



SA JECAM SITE (Free State) REPORT

Terry Newby (NEOSS), Renaud Mathieu (CSIR) & SA JECAM A-TEAM

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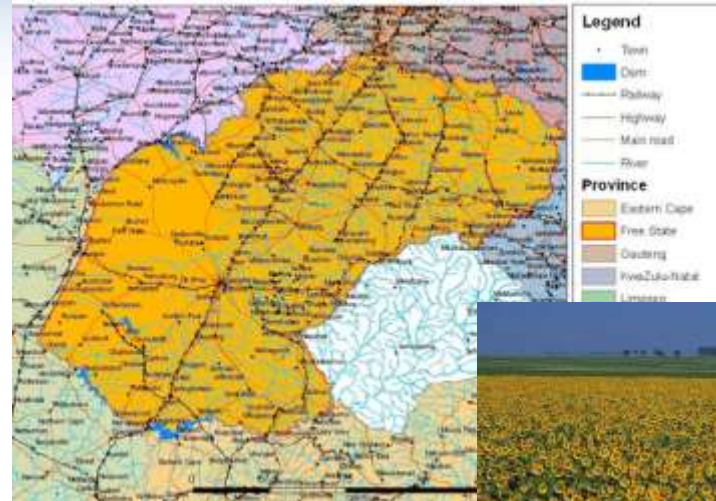
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An initiative of the DST
NEOSS serves as secretariat to SA-GEO

CONTENT

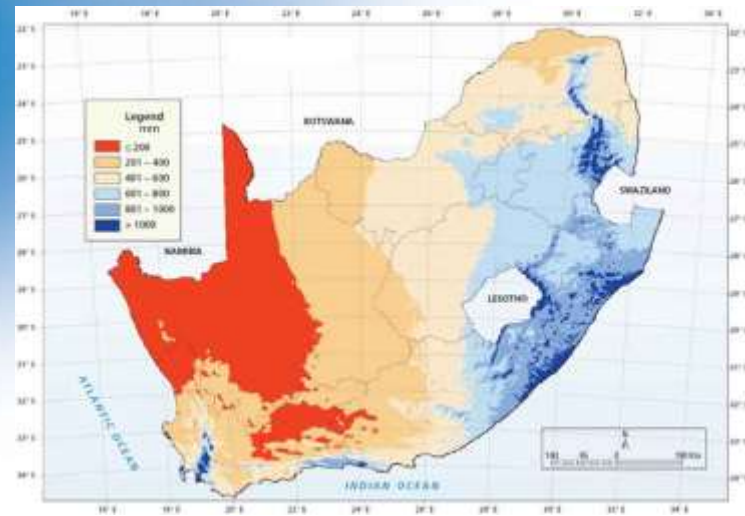
- Introduction
- Site Description
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- Conclusions



<http://www.places.co.za/cgi-bin/places/photos/photos.cgi?ac=ds&sq=13&nm=Free+State&lsq=14>

Introduction

- Area of SA : 1 219 090 square kilometres
 - Agriculture: 81.6% of land area
 - Arable land: 12.1% of land area – 3 % high potential
 - Irrigated land: 10.15% of arable land
-
- GDP composition / sector (2011): agriculture 2.5% (10% active population), industry 31.6%, services 65.9%
 - Ranking / GDP size: 25th largest in the world (second largest after Nigeria)
 - Unemployment (2012): 25.2%
 - Poverty Gap (Amount required to raise those below poverty line out of poverty)
 - R56-billion in 1996 R81-billion in 2001 (gap increasing but % in poverty remains constant 57%), i.e. richer get richer, poor get poorer
-
- Dominant production: grain crops (maize, cereals), sugar cane, dairy, beef production, fruit (grapefruit)
 - Contrasted agriculture: high productive cash crop vs subsistence agriculture



Site Description

- Free State (JECAM site) 2 745 590 sq Km 5.3% of SA
- Two sub sites:
 - Harrismith: Mix commercial and subsistence crops & rangeland
 - Bothaville: Commercial crops
- 1300 m asl
- Climate
 - Sub humid – semi arid (600mm/yr)
 - Summer convection rainfall
 - Typical Temperatures: Min: -5C Max: 33C
- Main crops: Maize wheat sorghum sunflower



