GNSS RTK and DGNSS in the Netherlands

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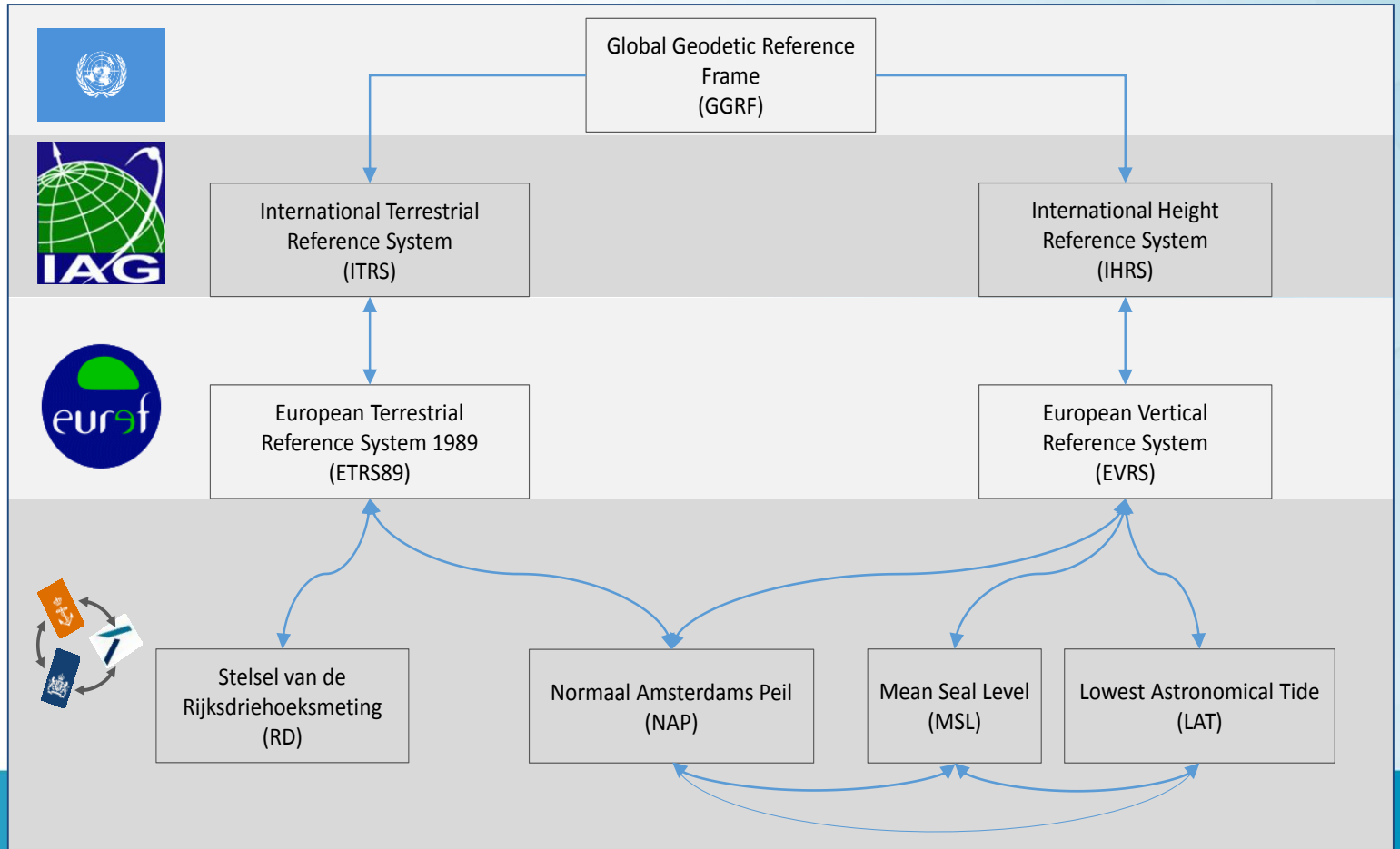
Nederlandse Samenwerking voor Geodetische Infrastructuur (NSGI)
Netherlands Partnership for Geodetic Infrastructure

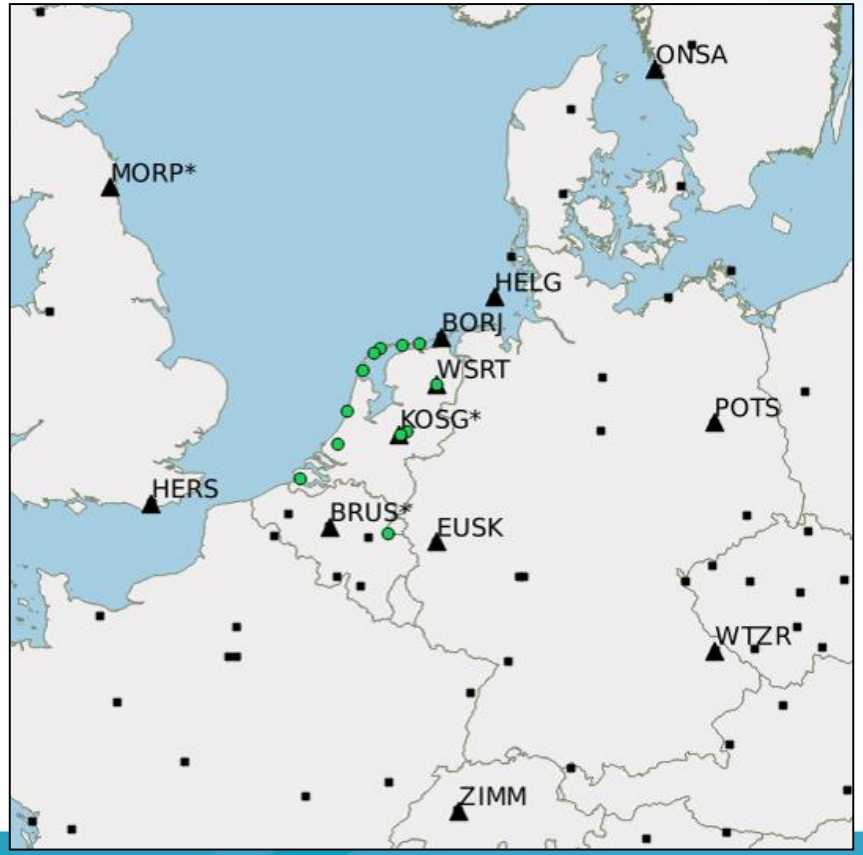
Outline

- **National reference frame for GNSS services**
- RTK and DGNSS services
- Galileo readiness

