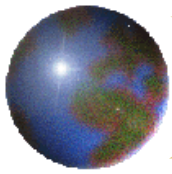


Základy aplikovanej geofyziky.

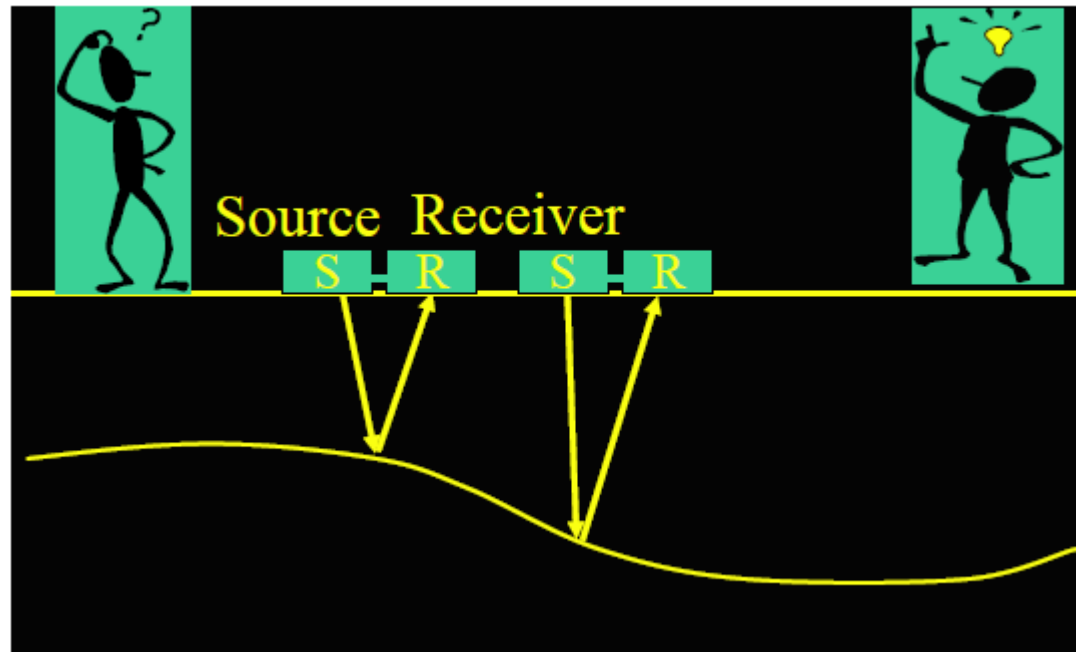
Geoelektrické metódy

RNDr. René Putiška, PhD.

Univerzita Komenského Bratislava



Geofyzikálne meranie: nastroj na získanie obrazu – informácií pod povrchom

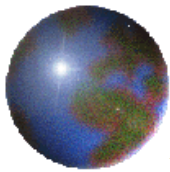


meranie

spracovanie

vizualizácia

Mapovanie geologických štruktúr
Detekcia objektov

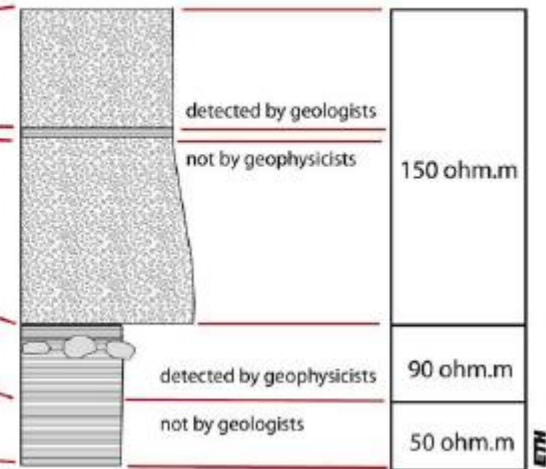


Definícia: model

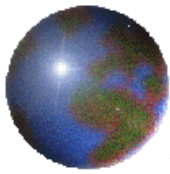
realita



Geologický model



Geofyzikálny model



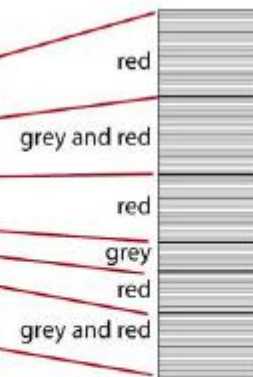
Definícia: kontrast

Ak chceme s geofyzikálnymi metódami charakterizovať rôzne geologické vrstvy musí existovať kontrast (rozdielne fyzikálne vlastnosti)

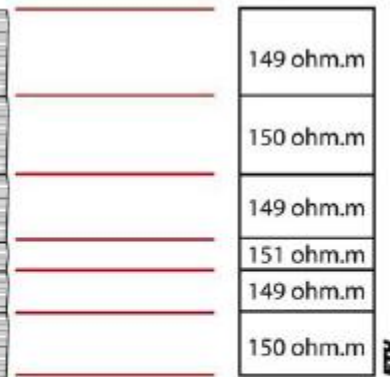
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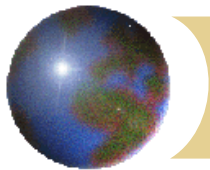
Geologický model



Geofyzikálny model

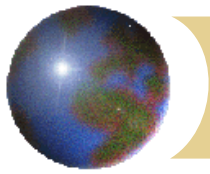


contrast in geology (color)
not in geophysics (same resistivity)



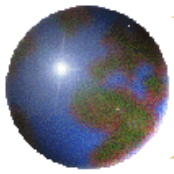
Geoelektrické metody - Literatúra

- ✦ Reynolds, J.M., 1997: An introduction to Applied and Environmental Geophysics, Wiley & Sons Ltd., Chichester 1997
- ✦ Karous, M., 1989: Geoelektrické metody průzkumu. SNTL/Alfa, Praha 1989.
- ✦ Mareš, S. a kol., 1979: Úvod do užité geofyziky, SNTL Praha.
- ✦ Mareš, S. a kol., 1983: Geofyzikální metody v hydrogeologii a inženýrské geologii. SNTL Praha.
- ✦ Telford a kol., 1990: Applied geophysics. Cambridge Univ.
- ✦ Bezvoda, V., Gruntorád, J., Knez, J., 1968: Geoelektrika. PrifUK, Praha
- ✦ Svetov, B., S. a kol., 1966: Elektromagneitnyje metody razvedky v rudnoj geofizike. Nedra, Moskva.
- ✦ Jakubovskij, J.V., Ljachov, L.L., 1956: Elektrorazvedka. Gosgeoltechizdat, Moskva.
- ✦ ABEM, prospekt
- ✦ CRONE, prospekt
- ✦ Zonge, K.L., 1992: Introduction to TEM

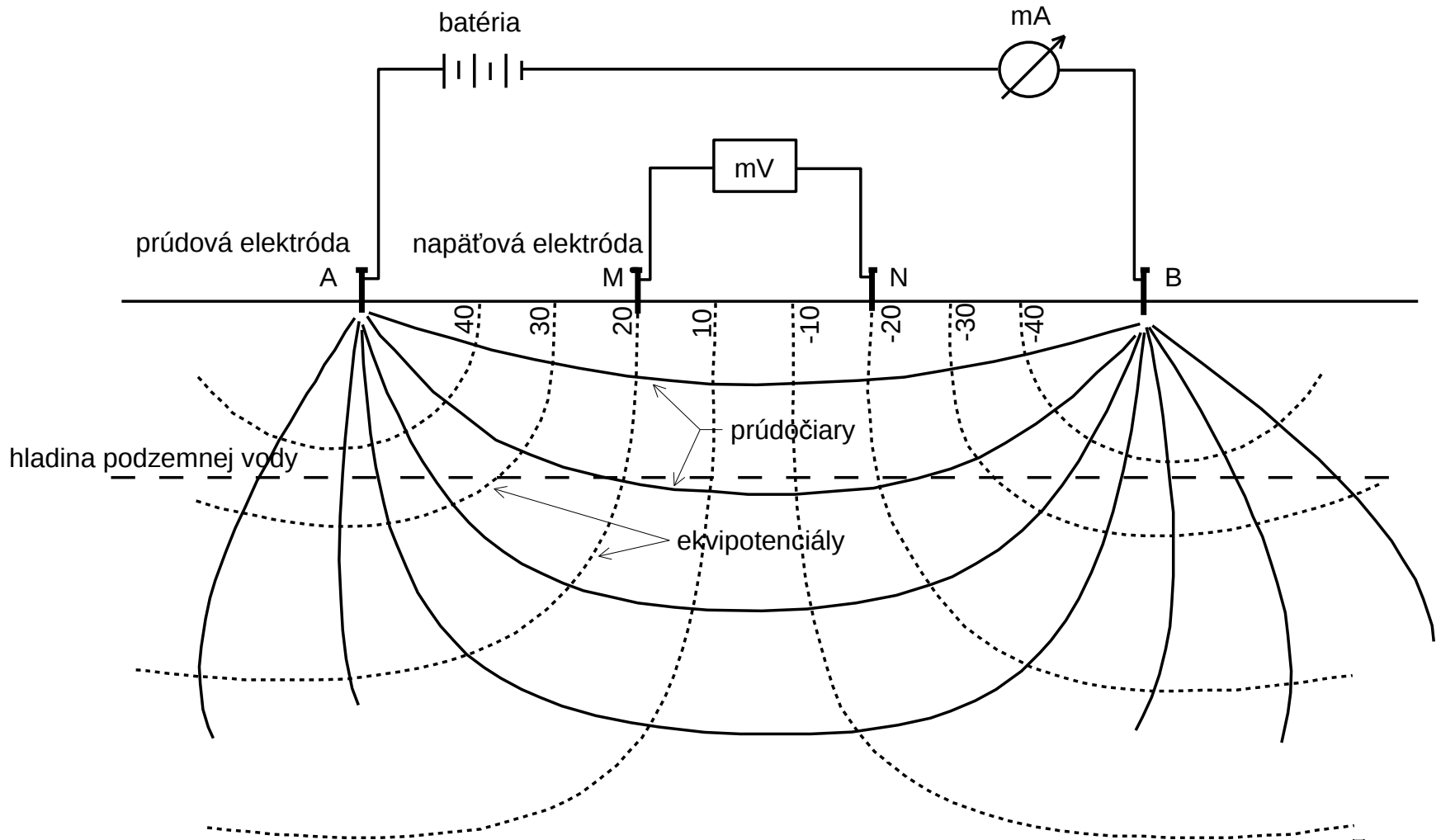


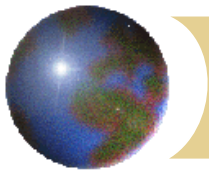
Geoelektrické metódy - prehľad

- ✚ Odporové metódy OM (*resistivity methods*)
- ✚ Indukovaná polarizácia (*induced polarization - IP*)
- ✚ Potenciálové metódy (*potential methods- PM*)
- ✚ Metóda spontánnej polarizácie (*Self potential - SP*)
- ✚ Elektromagnetické metódy (*Electromagnetic - EM*)
- ✚ Magnetotelurické metódy (*Magnetotelluric - MT*)



