

Geophysical investigation of the Lontzen Pb-Zn ore deposits



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Location

Pb-Zn districts of Belgium



(Dejonghe 1985a;b, 1990b, modified)

Liège and the Zinc

Liège: First industrial production of zinc metal (1809)

27% of the european zinc production (1854)

17 000t/ year



J-J Dony



La Calamine zinc deposit



Liège smelter

Goal of the project

- Target the Belgian Pb-Zn ore deposits using geophysics
- Better understand the geology and the genesis of these deposits
- Improve imaging using joint or cooperative inversion
- Better detection, targetting and estimation of the grades/tonnage

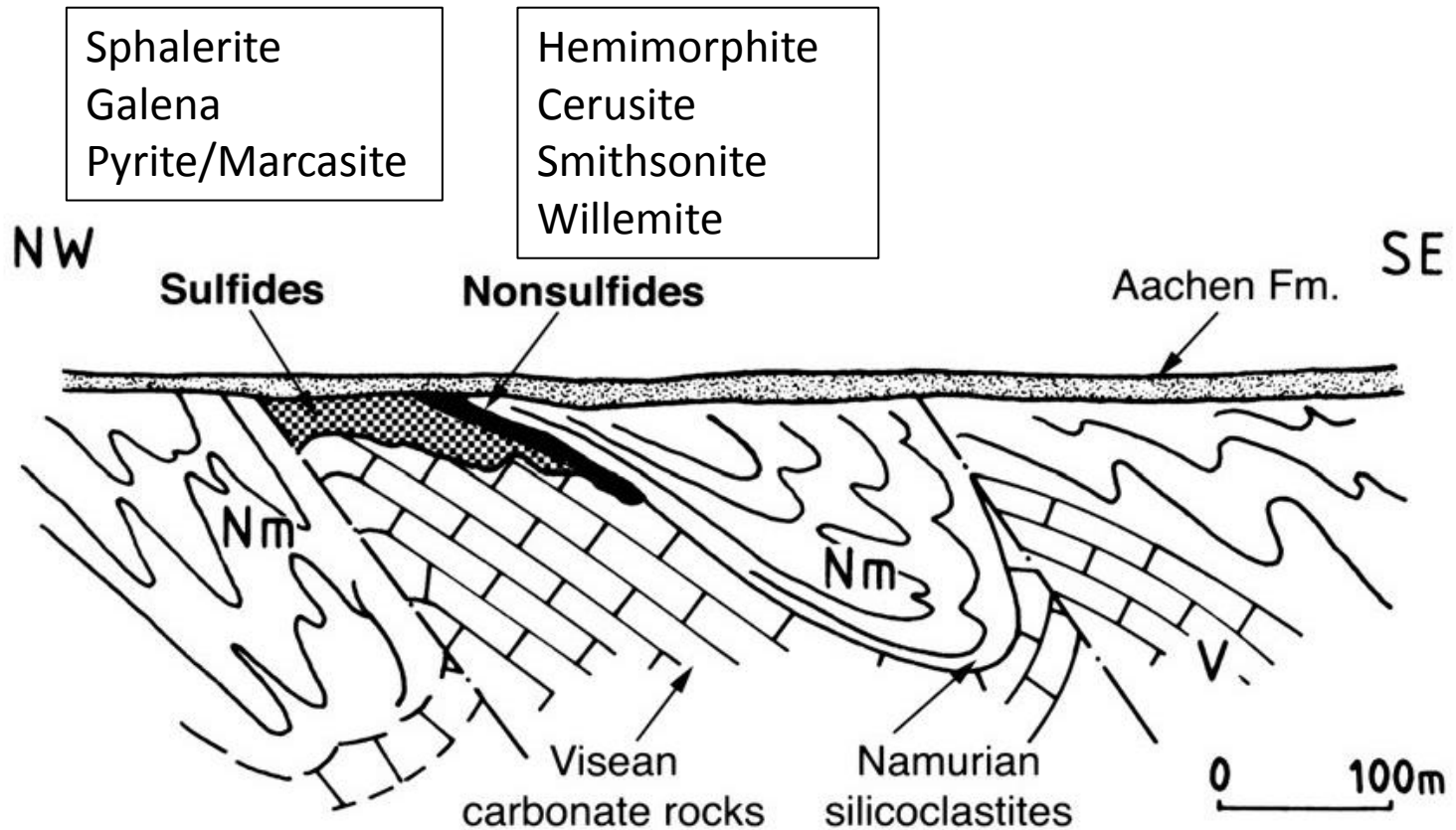
Location

Pb-Zn districts of Belgium



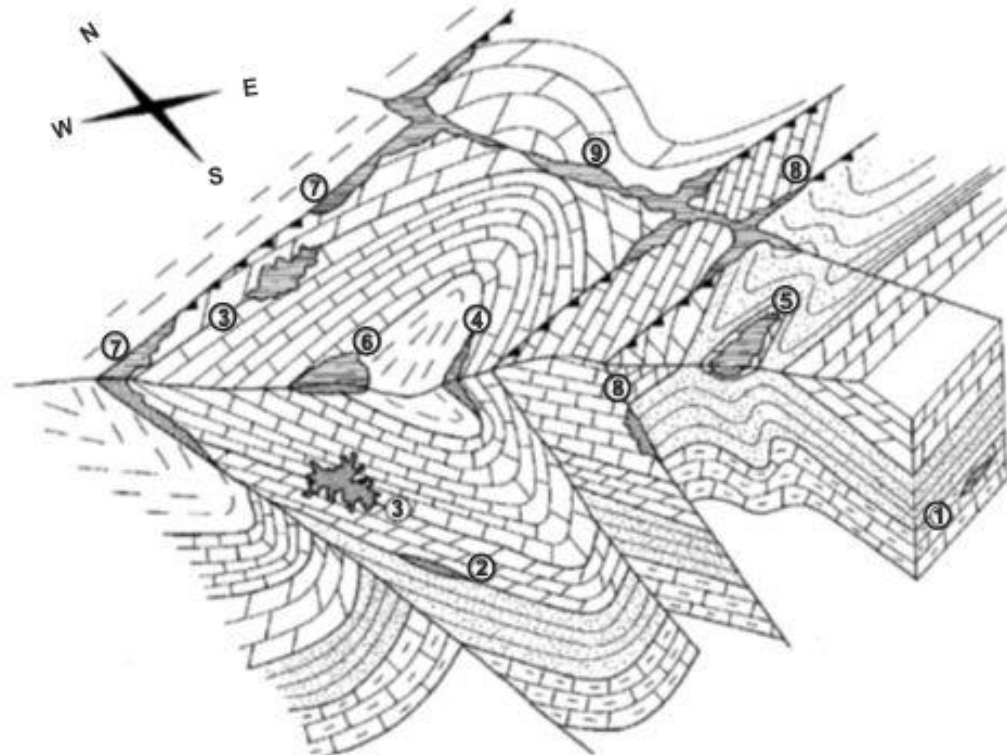
(Dejonghe 1985a;b, 1990b, modified)

MVT deposit of Belgium



Deposit of Dickenbusch (*Dejonghe et al., 1993*)

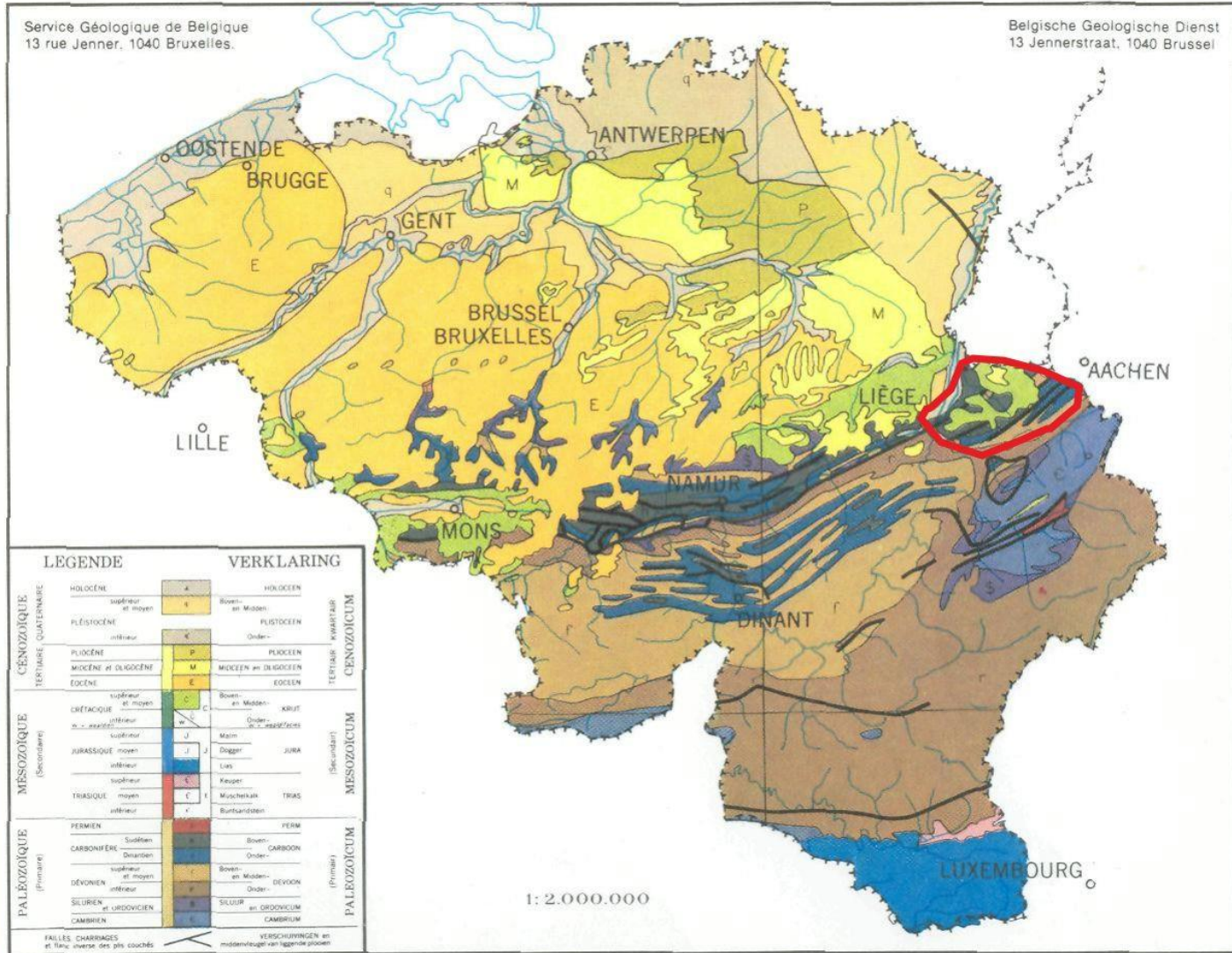
Mississippi Valley Type



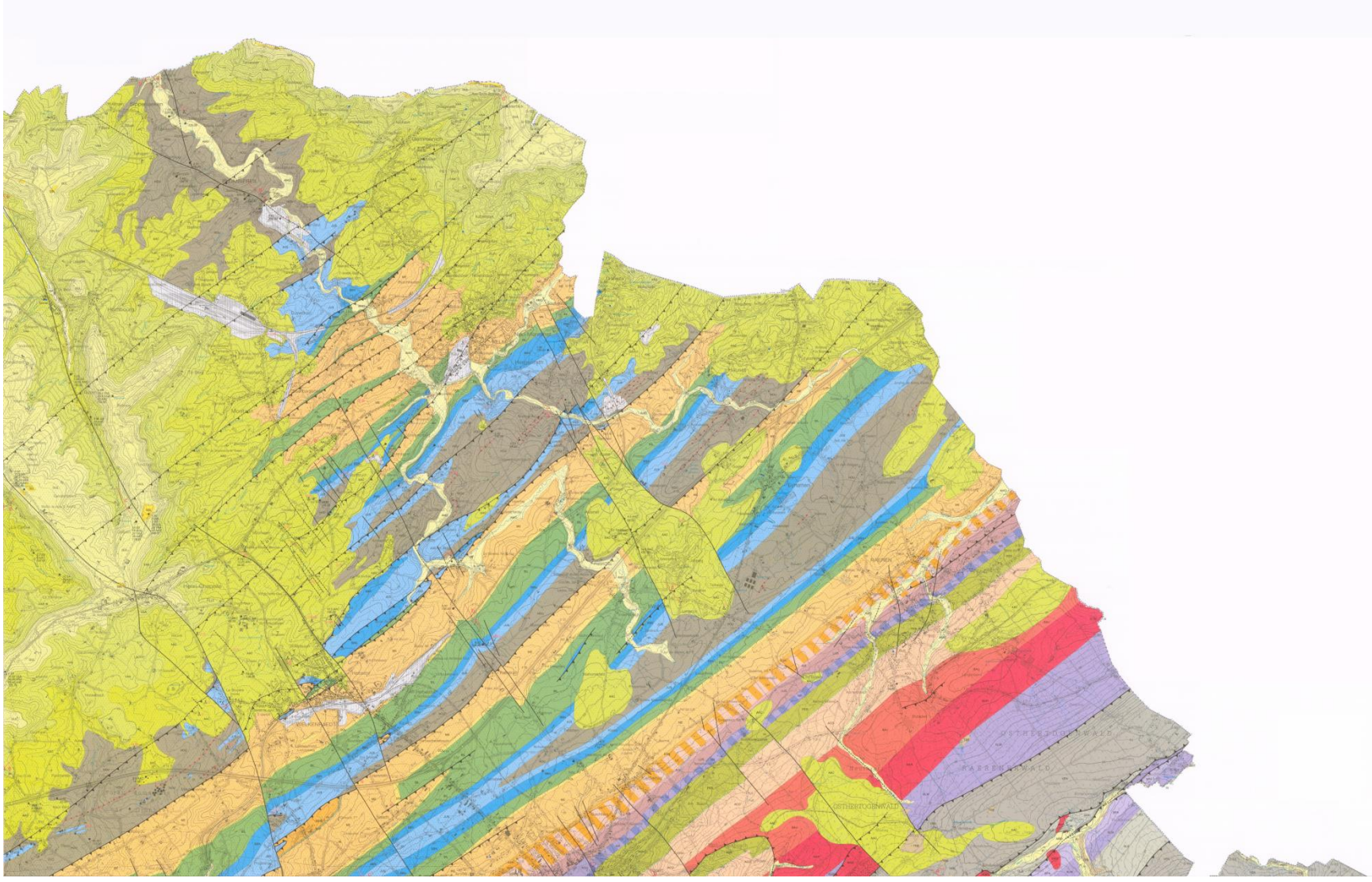
N°	Exemple
1	Chaufontaine
2	Wol Brig
3	Eschbroich
4	Rabbitrah
5	La Calamine
6	Pandour
7	Dickenbush
8	Lontzen
9	Schmalgraf

	Namurian (Nm) shales
	Viséan (Vi) Limestones
	Tournaisian (Tn) Dolostones
	Famennian (Fa) Sandstone and Shales
	Frasnian (Fr) and Middle Devonian (DM) Limestone and shales

