Driving innovation

Project Lithium - Making everywhere more accessible

Dr Estel Blay

We work with Innovate UK
Who are we?

An innovation and technology company transforming the way the world uses satellite technology and data.

WE HELP ORGANISATIONS GROW THEIR BUSINESS
We help organisations to use satellite applications to grow their business in the UK and internationally.

WE ARE INDEPENDENT
We bring together industry, researchers, end-users and government to explore and develop new ideas.

WE ARE GOVERNMENT BACKED
We are partly-funded by the Government and work closely with Innovate UK, UK Space Agency, UK Science & Innovation Network, and other public bodies.
Study Areas, Cornwall, UK

188km² site with an expansive history of mining activity and more recently reclaimed natural landscapes.

111km² site, a landscape that is still subject to intensive mining, providing a current context for environmental monitoring.
Geology – faults and alterations

Inputs - structures

Control - structures

Fault mapping

- Colour changes
- Texture changes
- Topographic changes
- Control & interpretation

Alteration mapping

- Spectral signatures

more details in M. Broadley talk
Derived Faults

cross-course faults (blue)

other faults (black)
Lithium toxicity to plants

Effects of lithium:

- high concentration: toxic – e.g. leaf abscission
- low concentration: stimulate growth
- other elements may have the same effects
- plant dependent

from: R. Yalamanchali, Lithium, an emerging environmental contaminant, is mobile in the soil-plant system
Vegetation anomalies extraction

- hi-res optical data
- thermal data
- hi-res land cover map
- plant health index

More details in C. Bielski talk
More details in E. Webb talk
Vegetation anomalies

high density of vegetation anomalies

Vegetation anomalies
Terrain deformations

Synthetic Aperture Radar (SAR)
Sentinel-1 image stack

stable point

stable area

useful for environmental baseline
Prospectivity map

Legend
1 km prospectivity - 10 classes
1 km prospectivity.Prospect
0 - 7
8 - 14
15 - 20
21 - 27
28 - 34
35 - 41
42 - 48
49 - 54
55 - 61
62 - 68

not probable
lower probability
higher probability

Prospectivity map

faults
mineral alterations
vegetation anomalies
terrain displacement (active faults)

1 sqkm probability of Li occurrence

more details in L. Bateson talk
Lithium prospectivity
Environmental Baseline

regular mapping of surface components

mine/tailings reclamation

pollution monitoring

vegetation
soil
water
drainage network
manmade features

change detection

land cover

surface
groundwater
air

baseline maps

more details in Clothier/Hicks talk
Earth observation pollution analysis

- Spectral indicators 1987-2017
  - 1987 Spectral Mine Extent Extraction
  - NDVI Change 1987-2017
  - 2017 Iron ratio

- key indicator of acid mine drainage
  - temporal changes
  - potential contamination

- vegetation healthiness index
  - temporal vegetation degradation
  - potential contamination

- extent of exposed mining area
  - temporal changes
  - potential disturbance and contamination
Conclusions and opportunities

- Earth observation capability demonstration in
  1) Prospecting lithium
  2) Environmental scoping

- How reproducible are remote sensing products?
  - While some products (terrain displacement) are fully reproducible, some still require manual interpretation or support from in-situ data.

- Can long term monitoring being achieved?
  - Definitively. Many new missions are planned and the technological continuity is certain.

- Do surface manifestation link to subsurface features?
  - The project is still in the first stage, but the prospectivity map and the ground campaign demonstrated high potential.

- Is there a gap between research and industry?
  - Catapult is here to fill the gap!
Thank you!

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