GHG Soil Daily Analysis Report

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Contents

0.1   1. Load and Process Data

`## Number of rows in final_data: 30924`

0.2   2.Checking Valid & Invalid

Table 1: Summary of Invalid or Missing Rows

Row Type	Count	Percentage (%)
Has -9999 Only	21416	69.3
Valid Row	9504	30.7

Has -9999 and Missing		3	0.0

Rows after filtering missing and -9999 values: 9504

0.3   3.MonthYear Valid & invalid

Table 2: Monthly Summary of Invalid or Missing Rows

Month-Year	Row Type	Count	Percentage (%)
2024-06	Has -9999 Only	1958	99.8
2024-06	Has -9999 and Missing	3	0.2
2024-07	Has -9999 Only	6557	100.0
2024-08	Has -9999 Only	6122	100.0
2024-09	Has -9999 Only	4396	100.0
2024-10	Has -9999 Only	192	100.0
2024-11	Has -9999 Only	721	12.5
2024-11	Valid Row	5031	87.5
2024-12	Has -9999 Only	1366	24.1
2024-12	Valid Row	4300	75.9
2025-04	Has -9999 Only	104	37.5
2025-04	Valid Row	173	62.5

Figure 1:Monthly Distribution of Invalid or Missing Rows

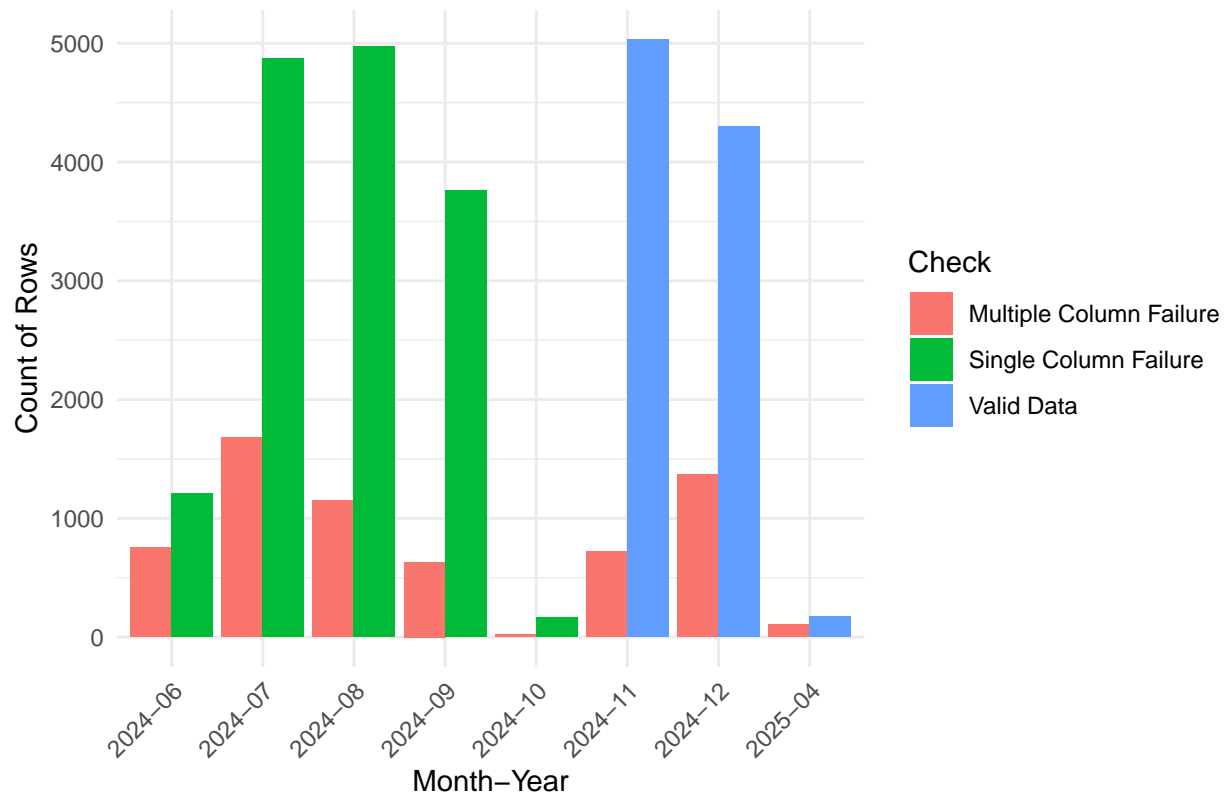Figure 1:Monthly Distribution of Invalid or Missing Rows
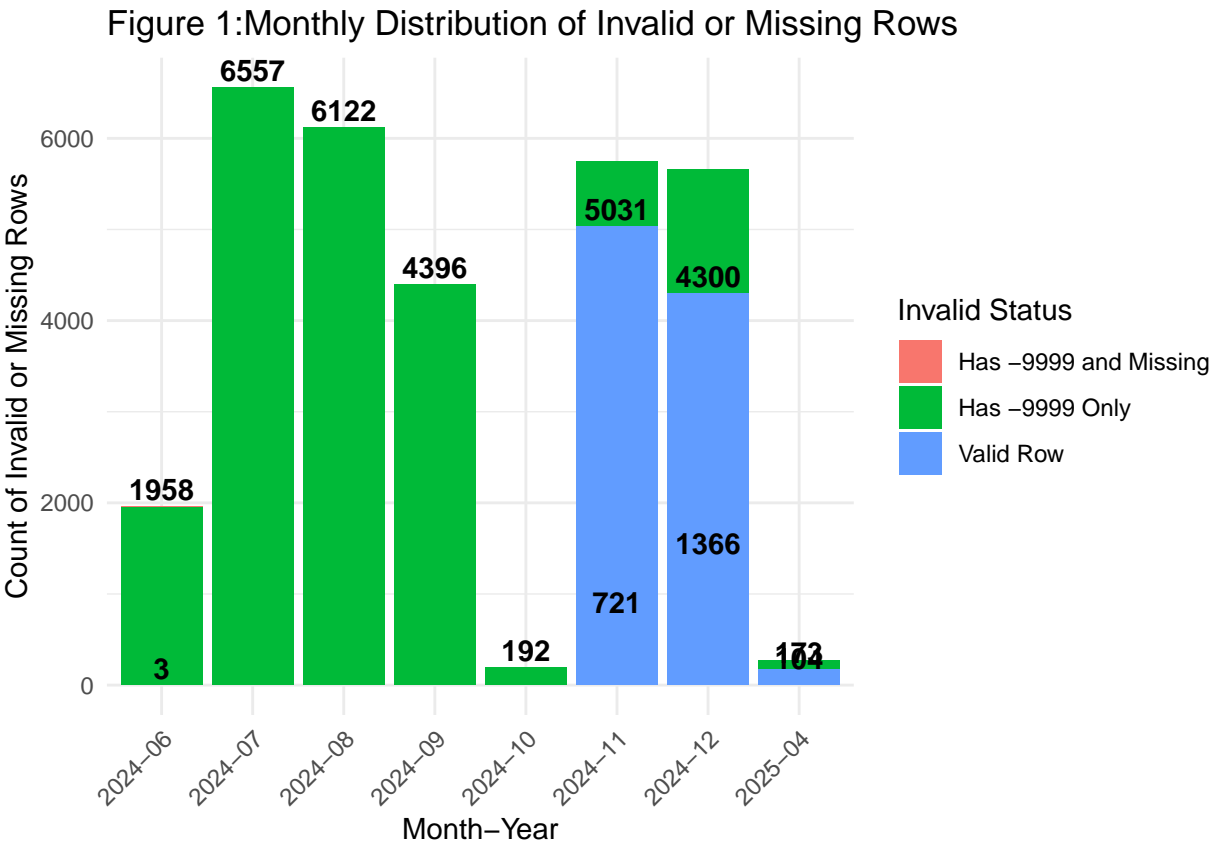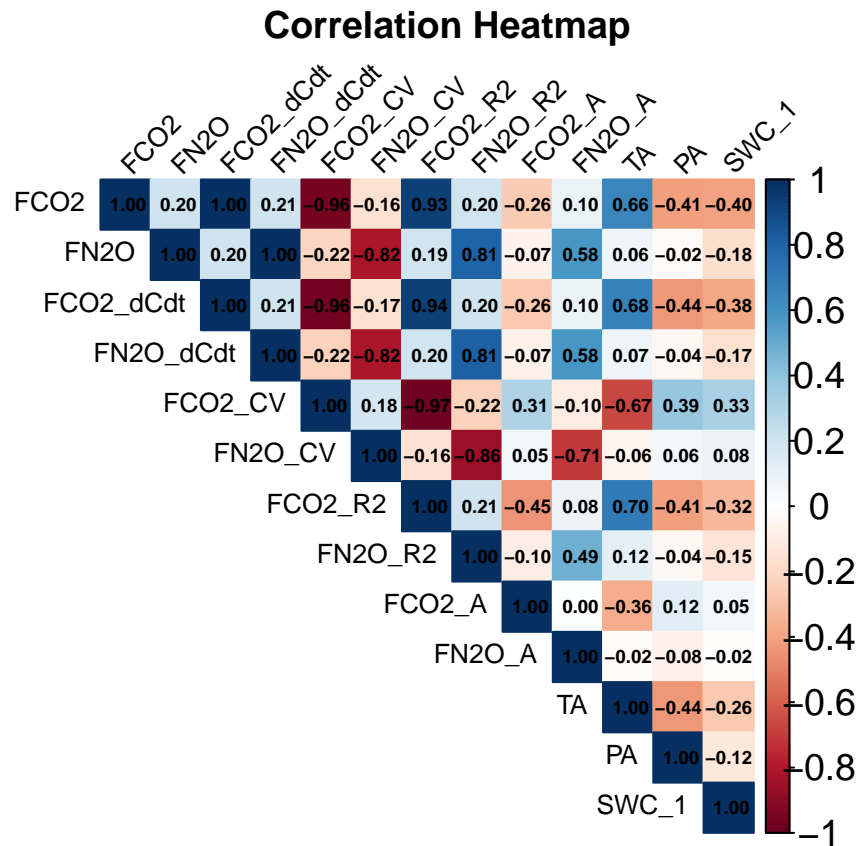
0.4 4. Sensor Failures

