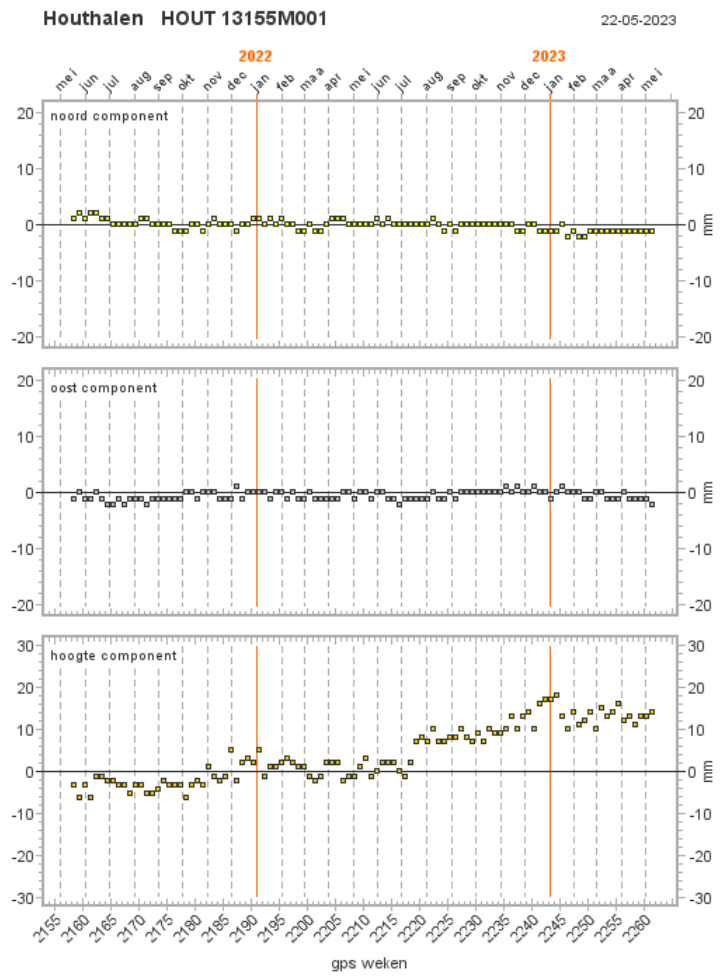
National Report - Belgium

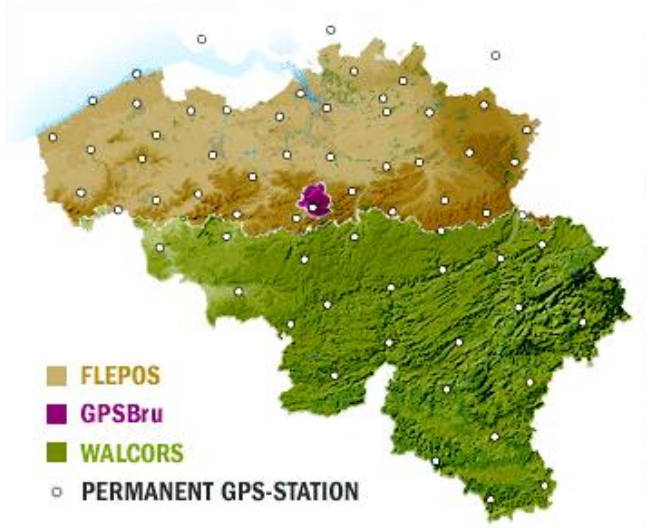
- National Geographic Institute
- Royal Observatory of Belgium

NGI Nationaal Geografisch Instituut
IGN Institut Géographique National

Royal Observatory of Belgium

AGN (Active Geodetic Network)





RTK networks operated since 2003:

- Operated by regional governmental agencies and federal NGI
- NGI is responsible for initial coordinates and monitoring of stations
- All information and results on our website (https://agn.ngi.be)

