

The lithosphere is the outer layer of the Earth, consisting of the crust and the lithospheric mantle that underlays it. The lithosphere is made of rigid rocks and is divided into fragments of various sizes, termed tectonic plates. The crust-lithospheric mantle boundary beneath the continents is located at a depth of at least 30 km. Below the lithosphere there is a hot, plastic asthenosphere. The composition and structure of the lithosphere are modified by many processes – including orogenies that lead to metamorphism, folding, collision or uplift of crust fragments. Magmas derived from melting of the asthenosphere or the lowermost lithosphere rocks can entrain small (a few to several centimetres in diameter) fragments of the lithospheric mantle called xenoliths and transport them to the Earth's surface. They are one of the few available sources of direct information about the lithospheric mantle, especially under continents, where it is not possible to drill for taking samples due to the large depths. Numerous Cenozoic volcanics located in Europe (termed the Central European Volcanic Province) sometimes contain large amounts of xenoliths.

A large area of the basement of central and western Europe was shaped during the Variscan (Hercynian) orogeny. The crust formed by this orogeny is relatively easily accessible, since it is exposed in many places in Europe (eg. the Bohemian Massif, the Harz Mountains, the Sudetes). This enabled to recognize various Hercynian units, describe their regional geology and reconstruct their history. However, there is lack of similar works regarding the lithospheric mantle, which could contribute to a better understanding of the evolution of the Variscan orogen. During the orogeny, small tectonic plates were colliding, resulting in the current structure of the crust. It is assumed that the lithospheric mantle was taking part in these collisions as well, “pulled” by moving plates. Since the Variscan crust consists of different units with diverse characteristics and history, it is possible that similar variation occurs within the lithospheric mantle. Mantle xenoliths found in many Cenozoic volcanic occurrences in central and western Europe can potentially reflect such spatial variability. The research carried out in this project is a part of a series of studies on xenoliths, aimed to create a regional characterization of the lithospheric mantle beneath Europe and to reconstruct its evolution.

The presented project focuses on xenoliths from the Vogelsberg (central Germany) and Devès volcanic fields (French Massif Central). The basement of those fields consists of different Variscan units. In order to obtain comprehensive information on the studied rocks (textural features, chemical composition) advanced research methods will be used, such as: scanning electron microscopy, electron microprobe, inductively coupled plasma mass spectrometry, electron backscatter diffraction, Mössbauer spectroscopy. The information obtained should enable to characterize the lithospheric mantle beneath several Variscan units, describe their possible variability and reconstruct the lithospheric mantle evolution.