Erfaringer med tTEM

som kortlægningsredskab

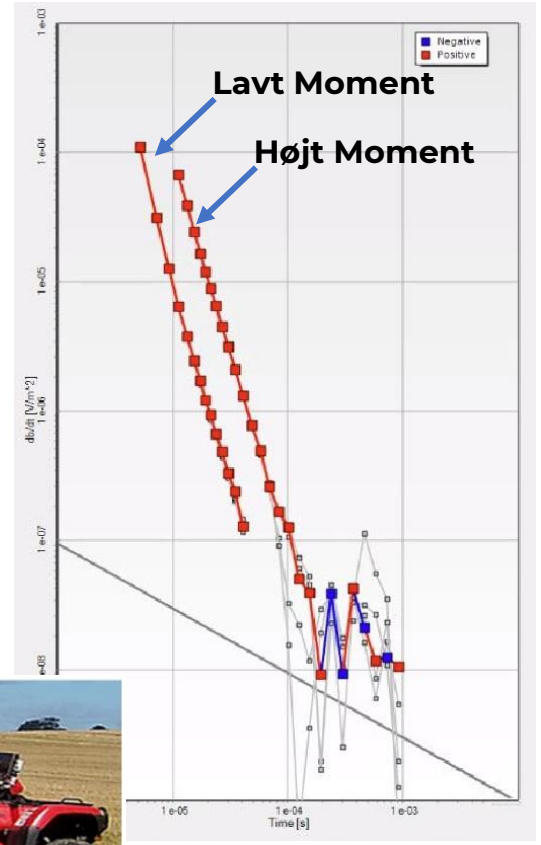
- Kort præsentation af tTEM metoden
- Erfaringer med tTEM….
  - Betydning af parametervalg ved dataindsamling
    - Indsamlingshastighed
    - Linjeafstand
    - Kørselsretning
  - System verifikation og datareproduktion
- Konklusioner og strøtanker…

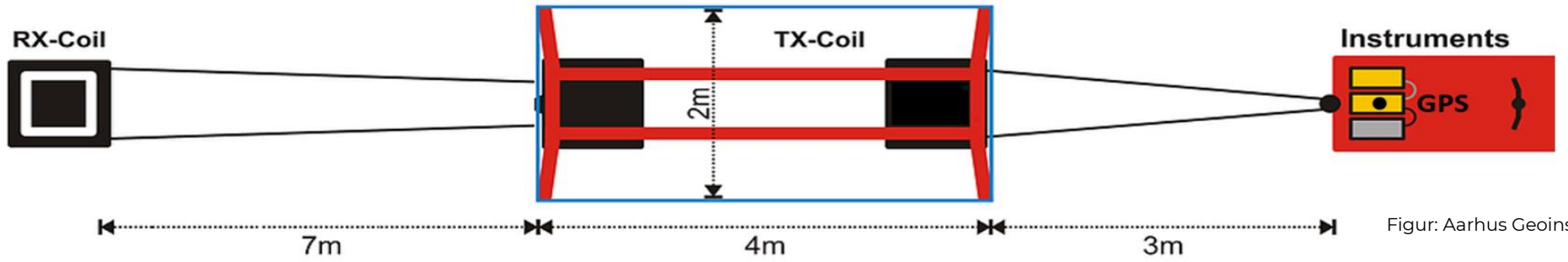
Anders Edsen (Fagchef Geofysik)

WSP Danmark

tTEM systemet – nogle fakta:

- Sender: 4 x 2 m / 3 x 3 m
- Dual Moment system:
  – 3 A på lavt moment (LM) og 30 A på højt moment (HM)
- Repetitionsfrekvens 1055 Hz (LM) og 315 Hz (HM)
- Typisk brugbare gates : 6 – 12 us (LM) og 10 – 90 us (HM)
- Dataindsamling kontinuert ved 15 km/t

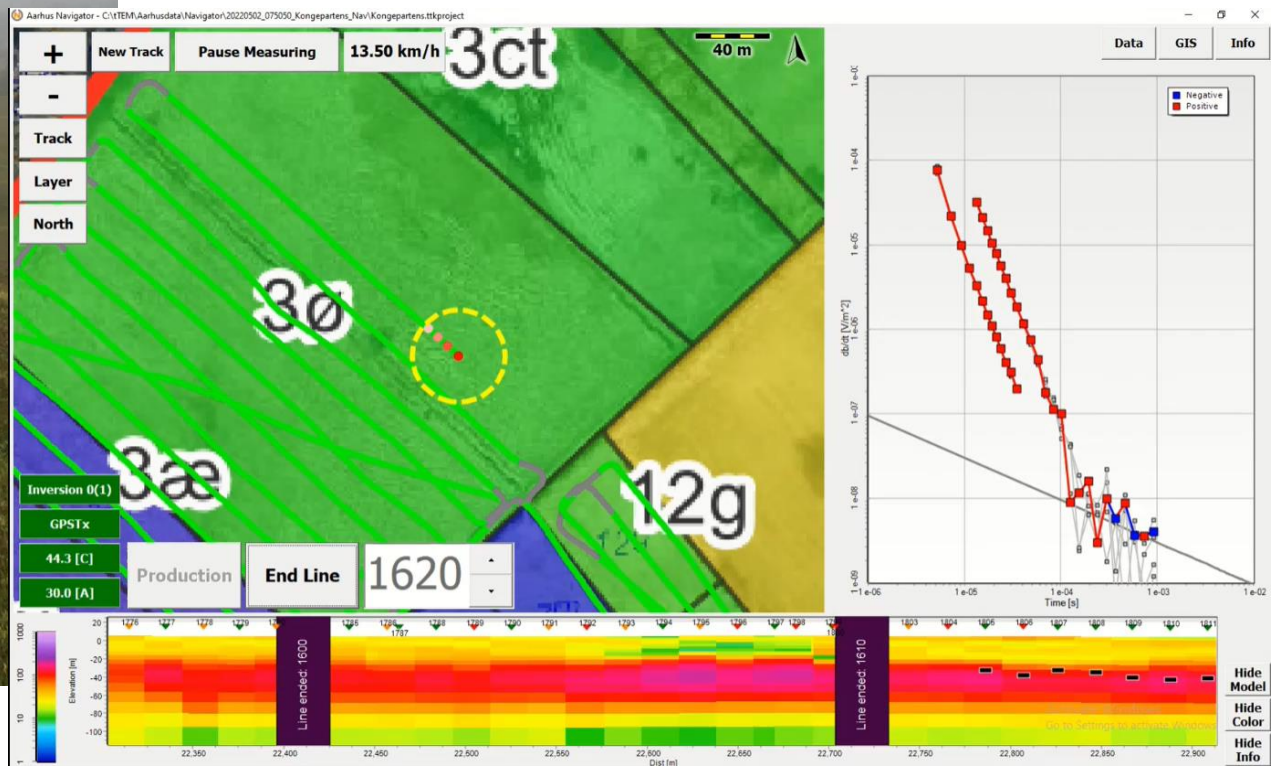




Figur: Aarhus Geoinstruments

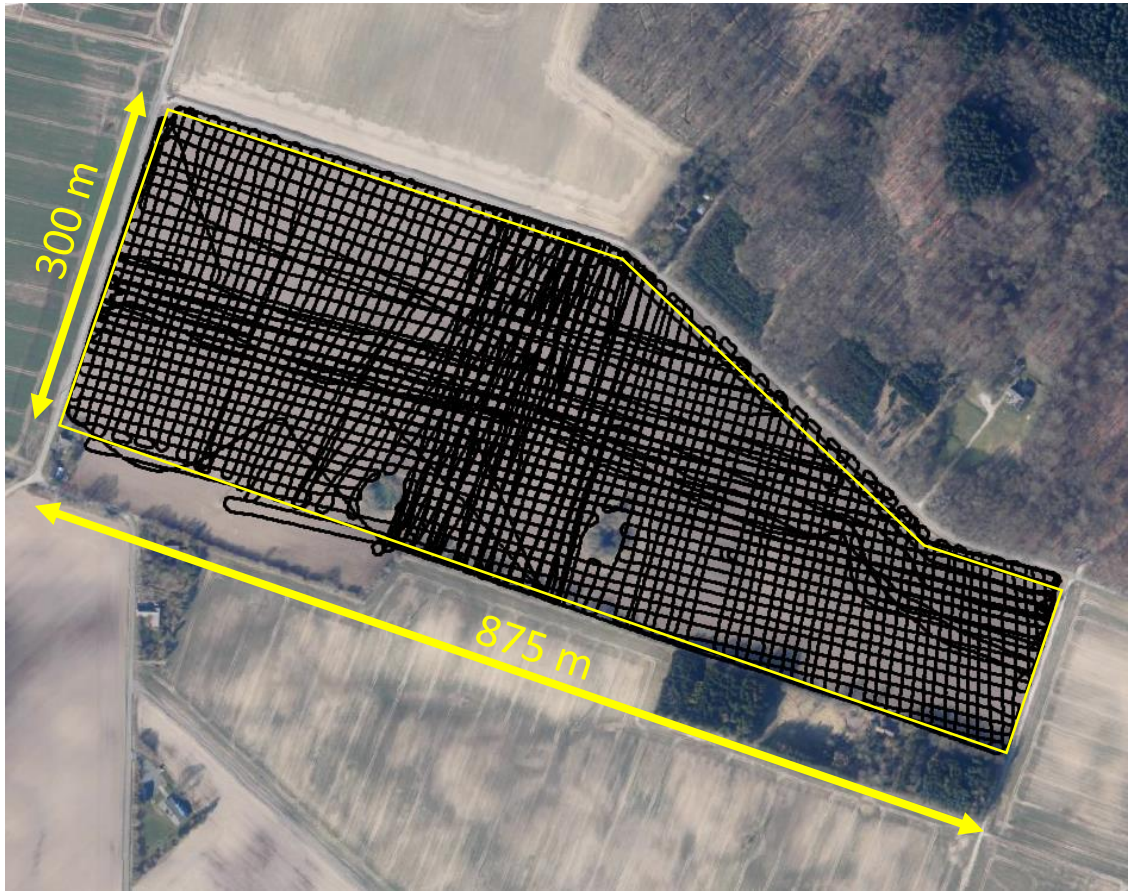
tTEM systemet – dataindsamling

tTEM dataindsamling
+ real time on-line data KS (!)

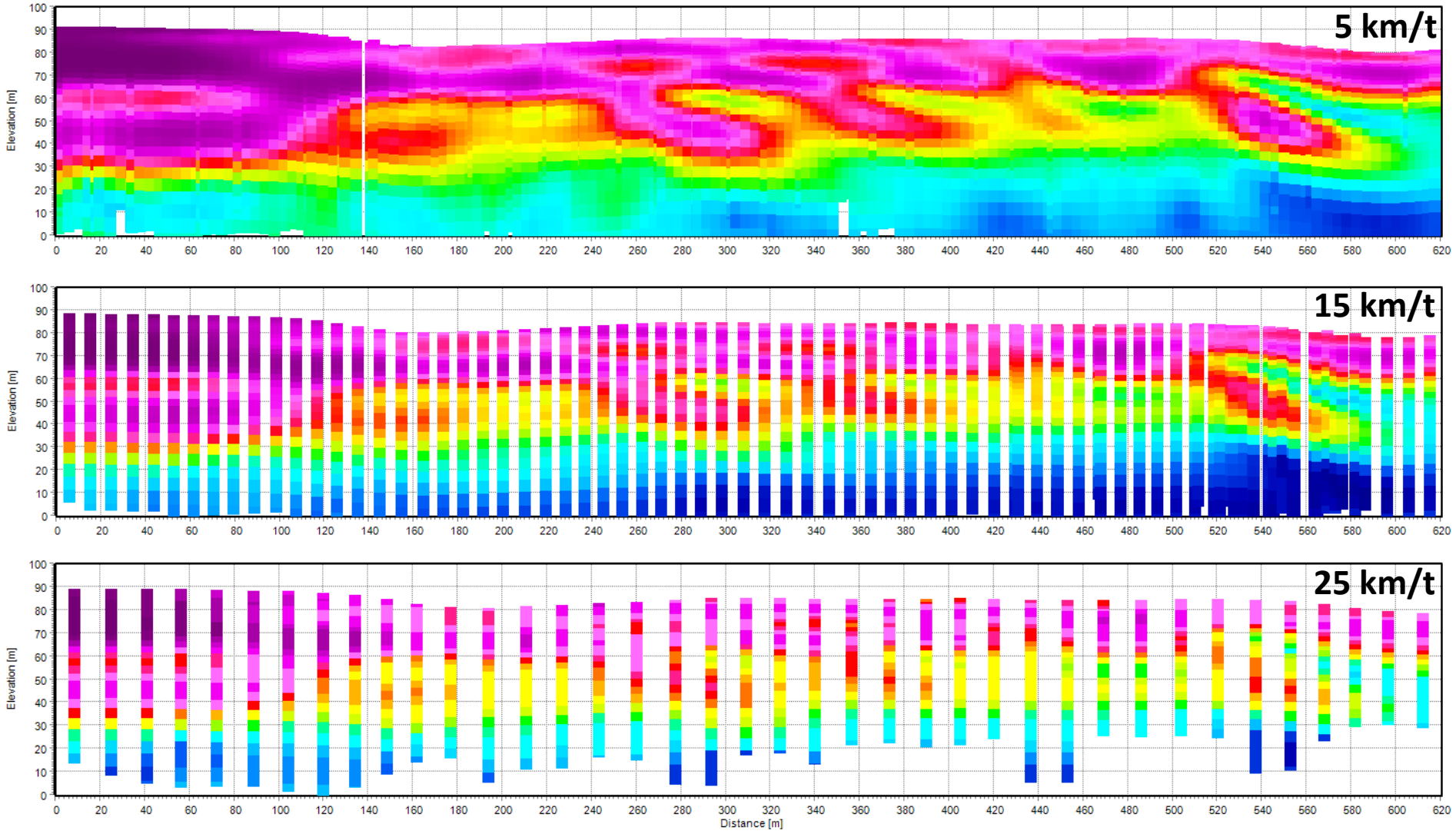


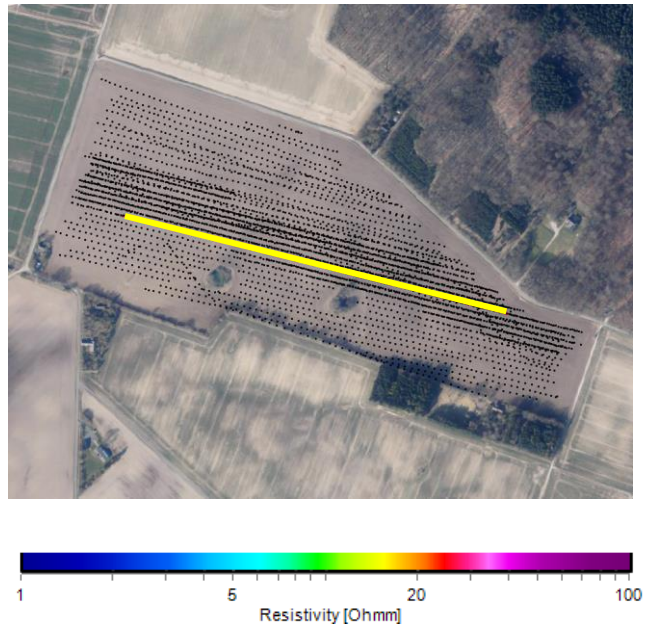
Betydning af parametervalg ved dataindsamling
Indflydelse fra indsamlingshastighed, linjeafstand og kørselsretning

