Electromagnetic survey of the Pb-Zn ore deposit of Lontzen (Belgium)

Evrard Maxime

GeMMe
Génie Minéral, Matériaux et Environnement

Université de Liège

1.Context

Ore deposits are more and more complexe

-Low grades

-Small size

-Mineralogy

- Geometry

- Depth

>>> Actual needs: more accurate geophysical methods (tonages, geometry, grades…)

1. Goal of the project

- Target the Belgian Pb-Zn ore deposits using geophysics

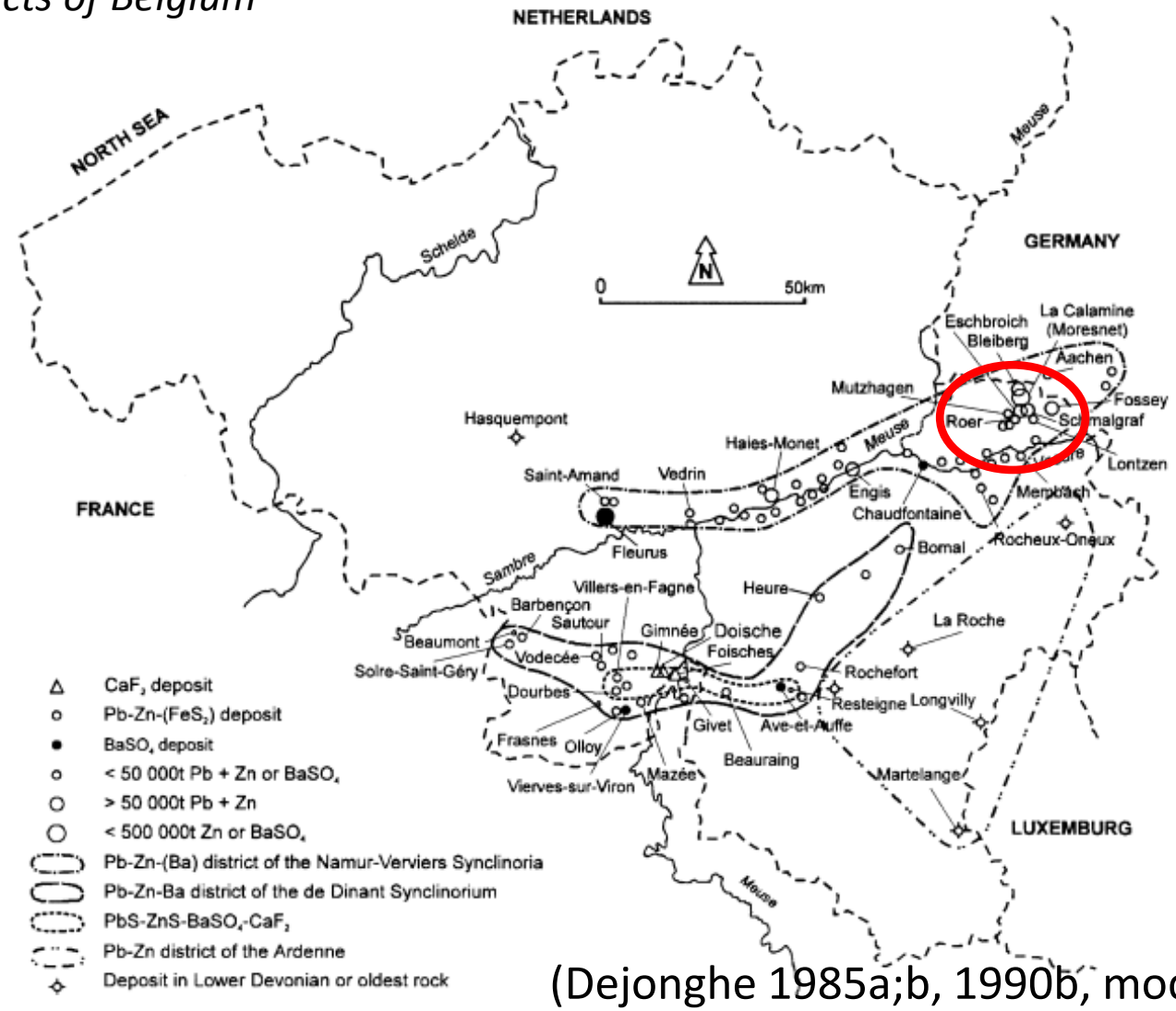
- Better understand the geology and the genesis of these deposits

- Improve imaging using innovative inversion techniques

- Better detection, targetting and estimation of the grades/tonnage

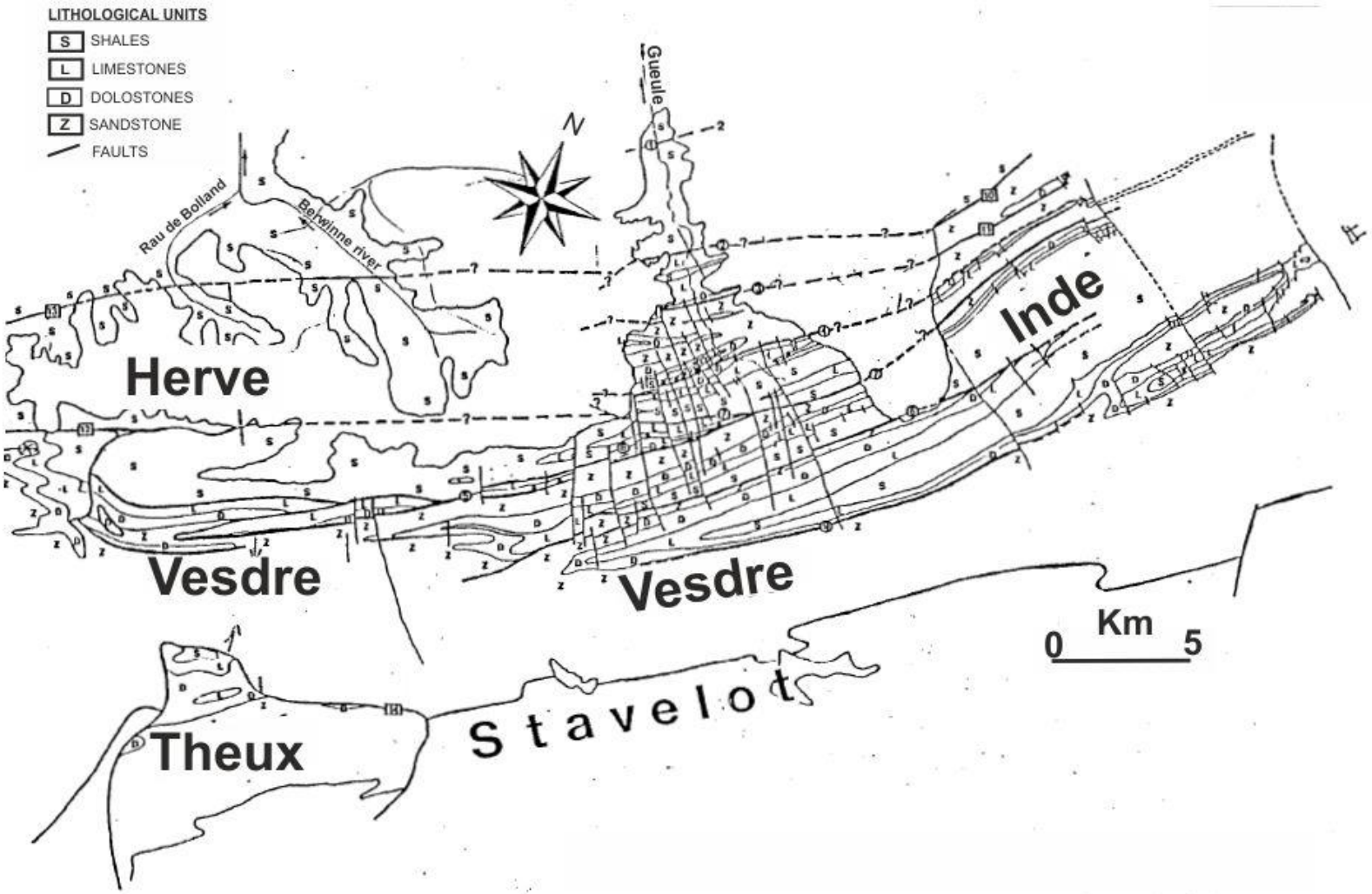
1. Location

Pb-Zn districts of Belgium



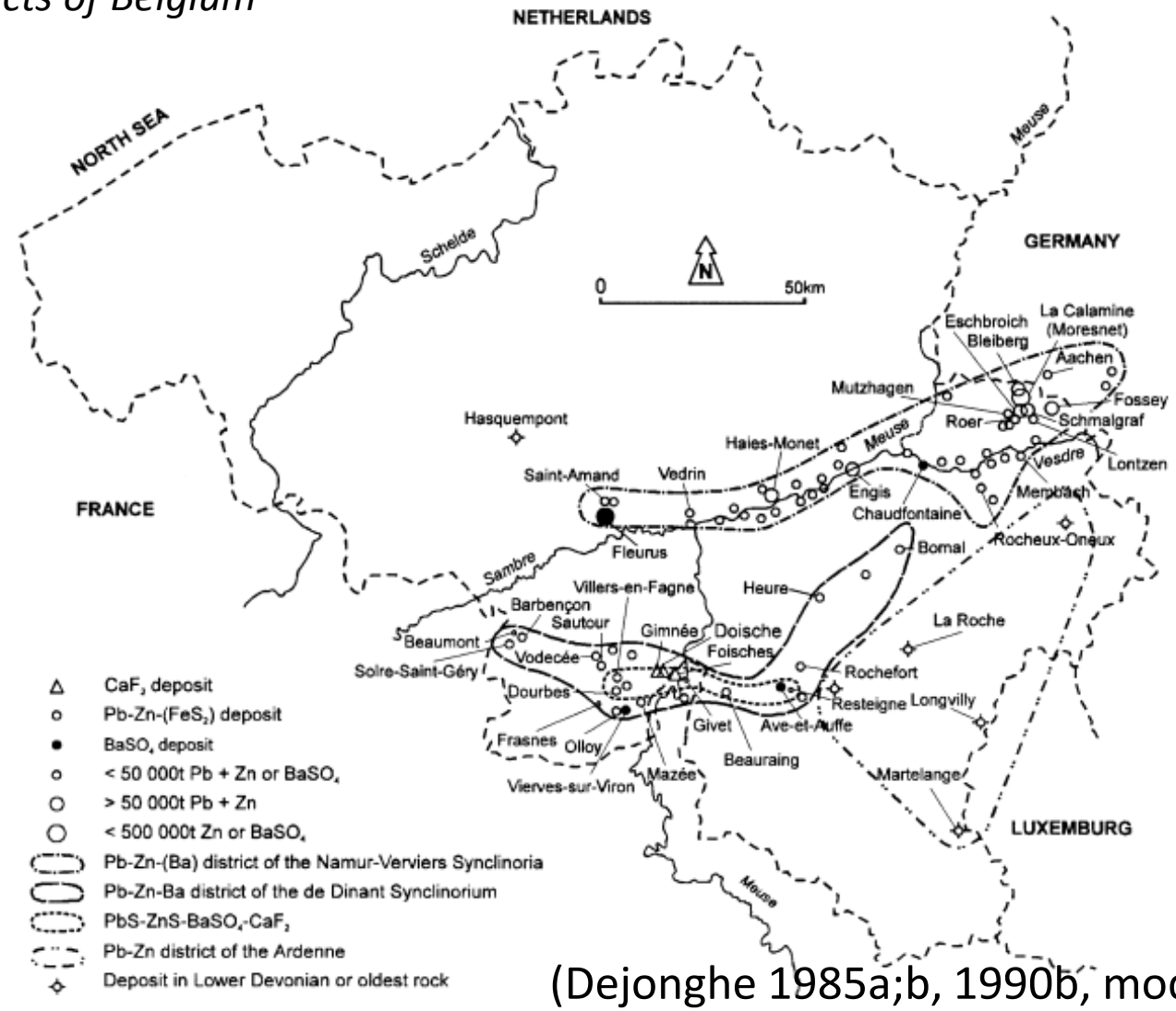
(Dejonghe 1985a;b, 1990b, modified)

1. Location


LITHOLOGICAL UNITS
S SHALES
L LIMESTONES
D DOLOSTONES
Z SANDSTONE
FAULTS
N
Gueule
Rau de Bolland
Behinne river
Herve
Inde
Vesdre
Vesdre
Km
0
5
Theux
Stavelot

