



AdriaArray status, data access, and lessons learned

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&
the AdriaArray Seismology Group

ORFEUS webinar, May 13

outline of the webinar

what is it?

history of AdriaArray

ORFEUS and AdriaArray

seismic network

data access and quality

sources of information

organization and working groups

examples of data

research and projects

lessons learned

next workshop

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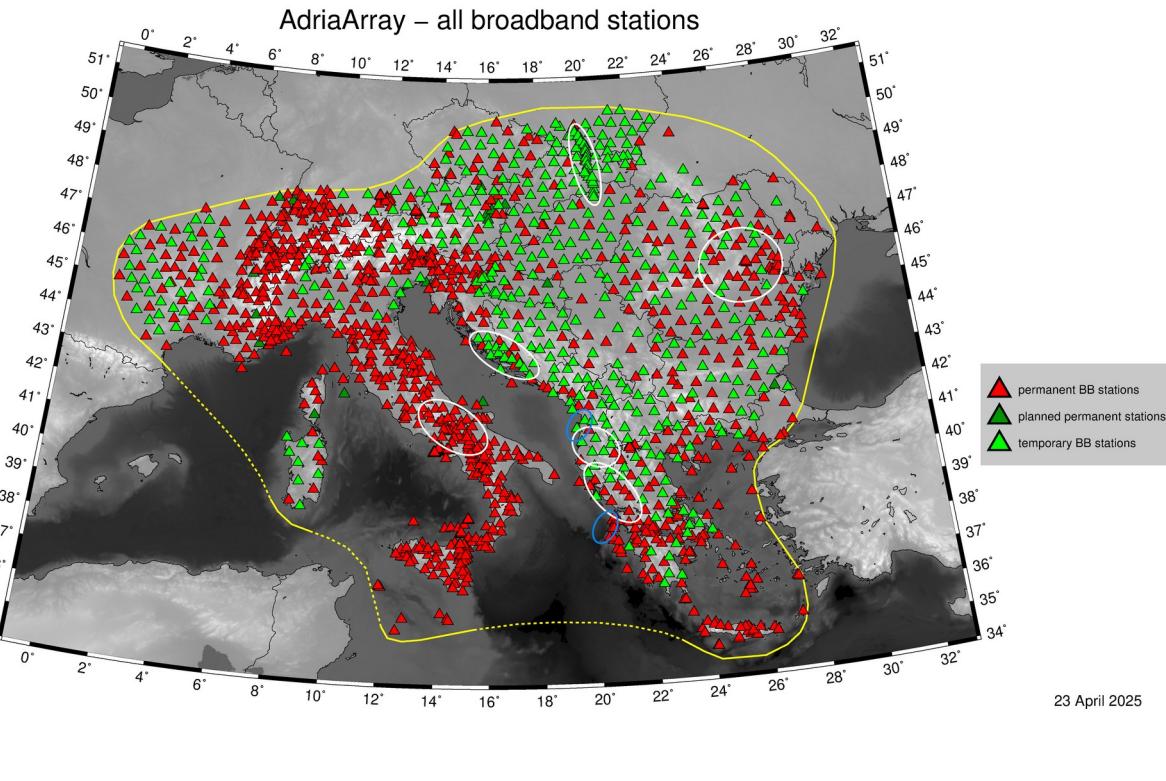
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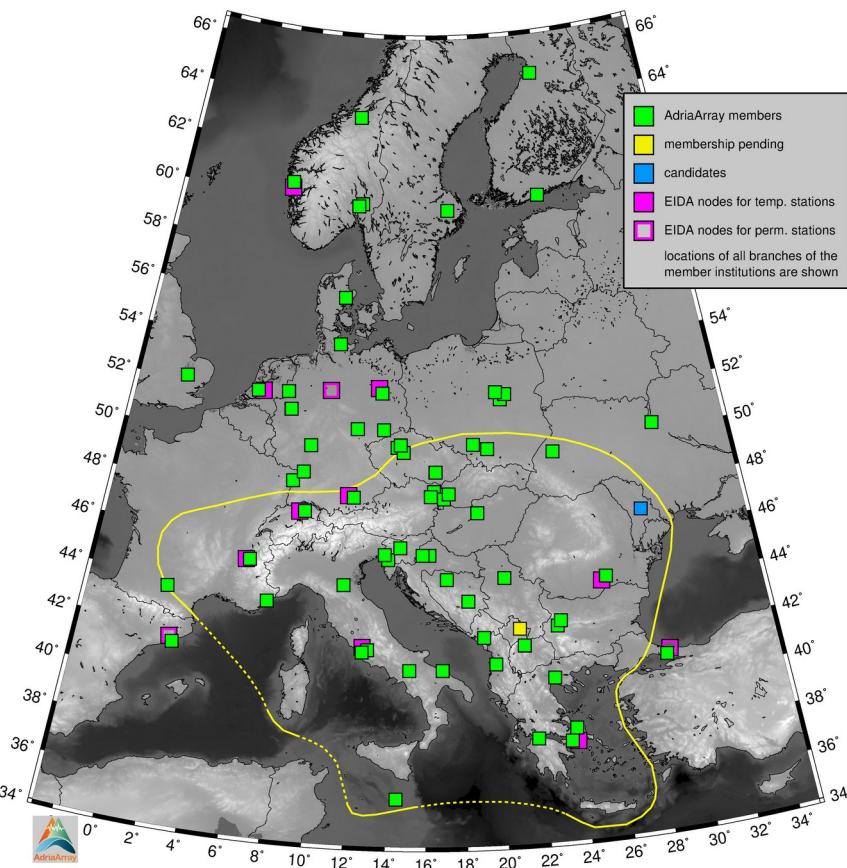
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consortium of 64 institutions



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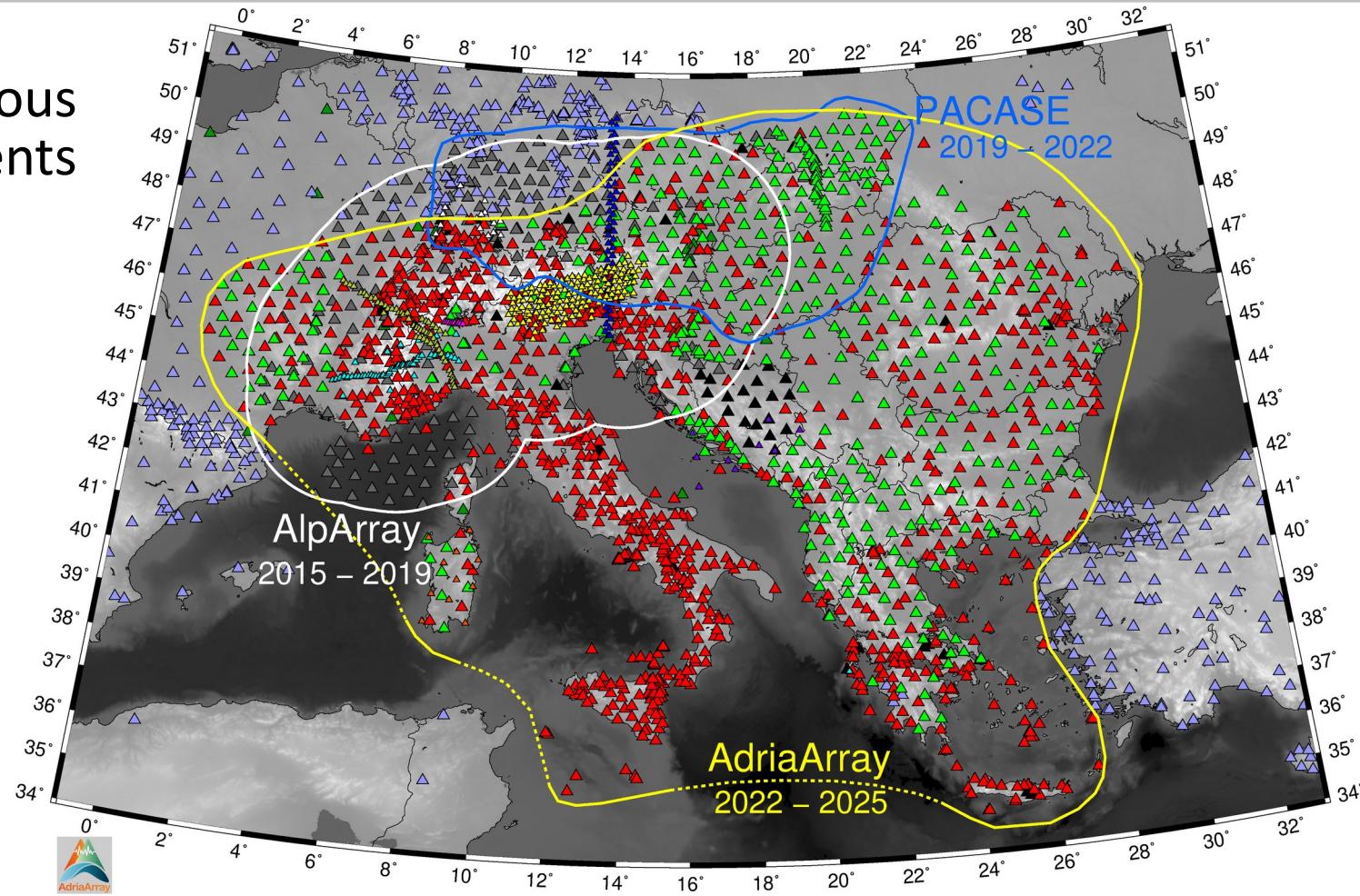
- proposed in **2018** at the AlpArray Science Meeting Zürich
 - preparation from 2019 – 2022
 - **AdriaArray Seismology Group** founded in 2022
 - deployment of stations: 2022 – 2023 (ongoing)
 - duration: 2022 – 2026 (not all stations kept till 2026)

AdriaArray Workshops:

2019	kick-off meeting, Thessaloniki, Greece
2020+2021	online workshops (EPOS/ORFEUS)
2022	AdriaArray/EPOS/ORFEUS Workshop, Potsdam, Germany
2023	AdriaArray workshop, Dubrovnik, Croatia
2024	AdriaArray workshop, Sofia, Bulgaria
2025	AdriaArray workshop, Venice, Italy
2026	AdriaArray workshop, Sopron, Hungary
2027	AdriaArray workshop, Czech Republic ?

COST proposals: submitted in November 2020 - declined
resubmitted in October 2024 - pending

previous experiments



- | | | | |
|---|---|--|------------------------|
| permanent BB stations
in the AdriaArray region | planned permanent stations
AlpArray and PACASE closed
before May 2022 | perm. and temp. active after
May 2022, closed before Jan 2025 | additional BB stations |
| ▲ active temporary AdriaArray | ▲ AlpArray and PACASE closed
before May 2022 | ▲ CASE | ▲ IvreaArray |
| ▲ Swath-D | ▲ EASI | ▲ LiSard | △ StressTransfer |
| ▲ + ▲ CIFALPS + CIFALPS2 | | | |

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Orfeus

- ORFEUS is a member institution
- ORFEUS hosts the AdA webpage https://orfeus.readthedocs.io/en/latest/adria_array_main.html and supports its mainetance
- ORFEUS – EIDA hosts all the data of AdriaArray, both from temporary and permanent stations
- EIDA has been supporting AdA from the beginning with advice and technical solutions
- EIDA maintains the virtual AdA network _ADARRAY
- ORFEUS supported all AdA workshops financially, and (co-)organized the first ones
- there is an AdriaArray category at the ORFEUS forum <https://forum.orfeus-eu.org/c/adriaarray/40>
- ORFEUS organizes webinars :-)

other sources of support

- EPOS - Task 4.3 included in the EPOS SP (EPOS Sustainability Phase) project (Horizon 2020) with the main goal of supporting “the design, coordination and preparation of a large-scale observational seismology project in the Adria-Balkans-Dinarides region with expected impacts for the broader Euro-Mediterranean Earth Science community”.



- CoLiBri - a Task Force of the International Lithosphere Programme (ILP, by IASPEI), supported the Sofia 2024 and San Servolo 2025 workshops



- attendance fee for the workshops, used fully for supporting travel and accommodation for participants, who would not come to the workshops otherwise



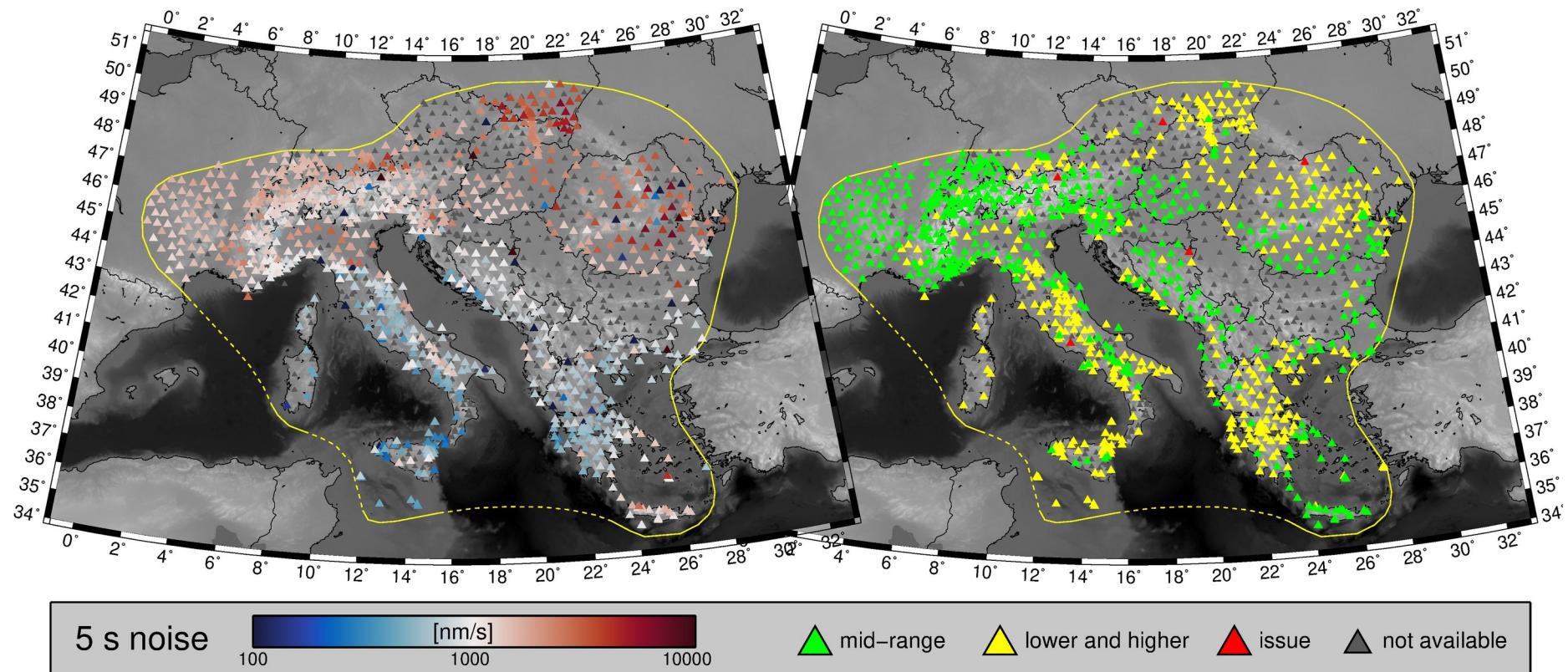
Sofia, 2024, photo by Gergana Georgieva

ORFEUS User Advisory Group and AdriaArray

personal and topical connections



ORFEUS User Advisory Group and AdriaArray



Left: noise levels for the AdriaArray backbone extracted for the 5 s band. Right: Simplified evaluation of outlying stations. Noise measurement by Felix Eckel, a member of the UAG.

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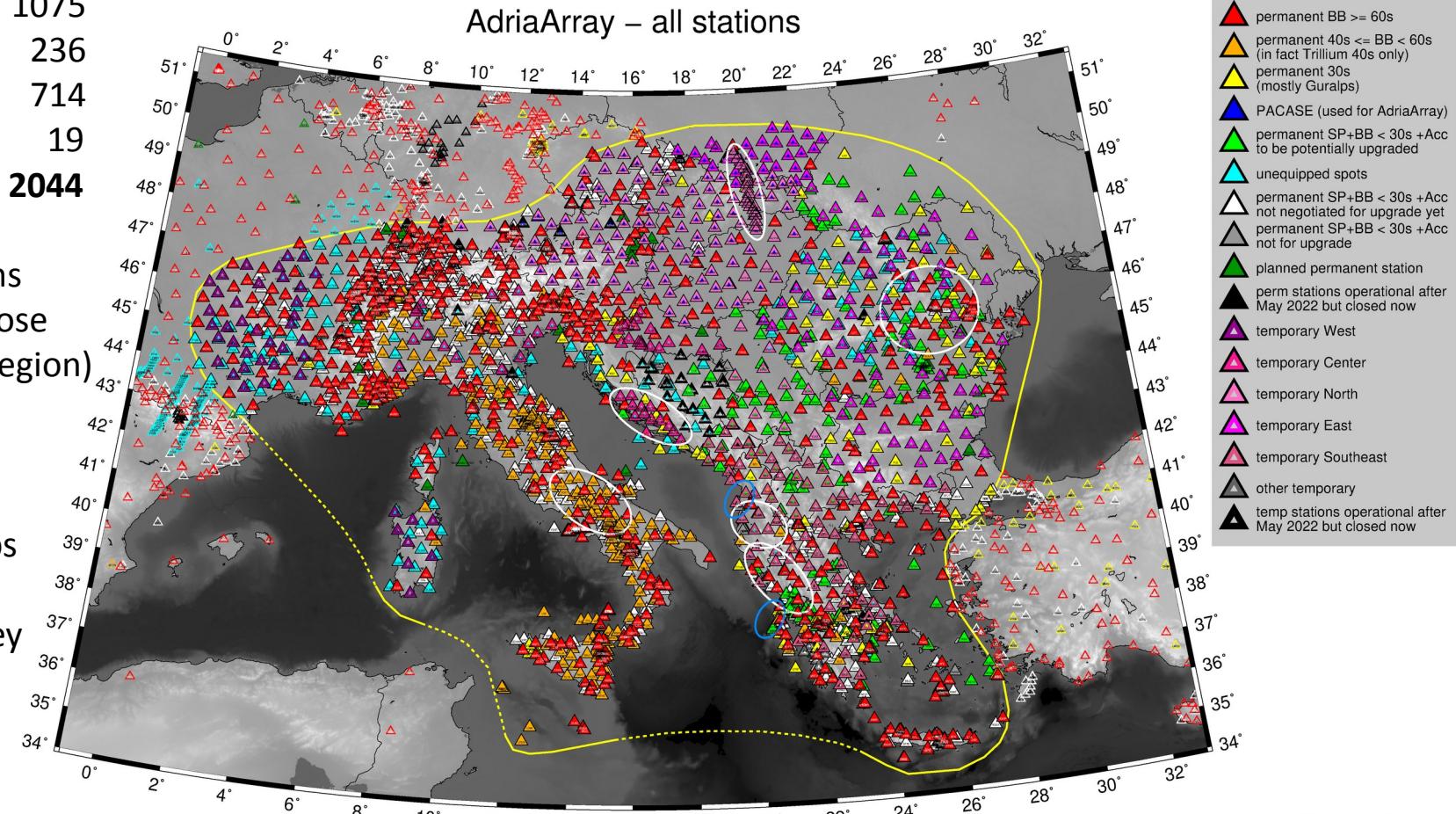
next workshop

