GEO Technologies
look deep into

EQUATOR

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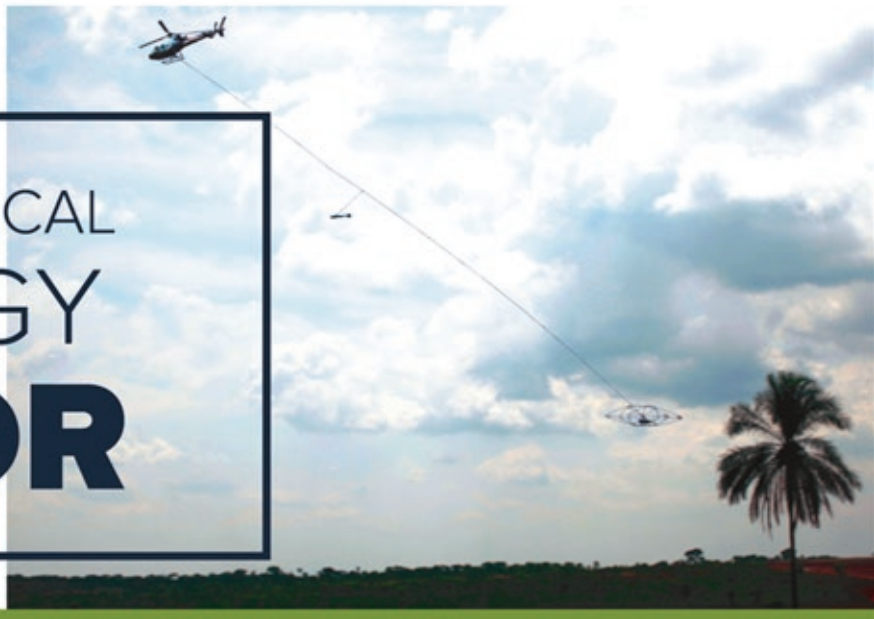
AIRBORNE GEOPHYSICAL

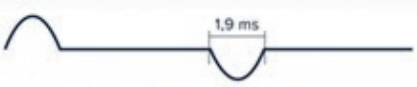
TECHNOLOGY EQUATOR



The EQUATOR system is intended to perform airborne geophysical surveys for the solution of a wide variety of geological and mapping problems. It consists of:

- airborne time-domain electromagnetic system (in addition, data can be represented in frequency domain)
- airborne magnetic system
- airborne gamma-ray spectrometry (NaI(Tl) 48 l, energy resolution 8% for the γ-ray energy E_γ 662 keV)
- system of data control and high-precision navigation
- software package for automatic data processing

Technical specifications

Electromagnetic measurements	
Principle of operation	Time-Domain & Frequency-Domain
Dipole moment (NIA)	50 000 - 100 000 Am^2
Base frequency	77 Hz
Waveform	Half-sine 
Installation type	Towed, transmitter and receiver are separated, the transmitter is below
Control of transmitter-receiver geometry	Built-in positioning system: spatial accuracy 15 cm, angular accuracy - 2 degrees
Output data in time domain	14 off-time channels from 5 μs to 4.5 ms (X,Y,Z components)
Output data in frequency domain	In-phase and quadrature components at 14 frequencies from 77 Hz to 16 000 Hz (X, Y, Z-components)
Sampling frequency	200 kHz, full-time
Frequency of data output	6,6 Hz
Total weight	250 - 300 kg
Transmitter loop diameter	7,5 - 11,5 m
Tow cable length	70 m
Placement of the receiver	In a towed bird, 40 m from the transmitter
Power consumption	100 A, 27 V
Survey speed	20-200 km/hr

Magnetic measurements	
Sensor	SCINTREX CS-3 or similar
Sensitivity	0.6 pT/√Hz
Sample rate	1000 Hz
Output rate of 'distilled' data	25 Hz
Synchronization	by GPS
Sensor placement	In a bird together with the EM field receiver

EQUATOR BENEFITS

RECORD-BREAKING PRODUCTIVITY

Thanks to design features of a towed platform steady towage of entire system can be implemented in the wide range of speeds of the aircraft. If Eurocopter AS350 B3 helicopter is used average speed in a survey flight is 155 km/h, but the maximum is 200 km/h. The small weight and good aerodynamics of the system allow a pilot to surely fly the system even in the most difficult mountain conditions, control and adjusting operations take minimum time, and as a result a survey is conducted with a record-breaking productivity: 10 000 line km per month.

