ON THE USABILITY OF SMALL-SCALE SCINTILLATION MUON TELESCOPES

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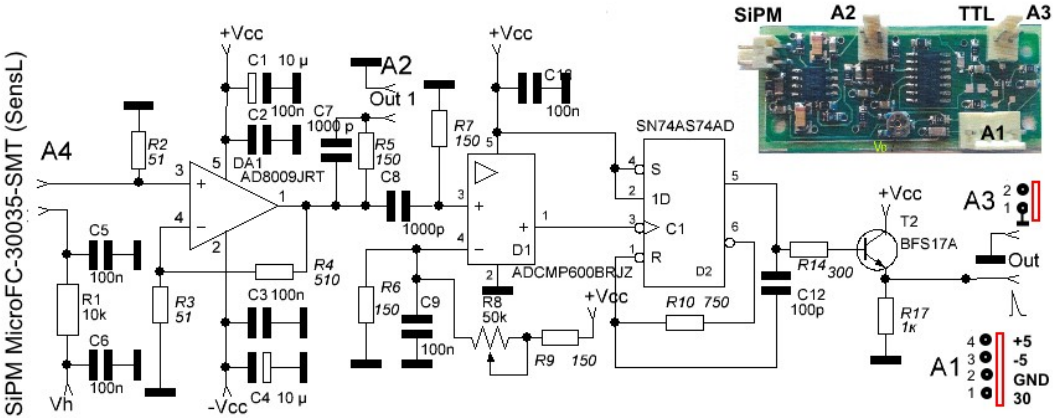
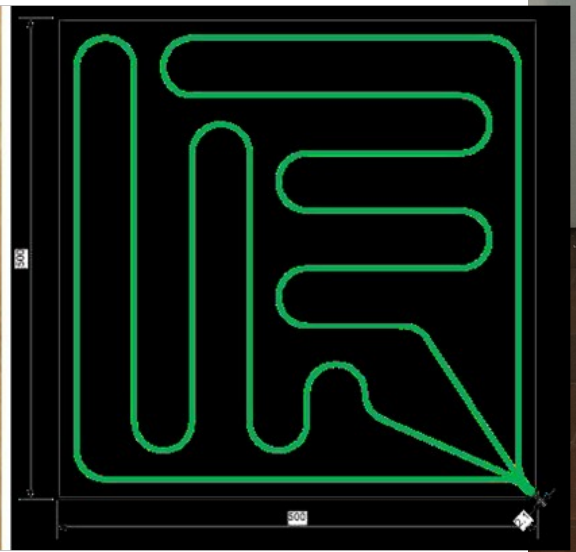
IZMIRAN

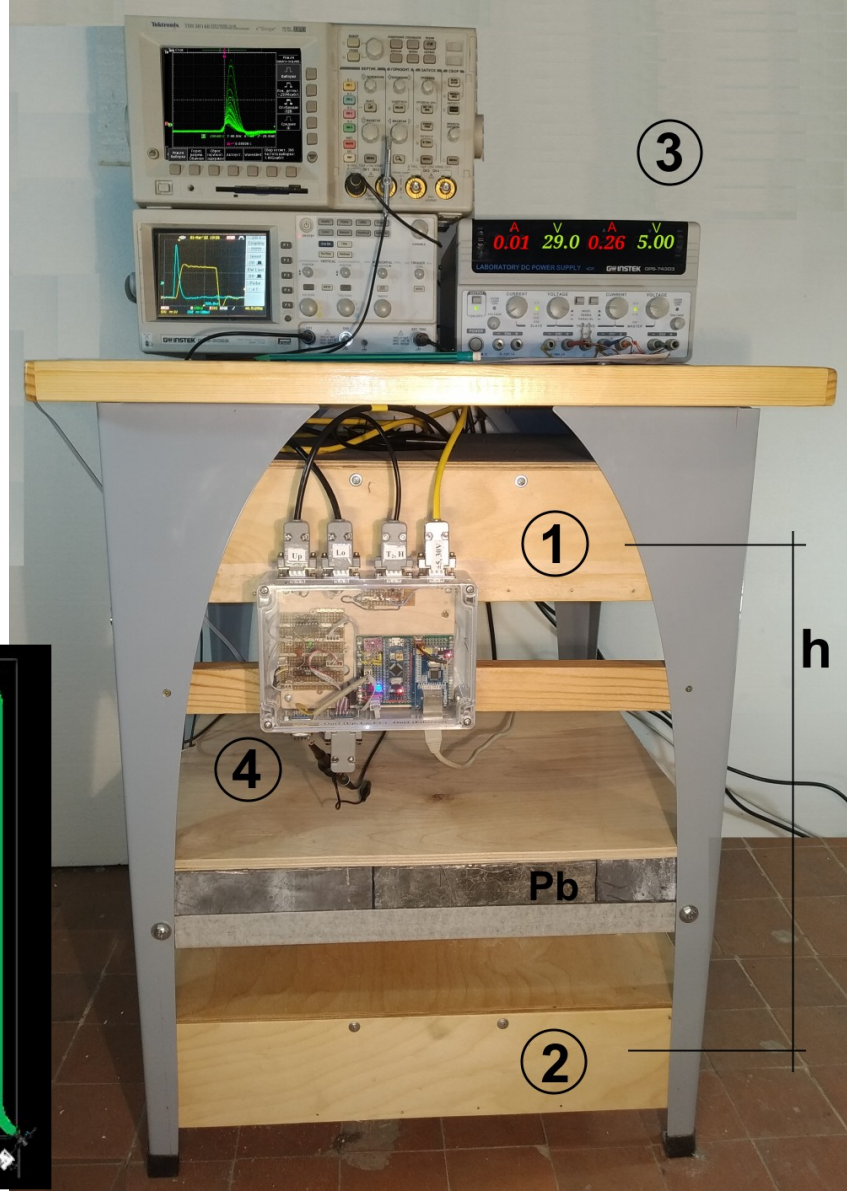
NMDB Athens, 2025

OPTO-Cell


SiPM MicroFC-30035-SMT (SensL)
A4
Vh
+Vcc
-Vcc
C1 10 µ
C2 100n
C3 100n
C4 10 µ
C5 100n
C6 100n
C7 1000 p
C8 1000p
C9 100n
C10 100n
C12 100p
R1 10k
R2 51
R3 51
R4 510
R5 150
R6 150
R7 150
R8 50k
R9 150
R10 750
R14 300
R17 1к
DA1 AD8009JRT
A2
Out 1
D1 ADCMP600BRJZ
SN74AS74AD
S
1D
C1
R
D2
T2 BFS17A
A3
Out
A1
+5
-5
GND
30

