GEOGLAM RAPP sites in South Africa

Clement Adjorlolo (PhD)

Earth Observation Directorate

Our core business

- Data reception
- Archive
- Data processing
- Data dissemination
- Geo-information Products & Applications

- Sensor Portfolio Management & Data reception

- Data Archiving, Processing & Dissemination

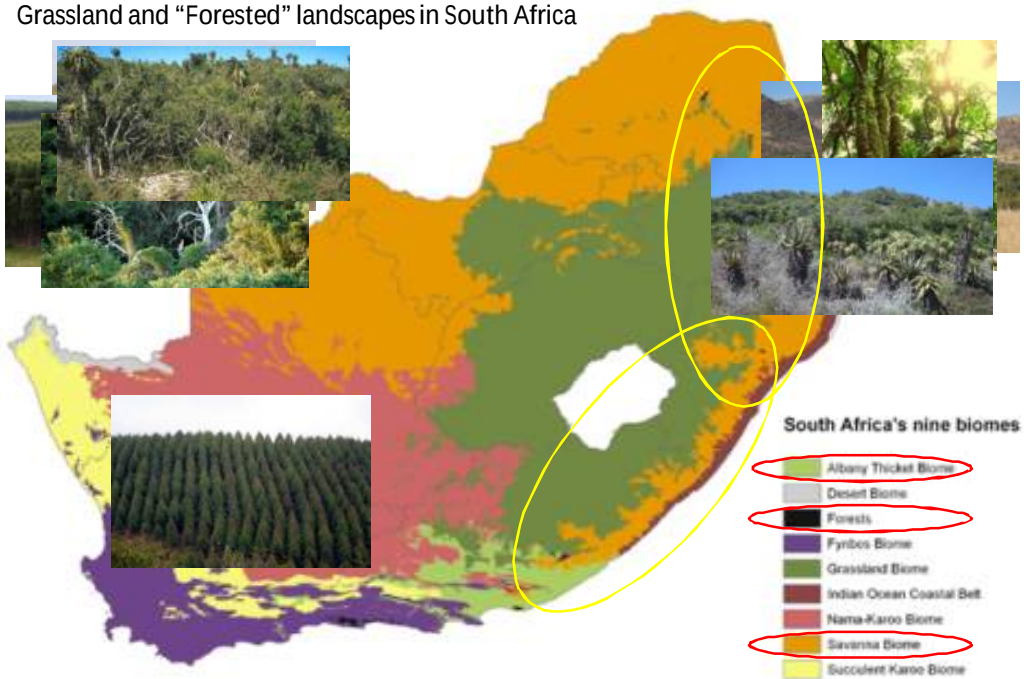
- Geo-information Products & Applications

Contribute to
- greater utilisation of earth observation in addressing day-to-day societal problems & needs
- better planning & decision making; performance monitoring; environmental & resource management; disaster management; national Food security & health

Direct reception sensors

- SPOT 5, 6 & 7
- Landsat 5, 7, 8
- MODIS (Aqua and Terra)
- NOAA AVHRR
- CBERS 4

