Assessment of standard positioning using individual GNSS

In preparation of EUREF contribution to ICG

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Available software & routine monitoring

Software: **G-Nut/Anubis V1.2** – developed at GOP/RIGTC recently

G-Nut/Anubis V1.1 – current last released in April 29, 2014 (+fix)

- *Quantitative check (all GNSSs)*
- *Qualitative check (partial support for GNSSs)*
- *Meta data check (in future)*
- *Positioning (all GNSSs)* → **V1.1***: GPS+GLO,*   **V1.2:** *GPS+GLO+GAL+BDS*

Multi-GNSS monitoring (GPS+GLO+GAL+BDS+SBS+QZS):

- IGSv3 monitoring:

http://www.pecny.cz/Joomla25/index.php/gnss/data-center/igs-mgex

- EURv3 monitoring:

http://www.pecny.cz/Joomla25/index.php/gnss/data-center/euref-rnx3

Standard monitoring (GPS+GLO):

- EUREF historical archive : (still temporary)

http://www.pecny.cz/WWW_IMG/MULTI-GNSS/EUREF/index.php

Day-to-day average single GNSS positions

Individual positioning depends on various aspects: quality of navigation messages and observations, processing models, adjusting, averaging, …

Day-to-day mean position repeatability (EGLT)
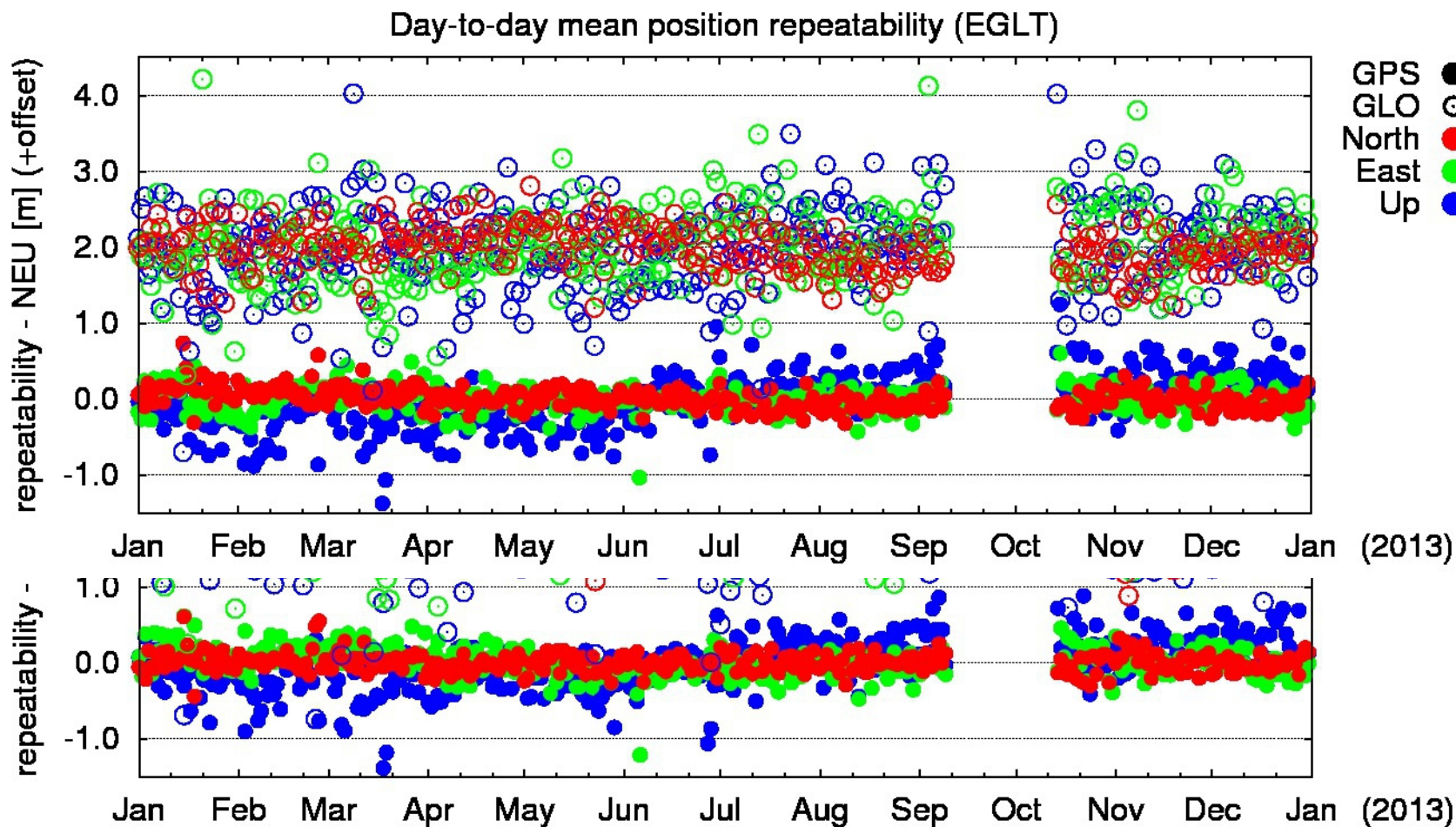
Day-to-day position repeatability