NGI Nationaal Geografisch Instituut
IGN Institut Géographique National

Royal Observatory of Belgium

GNSS processing

EPN Densification project

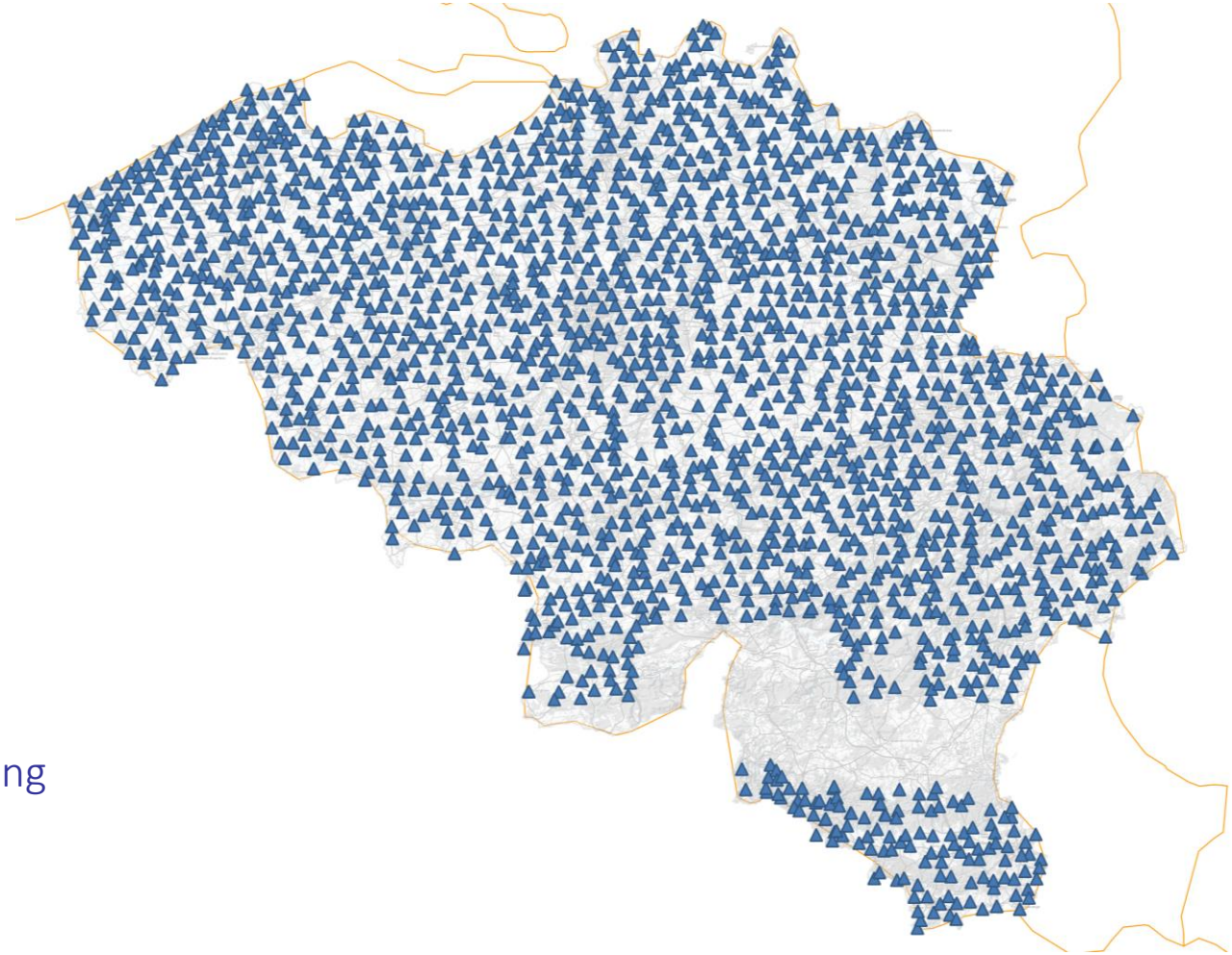
- Since the beginning of 2015, NGI is taking part in the EPN Densification project
- Week 1656 (2 October 2011) up to week 2237 (update: 26 November 2022) submitted

