EPN DENSIFICATION: STATUS REPORT 2016

AMBRUS KENYERES
EPN REFERENCE FRAME COORDINATOR

T HORVÁTH - A BARON - A CAPORALI - F DE DONCKER - B DROSCAK - A DURET - P FRANKE - I GEORGIEV - D HANSEN - L HUISMAN - O KHODA - K MOROZOVA - J NAGL - X PAPANIKOLAOU - P PIHLAK - G STANGL - M VALDES - K SZAFRANEK - M FIGURSKI - M RYCZYWOLSKI

C BRUYNINX - D MESMAKER

AND MANY MORE . . .

Donostia - San Sebastian
May 25th - 27th, 2016

OUTLINE

- EPN DENSIFICATION STATUS
  - NETWORK EXTENSION IN SPACE AND TIME
  - PREPARATIONS FOR ITRF2014
  - DELAY IN PRODUCT DISTRIBUTION
- EUREF WORKING GROUP ON EPN DENSIFICATION
  - SUPPORT AND VALIDATION
  - EXEMPLARY ACTIVITY OF UPA AC
- WEBSITE PREPARATION
  - CONNECTED TO THE EPNCB WEBSITE
  - SLOWER DEVELOPMENT
- CO-OPERATION WITH EPOS

EPN DENSIFICATION

TARGET

COMBINATION OF NATIONAL WEEKLY SINEX SOLUTIONS TO REALIZE ***HOMOGENEOUS, DENSE*** EUROPEAN LEVEL POSITION AND VELOCITY DATABASE, CONSIDERED AS DENSIFICATION OF THE ITRF AND ETRS89

MAIN FACTS

- DISTRIBUTED ANALYSIS, NO CENTRALIZED PROCESSING IS NEEDED
- CLEANED AND HOMOGENIZED (station naming) SINEX BACK TO DATA PROVIDERS,
- INDEPENDENT TEST OF THE NATIONAL NATIONAL ETRS89 REALIZATION,
- **COMBINED SOLUTION FREED FROM OCCASIONAL REFERENCE FRAME DEFINITION WEAKNESSES,**
- **GEODESY: POSSIBLE EXTENSION OF ETRS89 OVER THE NON-STABLE PART OF EUROPE (VELOCITY MODEL – DEFORMATION WG),**
- **GEOPHYSICS**: CONTRIBUTION TO LARGE SCALE TECTONIC INTERPRETATION

COMBINATION APPROACH

1./ PREPARATION OF NATIONAL LONG TERM WEEKLY / DAILY SINEX SOLUTIONS

- SINEX testing (**constraints**, quality, station naming)
- SINEX CLEANING: outlier and offset detection, elimination
- soln harmonization with EPN and IGS/ITRF
- EPN Working Group formed (to share workload and validation)

2./ COMBINATION WITH EPN WEEKLY SINEX

- EPN as skeleton, ITRFyy as reference
- CATREF / MC approach
- Handling of different software products (BERNESE, GAMIT)