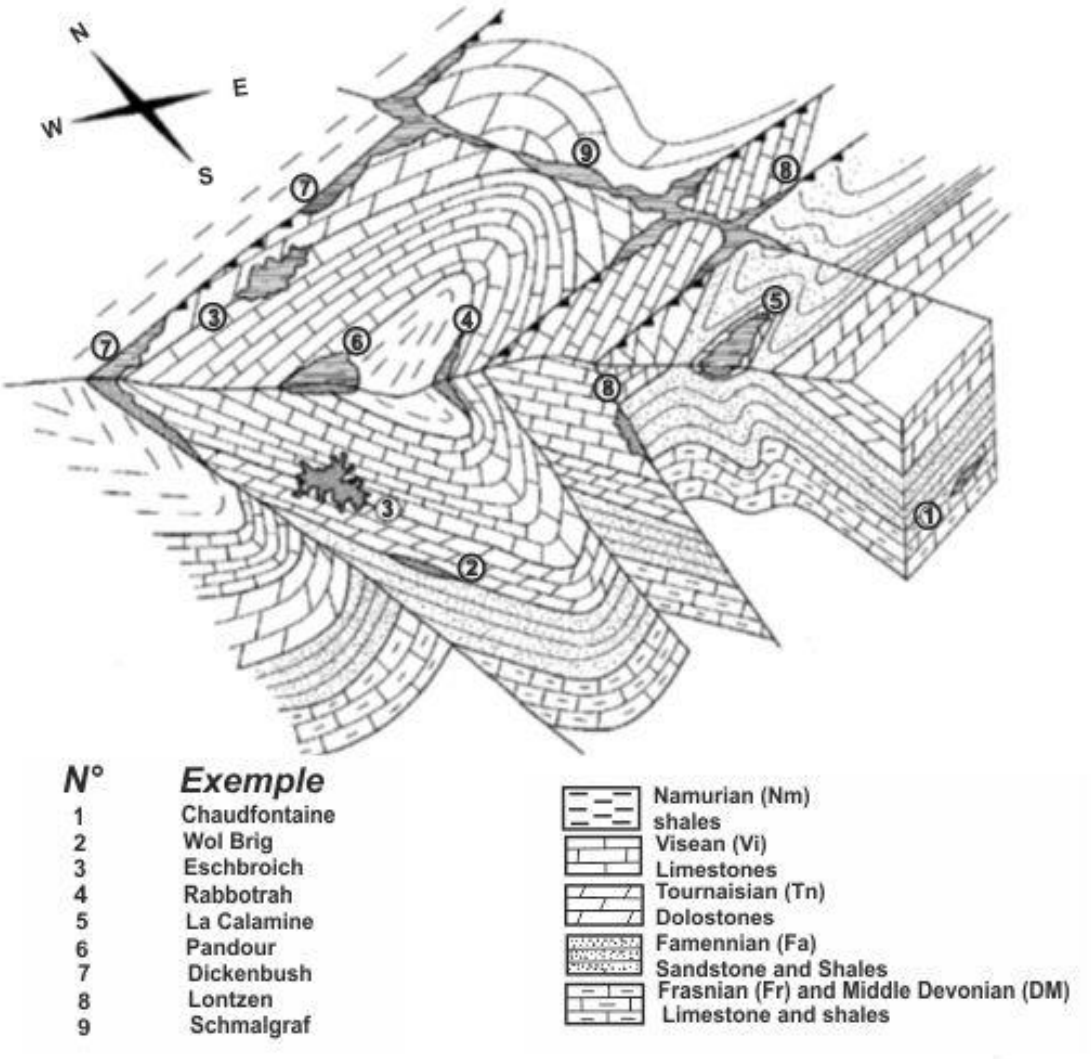
1. Location

Pb-Zn districts of Belgium



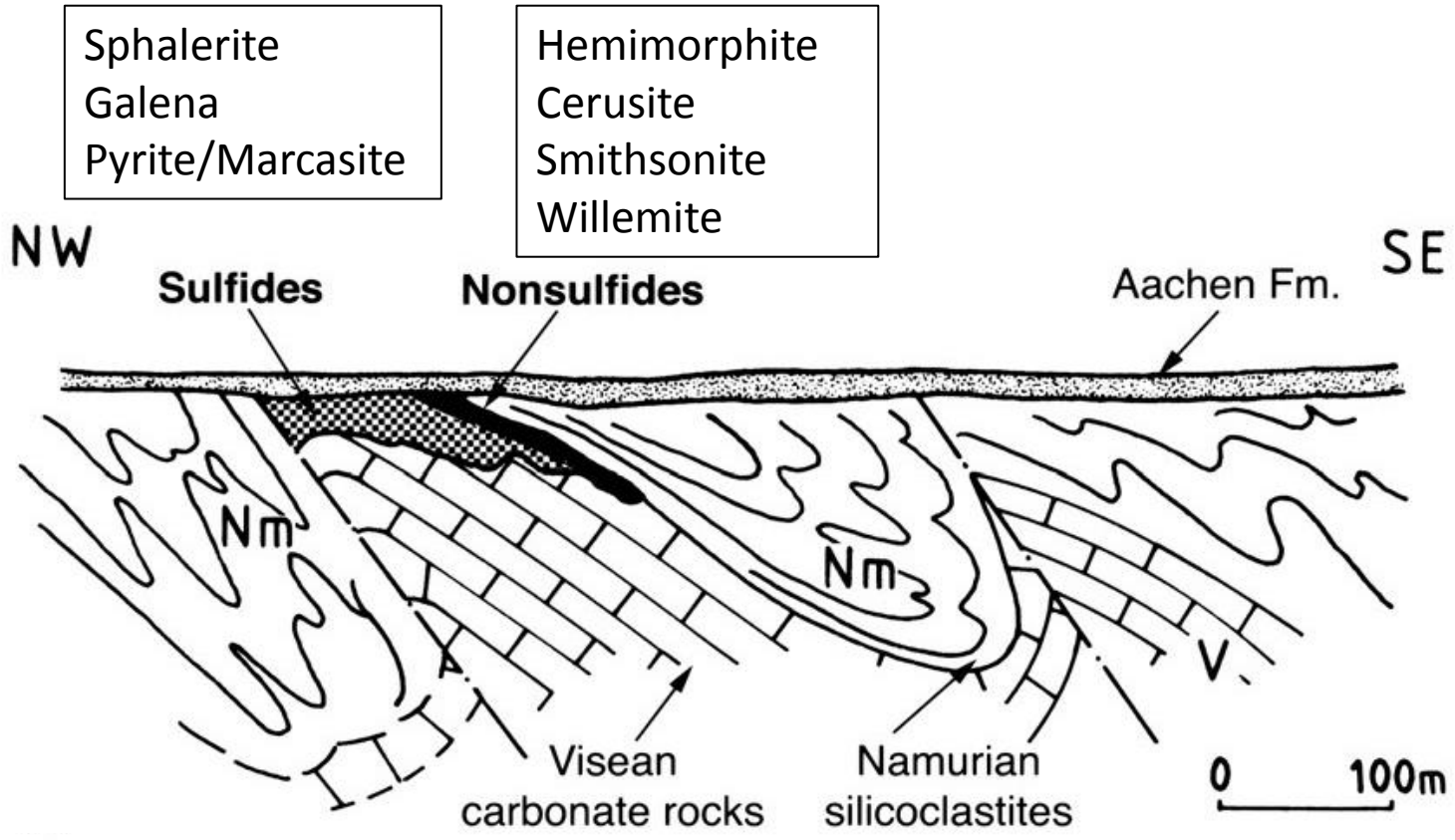
(Dejonghe 1985a;b, 1990b, modified)

1. Mississippi Valley Type



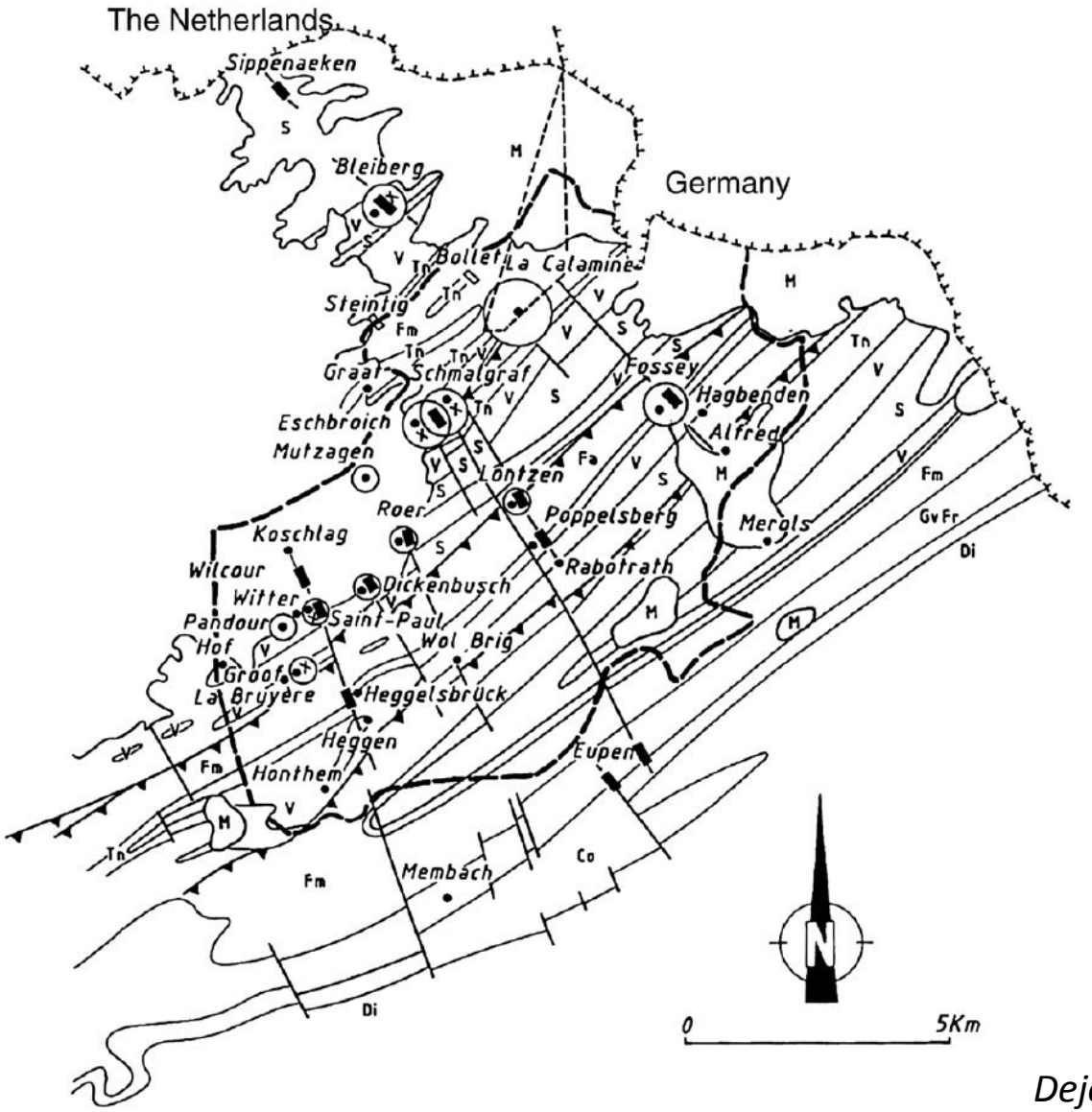
Dejonghe and Jans 1983

1. MVT deposit of Belgium



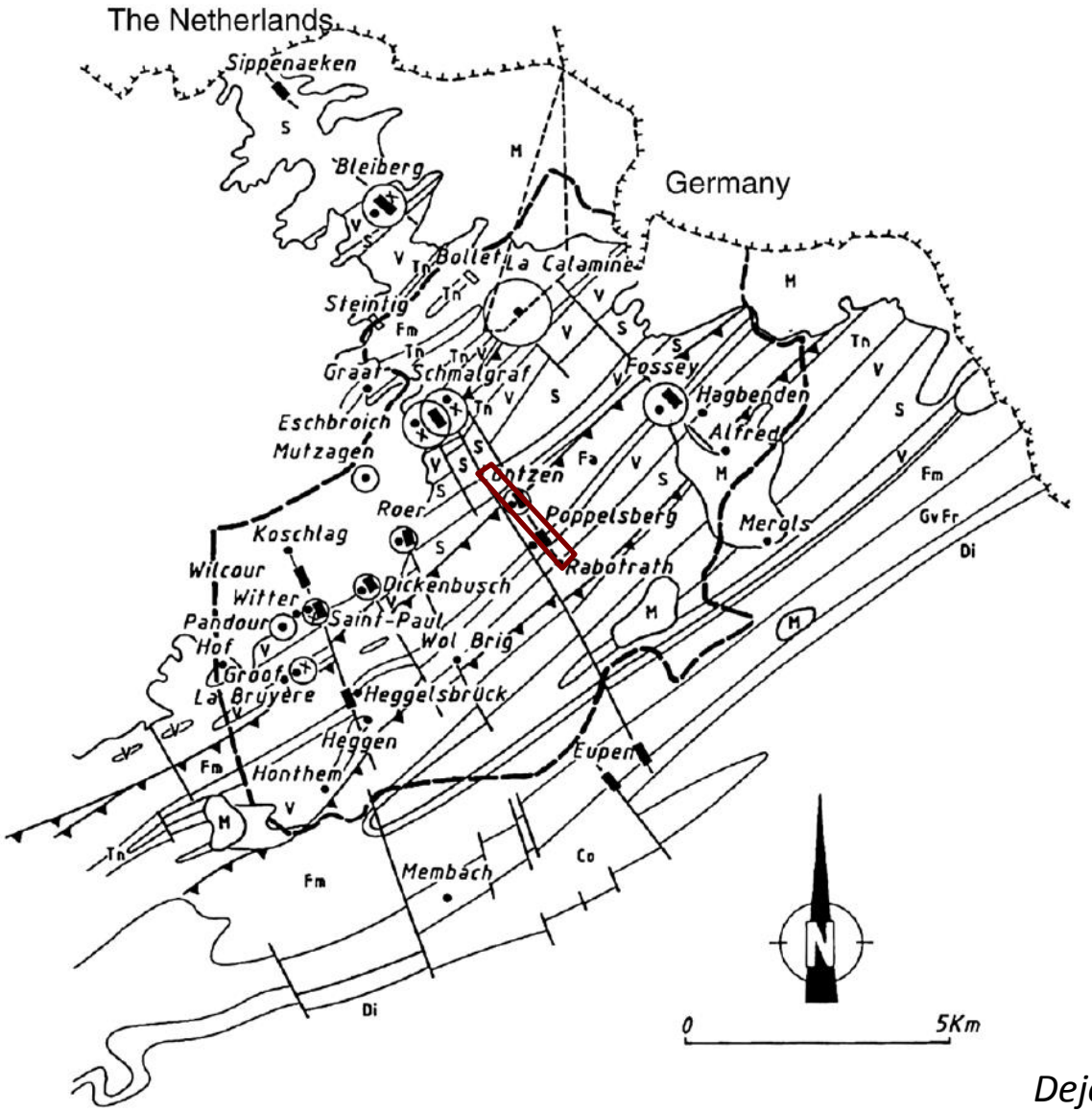
Deposit of Dickenbusch *(Dejonghe et al., 1993)*

1. Old mining works in the Verviers synclinorium



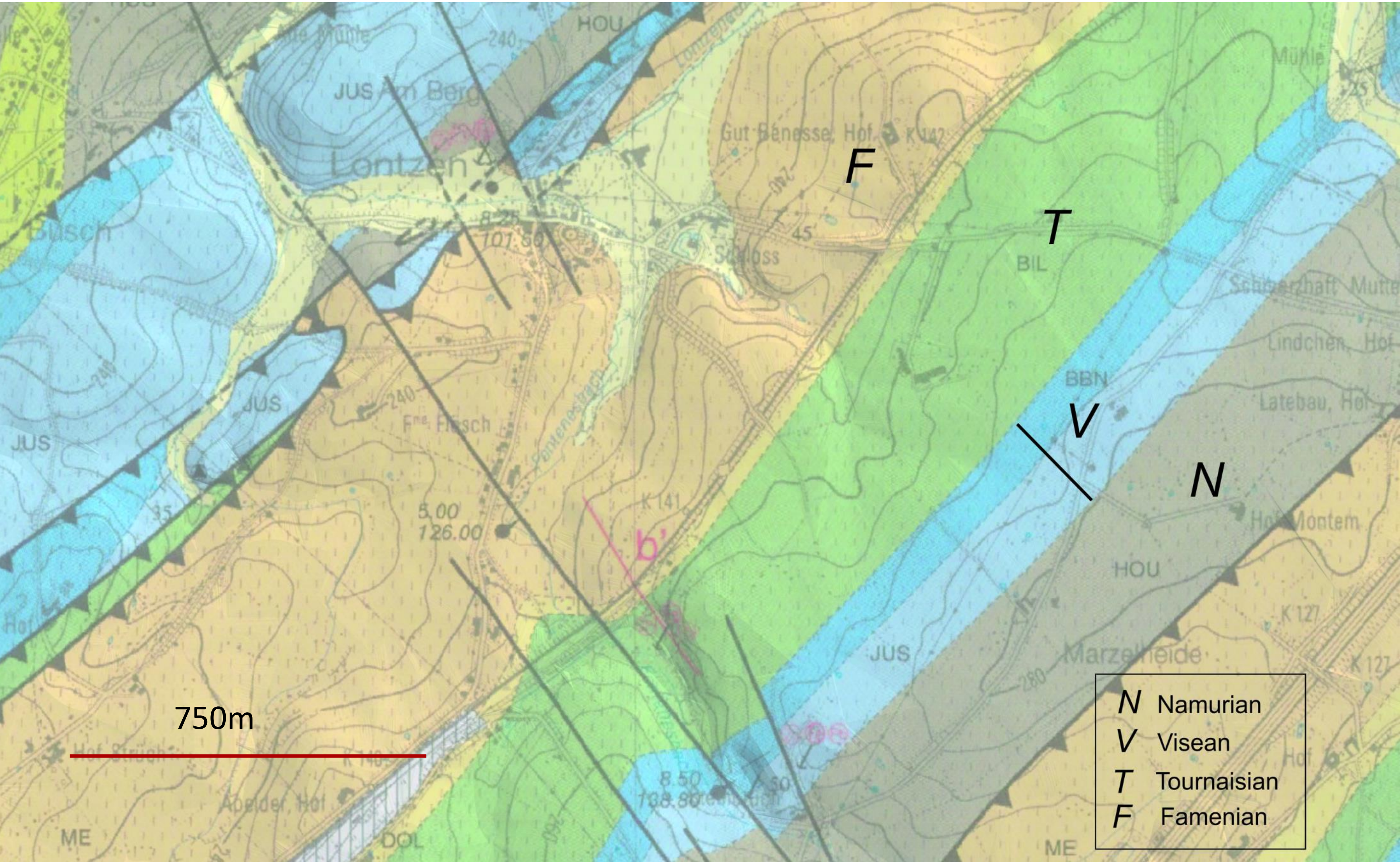
Dejonghe 1998

1. Lontzen ore deposit



Dejonghe 1998

1. Study area



F
T
V
N
JUS
HOU
BIL
BBN
ME
DOL
Lontzen
b'
750m
N Namurian
V Visean
T Tournaisian
F Famenian

