PROJECT A4 DISASTER LANDSCAPE ATTRIBUTION: THERMAL ANOMALY AND HAZARD MAPPING

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RMIT University

Work Package 1 (WP1)

Detection, monitoring and mapping active fire intensity, extent and configuration

Work Packages 2+3 (WP2+3)

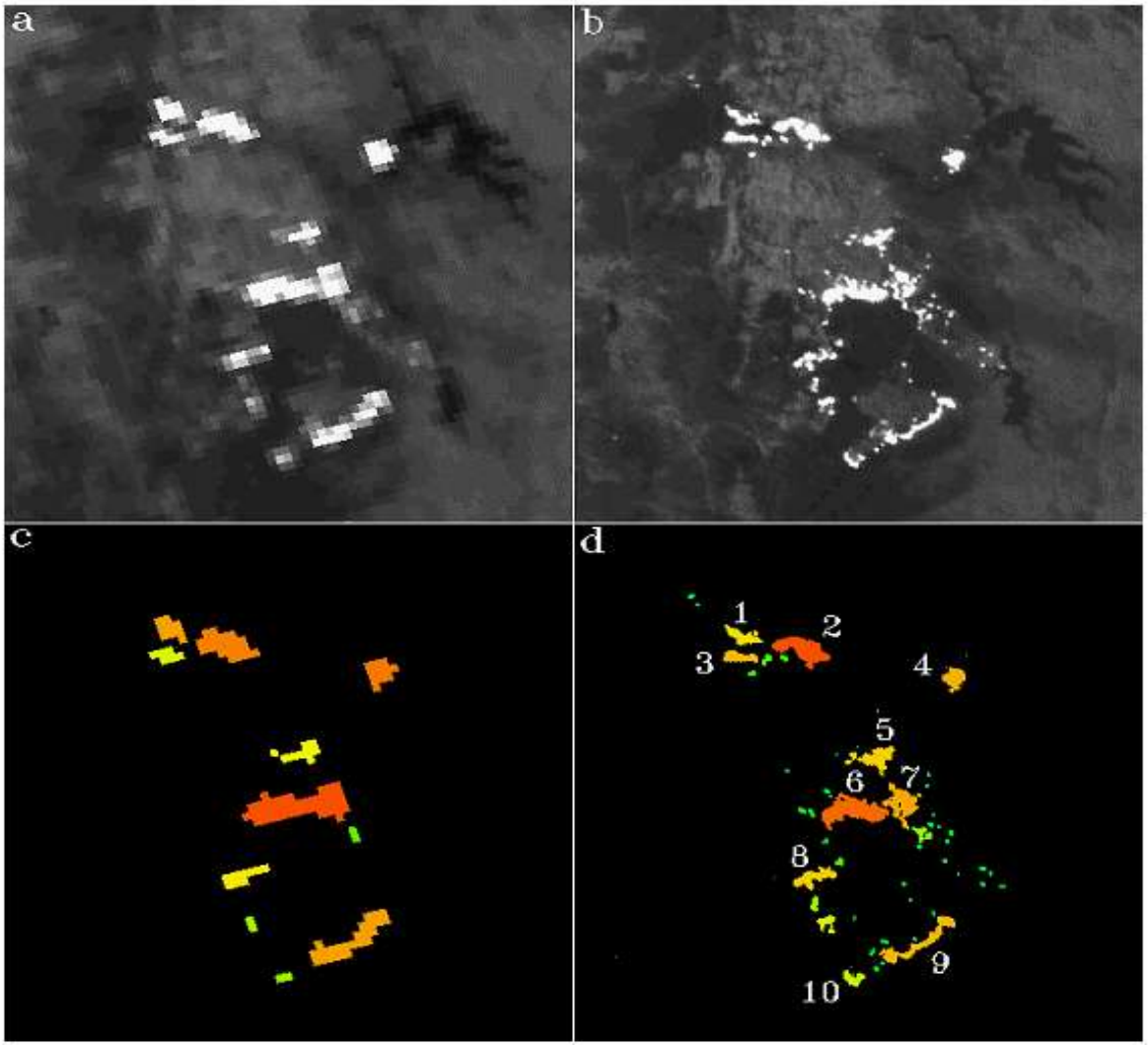
Fuel attribution and metrics for fire and land management

WORK PACKAGE 1: OBJECTIVE

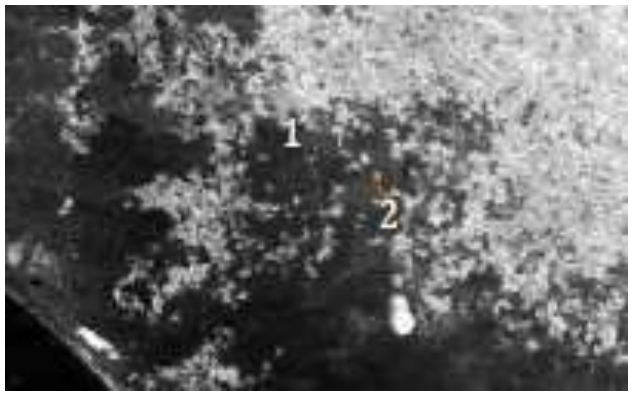
To implement, and assess, the utility of earth observation thermal sensors and algorithms for the enhanced surveillance of the extent, intensity and configuration of fire.

