



ERA-MIN 2

RESEARCH & INNOVATION PROGRAMME  
ON RAW MATERIALS  
TO FOSTER CIRCULAR ECONOMY

# Lights

Lightweight Integrated Ground and airborne  
Hyperspectral Topological Solutions

Jean CAUZID, GeoRessources/ University of Lorraine  
(France)

ERA-MIN 2 Final Conference and Final Seminar of Call 2017 projects  
18-19<sup>th</sup> November 2021





# Consortium

ERAMIN 2

- Supply of raw materials from exploration and mining
  - Exploration
- May 2018 – December 2021 / 3 years
- Project consortium
  - 5 partners
    - 4 academic, 1 SME
    - Funding :
      - ANR (France),
      - Projektträger Jülich (Germany),
      - FCT (Portugal)
  - + private mine (FELMICA, Deutsche Lithium) and experts (CPRM, Brazil ; UPV/EHU, Spain)
- TRLs – from 2 to 9 depending on WP
- 1,189,919 € requested for a total cost of 1,547,140 €



Université Claude Bernard



**GFZ**

Helmholtz Centre  
**POTSDAM**



UNIVERSITÉ  
DE LORRAINE

Geo  
Ressources

**U. PORTO**

FACULDADE DE CIÊNCIAS  
UNIVERSIDADE DO PORTO

**beak**  
CONSULTANTS





- **Objectives**

- providing a technical solution for spatially extensive and **rapid Lithium prospection**
- Filling two gaps
  - spatial gap in geochemical information,
  - time gap in data acquisition.

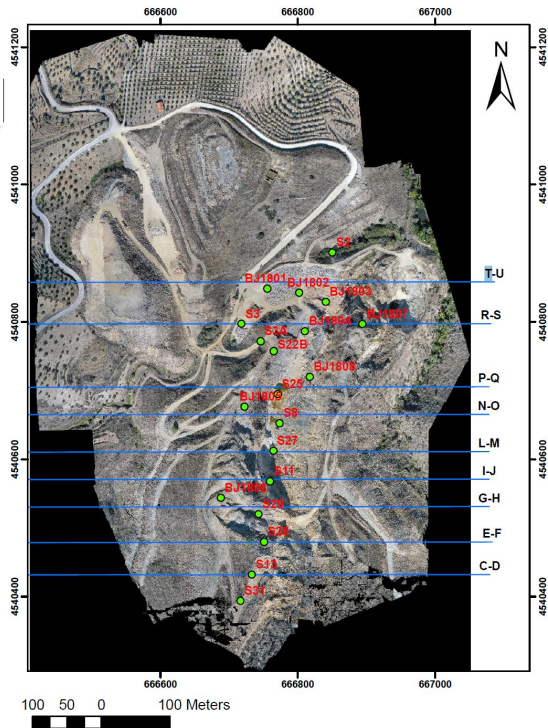
- **Expected impacts**

- The LIGHTS project will give a **world-first approach to find Li in the field**
  - Ease the exploration of Li
  - Deliver new algorithms to the market
  - Enhance the understanding of Li-bearing pegmatites
  - Participate to the reduction of exploration costs of Li-deposits





