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]	0.713 ± 0.300	612829	0.995	0.600	1.000	0.400	1.000
methane mixing ratio [parts per 10^9]	$(0.188 \pm 0.005) \times 10^4$	612829	1.913×10^3	58.5	1.885×10^3	1.290×10^3	2.266×10^3
methane mixing ratio precision [parts per 10^9]	2.34 ± 1.90	612829	1.10	1.43	1.79	0.705	62.5
methane mixing ratio bias corrected [parts per 10^9]	$(0.188 \pm 0.004) \times 10^4$	612829	1.893×10^3	42.9	1.886×10^3	1.301×10^3	2.330×10^3
number of spectral points in retrieval [1]	798 ± 3	612829	798	4.00	798	705	805
wavelength calibration offset SWIR [nm]	$(-1.051 \pm 0.354) \times 10^{-2}$	612829	-1.100×10^{-2}	2.293×10^{-3}	-1.032×10^{-2}	-7.688×10^{-2}	5.186×10^{-2}
chi square SWIR [1]	$(0.241 \pm 0.411) \times 10^5$	612829	2.550×10^3	2.760×10^4	1.238×10^4	1.598×10^3	2.254×10^7
chi square NIR [1]	$(0.103 \pm 50.557) \times 10^7$	612829	5.050×10^3	1.100×10^4	8.601×10^3	54.8	3.864×10^{11}
degrees of freedom [1]	18.3 ± 0.4	612829	18.1	0.640	18.3	17.0	21.0
number of iterations [1]	10.1 ± 1.0	612829	10.2	0.0	10.00	10.00	30.0
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(-1.178 \pm 18.606) \times 10^{-8}$	612829	-7.300×10^{-9}	3.559×10^{-8}	-1.039×10^{-8}	-7.039×10^{-5}	2.287×10^{-6}

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.400	0.400	0.400	0.400	0.400	1.000	1.000	1.000	1.000	1.000
methane mixing ratio [parts per 10^9]	1.754×10^3	1.796×10^3	1.817×10^3	1.836×10^3	1.855×10^3	1.913×10^3	1.923×10^3	1.930×10^3	1.939×10^3	1.959×10^3
methane mixing ratio precision [parts per 10^9]	0.973	1.05	1.10	1.16	1.29	2.71	3.31	3.91	5.09	10.4
methane mixing ratio bias corrected [parts per 10^9]	1.777×10^3	1.812×10^3	1.832×10^3	1.848×10^3	1.863×10^3	1.905×10^3	1.915×10^3	1.923×10^3	1.935×10^3	1.967×10^3
number of spectral points in retrieval [1]	791	793	794	795	796	800	801	802	803	804
wavelength calibration offset SWIR [nm]	-1.966×10^{-2}	-1.457×10^{-2}	-1.329×10^{-2}	-1.249×10^{-2}	-1.163×10^{-2}	-9.340×10^{-3}	-8.801×10^{-3}	-8.163×10^{-3}	-6.941×10^{-3}	-1.354×10^{-3}
chi square SWIR [1]	2.187×10^3	2.733×10^3	3.382×10^3	4.372×10^3	6.070×10^3	3.367×10^4	5.087×10^4	6.064×10^4	7.248×10^4	1.312×10^5
chi square NIR [1]	1.063×10^3	1.857×10^3	2.588×10^3	3.437×10^3	4.649×10^3	1.565×10^4	1.875×10^4	2.131×10^4	2.545×10^4	3.342×10^4
degrees of freedom [1]	17.3	17.6	17.8	17.9	18.0	18.7	18.9	19.0	19.1	19.2
number of iterations [1]	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	12.0
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	-1.216×10^{-7}	-7.539×10^{-8}	-5.554×10^{-8}	-4.289×10^{-8}	-2.952×10^{-8}	6.072×10^{-9}	1.830×10^{-8}	3.148×10^{-8}	5.209×10^{-8}	1.009×10^{-7}

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]	0.693 ± 0.300	481310	0.600	0.400	0.400	1.000	0.400	1.000
methane mixing ratio [parts per 10^9]	$(0.189 \pm 0.004) \times 10^4$	481310	52.8	1.898×10^3	1.360×10^3	2.266×10^3	1.866×10^3	1.919×10^3
methane mixing ratio precision [parts per 10^9]	2.32 ± 1.98	481310	1.58	1.67	0.705	51.5	1.20	2.78
methane mixing ratio bias corrected [parts per 10^9]	$(0.189 \pm 0.004) \times 10^4$	481310	37.5	1.893×10^3	1.396×10^3	2.330×10^3	1.873×10^3	1.910×10^3
number of spectral points in retrieval [1]	798 ± 3	481310	4.00	798	705	805	796	800
wavelength calibration offset SWIR [nm]	$(-1.050 \pm 0.340) \times 10^{-2}$	481310	2.147×10^{-3}	-1.030×10^{-2}	-7.688×10^{-2}	5.186×10^{-2}	-1.154×10^{-2}	-9.393×10^{-3}
chi square SWIR [1]	$(0.276 \pm 0.456) \times 10^5$	481310	3.855×10^4	1.502×10^4	1.598×10^3	2.254×10^7	5.588×10^3	4.414×10^4
chi square NIR [1]	$(0.130 \pm 57.048) \times 10^7$	481310	1.140×10^4	1.094×10^4	135	3.864×10^{11}	6.030×10^3	1.743×10^4
degrees of freedom [1]	18.4 ± 0.5	481310	0.738	18.4	17.0	21.0	18.0	18.8
number of iterations [1]	10.1 ± 0.9	481310	0.0	10.00	10.00	30.0	10.00	10.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(-1.404 \pm 20.957) \times 10^{-8}$	481310	4.421×10^{-8}	-1.313×10^{-8}	-7.039×10^{-5}	2.287×10^{-6}	-3.644×10^{-8}	7.763×10^{-9}

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]	0.787 ± 0.287	131519	0.600	1.000	0.400	1.000	0.400	1.000
methane mixing ratio [parts per 10^9]	$(0.185 \pm 0.003) \times 10^4$	131519	35.6	1.857×10^3	1.290×10^3	2.204×10^3	1.835×10^3	1.871×10^3
methane mixing ratio precision [parts per 10^9]	2.39 ± 1.59	131519	0.899	1.99	1.12	62.5	1.63	2.53
methane mixing ratio bias corrected [parts per 10^9]	$(0.186 \pm 0.003) \times 10^4$	131519	34.2	1.862×10^3	1.301×10^3	2.258×10^3	1.843×10^3	1.877×10^3
number of spectral points in retrieval [1]	798 ± 3	131519	4.00	798	783	805	796	800
wavelength calibration offset SWIR [nm]	$(-1.055 \pm 0.401) \times 10^{-2}$	131519	2.921×10^{-3}	-1.041×10^{-2}	-7.163×10^{-2}	4.968×10^{-2}	-1.199×10^{-2}	-9.069×10^{-3}
chi square SWIR [1]	$(0.114 \pm 0.078) \times 10^5$	131519	7.436×10^3	9.680×10^3	1.630×10^3	1.002×10^6	7.077×10^3	1.451×10^4
chi square NIR [1]	$(0.201 \pm 16.188) \times 10^5$	131519	2.613×10^3	4.730×10^3	54.8	2.283×10^8	3.324×10^3	5.937×10^3
degrees of freedom [1]	18.1 ± 0.2	131519	0.232	18.1	17.0	19.2	18.0	18.3
number of iterations [1]	10.1 ± 1.4	131519	0.0	10.00	10.00	30.0	10.00	10.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(-3.528 \pm 22.329) \times 10^{-9}$	131519	1.639×10^{-8}	-6.801×10^{-9}	-2.792×10^{-7}	1.255×10^{-6}	-1.393×10^{-8}	2.463×10^{-9}

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]	0.703 ± 0.300	48078	0.600	1.000	0.400	1.000	0.400	1.000
methane mixing ratio [parts per 10^9]	$(0.190 \pm 0.002) \times 10^4$	48078	23.7	1.907×10^3	1.627×10^3	2.010×10^3	1.894×10^3	1.918×10^3
methane mixing ratio precision [parts per 10^9]	3.04 ± 1.18	48078	1.15	2.88	0.859	32.2	2.37	3.52
methane mixing ratio bias corrected [parts per 10^9]	$(0.191 \pm 0.002) \times 10^4$	48078	23.8	1.914×10^3	1.633×10^3	2.018×10^3	1.902×10^3	1.925×10^3
number of spectral points in retrieval [1]	798 ± 3	48078	4.00	798	787	803	796	800
wavelength calibration offset SWIR [nm]	$(-9.712 \pm 1.061) \times 10^{-3}$	48078	1.026×10^{-3}	-9.715×10^{-3}	-2.992×10^{-2}	6.601×10^{-3}	-1.024×10^{-2}	-9.209×10^{-3}
chi square SWIR [1]	$(0.716 \pm 10.568) \times 10^4$	48078	3.220×10^3	5.561×10^3	1.741×10^3	2.254×10^7	4.279×10^3	7.499×10^3
chi square NIR [1]	$(0.267 \pm 0.215) \times 10^4$	48078	1.405×10^3	2.150×10^3	229	2.269×10^5	1.682×10^3	3.087×10^3
degrees of freedom [1]	18.0 ± 0.2	48078	0.177	18.1	17.0	18.8	18.0	18.1
number of iterations [1]	10.0 ± 0.4	48078	0.0	10.00	10.00	30.0	10.00	10.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(-8.448 \pm 16.403) \times 10^{-9}$	48078	1.482×10^{-8}	-8.653×10^{-9}	-1.224×10^{-6}	2.827×10^{-7}	-1.674×10^{-8}	-1.914×10^{-9}

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]	0.723 ± 0.299	445360	0.600	1.000	0.400	1.000	0.400	1.000
methane mixing ratio [parts per 10^9]	$(0.188 \pm 0.004) \times 10^4$	445360	58.7	1.888×10^3	1.354×10^3	2.204×10^3	1.857×10^3	1.916×10^3
methane mixing ratio precision [parts per 10^9]	1.88 ± 1.14	445360	0.993	1.52	0.814	28.1	1.19	2.18
methane mixing ratio bias corrected [parts per 10^9]	$(0.188 \pm 0.004) \times 10^4$	445360	40.9	1.884×10^3	1.377×10^3	2.258×10^3	1.861×10^3	1.902×10^3
number of spectral points in retrieval [1]	798 ± 3	445360	4.00	798	705	805	796	800
wavelength calibration offset SWIR [nm]	$(-1.061 \pm 0.212) \times 10^{-2}$	445360	2.203×10^{-3}	-1.041×10^{-2}	-4.059×10^{-2}	2.335×10^{-2}	-1.166×10^{-2}	-9.459×10^{-3}
chi square SWIR [1]	$(0.301 \pm 0.311) \times 10^5$	445360	3.816×10^4	1.883×10^4	1.630×10^3	1.794×10^6	8.535×10^3	4.669×10^4
chi square NIR [1]	$(0.140 \pm 59.305) \times 10^7$	445360	1.069×10^4	9.918×10^3	192	3.864×10^{11}	5.583×10^3	1.628×10^4
degrees of freedom [1]	18.4 ± 0.5	445360	0.691	18.4	17.0	21.0	18.1	18.8
number of iterations [1]	10.1 ± 1.1	445360	0.0	10.00	10.00	30.0	10.00	10.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(-1.151 \pm 17.226) \times 10^{-8}$	445360	4.066×10^{-8}	-9.915×10^{-9}	-7.039×10^{-5}	1.347×10^{-6}	-3.182×10^{-8}	8.836×10^{-9}

Table 7: Correlation matrix

Viewing zenith angle	Solar zenith angle	Latitude	Mole fraction of CH_4	Precision of mole fraction of CH_4	Bias corrected mole fraction of CH_4	Number of points in the spectrum	Spectral offset SWIR (λ(true) − λ(nominal))	χ^2 (SWIR)	χ^2 (NIR)	Degrees of freedom	Number of iterations	Fluorescence
1.000	4.251×10^{-2}	-6.860×10^{-2}	-3.061×10^{-2}	-6.222×10^{-2}	-5.379×10^{-2}	3.540×10^{-2}	−0.295	3.339×10^{-2}	9.509×10^{-4}	0.132	4.186×10^{-2}	6.252×10^{-2}
4.251×10^{-2}	1.000	-8.394×10^{-2}	−0.688	0.291	−0.612	-2.660×10^{-2}	-2.149×10^{-2}	−0.309	-1.210×10^{-3}	−0.610	-1.366×10^{-2}	-2.895×10^{-2}
-6.860×10^{-2}	-8.394×10^{-2}	1.000	-4.114×10^{-2}	0.203	3.164×10^{-2}	3.343×10^{-2}	-9.989×10^{-3}	-4.250×10^{-2}	-4.624×10^{-4}	−0.172	-1.930×10^{-2}	-3.418×10^{-2}
-3.061×10^{-2}	−0.688	-4.114×10^{-2}	1.000	−0.489	0.937	-1.377×10^{-2}	1.951×10^{-3}	0.310	1.060×10^{-3}	0.586	-1.833×10^{-2}	-1.774×10^{-2}
-6.222×10^{-2}	0.291	0.203	−0.489	1.000	−0.285	-8.346×10^{-3}	4.037×10^{-2}	−0.272	-1.223×10^{-3}	−0.490	-7.898×10^{-3}	-8.906×10^{-3}
-5.379×10^{-2}	−0.612	3.164×10^{-2}	0.937	−0.285	1.000	-1.956×10^{-2}	1.310×10^{-2}	0.143	4.849×10^{-4}	0.335	-3.202×10^{-2}	-2.364×10^{-2}
3.540×10^{-2}	-2.660×10^{-2}	3.343×10^{-2}	-1.377×10^{-2}	-8.346×10^{-3}	-1.956×10^{-2}	1.000	-1.506×10^{-2}	8.023×10^{-3}	-1.719×10^{-3}	1.106×10^{-2}	3.279×10^{-3}	5.344×10^{-3}
−0.295	-2.149×10^{-2}	-9.989×10^{-3}	1.951×10^{-3}	4.037×10^{-2}	1.310×10^{-2}	-1.506×10^{-2}	1.000	-1.331×10^{-2}	6.256×10^{-4}	-4.709×10^{-2}	-2.355×10^{-2}	-3.562×10^{-2}
3.339×10^{-2}	−0.309	-4.250×10^{-2}	0.310	−0.272	0.143	8.023×10^{-3}	-1.331×10^{-2}	1.000	1.266×10^{-3}	0.498	2.889×10^{-2}	1.551×10^{-2}
9.509×10^{-4}	-1.210×10^{-3}	-4.624×10^{-4}	1.060×10^{-3}	-1.223×10^{-3}	4.849×10^{-4}	-1.719×10^{-3}	6.256×10^{-4}	1.266×10^{-3}	1.000	3.155×10^{-3}	4.870×10^{-3}	2.478×10^{-3}
0.132	−0.610	−0.172	0.586	−0.490	0.335	1.106×10^{-2}	-4.709×10^{-2}	0.498	3.155×10^{-3}	1.000	-2.006×10^{-2}	2.384×10^{-2}
4.186×10^{-2}	-1.366×10^{-2}	-1.930×10^{-2}	-1.833×10^{-2}	-7.898×10^{-3}	-3.202×10^{-2}	3.279×10^{-3}	-2.355×10^{-2}	2.889×10^{-2}	4.870×10^{-3}	-2.006×10^{-2}	1.000	-3.530×10^{-2}
6.252×10^{-2}	-2.895×10^{-2}	-3.418×10^{-2}	-1.774×10^{-2}	-8.906×10^{-3}	-2.364×10^{-2}	5.344×10^{-3}	-3.562×10^{-2}	1.551×10^{-2}	2.478×10^{-3}	2.384×10^{-2}	-3.530×10^{-2}	1.000

Table 8: Covariance matrix

Viewing zenith angle	Solar zenith angle	Latitude	Mole fraction of CH_4	Precision of mole fraction of CH_4	Bias corrected mole fraction of CH_4	Number of points in the spectrum	Spectral offset SWIR (λ(true) $-$ λ(nominal))	χ^2 (SWIR)	χ^2 (NIR)	Degrees of freedom	Number of iterations	Fluorescence
273	11.0	−34.7	−23.1	−1.95	−34.2	1.66	-1.722×10^{-2}	2.264×10^{4}	7.938×10^{6}	0.975	0.715	1.921×10^{-7}
11.0	246	−40.3	−494	8.68	−370	−1.18	-1.192×10^{-3}	-1.987×10^{5}	-9.591×10^{6}	−4.28	−0.222	-8.445×10^{-8}
−34.7	−40.3	938	−57.6	11.8	37.4	2.90	-1.082×10^{-3}	-5.345×10^{4}	-7.160×10^{6}	−2.36	−0.612	-1.948×10^{-7}
−23.1	−494	−57.6	2.090×10^{3}	−42.5	1.651×10^{3}	−1.78	3.155×10^{-4}	5.824×10^{5}	2.449×10^{7}	12.0	−0.867	-1.509×10^{-7}
−1.95	8.68	11.8	−42.5	3.62	−20.9	-4.499×10^{-2}	2.716×10^{-4}	-2.125×10^{4}	-1.176×10^{6}	−0.417	-1.555×10^{-2}	-3.152×10^{-9}
−34.2	−370	37.4	1.651×10^{3}	−20.9	1.486×10^{3}	−2.14	1.786×10^{-3}	2.272×10^{5}	9.451×10^{6}	5.78	−1.28	-1.696×10^{-7}
1.66	−1.18	2.90	−1.78	-4.499×10^{-2}	−2.14	8.03	-1.510×10^{-4}	934	-2.462×10^{6}	1.402×10^{-2}	9.616×10^{-3}	2.817×10^{-9}
-1.722×10^{-2}	-1.192×10^{-3}	-1.082×10^{-3}	3.155×10^{-4}	2.716×10^{-4}	1.786×10^{-3}	-1.510×10^{-4}	1.251×10^{-5}	−1.93	1.119×10^{3}	-7.454×10^{-5}	-8.622×10^{-5}	-2.344×10^{-11}
2.264×10^{4}	-1.987×10^{5}	-5.345×10^{4}	5.824×10^{5}	-2.125×10^{4}	2.272×10^{5}	934	−1.93	1.687×10^{9}	2.628×10^{10}	9.148×10^{3}	1.228×10^{3}	1.185×10^{-4}
7.938×10^{6}	-9.591×10^{6}	-7.160×10^{6}	2.449×10^{7}	-1.176×10^{6}	9.451×10^{6}	-2.462×10^{6}	1.119×10^{3}	2.628×10^{10}	2.556×10^{17}	7.139×10^{5}	2.549×10^{6}	0.233
0.975	−4.28	−2.36	12.0	−0.417	5.78	1.402×10^{-2}	-7.454×10^{-5}	9.148×10^{3}	7.139×10^{5}	0.200	-9.295×10^{-3}	1.985×10^{-9}
0.715	−0.222	−0.612	−0.867	-1.555×10^{-2}	−1.28	9.616×10^{-3}	-8.622×10^{-5}	1.228×10^{3}	2.549×10^{6}	-9.295×10^{-3}	1.07	-6.797×10^{-9}
1.921×10^{-7}	-8.445×10^{-8}	-1.948×10^{-7}	-1.509×10^{-7}	-3.152×10^{-9}	-1.696×10^{-7}	2.817×10^{-9}	-2.344×10^{-11}	1.185×10^{-4}	0.233	1.985×10^{-9}	-6.797×10^{-9}	3.462×10^{-14}

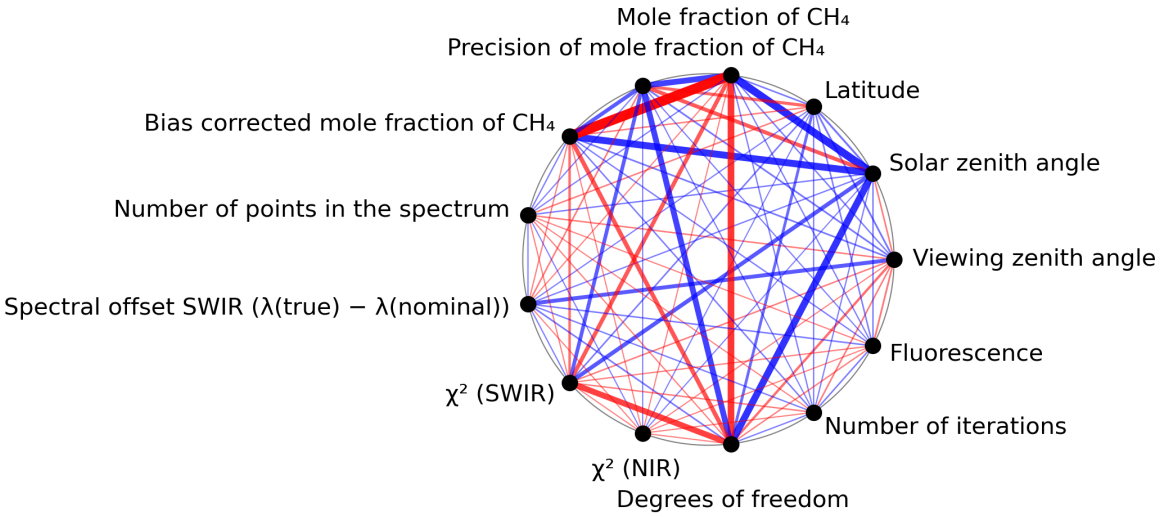


Figure 1: Map of correlation graph for 2024-05-13 to 2024-05-15.

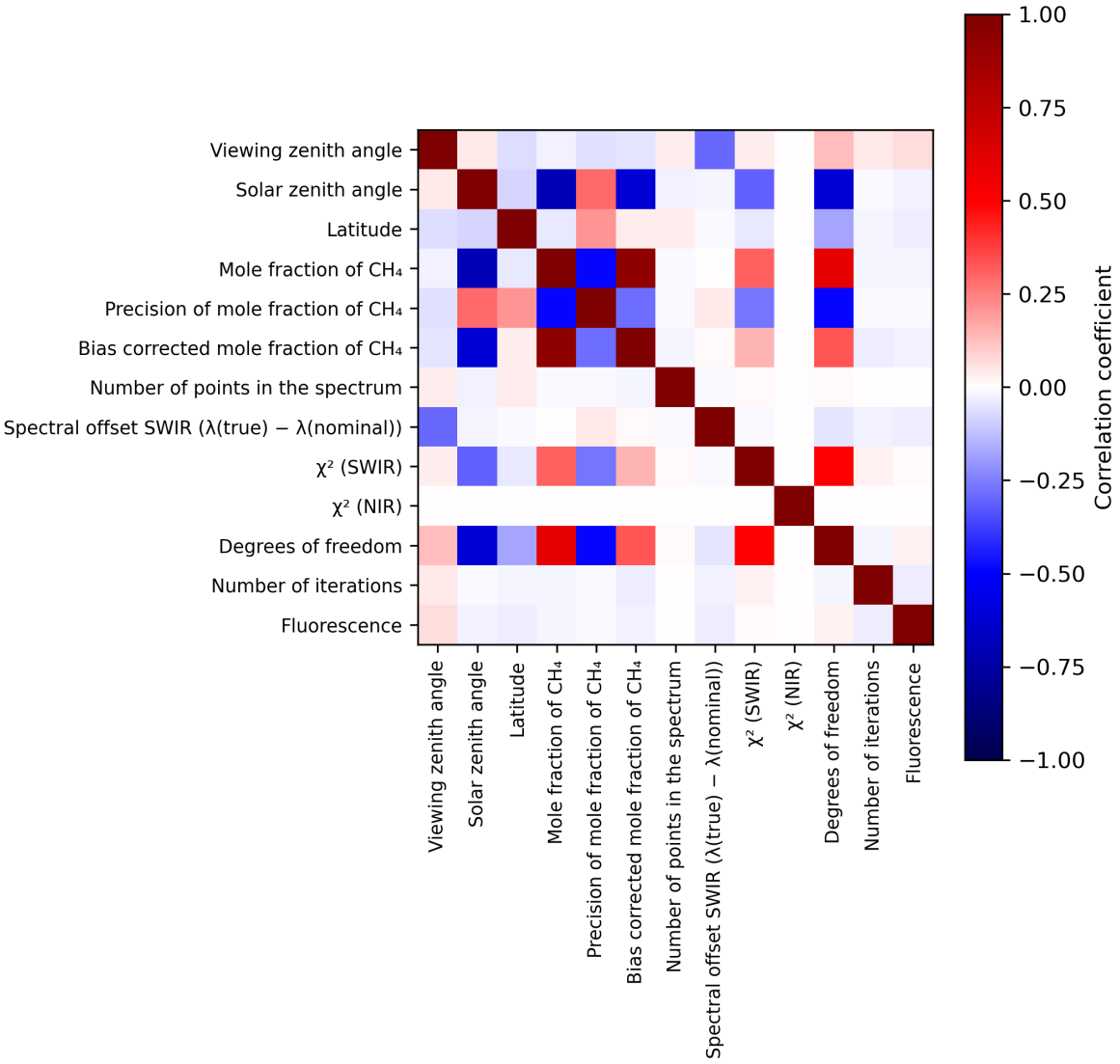


Figure 2: Map of correlation matrix for 2024-05-13 to 2024-05-15.

3 Granule outlines

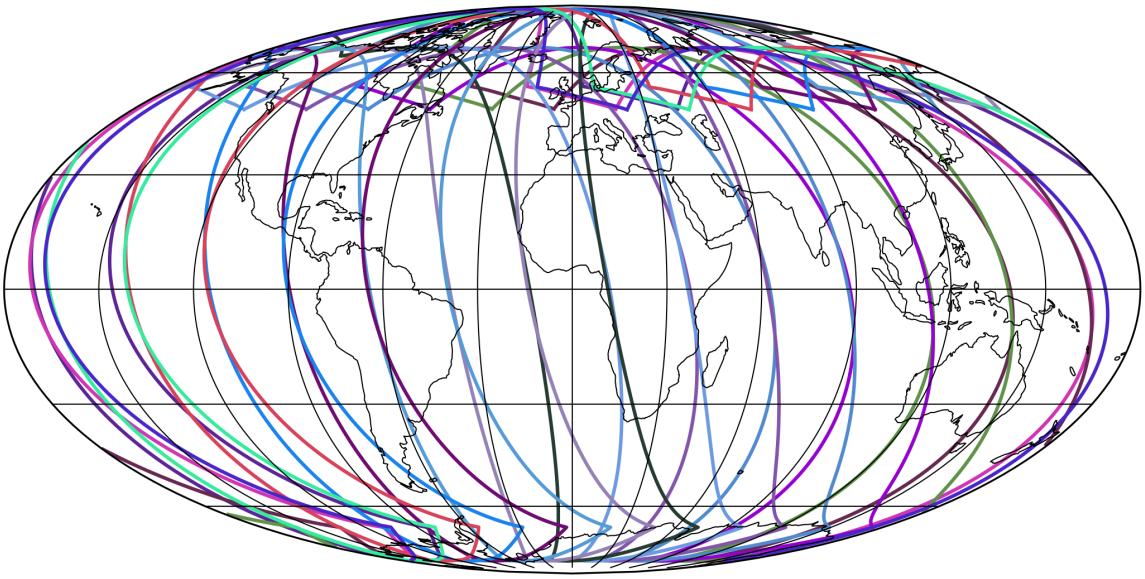


Figure 3: Outline of the granules.

4 Input data monitoring

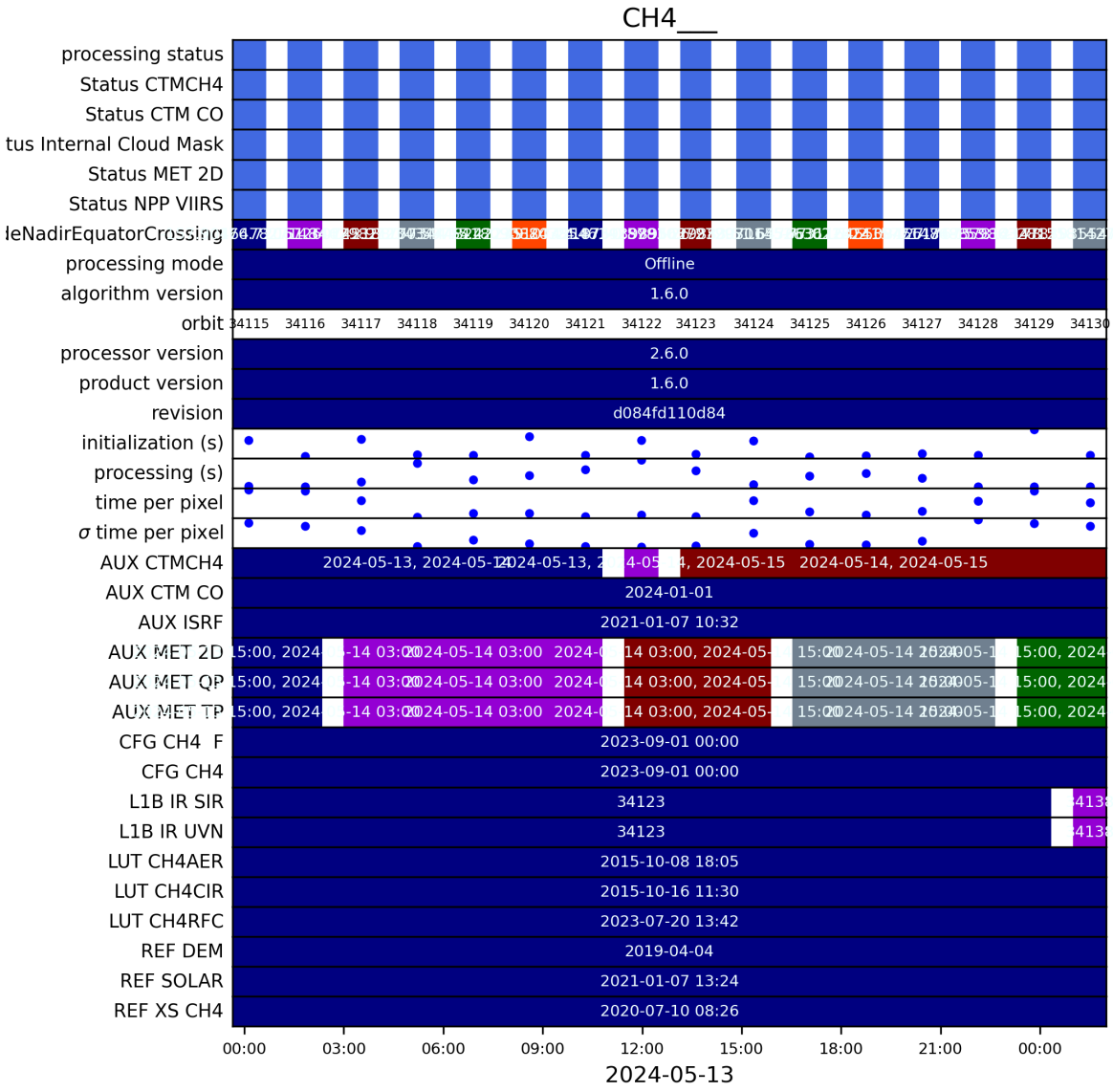


Figure 4: Input data per granule

5 Warnings and errors

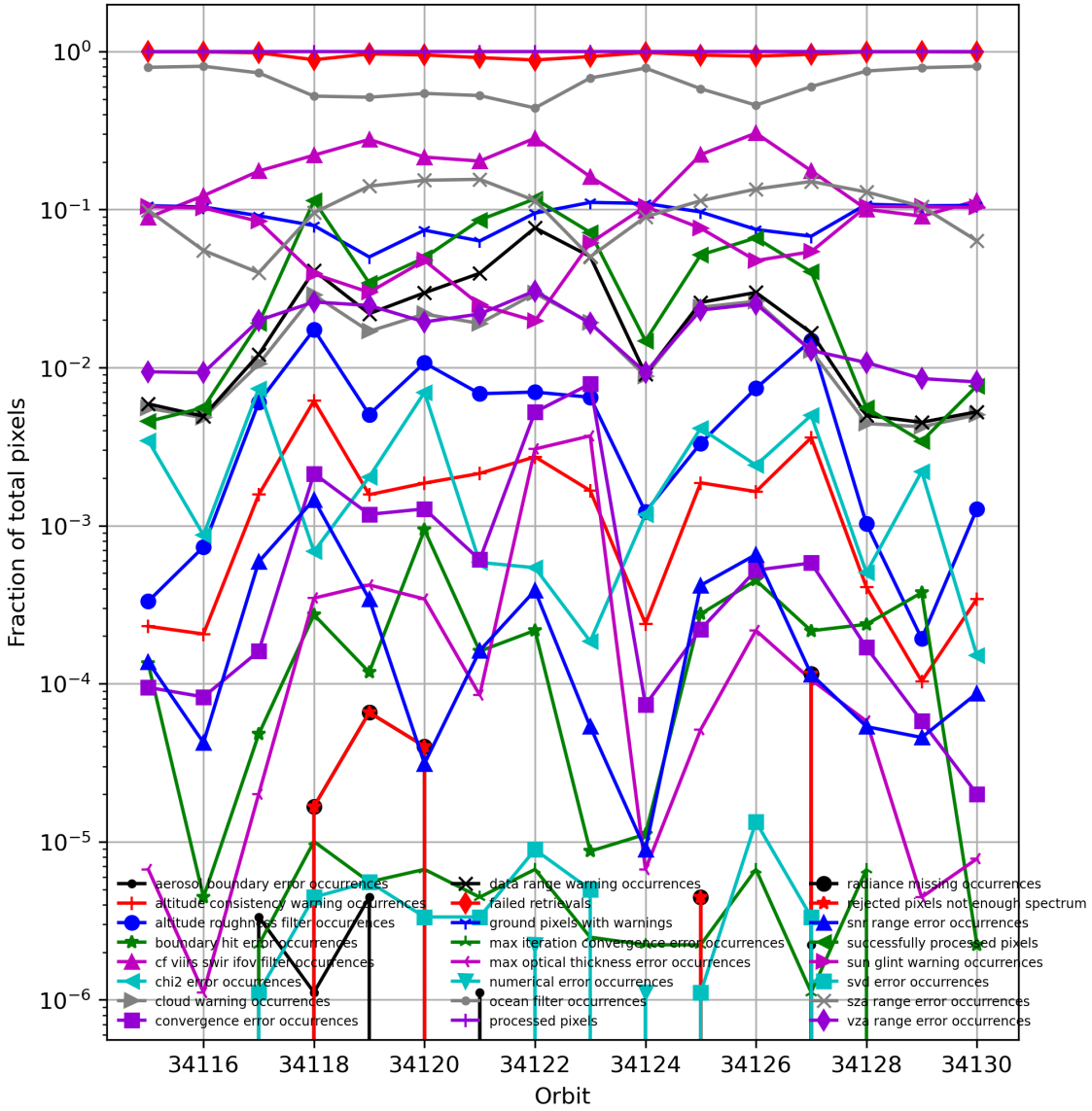


Figure 5: Fraction of pixels with specific warnings and errors during processing

6 World maps

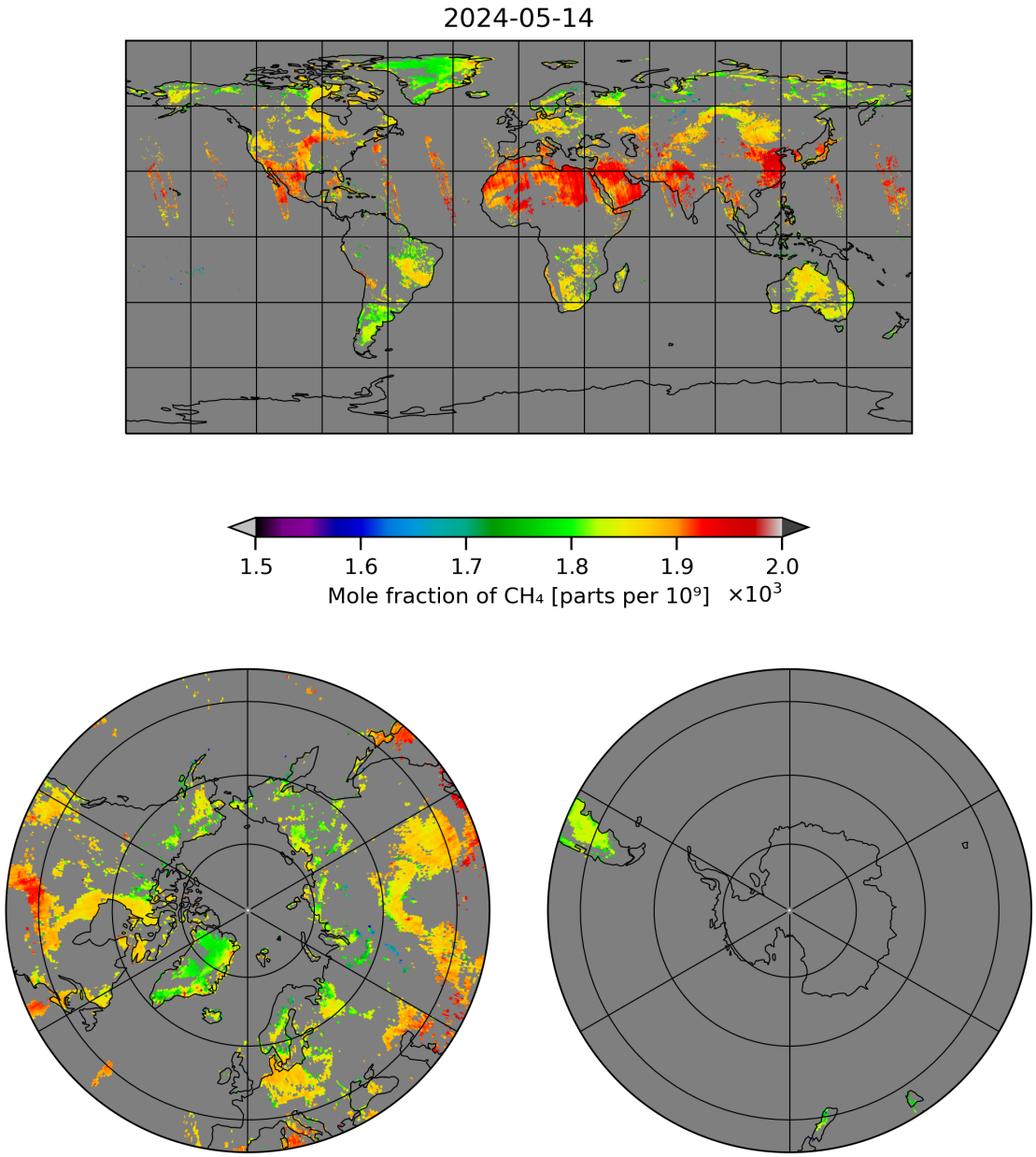


Figure 6: Map of “Mole fraction of CH_4” for 2024-05-13 to 2024-05-15

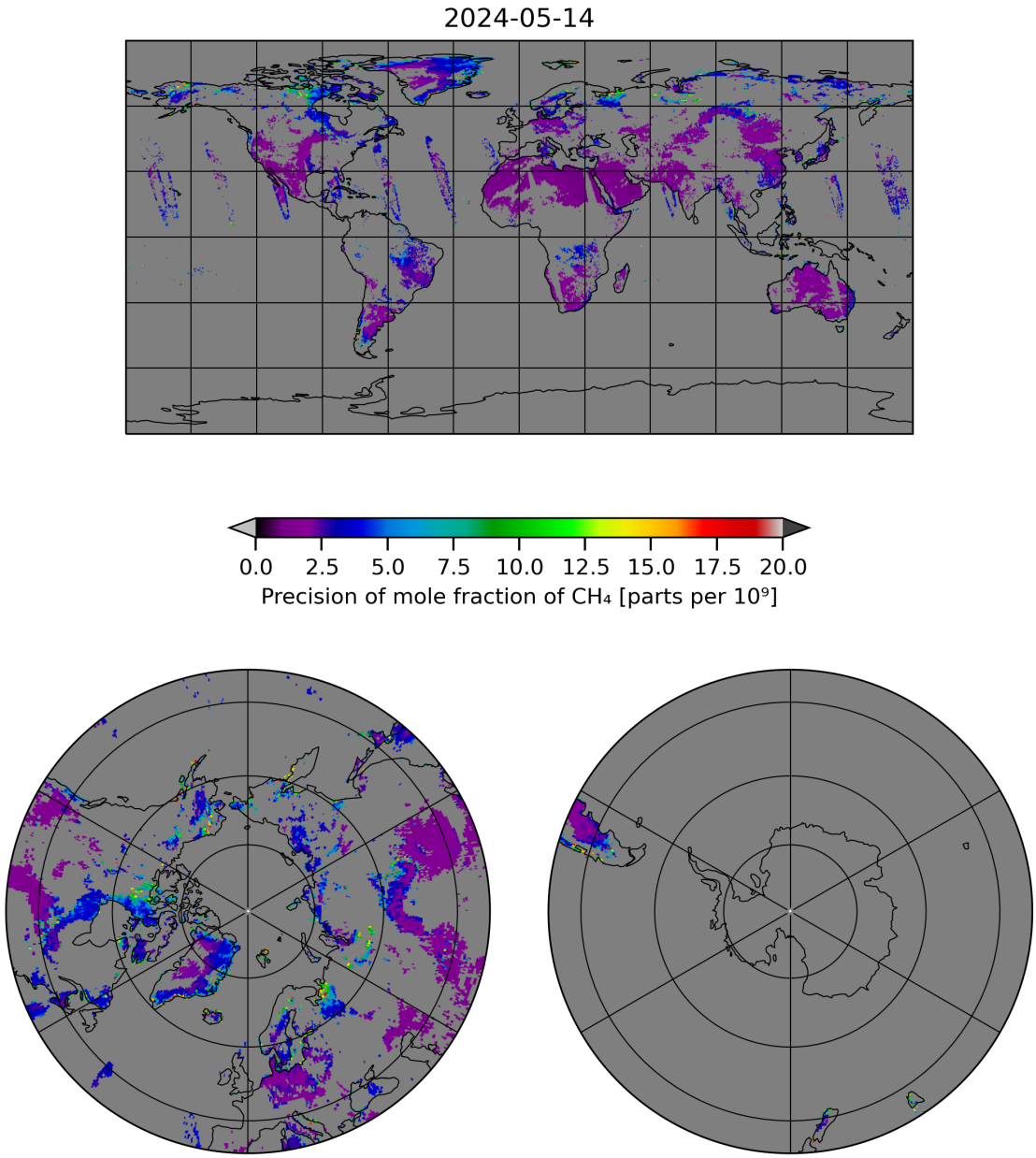


Figure 7: Map of "Precision of mole fraction of CH_4" for 2024-05-13 to 2024-05-15

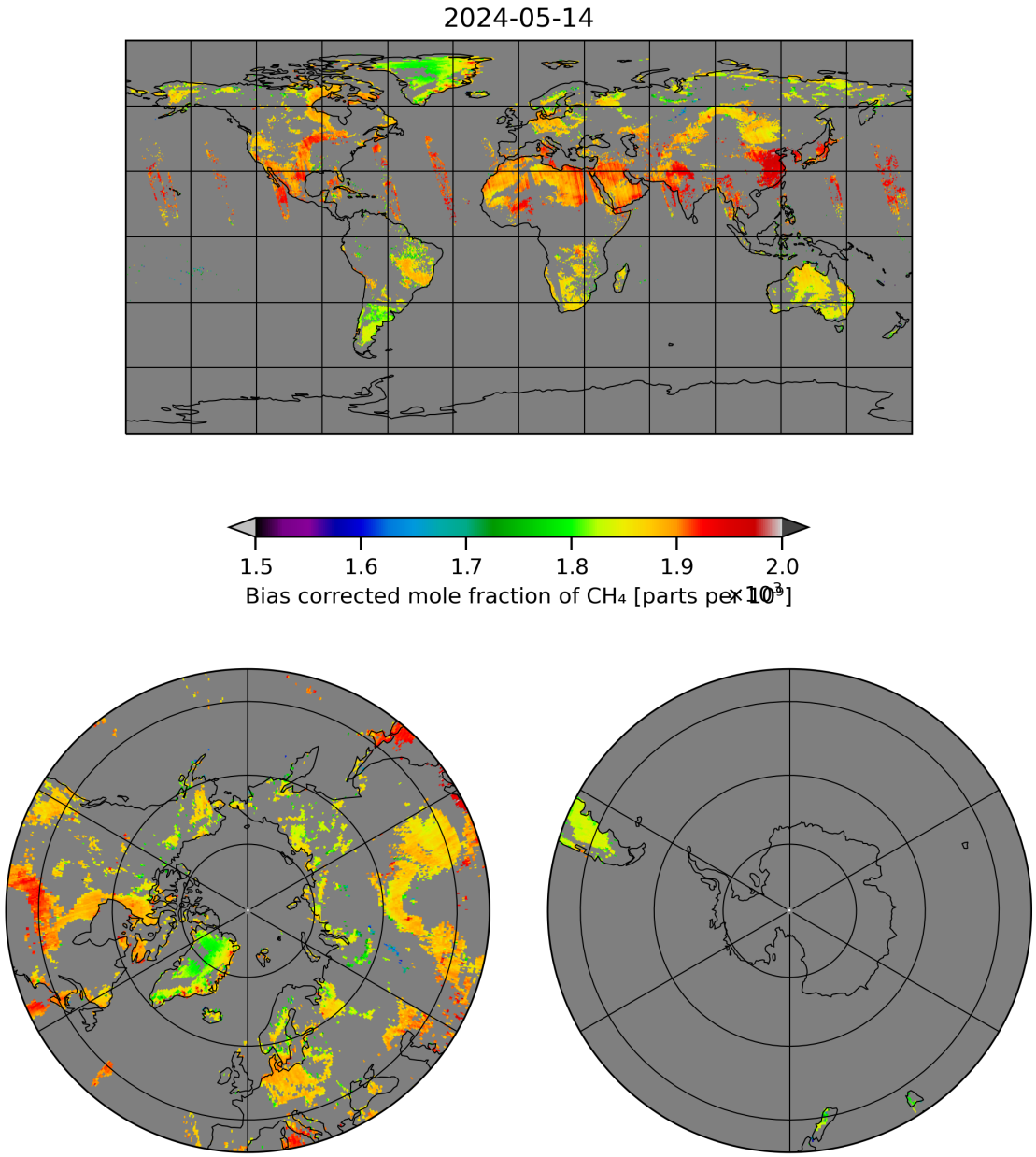


Figure 8: Map of "Bias corrected mole fraction of CH_4" for 2024-05-13 to 2024-05-15

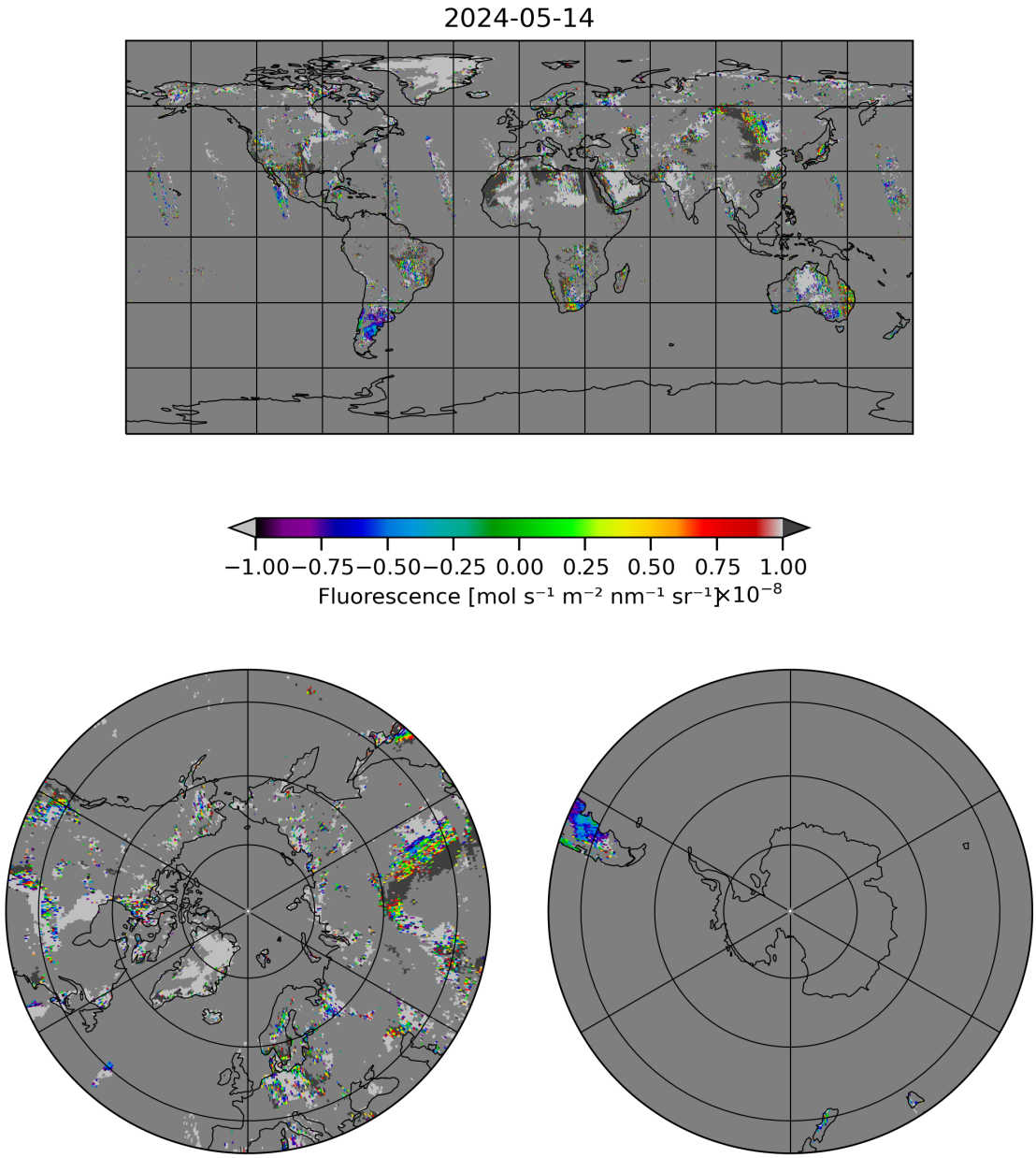


Figure 9: Map of “Fluorescence” for 2024-05-13 to 2024-05-15

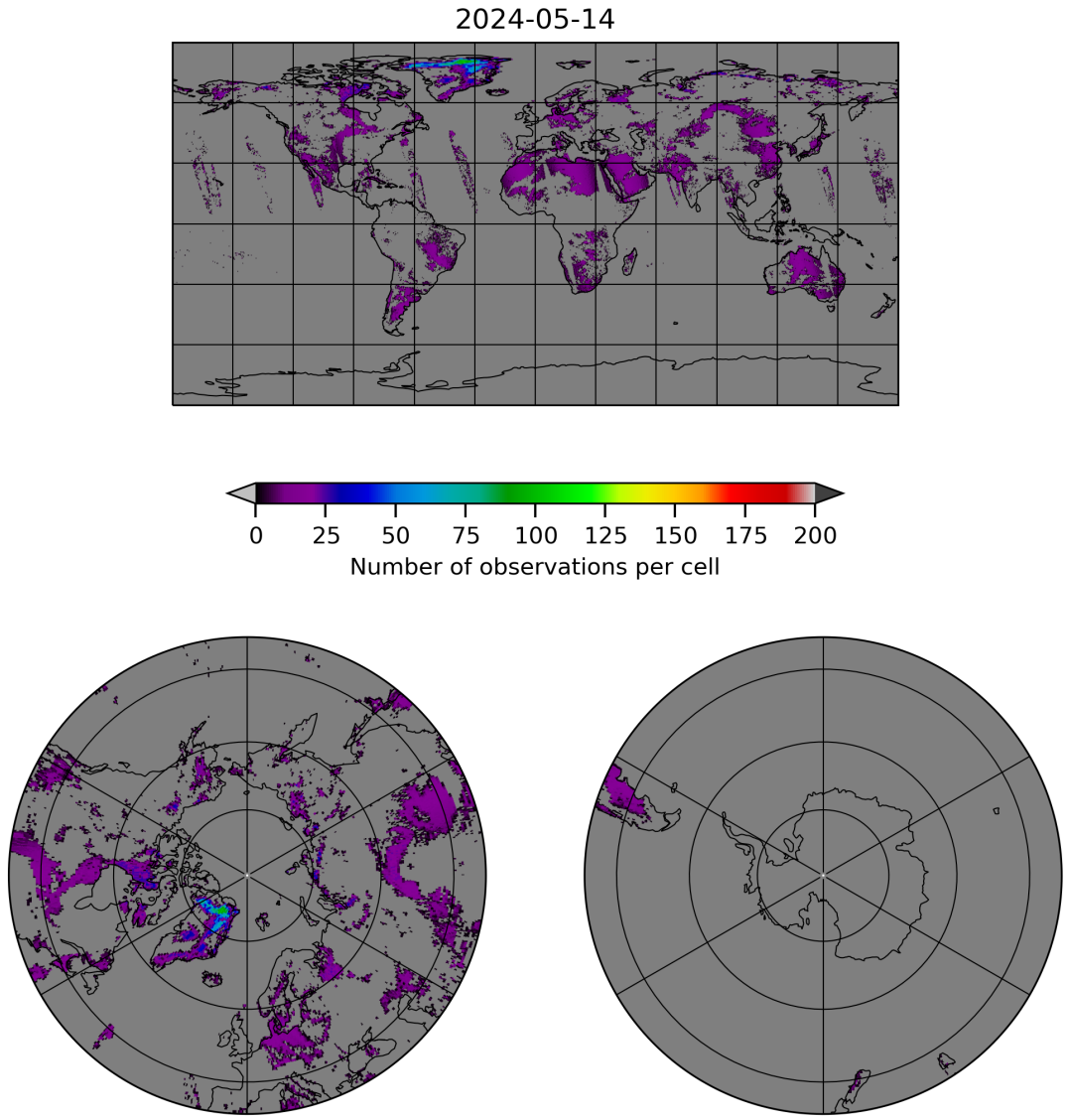


Figure 10: Map of the number of observations for 2024-05-13 to 2024-05-15

7 Zonal average

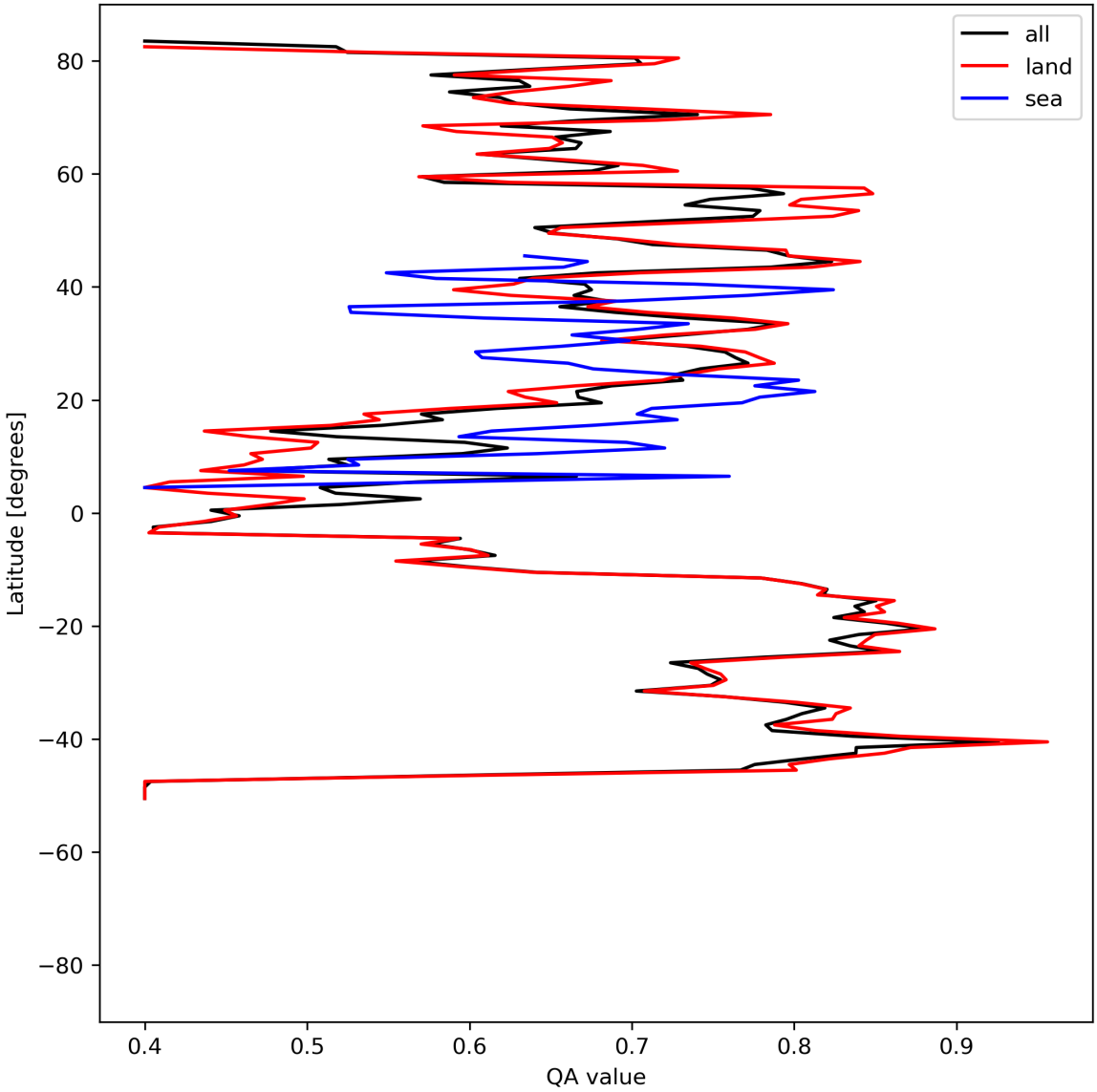


Figure 11: Zonal average of “QA value” for 2024-05-13 to 2024-05-15.

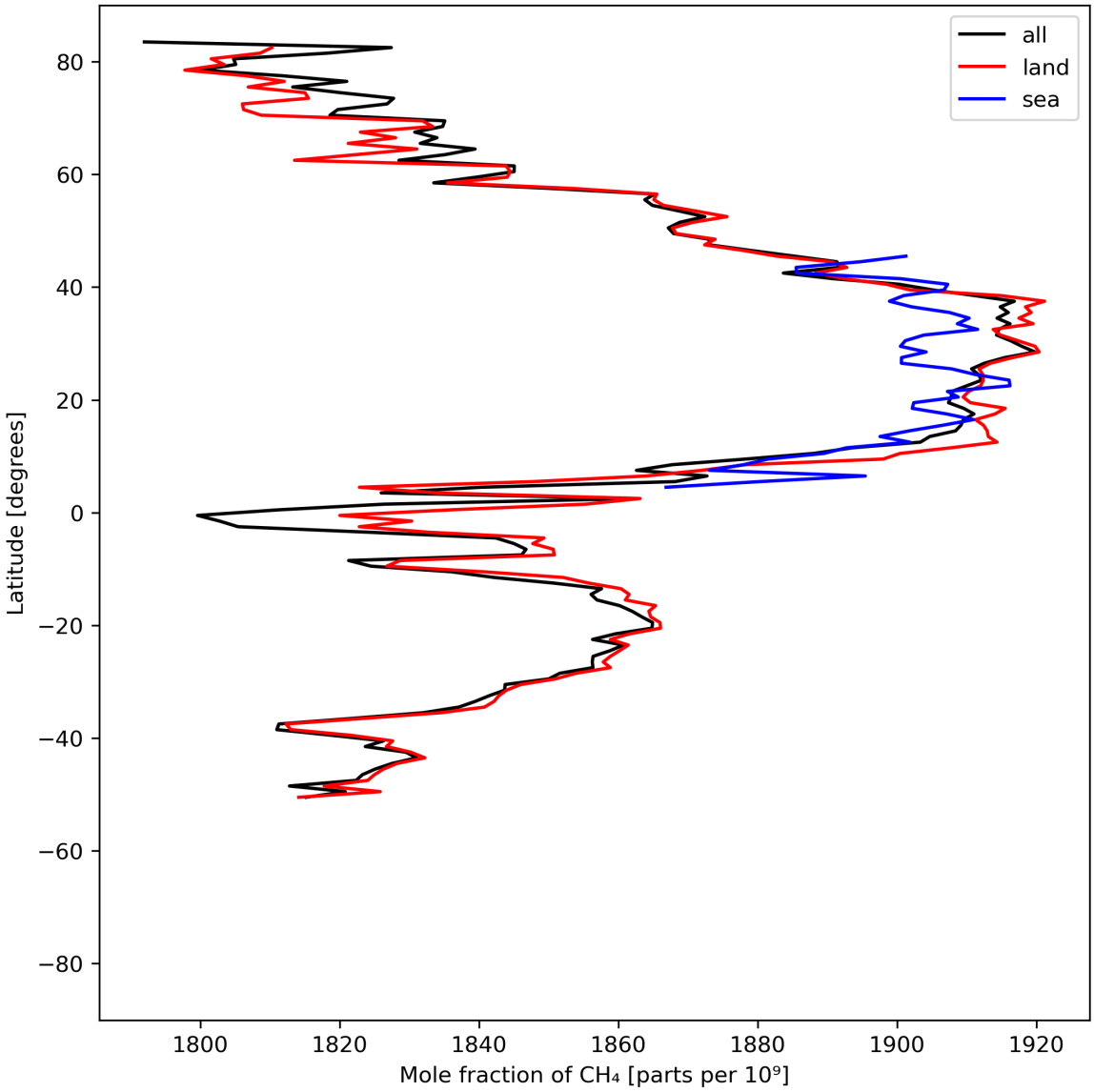


Figure 12: Zonal average of "Mole fraction of CH_4" for 2024-05-13 to 2024-05-15.

