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# Ionospheric influence on LatPos performance

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GNSS PERMANENT BASE STATION DIVISION

3<sup>rd</sup> *EUPOS*<sup>®</sup> Council and Technical Meeting  
14 – 15 November 2016

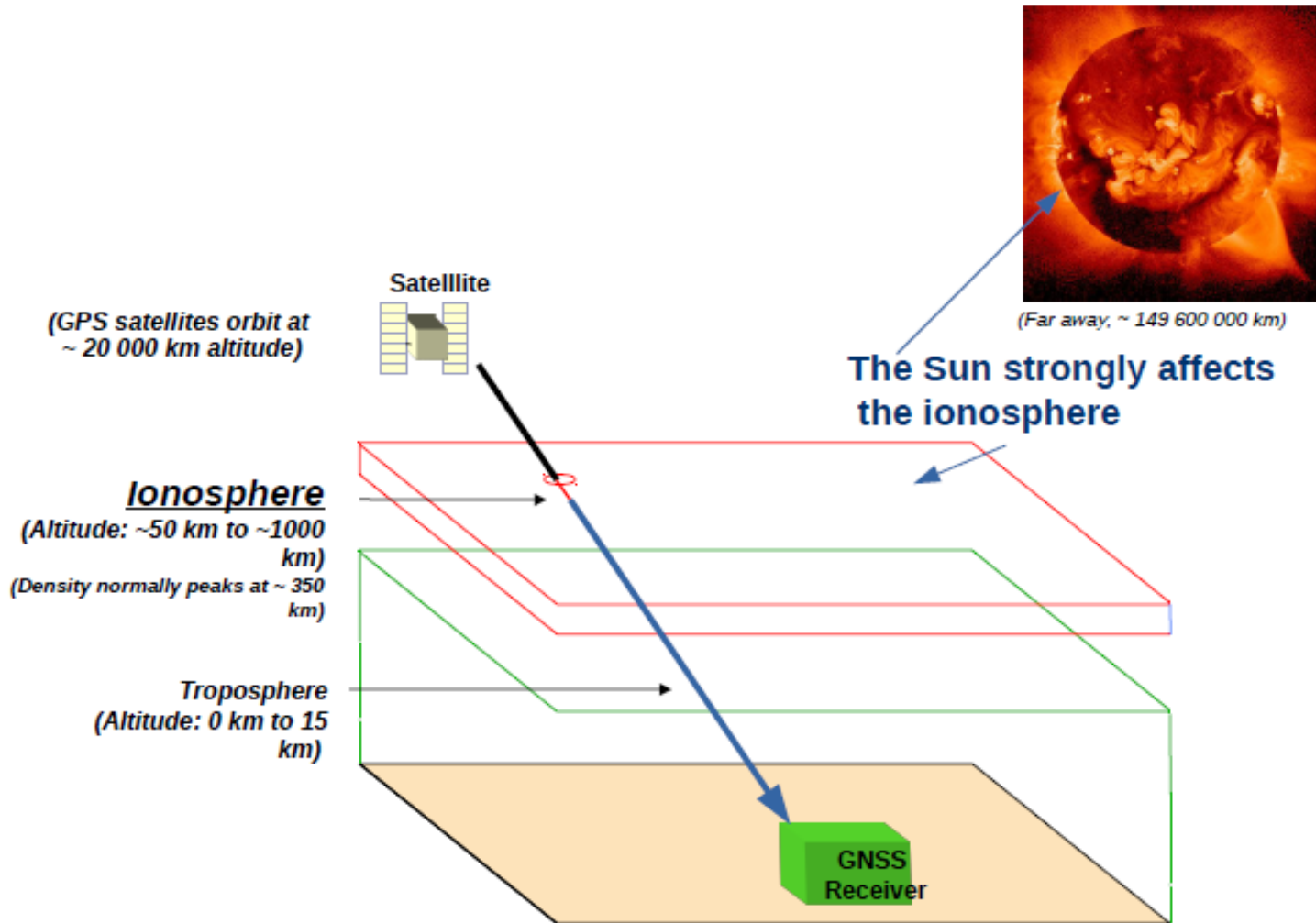


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# Content:

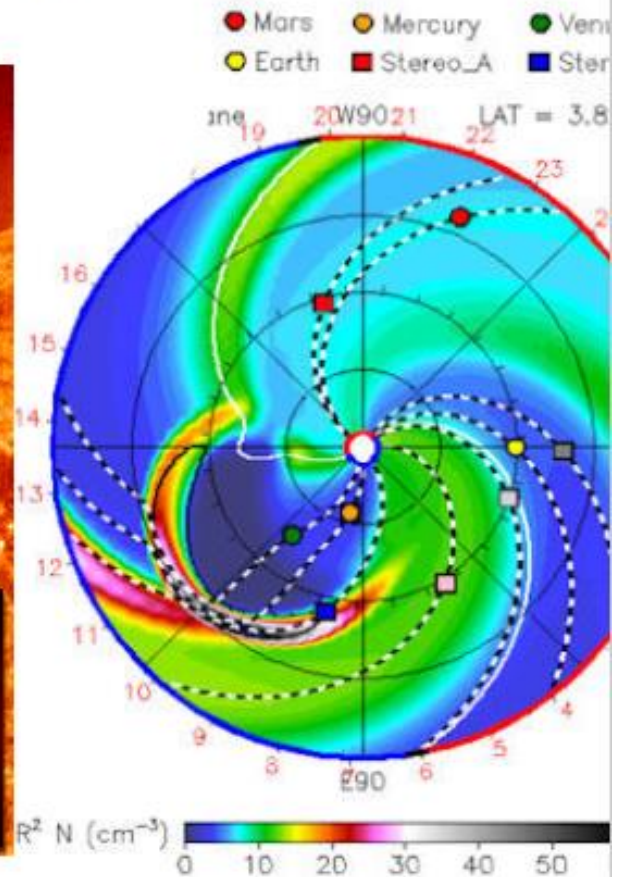
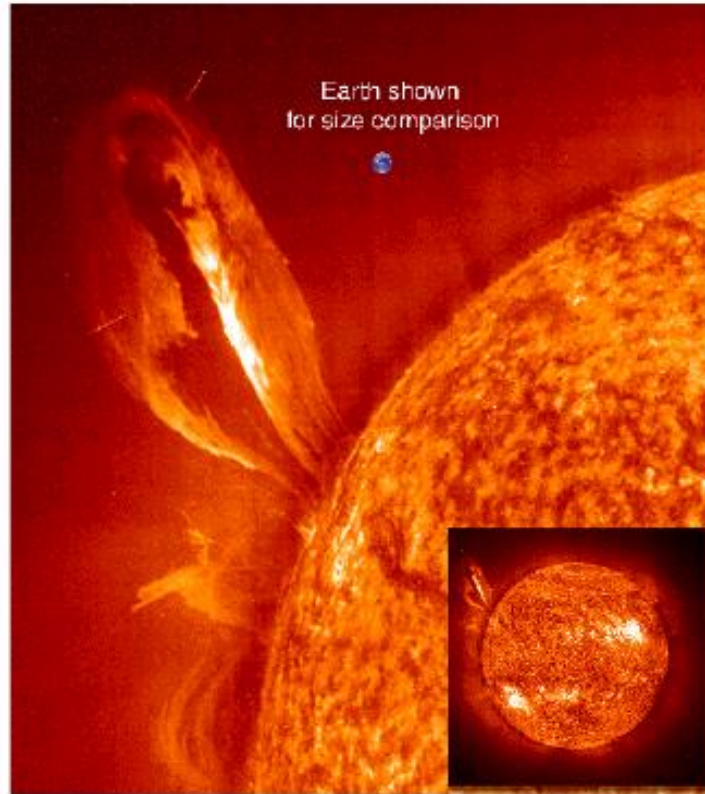
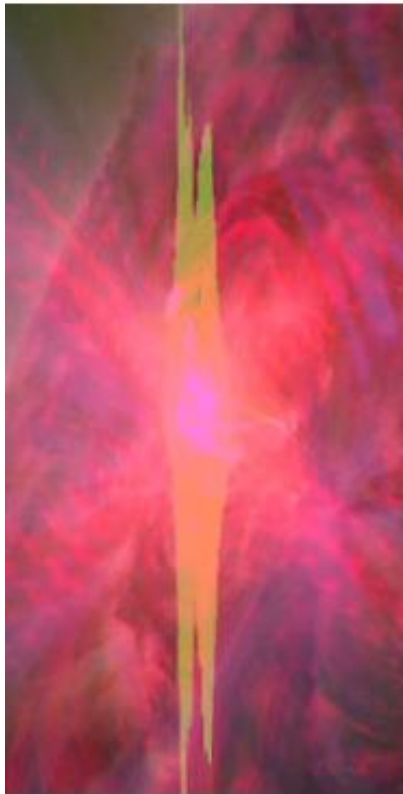
- Ionosphere, The Sun, Effect on GNSS;
- Yearly LatPos test procedure;
- Performance of LatPos during high ionospheric activity;
- Discussion;