NSGI


Global Geodetic Reference Frame (GGRF)
International Terrestrial Reference System (ITRS)
International Height Reference System (IHRS)
European Terrestrial Reference System 1989 (ETRS89)
European Vertical Reference System (EVRS)
Stelsel van de Rijksdriehoeksmeting (RD)
Normaal Amsterdams Peil (NAP)
Mean Seal Level (MSL)
Lowest Astronomical Tide (LAT)

Realization of ETRS89 by GNSS: AGRS.NL



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- National reference frame for GNSS services
- **RTK and DGNSS services**
- Galileo readiness

RTK and DGNSS services

- GNSS-service providers
  - 6 national providers
  - Local providers
- NSGI ensures common reference frame by ‘certification’ (= coordinate computation) of GNSS reference stations

Certification of GNSS reference stations

RDNAP

kadaster

Certificaat van Goedkeuring

Uitgereikt aan:

06-GPS B.V.
Kubus 11, 3364 DG, Sliedrecht

De Dienst voor het kadaster en de openbare registers (Kadaster) en de DID van Rijkswaterstaat (voorheen AGI), als beheerders van de geometrische infrastructuur van Nederland samenwerkend onder de naam RDNAP, verklaren dat het referentiestation

Lottum

van bovengenoemde leverancier beoordeeld en in overeenstemming bevonden werd met de eisen die door Kadaster en DID zijn vastgesteld.
Het bovengenoemde referentiestation past hiermee binnen de geometrische infrastructuur van Nederland.

De coördinaten van het **"Antenne Referentie Punt" (ARP)** van het bovengenoemde station zijn met gegevens van **19 maart t/m 26 maart 2015, in combinatie met de absolute antenne kalibratie file "762-11302.atx"** vastgesteld op:

European Terrestrial Reference System, ETRS89

X	*3959776,531 m*	*noorderbreedte*	*51°*	*27'*	*23,67432"*
Y	*424607,180 m*	*oosterlengte*	*6°*	*07'*	*13,60081"*
Z	*4965414,339 m*	*ellipsoïdische hoogte*			*77,761 m*

Stelsel van de Rijksdriehoeksmeting (RD) en hoogte H_{NAP} volgens het Normaal Amsterdams Peil (NAP) berekend uit ETRS89 met de transformatie RDNAPTRANS™2008.

X_{RD}	*205962,080 m*
Y_{RD}	*385534,129 m*
H_{NAP}	*33,279 m*

Behoudens de voortdurende, ongewijzigde en bevredigende werking van het referentiestation en gebruikmakend van bovenstaande coördinaten is dit certificaat geldig vanaf **26 maart 2015** tot en met **26 maart 2016**.