PERMANENT stations inside the AdriaArray region:

BB (>= 30s) = backbone	1075
SP+SM for upgrade	236
SP+SM others	714
planned permanent	19
total permanent	2044

(there are ~ 3200 stations
on the map including those
outside the AdriaArray region)

synchronization of
the inventories and maps
with EIDA provided
regularly by Luděk Vecsey

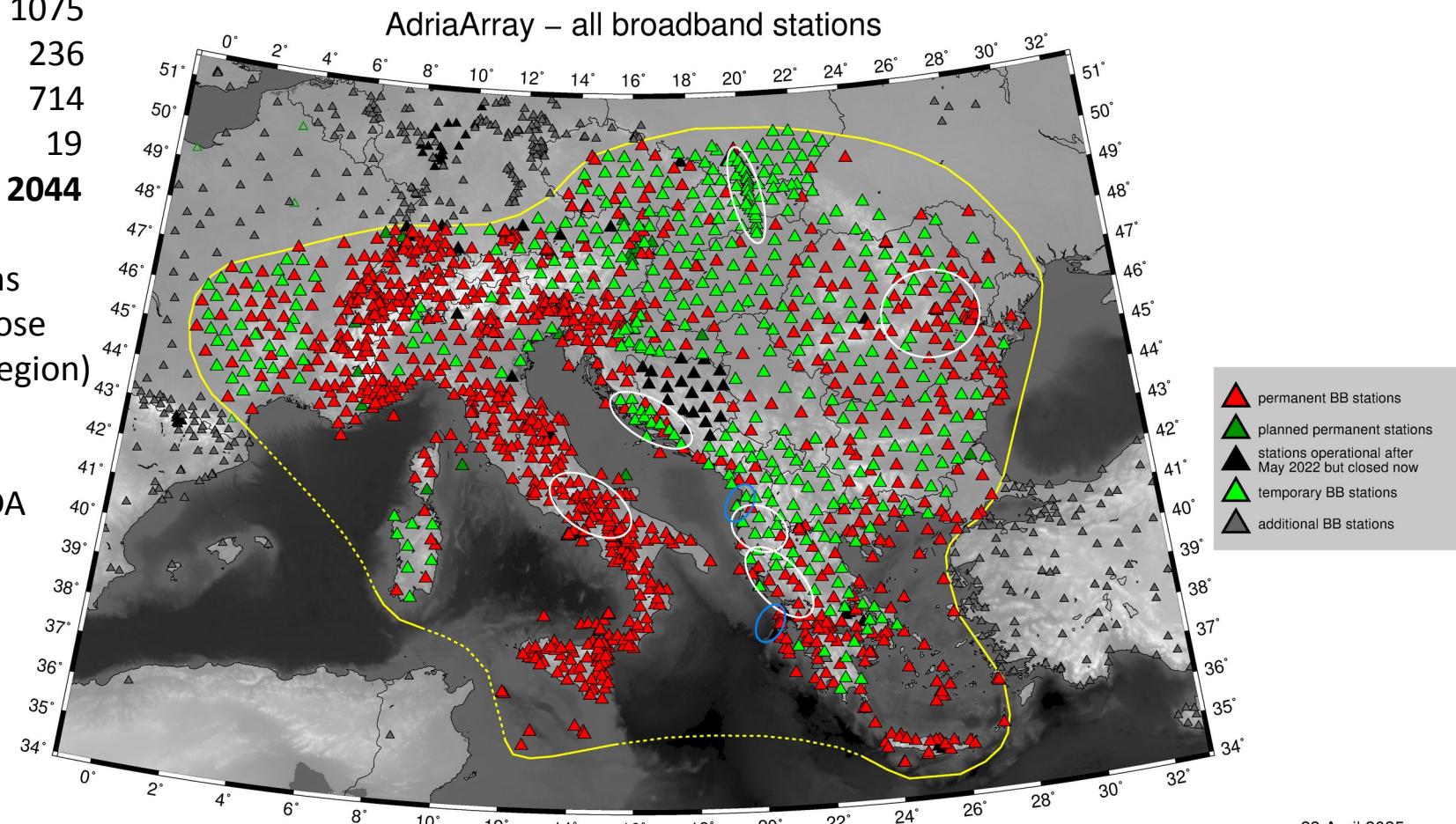


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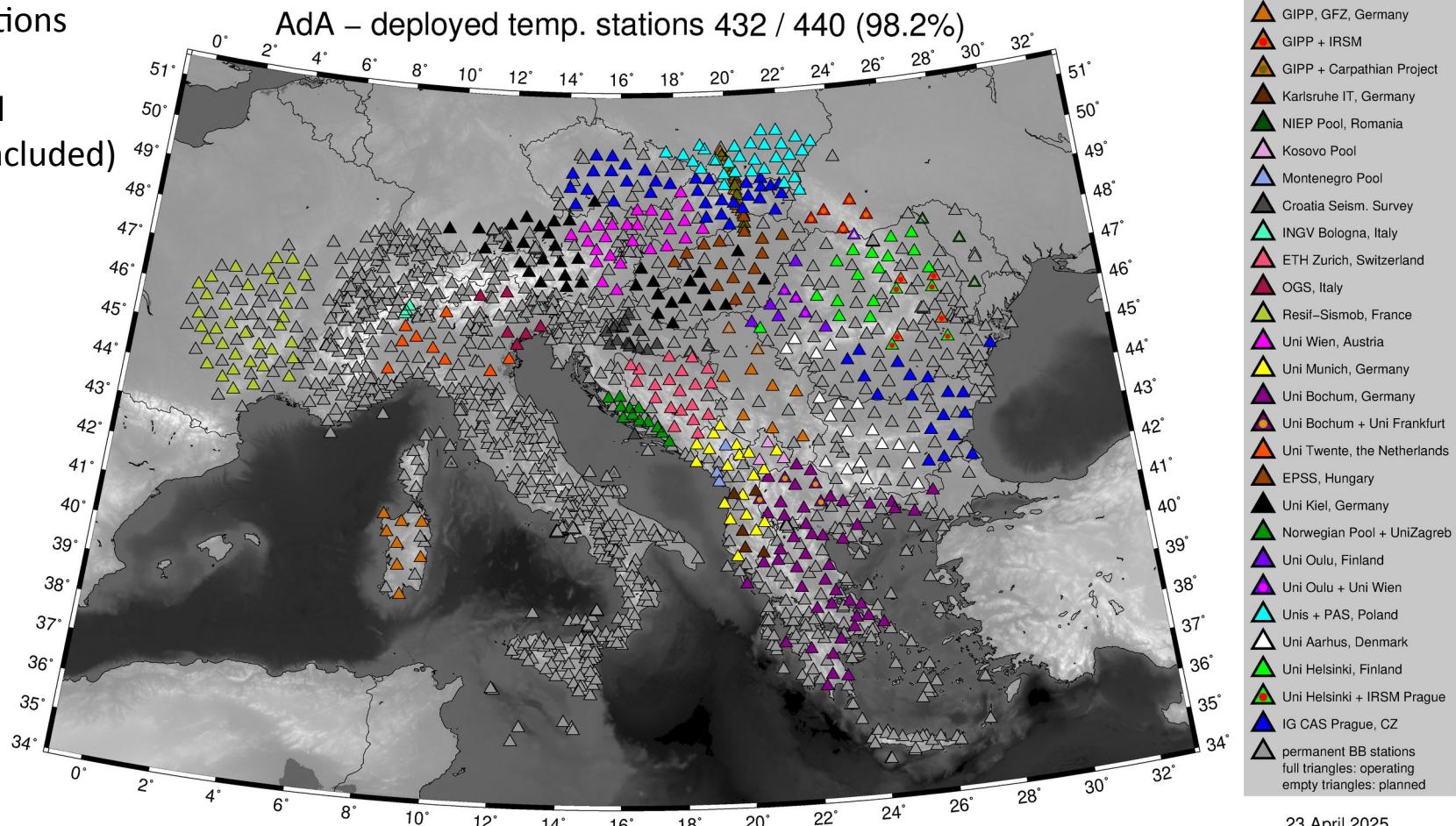
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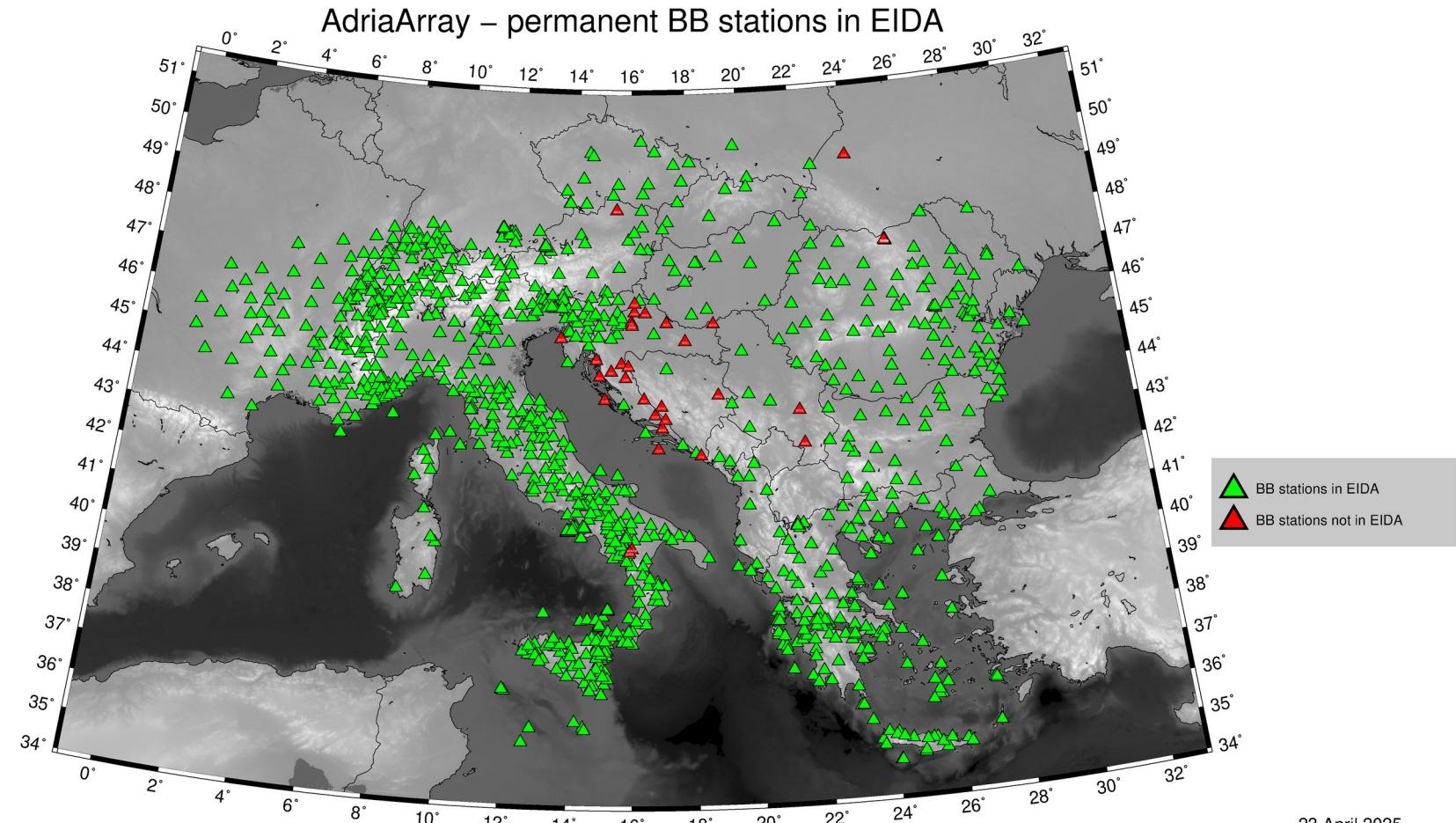


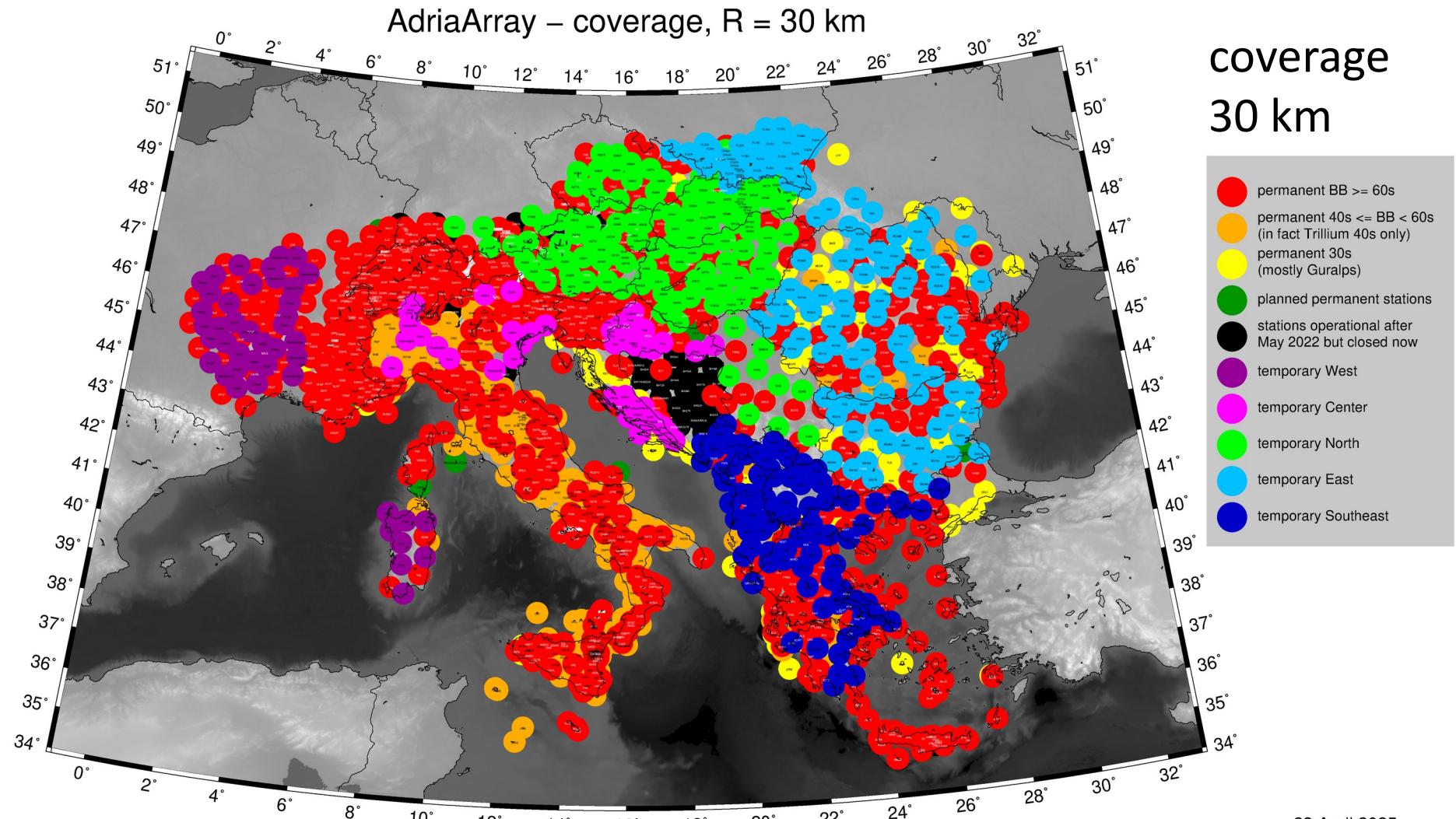
AdriaArray backbone**440** BB mobile stations**1075** BB permanent stations

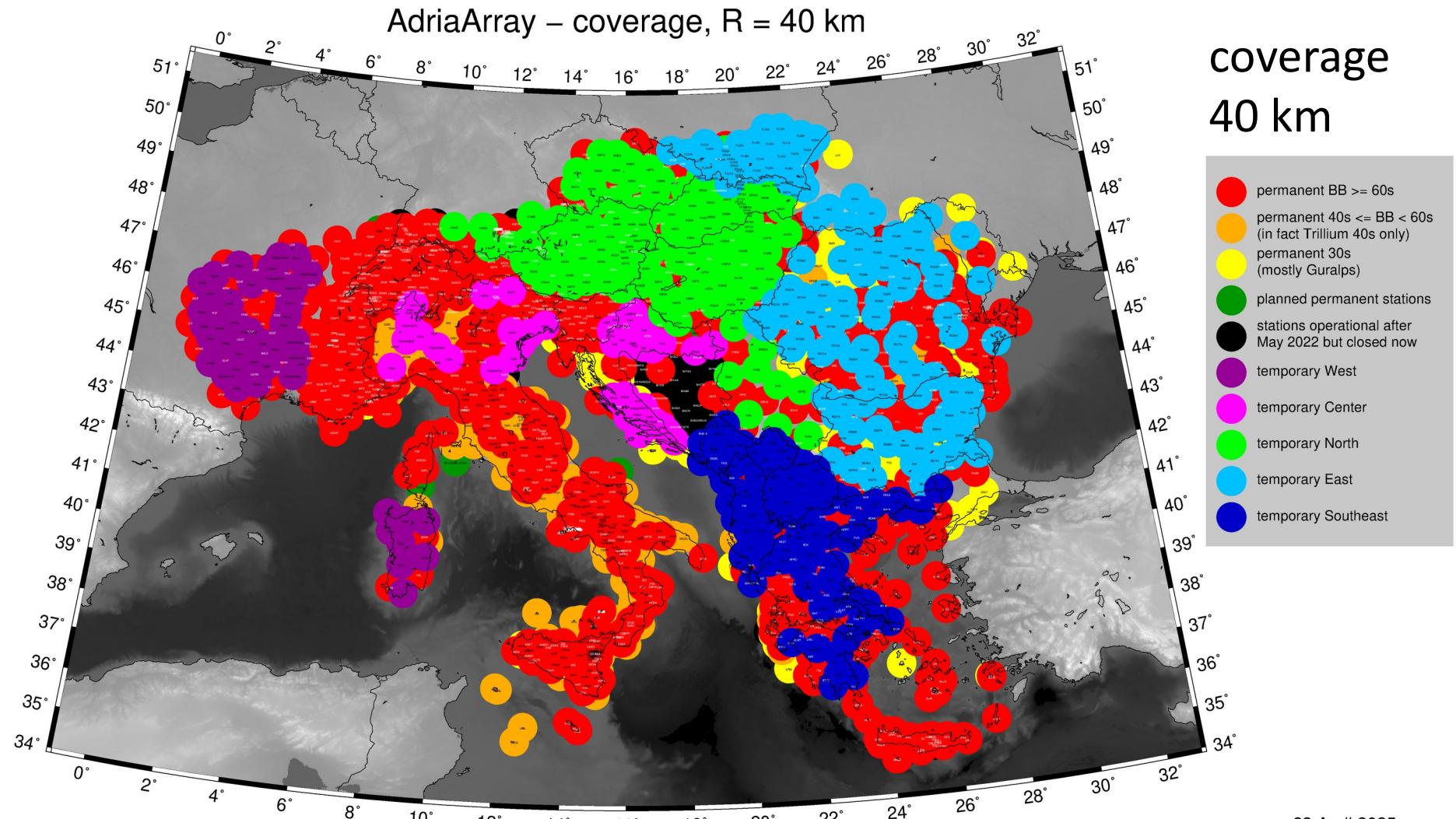
1515 BB stations in total
 (local BB experiments included)