	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Maize Phenology (1st)												
Maize Reflection (1st)												
Maize Phenology (2nd)												
Maize Reflection (2nd)												
Sorghum Phenology (1st)												
Sorghum Reflection (1st)												
Sorghum Phenology (2nd)												
Sorghum Reflection (2nd)												
Soybean Phenology												
Soybean Reflection												
Cottonseed Phenology												
Cottonseed Reflection												
Wheat Phenology												
Wheat Reflection												
Winterwheat Phenology												
Winterwheat Reflection												
MaizeWheatPhenology												
MaizeWheatPhenology												
Lucerne Cultivation Phenology												
Lucerne Cultivation Reflection												

Typical crop calendar

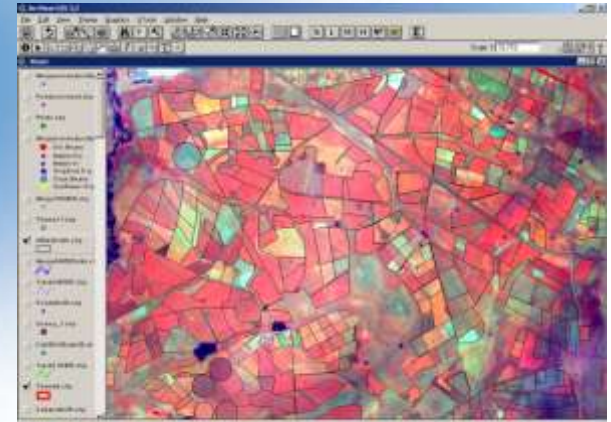
Significance of the Site



- Maize is SA's main grain crop (12 Mil tons per annum in a good year)
- Staple food, major fluctuation in production due to climate variability (droughts)
- National production accuracy (maize) of +/- 5% is required target set by DAFF
- A national monitoring system is in place – continual improvement required
- Free State is a good indicator of national production
- Free State also produces around 40% of SA's wheat (winter crop)
- Also selected as test site for Sentinel-2 Agricultural Project

Main Activities

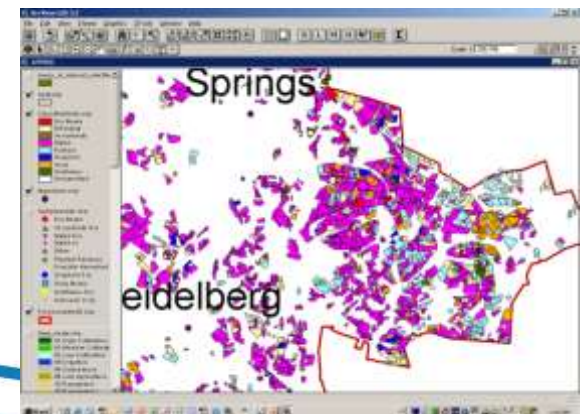
- Area estimate = PICES (Producer Independent Crop Estimation System)
 - Crop areas for main summer and winter grain crops nationally
 - Stratified random point sample
 - Observations from light aircraft
 - Also farmer interview (yield estimates)
 - Reach 2% accuracy of area planted
 - Unique in African context



