

PyCAMA report generated by tropl2-proc

tropl2-proc

2023-08-07 (02:16)

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:

$$\bar{x} = \frac{1}{N} \sum_{i=1}^N x_i \quad (1)$$

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 $\sigma(x) = \sqrt{V(x)}$.

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

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 :

$$P(x \leq m) = P(x \geq m) = \int_{-\infty}^m f(x) dx = \frac{1}{2} \quad (3)$$

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

The median is a special case of a percentile. Instead of 1/2 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} .

$$C_{kl} = C(x_{(k)}, x_{(l)}) = \frac{1}{N-1} \sum_{i=1}^N (x_{(k),i} - \bar{x}_{(k)})(x_{(l),i} - \bar{x}_{(l)}) \quad (4)$$

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

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

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]	0.617 ± 0.240	7640024	0.705	0.300	0.700	0.0	1.000
carbonmonoxide total column [mol m ⁻²]	$(2.958 \pm 1.070) \times 10^{-2}$	7640024	2.110×10^{-2}	1.292×10^{-2}	2.804×10^{-2}	0.0	2.86
carbonmonoxide total column corrected [mol m ⁻²]	$(2.958 \pm 1.059) \times 10^{-2}$	7640024	2.050×10^{-2}	1.277×10^{-2}	2.811×10^{-2}	-5.088×10^{-3}	2.86
carbonmonoxide total column precision [mol m ⁻²]	$(1.188 \pm 0.614) \times 10^{-3}$	7640024	8.050×10^{-4}	6.888×10^{-4}	1.021×10^{-3}	0.0	0.337
number of spectral points in retrieval [1]	154 ± 1	7640024	155	2.00	154	33.0	156
chi square [1]	$(0.151 \pm 1.047) \times 10^4$	7640024	518	1.019×10^3	1.006×10^3	188	5.197×10^6
degrees of freedom [1]	7.52 ± 0.46	7640024	7.95	0.913	7.68	4.00	8.00
number of iterations [1]	8.48 ± 1.22	7640024	8.17	1.000	8.00	5.00	15.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	0.400	0.400	0.400	0.700	0.700	1.000	1.000	1.000
carbonmonoxide total column [mol m ⁻²]	1.417×10^{-2}	1.697×10^{-2}	1.851×10^{-2}	1.982×10^{-2}	2.164×10^{-2}	3.456×10^{-2}	3.824×10^{-2}	4.296×10^{-2}	4.938×10^{-2}	6.559×10^{-2}
carbonmonoxide total column corrected [mol m ⁻²]	1.485×10^{-2}	1.736×10^{-2}	1.874×10^{-2}	1.993×10^{-2}	2.162×10^{-2}	3.439×10^{-2}	3.804×10^{-2}	4.289×10^{-2}	4.926×10^{-2}	6.545×10^{-2}
carbonmonoxide total column precision [mol m ⁻²]	3.960×10^{-4}	5.245×10^{-4}	6.070×10^{-4}	6.727×10^{-4}	7.613×10^{-4}	1.450×10^{-3}	1.745×10^{-3}	2.046×10^{-3}	2.439×10^{-3}	3.091×10^{-3}
number of spectral points in retrieval [1]	151	152	153	153	153	155	155	156	156	156
chi square [1]	333	404	464	530	637	1.656×10^3	2.085×10^3	2.558×10^3	3.415×10^3	6.652×10^3
degrees of freedom [1]	6.00	7.00	7.00	7.00	7.04	7.95	7.98	7.99	7.99	8.00
number of iterations [1]	7.00	7.00	8.00	8.00	8.00	9.00	9.00	9.00	11.0	14.0

4

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]	0.638 ± 0.228	5028230	0.0	0.700	0.0	1.000	0.700	0.700
carbonmonoxide total column [mol m ⁻²]	$(3.360 \pm 1.009) \times 10^{-2}$	5028230	1.030×10^{-2}	3.210×10^{-2}	0.0	0.366	2.720×10^{-2}	3.750×10^{-2}
carbonmonoxide total column corrected [mol m ⁻²]	$(3.360 \pm 0.996) \times 10^{-2}$	5028230	9.987×10^{-3}	3.210×10^{-2}	-2.657×10^{-3}	0.367	2.730×10^{-2}	3.728×10^{-2}
carbonmonoxide total column precision [mol m ⁻²]	$(1.135 \pm 0.578) \times 10^{-3}$	5028230	6.493×10^{-4}	9.810×10^{-4}	0.0	2.074×10^{-2}	7.306×10^{-4}	1.380×10^{-3}
number of spectral points in retrieval [1]	154 ± 1	5028230	2.00	154	33.0	156	153	155
chi square [1]	$(0.171 \pm 1.198) \times 10^4$	5028230	1.155×10^3	1.142×10^3	188	5.197×10^6	709	1.864×10^3
degrees of freedom [1]	7.52 ± 0.47	5028230	0.951	7.71	4.00	8.00	7.01	7.96
number of iterations [1]	8.45 ± 1.26	5028230	1.000	8.00	5.00	15.0	8.00	9.00

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]	0.576 ± 0.257	2611794	0.300	0.700	0.0	1.000	0.400	0.700
carbonmonoxide total column [mol m ⁻²]	$(2.183 \pm 0.693) \times 10^{-2}$	2611794	4.970×10^{-3}	2.069×10^{-2}	0.0	2.86	1.845×10^{-2}	2.342×10^{-2}
carbonmonoxide total column corrected [mol m ⁻²]	$(2.183 \pm 0.678) \times 10^{-2}$	2611794	4.510×10^{-3}	2.062×10^{-2}	-5.088×10^{-3}	2.86	1.864×10^{-2}	2.314×10^{-2}
carbonmonoxide total column precision [mol m ⁻²]	$(1.290 \pm 0.667) \times 10^{-3}$	2611794	7.672×10^{-4}	1.099×10^{-3}	0.0	0.337	8.249×10^{-4}	1.592×10^{-3}
number of spectral points in retrieval [1]	154 ± 1	2611794	2.00	154	147	156	153	155
chi square [1]	$(0.112 \pm 0.662) \times 10^4$	2611794	718	808	194	3.210×10^6	544	1.262×10^3
degrees of freedom [1]	7.52 ± 0.43	2611794	0.795	7.63	4.00	8.00	7.13	7.92
number of iterations [1]	8.53 ± 1.14	2611794	1.000	8.00	5.00	15.0	8.00	9.00

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]	0.601 ± 0.239	4991056	0.300	0.700	0.0	1.000	0.400	0.700
carbonmonoxide total column [mol m ⁻²]	$(2.757 \pm 1.019) \times 10^{-2}$	4991056	1.224×10^{-2}	2.467×10^{-2}	0.0	2.86	2.038×10^{-2}	3.262×10^{-2}
carbonmonoxide total column corrected [mol m ⁻²]	$(2.757 \pm 1.008) \times 10^{-2}$	4991056	1.215×10^{-2}	2.446×10^{-2}	-5.088×10^{-3}	2.86	2.043×10^{-2}	3.259×10^{-2}
carbonmonoxide total column precision [mol m ⁻²]	$(1.268 \pm 0.651) \times 10^{-3}$	4991056	7.869×10^{-4}	1.079×10^{-3}	0.0	0.337	7.960×10^{-4}	1.583×10^{-3}
number of spectral points in retrieval [1]	154 ± 1	4991056	2.00	154	146	156	153	155
chi square [1]	$(0.129 \pm 0.979) \times 10^4$	4991056	831	884	188	5.197×10^6	585	1.416×10^3
degrees of freedom [1]	7.53 ± 0.44	4991056	0.892	7.66	5.00	8.00	7.05	7.94
number of iterations [1]	8.53 ± 1.22	4991056	1.000	8.00	5.00	15.0	8.00	9.00

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]	0.663 ± 0.227	1789265	0.0	0.700	0.0	1.000	0.700	0.700
carbonmonoxide total column [mol m ⁻²]	$(3.155 \pm 0.976) \times 10^{-2}$	1789265	9.126×10^{-3}	3.055×10^{-2}	0.0	0.285	2.596×10^{-2}	3.509×10^{-2}
carbonmonoxide total column corrected [mol m ⁻²]	$(3.156 \pm 0.963) \times 10^{-2}$	1789265	8.744×10^{-3}	3.058×10^{-2}	-3.458×10^{-3}	0.285	2.613×10^{-2}	3.487×10^{-2}
carbonmonoxide total column precision [mol m ⁻²]	$(9.631 \pm 4.679) \times 10^{-4}$	1789265	5.332×10^{-4}	8.689×10^{-4}	0.0	2.044×10^{-2}	6.406×10^{-4}	1.174×10^{-3}
number of spectral points in retrieval [1]	154 ± 1	1789265	2.00	154	33.0	156	153	155
chi square [1]	$(0.213 \pm 1.148) \times 10^4$	1789265	1.452×10^3	1.466×10^3	209	3.852×10^6	907	2.359×10^3
degrees of freedom [1]	7.50 ± 0.52	1789265	0.954	7.72	4.00	8.00	7.01	7.97
number of iterations [1]	8.36 ± 1.24	1789265	1.000	8.00	5.00	15.0	8.00	9.00

Table 7: Correlation matrix

Viewing zenith angle	Solar zenith angle	Latitude	CO total vertical column	CO total vertical column (stripe-corrected)	CO total vertical column precision	Number of spectral points in retrieval	χ^2	Degrees of freedom for signal	Number of iterations
1.000	4.872×10^{-2}	-1.455×10^{-2}	4.901×10^{-3}	5.452×10^{-3}	-0.210	8.980×10^{-2}	1.133×10^{-2}	4.077×10^{-2}	4.311×10^{-2}
4.872×10^{-2}	1.000	-7.966×10^{-2}	-1.947×10^{-2}	-1.981×10^{-2}	-3.778×10^{-2}	2.874×10^{-3}	-4.442×10^{-2}	-0.114	-0.116
-1.455×10^{-2}	-7.966×10^{-2}	1.000	0.626	0.633	-0.158	1.864×10^{-3}	1.841×10^{-2}	-1.841×10^{-2}	-1.947×10^{-2}
4.901×10^{-3}	-1.947×10^{-2}	0.626	1.000	0.992	-6.016×10^{-2}	8.482×10^{-3}	1.337×10^{-2}	-1.547×10^{-2}	-2.594×10^{-2}
5.452×10^{-3}	-1.981×10^{-2}	0.633	0.992	1.000	-6.298×10^{-2}	3.272×10^{-3}	1.373×10^{-2}	-1.537×10^{-2}	-2.599×10^{-2}
-0.210	-3.778×10^{-2}	-0.158	-6.016×10^{-2}	-6.298×10^{-2}	1.000	-1.931×10^{-2}	-6.327×10^{-2}	3.325×10^{-2}	-2.519×10^{-2}
8.980×10^{-2}	2.874×10^{-3}	1.864×10^{-3}	8.482×10^{-3}	3.272×10^{-3}	-1.931×10^{-2}	1.000	1.350×10^{-3}	-8.835×10^{-3}	1.153×10^{-2}
1.133×10^{-2}	-4.442×10^{-2}	1.841×10^{-2}	1.337×10^{-2}	1.373×10^{-2}	-6.327×10^{-2}	1.350×10^{-3}	1.000	-3.546×10^{-3}	-7.681×10^{-3}
4.077×10^{-2}	-0.114	-1.841×10^{-2}	-1.547×10^{-2}	-1.537×10^{-2}	3.325×10^{-2}	-8.835×10^{-3}	-3.546×10^{-3}	1.000	-7.206×10^{-2}
4.311×10^{-2}	-0.116	-1.947×10^{-2}	-2.594×10^{-2}	-2.599×10^{-2}	-2.519×10^{-2}	1.153×10^{-2}	-7.681×10^{-3}	-7.206×10^{-2}	1.000

Table 8: Covariance matrix

Viewing zenith angle	Solar zenith angle	Latitude	CO total vertical column	CO total vertical column (stripe-corrected)	CO total vertical column precision	Number of spectral points in retrieval	χ^2	Degrees of freedom for signal	Number of iterations
348	19.4	-12.2	9.785×10^{-4}	1.077×10^{-3}	-2.405×10^{-3}	2.14	2.212×10^3	0.350	0.980
19.4	457	-76.7	-4.458×10^{-3}	-4.490×10^{-3}	-4.965×10^{-4}	7.840×10^{-2}	-9.945×10^3	-1.12	-3.03
-12.2	-76.7	2.024×10^3	0.302	0.302	-4.357×10^{-3}	0.107	8.667×10^3	-0.381	-1.07
9.785×10^{-4}	-4.458×10^{-3}	0.302	1.146×10^{-4}	1.125×10^{-4}	-3.956×10^{-7}	1.158×10^{-4}	1.50	-7.625×10^{-5}	-3.385×10^{-4}
1.077×10^{-3}	-4.490×10^{-3}	0.302	1.125×10^{-4}	1.123×10^{-4}	-4.099×10^{-7}	4.421×10^{-5}	1.52	-7.497×10^{-5}	-3.358×10^{-4}
-2.405×10^{-3}	-4.965×10^{-4}	-4.357×10^{-3}	-3.956×10^{-7}	-4.099×10^{-7}	3.775×10^{-7}	-1.513×10^{-5}	-0.407	9.407×10^{-6}	-1.887×10^{-5}
2.14	7.840×10^{-2}	0.107	1.158×10^{-4}	4.421×10^{-5}	-1.513×10^{-5}	1.63	18.0	-5.188×10^{-3}	1.793×10^{-2}
2.212×10^3	-9.945×10^3	8.667×10^3	1.50	1.52	-0.407	18.0	1.095×10^8	-17.1	-98.0
0.350	-1.12	-0.381	-7.625×10^{-5}	-7.497×10^{-5}	9.407×10^{-6}	-5.188×10^{-3}	-17.1	0.212	-4.046×10^{-2}
0.980	-3.03	-1.07	-3.385×10^{-4}	-3.358×10^{-4}	-1.887×10^{-5}	1.793×10^{-2}	-98.0	-4.046×10^{-2}	1.49

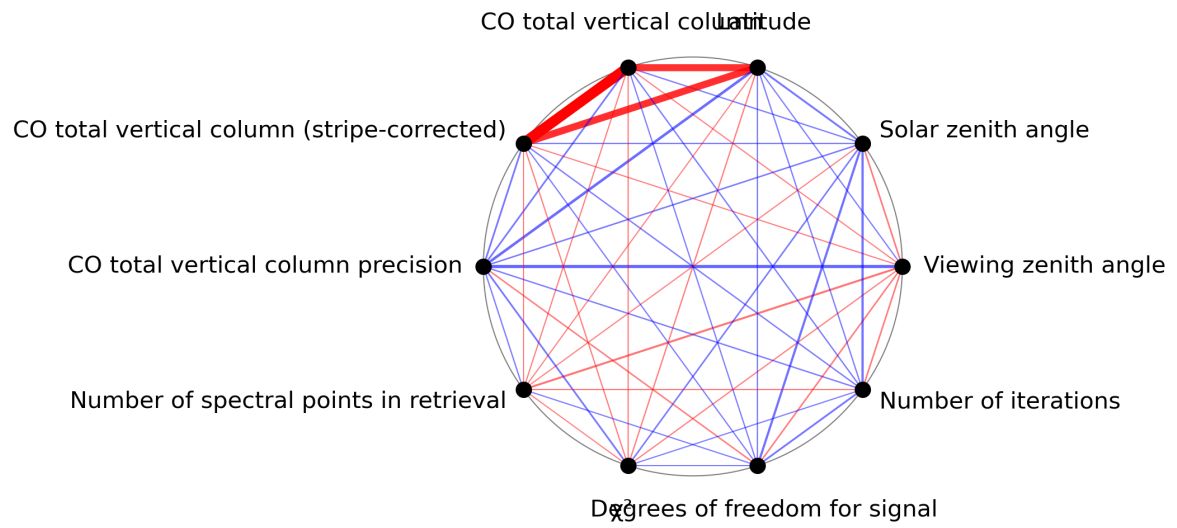


Figure 1: Map of correlation graph for 2023-07-22 to 2023-07-24.

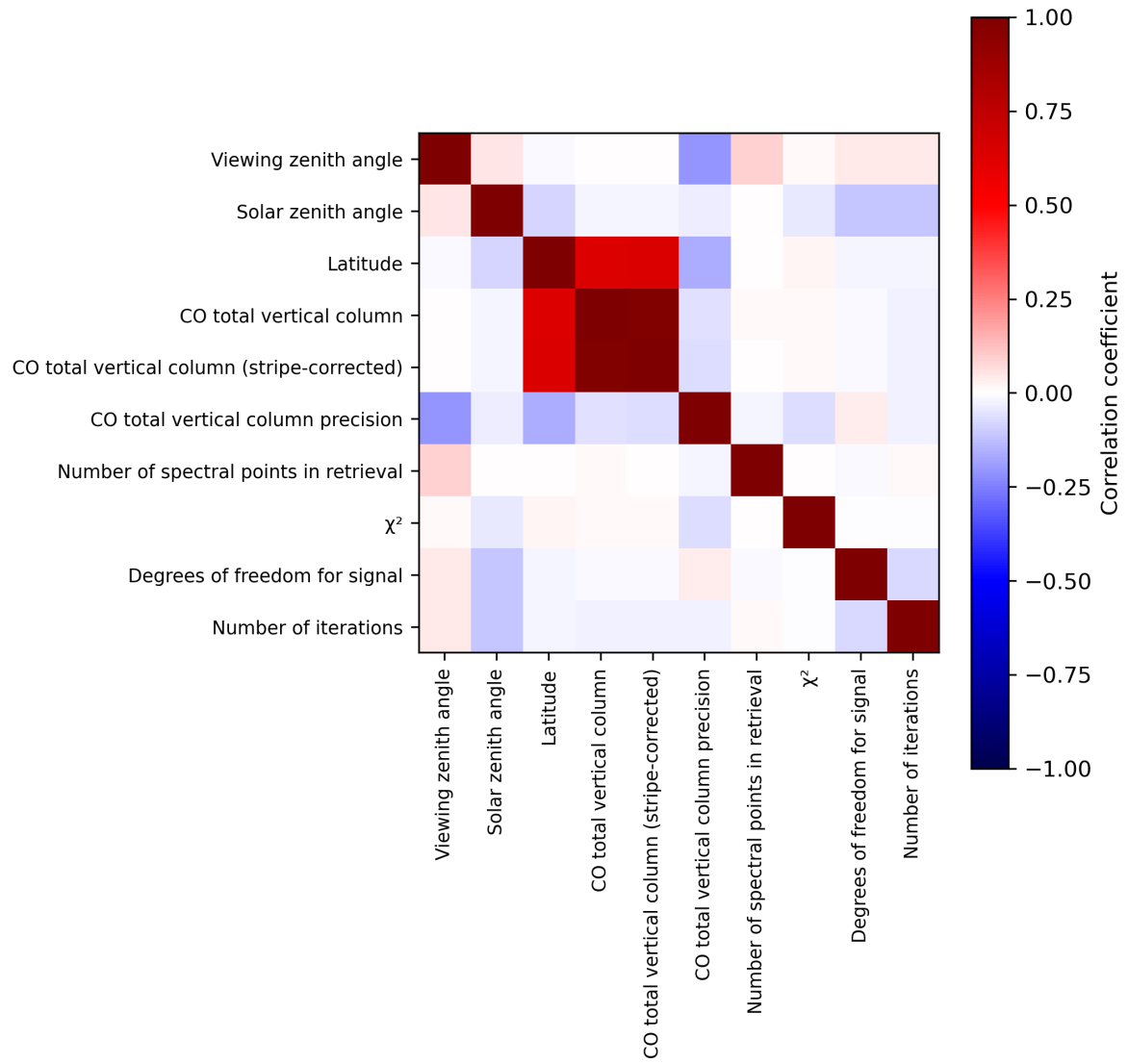


Figure 2: Map of correlation matrix for 2023-07-22 to 2023-07-24.

3 Granule outlines

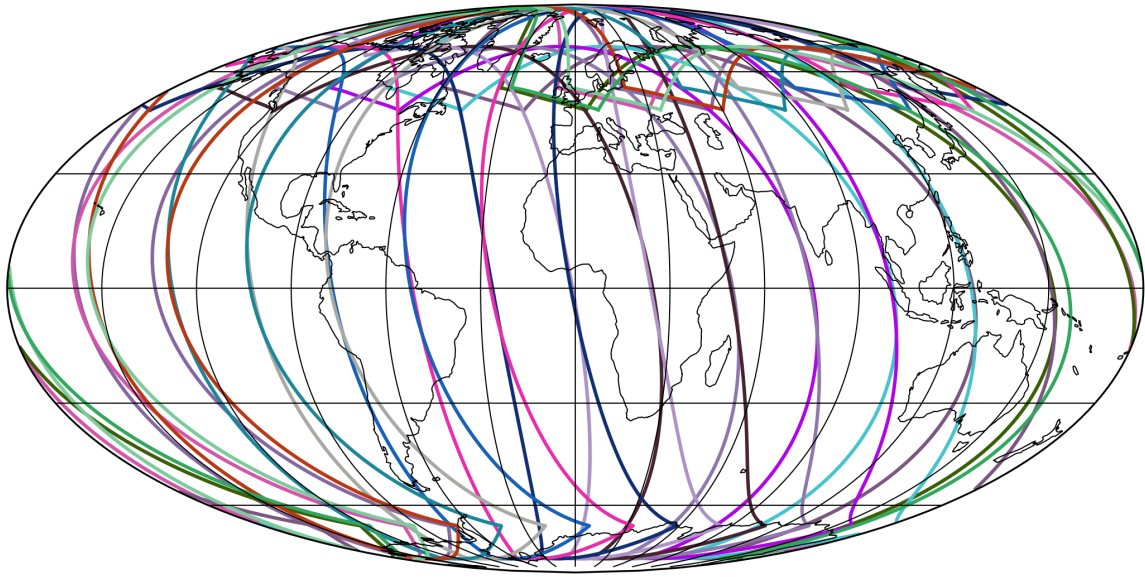


Figure 3: Outline of the granules.

4 Input data monitoring

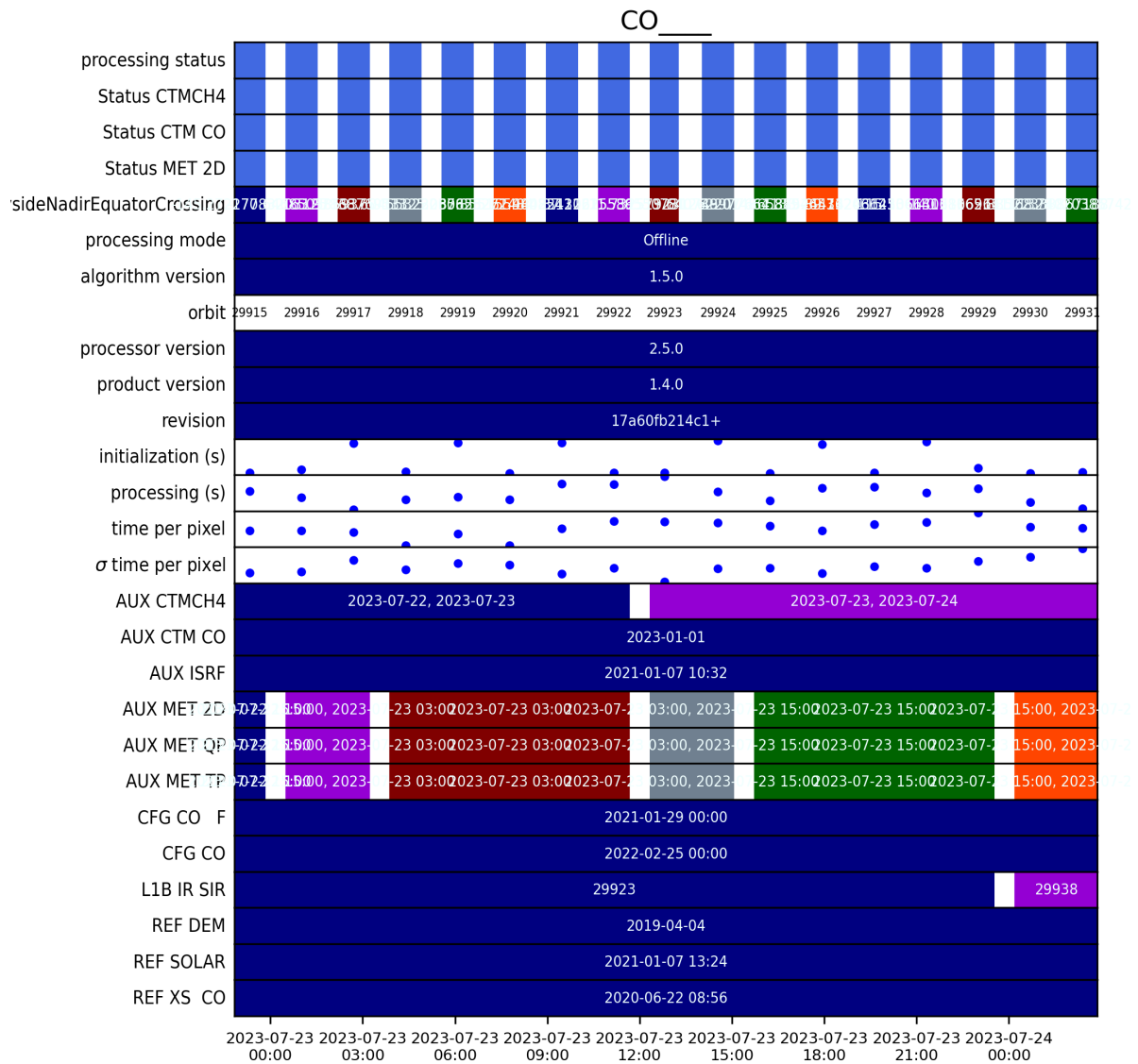


Figure 4: Input data per granule

5 Warnings and errors

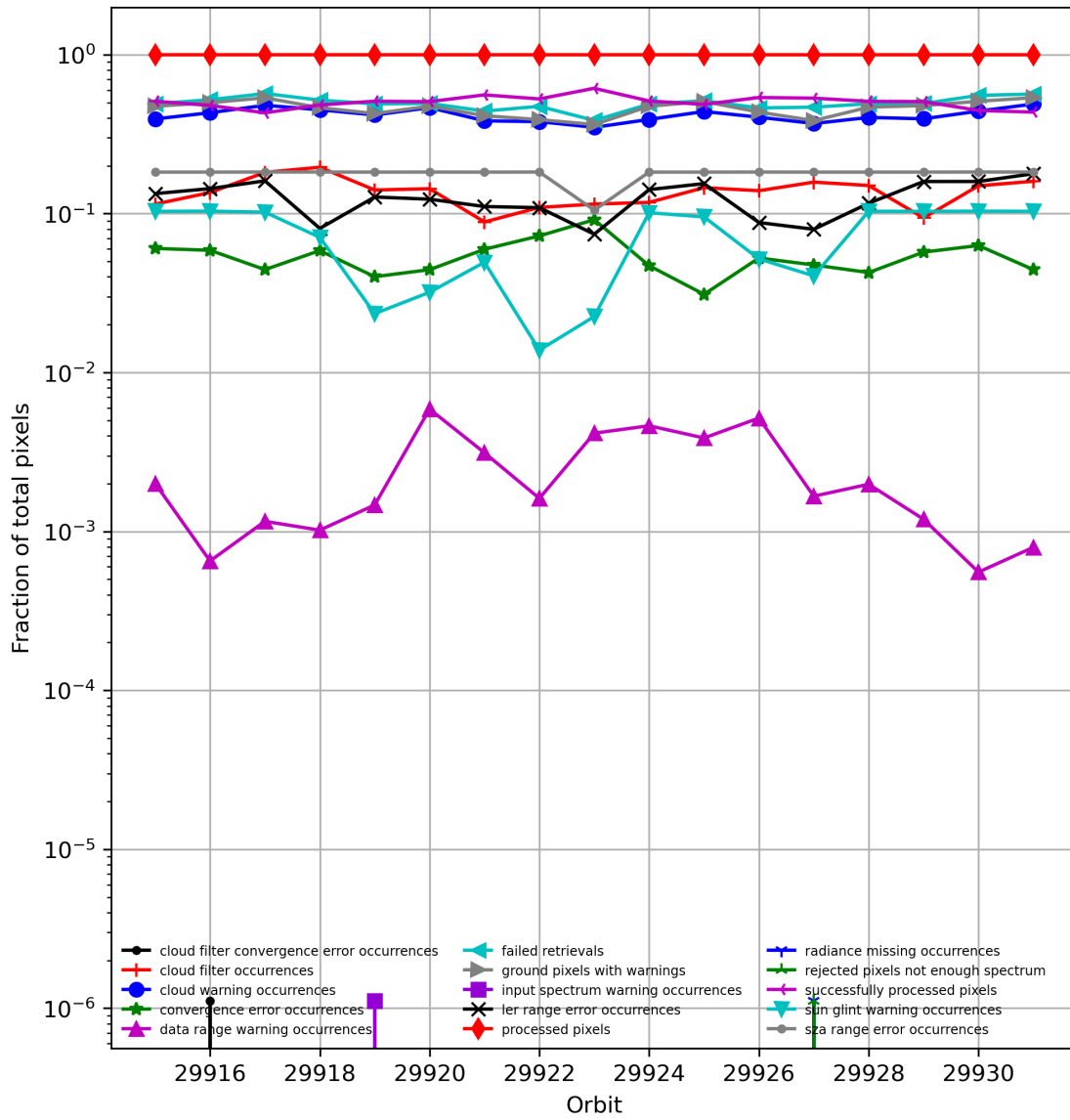


Figure 5: Fraction of pixels with specific warnings and errors during processing

6 World maps

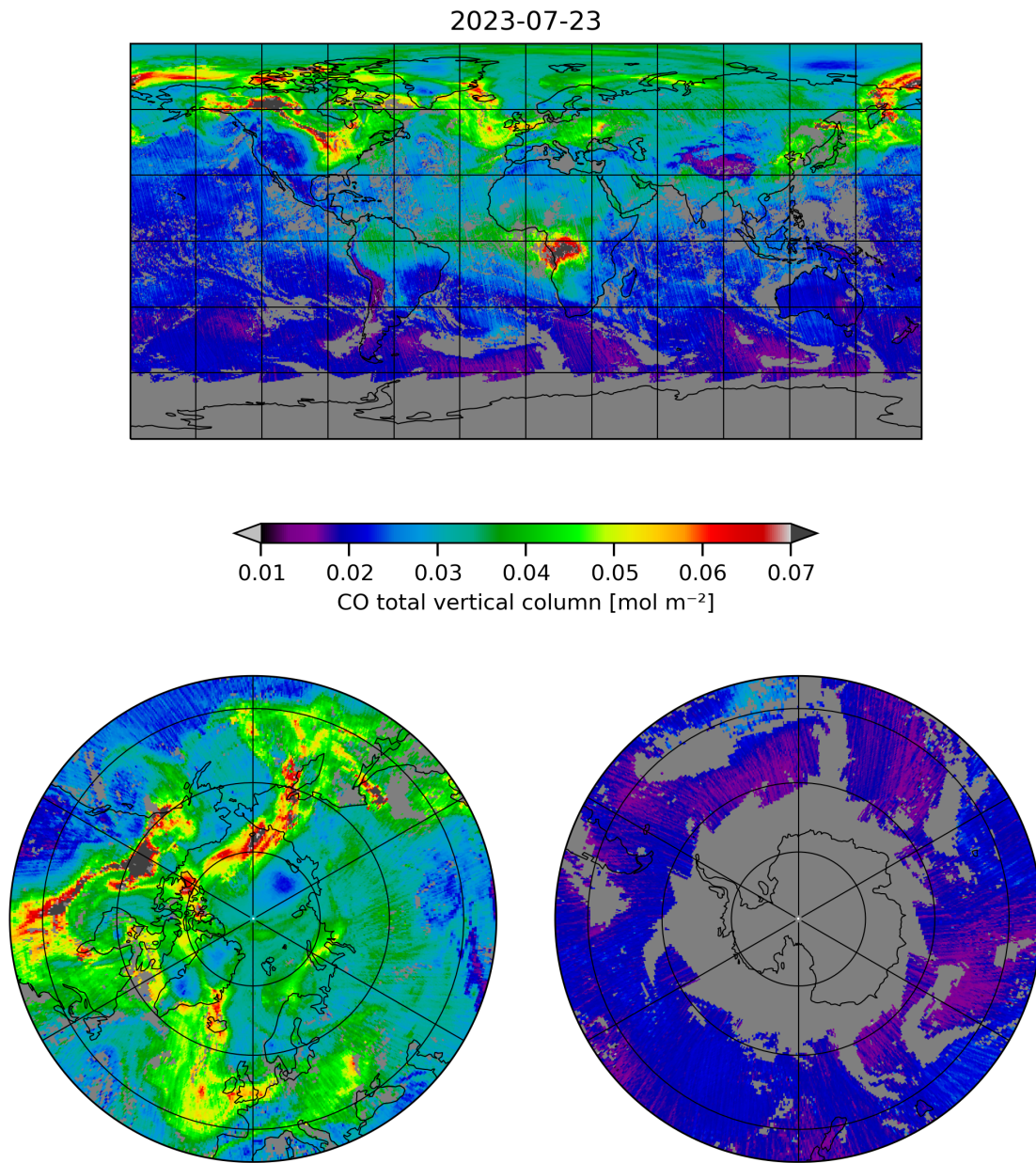


Figure 6: Map of “CO total vertical column” for 2023-07-22 to 2023-07-24

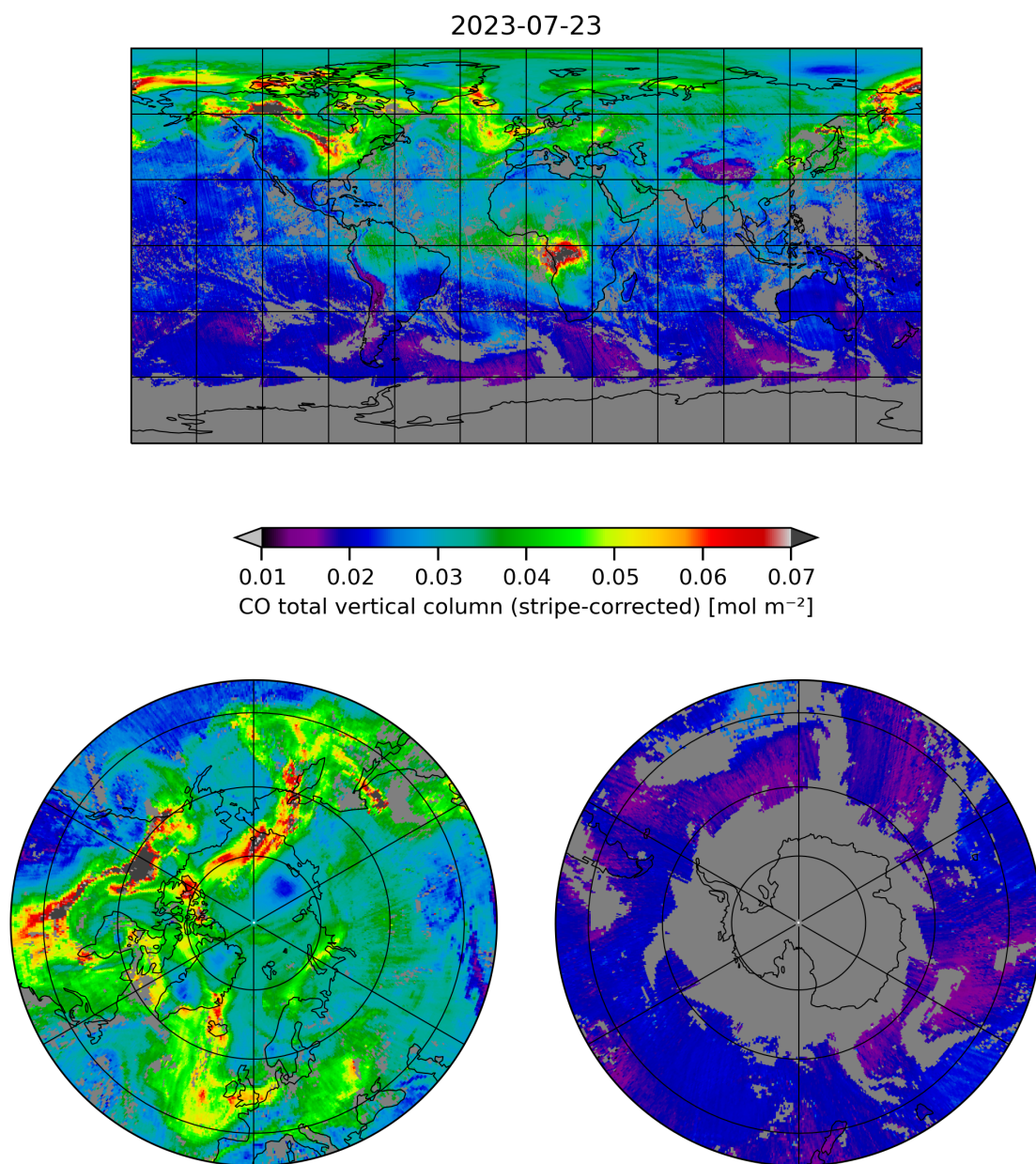


Figure 7: Map of “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24

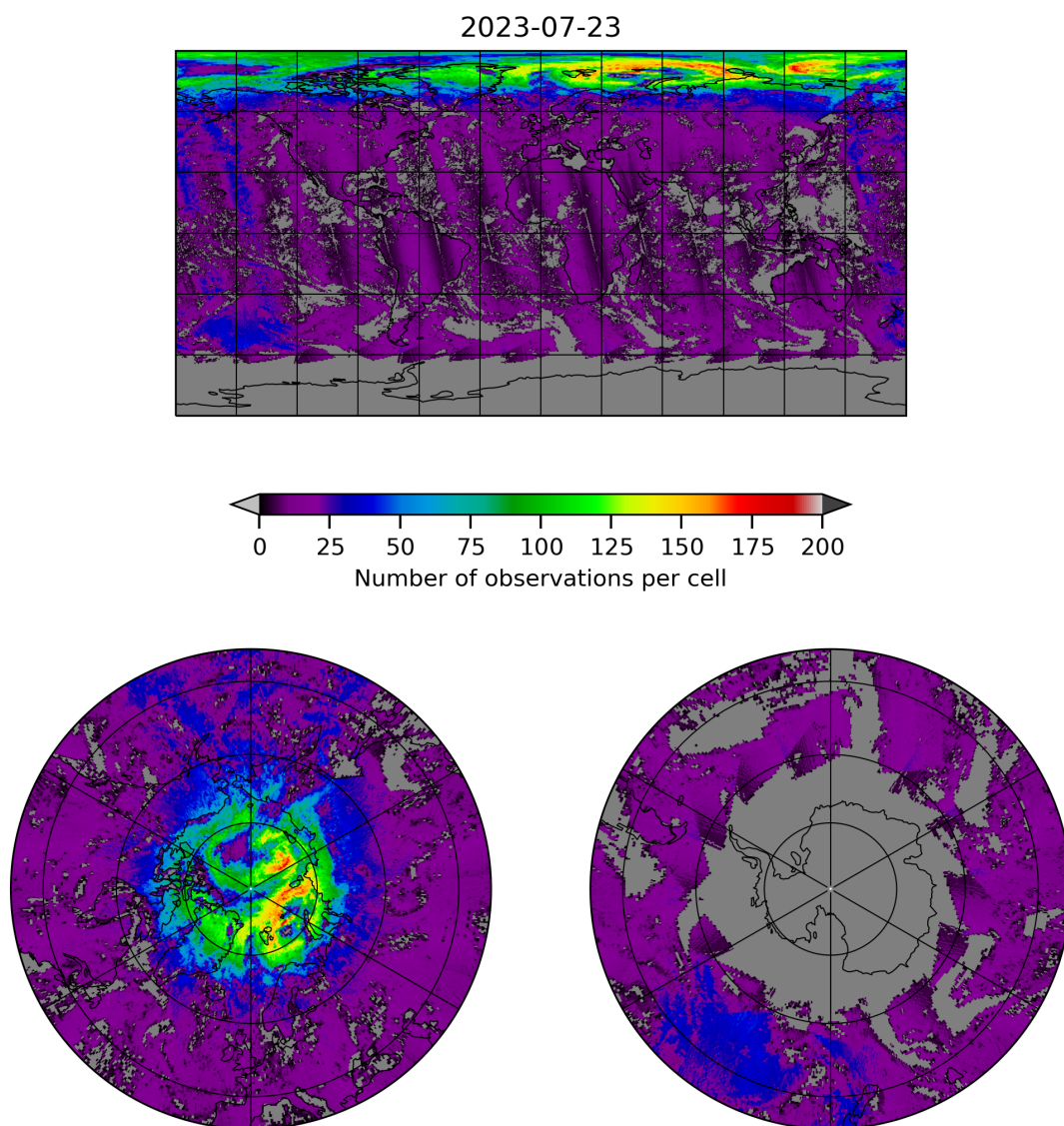


Figure 8: Map of the number of observations for 2023-07-22 to 2023-07-24

7 Zonal average

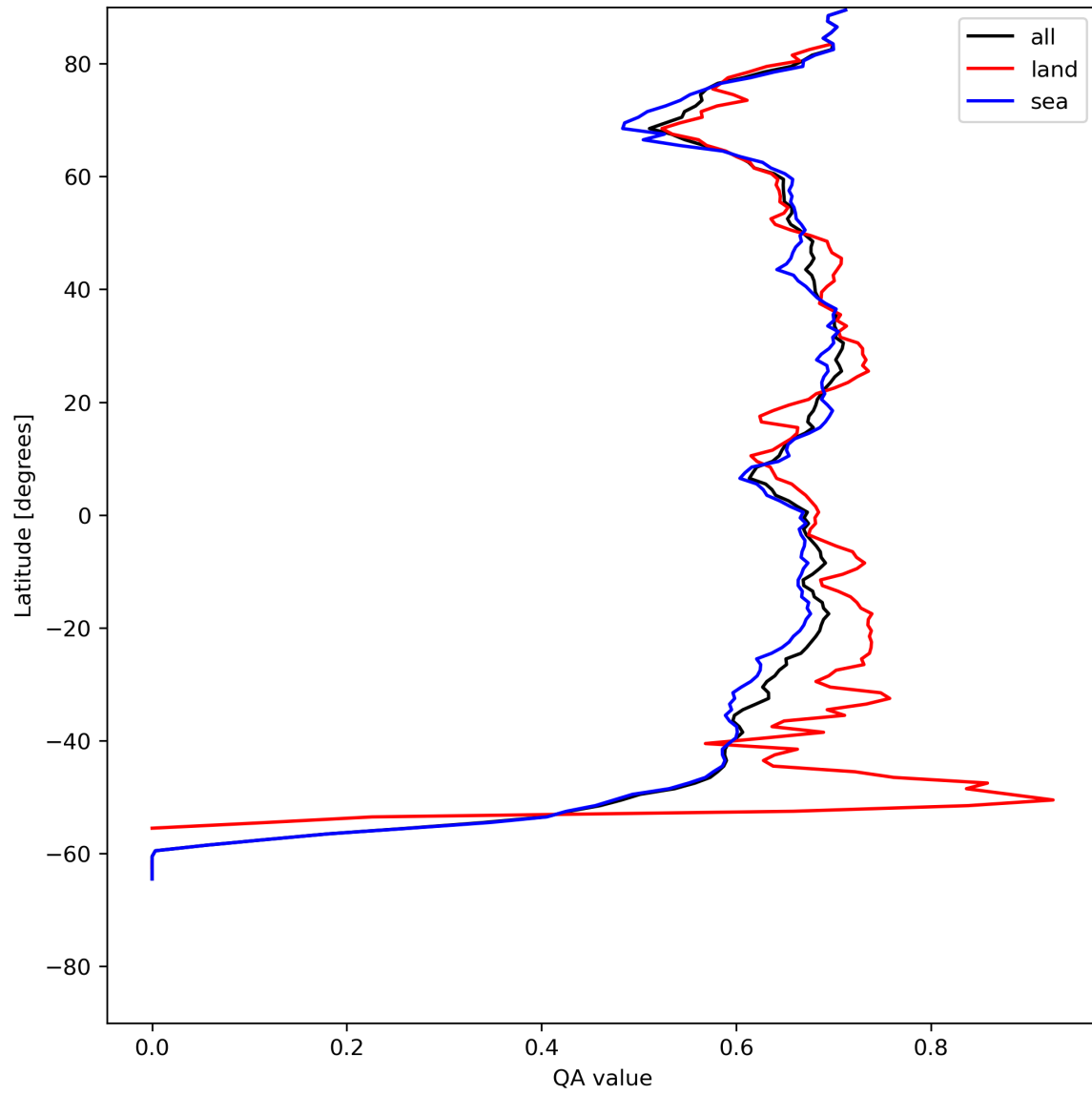


Figure 9: Zonal average of “QA value” for 2023-07-22 to 2023-07-24.

