Forbush of May 2024 with EEE telescopes

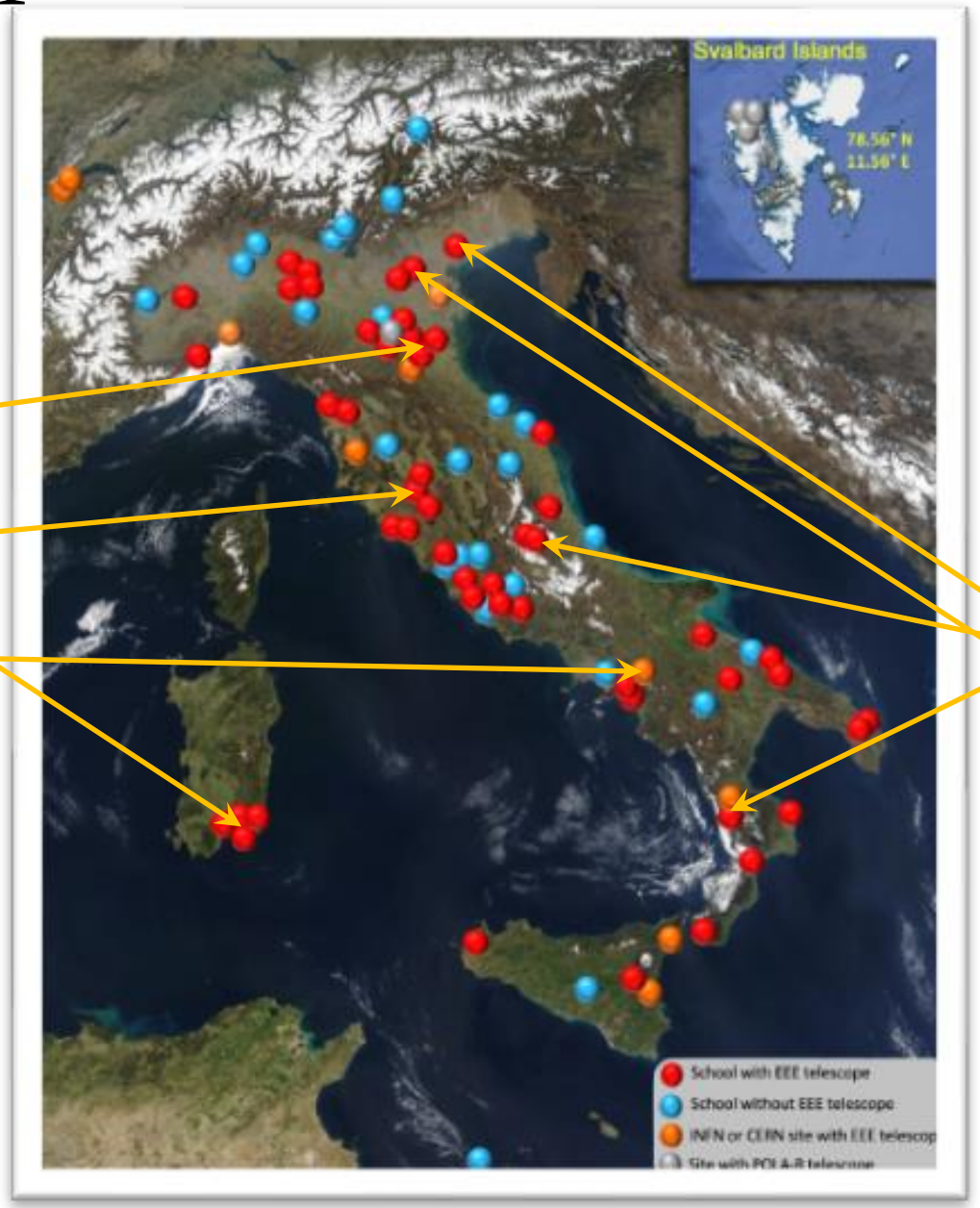
A. De Caro, F. Noferini, O. Pinazza, C. Ripoli

May 2024 Forbush analysis with EEE telescopes

- Analysis code implemented by O.Pinazza already for the same Forbush event studied with POLAR data
  - All details in her report 12.12.2024
- Eleven EEE telescopes used for this analysis: see next slide for their geografical distribution
- Barometric correction applied to each telescope
  - In some cases pression values have been recovered by external ‘weather station’ (aeroports, mainly)
- Results:
  - differential rates per each telescope
  - mean differential rate

EEE telescopes involved in this analysis

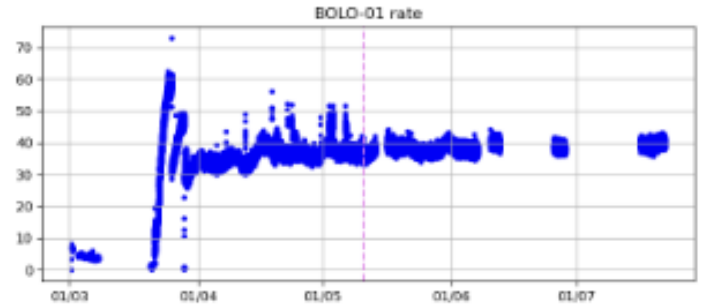
1. BOLO_01
2. BOLO_02
3. BOLO_03
4. CAGL_01
5. GROS_01
6. REND_01
7. SALE_03

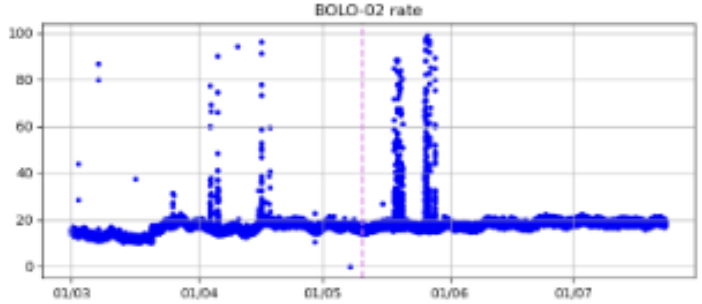


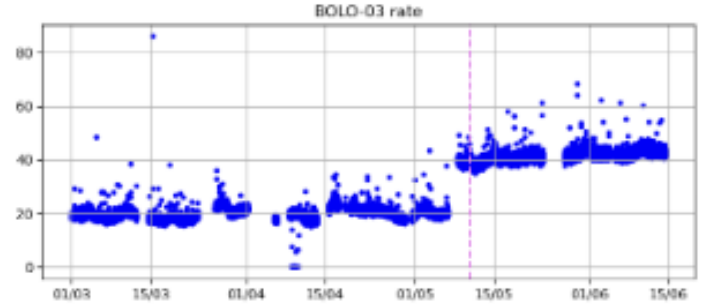
1. COSE_01
2. REND_01
3. LAQU_01
4. TREV_01
5. VICE_01

