

AdriaArray Seismic Network

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&

AdriaArray Seismic Network Working Group

AdriaArray SNWG Virtual Workshop, 12. May 2021, update 18. May 2021



Orfeus

EPOS
EUROPEAN PLATE OBSERVING SYSTEM

permanent station inventory: sheet of 2516 stations and spots (rows) x 25 “properties” (columns)

StationInventory.xls - OpenOffice.org Calc

Soubor Úpravy Zobrazit Vložit Formát Nástroje Data Okno Nápověda

A1 = name

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	difficulty	
1	name	Name					town	city	previous sheet	round	name	corner in [sec]	yes=1/no=0	name	table if r1=wors	operator	institute	no=0	EID	center	GB	DS	sug	any			
2	Network	Name	Latitude	Longitude	elevation	show	Site name	country	Housing*	Sensor pos	Sensor type	Corner period	Possible spot*	Digitizer	Sampling	Qual	Institut	Struct	prelimin	DA	OA	no=0	Be	SN	sug		
3	Network	station	WGS84	WGS84	[m]		village /	country	see remark on	rock/corr	marketing	sensor low	if corner<60s	marketing	higher	active	network	onsite	yes=0	IDA	ide / da	Bo	DS	hrs	su		
79	HT	ALN	40.885	26.046	1	Alexandroupolis	GR	CMG-3ESP 100s (200)	100		Janus-Trident 40 Vpp (Gain 1)																
80	BW	ALTM	48.995167	11.519922	0	Beilngries	D	Le3D-1	1																		
81	HU	AMBH	46.350100	20.725800	1	Ambrozfalva	H	G120	120																		
82	HL	AMGA	36.831561	25.893836	1	AmorgosIsland	GR	Building	concret	Lennartz20s+CMG-5T	20		0	SMART24	100	4	NOA	Evan	1	1	NOA	1	1				
83	HP	AMPL	38.9224	21.2135	1	Ampelaki	GR	Urban free field	concret	TrilCompact120s	120			Geobit SR32	100	3	UPAT	Soko	1	1	NOA	1	1				
84	RO	AMRR	44.6102	27.3351	67	Amara	RO	nderground shaft	concret	CMG40T	30	1	Q330	100	3	NIEP		1	0	0	0	0					
85	HP	AMT	37.5324	21.7089	1	Artemida	GR	Free field	bedrock	G120s	120			Guralp Minim	100	2	UPAT	Soko	1	1	NOA	1	1				
86	IV	AMUR	40.9071	16.6041	443	I	I		NANOMETRICS TRILL	40																	
87	ANAC		50.073800	17.378000	1	Anenský vrch	CZ		L43D	1																1	
88	IX	AND3	40.9298	15.3331	905	I	I		GEOTECH KS-2000ED	30																	
89	HL	ANKY	35.86704	23.30117	1	AntikytherasIsland	GR	Free field	bedrock	G60s	60			PS6-SC	100	1	NOA	Evan	1	1	NOA	1	1				
90	TH	ANNA	50.88902	12.64499	0		D		CMG-3ESPC 60s	60																	
91	BE	ANSA	50.668	5.507	180	0	Ans	B	A		1																
92	KO	ANTB	36.8998	30.6538	20	0	TR			120	120																
93	HP	ANX	38.5933	21.9209	1	AnoXora	GR	Urban free field	concret	G120s	120			Guralp DM24	100	2	UPAT	Soko	1	1	NOA	1	1				
94	IV	AOI	43.55017	13.602	530	I	I		NANOMETRICS TRILL	40																	
95	HT	AOS2	39.1478	23.8436	1	Alonissos-2	GR		CMG-3ESP 100s (200)	100				Janus-Trident 40 Vpp (Gain 1)													
96	HL	APE	37.07274	25.52301	1	Apeiranthos,Naxos	GR	Special	bedrock	STS2	120			PS6-SC	100	1	NOA	Evan	1	1	NOA	1	1				
97	IV	APEC	43.55846	12.41991	488	I	I		NANOMETRICS TRILL	40																	
98	IV	APPI	46.47868	11.22813	1056	I	I		LENNARTZ LE3D-5S	5																	
99	IV	APRC	41.75738	15.54308	672	I	I		NANOMETRICS TRILL	120																	
100	MN	AQU	42.354	13.405	1	L'Aquila, Italy	I		STS2	120																	
101	FR	ARBF	43.491700	5.332500	1	technopole de l'Arbois - 13001,	F		STS2	120																	
102	CA	ARBS	42.434492	1.533754	0		E		G120	120																	
103	RO	ARCB	44.4667	26.0758	125	1	Arcul de Triumf	RO	building	concret	Episensor_2g_2_5vf	2	1	k2	100	4	NIEP		1	0	0	0	0				
104	IV	ARCI	42.8519	11.4754	1080	I	I		NANOMETRICS TRILL	40																	
105	NL	ARCN	51.5013	6.1942	0	0	NL			CMG3ES																	
106	RO	ARCR	47.0855	24.3537	385	1	Arcalia	RO	nderground shaft	concret	STS2	120		Q330	100	3	NIEP		1	0	0	0	0				
107	HL	ARG	36.21356	28.1212	1	Archagelos,Rhodes	GR	Special	bedrock	Lennartz20s	20	0	DR24	100	2	NOA	Evan	1	1	NOA	1	1					
108	KO	ARMT	40.5683	28.866	320	0	TR			120s,	120																
109	RO	ARR	45.3657	24.8332	871	1	Vidru	RO	special	bedrock	CMG3ESP	59		Q330	100	3	NIEP		1	1	NIEP	1	1				
110	IV	ARRO	42.57917	12.76567	253	1	I			LENNARTZ LE3D-5S	5																
111	OE	ARSA	47.250500	15.523200	1	Arzberg, Steiermark	A		STS2	120																	
112	FR	ARTF	43.588200	5.806700	1	Artigues - 83006 - Var - Provence	F		Trillium 120PH	120																	
113	IV	ARVD	43.49807	12.94153	461	I	I		NANOMETRICS TRILL	40																	
114	RO	ASE	44.4445	26.0904	85	1	Academia de Studii Economice	RO	building	concret	Episensor_2g_2_5vf	2	1	k2	100	4	NIEP		1	0	0	0	0				
115	IV	ASOL	45.8003	11.9023	181	I	I		KINEMETRICS EPISE	1																	
116	IV	ASQU	43.7967	11.7893	860	I	I		NANOMETRICS TRILL	120																	
117	IV	ASSB	43.0426	12.6587	734	I	I		NANOMETRICS TRILL	40																	
118	HA	ATAL	38.6926	23.0213	1	Atalanti	GR		G120s	120				100		NKUA	G.Ka	1	1	NOA	1	1					
119	IV	ATBU	43.47571	12.54828	1000	I	I		LENNARTZ LE3D-5S	5																	
120	IV	ATCC	43.18514	12.63994	557	I	I		KINEMETRICS EPISE	1																	
121	FR	ATE	43.085800	-0.700700	0	Arette - 64040 - Pyrenees-Atlan	F		STS2	120																	
122	IV	ATFO	43.3666	12.5715	960	I	I		NANOMETRICS TRILL	40																	
123	HL	ATH	37.97384	23.71767	1	Athens	GR	Special	bedrock	STS2	120			DR24	100	1	NOA	Evan	1	1	NOA	1	1				
124	HA	ATHU	37.9665	23.7845	1	AthensUniversity	GR		G60s	60				100		NKUA	G.Ka	1	1	NOA	1	1					
125	IV	ATLO	43.31516	12.40726	584	I	I		LENNARTZ LE3D-5S	5																	

- Python script (317 lines) to distill the required information from the sheet
 - produces files for plotting by GMT (script 1369 lines)

The screenshot shows a Visual Studio Code interface with the following details:

- File Explorer:** Shows a tree view with nodes like 'listsCONT.py', 'countingLISTS.py', 'extract.py' (the active tab), 'make_inventory_manual.py', 'main.py', and 'station_pair.py'.
- Code Editor:** The main area displays Python code for file 'extract.py'. The code handles various inventory data (e.g., citacBB30, citacBB40, citacBB60) and logs them to files like 'outBB30', 'outBB40', 'outBB60', 'labBB30', 'labBB40', 'labBB60', and 'csvBB30', 'csvBB40', 'csvBB60'. It also manages 'UNKN' and 'SPOT' data.
- Terminal:** A terminal window at the bottom shows the command 'pyt 134 Col 47'.
- Status Bar:** Shows the status 'extract.py - Visual Studio Code [Administrator]'.

when the „final“ version of inventory and scripts are ready,
they will be **freely available** for anyone for plotting the station maps

