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# Forest Measurements and Modelling



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# Vision and strategy

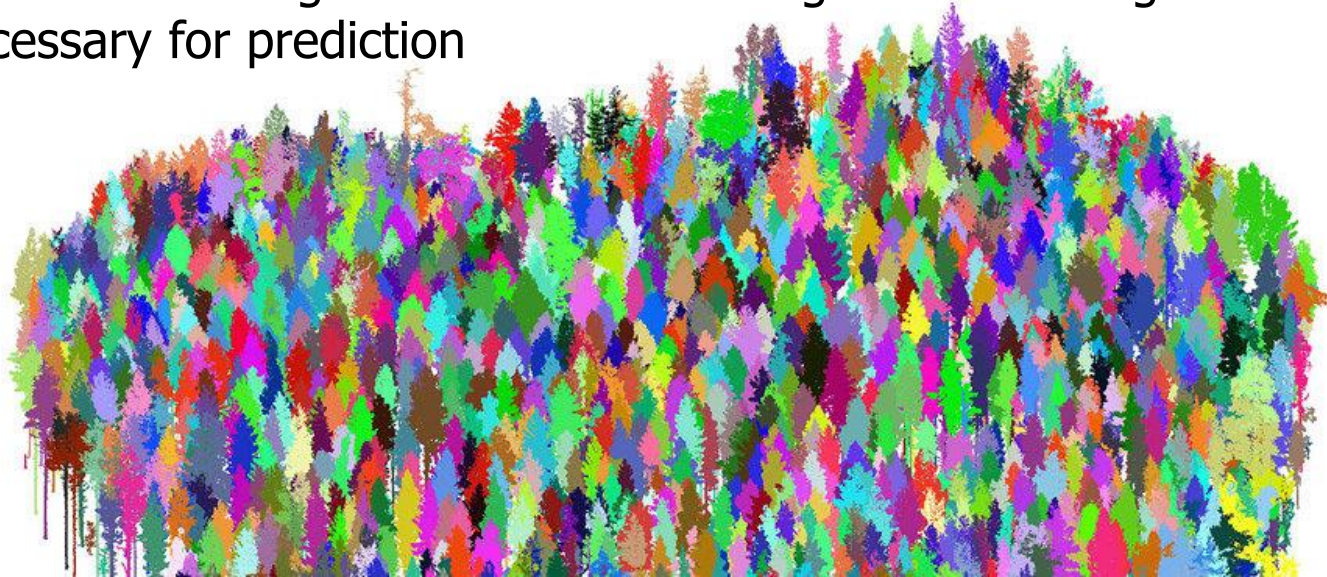


Our vision is that Forest Growth and Yield Science at Stellenbosch University will be

“an international research leader on measurements and modelling of southern hemisphere forests”

We are working towards achieving this vision by focussing on

- New generation, climate sensitive approaches to modelling forest growth, yield and product quality
- Precision thinking in context: measuring and modelling at scales necessary for prediction





# Collaborations and partnerships



⇐ **Dr Geoff Downes** (Forest Quality Pty. Ltd, Australia)

**Prof Jan van Aardt** ⇒ (Rochester  
Institute of Technology, USA)



⇐ **Prof Klaus von Gadow** (Extraordinary  
professor, Stellenbosch)

