

# **INTEGRATION OF THE EPN AND THE DENSE NATIONAL PERMANENT NETWORKS**

## **REPORT OF THE REFERENCE FRAME COORDINATOR**

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# TASKS OF THE EPN REFERENCE FRAME COORDINATOR

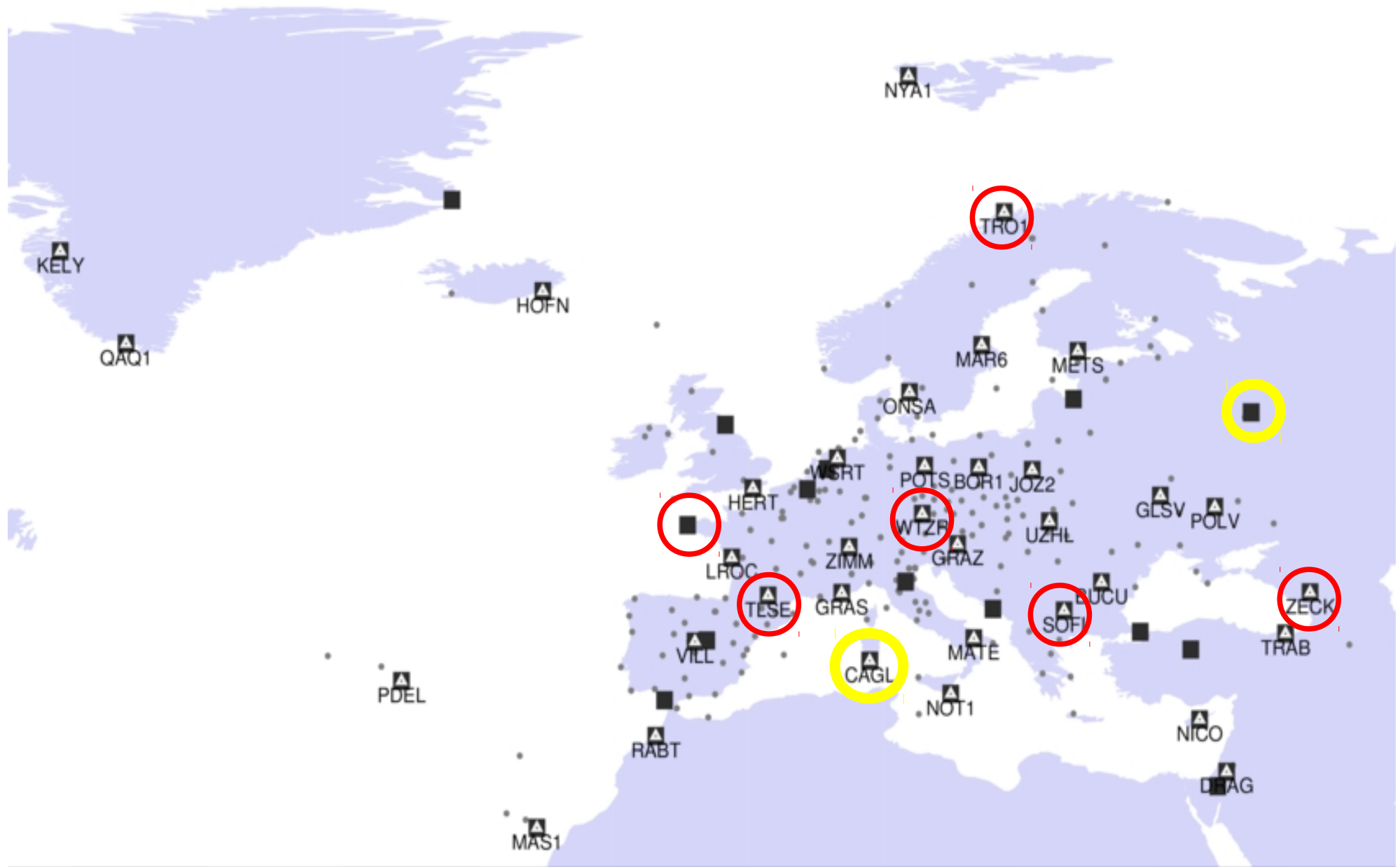
- PROVIDE UP-TO-DATE CUMULATIVE EPN POSITION AND VELOCITY SOLUTION (15 WEEKS UPDATE RATE)
- CONTRIBUTION TO ADVISORIES, GUIDELINES ON THE OPTIMAL USE OF REFERENCE SYSTEM REALIZATIONS
- CONTRIBUTION TO THE ETRS89 MAINTENANCE ON REGIONAL AND NATIONAL LEVEL
- EPN DENSIFICATION - EXPLOITATION OF THE DENSE NATIONAL GNSS NETWORKS FOR THE BETTER REALIZATION OF ETRS89

