SPECTRAL MAPPING OF SAVANNA TREE SPECIES AT CANOPY LEVEL, WITH A SPECIAL FOCUS ON TALL TREES, USING CAO INTEGRATED HYPERSPECTRAL and LiDAR DATA

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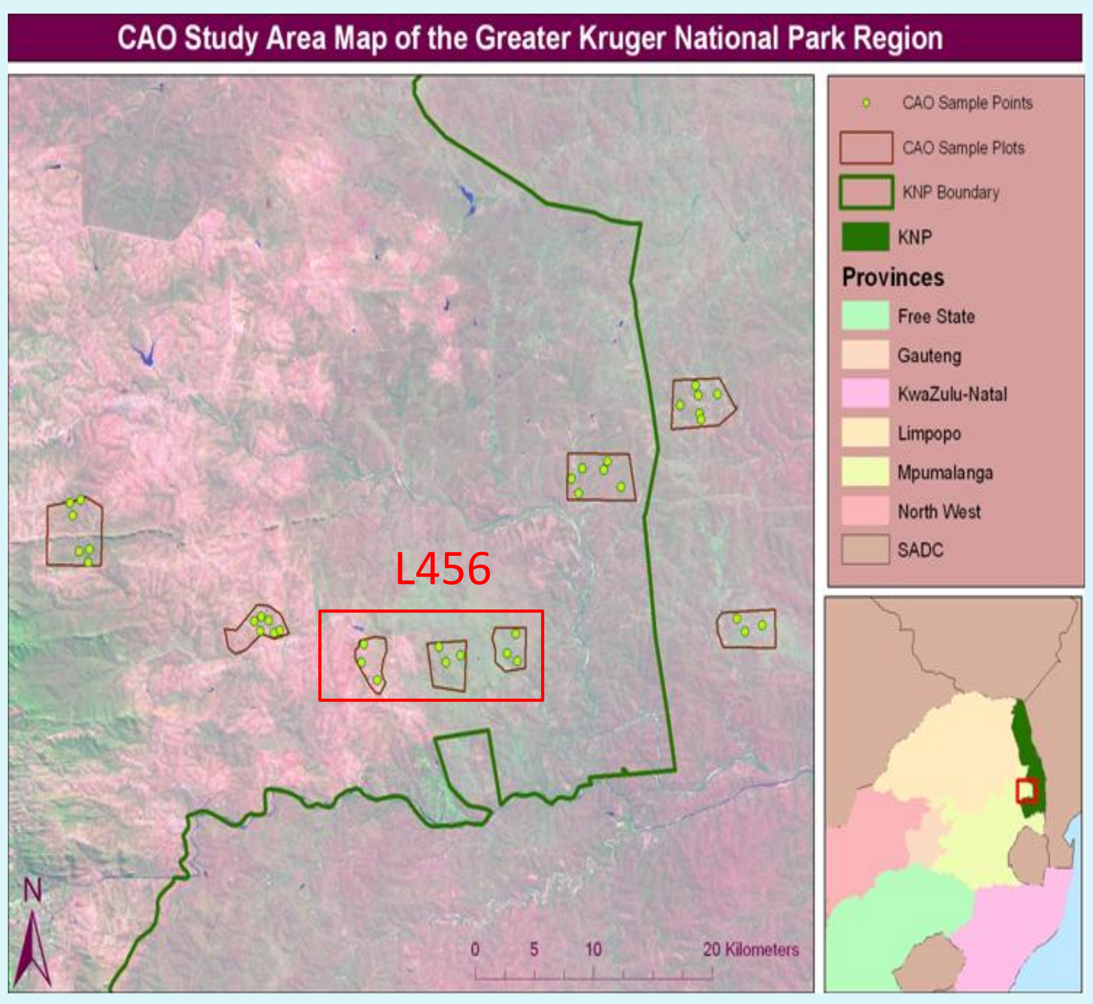
INTRODUCTION