BOLO_01 BOLO_02 BOLO _03

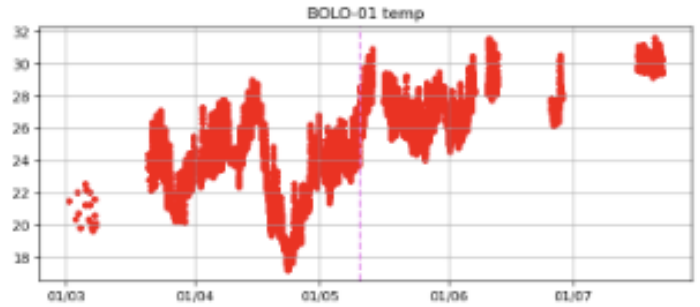
Rate

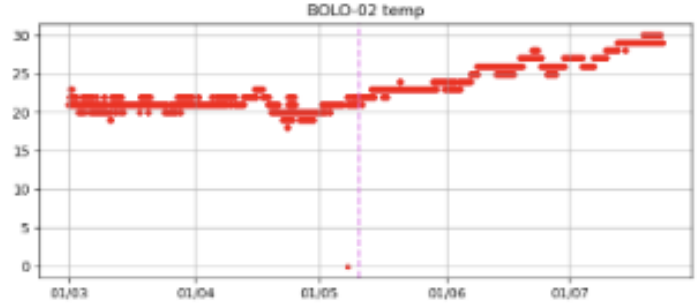


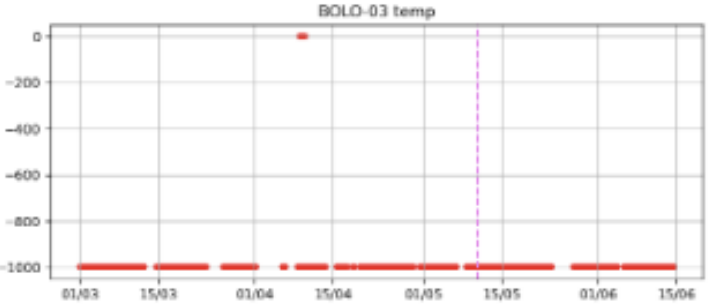




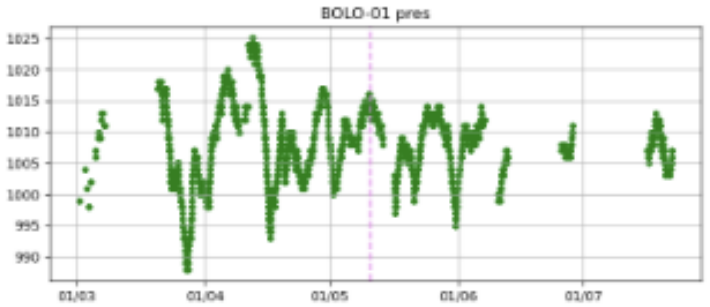
Temperature

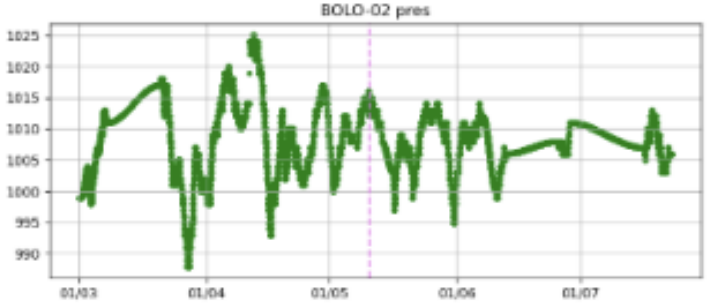


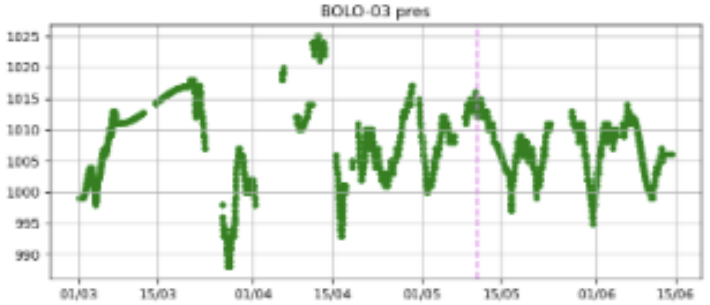




Pressure







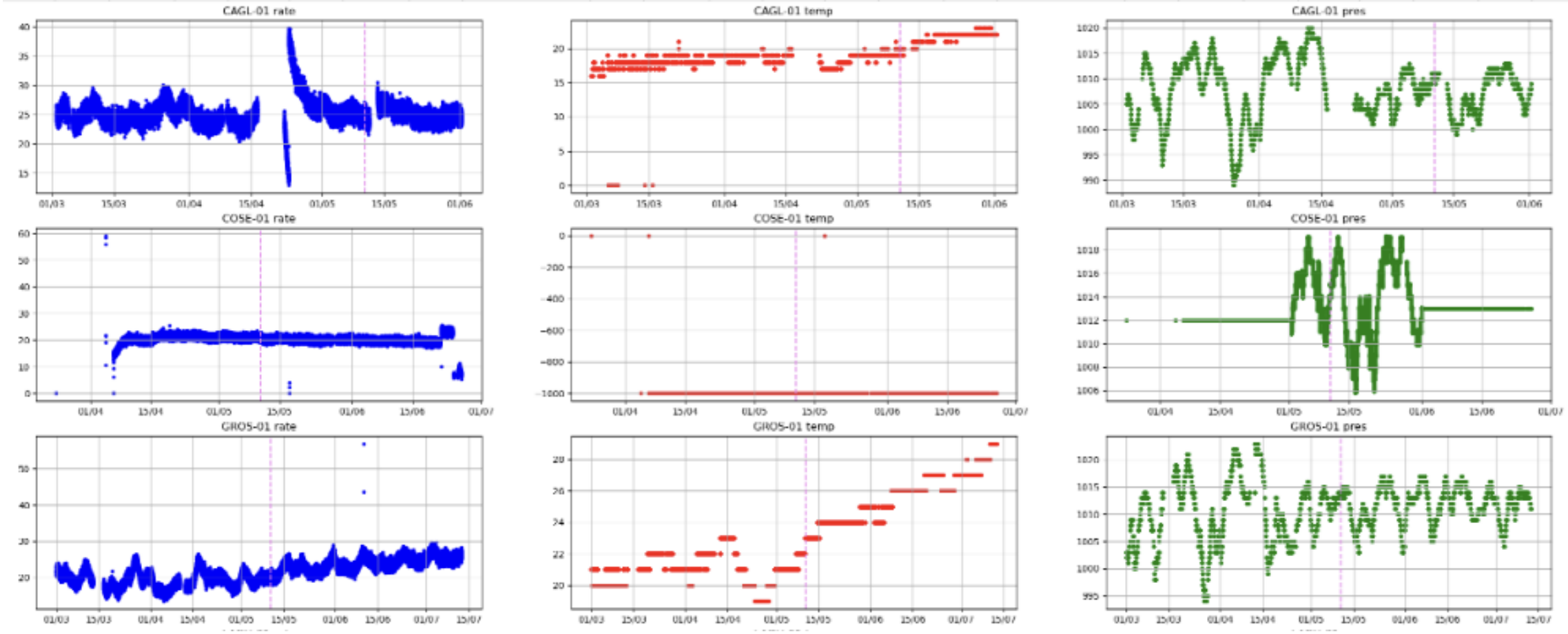
Per alcuni telescopi: misure di pressione recuperate solo nel periodo del Forbush

CAGL_01 COSE_01 GROS _01

Rate

Temperature

Pressure



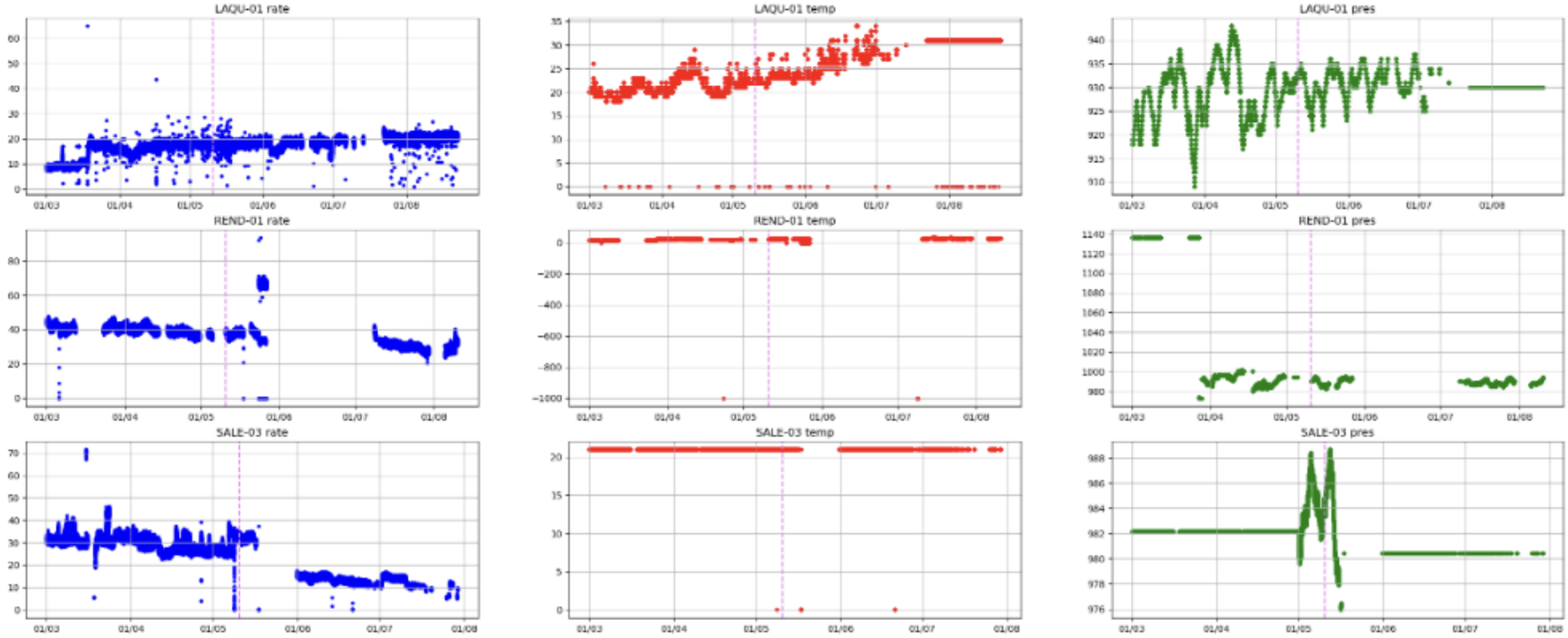
Per alcuni telescopi: misure di pressione recuperate solo nel periodo del Forbush

LAQU_01 **REND_01** **SALE_03**

Rate

Temperature

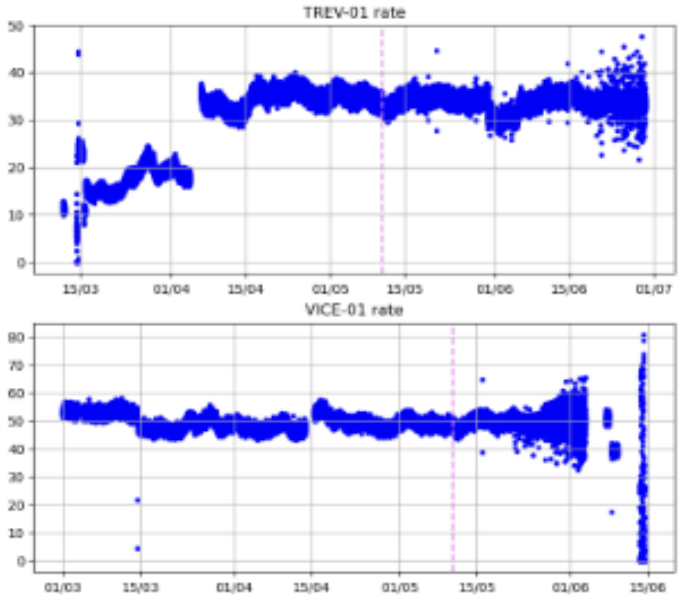
Pressure



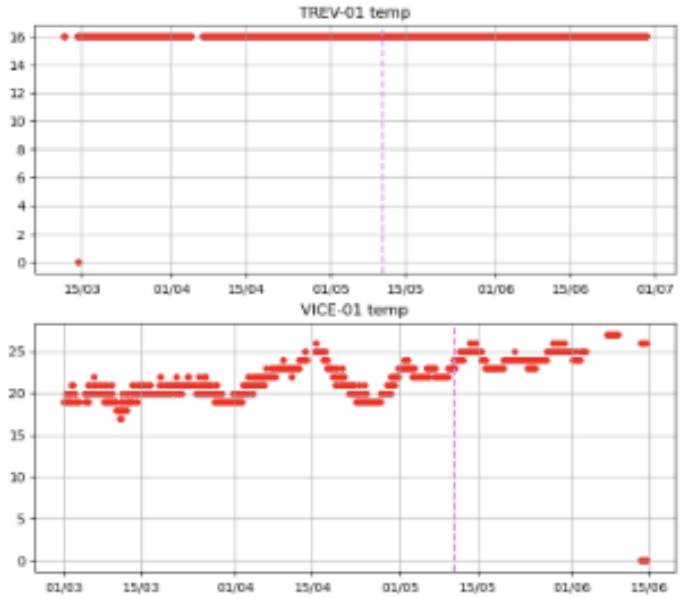
Per alcuni telescopi: misure di pressione recuperate solo nel periodo del Forbush

