tTEM - Et nyt instrument til ekstrem detaljeret kortlægning af den overfladenære geologi til geotekniske undersøgelser, grundvandsbeskyttelse og landbrug

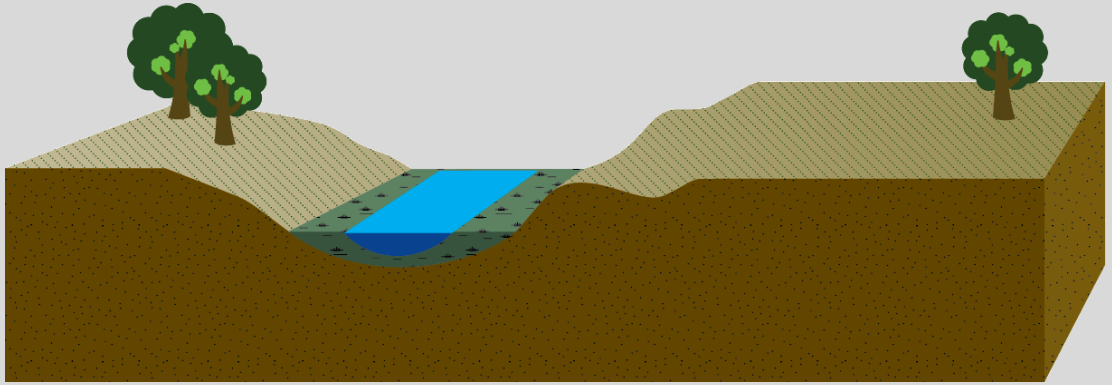
Esben Auken, Jesper B. Pedersen, *Anders V. Christiansen*, Nikolaj Foged og Troels Norvin Vilhelmsen
HydroGeophysics Group, Department of Geoscience,
Aarhus University, Denmark

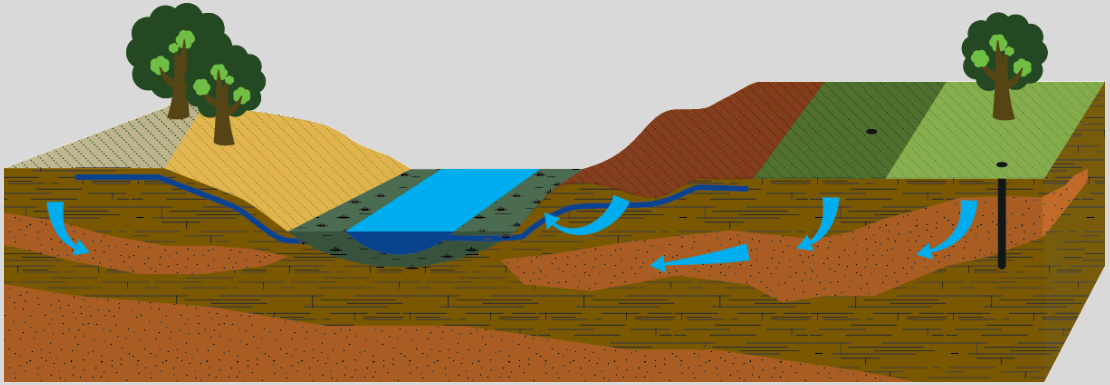
Outline

- **Why do we need a new geophysical method?**
- **Some of the technical details**
- **Examples**

Why is it relevant?

Identification of management areas



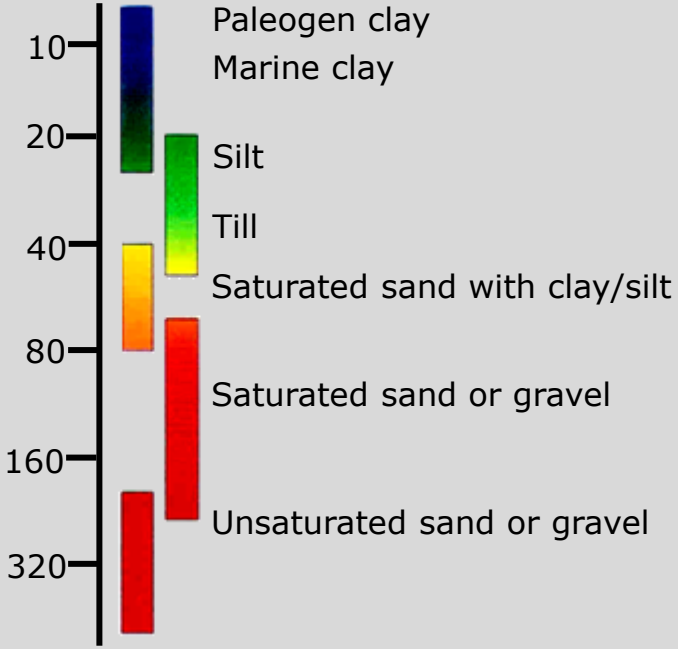


What do we measure?

Resistivity depends on:

- Sediment type – sand or clay
- Ioncontent of the porewater
- Porosity

Resistivity of different geological units



Possibilities

- **SkyTEM**
  - Fast, verified, effective
  - Large *footprint*, missing details in the nearsurface