Grassland and "Forested" landscapes in South Africa



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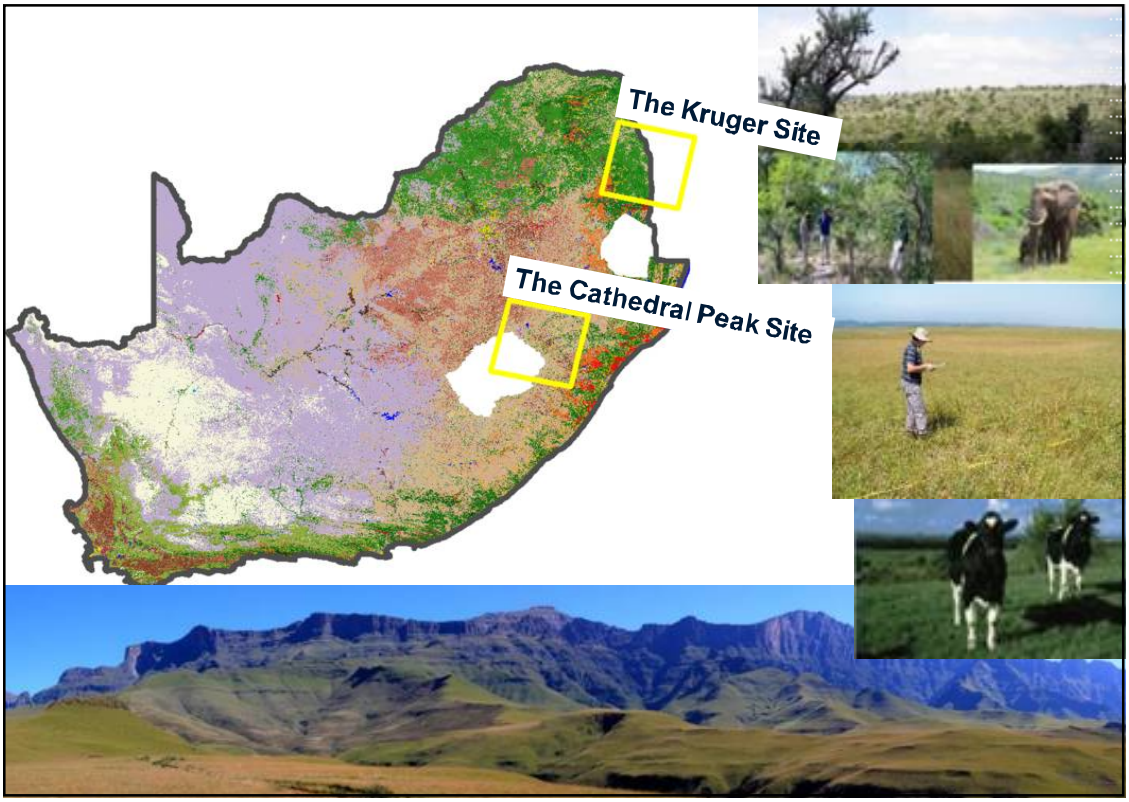

Threats

- Mining
- Forestry
- Climate Δ
- Development
- Transformation
  - D. Jewitt
  - Land-use
  - Land-cover
    - C3-C4

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NPP? Food security? Carbon & Water?

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Land use gradients





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Biodiversity shifts

Rangelands

- Assess relative impacts of local & global drivers on vegetation dynamics over time.
- **Structure, cover, composition**
- Implications for **secondary productivity**?

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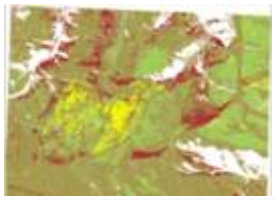

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Rangeland vegetation

- Climate envelopes
- Fire as a local driver
- Land use- grazing impacts
- C3-C4 dynamics
  - Temp - CO_2 - Moisture?
  - C3 woodies **C3 grasses?**

Water delivery

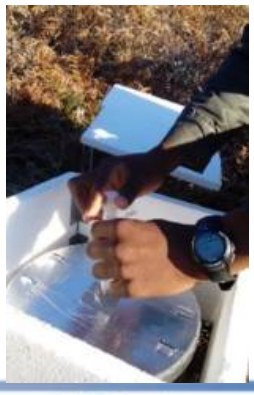
Is there a change in quality & quantity of water delivered?

- **Climate** & streamflow data
- Infilling & Cross Calibration
- Change detection
- Water balance: Processes
- Water Quality

Carbon Dynamics

Source or sink?
Current and under climate & landuse Δ

- Stocks & Fluxes
  - Eddy co, Soils
  - (Respiration), **(LAI), Biomass**
- NEE
  - Phenology
  - Time since fire
  - Elevated temperature



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Earth system **processes** & feedbacks

What is the Net effect?

α Landuse – climate Δ trajectories
(COP21)

- Biodiversity
- Climate data
- Water balance
- Carbon
- **Soil Moisture** (COSMOS)
- Energy balance

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V. Arora,, *Rev. Geophys.*, 2002 *40*(2), 1006,, 2002.