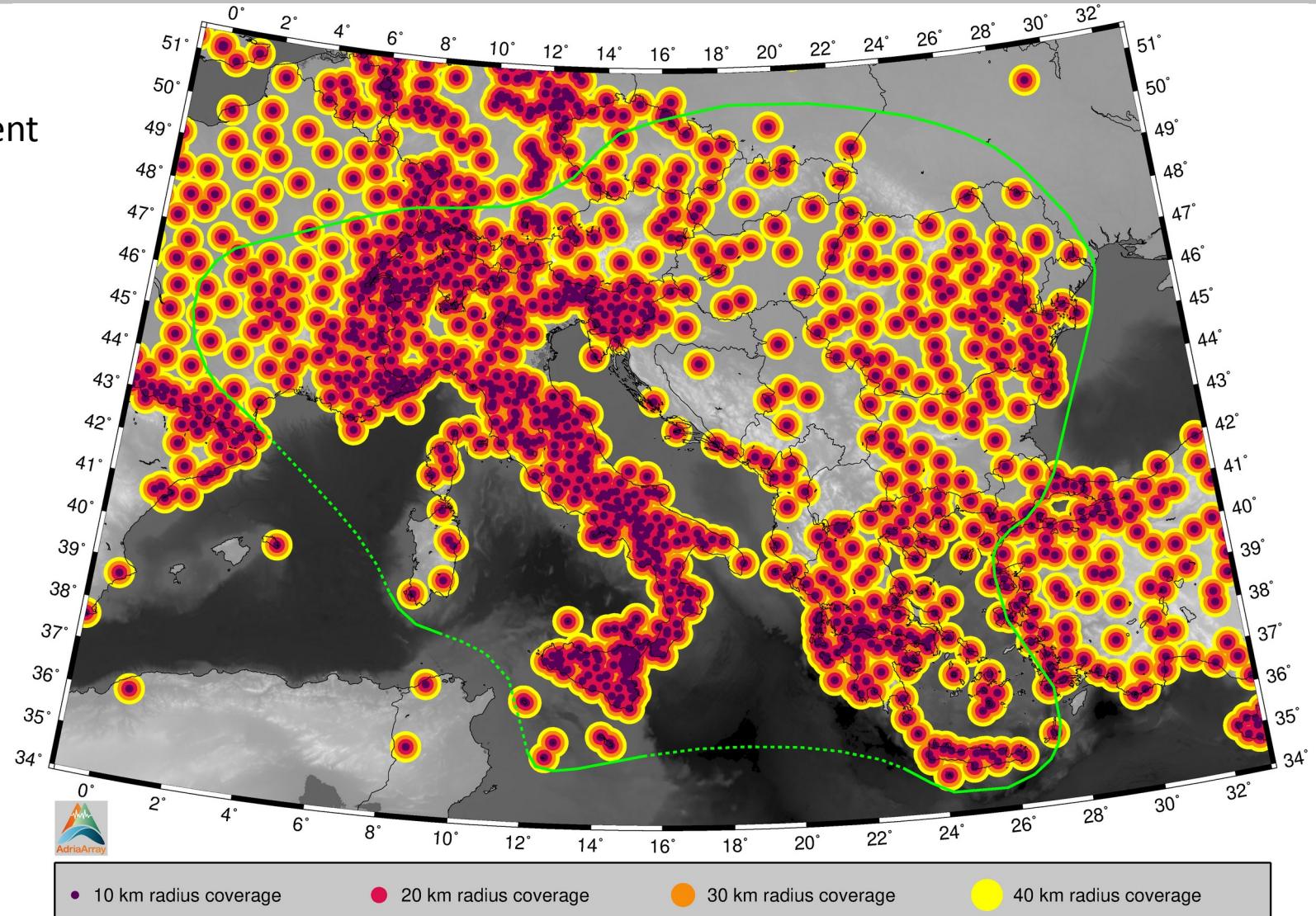
from that **1075** permanent stations, **1042** are already in EIDA (**97%**) => 33 are not in EIDA
(still talking about the **backbone**, meaning 30+ s corner period)



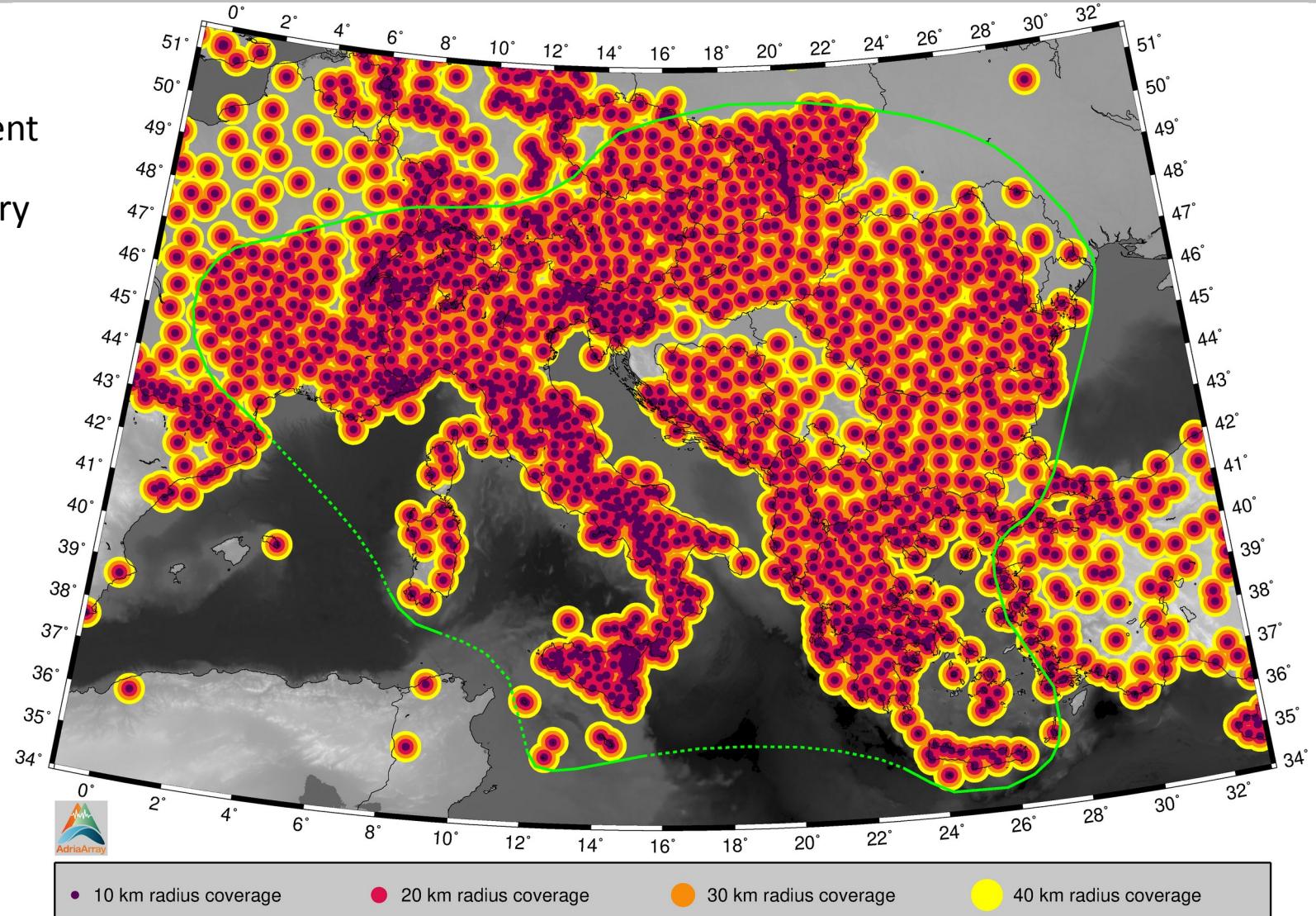


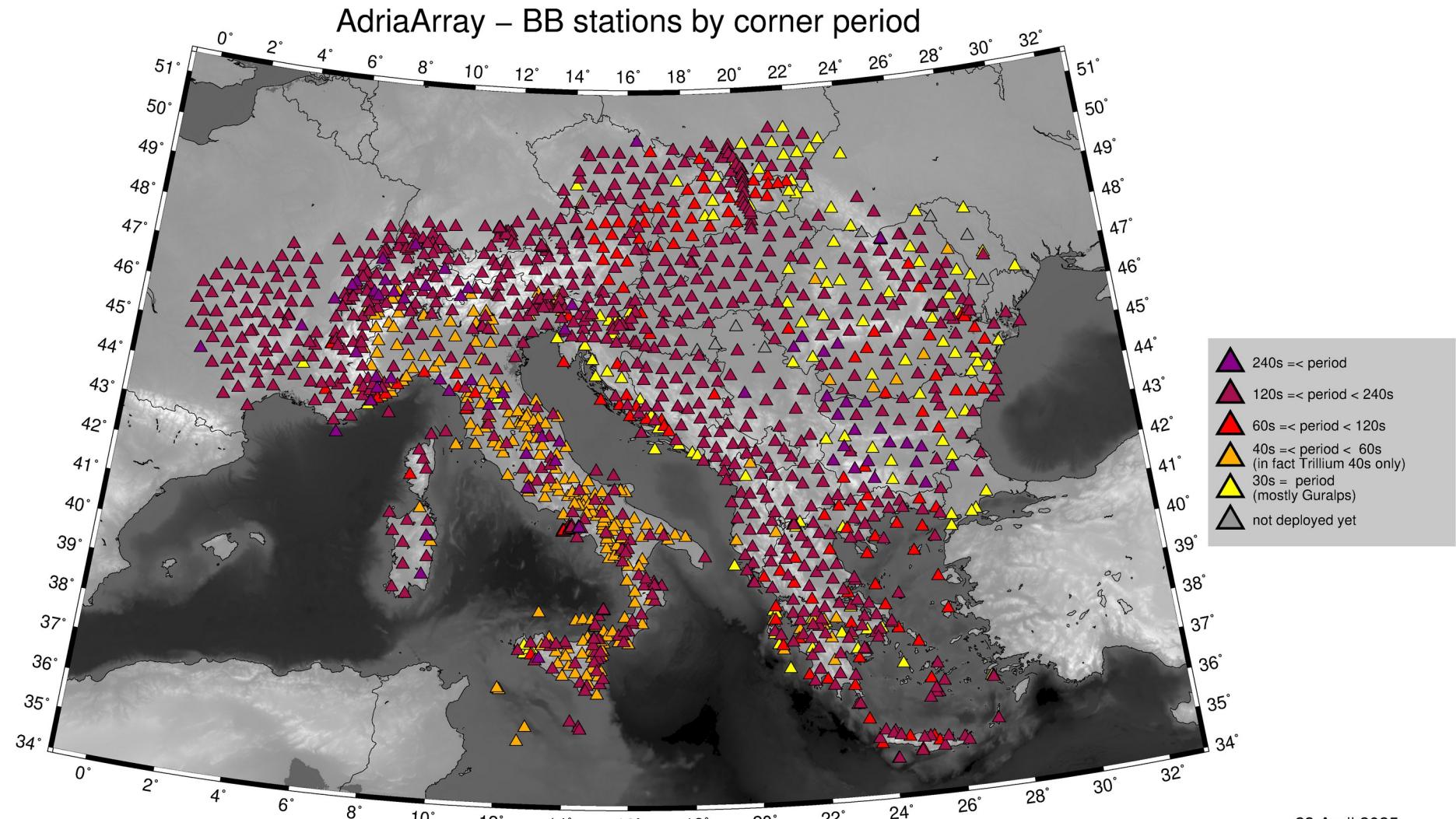


permanent



permanent
+
temporary





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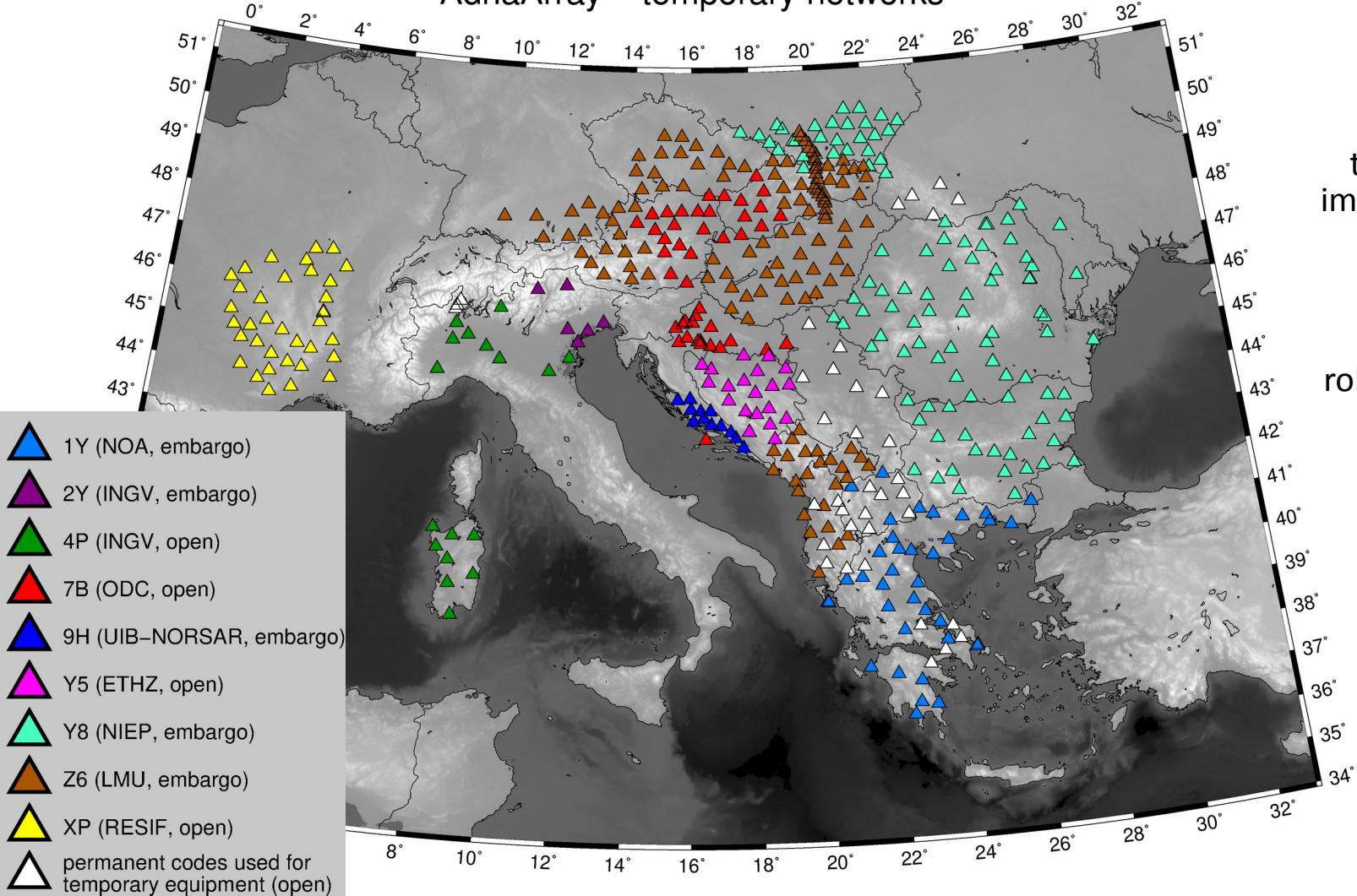
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AdriaArray – temporary networks