# GNSS signals have to pass through the ionosphere



# Coronal Mass Ejections (CMEs)

Giant clouds of plasma escaping from the Sun





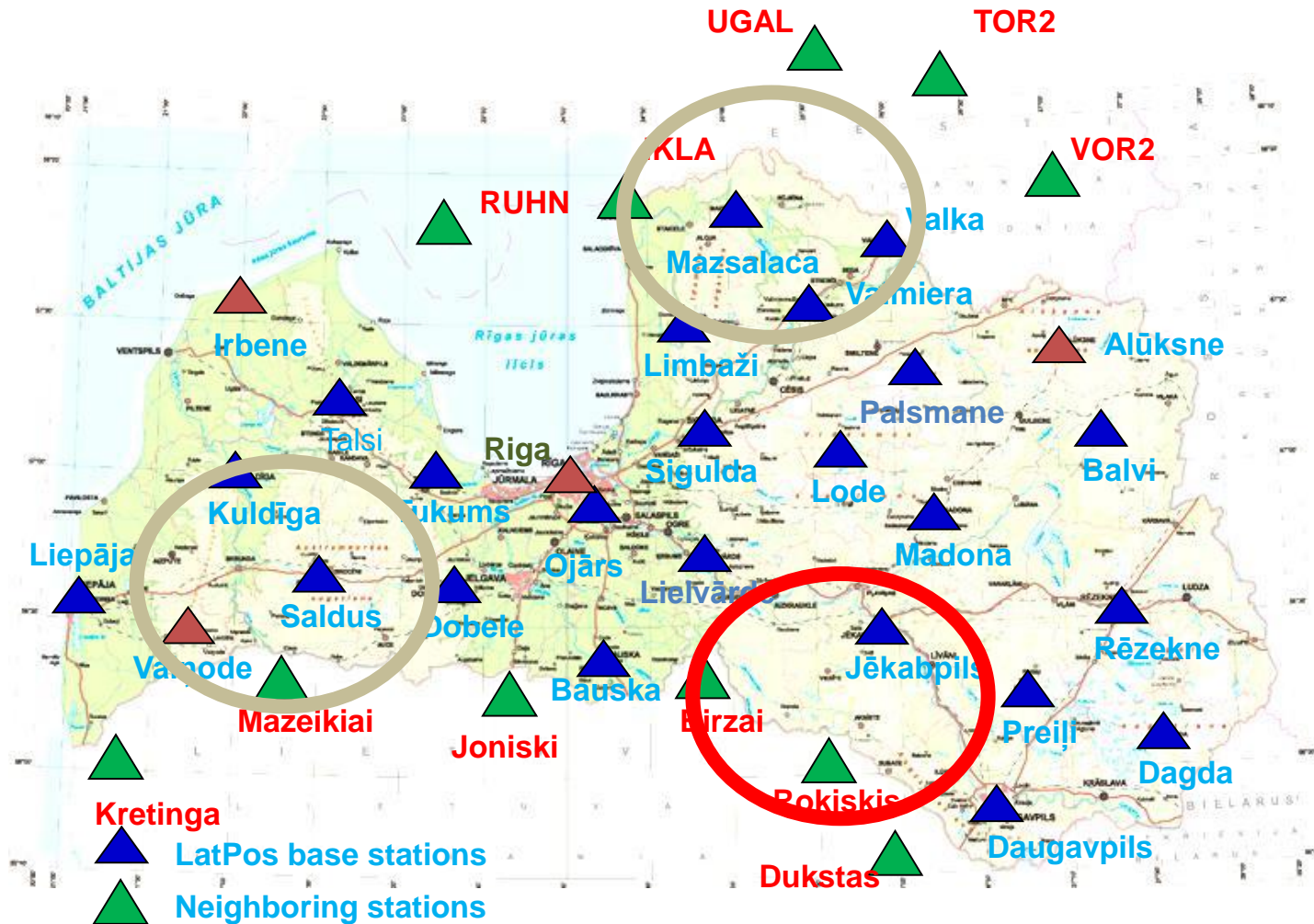
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# Yearly LatPos test procedure

1. Initialization time – Time to FIX
2. Initialization repeating – number of measurements
  - in same point with different FIX
  - different TYPE of FIX (MAX,iMAX,SINGLE-SITE,VIRTUAL-RS)
  - In time span up to HOUR
3. RTK stability in time span – Hour
4. Post processing.



# Yearly LatPos test procedure



Area for test measurements - **6 points** (2nd order Geodetic network)  
 Measurements done in October 11-13, (2 points per day)

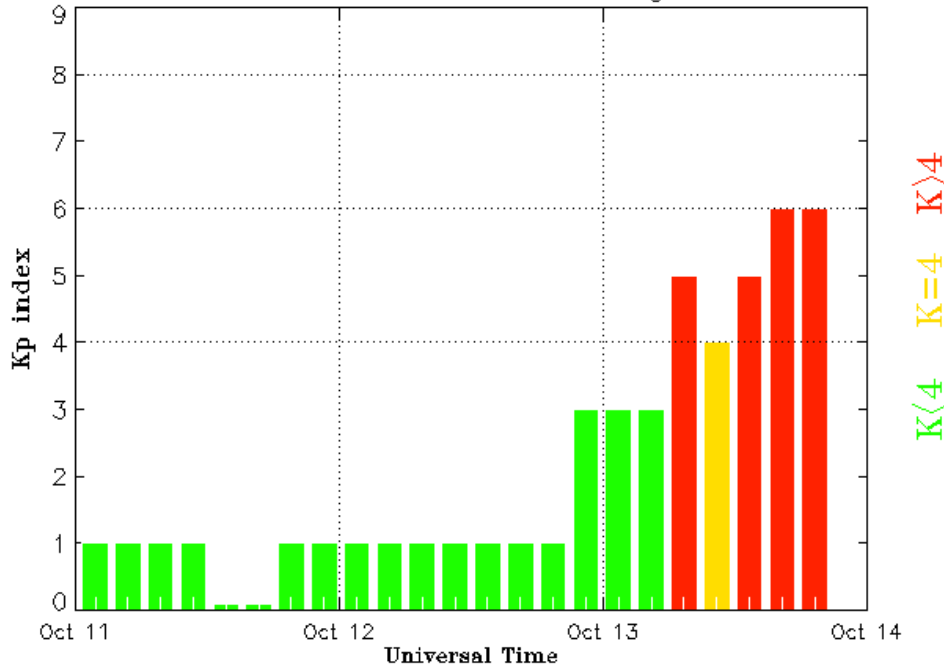


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# What happened?

A filament in Sun's northeast quadrant erupted between 15:00 and 17:00 UTC on Saturday, October 8, 2016, producing an asymmetric, partial-halo CME. The CME, although faint, was first observed in LASCO C2 imagery beginning 00:48 UTC on October 9.