Table 3: Monthly Summary of Rows with -9999 in Specific Columns

MonthYear	TotalRows	RowsWith_One_Column	RowsWith_Multiple_Columns	RowsWith_All_Columns
2024-06	1961	NA	NA	0
2024-07	6557	4874	1683	0
2024-08	6122	4970	1152	0
2024-09	4396	3763	633	0
2024-10	192	168	24	0
2024-11	5752	0	721	0
2024-12	5666	0	1366	0
2025-04	277	0	104	0

Figure 2:Monthly Distribution of Data Quality (Single Column Failures)

0.5 5. Corelation Matrix

Correlation Heatmap

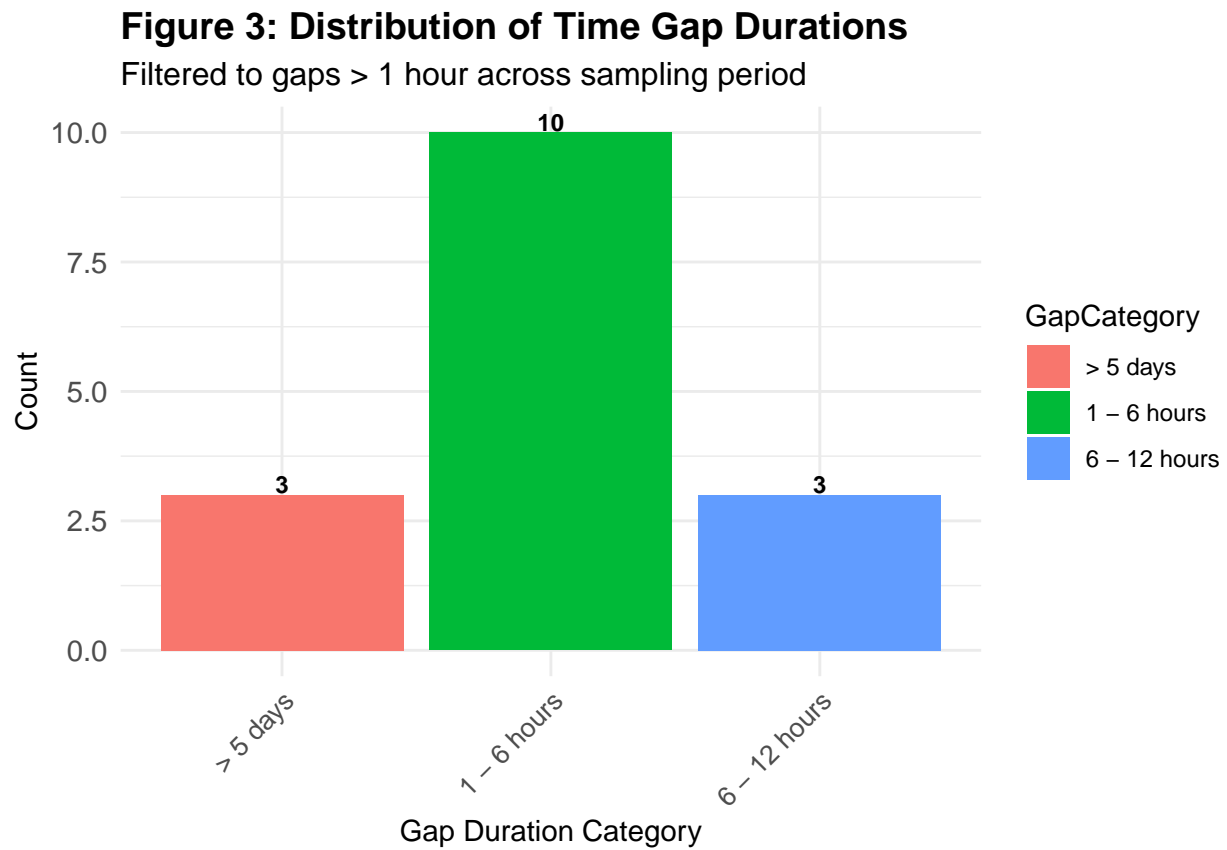|	FCO2	FN2O	FCO2_dCdt	FN2O_dCdt	FCO2_CV	FN2O_CV	FCO2_R2	FN2O_R2	FCO2_A	FN2O_A	TA	PA	SWC_1
FCO2	1.00	0.20	1.00	0.21	−0.96	−0.16	0.93	0.20	−0.26	0.10	0.66	−0.41	−0.40
FN2O		1.00	0.20	1.00	−0.22	−0.82	0.19	0.81	−0.07	0.58	0.06	−0.02	−0.18
FCO2_dCdt			1.00	0.21	−0.96	−0.17	0.94	0.20	−0.26	0.10	0.68	−0.44	−0.38
FN2O_dCdt				1.00	−0.22	−0.82	0.20	0.81	−0.07	0.58	0.07	−0.04	−0.17
FCO2_CV					1.00	0.18	−0.97	−0.22	0.31	−0.10	−0.67	0.39	0.33
FN2O_CV						1.00	−0.16	−0.86	0.05	−0.71	−0.06	0.06	0.08
FCO2_R2							1.00	0.21	−0.45	0.08	0.70	−0.41	−0.32
FN2O_R2								1.00	−0.10	0.49	0.12	−0.04	−0.15
FCO2_A									1.00	0.00	−0.36	0.12	0.05
FN2O_A										1.00	−0.02	−0.08	−0.02
TA											1.00	−0.44	−0.26
PA												1.00	−0.12
SWC_1													1.00