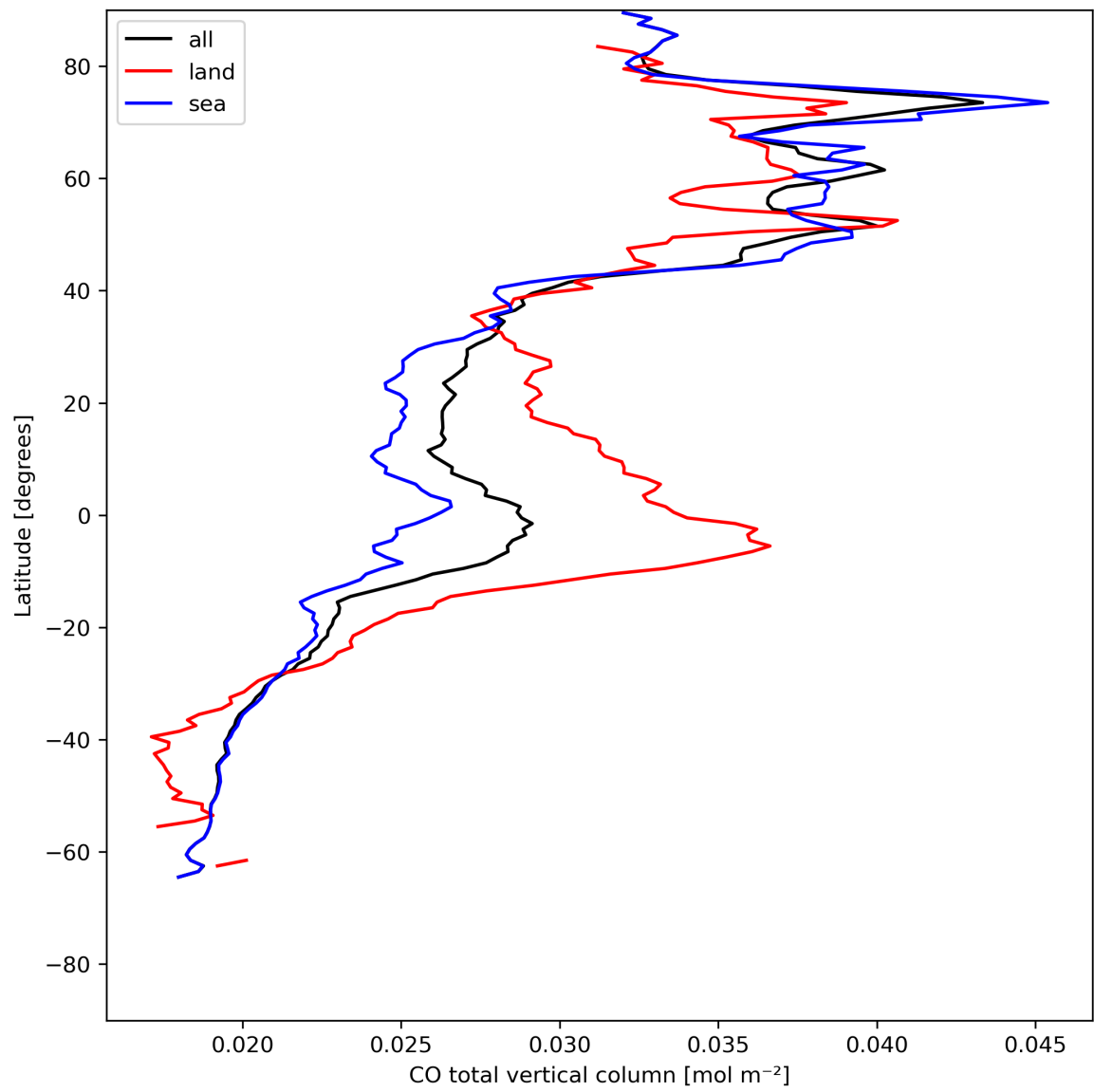


Figure 10: Zonal average of “CO total vertical column” for 2023-07-22 to 2023-07-24.

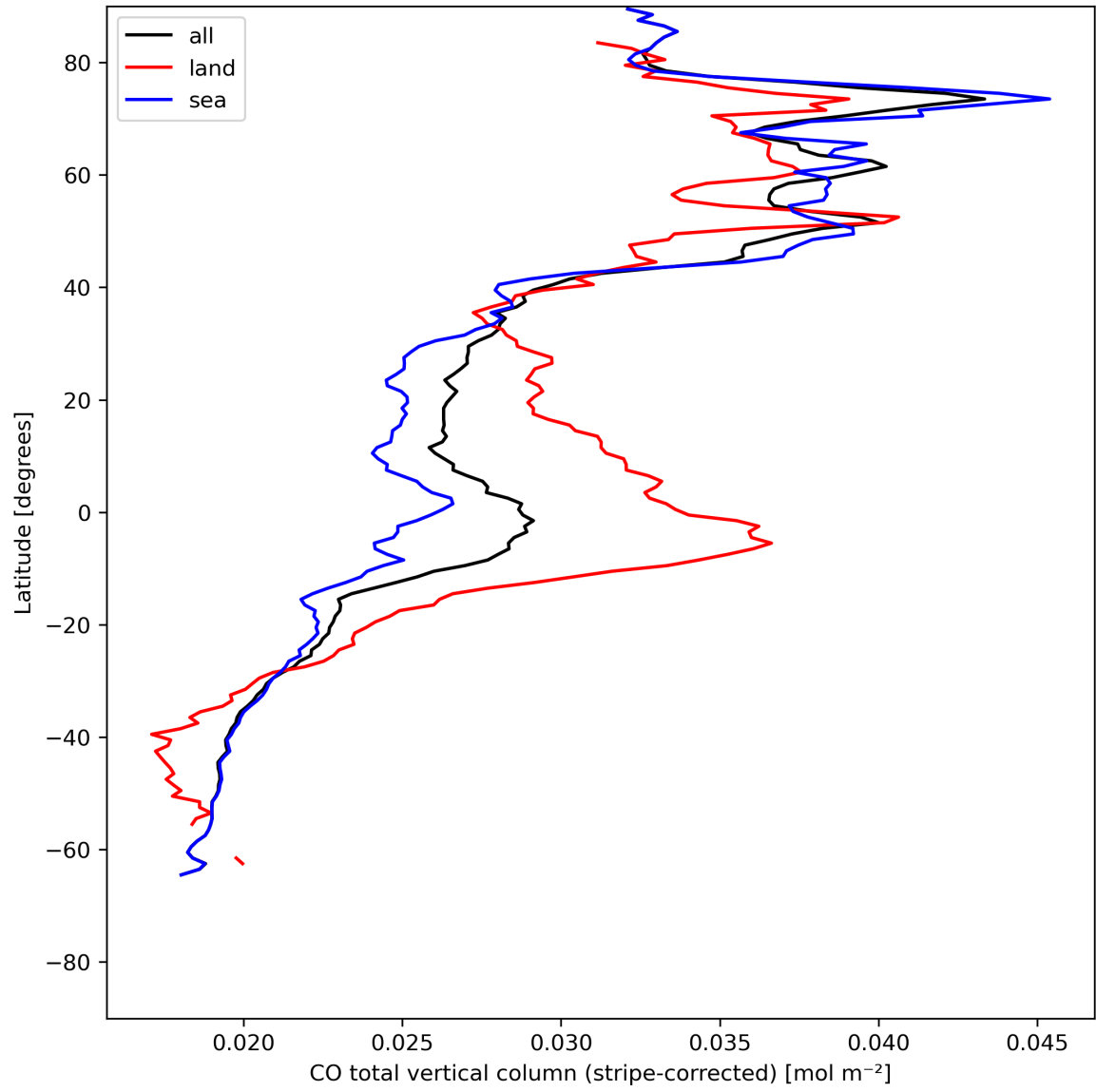


Figure 11: Zonal average of “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24.

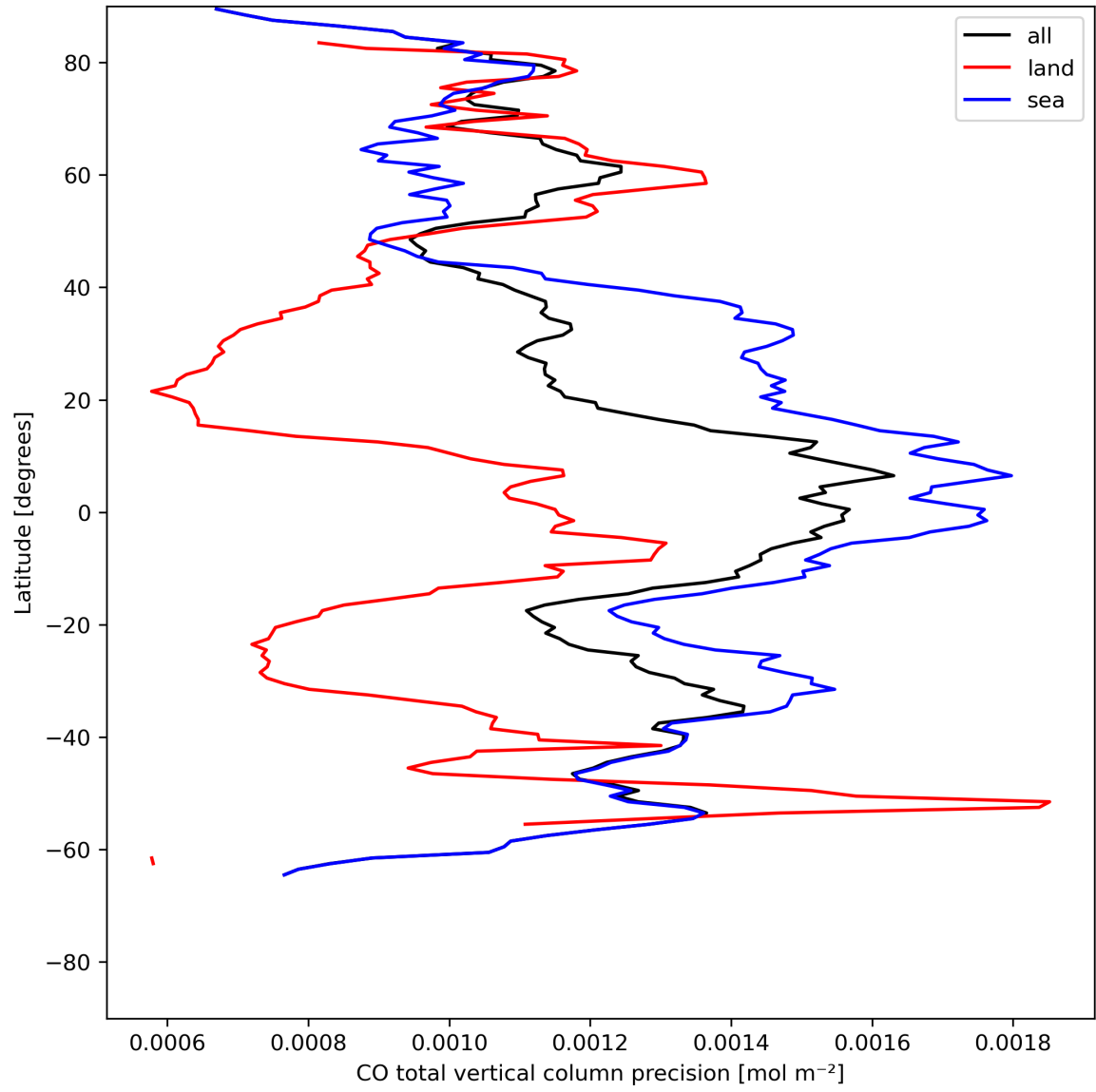


Figure 12: Zonal average of “CO total vertical column precision” for 2023-07-22 to 2023-07-24.

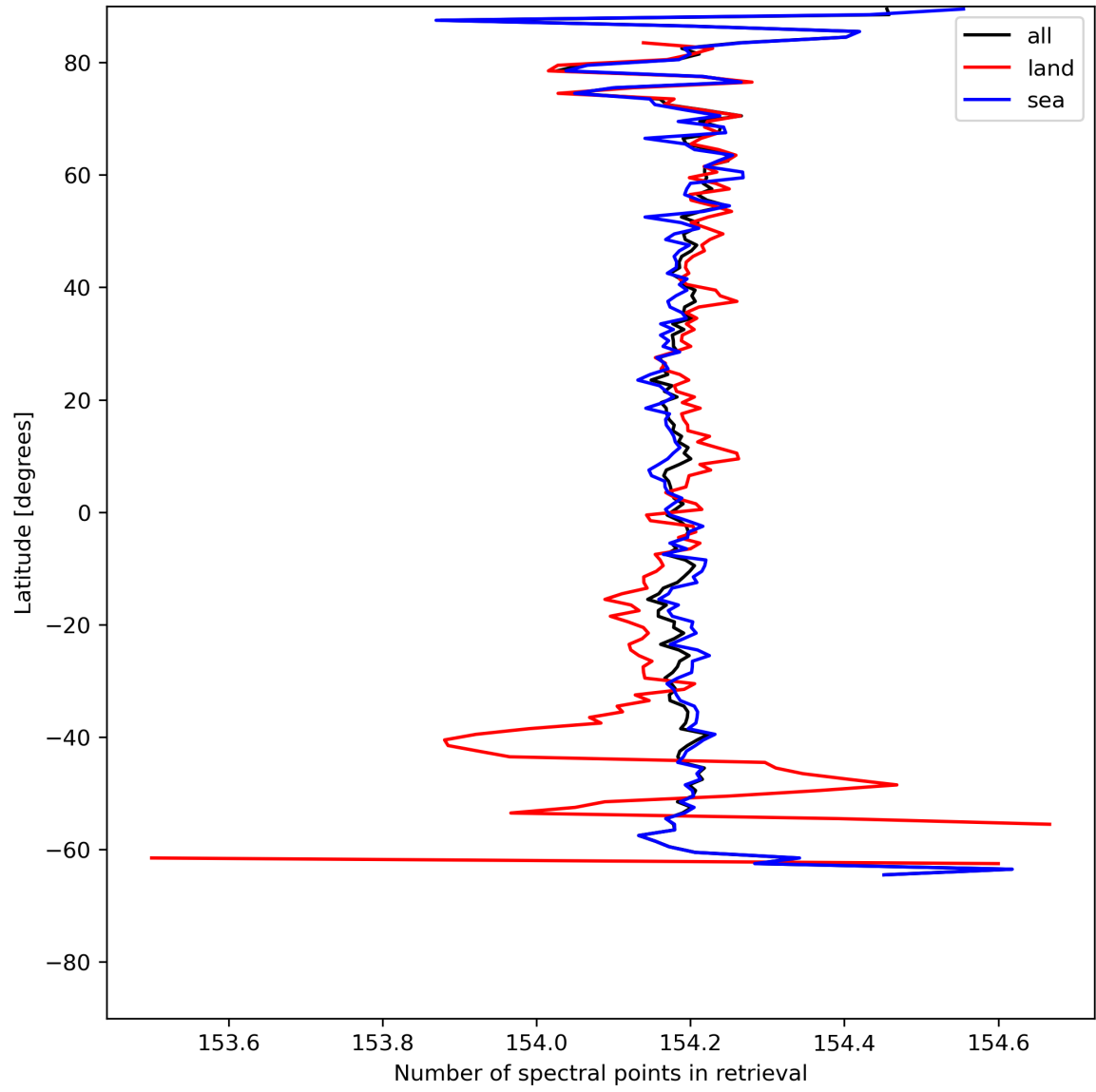


Figure 13: Zonal average of “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.

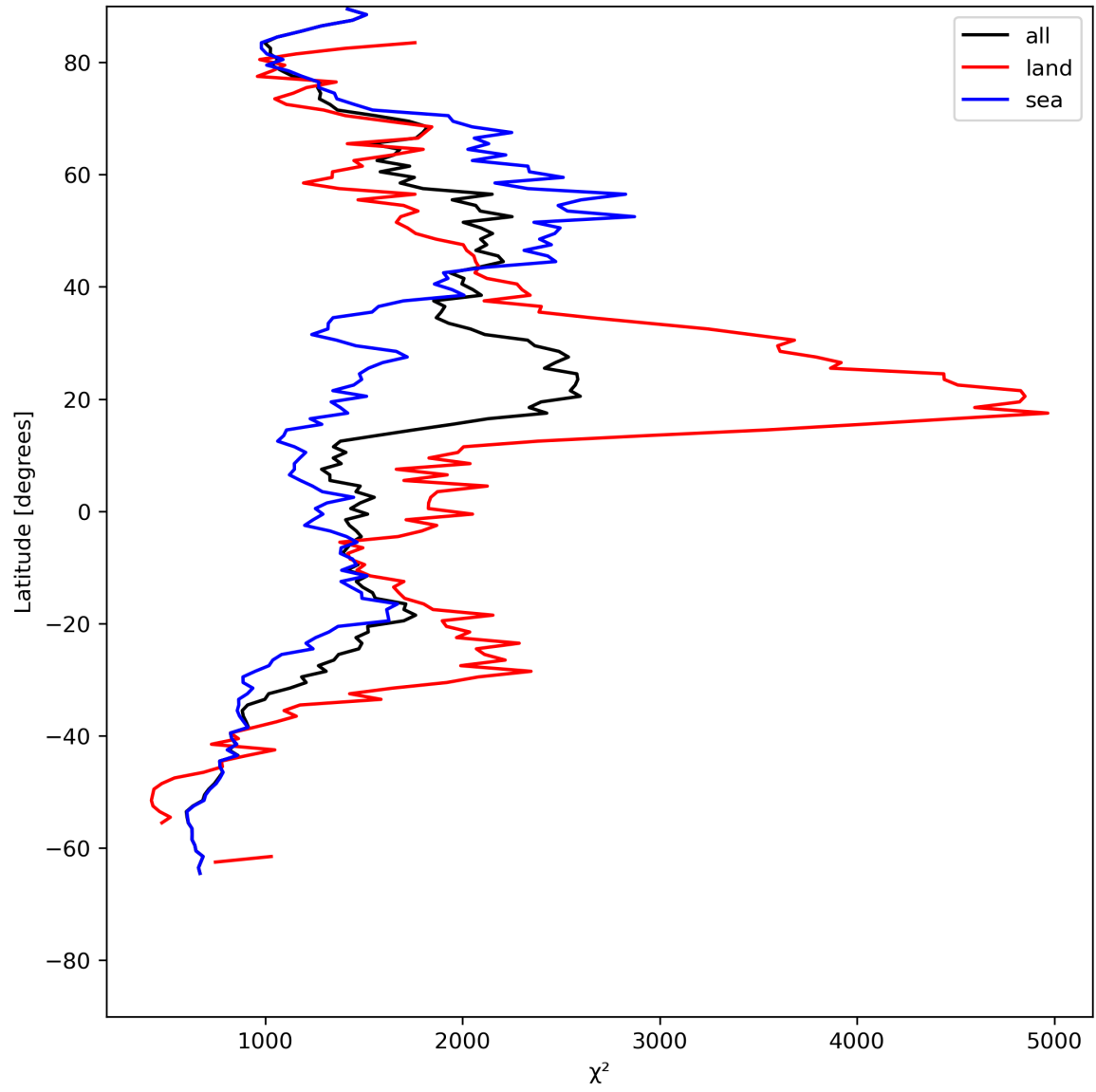


Figure 14: Zonal average of “ χ^2 ” for 2023-07-22 to 2023-07-24.

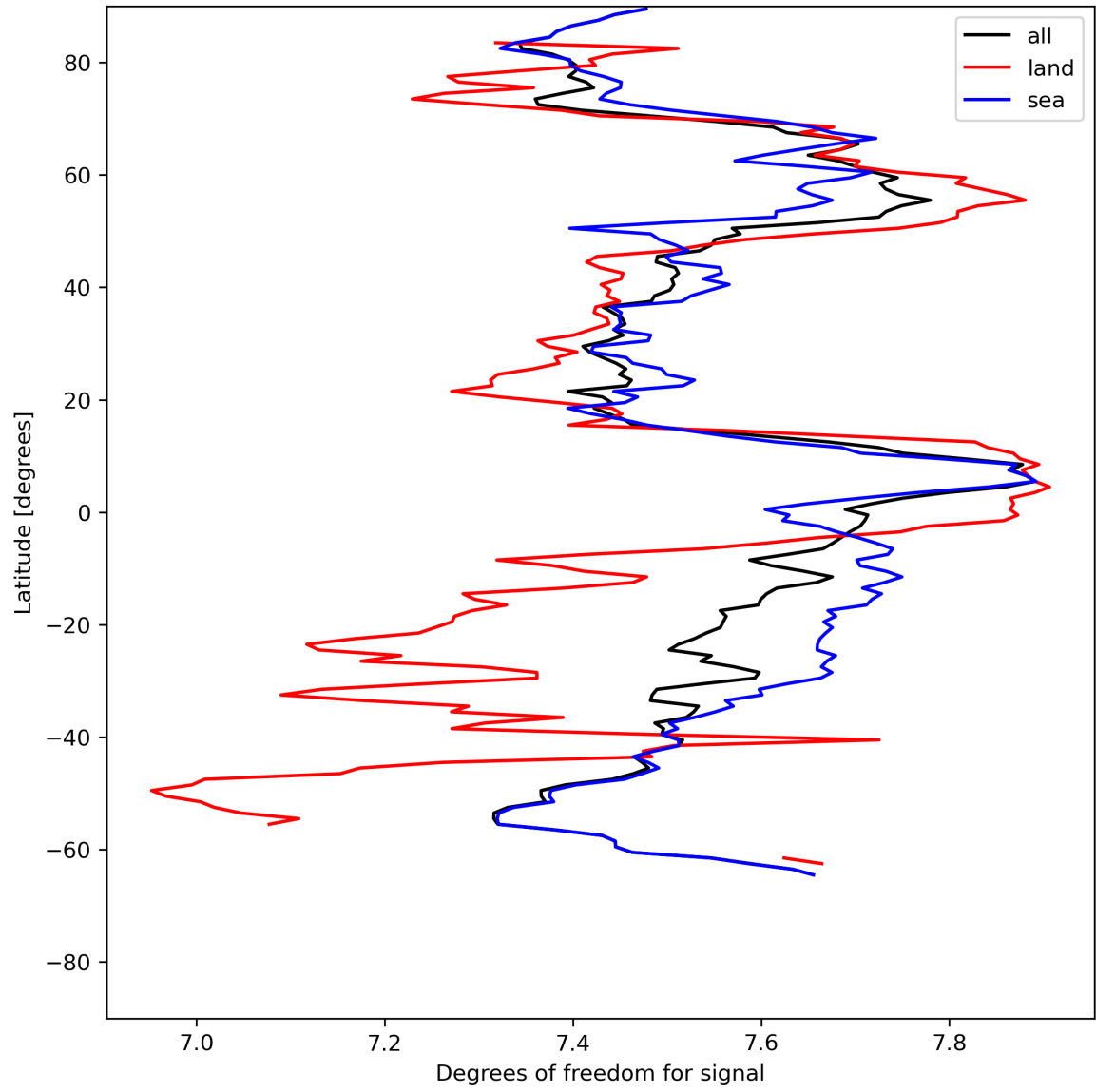


Figure 15: Zonal average of “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.

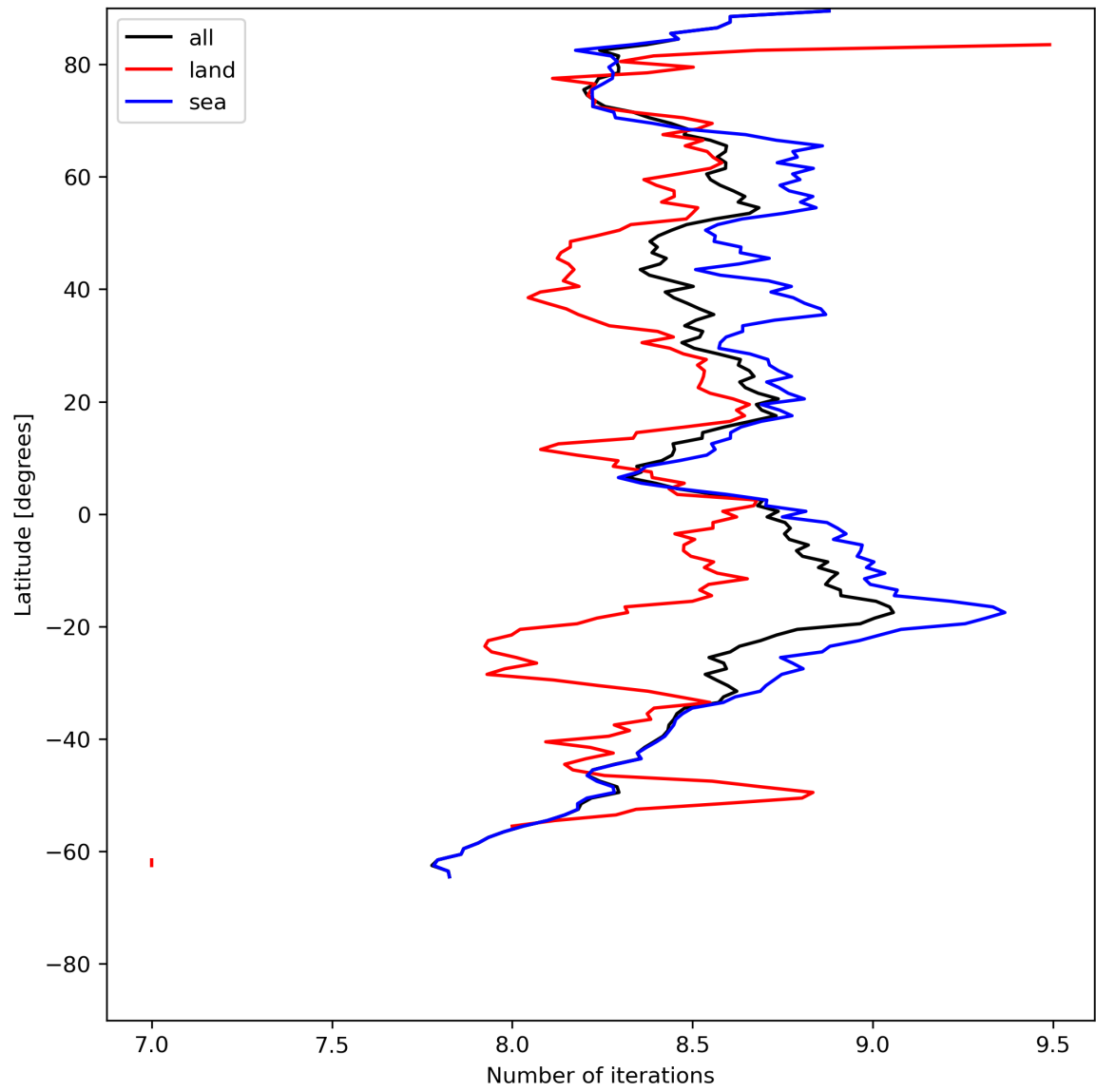


Figure 16: Zonal average of “Number of iterations” for 2023-07-22 to 2023-07-24.