- Source: daily averages of individual GNSS solutions: **GPS, GLONASS**
- Repeatability of daily position averages during Jan-Dec 2013

Day-to-day mean position repeatability (individual GNSS)
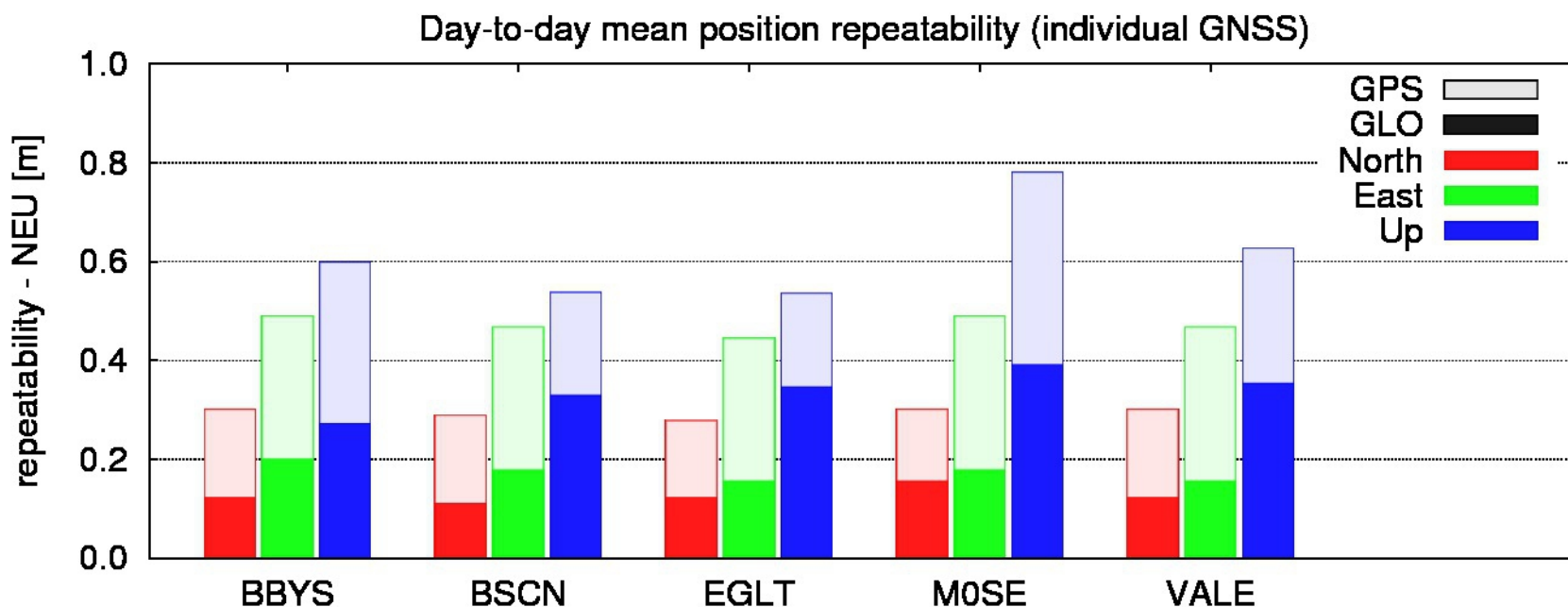
Epoch-to-epoch repeatability (NEU)

