

# ACTIVITIES OF THE EUREF TECHNICAL WORKING GROUP

EUREF 2014 Symposium  
Vilnius, Lithuania  
June 3-7, 2014

C. Bruyninx for EUREF TWG

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# EUREF TECHNICAL WORKING GROUP (TWG)

- ✖ Technical Working Group = EUREF steering committee
- ✖ The EUREF TWG was created at the EUREF symposium in Berne, 1992
- ✖ Meets three times a year to manage EUREF activities
- ✖ Minutes of the meetings : <http://www.euref.eu/>
- ✖ Members elected by the plenary (4 year term, renewable once), ex-officio members, members in charge of special tasks

# CURRENT MEMBER LIST

- ✕ Zuheir Altamimi, France
- ✕ Elmar Brockmann, Switzerland
- ✕ Carine Bruyninx, Belgium (TWG chair)
- ✕ Alessandro Caporali, Italy, (EUREF secretary)
- ✕ Rolf Dach, Switzerland
- ✕ Jan Dousa, Czech Republic
- ✕ Rui Fernandes, Portugal
- ✕ Heinz Habrich, Germany
- ✕ Johannes Ihde, Germany (EUREF chair)
- ✕ Ambrus Kenyeres, Hungary
- ✕ Martin Lidberg, Sweden
- ✕ Rosa Pacione, Italy
- ✕ Markku Poutanen, Finland
- ✕ Wolfgang Söhne, Germany
- ✕ Günter Stangl, Austria
- ✕ João Torres, Portugal

## Honorary members:

- ✕ Claude Boucher, France
- ✕ Erich Gubler, Switzerland
- ✕ Herman Seeger, Germany
- ✕ Helmut Hornik, Germany
- ✕ Werner Gurtner†, Switzerland
- ✕ Herman Seeger, Germany
- ✕ Knud Poder, Denmark

# EUREF GOALS

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Define, realise, maintain, provide access and promote the adoption of

- ✖ EVRS

European Vertical Reference System

- ✖ ETRS89

European Terrestrial Reference System



# KEY INFRASTRUCTURES

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✖ United European Levelling Network

+ EVRS

✖ EUREF Permanent Network

+ ETRS89

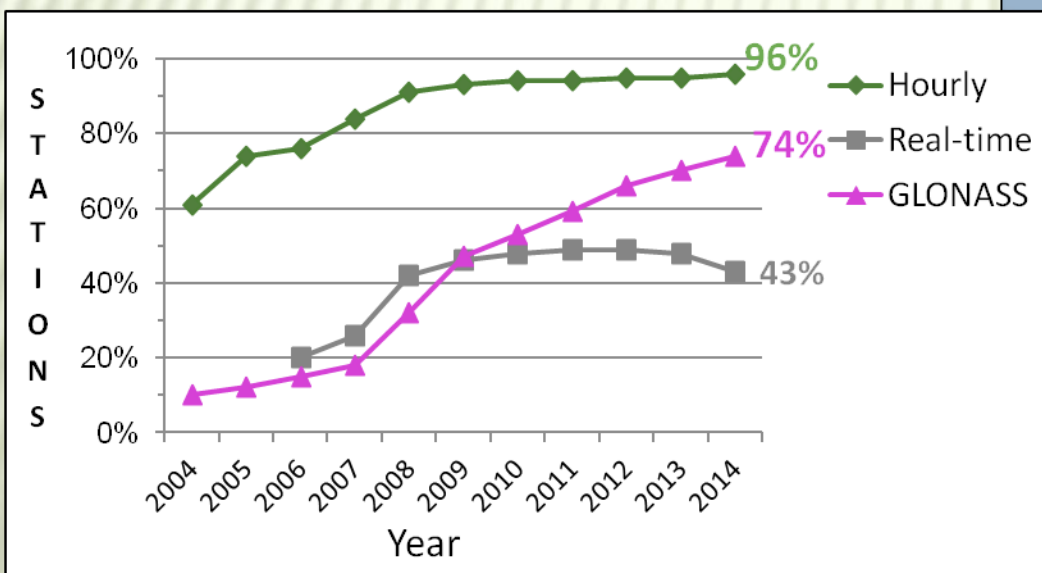
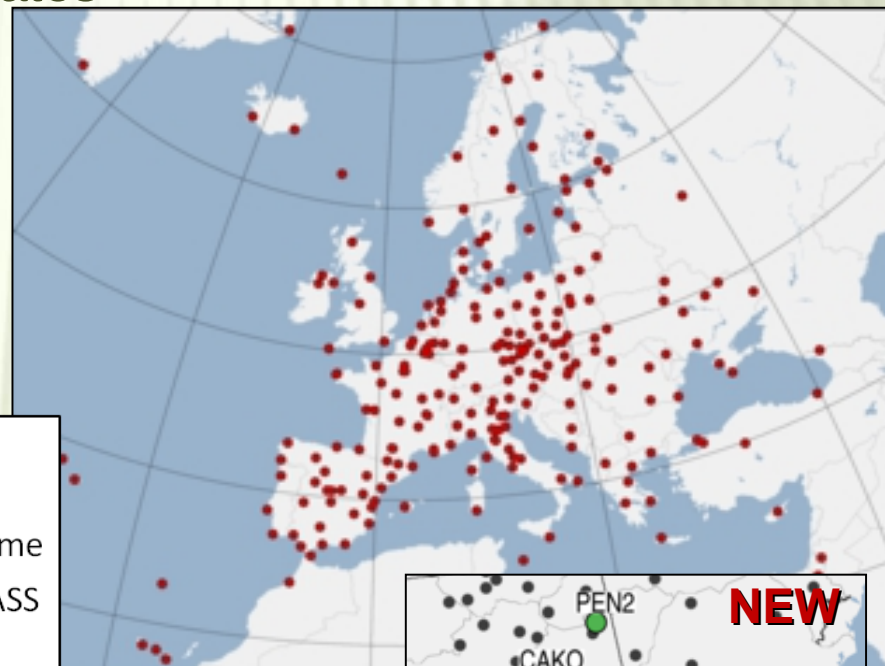
# EVRS

