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

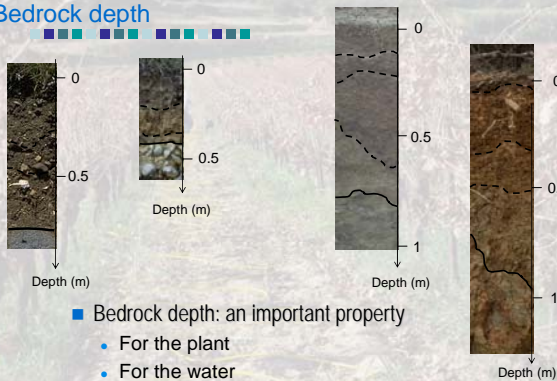
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Bedrock depth




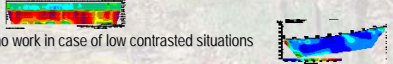
- Bedrock depth: an important property
 - For the plant
 - For the water
 - For the soil and CZ

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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

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Aim

- Test of diachronic ERT and SASW
- To predict Bedrock Depth
- In contrasted geopedological situations


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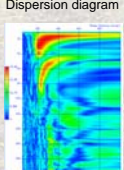
Spectral Analysis of Surface Waves (SASW)

- 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.

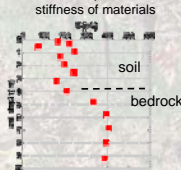
Seismic shot



Dispersion diagram



Vs model depends on the stiffness of materials


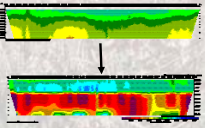
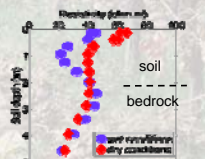


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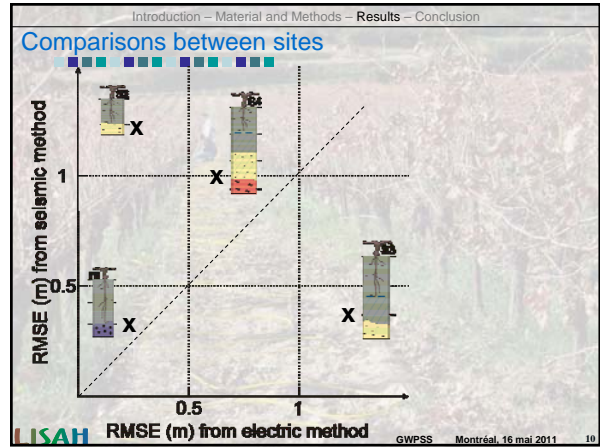
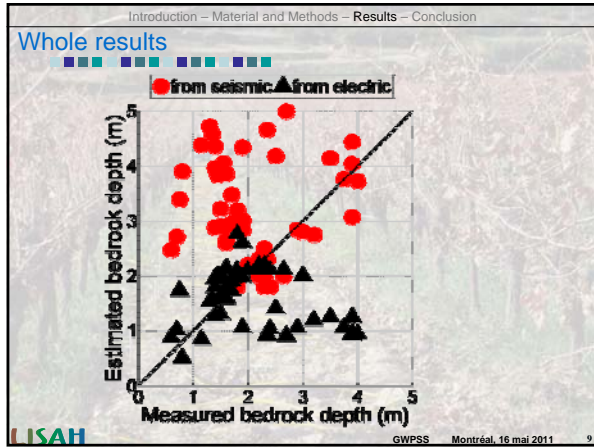
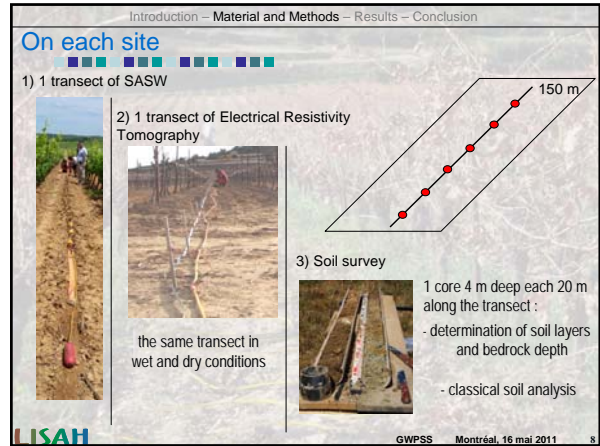
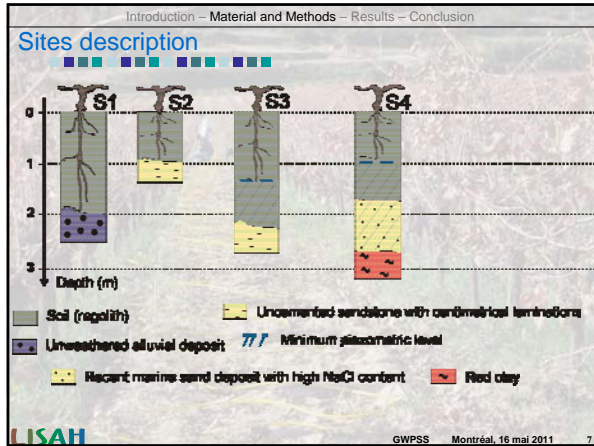
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Electrical Resistivity Tomography (ERT)

- Apparent resistivity measurement wenner- schlumberger array 1 m electrode spaced
- Inversion to obtain a model of resistivity= f(depth) from RES2DINV (see locke, 2002)
- Analysis of the model at the place of each borehole

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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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