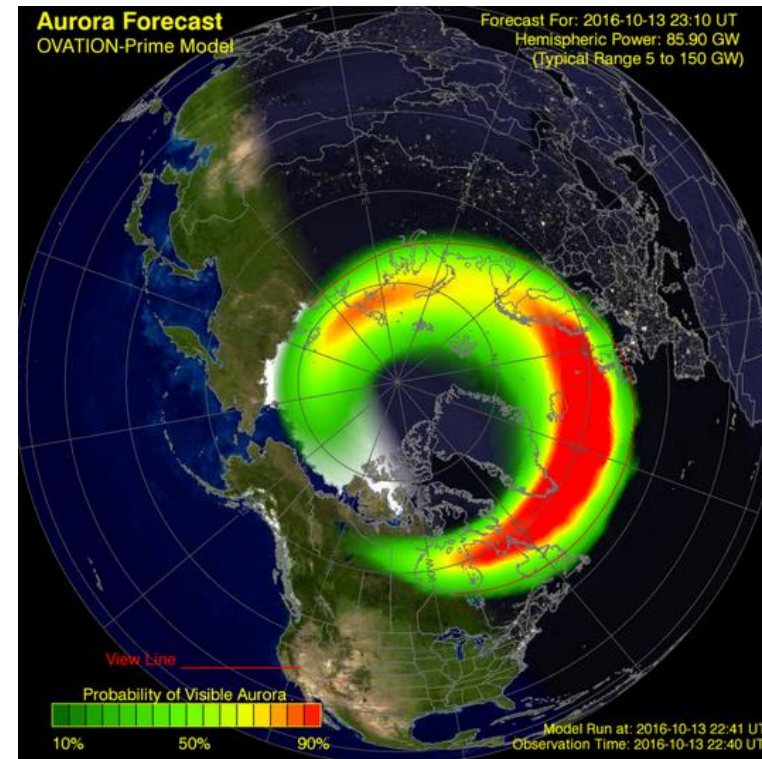
Estimated Planetary K index (3 hour data) Begin: 2016 Oct 11 0000 UTC



Updated 2016 Oct 13 21:30:02 UTC

NOAA/SWPC Boulder, CO USA

Geomagnetic K-index of 5 (G1 - Minor geomagnetic storm) threshold was first reached at 08:15 UTC.



# What happened?



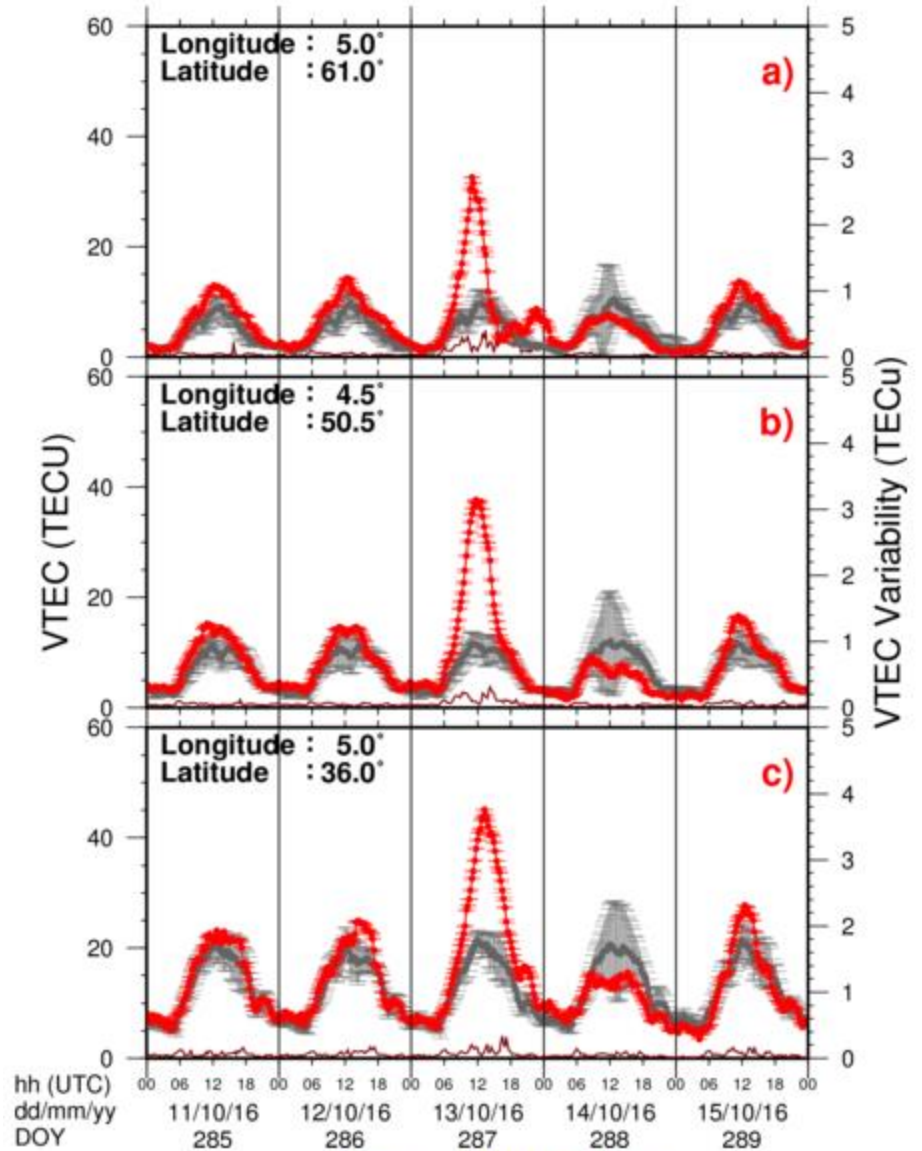
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Figure 2: VTEC extracting locations

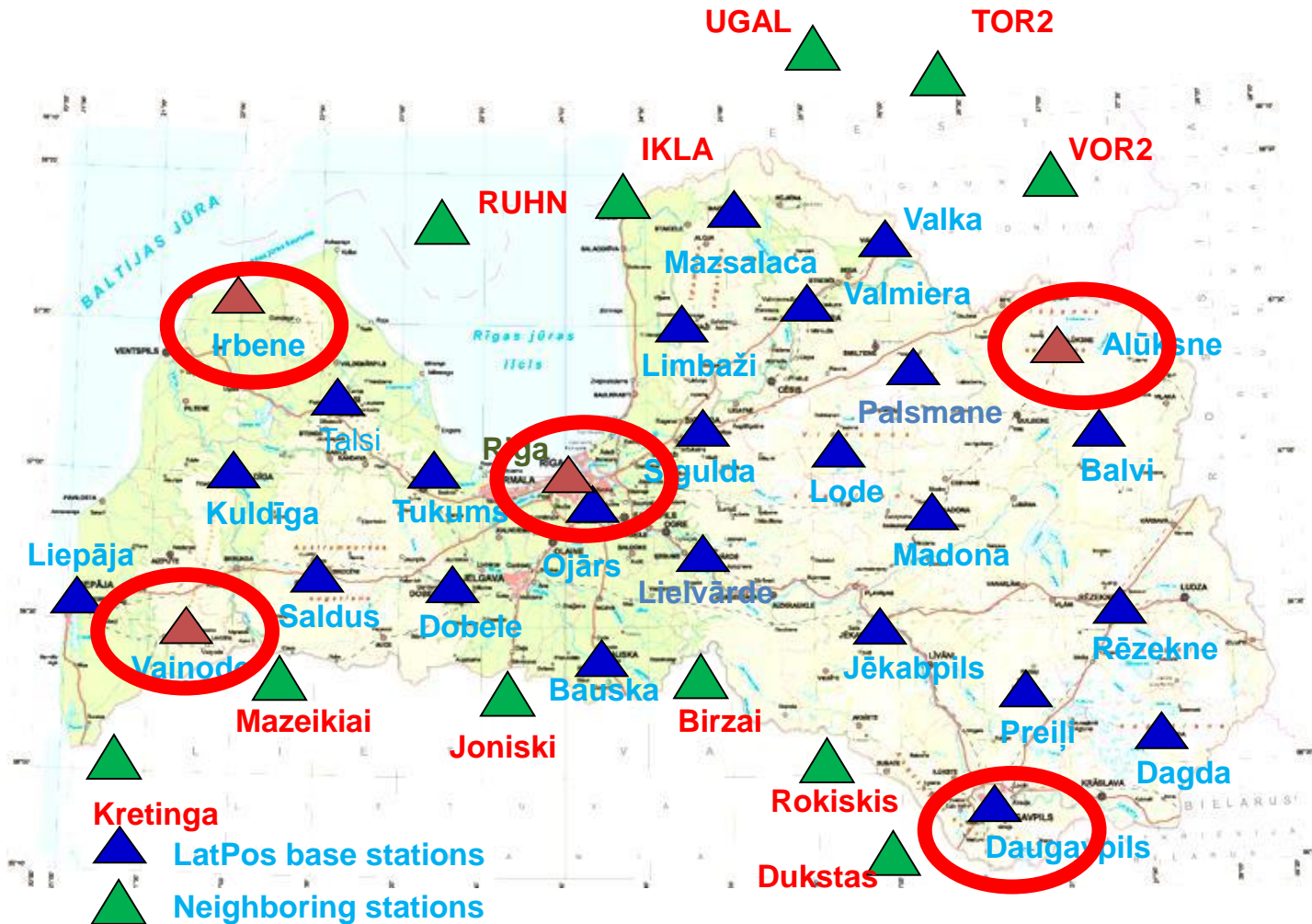
Source: Royal Observatory of Belgium  
GNSS Research Group

[http://gnss.be/Atmospheric\\_Maps/ionospheric\\_event.](http://gnss.be/Atmospheric_Maps/ionospheric_event.)



