

GEO TECHNOLOGIES 2012



DEAR FRIEND!

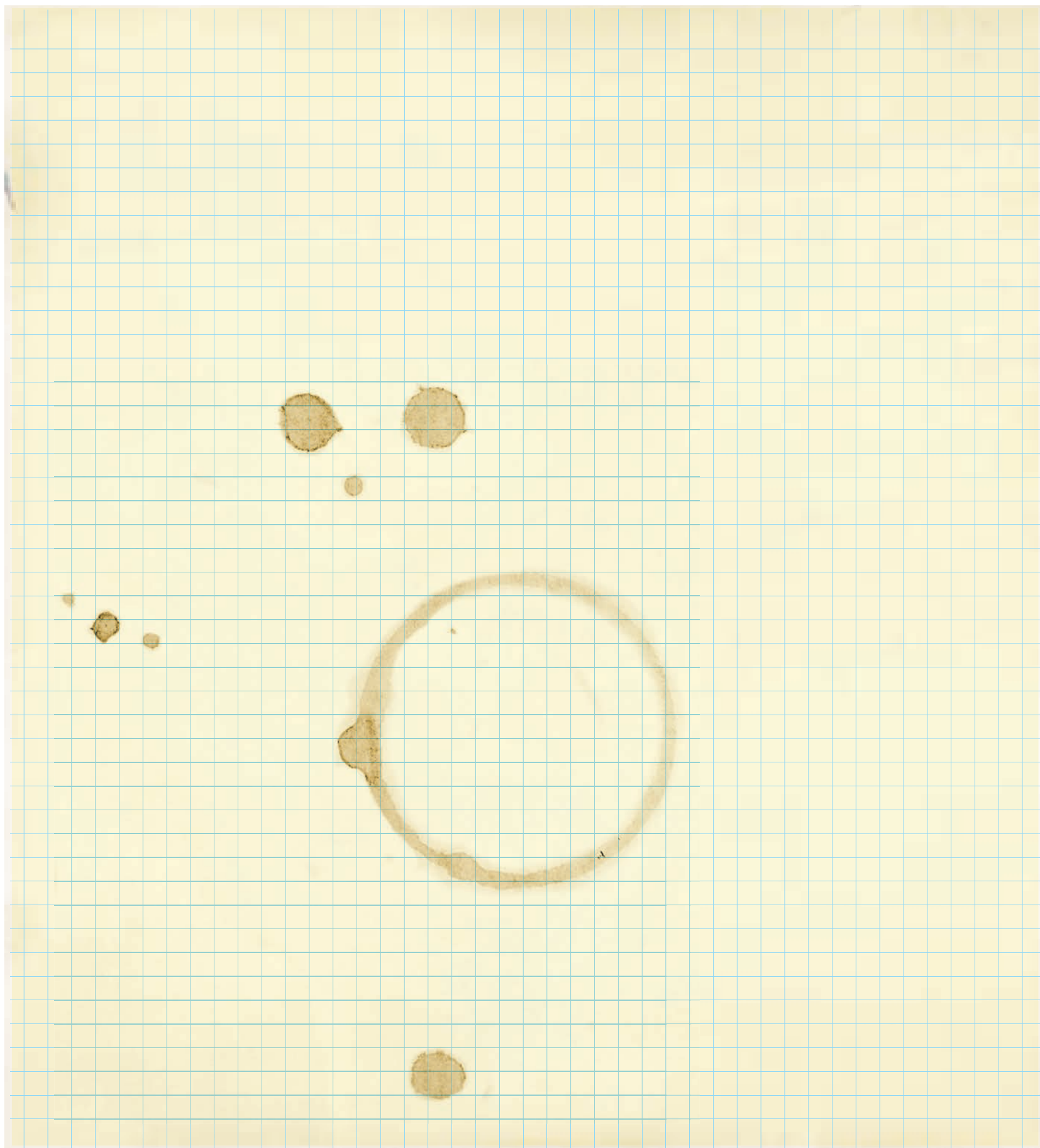
This notebook will tell you about our Russian company **GEOTECHNOLOGIES**. We work a lot and we take a great interest in what we do. Our company is well known in Russia. We have a lot of friends and partners there. Think you'll find something interesting in these pages and want to know more. And we'll be happy to share.

It is easy to find us:
PDAC Trade Show, booth #444

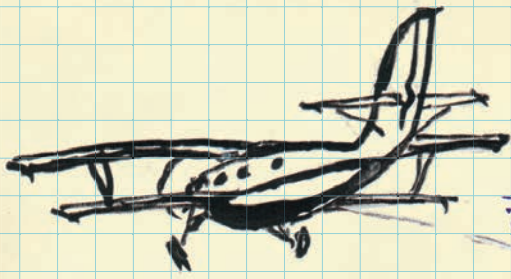
or

1, Derbenevskaya str.
Moscow, Russia 113114
tel: +7 (495) 7722-946
e-mail: gp@gtcomp.ru
web-site: gp.gtcomp.ru





Airborne Electromagnetics



70 m long tow cable

This is EM-4H
We launched it more than 10 years ago and still EM-4H is the most popular airborne EM-system in Russia

The reasons are:

- high efficiency (up to 1000 km per day)
- reliability
- easy of use



Transmitter Loop



What else?

EM-4H is a frequency domain system, bandwidth from 130 Hz to 8 kHz.

Monitoring of system geometry with the accuracy of 10 cm.



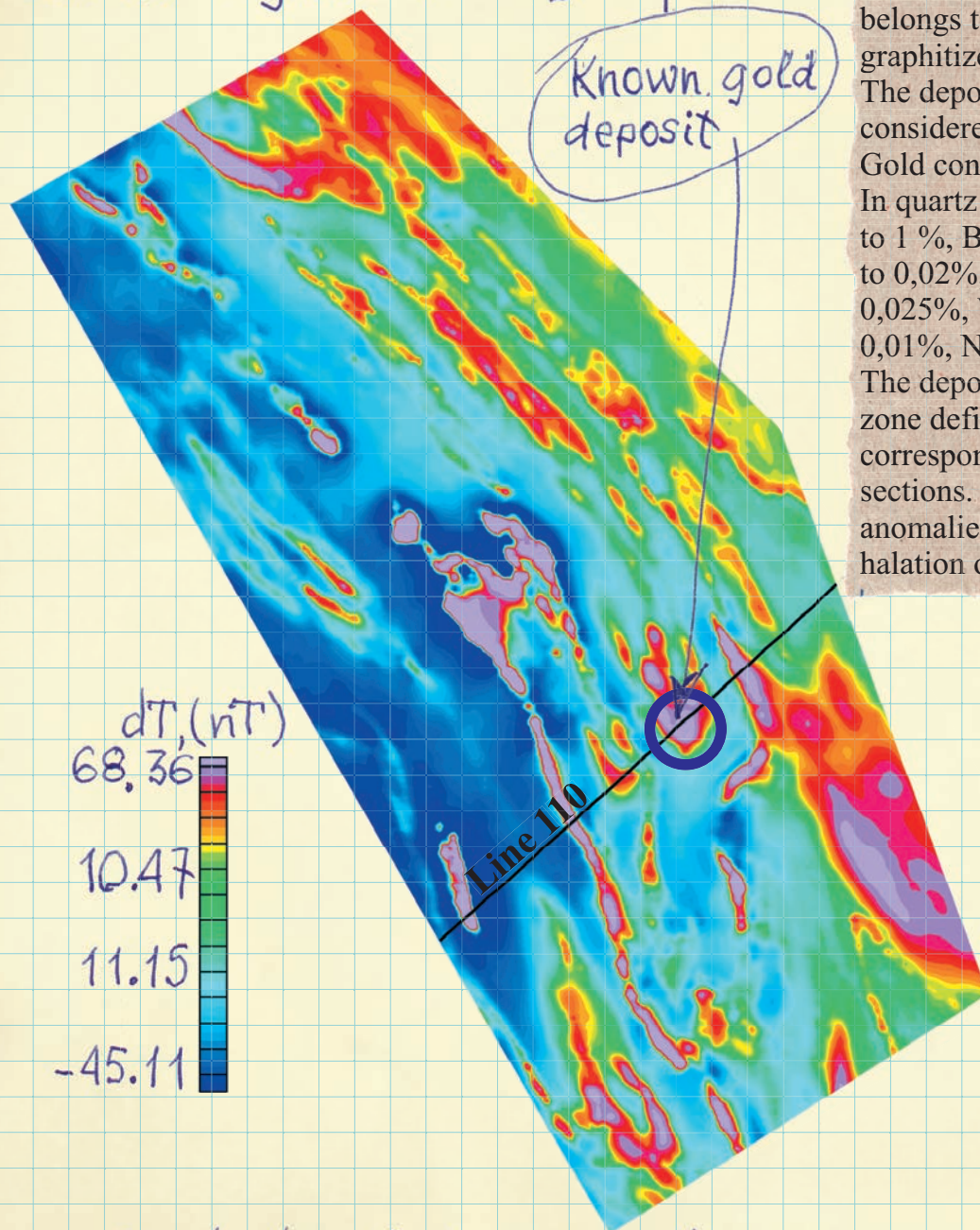
AND LOOK! We've got very interesting pictures here!

— Geotekhnologies ~ gtcomp.ru —

AIRBORNE ELECTROMAGNETICS

This EM4H survey was flown over the Yenisei Ridge (Central Siberian Plateau) in 2011

EM4H magnetic anomaly map



This gold deposit is situated in the north-eastern part of Yenisei Ridge. It belongs to the anticline core consisted of graphitized shale.

The deposit is weakly eroded and is considered to quartz-gold formation. Gold content varies to 10 gram per ton. In quartz shale were also detected As up to 1 %, B up to 0,5%, Bi up to 1%, Pb up to 0,02%, Ag up to $0,2 \times 10^{-3}$ %, Cu up to 0,025%, W up to 0,0015%, Sb up to 0,01%, Ni up to 0,01%.