- Testområde på ca. 20 ha
- Linjeafstand på 10 m, 20 m, 30 m og 40 m
- Dataindsamling i to retninger
- Hastigheder på 5 km/t, 15 km/t og 25 km/t



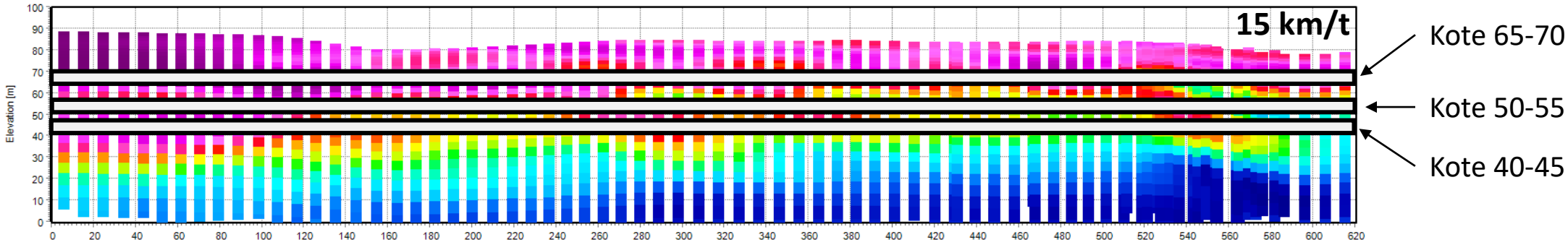
Test af indflydelse fra indsamlingshastighed, linjeafstand og kørselsretning





5 km/t = 1,4 m/s
15 km/t = 4,2 m/s
25 km/t = 6,9 m/s
Sonderinger udtaget for hver 2 sek.

Test af indflydelse fra indsamlingshastighed, linjeafstand og kørselsretning

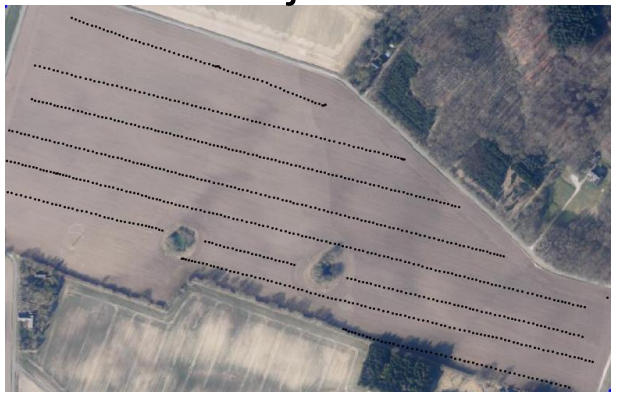


Linjeafstand 10 m

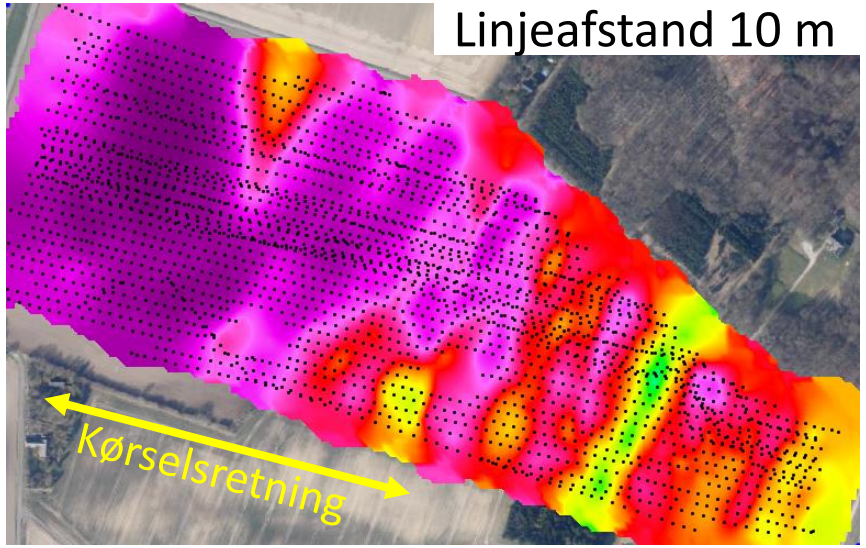
Linjeafstand 20 m

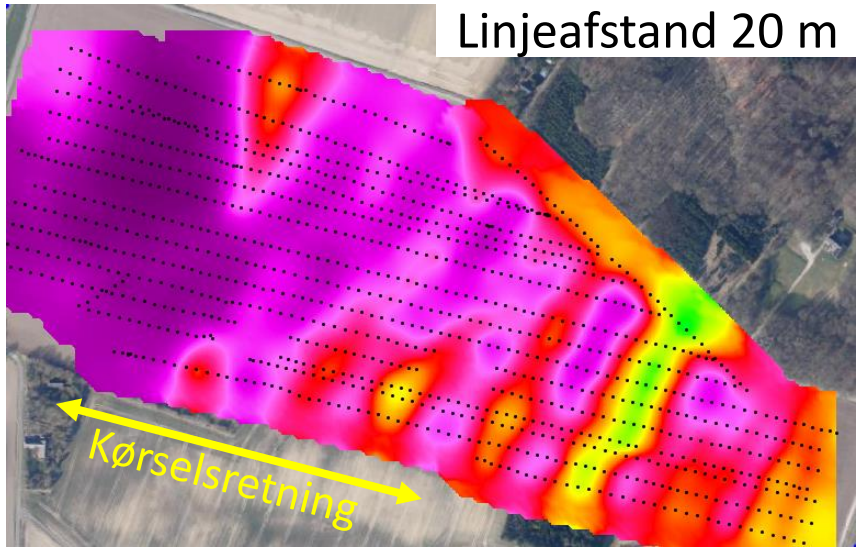
Linjeafstand 30 m

Linjeafstand 40 m

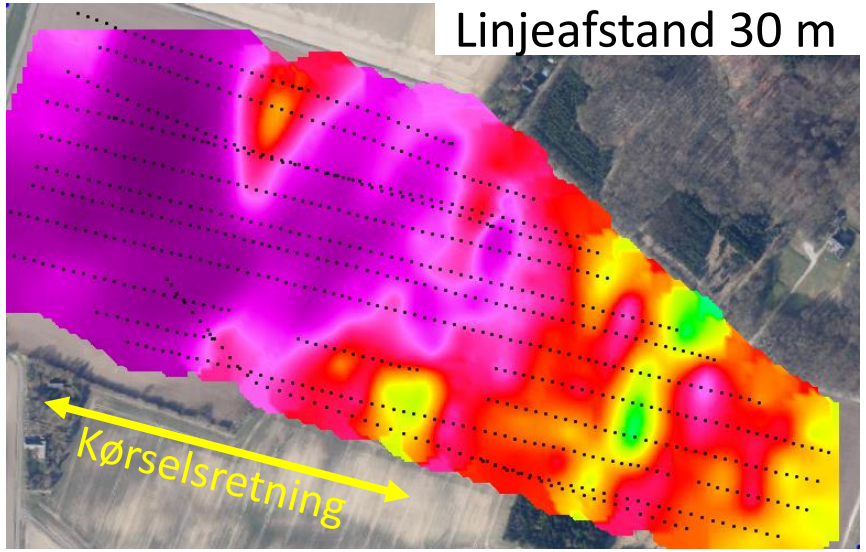


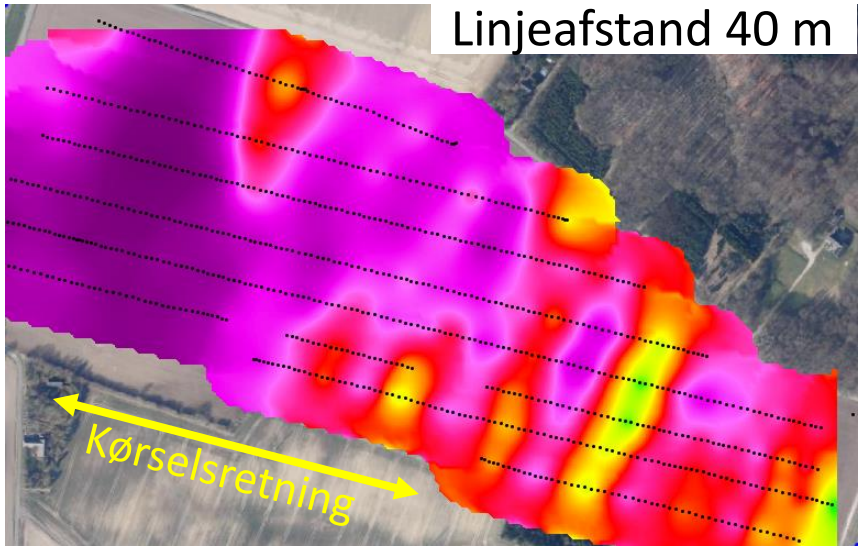
Test af indflydelse fra indsamlingshastighed, linjeafstand og kørselsretning