Data access via EIDA:
permanent stations:
1075 stations are open

temporary stations: available
immediately for the AdriaArray
participants

**public access to temporary
stations:**
rolling embargo of two years is
applied to **286** stations

154 stations are open

> 1/3 = open
< 2/3 = embargoed

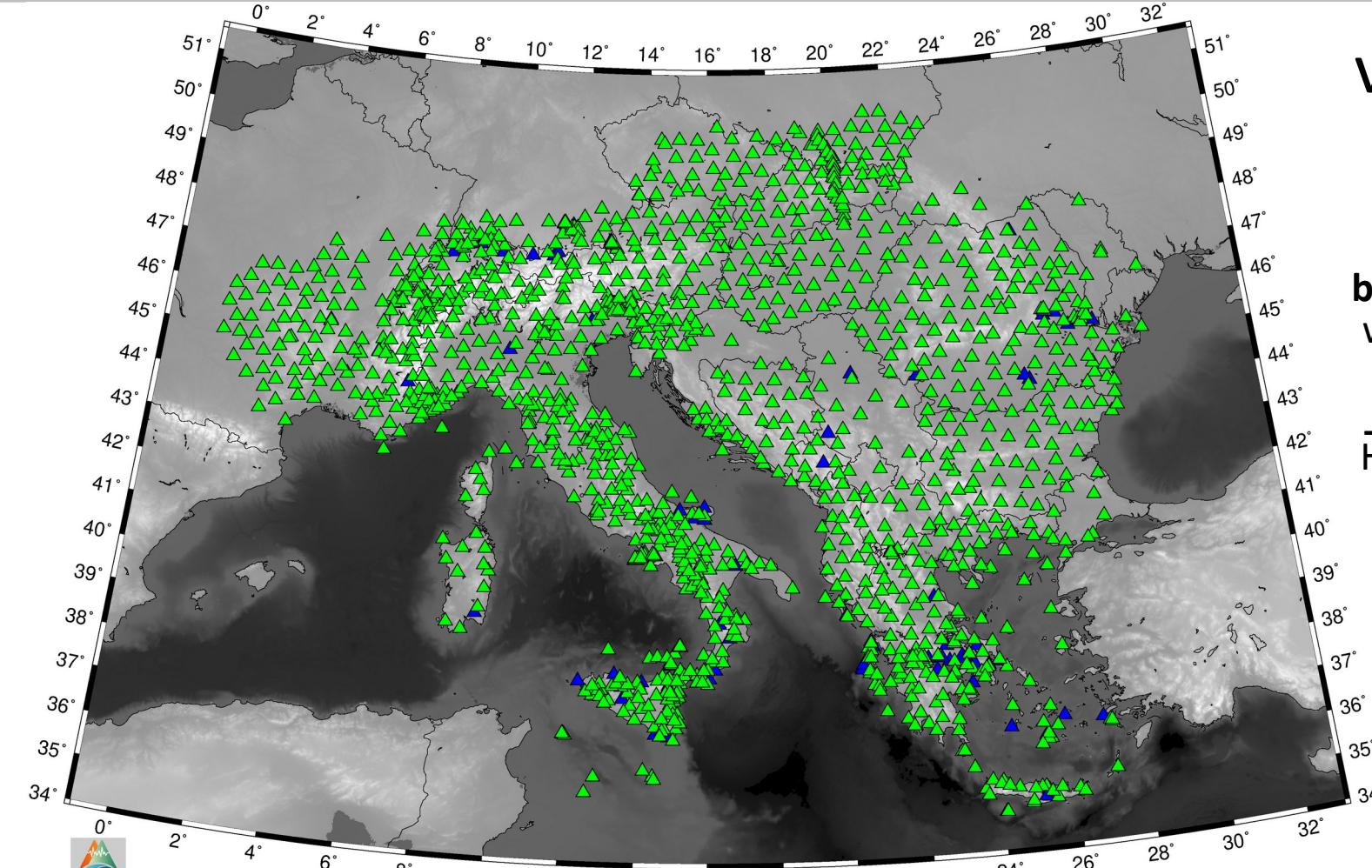
real-time data exchange of
AdA data: according to
existing institutional
agreements

virtual network _ADARRAY

backbone == all BB stations with corner period ≥ 30 s

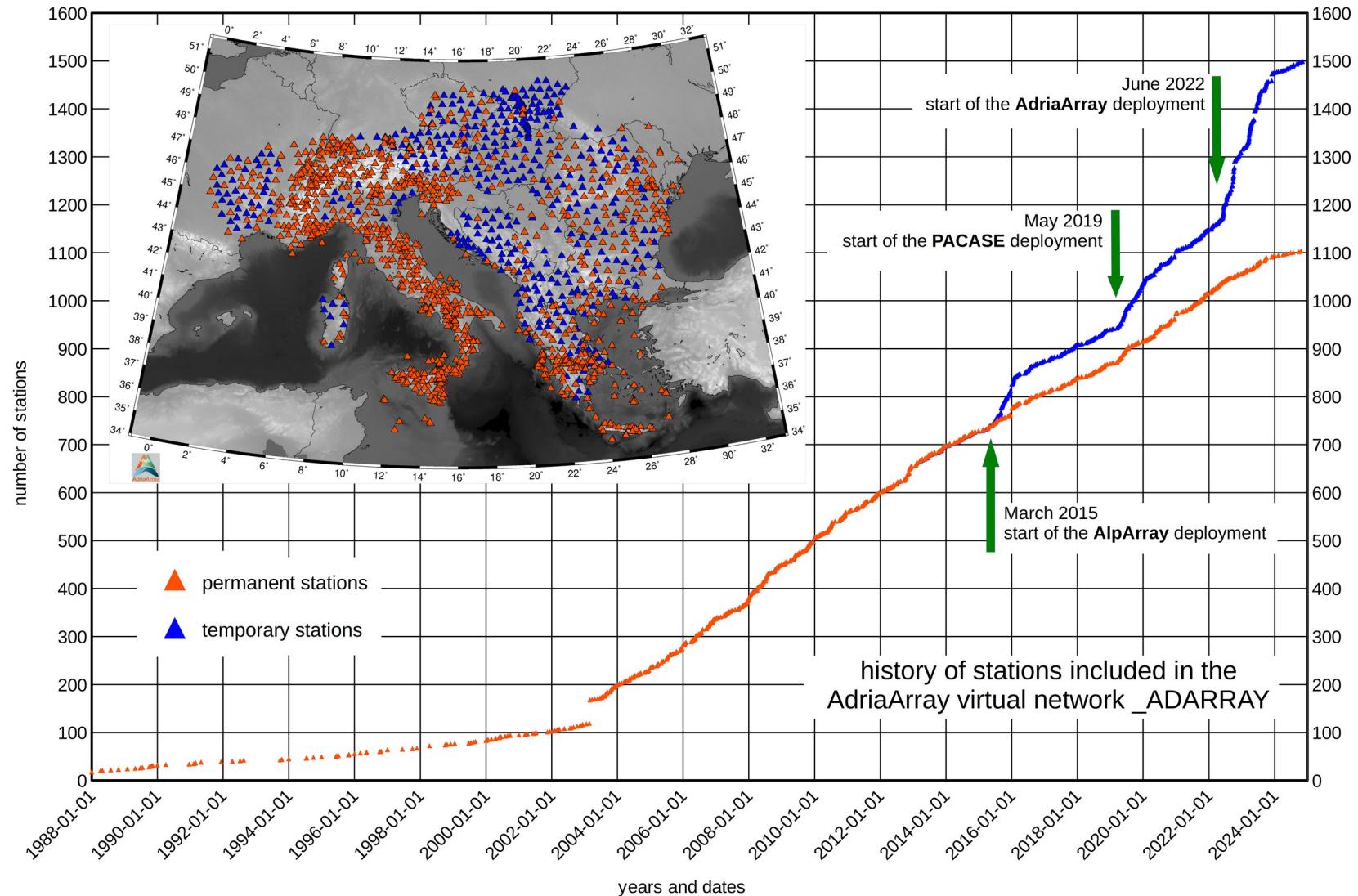
_ADARRAY == all BH* and HH* channels, meaning all BB stations with corner period ≥ 10 s

backbone is a subset of the virtual network
_ADARRAY



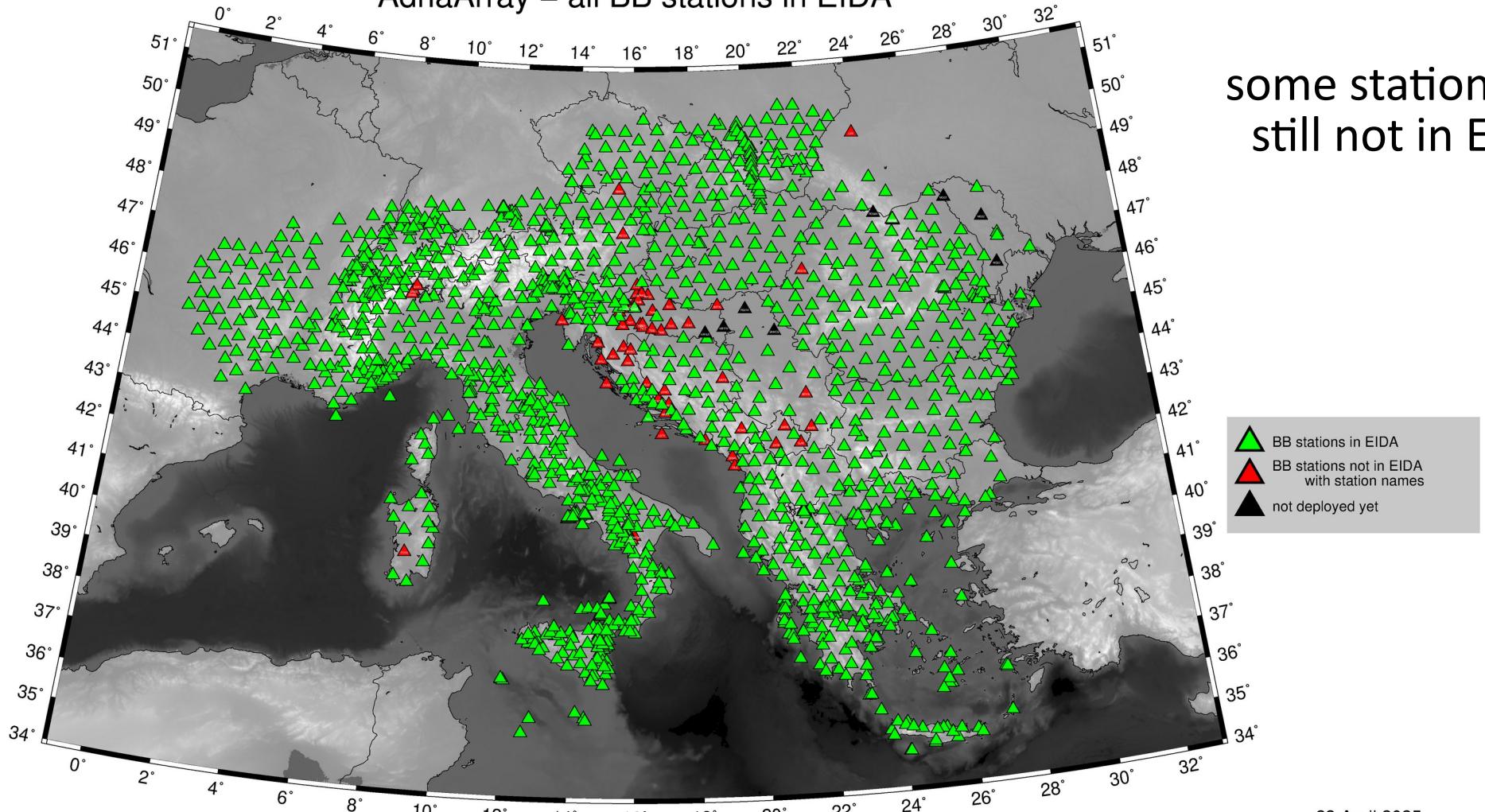
▲ AdriaArray backbone stations in EIDA, all included in the _ADARRAY

▲ additional stations of the _ADARRAY virtual network

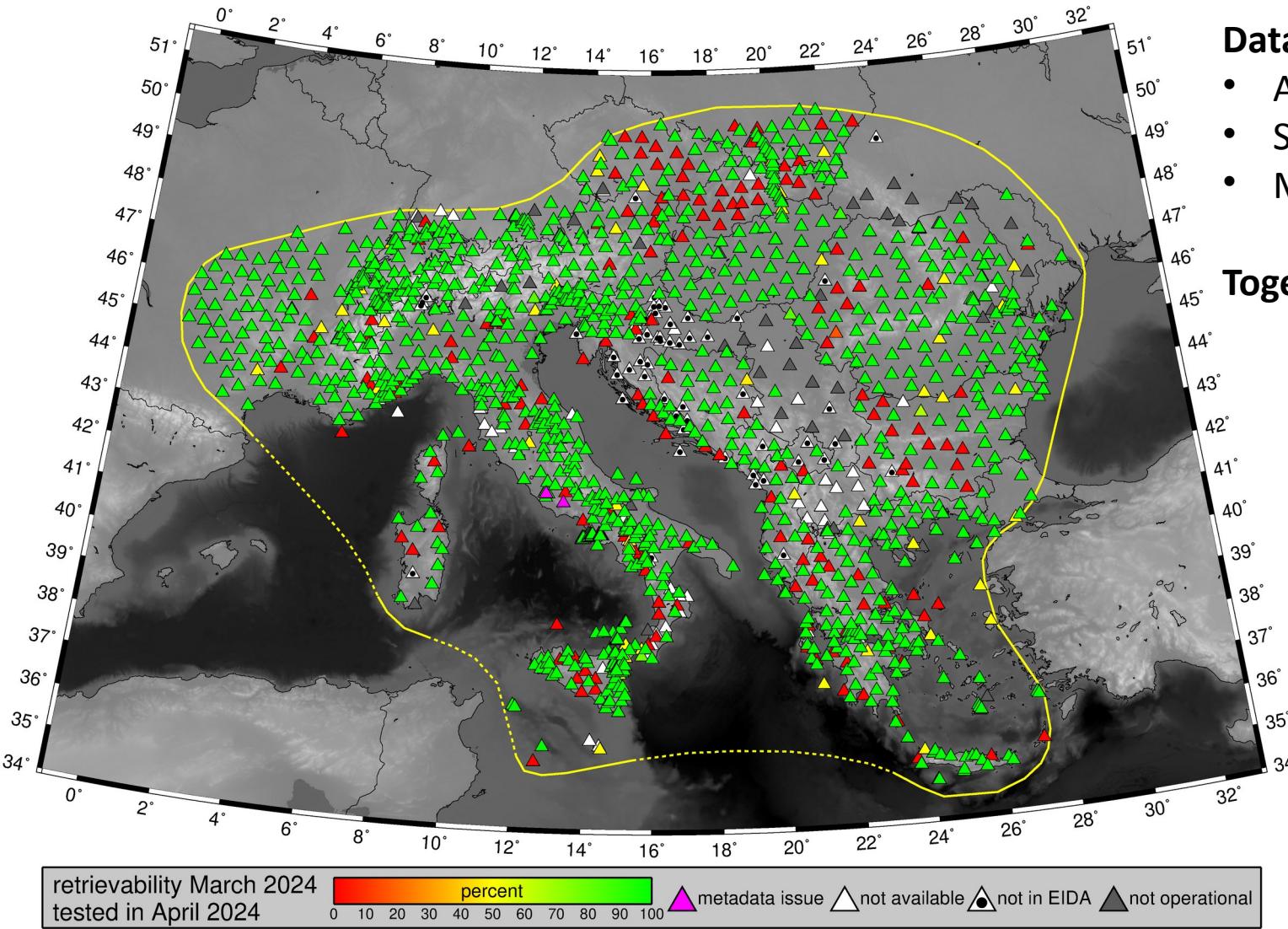


history
of
deployment
of stations
included in
ADARRAY

AdriaArray – all BB stations in EIDA



some stations are
still not in EIDA

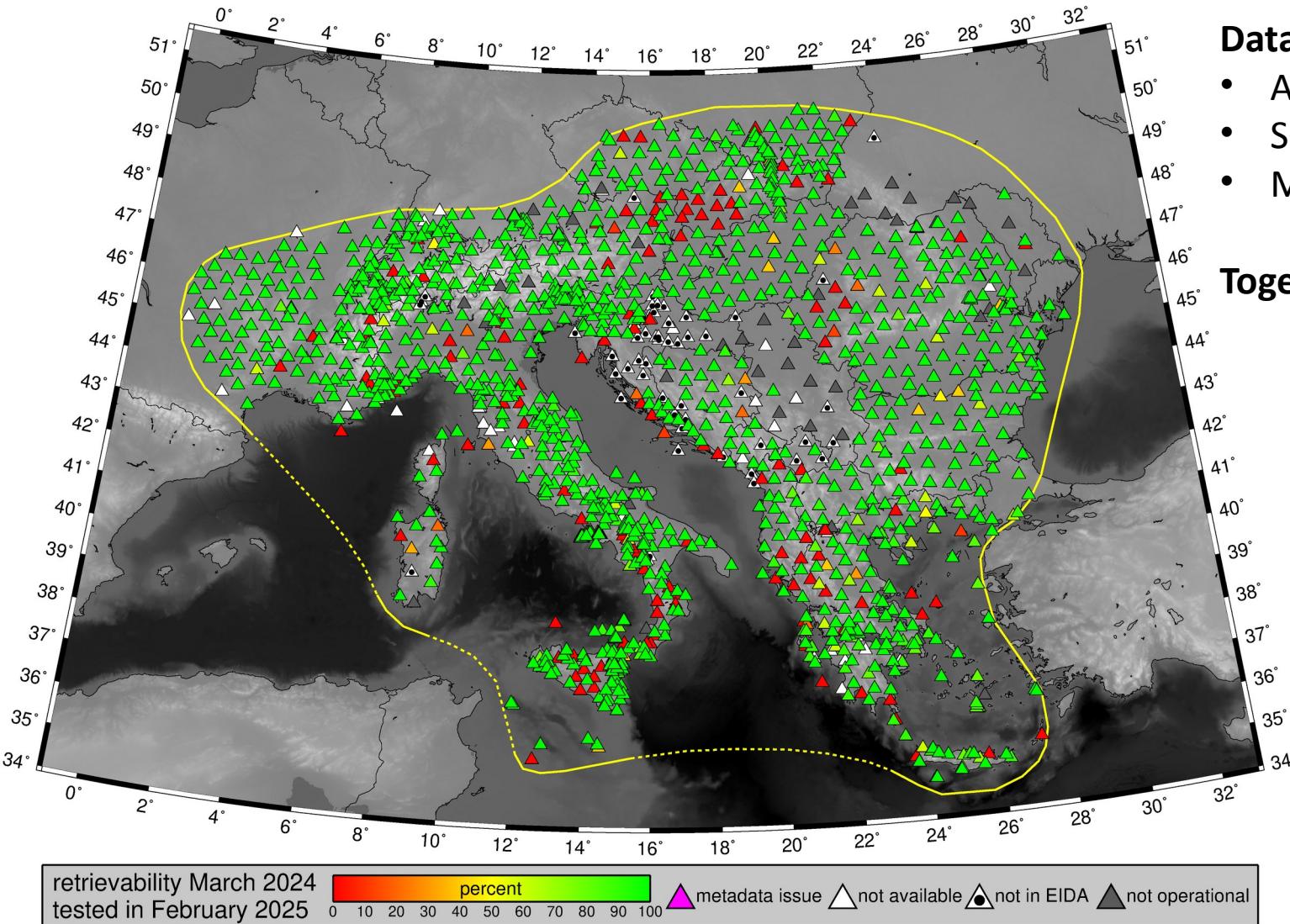


Data quality control:

- Availability
- Signal-to-noise ratio
- Metadata?

Together with ORFEUS UAG



**Data quality control:**

- Availability
- Signal-to-noise ratio
- Metadata?