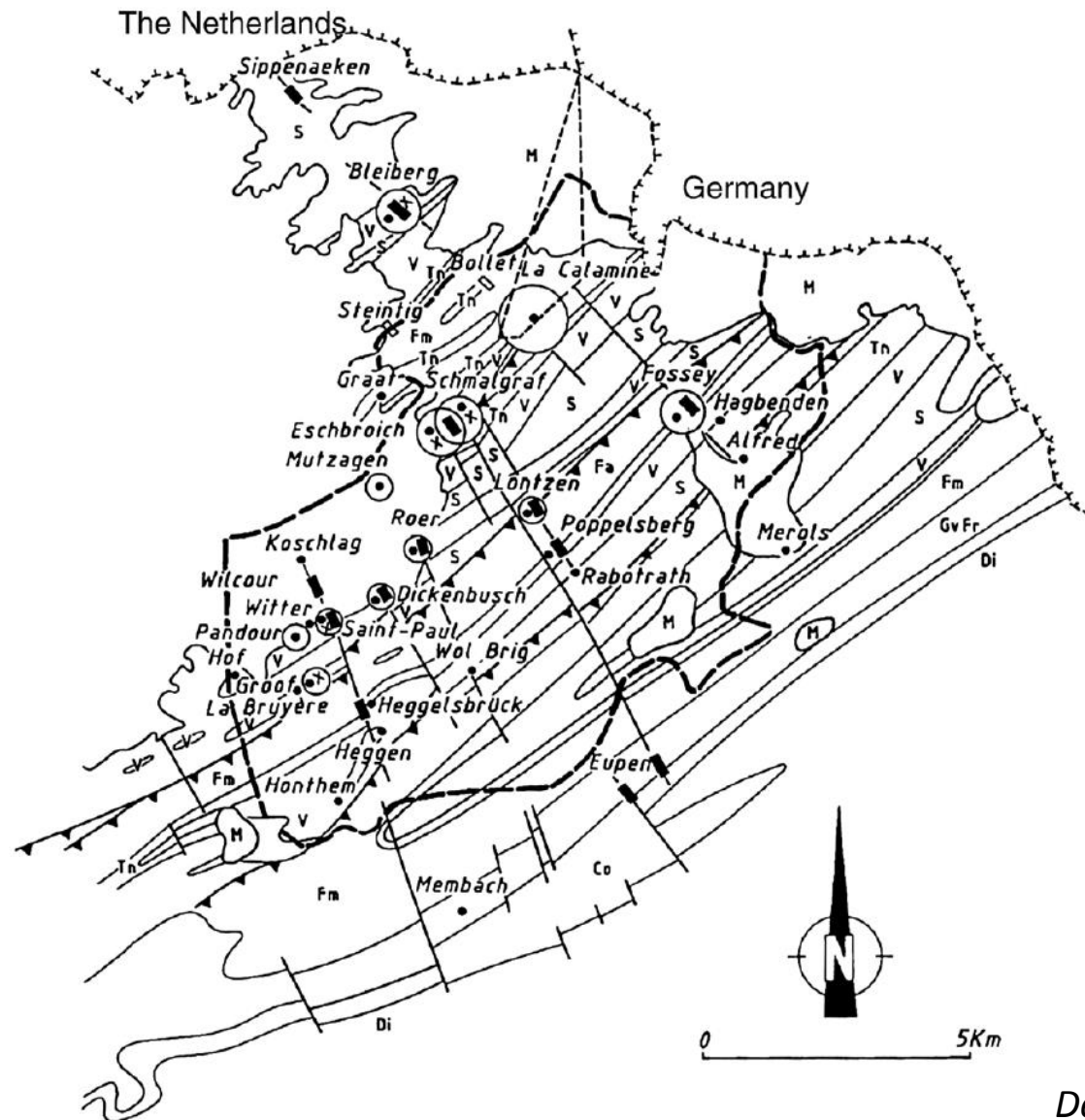
Geological context



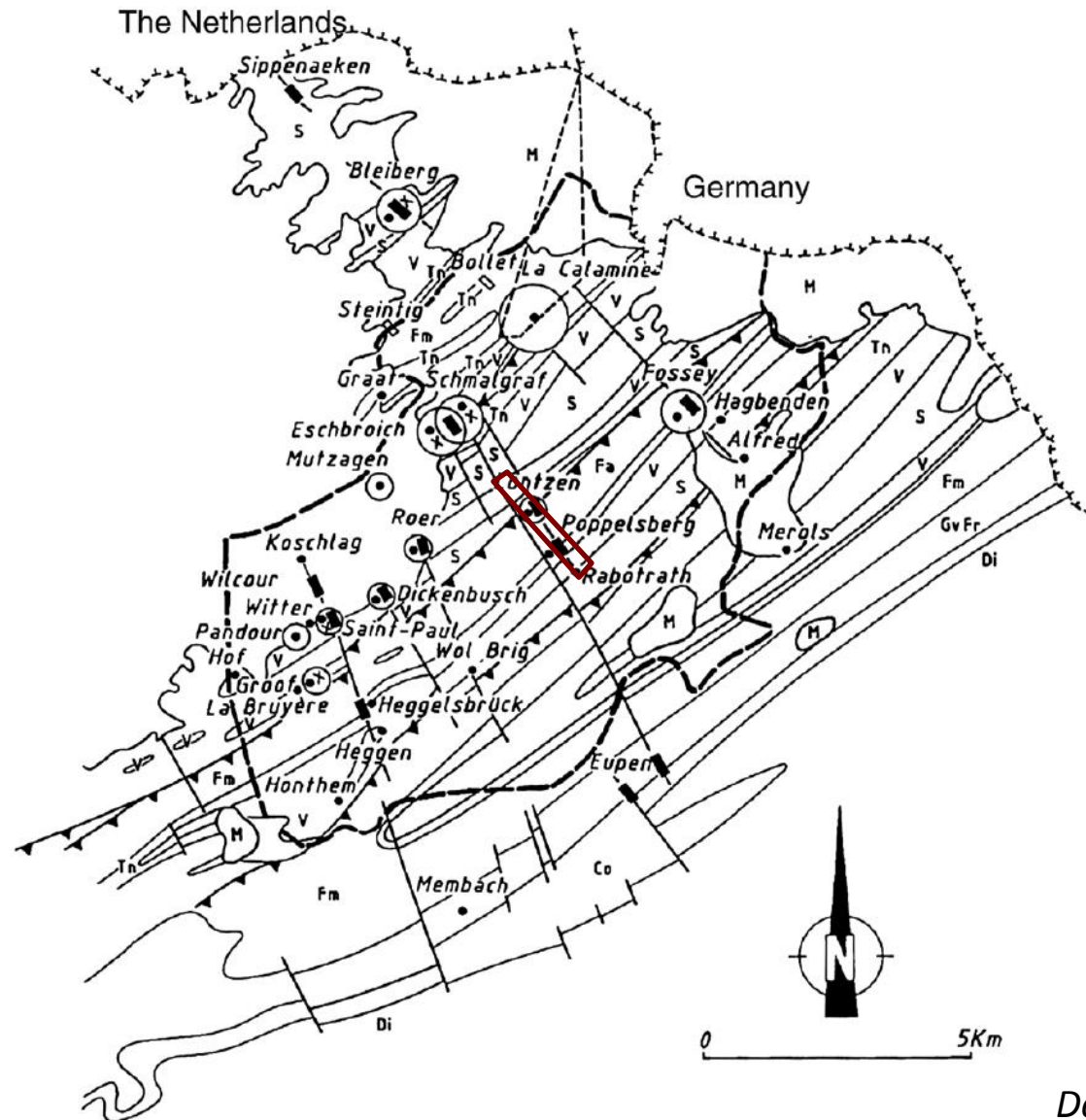
Verviers synclinorium



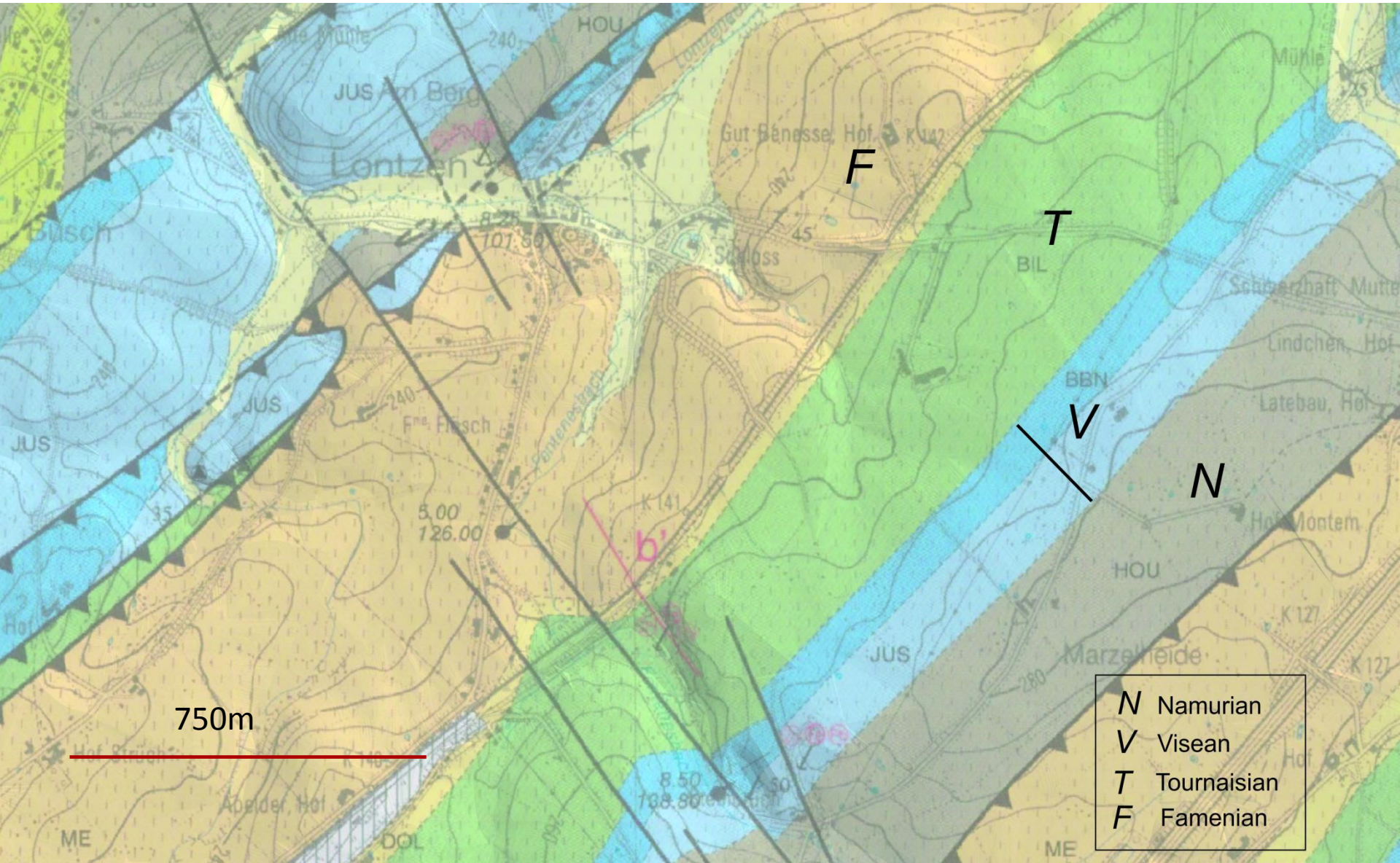
Old mining work in the Verviers synclinorium