- A renewed geological model for Li-pegmatites

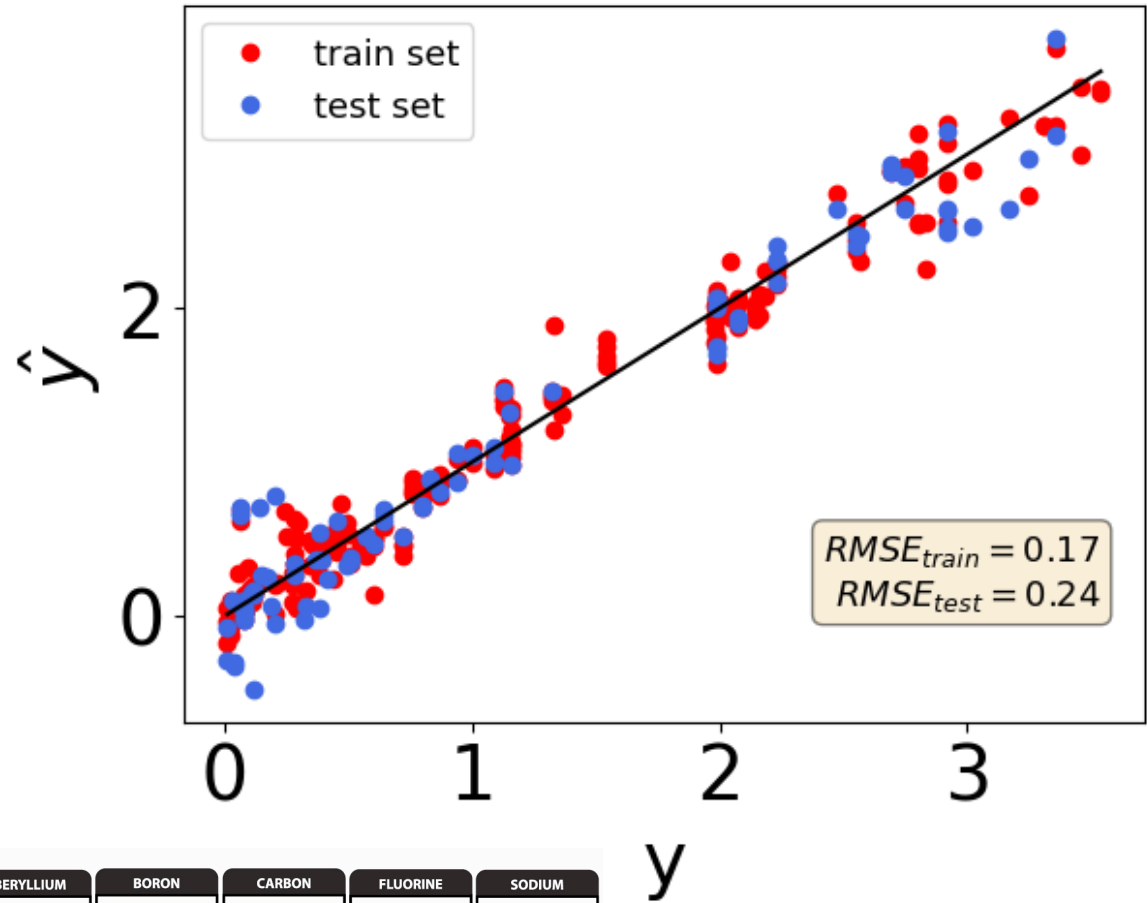






# Final Results

- Calibration curves for direct Li detection on the field





# Final Results

- Satellite – drone – tripod – handheld hyperspectral data and processing algorithms for Li-bearing minerals detection

