The bauxite residue deposits of the mining basin of Provence: characterization and impacts on the physico-chemical and biological qualities of soils

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5th symposium LabEx DRIIHM – May 9-11, 2017 – Aveiro University, Campus of Santiago, Aveiro, Portugal
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Background

- Mining basin of Provence → alumina extraction → terrestrial deposits of bauxite residues
- Questionings of civil society and scientific community → environmental impact?
- Various valuations are under consideration
- Few studies conducted on these deposits
- Priority thematic → OHM-BMP
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Framework

- IMBE, CEREGE, INERIS, Red Mud Observatory of OHM-BMP
- OHM-BMP → APR 2016
- LabEx DRIIHM → post-doctoral fellowship
Research objectives

How these industrial activities interact with terrestrial ecosystems through the soil-plant continuum?

The researches undertaken aim:
- To study the effects of bauxite residue inputs to soils on their pedo-biological characteristics
- To test their harmlessness on the biological functions of soils
- To determine how and to what extent these tailings modulate the structuring of vegetal and edaphic microbial communities through reciprocal functional relationships
Task 1 – *Overall characterization of bauxite residue deposits at the regional scale*

- Biogeochemical analyses
- Deposit typology of different sites
- Ecotoxicological diagnoses
- Physico-chemical modification of bauxite residues
Research steps

- Task 1 – *Overall characterization of bauxite residue deposits at the regional scale*
  - Biogeochemical analyses
  - Deposit typology of different sites
  - Ecotoxicological diagnoses
  - Physico-chemical modification of bauxite residues

- Task 2 – *Effects of bauxite residues on soils: field, multi-scale and experimental approaches*
  - Structure and diversity of plant communities
  - Dynamic of soil microbial communities
  - Functional interactions: aboveground-belowground linkages
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Study sites

Griffon, slag-heap and red lagoon

La Delorme, slag-heap

Mange-Garri, ponds

La Barasse, slag-heaps
**Preliminary results**

**ECOSYSTEM STUDY**

Altimetric profile

- **Transect 6**
- **Zone 1 (35 sp)**
- **Zone 2 (16 sp)**
- **Zone 3 (37 sp)**
- **Transect 2**

*The bauxite residue deposits of the mining basin of Provence: characterization and impacts on the physico-chemical and biological qualities of soils*
 Preliminary results

ECOSYSTEM STUDY

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<th>Z3</th>
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<td>EC (µS.cm⁻¹)</td>
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<td>TOC (g.kg⁻¹ DM)</td>
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<td>9.9</td>
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Preliminary results

ECOTOXICOLOGICAL DIAGNOSIS

Toxicity test on *Pseudomonas stutzeri* growth

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- **IC₅₀**
  - BRV ~ 10 g.L⁻¹
  - RBM BRV ~ 15 g.L⁻¹
  - BX ~ 7 g.L⁻¹
  - RBM BX ~ 5 g.L⁻¹

Concentration of bauxite residue (g.L⁻¹)
Preliminary results

MINI-RHIZOTRONS

Growth test of *Sinapis alba*

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THANK YOU FOR YOUR ATTENTION