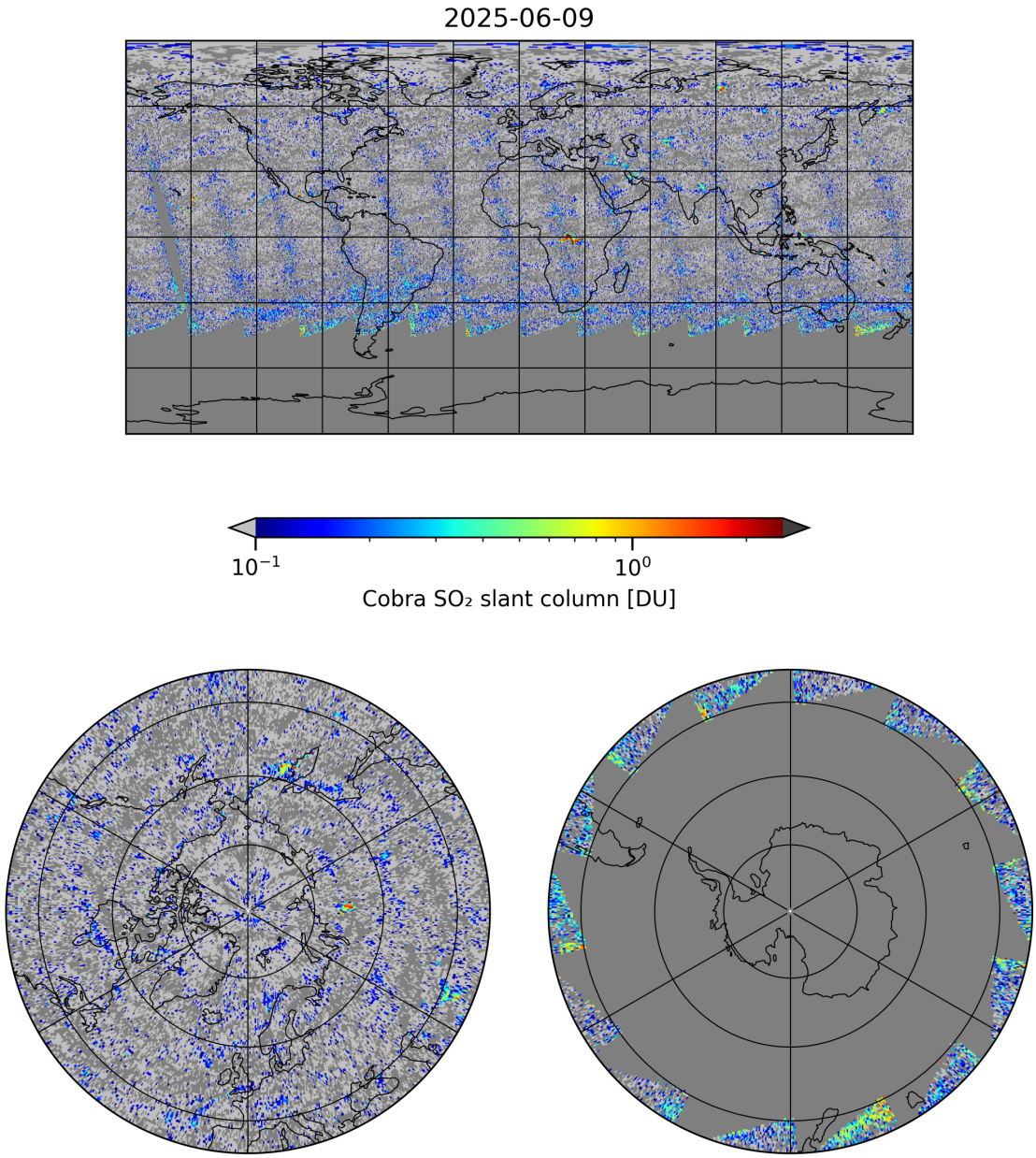


Figure 7: Map of "Cobra SO_2 slant column" for 2025-06-09 to 2025-06-09

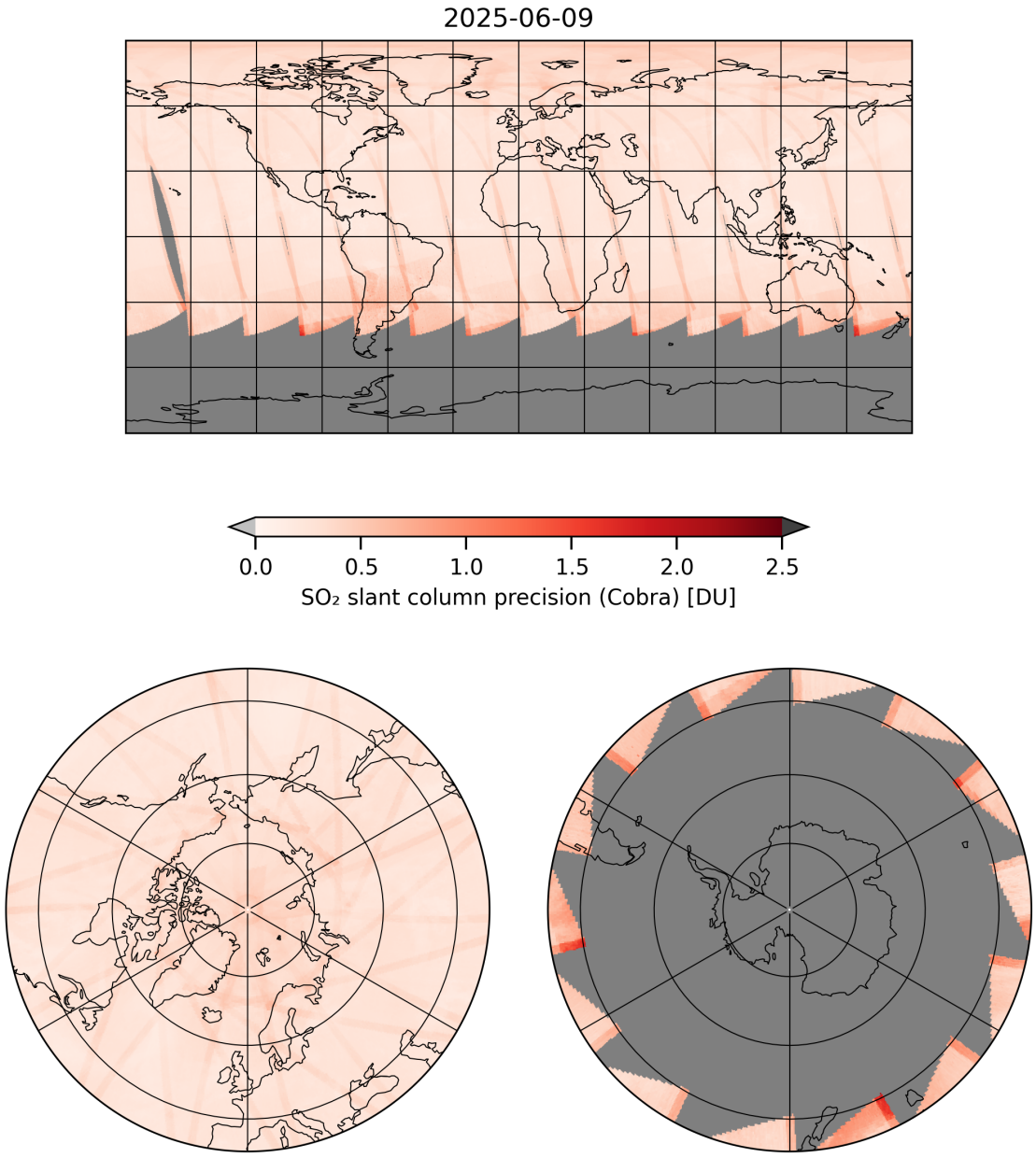


Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-06-09 to 2025-06-09

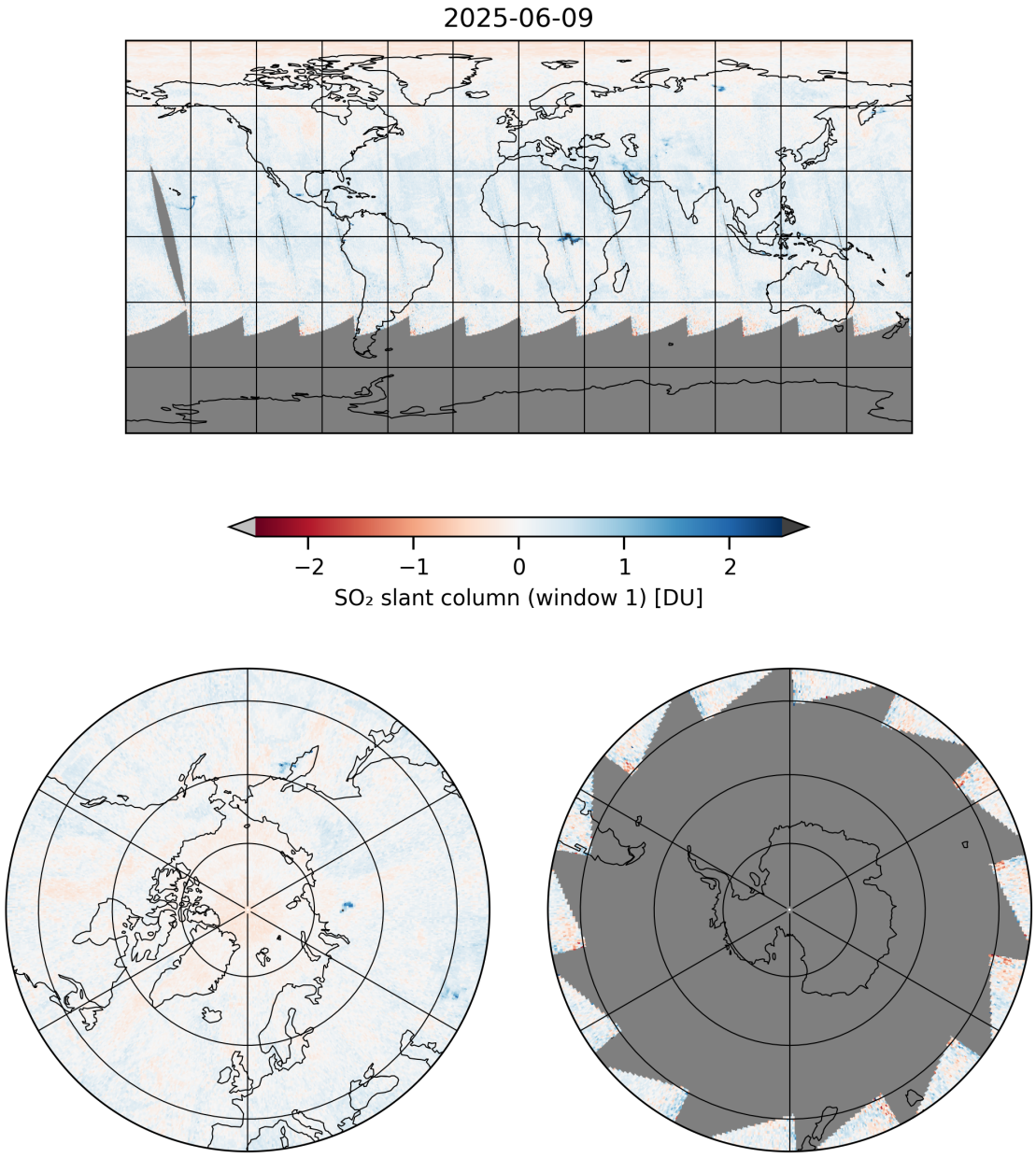


Figure 9: Map of "SO_2 slant column (window 1)" for 2025-06-09 to 2025-06-09

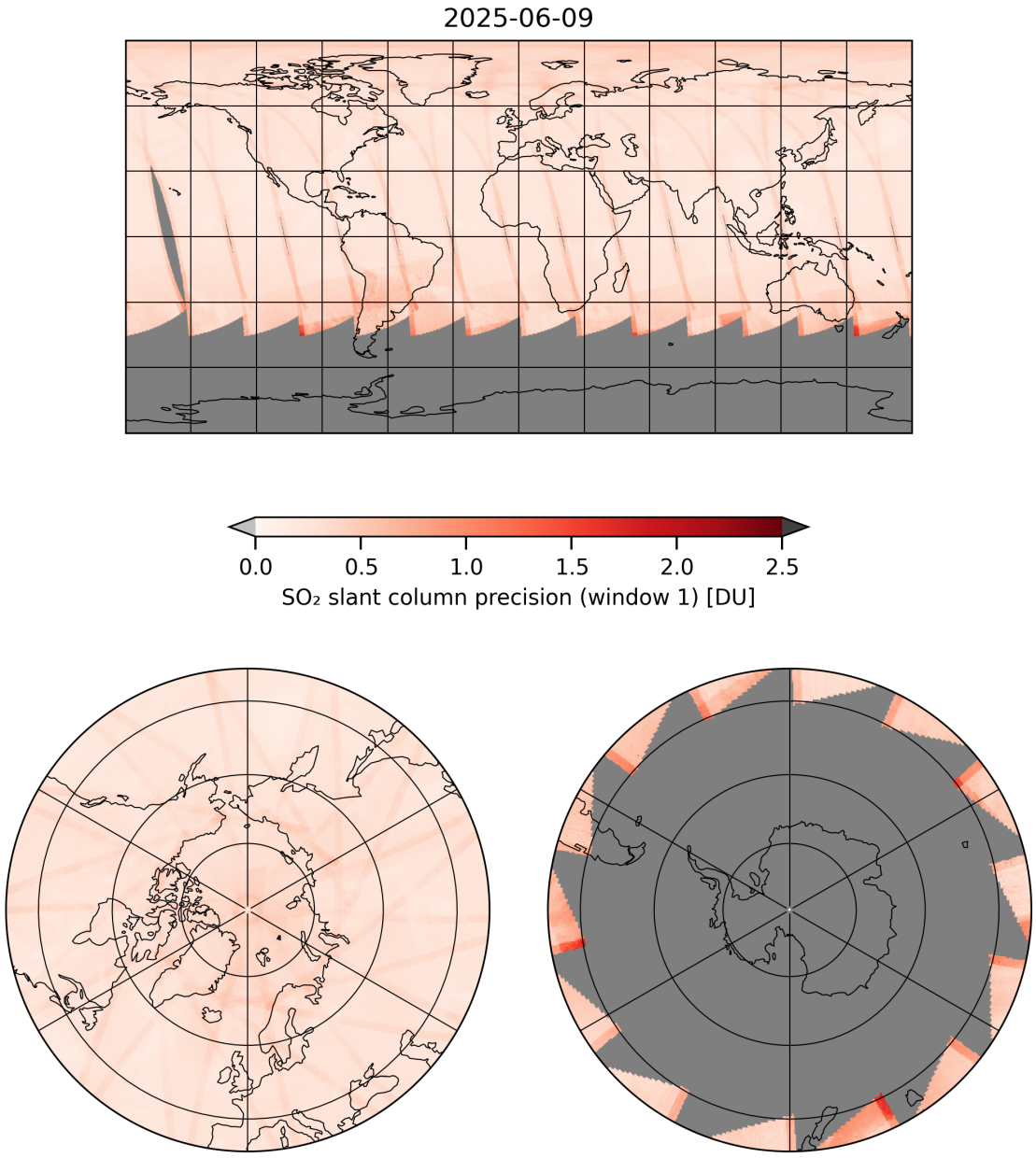


Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-06-09 to 2025-06-09

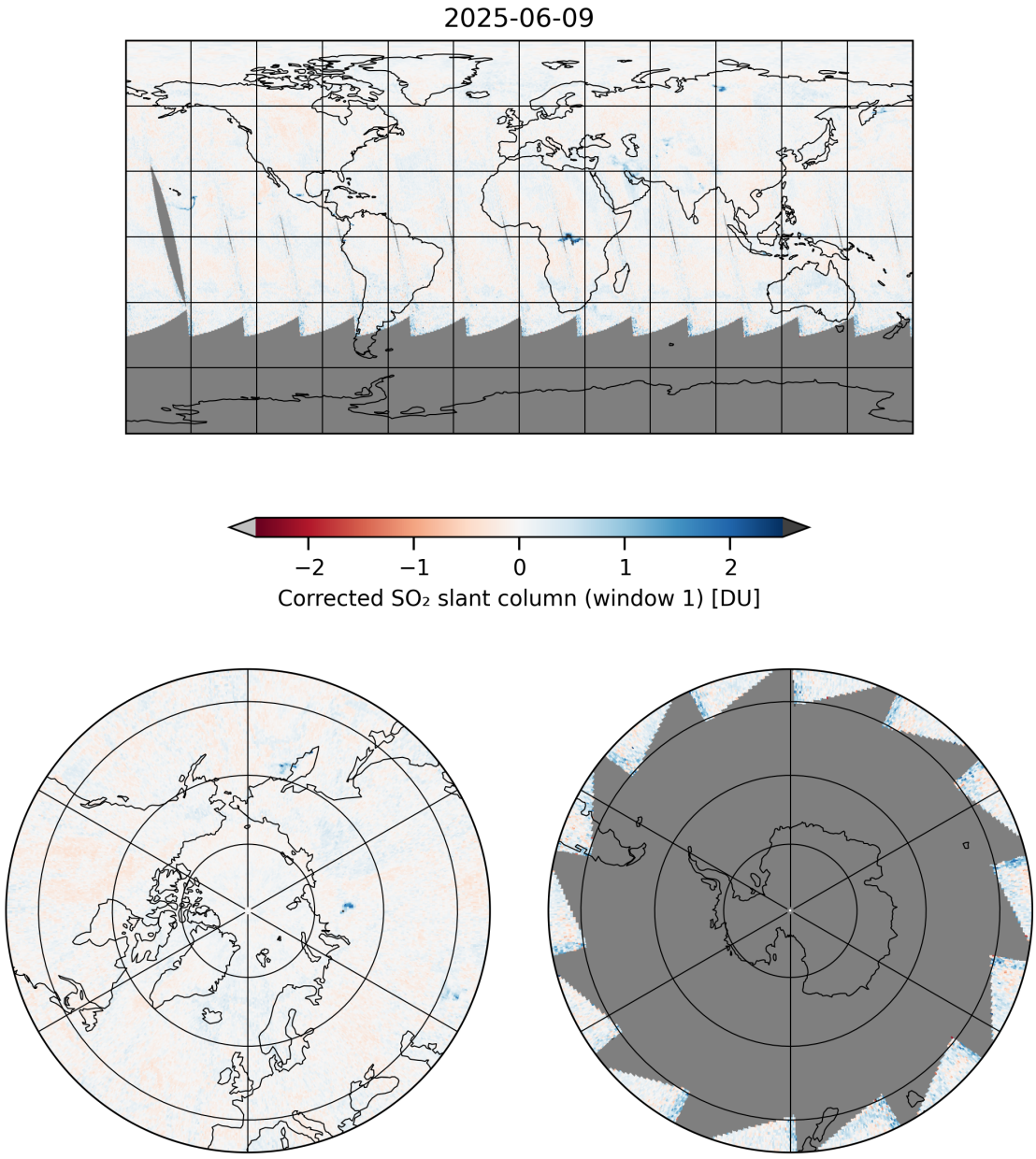


Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-06-09 to 2025-06-09

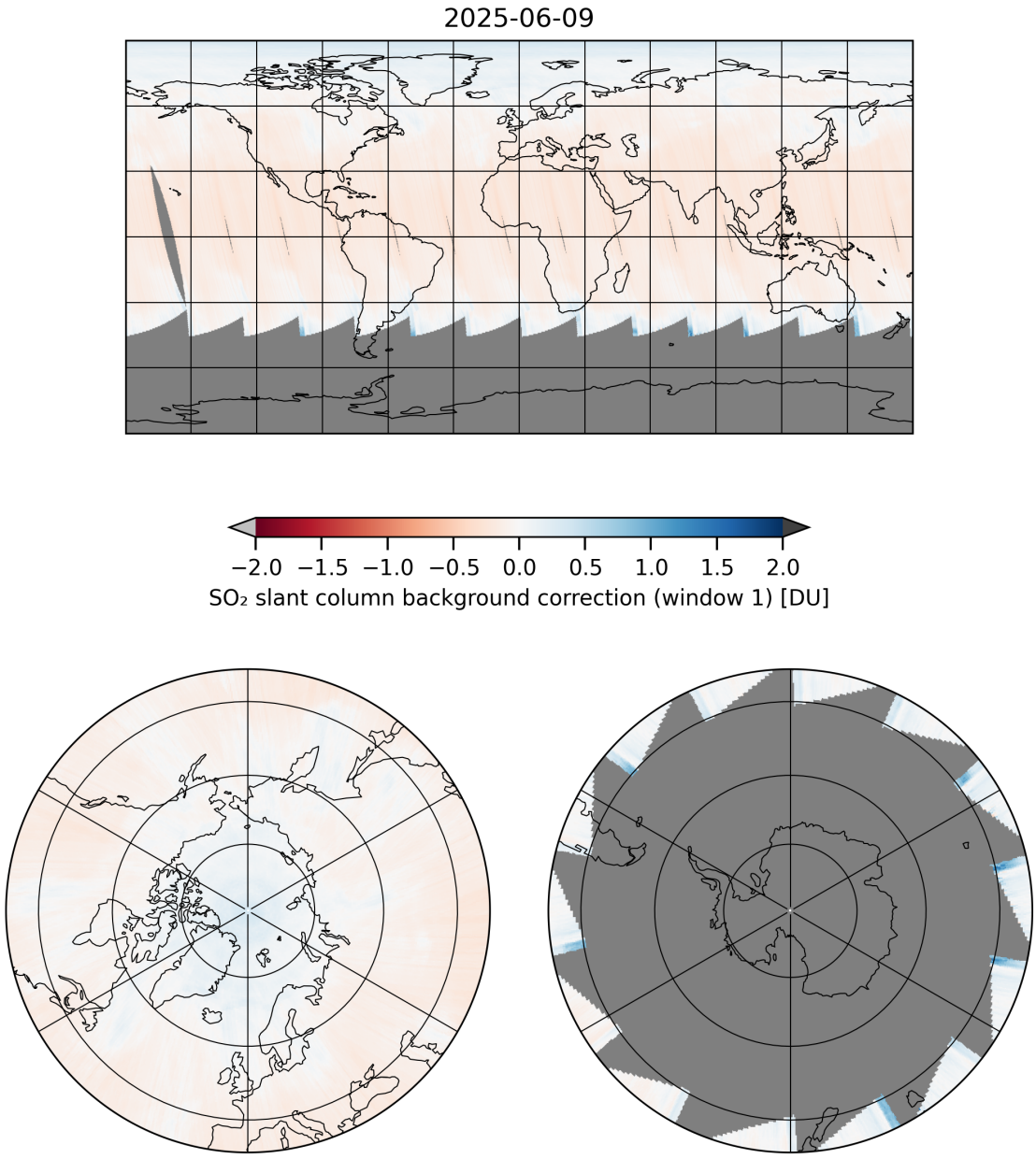


Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-06-09 to 2025-06-09

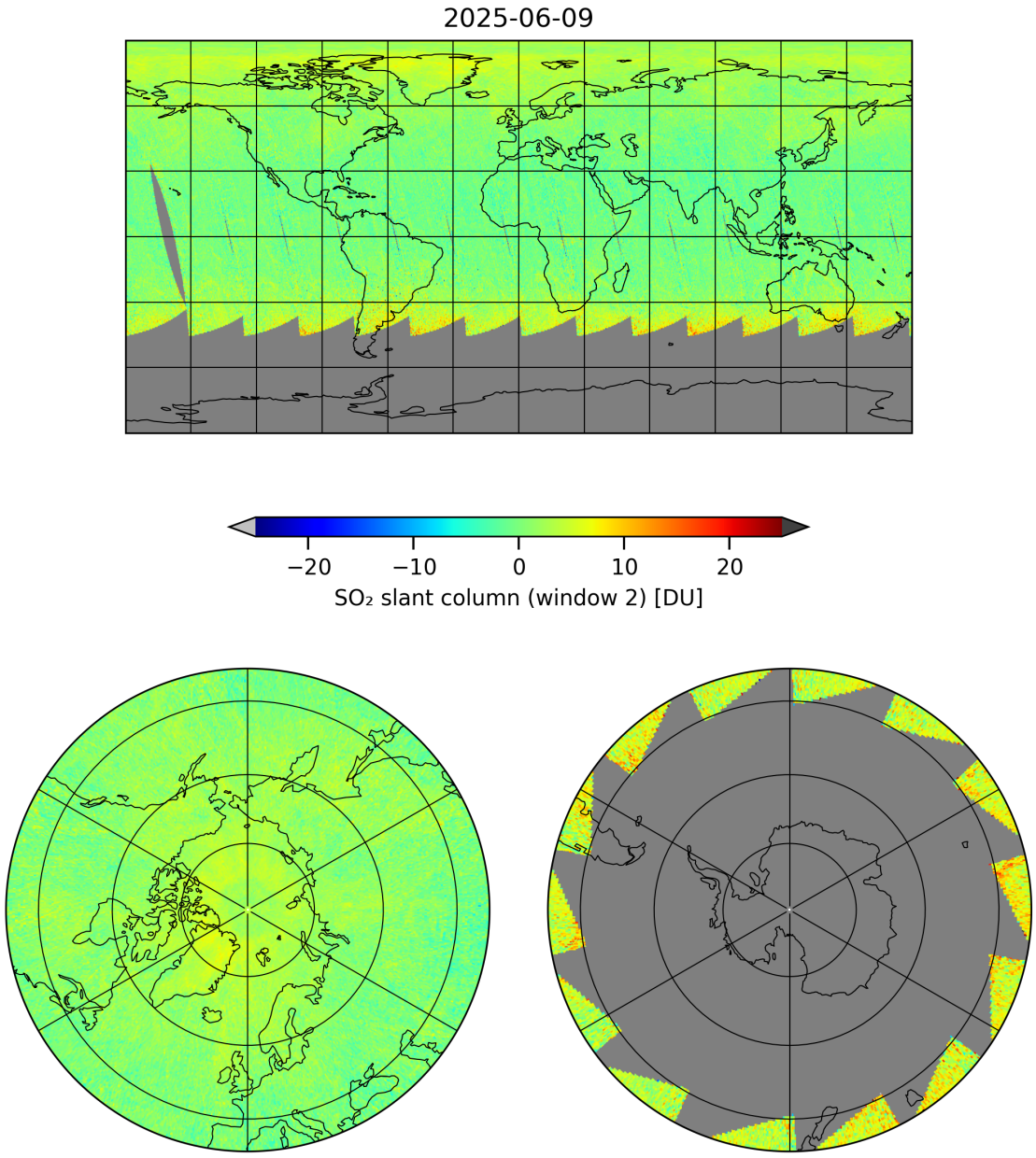


Figure 13: Map of "SO_2 slant column (window 2)" for 2025-06-09 to 2025-06-09

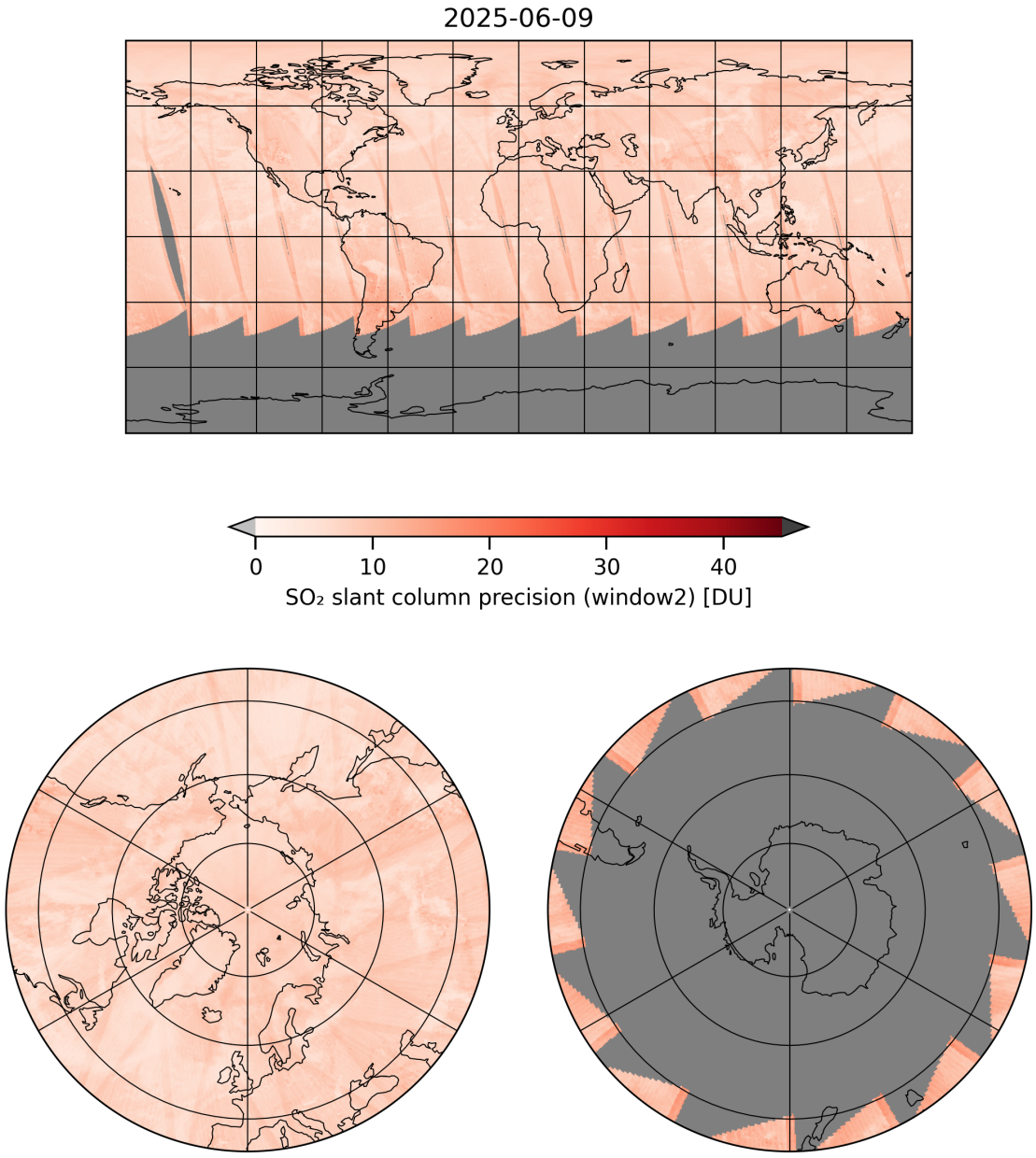


Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-06-09 to 2025-06-09

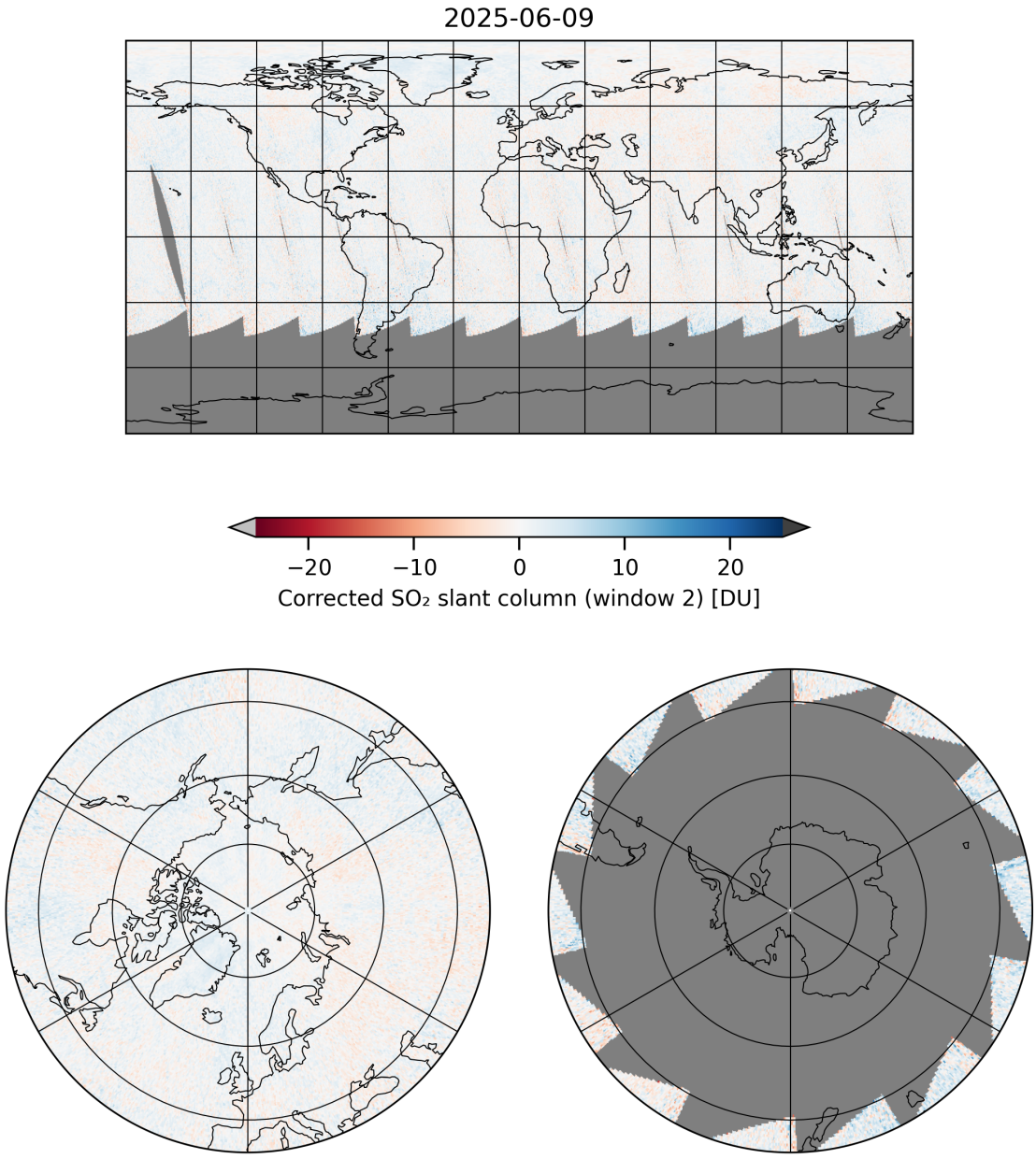


Figure 15: Map of “Corrected SO_2 slant column (window 2)” for 2025-06-09 to 2025-06-09