Lontzen deposit



Study area

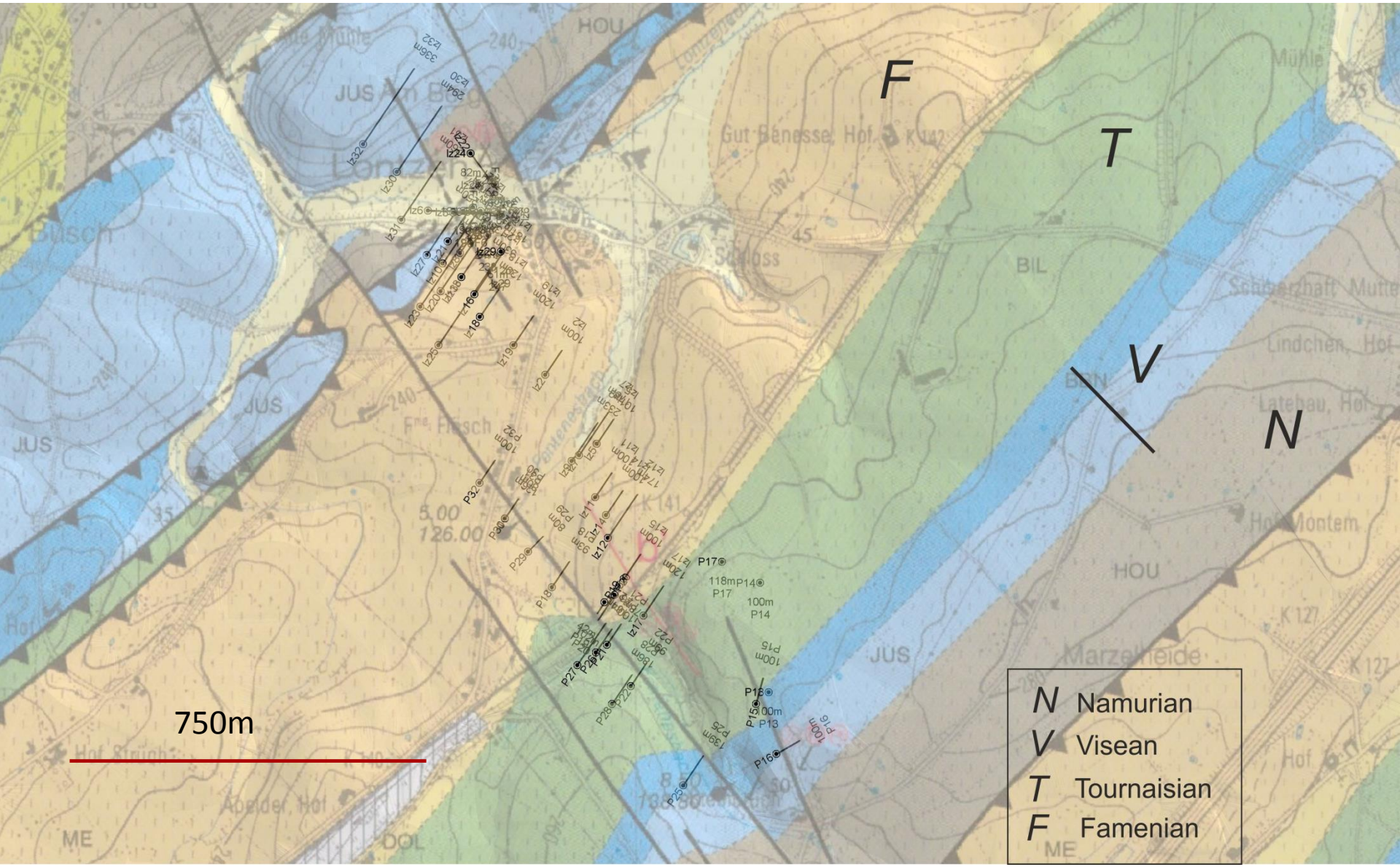


Lontzen/Poppelsberg mineralogy

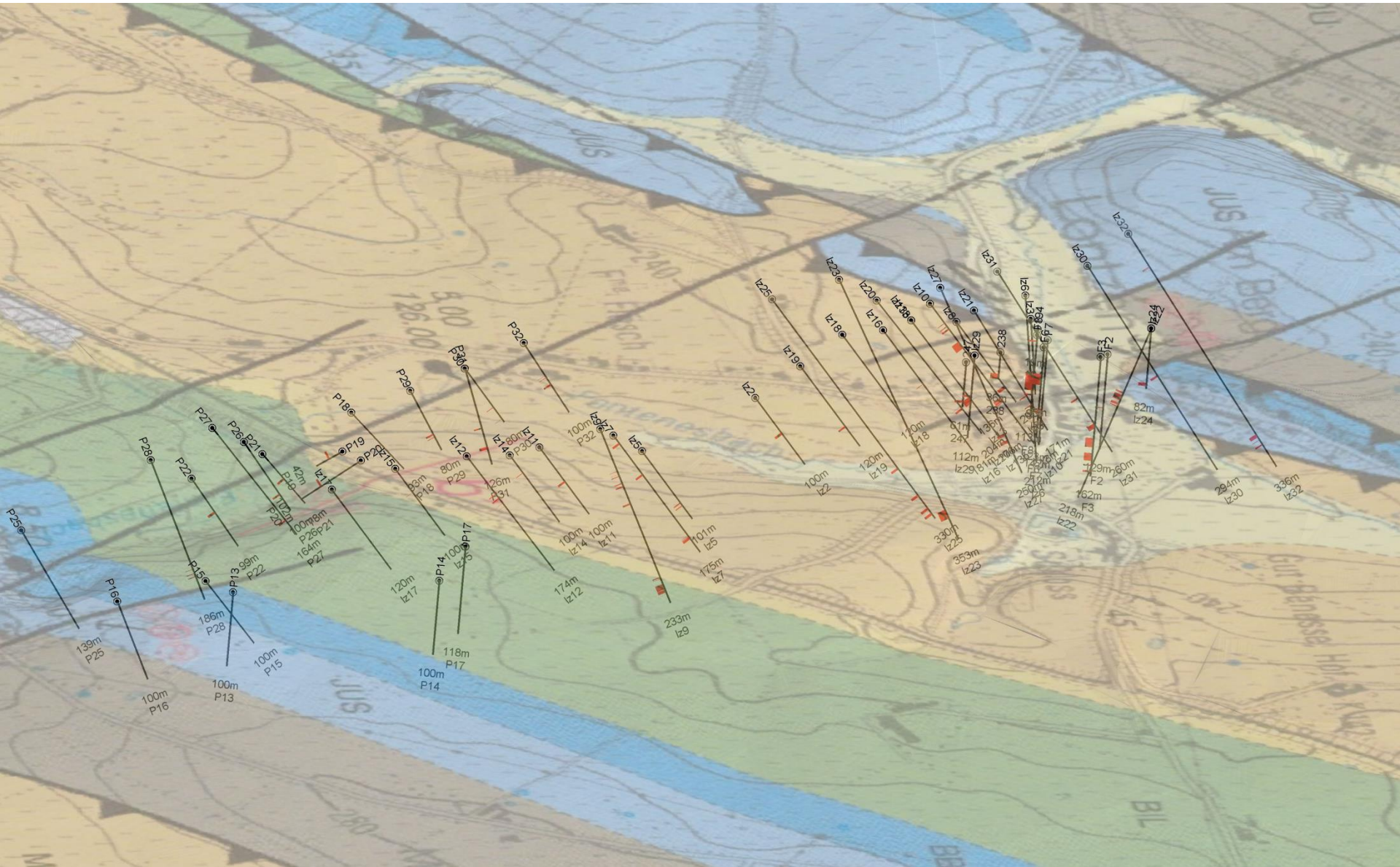
- Massive sulphides (95%)
 - Sphalerite, galena, pyrite/marcasite, chalcopyrite...
- Massive oxides (5%)
 - Smithsonite, limonite, cerusite...

Hole-drilling program

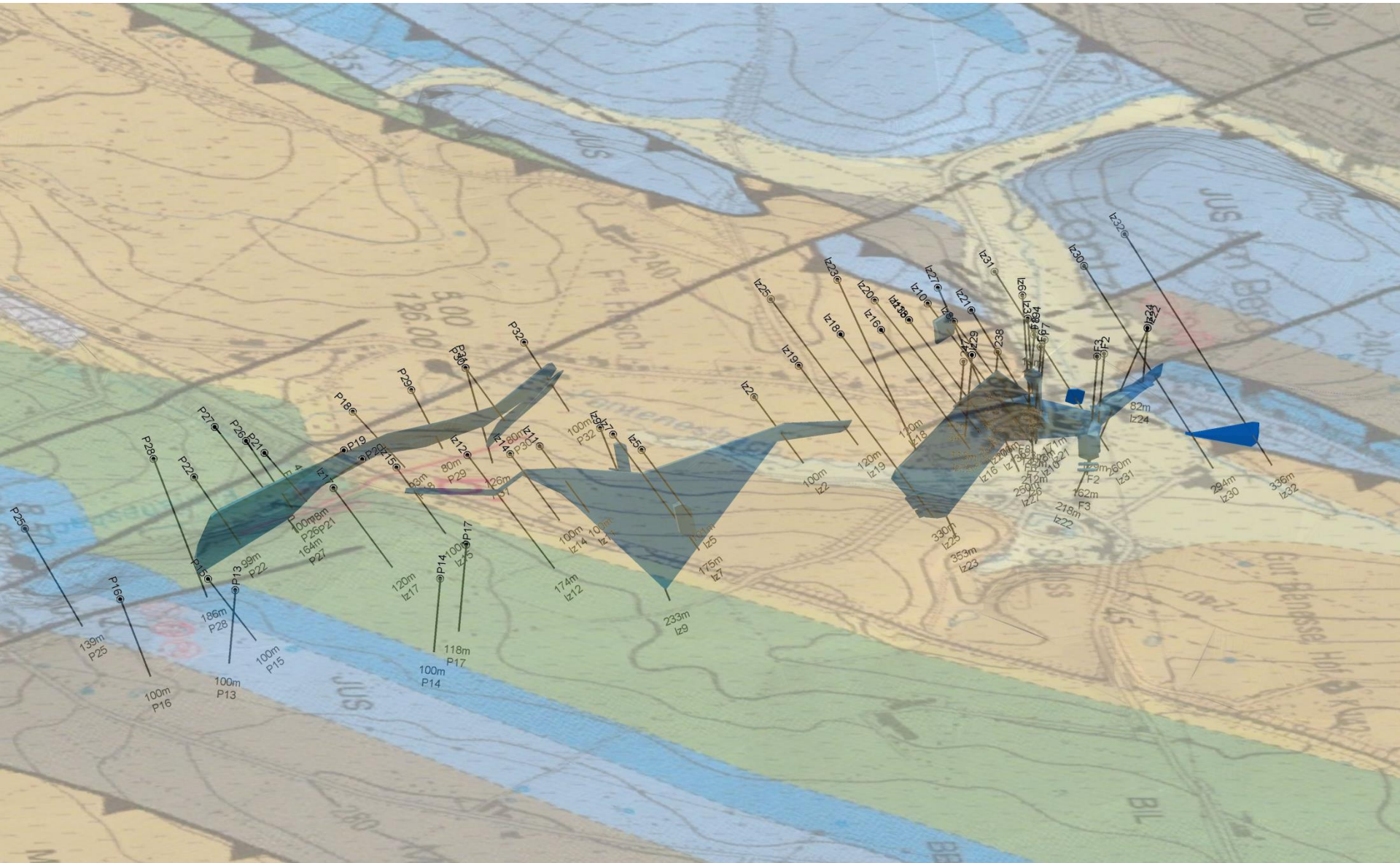
55 hole drill



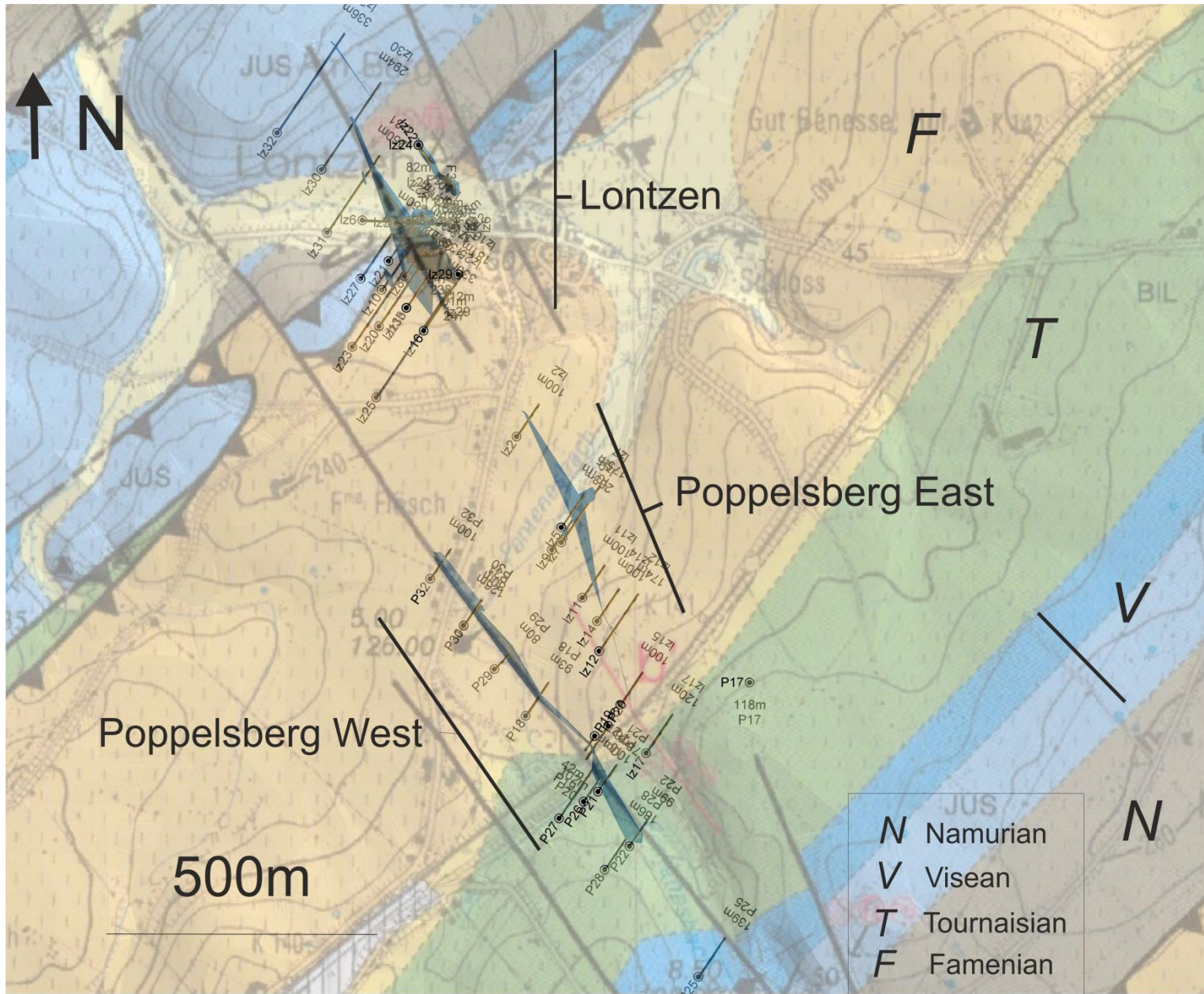
3D modeling



3D modeling



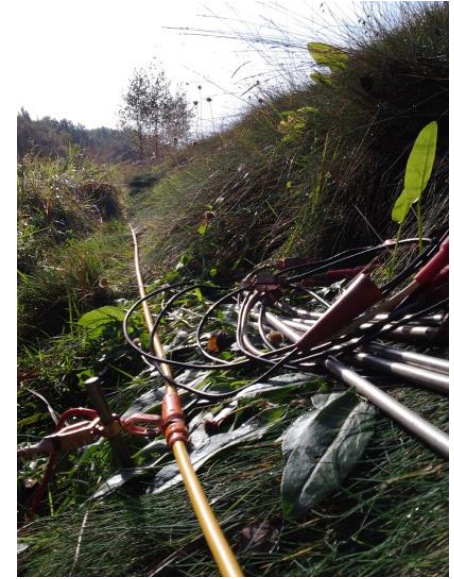
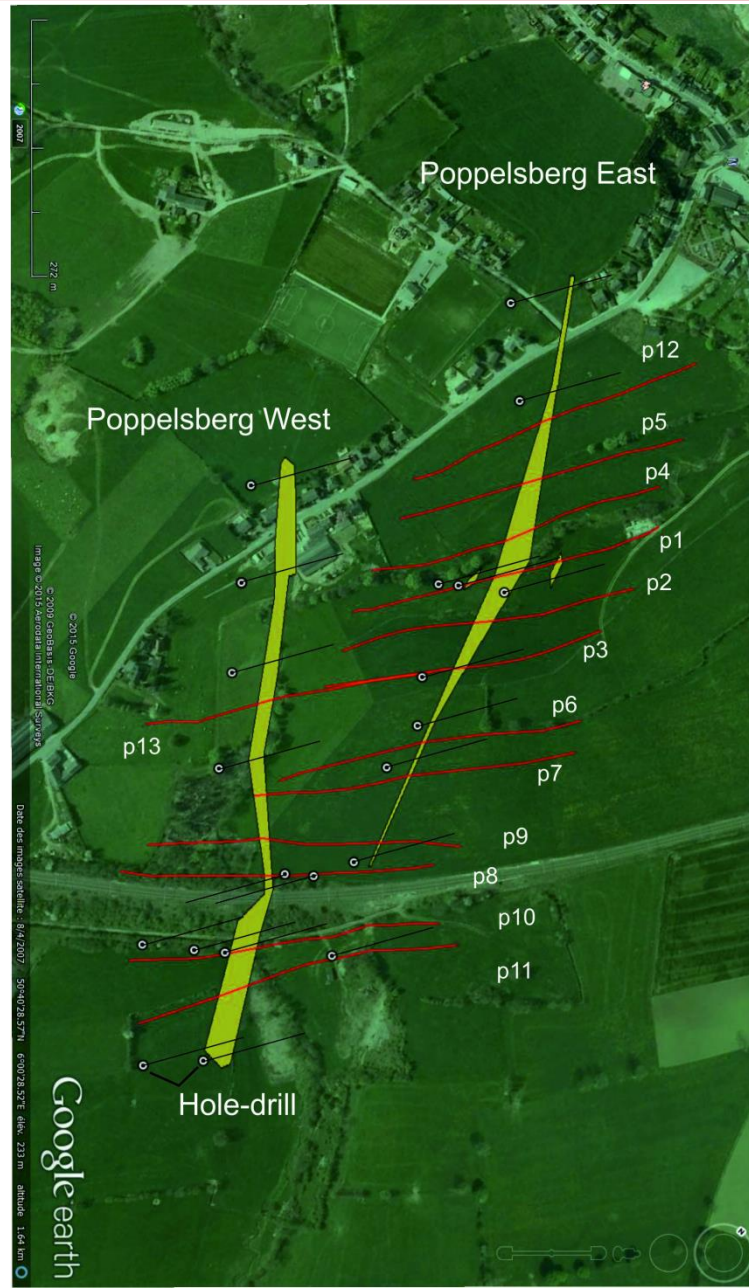
3D modeling



