# Seismic exploration of mineral deposits in Northern Finland

Stefan Buske (1), Suvi Heinonen (2), Elena Kozlovskaya (3), Jari Karjalainen (3), and Hanna Silvennoinen (4)

(1) TU Bergakademie Freiberg, Institute of Geophysics and Geoinformatics, Freiberg, Germany
(buske@geophysik.tu-freiberg.de), (2) Geological Survey of Finland, (3) Oulu Mining School, (4) Sodankylä Geophysical
Observatory

Within the project XSoDEx (eXperiment of SOdankylä Deep Exploration) the Geological Survey of Finland (GTK), Technische Universität Bergakademie Freiberg (TUBAF), Oulu Mining School (OMS) and Sodankylä Geophysical observatory (SGO) are working together to study bedrock structures in the Sodankylä area (Northern Finland). The aims of the project are to study the structural and lithological framework at depth possibly showing linkage of the two major mineral deposits of the area and to achieve a better understanding of the mineral system. A total of approximately 80 km seismic reflection and refraction data were acquired during July and August 2017 using mostly the Vibroseis source of TUBAF. The seismic reflection data were recorded in a roll-along scheme by a 3.6 km long spread with 10 m geophone spacing and 20-40 m source point spacing. The seismic refraction data were simultaneously recorded by 60 vertical- and 40 three-component receivers along an extended line around the reflection spread with maximum offsets of around 5-6 km.

The processing of these data sets is currently ongoing employing different seismic imaging and inversion techniques. The seismic reflection data will be used to map crustal structures down to approximately 3 km depth, while the seismic refraction data provide information about velocity structures of the subsurface as well as constraints to the seismic reflection data processing. In addition, petrophysical measurements are conducted from samples collected in the vicinity of the seismic profiles, which will deliver densities and seismic P-wave velocities to constrain the interpretation of the seismic data. Furthermore, new AMT (Audiomagnetotelluric) and gravity data were acquired along the same profiles in order to gain a better understanding of the deep conductivity structures and to provide a density model of the subsurface.

In summary, the acquisition and analysis of such a multi-parameter data set will enable a accurate and reliable geological interpretation of the subsurface features resulting in a 3D geological model including the major mineral systems in the Sodankylä area.