Together with ORFEUS UAG

backfilling of data



[https://github.com/PetrColinSky/
DataQuality/tree/master/summary](https://github.com/PetrColinSky/DataQuality/tree/master/summary)

Methods for data and metadata quality tests of large dense seismic networks - focus on AdriaArray

Petr Kolínský^{1*}, Johannes Stampa^{2,3}, Luděk Vecsey¹, Felix Eckel², Tena Belinić Topic⁴, Thomas Meier² and the AdriaArray Seismology Group⁵

(¹) Institute of Geophysics of the Czech Academy of Sciences, Prague, Czech Republic

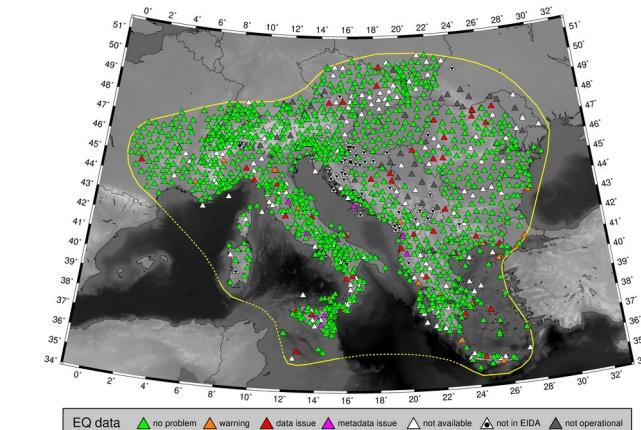
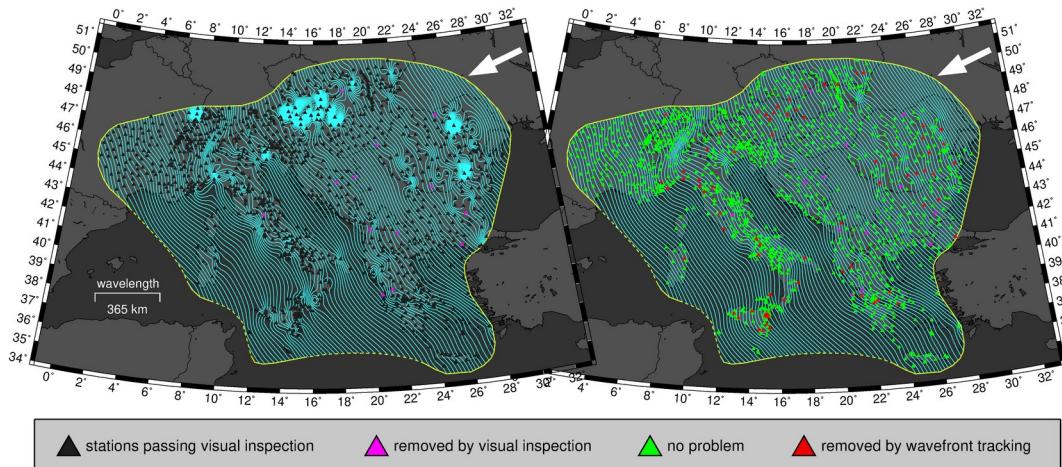
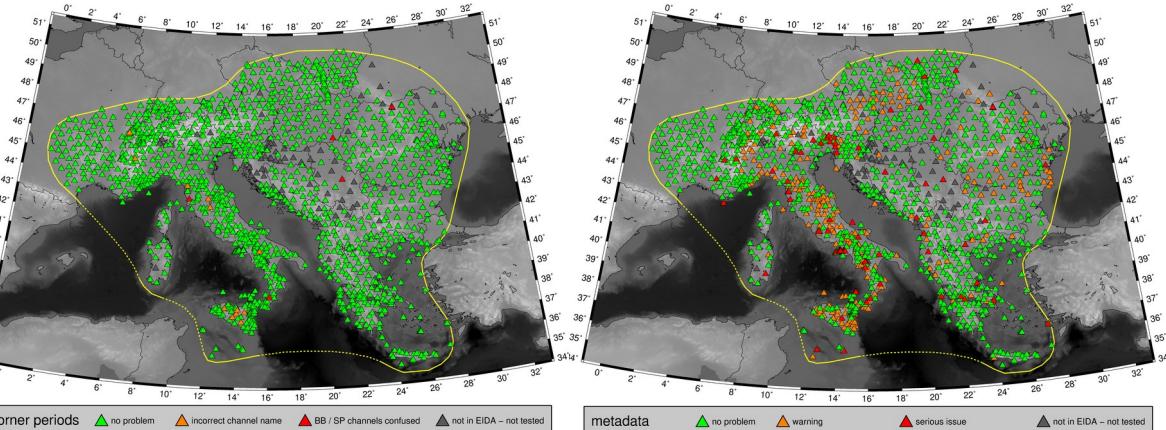
(²) Institute for Geosciences, University of Kiel, Germany

(³) Department of Earth Sciences, Bullard Laboratories, University of Cambridge, Cambridge, United Kingdom

(⁴) Department of Geophysics, Faculty of Science, University of Zagreb, Croatia

(⁵) https://orfeus.readthedocs.io/en/latest/adria_array_main.html

data and metadata tests



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ORFEUS Strong-Motion Support Grants

Focus Section on European Seismic Networks and Associated Services and Products

Conference Sessions

EPOS Seismology Workshop 2023

ORFEUS & Geo-INQUIRE Workshops 2024

GEO-INQUIRE PRODUCTS

Integration of UT network (Ukraine) in EIDA

Infrasound integration guidelines

EIDA Guidelines for the creation of derived products from raw DAS data

ORFEUS & Geo-INQUIRE Workshops 2024

ADRIAARRAY INITIATIVE:

AdriaArray

AdriaArray - Mission

AdriaArray - Logo

AdriaArray - Current deployment

AdriaArray - Station map

AdriaArray - Station properties

AdriaArray - Relation to EPOS

AdriaArray News

AdriaArray - Organization

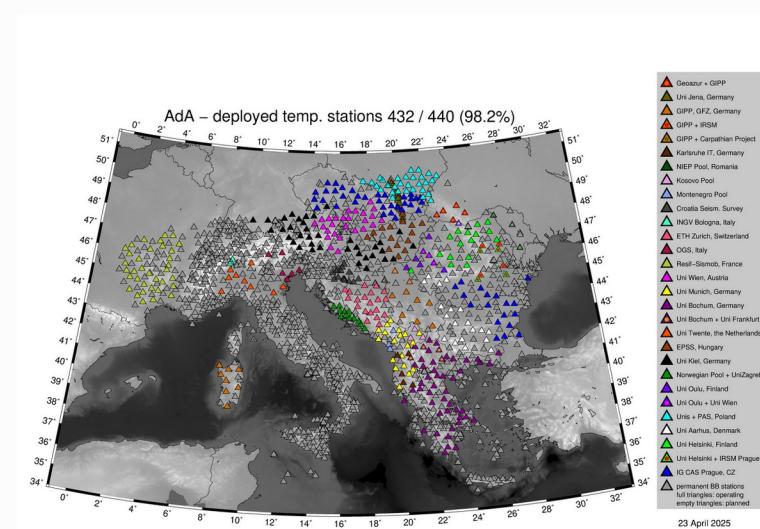
AdriaArray - Working Groups

AdriaArray - Data analysis and research

AdriaArray - Seismic networks

AdriaArray - Current deployment

Current status of the AdA seismic network. Filled triangles represent stations already in the field, while empty triangles indicate stations that are not yet deployed.



AdriaArray - Station map

Relation of AdA to PACASE and AlpArray. Red triangles: permanent broadband stations in the AdriaArray region. Dark green triangles are planned stations. Light green triangles indicate AlpArray, PACASE and AdriaArray temporary stations. Blue triangles: additional permanent broadband stations.

AdriaArray webpage

https://orfeus.readthedocs.io/en/latest/adria_array_main.html





The screenshot shows the GitHub repository page for 'PetrColinSky / AdriaArray'. The repository is public and has 42 commits. It contains several files and folders:

- AdA (AdriaArray maps)
- SanServolo2025 (program)
- Sofia2024 (basic info)
- logo (basic info)
- presentations (AdriaArray presentations)
- readme.md (basic info)

The README file provides a brief description of the repository's contents.

About

Here you find maps of AdriaArray Seismic Network, codes to draw them, input files, documentation and presentations.

Code

- Readme
- Activity
- 5 stars
- 3 watching
- 3 forks

Report repository

Releases

No releases published

Packages

No packages published

Languages

Python 99.9% Other 0.1%

Code Issues Pull requests Actions Projects Security Insights

PetrColinSky / AdriaArray Public

Code Issues Pull requests Actions Projects Security Insights

master Go to file Code

PetrColinSky AdriaArray presentations e2bd666 · 16 hours ago 42 Commits

AdA AdriaArray maps 3 weeks ago

SanServolo2025 program 2 months ago

Sofia2024 basic info 4 months ago

logo basic info 4 months ago

presentations AdriaArray presentations 16 hours ago

readme.md basic info 4 months ago

README

Here you find maps of AdriaArray Seismic Network, codes to draw them, input files, documentation and presentations.

There are four folders here in the AdriaArray repository.

Sofia2024

AdriaArray GitHub repository

[PetrColinSky / AdriaArray](#) Public

Notifications

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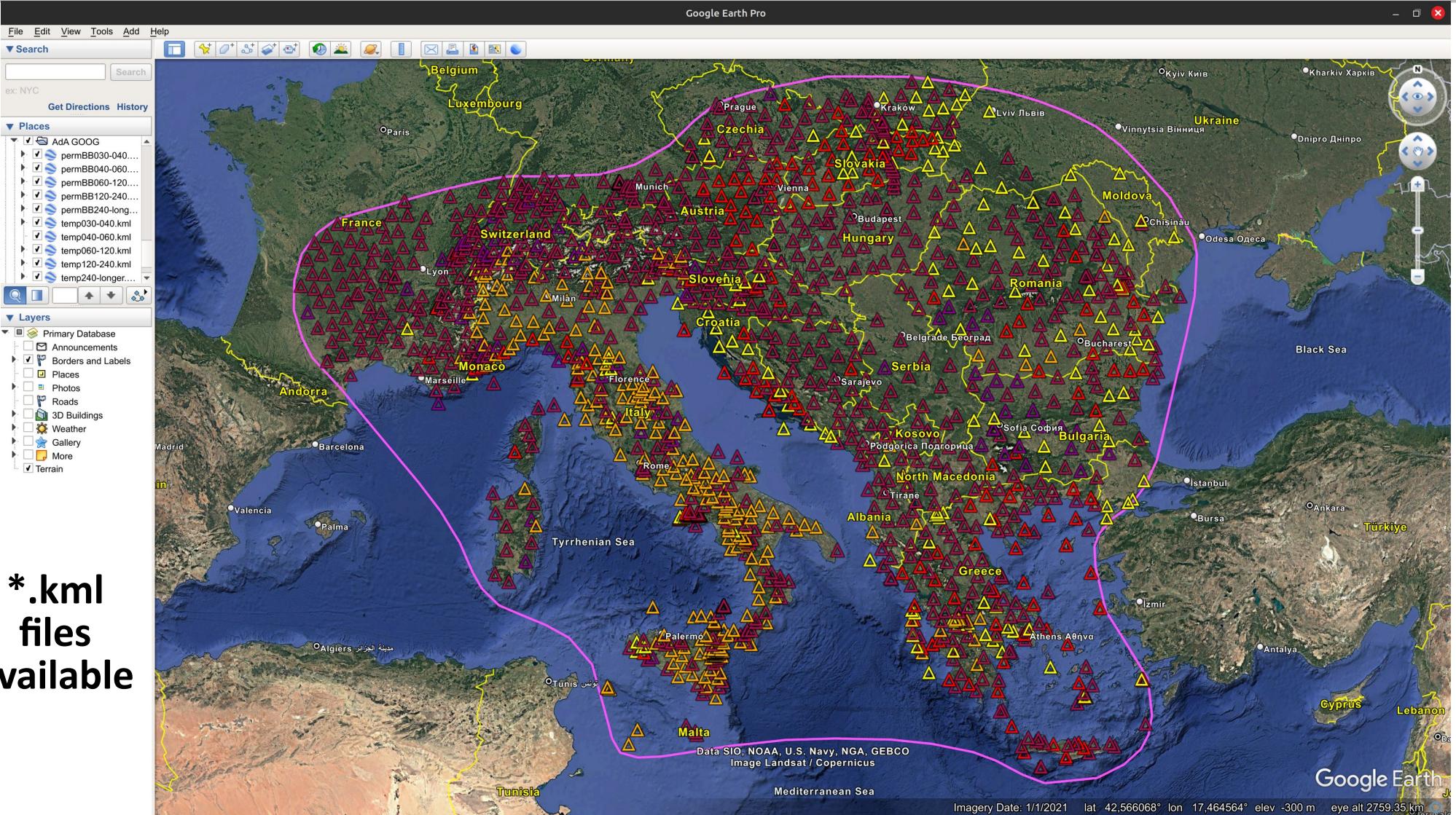
3ee494f · 3 weeks ago

[History](#)

Name	Last commit message	Last commit date
...		
AUXI	AdriaArray maps	3 weeks ago
GOOG	AdriaArray maps	3 weeks ago
MAPS	AdriaArray maps	3 weeks ago
PAPER	AdriaArray maps	3 weeks ago
PERM	AdriaArray maps	2 months ago
TEMP	AdriaArray maps	3 weeks ago
texts	basic info	4 months ago
.gmtcommands4	basic info	4 months ago
.gmtdefaults4	basic info	4 months ago
InventoryPermanent.ods	AdriaArray maps	2 months ago
InventoryTemporary.ods	AdriaArray maps	3 weeks ago
TechDocNames.pdf	basic info	4 months ago
extract.py	AdriaArray maps	3 weeks ago

AdA folder

Network	Name	Latitude	Longitude	elevation	show	town	country	previous sheet	sheet	housing	nsr	pb	Sensor type	corner in [sec]	year1	year2	round	400	800	1600	3200	6400	12800	25600	51200	102400	204800	409600	819200	1638400	3276800	6553600	13107200	26214400	52428800	104857600	209715200	419430400	838860800	1677721600	3355443200	6710886400	13421772800	26843545600	53687091200	107374182400	214748364800	429496729600	858993459200	1717986918400	3435973836800	6871947673600	13743895344000	27487780688000	54975561376000	109951122720000	219902245440000	43980449088000	87960898176000	175921784320000	351843568640000	703687137280000	1407374274560000	2814748549120000	5629497098240000	11258994196480000	22517988392960000	45035976785920000	90071953571840000	180143907143680000	360287814287360000	720575628574720000	1441151257495200000	2882302514988000000	5764605029976000000	11529210589532000000	23058421178864000000	46116842357728000000	92233684715456000000	184467369230912000000	368934738461824000000	737869476923648000000	1475738953847296000000	2951477907694592000000	5902955815389184000000	11805911630783760000000	23611823261567520000000	47223646523135040000000	94447293046270080000000	188894586084540000000000	377789172168880000000000	755578344337760000000000	1511156688655200000000000	3022313377310400000000000	6044626754620800000000000	12089253509241600000000000	24178507018483200000000000	48356014036966400000000000	96712028073932800000000000	193424056147865600000000000	386848112295731200000000000	773696224591464000000000000	154739244902928000000000000	309478489805856000000000000	618956977611712000000000000	1237913553223440000000000000	2475826706446880000000000000	4951653412893760000000000000	9903306825787520000000000000	19806613655575040000000000000	39613227311150240000000000000	79226454622300480000000000000	15845290924460096000000000000	31690581848920192000000000000	63381163697840384000000000000	12676232739568076800000000000	25352465479136153600000000000	50704925958272307200000000000	101409851916544614400000000000	202819703833089228800000000000	405639407666178457600000000000	811278815332356915200000000000	162255763066471383040000000000	324511526132942766080000000000	649023052265885532160000000000	1298046104531771064320000000000	2596092208563542128640000000000	5192184417127084257280000000000	10384368834254168514560000000000	20768737668508337029120000000000	41537475337016674058240000000000	83074950674033348116480000000000	166149901348066796232960000000000	332299802696133592465920000000000	664599605392267184921840000000000	132919921078453436983680000000000	265839842156856873967360000000000	511679684313713747934720000000000	1023359368264267954689440000000000	2046718736528535909378880000000000	4093437473057071818757760000000000	8186874946114143637515520000000000	1637374889222826727503040000000000	3274749778445653455006080000000000	6549499556891306910012160000000000	13098999113782613820024320000000000	26197998227565227640048640000000000	52395996455130455280097280000000000	104791992910260910560194560000000000	209583985820521821120389120000000000	419167971641043642240778240000000000	838335943282087284481556480000000000	167667188656417456896311200000000000	335334377312834913792622400000000000	670668754625669827585244800000000000	1341337509251339655170489600000000000	2682675018502679310340979200000000000	5365350037005358620681958400000000000	1073070007401071724136391200000000000	2146140014802143448272782400000000000	4292280029604286896545564800000000000	8584560059208573793091129600000000000	17169120118417147586182592000000000000	34338240236834295172365184000000000000	68676480473668590344730368000000000000	137352960947337180689460720000000000000	274705921894674361378921440000000000000	549411843789348722757842880000000000000	1098823687578695445515685760000000000000	2197647375157390891031371520000000000000	4395294750314781782062743040000000000000	8790589500629563564125486080000000000000	17581178001258867128250963200000000000000	35162356002517734256501926400000000000000	70324712005035468513003852800000000000000	14064944001007093702600765600000000000000	28129888002014187405201531200000000000000	56259776004028354810403062400000000000000	112519520080566796200806128000000000000000	225039040161133592401612560000000000000000	449978080322267184803225120000000000000000	899956160644534369606450240000000000000000	1799912321289068739212804800000000000000000	3599824642578137478425609600000000000000000	7199649285156274956851219200000000000000000	14399298570312549813702438400000000000000000	28798597140625099627404876800000000000000000	57597194281250199254809753600000000000000000	11519438856250399850961950720000000000000000	23038877712506799701923901440000000000000000	46077755425013599403847802880000000000000000	92155410850027198807695605760000000000000000	18430682170005439761539121152000000000000000	36861364340010879523078242304000000000000000	73722728680021759046156484608000000000000000	14744545736004358809231296921600000000000000	29489091472008717618462593843200000000000000	58978182944017435236925187686400000000000000	117956365888034870473850375372800000000000000	2359127317760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2019-11-13-Frankfurt.pdf
2020-11-02-Orfeus+EPOS+AdA-online.pdf
2021-05-18-AdA-virtual-WS.pdf
2021-11-12-AlpArray-AdA-Breakout-online.pdf
2022-05-19-SteeringCommittee-online.pdf
2022-05-23-EGU-GD8-4.pdf
2022-05-27-EGU-splinter-meeting.pdf
2022-10-06-Potsdam-poster.pdf
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2022-11-03-Slovakia-BanskaBystrica.pdf
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2023-04-03-Dubrovnik-AdA-NetworkStatus.pdf
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2024-04-18-EGUposter-QC.pdf
2024-05-01-SSAposterAdA.pdf
2024-11-05-Helsinki-AdAposter.pdf
2025-03-11-SanServolo-Status.pdf
2025-04-15-SSA-Baltimore-poster.pdf
2025-05-01-AdA-EGU-splintermeeting.pdf

presentations about AdriaArray
posters, slides from
EGU, SSA, DGG, IUGG, AG Seismologie,
AdA workshops, ORFEUS/EPOS workshops, splinter meetings

outline of the webinar

what is it?