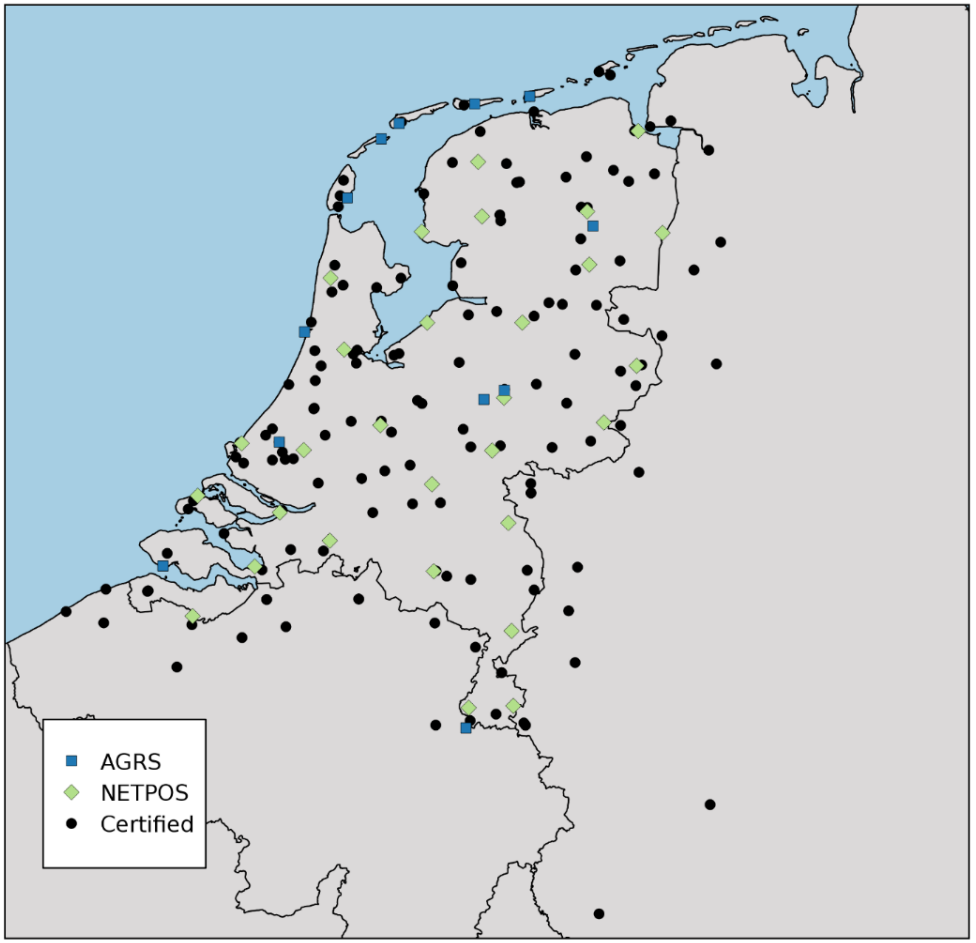
Datum: **20 april 2015**

Voor Kadaster en DID

ing. S.H. Oosterhof

Certificaat nummer: **368-26032015**

011009



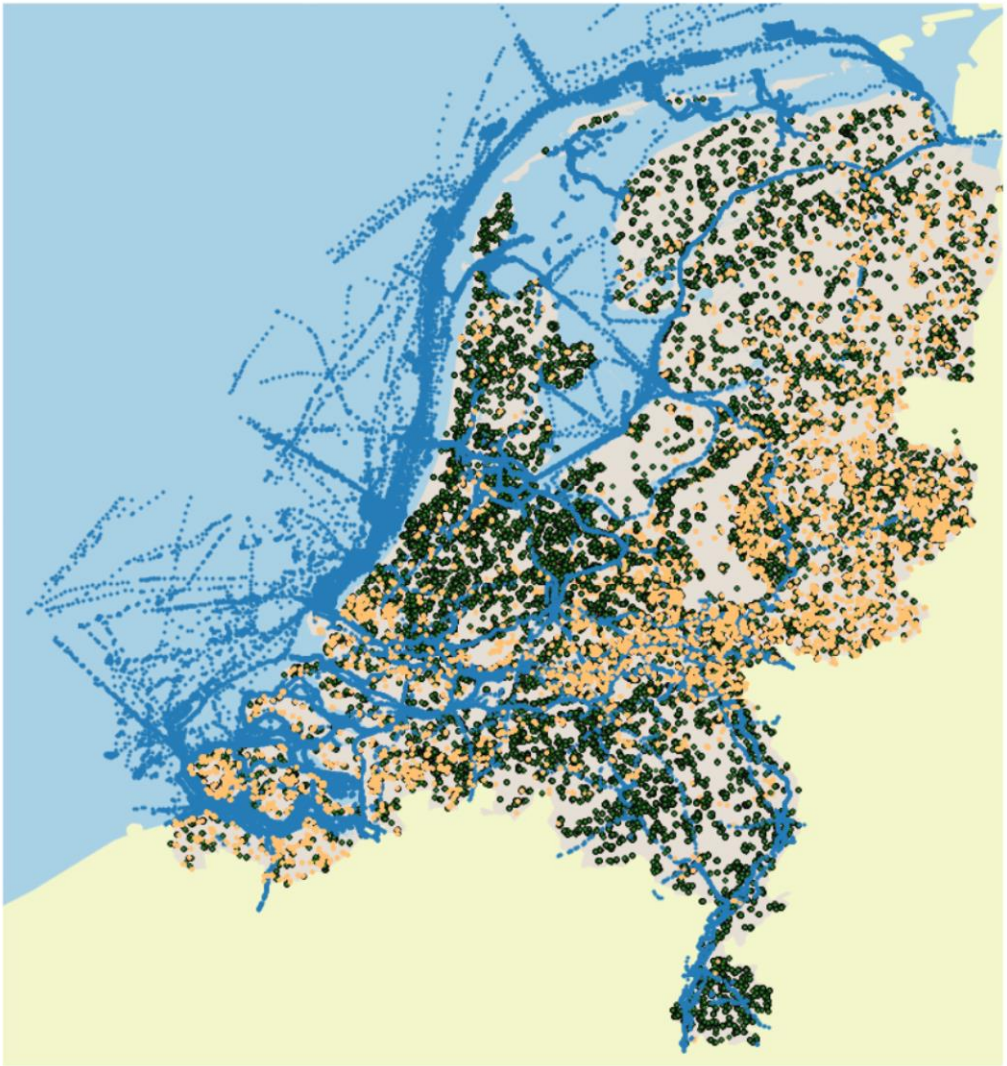
NETPOS

- National correction service for:
  - Kadaster*
    - Surveying
  - Rijkswaterstaat*
    - Surveying
    - IALA/AIS
  - Research, Education and Innovation

*) and their contractors

NETPOS RTK usage 2017

- Black: Kadaster
- Blue: Rijkswaterstaat
- Orange: Other (Contractors / Education and research)



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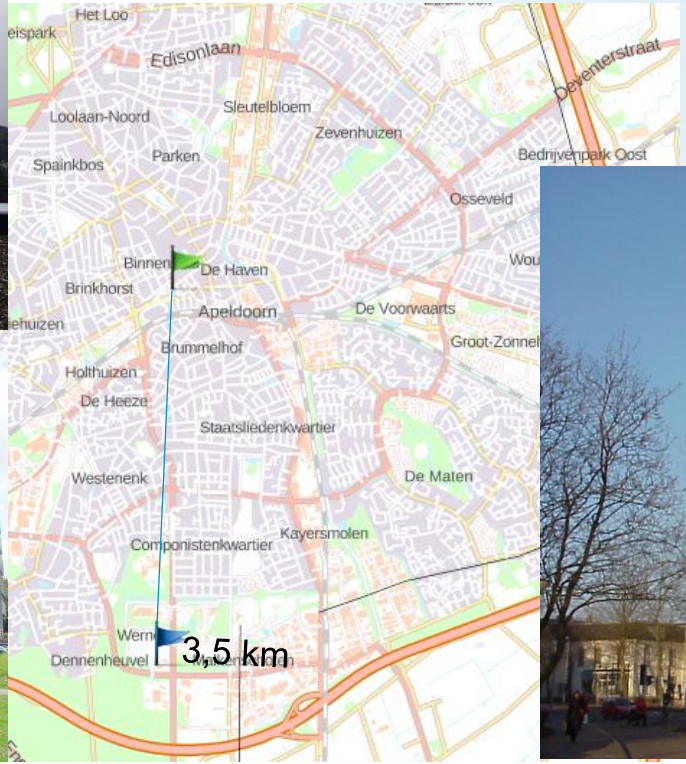
- **Galileo readiness**