8 Histograms

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

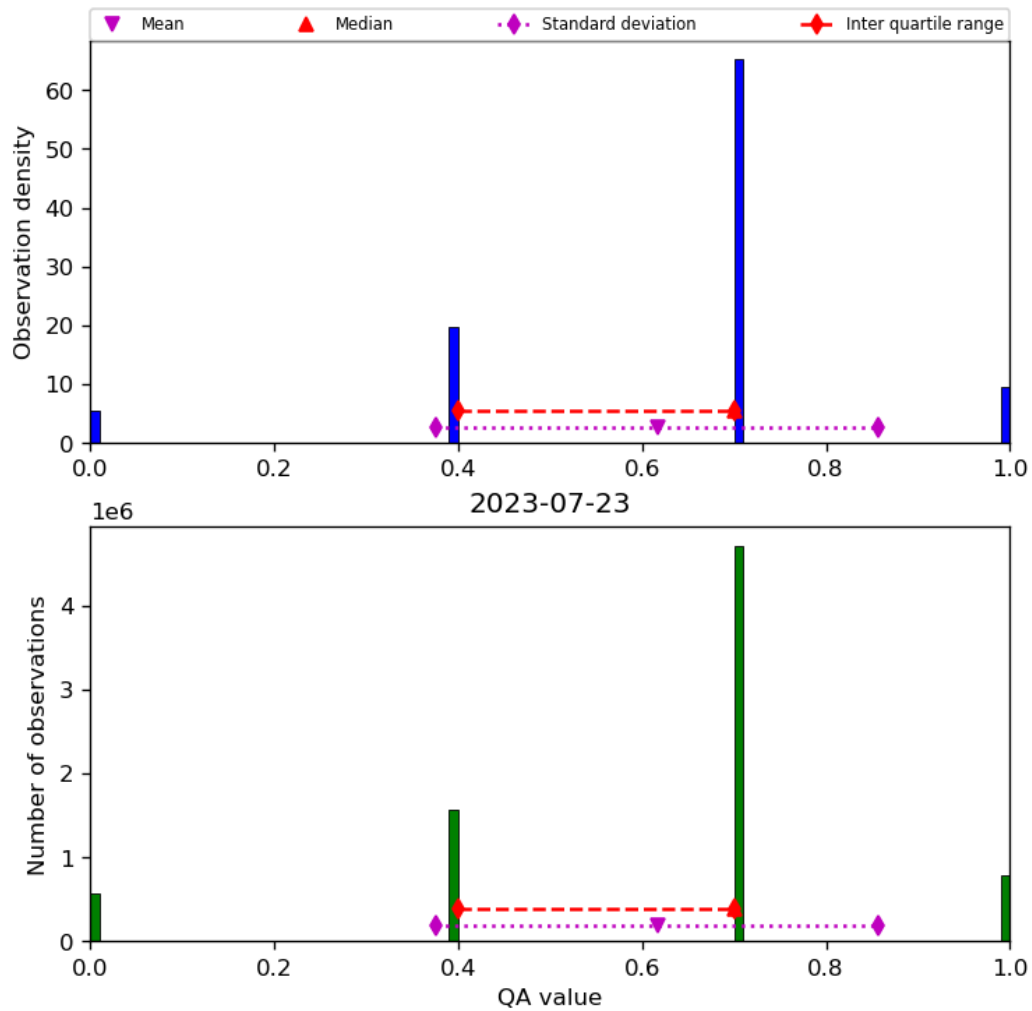


Figure 17: Histogram of “QA value” for 2023-07-22 to 2023-07-24

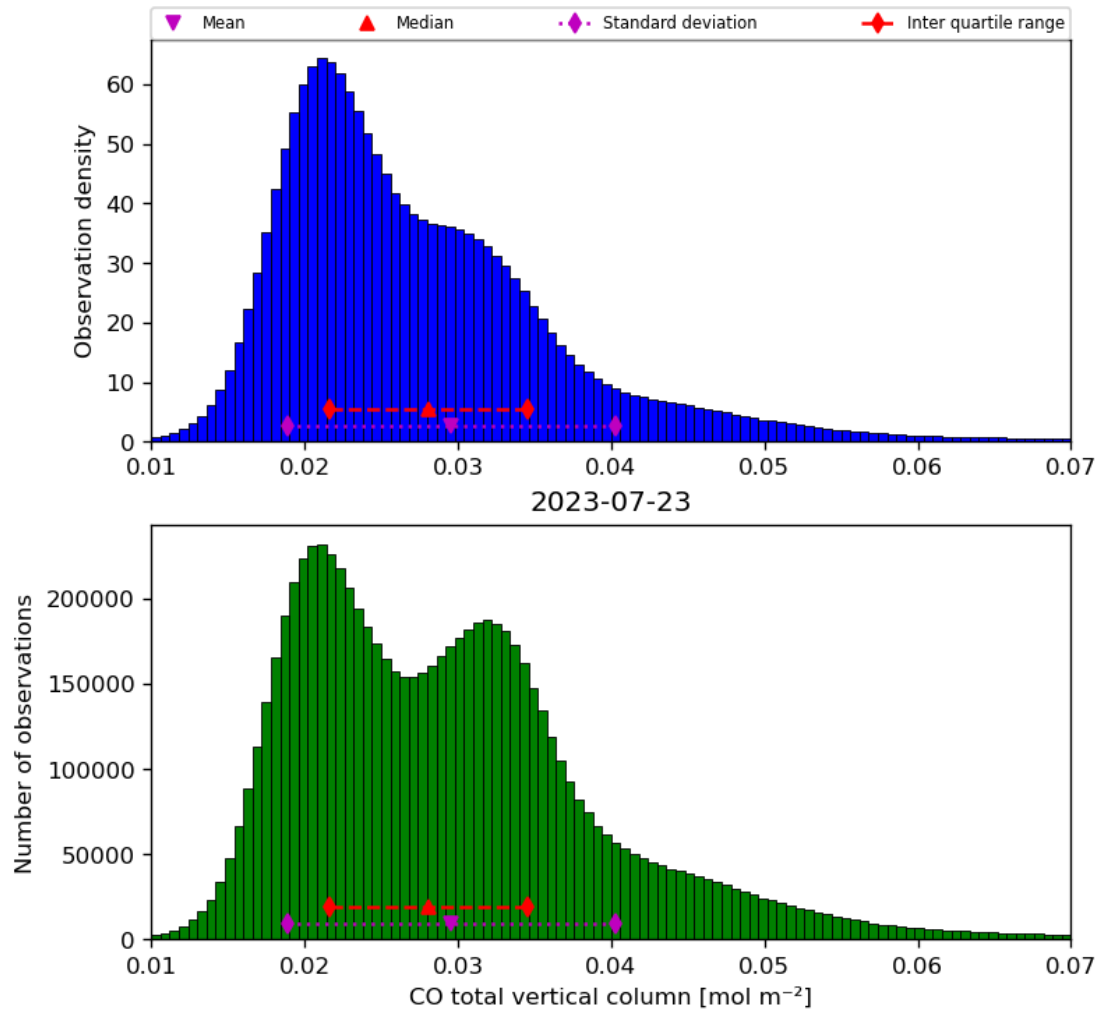


Figure 18: Histogram of “CO total vertical column” for 2023-07-22 to 2023-07-24

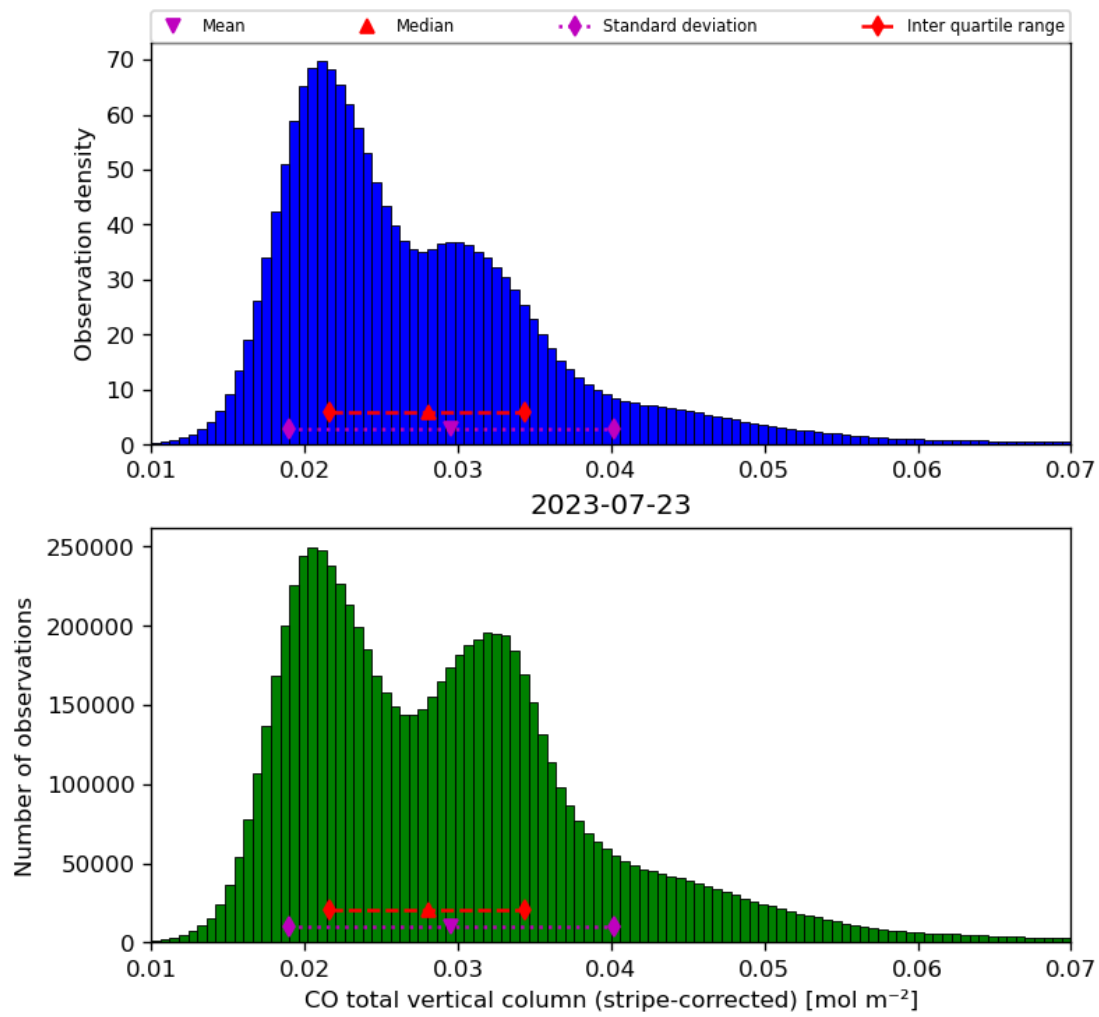


Figure 19: Histogram of “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24

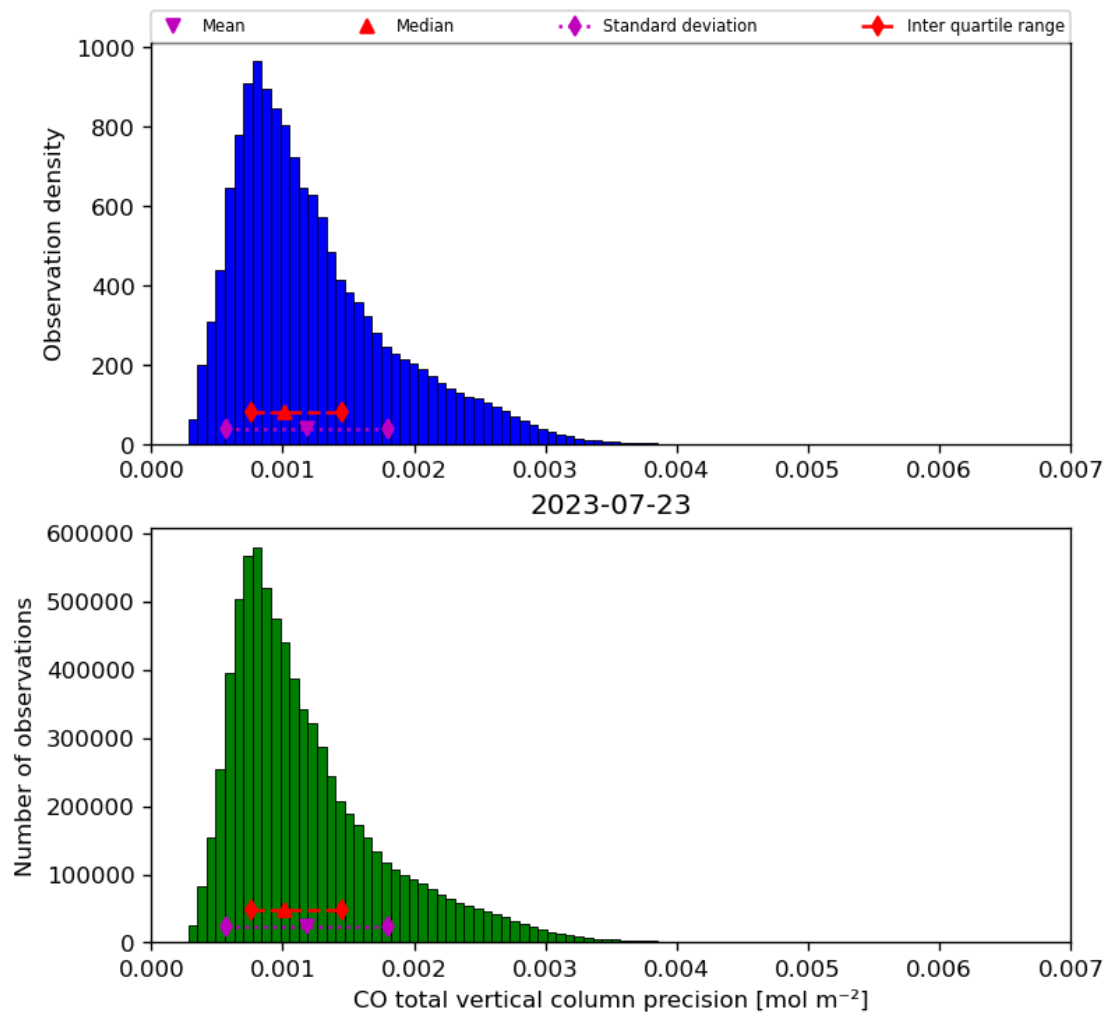


Figure 20: Histogram of “CO total vertical column precision” for 2023-07-22 to 2023-07-24

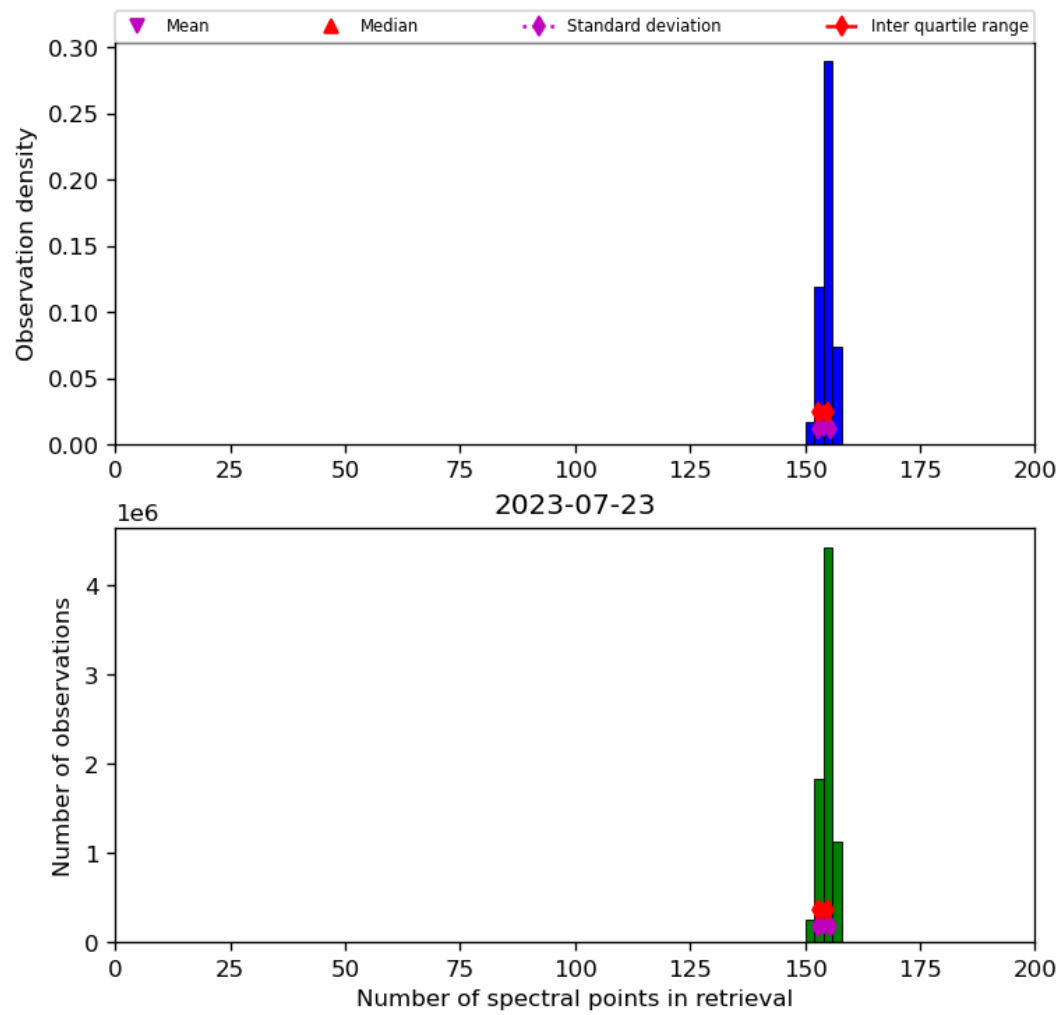


Figure 21: Histogram of “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24

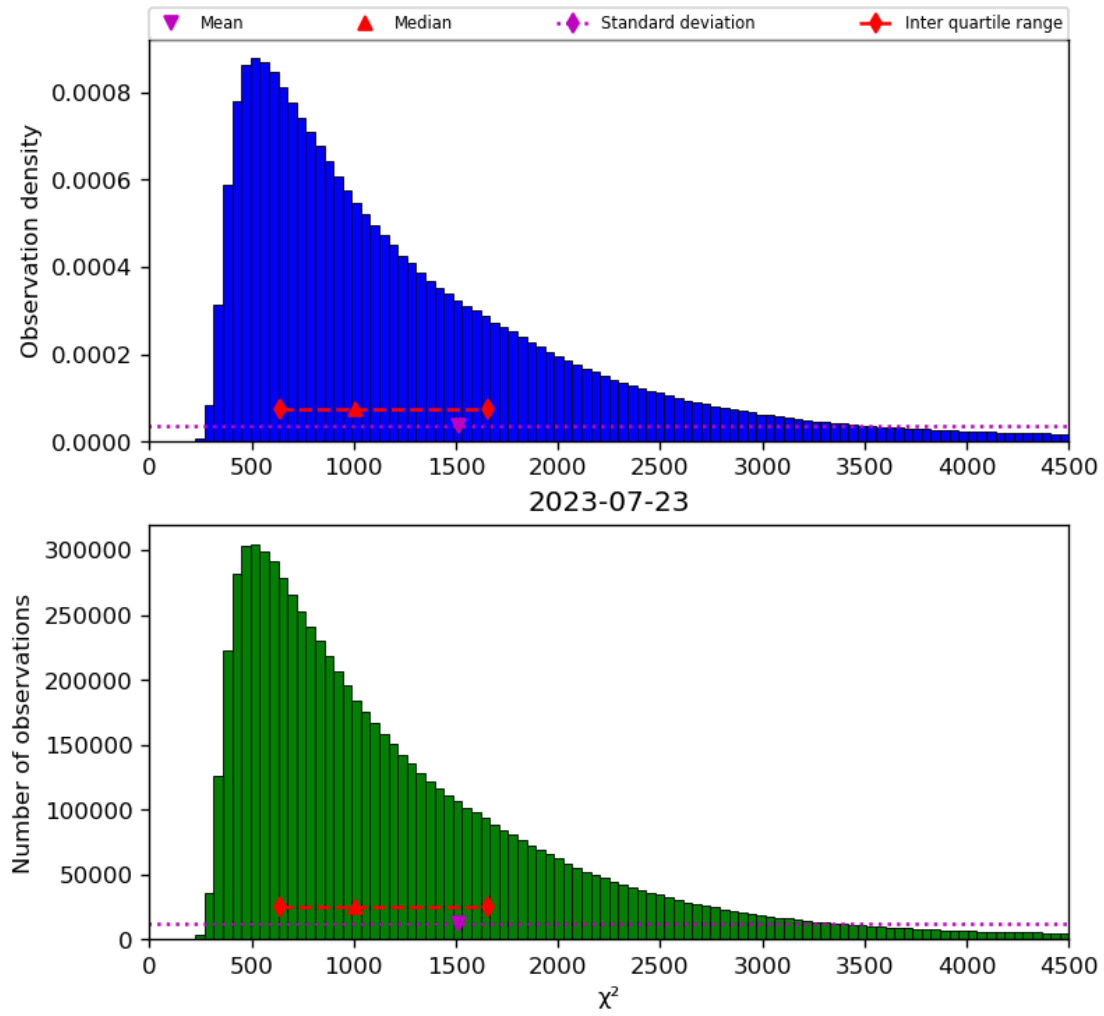


Figure 22: Histogram of “ χ^2 ” for 2023-07-22 to 2023-07-24

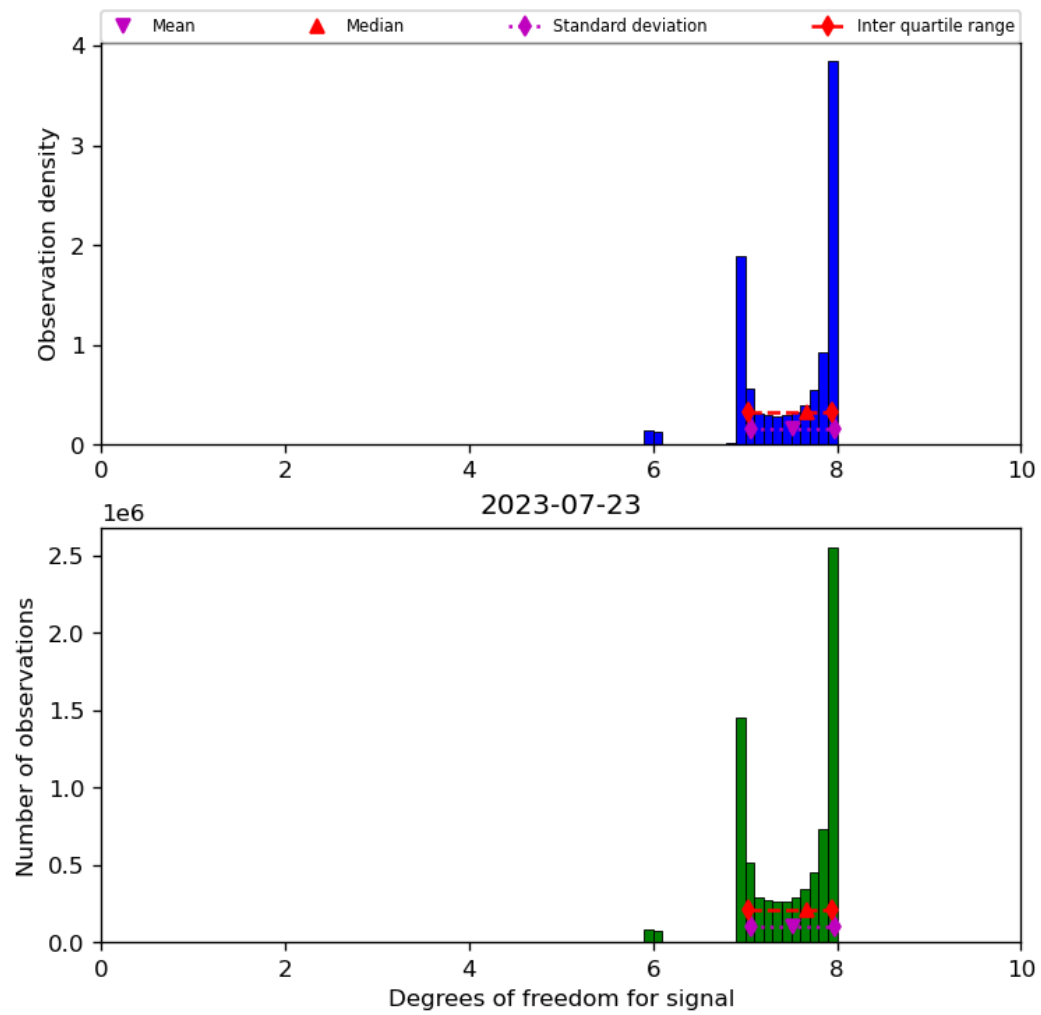


Figure 23: Histogram of “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24

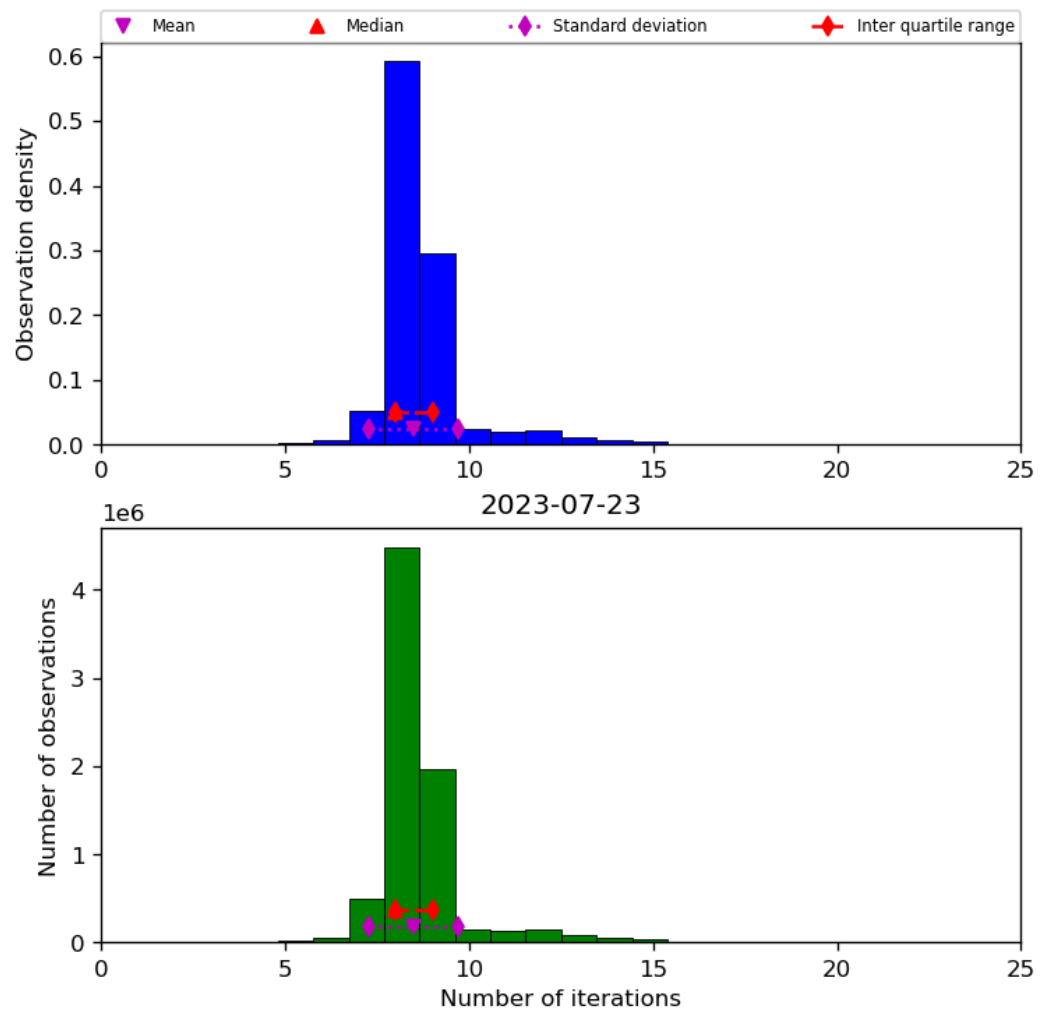


Figure 24: Histogram of “Number of iterations” for 2023-07-22 to 2023-07-24

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.

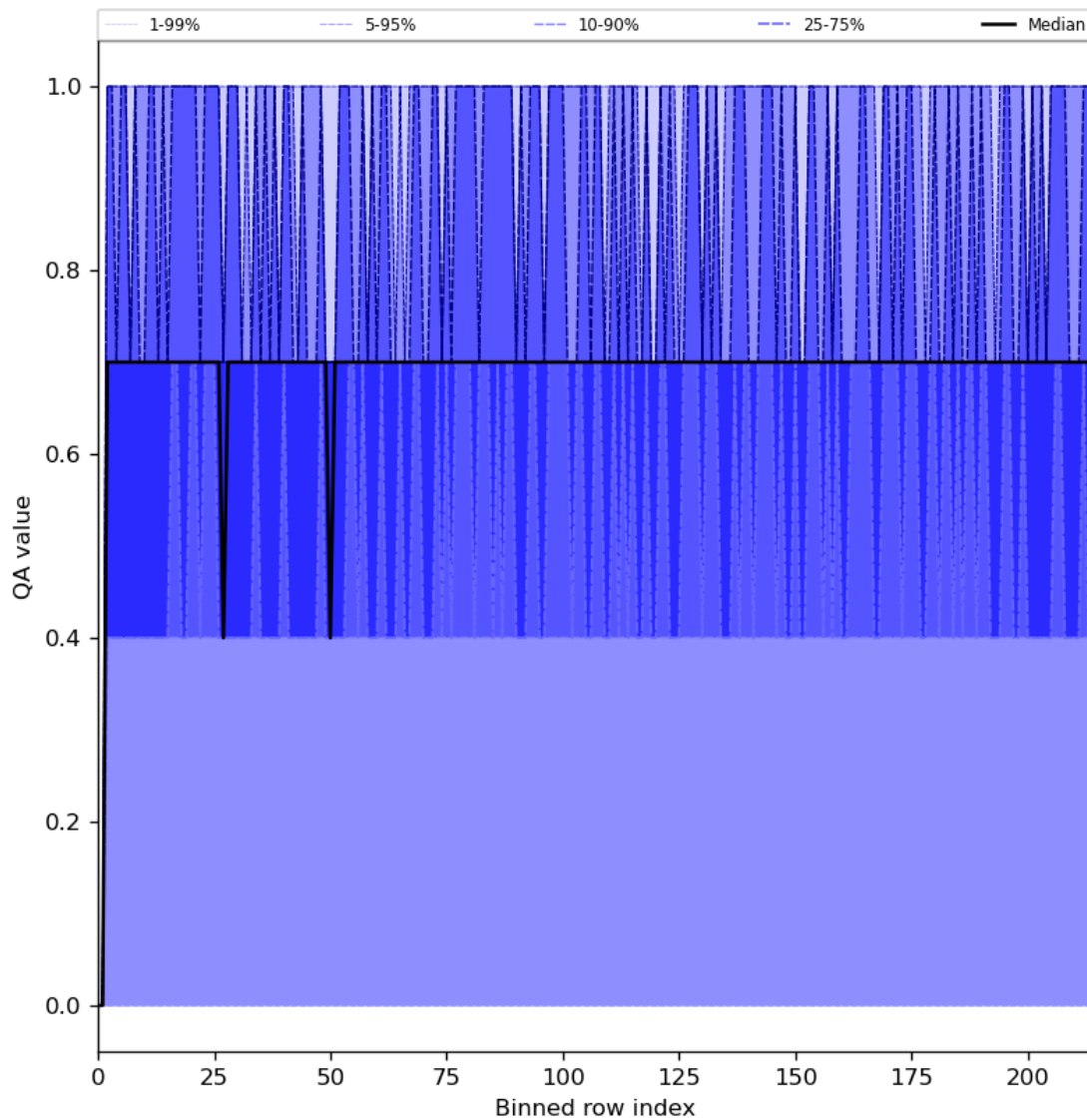


Figure 25: Along track statistics of “QA value” for 2023-07-22 to 2023-07-24

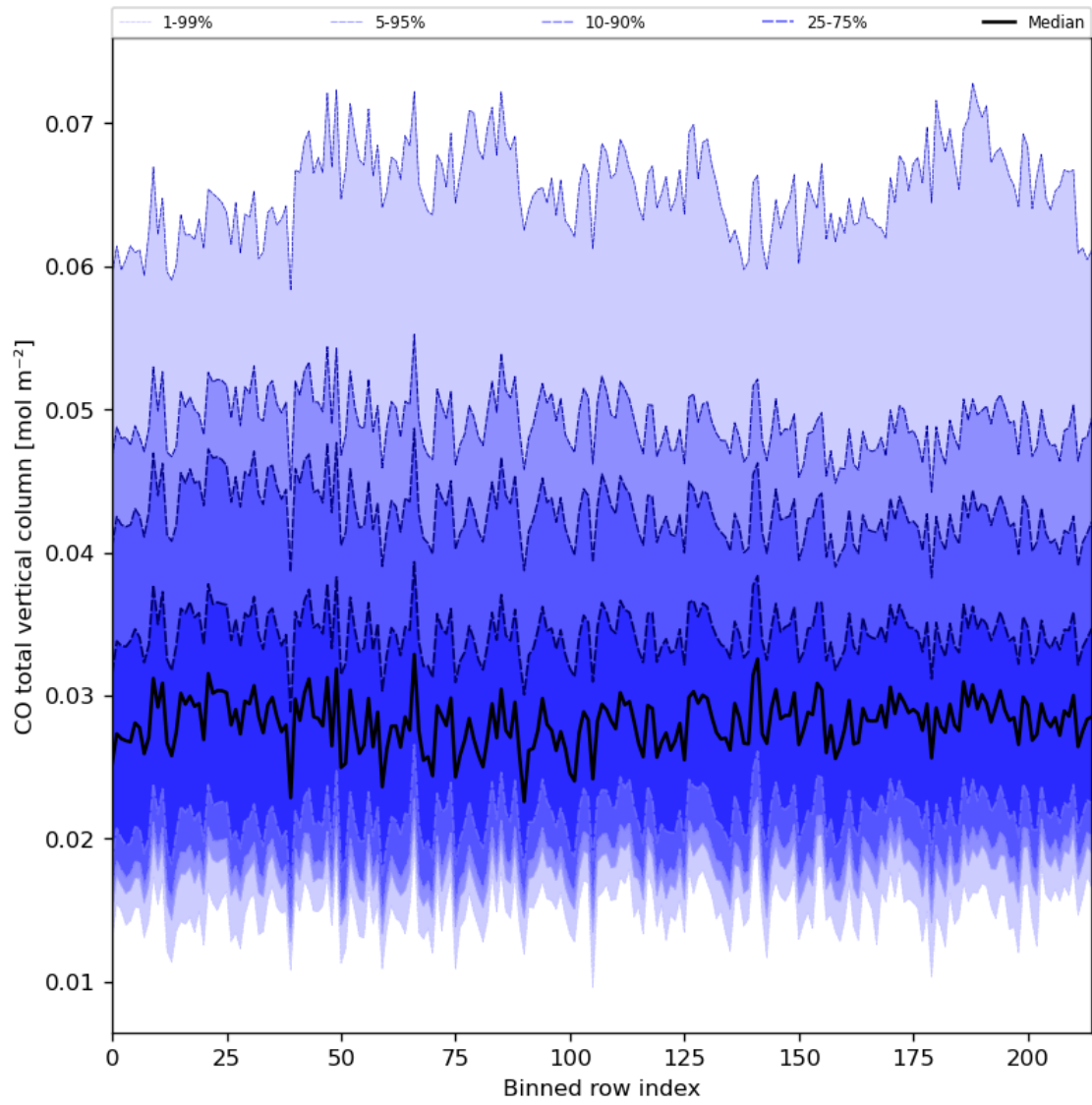


Figure 26: Along track statistics of “CO total vertical column” for 2023-07-22 to 2023-07-24

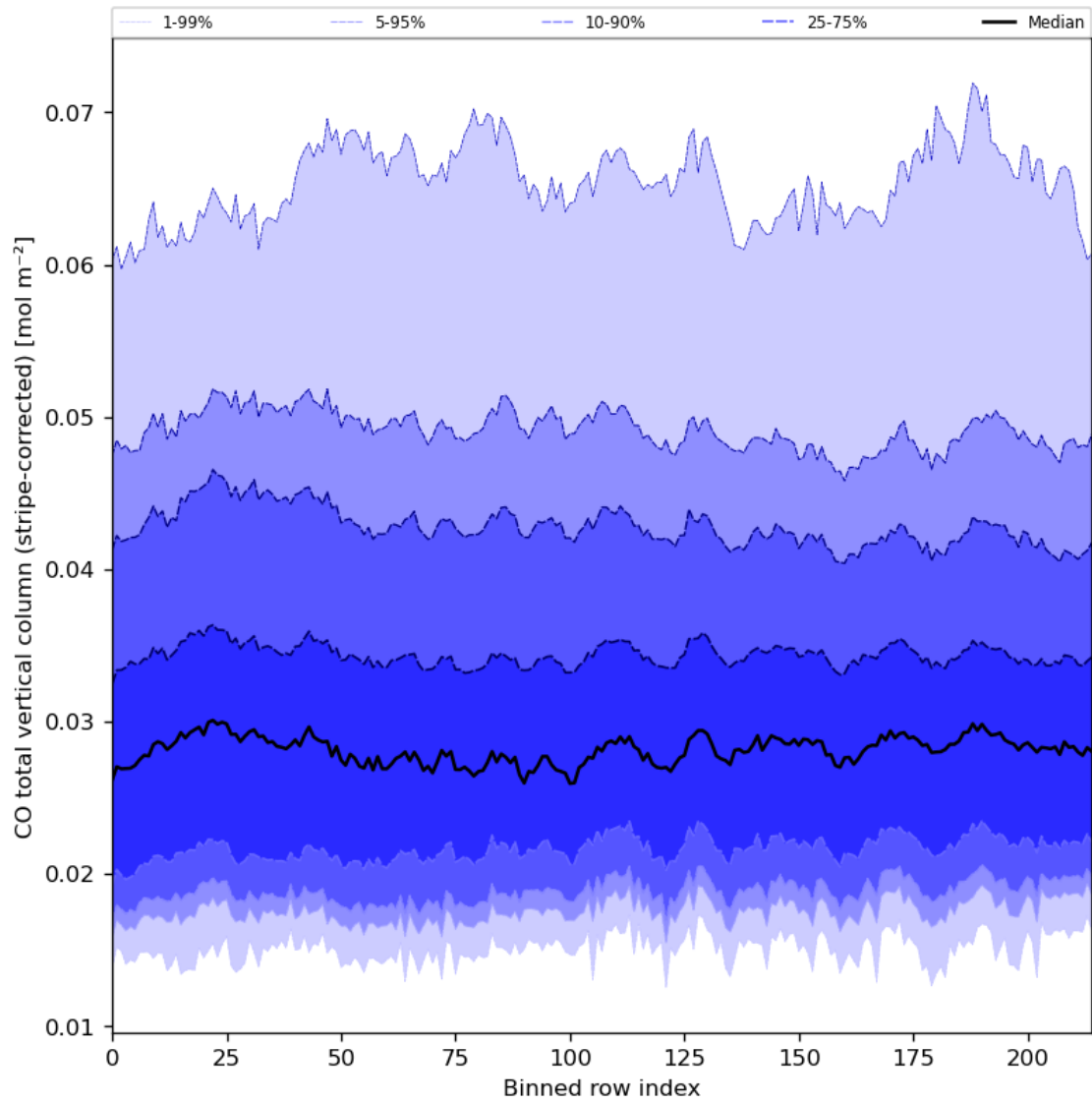


Figure 27: Along track statistics of “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24

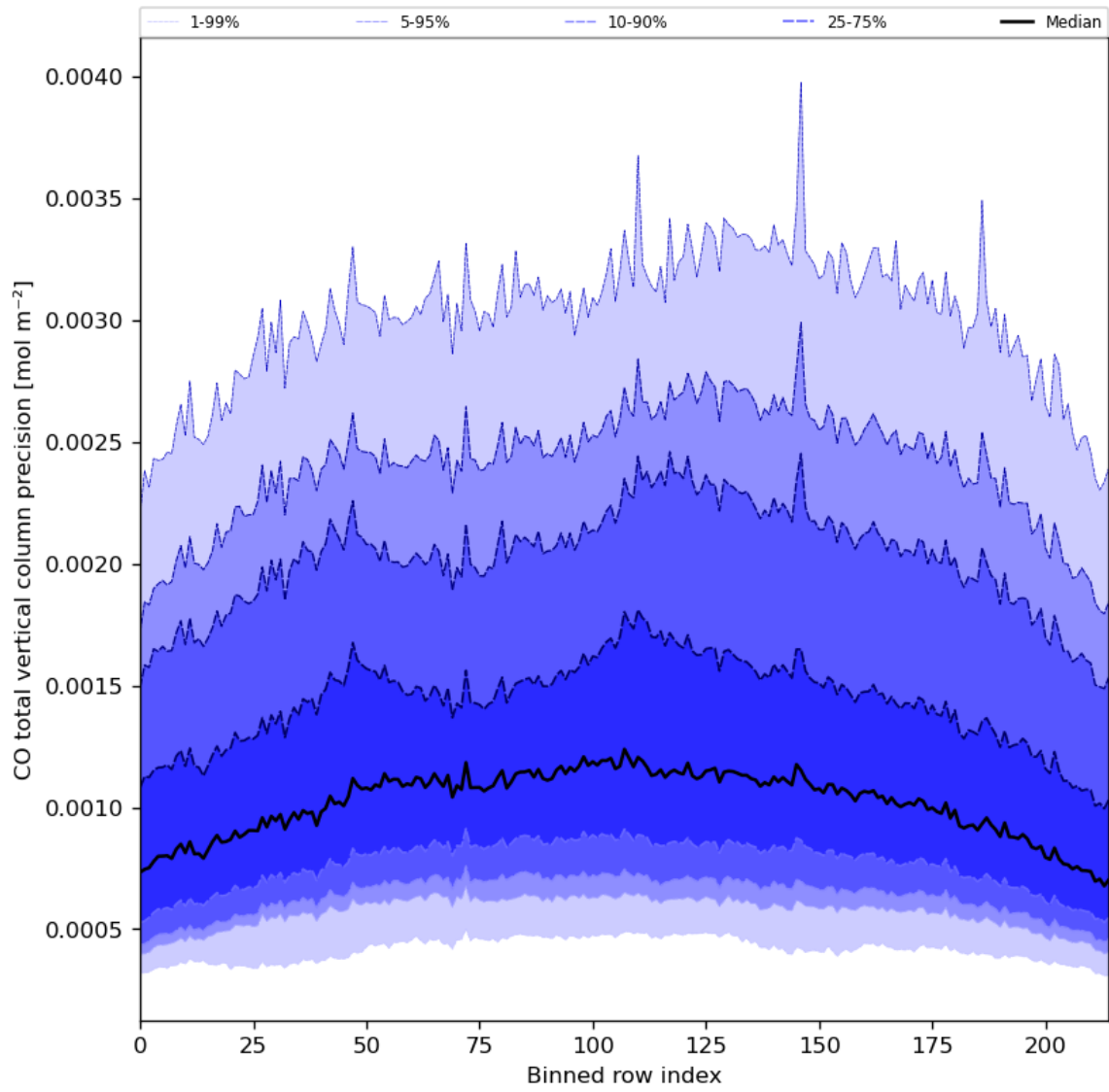


Figure 28: Along track statistics of “CO total vertical column precision” for 2023-07-22 to 2023-07-24

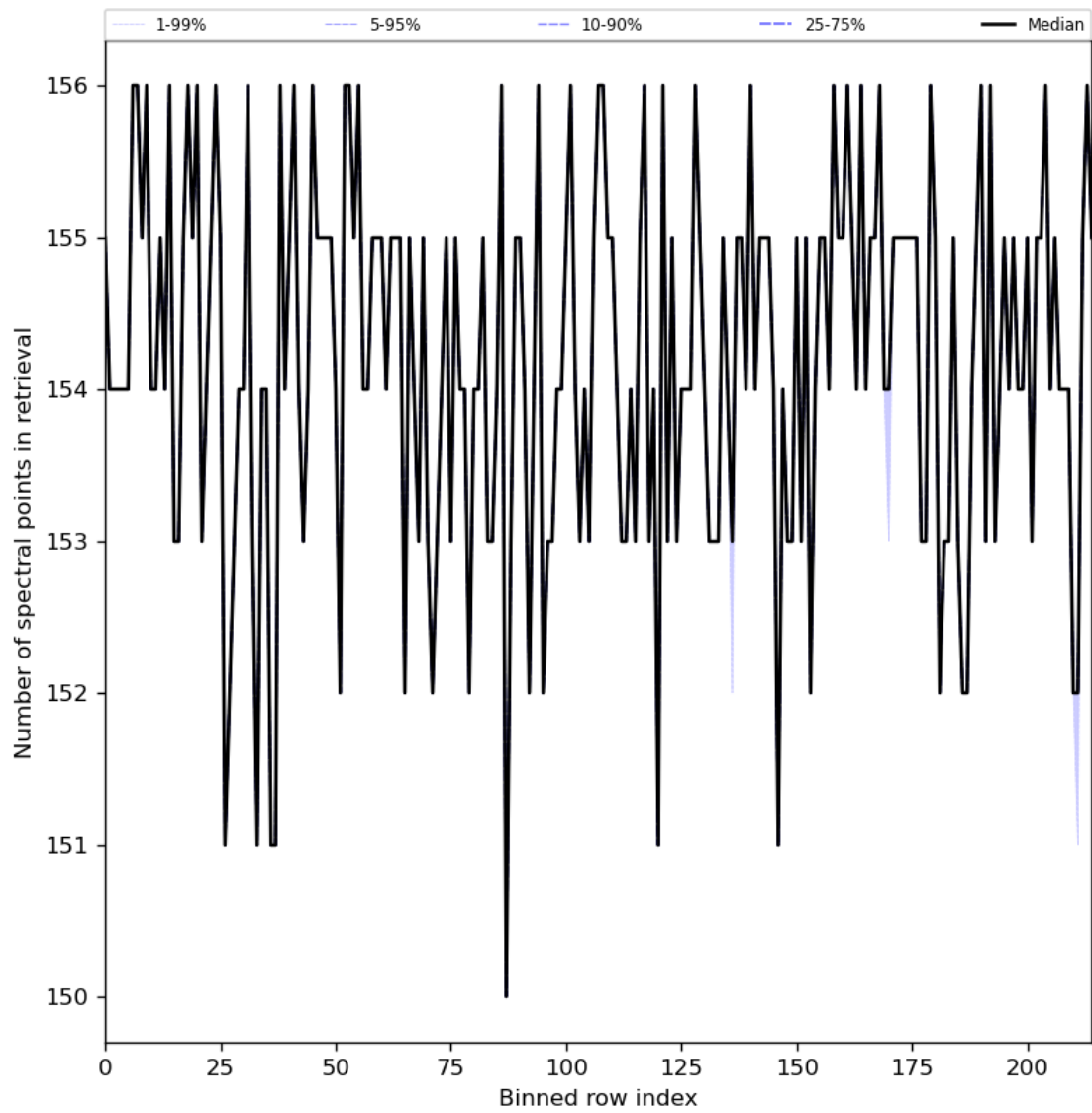


Figure 29: Along track statistics of “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24