- The detection and mapping of tree/plant species in the savanna ecosystem can provide numerous benefits for the managerial authorities
- This includes the accurate mapping of the spatial distribution of economically viable trees which are a key source of food production and fuel wood for the local populace and communities
- Economically viable tree species can thus be sustainably monitored while the pest species can be targeted and removed
- To accurately detect and map plant species, a sensor must have a very wide spectral range and a high spatial resolution such as the **CAO sensor**
- To overcome the spectral inter- and intra-species variability and confusion associated with the factors above, a **holistic decision tree approach** was considered (Hestir *et al.*, 2008)
- This study is the first of its kind to identify and map savanna tree species in the Greater Kruger National Park region (L456) with special focus on 5 tall (>5m) tree species.
- These tree species are *Acacia nigrescens, Combretum imberbe, Euclea natalensis, Lonchocarpus capassa* and *Sclerocarya birrea*.

AIM

To identify spectrally and map 5 tall savanna tree species in the Greater Kruger National Park region using a decision tree approach.

STUDY AREA



ACKNOWLEDGEMENTS

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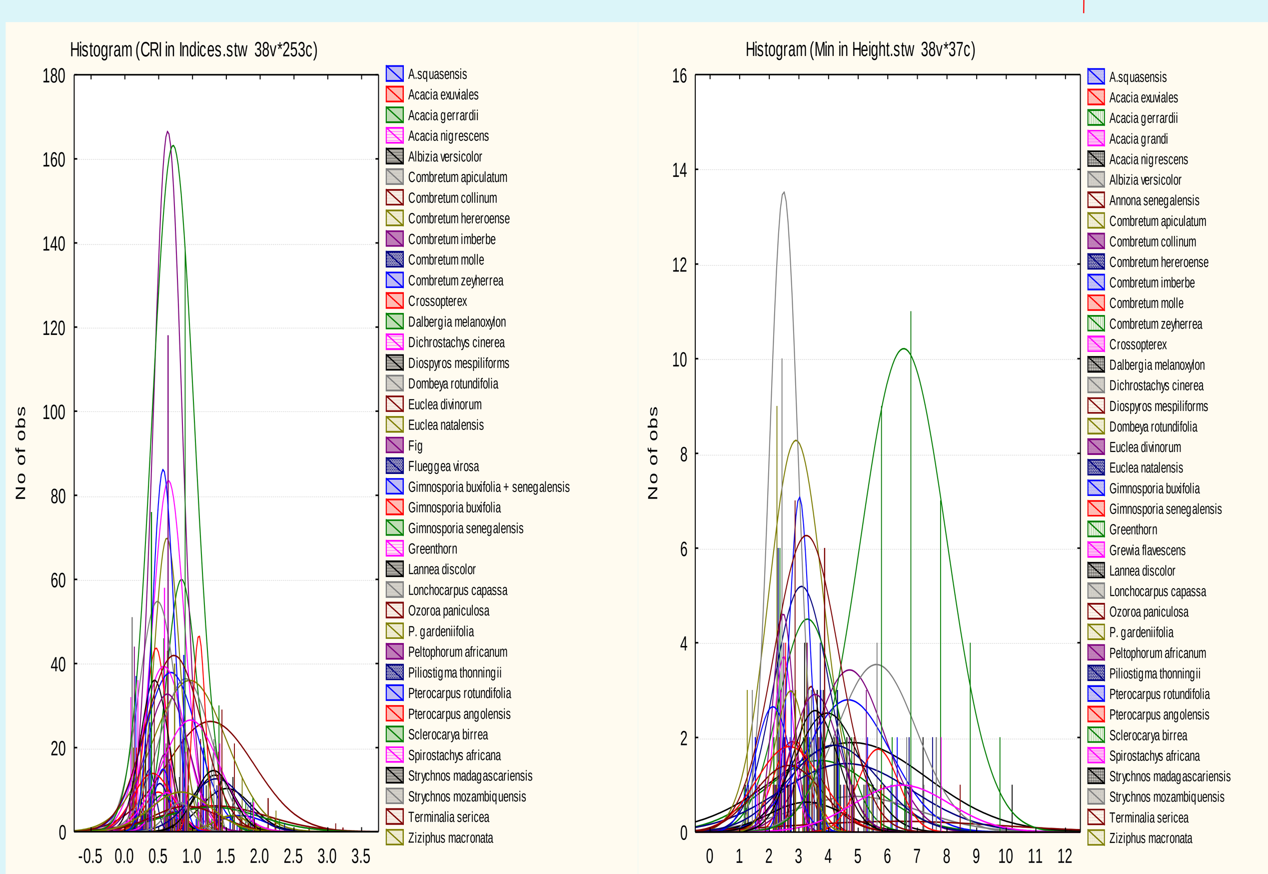
METHODOLOGY