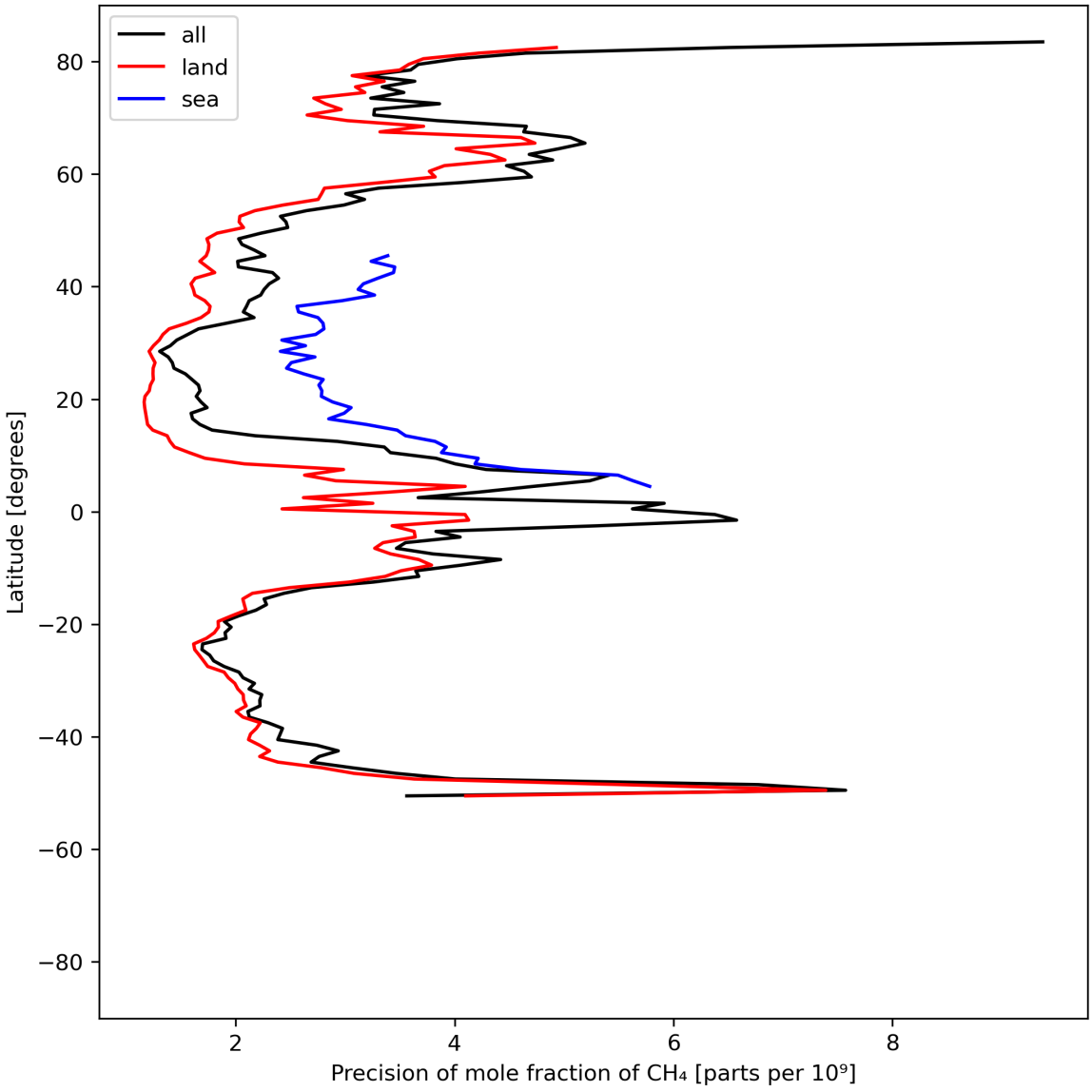


Figure 13: Zonal average of “Precision of mole fraction of CH_4” for 2024-05-13 to 2024-05-15.

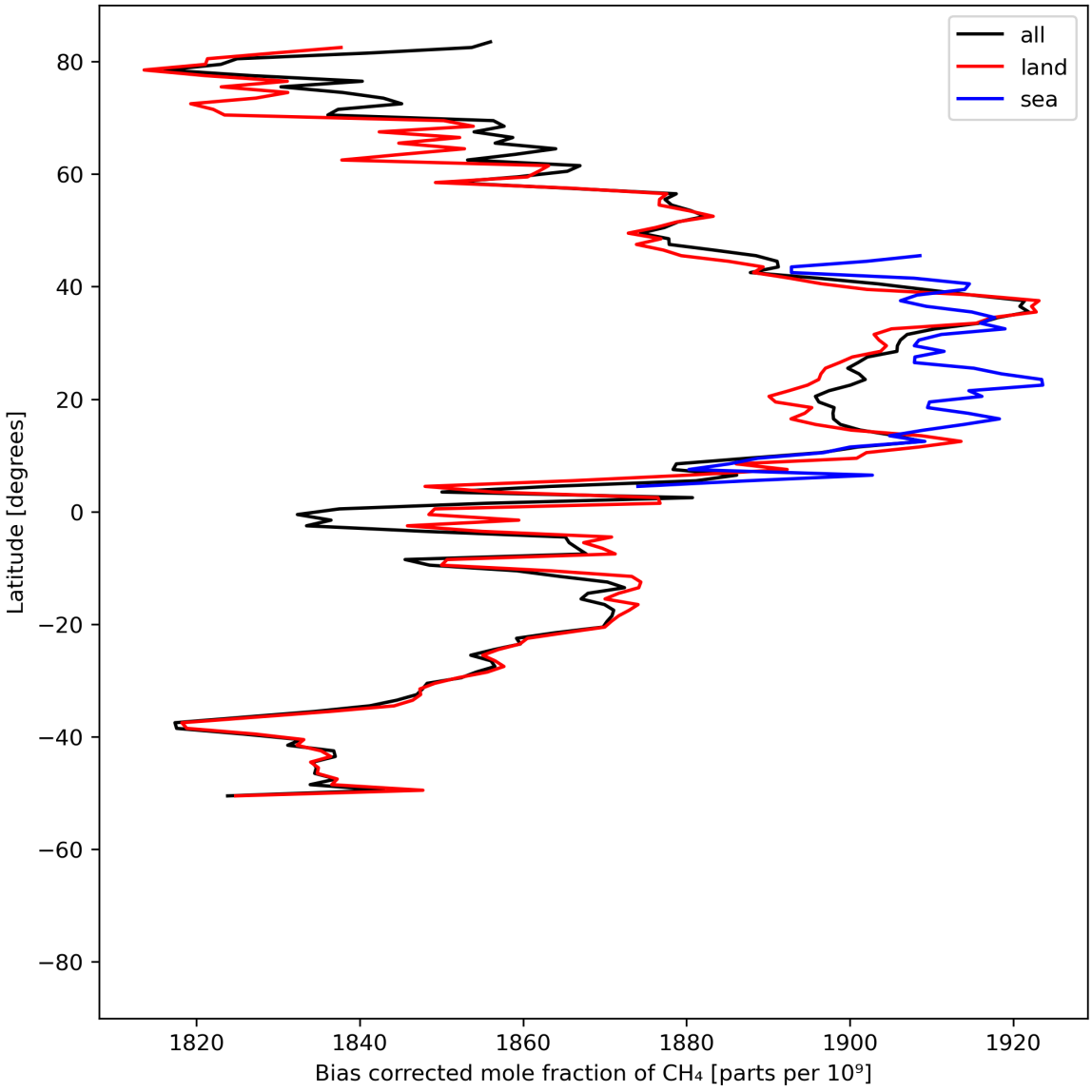


Figure 14: Zonal average of “Bias corrected mole fraction of CH_4” for 2024-05-13 to 2024-05-15.

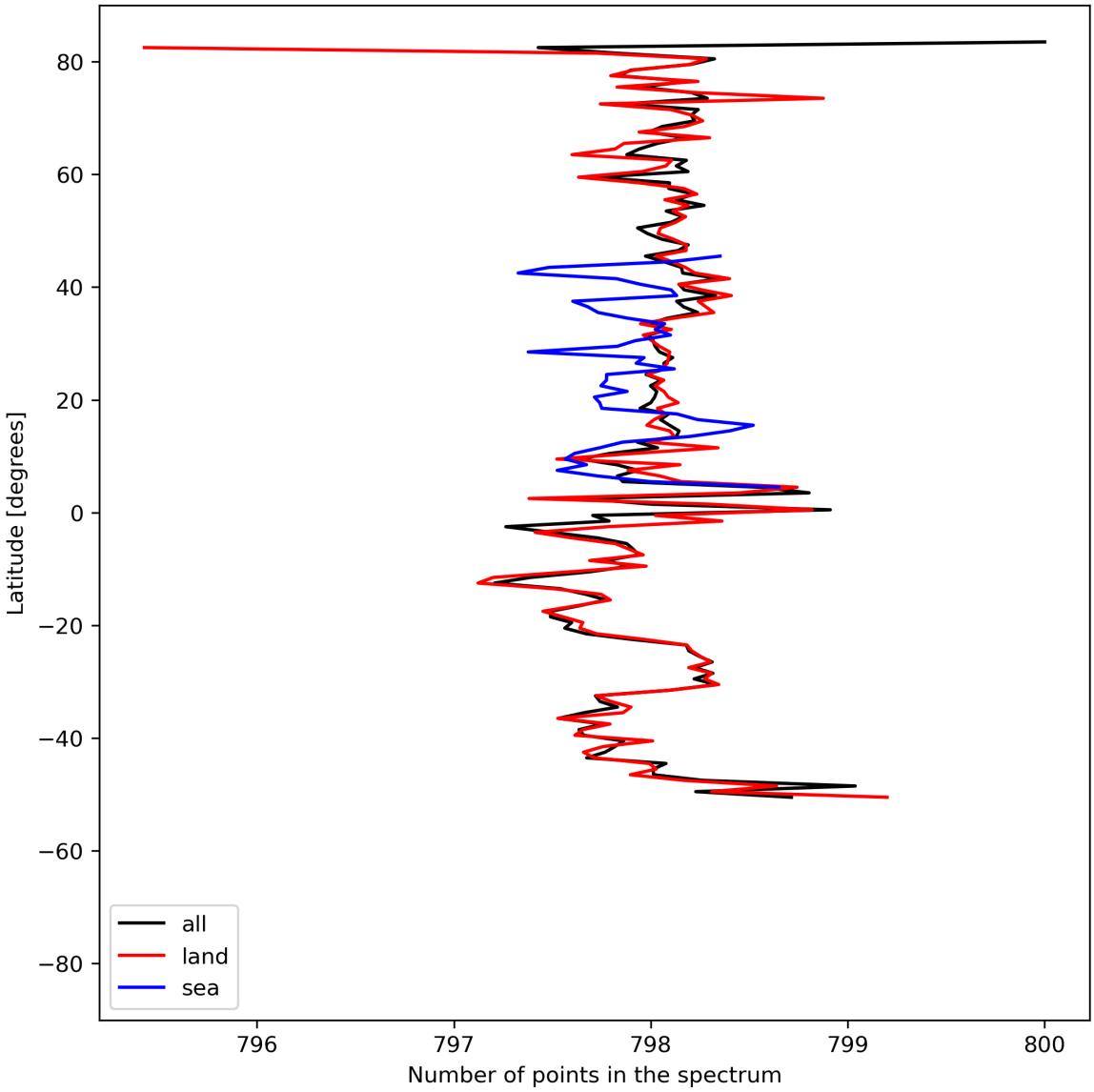


Figure 15: Zonal average of “Number of points in the spectrum” for 2024-05-13 to 2024-05-15.

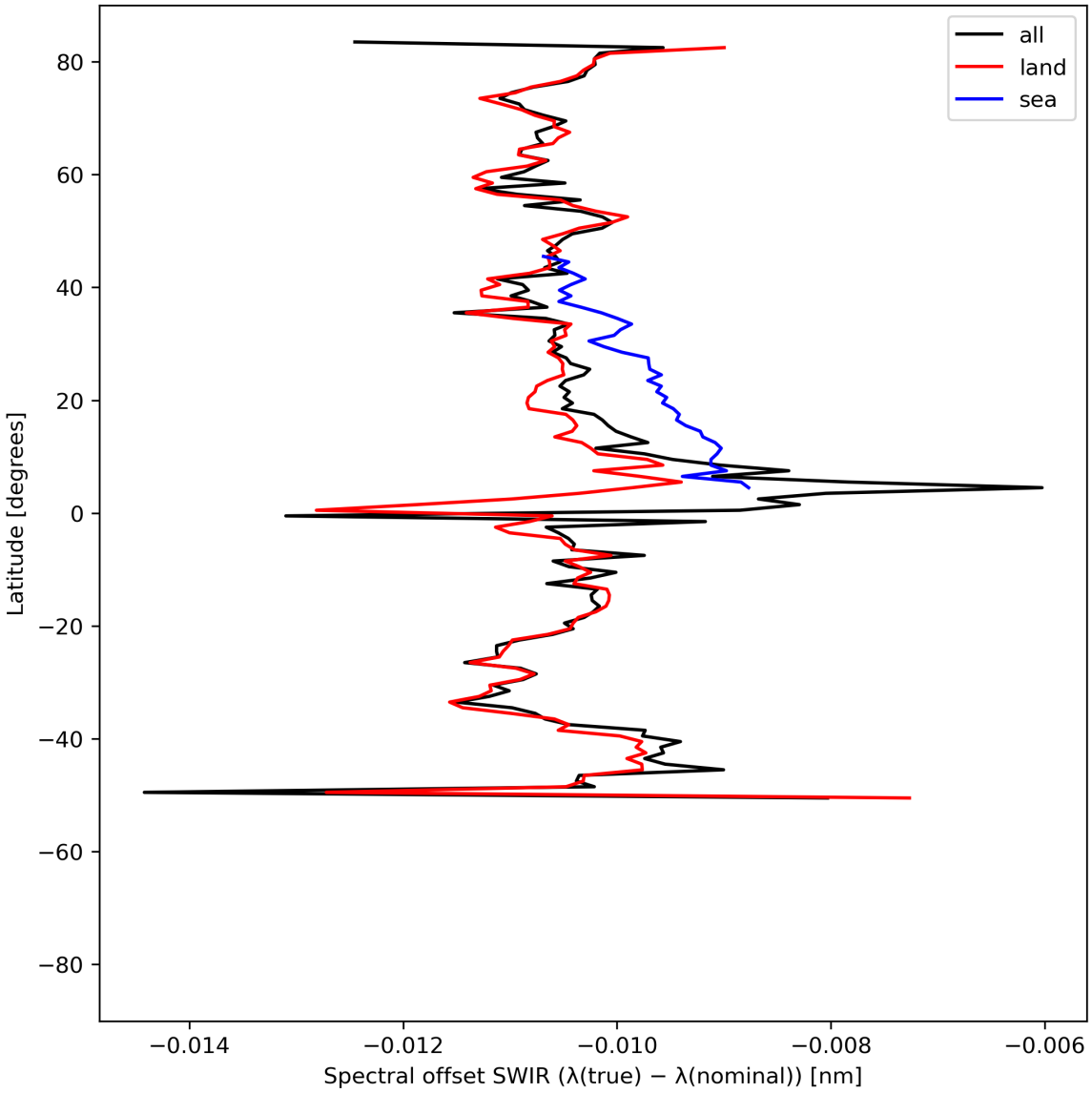


Figure 16: Zonal average of "Spectral offset SWIR (λ(true) − λ(nominal))" for 2024-05-13 to 2024-05-15.

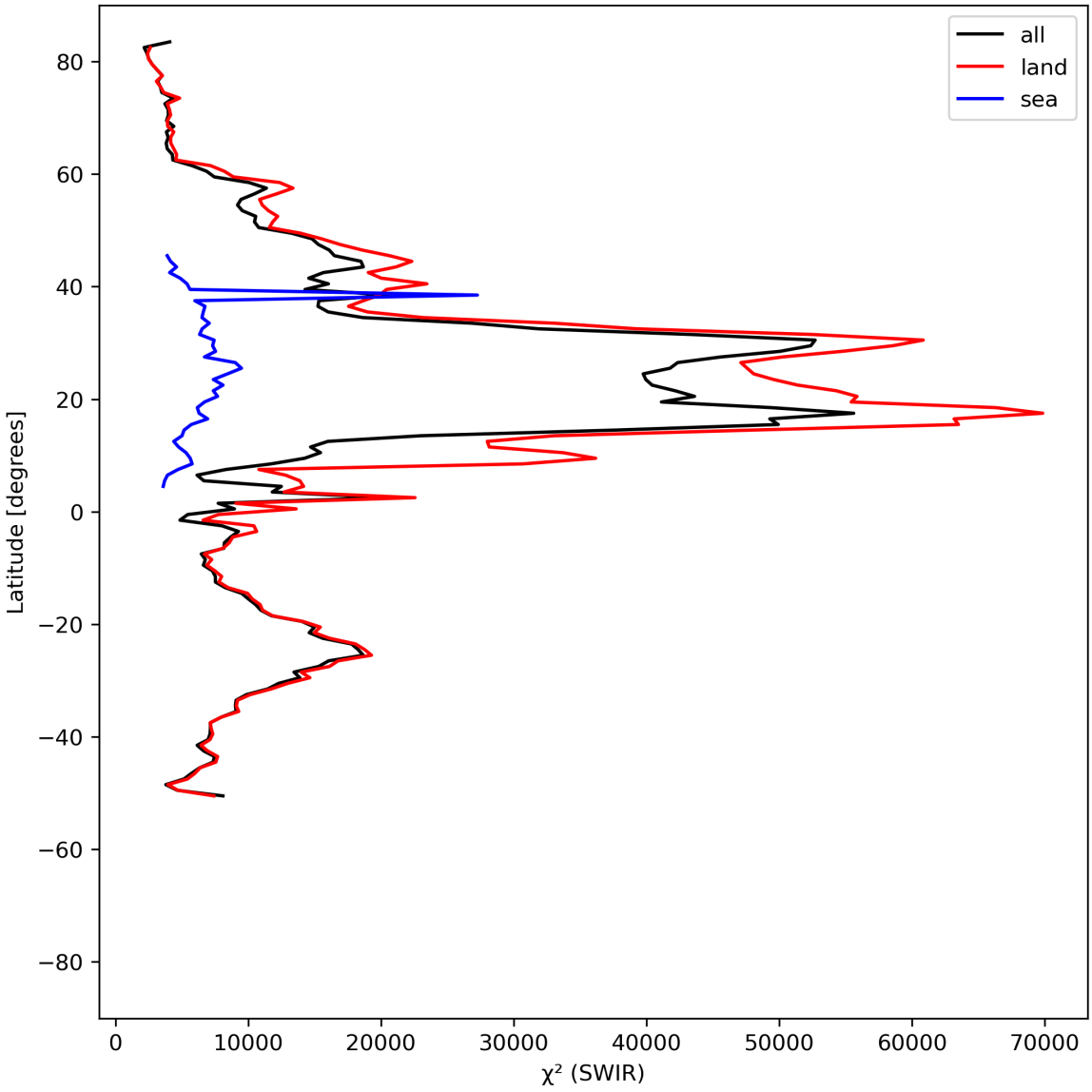


Figure 17: Zonal average of "χ^2 (SWIR)" for 2024-05-13 to 2024-05-15.

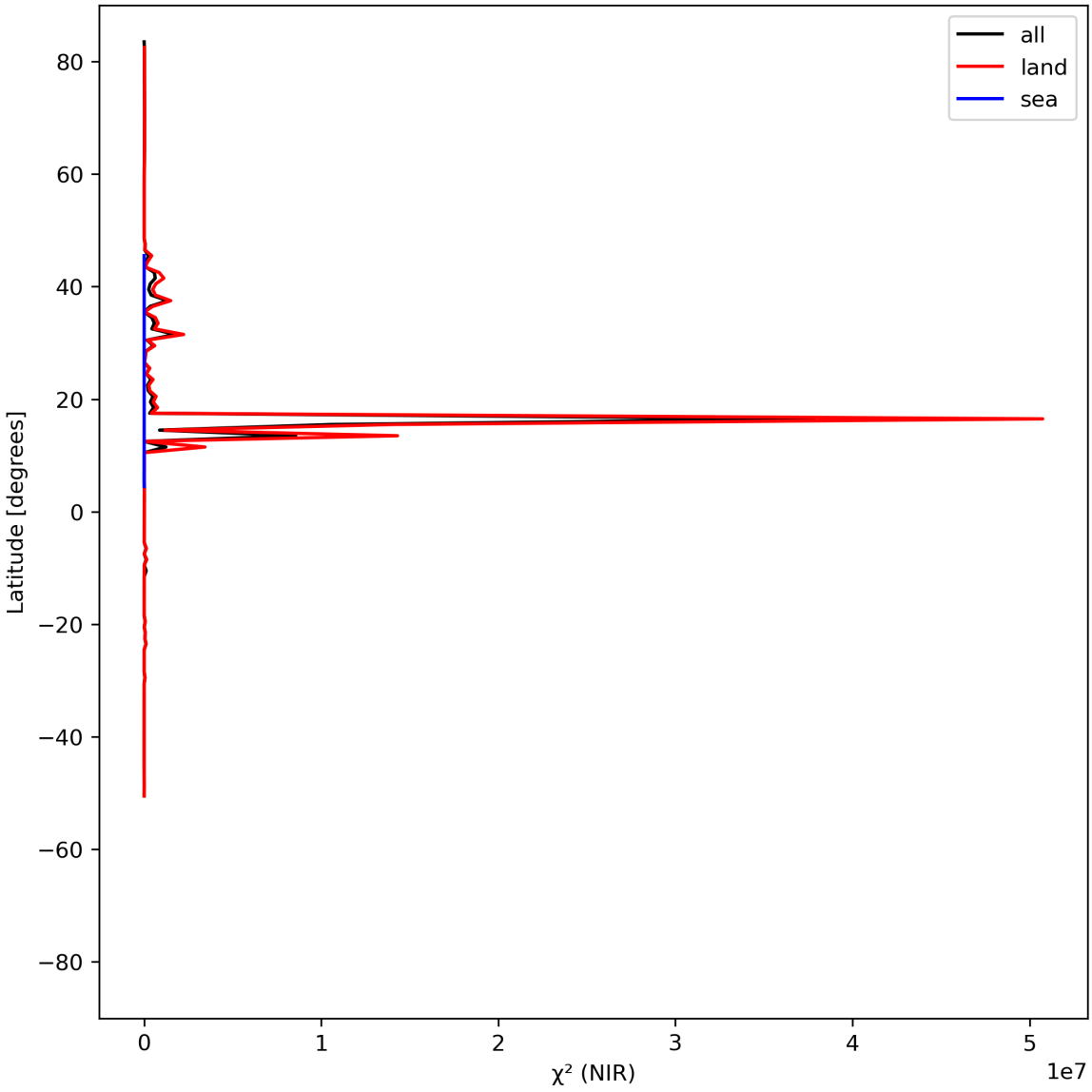


Figure 18: Zonal average of "χ^2 (NIR)" for 2024-05-13 to 2024-05-15.

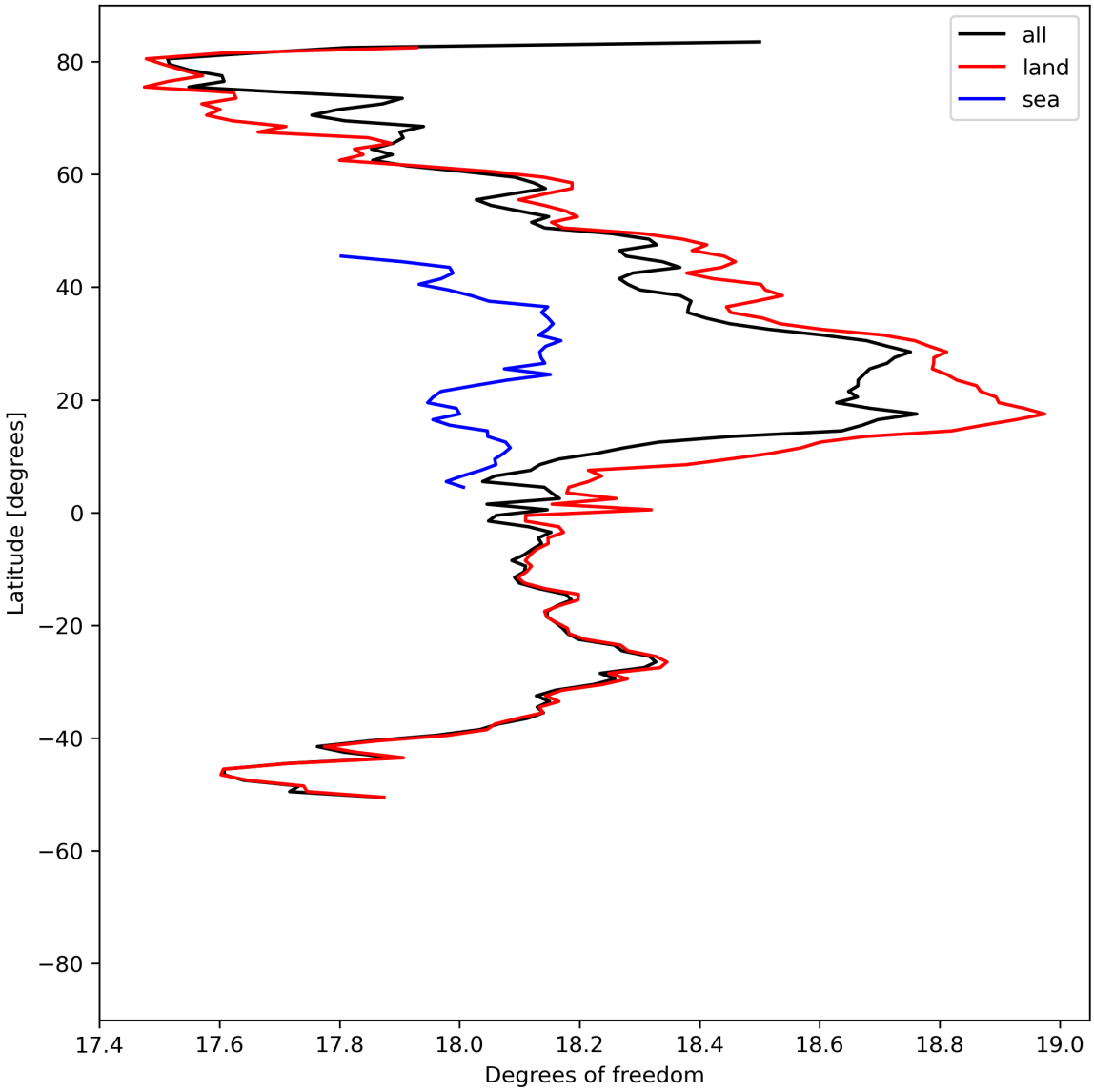


Figure 19: Zonal average of “Degrees of freedom” for 2024-05-13 to 2024-05-15.

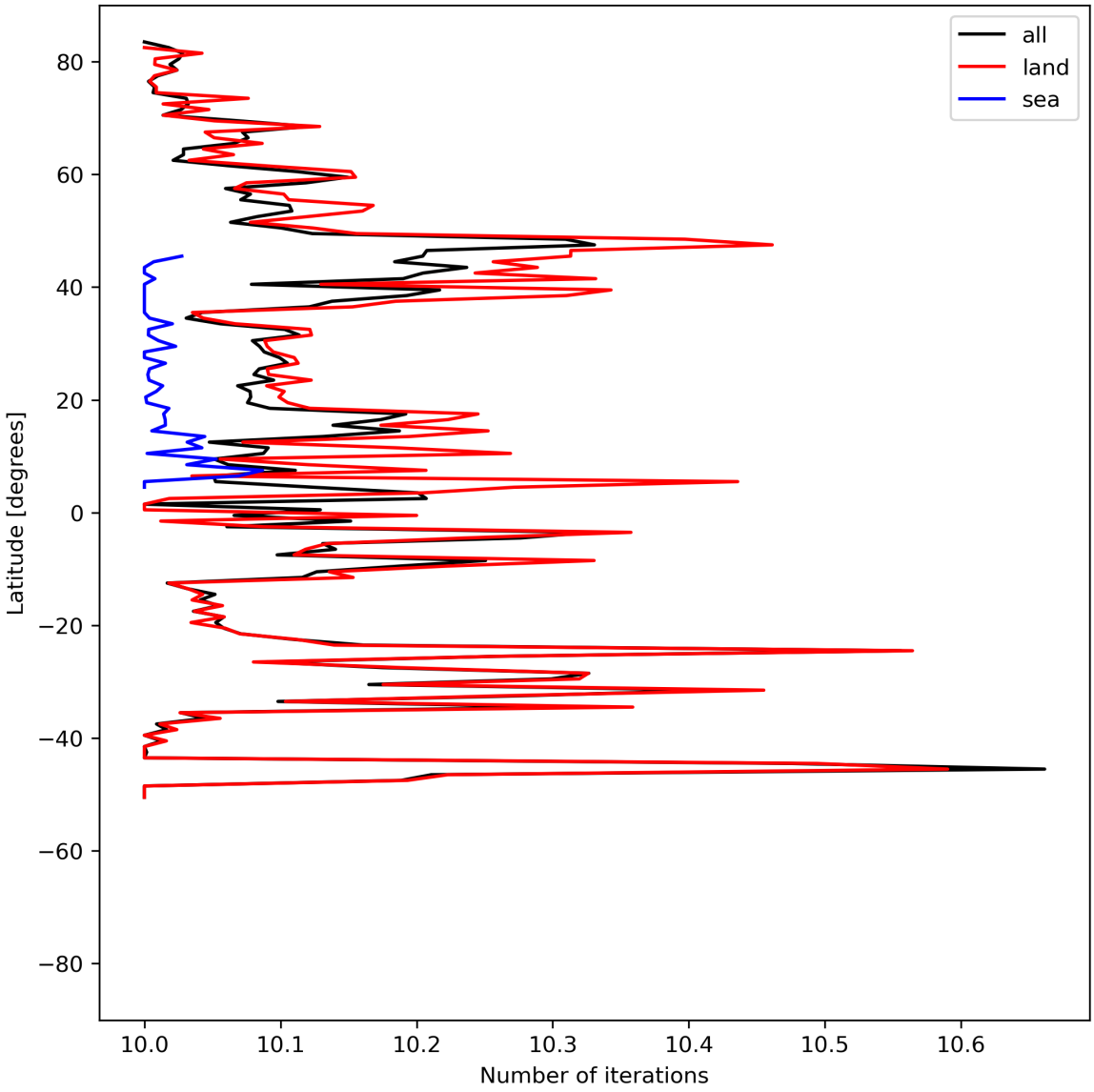


Figure 20: Zonal average of “Number of iterations” for 2024-05-13 to 2024-05-15.

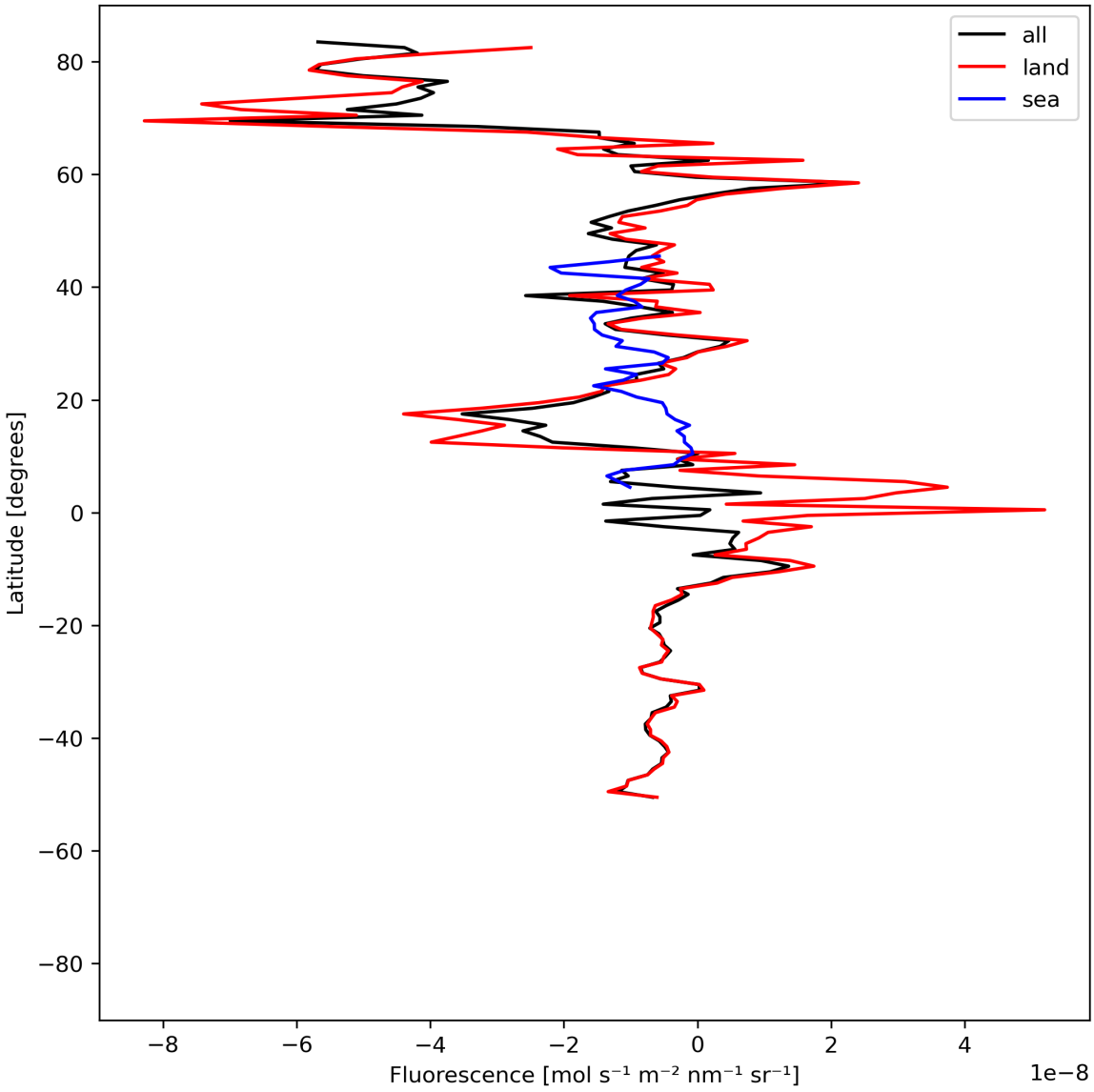


Figure 21: Zonal average of “Fluorescence” for 2024-05-13 to 2024-05-15.

8 Histograms

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

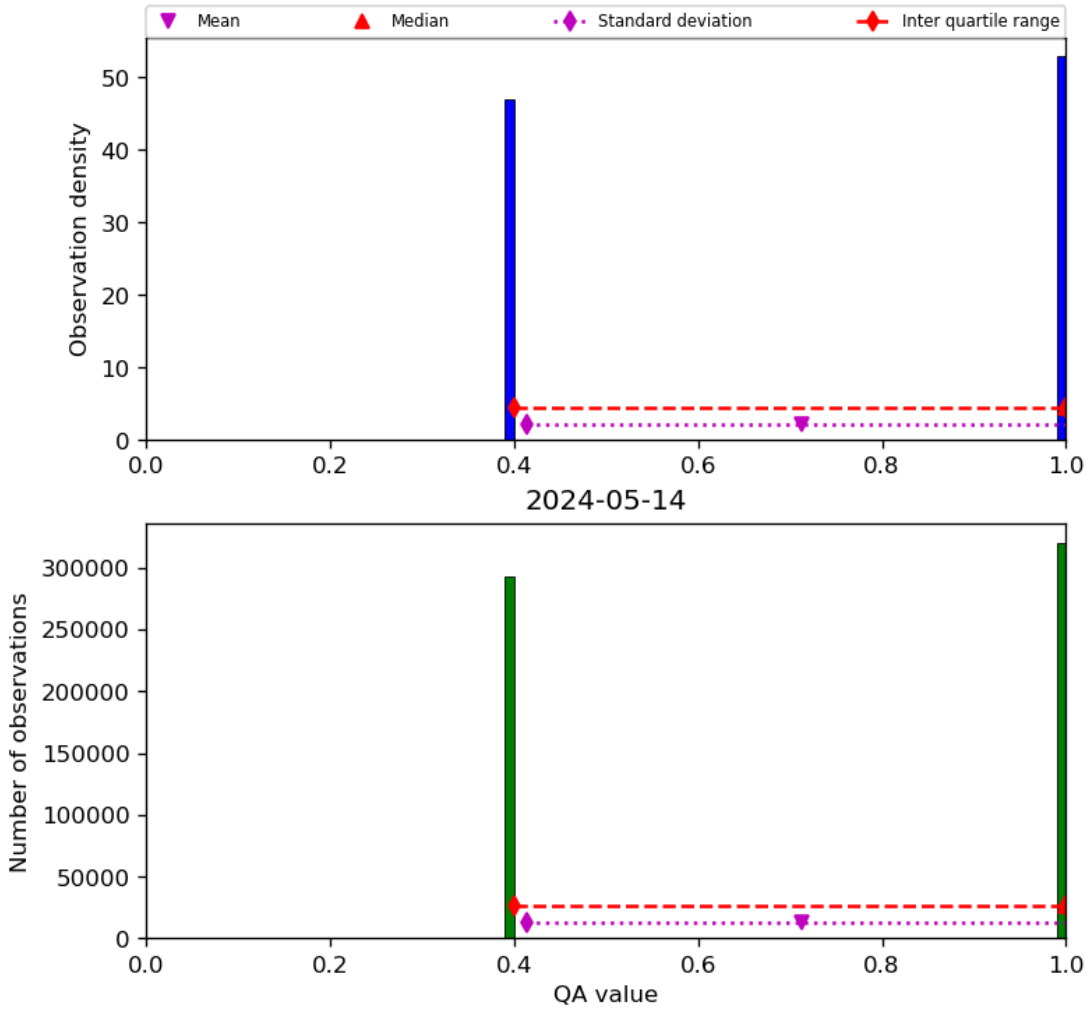


Figure 22: Histogram of “QA value” for 2024-05-13 to 2024-05-15

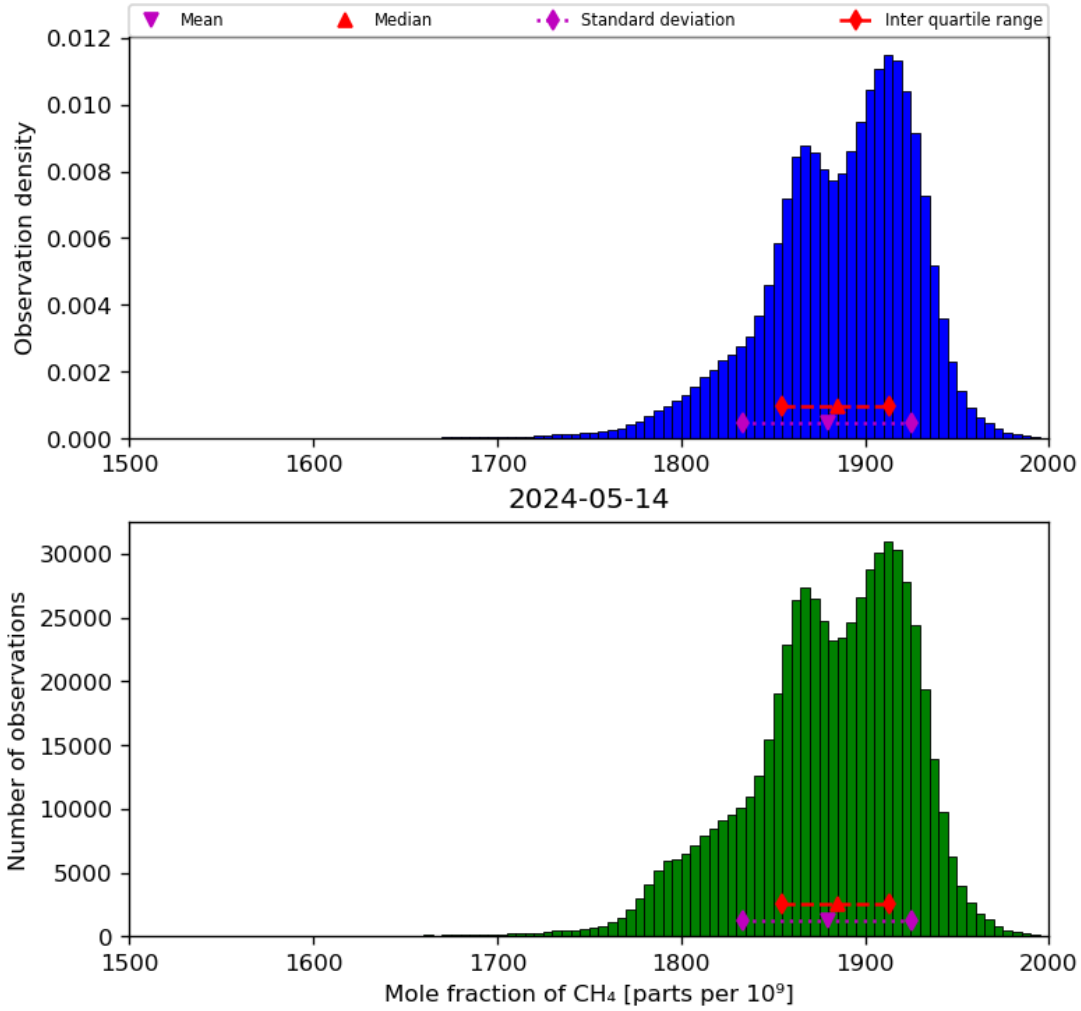


Figure 23: Histogram of "Mole fraction of CH_4" for 2024-05-13 to 2024-05-15

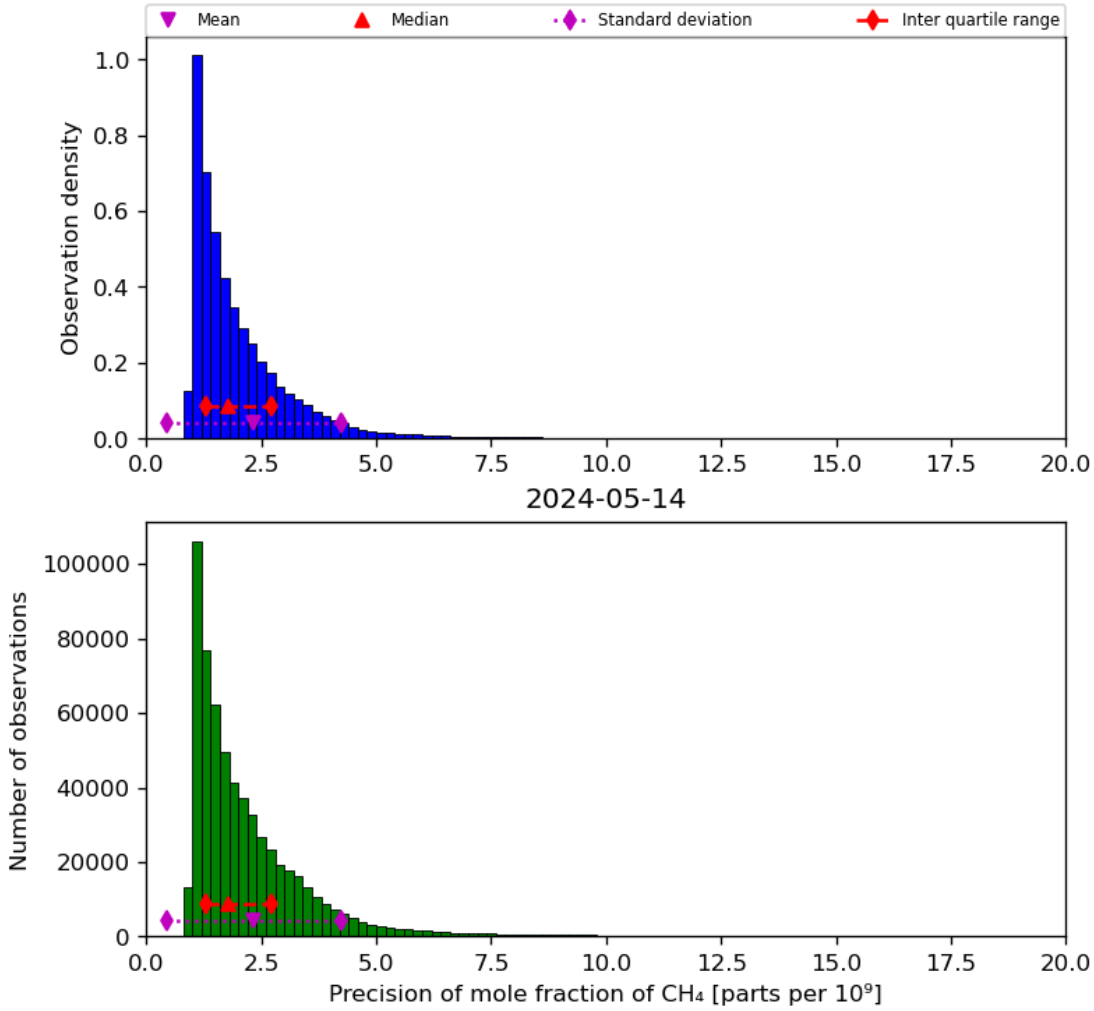


Figure 24: Histogram of "Precision of mole fraction of CH_4" for 2024-05-13 to 2024-05-15

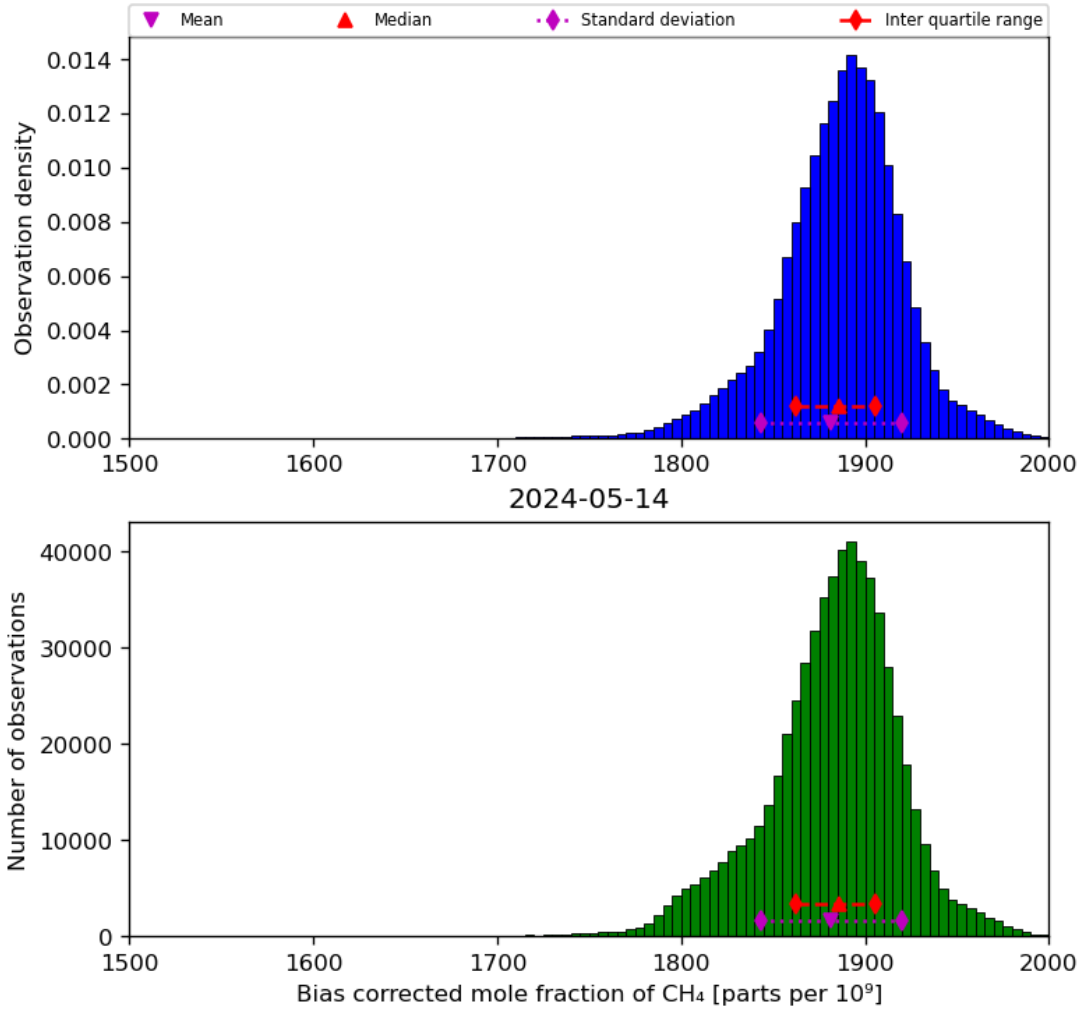


Figure 25: Histogram of "Bias corrected mole fraction of CH_4" for 2024-05-13 to 2024-05-15

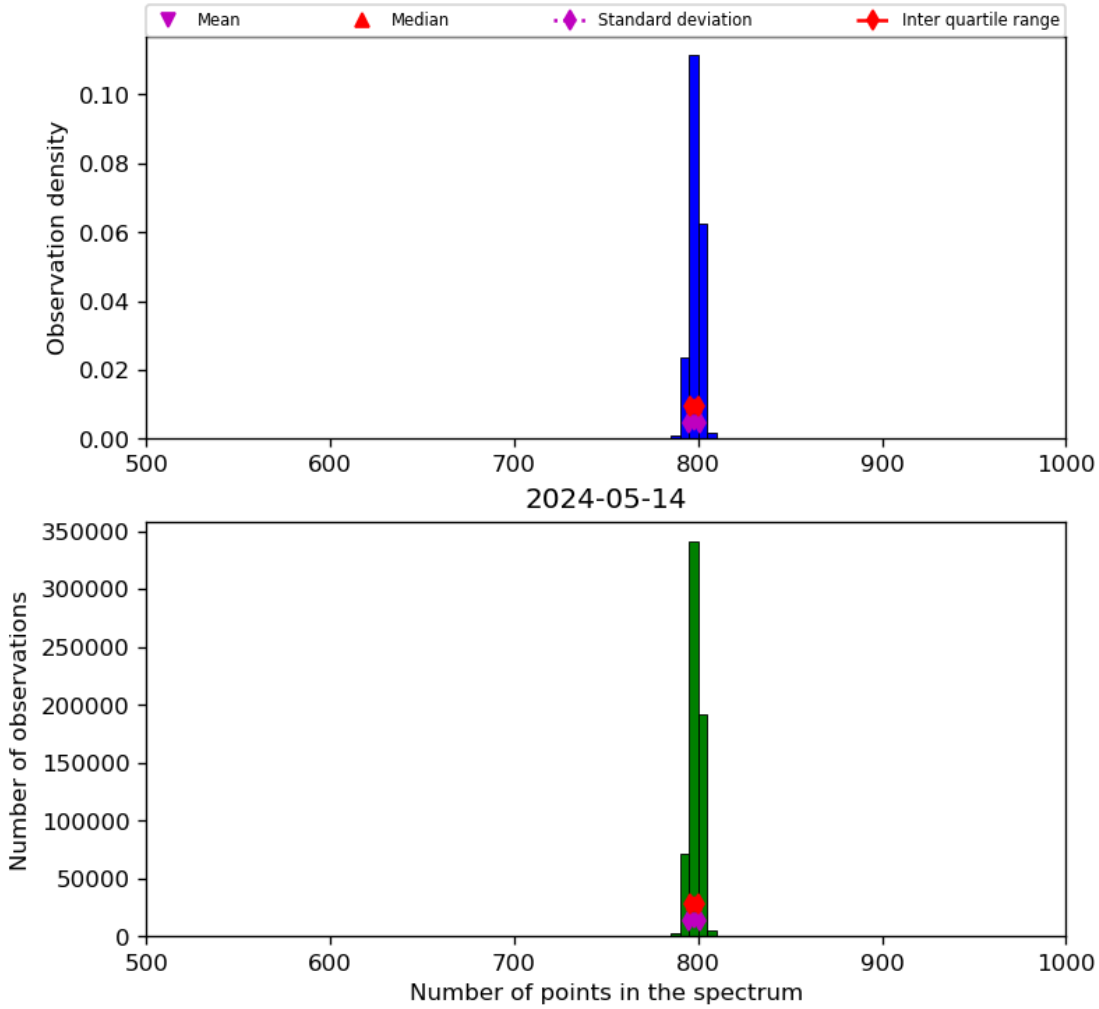


Figure 26: Histogram of “Number of points in the spectrum” for 2024-05-13 to 2024-05-15

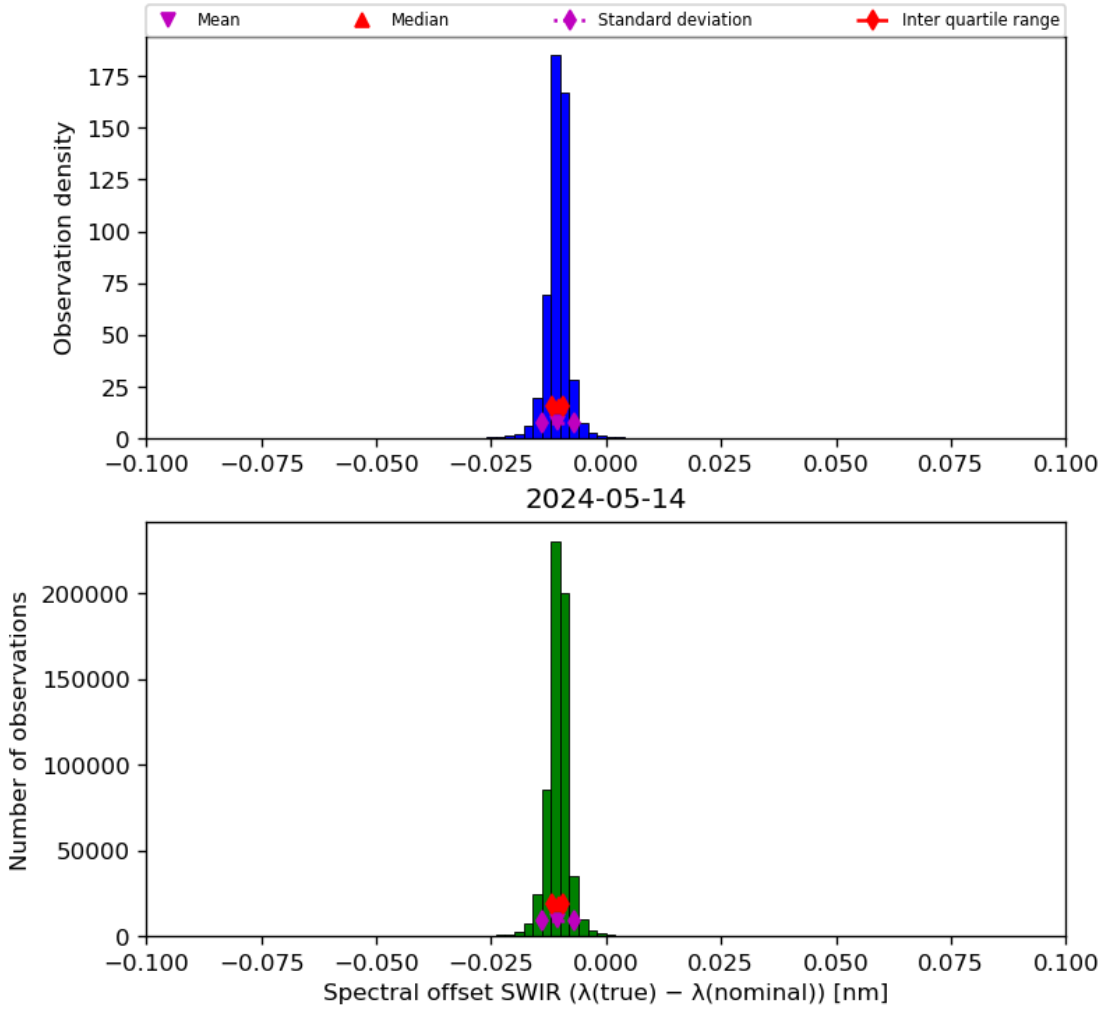


Figure 27: Histogram of "Spectral offset SWIR (λ(true) − λ(nominal))" for 2024-05-13 to 2024-05-15