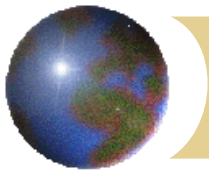
Odporové metódy – základný princíp





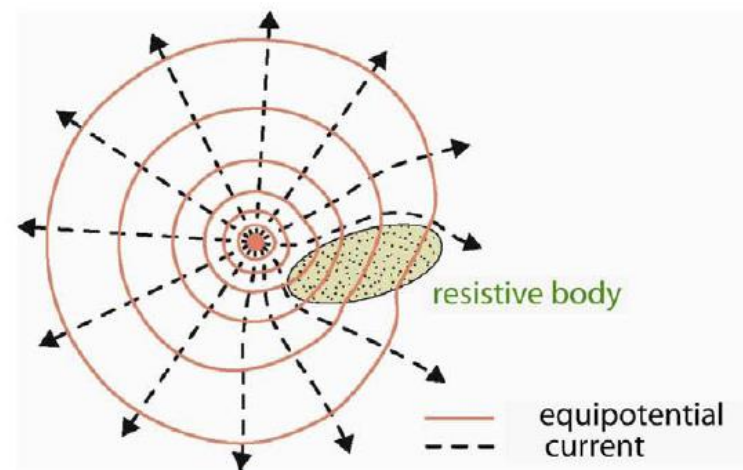
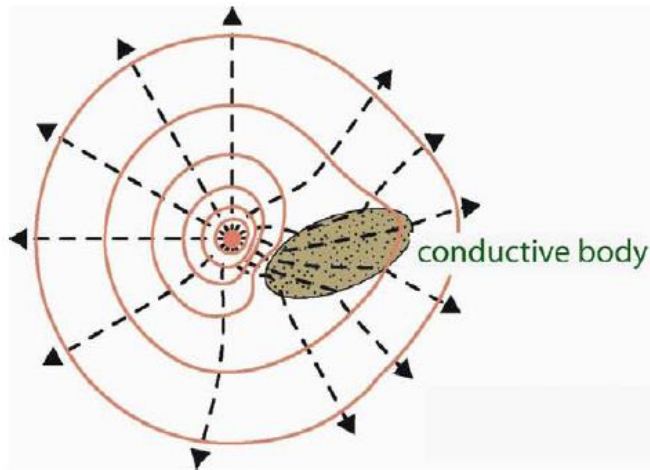
Odporové metódy – základný princíp

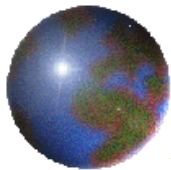
- ✚ Zisťujú merný elektrický odpor prostredia
- ✚ Izočiary elektrického pola nazývame ekvipotenciály elektrického pola – spájajú body s rovnakým potenciálom
- ✚ Napätie je rozdiel dvoch potenciálov
- ✚ Prúdočiary sú kolmé na ekvipotenciály
- ✚ Veľkosť (I) závisí od voľných nosičov a priechodnosti horninového prostredia
- ✚ Zdanlivý merný odpor ρ_z (apparent resistivity ρ_a)
 $\rho_z = k U/I$ kde k je usporiadanie elektród



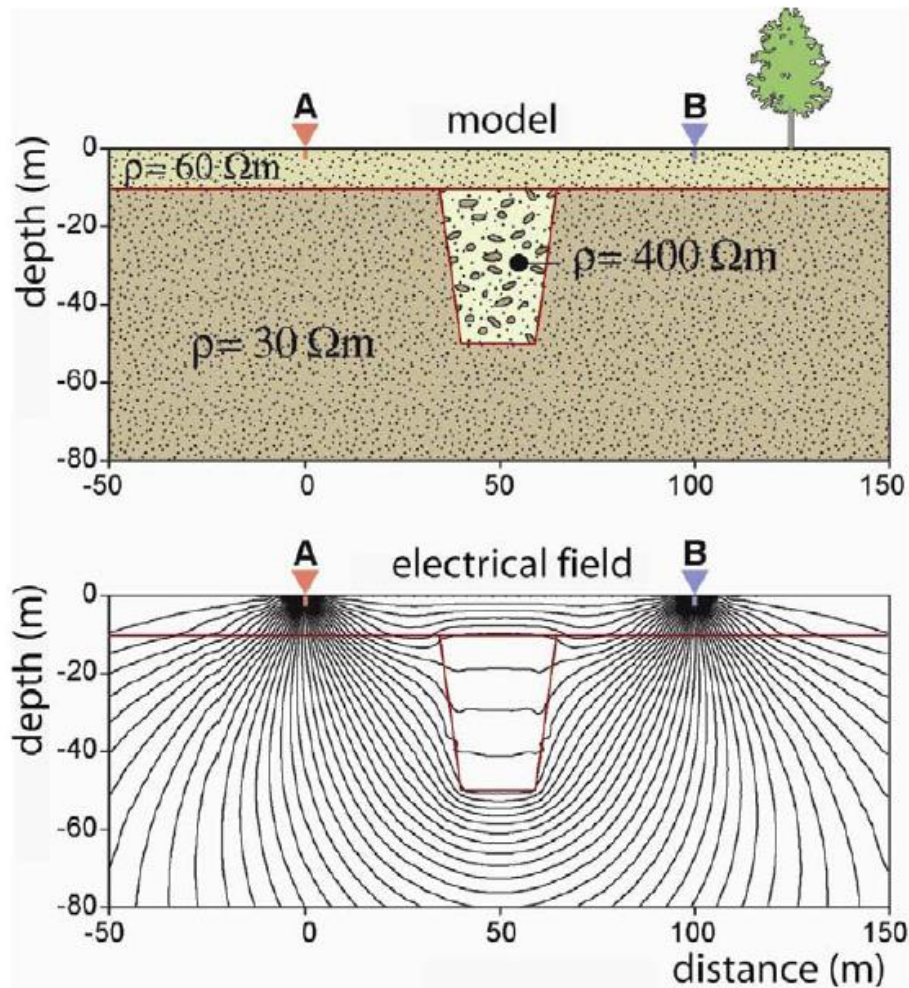
Odporové metódy

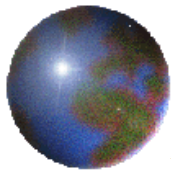
Odporové metódy sa používajú na štúdium horizontálnych a vertikálnych zmien odporových vlastností hornín a materiálov pod zemským povrchom.



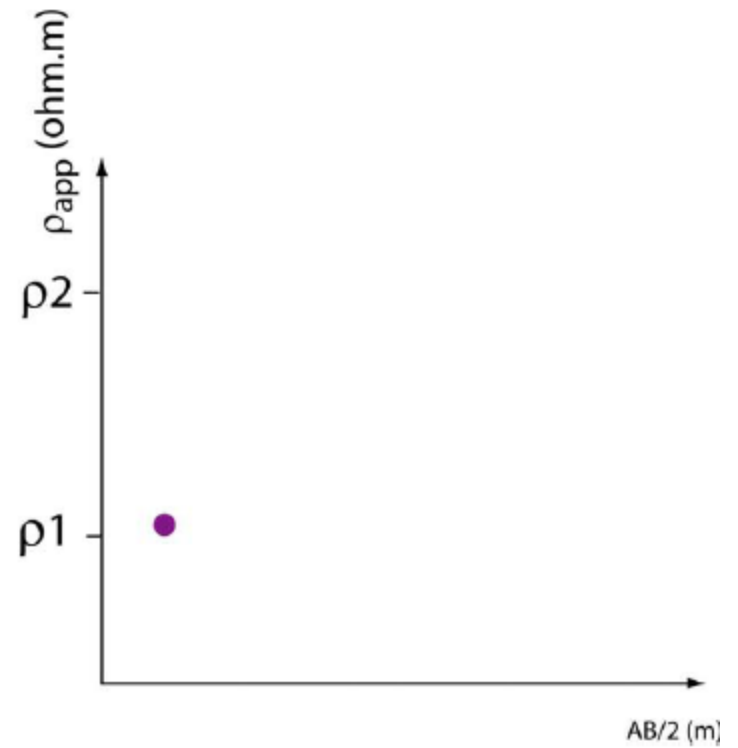
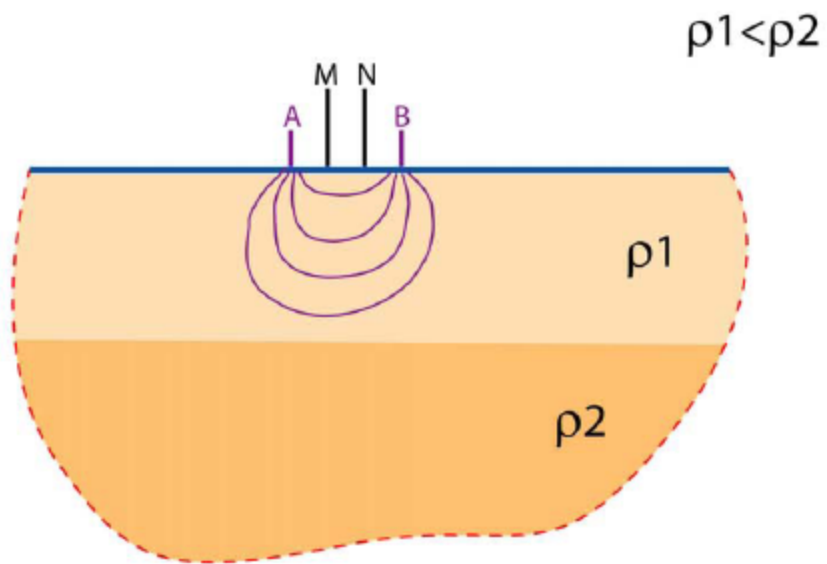