- Source: epoch-wise (15min) individual GNSS solutions: **GPS, GLONASS**
- Mean epoch-to-epoch position repeatability for each day of Jan-Dec, 2013
- RMS of mean epoch-to-epoch position repeatability (Jan-Dec, 2013)
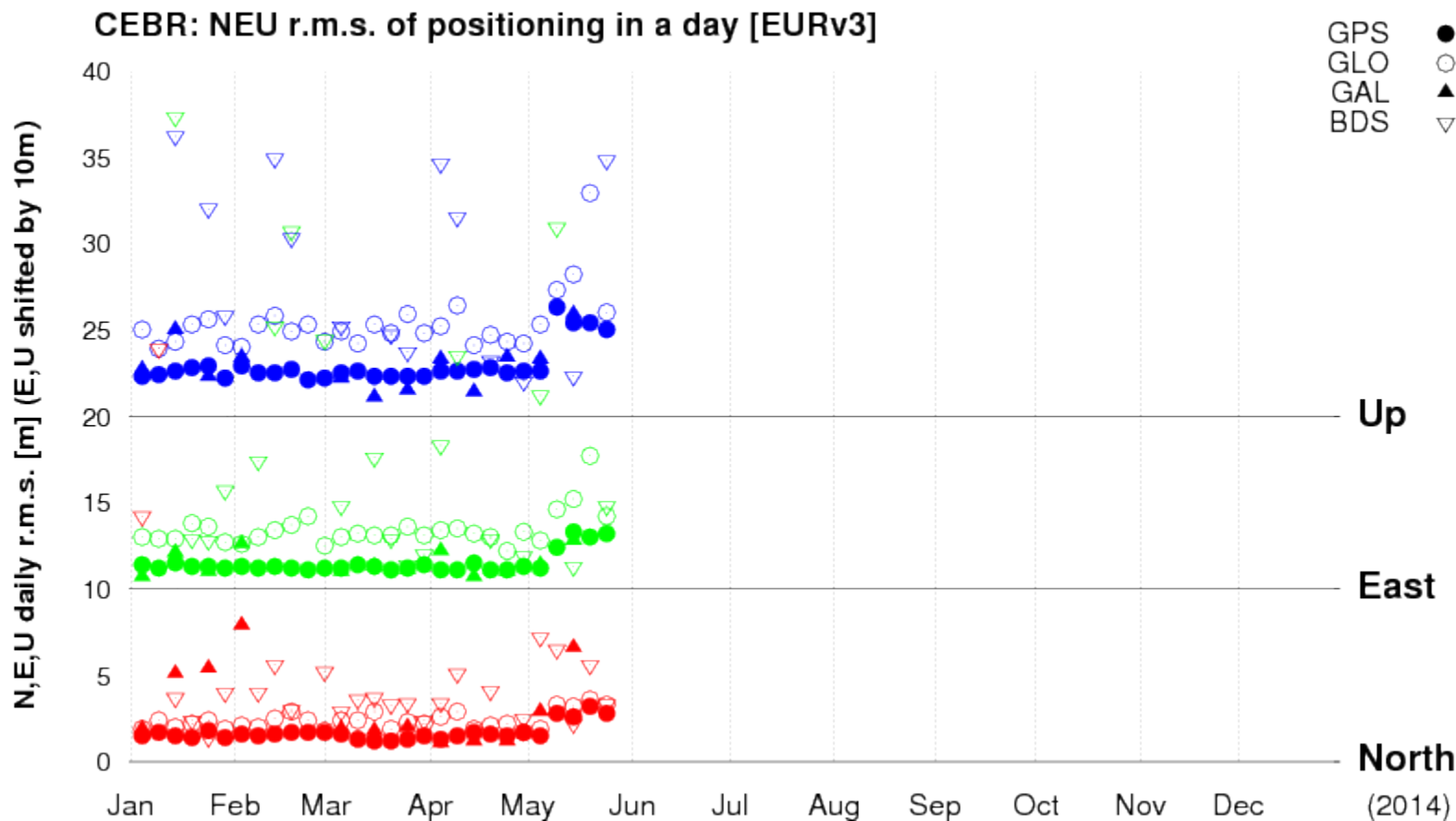