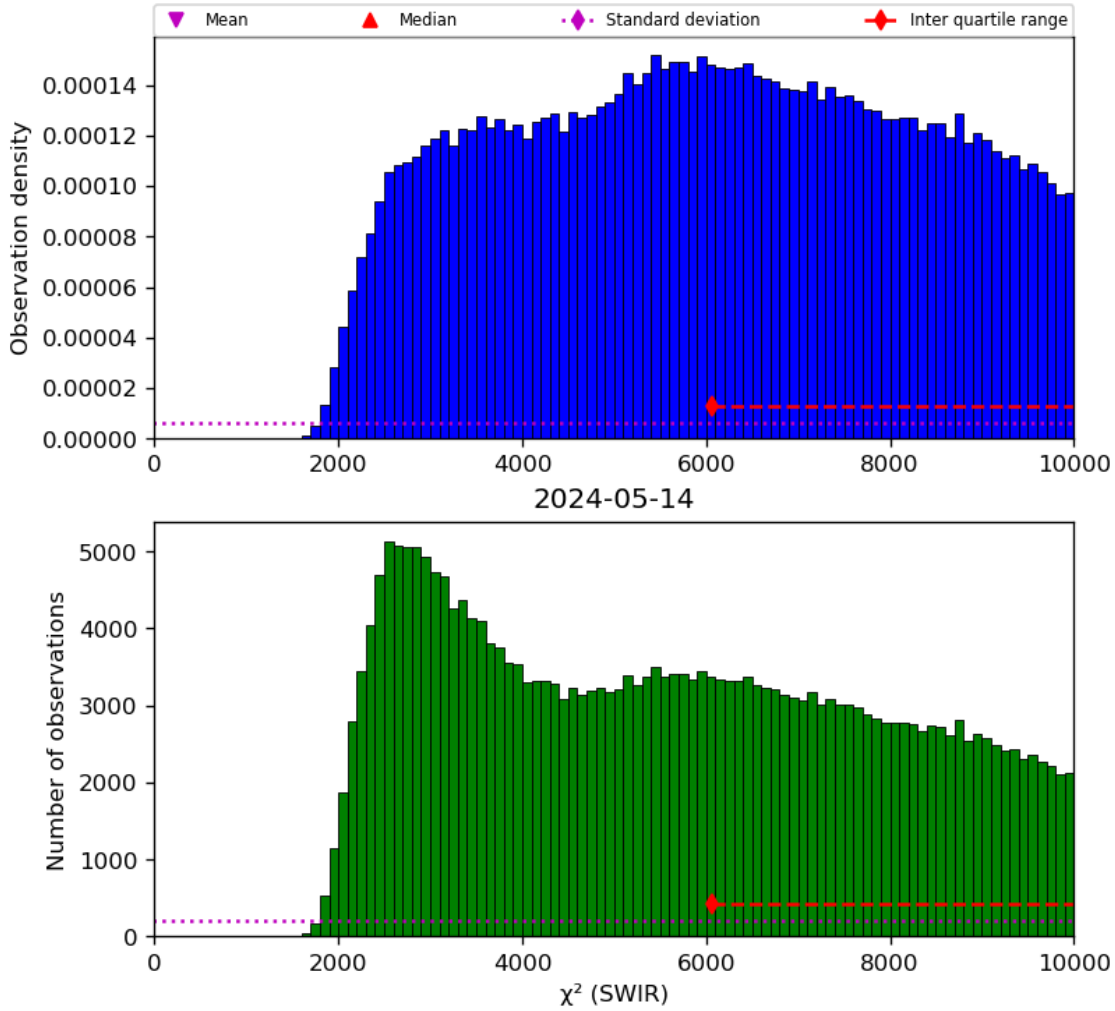


Figure 28: Histogram of "χ^2 (SWIR)" for 2024-05-13 to 2024-05-15

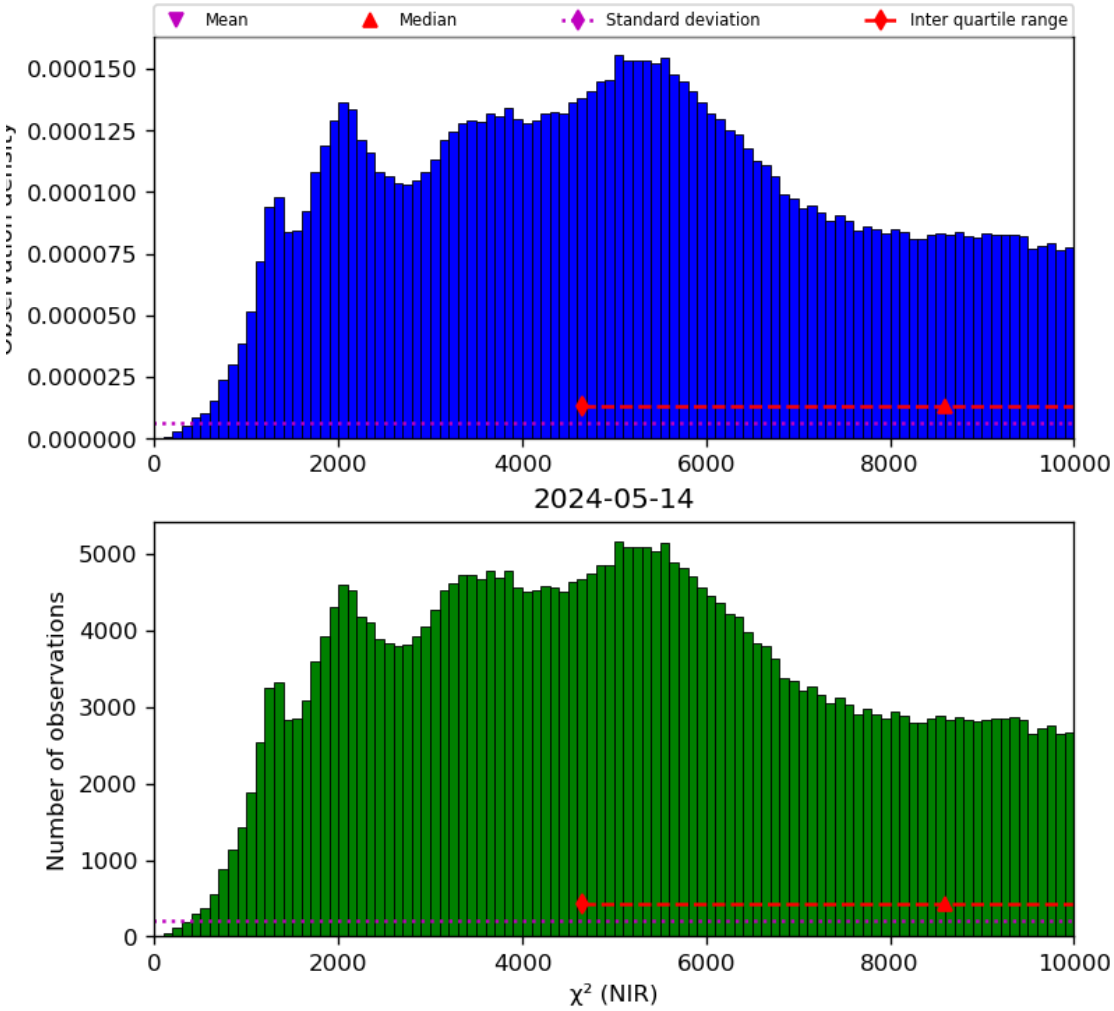


Figure 29: Histogram of "χ^2 (NIR)" for 2024-05-13 to 2024-05-15

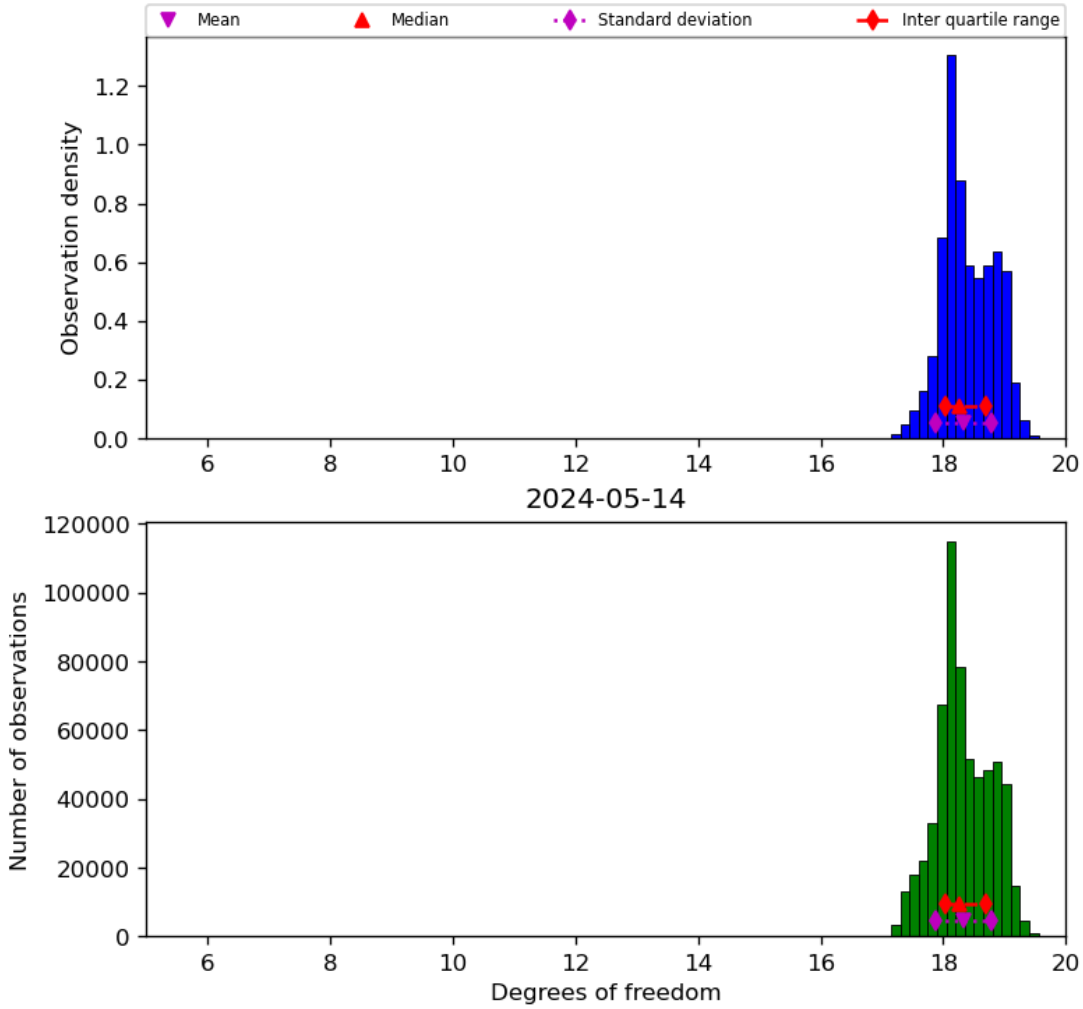


Figure 30: Histogram of “Degrees of freedom” for 2024-05-13 to 2024-05-15

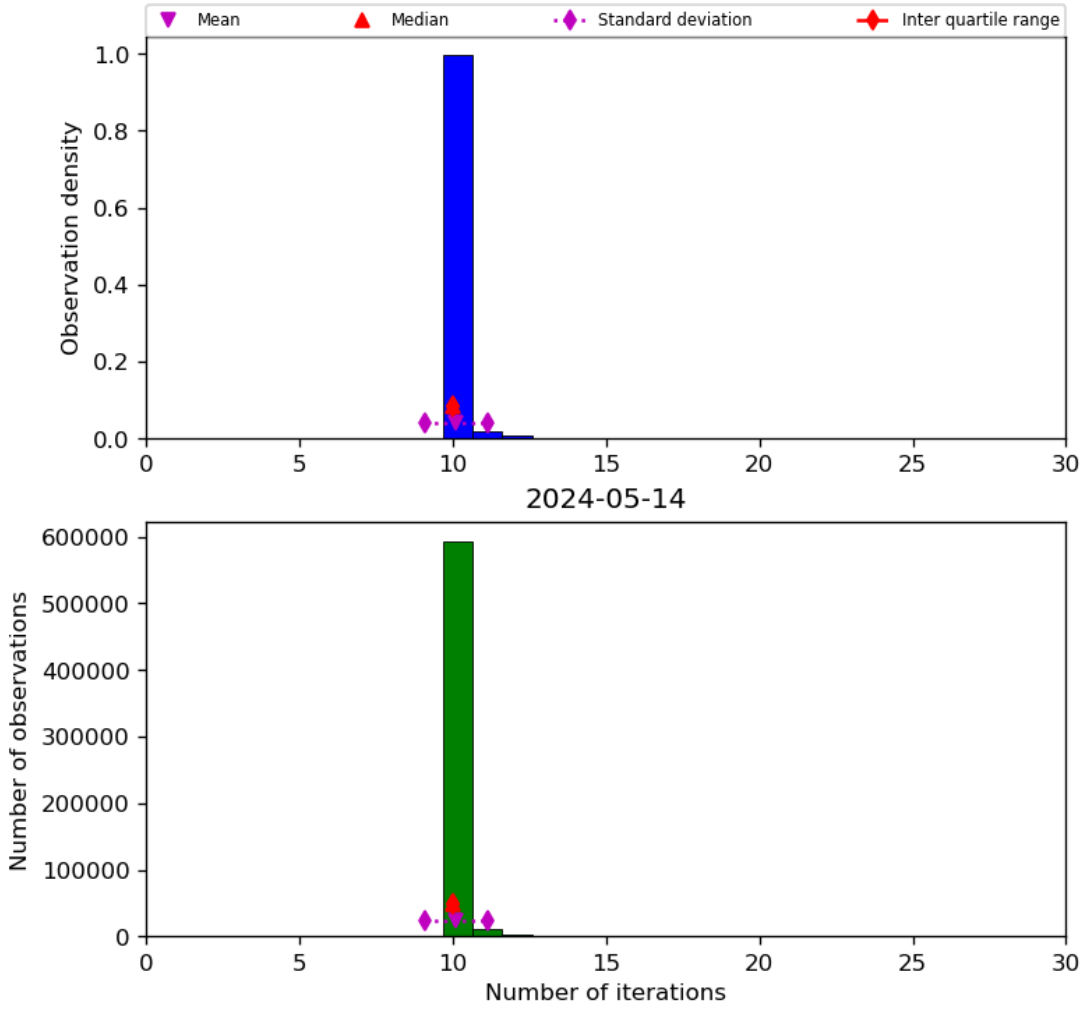


Figure 31: Histogram of “Number of iterations” for 2024-05-13 to 2024-05-15

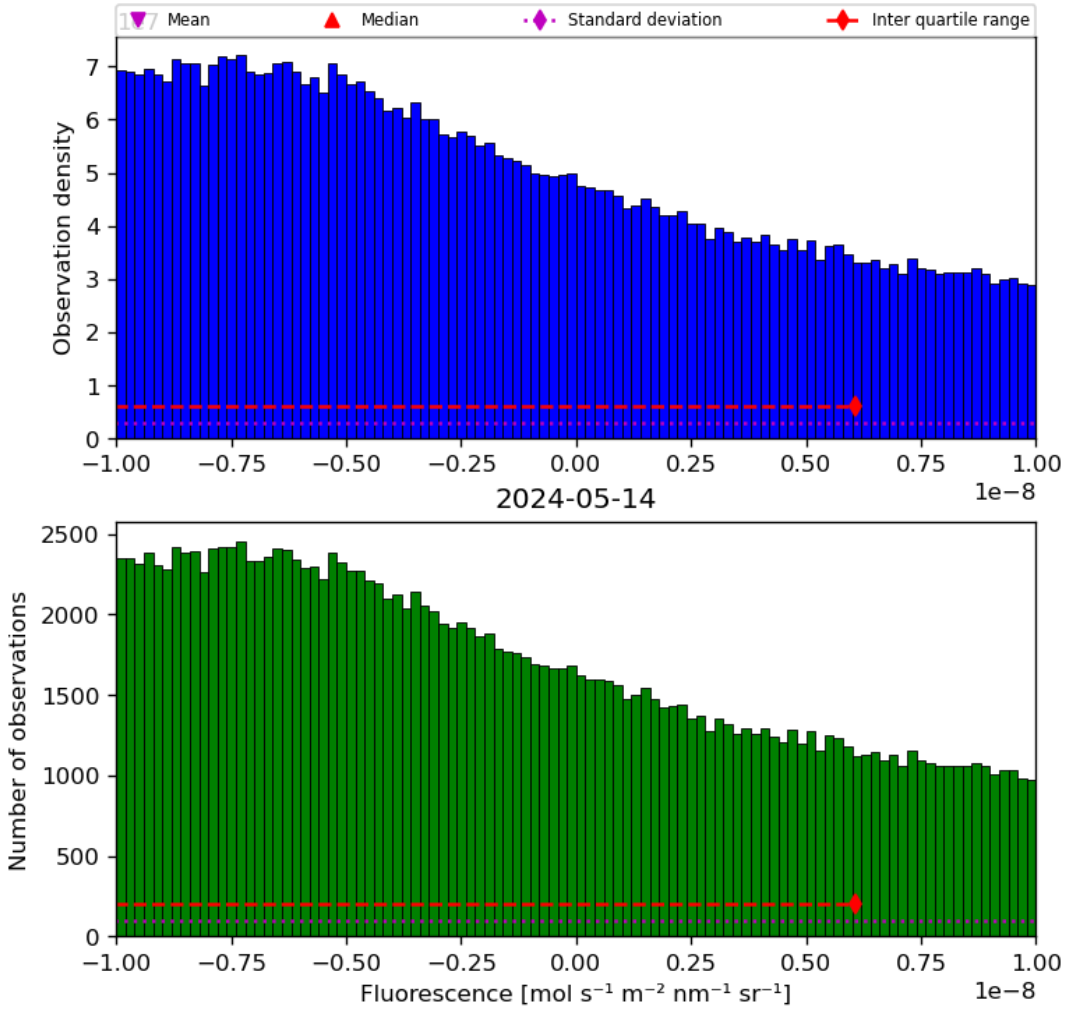


Figure 32: Histogram of “Fluorescence” for 2024-05-13 to 2024-05-15

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.

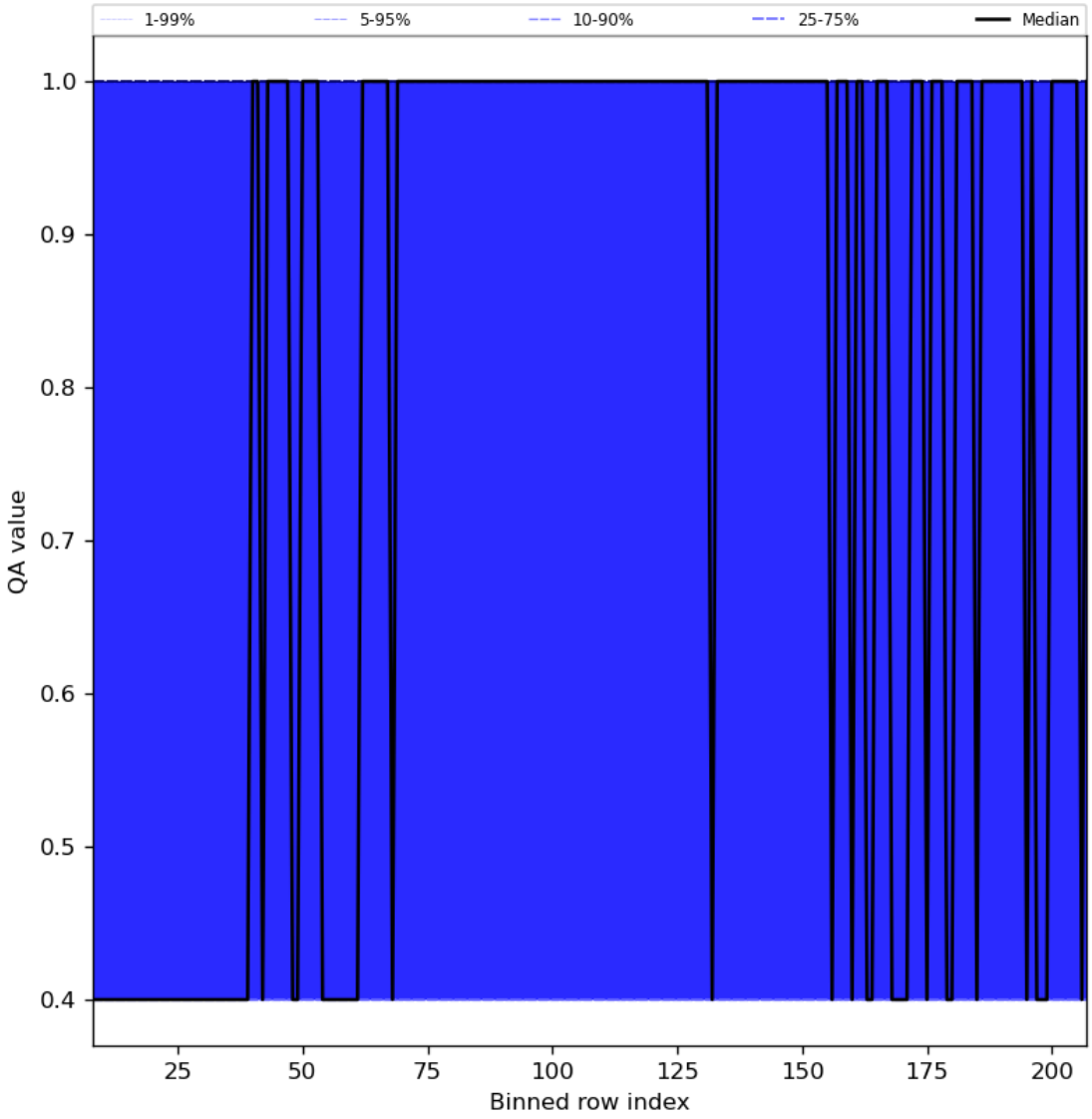


Figure 33: Along track statistics of “QA value” for 2024-05-13 to 2024-05-15

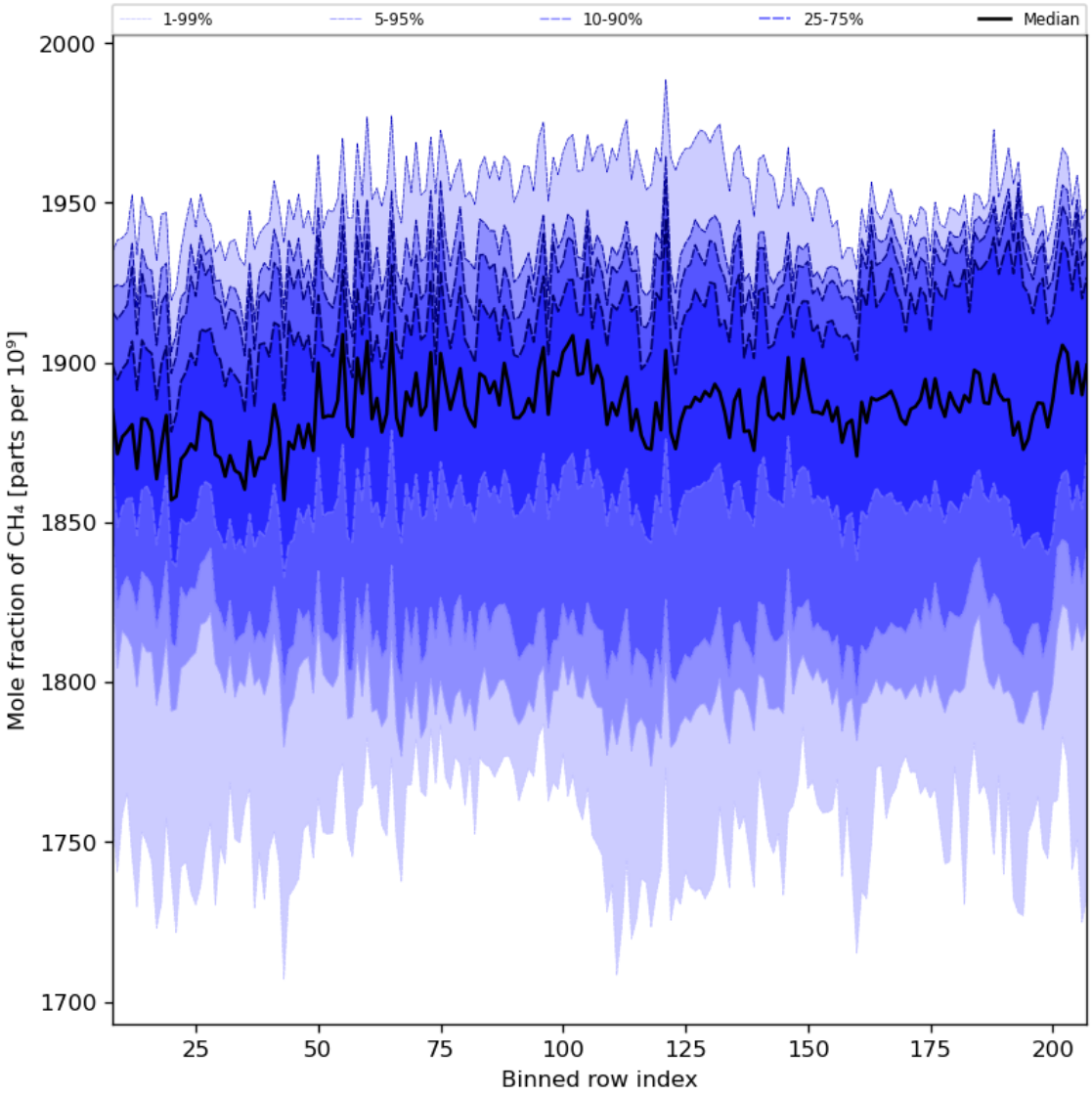


Figure 34: Along track statistics of “Mole fraction of CH_4” for 2024-05-13 to 2024-05-15

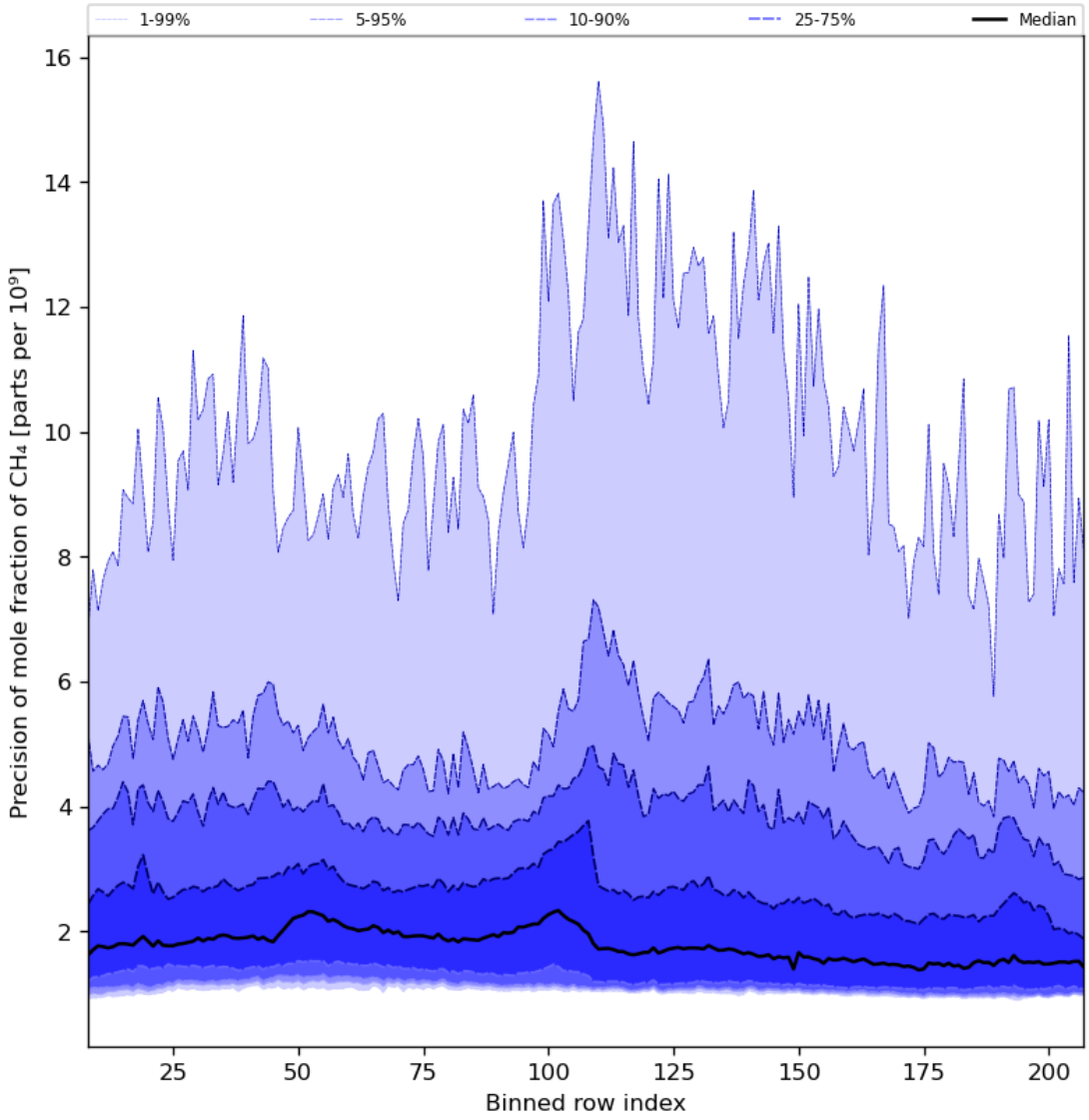


Figure 35: Along track statistics of “Precision of mole fraction of CH_4” for 2024-05-13 to 2024-05-15

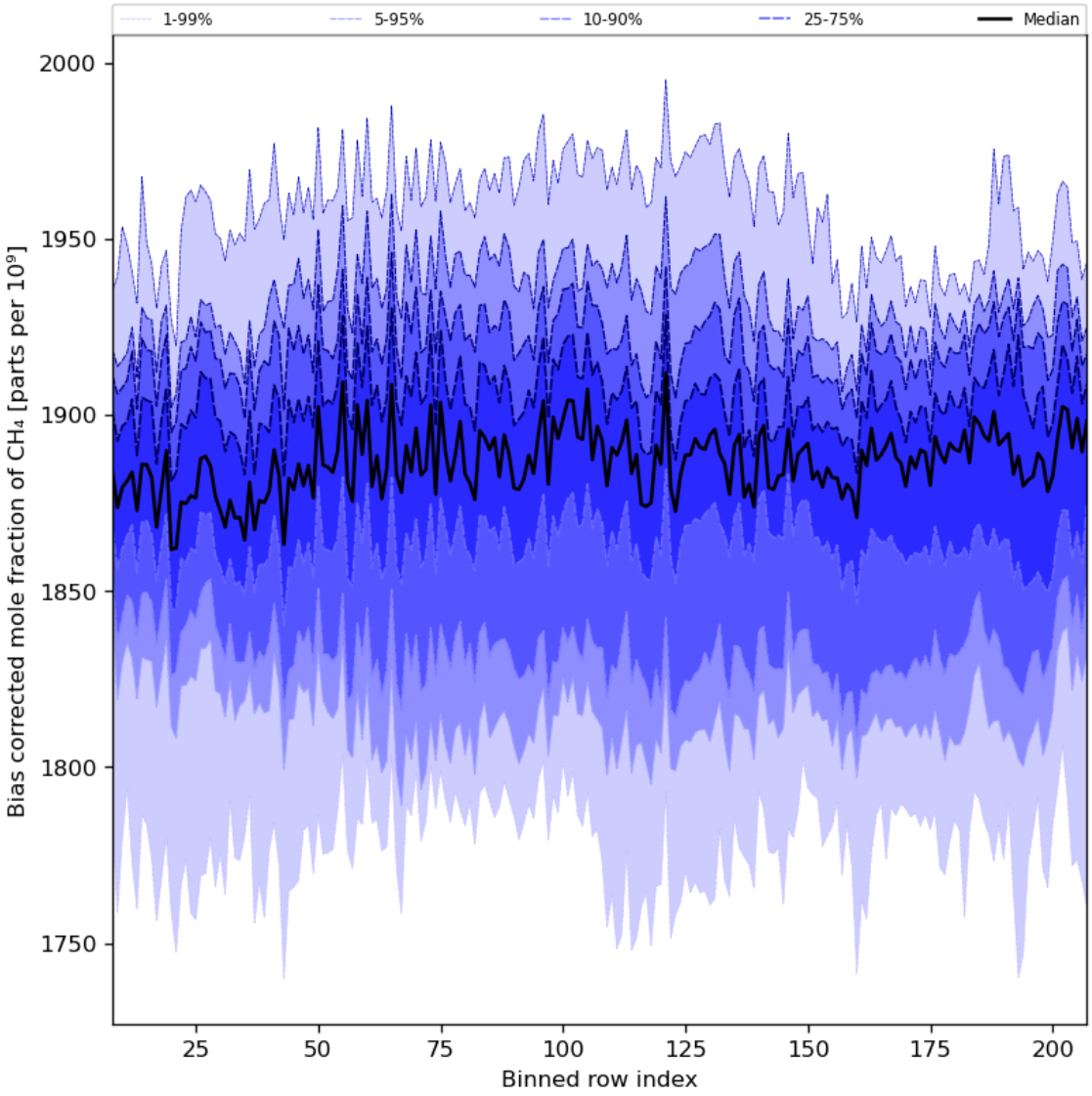


Figure 36: Along track statistics of “Bias corrected mole fraction of CH_4” for 2024-05-13 to 2024-05-15

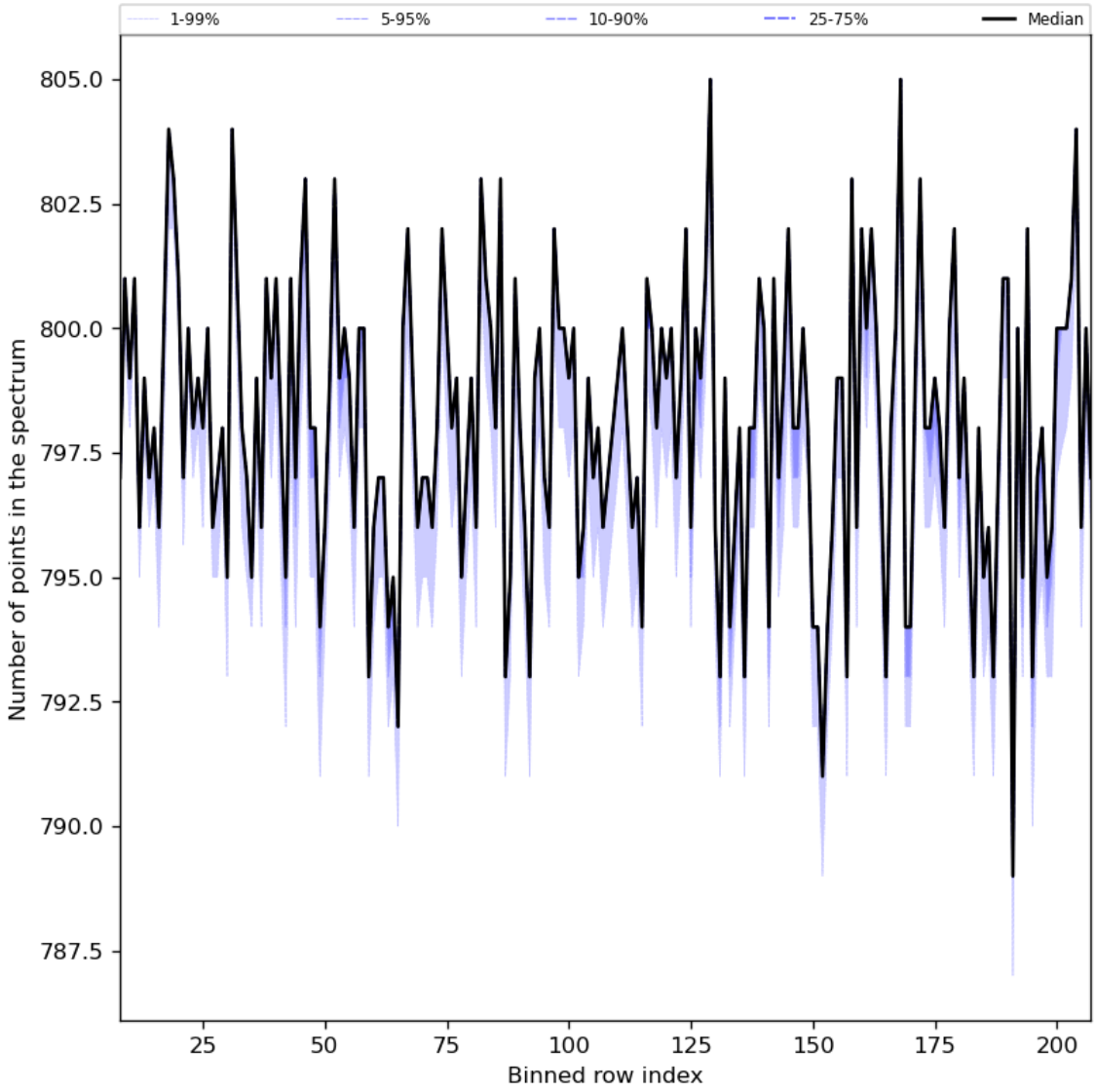


Figure 37: Along track statistics of “Number of points in the spectrum” for 2024-05-13 to 2024-05-15

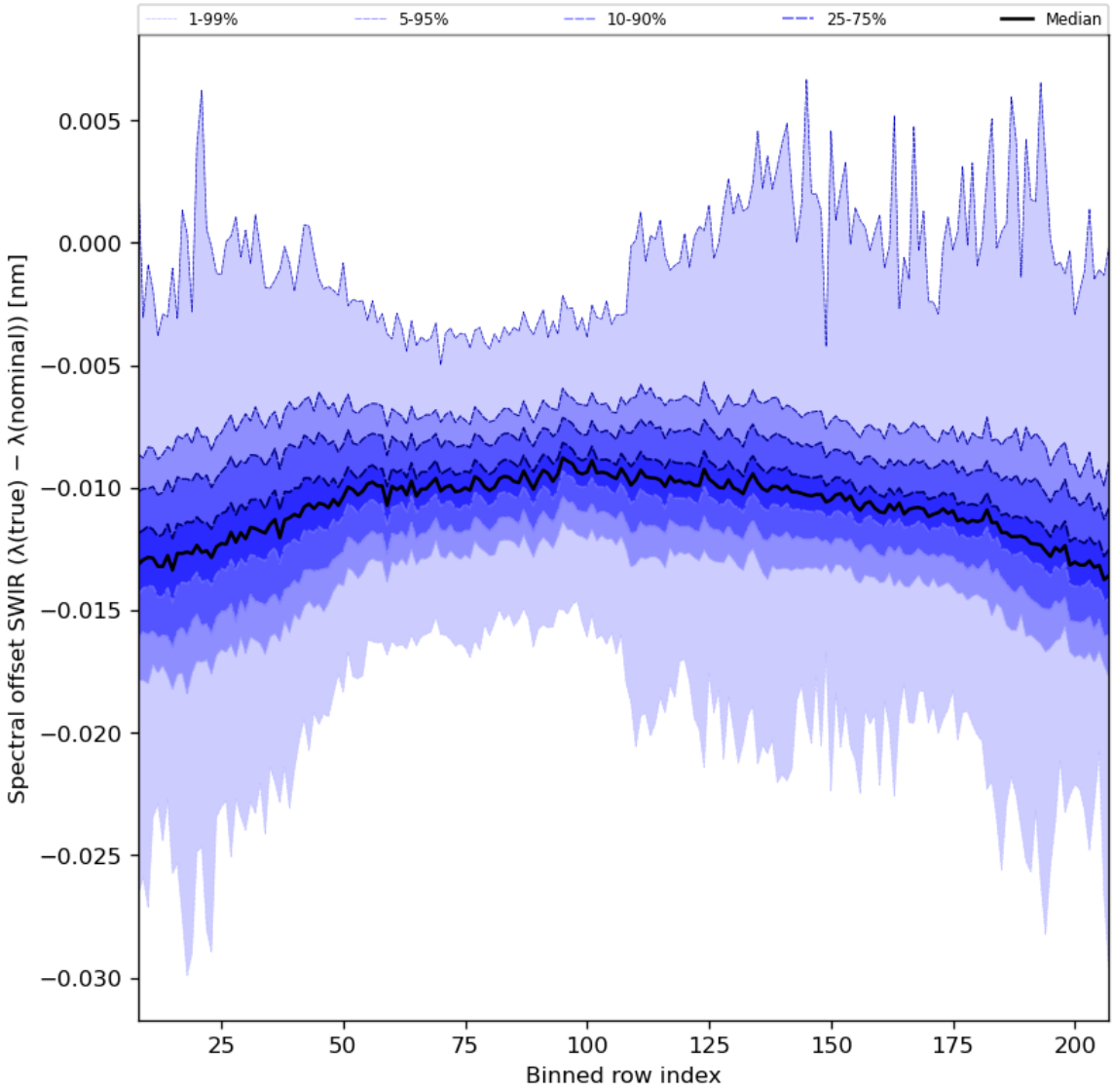


Figure 38: Along track statistics of “Spectral offset SWIR (λ(true) − λ(nominal))” for 2024-05-13 to 2024-05-15

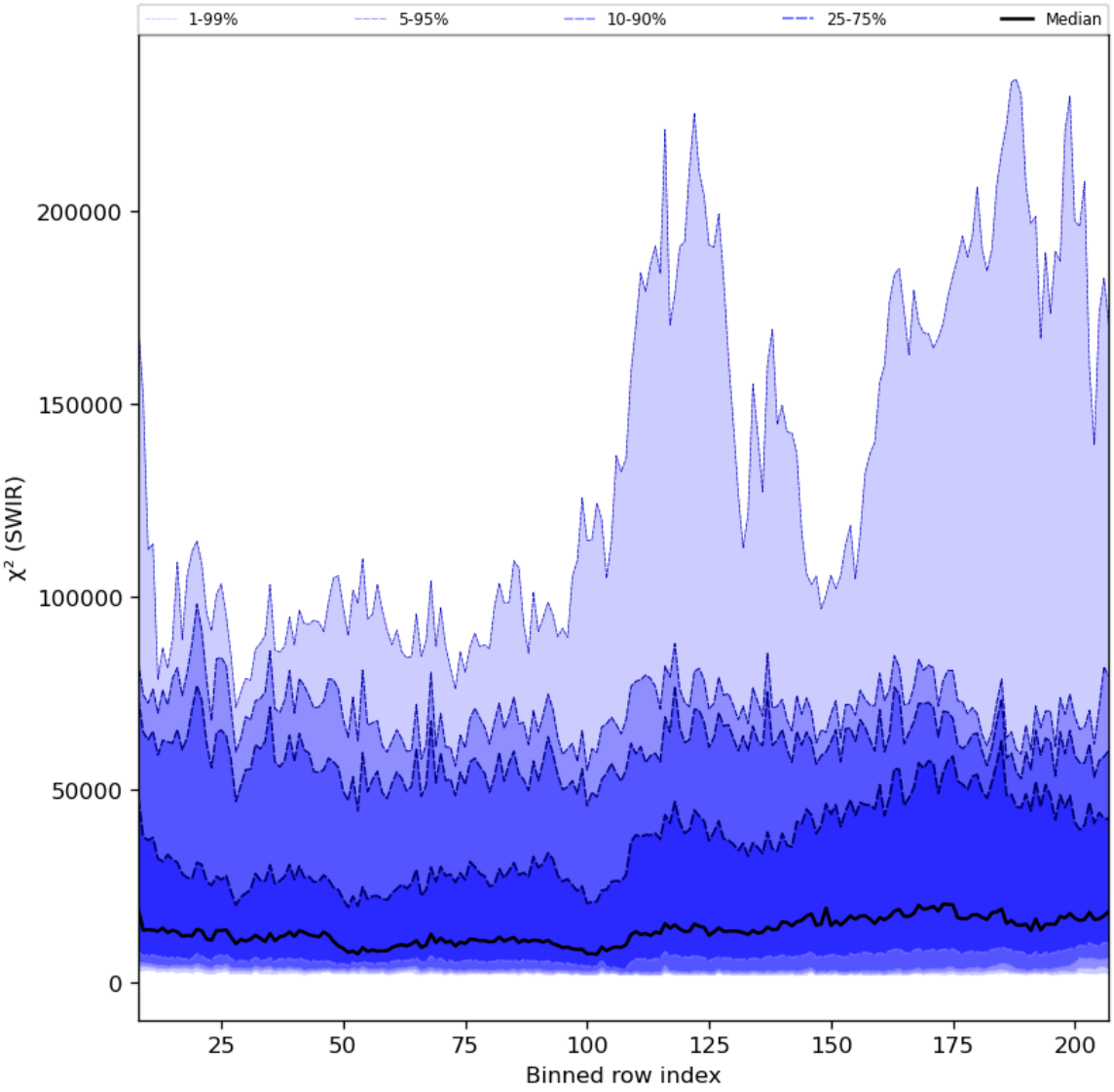


Figure 39: Along track statistics of "χ^2 (SWIR)" for 2024-05-13 to 2024-05-15

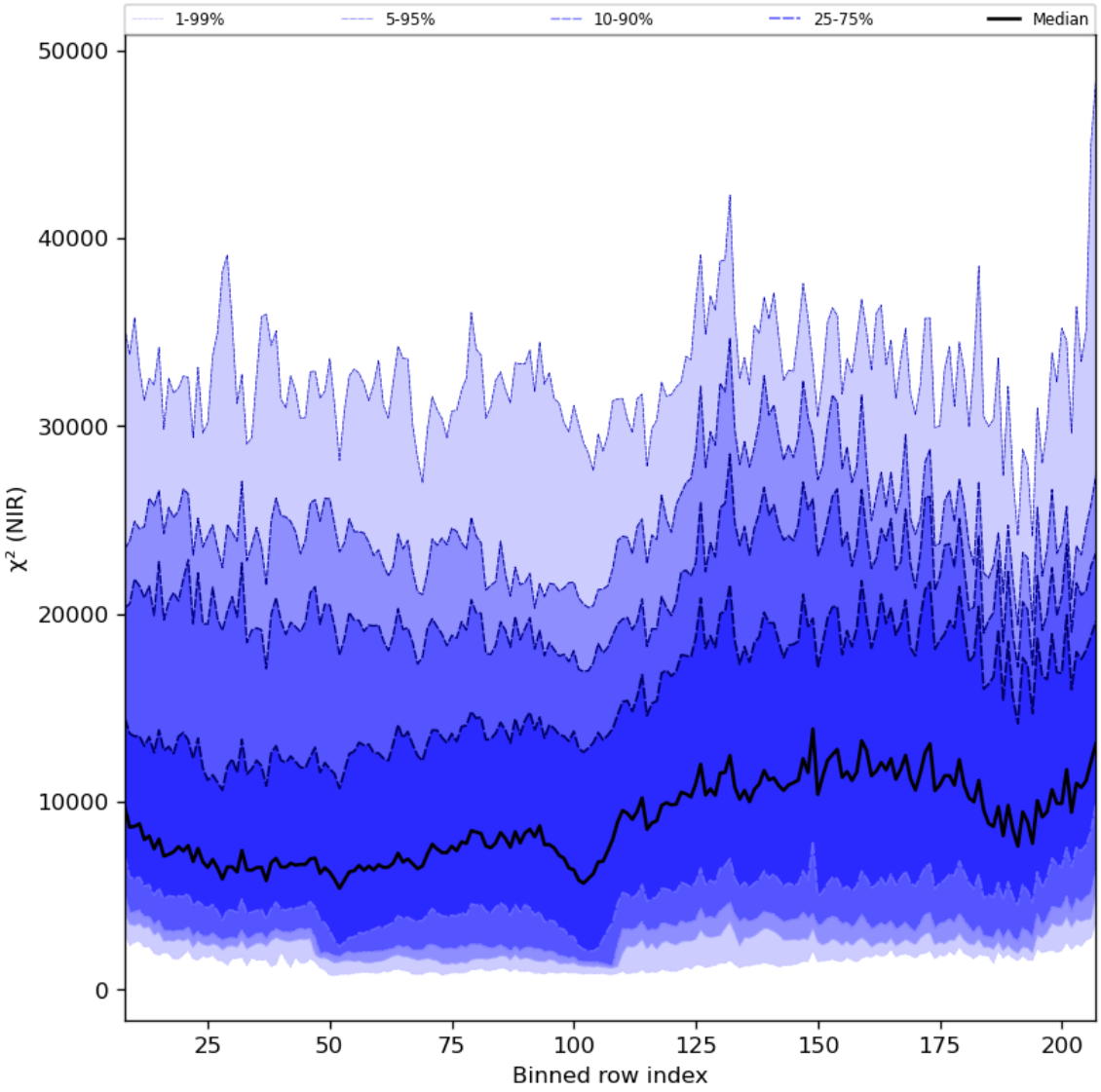


Figure 40: Along track statistics of "χ^2 (NIR)" for 2024-05-13 to 2024-05-15

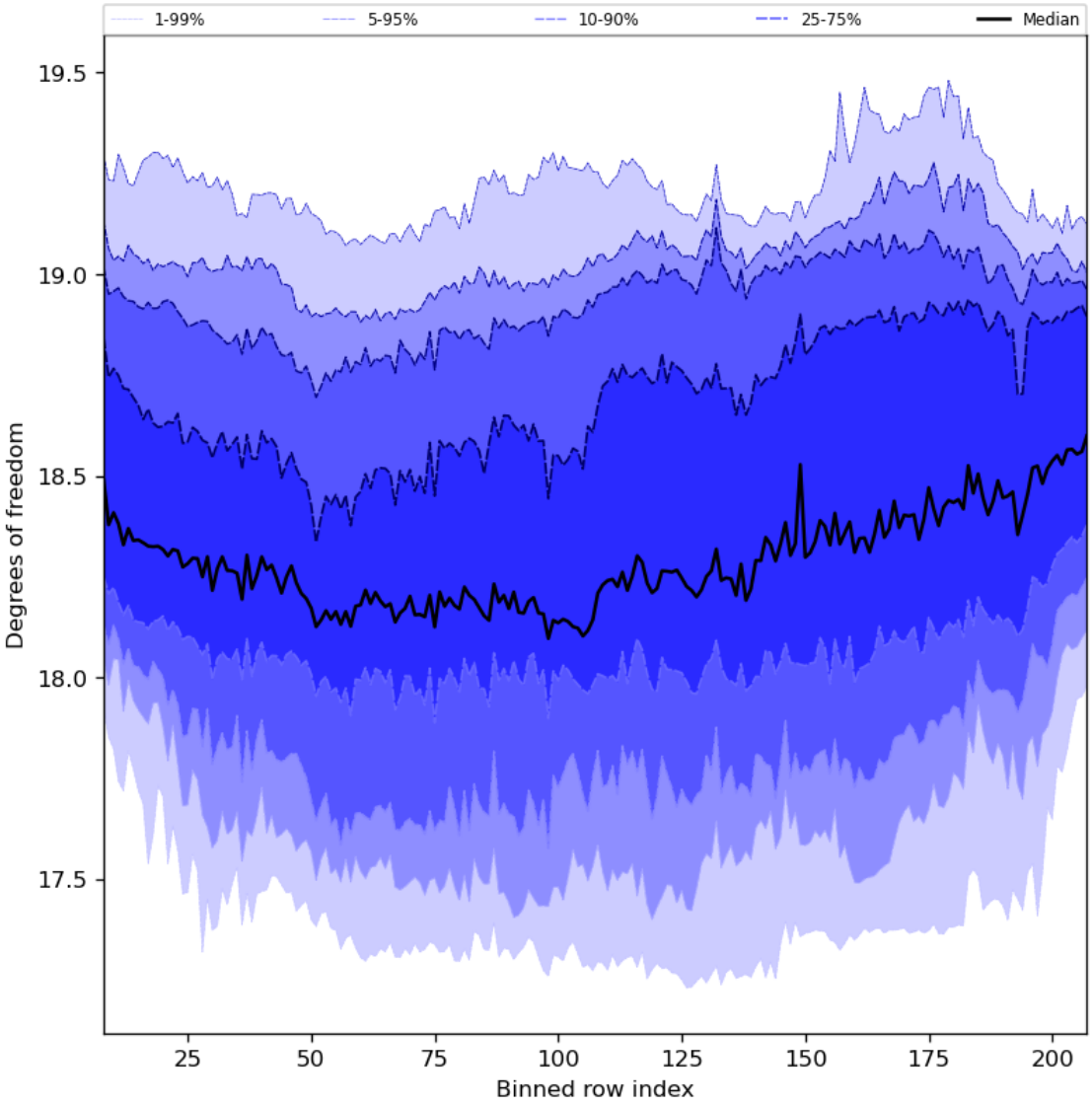


Figure 41: Along track statistics of “Degrees of freedom” for 2024-05-13 to 2024-05-15

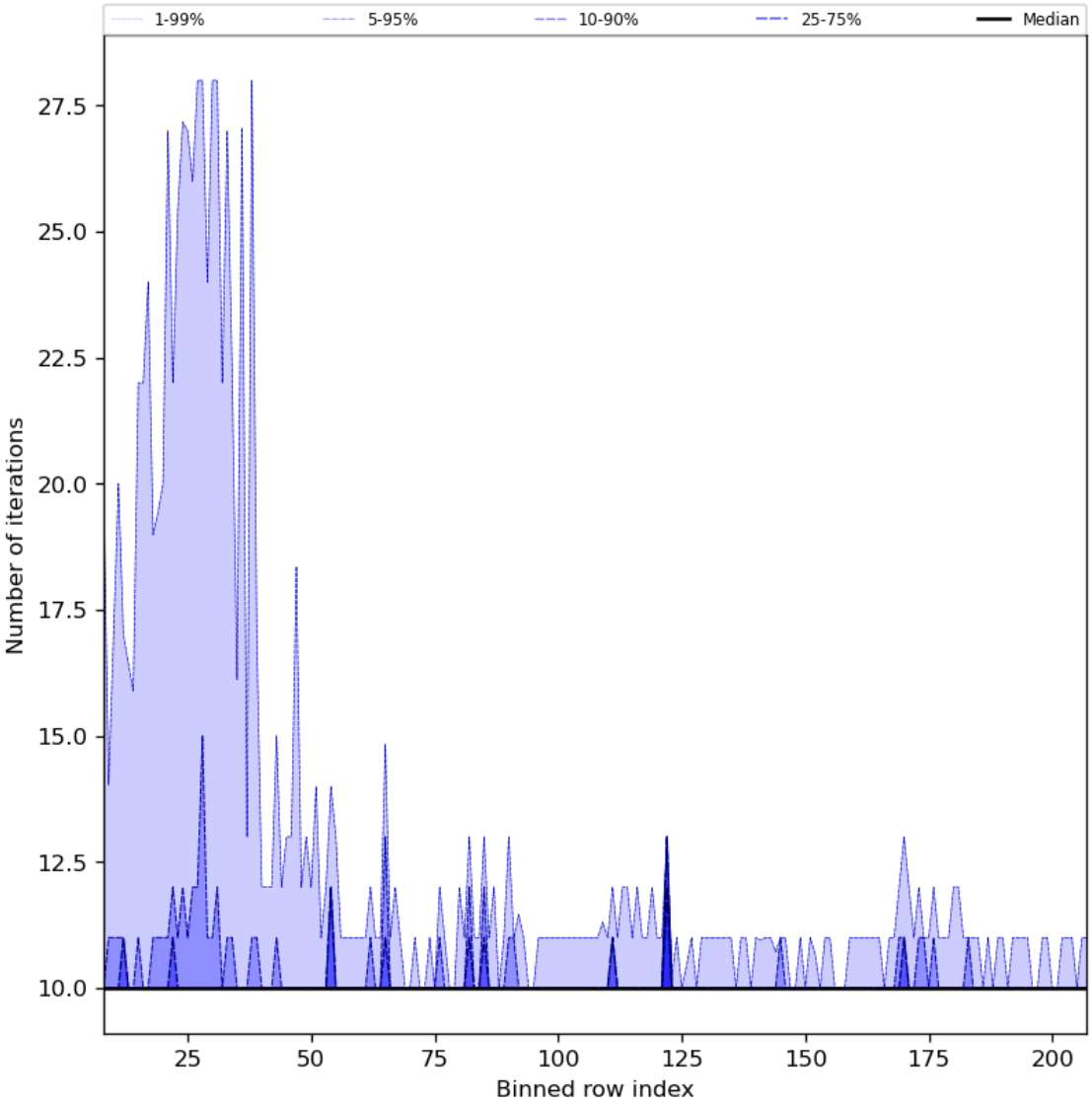


Figure 42: Along track statistics of “Number of iterations” for 2024-05-13 to 2024-05-15

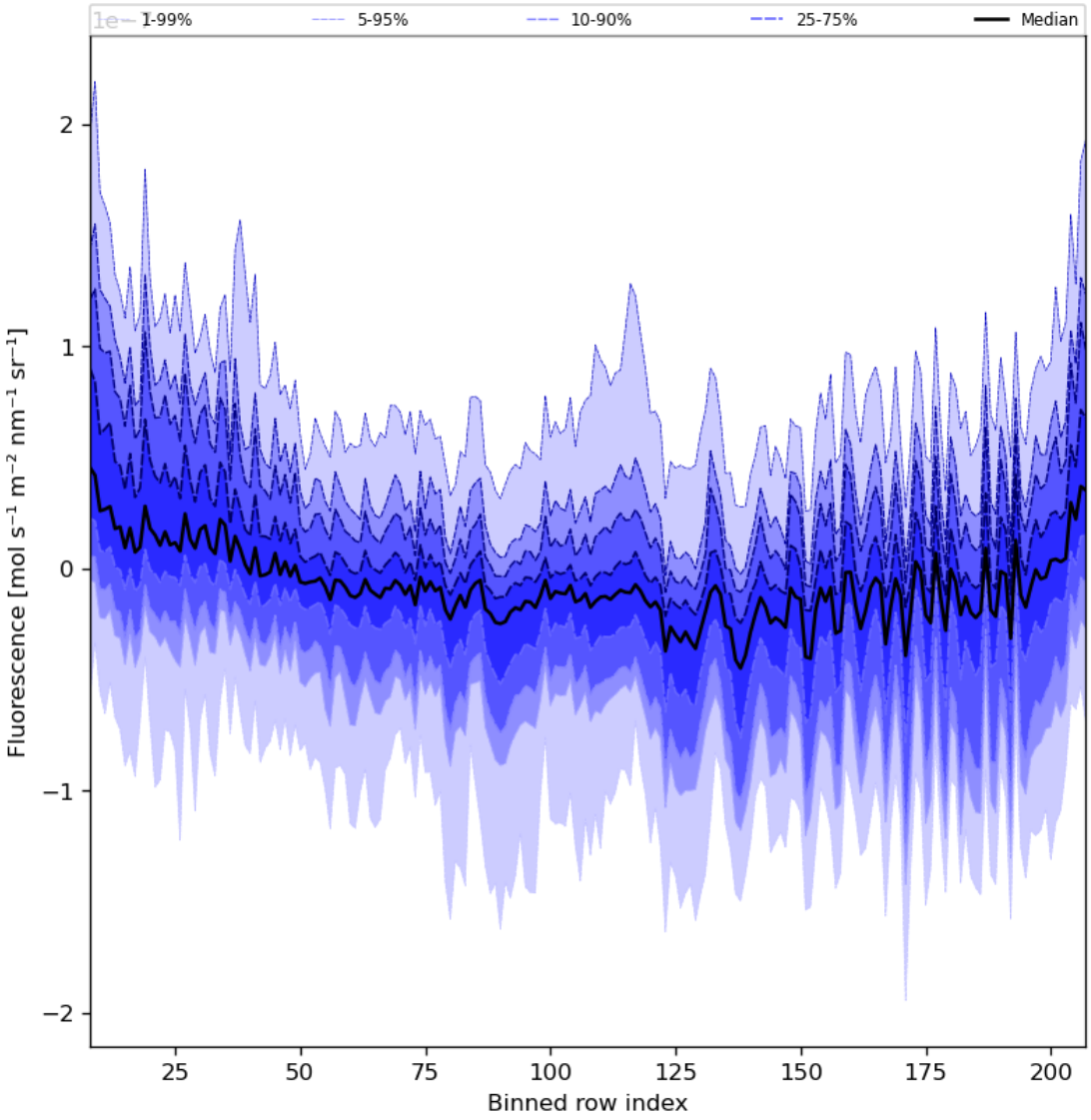


Figure 43: Along track statistics of “Fluorescence” for 2024-05-13 to 2024-05-15

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.