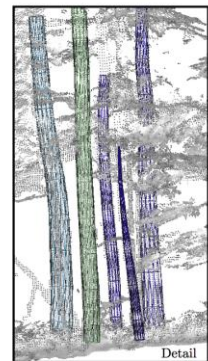
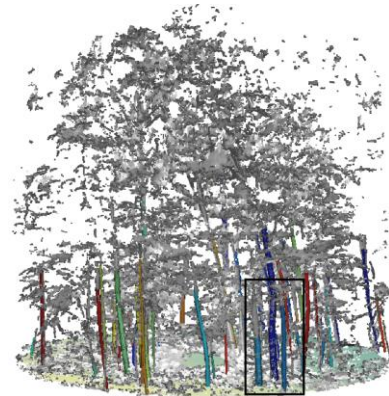
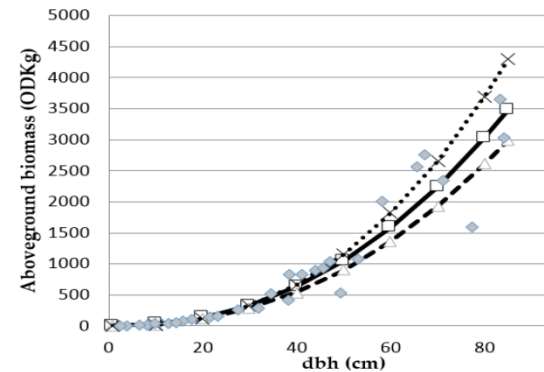
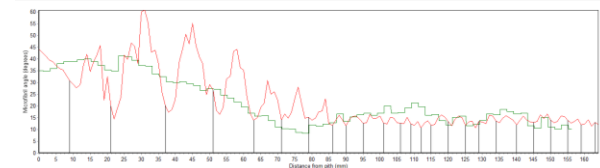
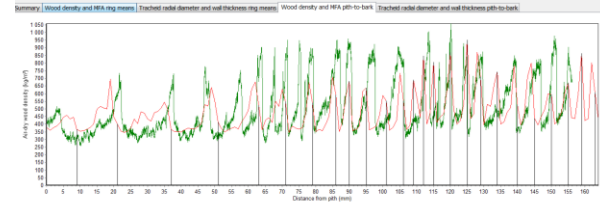
**Prof Thomas Seifert** ⇒ (Extraordinary  
professor, Stellenbosch)





# Main focus areas

- Hybrid approaches to modelling forest growth and wood formation
- Biomass estimation
- Detailed forest and tree characterisation



a

b

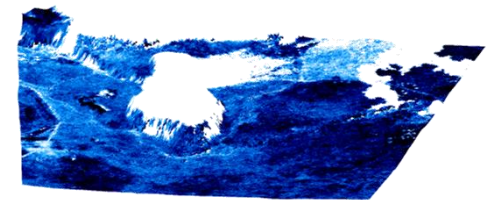
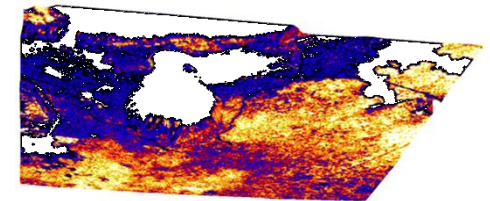
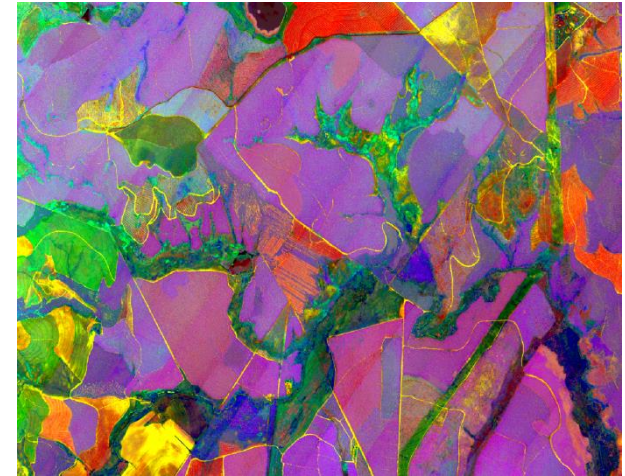


# RS-data and models



Approaches to optimise and augment model systems to harness multiple streams of remotely sensed data

- Satellite imagery and off-shelf products where possible
  - LiDAR
  - Aerial images, and photogrammetry
- + other spatial surfaces