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- **GCM**
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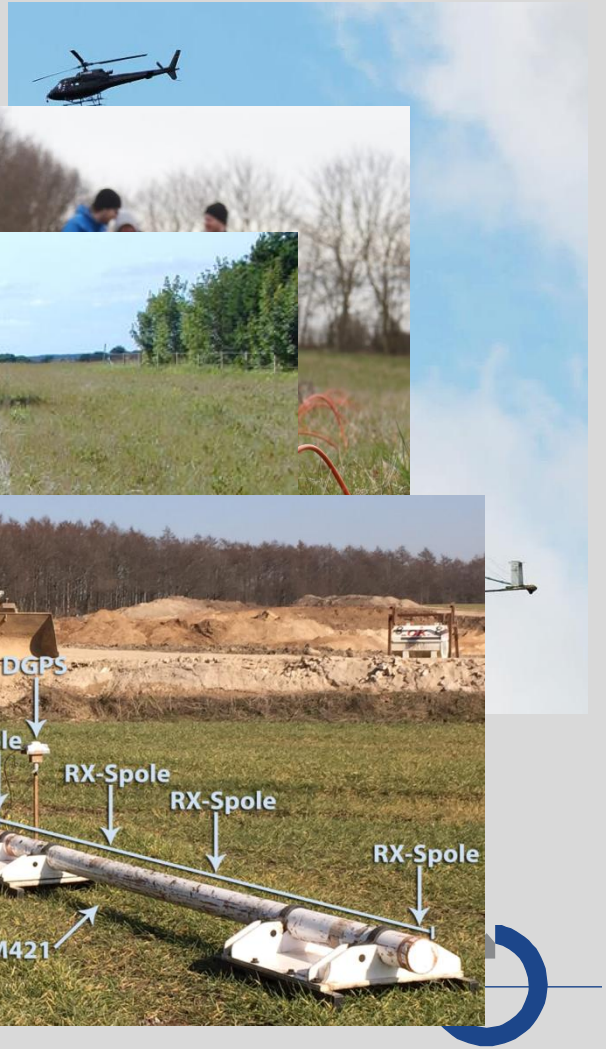
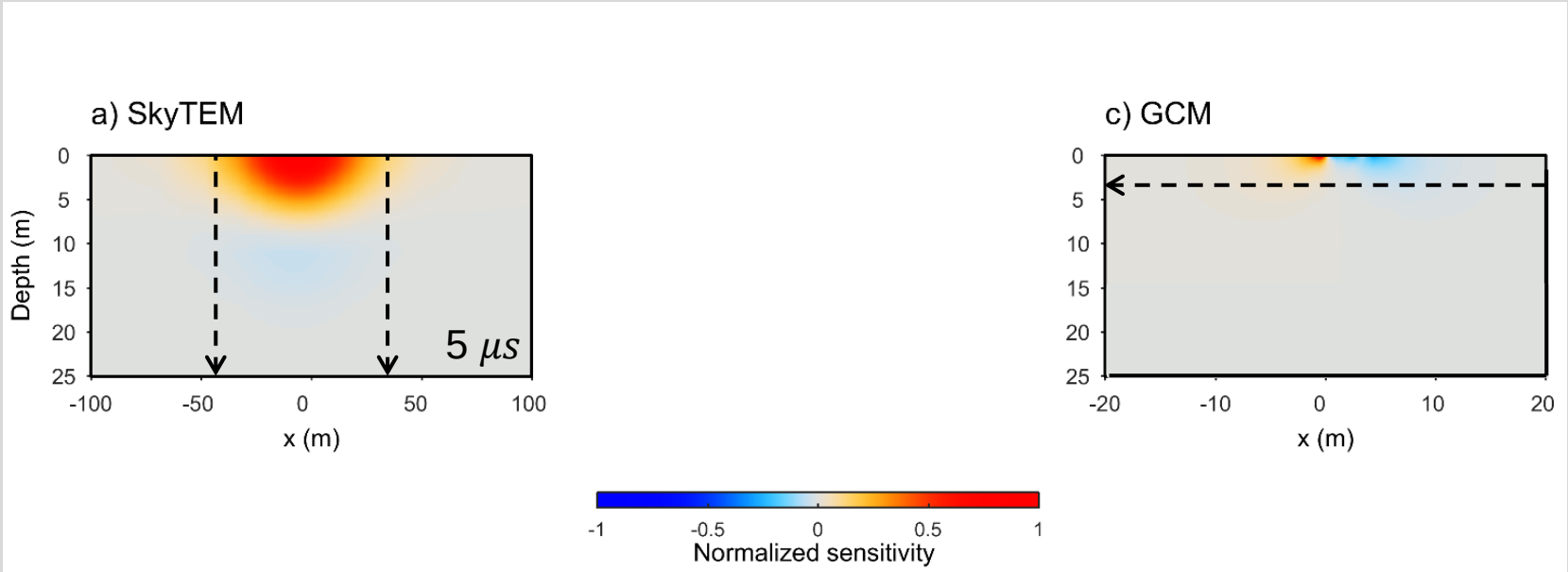
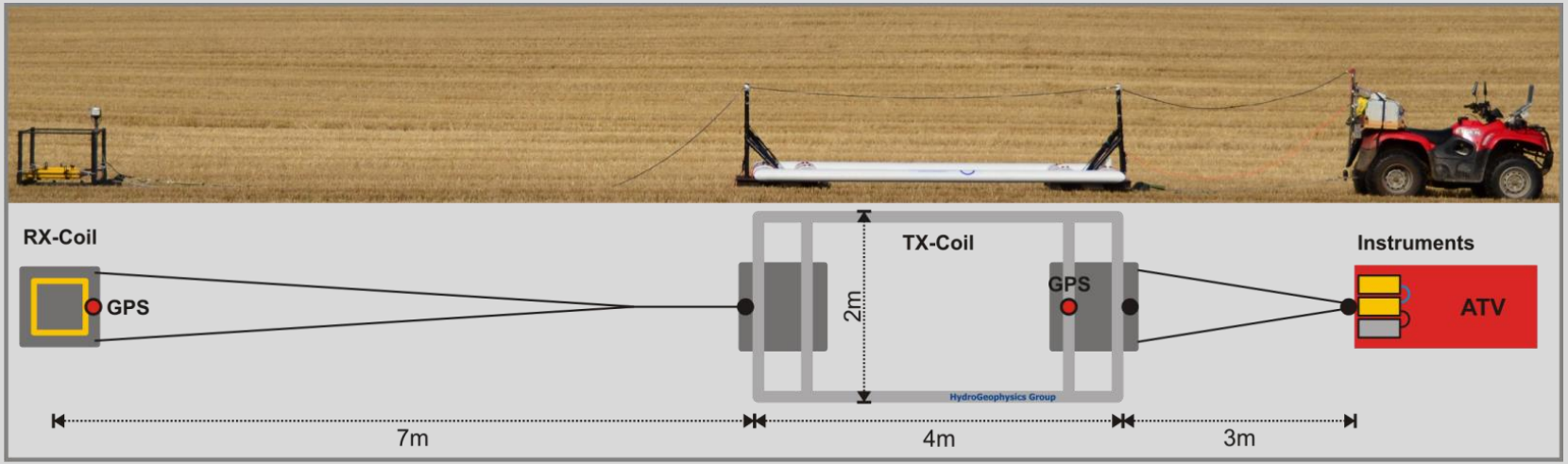
  - Too small depth of investigation