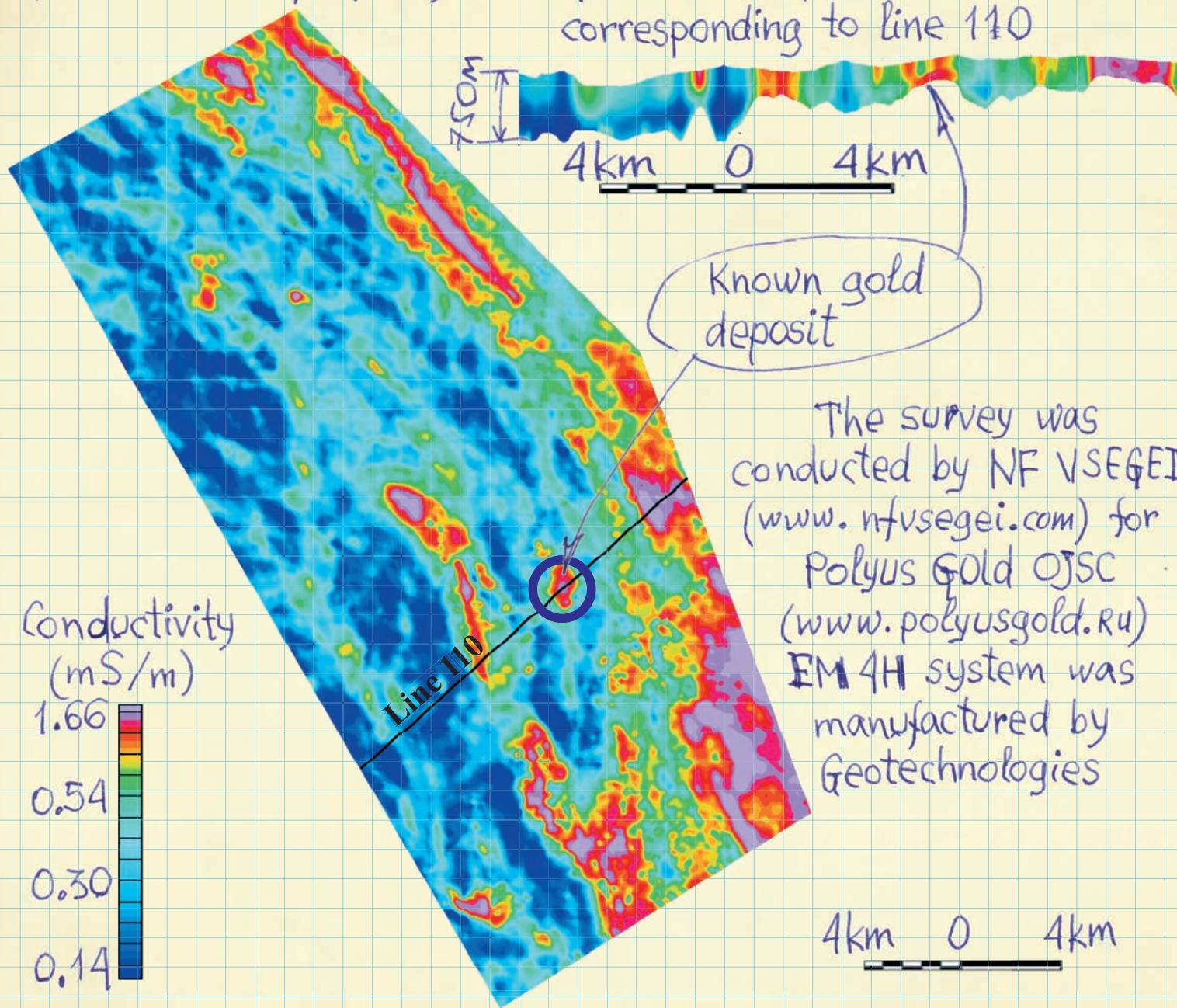
The deposit is located in high conductive zone defined in the deep part of corresponding geoelectrical pseudo-sections. Also there are positive magnetic anomalies and contrast secondary halation of Au and As.

— Geotechnologies — gp.gtcomp.ru —

AIRBORNE ELECTROMAGNETICS

EM 4H apparent conductivity map
for 2080 Hz frequency

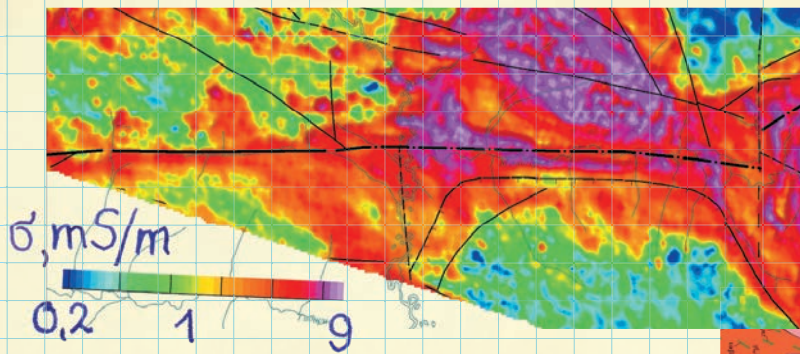
Geoelectrical pseudo section
corresponding to line 110



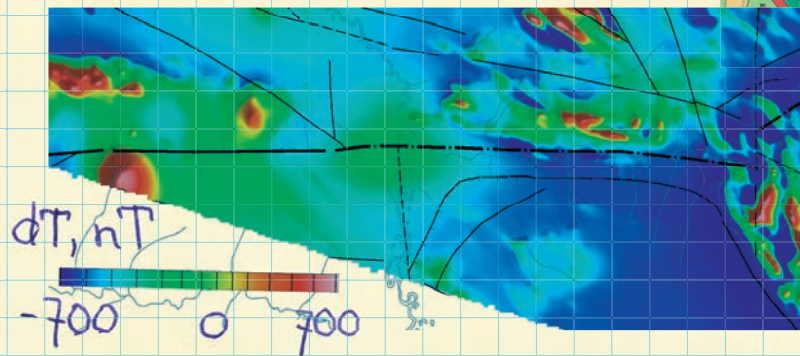
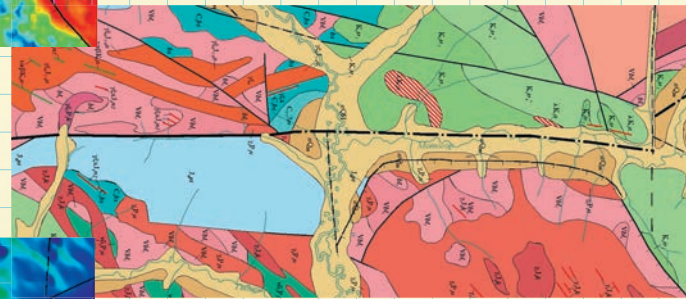
AIRBORNE ELECTROMAGNETICS

EM-4H measures full response vector as precise as 1% and here are some results (courtesy of NF VSEGEI,

www.nfvsegei.com)

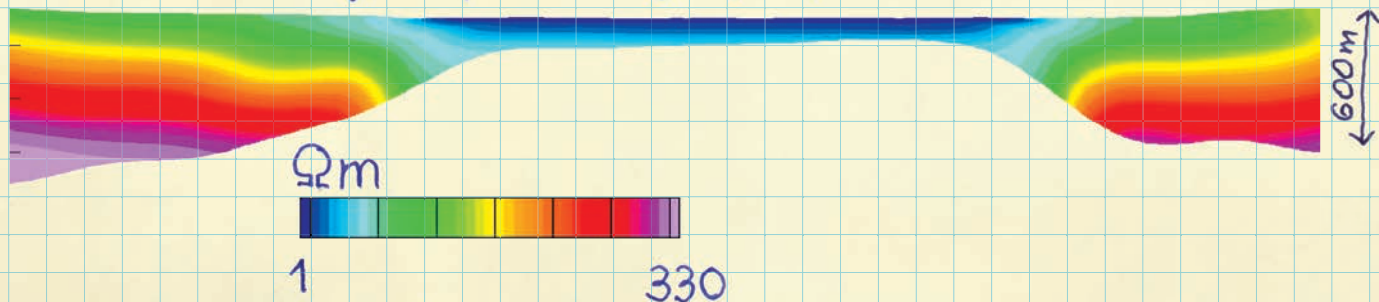


8 kHz conductivity map



Magnetic anomaly map

Resistivity depth imaging of salt lake Tus



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AIRBORNE ELECTROMAGNETICS

EQUATOR

The technology of
Time-domain EM and
high precision magnetic survey

The system is compact but
powerful and its performance is
extremely high

To be exact:
Statistics of one survey
2 000 line kilometers
Scale 1:5000
for 7 days including installation
average productivity 600 km/day
average speed on a route 140 km/hr