Reprocessing

- All Belgian data will be reprocessed in IGS20

3D network

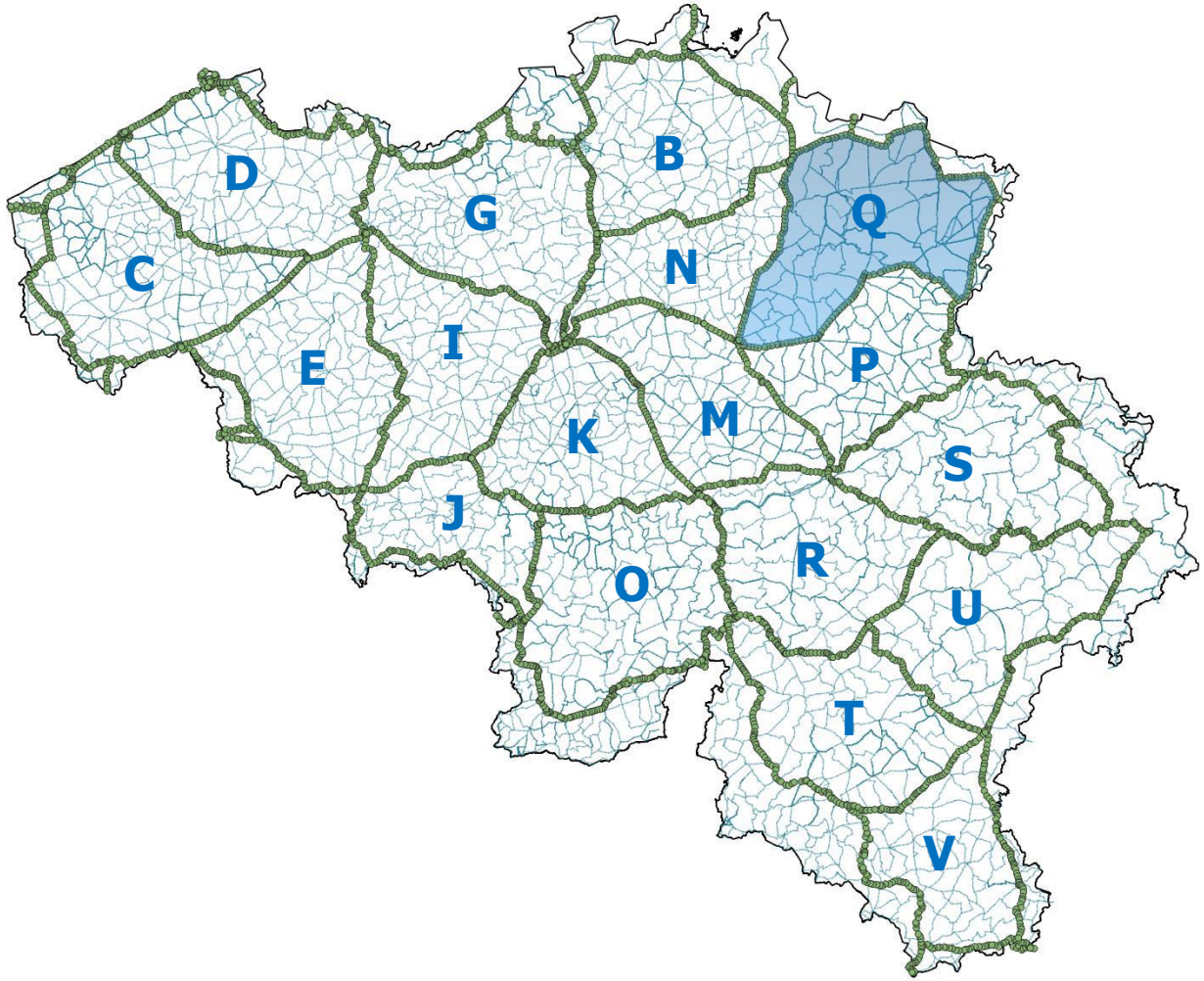
3D-network: 2034 points (≈90%)