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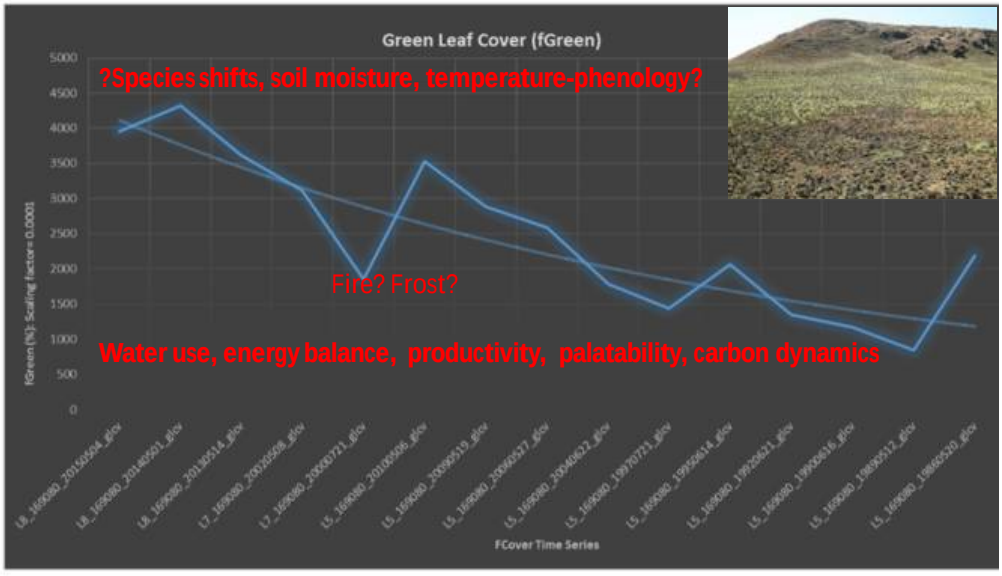

Figure 1 Time series FCover of winter-green grass cover profile, using n= 206 samples.

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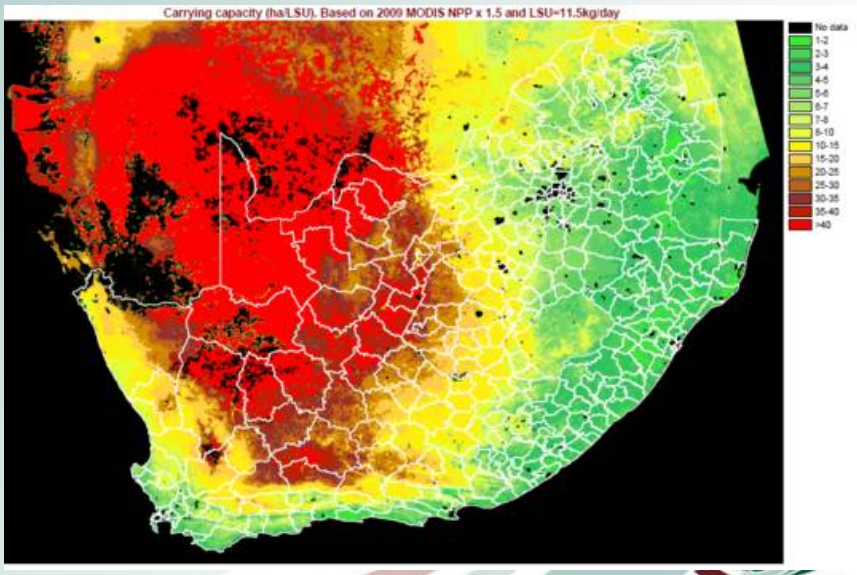
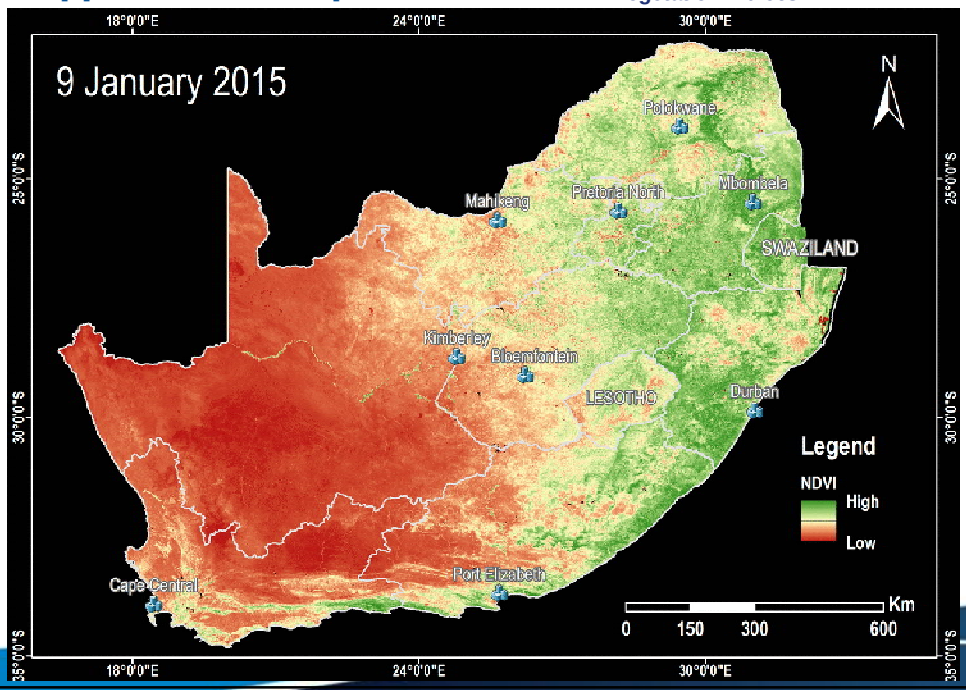
Grazing capacity map for RSA: policy



