

- Royal Observatory of Belgium :
- National Geographical Institute :

Manage the EUREF Permanent Network Central Bureau

next to core EPN:

- Collects and validates metadata of the EPN densification network
- Since 2017 use tool “M³G” (Metadata Management and Dissemination System for Multiple GNSS Networks)

Data analysis

- daily rapid position
- final position
- tropospheric zenith path delay estimates

Started to submit dedicated EPN densification solution containing also non-EPN stations in and around Belgium

Since May 2017, ROB is responsible for the Reference Frame Coordination of the EPN

- to provide the regional densification of the IGS reference frame in Europe in order to maintain of the ETRS89

Extensive explanation starting with the release IGS14 will be available in the National Report Belgium

- EPN multi-year position and velocity solution is computed
- CATREF
- updated each 15 weeks

Ionospheric Products and Space Weather impacts

- maintain the near real-time products dedicated to Space Weather

Tropospheric Products and E-GVAP Analysis Centre

- participating to the E-GVAP program and provided European meteorological institutes with tropospheric Zenith Path Delay (ZPD) estimates

Long-term Stability of GNSS-based Tropospheric Zenith Path Delays

ROB collaborate with the Royal Meteorological Institute (RMI) in different projects

- study the seasonal variabilities and trends in the atmospheric water vapor at about 100 worldwide IGS station locations based on GNSS

Research on Space Weather and Ionosphere

The ROB-IONO software (Bergeot et al. 2014) was used to re-process GPS and GLONASS data from up to 280 EPN stations available in 2015

- output consists of (European) regional maps of vertical TEC

Step-wise Analysis of the Quality of GNSS Network-based Processing

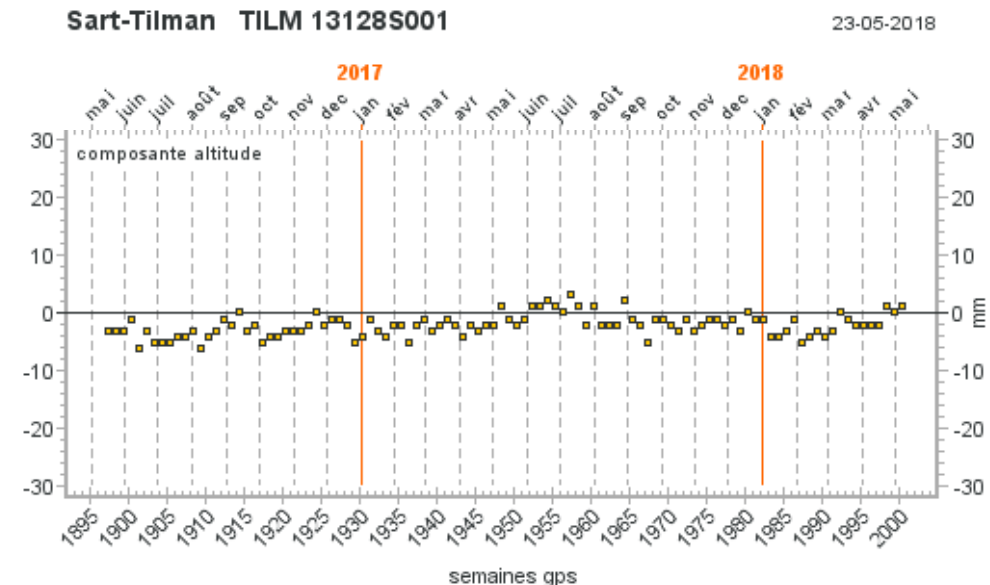
developed a tool 'ROBER' :

- monitor and
- analyse

the intermediate and final products of a GNSS network solution produced using the Bernese GNSS software V5.2

RTK networks: since 2003

- Operated by regional governmental agencies and NGI
- In the process of changing their hardware
- RTK data is free of charge (except agriculture)
- NGI is responsible for initial coordinates and monitoring of stations
- All information and results on our website