SiPM
A2
TTL
A3
A1

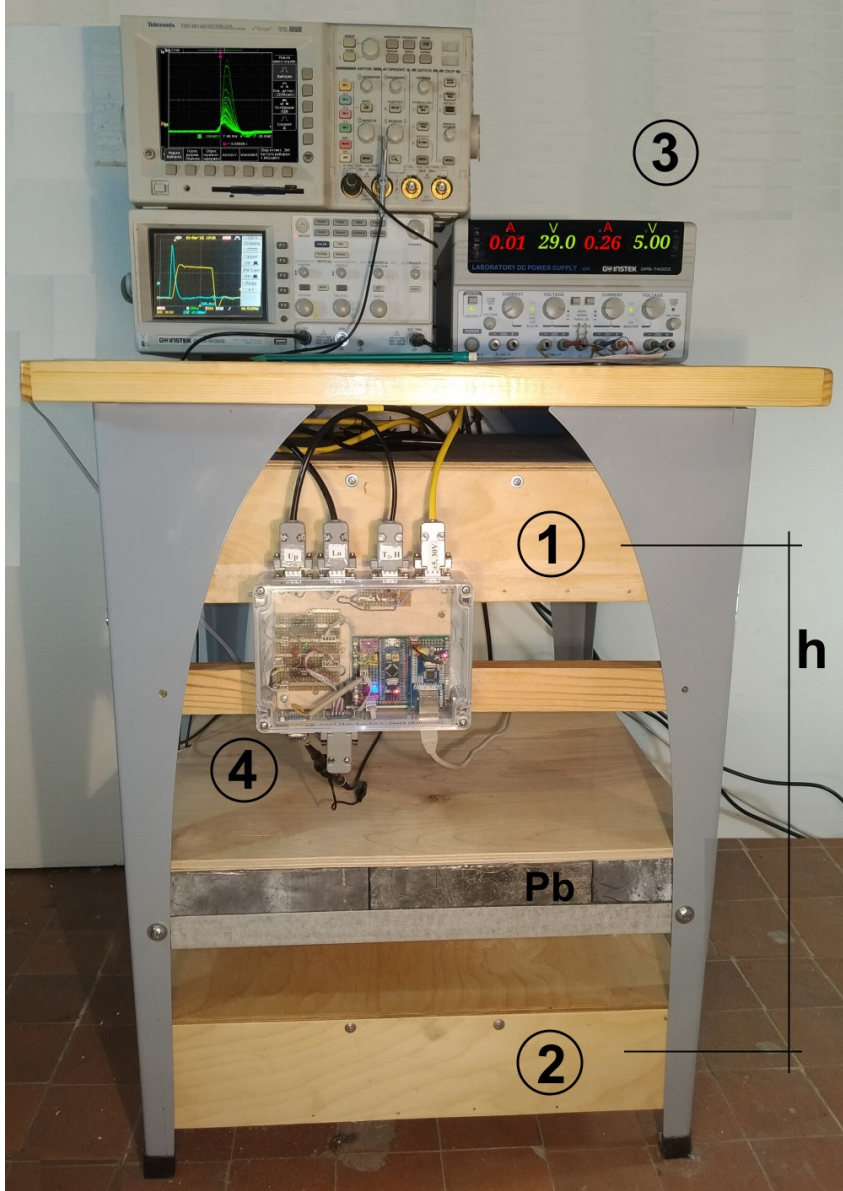



3
0.01
29.0
0.26
5.00
1
4
Pb
2
h

0.5 x 0.5 x 0.05 m

H = 0.5 m

Pb = 5 cm



Embedded data collection system:

STM32 microcontroller (with ADC)