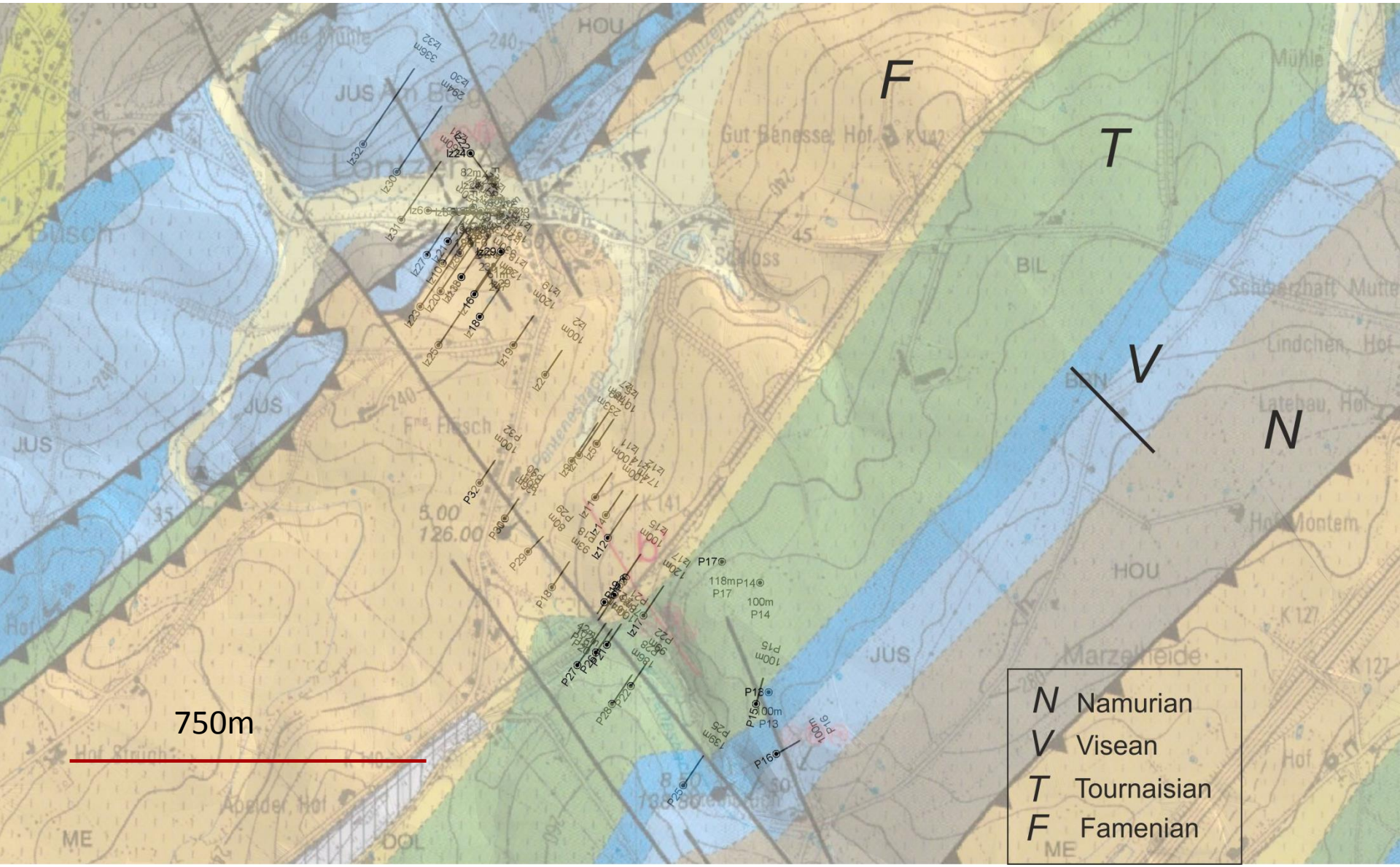
1.Lontzen/Poppelsberg mineralogy

Historical data

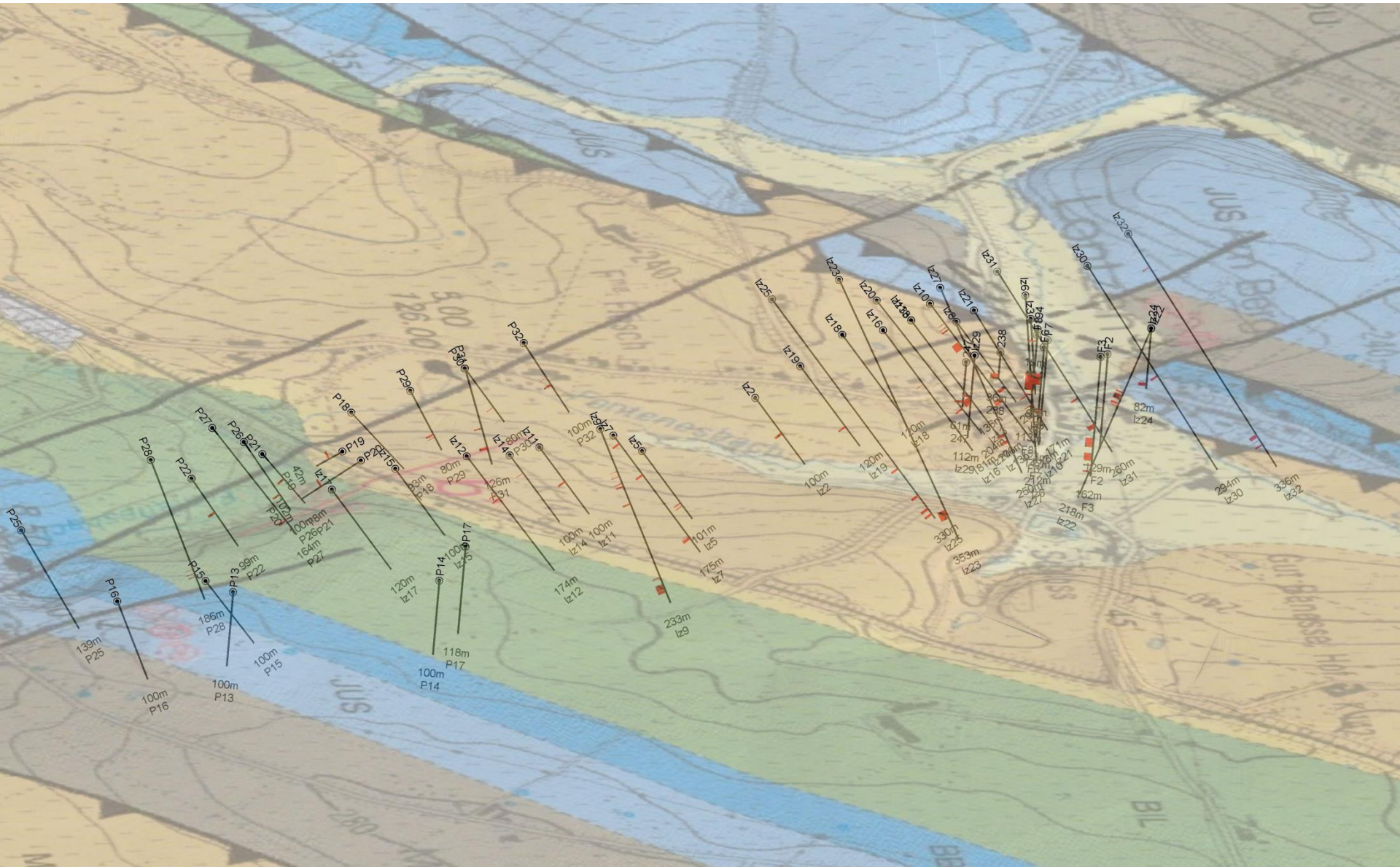
- Massive sulphides (95%)
  - Sphalerite, galena, pyrite/marcasite, chalcopyrite…
- Massive oxides (5%)
  - Smithsonite, limonite, cerusite…

1.Hole-drilling program

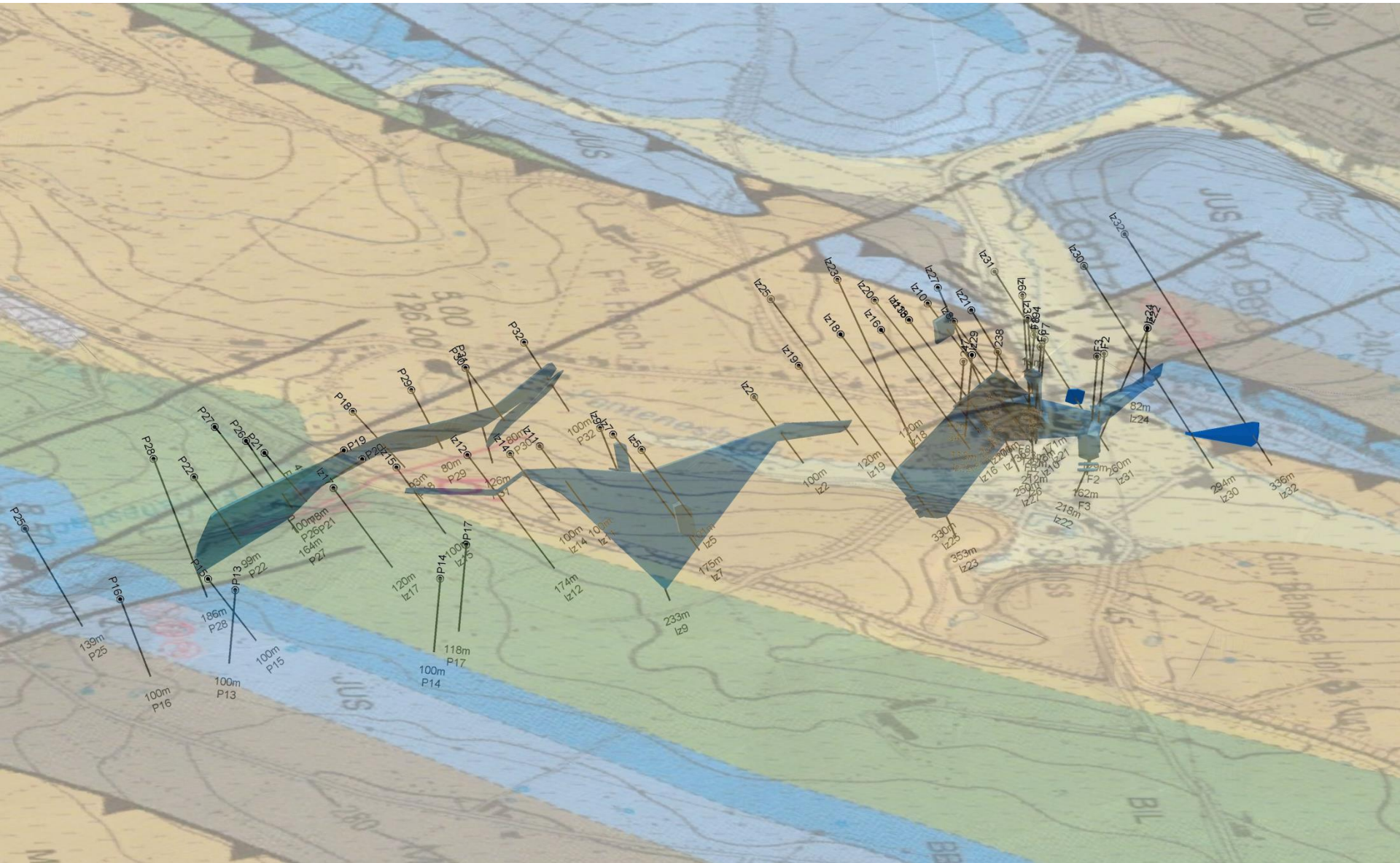
55 hole drill



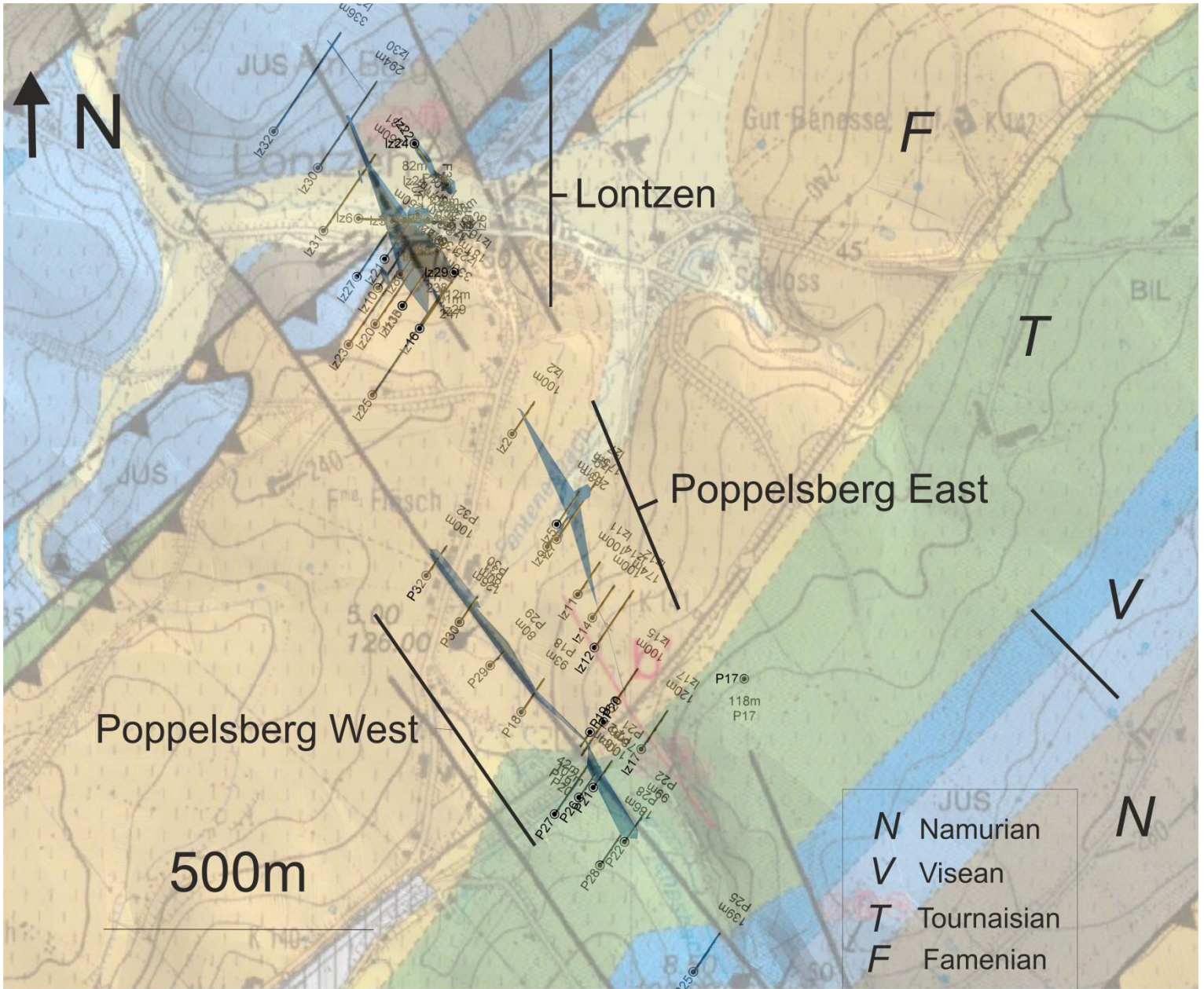
1. 3D modeling



1. 3D modeling



1. 3D modeling



2. Geophysics survey on the field

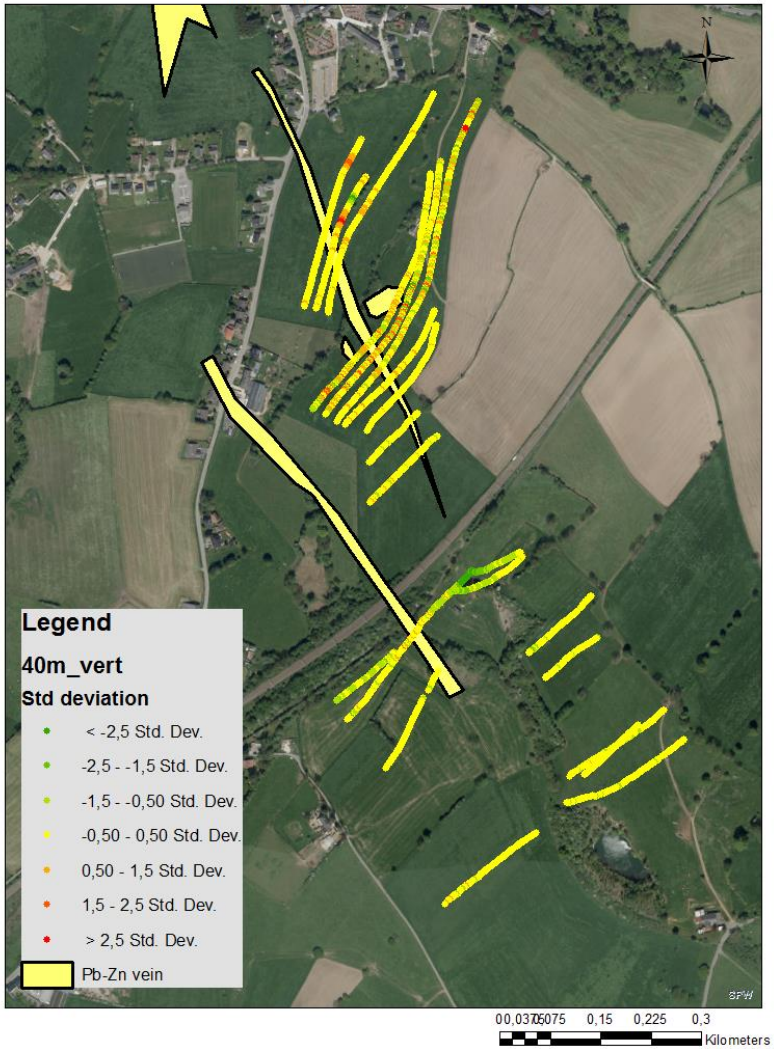
- Electromagnetic survey
- Electrical survey: Electrical Resistivity Tomography and Induced Polarisation
- Magnetometry