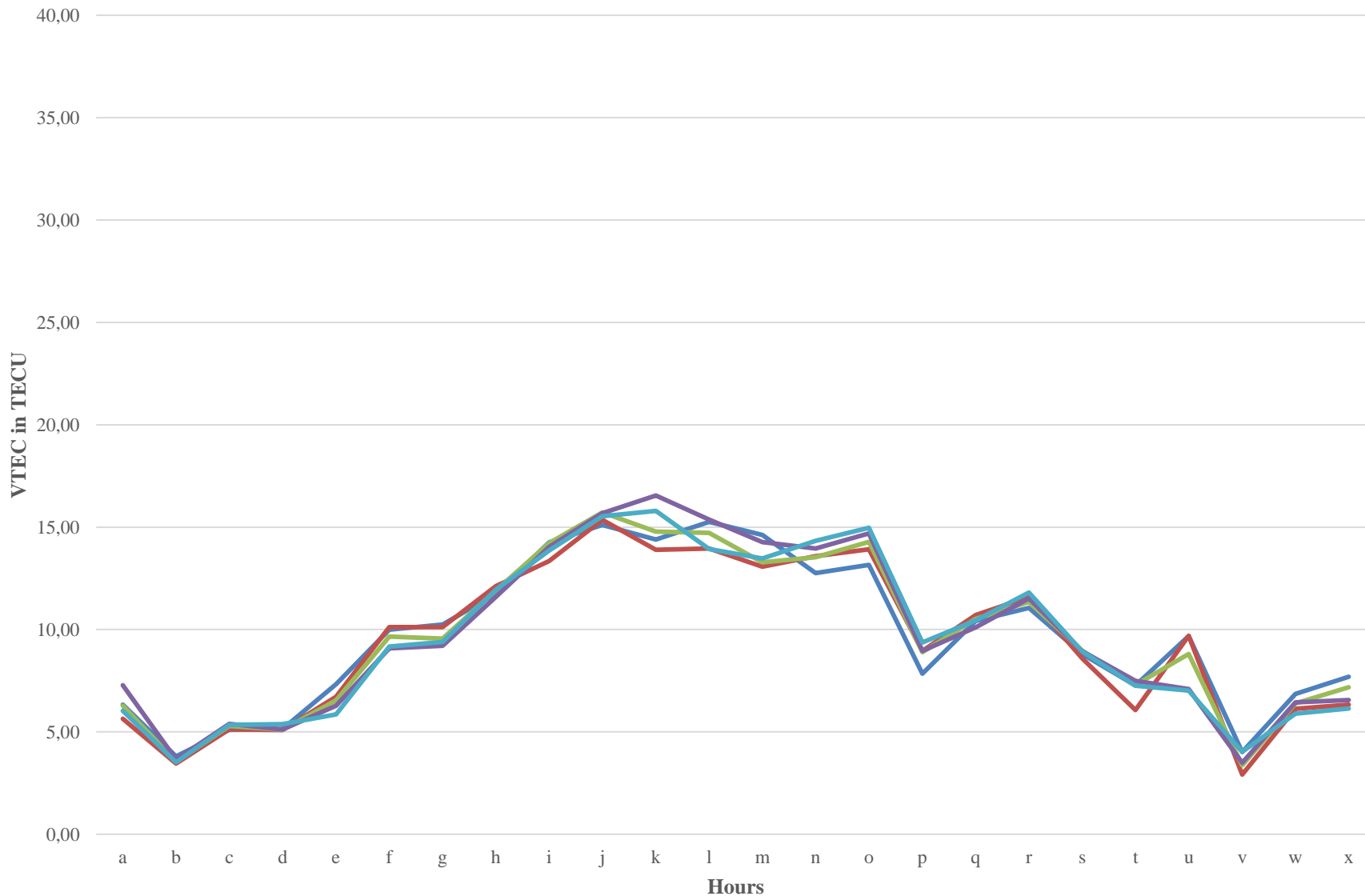


# LatPos stations used for VTEC calculations

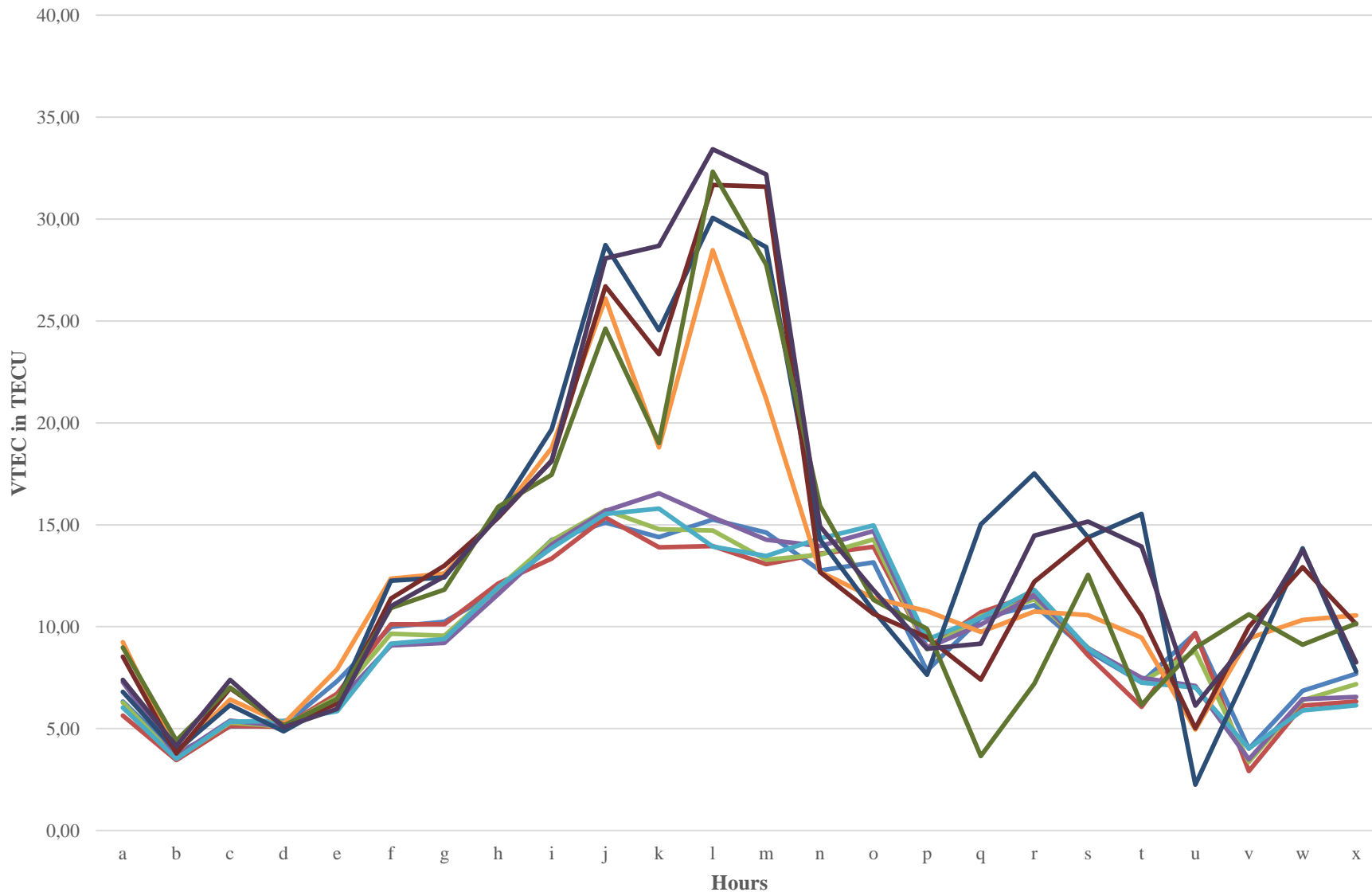


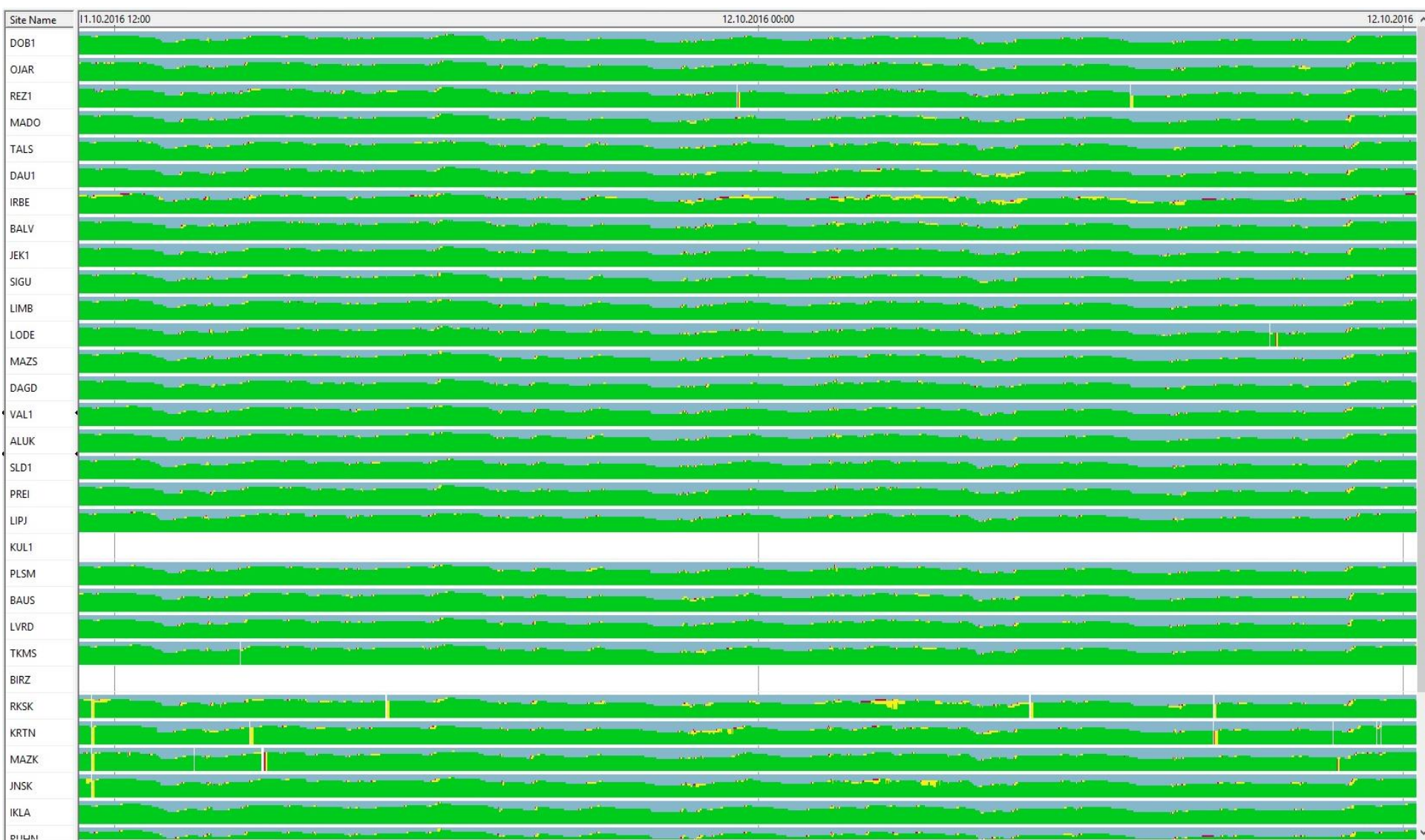
Ojars, Irbene, Vainode, Aluksne, Daugavpils

