Satellite monitoring of needle diseases

Grant Pearse

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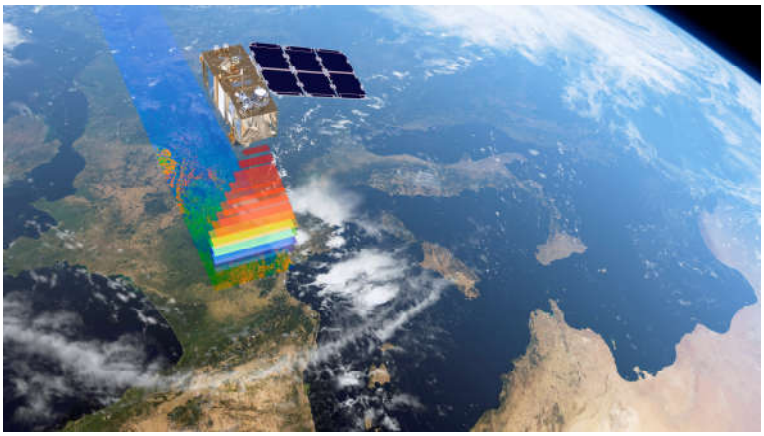
Satellite monitoring of forest health

Overview and background

Why satellite-based monitoring?

- RapidEye – previous detection
- Sentinel 2 (a,b)
  - 10 m global coverage
  - 5-day revisit
  - Key vegetation indices
- Opportunity for NZ forestry:
  - Continuous monitoring
  - New and existing diseases
  - Open data
  - Long-term



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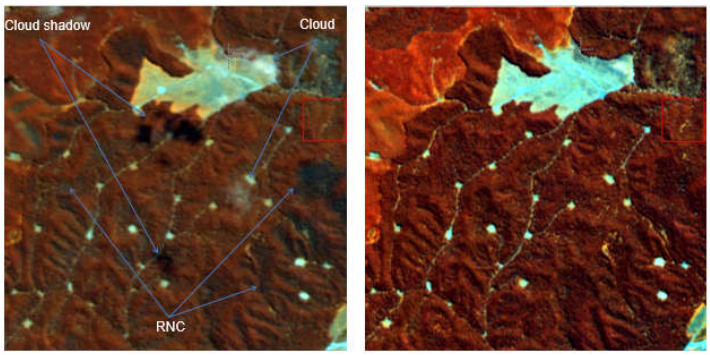
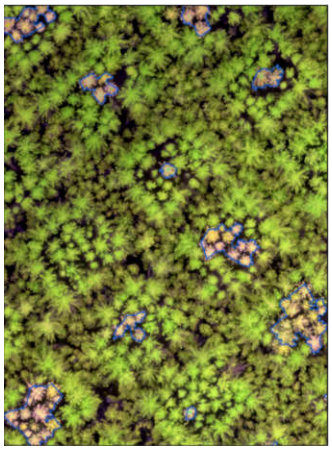
Remote sensing and forest health



RapidEye detection of RNC. Image: Watt et al. (2012)

Research at Scion:

- RapidEye detection (FFR)
- Success at 5m resolution, similar bands



- Simulated disease outbreak
- More insight into resolution and wavelengths

Scion's suite of tools for detection and monitoring

UAV detection using red band (left) and colourised photogrammetry (right)

- UAV detection and mapping
- LiDAR analysis of needle loss

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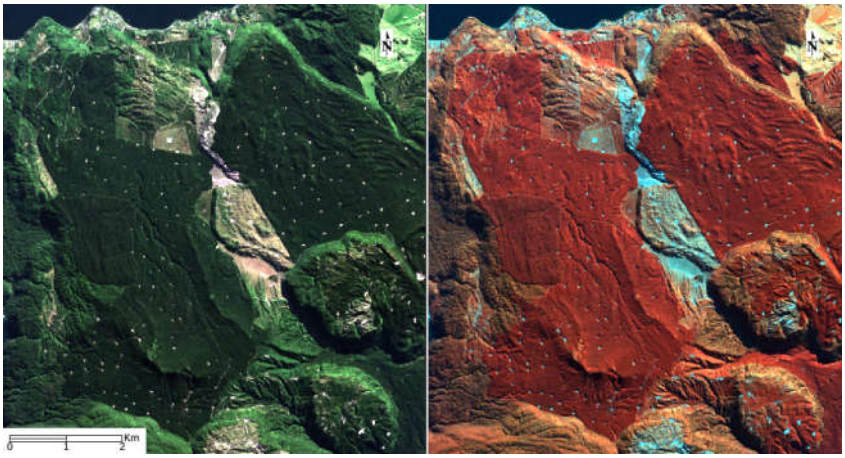
Monitoring framework