- Started in 2018
- Begin 2024
- GNSS friendly
- Good accessibility
- Stainless steel nails in existing solid concrete surfaces
- Coordinates determined with static GNSS and spirit levelling

Levelling

New first order spirit levelling



GNSS infrastructure

Ground Movement Analysis using MT-InSAR

Project together with Geological Survey of Belgium, ULiege, TUDelft

PBLB

DOEL

PBCM

NGI Nationaal Geografisch Instituut
IGN Institut Géographique National

Royal Observatory of Belgium

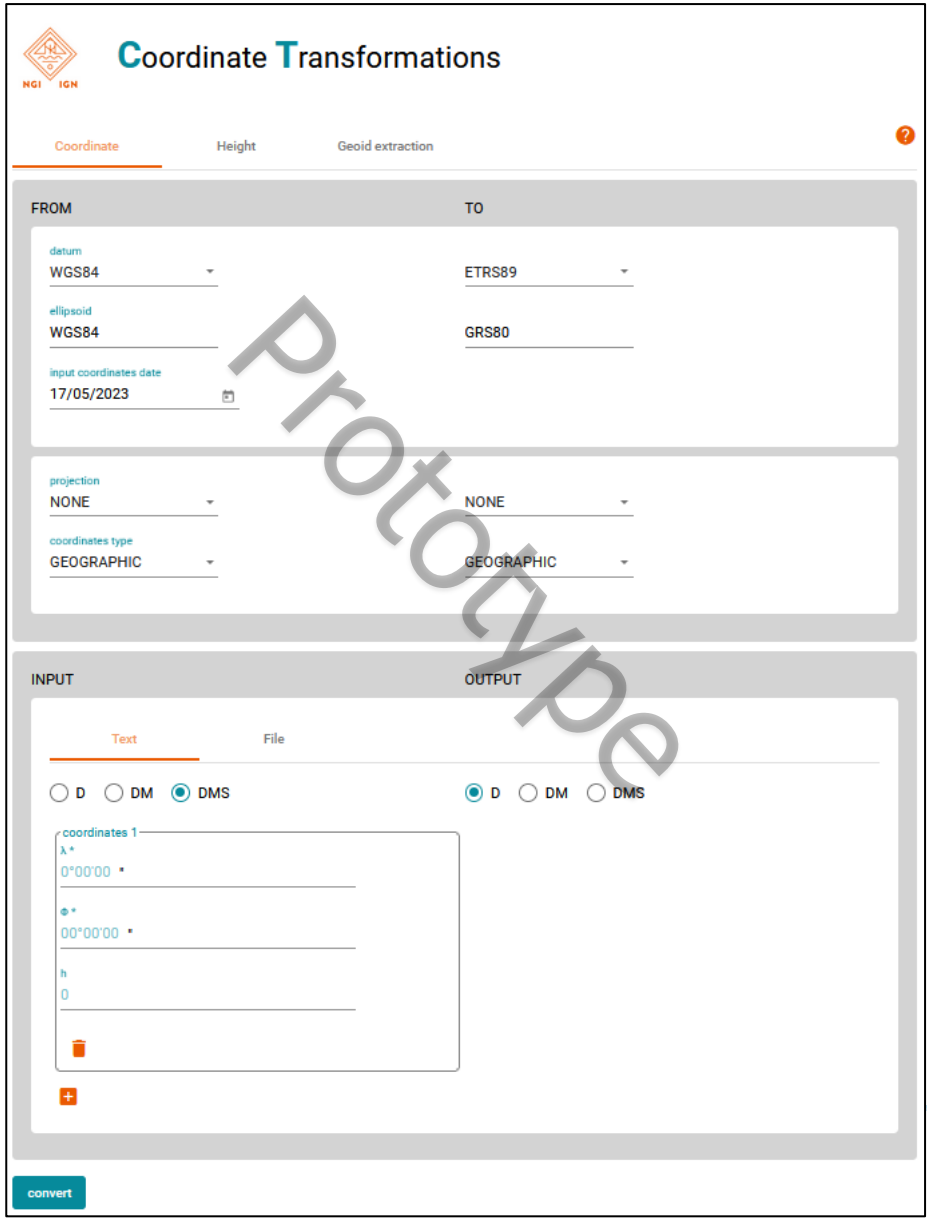
Coordinate systems

Lambert1950

- Predecessor of Lambert1972
- Digitalisation of historical data printouts
- Matched with common points in database
- Tool developed to create local transformation parameters

New Coordinate Transformation tool

- REST API (REST= Representational state transfer)
- Java library
- Angular (framework) used to create web-app and standalone at once
- Added WGS84 (ITRF2014) <-> ETRS89 (ETRF2000) functionality
- Added EVRS and EGM height systems