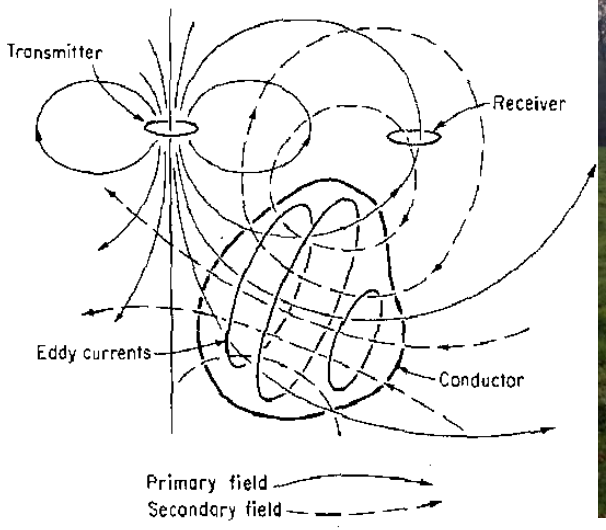
Geophysics survey on the field

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

2,1) Electromagnetic survey

EM-34 profiles in Lontzen area





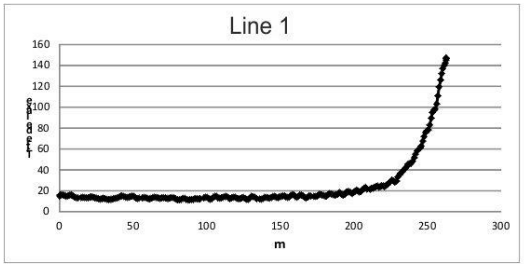
EM 34-3
Geonics

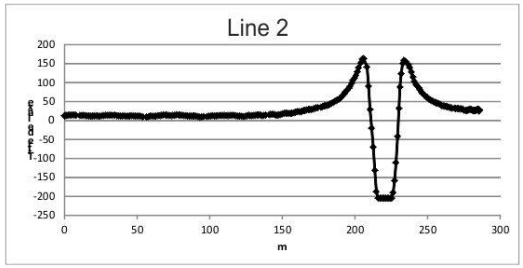
Spacing	Configuration	Depth of investigation
20m	Horizontal	15m
	Vertical	30m
40m	Horizontal	30m
	Vertical	60m

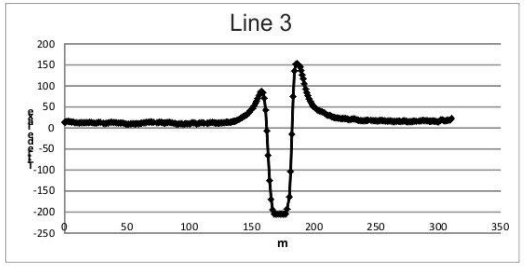
2,1) EM 34-3 survey

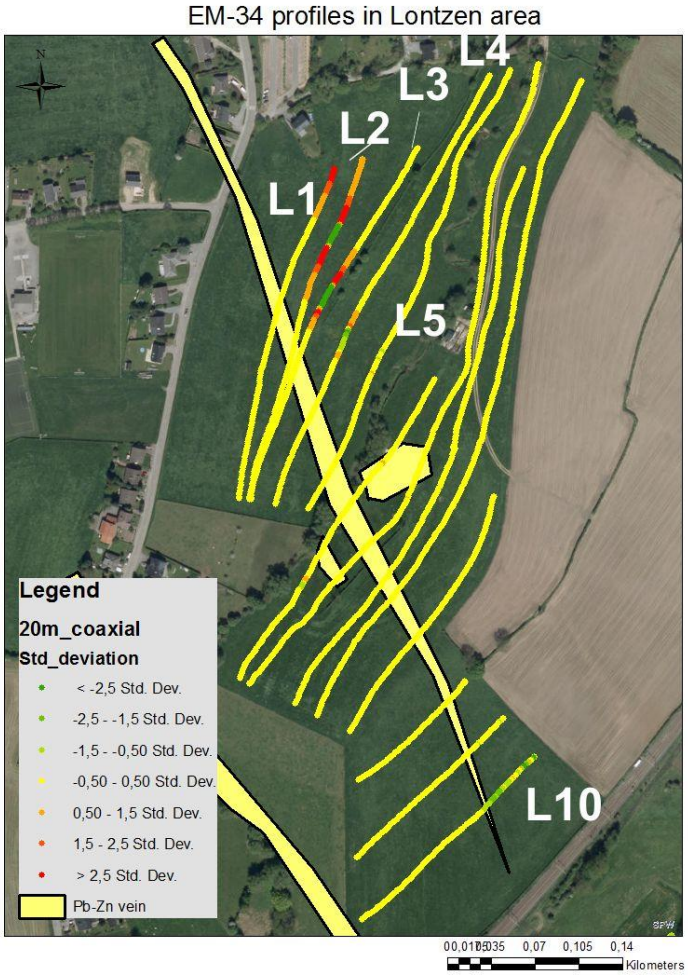
20m_spacing coaxial

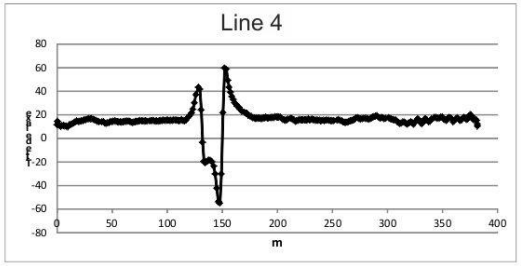
(1,6kHz => 15m)

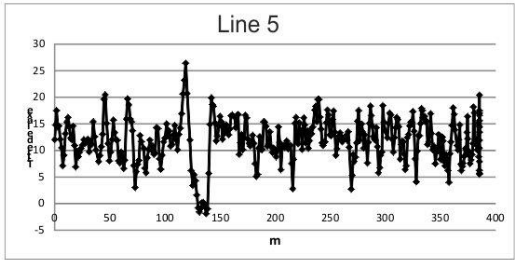


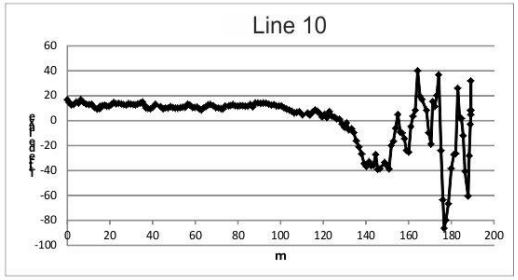




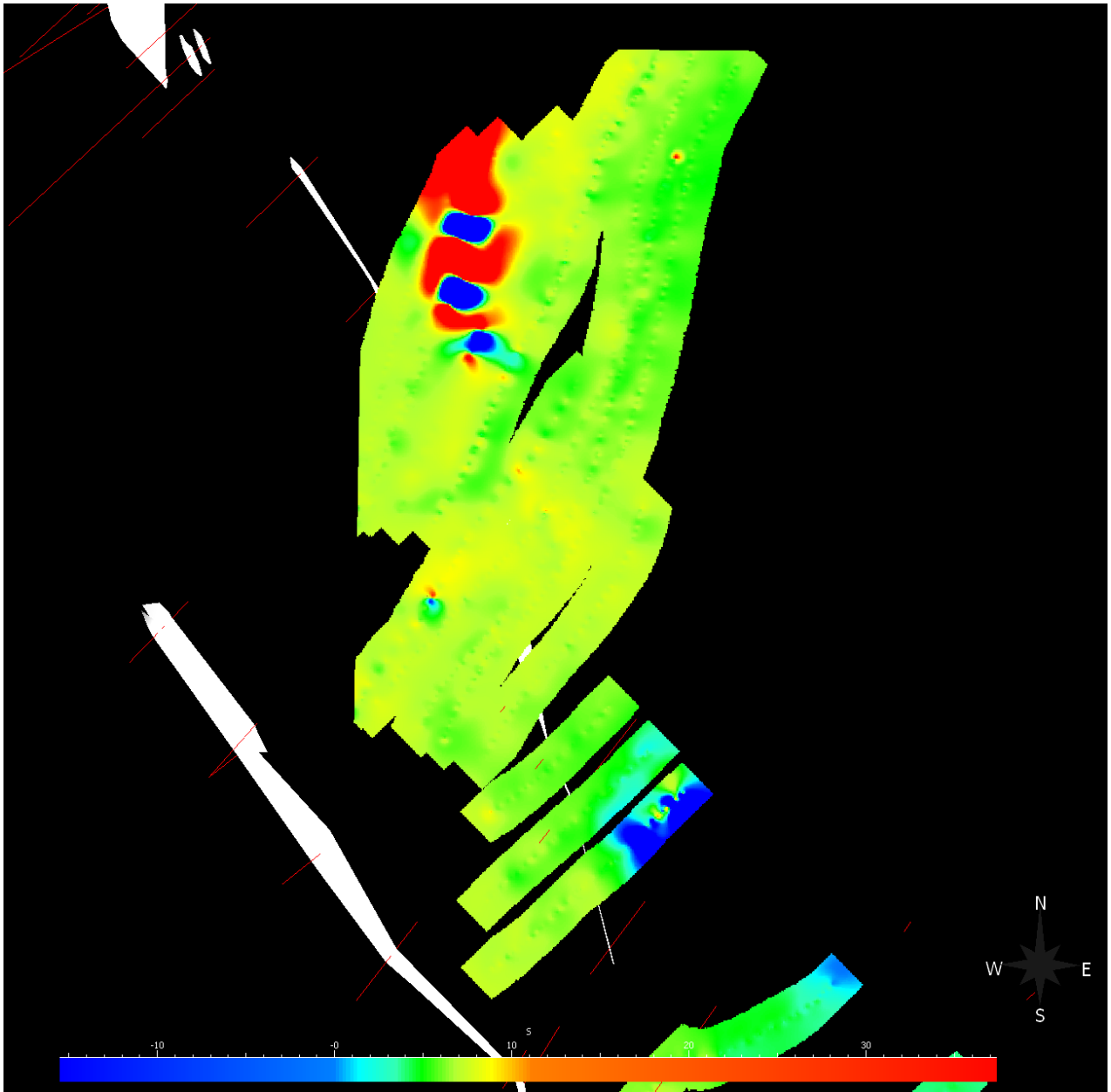




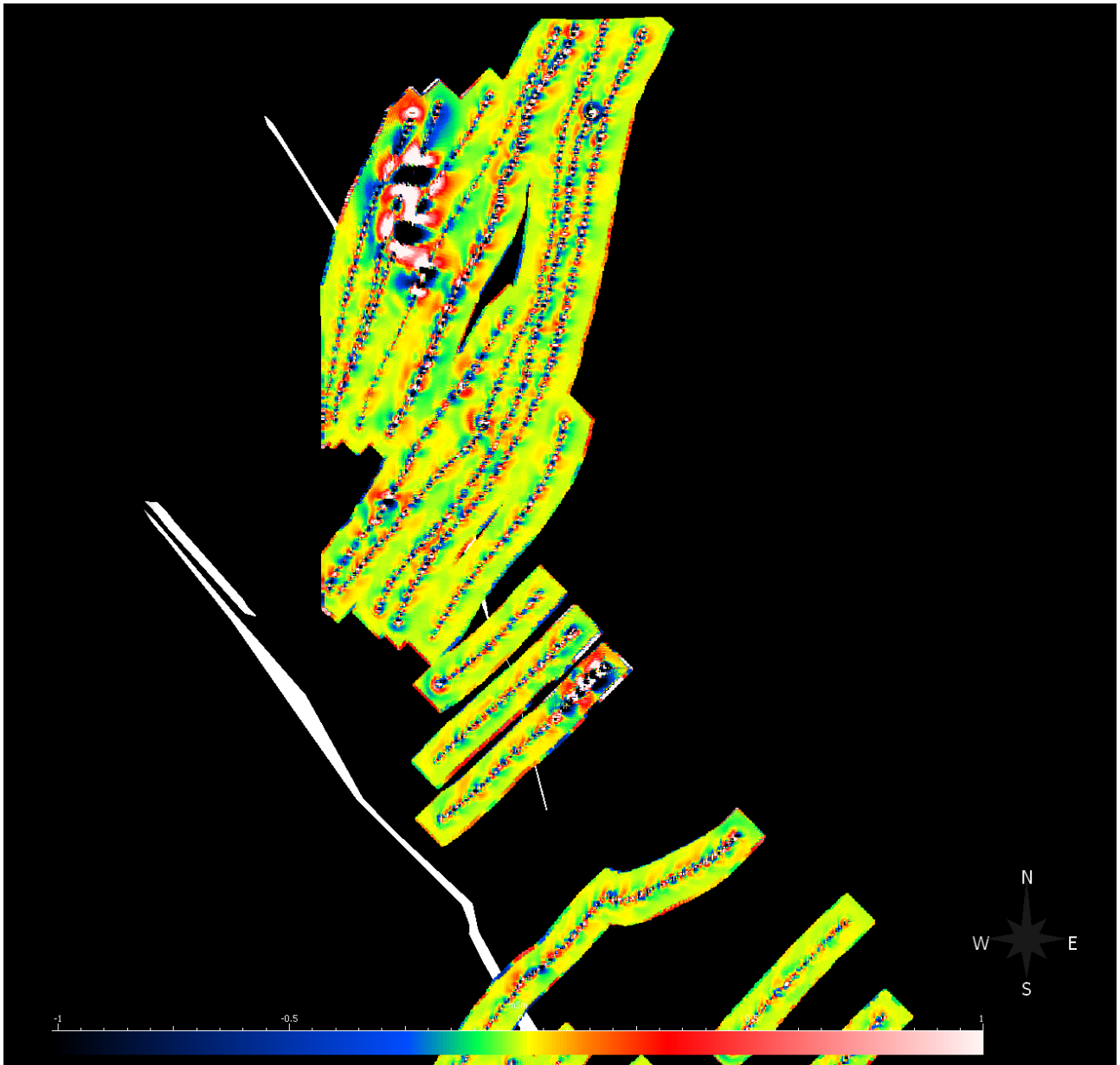




2,1) 20m spacing coaxial



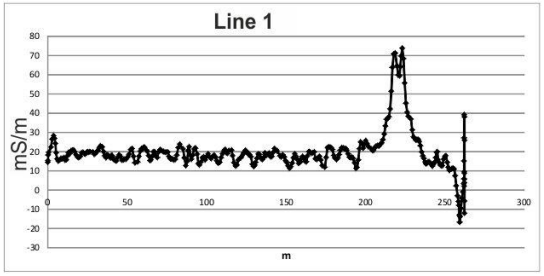
2,1) 20m spacing coaxial (secondary derivate)

