RECENT ADVANCES IN THE EPN DENSIFICATION: AN OVERVIEW

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A CAPORALI – A BARON - F DE DONCKER - B DROSCAK – A DURET - P FRANKE – I GEORGIEV – M GIANNIOU – D HANSEN – L HUISMAN - I JUMARE - J NAGL - P PIHLAK - G STANGL – M VALDES - K SZAFRANEK – M FIGURSKI – M RYCZYWOLSKI

AND MANY MORE . . .

EUREF2015 SYPOSIUM, LEIPZIG, 02-05 JUNE, 2015

OUTLINE

- **EPN DENSIFICATION STATUS**
  - NEWS SINCE VILNIUS
  - QUANTITY TO QUALITY FOR YOUR BENEFIT
- **EUREF WORKING GROUP ON EPN DENSIFICATION**
  - SUPPORT AND VALIDATION
- **WEB SITE DEVELOPMENT**
  - EPNCB WEBSITE – BY CARINE BRUYNINX

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

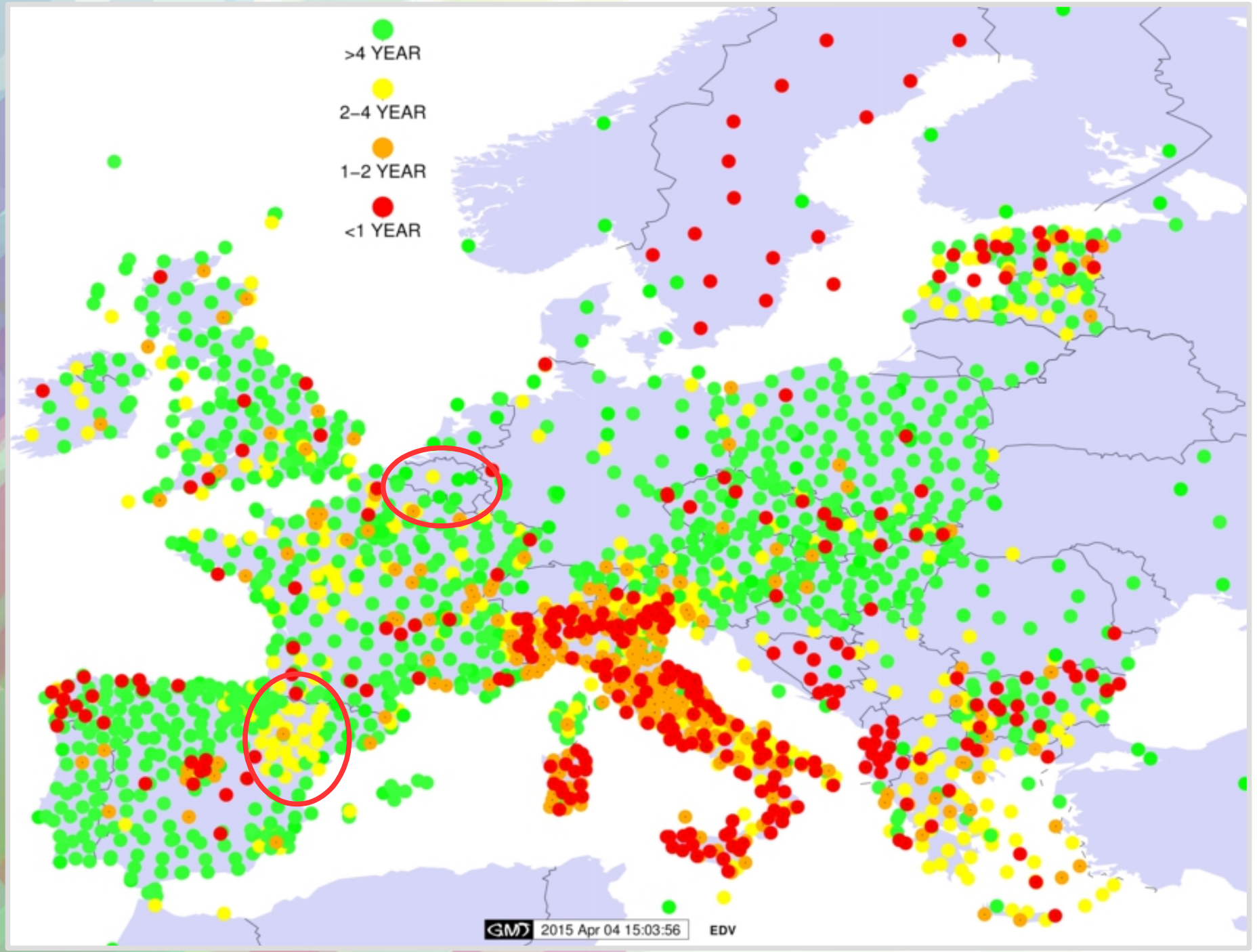
- **same reference network as for the EPN cumulative**
- MC is tested
- position and velocity estimates in ITRFyy/IGSyy/ETRFyy,
- time series plots

DATA AVAILABILITY – JUNE 2015

GPSweek 1831 corresponds to ITRF2014 data content

ASG	Poland	: 1482 -	>1831	**re-processed**
EST	Estonia	: 1448 -	>1831	
GGI	Latvia	: 1461 -	>1831	
GKU	Slovakia	: 1408 -	>1831	ECC contributions
CZE	Czech R	: 1565 -	1831	
SGO	Hungary	: 1200 -	>1831	**re-processed**
AMON	Austria	: 1356 -	>1831	
MON	Middle East	: 1400 -	>1831	
GRE	Greece	: 1721 -	>1831	
CEGRN	CE-Europe	: 1400 -	>1831	G.Stangl
BUL	Bulgaria	: 1434 -	>1831	daily GAMIT
UPA	**Italy**	**: 1623 -**	**1778**	**under revision (WG)**
IGN Spain	Spain/Portugal	: 1400 -	>1831	daily – repro2 will come!
CAT	Catalonia	: 1629 -	1831	
AGRS	The Netherlands	: 0782	>1800	
NGI	Belgium	: 1787 -	>1831	
SGN	France	: 0900 -	>1831	**GLOBAL**
BIGF	UK	: 0900 -	1831	**GLOBAL - IGS08 - REPRO2**

SINEX AVAILABILITY

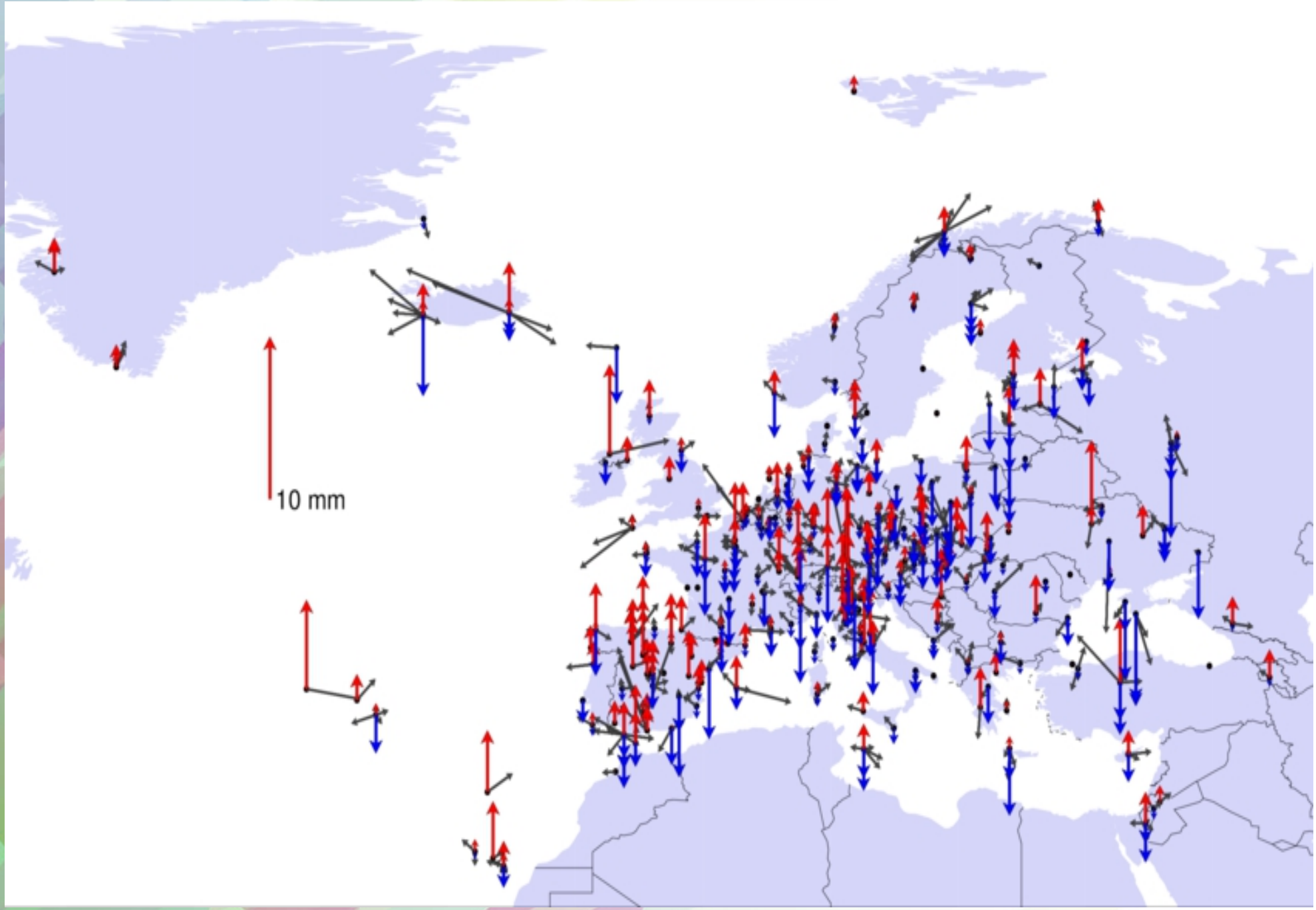


SOME STATISTICS, AS OF TODAY

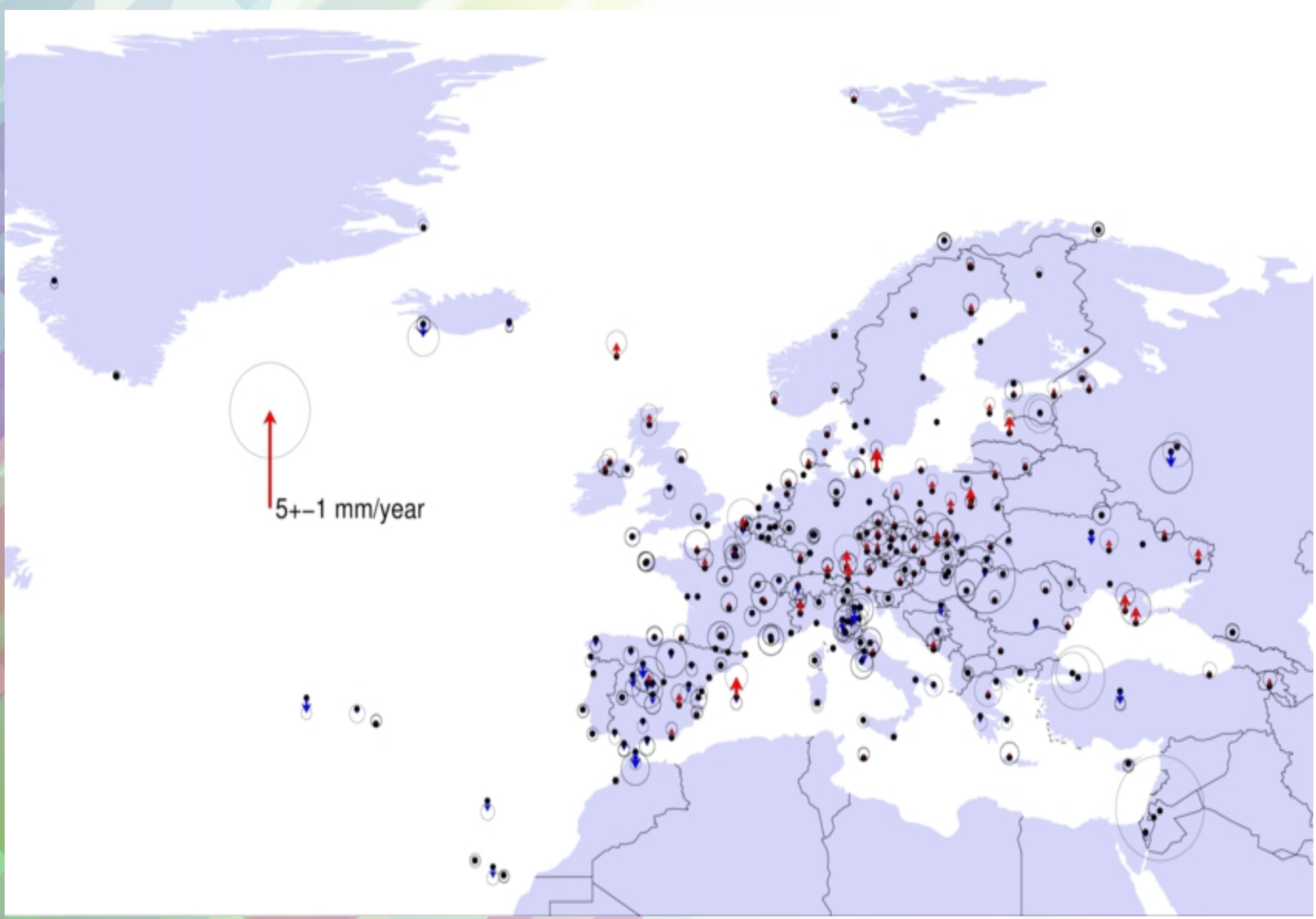
- >2500 STATIONS AND 4166 SOLUTIONS IN THE SOLUTION SINEX
- >6750 WEEKLY SINEX FILES
- >26 GB OF SINEX DATA
- DATA AVAILABILITY MOSTLY SINCE 2007 (AFTER WEEK 1400)
- >2000 SINGLE OUTLIERS/SHORT OUTLIER PERIODS DELETED