PSPad - [D:\1\AdriaArray\stations\xmaps2\figAdria.sh]
Soubor Projekt Úpravy Hledat Zobrazit Formát Nástroje Skripty HTML Nastavení Okno Nápověda
1. aktuality.html 2. uskutečnene20.html 3. folyzko20.html 4. menu.html 5. zapisy.html 6. index.html 7. fero.css 8. orbit.sh 9. global.sh 10. availableMap.sh 11. figMap.sh 12. figDensity.sh 13. figAdriaGP.sh
9 10 20 30 40 50 60 70 80 90 100 110 120
dos2unix pNOSEP.txt
psxy pNOSEP.txt -R -JL -St\$sizeps -G\$nbsp -W\$thps/\$block -K -O >> \$psfile01 # vyhodit pro Renatu
psxy pNOSEP.txt -R -JL -St\$sizeps -G\$nbsp -W\$thps/\$block -K -O >> \$psfile10 # vyhodit pro Renatu
dos2unix pWHITI.txt
dos2unix pWHITo.txt
psxy pWHITI.txt -R -JL -St\$sizeps -G\$whit -W\$thps/\$block -K -O >> \$psfile01
psxy pWHITI.txt -R -JL -St\$sizeps -G\$whit -W\$thps/\$block -K -O >> \$psfile10
psxy pWHITo.txt -R -JL -St\$sizeps -W\$thps/\$whit -K -O >> \$psfile01 # out
psxy pWHITo.txt -R -JL -St\$sizeps -W\$thps/\$whit -K -O >> \$psfile10 # cut
awk -v awk_diam30=\$diam30 '(print \$1, \$2, "0.0" awk_diam30 " " awk_diam30)' pWHITI.txt > circlesWHIT30.dat
awk -v awk_diam40=\$diam40 '(print \$1, \$2, "0.0" awk_diam40 " " awk_diam40)' pWHITI.txt > circlesWHIT40.dat
dos2unix pSPOT.txt
psxy pSPOT.txt -R -JL -St\$sizeps -G\$spot -W\$thps/\$block -K -O >> \$psfile01 # vyhodit pro Renatu
psxy pSPOT.txt -R -JL -St\$sizeps -G\$spot -W\$thps/\$block -K -O >> \$psfile10 # vyhodit pro Renatu
awk -v awk_diam30=\$diam30 '(print \$1, \$2, "0.0" awk_diam30 " " awk_diam30)' pSPOT.txt > circlesSPOT30.dat
awk -v awk_diam40=\$diam40 '(print \$1, \$2, "0.0" awk_diam40 " " awk_diam40)' pSPOT.txt > circlesSPOT40.dat
dos2unix pUNKN.txt
dos2unix pUNKN0.txt
psxy pUNKN.txt -R -JL -St\$sizeps -G\$unkn -W\$thps/\$block -K -O >> \$psfile01
psxy pUNKN.txt -R -JL -St\$sizeps -G\$unkn -W\$thps/\$block -K -O >> \$psfile10
psxy pUNKN0.txt -R -JL -St\$sizeot -W\$thot/\$unkn -K -O >> \$psfile01
psxy pUNKN0.txt -R -JL -St\$sizeot -W\$thot/\$unkn -K -O >> \$psfile10
psxy pUNKN.txt -R -JL -St\$sizeps -G\$unkn -W\$thps/\$block -K -O >> \$psfile02
psxy pUNKN0.txt -R -JL -St\$sizeot -W\$thot/\$unkn -K -O >> \$psfile02
awk -v awk_diam30=\$diam30 '(print \$1, \$2, "0.0" awk_diam30 " " awk_diam30)' pUNKN.txt > circlesUNKN30.dat
awk -v awk_diam40=\$diam40 '(print \$1, \$2, "0.0" awk_diam40 " " awk_diam40)' pUNKN.txt > circlesUNKN40.dat
dos2unix pUPGR.txt
psxy pUPGR.txt -R -JL -St\$sizeps -G\$upgr -W\$thps/\$block -K -O >> \$psfile01
psxy pUPGR.txt -R -JL -St\$sizeps -G\$upgr -W\$thps/\$block -K -O >> \$psfile10
awk -v awk_diam30=\$diam30 '(print \$1, \$2, "0.0" awk_diam30 " " awk_diam30)' pUPGR.txt > circlesUPGR30.dat
awk -v awk_diam40=\$diam40 '(print \$1, \$2, "0.0" awk_diam40 " " awk_diam40)' pUPGR.txt > circlesUPGR40.dat
dos2unix stations-PACASEstay.txt
awk '(print \$3, \$2)' PACASEstay.txt > stations-PACASEstay.txt
psxy stations-PACASEstay.txt -R -JL -St\$sizeps -G\$pce -W\$thps/\$block -K -O >> \$psfile01 # tady muze umazato to "stay" a namal
psxy stations-PACASEstay.txt -R -JL -St\$sizeps -G\$pce -W\$thps/\$block -K -O >> \$psfile10 # tady muze umazato to "stay" a namal
awk -v awk_ts=\$ts '(print \$3, \$2, awk_ts " 0 0 TC," \$1)' PACASEstay.txt > stations-PACASEstayLABEL.txt
awk -v awk_diam30=\$diam30 '(print \$1, \$2, "0.0" awk_diam30 " " awk_diam30)' stations-PACASEstay.txt > circlesPCSE30.dat
awk -v awk_diam40=\$diam40 '(print \$1, \$2, "0.0" awk_diam40 " " awk_diam40)' stations-PACASEstay.txt > circlesPCSE40.dat
dos2unix pBB30.txt
dos2unix pBB300.txt
psxy pBB30.txt -R -JL -St\$sizeps -G\$b30 -W\$thps/\$block -K -O >> \$psfile01
psxy pBB300.txt -R -JL -St\$sizeot -W\$thot/\$b30 -K -O >> \$psfile01
psxy pBB300.txt -R -JL -St\$sizeps -G\$b30 -W\$thps/\$block -K -O >> \$psfile10
psxy pBB300.txt -R -JL -St\$sizeot -W\$thot/\$b30 -K -O >> \$psfile10
psxy pBB300.txt -R -JL -St\$sizeps -G\$outs -W\$thps/\$block -K -O >> \$psfile09
psxy pBB300.txt -R -JL -St\$sizeps -G\$b30 -W\$thps/\$block -K -O >> \$psfile02
psxy pBB300.txt -R -JL -St\$sizeot -W\$thot/\$b30 -K -O >> \$psfile02
psxy pBB300.txt -R -JL -St\$sizeps -G\$perr -W\$thps/\$block -K -O >> \$psfile06
psxy pBB300.txt -R -JL -St\$sizeps -G\$perr -W\$thps/\$block -K -O >> \$psfile03
psxy pBB300.txt -R -JL -St\$sizeps -G\$perr -W\$thps/\$block -K -O >> \$psfile07
psxy pBB300.txt -R -JL -St\$sizeps -G\$perr -W\$thps/\$block -K -O >> \$psfile08
awk -v awk_diam30=\$diam30 '(print \$1, \$2, "0.0" awk_diam30 " " awk_diam30)' pBB30.txt > circlesBB3030.dat

permanent stations - properties of interest:

sensor corner period	< 30s
	=> 30 s and < 40 s (effectively = 30 s)
	=> 40 s and < 60 s (effectively = 40 s)
	=> 60 s

binary properties:

EIDA	yes / no
online	yes / no
StationBook	yes / no
FDSN	yes / no
inside	yes / no (to flexibly change the AdriaArray outline)
for upgrade	yes / no (if corner < 60 s)

idea: whenever you change or add a line (station properties) in the inventory,

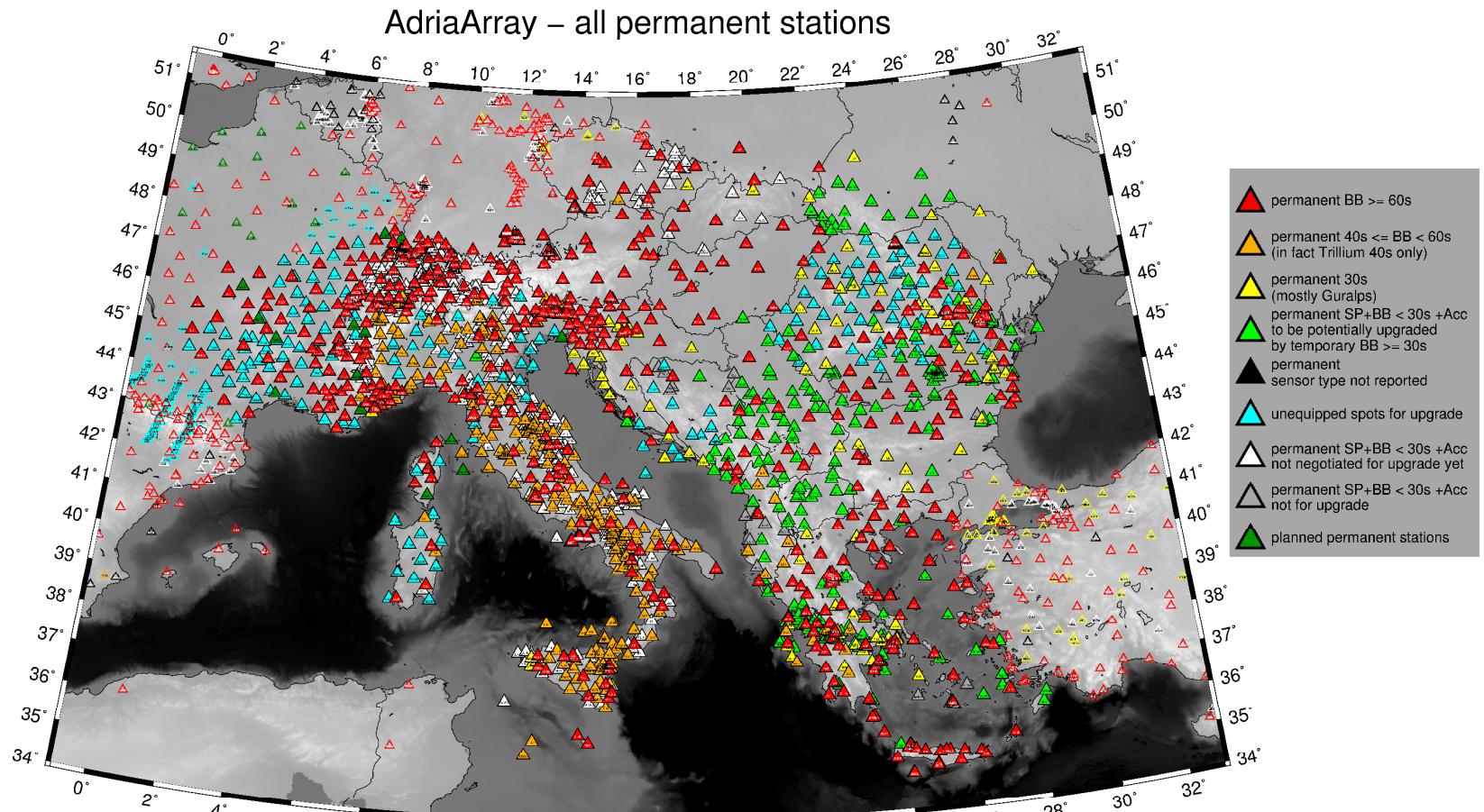
- you run the Python script
- and you get an updated map by the GMT script

