

INTERNATIONAL REGIONAL GEOPHYSICAL STUDIES IN THE UKRAINE

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In the 1980s, a fruitful cooperation of geological and geophysical organisations of different countries produced a network of transcontinental DSS geotraverses in Central Europe providing insight into the crustal structure of different regions. Most observations were made in the Ukraine. At the end of the 1980s, this network was supplemented with profiles crossing superdeep and deep boreholes. The studies were further advanced by combining seismic data with the results of other geophysical methods; this enabled 3-D modelling of geological structures adjacent to the geotraverses and was promising from the

viewpoint of mineral exploration. Methods of determining the properties of geological sections using combined geophysical field interpretation data were also developed. From the viewpoint of studying crustal geodynamics and elucidating the laws of the formation of mineral deposits, integrated CDP and DSS data processing and interpretation appears to be very effective.

At present, the systems of regional studies worked out in the Ukraine are widely used abroad to provide, among other things, an in-depth framework for mineral exploration. International projects include EUROPROBE's "Intraplate Tectonics and Basins Dynamics" and "EUROBRIDGE", whose prospects in the Ukraine are discussed below (Figs. 1,2).

The "Intraplate Tectonics and Basins Dynamics" project foresees activities at least until the year 2000 and includes studies of the tectonics and geodynamic development of the lithosphere of the Dnieper-Donets Basin (DDB) and adjacent territories, elucidating the geodynamic processes governing the formation of consolidated crust and sedimentary cover in intracratonic rift zones. CDP reflection seismic and DSS are the main methods of study. During the next three years, it is planned to make deep CDP studies of profiles I, IV, VI, XVI, XXIII (Fig. 2), across the DDB, which have been surveyed earlier by DSS methods, and a geotraverse Poltava-Baranovichi along the axial part of aulacogen; also planned are ca.1000 kilometres of profiles in the Donbas region along DSS profiles X, XI, XII, XIV, XIX, XX. Over the same profiles, magnetic variation studies will be made. To set up

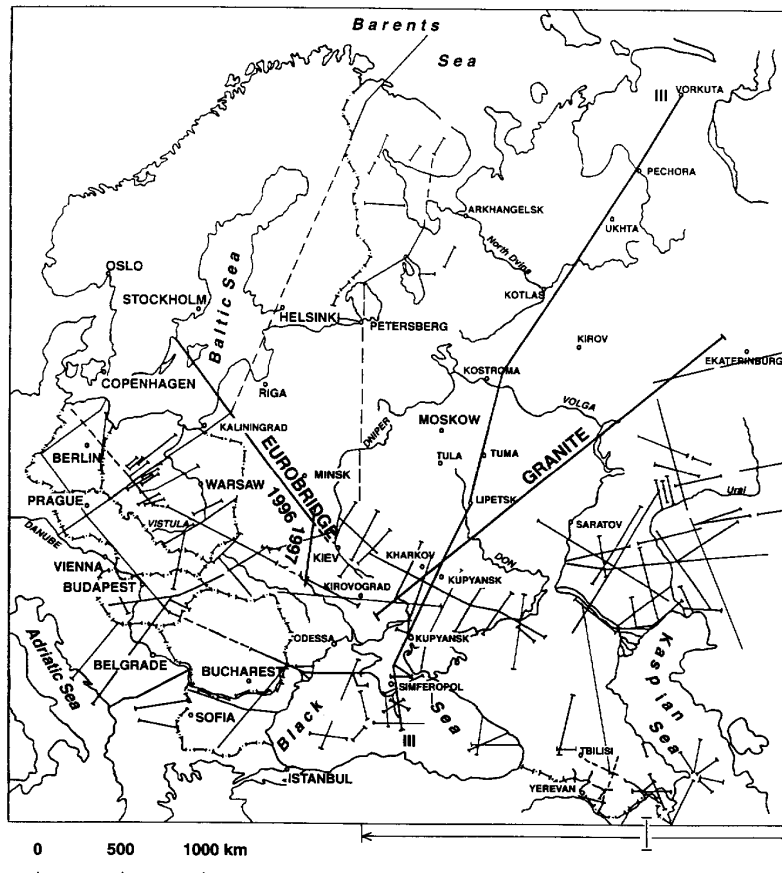


Fig. 1. Deep seismic profiles in Central Europe, recorded and planned.

tectonophysical and petrophysical models of the structure of the DDB, it is planned, in addition to the CDP time sections over the cited profiles, to make the following products: structural interpretation of the main seismic interfaces of the lithosphere, a map of the gravity field, a map of magnetic field anomalies and schemes of heat flow and fault tectonics.

