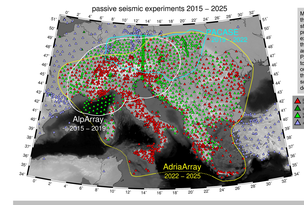
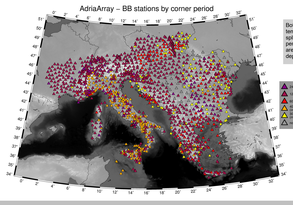
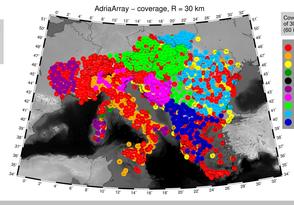


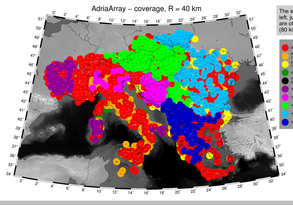
Map shows also the temporary stations of the previous experiments, the AlpArray and the PACASE, together with outlines of all three large-scale deployments.



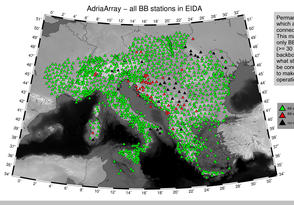
Both permanent and temporary stations split by five corner period ranges. Grey are stations not deployed yet.



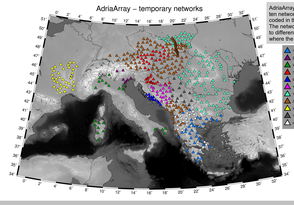
Coverage with circles of 30 km in radius (60 km in diameter).



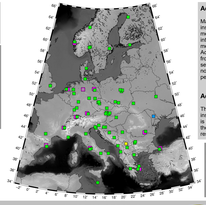
The same as on the left, just the circles are of 40 km in radius (80 km in diameter).



Permanent stations which are / are not connected to EIDA. This maps shows only BB stations (>= 30 s), so-called backbone, to see, what stations need to be connected to EIDA to make AdriaArray operational.



AdriaArray backbone uses ten network codes, color-coded in the map below. The networks are assigned to different EIDA nodes, where the data is archived.



AdriaArray institutions

Map shows the member institutions, the institutions that has applied and their membership is pending, and institutions interested as possible candidates for the membership. Some institutions joined the AdriaArray as institutional member, from some institutions, more groups joined separately as different members. EIDA nodes storing the data from temporary and permanent stations are also shown.

AdriaArray Seismology Group

The group has 53 members comprising 63 institutions from 30 countries. 1 membership is pending and there is 1 candidate. Overall, the initiative puts together over 400 researchers, technicians and students .

AdriaArray – a Passive Seismic Experiment to Study the Geodynamics and Geohazards in Central Mediterranean