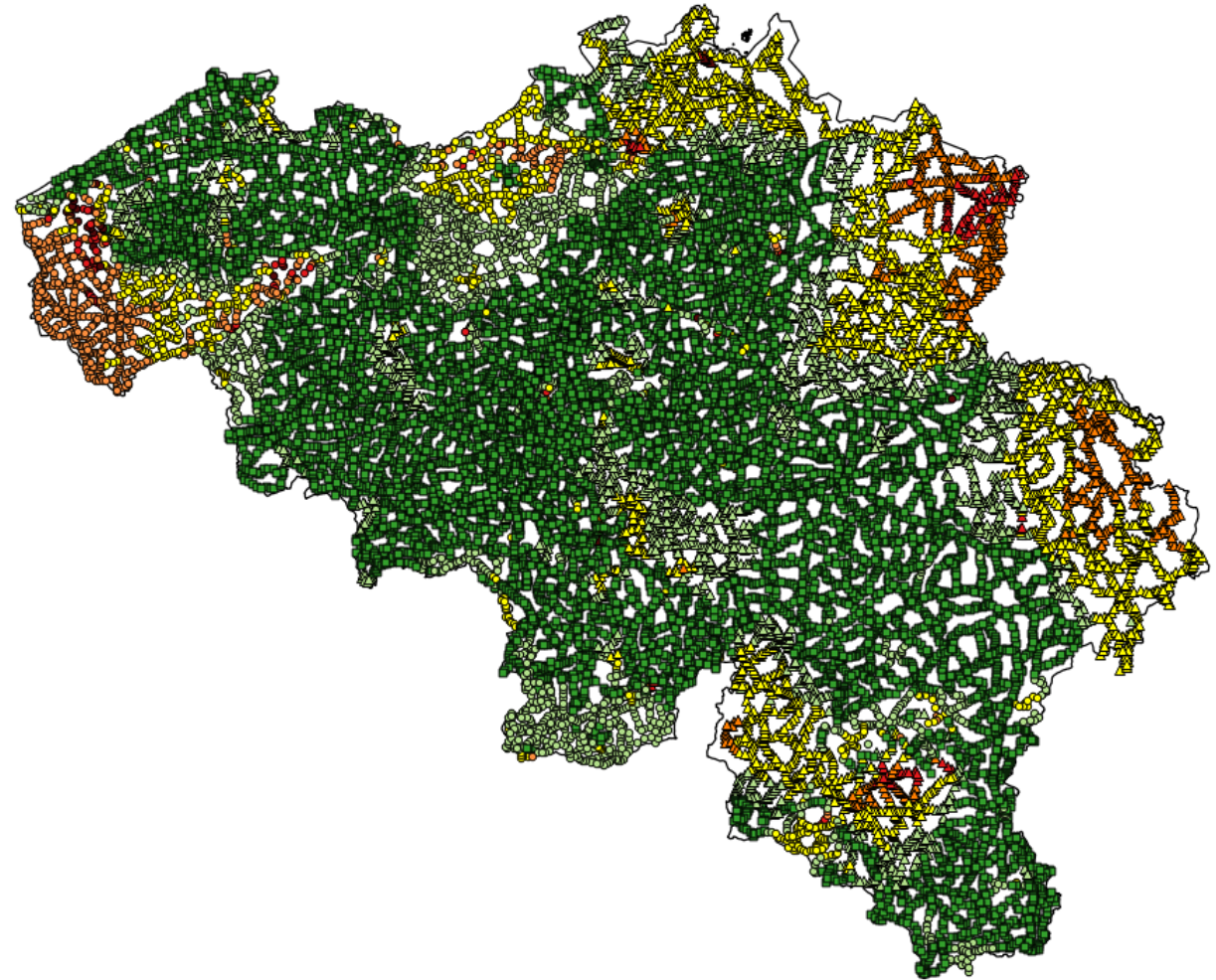


EPN Densification project

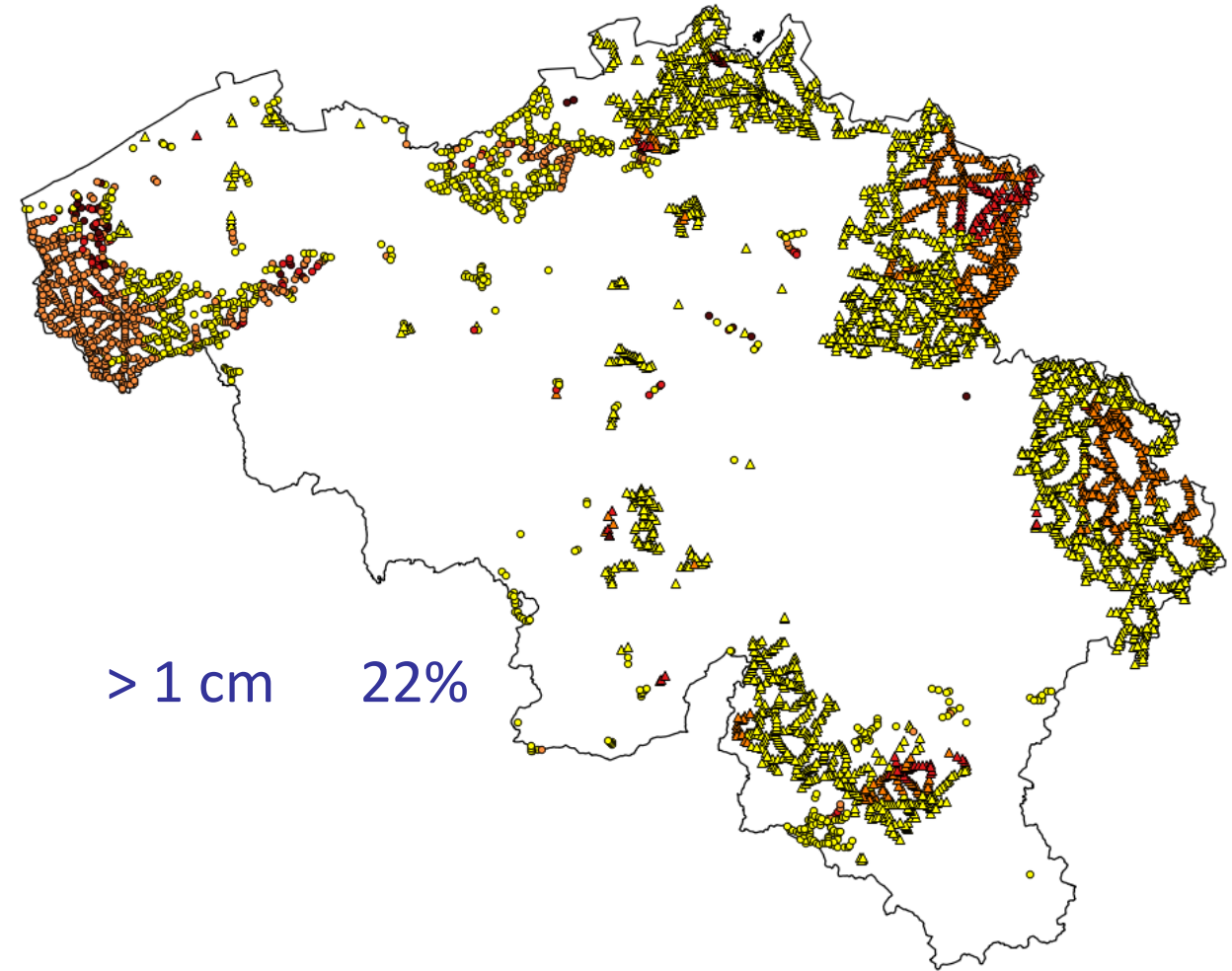
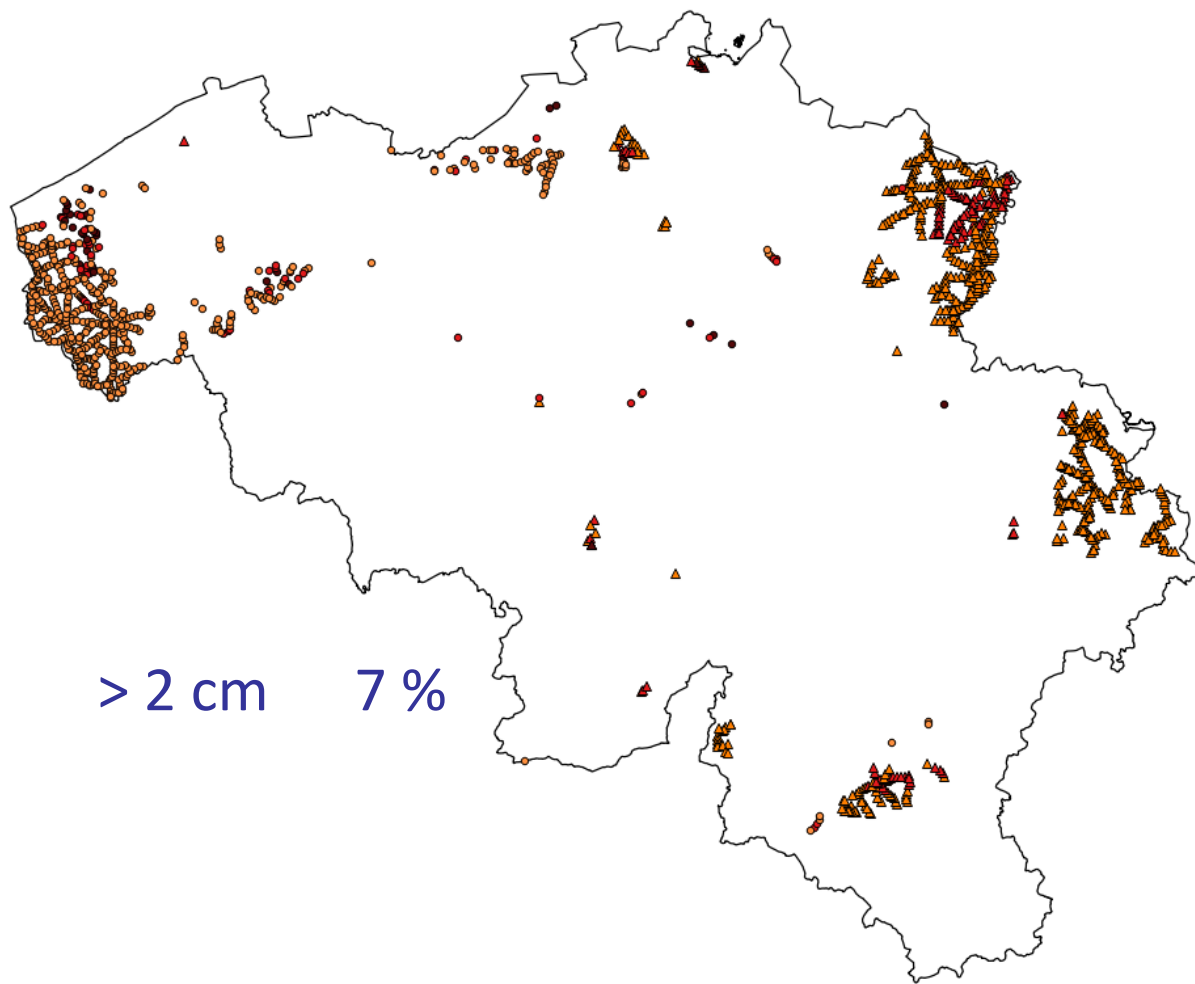
- Since the beginning of 2015, we are taking part in the EPN Densification project
- 1656 (2 October 2011) up to week 2000 (12 May 2018)

Results of the new adjustment of our leveling network

	%
 Very small changes	56
 Between 5 mm and 1 cm	22
 Between 1 and 2 cm	15
 Between 2 and 3 cm	5.7
 Between 3 and 5 cm	1.0
 More than 5 cm	0.3



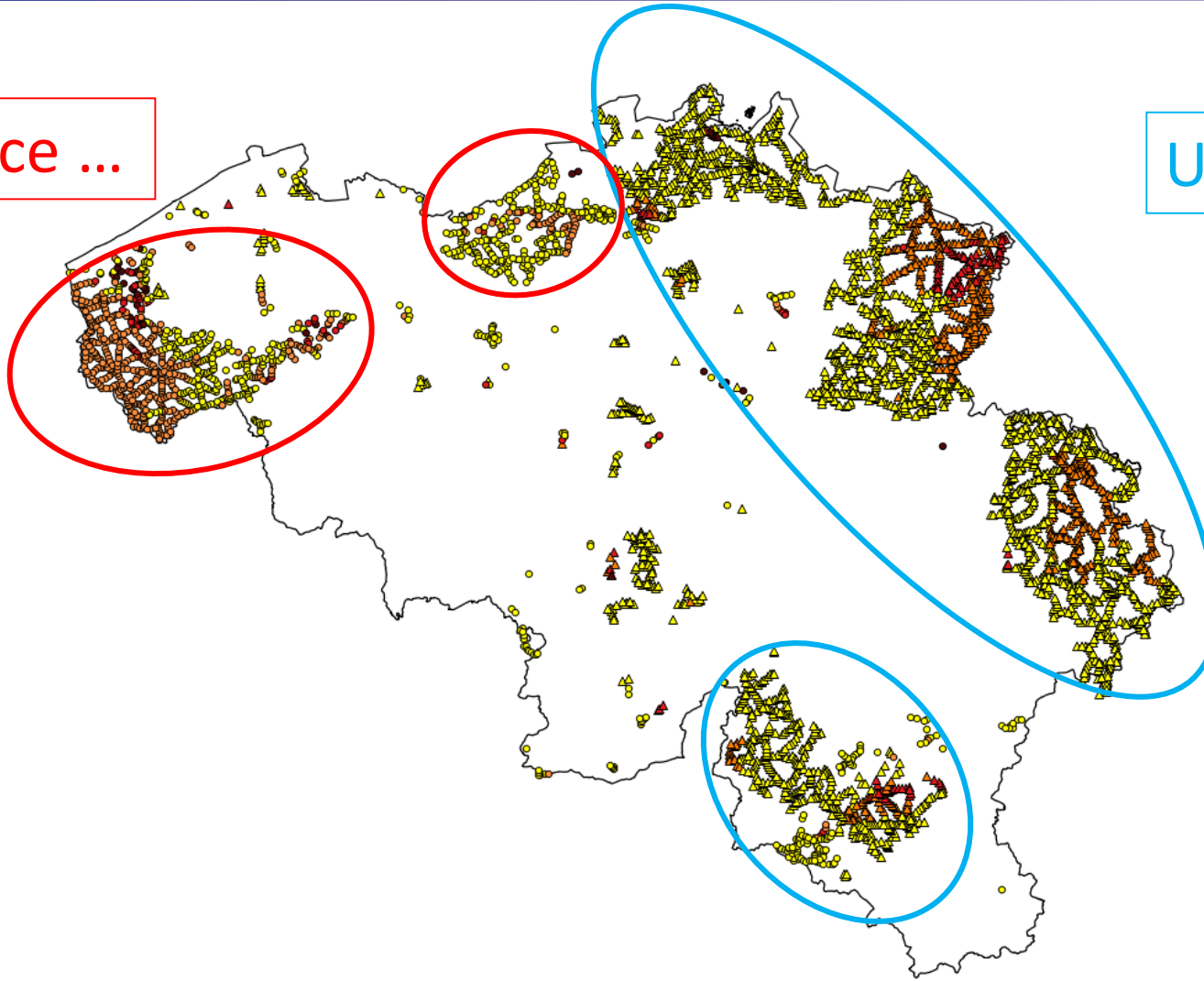
Towards a new quasi-geoid and height-conversion model



Towards a new quasi-geoid and height-conversion model

Subsidence ...

Uplift ...



Height-conversion model in 2018

- hBG18 made at “Delft University of Technology”
- Based on new quasi-geoid model “NLGEO2018grav”
- 3760 new GNSS-levelling points
- 53 points rejected
- Internal Standard deviation of 1 cm
- In process of validating the new model

New 3D network

- Permanent GNSS stations are the backbone
- The classical networks of horizontal and vertical reference markers will not be updated, remaining points are still available, but the networks will fade out.
- New 3D-network (± 3000 points) will be created
 - ✓ GNSS friendly
 - ✓ Good accessibility
 - ✓ Stainless steel nails in existing solid concrete surfaces
 - ✓ Coordinates will be determined with static GNSS and spirit levelling



Belgium