5. Time Gap Categorization & Flagging

```
##                   DateTime TimeDiff_min  GapCategory    TimeGapFlag
## 1  2024-07-12 15:00:41  4720.75000    1 - 5 days Very Long Gap
## 2  2024-07-18 17:00:41  1860.00000    1 - 5 days Very Long Gap
## 3  2024-08-02 11:44:53    92.53333   1 - 6 hours      Long Gap
## 4  2024-08-02 14:00:41    77.36667   1 - 6 hours      Long Gap
## 5  2024-08-07 12:00:41    94.10000   1 - 6 hours      Long Gap
## 6  2024-08-30 17:00:41   514.10000  6 - 12 hours      Long Gap
## 7  2024-09-09 15:00:41   348.90000   1 - 6 hours      Long Gap
## 8  2024-09-09 17:00:41   101.50000   1 - 6 hours      Long Gap
## 9  2024-09-25 18:00:41   585.26667  6 - 12 hours      Long Gap
## 10 2024-09-29 16:07:26  4315.71667    1 - 5 days Very Long Gap
## 11 2024-09-30 11:00:41    94.10000   1 - 6 hours      Long Gap
## 12 2024-11-24 13:00:41   154.20000   1 - 6 hours      Long Gap
## 13 2024-12-12 15:00:42   394.21667  6 - 12 hours      Long Gap
## 14 2024-12-17 16:00:42   120.00000   1 - 6 hours      Long Gap
```

```
## 15 2024-12-19 14:00:41    274.90000  1 - 6 hours      Long Gap
## 16 2025-04-14 15:00:51    136.70000  1 - 6 hours      Long Gap
```
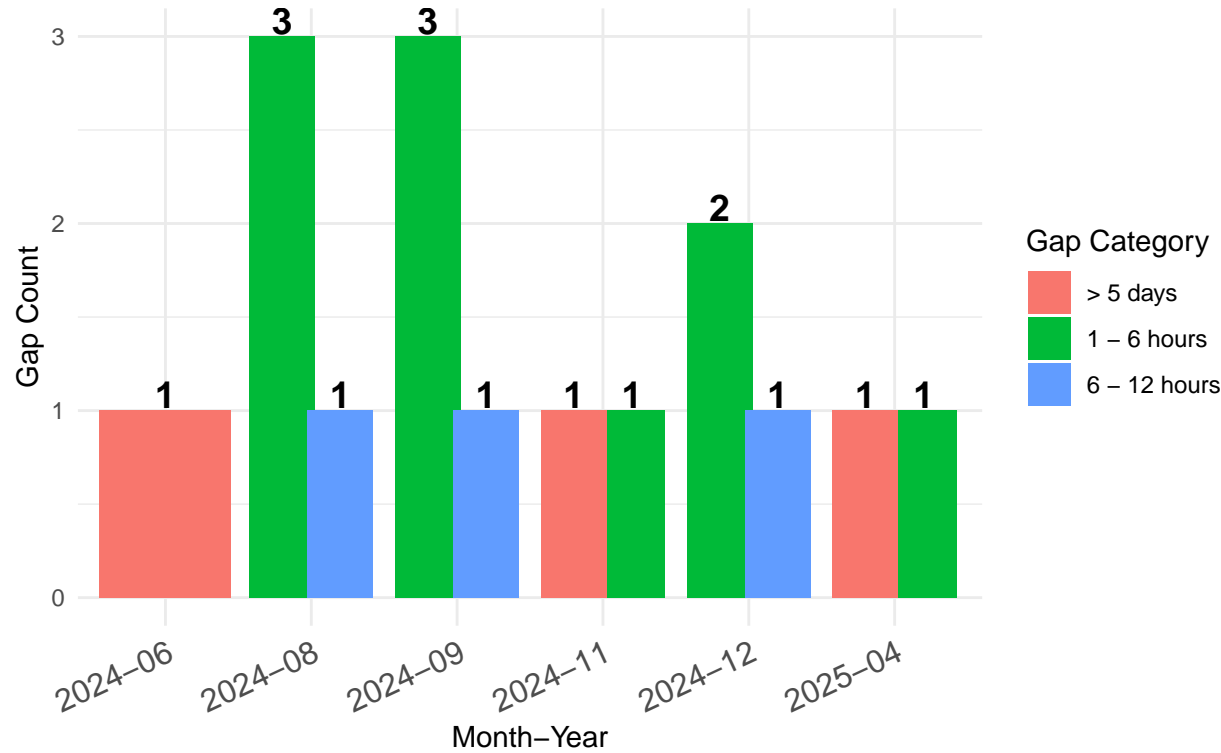
0.6   6. Summary & Visualization

```
## [1] "Skewness of TimeDiff_min: 45.61"
```