Spectral Library

Structural Library

Vegetation Indices	*λ is in nm*
Carotenoid Reflectance Index (CRI)	λ800(1/λ520 - 1/λ550)
Photochemical Reflectance Index (PRI)	(λ531 - λ570)/(λ531 + λ570)
Normalized Difference Vegetation Index (NDVI)	(λ800 – λ678)/(λ800.5 + λ678)
Red Edge NDVI (RE)	(λ750 - λ705)/(λ750 + λ705)

Multiple Variable Histograms



1SD – mean + 1SD (Lt) (Ht)

Species specific thresholds matrix

Decision Tree for Tall Tree Species

31 Species [Acacia exuviale -> Ziziphus macronata]

< 5 min Height:
Acacia exuviales, Combretum apiculatum, Combretum hereroense, Combretum molle, Combretum zeyherea, Crossopterex, Dalbergia melanoxylon, Dichrostachys cinerea, Euclea divinorum, Gimnosporia buxifolia, Gimnosporia senegalensis, Ozoroa paniculosa, Peltophorum africanum, Pterocarpus rotundifolia, Strychnos madagascariensis, Strychnos mozambiquensis, Terminalia sericea, Ziziphus macronata, Acacia gerrardii, Acacia nigrescens, Albizia versicolor, Combretum collinum, Combretum imberbe, Diospyros mespiliforms, Euclea natalensis, Lannea discolor, Piliostigma thonningii

>5 min Height:
Acacia nigrescens, Albizia versicolor, Combretum imberbe, Diospyros mespiliforms, Euclea natalensis, Pterocarpus angolensis, Sclerocarya birrea, Spirostachys africana, Lonchocarpus capassa

CRI < 1: Acacia nigrescens, Combretum imberbe, Euclea natalensis, Lonchocarpus capassa, Sclerocarya birrea, Spirostachys africana