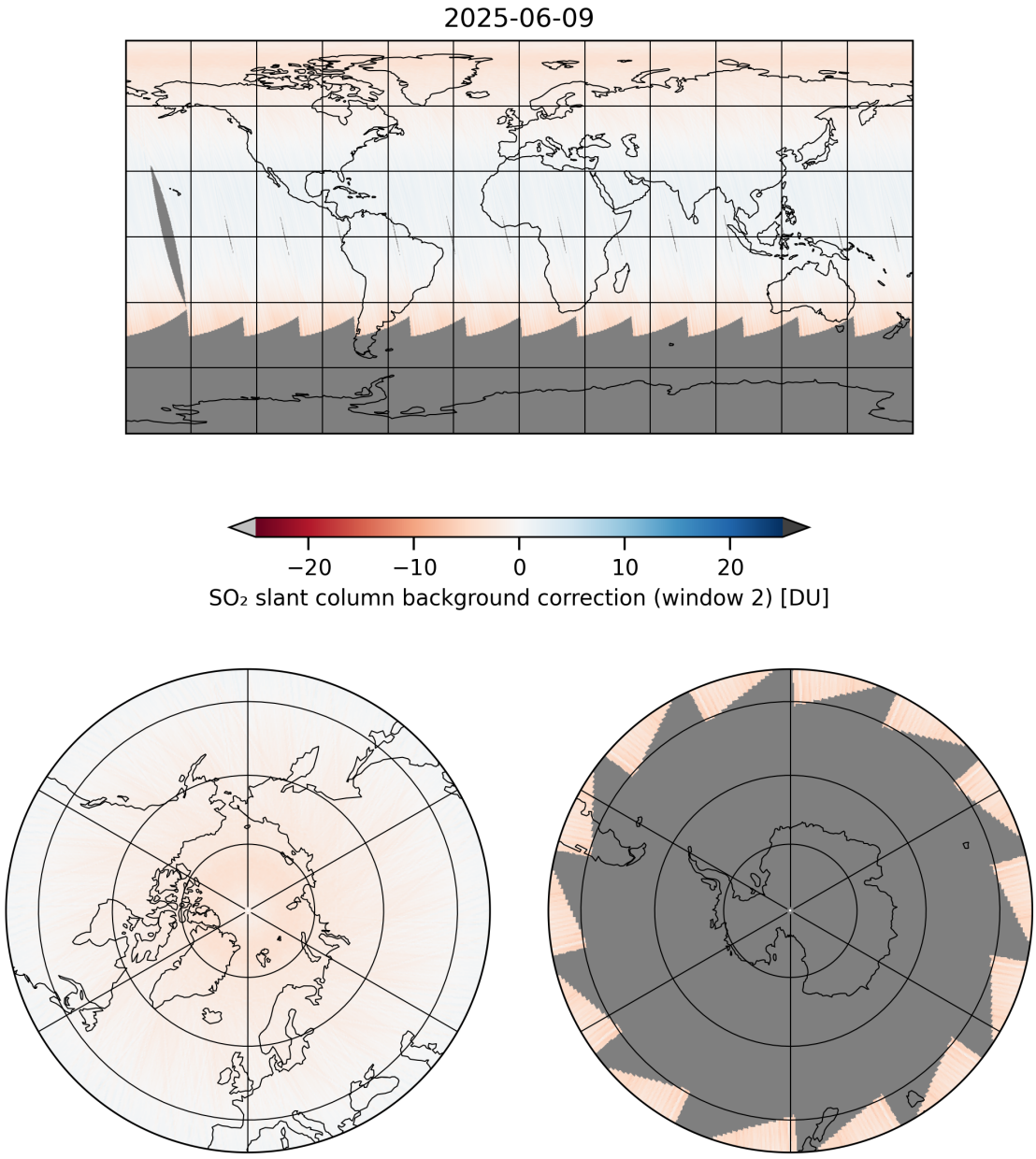


Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-06-09 to 2025-06-09

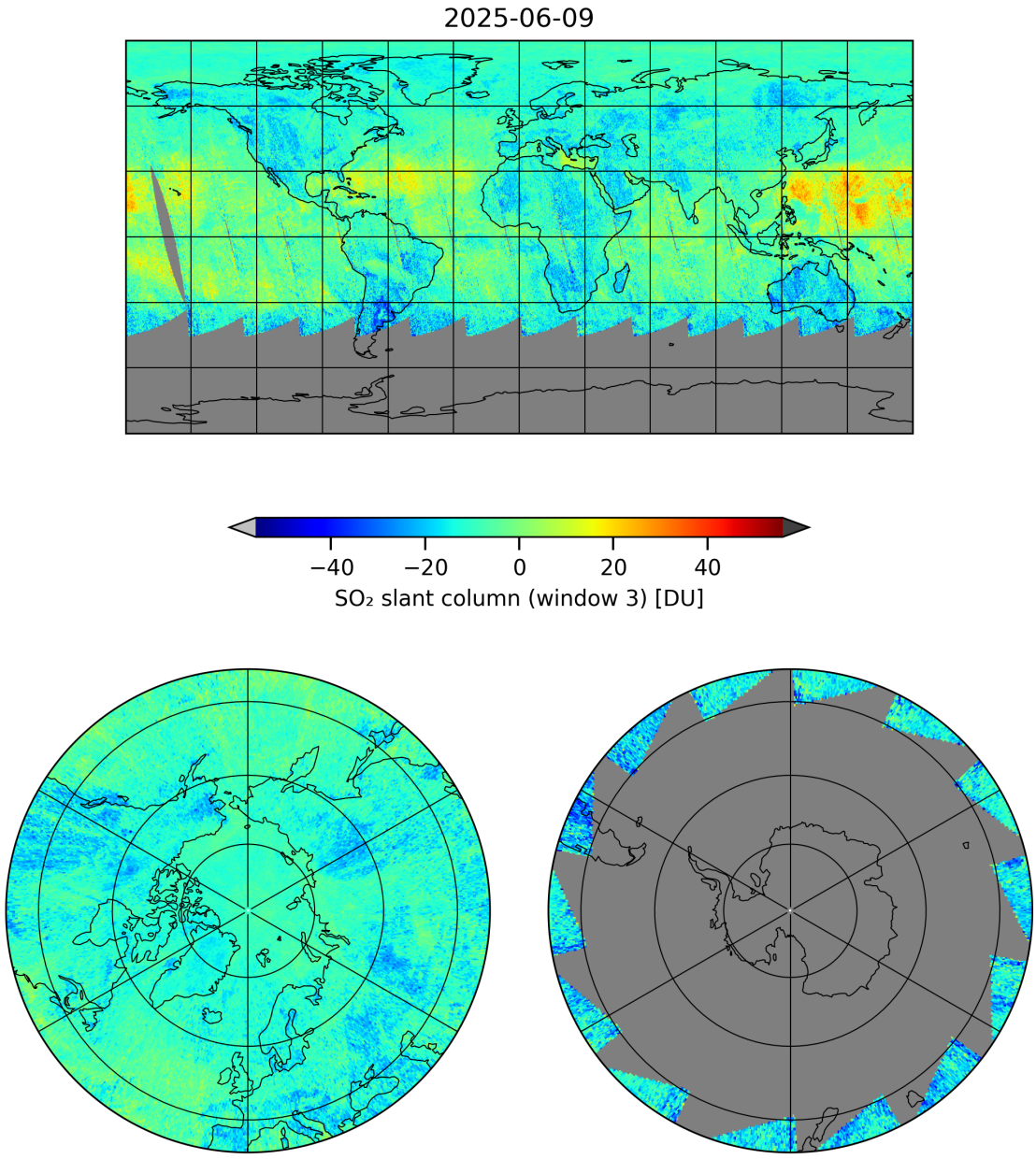


Figure 17: Map of "SO_2 slant column (window 3)" for 2025-06-09 to 2025-06-09

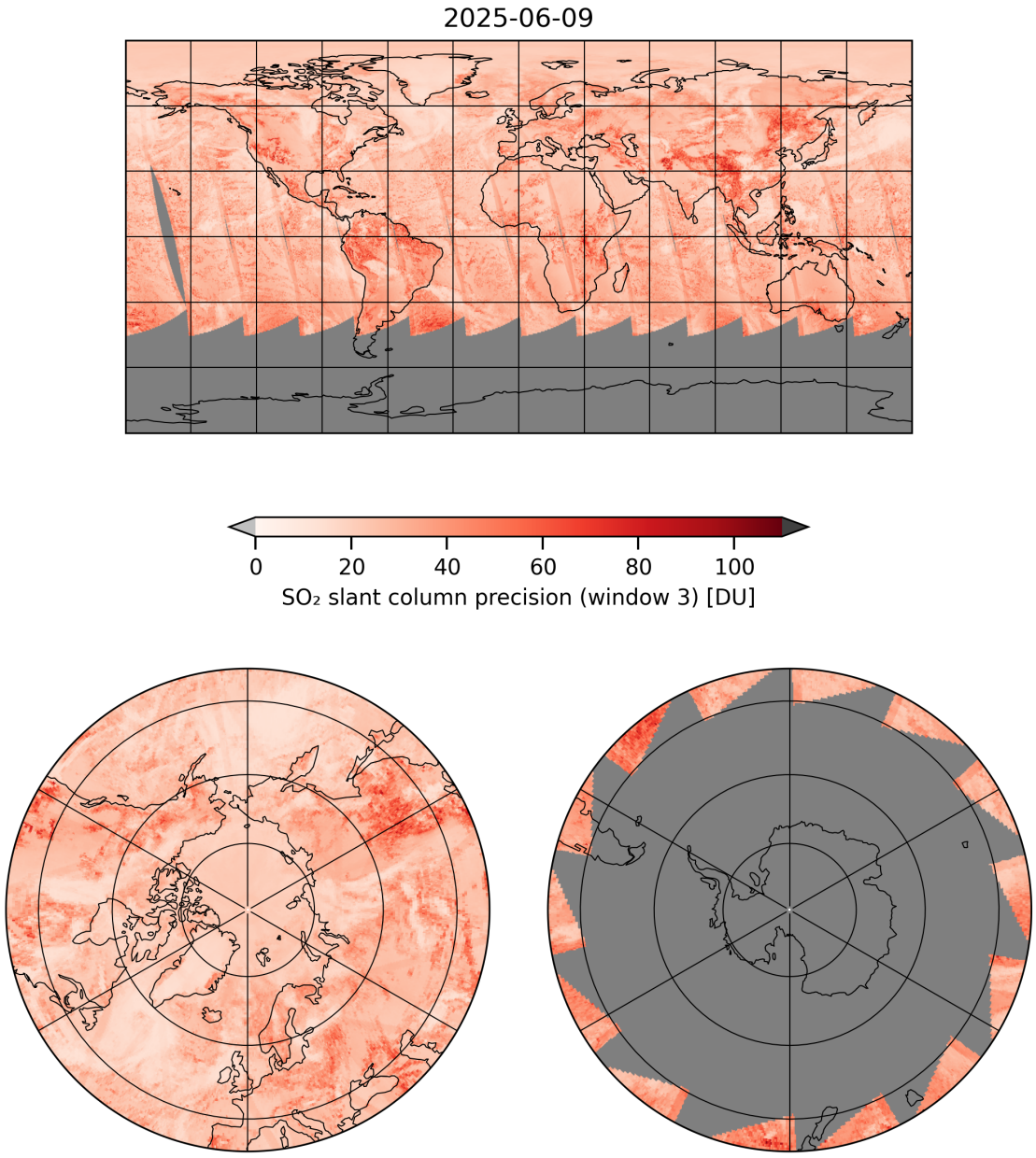


Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-06-09 to 2025-06-09

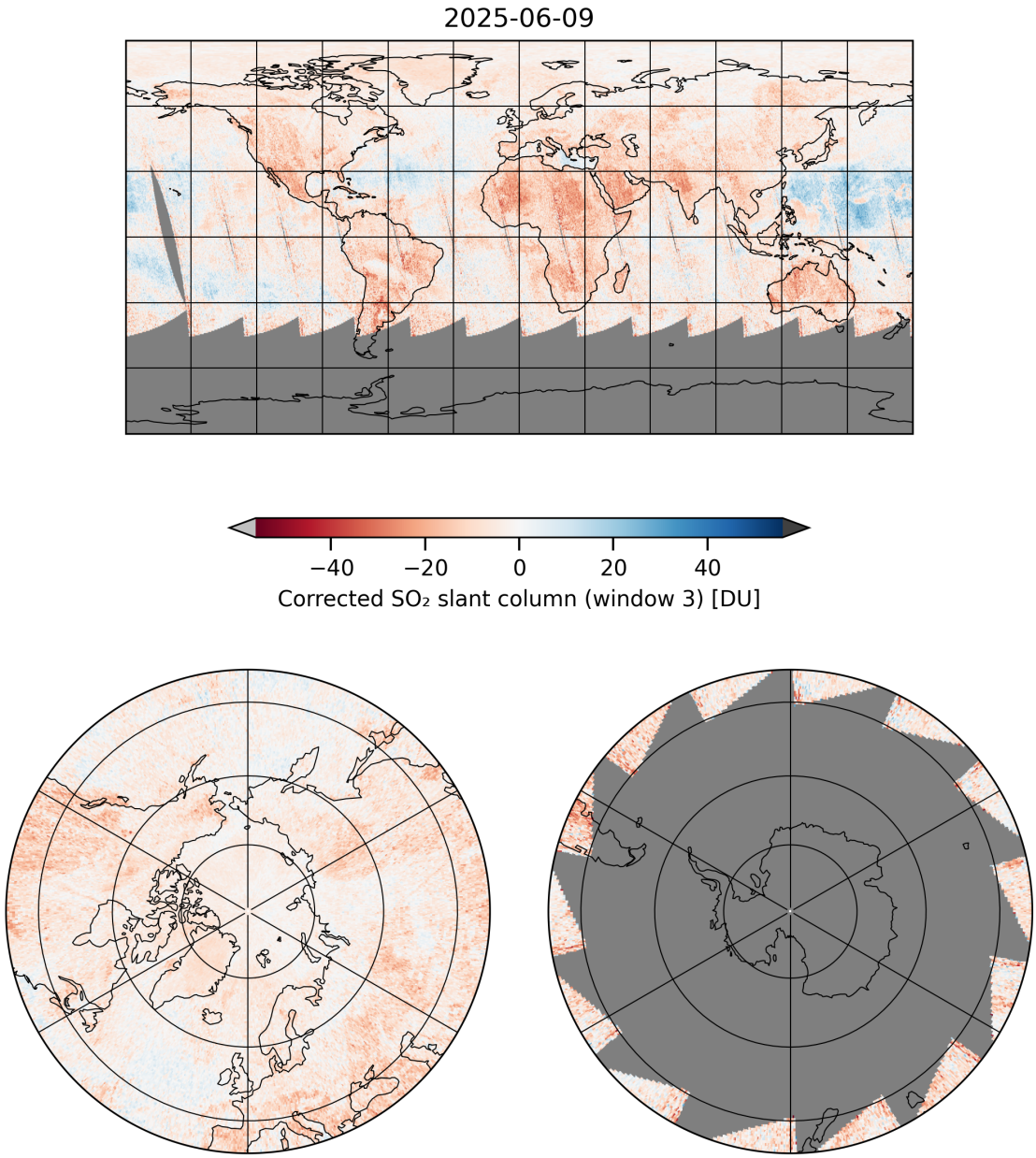


Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-06-09 to 2025-06-09

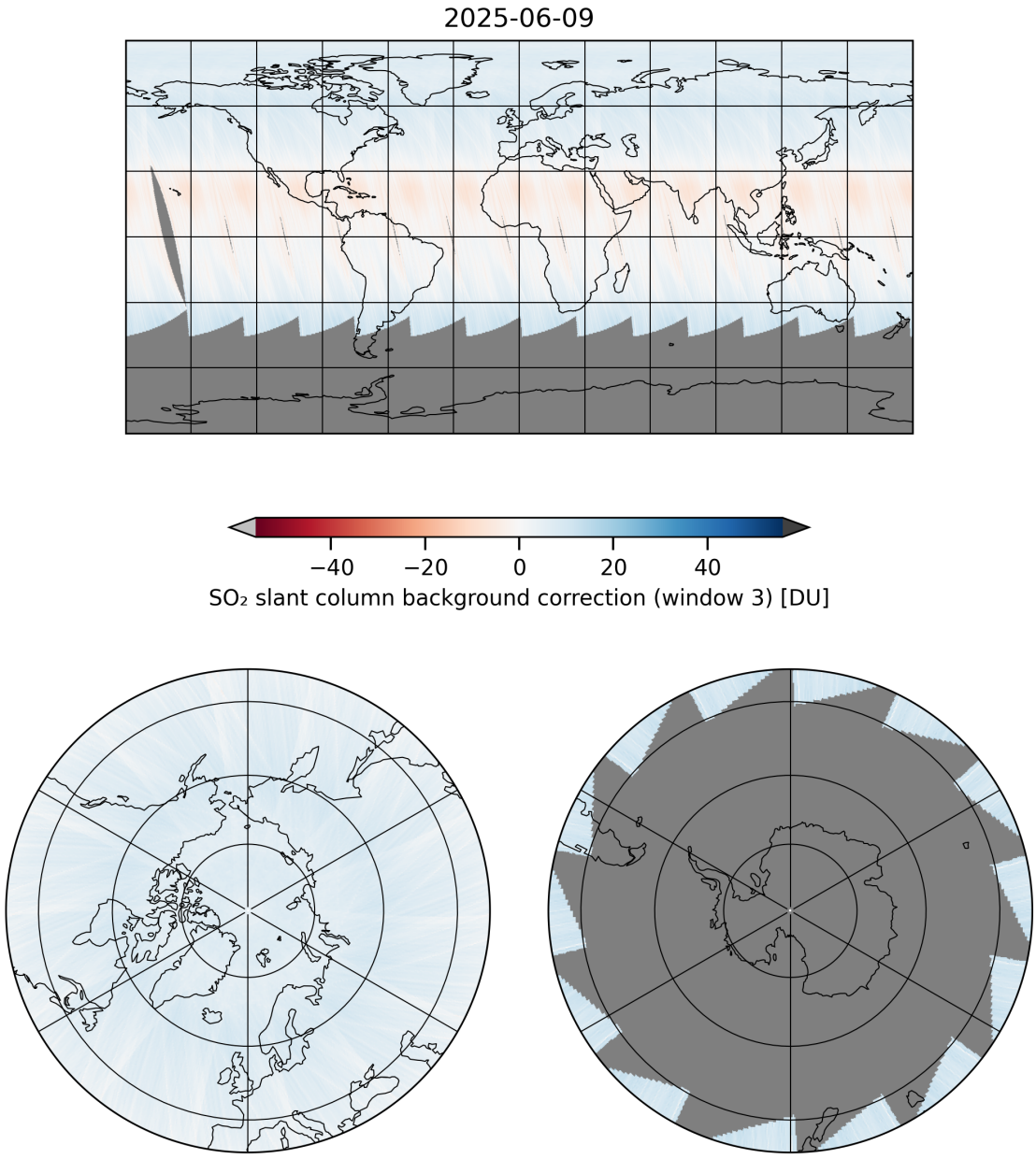


Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-06-09 to 2025-06-09

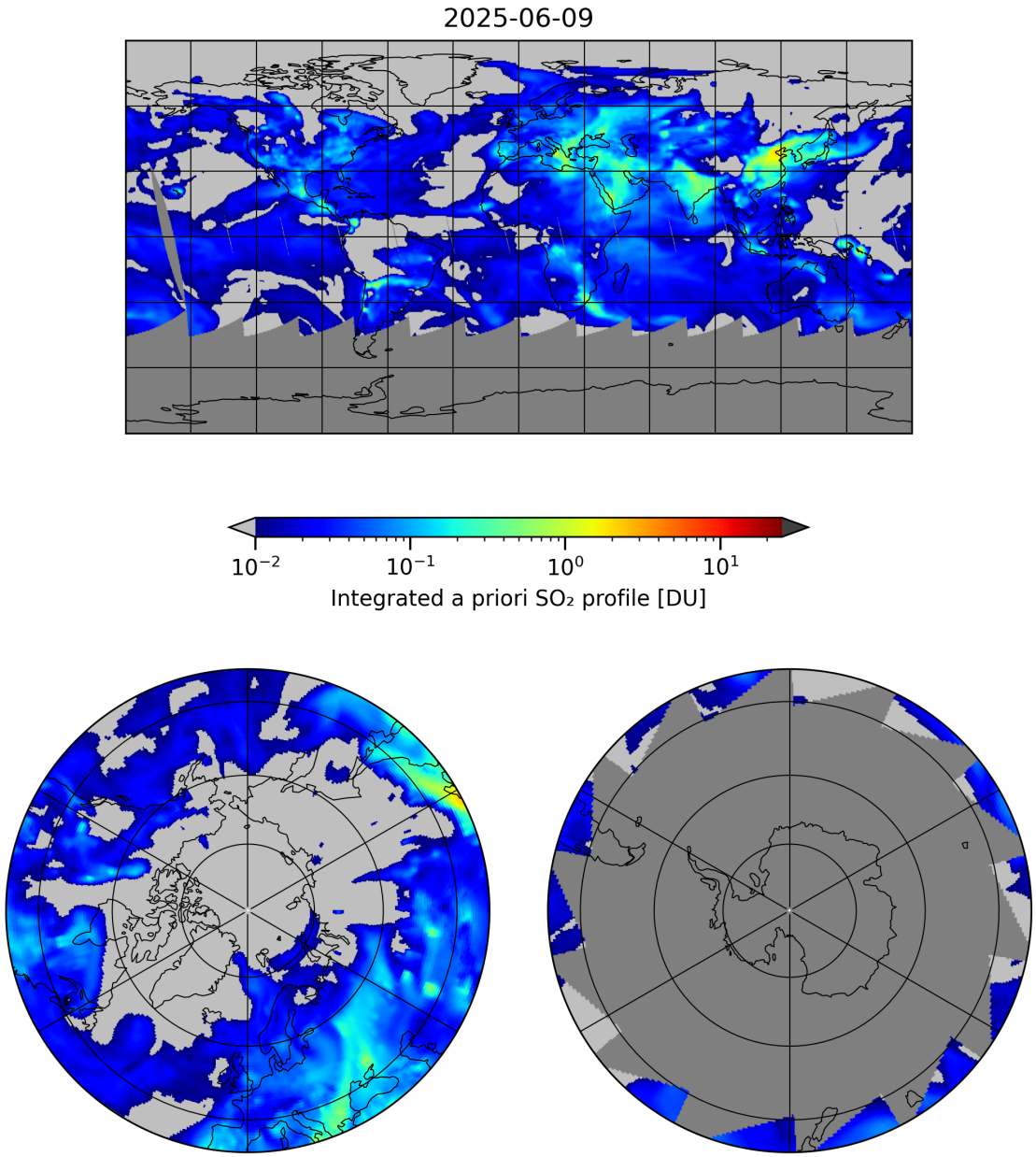


Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-06-09 to 2025-06-09

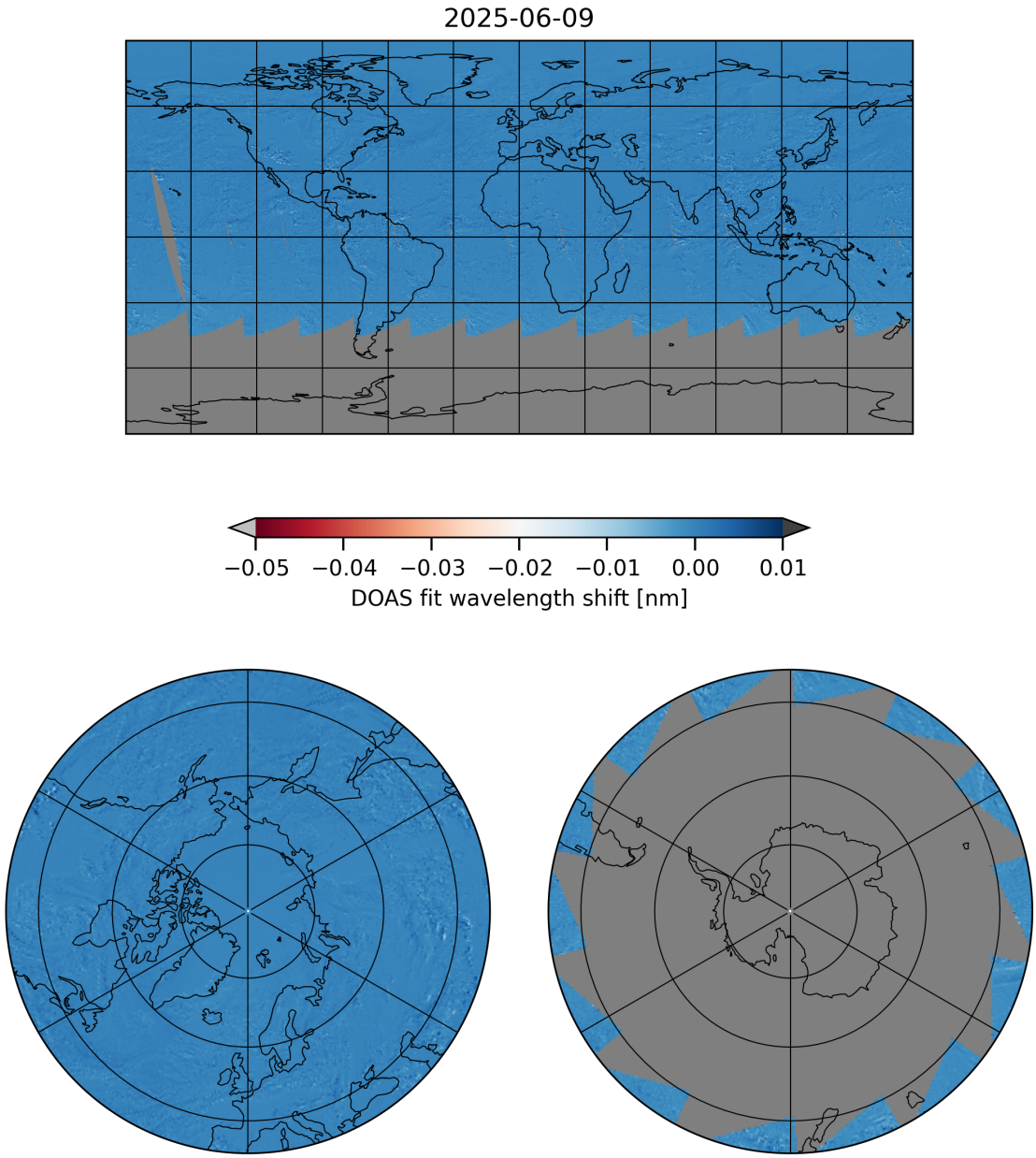


Figure 22: Map of “DOAS fit wavelength shift” for 2025-06-09 to 2025-06-09

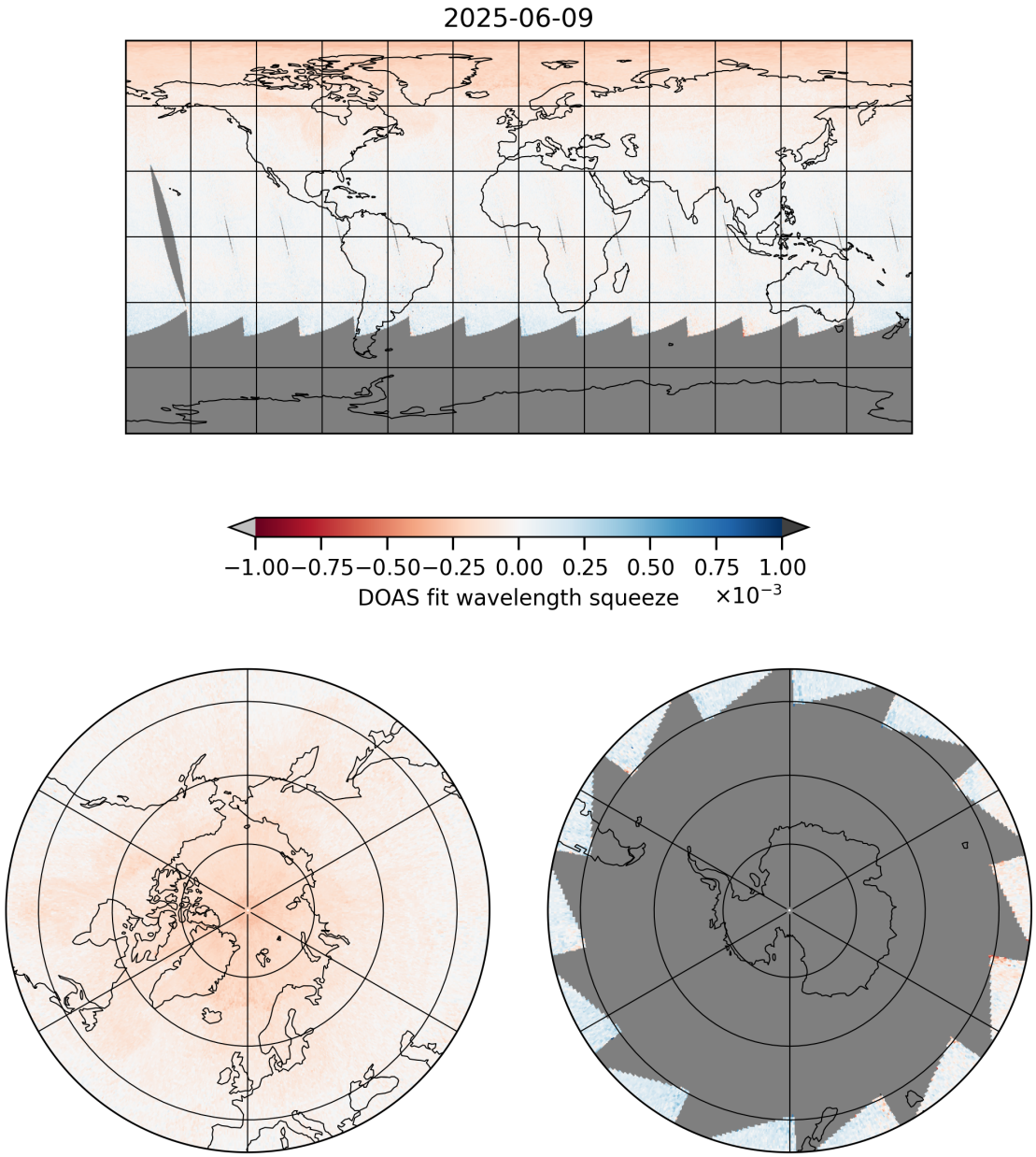


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-06-09 to 2025-06-09

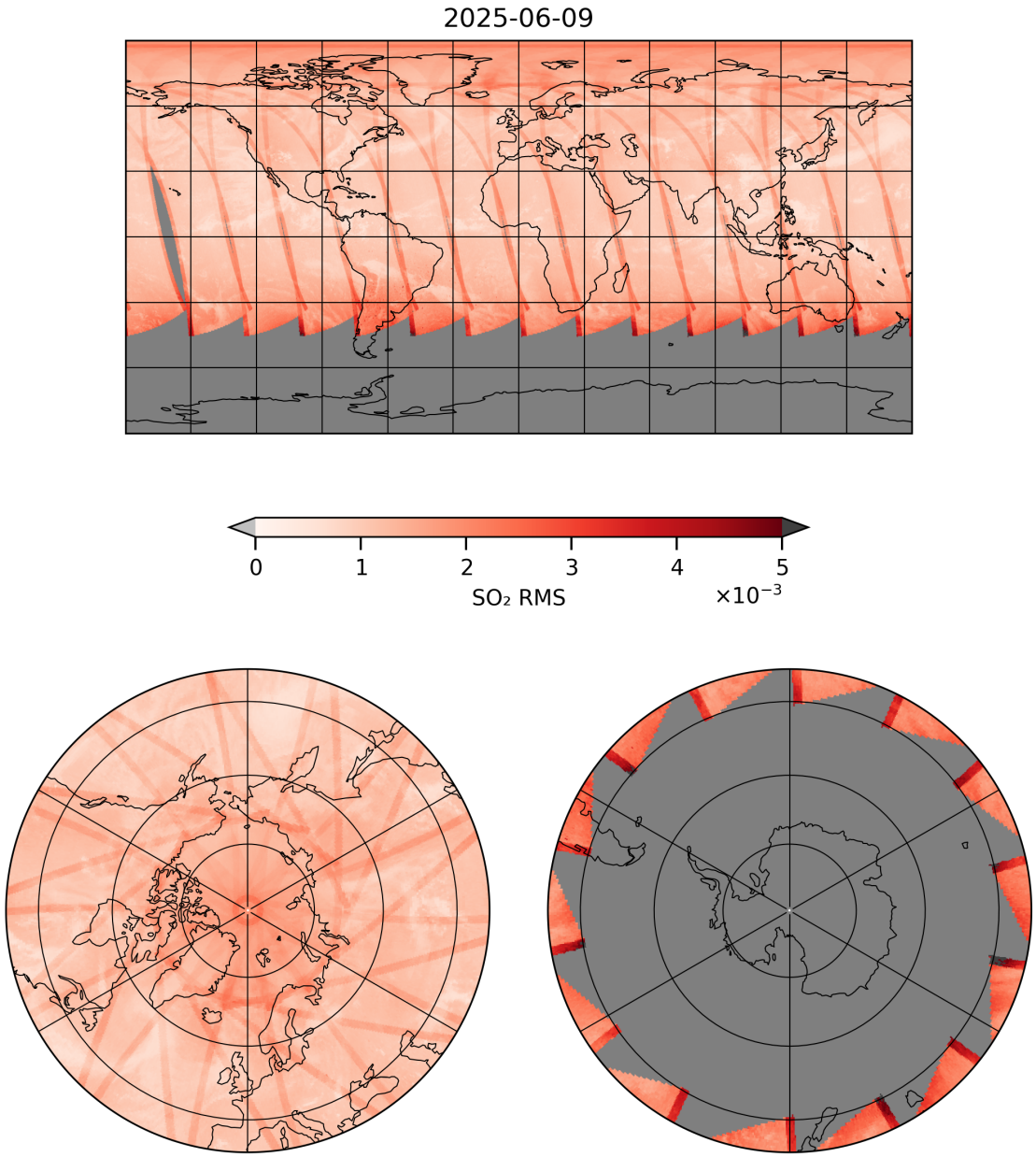


Figure 24: Map of "SO_2 RMS" for 2025-06-09 to 2025-06-09

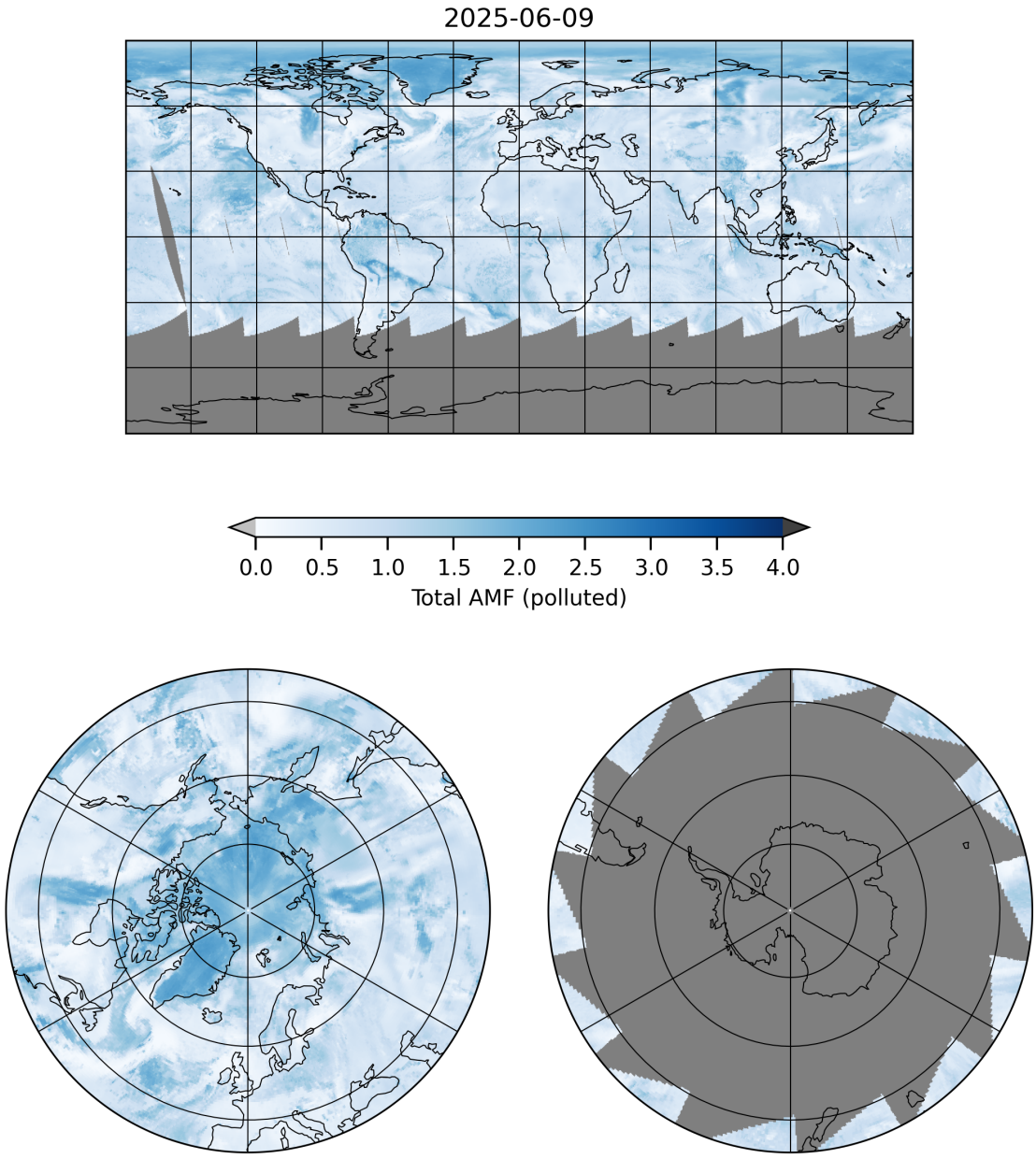


Figure 25: Map of “Total AMF (polluted)” for 2025-06-09 to 2025-06-09

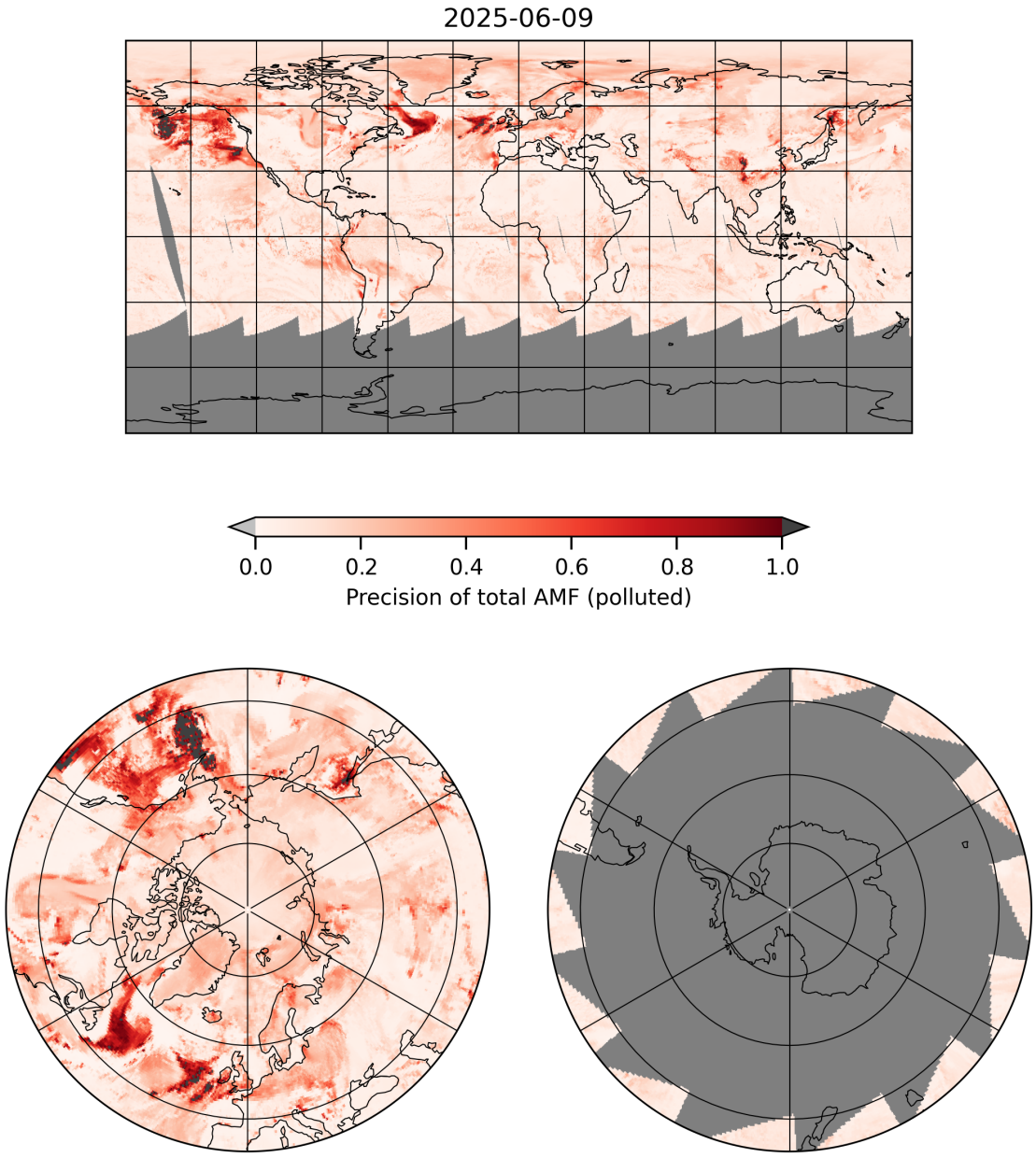


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-06-09 to 2025-06-09

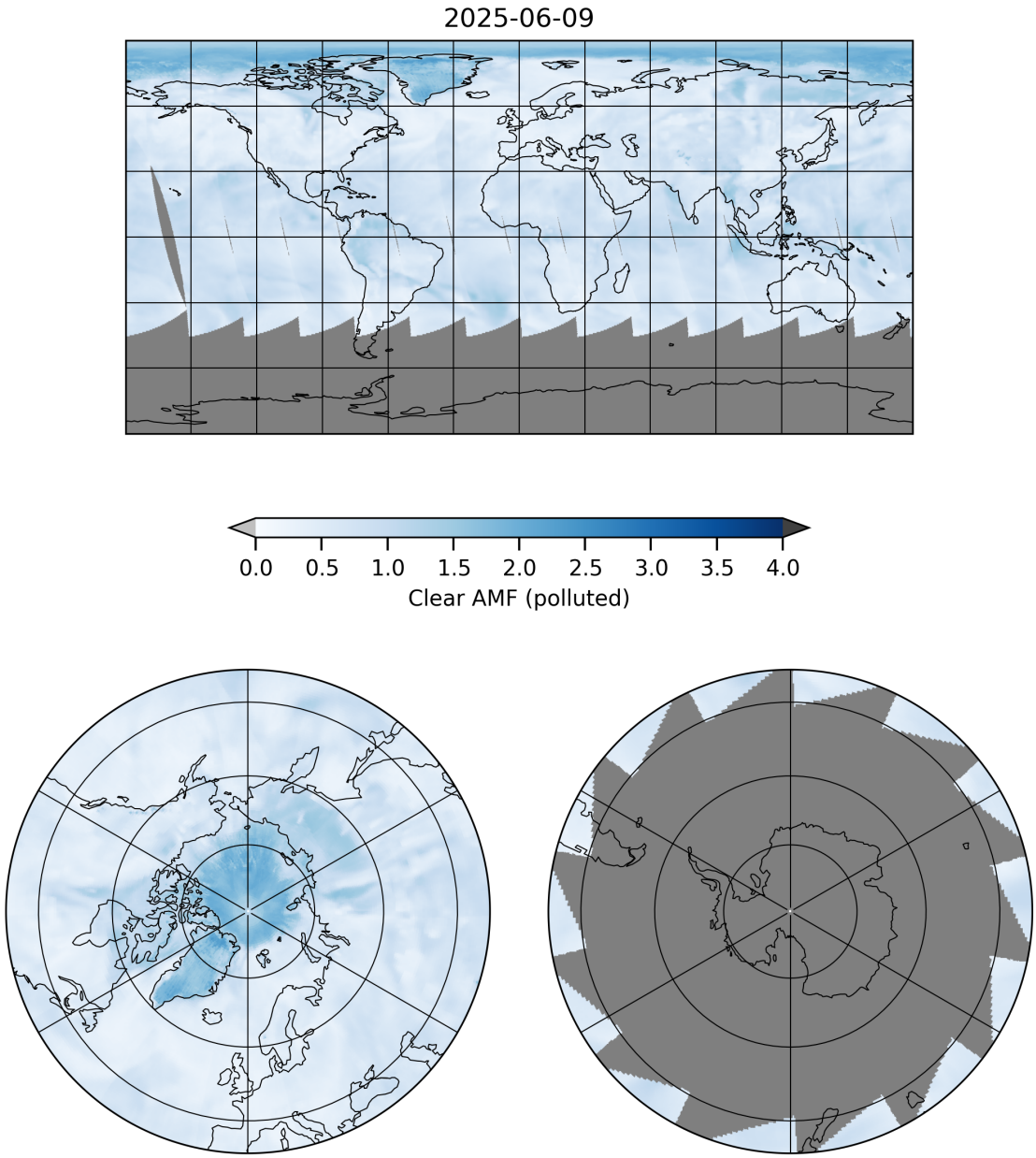


Figure 27: Map of “Clear AMF (polluted)” for 2025-06-09 to 2025-06-09

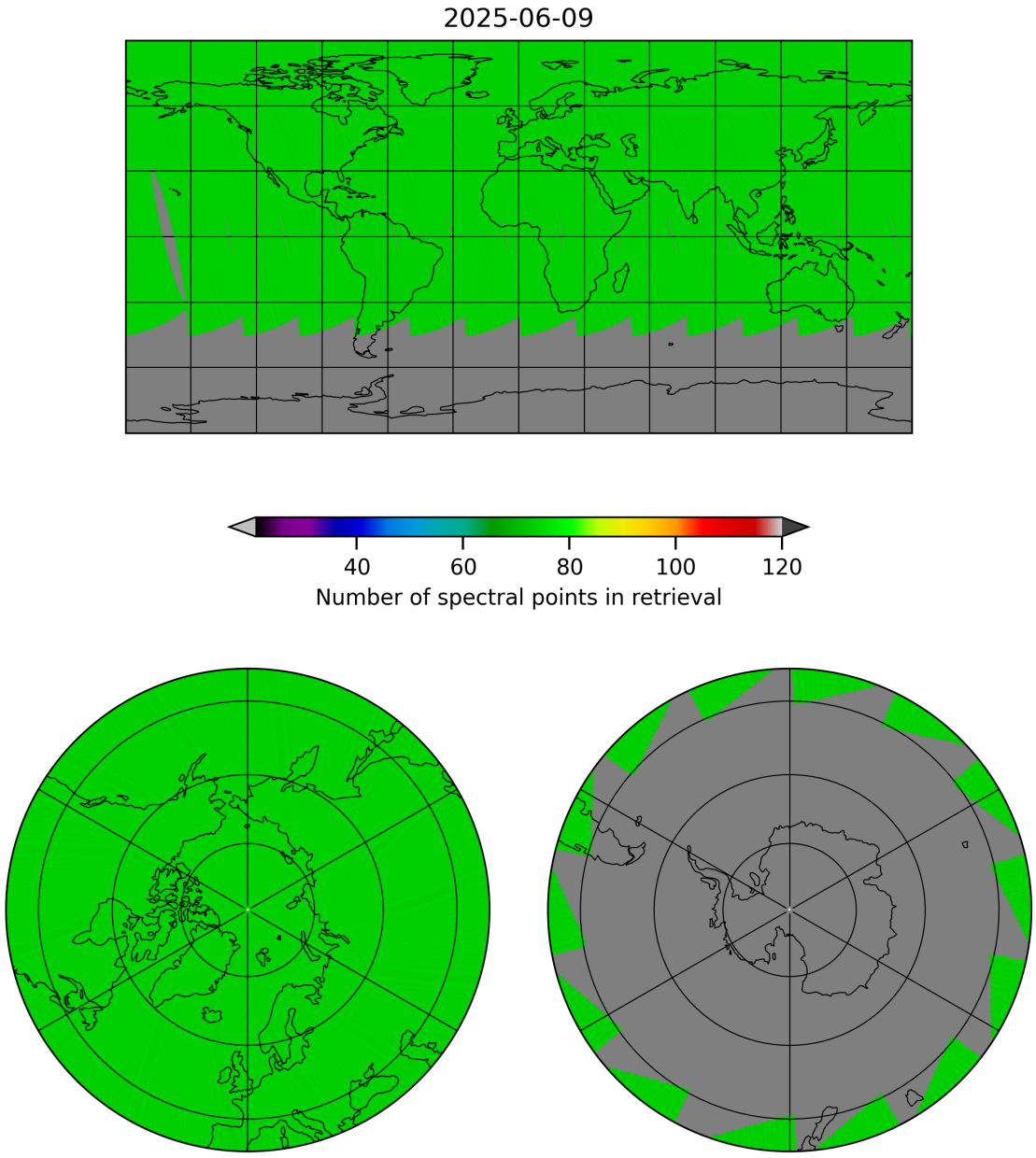


Figure 28: Map of “Number of spectral points in retrieval” for 2025-06-09 to 2025-06-09

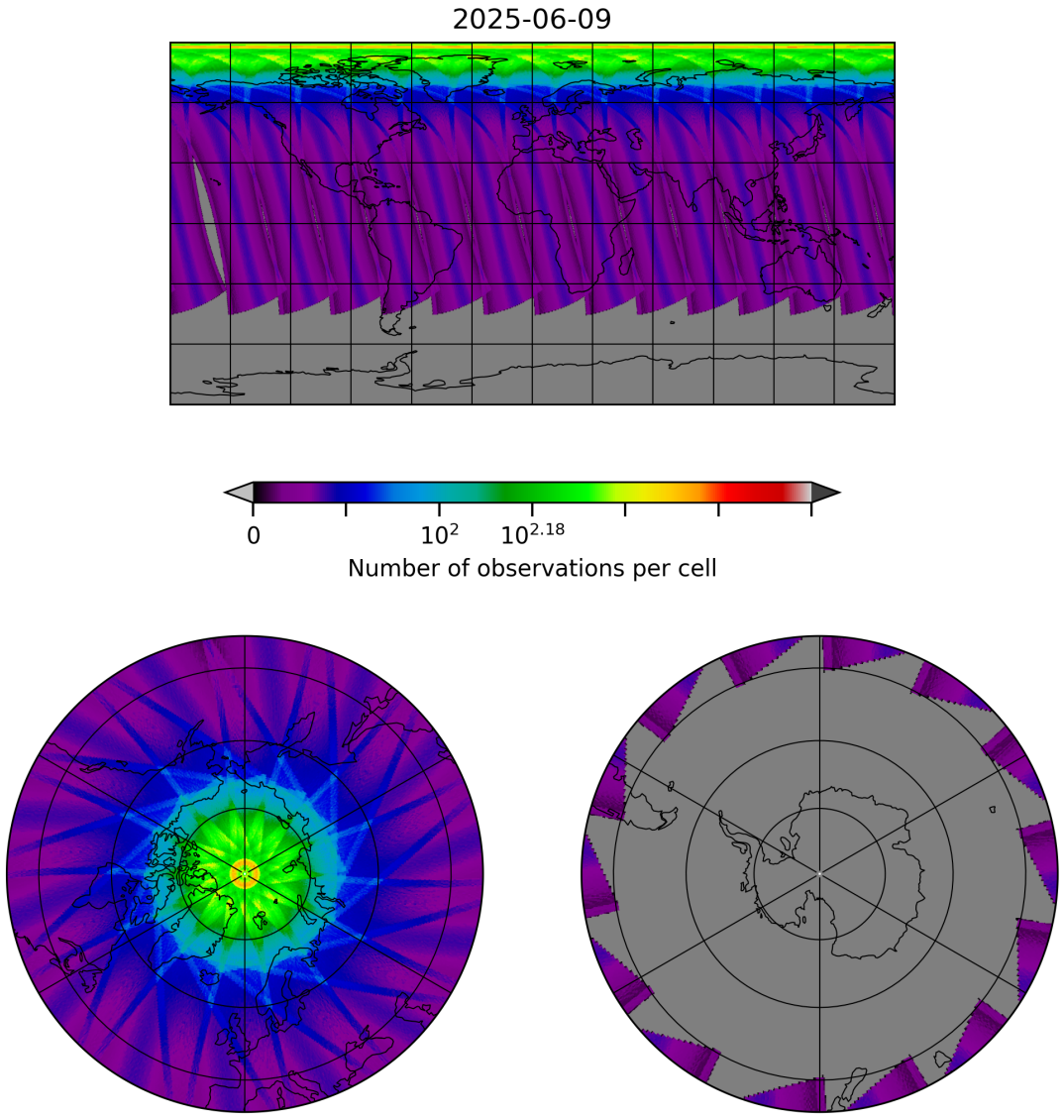


Figure 29: Map of the number of observations for 2025-06-09 to 2025-06-09

7 Zonal average

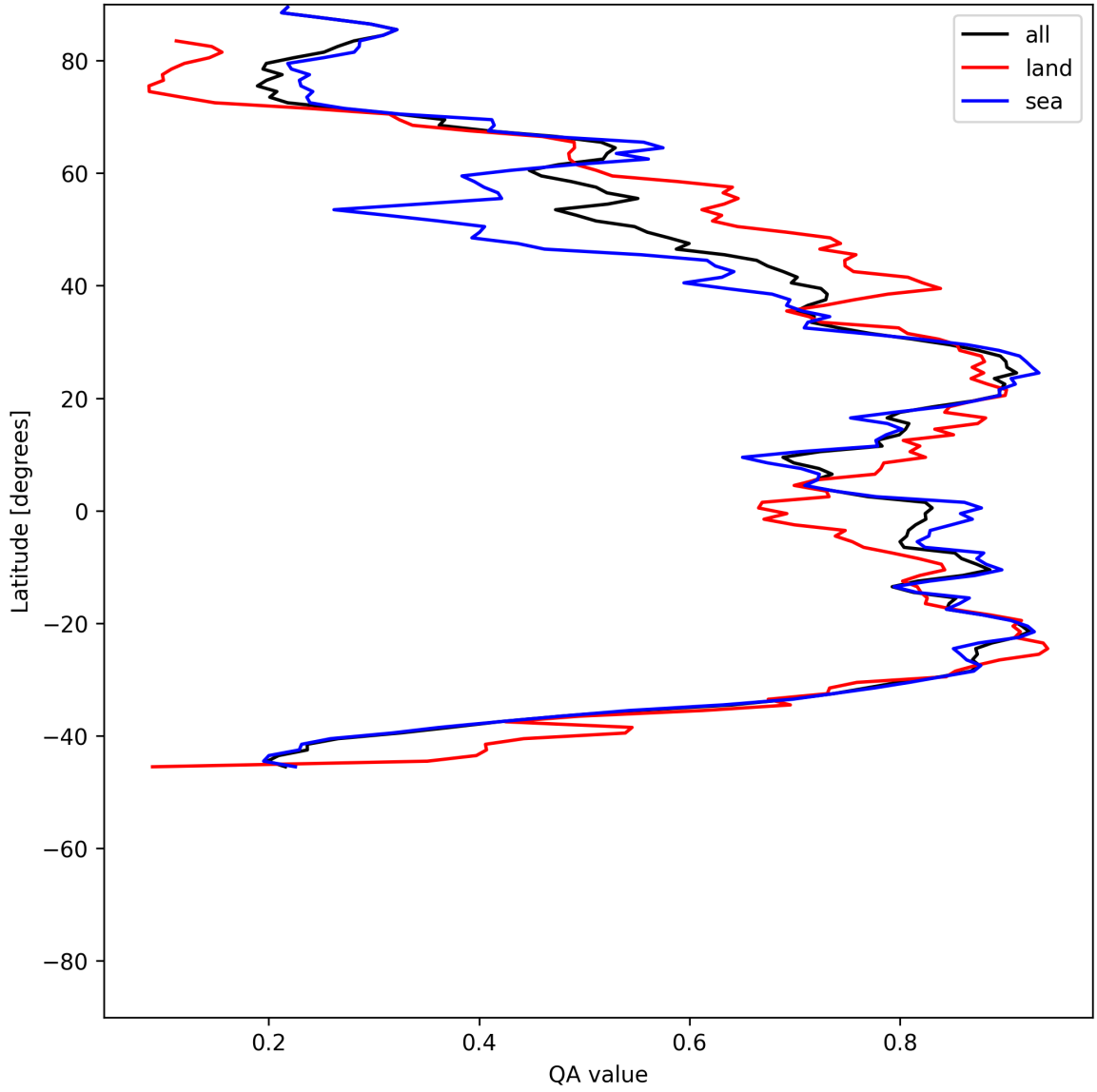


Figure 30: Zonal average of “QA value” for 2025-06-09 to 2025-06-09.

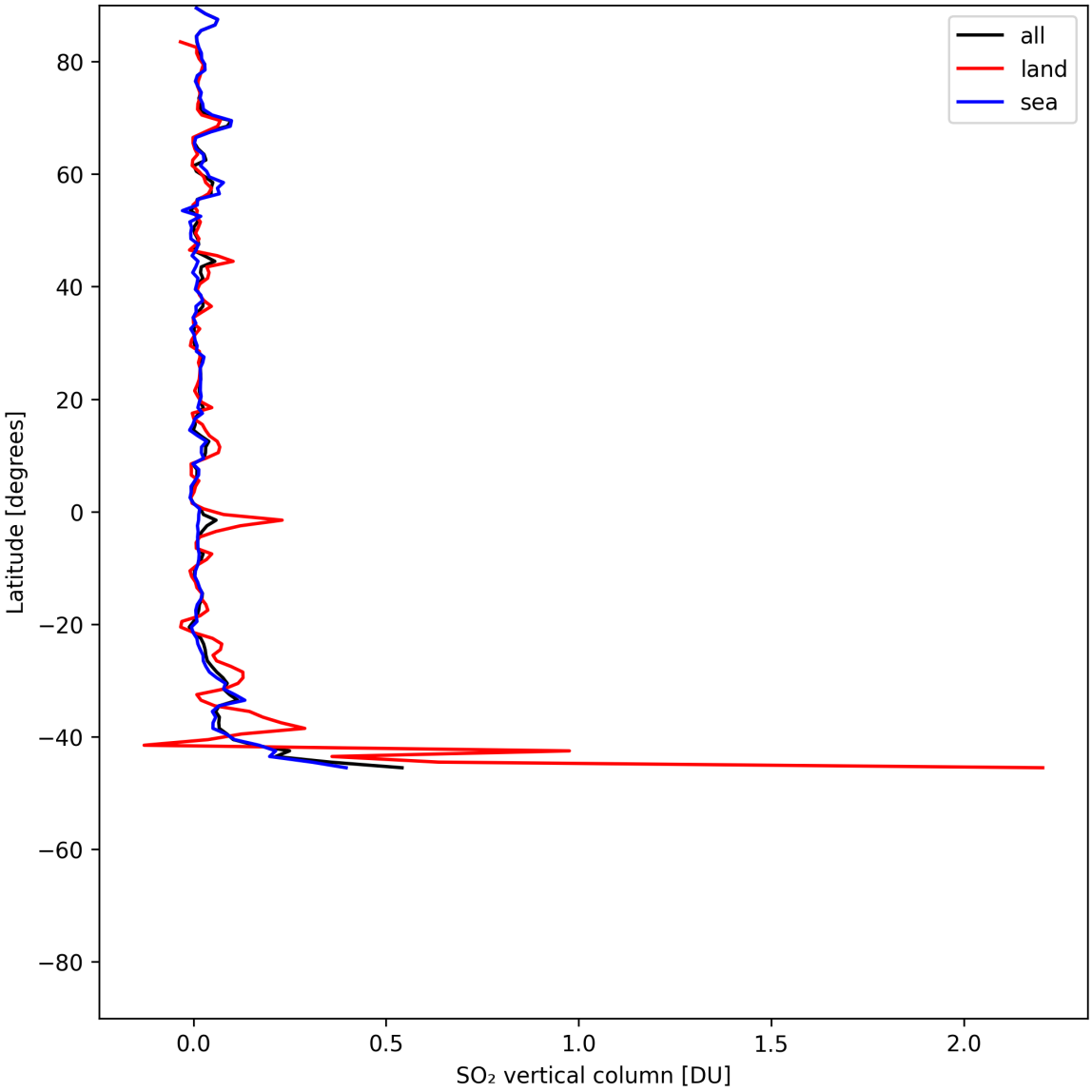


Figure 31: Zonal average of "SO_2 vertical column" for 2025-06-09 to 2025-06-09.