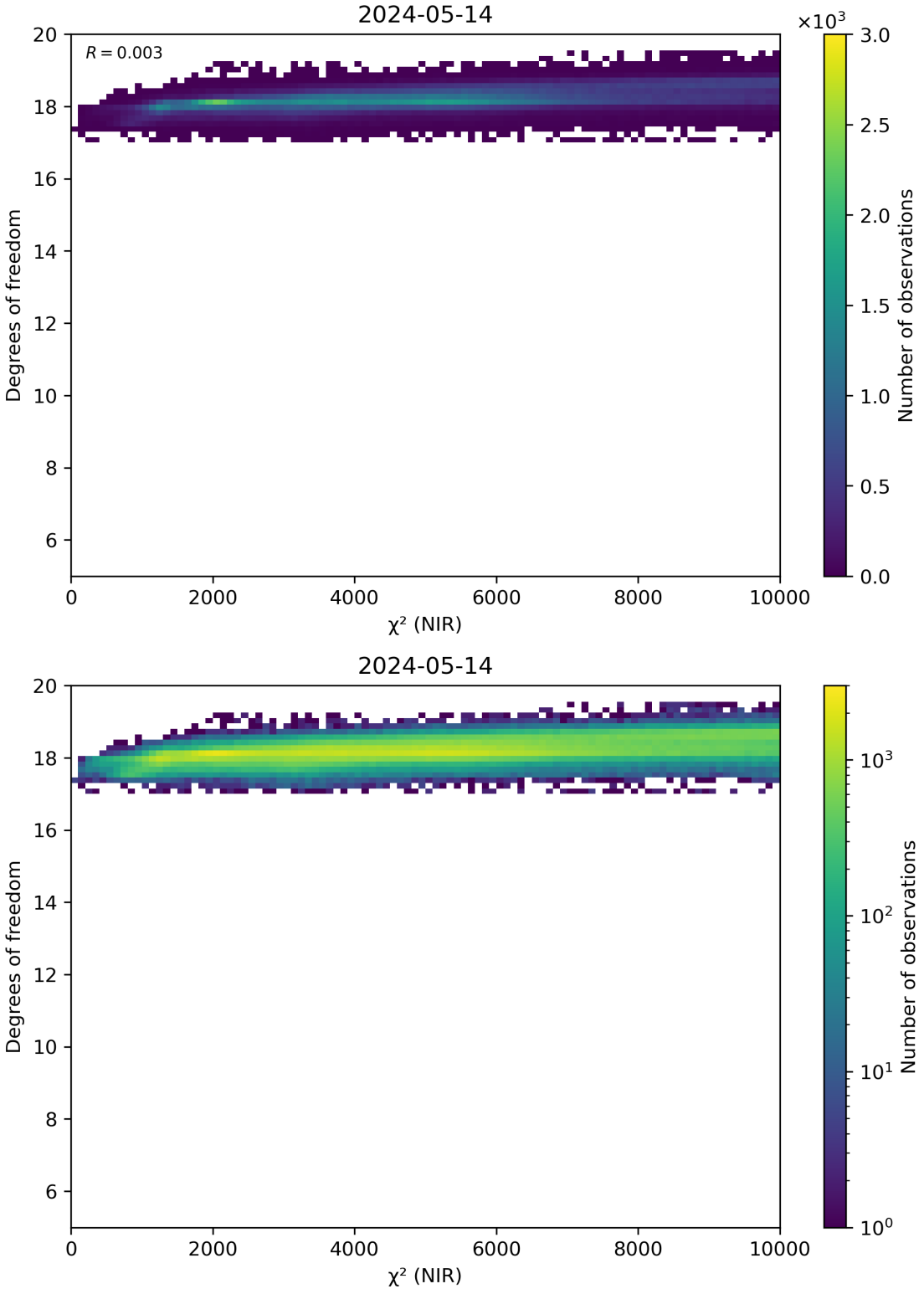


Figure 44: Scatter density plot of "χ^2 (NIR)" against "Degrees of freedom" for 2024-05-13 to 2024-05-15.

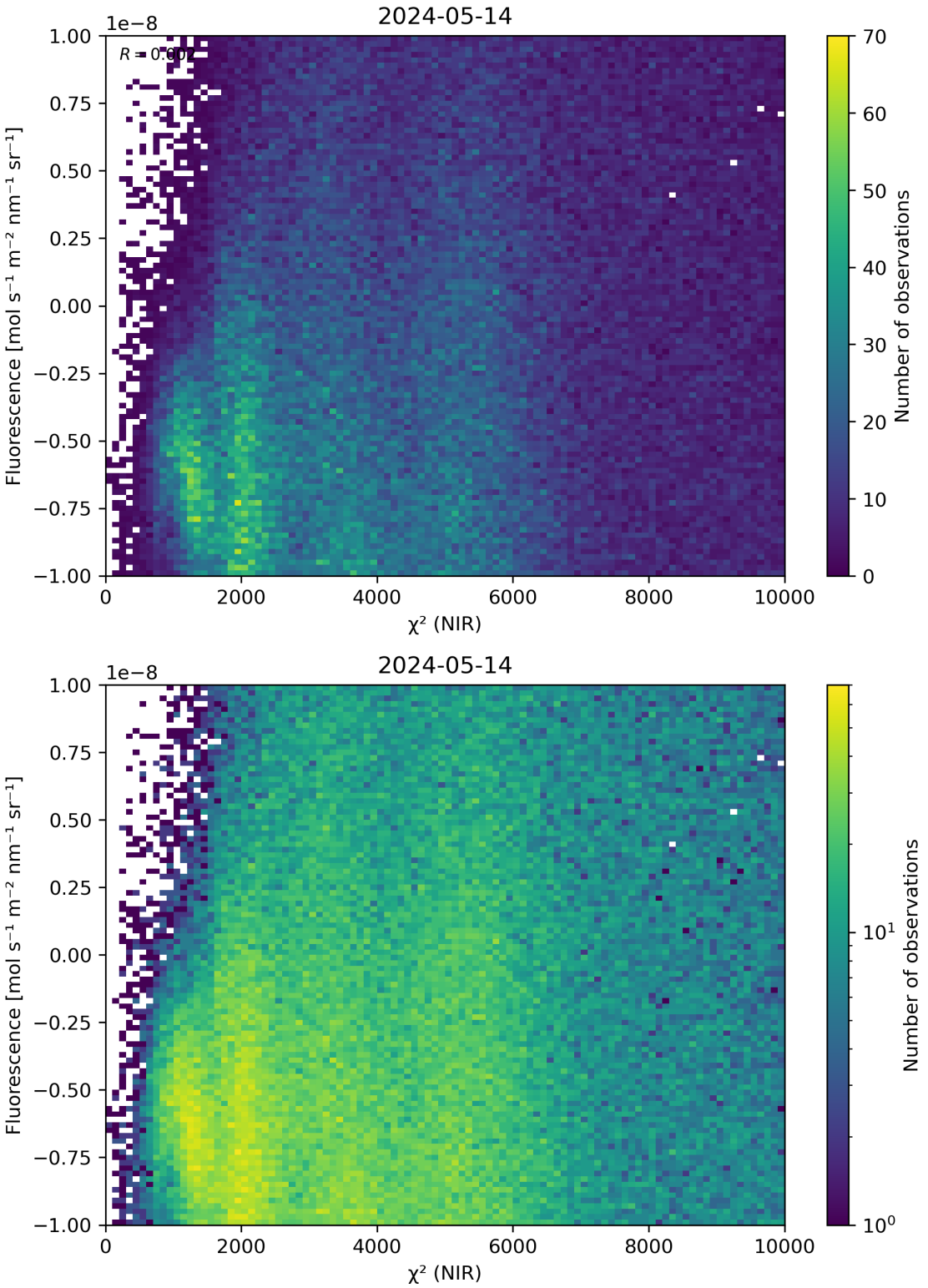


Figure 45: Scatter density plot of "χ^2 (NIR)" against "Fluorescence" for 2024-05-13 to 2024-05-15.

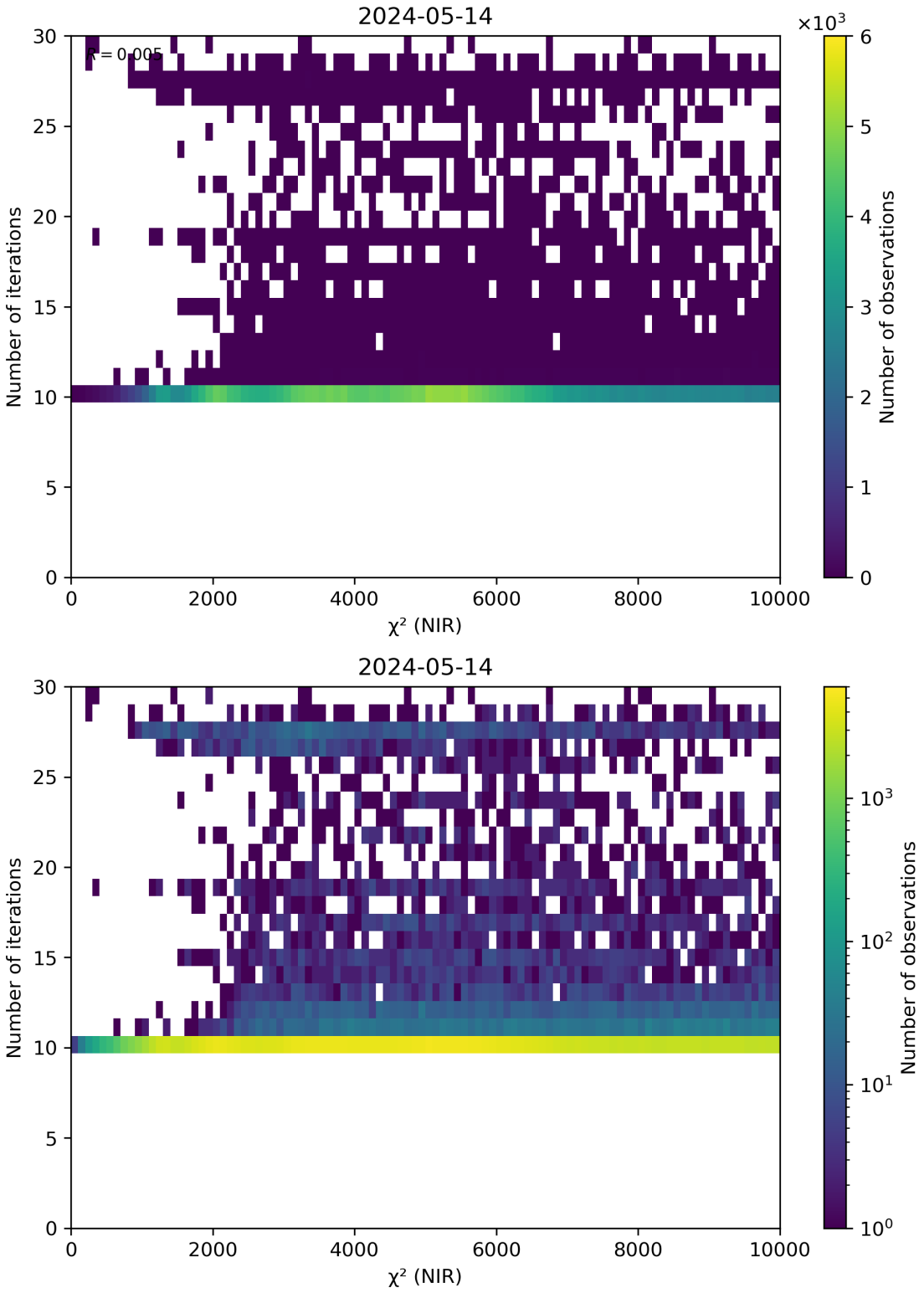


Figure 46: Scatter density plot of "χ^2 (NIR)" against "Number of iterations" for 2024-05-13 to 2024-05-15.

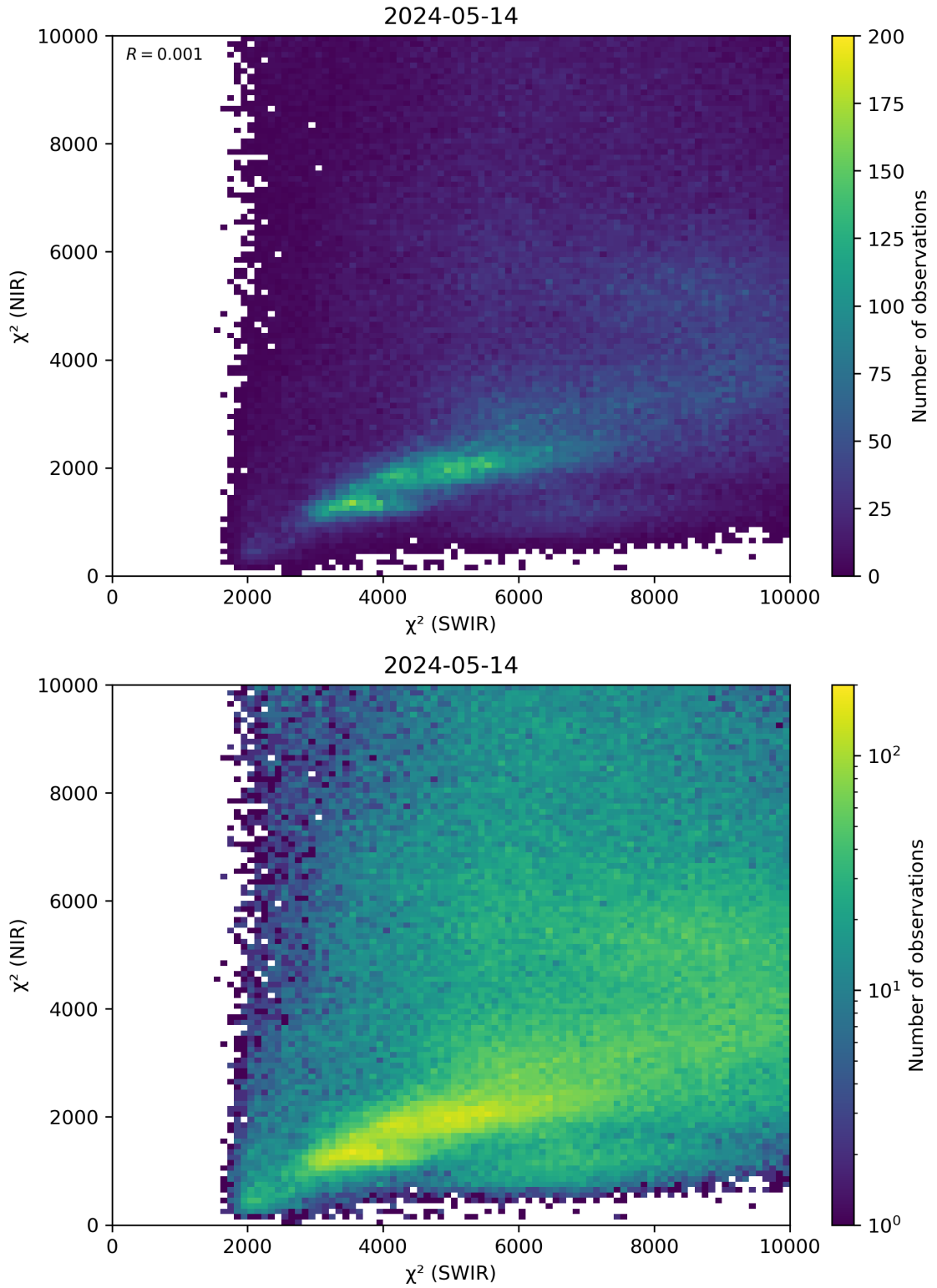


Figure 47: Scatter density plot of "χ^2 (SWIR)" against "χ^2 (NIR)" for 2024-05-13 to 2024-05-15.

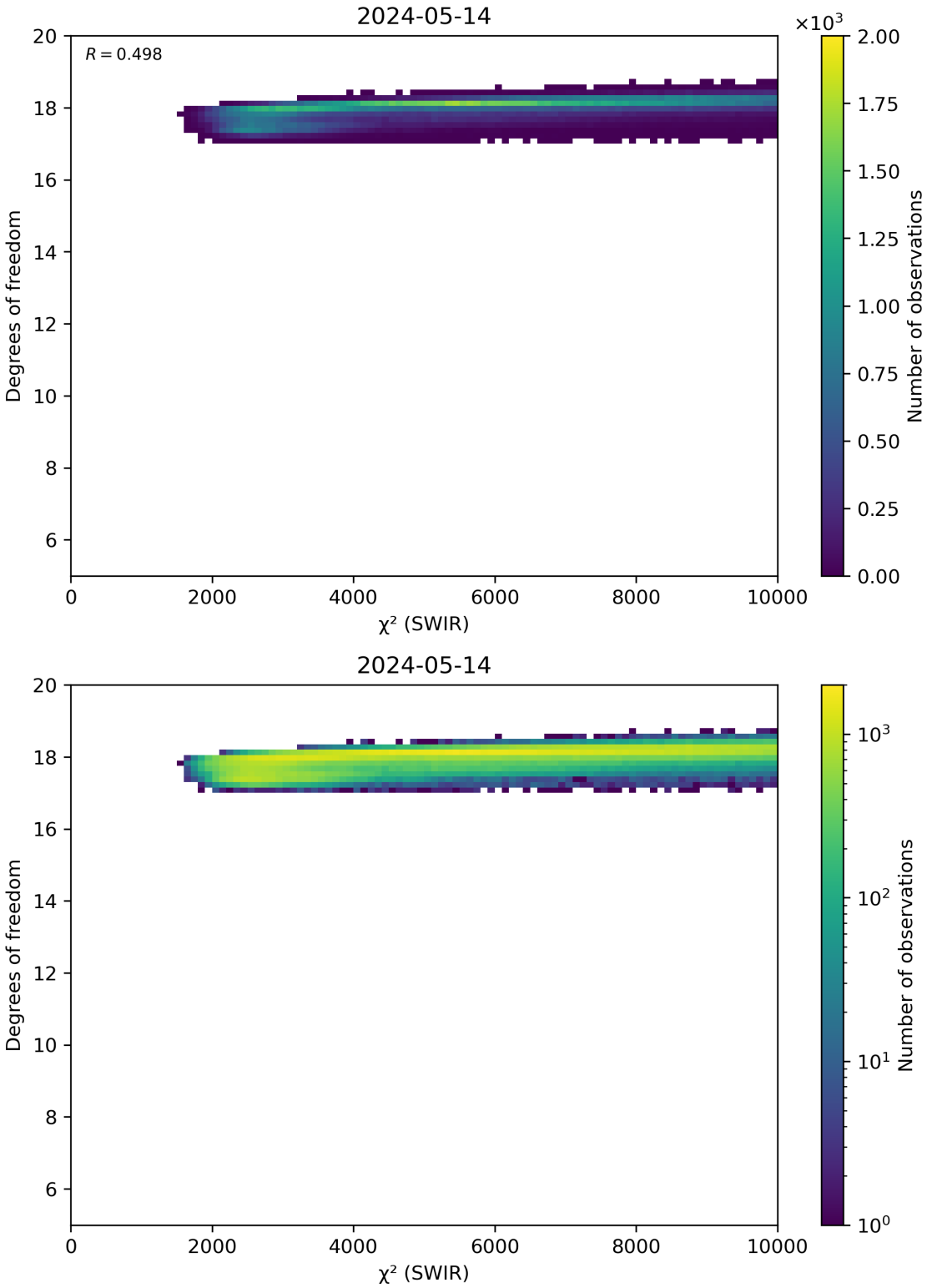


Figure 48: Scatter density plot of "χ^2 (SWIR)" against "Degrees of freedom" for 2024-05-13 to 2024-05-15.

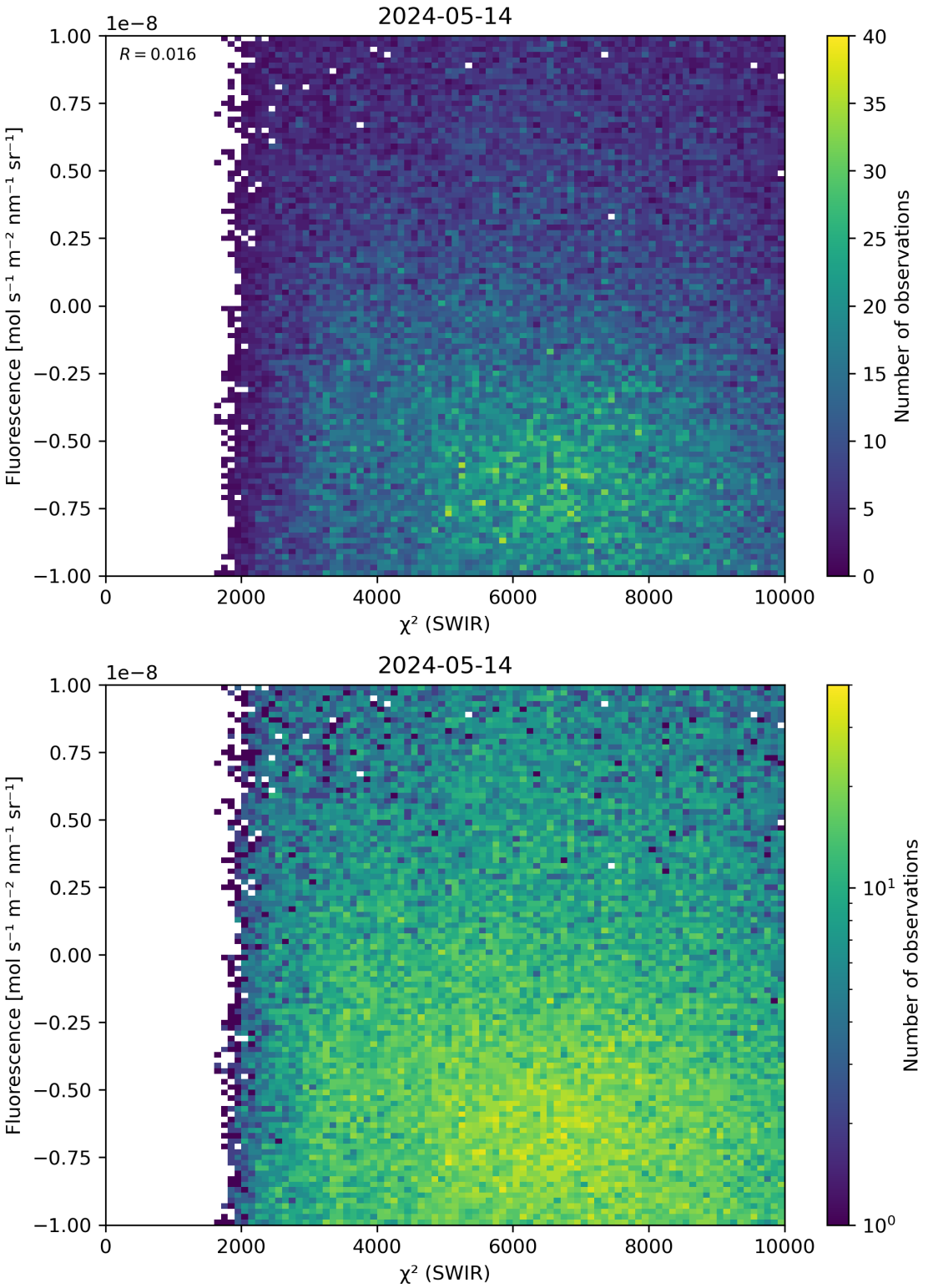


Figure 49: Scatter density plot of "χ^2 (SWIR)" against "Fluorescence" for 2024-05-13 to 2024-05-15.

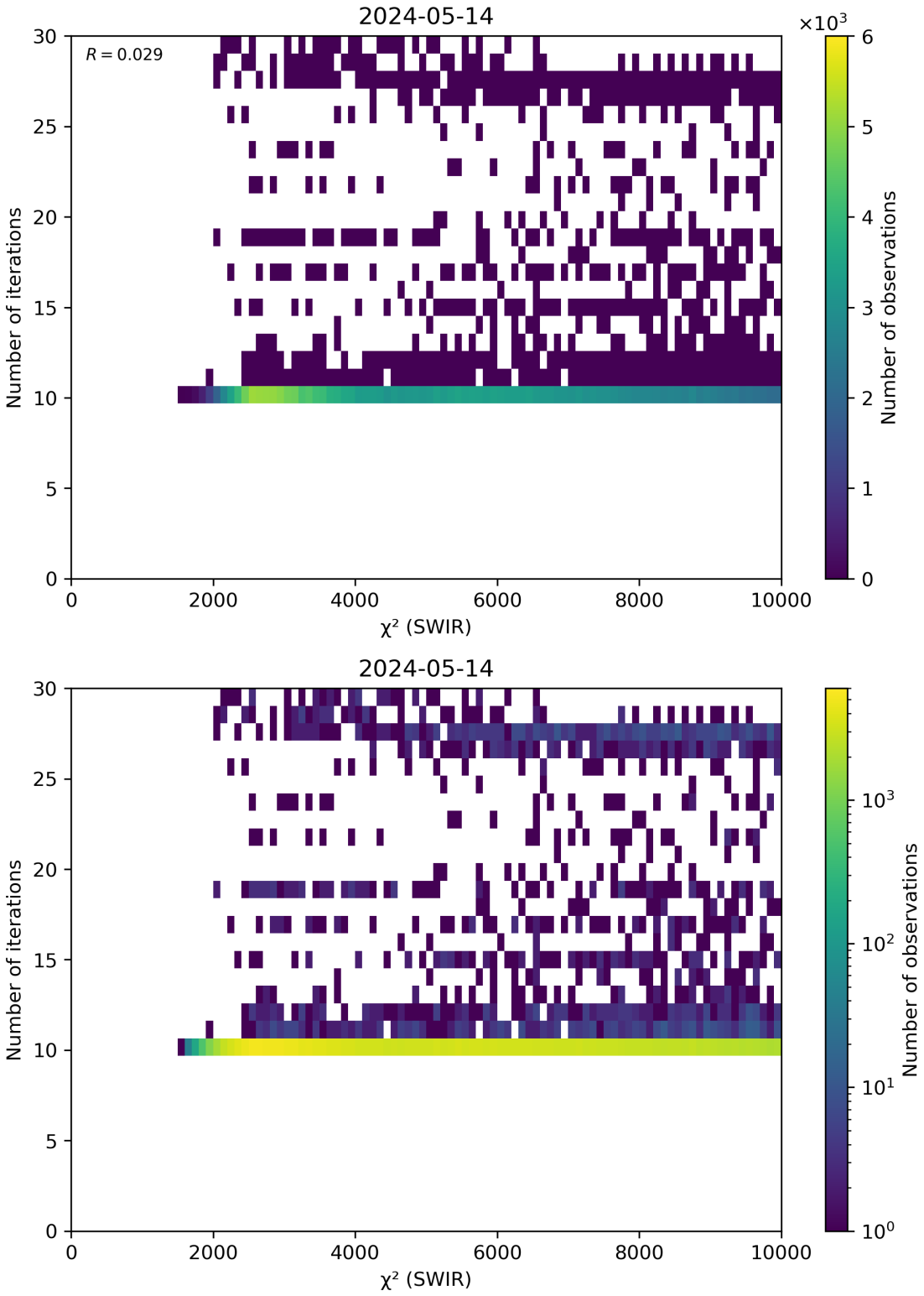


Figure 50: Scatter density plot of "χ^2 (SWIR)" against "Number of iterations" for 2024-05-13 to 2024-05-15.

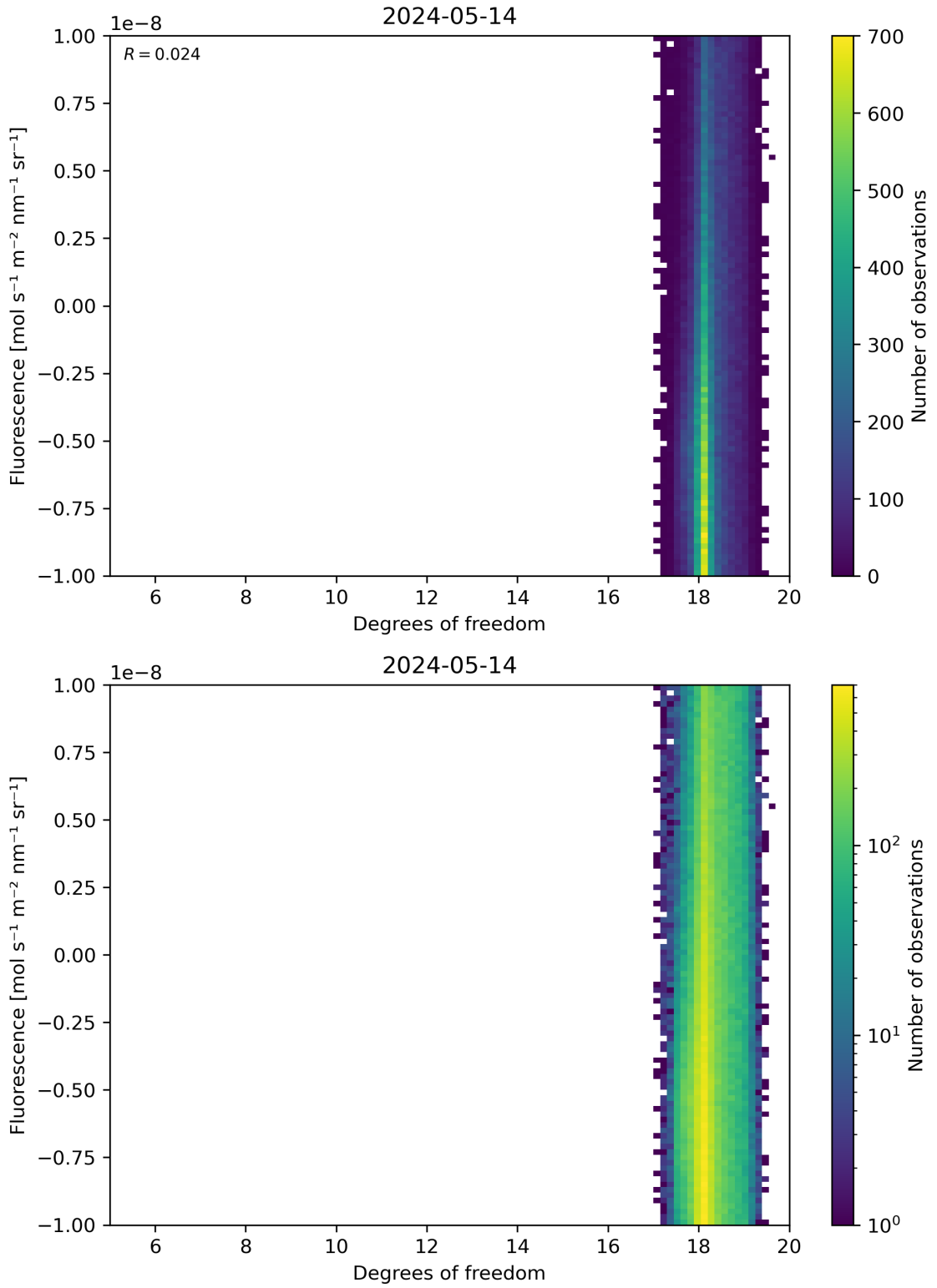


Figure 51: Scatter density plot of “Degrees of freedom” against “Fluorescence” for 2024-05-13 to 2024-05-15.

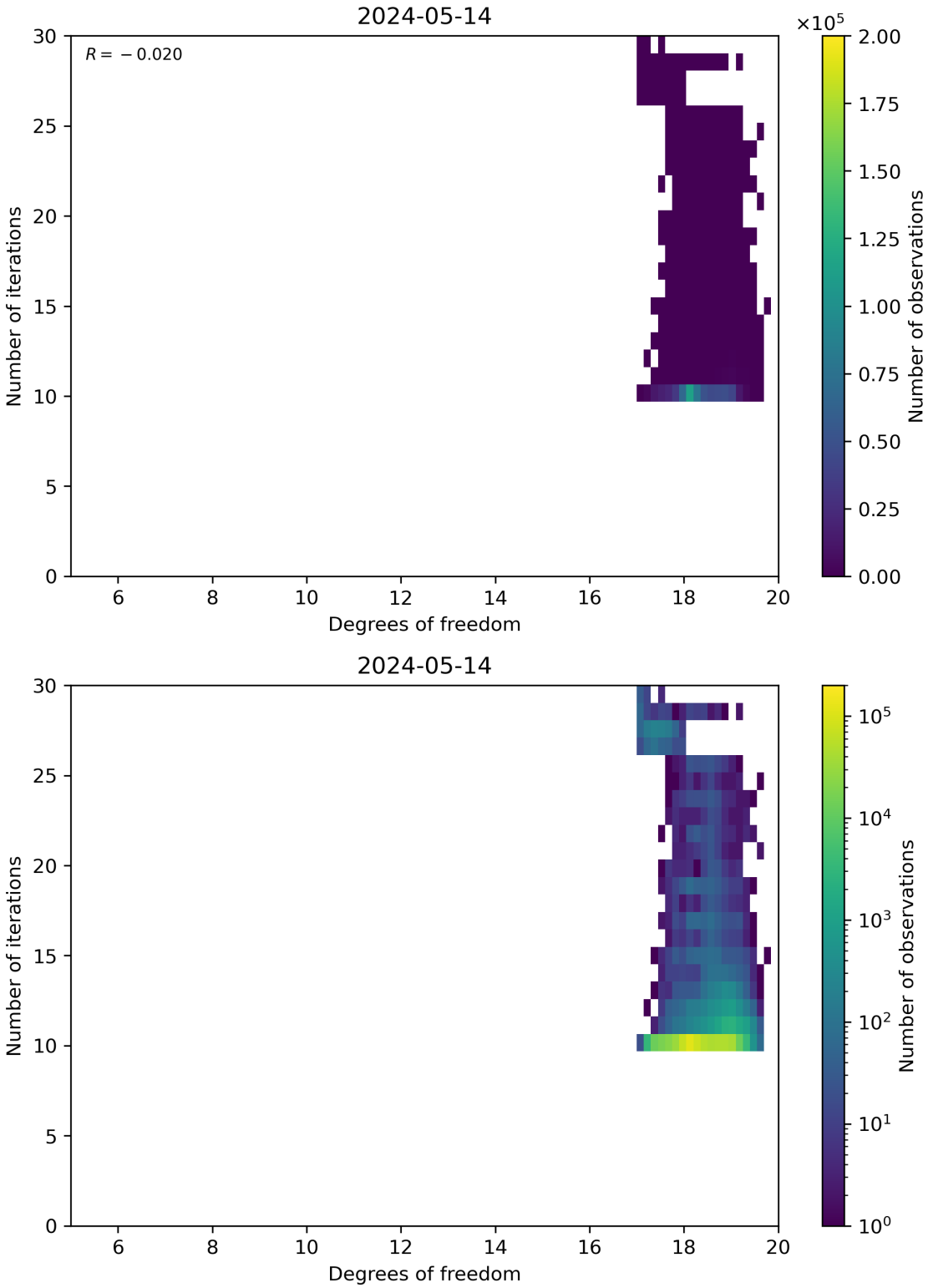


Figure 52: Scatter density plot of “Degrees of freedom” against “Number of iterations” for 2024-05-13 to 2024-05-15.

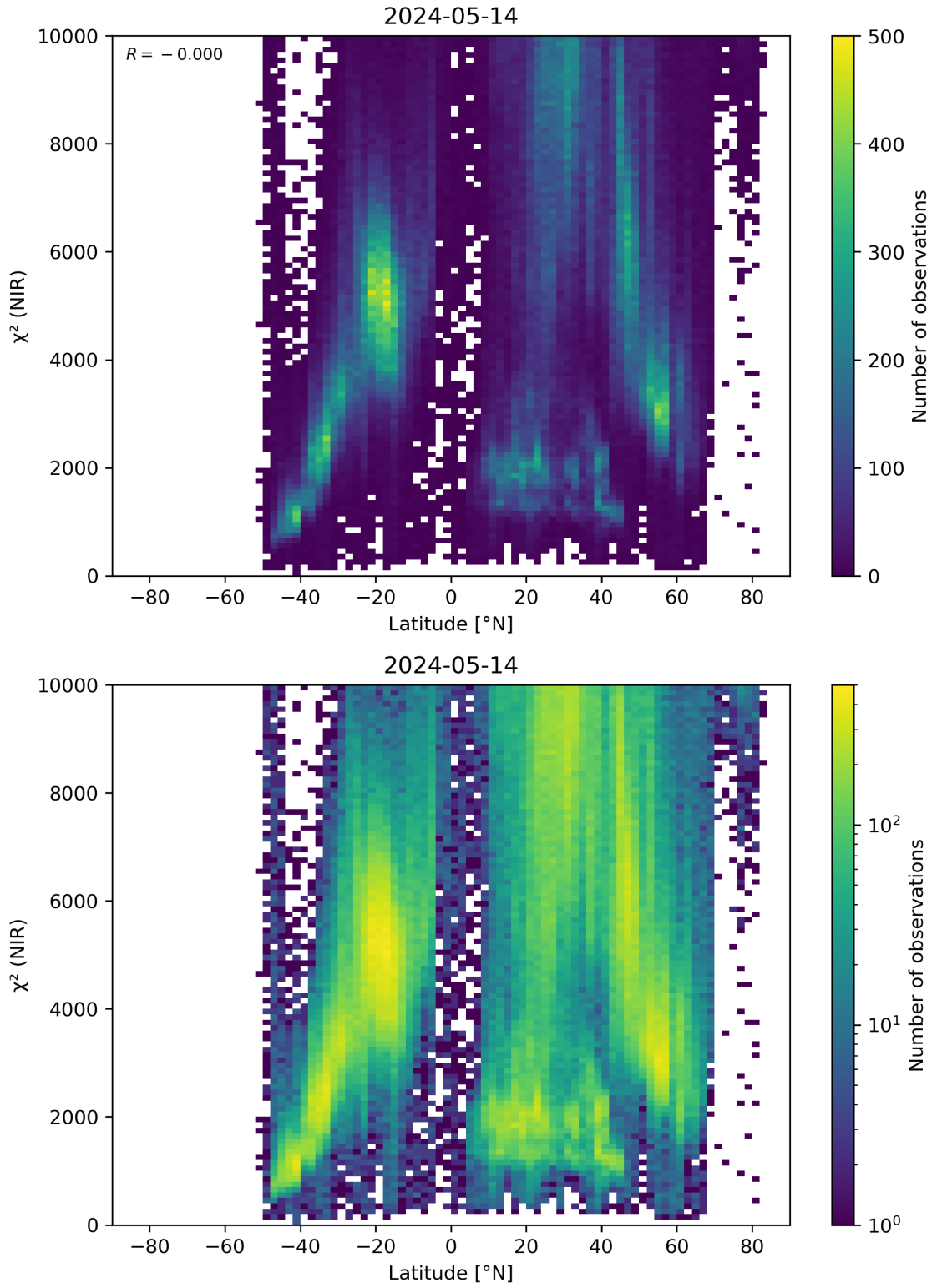


Figure 53: Scatter density plot of “Latitude” against “χ^2 (NIR)” for 2024-05-13 to 2024-05-15.

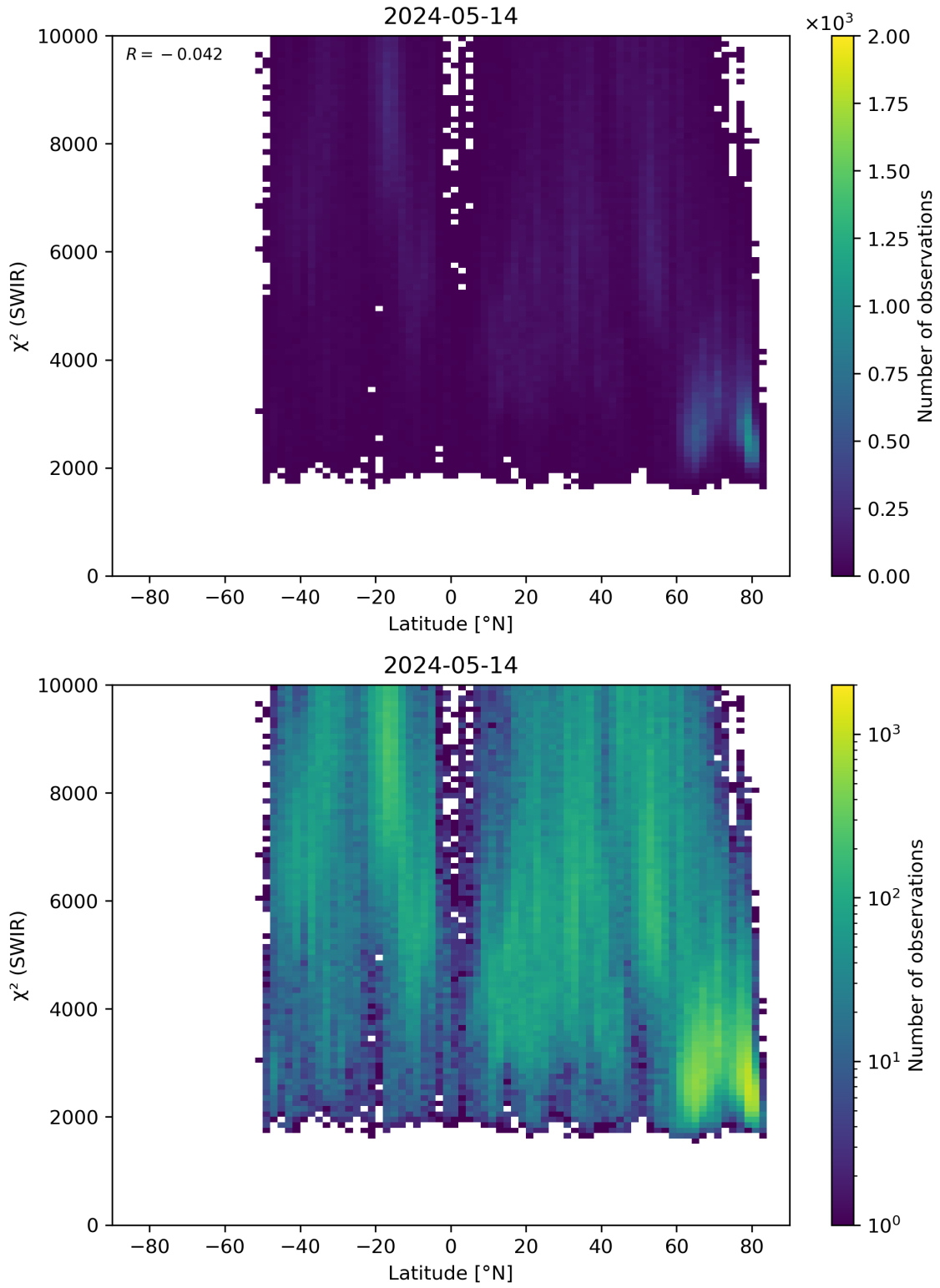


Figure 54: Scatter density plot of “Latitude” against “χ^2 (SWIR)” for 2024-05-13 to 2024-05-15.

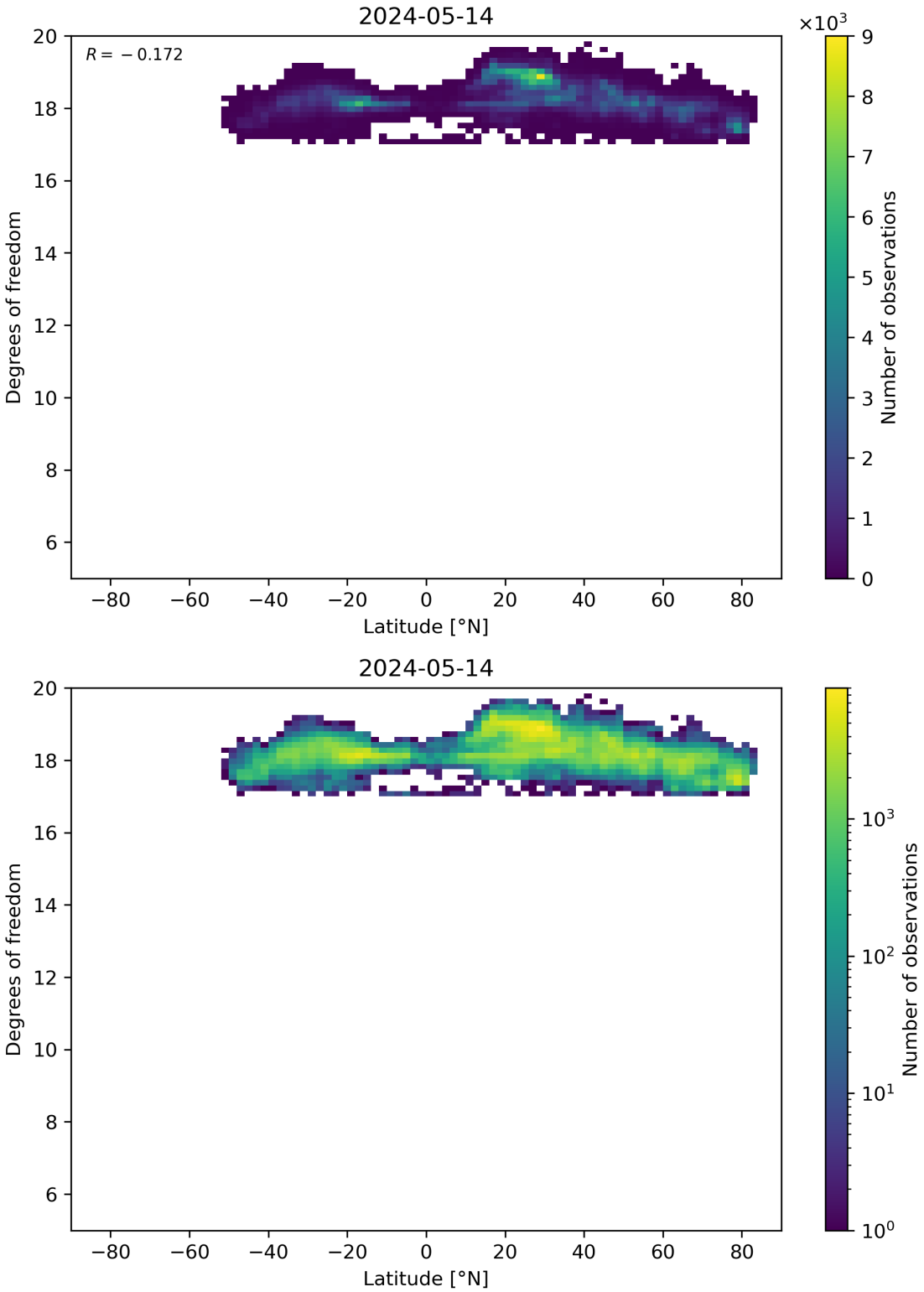


Figure 55: Scatter density plot of “Latitude” against “Degrees of freedom” for 2024-05-13 to 2024-05-15.

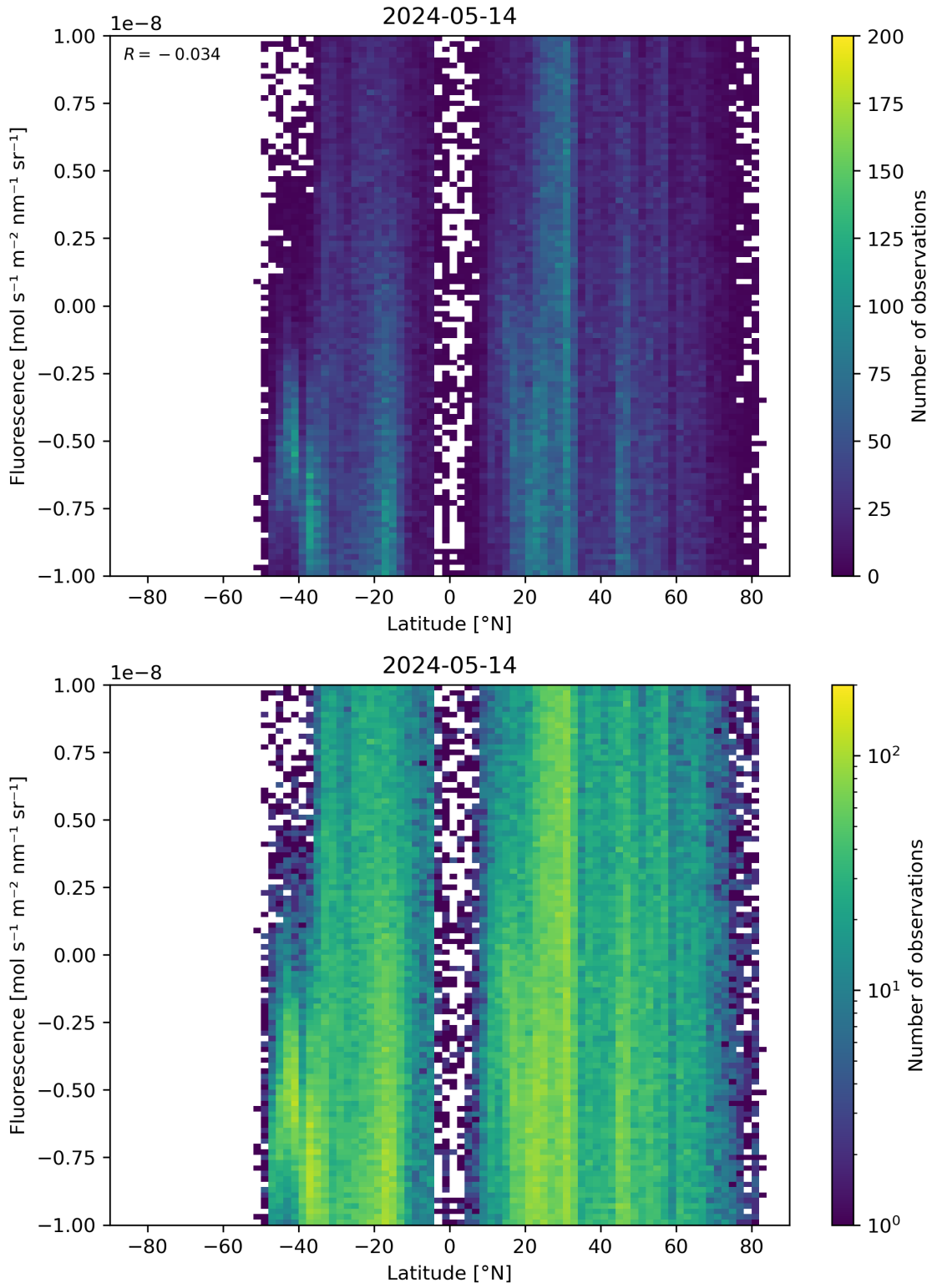


Figure 56: Scatter density plot of “Latitude” against “Fluorescence” for 2024-05-13 to 2024-05-15.

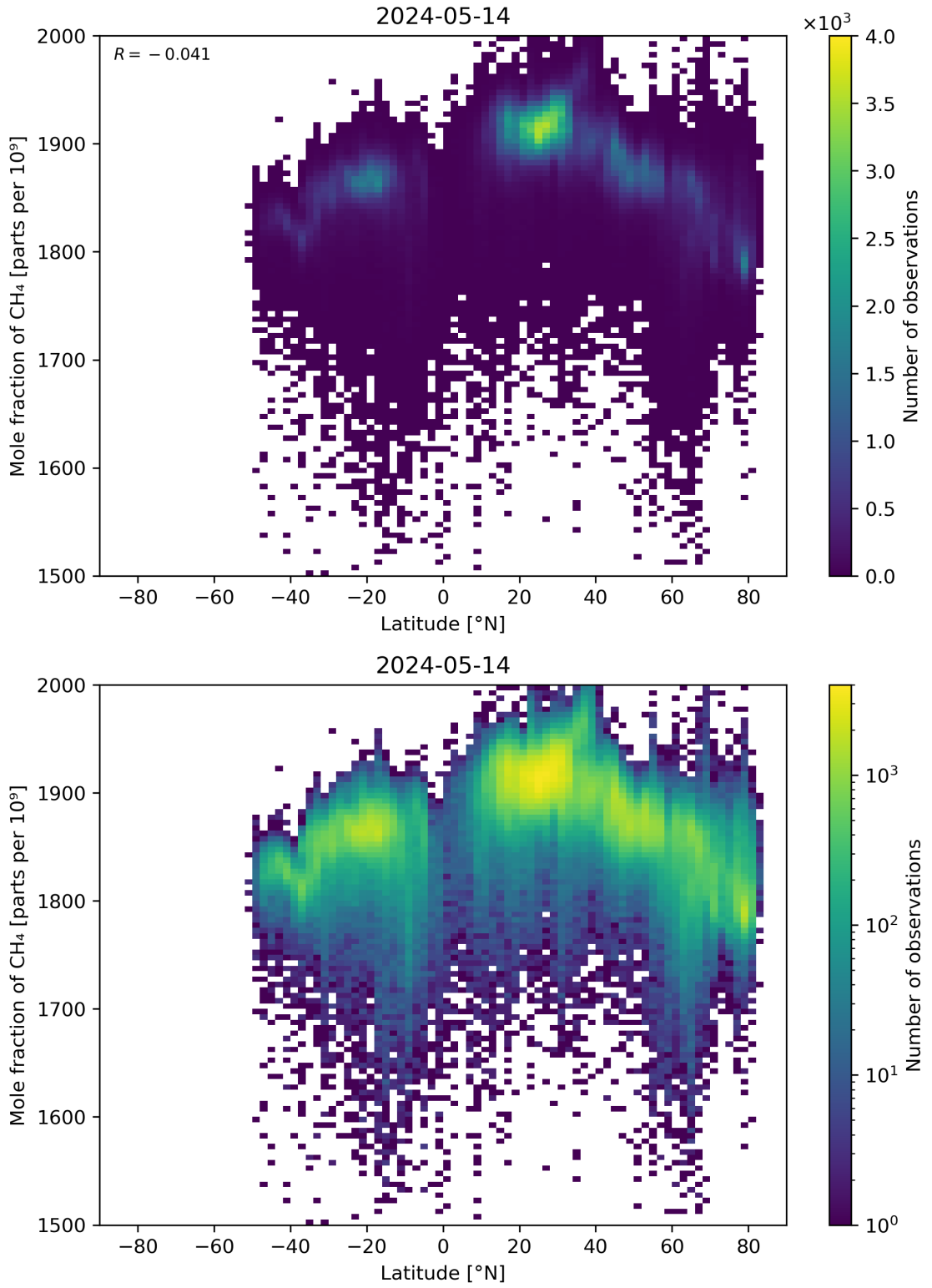


Figure 57: Scatter density plot of “Latitude” against “Mole fraction of CH_4” for 2024-05-13 to 2024-05-15.

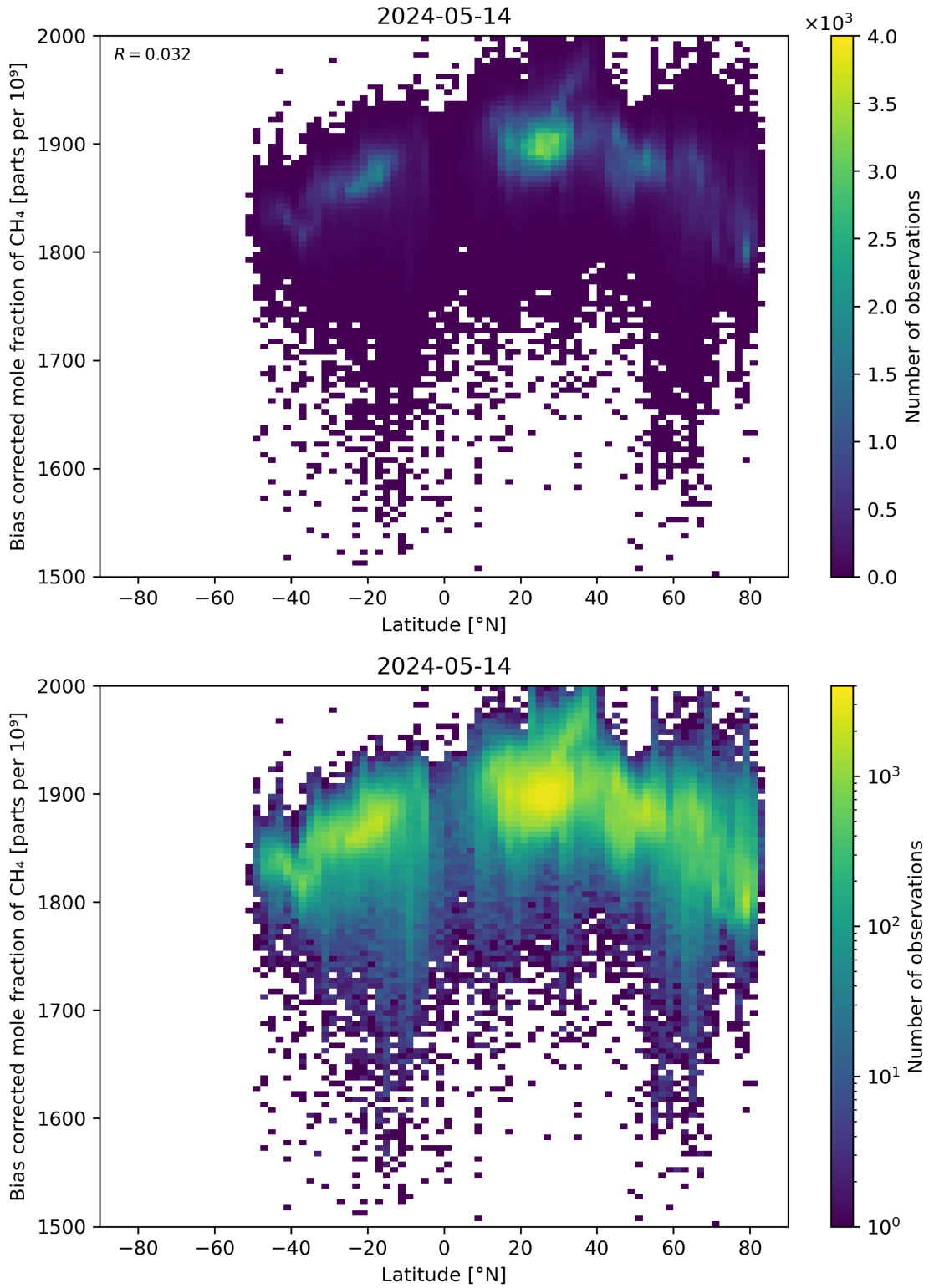


Figure 58: Scatter density plot of “Latitude” against “Bias corrected mole fraction of CH_4” for 2024-05-13 to 2024-05-15.

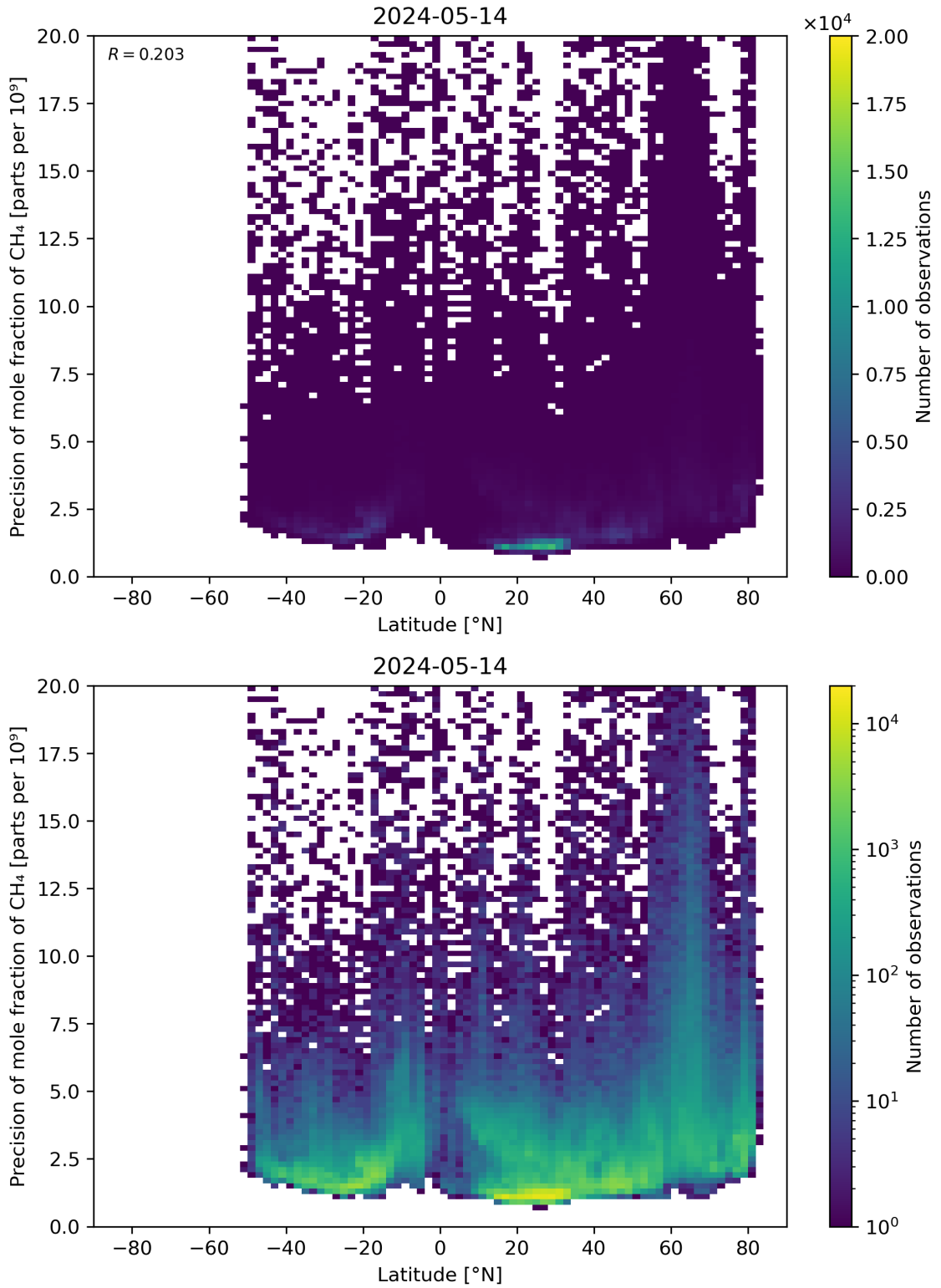


Figure 59: Scatter density plot of “Latitude” against “Precision of mole fraction of CH_4” for 2024-05-13 to 2024-05-15.

