

EuroArray: A programme for the 4D study of the Assembly of the European Continent

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EuroArray is a proposed initiative for a multi-disciplinary, pan-European programme to explore the three-dimensional structure and physical properties of the European continent. It is an essential component of Topo-Europe, providing the lithospheric context within which to interpret the observations. EuroArray will develop detailed knowledge of the complex, three-dimensional geometries of large-scale processes, and an understanding of their development over time, which result in the geology we enjoy and exploit today. EuroArray will build on existing knowledge and infrastructure in Europe and will coordinate and link seismology and electromagnetics with other geoscientific disciplines in an analysis of the deep structure and geological processes beneath Europe. This will be done via the acquisition, analysis and interpretation of data collected from an array over the whole of Europe recording seismic and MT time series, complemented by targeted, high-resolution studies over periods of two years. The stations in the array will be moved every few years, to yield high resolution of structures and geometries. The resulting comprehensive overview of Europe in four dimensions that will result from this programme will reveal the interaction of tectonic domains and plate deformations on a continental scale, which have profound effects on climate and oceans as well as cause the major European earthquakes and volcanoes. EuroArray will radically advance geoscientific knowledge by building on application of new technologies. It will be an outstanding vehicle for the education and training of young researchers in Europe, enabling substantial and sustainable opportunities for the next generation of researchers to transfer to institutes across the continent, working on problems at the cutting edge of science.

The resulting observations will provide data to continental-scale and regional-scale projects that address questions on fundamental geological and environmental processes in Europe. EuroArray will provide data that allows profound understanding of the deep mantle beneath Europe, particularly the European lithosphere–asthenosphere boundary, European natural resources, and risks to Europe from active tectonism.

Examples of target projects to EuroArray are PICASSO (Project to Investigate the Cause of Alboran and Atlas System convective Overturn), which is the pilot project of EuroArray, the North Atlantic uplift, the Caledonides of northern Europe, secular evolution of ancient lithosphere, the continent-ocean transition, the Variscides of northern Europe, basin evolution, mantle plumes, the Tornquist–Tessyre Zone, the Pannonian basin, the Carpathian and Danube system, subduction in the Eastern Mediterranean, the North Anatolian fault, southern Italian neotectonics, tectonic processes in the western Mediterranean, uplift of central Iberia, and the development of the Pyrenean and Alpine systems.

EuroArray is envisioned as a European scale programme, and will involve the brightest of the continent's young scientists to address problems that are fundamental to the future of Europe and mankind. It will provide a battery of land and space-based geophysical systems for studies of deep Earth processes and their impact on the climate, oceans and society throughout the continent. It will be a flagship Earth Science programme.