history of AdriaArray

ORFEUS and AdriaArray

seismic network

data access and quality

sources of information

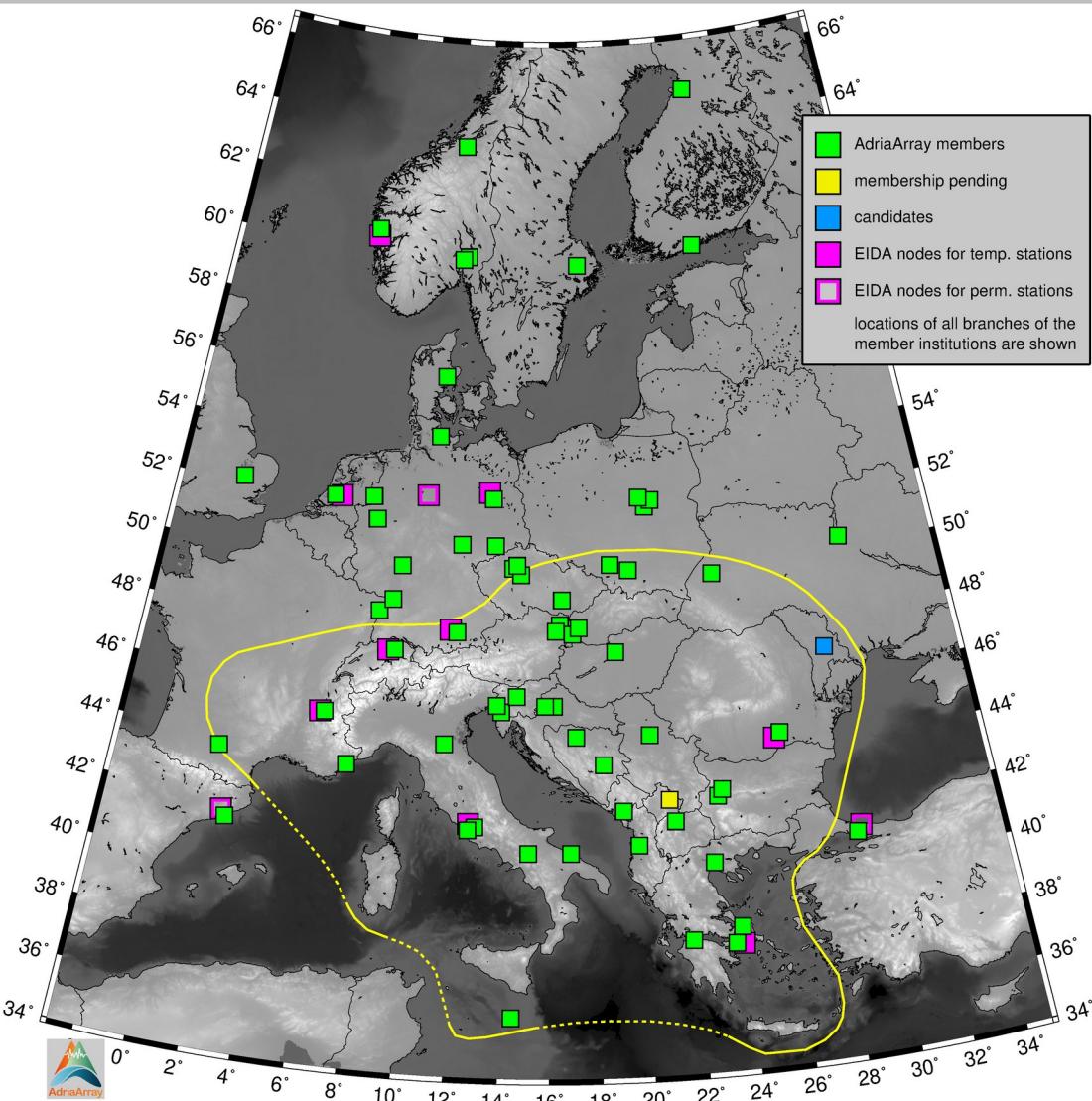
organization and working groups

examples of data

research and projects

lessons learned

next workshop



AdriaArray Seismology Group

54 members

64 member institutions

442 participants

30 countries

MEMBER INSTITUTIONS:

IGEWV-PUT, Tirana, Albania
Uni Vienna, Austria
ZAMG, Austria
SC FHMZ, Sarajevo, Bosnia and Herzegovina
GS Republic of Srpska, Bosnia and Herzegovina
NIGGG, BAS, Bulgaria
Uni Sofia, Bulgaria
CSS, Zagreb, Croatia
Charles Uni, Prague, Czech Republic
IG, CAS, Prague, Czech Republic
IPE, Masaryk Uni, Brno, Czech Republic
IRSM, CAS, Prague, Czech Republic
Uni Aarhus, Denmark
Uni Helsinki, Finland
Uni Oulu, Finland
Uni Grenoble, France
Uni Strasbourg, France
Geoazur, France
Uni Toulouse, France
Uni Frankfurt, Germany
TU Freiberg, Germany
Uni Kiel, Germany
Uni Jena, Germany
Karlsruhe I.T., Germany
LMU München, Germany
GFZ Potsdam, Germany
Uni Bochum, Germany
NOA, Greece
Uni Athens, Greece
Uni Thessaloniki, Greece
Uni Patras, Greece
EPSS, Hungary
INGV, Italy
OGS, Trieste, Italy
Uni Bari, Italy
Uni Roma Tre, Italy
Uni Trieste, Italy
Uni Sts. Cyril and Methodius, Skopje, N. Macedonia
Uni Malta
MSS, Podgorica, Montenegro
Uni Twente, the Netherlands
Uni Bergen, Norway
NORSAR, Norway
Uni Oslo, Norway
Geological Survey of Norway
IG PAS, Warsaw, Poland
Institute of Geological Sciences, PAS, Warsaw, Poland
Uni. of Science and Technology, Krakow, Poland
Uni Silesia, Katowice, Poland
Uni Warszawa, Poland
NIEP, Romania
Serbian Seismological Survey, Serbia
ESI SAV, Bratislava, Slovakia
Dept. of Geology and Paleontology, Comenius Uni, Bratislava, Slovakia
SSS, Ljubljana, Slovenia
Labsis, Geo3Bcn-CSIC, Barcelona , Spain
Uni Uppsala, Sweden,
ETH, Zürich, Switzerland
KOERI, Türkiye
Uni Cambridge, United Kingdom
log, NAS, Ukraine
ORFEUS

PENDING:

GS Kosovo, Pristina, Kosovo

CANDIDATES:

IGS-CES, Chisinau, Moldova

Structure of the consortium

- **Members:** participating groups or institutions
 - permanent or temporary stations
 - providing data, QC, methods, software, outreach, organization
 - some Members are composed of more institutions
- **Steering Committee:**
 - one representative per member, main decision-making body
- **Participants:** persons affiliated with member institutions or groups
- six **Working Groups** – technical support
- **Collaborative Research Groups (CRG)** - research

Working Groups

Data QC

QCing, data availability, noise conditions, metadata

contacts: Petr Kolínský (petr.kolinsky@ig.cas.cz), Thomas Meier (thomas.meier@ifg.uni-kiel.de)

Communication and outreach

Maintaining list participants, managing tokens, developing and updating web page, communication with participants and the public

contacts: Gregor Rajh (gregor.rajh@gov.si), Gergana Georgieva (ggeorgieva@phys.uni-sofia.bg)

Early Career Scientists

networking among ECS, participation in and suggestions of AdriaArray activities, organization of webinars

contacts: Felix Eckel (felix.eckel@ifg.uni-kiel.de),
Henrique Roisenberg (henrique.bergerroisenberg@uniroma3.it),
Tanishka Soni (ndsoni@cyf-kr.edu.pl)

Scientific Cooperation

coordinates the Collaborative Research Groups

contact: Thomas Meier (thomas.meier@ifg.uni-kiel.de)

Station siting obsolete

Technical advice

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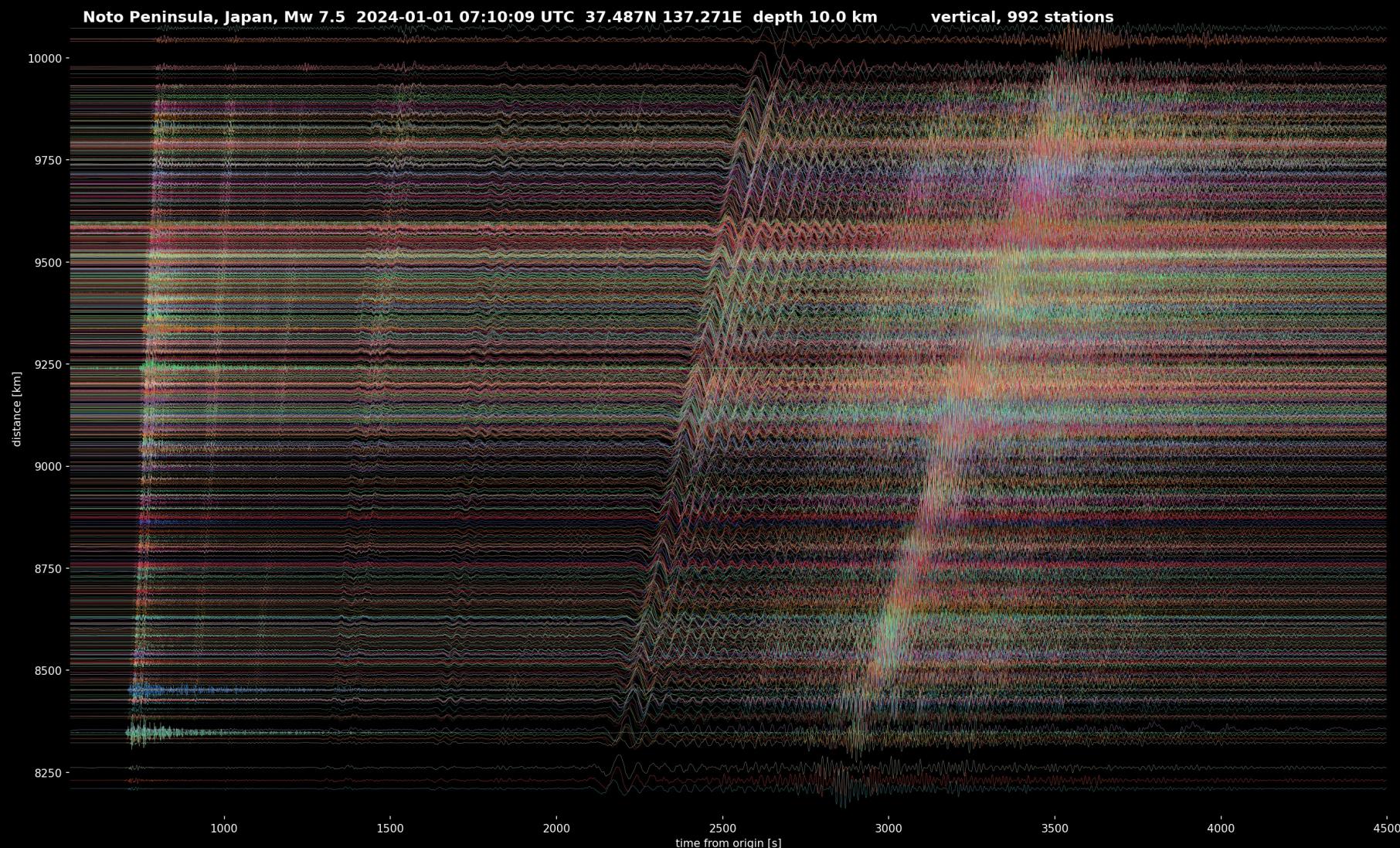
organization and working groups

examples of data

research and projects

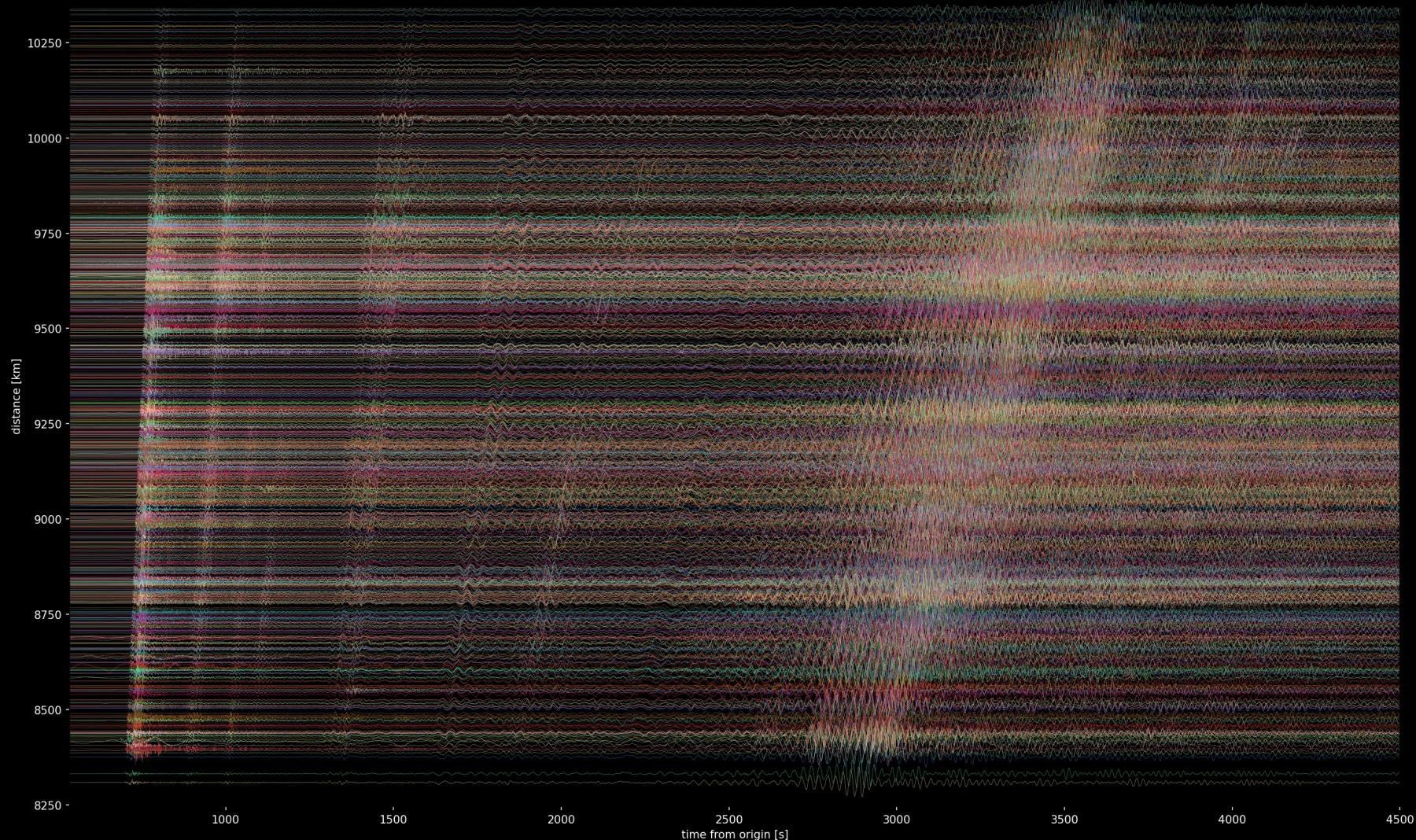
lessons learned

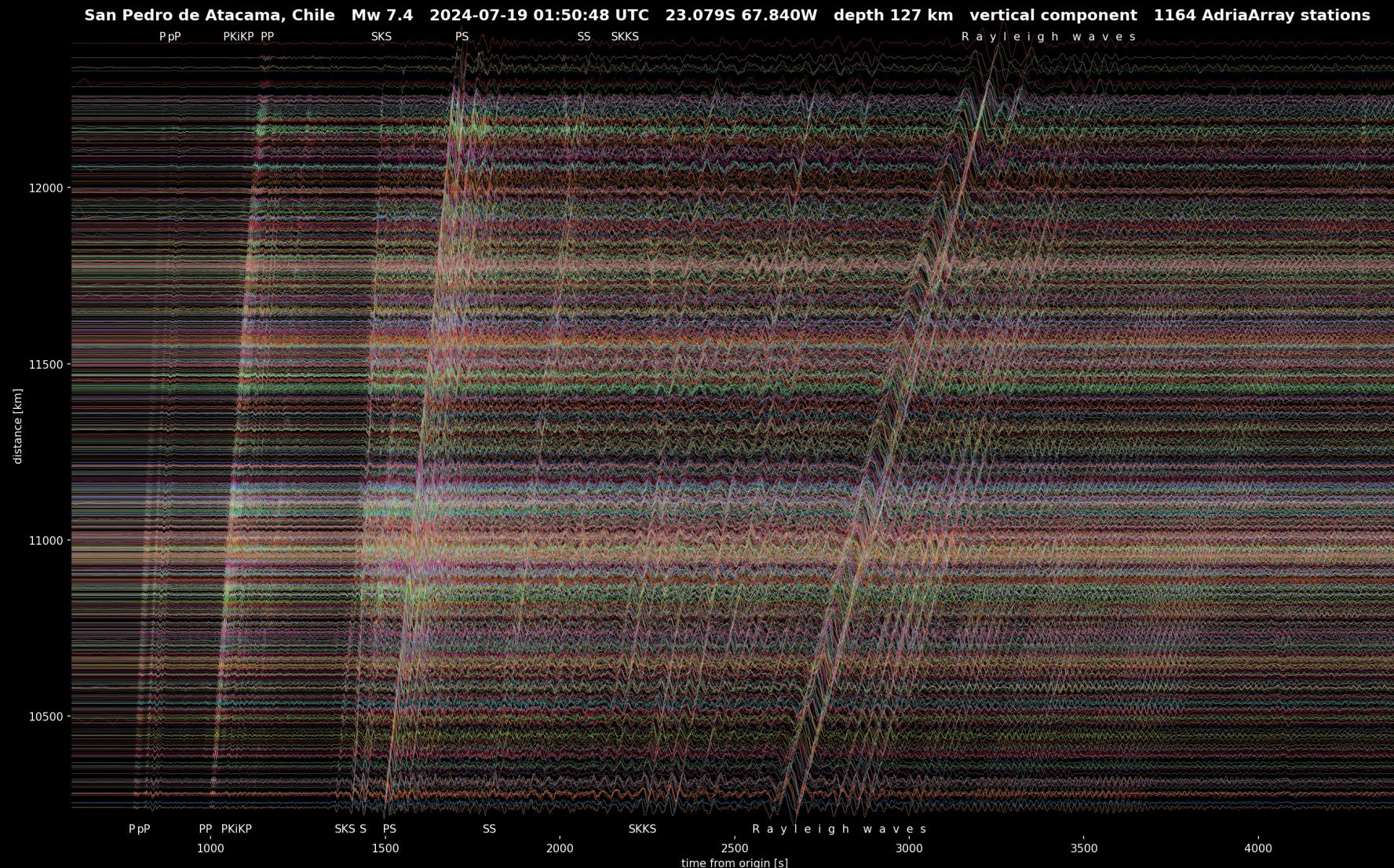
next workshop



Hualien City, Taiwan, Mw 7.4 2024-04-02 23:58:12 UTC 23.836N 121.598E depth 40 km

vertical, 1160 stations







AdriaArray

examples of data

Burma (Myanmar)