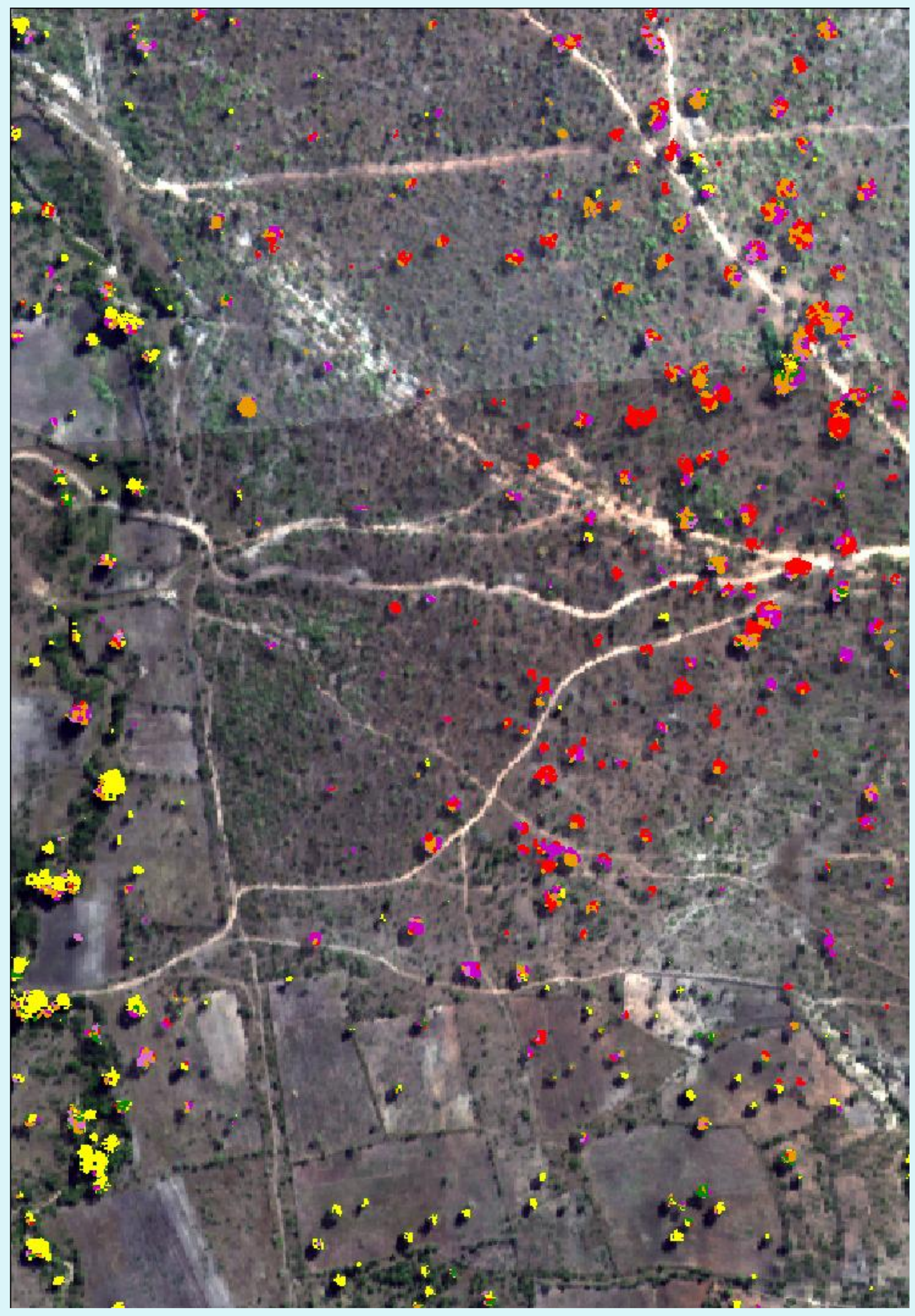
CRI > 1: Albizia versicolor, Diospyros mespiliforms, Euclea natalensis, Pterocarpus angolensis, Spirostachys africana

RE < 0.43: Euclea natalensis, Pterocarpus angolensis, Spirostachys africana

RE > 0.43: Albizia versicolor, Diospyros mespiliforms

Spectral Angle Mapper (**SAM**) classification at each end node

RESULTS



Legend	
Acacia nigrescens	red
Combretum imberbe	pink
Euclea natalensis	yellow
Lonchocarpus capassa	purple
Sclerocarya birrea	orange

DISCUSSION

- The map above is only a small subset of the bushbuckridge municipality area of the study region L456
- From the map, *Euclea natalensis* seems to dominate riparian zones
- *Acacia nigrescens* and *Sclerocarya birrea* appear to dominate the mid-crest and crest slopes of the landscape
- The remaining two species occur sparsely and sporadically in-between
- The classification result is still yet to be validated

CONCLUSION

- Remote sensing is the best possible tool for discriminating and mapping the individual canopies of the different tree species of interest
- The method proposed is in its prototype phase but its refinement and implementation over a larger sample of tree species is planned for the near future

REFERENCES

1. Hestir. E.L et al (2008). Identification of invasive vegetation using hyperspectral remote sensing in the Californian Delta ecosystem. *Remote Sensing of Environment*. Vol 112; pp 4034-4047
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