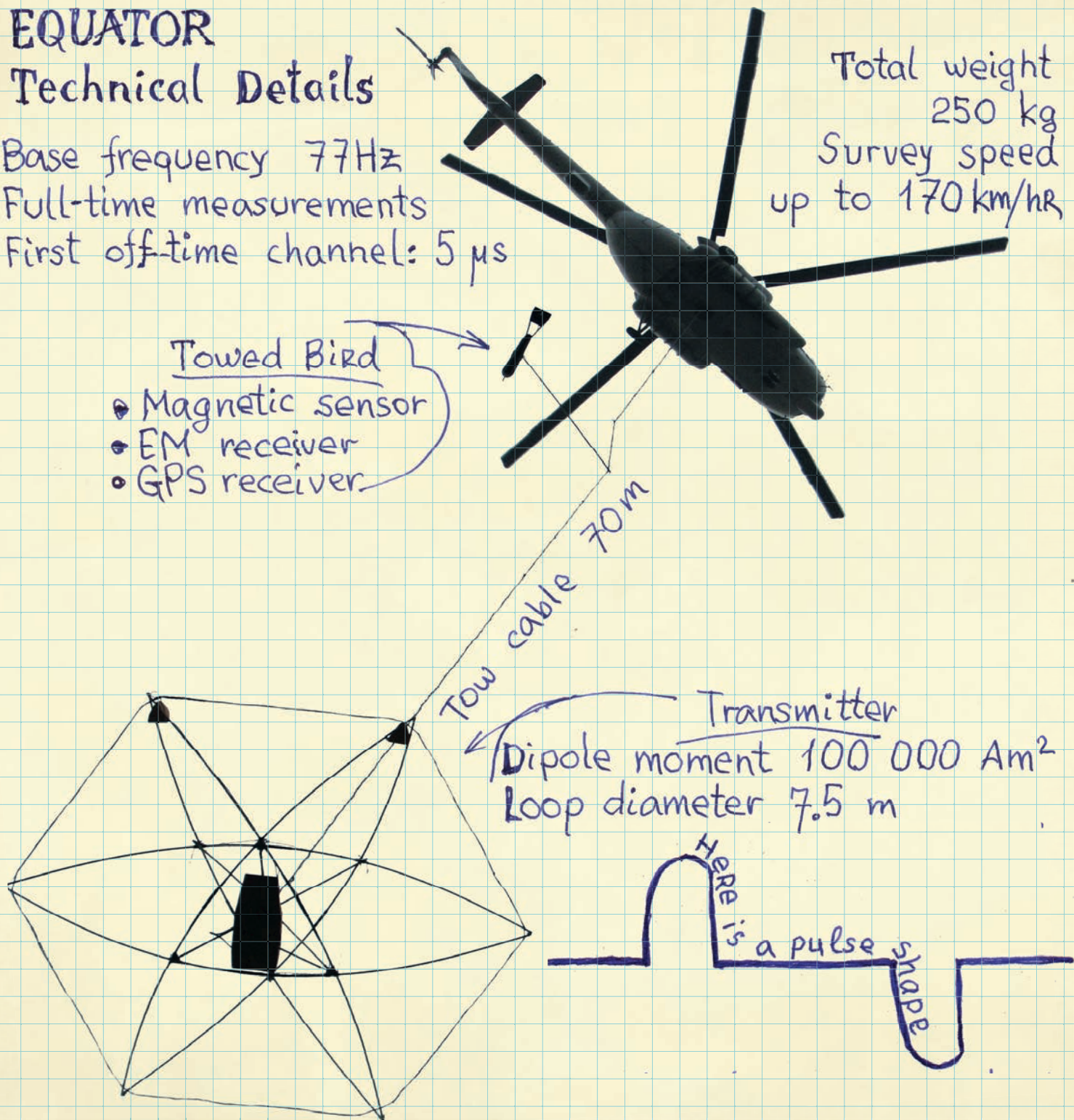
AIRBORNE ELECTROMAGNETICS

EQUATOR

Technical Details

Base frequency 77Hz
Full-time measurements
First off-time channel: 5 μ s

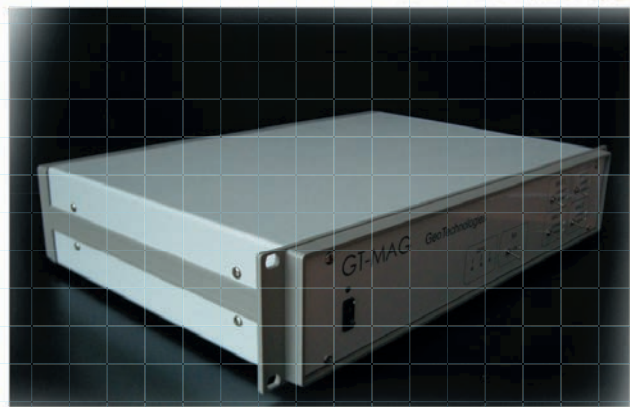
Total weight
250 kg
Survey speed
up to 170 km/hr



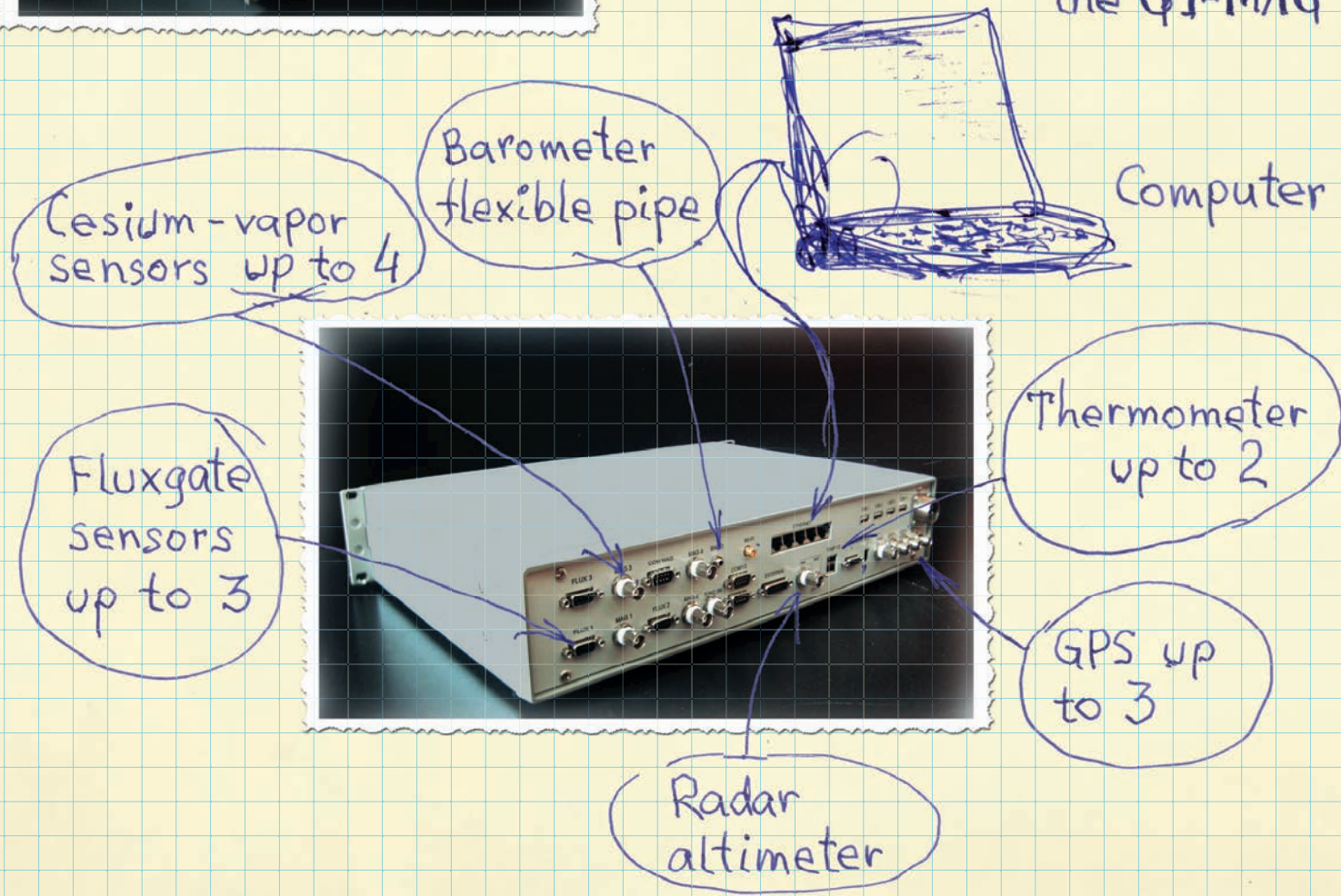
EQUATOR Magnetics Technical Details

Data acquisition unit **GT-MAG 2:**

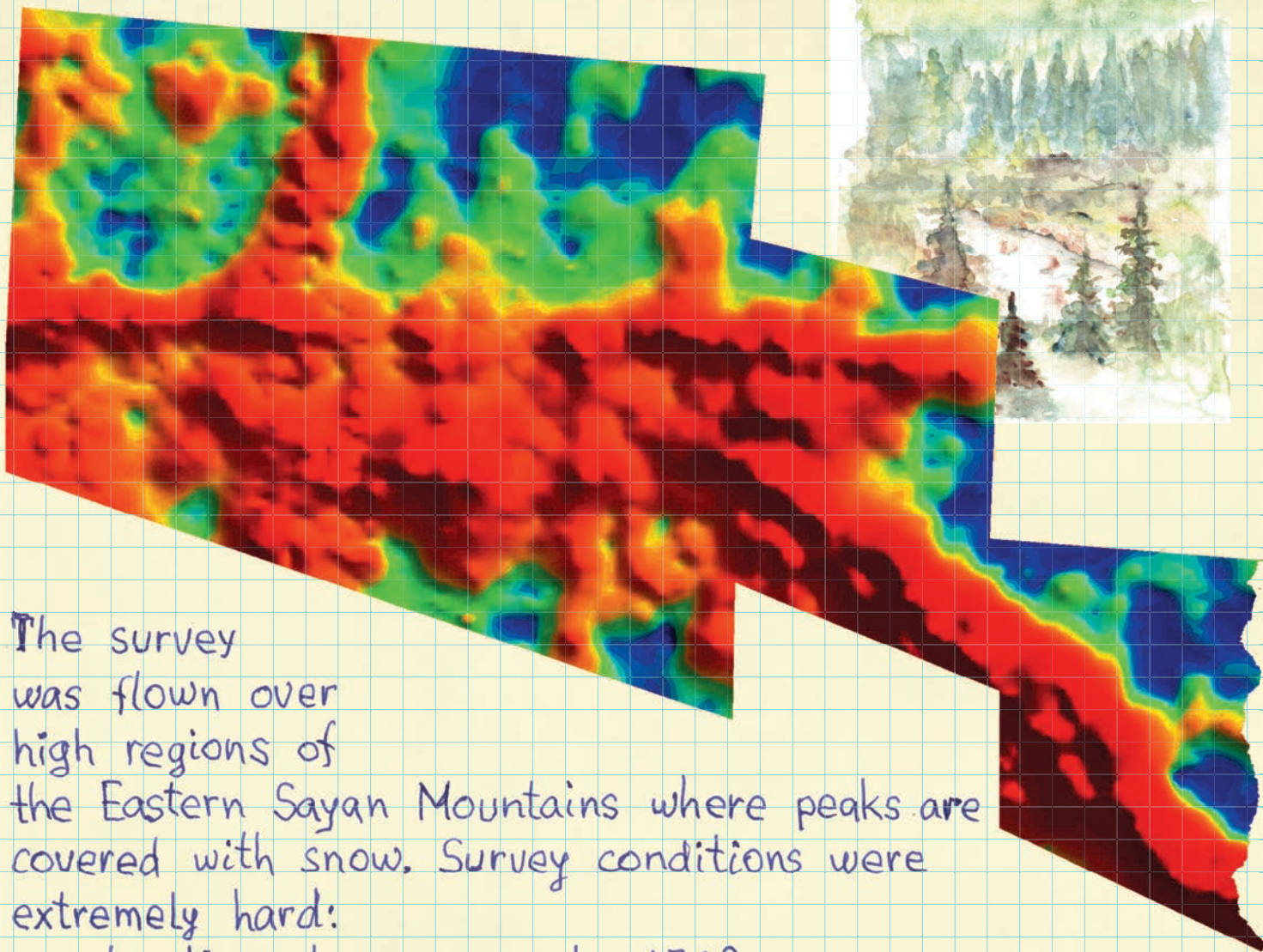
- sensitivity $0,2 \text{ pT}/\sqrt{\text{Hz}}$
- sample rate up to 1000 Hz