Mw 7.7

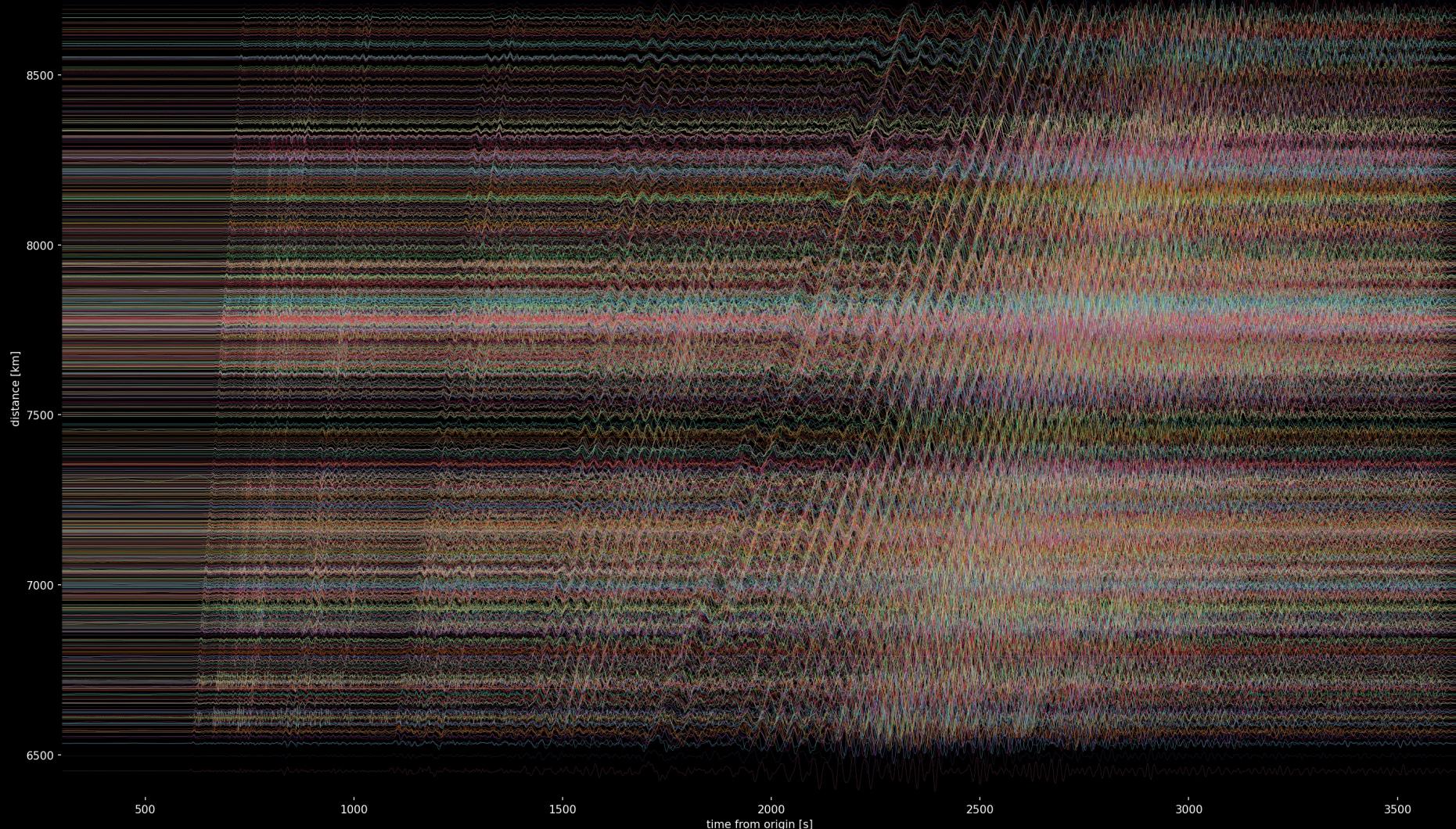
2025-03-28 06:20:52 UTC

21.996N 95.826E

depth 10 km

vertical component

1136 AdriaArray stations



animation of the **Burma** (Myanmar) earthquake wavefield
Mandalay, 2025-03-28, M=7.7
propagating across AdriaArray by **Luděk Vecsey**

creating with the use of a modified code from
IRIS DMC (2010), Data Services Products: GMV

external *.avif file

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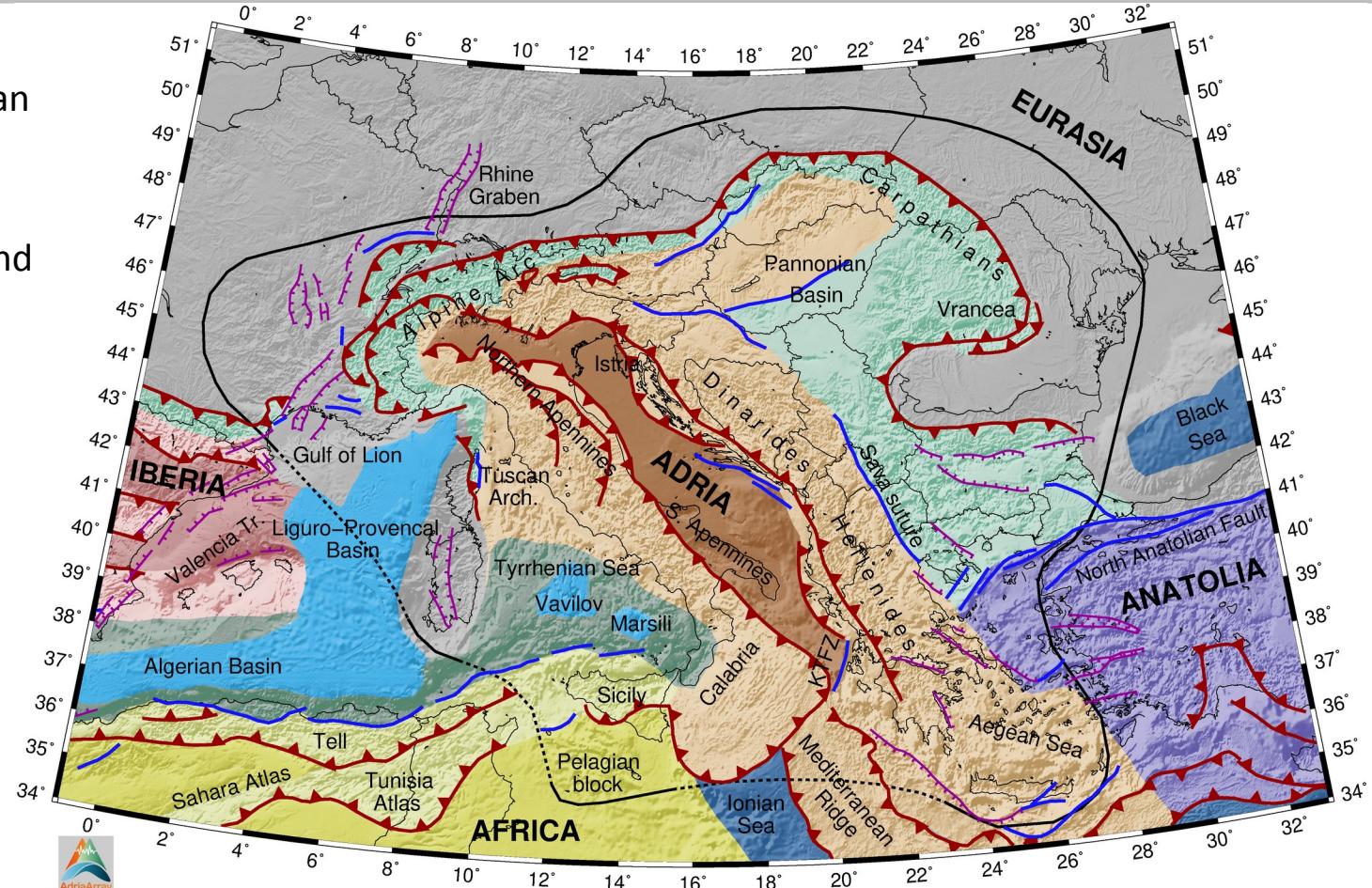
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Tectonic map of the central European and Mediterranean region, from Kolínský et al., (2025), modified after Faccenna et al. (2014), Le Breton et al. (2017, 2021) and Handy et al. (2010, 2019).



main thrust fronts

undeformed Iberia

deform

— main strike slip fault

undeformed Africa

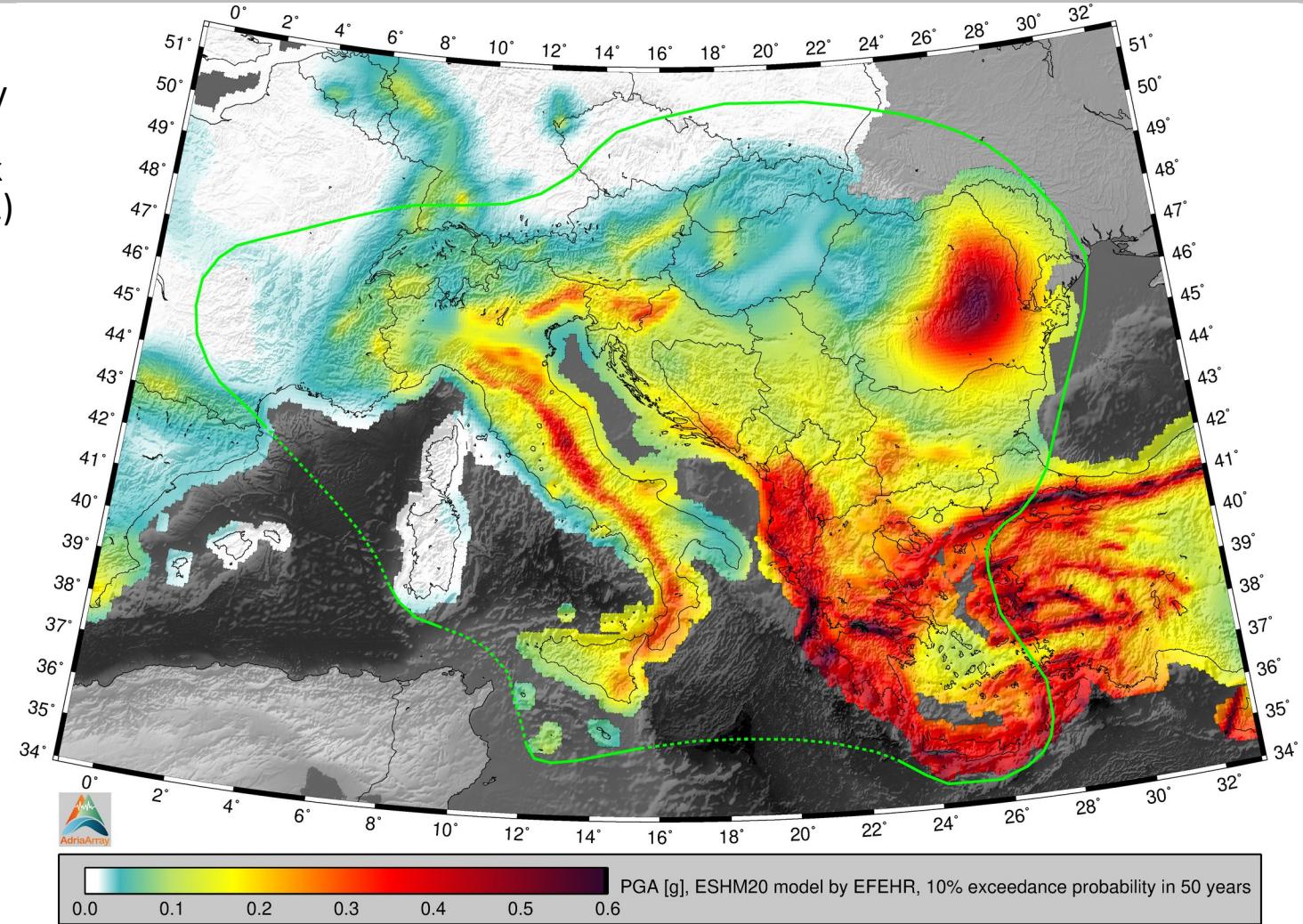
deformed Africa

 main extensional faults

undeformed Eurasia

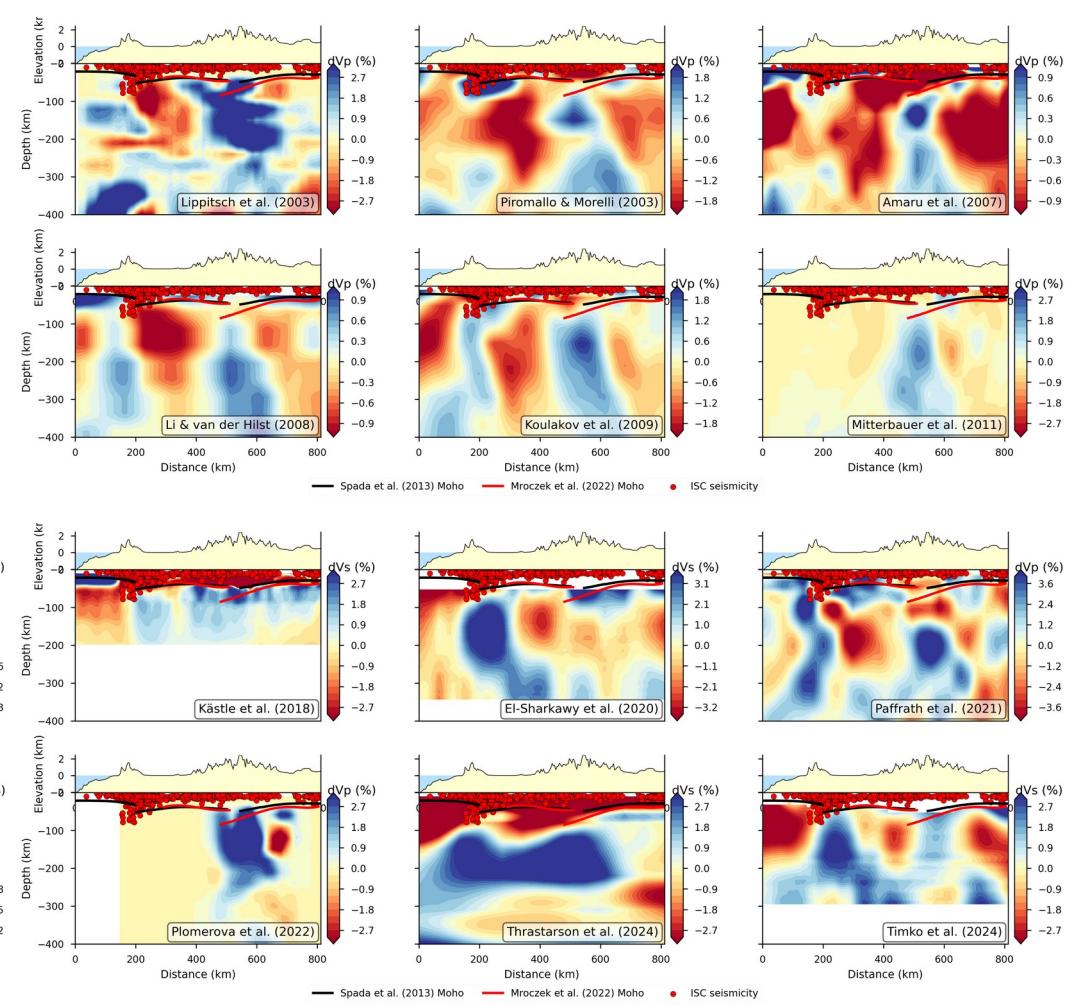
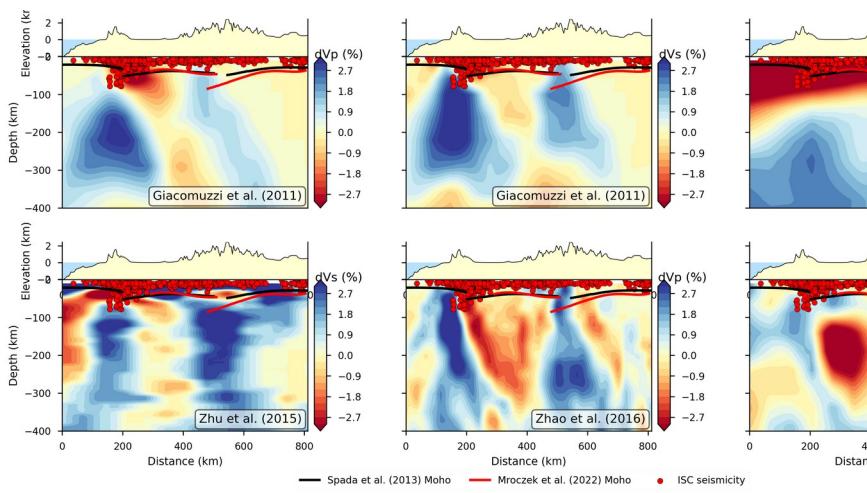
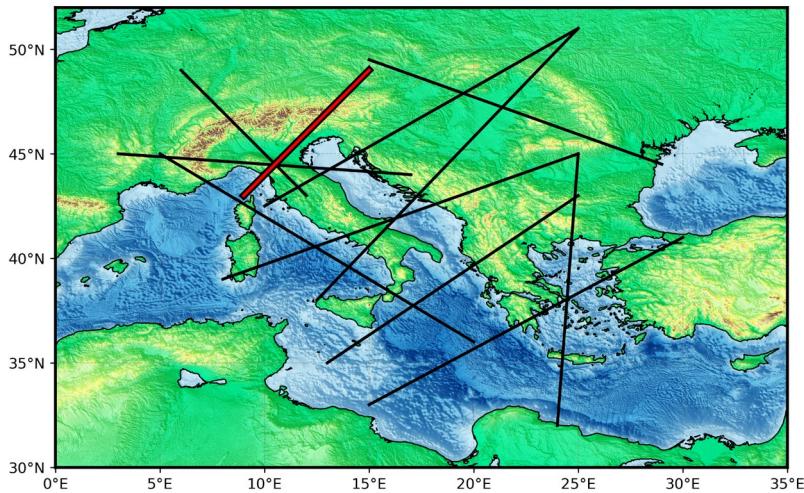
deformed Eurasia