Sensitivities



The tTEM system



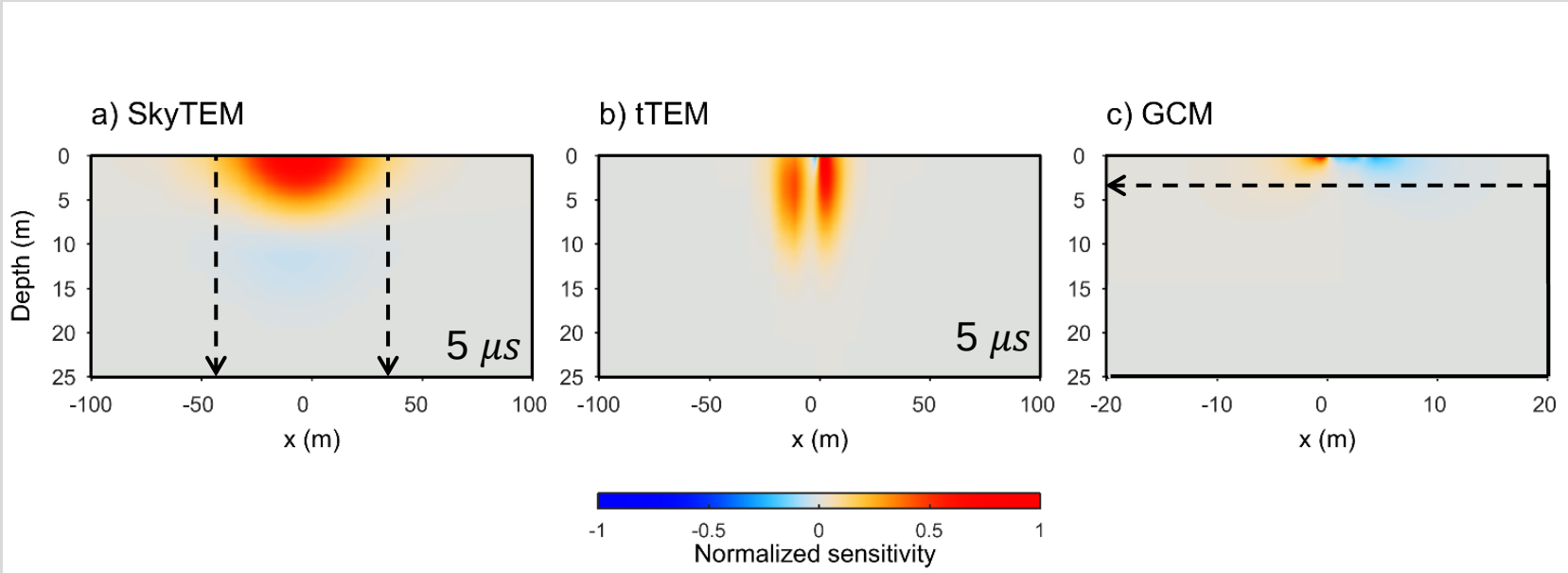
Technical details

- Measurement takes a few milliseconds
- 3-10 meters lateral resolution
- Depth of investigation 0-70 meters
- High-resolution in upper 30 meters

Mapping details

- 10-20 km/hour ~ 3-5 m/s
- Line distance is typically 10-20 meters (driving tracks distance)
- Coverage is 50-115 hectares per day

Results: Comparison of 2D sensitivities



tTEM - in the field...

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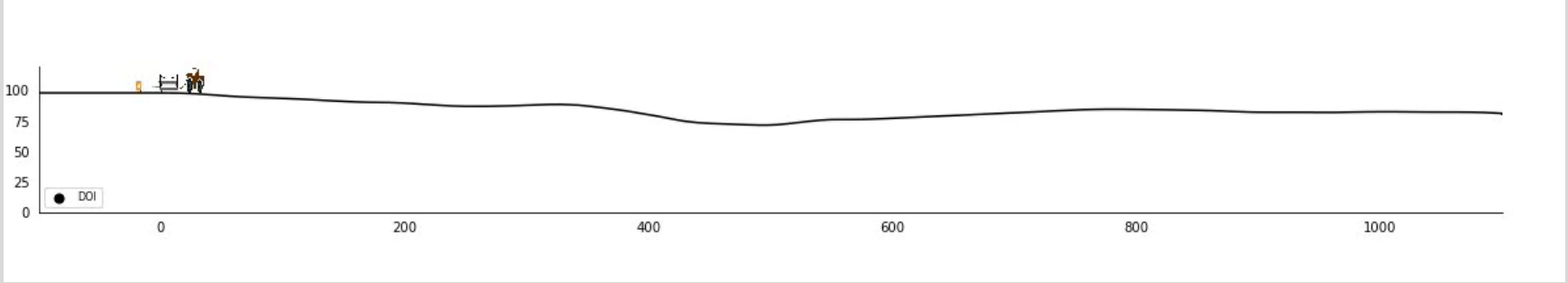