# RECENT EPN CUMULATIVE SOLUTIONS

- **IGS08\_C1680 (igs\_08.atx)**
  - EUREFMail 6684 (published 2012 November)
  - re-newed webpages
- **IGb08\_C1710**
  - IGS Mail 6663 - effective: 07 October 2012
  - offsets since publication of ITRF2008 (2009.5):  
BRST, SOFI, TLSE, TRO1, WTZR, ZECK  
CAGZ, **MDVJ**, ZIMJ - JPSREGANT\_DD\_E / SD\_E
  - updated guidelines on ETRS89 densifications
- **IGb08\_C1725**
  - ready

# EPN REFERENCE FRAME DEFINITION

## IGS08 to IGb08



# EPN DENSIFICATION / HISTORY

- **IAG Working Group on Regional Dense Velocity Fields, 2007-2011**
  - collection and integration of “local” cumulative solutions
  - inhomogeneities, inconsistencies
- **EUPOS Combination Centre - ECC - 2009**
  - combination of weekly SINEX solutions from national commercial permanent networks
  - successful pilot to prove the concept
  - kernel of the recent integration
- **IAG Working Group 'Unified Dense Velocity Fields' 2011-2015**
  - continental extension of the ECC-combination
  - EUREF2010 symposium resolution #4
  - **Letter to NMCAs - still under preparation!**

# THE STRATEGY

- **COLLECTION AND PREPARATION OF NATIONAL LONG TERM WEEKLY SINEX SOLUTIONS**
  - SINEX testing (“compatibility”, constraints, quality)
  - SINEX CLEANING: outlier and offset detection, elimination
  - soln harmonization with EPN
- **COMBINATION WITH EPN WEEKLY SINEX**
  - EPN as reference
  - CATREF / MC approach
  - Handling of different software products (GAMIT, GIPSY ..)

remember the EPN “benchmark” combination test

  - same reference network as for EPN cumulative
- **RESULTS / PRODUCTS**
  - cleaned national SINEX solutions,
  - position and velocity estimates in ITRFyy/IGSyy/ETRFyy,
  - time series plots