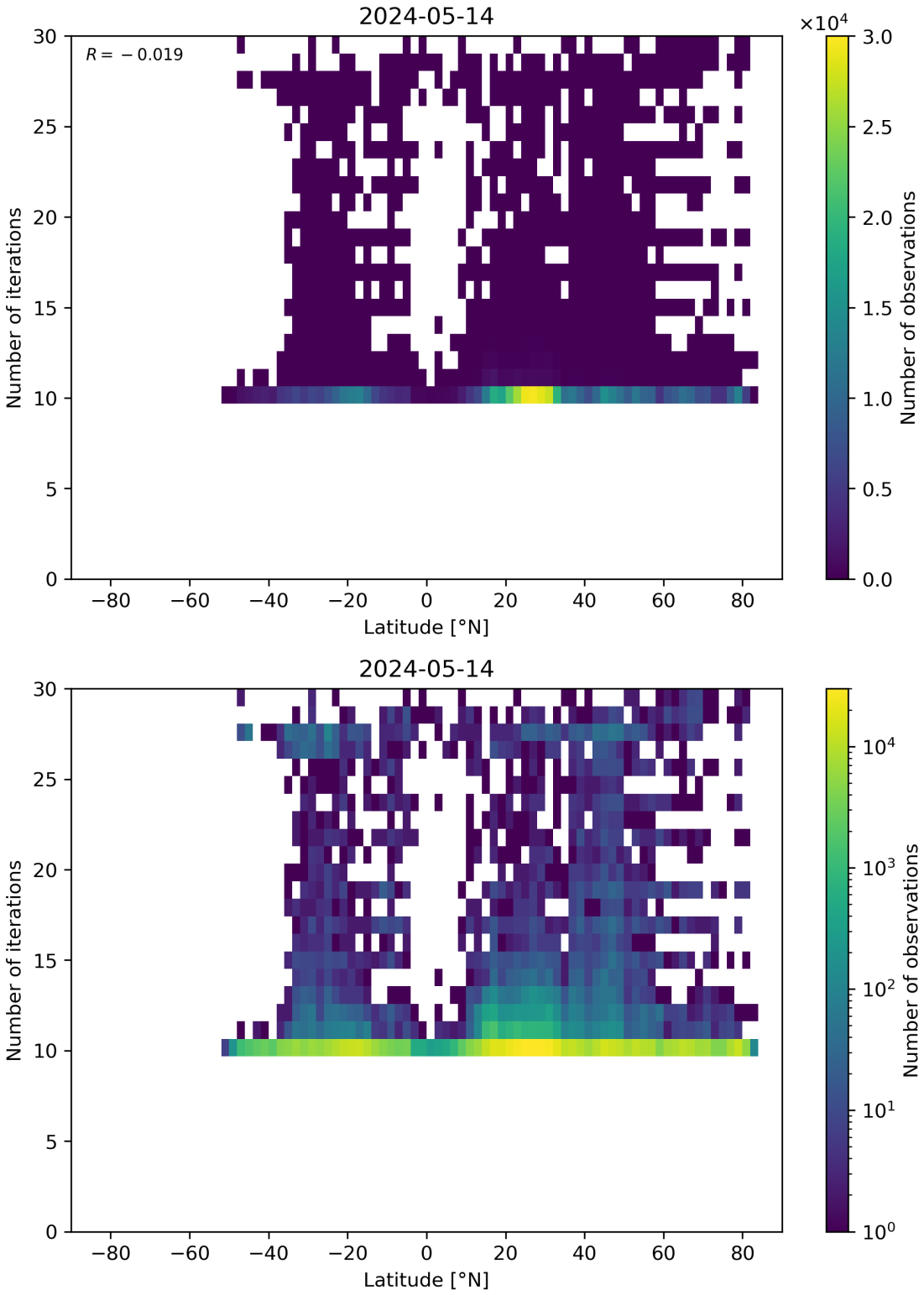


Figure 60: Scatter density plot of “Latitude” against “Number of iterations” for 2024-05-13 to 2024-05-15.

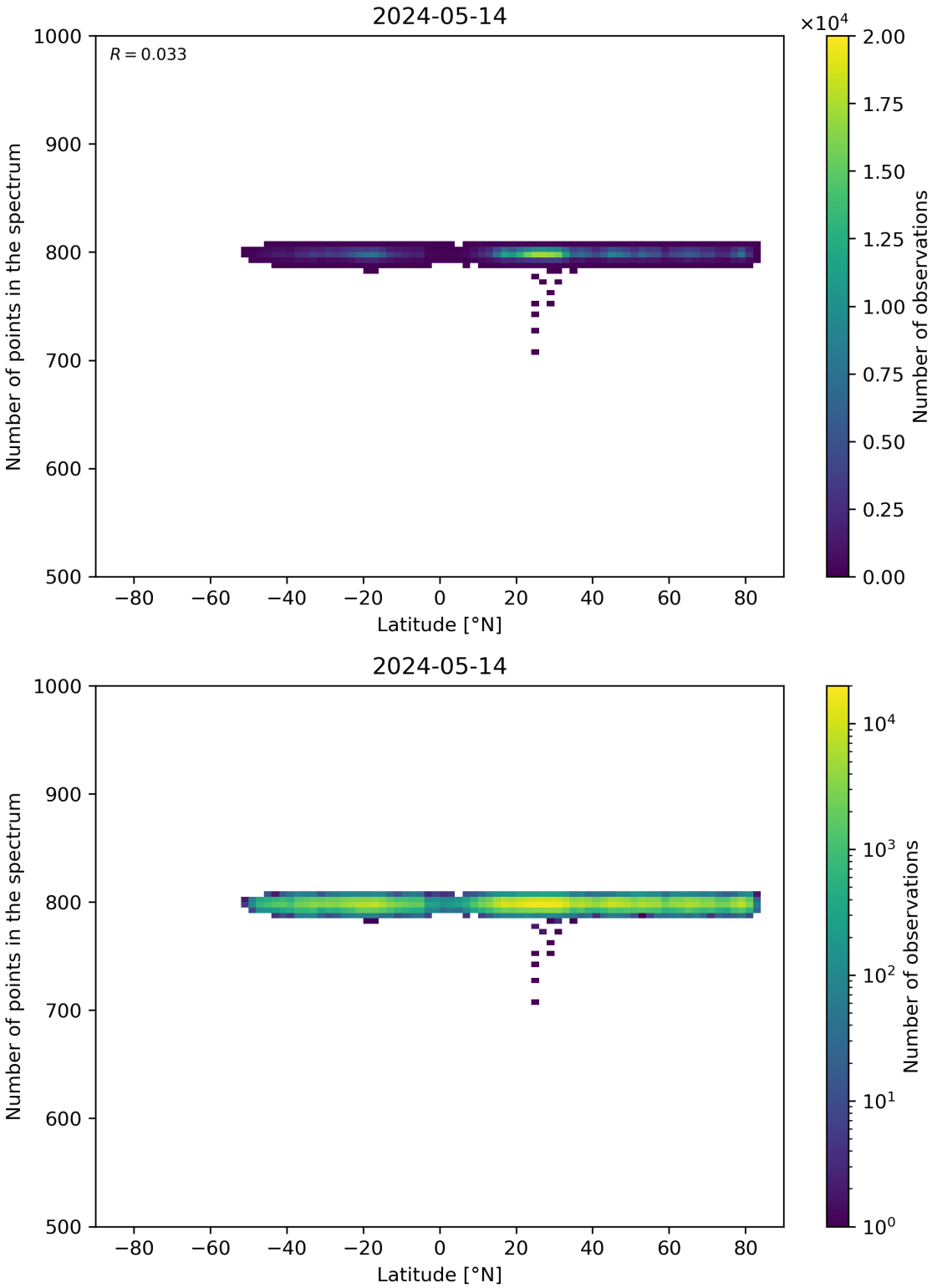


Figure 61: Scatter density plot of “Latitude” against “Number of points in the spectrum” for 2024-05-13 to 2024-05-15.

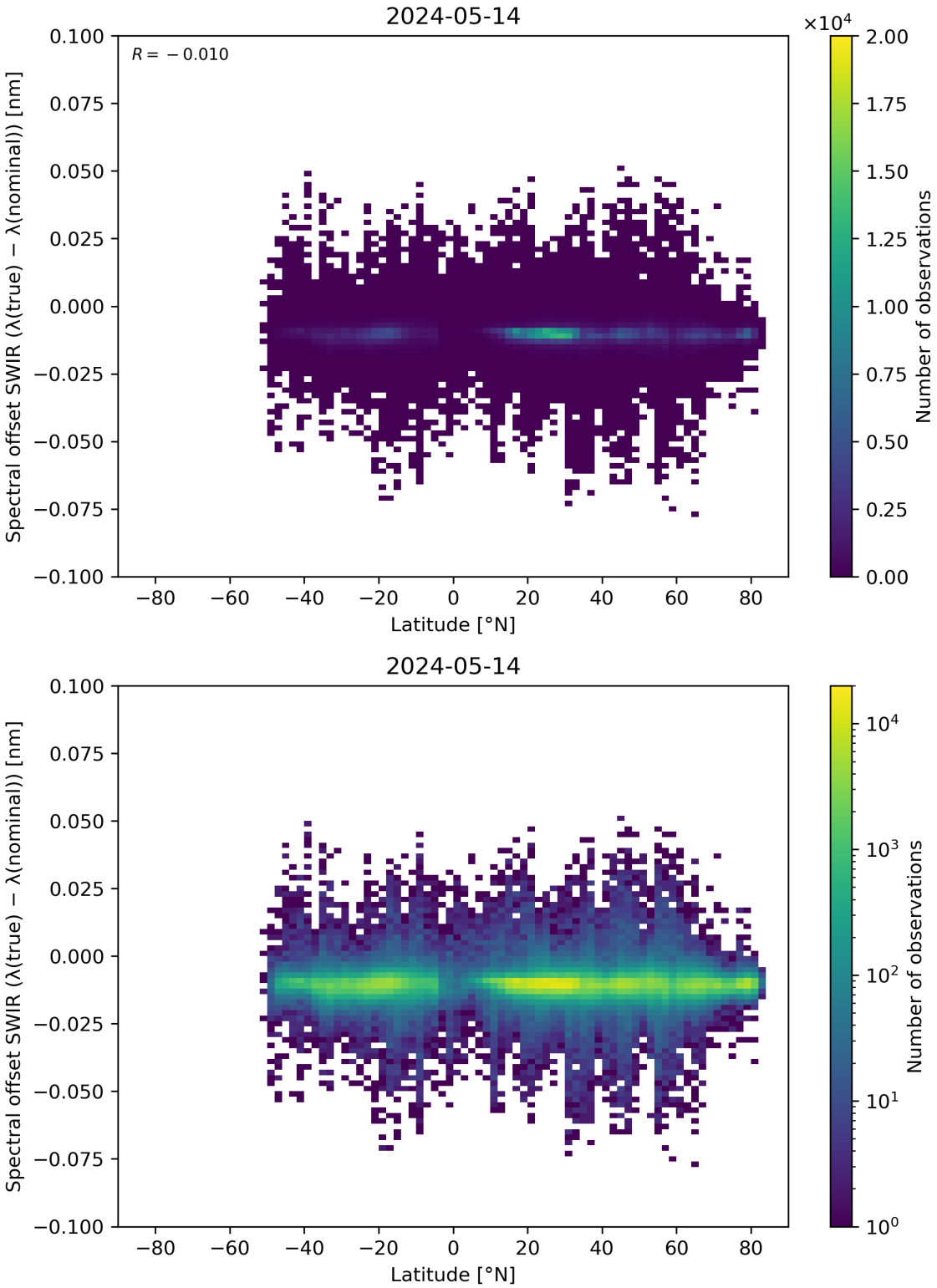


Figure 62: Scatter density plot of “Latitude” against “Spectral offset SWIR (λ(true) − λ(nominal))” for 2024-05-13 to 2024-05-15.

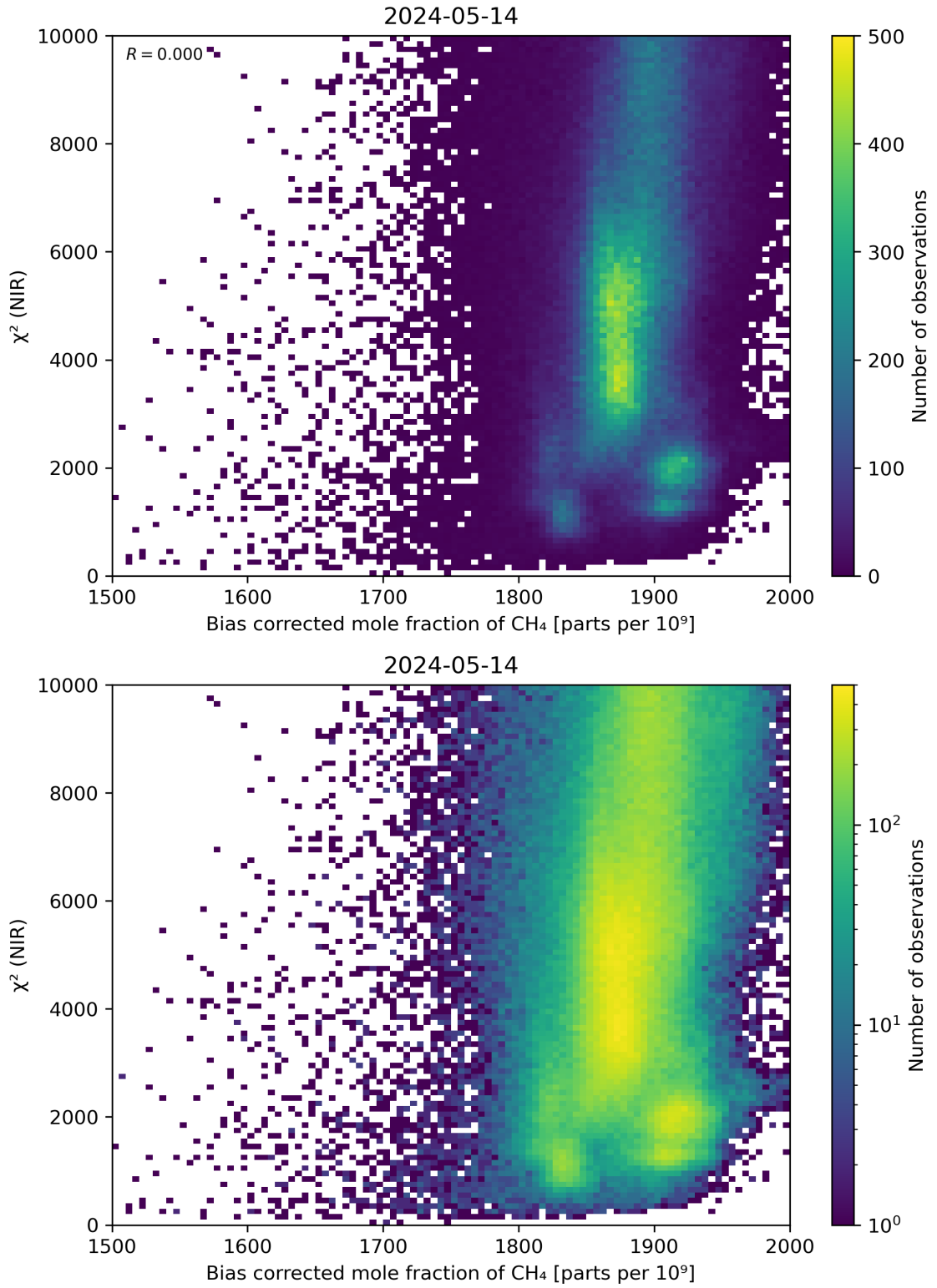


Figure 63: Scatter density plot of "Bias corrected mole fraction of CH_4" against "χ^2 (NIR)" for 2024-05-13 to 2024-05-15.

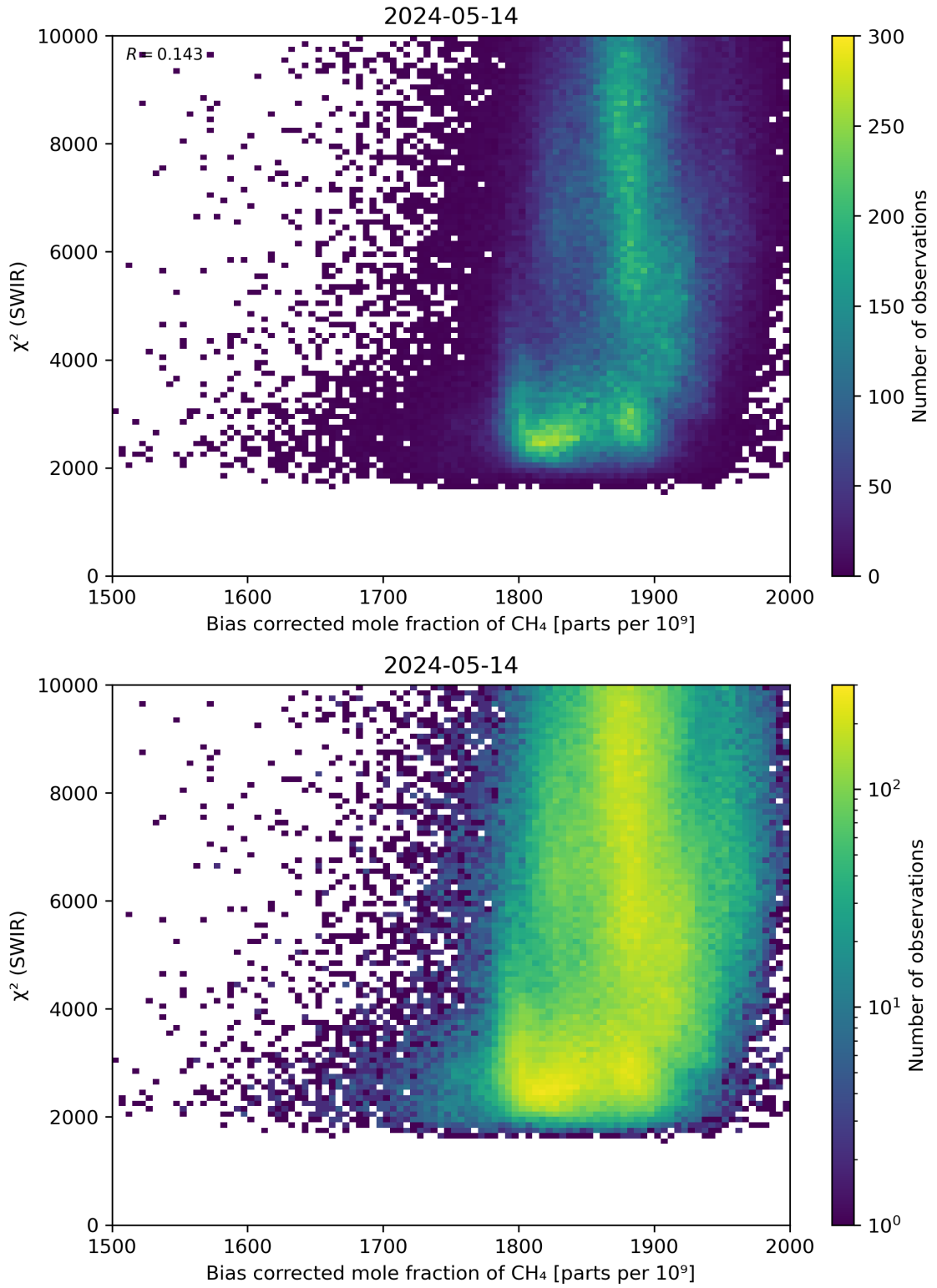


Figure 64: Scatter density plot of "Bias corrected mole fraction of CH_4" against "χ^2 (SWIR)" for 2024-05-13 to 2024-05-15.

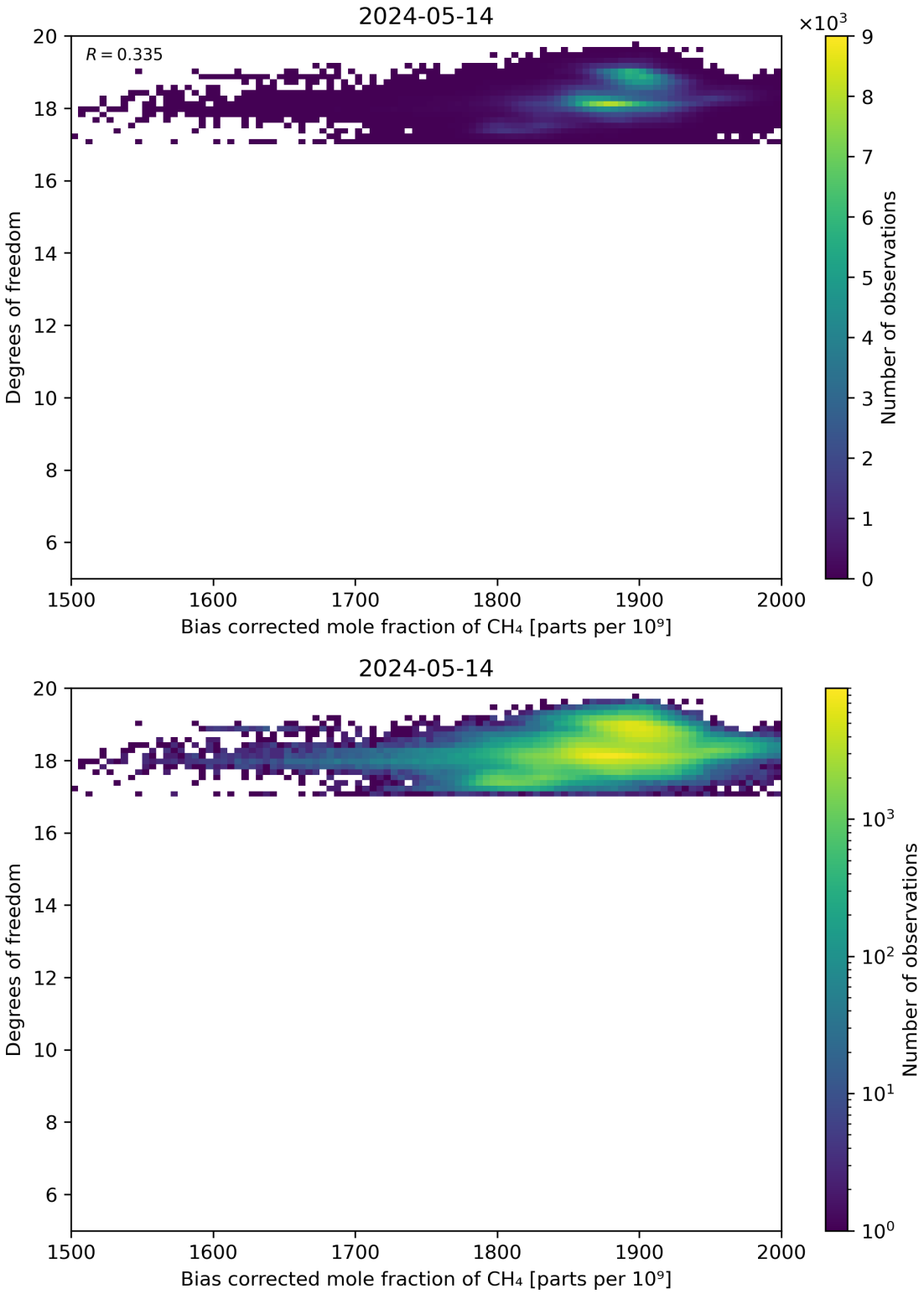


Figure 65: Scatter density plot of "Bias corrected mole fraction of CH_4" against "Degrees of freedom" for 2024-05-13 to 2024-05-15.

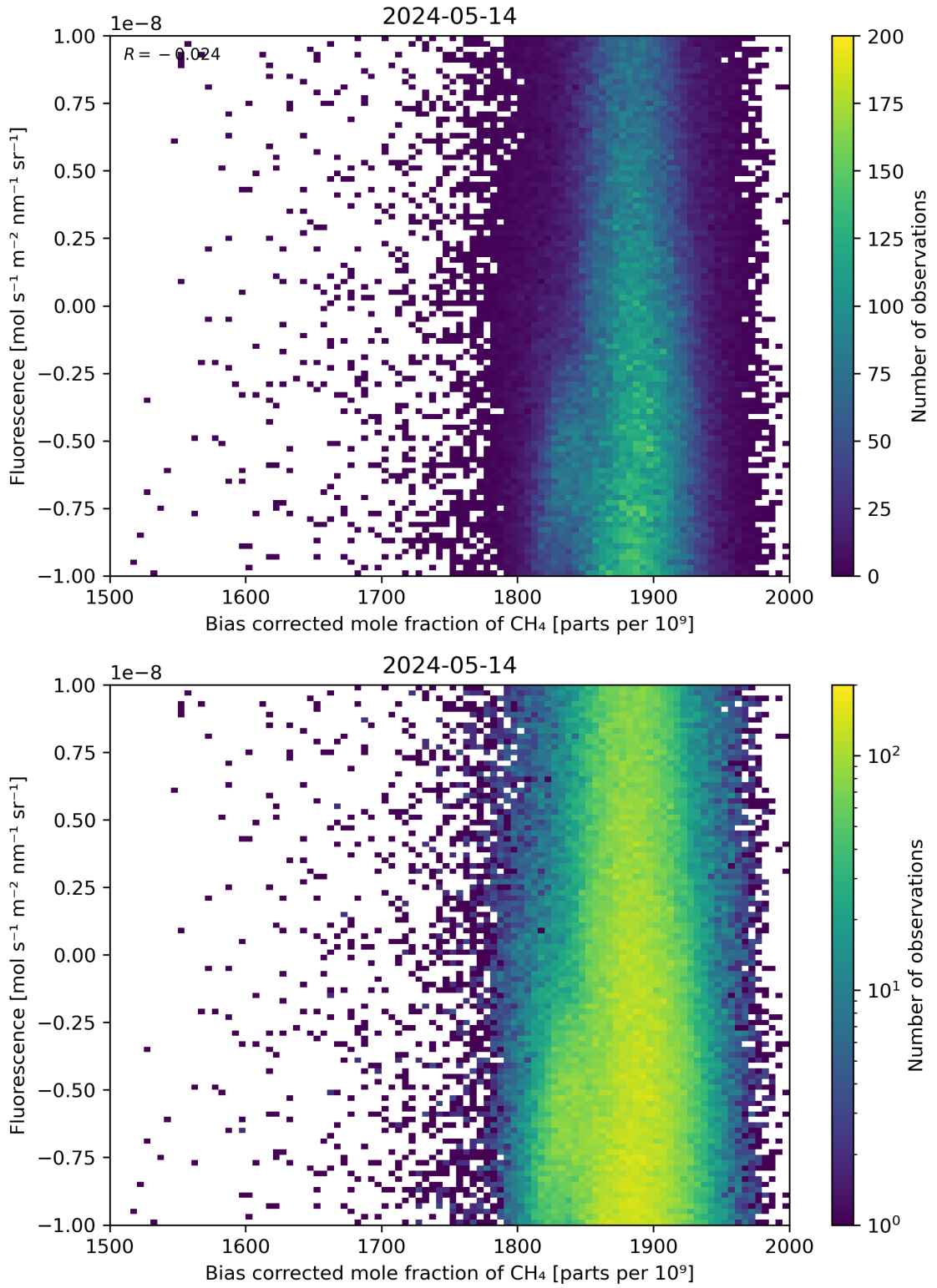


Figure 66: Scatter density plot of "Bias corrected mole fraction of CH_4" against "Fluorescence" for 2024-05-13 to 2024-05-15.

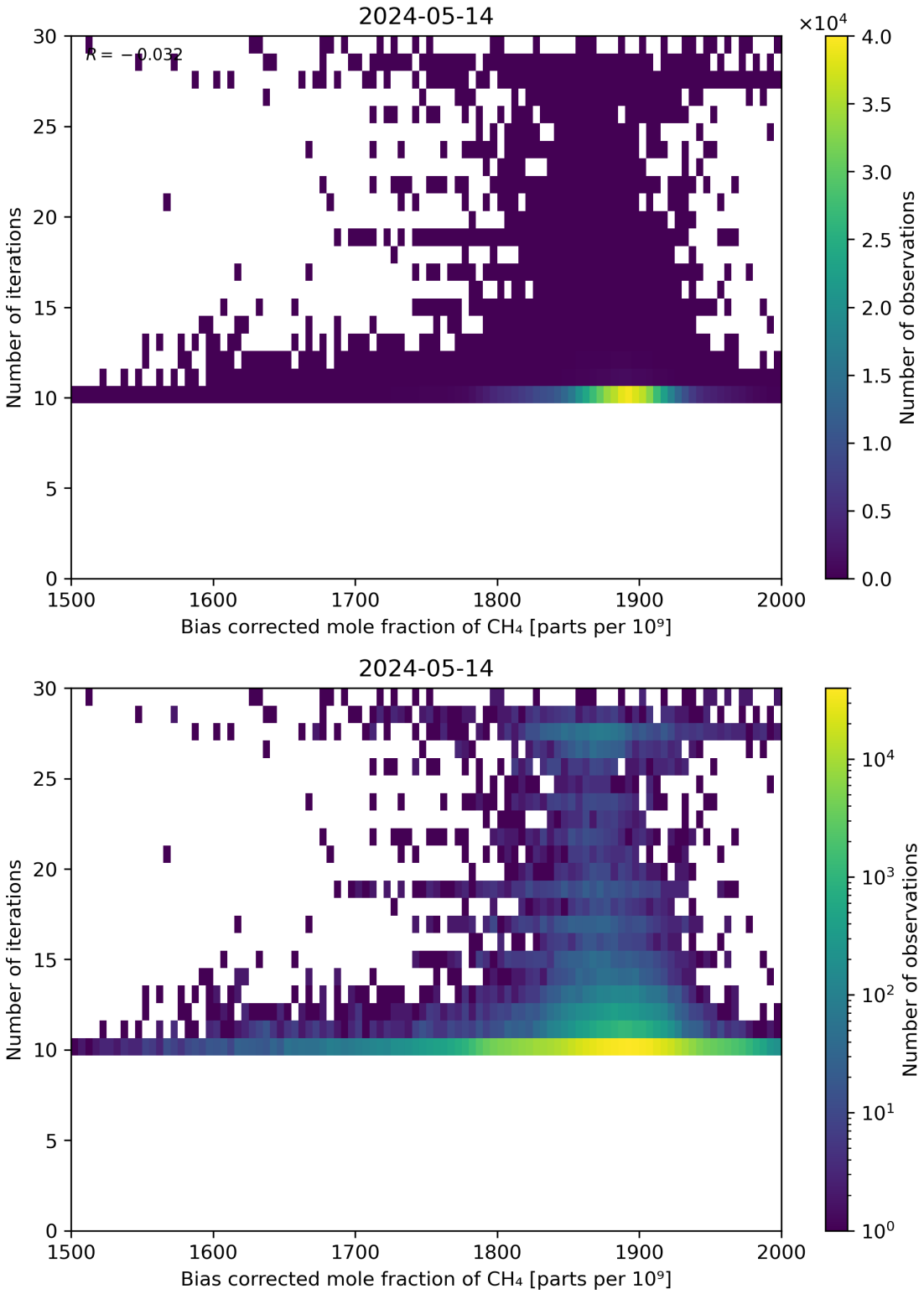


Figure 67: Scatter density plot of “Bias corrected mole fraction of CH_4” against “Number of iterations” for 2024-05-13 to 2024-05-15.

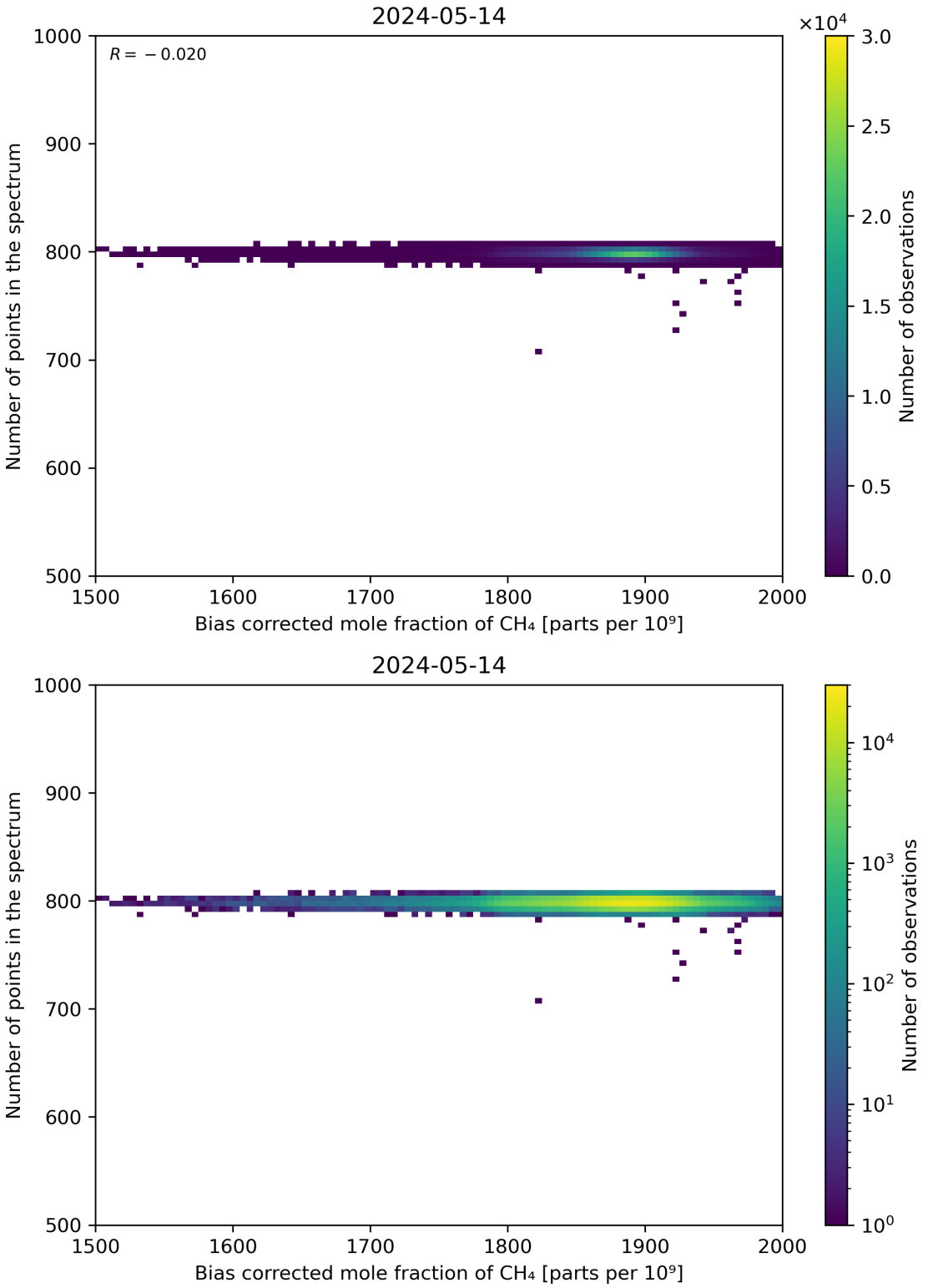


Figure 68: Scatter density plot of “Bias corrected mole fraction of CH_4” against “Number of points in the spectrum” for 2024-05-13 to 2024-05-15.

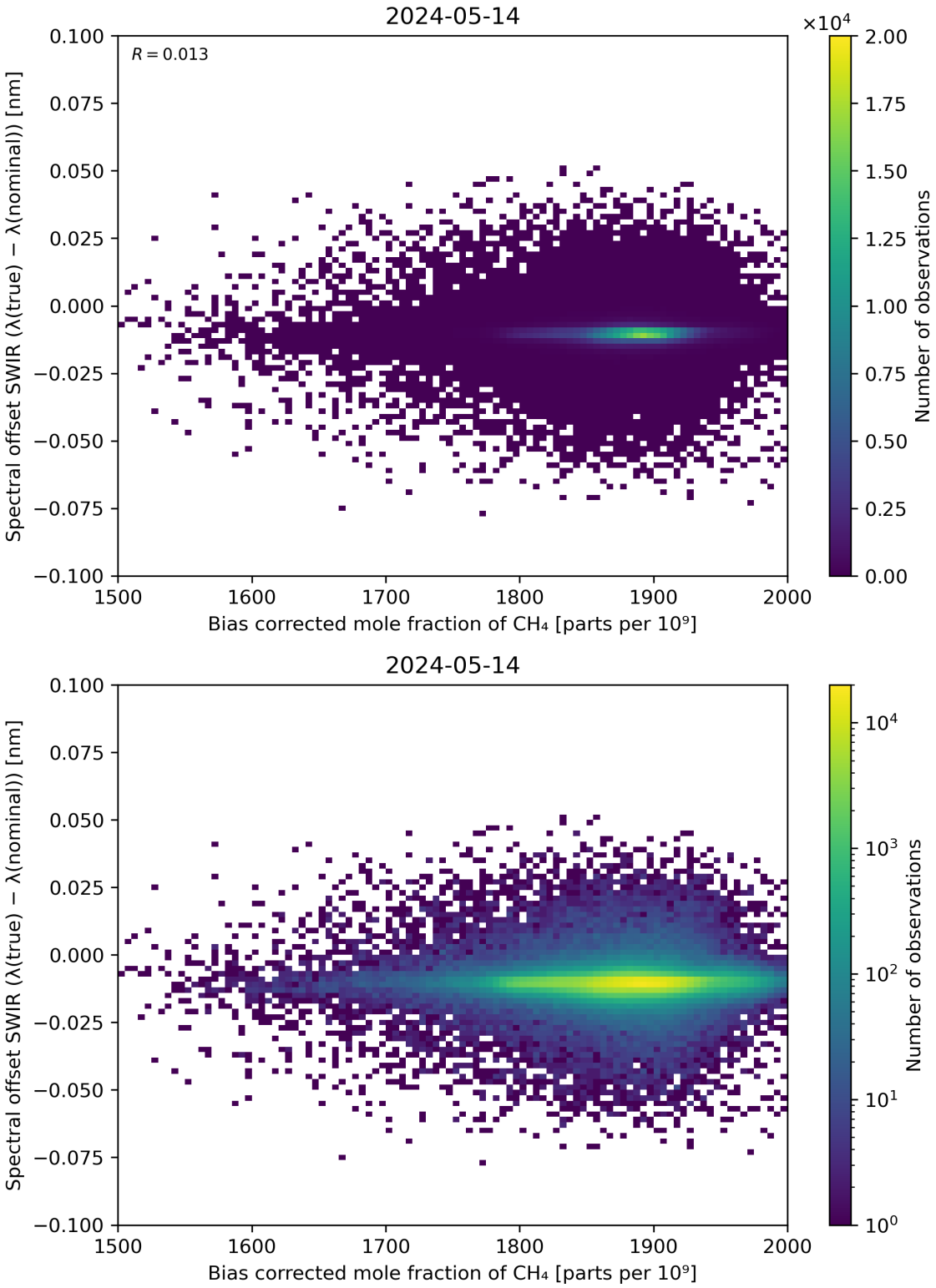


Figure 69: Scatter density plot of "Bias corrected mole fraction of CH_4" against "Spectral offset SWIR (λ(true) − λ(nominal))" for 2024-05-13 to 2024-05-15.

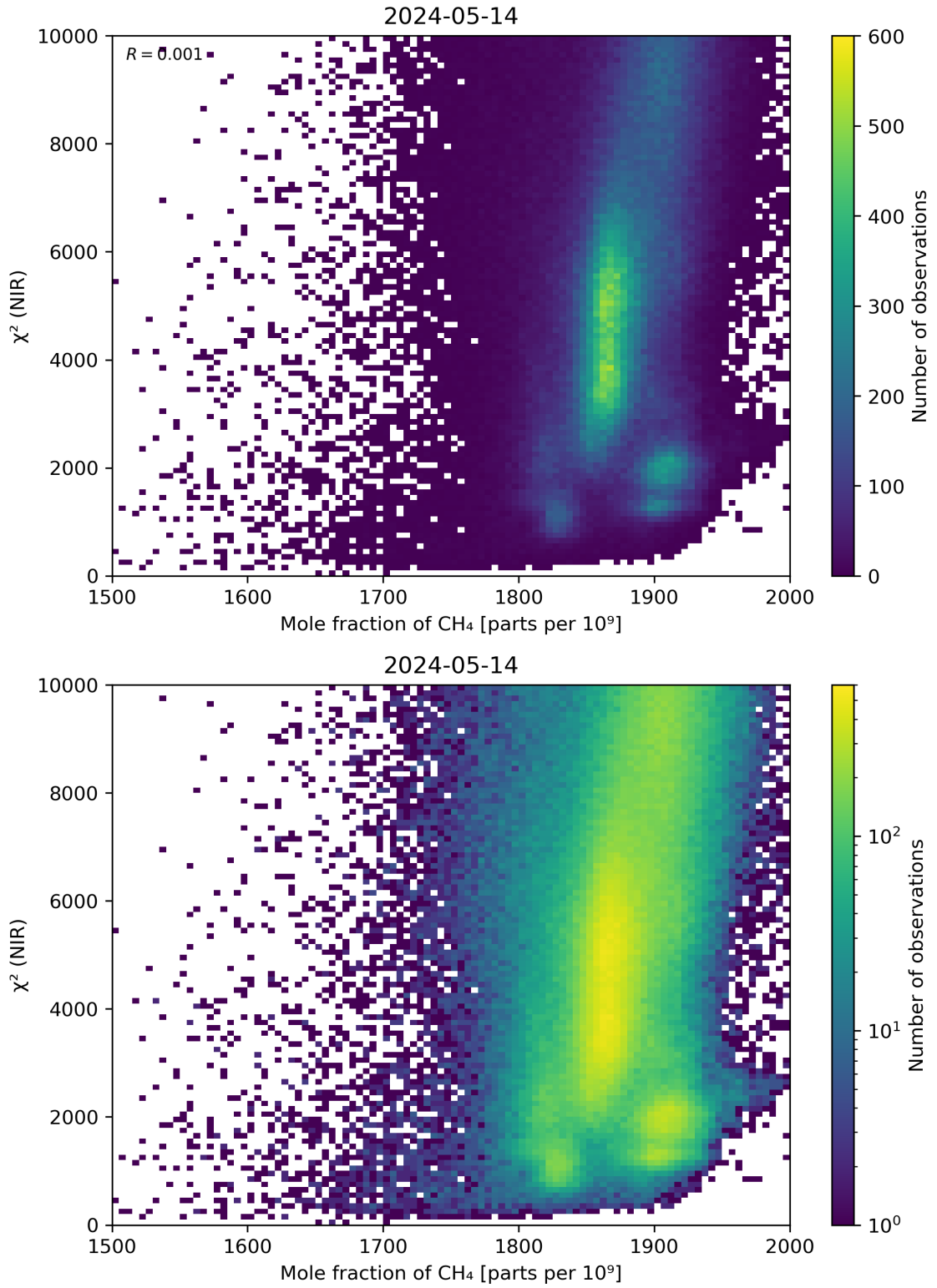


Figure 70: Scatter density plot of "Mole fraction of CH_4" against "χ^2 (NIR)" for 2024-05-13 to 2024-05-15.

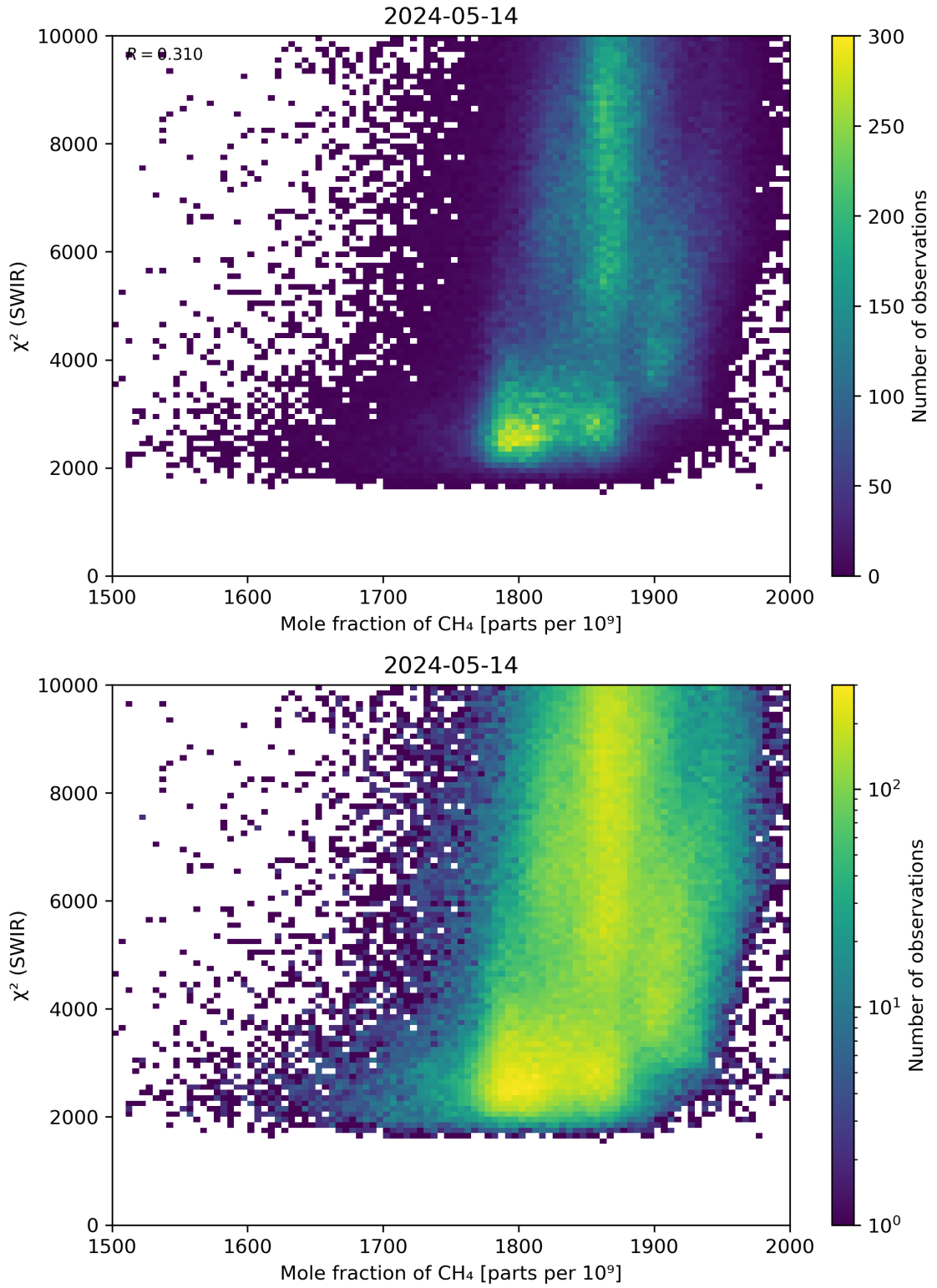


Figure 71: Scatter density plot of "Mole fraction of CH_4" against "χ^2 (SWIR)" for 2024-05-13 to 2024-05-15.

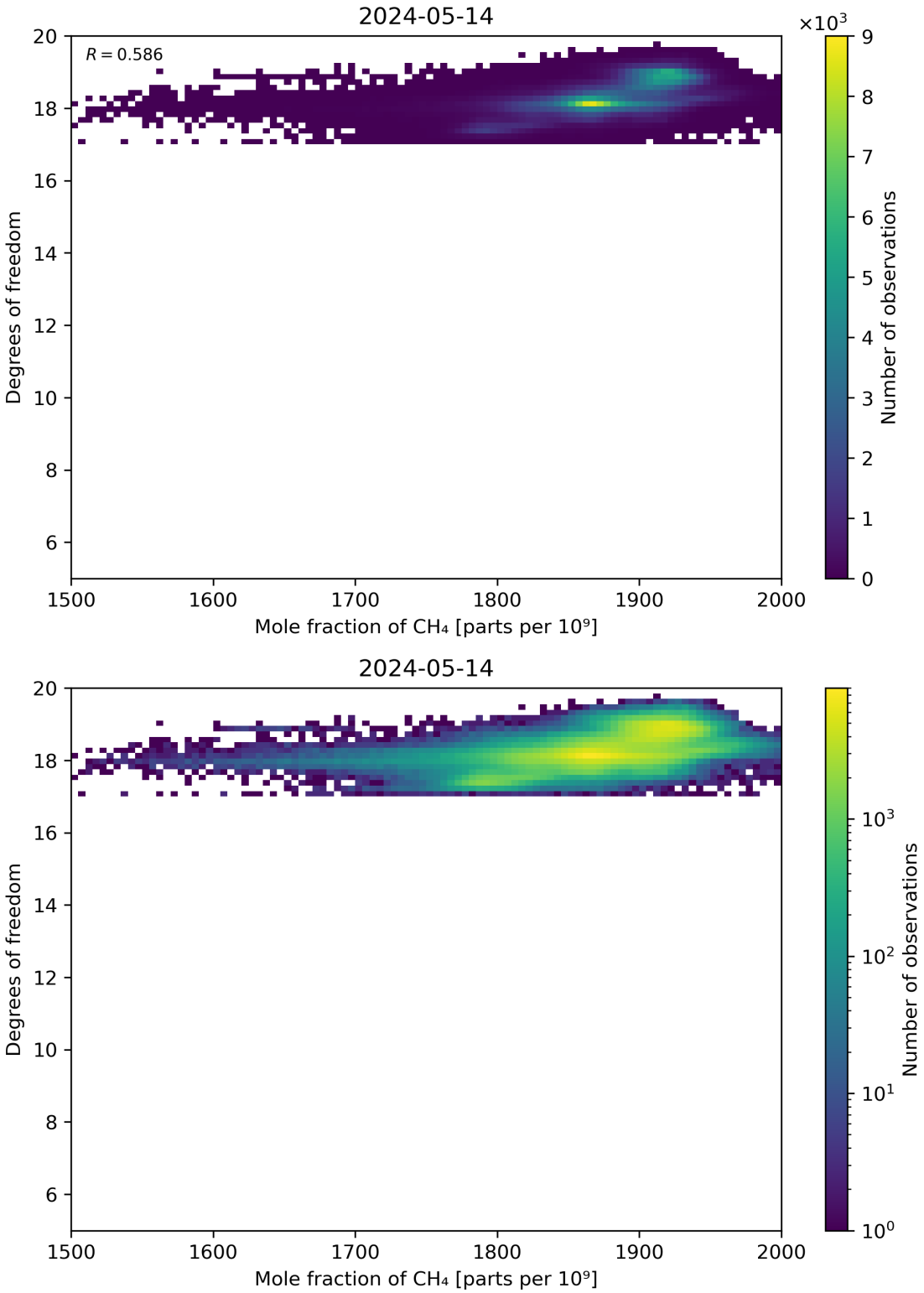


Figure 72: Scatter density plot of “Mole fraction of CH_4” against “Degrees of freedom” for 2024-05-13 to 2024-05-15.

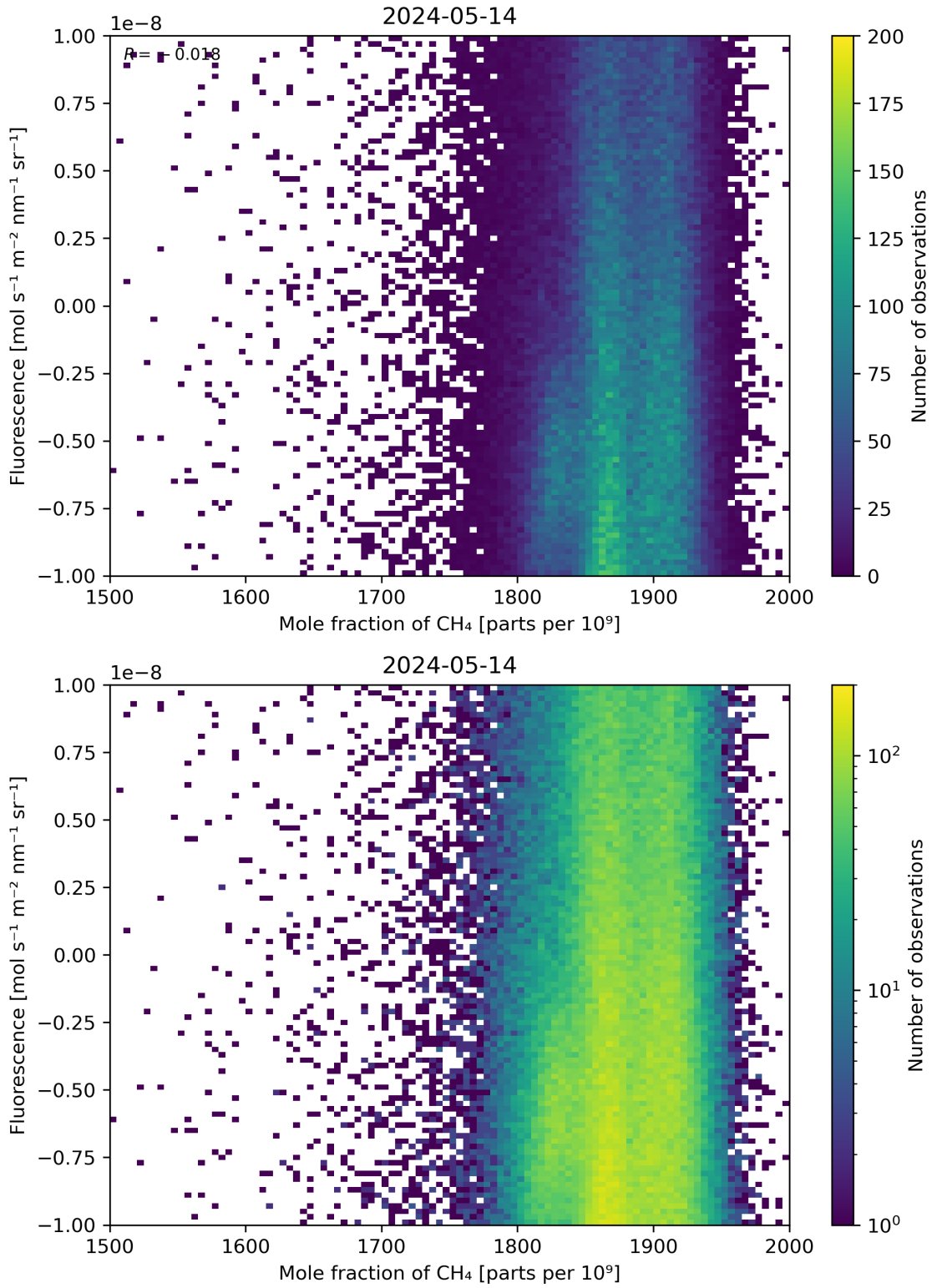


Figure 73: Scatter density plot of “Mole fraction of CH_4” against “Fluorescence” for 2024-05-13 to 2024-05-15.

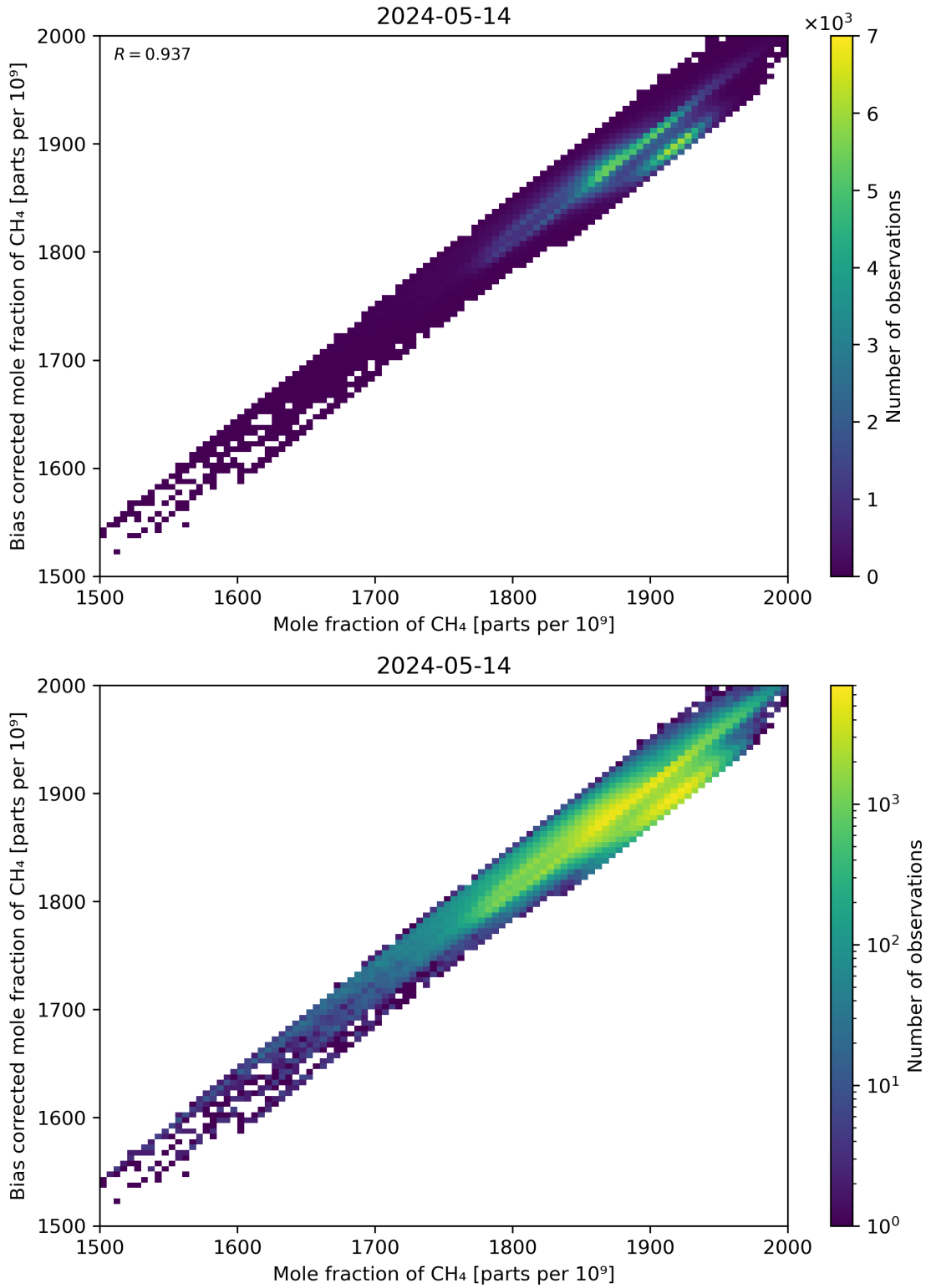


Figure 74: Scatter density plot of "Mole fraction of CH_4" against "Bias corrected mole fraction of CH_4" for 2024-05-13 to 2024-05-15.

