CALIXTO'99: THE INTERNATIONAL CARPATHIAN ARC LITHOSPHERE X-TOMOGRAPHY EXPERIMENT

The CALIXTO '99 Research Group

The CALIXTO'99 project is the first extensive seismic tomography experiment over the Carpathian Bending Arc with the aim to snap-shot structure and processes of the final stage of a subduction plate detachment. The large-scale passive high-resolution experiment was carried out in the Southeast Carpathians and surrounding region from April through November 1999, with about 150 mobile seismic acquisition systems including 30 broadband sensors. Slab detachment in an active subduction zone may appear when plate convergence comes to a halt and suction forces create a tear. The terminal phases of slab break-off, however, are hardly understood. The processes associated with the very last moments before the subducting slab of oceanic lithosphere is separated from the plate it was attached to and sinks/melts into the mantle, remain elusive. The Southeast Carpathians is probably the site beneath which such a slab detachment process is currently under way.The Vrancea zone in the center of our study area is characterized by an unusually narrow, near-vertical zone of intense seismicity between 70 and 220 km in depth. Preliminary tomographic inversion of regional and teleseismic P-wave arrival times indicate the slab dipping 50-60 degrees in the upper part and being subvertical in the lower part with a possible break-off at about 120km depth. The preliminary slab model suggests the Eastern Carpathian subduction zone retreated towards the east during middle Miocene and changed its direction toward southeast during the final stage in late Miocene. High-resolution tomographic images will also help to improve hazard assessment in an area that already experienced four strong earthquakes in this century: 1940 (M = 7.7), 1977 (M = 7.5), 1986 (M = 7.2), and 1990 (M = 6.9). Inverting for S-wave velocities and attenuation offers the possibility to simulate the propagation of destructive waves from potential future earthquakes to megacities such as Bucharest.The CALIXTO'99 Research Group: Collaborative Research Center 461, University of Karlsruhe, Germany; National Institute for Earth Physics, Bucharest, Romania; University of Bucharest, Romania; Ecole et Observatoire des Sciences de la Terre, Strasbourg, France; Institute of Geophysics, ETH Zurich, Switzerland; Istituto Ricerca Rischio Sismico, Milan, Italy; GeoForschungsZentrum Potsdam, Germany.