Adria Array – all permanent stations - update May 2021

inside AdriaArray region:

BB (>= 30s)	959
SP+SM for upgrade	259
SP+SM others	452
unknown	2
total permanent	1672

there are 2300+ stations on the map

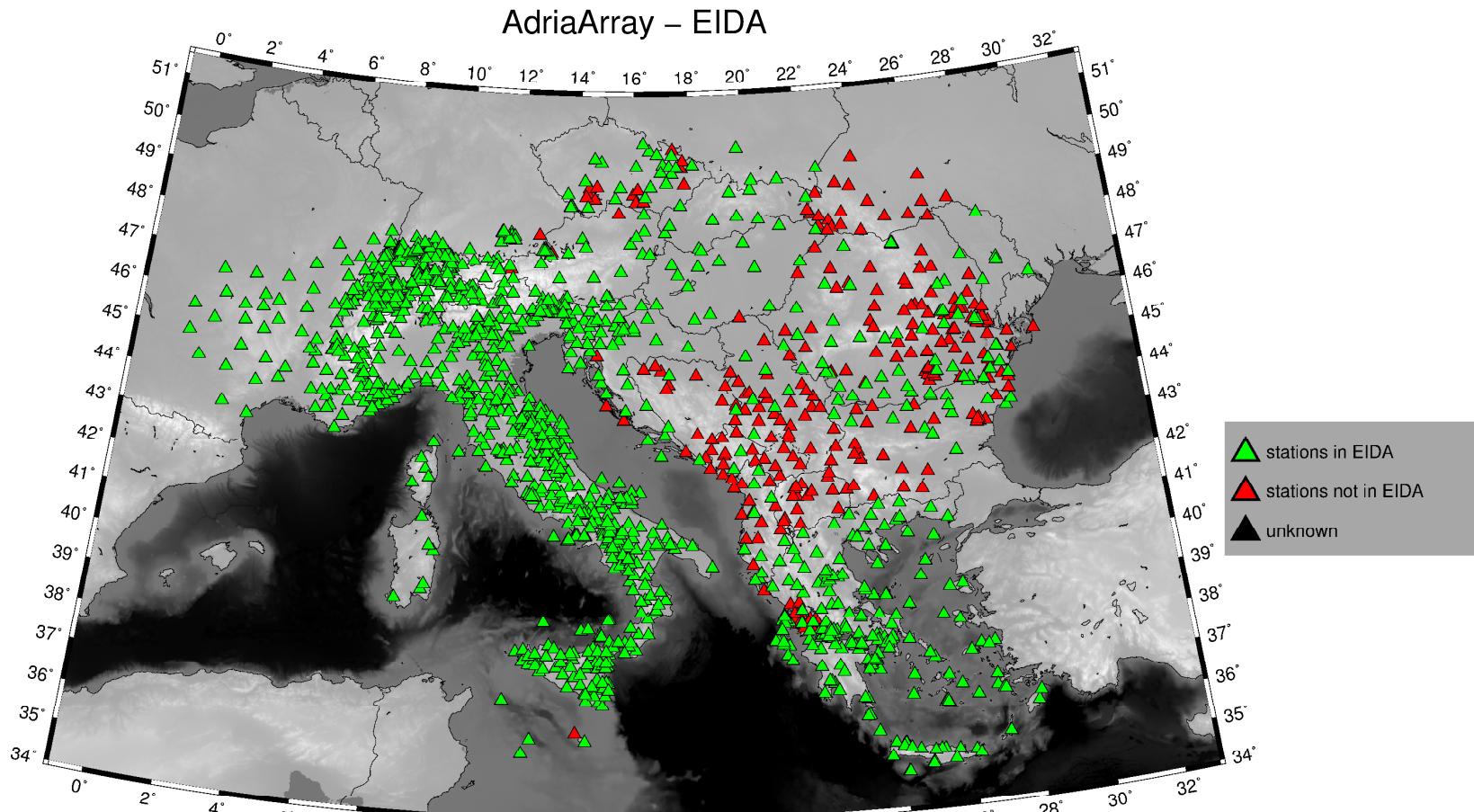


18 May 2021

from that **1672** permanent stations,
1388 are already in EIDA

HOMEWORK: if there is a new non-EIDA permanent station built since we communicated the last time (2019/2020), please, share the information with me, as I cannot find that station otherwise ...

... and connect it to EIDA!



AdriaArray

Seismic Network

Working Group

(May, 2021)

50 member institutions

(alphabetical order by countries)

= 50 permanent and mobile pool operators

seismic network preparatory steps:

- 1 permanent stations in the region
- 2 availability of the mobile stations
- 3 distribution of mobile stations

- 4 iterate 1 – 3 to update

2019 – 2020 – 2021 ...

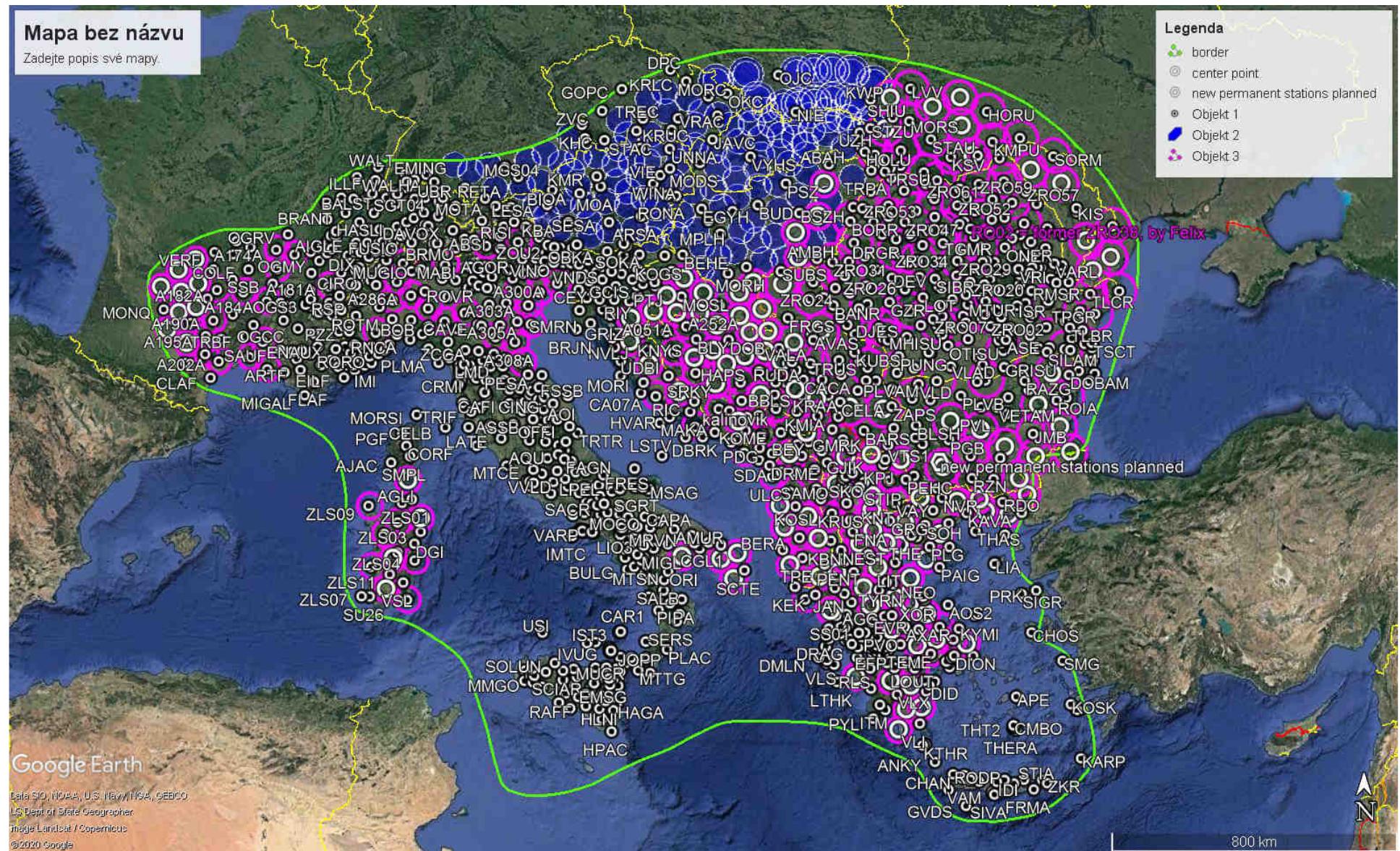
IGEWE-PUT, Tirana, Albania
Uni Vienna, Austria
ZAMG, Austria
SC Sarajevo, Bosnia and Herzegovina
GS Republic of Srpska, Bosnia and Herzegovina
BAS, Bulgaria
CSS, Zagreb, Croatia
Uni Zagreb, Croatia
Charles Uni, Prague, Czech Republic
IG, CAS, Prague, Czech Republic
IPE, Masaryk Uni, Brno, Czech Rep.
IRSM, CAS, Prague, Czech Republic
Uni Aarhus, Denmark
Uni Helsinki, Finland
Uni Oulu, Finland
Uni Grenoble, France
Observatoire Midi Pyrénées, France
Uni Bochum, Germany
GEOMAR Kiel, Germany
GFZ Potsdam, Germany
Uni Kiel, Germany
Uni Karlsruhe, Germany
Uni Münster, Germany
Uni München, Germany
Uni Frankfurt, Germany
NOA, Greece/ORFEUS
Uni Thessaloniki, Greece
HCMR, Athens, Greece
Uni Patras, Greece
HAS, Budapest, Hungary
EPSS, Hungary
INGV, Italy
OGS, Trieste, Italy
GS Kosovo, Pristina, Kosovo
Uni Sts. Cyril and Methodius, Skopje, N. Macedonia
Uni Malta
IGS-CES, Chisinau, Moldova
MSS, Podgorica, Montenegro
Uni Twente, The Netherlands
Uni Bergen, Norway
IG PAS, Warsaw, Poland
Uni Silesia, Katowice, Poland
Uni Warszawa, Poland
NIEP, Romania
ESI SAV, Bratislava, Slovakia
SSS, Ljubljana, Slovenia
ICTJA-CSIC, Barcelona, Spain
ETH, Zürich, Switzerland
IoG, NAS, Ukraine
ORFEUS

