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Integrated Geodynamic Stations in Central Europe

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Novel results in geochemistry suggest that the solidifying melt content of the cooling, partially molten asthenosphere and metasomatic alterations in thinned continental lithospheric mantle, such as in the Pannonian Basin, could be a source of volatiles, especially CO_2. This is because CO_2 cannot be incorporated into the minerals that crystallise as the asthenosphere cools, so it becomes enriched in CO_2 fluids. The flow of these fluids towards the surface is also strongly influenced by the stresses building up in the lithosphere. We propose that there are also signs that the combined observation of CO_2-rich surface emanations and earthquakes may provide an opportunity to identify anomalies that may precede earthquakes. The research is based on the Dutch-Hungarian-Romanian Topo-Transylvania cooperation and targets to deepen the understanding of the complex geological processes in the Carpathian bend. The Carpathian bend is one of the tectonically most dynamic areas in Europe and includes the highly earthquake-prone Vrancea zone. A prototype of the Integrated Geodynamic Station was built in Hungary, in the Balaton Highlands, where a suitable location to achieve the technical objectives was found in Badacsonytördemic. By simultaneously monitoring seismic activity, the flux of volatiles from the Earth's interior, meteorological parameters and the electromagnetic properties of the subsurface, this internationally unique station can play a key role in fingerprinting signals that precede earthquakes and better understanding the global carbon cycle. The integrated geodynamic station analyses the composition of gases (CO_2, C_xH_y, S and N components) at the surface and below the subsurface continuously and accurately using an infrared spectrometer. The most important goal is to identify precursors prior to earthquakes in the time series of gas compositions, conductivities of the Earth' lithosphere and seismic events. Recently second such a station was installed in Covasna (Romania) of the Carpathian Bend area close to the Vrancea zone. We will present some preliminary data from both of these stations having a great potentials to identify earthquke precursors.

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