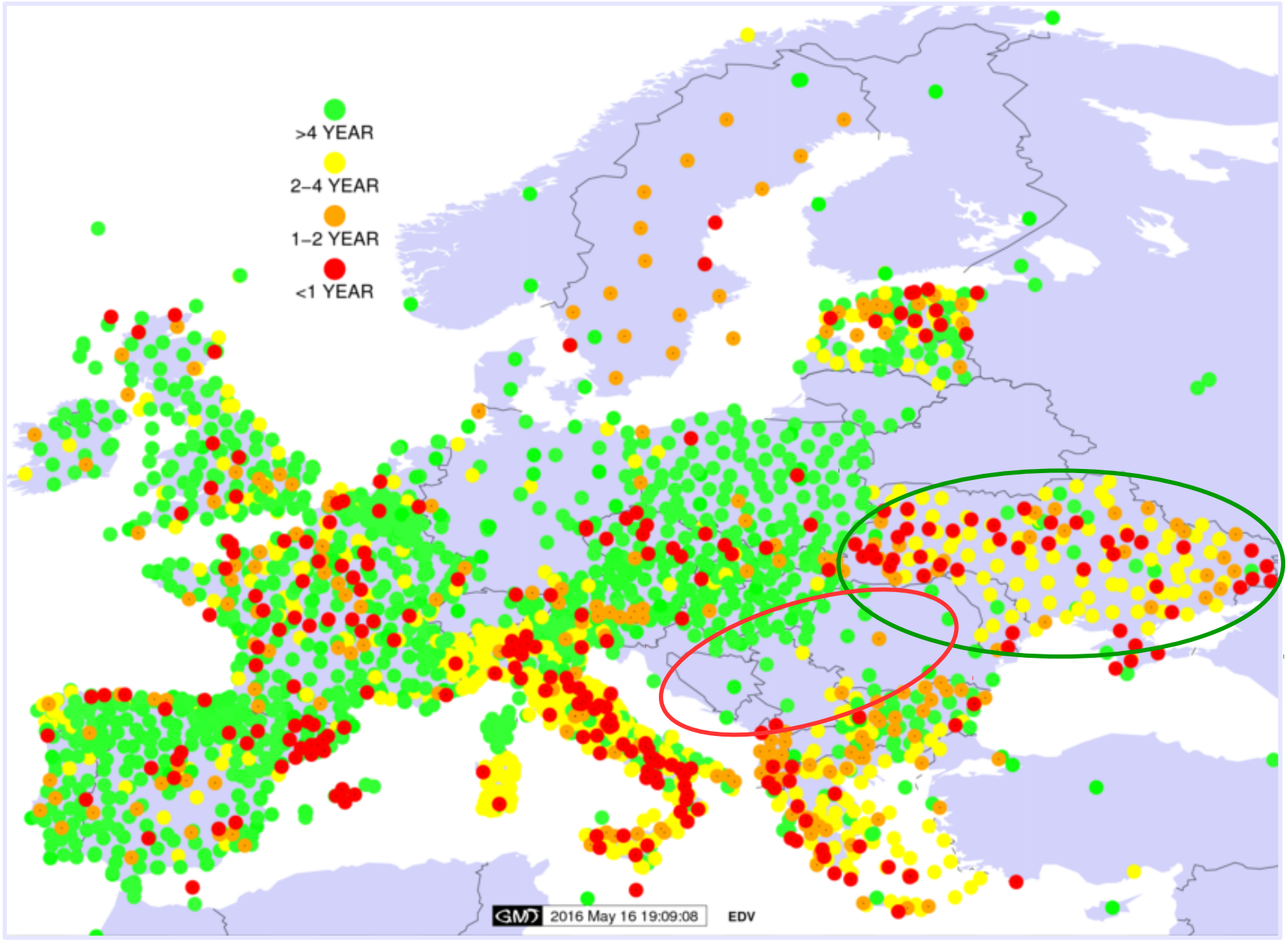
3./ MULTIYEAR COMBINATION

- same reference network as for the EPN cumulative
- MC is tested
- position and velocity estimates in ITRFyy/IGSyy/ETRFyy,
- time series plots