mobile stations available

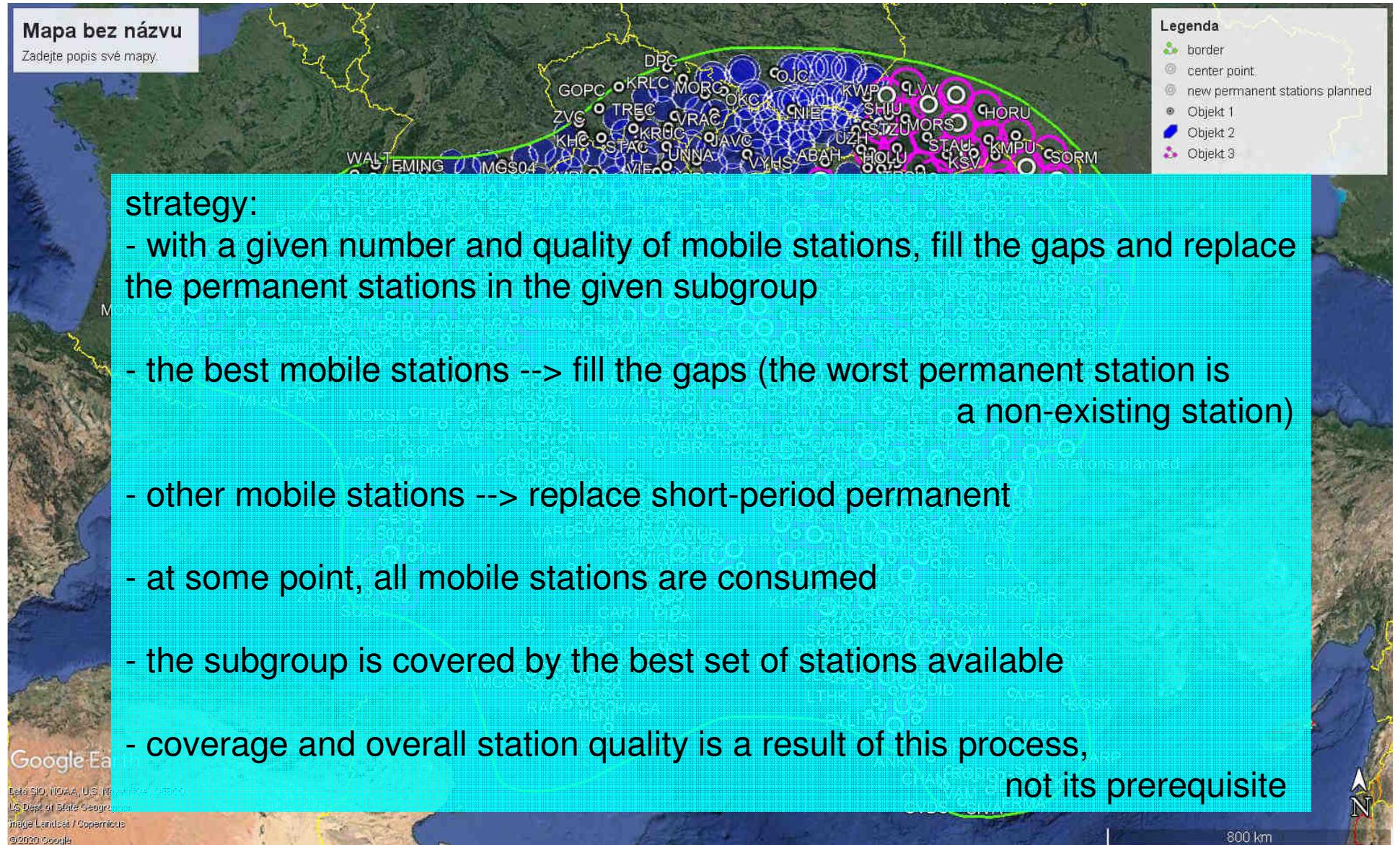
Uni Vienna, Austria	30
Uni Zagreb, Croatia	5+
IG, Czech Republic	50
IRSM, Czech Republic	4 + local experiment
Uni Aarhus, Denmark	20 + local experiment
Uni Helsinki, Finland	20
Uni Oulu, Finland	10
Resif-Sismob, France	35
Germany DSEBRA+	120 + local on-shore/off-shore experiments
Hungary	11
OGS, Italy	6
INGV, Italy	local experiment
Uni Twente, the Netherlands	10
Uni Bergen, Norway	9+
IG+Warszawa+Silesia, Poland	30
Barcelona, Spain	15
ETH, Switzerland	20
total available	395 mobile stations

	MOBILES	REGION	PACASE already in place					121		
EAST	Poland	Ukr.-Carp.	Ukr.-Coast	Moldavia	Romania	Bulgaria	sum columns	available	spare	
	IG CzechRep				5	8	13	14	1	
IRSM Czech Rep					4		4	4	0	
Denmark					12	6	18	20	2	
Helsinki				3	14		17	20	3	
Oulu			2				0	10	10	
???							2	0	-2	
Poland	14	16					30	30	0	
							84	98	14	
sum of rows	14	16	2	3	35	14	84 sums	available	spare	
needed	14	16	2	3	35	14	84 needed			
30s NOT replaced										
PANNONIAN	CzechRep	Austria	Slovakia	Hungary	Serbia	Germany	sum columns	available	spare	
	UniWien		17	9			26	30	4	
IG CzechRep	8		22		4		34	36	2	
Hungary				11			11	11	0	
Kiel		15		15		10	40	45	5	
							111	122	11	
sum of rows	8	32	31	30	0	10	111 sums	available	spare	
needed	8	32	31	30	0	10	111 needed			
CENTRE	Croatia	BiH	N. Italy	Slovenia			sum columns	available	spare	
	Berg+Zag+ETH	16	18				34	34	0	
OGS				6			6	6	0	
Netherlands				9			9	10	1	
							49	50	1	
sum of rows	16	18	15	0			49 sums	available	spare	
needed	16	18	15	0			49 needed			
SOUTHEAST	Albania	N. Macedon	Montenegro	Kosovo	Greece		sum columns	available	spare	
	Bochum		13		41		54	54	0	
Munich	10		7	3			20	21	1	
							74	75	1	
sum of rows	10	13	7	3	41		74 sums	available	spare	
needed	10	13	7	3	41		74 needed			
WEST	Apulia	Sicily	Sardinia	Massif Cent.	Switzerland		sum columns	available	spare	
	Spain	4		9			13	15	2	
France				35			35	35	0	
							48	50	2	
sum of rows	4	0	9	35	0		48 sums	available	spare	
needed	4	0	9	35	0		48 needed			
							total needed	366 total available	395	
								total spare	29	