- ✖ The EVRS can/will gain in importance and practical relevance
  - ✖ Chart Datum Working Group of the Baltic Hydrographic Commission intends to introduce EVRS as a common chart datum over the Baltic Sea
- ✖ Further updates of EVRF are necessary
- ✖ Progress in global and regional gravity field modelling opens new possibilities for the realization vertical reference frames
- ✖ How to proceed : EVRS conventions and its realizations?

→ More details ***G. Liebsch, “Definition and Realization of the EVRS: How do we want to continue?”, session 4***

# EUREF PERMANENT GNSS NETWORK

- ✖ 250+ GNSS reference stations with freely available observations, meta-data, and known ETRS89 coordinates
- ✖ <http://www.epncb.oma.be/>



Croatia  
Greece  
Hungary





# PROPOSED EPN STATIONS



Germany  
Ireland  
Italy  
Portugal  
Serbia  
Sweden

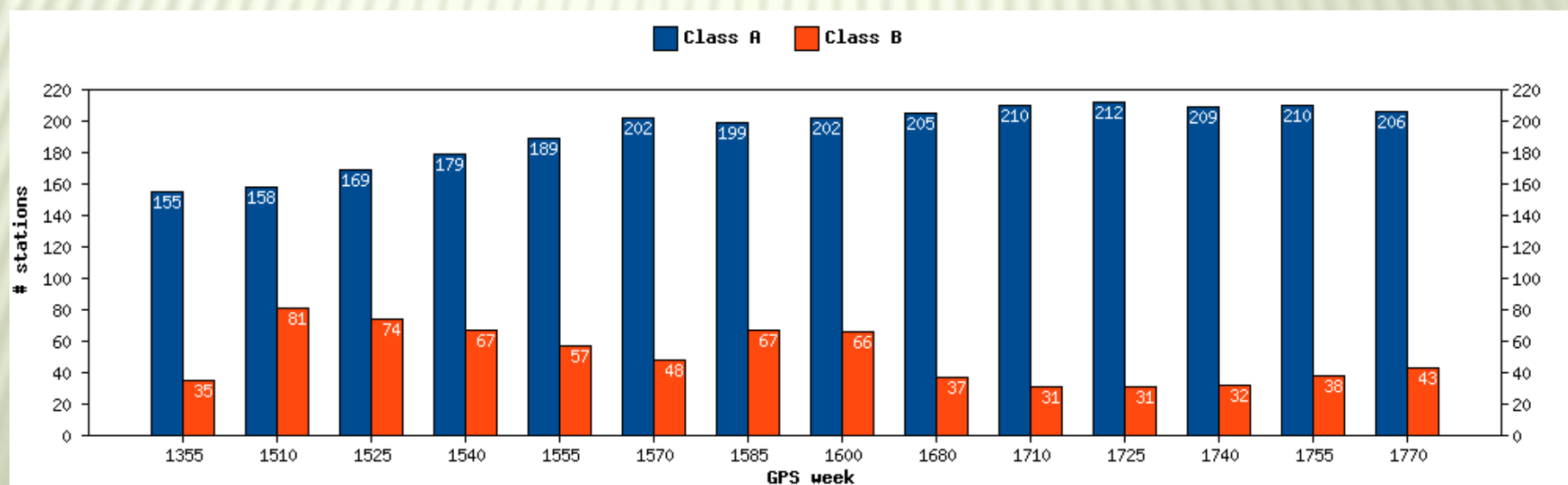


# EPN COORDINATES

## 15-weekly updates of EPN positions and velocities

+In ETRF2000 / IGB08 (ITRF2008)

- ✖ Class A stations (1 cm acc.@ all epochs) → basis for ETRS89 densifications
- ✖ Fully compatible with present-day antenna modelling  
epn\_08.atx (igs08.atx+ indiv. Calibrations)



# DENSIFICATION OF THE EPN

Consistent set of ETRS89 positions/velocities for a very dense network → deformations