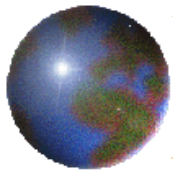
Distribúcia prúdu



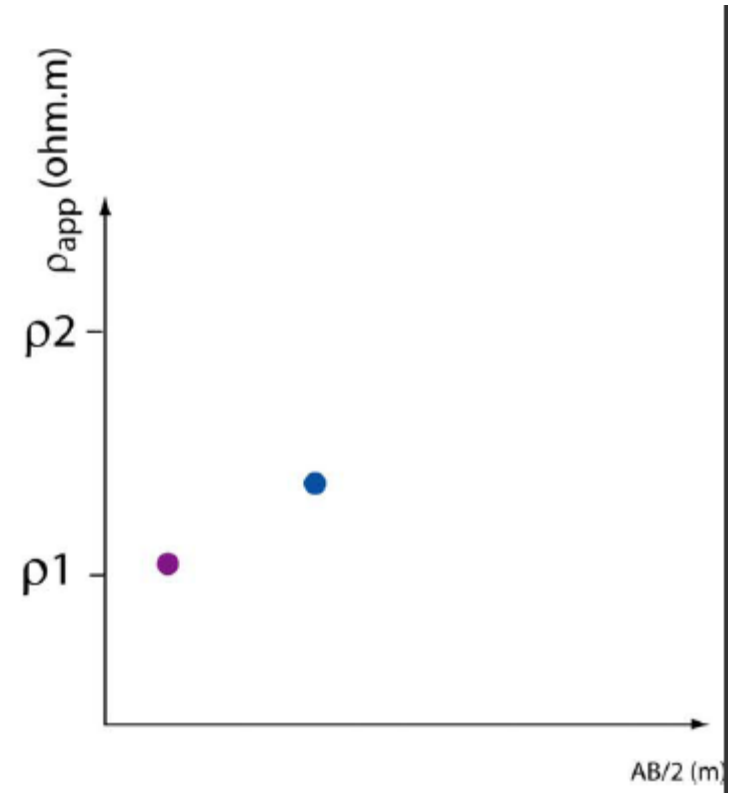
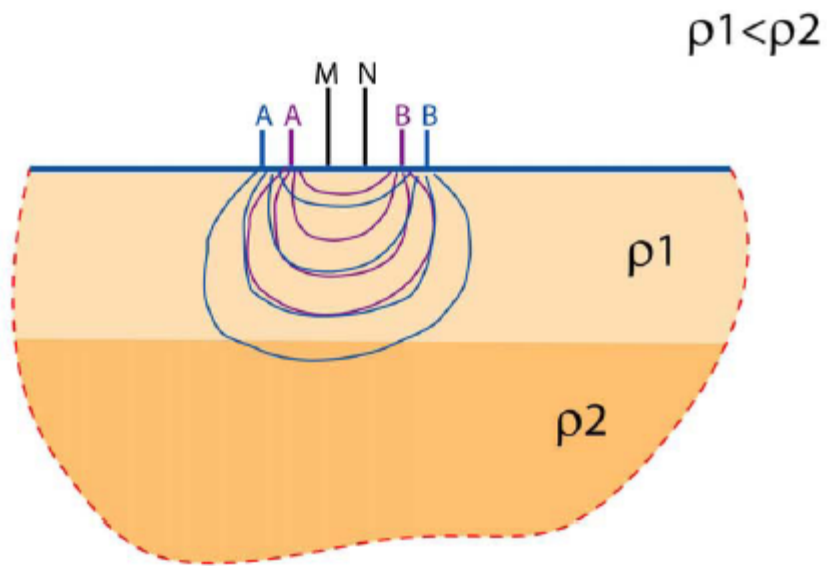


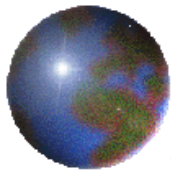
VES (I)



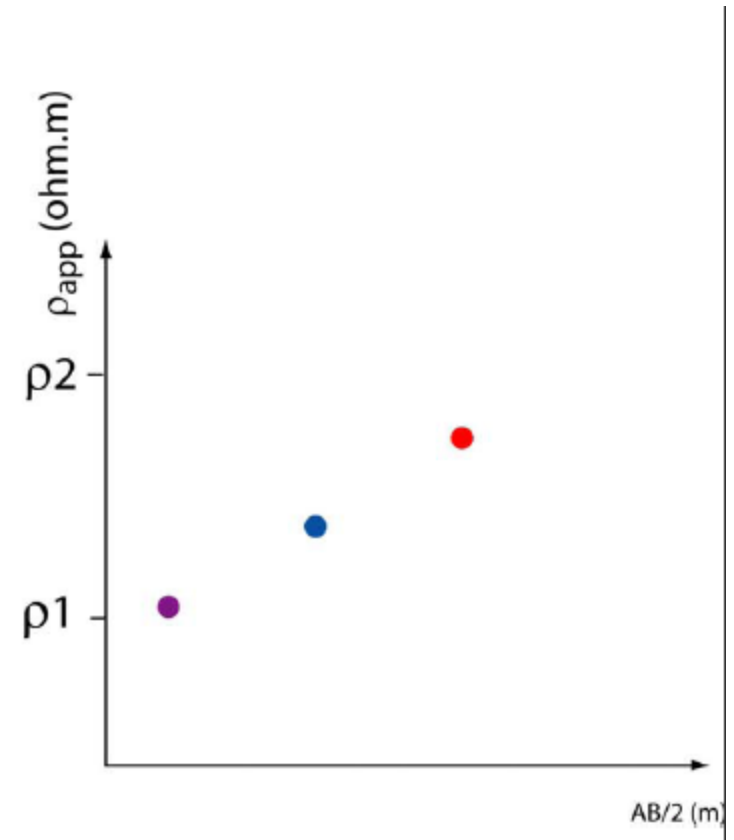
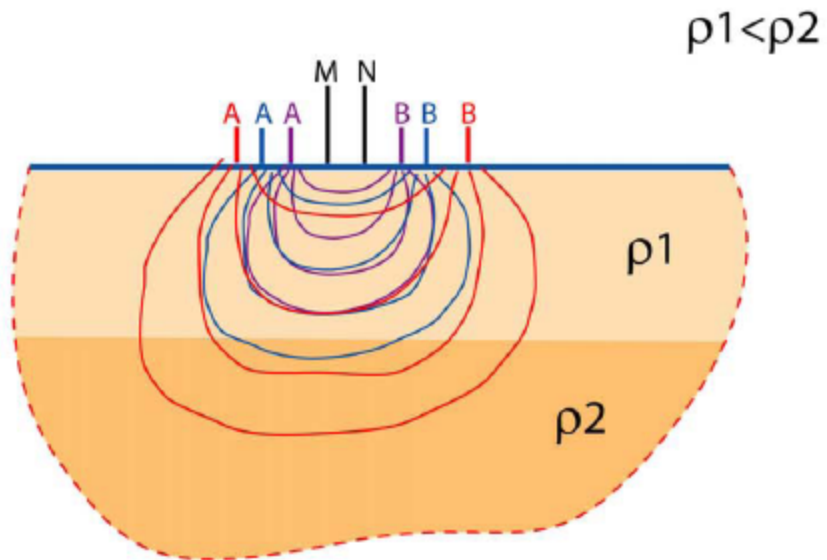


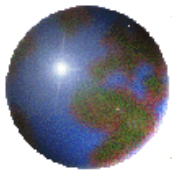
VES (II)



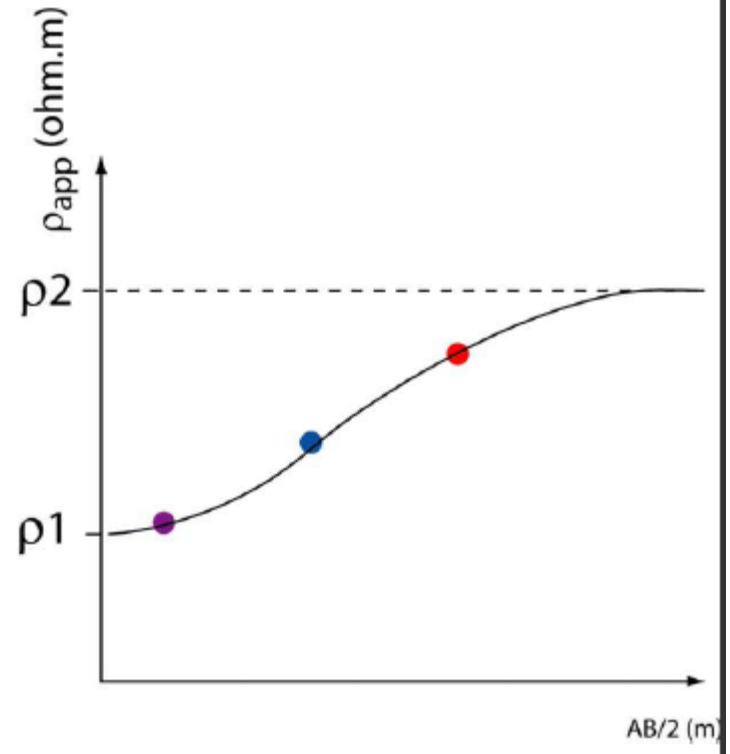
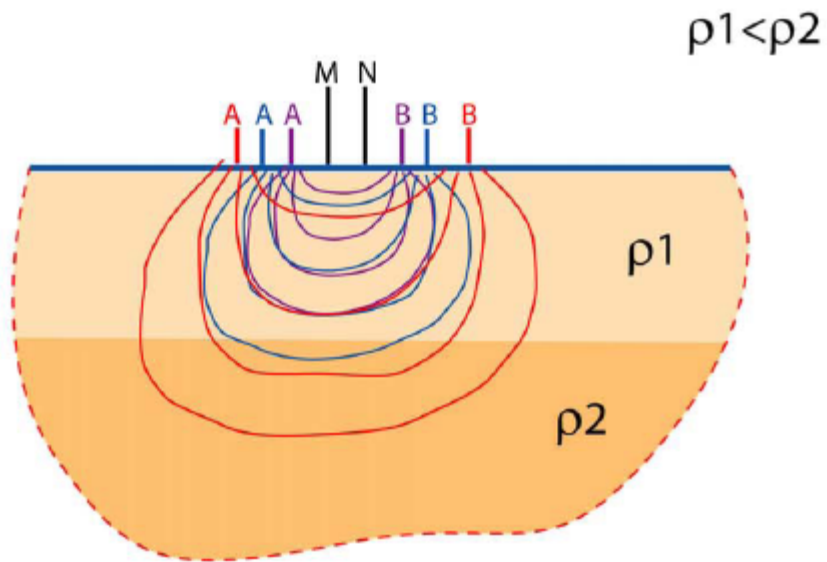