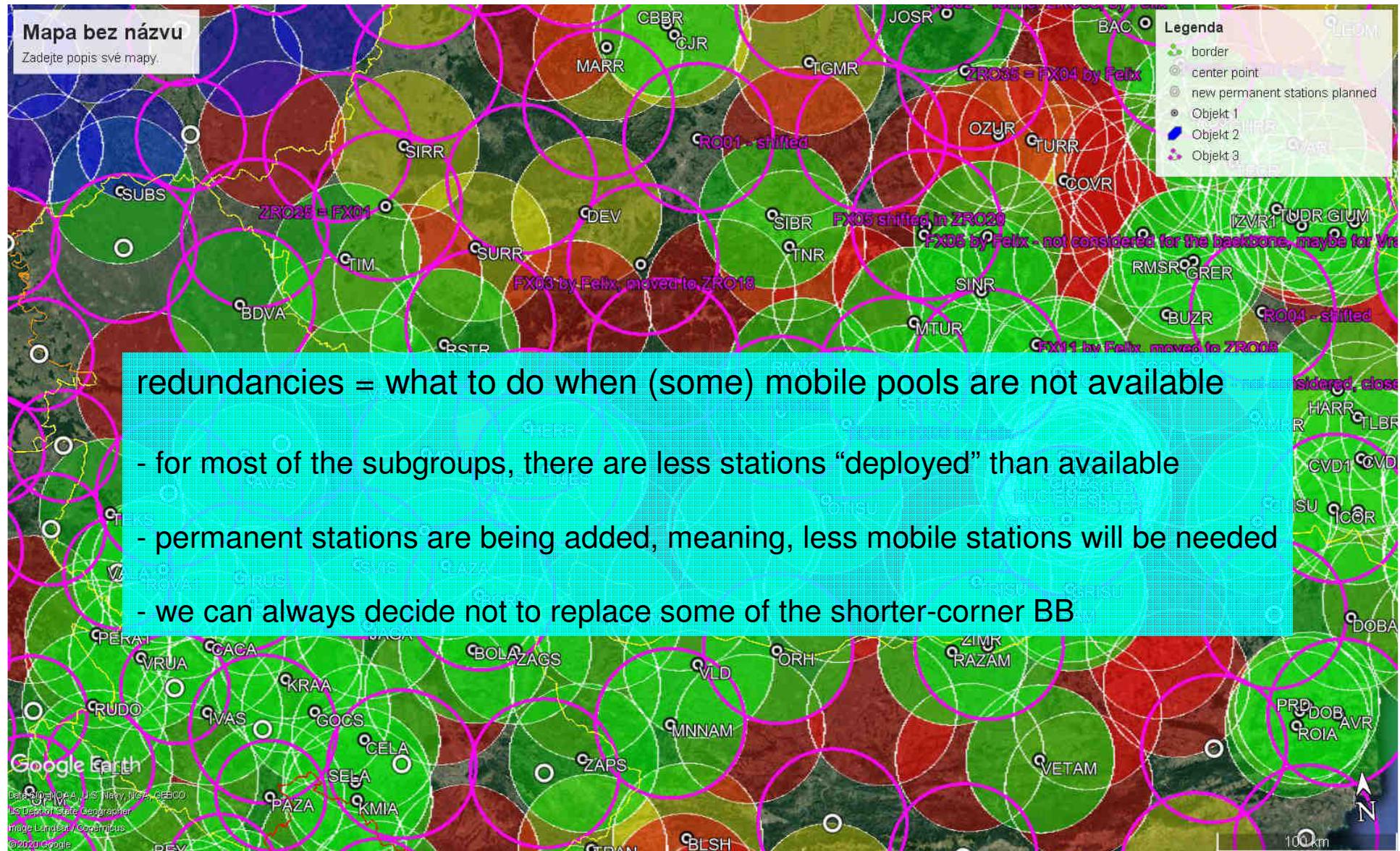
deployment of mobile stations – handmade in GoogleEarth



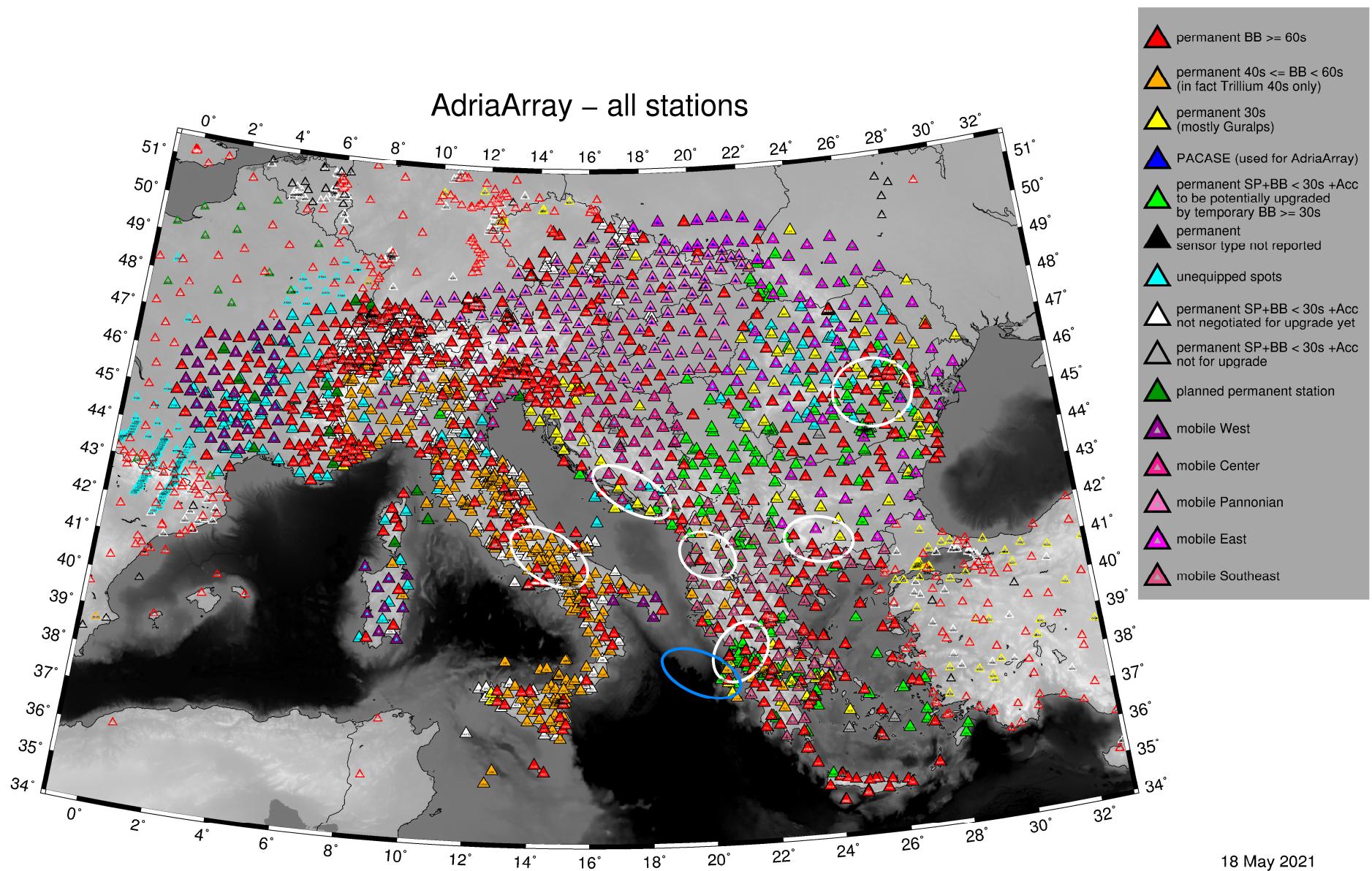
deployment of mobile stations – handmade in GoogleEarth