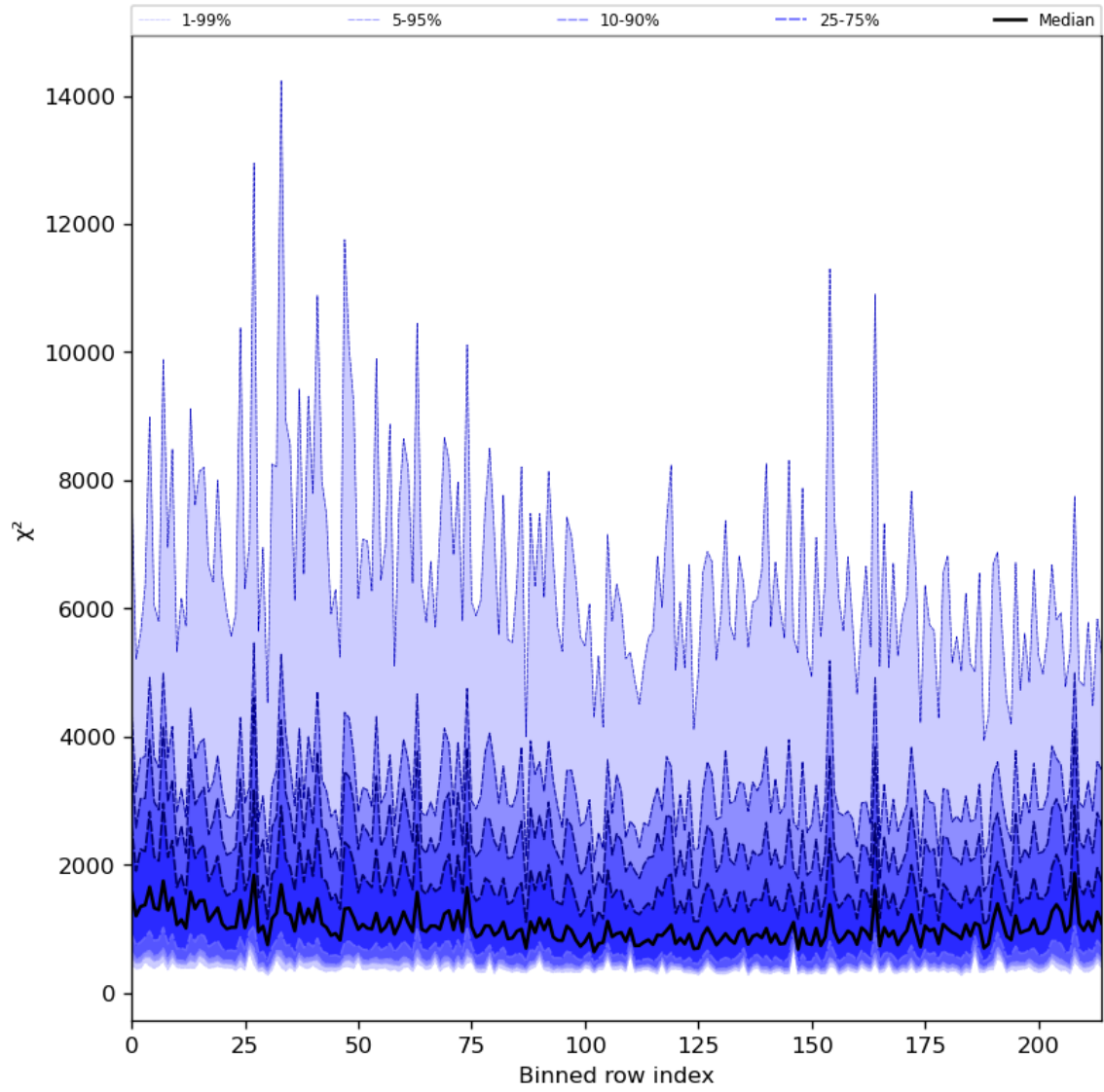


Figure 30: Along track statistics of “ χ^2 ” for 2023-07-22 to 2023-07-24

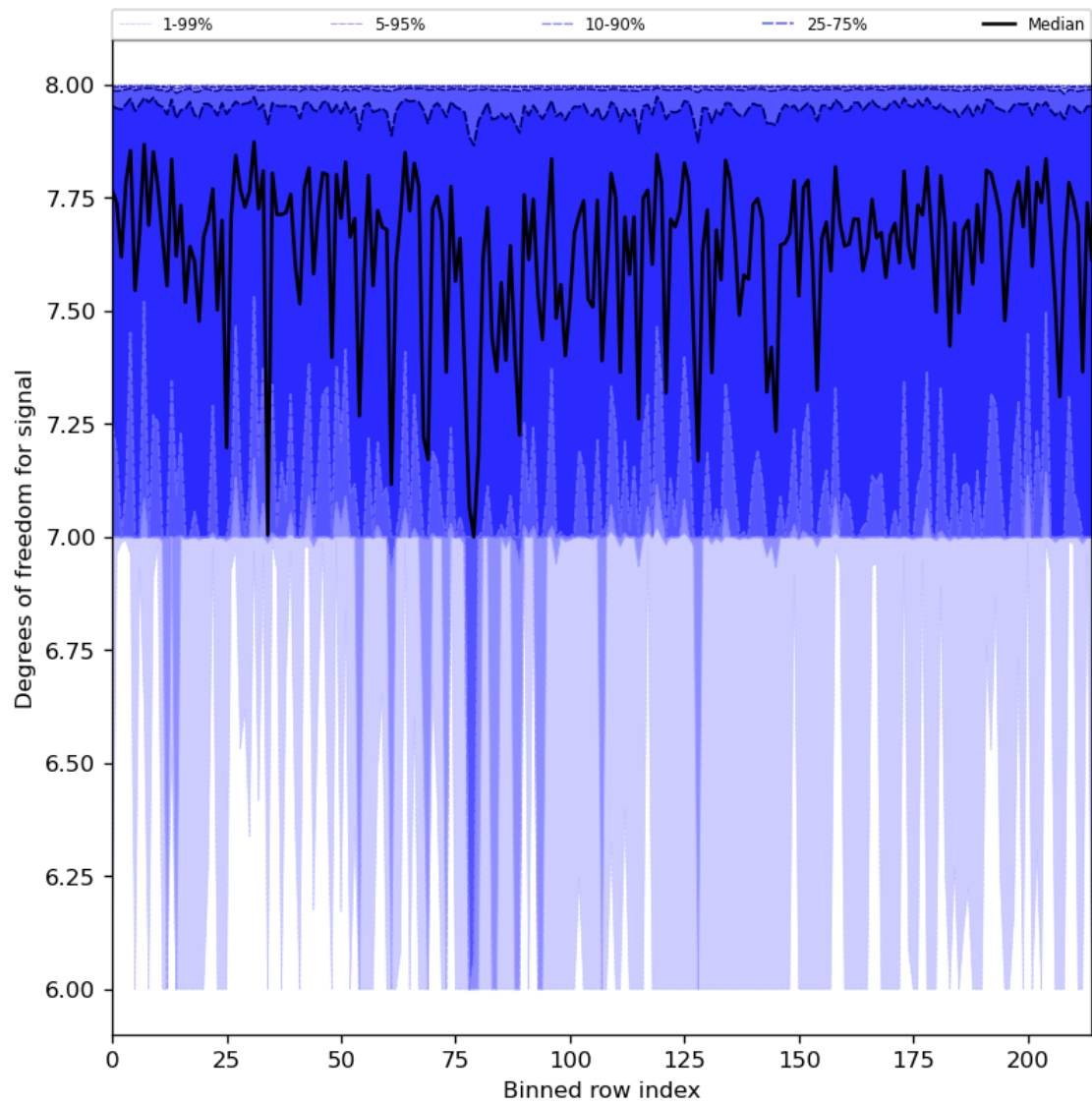


Figure 31: Along track statistics of “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24

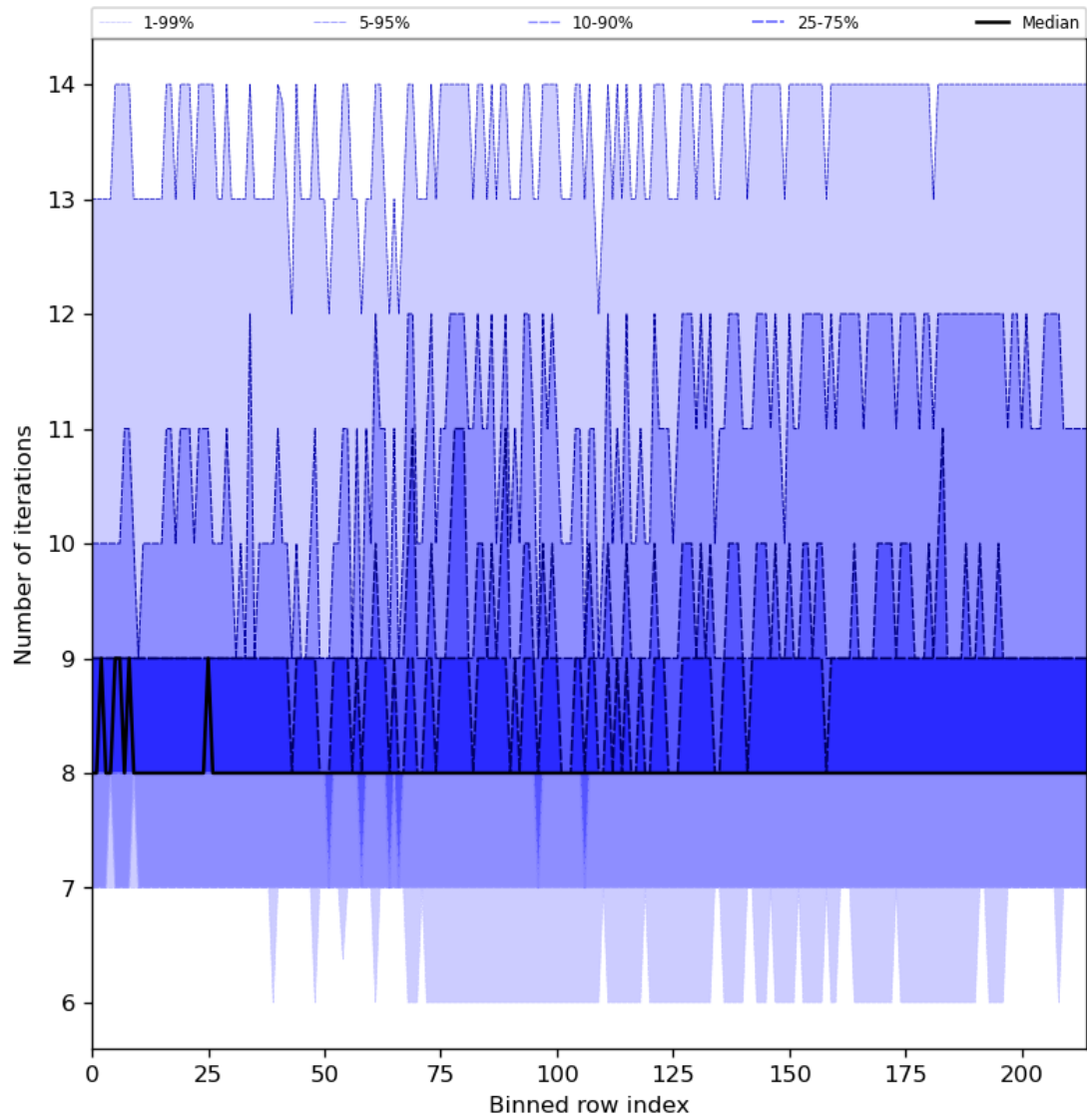


Figure 32: Along track statistics of “Number of iterations” for 2023-07-22 to 2023-07-24

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.

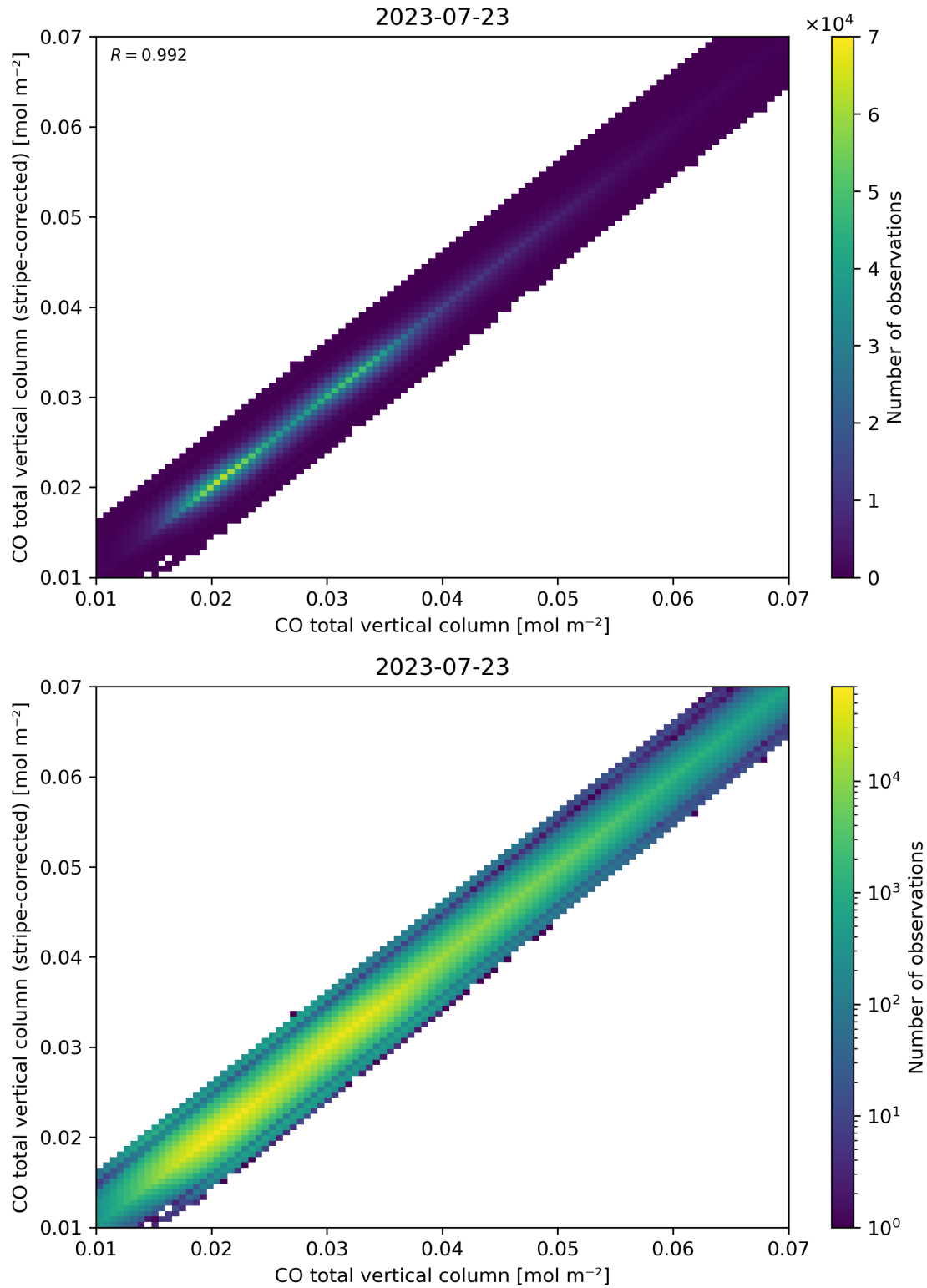


Figure 33: Scatter density plot of “CO total vertical column” against “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24.

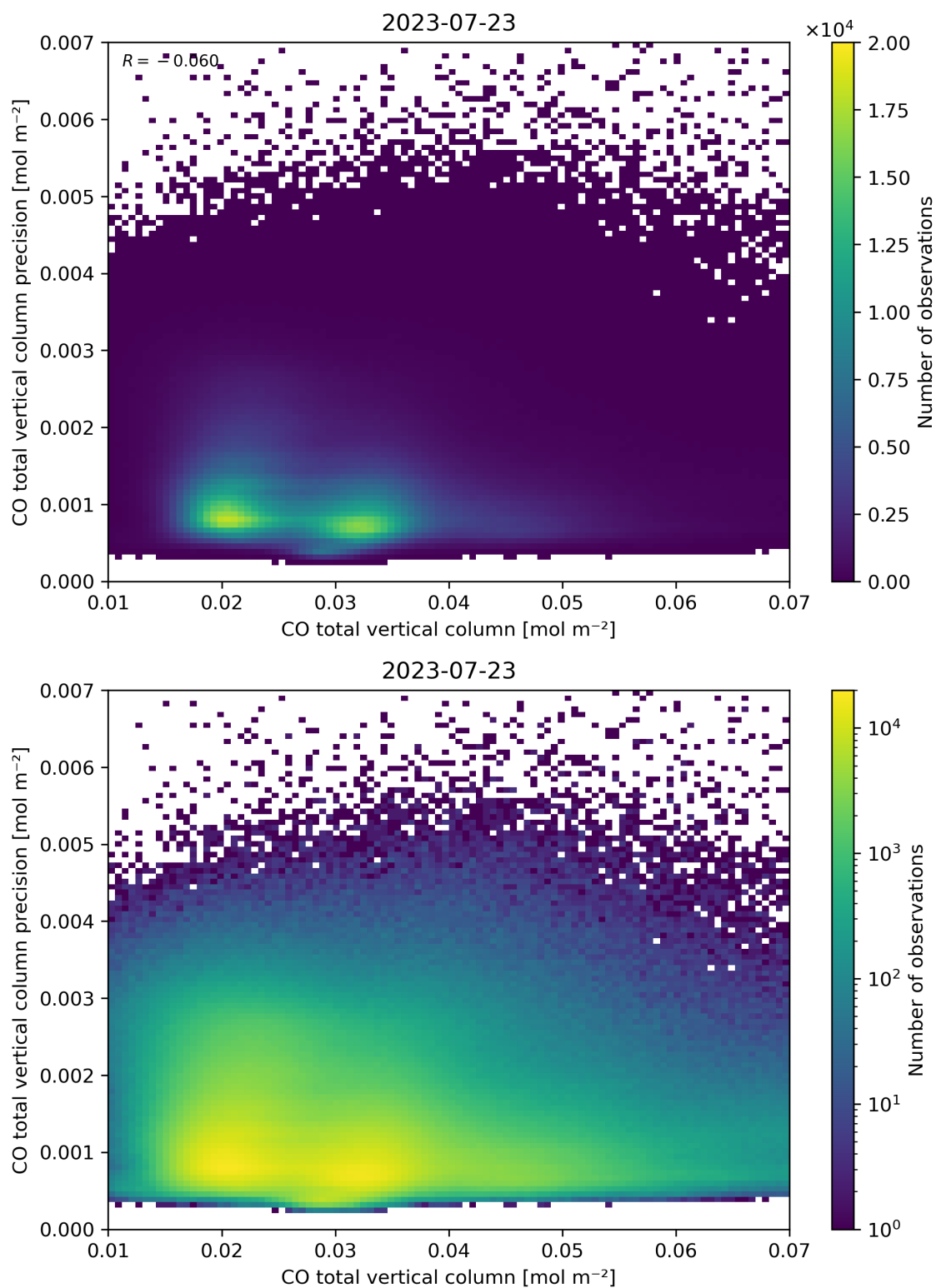


Figure 34: Scatter density plot of “CO total vertical column” against “CO total vertical column precision” for 2023-07-22 to 2023-07-24.

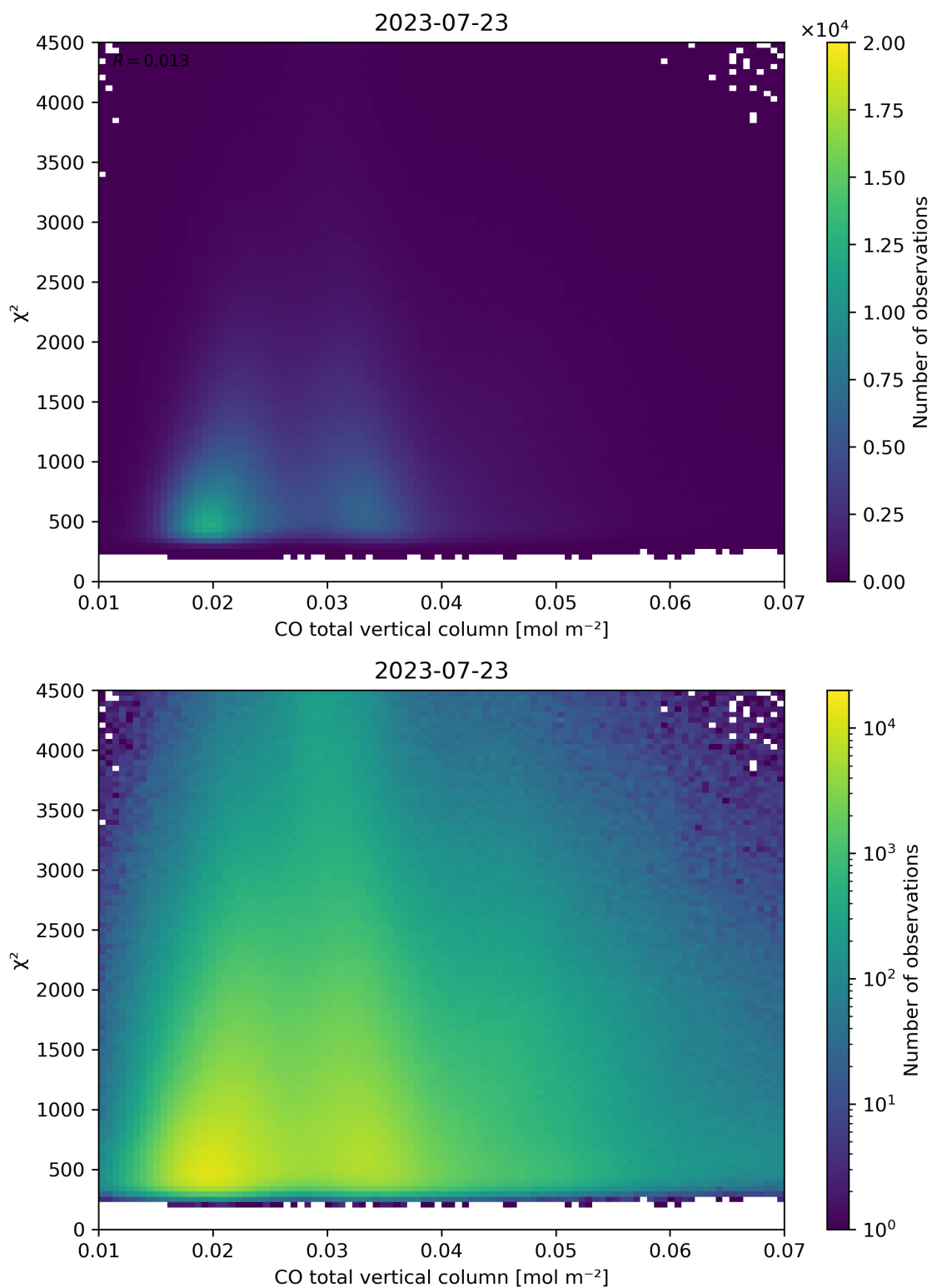


Figure 35: Scatter density plot of “CO total vertical column” against “ χ^2 ” for 2023-07-22 to 2023-07-24.

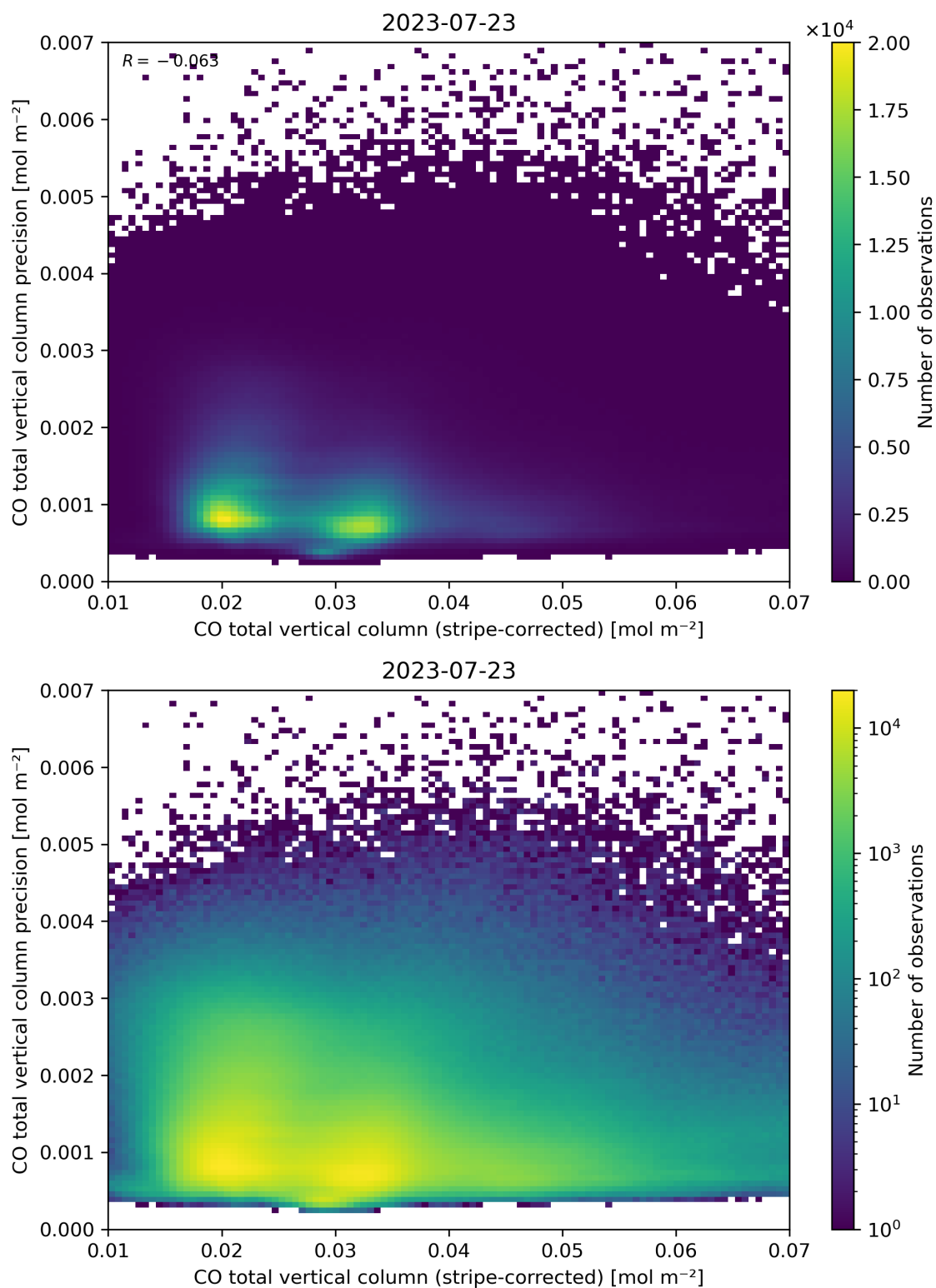


Figure 36: Scatter density plot of “CO total vertical column (stripe-corrected)” against “CO total vertical column precision” for 2023-07-22 to 2023-07-24.

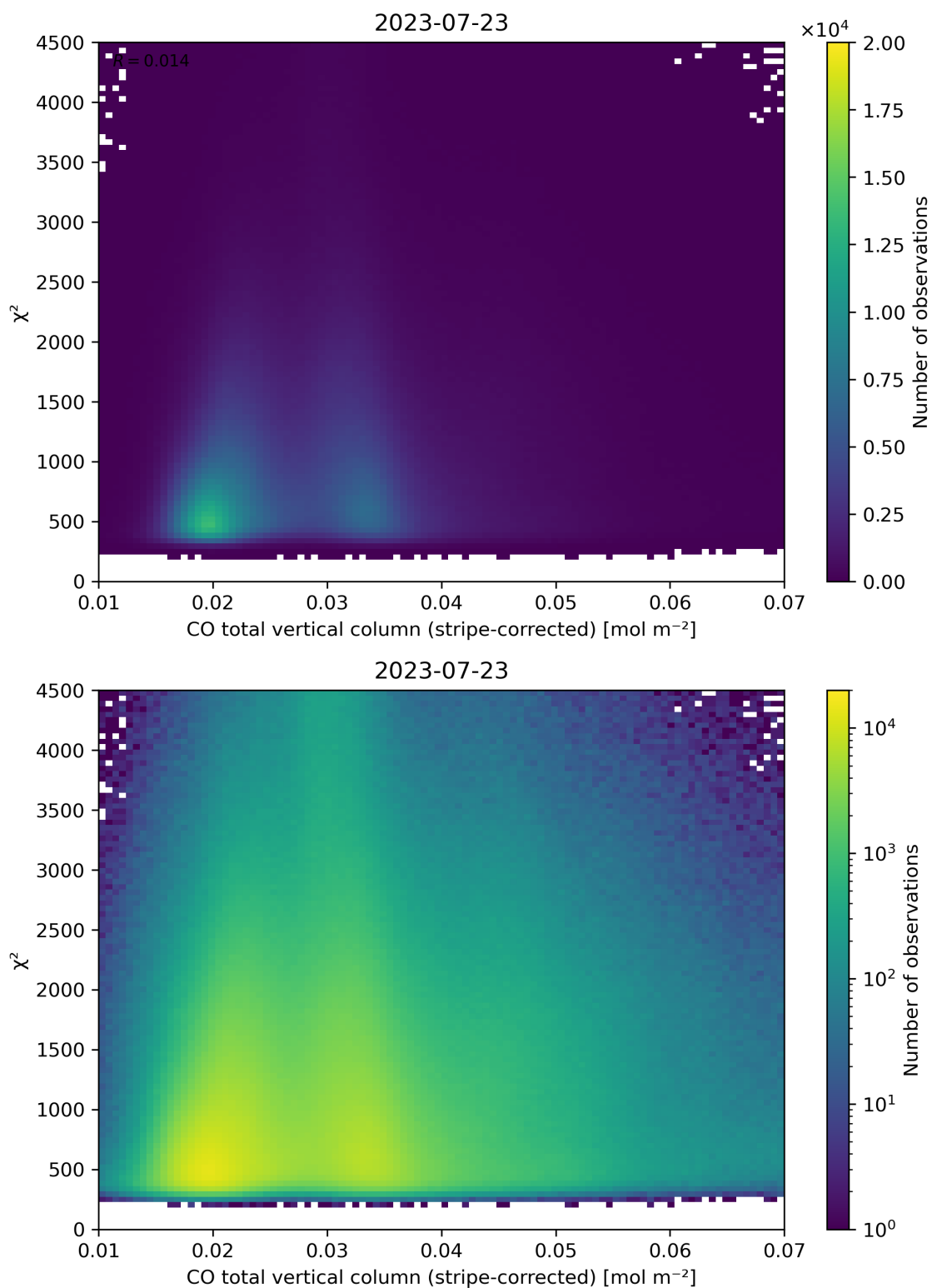


Figure 37: Scatter density plot of “CO total vertical column (stripe-corrected)” against “ χ^2 ” for 2023-07-22 to 2023-07-24.

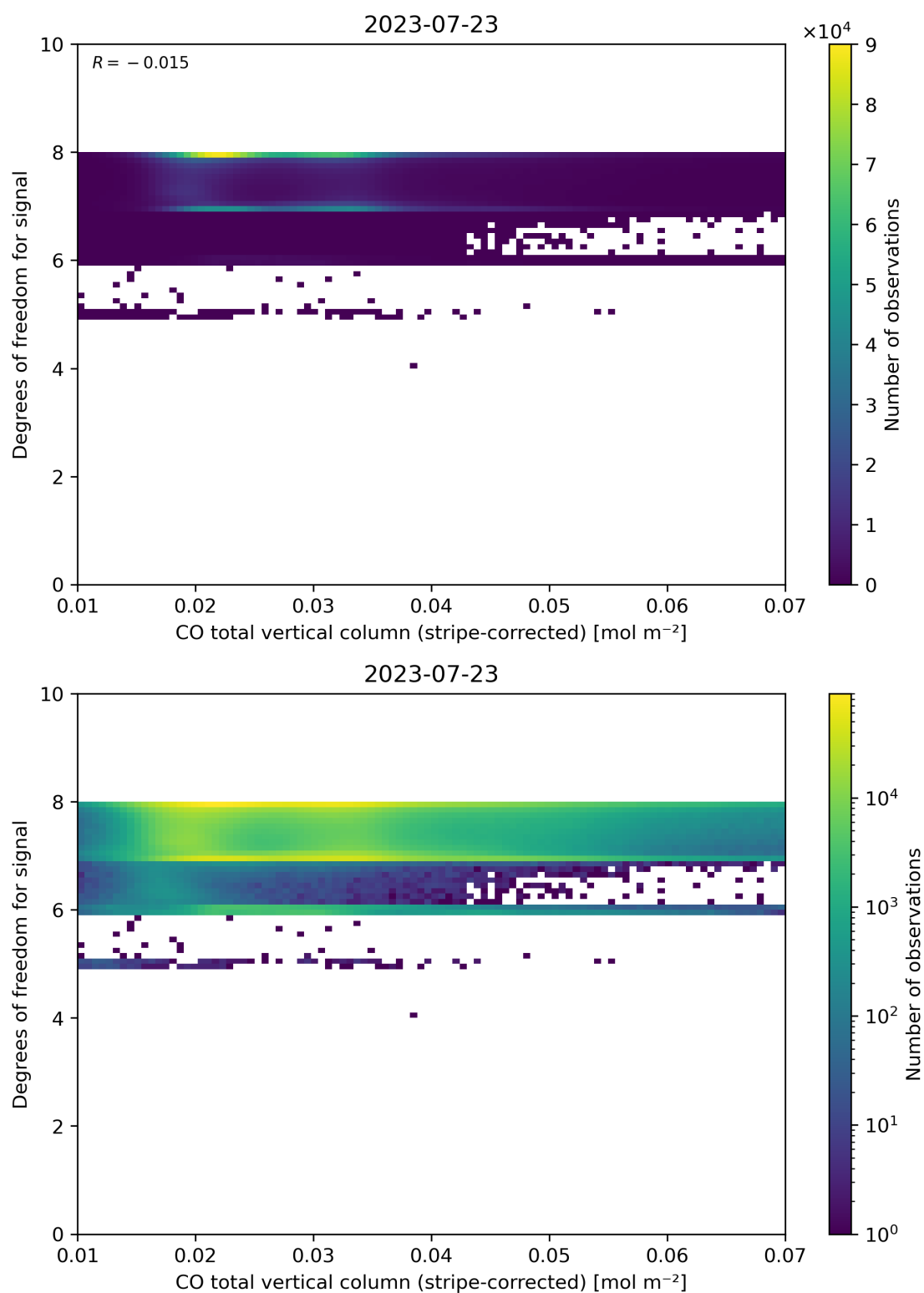


Figure 38: Scatter density plot of “CO total vertical column (stripe-corrected)” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.

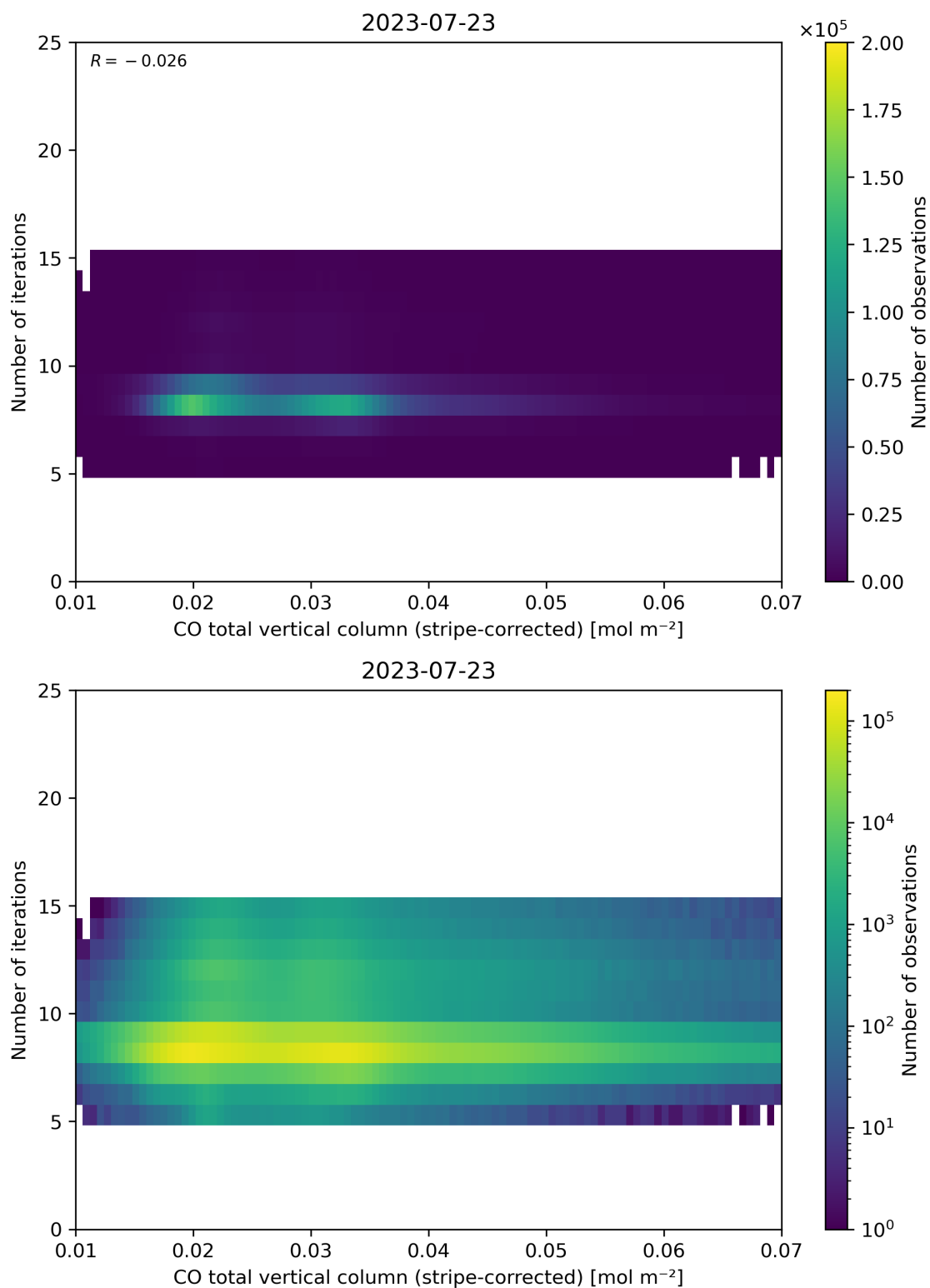


Figure 39: Scatter density plot of “CO total vertical column (stripe-corrected)” against “Number of iterations” for 2023-07-22 to 2023-07-24.