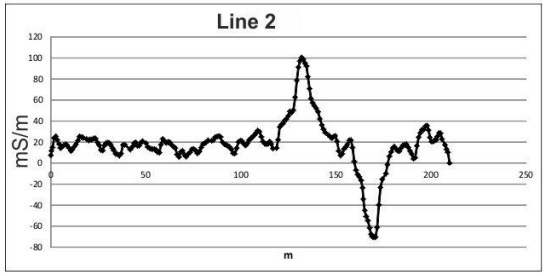


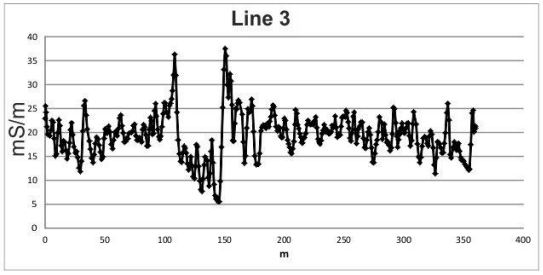
2,1) EM 34-3 survey

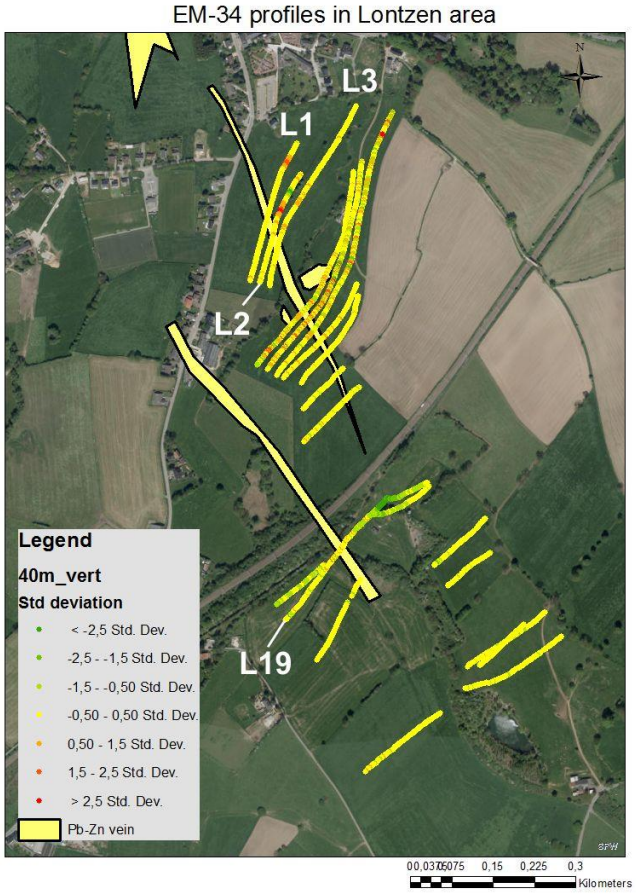
40m coaxial

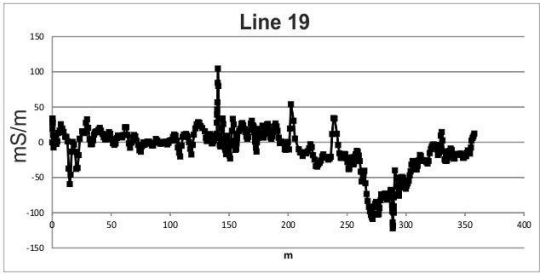
(0,4kHz =>30m)



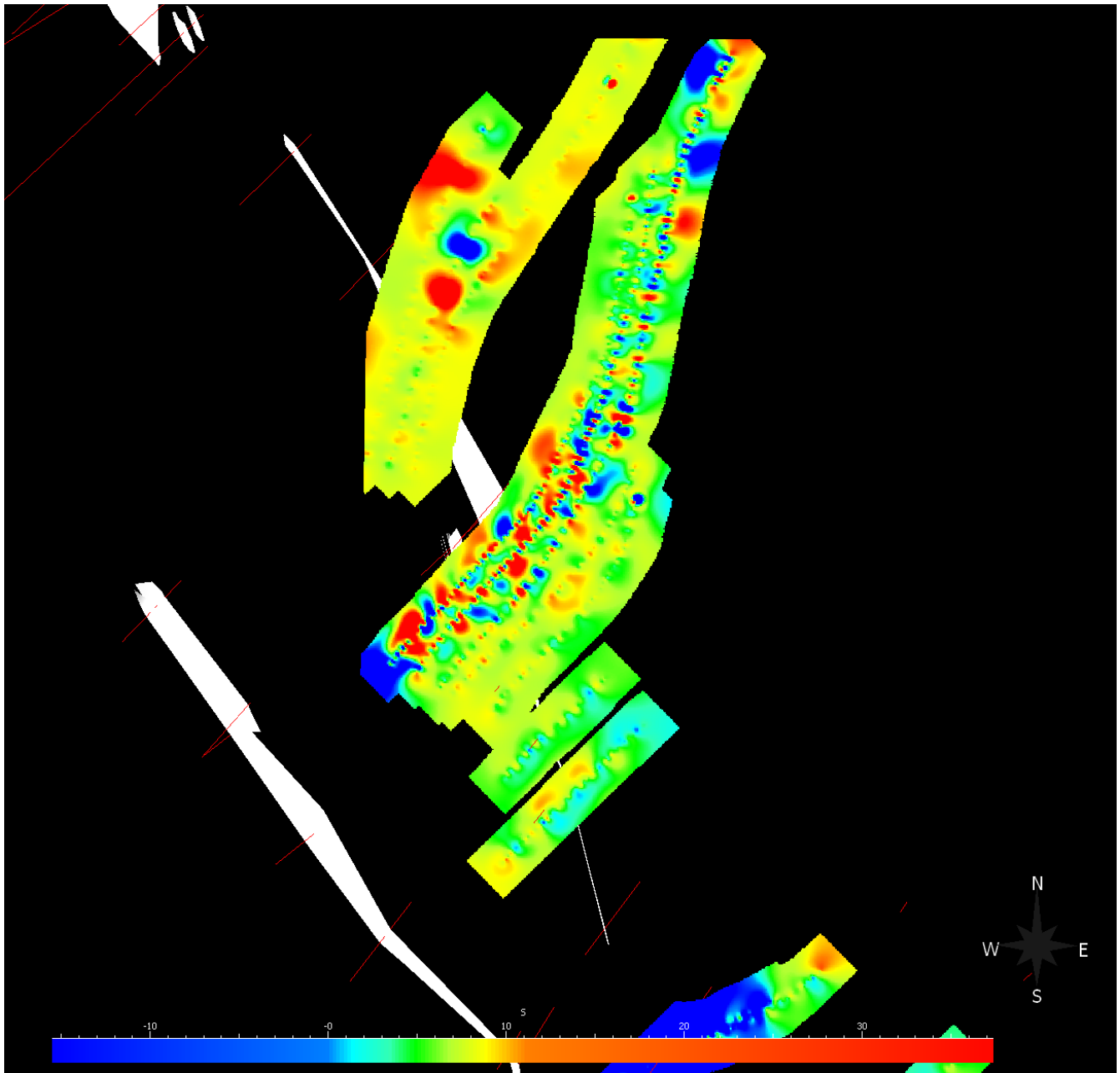






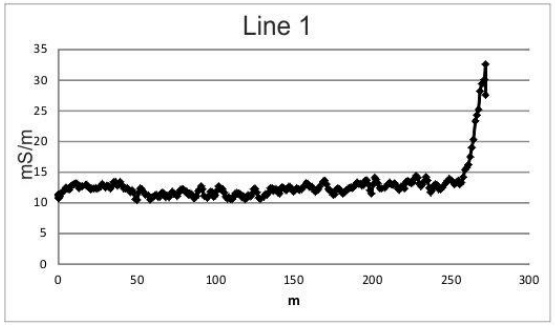


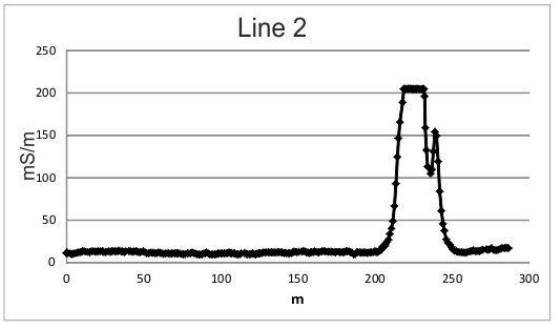
2,1) 40m spacing coaxial

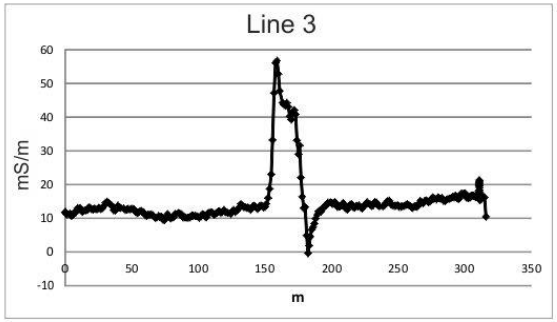


2,1) EM 34-3 survey

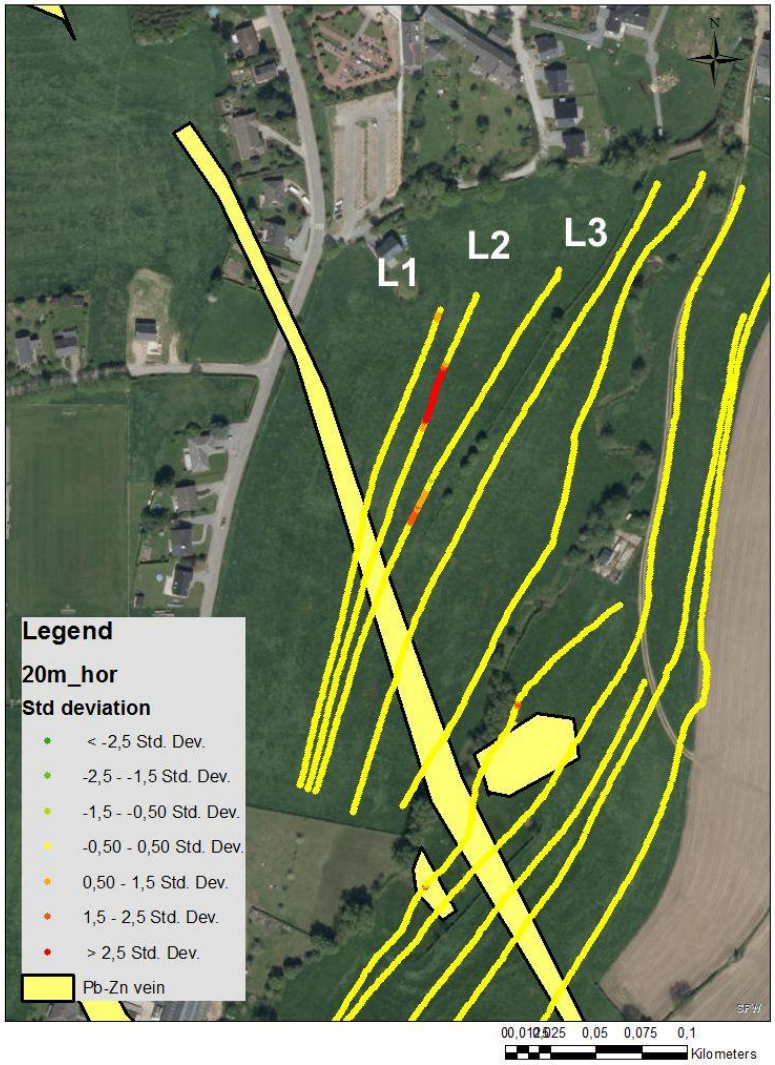
20m coplannar (1,6kHz => 30m)