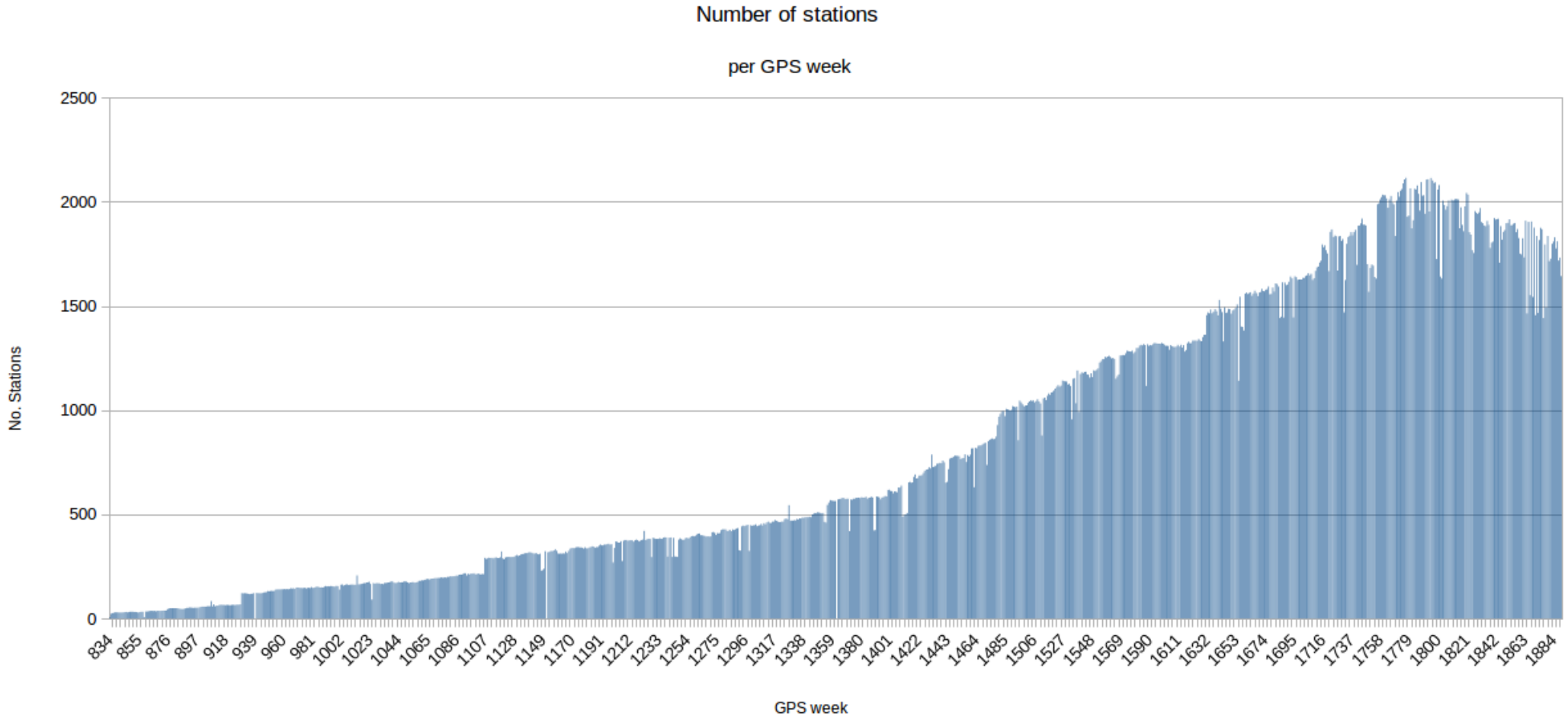
DATA AVAILABILITY – MAY 2016

ASG	Poland	: 1482 -	1825	
EST	Estonia	: 1448 –	1890	
GGI	Latvia	: 1461 –	1890	
GKU	Slovakia	: 1408 –	1846	
CZE	Czech R	: 1565 –	1890	
SGO	Hungary	: 1200 -	1890	EUPOS contributions
AMON	Austria	: 1356 –	1890	
MON	Middle East	: 1400 -	1890	
GRE	Greece	: 1721 -	1890	
CEGRN	CE-Europe	: 1400 -	1890	G.Stangl
BUL	Bulgaria	: 1434 –	1890	daily GAMIT
UPA	Italy	: 1623 -	1890	exemplary analysis
GREF	Germany	: 1554 -	1890	
IGN Spain	Spain/Portugal	: 1400 -	1890	daily
CAT	Catalonia	: 1408 -	1890	
AGRS	The Netherlands	: 0782	1873	
NGI	Belgium	: 1787 -	1890	
MAO	Ukraine	: 1400 -	1880	
DSO	Greece	: 0834 -	1560	processing in progress
ARA	ARANZADI, Spain	: 1850 -	1890	
SGN	France	: 0900 –	1890	GLOBAL
BIGF	UK	: 0900 -	1831	GLOBAL

SINEX AVAILABILITY – GREENING!