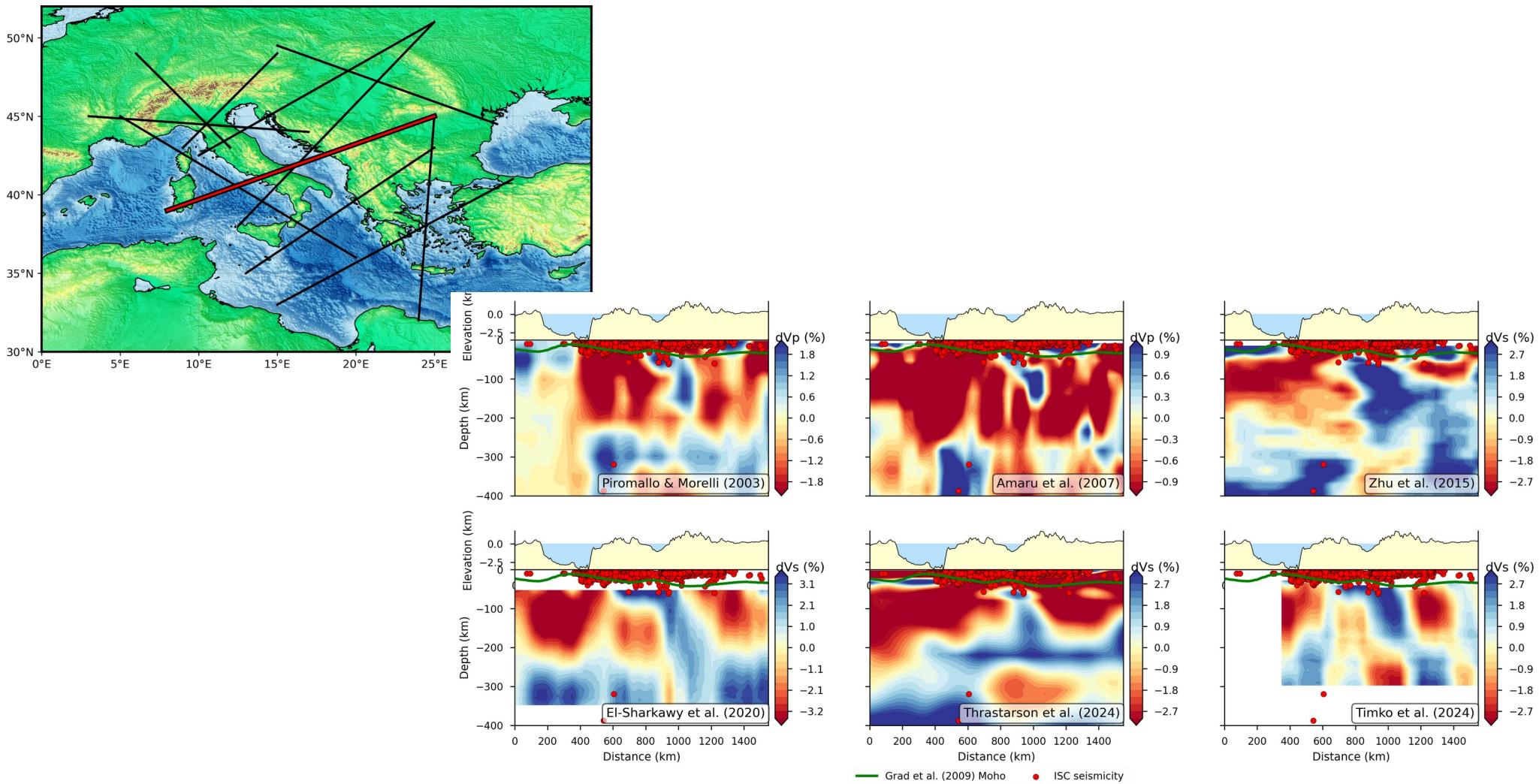
The 2020 European Seismic Hazard Model (ESHM20), by European Facilities for Earthquake Hazard and Risk (EFEHR), Danciu et al. (2021)



Collaborative Research Groups:

- Data processing & research
- Suggested by participants (since 2023): topics, chairs, first activities of 8 CRGs
- To be approved by the Steering Committee
- Work independently
- Report on activities at the AdASG Workshops
- Consist of participants of at least two countries
- Coordination of individual CRGs: experienced researcher + early career scientist if possible
- Members may change
- May be established at the beginning of the experiment or later





Collaborative Research Group ,**Seismicity and seismic sources'**

Chairs: *Edmond Dushi (edmonddushi@yahoo.com),*
Felix Borleanu (felix@infp.ro)
email list: adriaarray-seismicity@gfz-potsdam.de

Activities:

- Homogeneous Seismic Catalogs: Harmonization of earthquake catalogs and integration of national datasets into a regional framework.
- Best Practices: Standardization of earthquake locations, source parameters, and moment tensor solutions.
- Efficient Data Processing: Collaborative methods for handling large datasets within the AdriaArray initiative.

Collaborative Research Group ,**Body wave tomography'**

Chairs: *Claudia Piromallo (claudia.piromallo@ingv.it),*
Pasquale De Gori (pasquale.degori@ingv.it),
Clement Esteve (clement.esteve@univie.ac.at)

Activities:

- Manual and automated picking, evaluation of quality
- One-day Workshop 'Automated and manual picking of body wave phases' was held on September 22 in Corfu (Greece) at the Ionian University on Sunday before the opening of the 39th General Assembly of the ESC (ESC2024)
- Test of inversion methods
- Resolution tests

Collaborative Research Group ,**Modelling seismic wave propagation and full waveform inversion'**

Chairs: Henk Keers (henk.keers@uib.no),
Sebastien Chevrot (sebastien.chevrot@get.omp.eu)

Activities:

- Review existing forward modelling methods
- Benchmarking existing codes & training
- Forward modelling using synthetic model
- Application of inversion tools

Collaborative Research Group ,**Receiver functions'**

Chairs: Gergana Georgieva (ggeorgieva@phys.uni-sofia.bg),
Stéphane Rondenay (rondenay@uib.no),
Josip Stipčević (jstipcevic.geof@pmf.hr)

Activities:

- Planning joint activities
- Training & benchmarking of tools
- Coherent set of receiver function products

Collaborative Research Group ,**Surface wave and ambient noise tomography'**

Chairs: *Irene Molinari (irene.molinari@ingv.it),*
Anne Obermann (anne.obermann@sed.ethz.ch),
Laura Petrescu (laura.petrescu90@gmail.com)

Activities:

- Database of continuous data
- Repository of phase and group velocity maps
- Benchmarking of imaging tools

Collaborative Research Group ,**Shear-wave splitting and anisotropy'**

Chairs: *Silvia Pondrelli (silvia.pondrelli@ingv.it),*
Ayoub Kaviani (kaviani@geophysik.uni-frankfurt.de)

Activities:

- Collection of previous shear-wave splitting measurements
- Benchmarking of methods & training
- New shear-wave splitting measurements
- Depth & joint inversions

Collaborative Research Group ‚Engineering Seismology‘

Initial contacts: Anila Xhahysa (anila.xhahysa@yahoo.com),
Iva Dasović (iva.dasovic@gfz.hr),

Olga Ktenidou (olga.ktenidou@gmail.com),
Costas Papazachos (kpapaza@geo.auth.gr)

Discussed activities:

- Collection of information on site characteristics
- Benchmarking of tools constraining the near-surface structure & training
- H/V, GMPEs, attenuation/kappa, Vs(30)

Collaborative Research Group ‚Linking geophysical observables and geodynamics‘

Chair: Thomas Meier (thomas.meier@ifg.uni-kiel.de)

Activities:

- Collecting geophysical observables for the AdriaArray region constraining crustal and upper mantle structure & import in the Geophysical Model Generator (GMG)
- Development of slab hypotheses using the GMG
- Setting up 3D models of seismic velocities, densities, temperatures, viscosities for synthetic resolution tests and geodynamic modelling

Missing observations:

- Tomographic models?, Seismicity?, Receiver functions?, Crustal models?

Optimizing the Geophysical Model Generator

Picking Slabs:

contact: thomas.meier@ifg.uni-kiel.de, amr.elsharkawy@ifg.uni-kiel.de

Comparing crustal models:

contact: irene.molinari@ingv.it, irene.menichelli@ingv.it

Projects already funded:

Bulgaria, Czech Republic, Croatia, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Norway, Poland, Romania, Slovakia, Slovenia, Sweden, EPOS, ORFEUS

Projects pending:

COST, Germany (DFG Priority Program)

First publication:

- describing the AdriaArray initiative and the AdriaArray seismic network
- authors: representatives of all members & colleagues who contributed essentially to the establishment and operations of the AdriaArray seismic network (as agreed by the AdASG Steering Committee)

Authorlist of other publications:

- Active participants who contributed substantially to the research
- Recommendation: followed by „... and the AdriaArray Seismology Group“

Acknowledgements:

- AdriaArray Seismology Group is mentioned
- link to the AdriaArray web page is given

References:

- list of **Digital Object Identifiers (DOIs)** referring to the contributing networks and/or pools of temporary stations

Special Issue Annales of Geophysics 2025:
Recent large-scale temporary passive seismic experiments in Europe: deployment and data quality

28 submissions including a general paper presenting AdriaArray (Kolínský et al., 2025)

guest editors:

Irene Molinari, Gergana Georgieva,
Petr Kolínský, Thomas Meier

Annales of Geophysics
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ANNALS OF
GEOPHYSICS

**AdriaArray – a Passive Seismic Experiment to Study
Structure, Geodynamics and Geohazards of the
Adriatic Plate**

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Lukešová³¹, Stanisław Mazur³², Mark van der Meijde³³, Irene Molinari³⁴, Shemsi
Mustafa³⁵, Thorsten Nagel³⁶, Søren Bom Nielsen³⁷, Anne Obermann¹², Costas
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Anila Xhahysa¹⁹, Mladen Živčić¹⁰ and the AdriaArray Seismology Group⁵⁸

outline of the webinar

what is it?

history of AdriaArray

ORFEUS and AdriaArray

seismic network

data access and quality

sources of information

organization and working groups

examples of data

research and projects

lessons learned

next workshop

AdriaArray: community effort of 64 groups from 30 countries / the „hidden“ goal: join the community

potential for large scale experiments if deployment of mobile pools is coordinated – 23 mobile pools

integration of many stations / several networks into EIDA - still ongoing

real-time access to temporary networks, integration into existing networks

cooperation with ORFEUS: archiving, data quality control, connection of UAG, sponsoring of workshops

necessity for intense communication between network operators, mobile pool owners, and ORFEUS

many institutions, expected complexity of organization

long preparation time, 2019 – 2022, and then long deployment period 2022 – 2024

heterogeneous experiences (also diverse technical support, variable financial support)

difficult to keep track of negotiations with changing personnel

we tried to be less strict on formalities, the only document was the Memorandum of Collaboration signed, yet it did not help in some cases to keep the agreement functional

metadata: the same issues as with AlpArray ... around 10% stations have problems initially, mainly permanent ones

difficulty to find the balance between waiting and pushing

neither T.M., nor P.K. are „AdA employees“

next „big“ experiment ... let's get central funding

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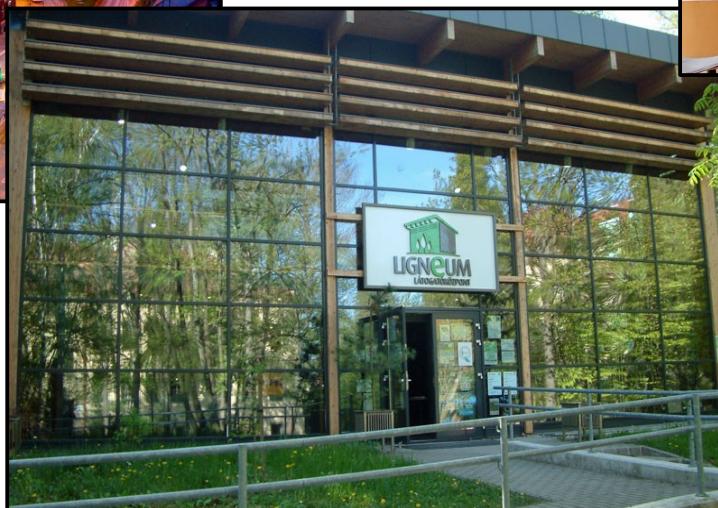
next workshop

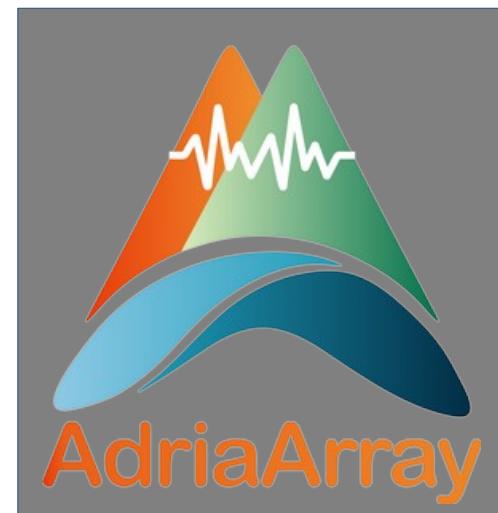
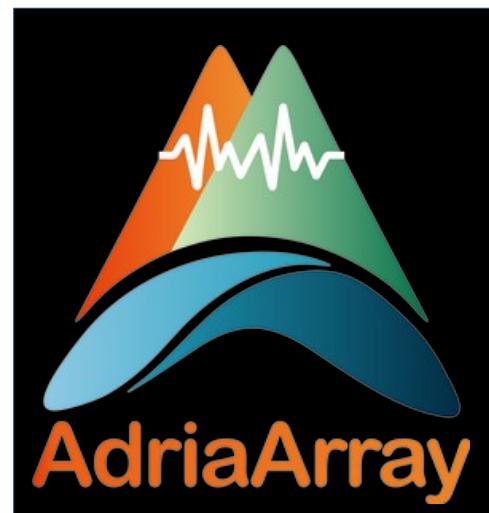
Local organizers:

Dániel Kalmár, István Kovács (HUN-REN, Institute of Earth Physics and Space Science, Hungary)

place: Sopron, Ligneum (Hungary)

Dates: 17 – 20 March 2026 (Tuesday - Friday)





AdriaArray logo by Claudia Piromallo and Hana Kampfová-Exnerová

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Seismic equipment for 9 stations in Sardinia, 12 stations in the Carpathian profile (Poland, Slovakia), 5 stations in Ukraine, 4 stations in Romania and 9 stations in Serbia in the years 2023 - 2026 were provided by ‘Geophysical Instrument Pool Potsdam’ GIPP of GFZ, grant number GIPP202306. SL acknowledges support from NERC grants NE/X000060/1 and NE/Y000218/1, Project InnerSpace (<https://projectinnerspace.org>) and the project 4D Dynamic Earth, funded by ESA (4000140327/23/NL/SD) as part of EXPRO+. The present study was partially financed by the Special Account for Research Grants of the National and Kapodistrian University of Athens (S.A.R.G. - NKUA). The present study was supported by the Slovak Foundation Grant VEGA 2/0163/25. The deployment of the XP temporary network in the French Massif Central is funded by the MACIV project of Agence Nationale de la Recherche, France (ANR-22-CE49-0019). 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PRIN2022_PE10_2022XZ3W22, funded by European Union-Next Generation EU - PRIN 2022 – M4C2 – 1.1. WF, ELB and JW acknowledge financial support from DFG grants FR 1146/15-1, WA1493/10-1 and BR 4900/8-1. The deployment of temporary seismic stations in Croatia was financed through the CRONOS project, funded by the Norway Grants (Norway Financial Mechanism 2014 - 2021, grant 04-UBS-U-0002/22-90) to the University of Zagreb with University of Bergen as collaborator. We thank the Independent Research Fund Denmark (Danmarks Frie Forskningsfond) for funding 19 stations installed in Bulgaria and Romania (project “Tracking the ocean along the lower-upper-mantle boundary”). CS is funded by the Swedish Research Council (Vetenskapsrådet, 2019-04843). Subbotin Institute of Geophysics of the National academy of sciences of Ukraine was supported by the data integration Geo-INQUIRE grant (<https://www.geo-inquire.eu/>); grant agreement No. 101058518) from the European Commission via ORFEUS. 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The Python Toolbox ObsPy by Beyreuther et al. (2010) and Megies et al. (2011) was used for data and metadata downloading and pre-processing. Earthquake parameters were taken from EMSC/CSEM, <https://www.emsc-csem.org> and from the U.S. Geological Survey Earthquake Lists, Maps, and Statistics, <https://www.usgs.gov/natural-hazards/earthquake-hazards/lists-maps-and-statistics>. The altitude and bathymetry data were plotted using theETOPO1 Global Relief Model provided by the NOAA Physical Sciences Laboratory, Boulder, Colorado, USA, from their website at https://www.ngdc.noaa.gov/mgg/global/relief/ETOPO1/data/bedrock/grid_registered/netcdf/, see also NOAA (2009) and Amante and Eakins (2009). Color scales for topography and seismic hazard maps were modified for this paper using the scales included in the GMT package. The arrival times of body wave phases for Fig. 14 were calculated using the TauP package embedded in the ObsPy toolbox, based on the original tool by Crotwell et al. (1999), with the iasp91 model by Kennett and Engdahl (1991). We are grateful to all researchers, scientists, experts and engineers contributing to the development of the 2020 European Seismic Hazard Model (ESHM20) shown in Fig. 2. All products of the ESHM20 are licensed under the Creative Commons Attribution 4.0 International License (CC BY): <https://creativecommons.org/licenses/by/4.0/>. We did not make any changes to the ESHM20 model and only replotted the PGA map using the same color scale as in Danciu et al. (2021).



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Orfeus

EPOS
EUROPEAN PLATE OBSERVING SYSTEM

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AdriaArray

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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.

AdA temporary stations by the AdriaArray Seismology Group https://orfeus.readthedocs.io/en/latest/adria_array_main.html.

Permanent stations by national seismological services and ORFEUS-EIDA.

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