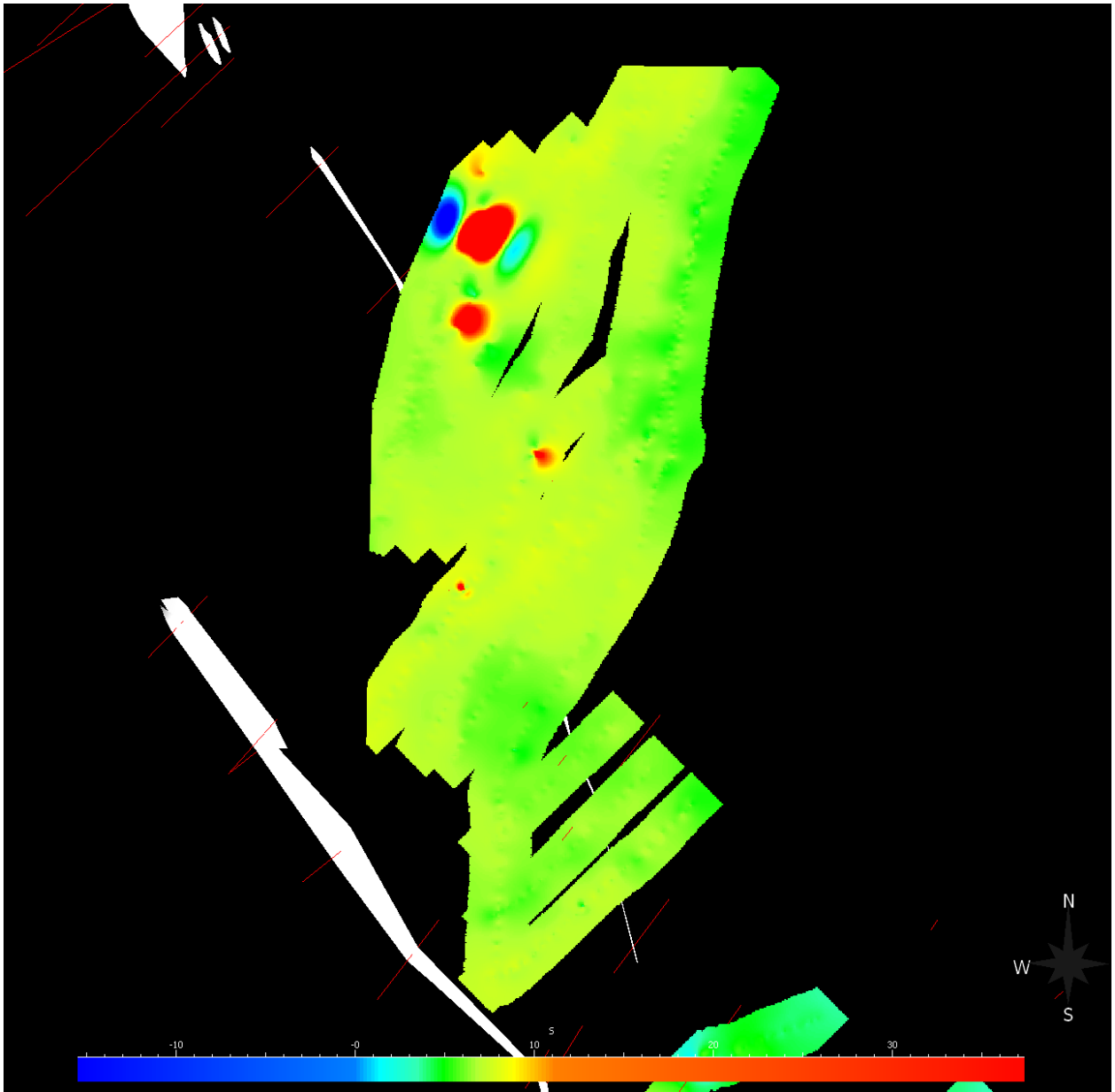




EM-34 profiles in Lontzen area

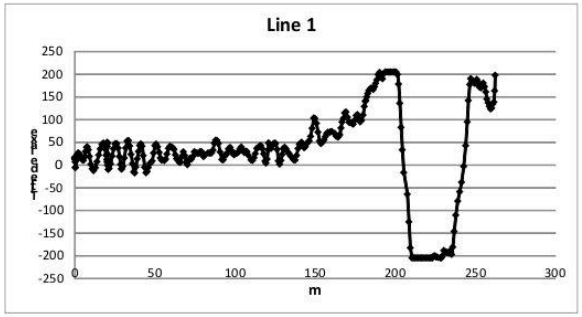


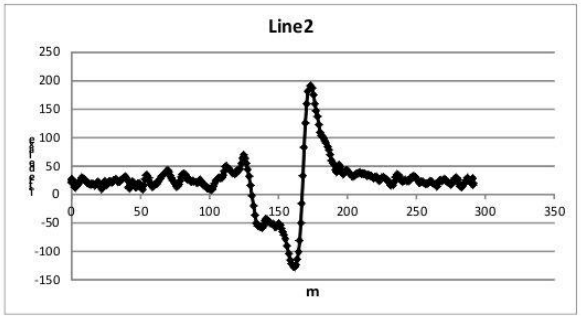
2,1) 20m spacing coplannar

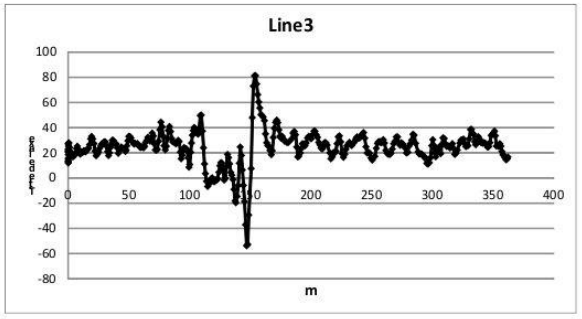


2,1) EM 34-3 survey

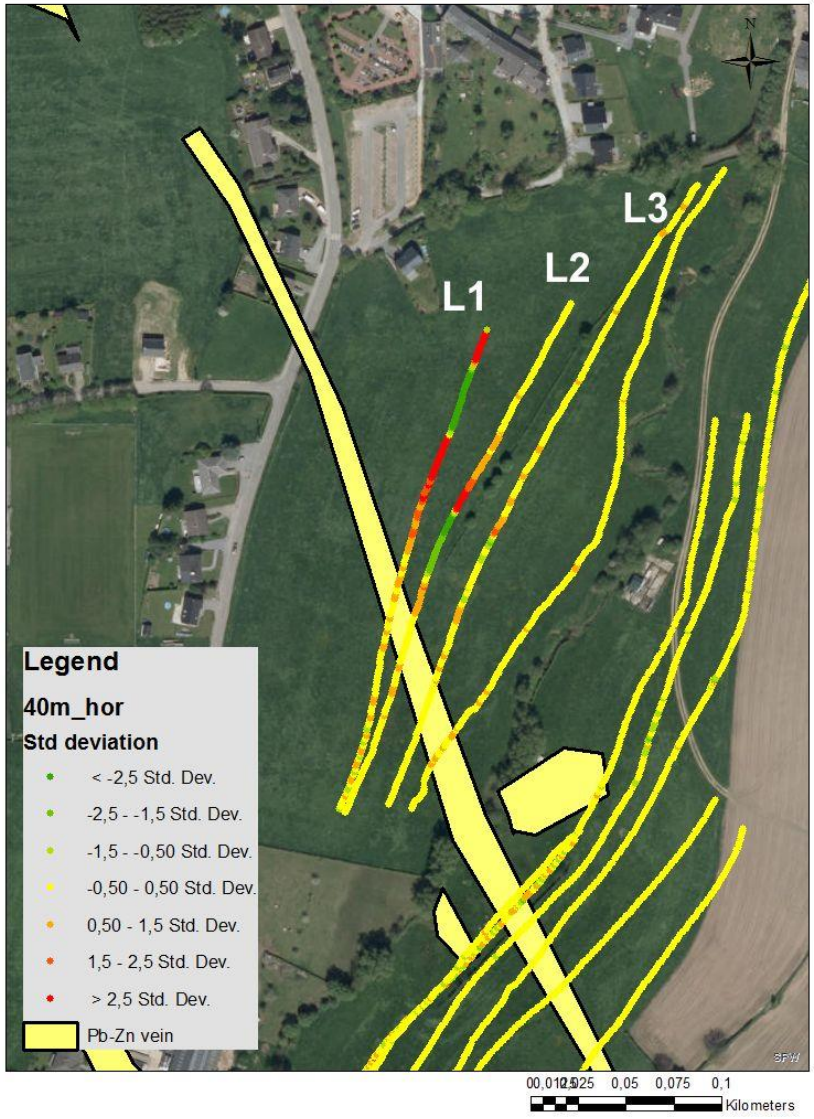
40m coplannar (0,4kHz =>60m)



