EPN AC solutions and network design in the context of the EPN repro3

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Virtual Zoom meeting

November 7, 2022, 9-12 CET

Introduction

- 12 EPN ACs (11 of 16 present and one new AC at the GFZ) are going to participate in the EPN repro3 project
- The goal is to check:
  - the distribution of stations (active and former) wrt. the number of processing ACs (min. 3 ACs per station)
  - the number of IGS20 stations
  - the number of stations in AC networks since 1996
- The analysis is based on information provided in file `ftp://ftp.epncb.oma.be/pub/station/general/StationProcessingStatus.txt` and in IGS20 files (coordinates, discontinuities)

AC	Software	Solutions		# sites
ASI	GipsyX 1.6	Final	–	96
BEK	Bernese 5.2	Final	R03	130
BEV	Bernese 5.2	Final	–	177
BKG	Bernese 5.2	Final	R03	149
COE	Bernese 5.5	Final	–	39
IGE	Bernese 5.2	Final	R03	92
IGN	Bernese 5.2	Final	R03	62
LPT	Bernese 5.3	Final	–	59
MUT	GAMIT 10.71	Final	R03	151
NKG	Bernese 5.2	Final	R03	104
RGA	Bernese 5.2	Final	–	64
ROB	Bernese 5.2	Final	R03	110
SGO	Bernese 5.2	Final	R03	51
SUT	Bernese 5.2	Final	R03	64
UPA	Bernese 5.2	Final	R03	86
WUT	Bernese 5.2	Final	R03	144

Distribution of active stations

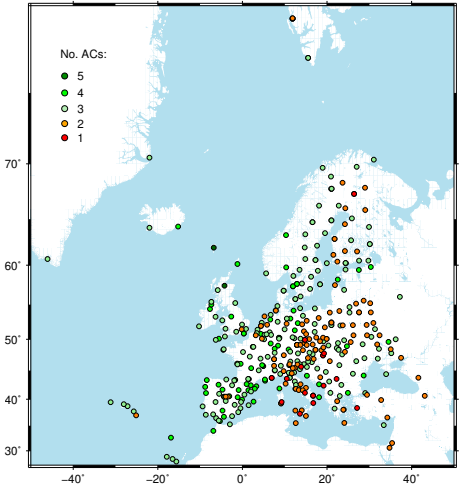
- Distribution of EPN stations (396) according to the number of processing ACs

#ACs	#sites (16 ACs)	#sites (11 ACs)
1	0	15
2	1	106
3	87	192
4	231	75
5	71	8
6	6	0

- Distribution of EPN stations wrt. a number of processing ACs in operational and repro3 solutions

#ACs in oper.	#ACs in repro3 1	2	3	4	5	Sum
2	–	1	–	–	–	1
3	10	46	31	–	–	87
4	4	54	121	52	–	231
5	1	4	37	22	7	71
6	–	1	3	1	1	6
Sum	15	106	192	75	8	396

EPN stations



Number of ACs (of 11) assigned to EPN stations

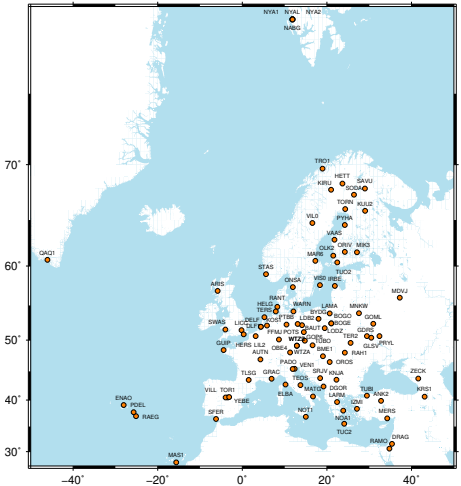
GFZ network of EPN stations

Proposed subnetwork of EPN GNSS stations for the GFZ AC:

- 114 EPN stations selected

Station distribution including GFZ network:

#ACs	#sites (11 ACs)	#sites (11 ACs & GFZ)
1	15	7
2	106	57
3	192	205
4	75	114
5	8	13
6	0	0



114 stations selected for GFZ network

Additional stations in AC networks

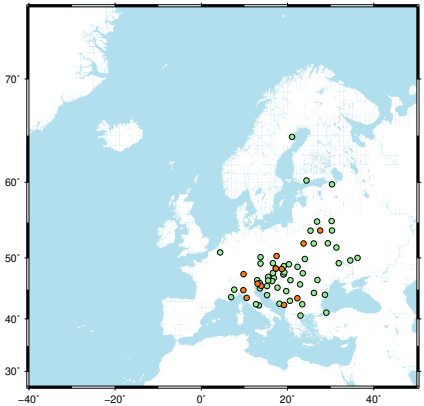
- In order to have at least 3 ACs per station, the remaining stations assigned to one (7 stations) or two (57) ACs need to be added to other AC networks
- The following aspects taken into account:
  - number of stations in present AC networks (more stations assigned to lesser networks)
  - region of interest
  - number of IGS20 stations
  - number of stations since 1996
- The additional stations could be processed by ACs also in the operational solutions:
  - the potential discontinuities between repro3 and operational solutions could be minimised
  - longer position time series in AC solutions

Additional stations in repro3 AC networks

AC	Software	Solutions		# sites OPS	New sites	#sites R03
BEK	Bernese 5.2	Final	R03	130	1	131
BKG	Bernese 5.2	Final	R03	149	3	152
GFZ	EPOS-8	Final	R03	114	0	114
IGE	Bernese 5.2	Final	R03	92	5	97
IGN	Bernese 5.2	Final	R03	62	0	62
MUT	GAMIT 10.71	Final	R03	151	8	159
NKG	Bernese 5.2	Final	R03	104	0	104
ROB	Bernese 5.2	Final	R03	110	3	113
SGO	Bernese 5.2	Final	R03	51	13	64
SUT	Bernese 5.2	Final	R03	64	17	81
UPA	Bernese 5.2	Final	R03	86	15	101
WUT	Bernese 5.2	Final	R03	144	9	153

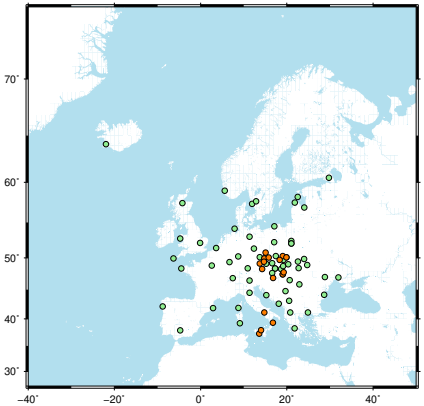
Examples of proposed new stations in AC networks (1/2)

SGO



13 new stations

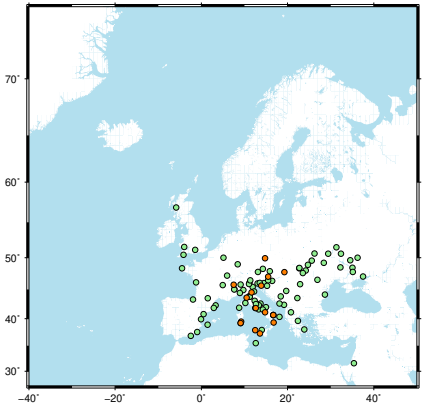
SUT



17 new stations

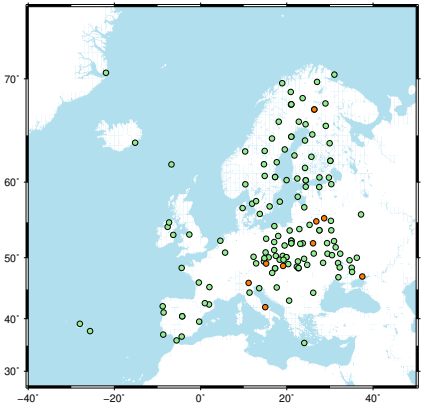
Examples of proposed new stations in AC networks (2/2)