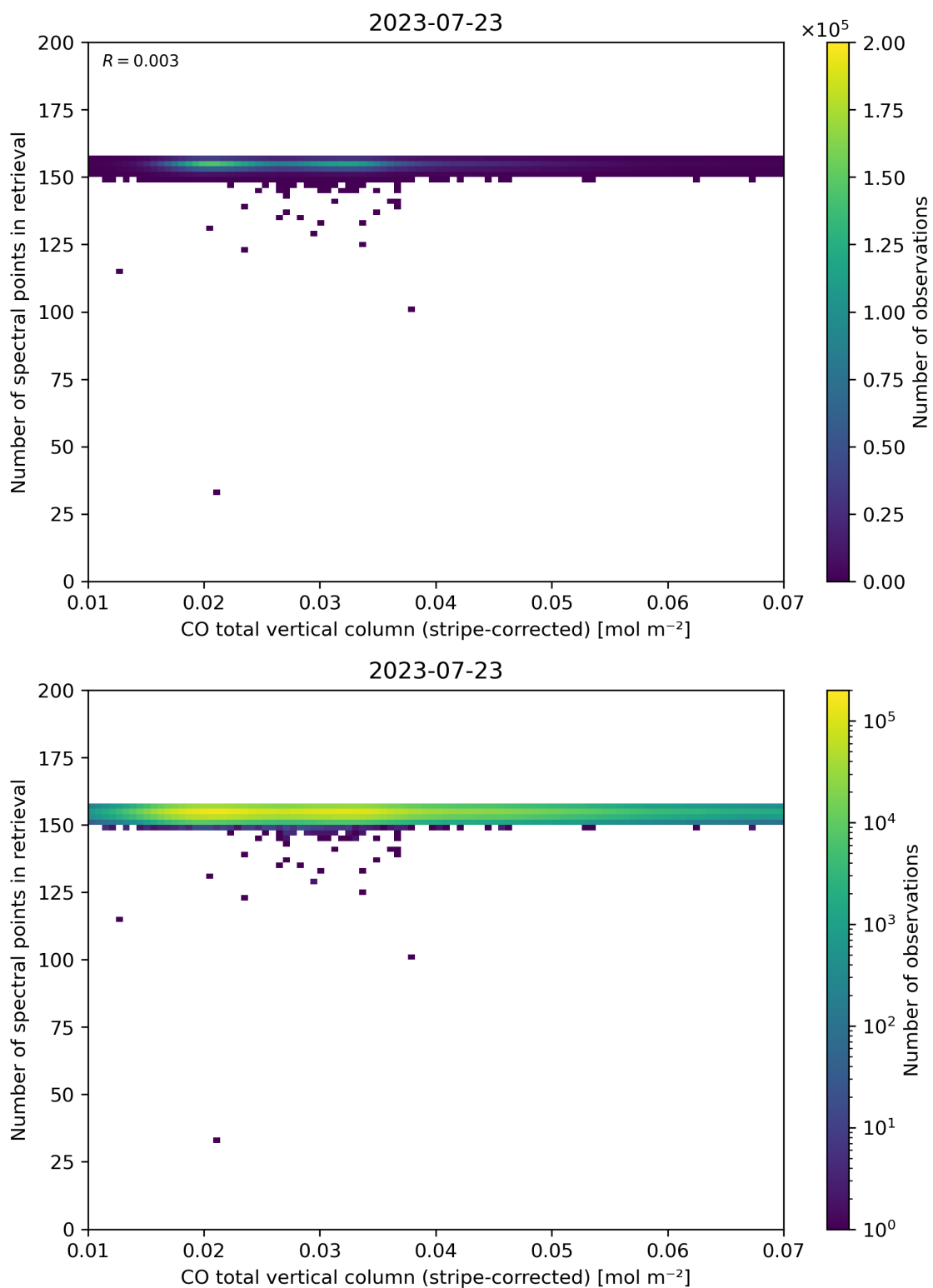


Figure 40: Scatter density plot of “CO total vertical column (stripe-corrected)” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.

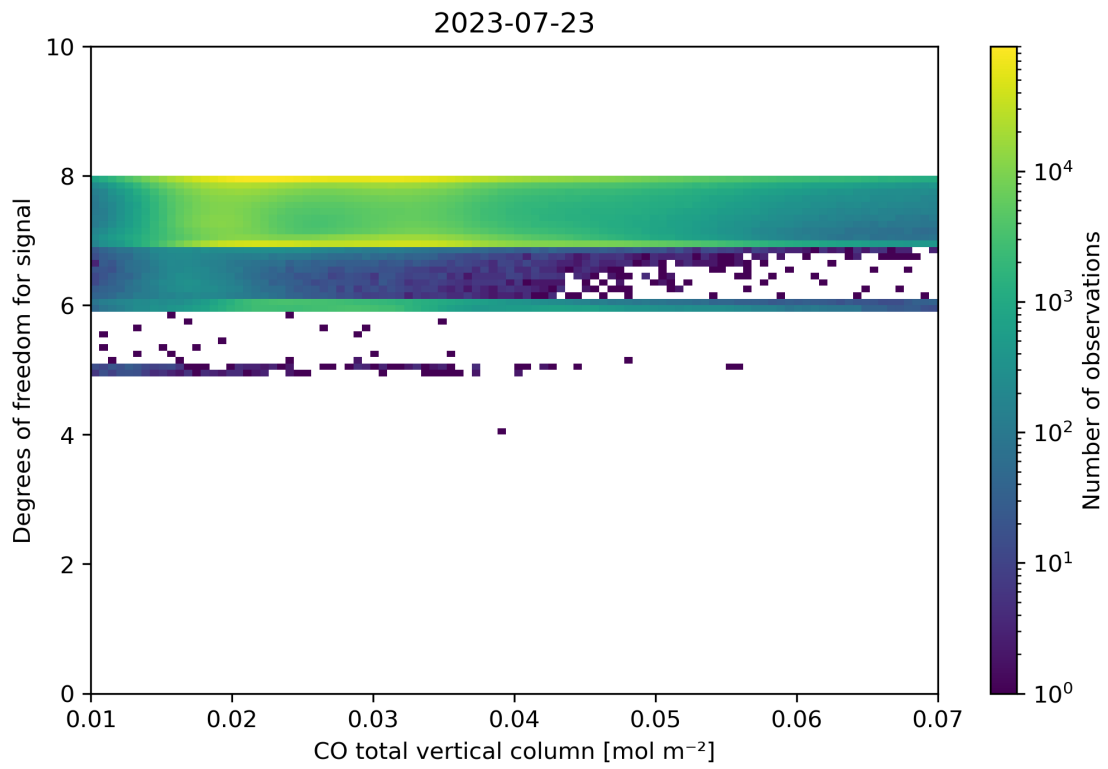
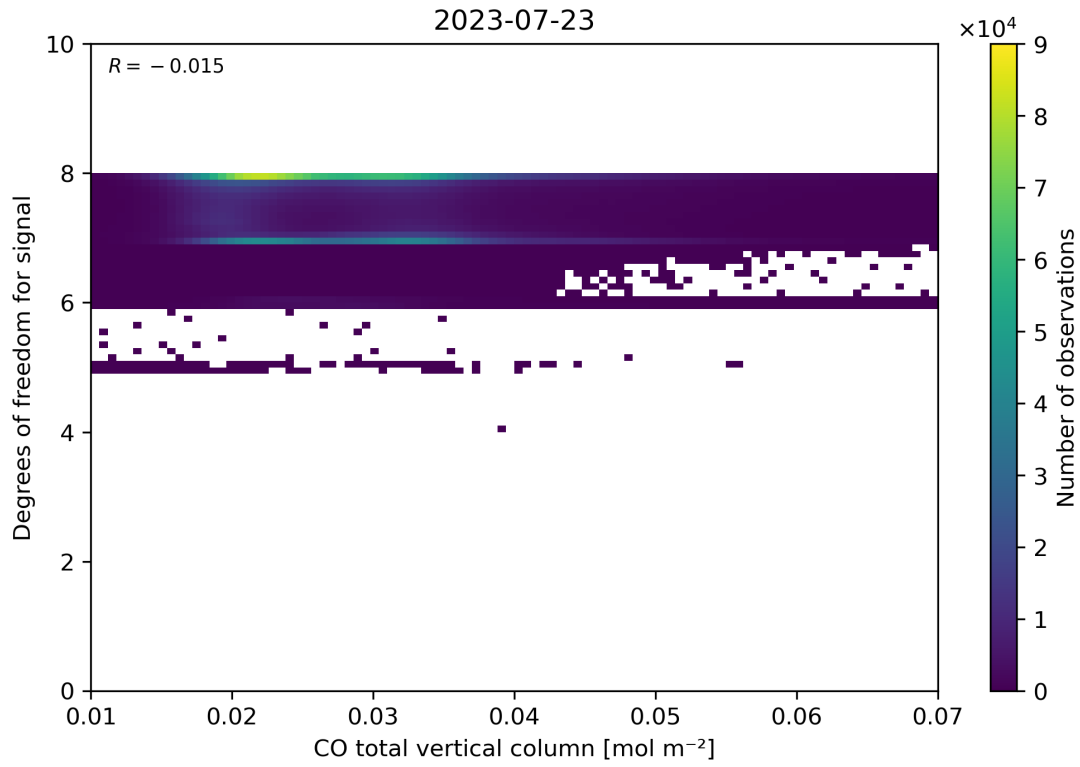


Figure 41: Scatter density plot of “CO total vertical column” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.

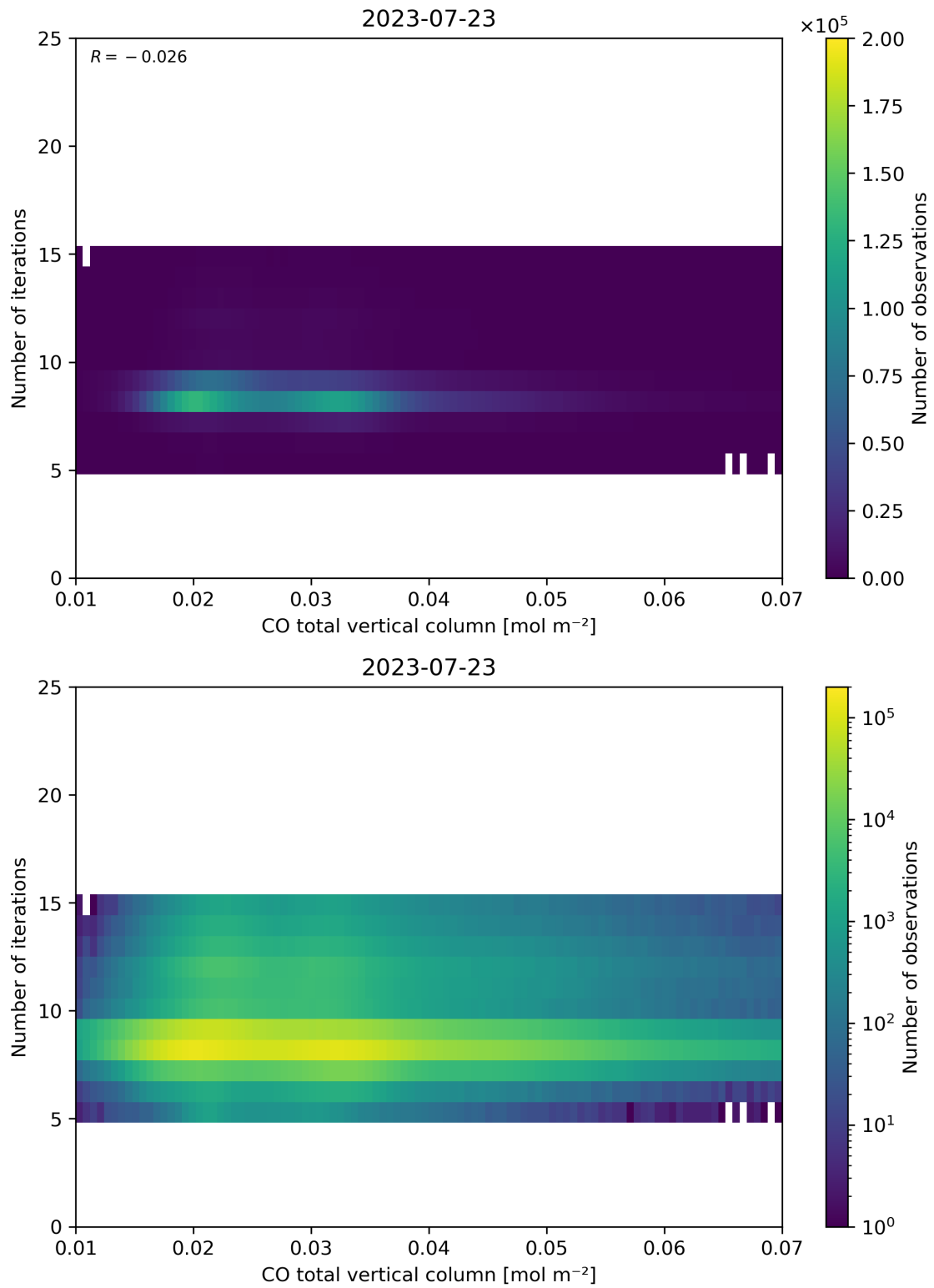


Figure 42: Scatter density plot of “CO total vertical column” against “Number of iterations” for 2023-07-22 to 2023-07-24.

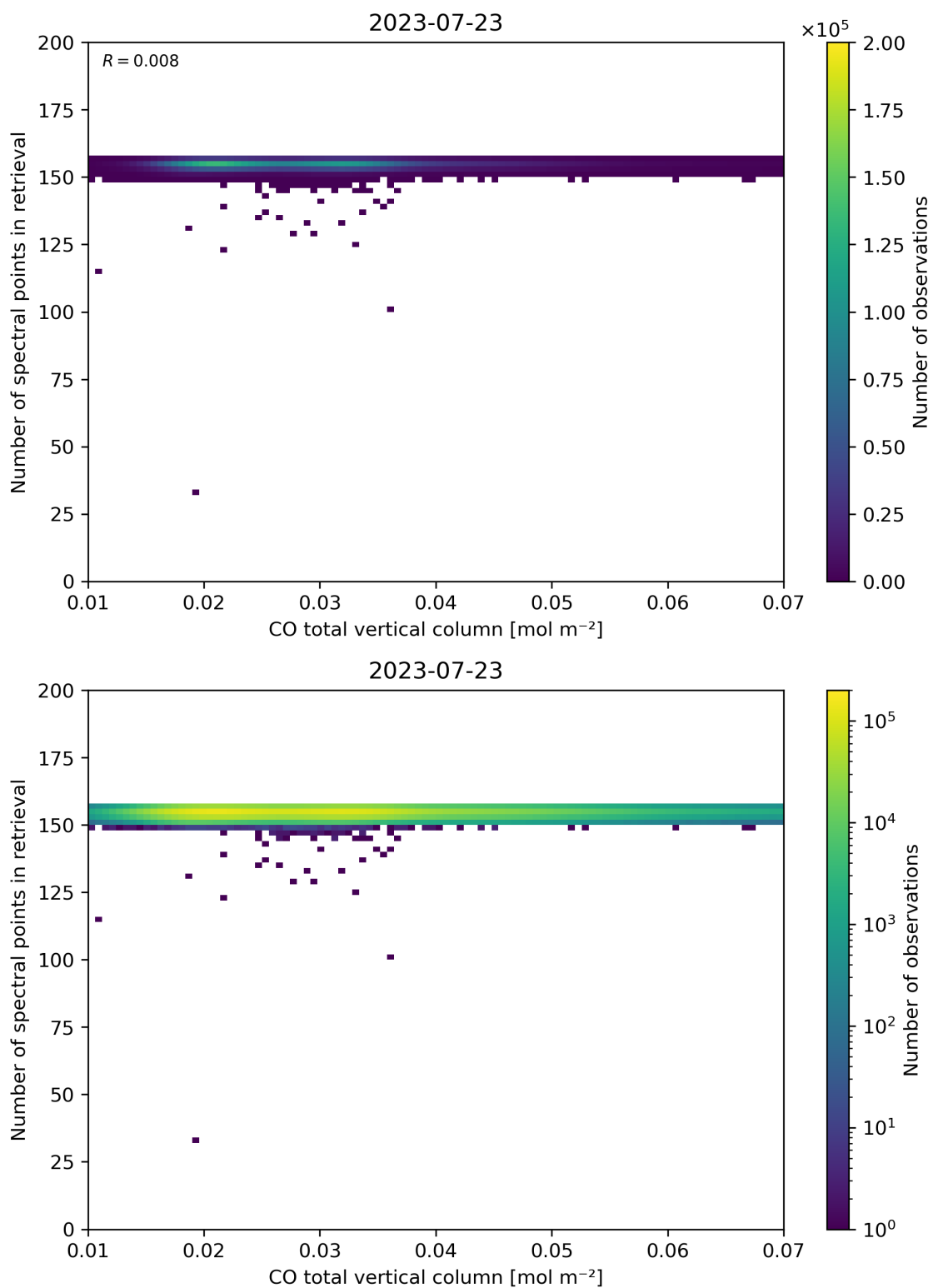


Figure 43: Scatter density plot of “CO total vertical column” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.

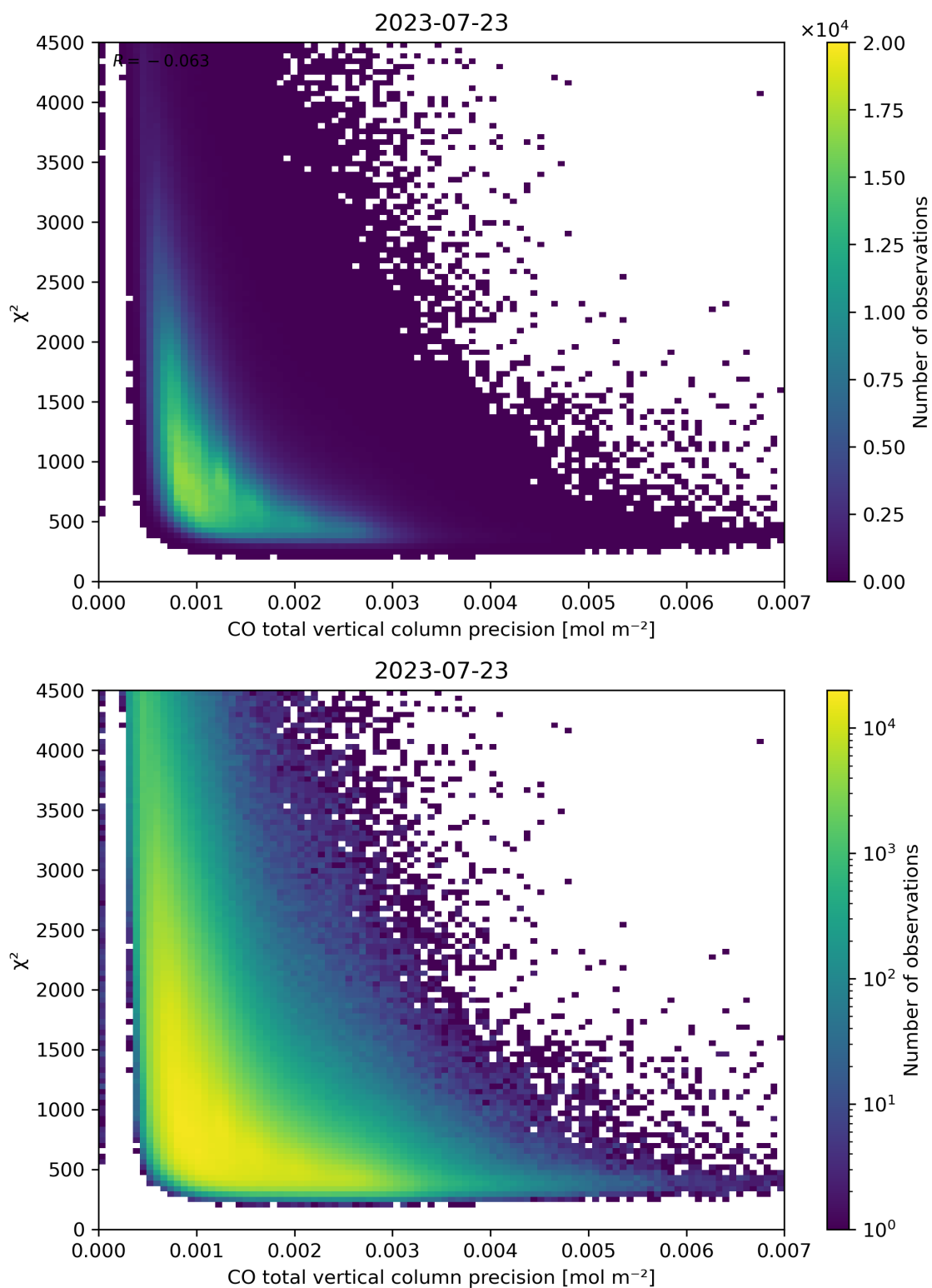


Figure 44: Scatter density plot of “CO total vertical column precision” against “ χ^2 ” for 2023-07-22 to 2023-07-24.

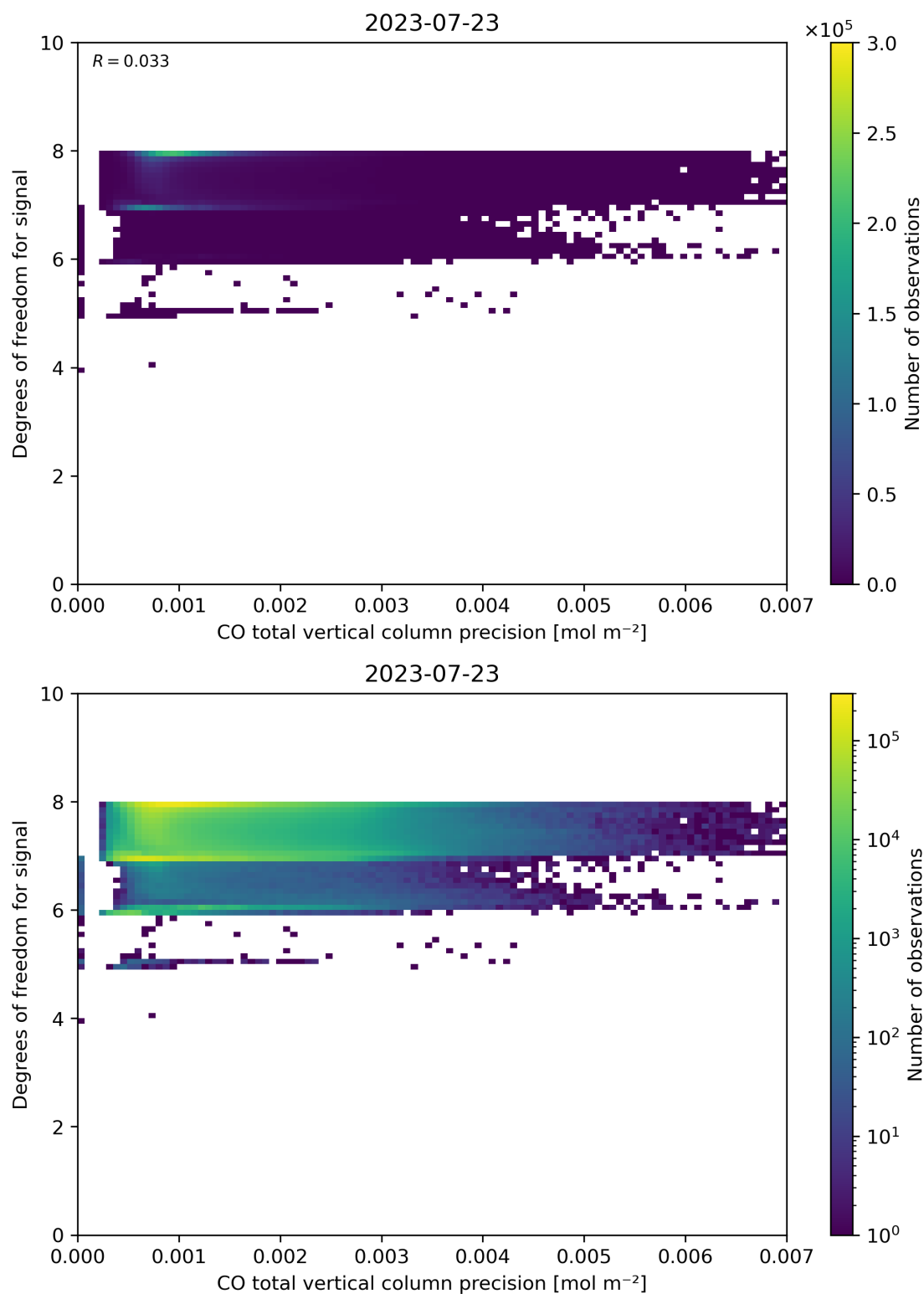


Figure 45: Scatter density plot of “CO total vertical column precision” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.

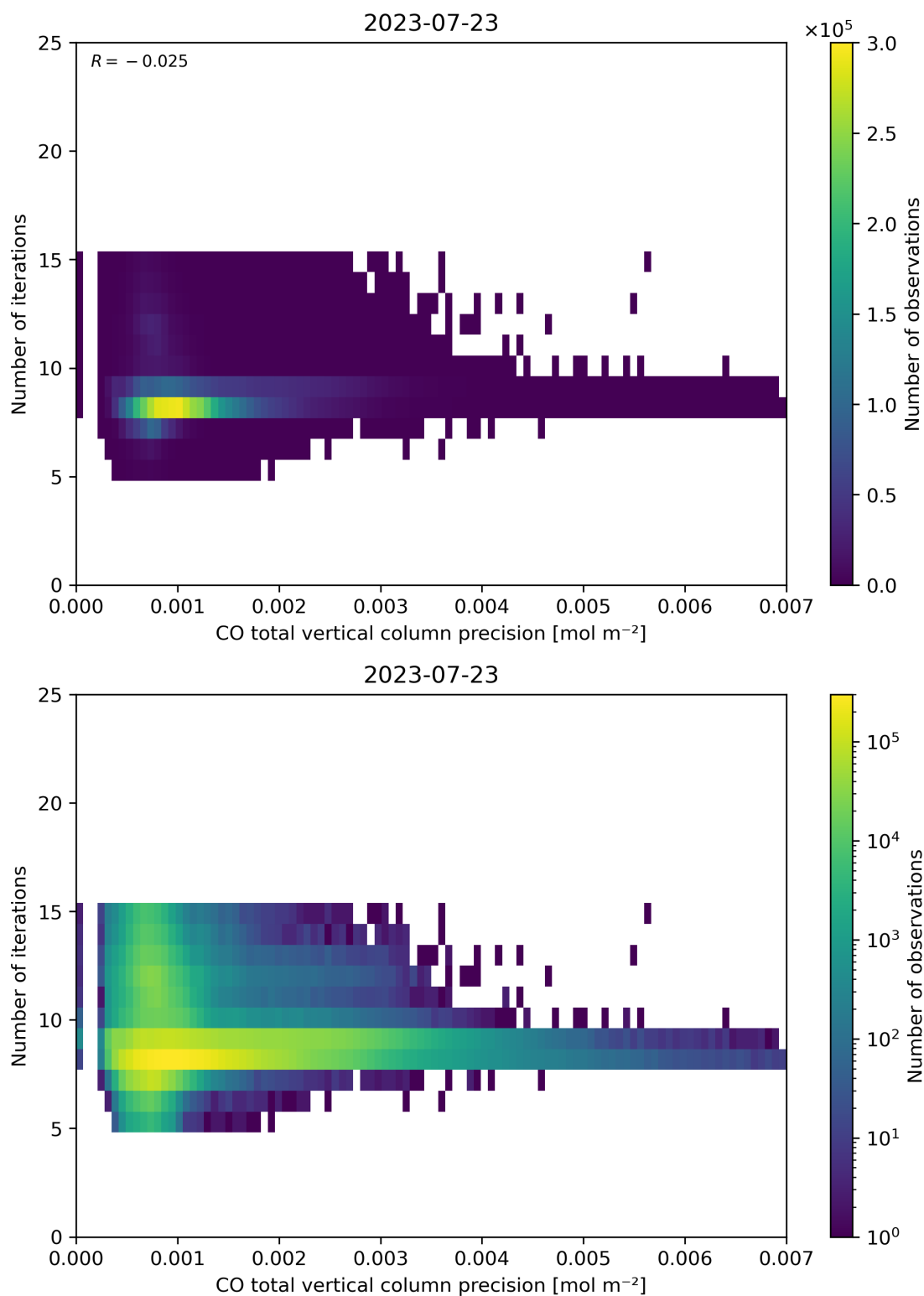


Figure 46: Scatter density plot of “CO total vertical column precision” against “Number of iterations” for 2023-07-22 to 2023-07-24.

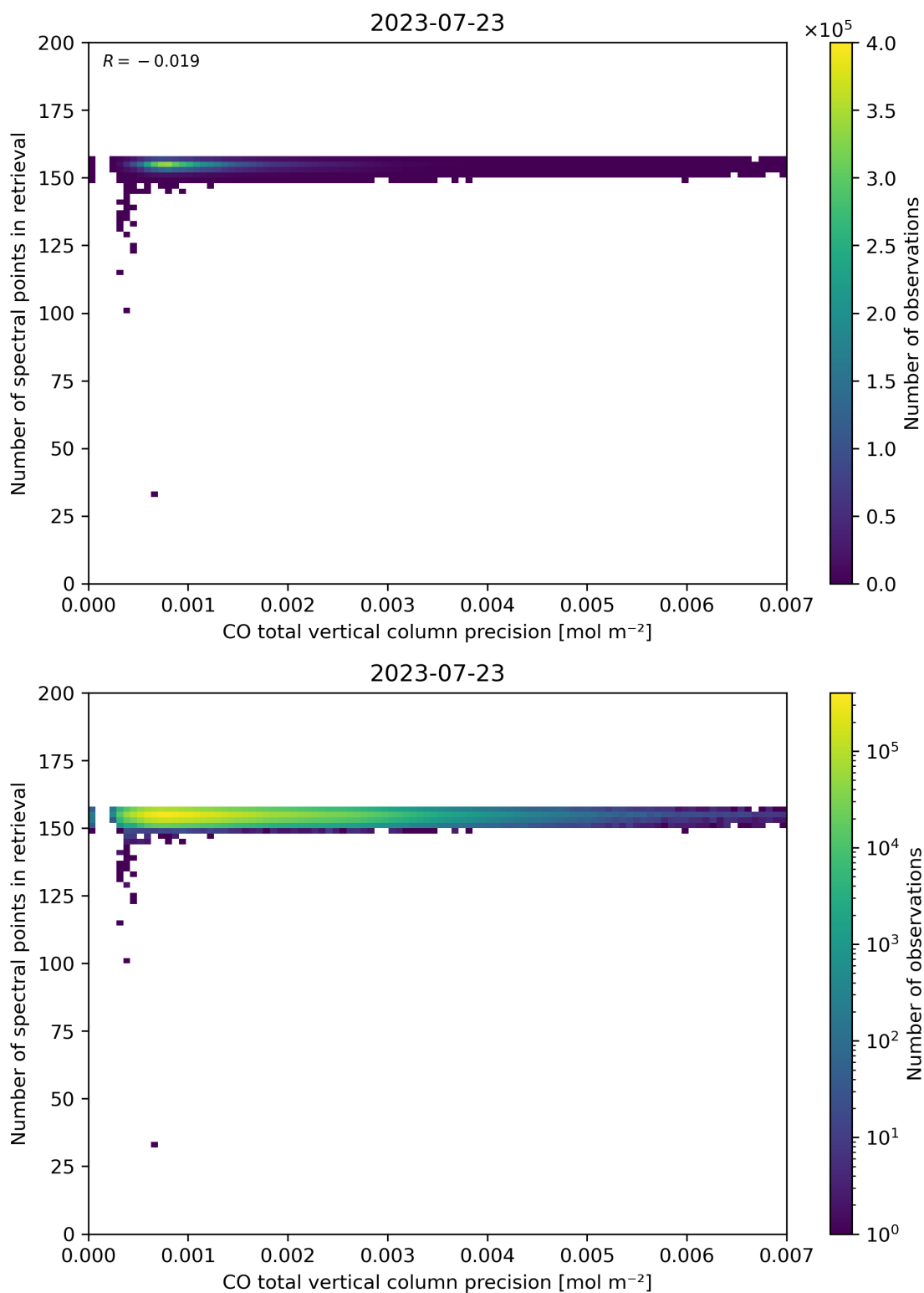


Figure 47: Scatter density plot of “CO total vertical column precision” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.

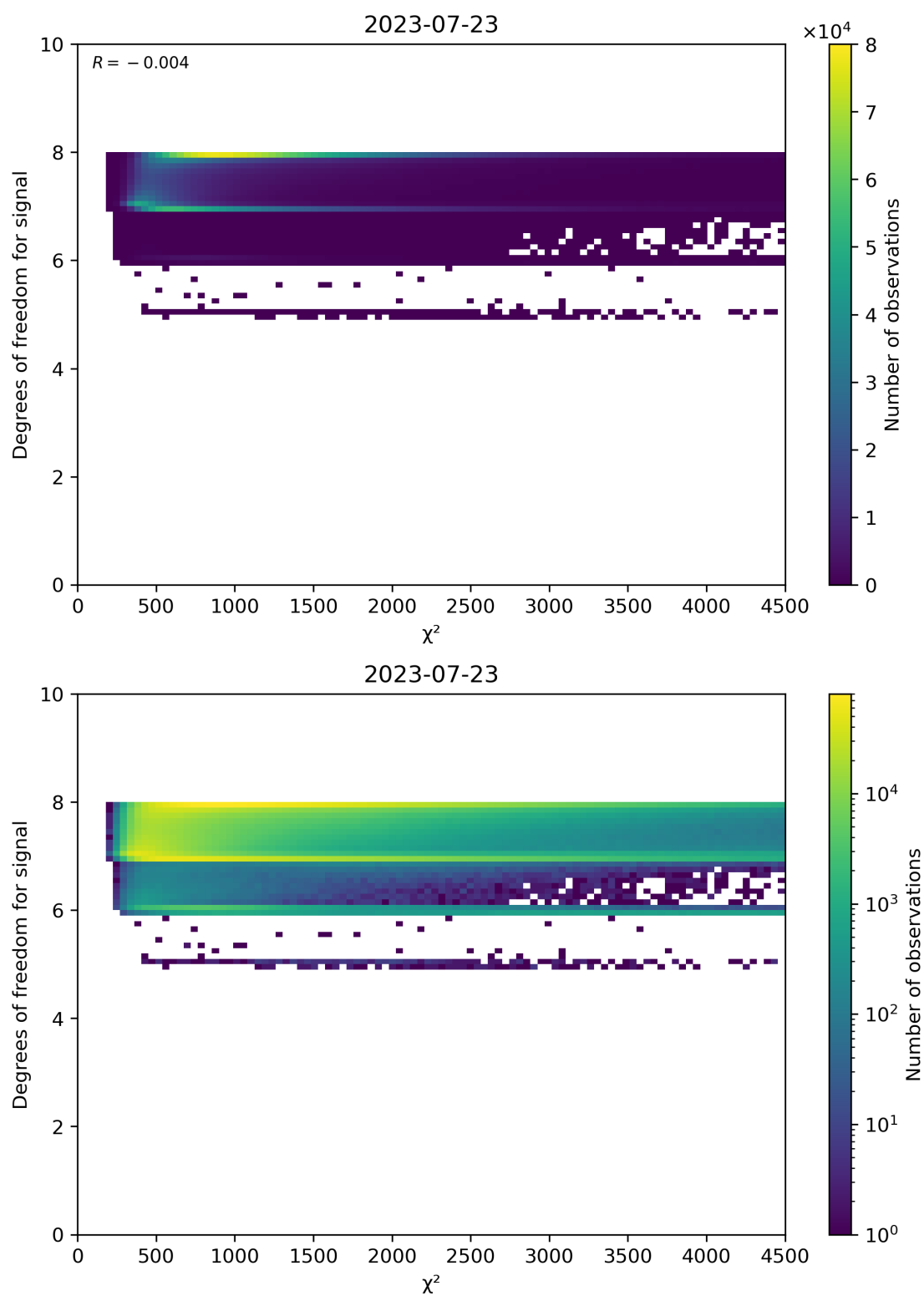


Figure 48: Scatter density plot of “ χ^2 ” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.

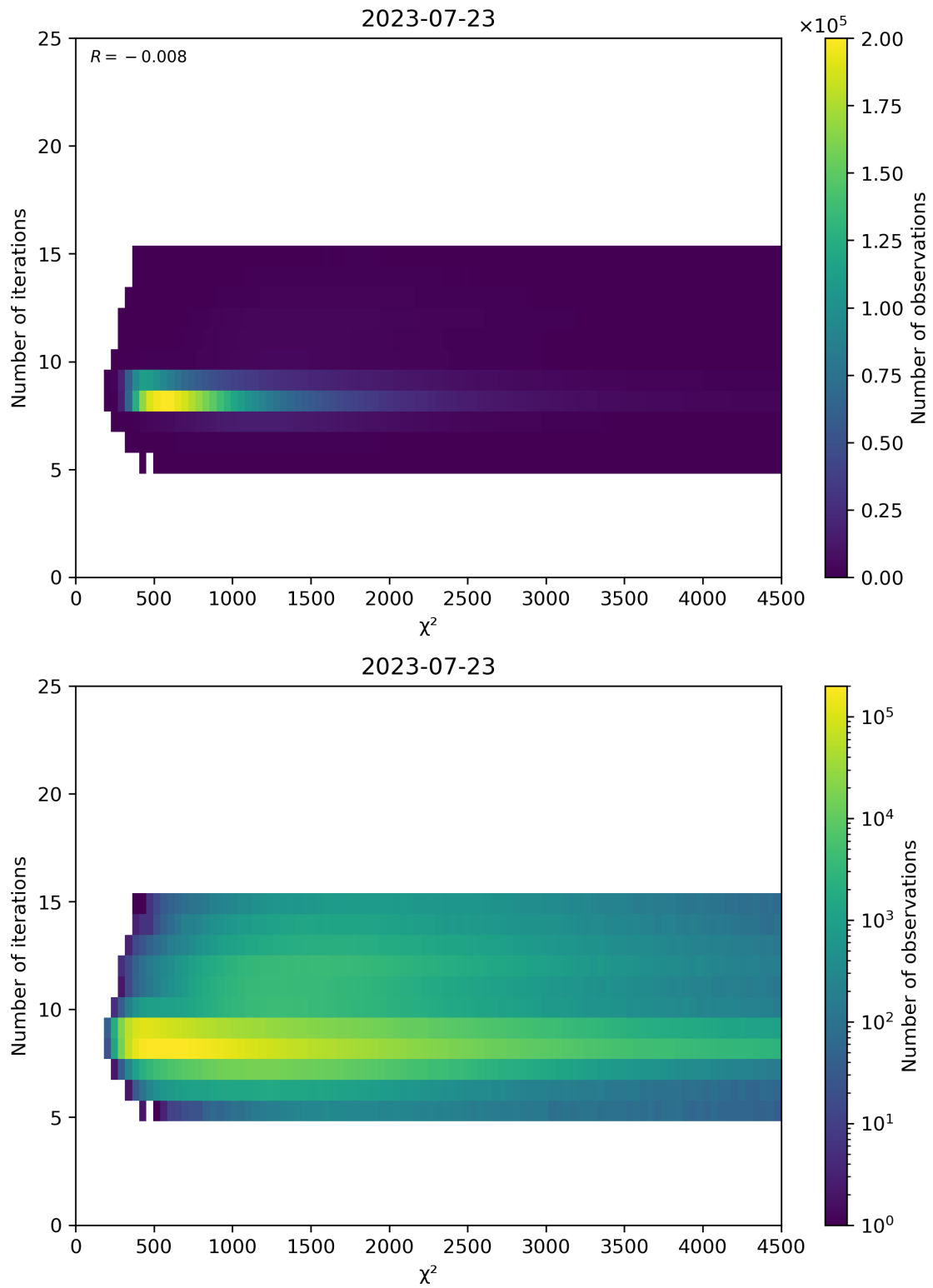


Figure 49: Scatter density plot of “ χ^2 ” against “Number of iterations” for 2023-07-22 to 2023-07-24.

