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The terrestrial red mud deposits in Provence: Ongoing researches in soil science

Mathieu Luglia^{1,*}, Camille Fourrier¹, Catherine Keller², Sophie Gachet¹, Pierre Hennebert³, Jean-Paul Ambrosi², Yves Noack^{2,4}, Virgile Calvert¹, Isabelle Giffard¹, Daniel Pavon¹, Bernard Angeletti² & Stéven Criquet¹

¹ IMBE, UMR CNRS 7263 / IRD 237 / Aix-Marseille Université / Avignon Université – Site de l'Étoile, FST de St-Jérôme, Case 441, F-13 397 Marseille Cedex 20, France

² CEREGE, UMR CNRS 7330 / IRD 161 / Aix-Marseille Université / Collège de France – Technopôle de l'Environnement Arbois Méditerranée, BP 80, F-13 545 Aix-en-Provence Cedex 04, France

³ INERIS – Technopôle de l'Environnement Arbois Méditerranée, BP 33, F-13 545 Aix-en-Provence Cedex 04, France

⁴ ECCOREV – OHM-BMP – Technopôle de l'Environnement Arbois Méditerranée, BP 80, F-13 545 Aix-en-Provence Cedex 04, France

* mathieu.luglia@imbe.fr

Framework

These researches fit into the works coordinated by the **Observatoire Hommes-Milieus (OHM)** of **Bassin Minier de Provence (BMP)** and dedicated to **vegetal covers** and **microbial communities of soils**. They aim to study the **terrestrial deposits of red muds** resulting from **past and current activities of alumina extraction**.



Pechiney Gardanne plant, 1951



Alteo Gardanne plant



Alusuisse Saint-Louis-les-Aygalades plant, 1964



Bauxite mining in Provence

Despite the **red muds** have been extensively studied about their industrial recycling potentials (Klauber et al., 2011), the studies on their **environmental effects**, especially on the **biological component of soils**, are far less numerous (Lombi et al., 2002; Garau et al., 2007, 2011, 2014; Krishna et al., 2014) and, furthermore, lacking in the context of BMP. To this date, the various studies available in the literature emphasize the importance of the **soil matrix** in the **modulation of biological responses** when it is mixed with **red muds**. Therefore, this aspect is important to invest at the local scale in the prospect of a **potential use of red muds as improvement to soils** or to the **development of artificial soils for various valuations** (e.g. pollution control, remediation, rehabilitation).

Research objectives

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

The researches undertaken aim:

- ✓ To study the **effects of red mud inputs to soils** on their **physico-chemical and biological qualities**.
- ✓ 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**.

Research steps

❖ **Task 1 – Overall characterization of red mud deposits at the regional scale**

- **Biogeochemical analyses.**
- **Deposit typology** of various sites.
- **Spatialization.**
- **Ecotoxicological diagnostics.**

❖ **Task 2 – Effects of red mud deposits on soils: field, multi-scale and experimental approaches**

- **Structure and diversity of plant communities.**
- **Dynamic of soil microbial communities.**
- **Functional interactions: aboveground-belowground linkages.**

Expected results

- ✓ Acquisition of **fundamental data**.
- ✓ **Ecosystemic diagnostics**.
- ✓ To consider **valuation solutions** of past deposits.
- ✓ To recommend **management actions** of forthcoming deposits.



Study sites



Griffon

Township: Vitrolles
Coord.: 43 26'27" N / 5 18'00" E
Average alt.: 156 m
Area: 99 090 m²

Mange-Garri

Township: Bouc-Bel-Air
Coord.: 43 27'58" N / 5 25'57" E
Average alt.: 234 m
Area: 465 350 m²

La Delorme

Township: Marseille (15th district)
Coord.: 43 20'26" N / 5 21'52" E
Average alt.: 37 m
Area: 37 570 m²



Gardanne plant built in 1893
Coord.: 43 27'8" N / 5 27'35" E

La Barasse (2)

Township: Marseille (11th district)
Coord.: 43 16'32" N / 5 28'47" E
Average alt.: 196 m
Area: 68 700 m²

La Barasse (1)

Township: Marseille (11th district)
Coord.: 43 17'6" N / 5 29'35" E
Average alt.: 76 m
Area: 49 980 m²