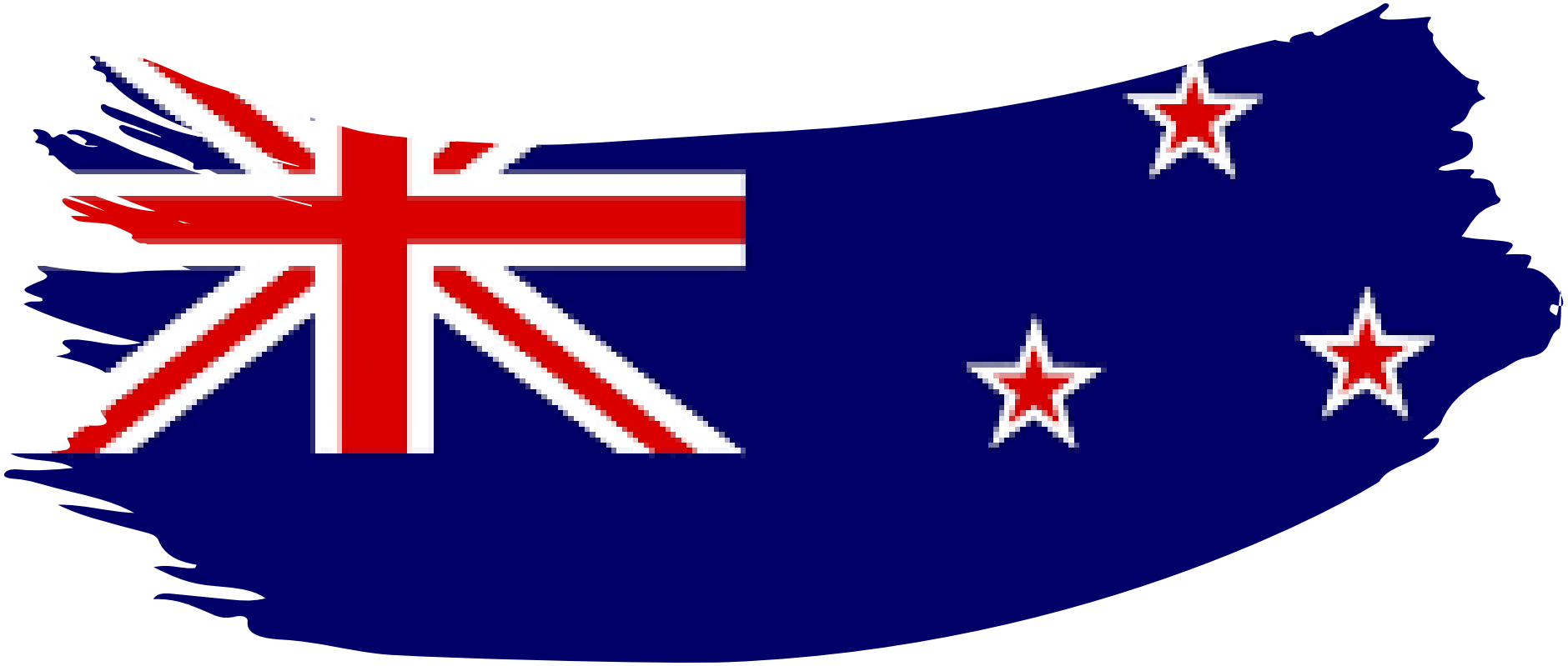


Update on research activities from New Zealand and collaborators

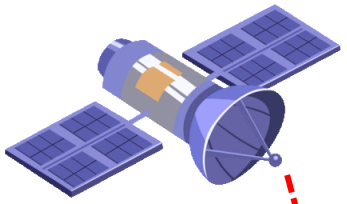
Ilze Pretorius, Wayne Schou, Tara Strand, Robert Bryce, Kate Melnik, Jack White and Alex Codoreanu, Darrin Woods

Overview

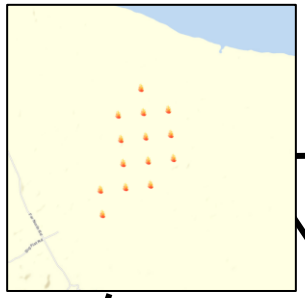
- NZ automated fire growth and smoke forecasting system & related developments by collaborators
- 2020 Bushfire Data Quest, research sprint
- Work commissioned by Fire and Emergency New Zealand (New Zealand's main firefighting and emergency services body)

NZ automated fire growth and smoke forecasting system

VIIRS/MODIS

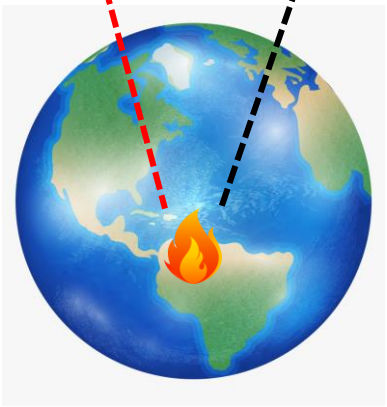


www.earthdata.nasa.gov

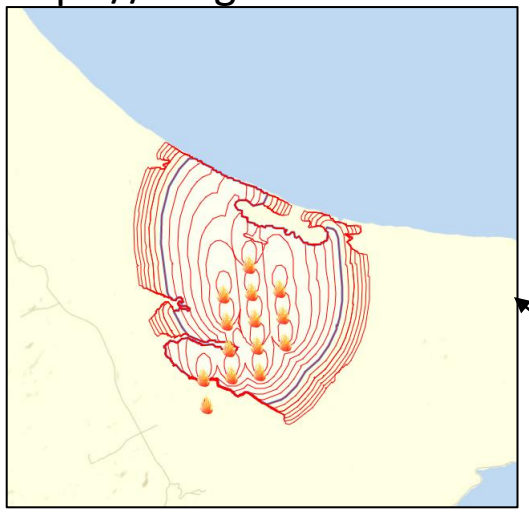


Within 4-5 hrs

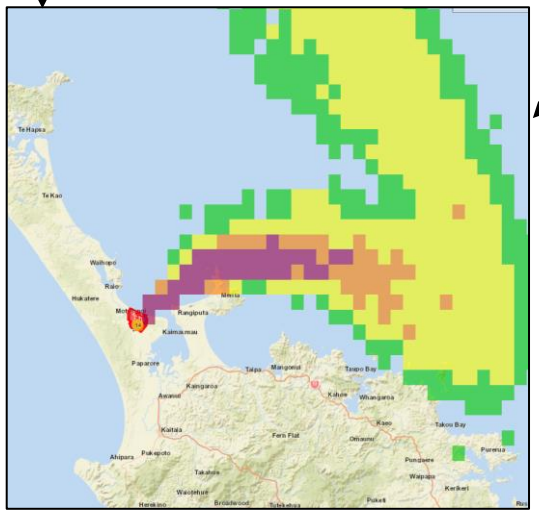
Within 3 hrs



Fire growth prediction (Prometheus Software as a Service) (NW Territories, Alberta Fire, Scion, Heartland Software) https://firegrowthmodel.ca