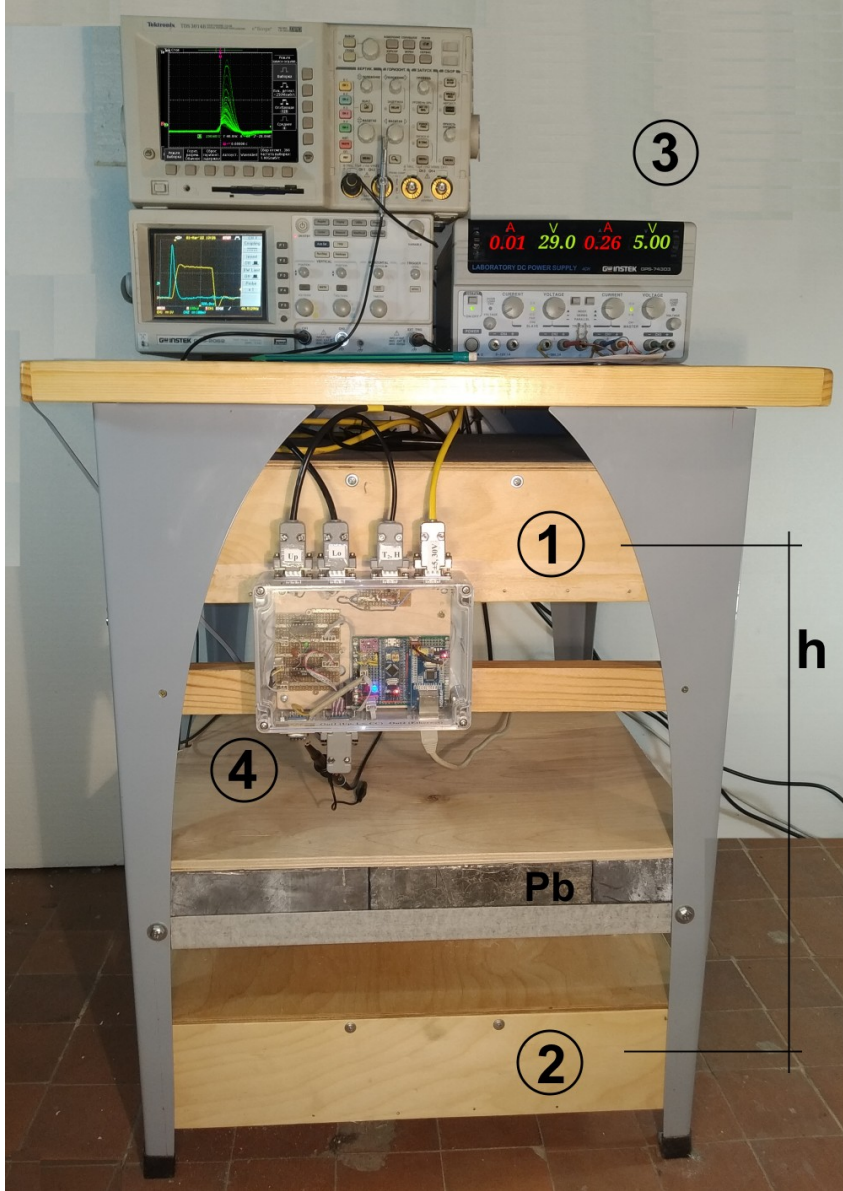
BMP280 pressure sensor

DS18B20 temperature sensor

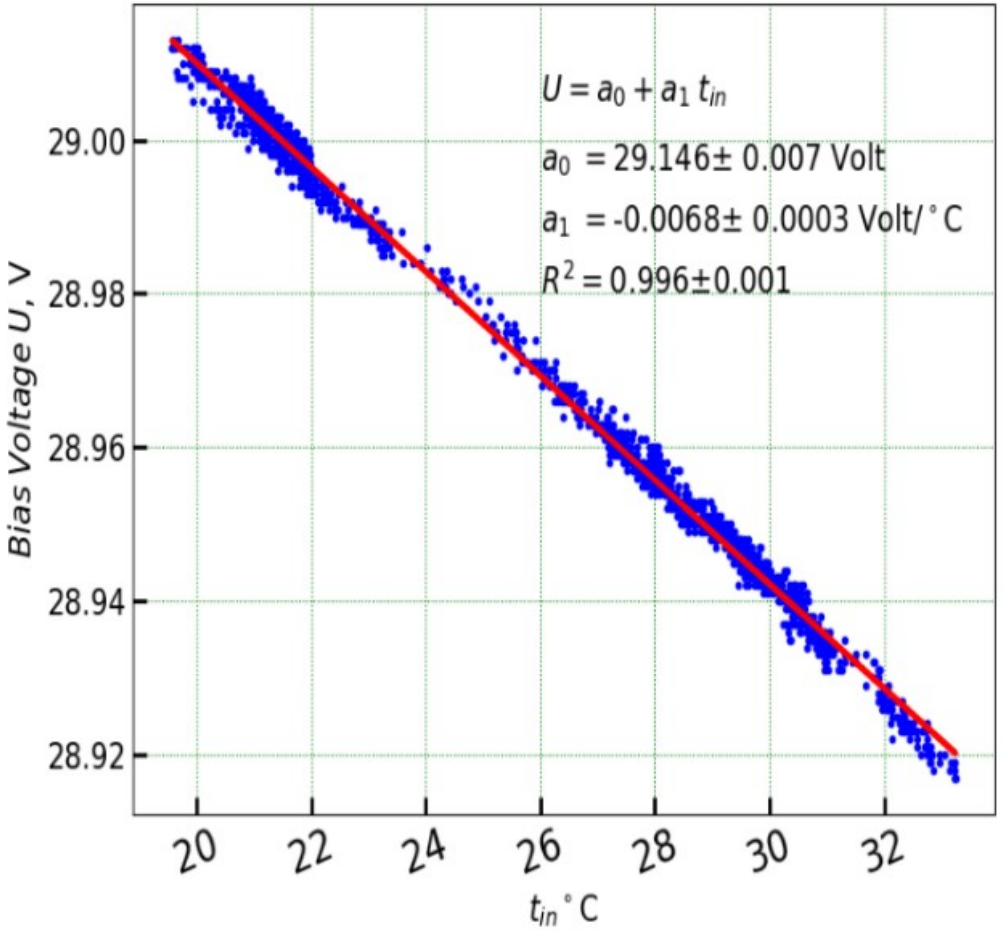
W5500 Ethernet-controller

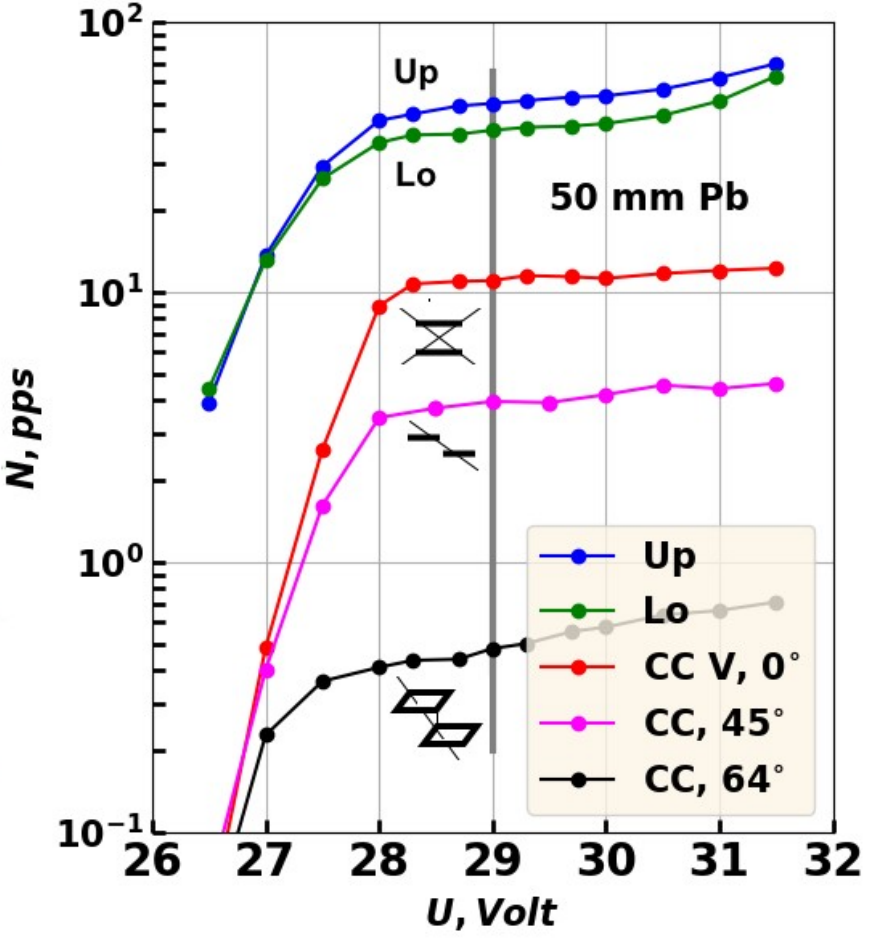