At the picture below you can see what can be connected to the **GT-MAG**



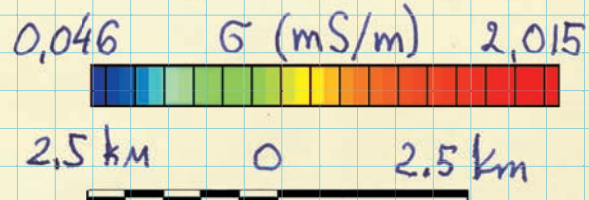
EQUATOR AIRBORNE ELECTROMAGNETICS



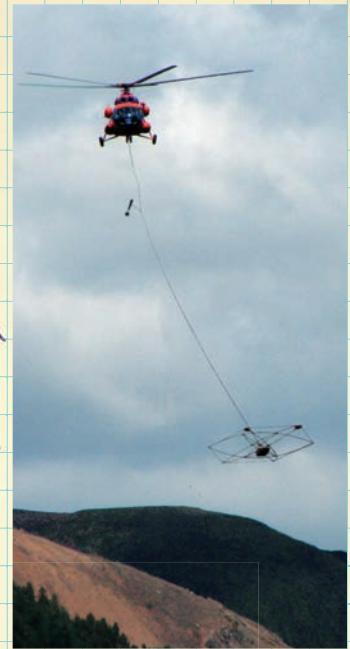
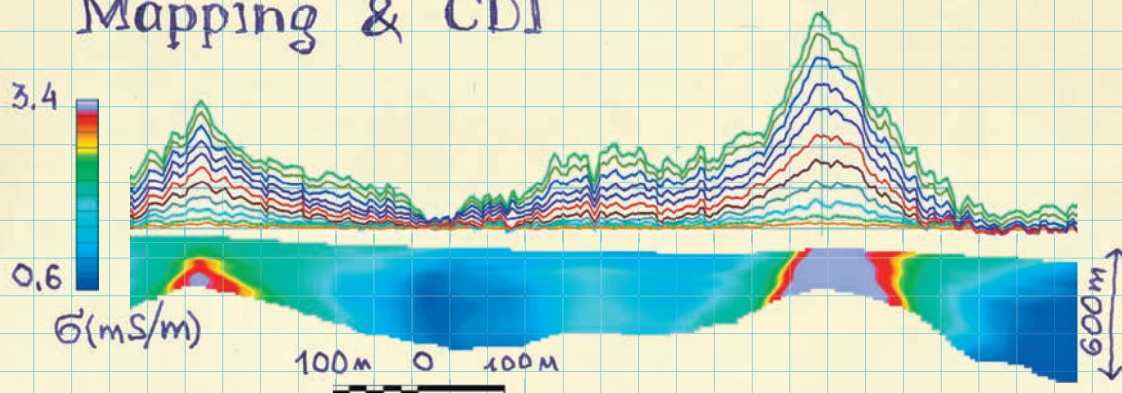
The survey was flown over high regions of the Eastern Sayan Mountains where peaks are covered with snow. Survey conditions were extremely hard:

- elevation change is up to 1300m
- the survey area is characterized by very low conductivity (approx 0,5 mS/m) and survey target objects are low-conductive too (approx 5 mS/m)

"DIELECTRIC inside DIELECTRIC"

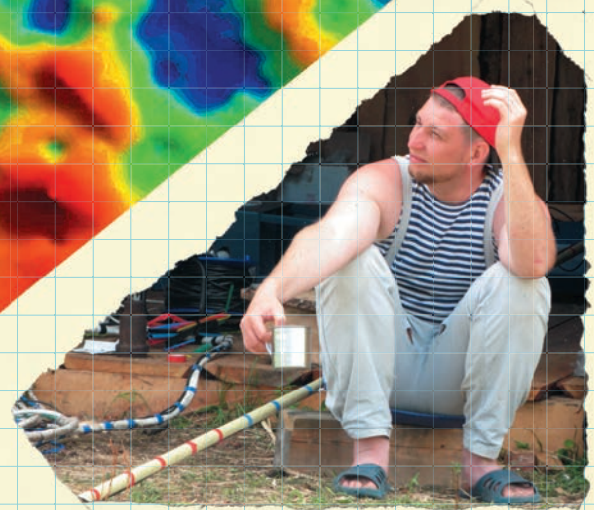
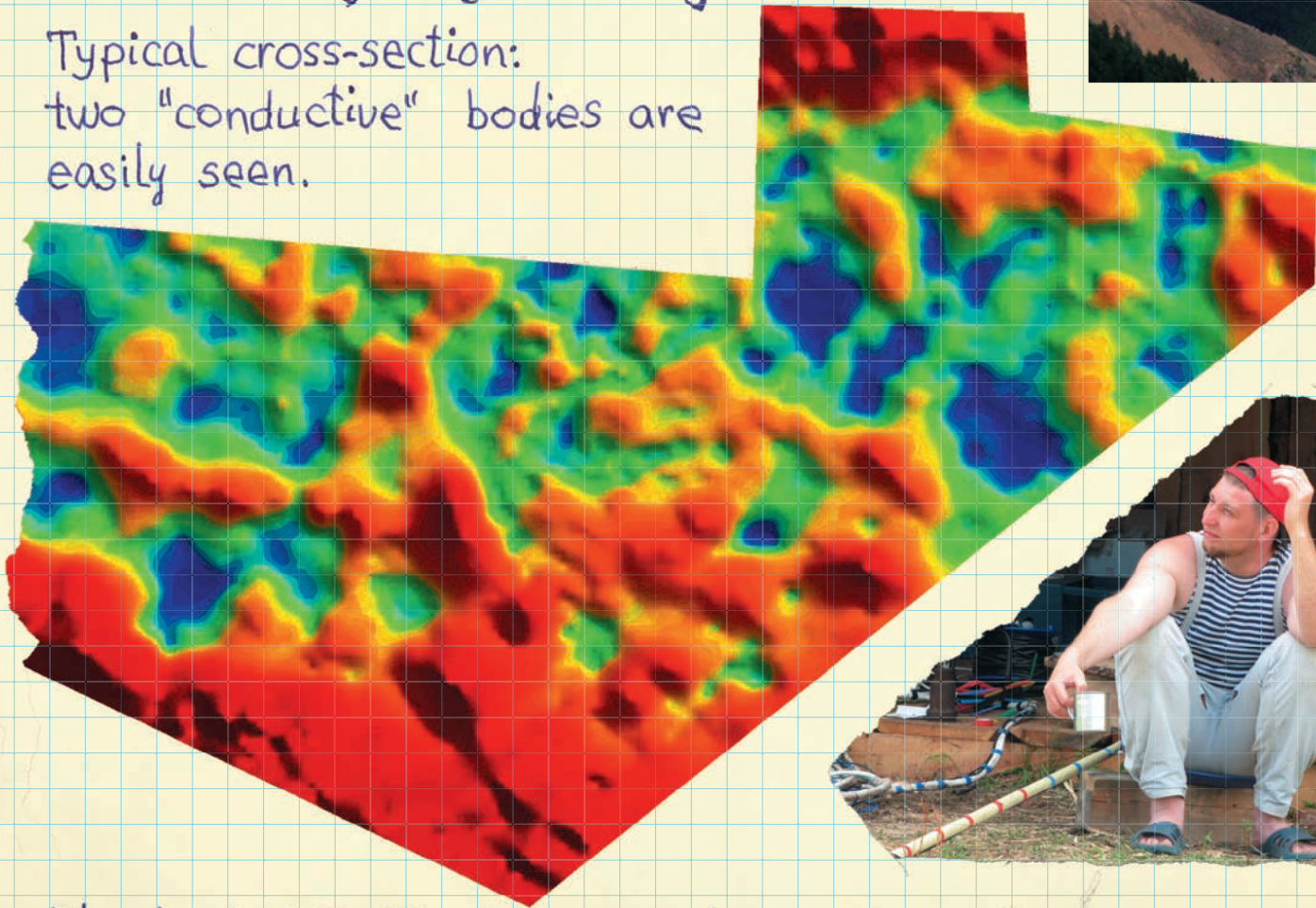


Apparent Conductivity Mapping & CDI



Conductivity-Depth Imaging

Typical cross-section:
two "conductive" bodies are easily seen.

