Geophysical Research Abstracts
Vol. 15, EGU2013-1669, 2013
EGU General Assembly 2013

The potentialities of ground-penetrating radar in the engineering geology using the radars GROT-12 and GROT-12E

Liudmila Volkomirskaya, Oxana Gulevich, and Dmitri Musalev
Russian Federation (mila@izmiran.ru)

The potentialities of ground-penetrating radar in the engineering geology using the radars GROT-12 and GROT-12E
L.B. Volkomirskaya(1,2), O.A. Gulevich(1,2), D.N. Musalev(3)

1. IZMIRAN, 142190, Russia, Moscow, Troitsk, Kalugskoe 4
2. ZAO Timer, 142190, Russia, Moscow, Troitsk, Lesnaya str. 4B
3. OAO Belgorchemprom, Republic of Belarus, Minsk, Masherov str. 17

The article presents the potentialities of ground-penetrating radar in the engineering geology on the basis of the latest modifications of the GPR "GROT": the low-frequency GPR GROT-12 and the high-frequency GPR GROT-12E. The article gives technical specifications of the GPRs GROT-12 and GROT-12E and their particular characteristics that define them from analogues.

The solutions of direct problems of ground penetrating radar on the basis of Maxwell's equations in general formulation with given wide-band signal source are confronted to experimental data received from different fields of the engineering geology, for example:

1. To secure mining in salt mines the method was adapted to locate in the working layers the investigating boreholes, fault lines, borders of displacement and blowout of productive layers, as well as working pits without access.
2. To monitor the reinforced concrete structures of airport runways the technology was worked out to collect and process GPR data so as to locate communications under the runways and examine basement condition.
3. To carry out the reconstruction of buildings and pre-project engineering geological works the GPR shooting technology was improved to process the examinations of the bearing capacity of soils and to locate lost communications.
4. To perform ecological monitoring of abandoned mines the technology of the GPR data collecting and processing was developed to assess the conditions of stowage materials in mouths of destroyed vertical mine shafts, the location of inclined mine shafts, the determination of hollow spaces and thinning zones, the localization of ground and mining waters, as well as the state of dumps (spoil tips).
The dependence was investigated between the resolution, the exploration depth and the characteristics of GPR: the power and pulse length of transmitter, the digit capacity and frequency of the receiver, the construction of antennas.
The article includes examples of usage of GROT-12 and GROT-12E in research at the depth 100 m and deeper in the salt mines in Starobinsk deposit, in the Sheremetyevo airport in Moscow, in the mining fields of Kuznetsk Basin, Donets Basin and Australia.
The article presents a study of the required characteristics of ground-penetrating radars considering the given parameters of the exploration depth and digit capacity.