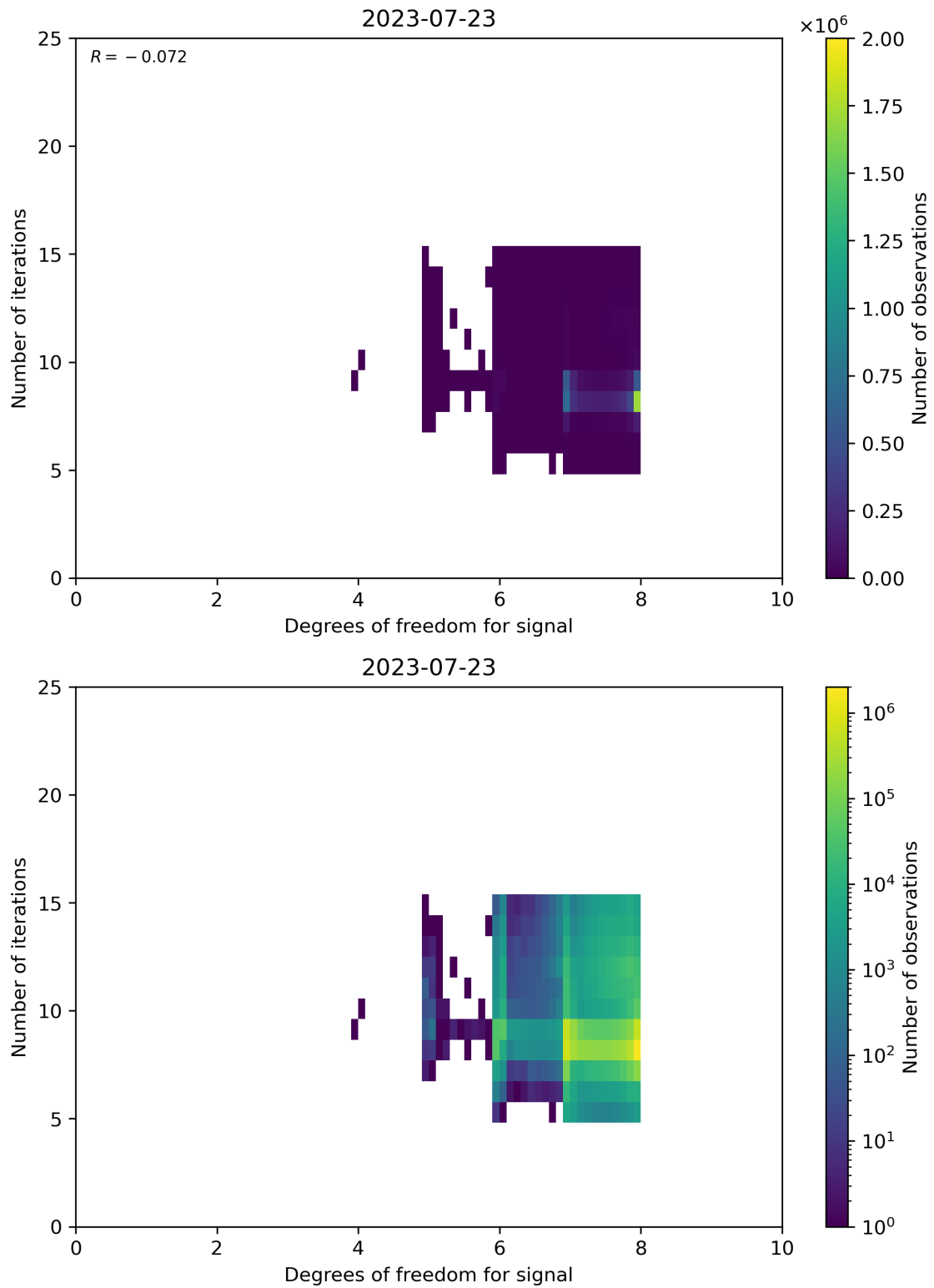


Figure 50: Scatter density plot of “Degrees of freedom for signal” against “Number of iterations” for 2023-07-22 to 2023-07-24.

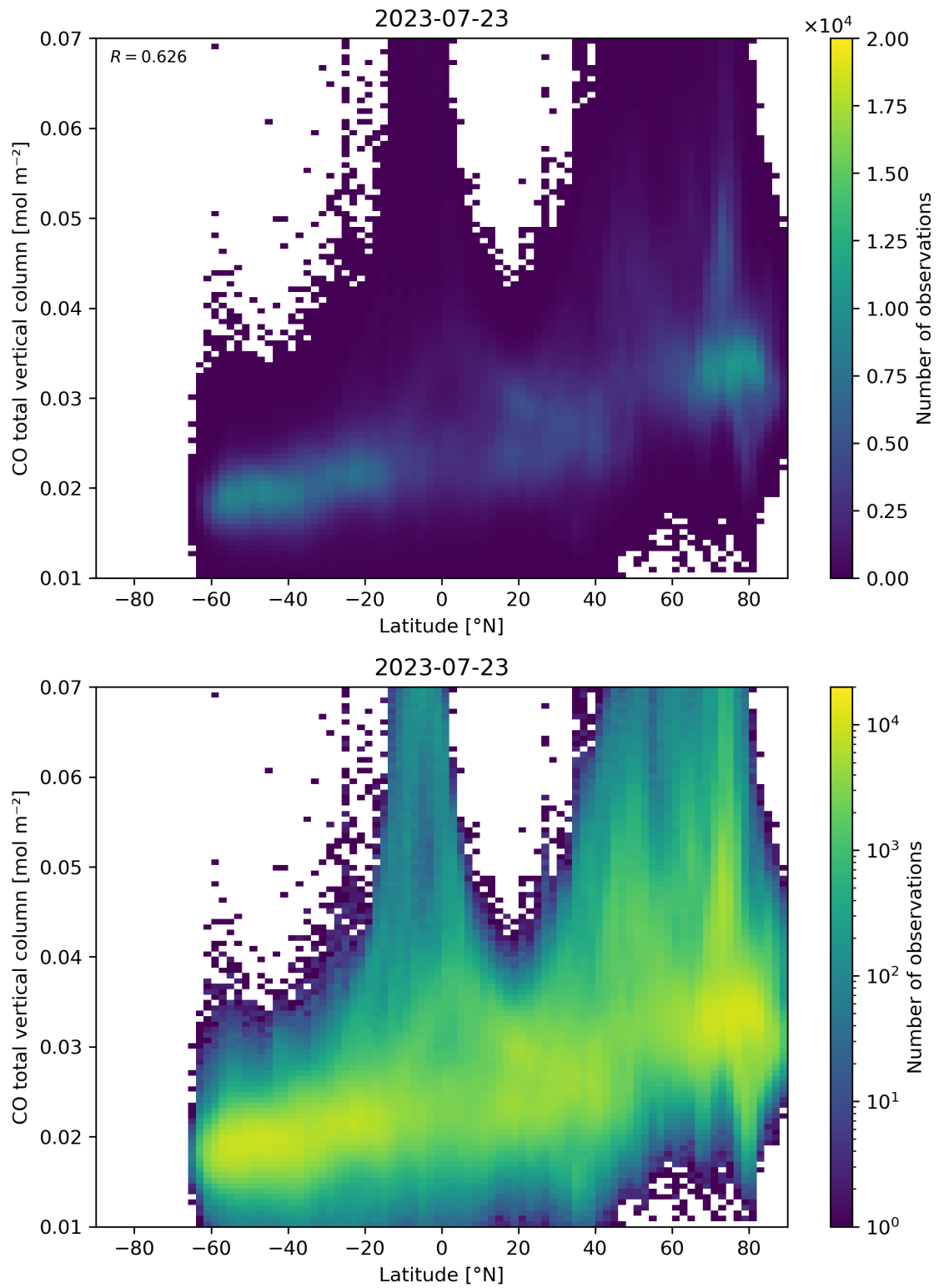


Figure 51: Scatter density plot of “Latitude” against “CO total vertical column” for 2023-07-22 to 2023-07-24.

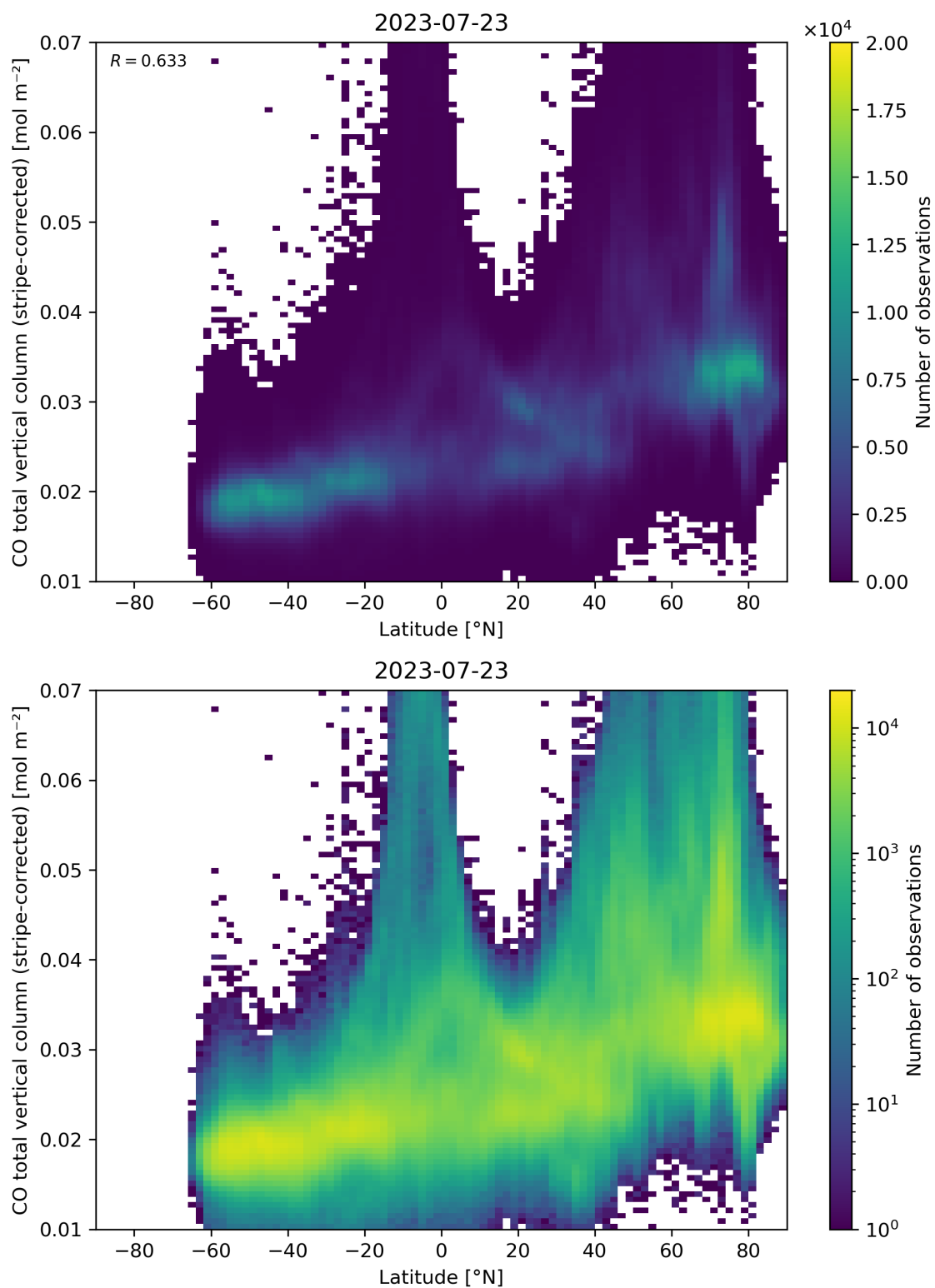


Figure 52: Scatter density plot of “Latitude” against “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24.

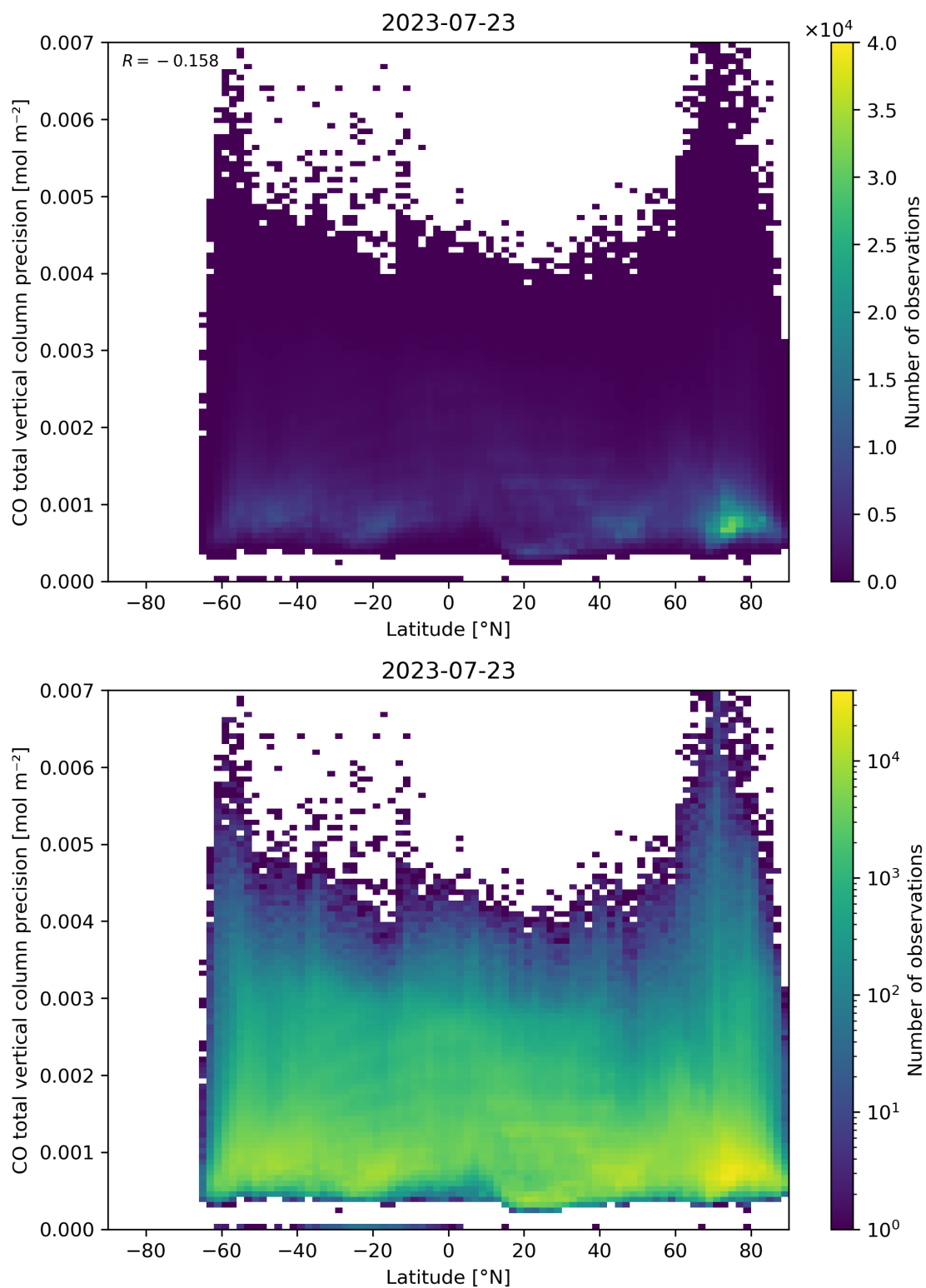


Figure 53: Scatter density plot of “Latitude” against “CO total vertical column precision” for 2023-07-22 to 2023-07-24.

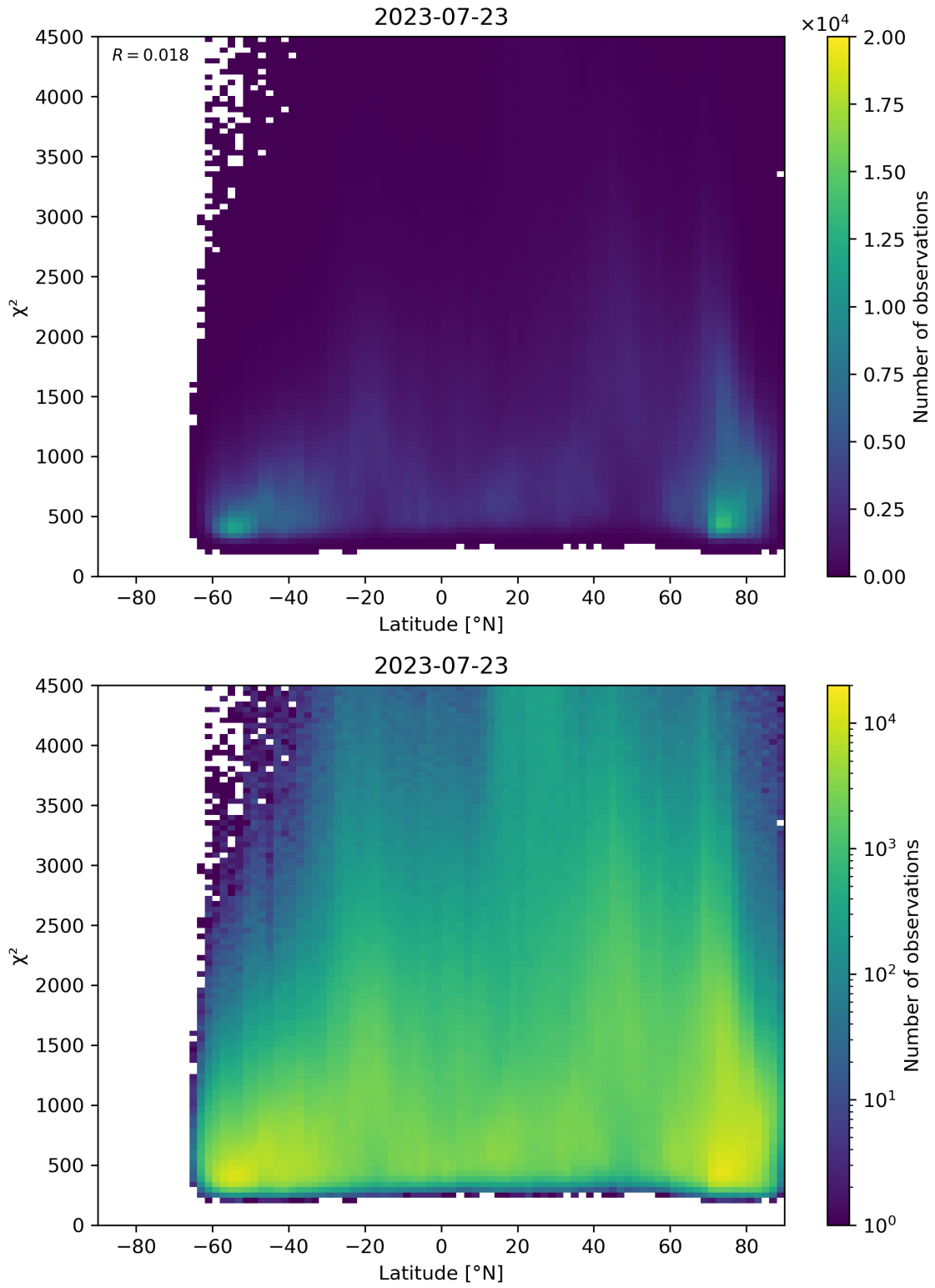


Figure 54: Scatter density plot of “Latitude” against “ χ^2 ” for 2023-07-22 to 2023-07-24.

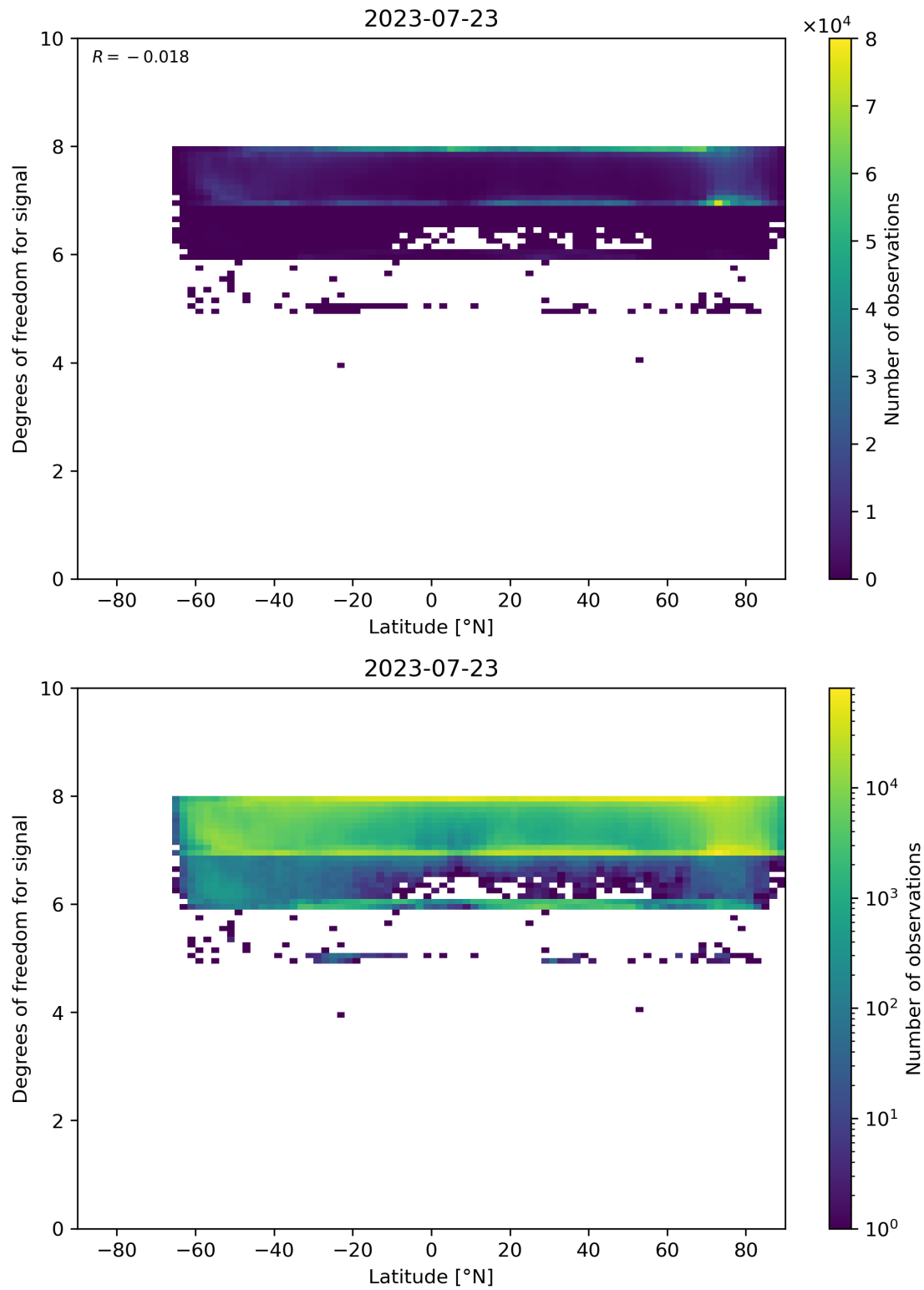


Figure 55: Scatter density plot of “Latitude” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.

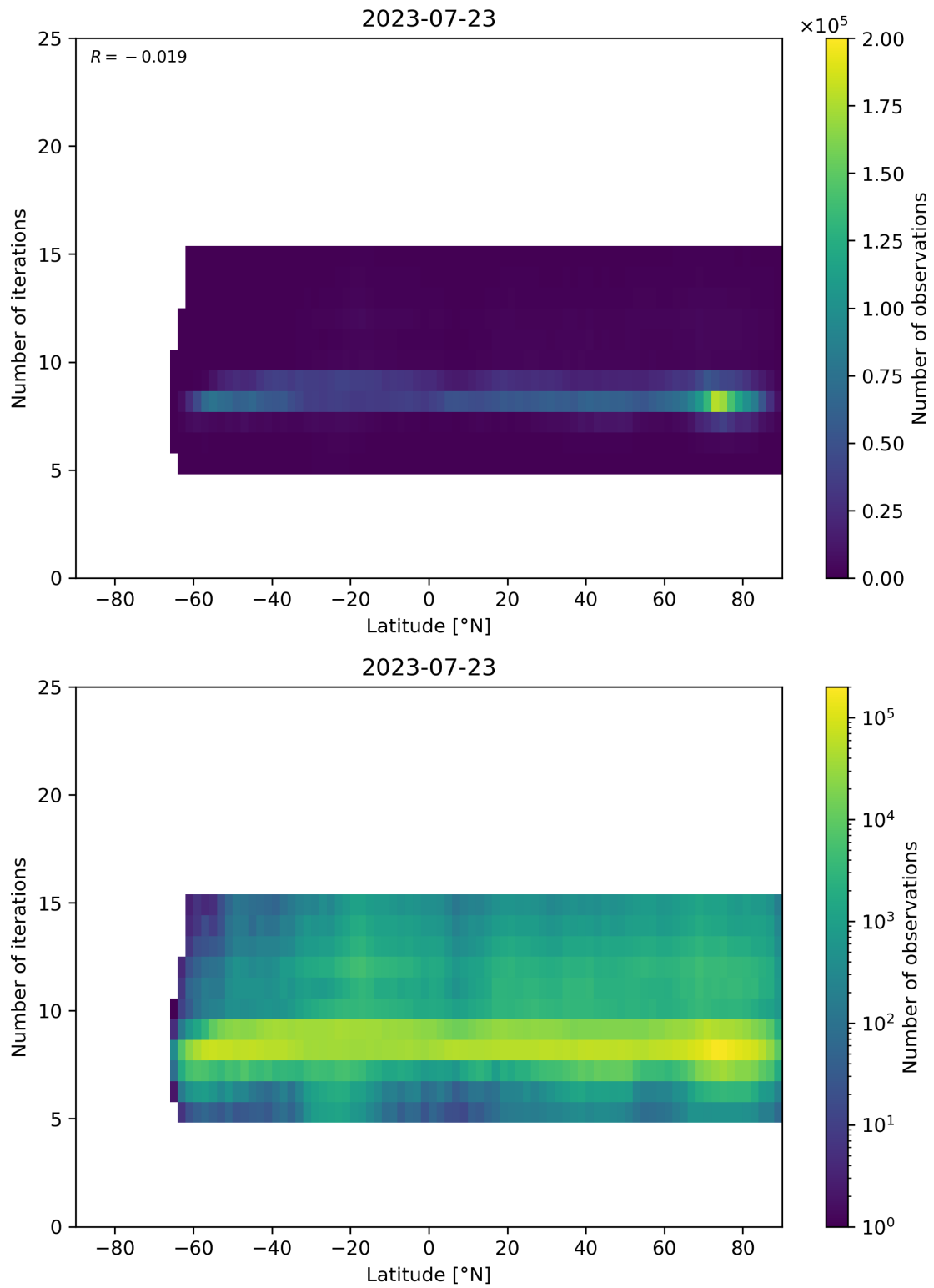


Figure 56: Scatter density plot of “Latitude” against “Number of iterations” for 2023-07-22 to 2023-07-24.

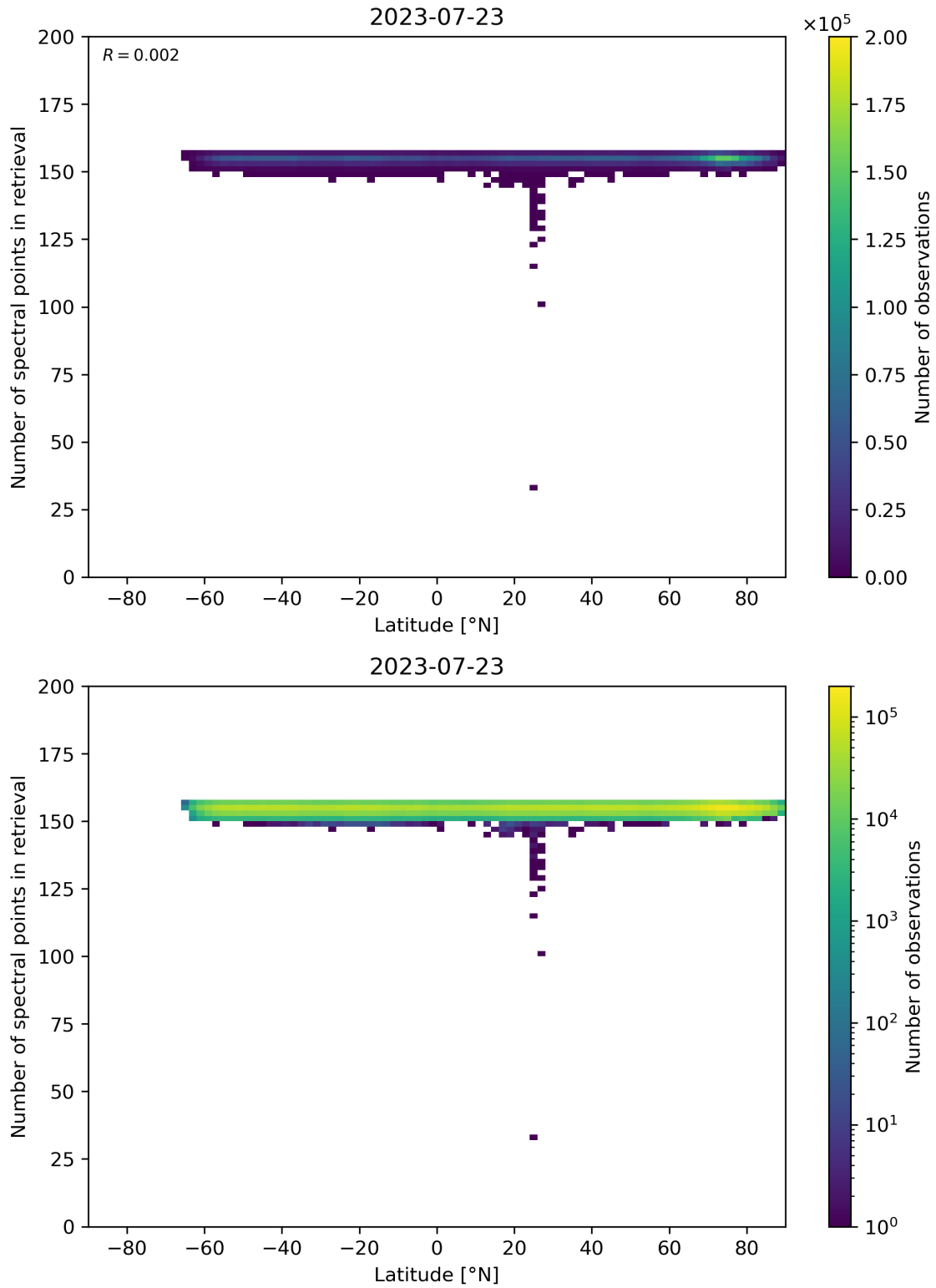


Figure 57: Scatter density plot of “Latitude” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.

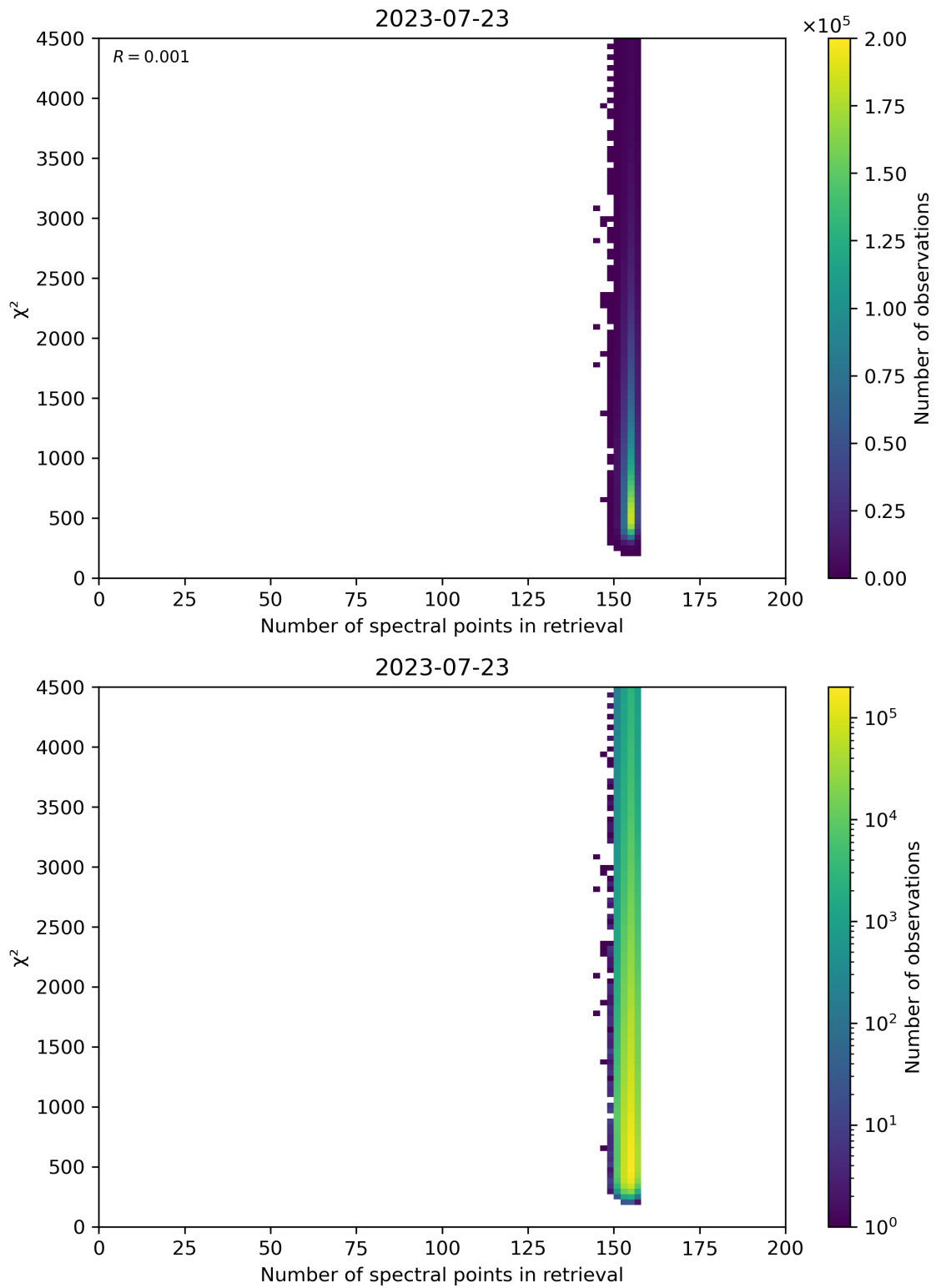


Figure 58: Scatter density plot of “Number of spectral points in retrieval” against “ χ^2 ” for 2023-07-22 to 2023-07-24.

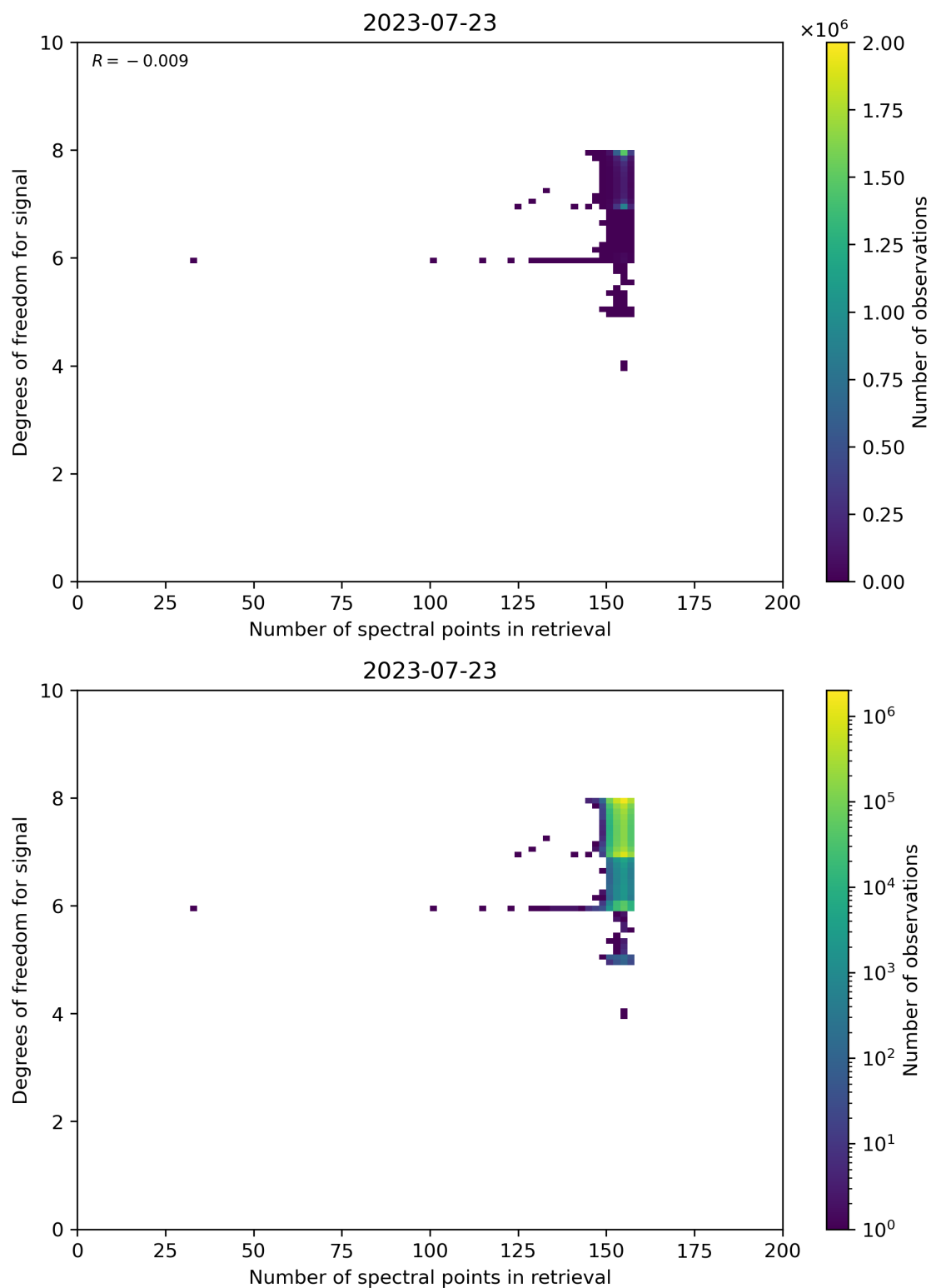


Figure 59: Scatter density plot of “Number of spectral points in retrieval” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.

