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:

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

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

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

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]	0.909 ± 0.183	24794786	0.995	0.1000	1.000	0.350	1.000
cloud pressure crb [hPa]	786 ± 193	24794786	1.015×10^{3}	280	839	130	1.065×10^{3}
cloud pressure crb precision [hPa]	2.43 ± 9.60	24794786	0.750	1.16	0.514	1.038×10^{-3}	1.460×10^{3}
cloud fraction crb [1]	0.478 ± 0.387	24794786	0.996	0.844	0.409	0.0	1.000
cloud fraction crb precision [1]	$(1.576 \pm 7.307) \times 10^{-4}$	24794786	2.500×10^{-4}	6.112×10^{-5}	7.303×10^{-5}	5.383×10^{-9}	1.04
scene albedo [1]	0.454 ± 0.333	24794786	1.500×10^{-2}	0.614	0.428	-6.521×10^{-2}	4.53
scene albedo precision [1]	$(7.658 \pm 8.233) \times 10^{-5}$	24794786	2.500×10^{-4}	6.016×10^{-5}	5.237×10^{-5}	1.026×10^{-5}	1.035×10^{-2}
apparent scene pressure [hPa]	814 ± 170	24794786	1.008×10^{3}	254	862	130	1.065×10^{3}
apparent scene pressure precision [hPa]	0.971 ± 1.743	24794786	0.500	0.498	0.419	6.476×10^{-2}	57.9
chi square [1]	$(0.228 \pm 1.457) \times 10^{5}$	24794786	0.150	2.750×10^{4}	1.595×10^{4}	59.2	2.542×10^{8}
number of iterations [1]	3.31 ± 1.03	24794786	3.23	1.000	3.00	1.000	14.0
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.289 \pm 6.383) \times 10^{-9}$	24794786	2.500×10^{-10}	5.041×10^{-9}	1.159×10^{-9}	-1.834×10^{-6}	1.874×10^{-6}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.742 \pm 0.706) \times 10^{-9}$	24794786	8.500×10^{-10}	1.048×10^{-9}	1.669×10^{-9}	4.268×10^{-10}	5.572×10^{-9}
chi square fluorescence [1]	$(0.506 \pm 0.960) \times 10^{5}$	24794786	1.250×10^{3}	4.659×10^{4}	1.542×10^{4}	110	5.998×10^{6}
degrees of freedom fluorescence [1]	6.00 ± 0.00	24794786	5.95	0.0	6.00	6.00	6.00
number of spectral points in retrieval [1]	50.0 ± 0.1	24794786	49.7	0.0	50.0	44.0	50.0
wavelength calibration offset [nm]	$(3.851 \pm 8.563) \times 10^{-3}$	24794786	3.600×10^{-3}	5.368×10^{-3}	3.880×10^{-3}	-0.107	0.210

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.500	0.500	0.500	0.700	0.900	1.000	1.000	1.000	1.000	1.000
cloud pressure crb [hPa]	247	398	497	586	663	943	973	993	1.010×10^{3}	1.020×10^{3}
cloud pressure crb precision [hPa]	0.149	0.229	0.250	0.268	0.300	1.46	2.63	4.53	9.14	31.8
cloud fraction crb [1]	8.282×10^{-4}	1.068×10^{-2}	2.368×10^{-2}	4.368×10^{-2}	8.956×10^{-2}	0.934	1.000	1.000	1.000	1.000
cloud fraction crb precision [1]	1.938×10^{-5}	2.272×10^{-5}	2.553×10^{-5}	2.911×10^{-5}	3.888×10^{-5}	1.000×10^{-4}	1.203×10^{-4}	2.020×10^{-4}	5.326×10^{-4}	1.909×10^{-3}
scene albedo [1]	8.029×10^{-3}	1.912×10^{-2}	3.527×10^{-2}	6.237×10^{-2}	0.130	0.743	0.859	0.917	0.964	1.09
scene albedo precision [1]	1.290×10^{-5}	1.512×10^{-5}	1.815×10^{-5}	2.256×10^{-5}	3.062×10^{-5}	9.078×10^{-5}	1.166×10^{-4}	1.505×10^{-4}	2.207×10^{-4}	4.387×10^{-4}
apparent scene pressure [hPa]	349	477	567	631	700	953	980	998	1.011×10^{3}	1.020×10^{3}
apparent scene pressure precision [hPa]	0.211	0.236	0.254	0.271	0.299	0.797	1.30	2.11	3.75	8.79
chi square [1]	277	646	1.334×10^{3}	2.670×10^{3}	5.413×10^{3}	3.291×10^{4}	4.149×10^{4}	4.876×10^{4}	5.782×10^{4}	7.789×10^{4}
number of iterations [1]	2.00	2.00	2.00	2.00	3.00	4.00	4.00	4.00	5.00	7.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	-1.442×10^{-8}	-6.615×10^{-9}	-3.964×10^{-9}	-2.469×10^{-9}	-1.129×10^{-9}	3.912×10^{-9}	5.551×10^{-9}	7.140×10^{-9}	9.455×10^{-9}	1.473×10^{-8}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	7.166×10^{-10}	8.096×10^{-10}	8.810×10^{-10}	9.717×10^{-10}	1.149×10^{-9}	2.198×10^{-9}	2.486×10^{-9}	2.662×10^{-9}	2.996×10^{-9}	3.651×10^{-9}
chi square fluorescence [1]	425	1.051×10^{3}	1.647×10^{3}	2.457×10^{3}	4.158×10^{3}	5.075×10^{4}	8.562×10^{4}	1.339×10^{5}	2.300×10^{5}	4.900×10^{5}
degrees of freedom fluorescence [1]	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
number of spectral points in retrieval [1]	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
wavelength calibration offset [nm]	-2.404×10^{-2}	-8.729×10^{-3}	-3.550×10^{-3}	-9.115×10^{-4}	1.153×10^{-3}	6.521×10^{-3}	8.546×10^{-3}	1.123×10^{-2}	1.646×10^{-2}	3.178×10^{-2}

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]	0.987 ± 0.065	9563590	0.0	1.000	0.350	1.000	1.000	1.000
cloud pressure crb [hPa]	774 ± 214	9563590	320	844	130	1.065×10^{3}	627	947
cloud pressure crb precision [hPa]	3.42 ± 11.54	9563590	2.07	0.942	1.038×10^{-3}	1.460×10^{3}	0.437	2.51
cloud fraction crb [1]	0.349 ± 0.342	9563590	0.558	0.205	0.0	1.000	5.294×10^{-2}	0.611
cloud fraction crb precision [1]	$(1.602 \pm 9.675) \times 10^{-4}$	9563590	7.847×10^{-5}	7.886×10^{-5}	8.844×10^{-9}	1.04	4.128×10^{-5}	1.198×10^{-4}
scene albedo [1]	0.371 ± 0.295	9563590	0.492	0.317	-6.521×10^{-2}	4.22	9.728×10^{-2}	0.589
scene albedo precision [1]	$(7.965 \pm 8.757) \times 10^{-5}$	9563590	6.084×10^{-5}	5.225×10^{-5}	1.131×10^{-5}	1.027×10^{-2}	3.155×10^{-5}	9.239×10^{-5}
apparent scene pressure [hPa]	817 ± 180	9563590	242	874	130	1.065×10^{3}	717	959
apparent scene pressure precision [hPa]	1.19 ± 2.01	9563590	0.677	0.526	6.476×10^{-2}	57.9	0.369	1.05
chi square [1]	$(0.149 \pm 1.174) \times 10^{5}$	9563590	1.684×10^{4}	1.071×10^{4}	59.2	1.485×10^{8}	3.664×10^{3}	2.050×10^{4}
number of iterations [1]	3.35 ± 1.05	9563590	1.000	3.00	1.000	14.0	3.00	4.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(7.389 \pm 45.197) \times 10^{-10}$	9563590	3.687×10^{-9}	8.521×10^{-10}	-1.658×10^{-6}	1.127×10^{-6}	-8.840×10^{-10}	2.803×10^{-9}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.489 \pm 0.600) \times 10^{-9}$	9563590	8.170×10^{-10}	1.386×10^{-9}	4.621×10^{-10}	5.152×10^{-9}	1.006×10^{-9}	1.823×10^{-9}
chi square fluorescence [1]	$(0.392 \pm 0.827) \times 10^{5}$	9563590	3.477×10^{4}	1.069×10^{4}	110	2.322×10^{6}	3.163×10^{3}	3.794×10^{4}
degrees of freedom fluorescence [1]	6.00 ± 0.00	9563590	0.0	6.00	6.00	6.00	6.00	6.00
number of spectral points in retrieval [1]	50.0 ± 0.1	9563590	0.0	50.0	48.0	50.0	50.0	50.0
wavelength calibration offset [nm]	$(3.868 \pm 9.588) \times 10^{-3}$	9563590	6.648×10^{-3}	3.785×10^{-3}	-8.097×10^{-2}	9.323×10^{-2}	4.780×10^{-4}	7.126×10^{-3}

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]	0.860 ± 0.213	15231196	0.300	1.000	0.350	1.000	0.700	1.000
cloud pressure crb [hPa]	793 ± 178	15231196	266	835	130	1.036×10^{3}	674	940
cloud pressure crb precision [hPa]	1.81 ± 8.10	15231196	0.630	0.373	1.770×10^{-3}	556	0.274	0.904
cloud fraction crb [1]	0.560 ± 0.391	15231196	0.861	0.599	0.0	1.000	0.139	1.000
cloud fraction crb precision [1]	$(1.559 \pm 5.305) \times 10^{-4}$	15231196	6.252×10^{-5}	6.983×10^{-5}	5.383×10^{-9}	0.141	3.748×10^{-5}	1.000×10^{-4}
scene albedo [1]	0.506 ± 0.344	15231196	0.670	0.526	-3.074×10^{-3}	4.53	0.155	0.825
scene albedo precision [1]	$(7.466 \pm 7.880) \times 10^{-5}$	15231196	5.994×10^{-5}	5.244×10^{-5}	1.026×10^{-5}	1.035×10^{-2}	2.995×10^{-5}	8.990×10^{-5}
apparent scene pressure [hPa]	812 ± 163	15231196	256	852	130	1.036×10^{3}	693	950
apparent scene pressure precision [hPa]	0.832 ± 1.539	15231196	0.386	0.357	0.110	57.3	0.278	0.663
chi square [1]	$(0.277 \pm 1.608) \times 10^{5}$	15231196	3.267×10^{4}	2.245×10^{4}	77.7	2.542×10^{8}	7.233×10^{3}	3.990×10^{4}
number of iterations [1]	3.28 ± 1.02	15231196	1.000	3.00	1.000	14.0	3.00	4.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.634 \pm 7.293) \times 10^{-9}$	15231196	6.105×10^{-9}	1.491×10^{-9}	-1.834×10^{-6}	1.874×10^{-6}	-1.325×10^{-9}	4.780×10^{-9}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.900 \pm 0.721) \times 10^{-9}$	15231196	1.110×10^{-9}	1.918×10^{-9}	4.268×10^{-10}	5.572×10^{-9}	1.300×10^{-9}	2.409×10^{-9}
chi square fluorescence [1]	$(0.578 \pm 1.029) \times 10^{5}$	15231196	5.509×10^{4}	1.935×10^{4}	120	5.998×10^{6}	5.010×10^{3}	6.010×10^{4}
degrees of freedom fluorescence [1]	6.00 ± 0.00	15231196	0.0	6.00	6.00	6.00	6.00	6.00
number of spectral points in retrieval [1]	50.0 ± 0.1	15231196	0.0	50.0	44.0	50.0	50.0	50.0
wavelength calibration offset [nm]	$(3.840 \pm 7.852) \times 10^{-3}$	15231196	4.705×10^{-3}	3.923×10^{-3}	-0.107	0.210	1.517×10^{-3}	6.222×10^{-3}

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]	0.982 ± 0.045	16132547	0.0	1.000	0.350	1.000	1.000	1.000
cloud pressure crb [hPa]	820 ± 184	16132547	234	883	130	1.037×10^{3}	725	959
cloud pressure crb precision [hPa]	2.59 ± 10.36	16132547	1.21	0.589	1.770×10^{-3}	1.153×10^{3}	0.330	1.54
cloud fraction crb [1]	0.388 ± 0.342	16132547	0.620	0.284	0.0	1.000	6.850×10^{-2}	0.689
cloud fraction crb precision [1]	$(8.390 \pm 31.247) \times 10^{-5}$	16132547	5.178×10^{-5}	5.062×10^{-5}	4.676×10^{-7}	0.284	2.940×10^{-5}	8.117×10^{-5}
scene albedo [1]	0.332 ± 0.289	16132547	0.513	0.248	-5.944×10^{-2}	3.87	6.497×10^{-2}	0.578
scene albedo precision [1]	$(5.774 \pm 6.790) \times 10^{-5}$	16132547	4.052×10^{-5}	4.217×10^{-5}	1.026×10^{-5}	1.035×10^{-2}	2.299×10^{-5}	6.351×10^{-5}
apparent scene pressure [hPa]	838 ± 172	16132547	212	896	130	1.036×10^{3}	758	970
apparent scene pressure precision [hPa]	1.28 ± 2.09	16132547	0.928	0.543	6.476×10^{-2}	57.9	0.322	1.25
chi square [1]	$(0.177 \pm 1.079) \times 10^{5}$	16132547	2.459×10^{4}	1.033×10^{4}	59.2	1.516×10^{8}	2.863×10^{3}	2.746×10^{4}
number of iterations [1]	2.91 ± 0.75	16132547	1.000	3.00	1.000	14.0	2.00	3.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(3.256 \pm 54.648) \times 10^{-10}$	16132547	4.378×10^{-9}	2.279×10^{-10}	-1.834×10^{-6}	1.266×10^{-6}	-1.808×10^{-9}	2.570×10^{-9}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.667 \pm 0.738) \times 10^{-9}$	16132547	1.151×10^{-9}	1.520×10^{-9}	4.268×10^{-10}	5.498×10^{-9}	1.028×10^{-9}	2.179×10^{-9}
chi square fluorescence [1]	$(0.526 \pm 0.956) \times 10^{5}$	16132547	5.091×10^{4}	1.817×10^{4}	110	2.322×10^{6}	5.136×10^{3}	5.604×10^{4}
degrees of freedom fluorescence [1]	6.00 ± 0.00	16132547	0.0	6.00	6.00	6.00	6.00	6.00
number of spectral points in retrieval [1]	50.0 ± 0.1	16132547	0.0	50.0	47.0	50.0	50.0	50.0
wavelength calibration offset [nm]	$(3.817 \pm 10.034) \times 10^{-3}$	16132547	6.842×10^{-3}	3.841×10^{-3}	−0.107	0.210	3.647×10^{-4}	7.207×10^{-3}

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]	0.727 ± 0.252	7123793	0.500	0.500	0.350	1.000	0.500	1.000
cloud pressure crb [hPa]	722 ± 184	7123793	235	725	130	1.065×10^{3}	631	866
cloud pressure crb precision [hPa]	1.96 ± 7.56	7123793	0.811	0.337	1.038×10^{-3}	1.460×10^{3}	0.264	1.08
cloud fraction crb [1]	0.695 ± 0.402	7123793	0.768	1.000	0.0	1.000	0.232	1.000
cloud fraction crb precision [1]	$(3.040 \pm 10.372) \times 10^{-4}$	7123793	2.826×10^{-5}	1.000×10^{-4}	5.383×10^{-9}	0.401	1.000×10^{-4}	1.283×10^{-4}
scene albedo [1]	0.716 ± 0.278	7123793	0.447	0.814	-6.055×10^{-2}	4.53	0.482	0.928
scene albedo precision [1]	$(1.151 \pm 0.941) \times 10^{-4}$	7123793	7.728×10^{-5}	9.284×10^{-5}	1.228×10^{-5}	1.027×10^{-2}	5.541×10^{-5}	1.327×10^{-4}
apparent scene pressure [hPa]	763 ± 147	7123793	233	758	130	1.065×10^{3}	657	890
apparent scene pressure precision [hPa]	0.375 ± 0.169	7123793	0.155	0.328	7.457×10^{-2}	37.9	0.274	0.429
chi square [1]	$(0.342 \pm 1.799) \times 10^{5}$	7123793	2.696×10^{4}	2.679×10^{4}	149	1.485×10^{8}	1.485×10^{4}	4.181×10^{4}
number of iterations [1]	4.10 ± 1.04	7123793	0.0	4.00	1.000	14.0	4.00	4.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(3.304 \pm 7.199) \times 10^{-9}$	7123793	4.532×10^{-9}	3.173×10^{-9}	-1.785×10^{-6}	1.874×10^{-6}	1.136×10^{-9}	5.668×10^{-9}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.904 \pm 0.610) \times 10^{-9}$	7123793	8.057×10^{-10}	1.874×10^{-9}	5.190×10^{-10}	5.572×10^{-9}	1.451×10^{-9}	2.257×10^{-9}
chi square fluorescence [1]	$(0.411 \pm 0.882) \times 10^{5}$	7123793	3.296×10^{4}	8.978×10^{3}	128	5.998×10^{6}	2.808×10^{3}	3.577×10^{4}
degrees of freedom fluorescence [1]	6.00 ± 0.00	7123793	0.0	6.00	6.00	6.00	6.00	6.00
number of spectral points in retrieval [1]	50.0 ± 0.1	7123793	0.0	50.0	44.0	50.0	50.0	50.0
wavelength calibration offset [nm]	$(3.888 \pm 4.075) \times 10^{-3}$	7123793	3.326×10^{-3}	3.918×10^{-3}	-6.859×10^{-2}	6.587×10^{-2}	2.237×10^{-3}	5.563×10^{-3}

Table 7: Correlation matrix

Viewing zenith angle	Solar zenith angle	Latitude	Cloud pressure	Cloud fraction	Scene albedo	Apparent scene pressure	χ^2	Number of iterations	Fluorescence	χ^2 of fluorescence retrieval	Number of points in the spectrum	Spectral offset ($\lambda_{\text{true}} - \lambda_{\text{nominal}}$)
1.000	1.387×10^{-2}	-2.146×10^{-4}	-8.664×10^{-2}	6.922×10^{-2}	7.588×10^{-2}	-9.827×10^{-2}	-2.448×10^{-3}	-1.626×10^{-2}	6.489×10^{-2}	1.401×10^{-2}	1.660×10^{-2}	-1.005×10^{-2}
1.387×10^{-2}	1.000	6.463×10^{-2}	−0.237	0.477	0.551	−0.269	3.091×10^{-2}	0.377	0.229	−0.352	4.091×10^{-3}	-3.471×10^{-2}
-2.146×10^{-4}	6.463×10^{-2}	1.000	-7.190×10^{-2}	−0.408	−0.346	1.492×10^{-2}	-6.314×10^{-2}	-4.800×10^{-2}	−0.145	1.396×10^{-4}	1.090×10^{-3}	6.452×10^{-3}
-8.664×10^{-2}	−0.237	-7.190×10^{-2}	1.000	−0.284	−0.349	0.896	2.544×10^{-3}	−0.352	−0.177	0.159	-5.715×10^{-3}	2.851×10^{-2}
6.922×10^{-2}	0.477	−0.408	−0.284	1.000	0.938	−0.472	8.432×10^{-2}	0.164	0.343	3.880×10^{-2}	-1.639×10^{-3}	-1.834×10^{-2}
7.588×10^{-2}	0.551	−0.346	−0.349	0.938	1.000	−0.469	8.541×10^{-2}	0.314	0.367	4.052×10^{-2}	-1.160×10^{-3}	-1.570×10^{-2}
-9.827×10^{-2}	−0.269	1.492×10^{-2}	0.896	−0.472	−0.469	1.000	-1.702×10^{-3}	−0.217	−0.217	0.192	-4.317×10^{-3}	3.141×10^{-2}
-2.448×10^{-3}	3.091×10^{-2}	-6.314×10^{-2}	2.544×10^{-3}	8.432×10^{-2}	8.541×10^{-2}	-1.702×10^{-3}	1.000	7.807×10^{-2}	3.043×10^{-2}	3.268×10^{-2}	-1.569×10^{-4}	-1.024×10^{-3}
-1.626×10^{-2}	0.377	-4.800×10^{-2}	−0.352	0.164	0.314	−0.217	7.807×10^{-2}	1.000	0.191	−0.167	1.833×10^{-3}	-3.117×10^{-3}
6.489×10^{-2}	0.229	−0.145	−0.177	0.343	0.367	−0.217	3.043×10^{-2}	0.191	1.000	−0.224	1.296×10^{-3}	3.786×10^{-2}
1.401×10^{-2}	−0.352	1.396×10^{-4}	0.159	3.880×10^{-2}	4.052×10^{-2}	0.192	3.268×10^{-2}	−0.167	−0.224	1.000	-4.741×10^{-3}	4.406×10^{-2}
1.660×10^{-2}	4.091×10^{-3}	1.090×10^{-3}	-5.715×10^{-3}	-1.639×10^{-3}	-1.160×10^{-3}	-4.317×10^{-3}	-1.569×10^{-4}	1.833×10^{-3}	1.296×10^{-3}	-4.741×10^{-3}	1.000	9.395×10^{-5}
-1.005×10^{-2}	-3.471×10^{-2}	6.452×10^{-3}	2.851×10^{-2}	-1.834×10^{-2}	-1.570×10^{-2}	3.141×10^{-2}	-1.024×10^{-3}	-3.117×10^{-3}	3.786×10^{-2}	4.406×10^{-2}	9.395×10^{-5}	1.000

Table 8: Covariance matrix

Viewing zenith angle	Solar zenith angle	Latitude	Cloud pressure	Cloud fraction	Scene albedo	Apparent scene pressure	χ^2	Number of iterations	Fluorescence	χ^2 of fluorescence retrieval	Number of points in the spectrum	Spectral offset ($\lambda_{\mathrm{true}} - \lambda_{\mathrm{nominal}}$)
384	5.55	−0.193	−327	0.525	0.494	−326	-6.984×10^{3}	−0.328	8.112×10^{-9}	2.635×10^{4}	3.099×10^{-2}	-1.685×10^{-3}
5.55	418	60.8	−937	3.77	3.74	−931	9.208×10^{4}	7.94	2.995×10^{-8}	-6.911×10^{5}	7.974×10^{-3}	-6.078×10^{-3}
−0.193	60.8	2.114×10^{3}	−638	−7.26	−5.29	116	-4.229×10^{5}	−2.28	-4.242×10^{-8}	616	4.779×10^{-3}	2.540×10^{-3}
−327	−937	−638	3.723×10^{4}	−21.2	−22.4	2.931×10^{4}	7.152×10^{4}	−70.1	-2.180×10^{-7}	2.945×10^{6}	−0.105	4.711×10^{-2}
0.525	3.77	−7.26	−21.2	0.150	0.121	−31.0	4.755×10^{3}	6.544×10^{-2}	8.475×10^{-10}	1.442×10^{3}	-6.048×10^{-5}	-6.079×10^{-5}
0.494	3.74	−5.29	−22.4	0.121	0.111	−26.4	4.139×10^{3}	0.108	7.786×10^{-10}	1.294×10^{3}	-3.677×10^{-5}	-4.471×10^{-5}
−326	−931	116	2.931×10^{4}	−31.0	−26.4	2.875×10^{4}	-4.205×10^{4}	−38.0	-2.343×10^{-7}	3.120×10^{6}	-6.977×10^{-2}	4.561×10^{-2}
-6.984×10^{3}	9.208×10^{4}	-4.229×10^{5}	7.152×10^{4}	4.755×10^{3}	4.139×10^{3}	-4.205×10^{4}	2.123×10^{10}	1.173×10^{4}	2.830×10^{-5}	4.573×10^{8}	−2.18	−1.28
−0.328	7.94	−2.28	−70.1	6.544×10^{-2}	0.108	−38.0	1.173×10^{4}	1.06	1.258×10^{-9}	-1.655×10^{4}	1.802×10^{-4}	-2.752×10^{-5}
8.112×10^{-9}	2.995×10^{-8}	-4.242×10^{-8}	-2.180×10^{-7}	8.475×10^{-10}	7.786×10^{-10}	-2.343×10^{-7}	2.830×10^{-5}	1.258×10^{-9}	4.075×10^{-17}	-1.371×10^{-4}	7.884×10^{-13}	2.070×10^{-12}
2.635×10^{4}	-6.911×10^{5}	616	2.945×10^{6}	1.442×10^{3}	1.294×10^{3}	3.120×10^{6}	4.573×10^{8}	-1.655×10^{4}	-1.371×10^{-4}	9.224×10^{9}	−43.4	36.2
3.099×10^{-2}	7.974×10^{-3}	4.779×10^{-3}	−0.105	-6.048×10^{-5}	-3.677×10^{-5}	-6.977×10^{-2}	−2.18	1.802×10^{-4}	7.884×10^{-13}	−43.4	9.086×10^{-3}	7.669×10^{-8}
-1.685×10^{-3}	-6.078×10^{-3}	2.540×10^{-3}	4.711×10^{-2}	-6.079×10^{-5}	-4.471×10^{-5}	4.561×10^{-2}	−1.28	-2.752×10^{-5}	2.070×10^{-12}	36.2	7.669×10^{-8}	7.333×10^{-5}

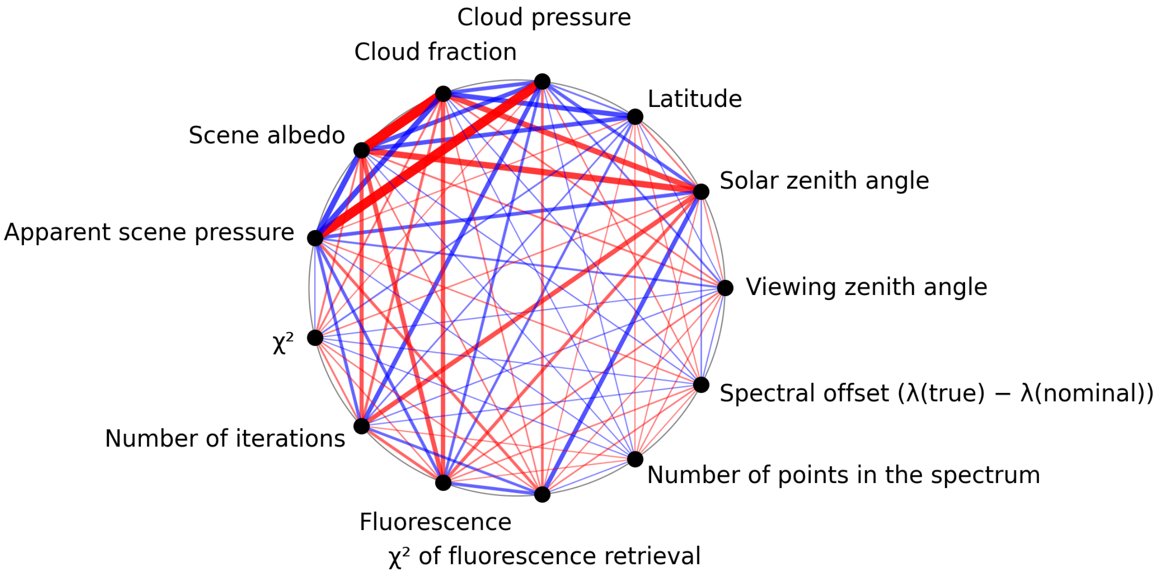


Figure 1: Map of correlation graph for 2025-01-13 to 2025-01-15.

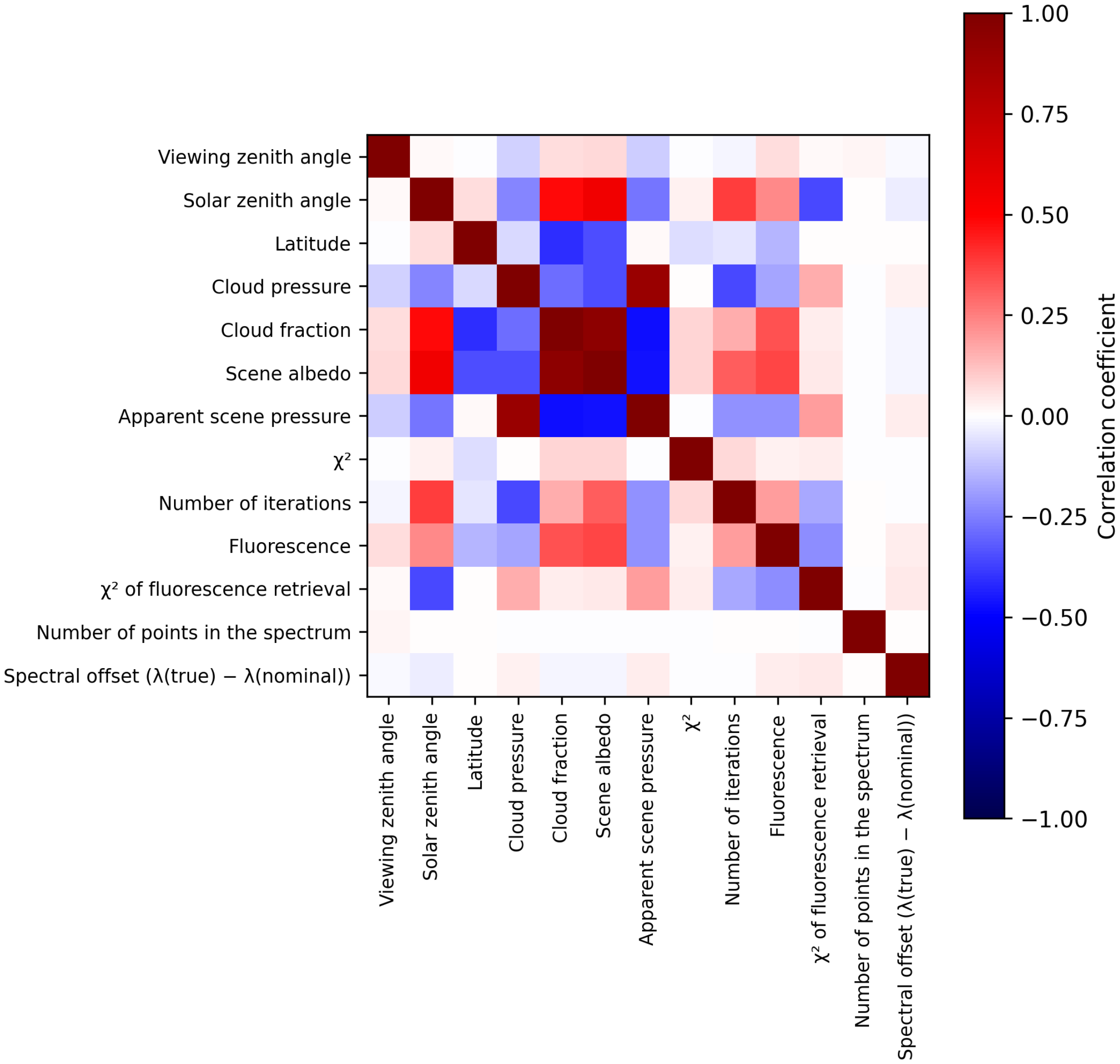


Figure 2: Map of correlation matrix for 2025-01-13 to 2025-01-15.

3 Granule outlines

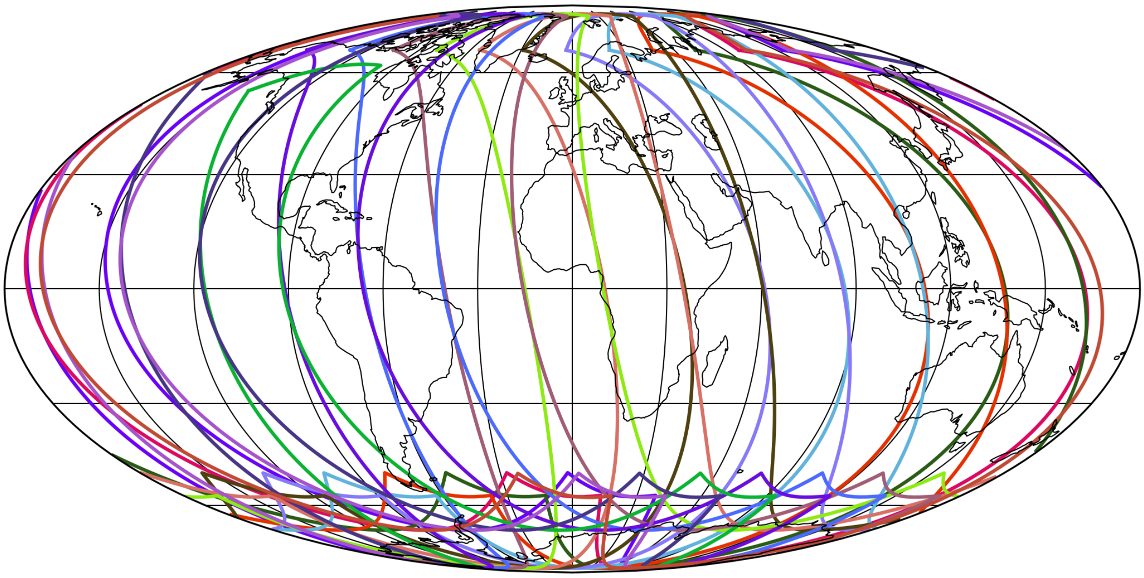


Figure 3: Outline of the granules.

4 Input data monitoring

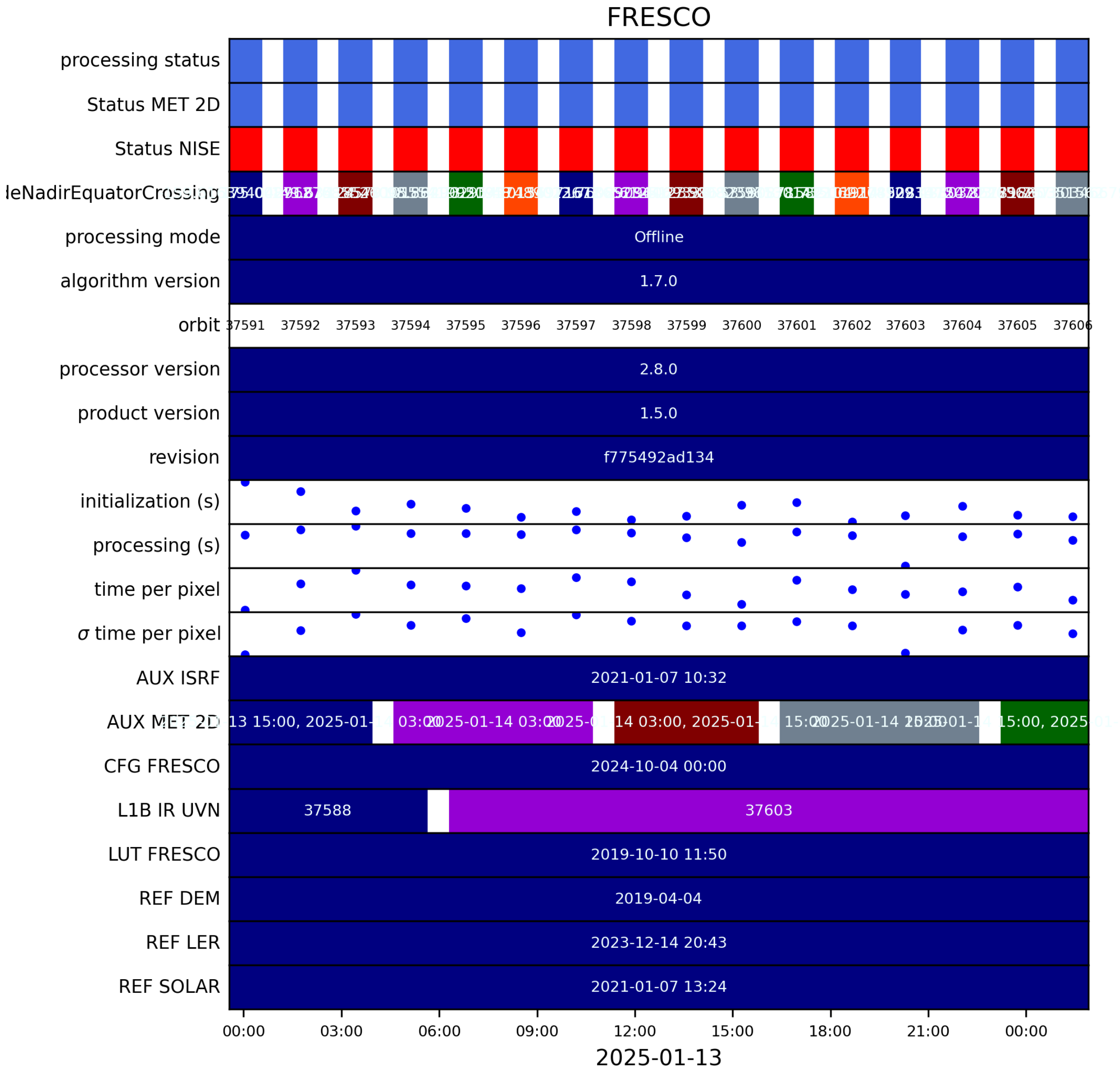


Figure 4: Input data per granule

5 Warnings and errors

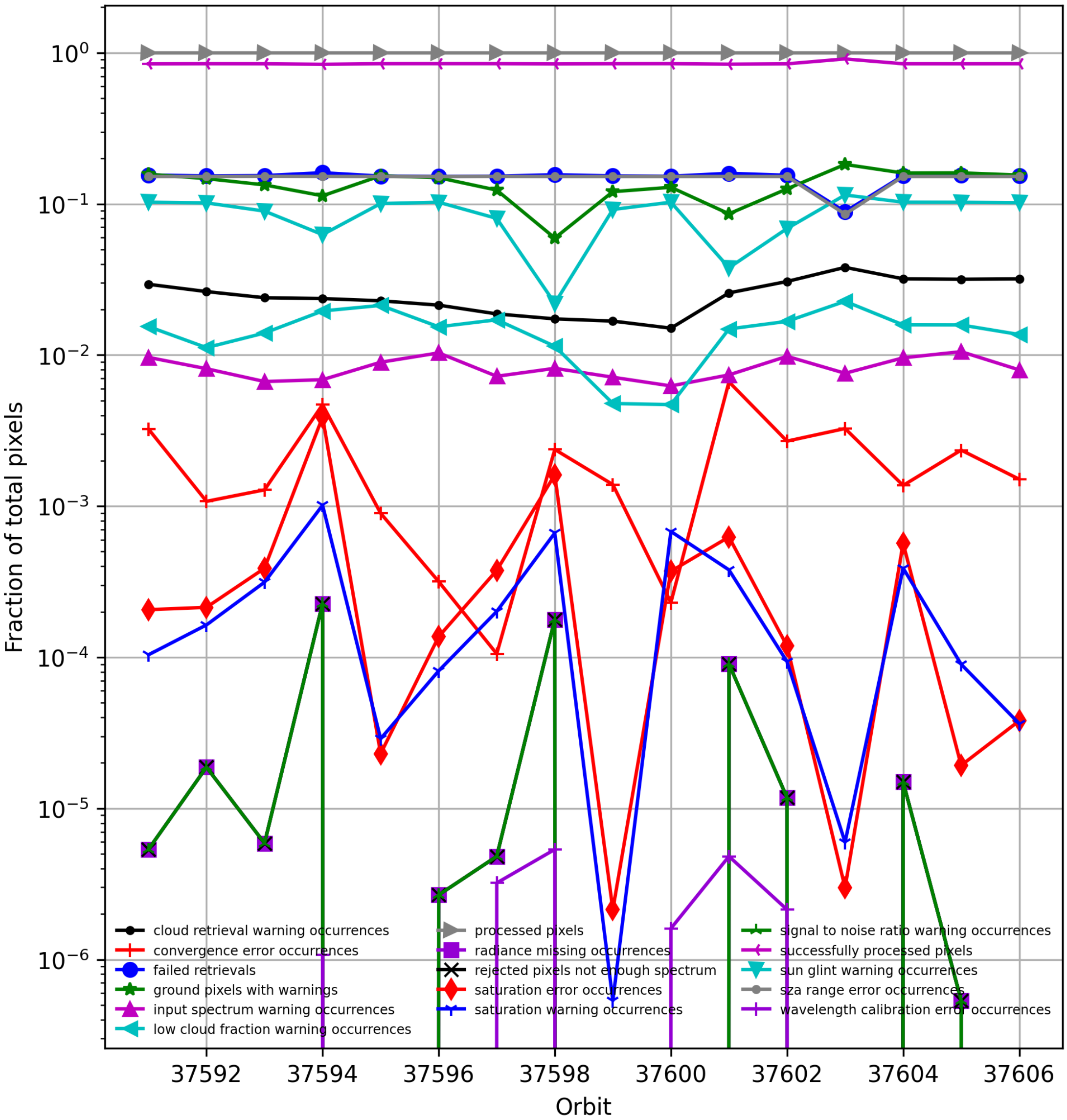


Figure 5: Fraction of pixels with specific warnings and errors during processing

6 World maps

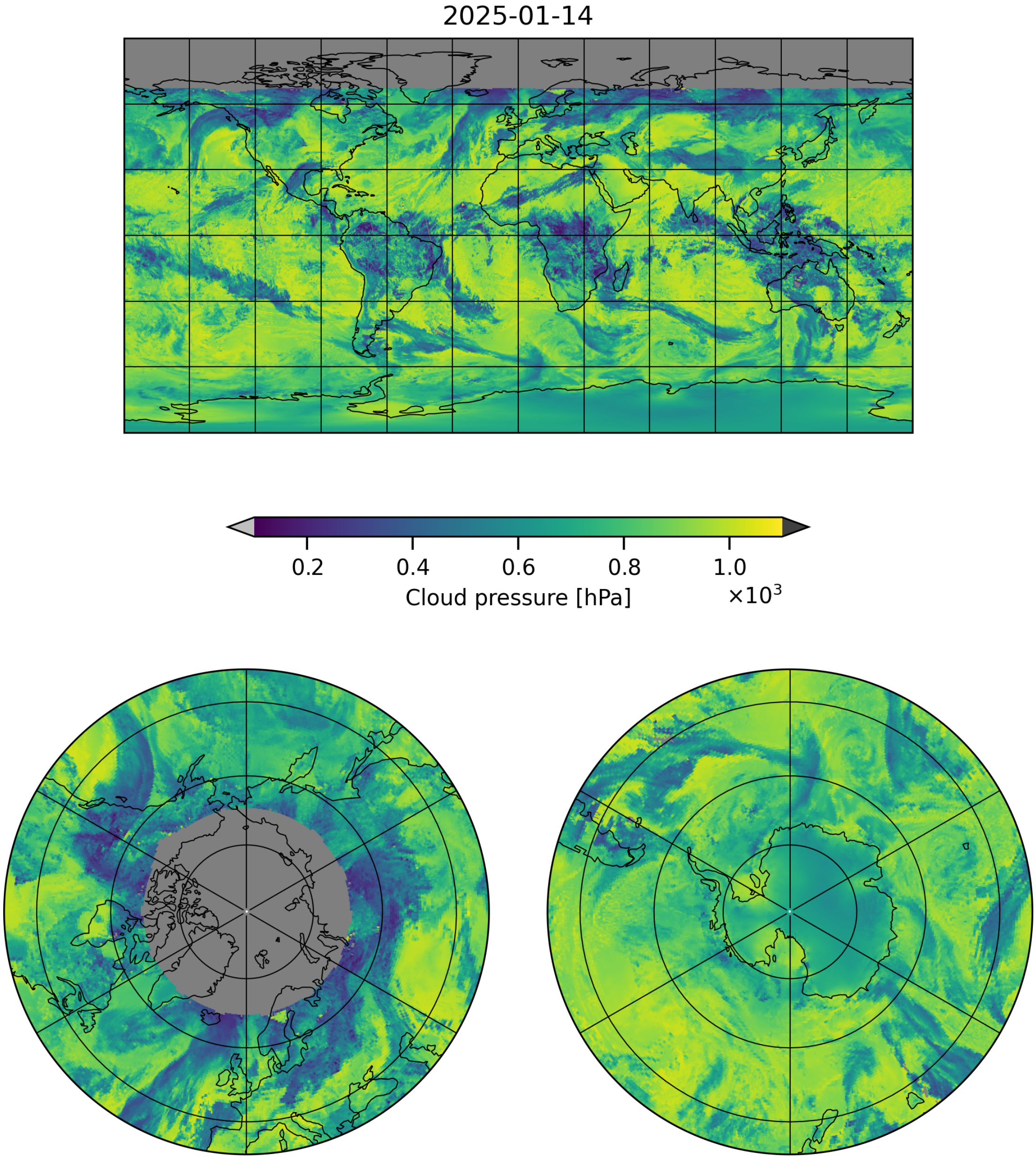


Figure 6: Map of "Cloud pressure" for 2025-01-13 to 2025-01-15

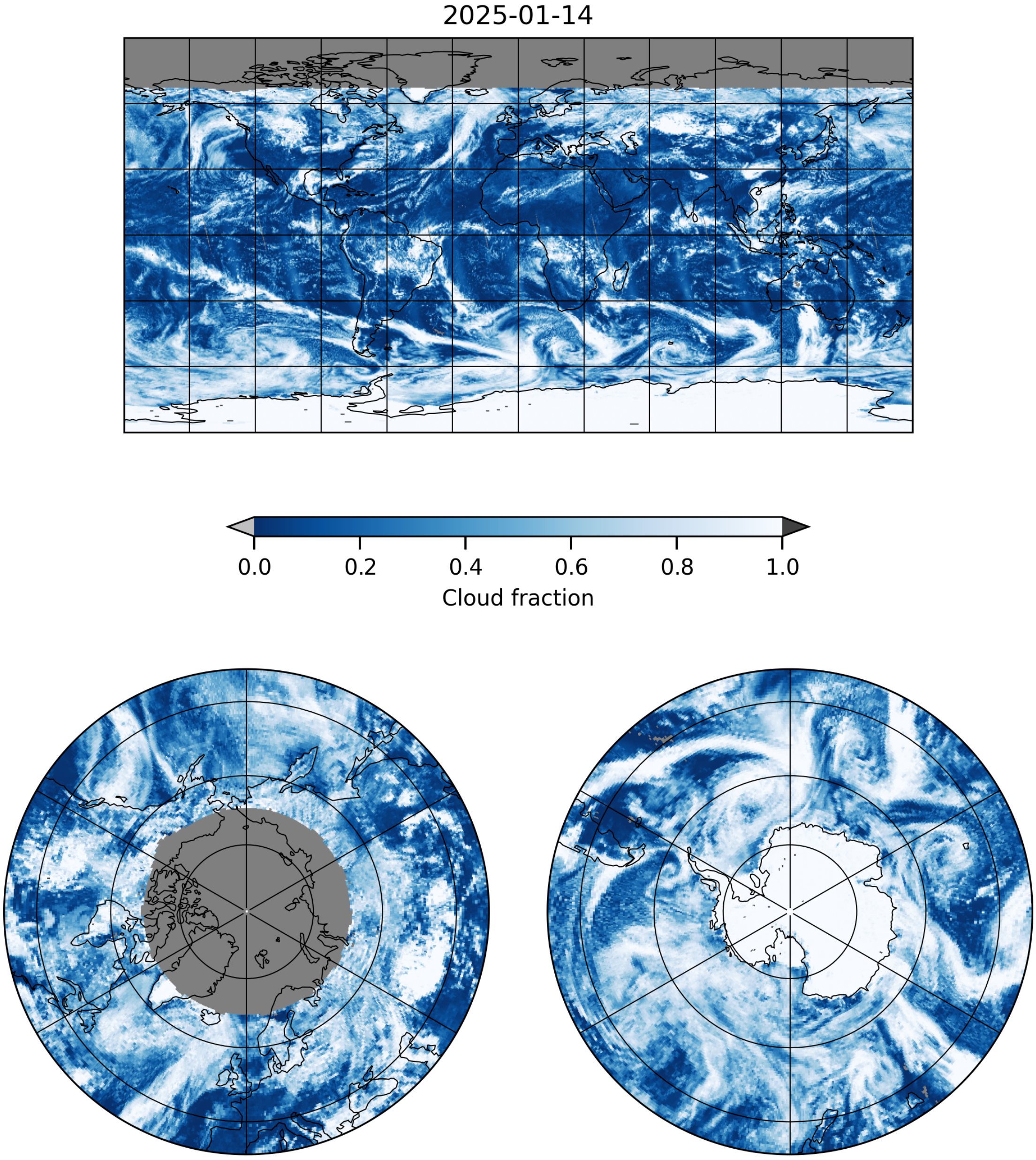


Figure 7: Map of "Cloud fraction" for 2025-01-13 to 2025-01-15

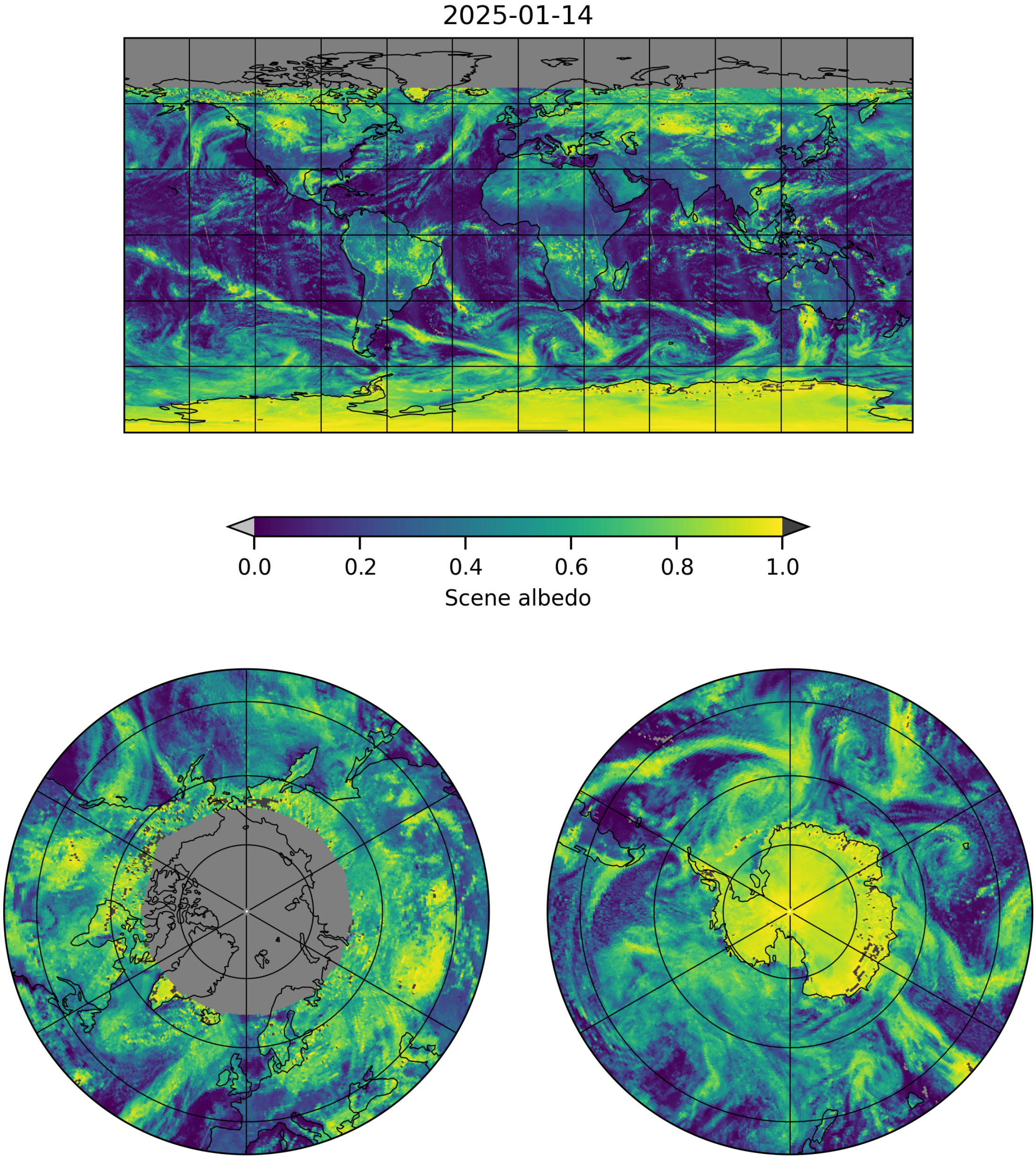


Figure 8: Map of “Scene albedo” for 2025-01-13 to 2025-01-15

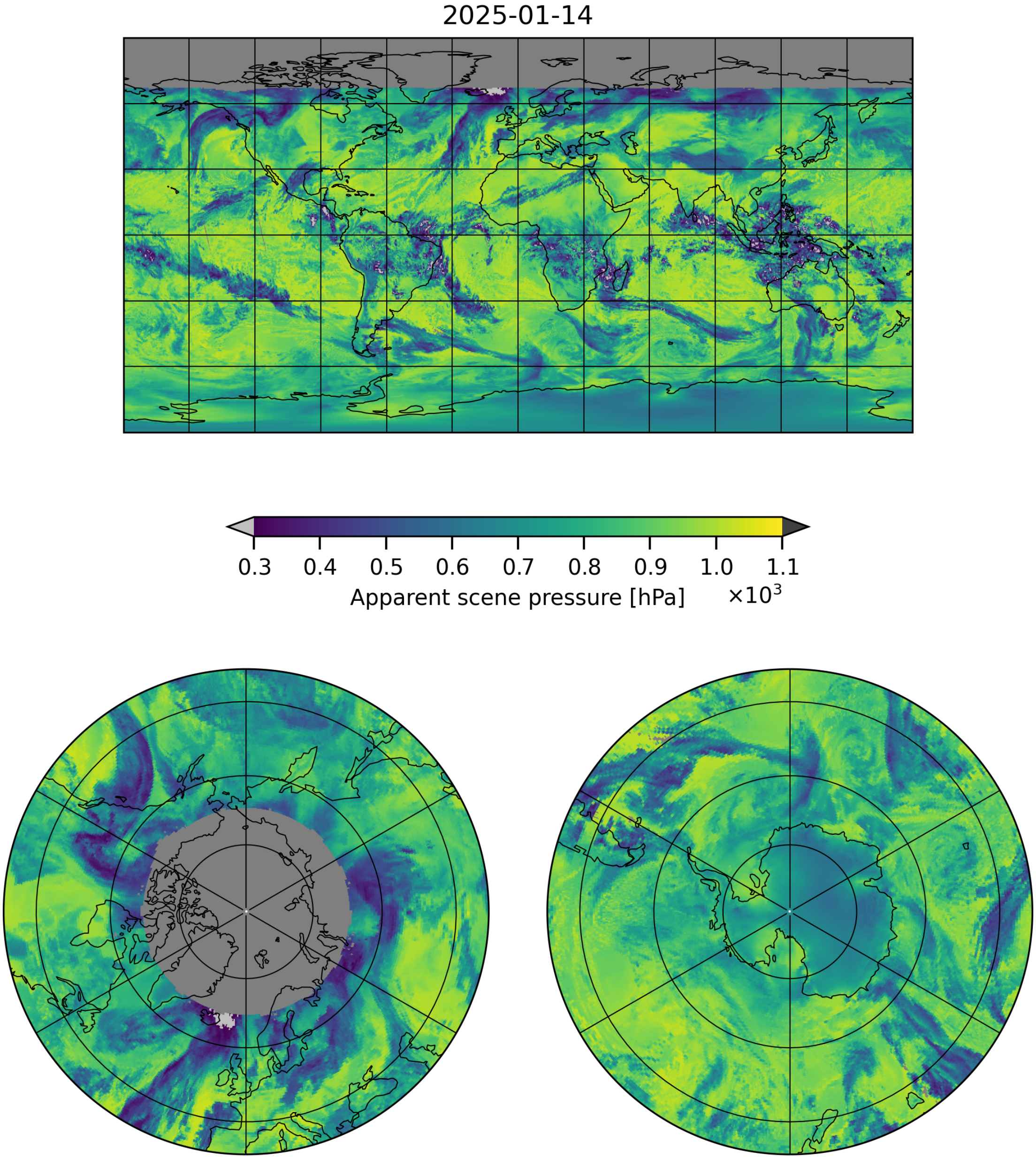


Figure 9: Map of “Apparent scene pressure” for 2025-01-13 to 2025-01-15

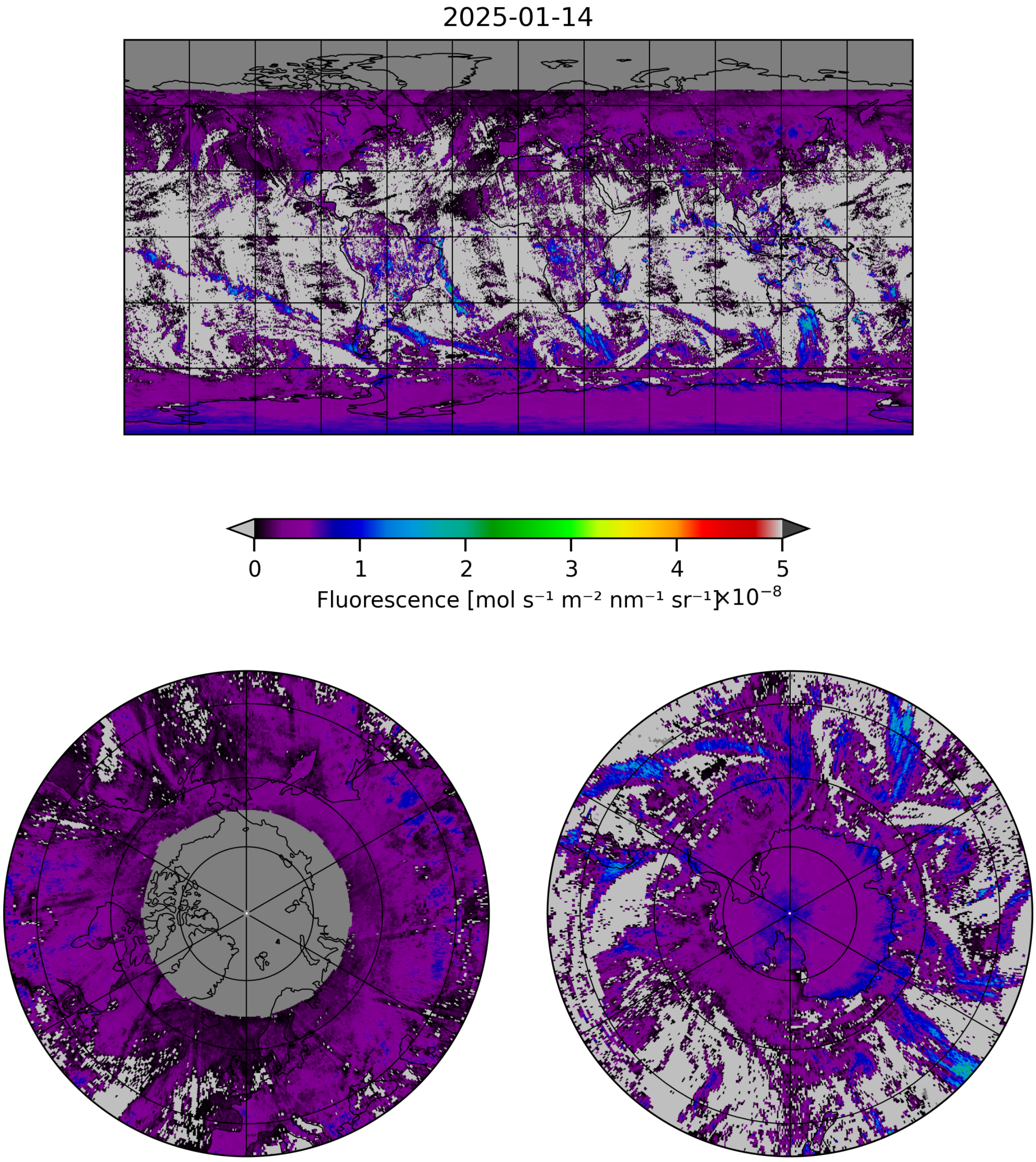


Figure 10: Map of “Fluorescence” for 2025-01-13 to 2025-01-15

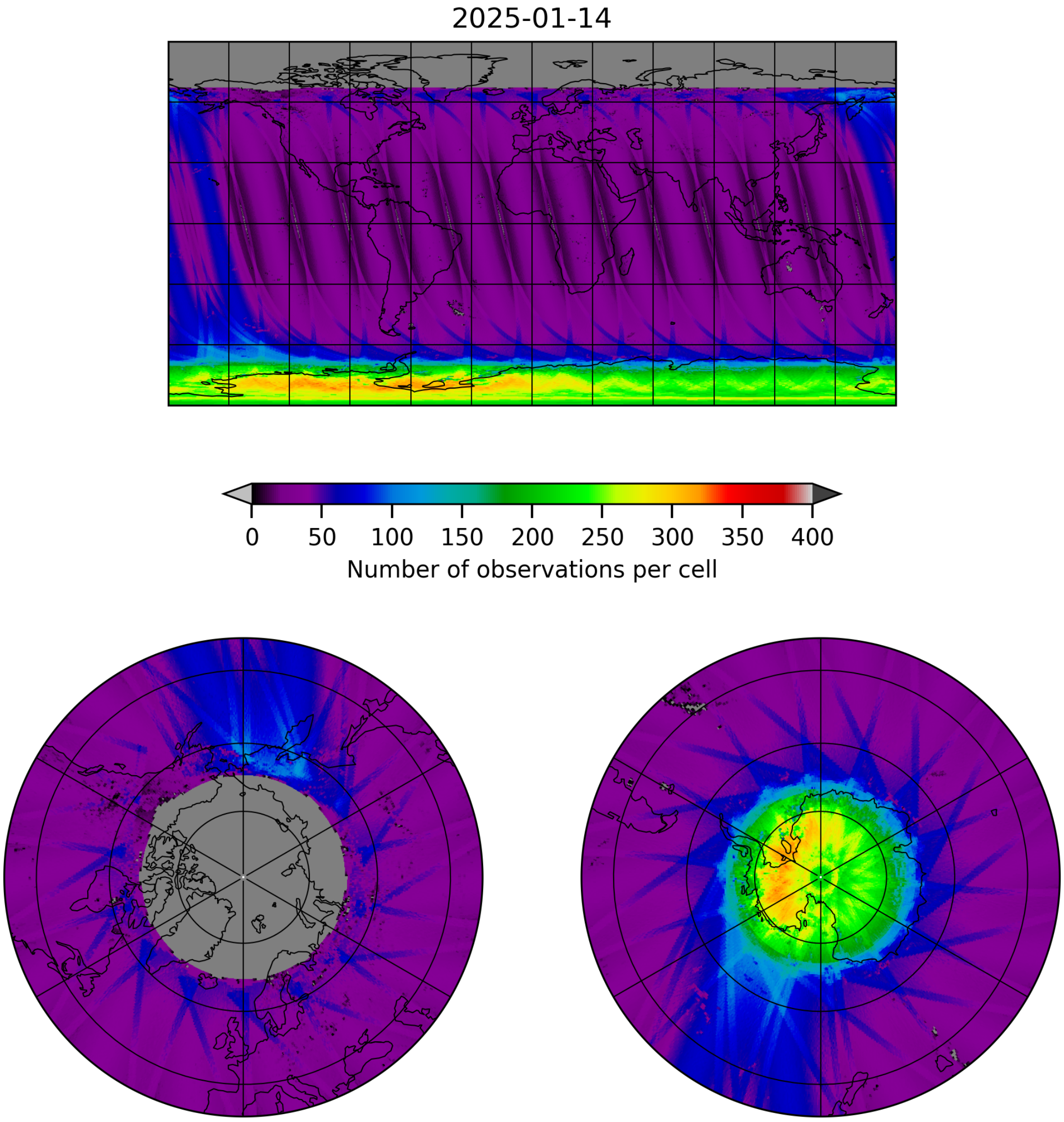


Figure 11: Map of the number of observations for 2025-01-13 to 2025-01-15

7 Zonal average

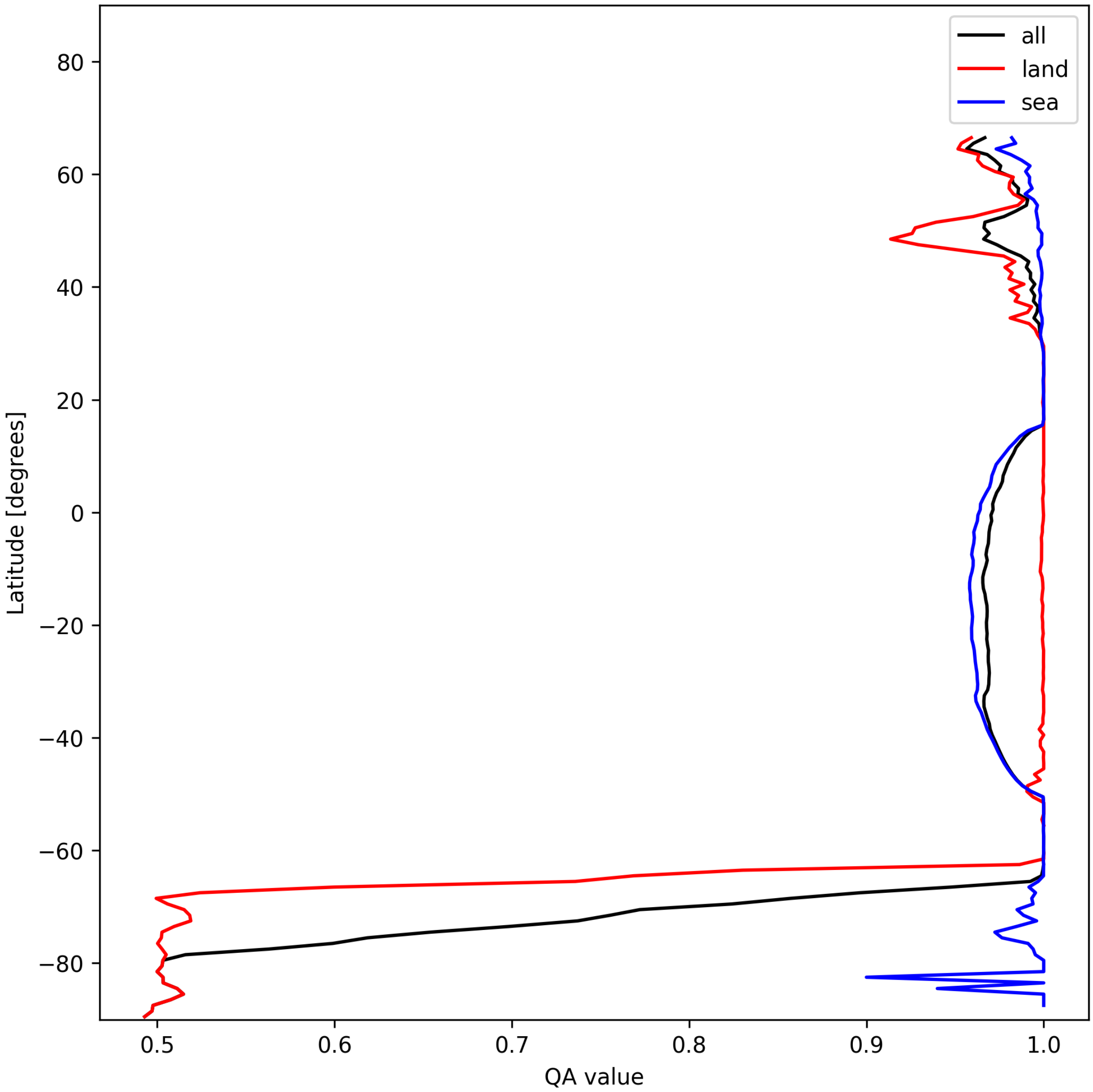


Figure 12: Zonal average of “QA value” for 2025-01-13 to 2025-01-15.