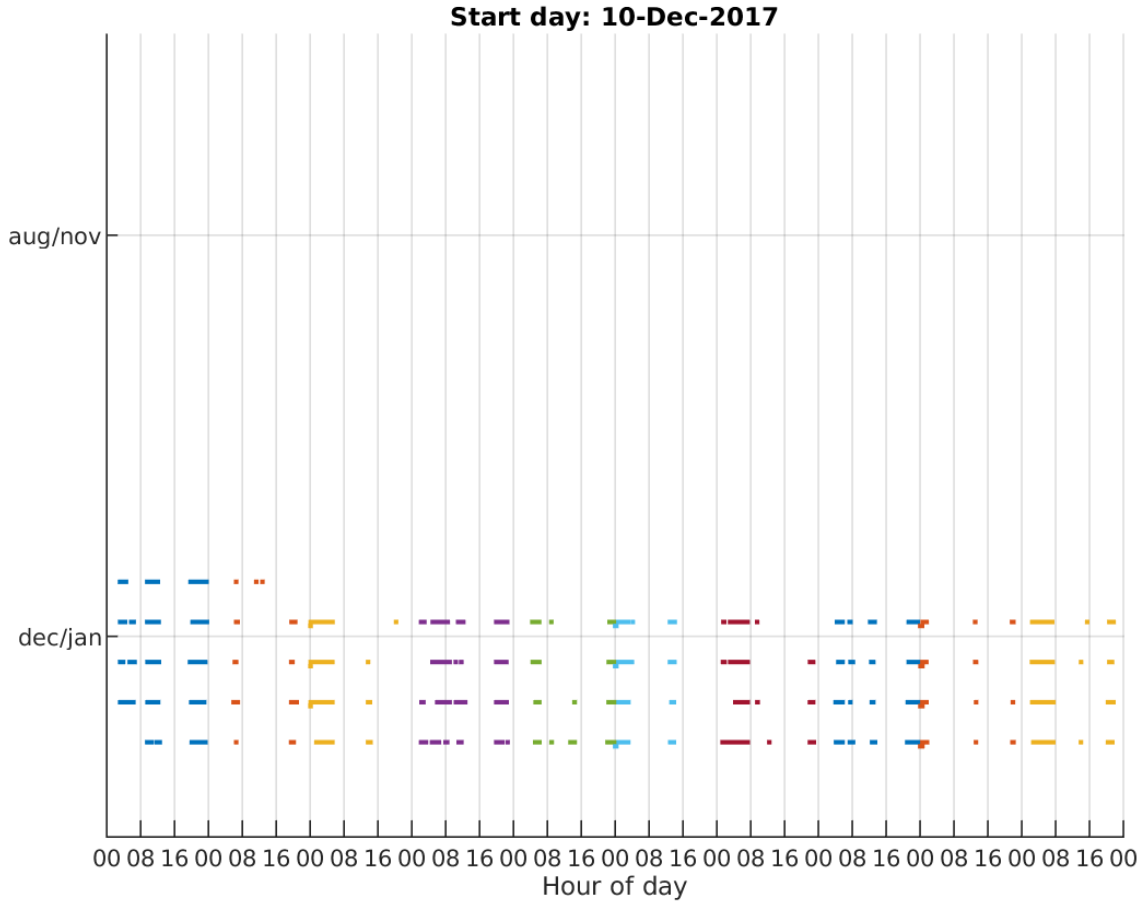
Galileo Ready?

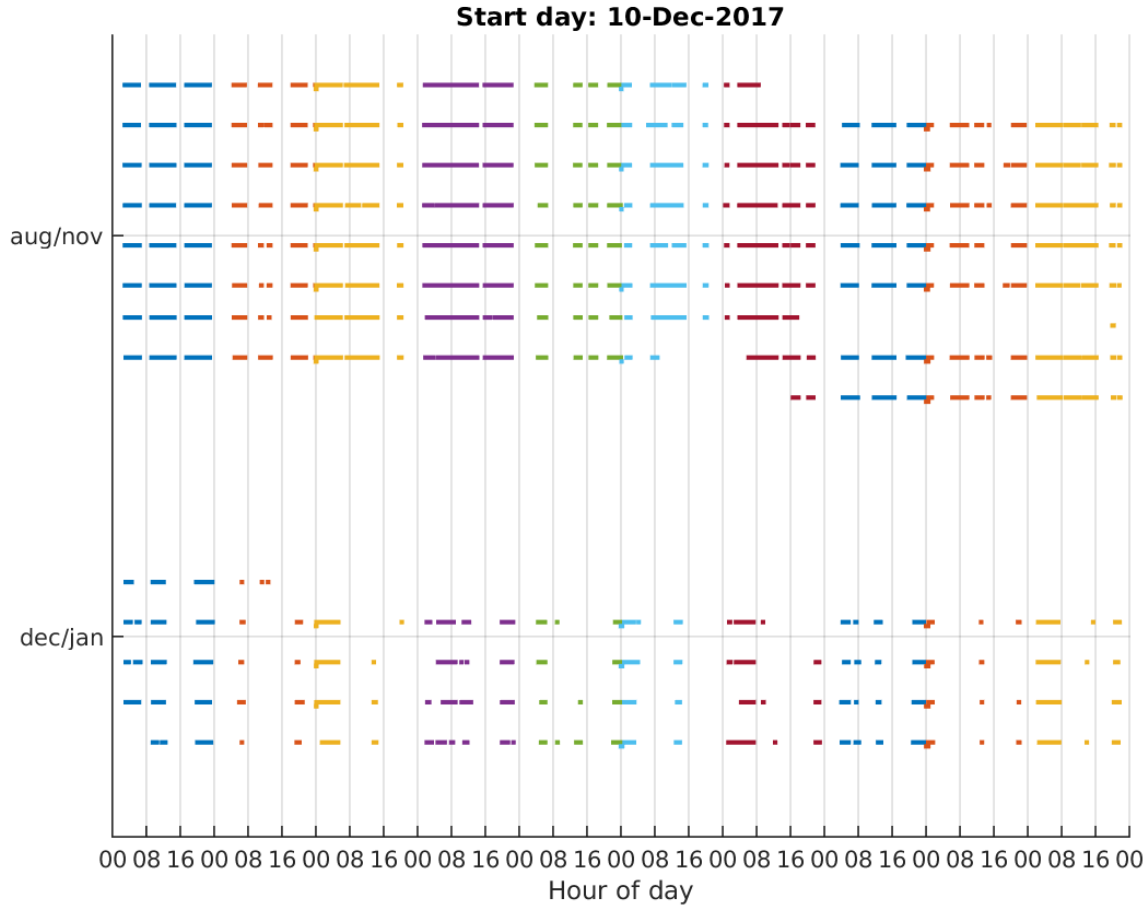
- All GNSS reference stations operated by NSGI capable of tracking Galileo (E1, E5a, E5b, AltBOC)