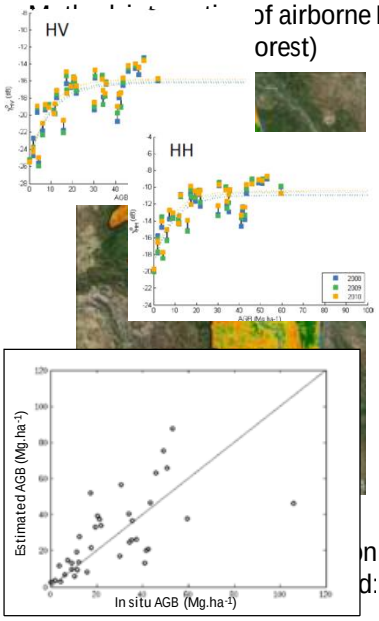
Application examples

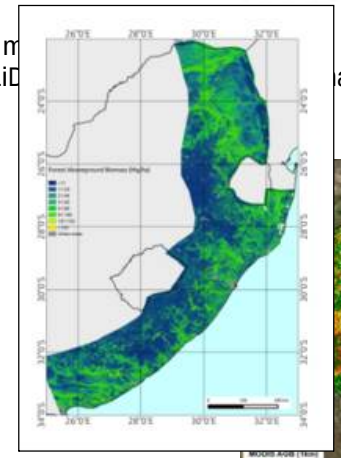
Long-term time Series of Satellite-derived Vegetation Indices

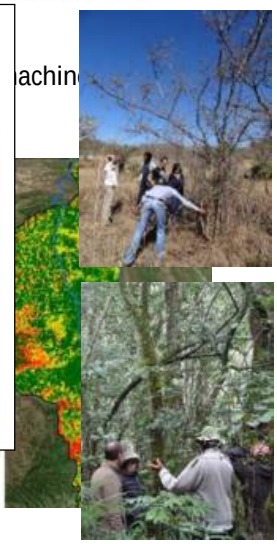


Biomass mapping in South Africa

2010 CSIR above ground biomass m… of airborne LiD… achin… orest)



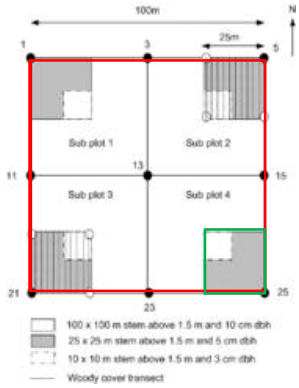




Le Toan & team
2005/2010/2015 CESBIO-CSIR above ground biomass map in SA forest belt; method: semi empirical methods, use small number of cal plots, MIPERS SAR simulator (forest/ env parameters), water cloud models & Bayesian inversion

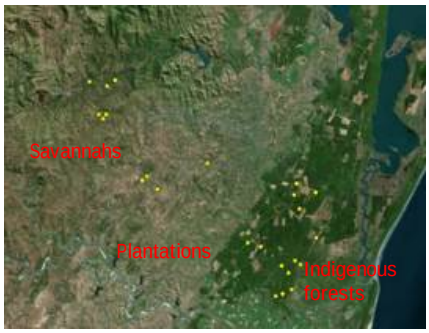
Field sampling effort – above ground biomass

- 1 ha square plots (cal/val LiDAR & SAR)
  - Height & DBH
  - Species
- ~ 100 plots over various veg types
- Allometric equations