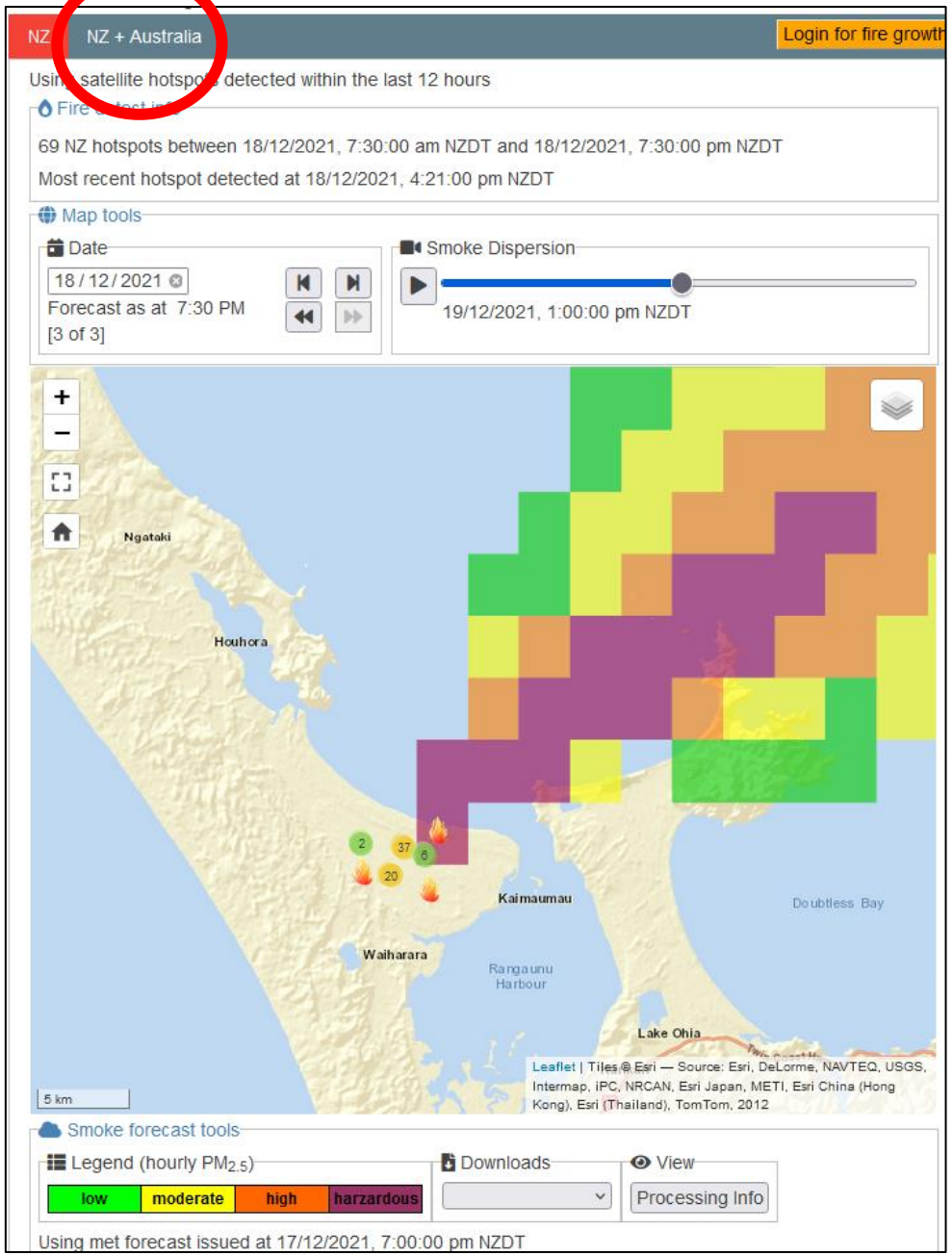
Smoke prediction (Bluesky system, USFS)