Seismological Society of America

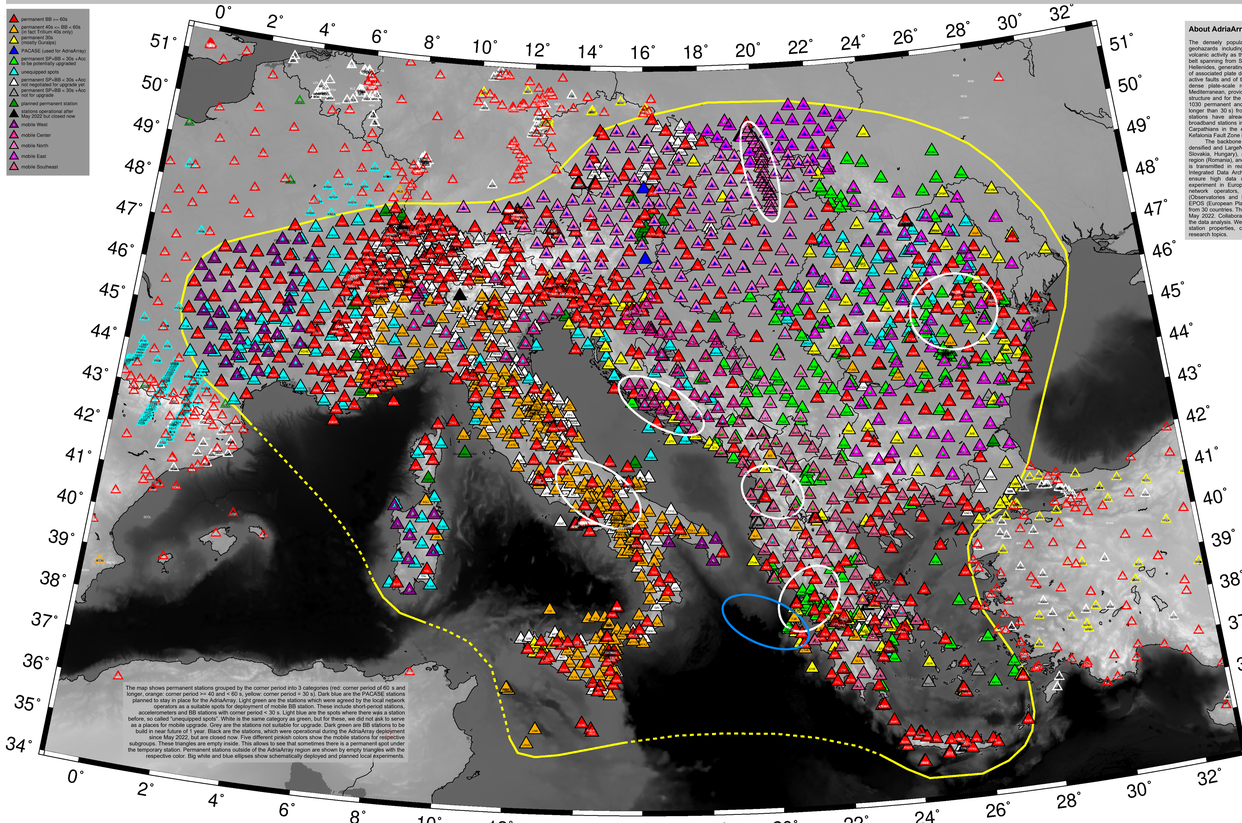
Anchorage, Alaska, 29 April – 3 May 2024

Petr Kolínský, Thomas Meier and the AdriaArray Seismology Group
Institute of Geophysics of the Czech Academy of Sciences, Prague, Czech Republic; Christian-Albrechts-Universität zu Kiel, Institut für Geowissenschaften, Kiel, Germany petr.kolinsky@ig.cas.cz

INSTITUTE OF GEOPHYSICS OF THE CZECH ACADEMY OF SCIENCES

Christian-Albrechts-Universität zu Kiel
Mathematisch-Naturwissenschaftliche Fakultät

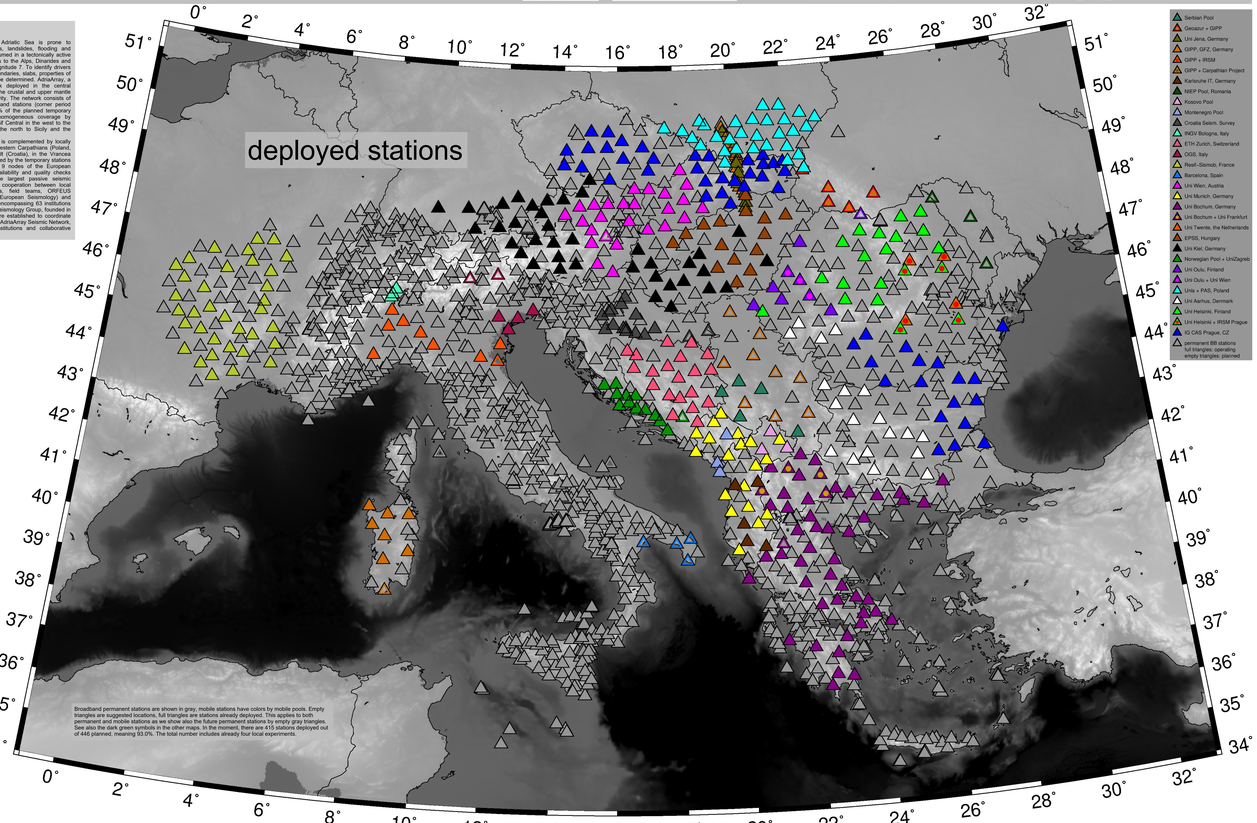
https://orfeus.readthedocs.io/en/latest/adria_array_main.html