Data processing and inversion

- **Data processed in Aarhus Workbench similar to e.g. SkyTEM data**

- **Inversion with spatial constraints and sharp or smooth layer boundaries**

The obvious applications for tTEM

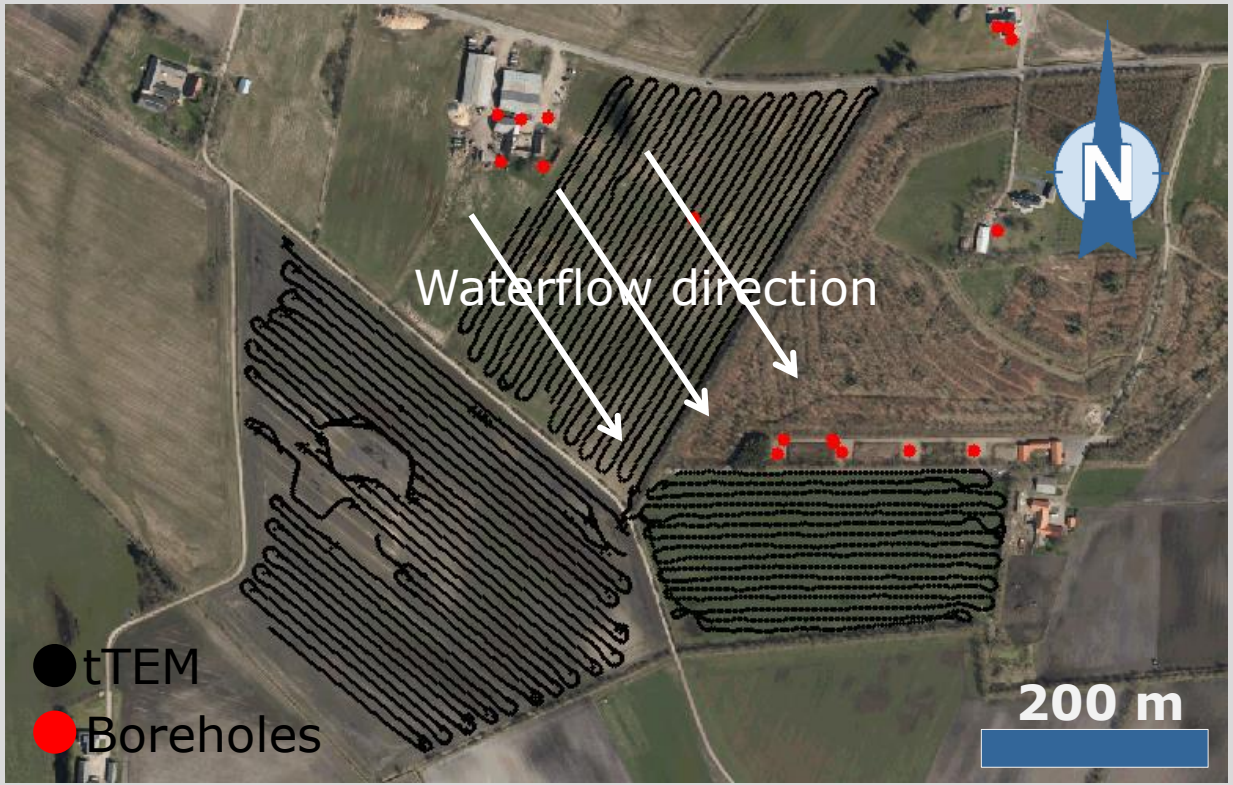
- **Nitrate retention – vulnerability mapping**
- **Mapping of raw materials**
  - Sand and gravel pits
- **Mapping of waste deposits and the *background* geology**
- **Geotechnical applications**
  - Climate adaptation, LAR
  - Infrastructure

Vildbjerg

Vildbjerg

- Pesticide pollution, investigate thickness of shallow clay layer
- 24,1 km data -> 2410 models
- 10 m line distance
- Mapping took 2 hours
- 12 boreholes

Vildbjerg



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- Geological setting:

  Till – Mica clay – Quartz sand

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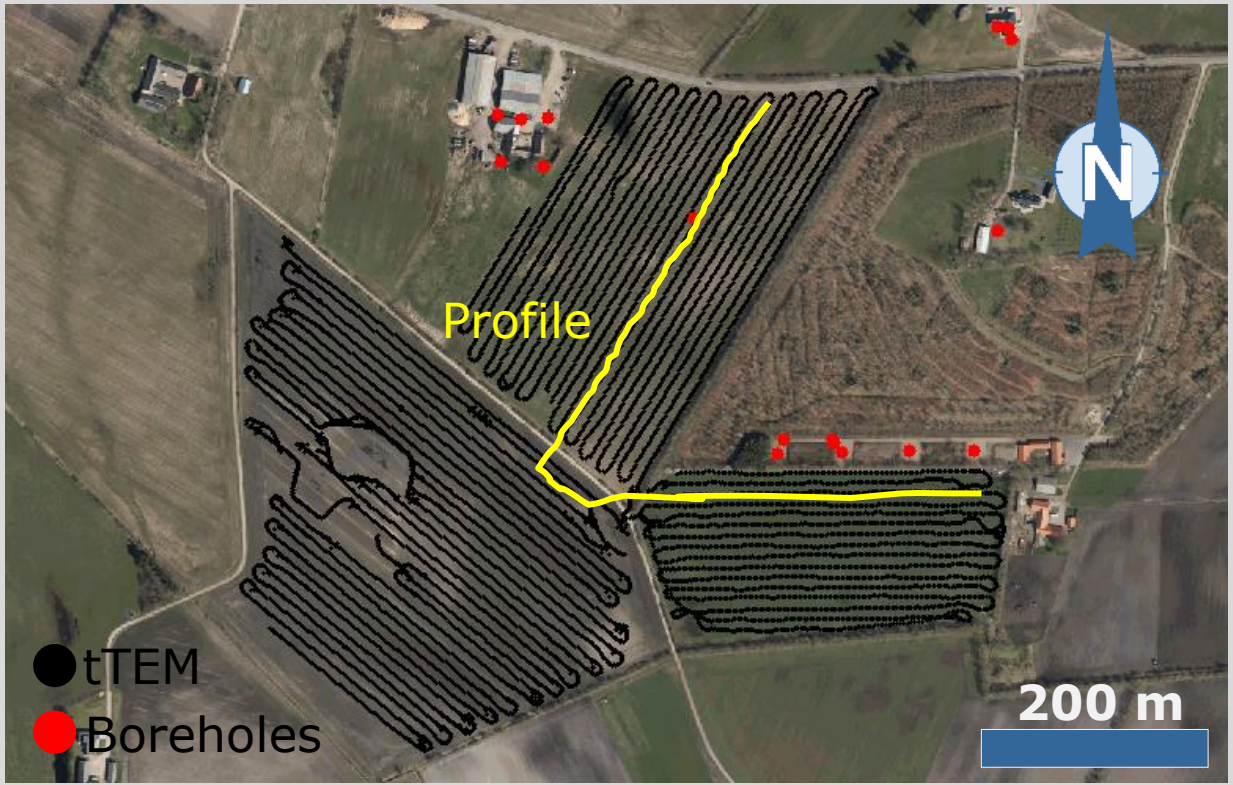