- NETPOS: Beta version of software available with Galileo support

Galileo experiment Apeldoorn




Start day: 10-Dec-2017
aug/nov
dec/jan
00 08 16 00 08 16 00 08 16 00 08 16 00 08 16 00 08 16 00 08 16 00 08 16 00 08 16 00
Hour of day


Start day: 10-Dec-2017
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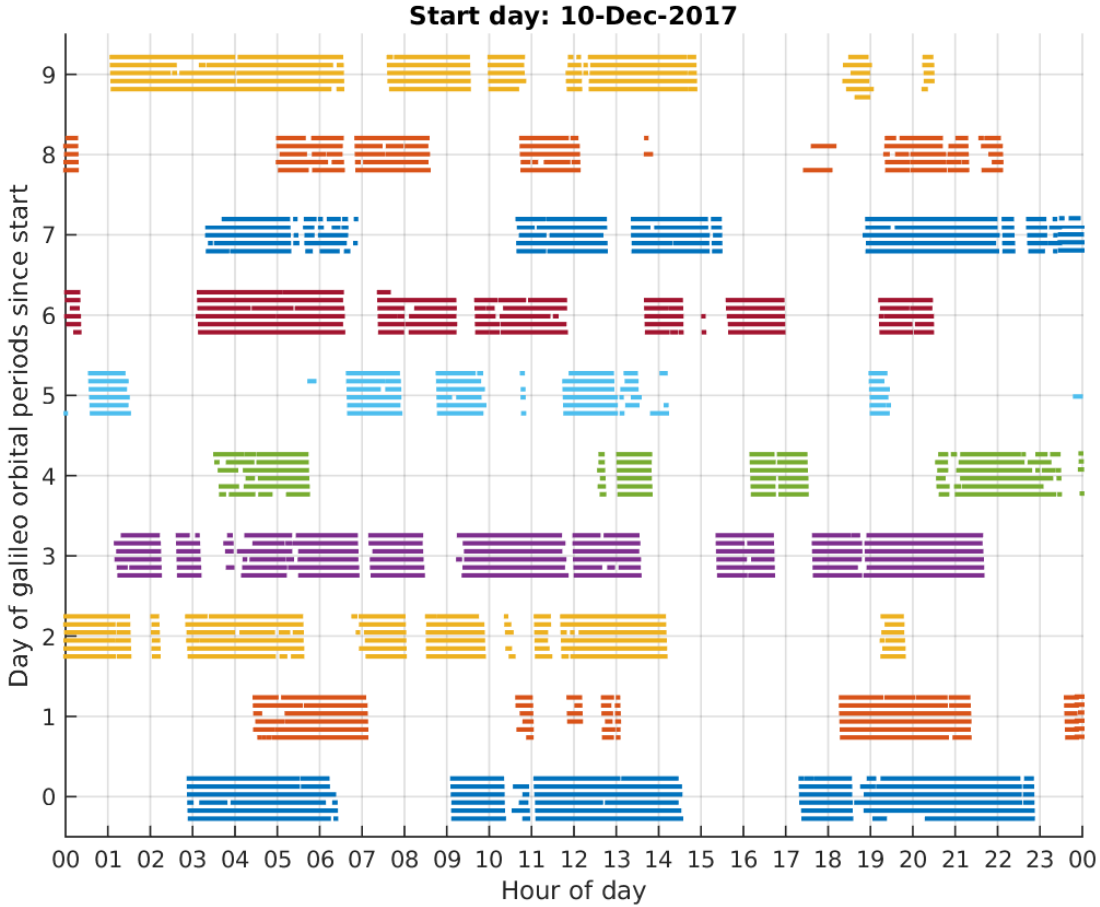
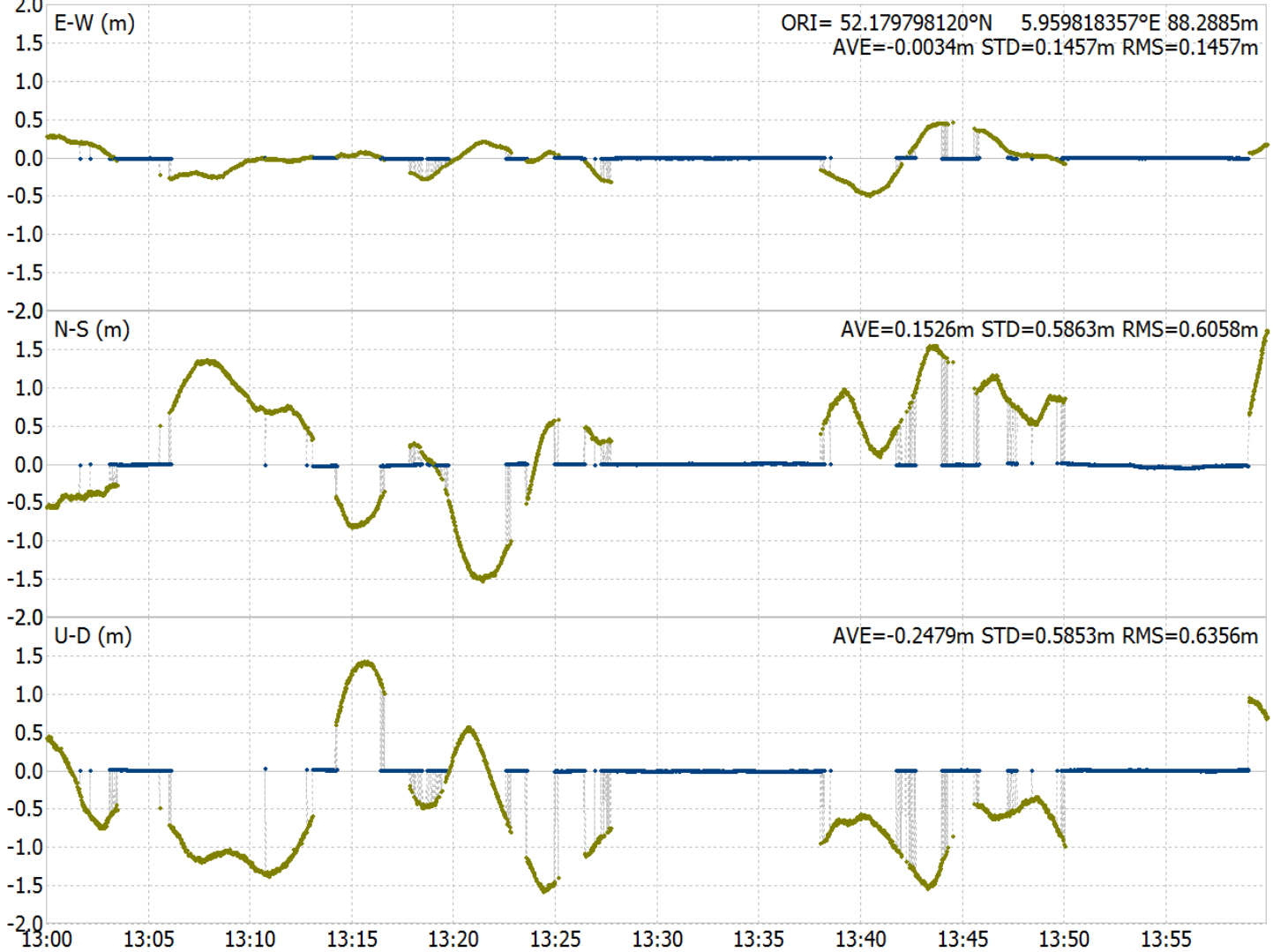
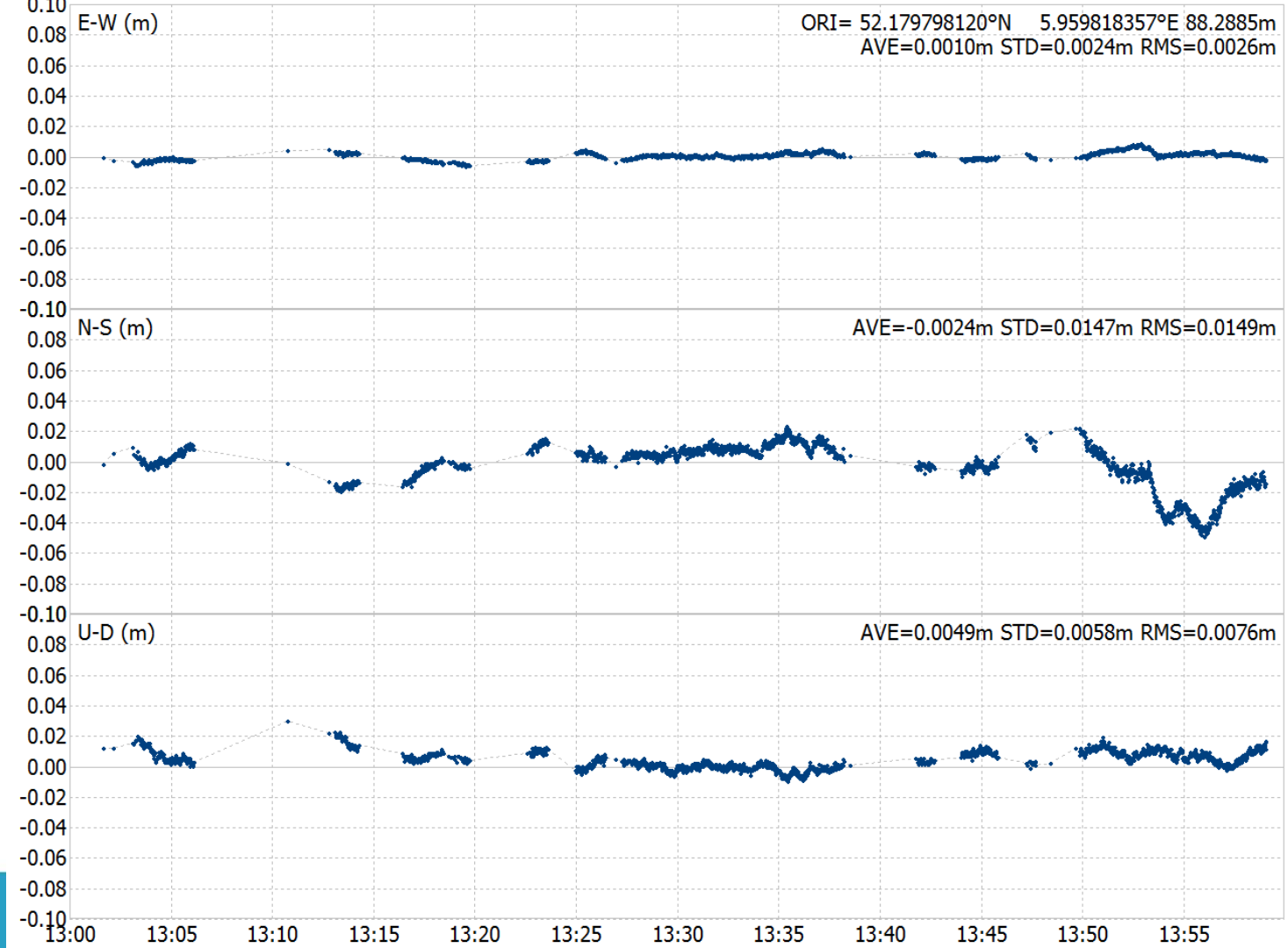
Hour of day