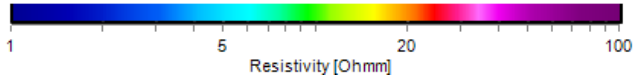




15 km/t
Kote 65-70

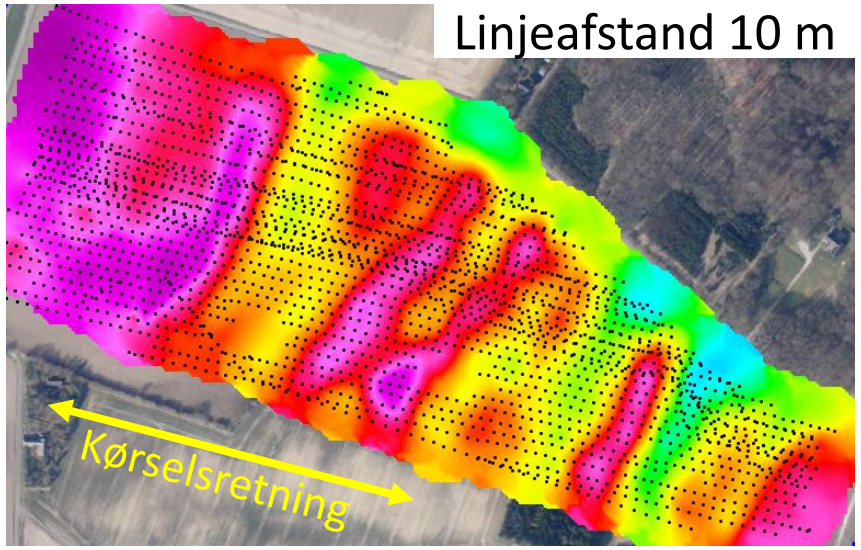


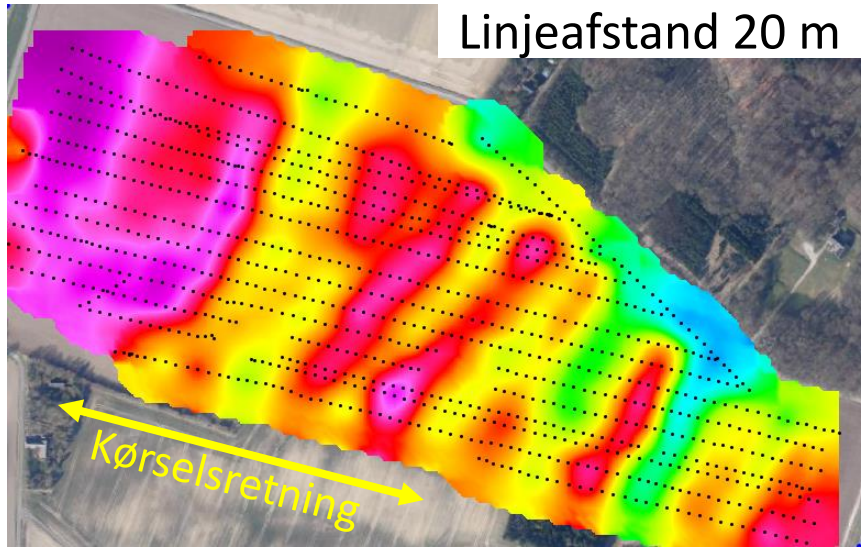




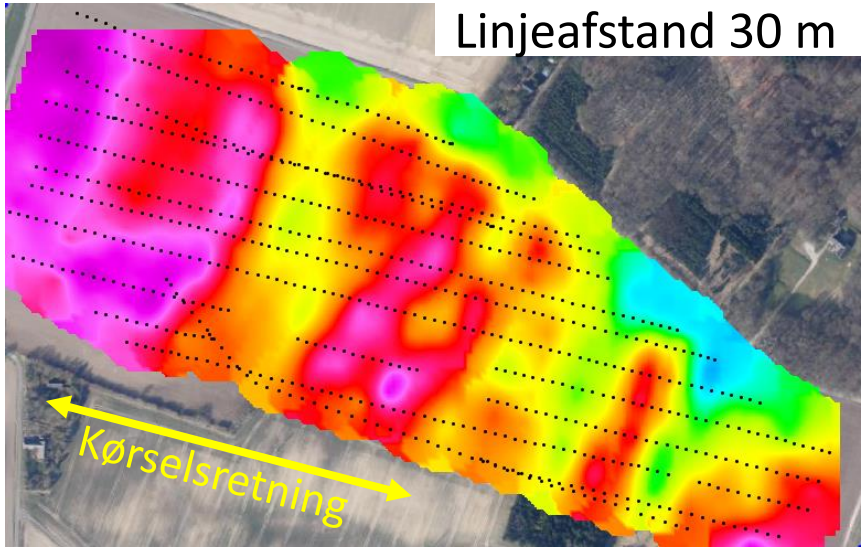
5 x 5 m grid
Kriging
Søgeradius 40 m

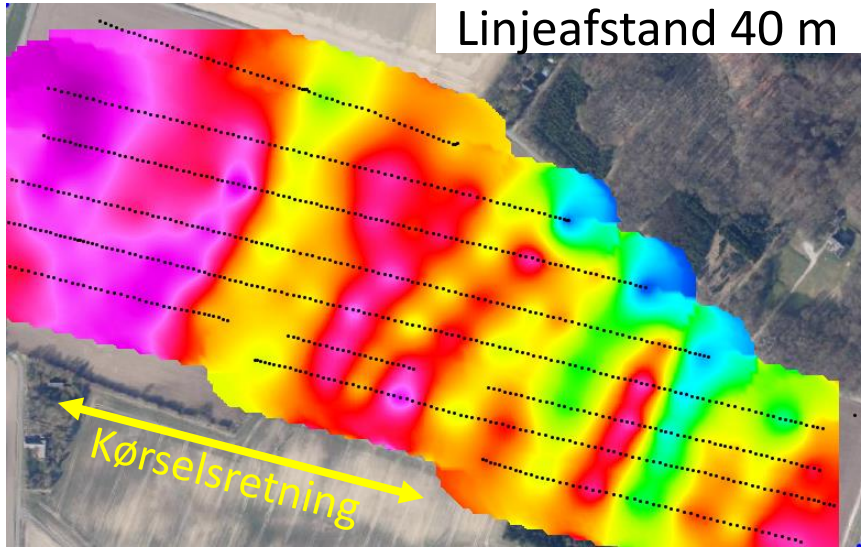
Test af indflydelse fra indsamlingshastighed, linjeafstand og kørselsretning

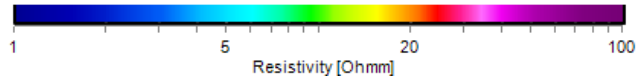




15 km/t
Kote 50-55

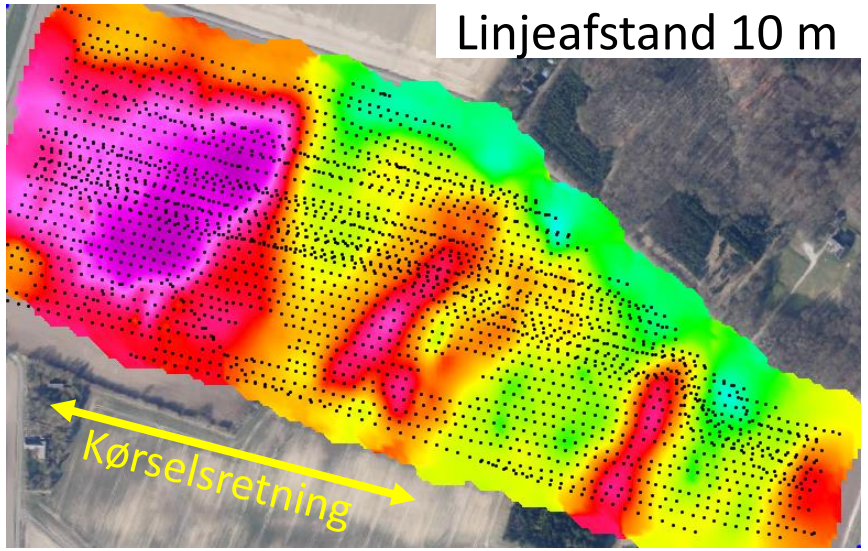


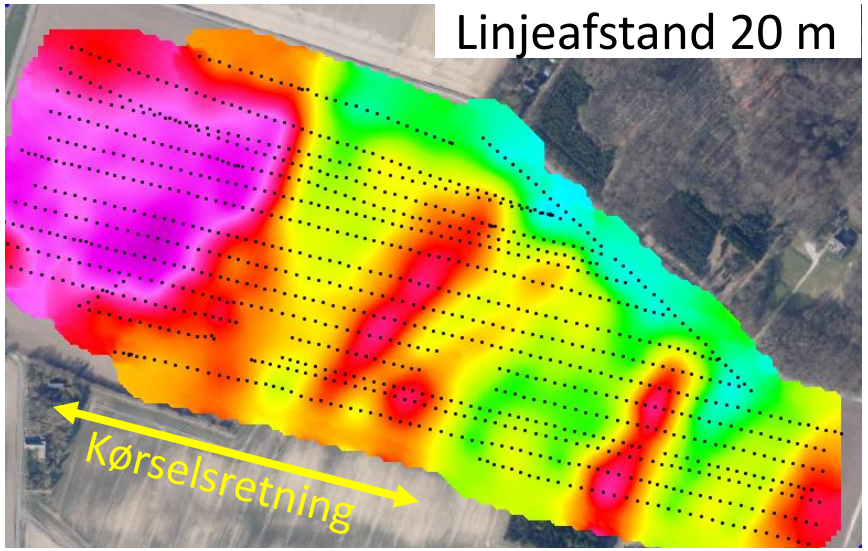




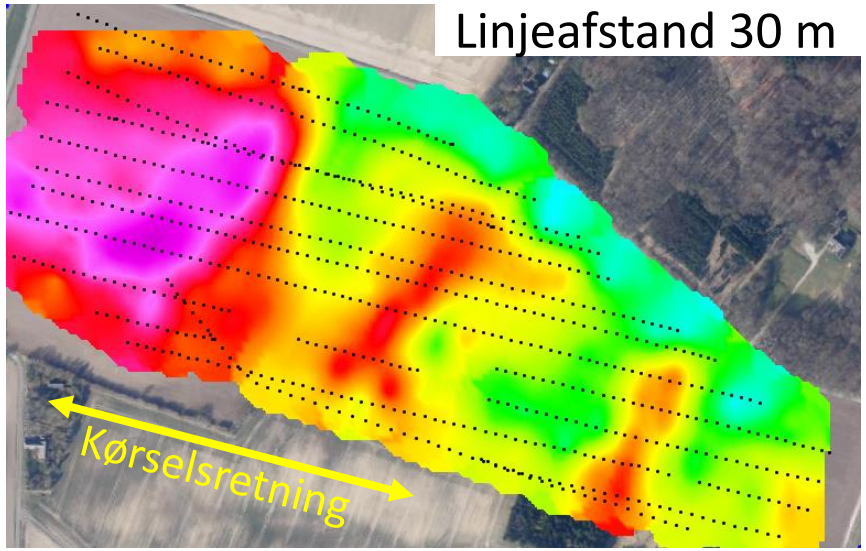
5 x 5 m grid
Kriging
Søgeradius 40 m

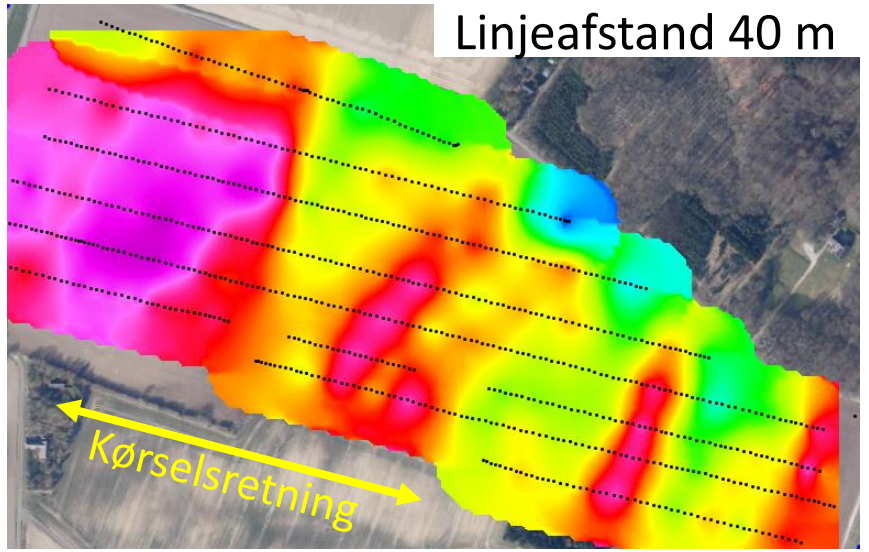
Test af indflydelse fra indsamlingshastighed, linjeafstand og kørselsretning

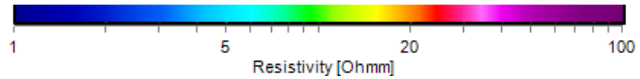




15 km/t
Kote 40-45

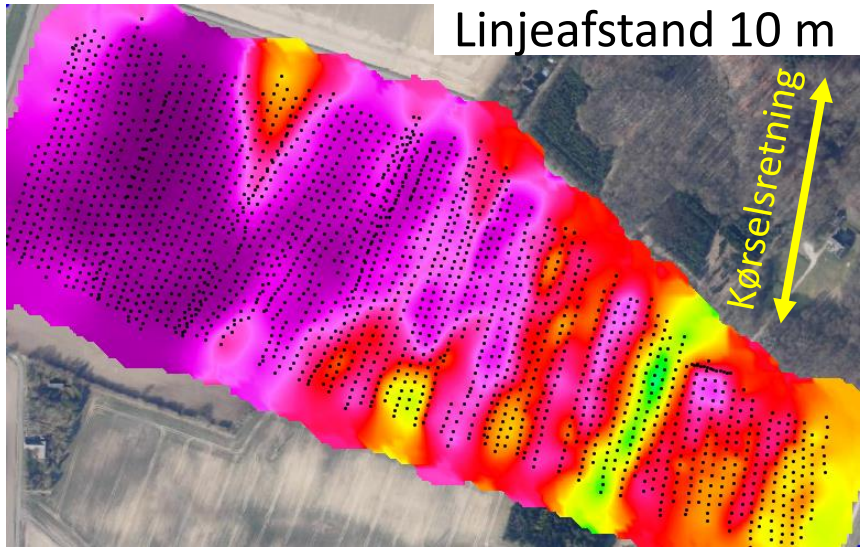


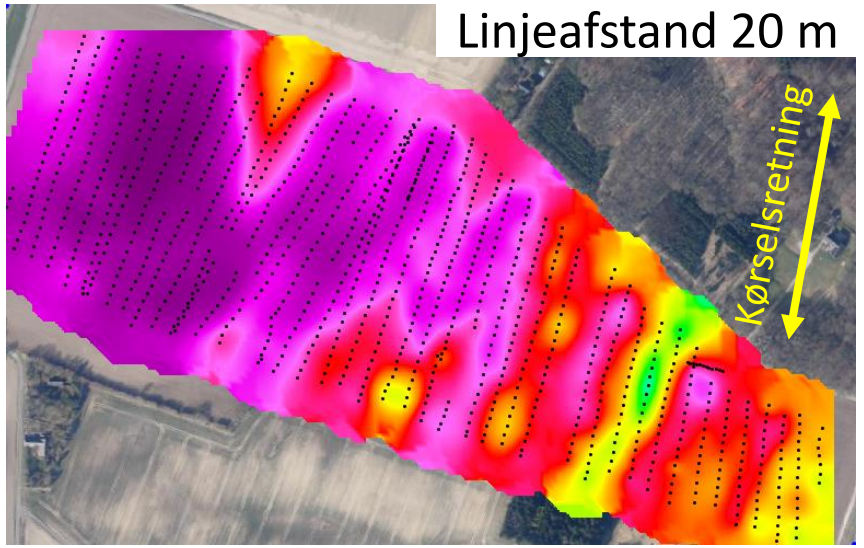




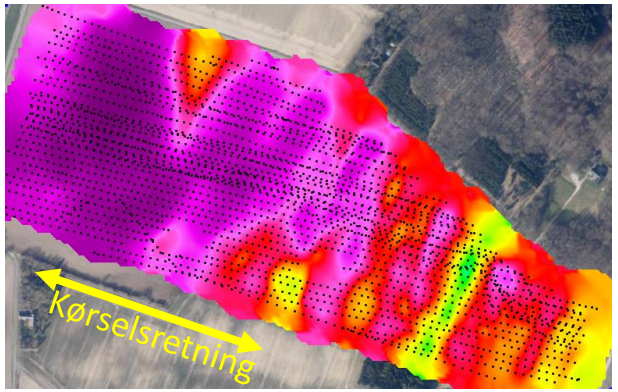
5 x 5 m grid
Kriging
Søgeradius 40 m

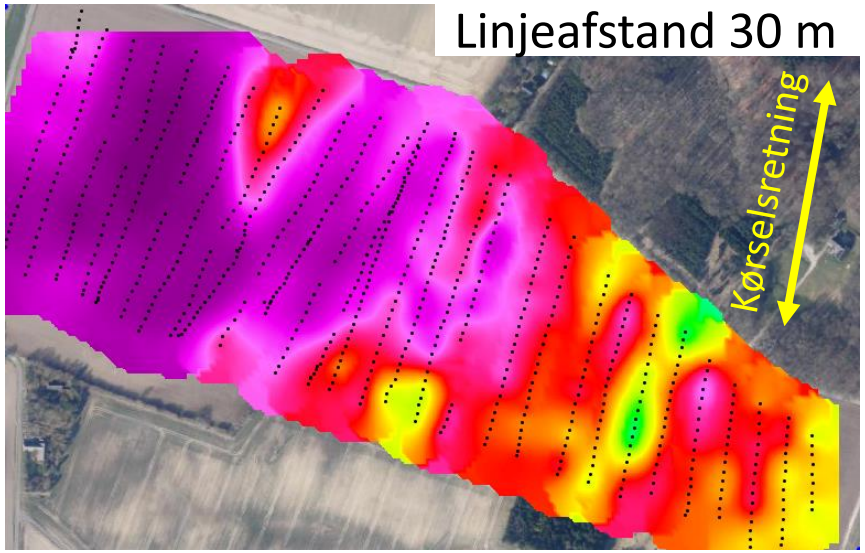
Test af indflydelse fra indsamlingshastighed, linjeafstand og kørselsretning