  STORED IN A META-DATA BASE
- RUNTIME: ~18 HOURS IN A MULTI-CORE COMPILER ENVIRONMENT
- 1.6 GB cumulative SINEX
- [11200 x 11200] COV matrix

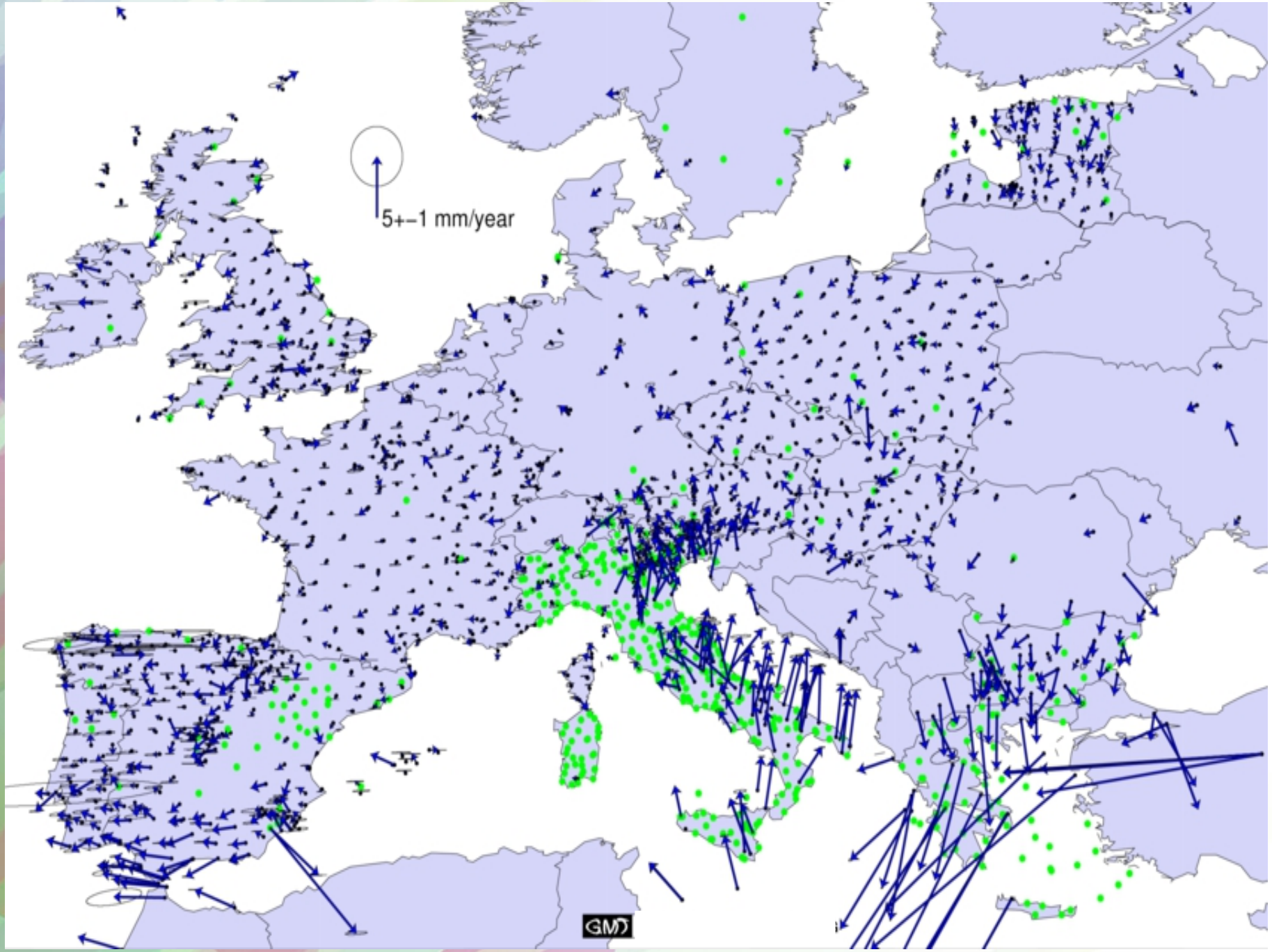
COMPARISON WITH OFFICIAL EPN - CRD



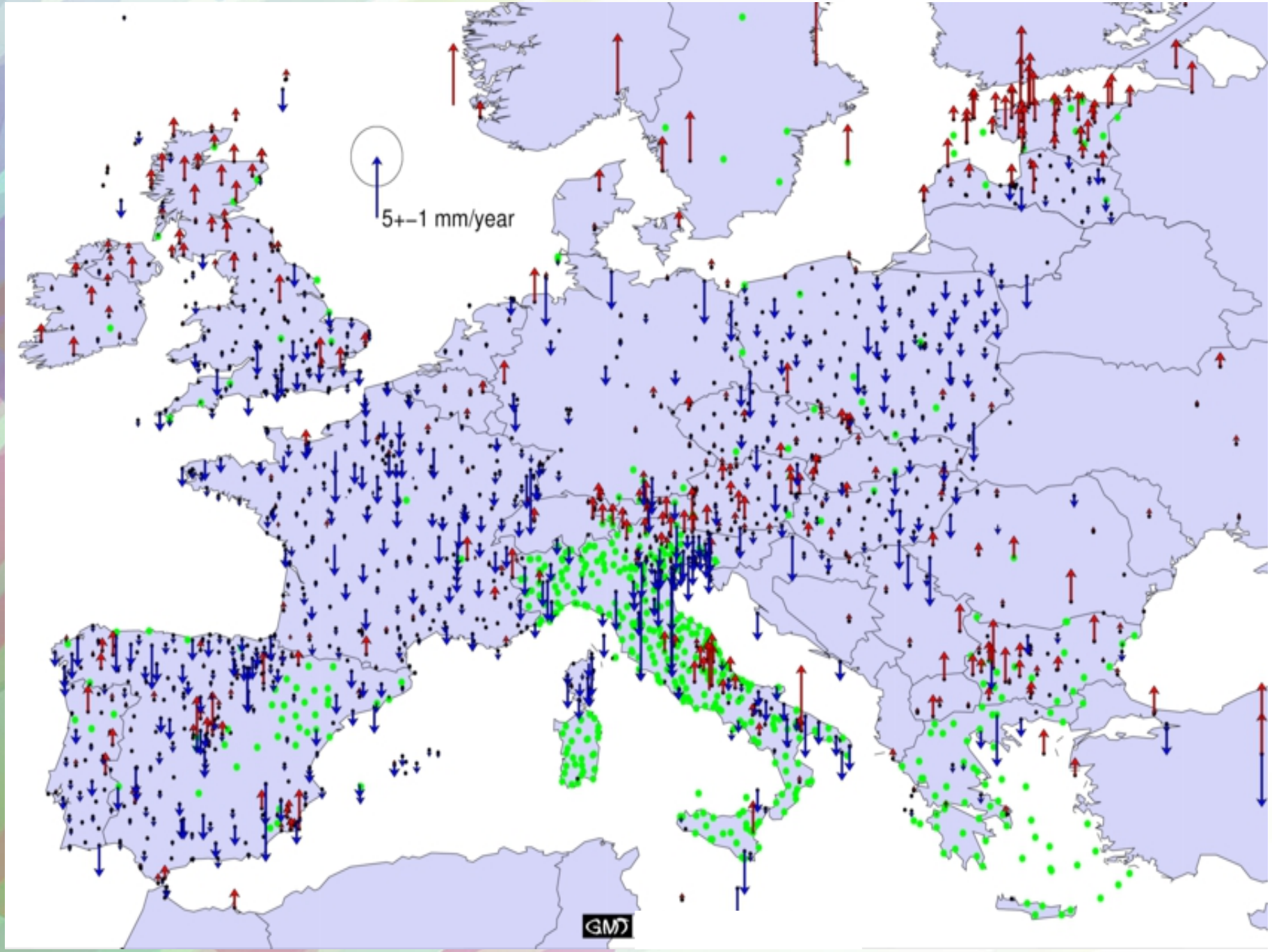
COMPARISON WITH OFFICIAL EPN - VEL



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 EPNCBV WEBSITE

EUREF WORKING GROUP ON EPN Ddensification

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 Ddensification

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!

SUMMARY, FUTURE PLANS

- EPN DENSIFICATION: JOINT EFFORT OF ALL EUROPEAN COUNTRIES
- HOMOGENEOUS ANALYSIS TOOLS AND STRATEGY
  REPRO2 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