Figure 3: Distribution of Time Gap Durations

Filtered to gaps > 1 hour across sampling period

0.7 7. Monthly Trends & Power Outages

Figure 4: Monthly Frequency of Time Gaps
Only gaps exceeding 60 minutes shown

0.8 8. R2 Analysis

Table 4: Summary of R² Values for CO2 Flux (FCO2)

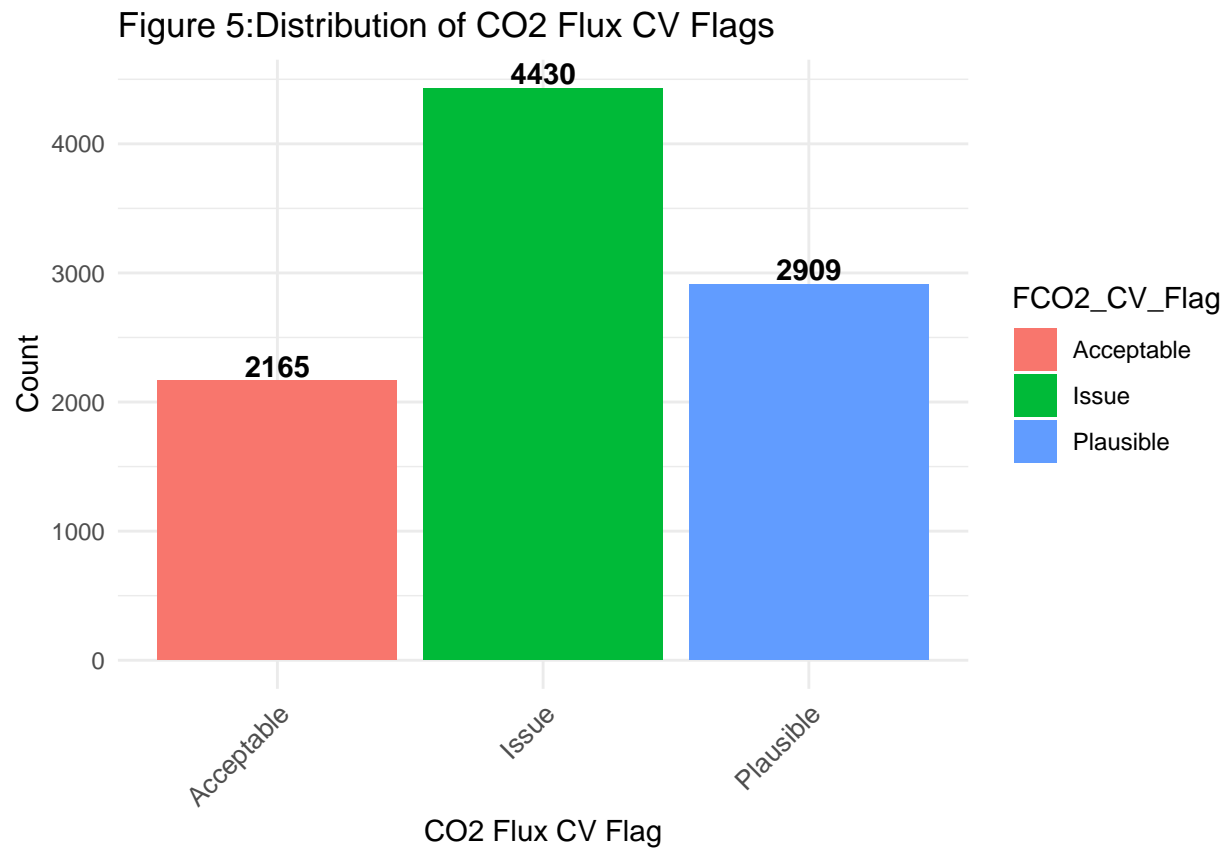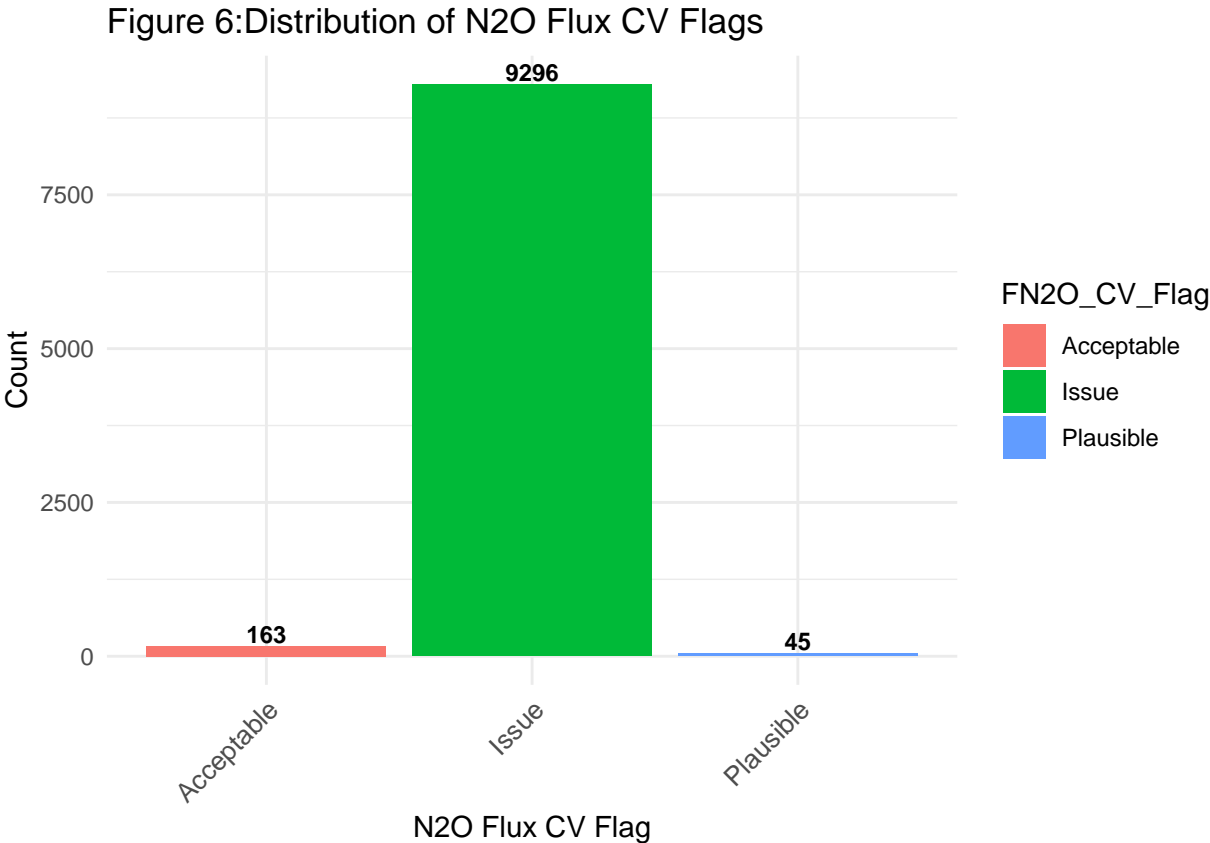| Total Records	R² >= 0.75	R² < 0.75	Percentage ≥ 0.75	Percentage < 0.75
9504	7669	1835	80.7	19.3