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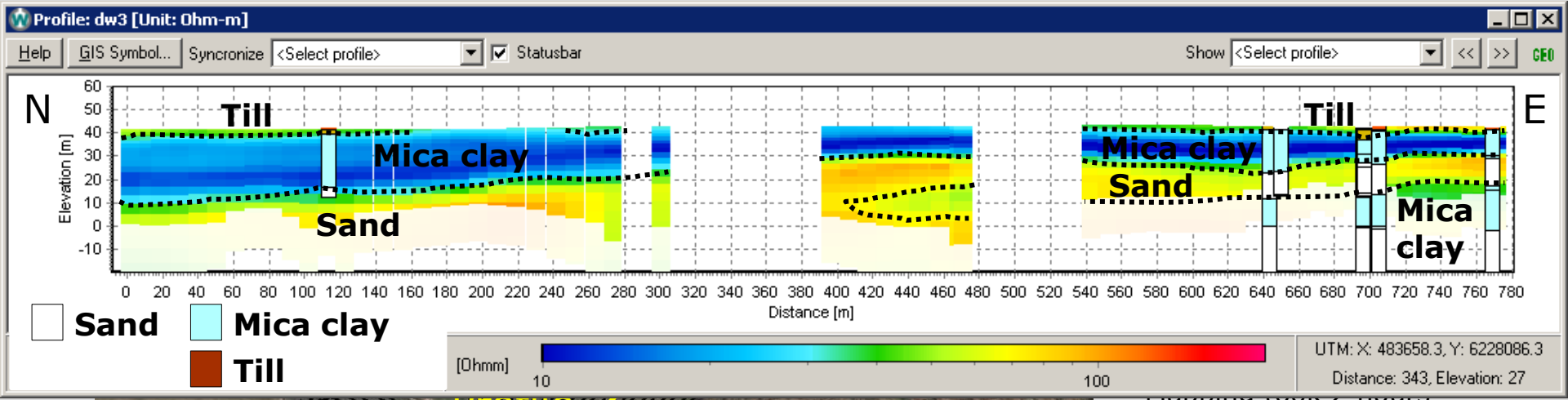

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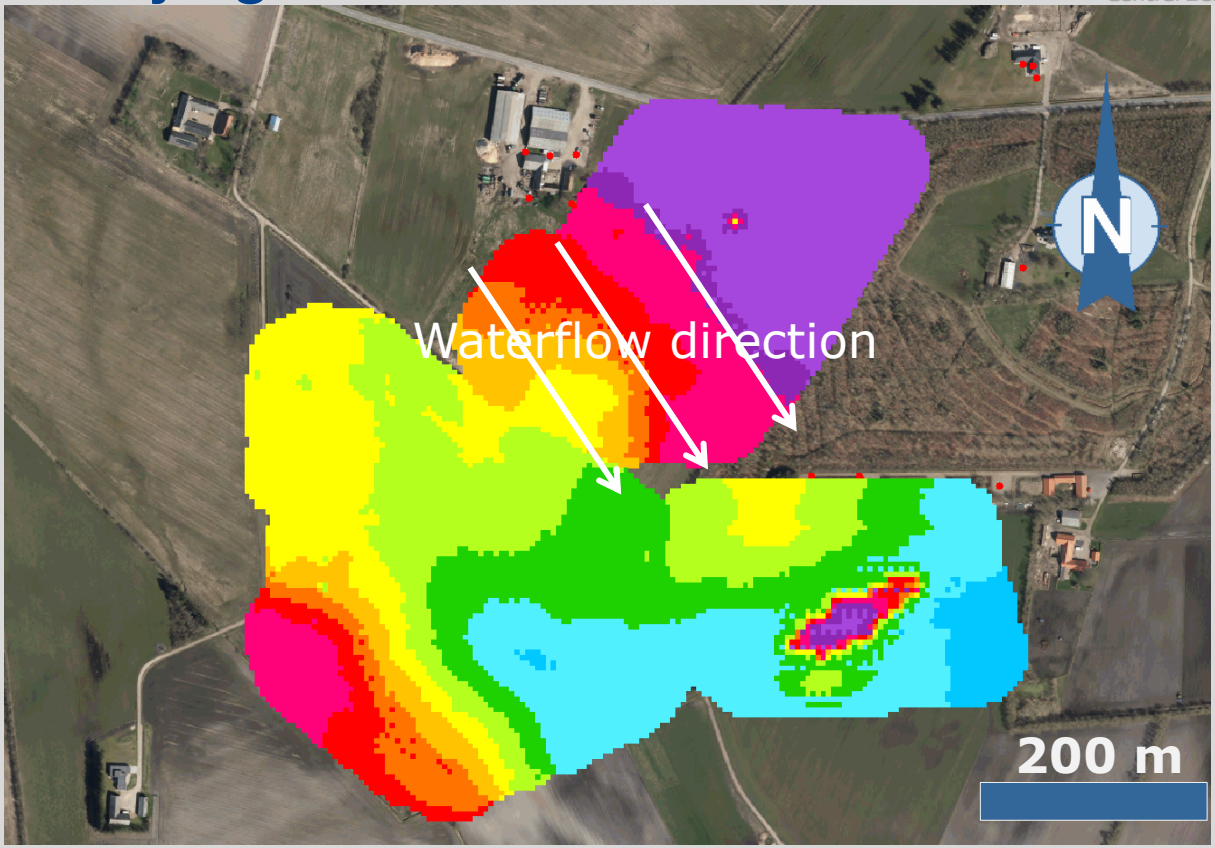