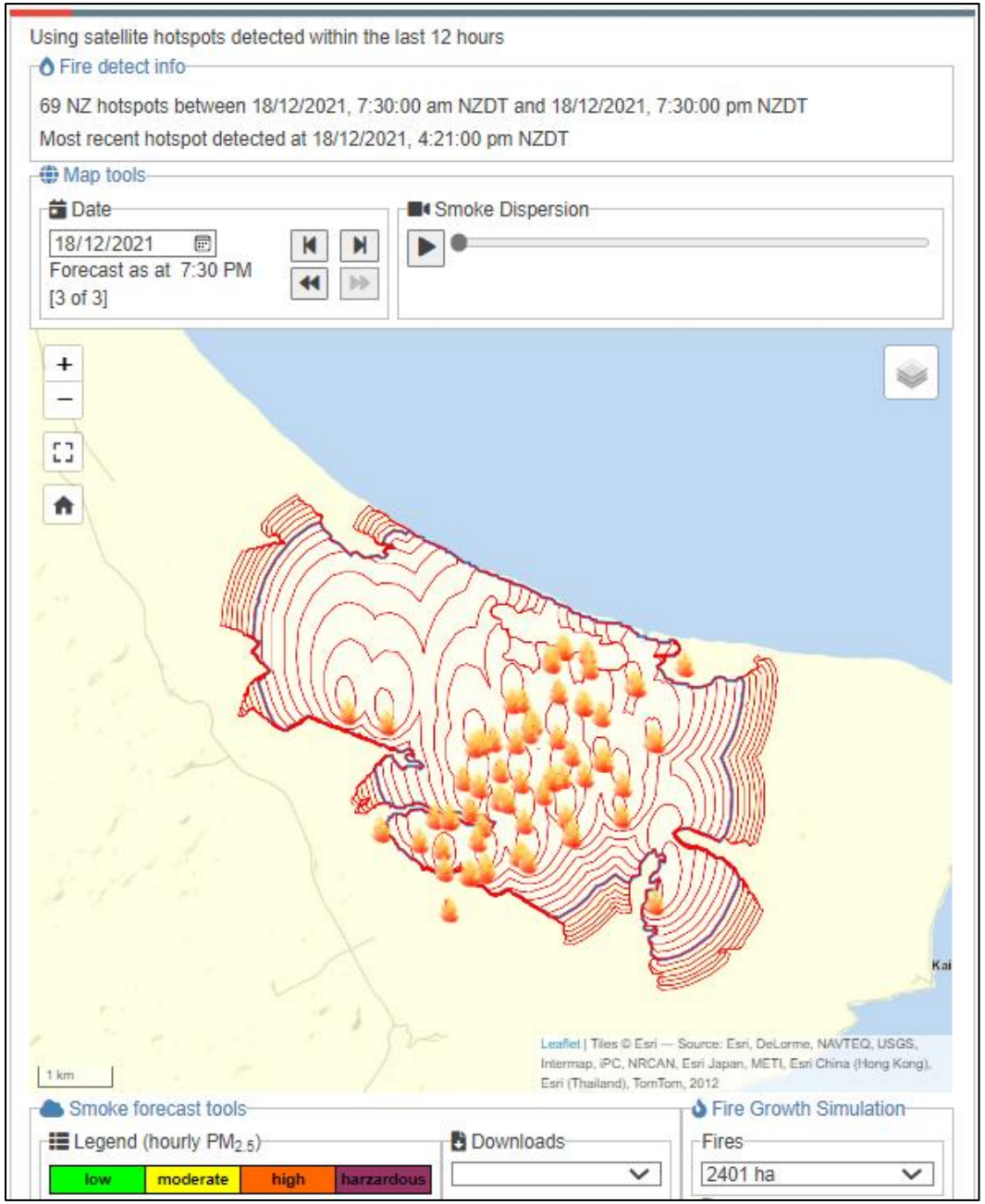


Weather Prediction Model Data
Weather Research and Forecasting system (WRF), 4km horizontal resolution

scion
FORESTS | PRODUCTS | INNOVATION

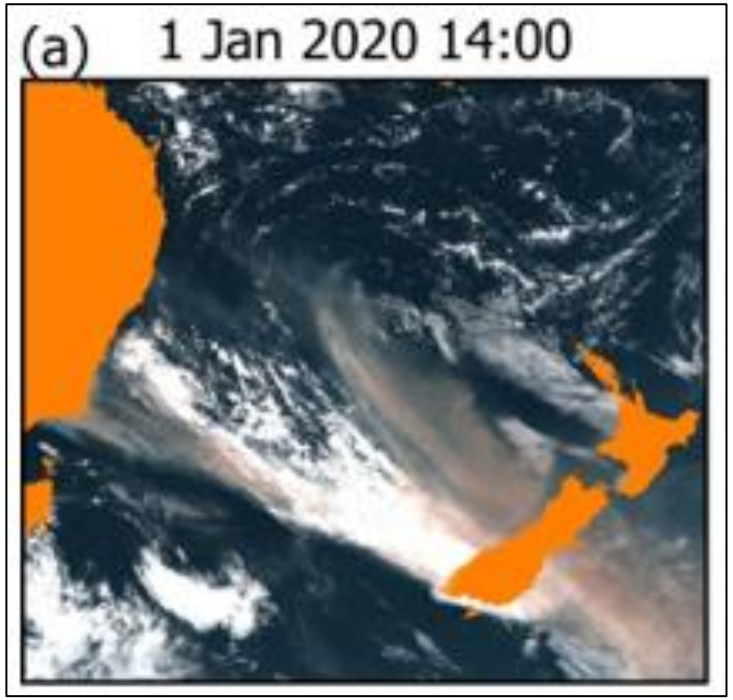
www.ruralfireresearch.co.nz/tools/fire-registry