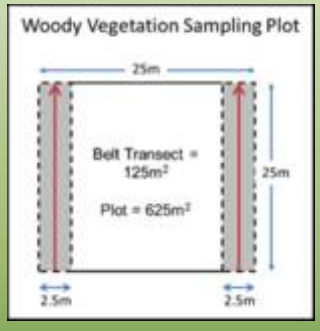
SAR scale

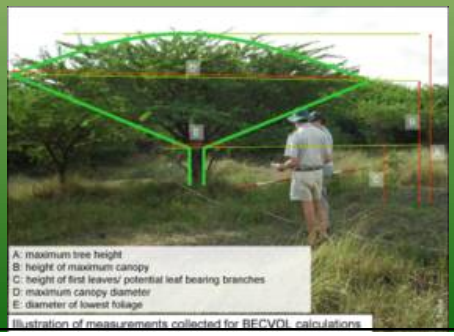
LiDAR scale



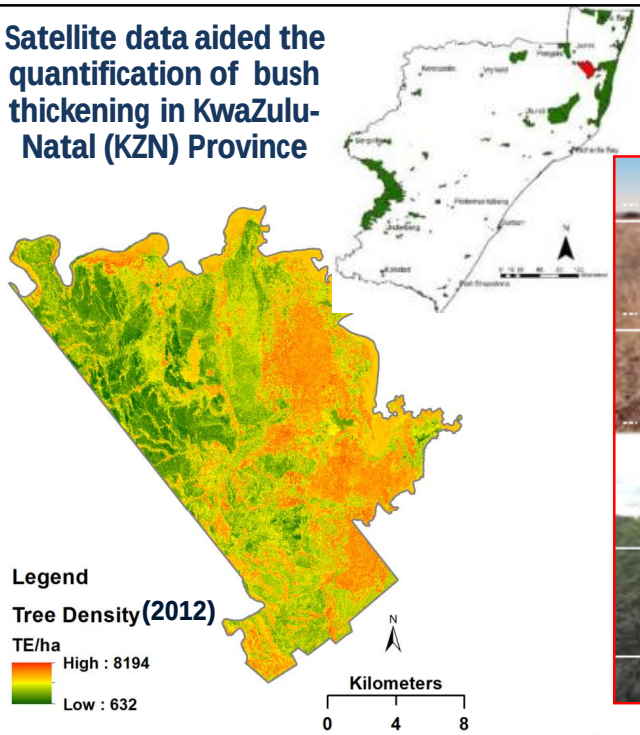
STANDARD OPERATING PROCEDURES

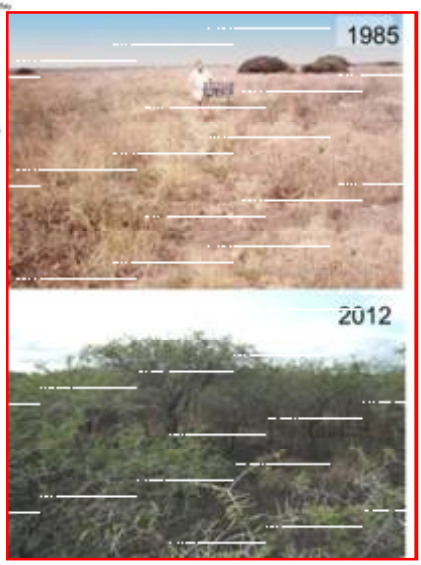
- Client driven projects:
  - Commercial agriculture & subsistence agriculture
  - Game farming sector
  - Conservation sector
  - Risk & Disaster
- Range condition, carrying capacity & management planning recommendations
- Type of data collected:
  - Herbaceous species composition
  - Standing herbaceous biomass
  - Woody vegetation composition, phytomass & browseable material
  - Soil properties
- Project areas: 50 – 50 000 ha
- 80 – 120 sites per annum covering between 20 000 and 80 000 ha





Satellite data aided the quantification of bush thickening in KwaZulu-Natal (KZN) Province





Data Requirements

Variables/ Parameters	Spatial Resolution	Spectral Resolution	Temporal frequency
Biomass (AGB): woody & grass/herbaceous	20-30 m	Pan-VIS-NIR/ SAR data	Updated monthly over the growing season
Grazing/Browse capacity maps and stocking rate	10-20 m	VIS-NIR	Updated seasonally and on demand requests
Vegetation condition/ status indicators	10-20 m	Pan-VIS-NIR-SWIR- TIR	Weekly during growing season
Plant type identification	0.5-5 m	Pan-VIS-NIR-SWIR	Growing season/yearly products
High resolution drought monitoring/assessment	50 m ±	VIS-NIR-SWIR-TIR	Monthly products
Vegetation Indices: NDVI, SR, SAVI, EVI	10-30 m	VIS-NIR	Monthly or bi- weekly
Biophysical variables: LAI, fPAR, FAPAR, FCover, leaf Chl, canopy nitrogen, Leaf Area Index, Soil fraction	5-20 m	VIS-NIR	Monthly or bi-weekly
Cloud free surface reflectance products	10-50 m	VIS-NIR-SWIR-TIR	Monthly or bi-weekly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Rangeland and Pasture Productivity
Thank You
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