Very High Resolution Remote Sensing of *Portulacaria afra* Canopy Cover

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NGI NATIONAL GEO-SPATIAL INFORMATION
MAPPING OUR NATION

INTERGRAPH
s·y·s·t·e·m·s
Southern Africa

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Background

- Restoration of degraded Spekboom habitat is beneficial from a number of perspectives.
- Spekboom canopy cover maps are needed to help select and monitor restoration sites.
- Canopy cover provides information on the level of degradation, economic feasibility and progress of restoration.
- There is an initiative to involve private land owners in restoration. Canopy cover maps at 1:10000 scale are required to work at a farm level.

Aim and Objectives

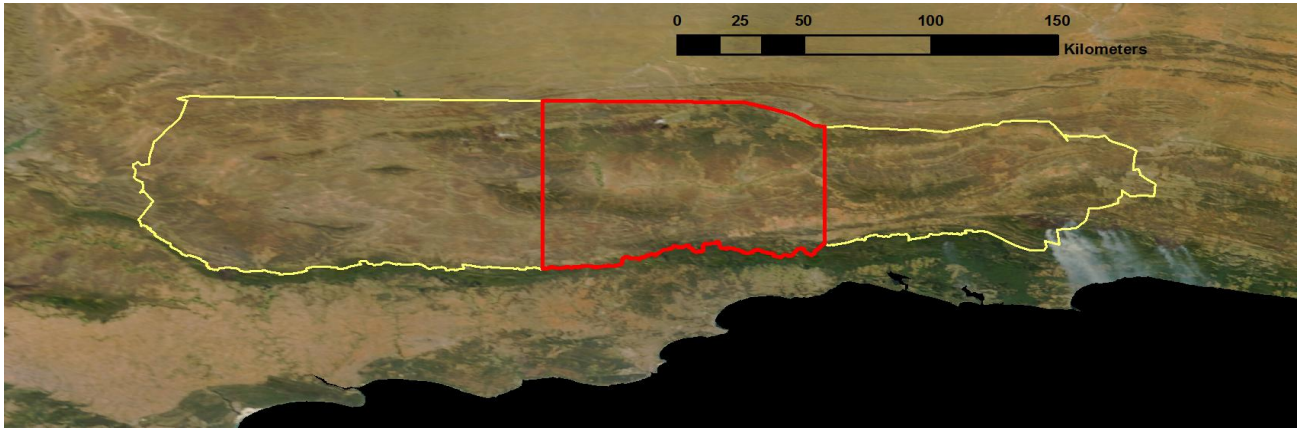
Aim

The research aim is to develop an image analysis technique to accurately estimate Spekboom canopy cover over large areas at very high resolution (VHR).

Objectives

- Perform a field study to establish reference sites with ground truth.
- Source and calibrate imagery from National Geo-spatial Information (NGI).
- Develop a classifier that distinguishes Spekboom from surrounding vegetation & determine Spekboom canopy cover from the classification results.
- Apply the canopy cover estimation to the Little Karoo study area and interpret results. Conduct a second field study to validate the results.

Study Area



- Subtropical thicket makes up 35% of the Little Karoo of which roughly 90% is degraded to some extent.
- Relevant studies have been performed in the area which provide useful ancillary and validation data.
- Due to processing and storage requirements, the study area was reduced.
- Reduced area was chosen to incorporate as much variation as possible.

Image Calibration

- Radiometrically and geometrically calibrated/consistent imagery is required for study area.
- None of available NGI imagery satisfies these requirements.