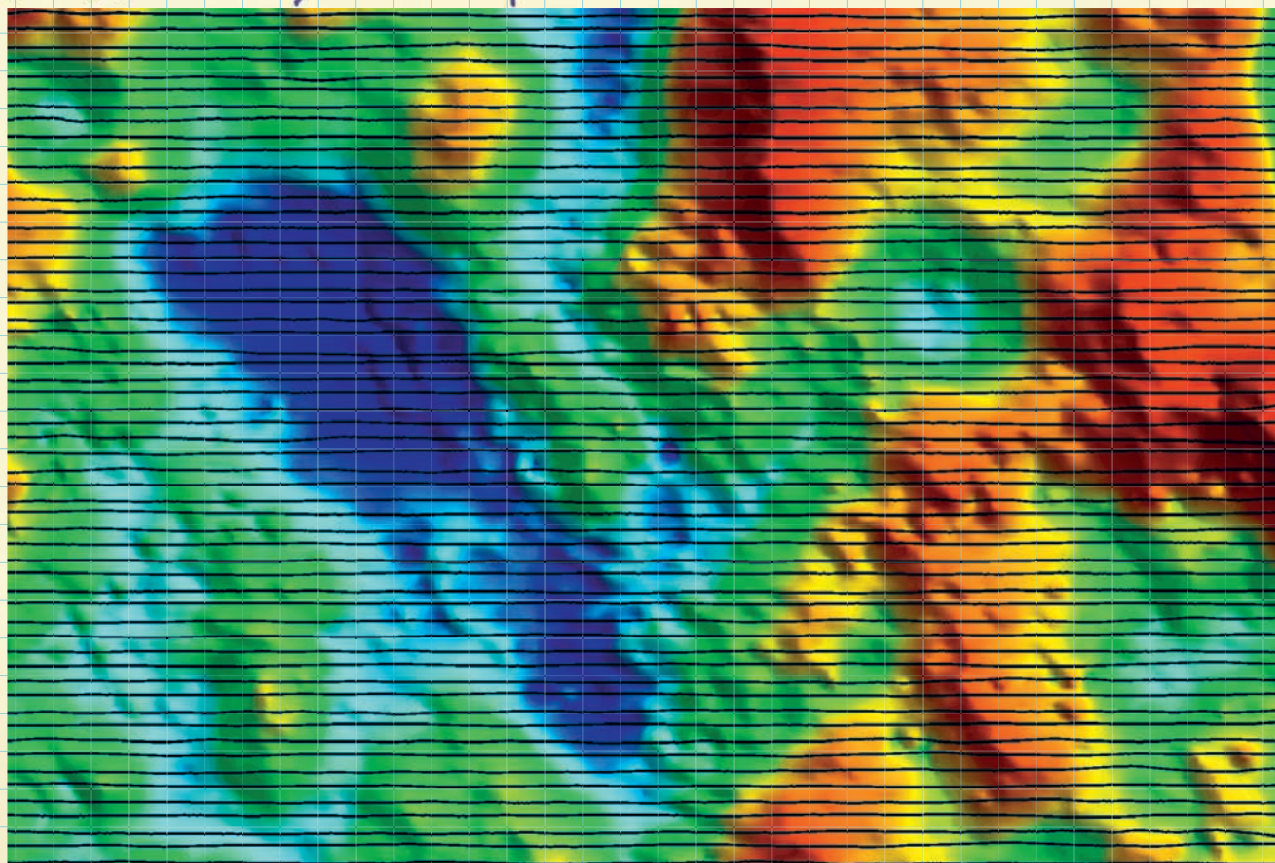


Thanks to NF VSEGEI www.nfvsegei.com for cooperation
Published with permission of MMC INTERGEO



In the photo:
EQUATOR in the woods
of Arkhangelsk region
FIND IT!

Results of **EQUATOR** detailed survey are shown on the image below. **AEROGEOPHISICA JSC** conducted the survey with the support of our specialists and kindly granted the materials for the publication.



$\sigma \left(\frac{mS}{m} \right)$

10

22



500m

0

500m

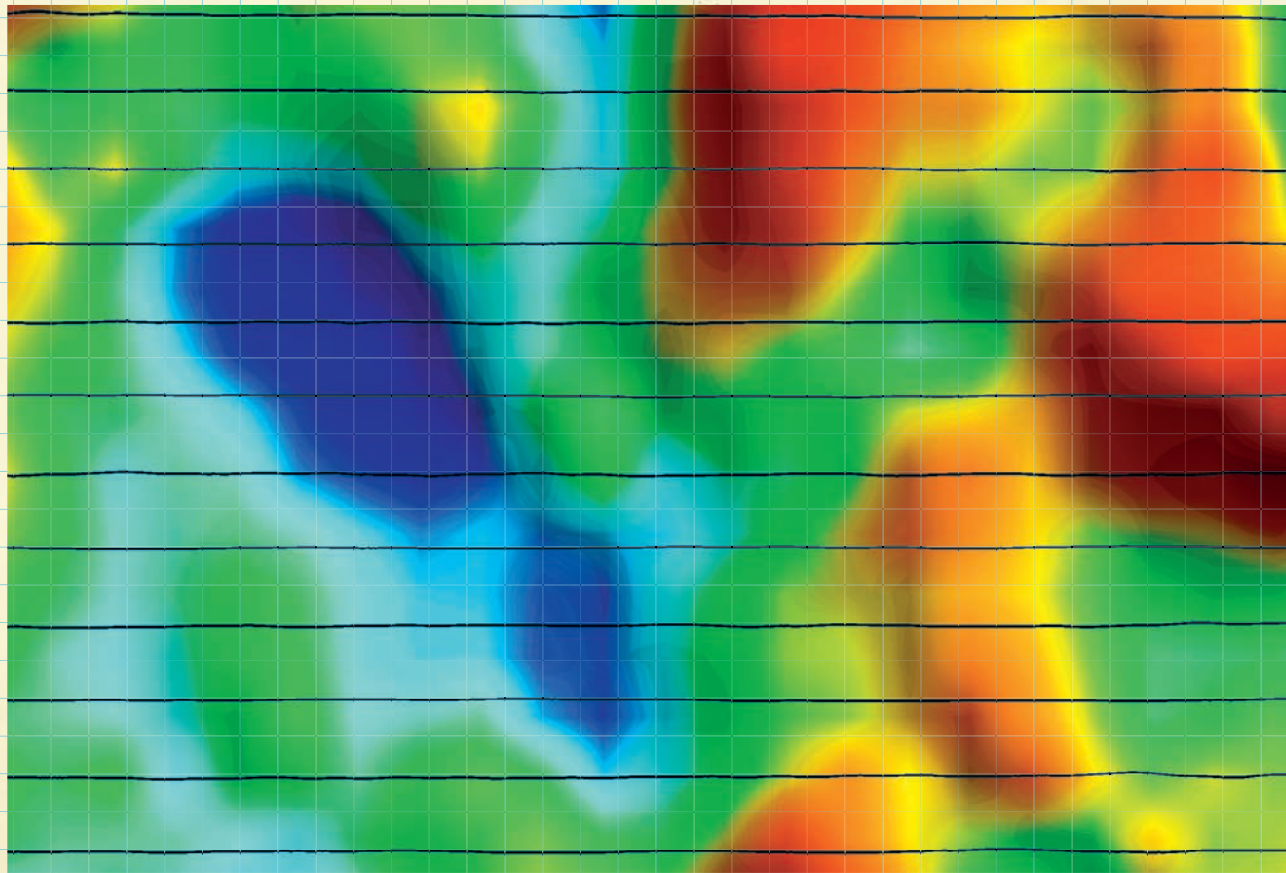


Detailed Mapping

AIRBORNE ELECTROMAGNETICS

The experience showed that EQUATOR can be used for EXTREMELY detailed mapping. Pay attention to the accuracy of navigation along flight path lines. The distance between routes is only 50 meters!

COMPARE THESE MAPS! The map on the left is of 1:5000 scale and on the right - 1:25000. The same data were used for both but for the right one only every fifth route was taken.