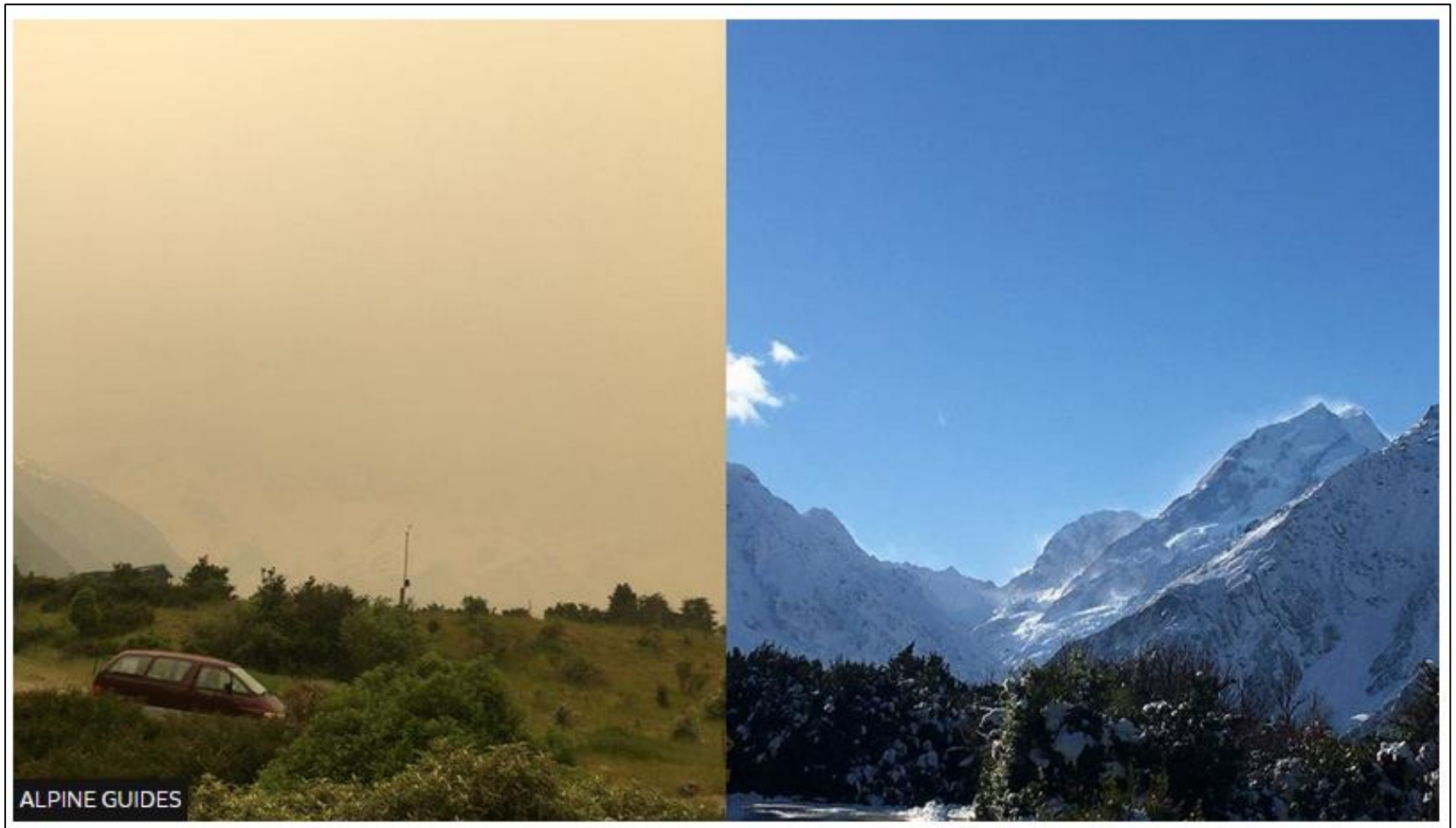




Australia fires: Smoke turns New Zealand skies 'eerie' yellow

BBC NEWS





The view of Mount Cook over the past days vs on a clear day

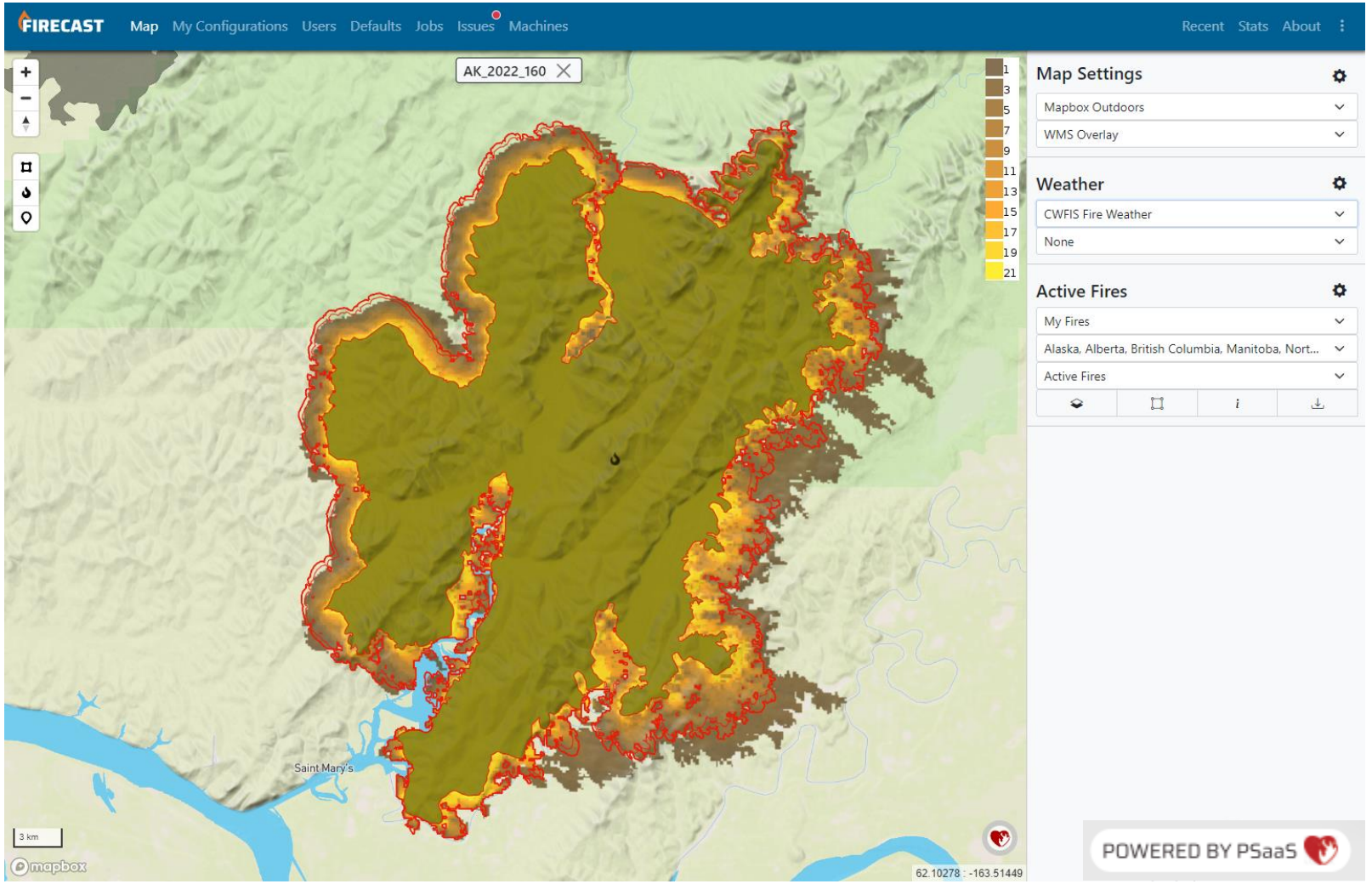
HEARTLAND
SOFTWARE SOLUTIONS

FireCast

- Wraps PSaaS to automate fire growth modelling
- Uses:
  - Environment Canada weather forecasts (being expanded)
  - Agency and national fuel maps
  - Public elevation data
  - Agency published fire perimeters
    - Not always automatically generated
  - Starting on satellite hot-spot data

FIRECAST

- 3 day projection showing outputs from deterministic (GDPS) and ensemble (GEPS) weather models
  - Yellow shows good correlation among ensemble members, brown shows less correlation