Geophysics survey on the field

- **Electrical survey:** Electrical Resistivity Tomography and Induced Polarisation
- **Gravity survey**
- **Electromagnetic survey**
- **Magnetometry**

1. Electrical survey on the field

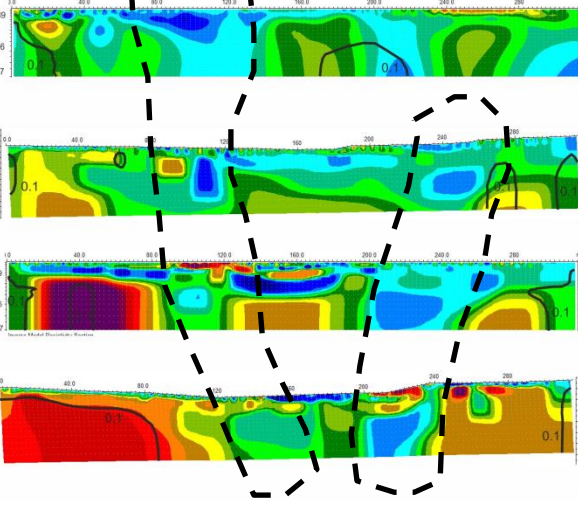
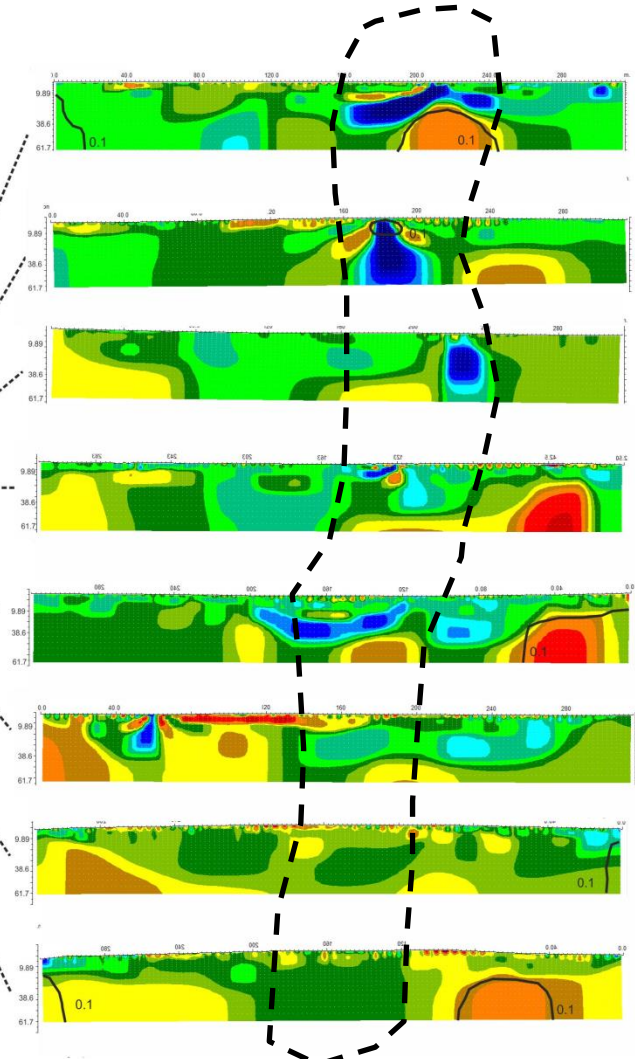
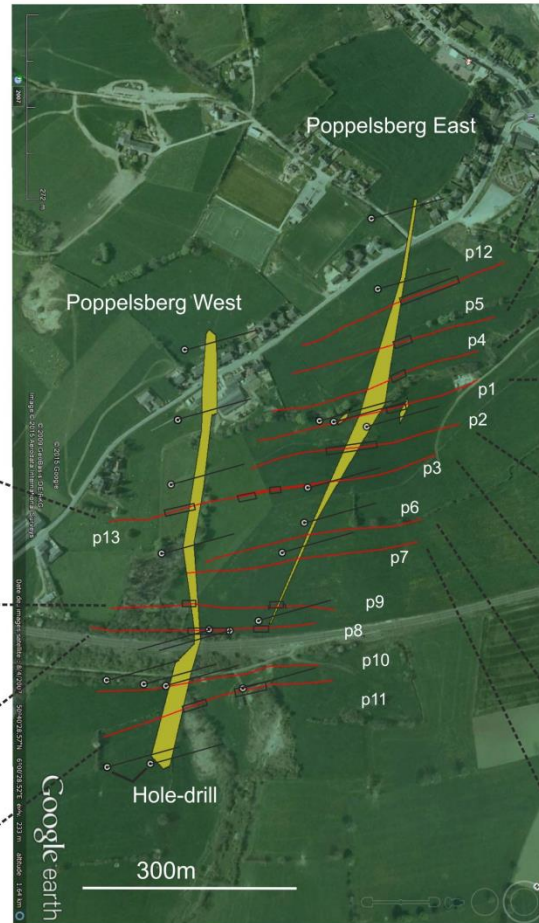


