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TOPO TRANSYLVANIA within TOPO EUROPE: Introduction to an unfolding project

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Initiated with a spatially limited local focus as an informal cooperation between a few Hungarian and Romanian researchers looking for a test-area of newly developed original satellite-based geodetic techniques by the MTA CSFK Geodetic and Geophysical Institute (Hungary), the original idea evolved into a multi- and inter-disciplinary project proposal which aims at the complex monitoring of the geodynamically most active part of Europe, the internal part of the Carpathian bend area in South-Eastern Transylvania, where a number of ongoing and geologically recent processes (such as seismicity, recent volcanism, "post-volcanic" phenomena, focused geothermalism) converge in space and time. TOPO TRANSYLVANIA now involves a large number of scientists representing a spectrum of Earth-science expertise, and a number of institutions from Romania (Institute of Geodynamics, National Institute of Earth Physics, Babeș-Bolyai University), Hungary (MTA CSFK Geodetic and Geophysical Institute and Eötvös Loránd University) with the cooperation of Tectonics Group, University of Utrecht (Netherlands) under the aegis of the broader TOPO EUROPE project. It addresses the following research topics and scientific objectives: 1) coupling deep earth kinematics to surface evolution/ topographic changes; 2) process-oriented understanding of landform evolution and linking it to the timescales of relevant geodynamical processes; 3) evaluating the societal relevance of this geodynamically highly active area; 4) supporting decision making with the due consideration of georisks; 5) assessing vulnerability and sensitivity of the target area with respect to geohazards. The investigation and modelling of the ongoing geodynamic processes in the target area, focused on, but not restricted to, the Carpathian Bend interior, will be accomplished by the integrated application of a number of investigation methods and techniques: 1) monitoring Earth's surface dynamics by using the recently developed high-resolution space geodetic techniques, as well as by integrating the results with ground-based geochemical and geophysical observations; 2) investigation of Lithospheric architecture by means of seismic tomography based on densified seismic network and electromagnetic deep-sounding, also benefiting from the available potential field analysis; 3)the physical and chemical state of the lithosphere will be investigated either by a) petrological investigation of mantle materials (mantle xenoliths), study of cryptic water content of anhydrous rock-forming minerals of volcanic formations, b)observation and monitoring ongoing geochemical and "post-volcanic" processes by obtaining time series of parameters such as focused (mofette) and diffuse gas fluxes and compositions (including Radon), changes in mineral water (springs and wells) chemical compositions and temperatures, in relation with external (atmospheric) and internal (geodynamics-related) causes and modulations, and c)paleo-geothermal studies on fluid-inclusions in post-emplacement minerals of volcanic rocks; 4) analogue and numerical modelling fostering better understanding of the coupling between volcanism, "post-volcanic" phenomena and tectonics using thermo-chemical models as well as constructing the linkage between the refined lithospheric architecture and dynamical observation; 5) exhausting inventory and evaluation of the natural resources in the area with special consideration of geothermal energy; 6) evaluation of geohazards of natural (volcanic, tectonic) and anthropogenic (induced and triggered seismicity) origin, as well as of hazards related to climate change (flooding, erosion).