# BENEFITS

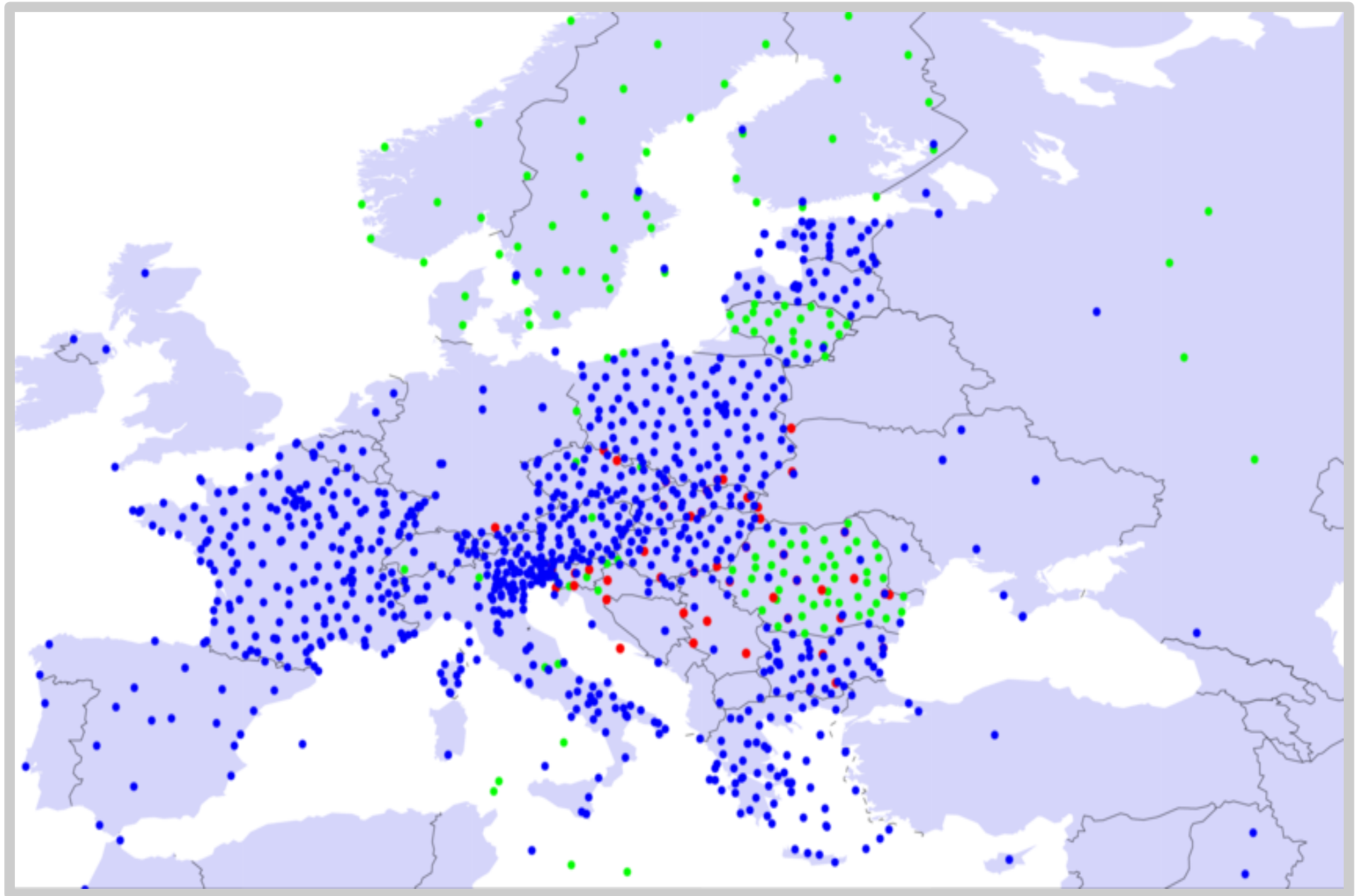
## USER / PROVIDER SIDE

- independent tests of the national SINEX solutions,
- cleaned and “internationalized” (site naming) SINEX back to the user for own purposes,
- the combined solution is freed from occasional reference frame definition weaknesses,
- decreased network effect,
- high quality ETRS89 positions to test the national realization (EB),
- push forward the scientific analysis and use of the national GNSS production networks,

## COMMUNITY SIDE

- creation of an absolutely homogeneous, dense ETRS89 velocity field,
- steps forward to the better realization of ETRS89, and
- possible extension of ETRS89 over the non-stable part of Europe ( EPN WG)

# SITES AVAILABLE AS OF TODAY





# DATA AVAILABILITY - MAY-2013

|       |                |                                     |
|-------|----------------|-------------------------------------|
| ASG   | Poland         | : 1482 - 1701 repro started         |
| EST   | Estonia        | : 1448 - 1723                       |
| GGI   | Latvia         | : 1461 - 1720                       |
| GKU   | Slovakia       | : 1408 - 1705                       |
| SGO   | Hungary        | : 1400 - 1730 repro done            |
| AMON  | Austria        | : 1470 - 1720                       |
| MON   | Austria (reg)  | : 1107 - 1734                       |
| BUL   | Bulgaria       | : 1434 - 1720 daily GAMIT           |
| CZE   | Czech R        | : 1565 - 1721                       |
| UPA   | Italy (Padova) | : (1422) 1623 - 1735                |
| SGN   | France (glo)   | : 1200 - 1700 more                  |
| CEGRN | C-Europe (p)   | : 1106 - 1734                       |
| CEGRN | C-Europe (c)   | : 1994 - 2009 biannual<br>campaigns |