Led by post-doctoral fellow, **Dr Abdelmoneim Ahmed**





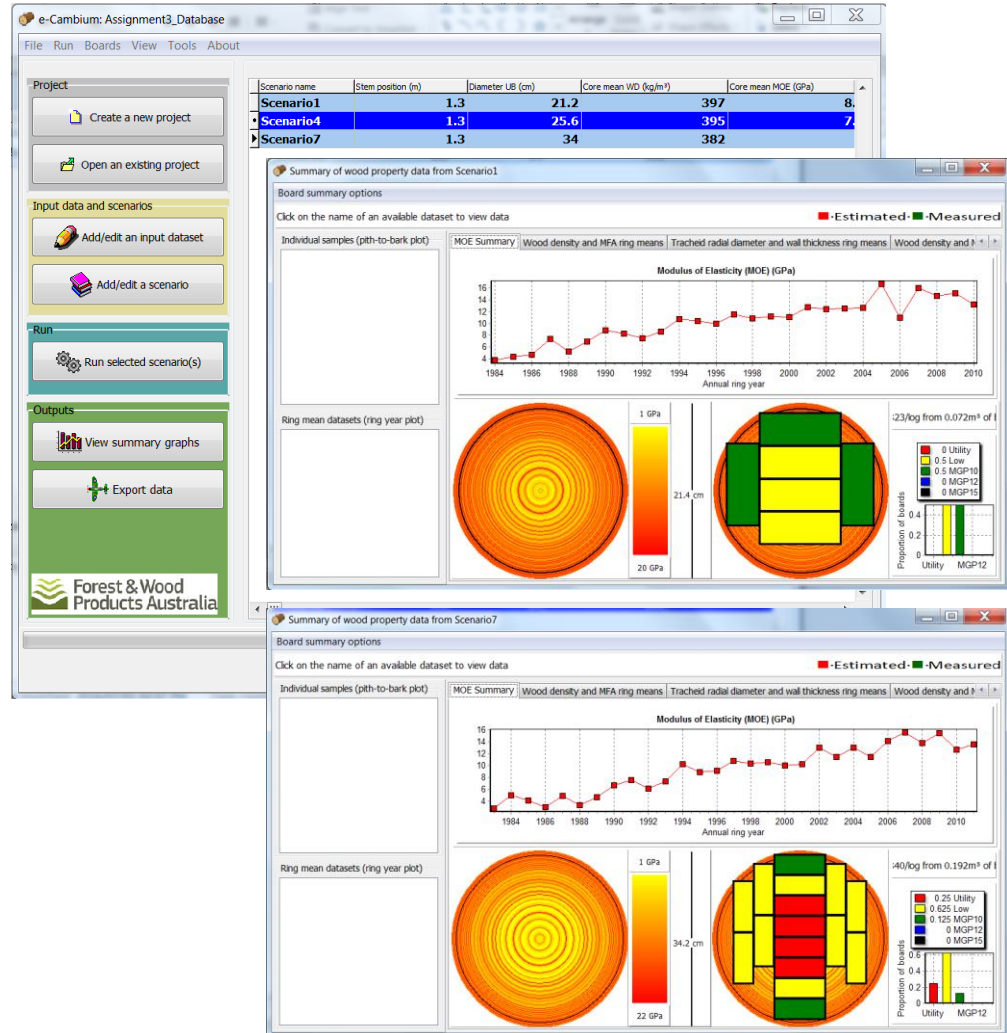
# eCambium hybrid modelling platform



↑ Justin Erasmus (Ph.D.)