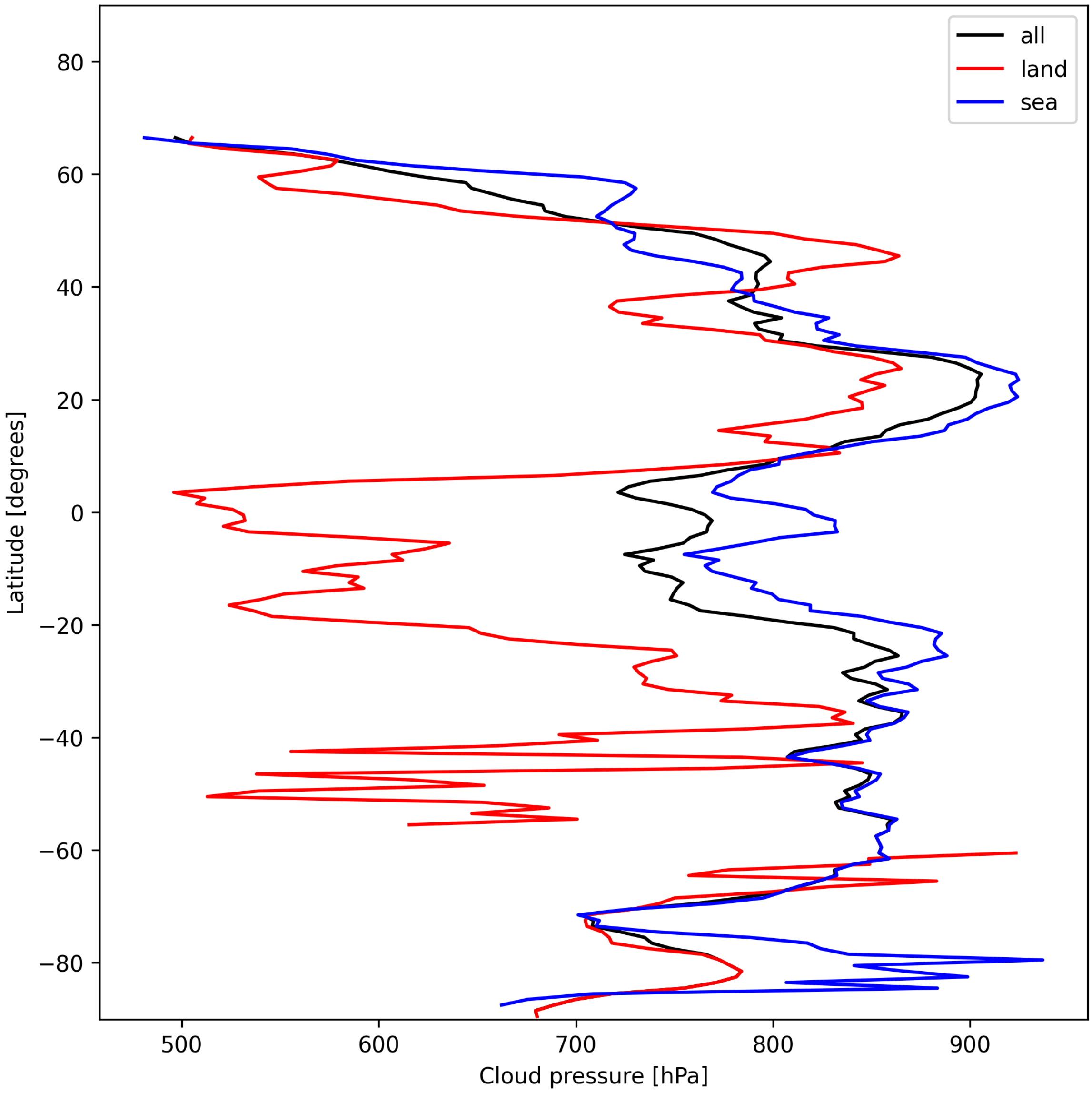


Figure 13: Zonal average of “Cloud pressure” for 2025-01-13 to 2025-01-15.

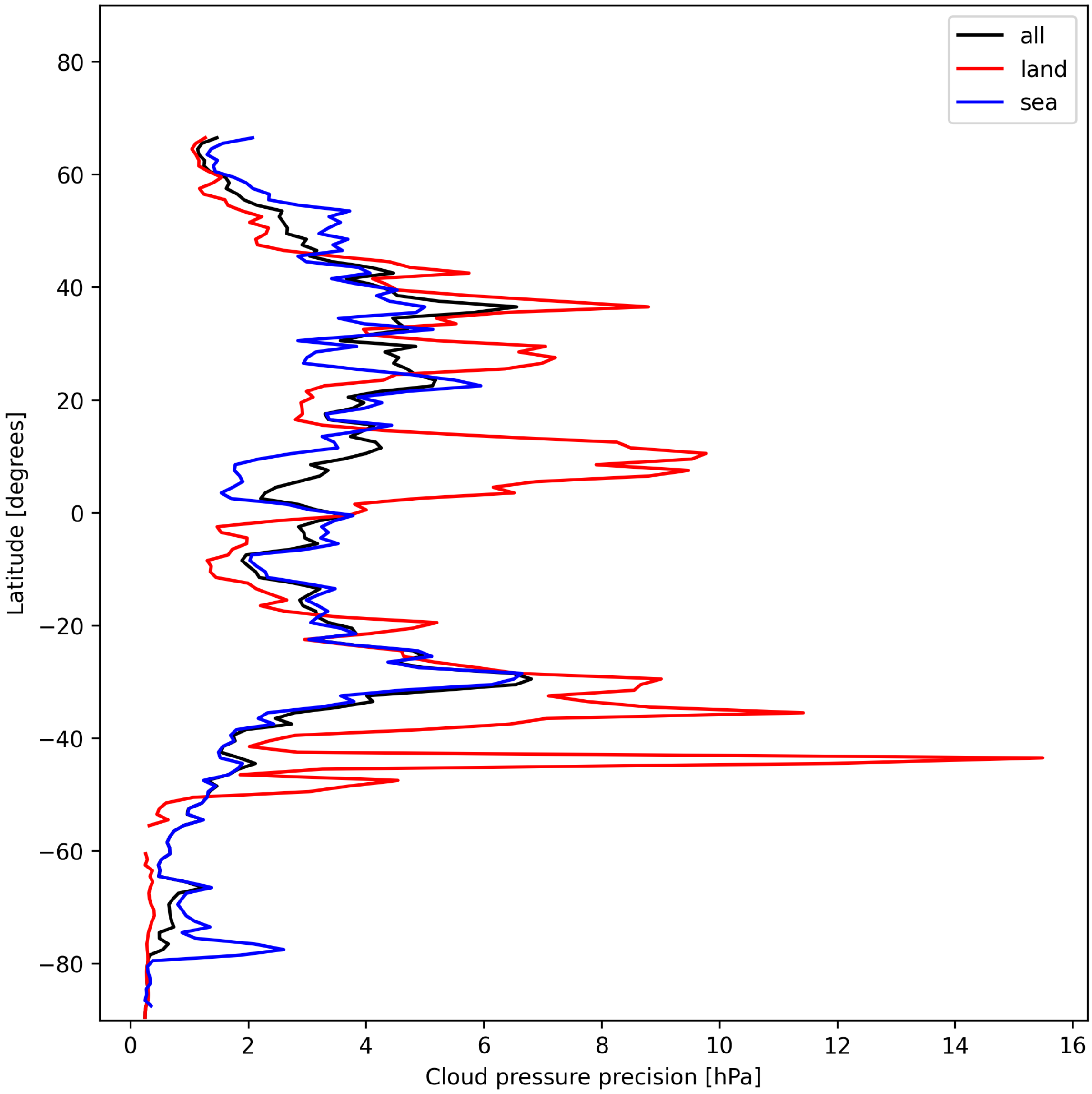


Figure 14: Zonal average of “Cloud pressure precision” for 2025-01-13 to 2025-01-15.

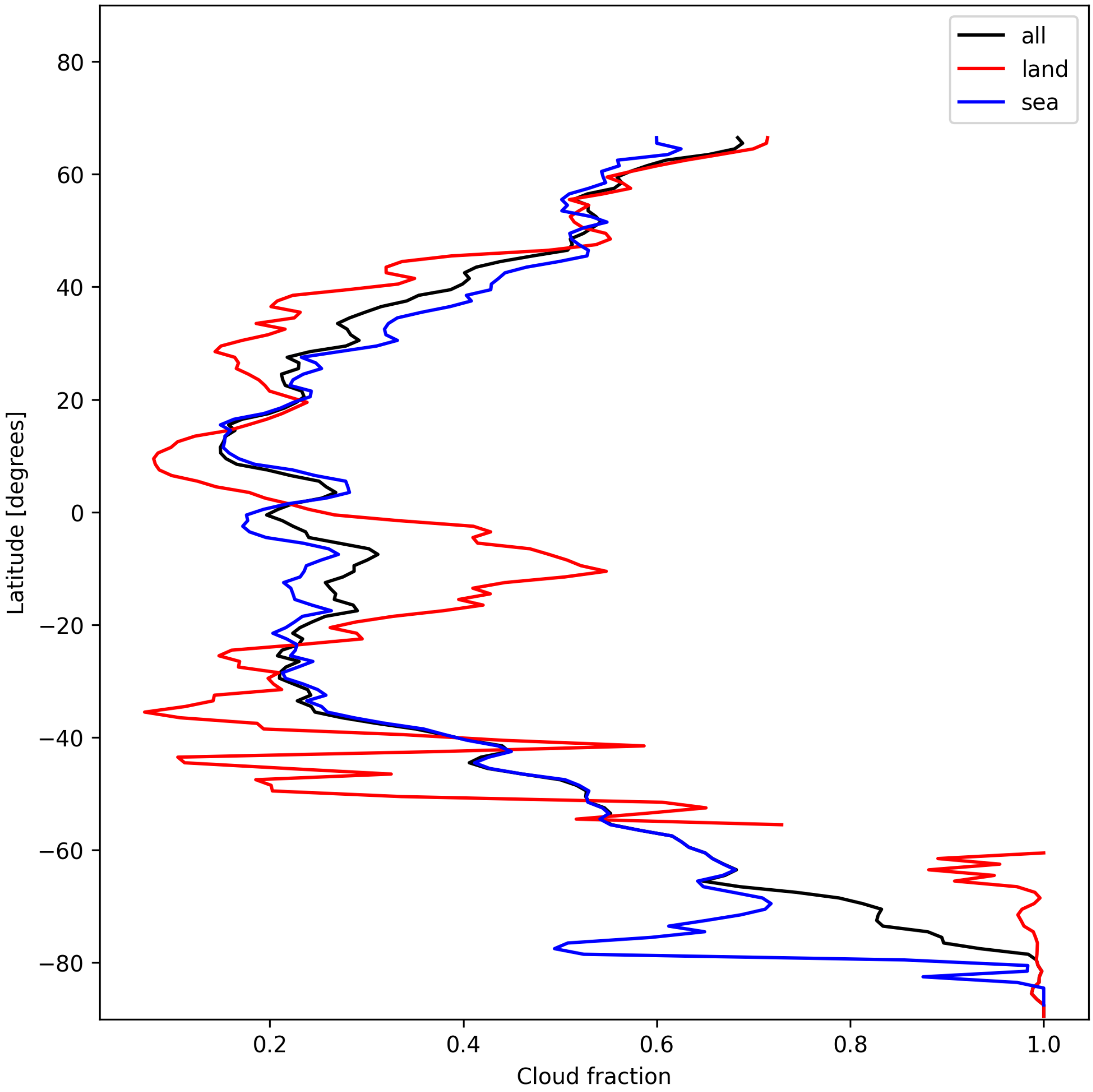


Figure 15: Zonal average of “Cloud fraction” for 2025-01-13 to 2025-01-15.

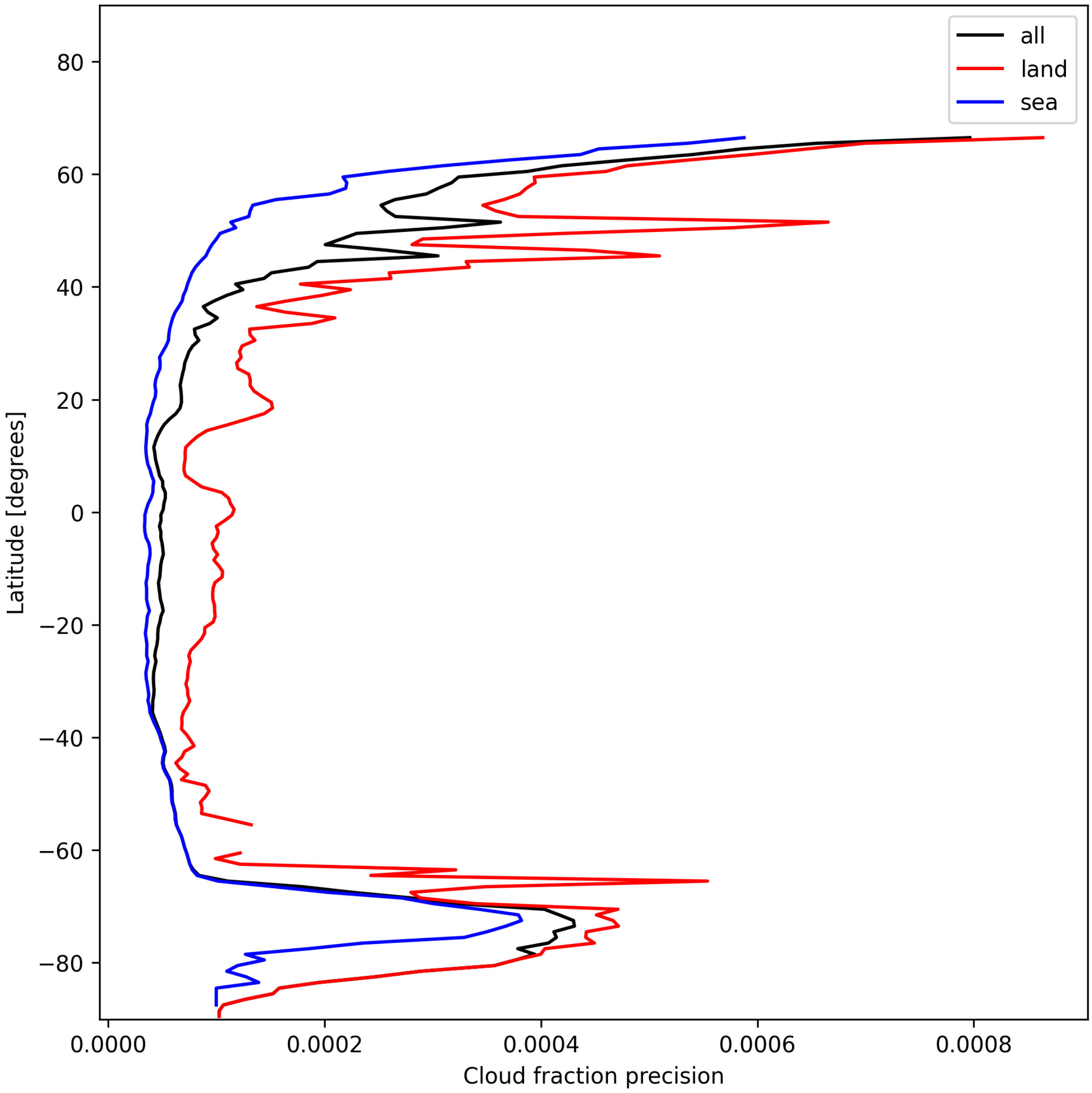


Figure 16: Zonal average of “Cloud fraction precision” for 2025-01-13 to 2025-01-15.

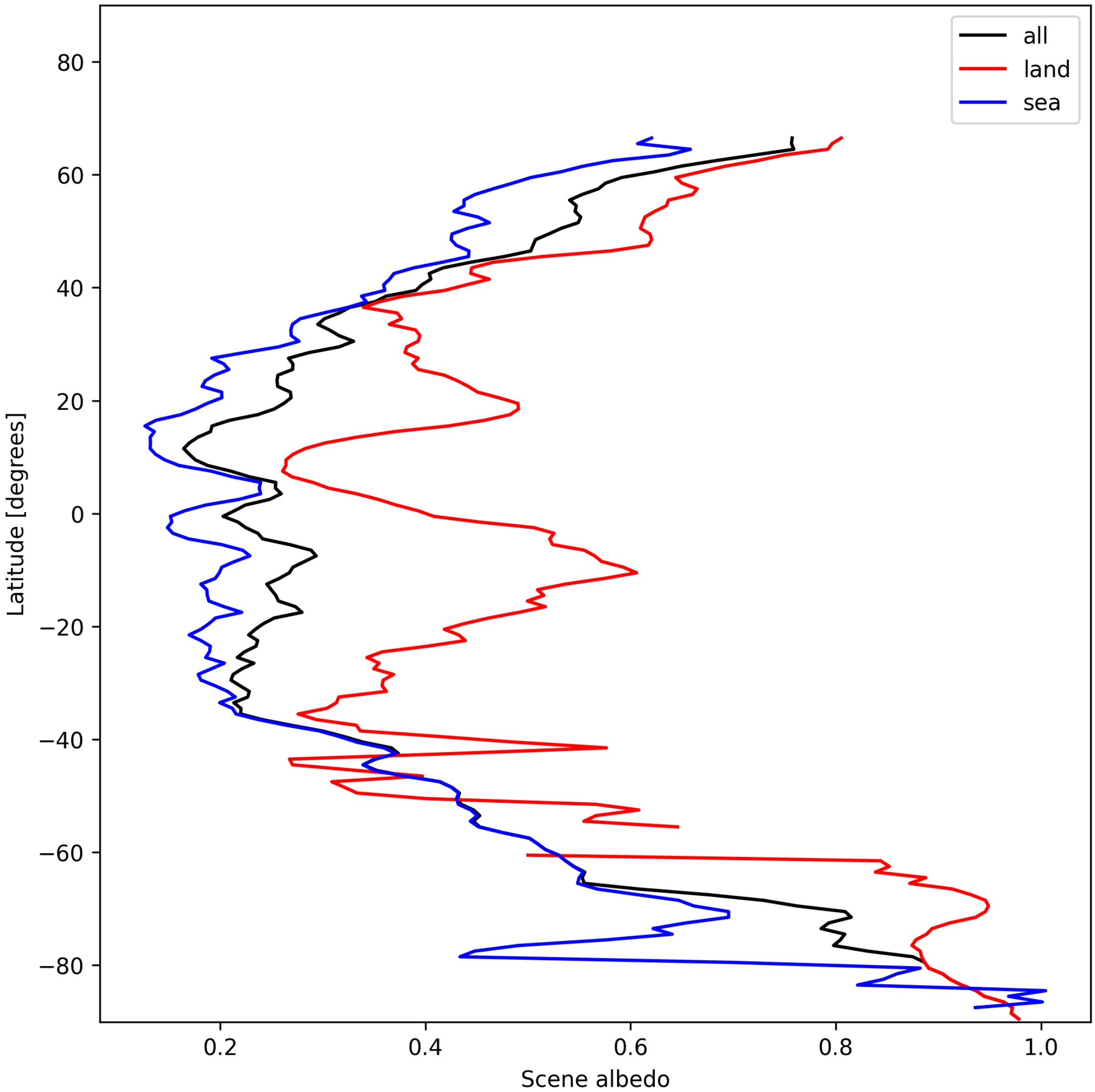


Figure 17: Zonal average of “Scene albedo” for 2025-01-13 to 2025-01-15.

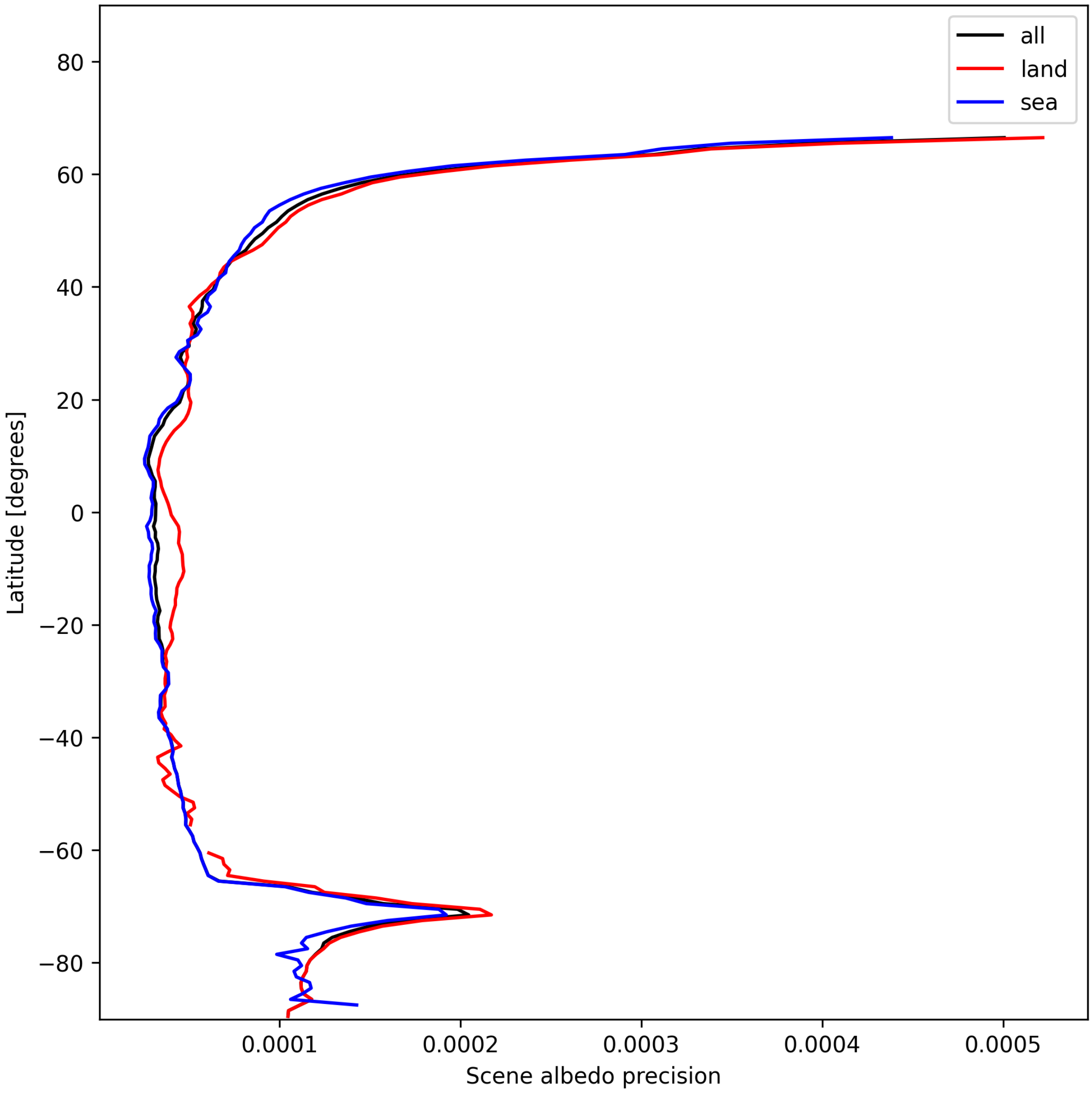


Figure 18: Zonal average of “Scene albedo precision” for 2025-01-13 to 2025-01-15.

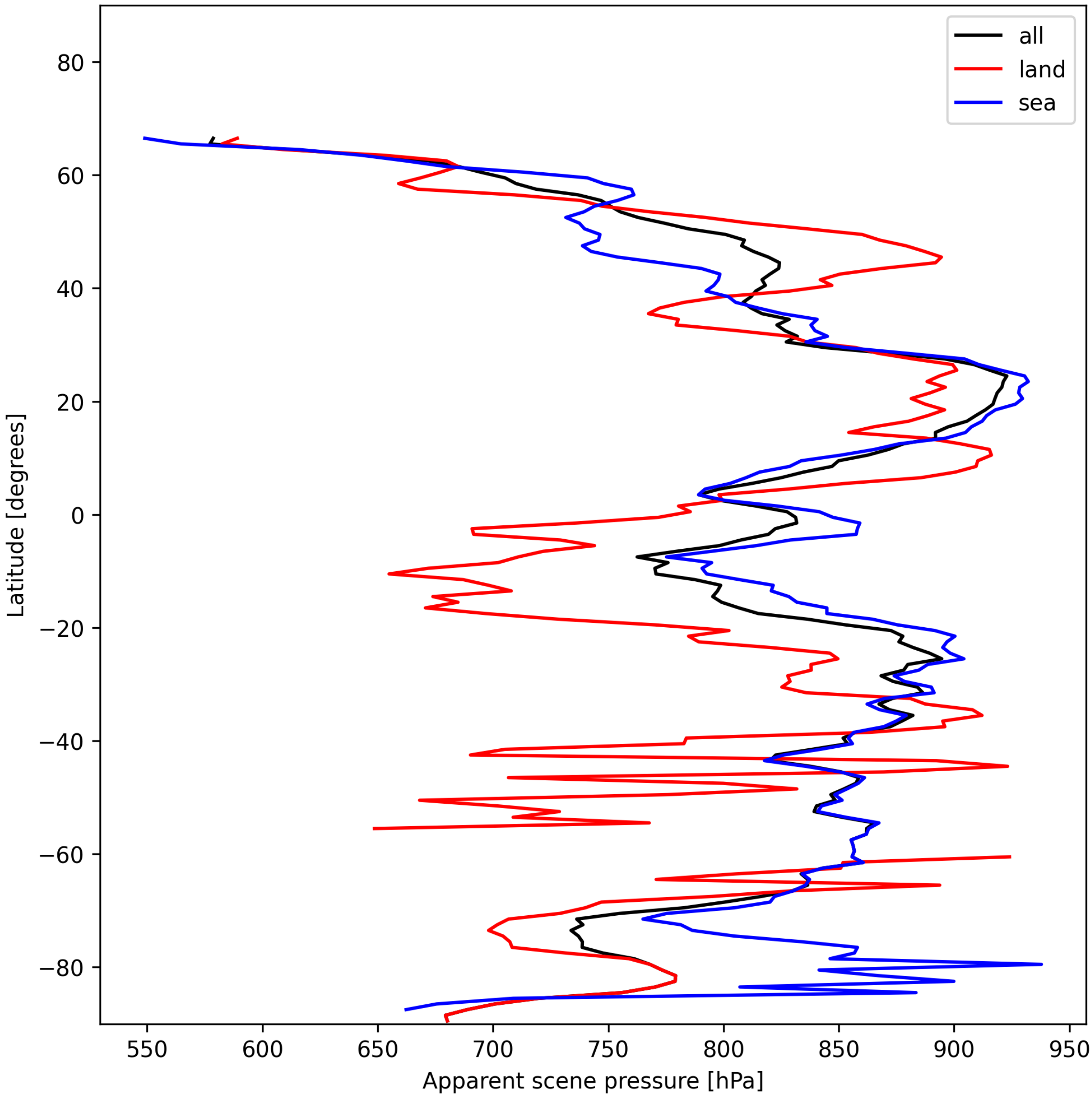


Figure 19: Zonal average of “Apparent scene pressure” for 2025-01-13 to 2025-01-15.

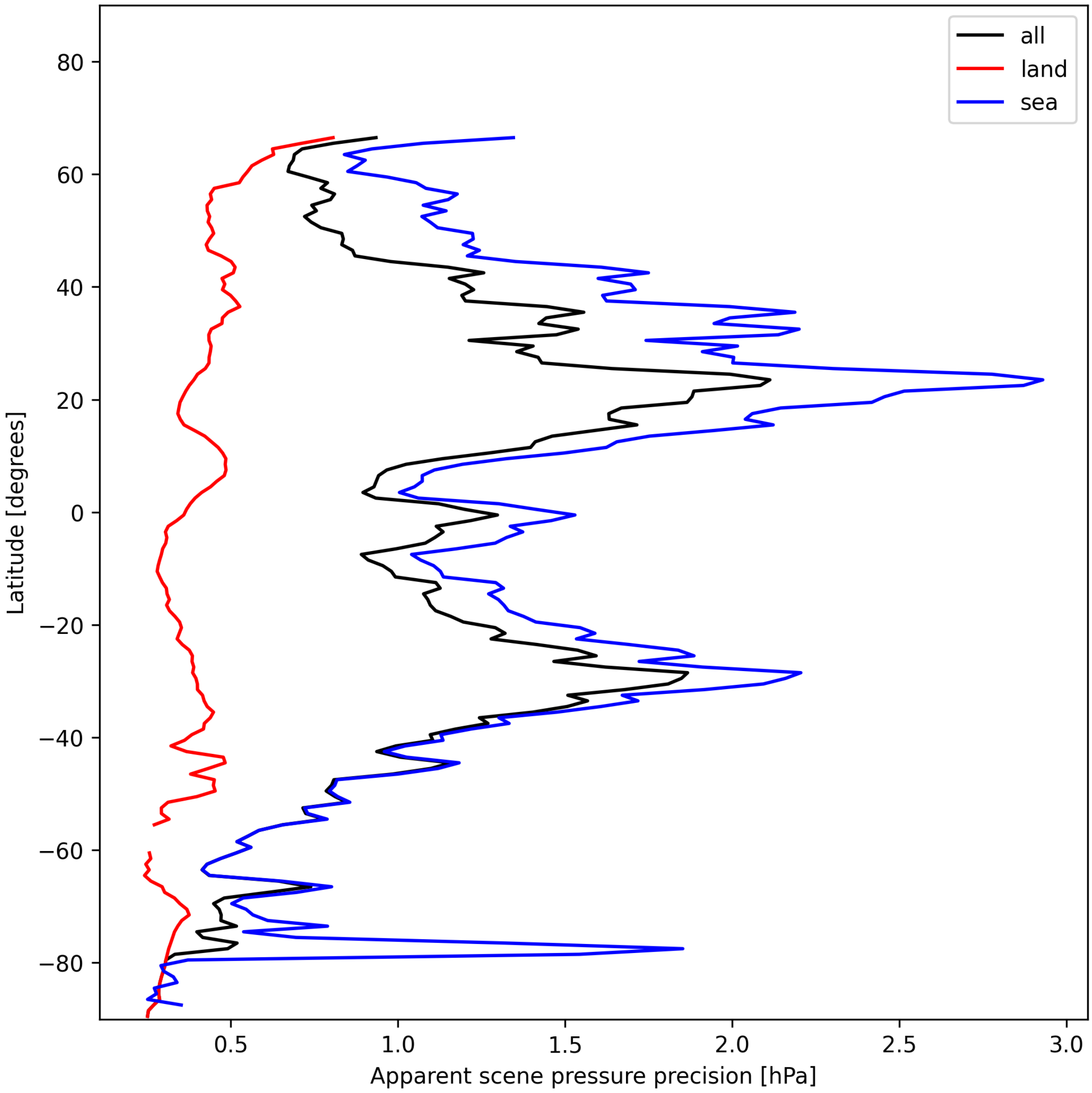


Figure 20: Zonal average of “Apparent scene pressure precision” for 2025-01-13 to 2025-01-15.

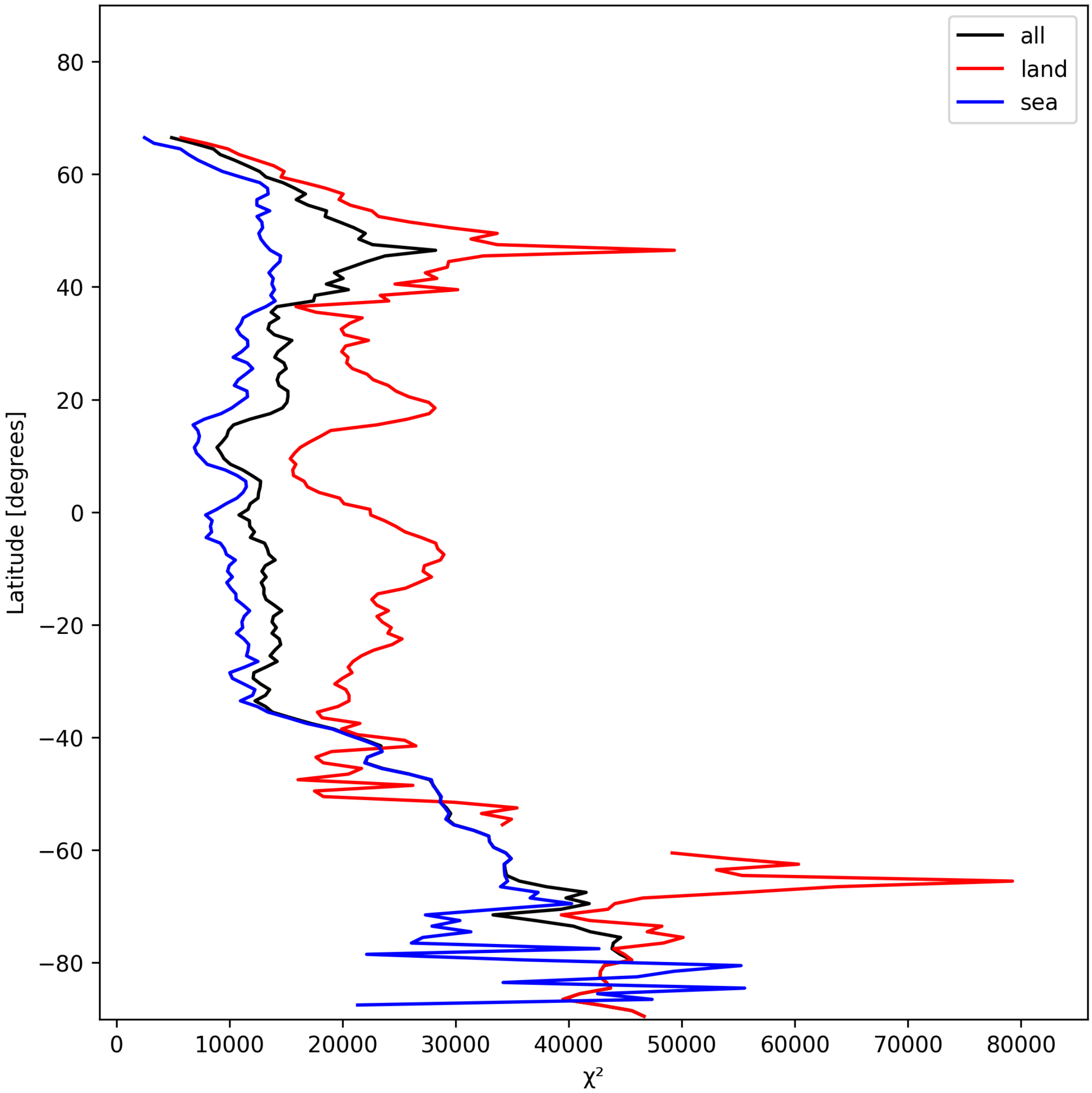


Figure 21: Zonal average of “χ^2” for 2025-01-13 to 2025-01-15.

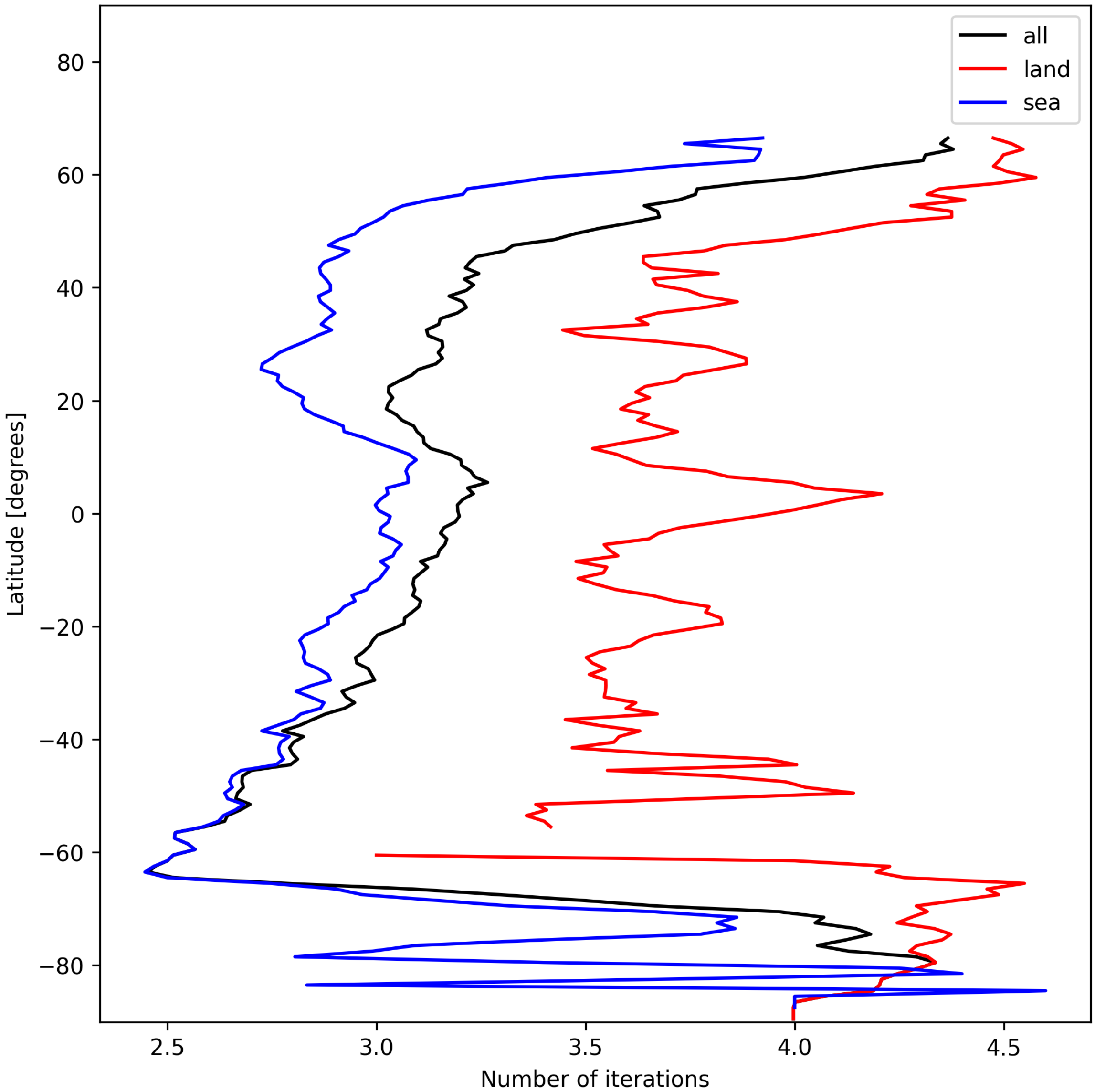


Figure 22: Zonal average of “Number of iterations” for 2025-01-13 to 2025-01-15.

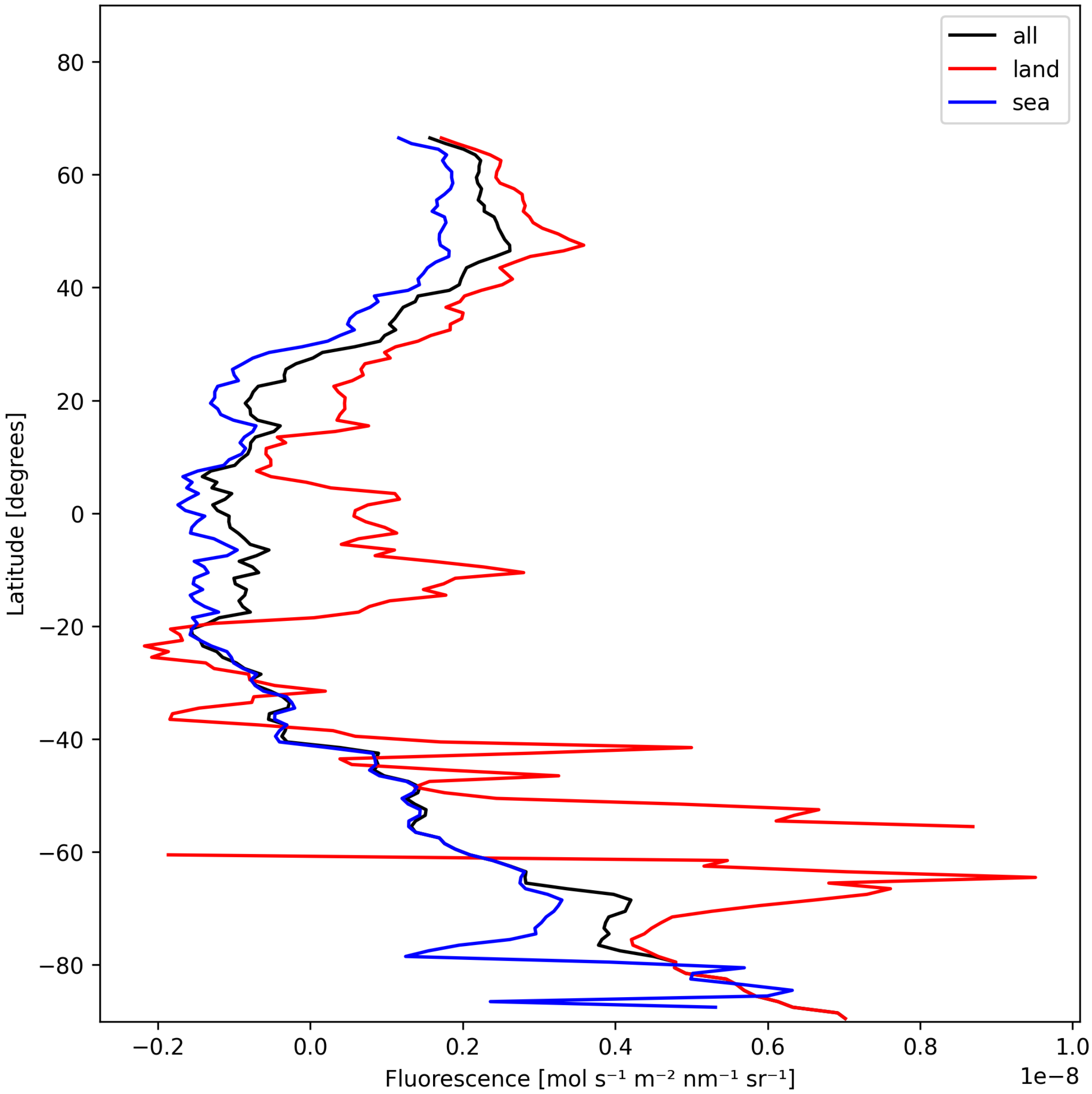


Figure 23: Zonal average of “Fluorescence” for 2025-01-13 to 2025-01-15.

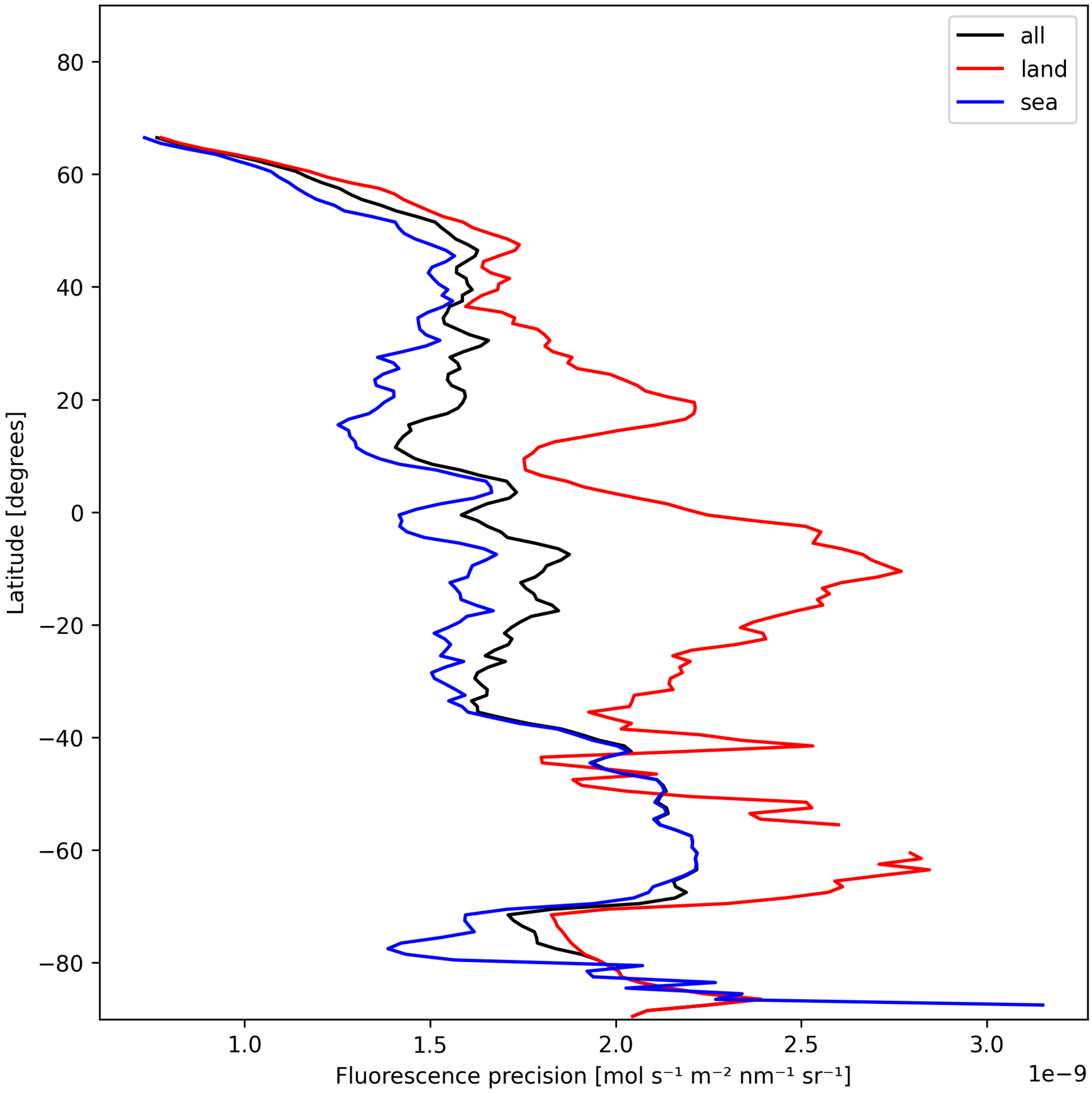


Figure 24: Zonal average of “Fluorescence precision” for 2025-01-13 to 2025-01-15.

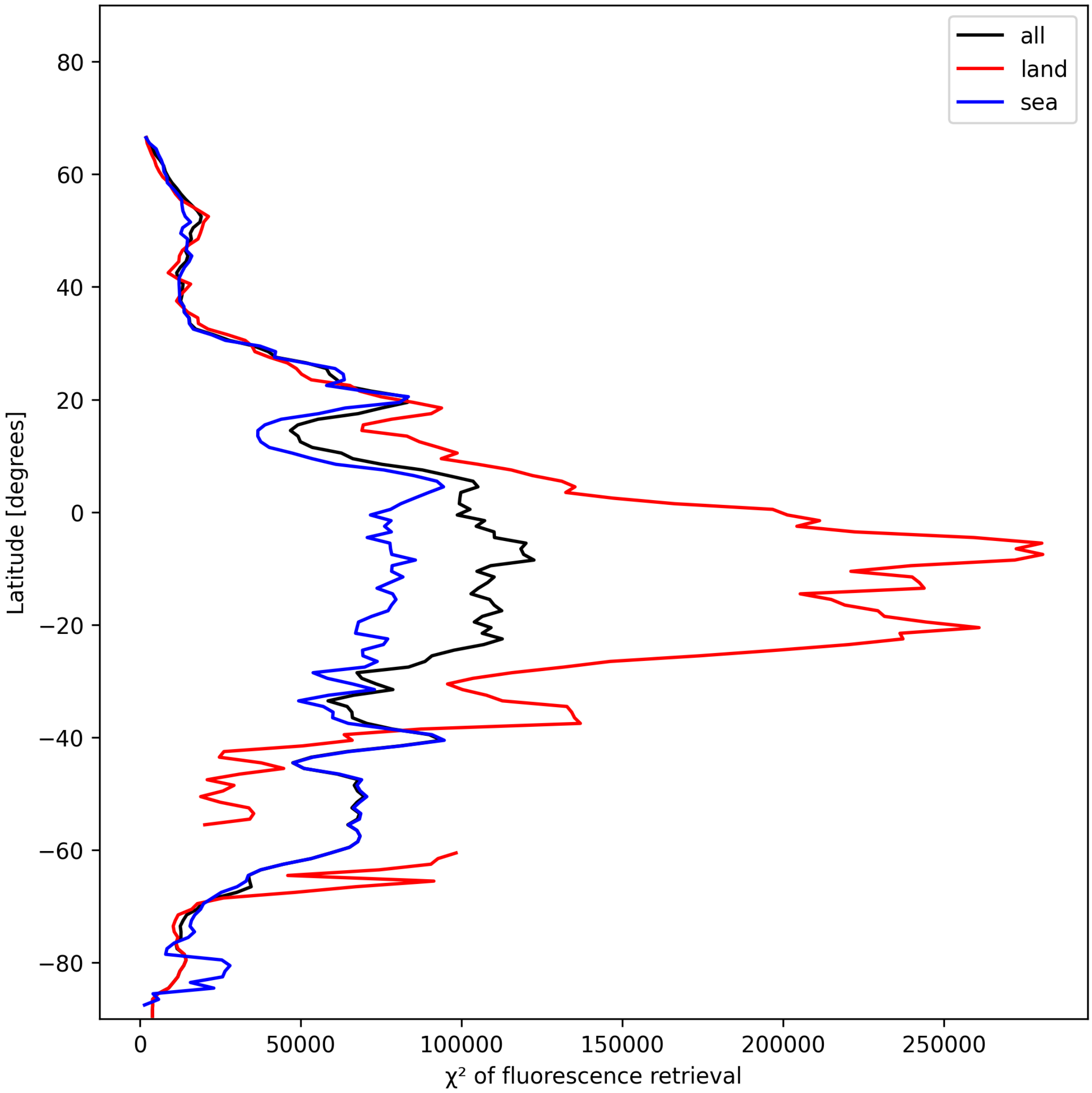


Figure 25: Zonal average of "χ^2 of fluorescence retrieval" for 2025-01-13 to 2025-01-15.

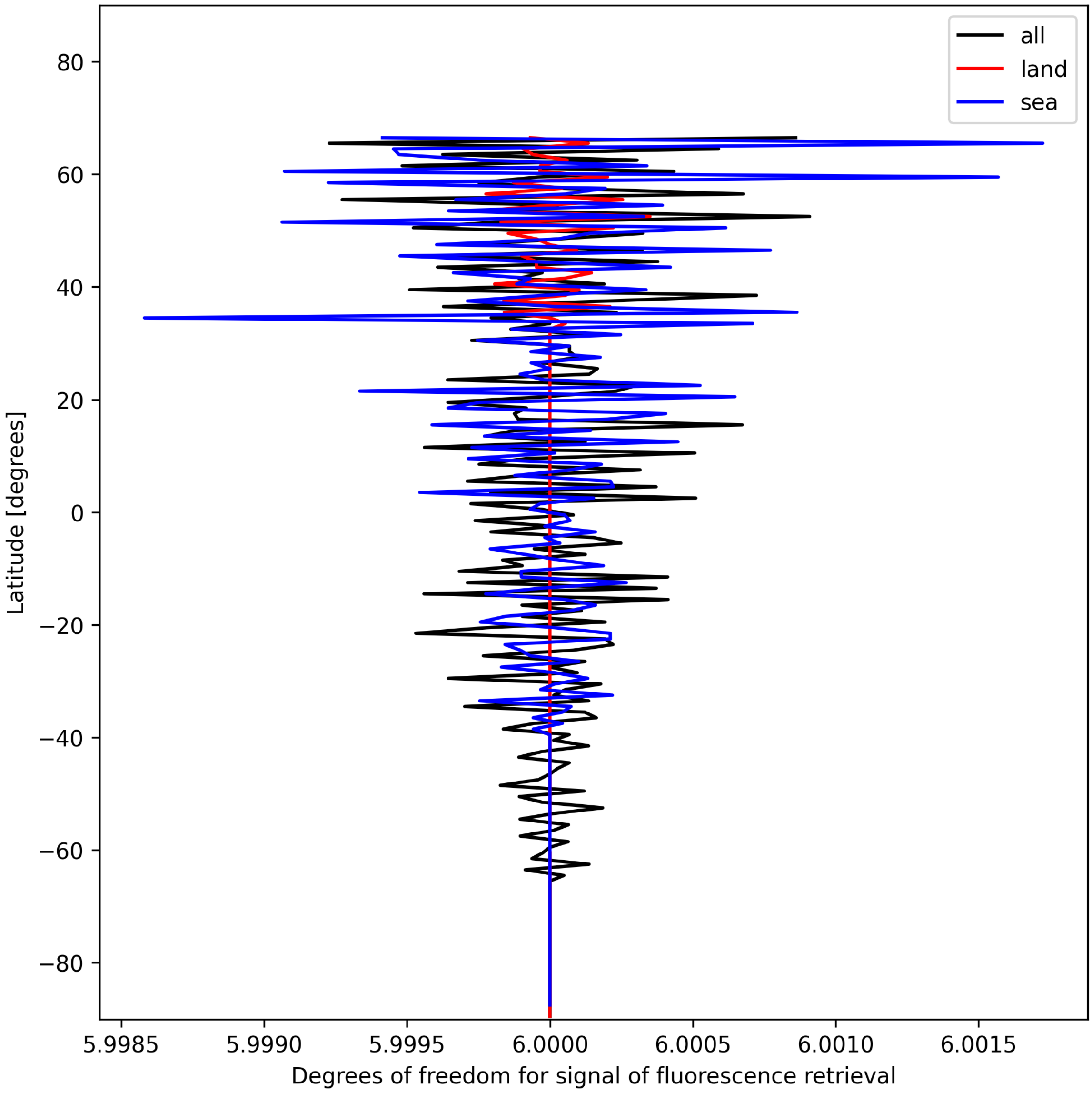


Figure 26: Zonal average of “Degrees of freedom for signal of fluorescence retrieval” for 2025-01-13 to 2025-01-15.

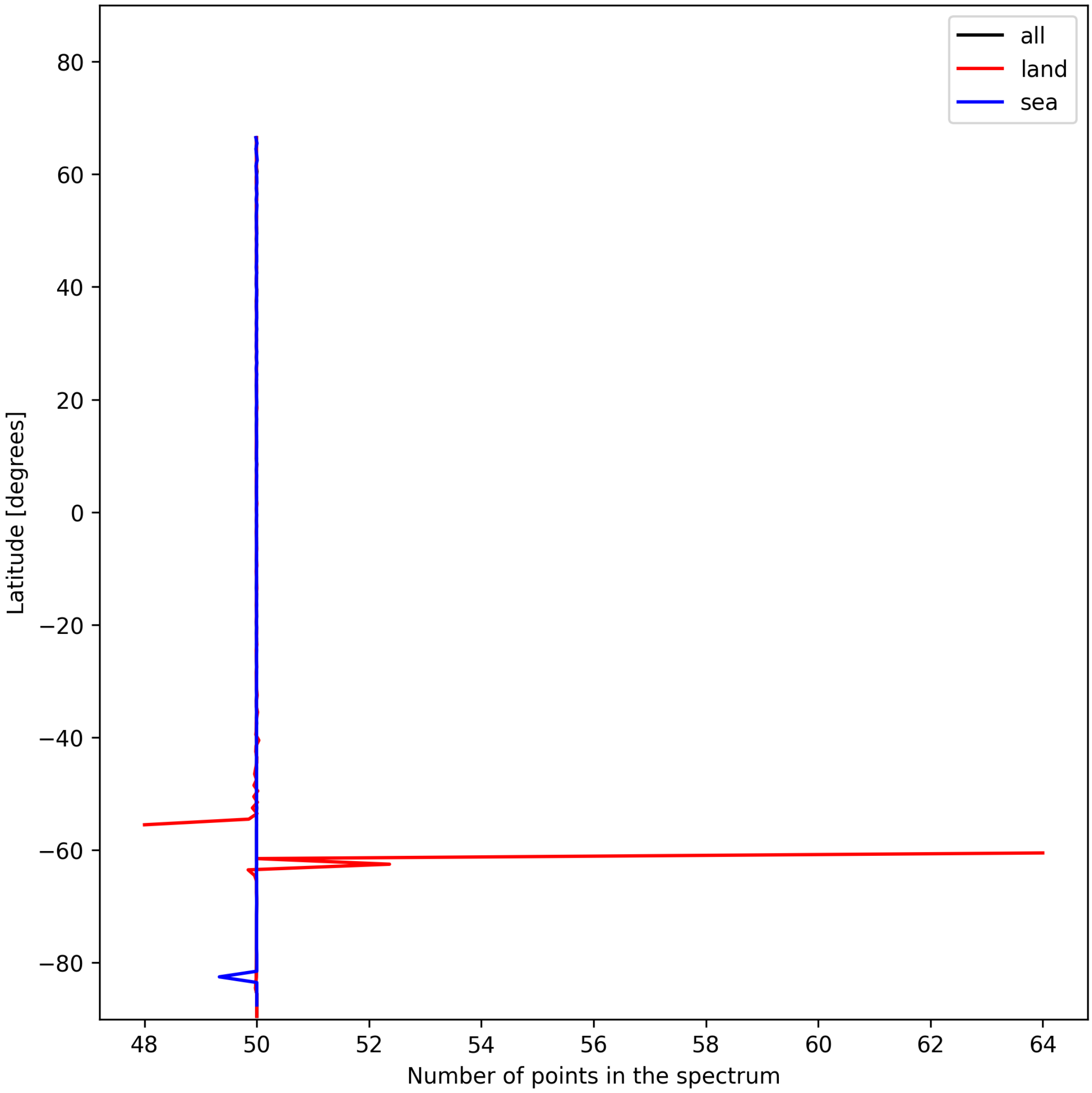


Figure 27: Zonal average of “Number of points in the spectrum” for 2025-01-13 to 2025-01-15.

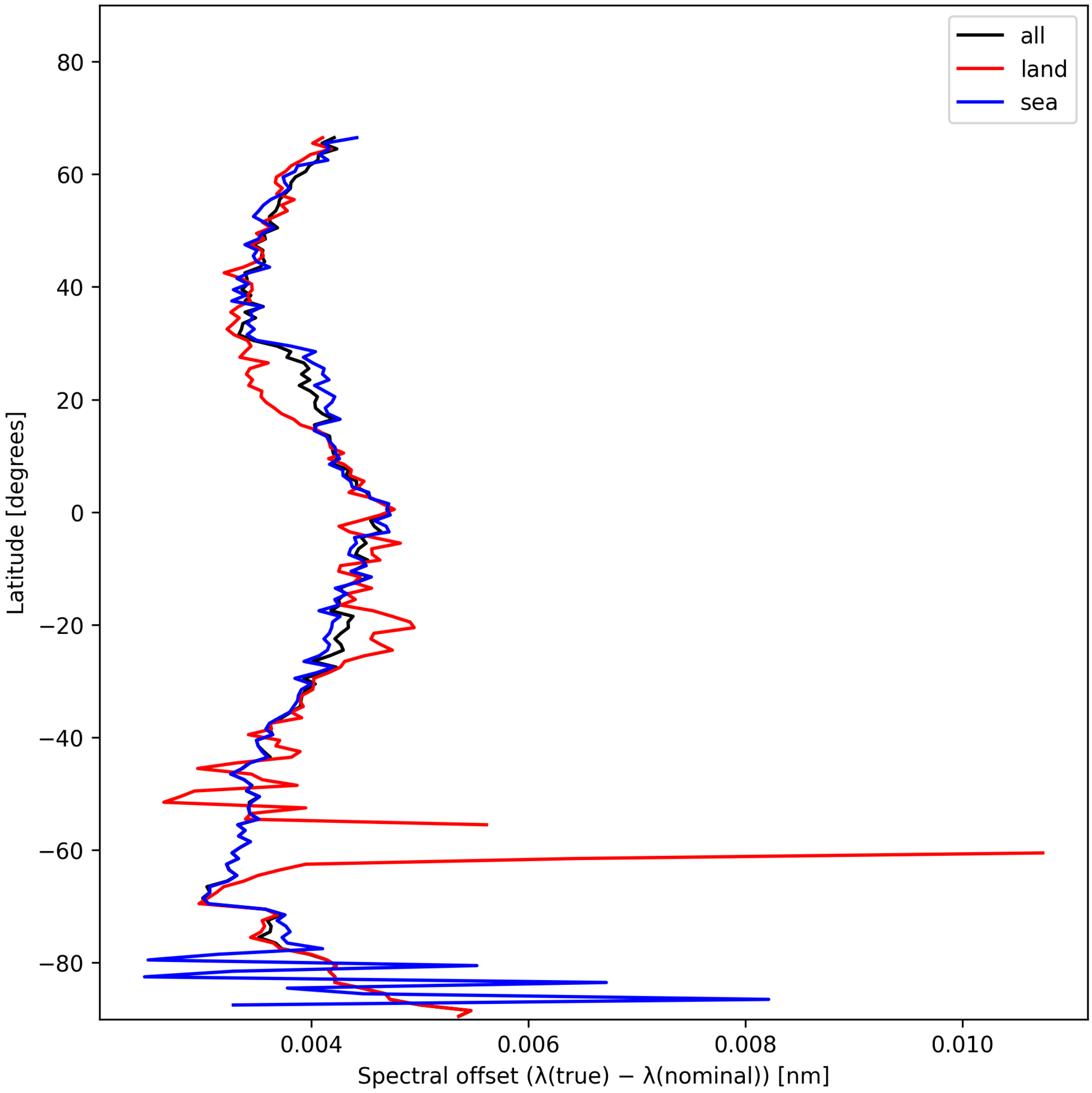


Figure 28: Zonal average of “Spectral offset ($\lambda_{\text{true}} - \lambda_{\text{nominal}}$)” for 2025-01-13 to 2025-01-15.