TREV_01 **VICE_01**

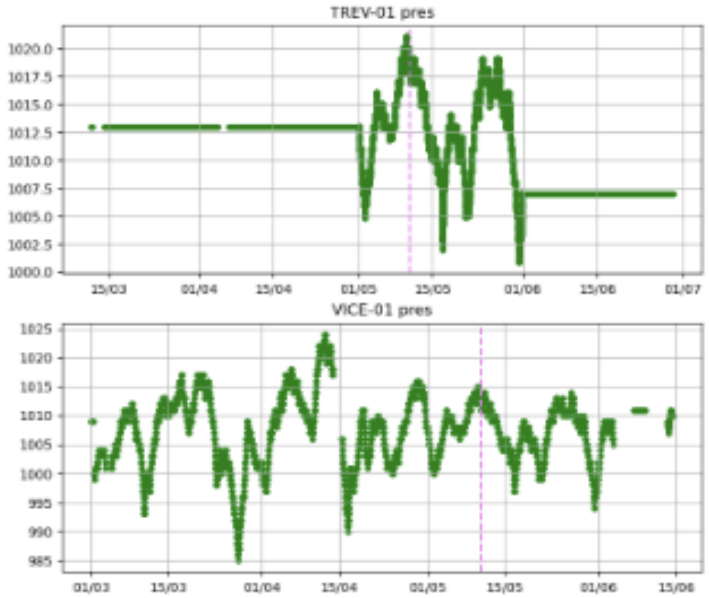
Rate



Temperature

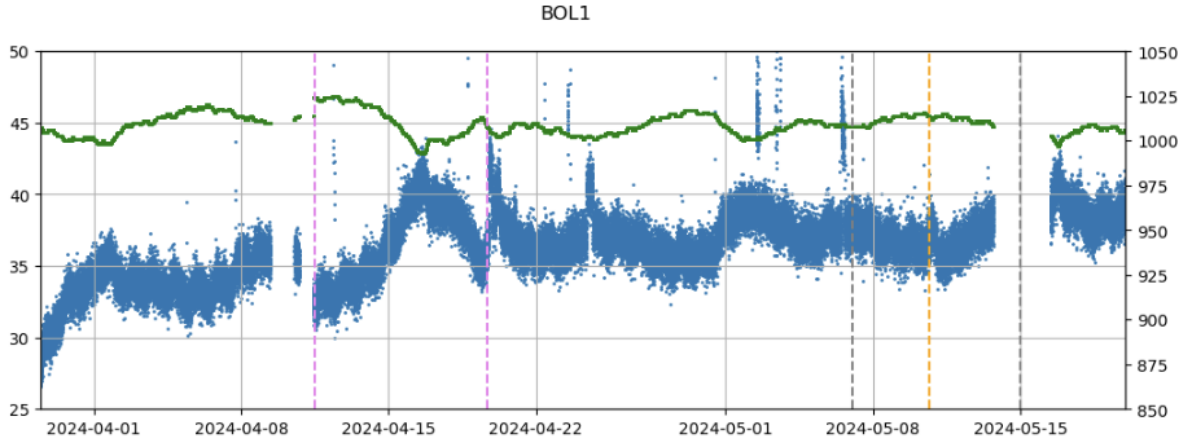


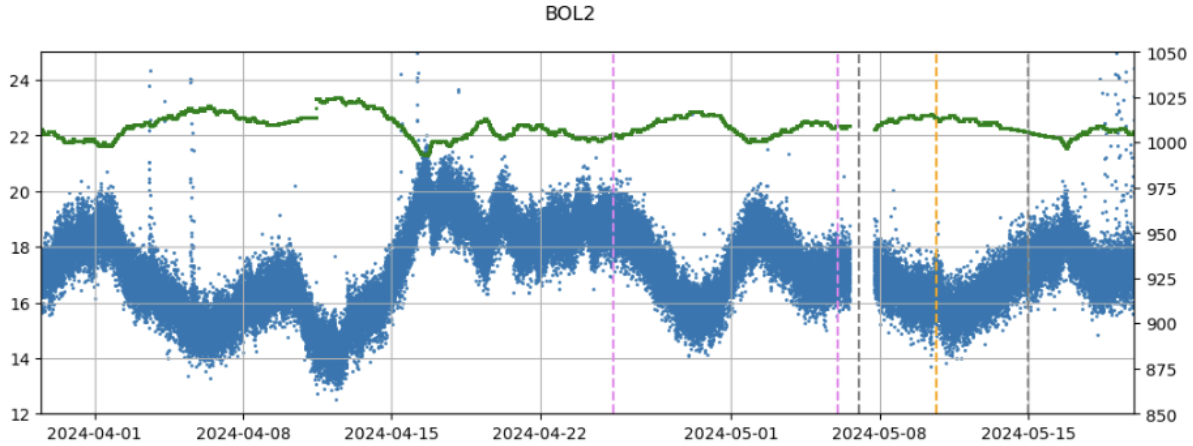
Pressure

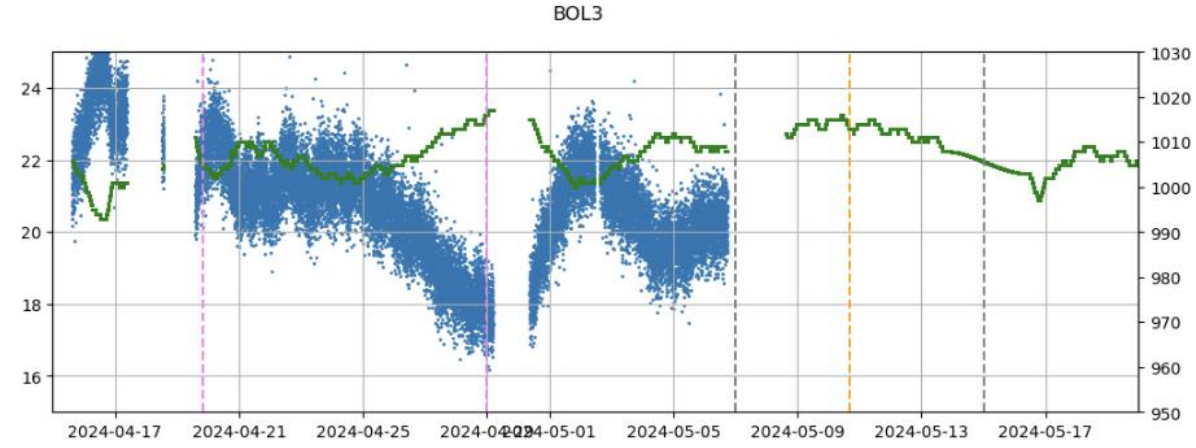


Per alcuni telescopi: misure di pressione recuperate solo nel periodo del Forbush