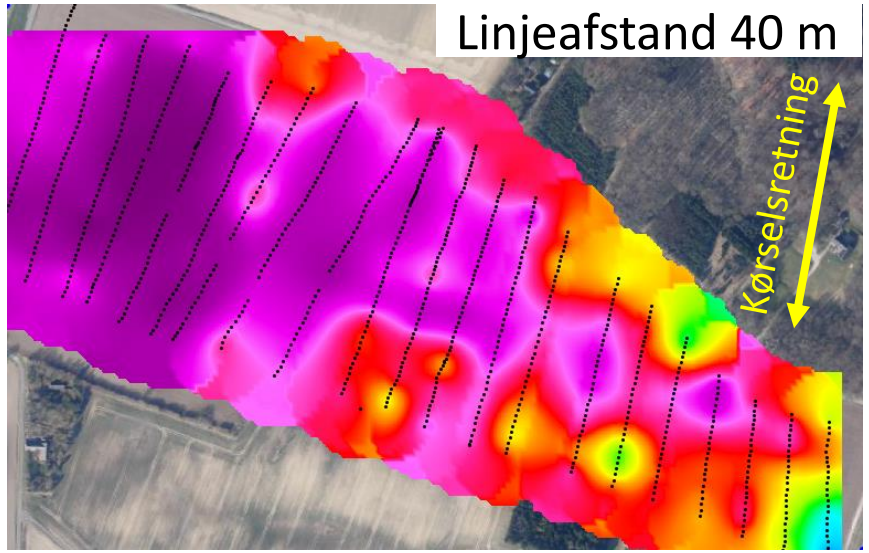


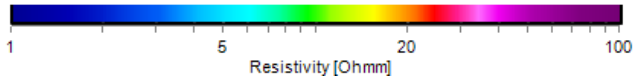


15 km/t
Kote 65-70



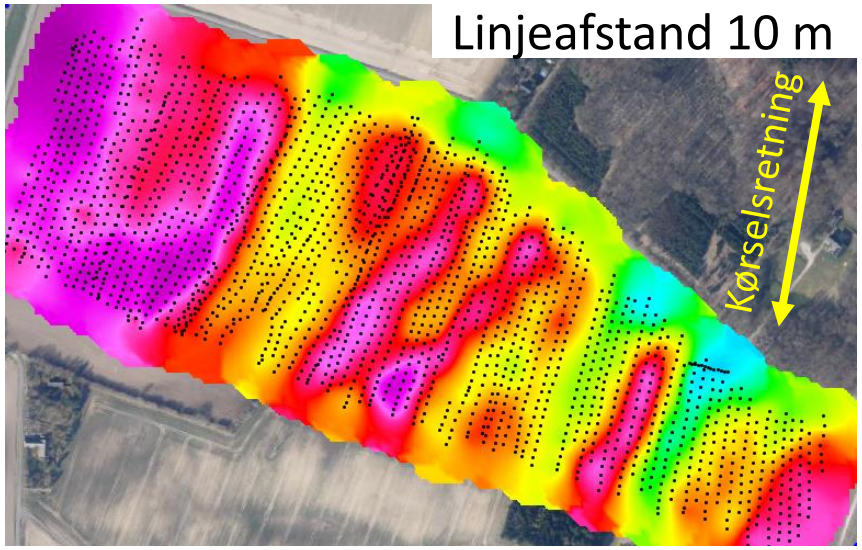


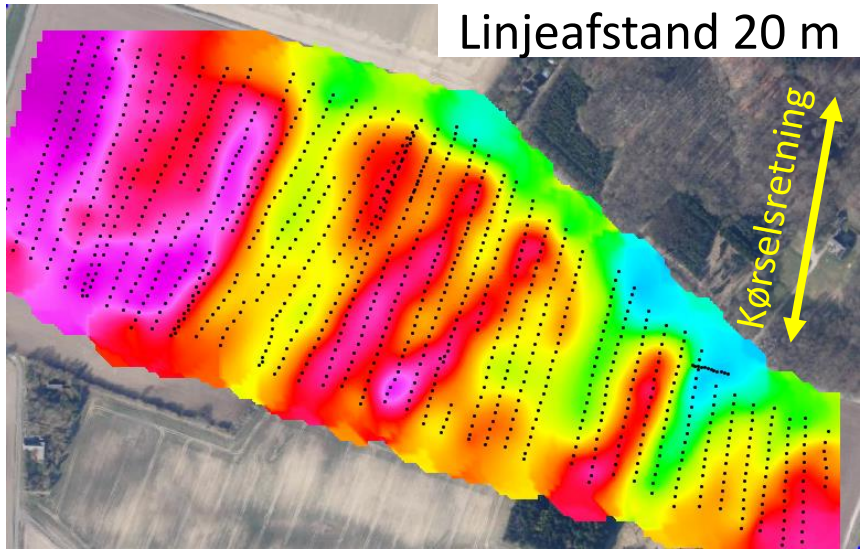




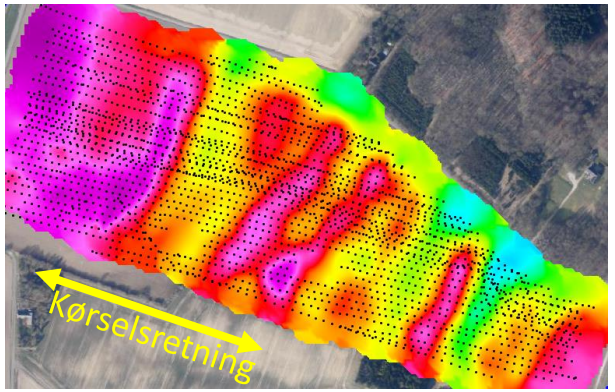
5 x 5 m grid
Kriging
Søgeradius 40 m

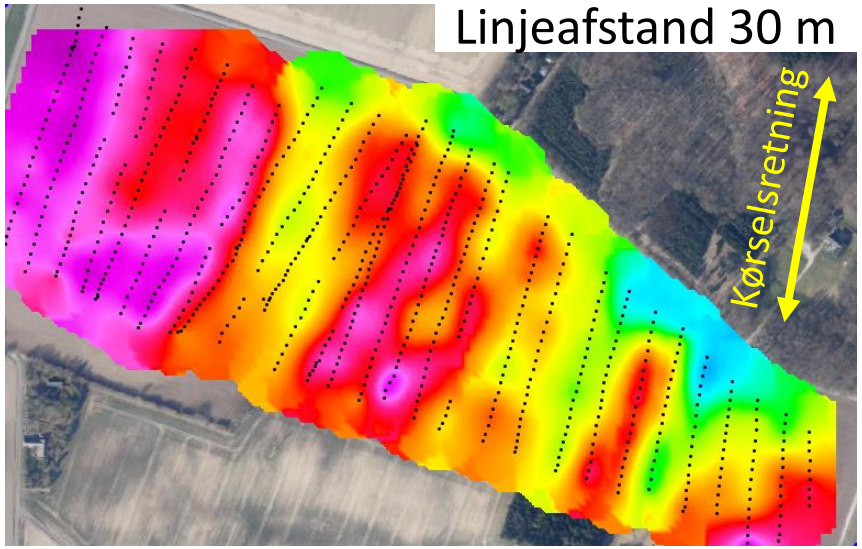
Test af indflydelse fra indsamlingshastighed, linjeafstand og kørselsretning

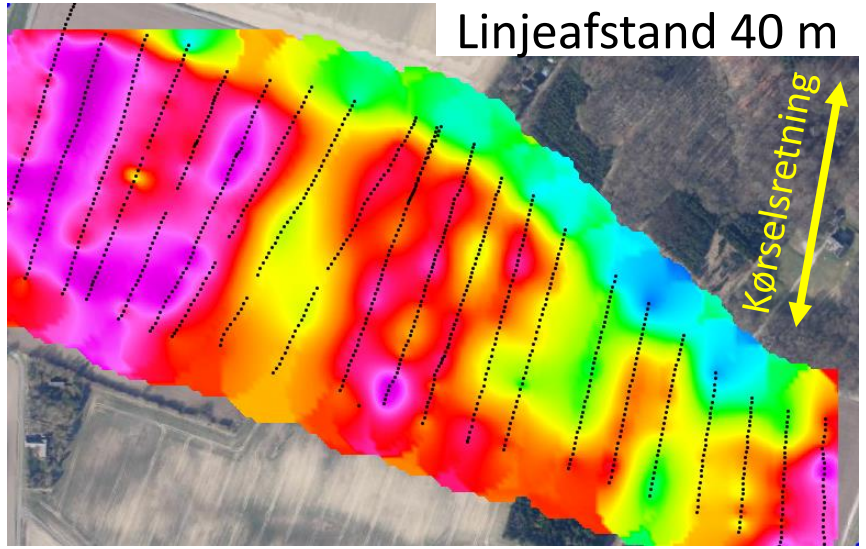


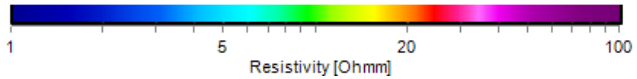


15 km/t
Kote 50-55



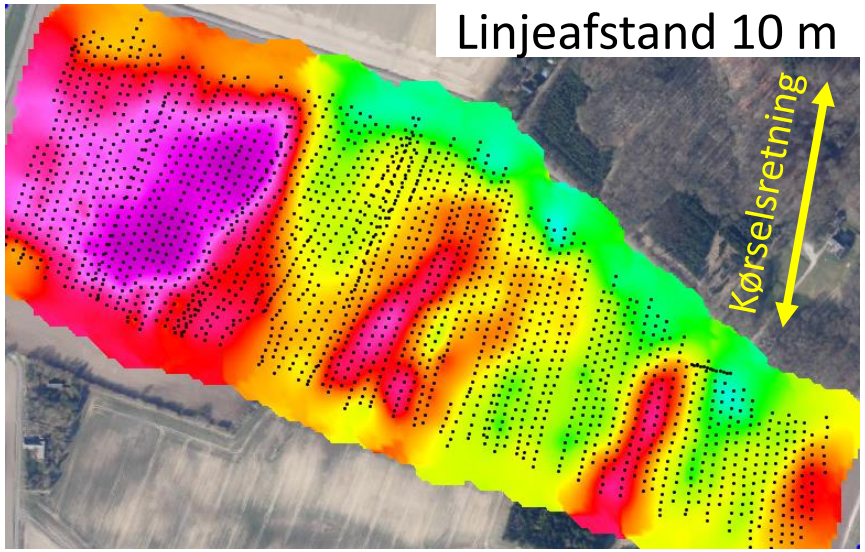


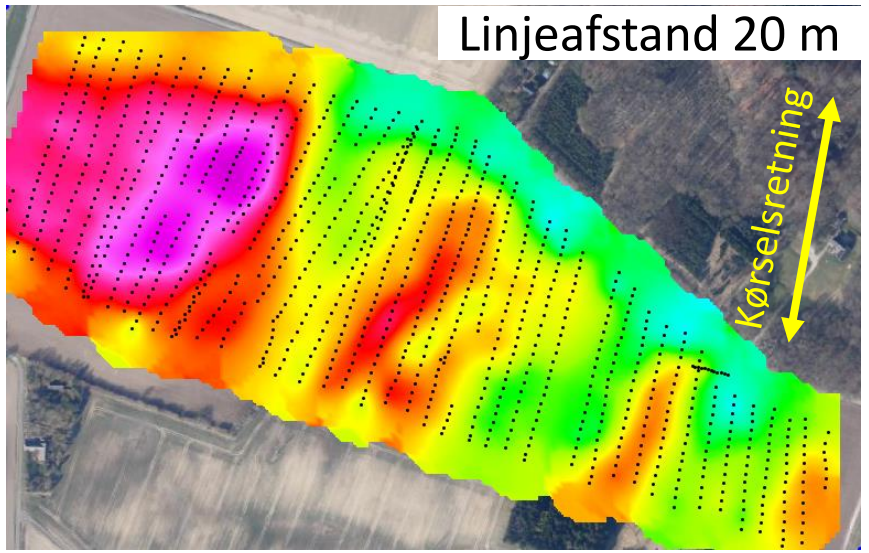




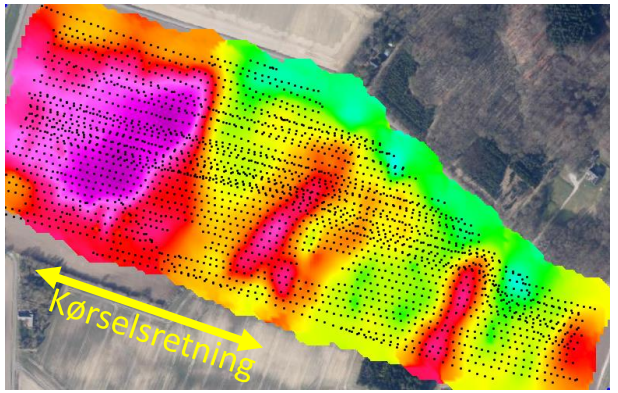
5 x 5 m grid
Kriging
Søgeradius 40 m

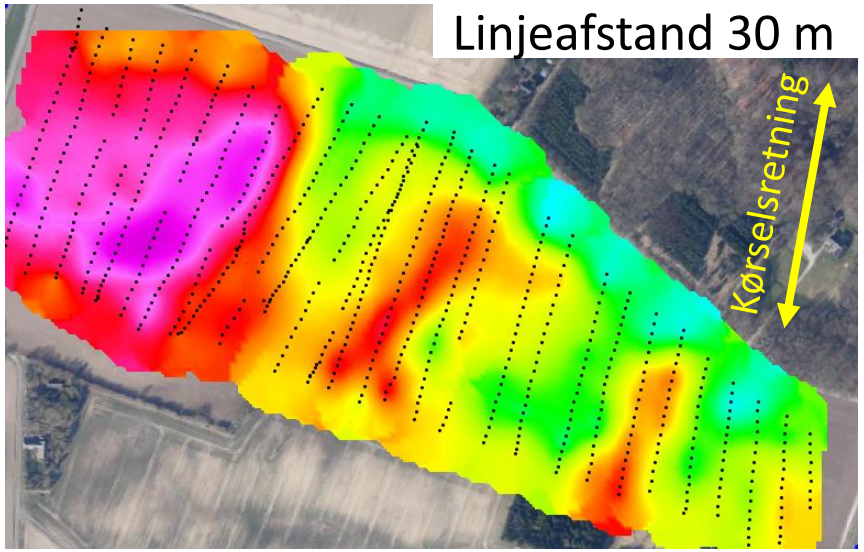
Test af indflydelse fra indsamlingshastighed, linjeafstand og kørselsretning