8 Histograms

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

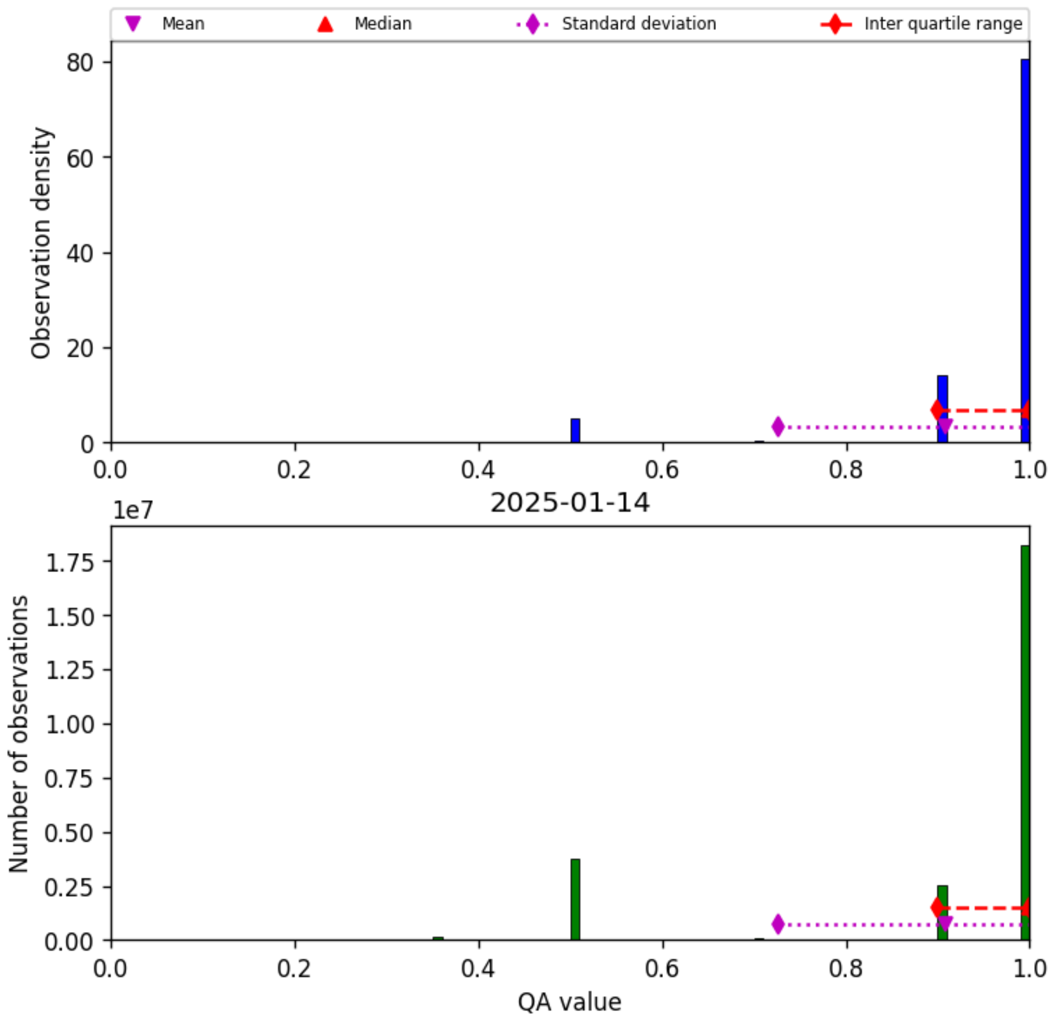


Figure 29: Histogram of “QA value” for 2025-01-13 to 2025-01-15

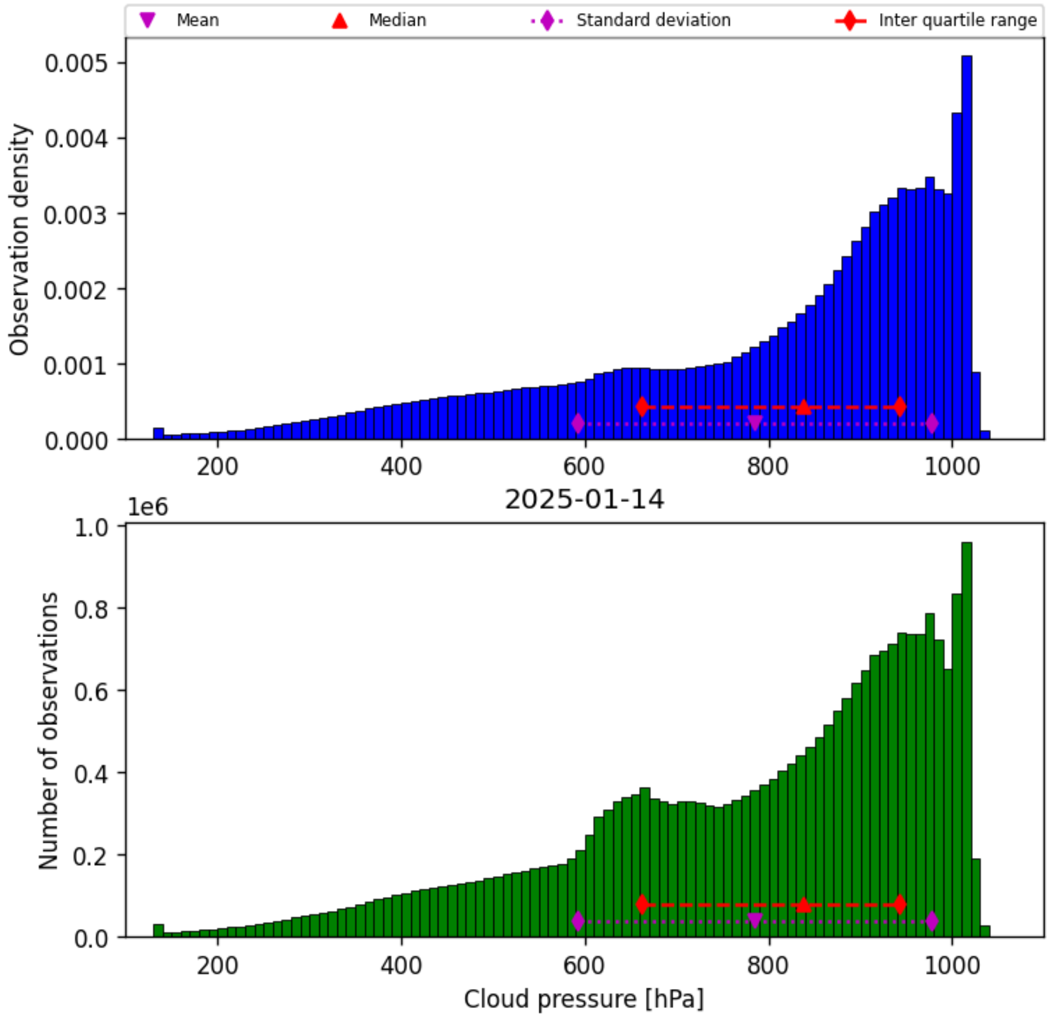


Figure 30: Histogram of "Cloud pressure" for 2025-01-13 to 2025-01-15

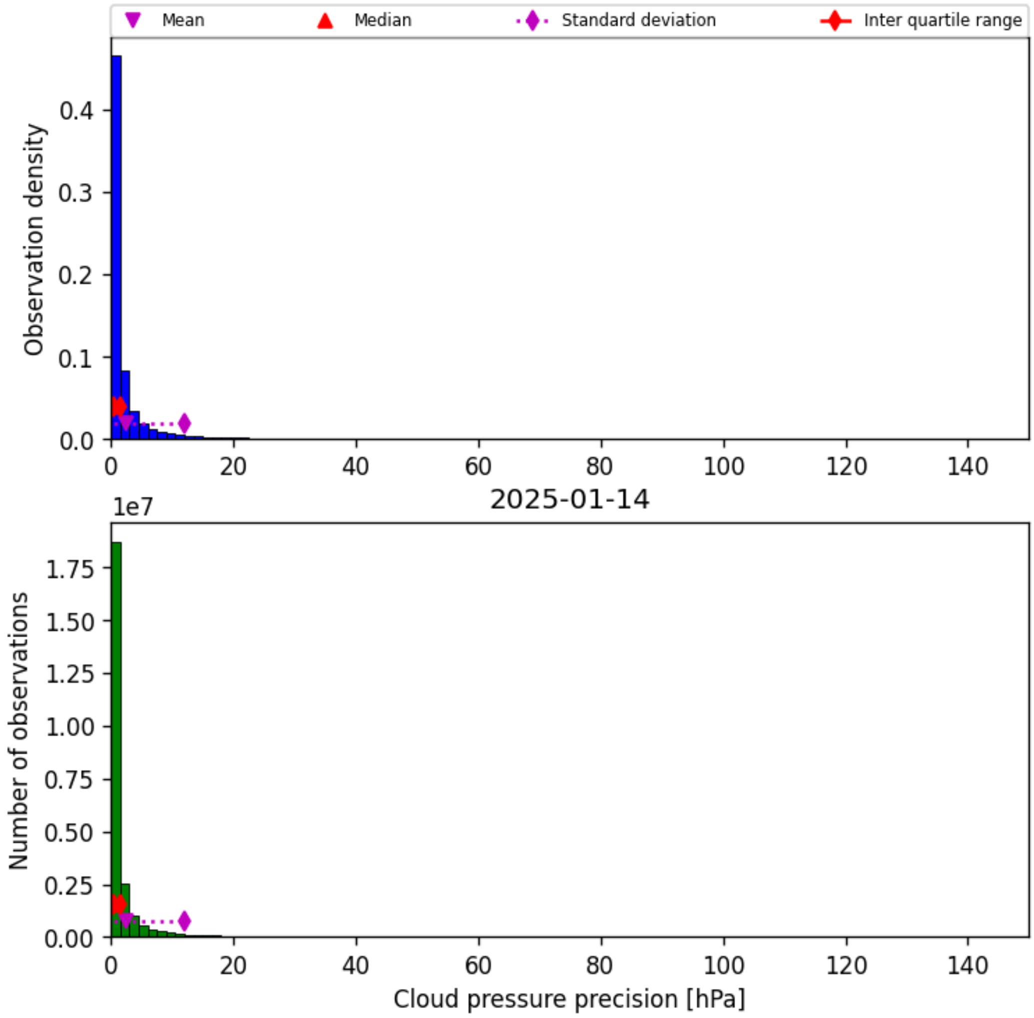


Figure 31: Histogram of "Cloud pressure precision" for 2025-01-13 to 2025-01-15

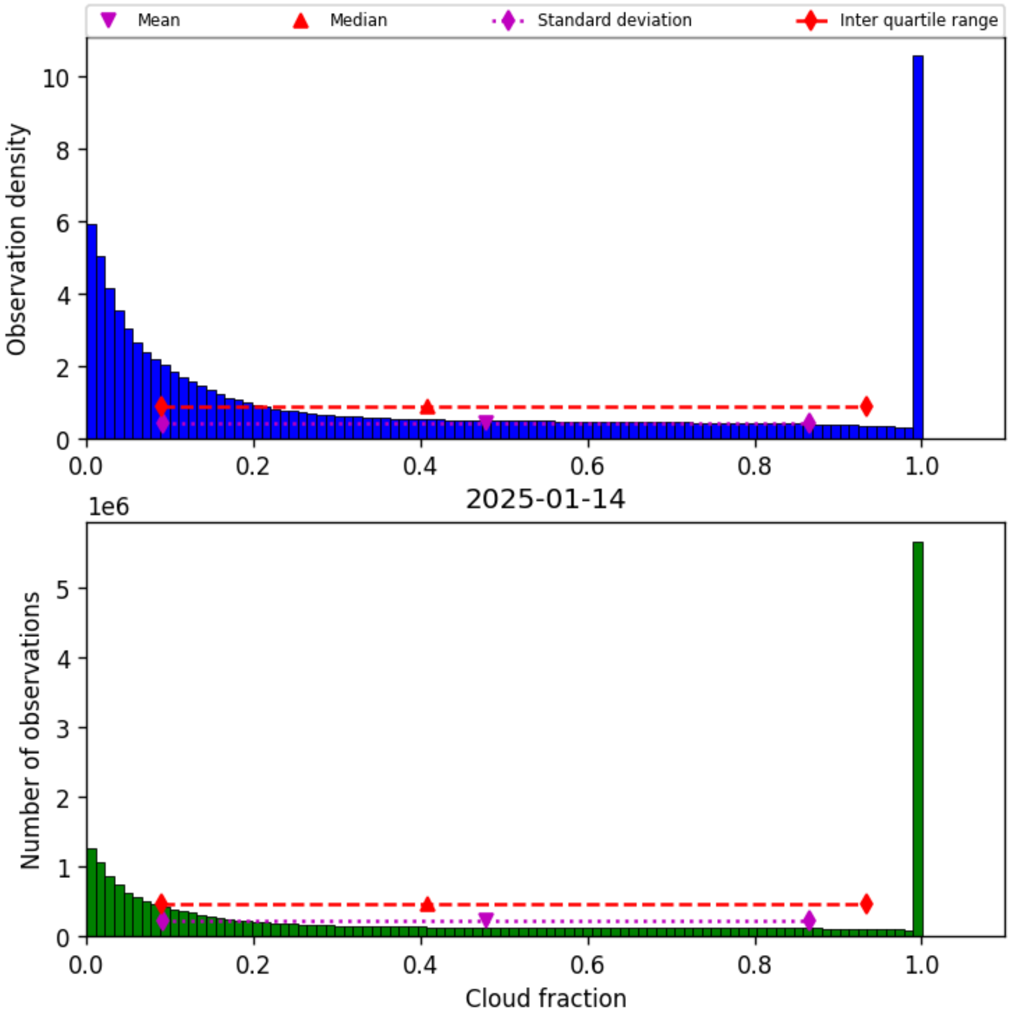


Figure 32: Histogram of “Cloud fraction” for 2025-01-13 to 2025-01-15

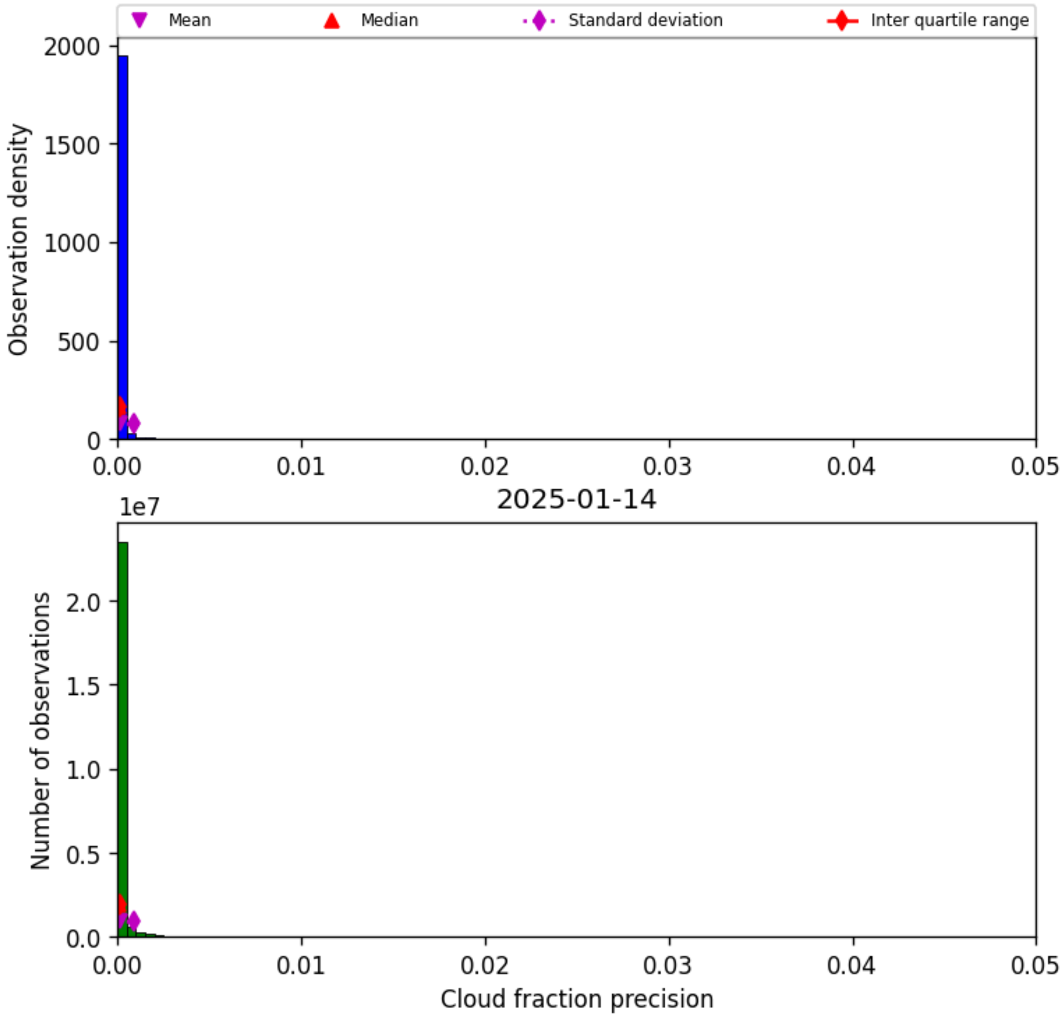


Figure 33: Histogram of “Cloud fraction precision” for 2025-01-13 to 2025-01-15

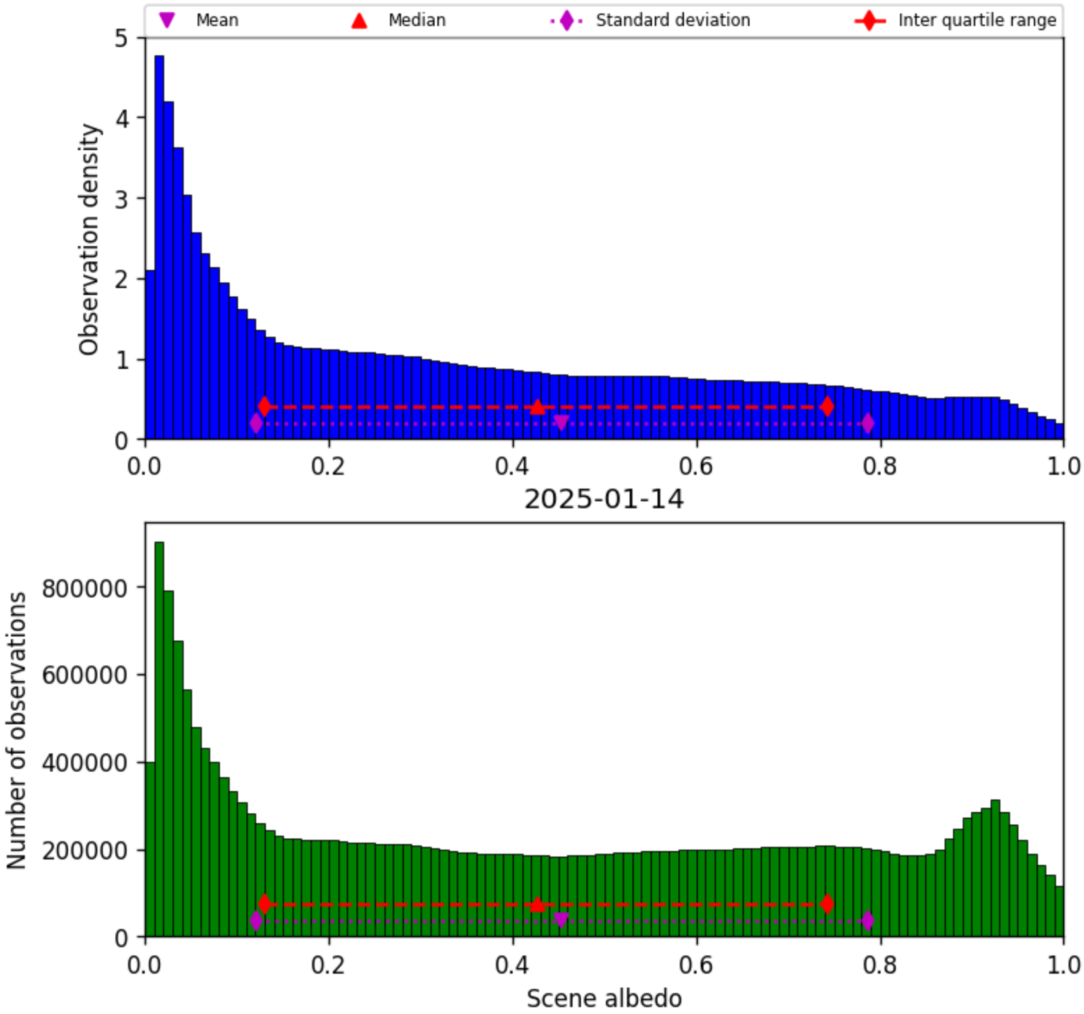


Figure 34: Histogram of “Scene albedo” for 2025-01-13 to 2025-01-15

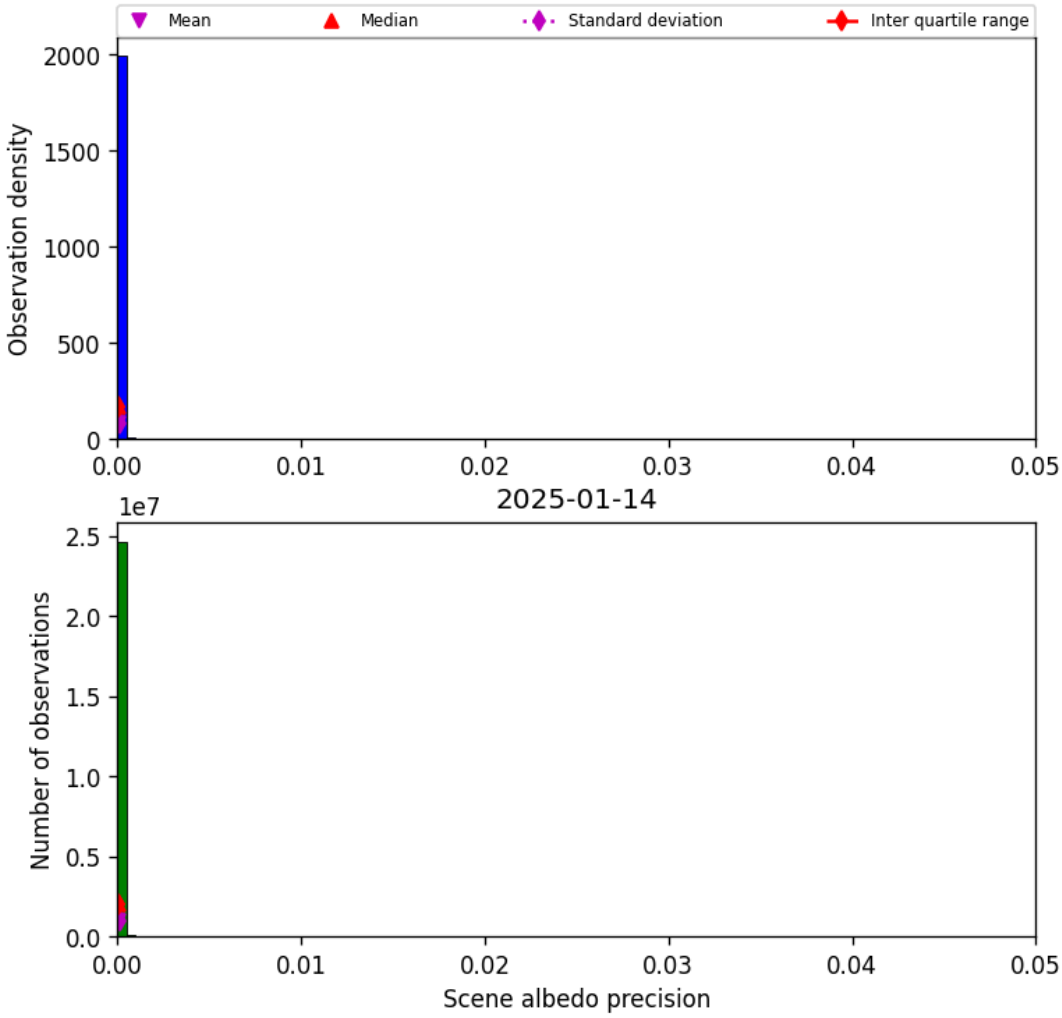


Figure 35: Histogram of “Scene albedo precision” for 2025-01-13 to 2025-01-15

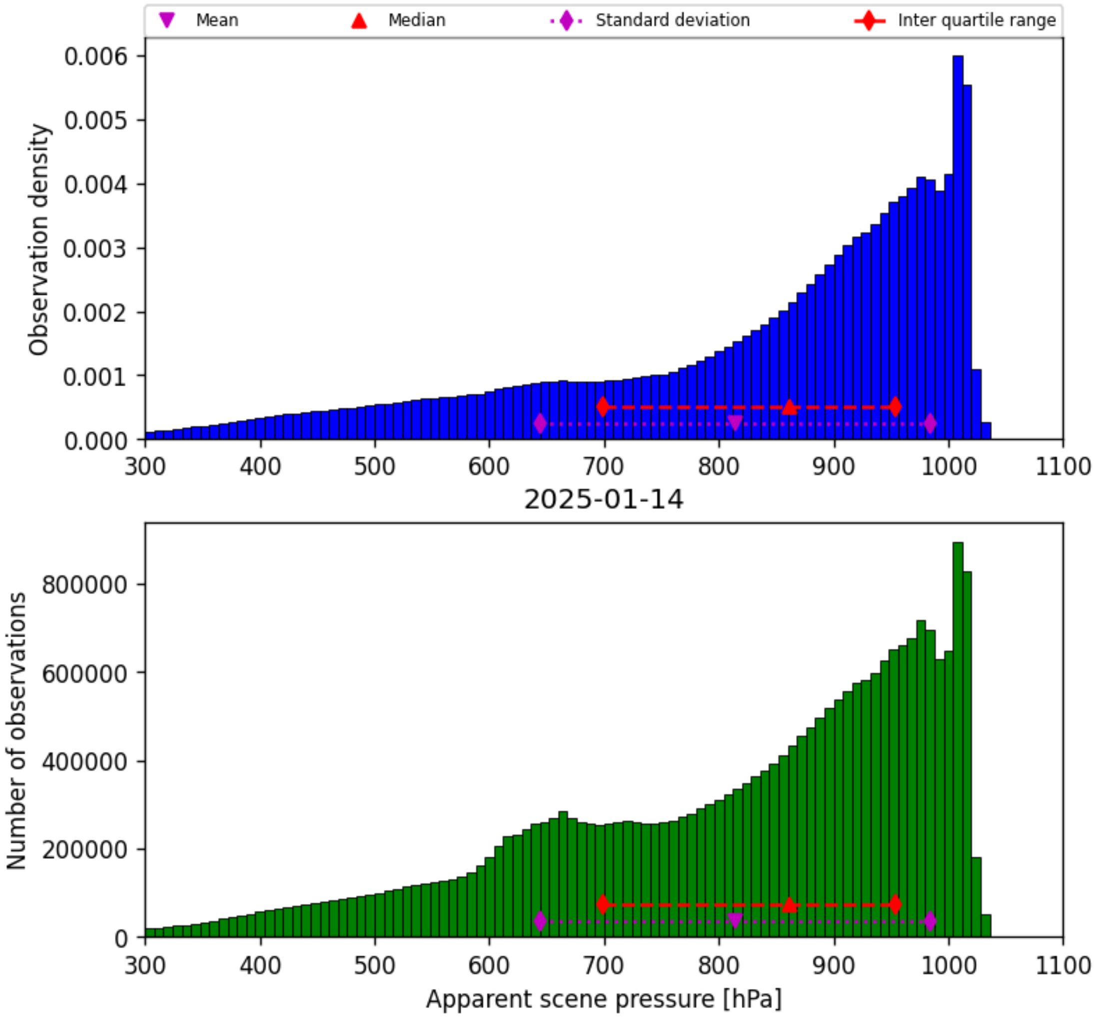


Figure 36: Histogram of “Apparent scene pressure” for 2025-01-13 to 2025-01-15

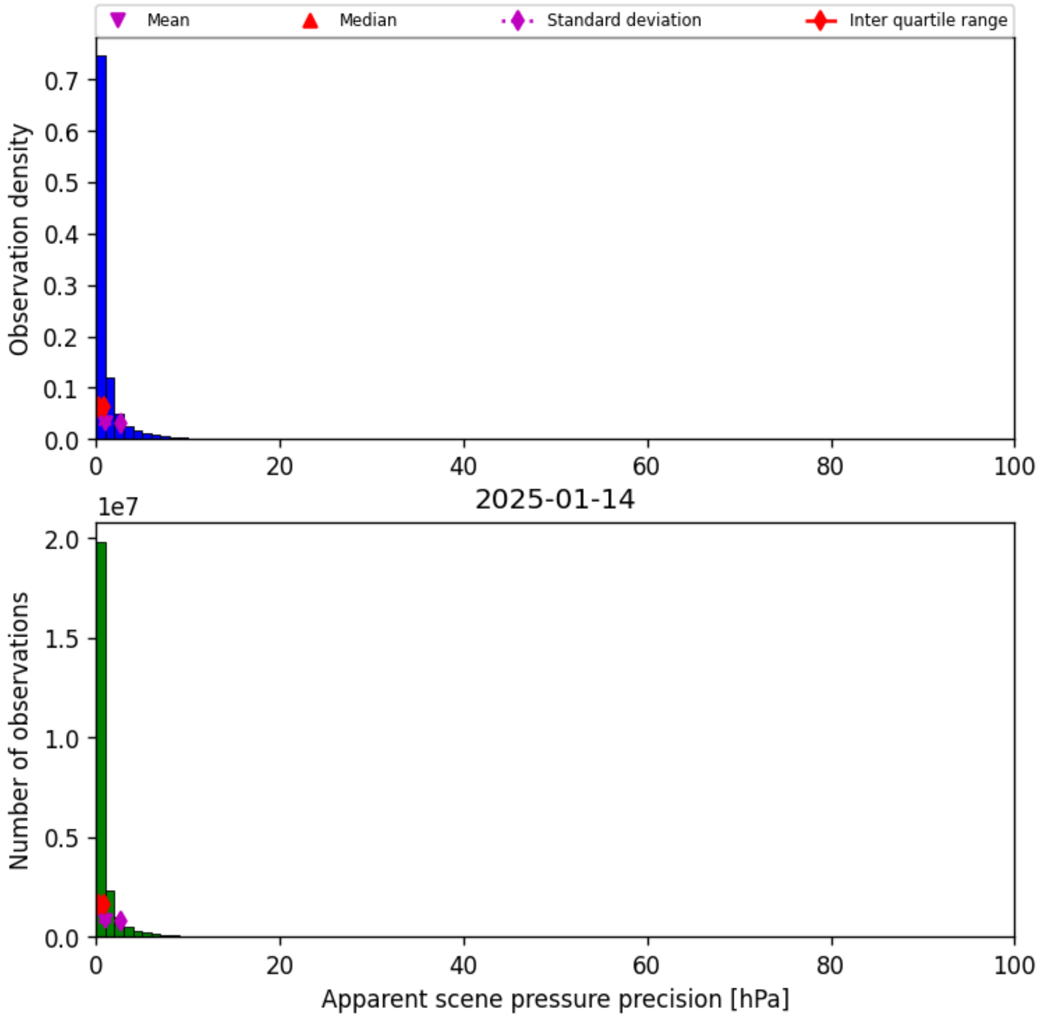


Figure 37: Histogram of “Apparent scene pressure precision” for 2025-01-13 to 2025-01-15

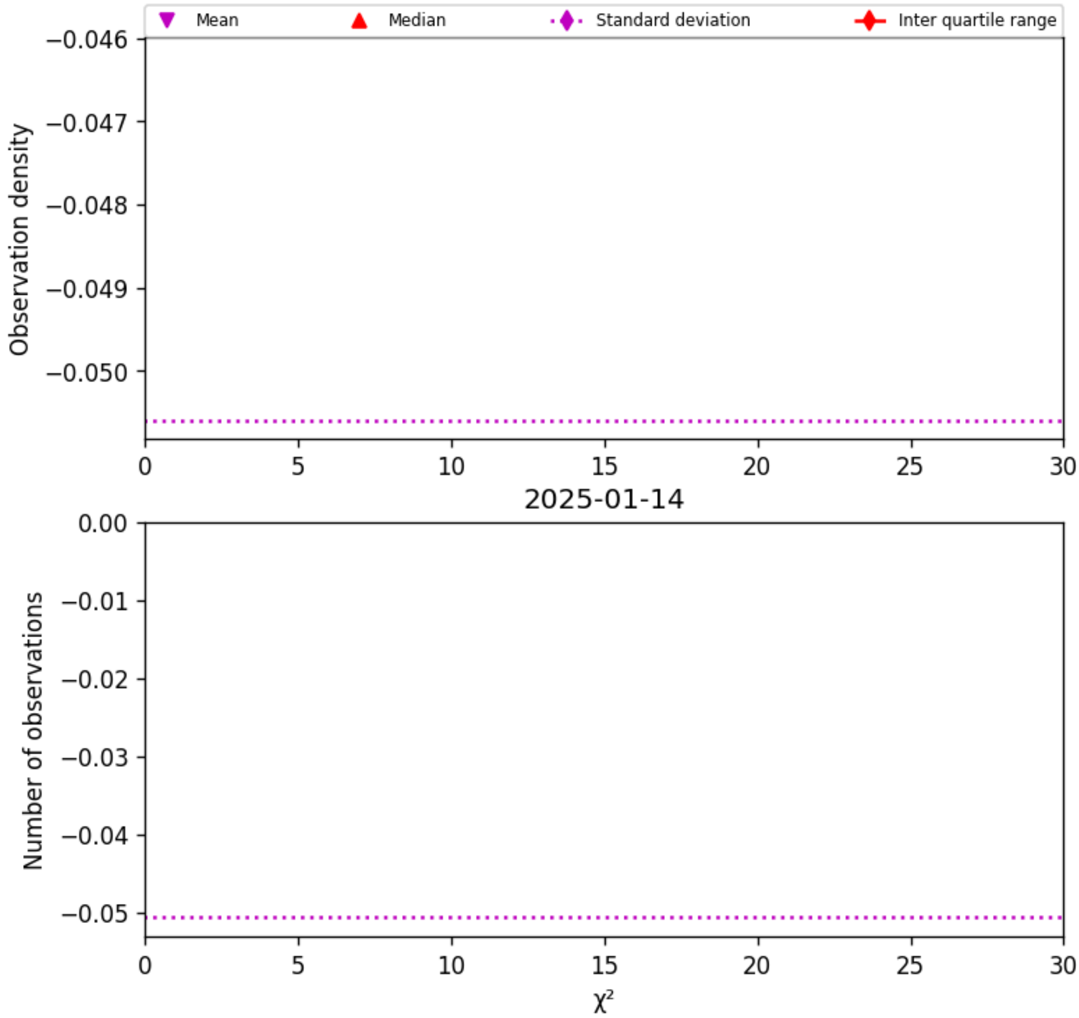


Figure 38: Histogram of "χ^2" for 2025-01-13 to 2025-01-15

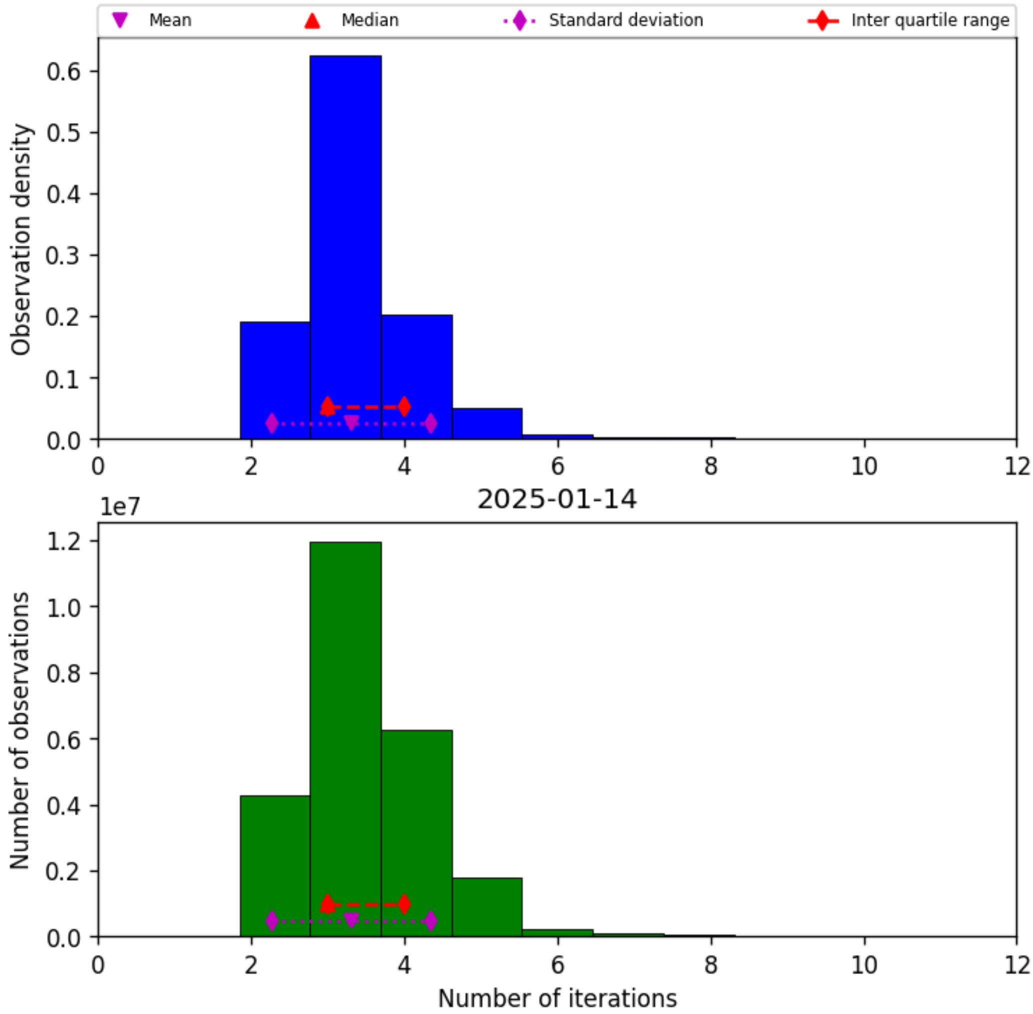


Figure 39: Histogram of “Number of iterations” for 2025-01-13 to 2025-01-15

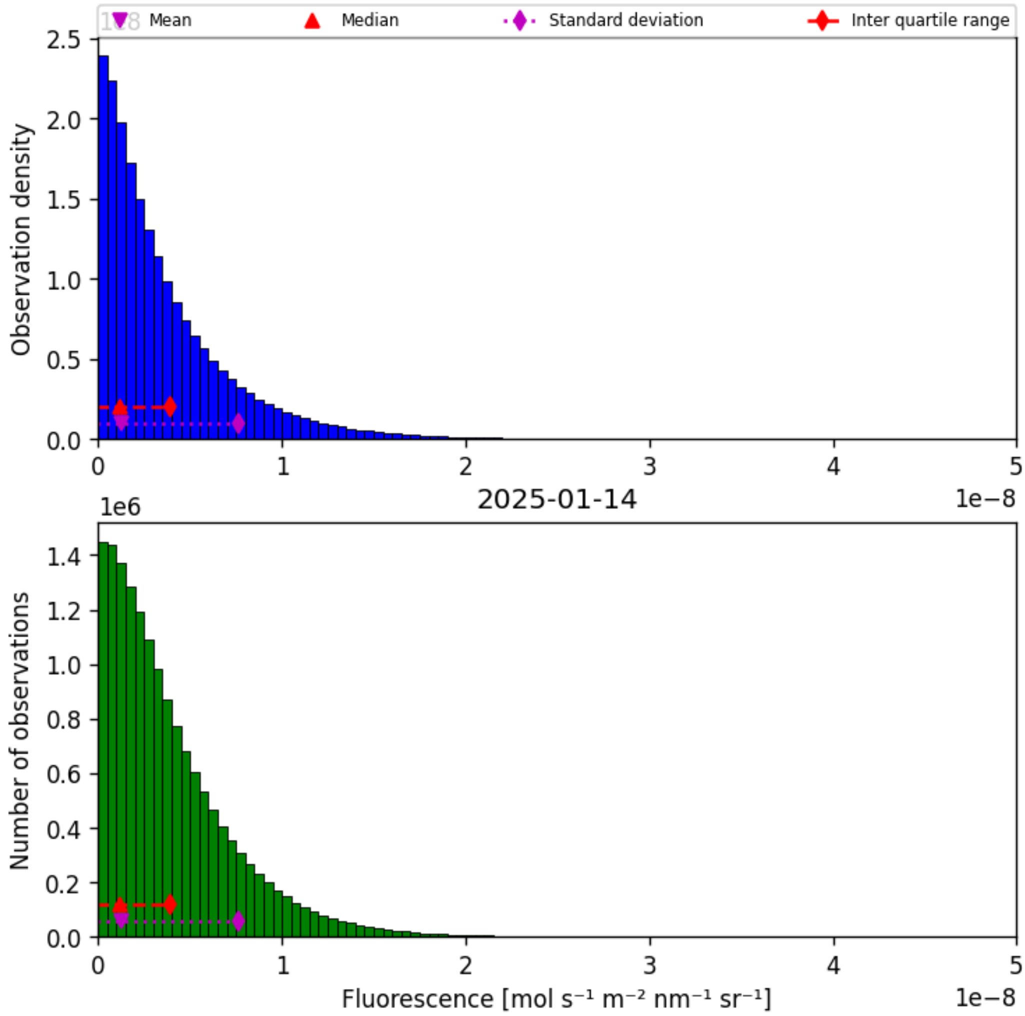


Figure 40: Histogram of “Fluorescence” for 2025-01-13 to 2025-01-15

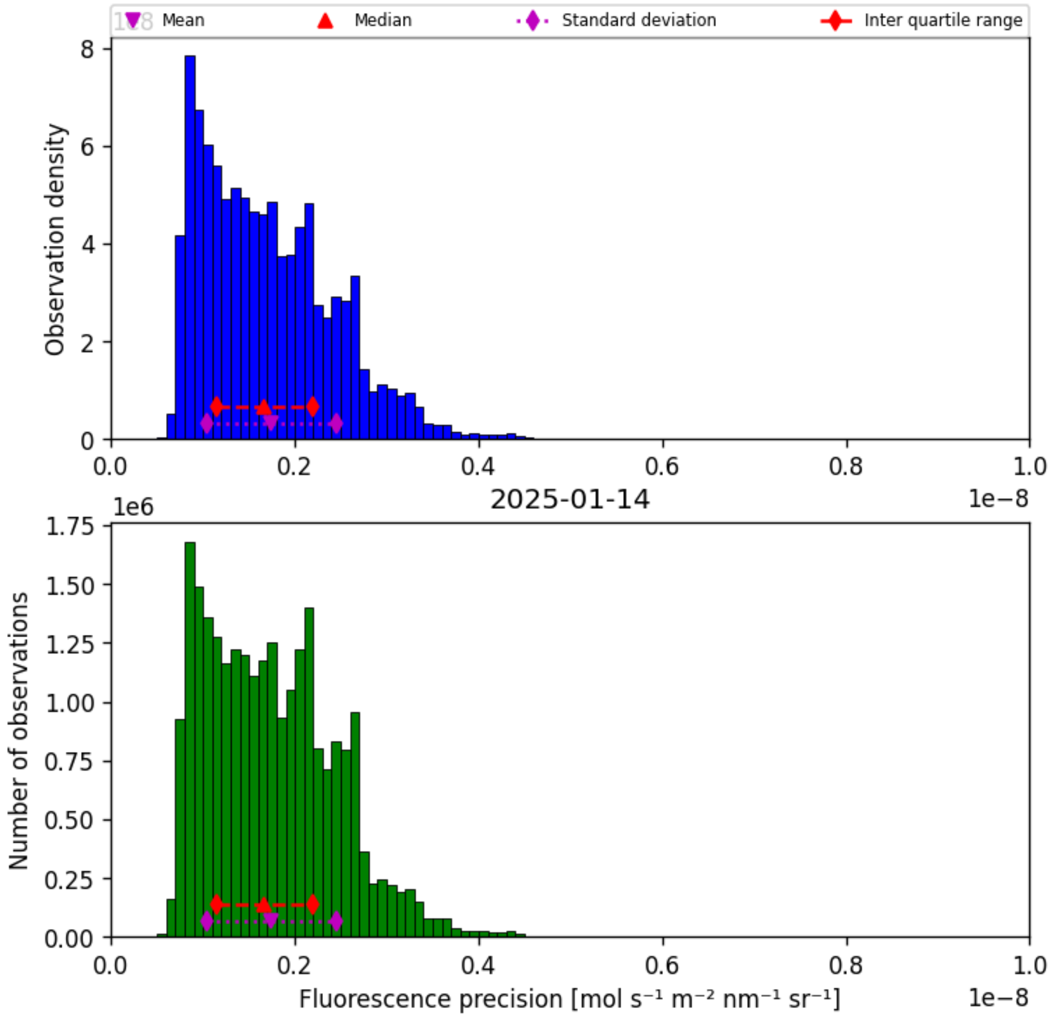


Figure 41: Histogram of “Fluorescence precision” for 2025-01-13 to 2025-01-15

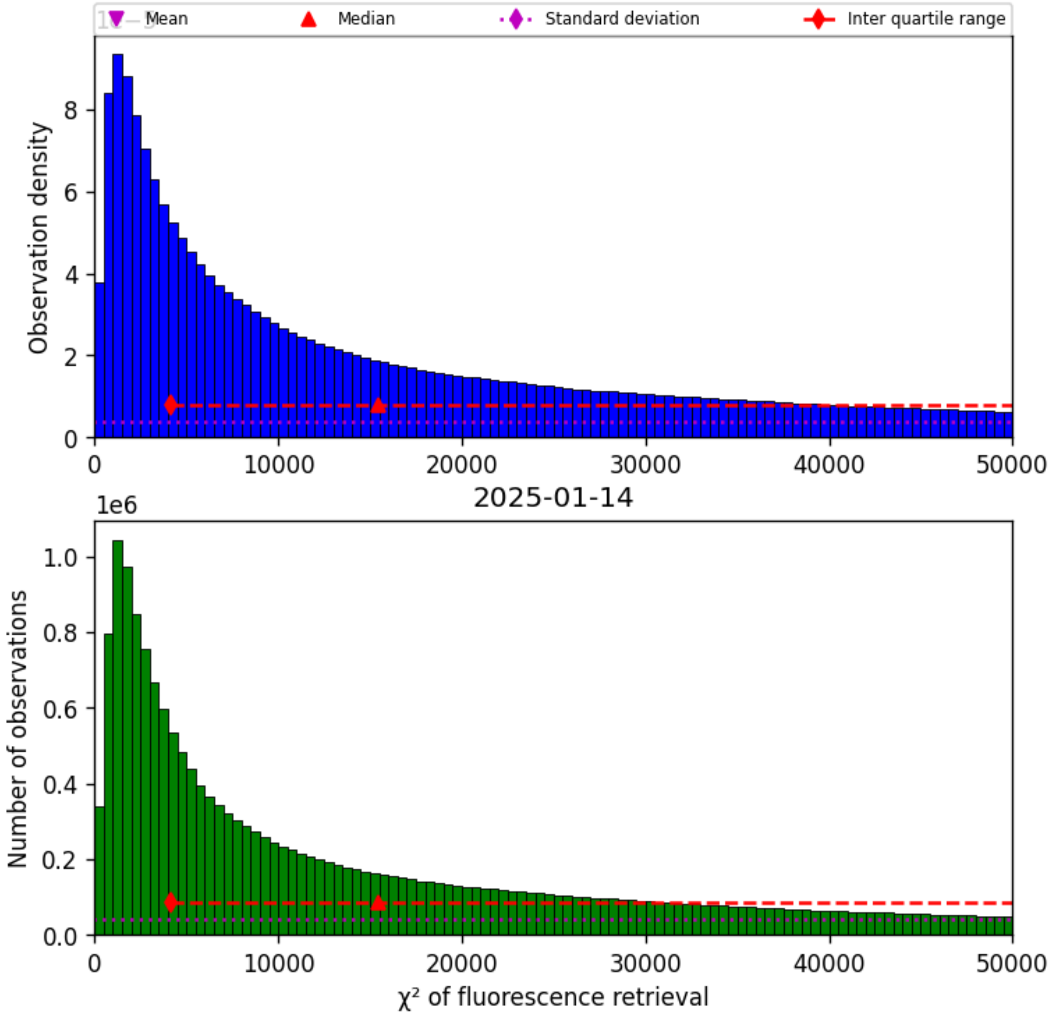


Figure 42: Histogram of "χ^2 of fluorescence retrieval" for 2025-01-13 to 2025-01-15

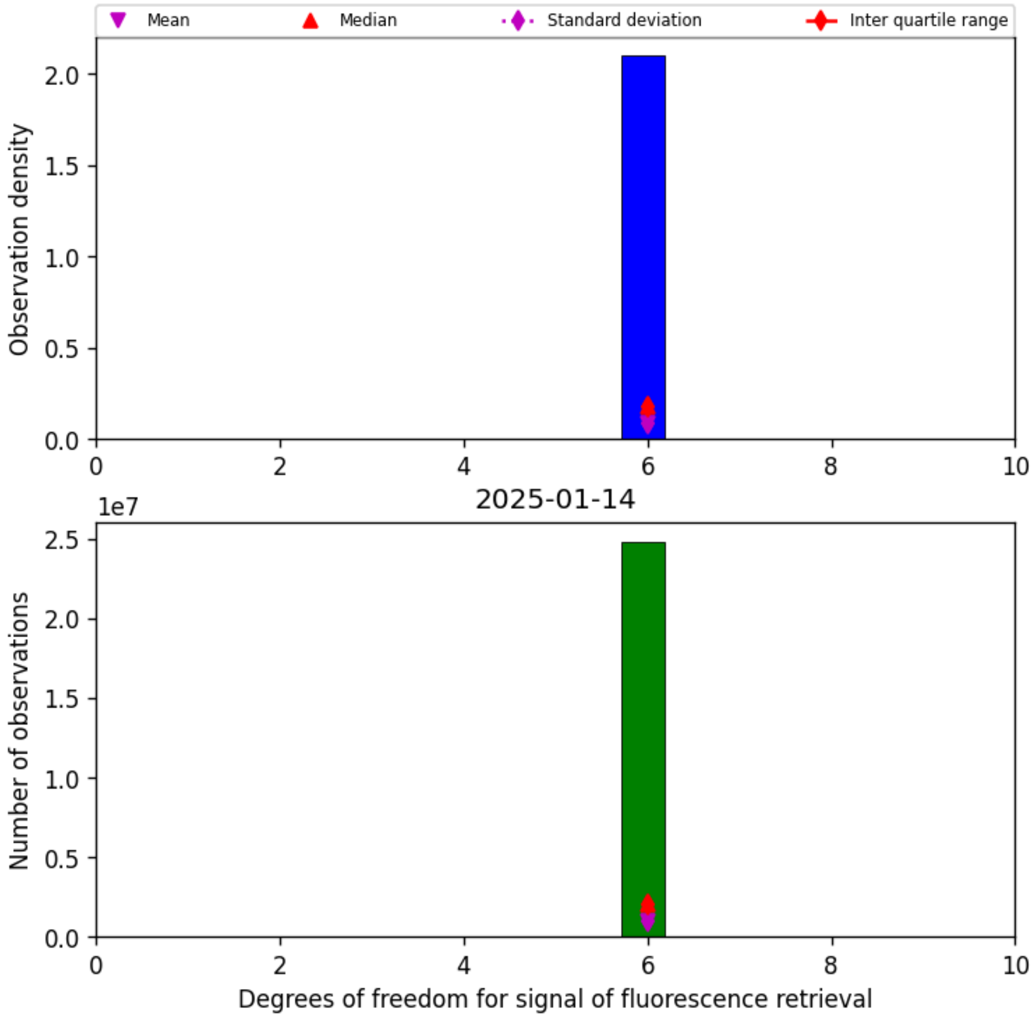


Figure 43: Histogram of "Degrees of freedom for signal of fluorescence retrieval" for 2025-01-13 to 2025-01-15

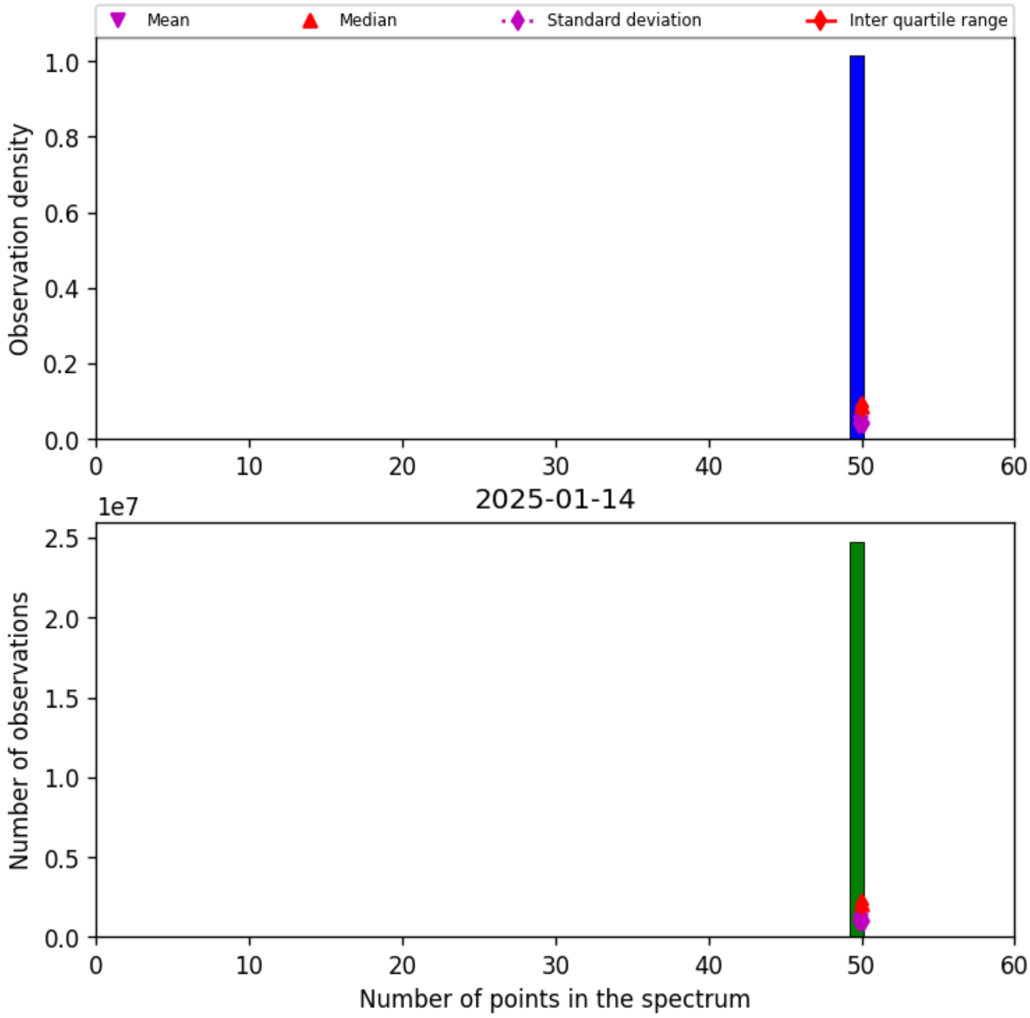


Figure 44: Histogram of "Number of points in the spectrum" for 2025-01-13 to 2025-01-15

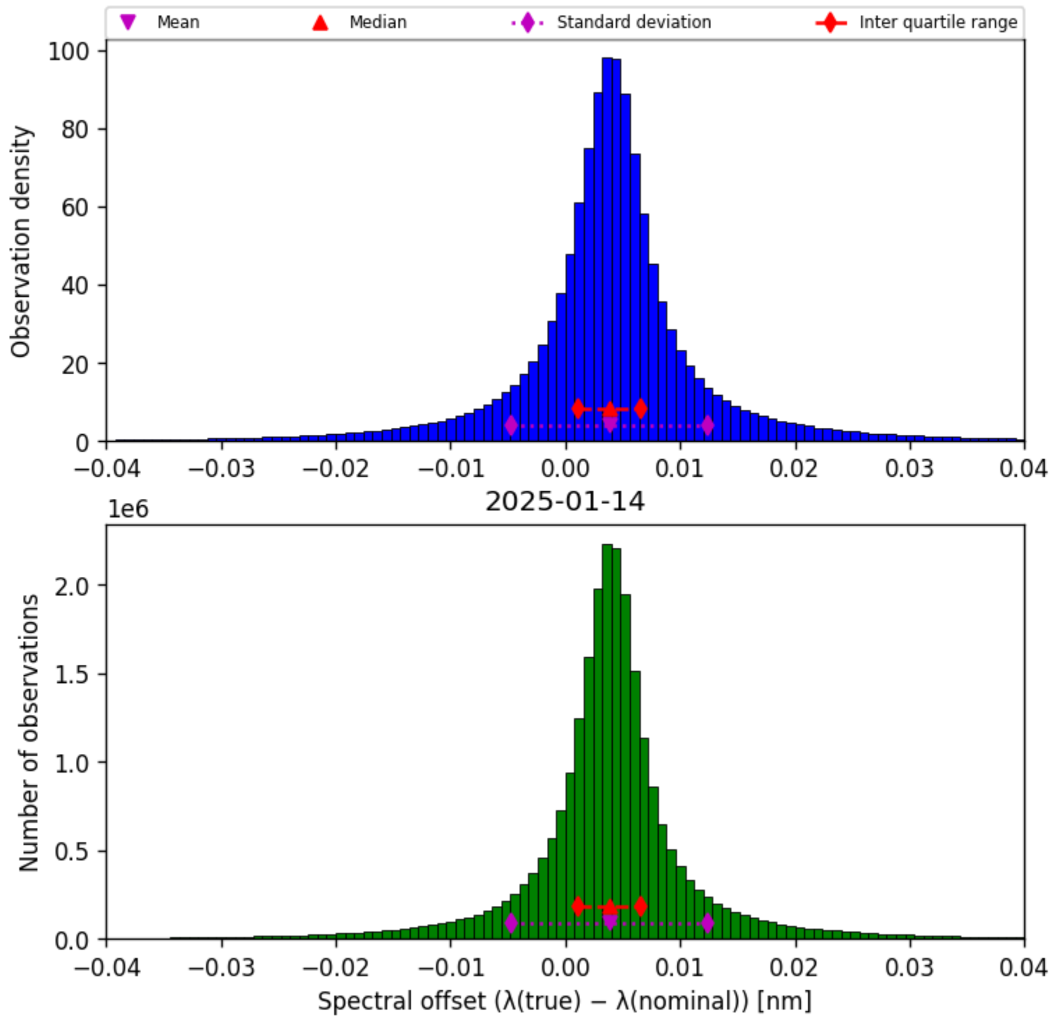


Figure 45: Histogram of “Spectral offset ($\lambda_{\text{true}} - \lambda_{\text{nominal}}$)” for 2025-01-13 to 2025-01-15

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.