Epoch-to-epoch position repeatability (individual GNSS)
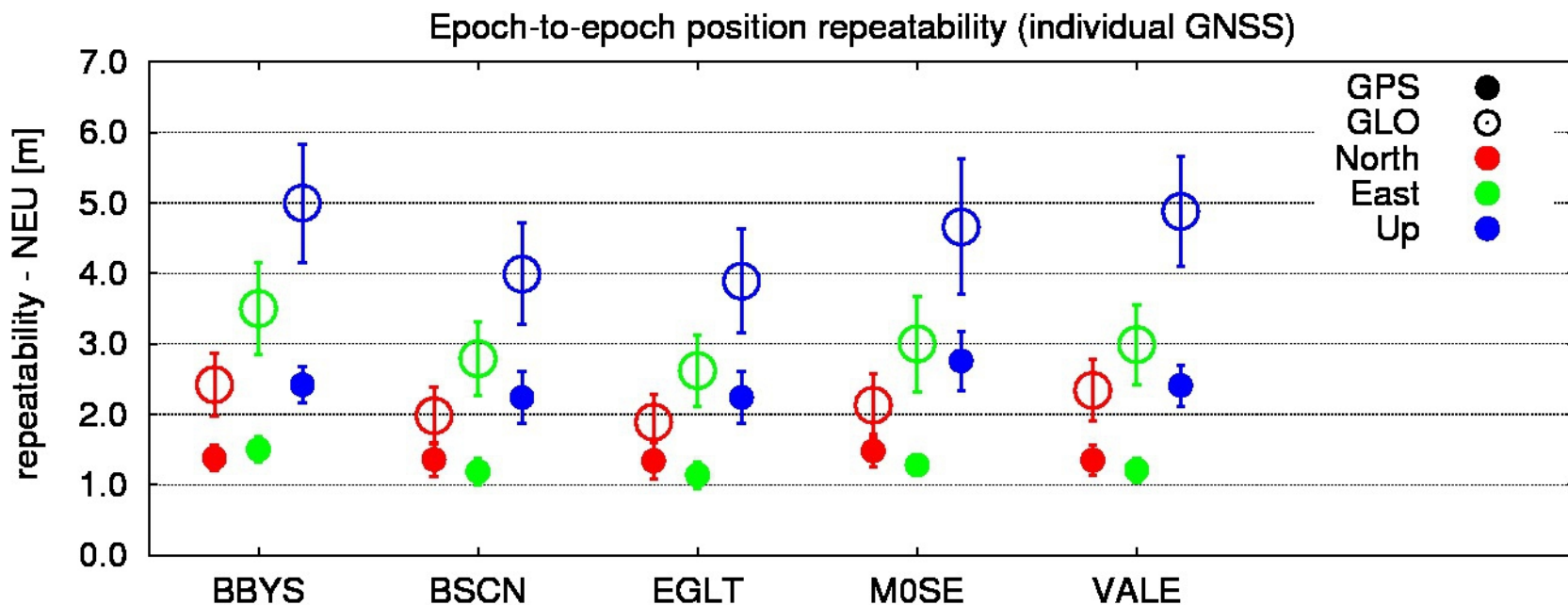
Preliminary Galileo positioning