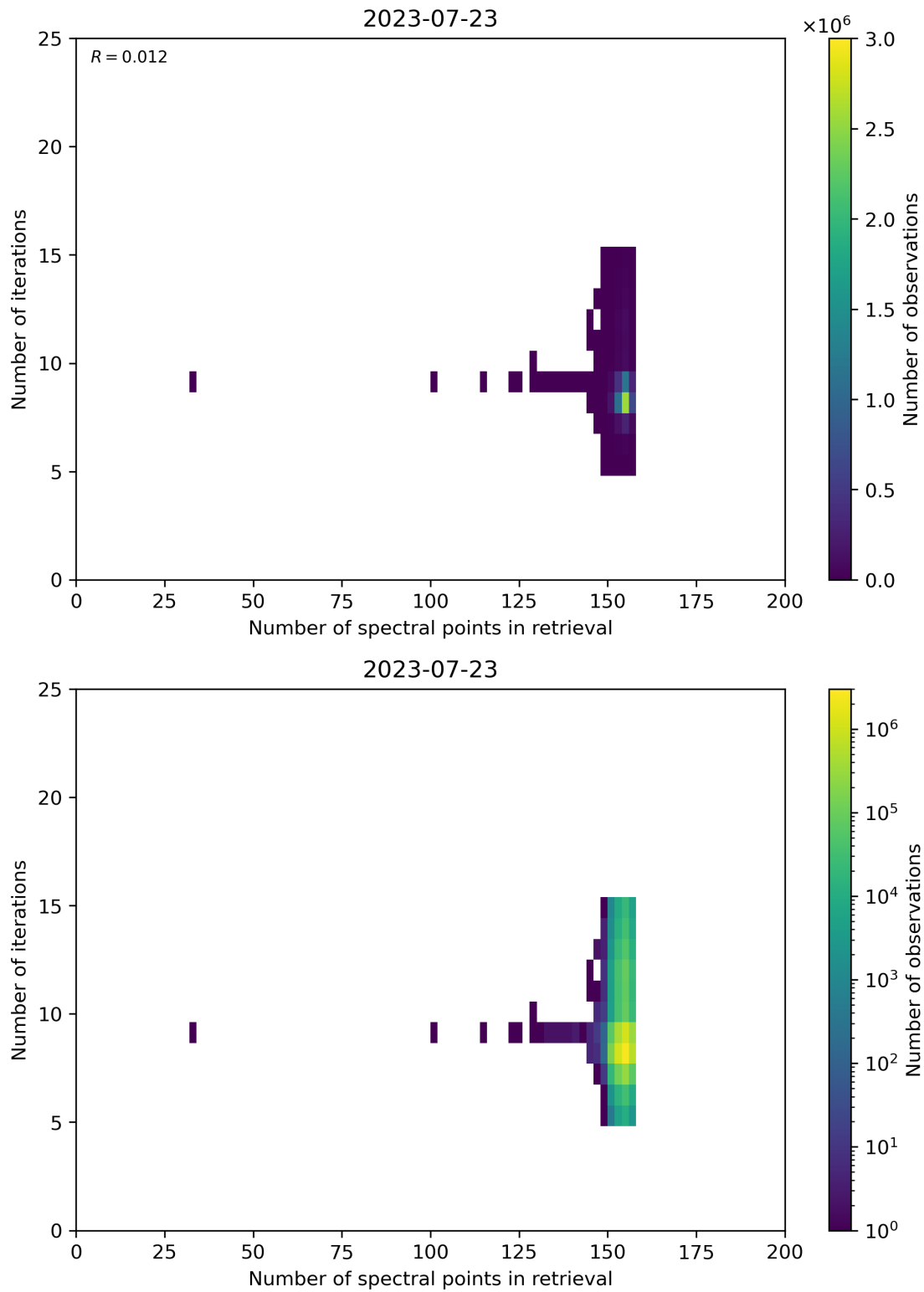


Figure 60: Scatter density plot of “Number of spectral points in retrieval” against “Number of iterations” for 2023-07-22 to 2023-07-24.

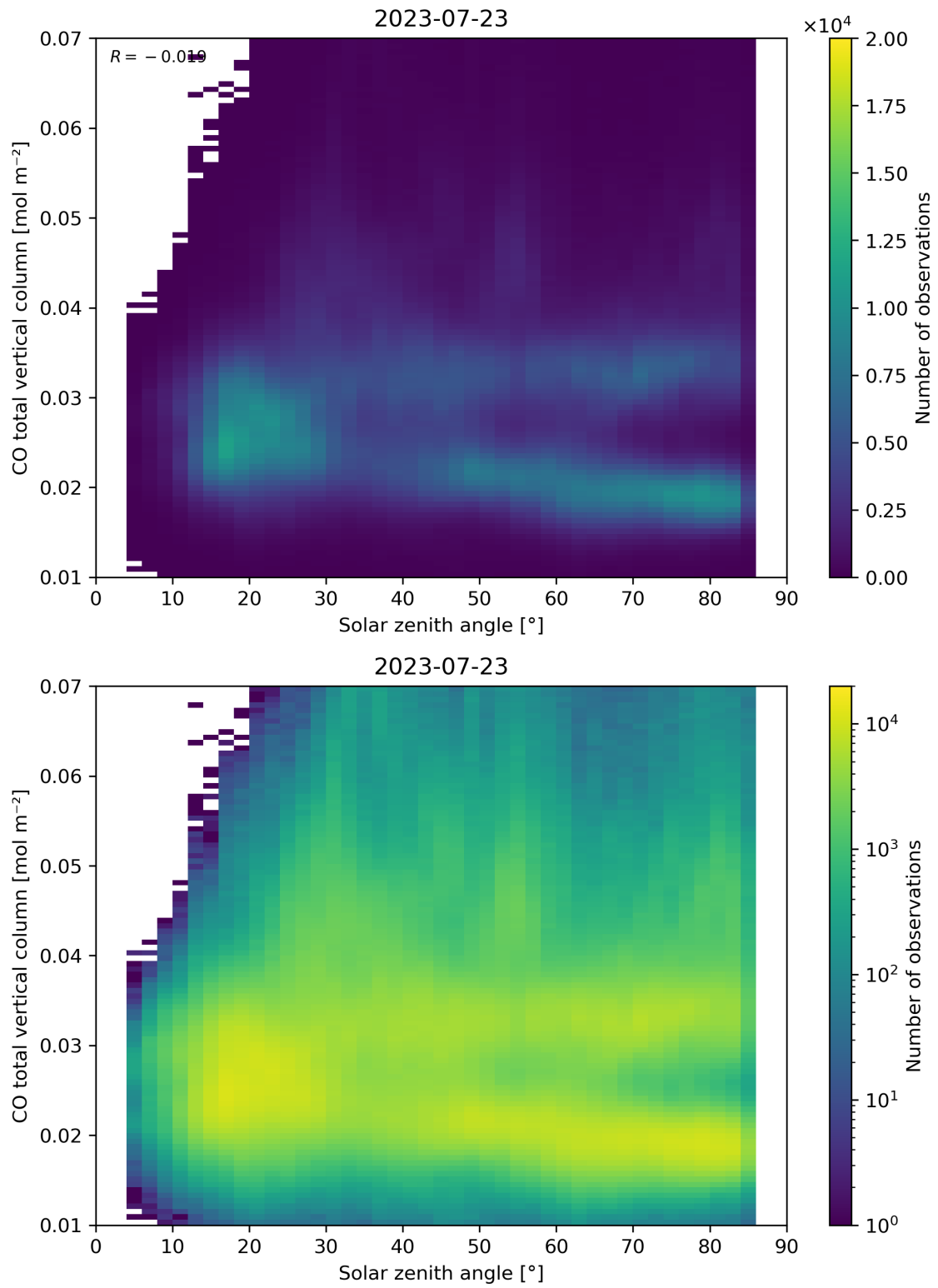


Figure 61: Scatter density plot of “Solar zenith angle” against “CO total vertical column” for 2023-07-22 to 2023-07-24.

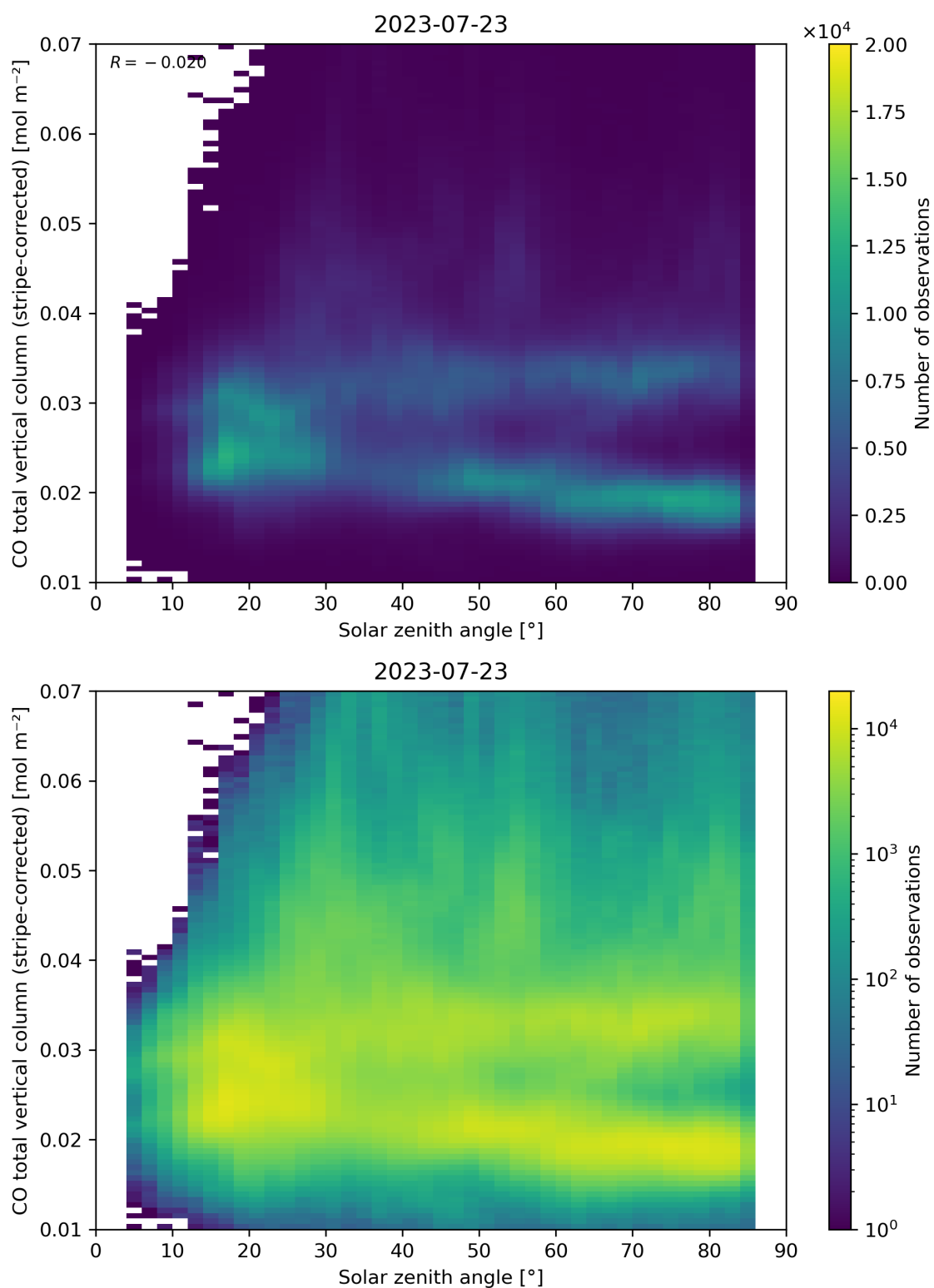


Figure 62: Scatter density plot of “Solar zenith angle” against “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24.

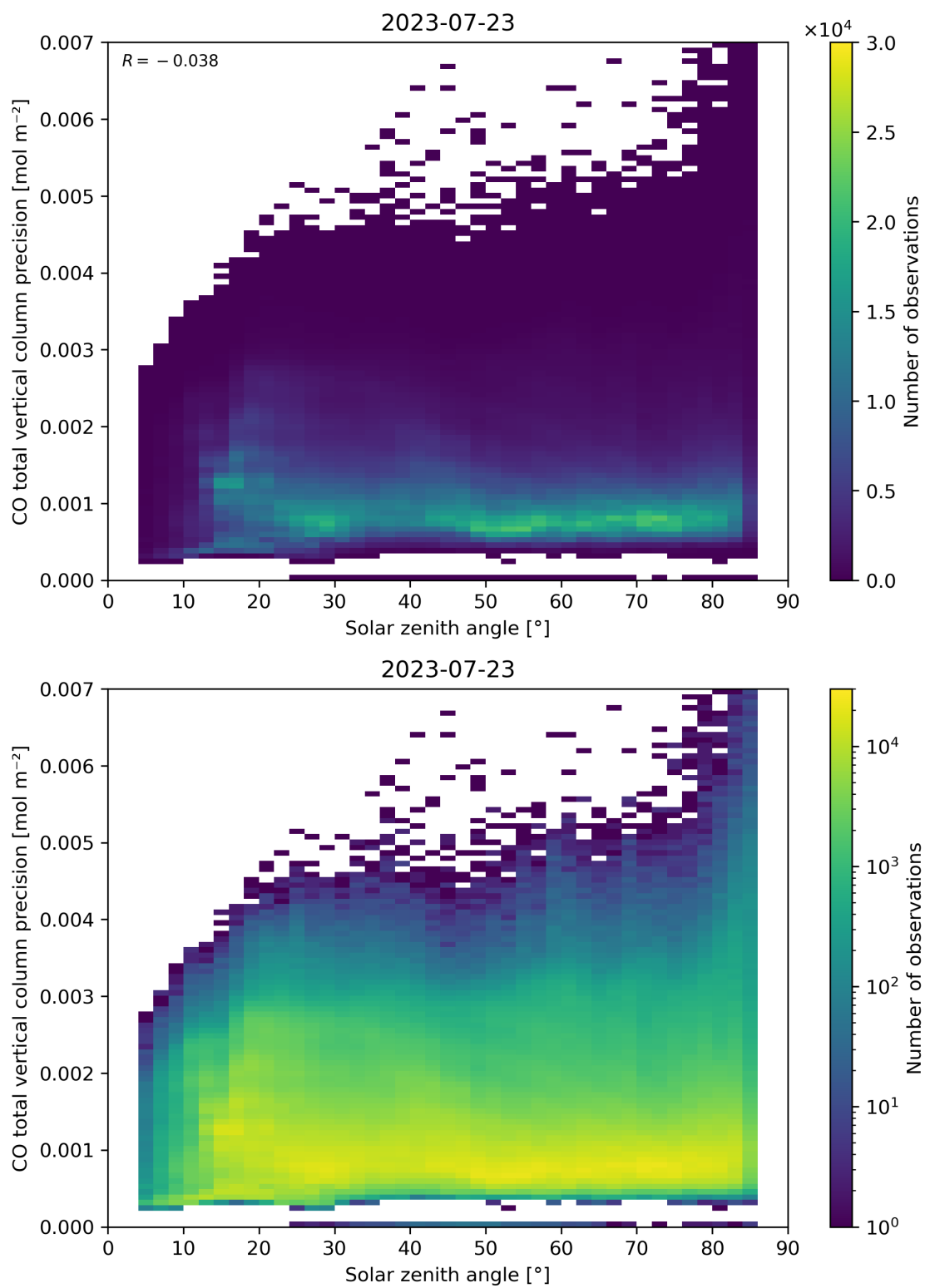


Figure 63: Scatter density plot of “Solar zenith angle” against “CO total vertical column precision” for 2023-07-22 to 2023-07-24.

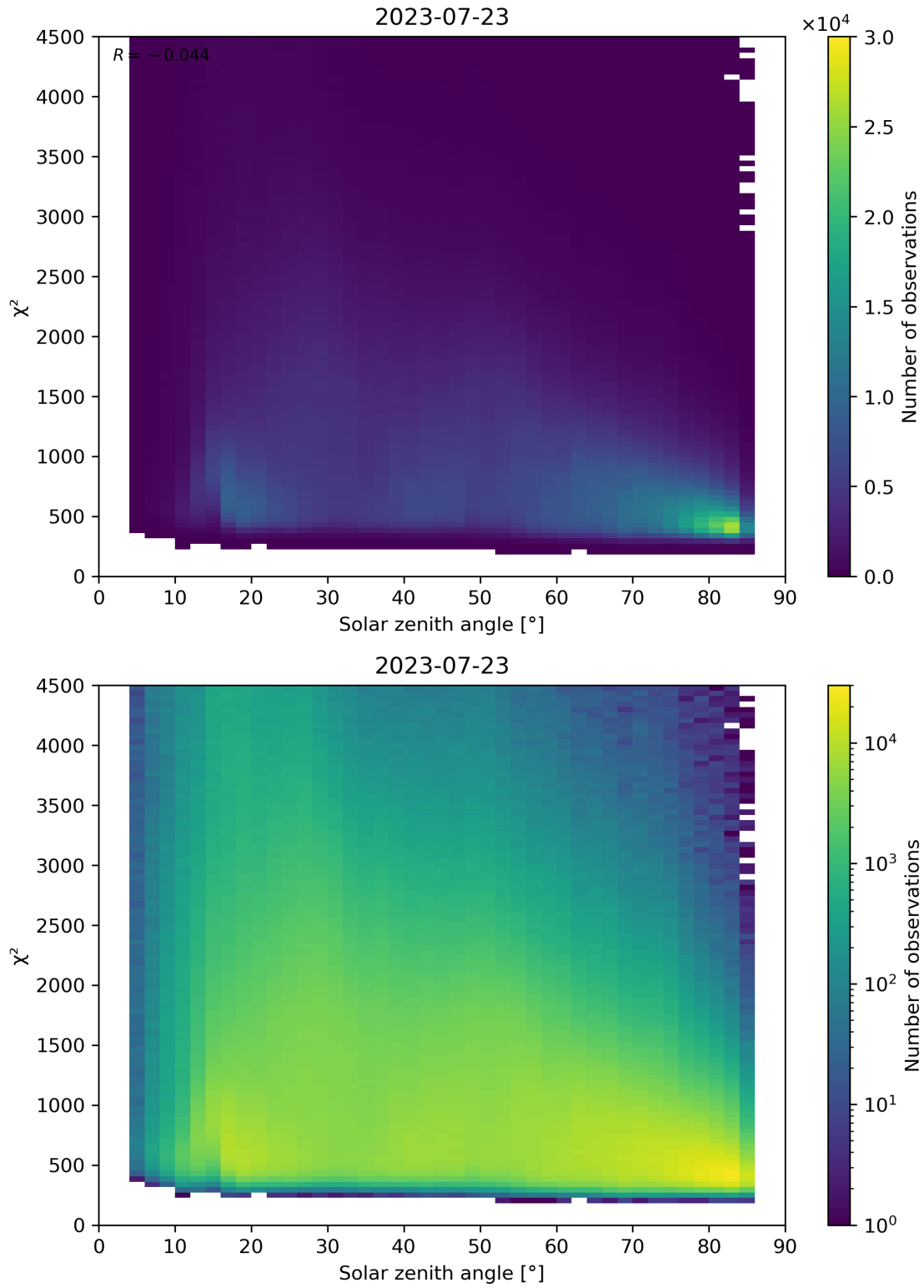


Figure 64: Scatter density plot of “Solar zenith angle” against “ χ^2 ” for 2023-07-22 to 2023-07-24.

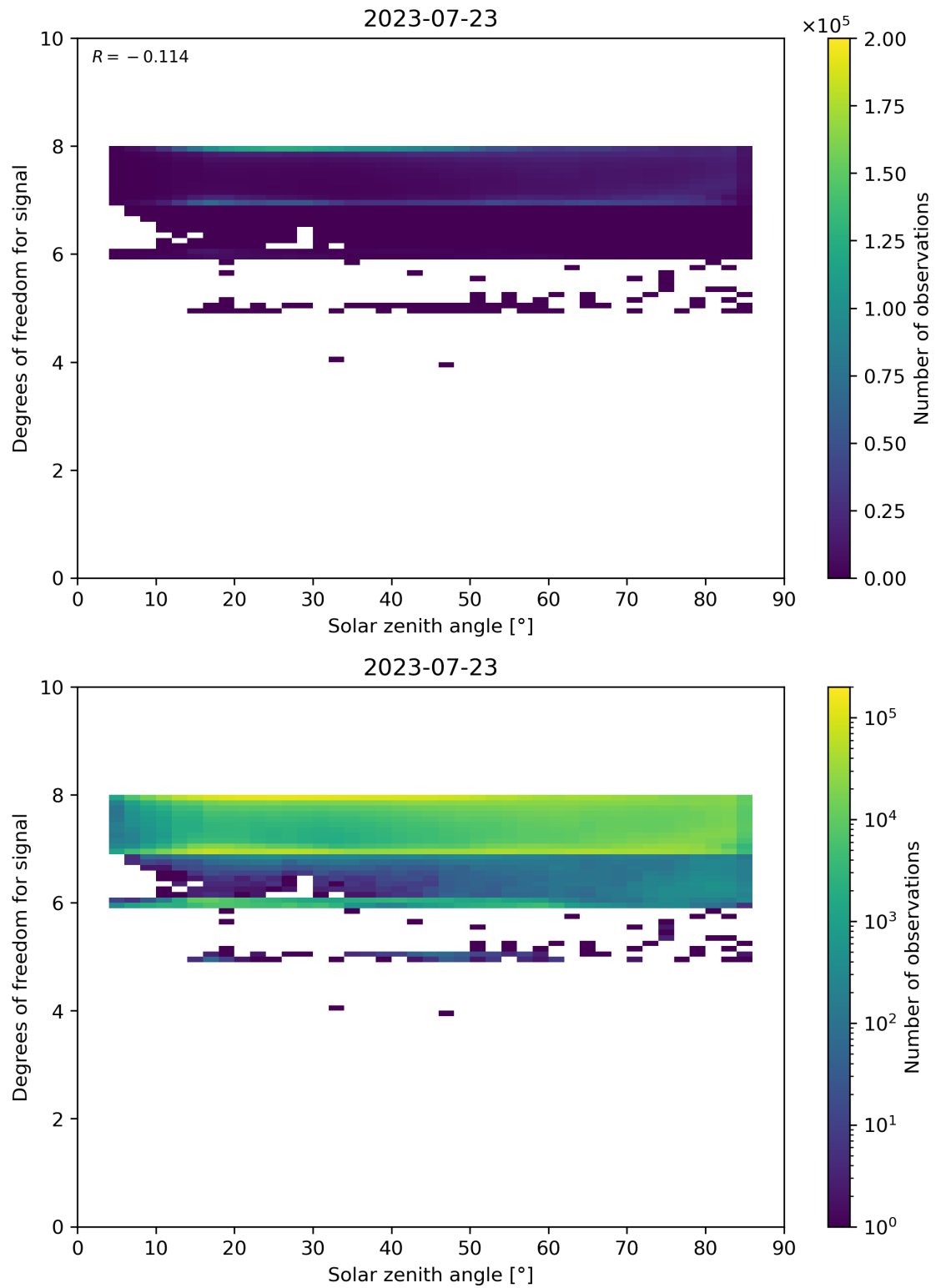


Figure 65: Scatter density plot of “Solar zenith angle” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.

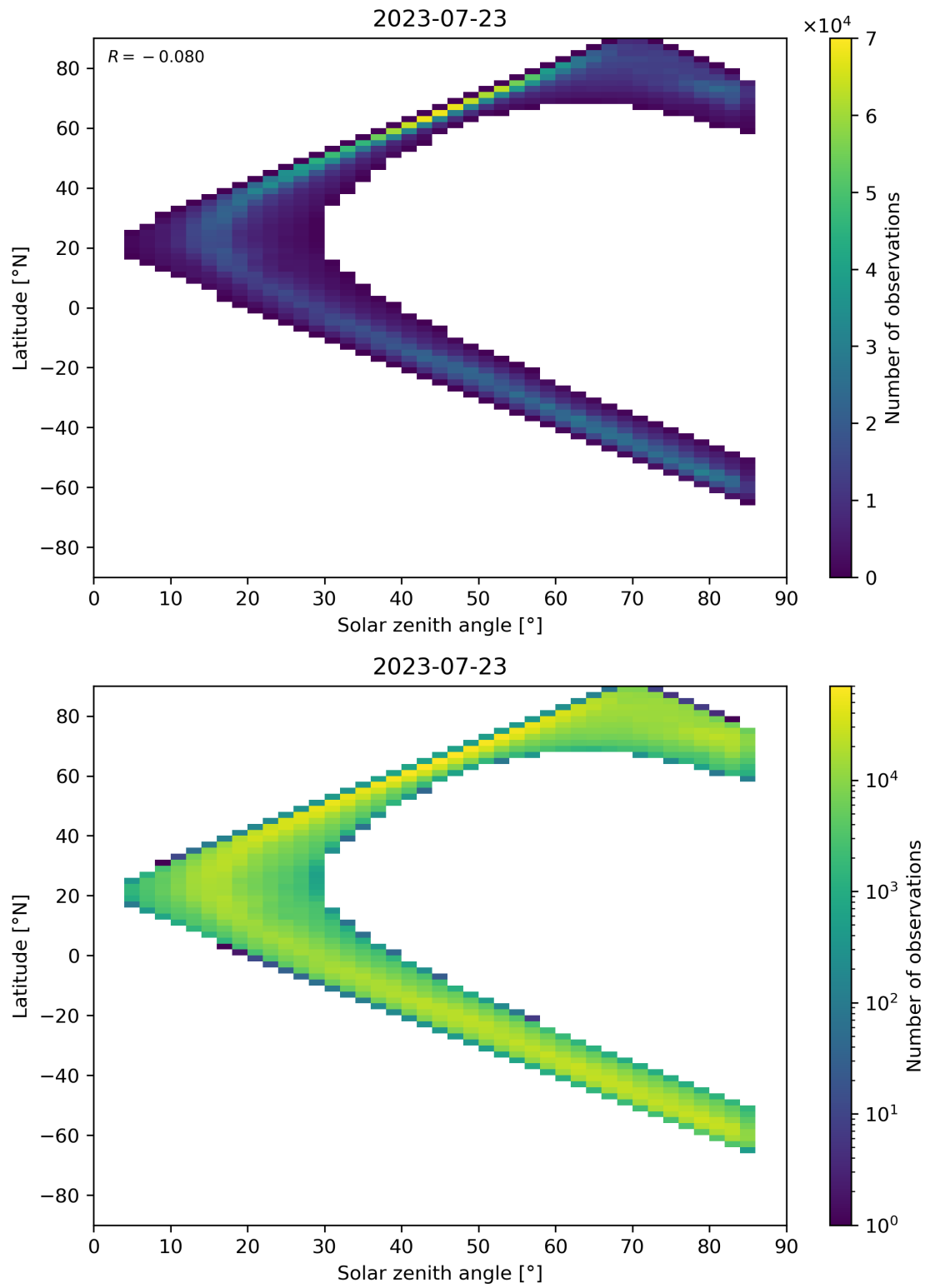


Figure 66: Scatter density plot of “Solar zenith angle” against “Latitude” for 2023-07-22 to 2023-07-24.

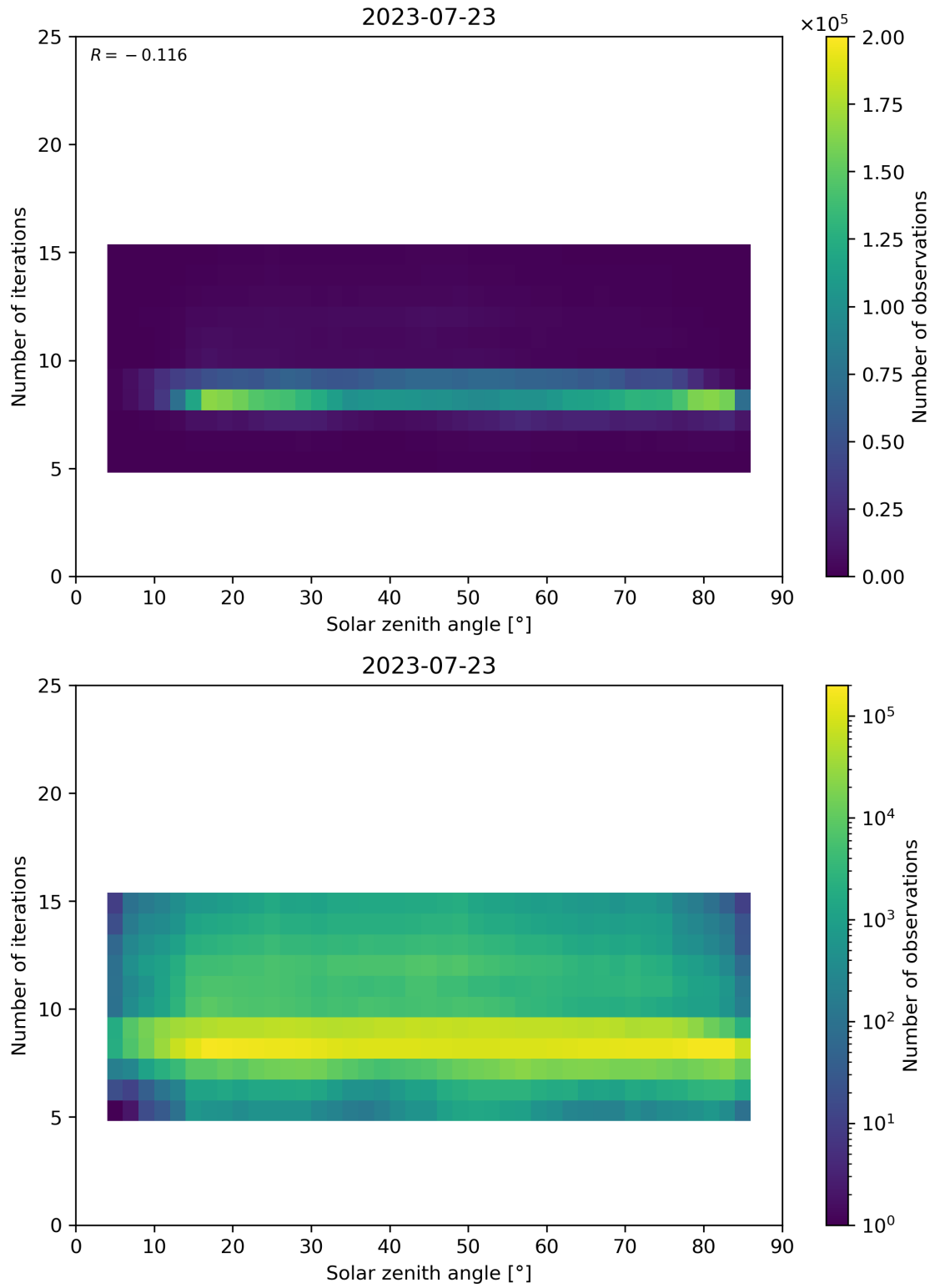


Figure 67: Scatter density plot of “Solar zenith angle” against “Number of iterations” for 2023-07-22 to 2023-07-24.

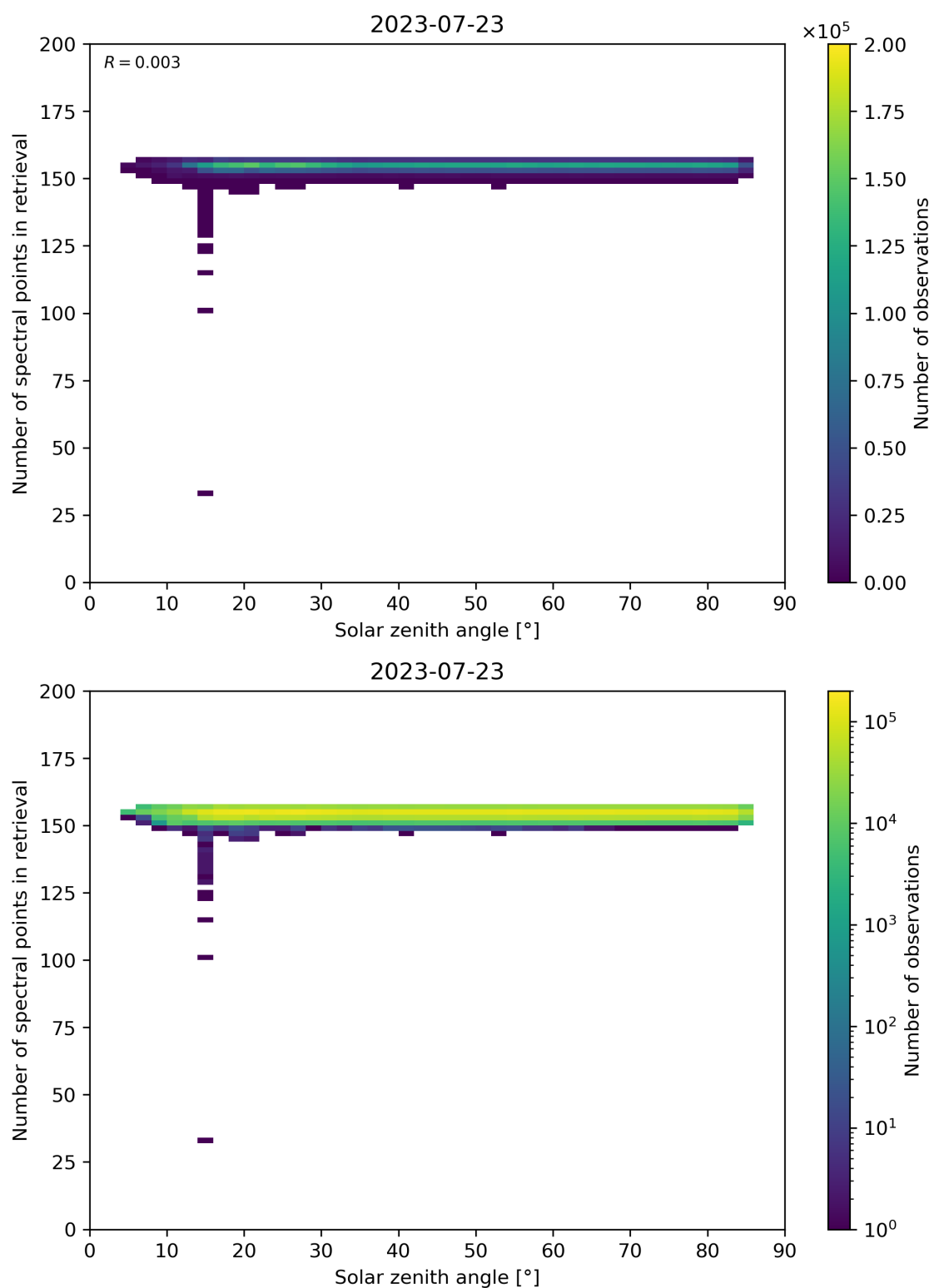


Figure 68: Scatter density plot of “Solar zenith angle” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.

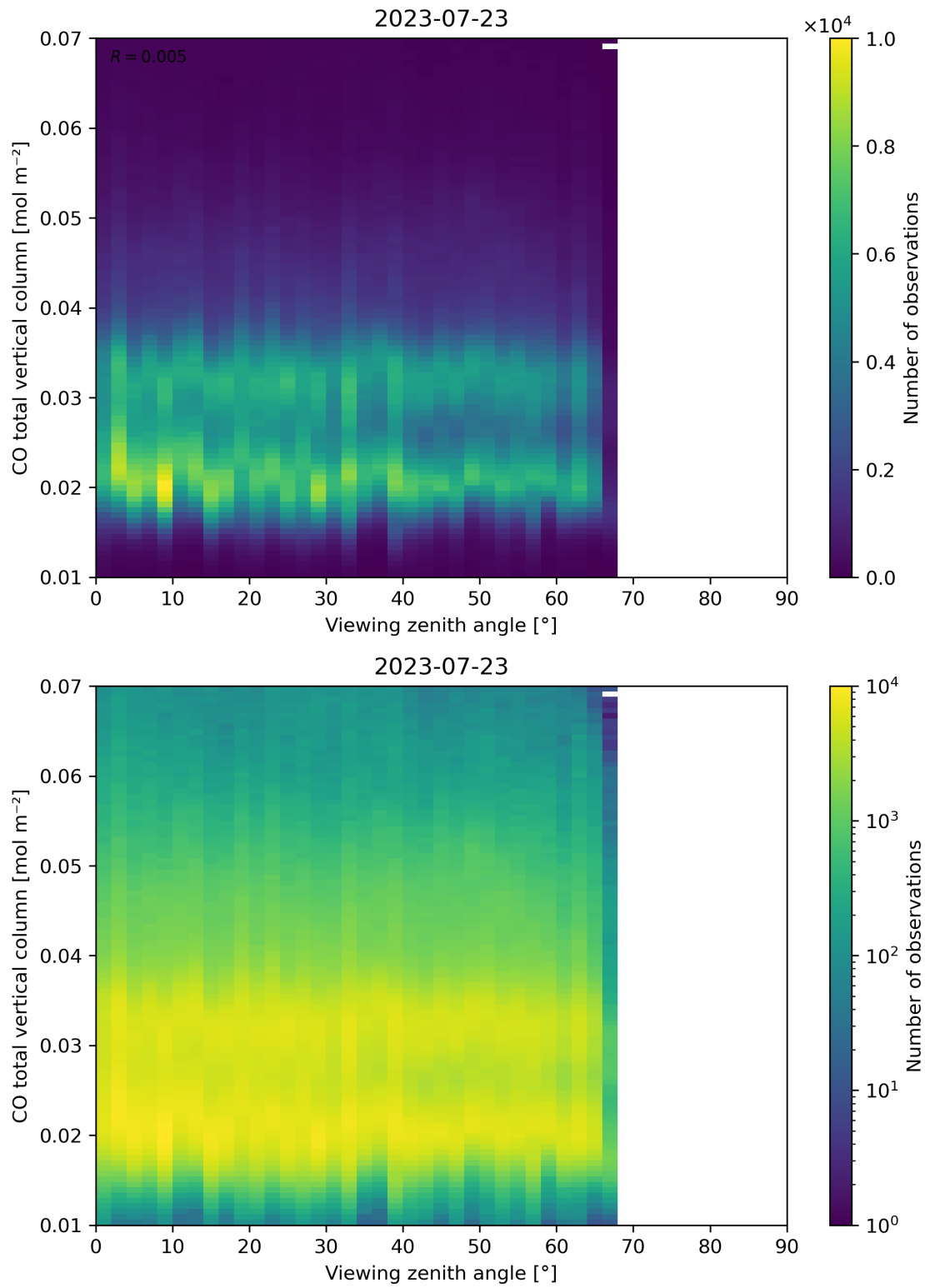


Figure 69: Scatter density plot of “Viewing zenith angle” against “CO total vertical column” for 2023-07-22 to 2023-07-24.