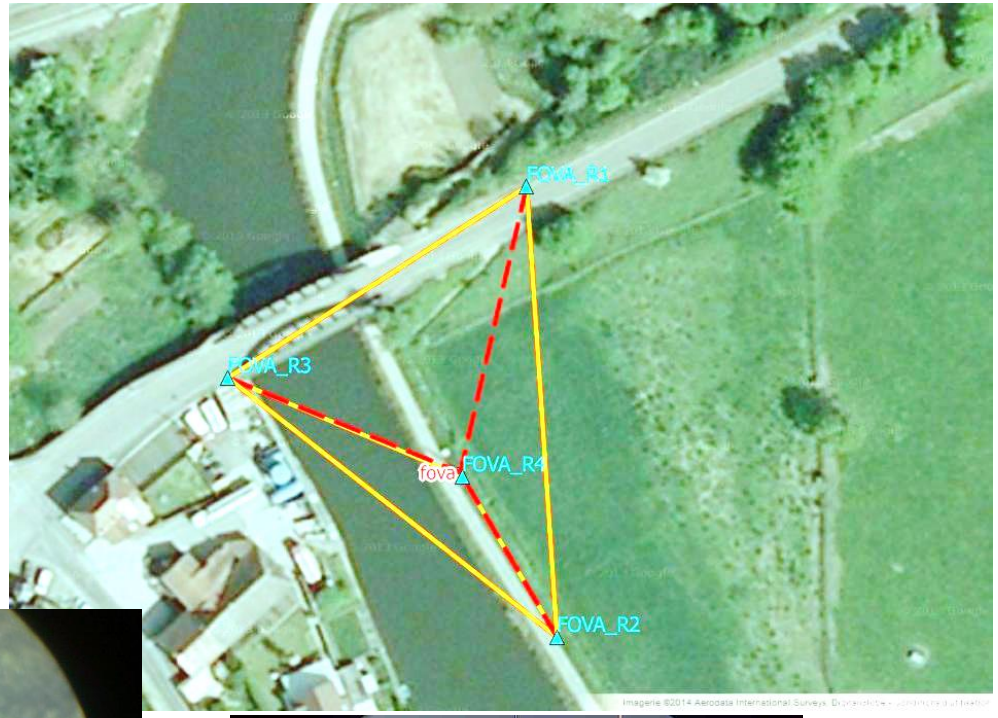


NGI Nationaal Geografisch Instituut
IGN Institut Géographique National

Case study

RTK networks: terrestrial measurements

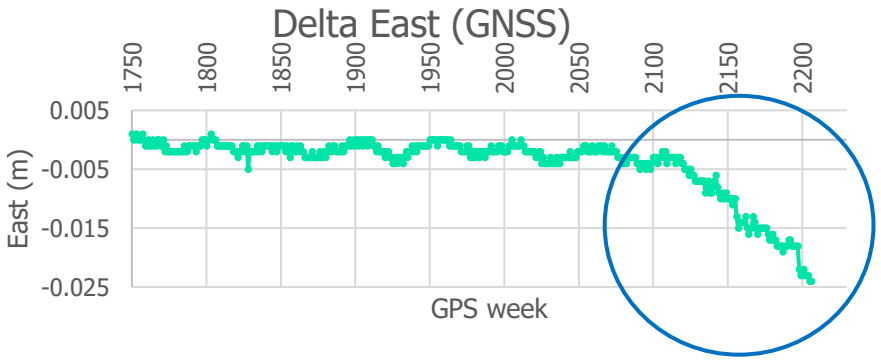
