The use of Frequency Domain Electro-magnetometry for the characterization of permafrost active layers: case studies in the Swiss Alps

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Jeannette Noetzli [2], Anna Haberkorn [2],
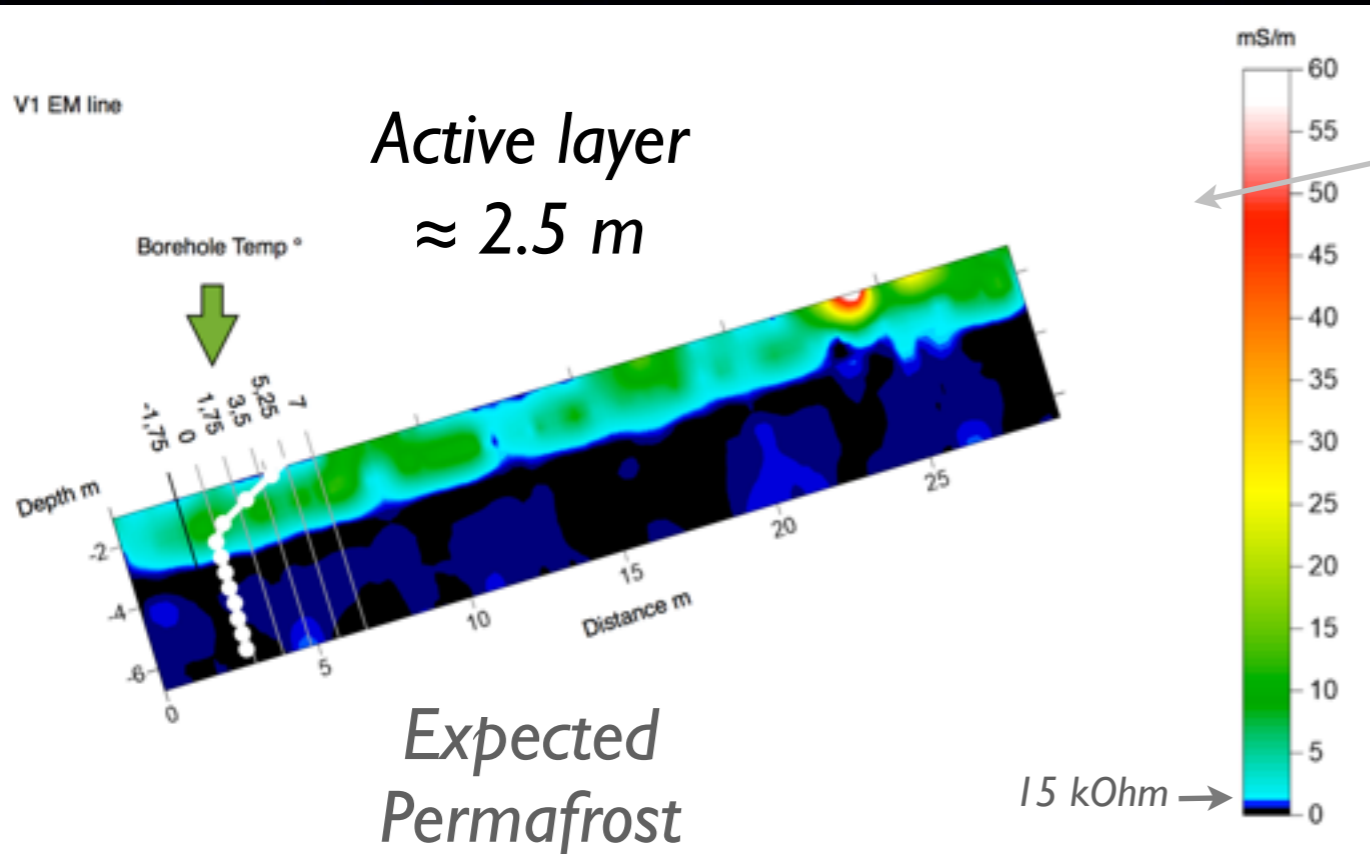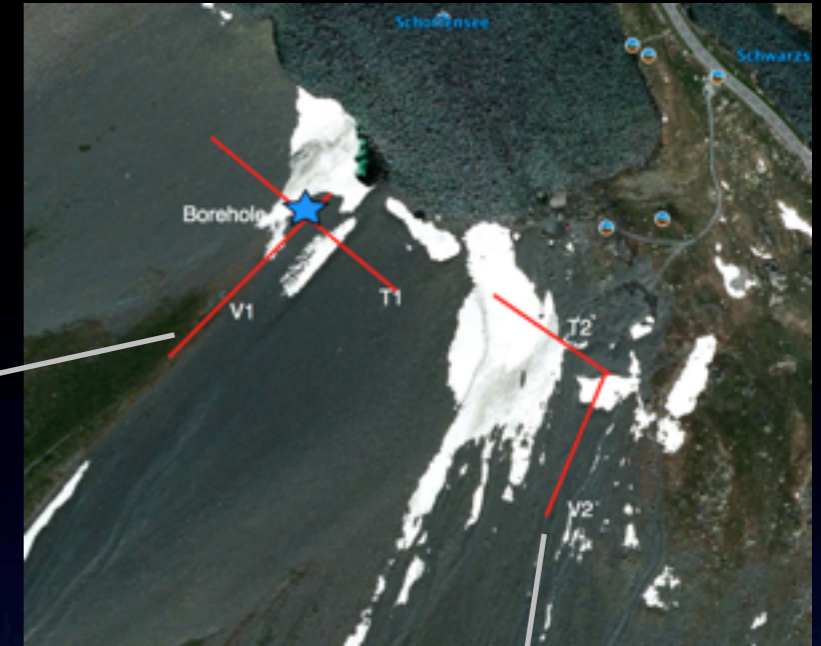
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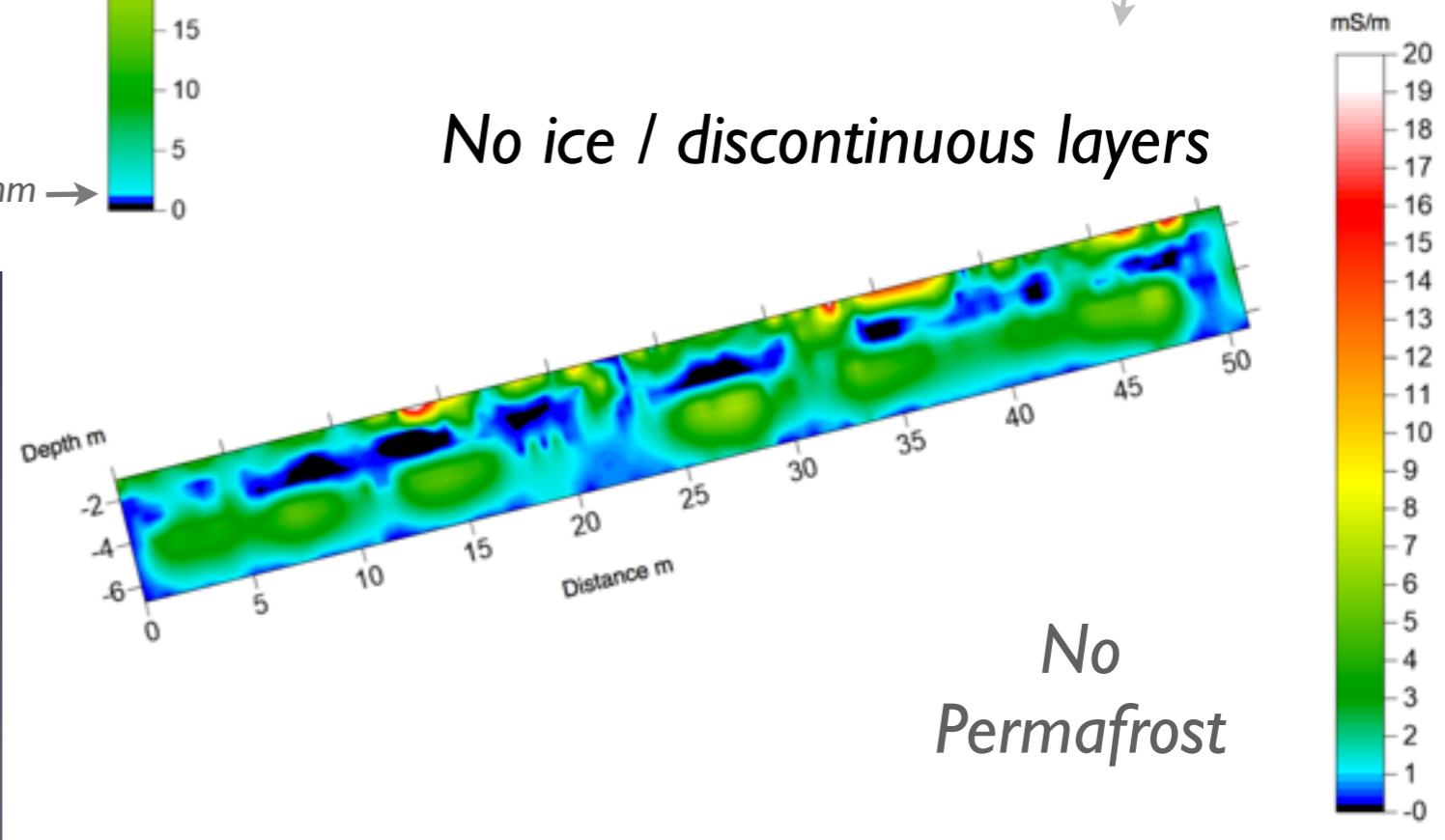[2] WSL Institute for Snow and Avalanche Research SLF, Davos, Switzerland

FDEM

Active layer ≈ 2.5 m

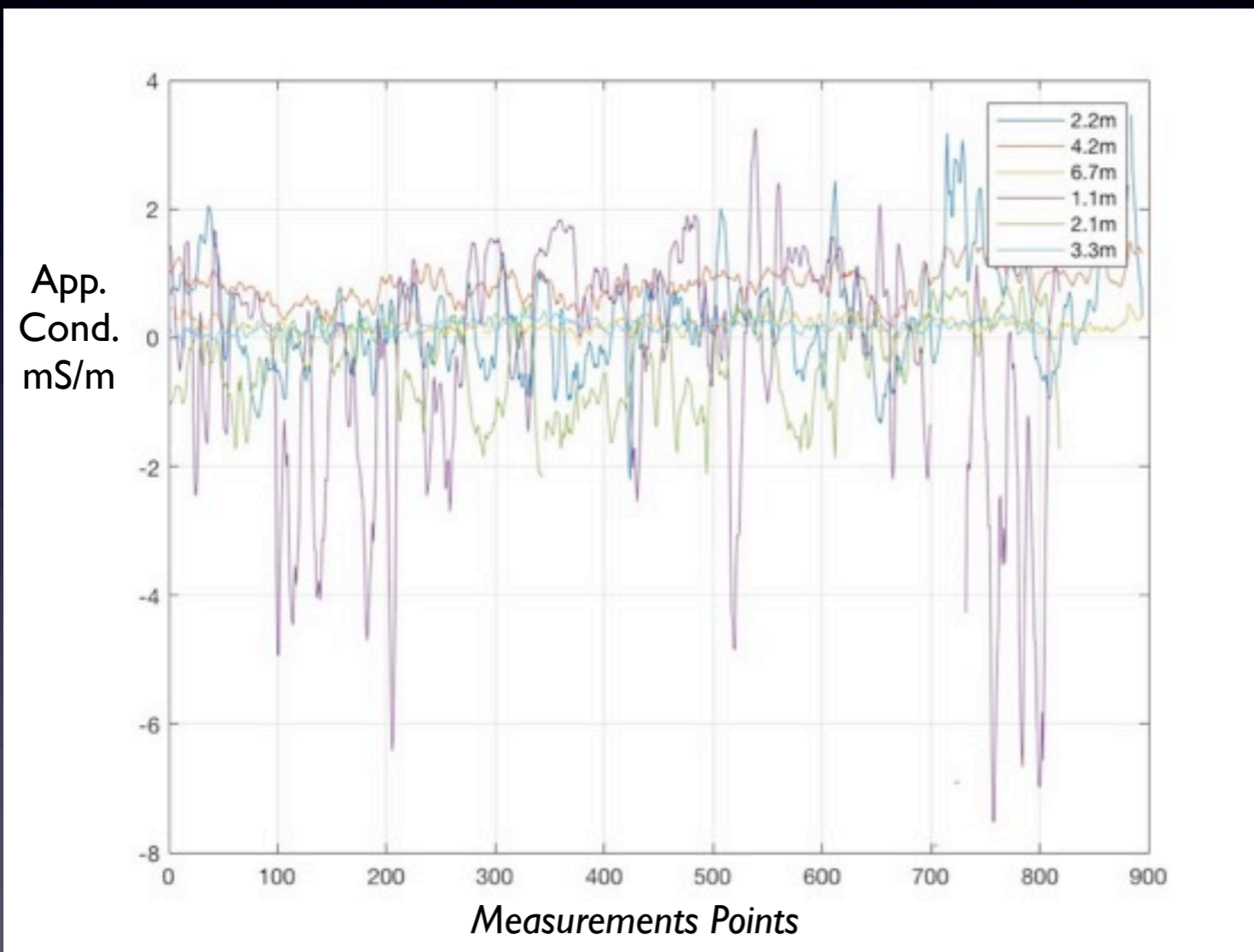agreement with borehole temp.

Active layer ≈ 2.5 m

V1 EM line

Borehole Temp °

Expected Permafrost

15 kOhm →

No ice / discontinuous layers

Good agreement with expected / not expected permafrost presence

No Permafrost

FDEM for permafrost   works everywhere ?

Example: Totalp site

App. Cond. mS/m

Measurements Points

Legend:
- 2.2m
- 4.2m
- 6.7m
- 1.1m
- 2.1m
- 3.3m

RAW data

- Negative conductivity values and scattered data

- Massive presence of ferro-magnetic rocks (Serpentinite)

Electro- Magnetic

⚠️⚠️ !!

Rock - Glacier

- EM method is logistically easier and quicker than ERT to extend punctual borehole information in wider area

but...

- EM has lower resolution than ERT and is influenced by a number of environmental issues:

- Rock Type
- Presence of voids / blocks
- Height of the Probe not constant
- Sensitive to presence of metal (e.g. anti-avalanche str.)
- Open issues about inversion and interpretation

-Relevant drifts observed for temperature variations and probe/soil distance!!