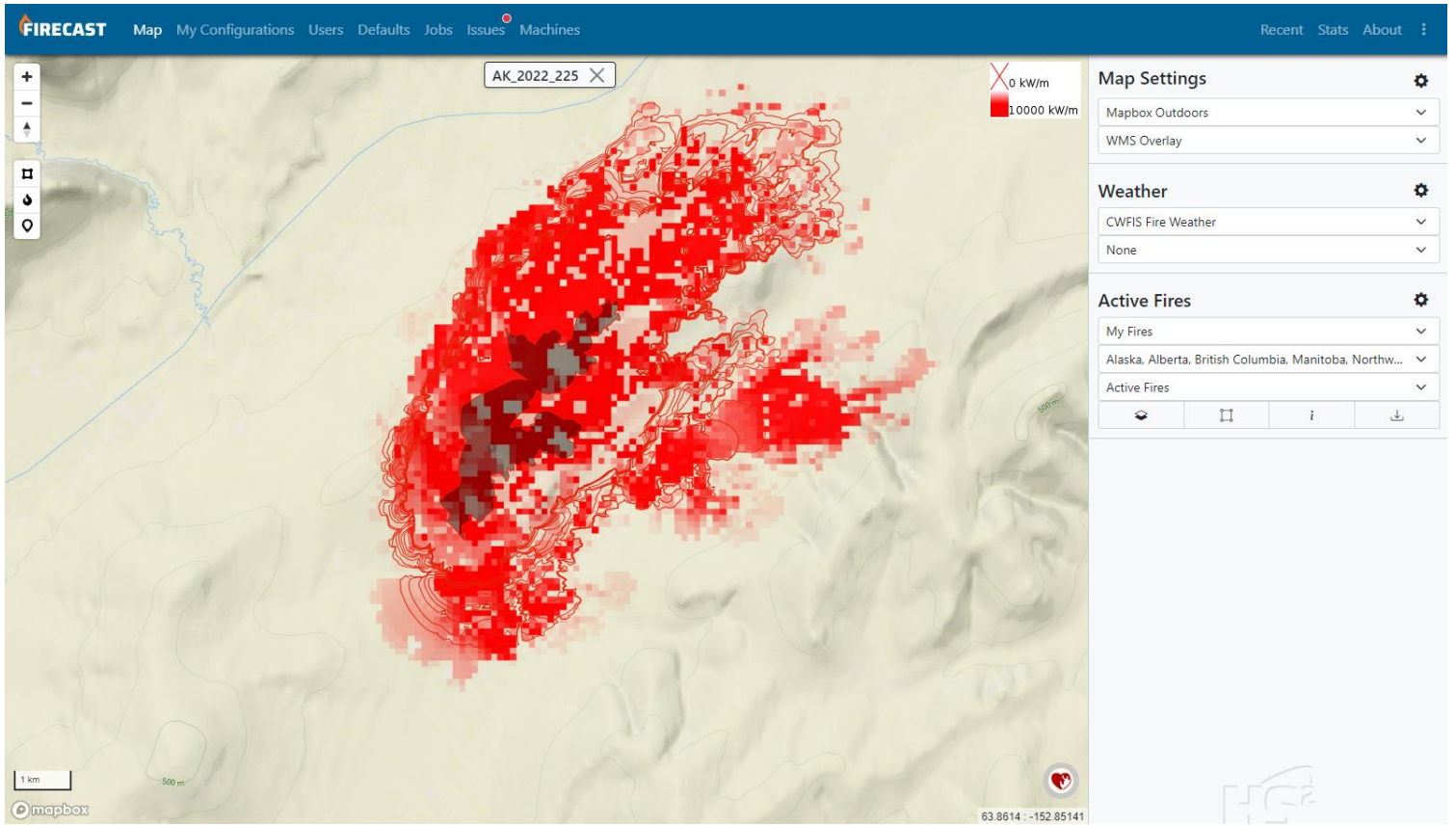
HEARTLAND
SOFTWARE SOLUTIONS

FireCast

- **2021:**
  - **over 2500 fires in near real-time**
  - **over 4000 separate fire perimeters**
  - **over 125,000 simulations**
- **User interaction to model fires was minimal in this automated service**
- **Generally have outputs generated:**
  - **deterministic within 10 minutes**
  - **Ensemble in 10 minutes to a few hours, depending on the inputs and configuration**

FIRECAST

- **3 day projection showing maximum fire intensities over a 3 day span**



- **Currently operational with Canadian and New Zealand data feeds.**
- **Can be configured to automatically model fires anywhere data (FWI, FBP, DEM, ignitions, weather) is available**

POWERED BY PSaaS

HEARTLAND
SOFTWARE SOLUTIONS

FIRECAST DEMO: https://www.youtube.com/watch?v=s07EQxZgVXs

rbryce@heartlandsoftware.ca

FIRECAST

DATA QUEST 2020

EARLY DETECTION TEAM

fdlausnz.org

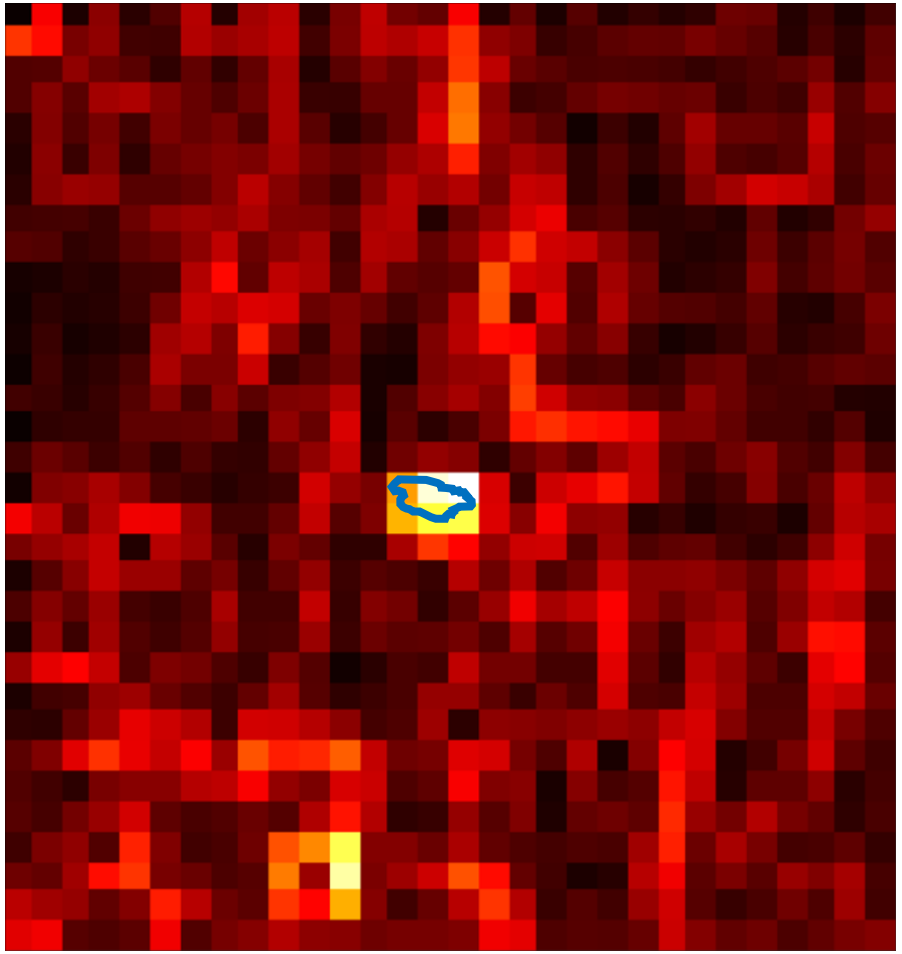
RESEARCHER
ILZE PRETORIUS

RESEARCHER
JACK WHITE

RESEARCHER
KATE MELNIK

RESEARCHER
ALEX CODOREANU

Orroral Valley Fire



Geostationary Satellite data challenges:

- **Low resolution:**
  B7 (central wavelength 3.85 µm) = 2 km Sub Satellite Point
- **High heterogeneity:**
  False alarms vs sensitivity