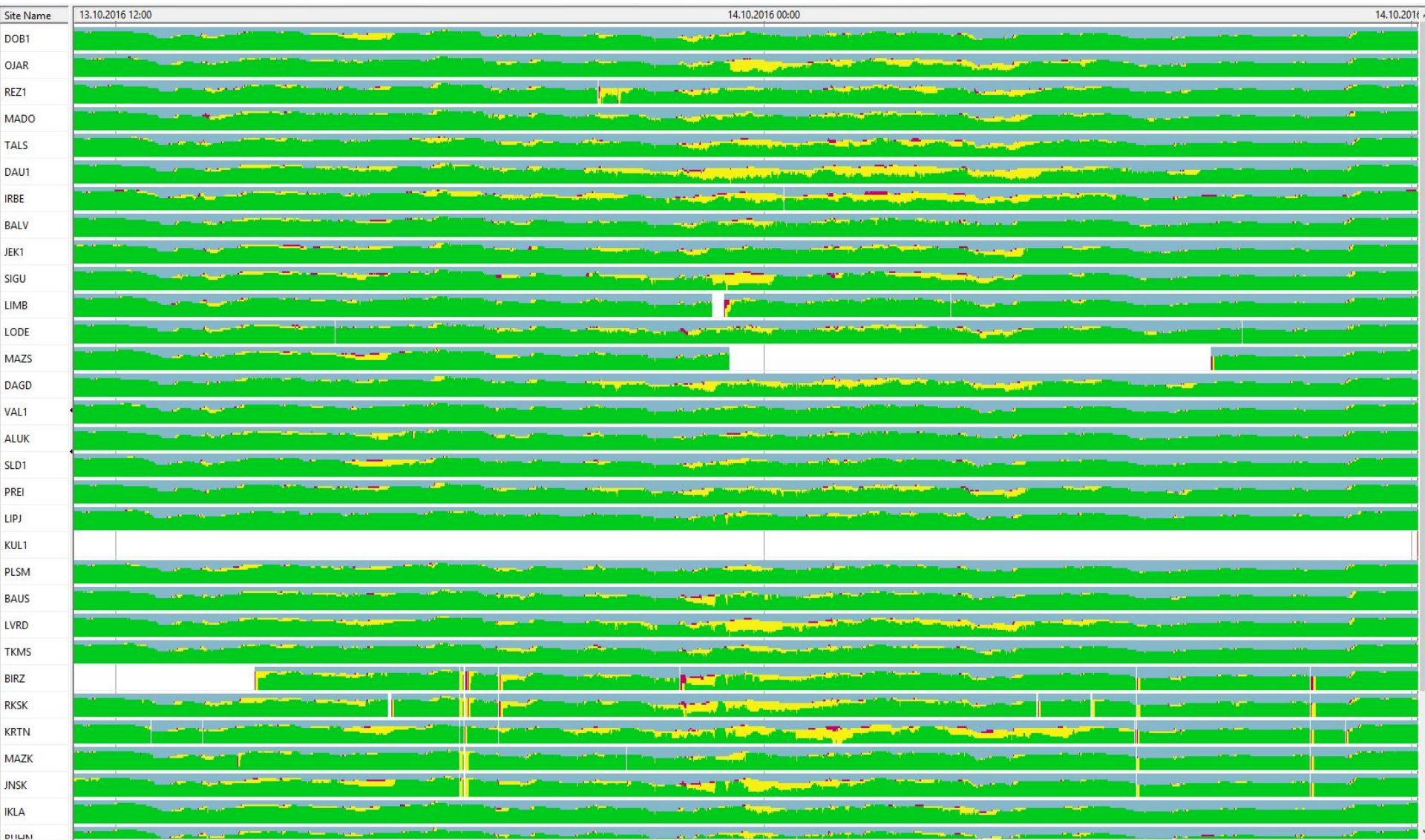
# Calculated VTEC October 12, 2016



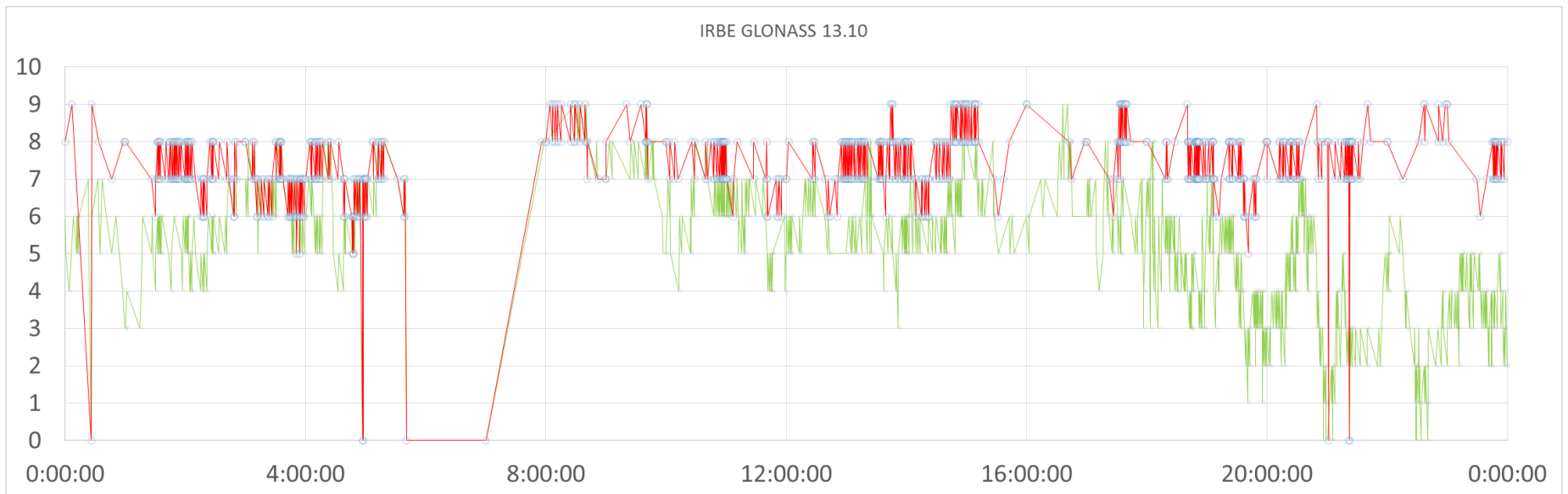
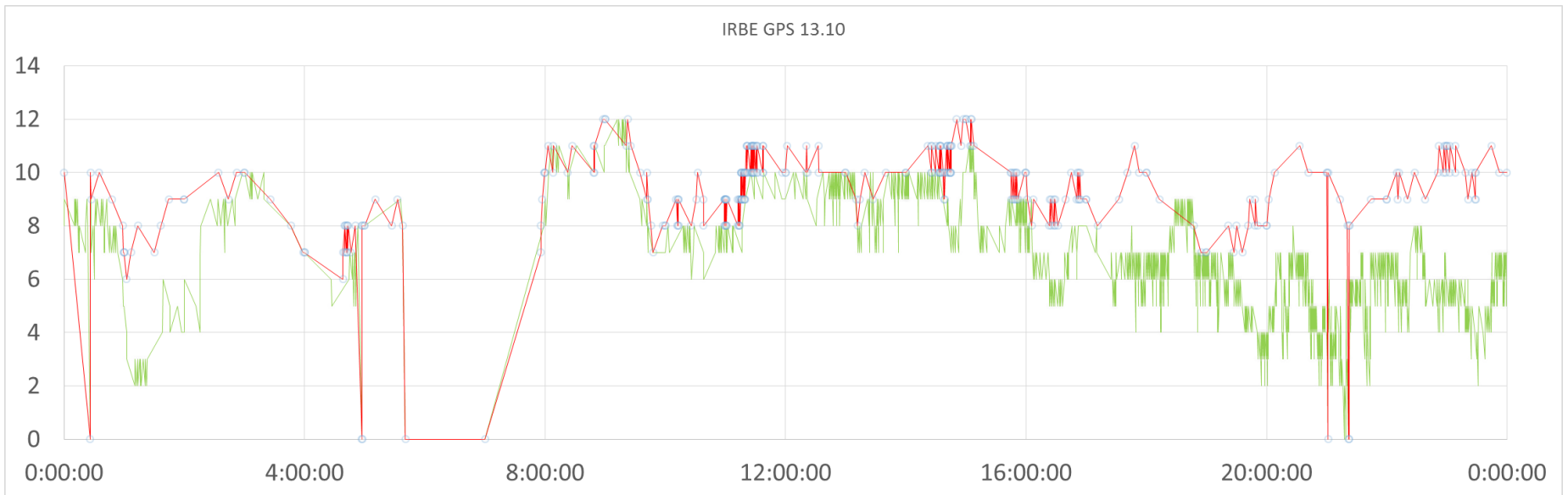