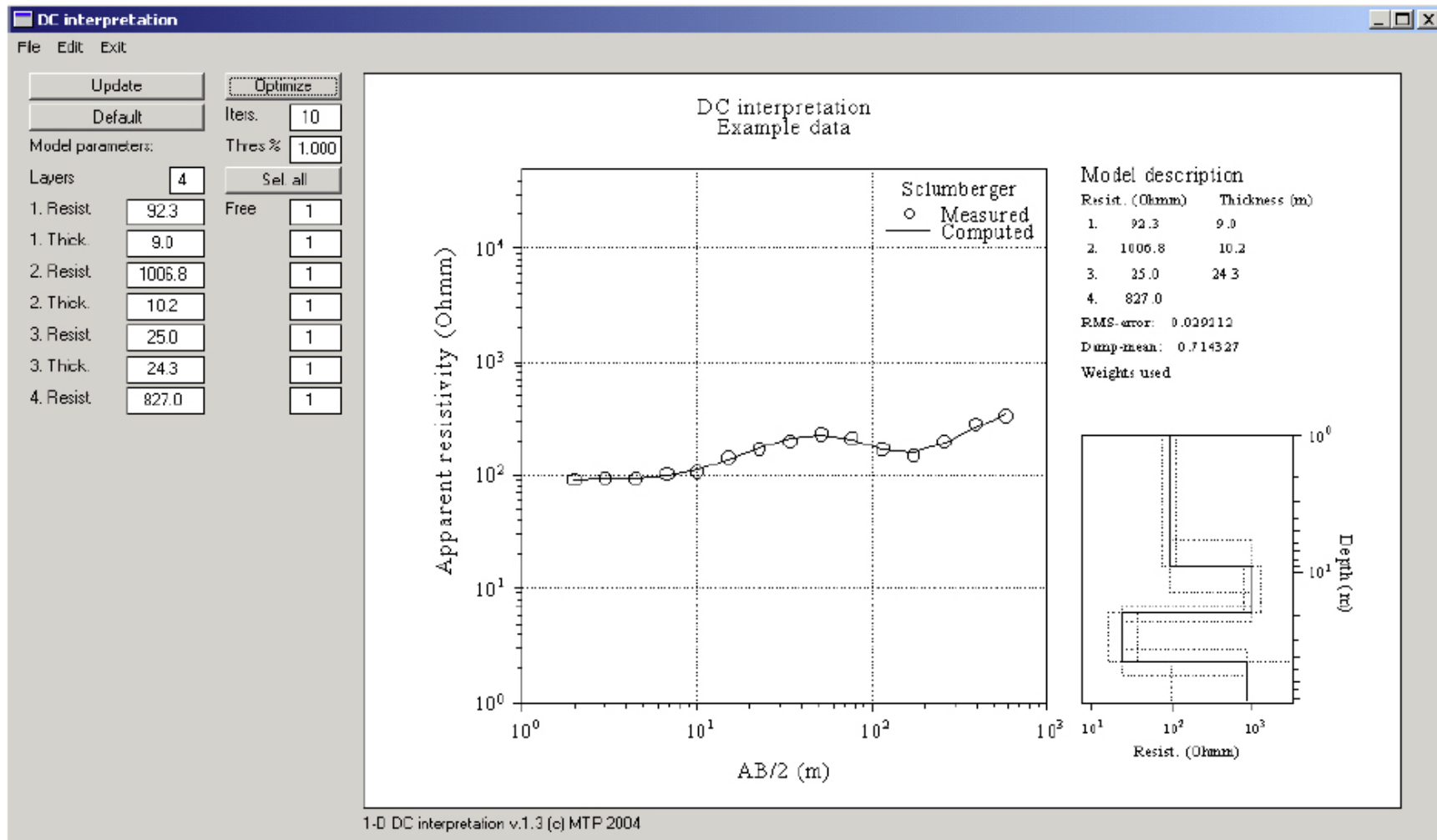
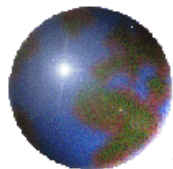
VES (III)

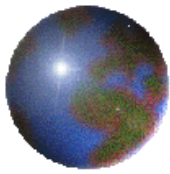




VES (IV)

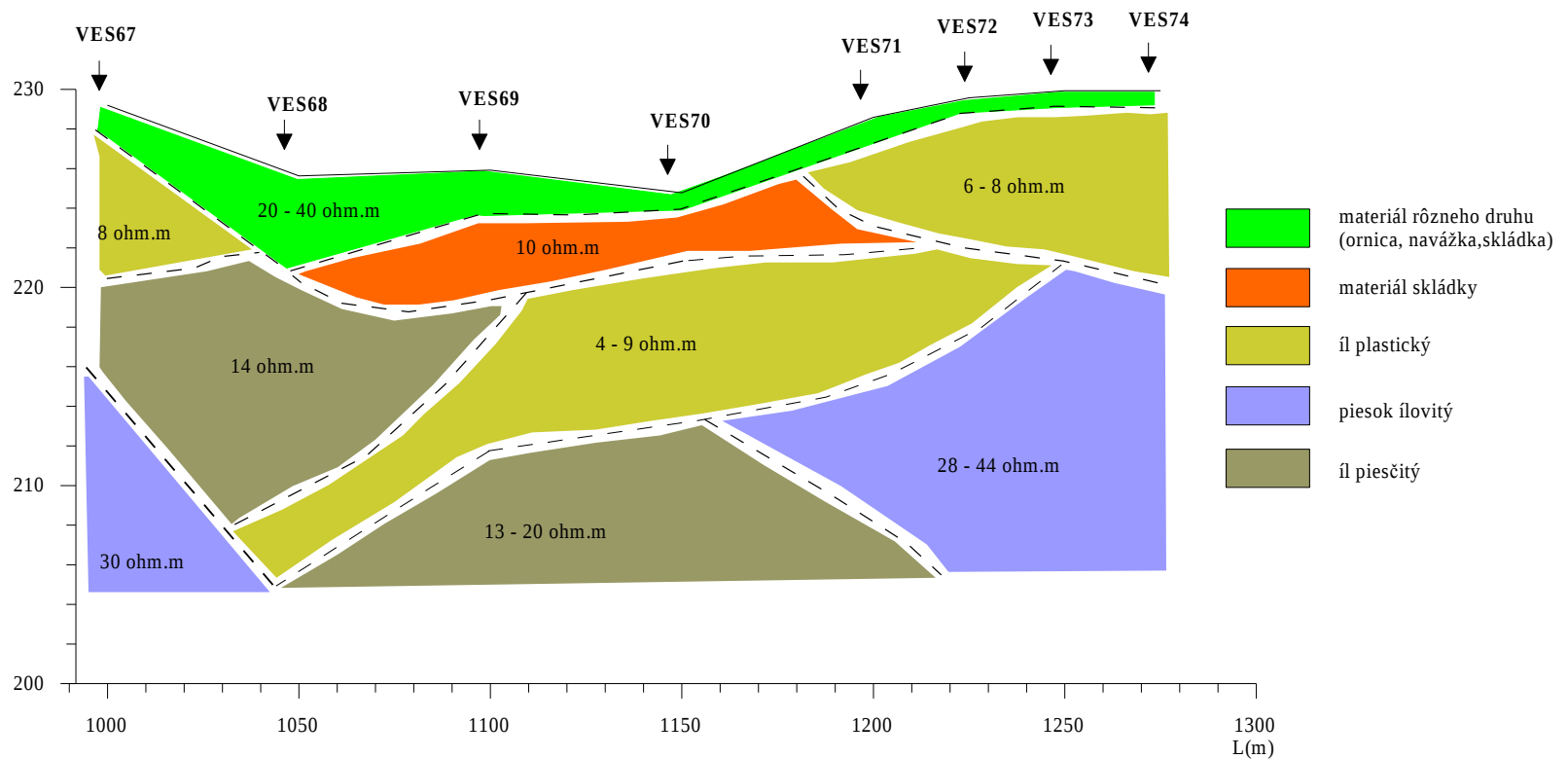


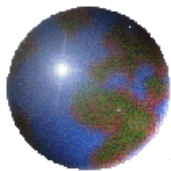




VES kontaminácia

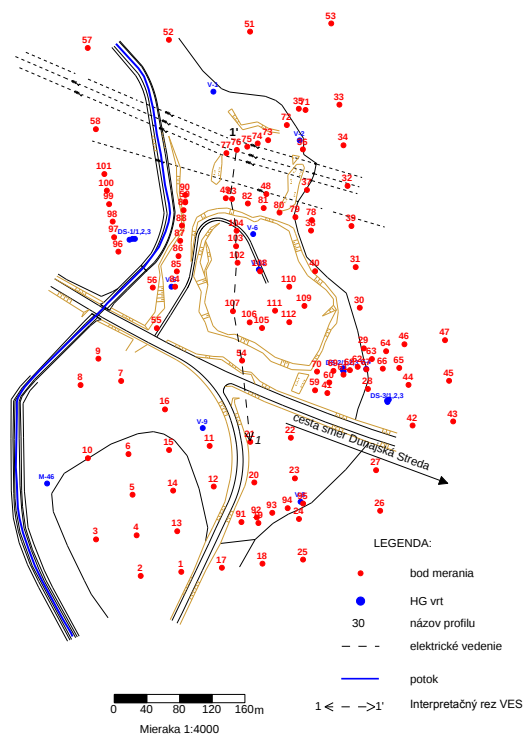
Interpretačný rez profilom VES 1-1'
(podľa výsledkov geofyzikálnych meraní VES)





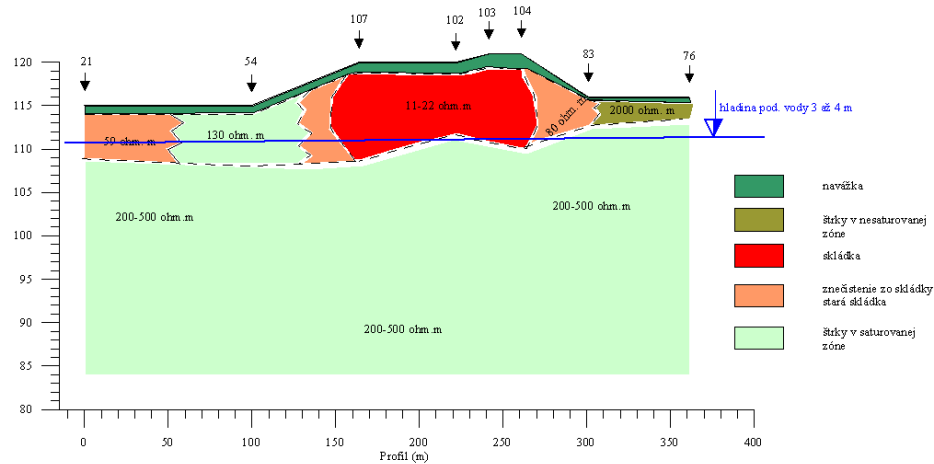
VES kontaminácia

Dunajská Streda - skládka TKO
Metóda VES
Situácia meraných bodov

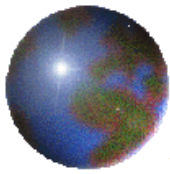


Obr. č.: 57

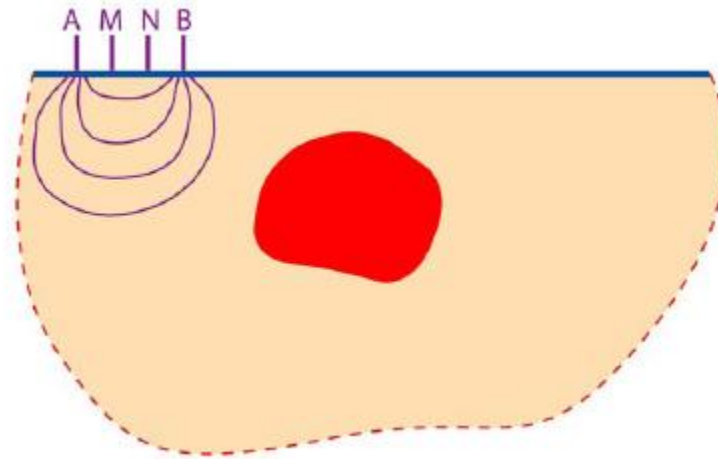
Interpretačný rez profilom VES 1 - 1'
(podľa výsledkov geofyzikálnych meraní VES)