Will be further developing and using this approach to understand effects of establishment stand density/environment on wood stiffness

Main supervisor: Brand Wessels





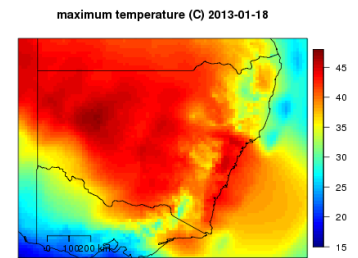
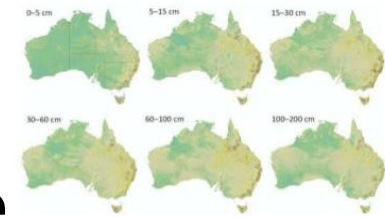
# Climate-explicit models



An incipient research initiative to explore the most suitable modelling approaches for South Africa that use “real date” climate data

- Climate surfaces
- Soil surfaces

Proactively adapting growth and yield forecasting systems to take into account effects of periodic droughts and altered silviculture





# Detailed forest characterisation, yield and product estimation



- Terrestrial and air-borne LiDAR

Critical support from **Anton Kunneke:**

- Photogrammetry

- Image and point-cloud processing



⇐ **Brendan Marais (M.Sc.)**

Estimating product options from alien invasive riverine stands

**Moses Moses (Ph.D.)** ⇒

A framework for estimating product options from encroacher bush in Namibia



⇐ **Erich Seifert (Ph.D.)**

Derivation of new algorithms for full 3D reconstruction of forests from BG and AG RS







# Estimating forest biomass



⇐ **Philip Muyambo (M.Sc.)**

New biomass models for *Pinus elliottii*

**Philip van Niekerk (M.Sc.)** ⇒

Biomass models *Eucalyptus grandis* x *nitens*, including an analysis of the effect of site quality



**Otto Pienaar (M.Sc., completed)** ⇒

Biomass models for mist-belt forests

⇐ **Martin Kambayi (M.Sc.)**

Biomass models for *Cryptosepalum* forest in Zambia

(Ben du Toit main supervisor)

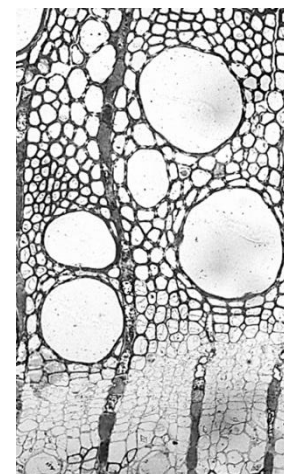
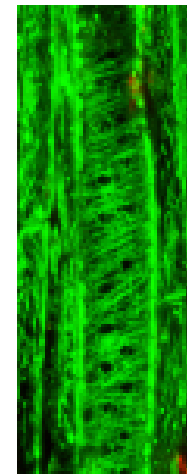
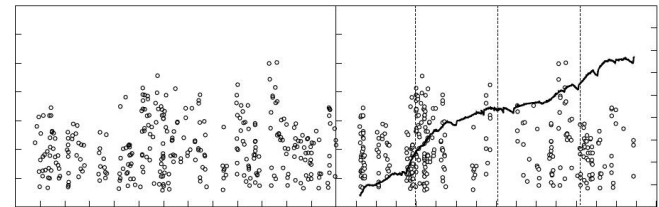
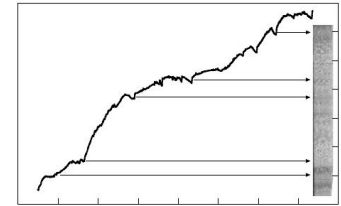




# Special projects



- Precision measurement of tree growth response
  - Understanding and simulating short-term responses to changing environmental conditions...
- Fundamentals of wood formation
  - Towards a detailed process-based understanding of how tree stems grow...





# Some final thoughts



- South African forestry research community can be at the forefront of excellent R & D:
  - Characterisation of forest plantation structure and variability
  - Estimation and forecasting of total yields and product mixes
- An opportunity exists for coordinated research efforts around forest measurements and modelling
  - Industry-wide or niche “working groups” or cooperatives, as applicable