# TECHNICAL ISSUES TO BE SOLVED

**CURRENT STATUS: MIXED (ATX) solutions are used!**

IGS05 CONVERSION TO IGS08 (FROM GPSweek 1632)

Individual calibrations are not affected!

**IGS tool should be extended**

IGS08 to IGb08 (week 1709)

CAGZ, MDVJ - JPSREGANT\_DD\_E / SD\_E)

**LOG FILE DATABASE MAINTENANCE!!!**

EPN is OK

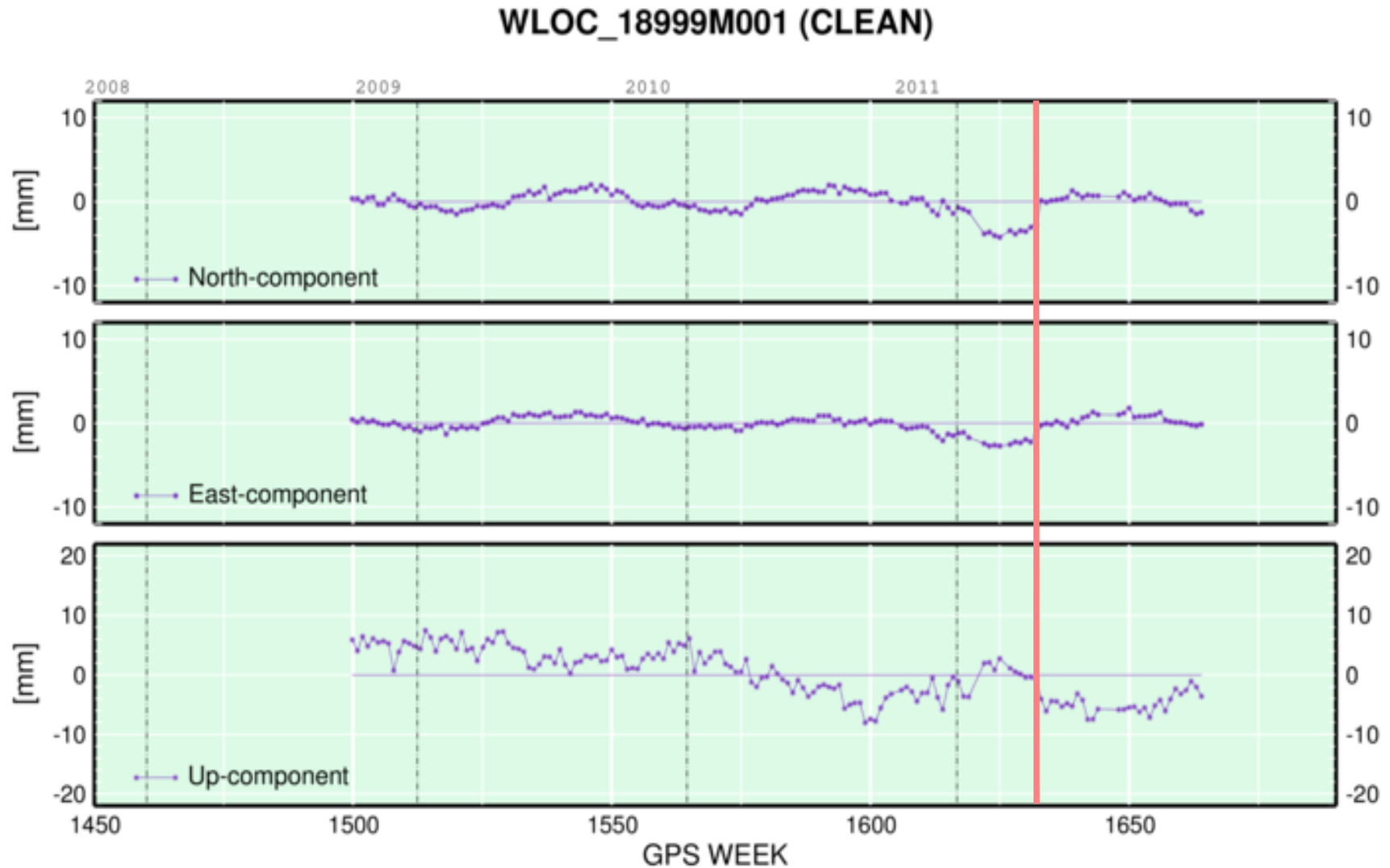
**ESDB (EUPOS Station Database)**

**individual STA files**

**SITE NAMING (4CHAR, DOMES NUMBERS)**

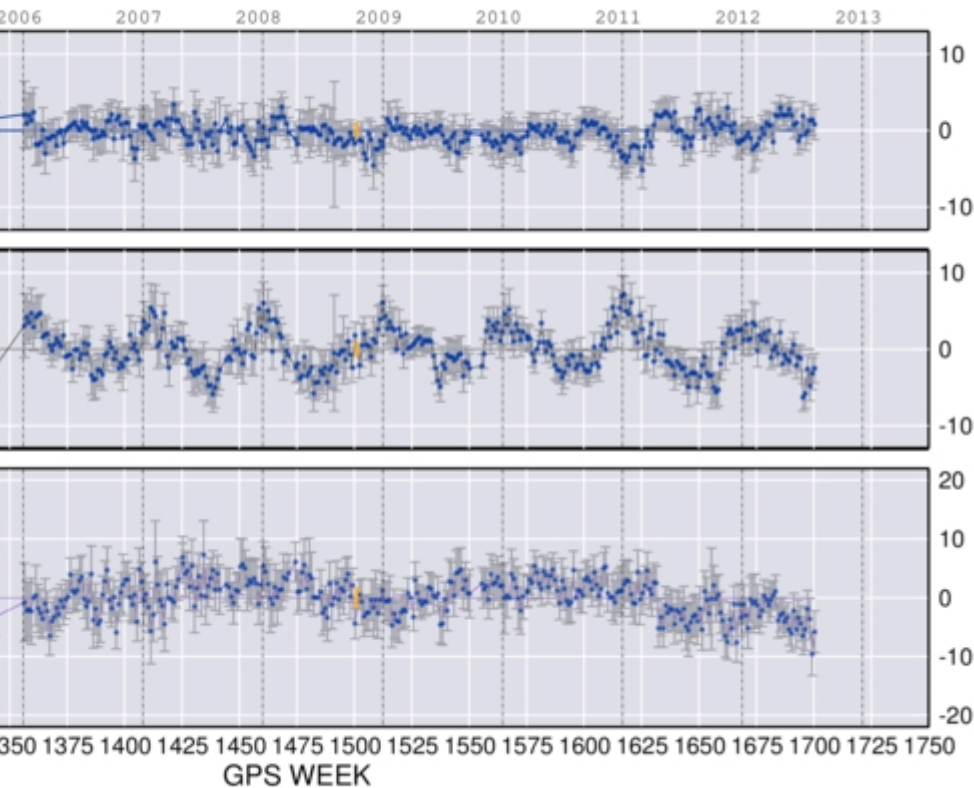
**VERIFICATION OF ANALYSIS STRATEGY (constraints)**