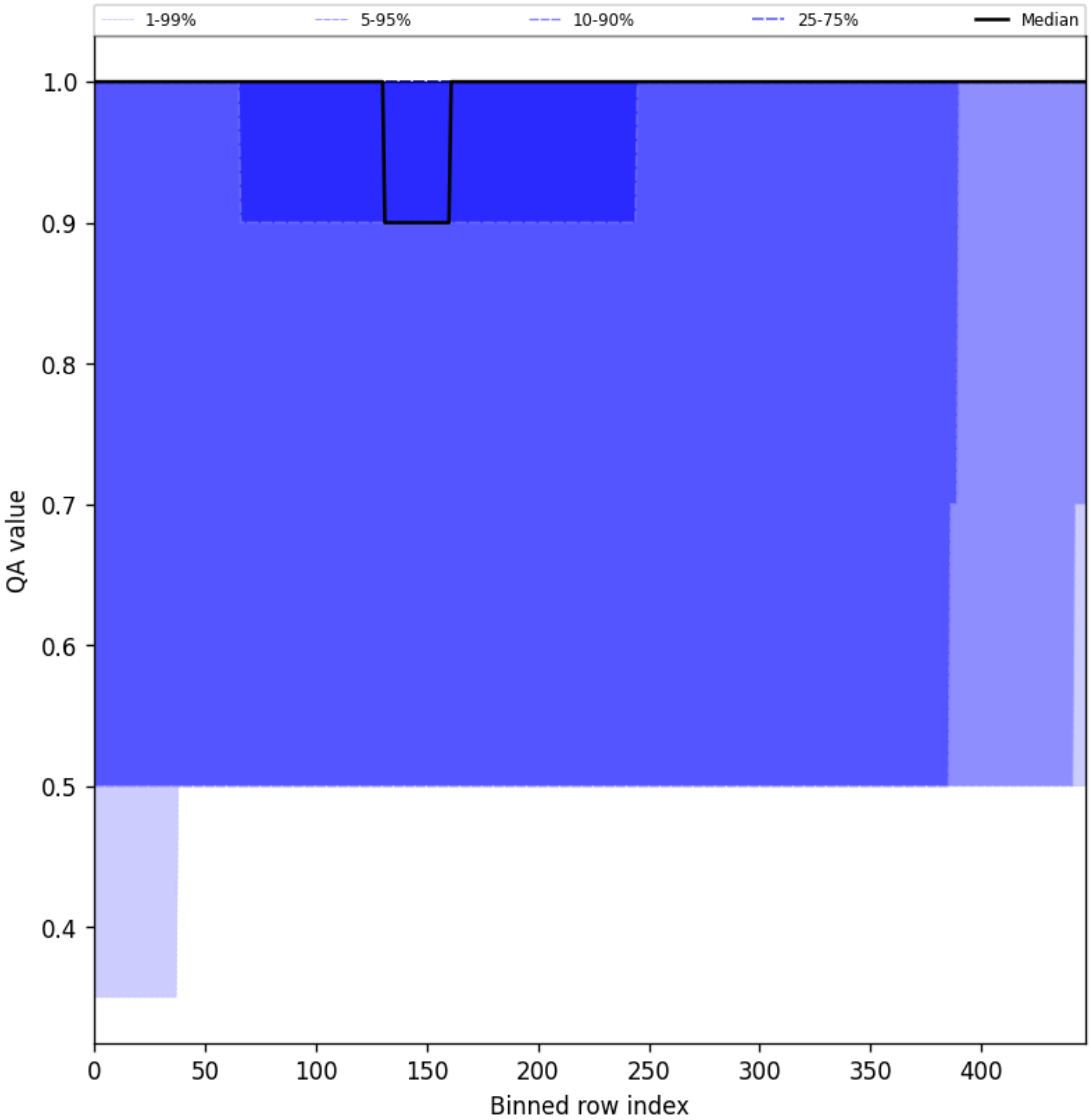


Figure 46: Along track statistics of “QA value” for 2025-01-13 to 2025-01-15

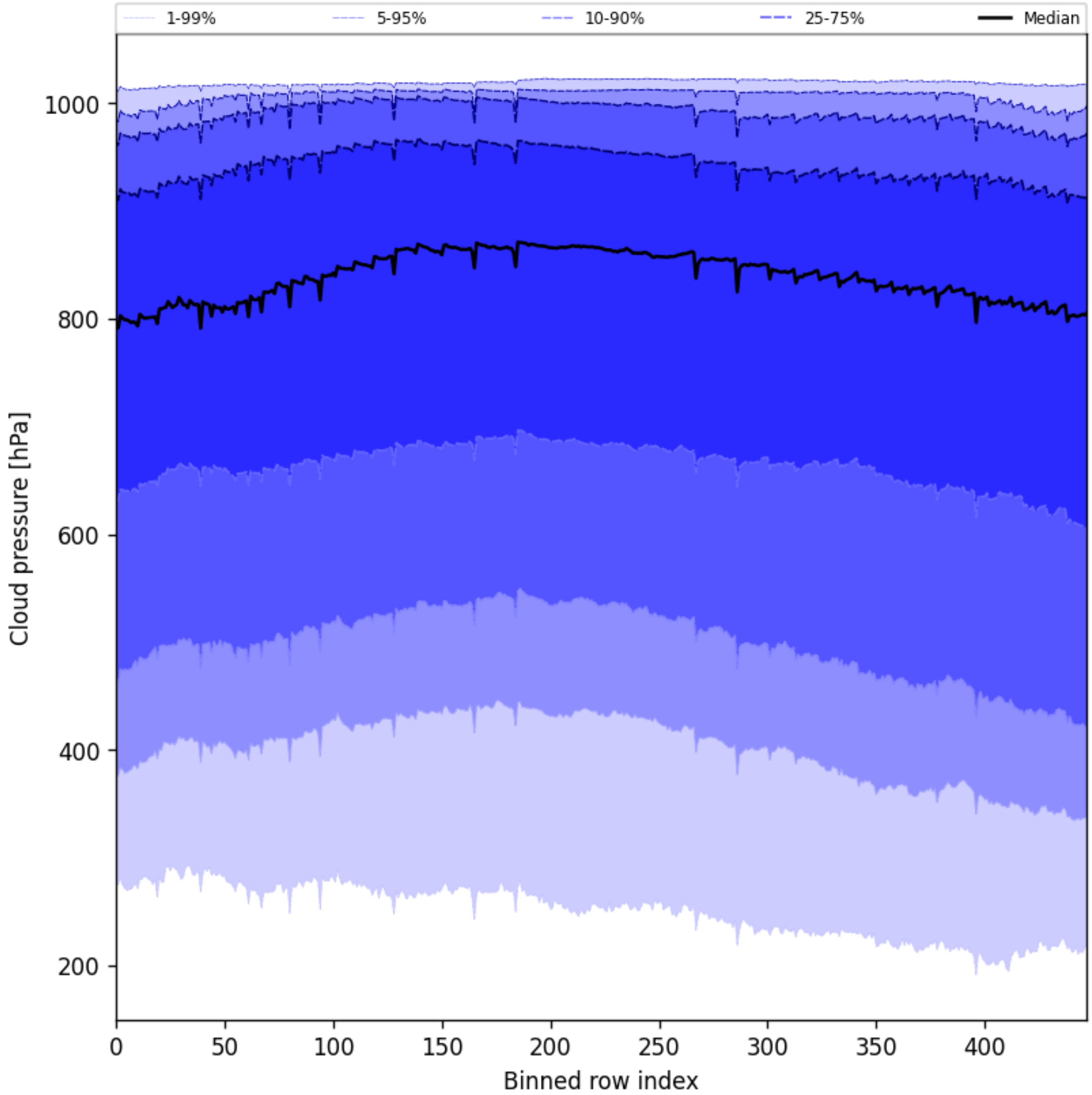


Figure 47: Along track statistics of “Cloud pressure” for 2025-01-13 to 2025-01-15

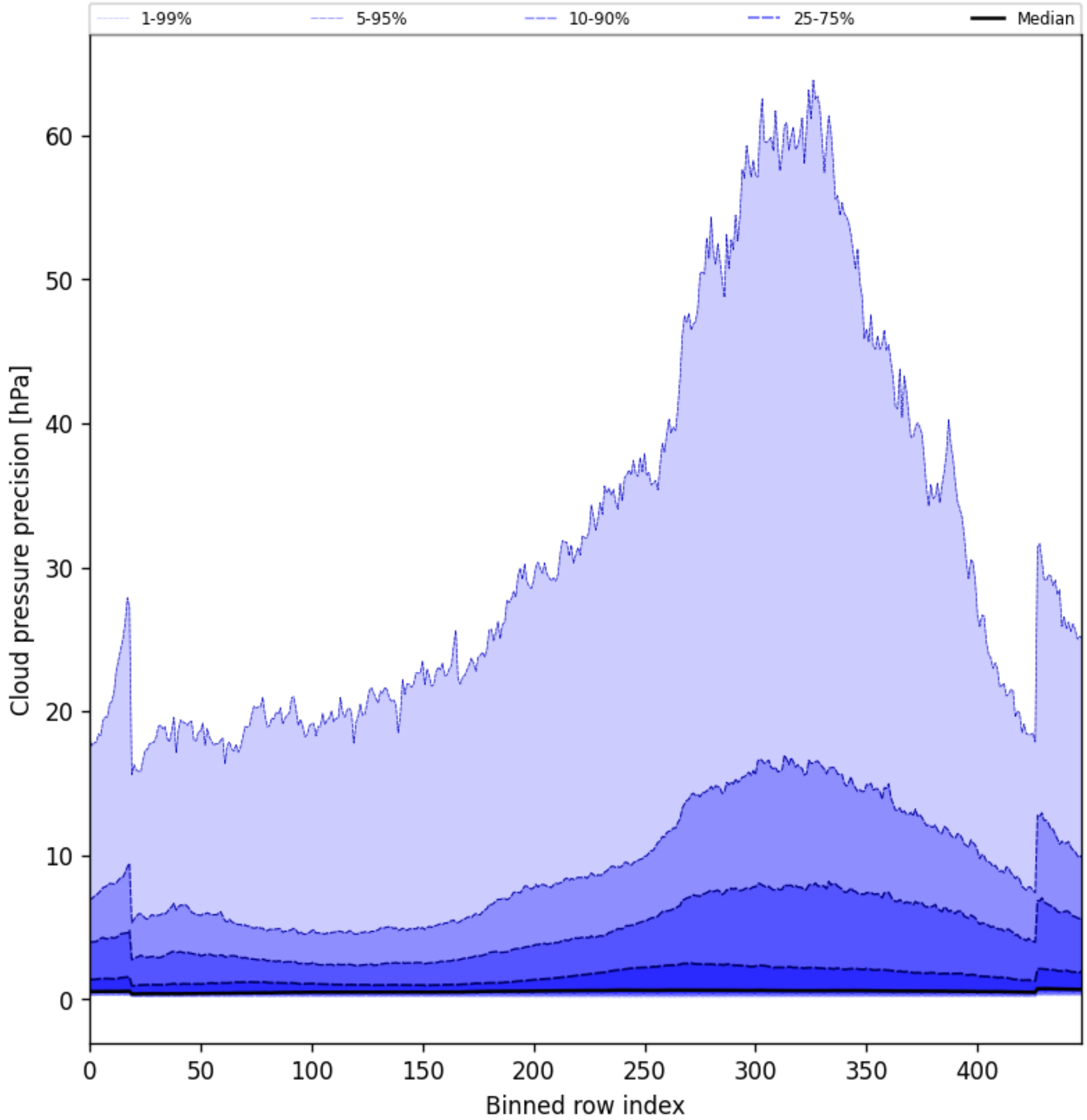


Figure 48: Along track statistics of “Cloud pressure precision” for 2025-01-13 to 2025-01-15

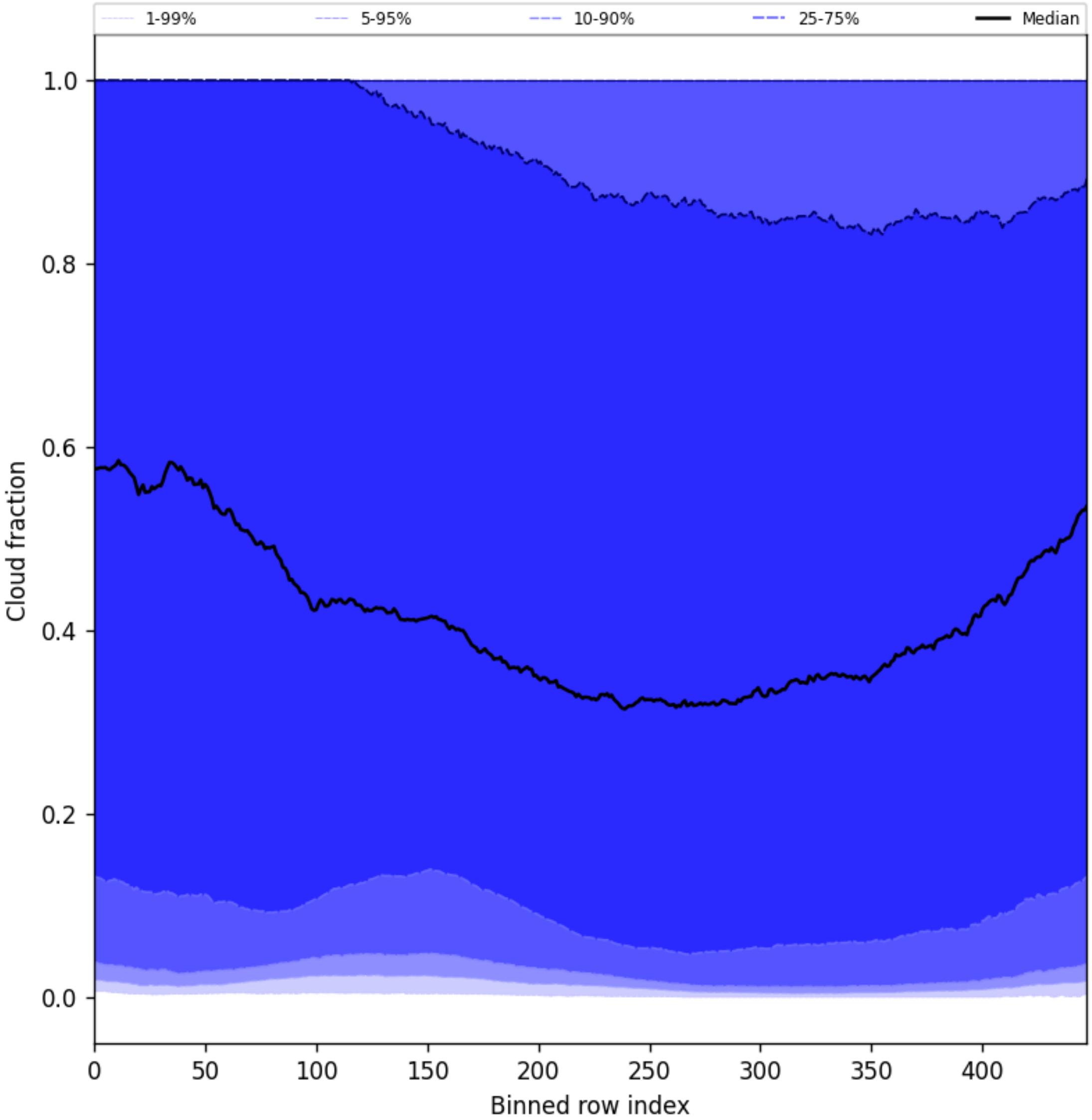


Figure 49: Along track statistics of “Cloud fraction” for 2025-01-13 to 2025-01-15

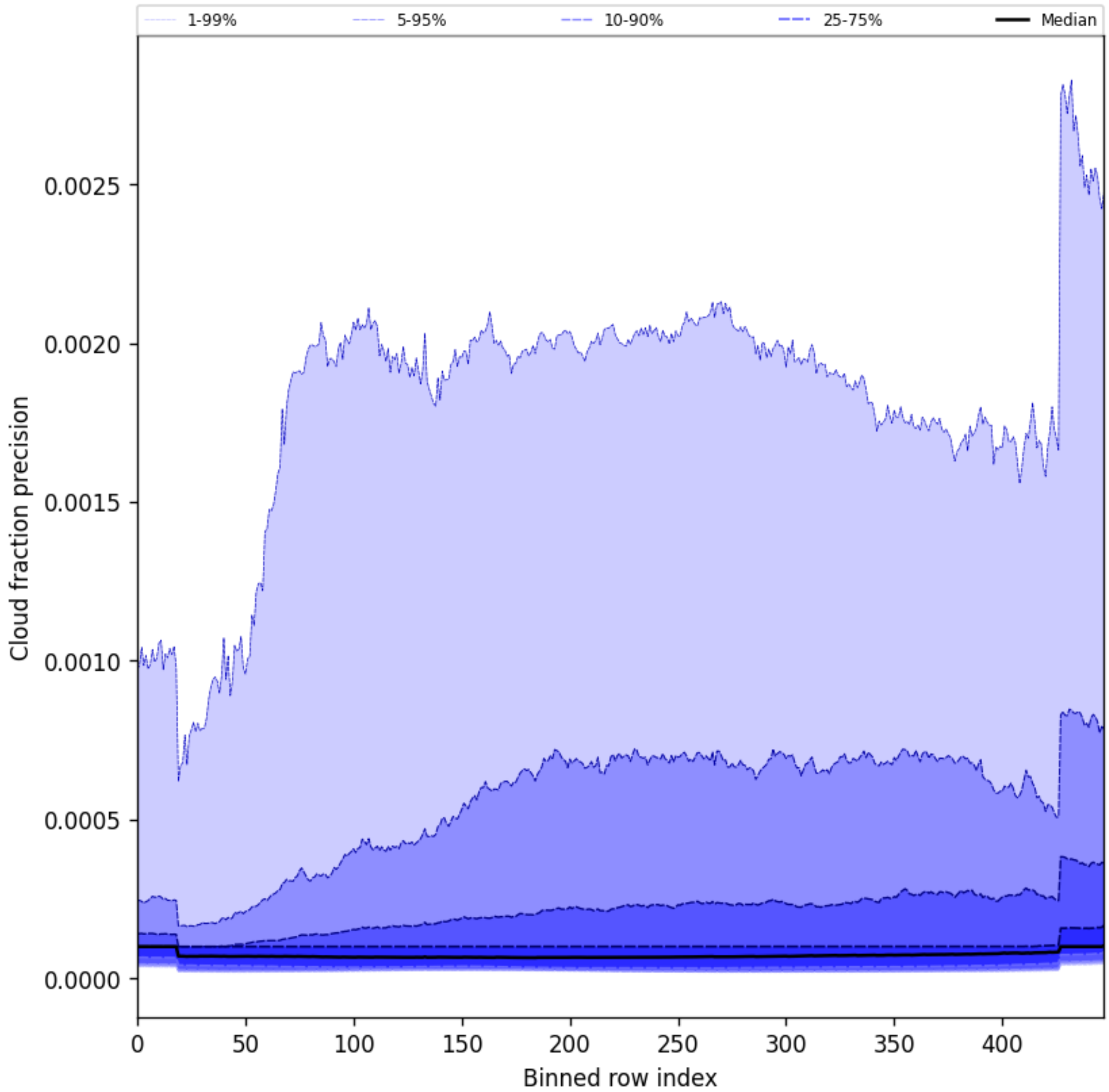


Figure 50: Along track statistics of “Cloud fraction precision” for 2025-01-13 to 2025-01-15

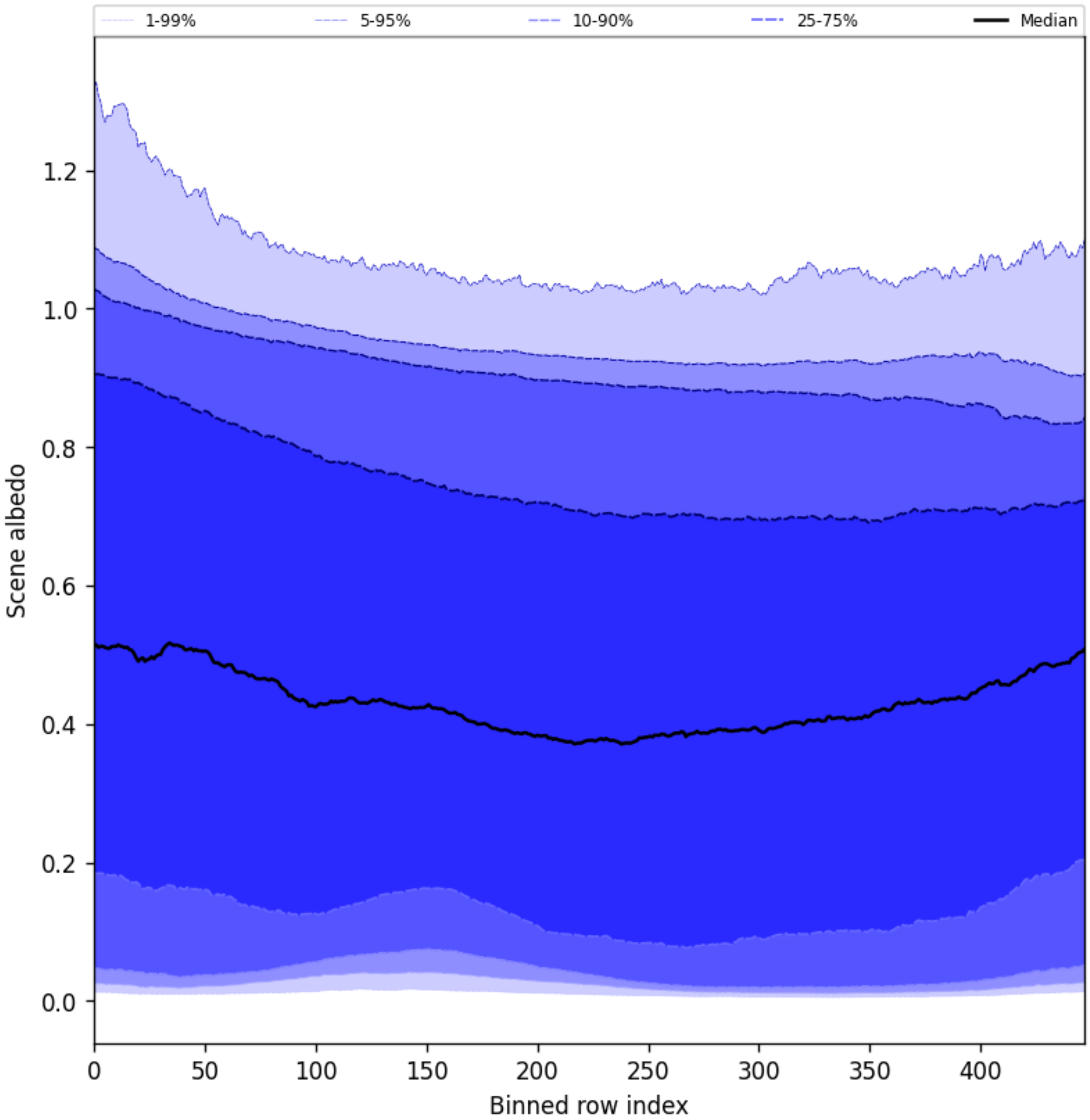


Figure 51: Along track statistics of “Scene albedo” for 2025-01-13 to 2025-01-15

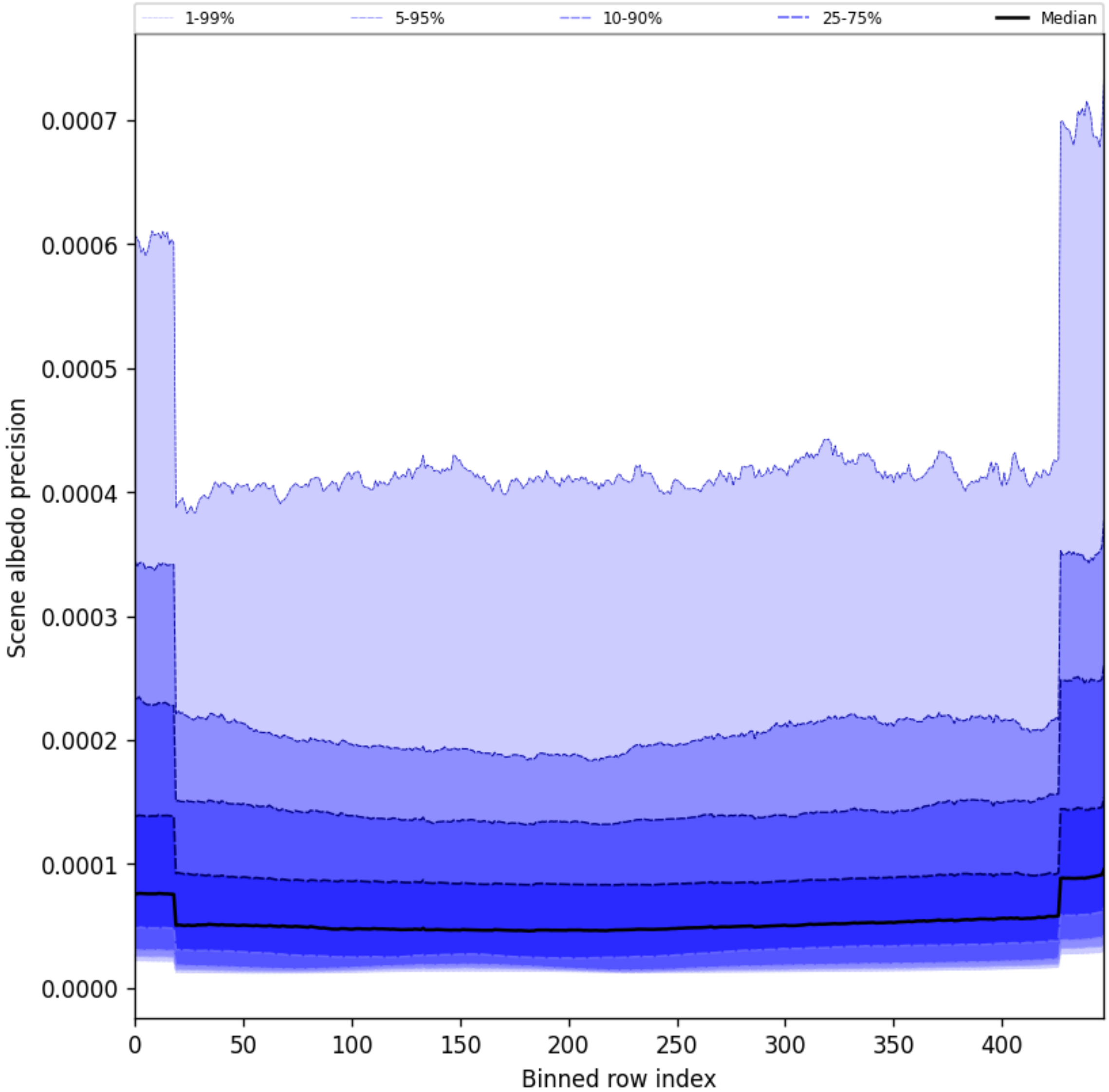


Figure 52: Along track statistics of “Scene albedo precision” for 2025-01-13 to 2025-01-15

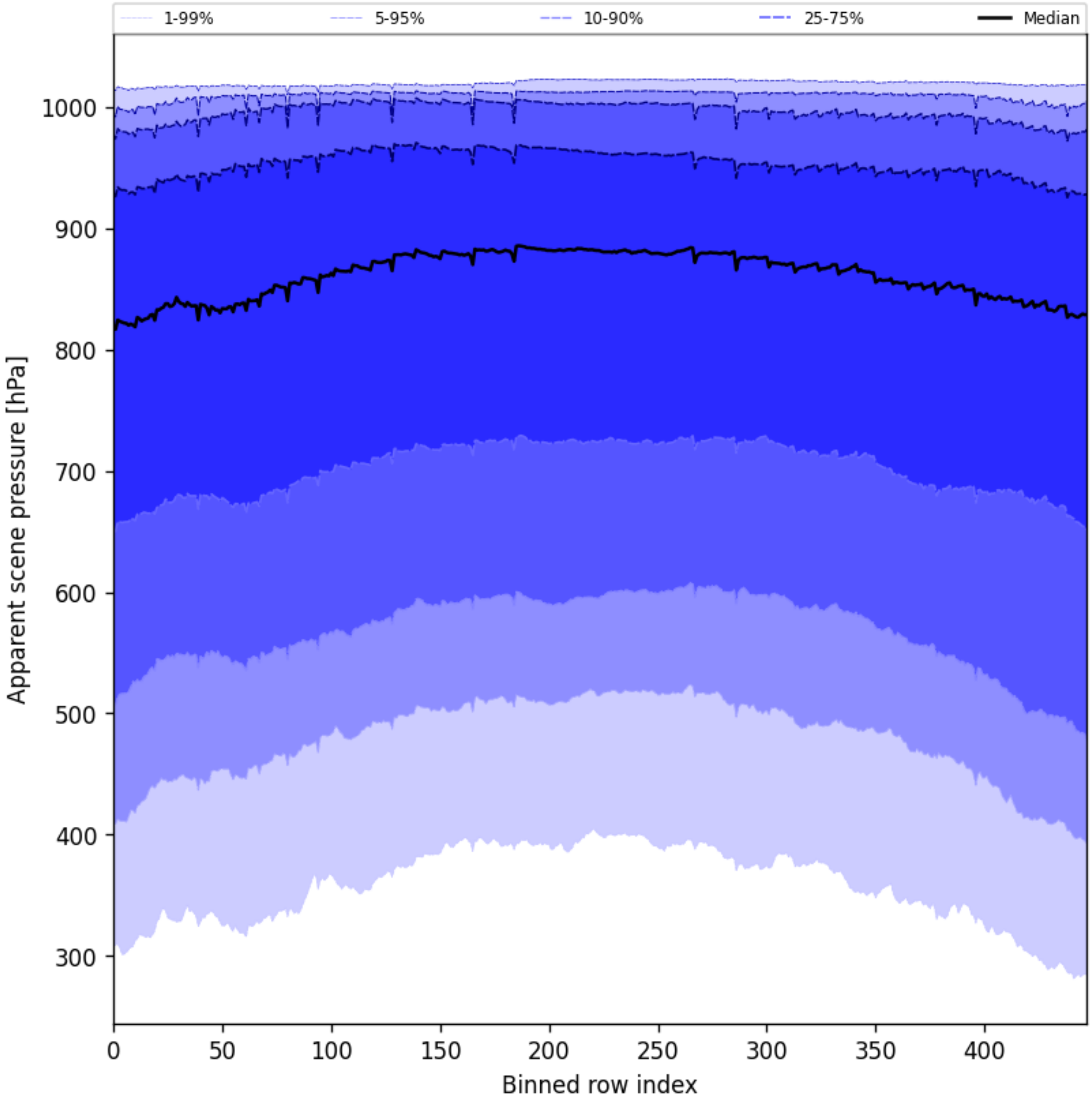


Figure 53: Along track statistics of “Apparent scene pressure” for 2025-01-13 to 2025-01-15

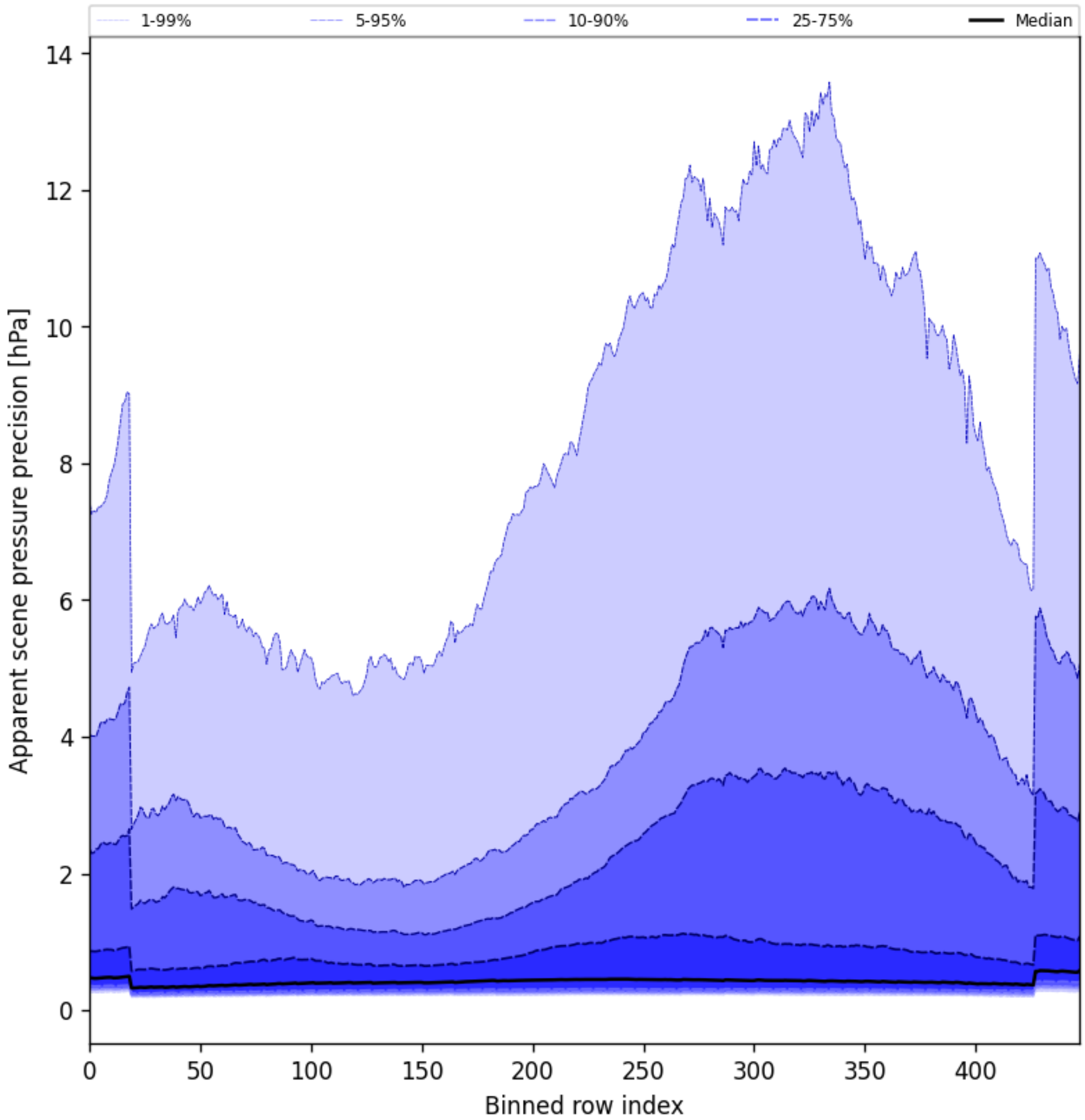


Figure 54: Along track statistics of “Apparent scene pressure precision” for 2025-01-13 to 2025-01-15

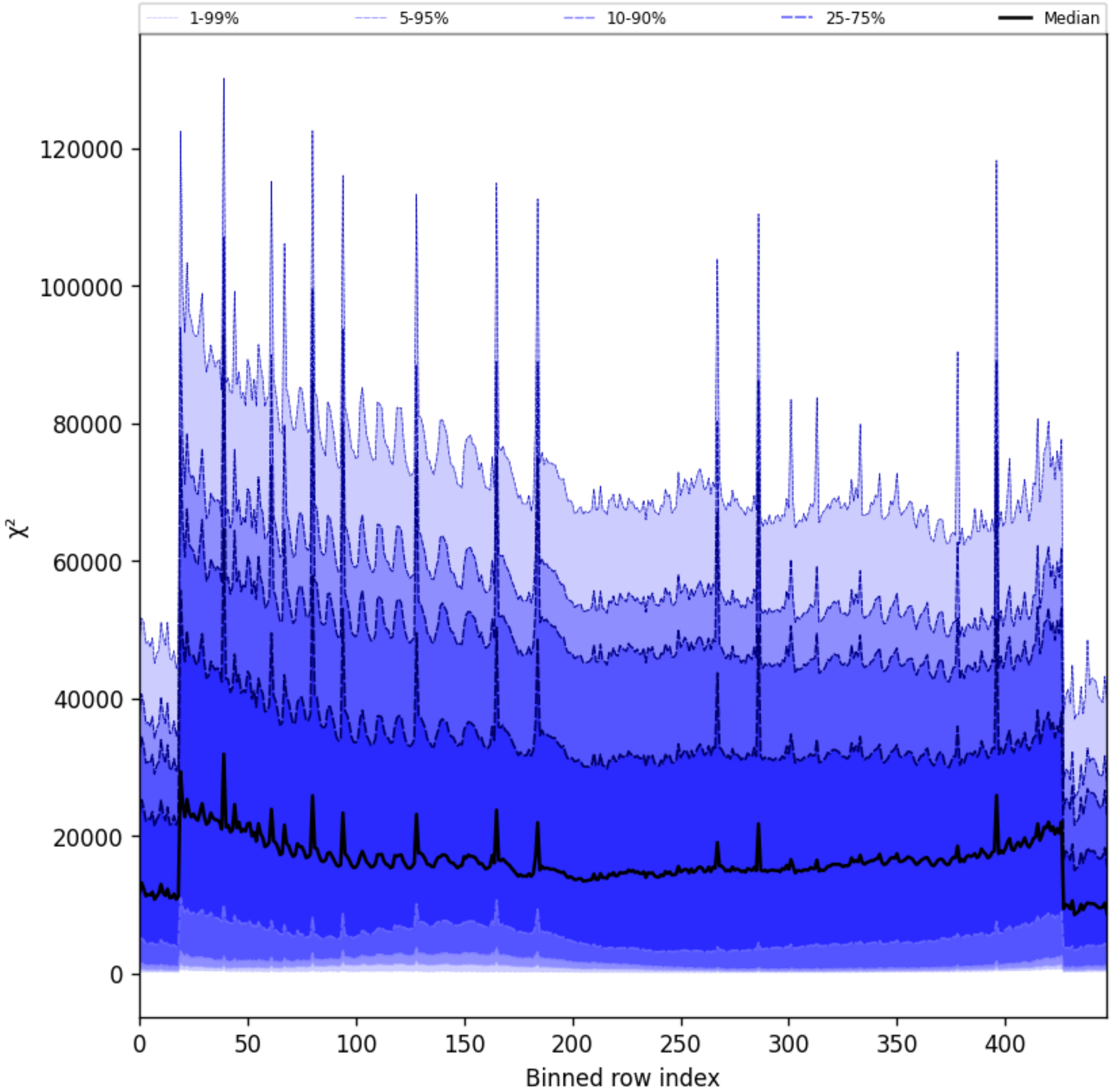


Figure 55: Along track statistics of "χ^2" for 2025-01-13 to 2025-01-15

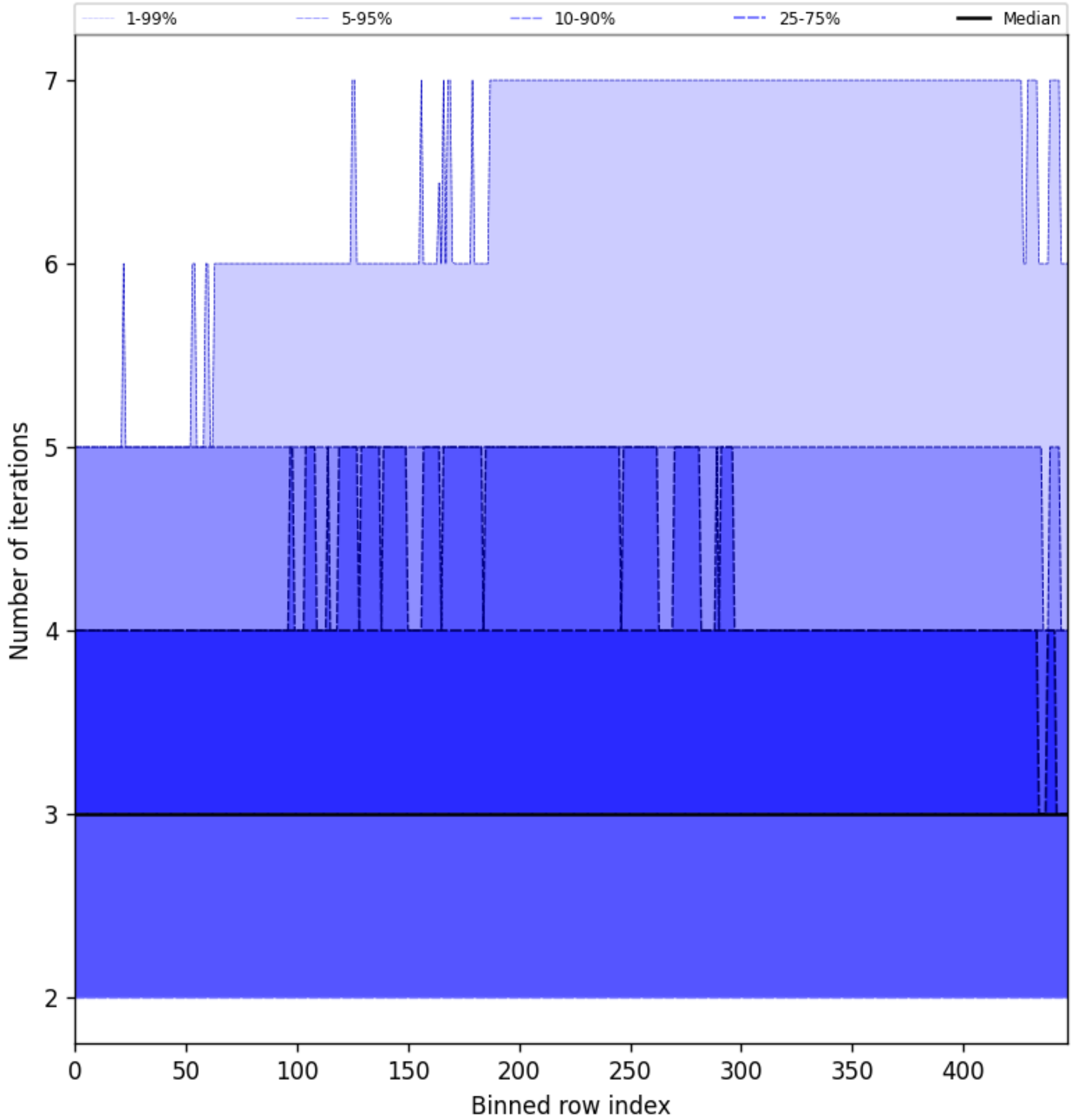


Figure 56: Along track statistics of “Number of iterations” for 2025-01-13 to 2025-01-15

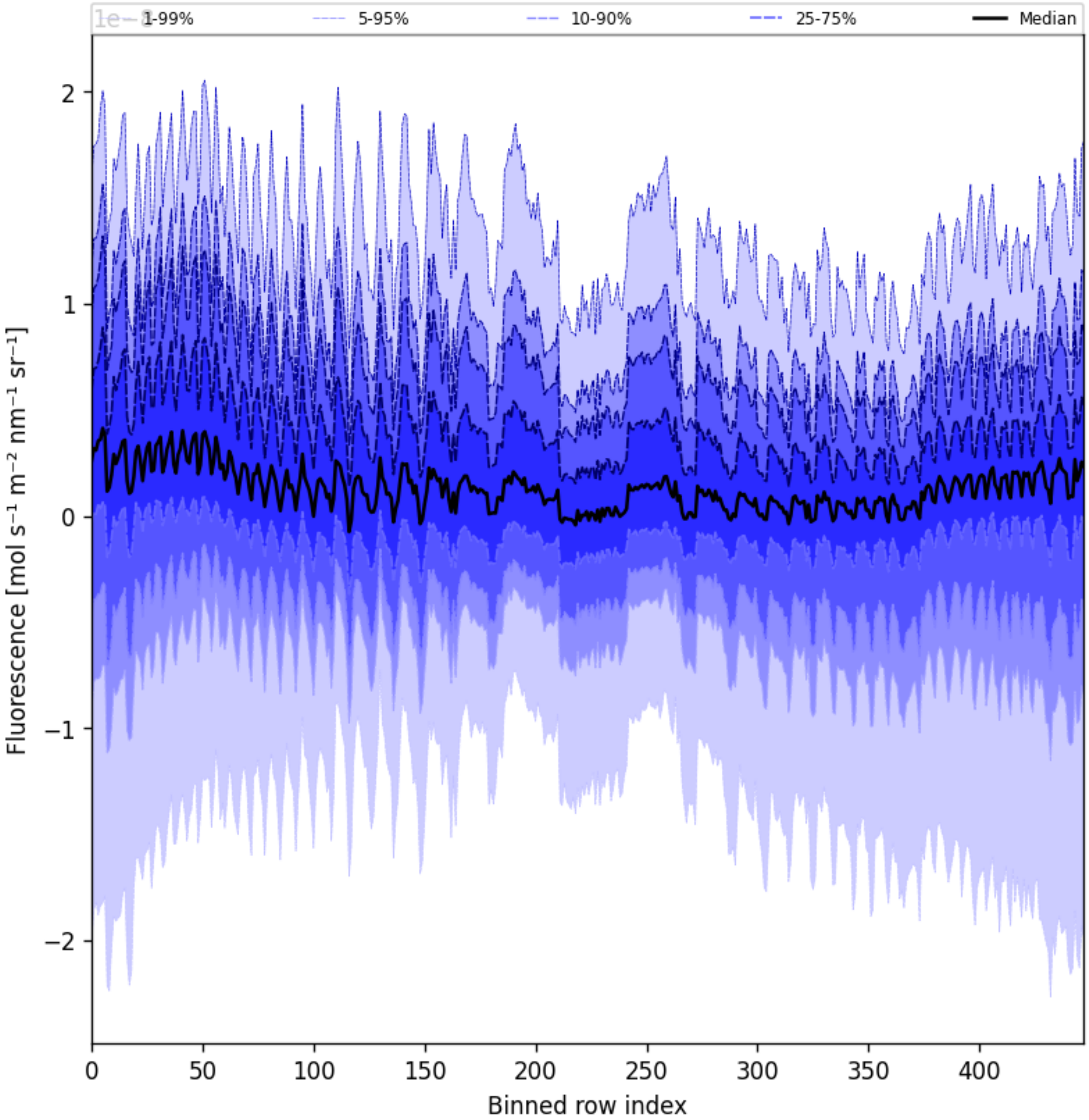


Figure 57: Along track statistics of “Fluorescence” for 2025-01-13 to 2025-01-15

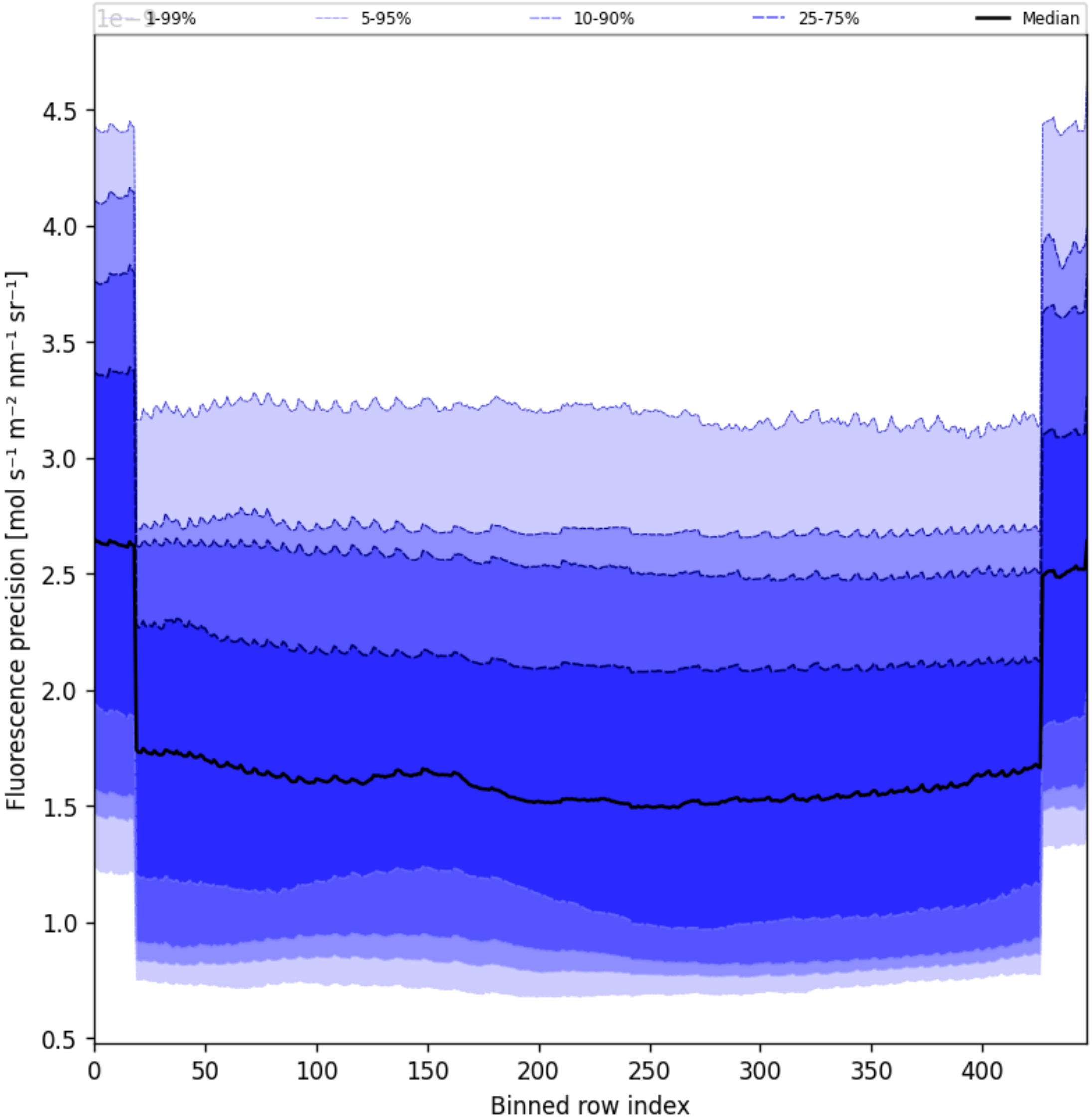


Figure 58: Along track statistics of “Fluorescence precision” for 2025-01-13 to 2025-01-15

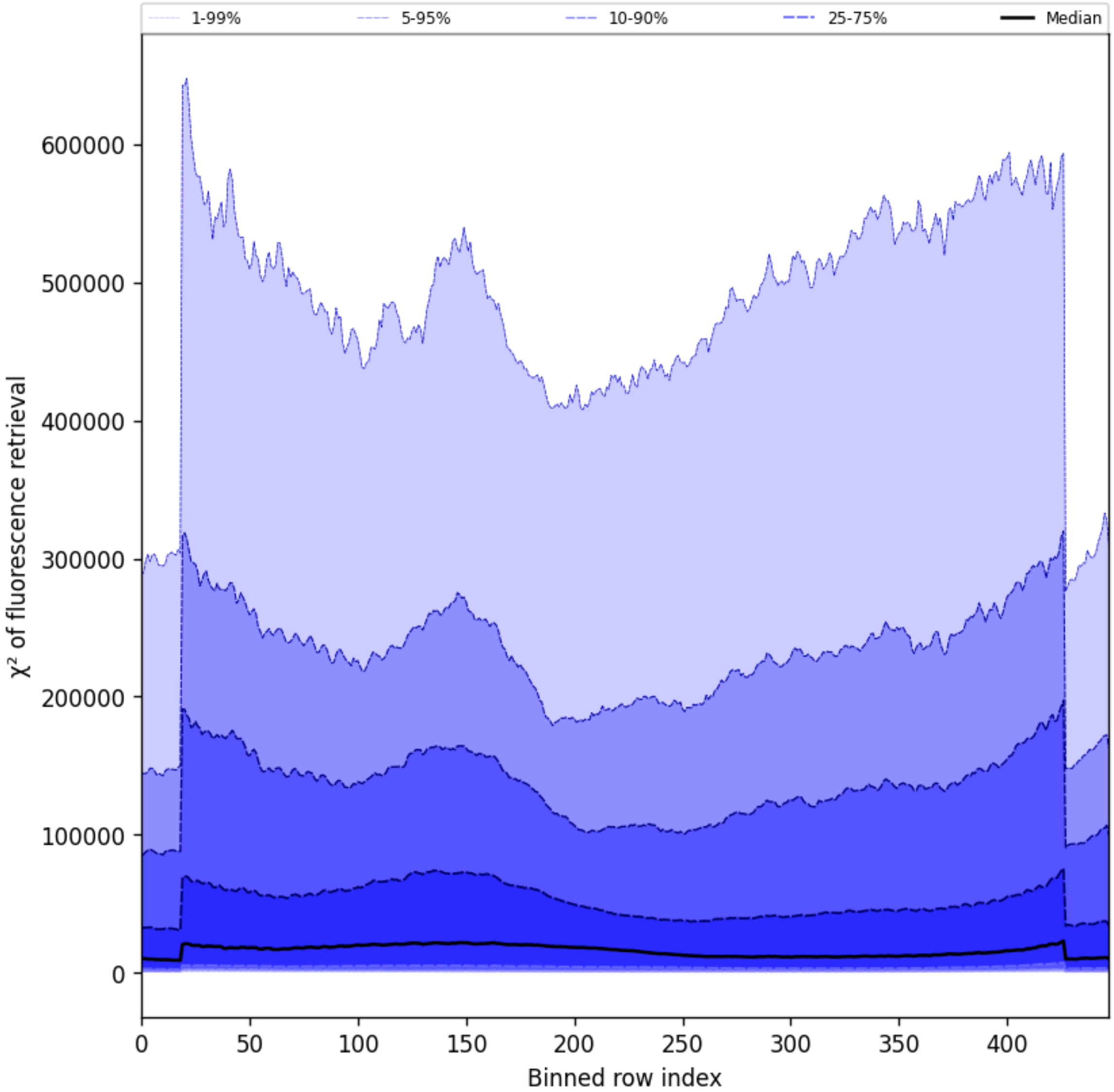


Figure 59: Along track statistics of "χ^2 of fluorescence retrieval" for 2025-01-13 to 2025-01-15

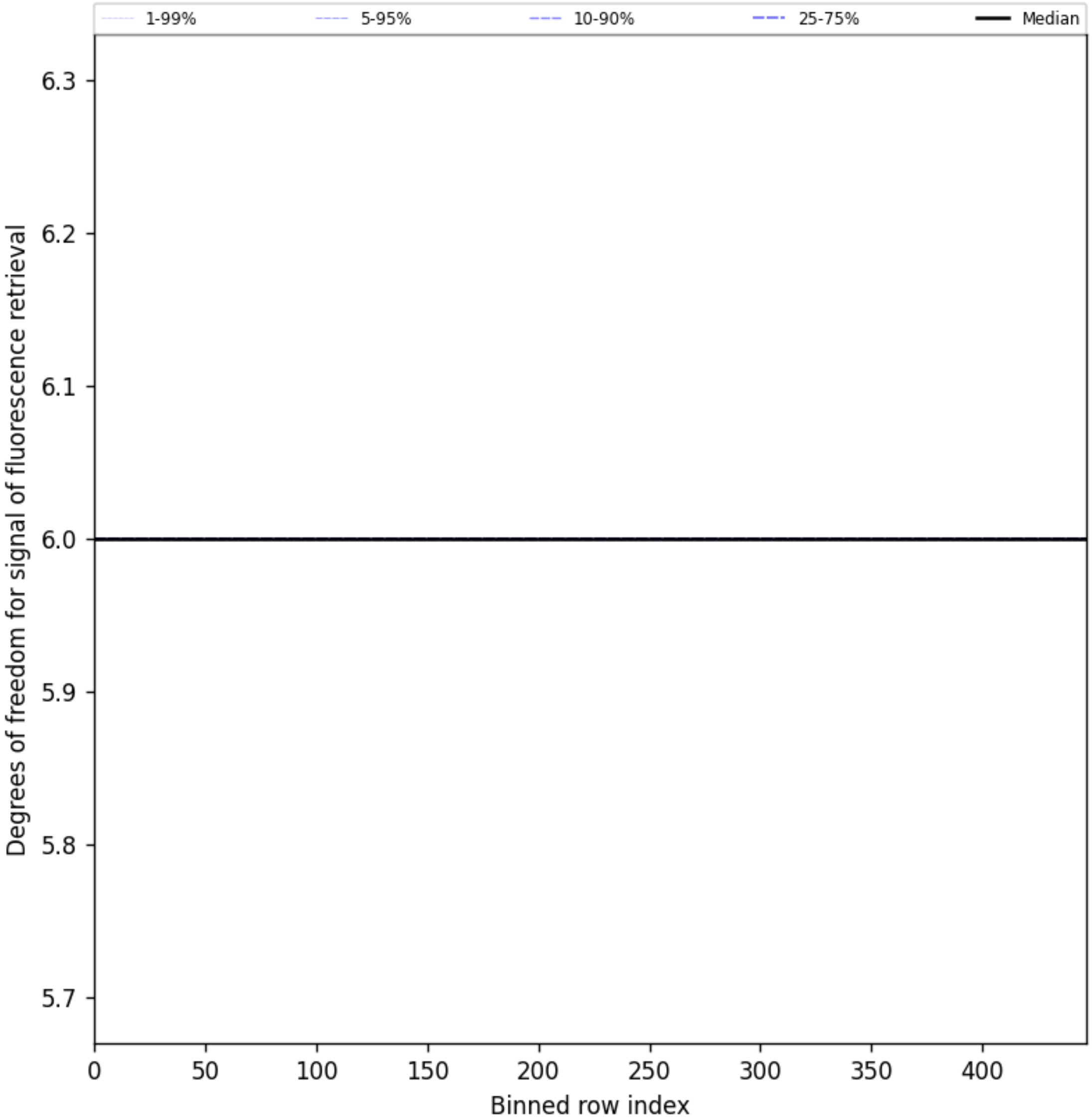


Figure 60: Along track statistics of “Degrees of freedom for signal of fluorescence retrieval” for 2025-01-13 to 2025-01-15

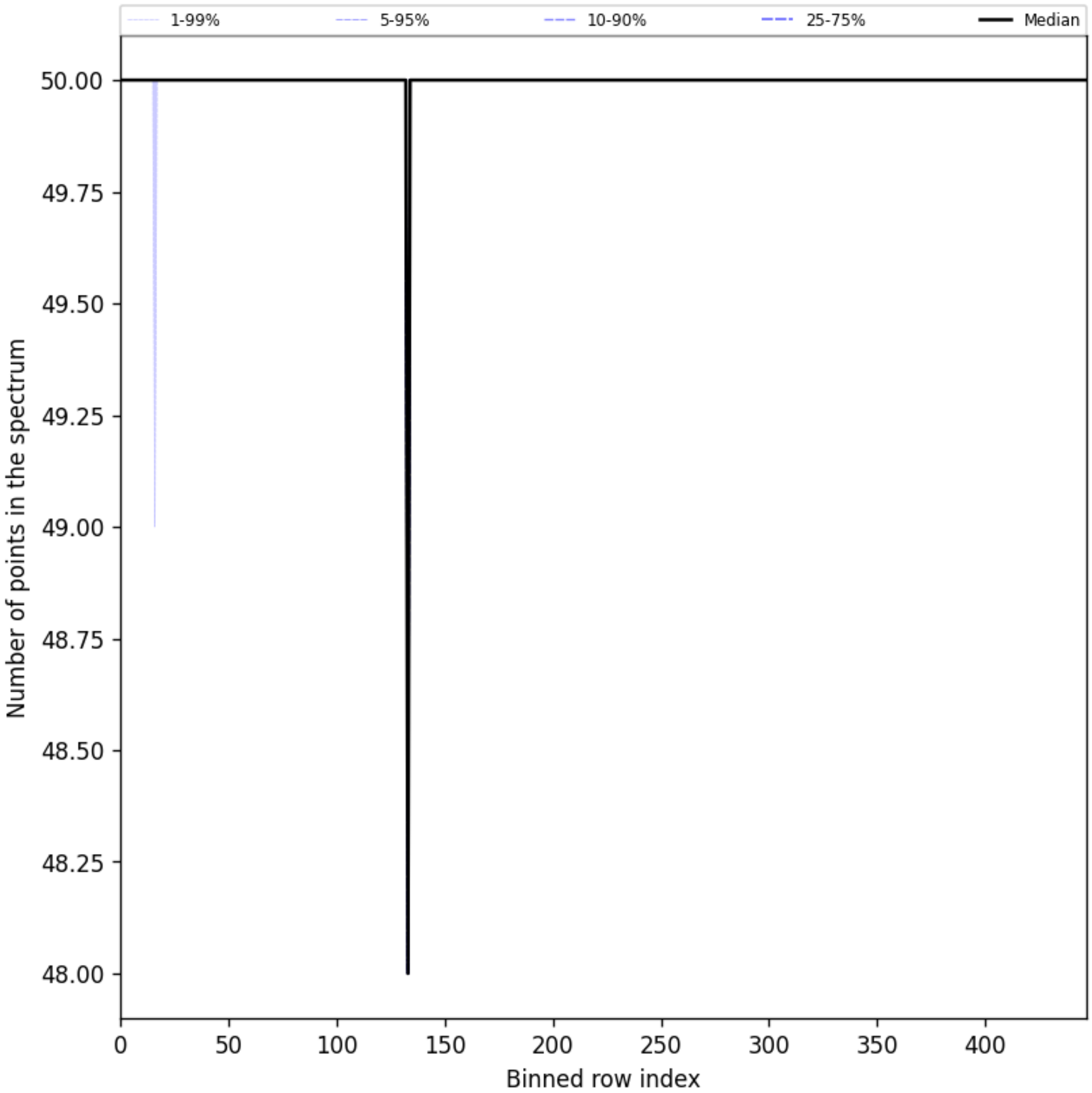


Figure 61: Along track statistics of “Number of points in the spectrum” for 2025-01-13 to 2025-01-15

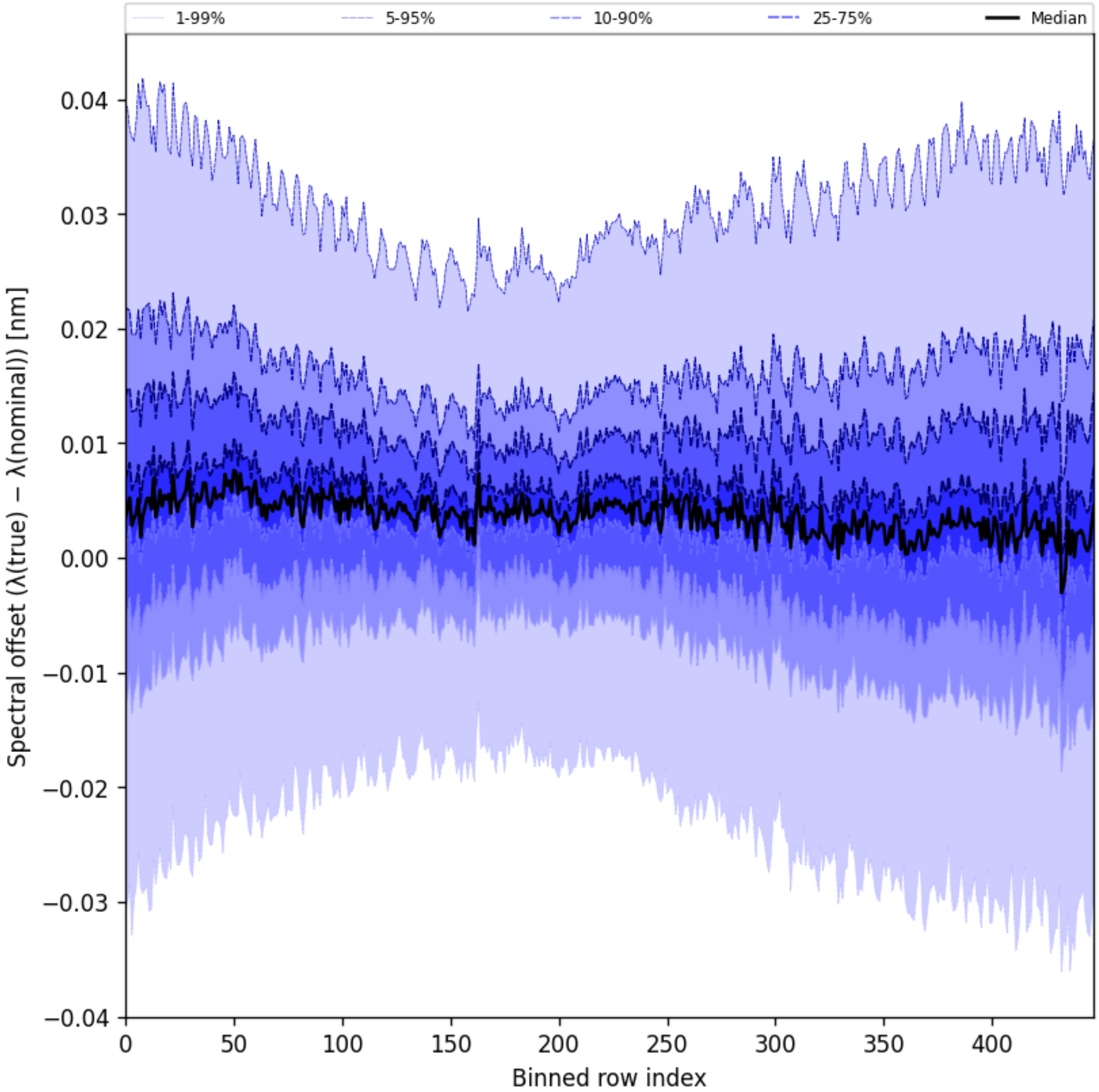


Figure 62: Along track statistics of “Spectral offset ($\lambda_{\text{true}} - \lambda_{\text{nominal}}$)” for 2025-01-13 to 2025-01-15

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.

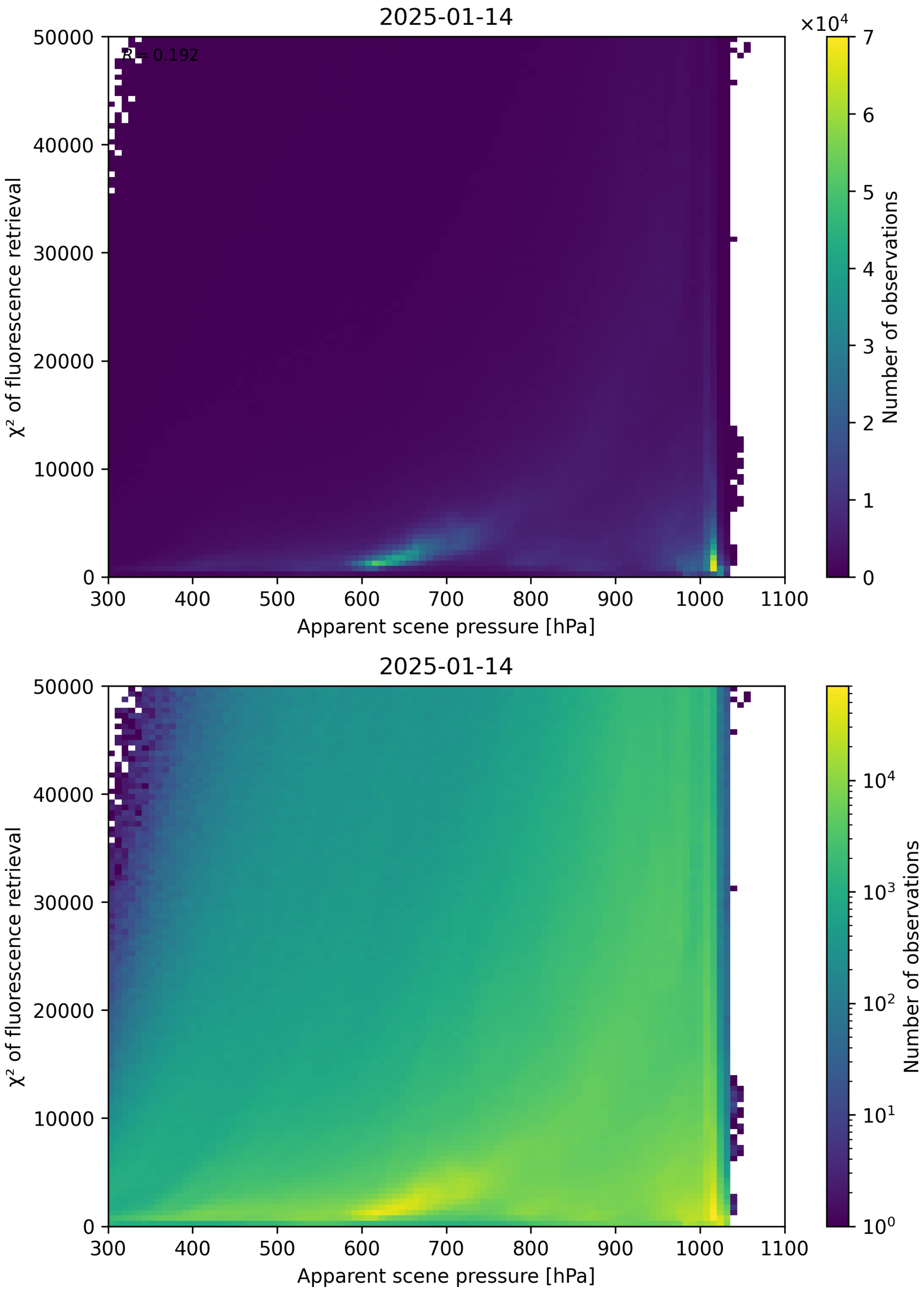
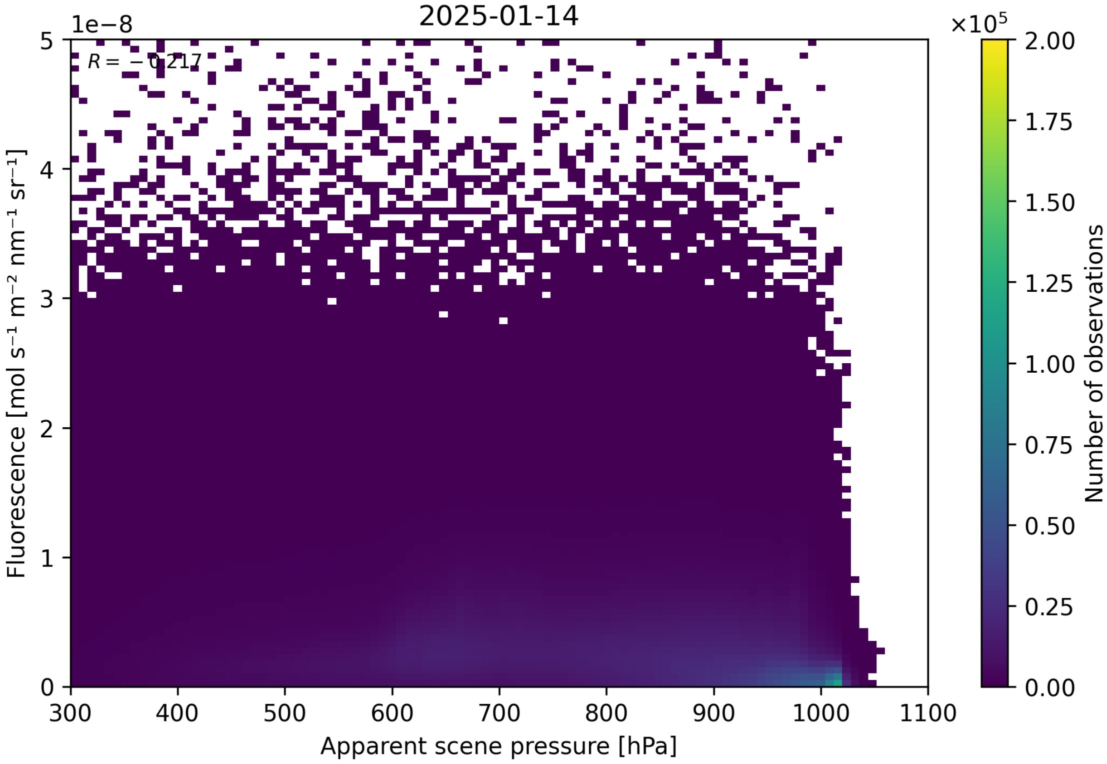


Figure 63: Scatter density plot of "Apparent scene pressure" against "χ^2 of fluorescence retrieval" for 2025-01-13 to 2025-01-15.



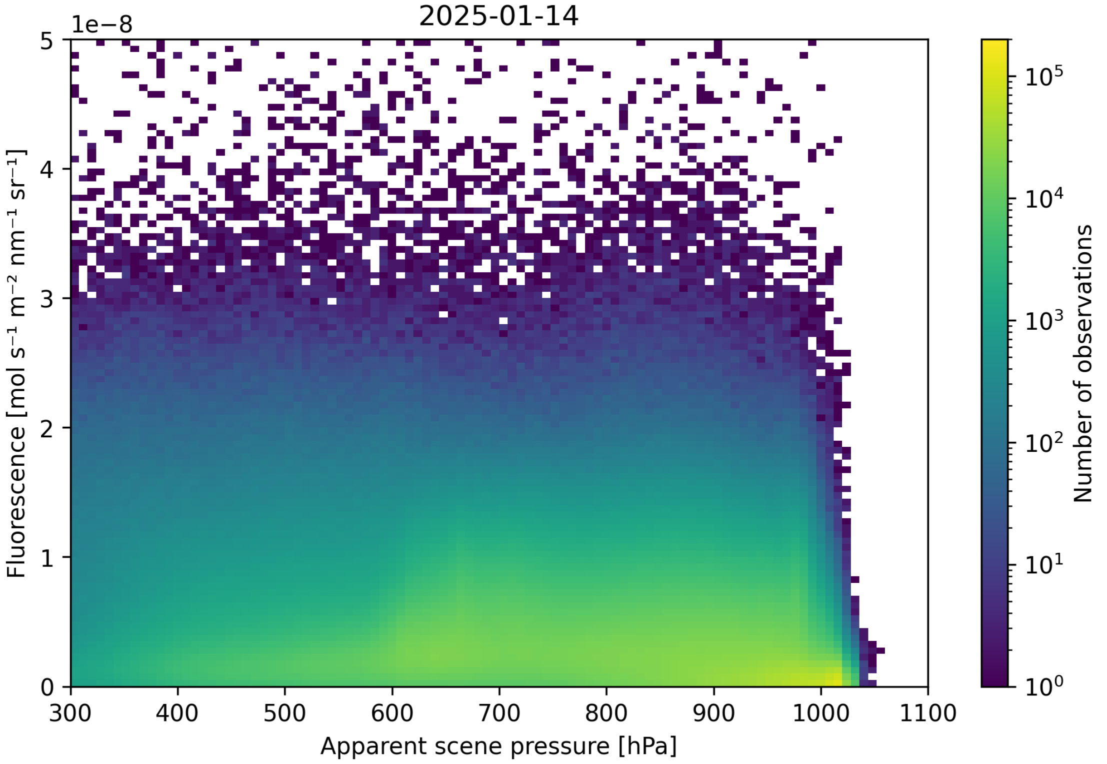


Figure 64: Scatter density plot of “Apparent scene pressure” against “Fluorescence” for 2025-01-13 to 2025-01-15.