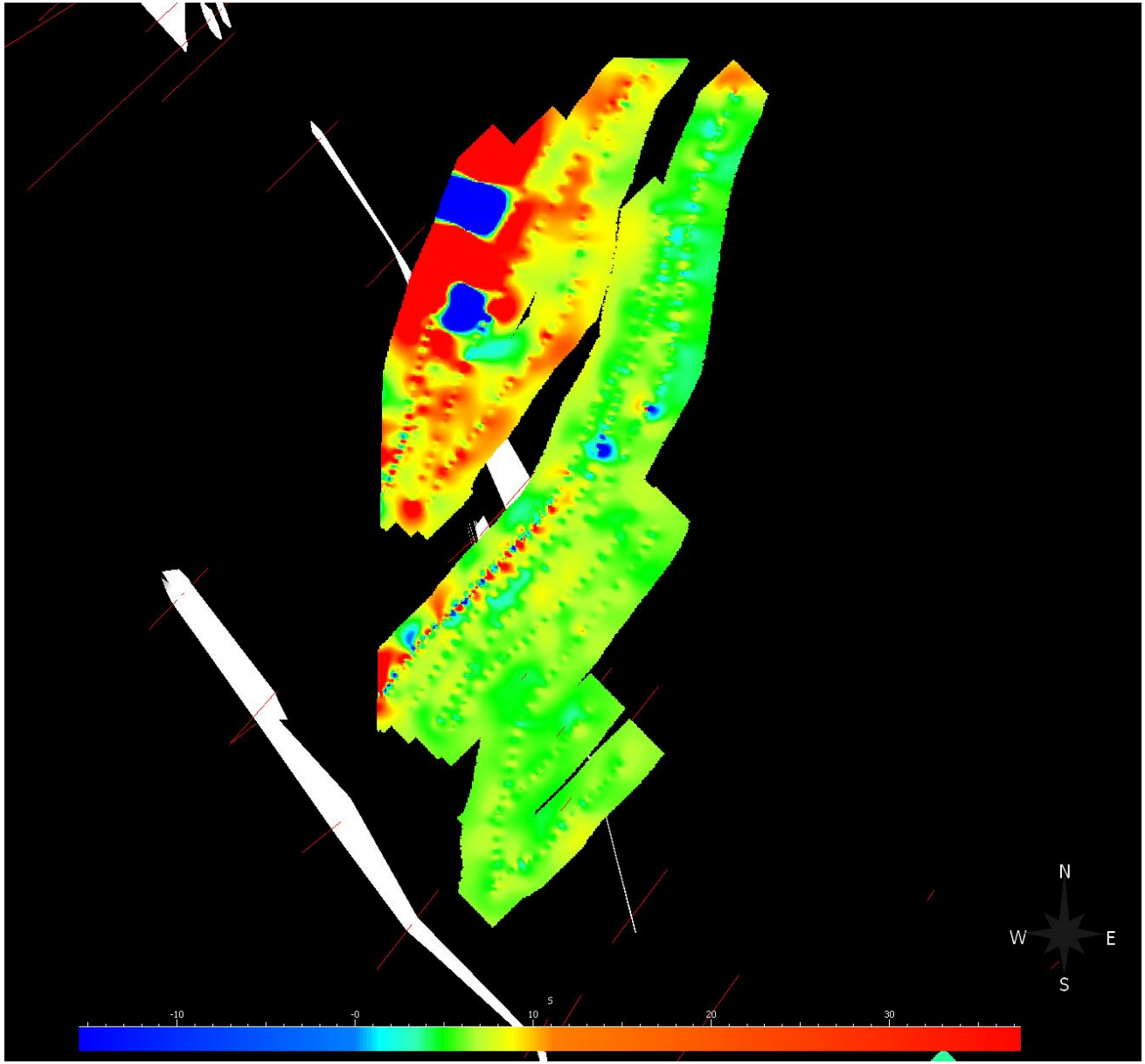




EM-34 profiles in Lontzen area



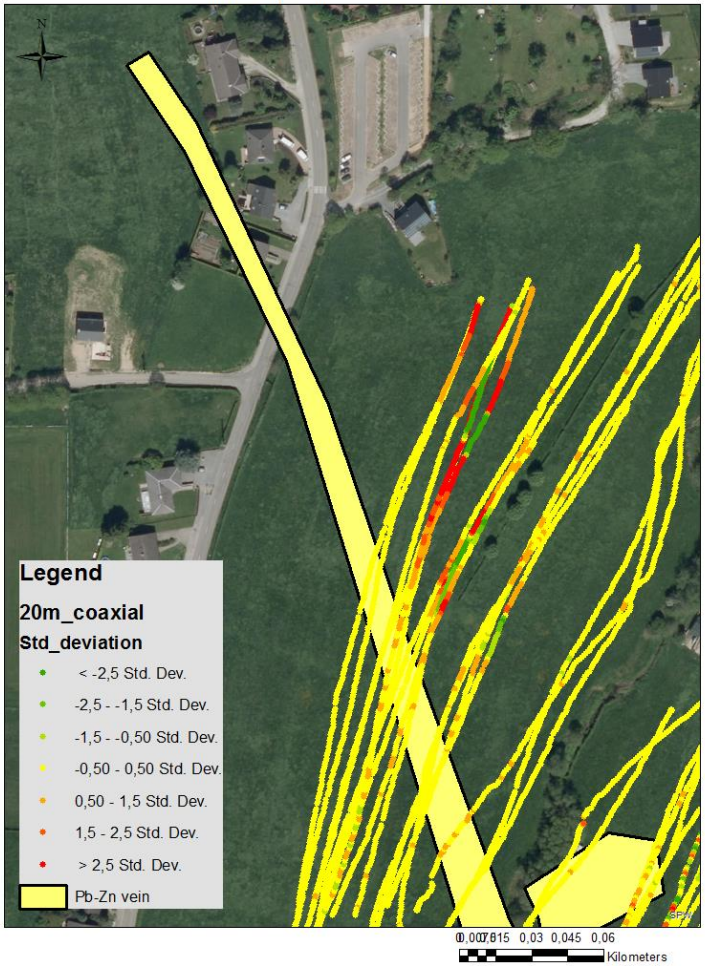
2,1) 40m spacing coplannar



2,1) Electromagnetic anomalies

Big anomalies on the Northern part of Poppelsberg East vein

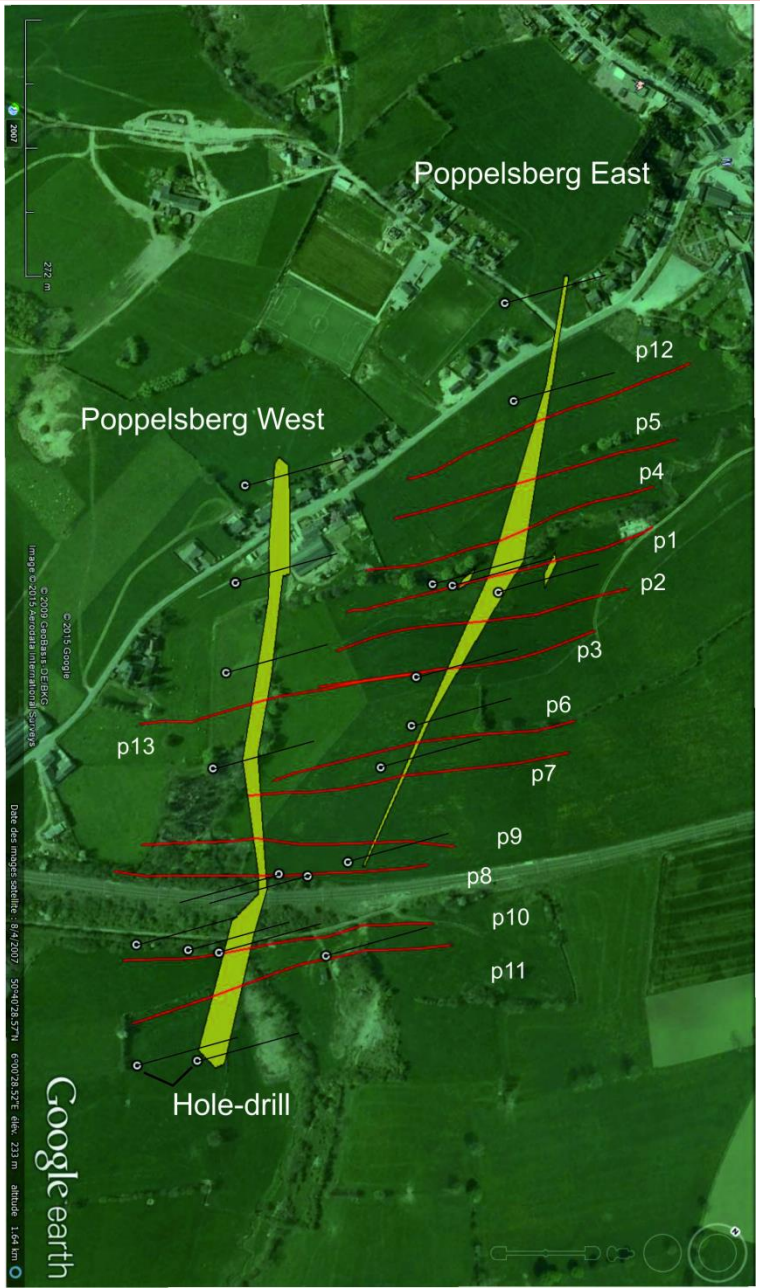
EM-34 profiles in Lontzen area



2,2) Geophysics survey on the field

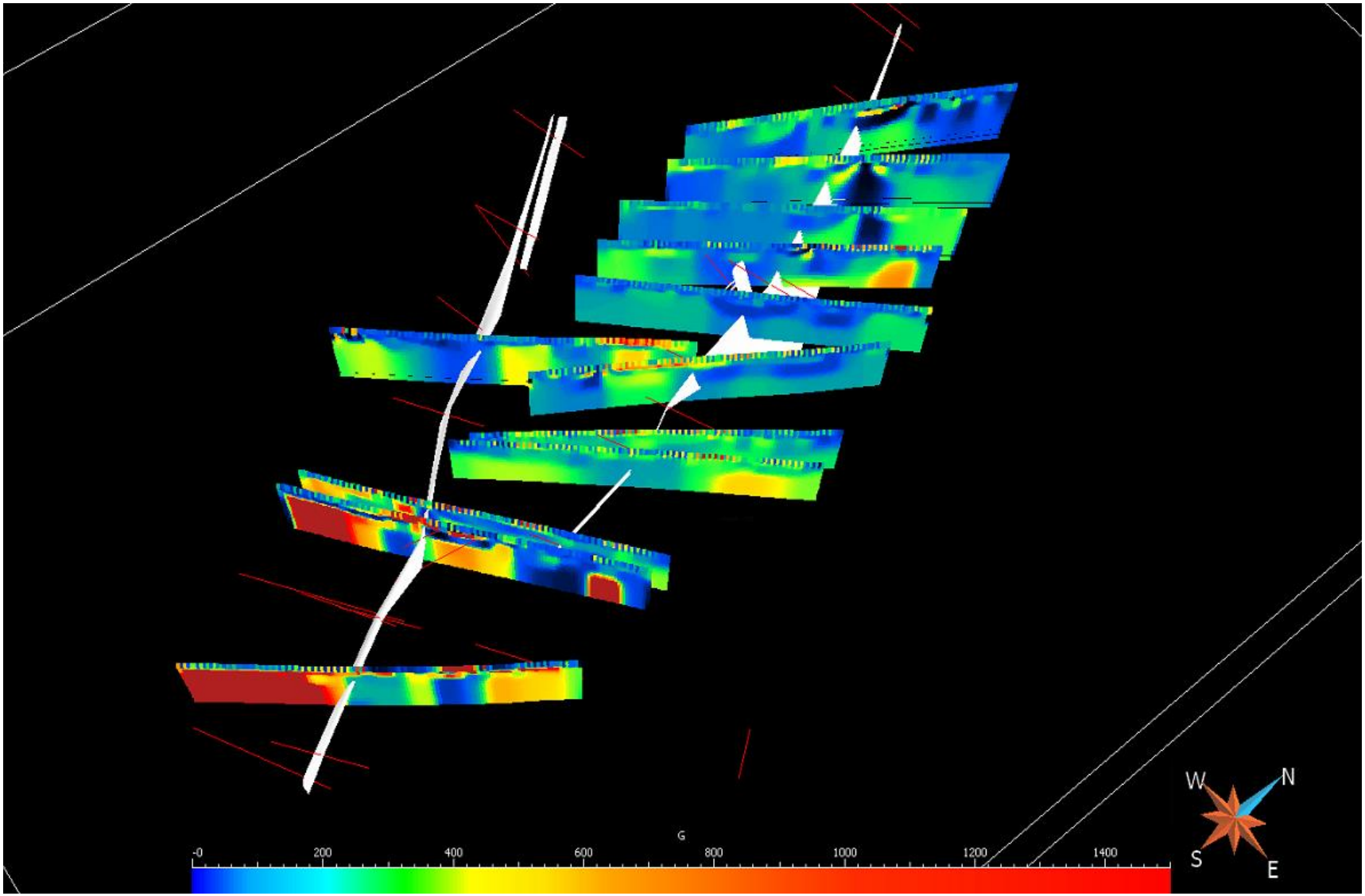
- Electromagnetic survey
- **Electrical survey: Electrical Resistivity Tomography and Induced Polarisation**
- Magnetometry

2,2) Electrical survey on the field

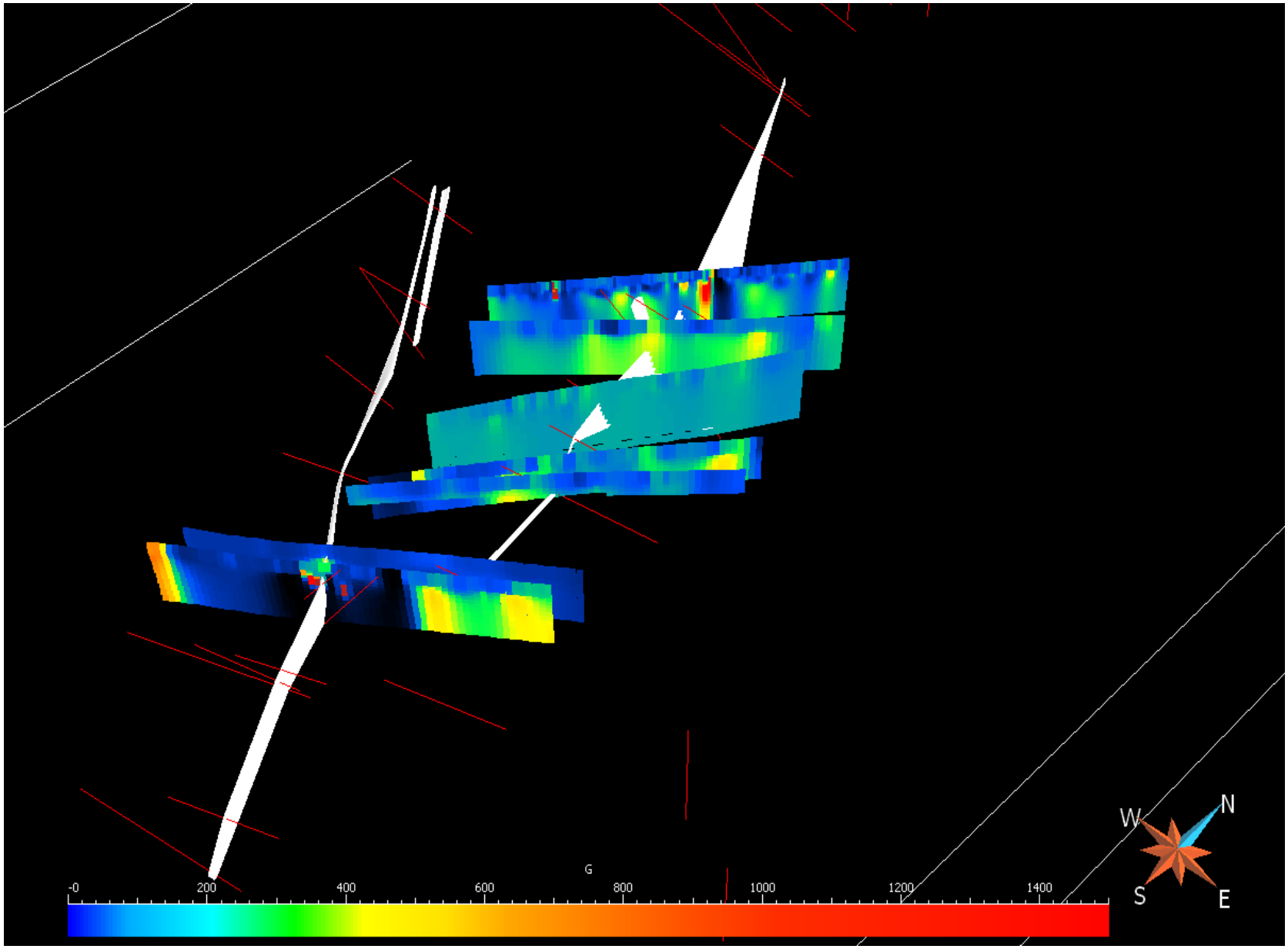


ABEM terrameter LS

2,2) Electrical resistivity survey on the field



2,2) IP results



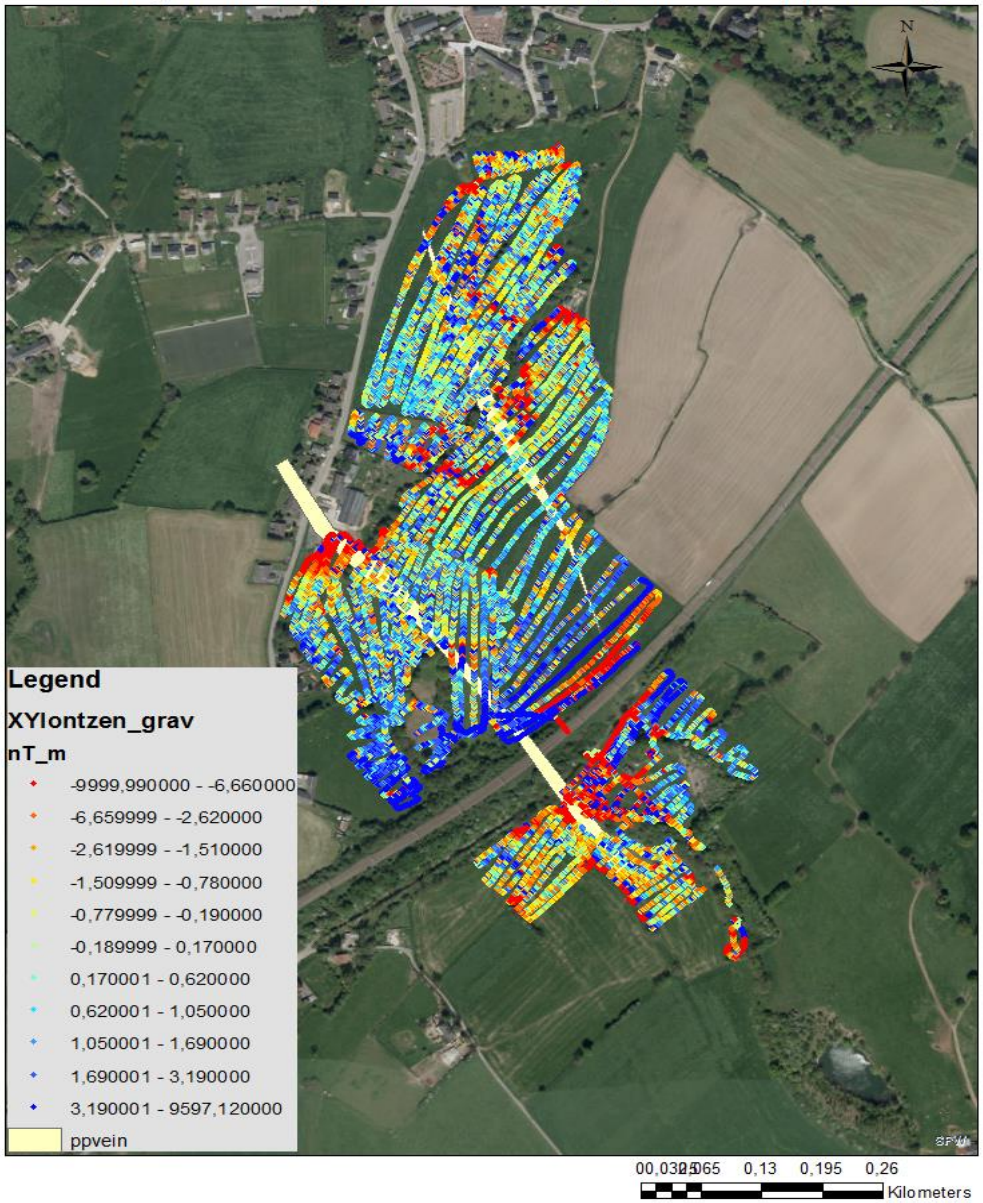
2,3) Geophysics survey on the field

- Electomagnetic survey
- Electrical survey: Electrical Resistivity Tomography and Induced Polarisation
- **Magnetometry**

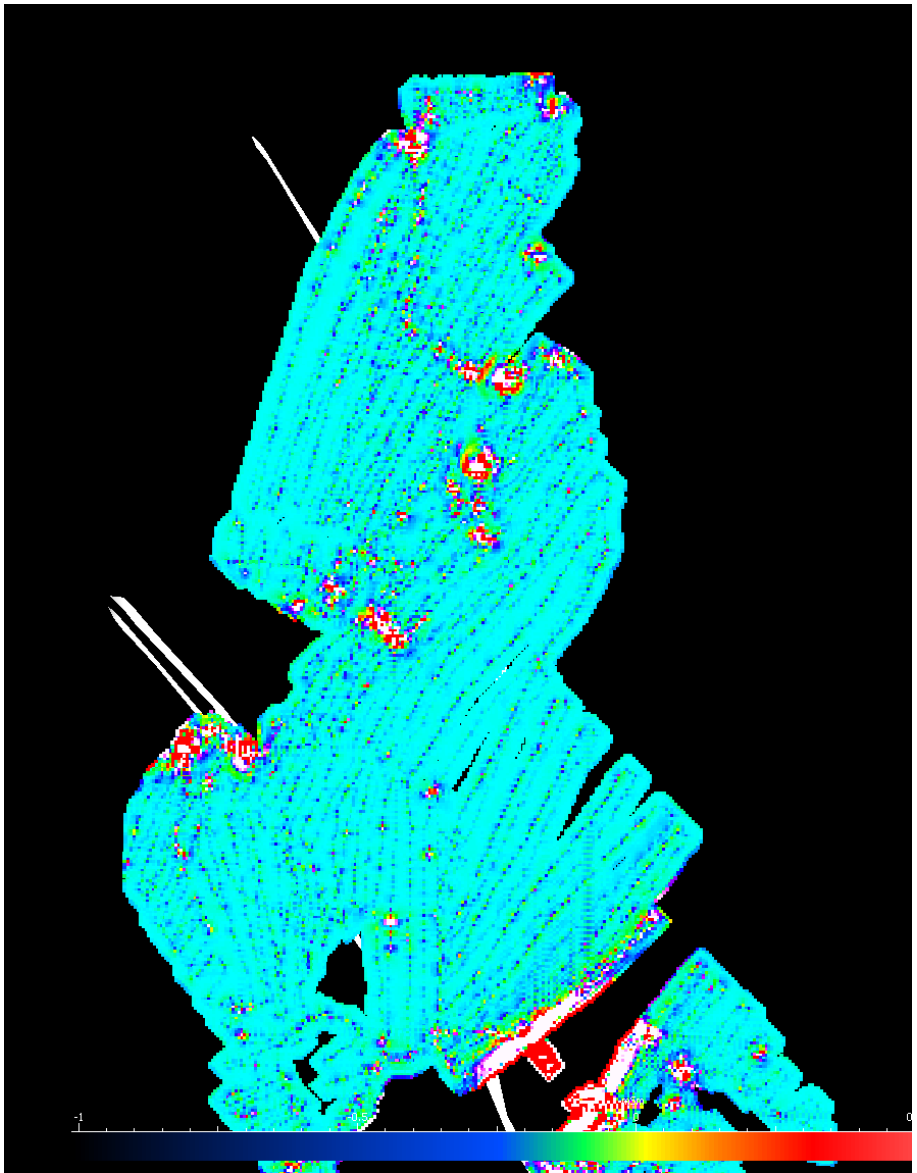
2,3) Magnetometric survey

GSM-19 v7.0
GEM system

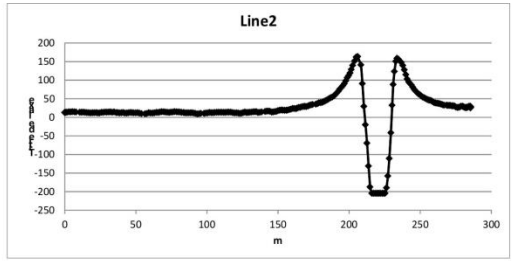
Magnetic map of the Pb-Zn deposit of Poppelsberg

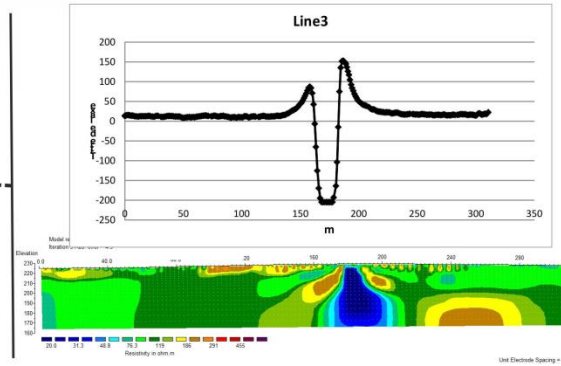


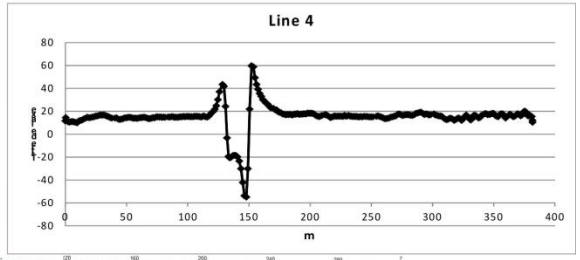
2,3) Magnetometryic survey (second derivate)