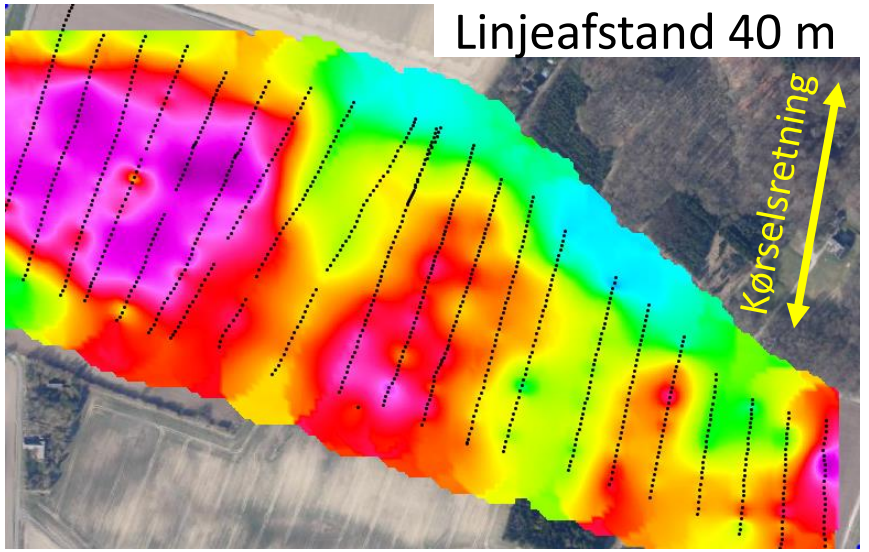


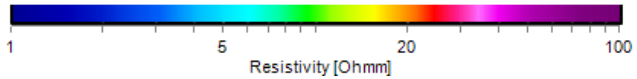


15 km/t
Kote 40-45



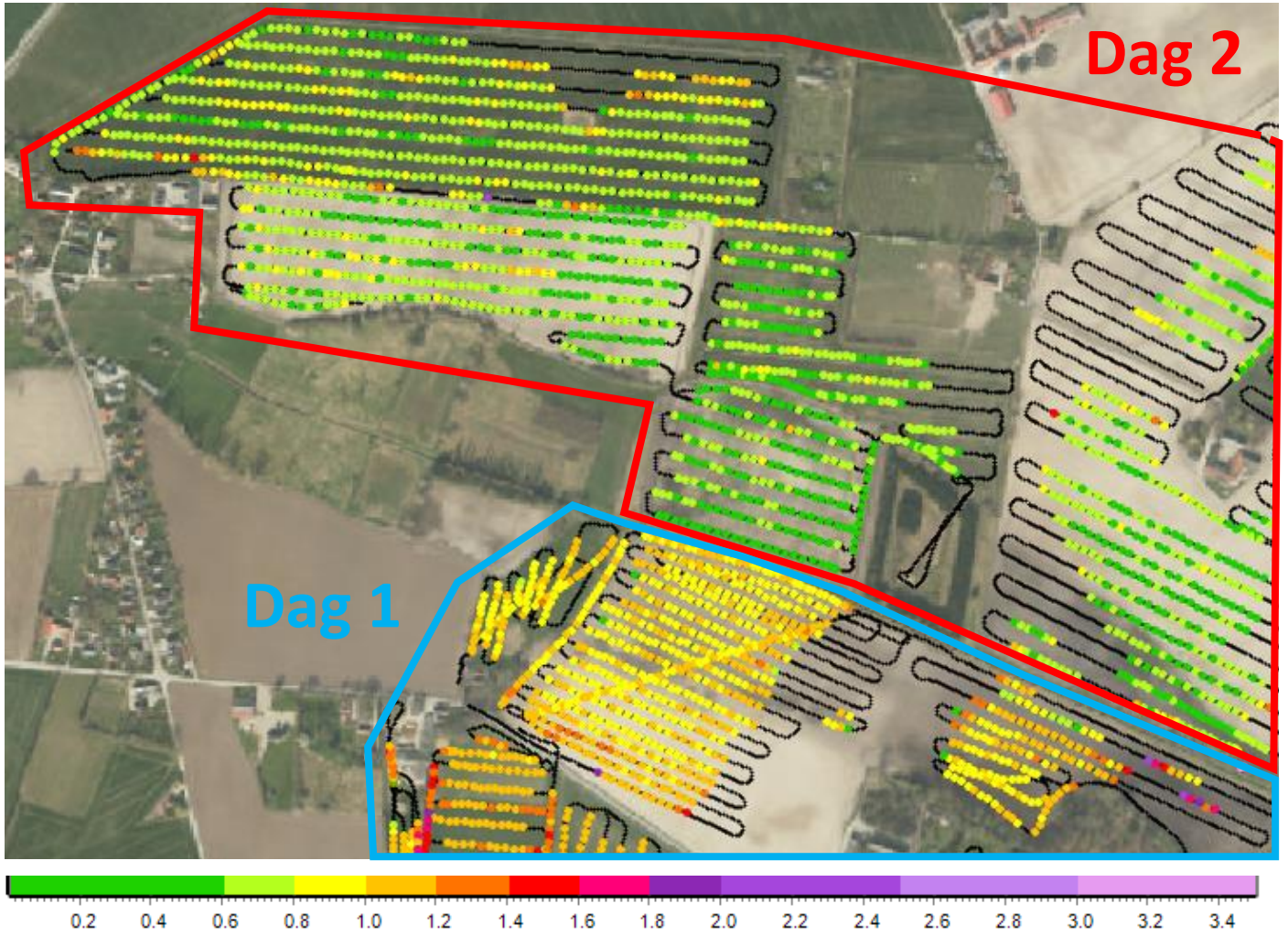






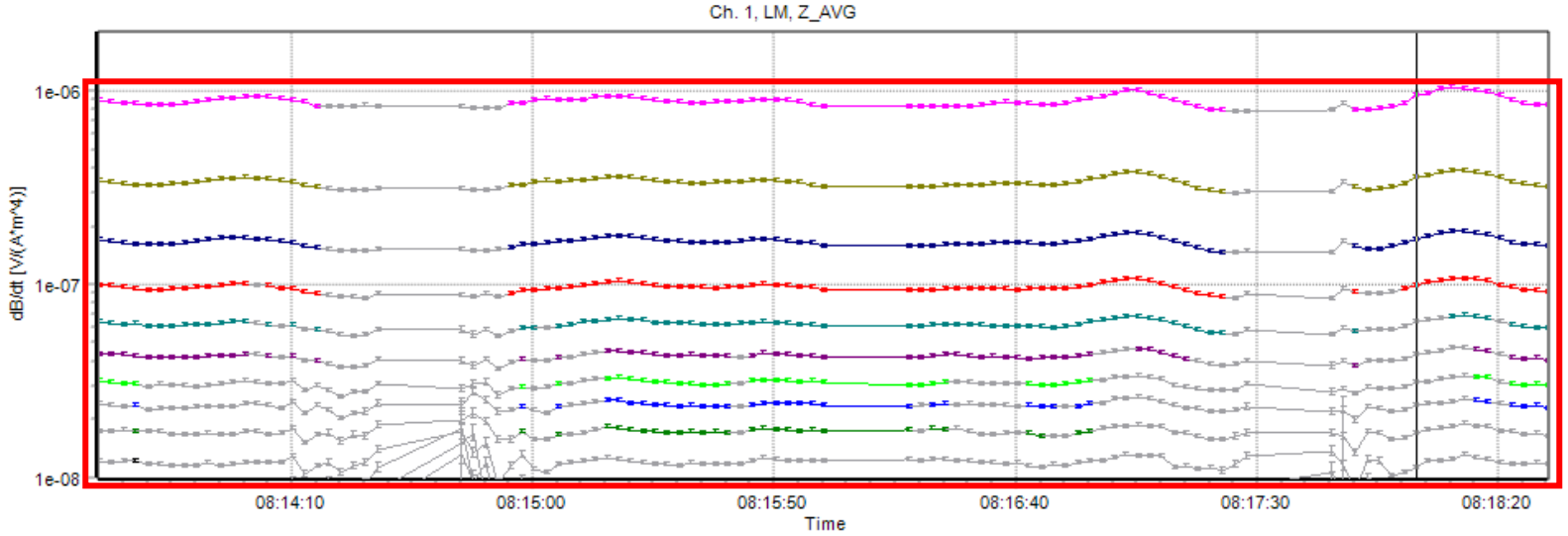
5 x 5 m grid
Kriging
Søgeradius 40 m

System verifikation og datareproduktion

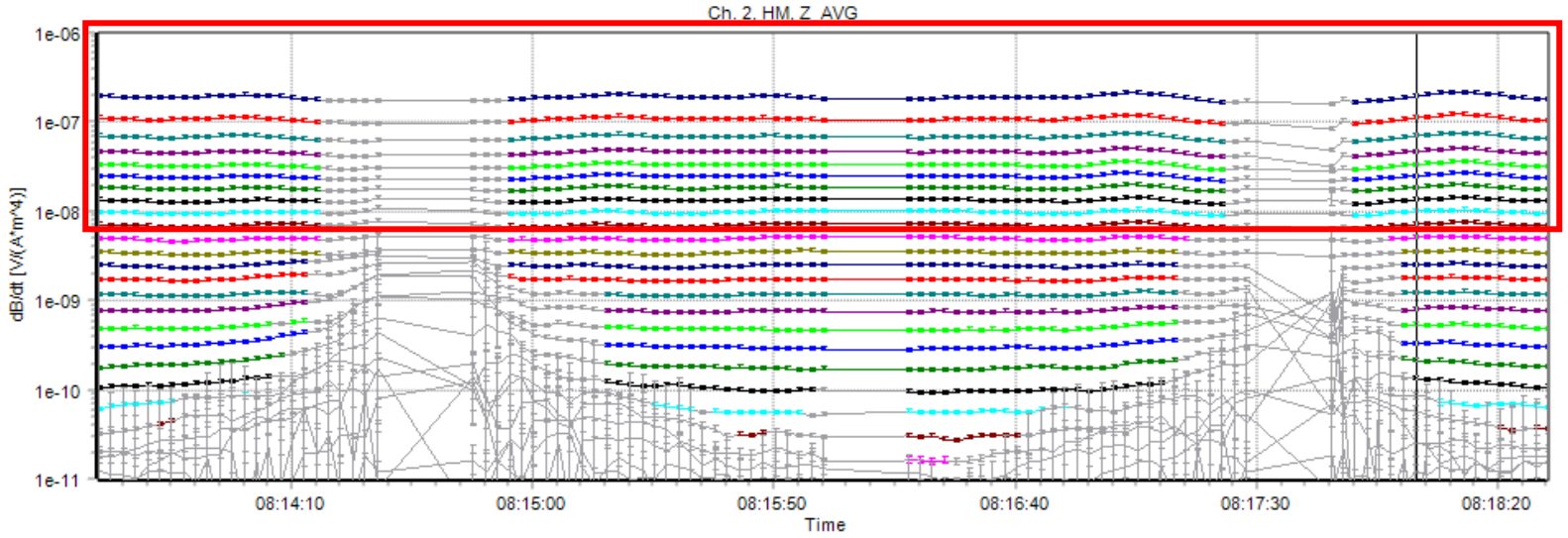


Dataresidual

System verifikation og datareproduktion

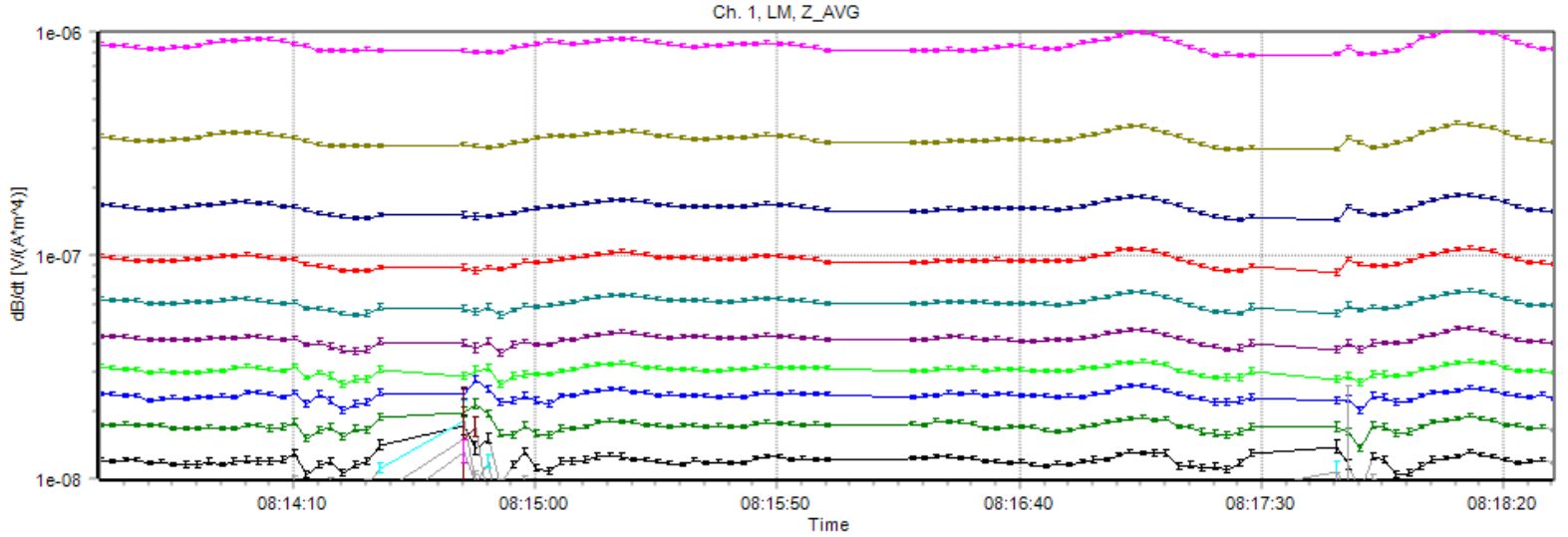


Dag 1 LM
Average Data

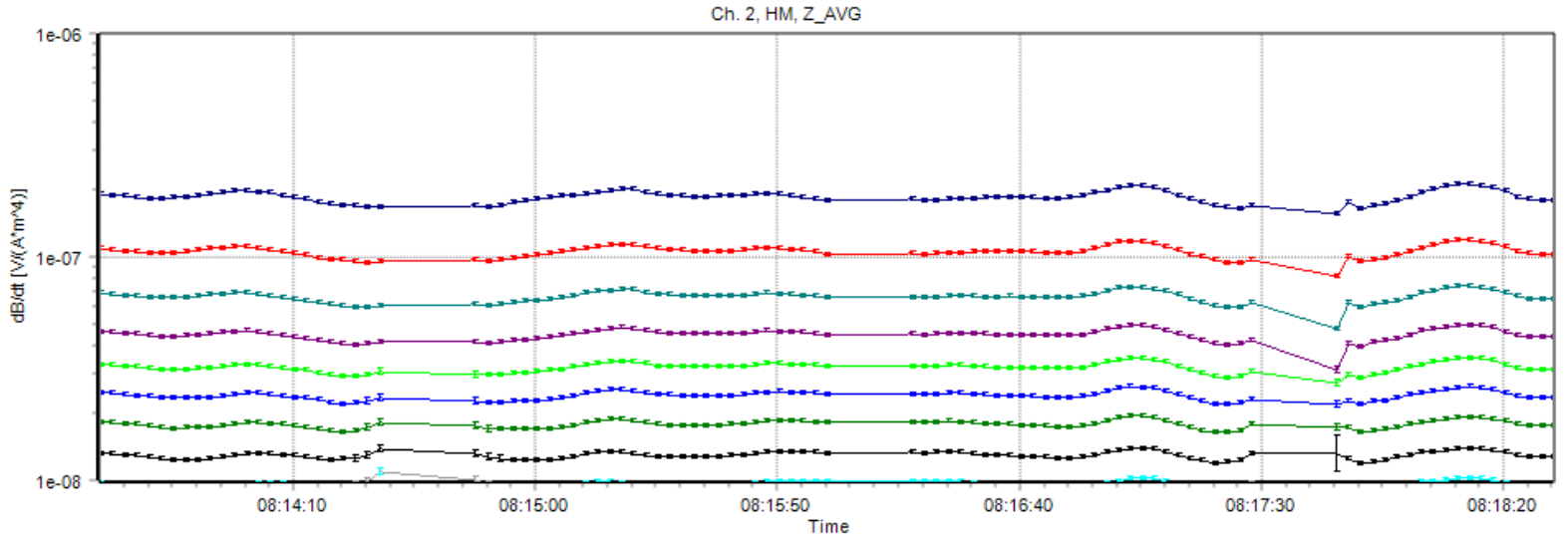