Start day: 10-Dec-2017
Day of galileo orbital periods since start
0
1
2
3
4
5
6
7
8
9
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00
Hour of day



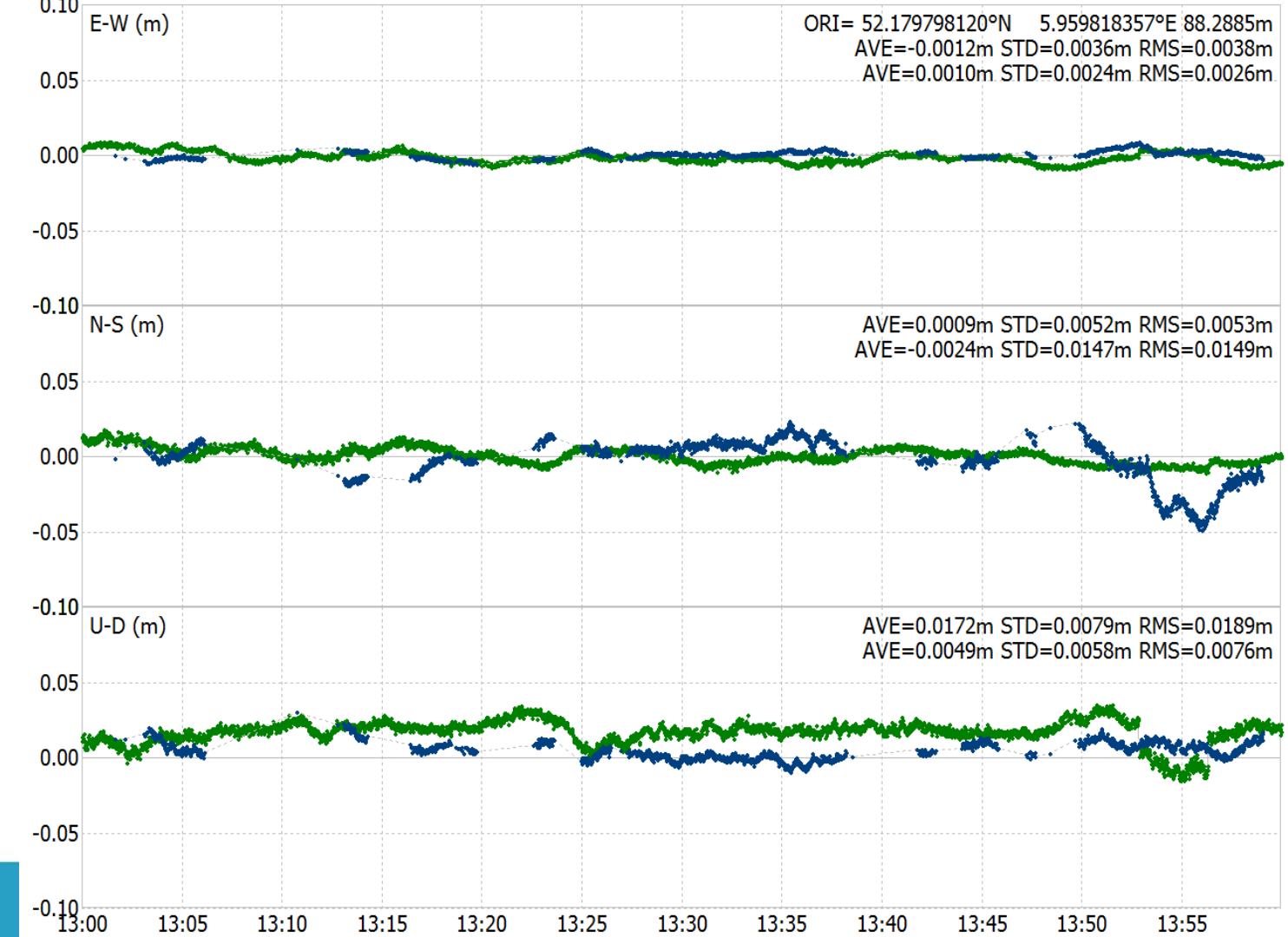
22 november 2017

- Galileo-float
- Galileo-fix



22 november 2017

- Galileo-only



22 november 2017

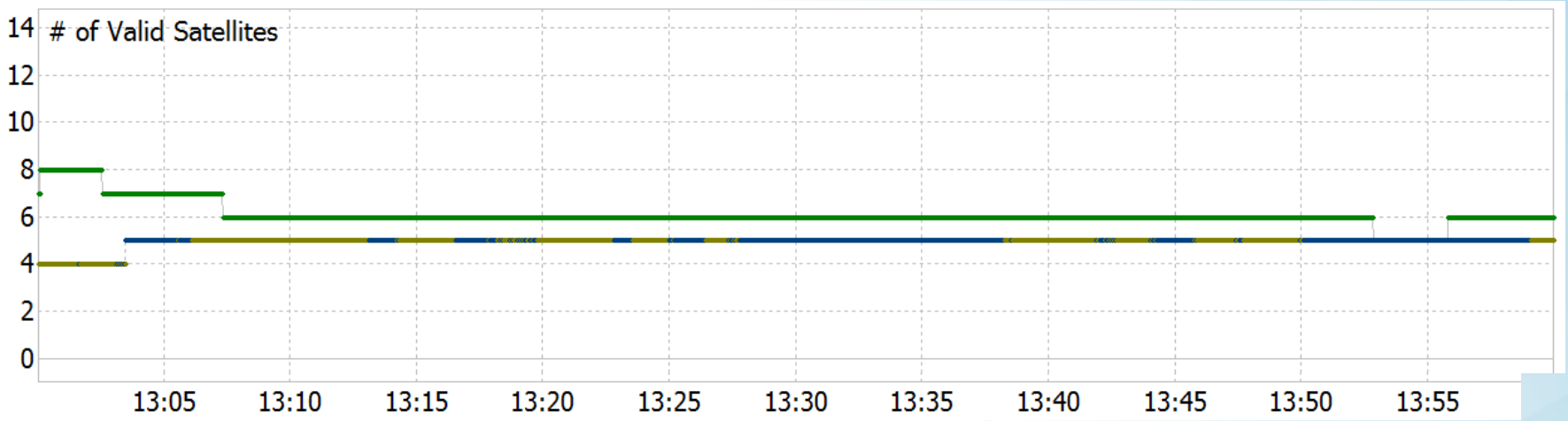
- GPS-only
- Galileo-only

Galileo only RTK, nearly available?

22 november 2017

Number of satellites

- GPS-only
- Galileo-only



General information

On behalf of the Netherlands partnership for geodetic infrastructure (NSGI) we invite you to attend the EUREF 2018 Symposium, which will take place from Wednesday, May 30 to Friday, June 1 in Amsterdam, the Netherlands. Following the success of the tutorials held in the previous years, a one day tutorial will be held on Tuesday, May 29.

About EUREF