Pres and temp vs time

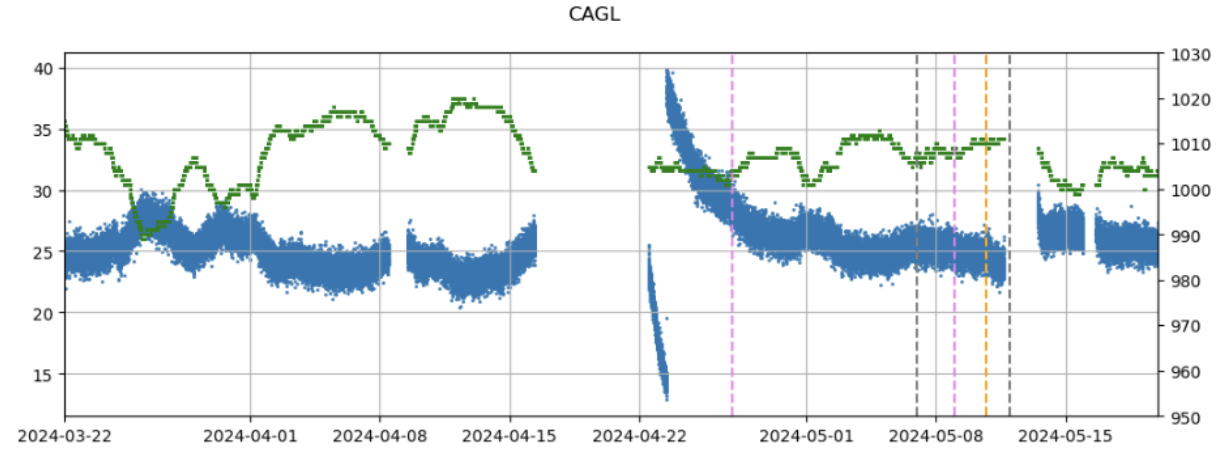


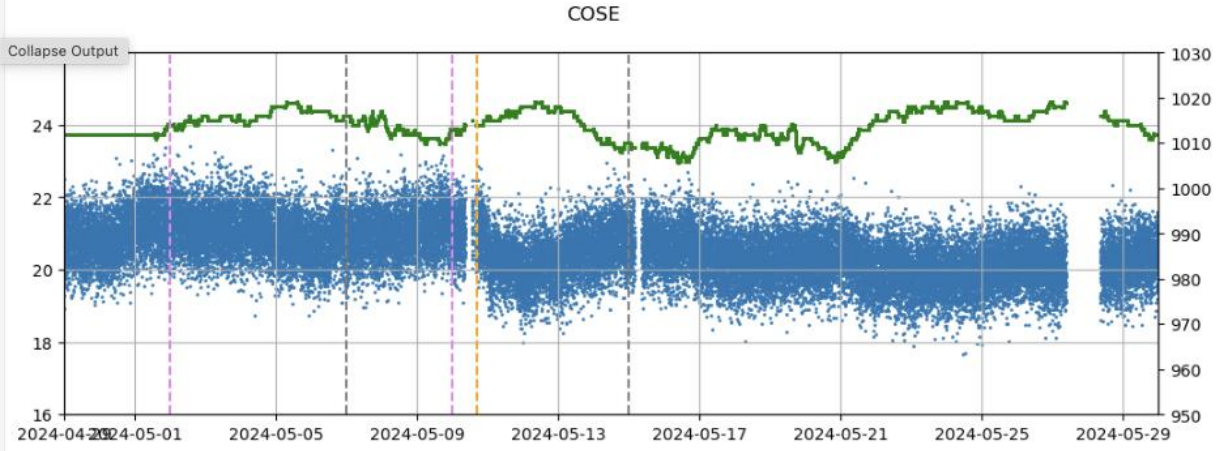


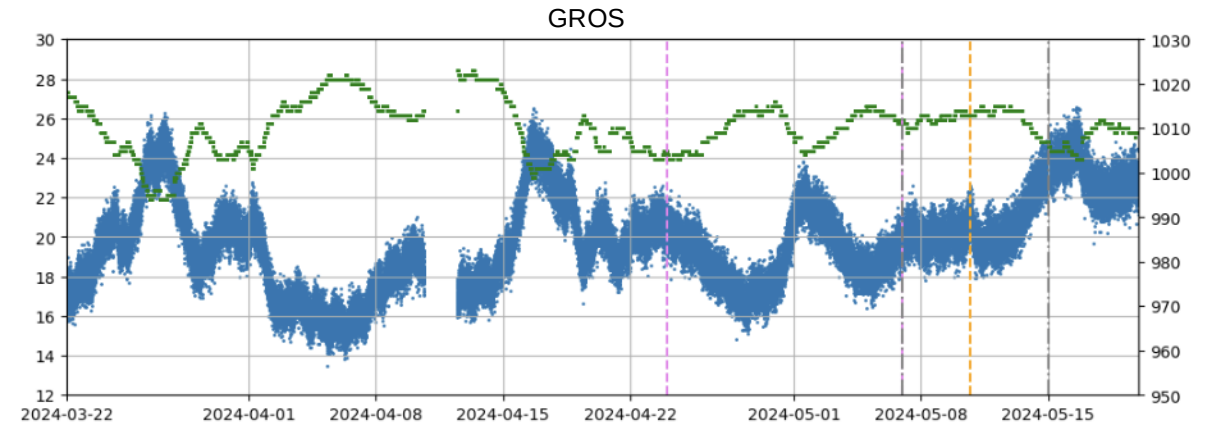



```
Telescope name =  BOL1
ydata.mean()= 36.49846941111039
        P mean =  1011.0255102040817    P std  =  9.957017945767943     P diff =  32.0
        Beta =  -0.0069469181232036745
        ParA =  -0.24833409836250867
        Pearson before =  -0.9821014452472864
        Pearson after  =  0.0008806389028135471

Telescope name =  BOL2
ydata.mean()= 17.26627298509042
        P mean =  1009.0034448818898    P std  =  4.71491528289902      P diff =  17.0
        Beta =  -0.01143529956652847
        ParA =  -0.16260520073364404
        Pearson before =  -0.9434701612866365
        Pearson after  =  -0.002739471650913509

Telescope name =  BOL3
ydata.mean()= 20.63691612156955
        P mean =  1006.8545454545455    P std  =  3.9118674072072337    P diff =  15.0
        Beta =  -0.013549967209398772
        ParA =  -0.19920224607867484
        Pearson before =  -0.8271462859664676
        Pearson after  =  0.0016404619460456743
```

Pres and temp vs time

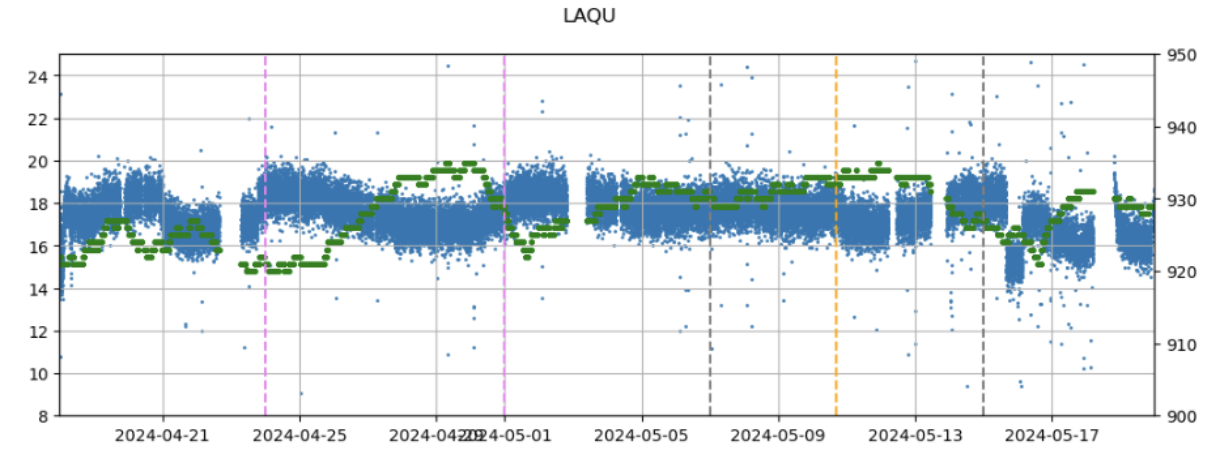


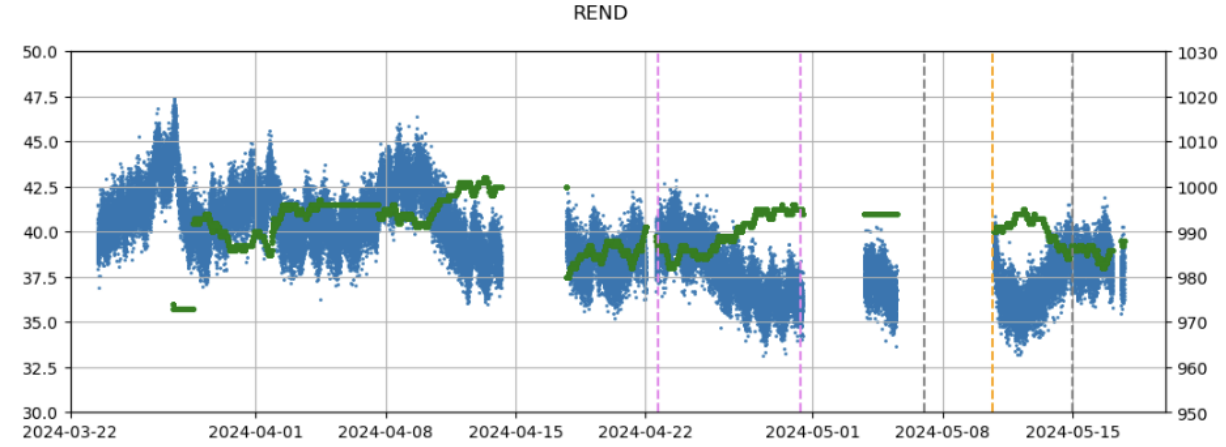


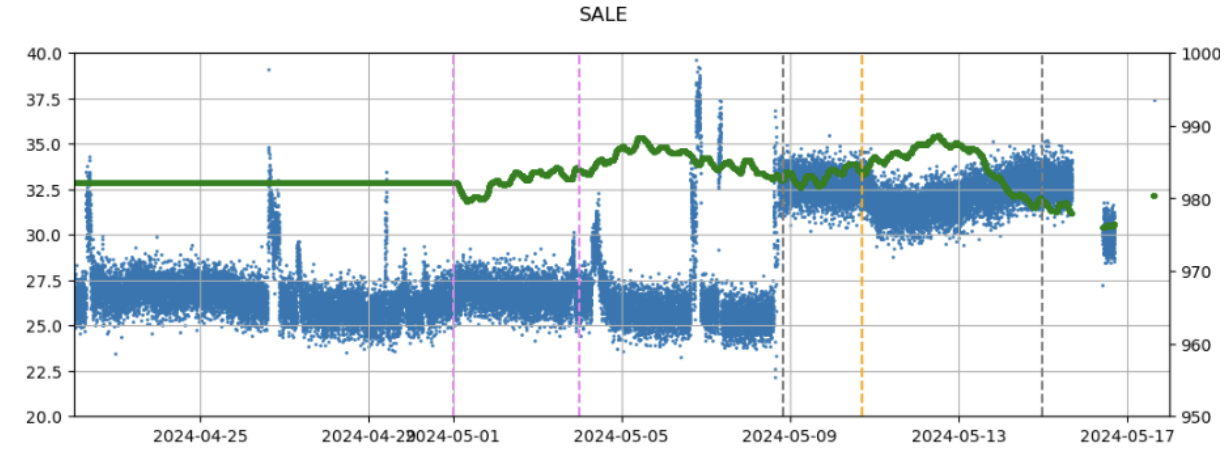



```
Telescope name =  CAGL
ydata.mean()= 25.776113993591732
        P mean =  1007.5520833333334    P std  =  2.8094698182614852    P diff =  12.0
        Beta =  -0.009778432369631851
        ParA =  -0.06336012563292283
        Pearson before =  -0.7687358377560708
        Pearson after  =  -0.006886608740466802

Telescope name =  COSE
ydata.mean()= 21.01597226659457
        P mean =  1014.8595038039788    P std  =  2.226267683667845     P diff =  9.146508653857836
        Beta =  -0.0027029316846286624
        ParA =  -0.006779759691923459
        Pearson before =  -0.5162782079458893
        Pearson after  =  0.0007241215144412801

Telescope name =  GROS
ydata.mean()= 19.041801729263405
        P mean =  1009.9775641025641    P std  =  3.7968622963142753    P diff =  13.0
        Beta =  -0.014245653757828467
        ParA =  -0.2705780667424768
        Pearson before =  -0.734849551319645
        Pearson after  =  -0.005740106725402259
```