Image Subtraction

very effective at *'finding a needle in the haystack'*

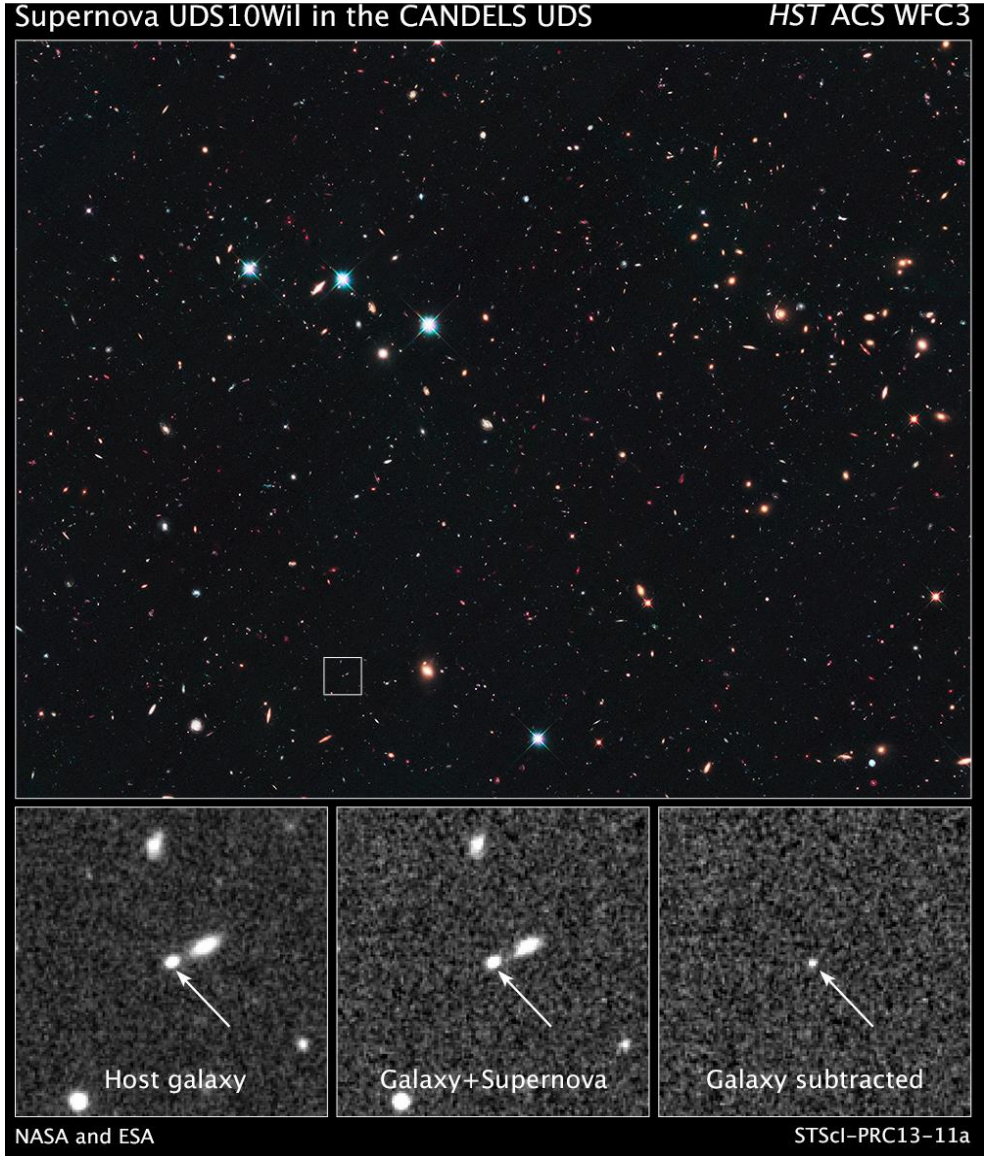
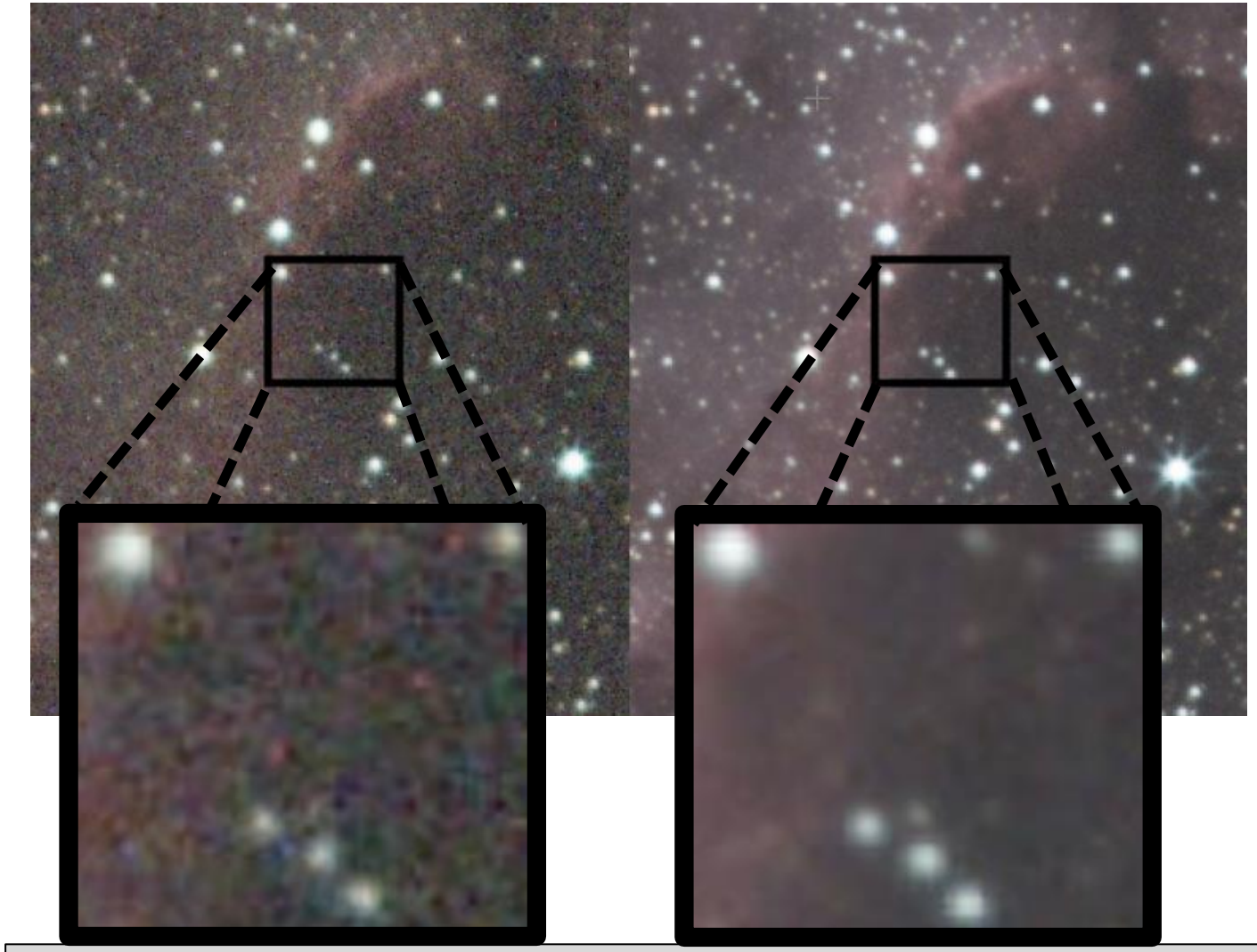


