Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05716, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05716
EGU General Assembly 2008

Preliminary Results from the Carpathian Basins Project: an Investigation of the Seismic Structure of the Lithosphere in the Pannonian and Vienna Basins

G. Houseman (1), G. Stuart (1), E. Hegedüs (2), E. Brückl (3), S. Radovanovic (4), A. Brisbourne (5), P. Lorinczi (1), B. Dando (1), A. Kovács (2) and H. Hausmann (3)

1. School of Earth and Environment, University of Leeds, Leeds, LS2 9JT, UK

2. Eötvös Loránd Geophysical Institute, 1145 Budapest, XIV. ker. Columbus u. 17-23, Hungary

3. Institute of Geodesy and Geophysics, TU-Wien, A-1040, Vienna, Austria

4. Seismological Survey of Serbia, 11000 Beograd, Park Tasmajdan, Serbia

5. SEIS-UK, University of Leicester, University Road, Leicester, LE1 7RH, UK

The Carpathian Basins Project (CBP) includes a major international broadband seismology experiment, together with geodynamical modelling designed to improve our understanding of the structure and evolution of the lithosphere and upper mantle beneath the western Pannonian and Vienna Basins. The Pannonian Basin is the largest of a group of Miocene-age extensional basins within the arc of the Alpine-Carpathian Mountain Ranges. These basins are generally recognized as extensional in origin, but their formation is paradoxical because they are surrounded by mountain chains of a similar age, which result from sustained convergence during and since the period of active extension. Starting in September 2005 we deployed 56 portable broadband seismic stations in Austria, Hungary and Serbia, mainly using equipment from SEIS-UK. The CBP array had two major components: a regional broadband (RBB) array of 10 stations (to 100 sec period) across the interior of the Pannonian Basin, and a High-resolution Seismic Tomography array (HST) of 46 stations (broadband to 30 sec), spanning the Vienna Basin and the western part of the Pannonian Basin. Preliminary analyses of these data have revealed arrival time residuals from teleseismic earth-

quakes on the order of + or - 0.8 sec, with early arrivals in the Vienna Basin and later arrivals in the SW Pannonian Basin. Variation of the travel time residuals with back azimuth suggests an irregular 3D variation of P-wave velocity in the upper mantle. Seismic anisotropy (SKS) measurements reveal an intriguing pattern of lithospheric anisotropy: in the north-west the fast direction is generally elongated EW, perpendicular to the shortening direction across the Alps. Across the Vienna Basin the fast direction is NW-SE, perpendicular to the major bounding fault systems. Across the Pannonian Basin the dominant fast direction is EW, but in several locations the vectors are rotated toward NW-SE. The Mid-Hungarian Line, a major strike-slip structure already clearly identified in the gravity field, also is associated with abrupt changes in the azimuth of lithospheric anisotropy, and crustal receiver function signature. The length-scale on which seismic anisotropy varies confirms the need for a high density of stations in order to reliably map the structures. The object of these investigations is to use the seismic data to discriminate between different models for how this orogenic system evolved. In support of this aim we are also using 3D finite element methods to examine mechanical models of lithospheric deformation. In these finite deformation models we track the development of stress and deformation in crust and lithosphere as the basins extend, with shortening across the Carpathians.