Field digitizing = crop area mask



Sample selection



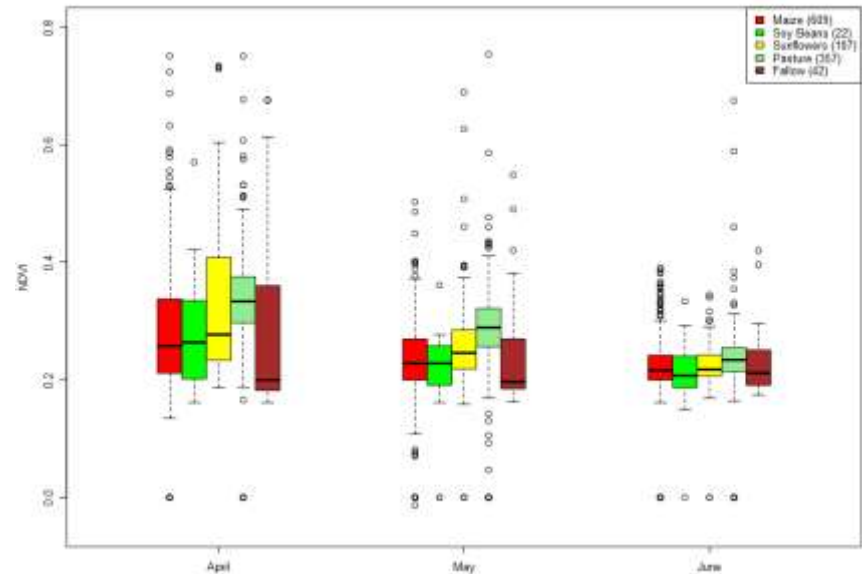
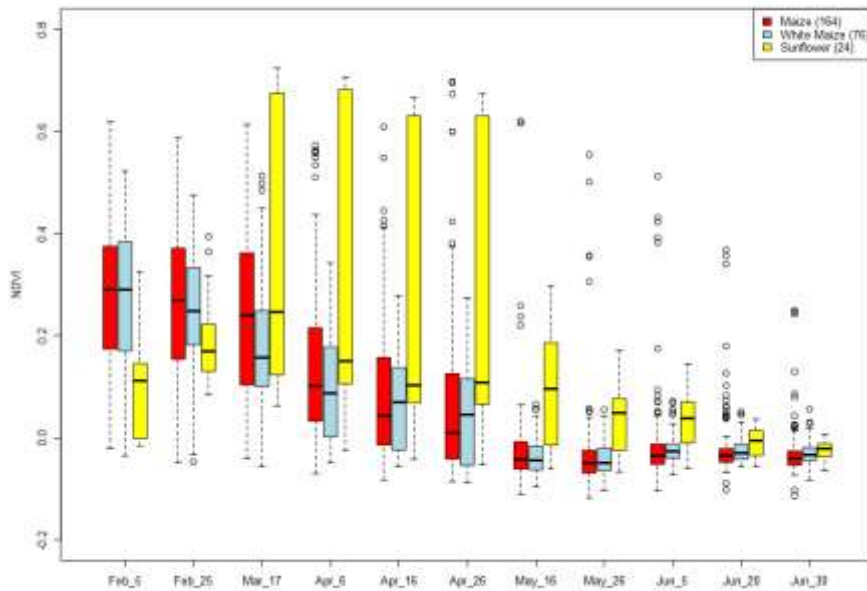
Crop identification



Main Activities

- Crop type mapping - summer crops (annual maps available for Free State sites)
 - Based on multi in season images (Landsat) and aerial survey observations
 - Classification (multispectral)

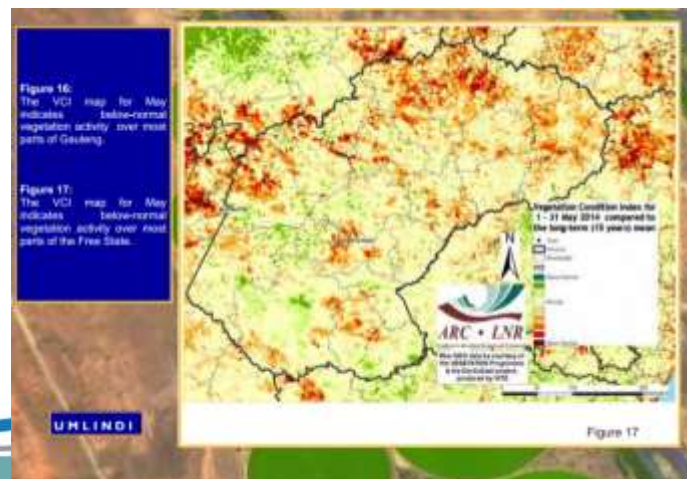
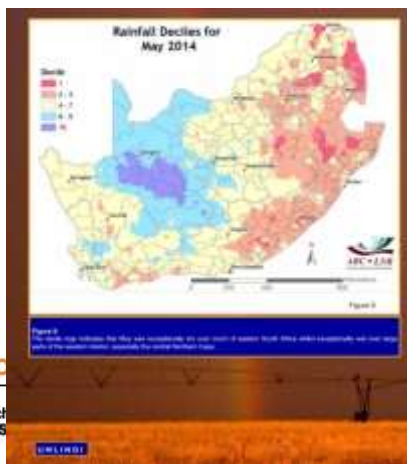
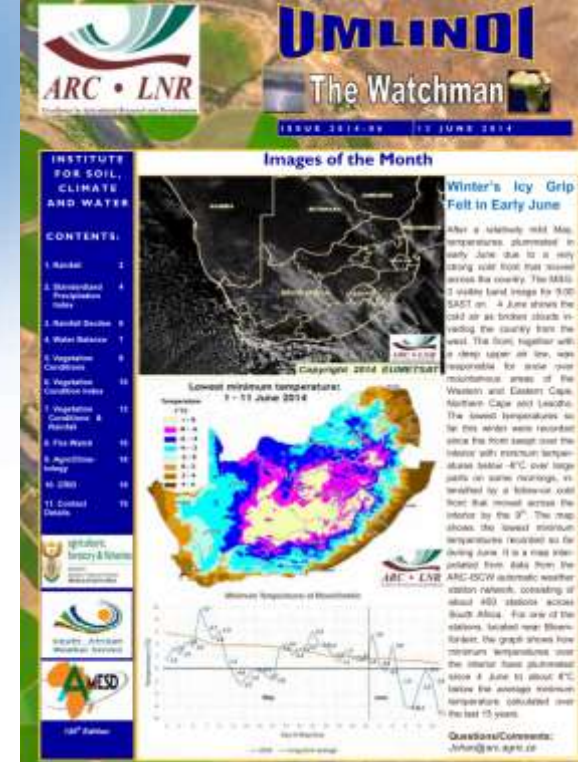
Crop type discrimination using time series imagery (Preliminary results – Rapid eye)