DS3231 clock with NTP sync

Fallback flash-memory storage

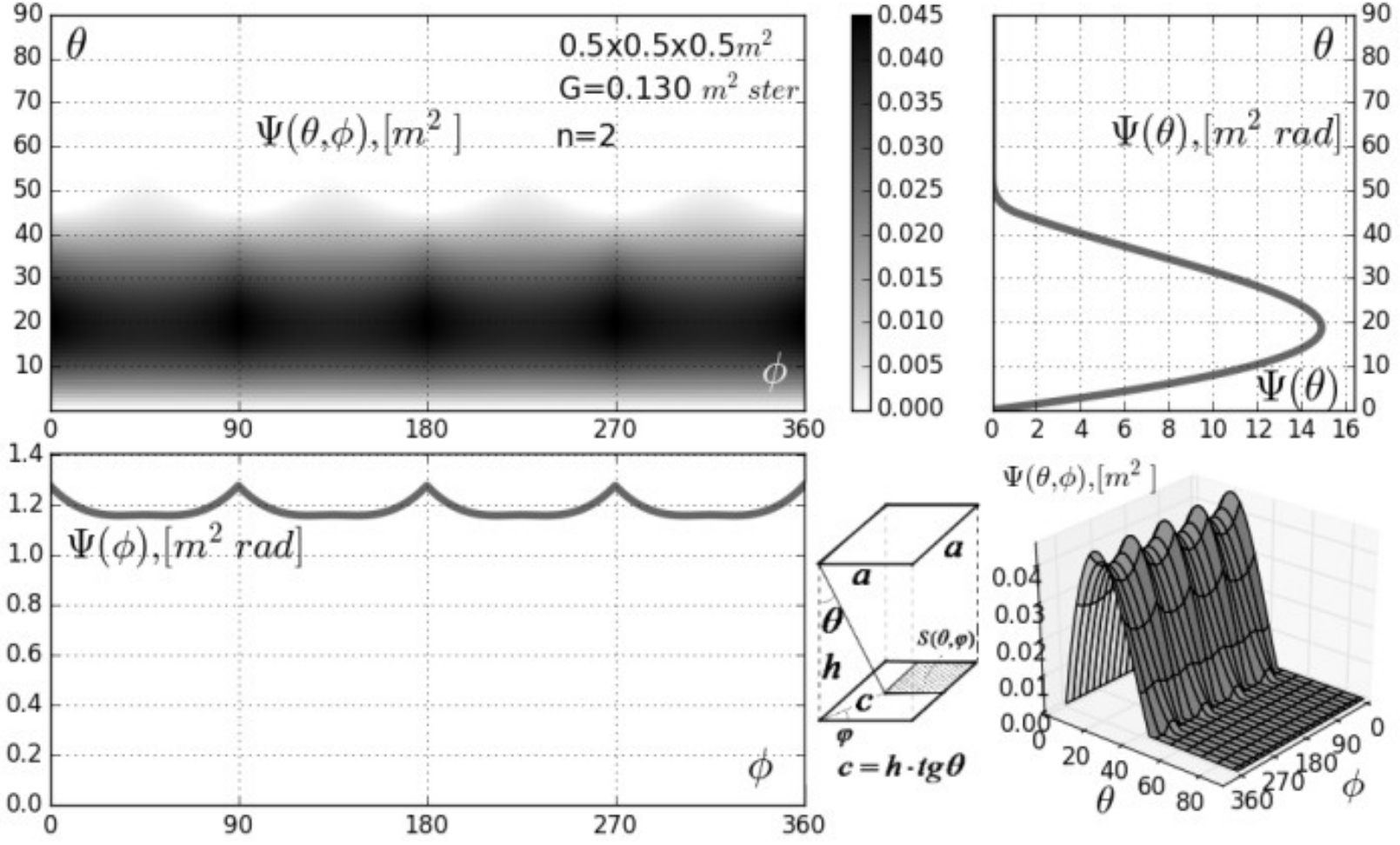


Power supply dependence





Direction diagramm

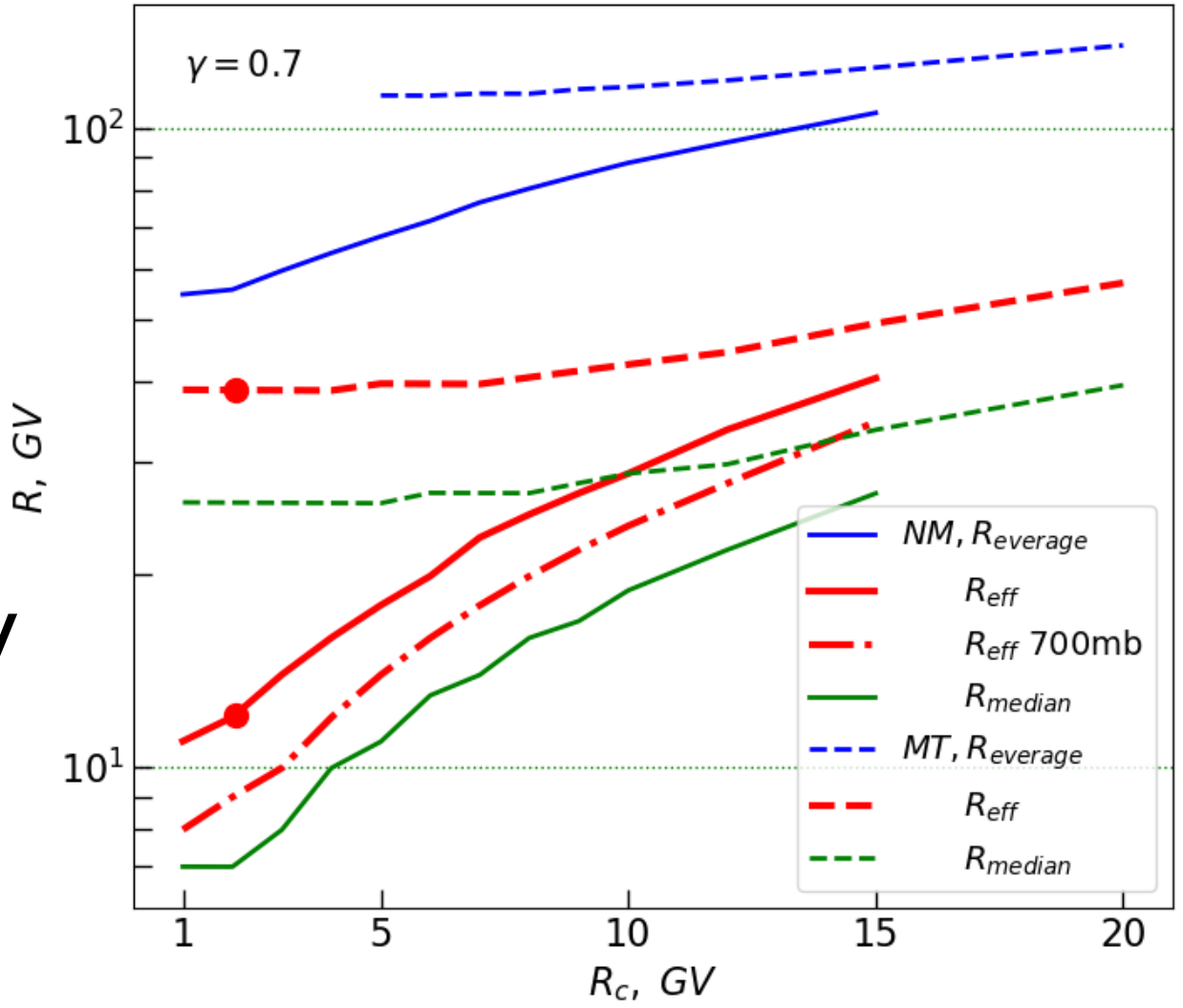


Rigidity characteristics:

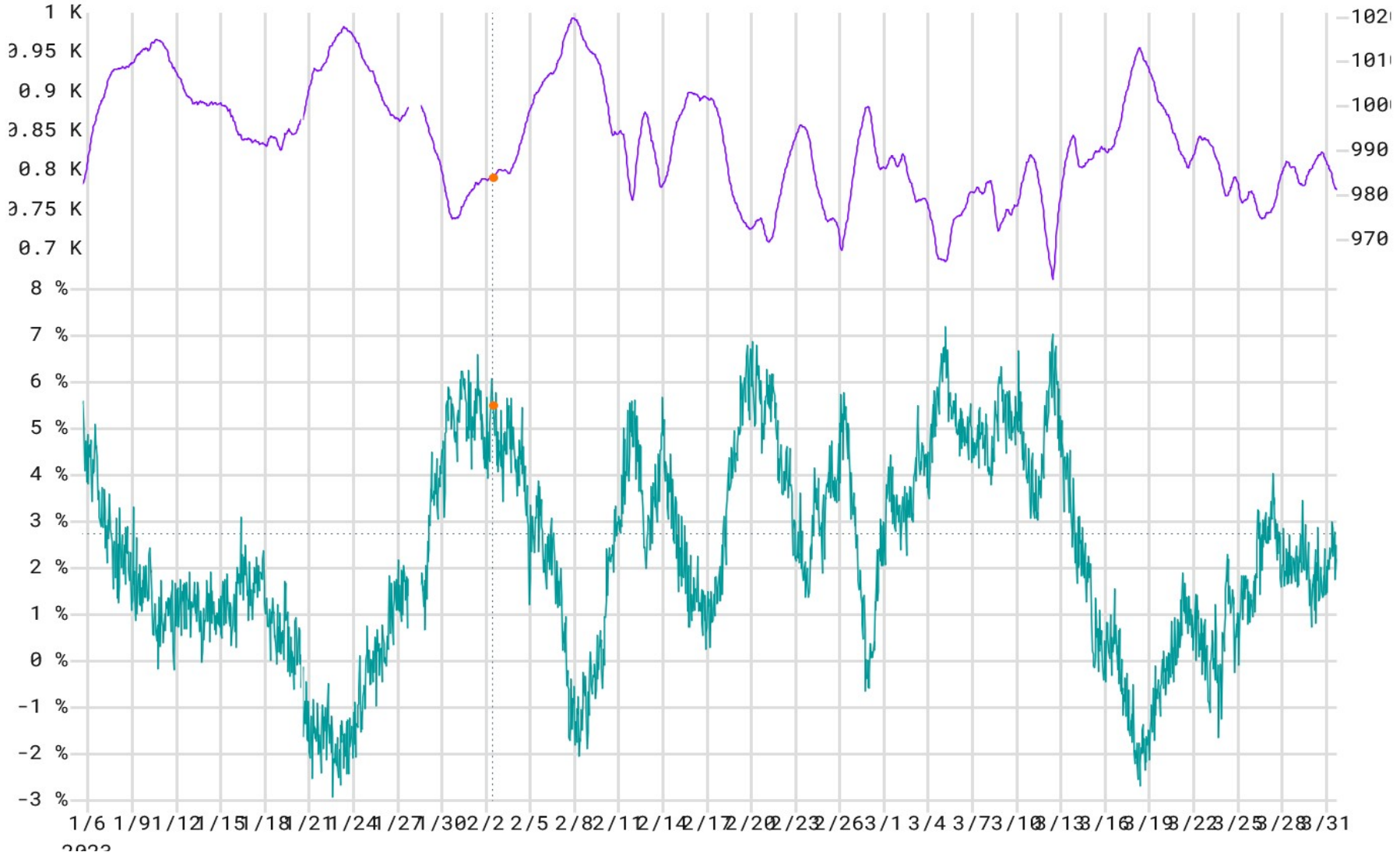
Ravg = 110 GV

Rmedian = 26 GV

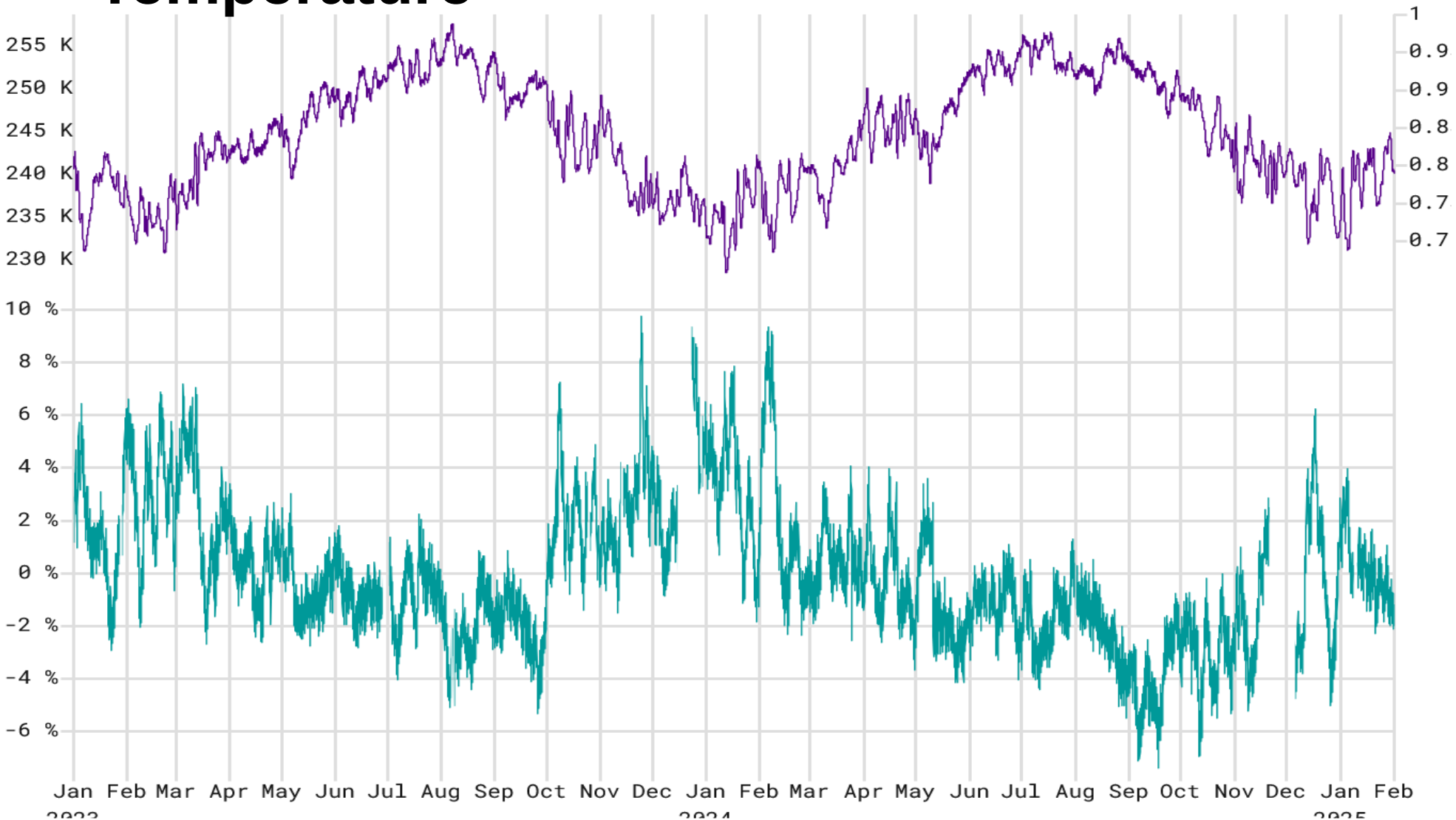
Reff = 38.9 GV



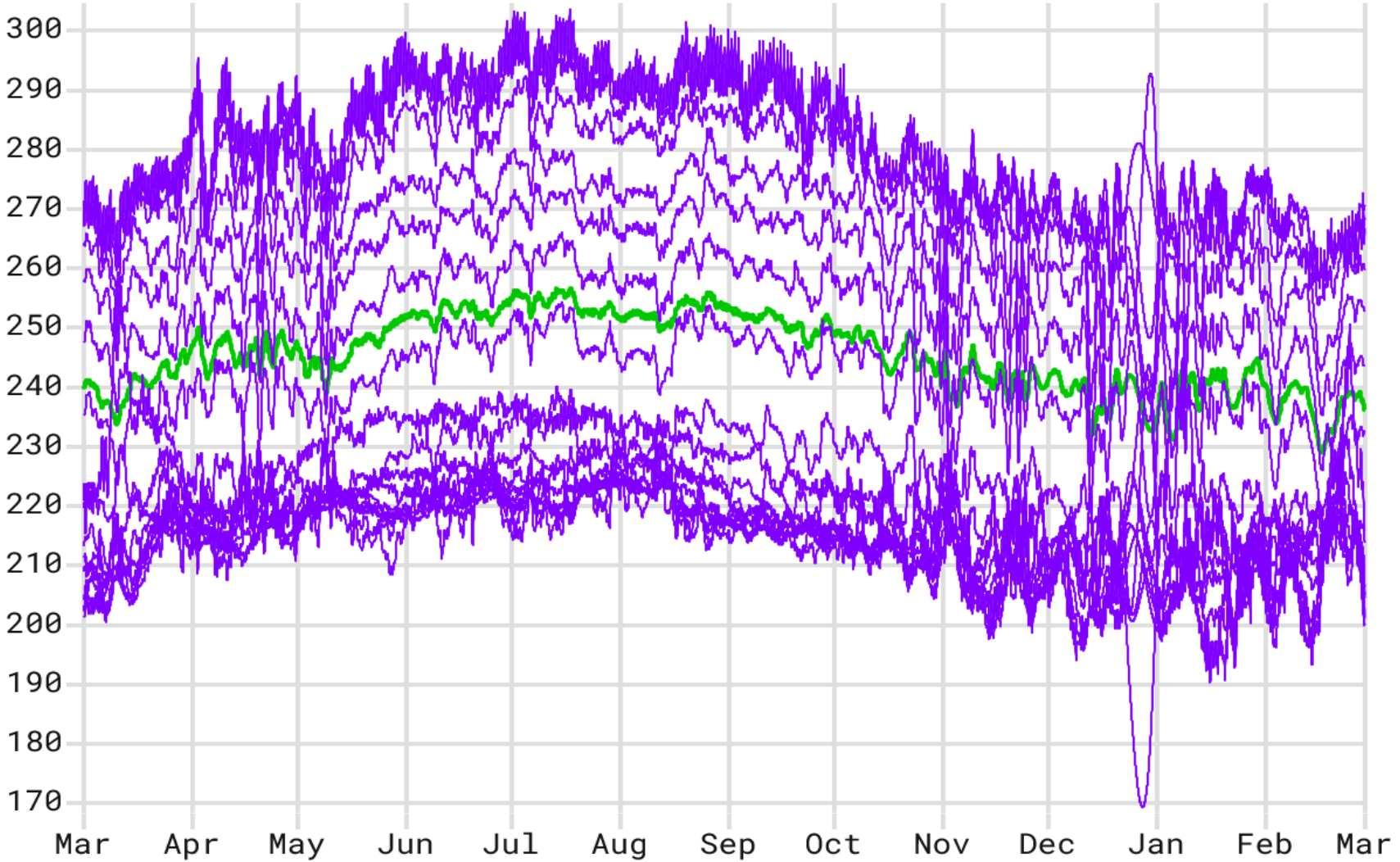
Pressure


1 K
0.95 K
0.9 K
0.85 K
0.8 K
0.75 K
0.7 K
8 %
7 %
6 %
5 %
4 %
3 %
2 %
1 %
0 %
-1 %
-2 %
-3 %
1/6
1/9
1/12
1/15
1/18
1/21
1/24
1/27
1/30
2/2
2/5
2/8
2/11
2/14
2/17
2/20
2/23
2/26
3/1
3/4
3/7
3/10
3/13
3/16
3/19
3/22
3/25
3/28
3/31
2023
102
101
100
990
980
970