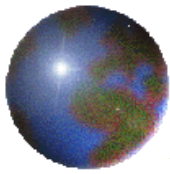


Obr. č.: 60

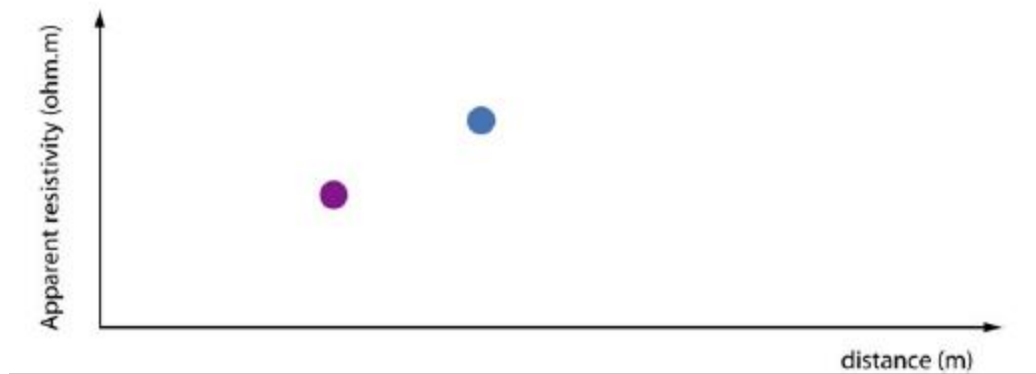
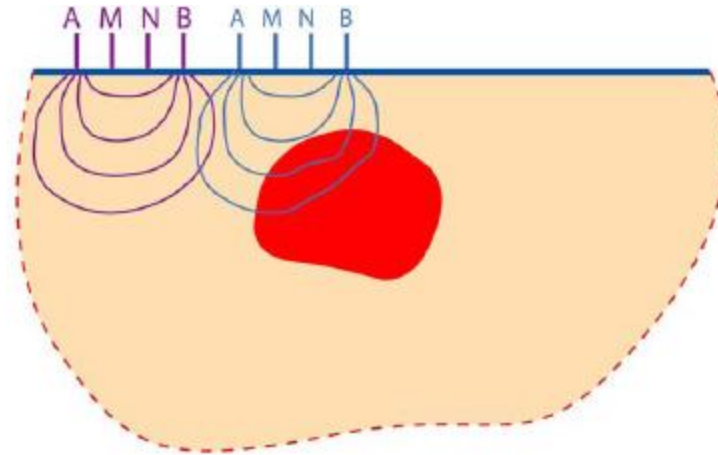


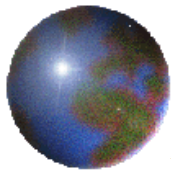
HP (I)



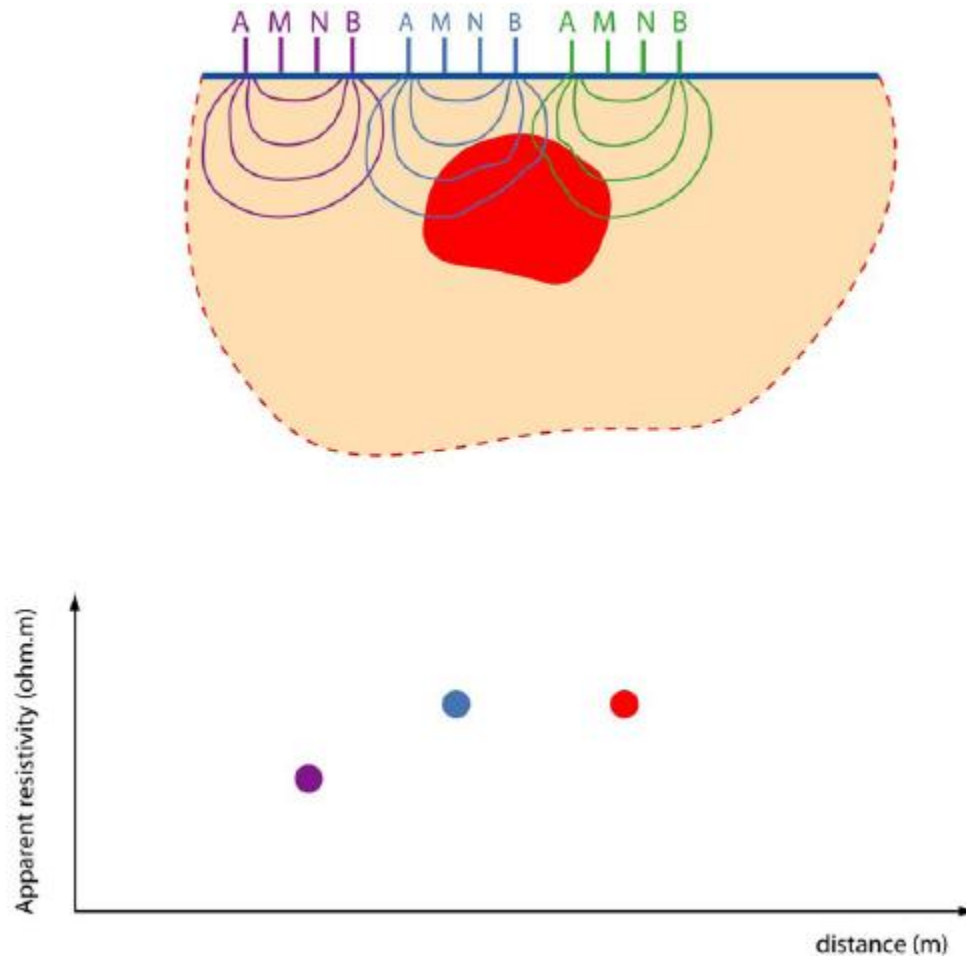


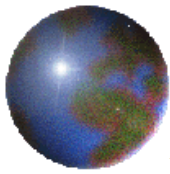
HP (II)



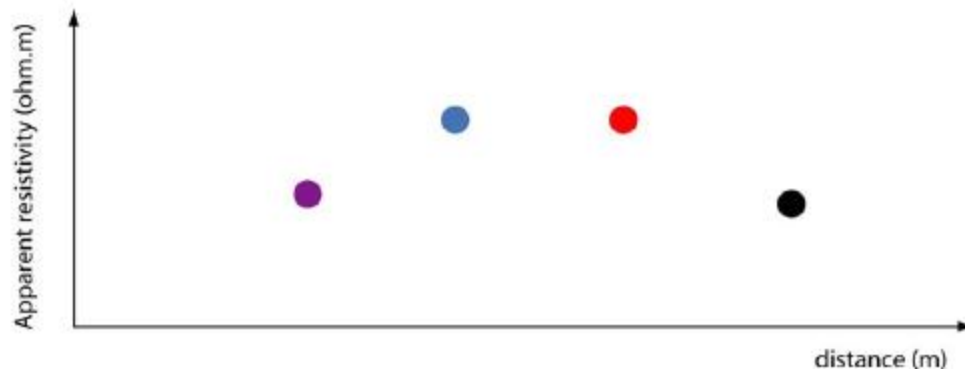
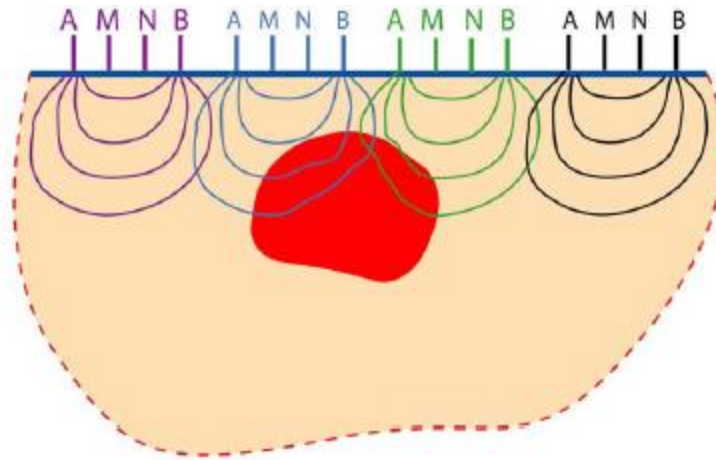


HP (III)

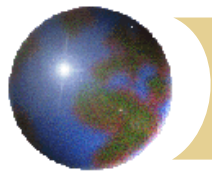




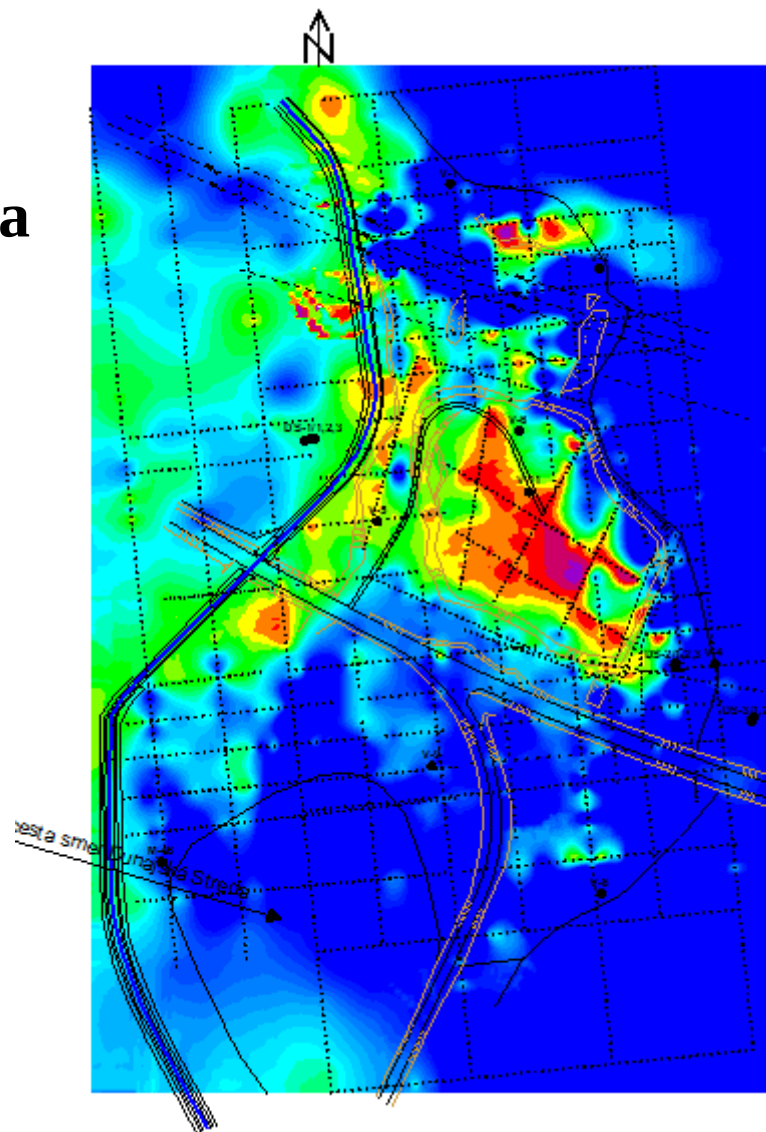
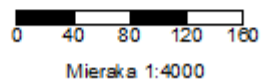
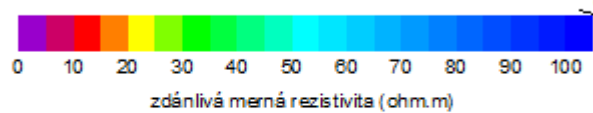
HP (IV)