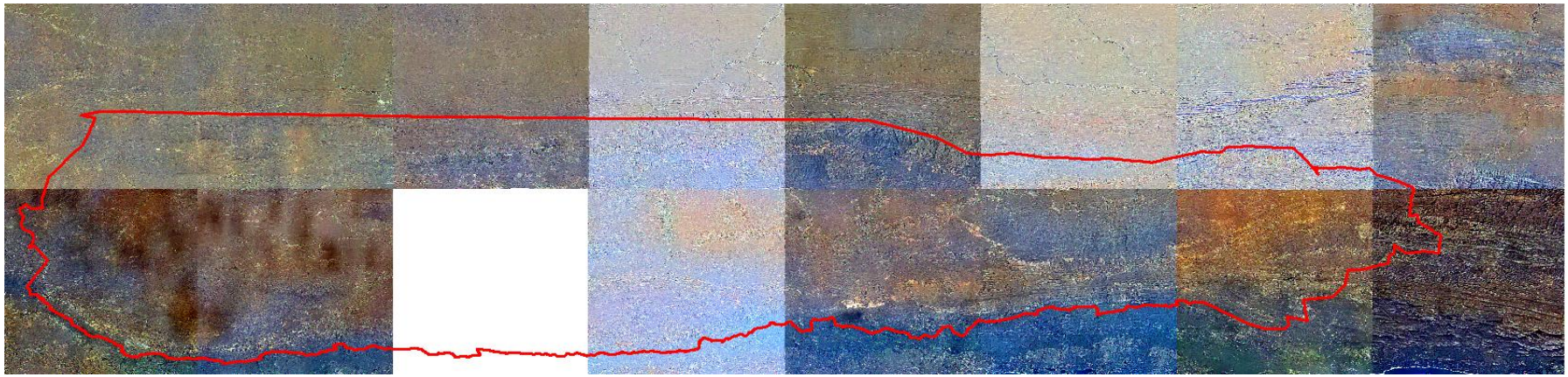
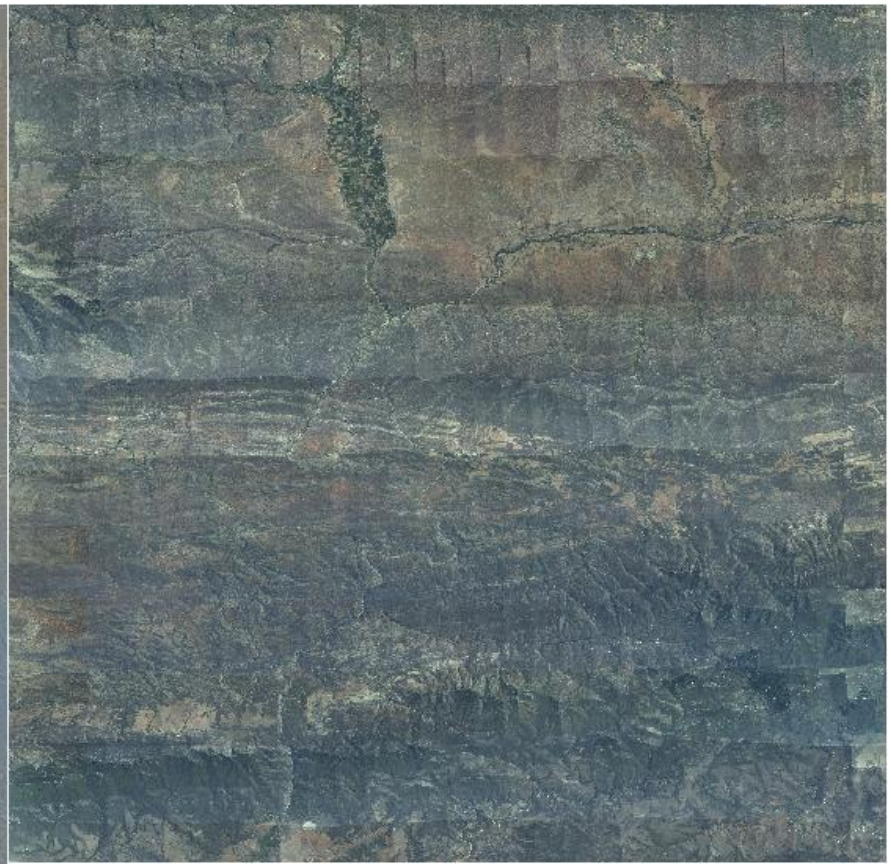


Image Calibration

- Raw imagery obtained from NGI archives.
- Post-processing software obtained from Integraph SA. Corrects for:
- Dark current
- Sensor non-linearity and non-uniformity
- Lens distortion
- Misalignment of bands
- Relevant camera calibration data obtained from GeoSpace.
- Raw imagery has been successfully processed.
- Orthorectification applied using aero-triangulation information from NGI.