Figure 4: Distribution of R² Values for CO2 Flux
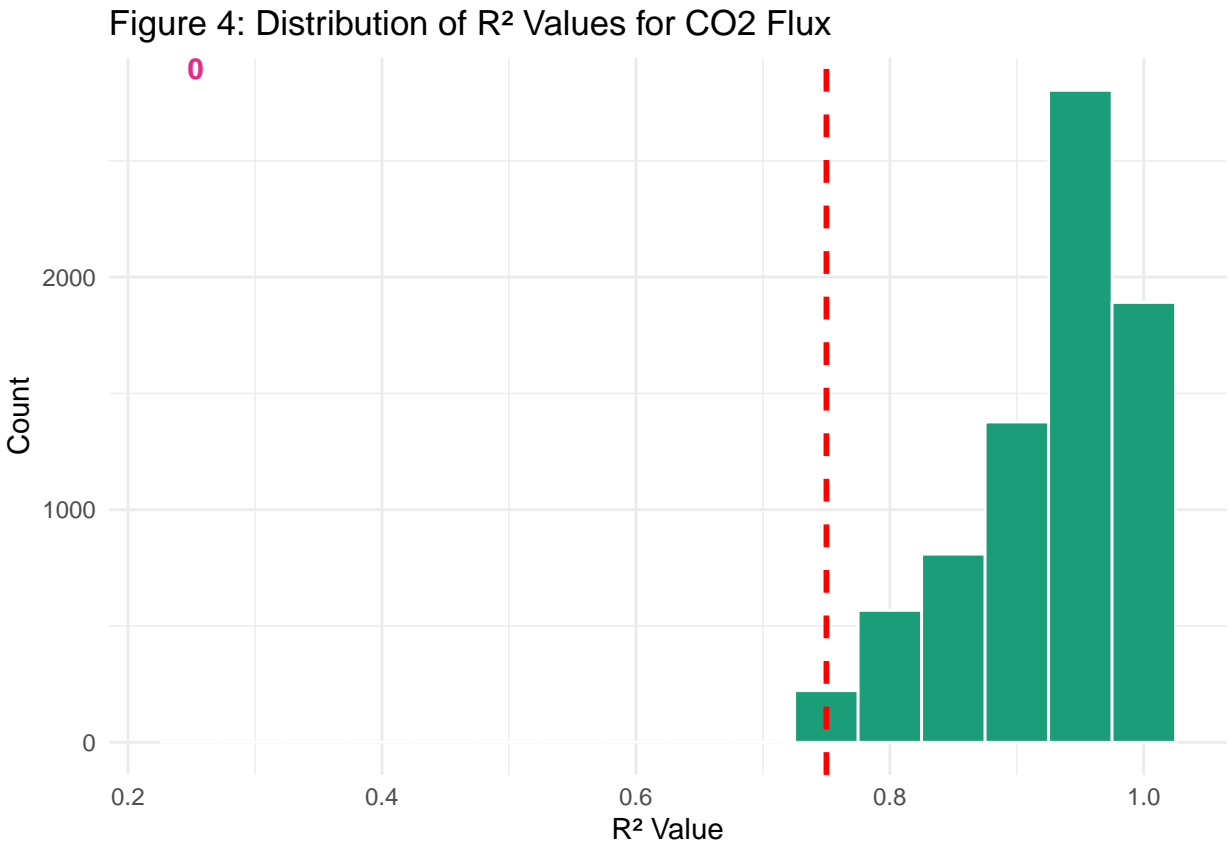
9. CV Analysis