# Calculated VTEC October 12 and 13, 2016



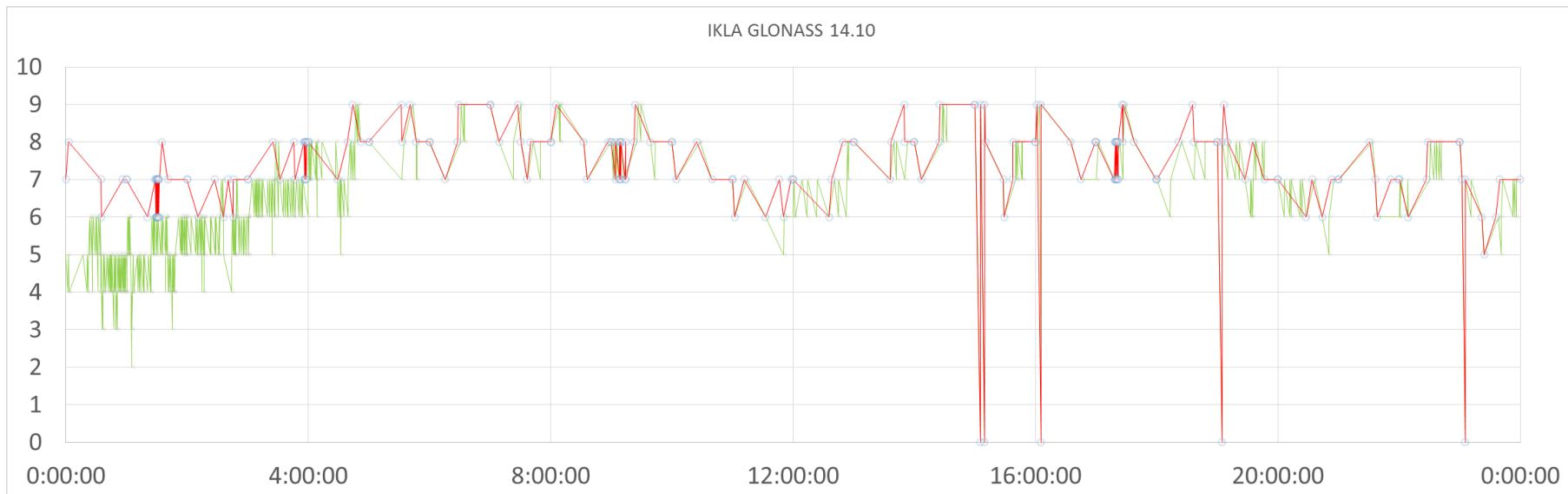
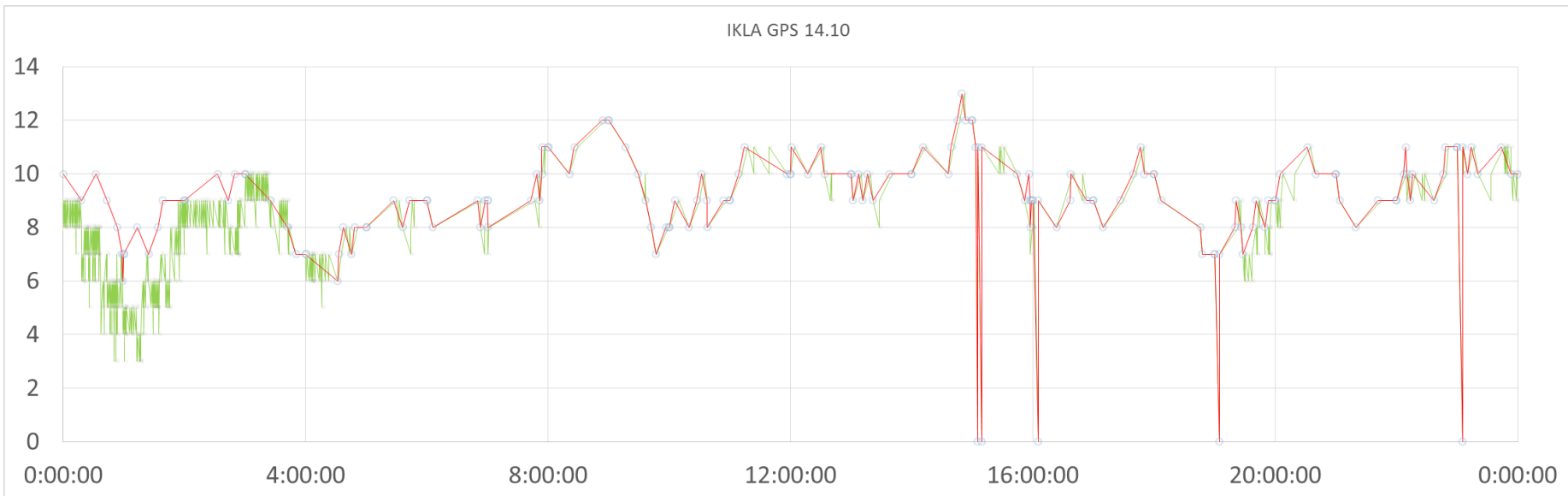