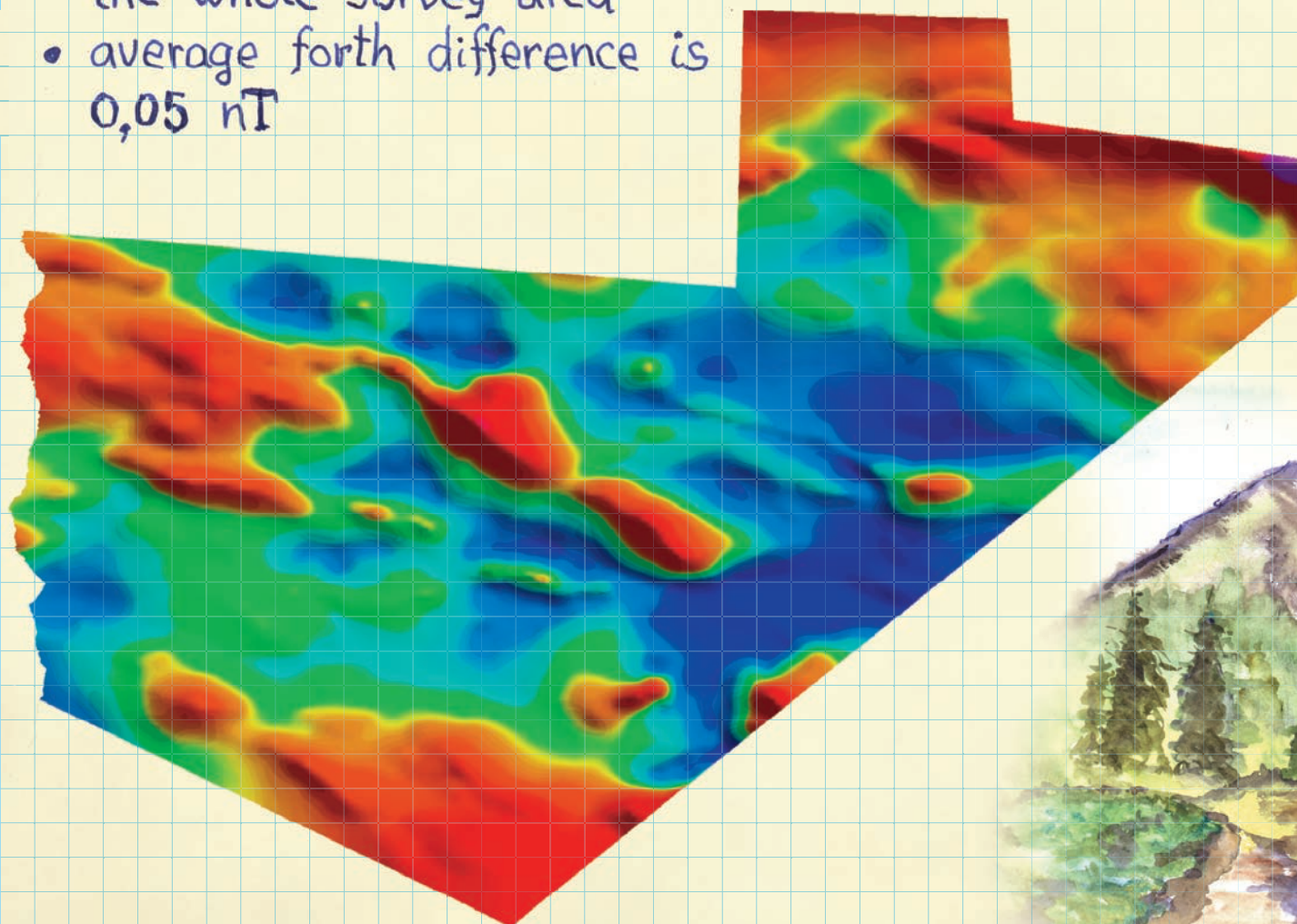
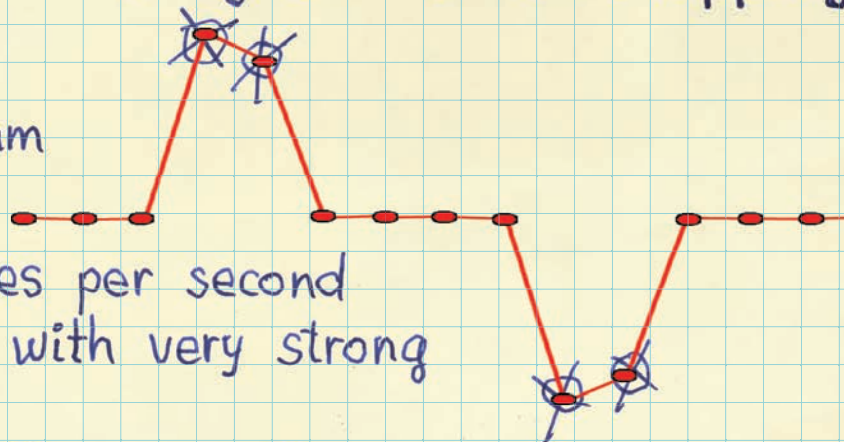
Magnetic Field Mapping

It works like that,
We just strike on-time
samples out of data stream

"Distilled" data

sample rate is 25 samples per second
and data quality comply with very strong
requirements:

- forth difference is less than 0,3 nT on the whole survey area
- average forth difference is 0,05 nT



OUR TECHNOLOGIES AT WORK

In 2011 our turnkey technology of airborne magnetics was transferred to Geoken company (Kazakhstan).

Our solution includes:

Data acquisition unit **GT MAG 2**



Navigation and data control system **NavDat**



Installation, launching and stuff training
Compensator **ReinMag**

The technology was transferred in September and by December Geoken completed 90 000 Line km magnetic survey



— Geotechnologies — gtcomp.ru —

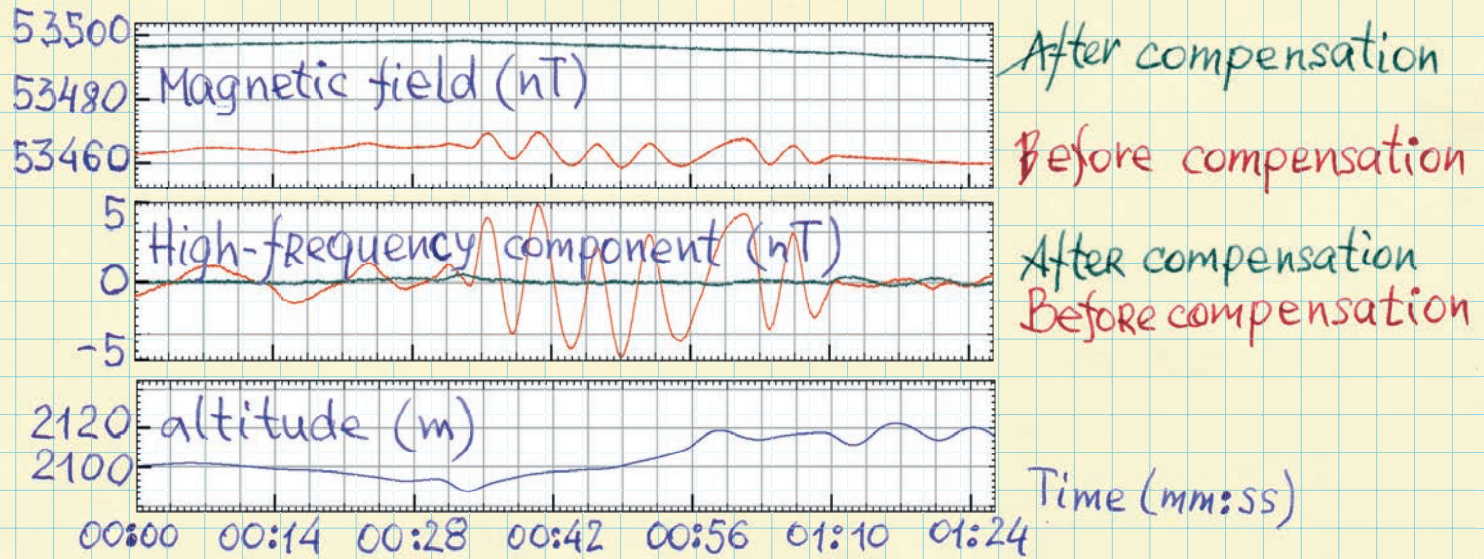
Airborne Magnetics



DETAILS

Compensator ReinMag

- new algorithms
- Real-time or post-processing
- output data format - Geosoft XYZ



Data acquisition unit GT MAG-2



- provides connection for all necessary sensors and devices
- sensitivity $0,2 \text{ pT}/\sqrt{\text{Hz}}$
- sample rate up to 1000 Hz

NavDat system

- accurate navigation (enough for scale 1:5000)
- data recording visualization and control



GROUND MAGNETICS

PROBLEM: Industrial noise

ANSWER:
Magnetometer GT-MVS-SB

WHY? Because its sample rate is up to 500 samples per second. This allows to remove 50 or 60Hz noise.



Cesium vapor
sensor

Other details:
Internal GPS receiver
USB flash drive for data recording.

Weight (including batteries) 10kg
Sensitivity: $0,2 \text{ pT}/\sqrt{\text{Hz}}$



LOOK!
There's no wires: for all operations Wi-Fi connection is used and an operator uses PDA



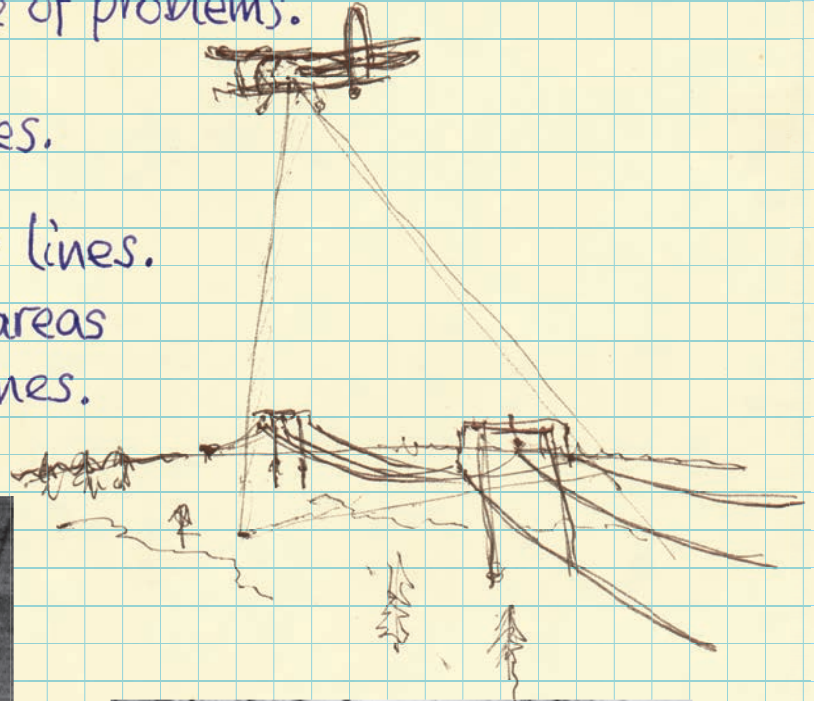
AIRBORNE INFRARED IMAGING

This is an airborne infrared scanner **SCAN-T**

It can solve a wide range of problems.

Here are some examples.

Electric loss in power lines.
We can detect problem areas
by flying along power lines.