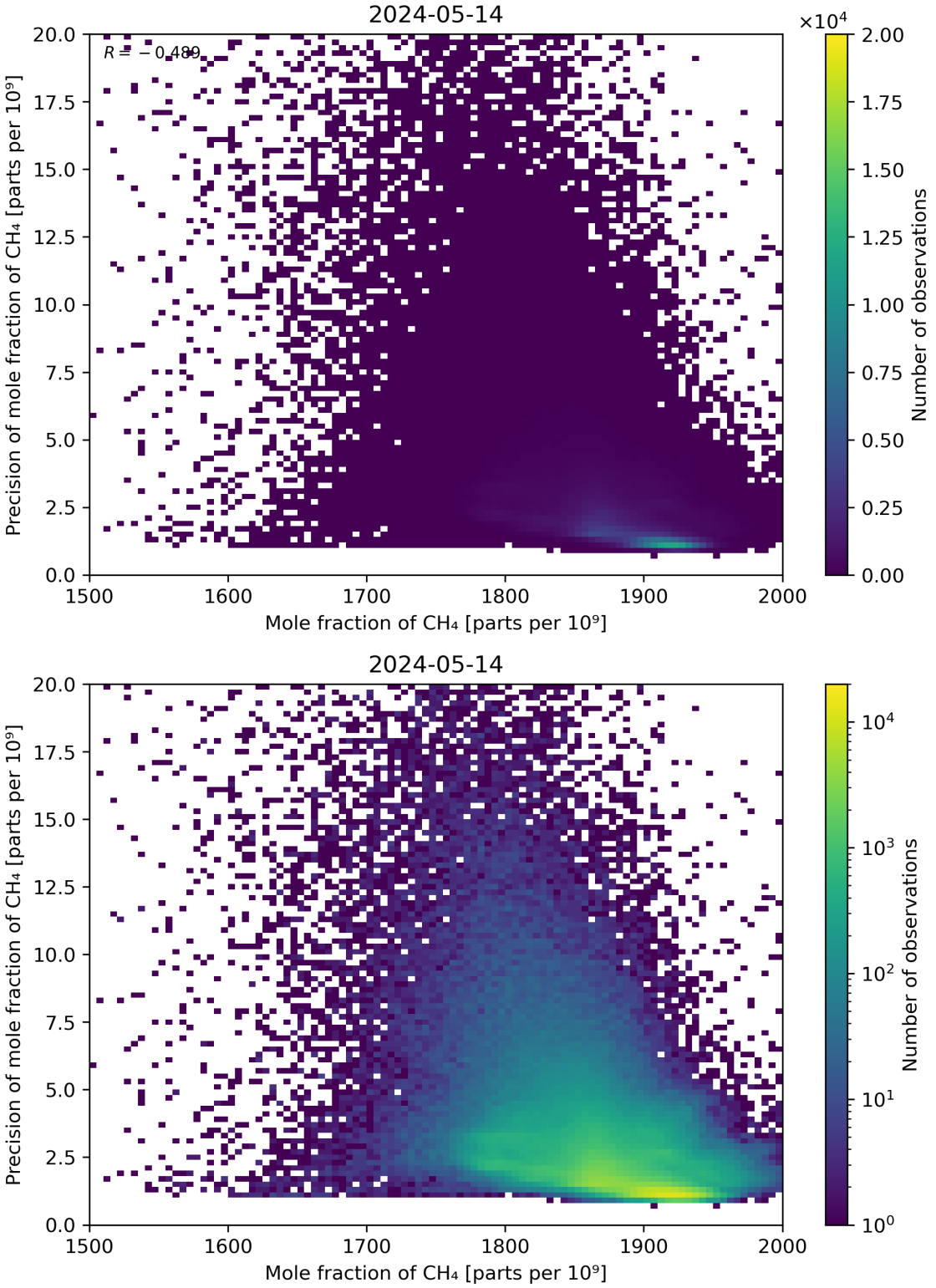


Figure 75: Scatter density plot of "Mole fraction of CH_4" against "Precision of mole fraction of CH_4" for 2024-05-13 to 2024-05-15.

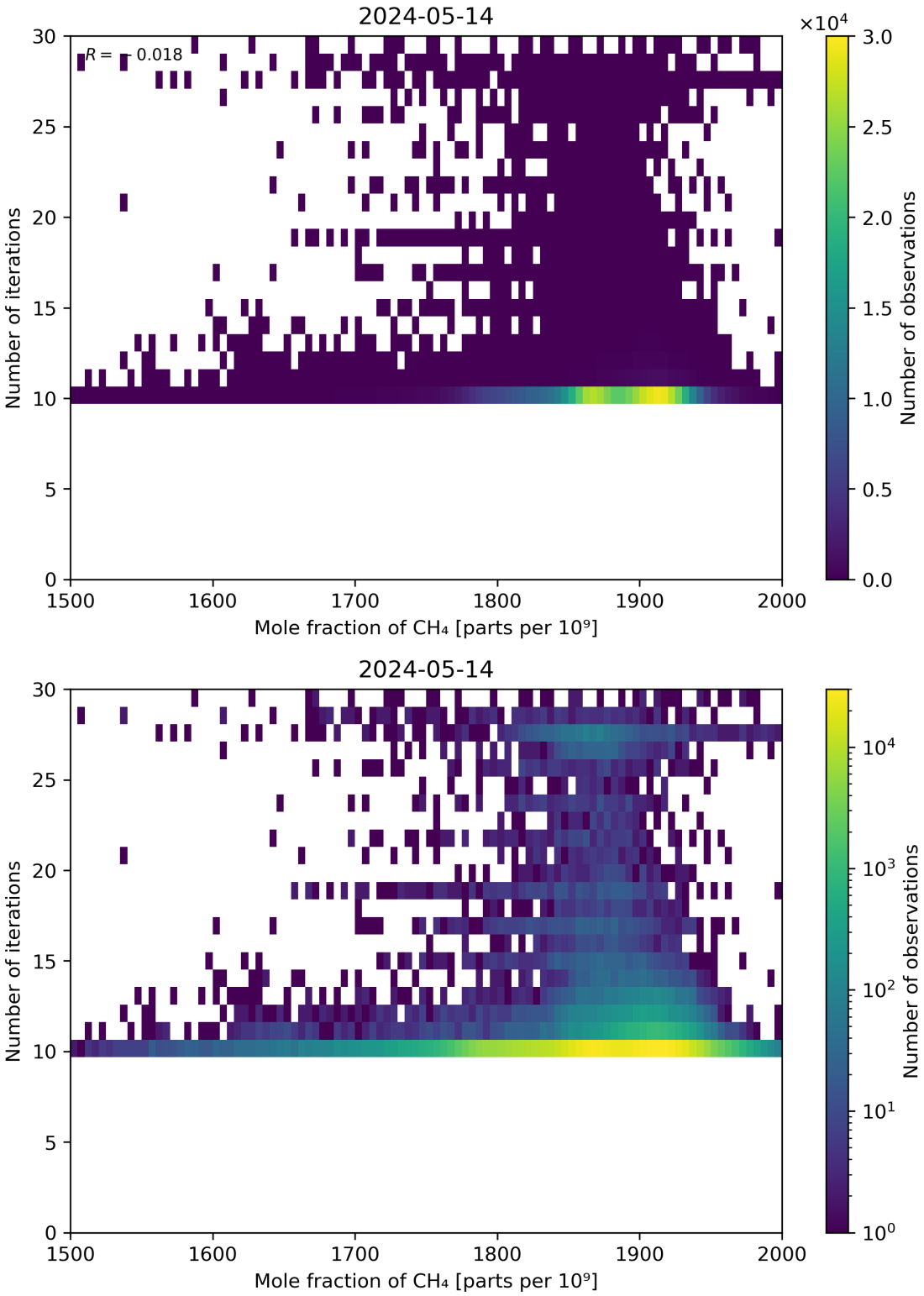


Figure 76: Scatter density plot of “Mole fraction of CH_4” against “Number of iterations” for 2024-05-13 to 2024-05-15.

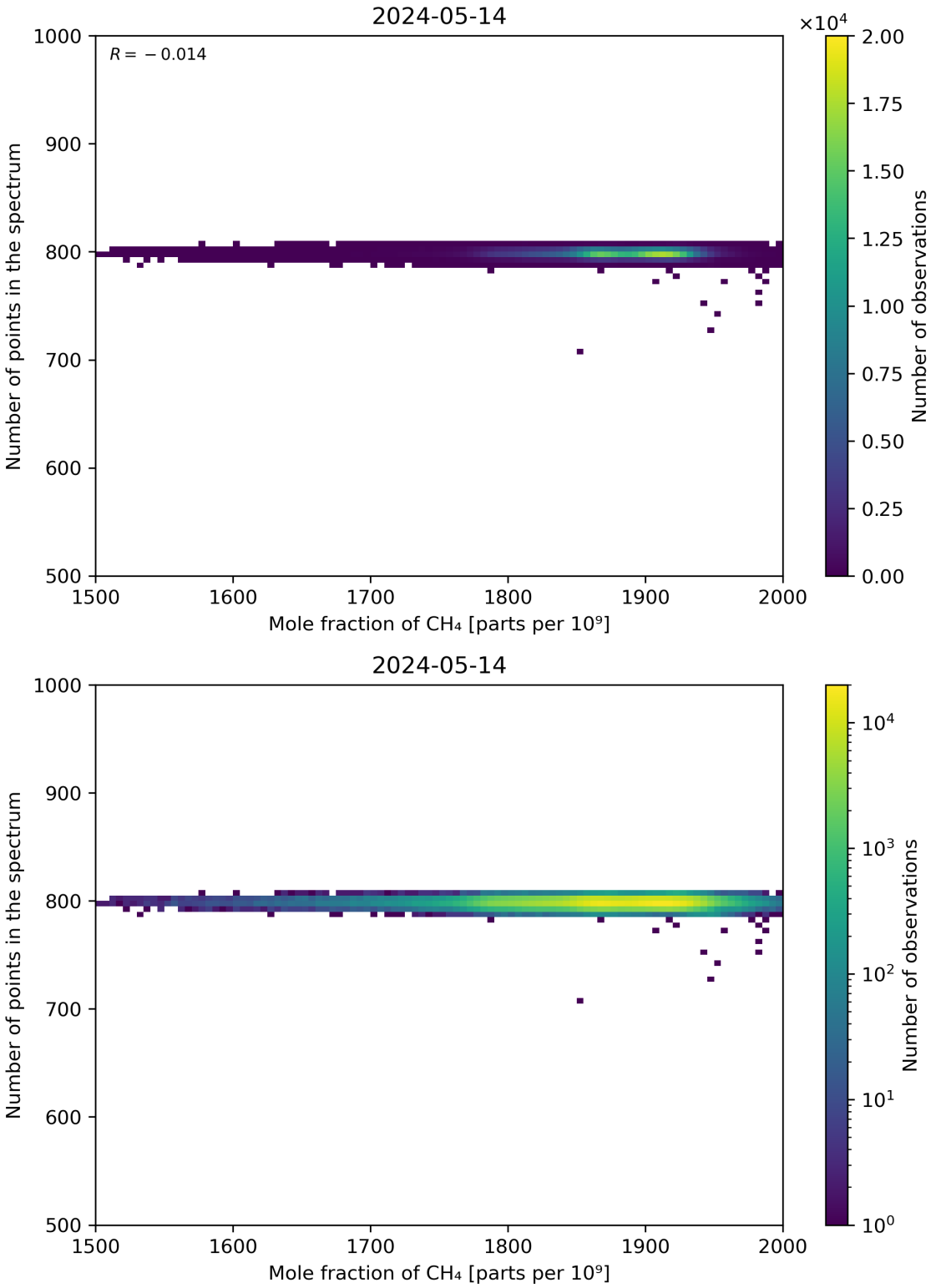


Figure 77: Scatter density plot of "Mole fraction of CH_4" against "Number of points in the spectrum" for 2024-05-13 to 2024-05-15.

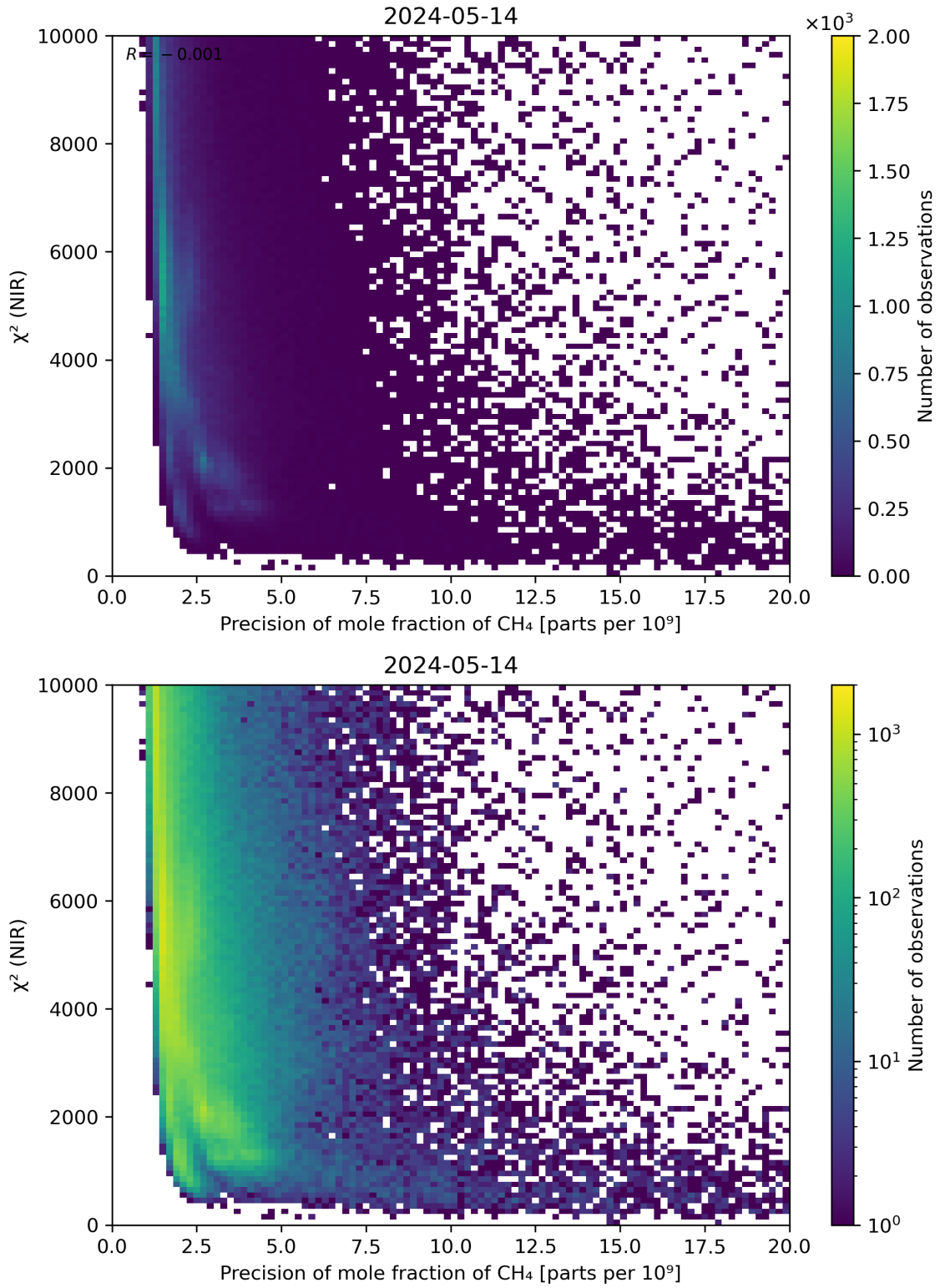


Figure 78: Scatter density plot of "Precision of mole fraction of CH_4" against "χ^2 (NIR)" for 2024-05-13 to 2024-05-15.

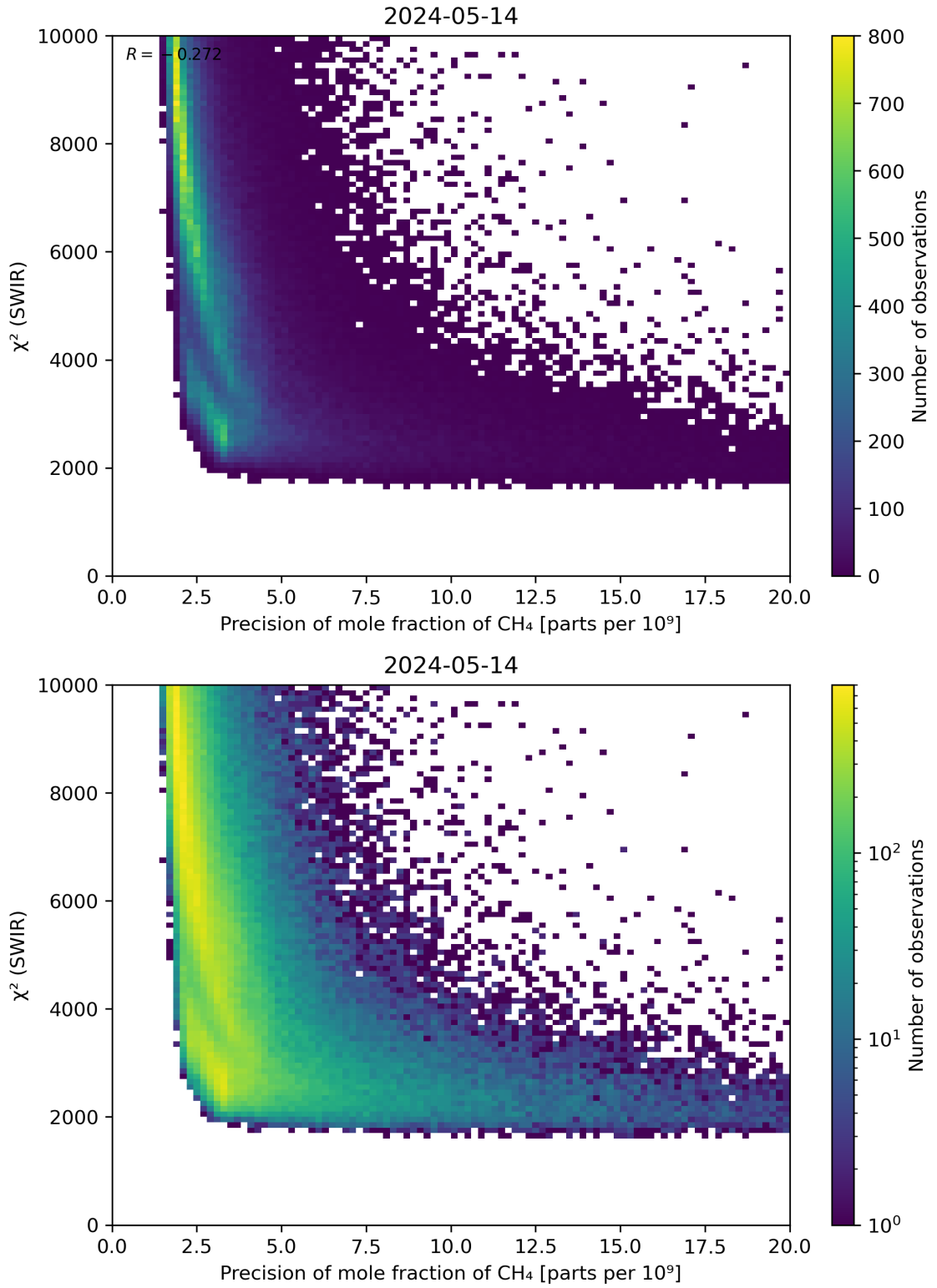


Figure 79: Scatter density plot of "Precision of mole fraction of CH_4" against "χ^2 (SWIR)" for 2024-05-13 to 2024-05-15.

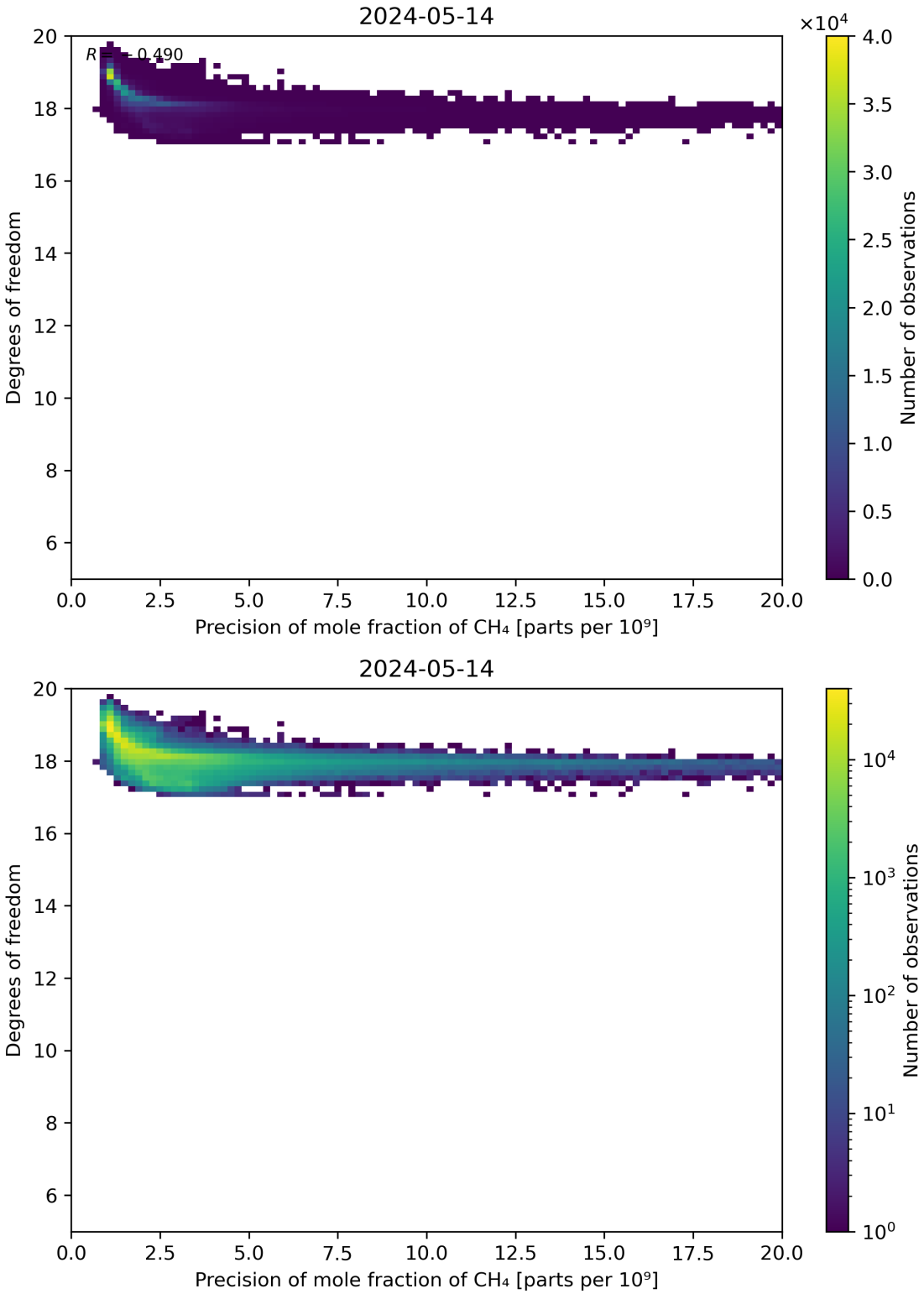


Figure 80: Scatter density plot of "Precision of mole fraction of CH_4" against "Degrees of freedom" for 2024-05-13 to 2024-05-15.

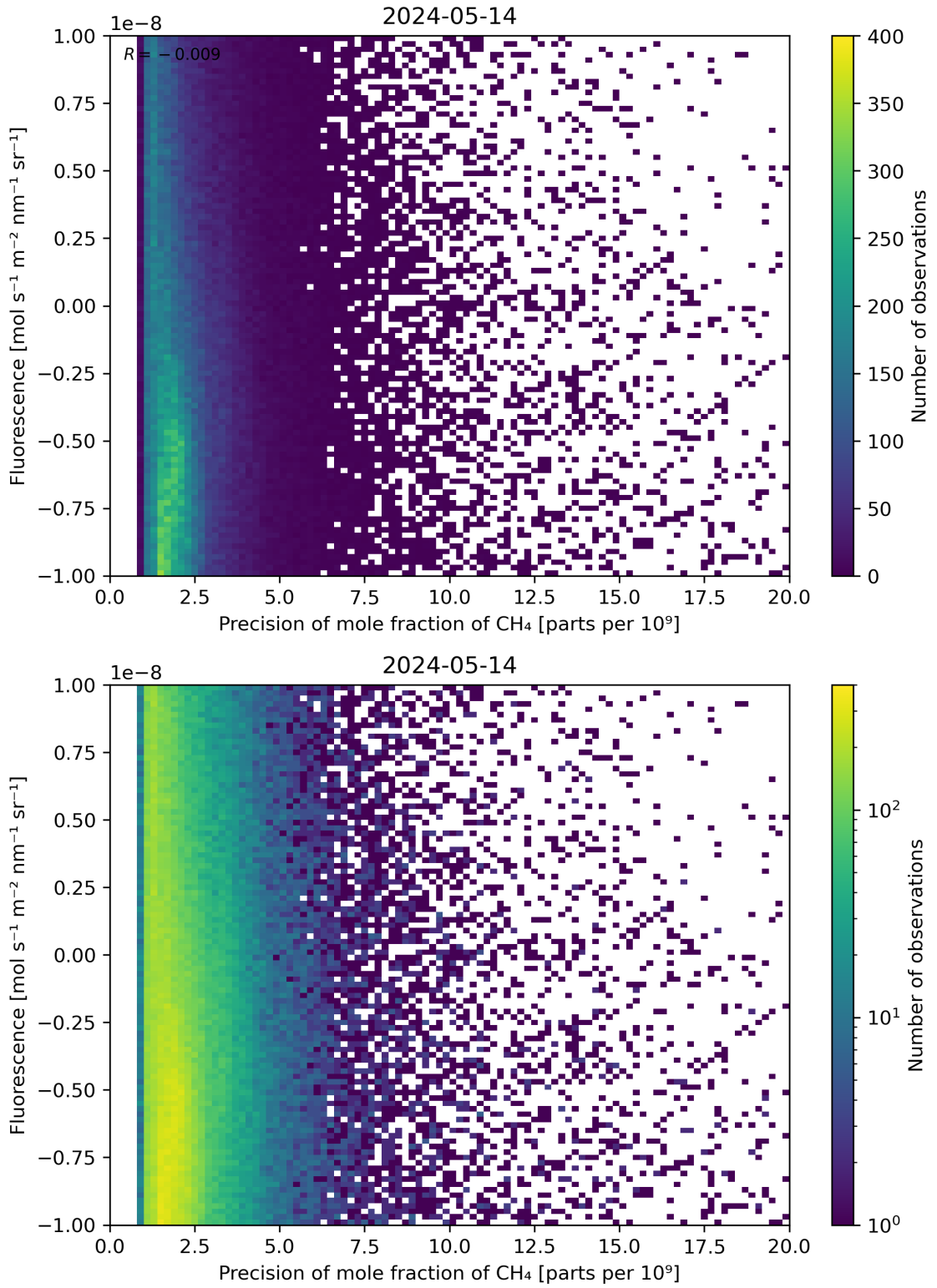


Figure 81: Scatter density plot of "Precision of mole fraction of CH_4" against "Fluorescence" for 2024-05-13 to 2024-05-15.

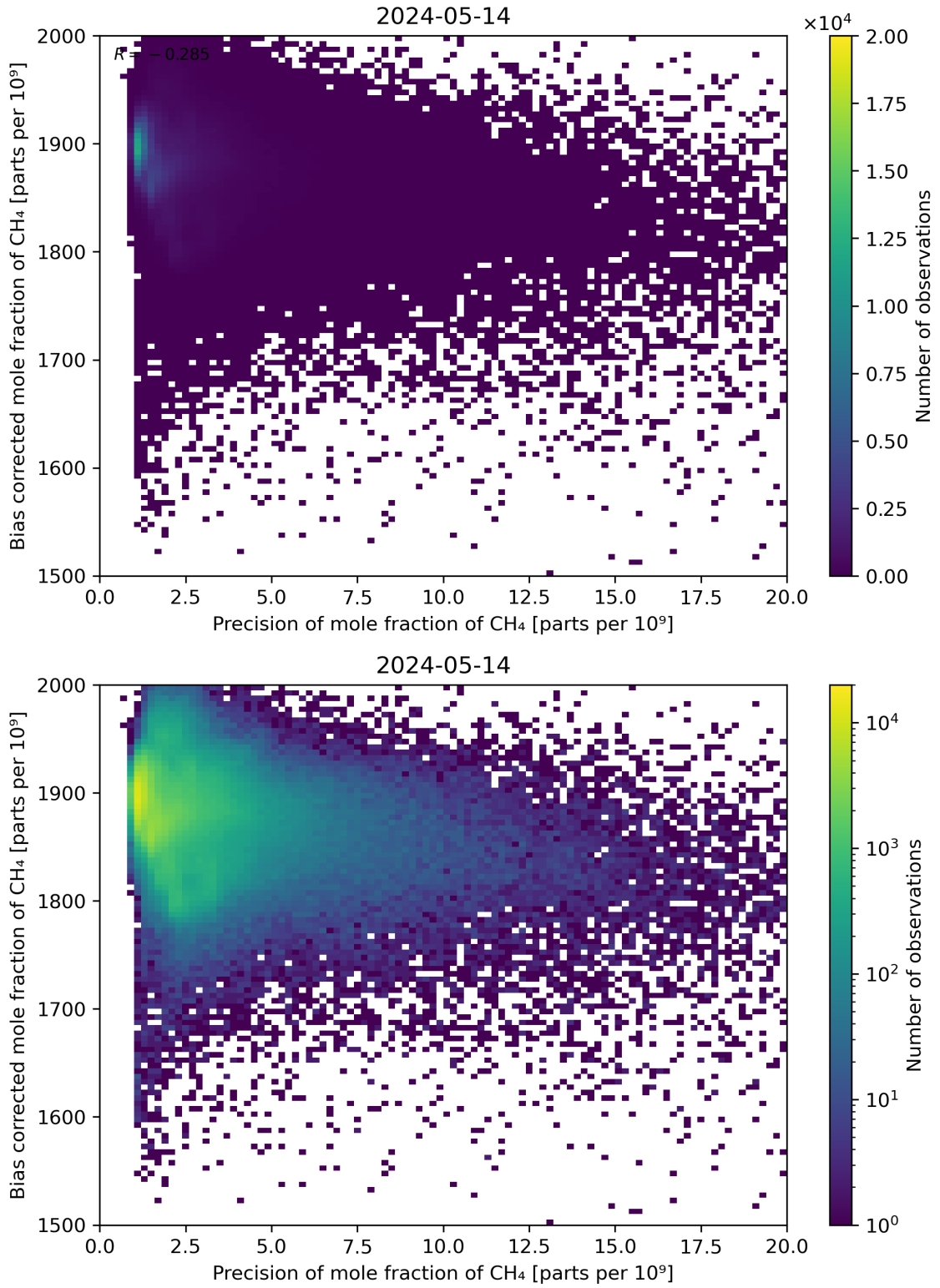


Figure 82: Scatter density plot of "Precision of mole fraction of CH_4" against "Bias corrected mole fraction of CH_4" for 2024-05-13 to 2024-05-15.

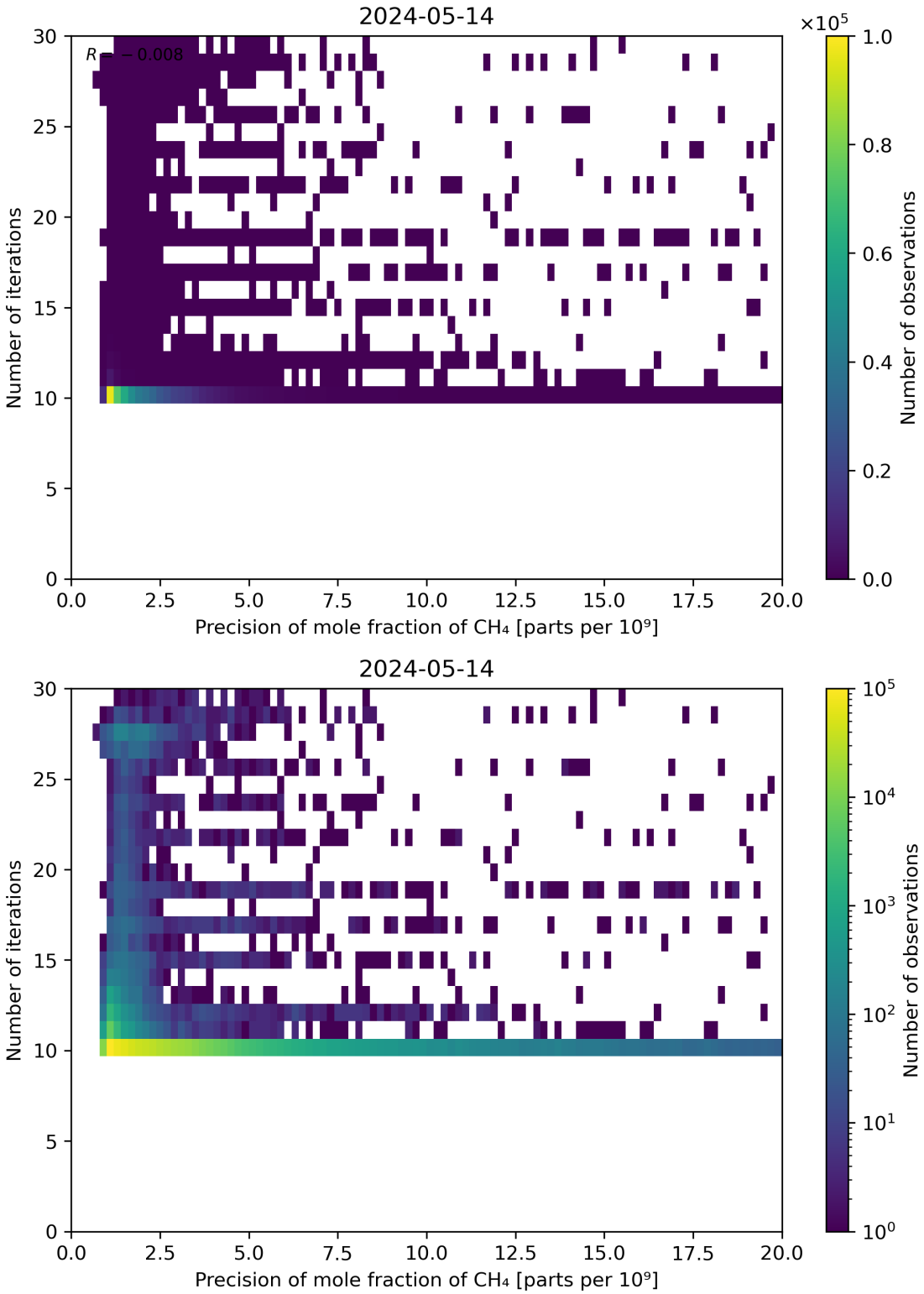


Figure 83: Scatter density plot of "Precision of mole fraction of CH_4" against "Number of iterations" for 2024-05-13 to 2024-05-15.

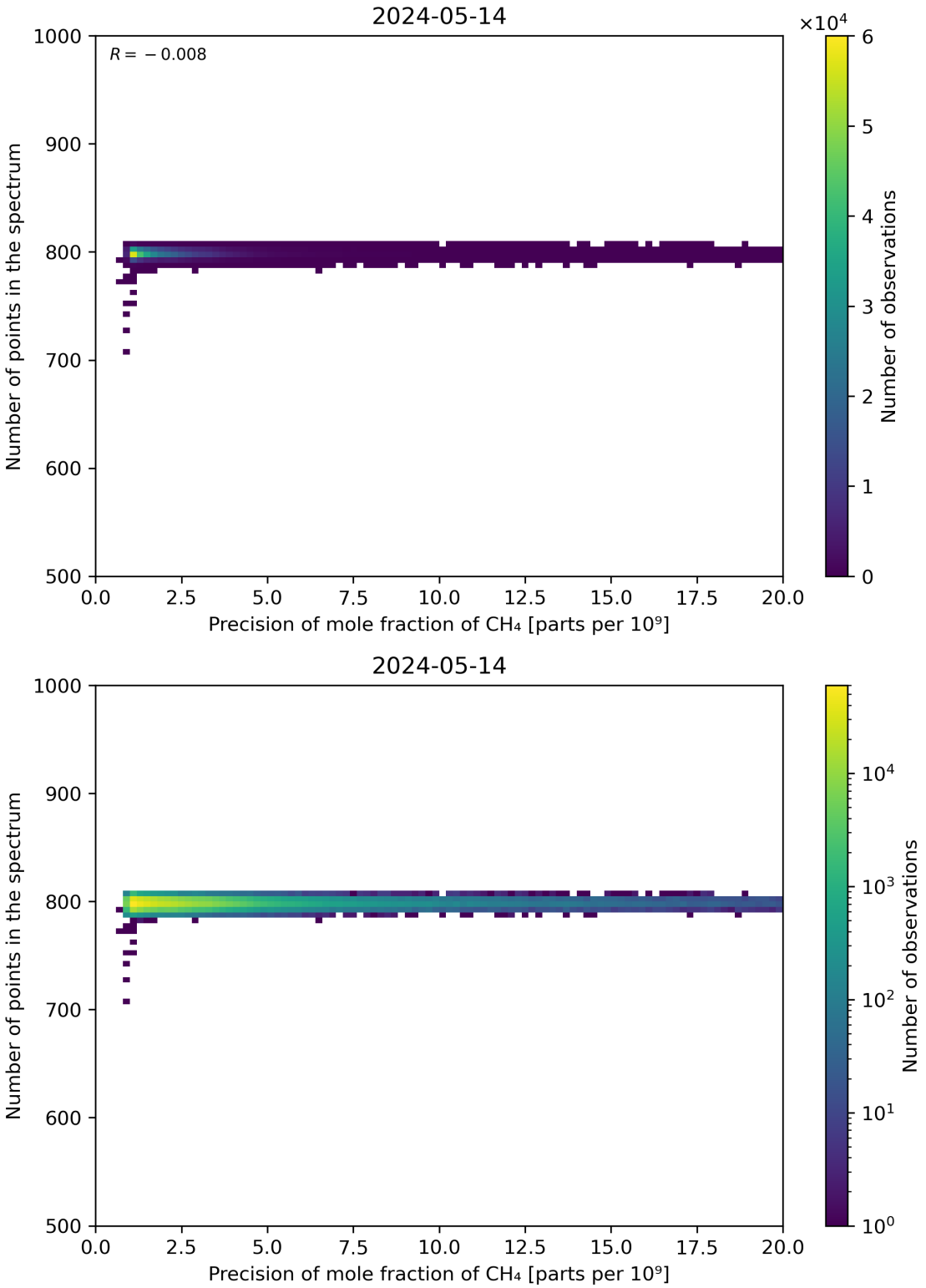


Figure 84: Scatter density plot of "Precision of mole fraction of CH_4" against "Number of points in the spectrum" for 2024-05-13 to 2024-05-15.

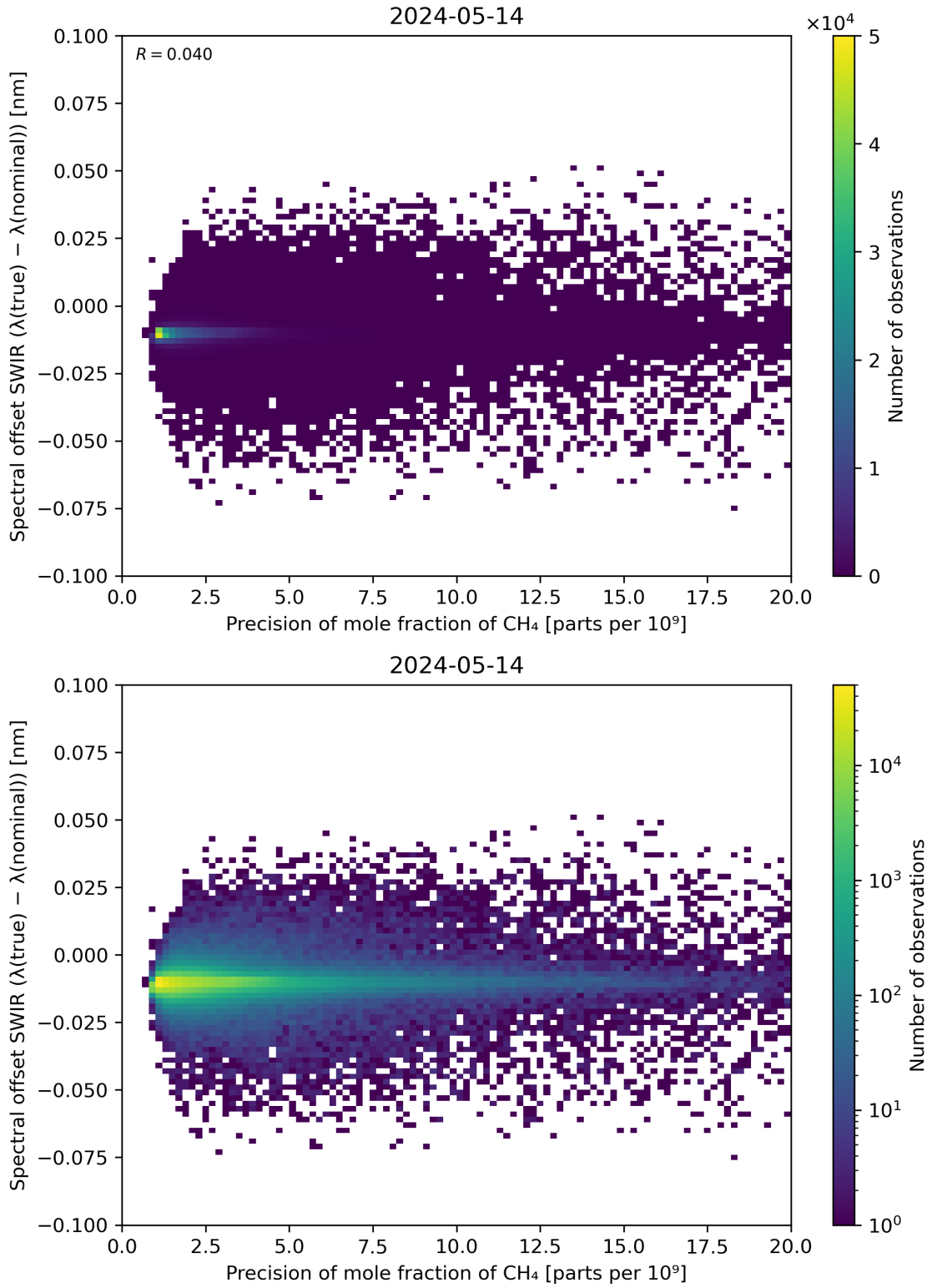


Figure 85: Scatter density plot of "Precision of mole fraction of CH_4" against "Spectral offset SWIR (λ(true) − λ(nominal))" for 2024-05-13 to 2024-05-15.

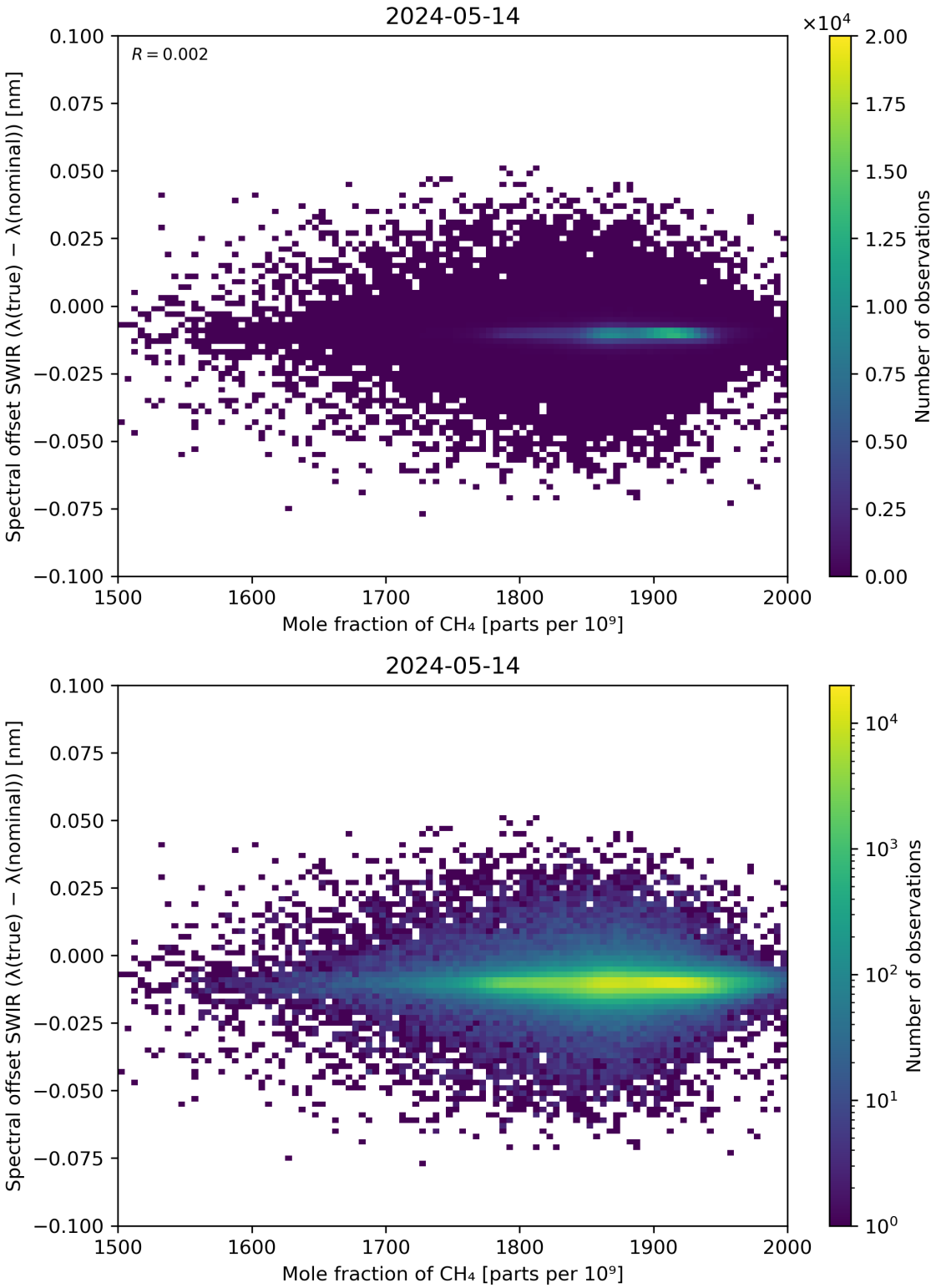


Figure 86: Scatter density plot of "Mole fraction of CH_4" against "Spectral offset SWIR (λ(true) − λ(nominal))" for 2024-05-13 to 2024-05-15.

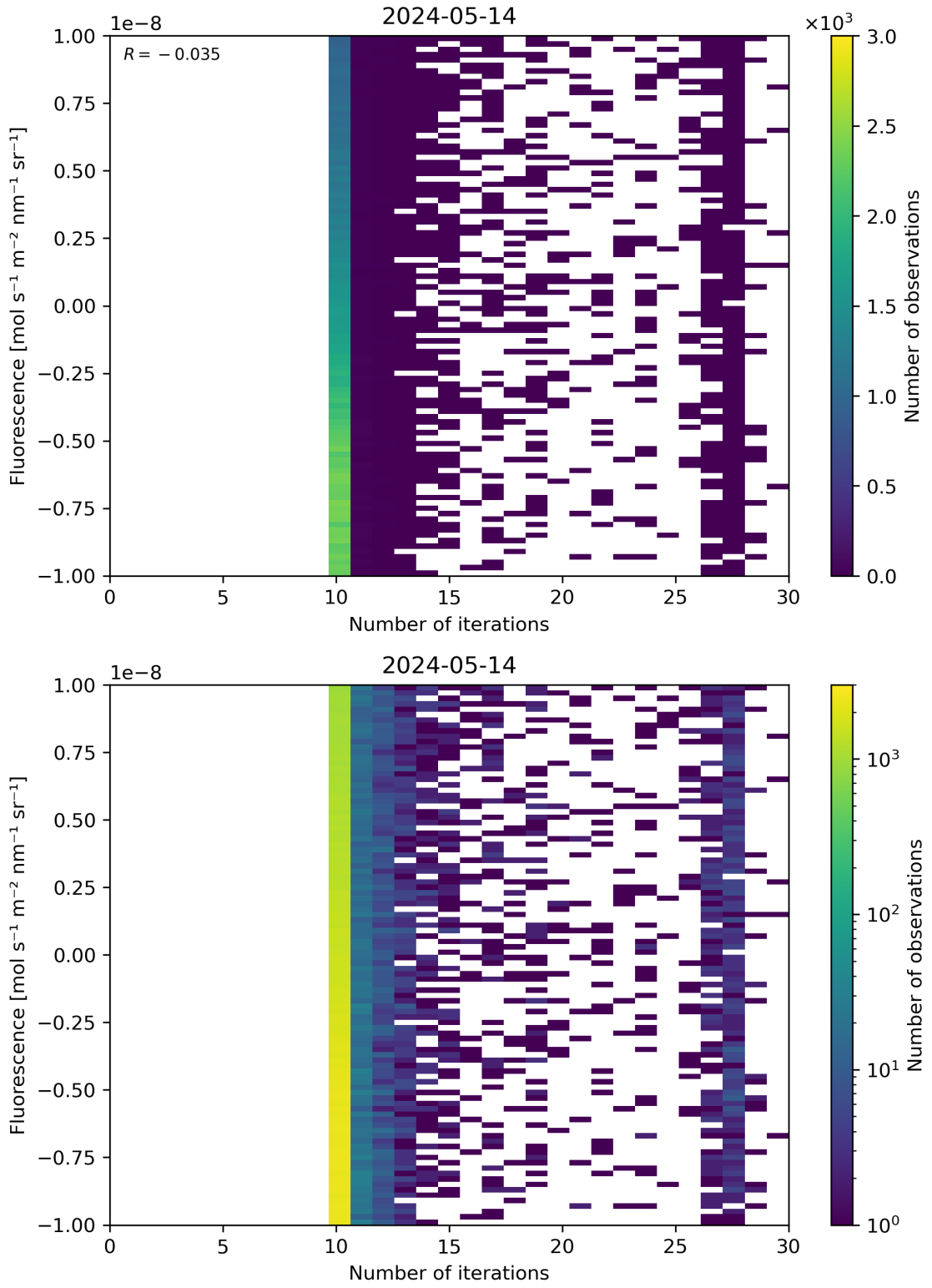


Figure 87: Scatter density plot of “Number of iterations” against “Fluorescence” for 2024-05-13 to 2024-05-15.

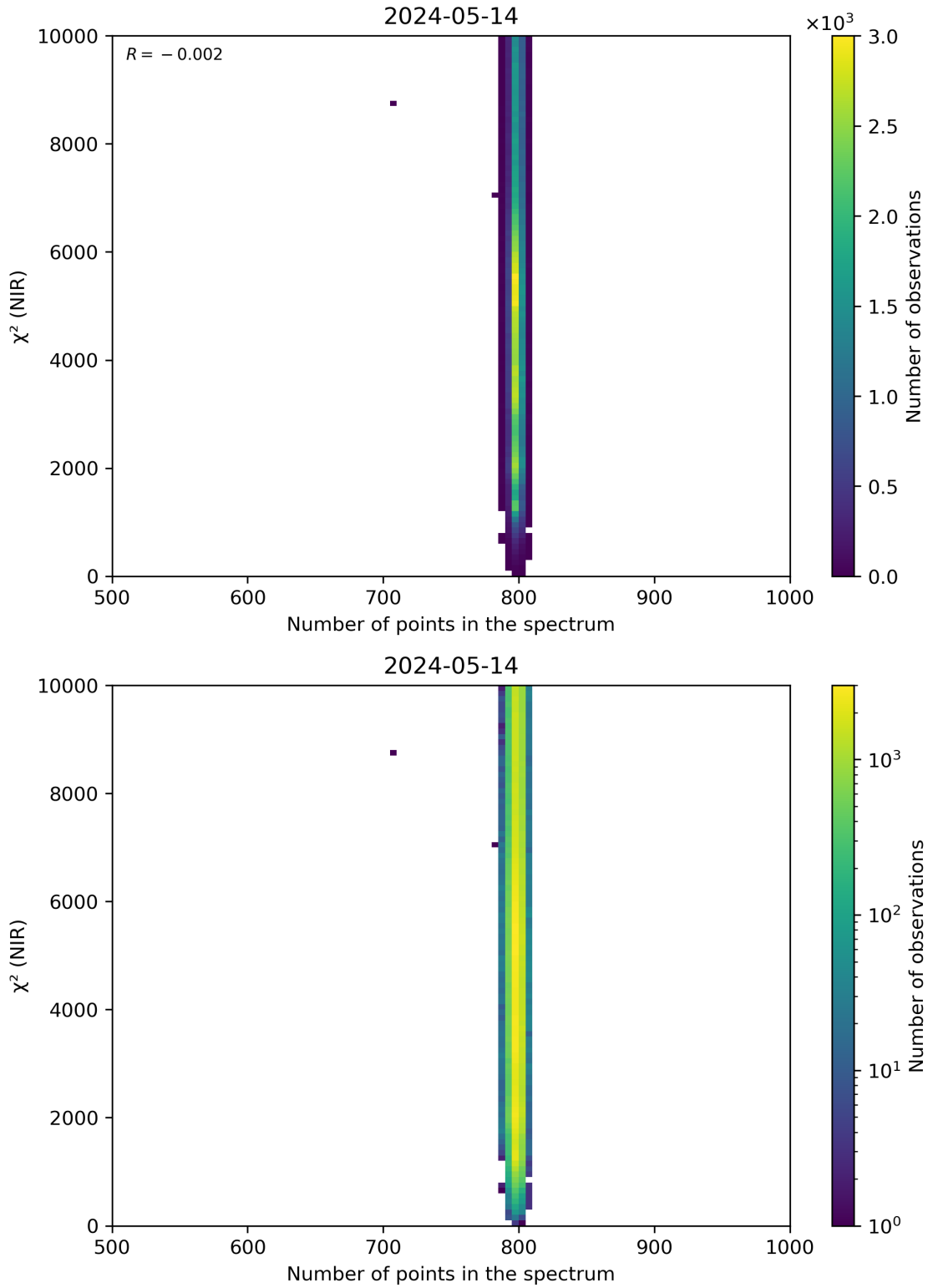


Figure 88: Scatter density plot of "Number of points in the spectrum" against "χ^2 (NIR)" for 2024-05-13 to 2024-05-15.

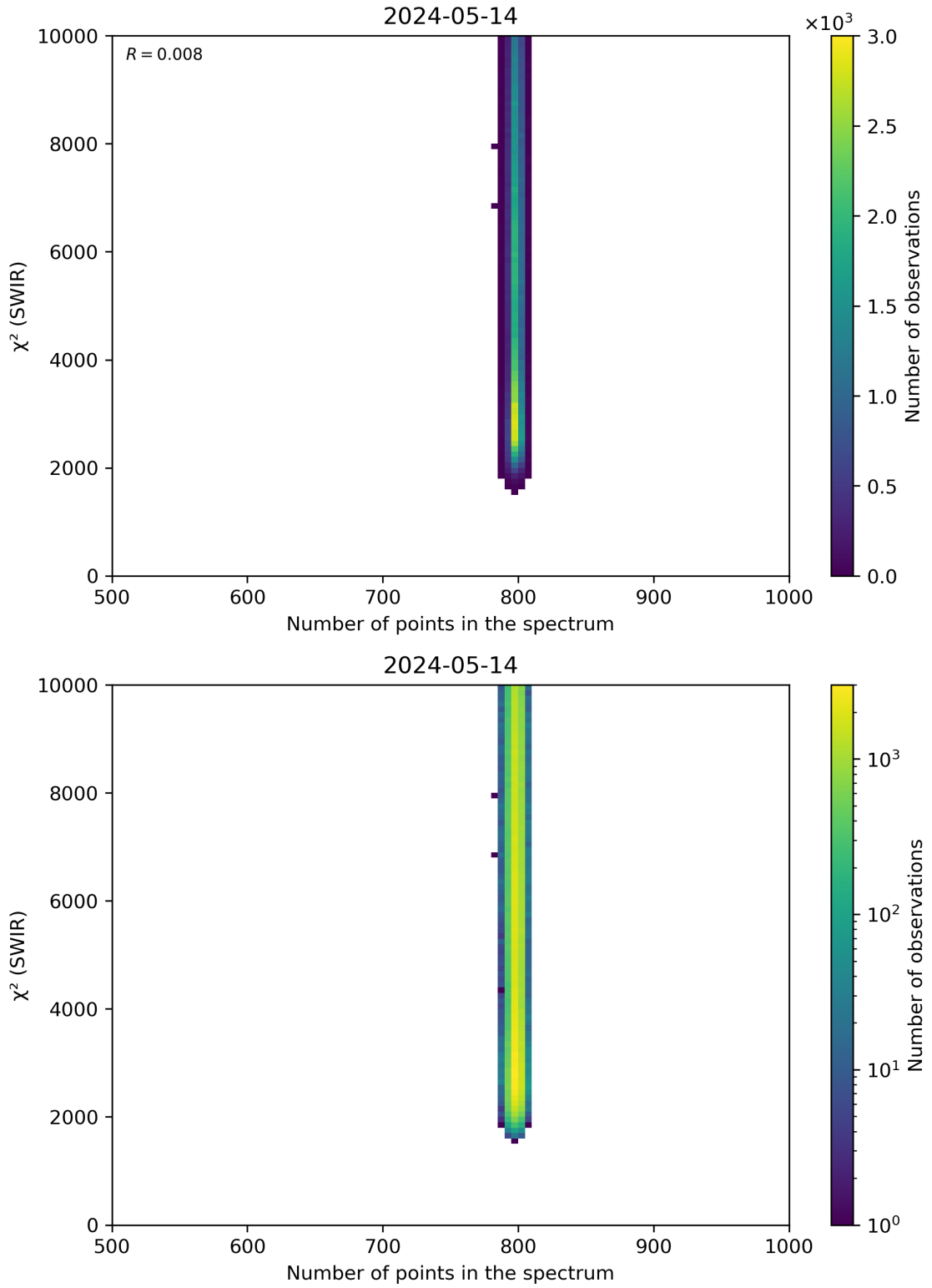


Figure 89: Scatter density plot of “Number of points in the spectrum” against “χ^2 (SWIR)” for 2024-05-13 to 2024-05-15.

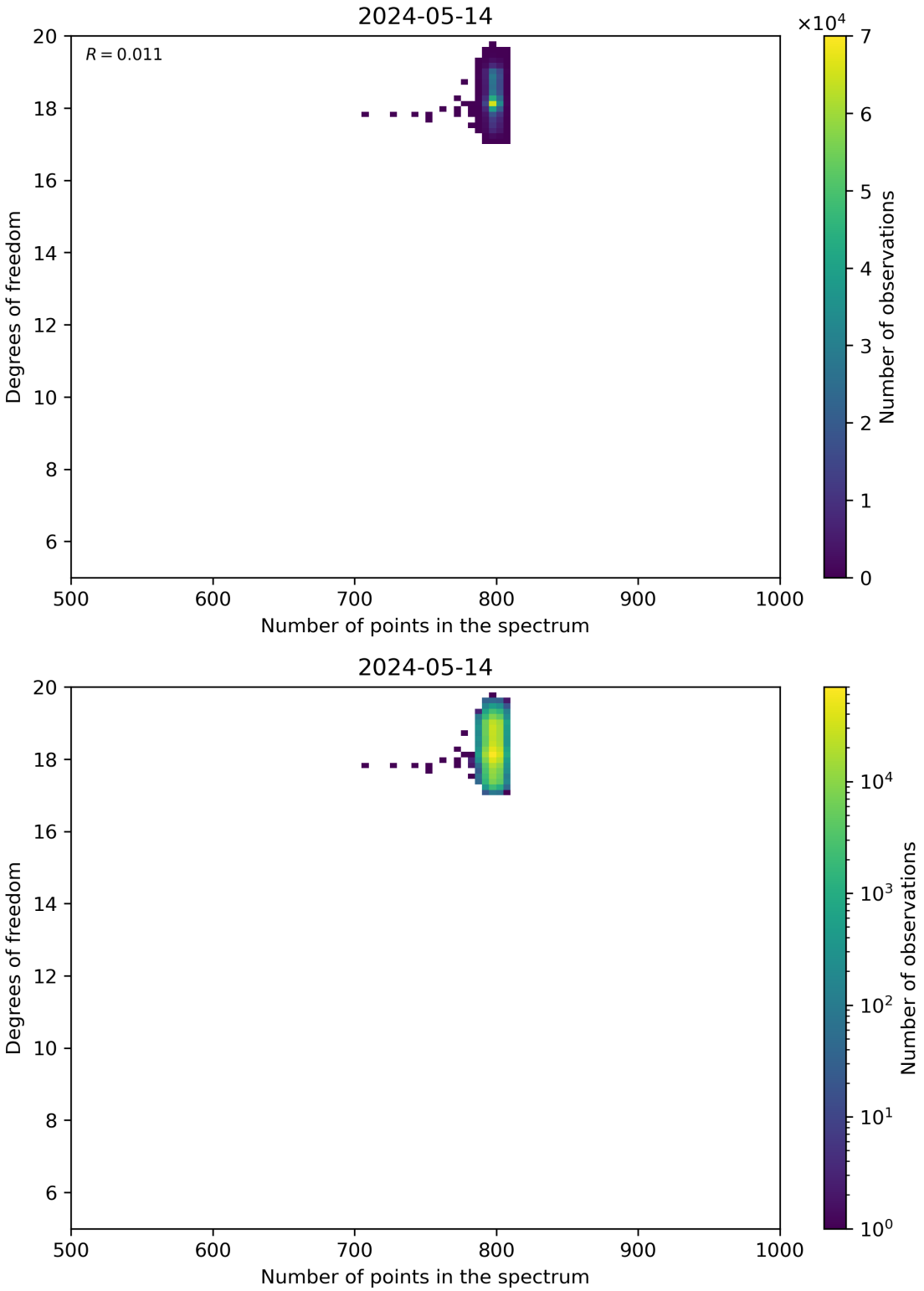


Figure 90: Scatter density plot of “Number of points in the spectrum” against “Degrees of freedom” for 2024-05-13 to 2024-05-15.

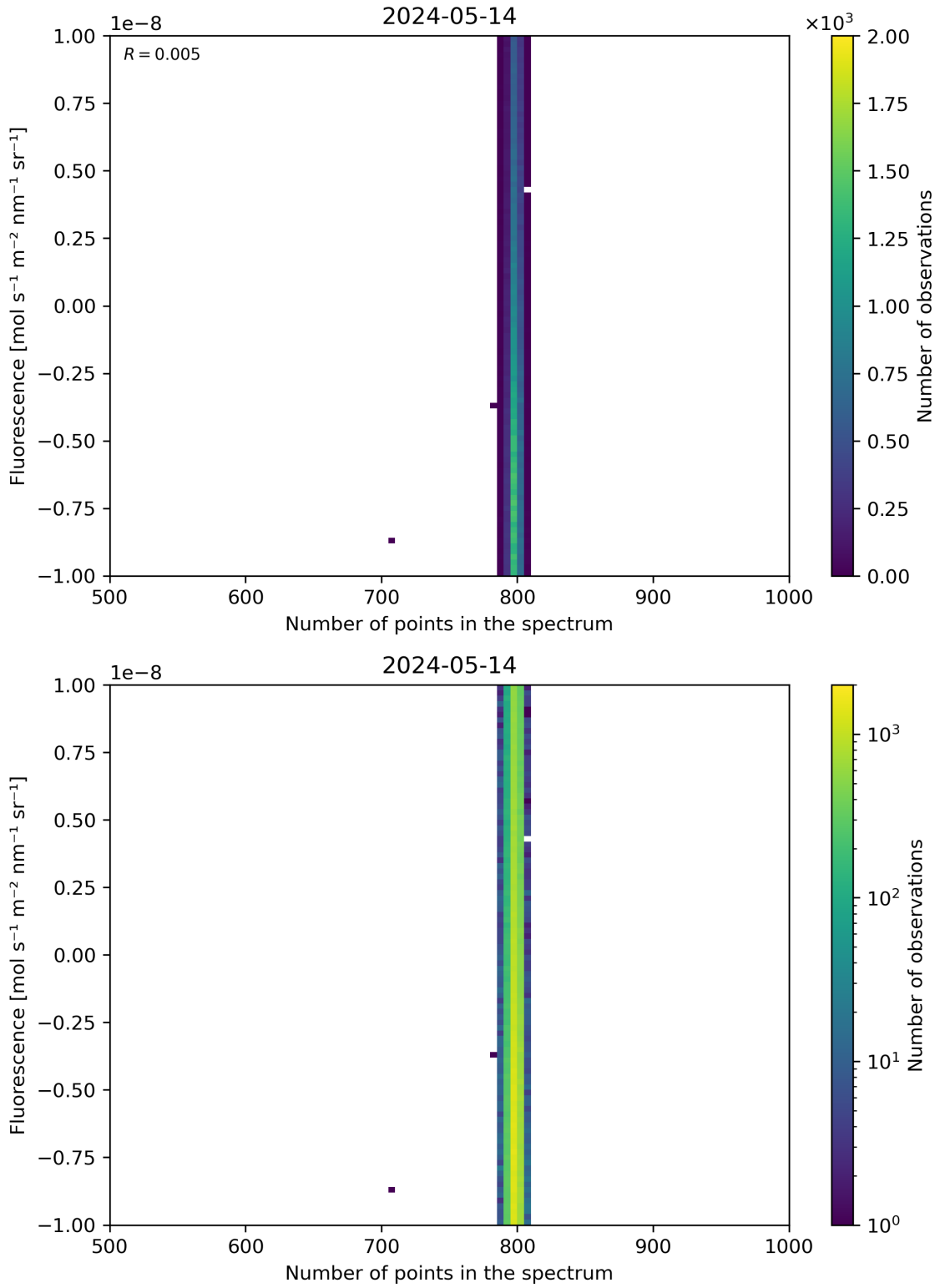


Figure 91: Scatter density plot of “Number of points in the spectrum” against “Fluorescence” for 2024-05-13 to 2024-05-15.

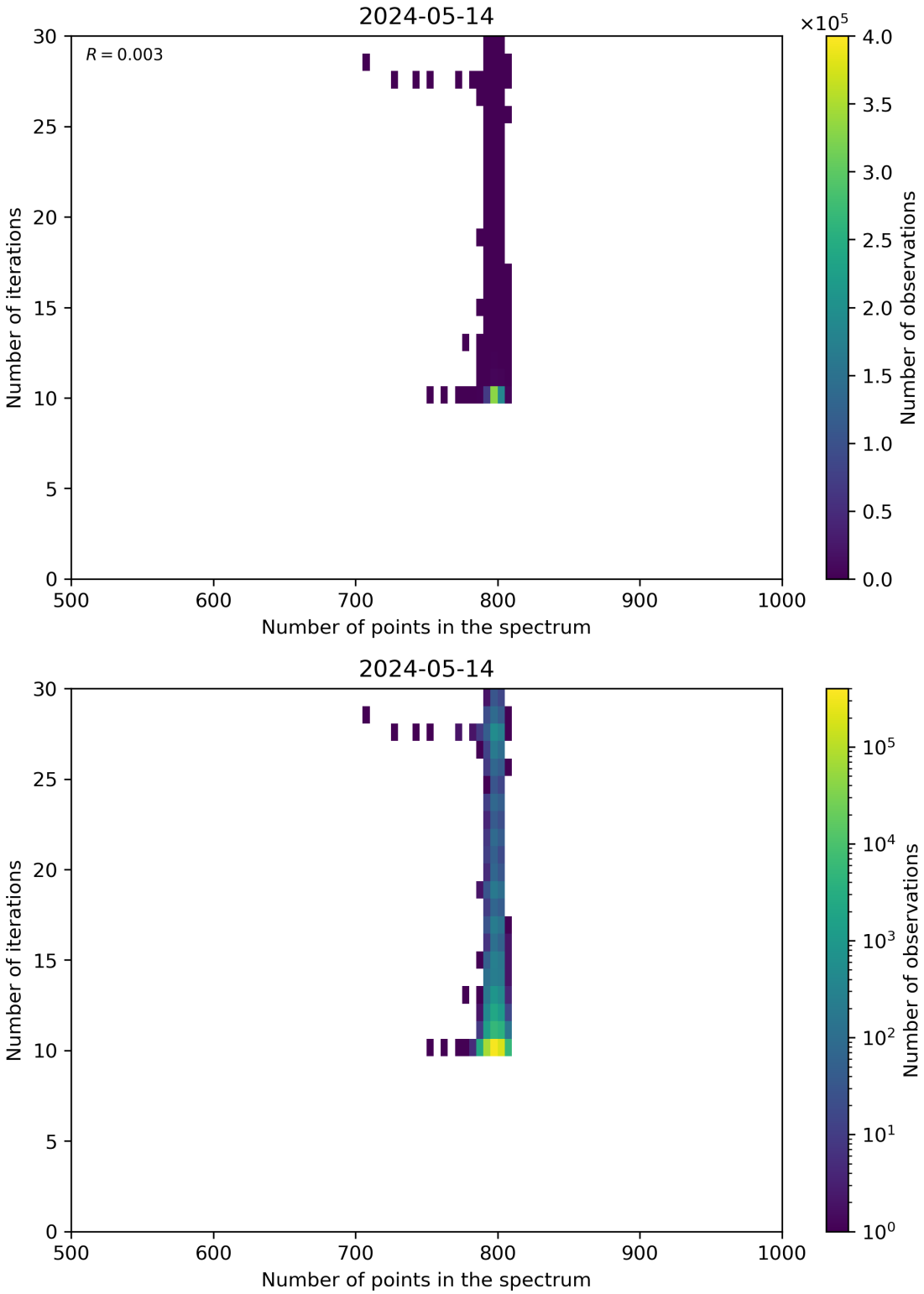


Figure 92: Scatter density plot of “Number of points in the spectrum” against “Number of iterations” for 2024-05-13 to 2024-05-15.

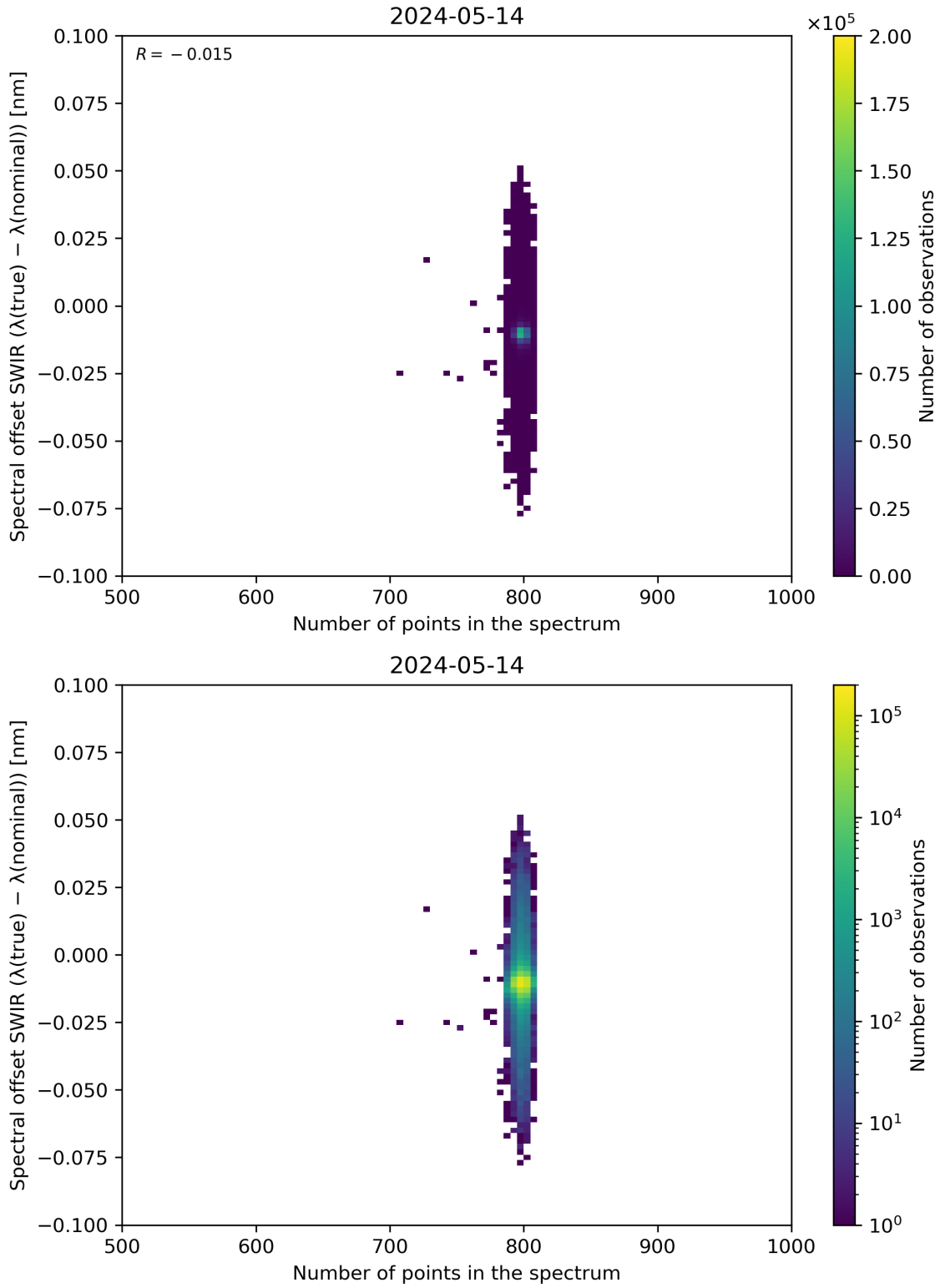


Figure 93: Scatter density plot of "Number of points in the spectrum" against "Spectral offset SWIR (λ(true) − λ(nominal))" for 2024-05-13 to 2024-05-15.

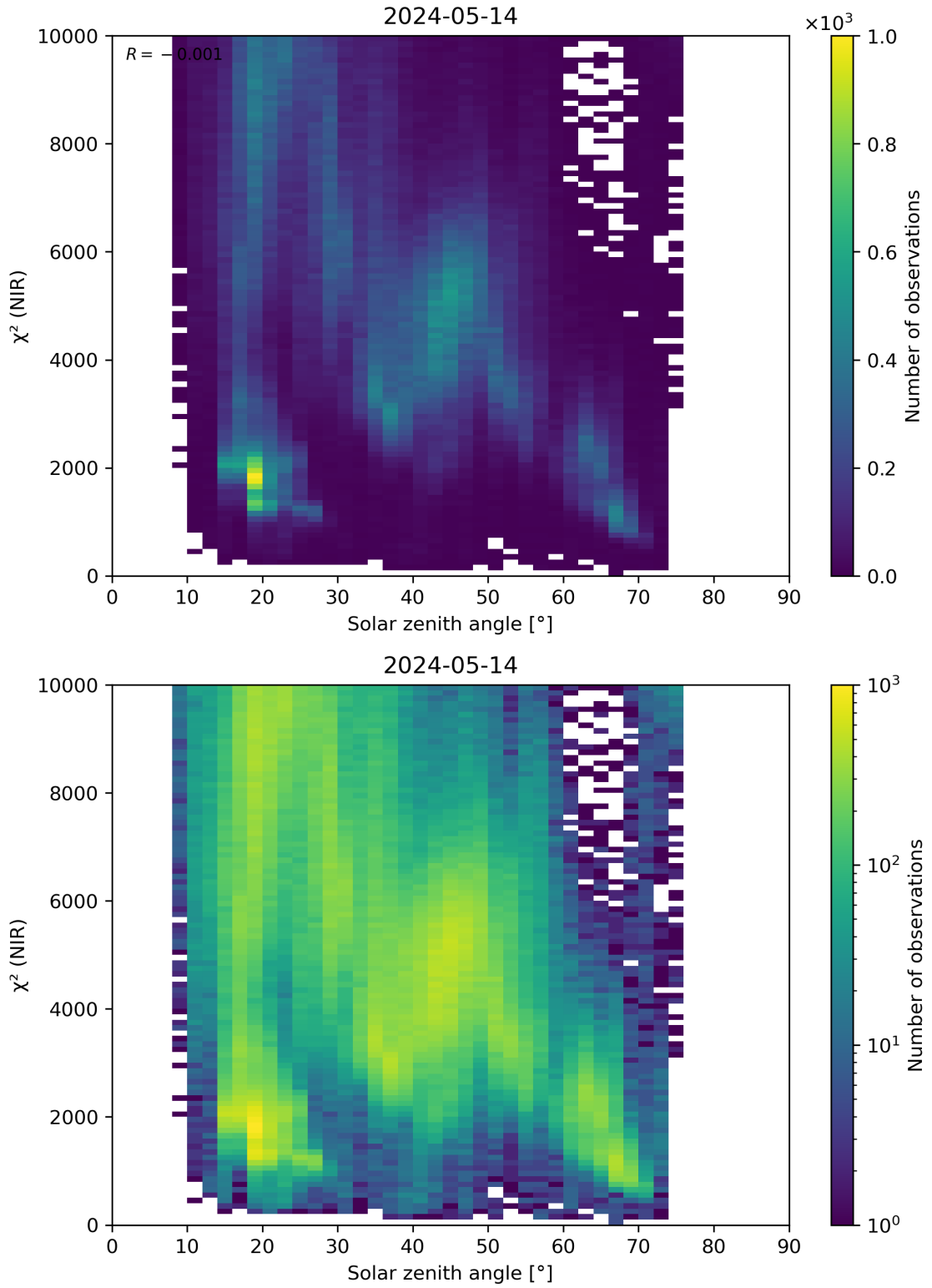


Figure 94: Scatter density plot of “Solar zenith angle” against “χ^2 (NIR)” for 2024-05-13 to 2024-05-15.

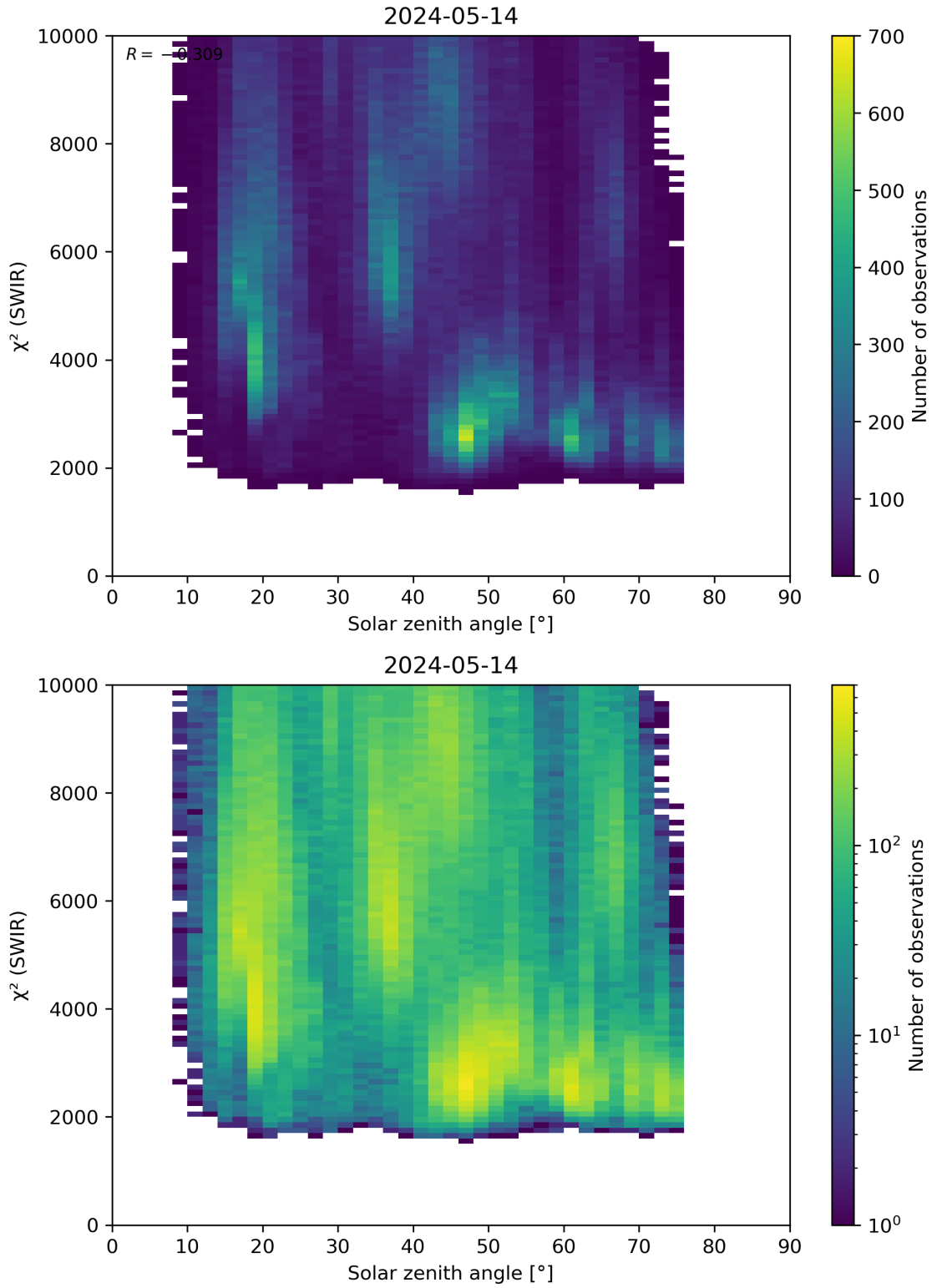
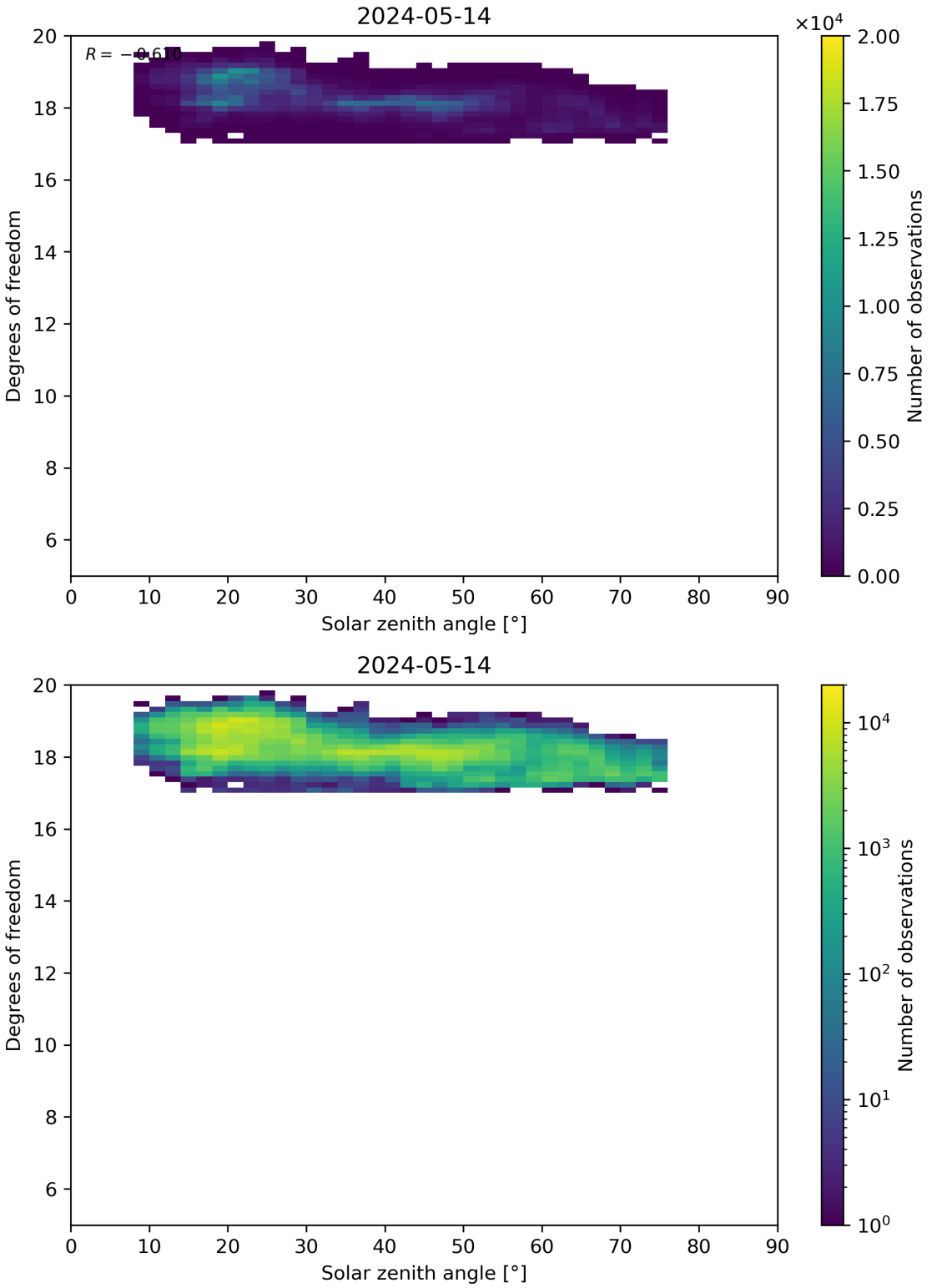


Figure 95: Scatter density plot of “Solar zenith angle” against “χ^2 (SWIR)” for 2024-05-13 to 2024-05-15.



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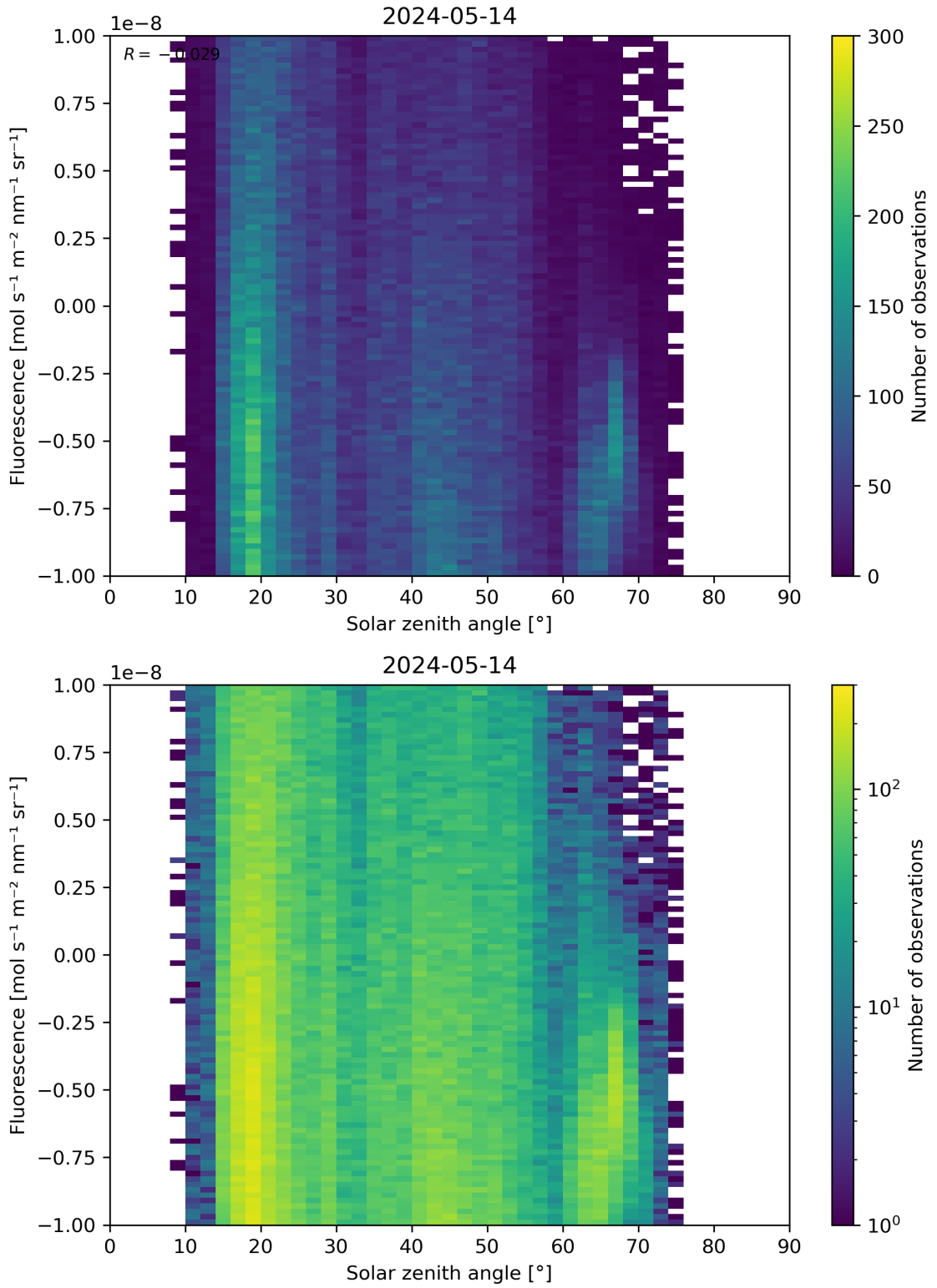

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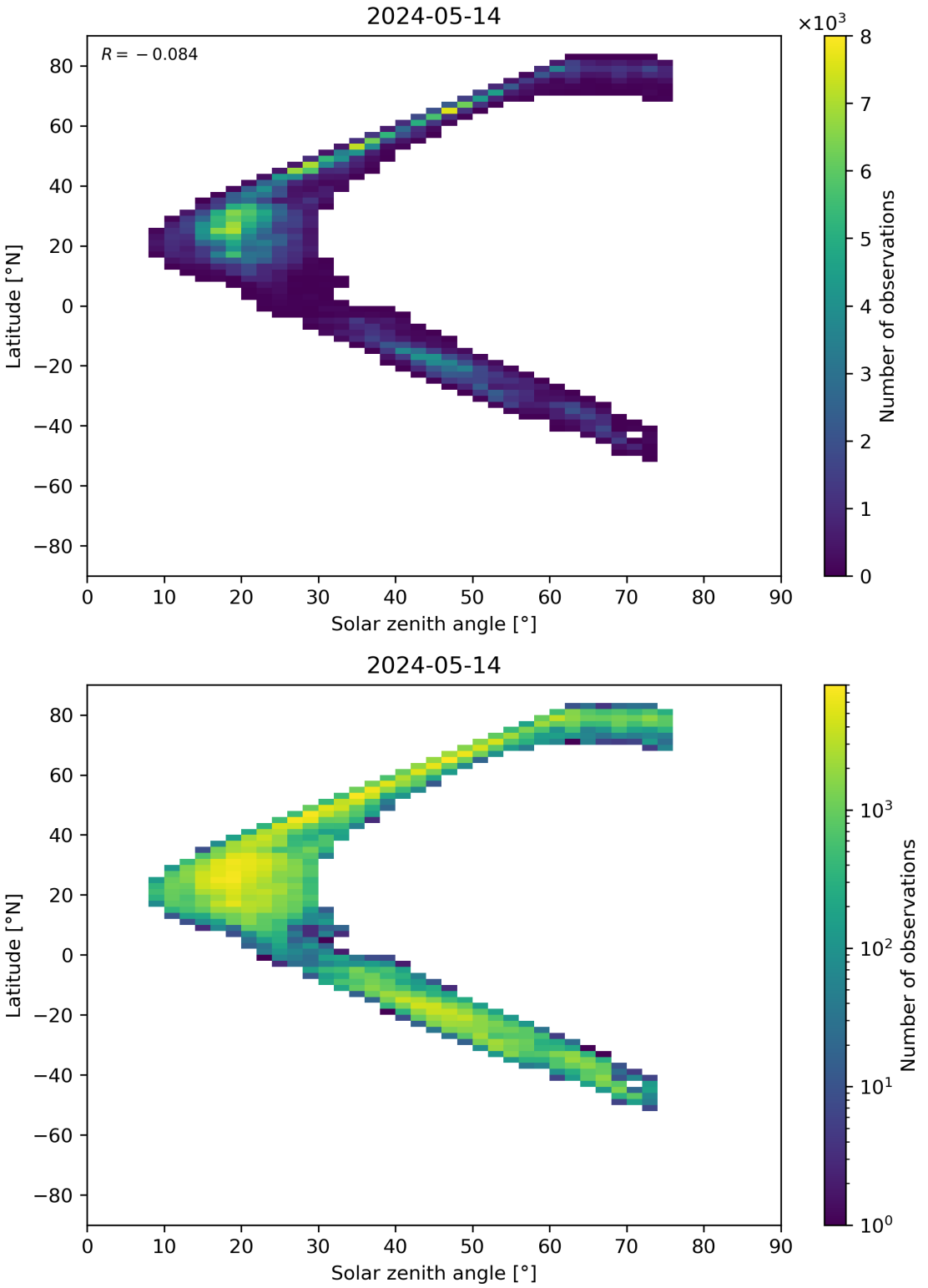
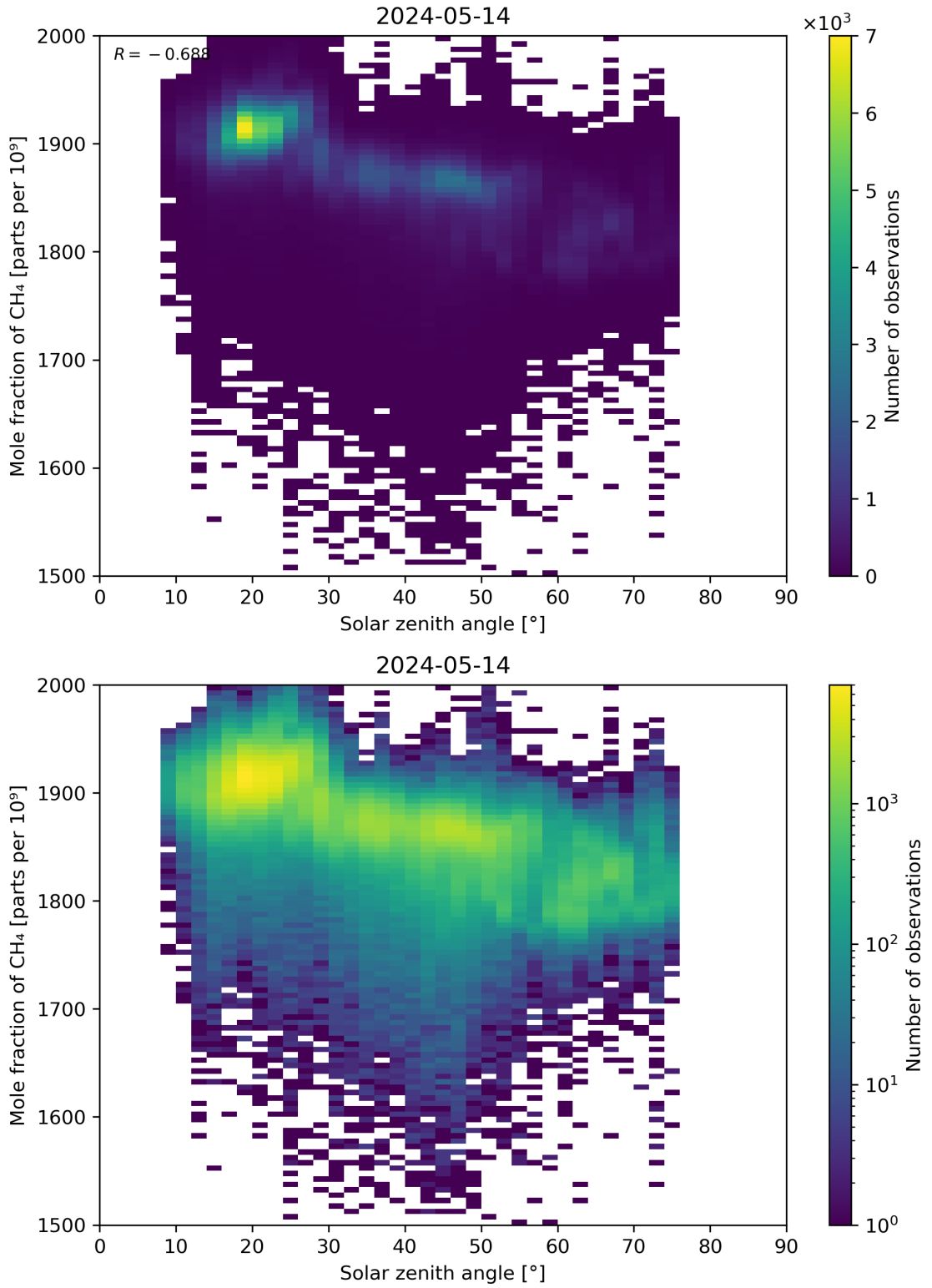


Figure 98: Scatter density plot of “Solar zenith angle” against “Latitude” for 2024-05-13 to 2024-05-15.



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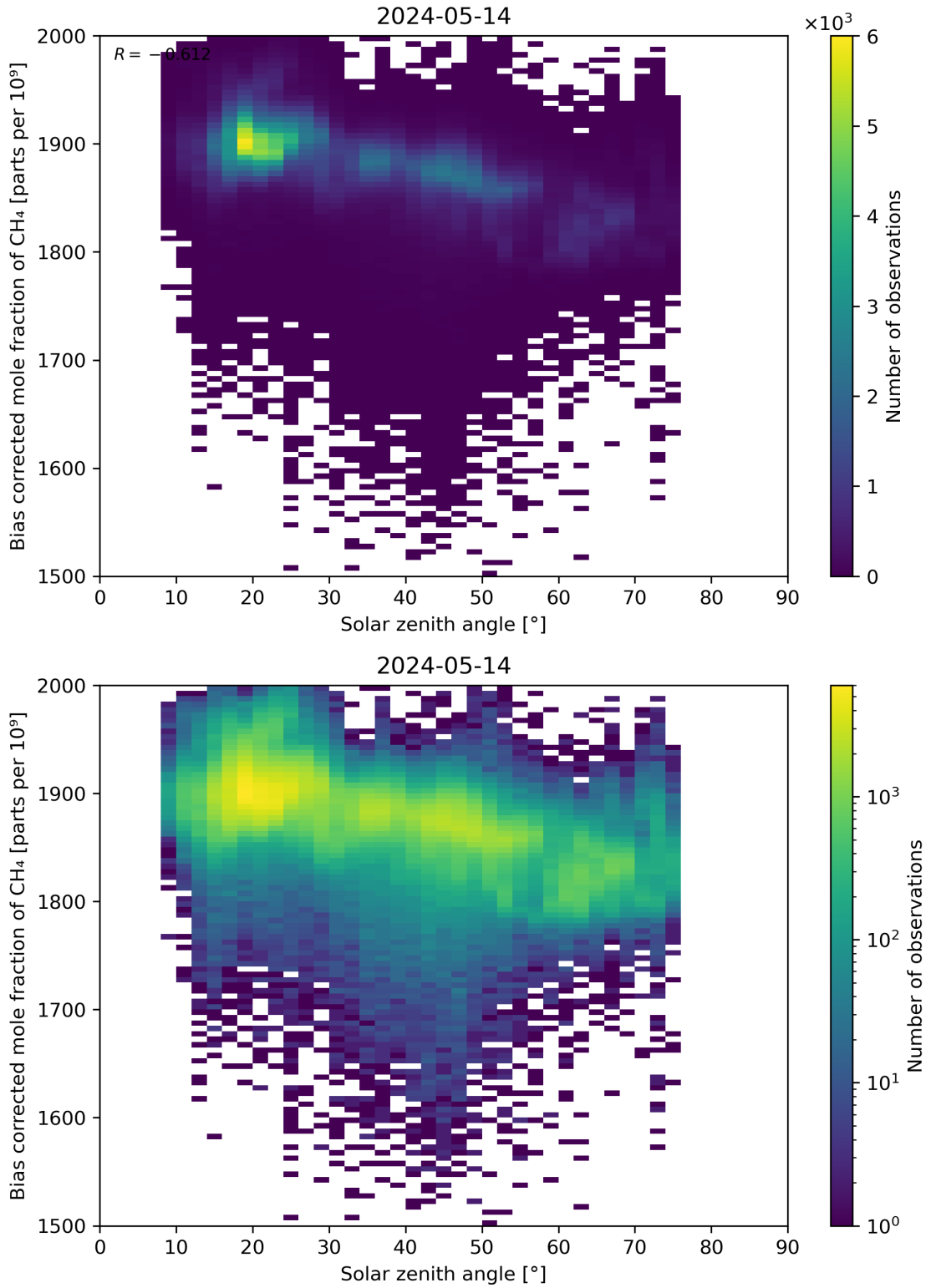

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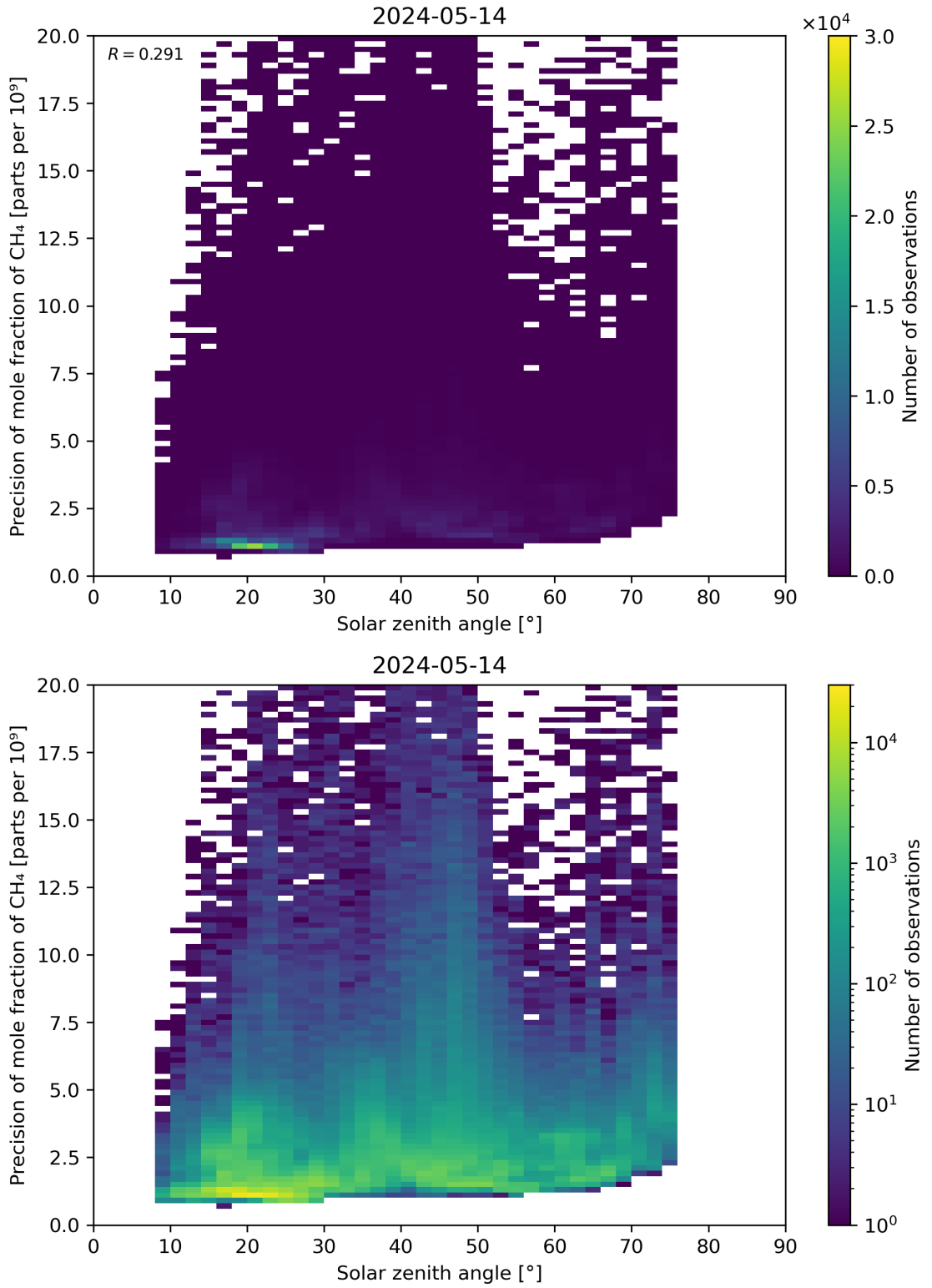

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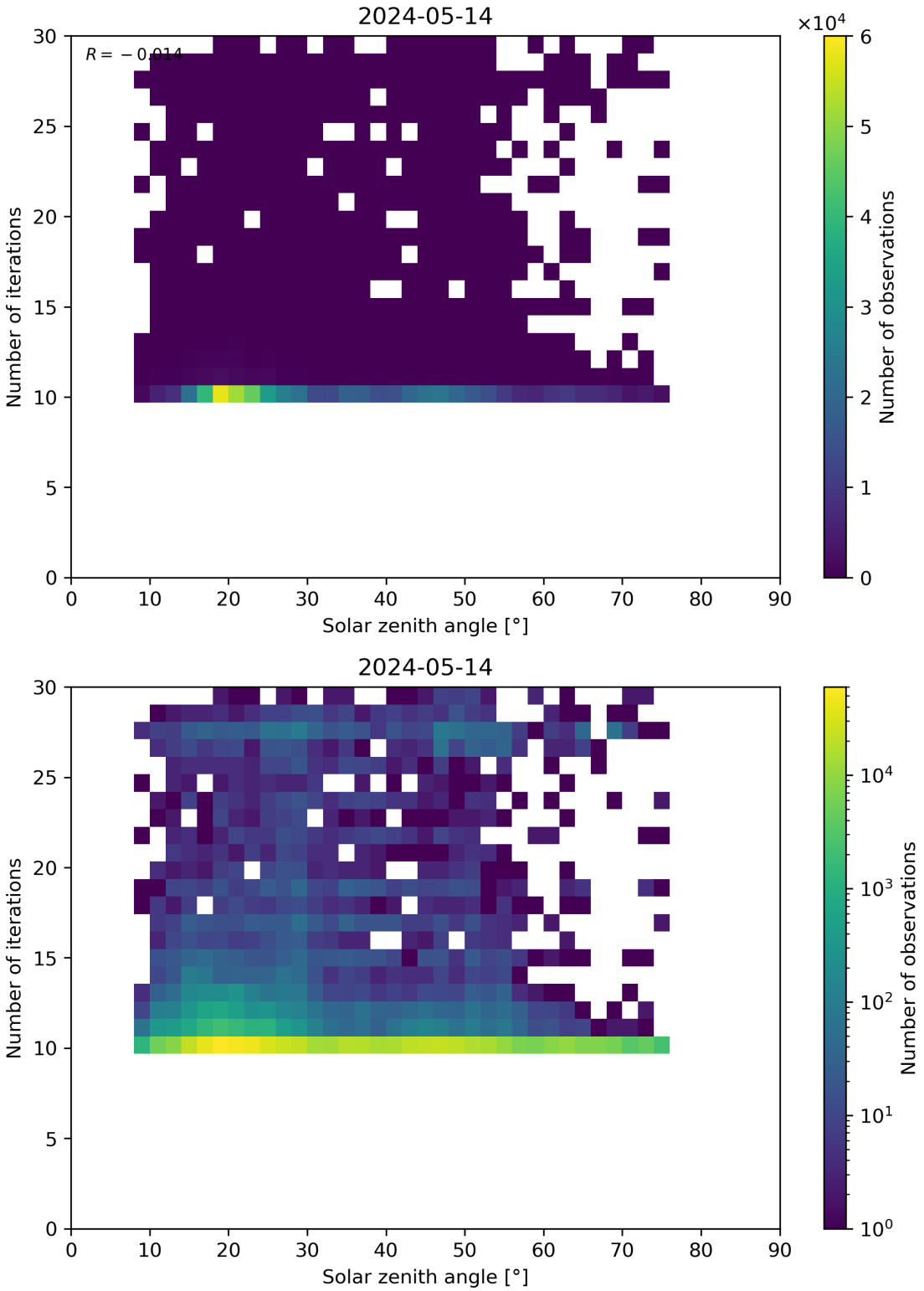

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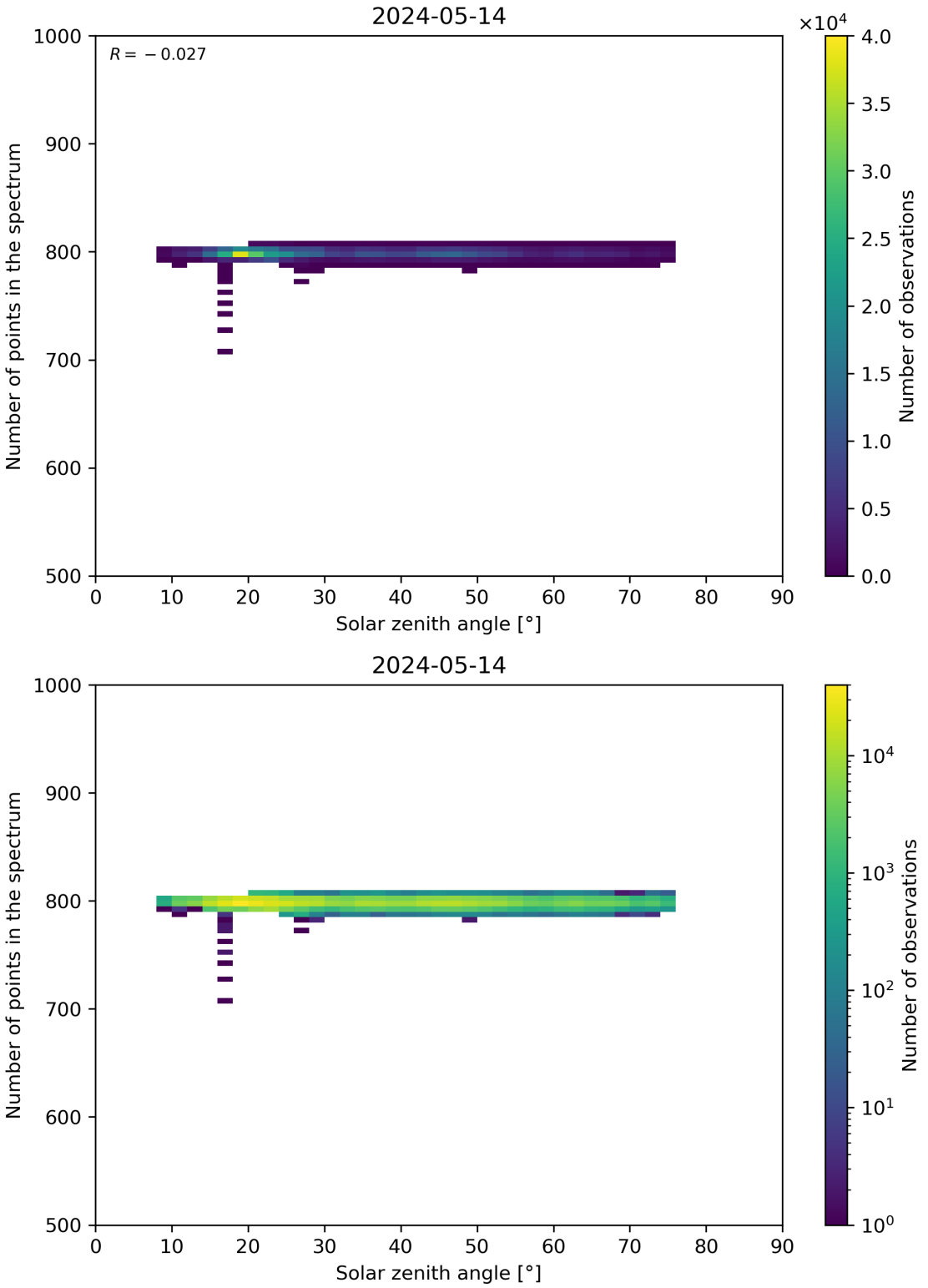

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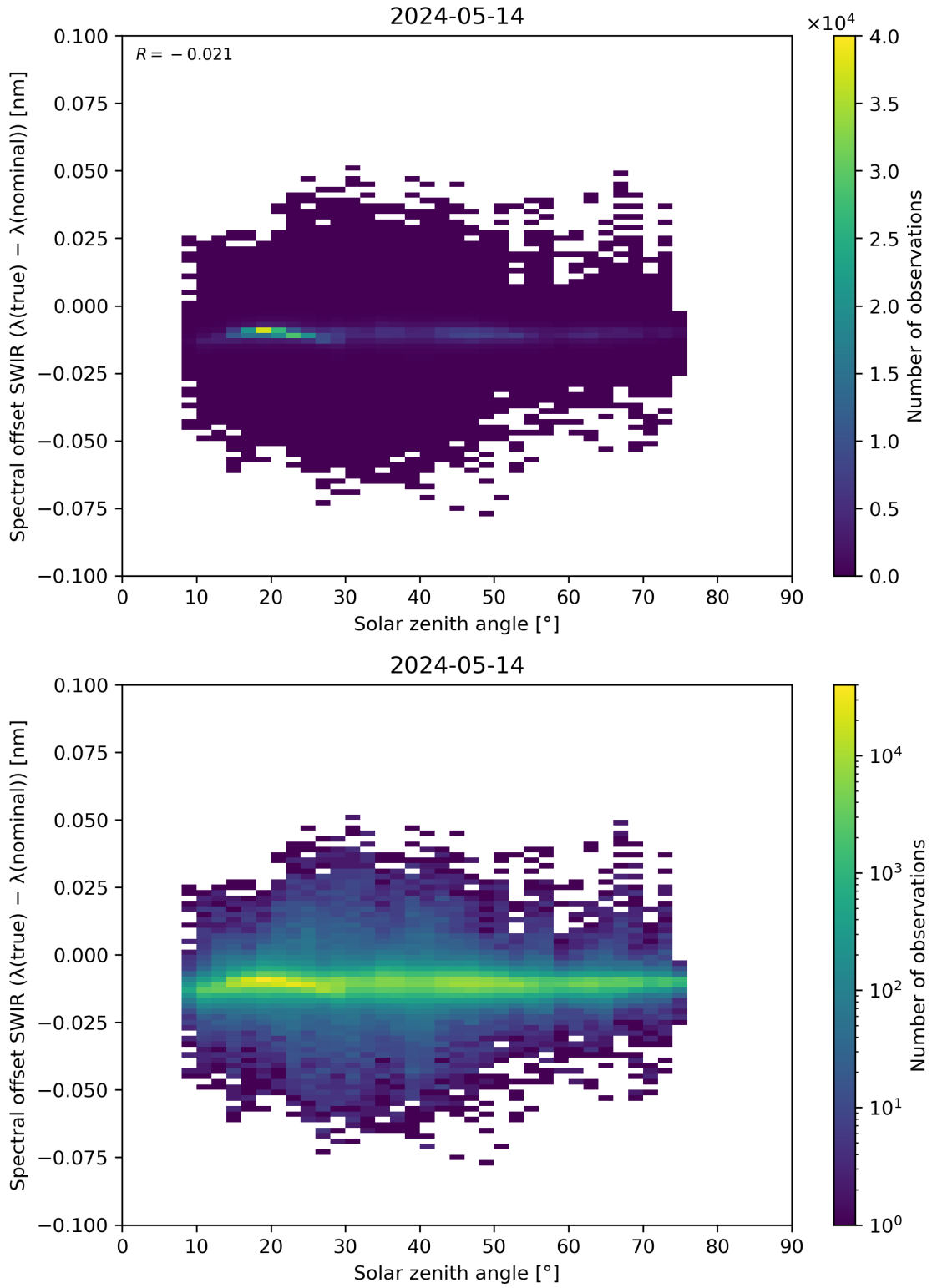

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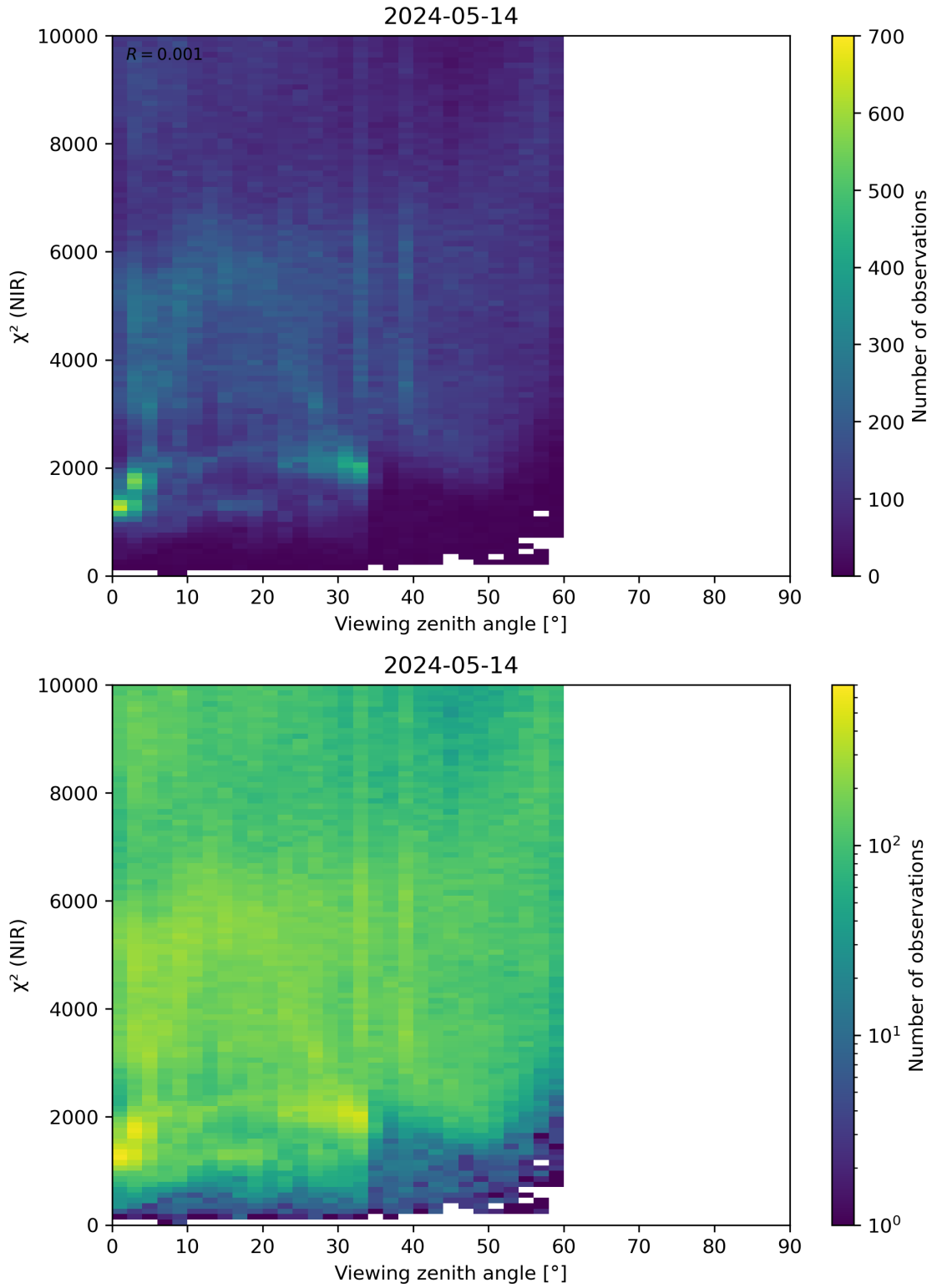


Figure 105: Scatter density plot of “Viewing zenith angle” against “χ^2 (NIR)” for 2024-05-13 to 2024-05-15.