- Changes in coordinates: Why ?
- Independent technique from GNSS observation

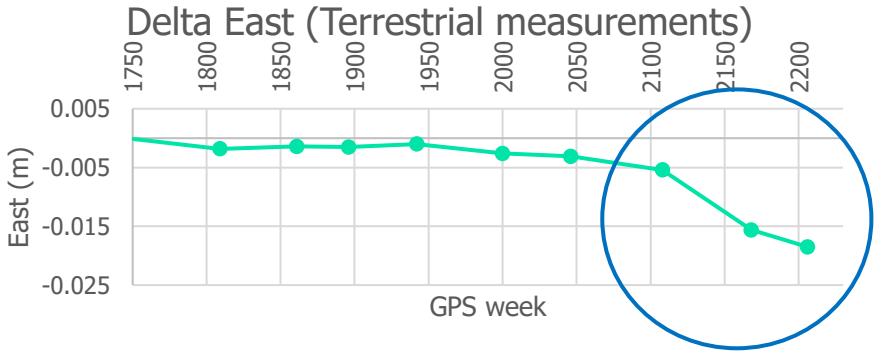


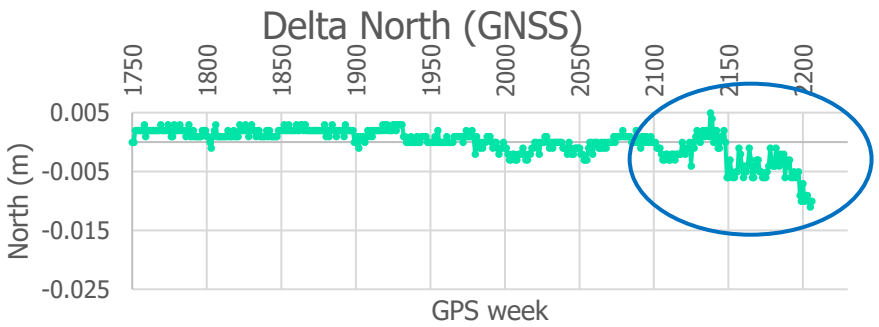
NGI Nationaal Geografisch Instituut
IGN Institut Géographique National