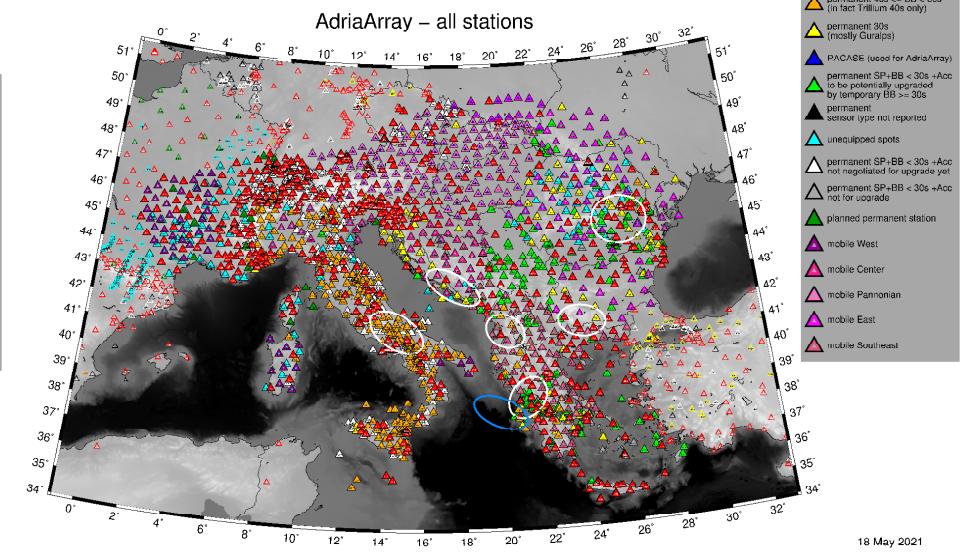
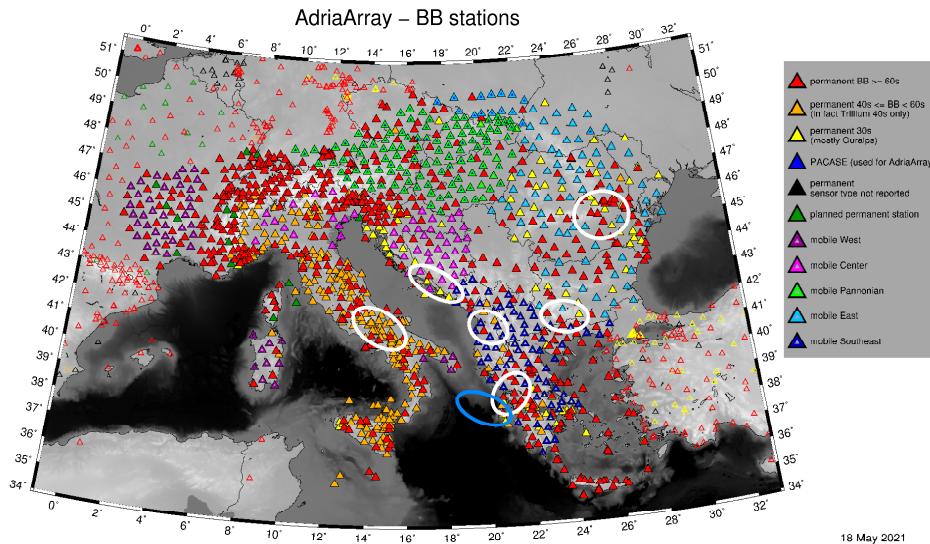


deployment of mobile stations – handmade in GoogleEarth

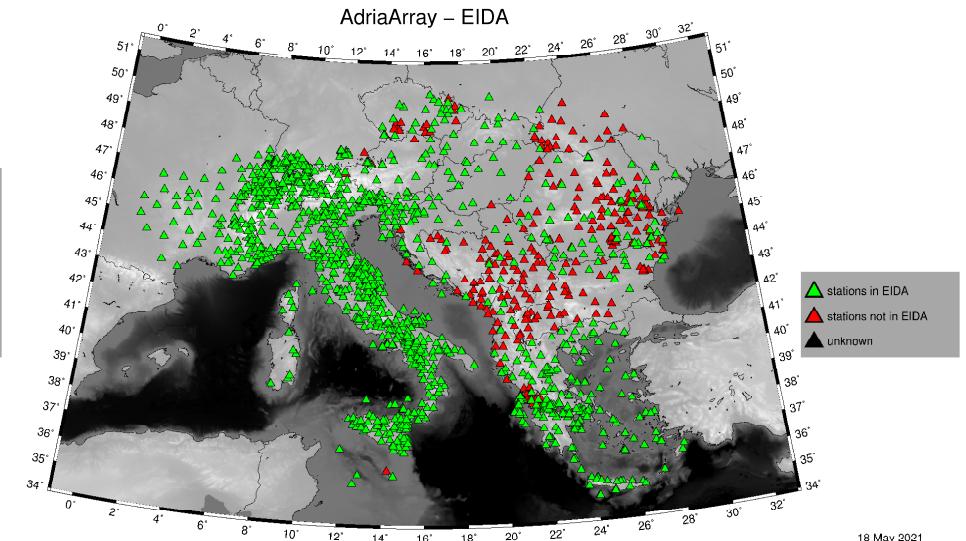
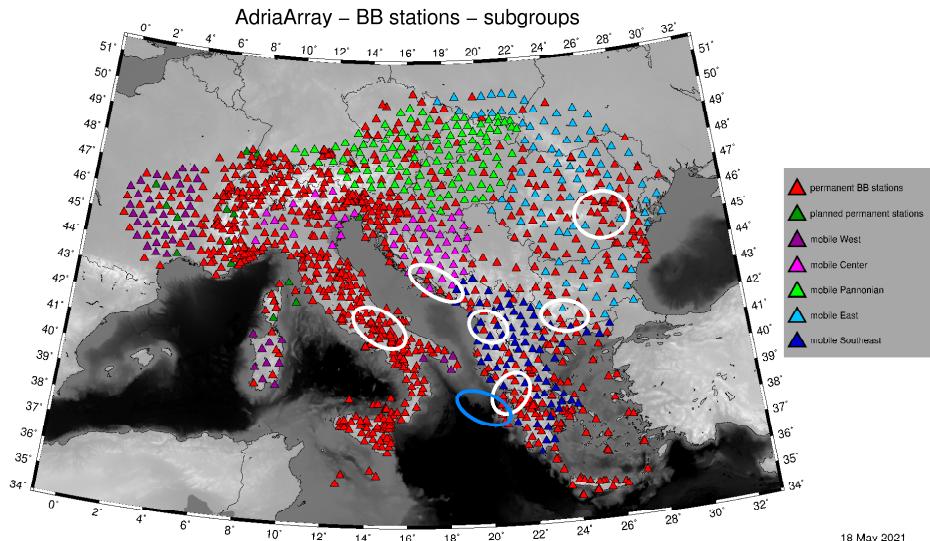


Adria Array – all permanent stations + mobile stations





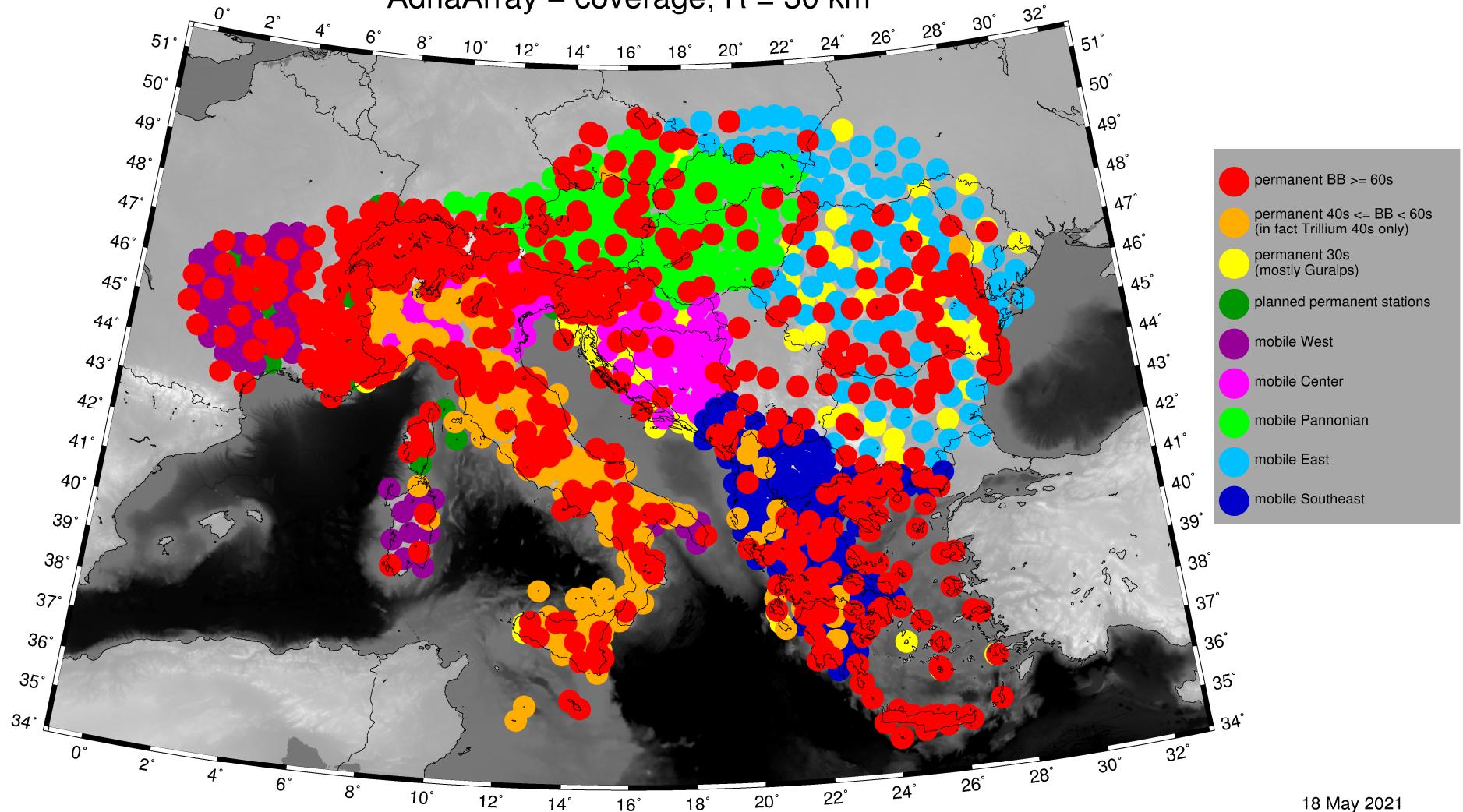
various versions of the map – different levels of information plotted