Pres and temp vs time

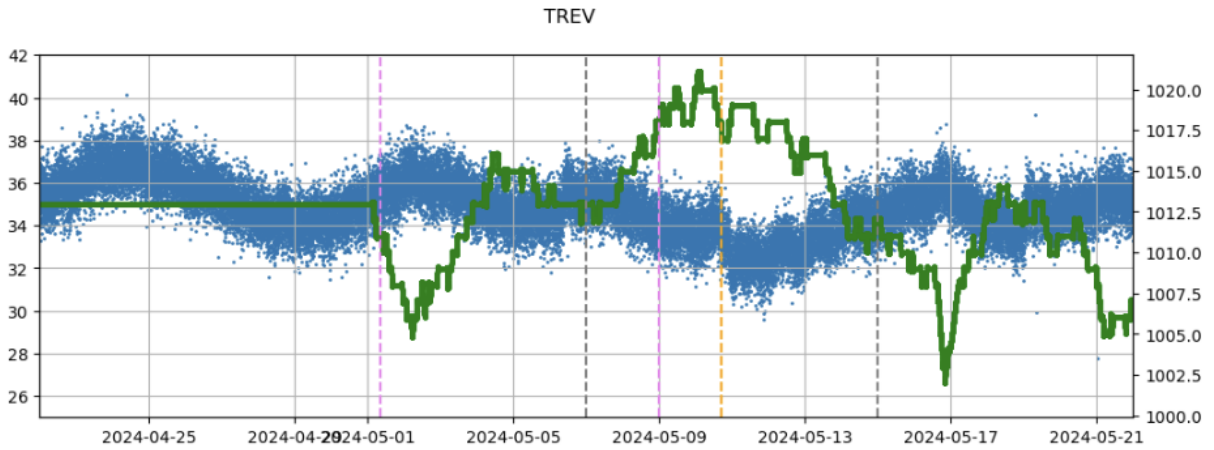


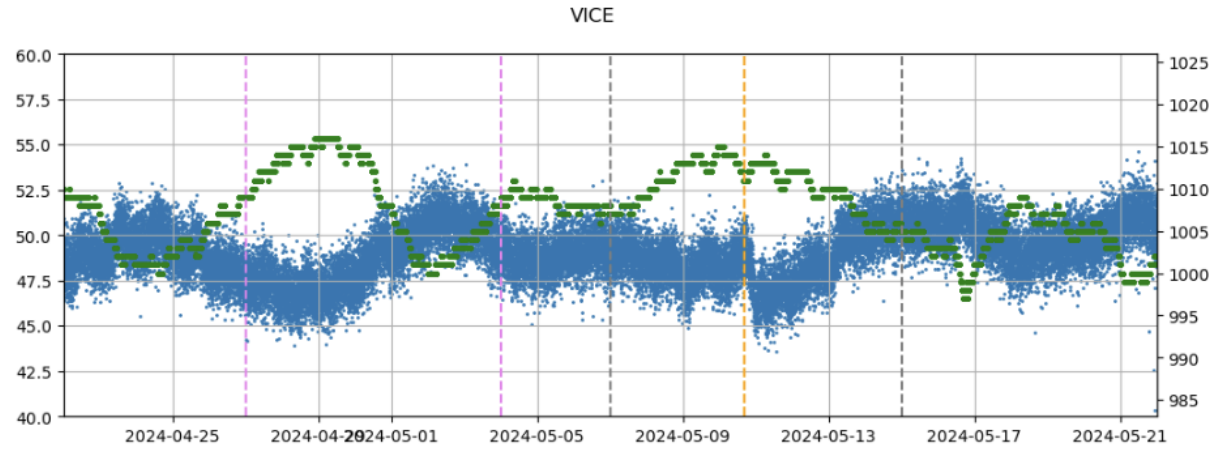





```
Telescope name =  LAQU
ydata.mean()= 17.56954347812134
        P mean =  928.2113095238095     P std  =  5.187552932549655     P diff =  15.0
        Beta =  -0.006209509342444696
        ParA =  -0.056501493630310706
        Pearson before =  -0.960217396177609
        Pearson after  =  0.0011119071941409274

Telescope name =  REND
ydata.mean()= 37.82574998814127
        P mean =  989.4701086956521     P std  =  4.194869794985407     P diff =  14.0
        Beta =  -0.008637447940327968
        ParA =  -0.07344311481384655
        Pearson before =  -0.9453522748022205
        Pearson after  =  0.000618532940508499

Telescope name =  SALE
ydata.mean()= 26.79571753078037
        P mean =  982.3504218269336     P std  =  1.3653510661511865    P diff =  4.599123364144134
        Beta =  -0.0037495282284520804
        ParA =  -0.0074676049358046726
        Pearson before =  -0.4127034874486025
        Pearson after  =  0.0025332462626085715
```

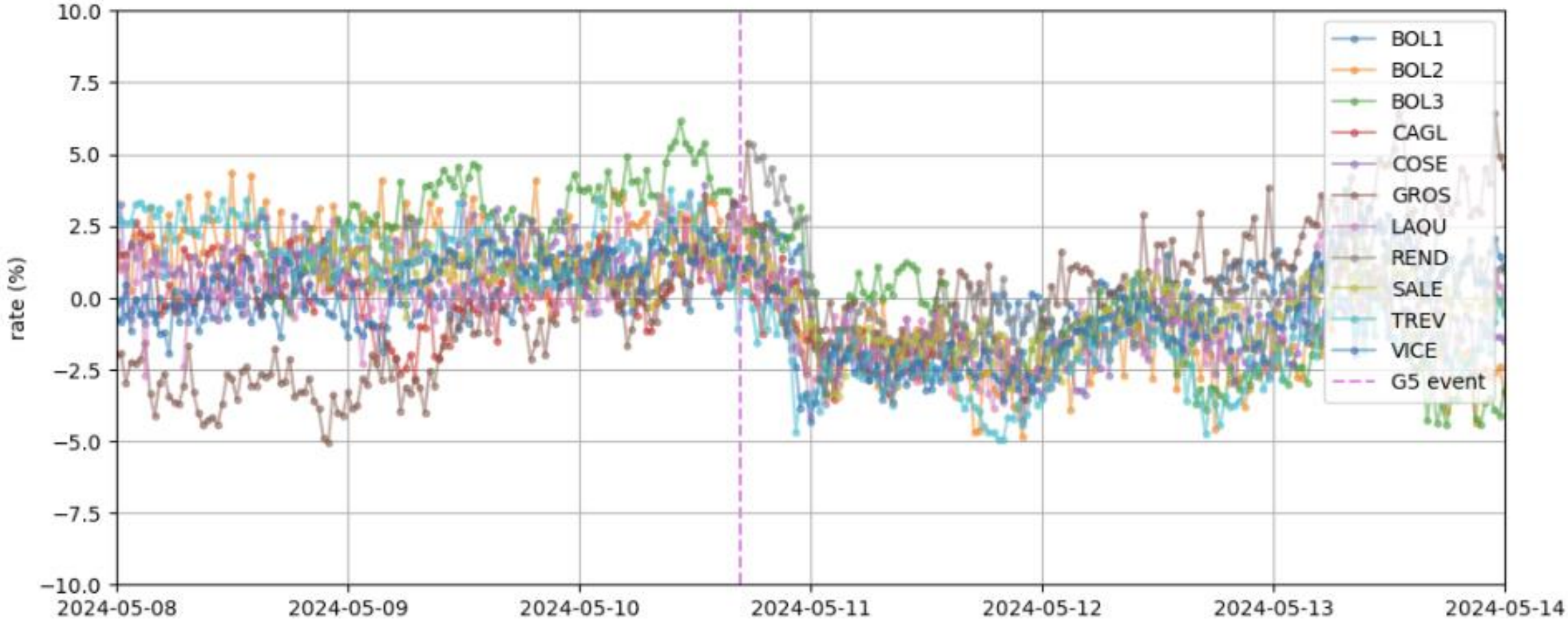
Pres and temp vs time



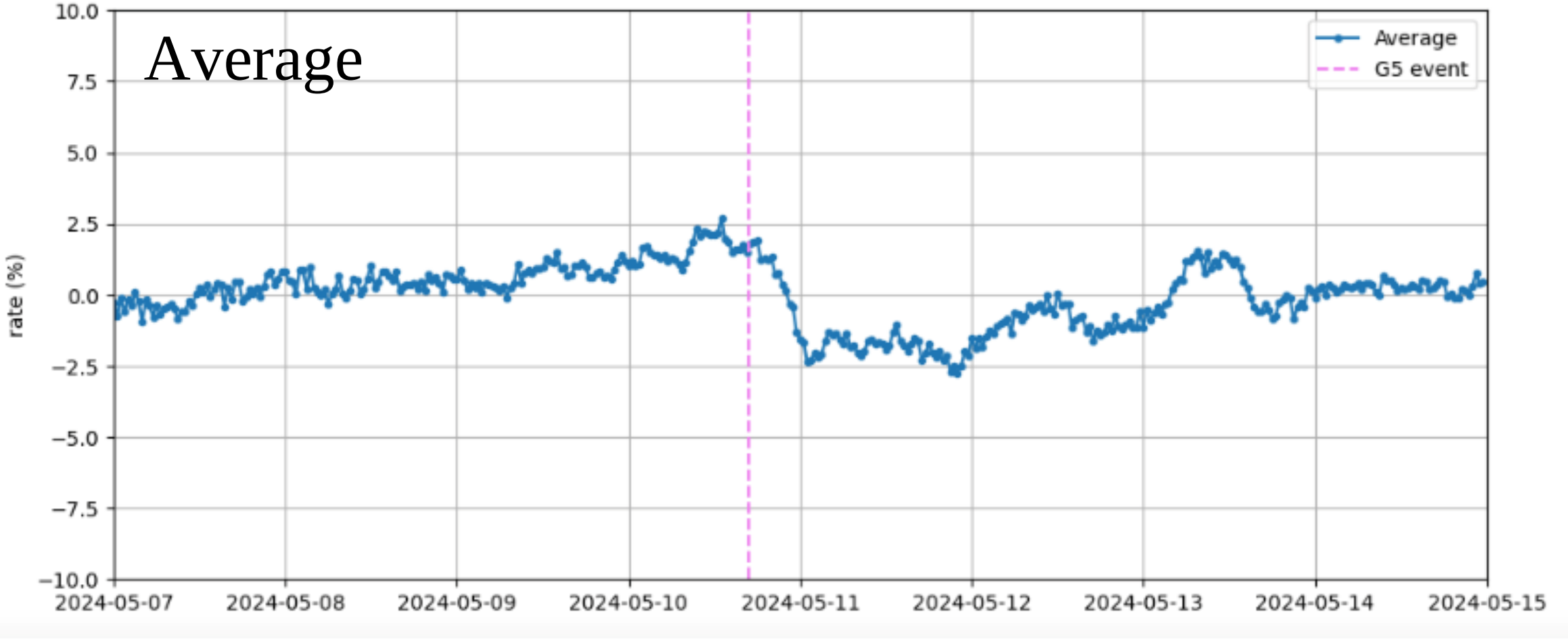



```
Telescope name =  TREV
ydata.mean()= 35.18029882596887
        P mean =  1012.3639052195557    P std  =  3.007602309375085     P diff =  13.140888214802658
        Beta =  -0.005224433262837982
        ParA =  -0.01640258771076475
        Pearson before =  -0.8695366575342904
        Pearson after  =  0.0007452337316686296

Telescope name =  VICE
ydata.mean()= 48.6601060458592
        P mean =  1008.9832053124155    P std  =  5.361991708080872     P diff =  16.0
        Beta =  -0.0054748579524559575
        ParA =  -0.049475222206126546
        Pearson before =  -0.9345772345300799
        Pearson after  =  0.0006021271517653831
```