# epr05.atx to epr08.atx change

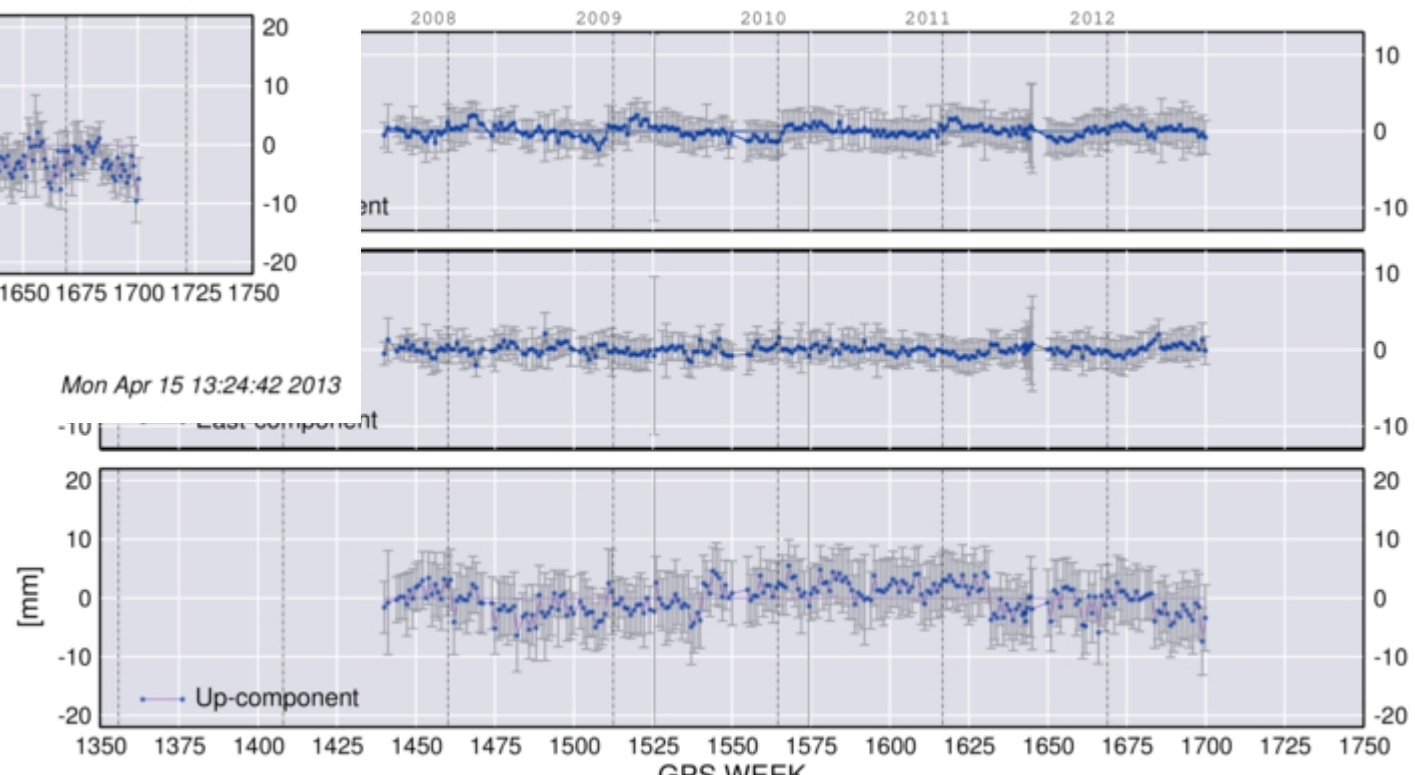


# NATIONAL AND COMBINED TIME SERIES

CNNS\_10089M001 (CLEAN)

