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

To cite this version:
A. Poszwa, A. Grzesznik, A. Gebhardt, A. Agat, P. Even, et al.. 1400 years of man-environment interactions and soil evolution in the Saint-Mont mountain (Remiremont, Vosges). Historical Ecology for the future - International conference in historical ecology, May 2021, Metz, France. 2021. hal-03236655

HAL Id: hal-03236655
https://hal.univ-lorraine.fr/hal-03236655
Submitted on 26 May 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Context of the study

The Saint-Mont site: a relatively inhospitable mountain:
- hard climate, steep slopes,
- on acid soils developed from a granitic rock,
- nowadays covered by forests.

Remains suggest human presence for at least 1400 years:
- At the top, the monastery Habendrum (from the 7th century to the French Revolution) and a late antique occupation (Chenal 2016).
- Monumental enclosure dry-stones walls of unknown age (Grzeszniak, 2019).
- The "Point des Fées": an enigmatic structure.

Objectives

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.

Software tools to extract and analyze geometric structures in LiDAR data.

Field prospections / rocks and soils descriptions and sampling, foresic surveys.

Studies along gradients from highly to poorly human impacted areas.

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 archaeomorphological enclosure walls and old hollweways (Even et al., 2021).

IL3D: Open-source software for direct exploitation by soil scientists or future integration in geographical information systems (https://github.com/egev/ILD3).

Landscape and geological materials

A tectonic and glacial heritage
- 3 axes of fracturing highlighted from rock outcrops and preferential feldspar orientations in thin-sections measurements.
- Tectonic fracturing guided the action of the Quaternary. Both factors structure the massif and control its triangular shape.

Geological heritage: The rock descriptions (macroscopically and in thin sections) confirm that most of the Saint-Mont is composed of Remiremont granite (Vincent, 1976).
- New informations, not noted on the geological map:
  * Longer vein of apatite (supposed by the presence of apatite fragments in our studied profiles).
  * At the bottom of unit 6, a lamprophyre vein (rock more basic than granite).

Soil covers

1. Soils not clearly disturbed
- Far from any known archaeological remains, two main types of soils develop on granite:
  - Humic aluvial soils (HRH)
  - Rankine soils (RP)

2. Highly anthropised soils on platform P
- Anthropised (RP) from man made terrace -> Anthrosol with a prismatic horizon (HRB)
- Highly mineralised structure
- Neutral to basic pH

3. Other evidence of ancient human influence on soils?
- Detection of same anomalies:
  * Light when pH is between 4 and 5
  * Easily related to the long-lasting human occupation on the summit.
  * More surprising on some western or southern platforms:

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 heritance 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.