May 2024 Forbush as seen by EEE telescopes

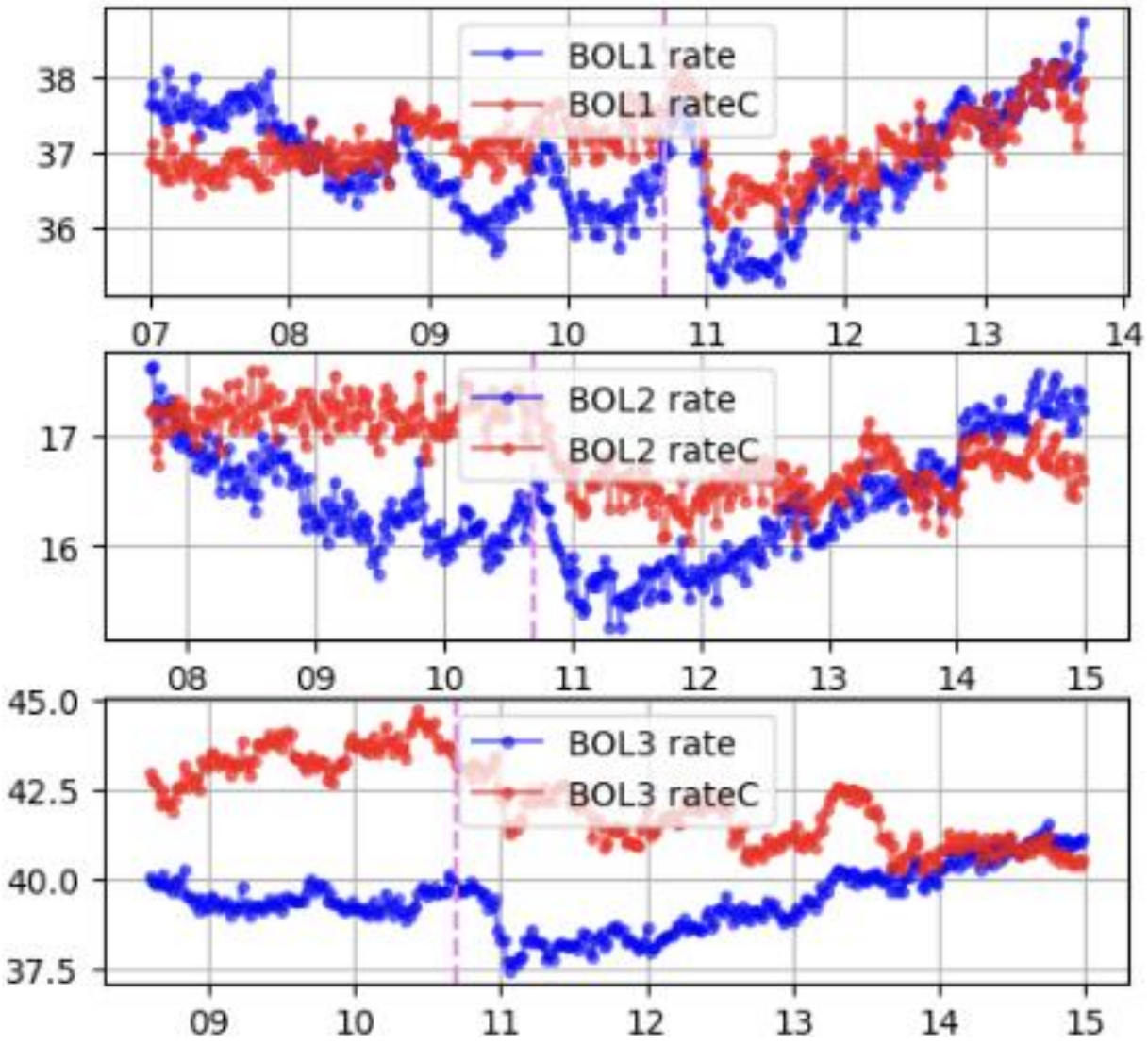


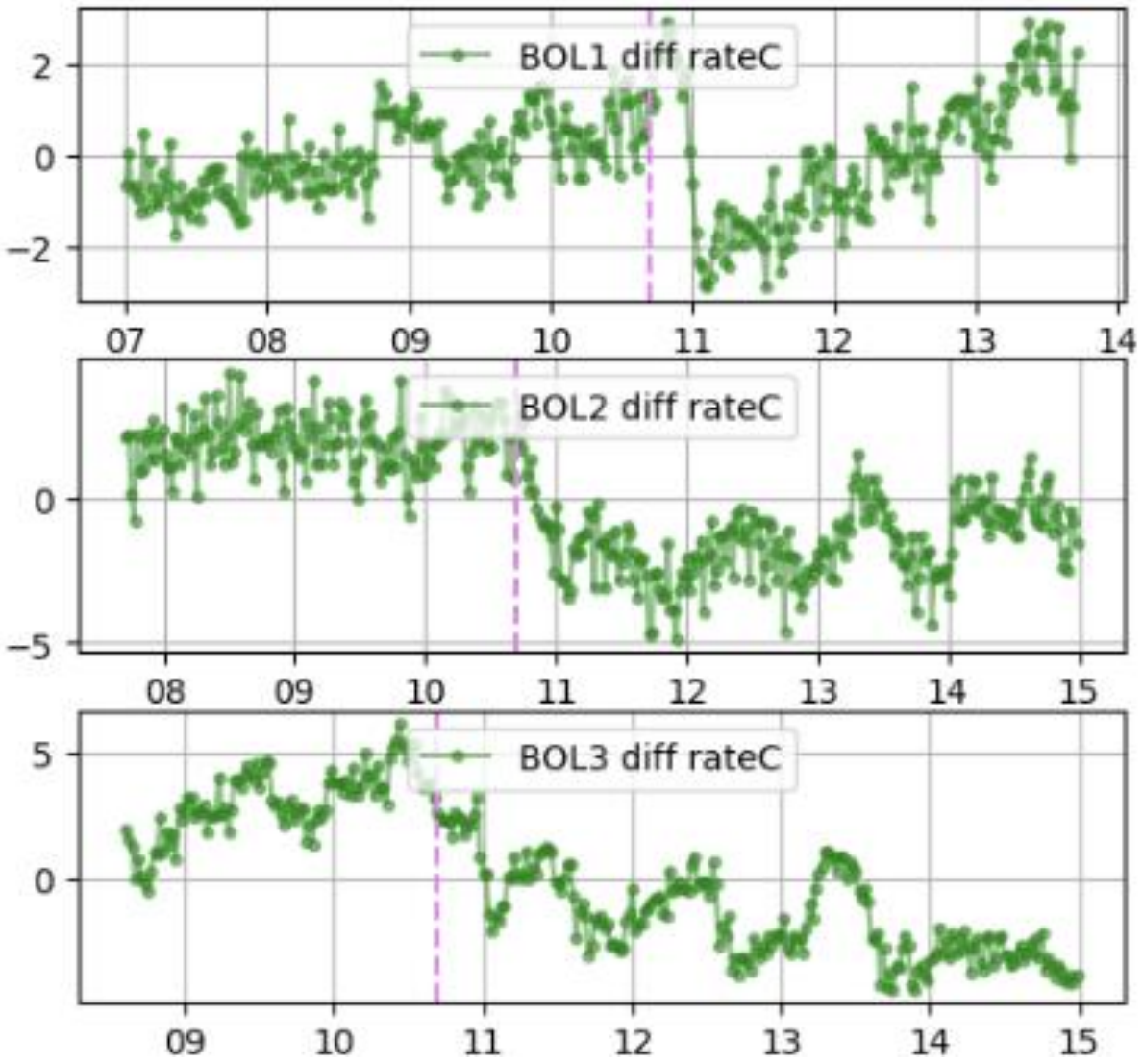
May 2024 Forbush as seen by EEE telescopes



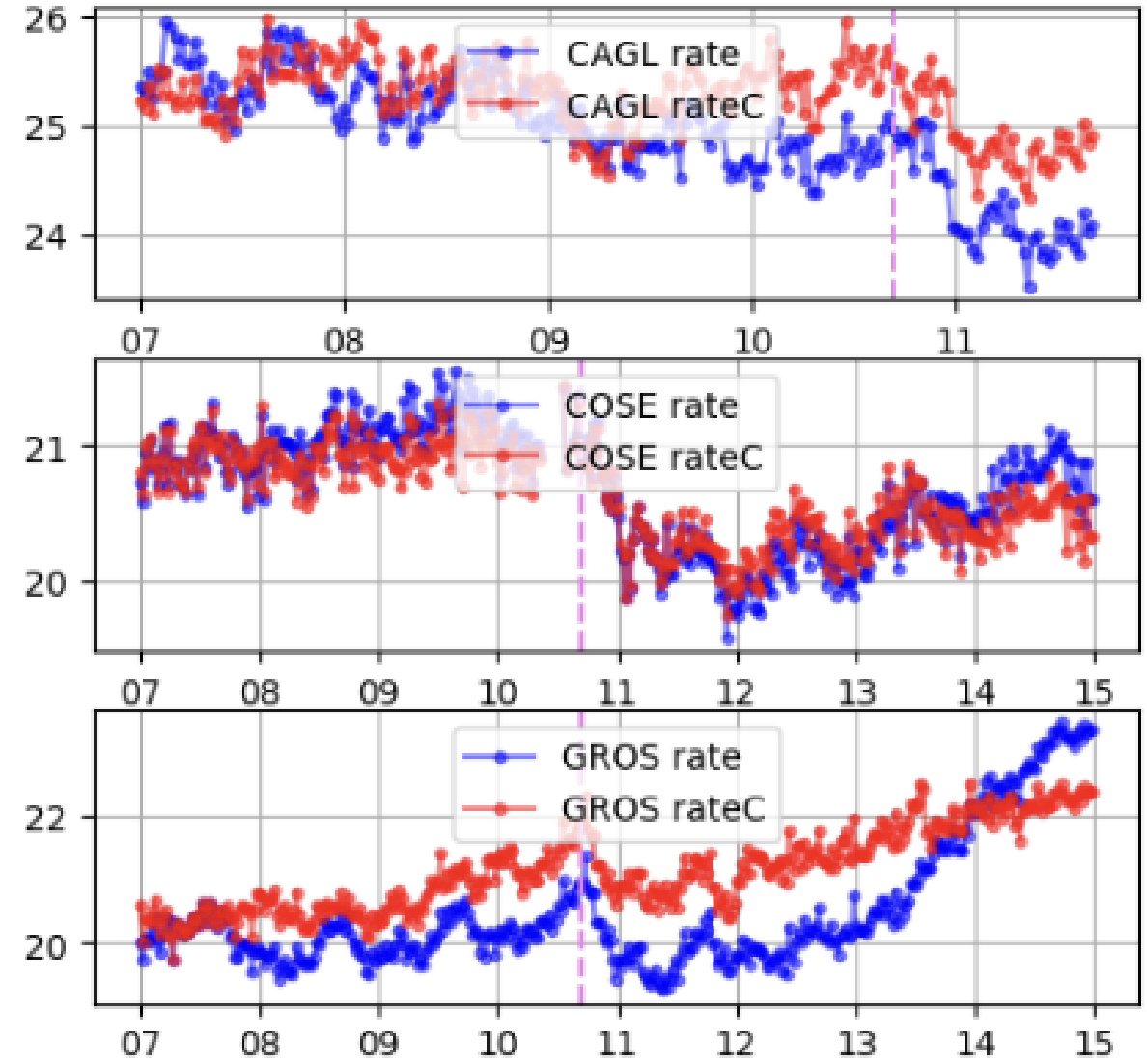
May 2024 Forbush as seen by EEE telescopes