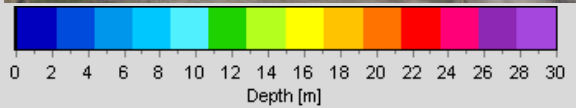

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- Thickness mica-clay/till

  (30 ohm-m threshold)

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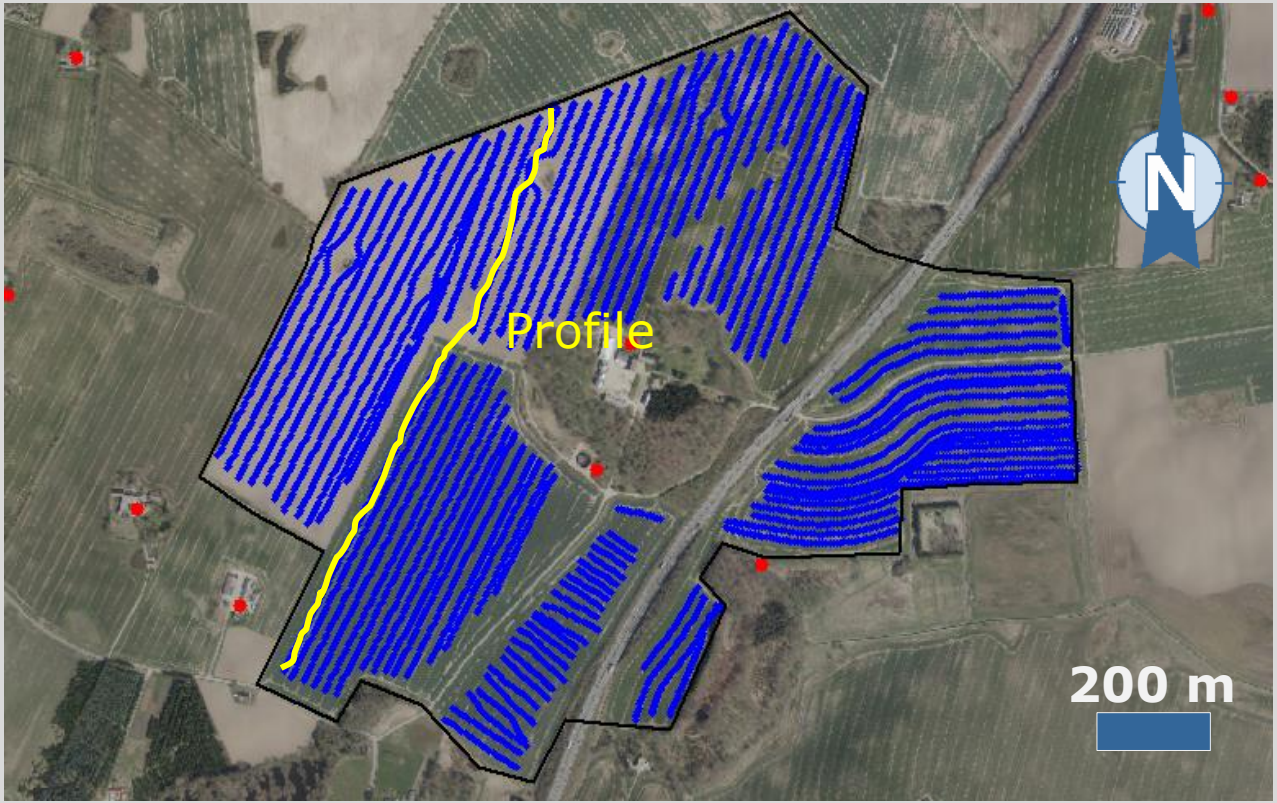
Gedved / Go-Gris



Go-gris

- Geological setting, vulnerability mapping
- 231 hectares
- 60 km -> 60000 models
- 25 m line distance
- Mapping took 2 days

- Complex geology

Boreholes tTEM

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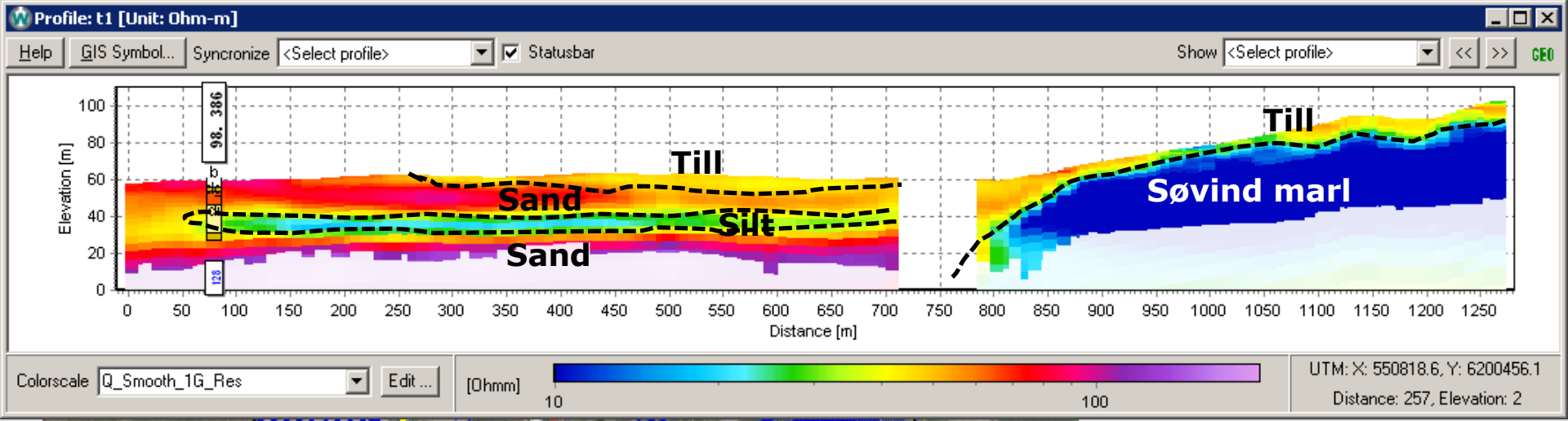