Temperature

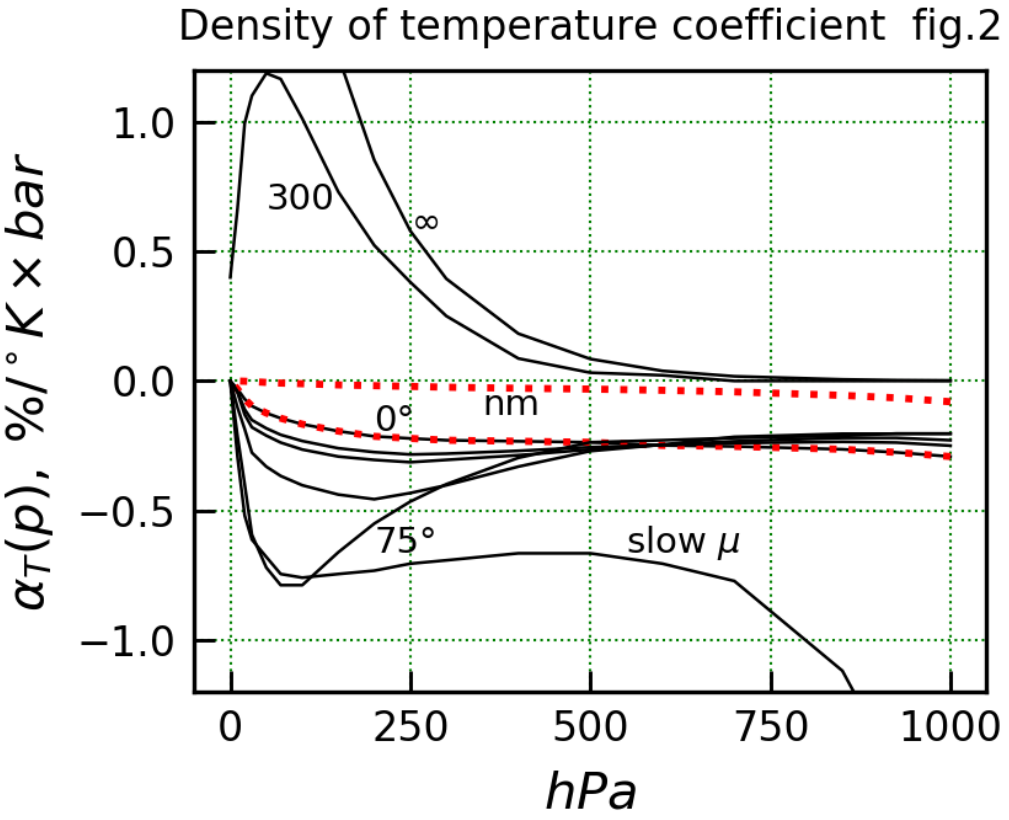


NCEP/NCAR Reanalysis data interpolated



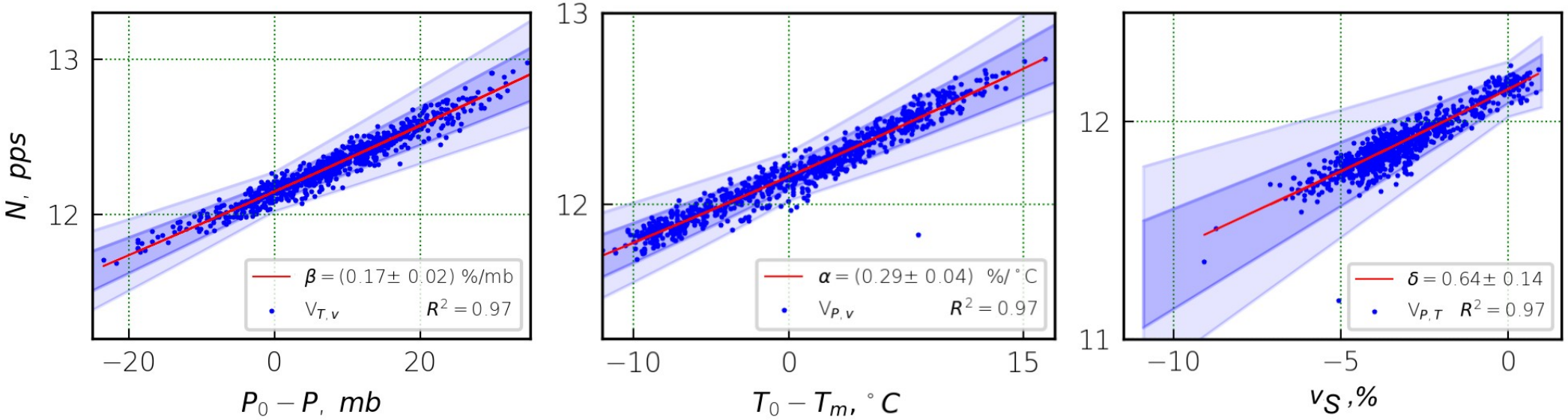
Temperature effect correction:

- Effective
- Mass-average
- Individual levels

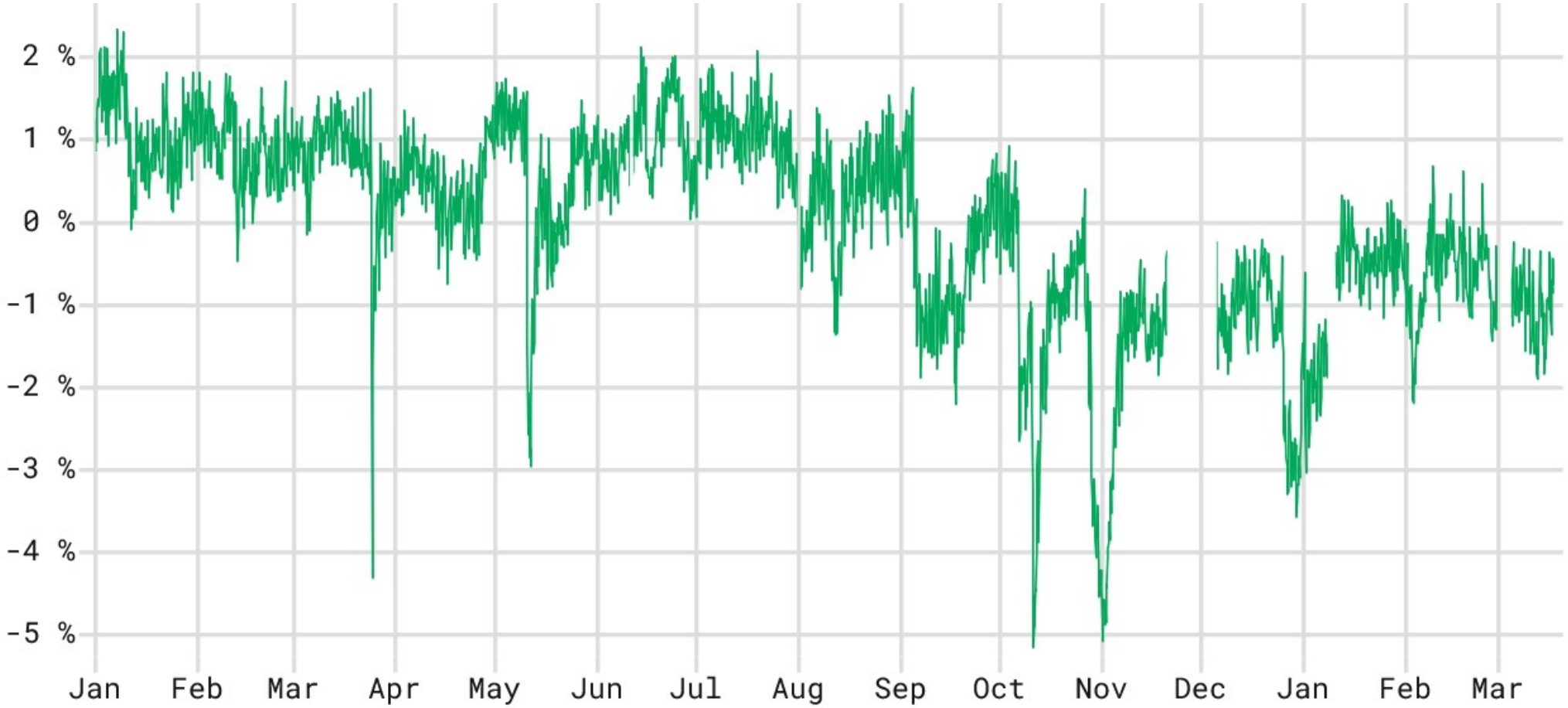


$$\ln N_U = \ln N_C + \beta(P_0 - P) + \alpha(T_0 - T_m) + \delta v_S$$

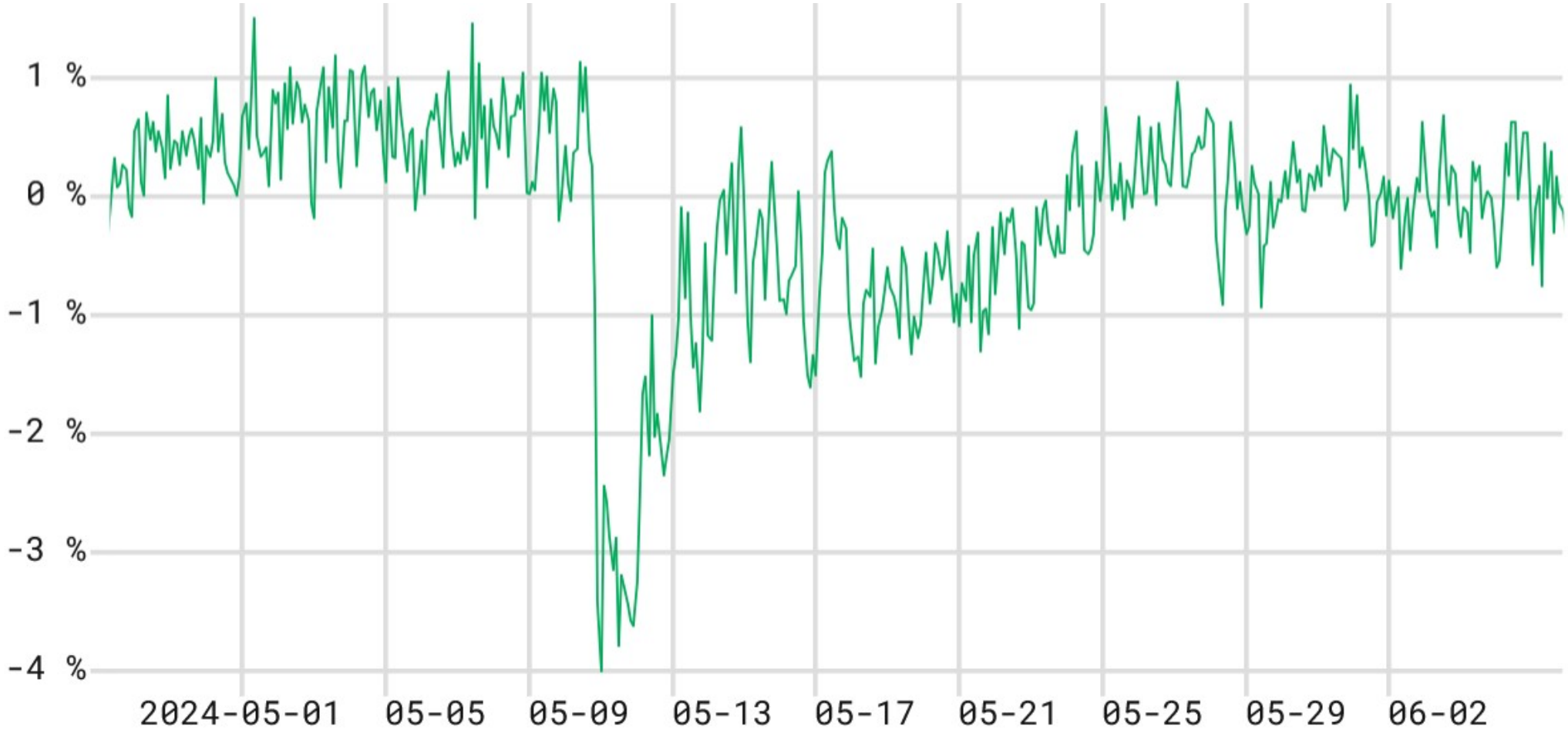
$$N_C = N_U \exp[-\beta(P_0 - P)] \times [1 - \alpha(T_0 - T_m)] / (I_E / I_{Base})]$$



Last year of data, 4h avg

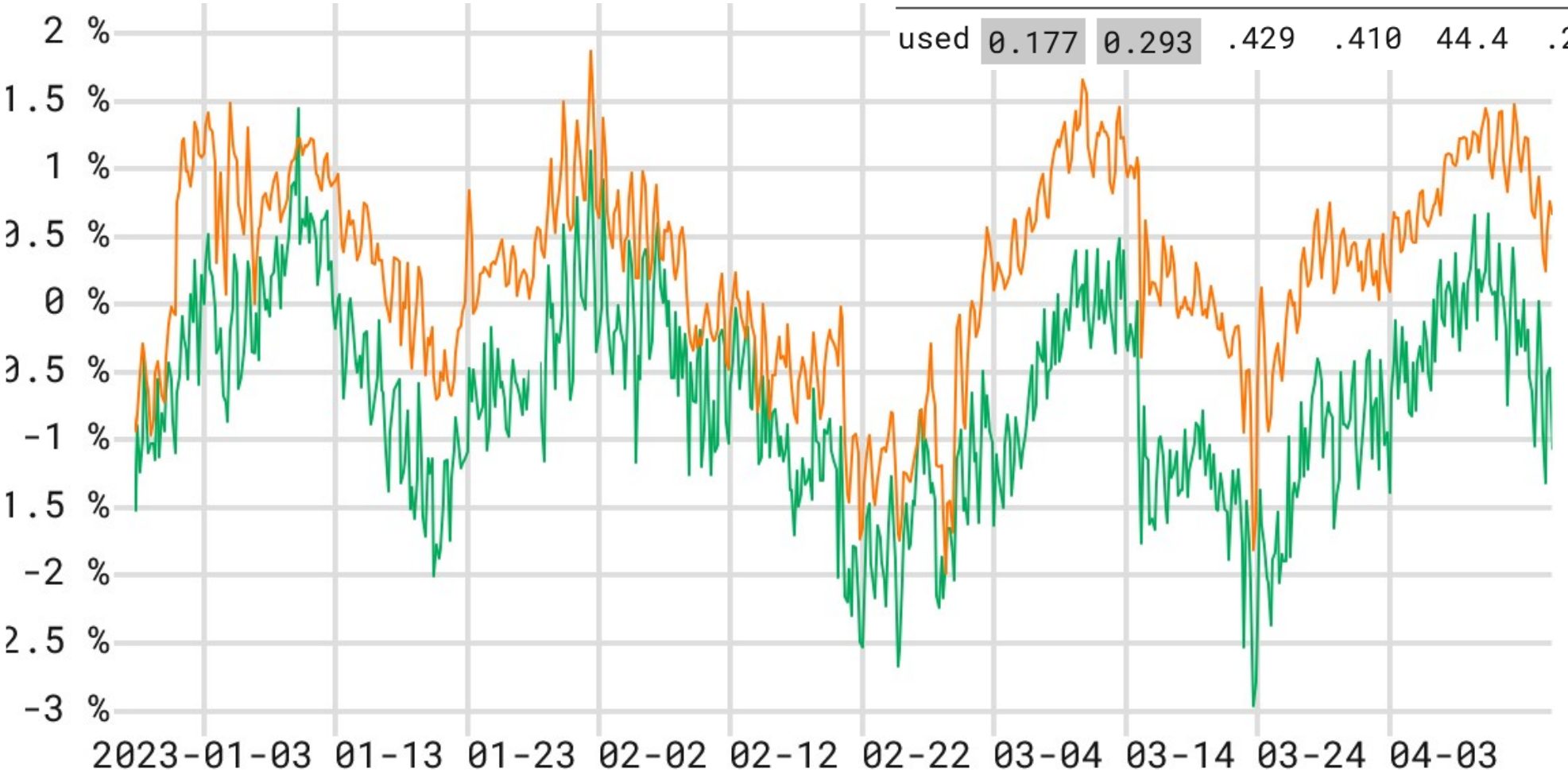


May 2024 Forbush



Correlation with GSM result

	p	t	c0	cxy	φ	cz
cur	.168	.357	.328	.433	48.8	.384
err	.001	.003	.006	.033	34.6	.019
used	0.177	0.293	.429	.410	44.4	.271



Thank you for attention!

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