Galileo: a few satellites only --> a few epochs in a day

... starting from 2014

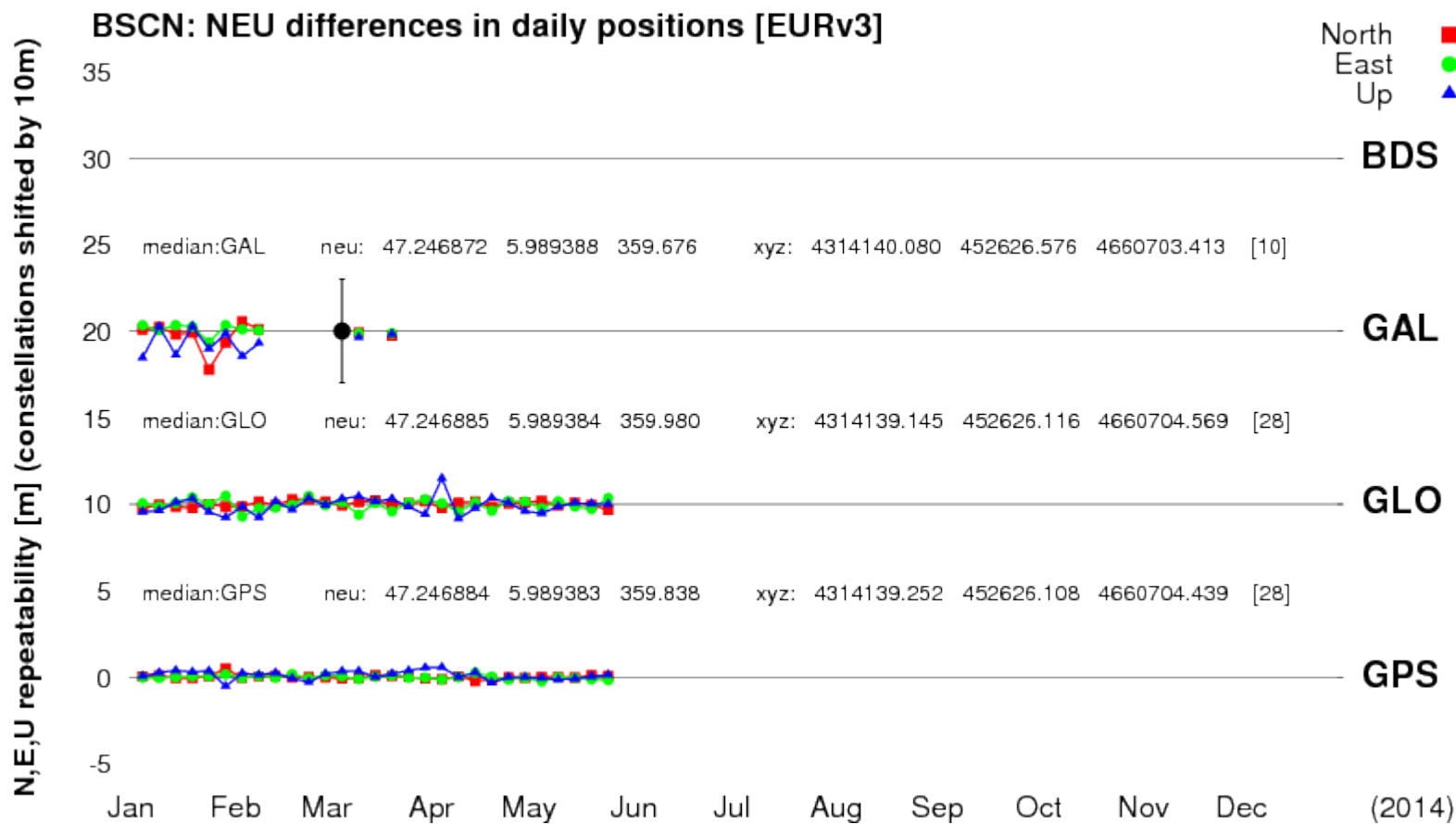CREI: NEU r.m.s. of positioning in a day [EURv3]
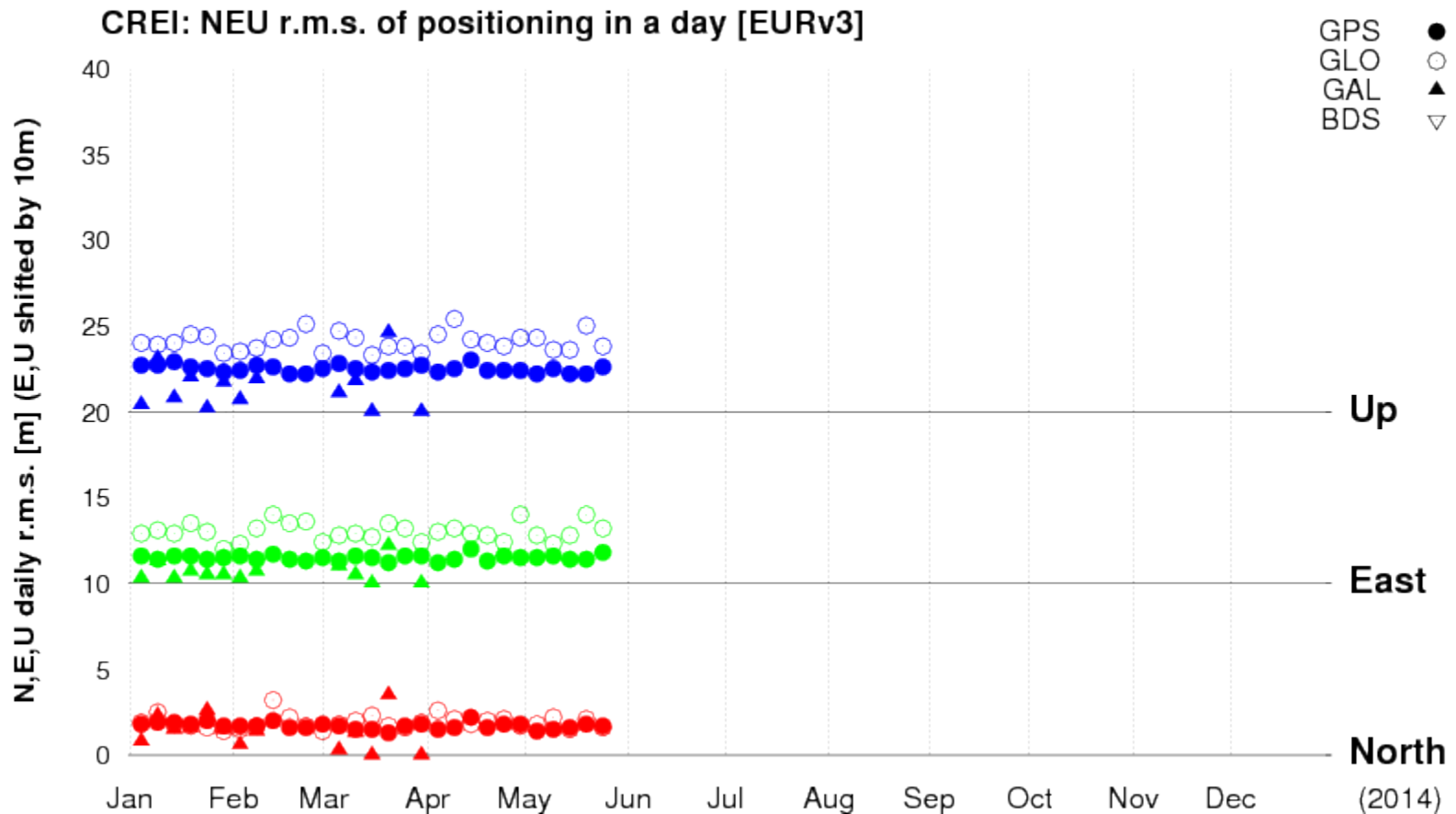
Preliminary Galileo & BeiDou positioning