- Can detection be accomplished using Sentinel-2?
- Possibility of automated detection?
- Framework for large-scale detection



Example of Sentinel-2 10m RGB (left) and NIR false colour (right)

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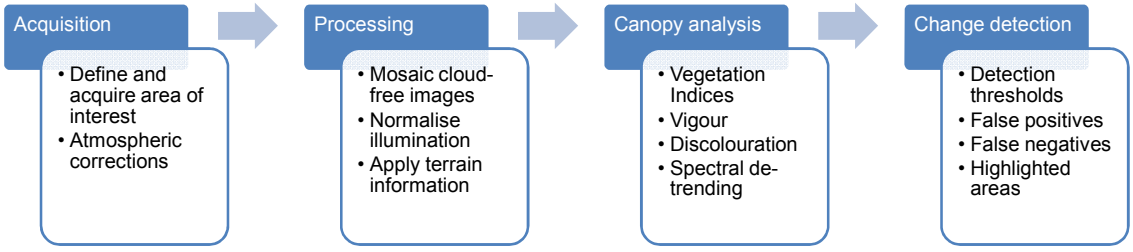
Project framework



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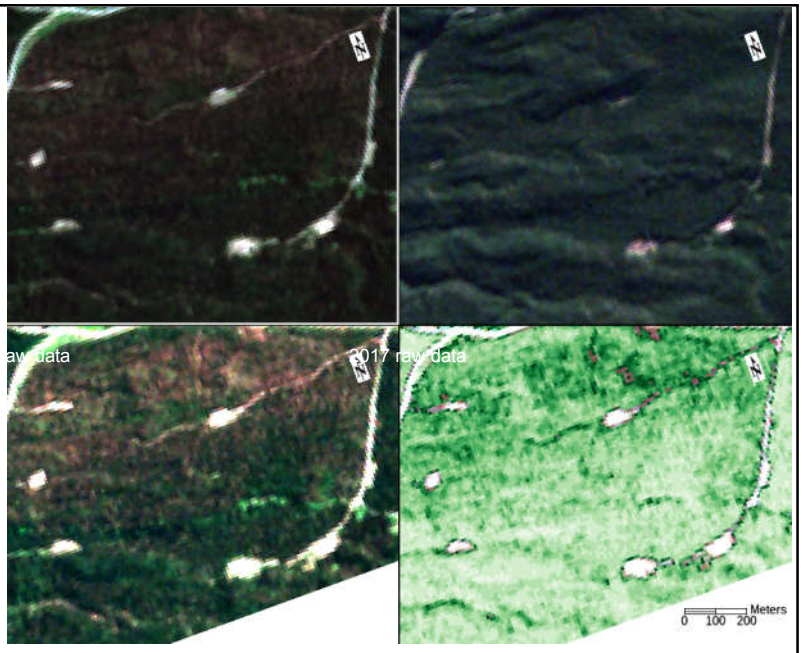
Results

- Batch processing
- Validation on reported areas
- Validated vegetation indices
- Limitations: **clouds**, terrain, shadow

New key objectives

- Refine analysis pipeline
- False positives: harvest, new roads
- Framework for automated detection



Vigour index (2016/2017)

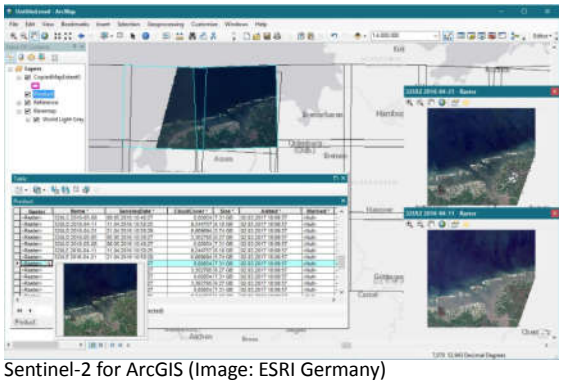
Detection from Sentinel 2 using change in vegetation vigour (1 year recovery)

Conclusions

- Demonstrated feasibility of detection from free, public data
- The how - methods, processes, indices, thresholds will be published
  - Combinations specific to *P. radiata* in New Zealand
- Look to run ongoing detection into the next season (semi-automated)
- Towards continuous, automated detection

Final word:

- Seeking further test sites
  - 5-day revisit: greater success
- Contact via email (confidential)
- Sentinel-2 data is easy to access:
  - https://code-de.org/
  - https://github.com/EsriDE/ArcGIS-Sentinel2-Download-Tools
  - https://scihub.copernicus.eu/



Sentinel-2 for ArcGIS (Image: ESRI Germany)

References

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