## Bajoca Lab

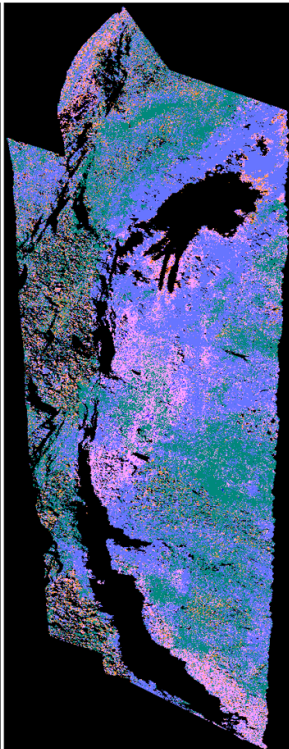
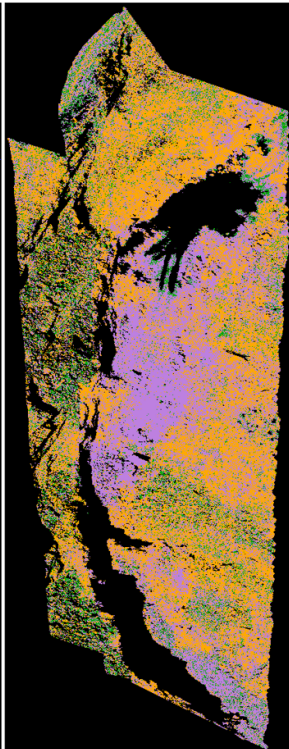
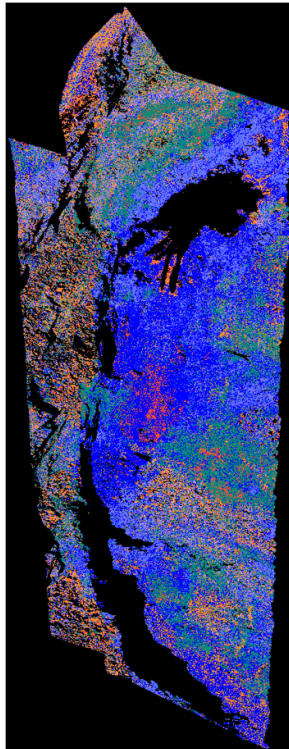
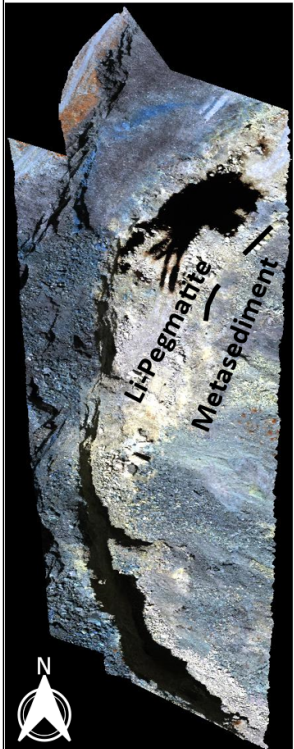
geochemically clustered

lithologically clustered

## Bajoca Field

geochemically clustered

Bajoca Mine (Almendra, Portugal)  
UAV data classification - BFF results



Bajoca Lab

Bajoca Field

### geochemically clustered

- group 1 qtz dominated, weathering crust - Fe-rich 900nm
- group 2 metased. psammitic kaolinite
- group 3 fresh pegmatite
- group 4 metased. pelitic chloritic
- group 5 weathered granite
- group 6 weathering crust - Fe-rich 650 & 900nm