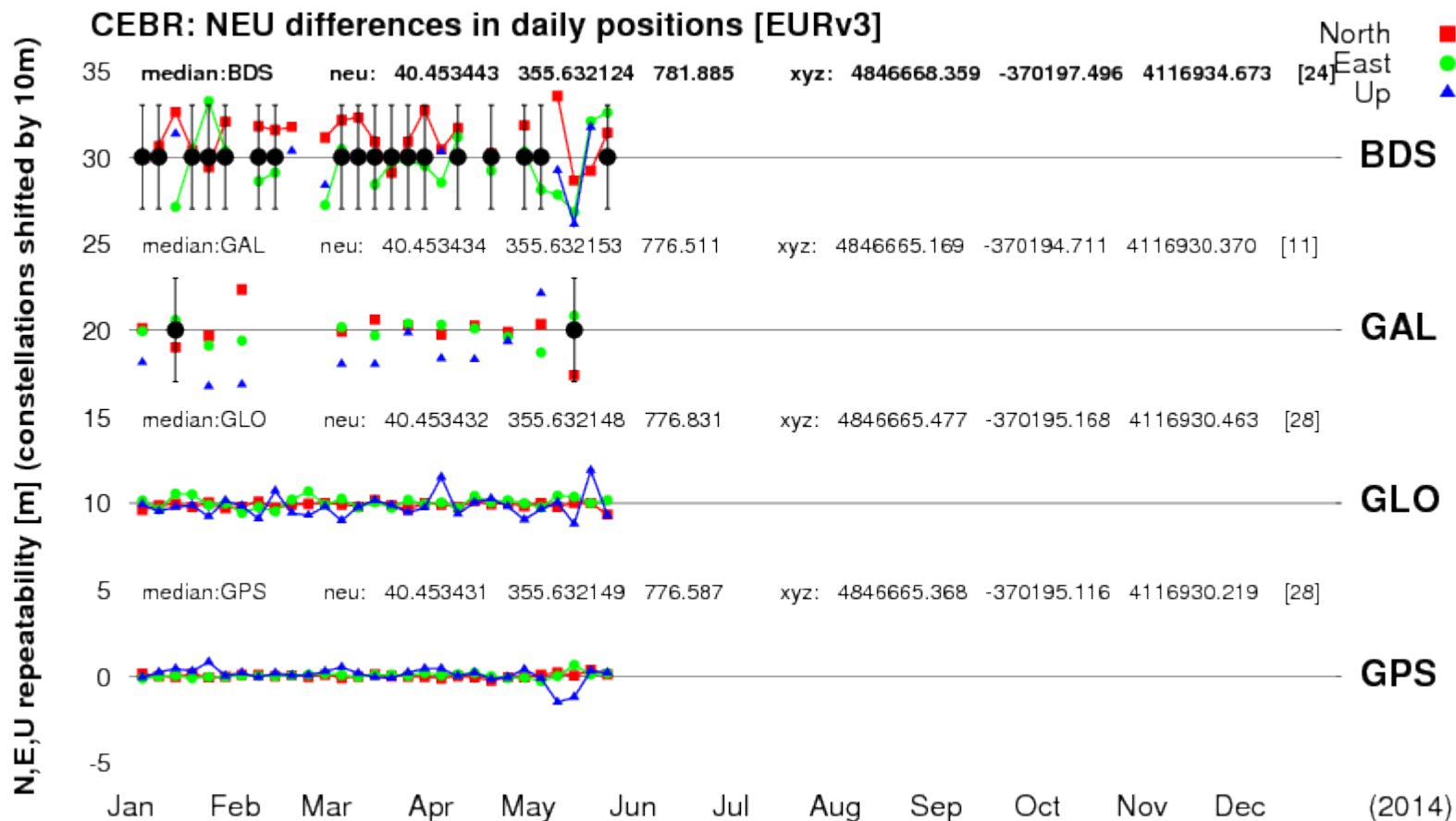**BeiDou:** a few satellites --> two stations in Europe only