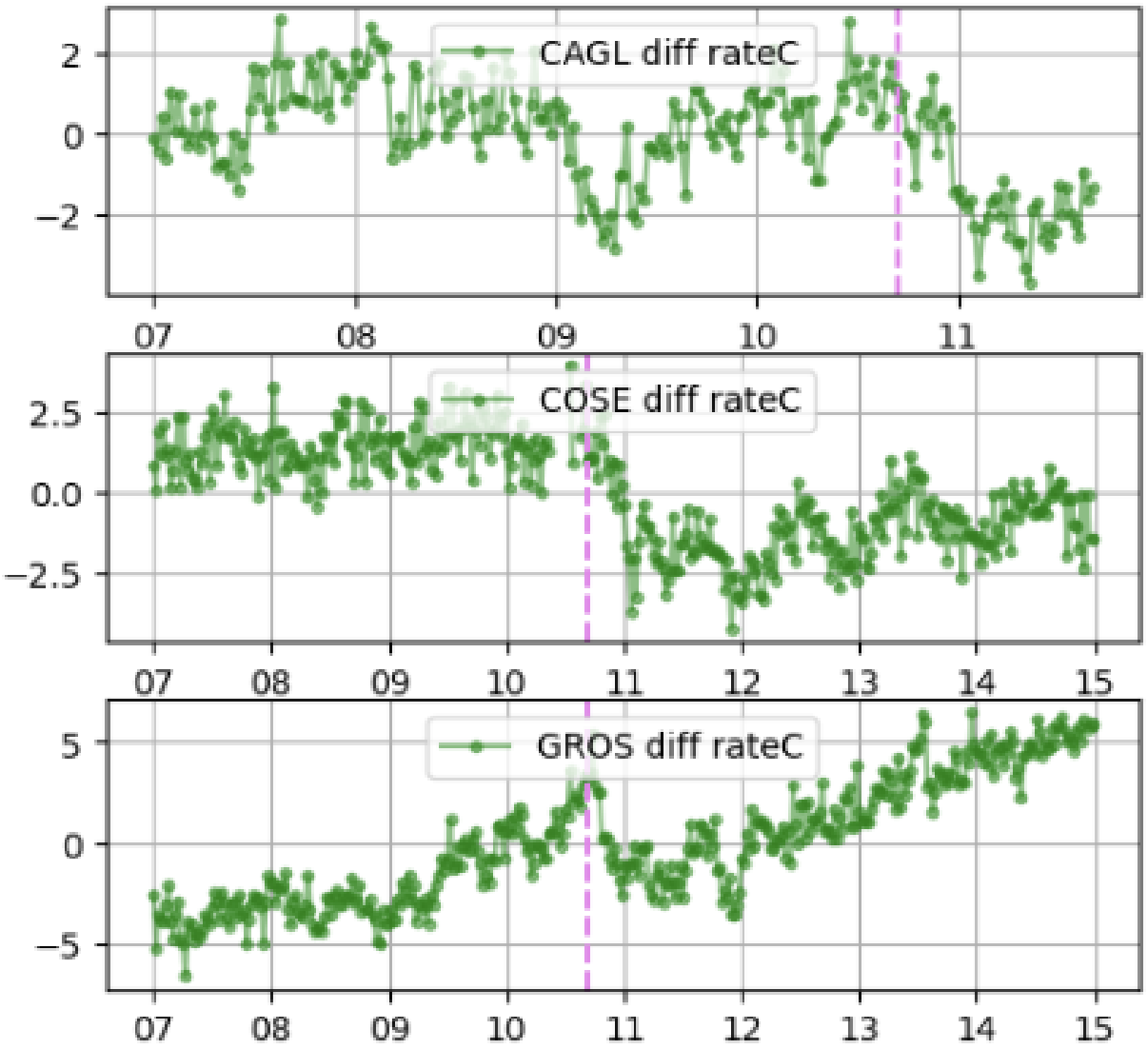
Telescope rates with/out barometric correction



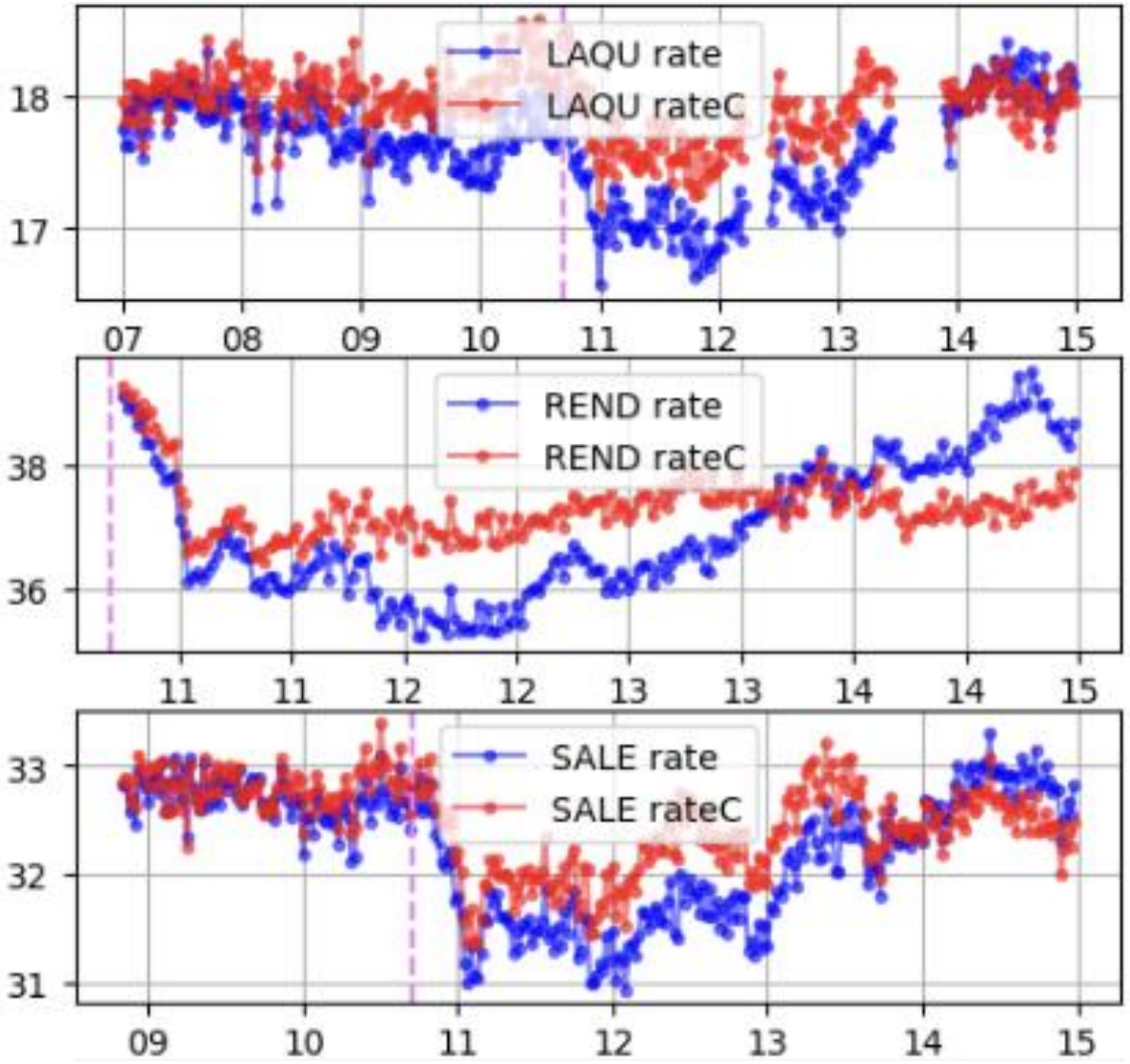


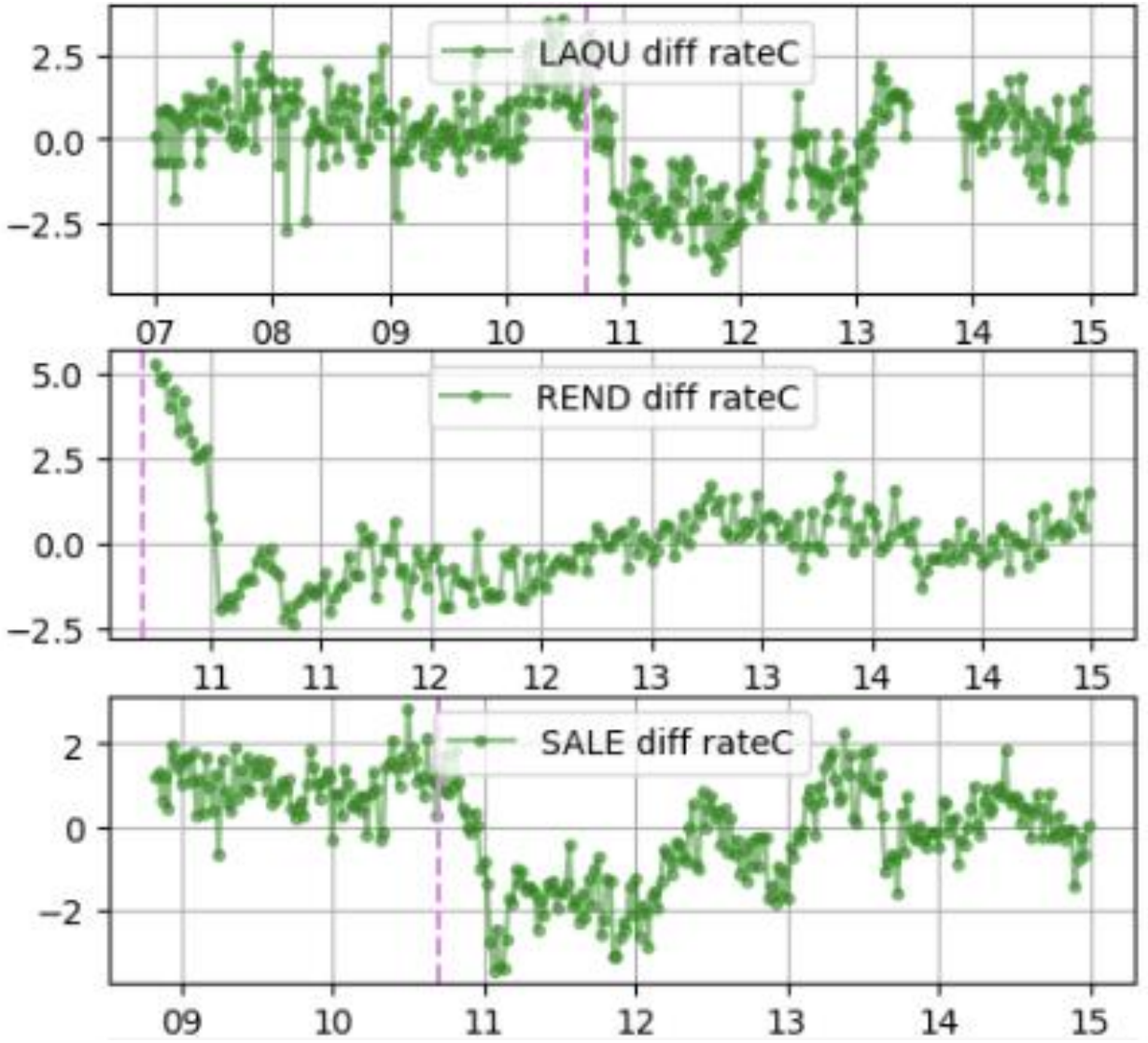
Telescope rates with/out barometric correction



