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The Carpathian Basins Project: an investigation of the evolution of the Pannonian-Carpathian orogenic system

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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 almost entirely surrounded by mountain chains of a similar age, which result from sustained convergence throughout and since the period of lithospheric extension. The lithospheric extension within the Pannonian region is usually attributed to the roll-back of subduction systems in which oceanic lithosphere was subducted beneath the outer Carpathians as the crust and lithosphere within extended. An alternative class of models relies on the idea of gravitational instability of the mantle lithosphere in which synchronous extension of the basin, and convergence of the peripheral mountain belts is driven by a convective overturn of the upper mantle. In either case however, these models remain conceptual and require further quantitative development and testing against observation.

The Carpathian Basins Project (CBP) is a major international seismology collaboration within the framework of Topo-Europe, designed to provide much improved spatial resolution on the seismic velocity structure of the Pannonian and Vienna Basins. Starting in September 2005 we commenced the deployment of 60 portable broadband

seismic stations in Austria, Hungary and Serbia. The CBP array has two major components: a regional broadband (to 100 sec period) array (RBB) of 10 stations across the interior of the Pannonian Basin, and a High-resolution Seismic Tomography array (HST) of 50 stations (broadband to 30 sec), spanning the Vienna Basin and the western part of the Pannonian Basin. Continuously recording for two years (RBB) and for one year (HST) respectively, these data will enable relatively high-resolution seismic tomography images of the lithosphere and upper mantle beneath the western part of the Vienna/Pannonia region to be obtained. The data also will enable receiver-function analysis, surface-wave analysis, and seismic anisotropy (SKS) measurements to be carried out. The object of these analyses is to examine the evidence for deformation of the mantle lithosphere and anomalous properties within the asthenosphere and upper mantle, in order to discriminate between different models for how this orogenic system evolved. The project is supported by a numerical modelling effort using 3D finite element methods to examine mechanical models of the formation and evolution of the basin. In these finite deformation models we track the development of stress and deformation in crust and lithosphere as the basin extends. We will report on progress to date in the CBP project.