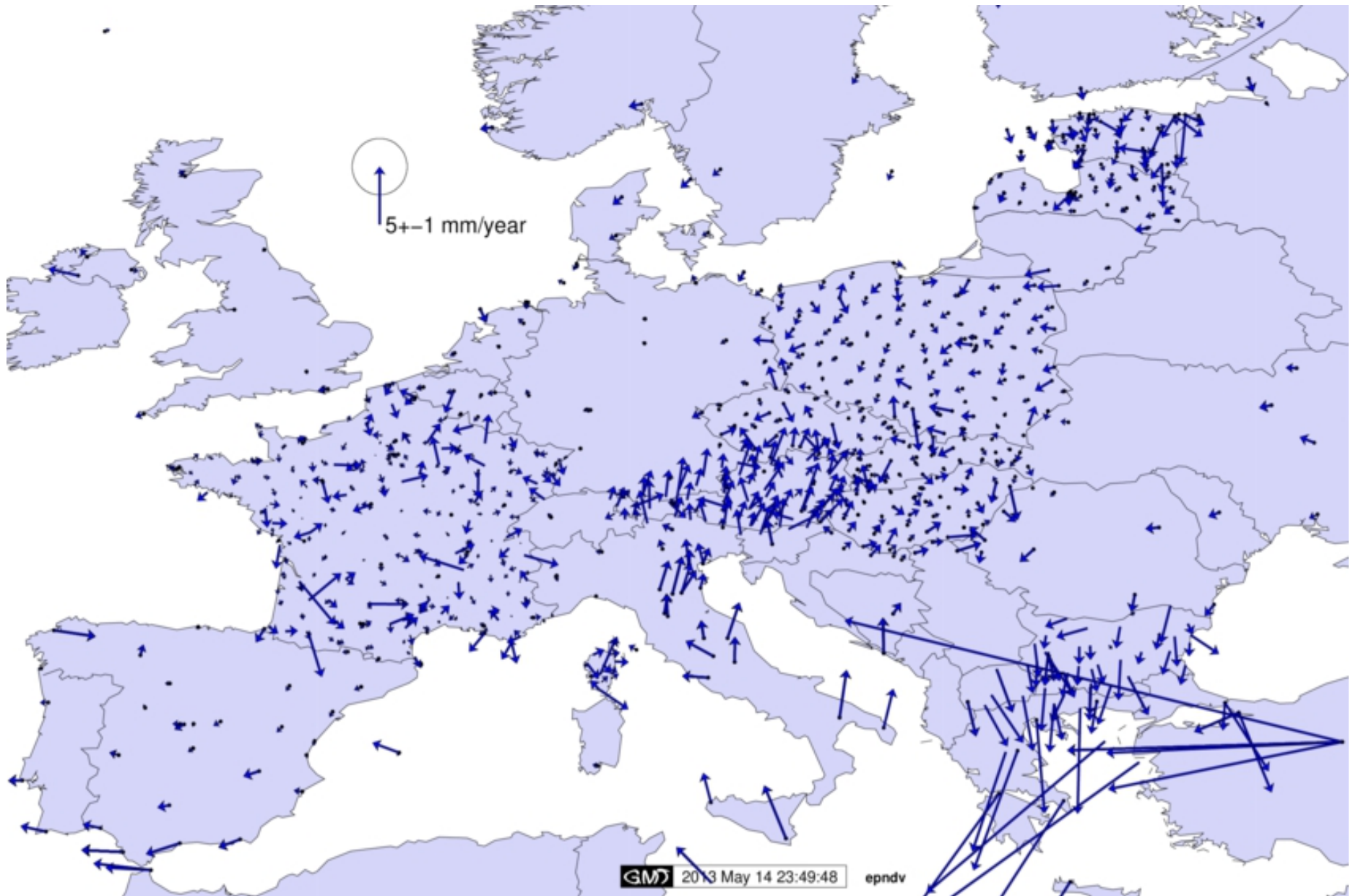


CNNS\_10089M001 (CLEAN)