THE GROWTH OF THE NETWORK



Temporary decrease from week 1800 due to delayed submissions

SOME STATISTICS, AS OF TODAY

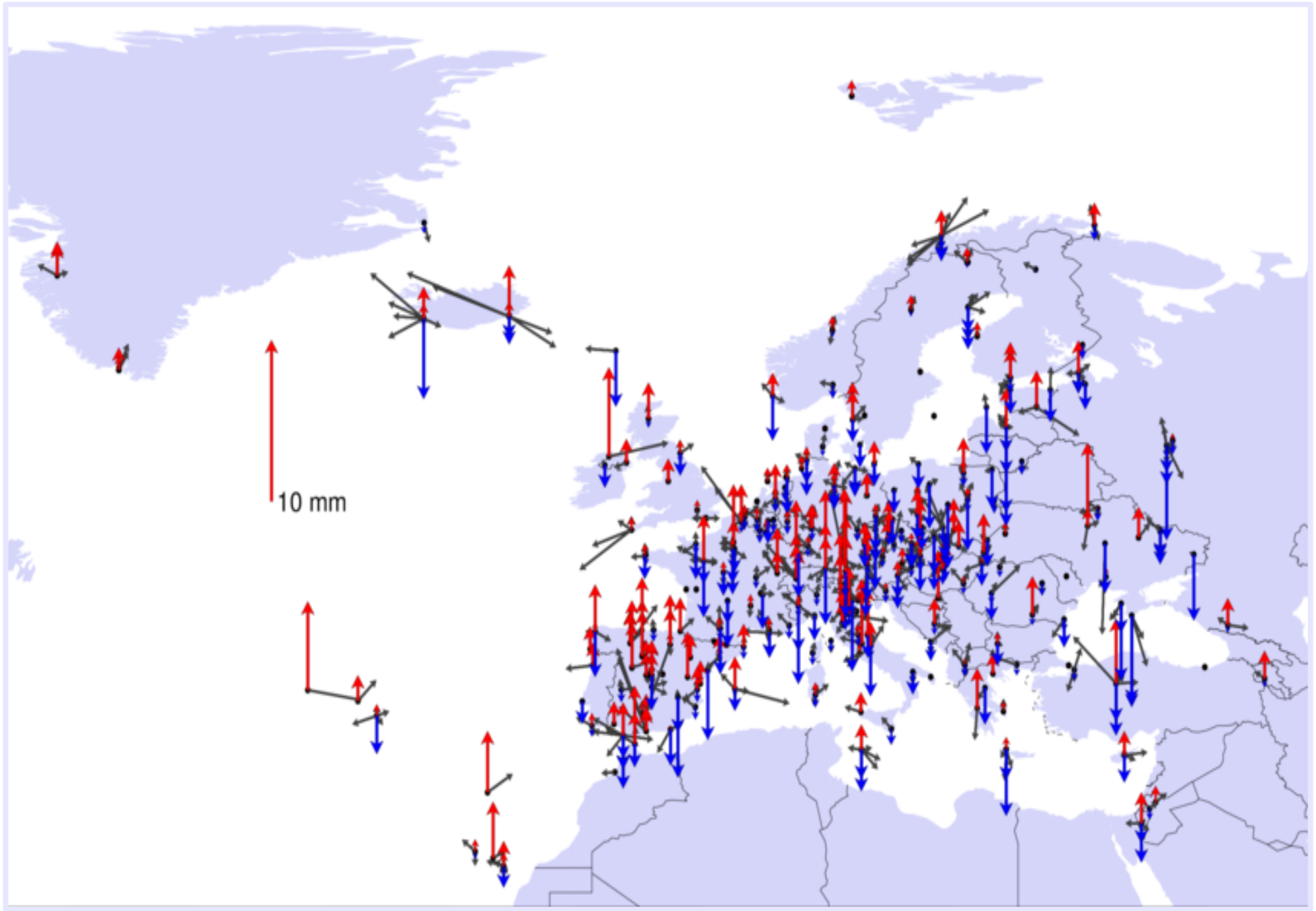
- 118 COUNTRIES (GLOBAL!)

  IT/610 – ES/345 - FR/321 – GB/170 - UA/165 – GR/122
- >3000 STATIONS AND 5400 SOLUTIONS IN THE SOLUTION SINEX
- 10270 WEEKLY SINEX FILES
- >32 (7 in last year) GB OF SINEX DATA
- DATA AVAILABILITY MOSTLY SINCE 2007 (AFTER WEEK 1400)
- >3200 SINGLE OUTLIERS/SHORT OUTLIER PERIODS DELETED