HIGH SENSITIVITY

Thanks to unique algorithms of signal processing noise is suppressed by more than 30 times. This allows achieving high sensitivity with rather small weight and compact dimensions of the system.

INVARIANCE TO SURVEY'S CONDITIONS

The EQUATOR system includes the monitoring system of geometrical parameters of the unit. It measures spatial coordinates of the helicopter, the EM-transmitter and receiver, the magnetometer's sensor, flight altitude over a relief and other necessary parameters. The accounting of all these parameters at data processing provides high quality and stability of received geophysical information.
Our special algorithms for navigation allow to complete a good quality survey with 50 m between lines.

HIGH QUALITY OF AIRBORNE MAGNETIC MEASUREMENTS

Sampling frequency of EQUATOR's magnetometer is 1000 Hz. Its' sensitivity is 0.6 pT/ √Hz. It corresponds to sensitivity of quantum CS-3, CS-L sensors. Such sample rate allows excluding the influence of transmitter of electromagnetic system. Also it allows providing survey in a industry noisy areas (e.g. in a presence of power lines).

HIGH SENSITIVITY OF AIRBORNE GAMMA-RAY SPECTROMETRY

Due to using several lines of characteristic radiation from uranium and thorium it possible, if necessary, to increase the altitude of flight. It also possible to make a survey in high humidity conditions (for example, during the rain season in Africa) due to the original procedure for free radon correction.

MAXIMUM COMPLETENESS OF COLLECTED DATA

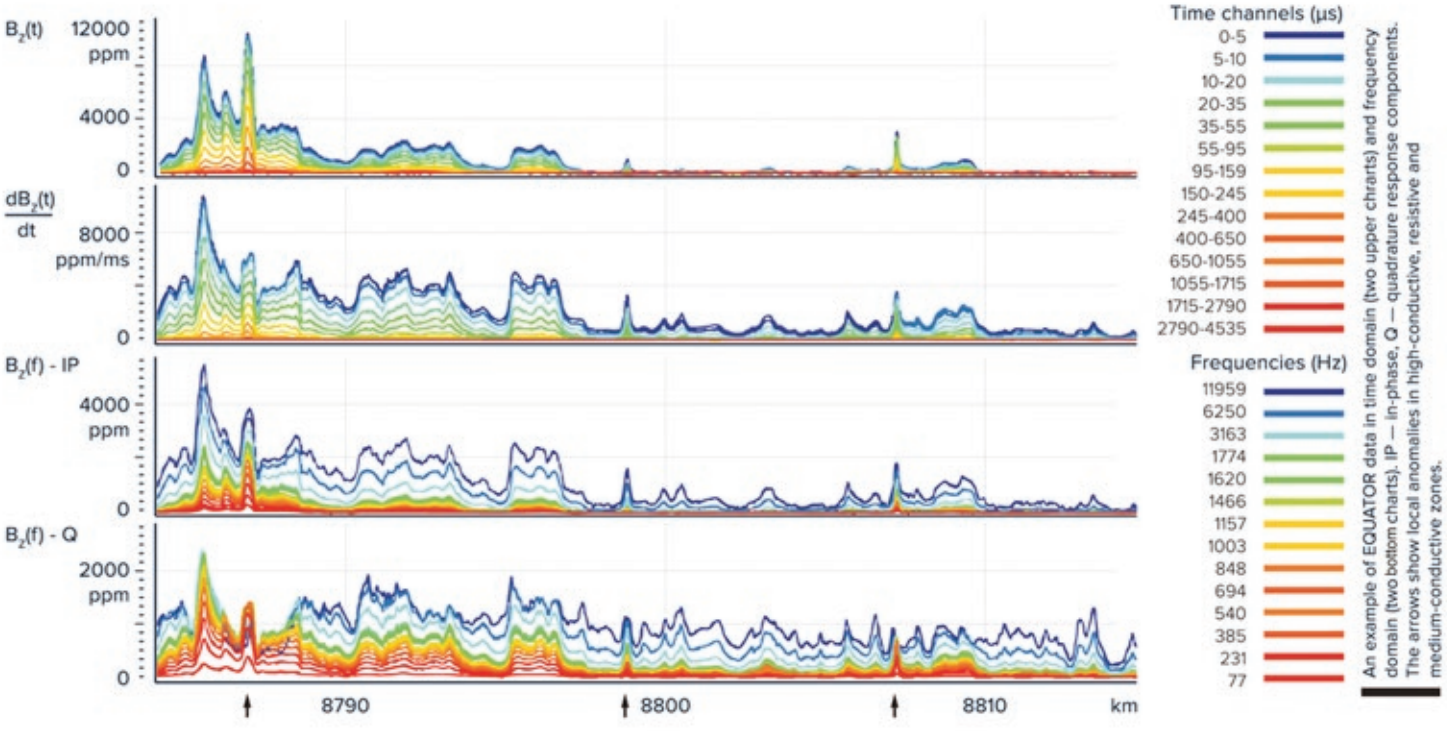
The dataset received using EQUATOR system gives the greatest opportunities for geophysical interpretation. The geophysicist can analyze responses in a traditional representation for transient electromagnetic method - as a set of values dB/dt (and even values of the field B(t)). Also the data can be presented in a form traditional for frequency-domain systems (in-phase and quadrature components).