Dag 1 HM
Average Data

System verifikation og datareproduktion

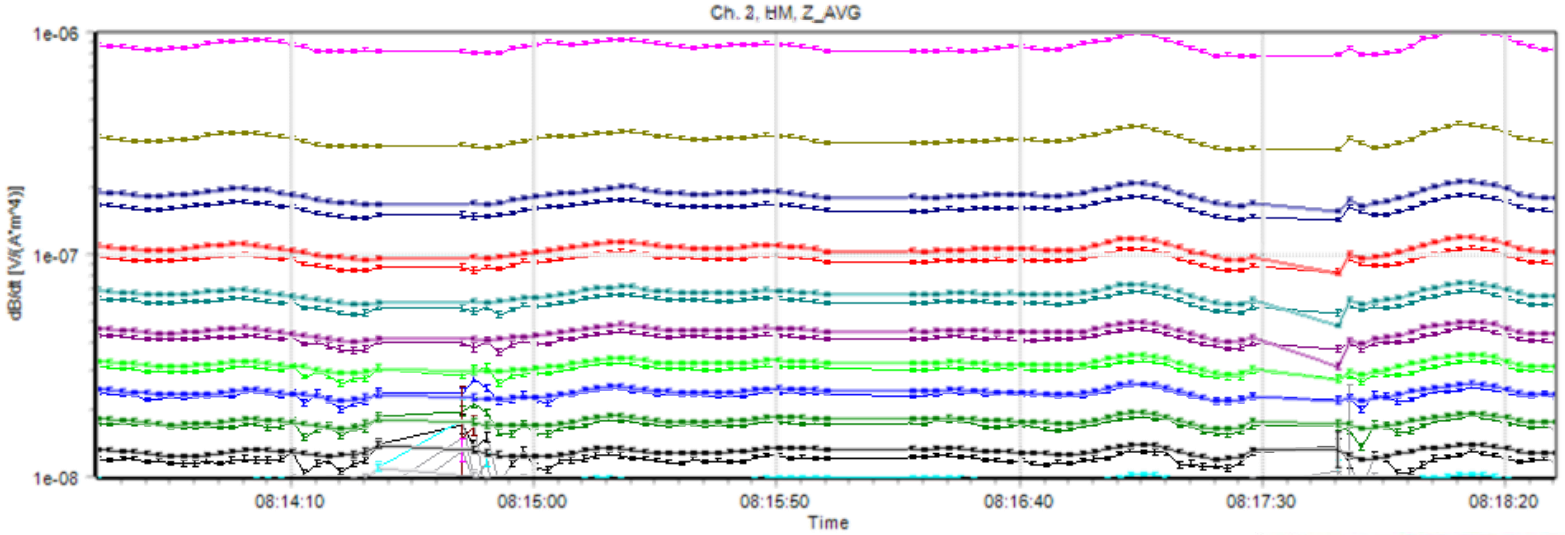


Dag 1 LM
Average Data

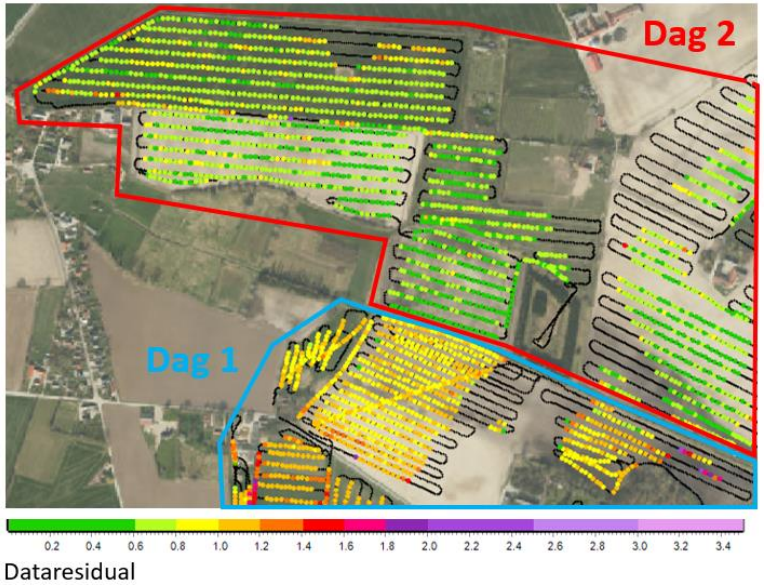


Dag 1 HM
Average Data

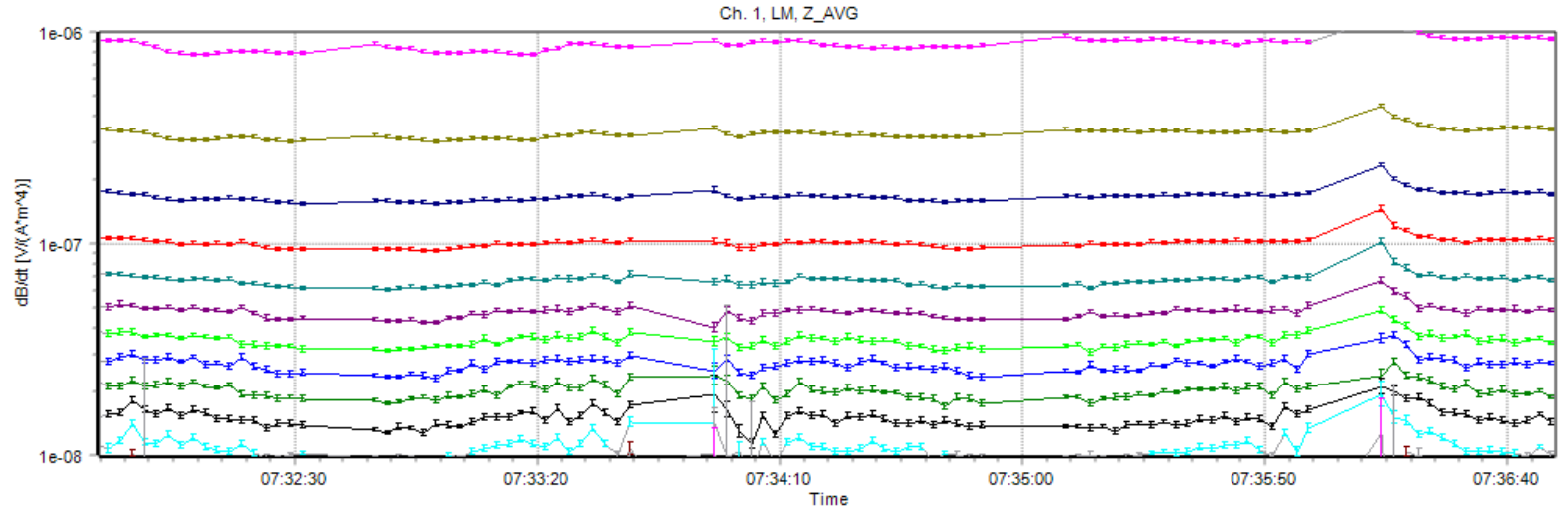
System verifikation og datareproduktion



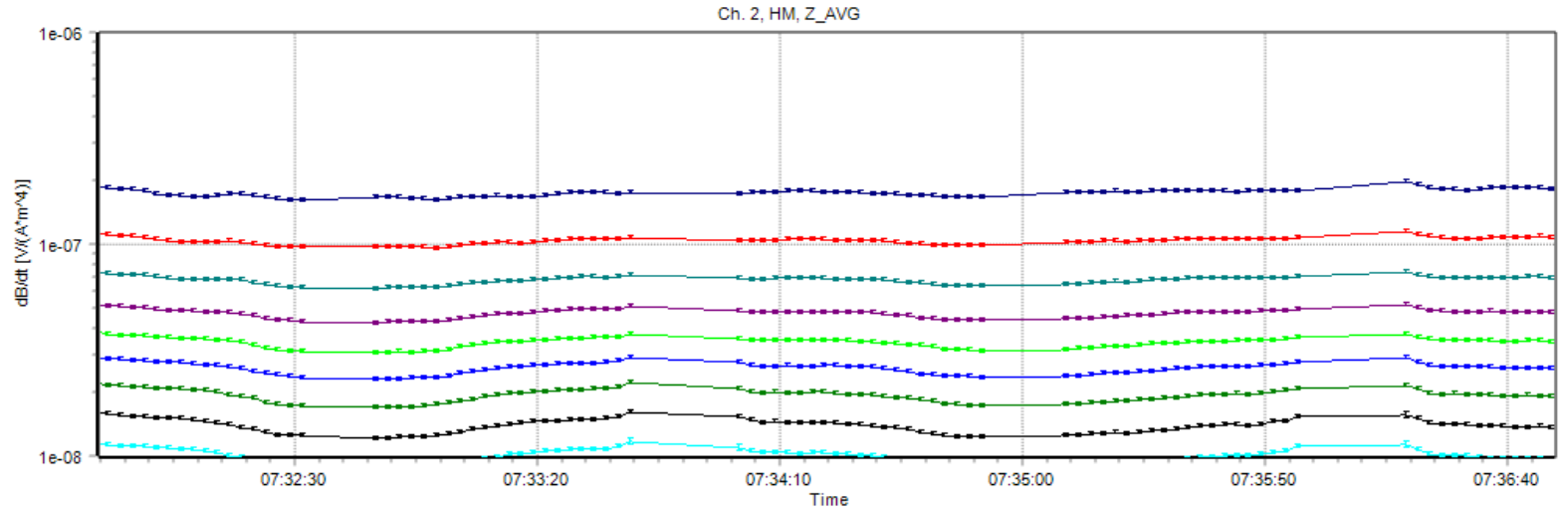
Dag 1 LM, HM
Average Data



System verifikation og datareproduktion

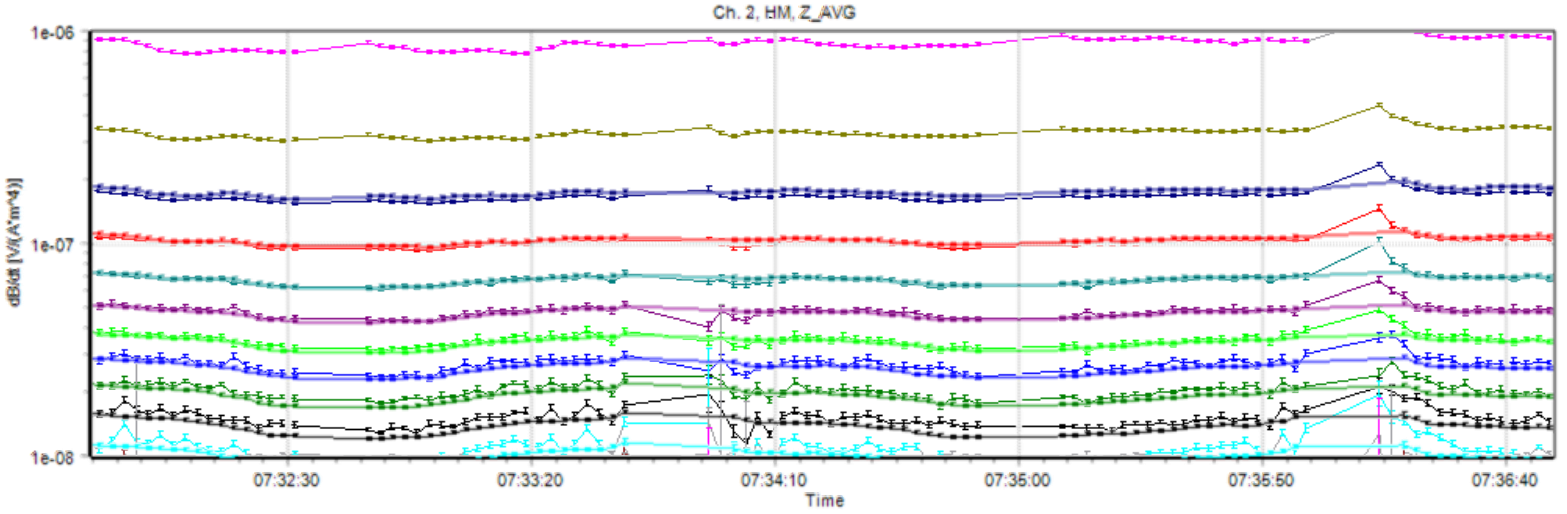


Dag 2 LM
Average Data