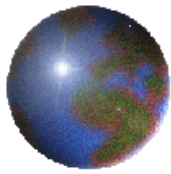


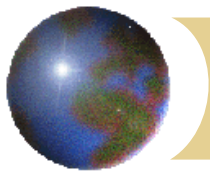




Profilovanie - kontaminácia



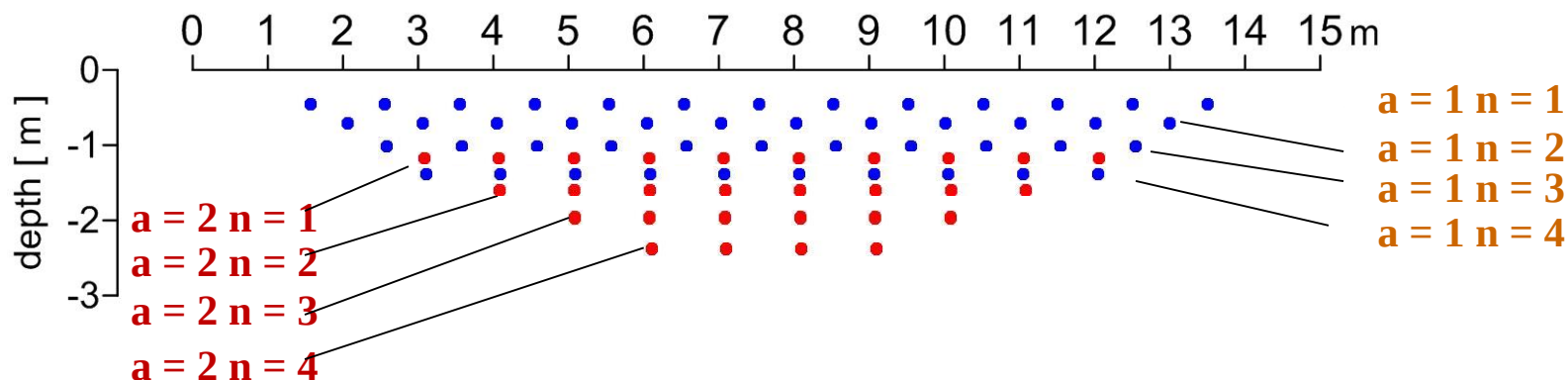
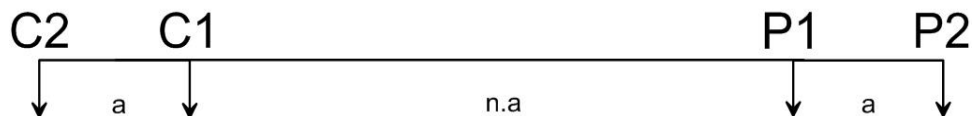




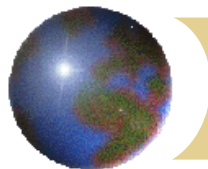
System merania metódou ERT

2D meranie

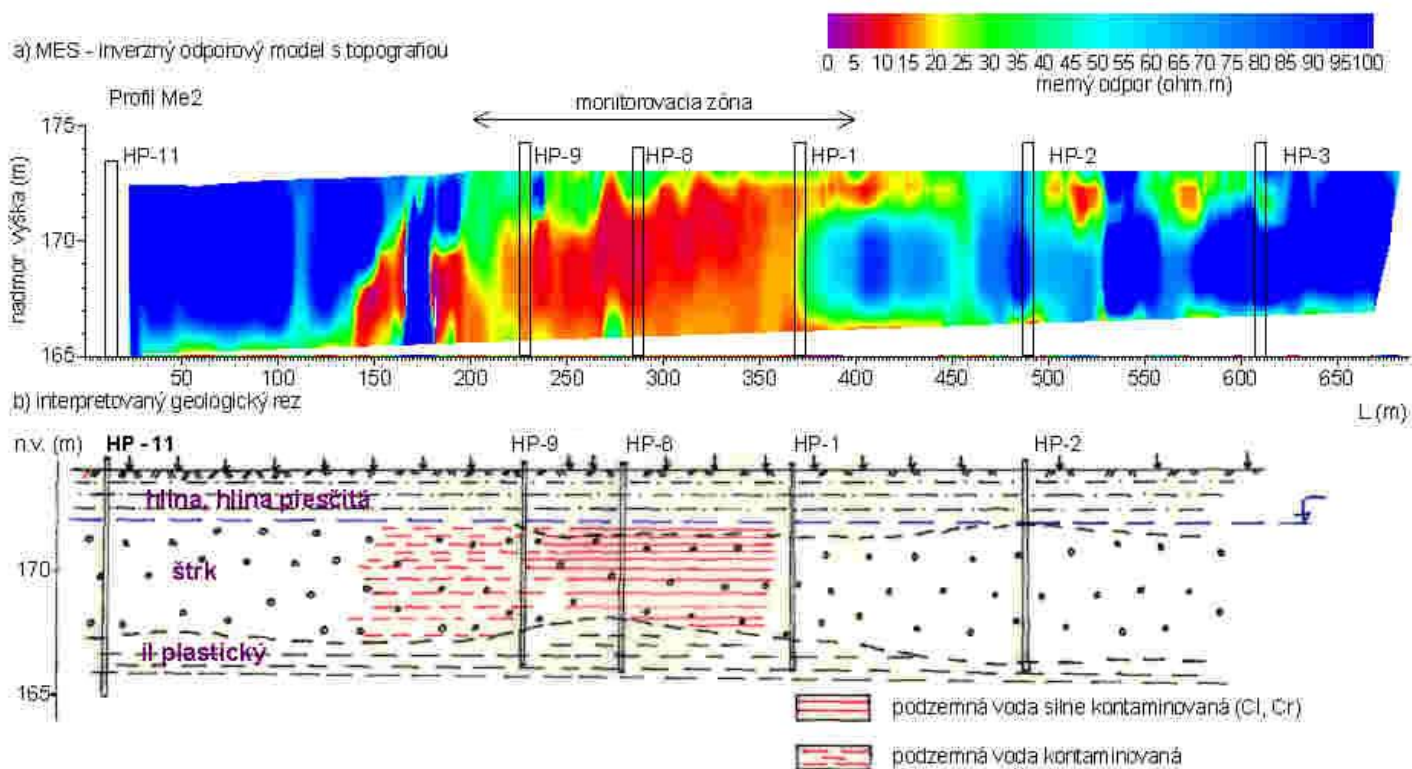
Elektródové usporiadanie
dipól - dipól

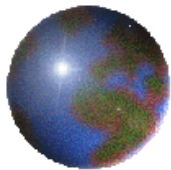


- kombináciou rôznych hodnôt parametrov „a“ a „n“
môžeme získať vysokú hustotu informácie



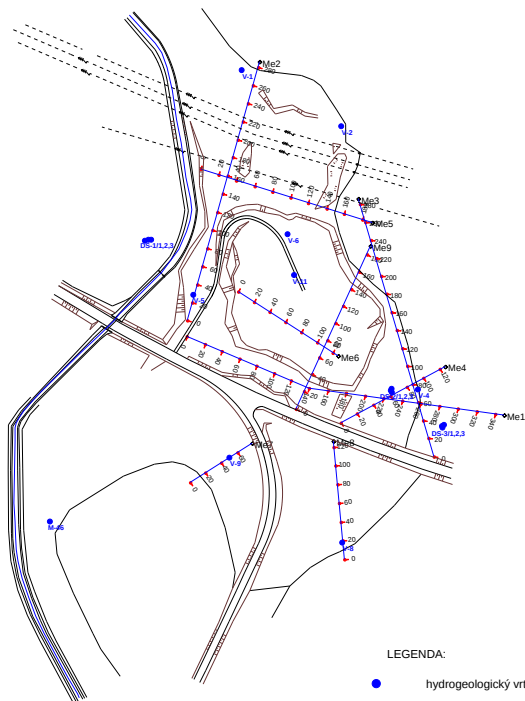
Elektrická tomografia kontaminácia





Elektrická tomografia kontaminácia

Dunajská Streda - skládka TKO
Situácia meraní
Multielektrodové sondovanie



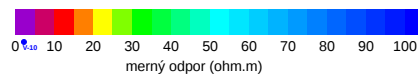
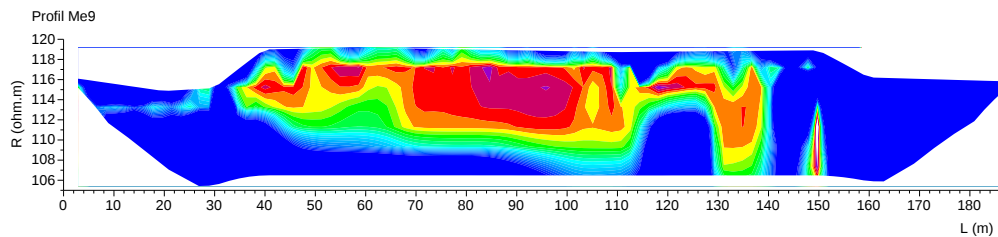
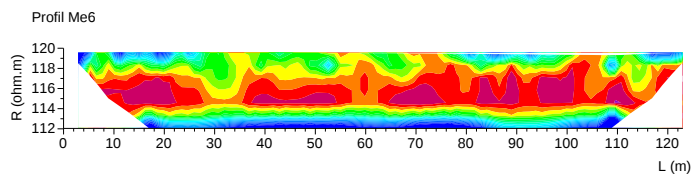
0 35 70 105 140m
Mierka 1:3500