coverage

30 km

AdriaArray – coverage, $R = 30$ km

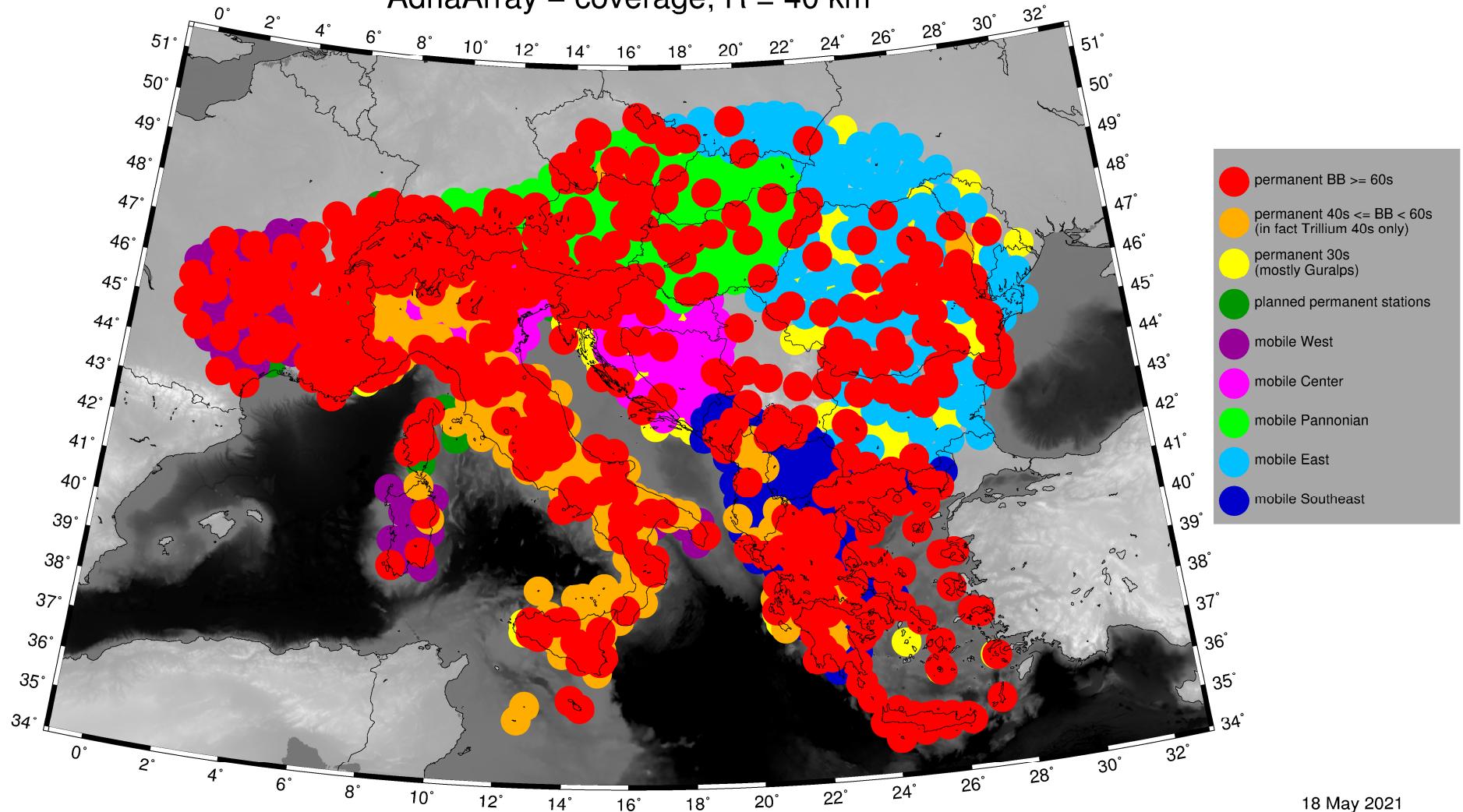


18 May 2021

coverage

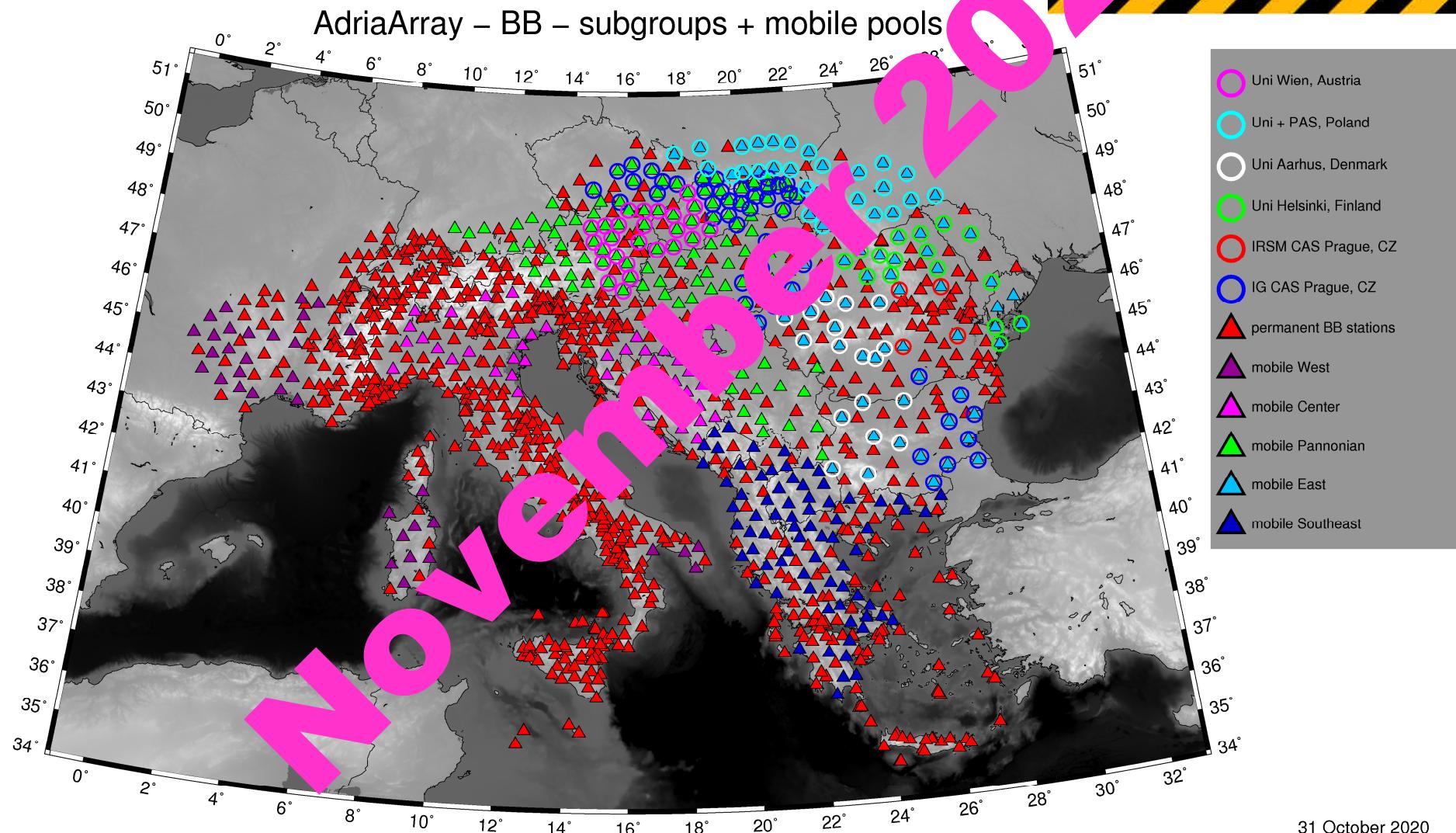
40 km

AdriaArray – coverage, R = 40 km



18 May 2021

mobile pools assigned to the stations – work in progress

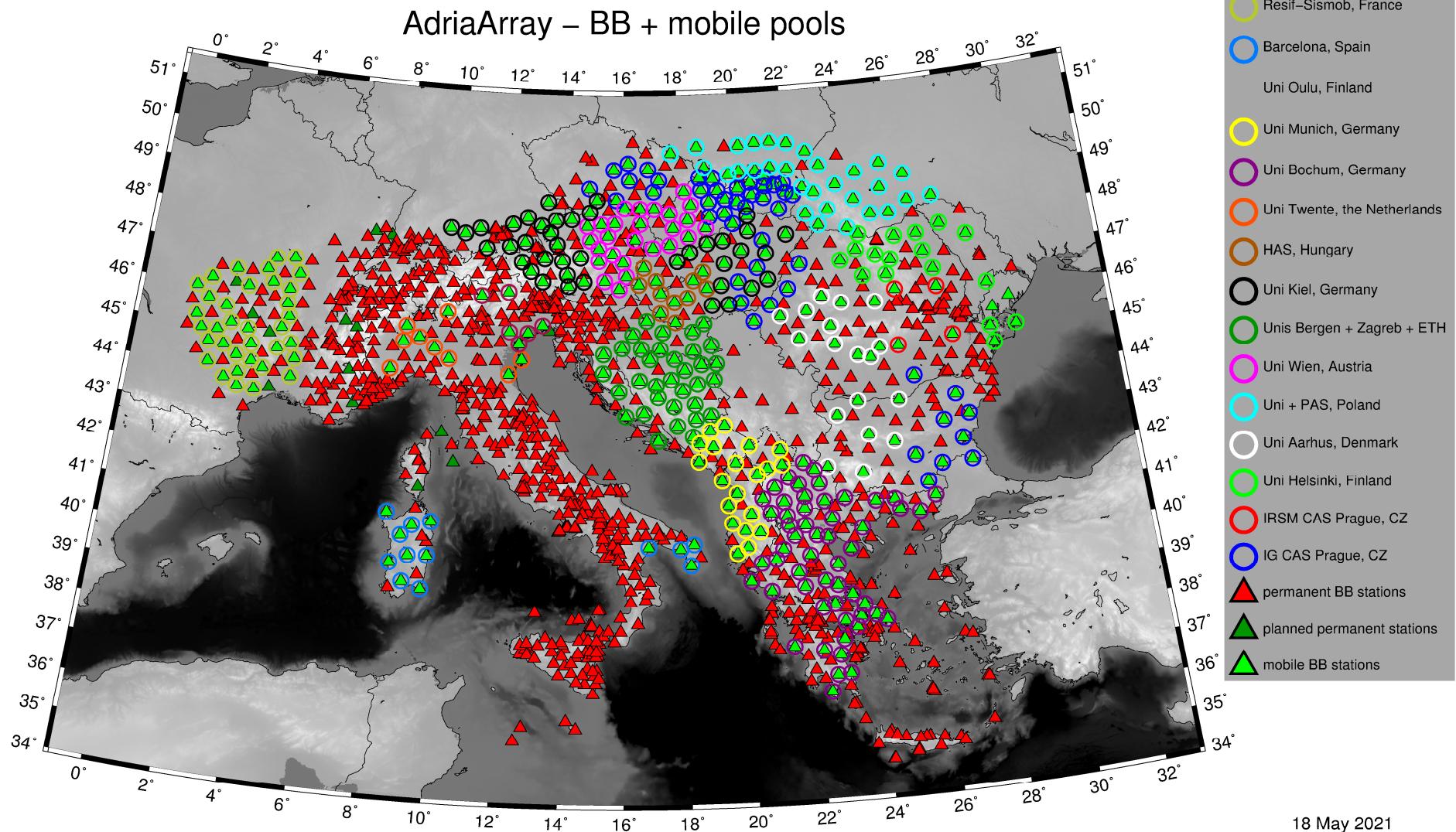


mobile pools assigned to the stations

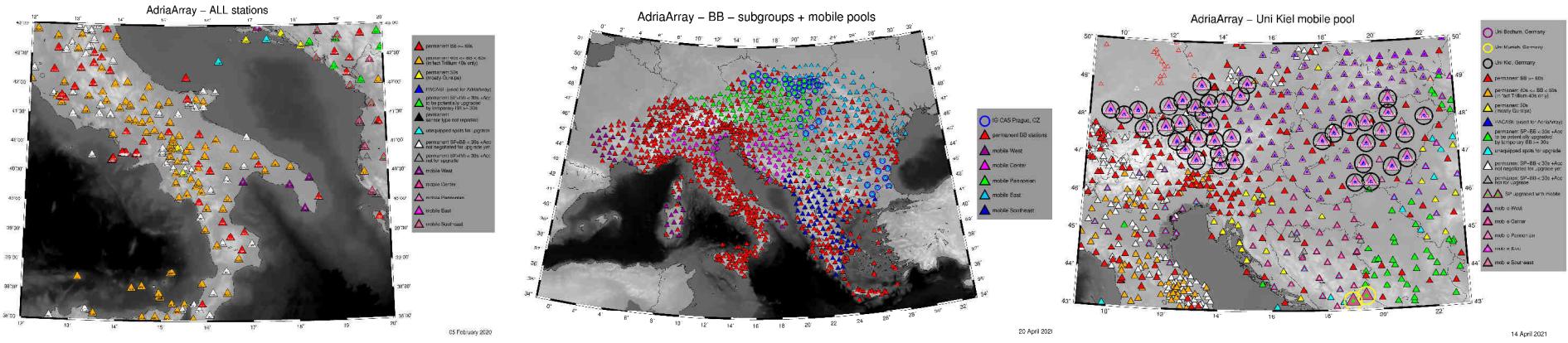
366 BB mobile stations

959 BB permanent stations

--> **1325 BB stations in total**



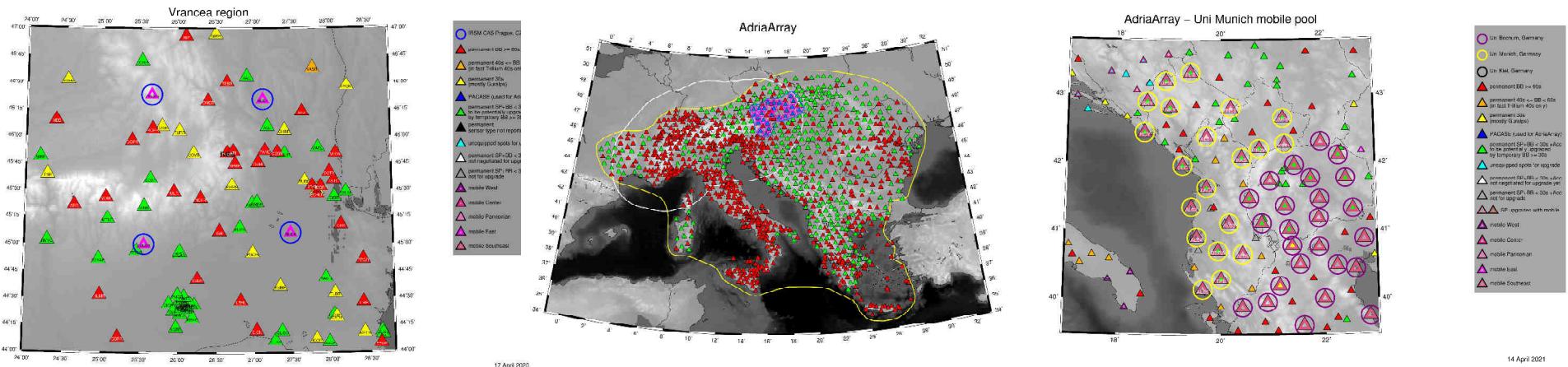
examples of maps to support project proposals



INGV

IG CAS CZ

Uni Kiel



IRSM CAS CZ

Uni Wien

Uni Munich

status:

- overview of permanent stations in the region is ready (and continuously updated)
- the mobile stations are existing and available
- the local network operators are willing to accept and support
 - the installation of the mobile stations
- the local networks and the mobile pool operators are willing to exchange data
 - within the AdriaArray Initiative
- some groups have got already some funding
- suggestion of mobile station distribution is ready (with some redundancy)

plans:

- other groups will apply for funding this year (2021)
- the anticipated time for the installation of the mobile stations
 - is 2 years within 2022-2024
- the plans have to be adjusted according to the pandemic
- I will share the maps and the slides with you

homeworks:

- if there is a **new non-EIDA permanent station** built, please, share the information
- please, let me know your **plans** about building a **new permanent stations** in the near future; longitude + latitude + BB/SP/SM is enough
- comments (reporting errors and so on) **to the maps** are welcome

