Comparison of diachronic ERT and Spectral Analysis of Surface Waves for estimating bedrock depth

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Introduction – Material and Methods – Results – Conclusion

Bedrock depth: an important property

- For the plant
- For the water
- For the soil and CZ

How to obtain bedrock depth?

- Difficult to directly measure this variable
- With Soil pits or soil cores
- Punctual information
- High cost over large zones

- Geophysical methods can give bedrock depth
- Classical ERT or EMI methods
  - already used in contrasted areas (Zhou et al., 2000; Beauvais et al., 2007; Saey et al., 2010)
  - But do no work in case of low contrasted situations
- New methodologies
  - Seismic method uncommon in soil science
  - Diachronic ERT not tested for detection of bedrock depth

Spectral Analysis of Surface Waves (SASW)

- New type of multichannel seismic cable designed for soil investigation
- Based on dispersive character of surface waves (phase velocity depends on the frequency)
- A S-waves velocity model is obtained using inversion of the dispersion curves.

Electrical Resistivity Tomography (ERT)

- Apparent resistivity measurement
- Schlumberger array
- Inversion to obtain a model of resistivity f(depth) from RES2DINV (see Locke, 2002)
- Analysis of the model at the place of each borehole
Introduction – Material and Methods – Results – Conclusion

**Sites description**

1. **1 transect of SASW**
   - On each site
   - 150 m
   - Determination of soil layers and bedrock depth
   - Classical soil analysis

2. **1 transect of Electrical Resistivity Tomography**
   - The same transect in wet and dry conditions

3. **Soil survey**
   - 150 m
   - 4 m deep
   - 11 cores
   - Determination of soil layers and bedrock depth
   - Classical soil analysis

**Whole results**

**Comparisons between sites**

**Conclusion**

- SASW and ERT are sensitive to different properties
  - Structure and hardness of the bedrock
  - Depth of bedrock
  - Presence of shallow groundwater
  - Electrical properties
- The performance of each sensor highly depends on the geopedological conditions
- These sensors have complementary results
- In the future, such sensors have to be coupled according to prior geopedological knowledge

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