## Station IRBE (13.10)



## Station IKLA (14.10.)

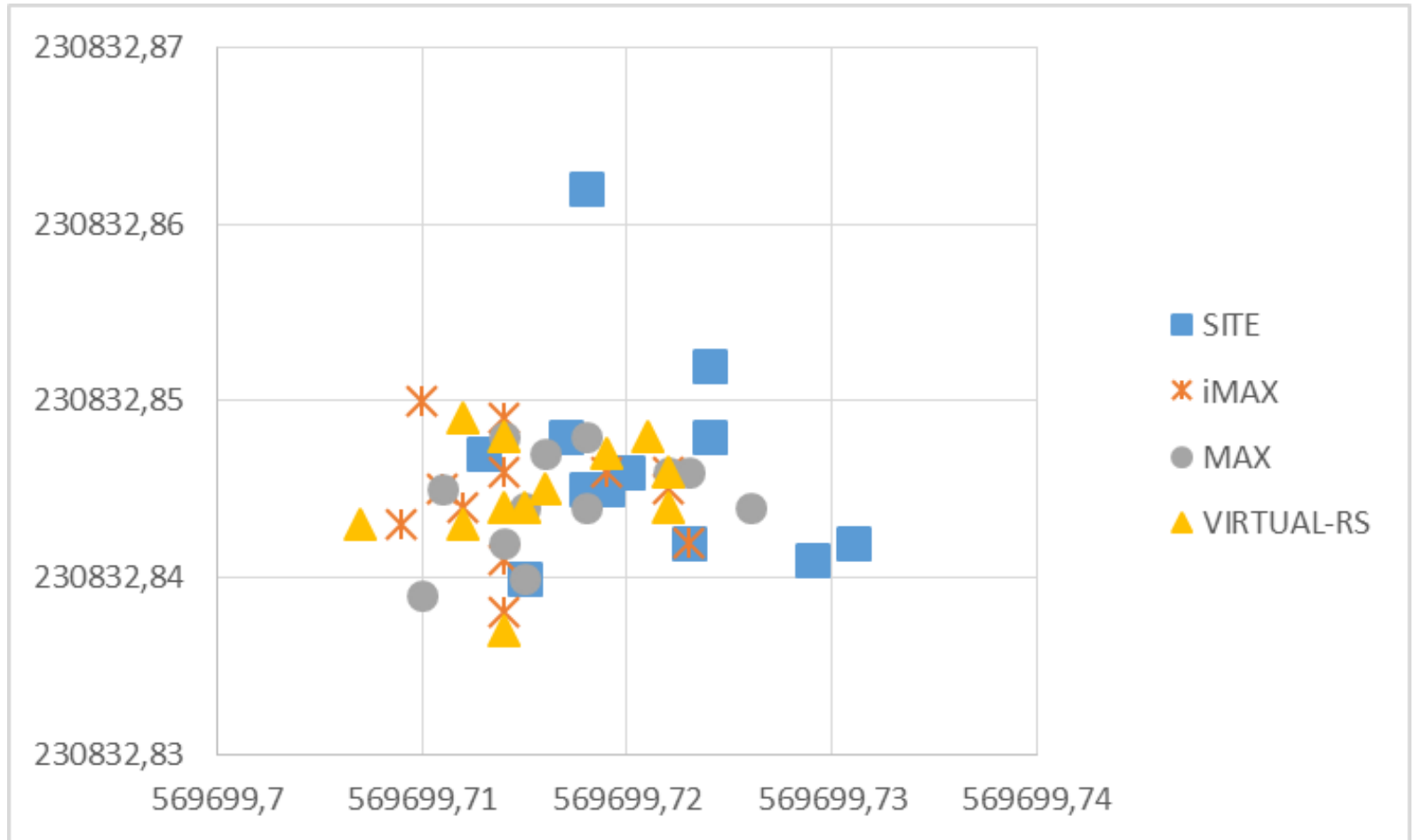




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# FIX results on point "Gricgale"

*average time-to-FIX: 18 sec (12 sessions)*





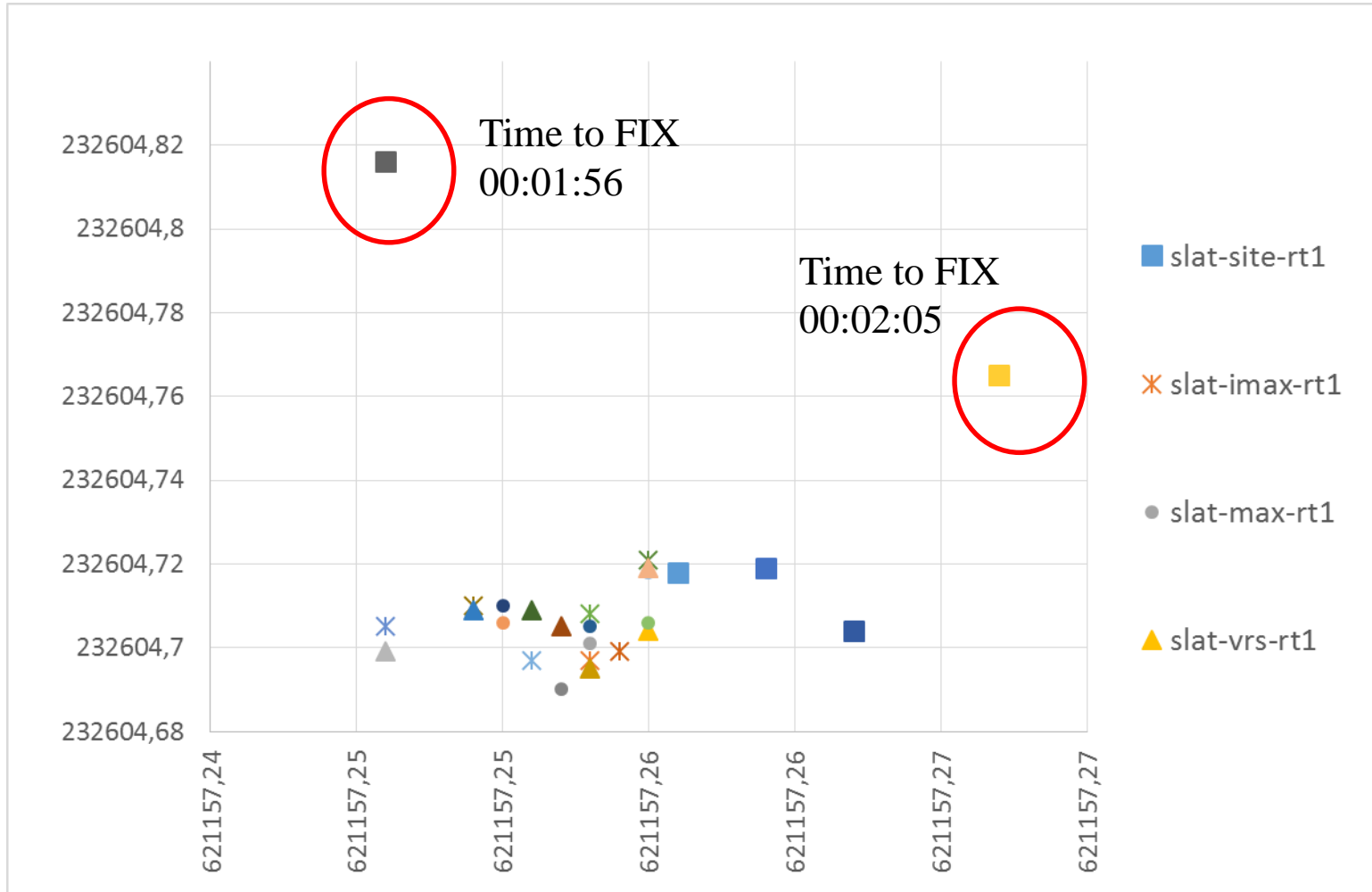


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# FIX results on point "Slāte"

