1400 years of man-environment interactions and soil evolution in the Saint-Mont mountain (Remiremont, Vosges)

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To investigate traces of ancient anthropic activities in soils and landscapes, on areas where archaeological structures have not yet been detected.

## Material and methods

### Joint work involving soil scientists, archaeologists, geographers, geologists and computer scientists

**Approaches from the landscape to the microscopic scales.**

- **Archaeological data**
- **Field prospections / rocks and soils descriptions and sampling, floristic surveys**
- **Studies along gradients from highly to poorly human impacted areas.**
- **LiDAR image to locate platforms connected to archaeological structures and (ii) all our sampling stations: subsurface soils, pits and rock outcrops.**

## Results

### Interactive extraction of linear structures from LiDAR raw data

Development of new algorithms based on digital geometry tools to directly process 3D ground points and get rid of digital terrain model approximations in forested areas (Even and Ngo, 2020).

Immediate visualization of extracted structure, cross and longitudinal profiles and of geometric estimations (height or depth, width, volume, ...).

- **Time and precision performance evaluated on well controlled structures: forest roads (Even and Ngo, 2021).**
- **Usability assessed on archaeological enclosed walls and old holloways (Even et al., 2021).**
- **ILSD: Open-source software for direct exploitation by soil scientists, or future integration in geographical information systems (https://github.com/epesq/IOLSD).**

## Soil covers

### 1. Soils not clearly disturbed

- Far from any known archaeological remains, two main types of soils develop on granite:
  - **Humic alcreolos (RH0)**
  - **Rankine soils (RF2)**

#### Physico-chemical characteristics close to those of reference soils:

- **Low human activity?**

### 2. Highly anthropised soils on platform P

- **Anthroposol (RP) = Transformed on a man made terrace**
  - **Arthrosol with a pristine horizon (RH0)**

#### Physico-chemical characteristics close to those of reference soils:

- **Low human activity?**

#### Video: Clearing of ancient human occupation [16:9] (YouTube video)

### 3. Other evidence of ancient human influence on soils?

- **Detection of anomalies:**
  - Light when pH is between 4 and 5
  - More significant when pH is > 5
  - Easily related to the long-lasting human occupation on the summit.
  - More surprising on some western or southern platforms:
    - Leads for future archaeological studies?

## Conclusion and perspectives

- Our results confirm:
  - A very strong imprint of historical human activities on soils close to the summit part of the massif.
  - An heritage on the western slope mainly from natural glacial and pedogenetic processes.
  - Possible other human activities on some western or southern platforms.

- We hypothesize that the weak anomalies are due to older and/or different human activities than those that took place at the top of Saint-Mont (like breeding).

Other analyses are being acquired and interpreted on soils, rocks and LiDAR images.