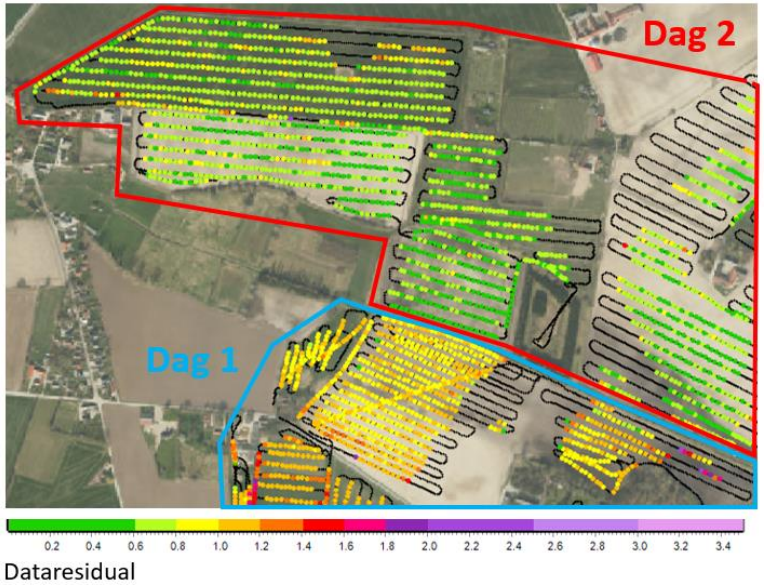


Dag 2 HM
Average Data

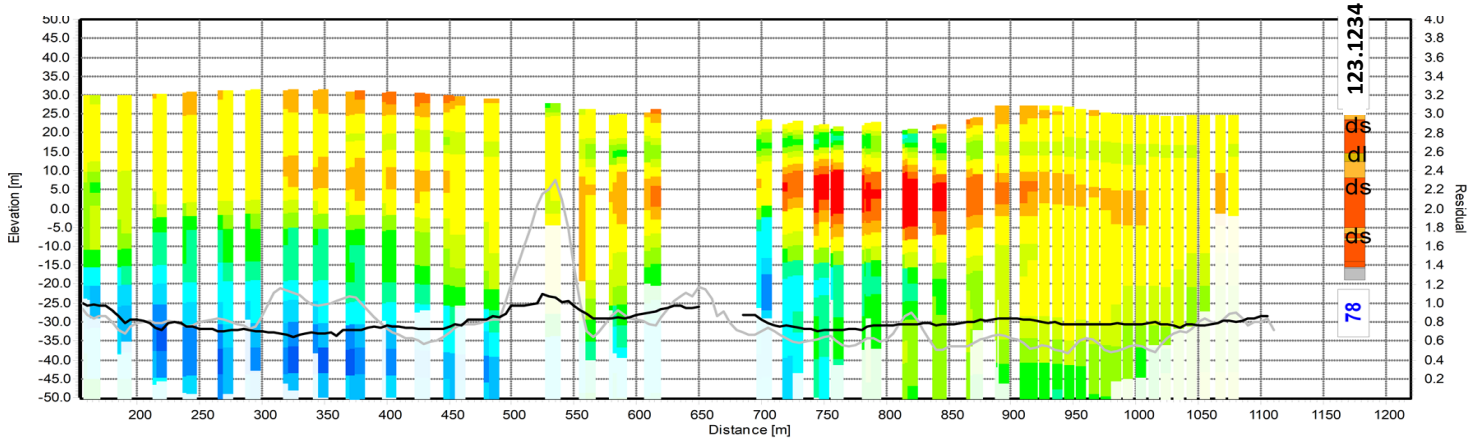
System verifikation og datareproduktion

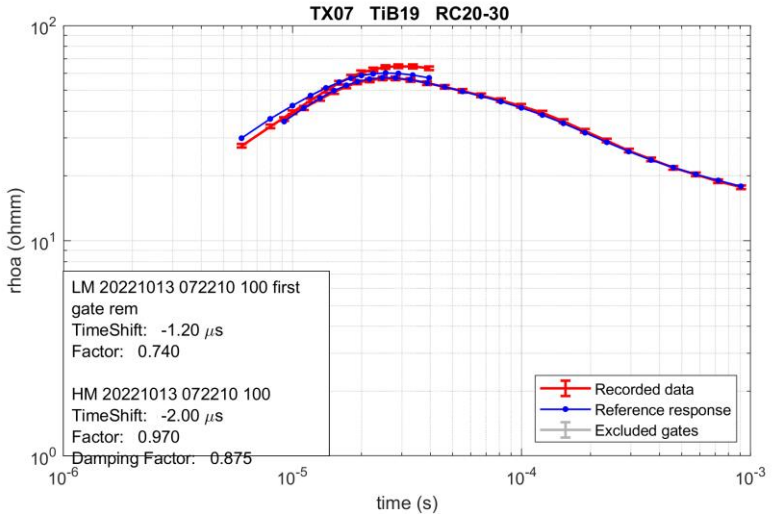


Dag 2 LM, HM
Average Data

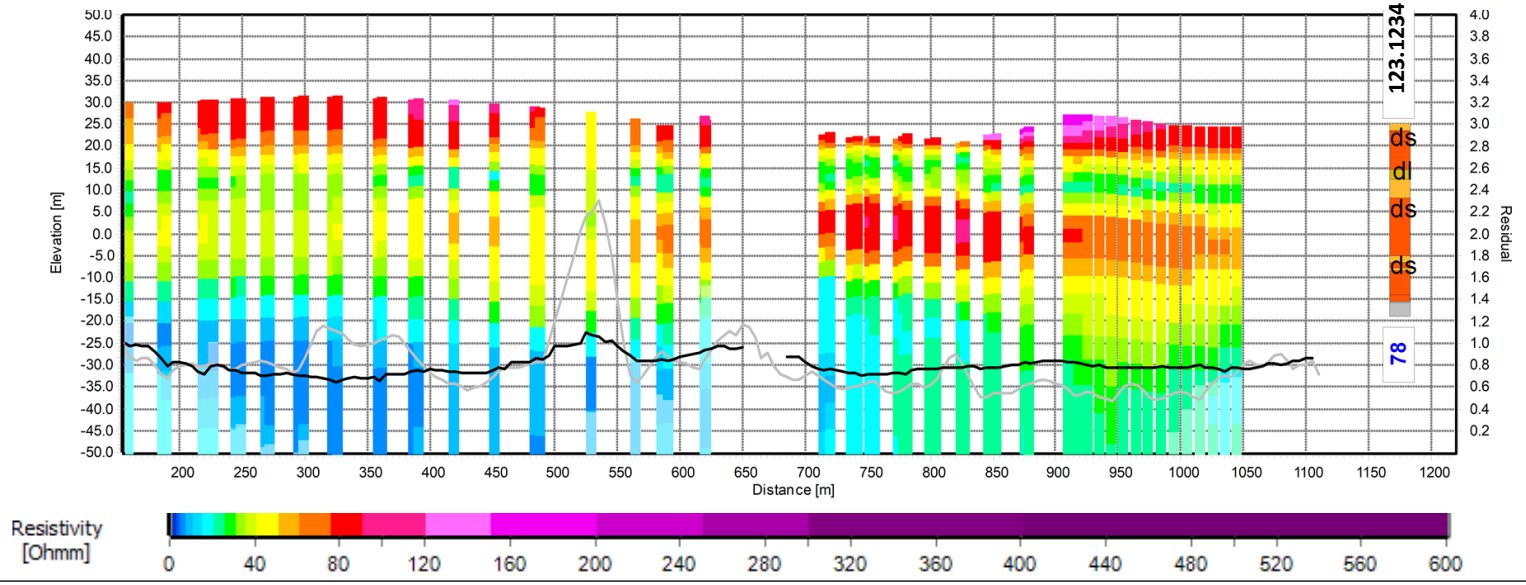


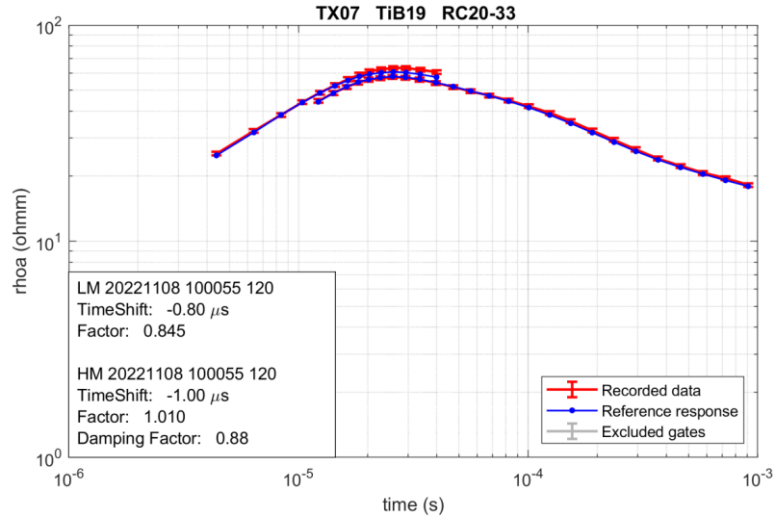
System verifikation og datareproduktion



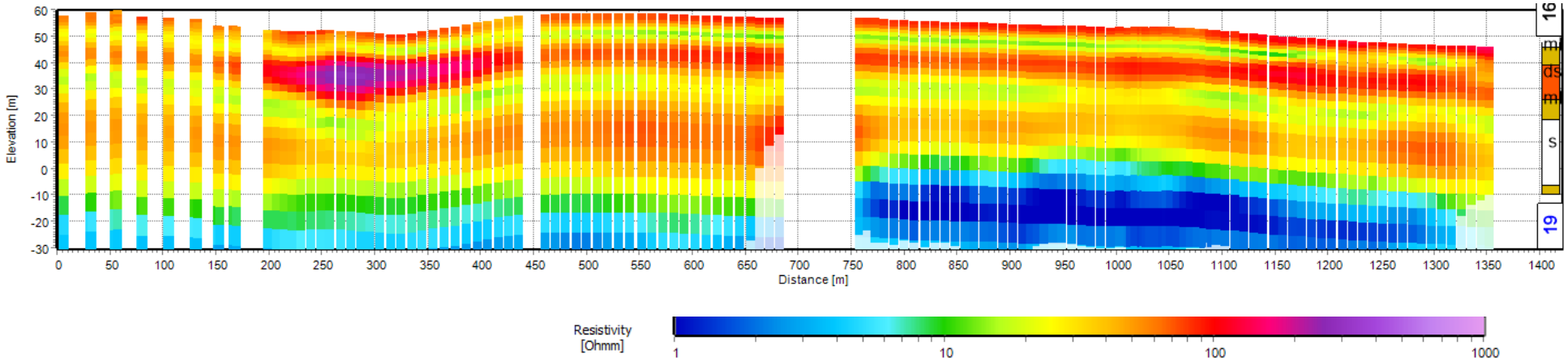


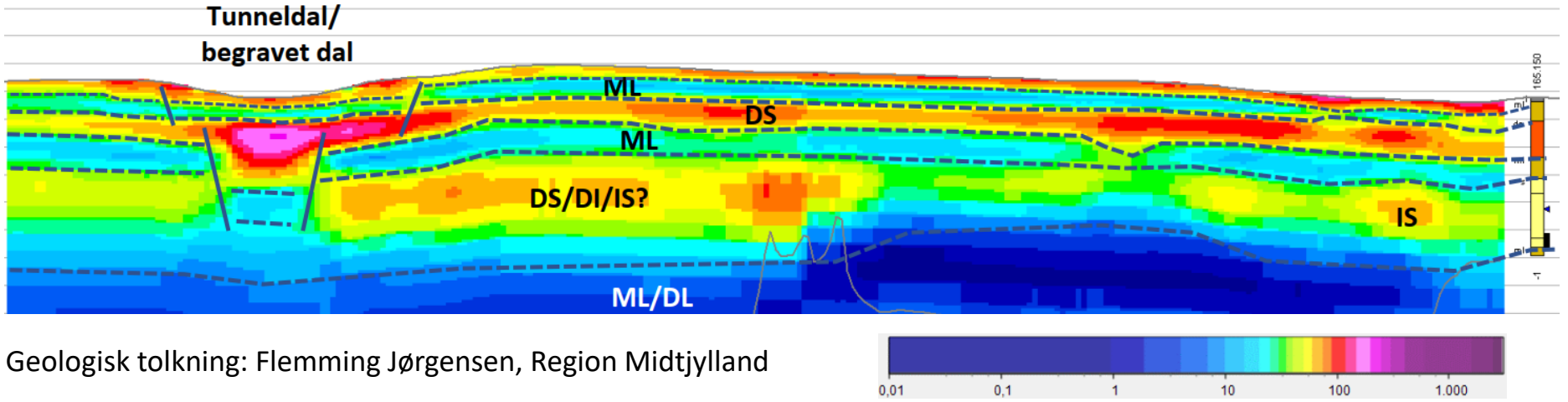
Ny modtage-antenne – Ny kalibrering - Nyt datasæt – Samme linje:





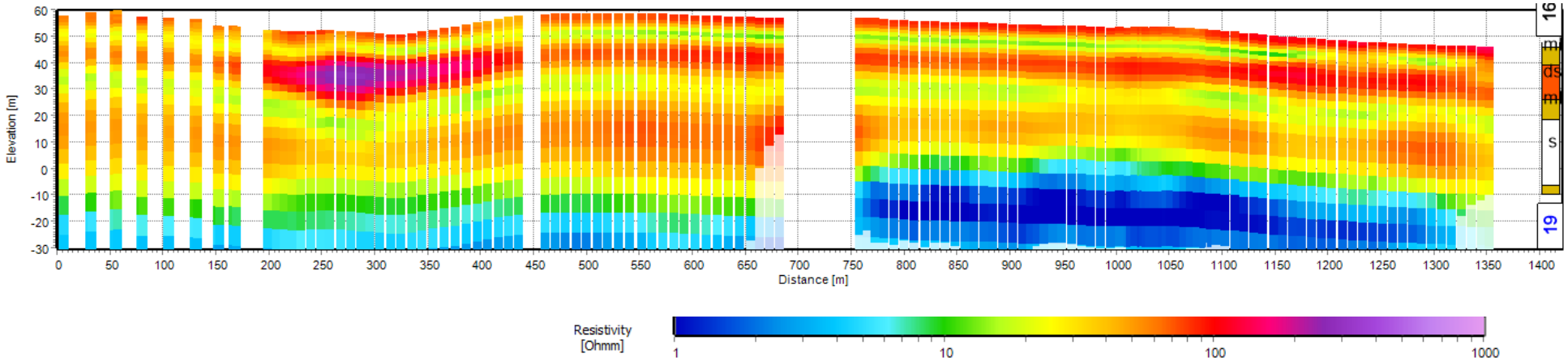
System verifikation og datareproduktion



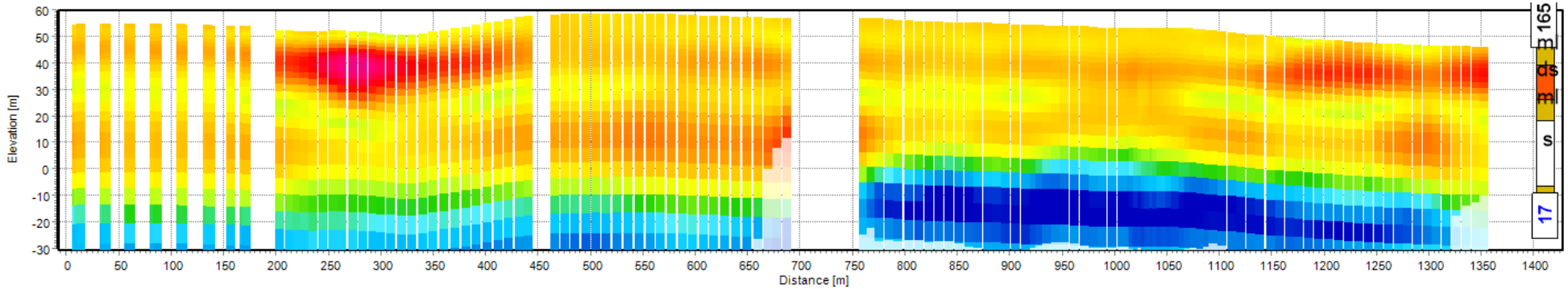


Geologisk tolkning: Flemming Jørgensen, Region Midtjylland

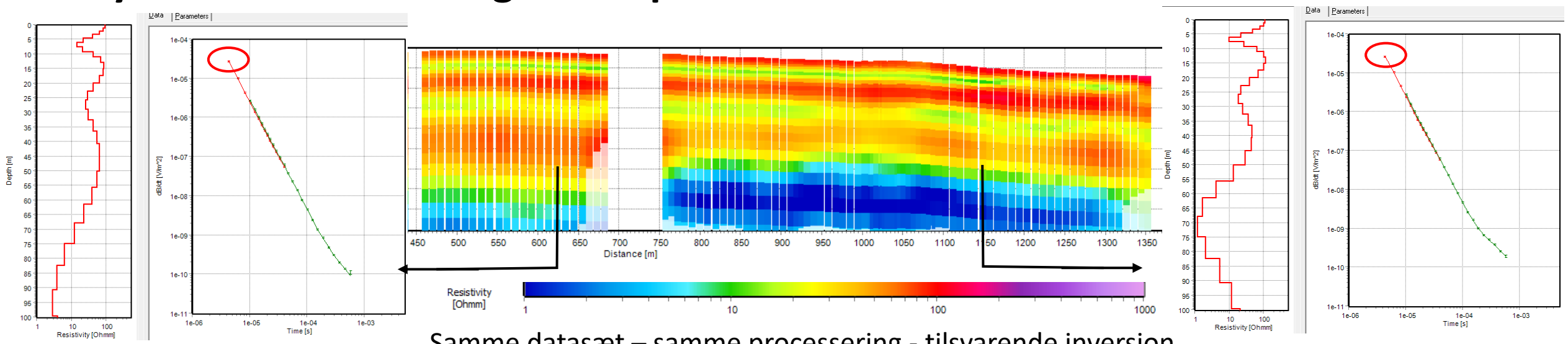
System verifikation og datareproduktion



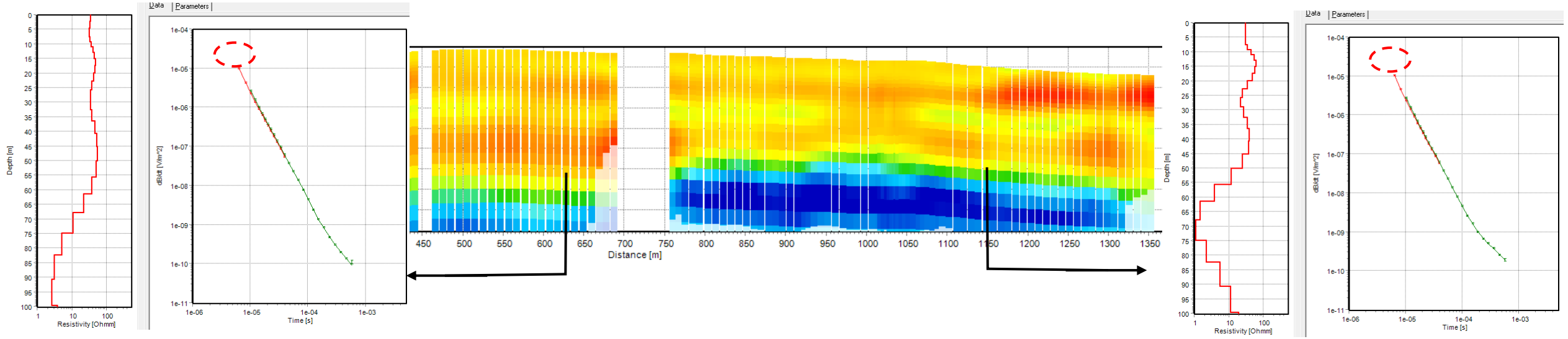
Samme datasæt – samme processering - tilsvarende inversion….



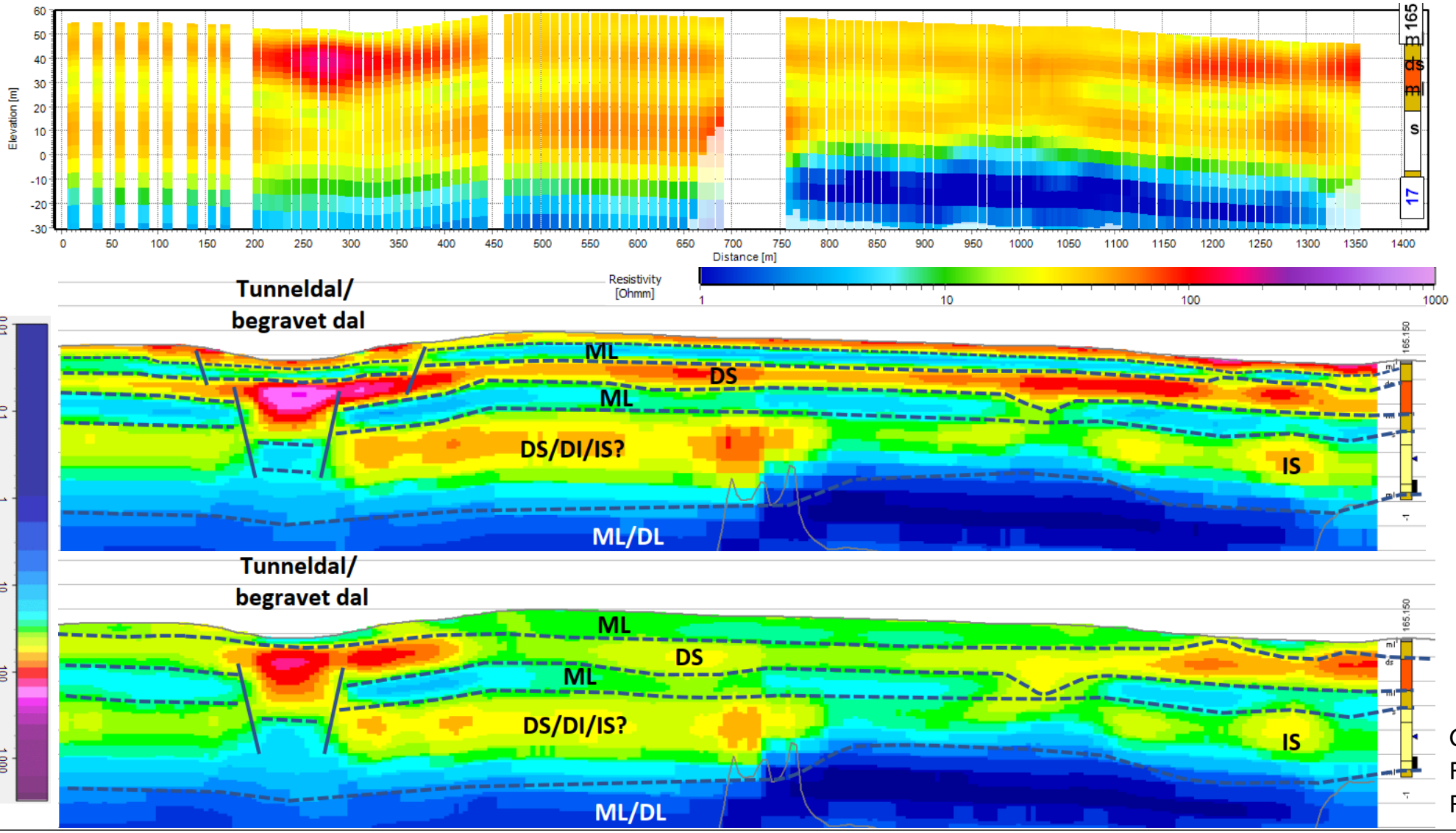
System verifikation og datareproduktion



Samme datasæt – samme processering - tilsvarende inversion….



System verifikation og datareproduktion



Inversion uden gate 2

Geologisk tolkning med gate 2

Geologisk tolkning uden gate 2

Geologisk tolkning:
Flemming Jørgensen,
Region Midtjylland

Konklusioner og strøtanker…

- ***HGG Guideline and standards for tTEM data collection… (2020) :***
  - ✓ Hastighed op til 20 km/t
  - ✓ Linjeafstand op til 25 m
- ***Regelmæssig verifikation af tTEM systemet***
- ***Vær kritisk overfor data og spørg en geolog om tolkningen giver mening***
- ***Del dine erfaringer med en kollega***

Erfaringer med tTEM

som kortlægningsredskab

- Kort præsentation af tTEM metoden
- Erfaringer med tTEM….
  - Betydning af parametervalg ved dataindsamling
    - Målemiljø
    - Linjeafstand
    - Kørselsretning
  - System verifikation og datareproduktion
- Konklusioner og strøtanker…

Tak for opmærksomheden!

Anders Edsen (Fagchef Geofysik)

WSP Danmark