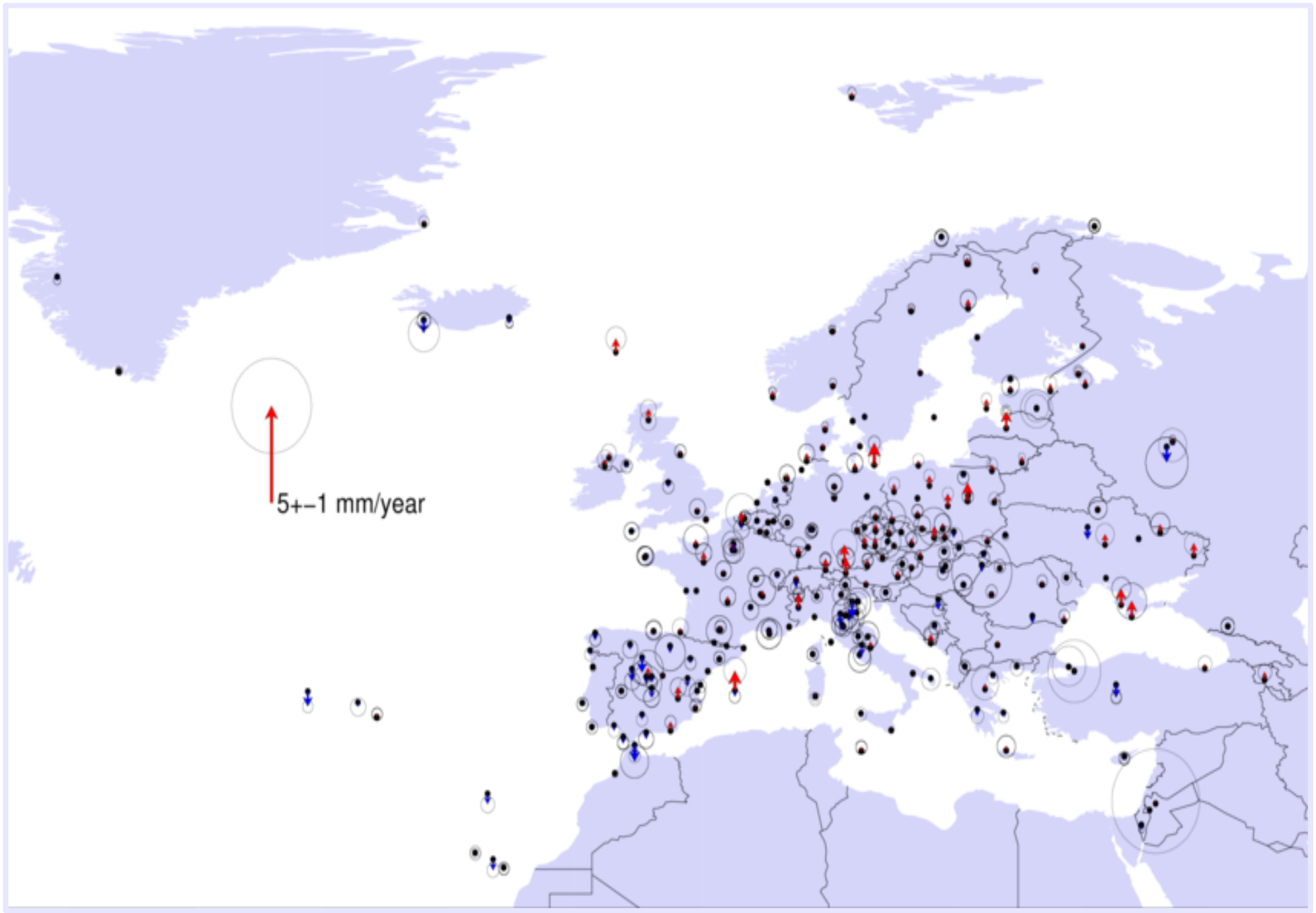
  STORED IN A META-DATA BASE
- RUNTIME: ~1 DAY IN A MULTI-CORE COMPILER ENVIRONMENT
- 1.9 GB cumulative SINEX
- [11200 x 11200] COV matrix