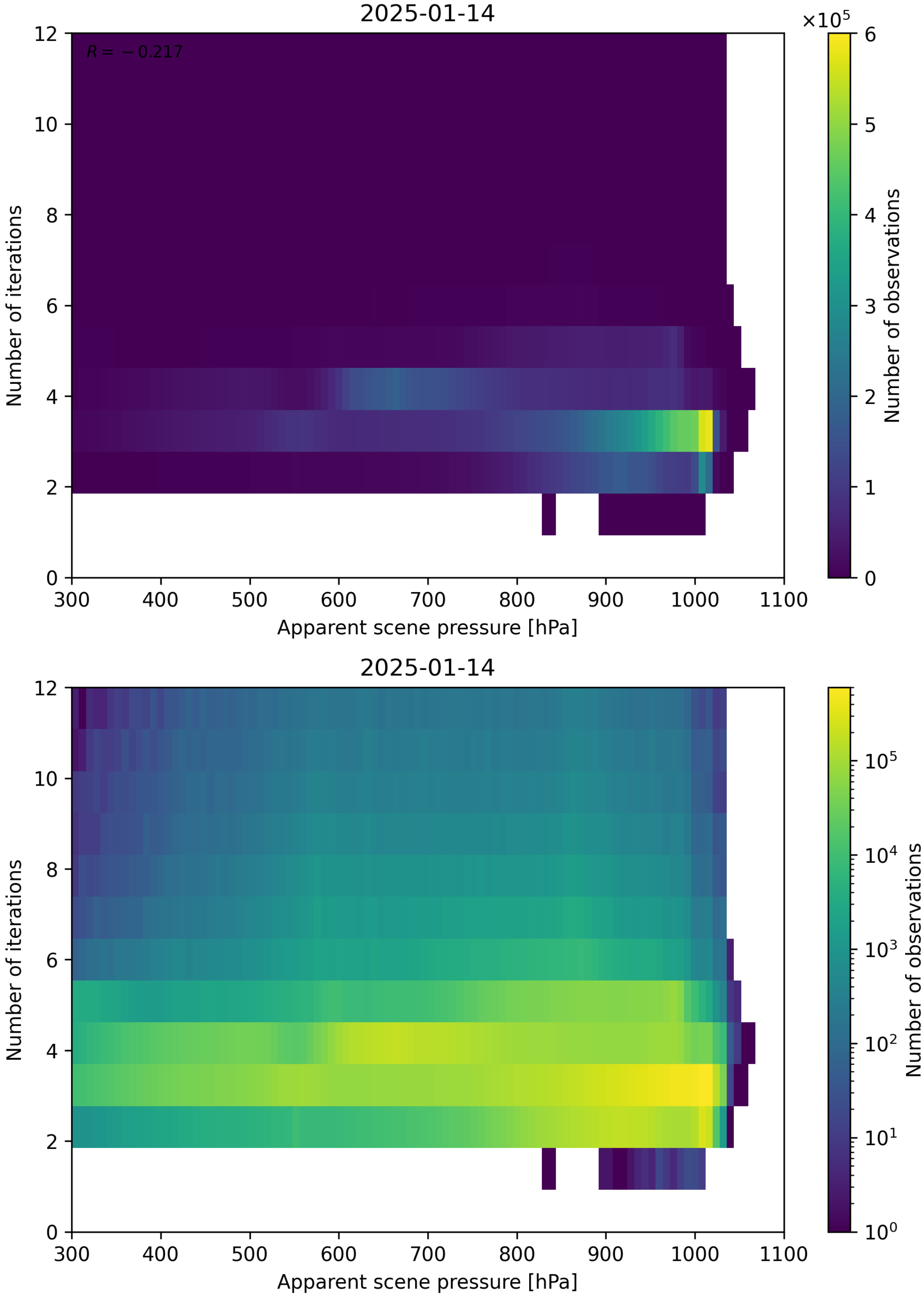
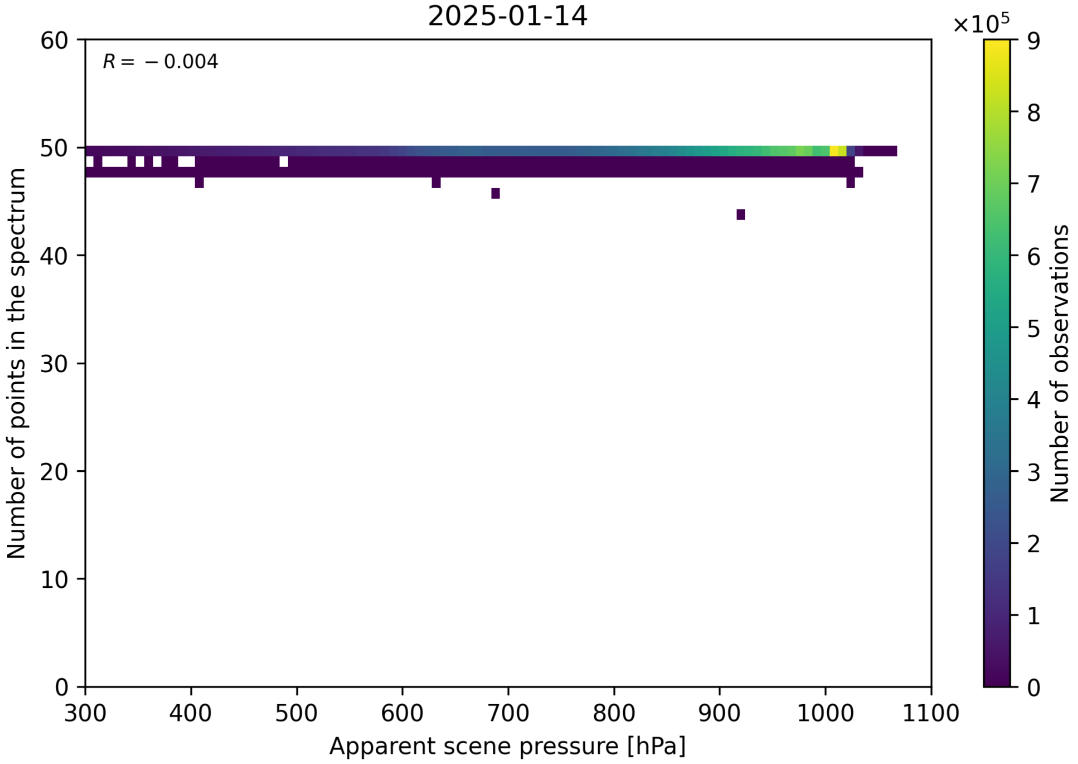


Figure 65: Scatter density plot of “Apparent scene pressure” against “Number of iterations” for 2025-01-13 to 2025-01-15.



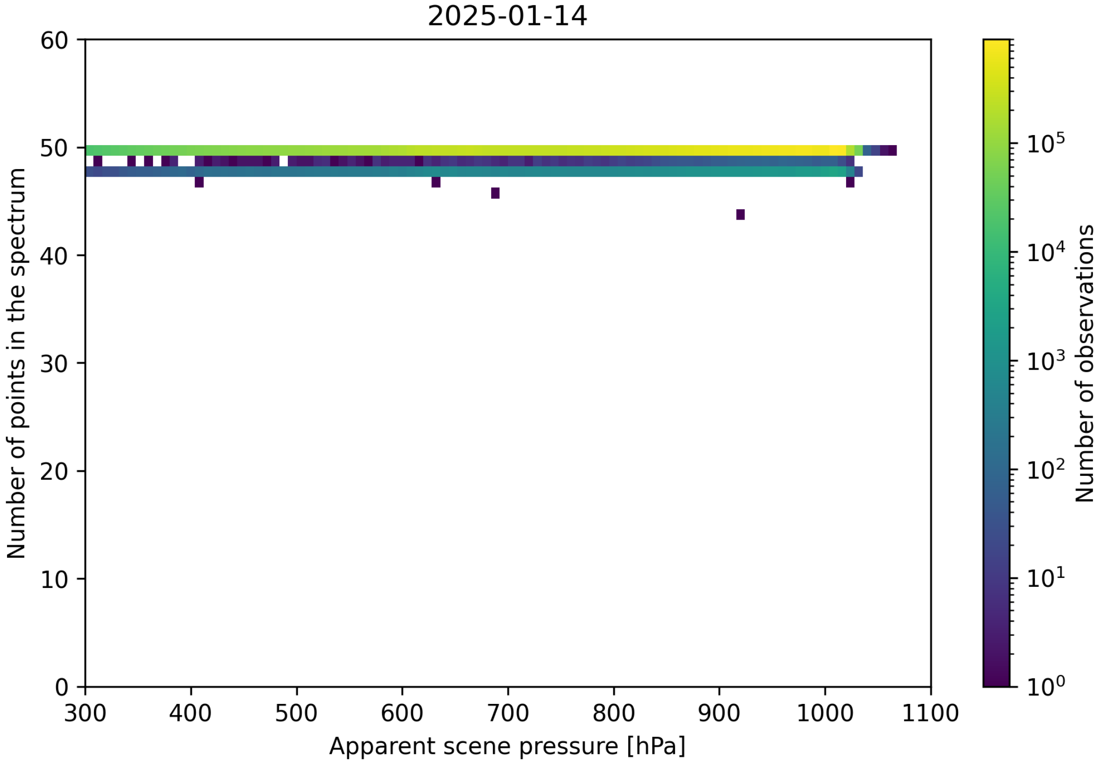


Figure 66: Scatter density plot of “Apparent scene pressure” against “Number of points in the spectrum” for 2025-01-13 to 2025-01-15.

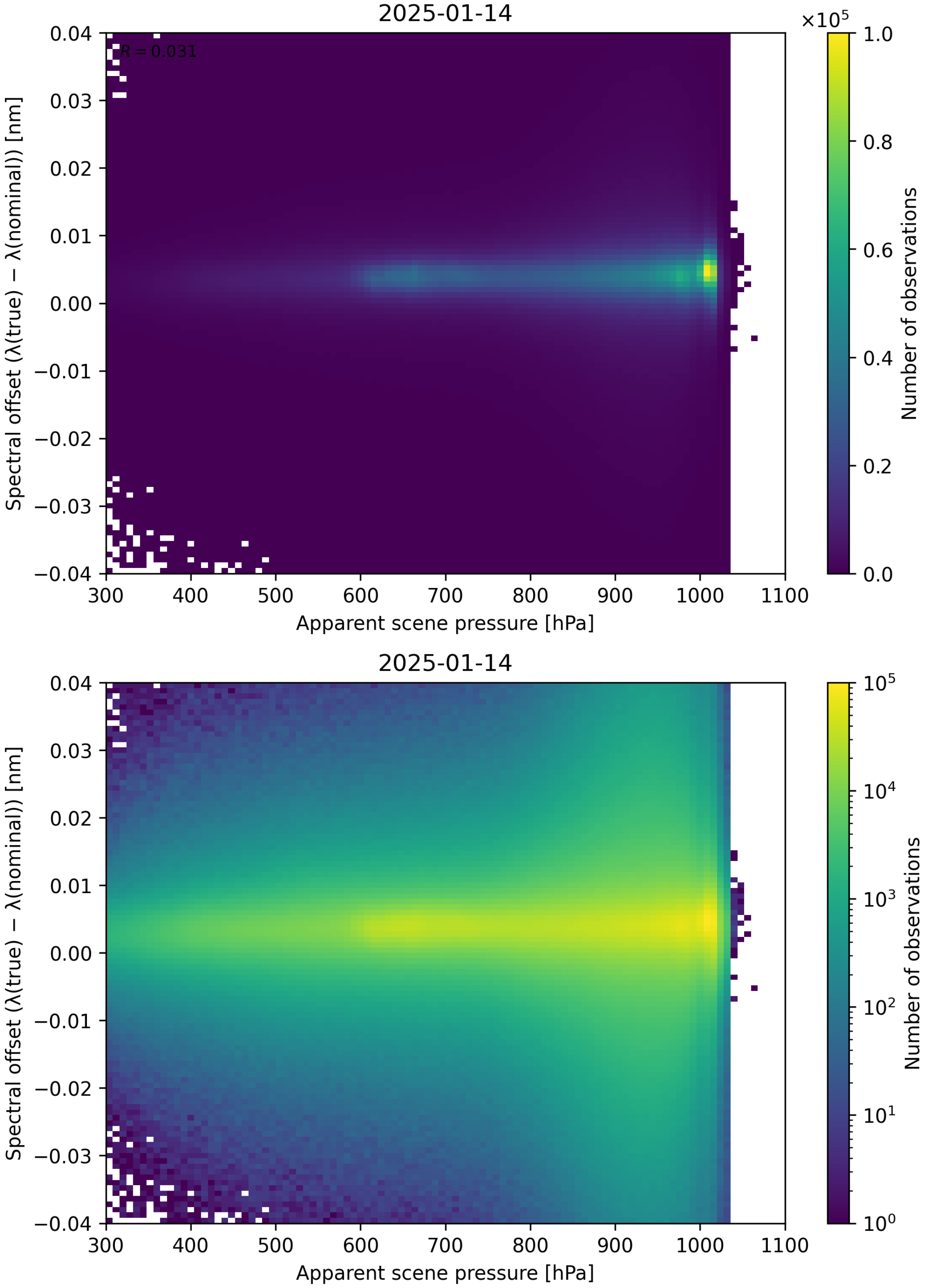


Figure 67: Scatter density plot of “Apparent scene pressure” against “Spectral offset ($\lambda_{\text{true}} - \lambda_{\text{nominal}}$)” for 2025-01-13 to 2025-01-15.

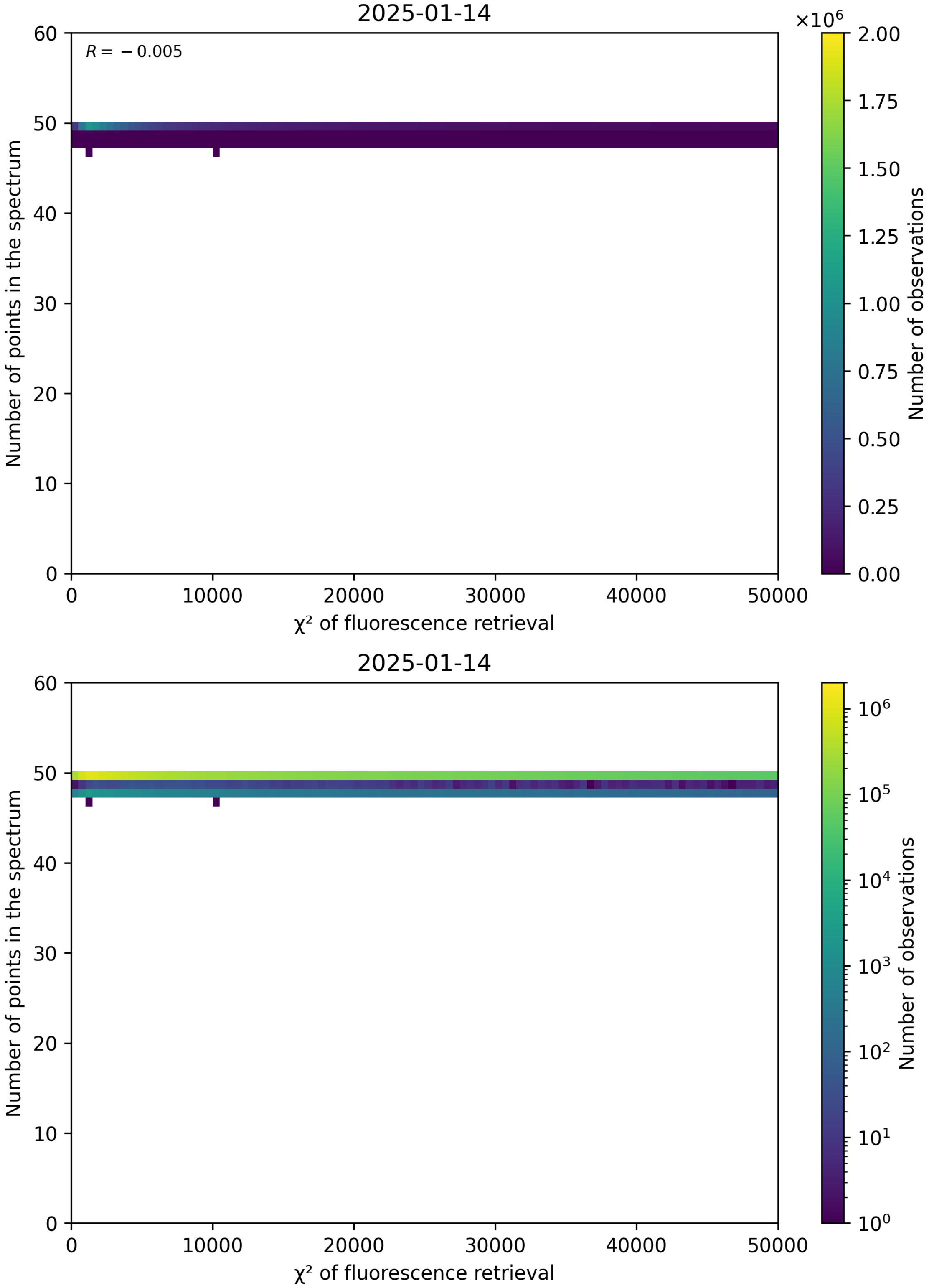


Figure 68: Scatter density plot of "χ^2 of fluorescence retrieval" against "Number of points in the spectrum" for 2025-01-13 to 2025-01-15.

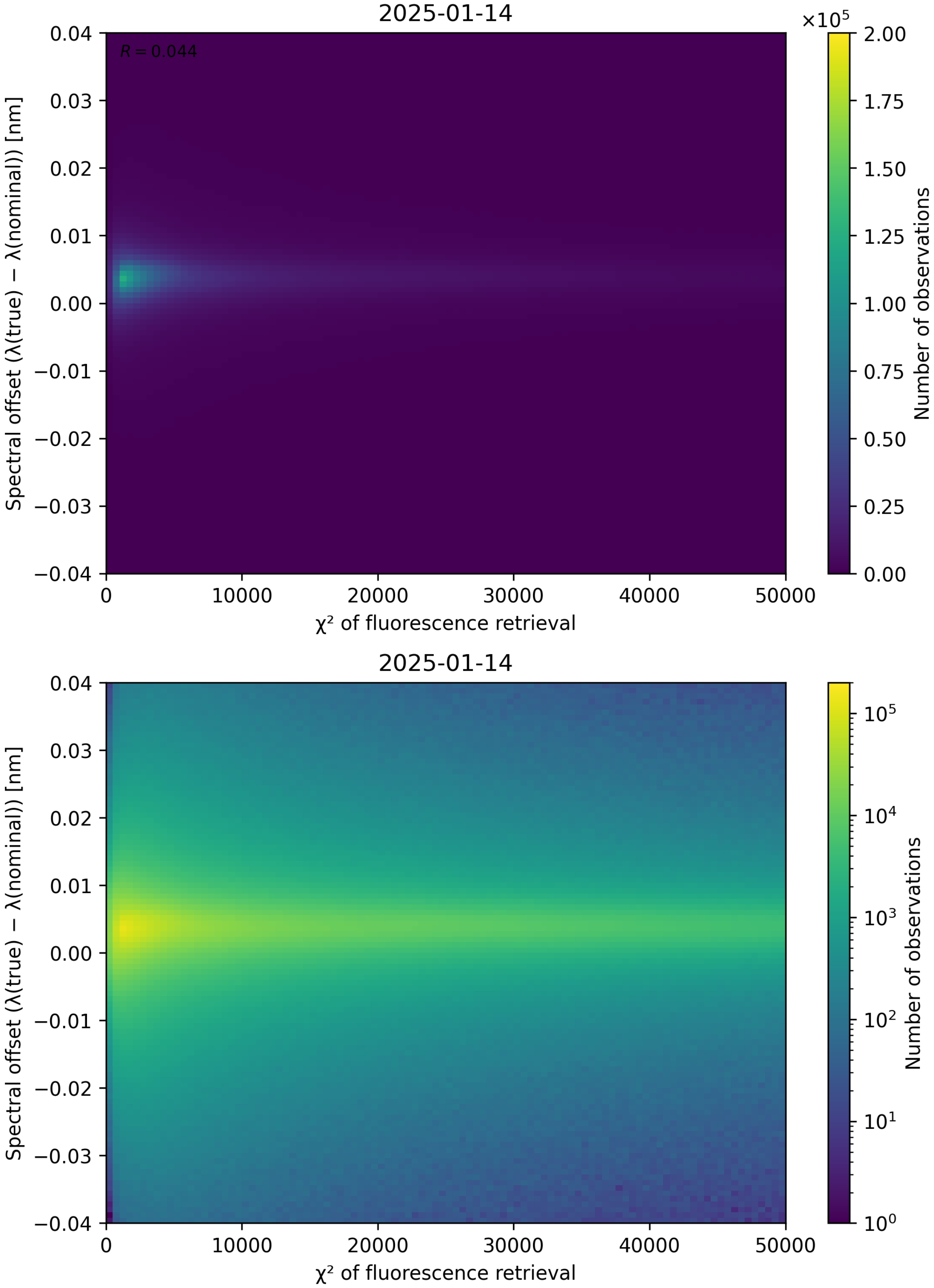


Figure 69: Scatter density plot of "χ^2 of fluorescence retrieval" against "Spectral offset ($\lambda_{\text{true}} - \lambda_{\text{nominal}}$)" for 2025-01-13 to 2025-01-15.

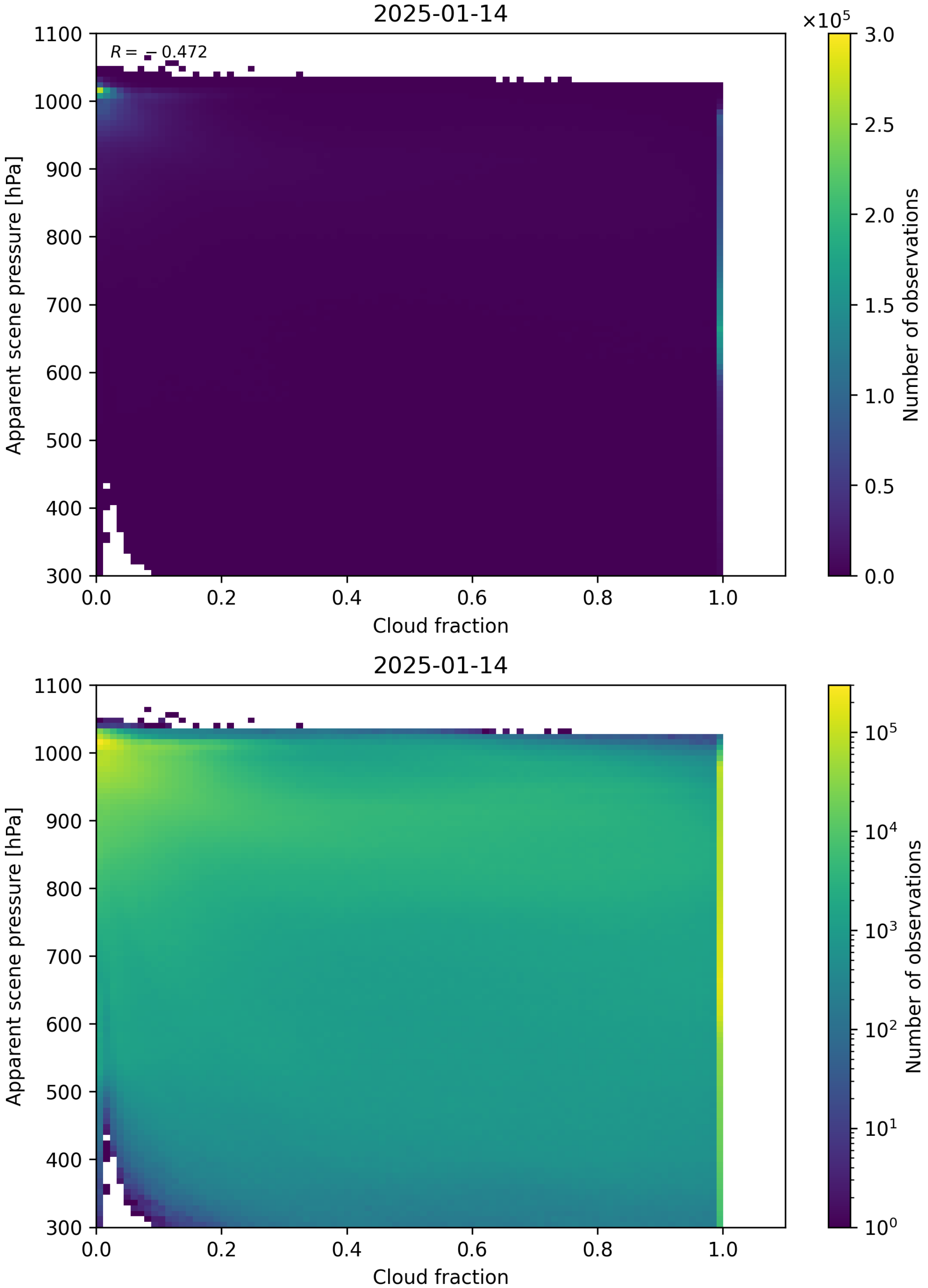


Figure 70: Scatter density plot of “Cloud fraction” against “Apparent scene pressure” for 2025-01-13 to 2025-01-15.

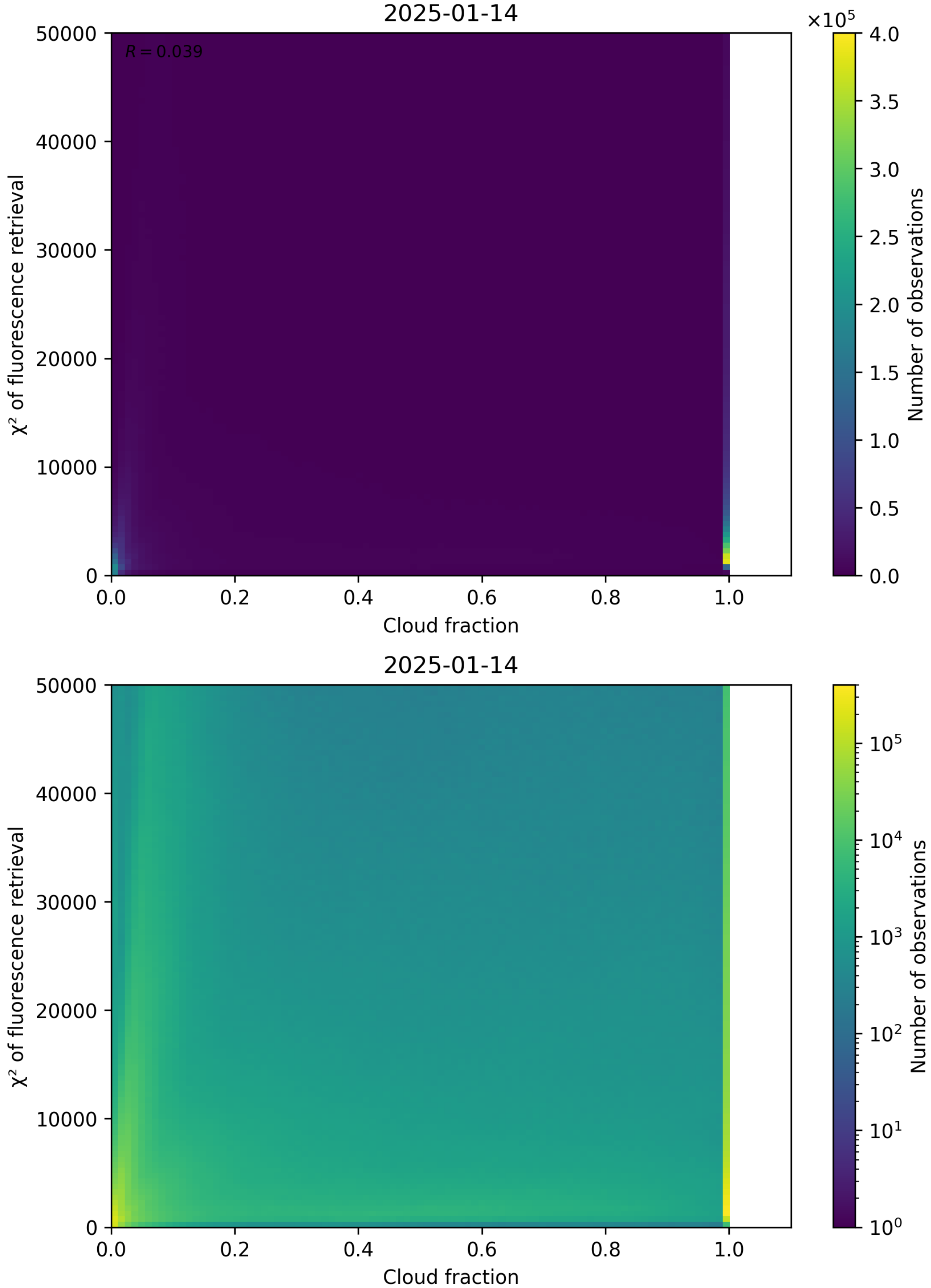


Figure 71: Scatter density plot of “Cloud fraction” against “χ^2 of fluorescence retrieval” for 2025-01-13 to 2025-01-15.

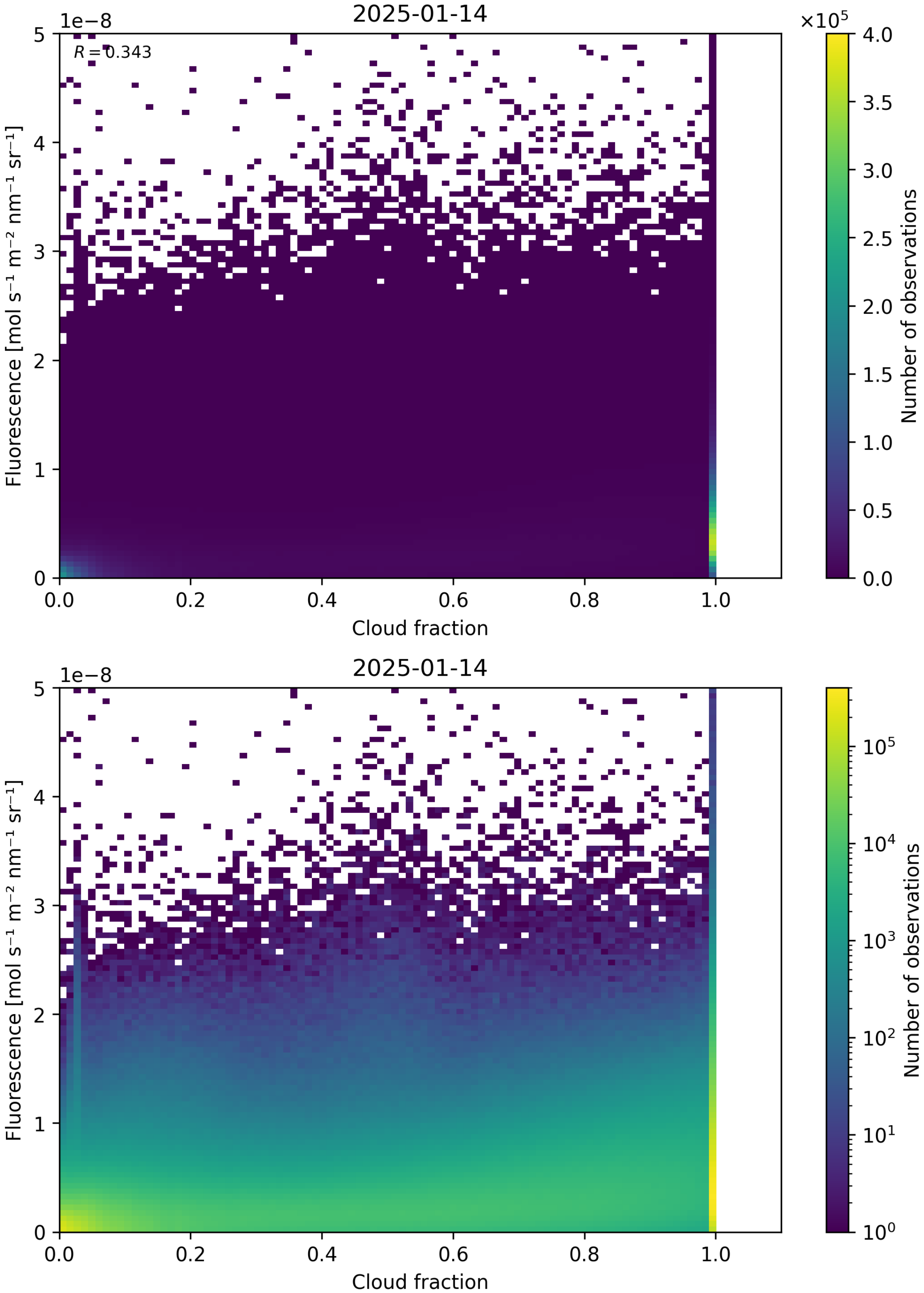


Figure 72: Scatter density plot of “Cloud fraction” against “Fluorescence” for 2025-01-13 to 2025-01-15.

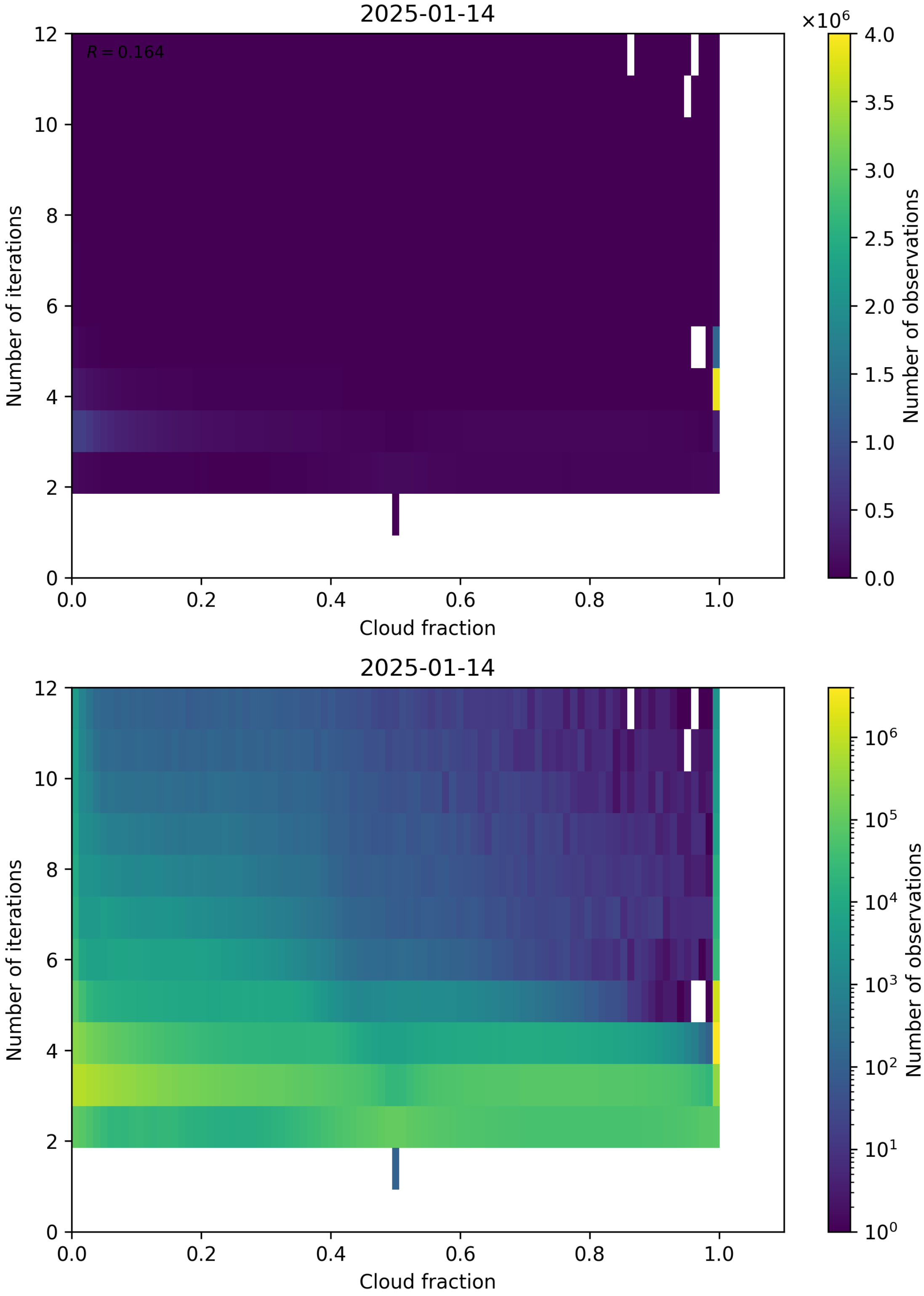


Figure 73: Scatter density plot of “Cloud fraction” against “Number of iterations” for 2025-01-13 to 2025-01-15.

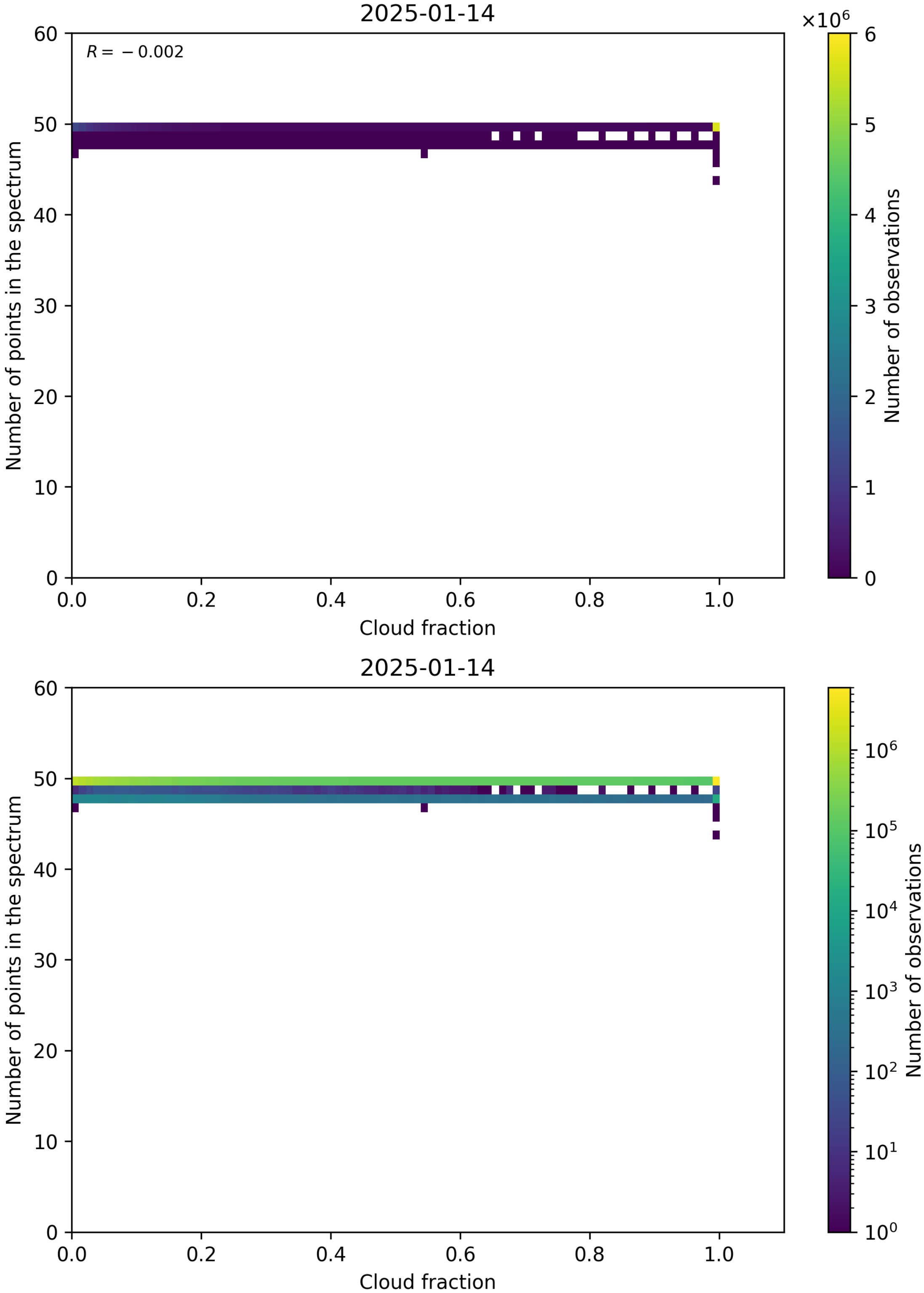


Figure 74: Scatter density plot of “Cloud fraction” against “Number of points in the spectrum” for 2025-01-13 to 2025-01-15.

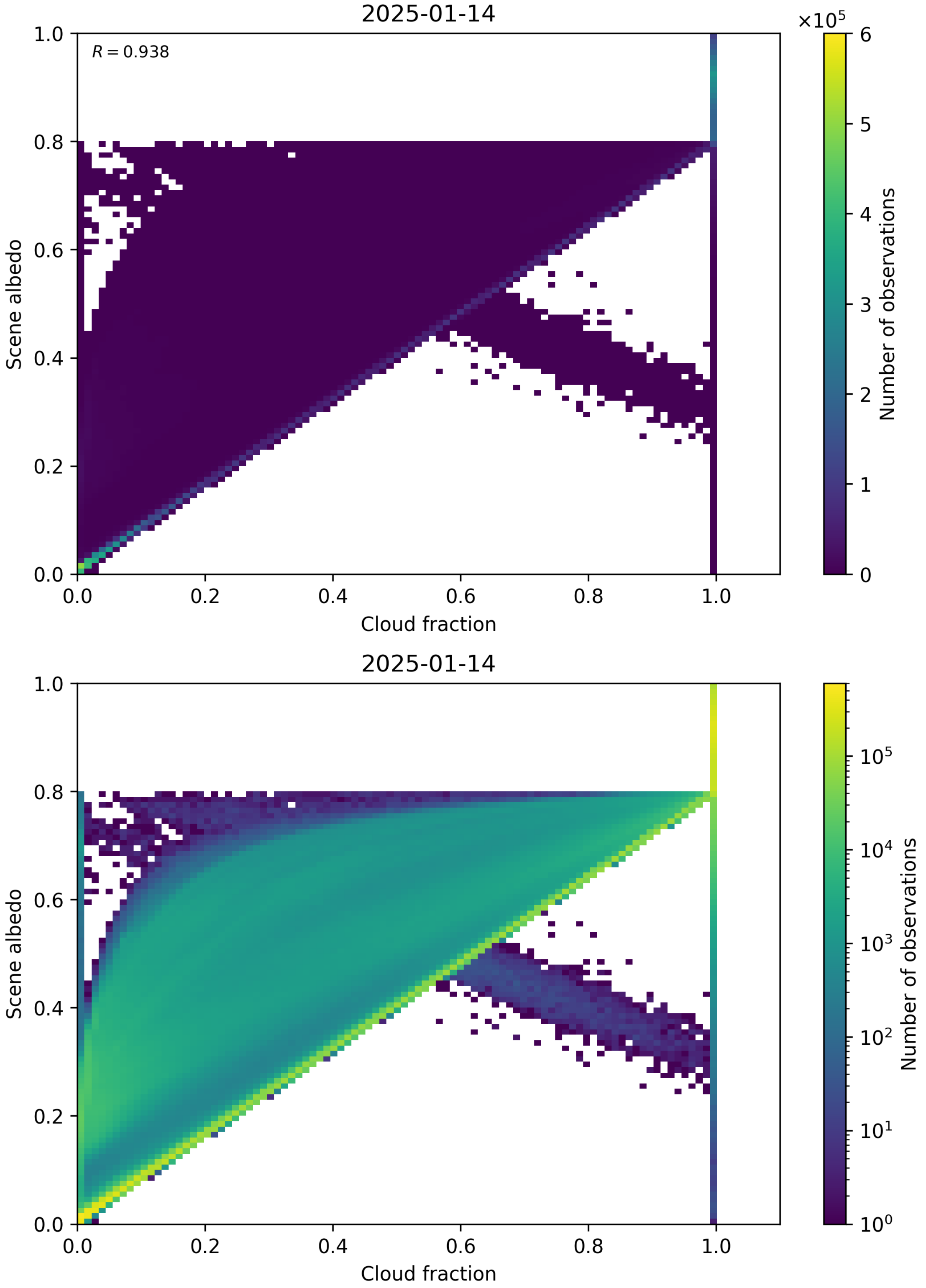


Figure 75: Scatter density plot of “Cloud fraction” against “Scene albedo” for 2025-01-13 to 2025-01-15.

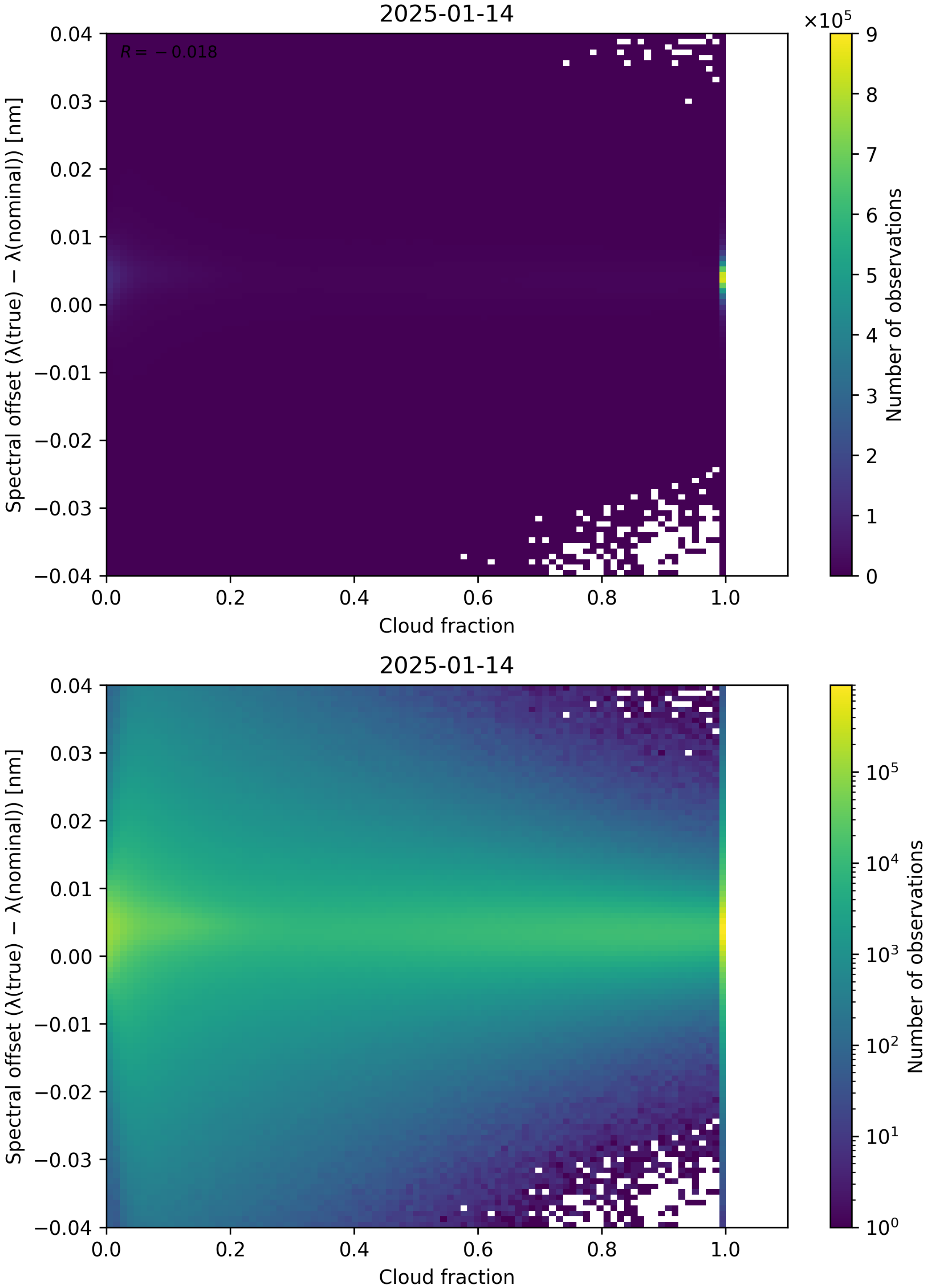


Figure 76: Scatter density plot of "Cloud fraction" against "Spectral offset ($\lambda_{\mathrm{true}} - \lambda_{\mathrm{nominal}}$)" for 2025-01-13 to 2025-01-15.

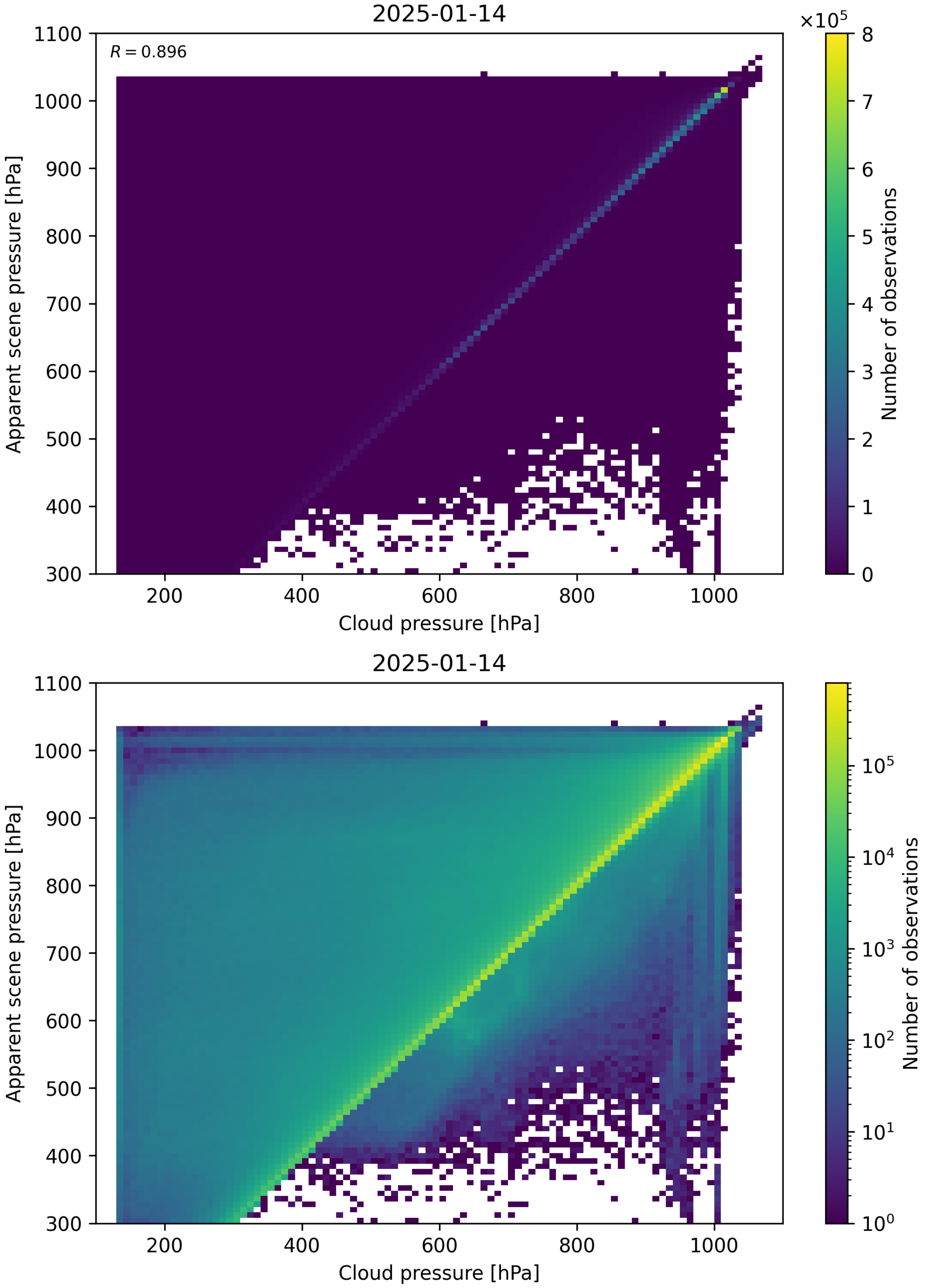


Figure 77: Scatter density plot of “Cloud pressure” against “Apparent scene pressure” for 2025-01-13 to 2025-01-15.

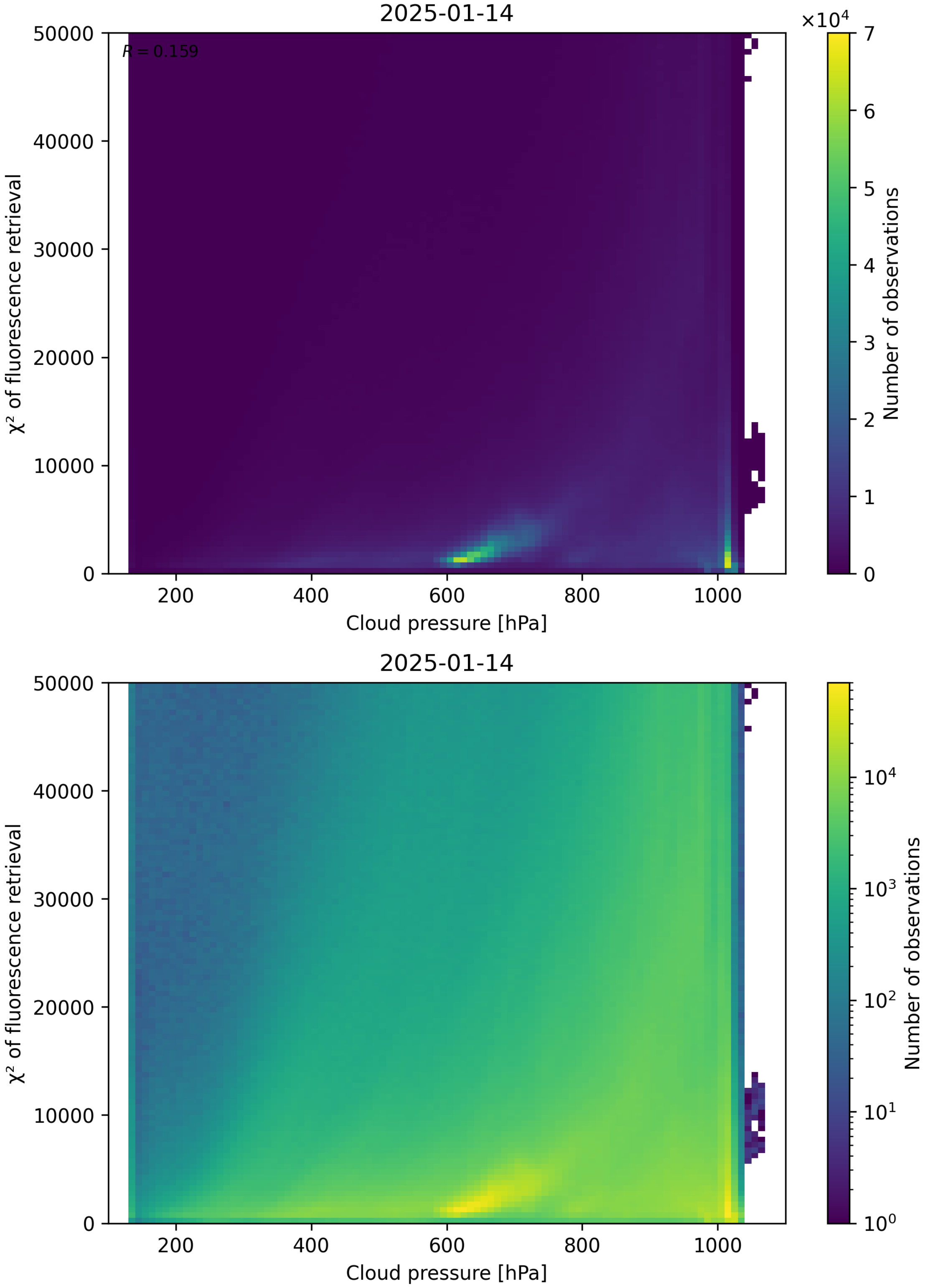


Figure 78: Scatter density plot of "Cloud pressure" against "χ^2 of fluorescence retrieval" for 2025-01-13 to 2025-01-15.

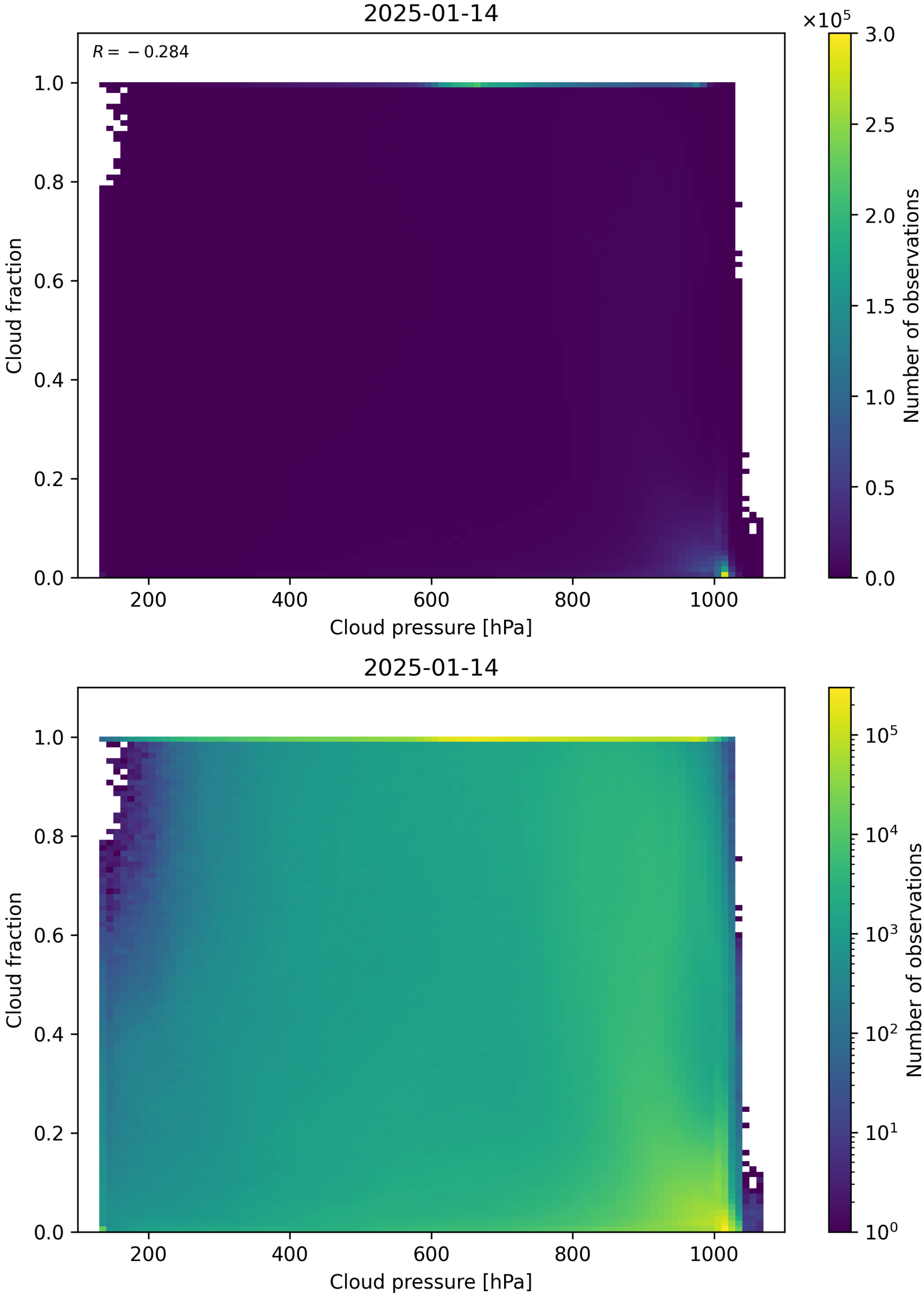
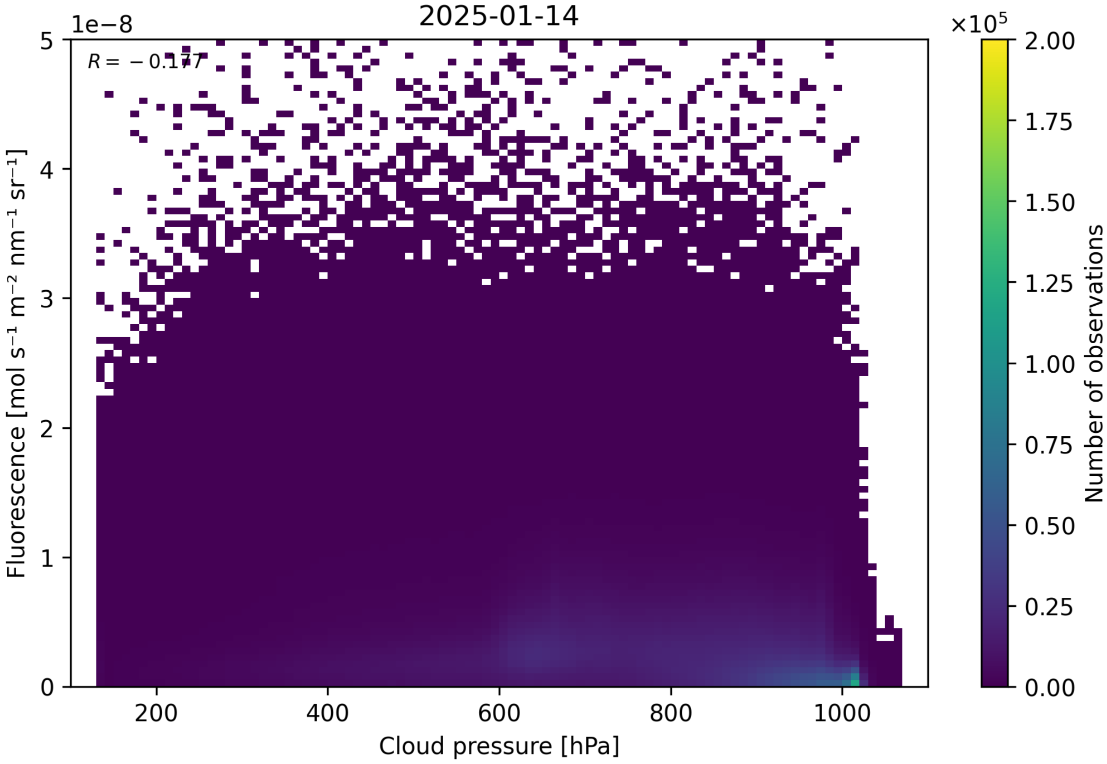


Figure 79: Scatter density plot of “Cloud pressure” against “Cloud fraction” for 2025-01-13 to 2025-01-15.



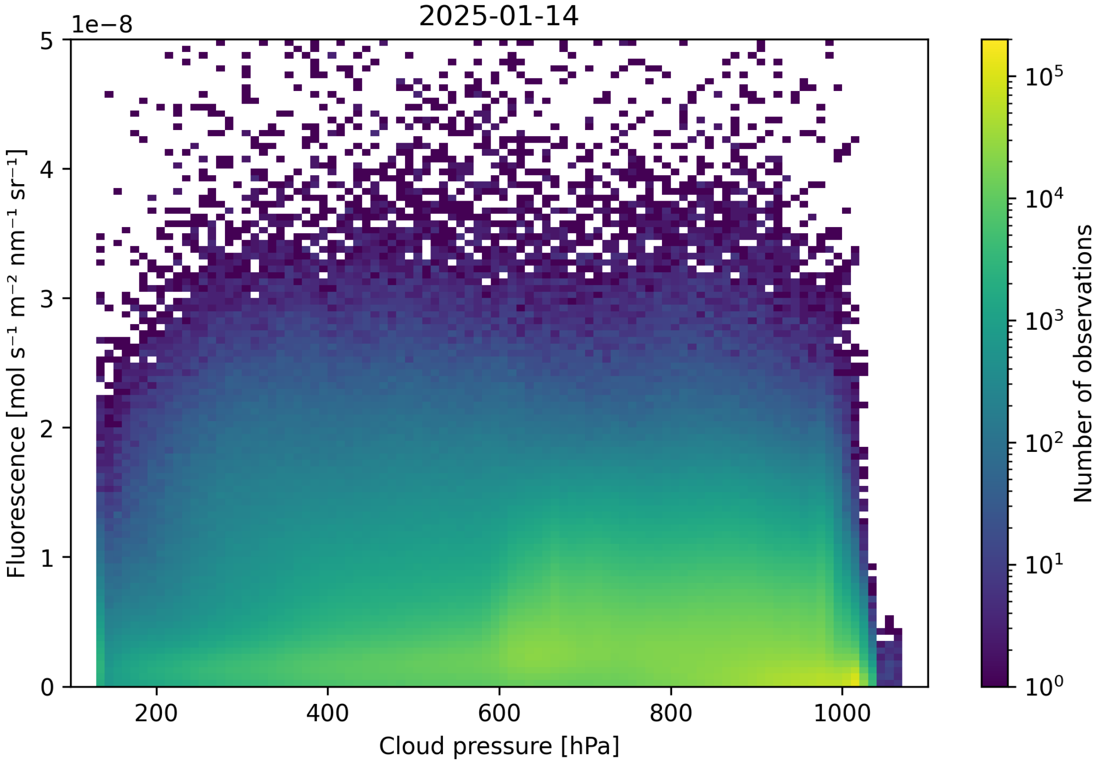


Figure 80: Scatter density plot of “Cloud pressure” against “Fluorescence” for 2025-01-13 to 2025-01-15.