ABEM
terrameter LS

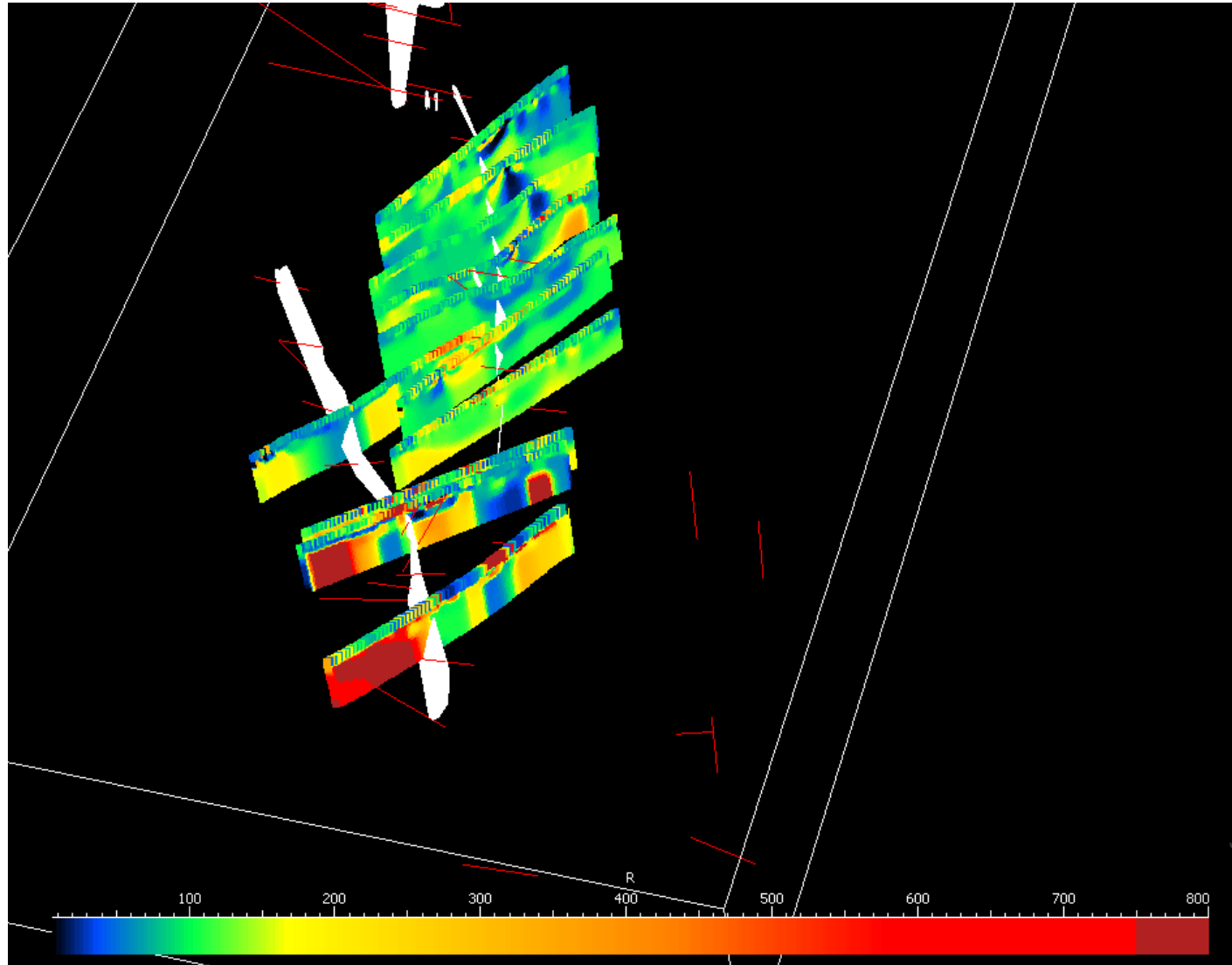
Electrical survey on the field

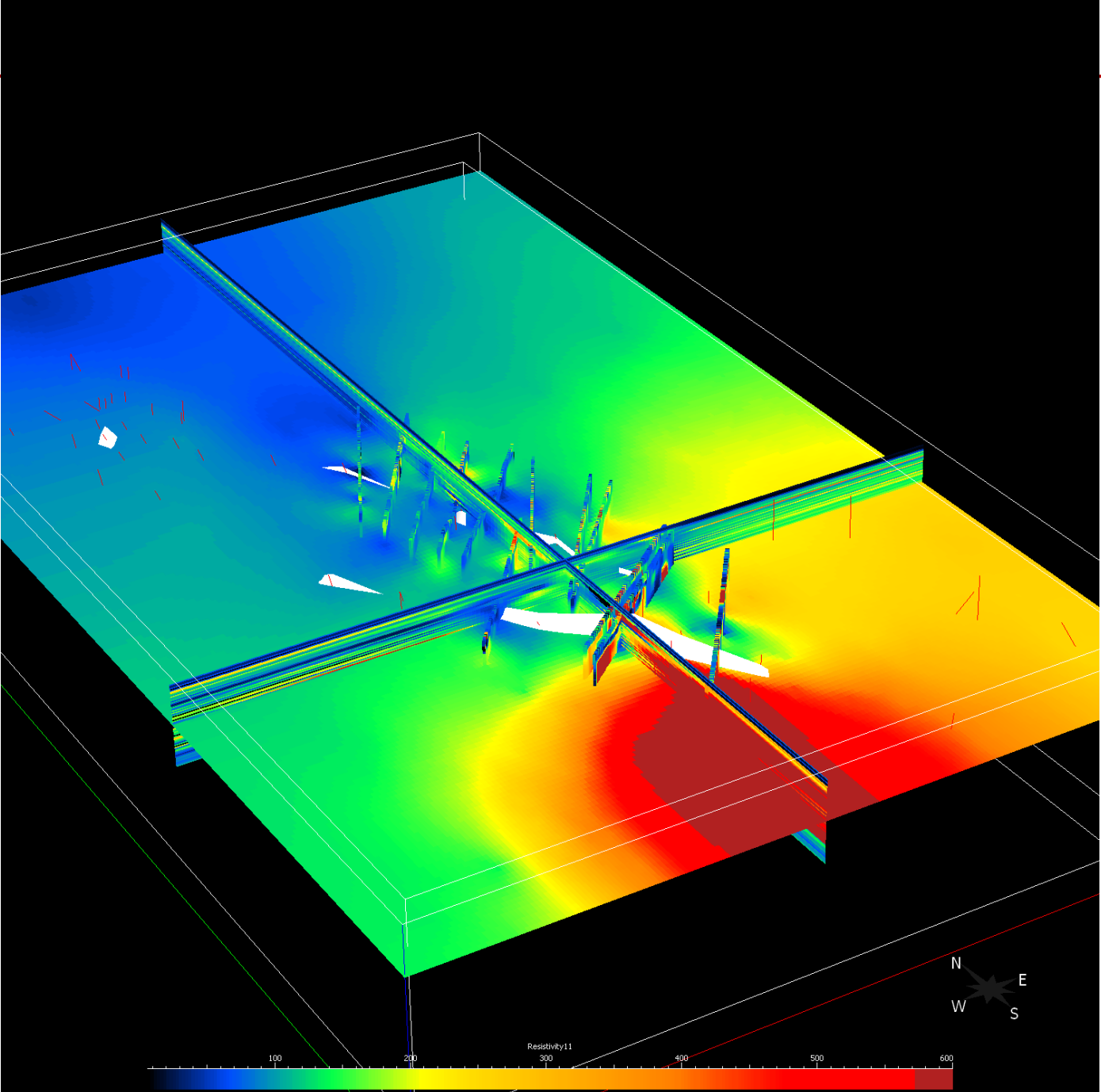
Correction

- DOI
- %Var



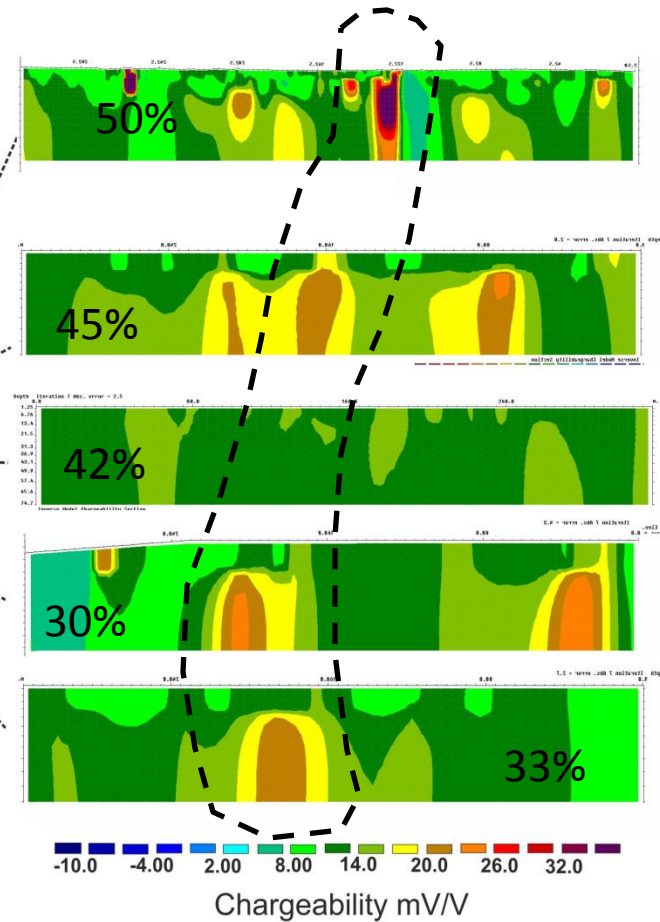
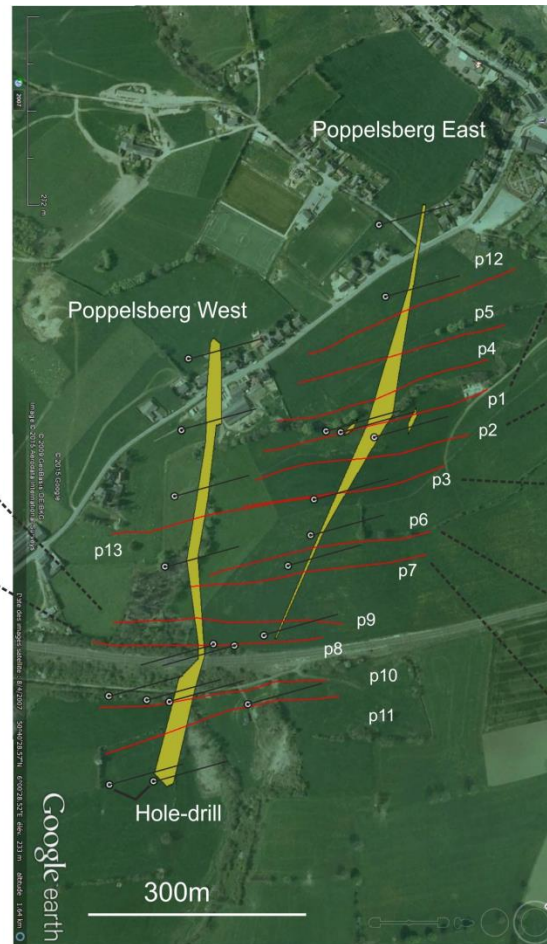
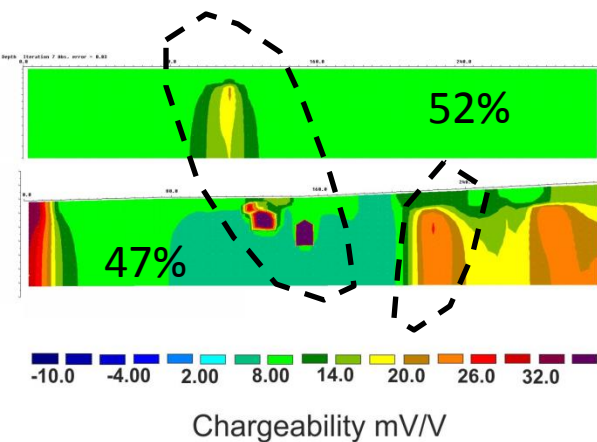
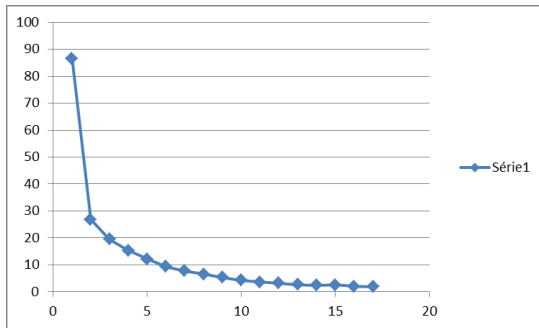
ERT survey



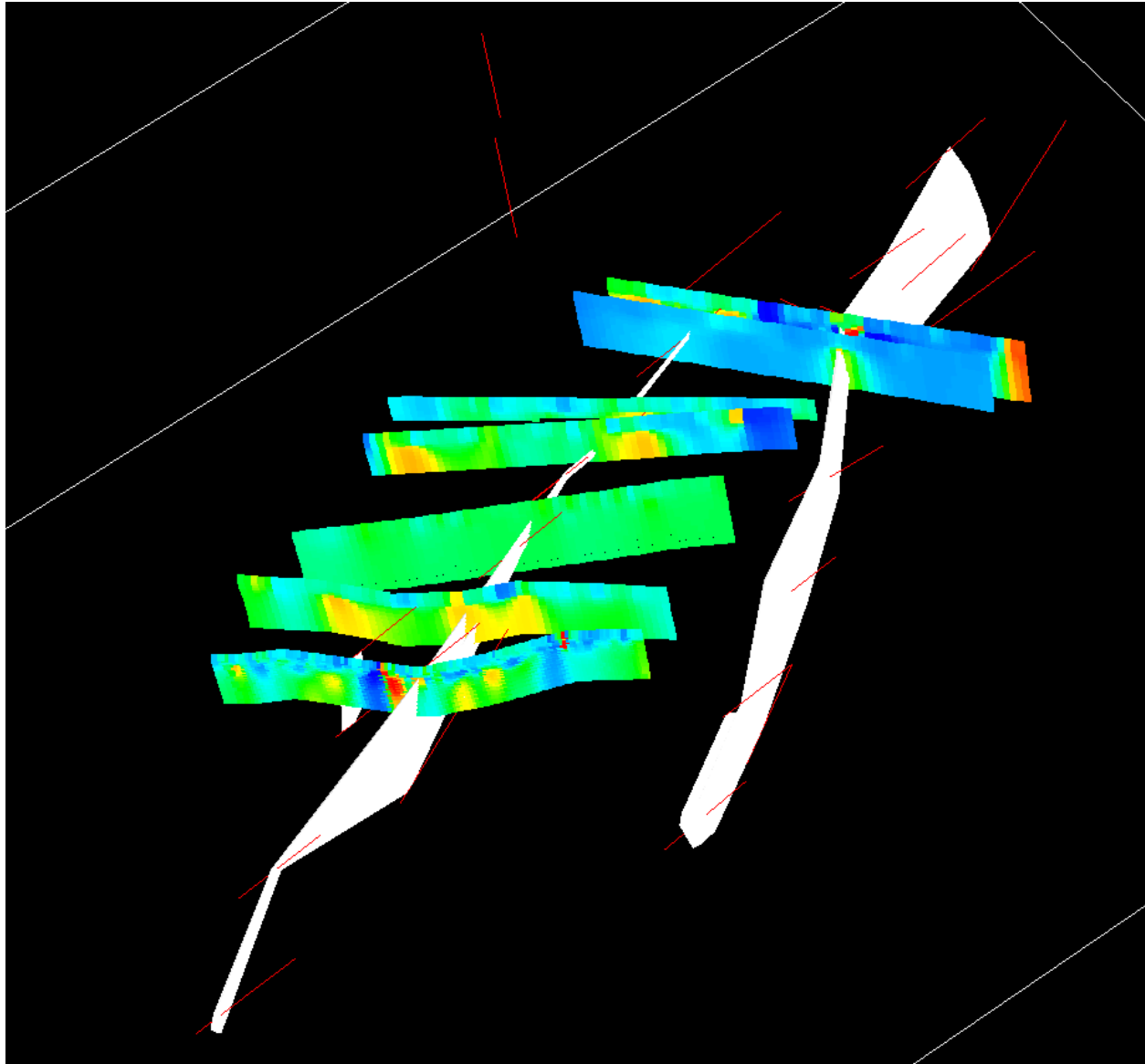


Electrical survey on the field

IP results



IP results

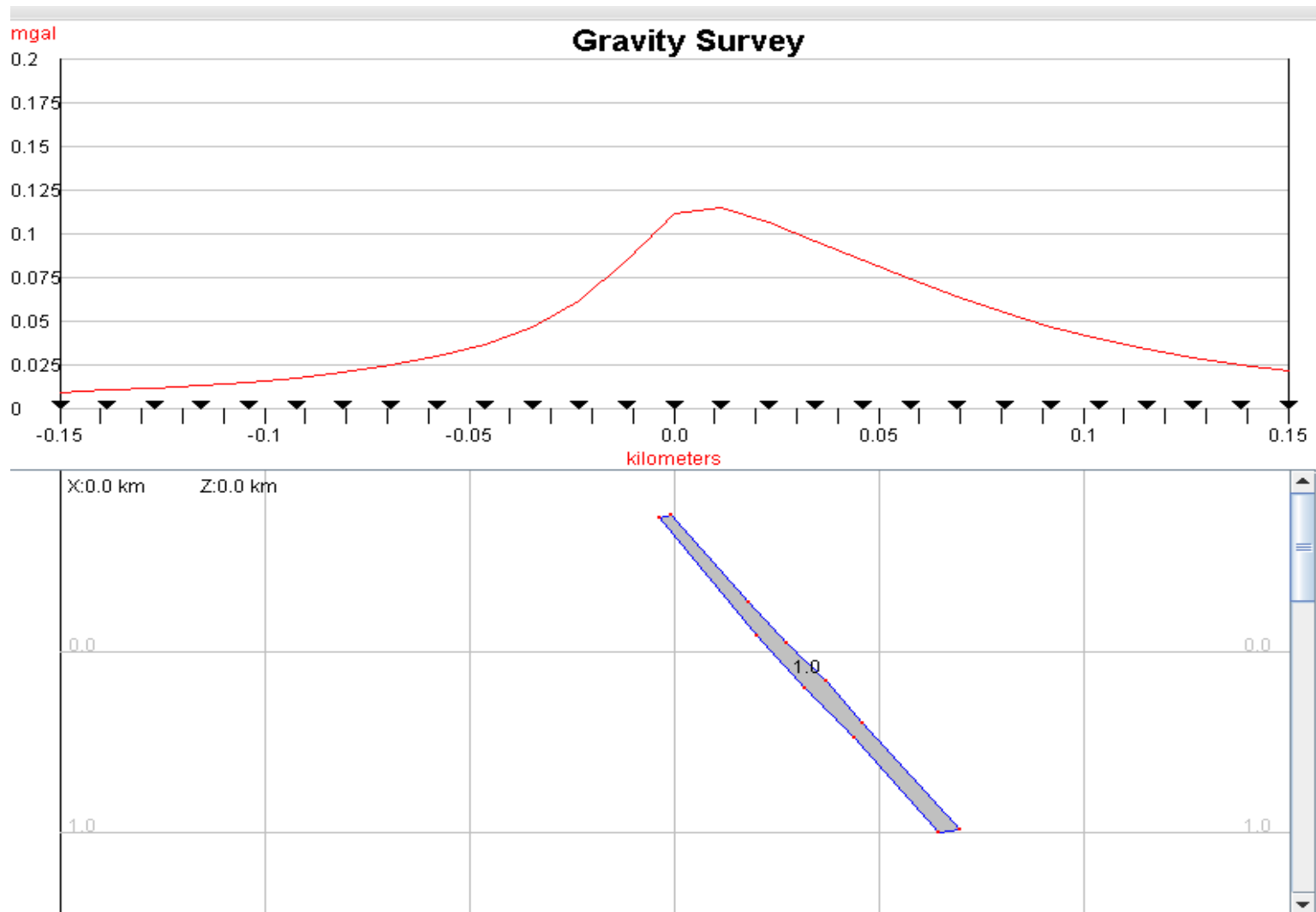


2. Gravity survey on the field

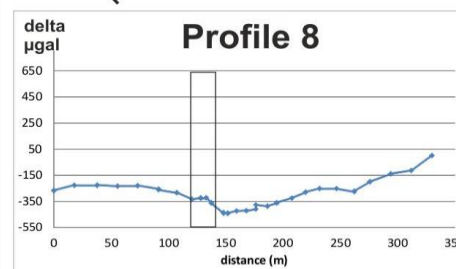
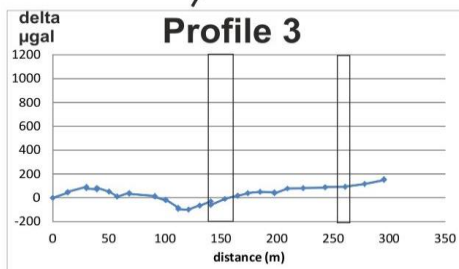
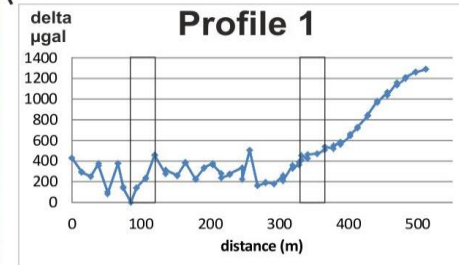
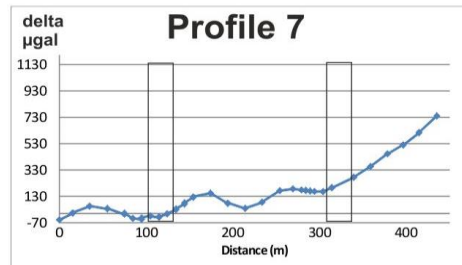
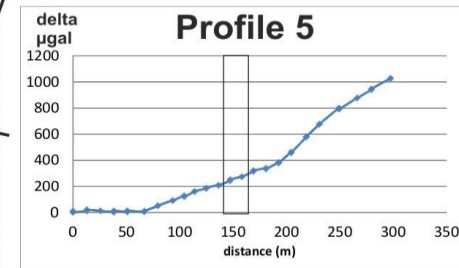
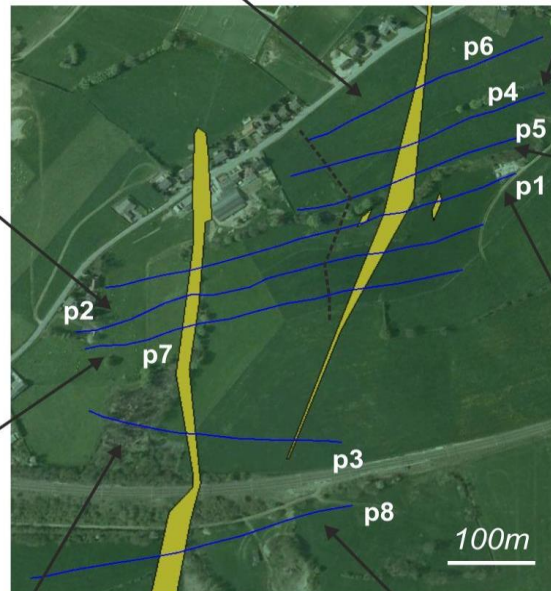
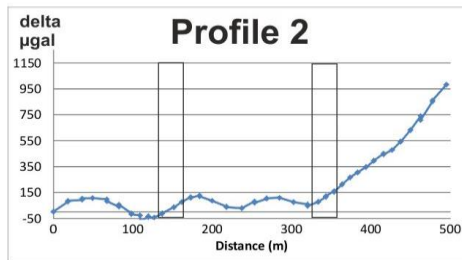
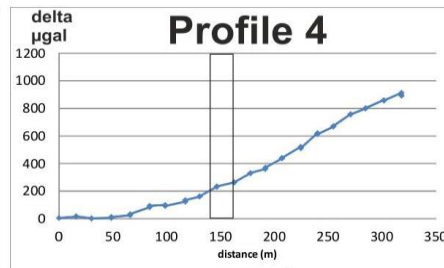
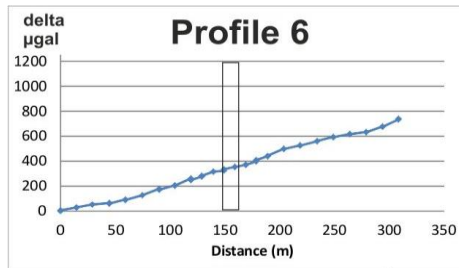
Scintrex CG5