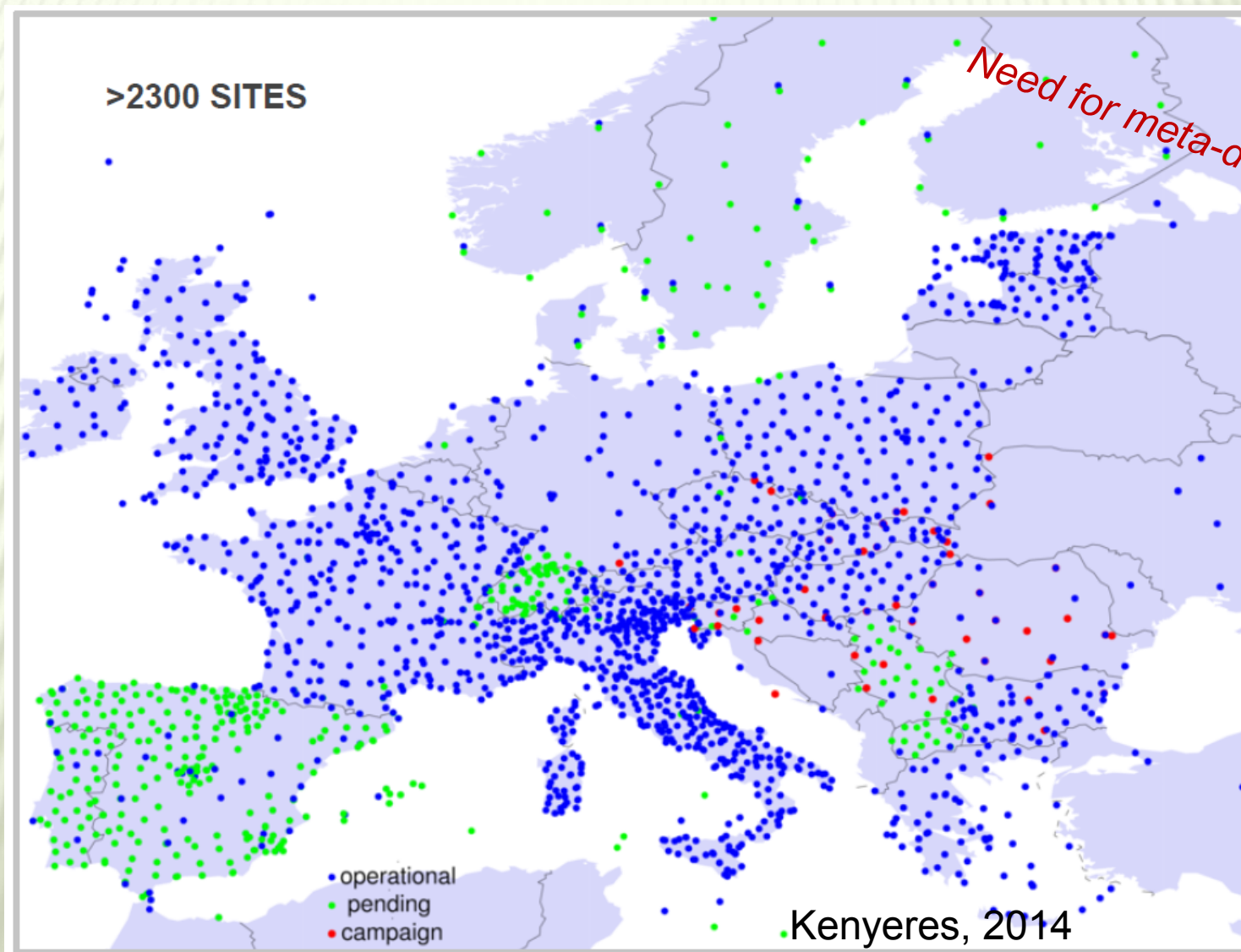
EPN Reference Frame Coordinator

→ Combining of weekly position solutions (SINEX) from third party networks with EPN

→ National Mapping Agencies are invited to participate!

→ More details → ***A. Kenyeres “European Dense Velocity Field Based on the Integration of the National Active GNSS Network Products”, session 3***

# DENSIFICATION OF THE EPN





# EUROPEAN PLATE OBSERVATORY SYSTEM

## EPOS

- ✖ Big European Research Infrastructure (ESFRI) under construction
- ✖ Multi-technique observation of ground deformations and understanding of underlying physical processes
- ✖ GNSS is one of these techniques → link with EPN
- ✖ Construction of the EPOS infrastructure will be done gradually starting in 2014-2015

More details,

→ **R. Fernandes, “Present Status of EPOS GNSS Working Group”, session 2**

→ **Q. Baire, “Experiences with GNSS Data Dissemination Using GSAC and its Potential Usage in EPOS and the EPN”, session 2**

# EUREF STRATEGY WRT EPOS

Defined by TWG in Jan.- Feb. 2014

Focus on

- ✖ Provision of EPN data and products : any contribution to EUREF should be considered as a contribution to EPOS
- ✖ Expertise in Guidelines and Standards
- ✖ Coordination expertise : data flow, data monitoring, data analysis, real-time, etc...
- ✖ Link with “Densification of the EPN”: 2500+ stations



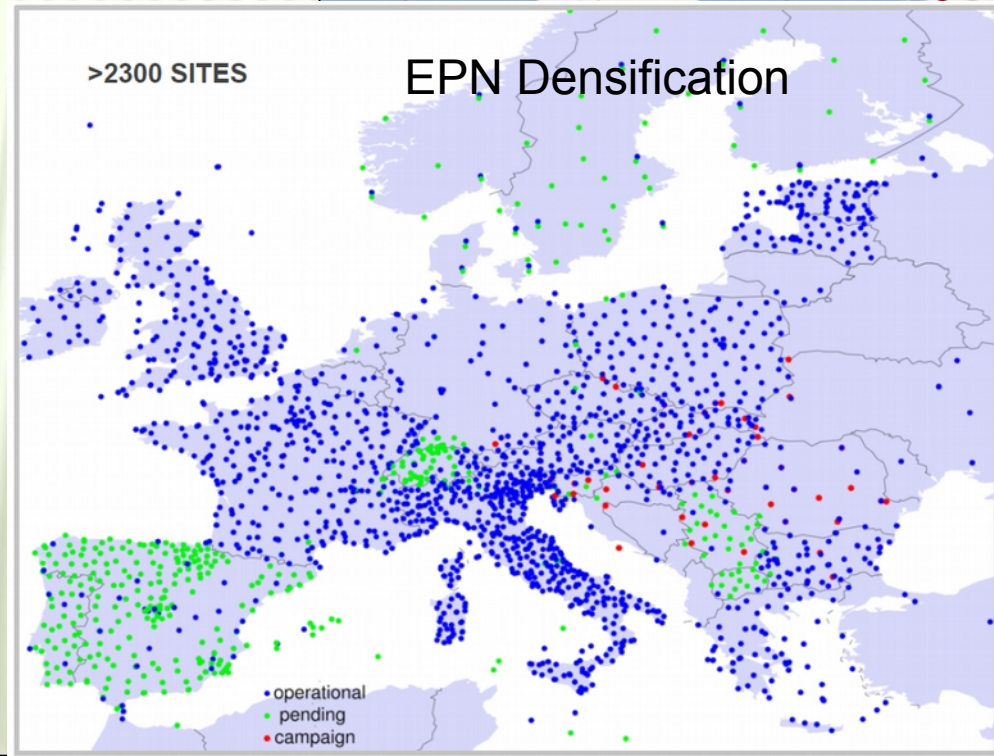
# LINK EPOS – EPN

**EPOS station: observation data AND meta-data available (and maintained!)**



EPOS: Existing GNSS stations

metadata & data available?  
*huge challenge!*





# EPN ANALYSIS CENTRE COORDINATOR

- ✖ MUT/WUT consortium
    - + K. Szafranek (MUT): EPN ACC from June 1<sup>st</sup>, 2013 → May 31, 2015
    - + A. Araskiewicz (MUT): EPN ACC from June 1<sup>st</sup>, 2015 → May 31, 2017
  
  - ✖ Since January 2014,
    - + Weekly combined EPN positions
    - + Rapid daily EPN positions
    - + Recently also final daily EPN positions
- More details: ***K. Szafranek “Activities in the frame of EPN Analysis Combination Center”, session 3***

# DEDICATED ANALYSIS CENTRES

## ✖ 16 Local Analysis Centers (LAC)

- + Routine daily & weekly positions and tropospheric estimates of EPN subnetwork
- + Switch to Bernese v5.2

No need for additional LAC, but need for

## ✖ Dedicated Analysis Centers (DAC)

- + Reprocessing (GOP: LAC → DAC)
- + EPN densification
- + Multi-GNSS



# EPN TROPOSPHERE COORDINATOR

- ✖ W. Söhne resigns as EPN troposphere coordinator
  - ✖ Task taken over by Rosa Pacione, ASI from summer 2014 on.
- More details: ***W. Söhne, "Status Report of the EPN Troposphere Coordinator", session 2***



# EUREF WORKING GROUPS

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- ✖ Deformation Models (2012)
- ✖ Multi-GNSS (2012)
- ✖ EPN Reprocessing (2009)
- ✖ EPN Real-time Analysis (2008)
- ✖ European Combined Geodetic Network (2003)

# WG ON DEFORMATION MODELS

Established at the TWG meeting in Berne in November 2012

- It has a long term goal to establish a velocity model of the crustal deformations present in the EUREF area of interest (intra-plate and inter-plate velocities)
- Tectonic events (earth quakes) are considered complicated and are therefore not yet of 1<sup>st</sup> priority
- Improve knowledge of the velocities and the underlying processes to improve the maintenance and use of national realizations of ETRS89

Input from EPN densification activity!

# WG ON DEFORMATION MODELS

## Activities:

1. Evaluation of GNSS station velocities *(to find out to what extent observed velocity at a station represent the crustal deformation in the area)*
2. Work towards models of crustal deformations in Europe
3. Consideration of a deformation model in maintenance and use of national realizations of ETRS89

- ✖ As a first step an inventory and analysis of published work on crustal deformations has been done
- ✖ Mini-workshop, March 2014, Gävle

***Lidberg et al., “Report from the EUREF WG on Deformation models”, session 3***



# MULTI-GNSS WORKING GROUP

Established at the TWG meeting in Berne in November 2012

Enhance EPN infrastructure (GPS, GLONASS, Galileo, ...)