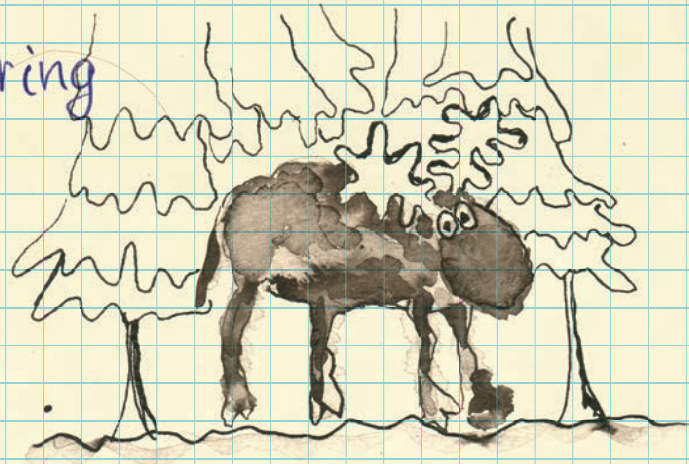
Infrared thermal image



photo

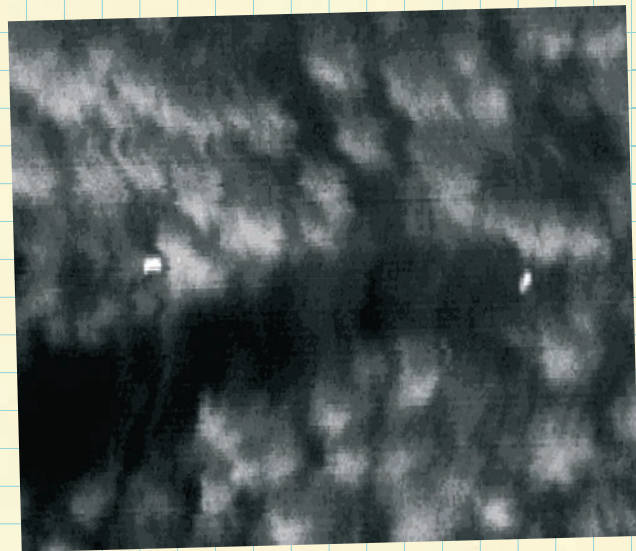
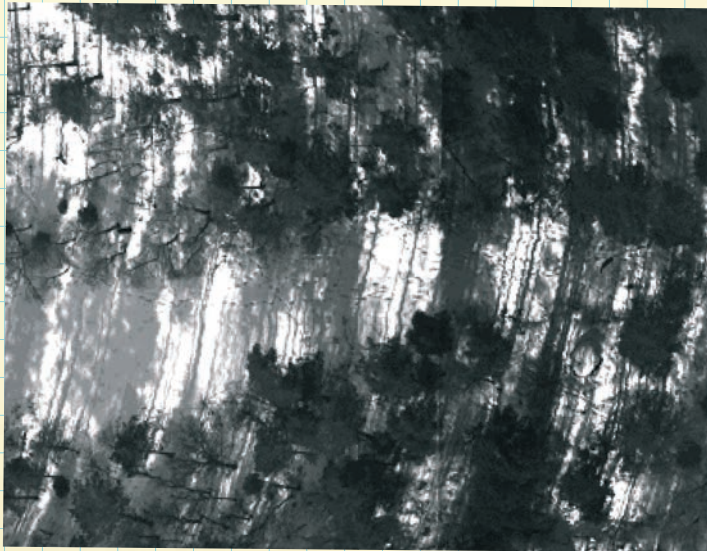
AIRBORNE INFRARED IMAGING

Animal population monitoring



Heat emission allows to locate animals.

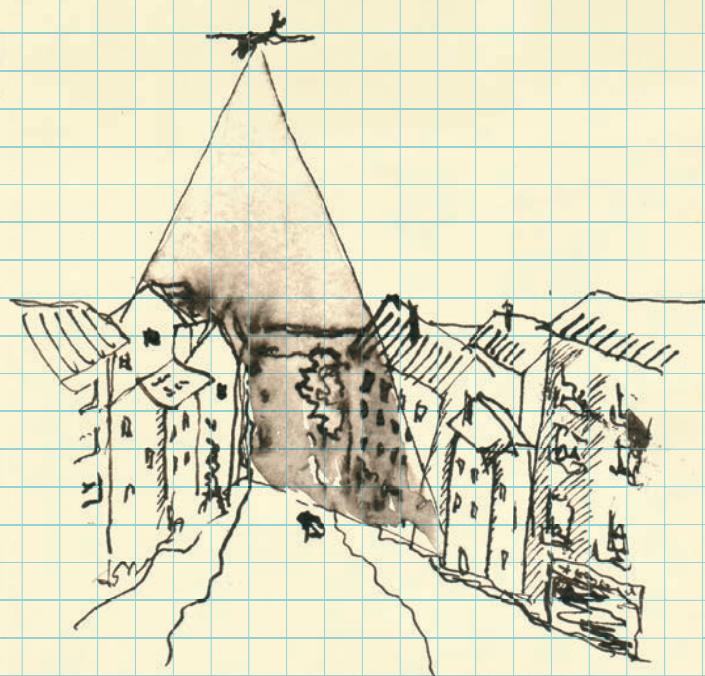
Try to spot elks on this photo. It's rather difficult. Isn't it?



But look on the infrared image. Here they are!

AIRBORNE INFRARED IMAGING

Heat supply network
monitoring



Problem zones of
underground network

In addition:

SCAN-T can be installed in
light aircraft inside or outside
fuselage with ease.

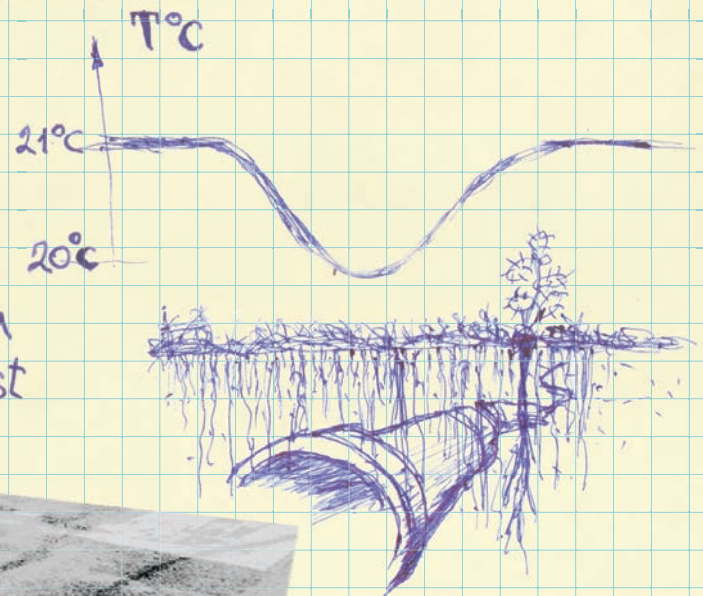
We provide full software
support including automatic
georeferencing



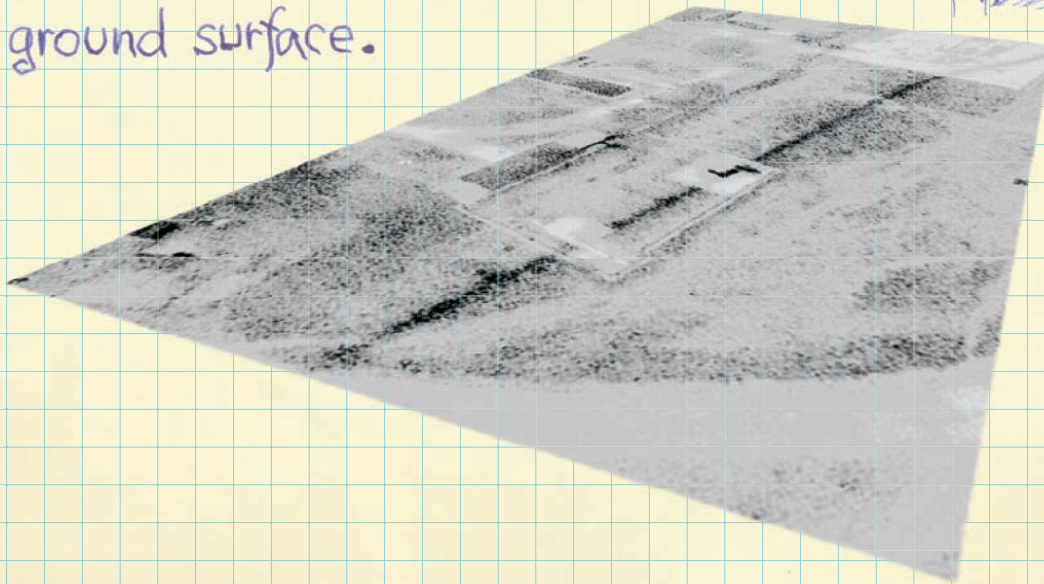
AIRBORNE INFRARED IMAGING

The method works with cold objects as well

During the Infrared survey in Mexican outback (January 2011) we found a long cold underground object among swamps, cactus and wild animals.



It turned out to be an ammonia pipeline. Its temperature was just 5°C colder than that of the ground surface.