HIGH EXPLORATION EFFICIENCY

High spatial resolution of the EQUATOR system provided by a low placement of the transmitter and high rate of measurements (6.6 Hz) ensure detection of small low-contrast objects. The near-surface objects of 40 m in size with resistivity contrast of 10-15% are reliably observed on apparent resistivity maps and are confirmed by accompanying magnetic anomaly.

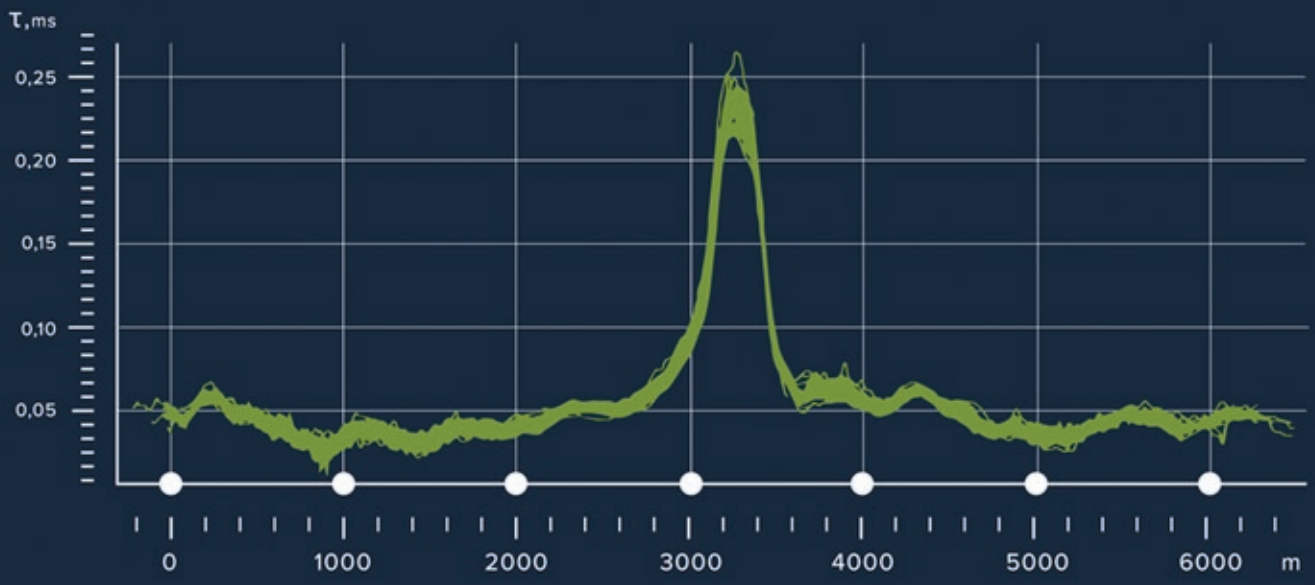
AVAILABILITY FOR ALL

High efficiency of the EQUATOR system and simplicity of operation provide its efficiency even on small survey areas.



MEASUREMENT STABILITY:

Charts of time constant calculated for 80 control flights along the same route, onefl ight for one survey day.



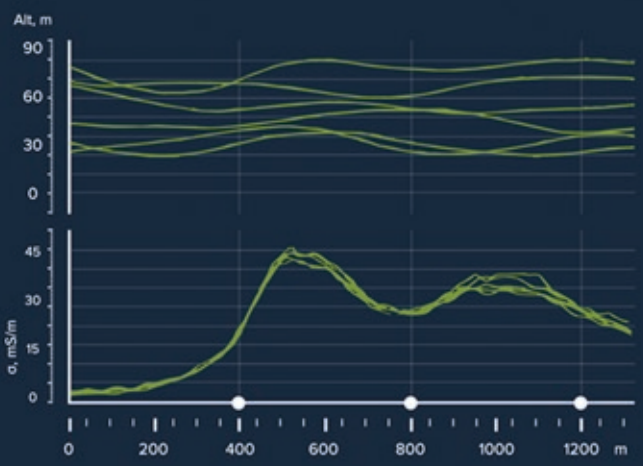