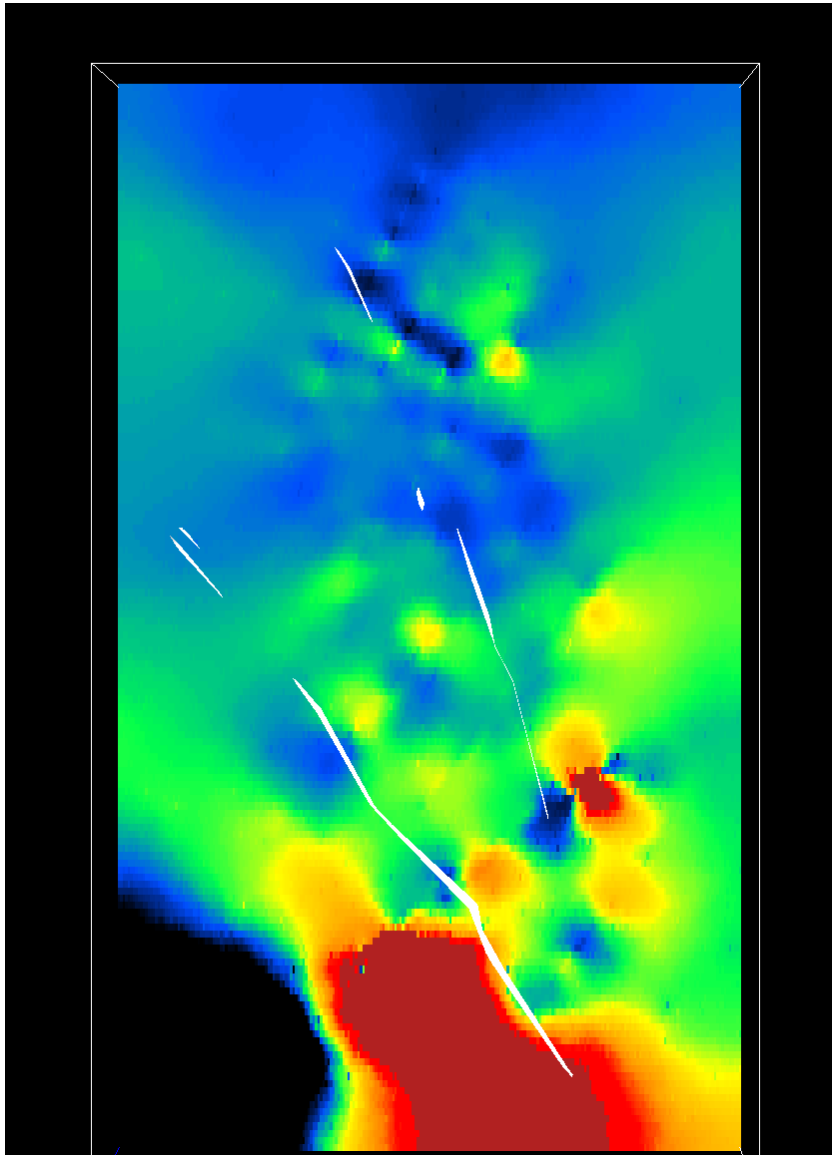
3) Discussion (ERT/EM)



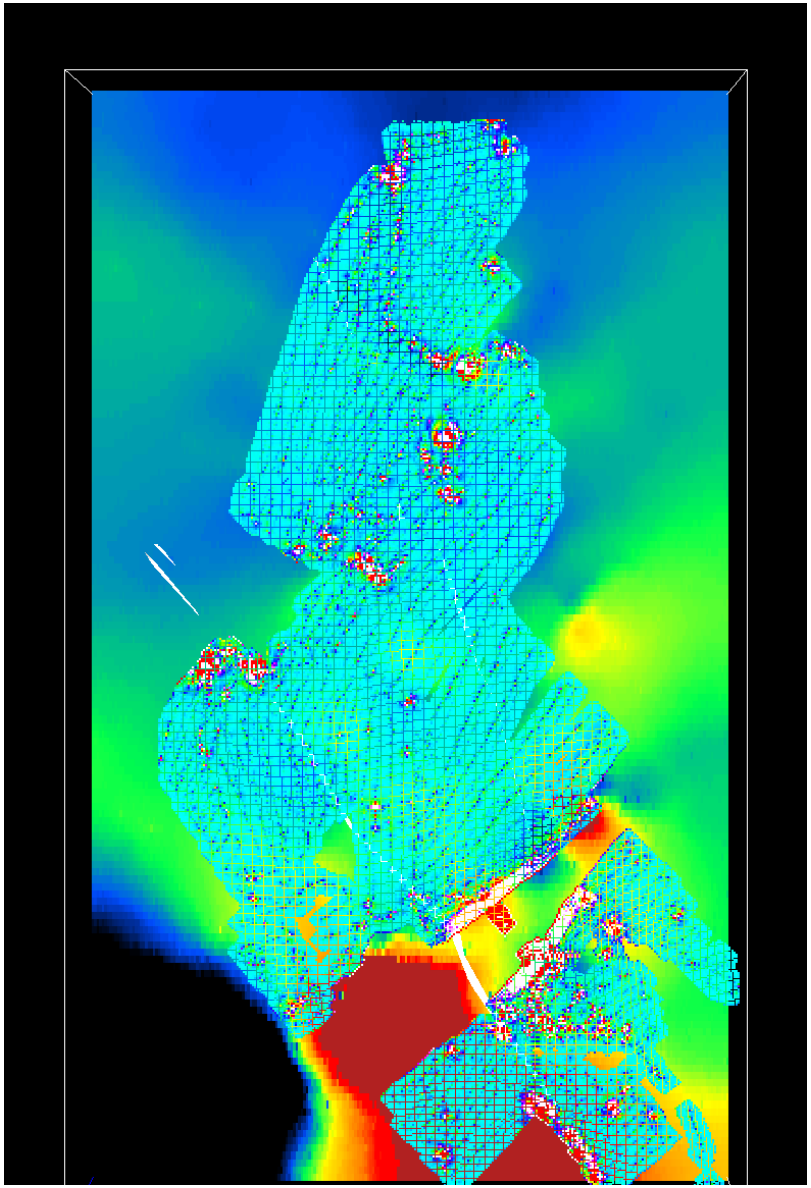




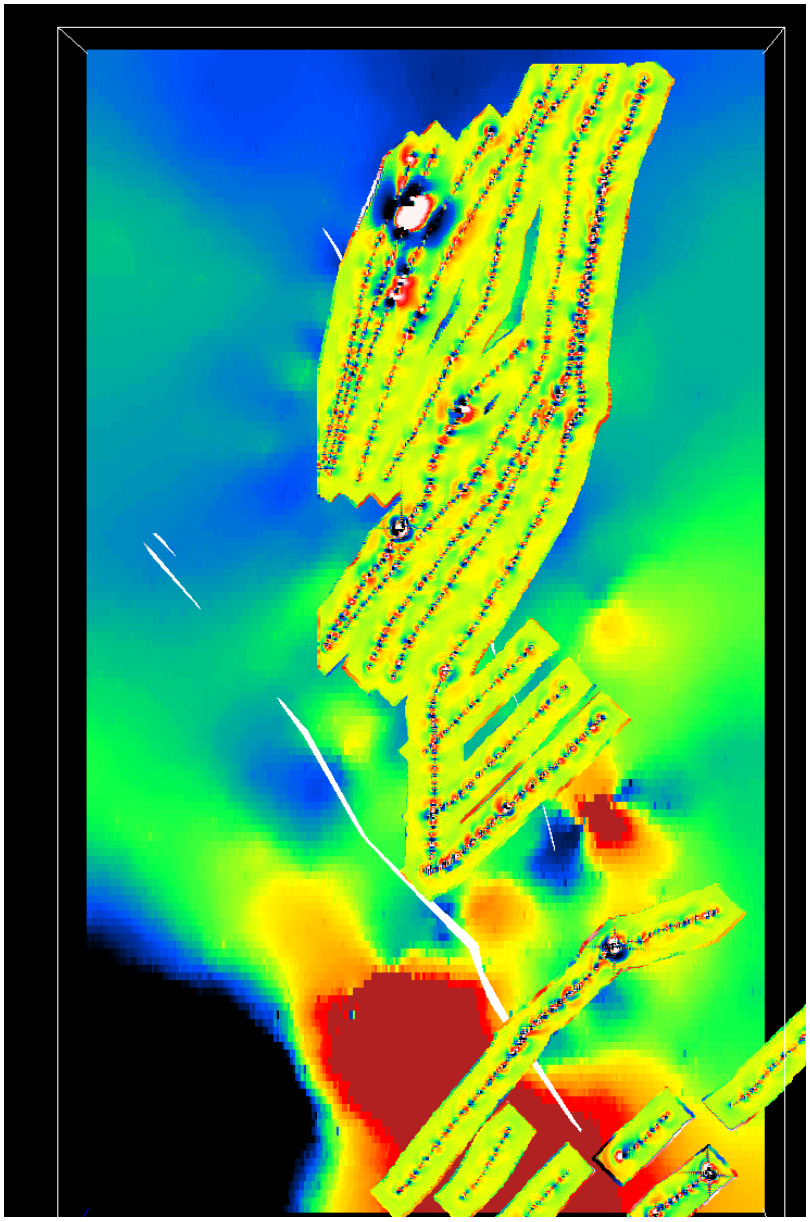
3. ERT_krigeage



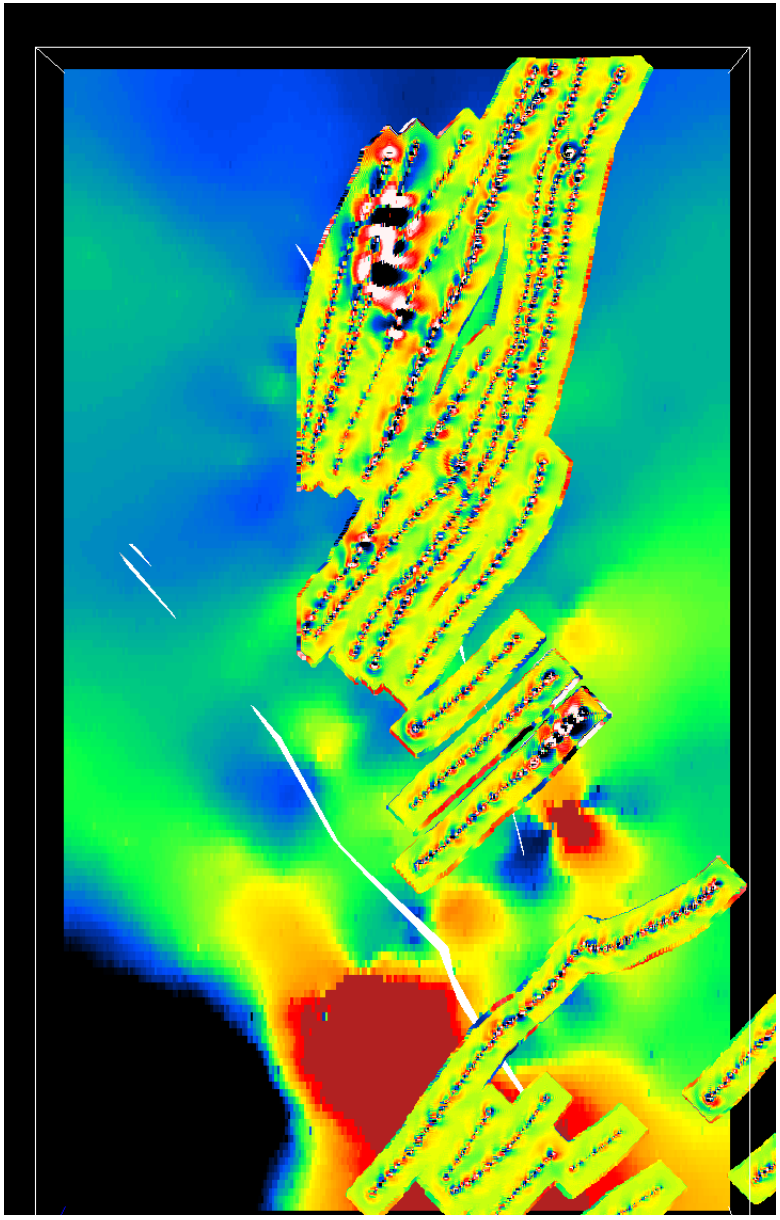
3. Magnetometry (second derivate)



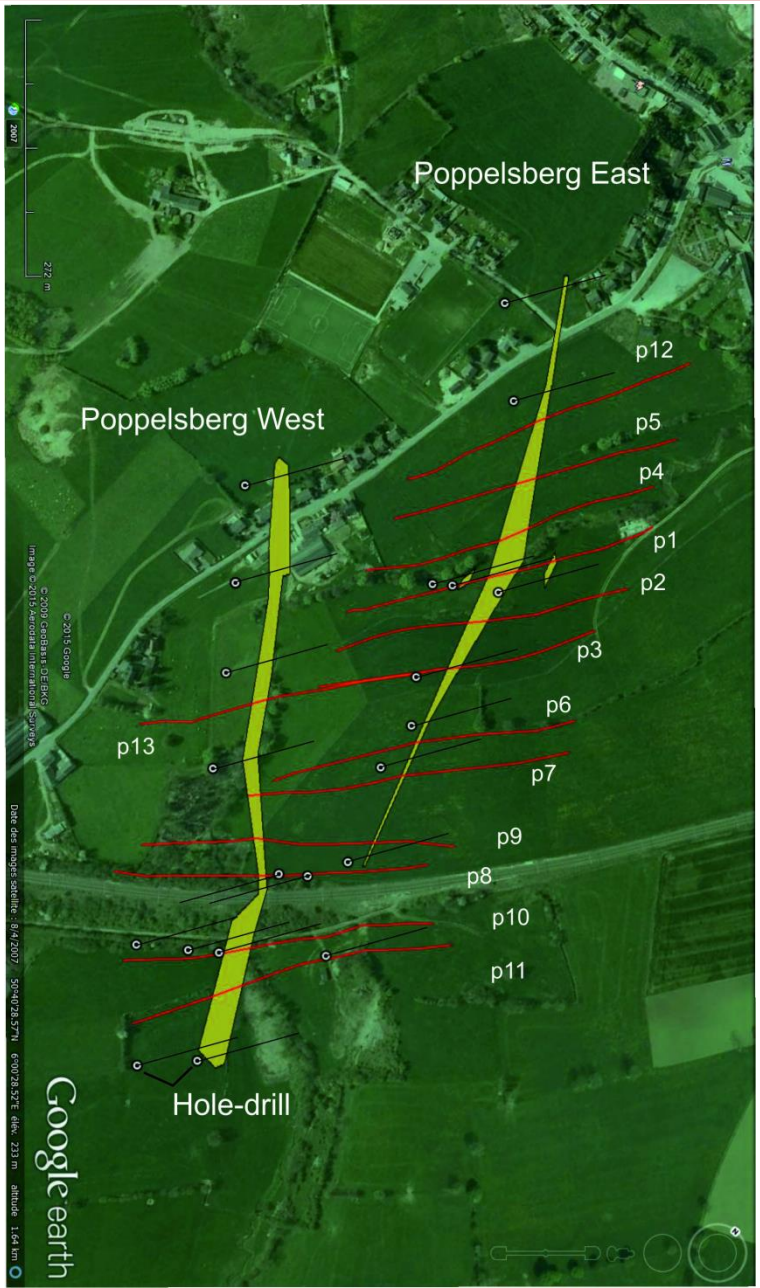
3. EM 34: 20m coaxial (second derivate)



3. EM 34: 20m coplannar (second derivate)



3. Discussion



4. 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
  - **EM survey**: good results on a part of the vein
  - **Magnetometry:** good results on a part of the vein
- **…**

Thank you for your attention