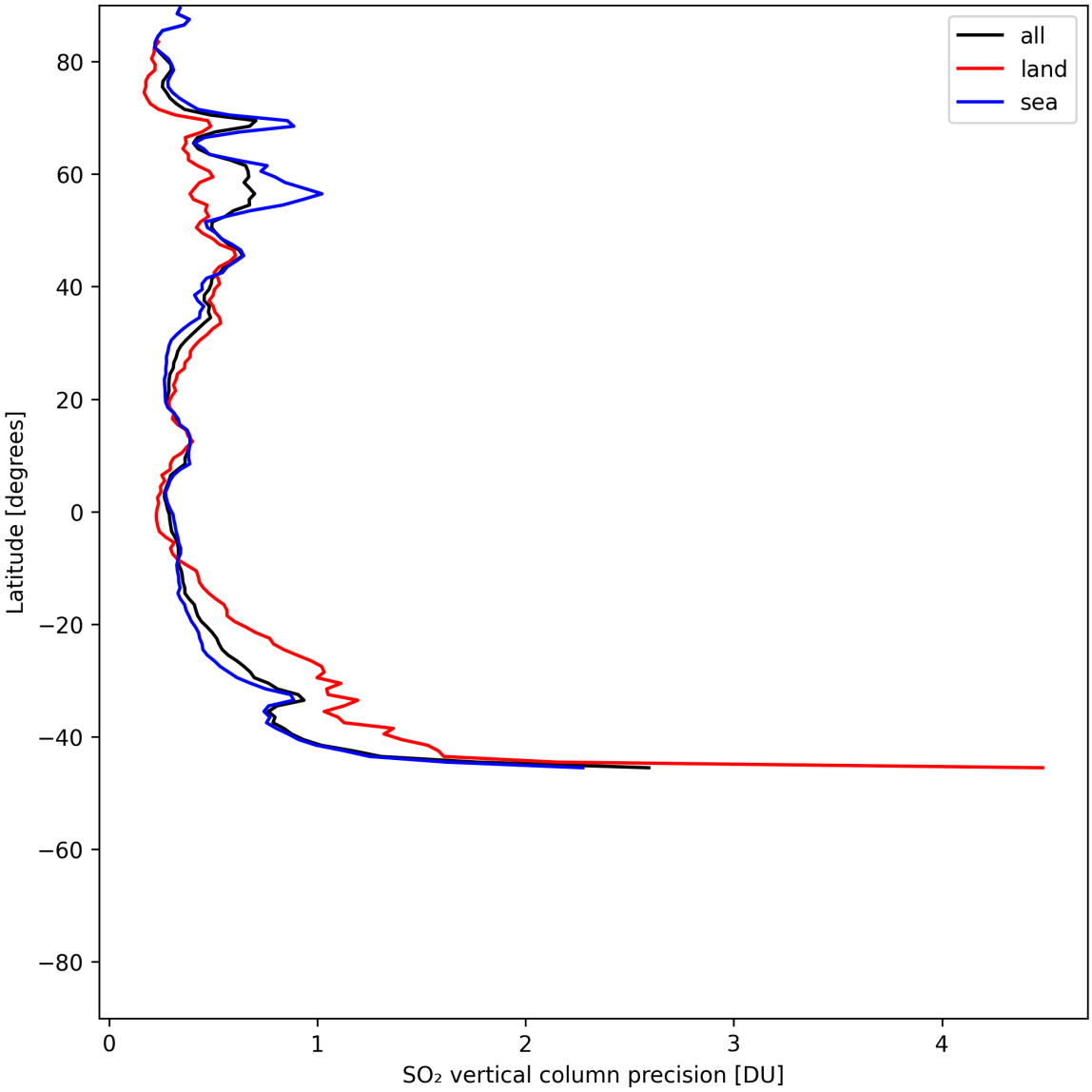


Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-06-09 to 2025-06-09.

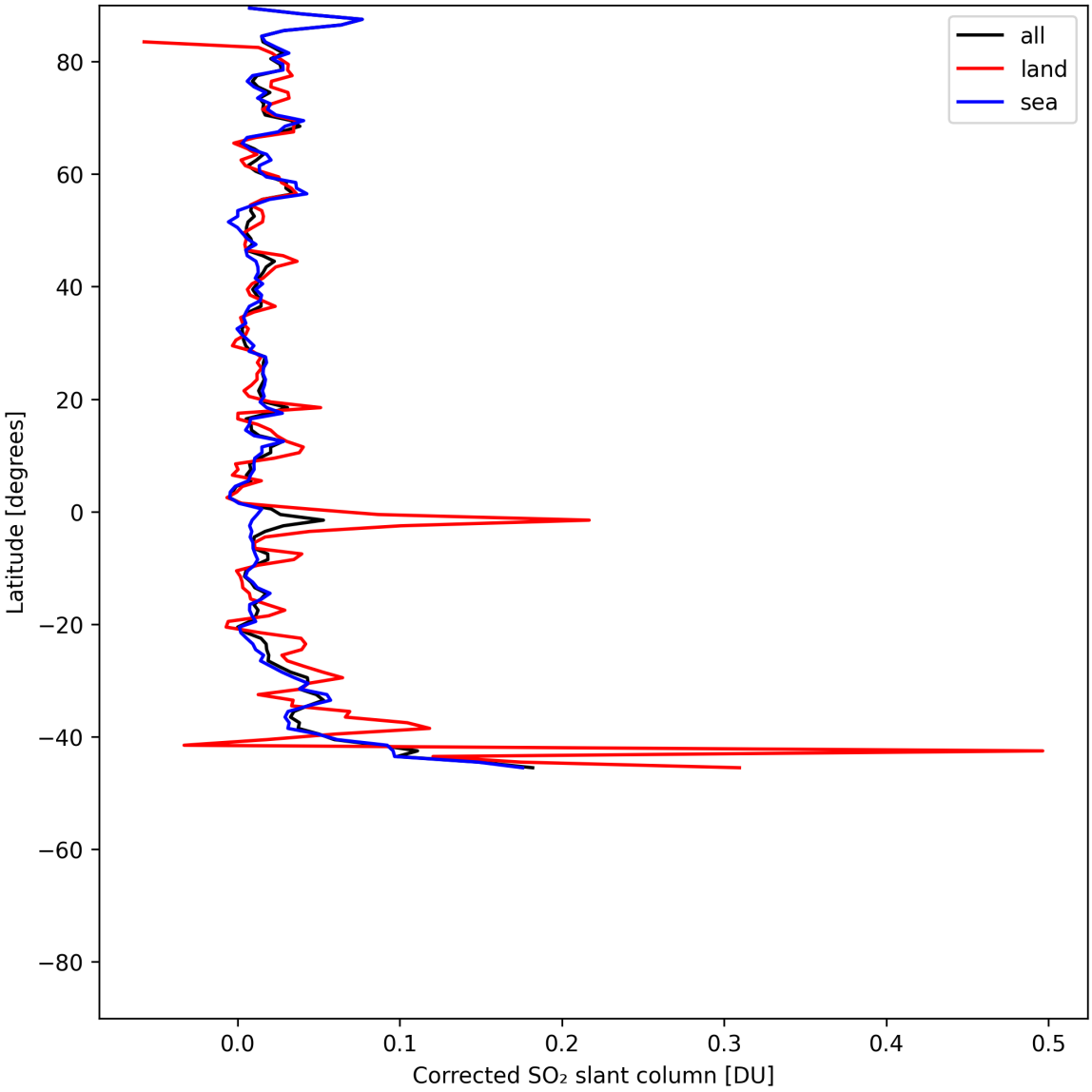


Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-06-09 to 2025-06-09.

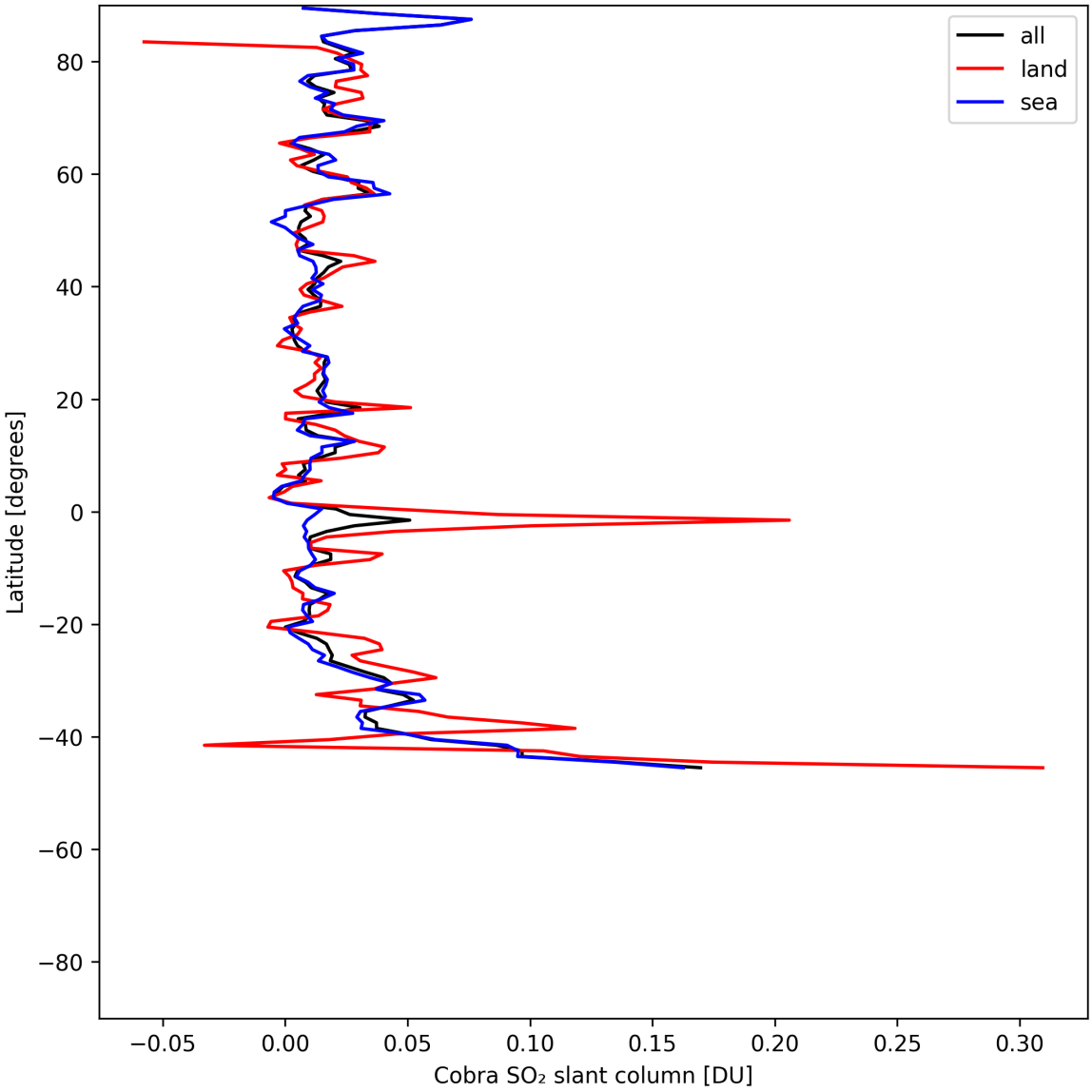


Figure 34: Zonal average of “Cobra SO_2 slant column” for 2025-06-09 to 2025-06-09.

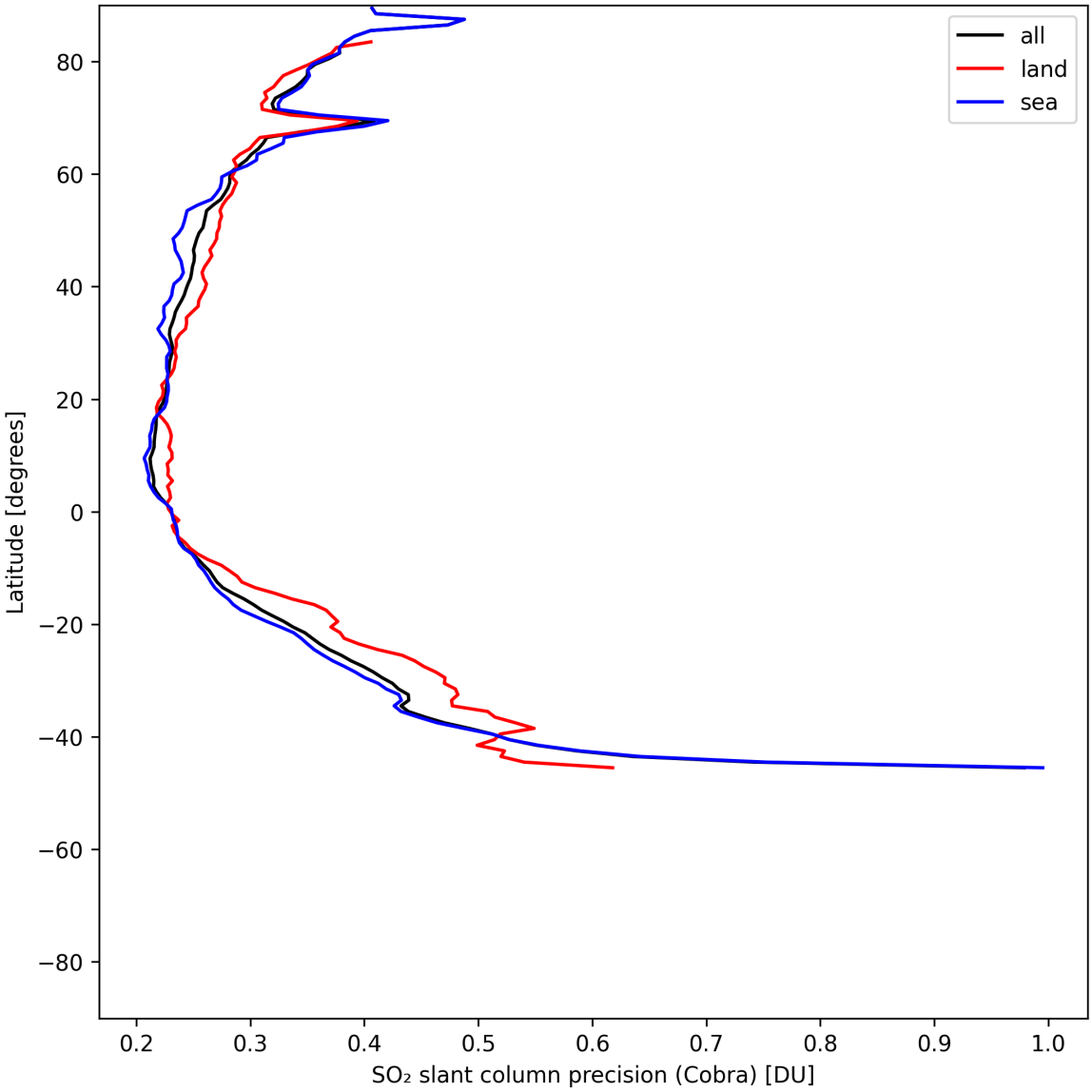


Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-06-09 to 2025-06-09.

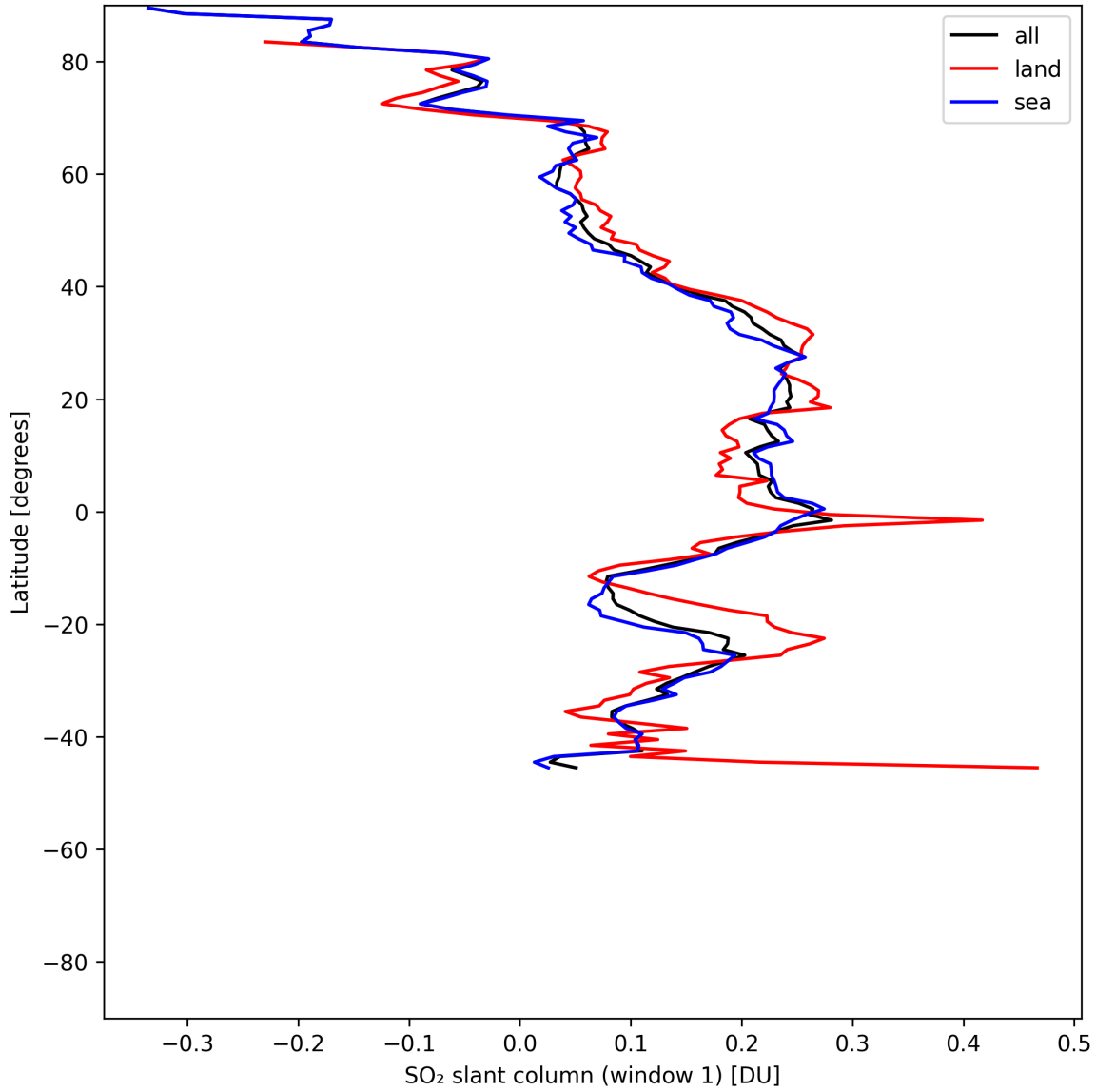


Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-06-09 to 2025-06-09.

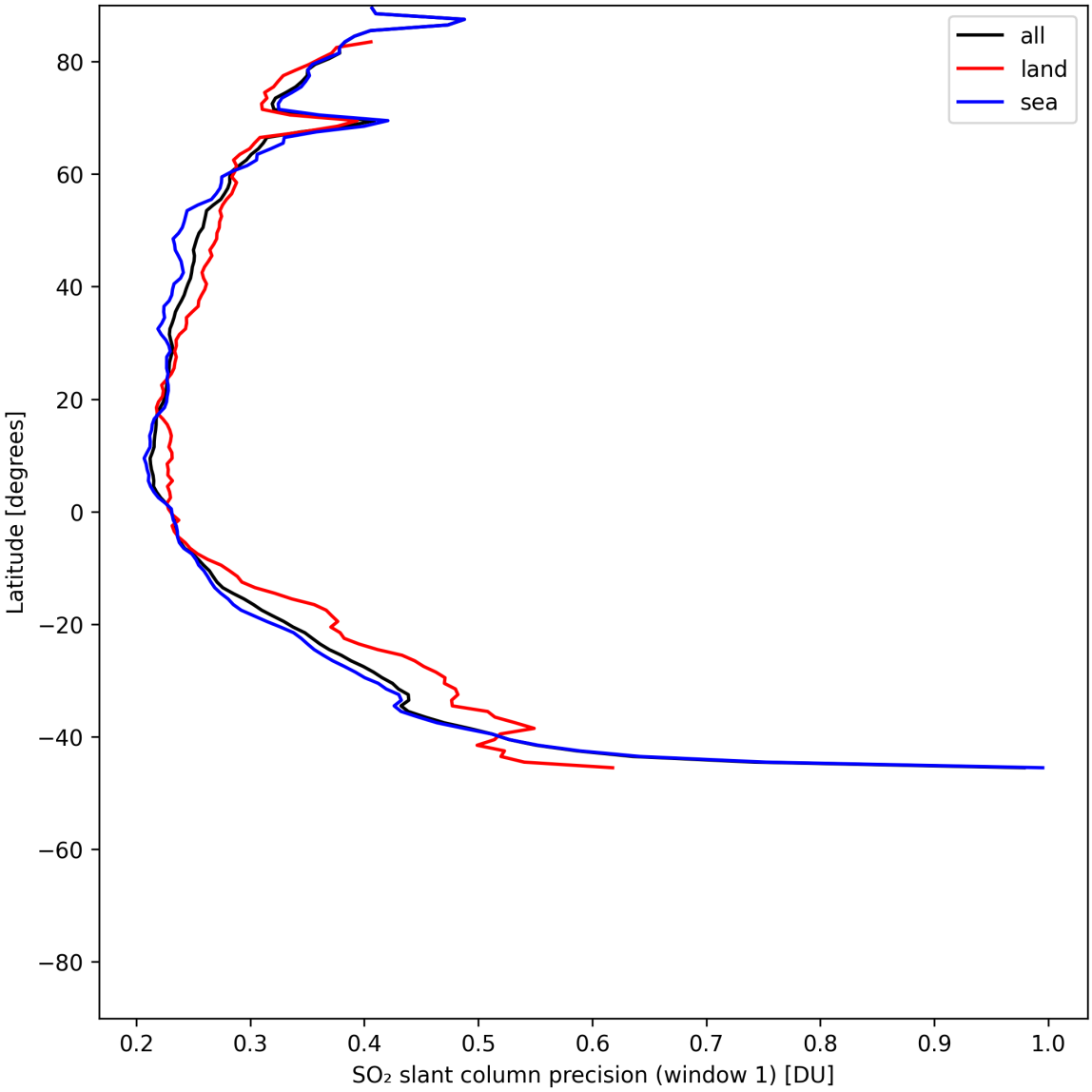


Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-06-09 to 2025-06-09.

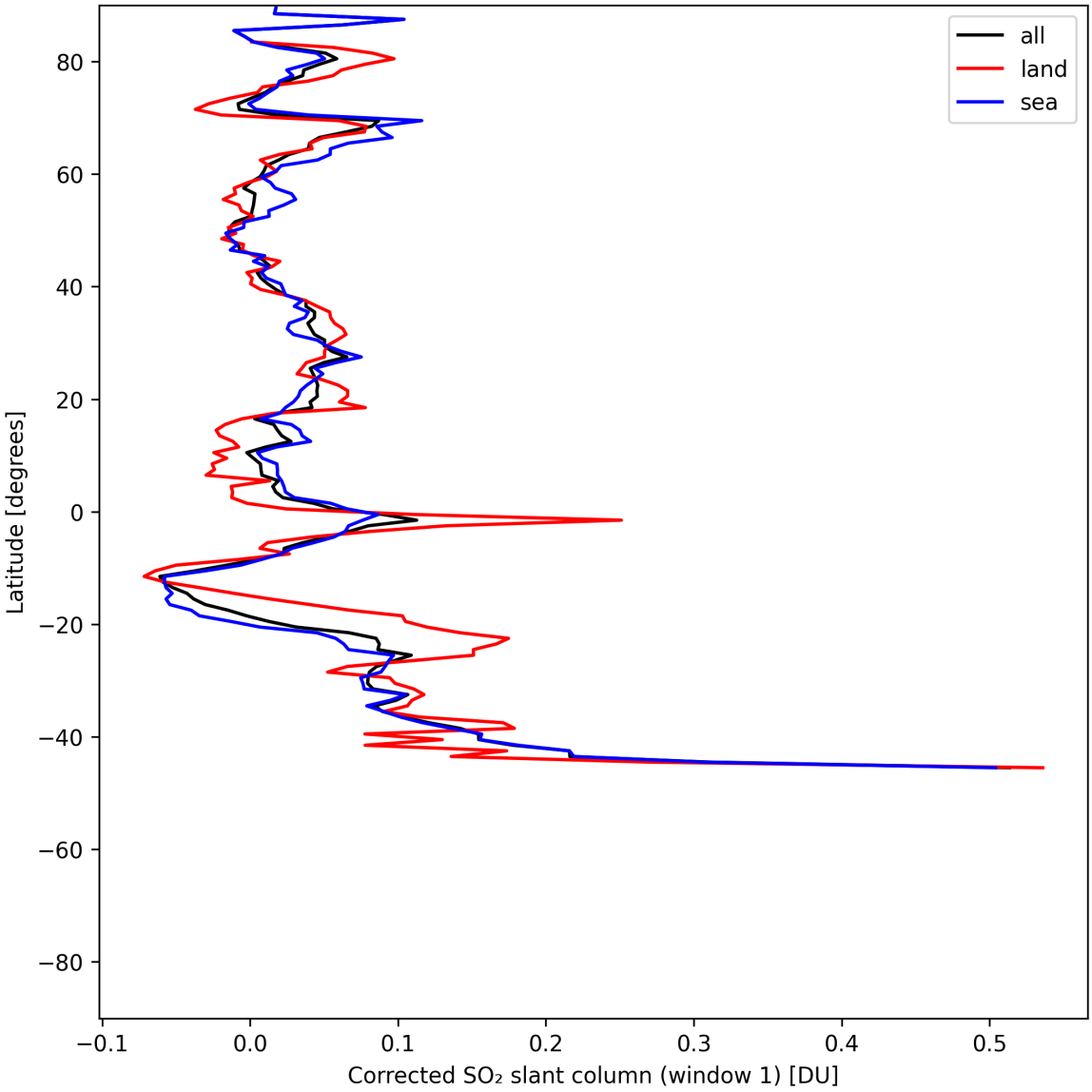


Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-06-09 to 2025-06-09.

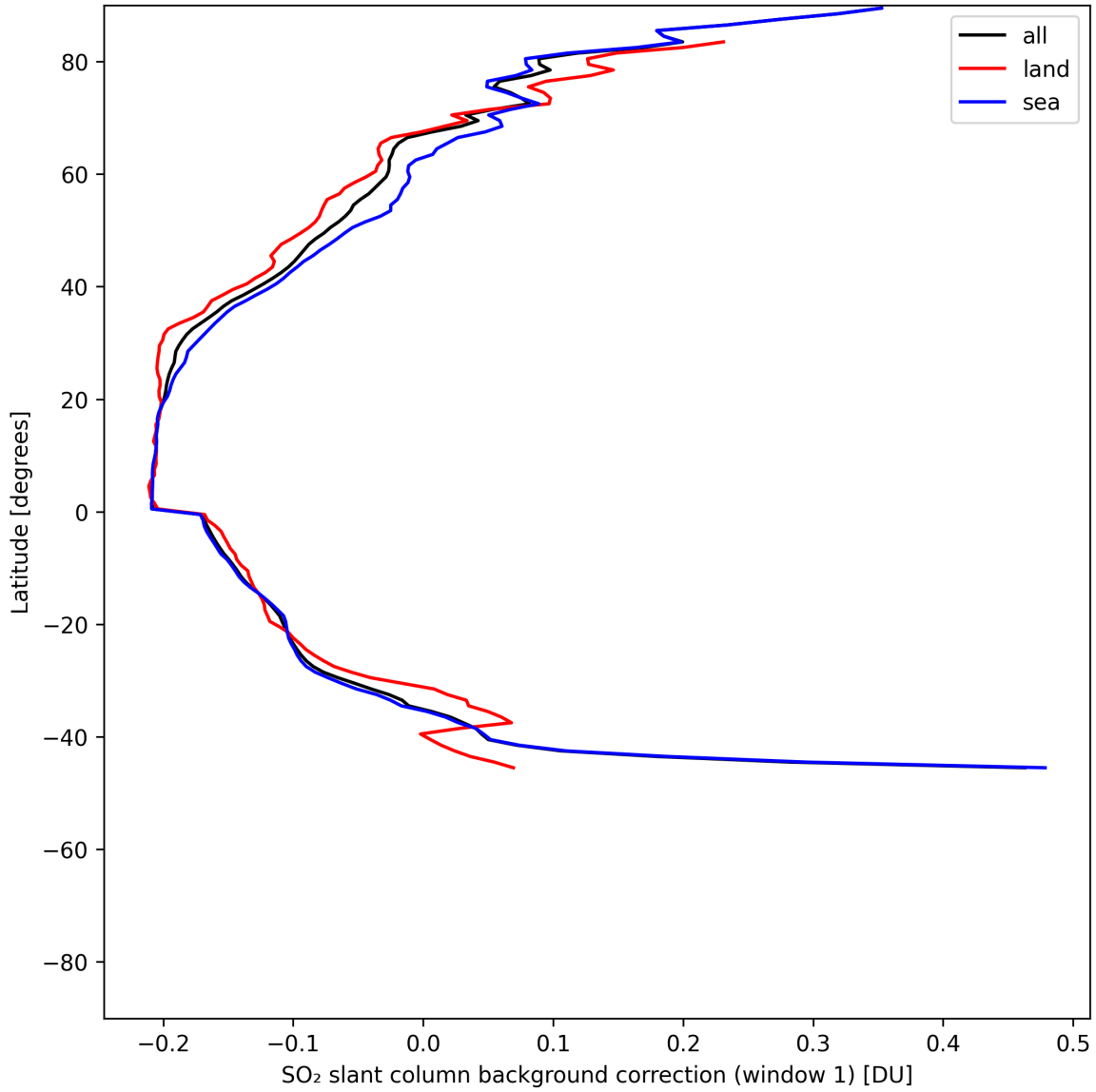


Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-06-09 to 2025-06-09.

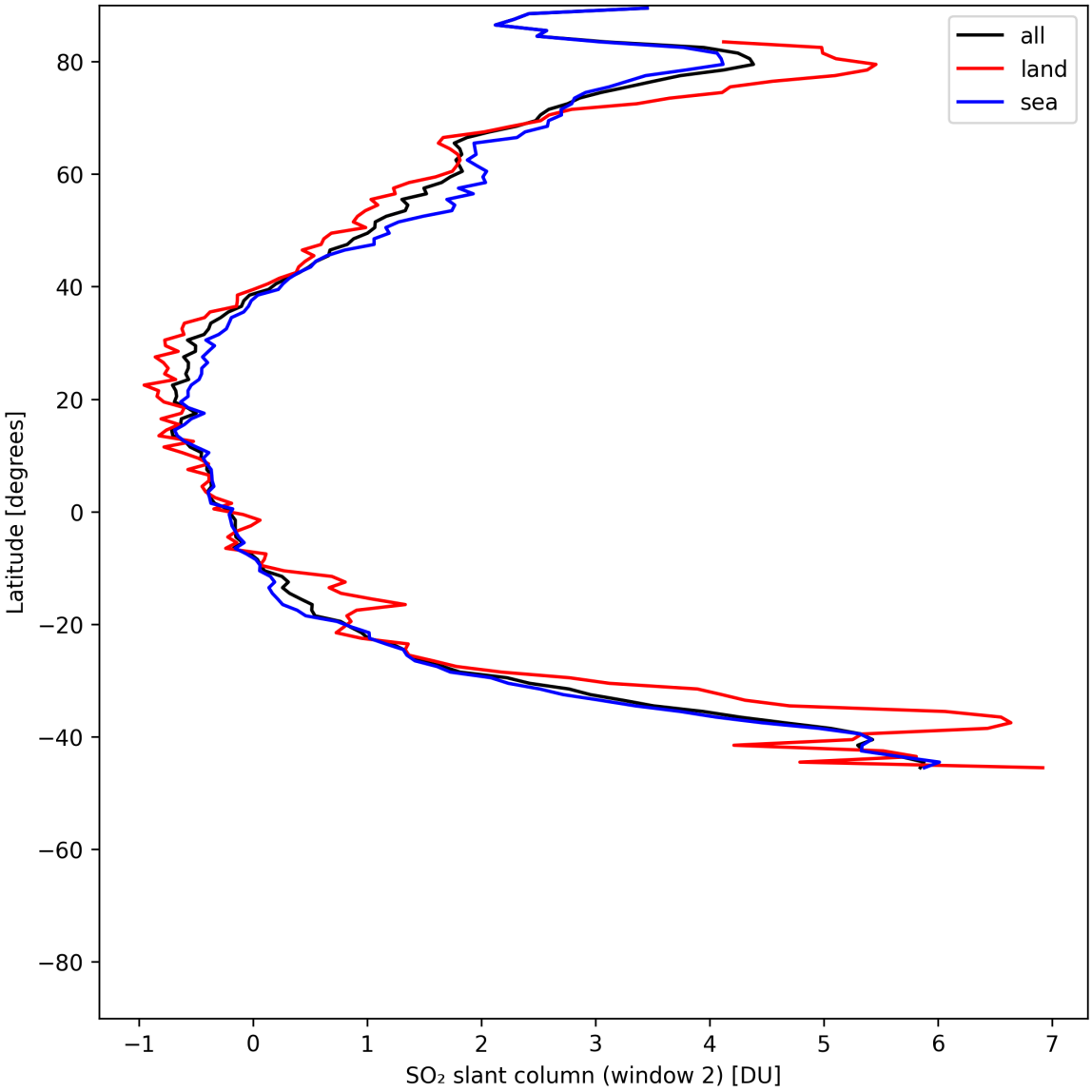


Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-06-09 to 2025-06-09.

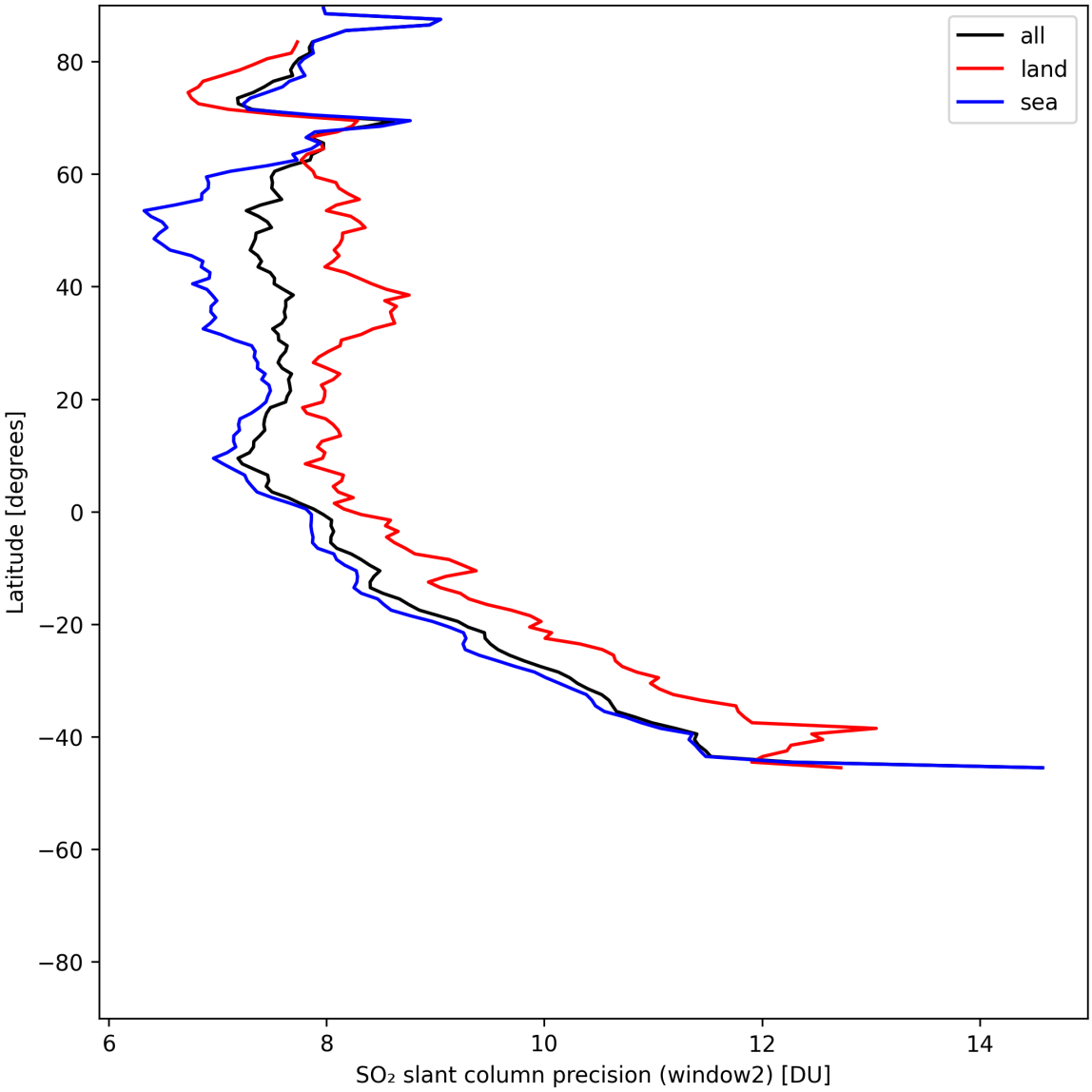


Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-06-09 to 2025-06-09.

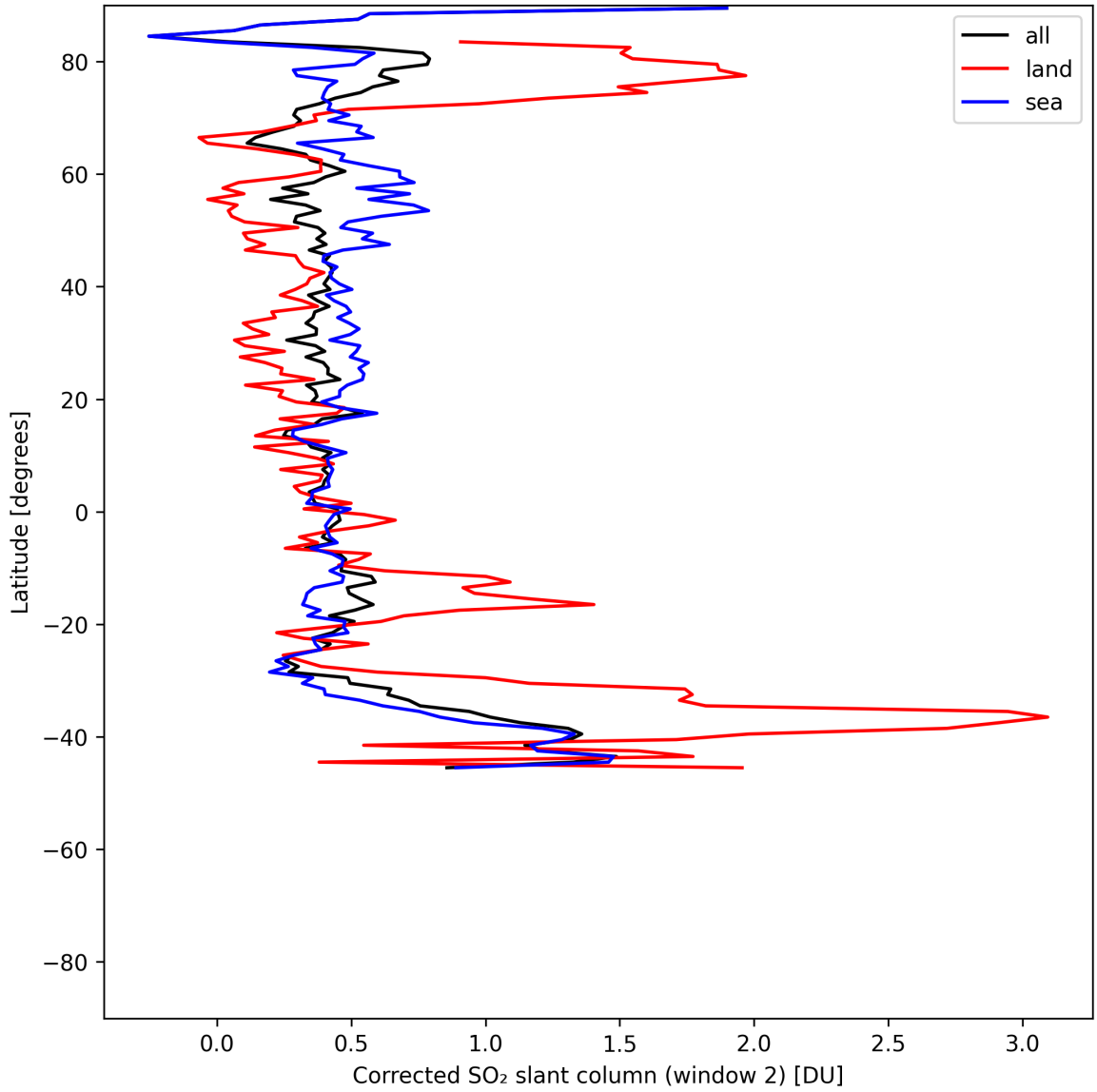


Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-06-09 to 2025-06-09.

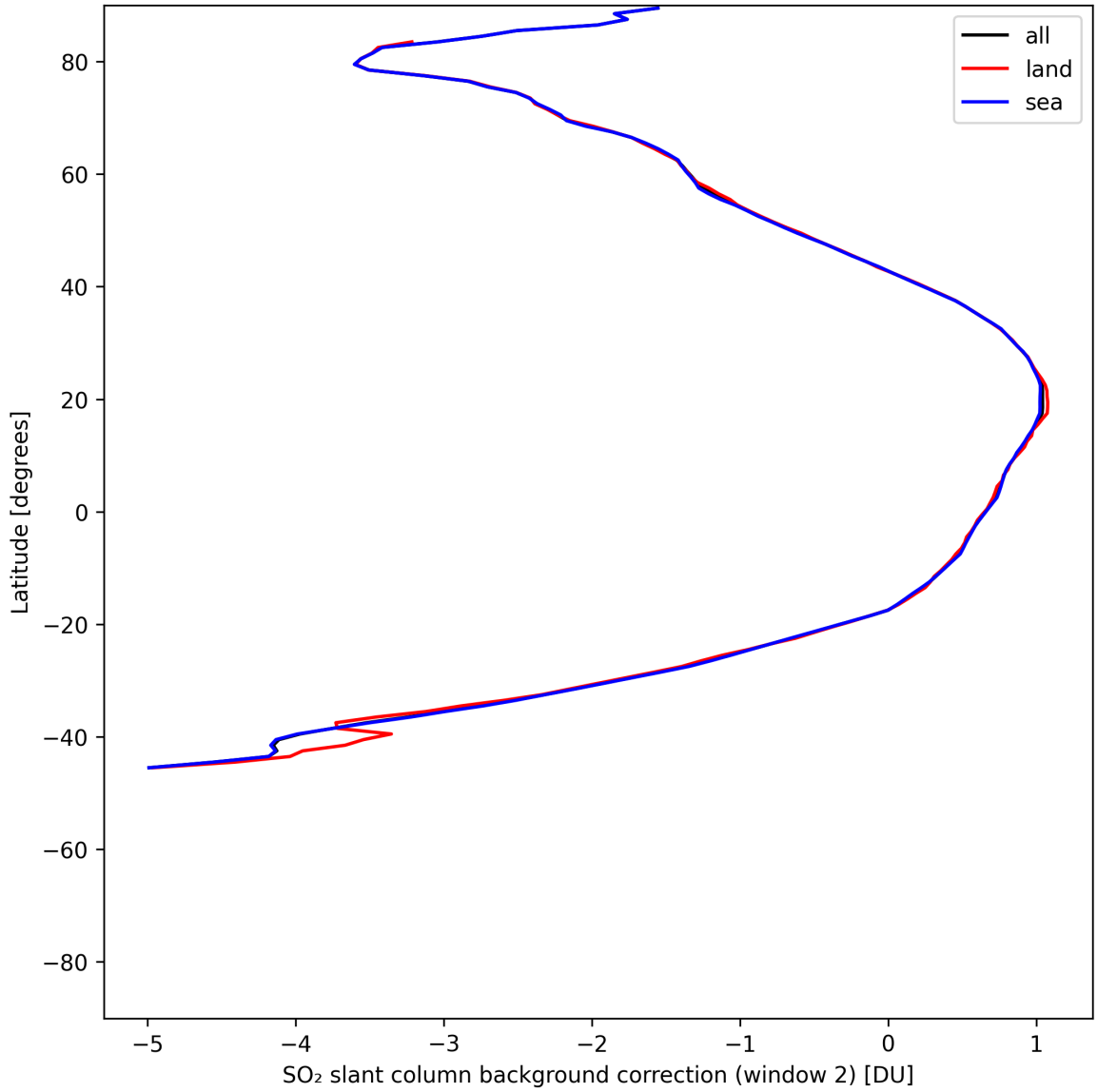


Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-06-09 to 2025-06-09.

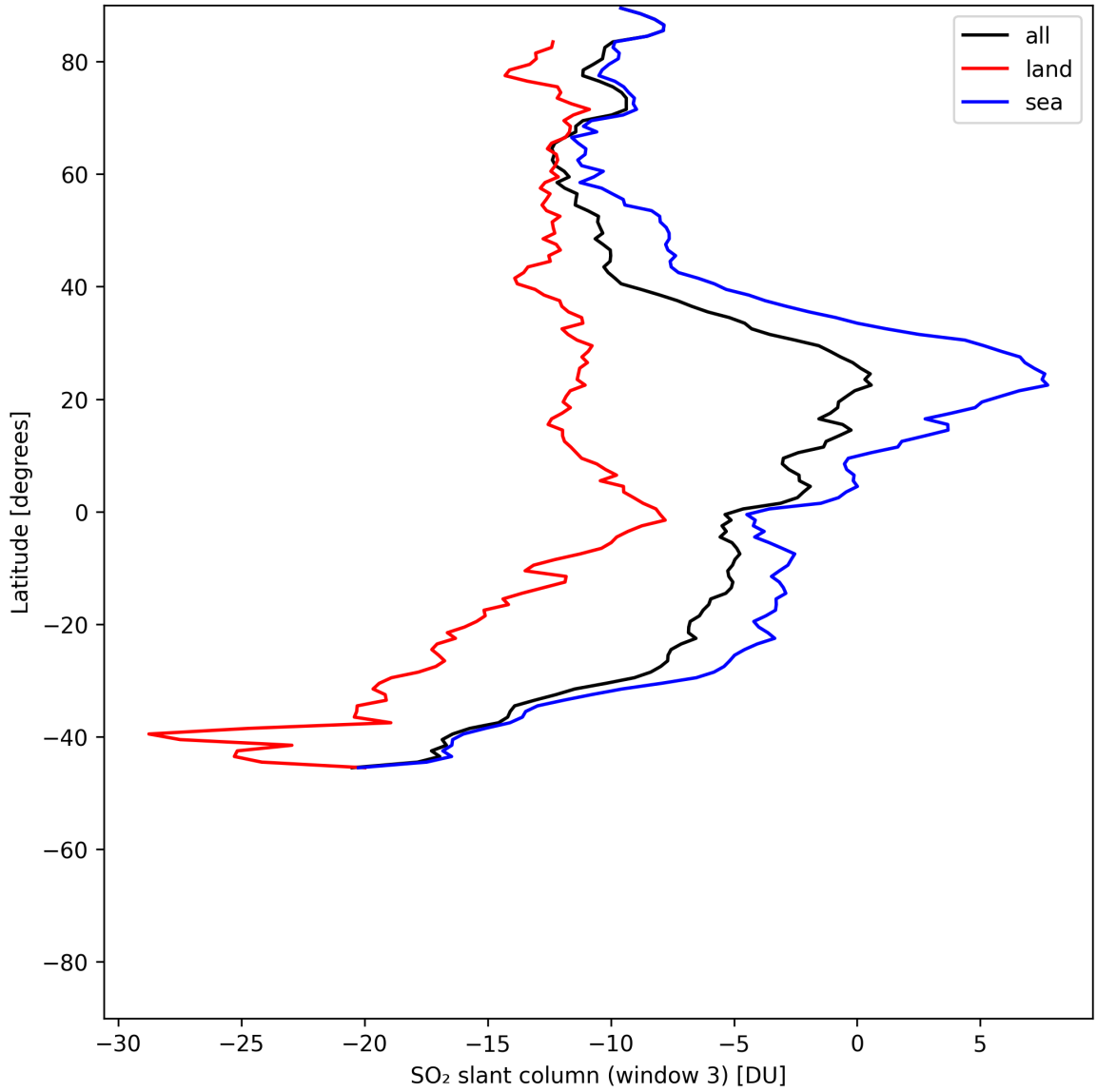


Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-06-09 to 2025-06-09.

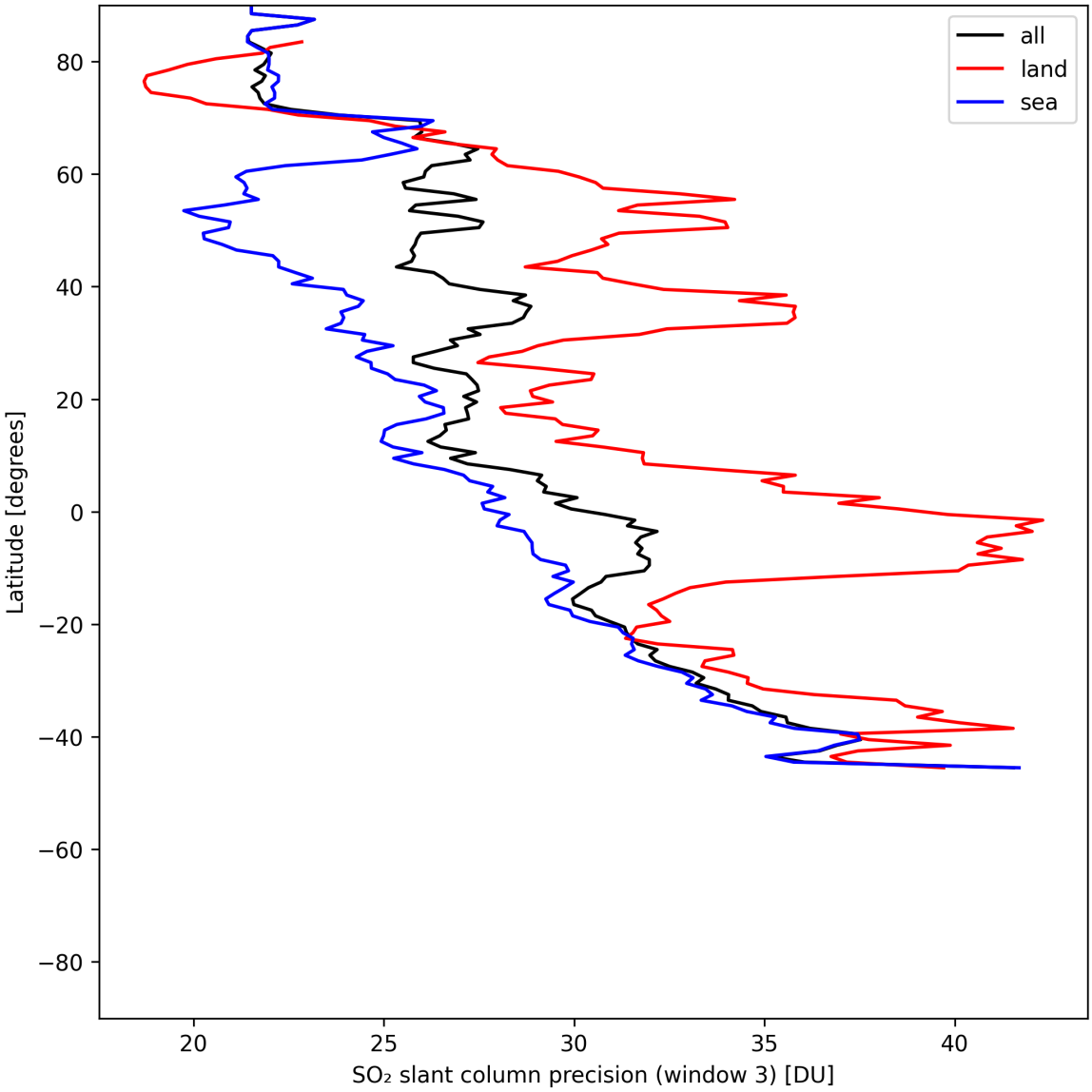


Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-06-09 to 2025-06-09.

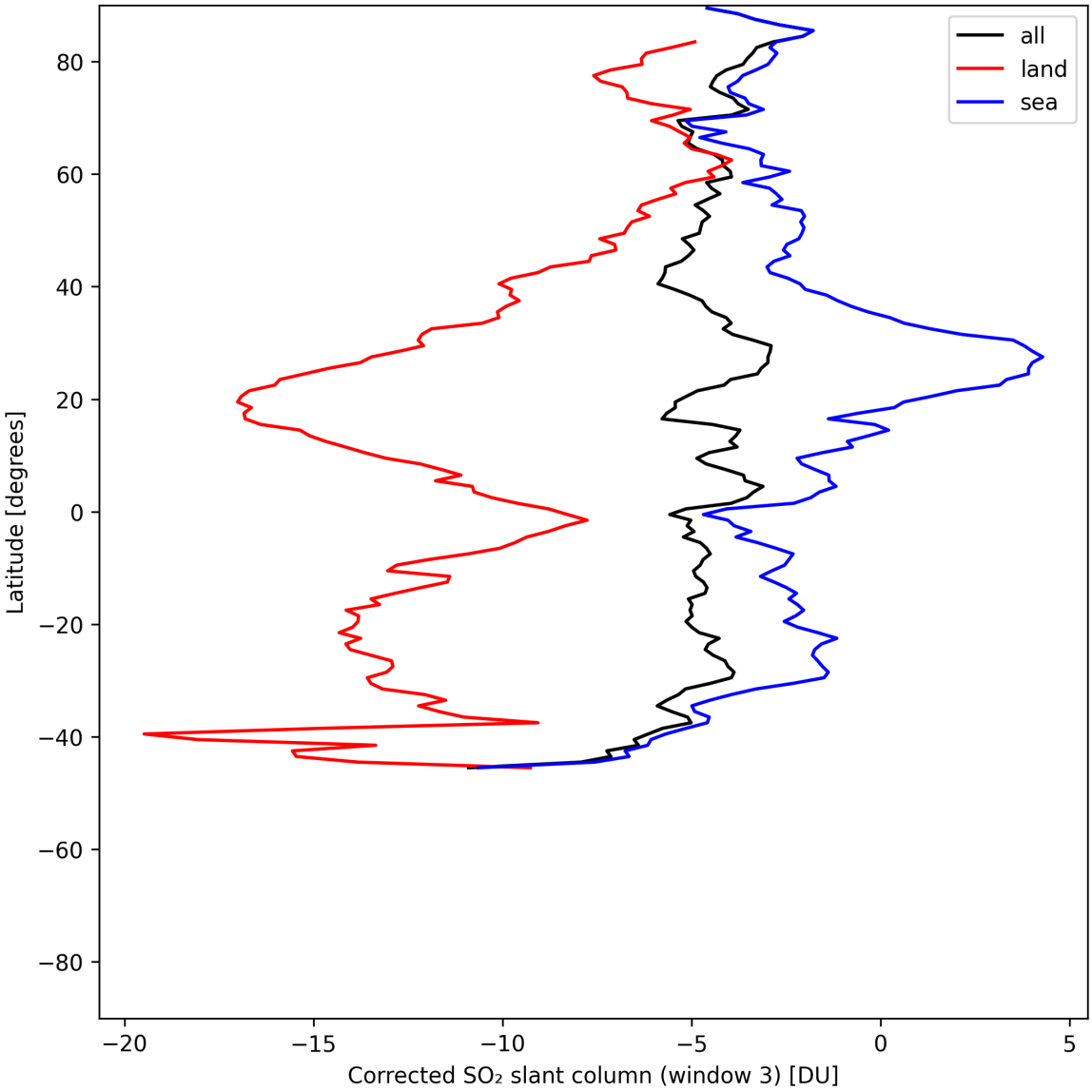


Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-06-09 to 2025-06-09.

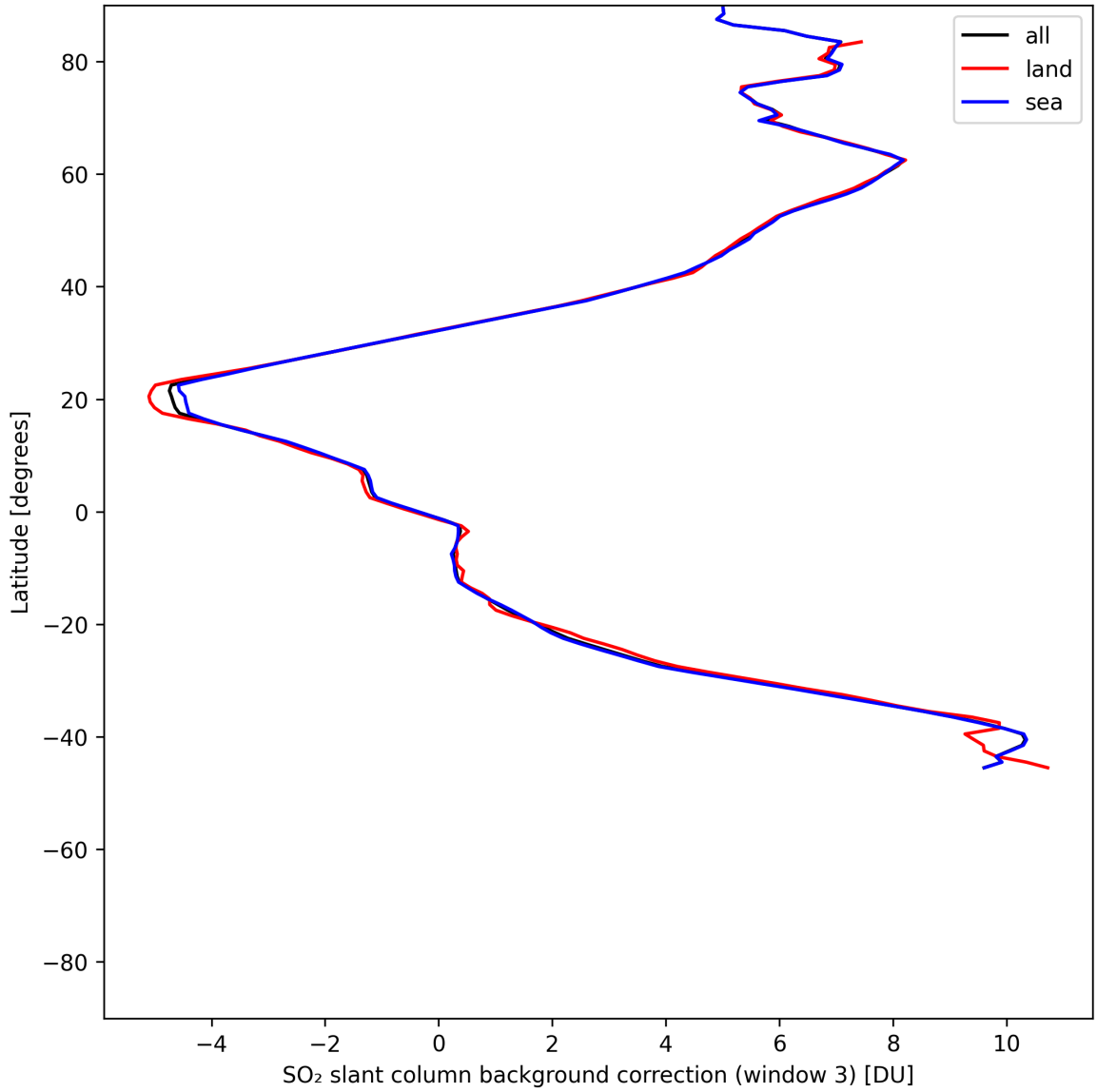


Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-06-09 to 2025-06-09.

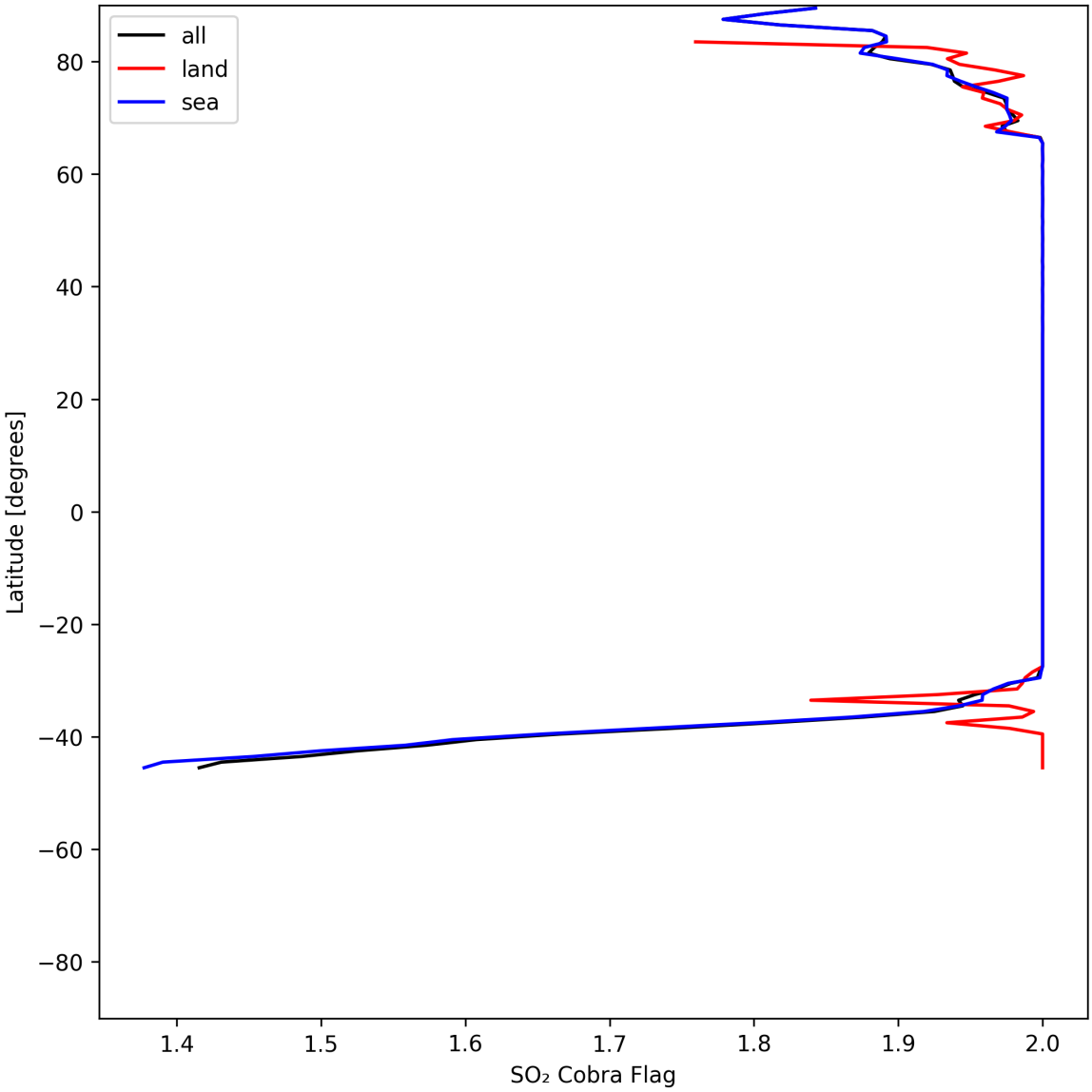


Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-06-09 to 2025-06-09.

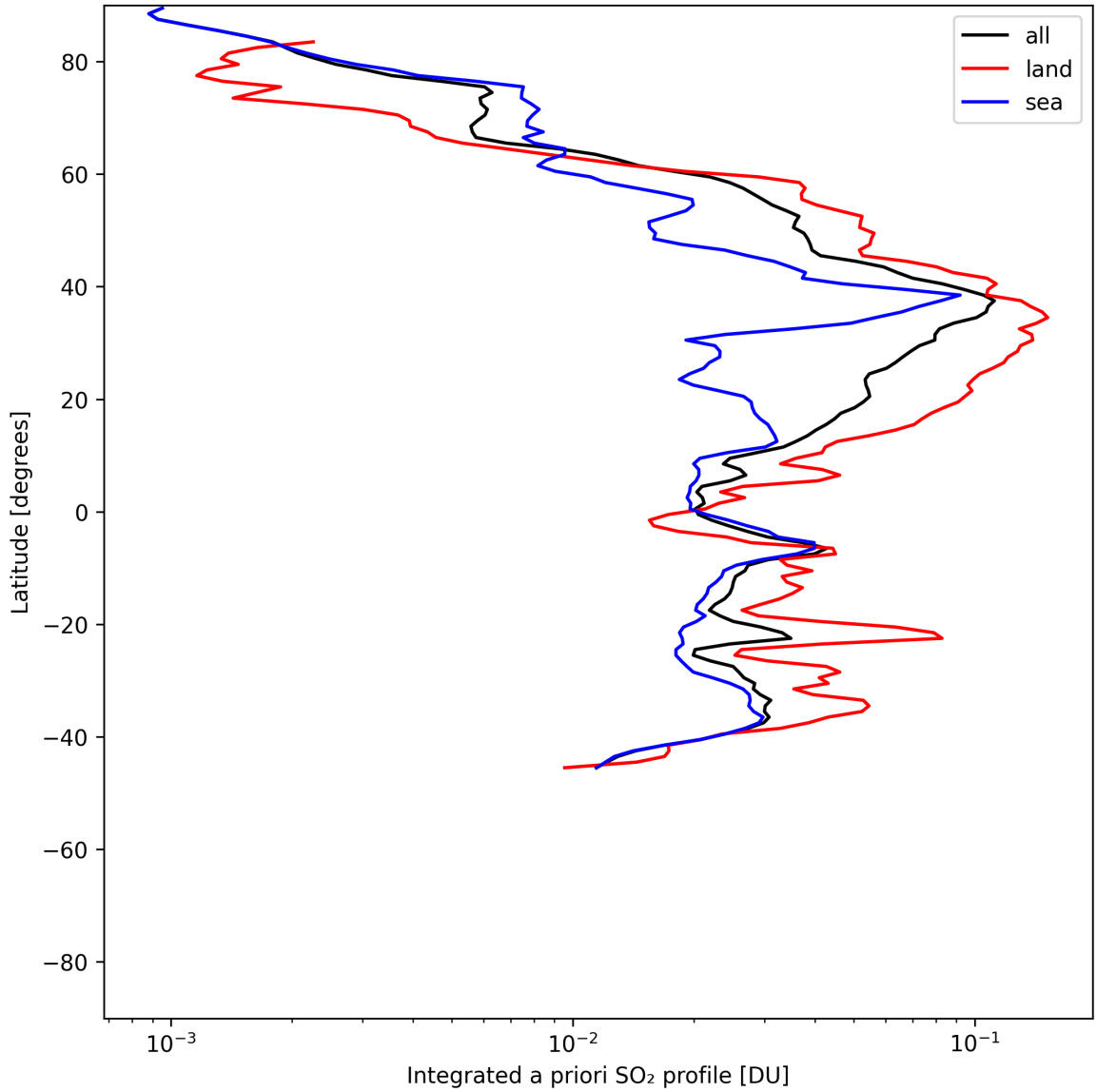


Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-06-09 to 2025-06-09.

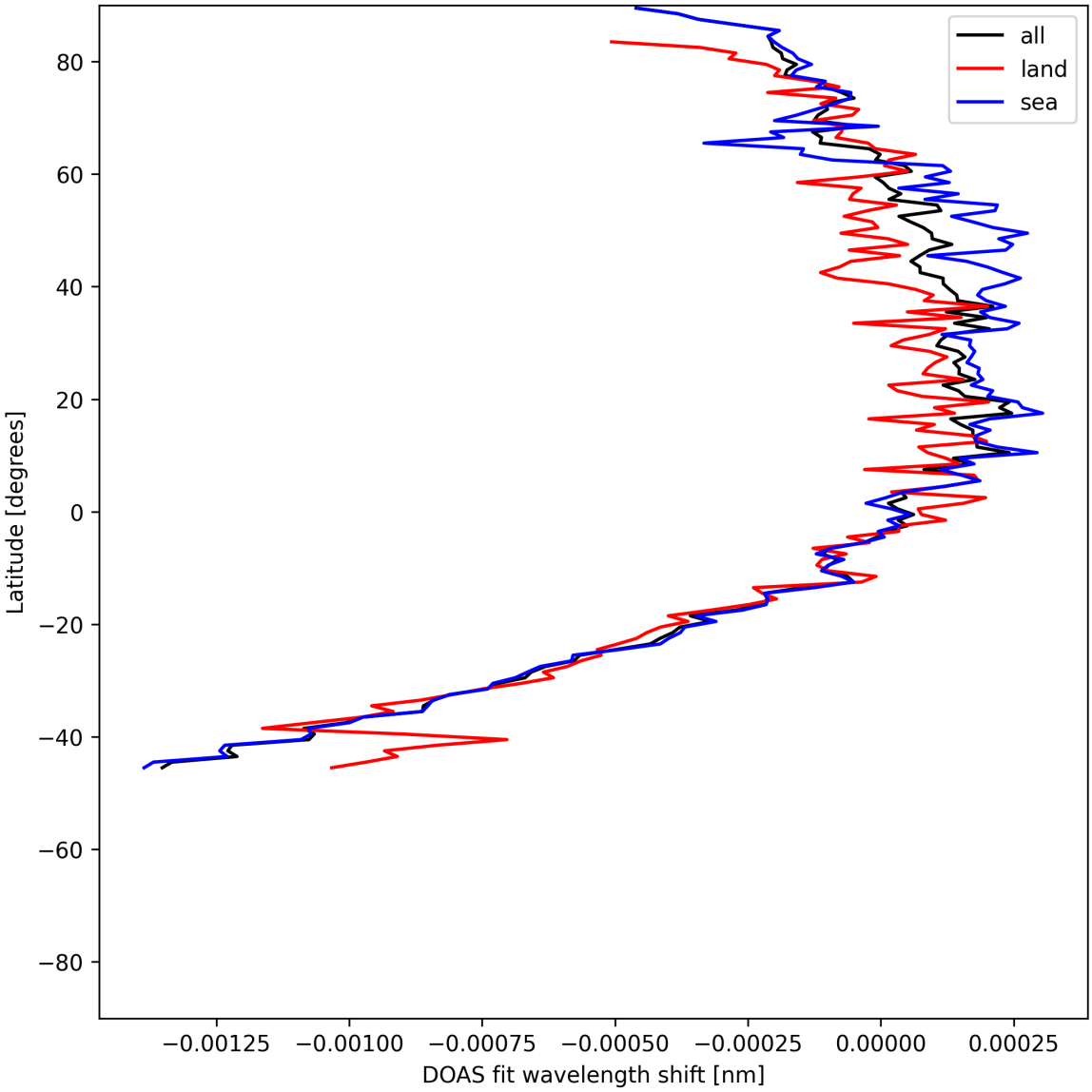


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-06-09 to 2025-06-09.

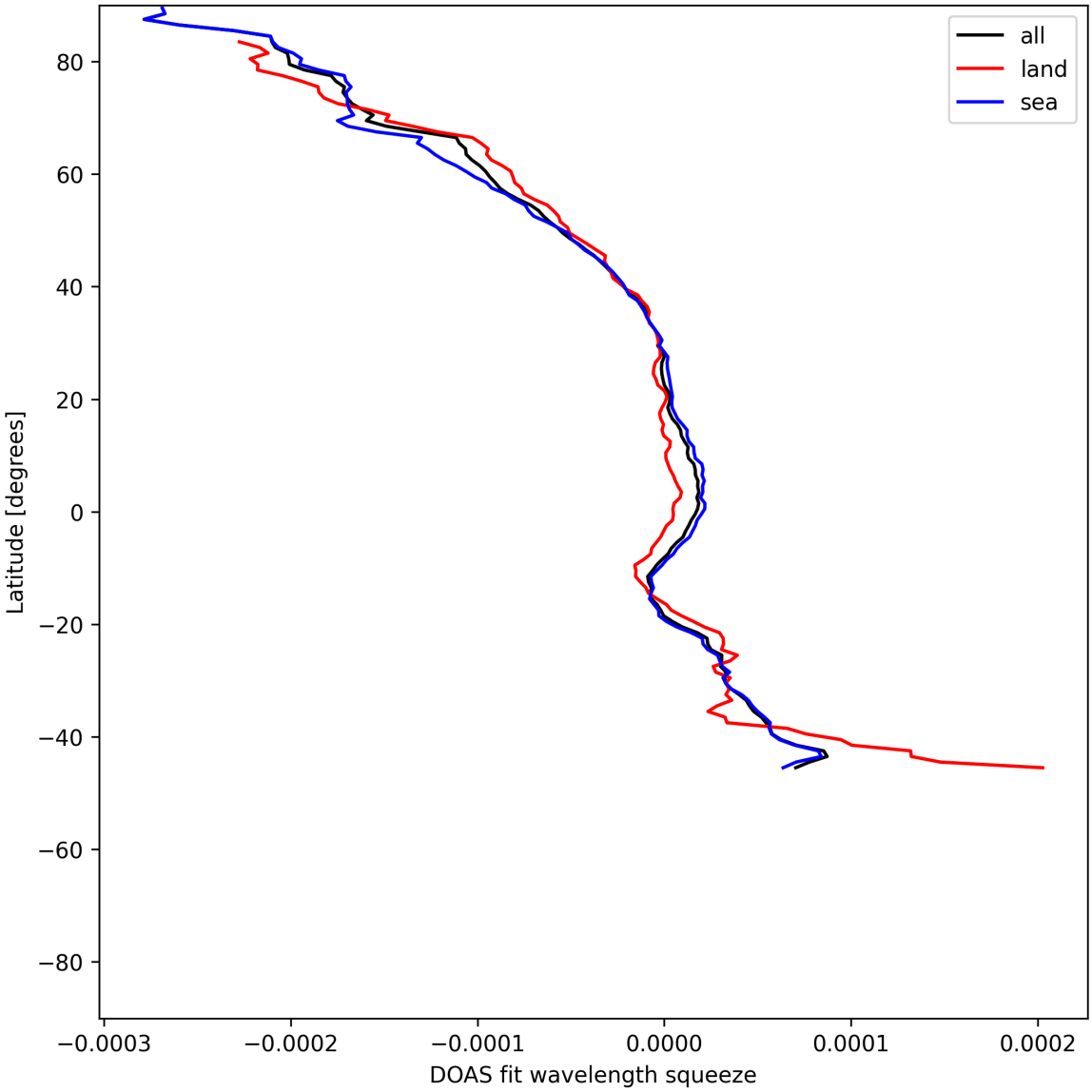


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-06-09 to 2025-06-09.

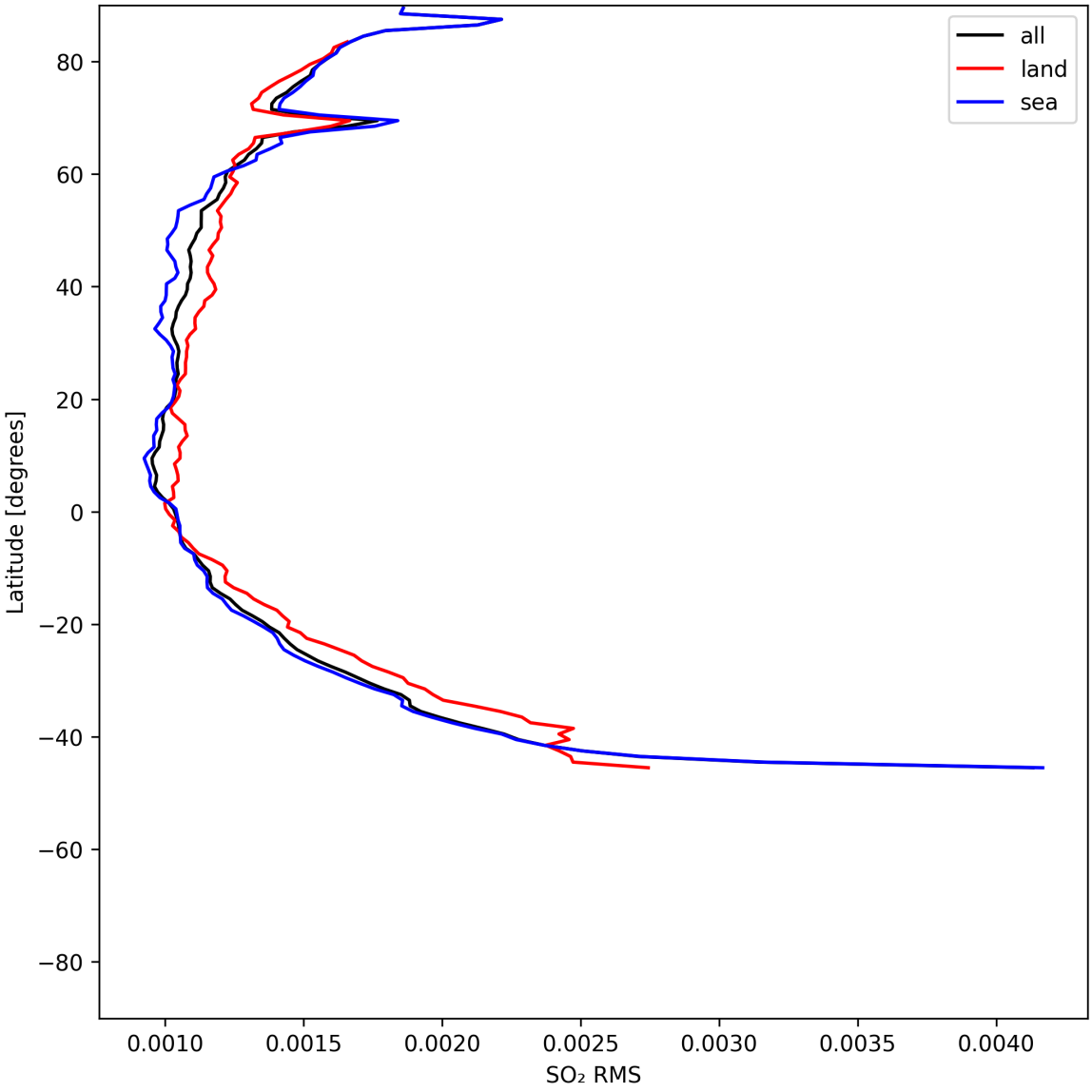


Figure 52: Zonal average of "SO_2 RMS" for 2025-06-09 to 2025-06-09.

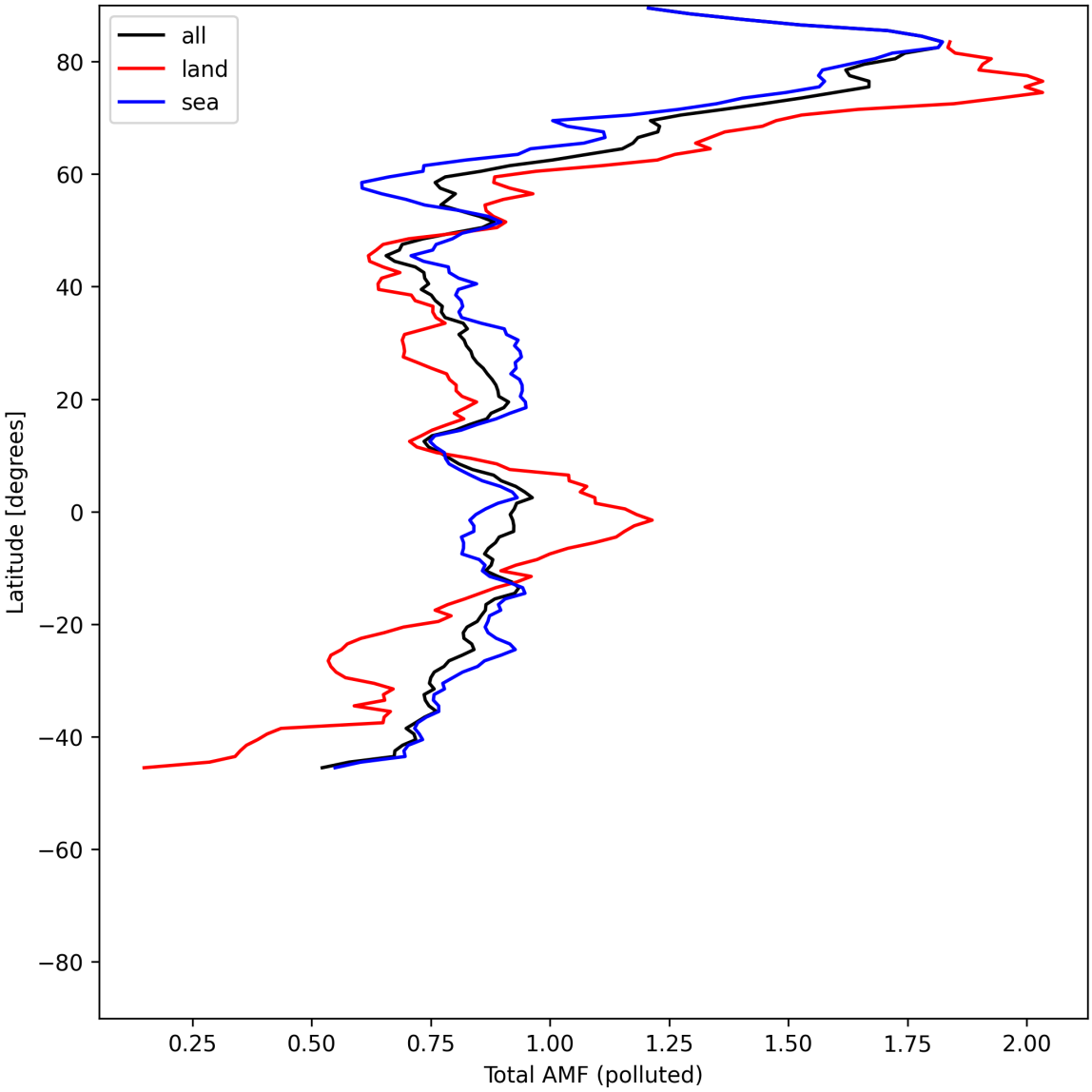


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-06-09 to 2025-06-09.

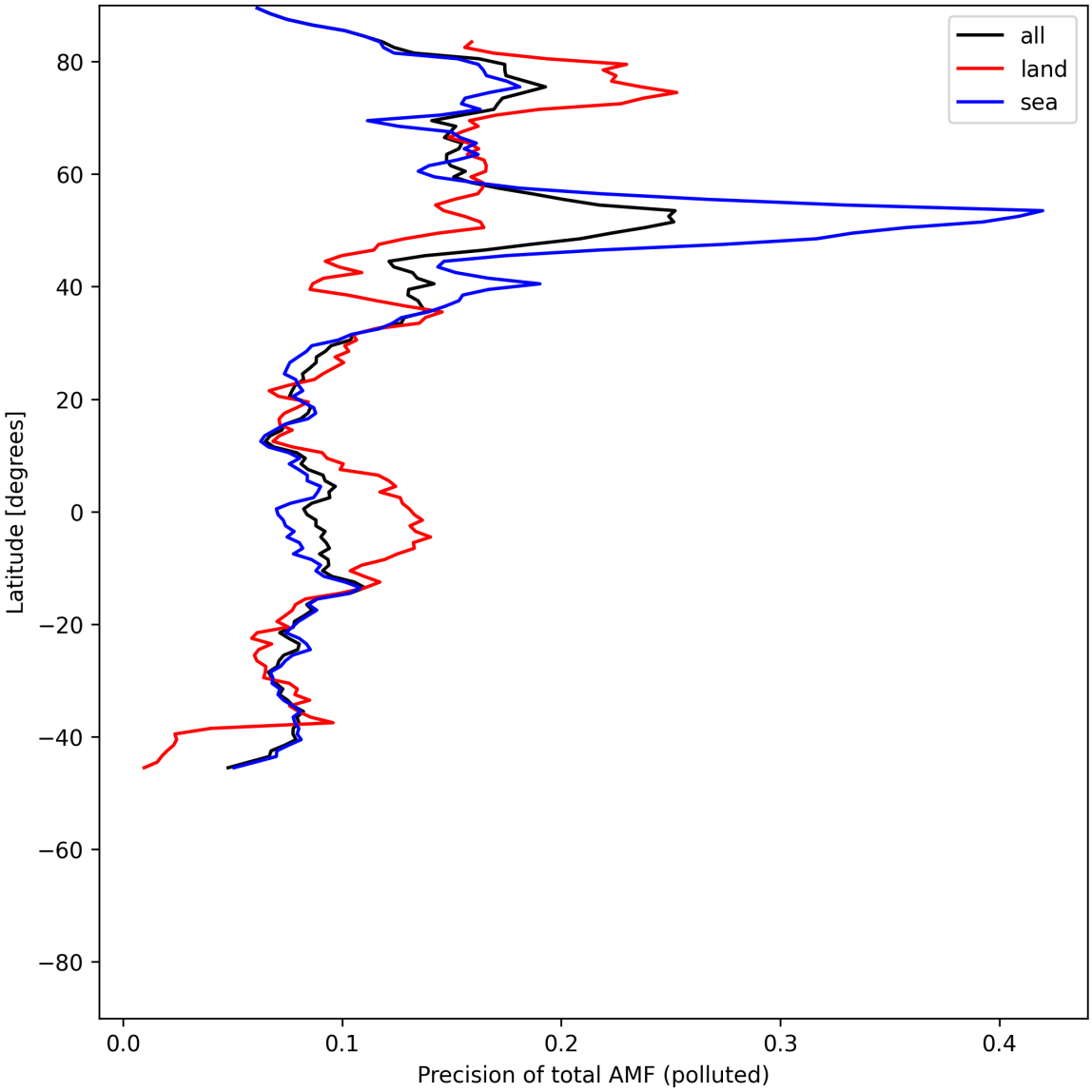


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-06-09 to 2025-06-09.

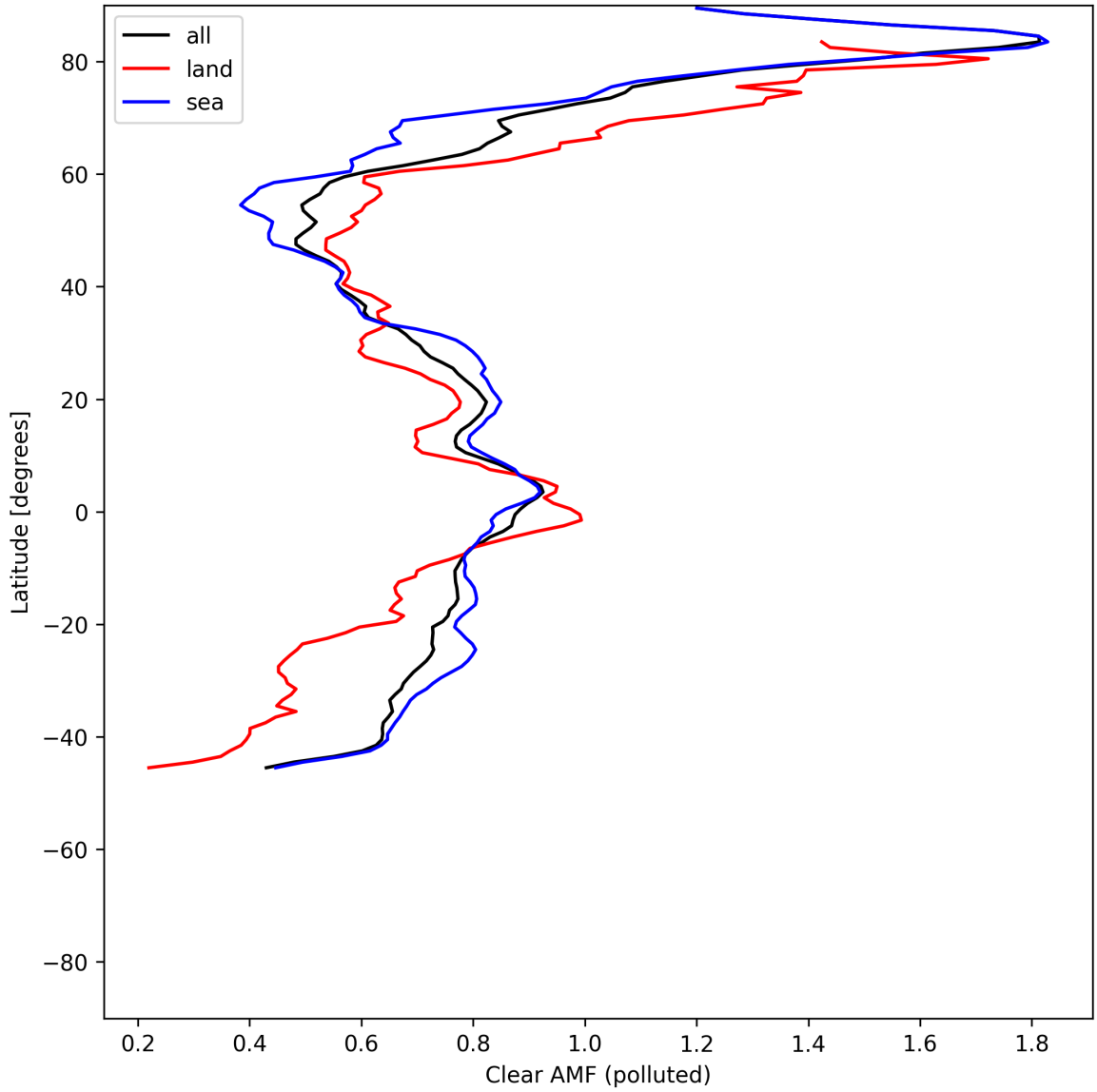


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-06-09 to 2025-06-09.

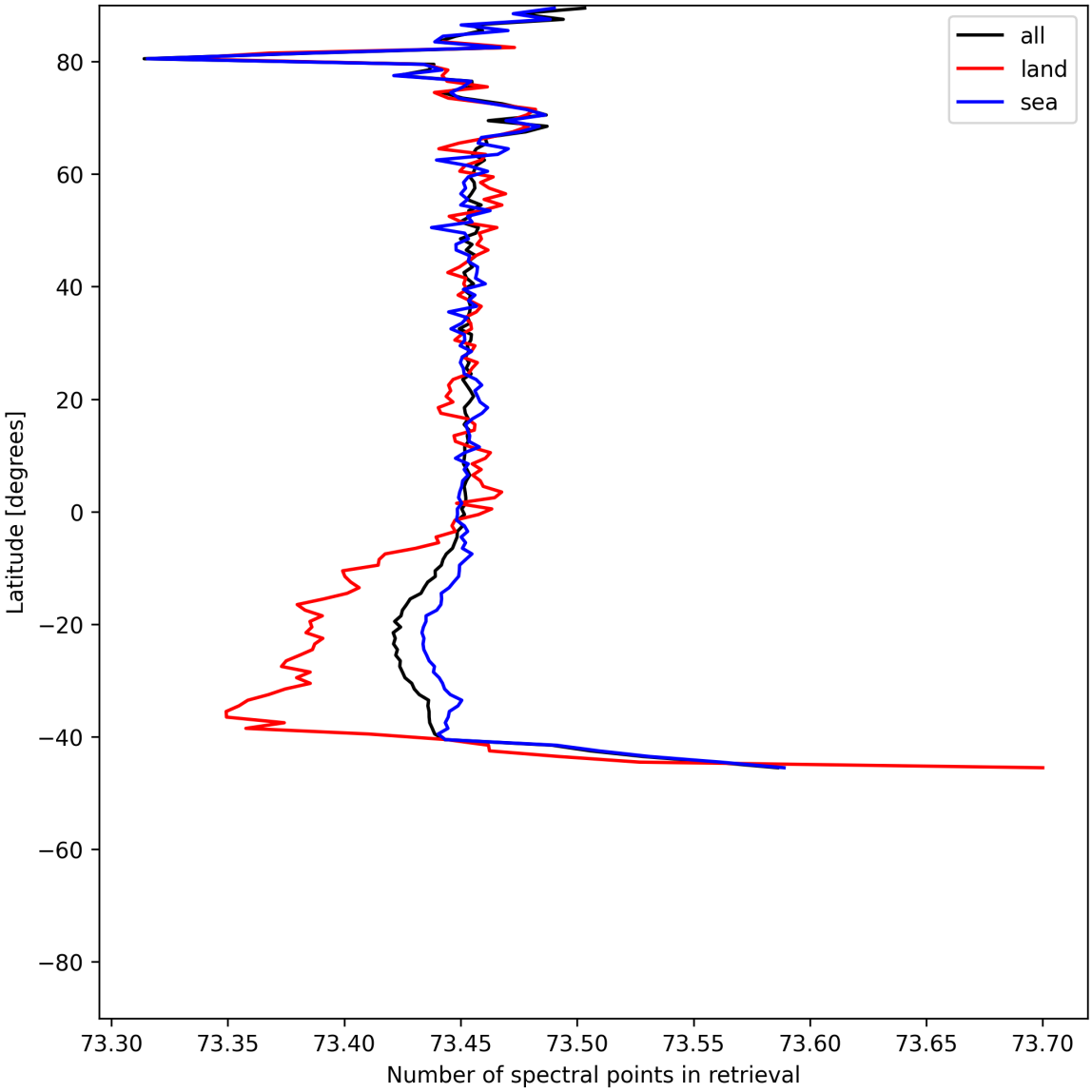


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-06-09 to 2025-06-09.

8 Histograms

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

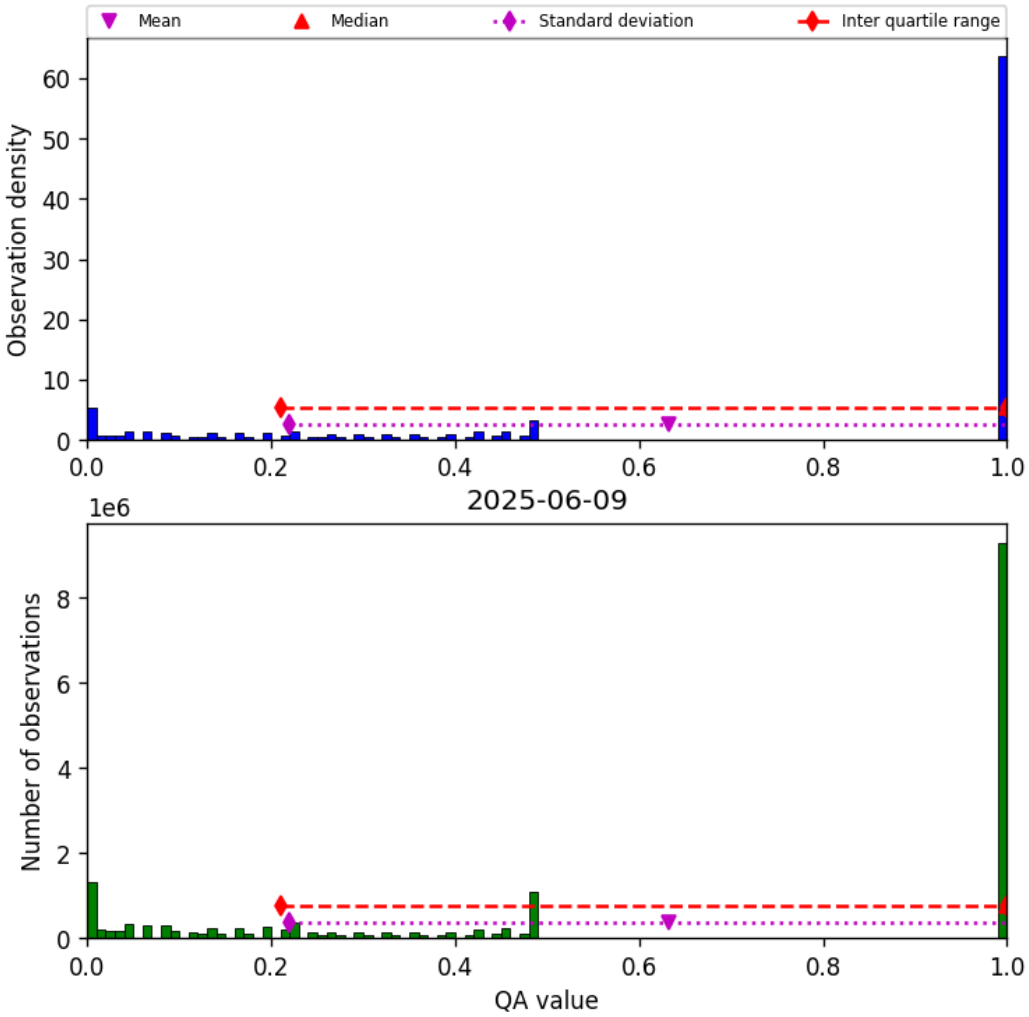


Figure 57: Histogram of “QA value” for 2025-06-09 to 2025-06-09

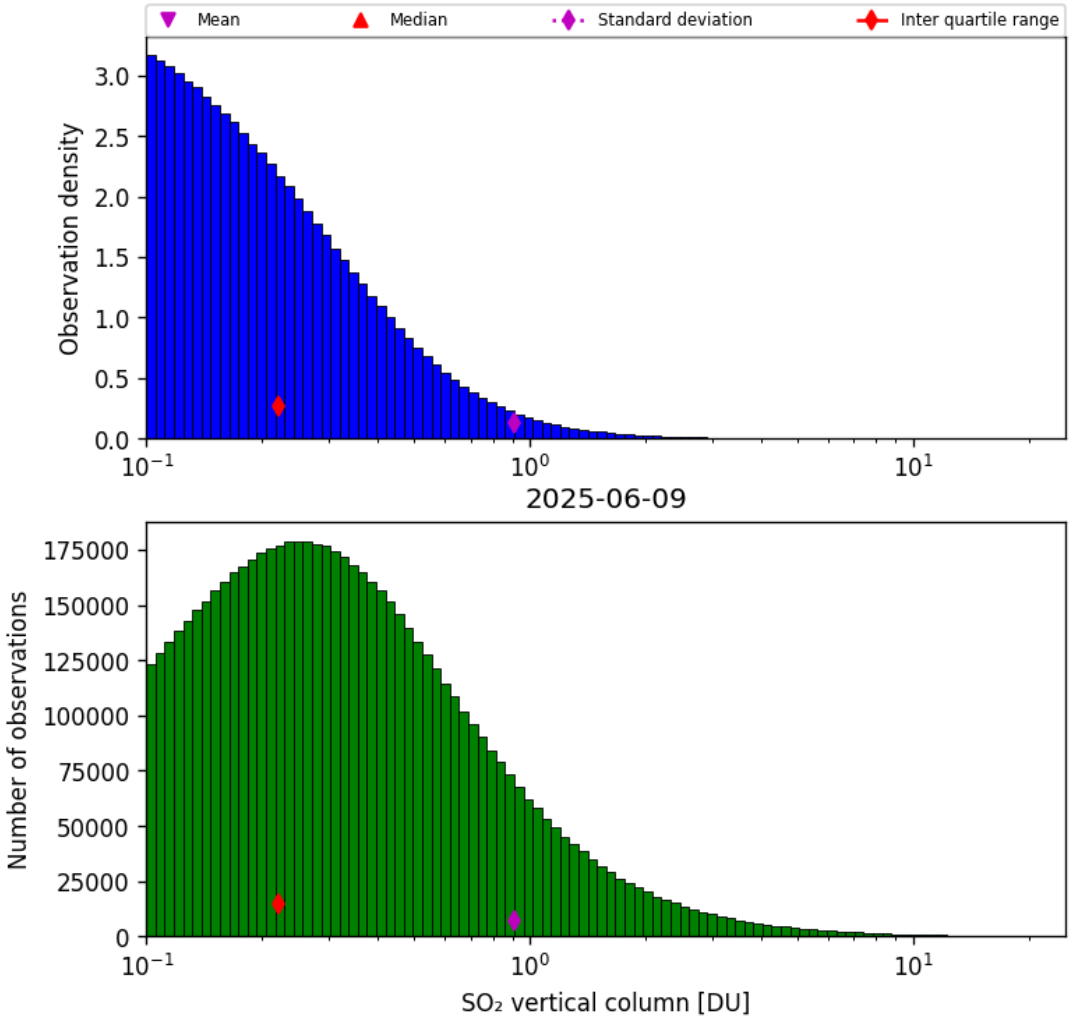


Figure 58: Histogram of "SO_2 vertical column" for 2025-06-09 to 2025-06-09

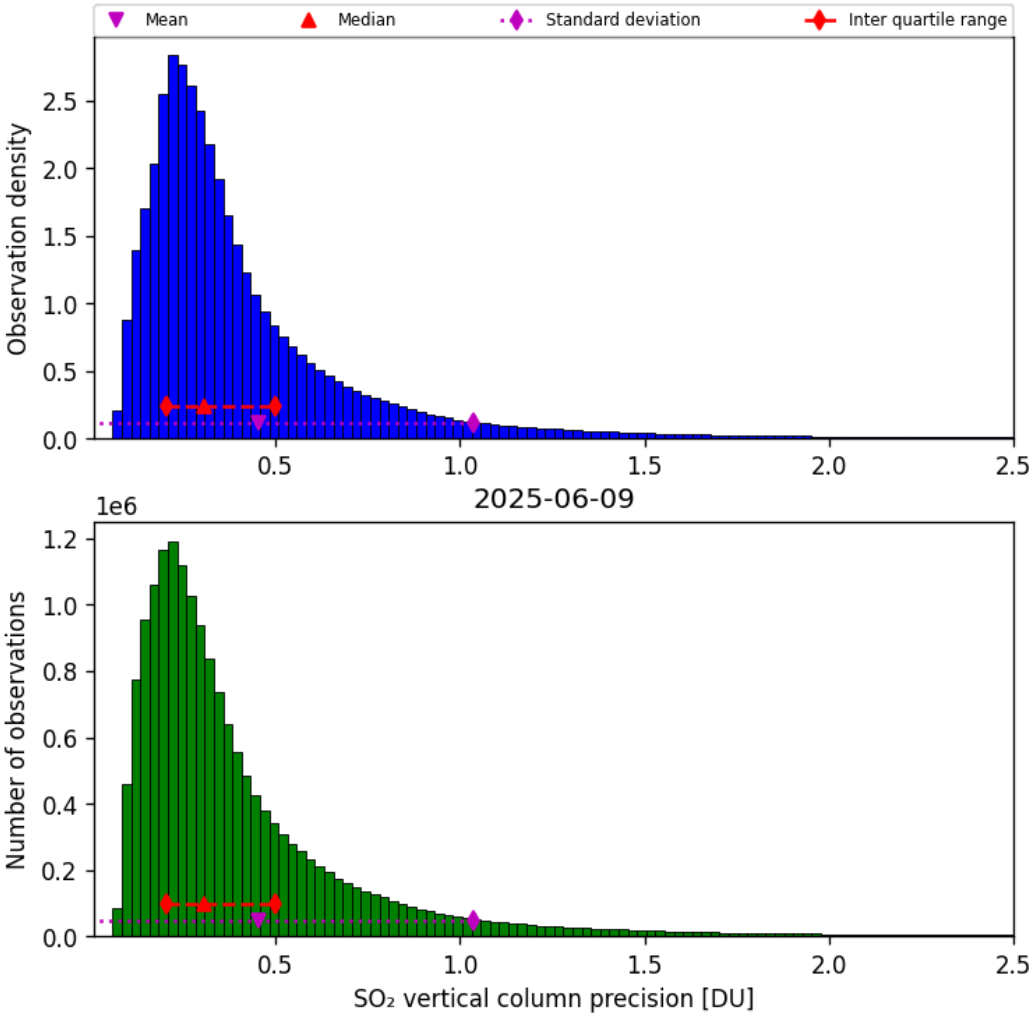


Figure 59: Histogram of "SO_2 vertical column precision" for 2025-06-09 to 2025-06-09

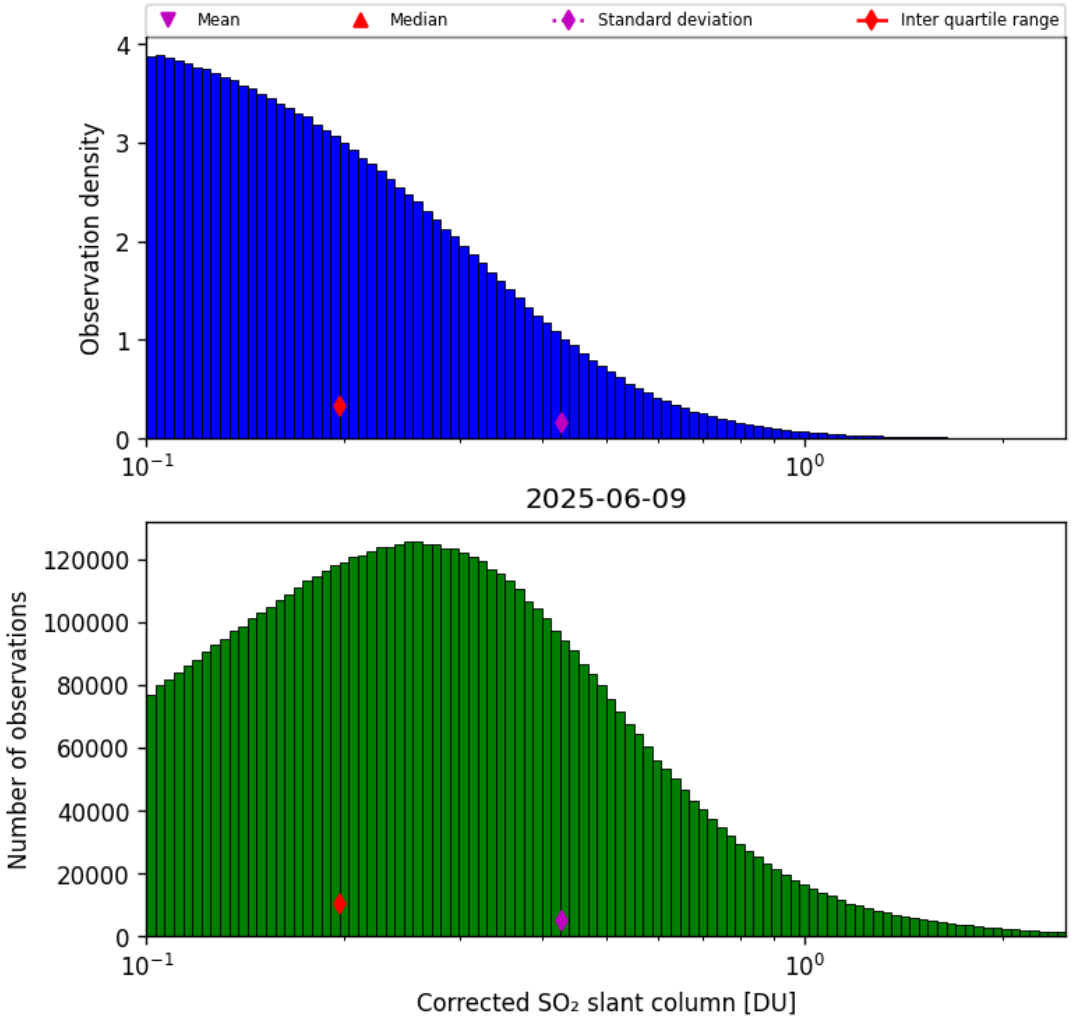


Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-06-09 to 2025-06-09

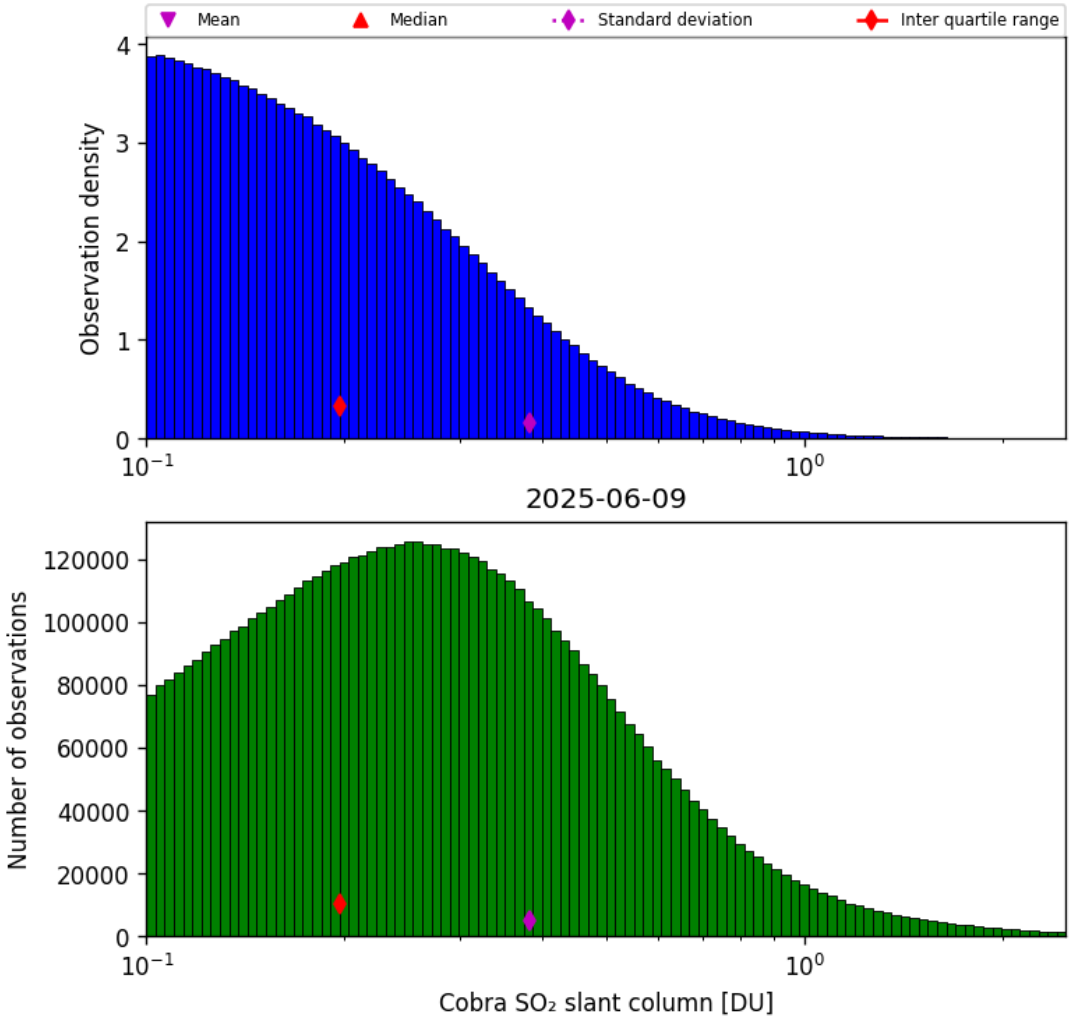


Figure 61: Histogram of “Cobra SO_2 slant column” for 2025-06-09 to 2025-06-09

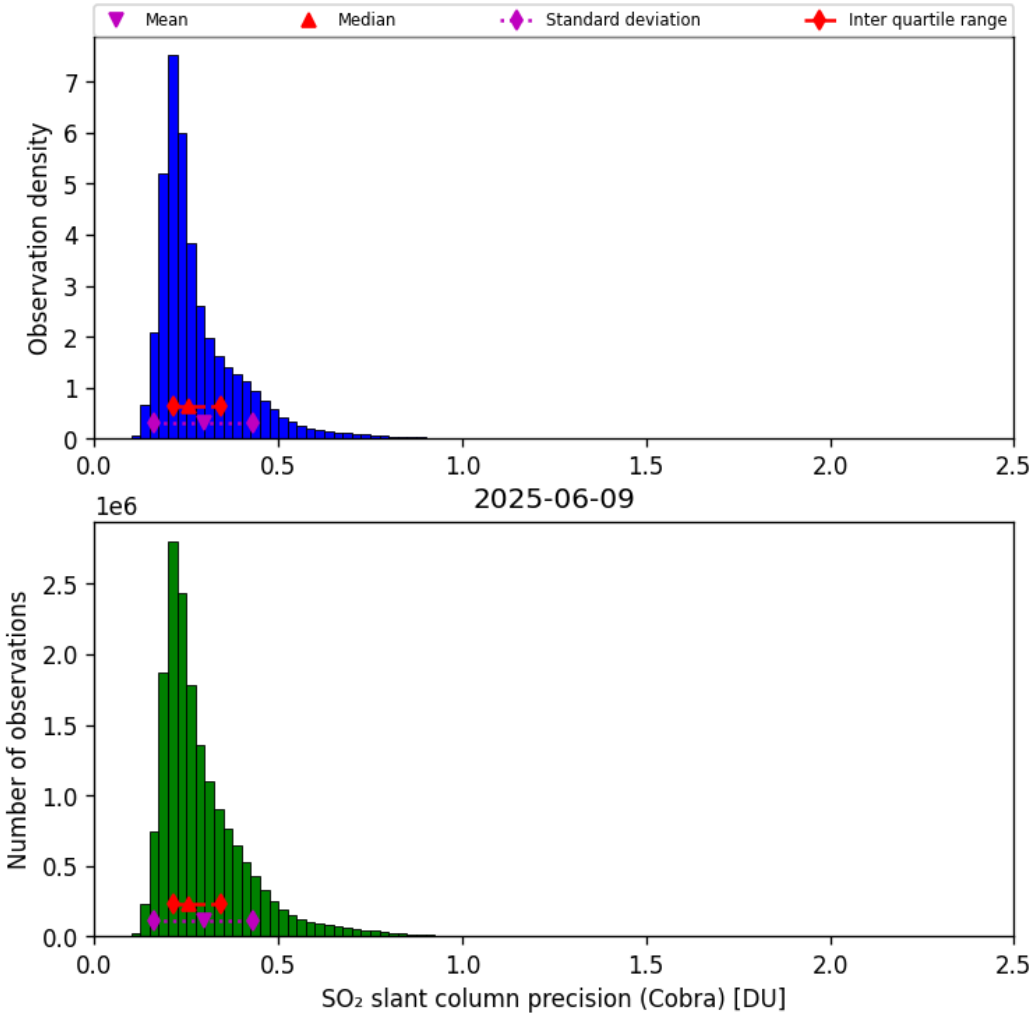


Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-06-09 to 2025-06-09

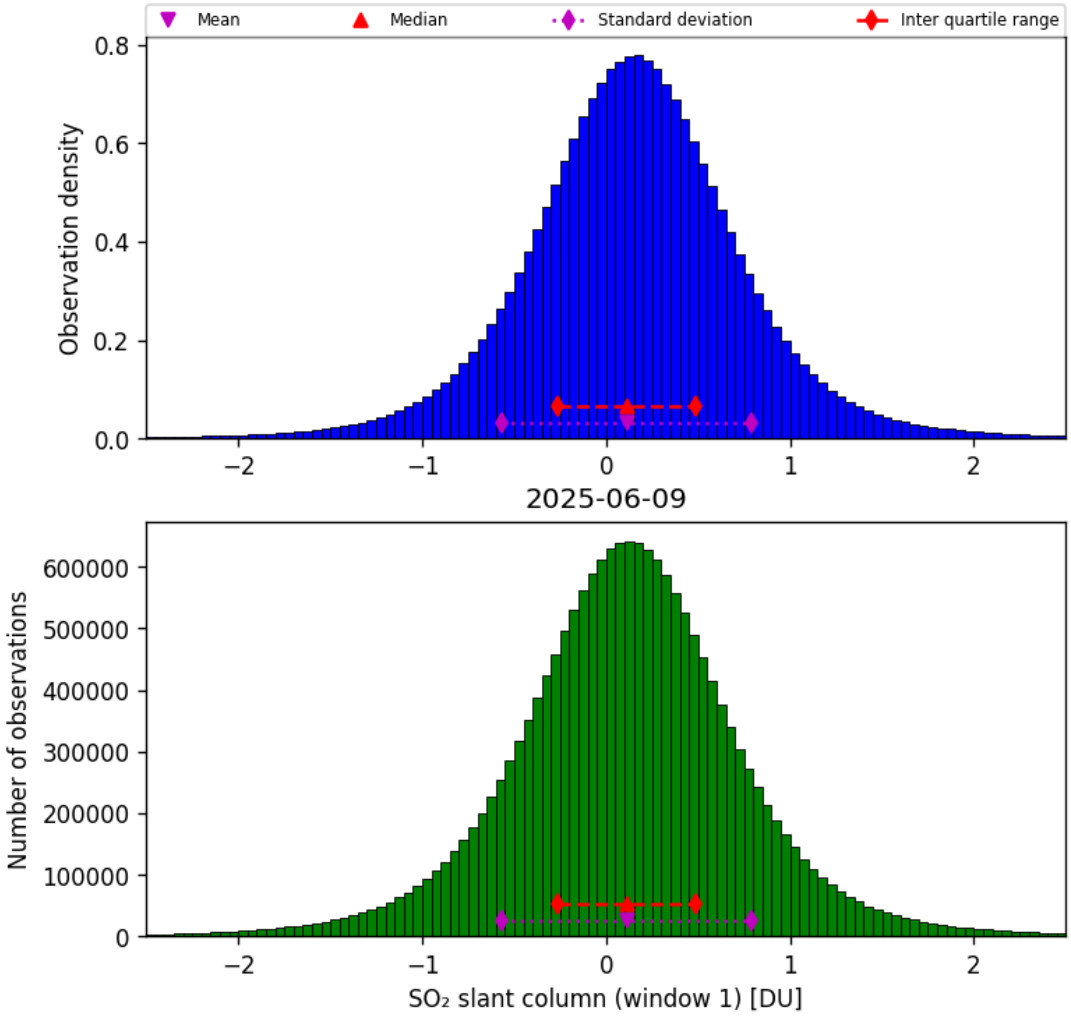


Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-06-09 to 2025-06-09

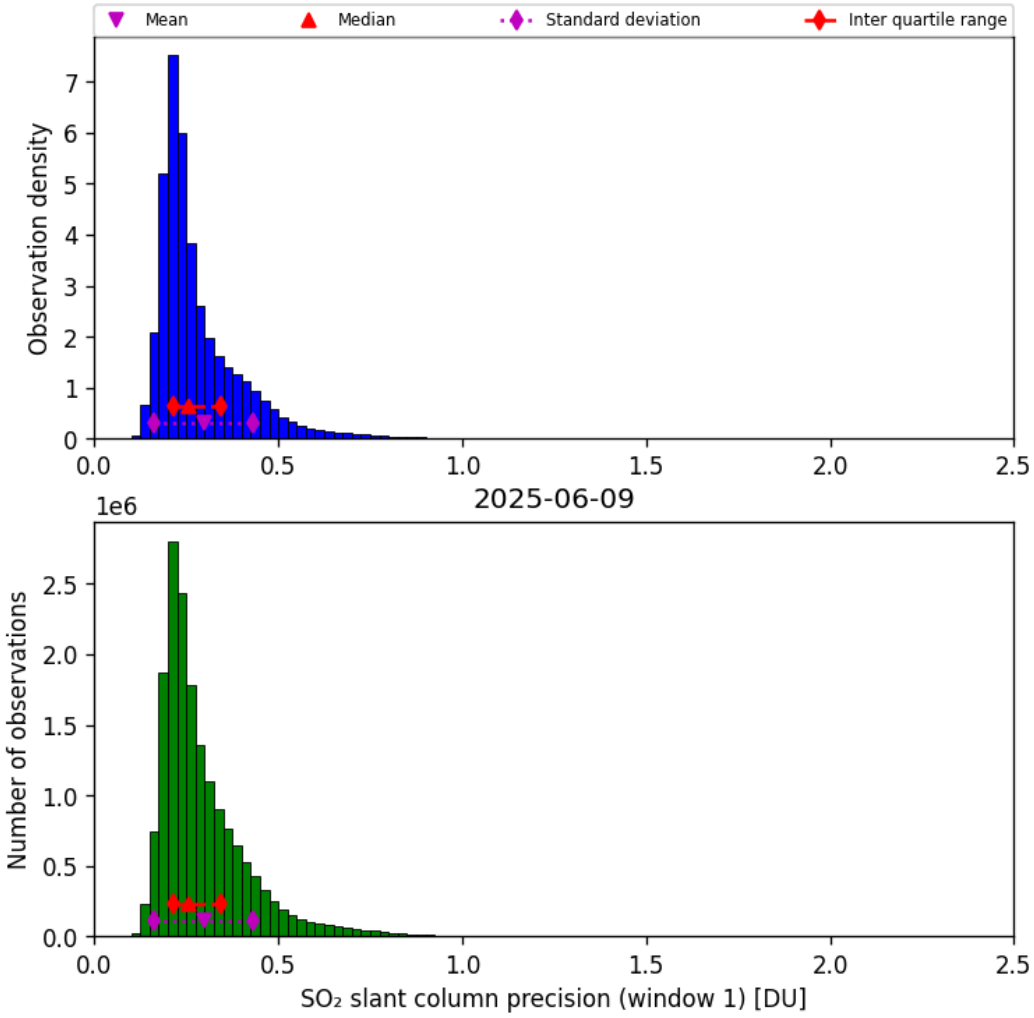


Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-06-09 to 2025-06-09

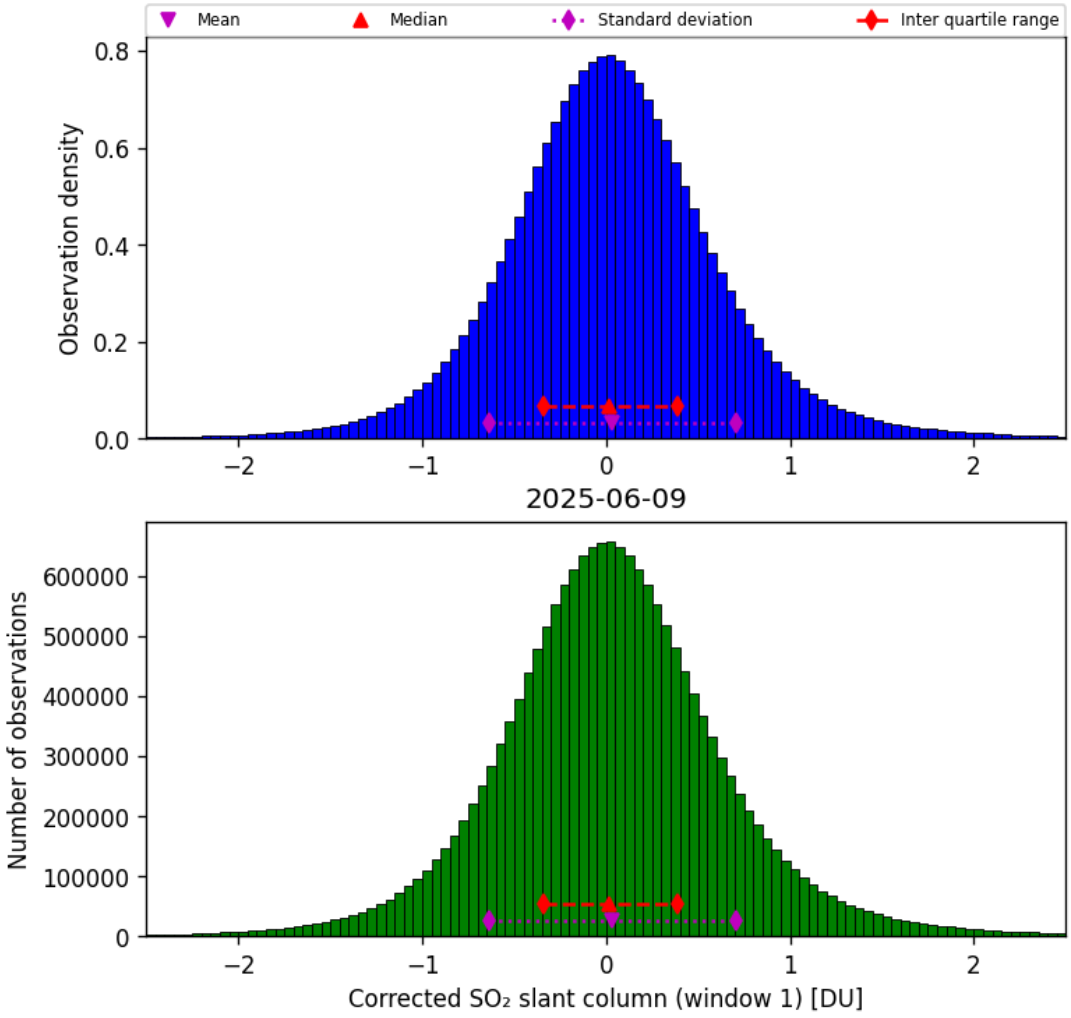


Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-06-09 to 2025-06-09

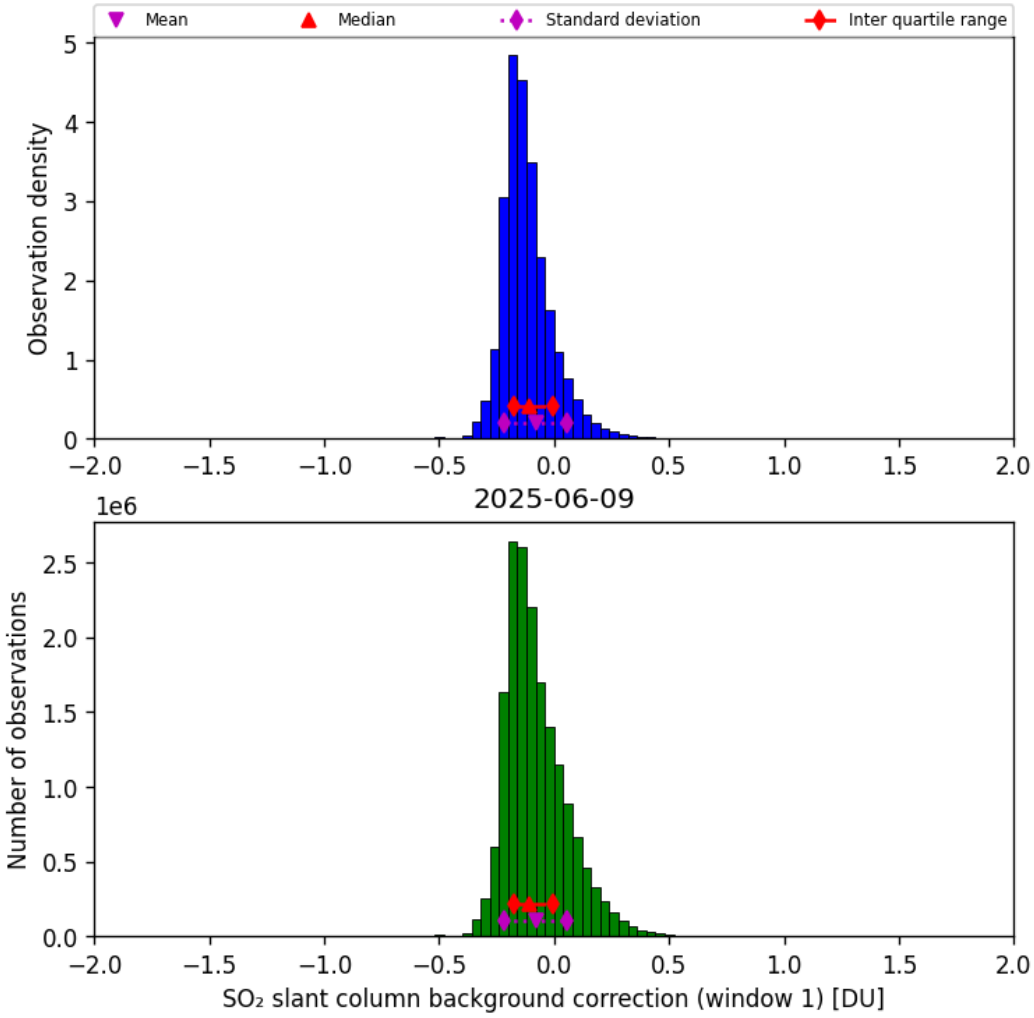


Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-06-09 to 2025-06-09

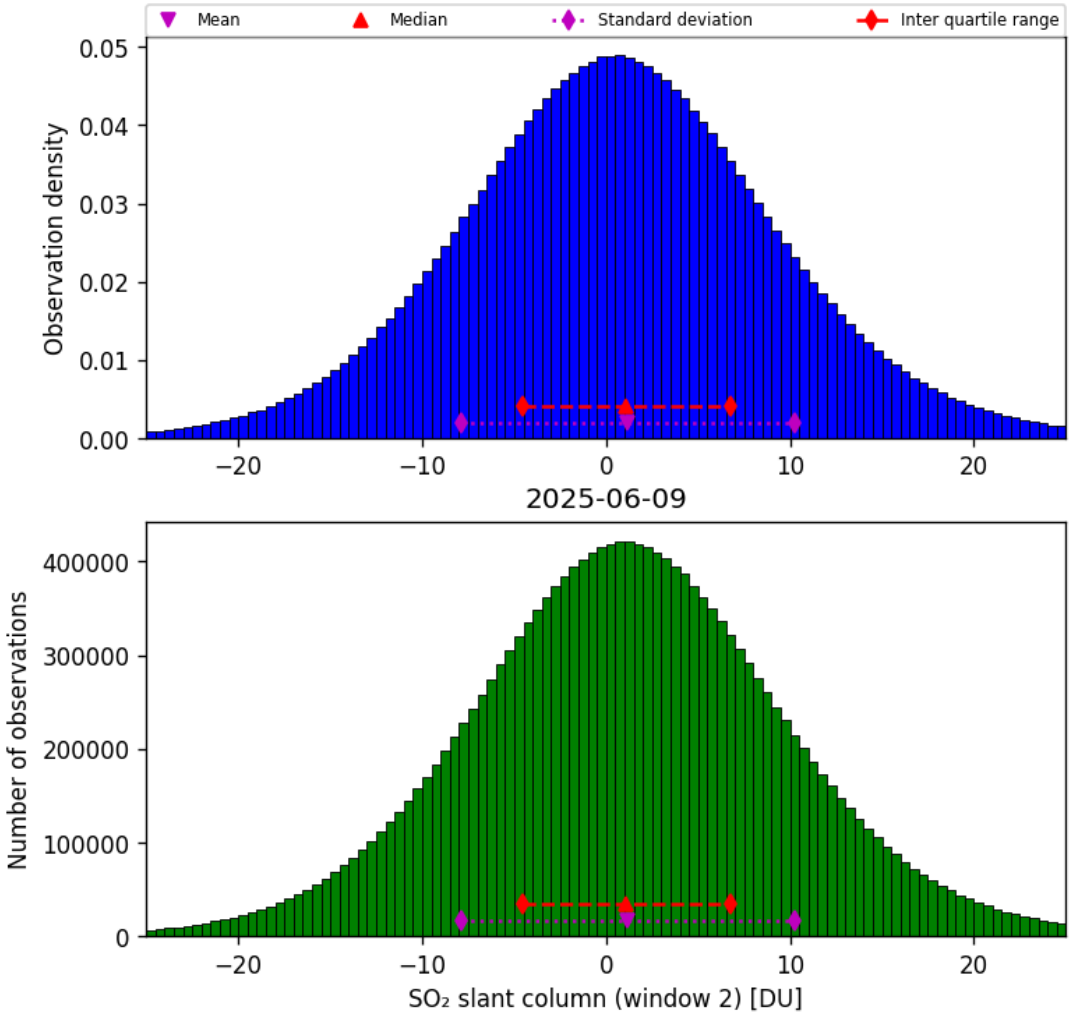


Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-06-09 to 2025-06-09

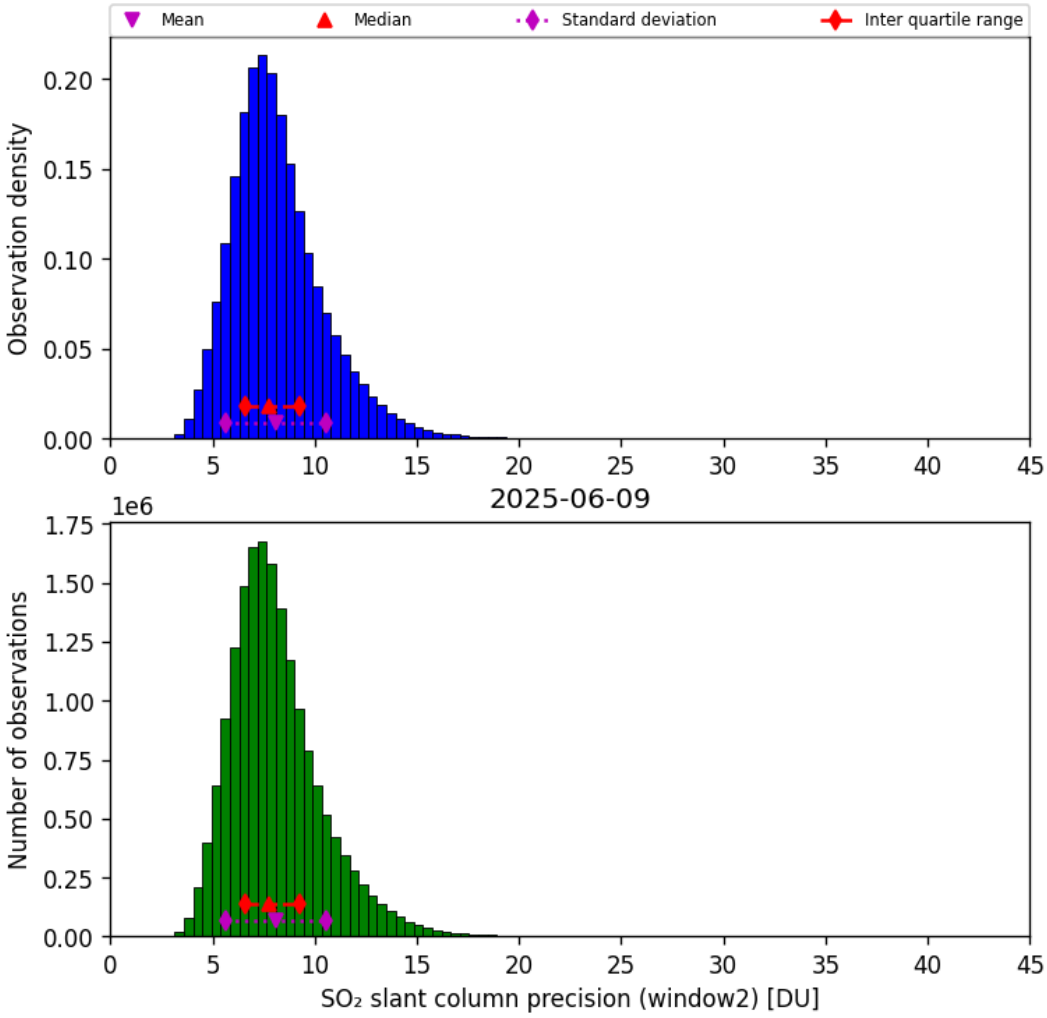


Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-06-09 to 2025-06-09

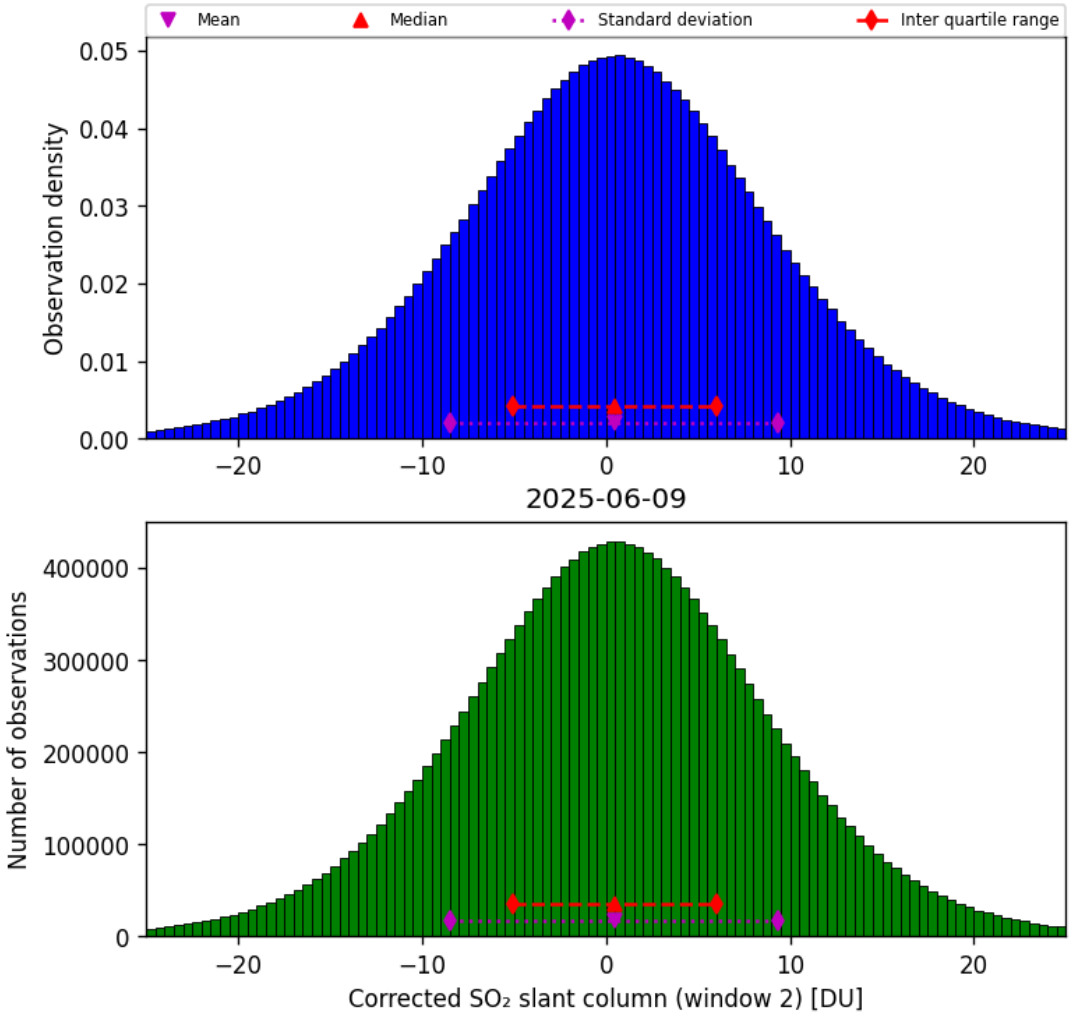


Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-06-09 to 2025-06-09

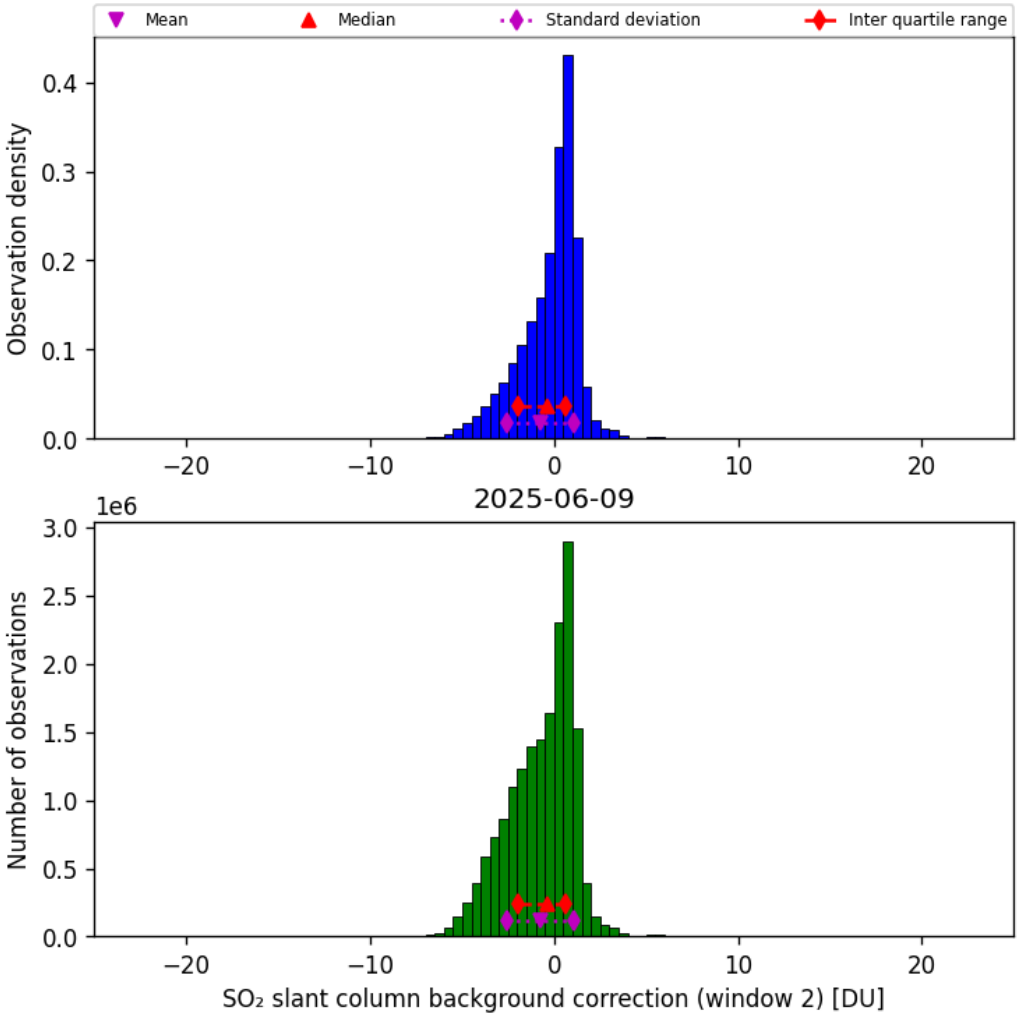


Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-06-09 to 2025-06-09

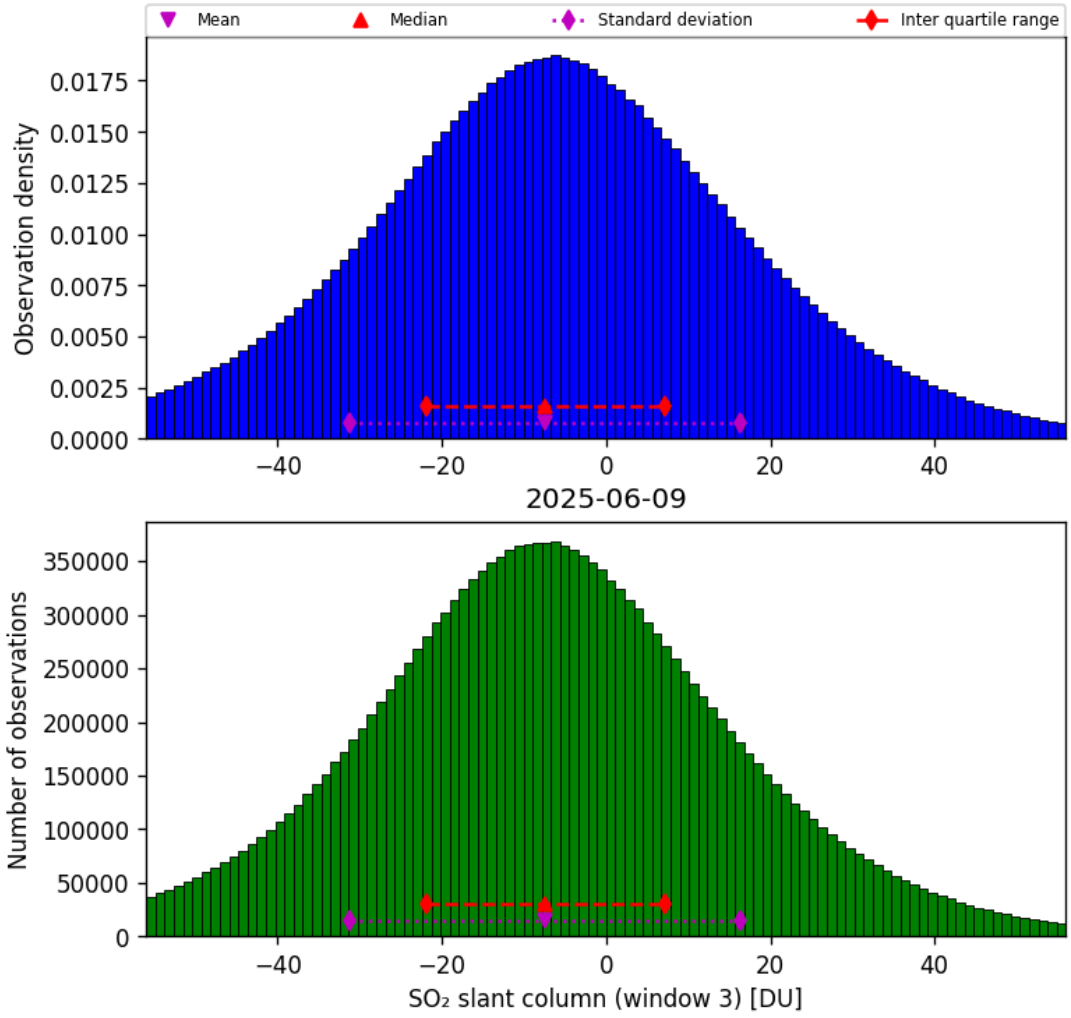


Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-06-09 to 2025-06-09

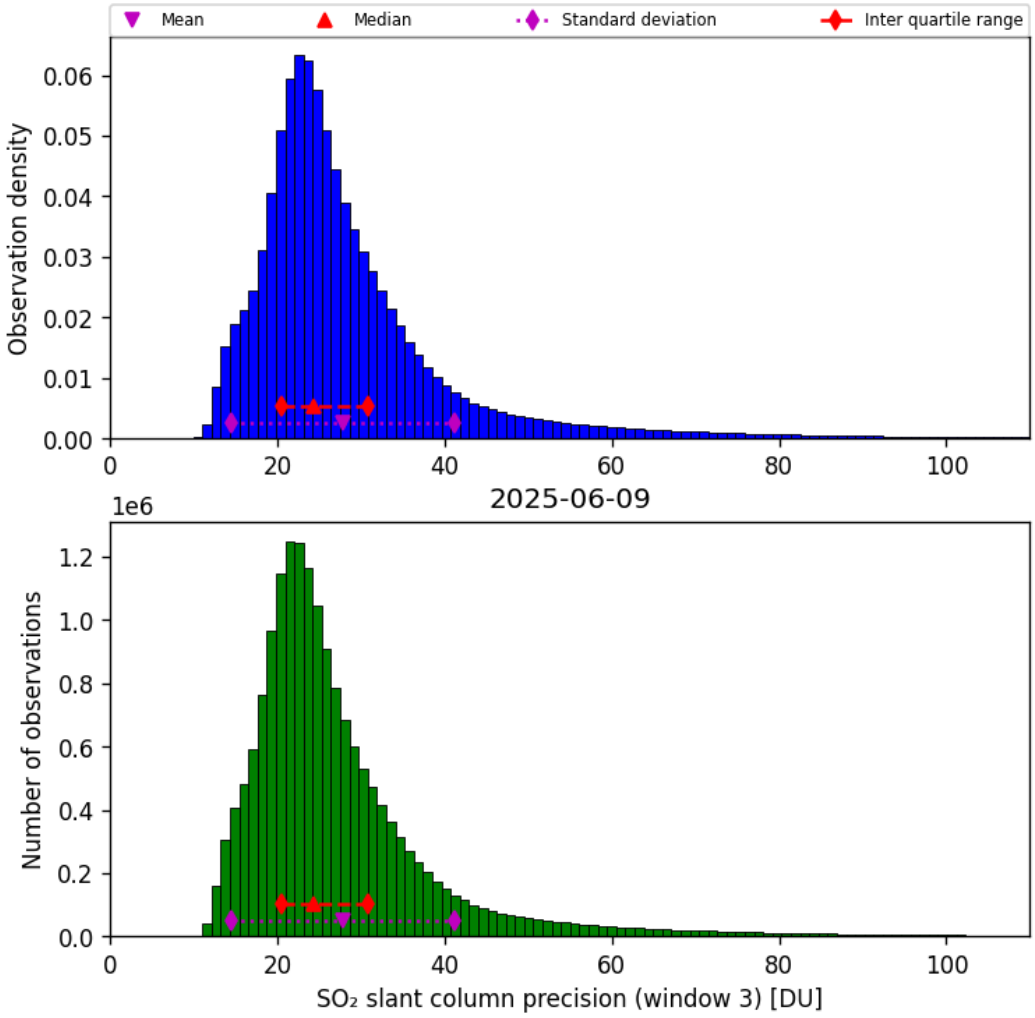


Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-06-09 to 2025-06-09

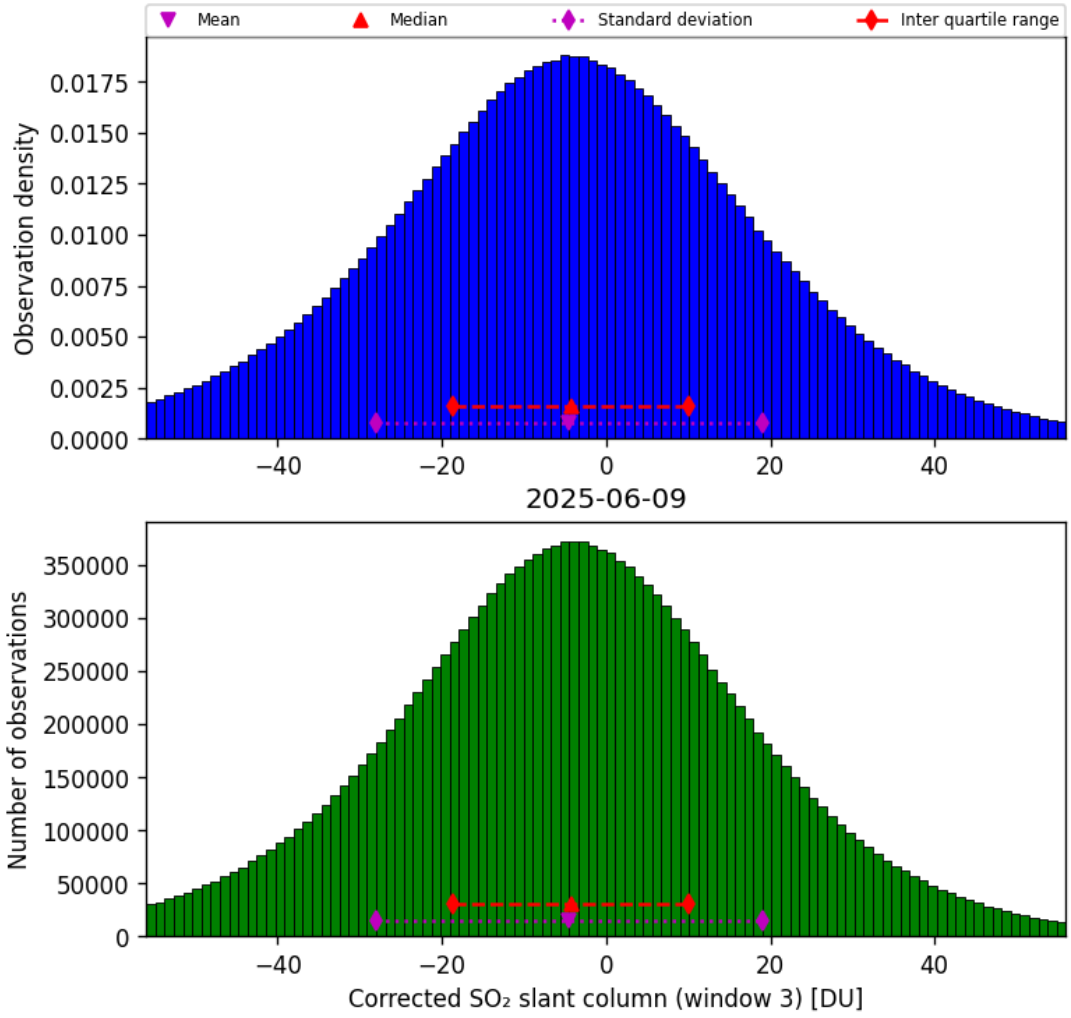


Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-06-09 to 2025-06-09

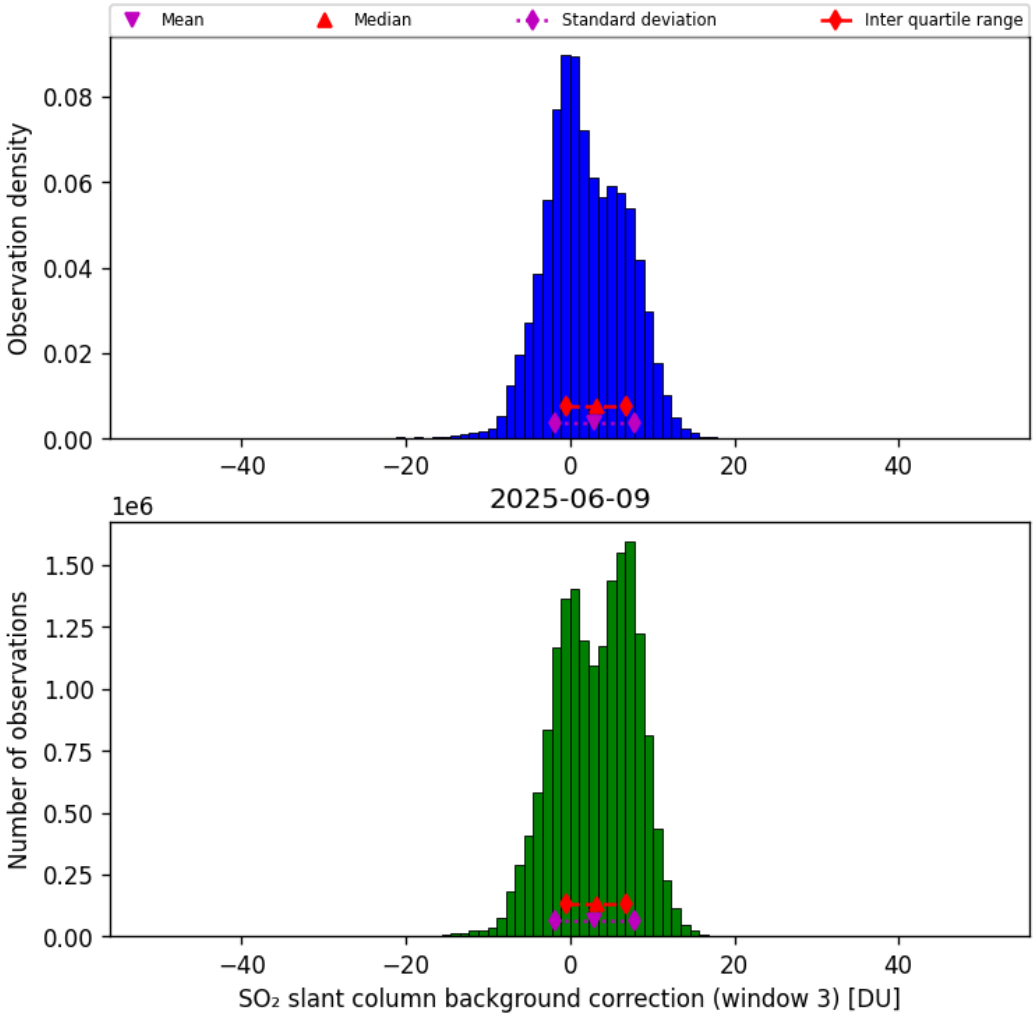


Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-06-09 to 2025-06-09

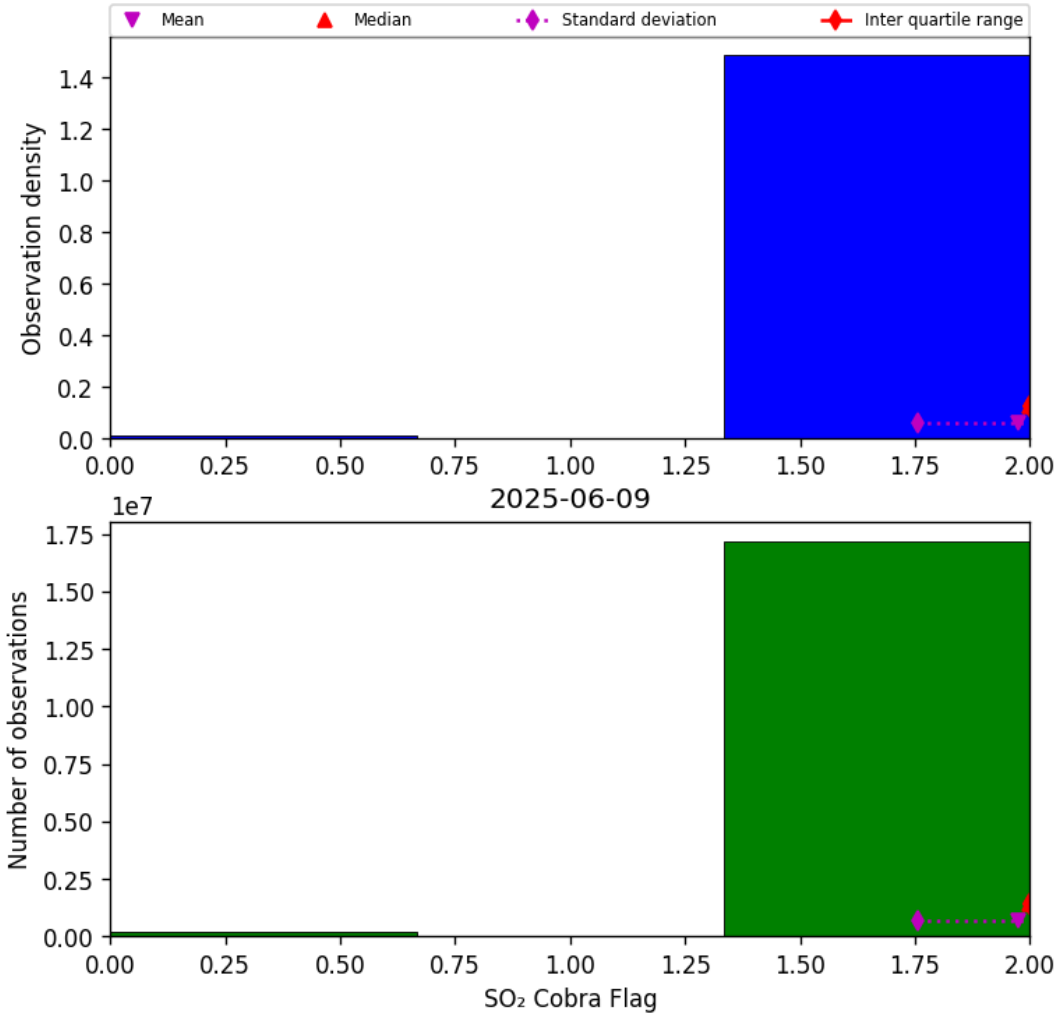


Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-06-09 to 2025-06-09

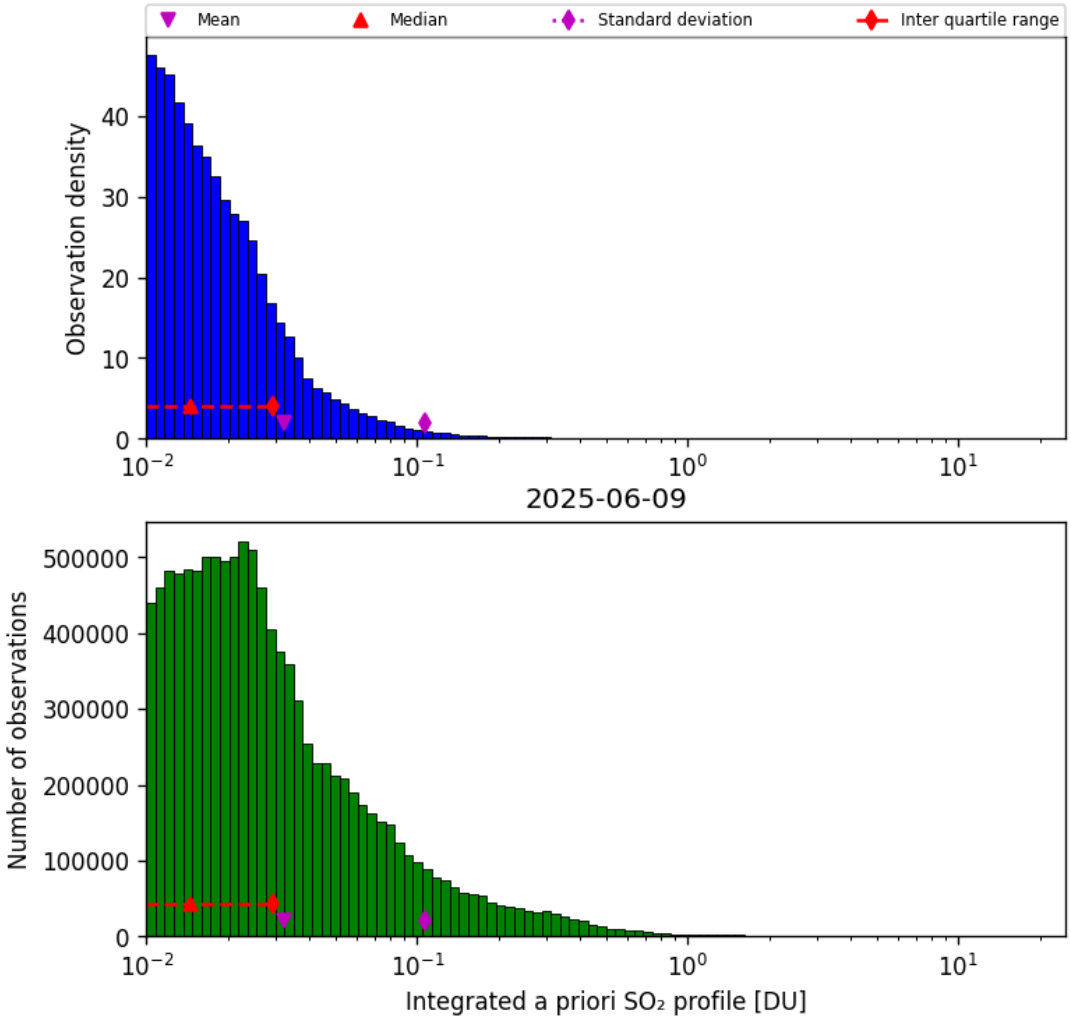


Figure 76: Histogram of "Integrated a priori SO_2 profile" for 2025-06-09 to 2025-06-09

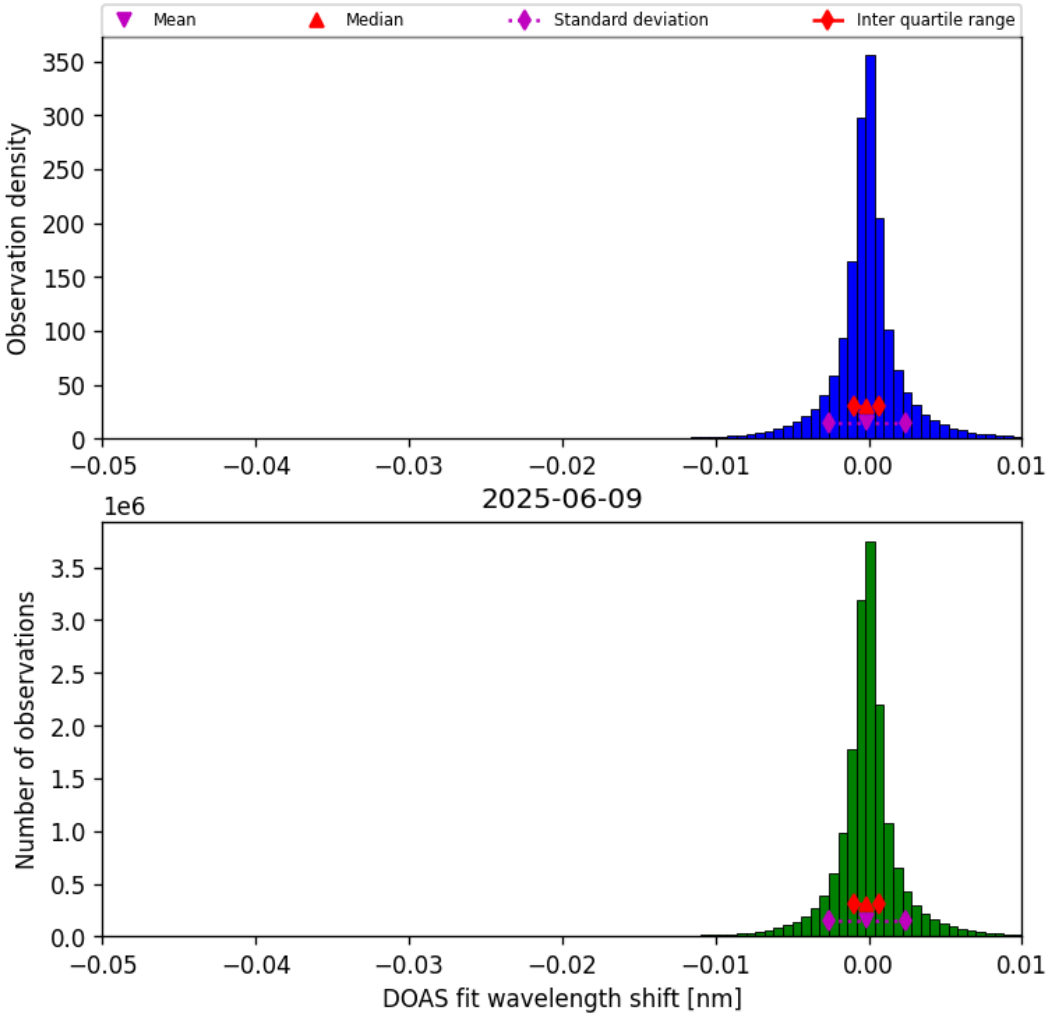


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-06-09 to 2025-06-09

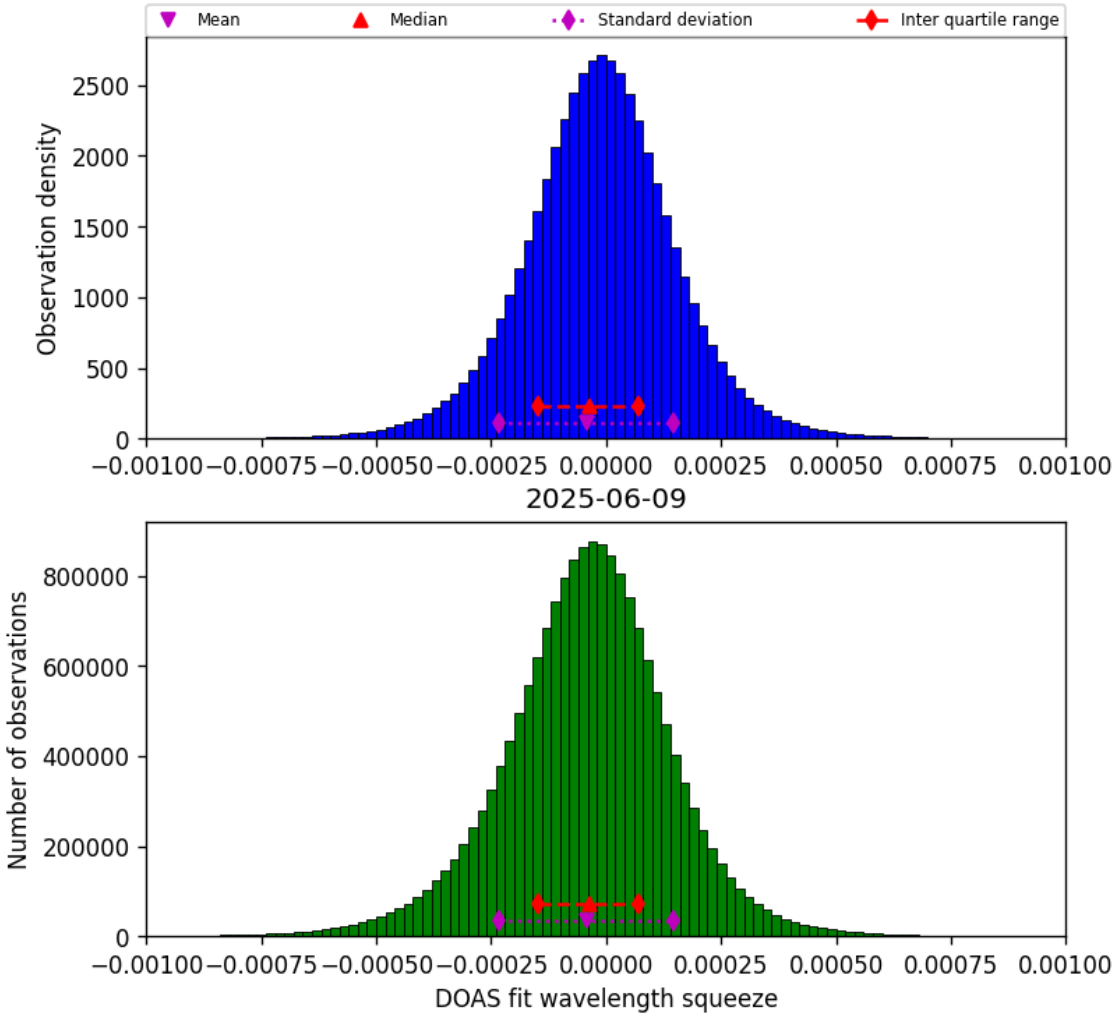


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-06-09 to 2025-06-09

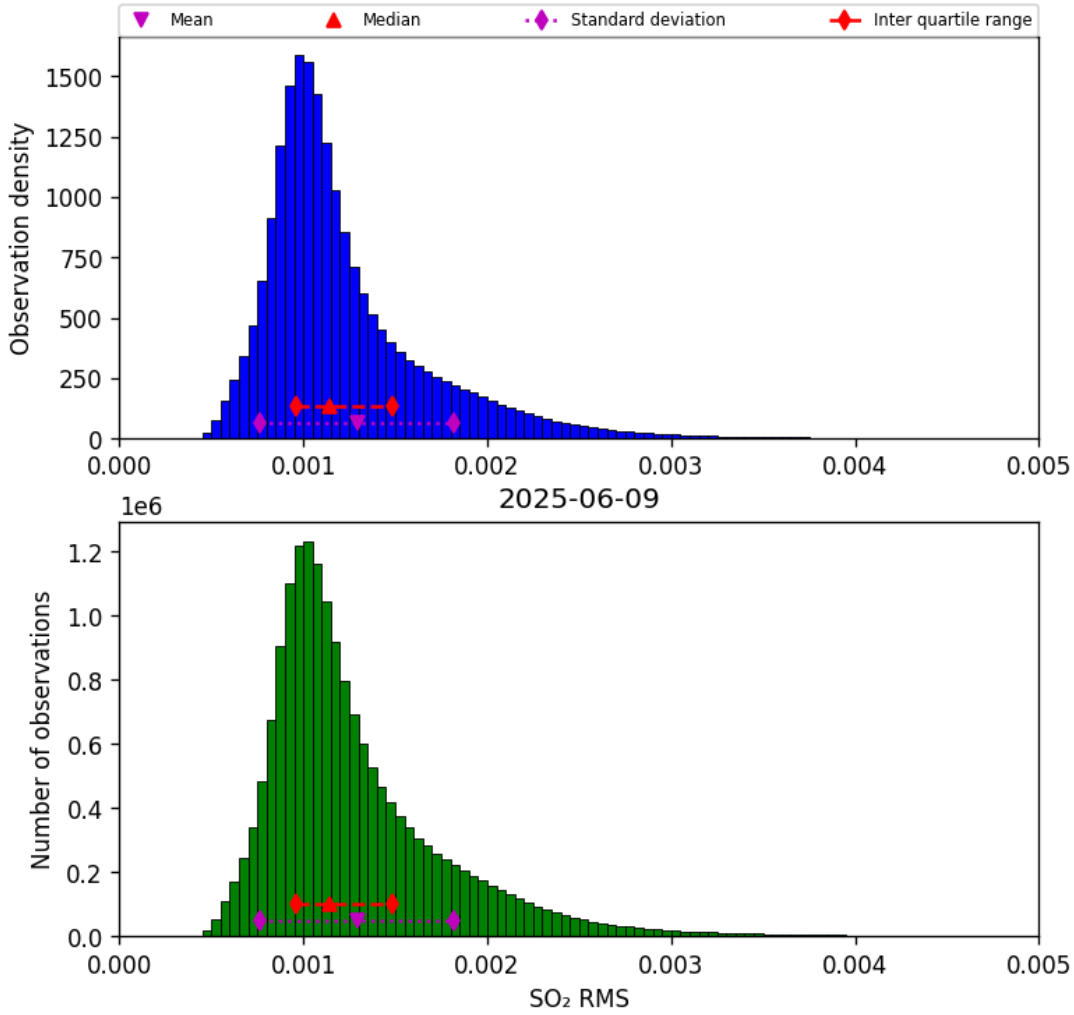


Figure 79: Histogram of "SO_2 RMS" for 2025-06-09 to 2025-06-09

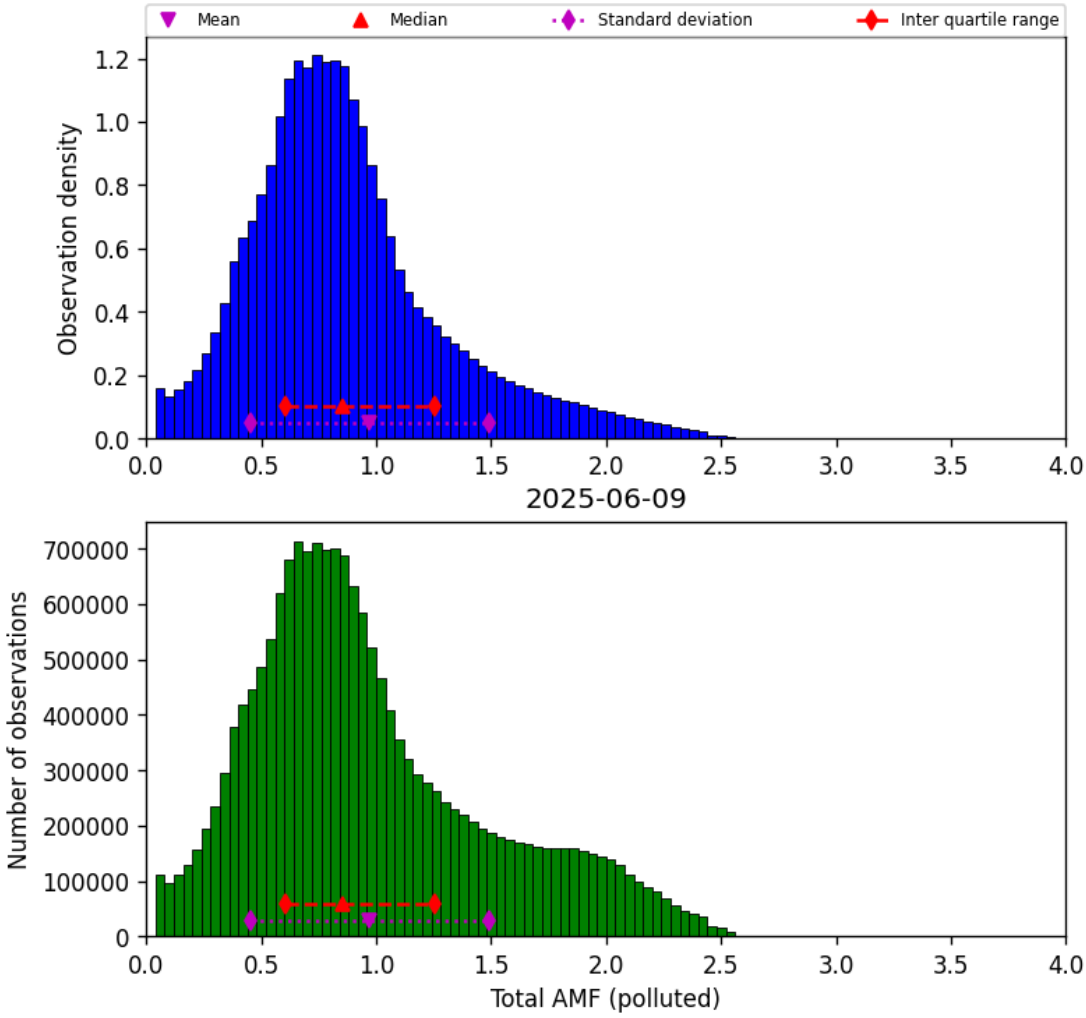


Figure 80: Histogram of “Total AMF (polluted)” for 2025-06-09 to 2025-06-09

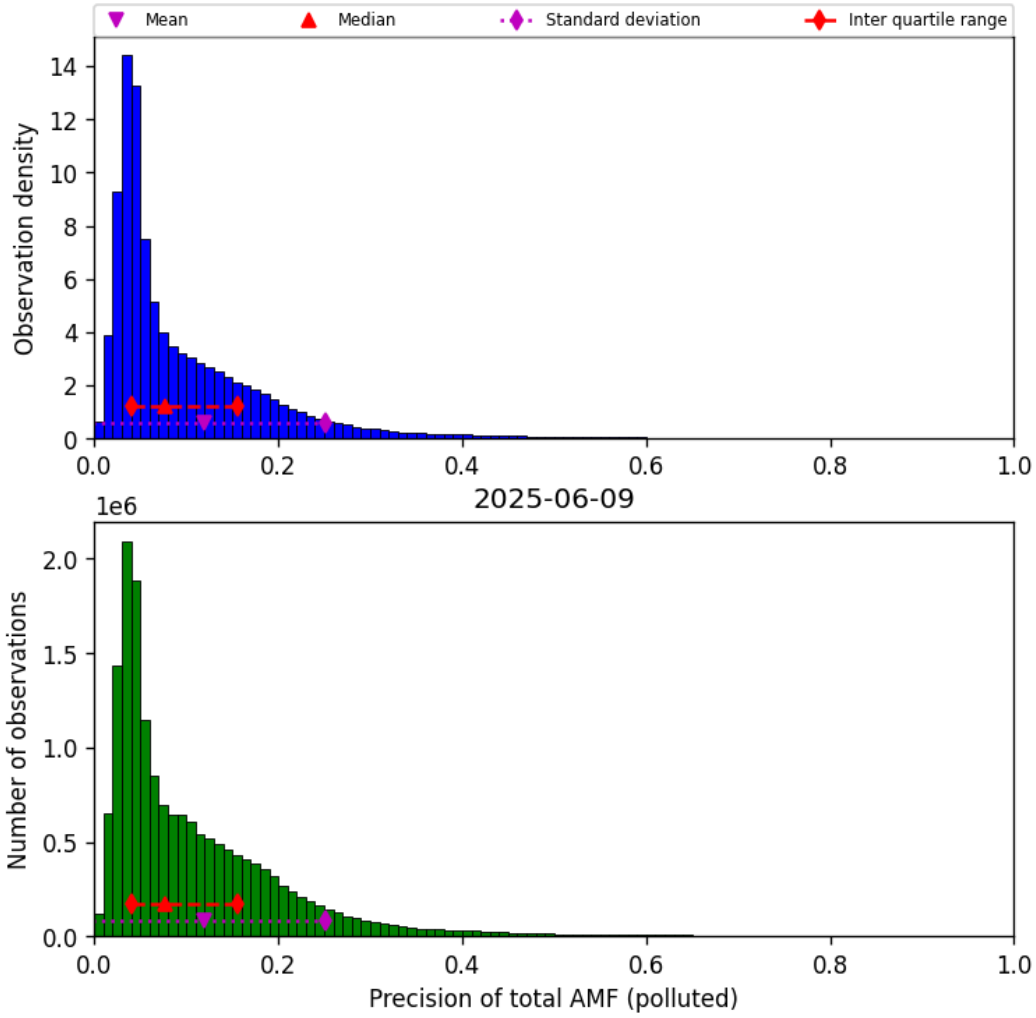


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-06-09 to 2025-06-09

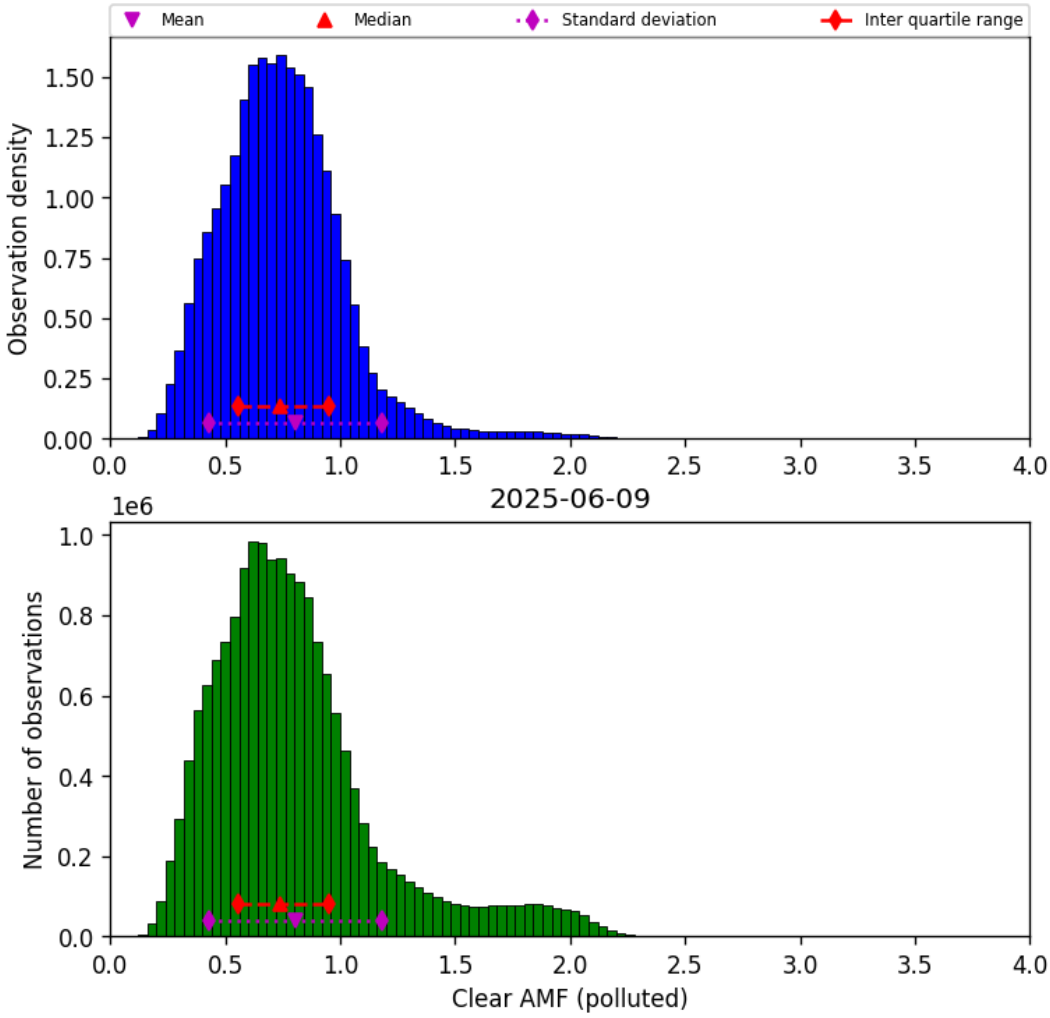


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-06-09 to 2025-06-09

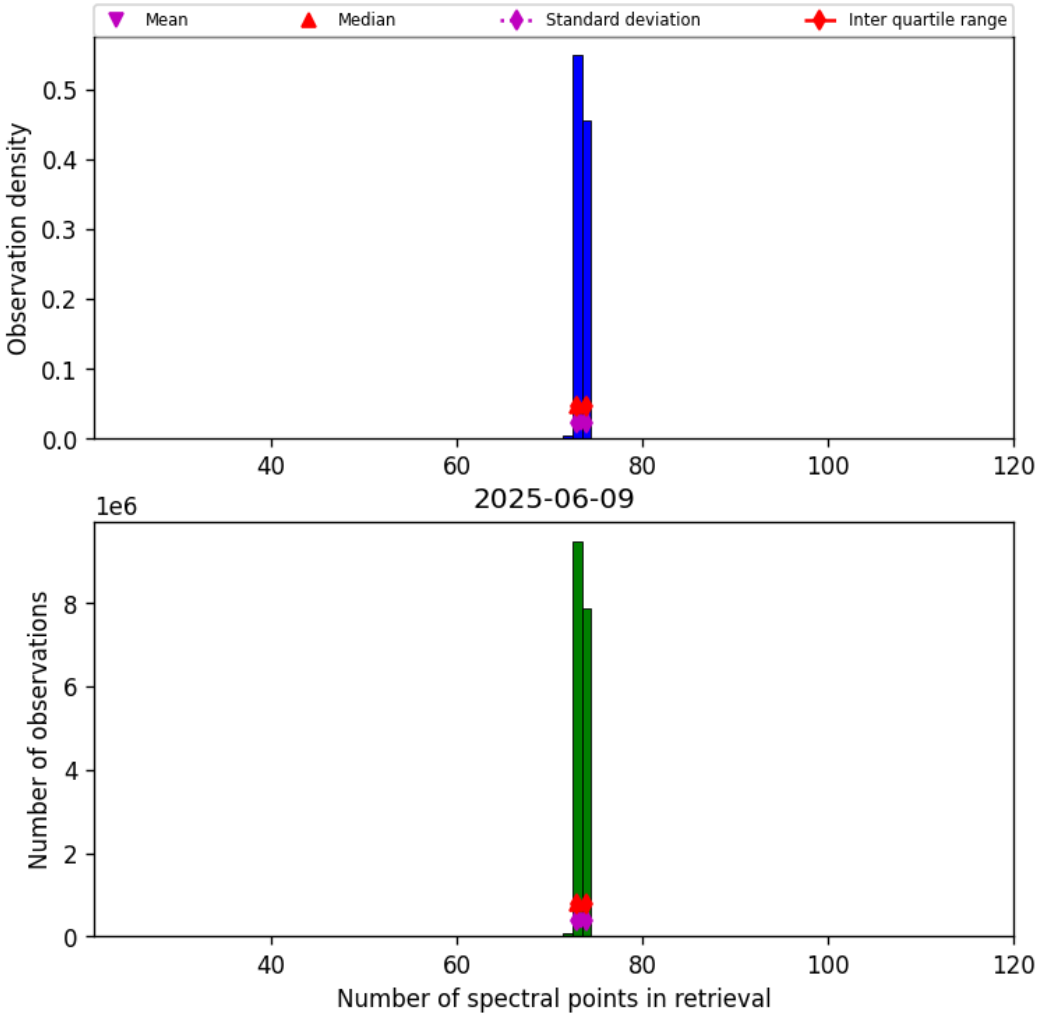


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-06-09 to 2025-06-09

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.

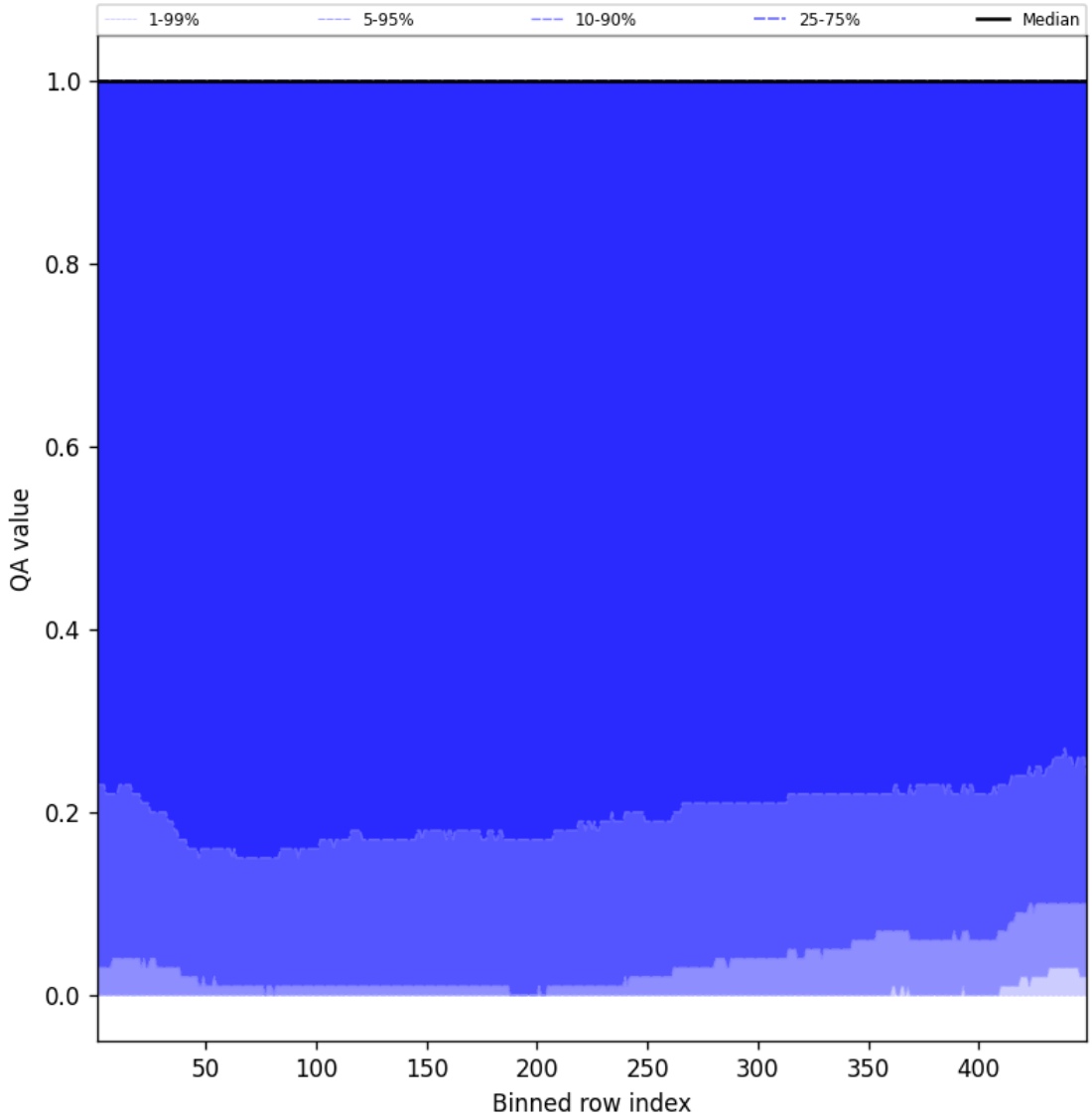


Figure 84: Along track statistics of “QA value” for 2025-06-09 to 2025-06-09

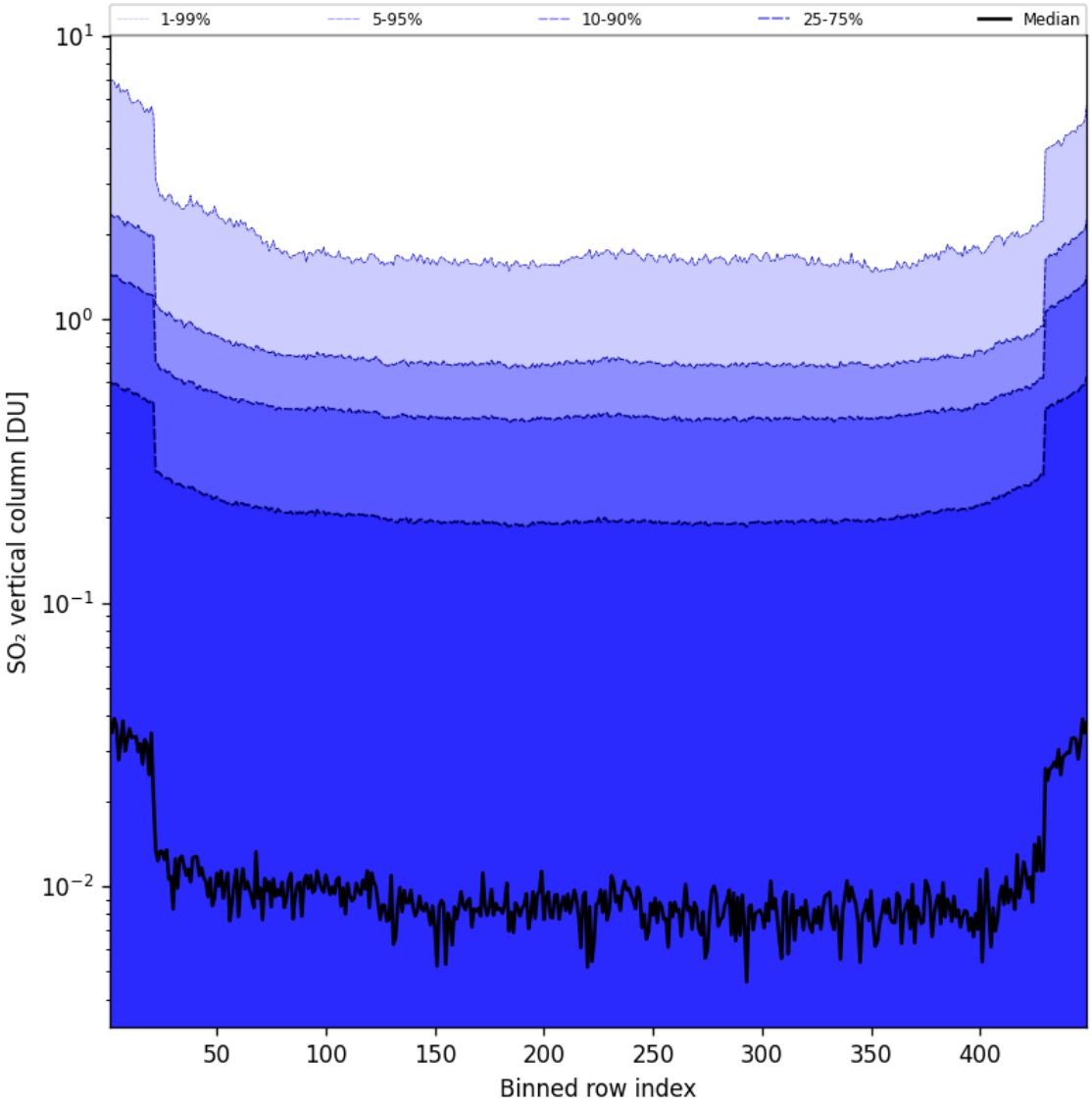


Figure 85: Along track statistics of "SO_2 vertical column" for 2025-06-09 to 2025-06-09

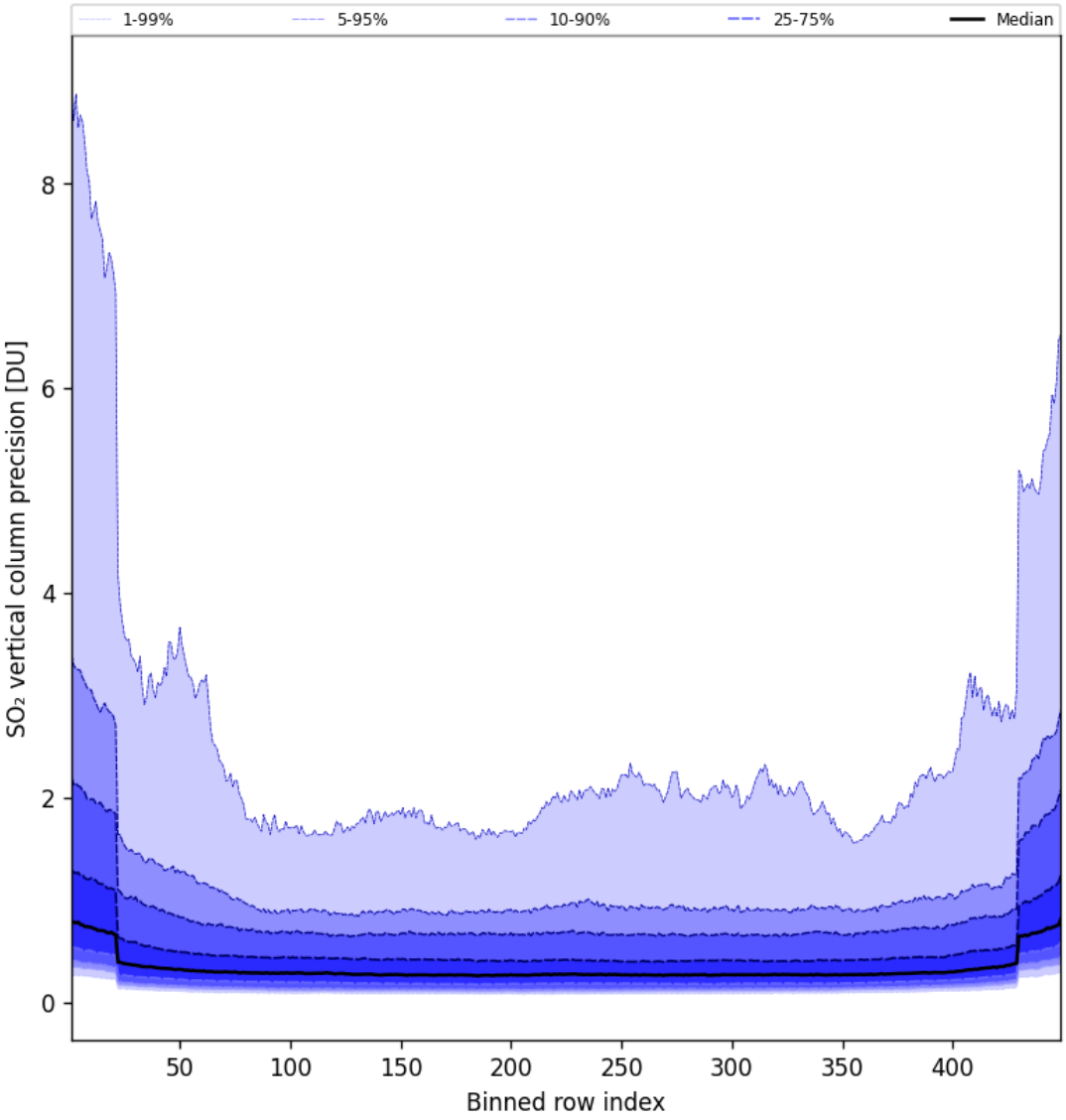


Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-06-09 to 2025-06-09

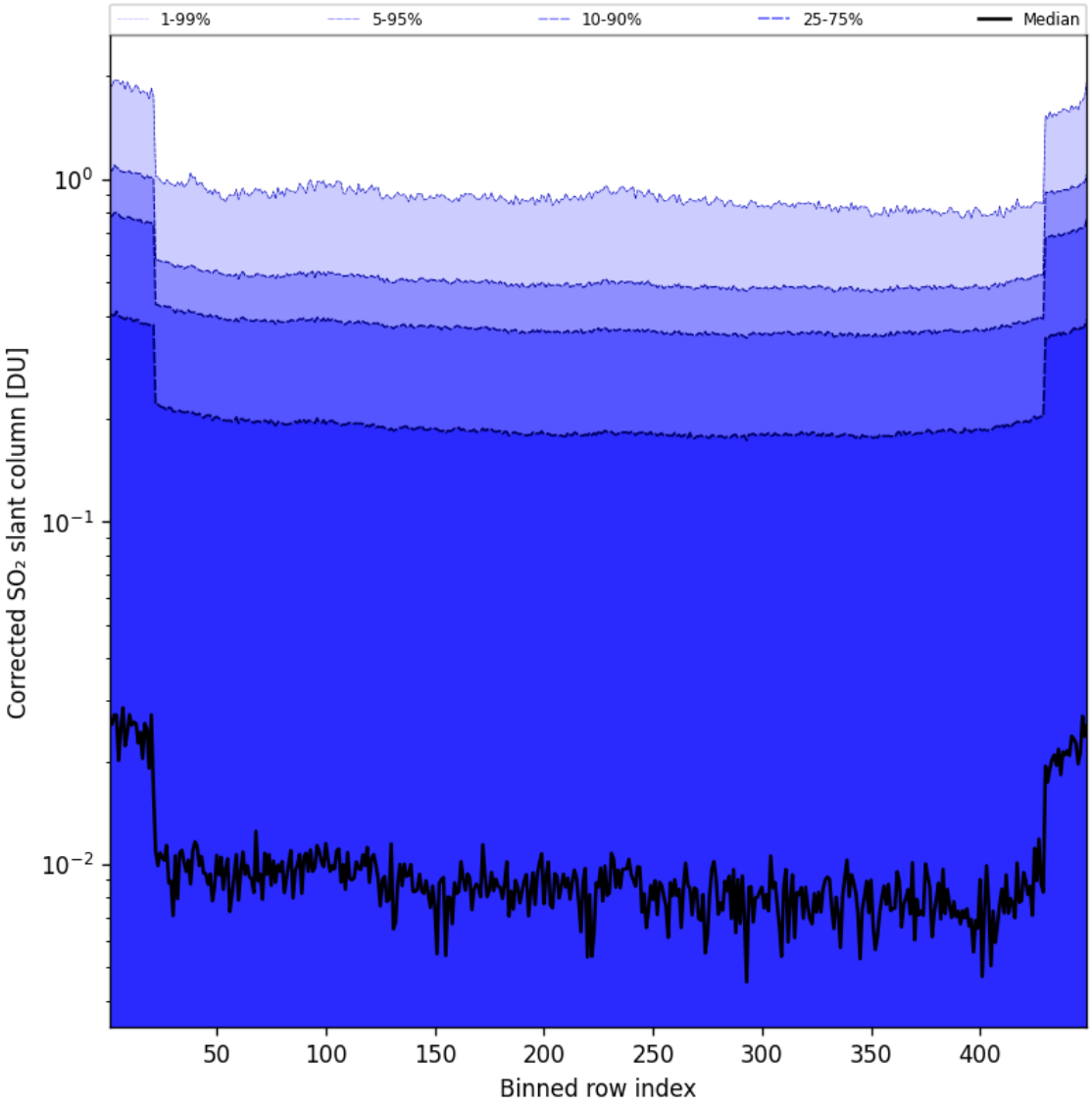


Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-06-09 to 2025-06-09

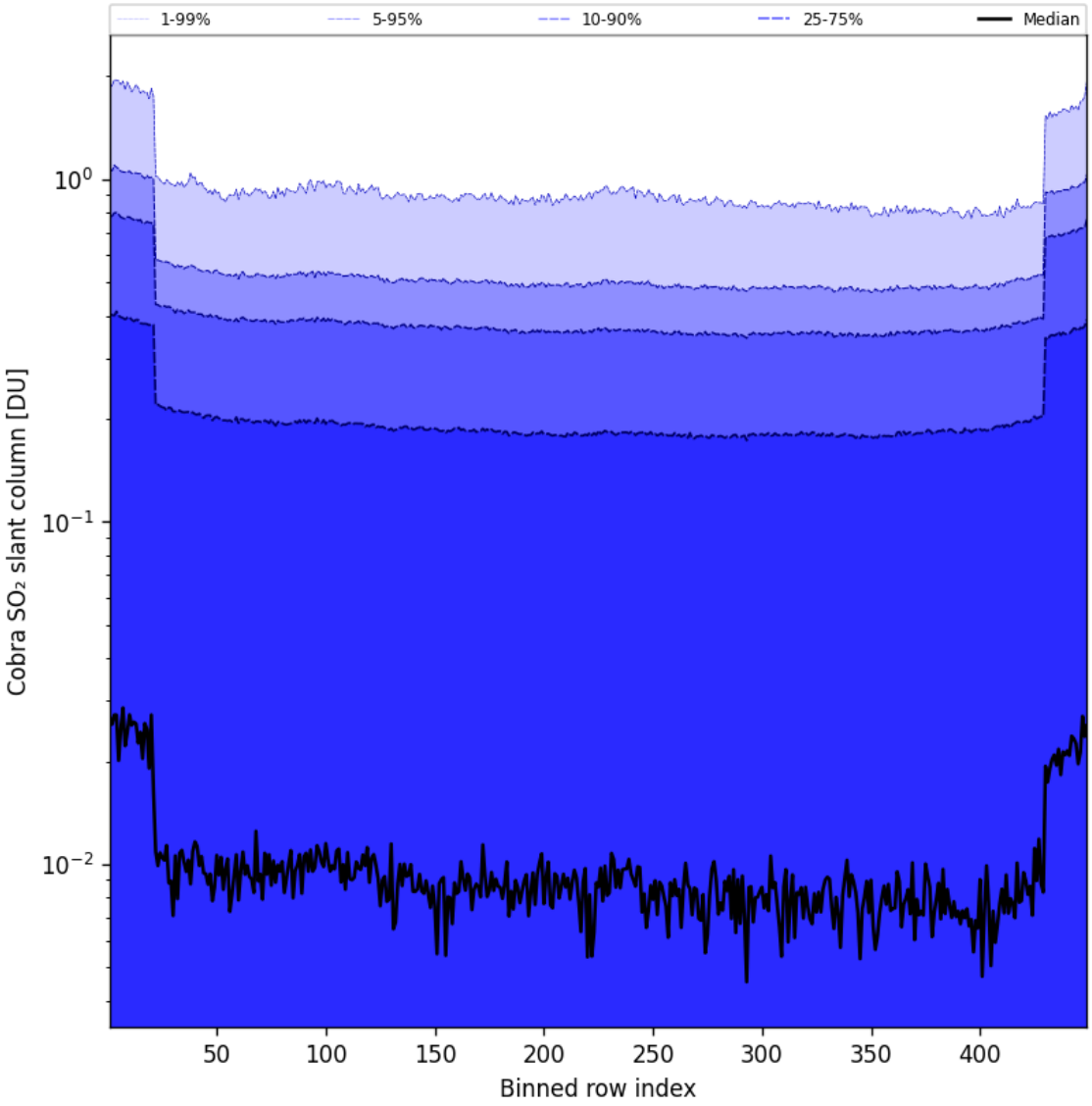


Figure 88: Along track statistics of “Cobra SO_2 slant column” for 2025-06-09 to 2025-06-09

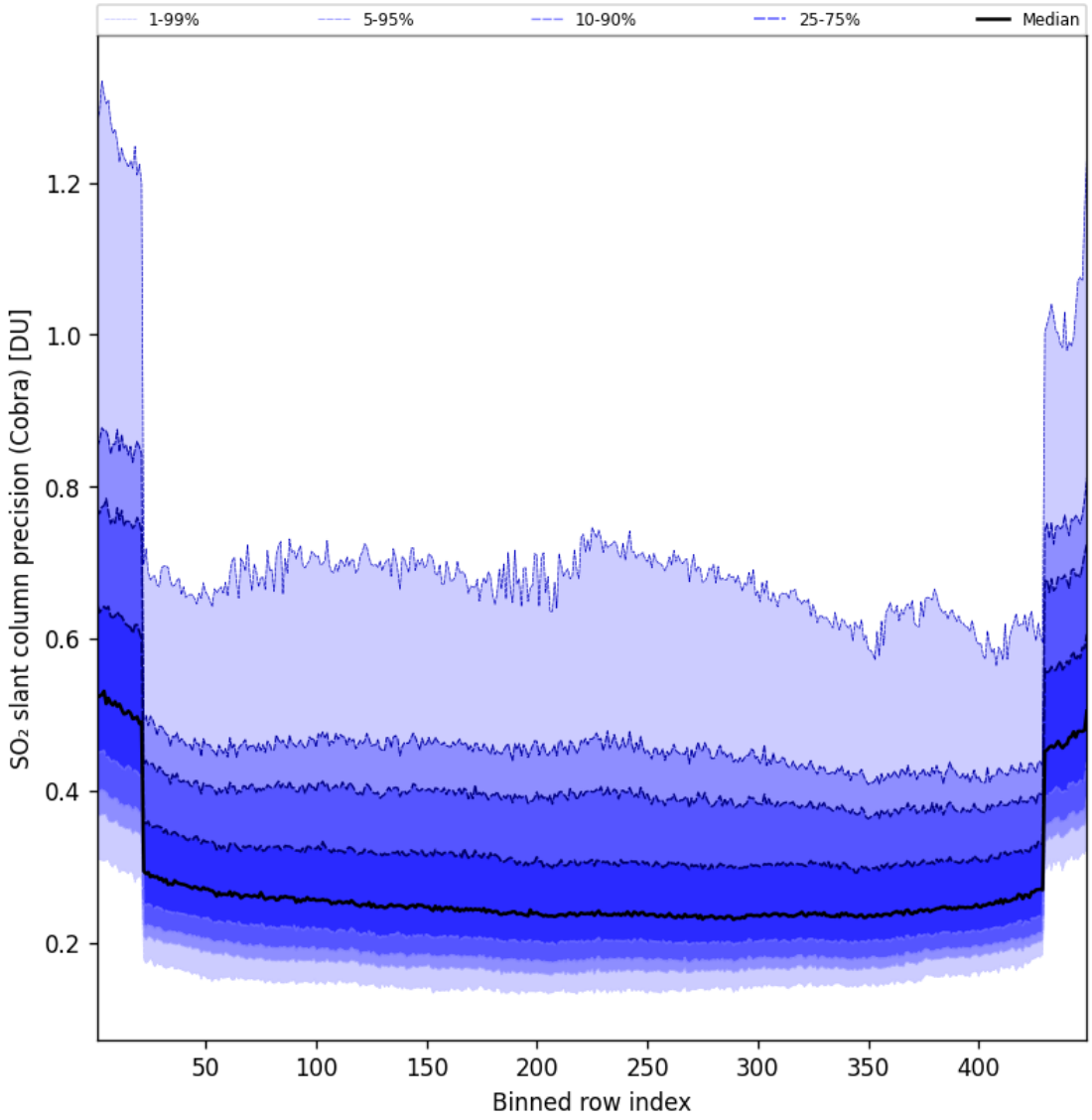


Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-06-09 to 2025-06-09

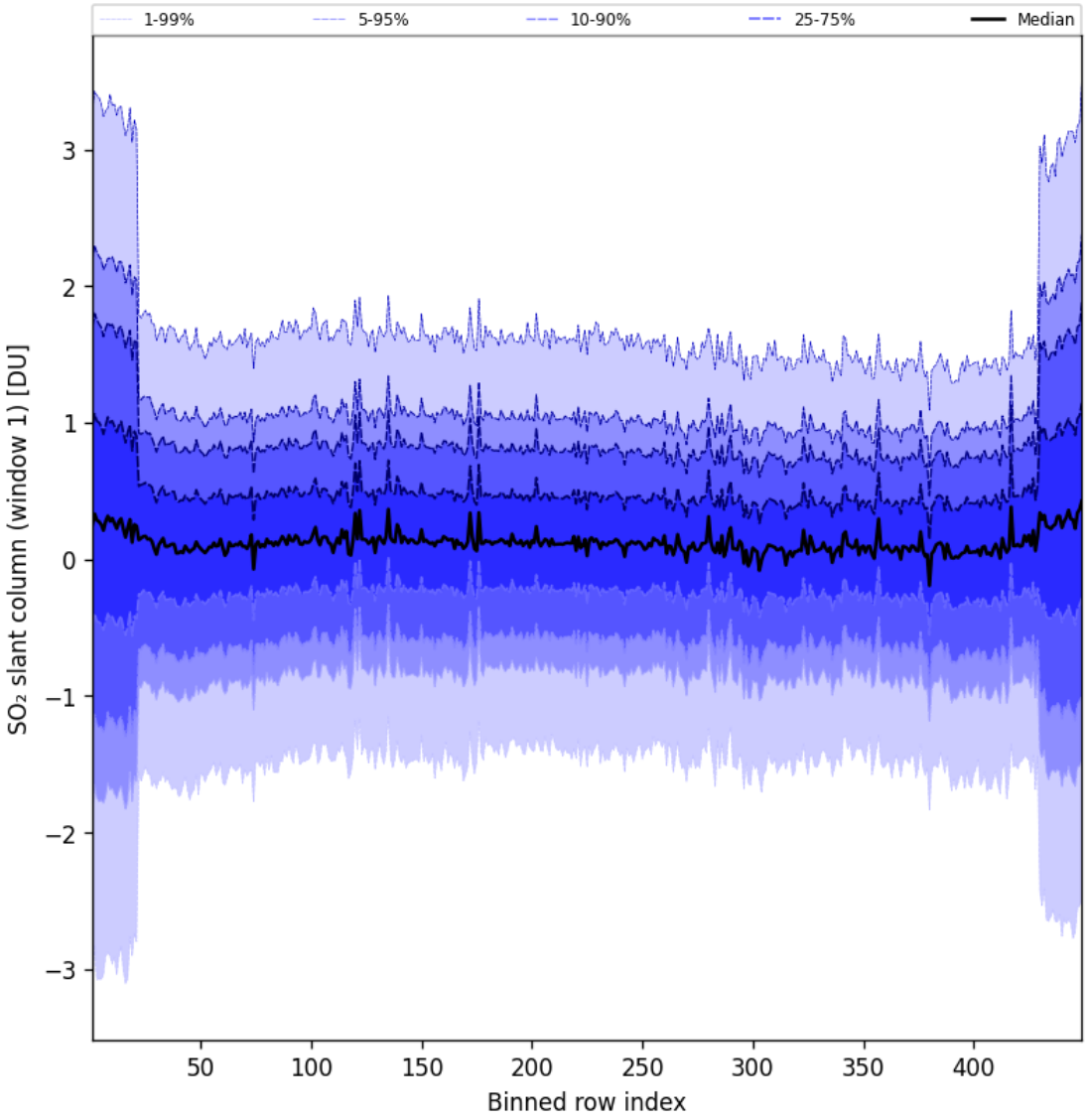


Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-06-09 to 2025-06-09

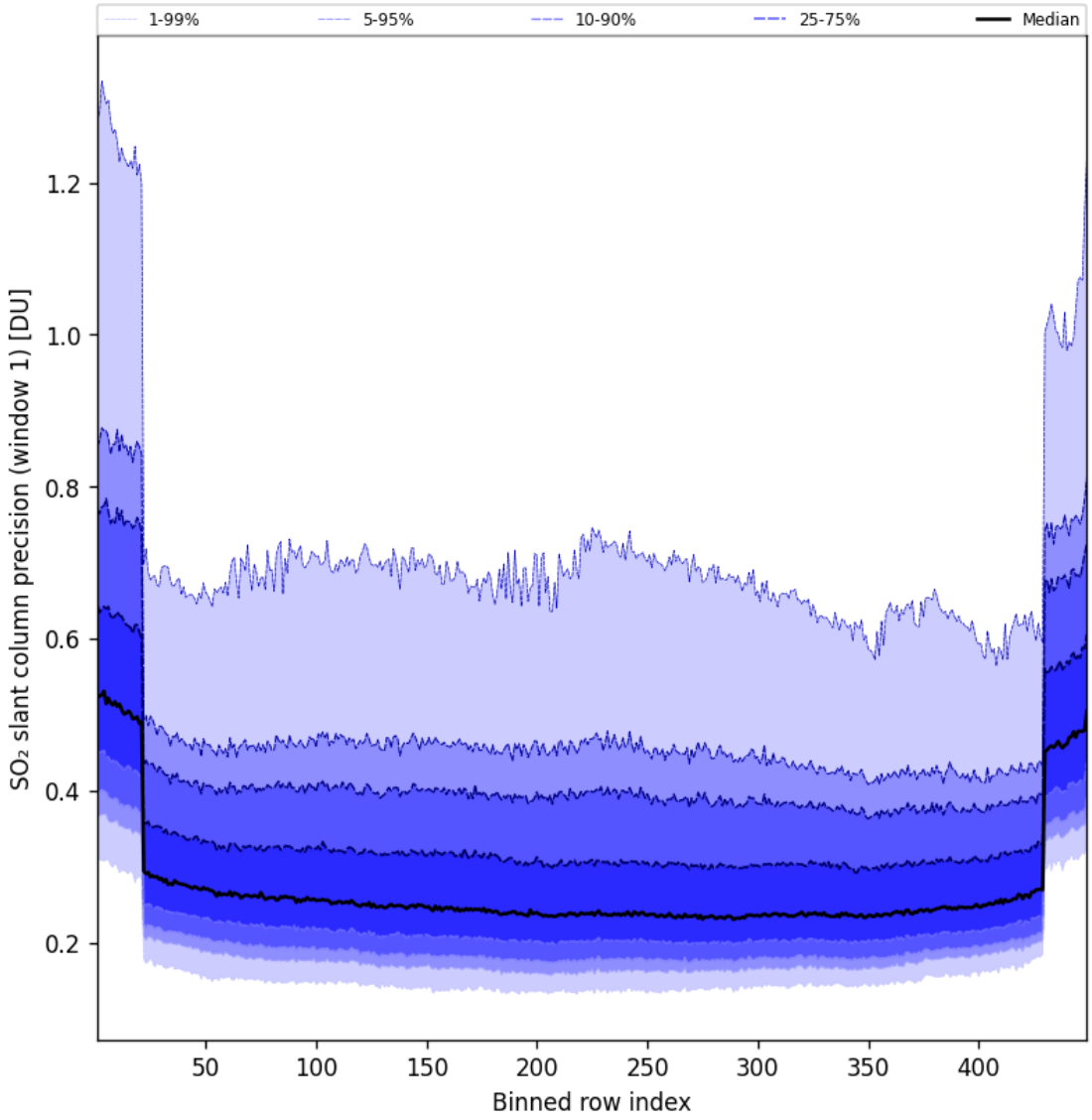


Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-06-09 to 2025-06-09

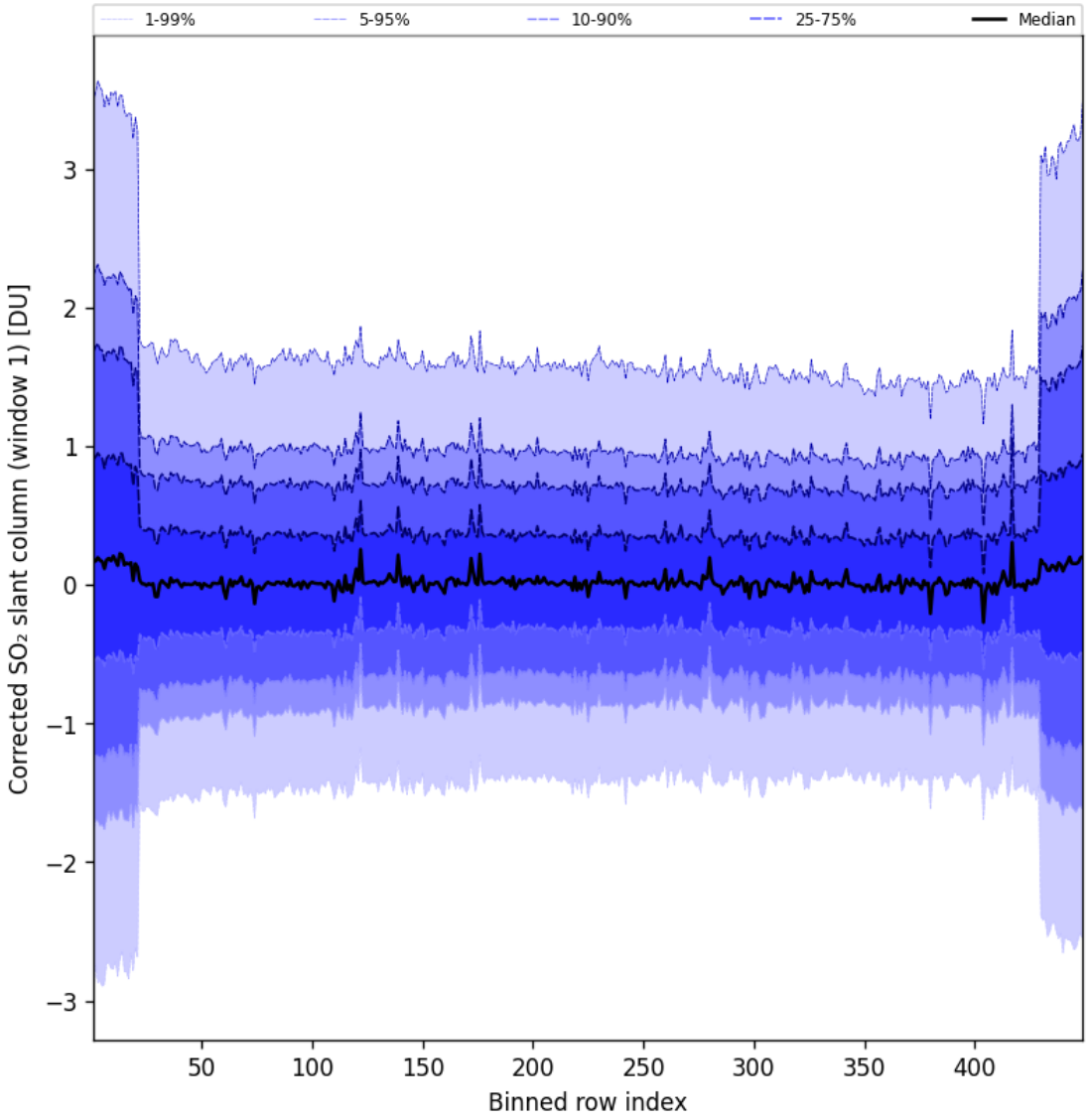


Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-06-09 to 2025-06-09

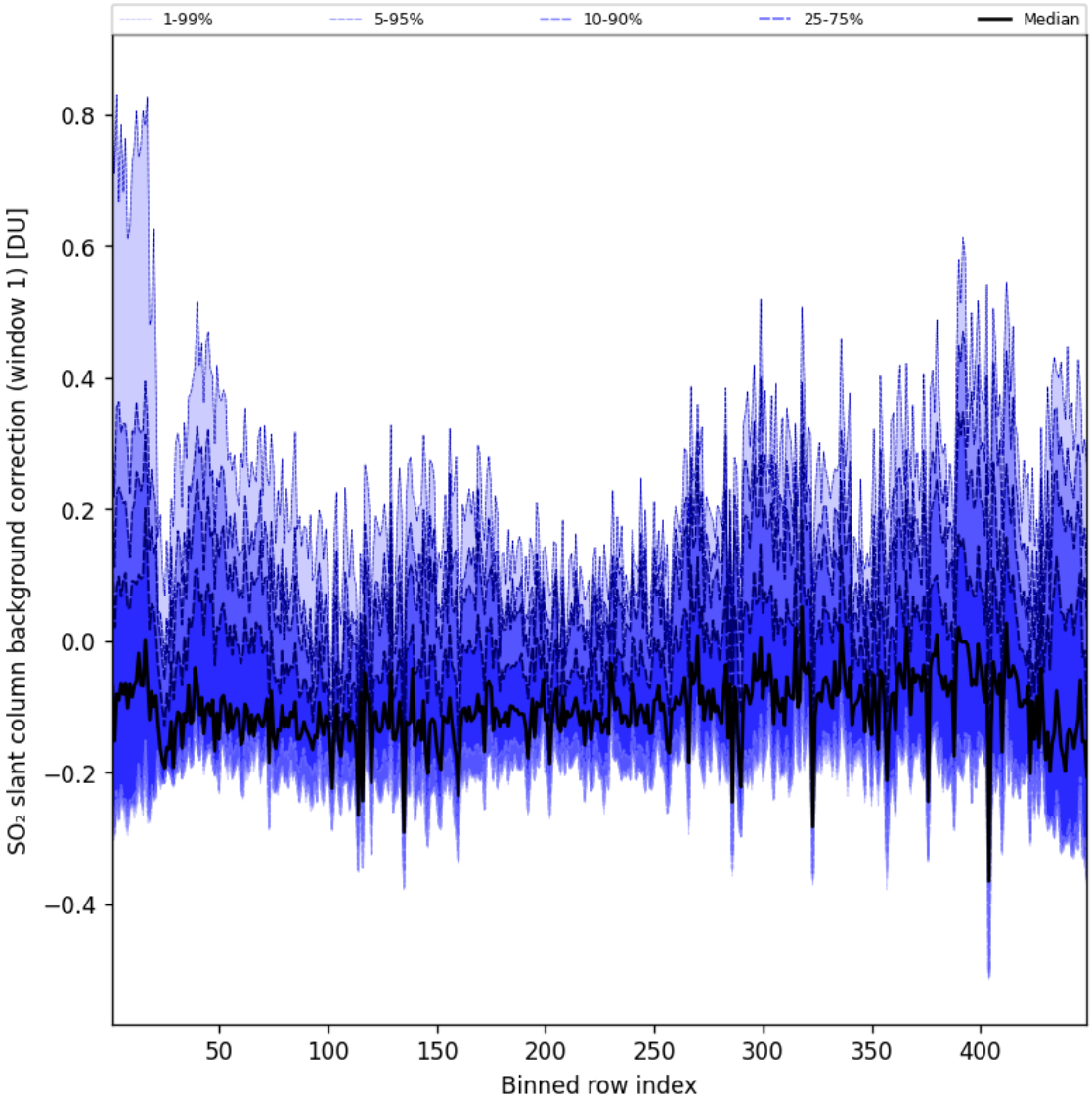


Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-06-09 to 2025-06-09

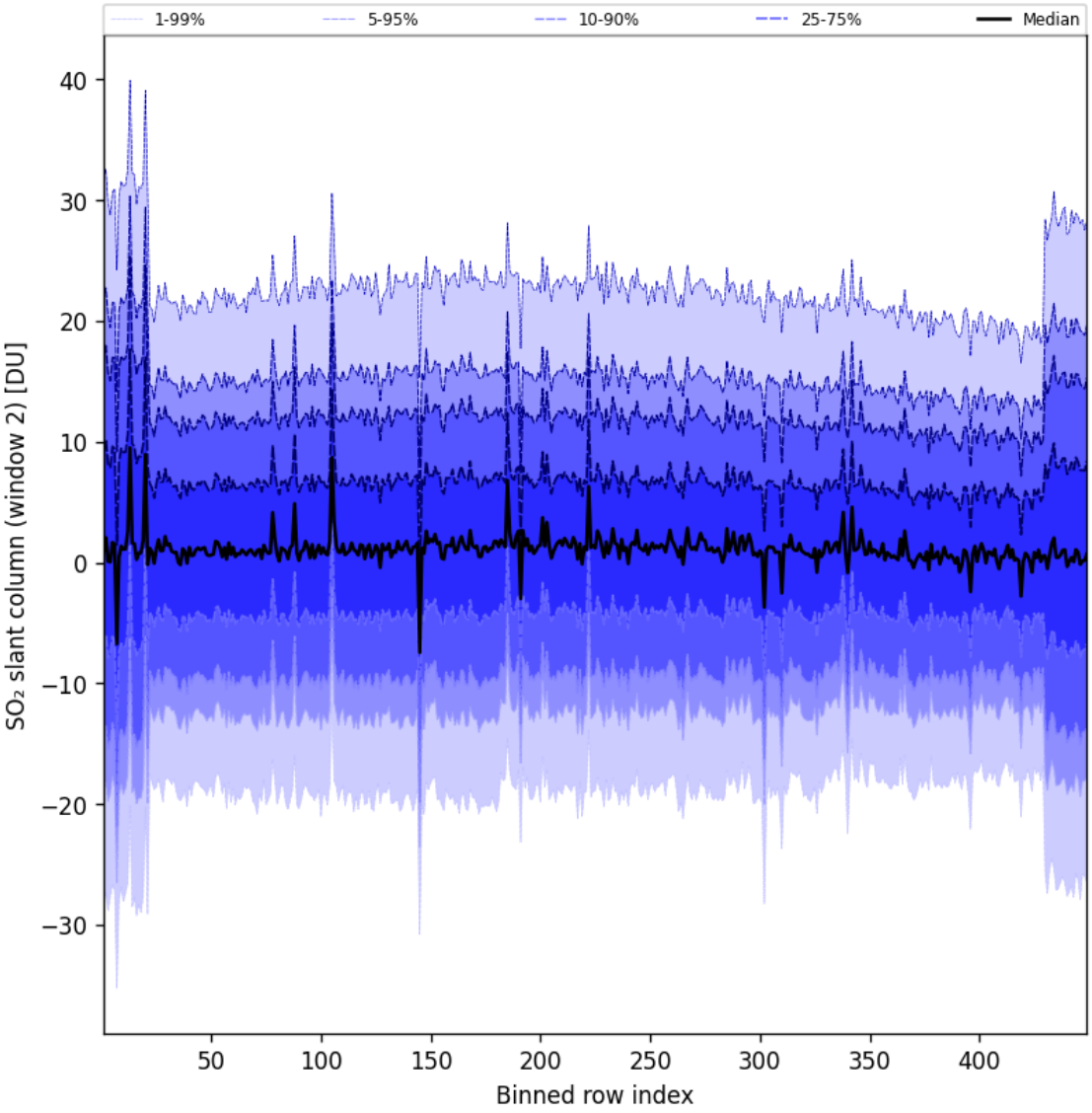


Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-06-09 to 2025-06-09

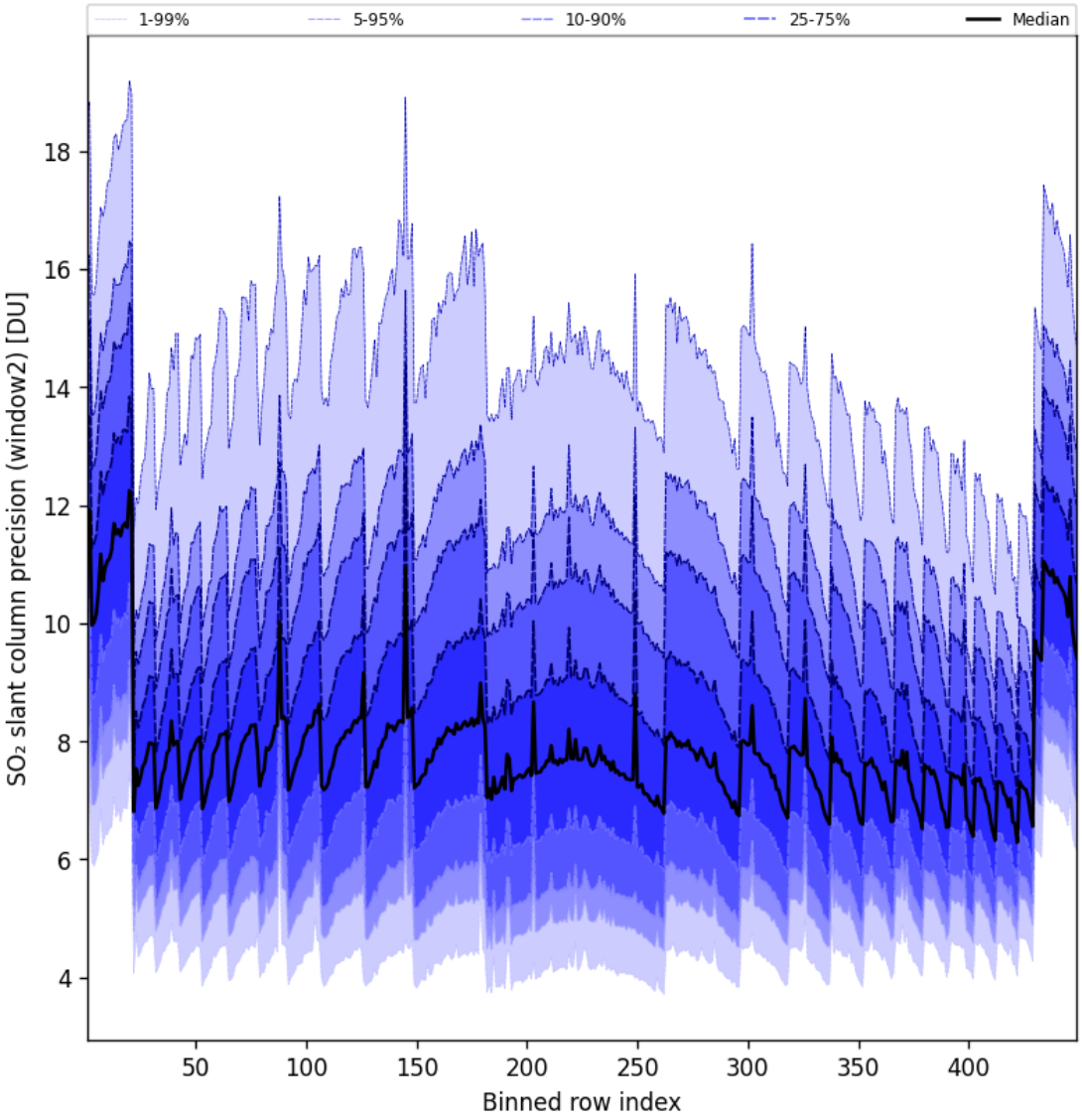


Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-06-09 to 2025-06-09

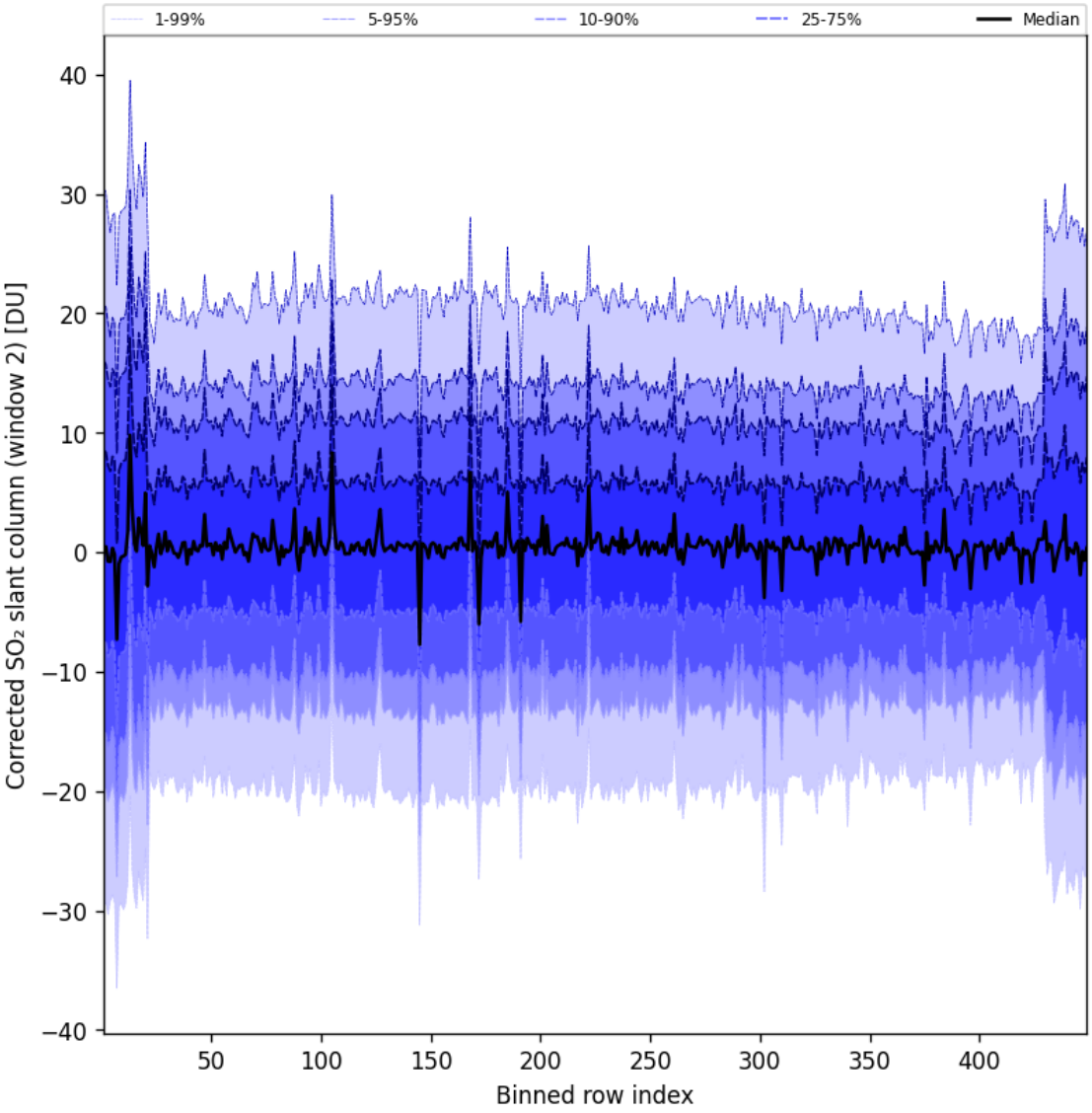


Figure 96: Along track statistics of “Corrected SO_2 slant column (window 2)” for 2025-06-09 to 2025-06-09