Expected results

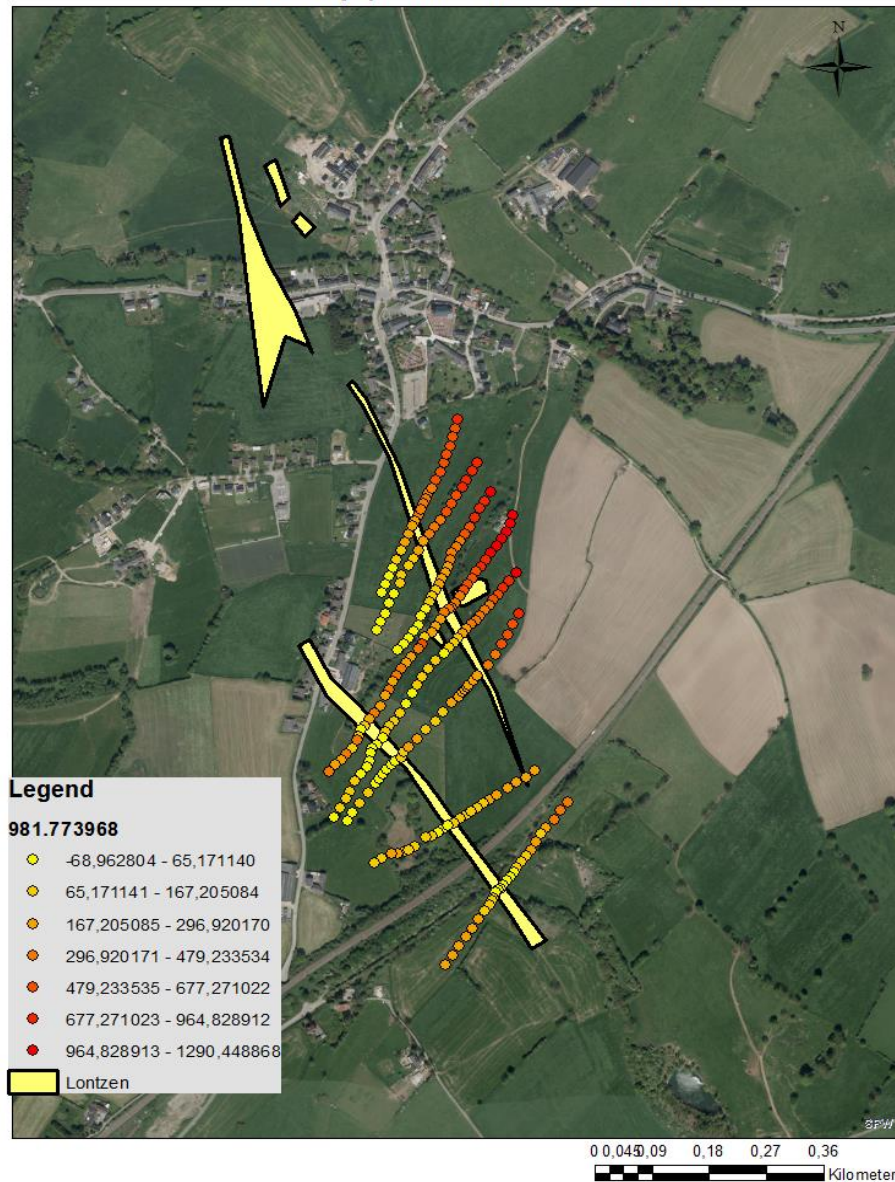


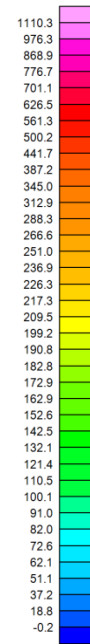
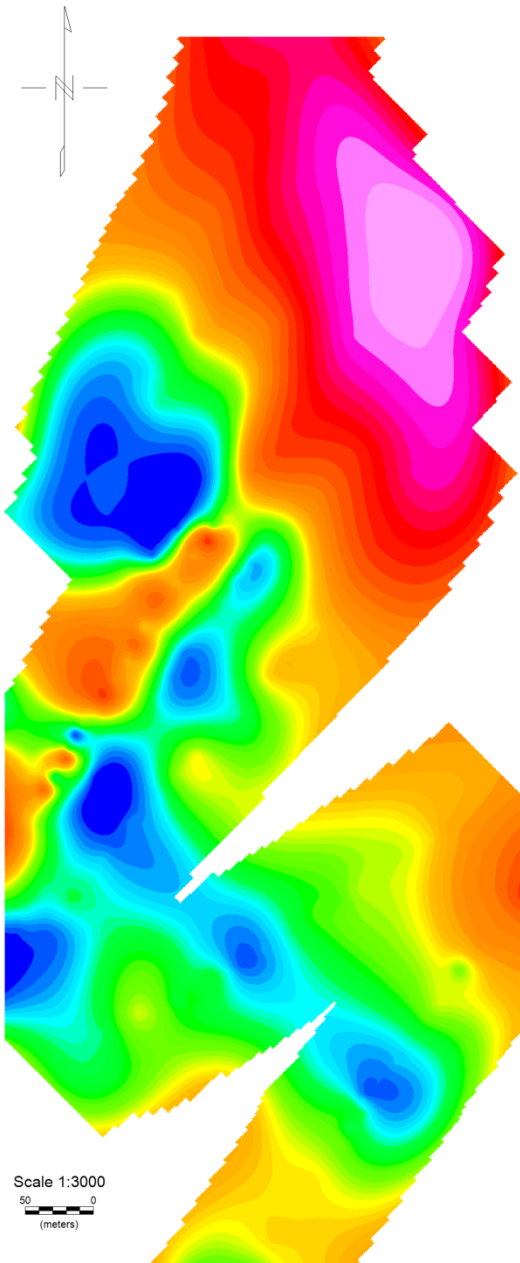
Gravity survey on the field



Gravity survey on the field

Gravity profiles in Lontzen area

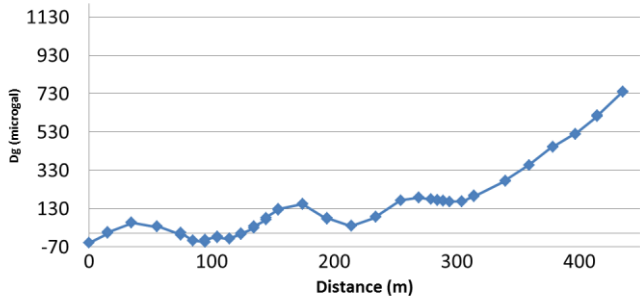




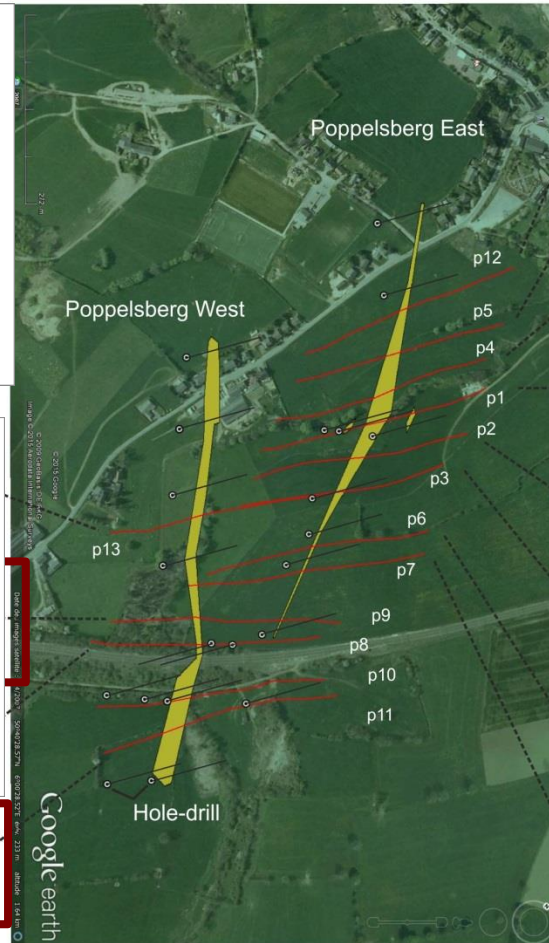
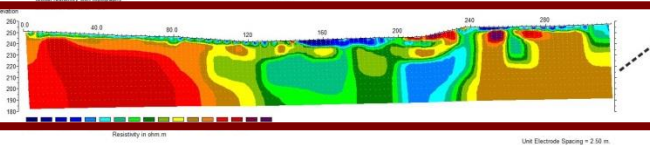
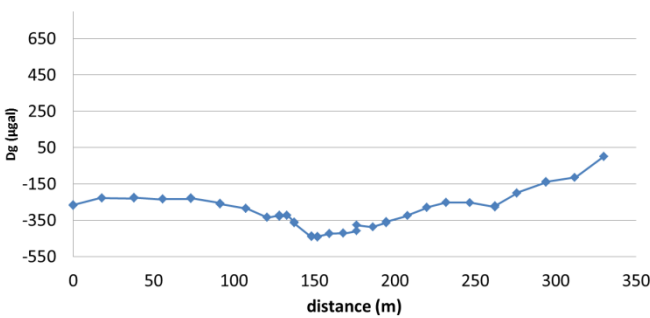
Gravity data

Resistivity profiles investigation in Poppelsberg

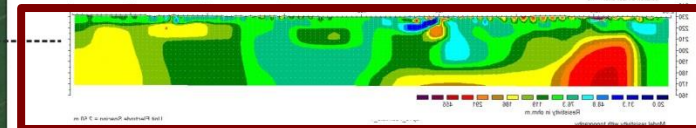
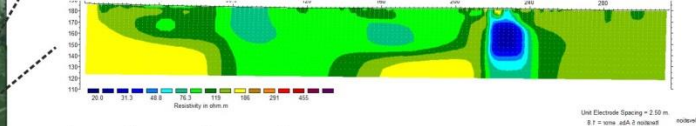
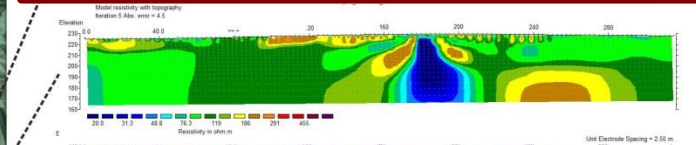
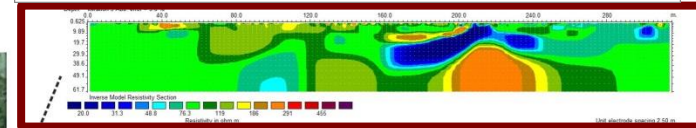
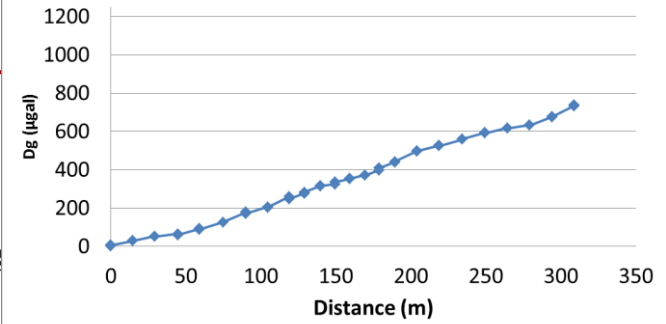
Profile 7