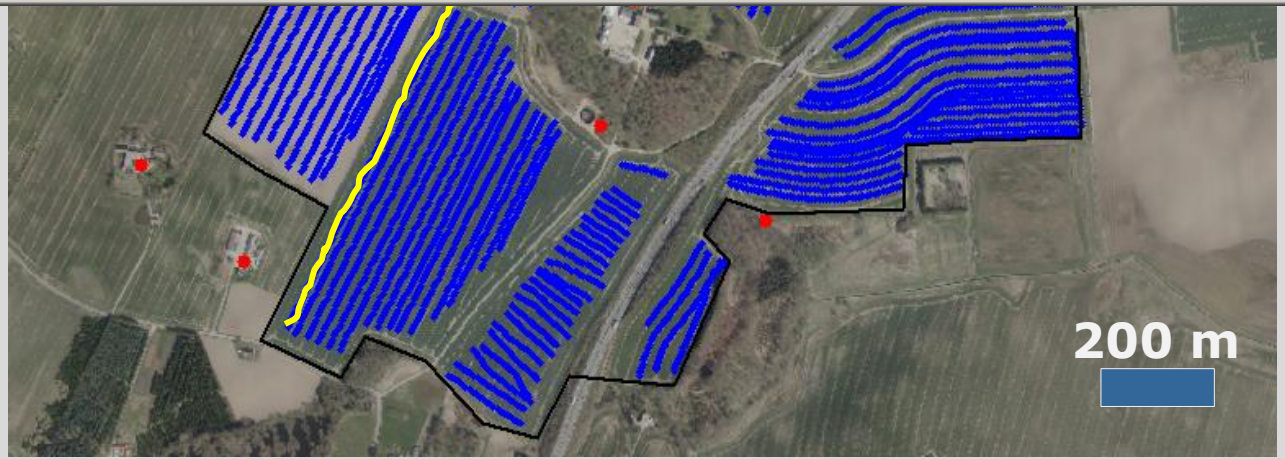

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● Boreholes ● tTEM

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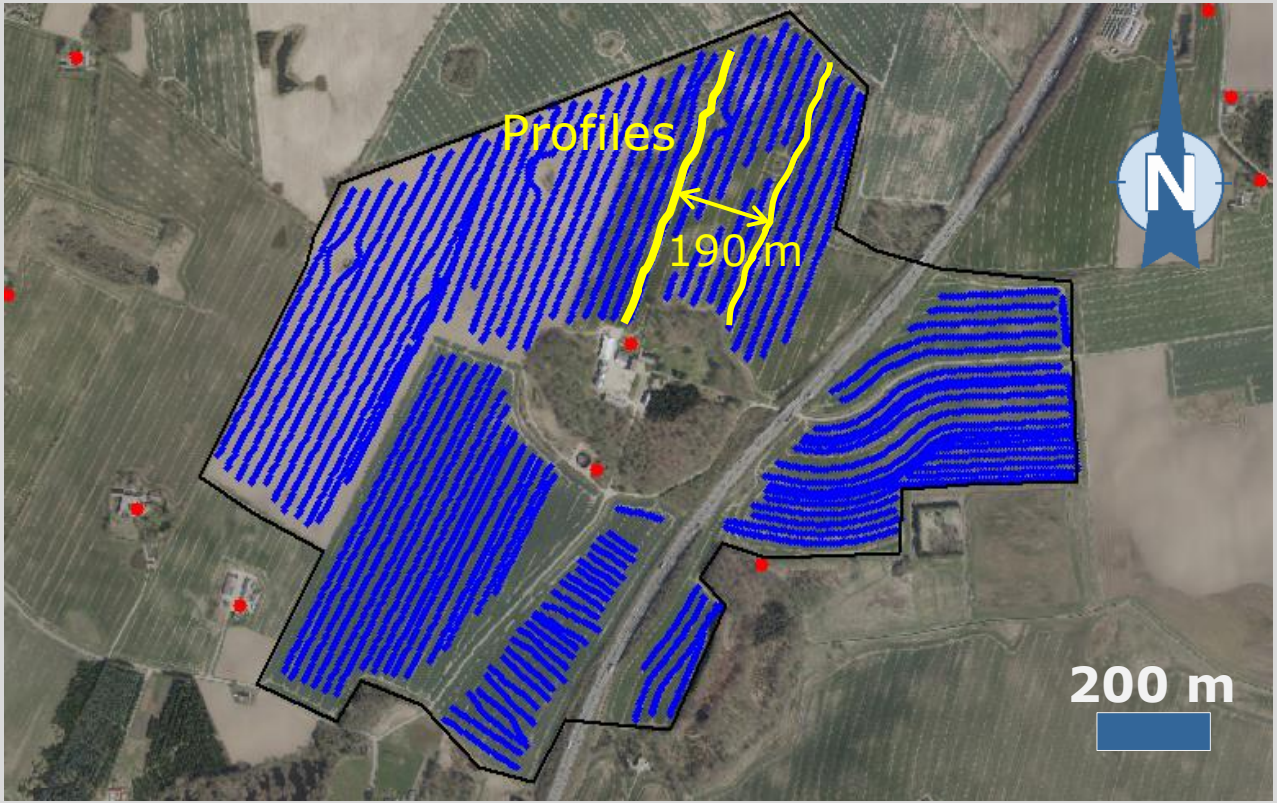