Image Calibration

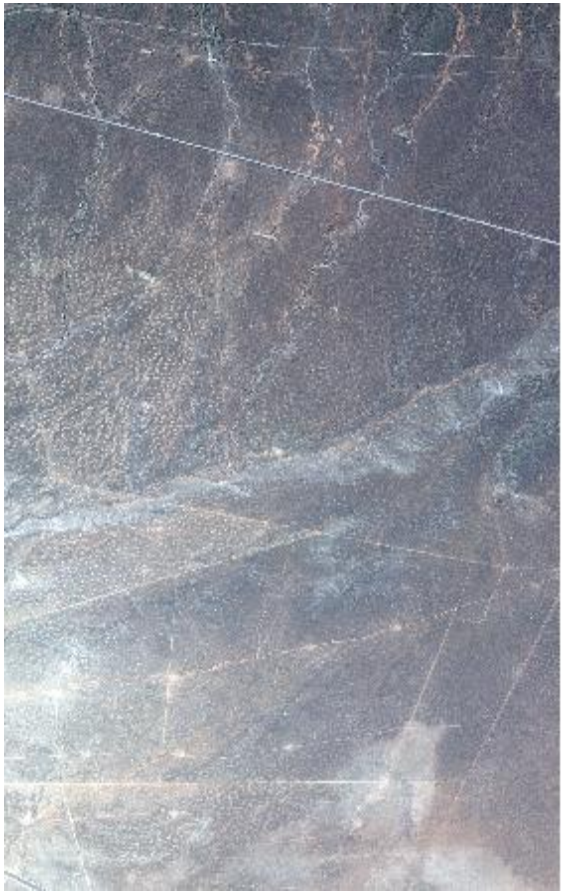
NGI Processed Mosaic



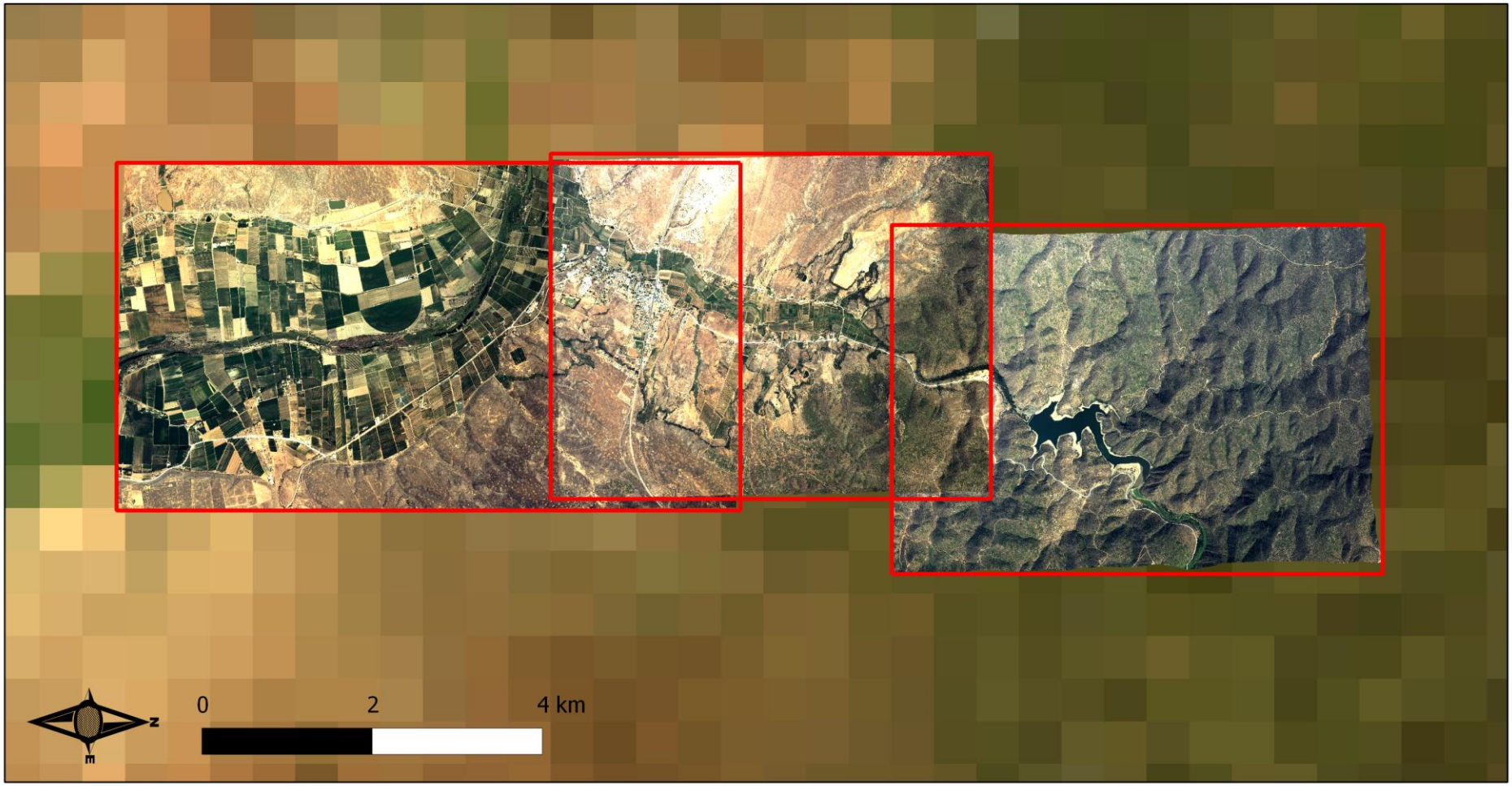
“Raw” Mosaic

Cross Calibration

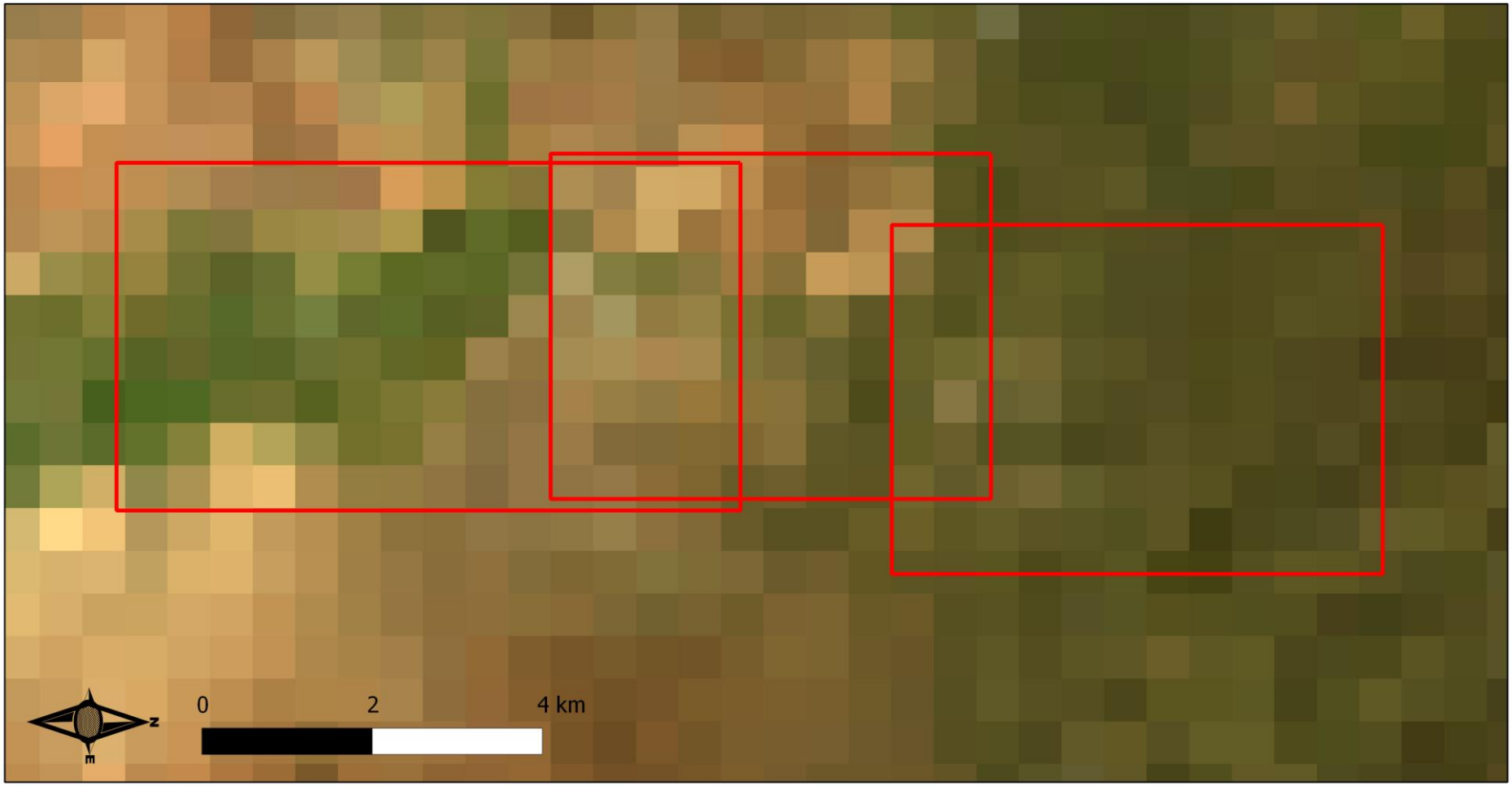
- After rectification, compensation for BRDF and exposure effects required
- Cross calibration uses existing calibrated image as reference or target values
- Advantages of being simple and compensating for both within and between scene variations
- MODIS 500m, 16 day NBAR used as a calibration reference
- Linear relationship found between MODIS and NGI pixel values