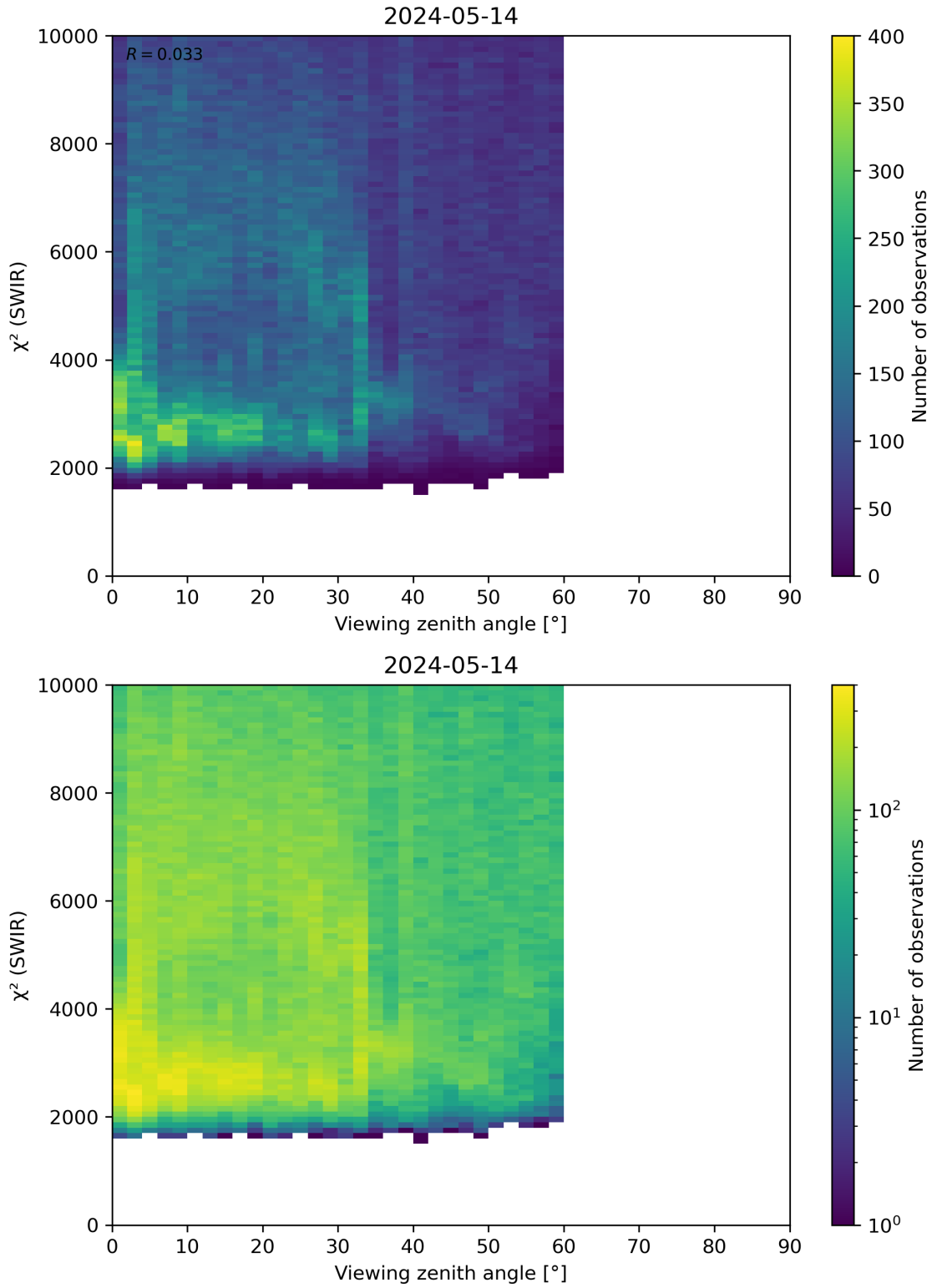
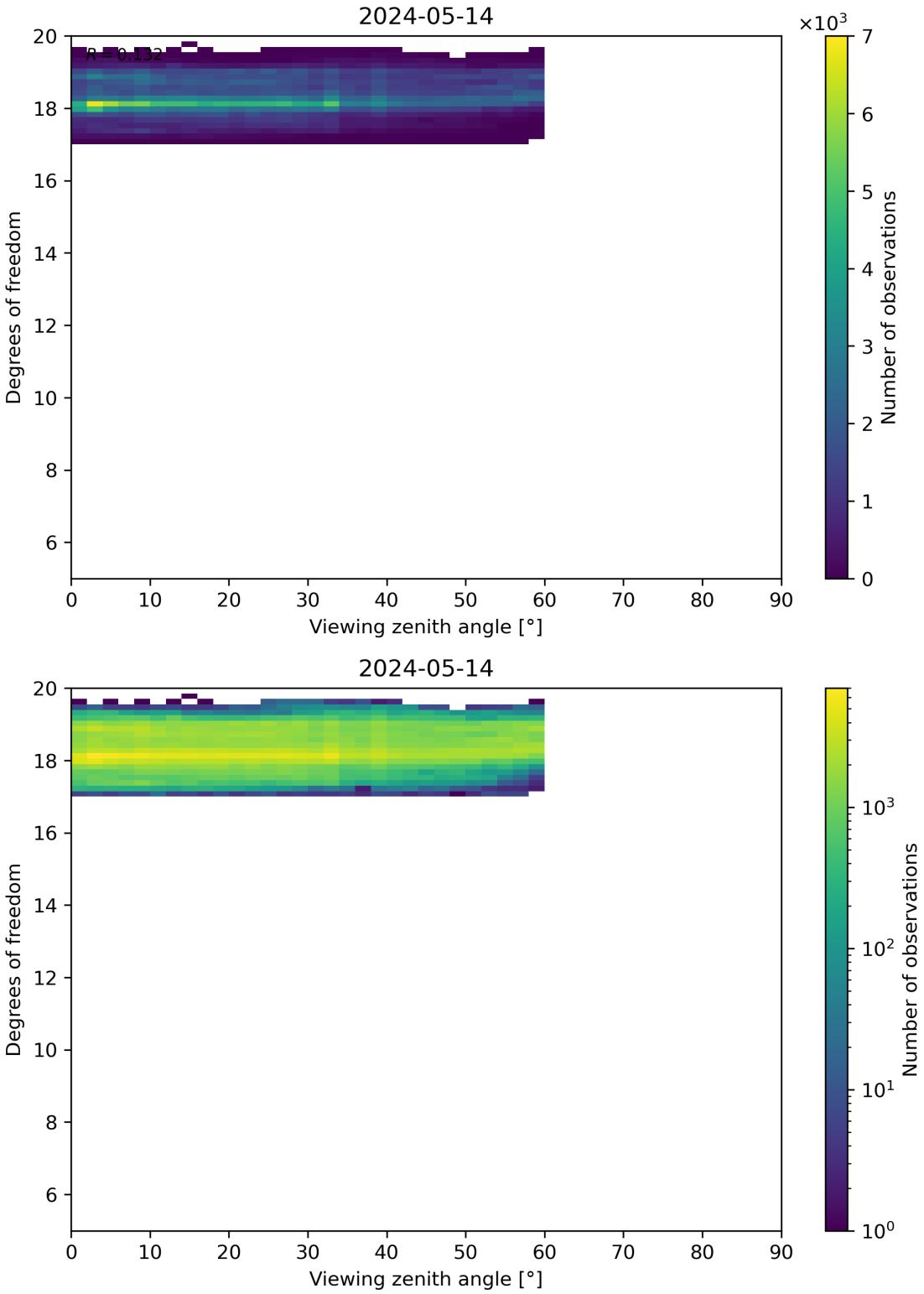


Figure 106: Scatter density plot of “Viewing zenith angle” against “χ^2 (SWIR)” for 2024-05-13 to 2024-05-15.



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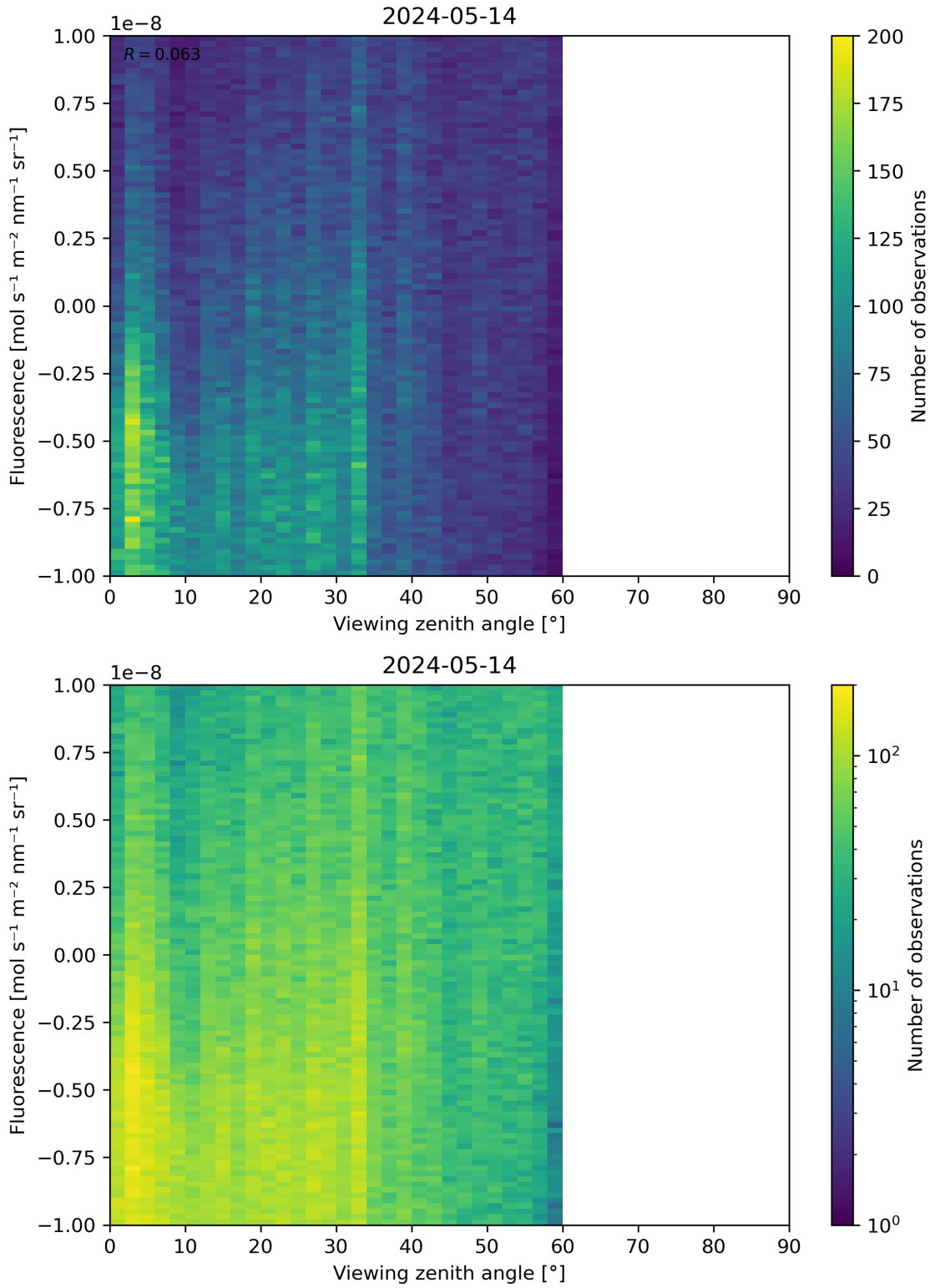

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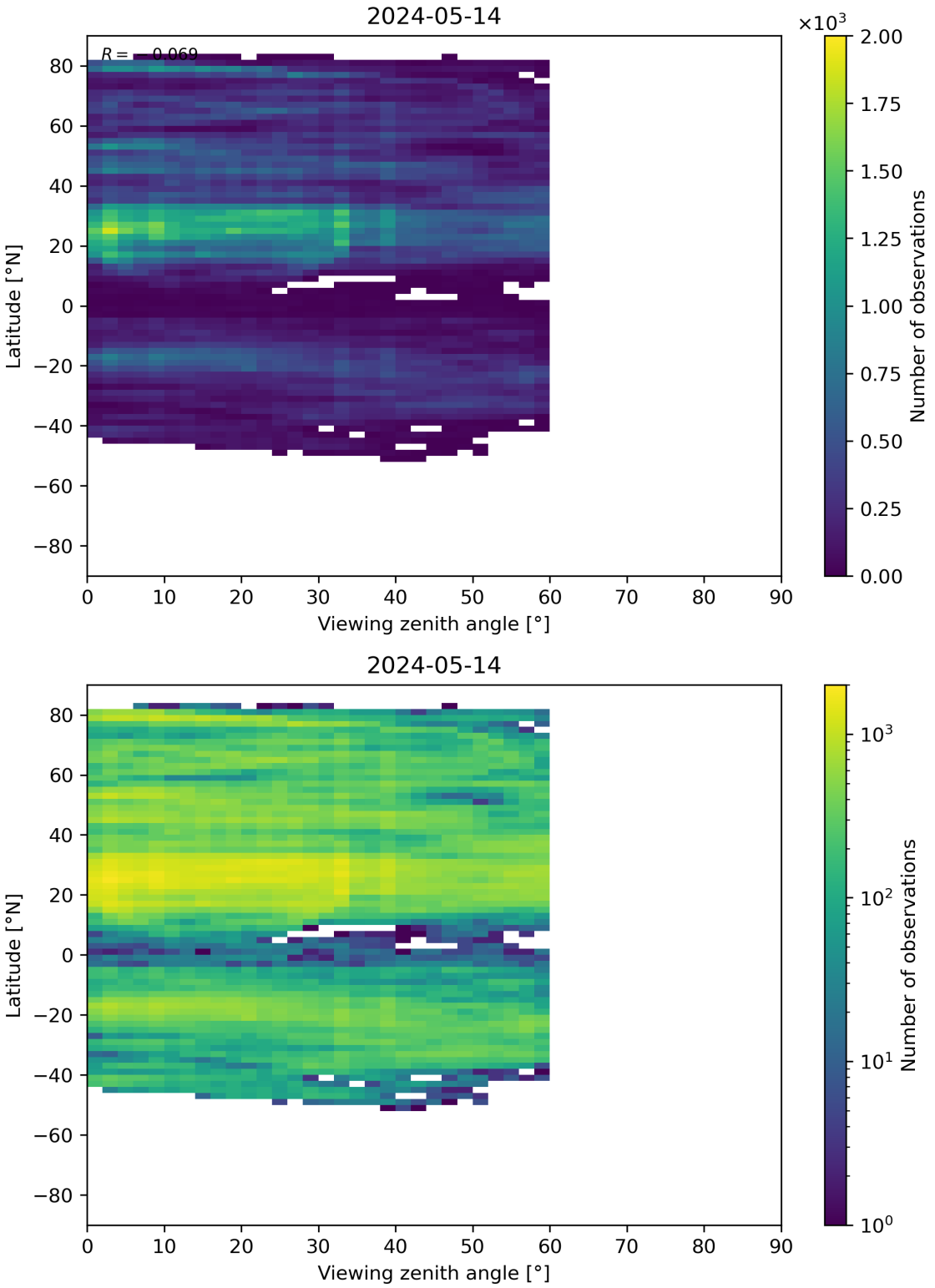

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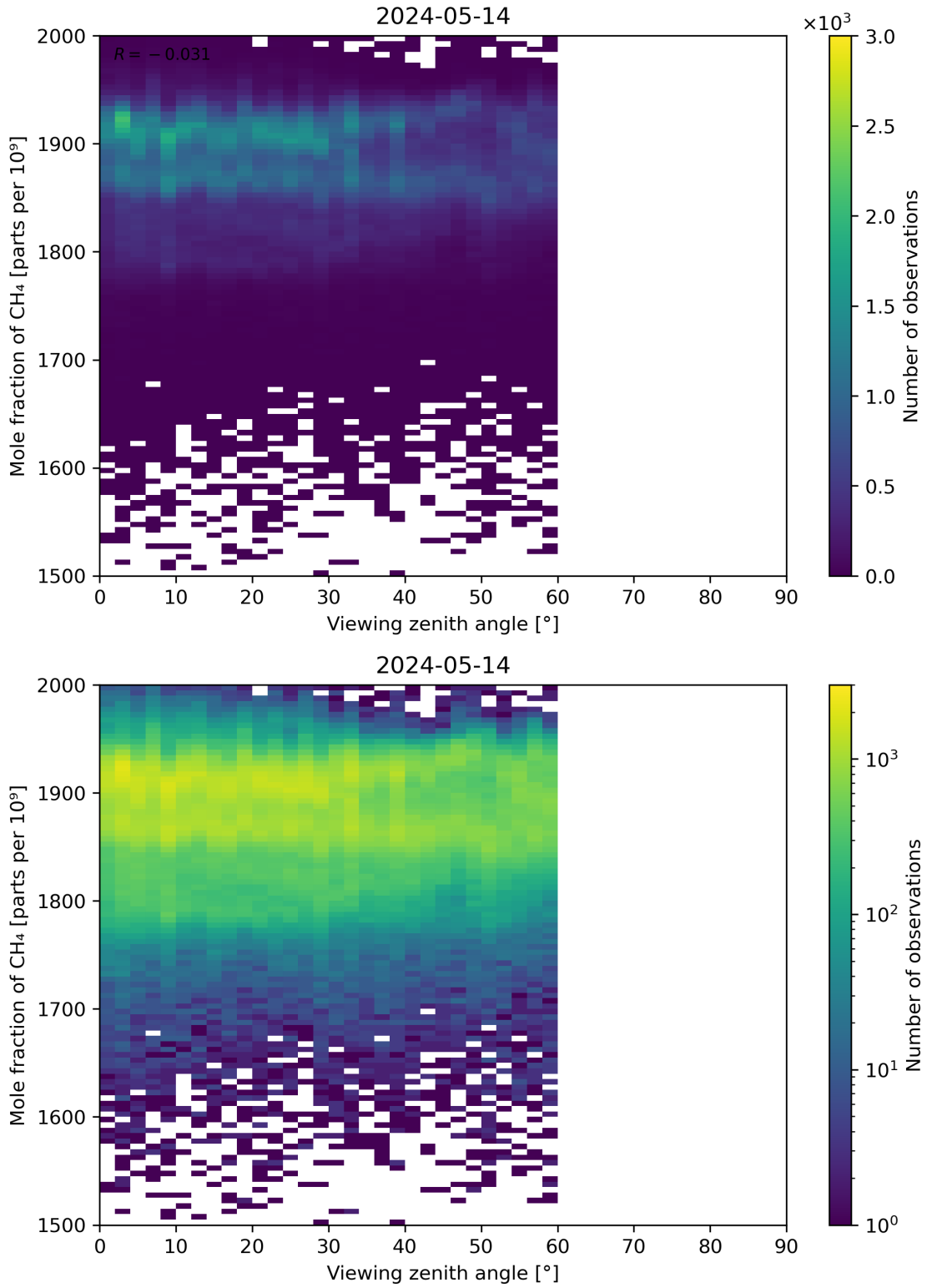

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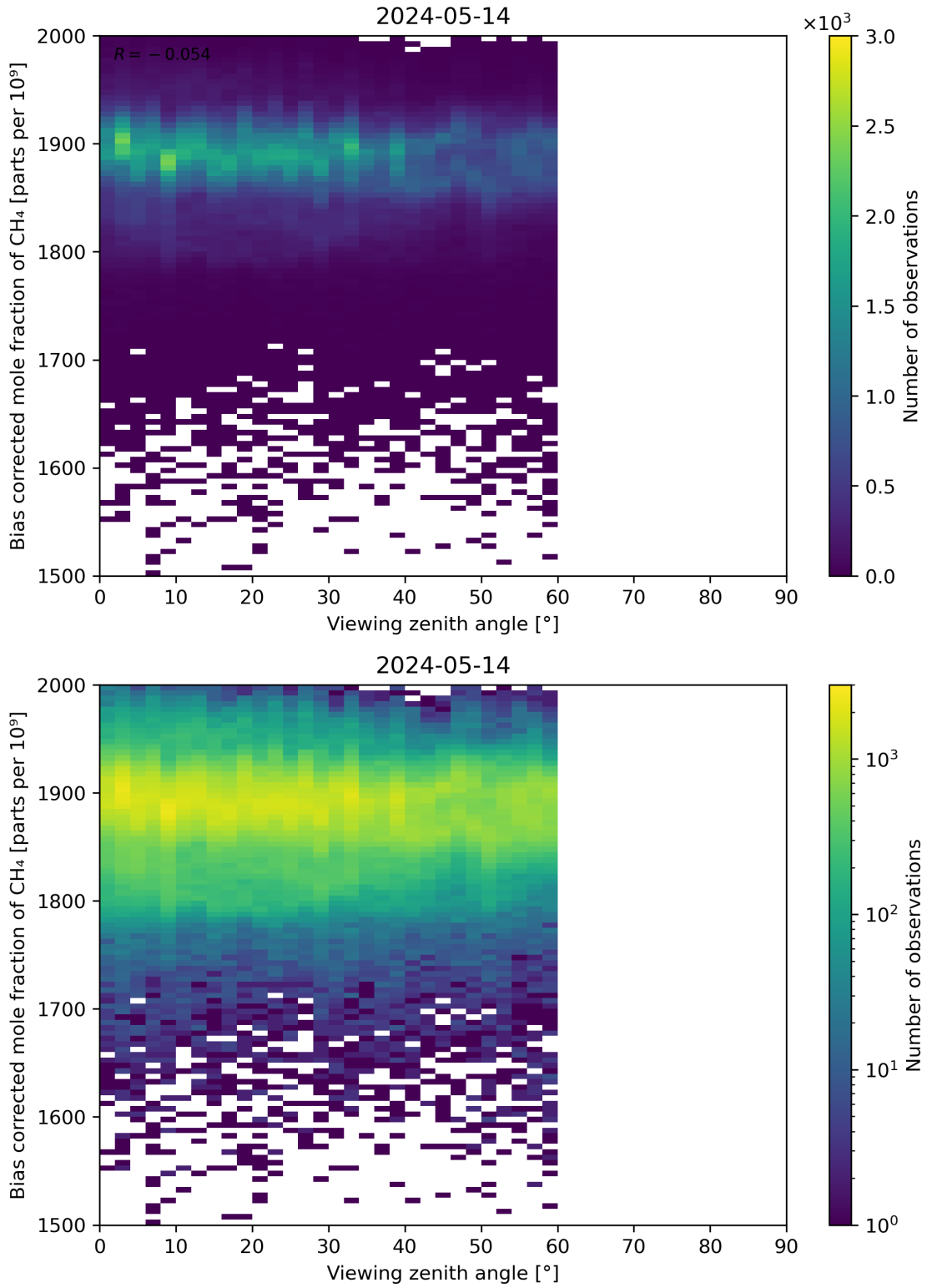

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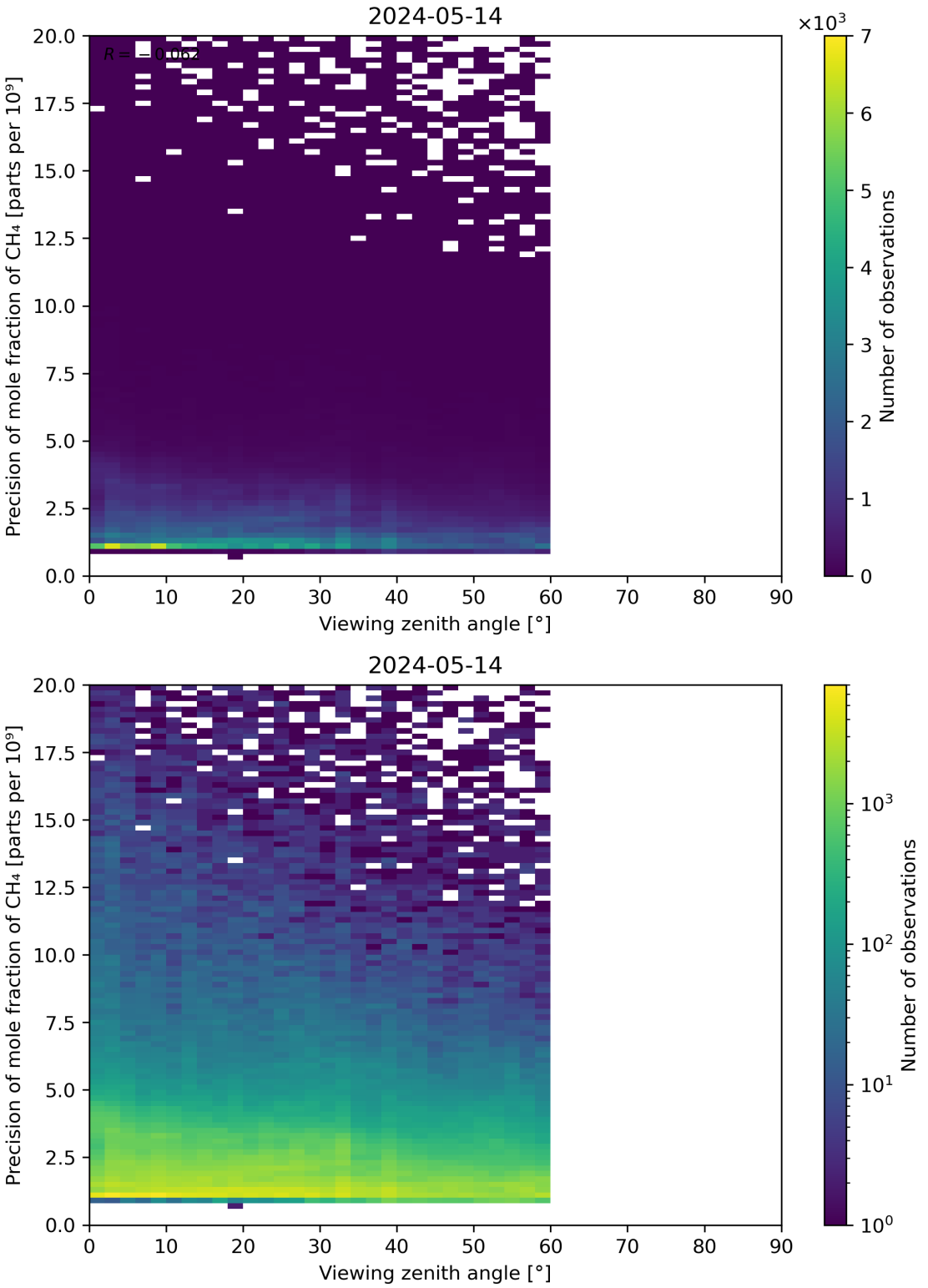

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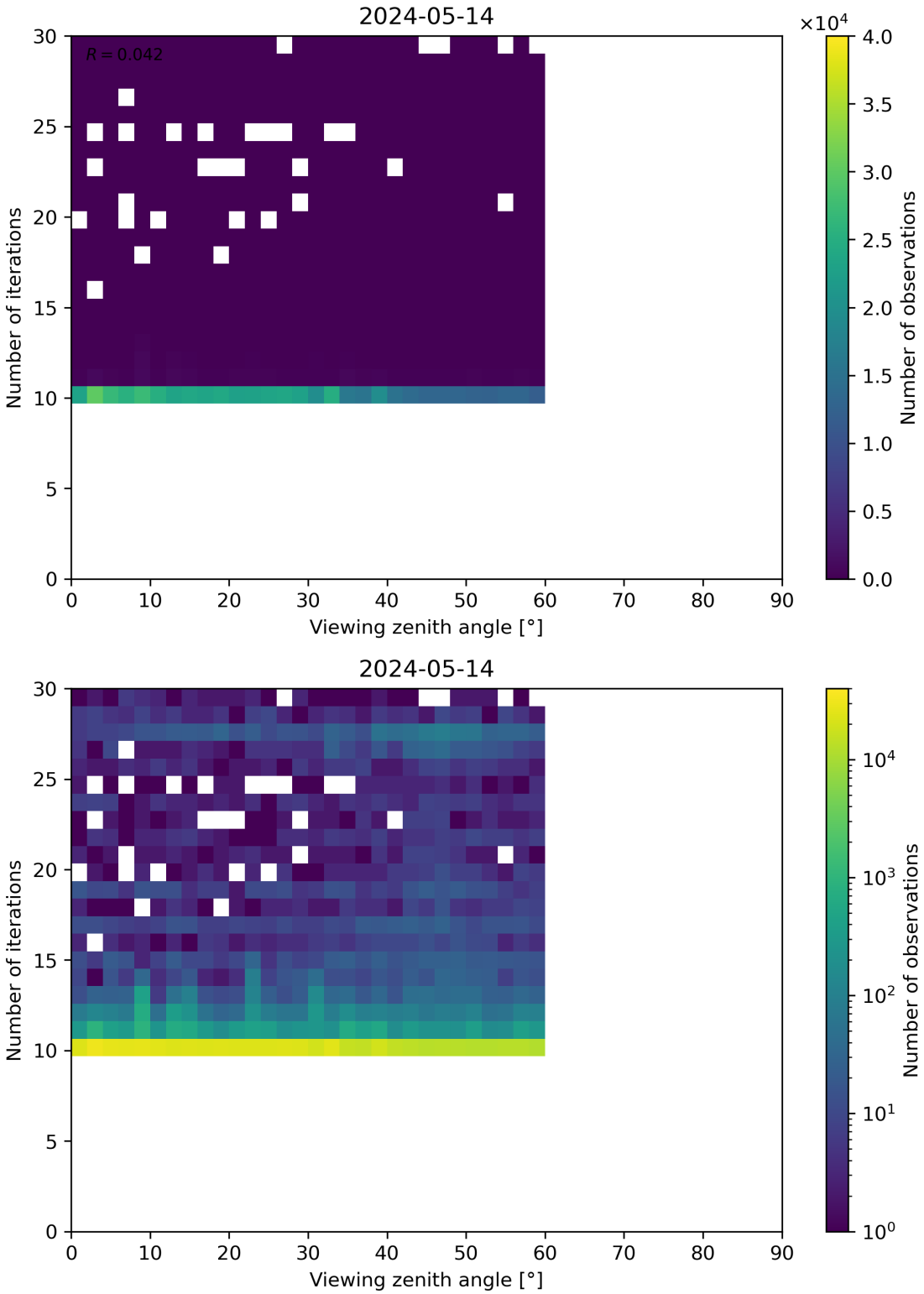

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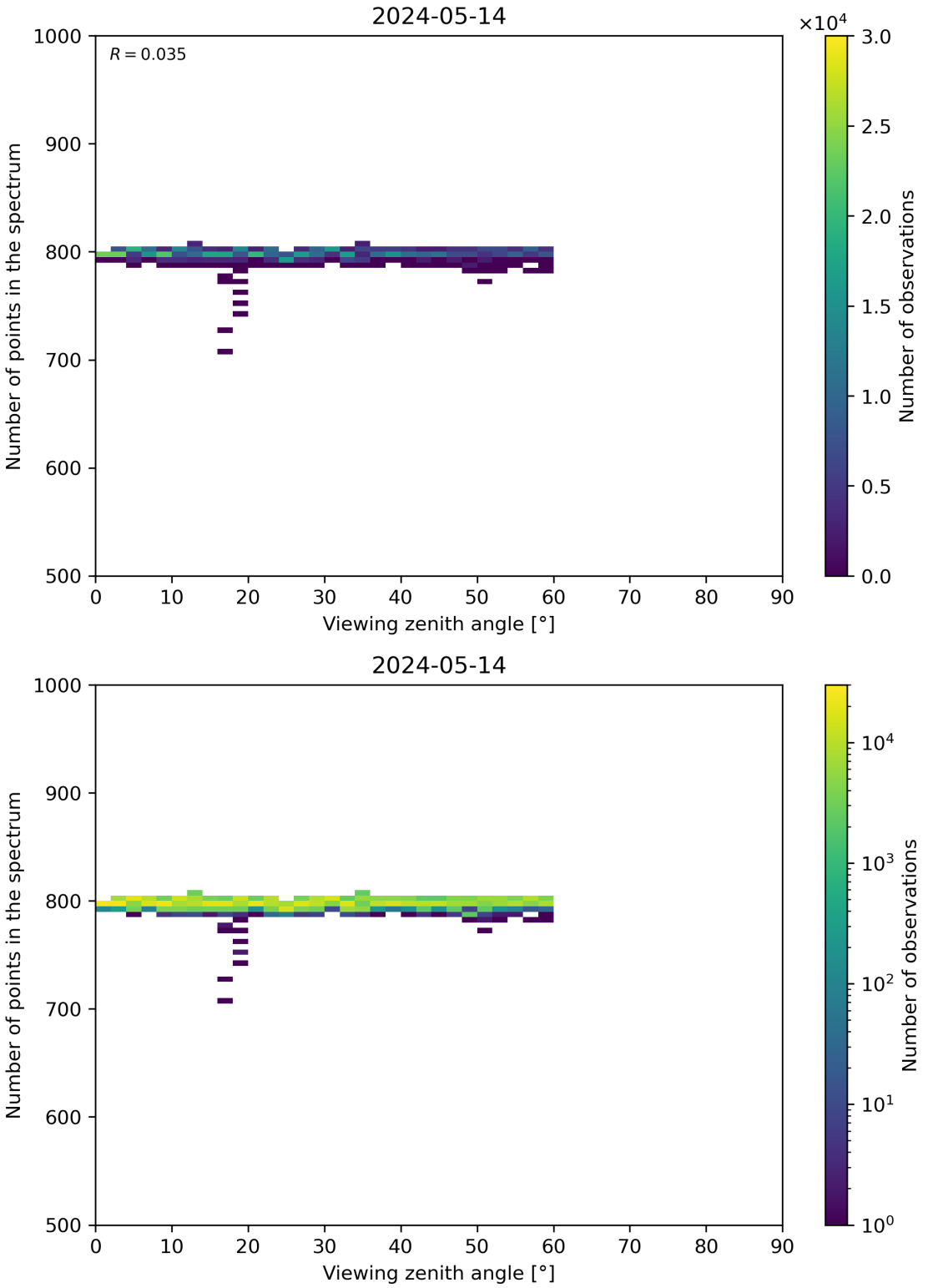

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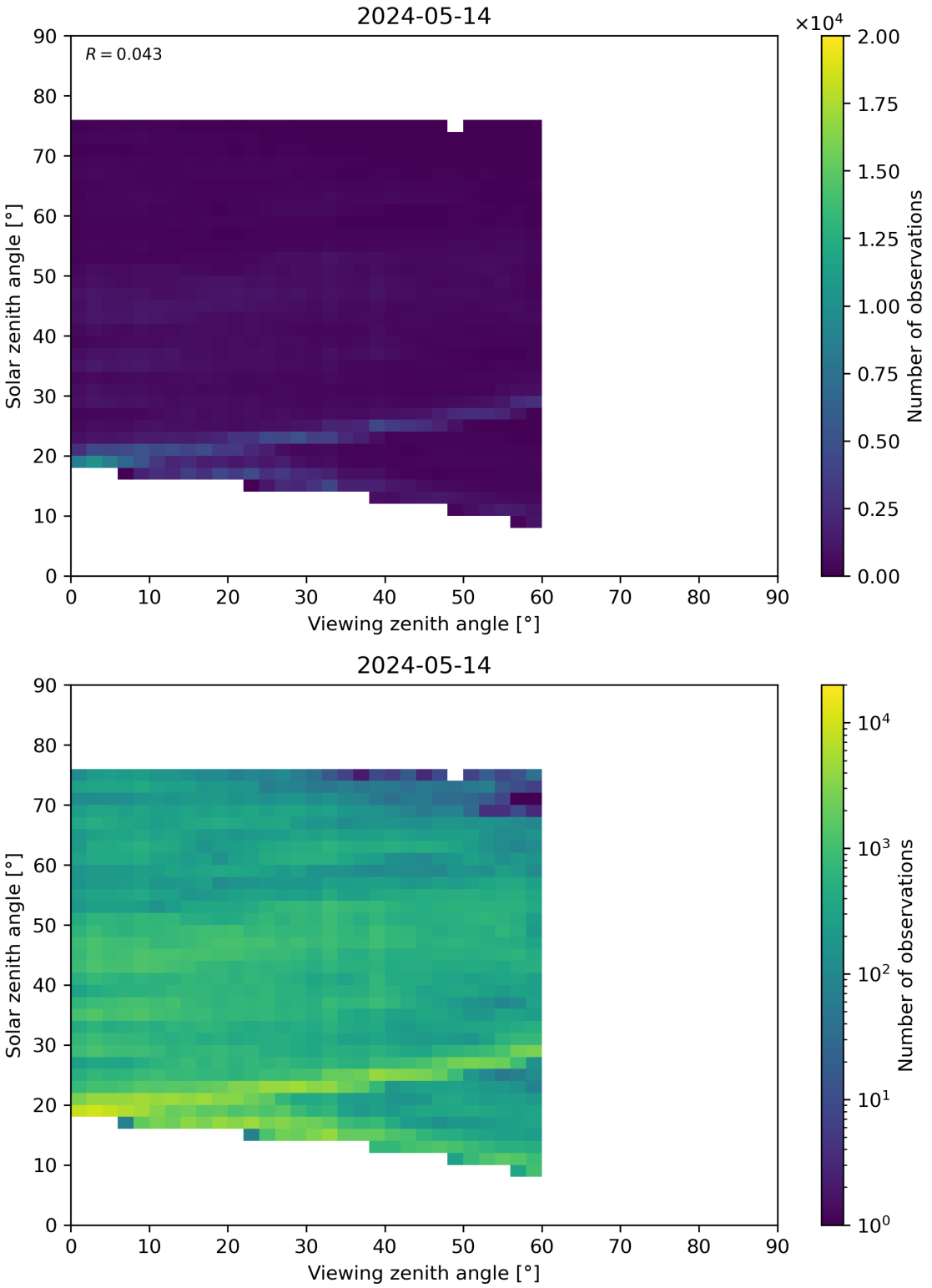

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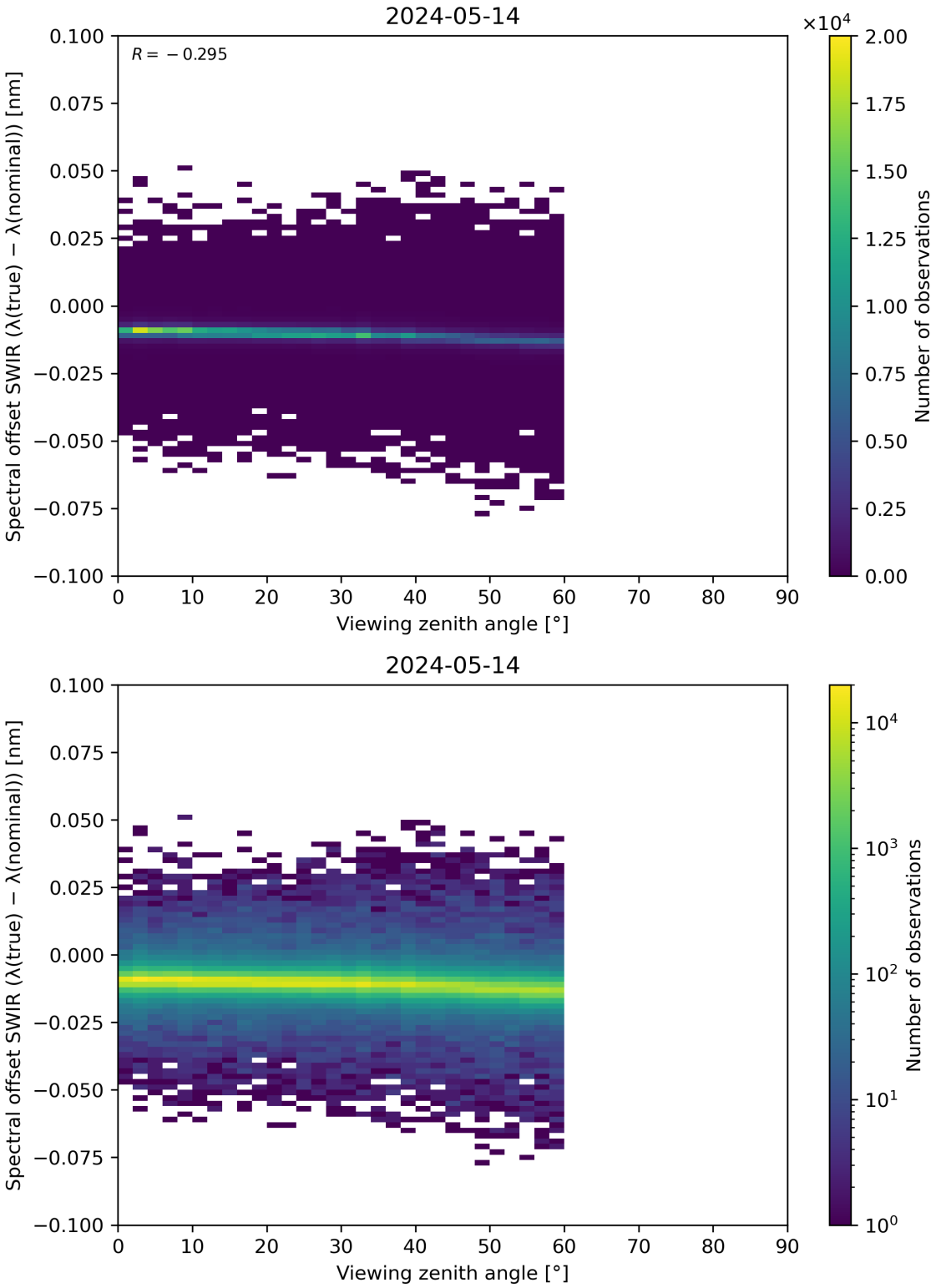

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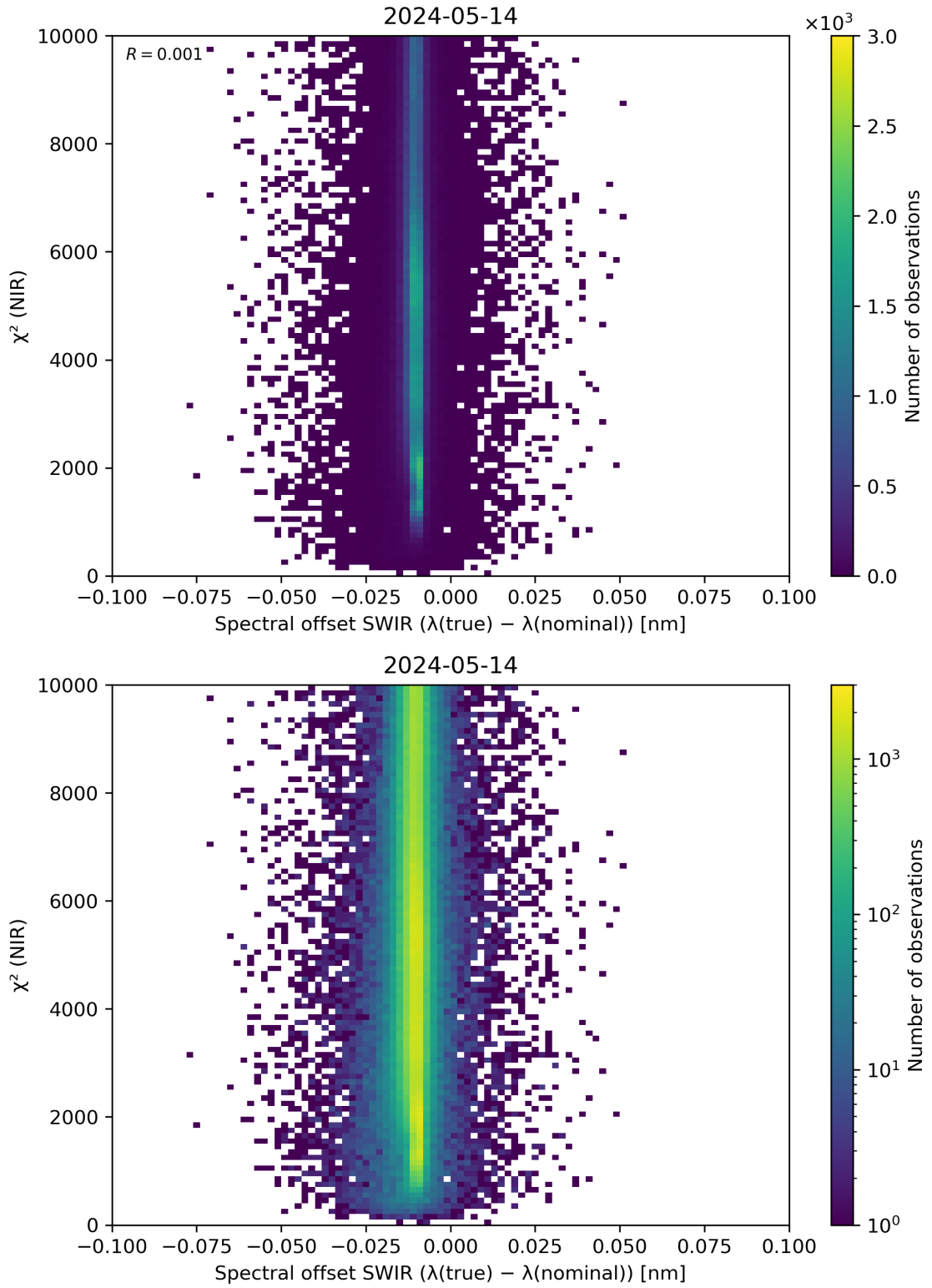

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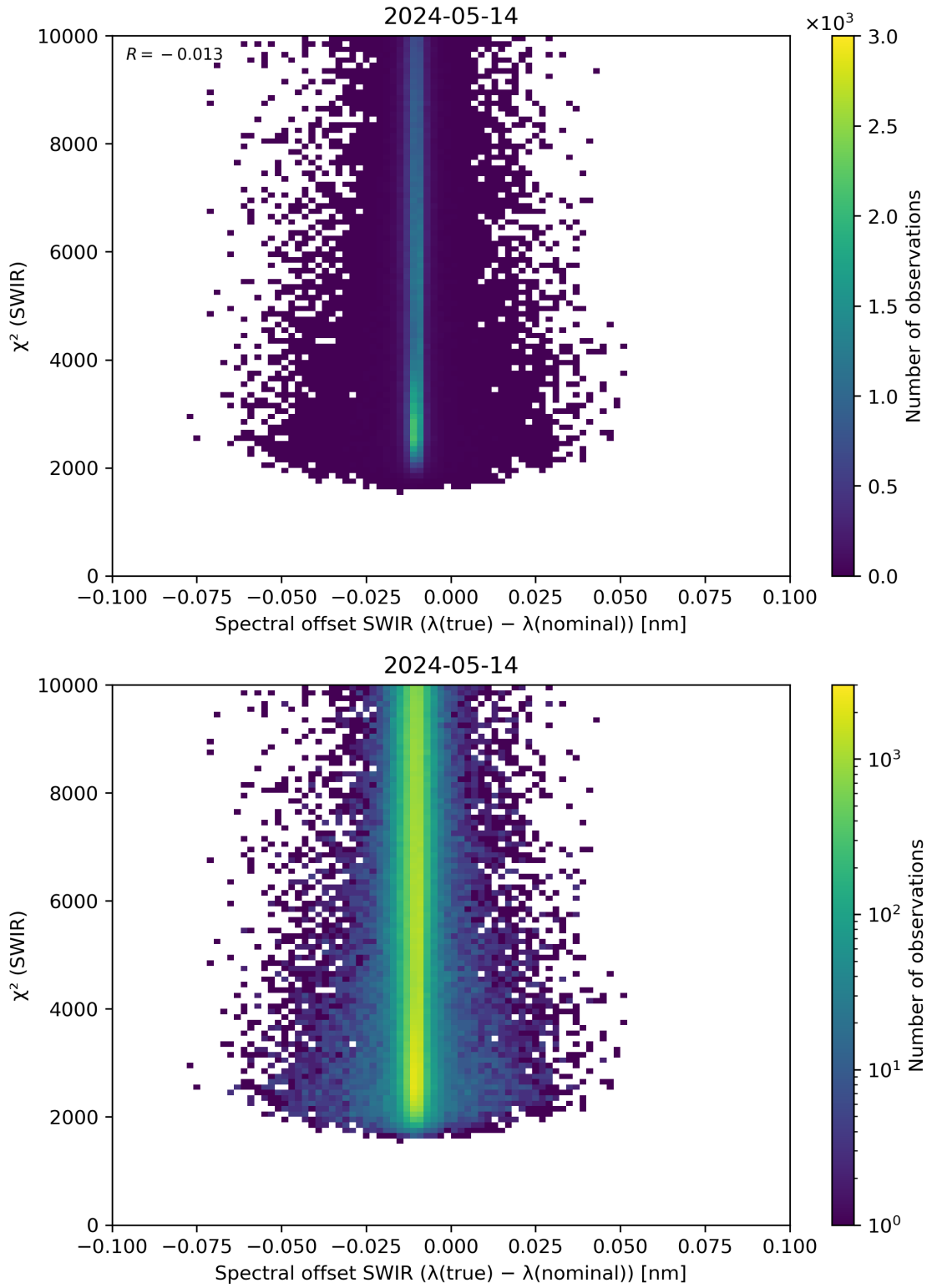

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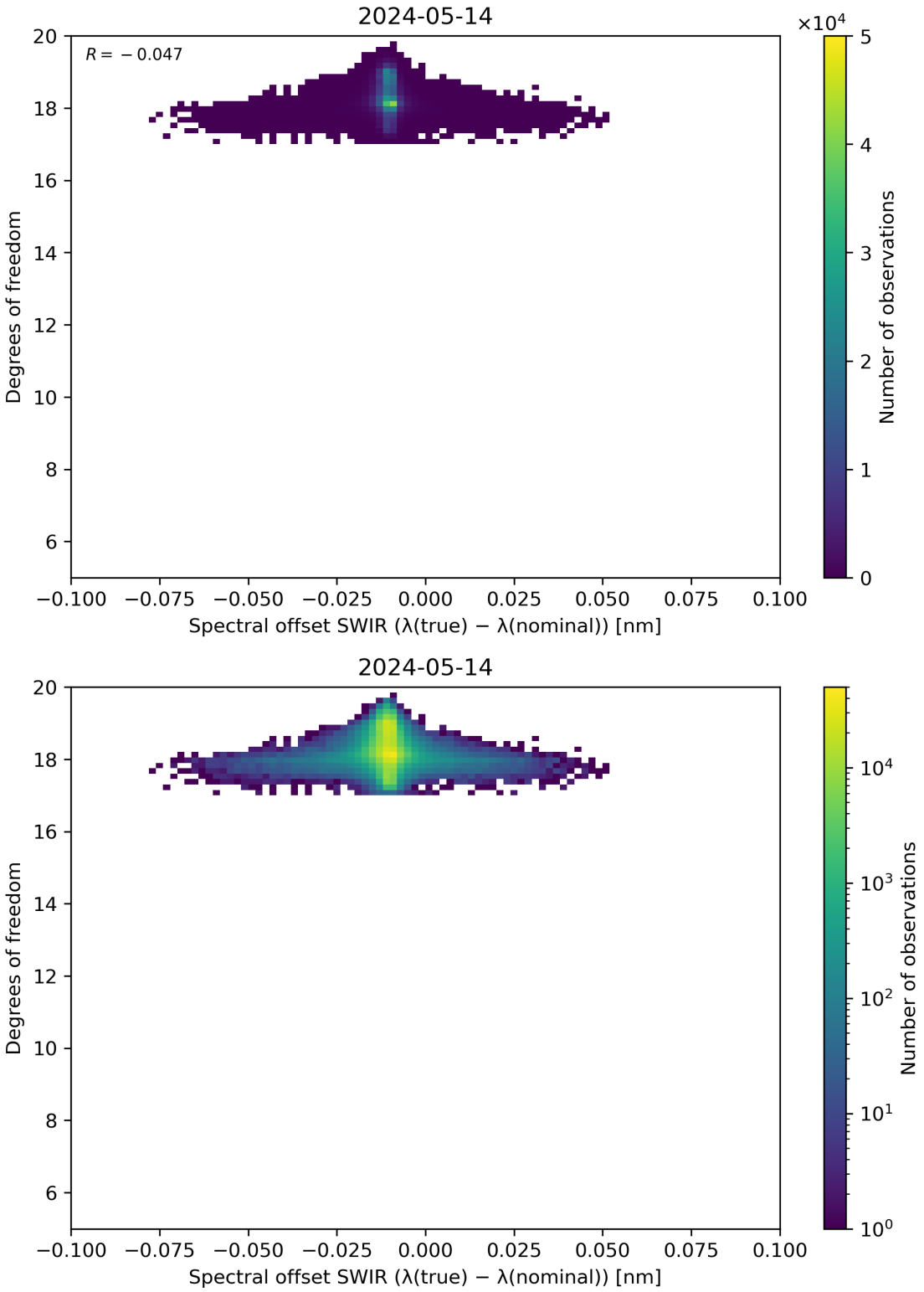

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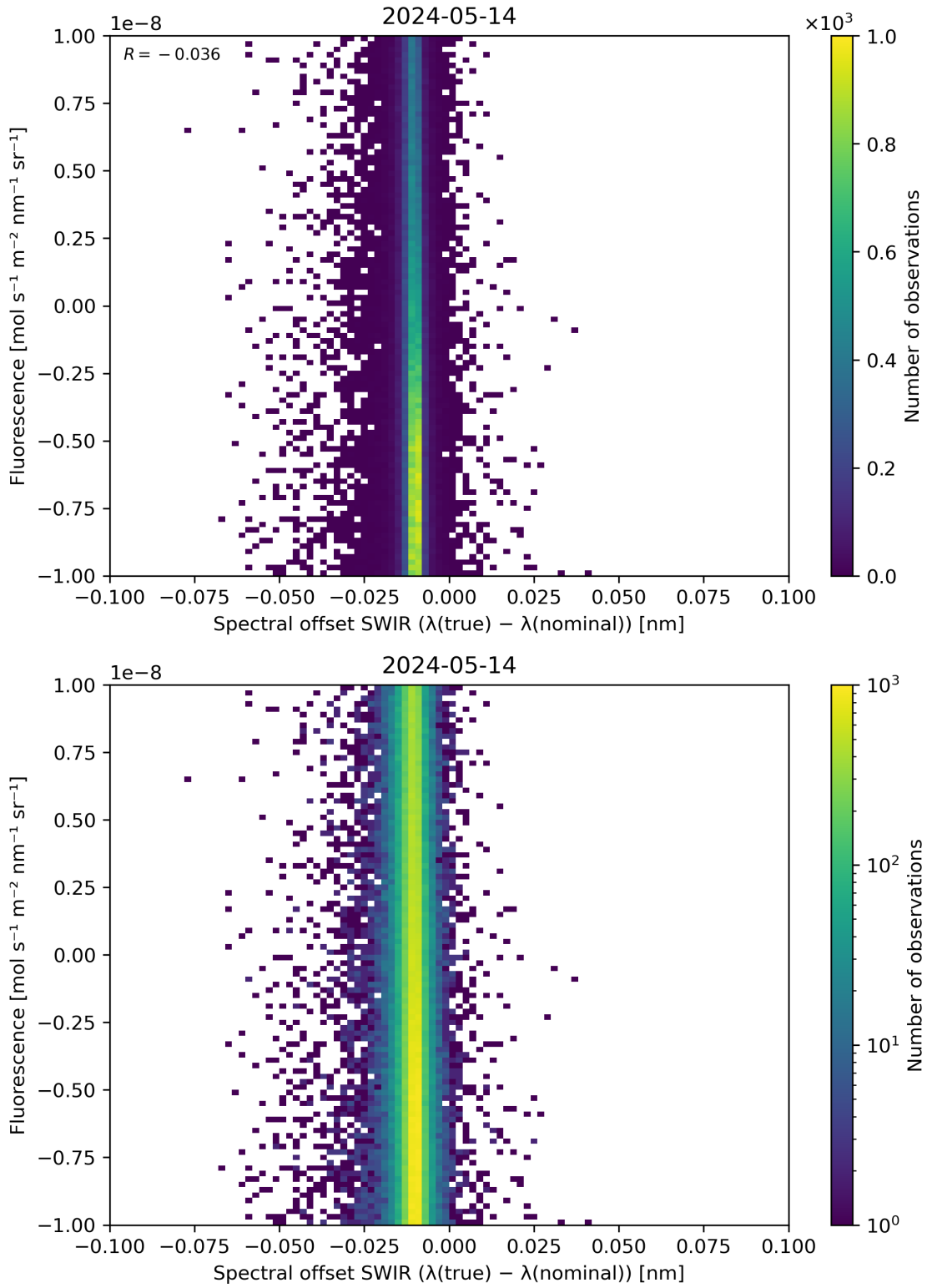

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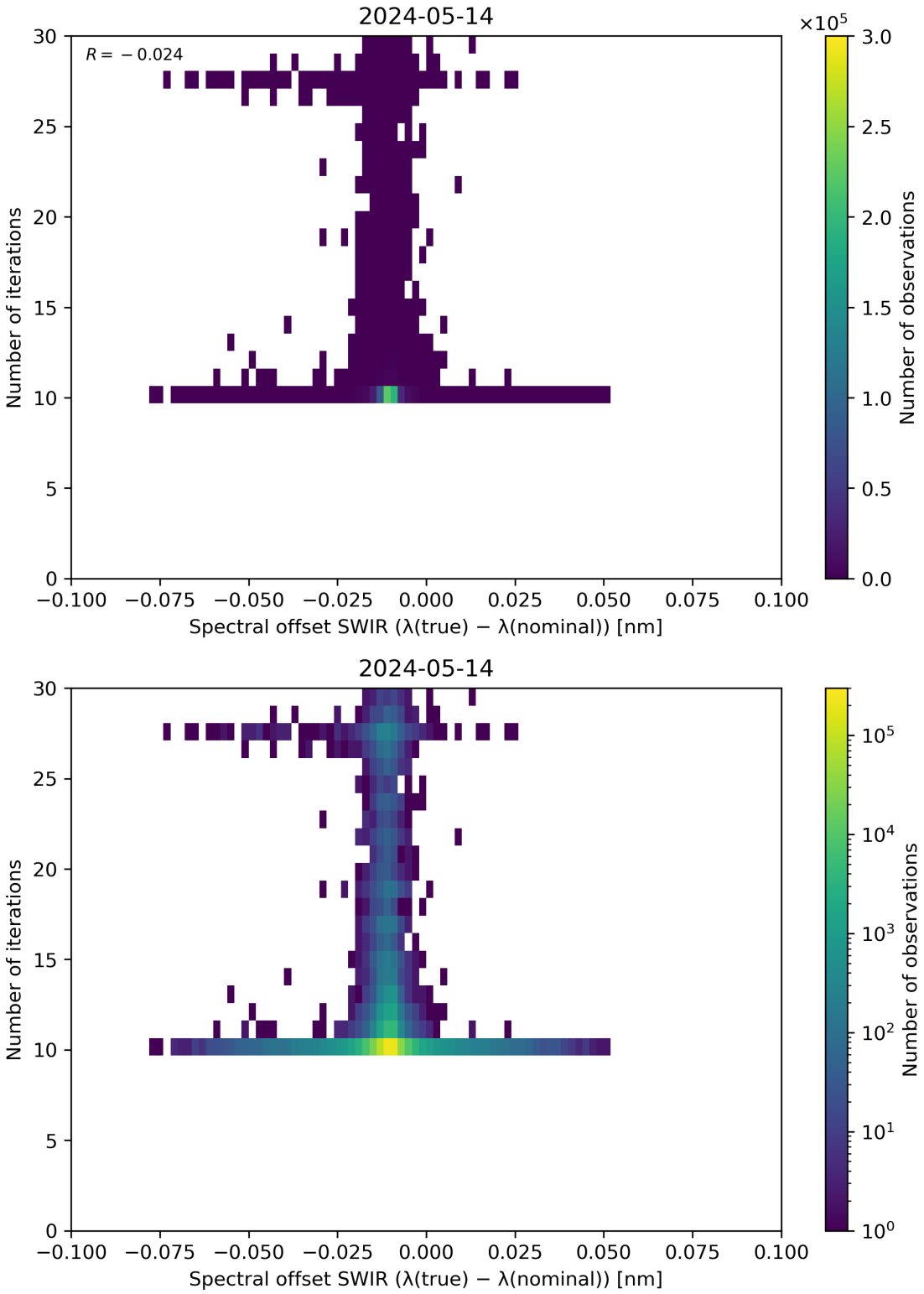

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