

**CENTRAL EUROPEAN LITHOSPHERIC EXPERIMENT BASED
ON REFRACTION 2000
THE CELEBRATION 2000 SEISMIC EXPERIMENT**

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Key words: CELEBRATION 2000, POLONAISE'97, Seismic Refraction Experiment, crustal structure

The CELEBRATION 2000 Seismic Experiment is located on the area of the southern portion of the Trans European Suture Zone (TESZ) region, the margin of Baltica (East European Craton), inversion structures along the TESZ, the Carpathian orogenic belt, the Pannonian basin, and the Bohemian Massif (Fig 1.)

The CELEBRATION 2000 effort is an extension of the POLONAISE'97 Experiment. Both of these experiments were integrated into the framework of the EUROPROBE Program – Trans European Suture Zone, EUROBRIDGE (East European Precambrian Craton) and PANCARDI (Pannonian basin, Carpathian Arc, Dinarides) projects.

CELEBRATION 2000 targets many of the questions that remain about the geodynamics and structural relationship in Central Europe. Previous seismic studies do provide a regional picture of a complex crustal structure in which the depth to the Moho discontinuity varies from ~ 25 km in the Pannonian basin to ~ 55 km in the TESZ region of southern Poland.

When viewed from a larger perspective, the Palaeozoic tectonic evolution of Europe involved a complex series of orogenic pulses resulting from the collision and the suturing of Baltica, Laurentia, Gondwana, intervening terranes like Avalonia and Bohemian Massif, transported crustal blocks to form the supercontinent Pangea. As the Palaeozoic era ended, the formation of the supercontinent was completed, and the northern part of the TESZ region was actively subsiding to form the southern Permian basin. This basin consist of several sub-basins that extended from central Poland, across northern Germany and Denmark, into the North Sea region. The origin of the basins is uncertain but it may indicate the first phase of the break-up of Pangea. North of the Carpathian Mountains, the area targeted by CELEBRATION 2000 experienced relatively minor extension during the Mesozoic as evidenced by further subsidence in the Polish Trough that was followed by tectonic inversion along the Tornquist-Teisseyre zone due to the Alpine orogeny.

The primary scientific goals of CELEBRATION 2000 are:

- Investigate the deep structure of southwestern Baltica and its relationship to younger terranes
- Delineate the major terranes and crustal blocks in the TESZ region (e.g., Bohemian Massif, Upper Silesian Massif, and blocks exposed in the Holy Cross Mountains, Fig.1)
- Investigate the origin and the structural framework of the Pannonian basin and its subbasins
- Investigate the nature and extent of thrust faulting along the northern front of the Carpathian Mountains
- Investigate the relationships between the Bohemian Massif and Western Carpathians
- Construct the 3-D model of the lithospheric structure in the study area
- Evaluate and develop geodynamic models for the tectonic evolution of the region

CELEBRATION 2000 was built on the productive collaborations established during the POLONAISE'97 Experiment. The layout of the experiment was a network of interlocking profiles whose total length was about 9000 km (Fig.2.). The station spacing along the profiles was 2.8 or 5.6 km, so that in addition to forming an array, about 5400 km of profiles were obtained. Covering this network of profiles required three deployments over a period of 1 month (June 2000).

Realising that the lithospheric structure in the targeted area is very complex, the need for a 3-D approach was recognised early in our planning process. Recent advances in seismic instrumentation have made many more instruments available so that 3-D approach could be implemented. In fact by pooling European and US resources, >800 new matched seismic instruments that were jointly developed by the University of Texas at El Paso and Refraction Technology were available for this experiment. Other Canadian, European, and US instruments brought the total number of instruments deployed to 1230.

A large number of seismic sources was also required, and again the pooling of resources proved to be effective. Ultimately, scientific organisations in Poland, Hungary, the Czech Republic, the Slovak Republic and Austria funded 142 sources. An additional 5 shots were made in Russia, Belarus and Germany. These sources ranged in size from 15,000 to 90 kg with the average being \sim 500 kg. Since some of these sources were small we estimate that about 100,000 useable vertical component seismograms were obtained. In addition, about

15% of the stations were occupied by 3-component recorders and included two horizontal seismometers producing even more seismograms.

International Consortium for CELEBRATION 2000 Experiment consisted of 28 institutions from 13 countries in Europe and North America (Table 1). CELEBRATION Working Group consists of over 50 geophysicists.

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Fig. 1. Main Geological units in the area of the Celebration 2000 experiment

Fig. 2. Celebration 2000 recording scheme