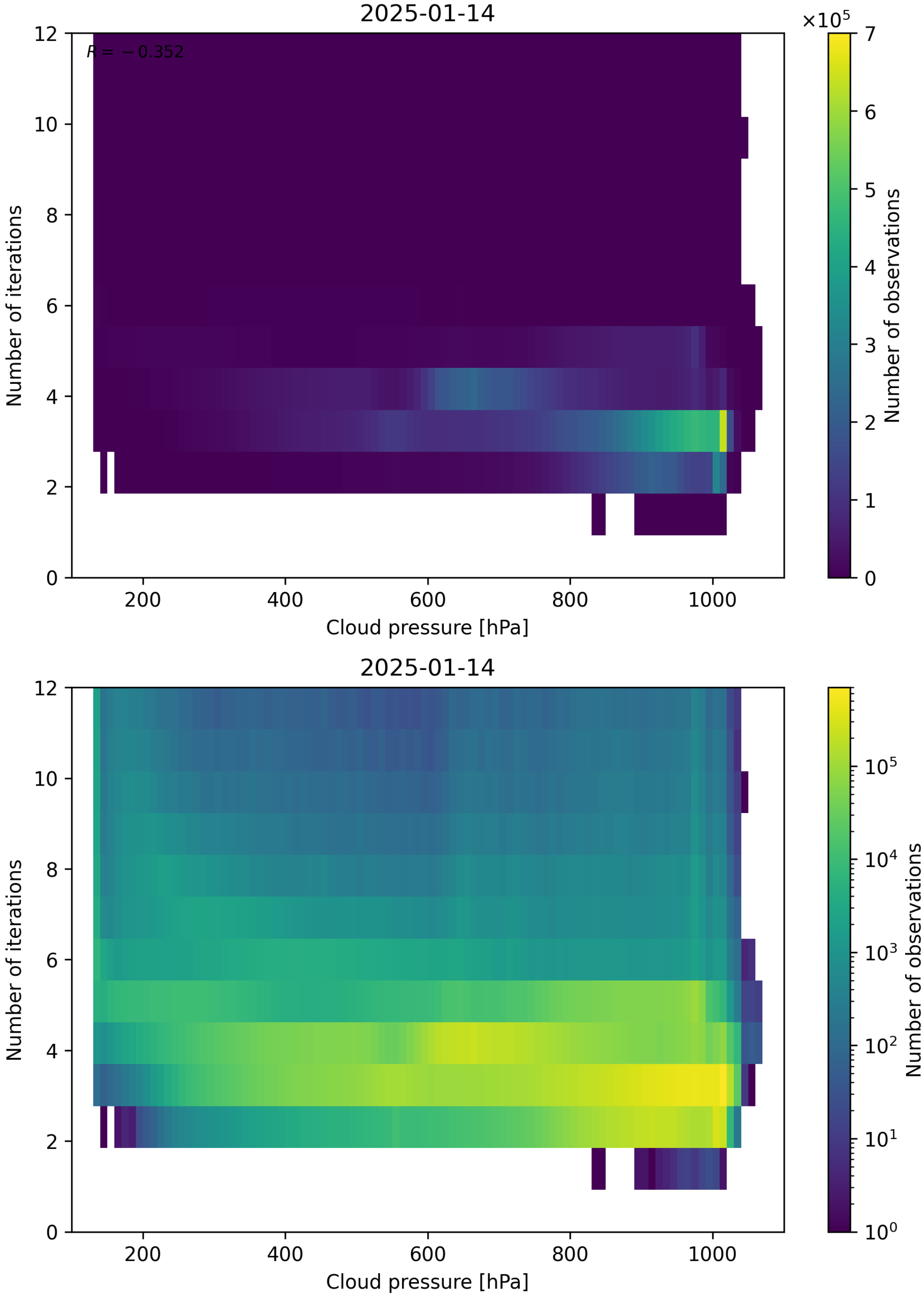


Figure 81: Scatter density plot of “Cloud pressure” against “Number of iterations” for 2025-01-13 to 2025-01-15.

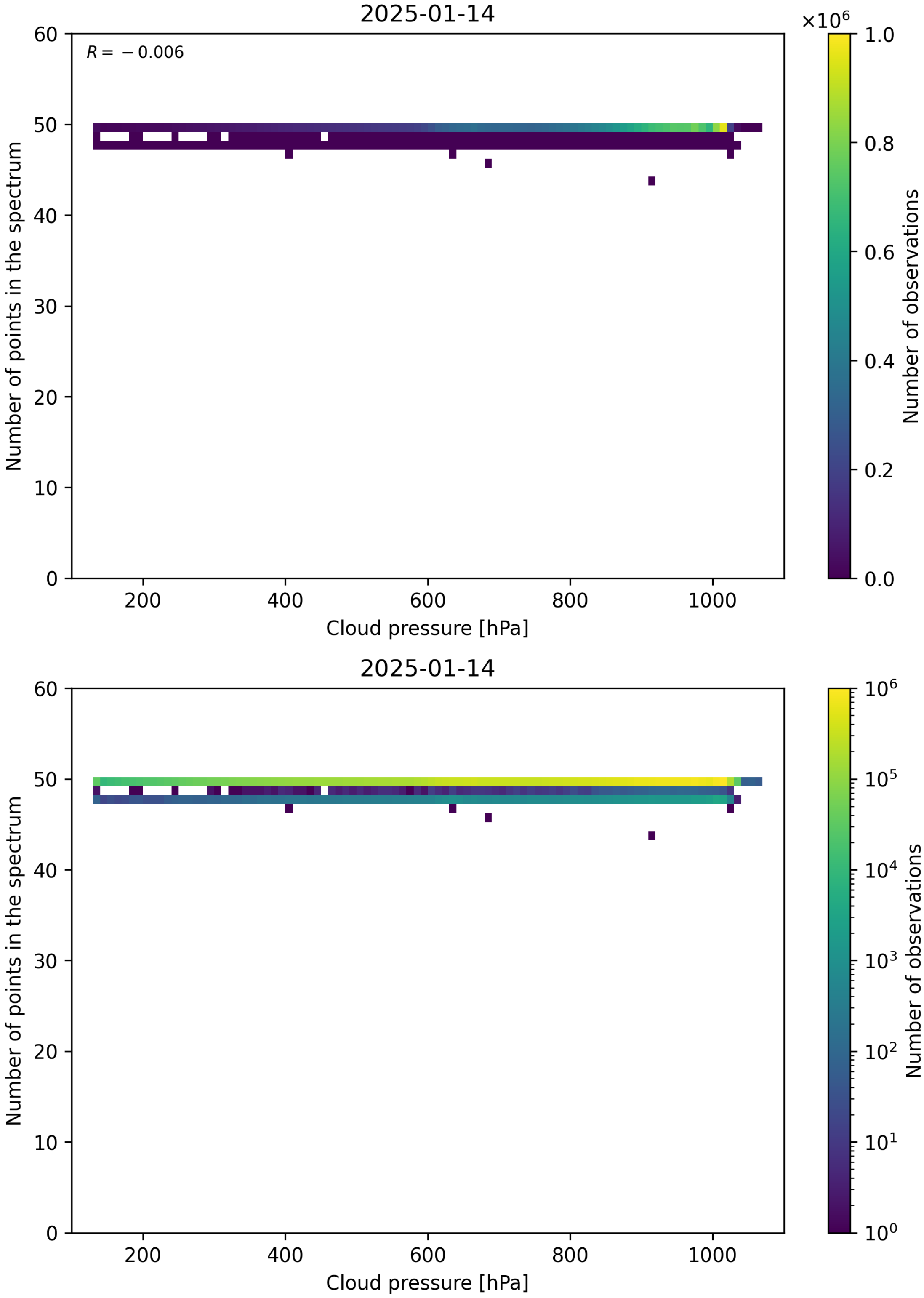


Figure 82: Scatter density plot of “Cloud pressure” against “Number of points in the spectrum” for 2025-01-13 to 2025-01-15.

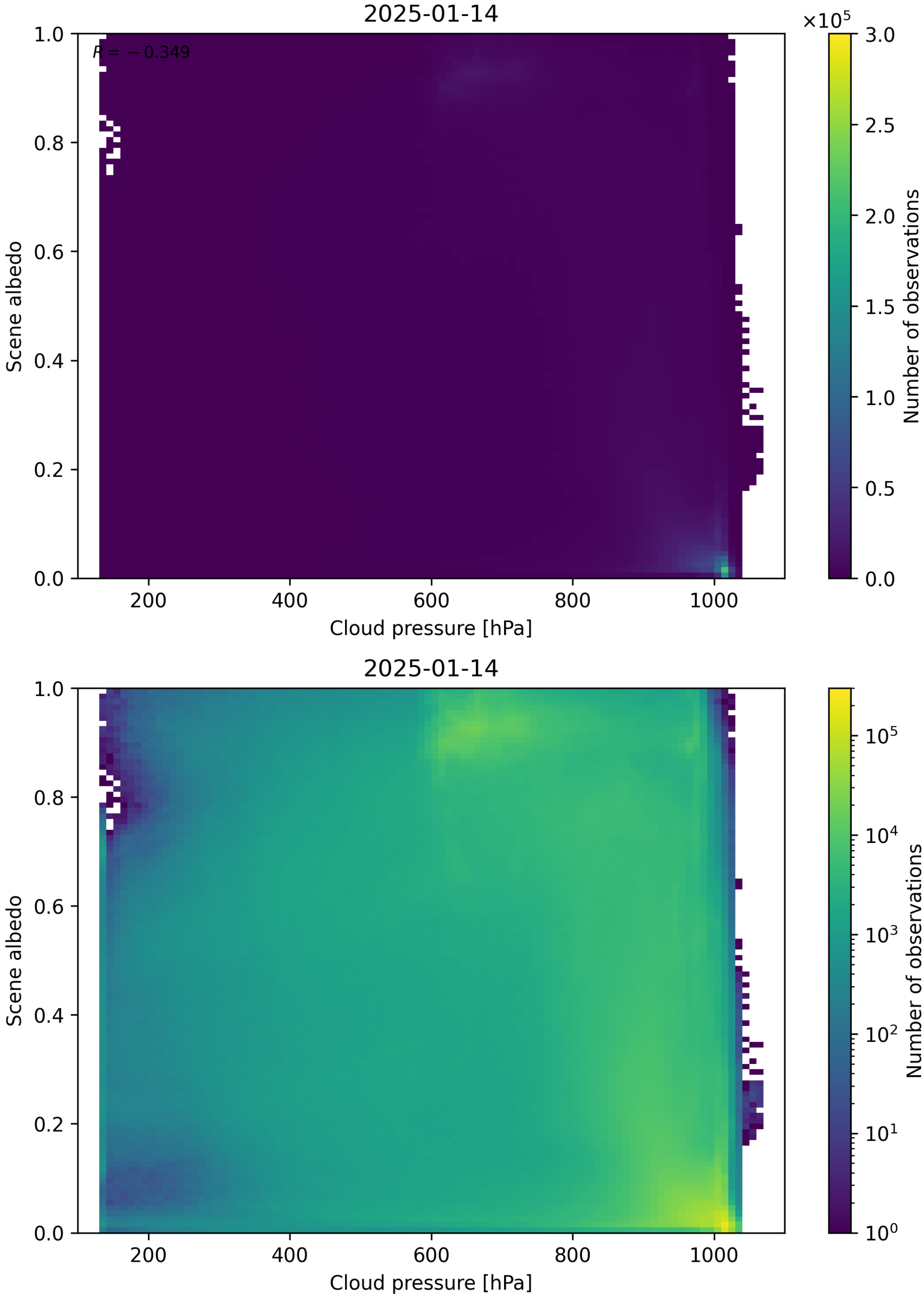


Figure 83: Scatter density plot of “Cloud pressure” against “Scene albedo” for 2025-01-13 to 2025-01-15.

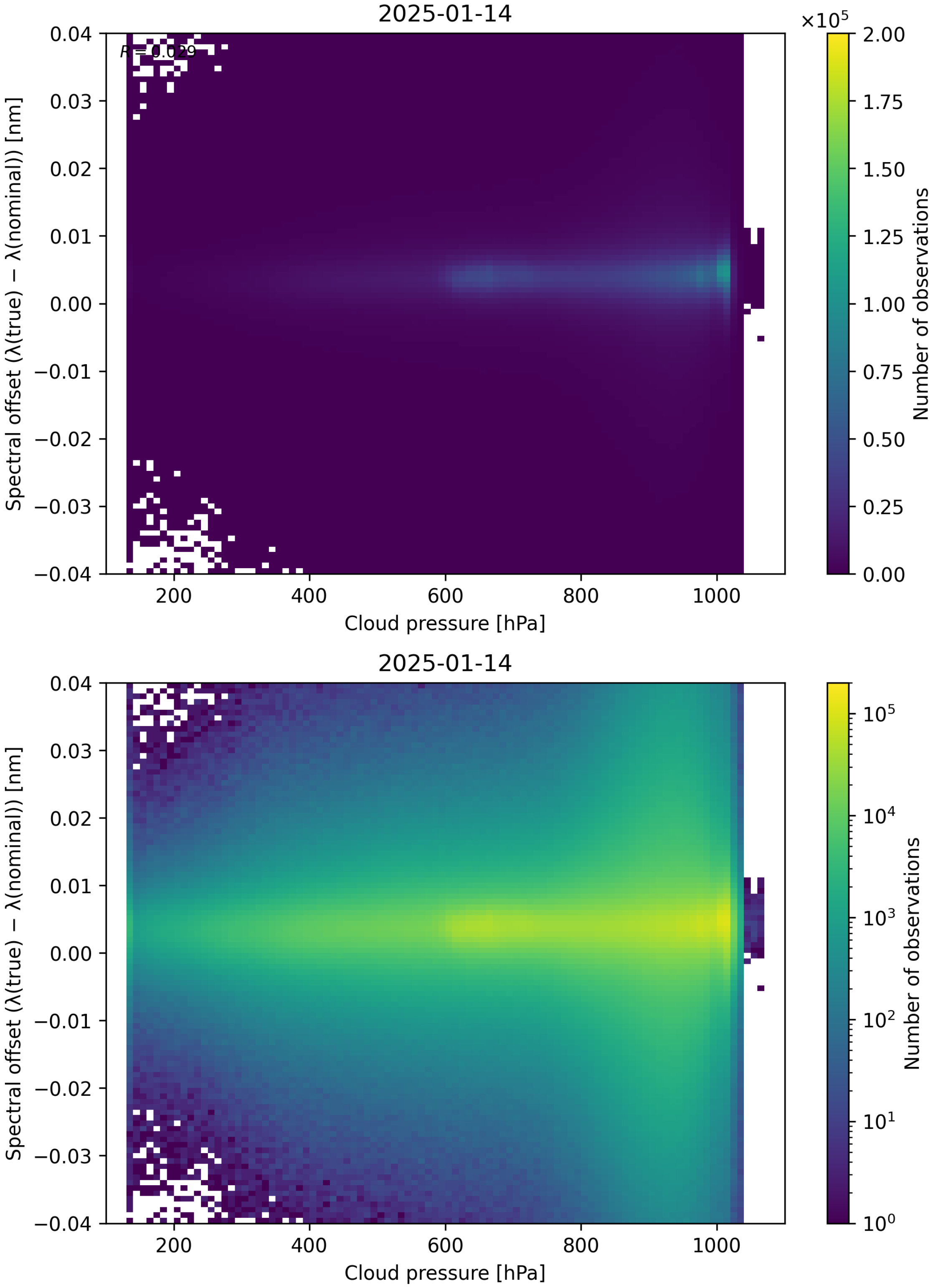


Figure 84: Scatter density plot of “Cloud pressure” against “Spectral offset ($\lambda_{\text{true}} - \lambda_{\text{nominal}}$)” for 2025-01-13 to 2025-01-15.

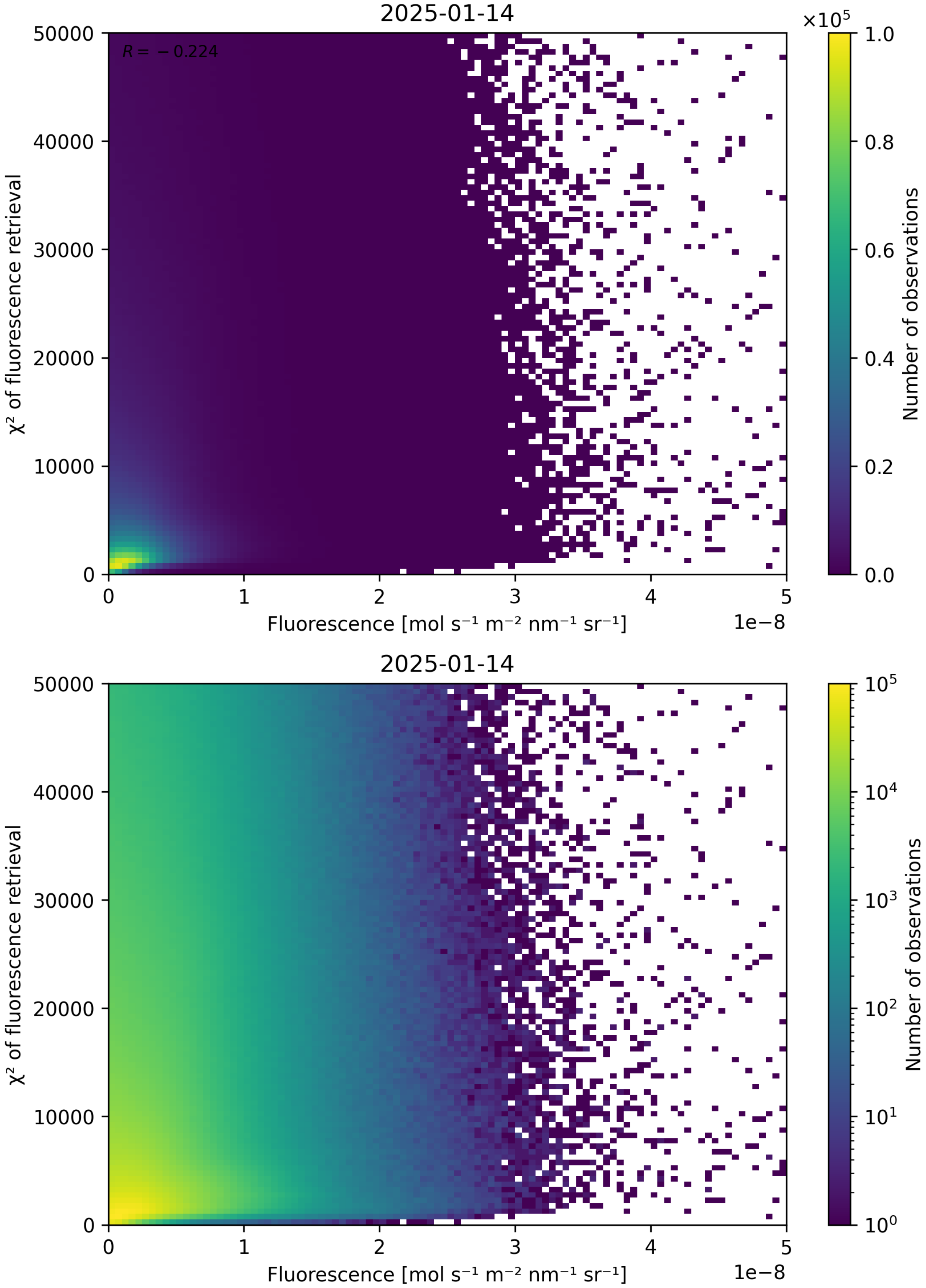


Figure 85: Scatter density plot of “Fluorescence” against “χ^2 of fluorescence retrieval” for 2025-01-13 to 2025-01-15.

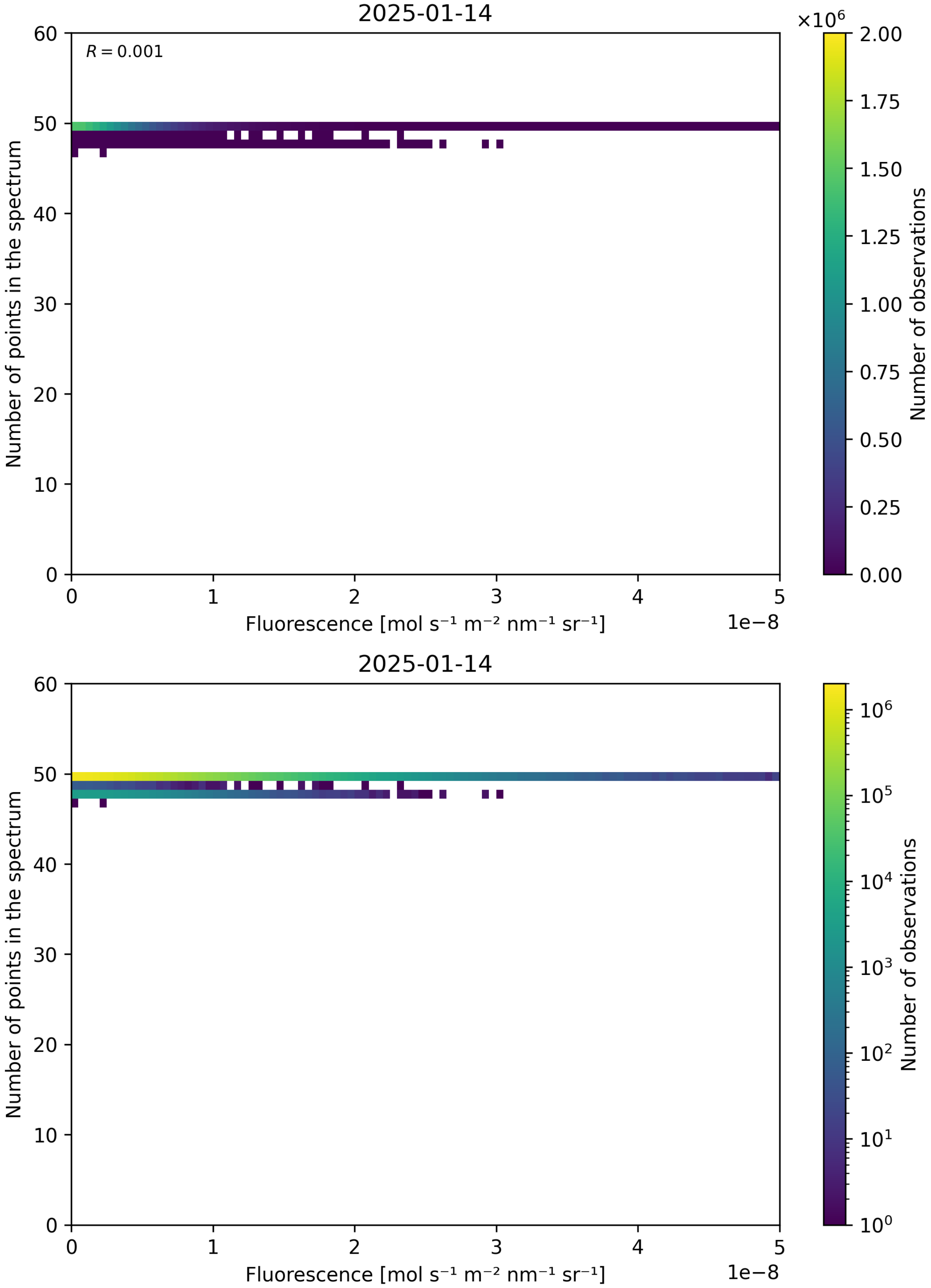


Figure 86: Scatter density plot of “Fluorescence” against “Number of points in the spectrum” for 2025-01-13 to 2025-01-15.

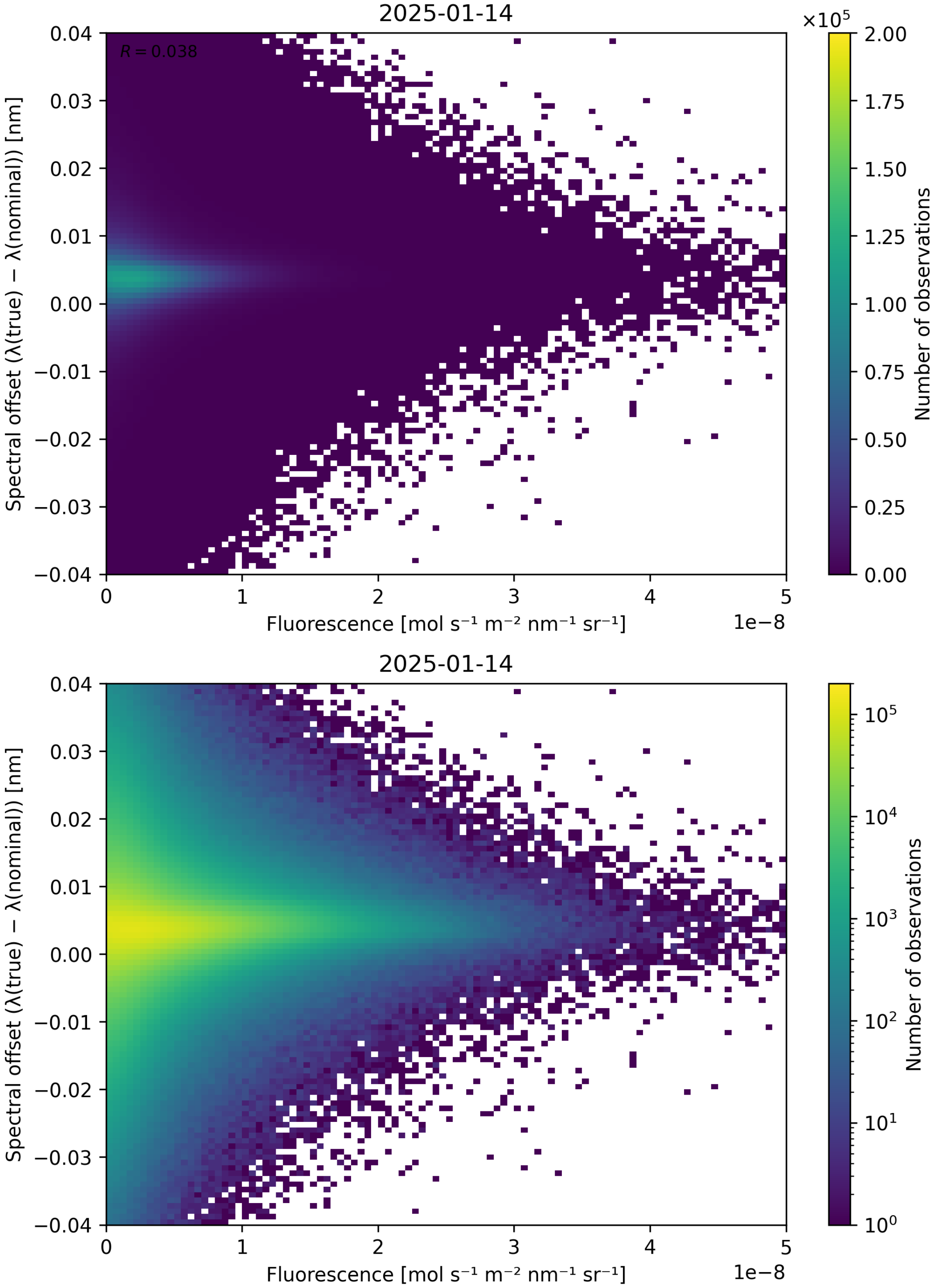


Figure 87: Scatter density plot of "Fluorescence" against "Spectral offset ($\lambda_{\text{true}} - \lambda_{\text{nominal}}$)" for 2025-01-13 to 2025-01-15.

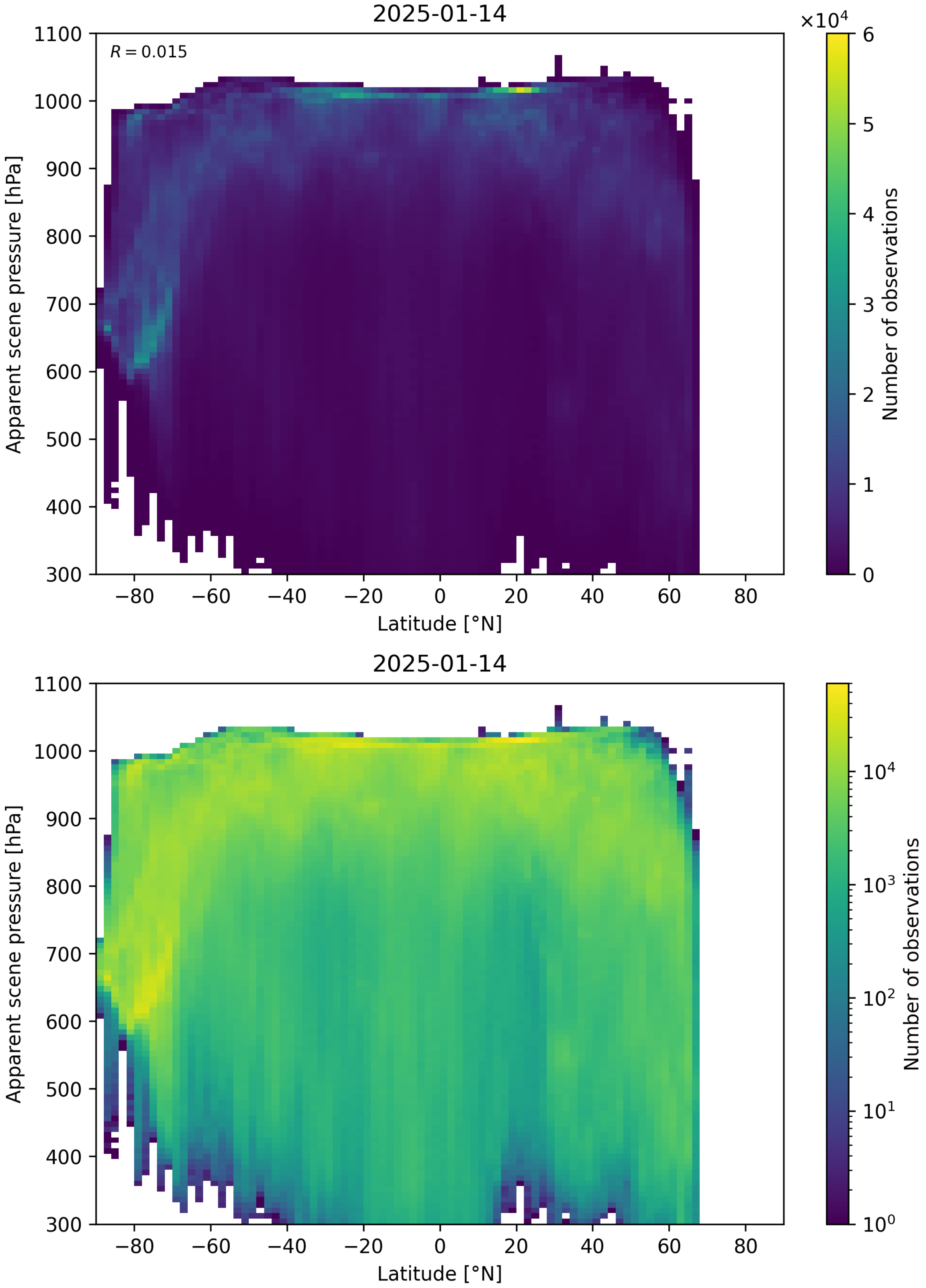
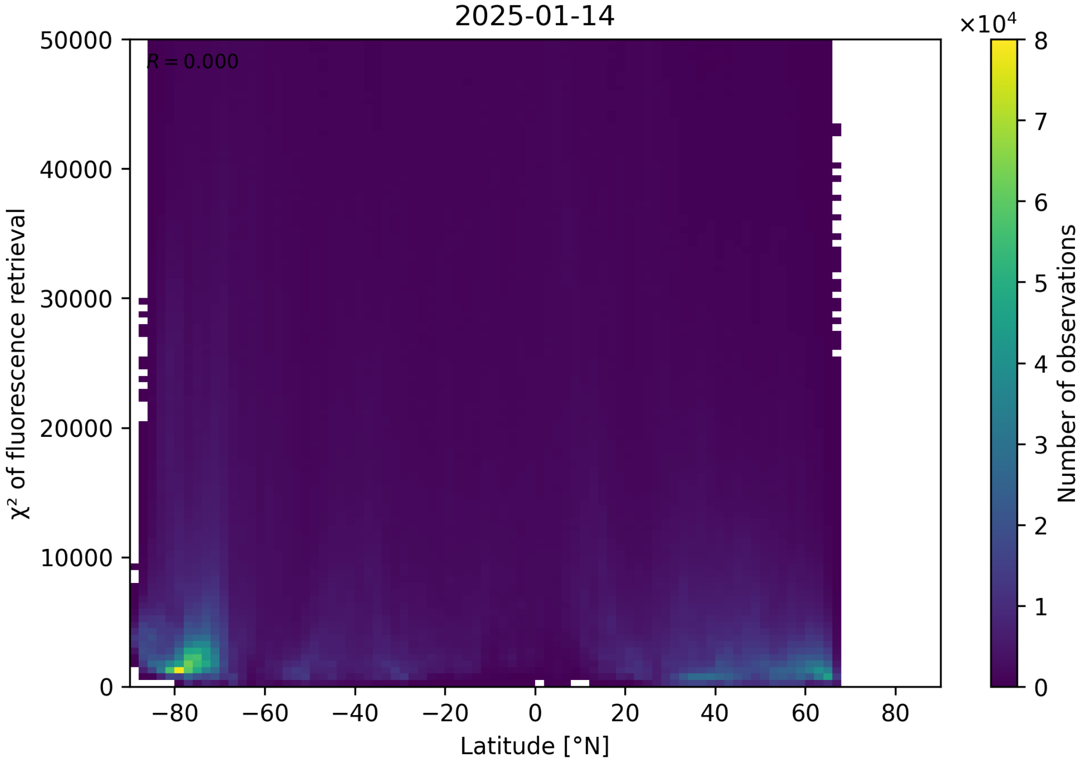


Figure 88: Scatter density plot of “Latitude” against “Apparent scene pressure” for 2025-01-13 to 2025-01-15.



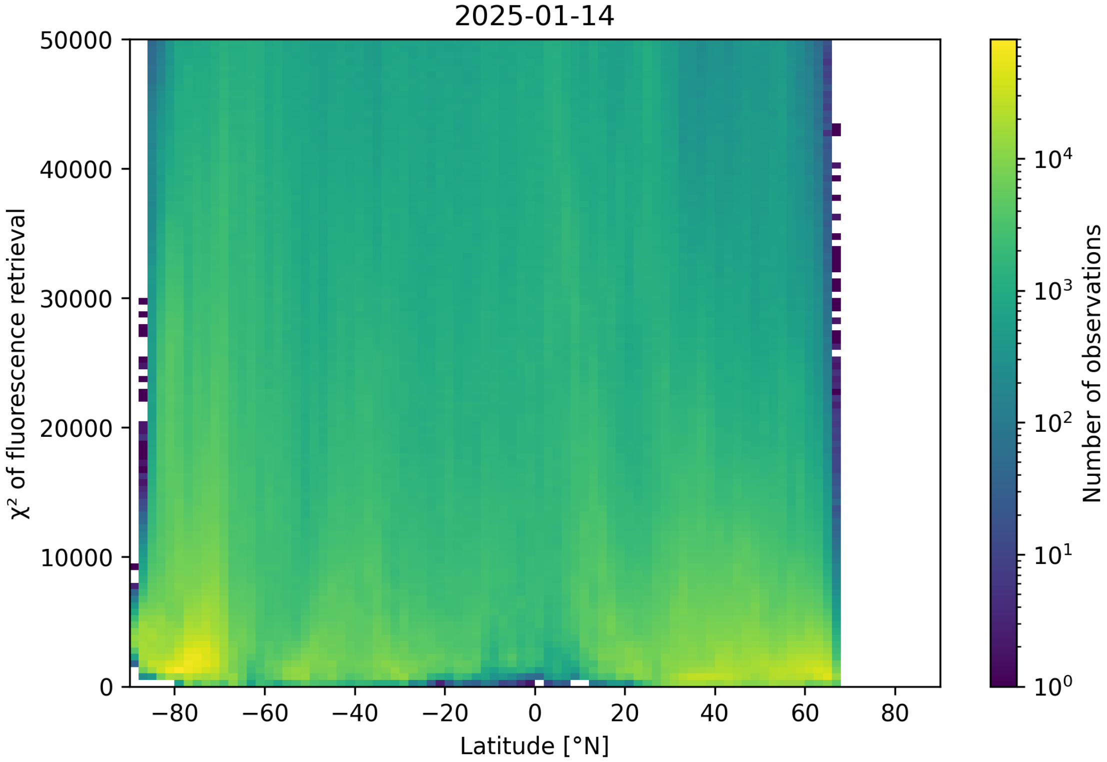
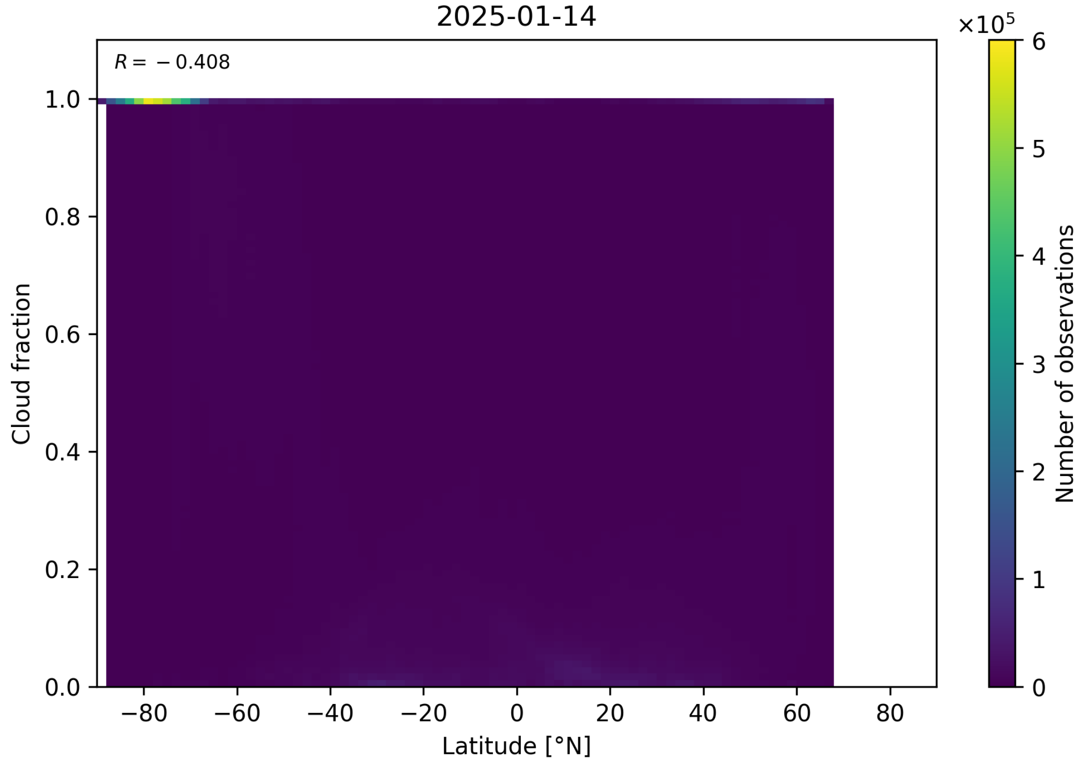


Figure 89: Scatter density plot of “Latitude” against “χ^2 of fluorescence retrieval” for 2025-01-13 to 2025-01-15.



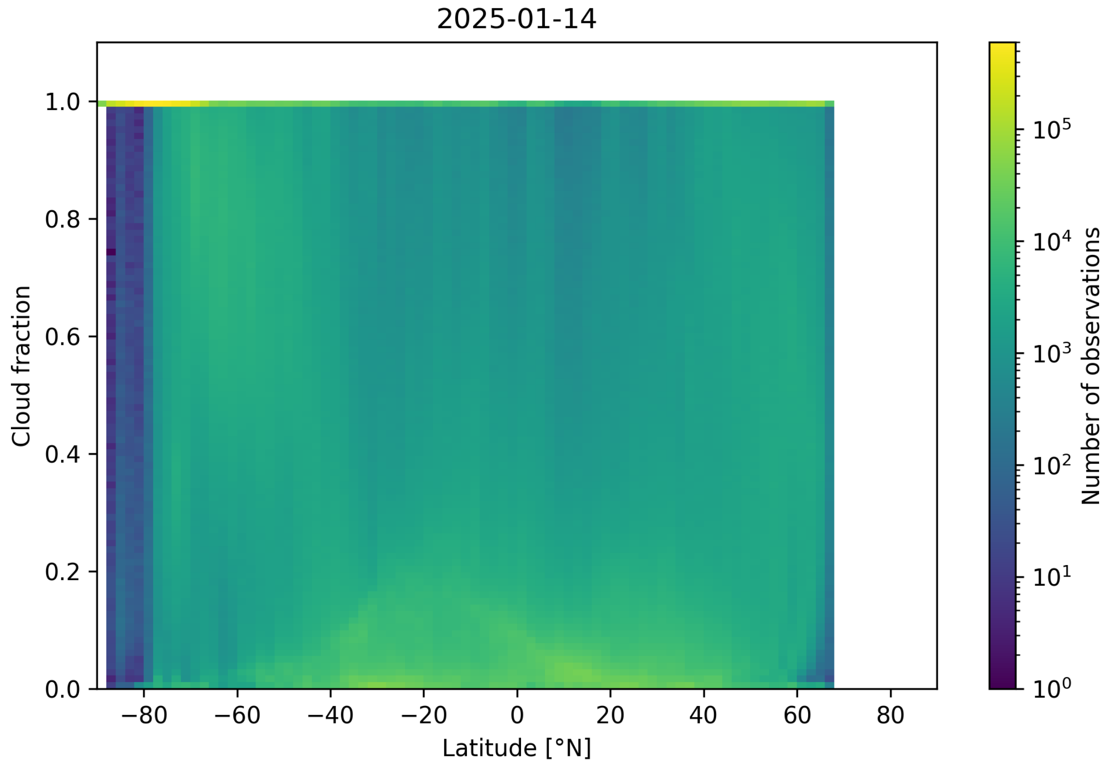


Figure 90: Scatter density plot of “Latitude” against “Cloud fraction” for 2025-01-13 to 2025-01-15.

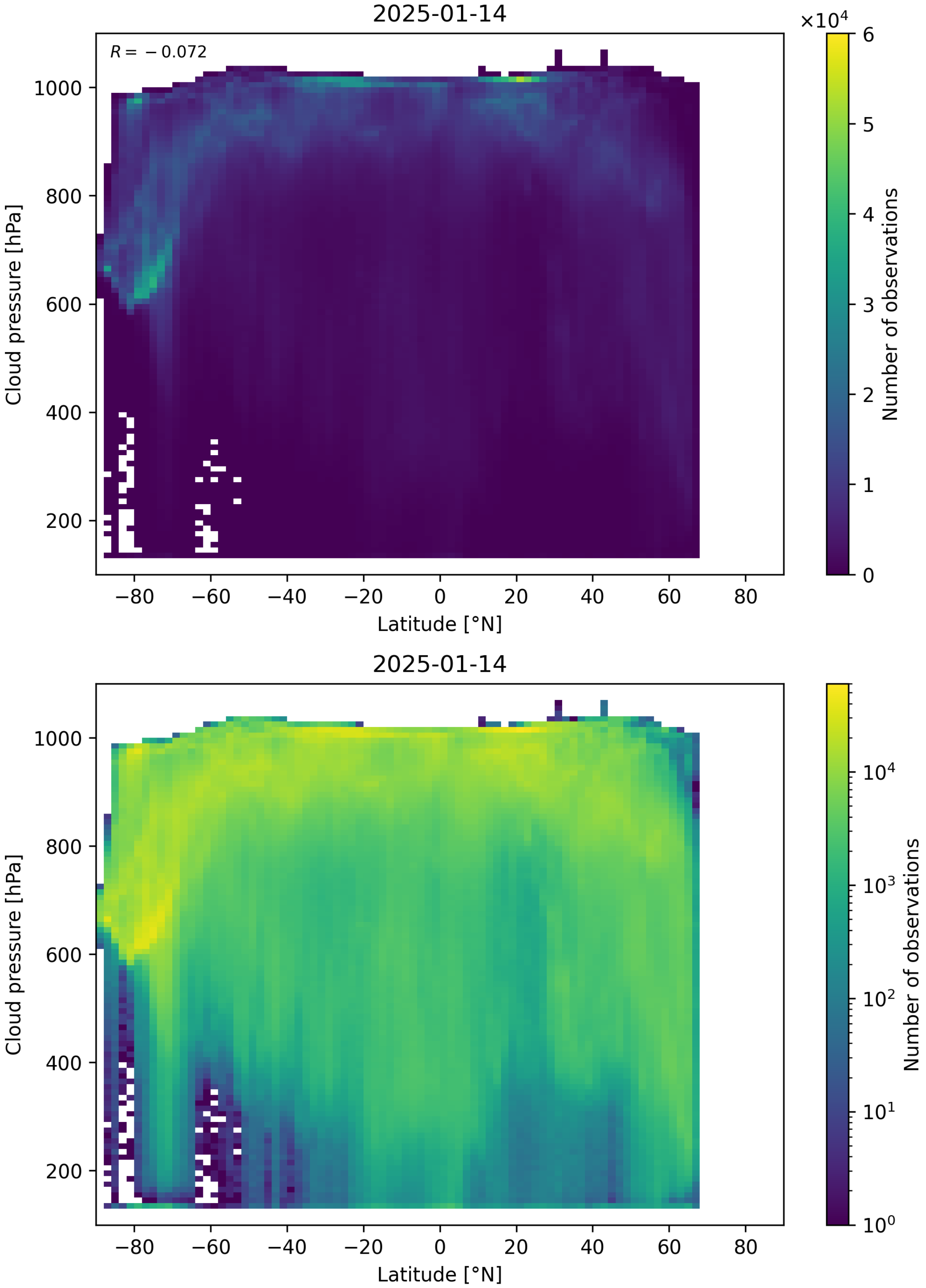


Figure 91: Scatter density plot of "Latitude" against "Cloud pressure" for 2025-01-13 to 2025-01-15.

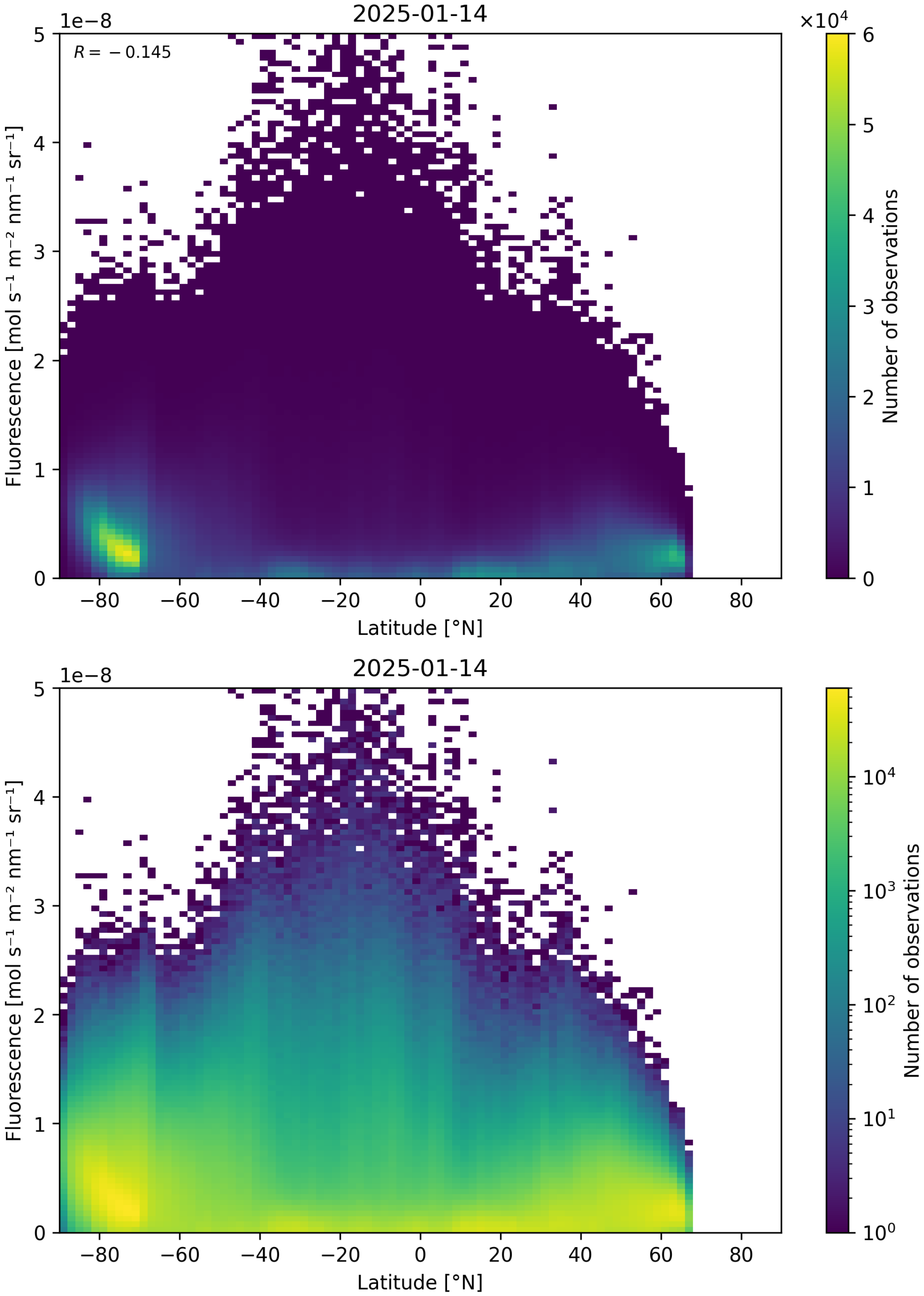


Figure 92: Scatter density plot of “Latitude” against “Fluorescence” for 2025-01-13 to 2025-01-15.

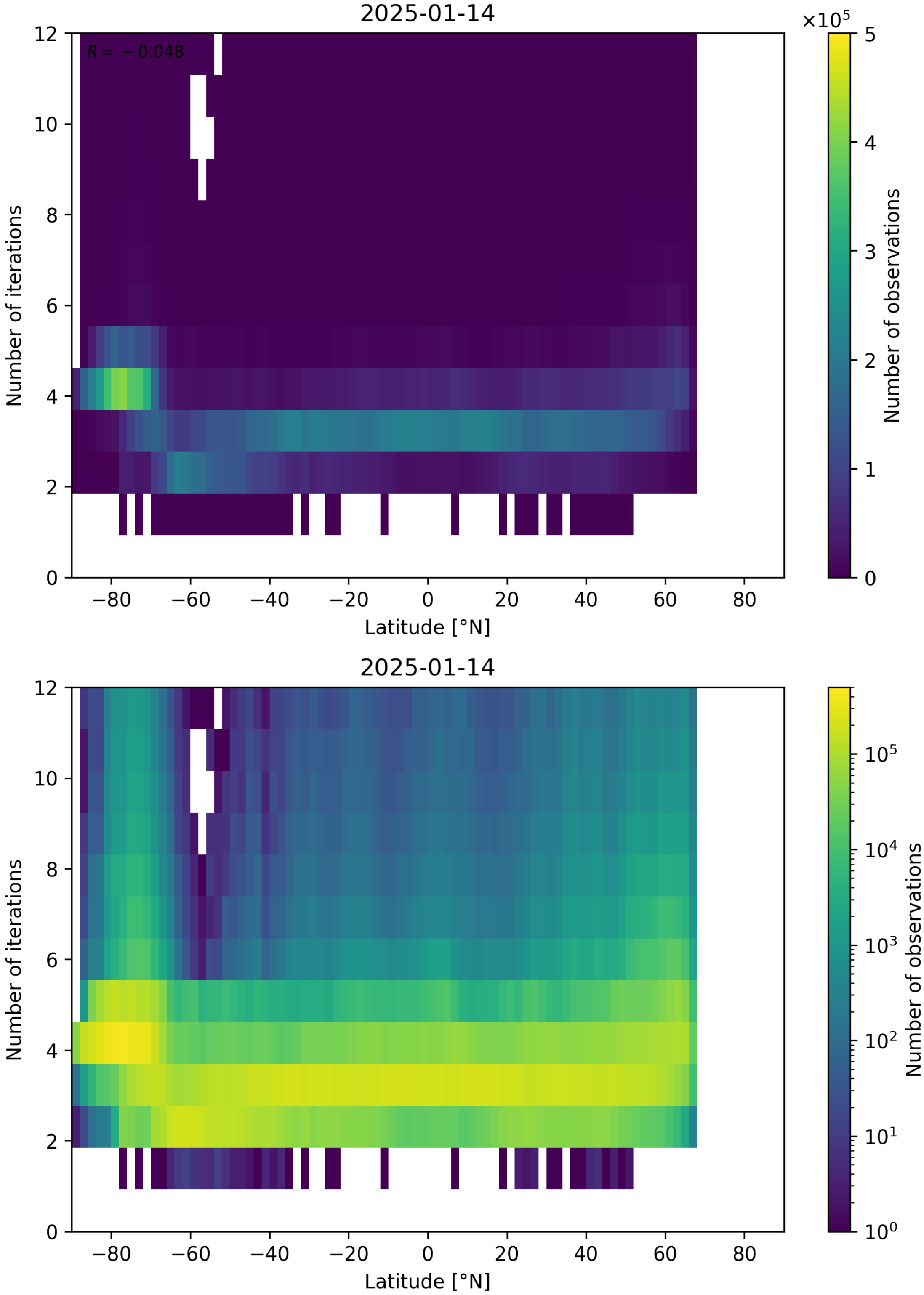


Figure 93: Scatter density plot of “Latitude” against “Number of iterations” for 2025-01-13 to 2025-01-15.

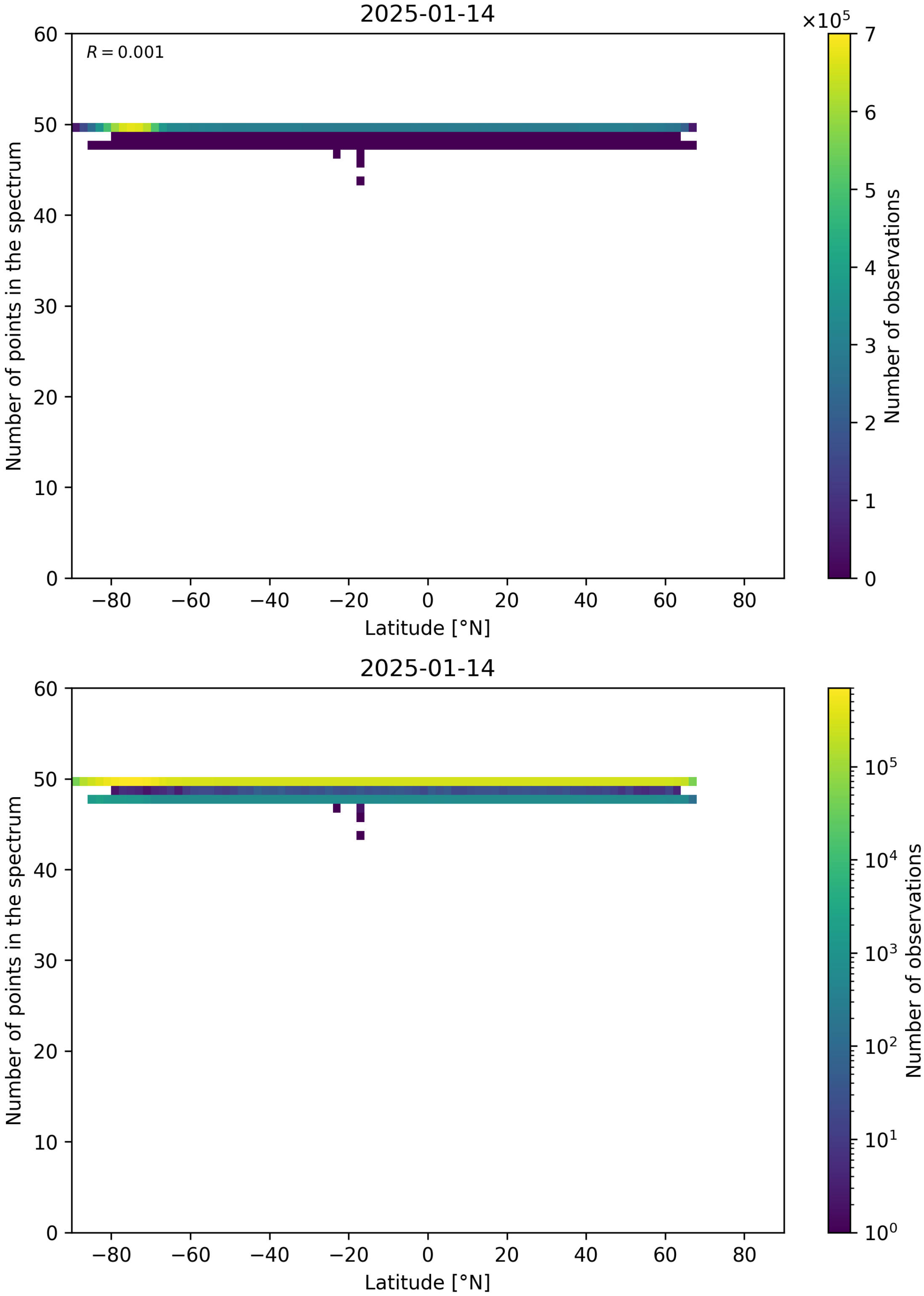


Figure 94: Scatter density plot of “Latitude” against “Number of points in the spectrum” for 2025-01-13 to 2025-01-15.

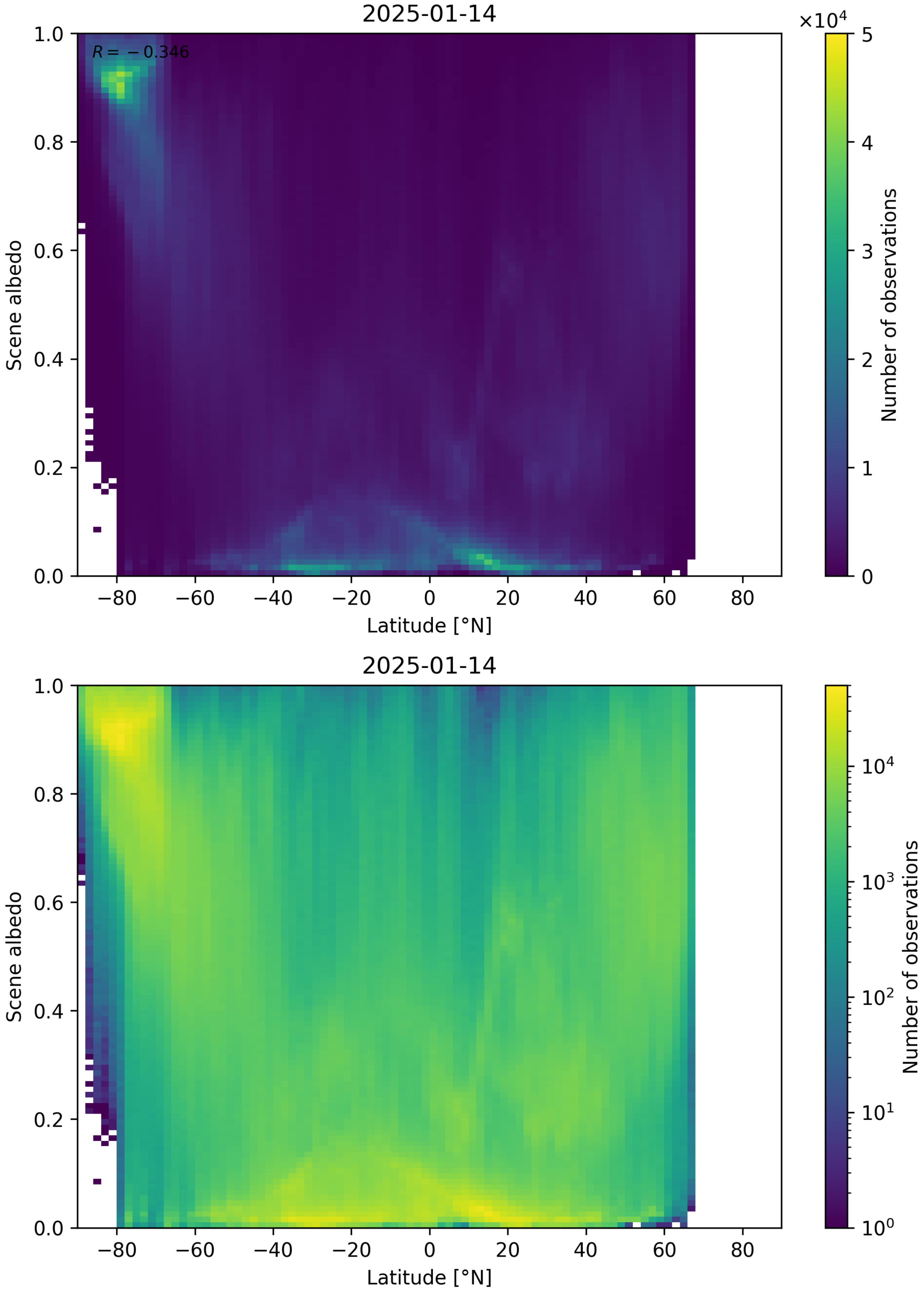


Figure 95: Scatter density plot of “Latitude” against “Scene albedo” for 2025-01-13 to 2025-01-15.

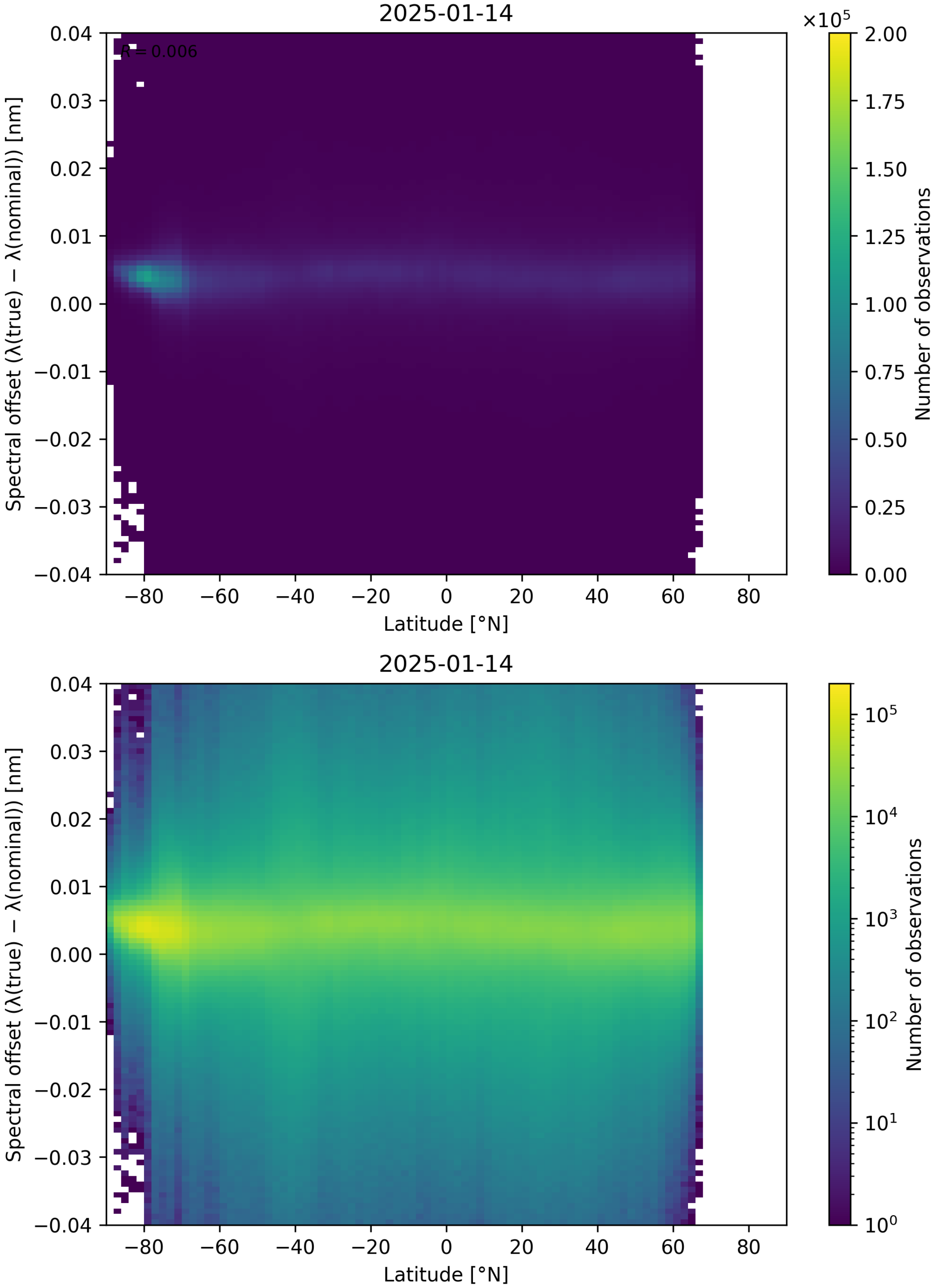


Figure 96: Scatter density plot of “Latitude” against “Spectral offset ($\lambda_{\text{true}} - \lambda_{\text{nominal}}$)” for 2025-01-13 to 2025-01-15.