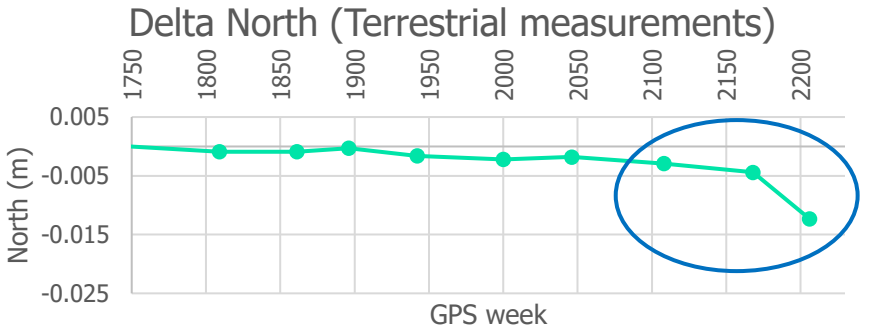
bservatory
um

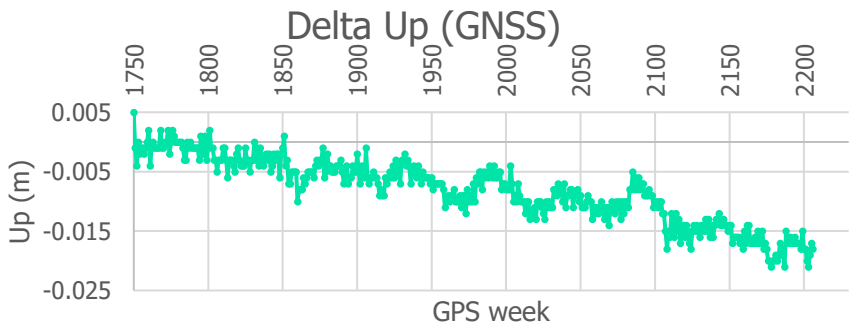
Case study PITM (Pittem) => PTTM

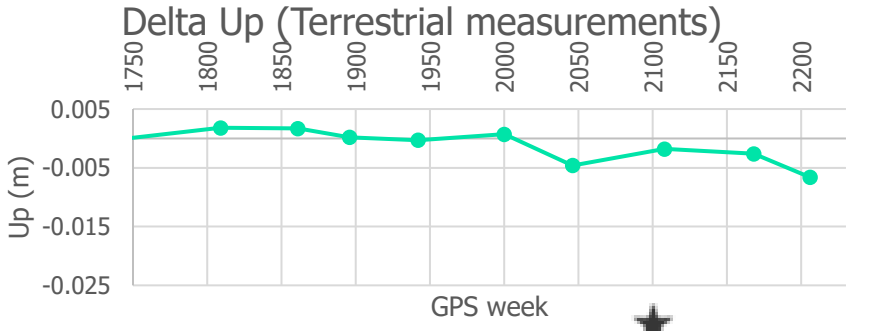












NGI Nationaal Geografisch Instituut
IGN Institut Géographique National
Royal Observatory of Belgium

Database

- Geodesy Oracle database has been transformed to Postgres database
- This will be integrated in the main database of the institute
- Tests and validations are ongoing

Varia

- Regional governments will reduce # of reference stations
- Ground motion near the Belgian coast will be investigated
- Co-location main tide gauge and GNSS (Ostend)
- Both NGI and ROB represent Belgium in UN-GGIM / WG Geodetic Reference Frames

Royal Observatory of Belgium

1. EPN Central Bureau and M3G
2. EPN analysis center providing rapid and final position estimates for EPN stations to EUREF
3. EPN densification analysis center (481 GNSS stations in and around Belgium)
4. EPN reference frame coordinator
5. EPN Historical Data Center
6. EPN Regional Broadcaster (www.euref-ip.be)

Royal Observatory of Belgium – some highlights

- In order to progress toward the application of FAIR data principles in 2022-2023, the EPN Historical Data Centre managed by ROB, started to operationally collect data provenance information for all new incoming daily RINEX data. This information:
  - includes the origin of the RINEX files in the Historical Data Center (HDC),
  - the modifications (if any) occurred to the RINEX header,
  - as well as information on the issues (if any) encountered when reading the RINEX file.
- ROB, together with open science experts at Ghent University, also has organized a webinar "Putting the FAIR principles into practice: the journey of a GNSS data repository" on October 11th, 2022 and the recordings are available from https://fair-gnss.oma.be/webinar.php .
- ROB implemented a supervised machine-learning algorithm to automatically identify possible position outliers in EPN stations caused by degraded data quality.
  - The algorithm was trained using the position time series of EPN stations
  - Along with six GPS daily data quality indicators generated by the EPN CB.

  Through this process, it is possible to identify the most important GPS data quality indicators explaining outliers in the GPS position time series.
- As an EPN and EPN densification analysis center, ROB will start soon with its reprocessing in IGS20

NGI Nationaal Geografisch Instituut
IGN Institut Géographique National

Thank you

Royal Observatory of Belgium