  SUBDIVISION TO 2-3 CLUSTERS MUST BE CONSIDERED

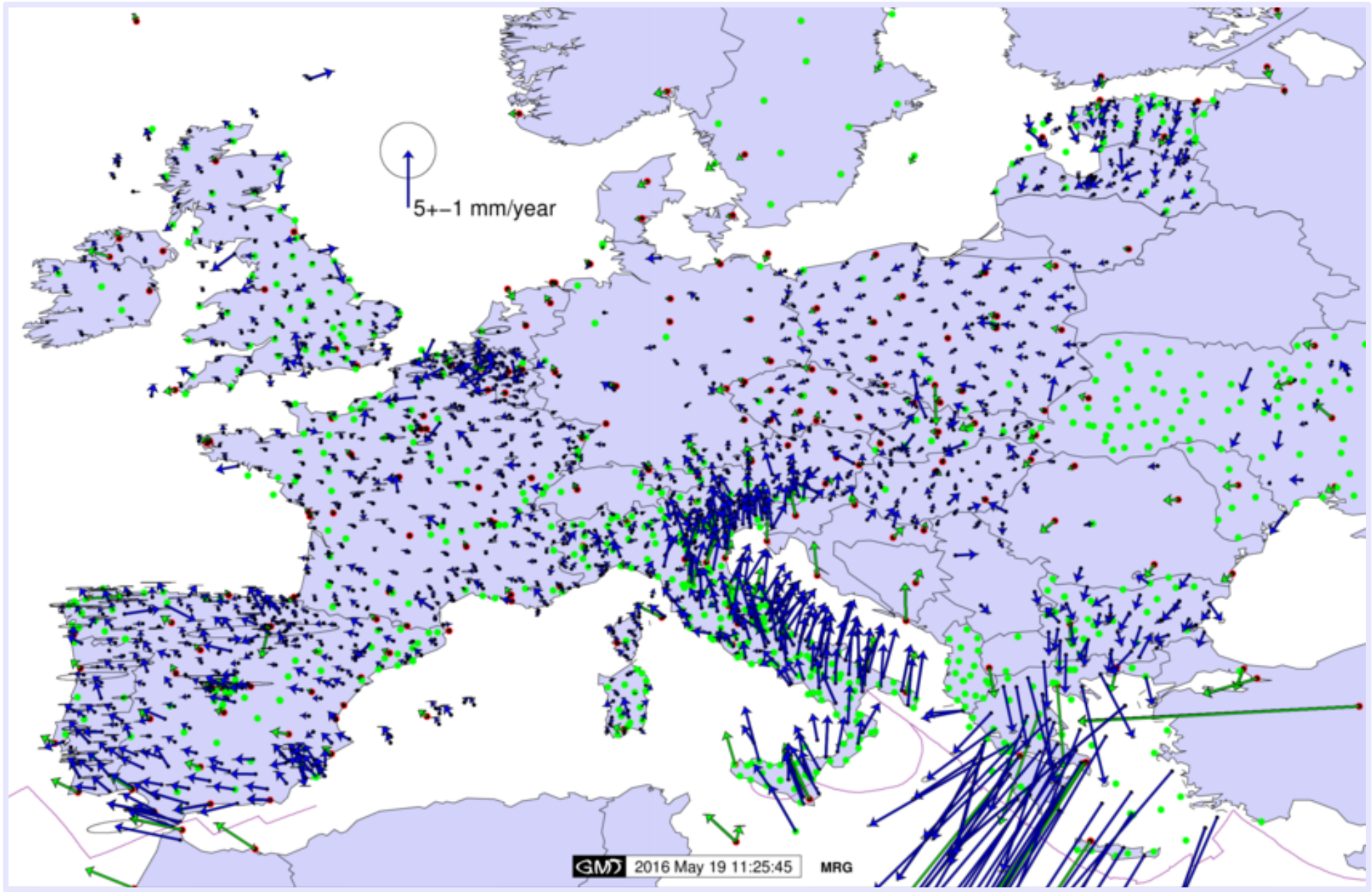
COMPARISON WITH OFFICIAL EPN - CRD



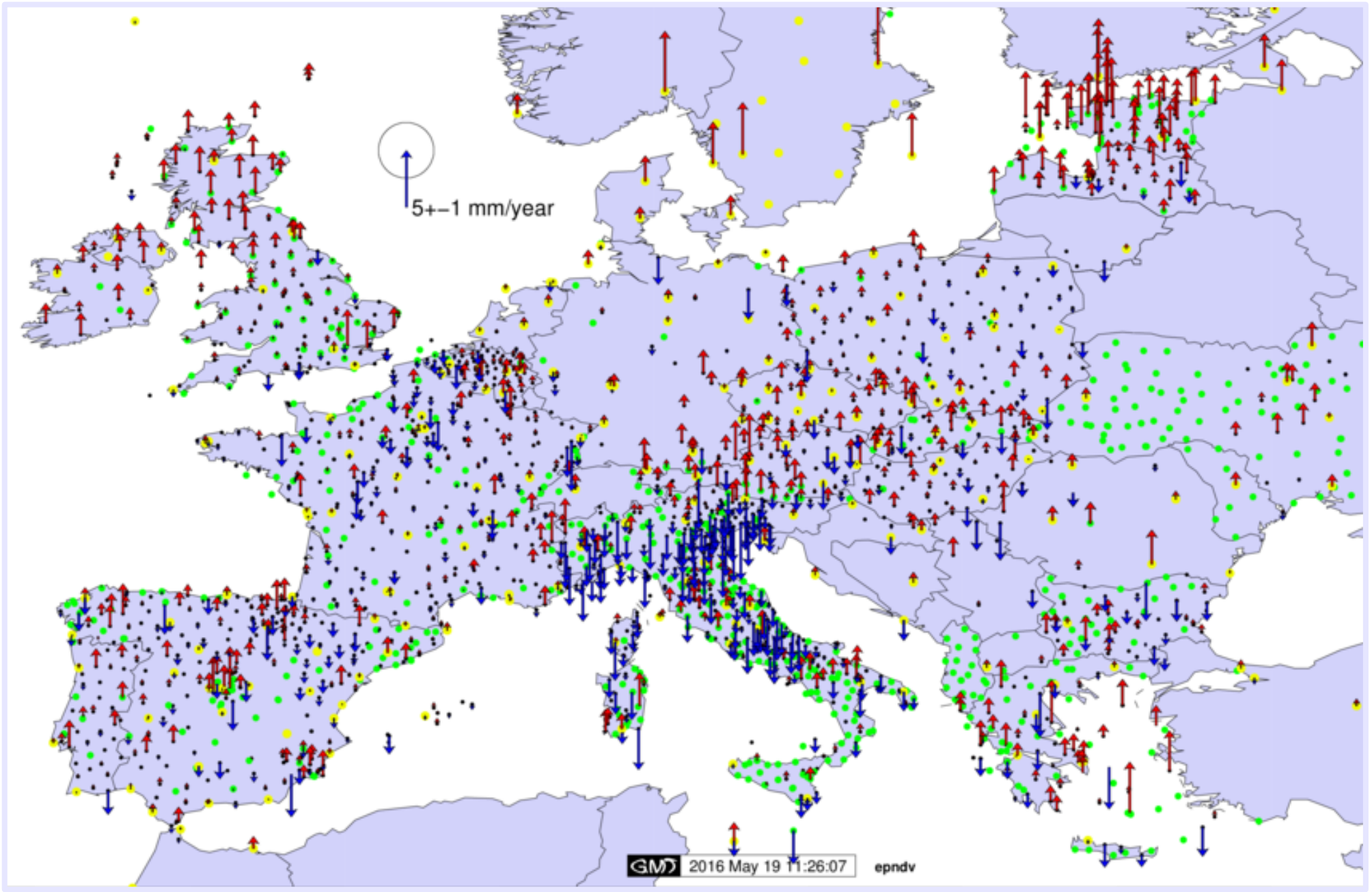
COMPARISON WITH OFFICIAL EPN - VEL



ETRF2000 VELOCITIES L> 3 years



UP VELOCITIES L> 3 years



EUREF WORKING GROUP ON EPN DENSIFICATION

- HELP: GROWING WORKLOAD OF THE RFC
- FORMAL WORKING ENVIRONMENT TO PREPARE THE NEW EUREF PRODUCT
- INDEPENDENT PRODUCT VALIDATION
- PUBLICATION ON THE EPNCB WEBSITE

EUREF WORKING GROUP ON EPN DENSIFICATION

WORKING GROUP TASKS

- REVISION OF THE EPN GUIDELINES (IF NECESSARY)
- INPUT SINEX MONITORING
- METADATA COLLECTION AND SCREENING

  (DOMES NUMBERS AND LOG SHEETS)
- PRELIMINARY TS ANALYSIS TO DETECT MAIN SINEX ISSUES
- RUNNING THE FINAL COMBINATION (WITH 6 MONTHS REPEAT CYCLE)
- PRODUCT TEST AND VALIDATION
- MAINTENANCE OF THE DENSIFICATION WEBSITE