Based on the geophysical field data, the following results are expected: a physico-mechanical model of the DDB lithosphere; a geothermal model of the early stage of rift evolution; layered models of the consolidated crust under conditions of tension; physico-mechanical and rheological models of Proterozoic basement structures; a mathematical model of the geodynamic processes in the Palaeozoic, controlling the maturation and distribution of hydrocarbon deposits; and an integrated geodynamic analysis of geological and geophysical data.

Of great interest are studies of the lithospheric structure in the areas of conjunction of the DDB with adjacent ancient structures, e.g. the Ukrainian Shield in the southwest and Voronezh massif in the northeast. For this purpose it is planned to complete CDP-DSS studies along the geotraverse "Granite", passing through the Ukraine from the Krivoi Rog superdeep borehole (SD-8) toward Lipetsk and further to the Uralian superdeep borehole (SD-4). Project "Granite" foresees CDP activities in a DSS version for studying

the whole lithospheric structure. It is expected that a 3-D lithosphere model will be set up for the region of the Krivoi Rog superdeep borehole within a ± 50 km "polygon" in the vicinity of the geotraverse using the geophysical data set.

To provide a framework for economically important mineral exploration in the ancient shields of the East-European Platform (EEP), the project "Eurobridge", cutting the western part of EEP from the Baltic to Ukrainian shields was established. Its main task has been to elucidate the processes controlling the formation of mineral deposits within geostructures adjacent to the geotranssect. The investigations include regional seismic observations (three-component recording) integrating the results with DSS and CDP-DSS data and the setting up 3-D models, using the geophysical data set from the Korosten pluton area and the intersections with geotranssects II, IV, VI, VII, VIII ("Granite").

Seismic observations planned for the Ukrainian sector of "EUROBRIDGE" will also allow definition of lithosphere velocities beneath the Pripjat Basin. For similar reasons, it is planned to extend, in 1997, "EUROBRIDGE" within the territory of the Ukraine along the line Ozarichi-Wystupovich-Chopovich-Lodyzhin, coinciding with the CDP profile cutting the Pripjat Basin.

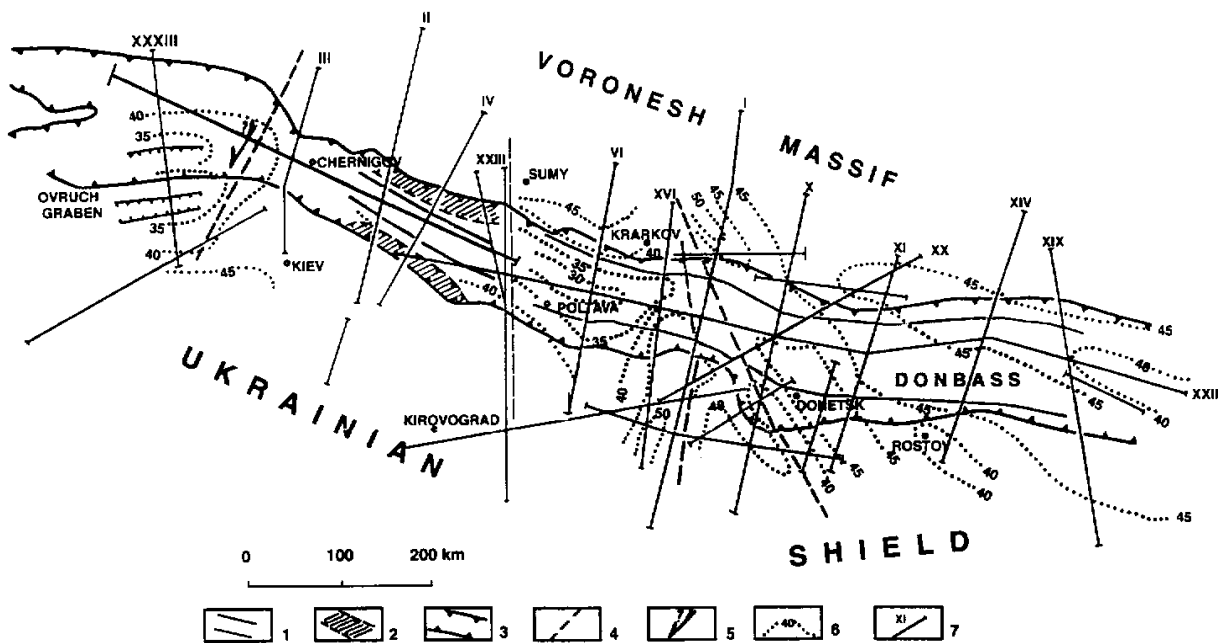


Fig. 2. Planned CDP profiles across the Dnieper-Donets and Donbas Basins with indication of Moho depths (km).