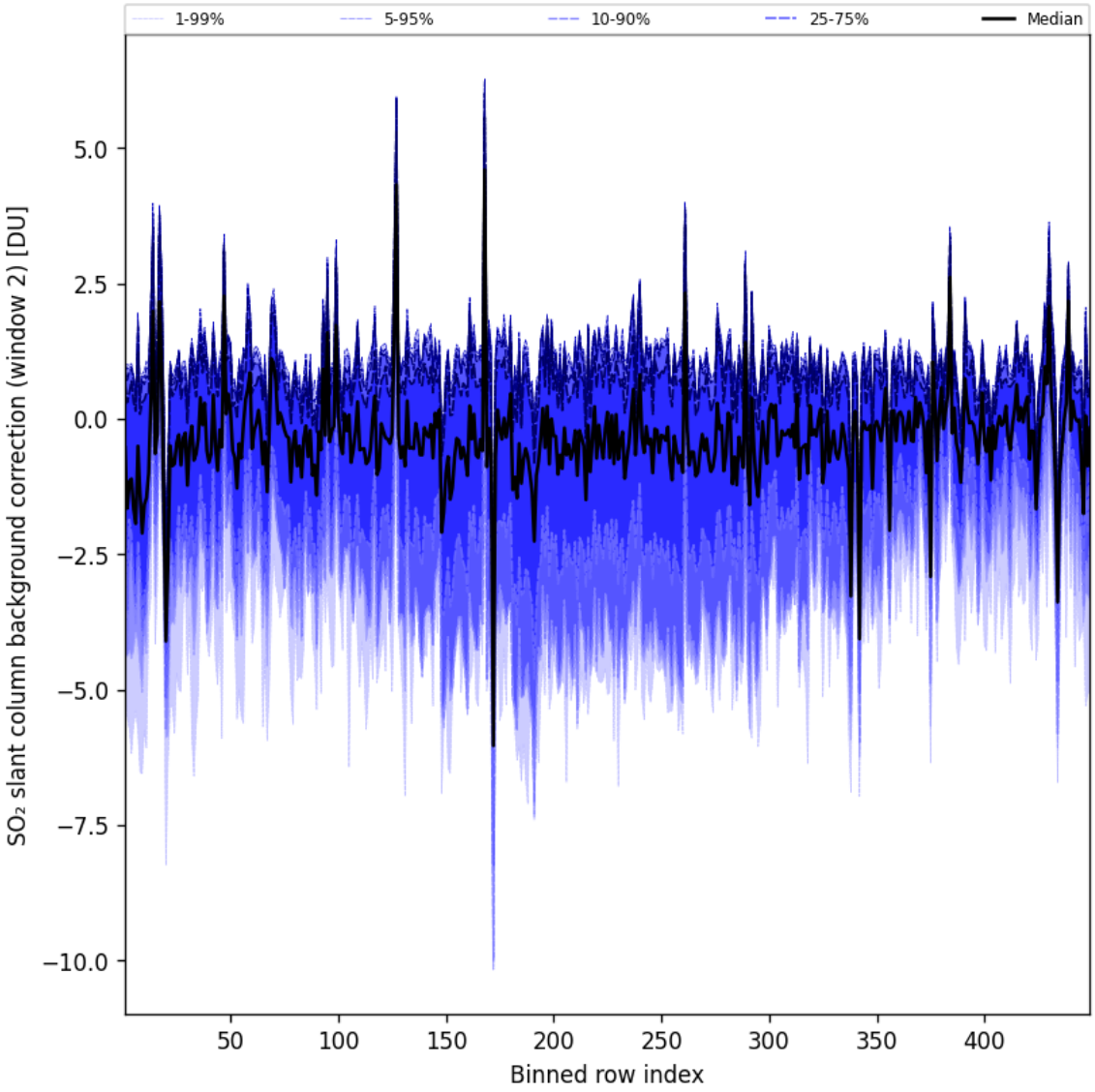


Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-06-09 to 2025-06-09

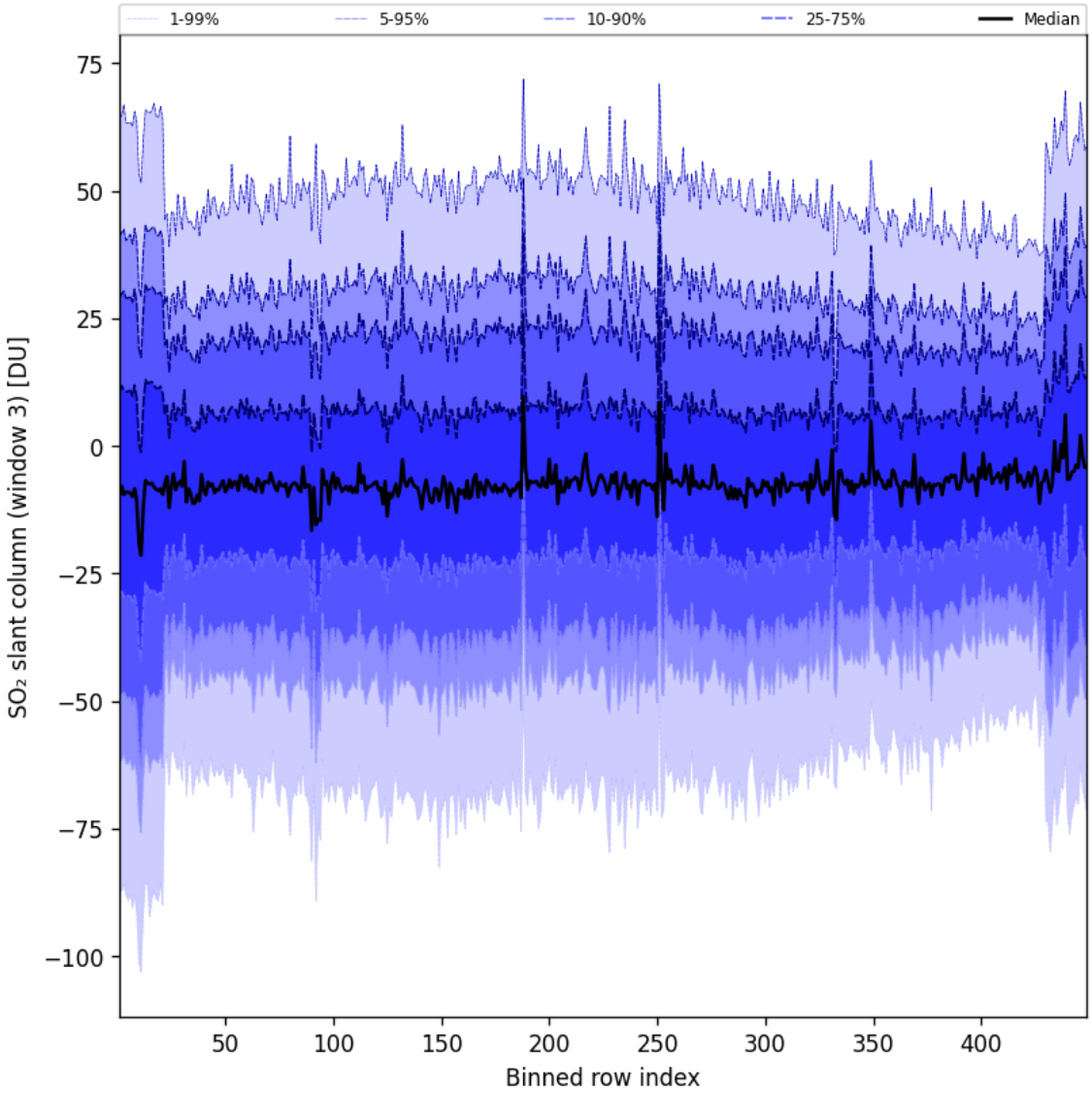


Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-06-09 to 2025-06-09

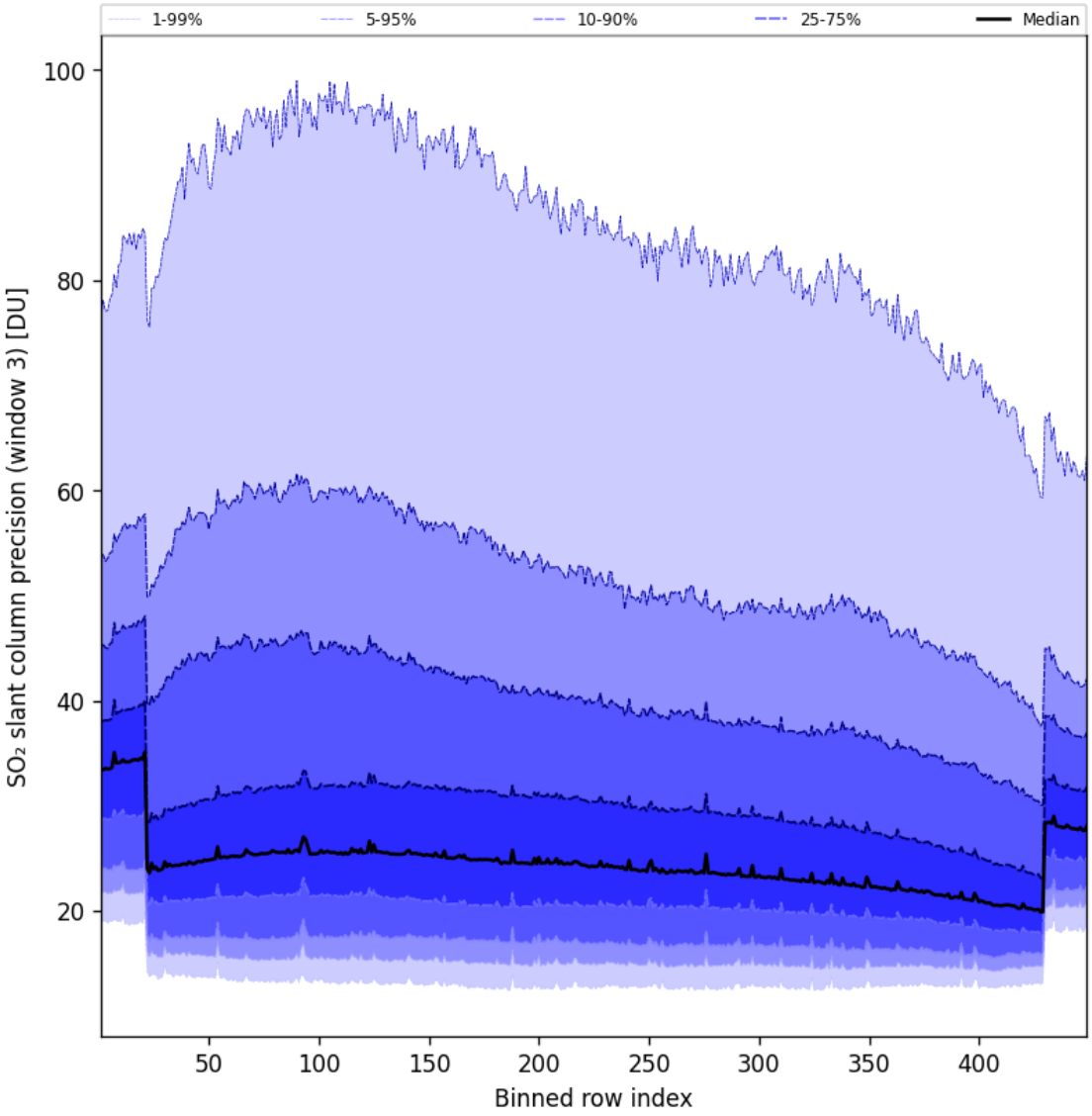


Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-06-09 to 2025-06-09

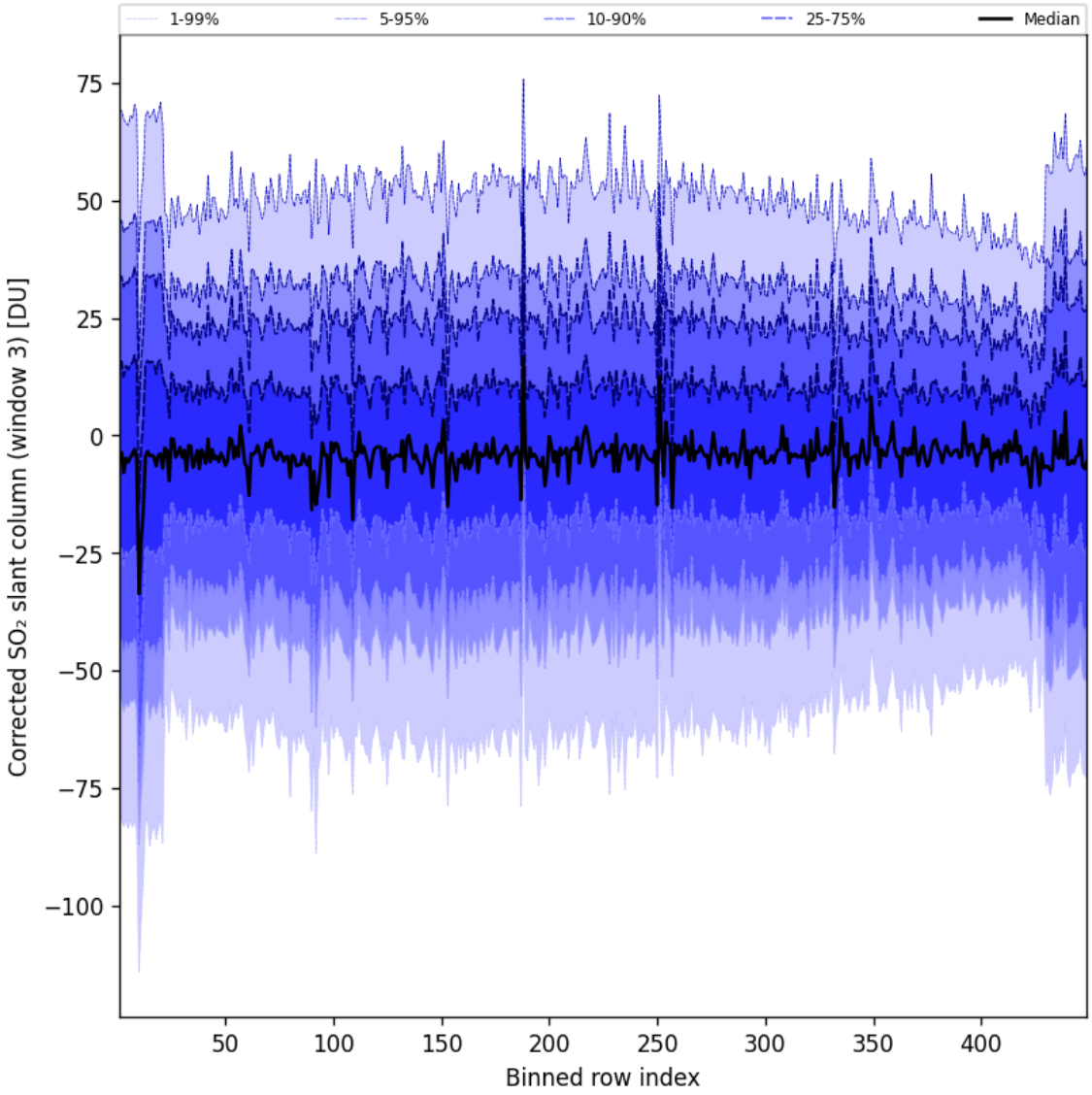


Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-06-09 to 2025-06-09

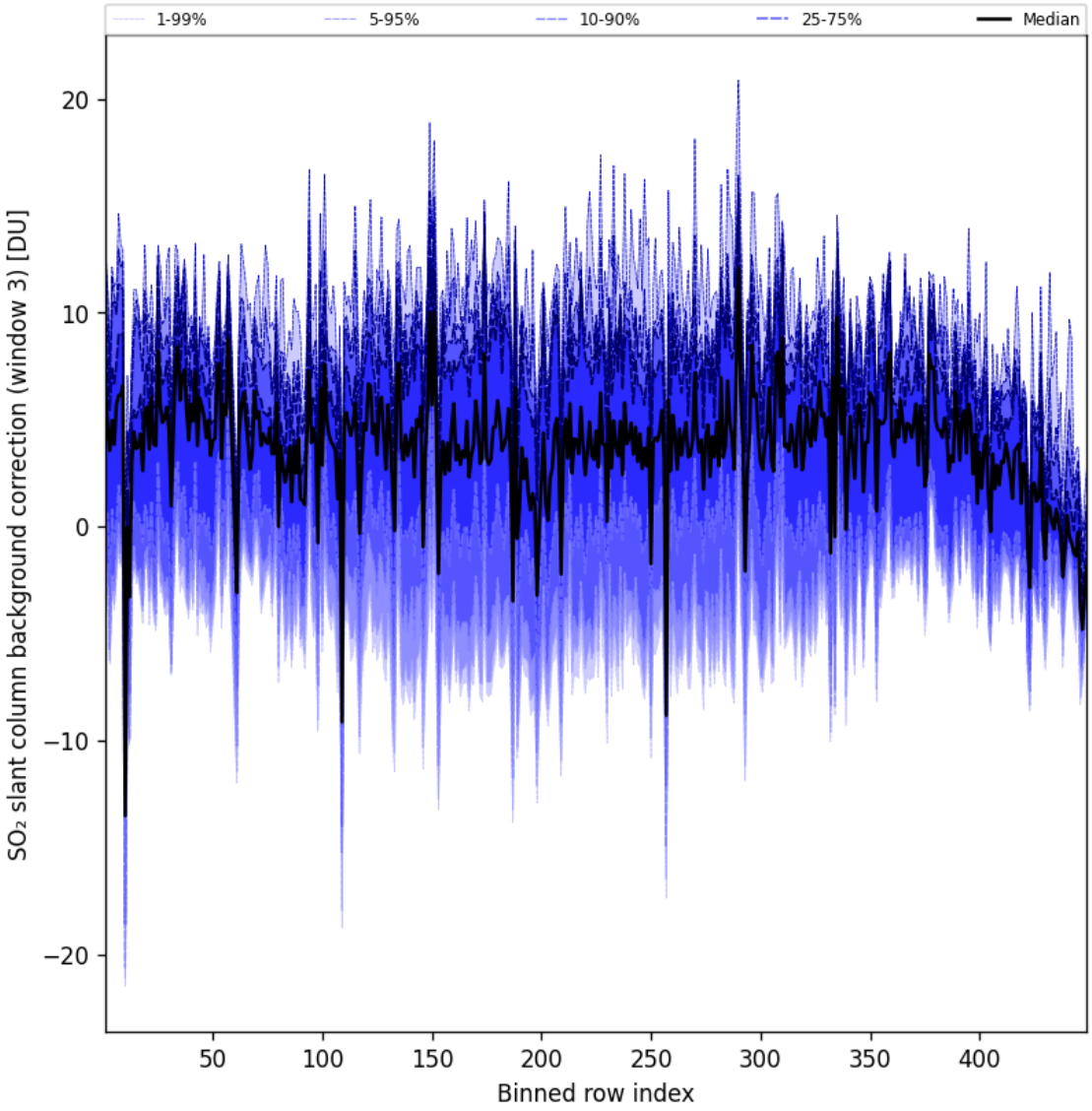
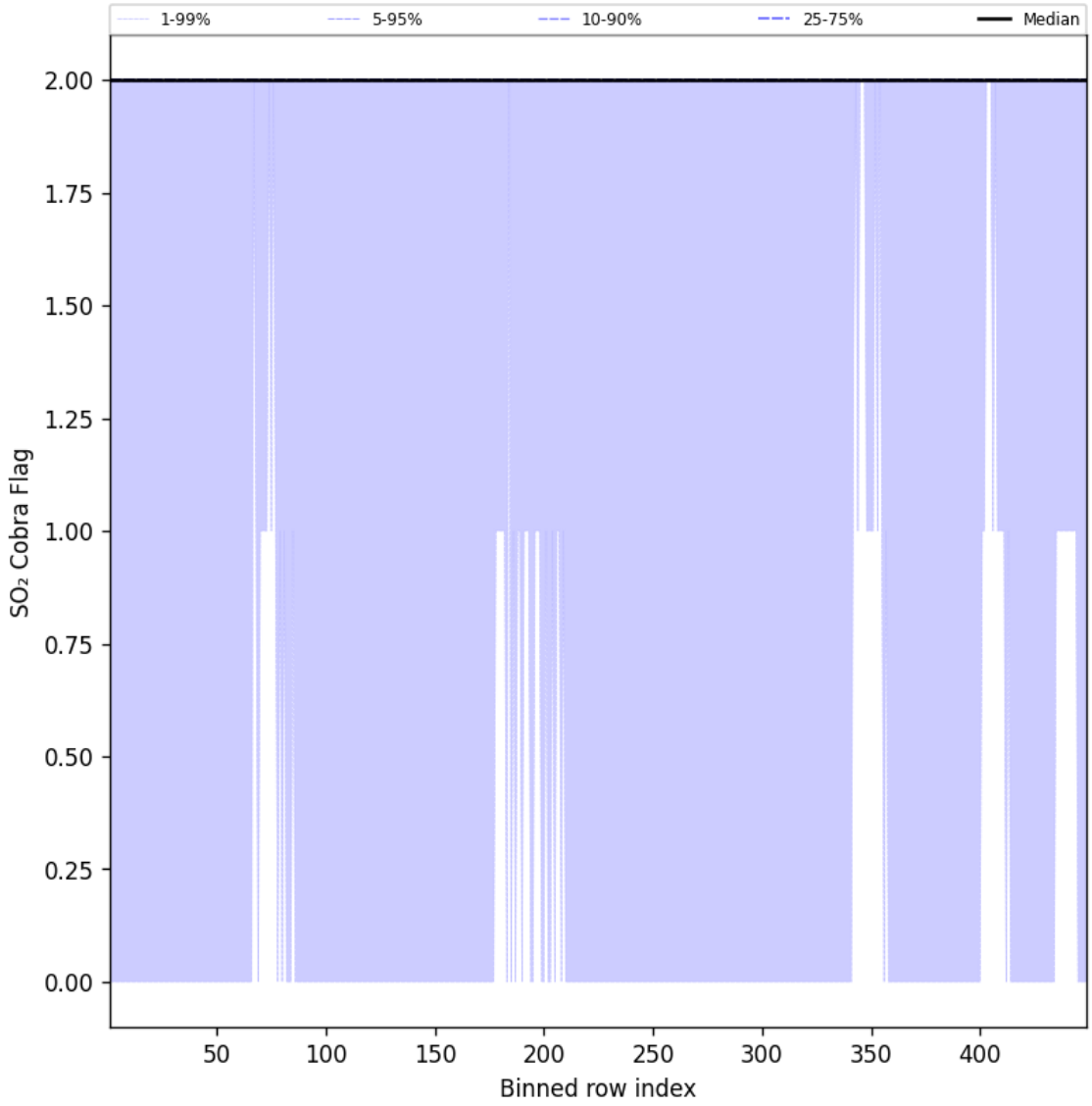


Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-06-09 to 2025-06-09



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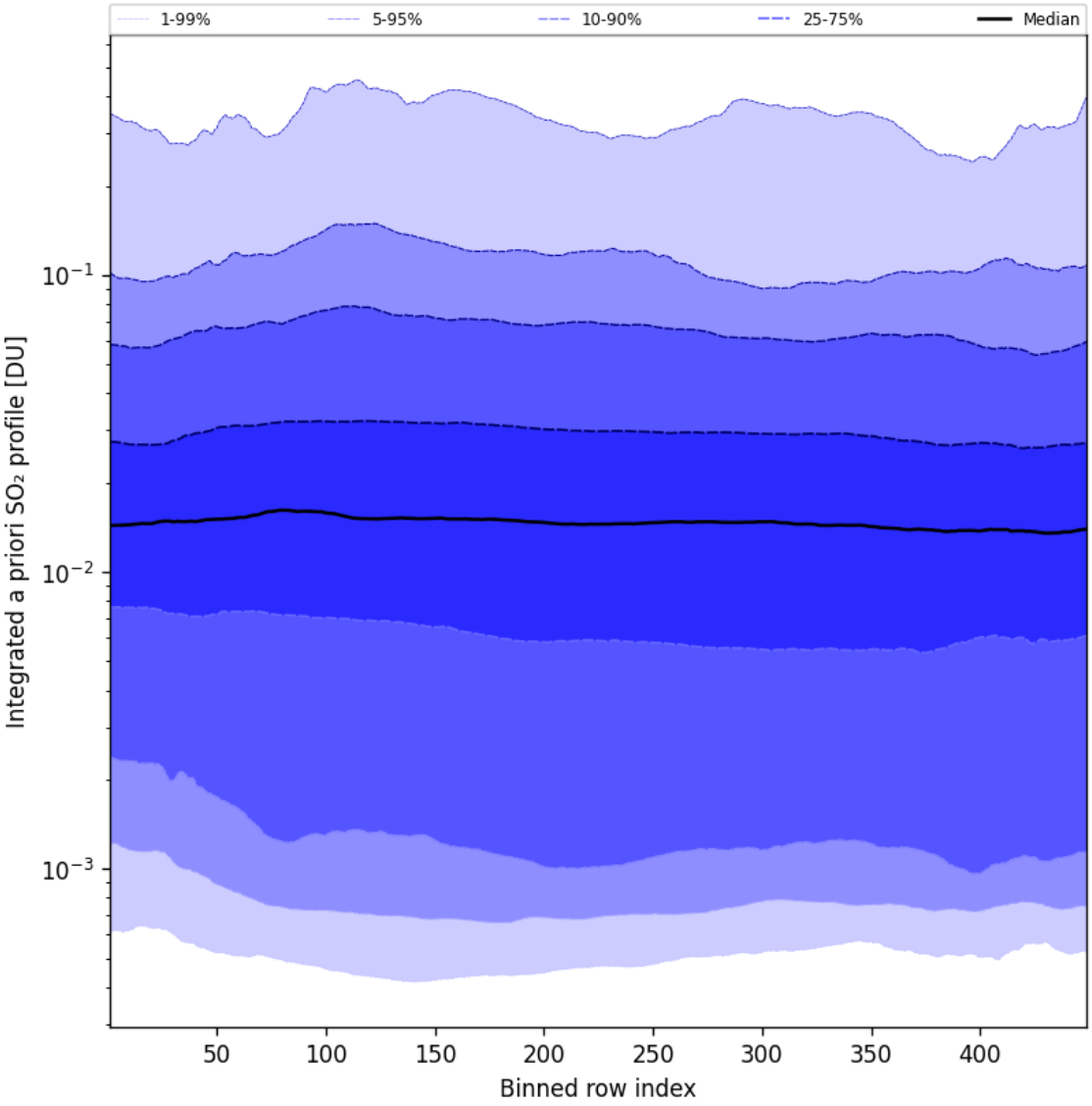
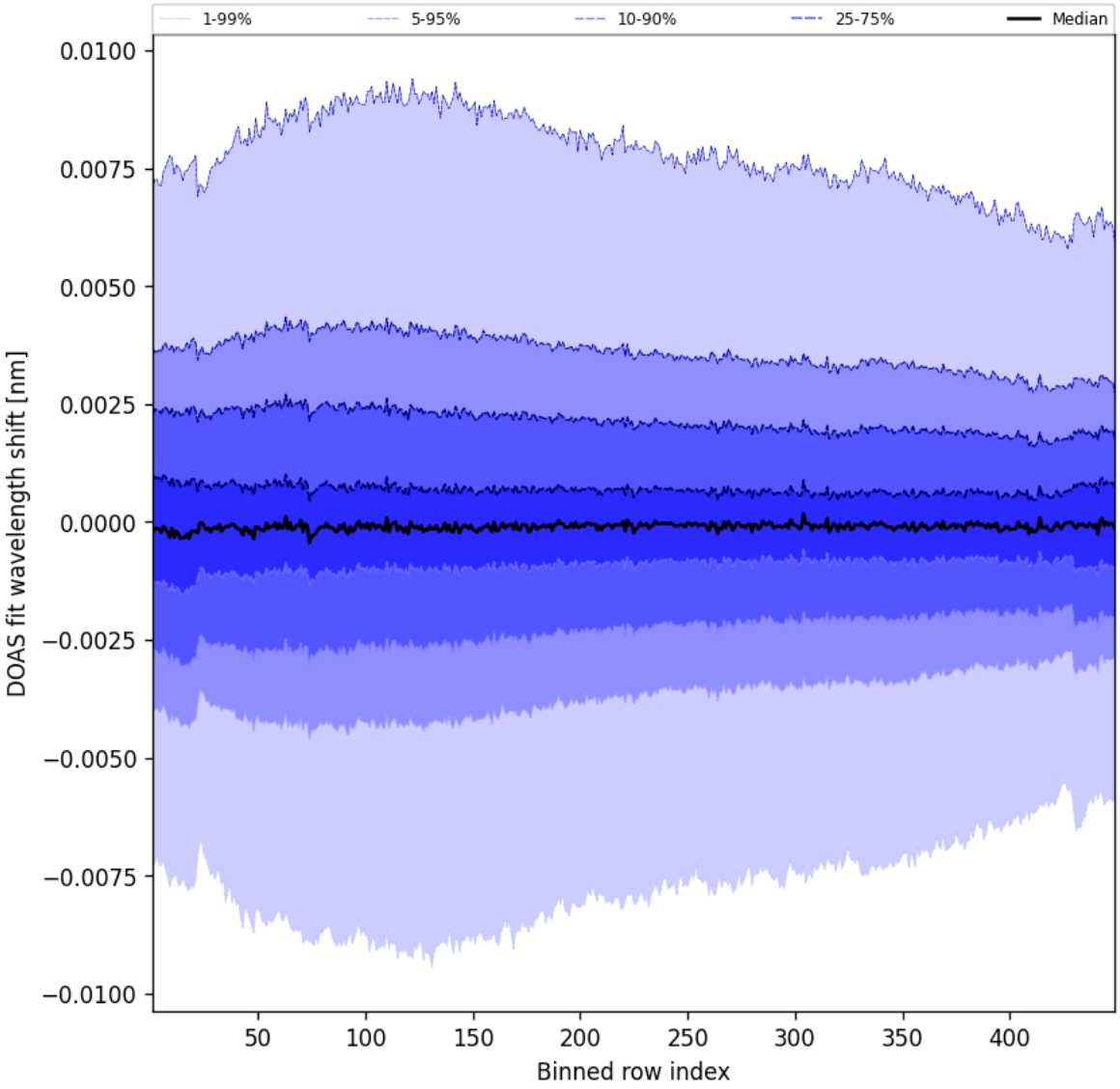


Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-06-09 to 2025-06-09



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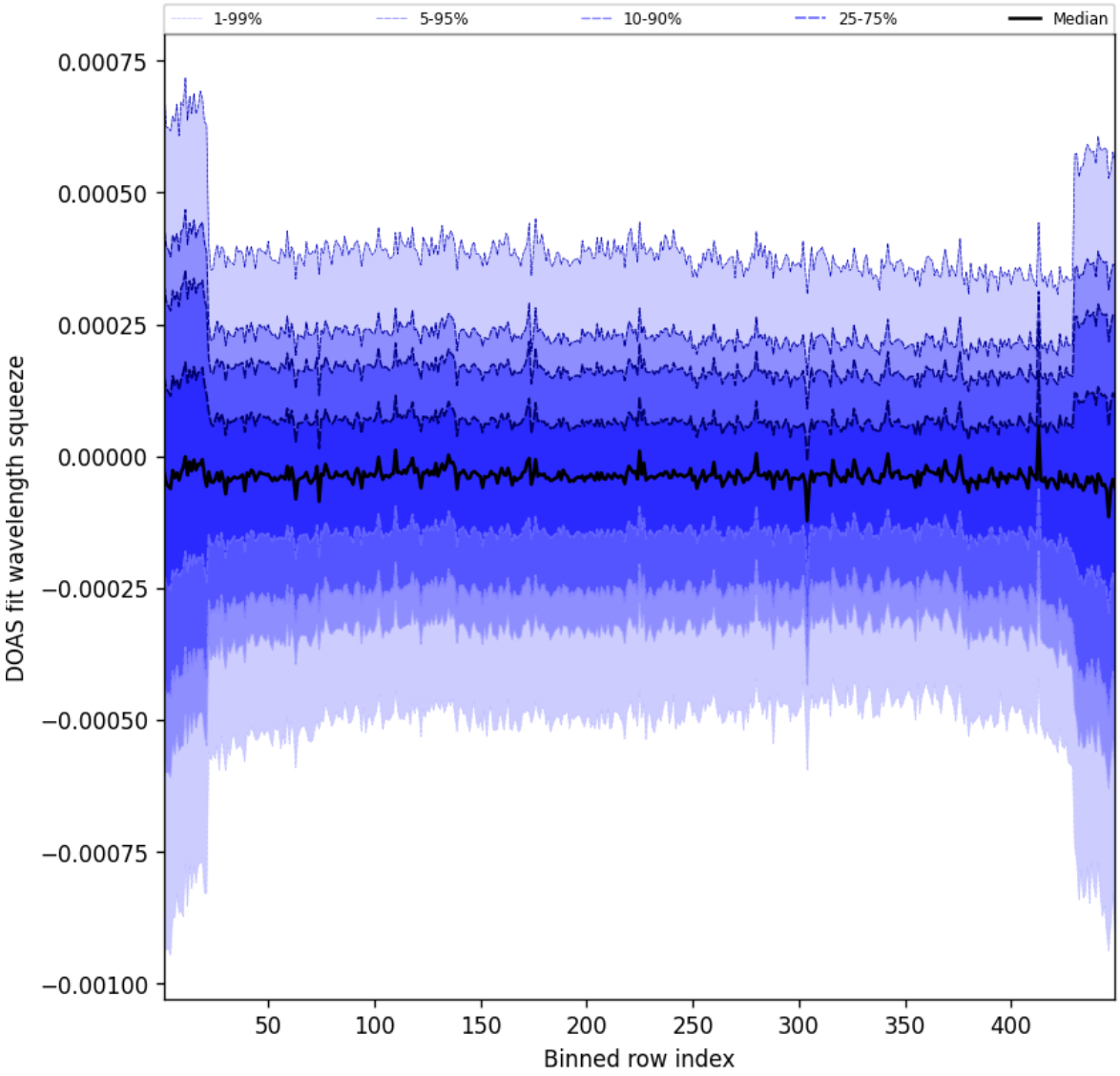

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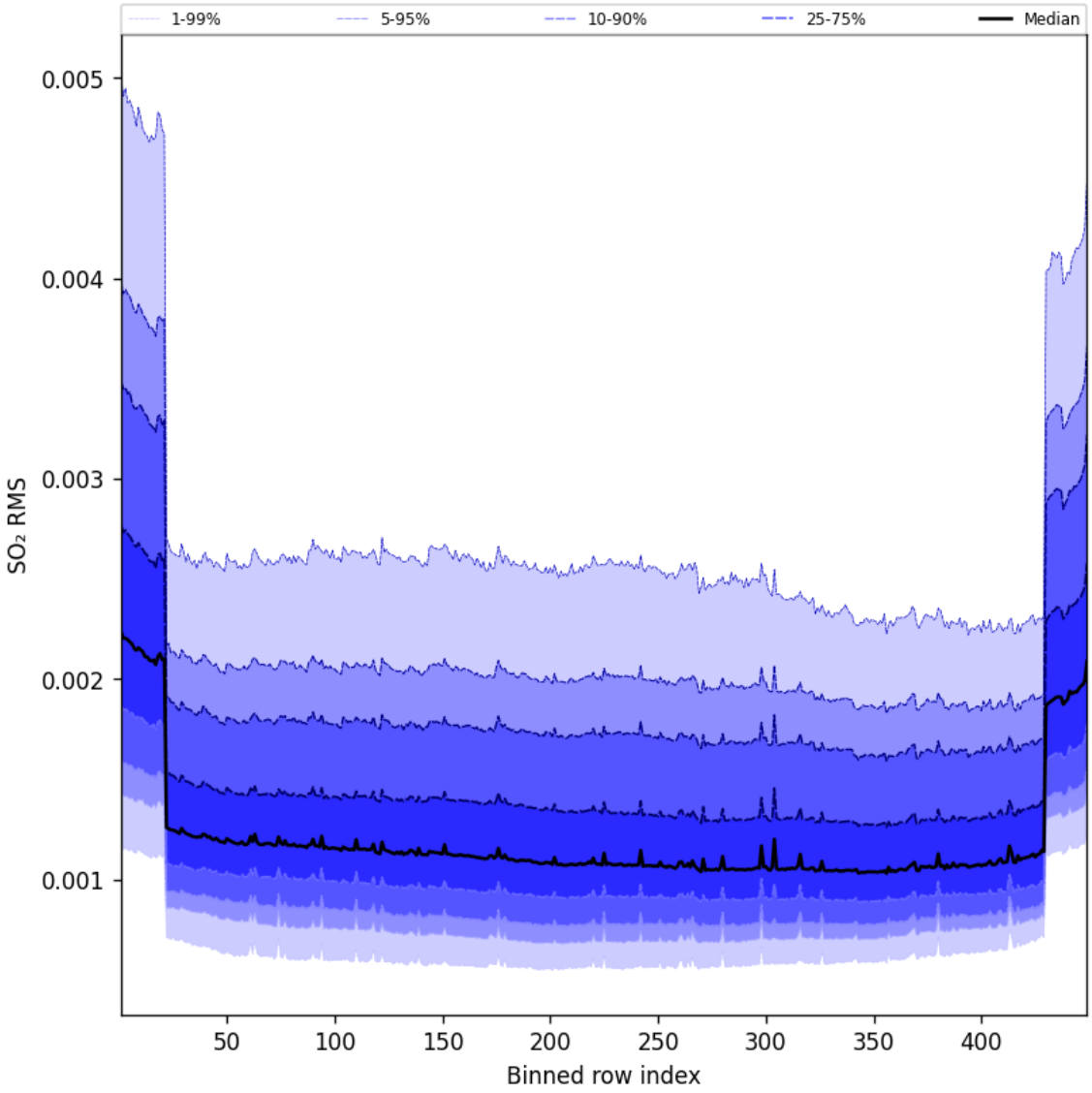

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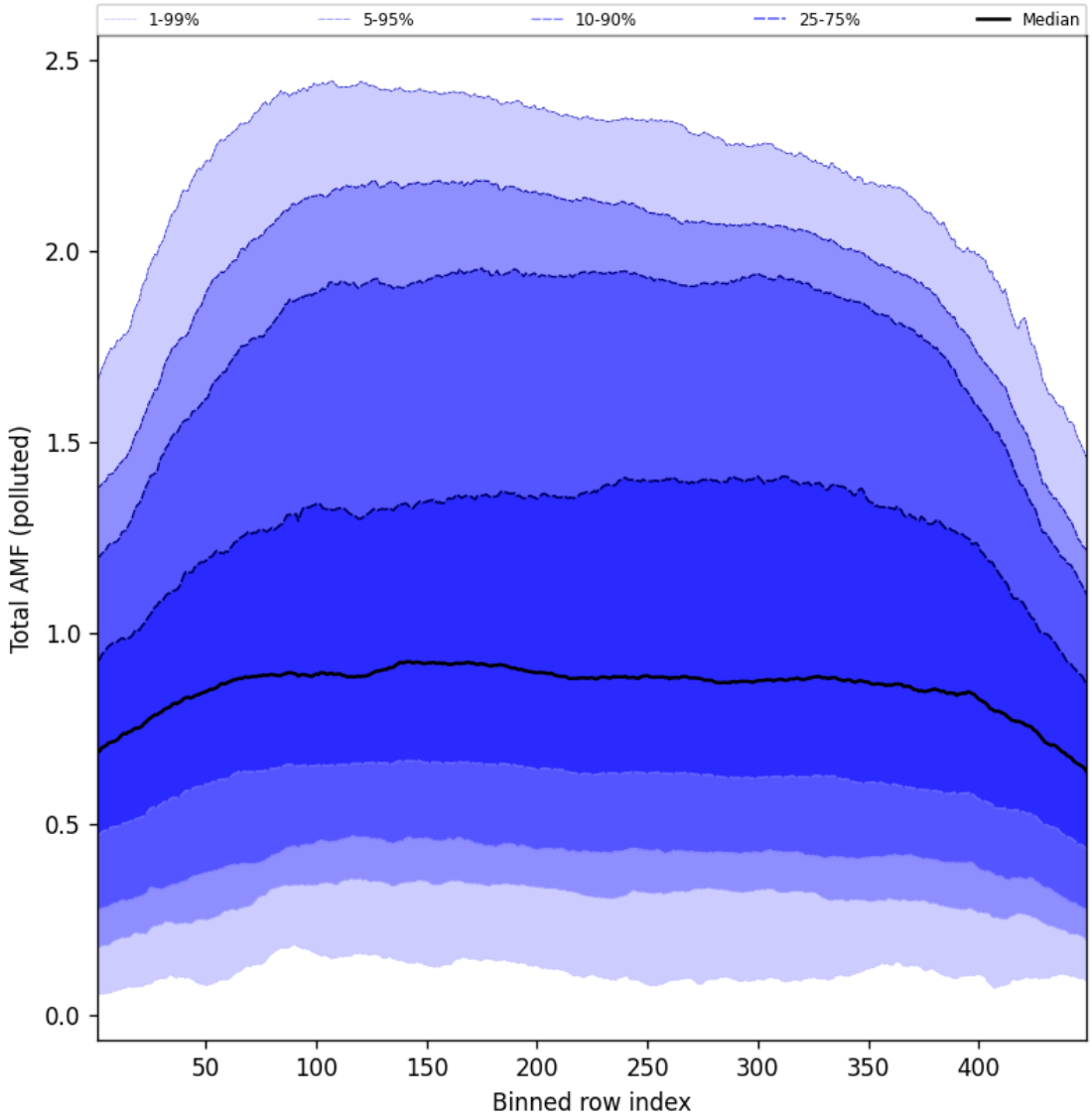

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-06-09 to 2025-06-09

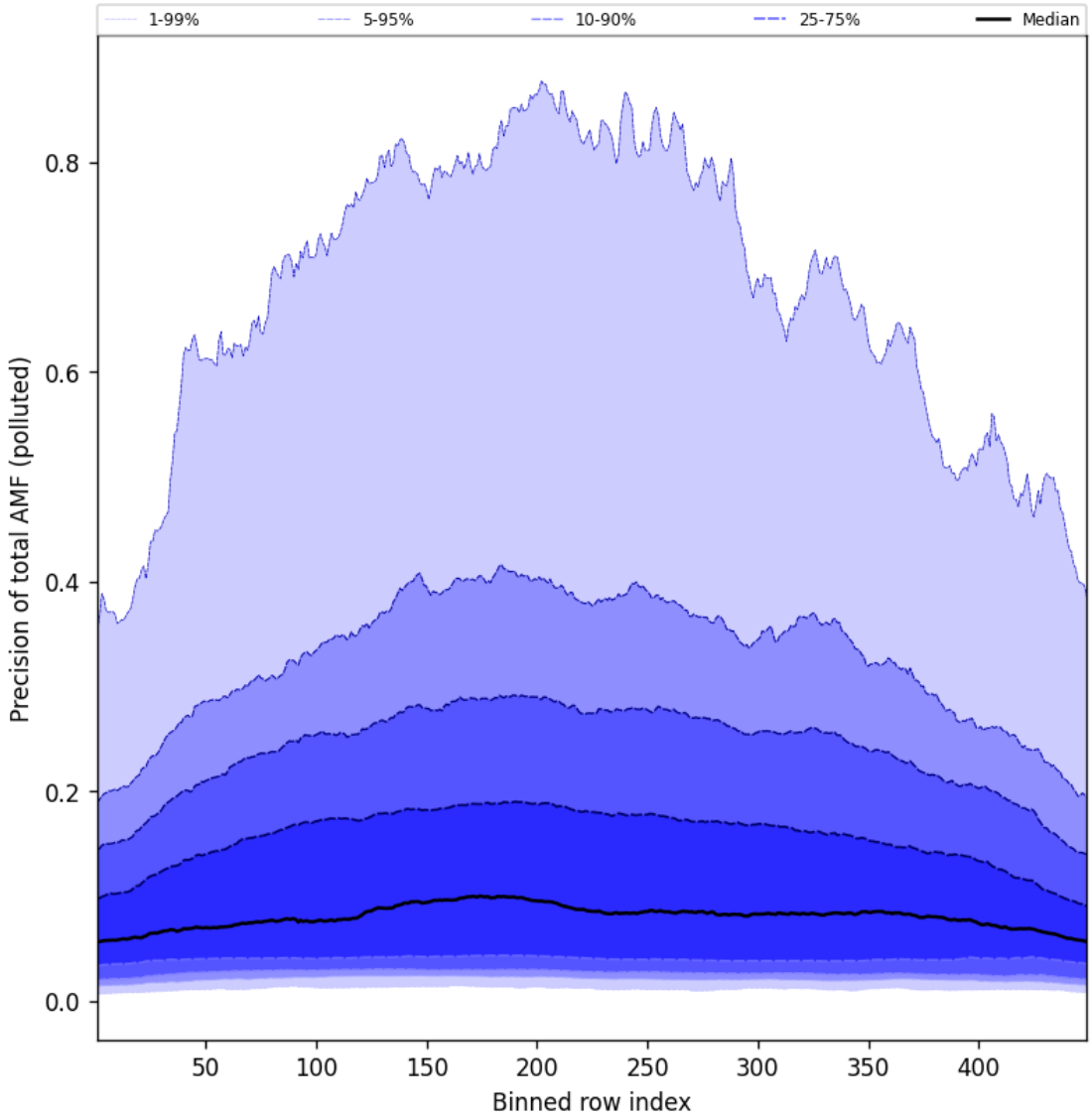

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-06-09 to 2025-06-09

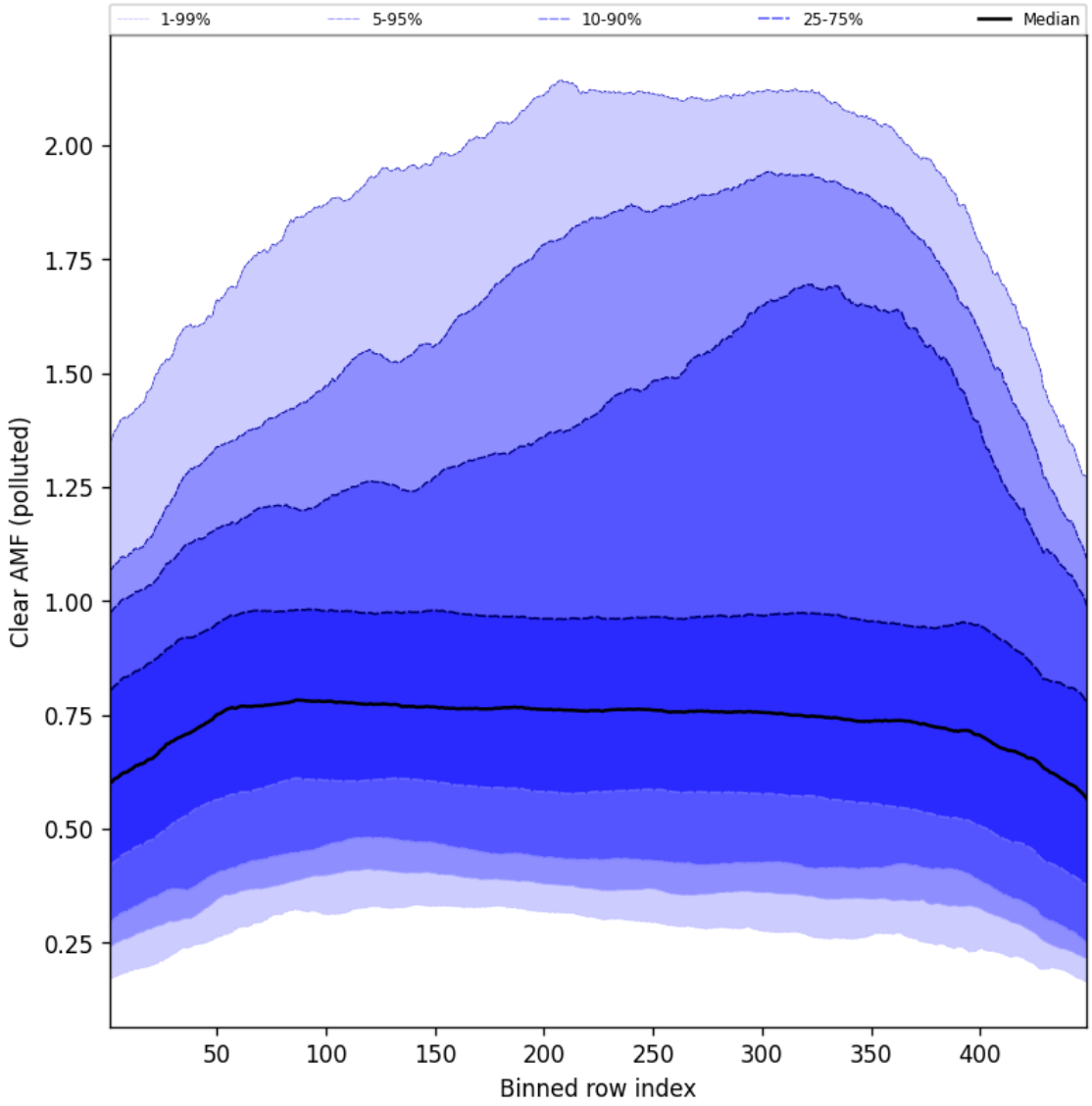

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-06-09 to 2025-06-09

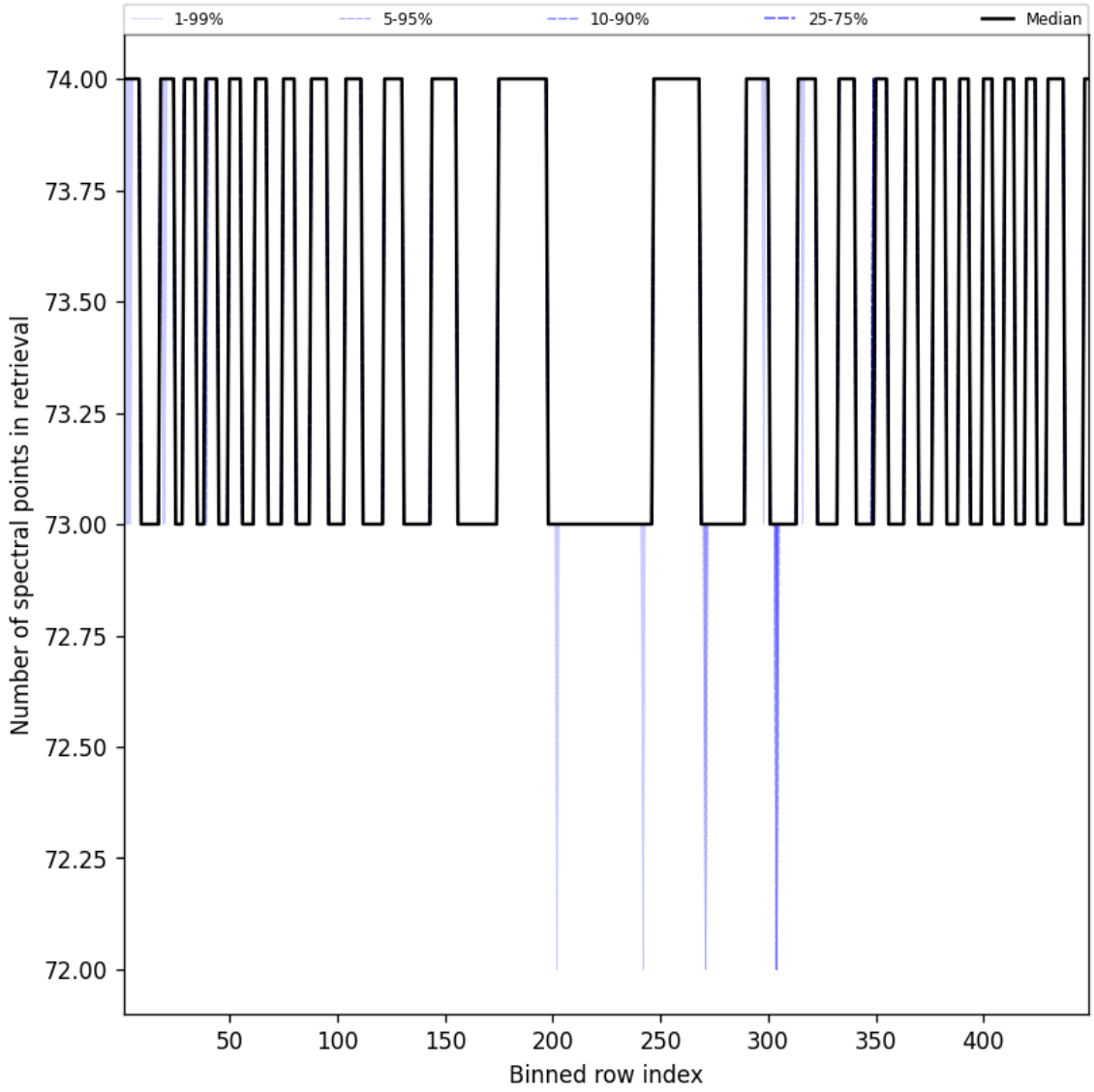

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-06-09 to 2025-06-09

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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