.. starting from 2014

CEBR: NEU r.m.s. of positioning in a day [EURv3]

Preliminary Galileo position time-series

BSCN: NEU differences in daily positions [EURv3]

North ■ (red)
East ● (green)
Up ▲ (blue)

BDS

median:GAL   neu: 47.246872   5.989388   359.676   xyz: 4314140.080   452626.576   4660703.413   [10]

GAL

median:GLO   neu: 47.246885   5.989384   359.980   xyz: 4314139.145   452626.116   4660704.569   [28]

GLO

median:GPS   neu: 47.246884   5.989383   359.838   xyz: 4314139.252   452626.108   4660704.439   [28]

GPS

Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   (2014)

N,E,U repeatability [m] (constellations shifted by 10m)

Preliminary Galileo & BeiDou positioning

CEBR: NEU differences in daily positions [EURv3]

Summary

- **G-Nut/Anubis V1.1:** only GPS+GLO with Bancroft solution
- **G-Nut/Anubis V1.2 :** all GNSS supported with SPP solution
    - V1.2 will be released in summer 2014

Source: http://www.pecny.cz/Joomla25/index.php/gnss/sw/anubis

Pending question: What is a 'standard' methodology for the assessment
- epoch-to-epoch solution
- day-to-day solution
- which solution (SPP), which models to use
- navigation messages – which to use, QC, …
- how to optimally generate statistics

Output: Numerical values will be provided when the above is agreed