- +Tracking & Monitoring

- +Data Analysis

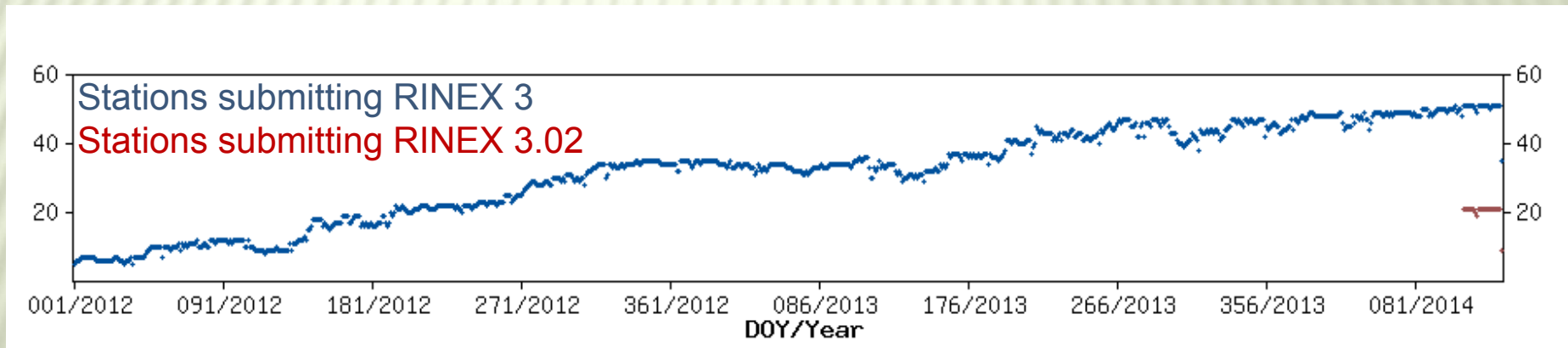
Bernese V5.2 Galileo-ready

- +First experiences with analysis of RINEX v3 observation files and Galileo data have been presented at TWG

- +Combined GPS/GLONASS/Galileo orbits available from IGS-MGEX (CODE)

# MULTI-GNSS AND RINEX 3

- +8 additional LAC started to analyse GLONASS observations
- +RINEX v2.11 is mandatory format to be submitted by all EPN stations
- +Submission of additional RINEX 3 data recommended in support of multi-GNSS activities
- +Official RINEX 3 format to be used is **RINEX v3.02**
  - × Station managers are urged to switch to this format



*Some firmware does not allow generation of RINEX v3.02 → contact vendor to put press*

# REPROCESSING WORKING GROUP

- ✖ Routinely estimated EPN positions are affected by changes in GNSS modeling
- ✖ Regular reprocessing of historical EPN data
  - + EPN-Repro1: Jan. 1996 - Jan., results released in 2012
  - + EPN-Repro2: Jan. 1996 - Apr. 2011, results expected for 2014
    - Preceded by benchmark test aiming at comparing results of different GNSS analysis software packages

More details → ***C. Völksen «The Benchmark Test of the EPN-Repro2 Campaign», session 3***



# PARTNERS



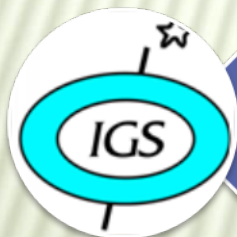
## EuroGeographics

- MoU signed August 2007
- Mutual projects, e.g. INSPIRE



## EUMETNET

- MOU signed June 2007
- Mutual exchange of data



## International GNSS Service

- Cross-fertilization
- Common standards
- EUREF involved in IGS Governing Board, WG: real-time, antenna calibration, and Infrastructure Committee



## CERGOP, Central European GPS Geodynamic Network Consortium

facilitate the densification of the European GNSS network for reference frame definition and geokinematical applications

MoU signed May 2011

# MOU EUREF-EUPOS SIGNED JUNE 3, 2014

***EUPOS*** (European Position Determination System)  
partnership of DGNSS service providers



# MOU EUREF-EUPOS

- ✖ Exchange of information on activities of common interest
- ✖ Interface between EPN and position services of EUPOS members
- ✖ Work towards dense European velocity field
- ✖ Common operation of a Knowledge Exchange Network in the context of EuroGeographics
- ✖ Cooperation in e.g. EPOS, UN-GGIM, EUMETNET, as well as common position and mutual support towards other international bodies, such as ICG or RTCM.





# EUREF WEB SITE

<http://www.euref.eu/>



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## Welcome to EUREF !

Our work is focused on:

- Definition, realization and maintenance of the European Geodetic Reference Systems;
- Promotion and assistance of the adoption and use of European Terrestrial Reference System (ETRS89) and European Vertical Reference System (EVRS) in our partner countries;
- Development and maintenance of the EUREF GNSS Permanent Network (EPN) which is the ground based GNSS infrastructure for scientific and practical applications in positioning and navigation (GGOS, IGS-RT);
- Development of strategies and technologies for the realization of geodetic reference systems.

EUREF provides all its products on the "best effort" basis and free of charge to the public.

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# MORE INFORMATION

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- ✖ EUREF Permanent Network
  - ✖ <http://epncb.oma.be/>
- ✖ ETRS89
  - ✖ <http://etrs89.ensg.ign.fr/>
- ✖ EVRS
  - ✖ <http://www.bkg.bund.de/geodIS/EVRS/>
- ✖ CRS (Information system for European Coordinate Reference Systems)
  - + <http://www.crs-geo.eu/>