Image Stacking

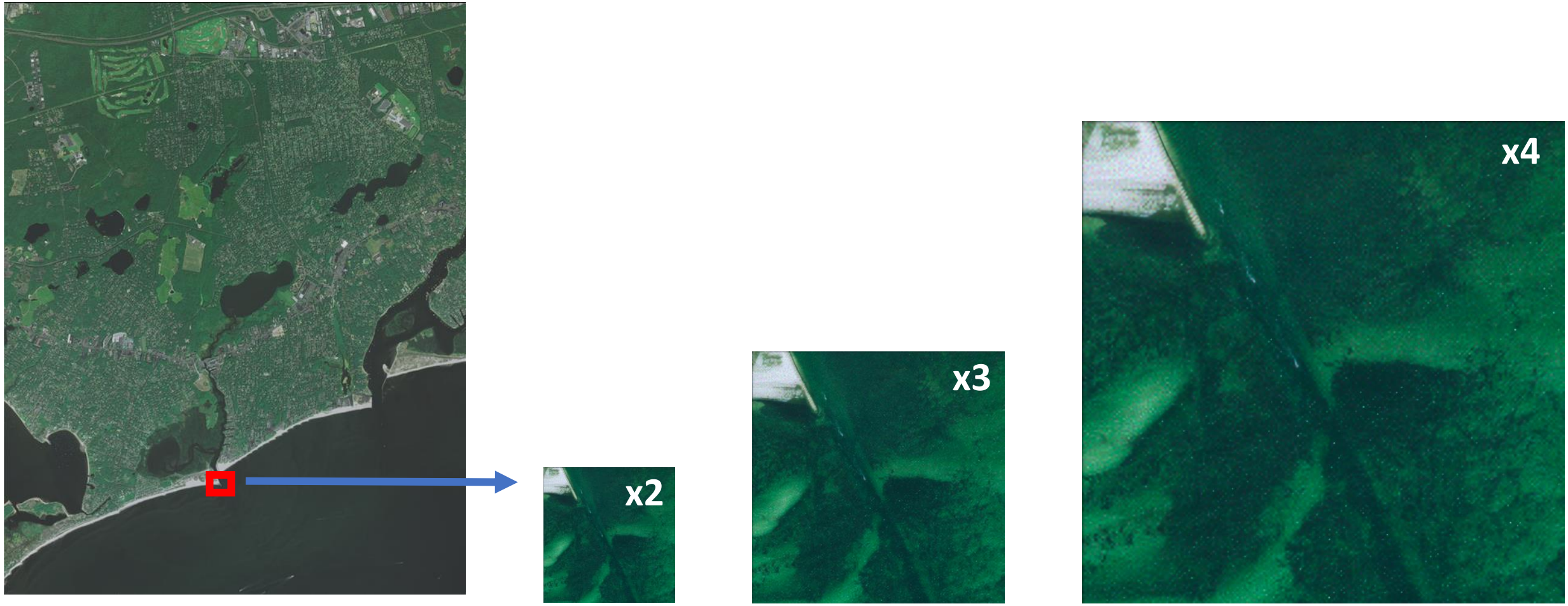
Increases signal-to-noise leading to lower false positive rates



One vs. stack of 60 two minute exposures

EDSR:
Enhanced Deep Residual Networks for Single Image Super Resolution

Transforms on the ground size of Himawari8 pixel from 2x2km to 0.5x0.5km

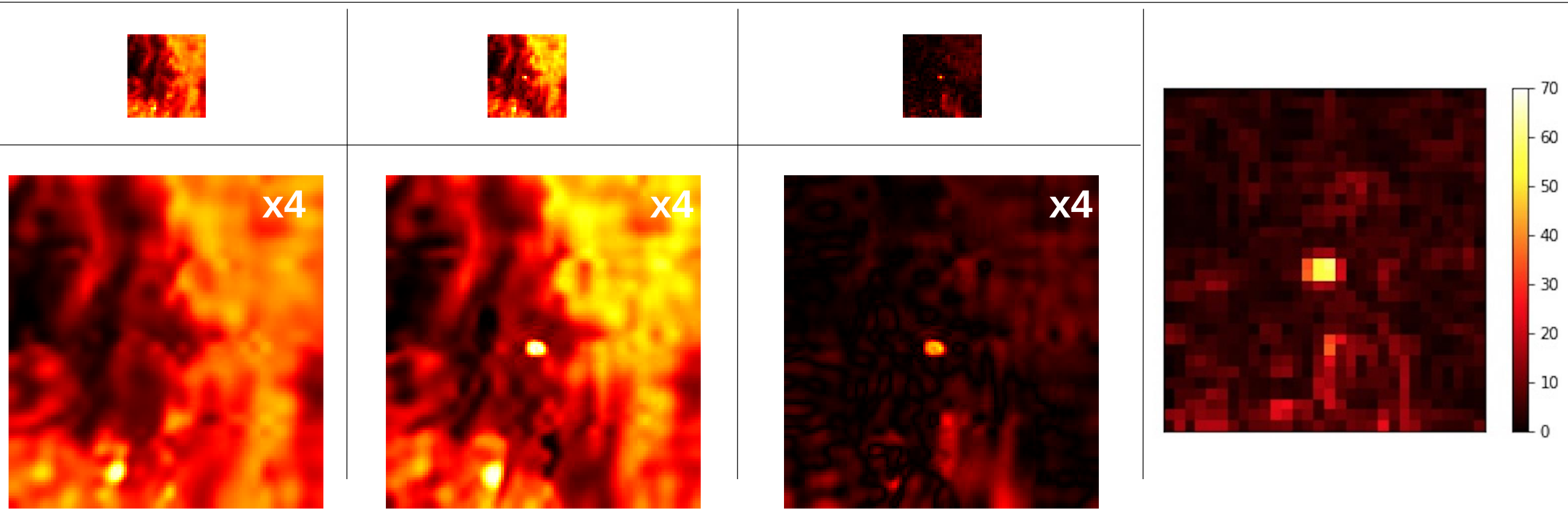


Our Single Band Detection Algorithm (B07)