Crop type discrimination using time series imagery (Preliminary results Landsat 8)

Main Activities

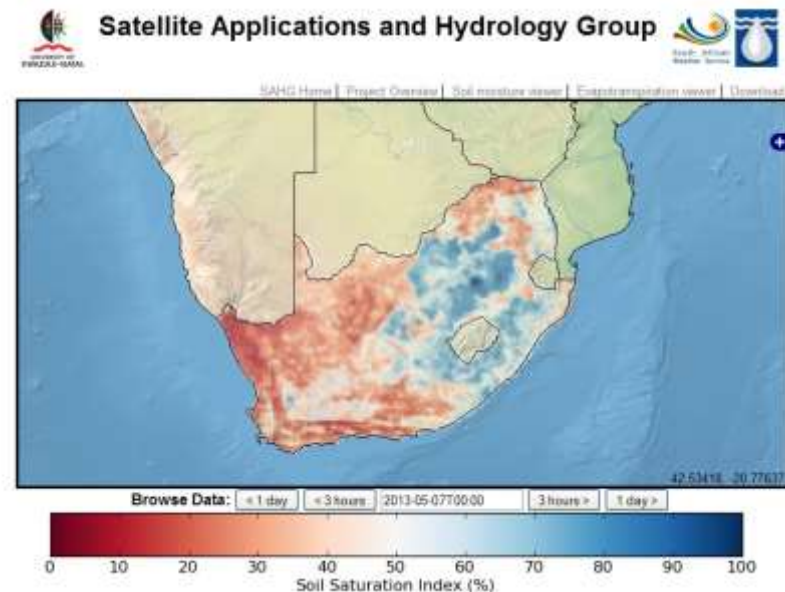
- Crop condition monitoring
 - UMLINDI national system
 - Monthly, growing conditions, sources of stress and current crop condition
 - Based on climate and coarse resolution satellite data
 - Vegetation indices, rainfall, temperature, water balance, soil moisture



Extracts from UMLINDI bulletin

Main Activities

- Soil moisture map – soil saturation index
 - Soil Saturation Index (SSI), percentage water saturation in the soil (root mean zone), TOPKAPI hydrological model
 - Satellite derived rainfall (TRMM 3B42RT) and incoming solar radiation (LSA-SAF DSSF) in addition to inputs from the SA Weather Service's NWP model (Unified model).
 - Semi operational, moving to operational in 2014