*average time-to-FIX: 42 sec*

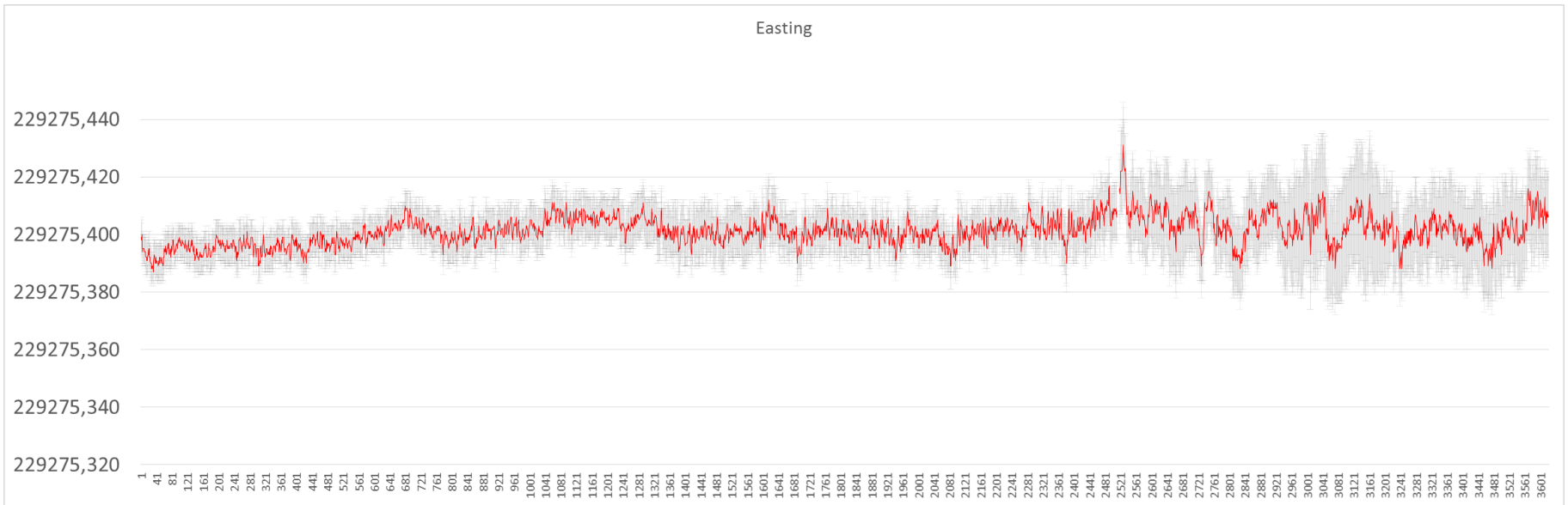
*(7 sessions)*





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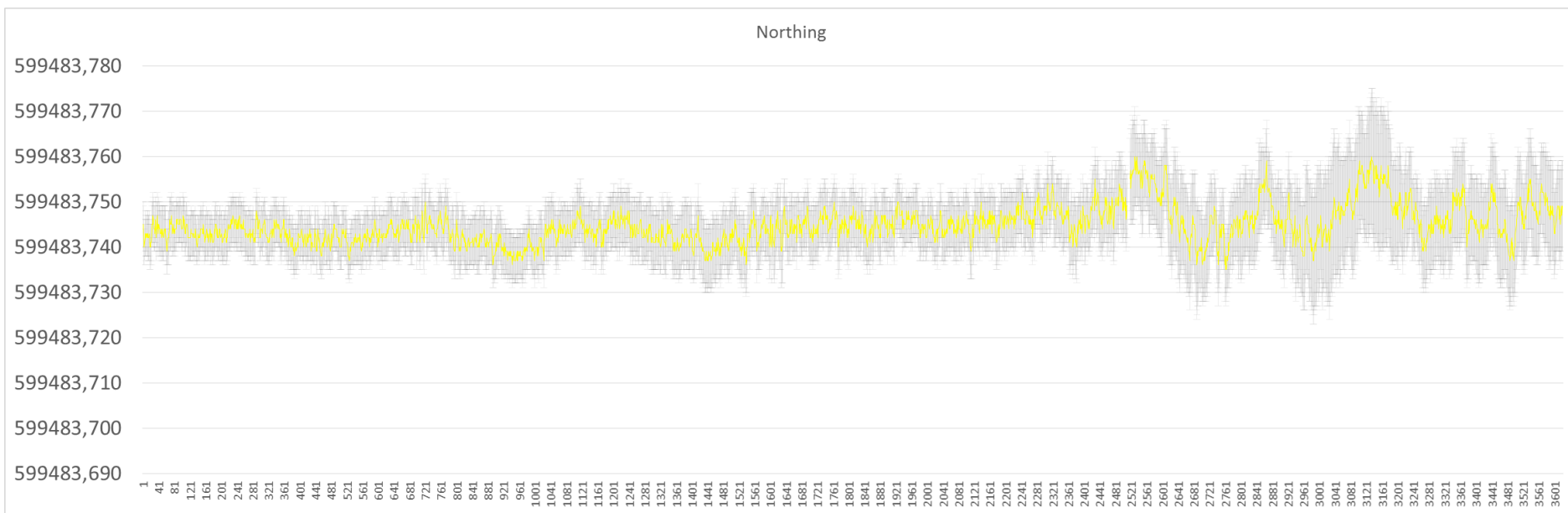
# RTK Stability "Vižuļi" (MAX)





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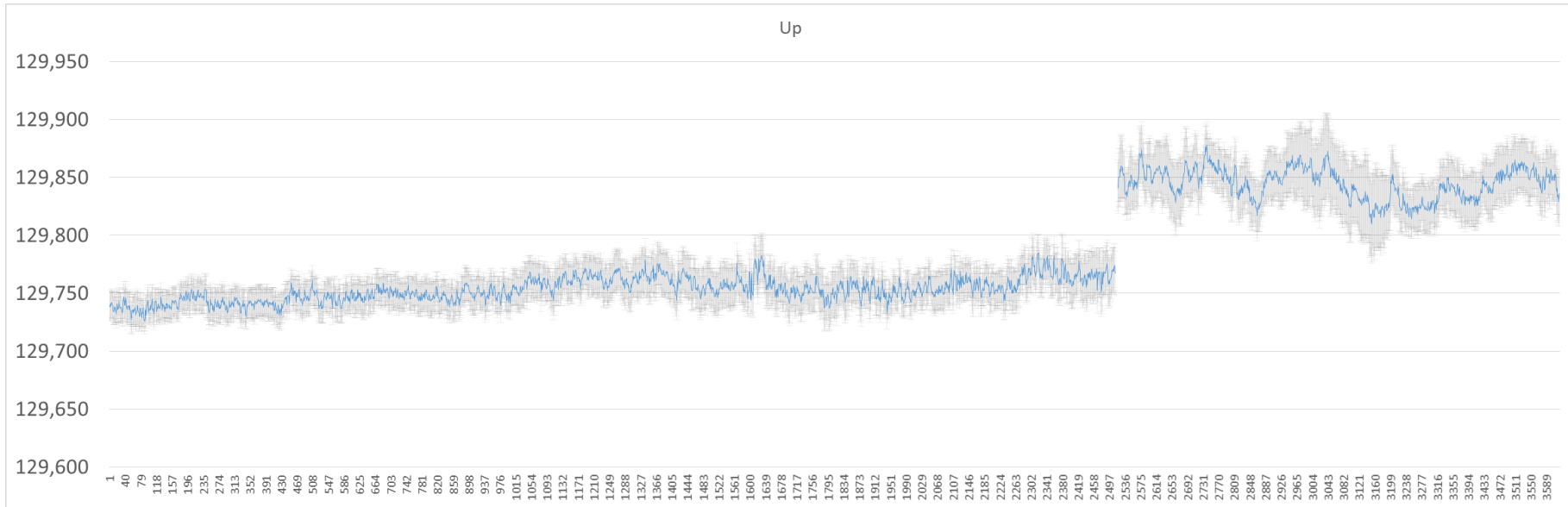
# RTK Stability "Vižuļi" (MAX)





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# RTK Stability "Vižuļi" (MAX)





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Thank You for attention!

QUESTIONS?

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