LEGENDA:
● hydrogeologický vrt
○ profil MES s metrážou

Obr. č.: 61



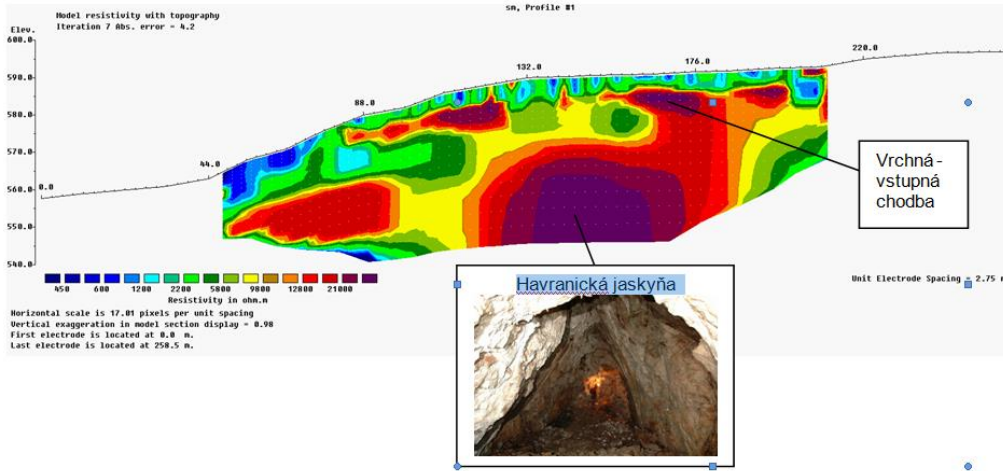
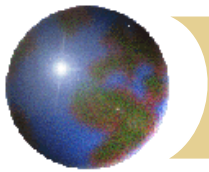
Dunajská Streda - skládka TKO
Multielektrodové sondovanie
Inverzný odporový model s topografiou



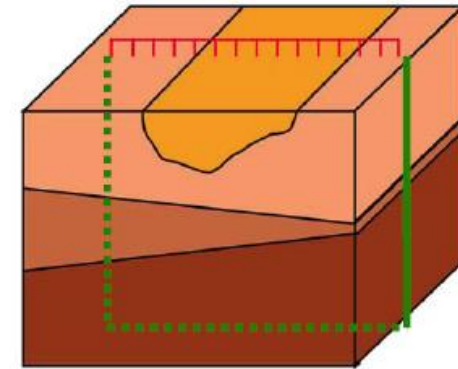
Horizontálna mierka 1: 800
Vertikálna mierka 1:400

Usporiadanie Wenner - Schlumberger
Krok merania 2m

Obr. č.: 62

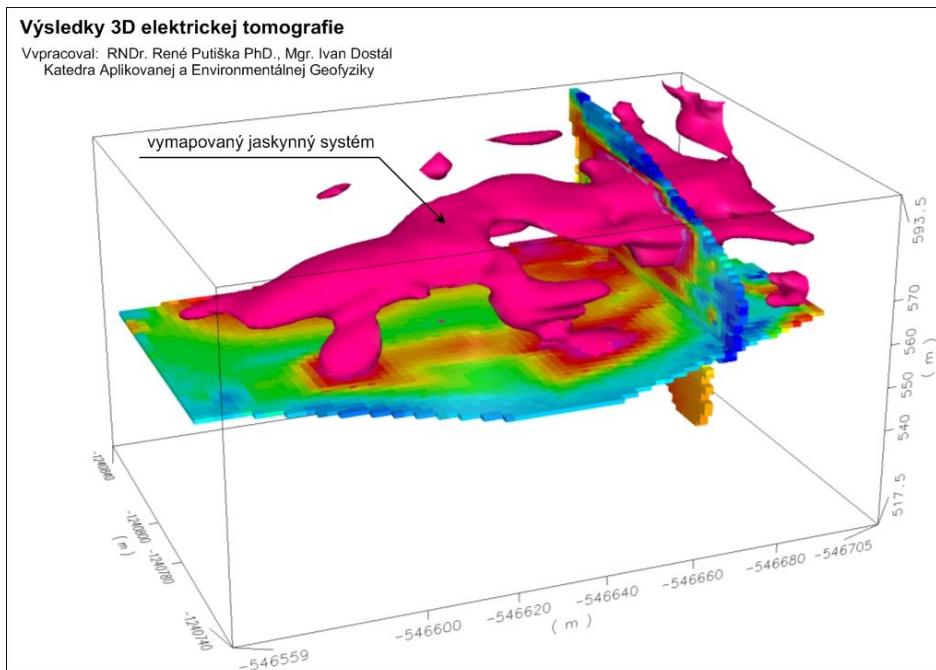


2D

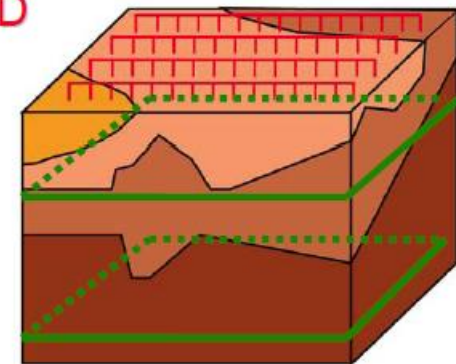


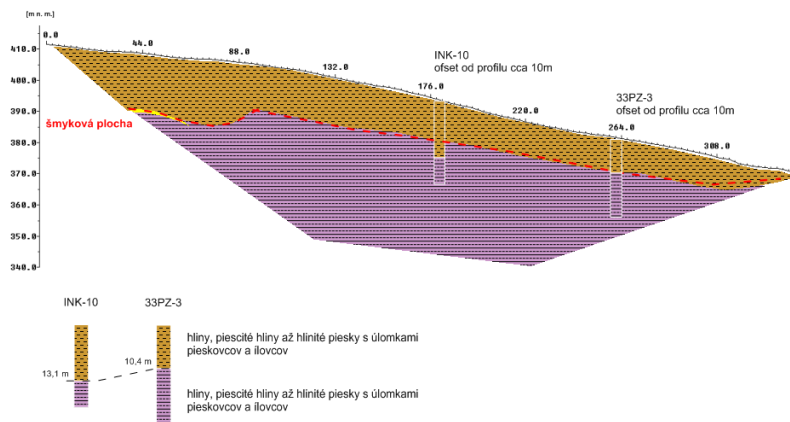
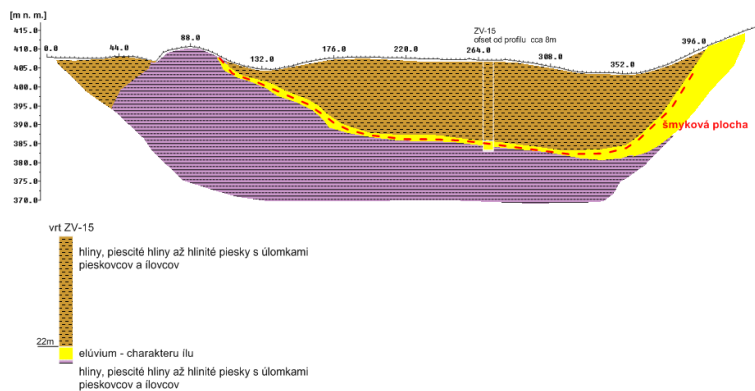
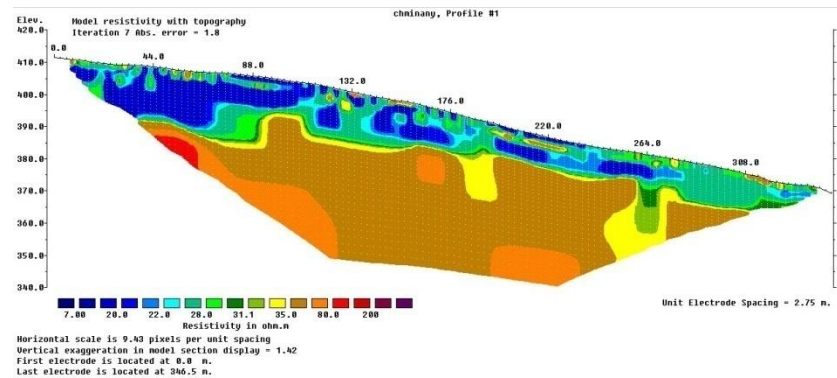
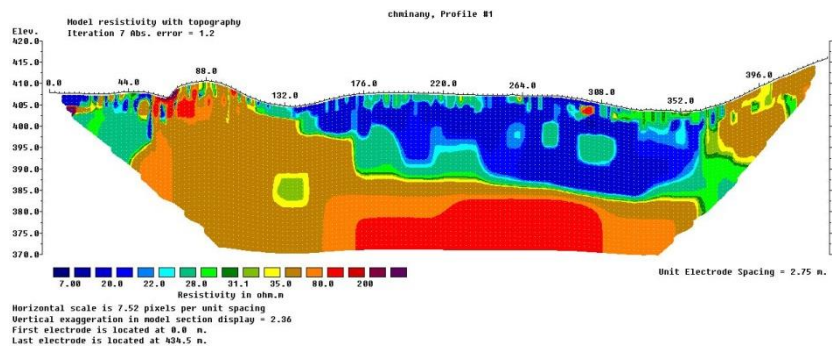
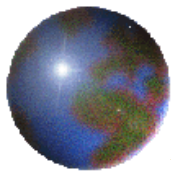
Výsledky 3D elektrickej tomografie