EUREF is the International Association of Geodesy (IAG) Reference Frame Sub-Commission for Europe. The Sub-Commission EUREF was founded in 1987 at the International Union of Geodesy and Geophysics (IUGG) General Assembly held in Vancouver.

The scope of the symposium covers the EUREF activities, such as the realisation, maintenance, and usage of ETRS89, EVRS and the EUREF Permanent Network.

Location

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Continuously Operating Reference Stations

1st order

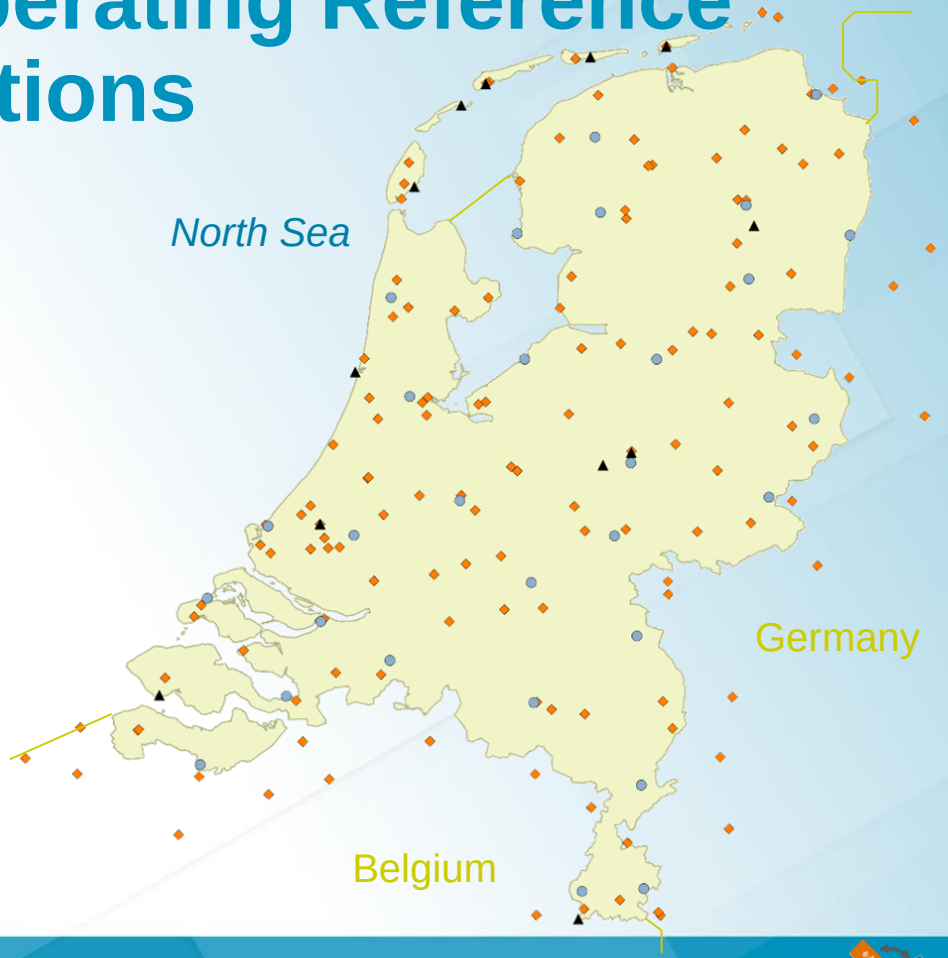
▲ AGRS.NL

2nd order

● NETPOS

◆ Certified other parties

- networks
- single stations



Passive reference points

- GNSS Footprint (backup)
- Levelling benchmarks
  (only 1st order shown!)
- Absolute gravimetry

No maintenance:

- xTriangulation points
- xGNSS Kernnet
- xRelative gravimetry