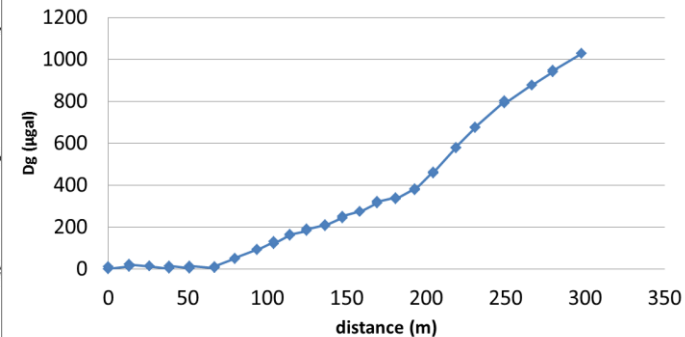
Profile 8



Profile 6

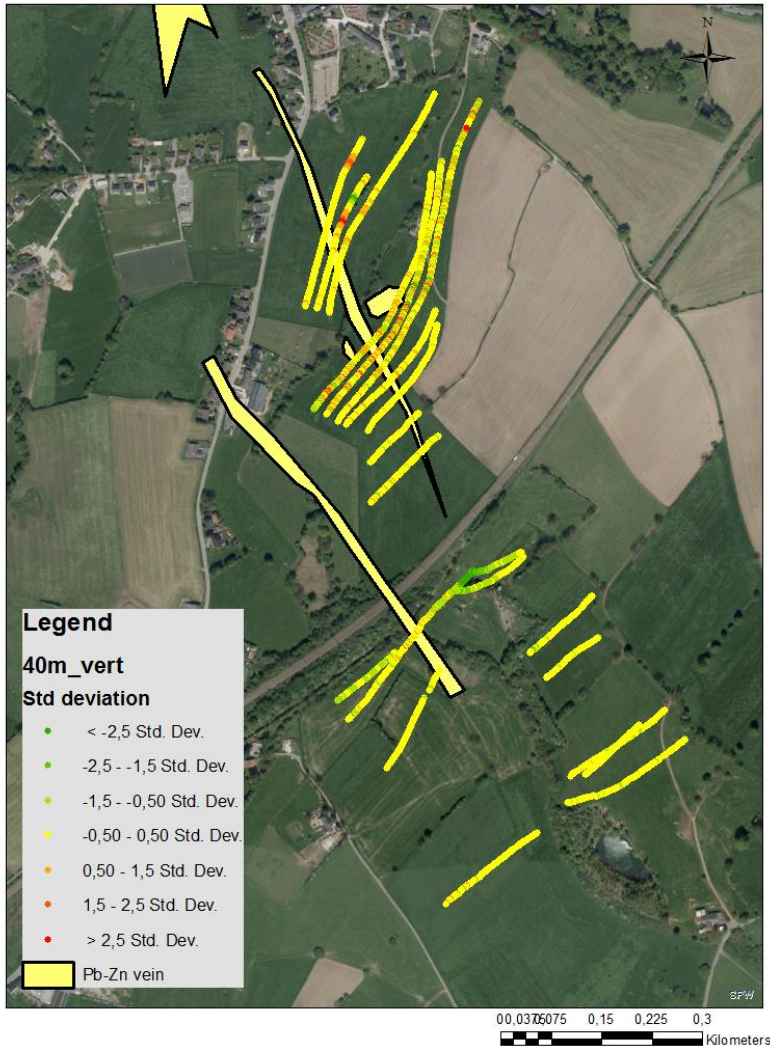


Profile 5



3. Electromagnetic survey

EM-34 profiles in Lontzen area



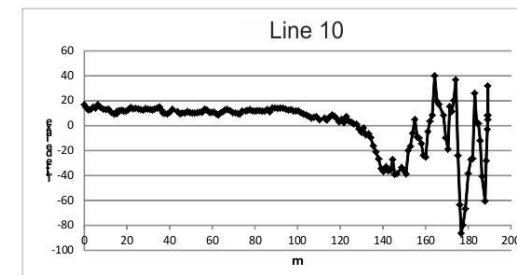
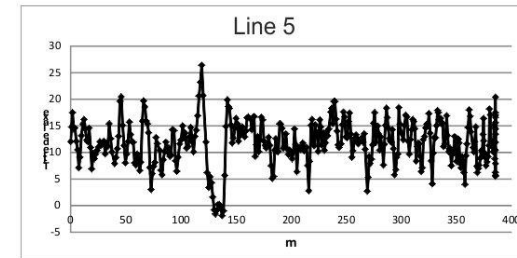
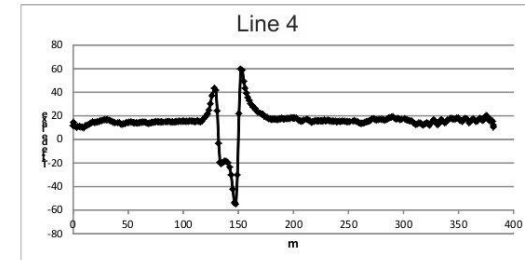
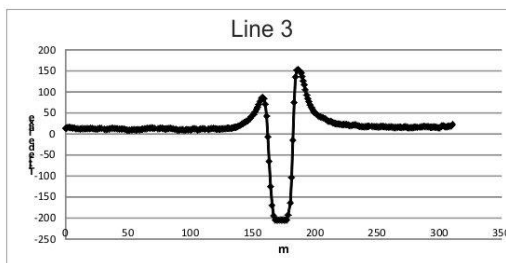
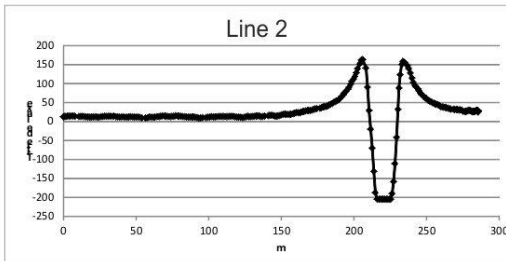
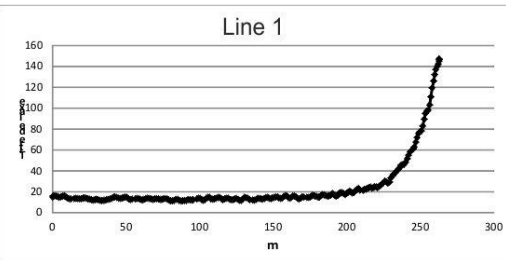
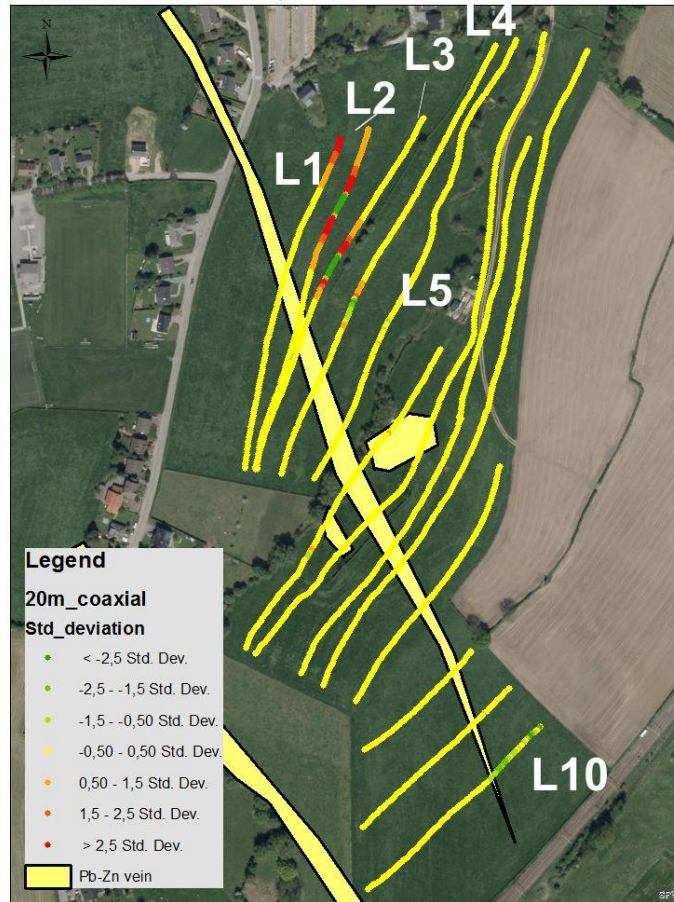
EM 34-3
Geonics

Spacing	Configuration	Depth of investigation
20m	Horizontal	15m
	Vertical	30m
40m	Horizontal	30m
	Vertical	60m

EM 34-3 survey

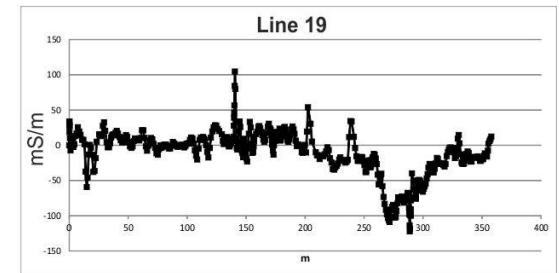
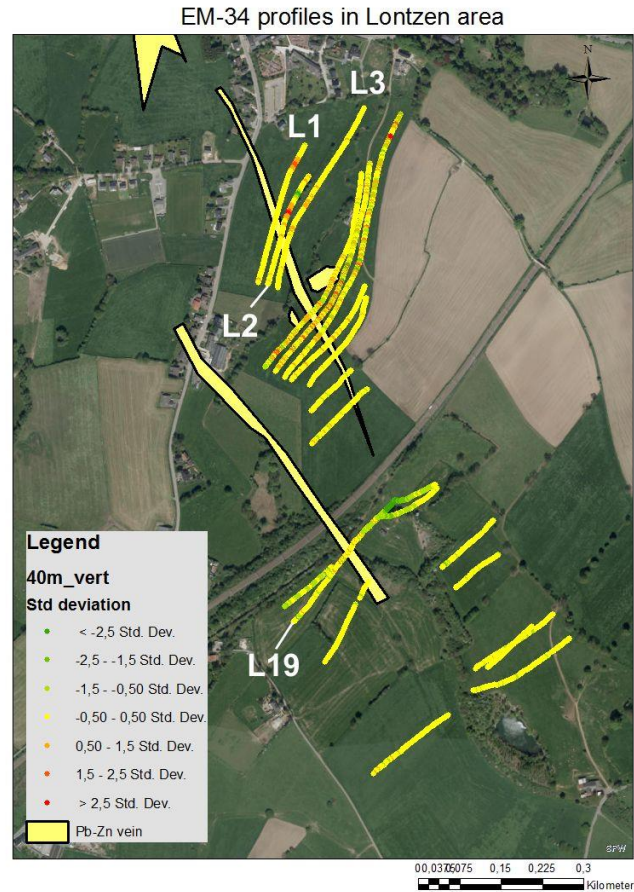
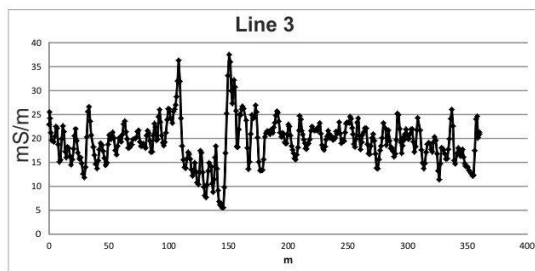
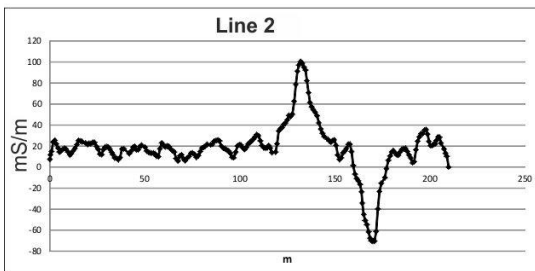
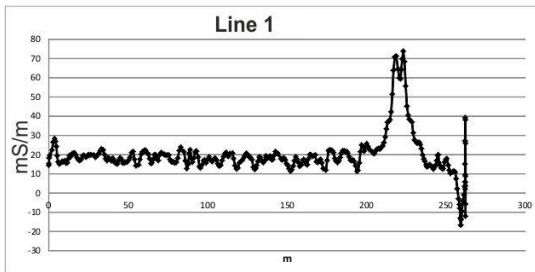
20m_spacing (70') coaxial
(1,6kHz => 15m (50'))

EM-34 profiles in Lontzen area



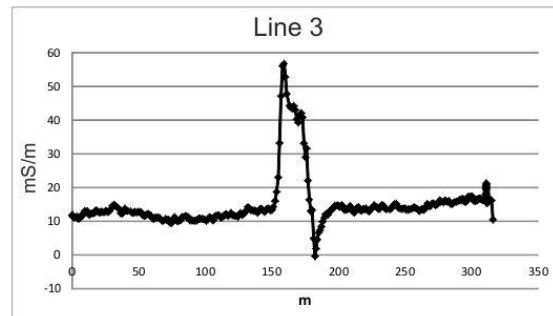
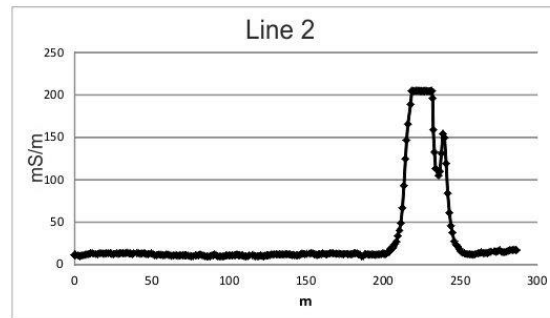
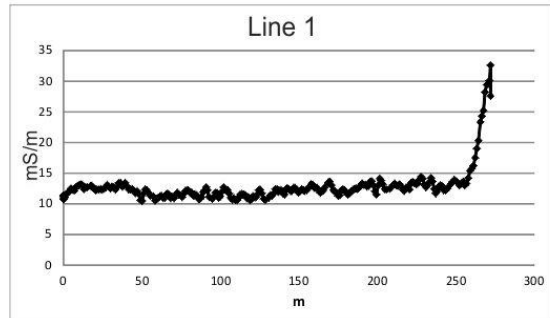
EM 34-3 survey

40m coaxial
(0,4kHz =>30m)

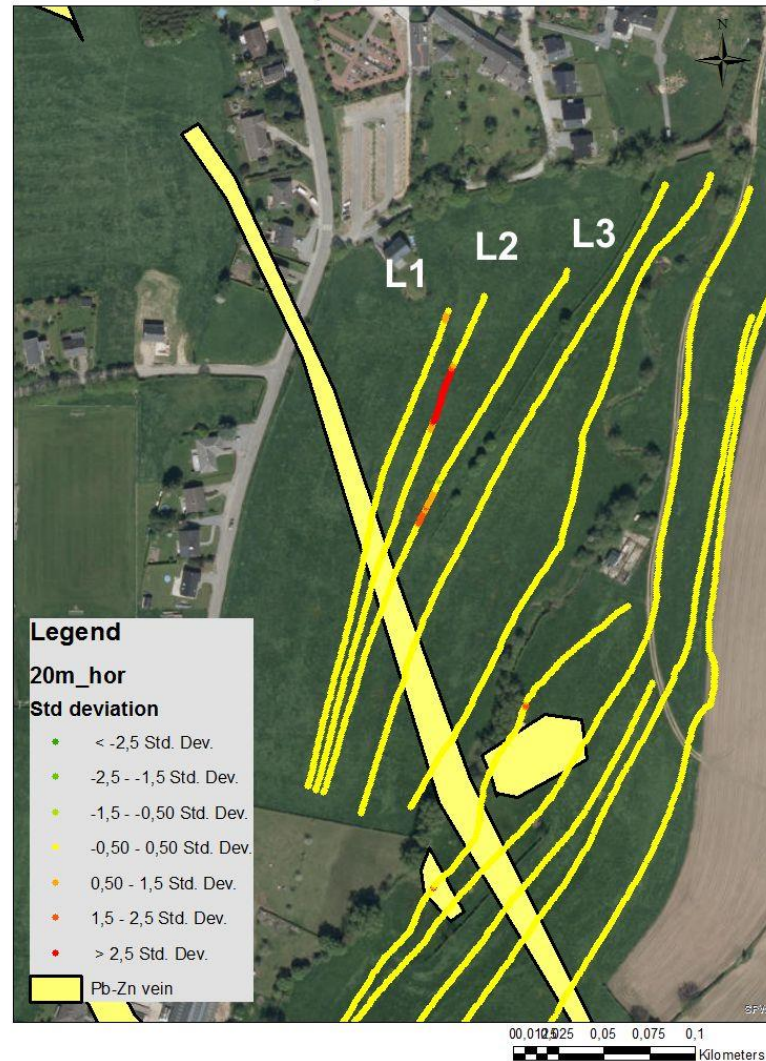


EM 34-3 survey

20m coplannar (1,6kHz => 30m)

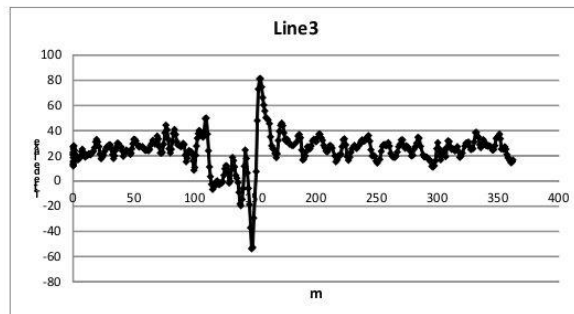
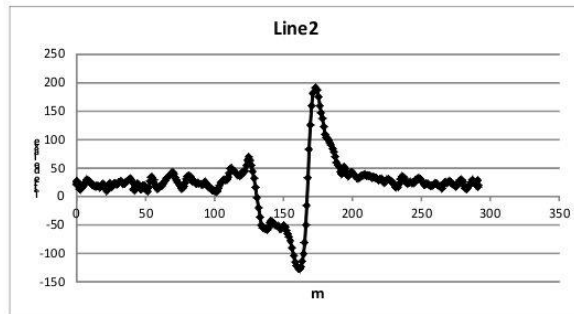
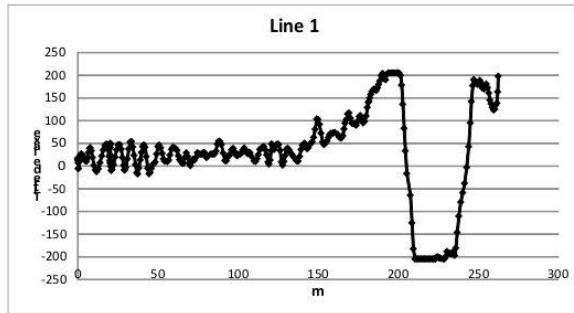