Jan 25th, 13:50

Jan 27th, 13:50

Preprocessed Stack − Incoming Single Image = Subtraction Image → Detection Space



https://en.calameo.com/read/0055032803bad6398571e

Remote Sensing Geospatial Data Applications for Fire and Emergency New Zealand

- **Burnscar Detection**

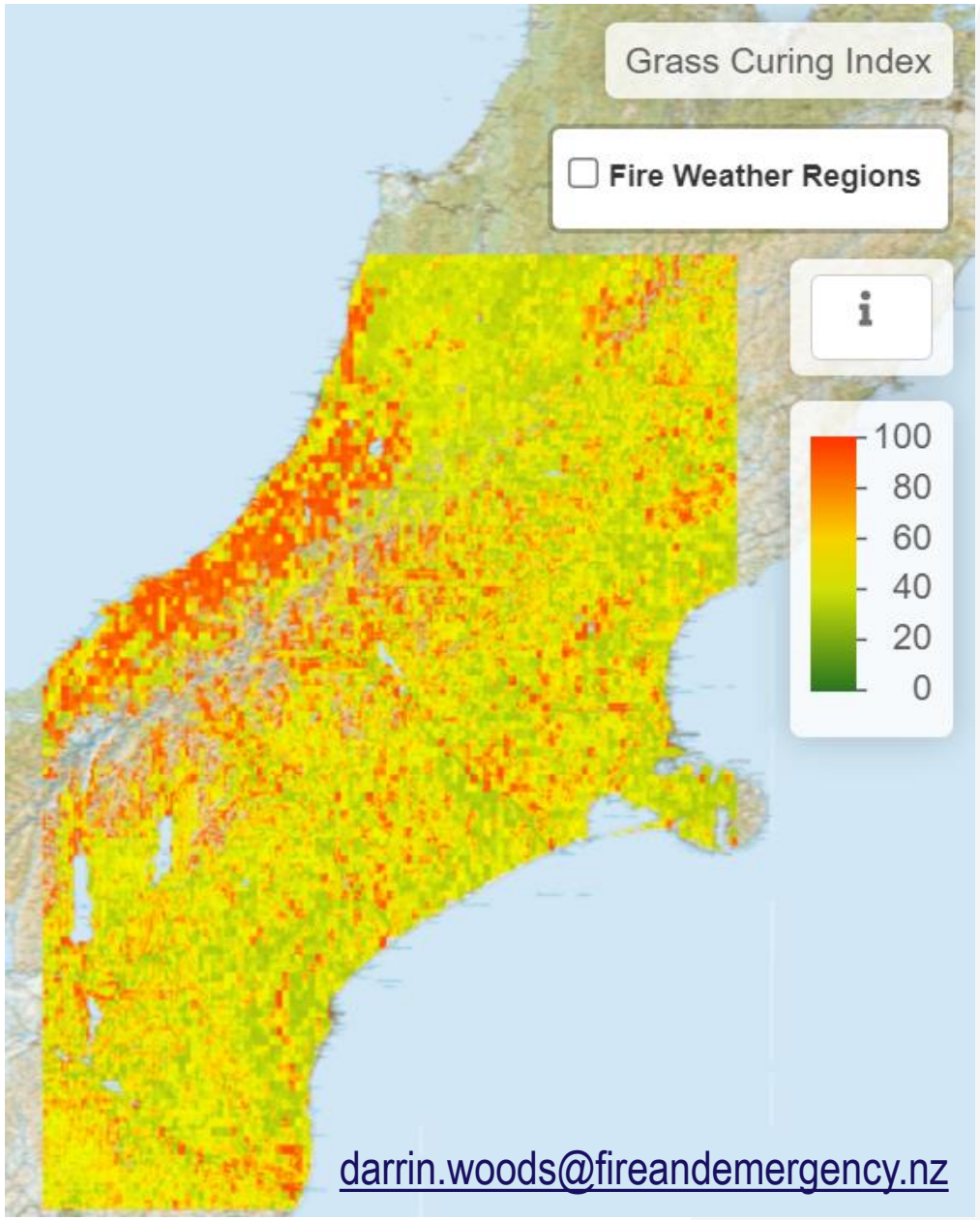
Using remote sensing to support accurate identification of the true extent of a wildfire

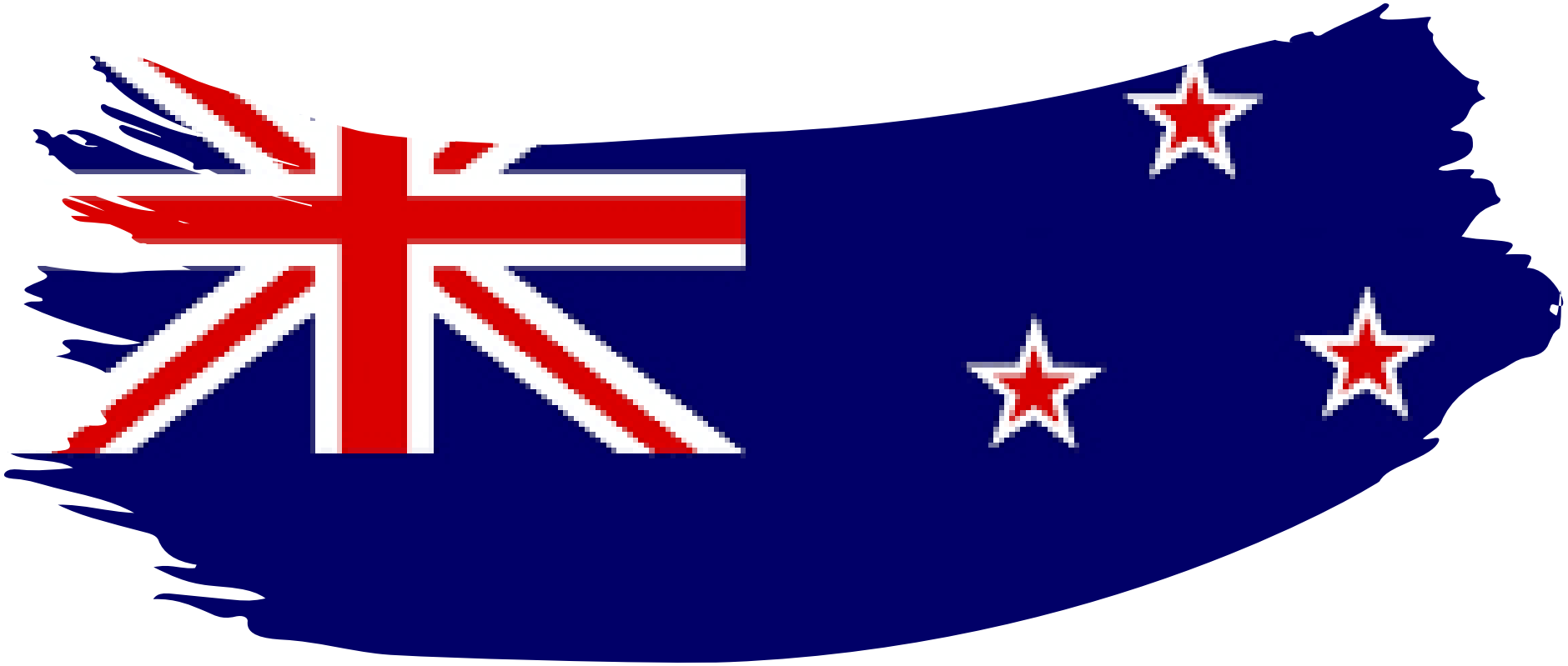
- **Fuel Type Mapping**

Augmenting existing land cover classification with refined fuel coverage mapping to support fire behaviour prediction

- **Grass Curing**

Combining remote sensing with ground observations to generate grass curing values





Thank you!

Ilze.Pretorius@scionresearch.com