UNIBRA / DSEBRA -- the German seismological contribution to *AlpArray*

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DSEBRA is a major component of the *AlpArray* project which comprises the uniform *AlpArray* Seismic Network, the OBS experiment (LOBSTER) and several swaths of particularly high station density located at key sites of lithospheric reorganization. The overall objective of these deployments is to provide the observational basis for

- an orogen-wide, high-resolution 3D image of the physical properties of the lithosphere and the mantle below down to the mantle transition zone and beyond, including a mapping of the anisotropic properties, and
- a clear and seamless identification and delineation of the geometry and boundaries of the structural units in the lithosphere and the mantle below.

DSEBRA is Germany's big step into the emerging era of large-aperture, high-density and long-term seismological broadband arrays that serve as geo-telescopes for probing the depths of Earth's dynamic interior. The detailed images provided by such multi-component research instruments will vastly improve our understanding of both, localized and fast deformation phenomena such as earthquakes and volcanic activity, and large-scale and slow pro-cesses such as mantle flow. The new technology has already produced astonishing results in North America (US-ARRAY) and promises to do the same within AlpArray and in further targeted studies in Europe and around the world.

DSEBRA is the instrumental heart of this SPP (MB-4D) and is conceived as a single array instrument of 100 mobile, broadband stations which can be deployed either alone or in conjunction with other stations to form even larger arrays. Thus, DSEBRA is the ideal, long-term counterpart to the German instrument pool (GIPP) which is already shared by many researchers in Germany for short-term experiments, usually lasting from weeks to a maximum of one year, and the permanent German Regional Seismic Network (GRSN).

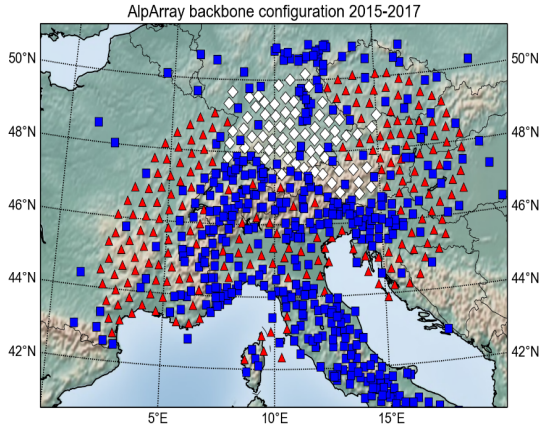

Figure 1: Configuration of AlpArray Seismic Newtwork since end of 2015. White diamonds: sites occupied by stations of German universities (UNIBRA, University Broadband Array). Red triangles: sites occupied by temporary stations of project partners. Blue squares: Sites of permanent stations as of May 2015.

The AlpArray Seismic Network will be the densest seismic array ever deployed on the scale of an orogen. It comprises about 600 land-based seismometers spaced at c. 30-40 km that will cover the greater Alpine region from the Massif Central to the Pannonian Basin, and from the Northern Apen-nines to the Main River in Germany. These stations will be augmented by ocean-bottom seismometers in the Ligurian Sea (LOBSTER). Newly developed seismic imaging methods based on full wave-form inversion and inverse scattering can unleash their full potential for imaging when applied to the unprecedented, high-quality data from AlpArray. AlpArray is therefore an ideal platform for testing and further developing these innovative seismological methods. It will also provide new insight into hitherto unanswered questions on the deep structure and active dynamics of mountain belts, including their relationship to surface processes.

DSEBRA's mission only begins with SPP-2017 (MB-4D) and AlpArray. The stations of UNIBRA (**Uni**versity **Br**oadband **A**rray) that was preliminarily installed at the end of 2015 by the proponents in order to ensure that the *AlpArray* project could begin in accordance with international commitments will be exchanged with DSEBRA stations in 2018. Afterwards, DSEBRA will serve as the core instrument for other innovative German initiatives conducted in concert with international, multi-disciplinary projects. These could include long-term deployments in the European-Mediterranean region or participation in follow-up initiatives to the current North-American EARTHSCOPE project such as the envisaged “Subduction Zone Observatory (SZO)” consisting of observational facilities distributed along active margins world-wide to target subduction zone processes. To conclude, DSEBRA will propel Germany to the forefront of international geophysical and geodynamic research.

This proposal provides the means to obtain stations and record the data necessary to carry out the work in many of the funded projects in AlpArray and the SPP MB4D as well as many future projects. Its locations, together with the SWATH projects will ensure a dense and exceptional coverage with seismic recordings.

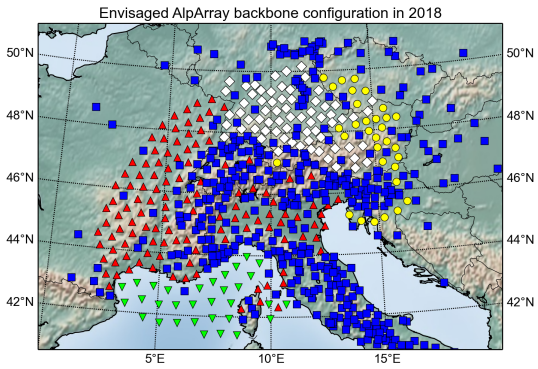

Figure 2: Figure 3: Envisaged configuration of the AlpArray Seismic Network in 2018. White diamonds: UNIBRA sites to be replaced by DSEBRA stations. Yellow circles: Sites of project partners to be taken over by DSEBRA stations. Red triangles: Sites of project partners occupied until 2018. Green triangles: sites of OBS deployment. Blue squares: permanent station sites as of May 2015.

Apart from the PIs, a Postdoctoral Researcher (Dr Antje Schlömer) and a technician (NN) are involved in this project. They are placed at the LMU and will work on the deployment of stations and the daily running of seismic stations at the existing places, currently taken by UNIBRA stations and the new installation of a further 40 stations.

Collaboration in this project is international, since the station deployment of AlpArray stations is an international effort. Several of our stations will be deployed in neighbouring countries (Figure 2) to provide a dense and continuing coverage of the Alpine area. Future projects for which the DSEBRA stations will be used after AlpArray will also rely on international collaborations.