UPA



15 new stations

WUT



9 new stations

Proposed stations to AC networks

BEK: LAMP00ITA

BKG: GRAC00FRA, IZMI00TUR, RVNE00UKR

IGE: DOUR00BEL, FRNE00ITA, HERS00GBR, SART00ITA, ZIM200CHE

MUT: DNMU00UKR, GWWL00POL, ISRN00ITA, KLNK00BLR, MOGI00BLR, SMLA00UKR, SWKI00POL, VITR00BLR

ROB: GRAS00FRA, WTZR00DEU, ZIMM00CHE

SGO: BISK00CZE, BRTS00BLR, BSVZ00ITA, DGOR00MNE, DVCN00SVK, ENZA00ITA, KNJA00SRB, MNSK00BLR, MOP200SVK, MOPI00SVK, PFA300AUT, RIVO00ITA, VIRG00ITA

SUT: AGRN00ITA, BME100HUN, BUTE00HUN, CFRM00CZE, CLIB00CZE, CPAR00CZE, CTAB00CZE, GALH00ITA, GOP600CZE, KATO00POL, KRA100POL, LINZ00AUT, PENC00HUN, SVLL00ITA, UBEN00ITA, VACO00CZE, ZZON00HUN

UPA: AGRN00ITA, ASIR00ITA, BIRG00ITA, BSVZ00ITA, GOPE00CZE, GRAZ00AUT, LIGN00ITA, MATG00ITA, MEDI00ITA, PENC00HUN, SART00ITA, SVLL00ITA, UBEN00ITA, UCAG00ITA, VIRG00ITA

WUT: BBYS00SVK, KUNZ00CZE, MARP00UKR, NOVP00BLR, PINS00BLR, PSTV00BLR, SODA00FIN, TREU00ITA, TRMI00ITA

Characteristics of AC networks including proposed changes

AC	Software	Solutions		# sites
ASI	GipsyX 1.6	Final	–	96
BEK	Bernese 5.2	Final	R03	131
BEV	Bernese 5.2	Final	–	177
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- Distribution of stations in present final solutions (16 ACs) and in proposed future solutions (17 ACs)

	#sites in final sol.	
#ACs	16 ACs	17 ACs
2	1	0
3	87	5
4	231	224
5	71	149
6	6	16
7	0	2

Former EPN stations (preliminary)

- There are 75 former EPN stations

#ACs	#sites (11 ACs)	#sites (R03)
1	11	0
2	18	0
3	33	48
4	12	21
5	1	5
6	0	1

- Stations assigned to repro3 AC networks considering:
  - redundancy
  - number of IGS20 stations
  - number of stations since 1996
- Some stations observed for a short time

BKG: AMMN00JOR, NSSP00ARM, OBE200DEU, OBER00DEU, VENE00ITA

GFZ: ANKR00TUR, BORK00DEU, BZRG00ITA, CAEN00FRA, CAGZ00ITA, CREI00FRA, DUBR00HRV, EVPA00UKR, HOE200DEU, KELY00GRL, MARJ00CZE, MDVO00RUS, NOTO00ITA, OBE200DEU, OBER00DEU, PFA200AUT, TRAB00TUR, TROM00NOR, VARD00NOR, WETT00DEU