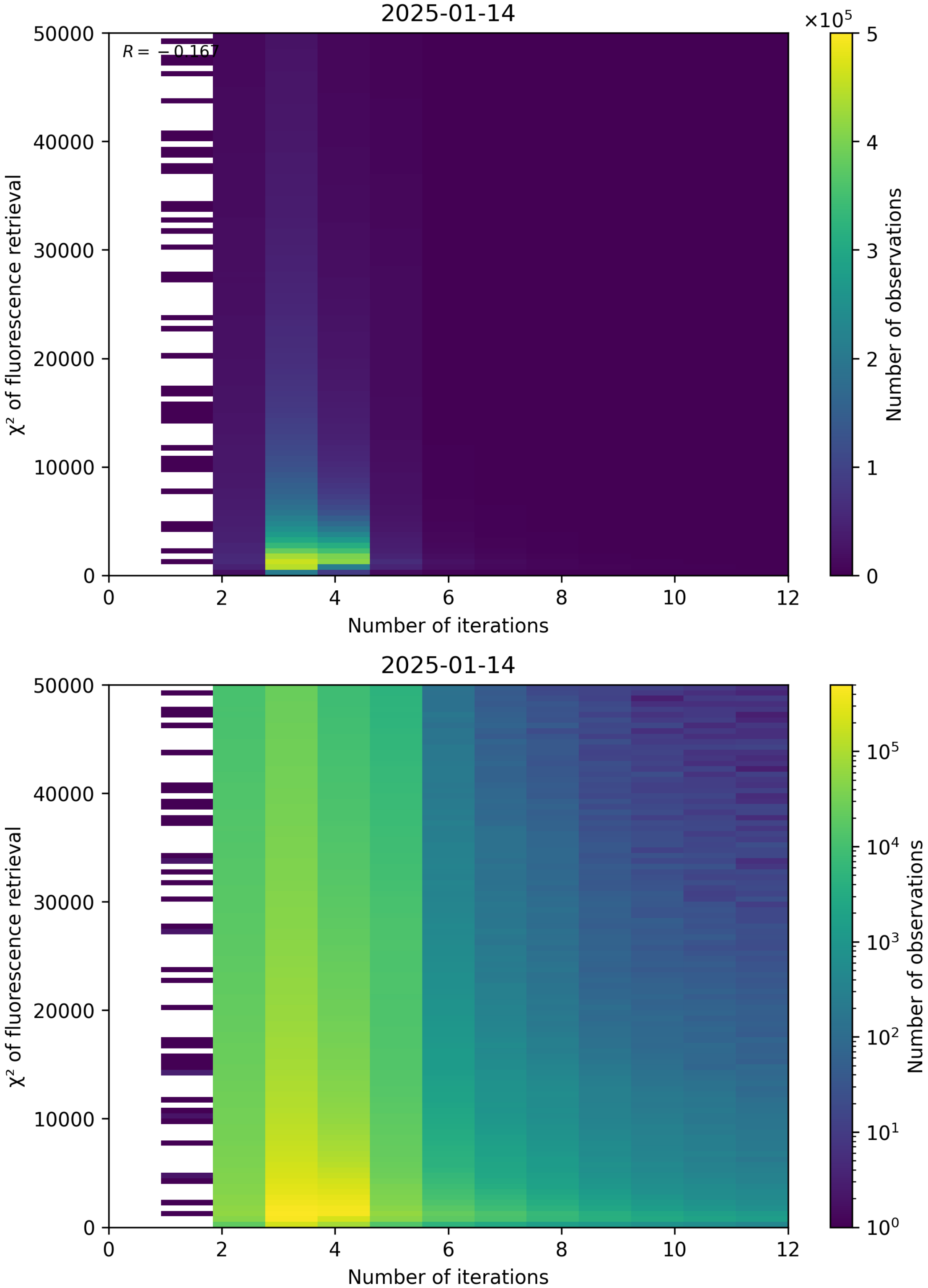


Figure 97: Scatter density plot of “Number of iterations” against “χ^2 of fluorescence retrieval” for 2025-01-13 to 2025-01-15.

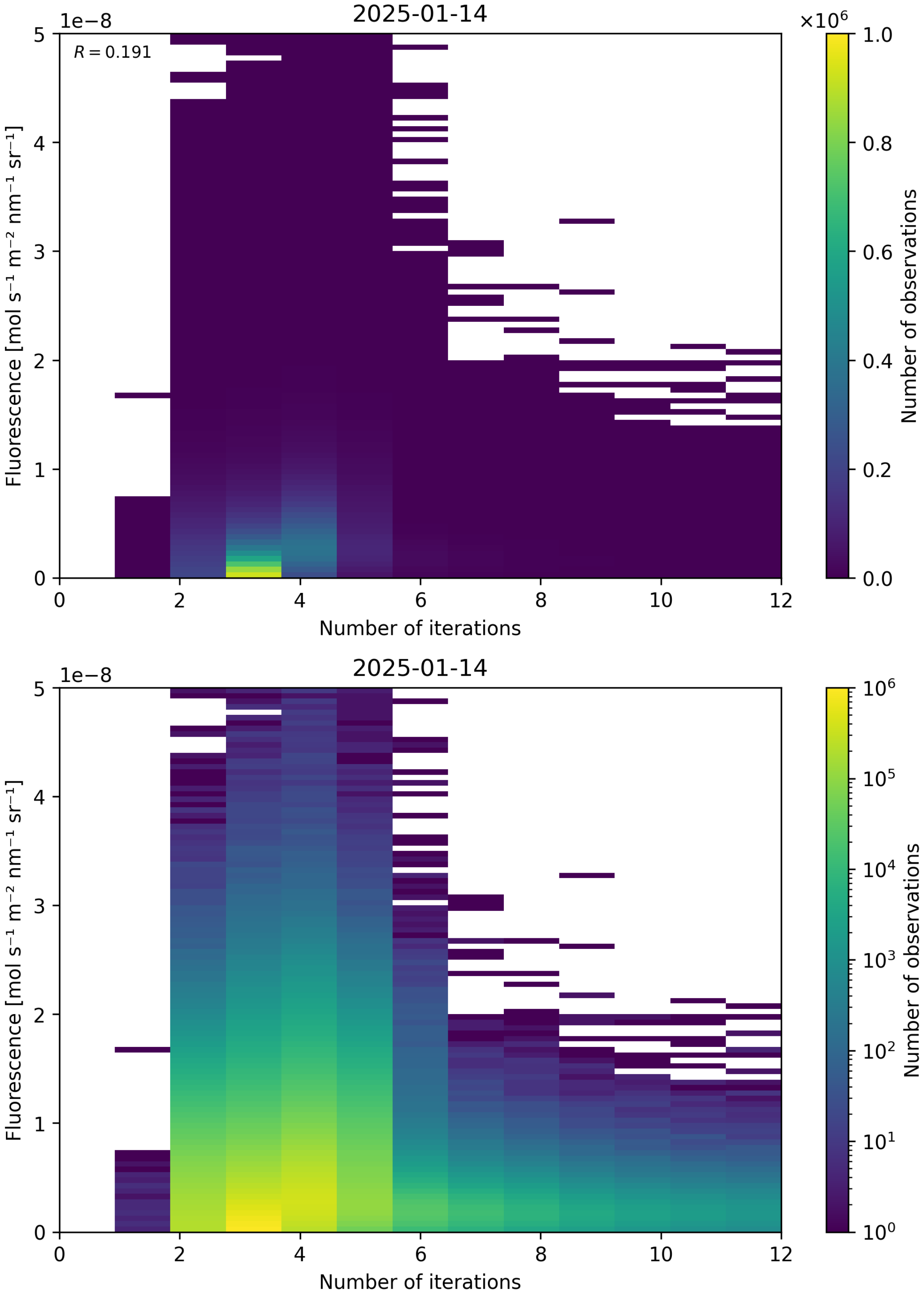
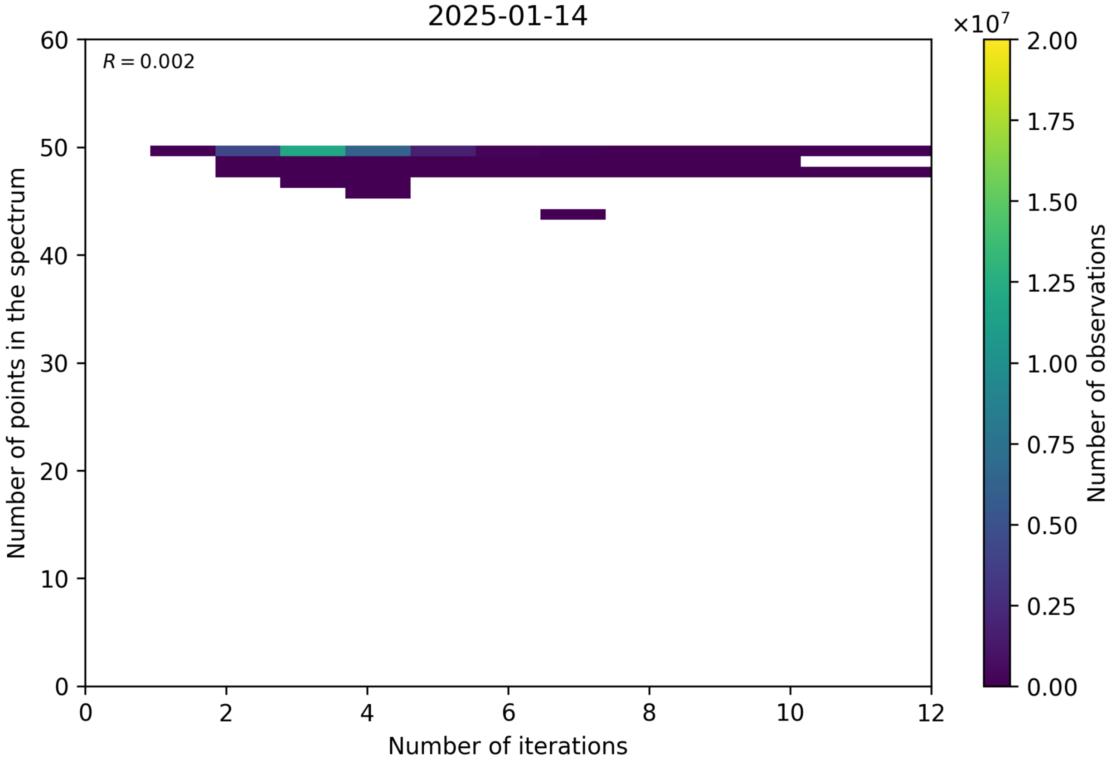
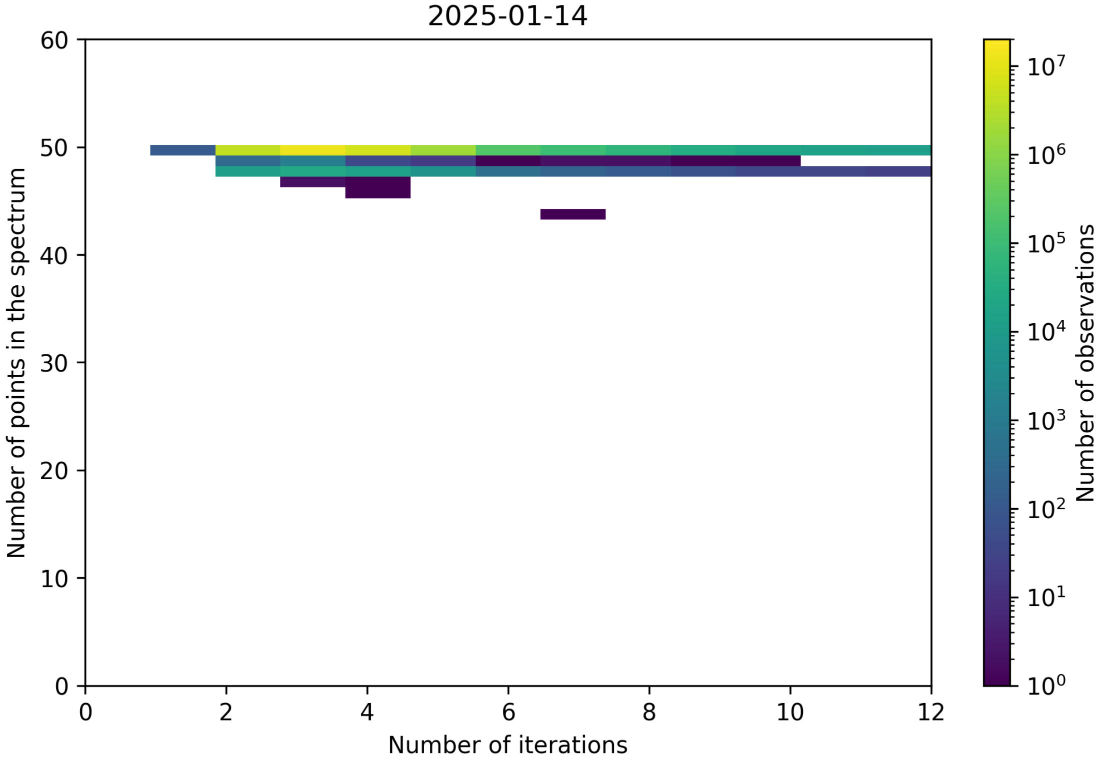


Figure 98: Scatter density plot of “Number of iterations” against “Fluorescence” for 2025-01-13 to 2025-01-15.





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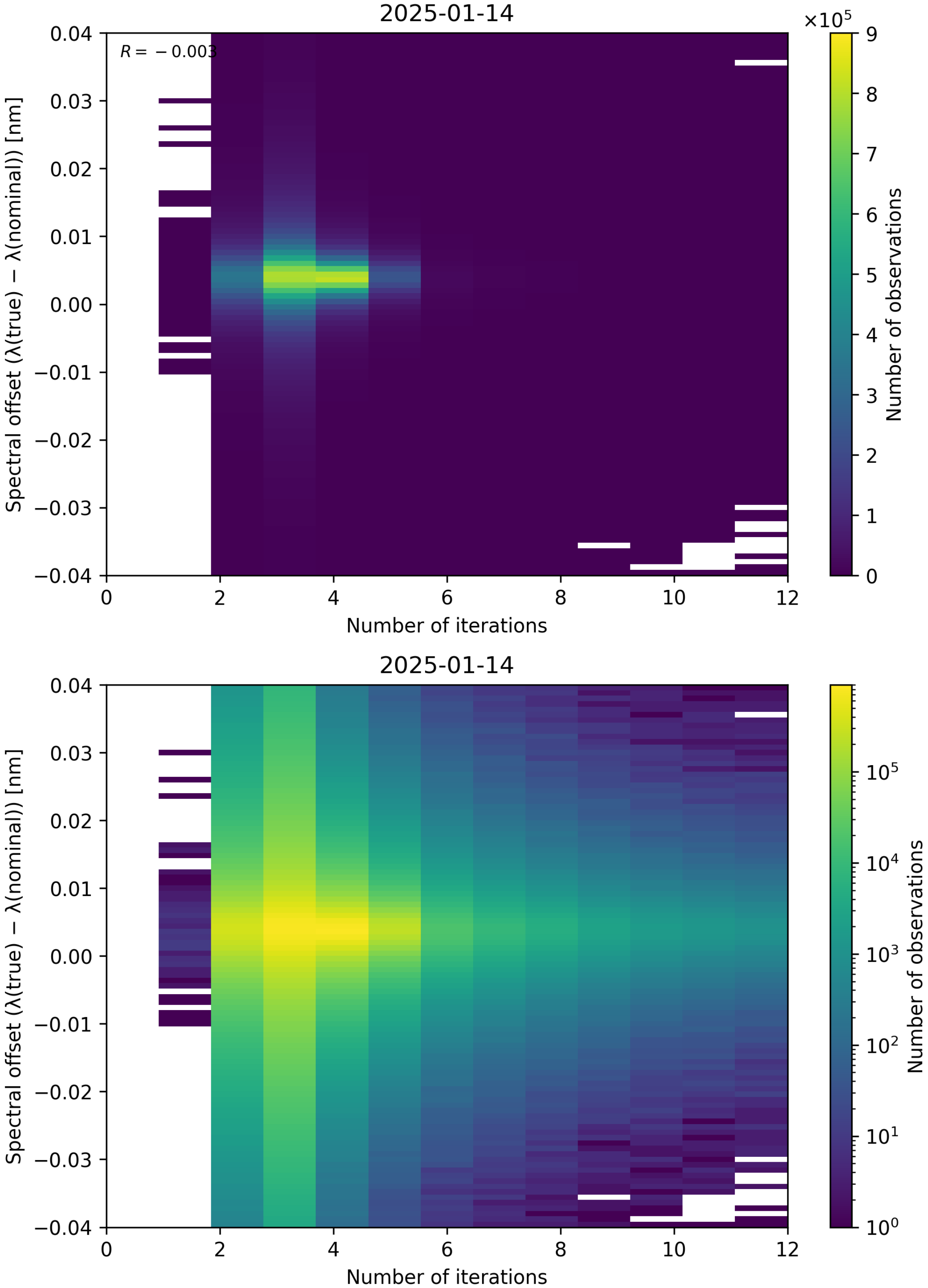

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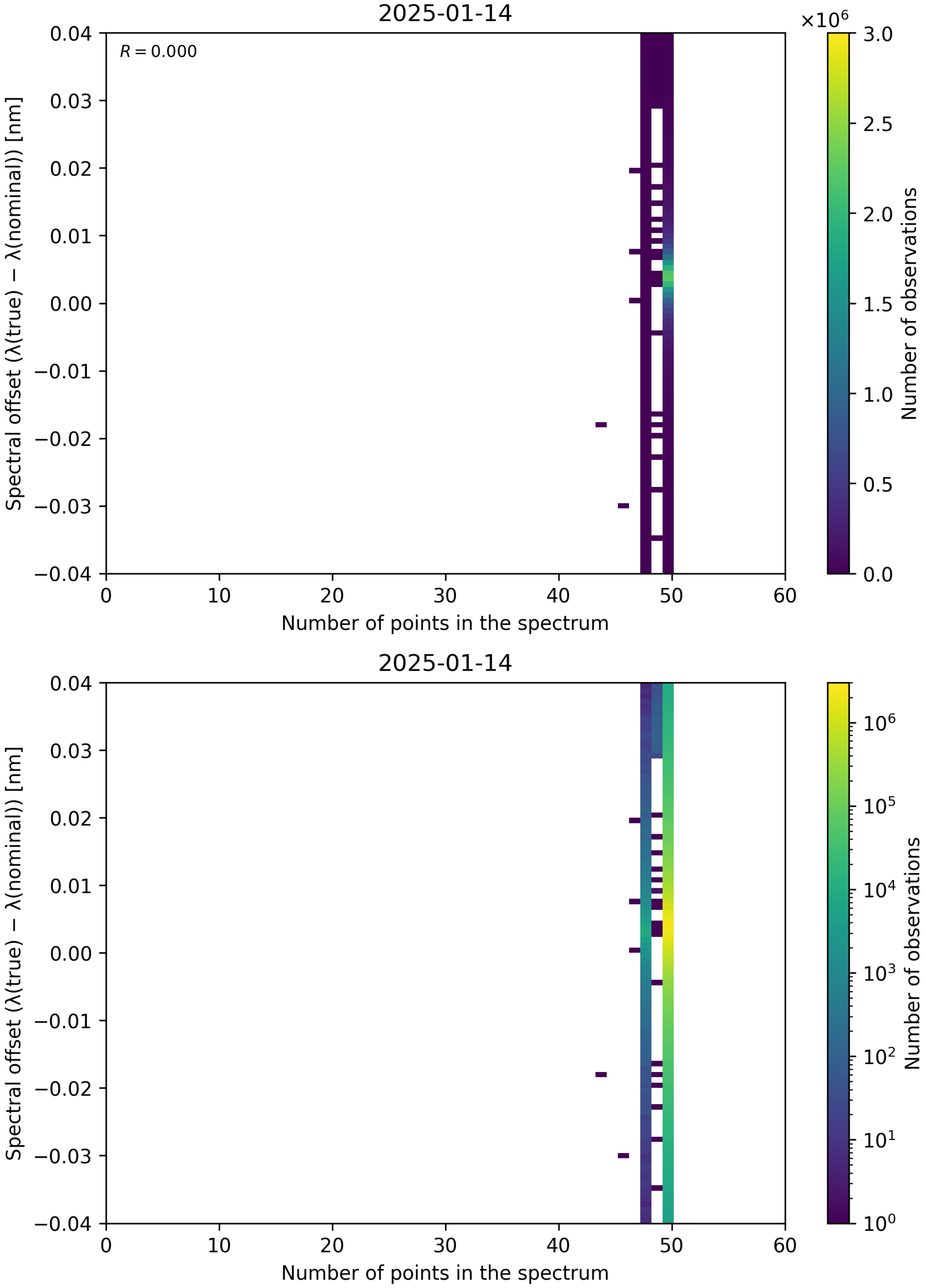

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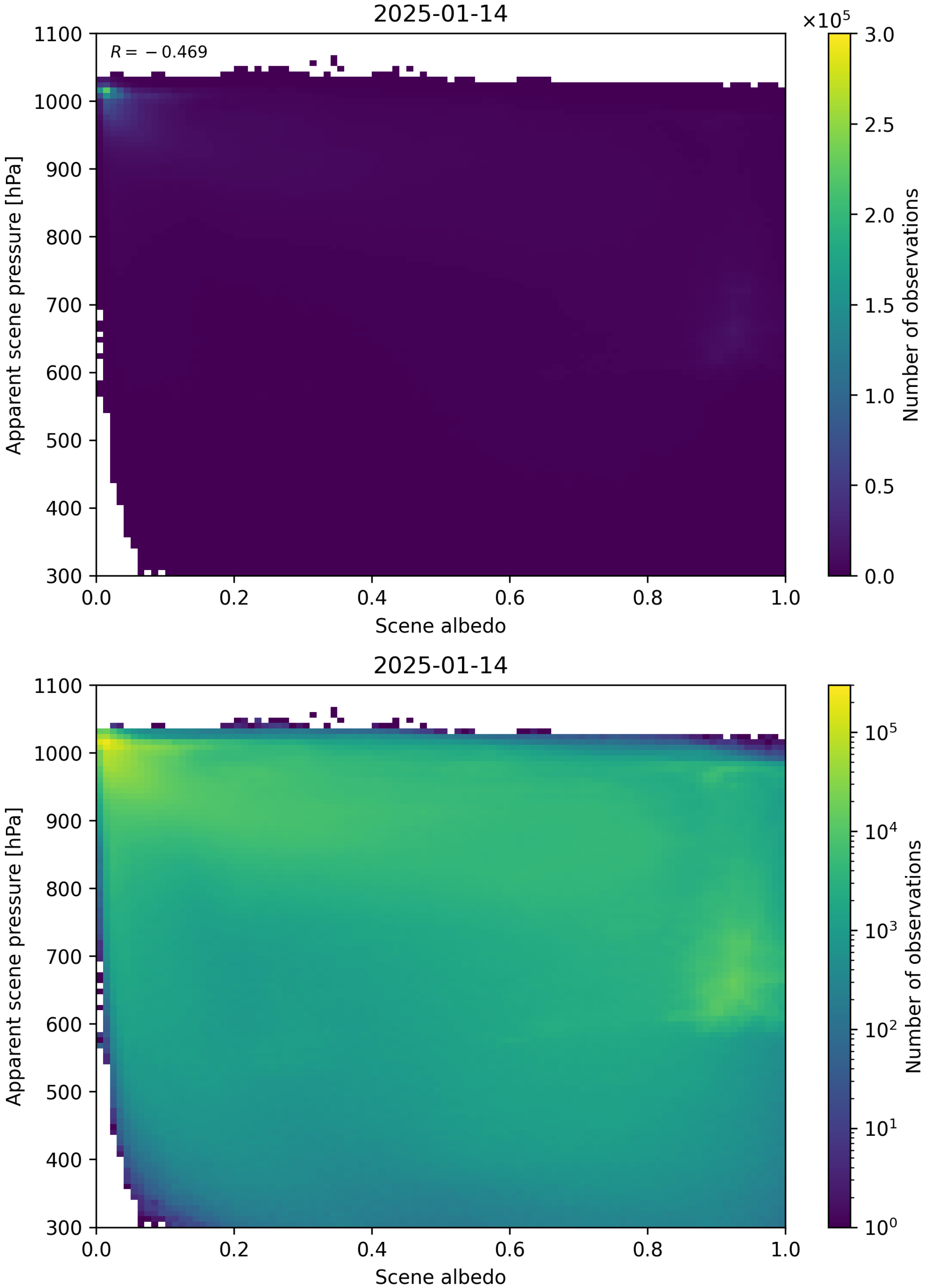

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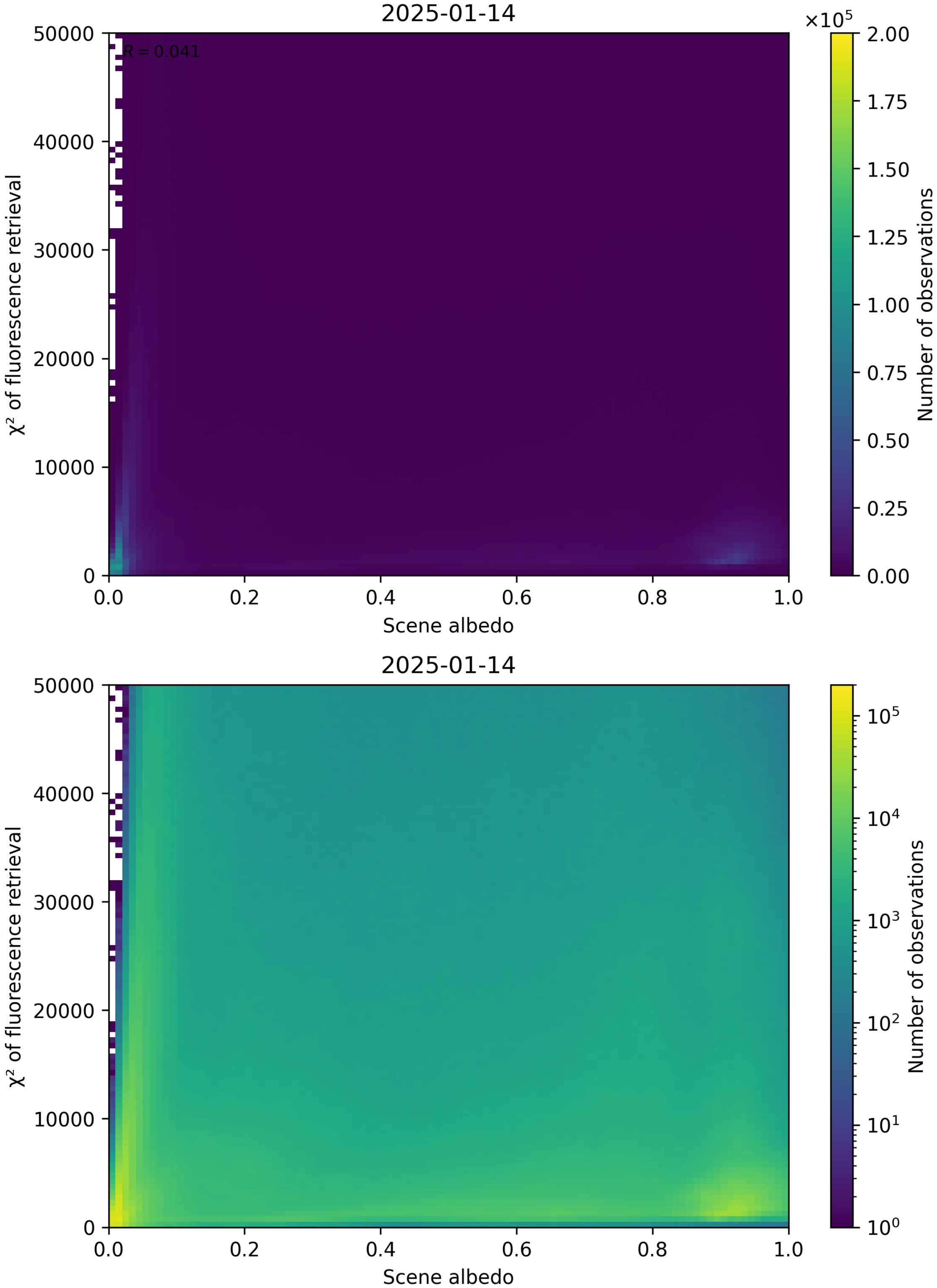

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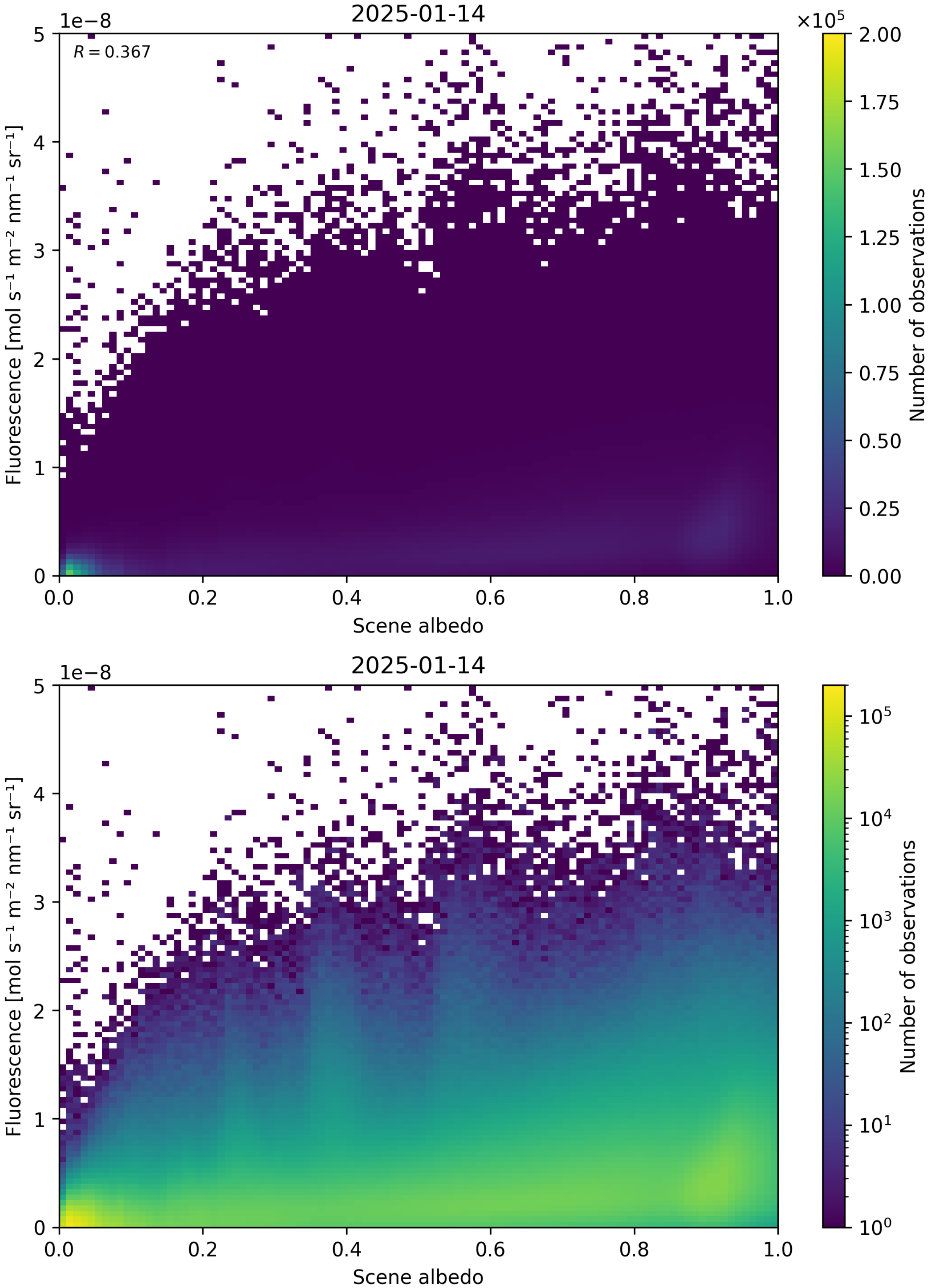

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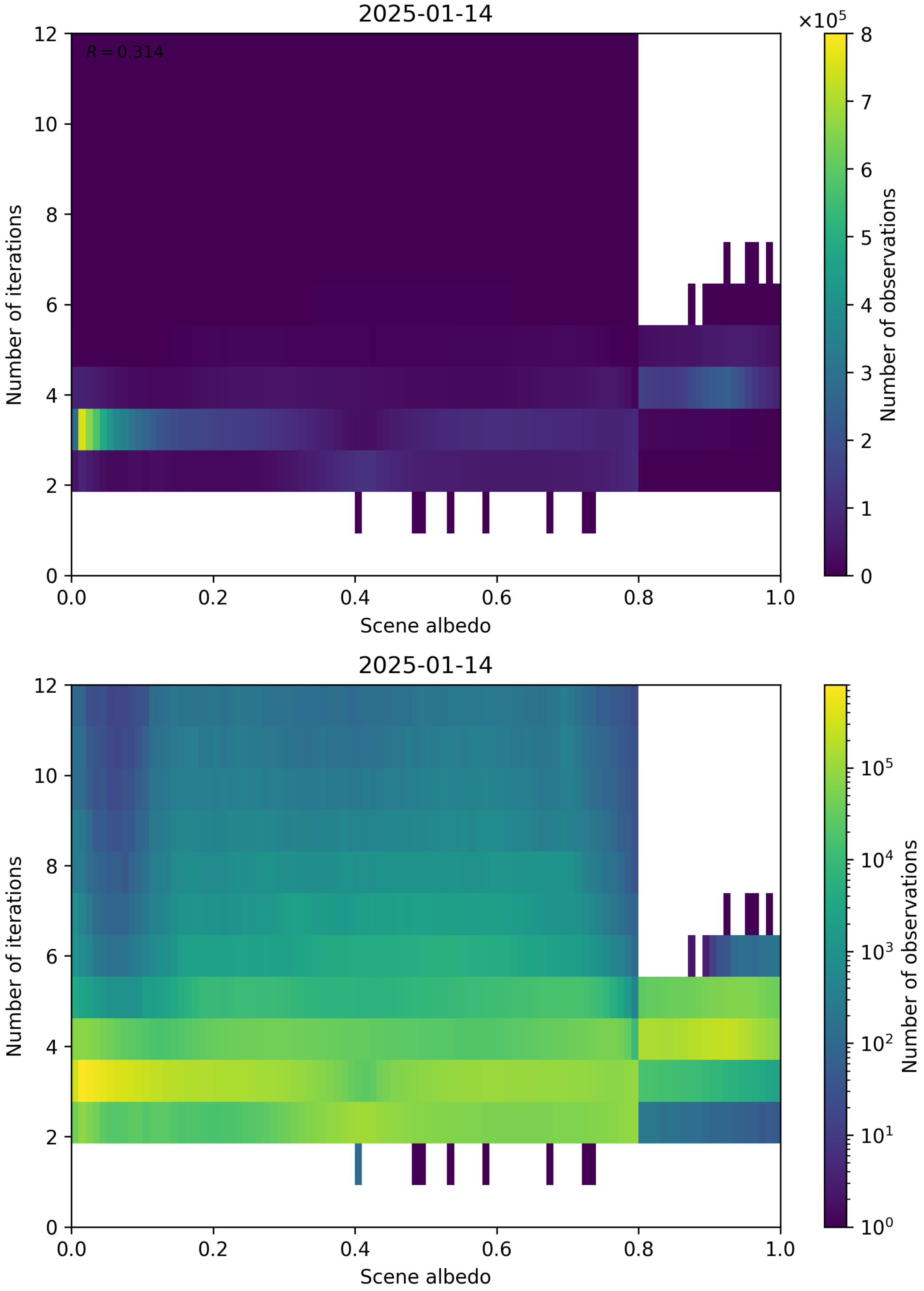

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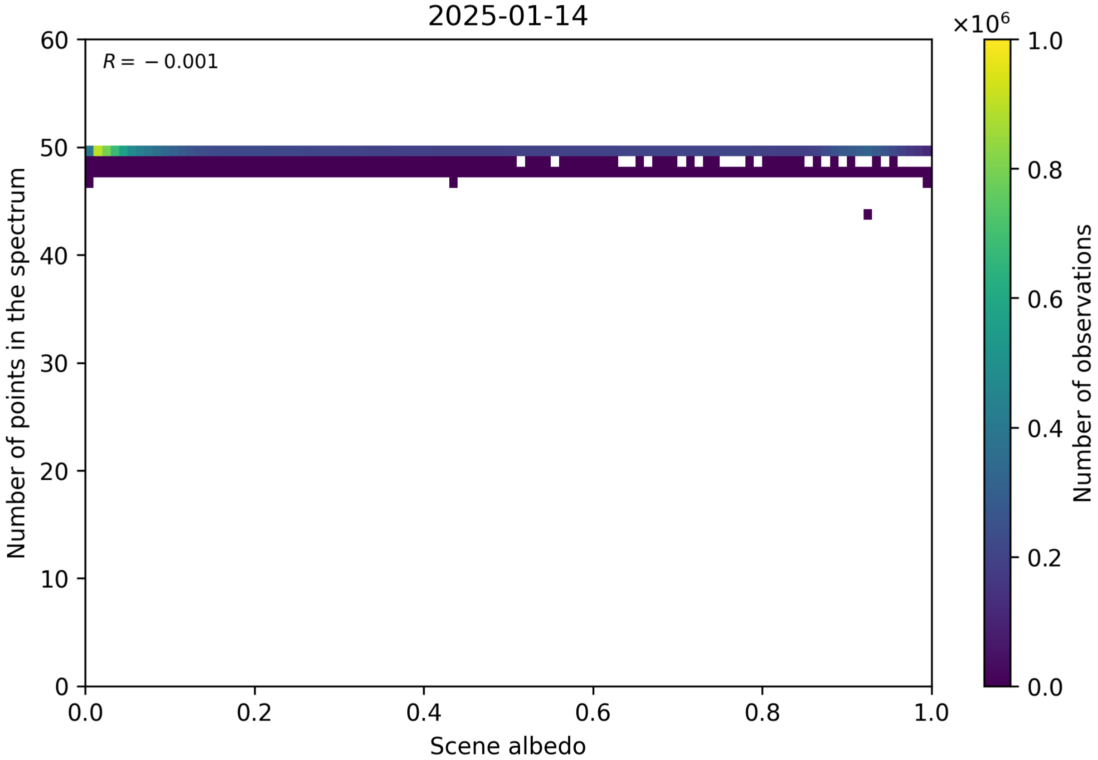

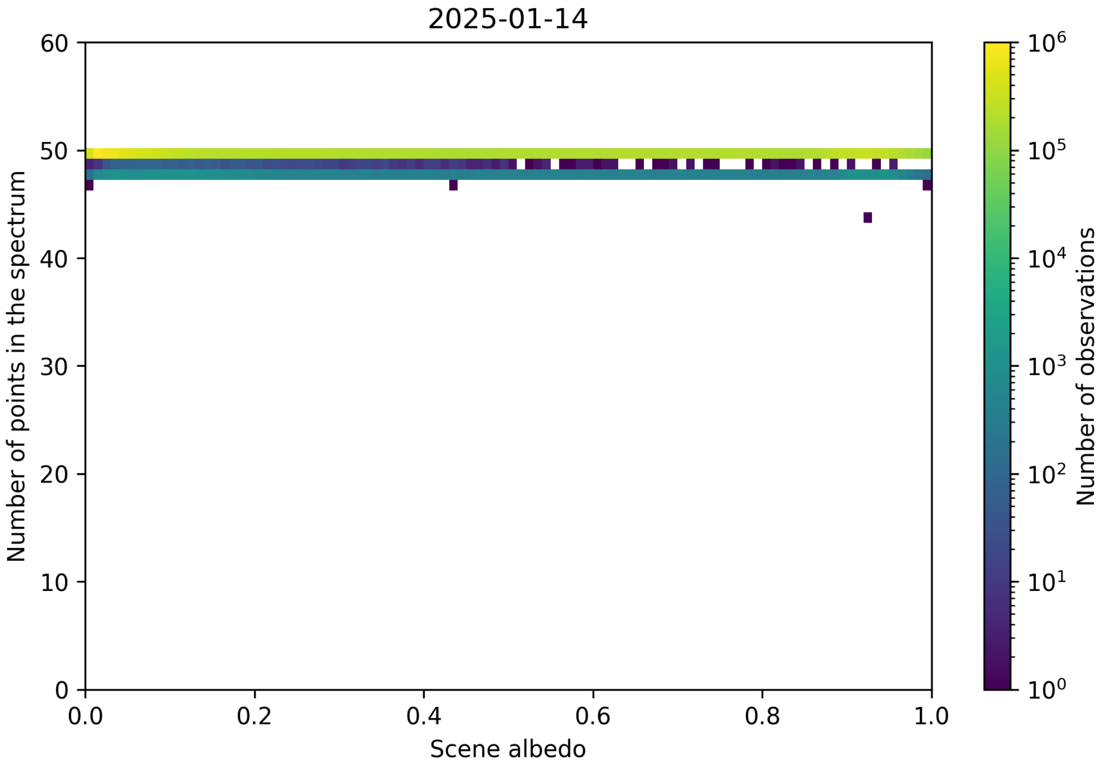

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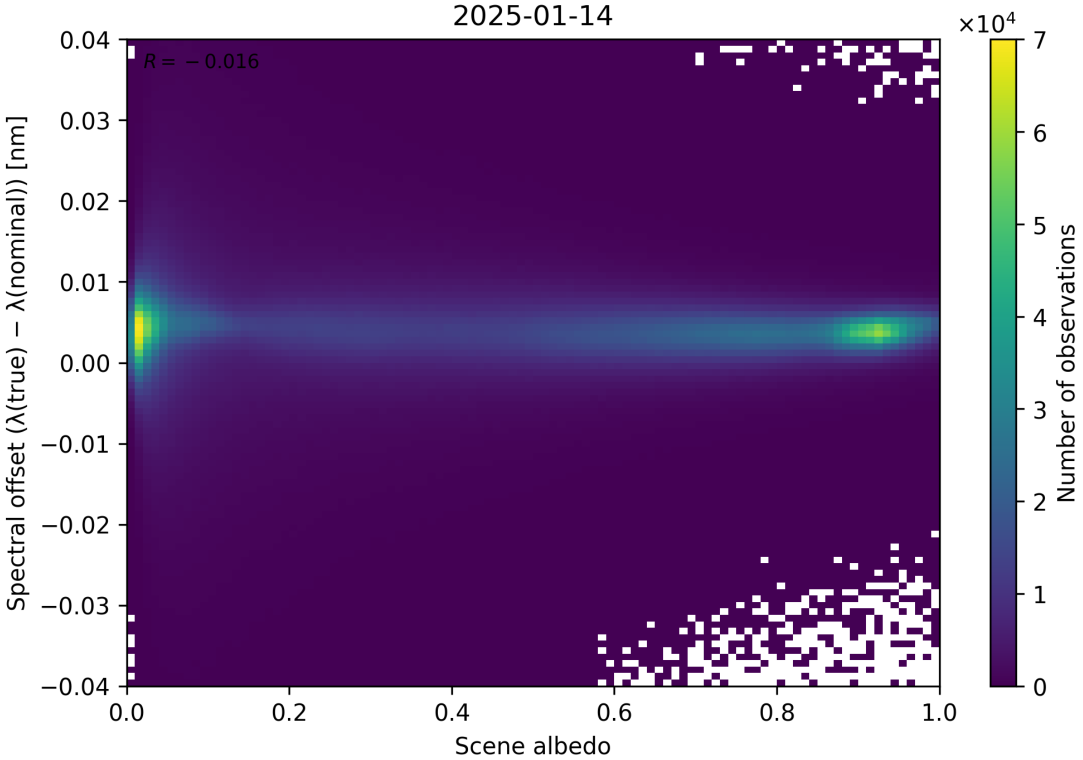

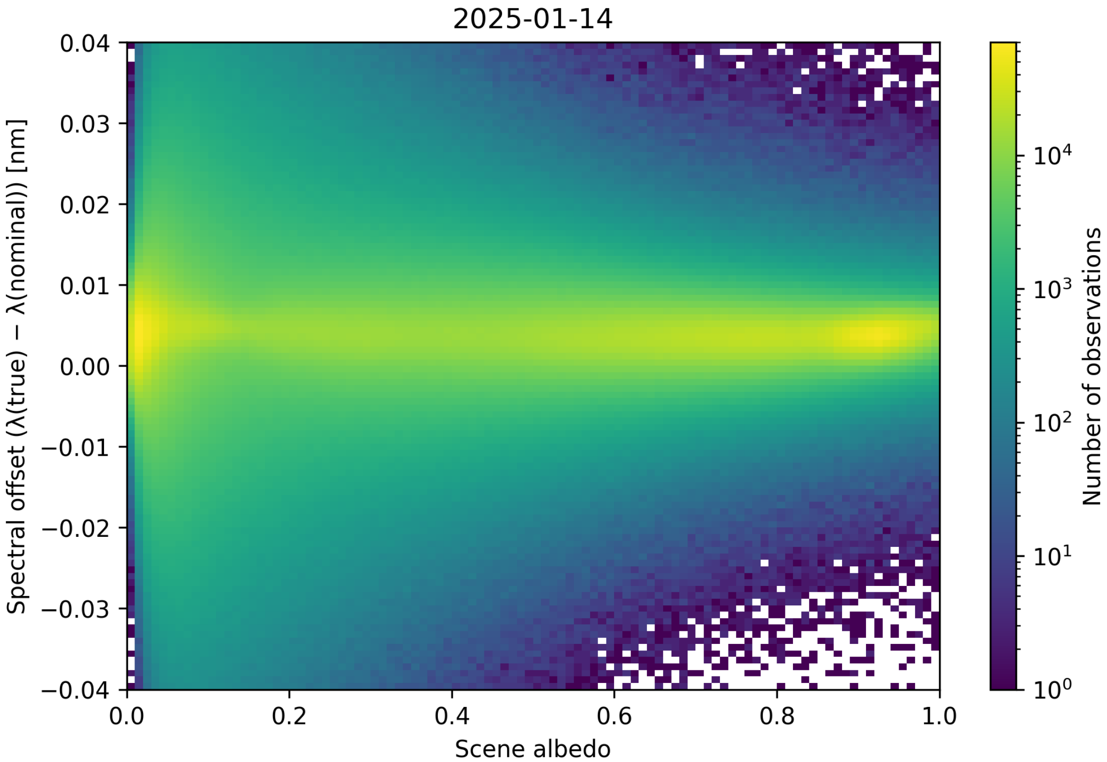

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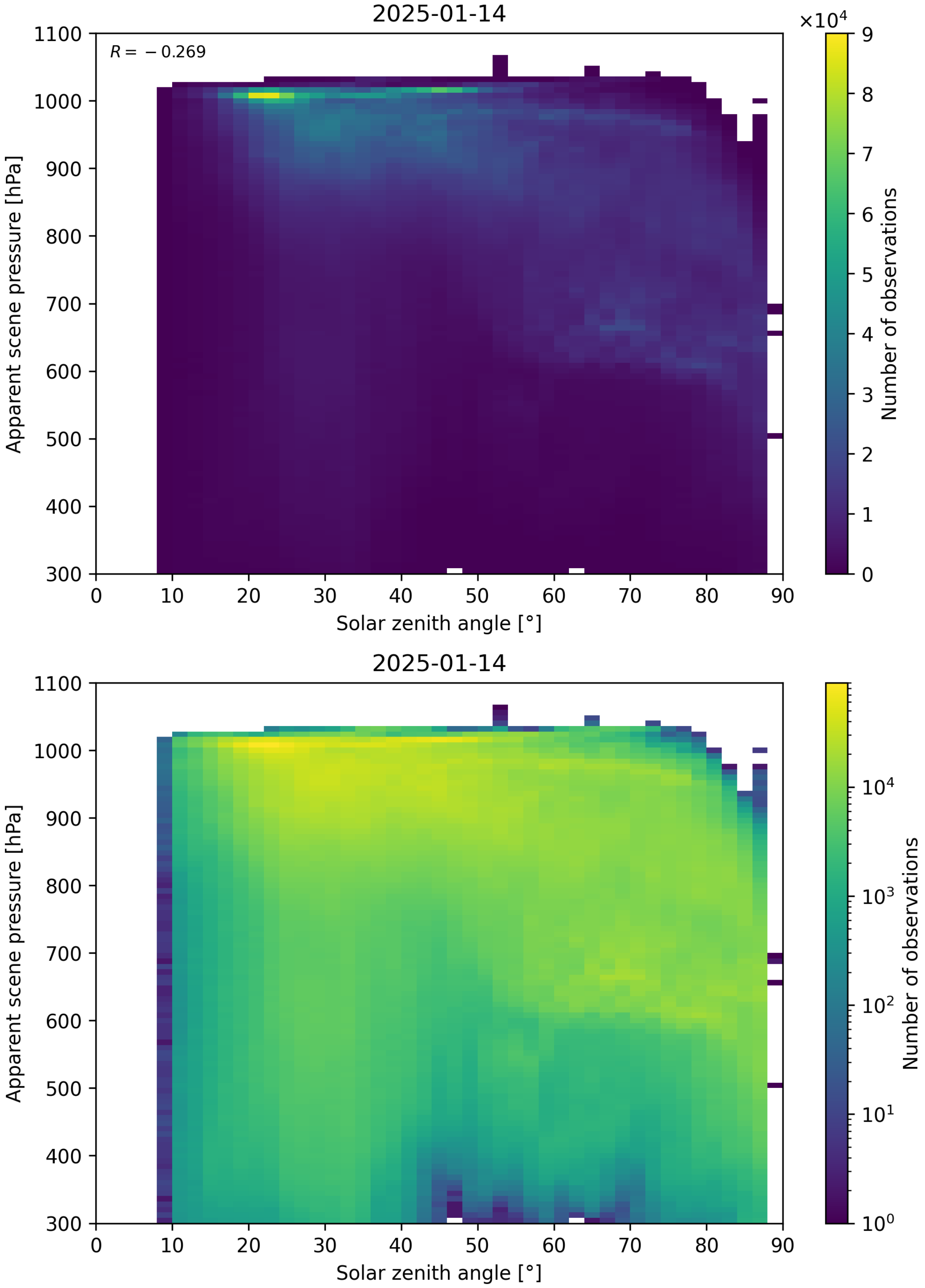

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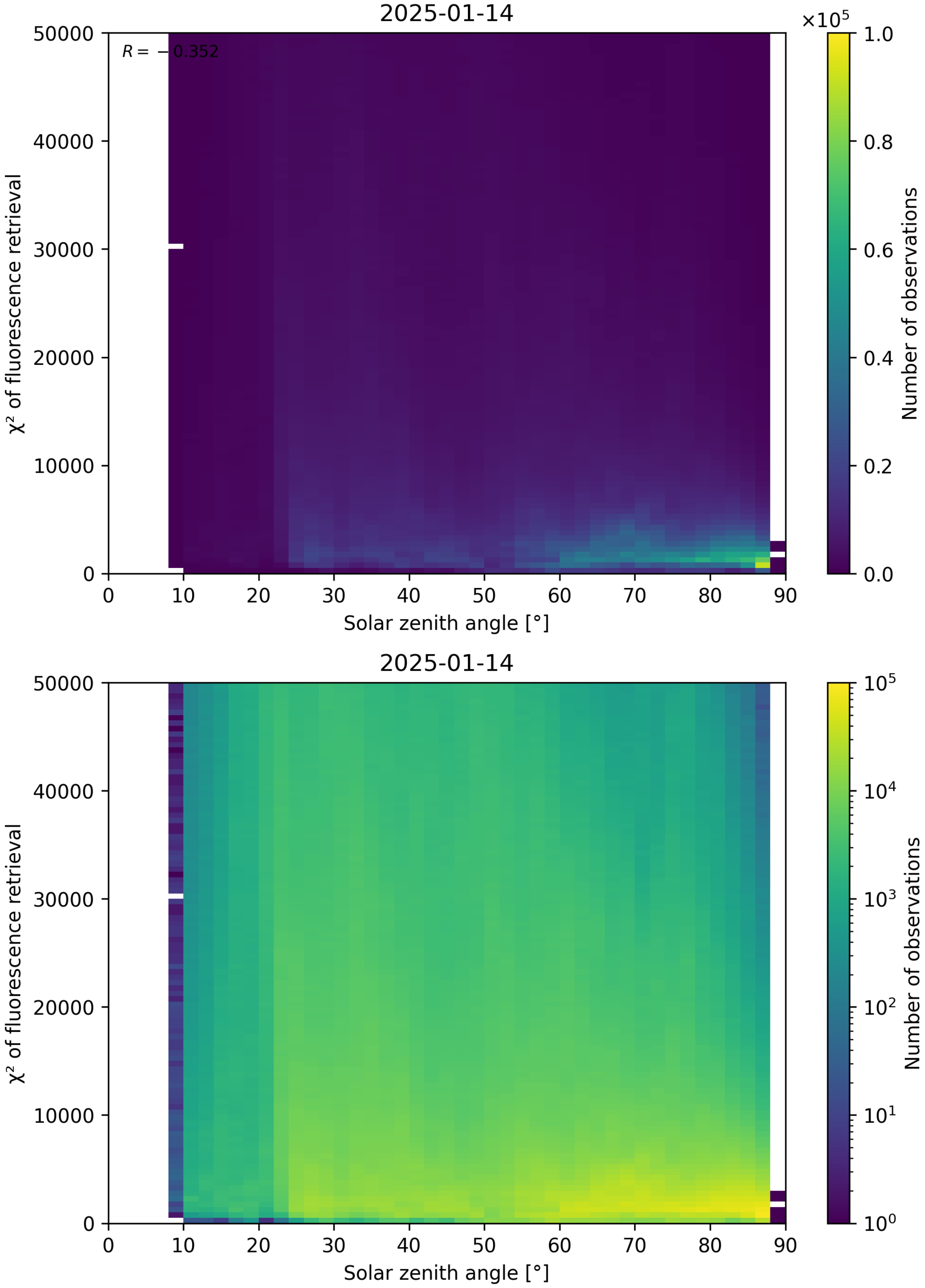

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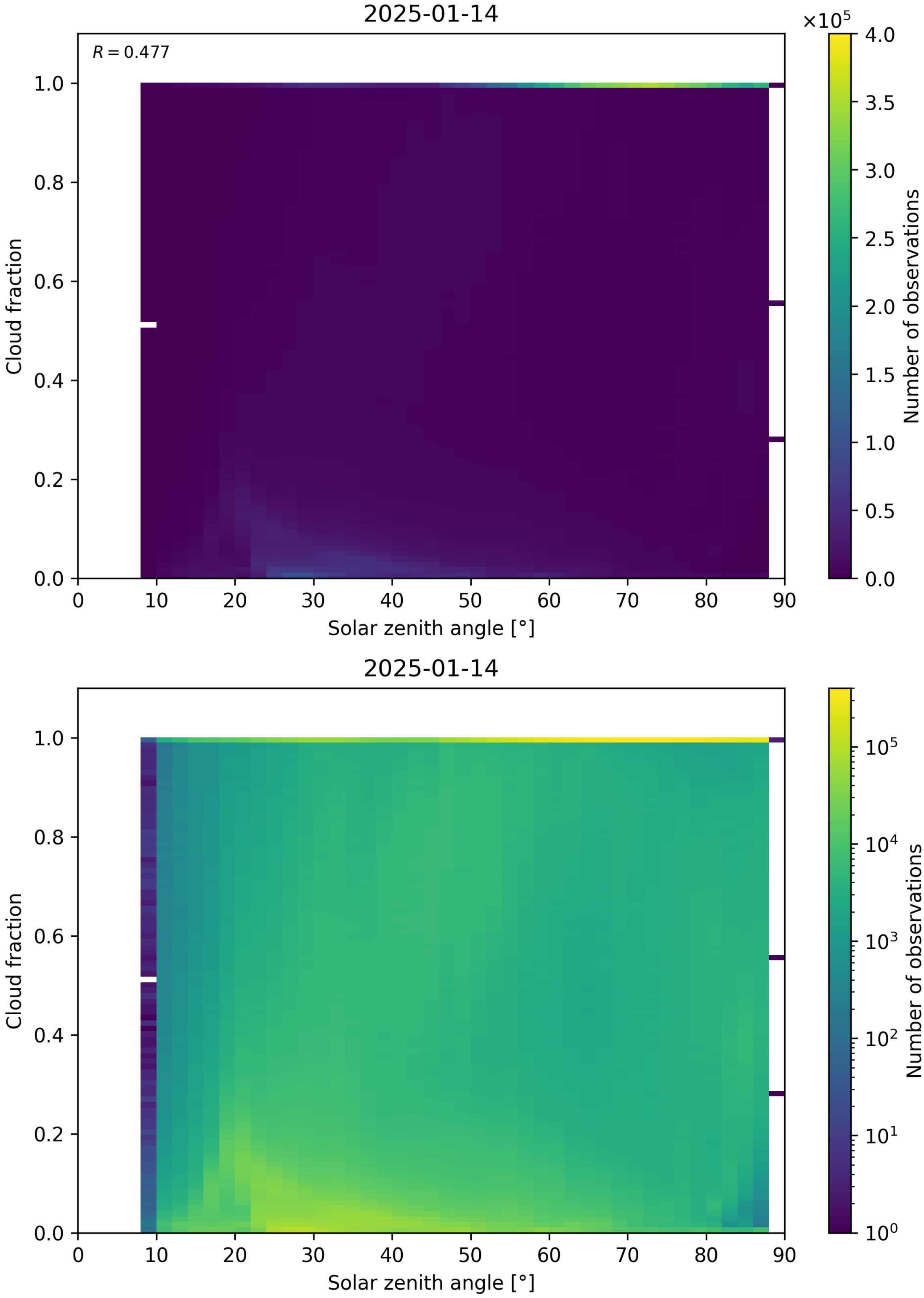

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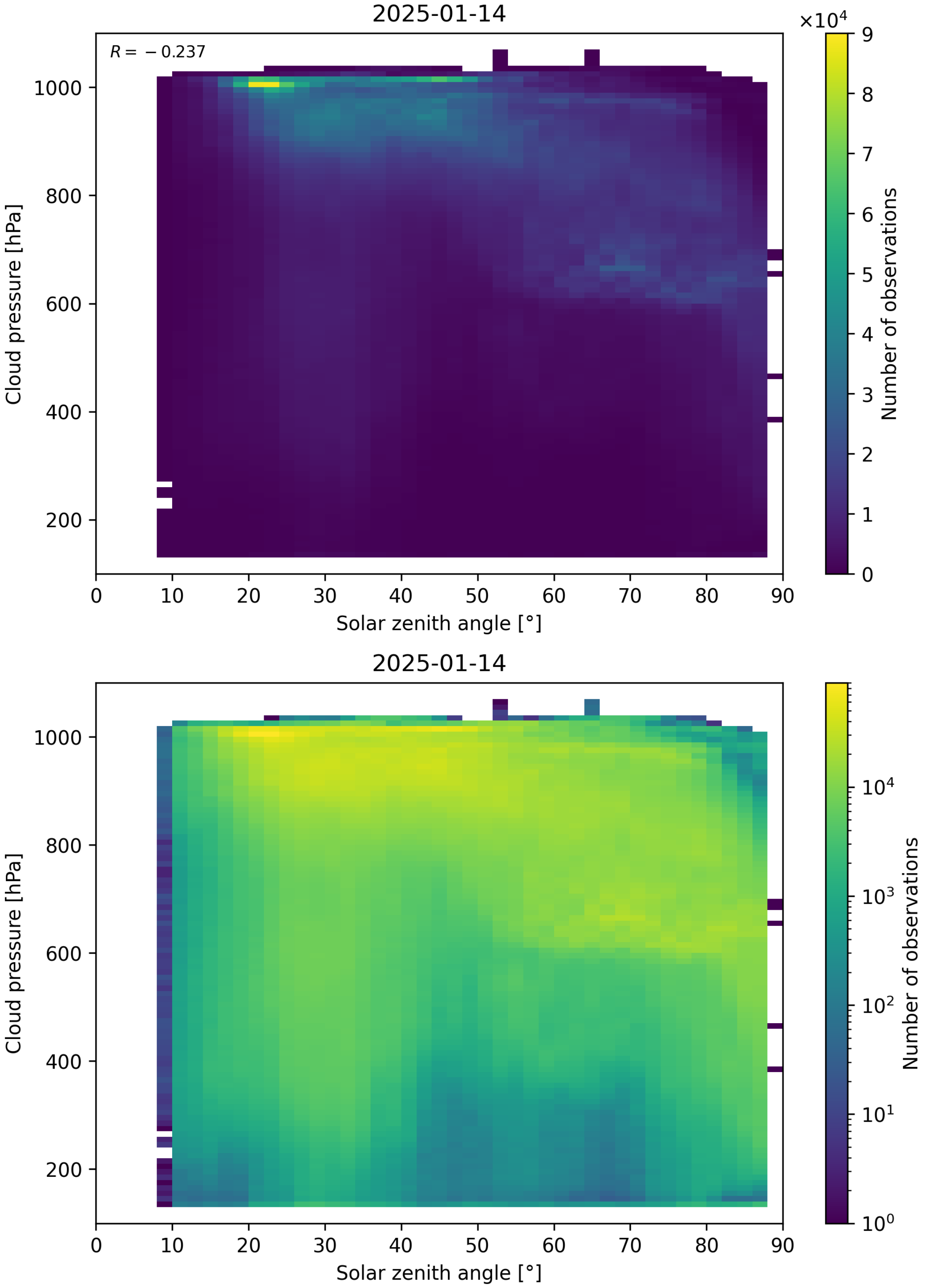

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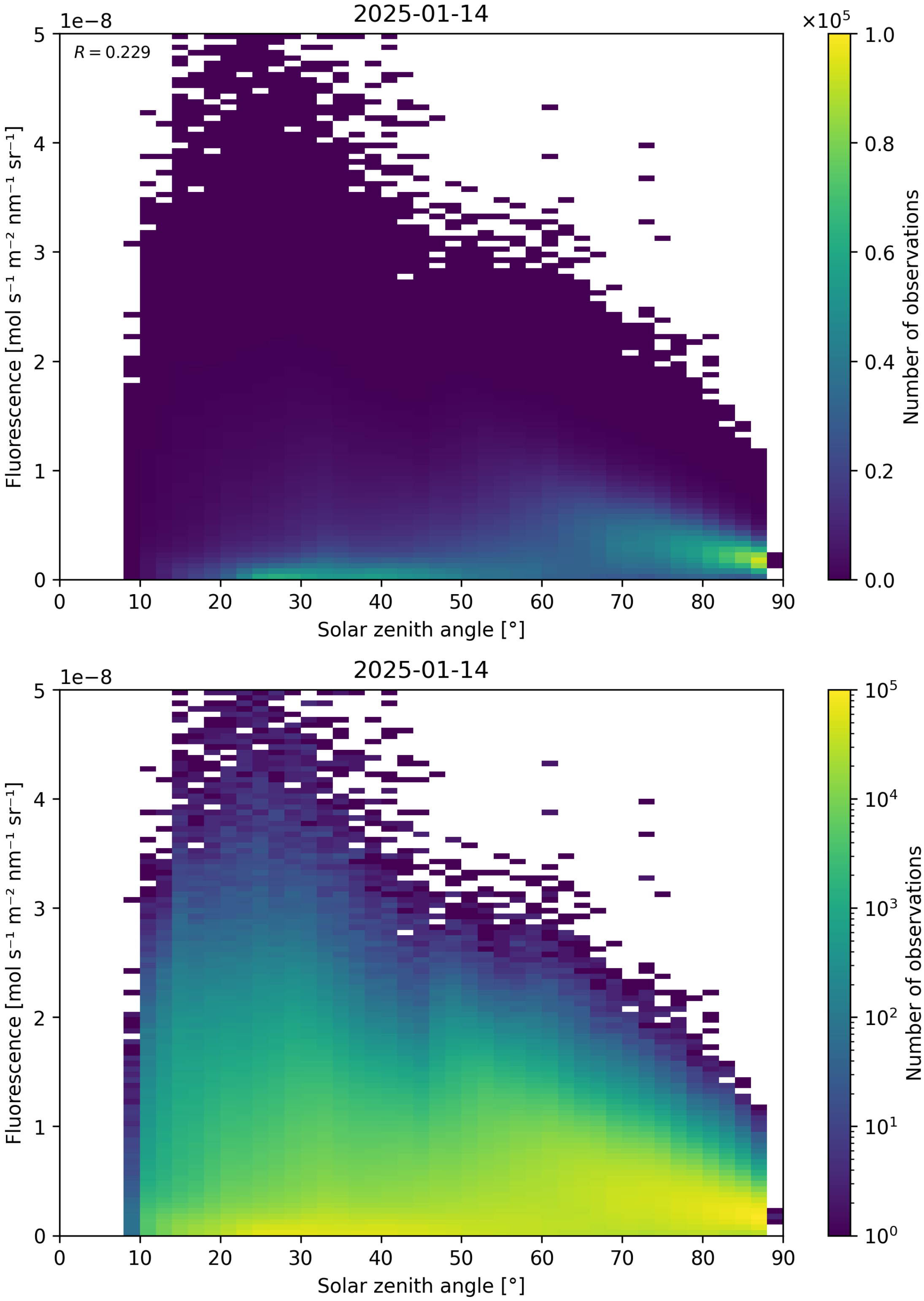