EUREF WORKING GROUP ON EPN DENSIFICATION

WORKING GROUP CHARTER

- HAD BEEN ITERATIVELY DISCUSSED BY THE TWG
- ACCEPTED AT THE 68th TWG MEETING IN LEIPZIG

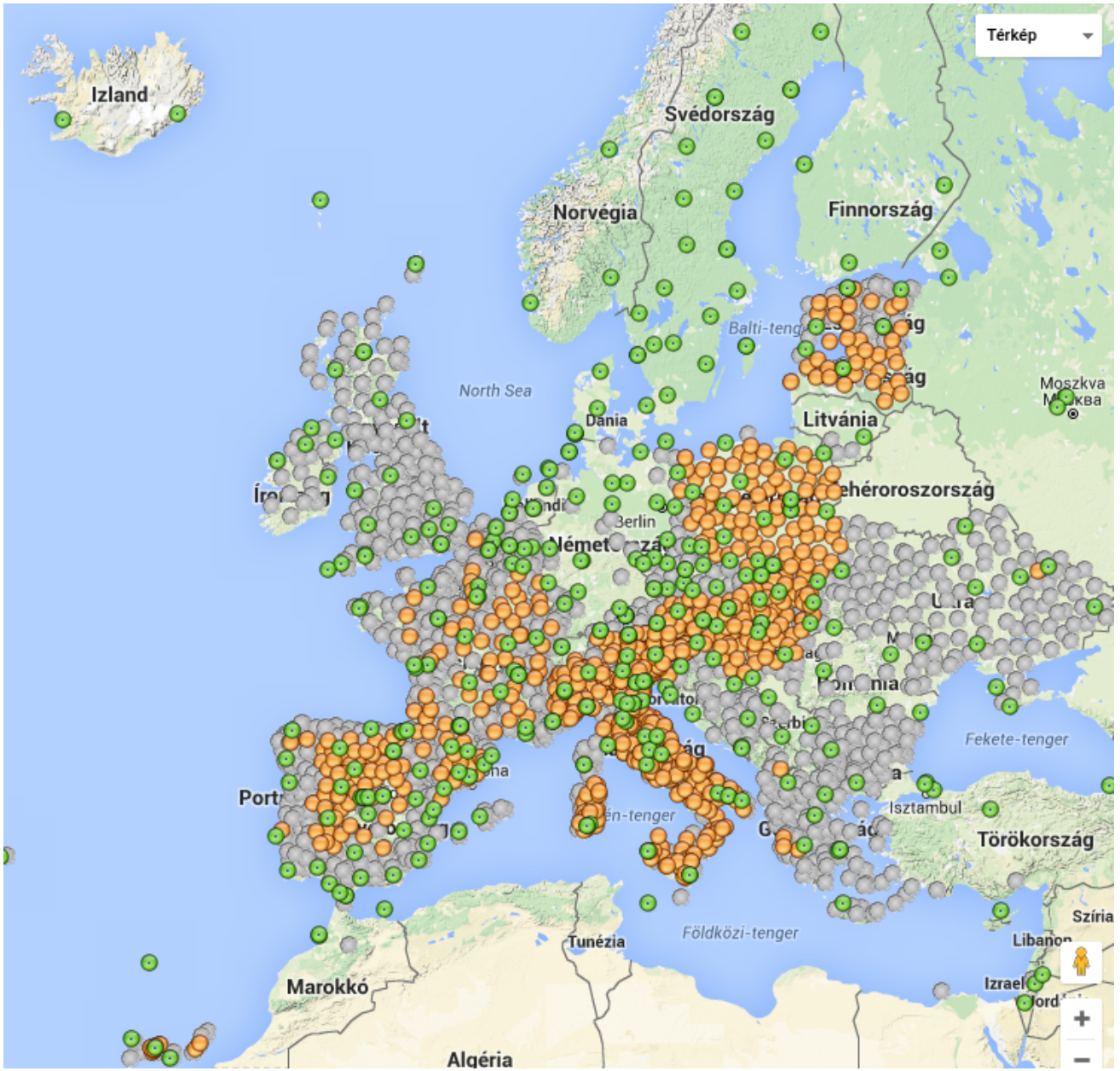
WG MEMBERSIP

- Ambrus Kenyeres	WG chair, combination
- Carine Bruyninx	guidelines, website, validation
- Alessandro Caporali	analyst, validation
- Martin Lidberg	validation, product test (chair Deformation WG)
- Günter Stangl	analyst, chair EUREF Campaign Database
- Zuheir Altamimi	validation

ANY FURTHER MEMBERSHIP PROPOSAL IS WELCOME!

EPN DENSIFICATION WEBSITE

www.epncb.oma.be/_densification



- *.AC and *.OC forms are prepared and available
- partners are working on site logs
- site log submission like at EPN
- results section is still empty, but will be gradually filled in

CO-OPERATION WITH GEOPHYSICS GROUPS
E P O S

EPOS – European Plate Observing System

- EPOS-IP (Implementation Phase) project
- Thematic and Core Services
- EPOS GNSS Group: co-operation with EUREF, discussed at the TWG (services, data, quality, combination, products)
- Two pan-European EPOS GNSS Analysis Center: CNRS and INGV + regional Analysis Centers (Turkey!)

EPOS SINEX combination by the EPN RFC

- EPOS final product combination on the velocity level

AVAILABILITY OF EPN DENSIFICATION PRODUCTS FOR EPOS?

EUREF: open data policy, but

each AC providing results will be asked

SUMMARY, FUTURE PLANS

- EPN DENSIFICATION: JOINT EFFORT OF ALL EUROPEAN COUNTRIES
- HOMOGENEOUS ANALYSIS TOOLS AND STRATEGY

  REPRO_2 OF ALL ACs IS NEEDED

- ABSOLUTELY POSITIVE EXPERIENCES (SINEX AVAILABILITY, QUALITY, CONCEPT FEASIBILITY)
- FILLING IN THE WHITE SPOTS (BALKAN, FENNOSCANDIA)
- WORKING GROUP BEING FORMED
- MULTIDISCIPLINARY USE OF THE PRODUCTS
- **COOPERATION WITH GEOPHYSICS GROUPS << EPOS >>**
- WEBSITE UNDER PREPARATION (EPNCB)

  METADATA MANAGEMENT,
  VISIBILITY FOR THE CONTRIBUTING ACs,
  PUBLICATION OF THE RESULTS