IGE: CAGL00ITA, HFLK00AUT, NOTO00ITA, NPLD00GBR, UPAD00ITA, WETT00DEU

IGN: HFLK00AUT, KOSG00NLD, NOTO00ITA, TOUL00FRA

MUT: IZRS00UKR, MDVO00RUS, THU100GRL, TRON00NOR, ZWEN00RUS

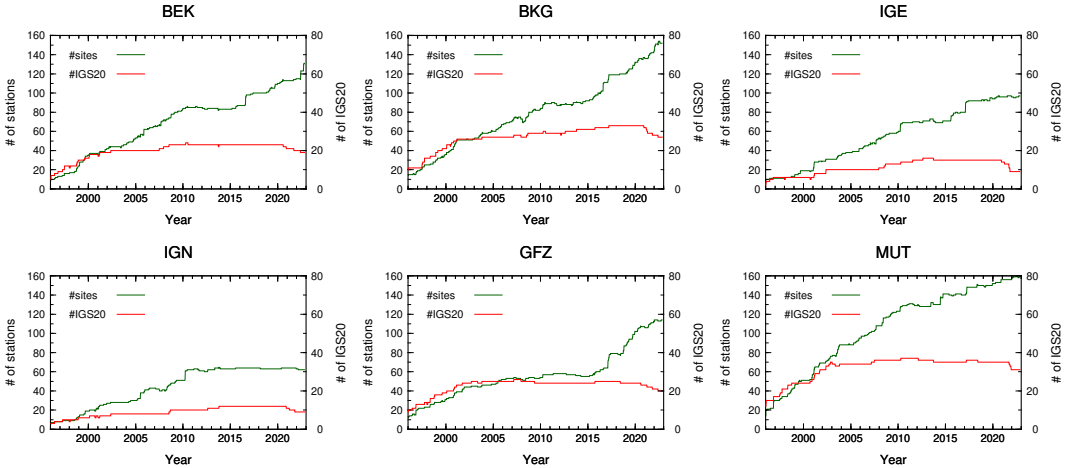
SGO: CAME00ITA, PFA200AUT, PULA00HRV

SUT: MARJ00CZE, NYIR00HUN, OSJE00HRV, PEN200HUN

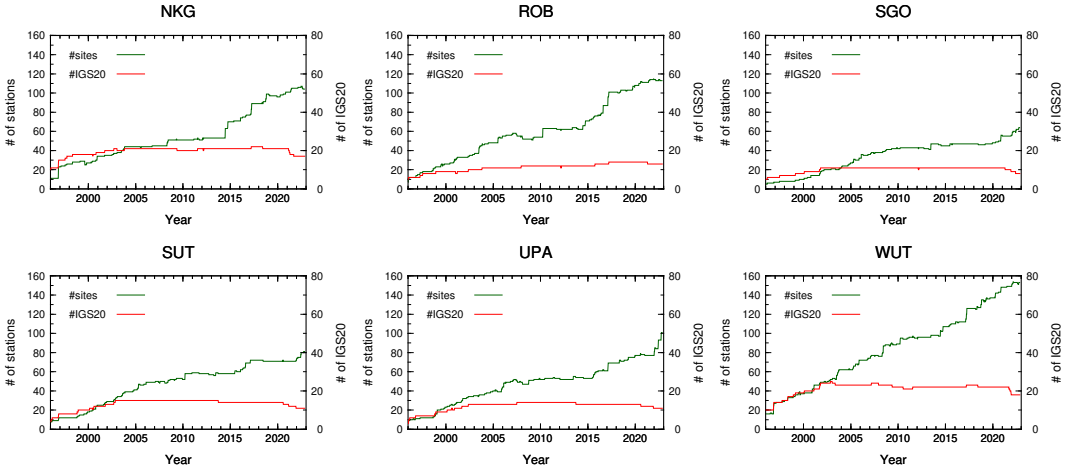
UPA: CAGL00ITA, NOTO00ITA, PEN200HUN, PFAN00AUT, PULA00HRV, UPAD00ITA, WETT00DEU

WUT: OSLO00NOR, STAV00NOR, THU100GRL, TROM00NOR, VARD00NOR, ZWEN00RUS

Number of stations in AC networks in time (1/2)



Number of stations in AC networks in time (2/2)



Summary

- Stations of EPN network checked against the number of repro3 ACs assigned to them
- Networks of repro3 ACs checked wrt. number of IGS20 stations, number of stations since 1996
- The need to improve the characteristics of AC network and the redundancy in combined solutions was observed
- Additional stations to AC networks are proposed