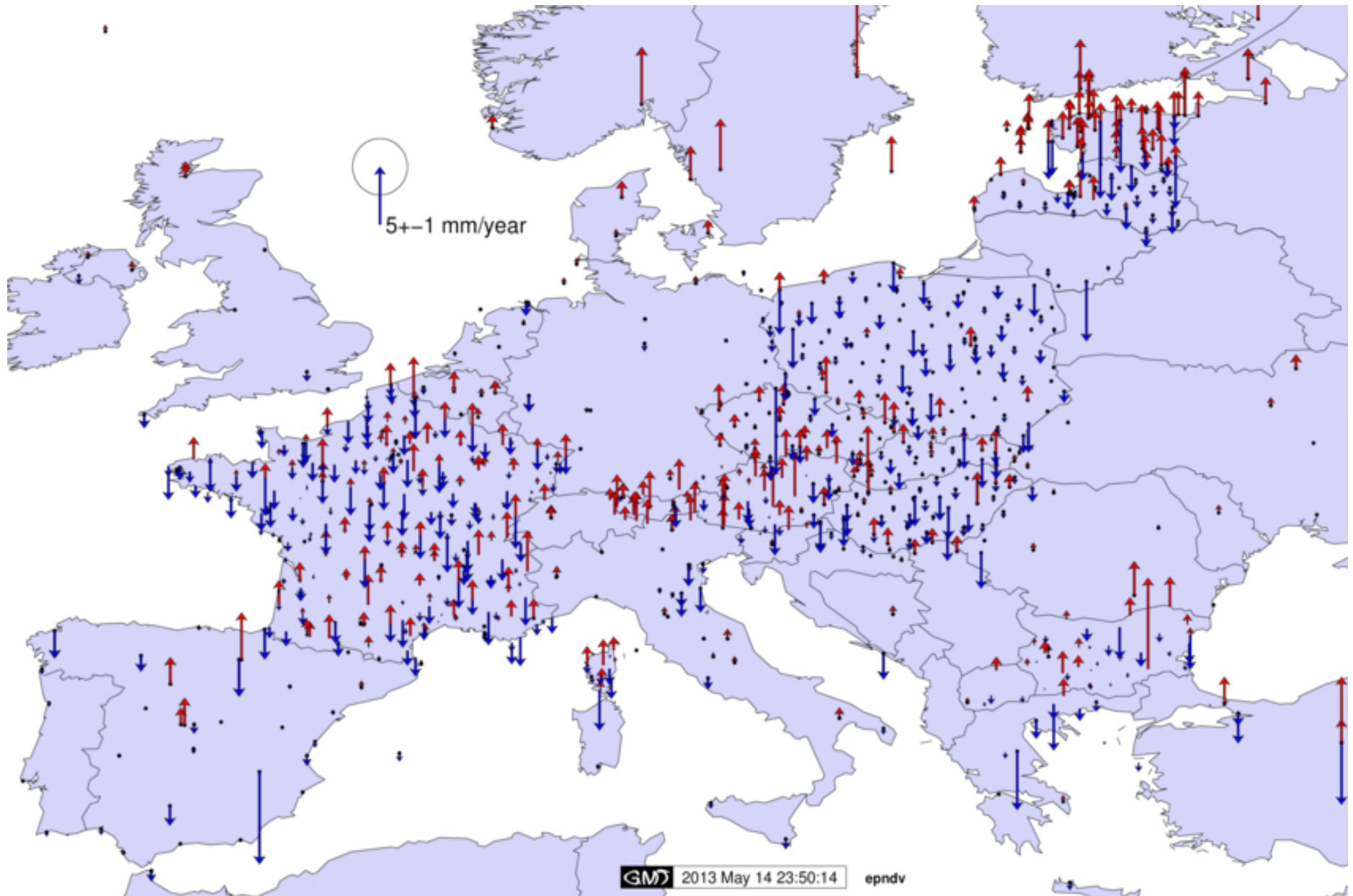


# ESTIMATED VELOCITIES

## horizontal



# ESTIMATED VELOCITIES vertical





# PHASE II

## ENHANCED OPERABILITY

- METADATA UP-TO-DATE MAINTENANCE
- ROUTINE PRODUCT DELIVERY
  - INPUT SINEX DATA
  - OUTPUT CLEANED WEEKLY AND CUMULATIVE SINEX
  - POSITIONS + VELOCITIES
  - TIME SERIES PLOTS

# ACKNOWLEDGEMENTS

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IGN, France  
BAS, Bulgaria  
LU, Latvia  
CUZK, Czech R  
MAAAMET, Estonia  
ASG, Poland  
OEAW, Austria

**ALL EUROPEAN COUNTRIES ARE CORDIALLY INVITED!**