ORFEUS + EPOS

support from Orfeus/EPOS is crucial for the AdriaArray

AdriaArray idea and Orfeus/EPOS are aiming
in the same direction, focusing on different aspects

infrastructure + science + networking

- archival of data at regional EIDA nodes
- support to AdA workshops via EPOS SP

Datacenter ID	Description and Focus Region
ODC - KNMI	European-Mediterranean, Netherlands
GFZ	European, Global, temporary deployments
RESIF	France + Global temporary deployments
INGV	Italy, European-Mediterranean (MedNet)
ETHZ	Switzerland
BGR	Germany
LMU	Germany (BayernNetz)
NIEP	Romania
KOERI	Turkey
NOA	Greece
UIB - NORSAR	Norway
ICGC	Spain

from the Orfeus web page:

ORFEUS

Observatories & Research Facilities for European Seismology

ORFEUS is the non-profit foundation to coordinate and promote digital, broadband seismology in the European-Mediterranean area.

EIDA is the European Integrated Data Archive infrastructure within ORFEUS to provide access to seismic waveform data in European archives.

- guidelines for quality control and data management being developed

acknowledgements

Maps plotted using GMT by Wessel, P., Smith, W. H. F., Scharroo, R., Luis, J. F. and Wobbe, F., 2013: Generic Mapping Tools: Improved version released, EOS Trans. AGU, 94, 409-410.

AlpArray stations by the AlpArray Working Group www.alparray.ethz.ch.

Permanent stations by national seismological services and ORFEUS-EIDA.

Big thanks to all the network operators for supplying the permanent station information.

PACASE station information thanks to György, Jarka and Antje.

Thanks to Orfeus + Epos for supporting AdriaArray.

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