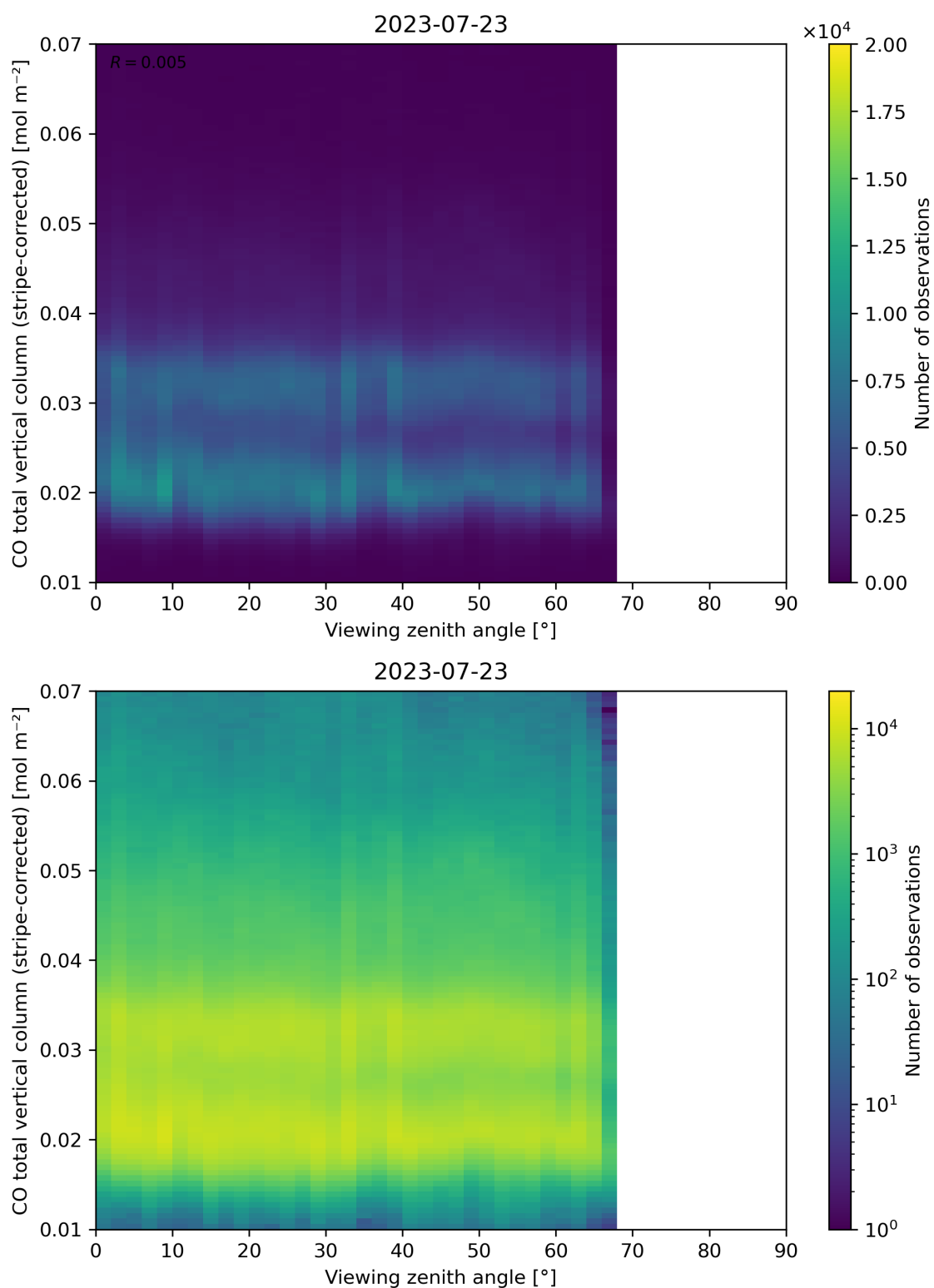


Figure 70: Scatter density plot of “Viewing zenith angle” against “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24.

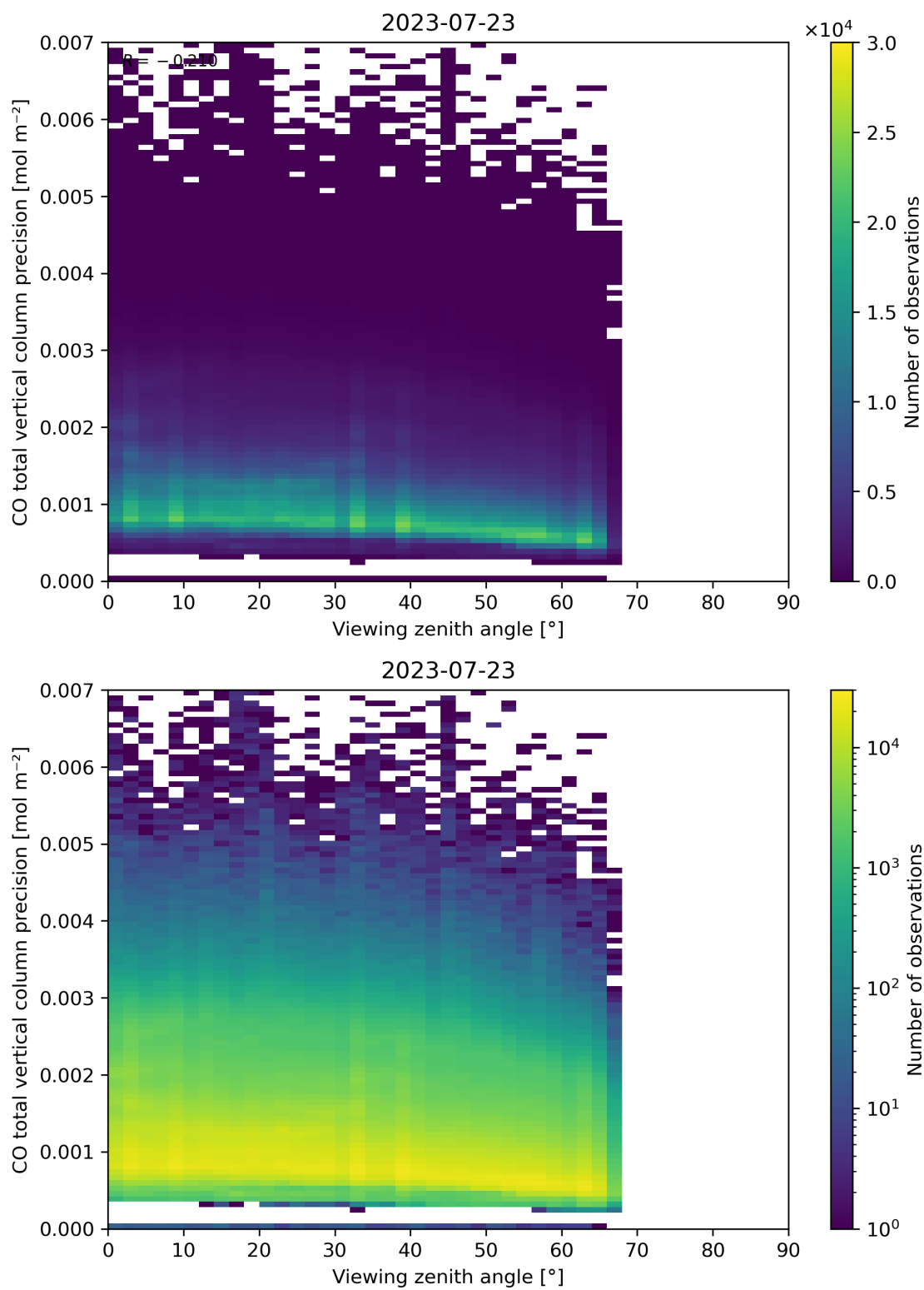


Figure 71: Scatter density plot of “Viewing zenith angle” against “CO total vertical column precision” for 2023-07-22 to 2023-07-24.

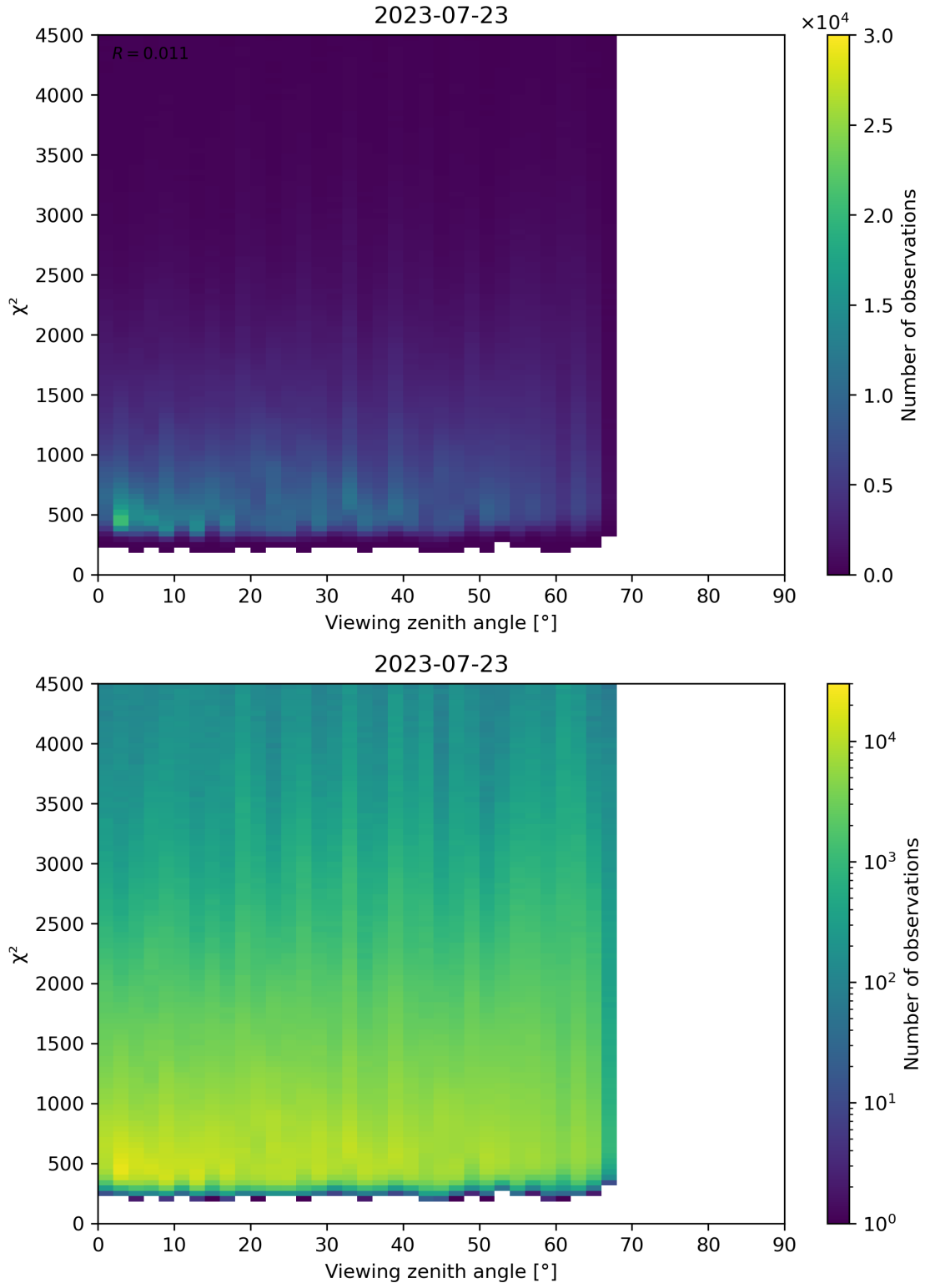


Figure 72: Scatter density plot of “Viewing zenith angle” against “ χ^2 ” for 2023-07-22 to 2023-07-24.

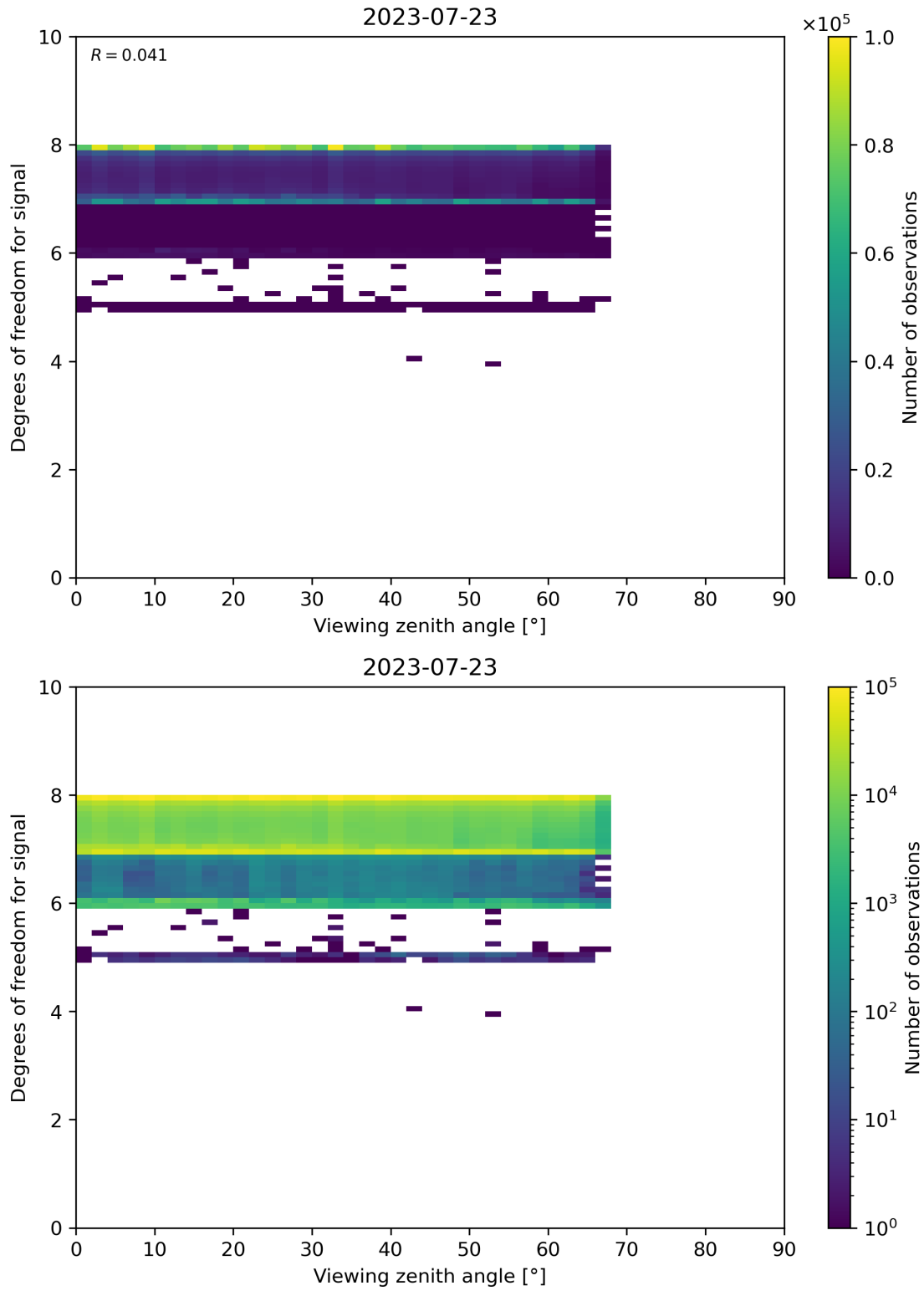


Figure 73: Scatter density plot of “Viewing zenith angle” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.

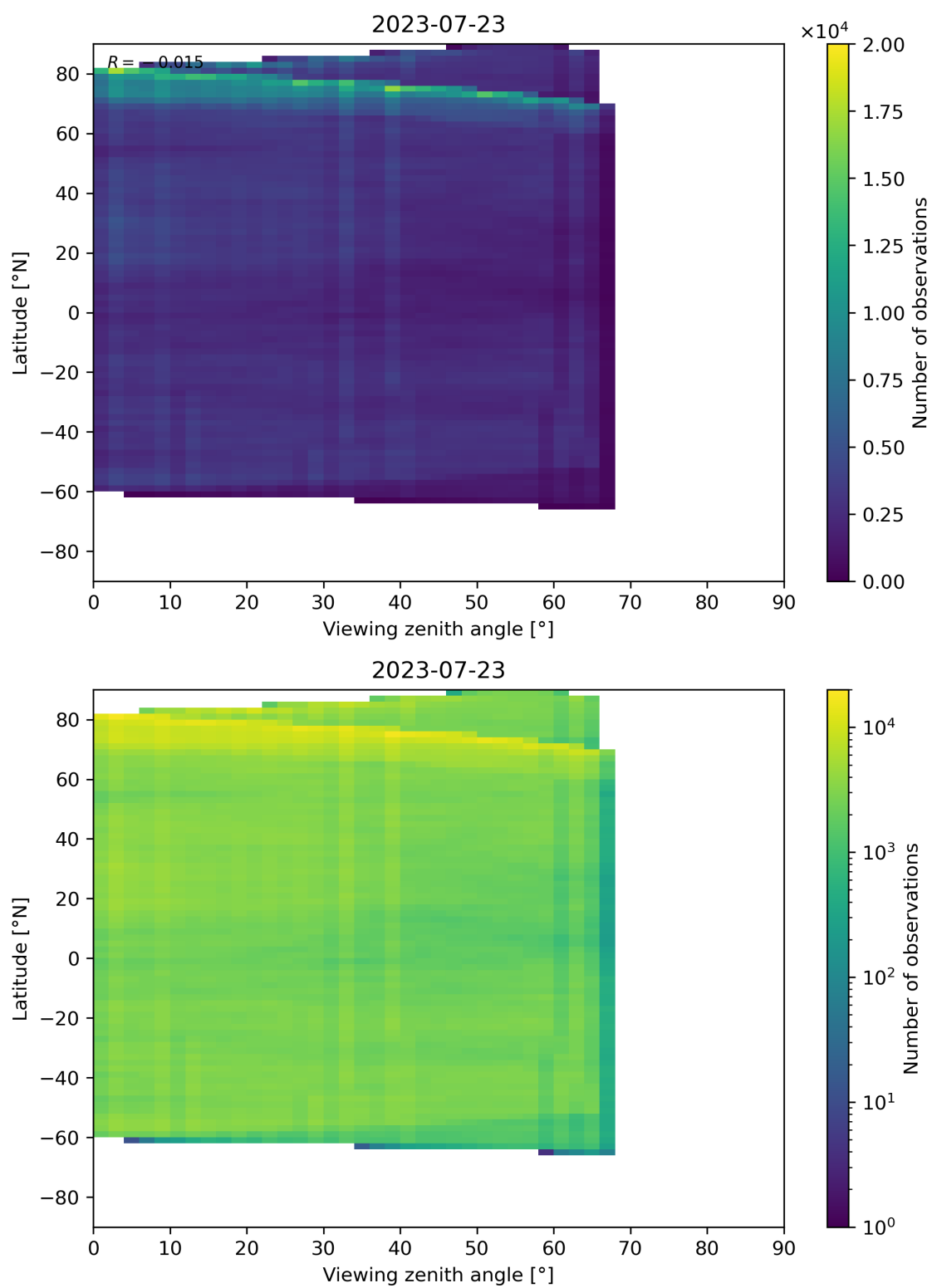


Figure 74: Scatter density plot of “Viewing zenith angle” against “Latitude” for 2023-07-22 to 2023-07-24.

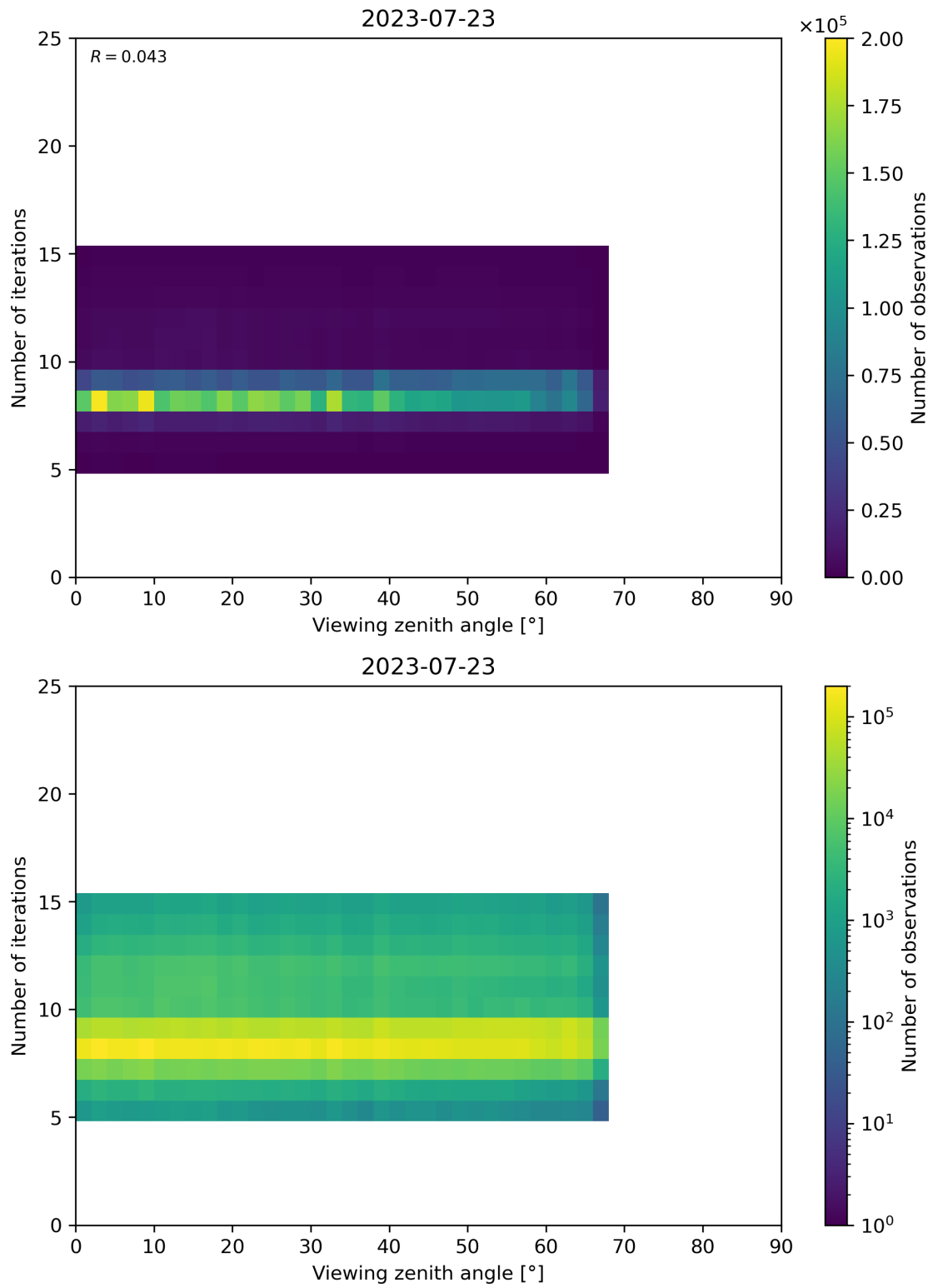


Figure 75: Scatter density plot of “Viewing zenith angle” against “Number of iterations” for 2023-07-22 to 2023-07-24.

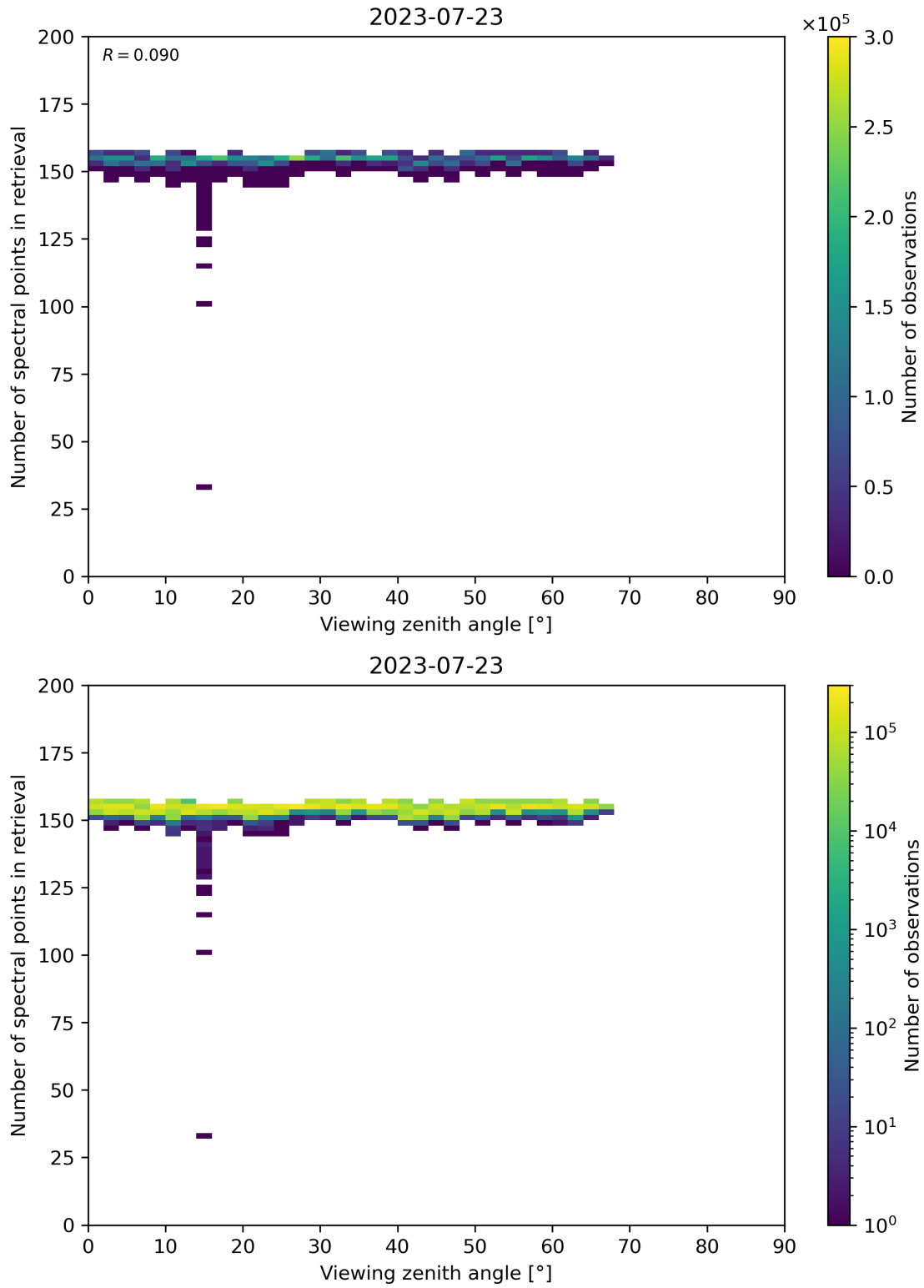


Figure 76: Scatter density plot of “Viewing zenith angle” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.

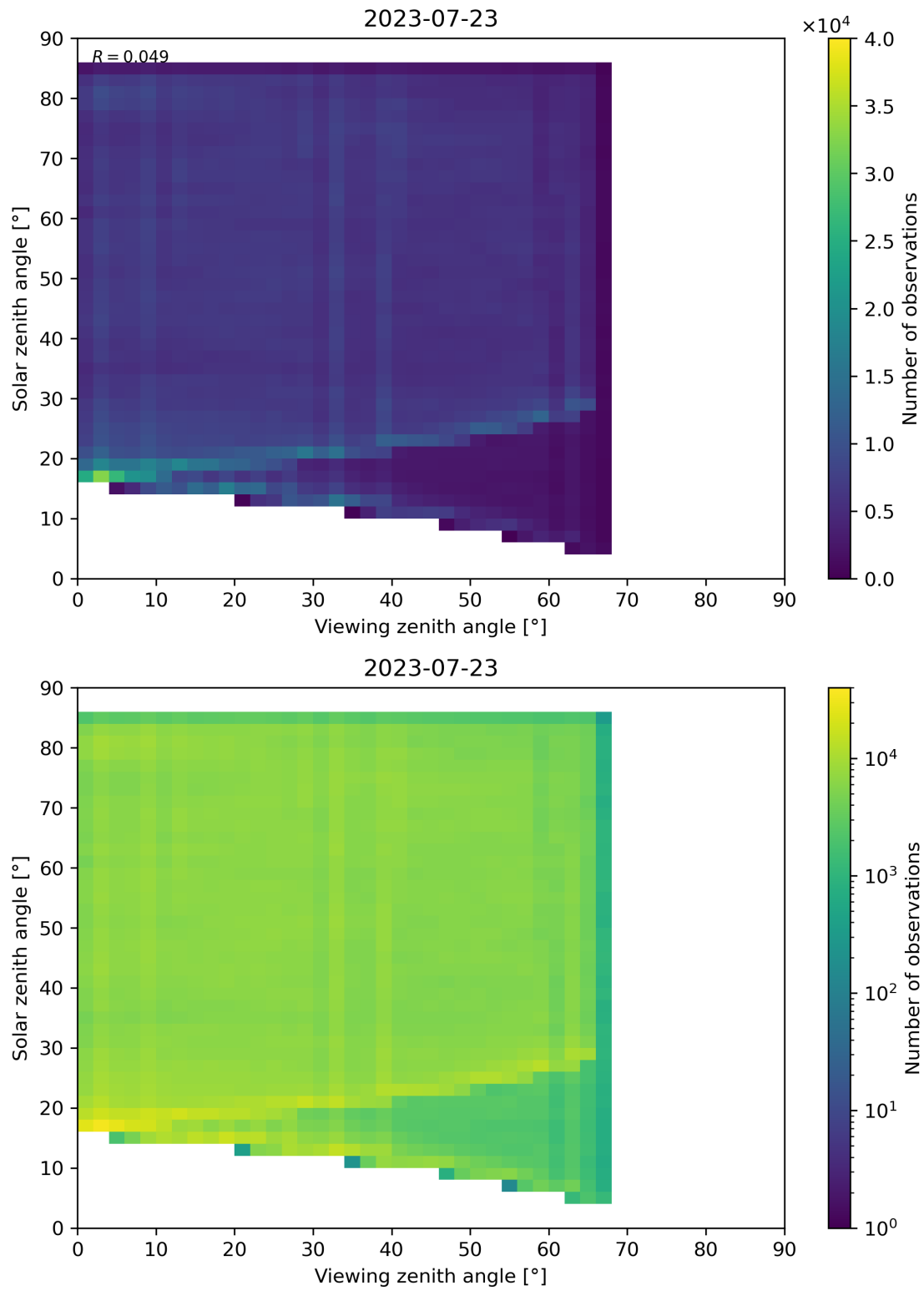


Figure 77: Scatter density plot of “Viewing zenith angle” against “Solar zenith angle” for 2023-07-22 to 2023-07-24.

Contents

1	Short Introduction	1
1.1	The list of parameters	1
2	Definitions	1
3	Granule outlines	12
4	Input data monitoring	13
5	Warnings and errors	14
6	World maps	15
7	Zonal average	18
8	Histograms	26
9	Along track statistics	34
10	Coincidence density	42
11	Copyright information of ‘PyCAMA’	87

List of Figures

1	Map of correlation graph for 2023-07-22 to 2023-07-24.	10
2	Map of correlation matrix for 2023-07-22 to 2023-07-24.	11
3	Outline of the granules.	12
4	Input data per granule	13
5	Fraction of pixels with specific warnings and errors during processing	14
6	Map of “CO total vertical column” for 2023-07-22 to 2023-07-24	15
7	Map of “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24	16
8	Map of the number of observations for 2023-07-22 to 2023-07-24	17
9	Zonal average of “QA value” for 2023-07-22 to 2023-07-24.	18
10	Zonal average of “CO total vertical column” for 2023-07-22 to 2023-07-24.	19
11	Zonal average of “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24.	20
12	Zonal average of “CO total vertical column precision” for 2023-07-22 to 2023-07-24.	21
13	Zonal average of “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.	22
14	Zonal average of “ χ^2 ” for 2023-07-22 to 2023-07-24.	23
15	Zonal average of “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.	24
16	Zonal average of “Number of iterations” for 2023-07-22 to 2023-07-24.	25
17	Histogram of “QA value” for 2023-07-22 to 2023-07-24	26
18	Histogram of “CO total vertical column” for 2023-07-22 to 2023-07-24	27
19	Histogram of “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24	28
20	Histogram of “CO total vertical column precision” for 2023-07-22 to 2023-07-24	29
21	Histogram of “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24	30
22	Histogram of “ χ^2 ” for 2023-07-22 to 2023-07-24	31
23	Histogram of “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24	32
24	Histogram of “Number of iterations” for 2023-07-22 to 2023-07-24	33
25	Along track statistics of “QA value” for 2023-07-22 to 2023-07-24	34
26	Along track statistics of “CO total vertical column” for 2023-07-22 to 2023-07-24	35
27	Along track statistics of “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24	36
28	Along track statistics of “CO total vertical column precision” for 2023-07-22 to 2023-07-24	37
29	Along track statistics of “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24	38
30	Along track statistics of “ χ^2 ” for 2023-07-22 to 2023-07-24	39
31	Along track statistics of “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24	40
32	Along track statistics of “Number of iterations” for 2023-07-22 to 2023-07-24	41
33	Scatter density plot of “CO total vertical column” against “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24.	42
34	Scatter density plot of “CO total vertical column” against “CO total vertical column precision” for 2023-07-22 to 2023-07-24.	43

35	Scatter density plot of “CO total vertical column” against “ χ^2 ” for 2023-07-22 to 2023-07-24.	44
36	Scatter density plot of “CO total vertical column (stripe-corrected)” against “CO total vertical column precision” for 2023-07-22 to 2023-07-24.	45
37	Scatter density plot of “CO total vertical column (stripe-corrected)” against “ χ^2 ” for 2023-07-22 to 2023-07-24.	46
38	Scatter density plot of “CO total vertical column (stripe-corrected)” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.	47
39	Scatter density plot of “CO total vertical column (stripe-corrected)” against “Number of iterations” for 2023-07-22 to 2023-07-24.	48
40	Scatter density plot of “CO total vertical column (stripe-corrected)” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.	49
41	Scatter density plot of “CO total vertical column” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.	50
42	Scatter density plot of “CO total vertical column” against “Number of iterations” for 2023-07-22 to 2023-07-24.	51
43	Scatter density plot of “CO total vertical column” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.	52
44	Scatter density plot of “CO total vertical column precision” against “ χ^2 ” for 2023-07-22 to 2023-07-24.	53
45	Scatter density plot of “CO total vertical column precision” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.	54
46	Scatter density plot of “CO total vertical column precision” against “Number of iterations” for 2023-07-22 to 2023-07-24.	55
47	Scatter density plot of “CO total vertical column precision” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.	56
48	Scatter density plot of “ χ^2 ” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.	57
49	Scatter density plot of “ χ^2 ” against “Number of iterations” for 2023-07-22 to 2023-07-24.	58
50	Scatter density plot of “Degrees of freedom for signal” against “Number of iterations” for 2023-07-22 to 2023-07-24.	59
51	Scatter density plot of “Latitude” against “CO total vertical column” for 2023-07-22 to 2023-07-24.	60
52	Scatter density plot of “Latitude” against “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24.	61
53	Scatter density plot of “Latitude” against “CO total vertical column precision” for 2023-07-22 to 2023-07-24.	62
54	Scatter density plot of “Latitude” against “ χ^2 ” for 2023-07-22 to 2023-07-24.	63
55	Scatter density plot of “Latitude” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.	64
56	Scatter density plot of “Latitude” against “Number of iterations” for 2023-07-22 to 2023-07-24.	65
57	Scatter density plot of “Latitude” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.	66
58	Scatter density plot of “Number of spectral points in retrieval” against “ χ^2 ” for 2023-07-22 to 2023-07-24.	67
59	Scatter density plot of “Number of spectral points in retrieval” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.	68
60	Scatter density plot of “Number of spectral points in retrieval” against “Number of iterations” for 2023-07-22 to 2023-07-24.	69
61	Scatter density plot of “Solar zenith angle” against “CO total vertical column” for 2023-07-22 to 2023-07-24.	70
62	Scatter density plot of “Solar zenith angle” against “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24.	71
63	Scatter density plot of “Solar zenith angle” against “CO total vertical column precision” for 2023-07-22 to 2023-07-24.	72
64	Scatter density plot of “Solar zenith angle” against “ χ^2 ” for 2023-07-22 to 2023-07-24.	73
65	Scatter density plot of “Solar zenith angle” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.	74
66	Scatter density plot of “Solar zenith angle” against “Latitude” for 2023-07-22 to 2023-07-24.	75
67	Scatter density plot of “Solar zenith angle” against “Number of iterations” for 2023-07-22 to 2023-07-24.	76
68	Scatter density plot of “Solar zenith angle” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.	77
69	Scatter density plot of “Viewing zenith angle” against “CO total vertical column” for 2023-07-22 to 2023-07-24.	78
70	Scatter density plot of “Viewing zenith angle” against “CO total vertical column (stripe-corrected)” for 2023-07-22 to 2023-07-24.	79
71	Scatter density plot of “Viewing zenith angle” against “CO total vertical column precision” for 2023-07-22 to 2023-07-24.	80
72	Scatter density plot of “Viewing zenith angle” against “ χ^2 ” for 2023-07-22 to 2023-07-24.	81
73	Scatter density plot of “Viewing zenith angle” against “Degrees of freedom for signal” for 2023-07-22 to 2023-07-24.	82
74	Scatter density plot of “Viewing zenith angle” against “Latitude” for 2023-07-22 to 2023-07-24.	83

75	Scatter density plot of “Viewing zenith angle” against “Number of iterations” for 2023-07-22 to 2023-07-24.	84
76	Scatter density plot of “Viewing zenith angle” against “Number of spectral points in retrieval” for 2023-07-22 to 2023-07-24.	85
77	Scatter density plot of “Viewing zenith angle” against “Solar zenith angle” for 2023-07-22 to 2023-07-24. .	86

List of Tables

1	Parameterlist and basic statistics for the analysis	2
2	Percentile ranges	3
3	Parameterlist and basic statistics for the analysis for observations in the northern hemisphere	4
4	Parameterlist and basic statistics for the analysis for observations in the southern hemisphere	5
5	Parameterlist and basic statistics for the analysis for observations over water	6
6	Parameterlist and basic statistics for the analysis for observations over land	7
7	Correlation matrix	8
8	Covariance matrix	9

11 Copyright information of ‘PyCAMA’

Copyright © 2005 – 2023, Maarten Sneeep (KNMI).

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Neither the name of the copyright holder nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

This software is provided by the copyright holders and contributors “as is” and any express or implied warranties, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose are disclaimed. In no event shall the copyright holder or contributors be liable for any direct, indirect, incidental, special, exemplary, or consequential damages (including, but not limited to, procurement of substitute goods or services; loss of use, data, or profits; or business interruption) however caused and on any theory of liability, whether in contract, strict liability, or tort (including negligence or otherwise) arising in any way out of the use of this software, even if advised of the possibility of such damage.

Maarten Sneeep (maarten.sneeep@knmi.nl).