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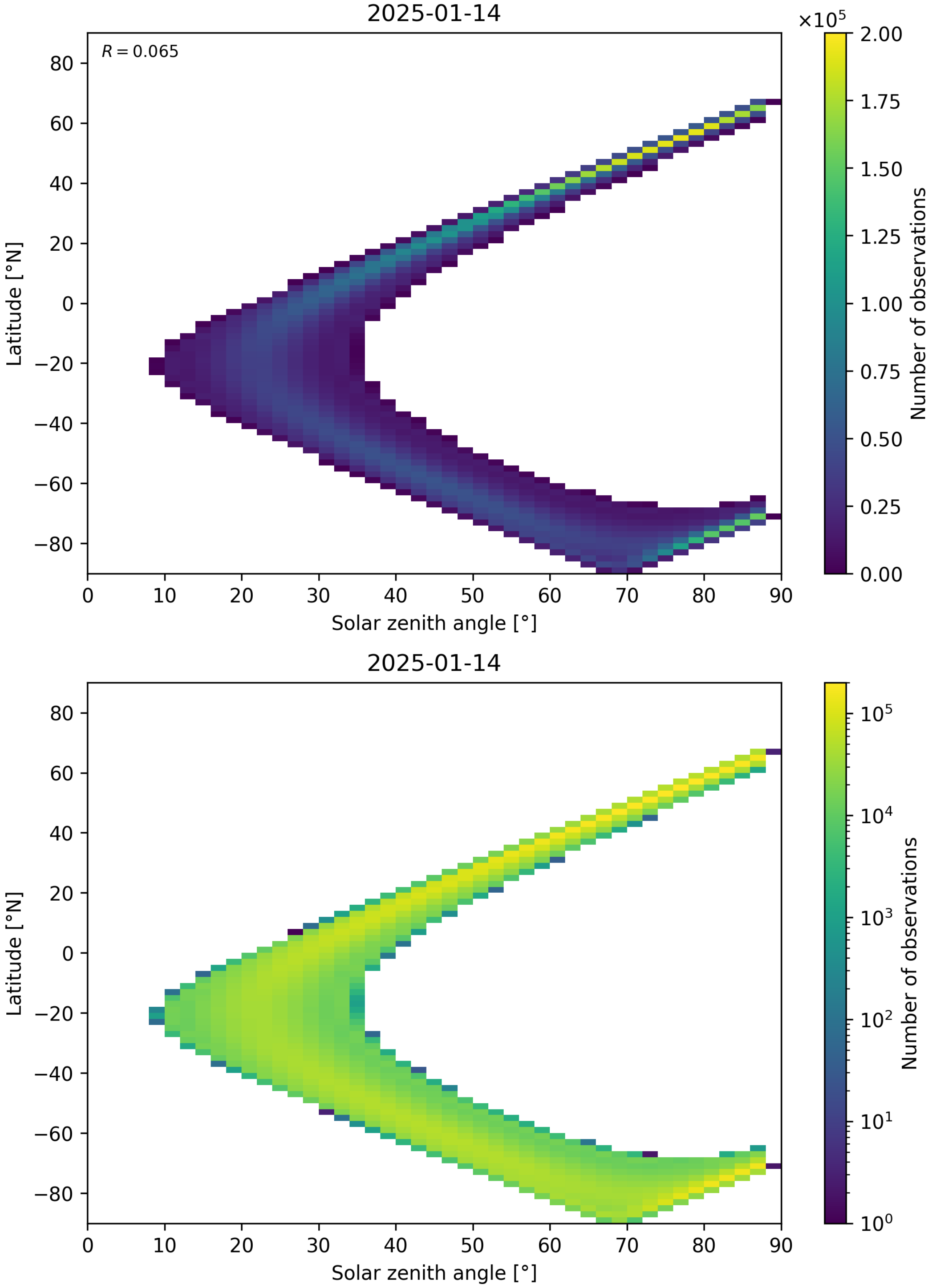

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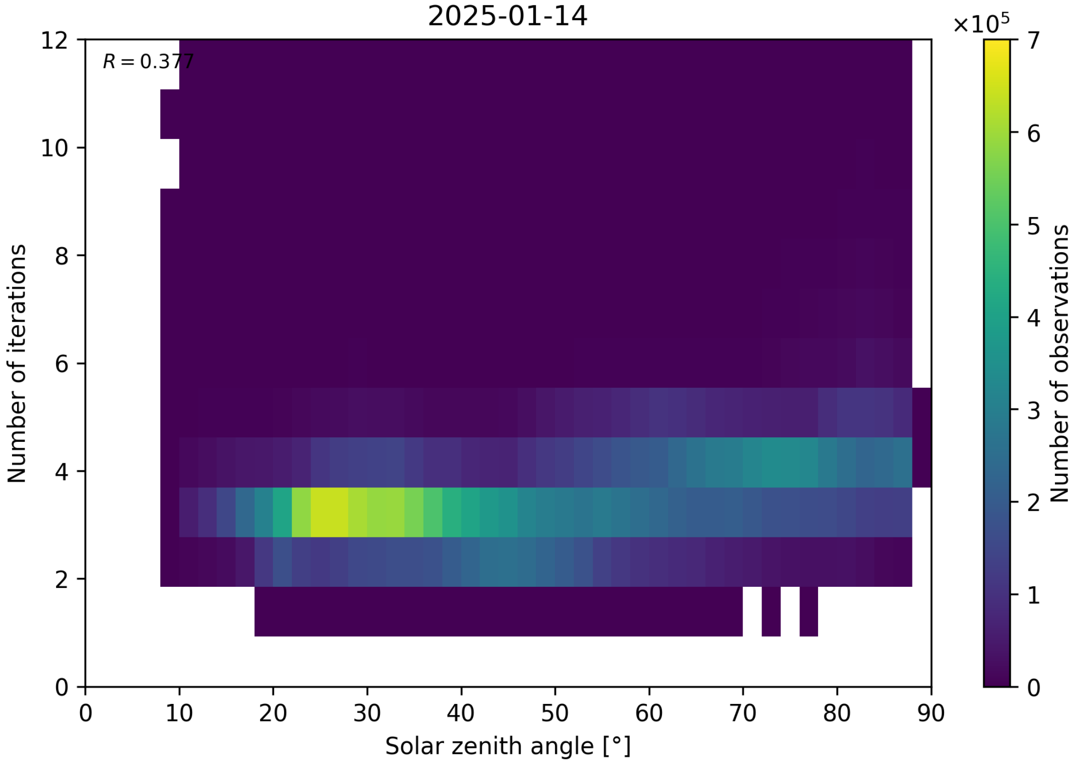

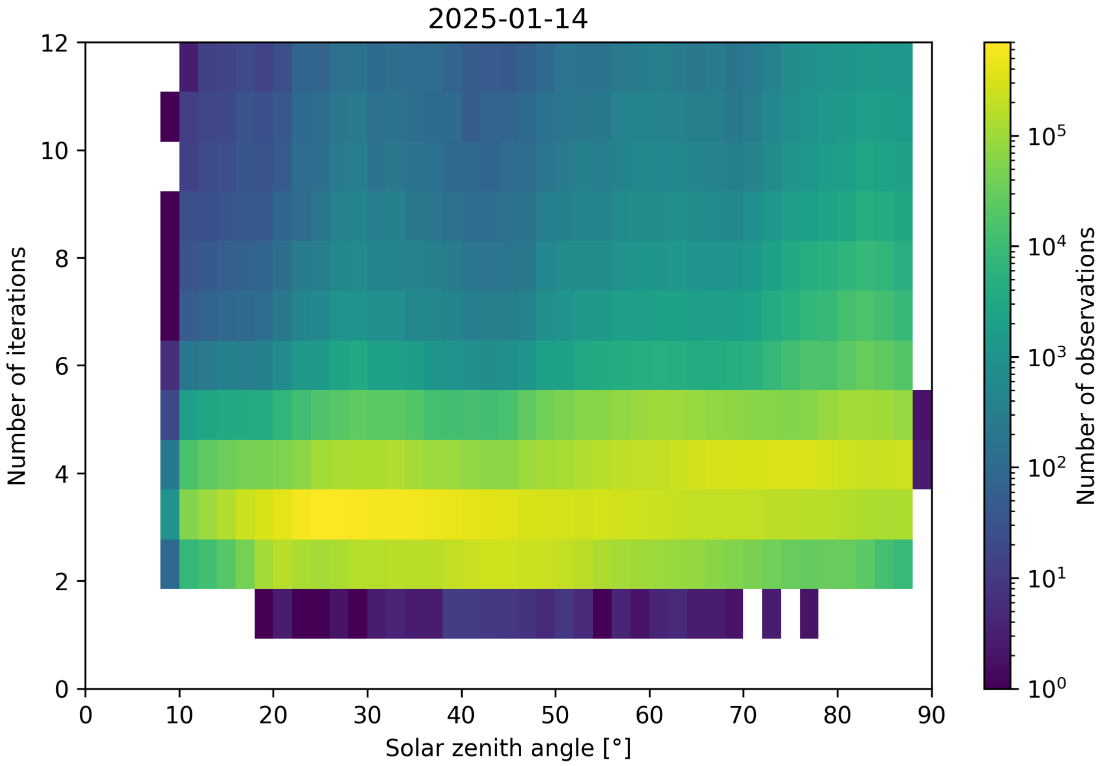

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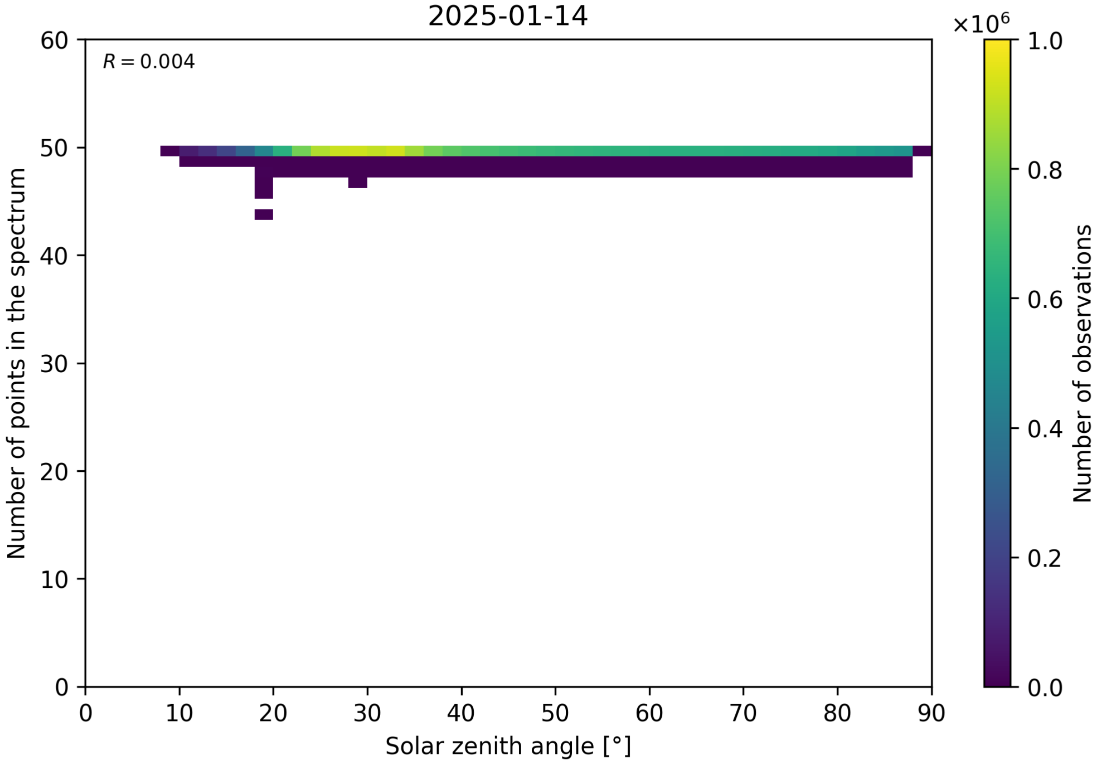

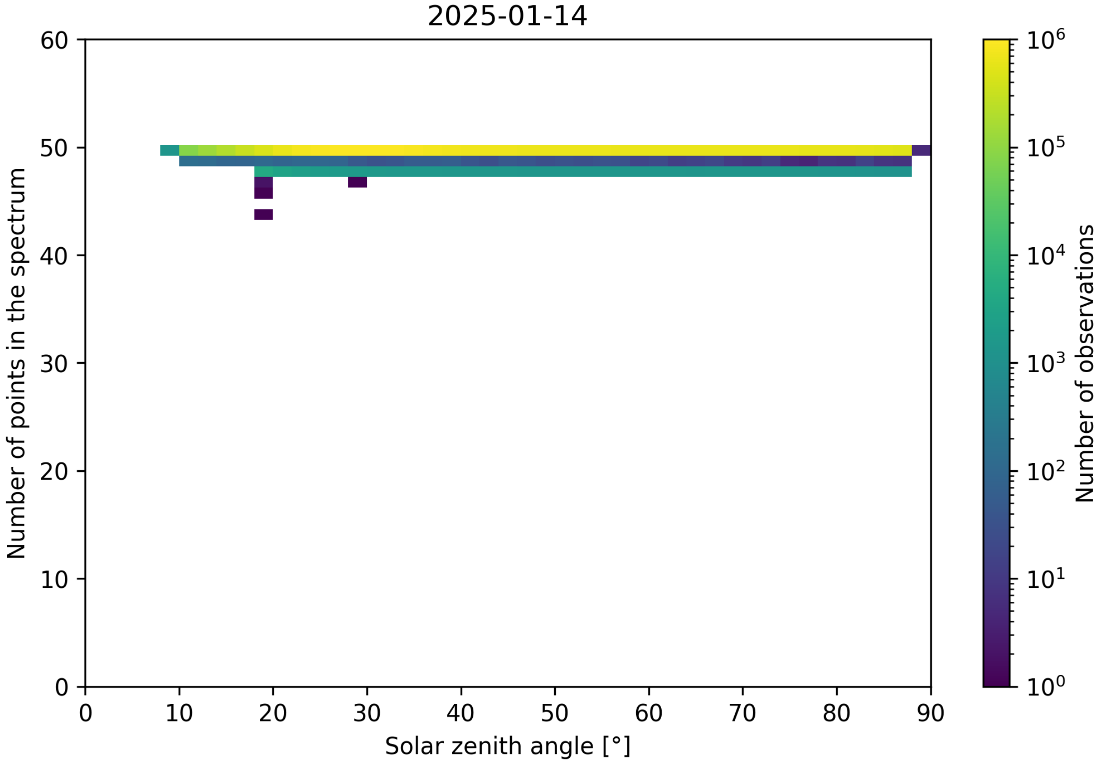

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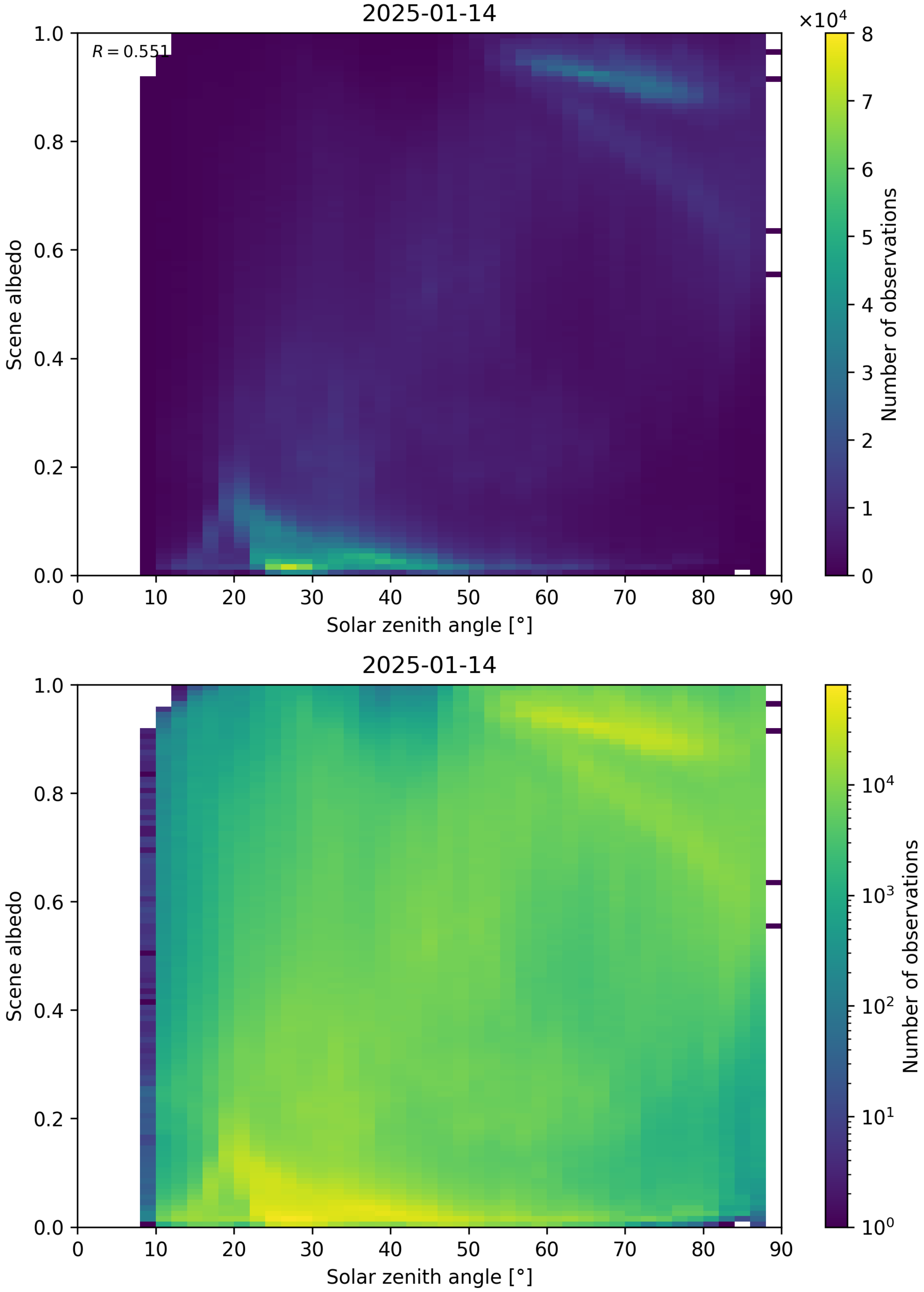

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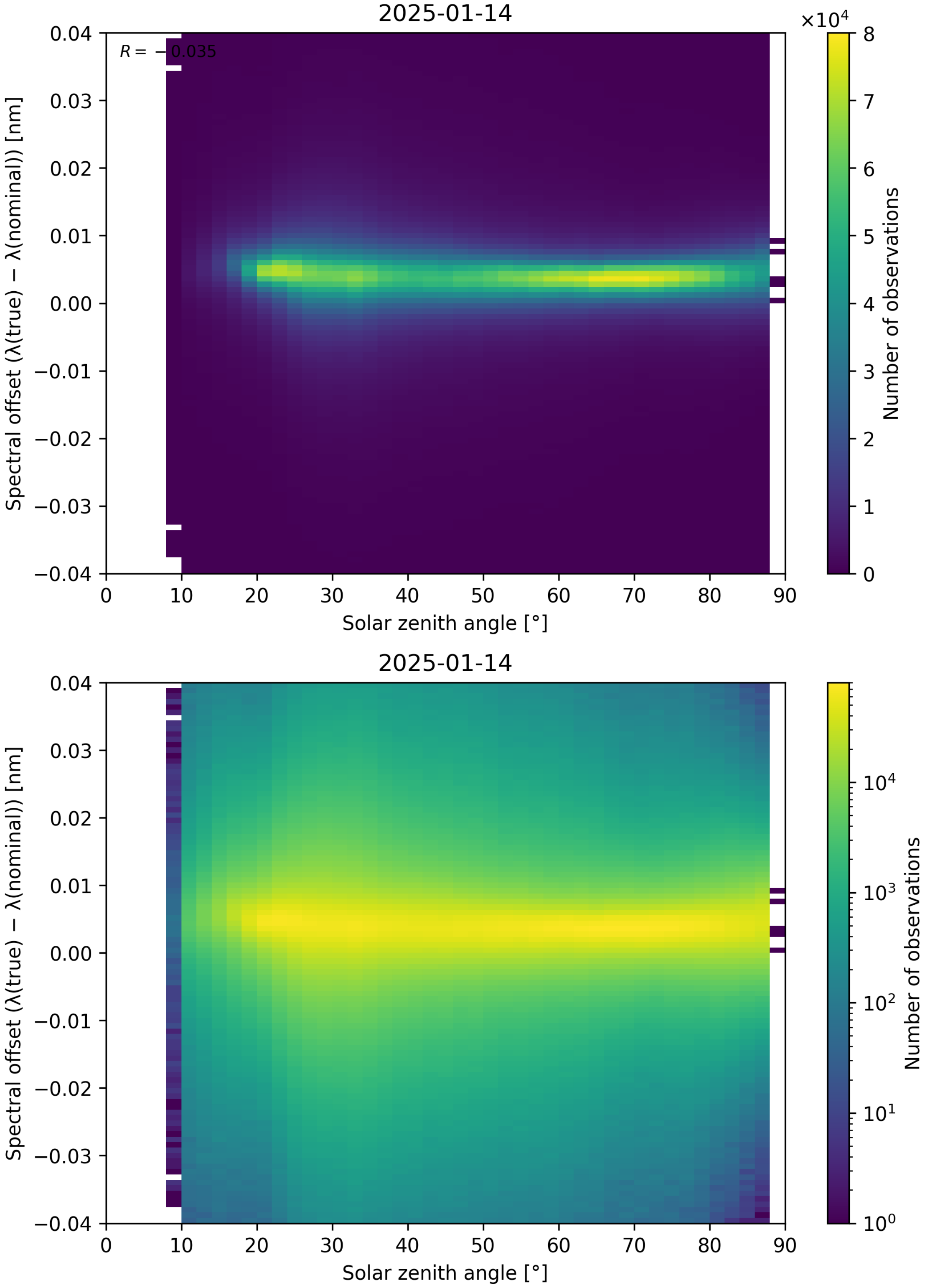

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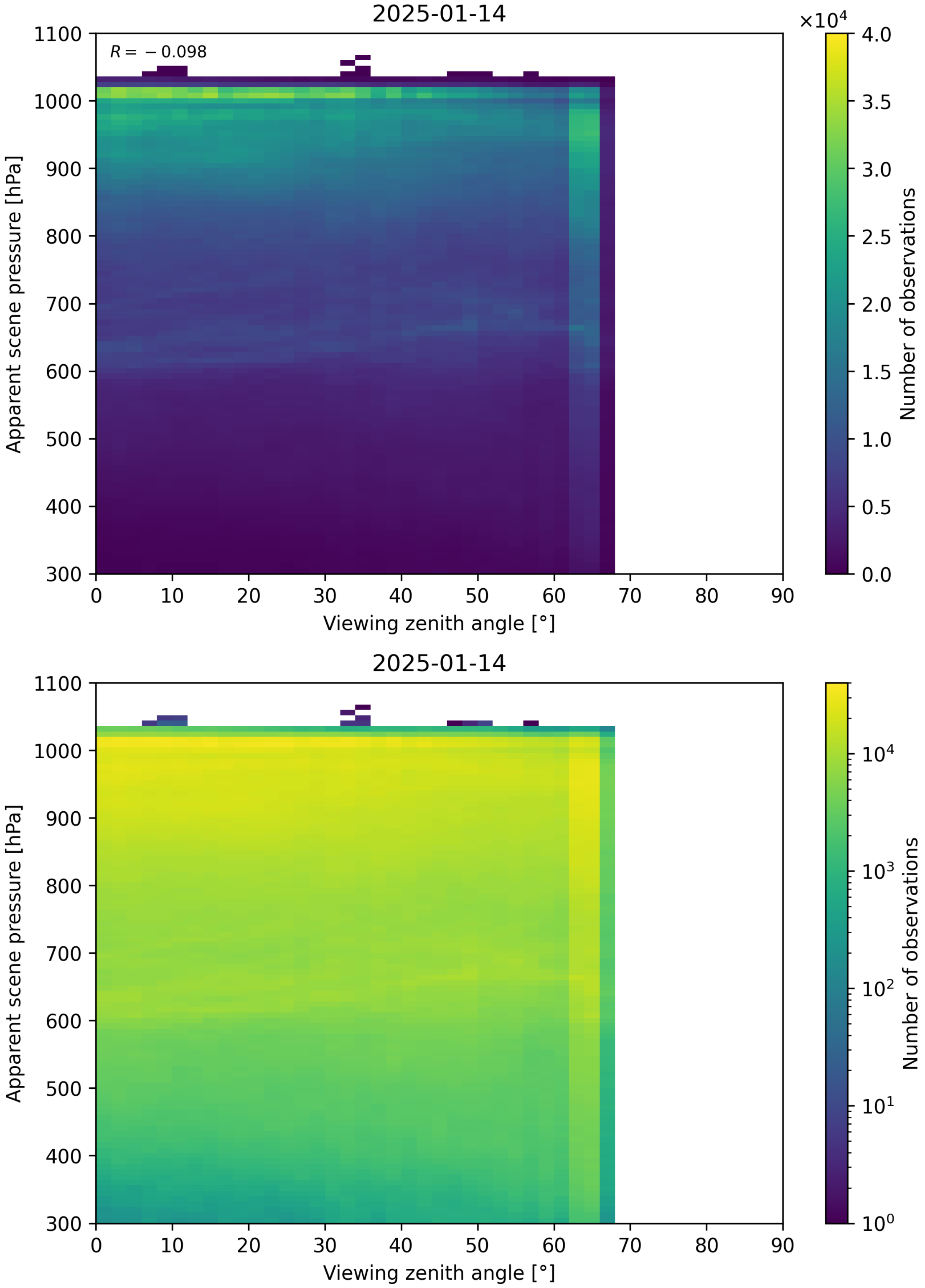

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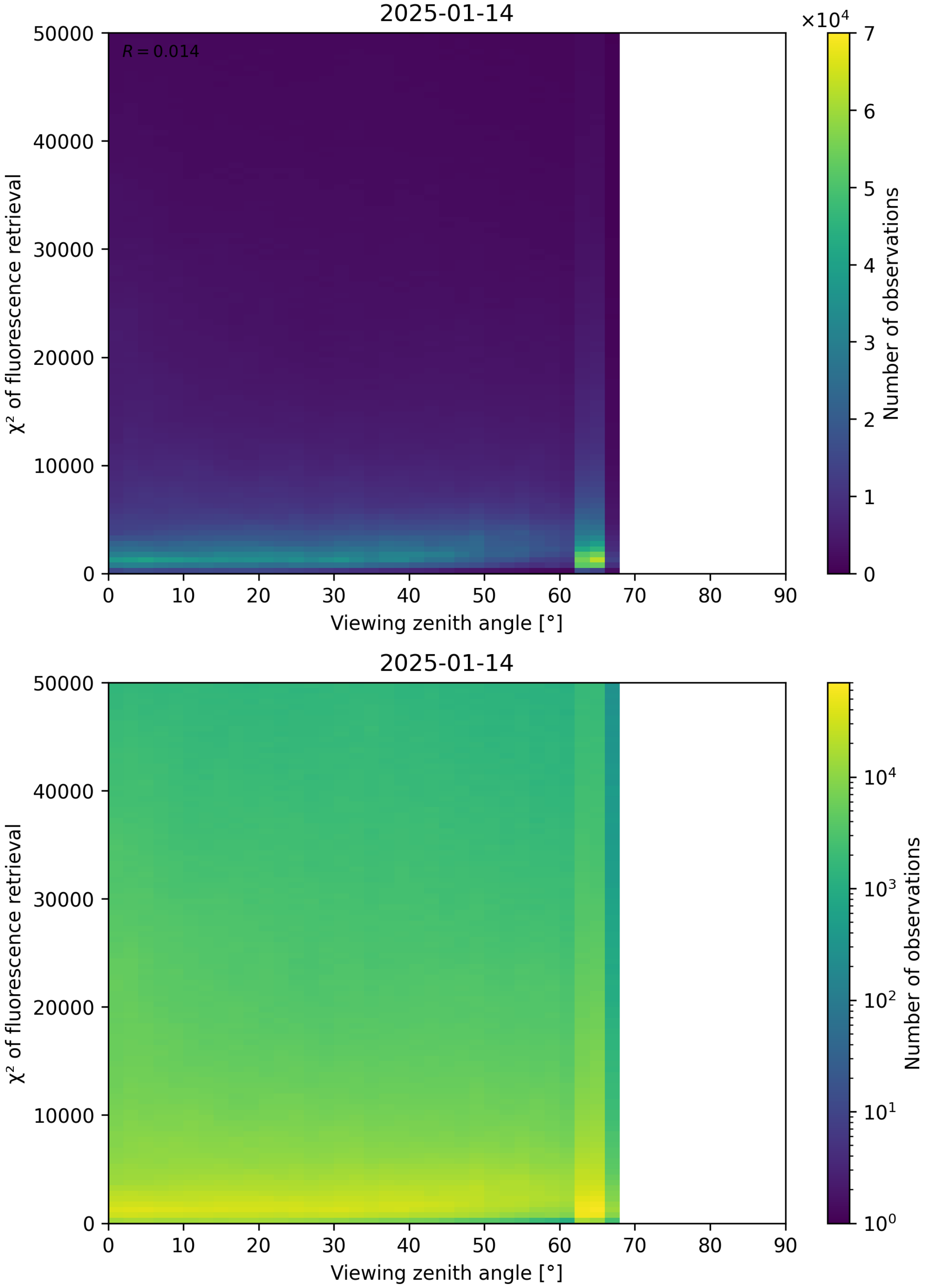

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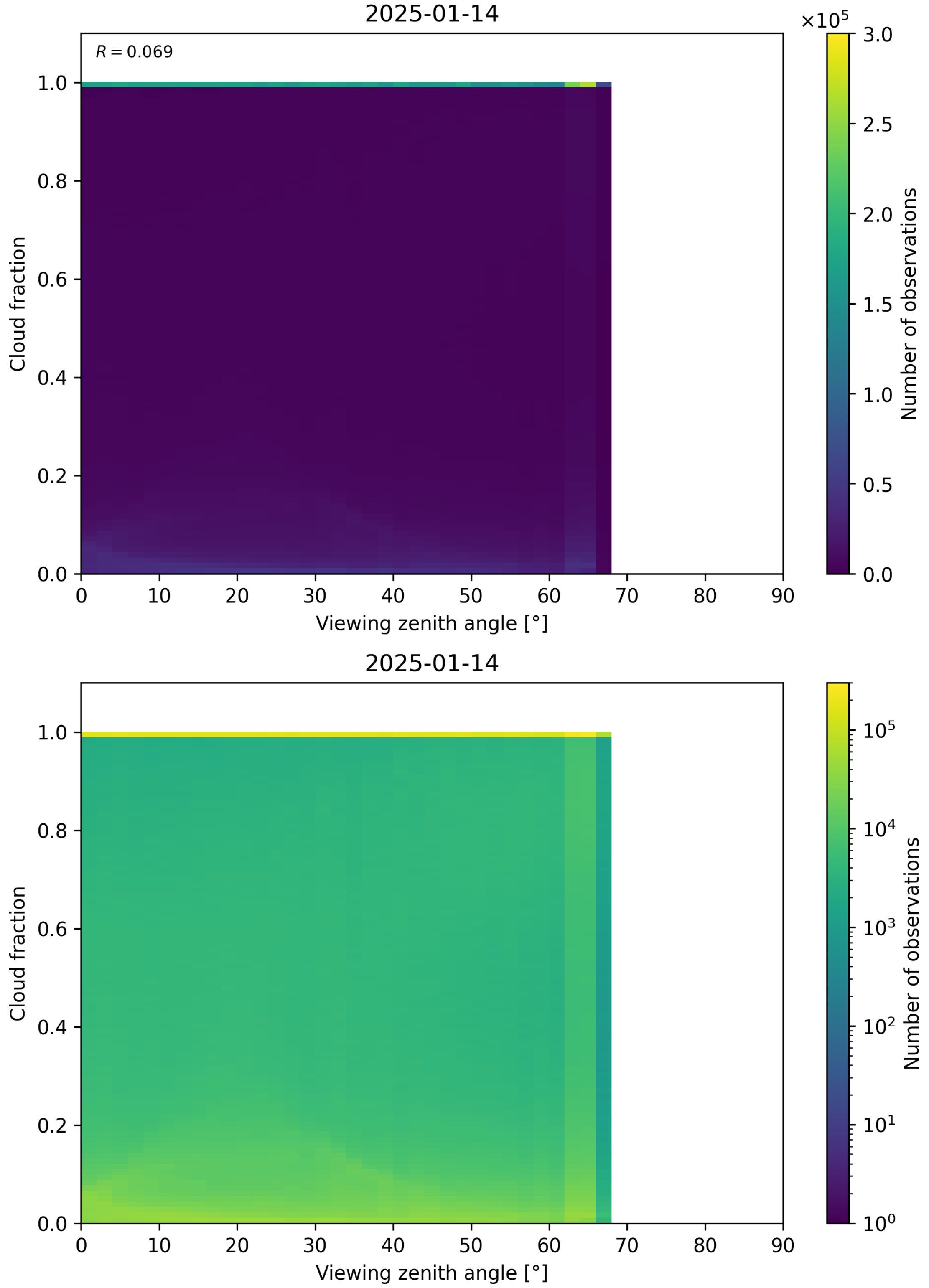

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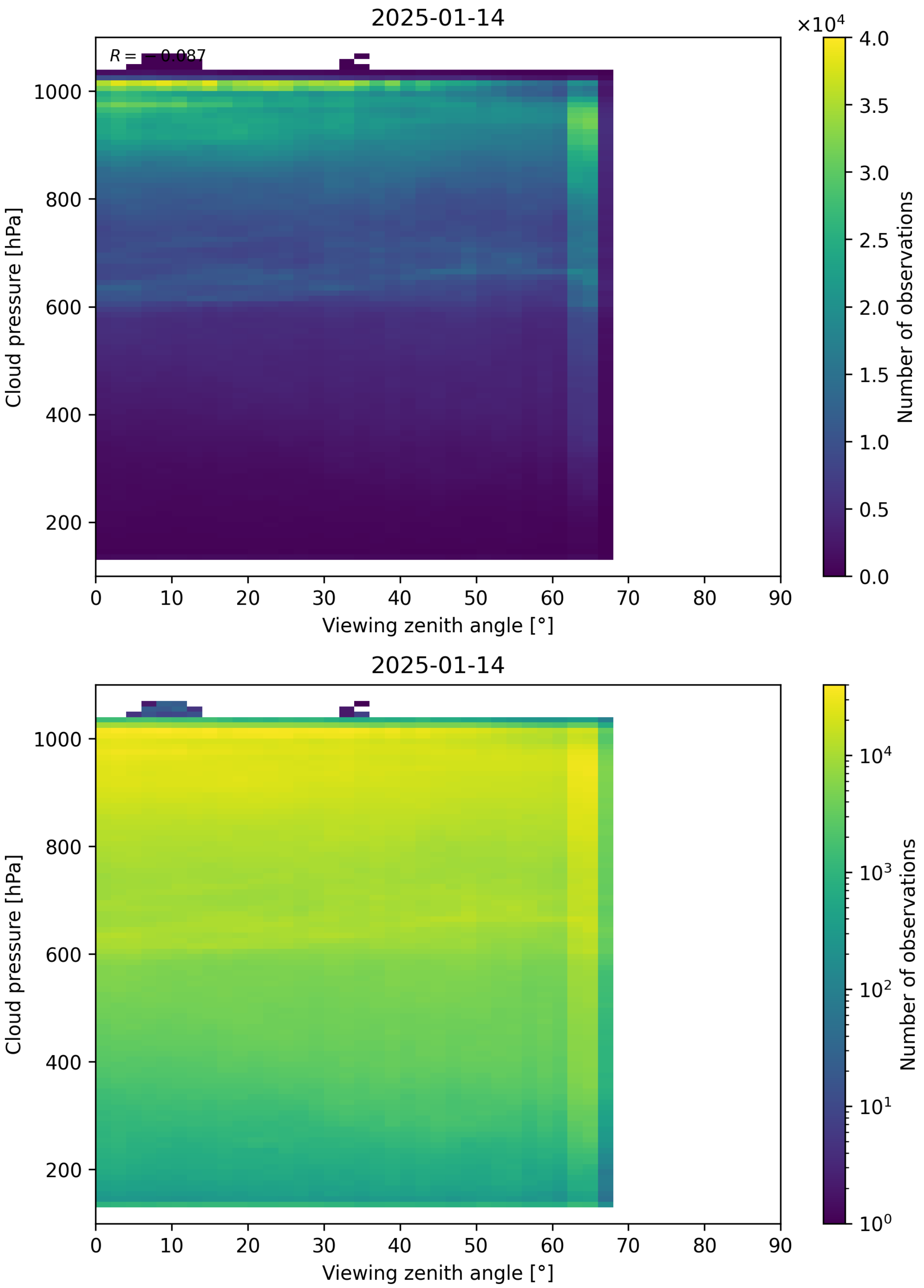

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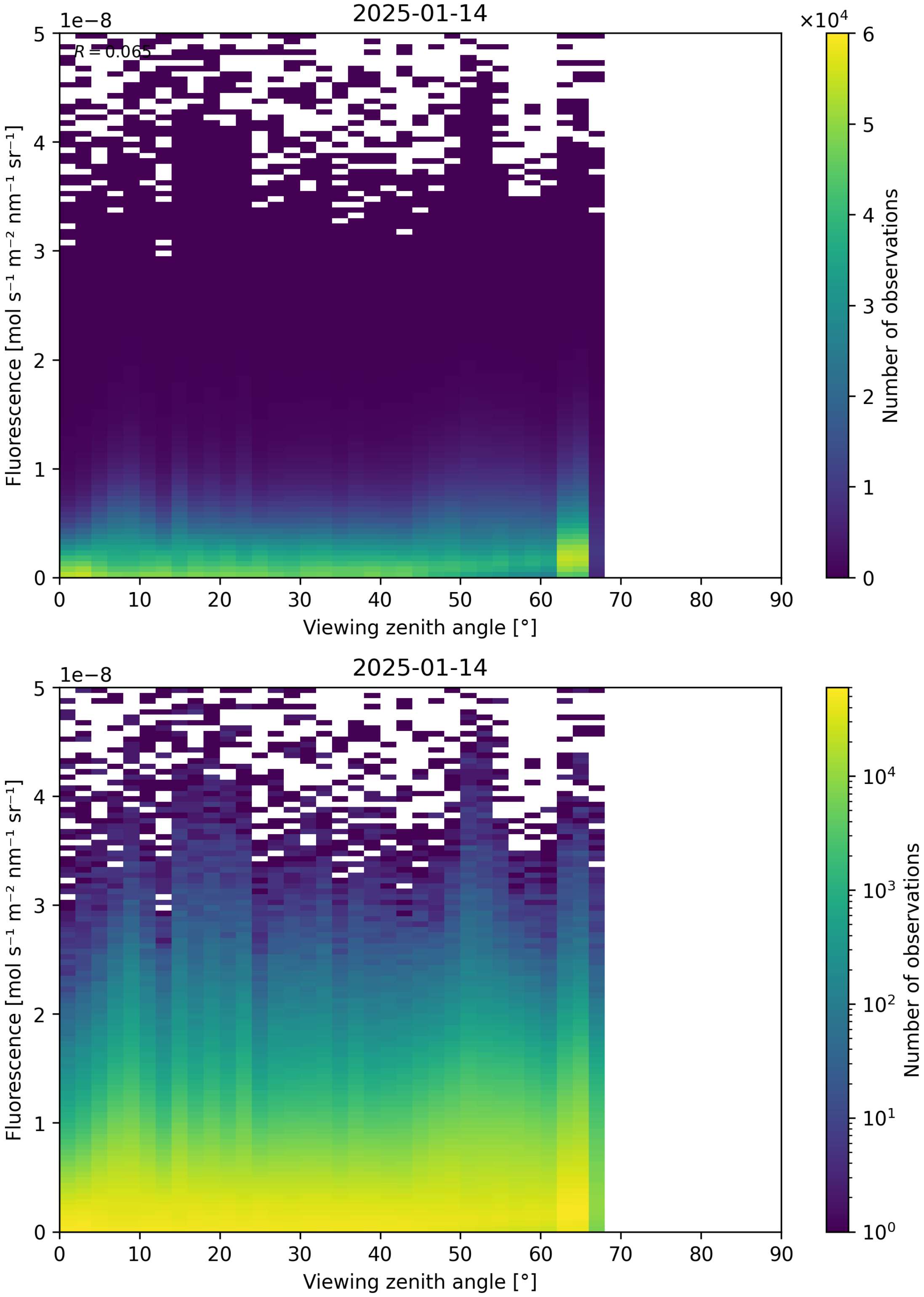

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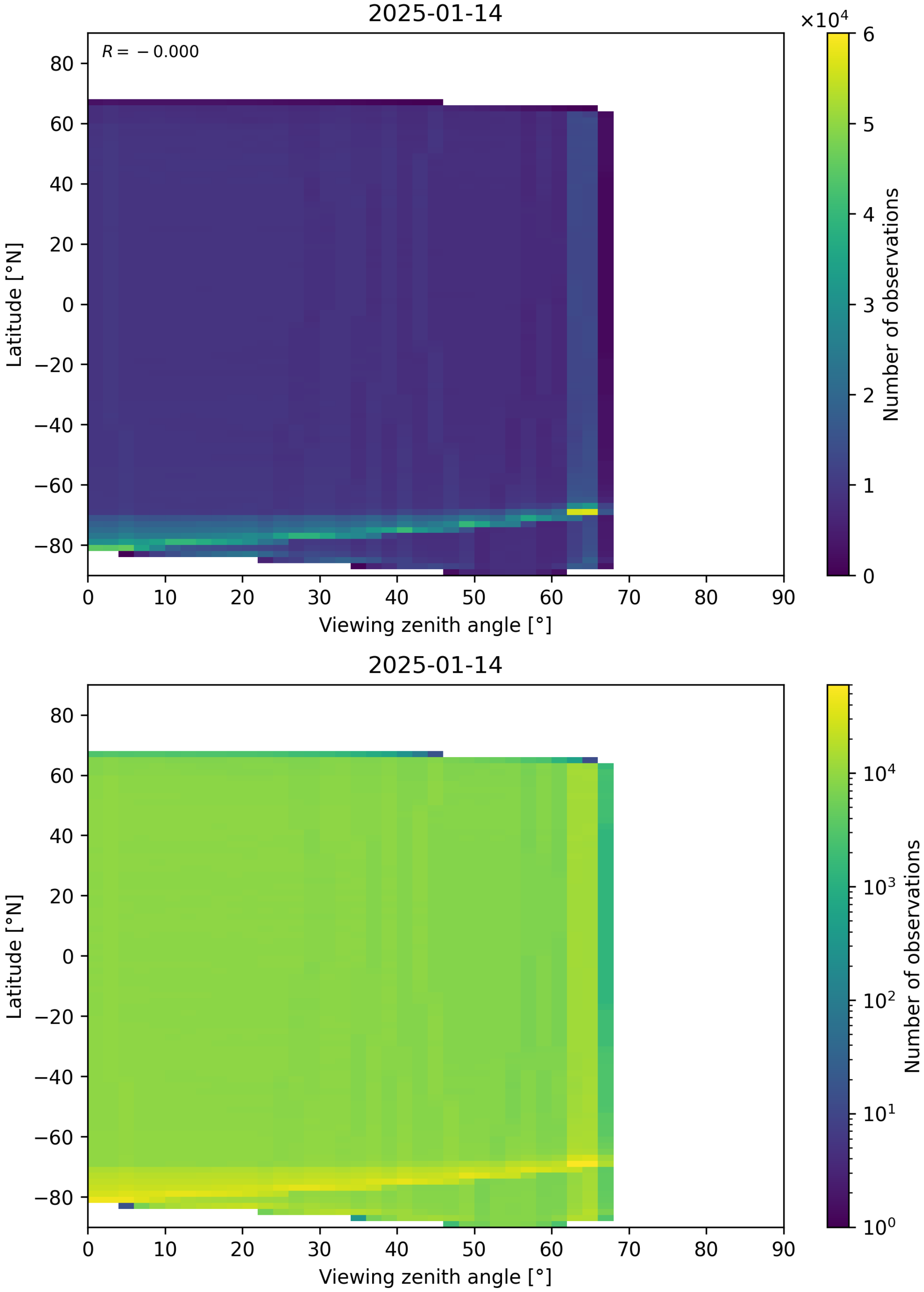

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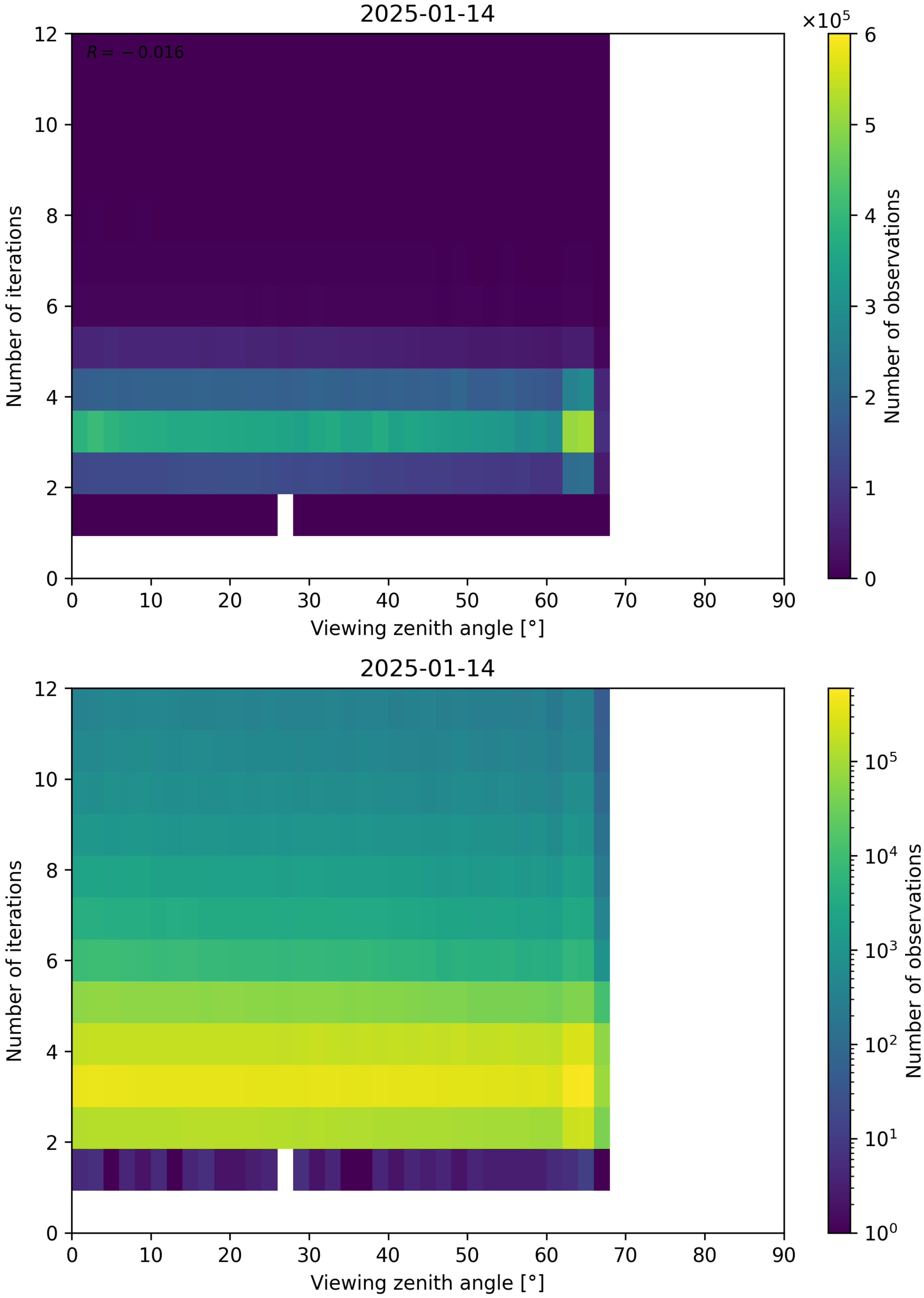

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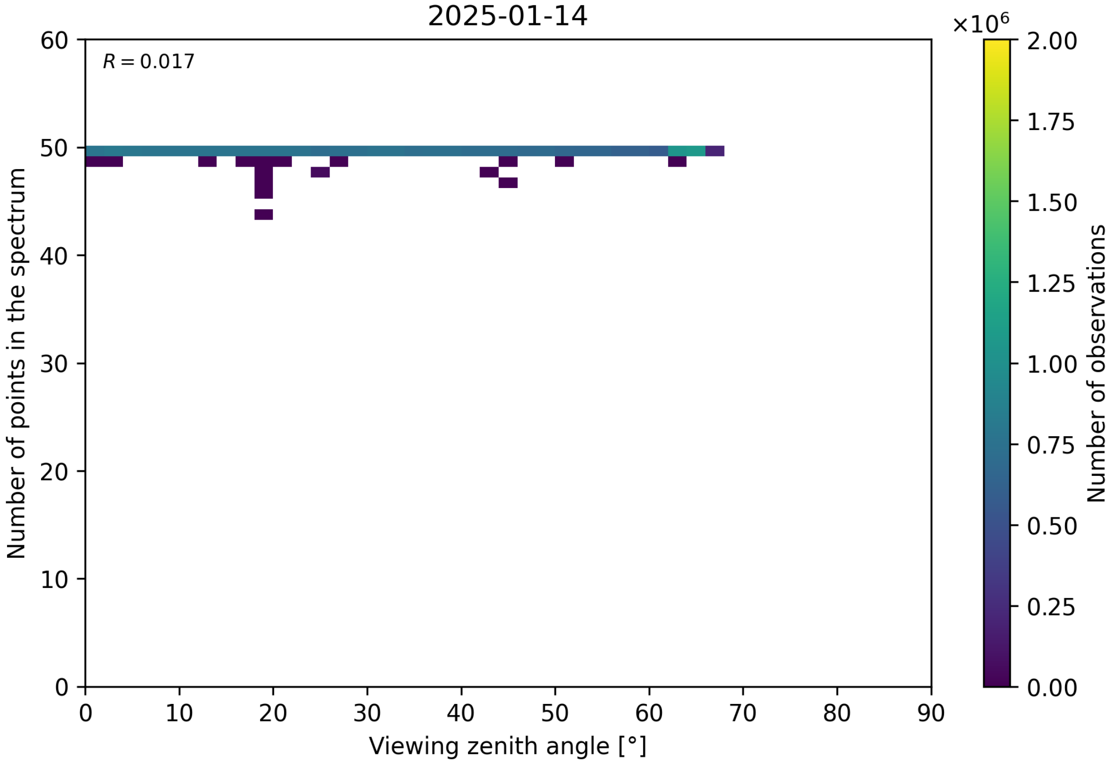

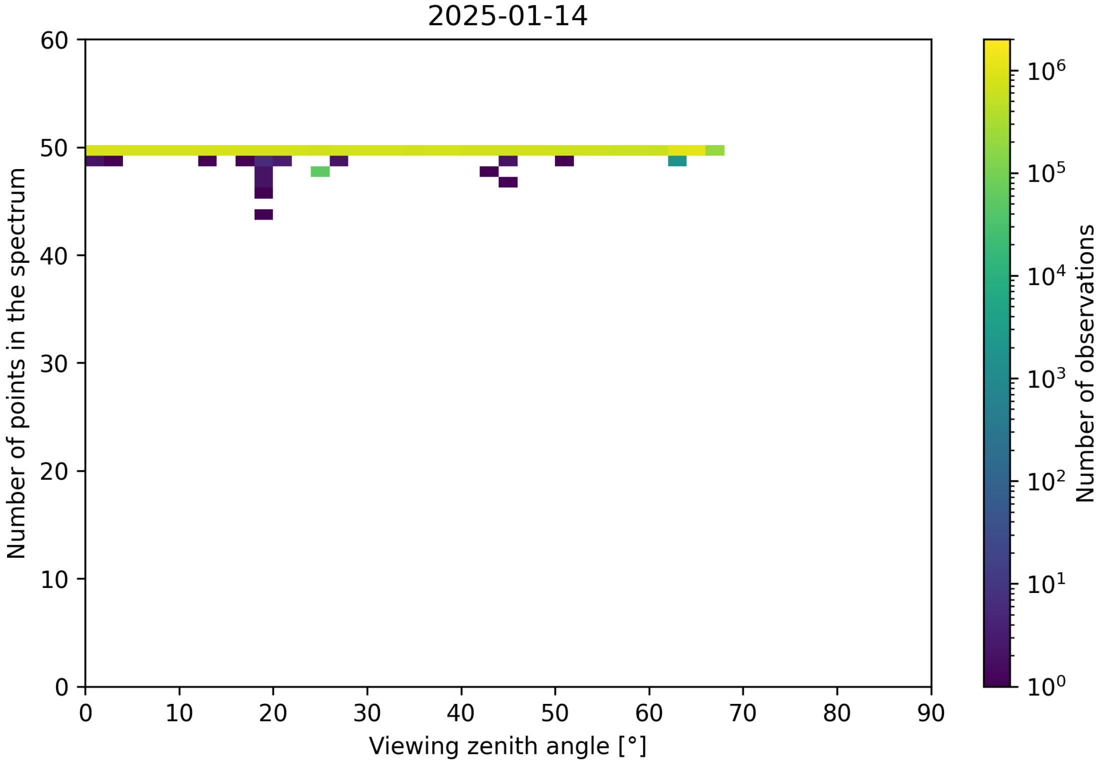

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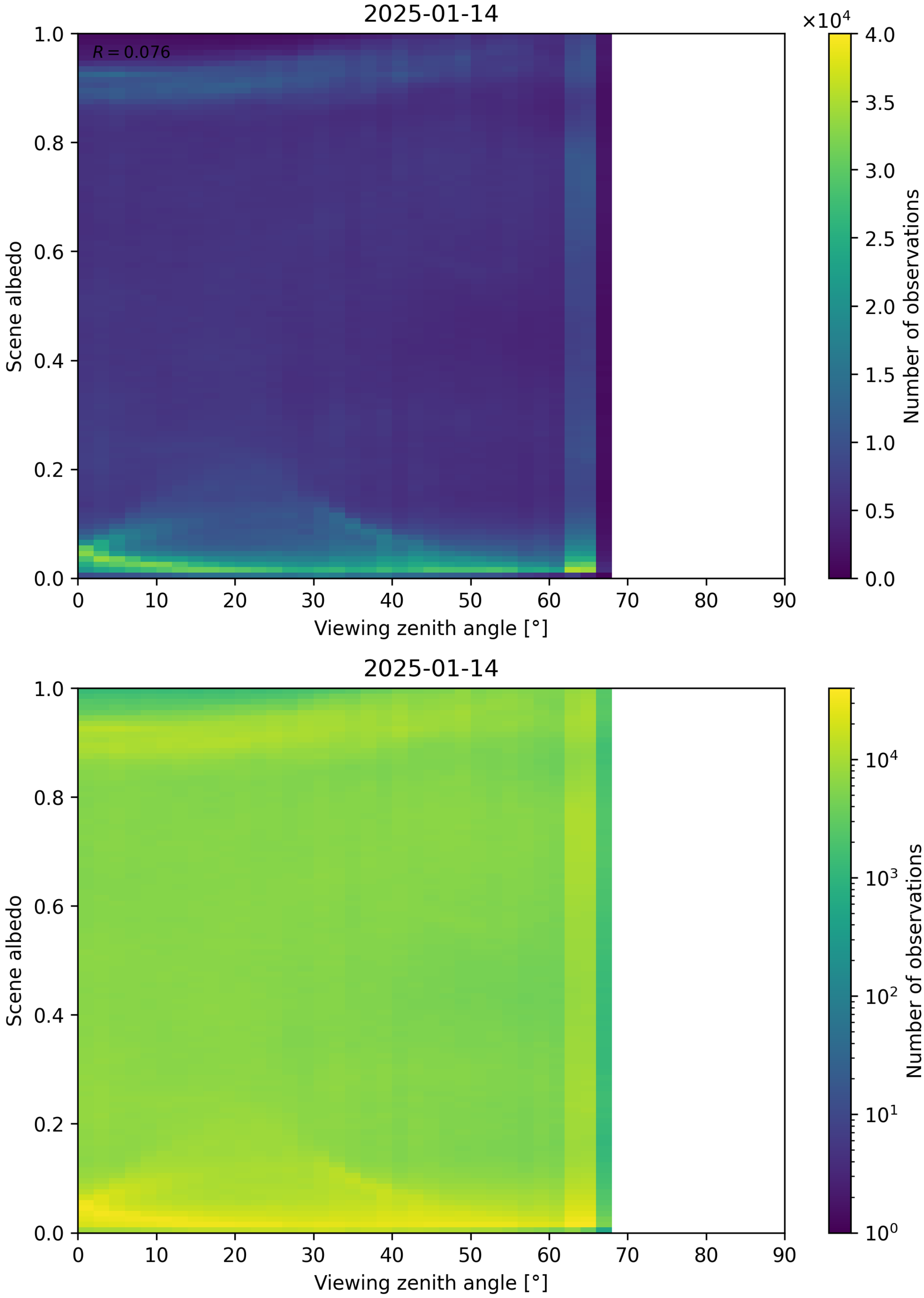

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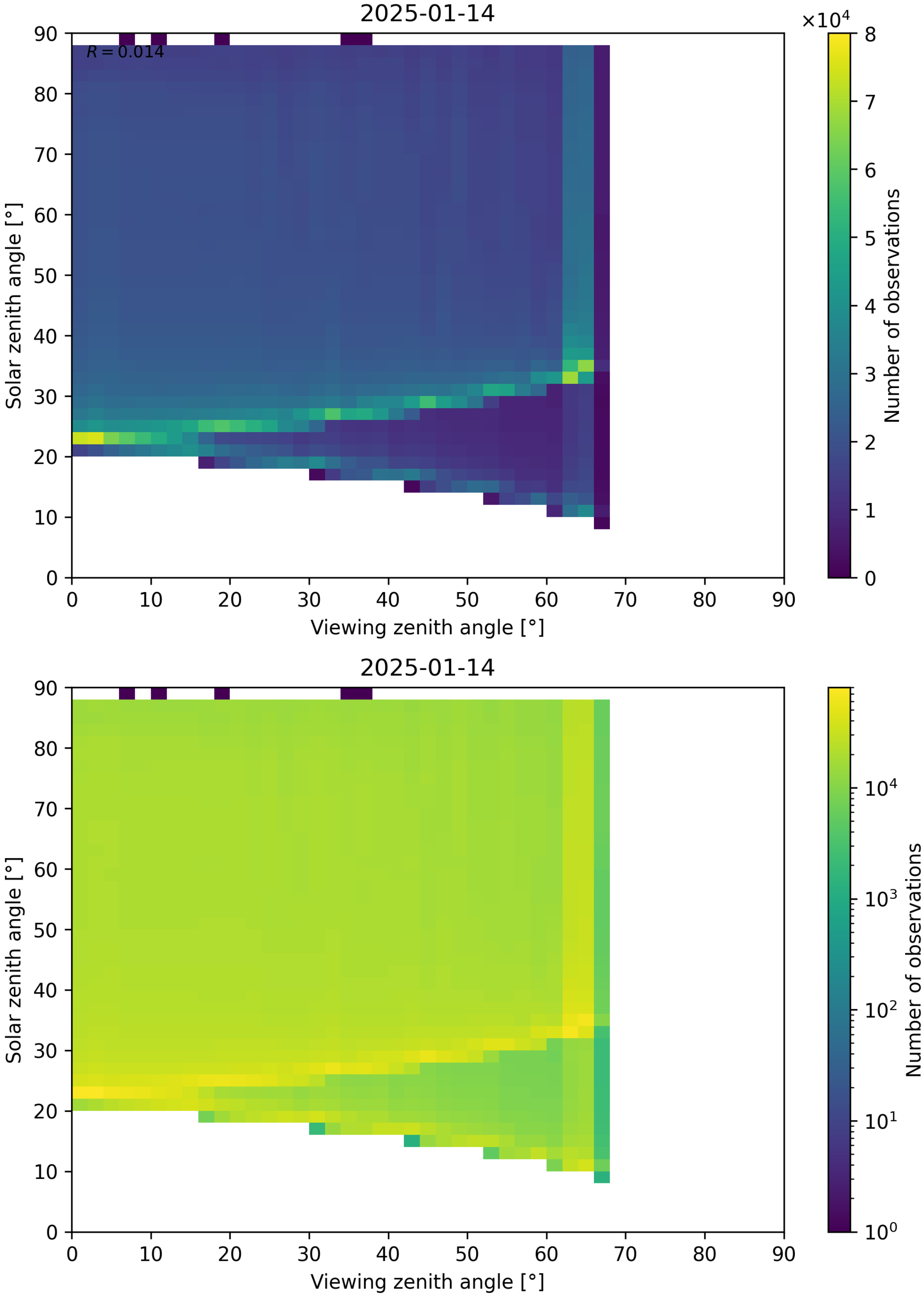

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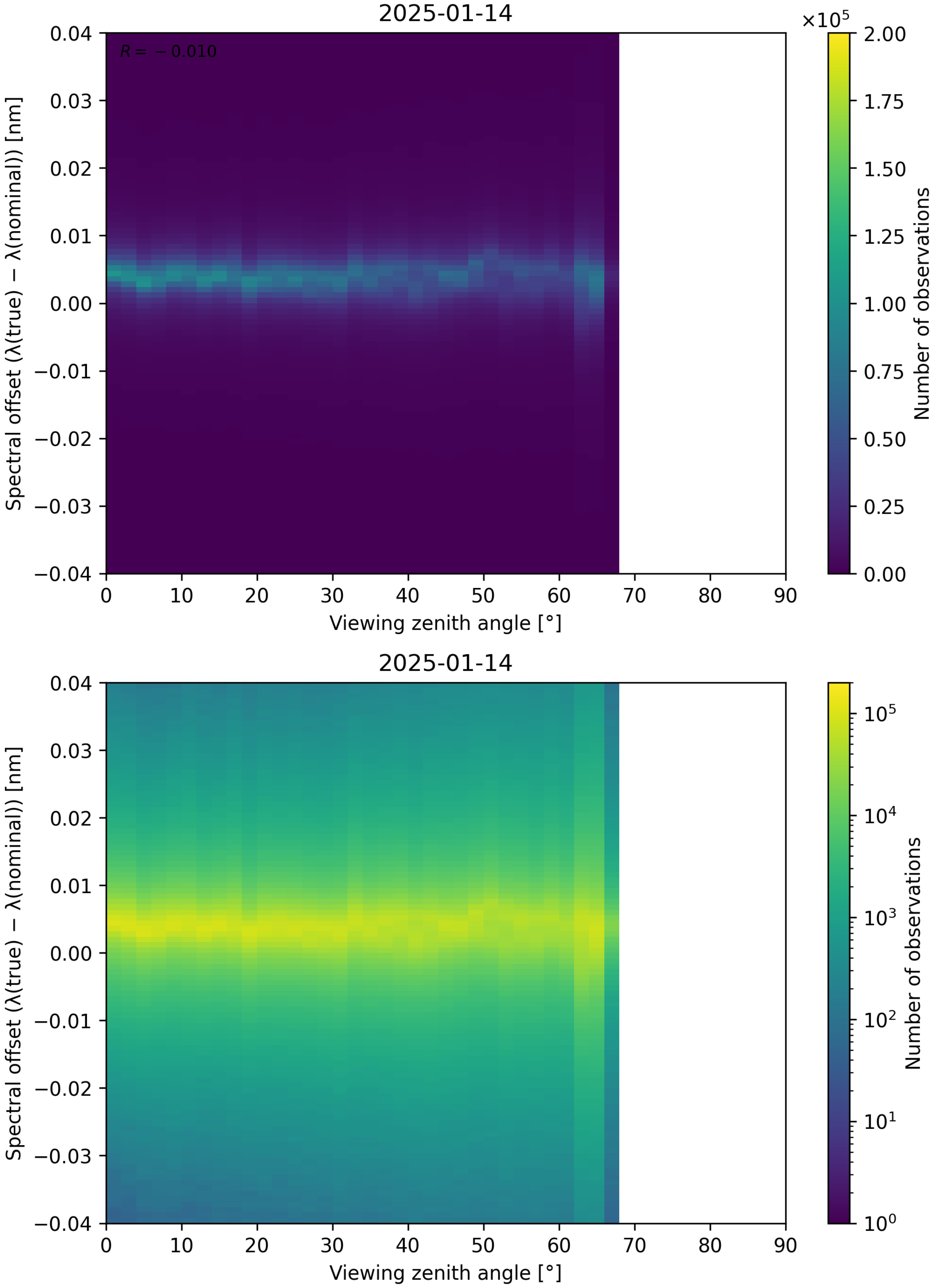

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