EM-34 profiles in Lontzen area

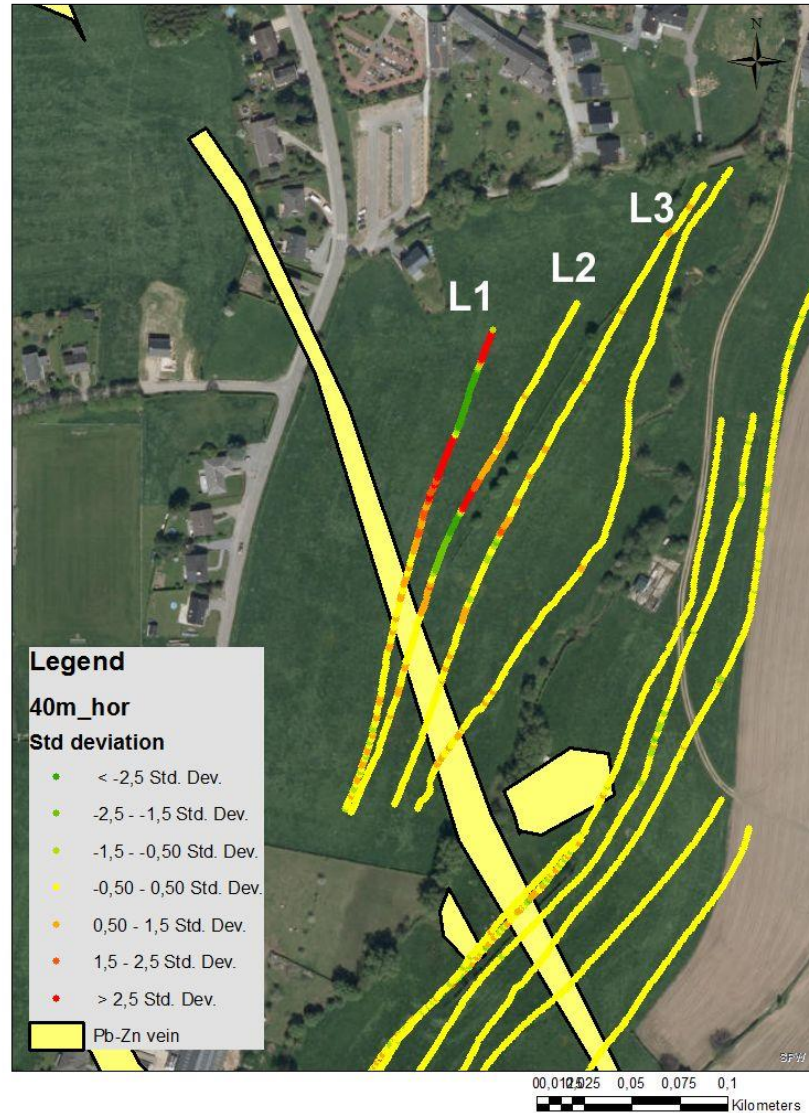


EM 34-3 survey

40m coplannar (0,4kHz =>60m)

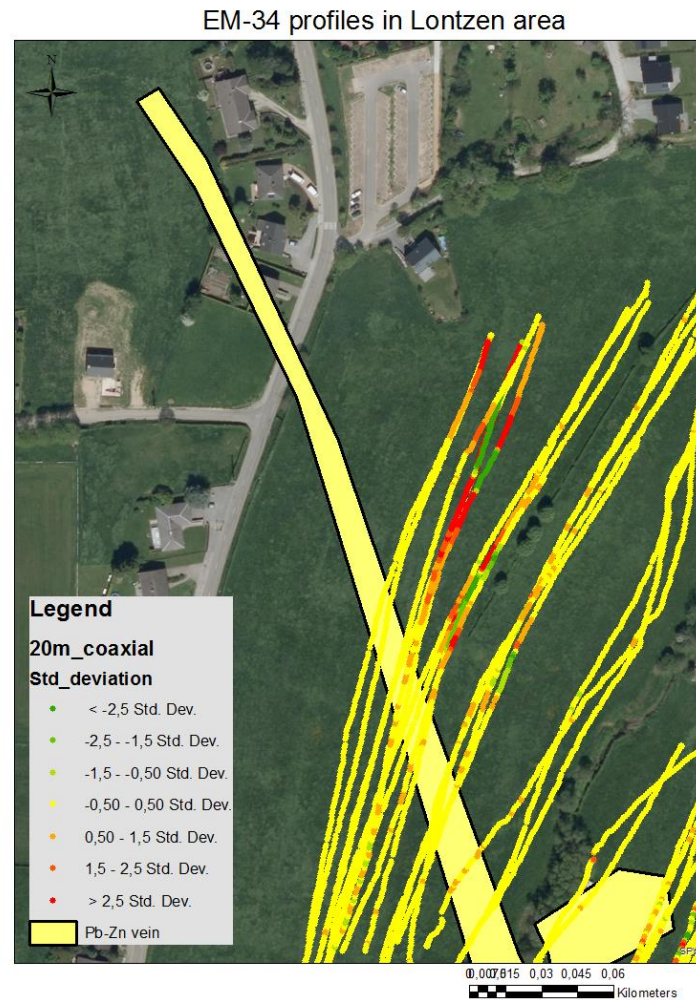


EM-34 profiles in Lontzen area

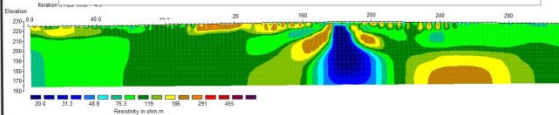
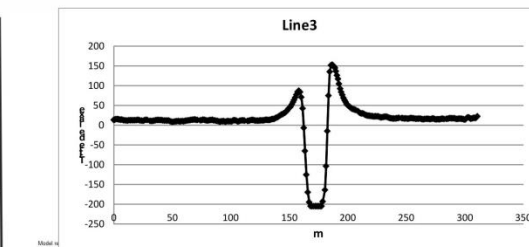
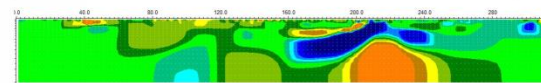
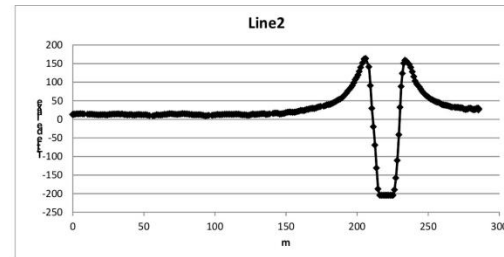


Electromagnetic anomalies

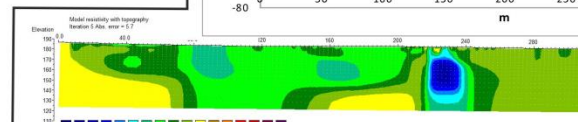
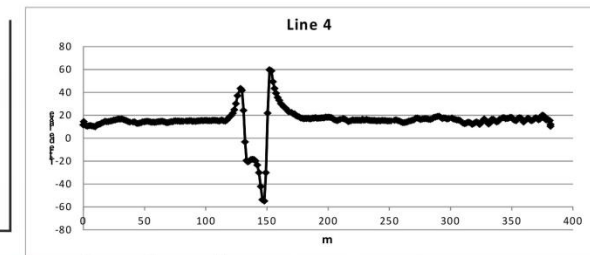
Big anomalies on the Northern part of Poppelsberg East vein



Discussion (ERT/EM)



Unit Electrode Spacing = 2.00 m



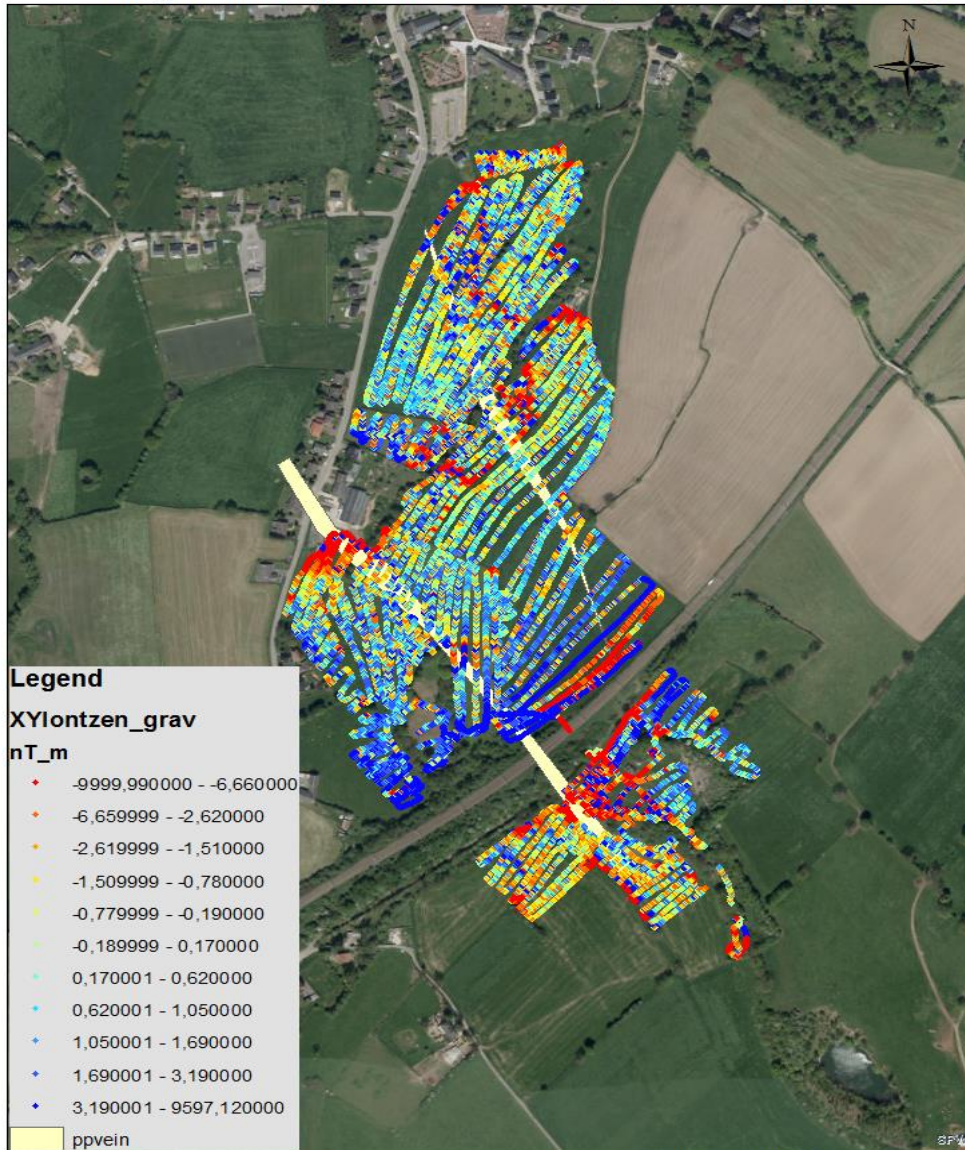
Unit Electrode Spacing = 2.00 m



Resistivity in ohm.m

4. Magnetometry survey

Magnetic map of the Pb-Zn deposit of Poppelsberg



00,030,065 0,13 0,195 0,26
Kilometers

GSM-19 v7.0
GEM system



Conclusion

- **3D modeling of the Pb-Zn deposit of Lontzen allowed to**
 - **Better understand the geology and the genesis of the deposit**
 - **Target the deposit to explore it using geophysics**
- **Geophysics on the field:**
 - **Electrical survey** : The best technique in our case study
 - **Gravity survey**: mixed result
 - **EM survey**: good results on a part of the vein
 - **Magnetometry**: no para or ferro magnetic mineral
- ...

Further works

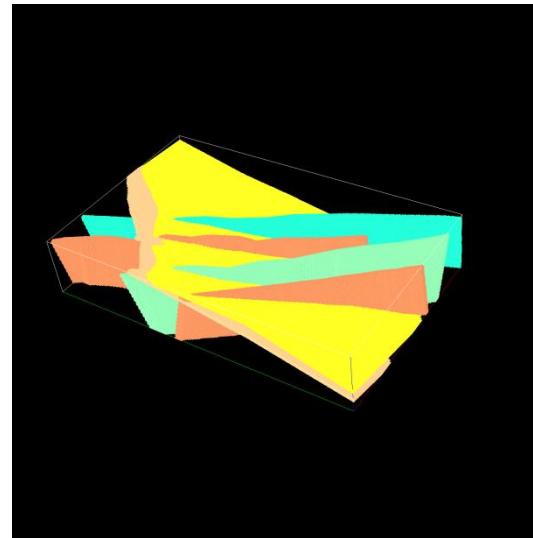
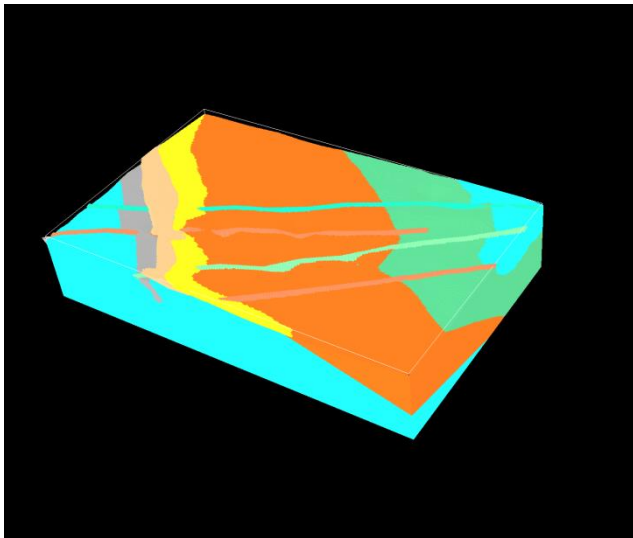
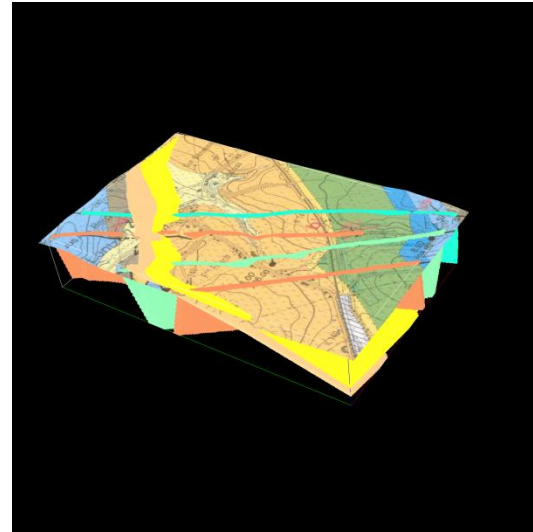
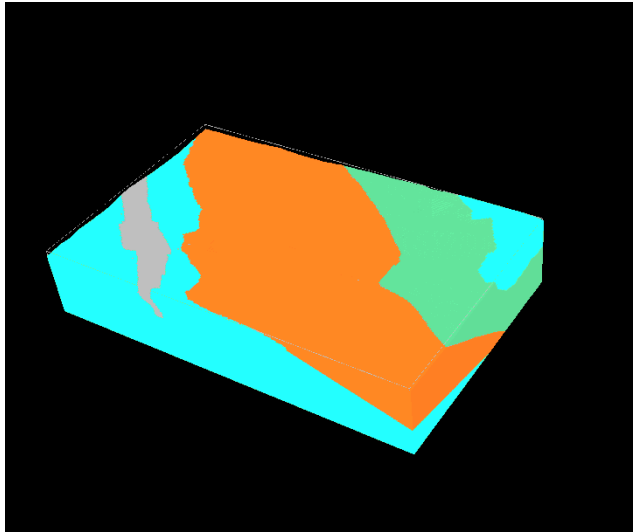
2D/3D (?) Inversion of the data

- Constrain the inversion with drill hole information
- Cooperative/joint inversion
- Inversion of the unique geological model in minimizing a objective common function

Geophysical campaign

- 600m ERT/IP profiles to target the Pb-Zn mineralization at higher depth
- IP using MPT-DAS at different frequencies
- Exploration in brownfields

Further work



Thank you for your attention