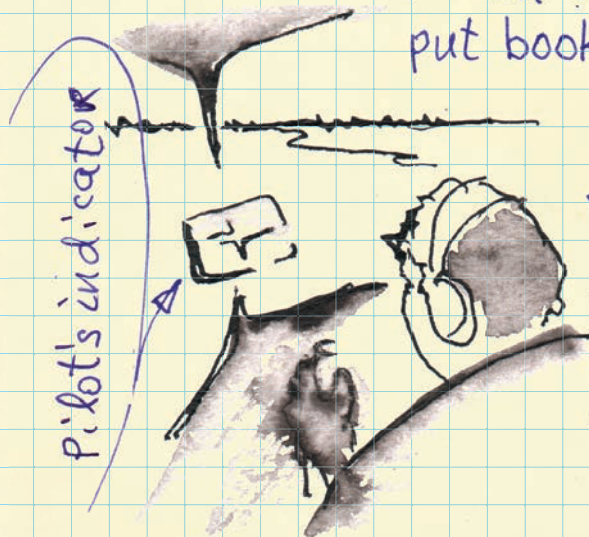
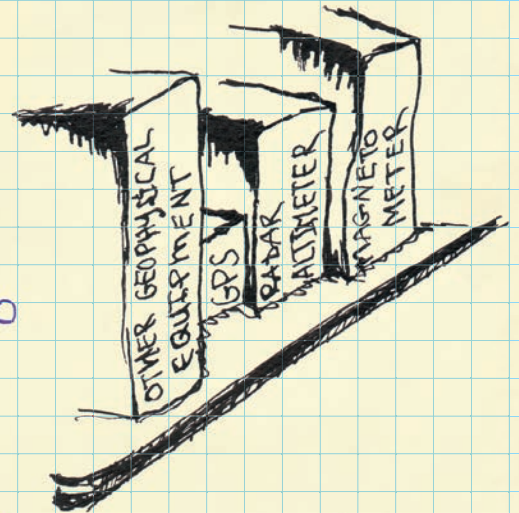
NAVIGATION AND DATA CONTROL

Airborne surveys employ one or more geophysical devices and requires very accurate navigation. That's why we developed system **NAVDAT**

Its main functions are:

Geophysical equipment integration

is almost as simple as to put books on a shelf



Navigation:

To approach and follow a route a pilot should keep the needle of the deviation indicator in zero position during all flight

Survey process monitoring:

operator observes all measured signals and inspects navigation accuracy

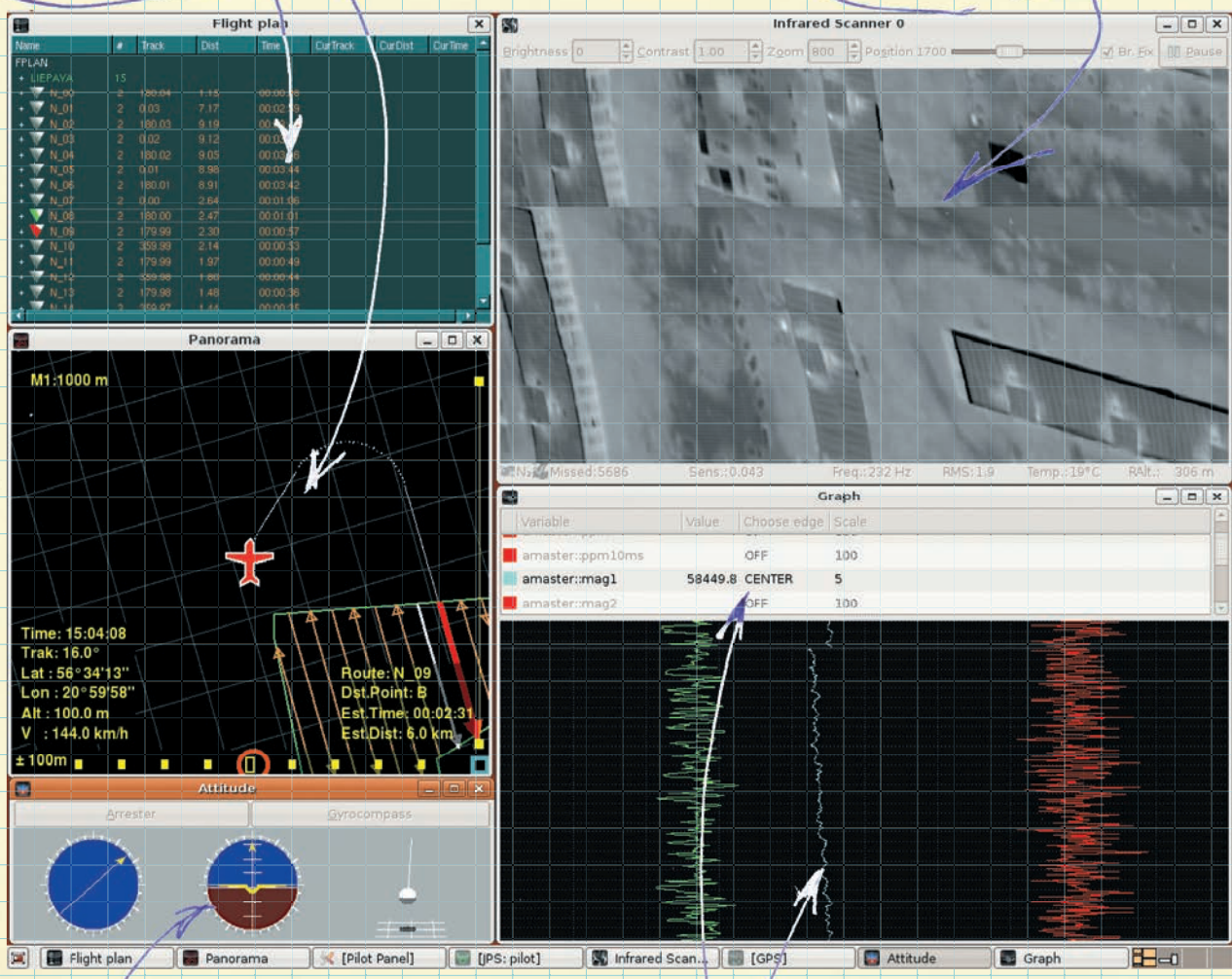


NAVIGATION AND DATA CONTROL SYSTEM NAVDAT

An example of NavDat screen for airborne infrared imaging

Navigation map and flight plan

Infrared image in real-time



Gyro system parameters

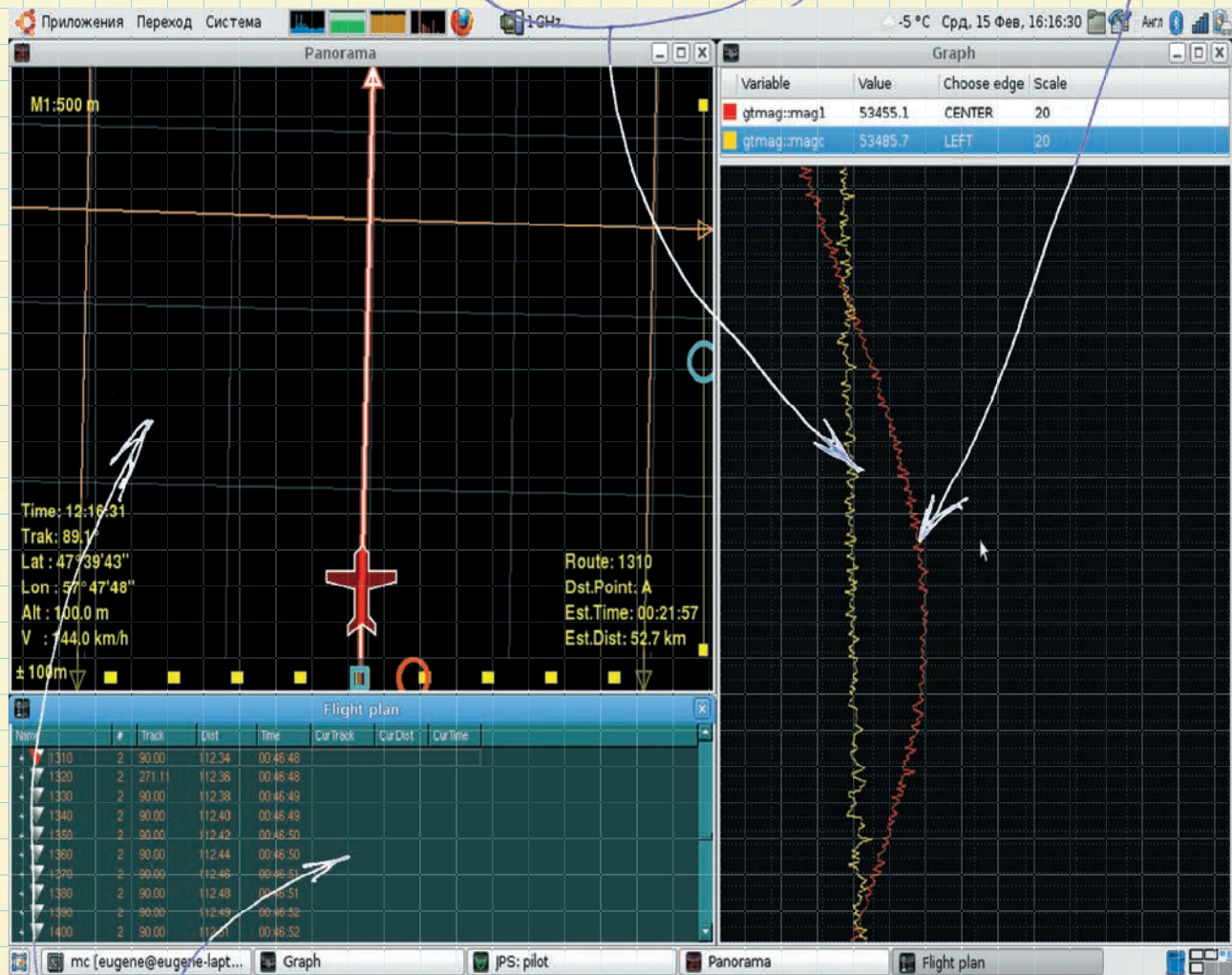
Measured parameters list and charts

NAVIGATION AND DATA CONTROL SYSTEM NAVDAT

An example of NavDat screen for airborne magnetic survey

Compensated magnetic data

Incompensated magnetic data



Navigation map and flight plan

С. А. Лопухин, 2010



TO BE CONTINUED

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