Close range aerial sensing of soils for improved remote sensing products

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Introduction
Knowledge of soil properties and dynamics is essential for optimal and sustainable management of soil and water resources in a growing demographic context.

Soil governs: infiltration and runoff, evaporation, climate feedbacks, plant growth (food & energy), contamination of groundwater, etc.
Project objective
To integrate ground-penetrating radar (GPR) and hyperspectral spectrometer (HS) on a close range remotely piloted aircraft system (RPAS) for improving digital soil sensing capabilities

**Setup of the close range sensing platform**
- WP1: GPR instrument design and control
- WP2: Spectrometer instrument design and control

**Data acquisition and data processing**
- WP3: Full-wave GPR data inversion
- WP4: Spectrometer data processing

**Data fusion**
- WP5: Joint radar and hyperspectral data interpretation and fusion

**Comparison with spaceborne remote sensing**
- WP6: Upscaling of soil moisture using Sentinel-1 radar products
Full-wave inverse modeling for soil characterization

**Accurate electromagnetic modeling** (Lambot et al., IEEE TGRS 2004; 2014)

- 3-D layered medium
- Efficient antenna model
- Antenna-medium interactions

Signal inversion

System design

Product
Numerical analyses for root zone characterization

- Information content (permittivity, conductivity)
- Sensitivity with respect to depth
Radar antenna calibration over water
Measurements over water

- Water surface reflection
- 105 m height
Measurements over the soil

First root-zone moisture map coming soon
Thank you for your attention

http://sites.uclouvain.be/gprlouvain/rapas.html