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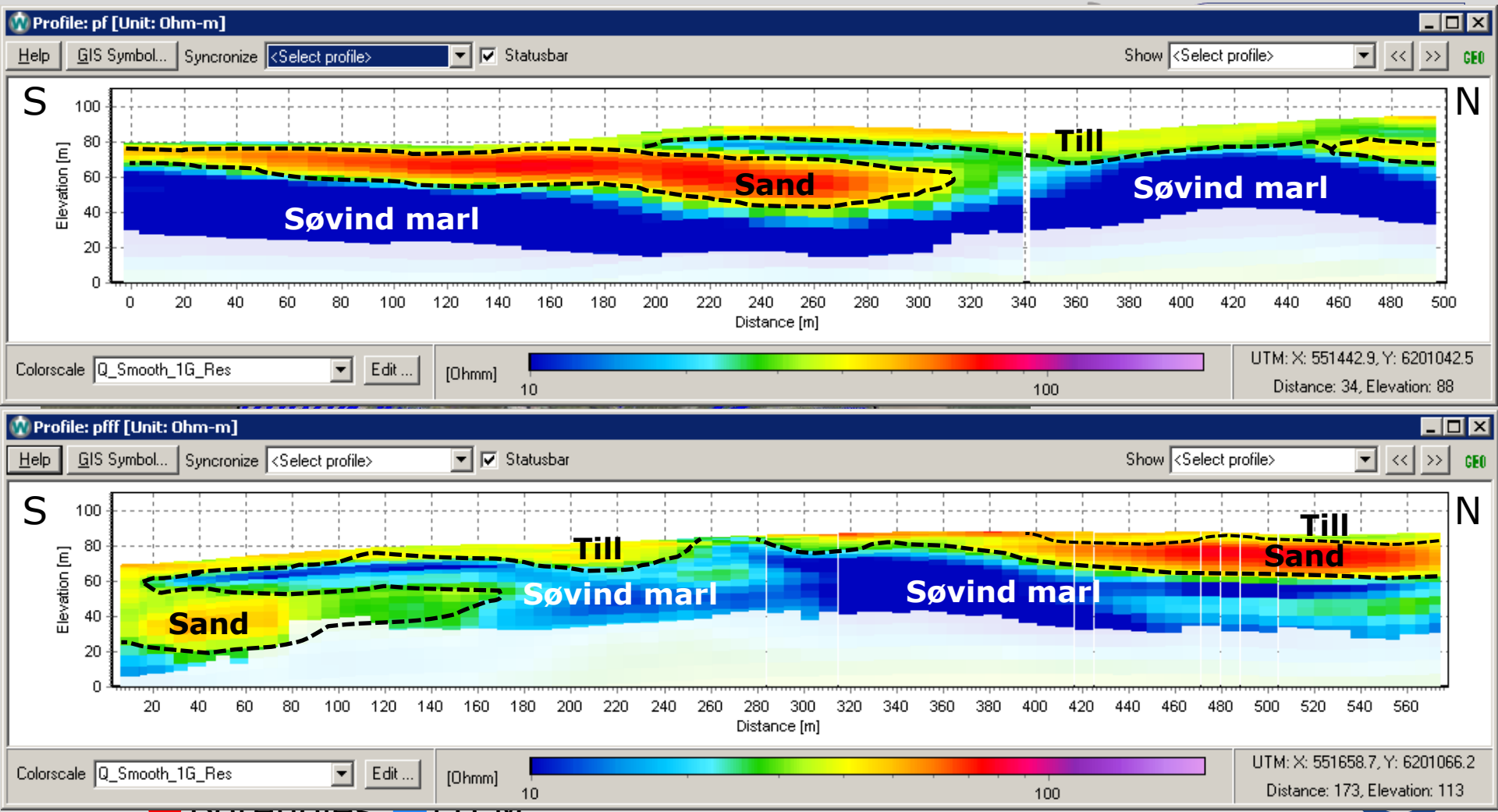
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Raw materials, Jeksen

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Central Denmark Region

Jeksen

- Investigate sand/gravel deposits
- 5,7 km data -> 570 models
- 10 m line distance
- Mapping took 40 minutes

Raw materials, Jeksen

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Jeksen

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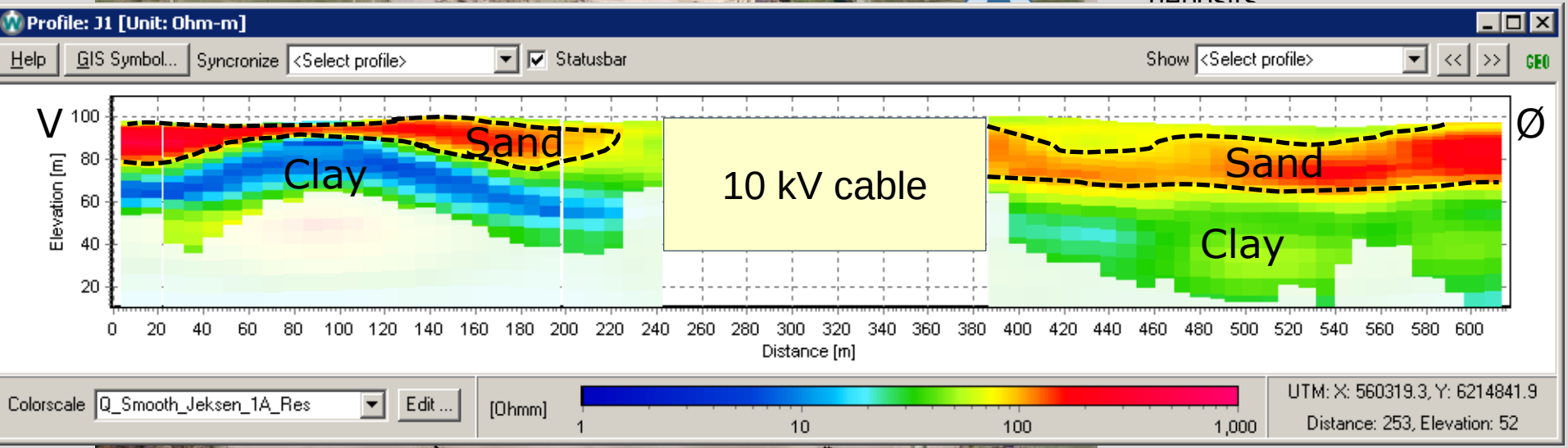

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Thanks for listening

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