Table 5: Summary of CO2 Flux CV Flags

CO2 Flux CV Flag	Count	Percentage
Acceptable	2165	22.8
Issue	4430	46.6
Plausible	2909	30.6

Table 6: Summary of N2O Flux CV Flags

N2O Flux CV Flag	Count	Percentage
Acceptable	163	1.7
Issue	9296	97.8
Plausible	45	0.5

Figure 5:Distribution of CO2 Flux CV Flags

Figure 6:Distribution of N2O Flux CV Flags

Figure 6:Distribution of N2O Flux CV Flags

0.9 10. Flux Control

Table 7: Summary of CO2 Flux Flags

CO Flux Flag	Count	Percentage
Very Low (<100)	7669	100

Table 8: Summary of N2O Flux Flags

NO Flux Flag	Count	Percentage
Below Detection (<0.01)	760	9.9
Extremely High (>5)	4	0.1
Negative	693	9.0
Plausible	6212	81.0

Figure 7: Distribution of CO2 Flux Flags
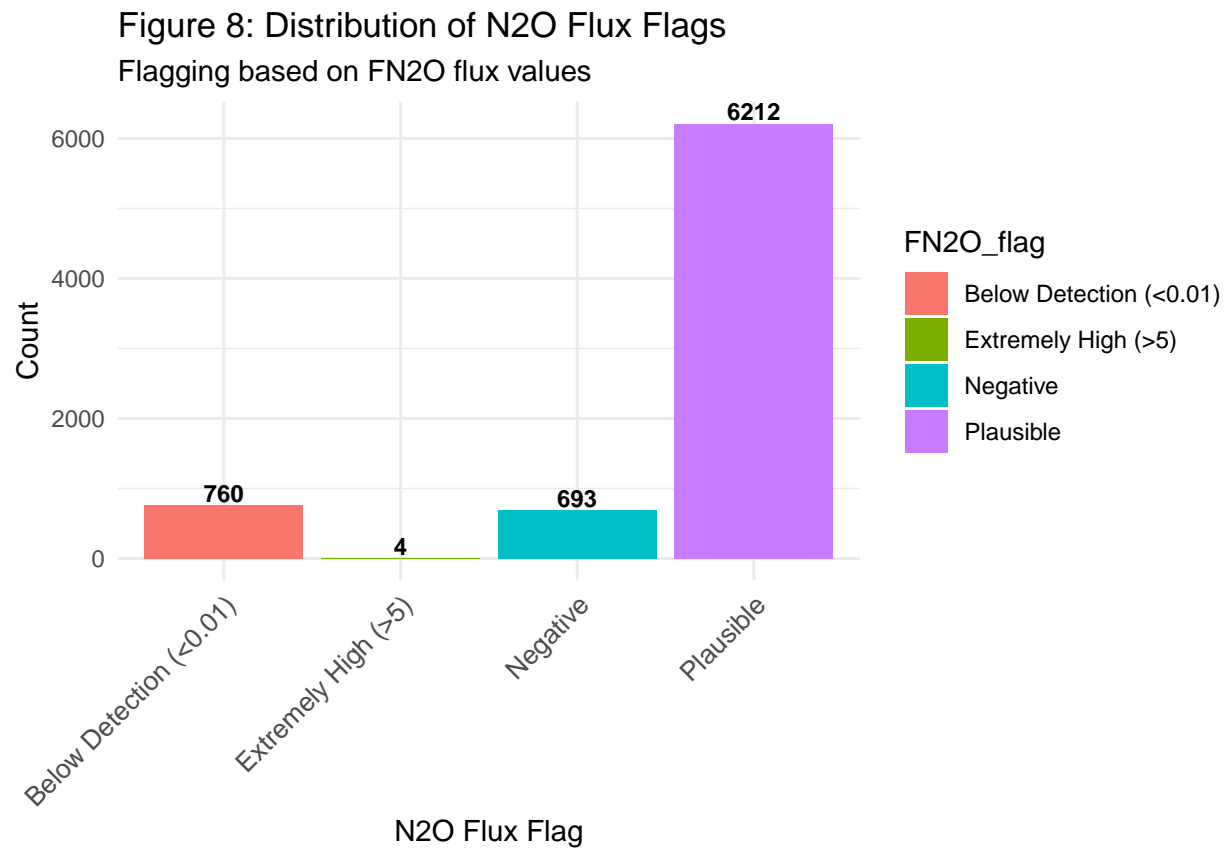
Figure 8: Distribution of N2O Flux Flags