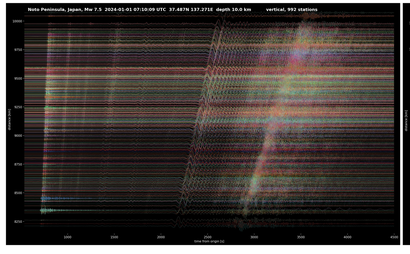


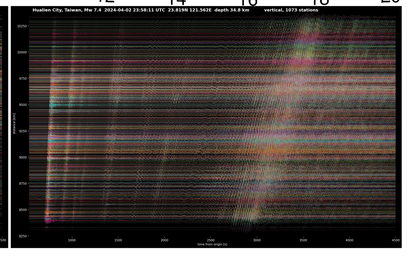
About AdriaArray

The densely populated area around the Adriatic Sea is prone to geohazards including earthquakes, tsunamis, landslides, flooding and volcanic activity as the Adriatic Plate is consumed in a tectonically active belt spanning from Sicily, over the Apennines to the Alps, Dinarides and Hellenides, generating earthquakes up to magnitude 7. To identify drivers of associated plate deformation, the plate boundaries, slabs, properties of active faults and of fluid systems, the AdriaArray Seismic Network, a large-aperture, state-of-the-art regional seismic network deployed in the central Mediterranean, provides data for imaging of the crustal and upper mantle structure and for the analysis of seismic activity. The network consists of 1030 permanent and 446 temporary broadband stations (corner period longer than 30 s) from 24 mobile pools. 93% of the planned temporary stations have already been installed. A homogeneous coverage by broadband stations in an area from the Massif Central in the west to the Carpathians in the east, from the Alps in the north to Sicily and the Aeolian Islands in the south is thus ensured.

The backbone network (2022 – 2025) is complemented by locally densified and Large# networks, e.g. in the western Carpathians (Poland, Slovakia, Hungary), along the Dubrovnik fault (Croatia), in the Vranoa region (Romania), and in Albania. Data recorded by the temporary stations is transmitted in real-time and archived at 9 nodes of the European Integrated Data Archive (EIDA). Regular availability and quality checks ensure high data usability. AdriaArray, the largest passive seismic experiment in Europe so far, is based on cooperation between local institutions and networks in Central Mediterranean, EIDA, ORFEUS (Observatories and Research Facilities for European Seismology) and EPOS (European Plate Observing System), encompassing 63 institutions from 30 countries. They form the AdriaArray Seismology Group, founded in May 2022. Collaborative Research Groups are established to coordinate the data analysis. We present the maps of the AdriaArray Seismic Network, station properties, coverage, contributing institutions and collaborative research topics.