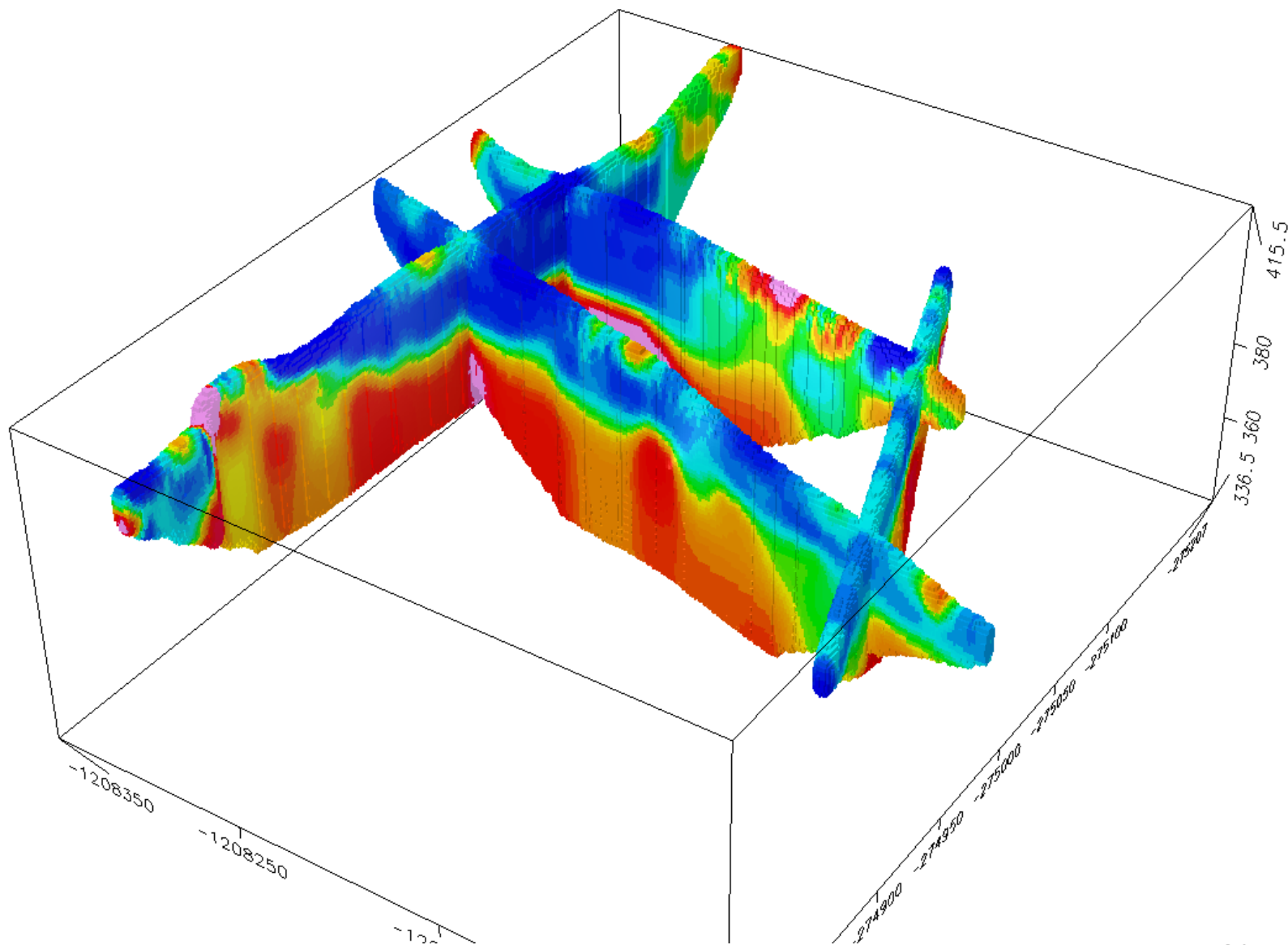
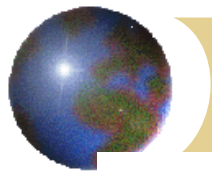
Vypracoval: RNDr. René Putiška PhD., Mgr. Ivan Dostál
Katedra Aplikovanej a Environmentálnej Geofyziky

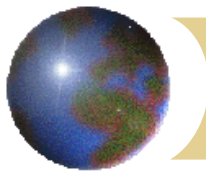


3D

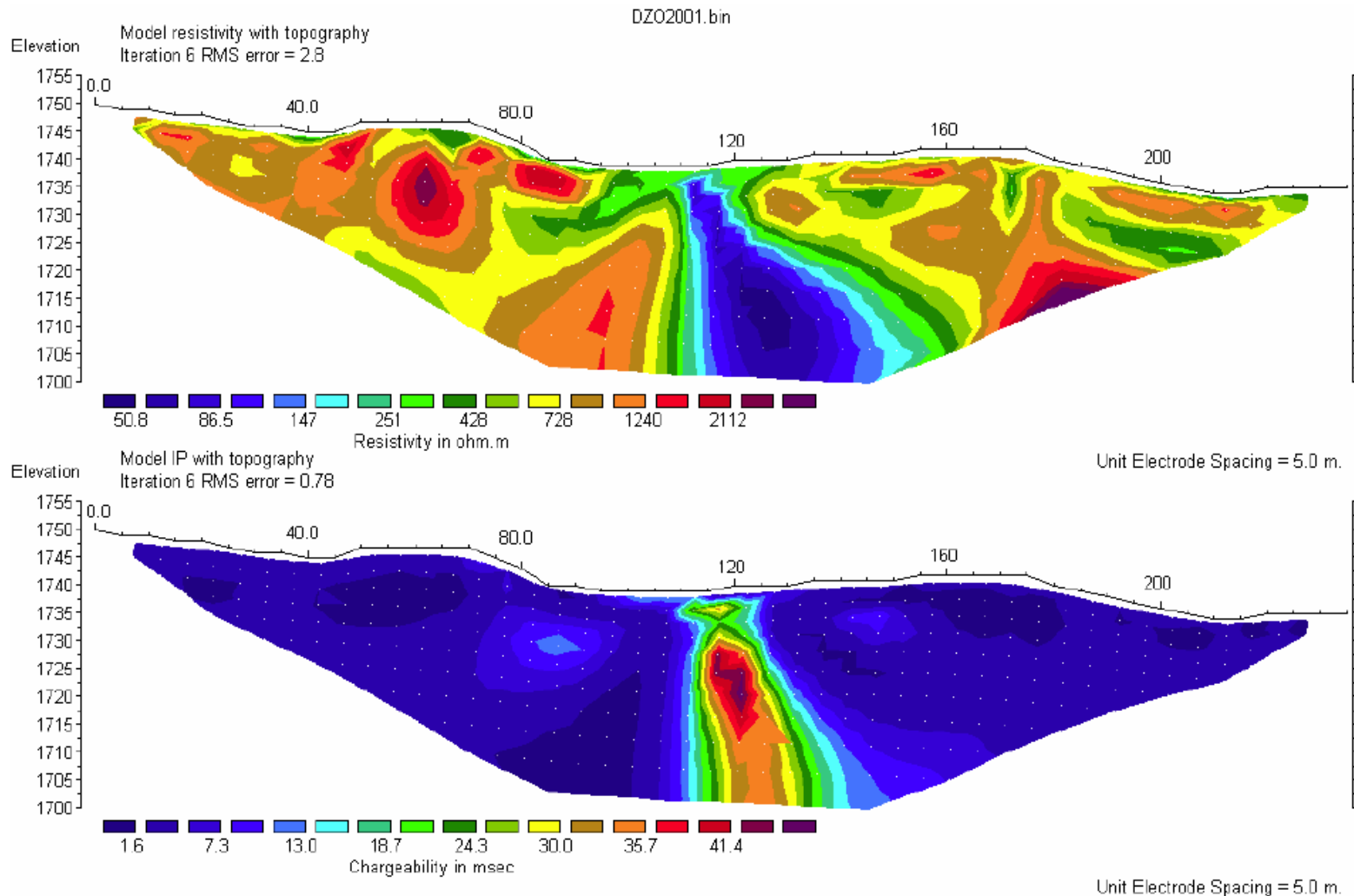


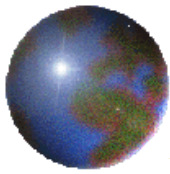




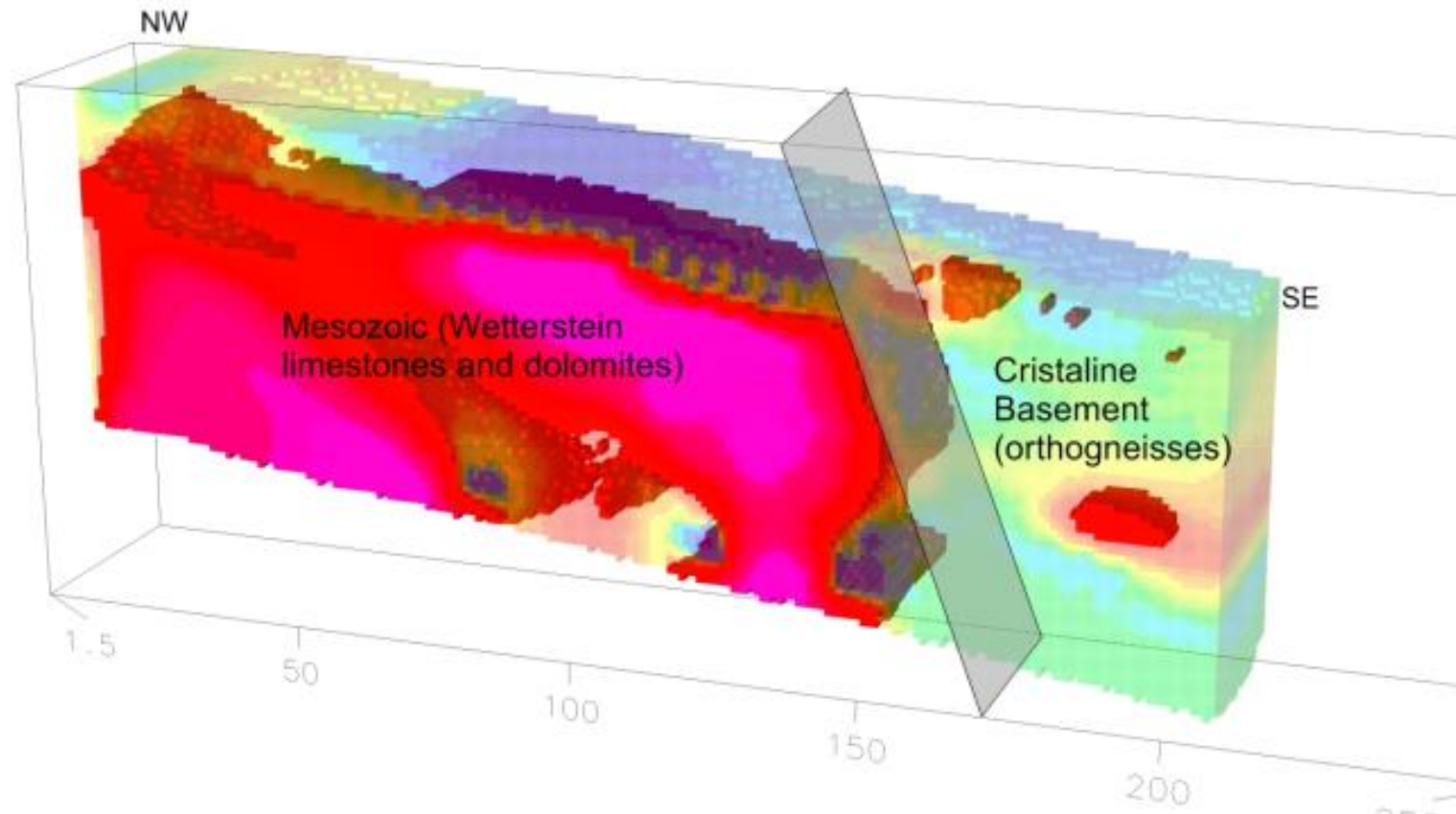


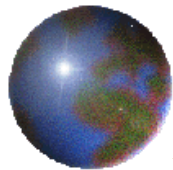
Tektonika





Tektonika





Ďakujem za pozornosť