Flagging based on FN2O flux values
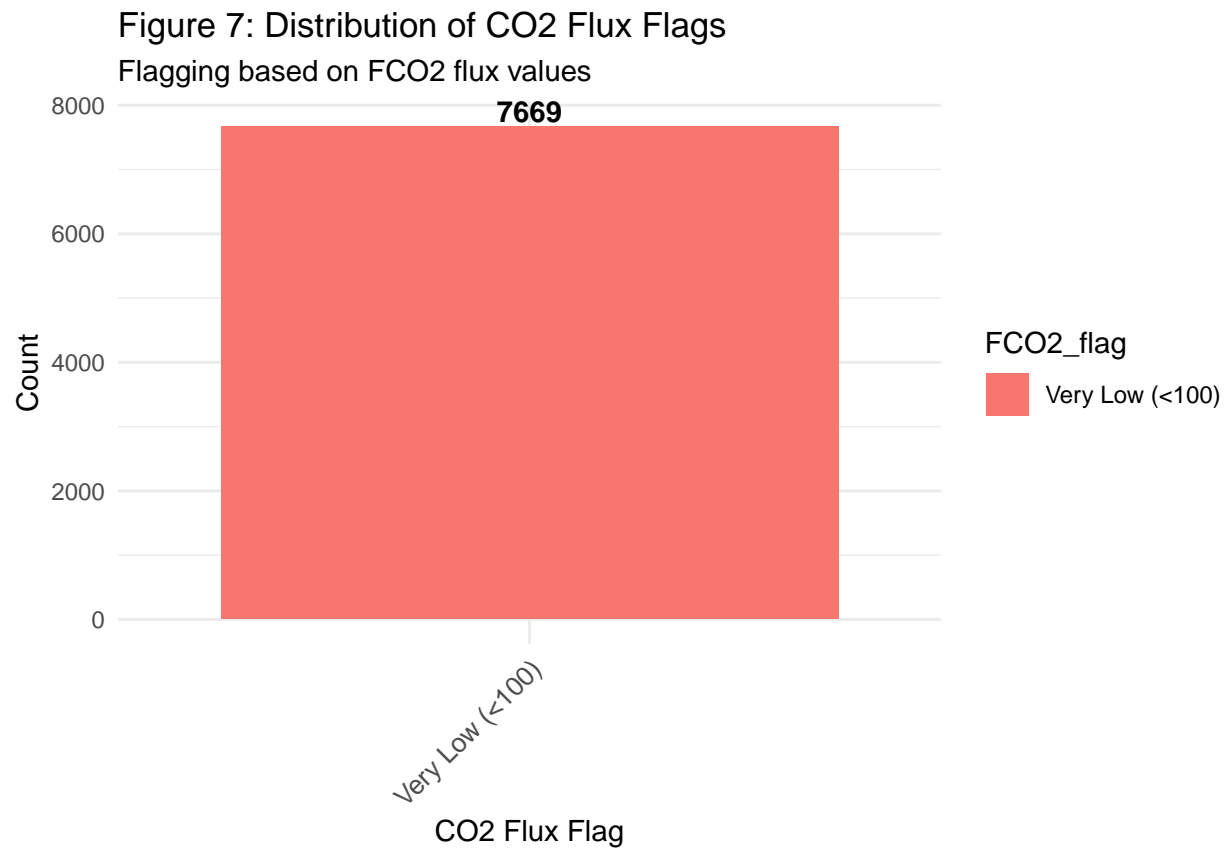
Figure 9:Monthly Distribution of Negative Fluxes

Figure 10:Monthly Distribution of CO2 Flux Flags

Figure 11:Monthly Distribution of N2O Flux Flags