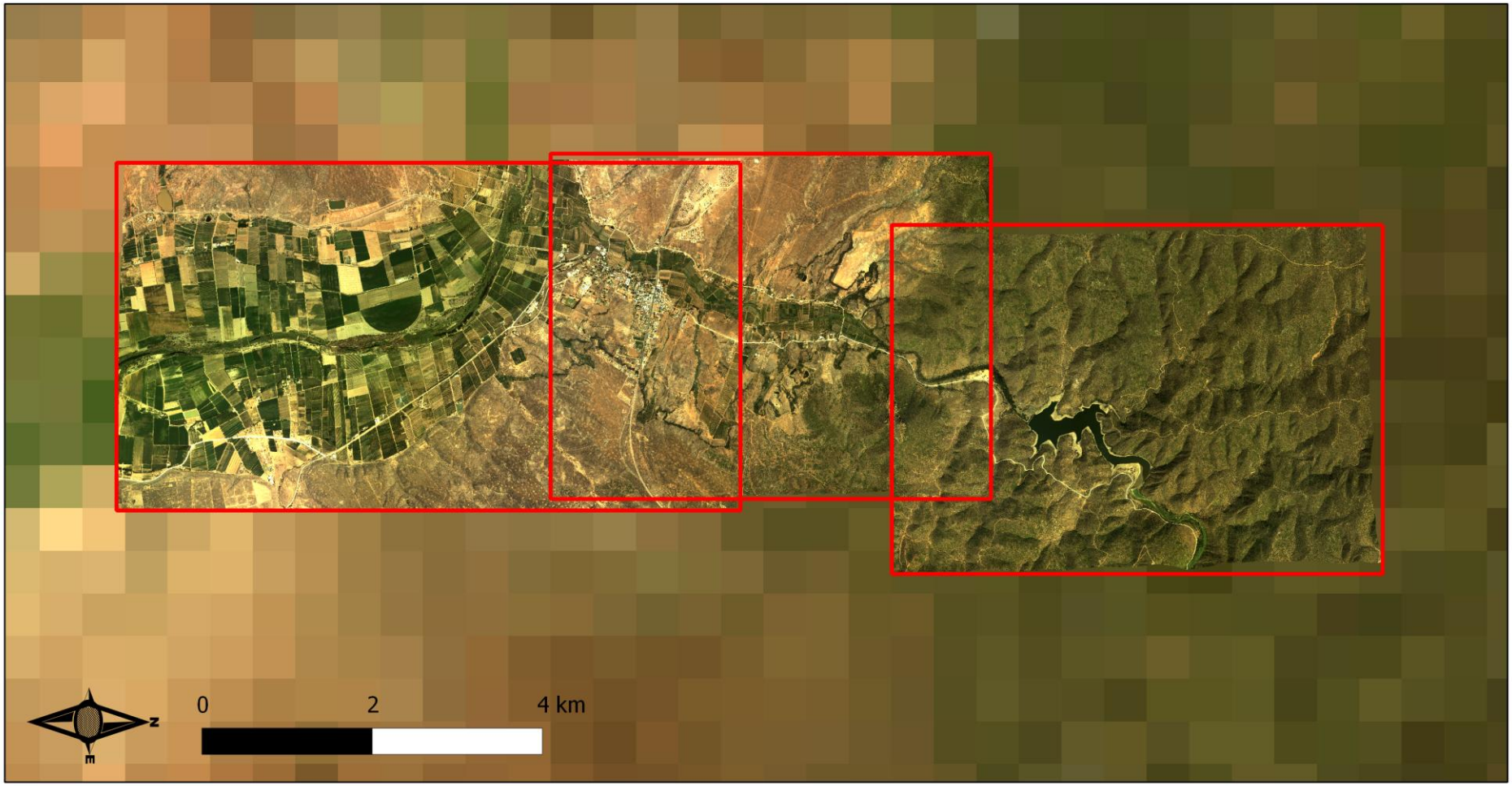
Cross Calibration – NGI Source



Cross Calibration – MODIS reference



Cross Calibration – NGI Calibrated



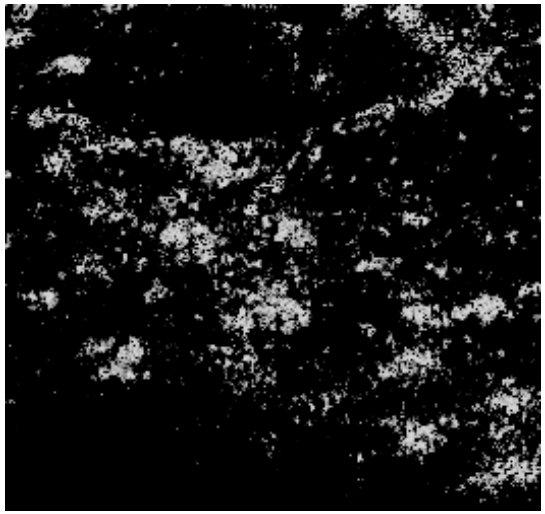
Classification

- Classification feasibility study conducted using available NGI CIR, RGB imagery.
- Ground truth data established by hand-labelling small scene.
- The NDVI (Normalised Difference Vegetation Index) and normalised green channel (g=G/(R+G+B)) found to be informative features.
- Per-pixel Normal Bayes classifier trained on the extracted features.
- Cross validation procedure indicated the classifier was 95% accurate on the labelled data.
- Results show promise for canopy cover measurement over larger area on calibrated imagery.