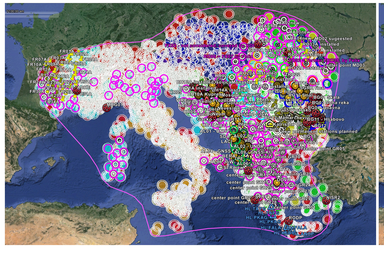


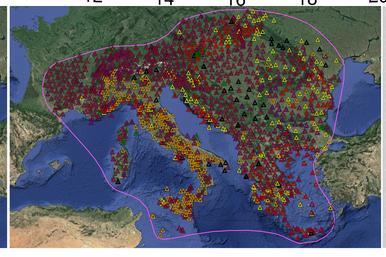


Collaborative Research Groups

CRGs are groups of AdriaArray participants focusing on a specific topic of data processing & research. They are suggested by participants (since 2023) and approved by the Steering Committee. CRGs work independently and report on activities at the AdriaArray Workshops. CRGs consist of participants of at least two countries. Coordination of individual CRGs by an experienced researcher and an early career scientist is encouraged. Members of CRGs may change. CRGs may be established at the beginning of the experiment or later. Currently, there are the following CRGs:

Seismicity and seismic sources	detection and location of earthquakes, determination of source mechanisms, statistical analyses and seismotectonics subgroups: Parametric data exchange with EMSC, station naming and reporting Parametric data exchange with EMSC, station naming and reporting Machine learning for seismicity detection and location & crowd processing Moment tensors and seismic sources
Body wave tomography	manual and automated picking, evaluation of quality, test of inversion methods, resolution tests one-day workshop 'Automated and manual picking of body wave phases' to be held on September 22 in Corfu (Greece) at the Ionian University on Sunday before the opening of the 39th General Assembly of the EGC (ESC2024)
Receiver functions	access to harmonized receiver function analysis tools, training & benchmarking of tools, providing a harmonized set of receiver function products
Ambient noise	database of continuous data, characterization and localization of seismic noise sources, imaging using body and surface waves
Surface wave tomography	collecting information on available tools and interests of participants, sharing data products (phase velocity measurements, phase and amplitude fields, phase velocity maps), benchmarking and development of measurement and inversion tools
Shear-wave splitting and anisotropy	collection of previous shear-wave splitting measurements, benchmarking of methods & training, new shear-wave splitting measurements, depth & joint inversions
Modeling seismic wave propagation and full waveform inversion	review existing forward modeling methods, benchmarking existing codes & training, forward modeling using synthetic model, application of inversion tools
Linking geophysical observables and geodynamics	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
Engineering Seismology	collection of information on site characteristics, benchmarking of tools constraining the near-surface structure & training, H/V, GMPEs, attenuation/kappa, Vs(30)





Planning the station deployment

The mobile station distribution was done in GoogleEarth. Permanent stations were imported to the maps and circles of 30 and 40 km in radius corresponding to the mobile stations were manually moved over the region to cover it – see the second figure on the left. We tried to place the mobile pools into the densely populated areas to ensure good logistical accessibility and so that the scouting is minimized later on the field. As there was no strict limit of what was the corner period of the backbone, the virtual "deployment" of the mobile stations was done so, that we were successively replacing the "worst" (most SP) stations with the "best" (long-period BB). As a result, we ended up consuming all the mobile stations at hand having replaced as many SP as possible. This gave us the best "quality" of the given coverage in the given subgroup. The lowest corner period of each subgroup thus differs. In the subgroup EAST and partly in the subgroup CENTER, there are several stations with 30 s corner period used for the backbone. The rest is covered with stations of 40 s and longer corner period. This obviously trades-off with the homogeneity of resolution. In the subgroup WEST, all the stations are homogeneous and for subgroup CENTER, it is also almost all covered with "> 40 s sensors. As, however, for the subgroup the stations spacing used was ~30 km", some 30 s sensors are popping up in the respective coverage maps.

Besides using GMT for plotting the various properties of the stations, the same can be shown also in GoogleEarth. The *.kml files are generated by a Python script from the station inventories. The figure on the left shows all AdriaArray stations split by color according to their corresponding to their corner periods in GoogleEarth, similarly as the second map from the left at the top of the poster.

In addition to the backbone, we suggested several local experiments. These are to be considered as a local densification of the backbone, either with BB or SP/SM (or a combination) stations in the regions of particular interest. So far, there are four local experiments deployed.

The table on the right shows which mobile pool goes to which region including the number of stations to be deployed. The table is split by the five regional subgroups. Cells with blue background denote the mobile pools already deployed.

All information about the AdriaArray Seismic Network can be found in the GitHub repository at
https://github.com/PetrColinSky/AdriaArray.

Scan the QR code: