# Work group 3
# Advances and Prospects in Field Measurements

Key points

1.Electrodes

2. Coupling effects

3.External noise

4. Signal to noise ratio

5. Reducing the acquisition time

6. Validation

7. Instrumentation

# 1. Electrodes

- Need to have good galvanic contact (current transmission and potential measurement), extra important for noise at high frequencies
- Different electrode materials have different noise characteristics (e.g. stainless steel quality, design & condition of porous pot electrodes)
- Need to reduce the drift (by waiting some minutes before use after installing / watering)
- Electrodes not to be used for measurements immediately after  they have been used for current injection

# 2. Coupling effects

- Different types of coupling exist (EM, inductive, capacitive)
- Coupling in multi-core cables can be minimized be using separated cables for injection and measurement
- Coupling between the cables and the soil can be minimized be using coaxial cables
- Classical EM coupling can be eliminated by modelling

# 3. External noise

- Need to stack to reduce the noise but this is time consuming
- Smart stacking; only use pulses with less noise
- Filtering techniques can be used to remove e.g. power line noise
- Remote reference technique records the noise at the remote location and use the remote to predict and eliminate the noise

# 4. Signal to noise ratio

- Needs to be large enough to see the target
- Select a suitable electrode array
- Large enough current
- Use low noise instruments and low noise electrodes

# 5. Reducing the acquisition time

- Too short pulse time in TDIP will give errors in measured resistivities and chargeabilities!
- Multi-channel instrument instead of single channel
- TDIP measurements with IP measurement during on time
- Work with multiple transmitters and/or multiple frequencies

# 6. Validation

- For data quality: check the reciprocity, calculate error estimate
- Standard deviation should be low
- Standard deviation from stacking can be low even if error due to e.g. capacitive coupling is high
- Direct push/ ELLOG/ borehole measurements
- Chemical and petrophysical analysis on soil/rock/water samples

# 7. Instrumentation

- Instrument design and specifications important (high dynamic resolution & low noise inputs, etc)
- Constant current transmitter for TDIP
- Pre and post-field checks of electrodes, cables, connectors (eg moisture), instrument calibration etc.