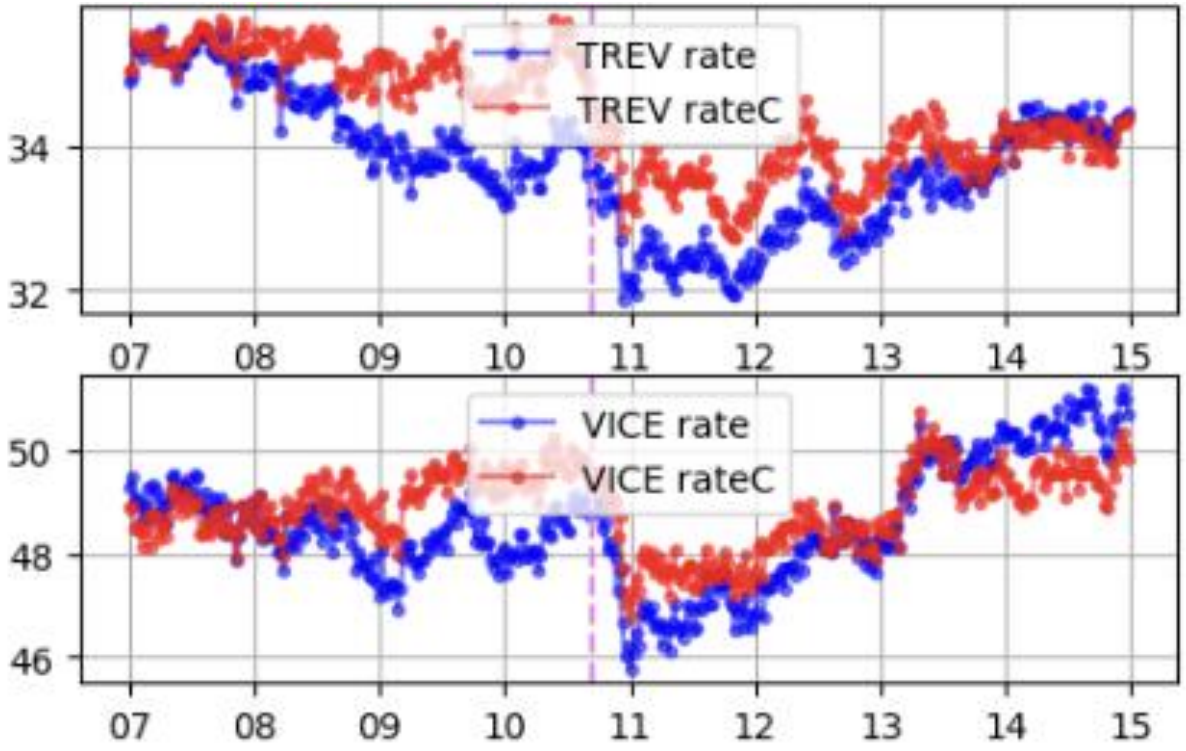


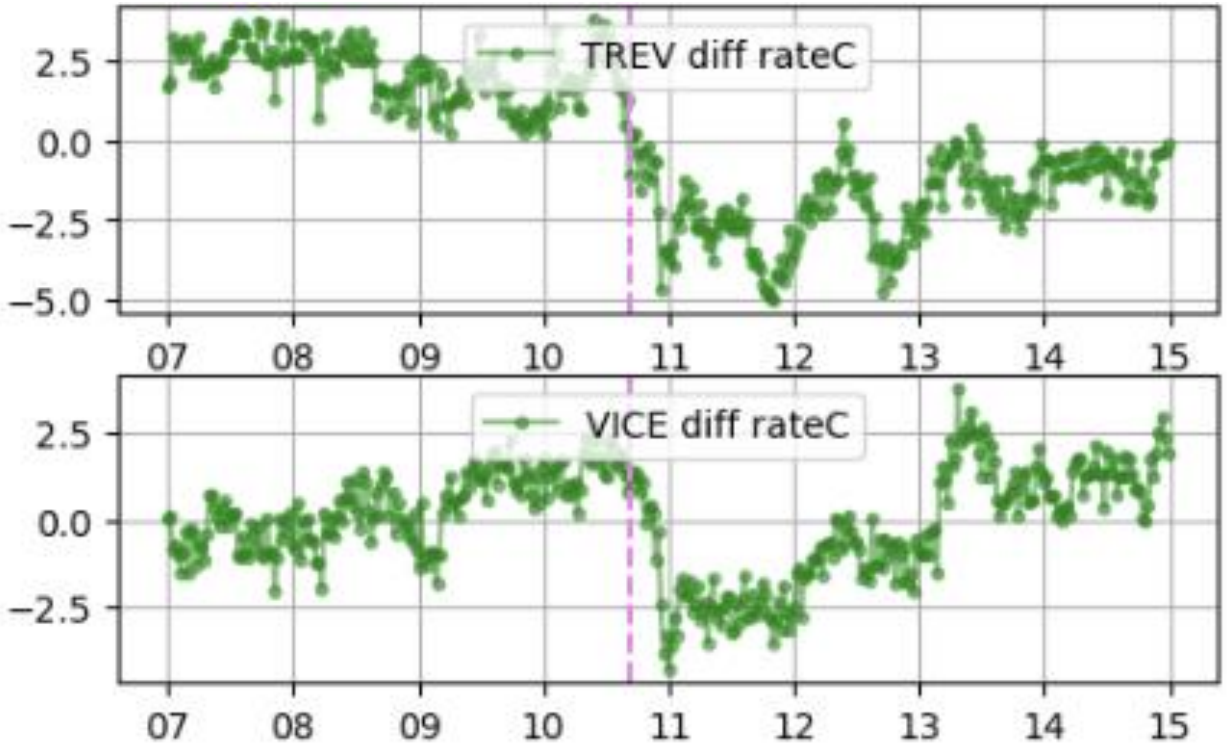
Telescope rates with/out barometric correction





Telescope rates with/out barometric correction





BACKUP

Periods for barometric correction computation and Forbush decrease

```
Periods for barometric correction computation
BOL1 : 2024-04-11 12:00:00+00:00 2024-04-19 16:00:00+00:00
BOL2 : 2024-04-25 10:00:00+00:00 2024-05-06 00:00:00+00:00
BOL3 : 2024-04-19 20:00:00+00:00 2024-04-29 00:00:00+00:00
CAGL : 2024-04-27 00:00:00+00:00 2024-05-09 00:00:00+00:00
COSE : 2024-05-02 00:00:00+00:00 2024-05-10 00:00:00+00:00
GROS : 2024-04-24 00:00:00+00:00 2024-05-07 00:00:00+00:00
LAQU : 2024-04-24 00:00:00+00:00 2024-05-01 00:00:00+00:00
REND : 2024-04-22 16:00:00+00:00 2024-04-30 08:00:00+00:00
SALE : 2024-05-01 00:00:00+00:00 2024-05-04 00:00:00+00:00
TREV : 2024-05-01 08:00:00+00:00 2024-05-09 00:00:00+00:00
VICE : 2024-04-27 00:00:00+00:00 2024-05-04 00:00:00+00:00

Periods for Forbush decrease truncation
BOL1 : 2024-05-07 00:00:00+00:00 2024-05-15 00:00:00+00:00
BOL2 : 2024-05-07 00:00:00+00:00 2024-05-15 00:00:00+00:00
BOL3 : 2024-05-07 00:00:00+00:00 2024-05-15 00:00:00+00:00
CAGL : 2024-05-07 00:00:00+00:00 2024-05-12 00:00:00+00:00
COSE : 2024-05-07 00:00:00+00:00 2024-05-15 00:00:00+00:00
GROS : 2024-05-07 00:00:00+00:00 2024-05-15 00:00:00+00:00
LAQU : 2024-05-07 00:00:00+00:00 2024-05-15 00:00:00+00:00
REND : 2024-05-07 00:00:00+00:00 2024-05-15 00:00:00+00:00
SALE : 2024-05-08 20:00:00+00:00 2024-05-15 00:00:00+00:00
TREV : 2024-05-07 00:00:00+00:00 2024-05-15 00:00:00+00:00
VICE : 2024-05-07 00:00:00+00:00 2024-05-15 00:00:00+00:00
```

Periods for barometric correction computation and Forbush decrease

tele,	beta,	presMean,	rateCMean
BOL1	-0.0069469181232036745	1011.0255102040817	36.4113443411668
BOL2	-0.011435299566528 47	1009.0034448818898	17.241344802939892
BOL3	-0.013549967209398772	1006.8545454545455	20.608752559777177
CAGL	-0.009778432369631851	1007.5520833333334	25.76631565683091
COSE	-0.0027029316846286624	1014.8595038039788	21.01559308870966
GROS	-0.014245653757828467	1009.9775641025641	19.013780836662313
LAQU	-0.006209509342444696	928.2113095238095	17.560402408524187
REND	-0.008637447940327968	989.4701086956521	37.80089412729737
SALE	-0.0037495282284520804	982.3504218269336	26.795370316289823
TREV	-0.005224433262837982	1012.3639052195557	35.175950677445215
VICE	-0.0054748579524559575	1008.9832053124155	48.63912249230205