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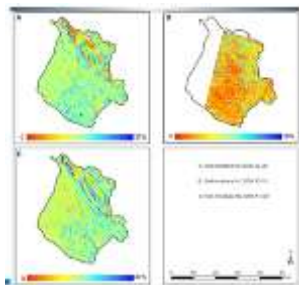
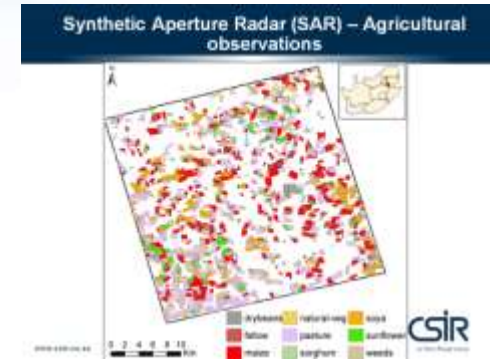
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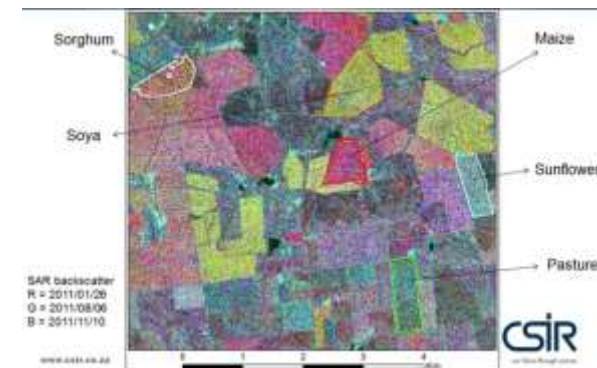
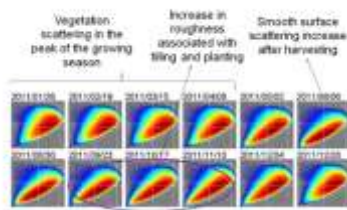
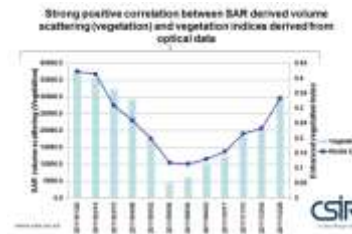
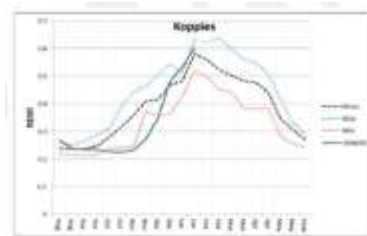
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Main Activities

- Research / main objectives
 - Crop type mapping with SAR
 - Yield modelling (SAR & multi temporal MS)
 - Yield and VI correlations
 - Planting & Harvesting dates (SAR)
 - Need focus on small field 0.05 – 0.5 ha (poverty alleviation and food security)



Soil Moisture



Ground data

- Climate data (80 automated weather station in the province, including two on or close to site): temperature, humidity, rainfall, solar radiation, wind, potential evapotranspiration (derived)
- Annual aerial crop types from 300 points
- Annual yield measurements on subset of 30 points
- Field capacity but limited funding to sustain regular acquisition of field data



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EO Data Received/Used

- Data (GEONETCAST, SANSA, JECAM)
 - Coarse res: SPOT VEG decadal NDVI, MODIS 16-day NDVI
 - High res: SPOT4 Take5 (14) & RapidEye (17) & SPOT5 (54)
- Challenges
 - Difficulty experienced in acquiring RADARSAT, need clarification on procedure to get access to this dataset
 - Only archive data for WorldView-II and some other satellite? Clarification needed on archive vs new acquisition (critical for proposal development / funding).



Constraints



- Limited research funding
 - Some research is a by product of operational system
- Constrained Human Resource capacity
 - Few researchers working in this field
- Free and open access to data (e.g. climate data) not always available

Way Forward



SA-GEO community of practice is growing
CoP will co-ordinate and encourage research
CoP will collectively lobby for research funding

Focus on :

- Yield modelling
- Small field monitoring (area, crop type & yield)
- Sampling strategies & statistics

Conclusion



- SA remains committed to using the JECAM site for focused research
- Funding will allow a focused field data collection campaign
- SA realises that the site has value for international researchers
- Collaborative research will be pursued (and has been)
- SA data will be available on a www (Either JECAM.ORG or on the SA-GEO site)