### lithologically clustered

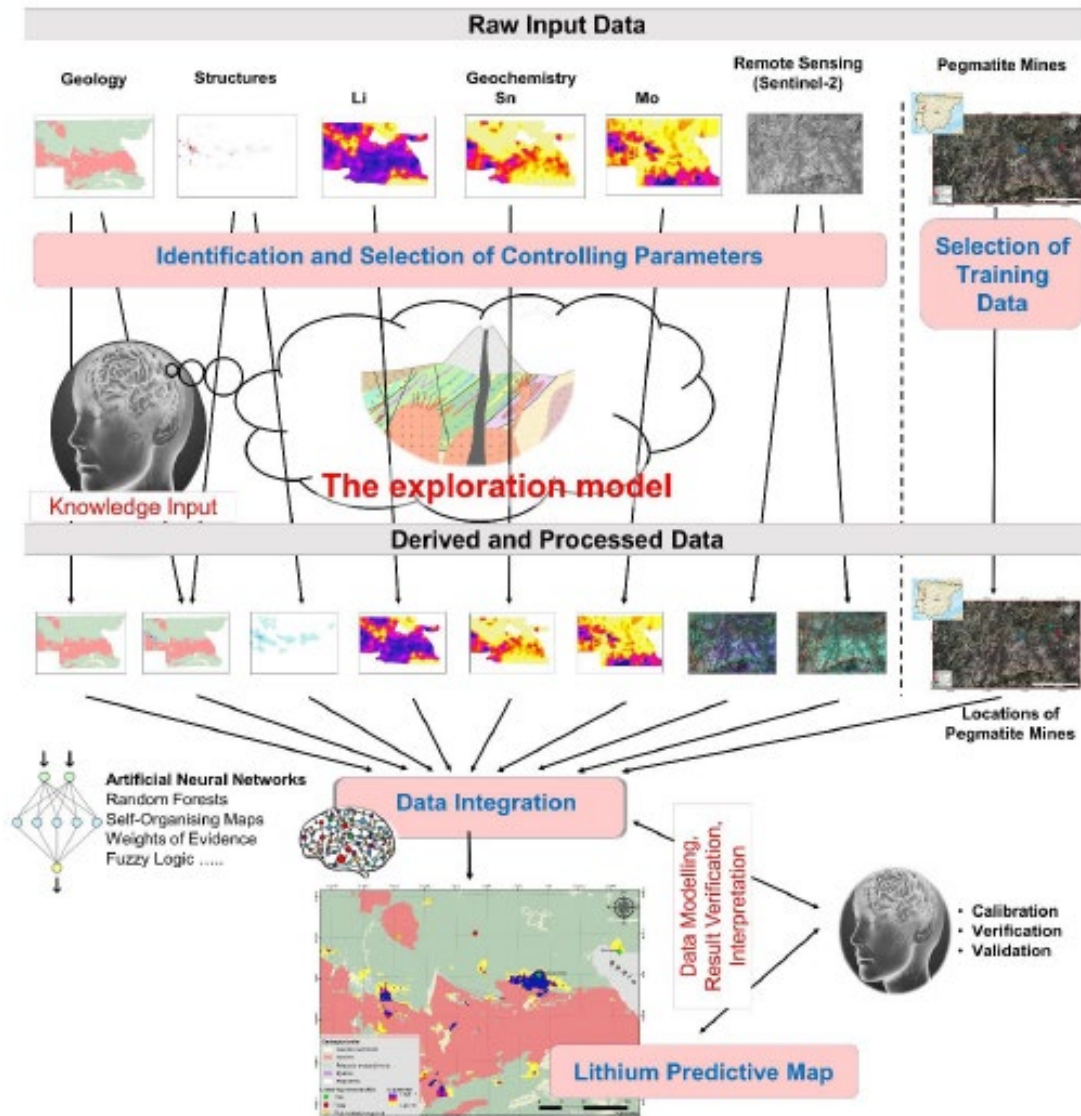
- Granitic-pegmatite
- Li-pegmatite
- Meta-sediment
- group 1 qtz dominated, weathering crust - Fe-rich 900nm
- group 2 metased. psammitic kaolinite
- group 3 fresh pegmatite
- group 4 metased. pelitic chloritic
- group 5 weathered granite
- group 6 weathering crust - Fe-rich 650 & 900nm







- AI for integrating all datasets and produce Li score maps
  - collection of model input data
  - Processing of the spatial data
  - Design, training and validation of the ANN models
  - Model application
  - Refinement and presentation
  - Final distribution map of the Li-bearing mineralization





- **Outputs**

- 11 articles in international journals & 1 chapter/book
- 19 presentations in international events
- 2 articles in national journals
- 4 technical output (databases, libraries) for worldwide free access (hyperspectral & LIBS li-bearing minerals)
- 1 spin-off
- 1 improved commercial software

- **Communication and dissemination activities  
(tools/audiences/stakeholders/end-users/public in general)**

- 8 presentations in national media
- 2 symposiums for large audience (online and presential mode)







- Lessons learnt (i.e. impact of COVID-19)
  - Physical meetings are required for scientific progresses
  - Access to the field cannot be replaced
- Have you cooperated with policymakers during the lifetime of the project? No
- Have the results been implemented by the industry to some extent?
  - Spin-off with license used
  - Software “advangeo” developed by Beak
- Have the results contributed to white papers, regulations or standards? No
- How have the results contributed to the priorities of the ERA-MIN Research Agenda and the Strategic Implementation Plan of the EIP on Raw Materials? No idea
- What’s the biggest impact that the project has produced in the regions/countries of consortium partners?
  - Results and methodologies transferred to other projects related to mining (Beauvoir granite in France, Greenpeg in Portugal)
  - Mining Partner in Portugal changed its view on scientific collaboration and openness on scientific data. Big progress in the frame of social license to operate





- How will the research results of the project be utilised?
  - Work base for other projects (spectral libraries, database...), also for worldwide use (open access).
  - Scientific papers
  - Other projects building on LIGHTS results, including teaching
  - 1 spin-off and 1 software for commercialization
- Will the cooperation continue after the end of this project?
  - Not as a whole but as subgroups inside several projects