INDEPENDANCE OF INTERPRETATION RESULTS FROM MEASUREMENT CONDITIONS

ON THE CHARTS:

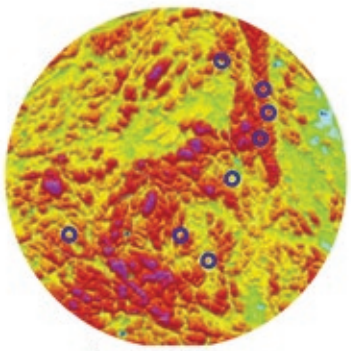
At the top - altitude variations for six flights along the same route

At the bottom - calculated values of apparent conductivity for these flights

It's clearly seen that values of apparent conductivity are almost independent from flight altitude.

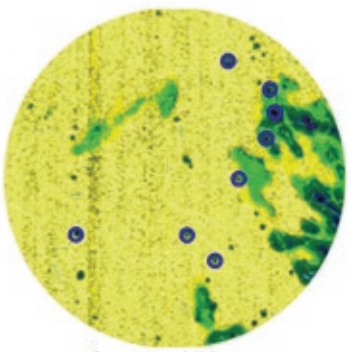


THE EXAMPLES OF MAPS

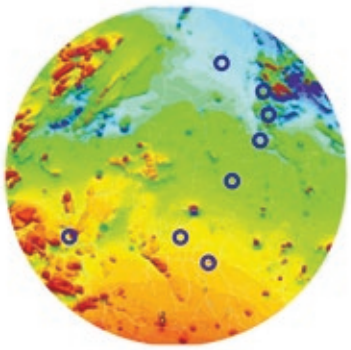


Apparent resistivity map
Frequency-domain
effective depth 30 m

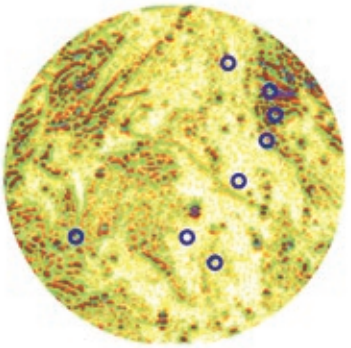
- kimberlite
(drilling data)



Apparent resistivity map
Time-domain
effective depth 200 m



Anomaly magnetic field



Anomaly magnetic field, local component