Classification

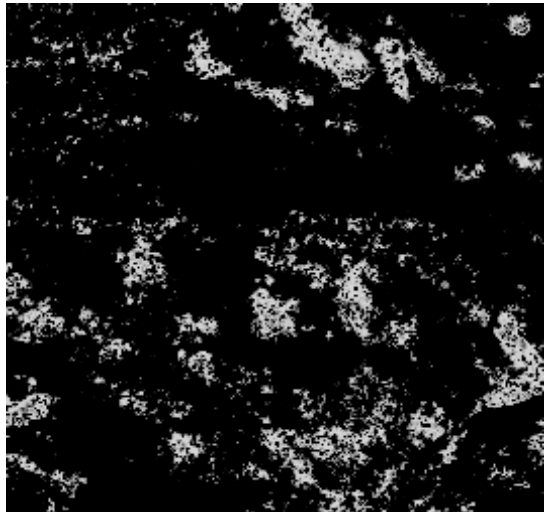
Scene

P. Afra Probability Map

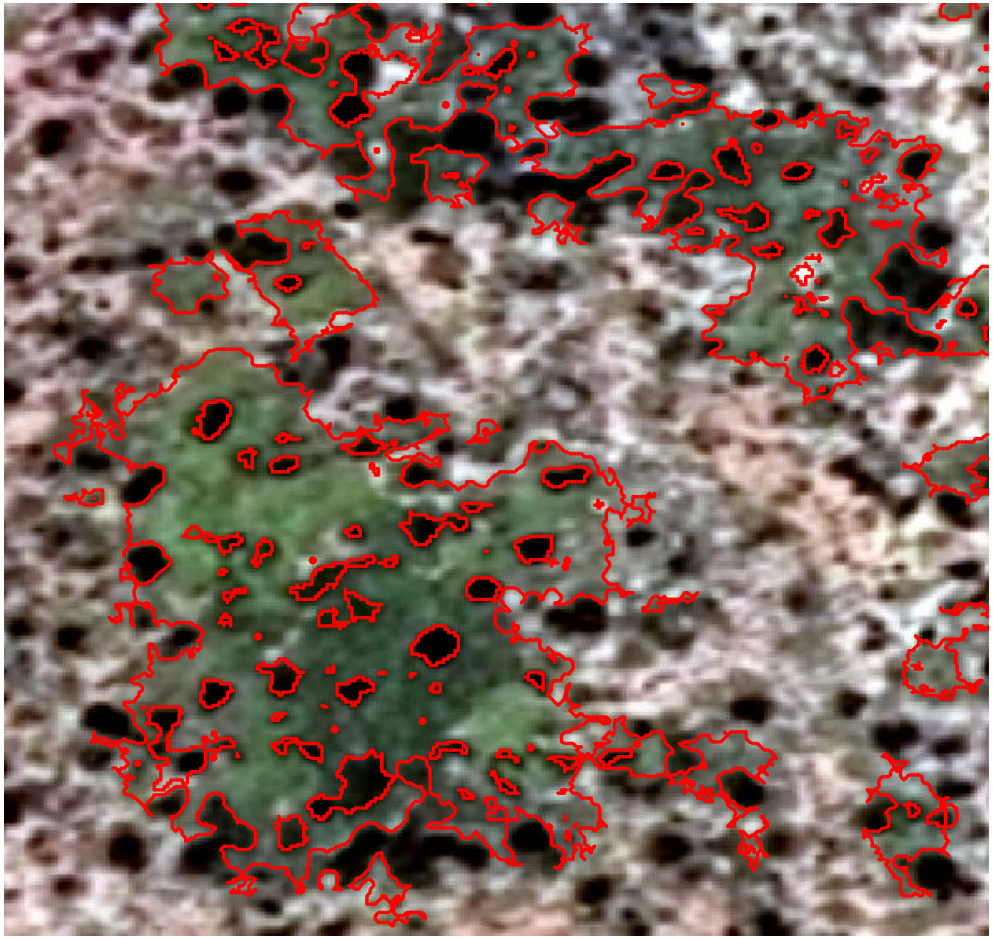


Scene

P. Afra Probability Map



Classification



Classification Close-up

Questions?