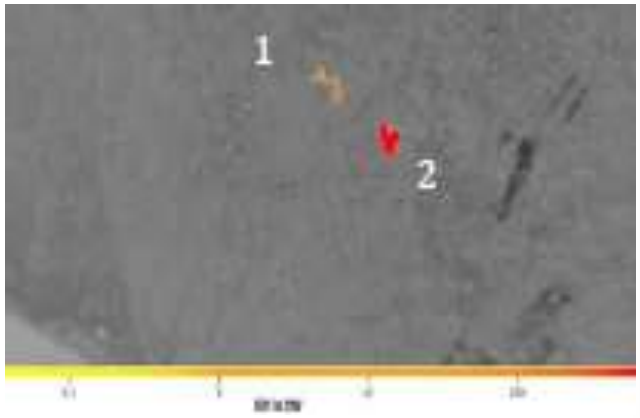
a) Literature review and report (*completed*)
b) Spatial and temporal patterns of Australian wildfires (*new activity Q3.2015*)
c) Simulation analysis of sensor and algorithm performance (*on track Q3.2015*)
d) Multi-scale analysis and data validation through field campaigns (*on track, revised from Q3.2016 to Q2.2015*)

What data products to use; when and where? What are the trade-offs between different sensors and products? How can these be integrated to provide a solution that is fit-for-purpose?



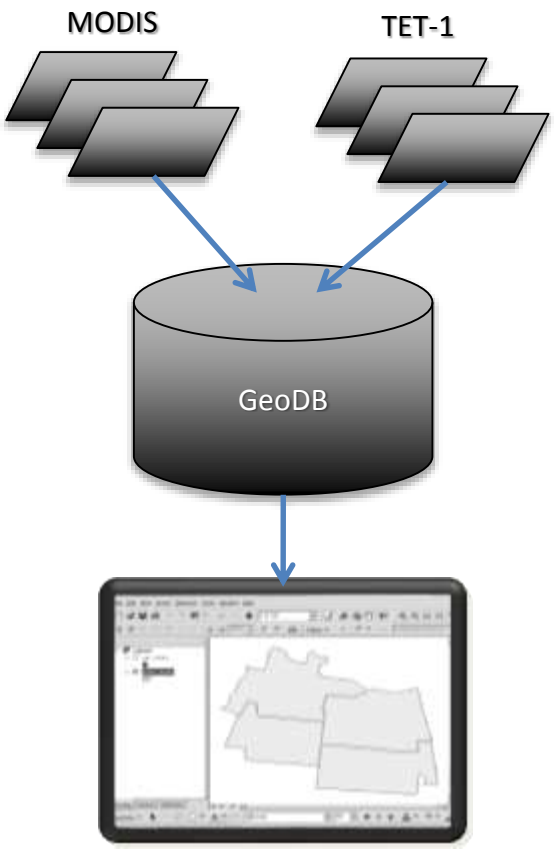
MODIS vs BIRD





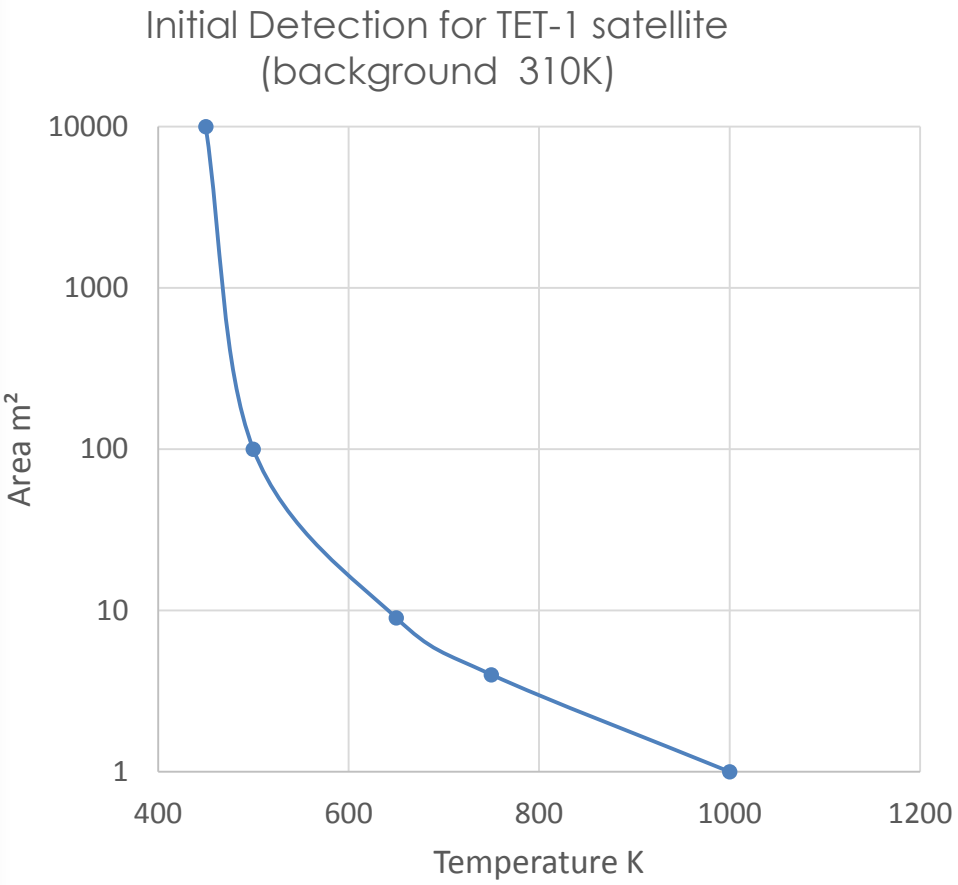
MODIS vs TET-1

WP1(B): SPATIAL AND TEMPORAL FIRE PATTERNS



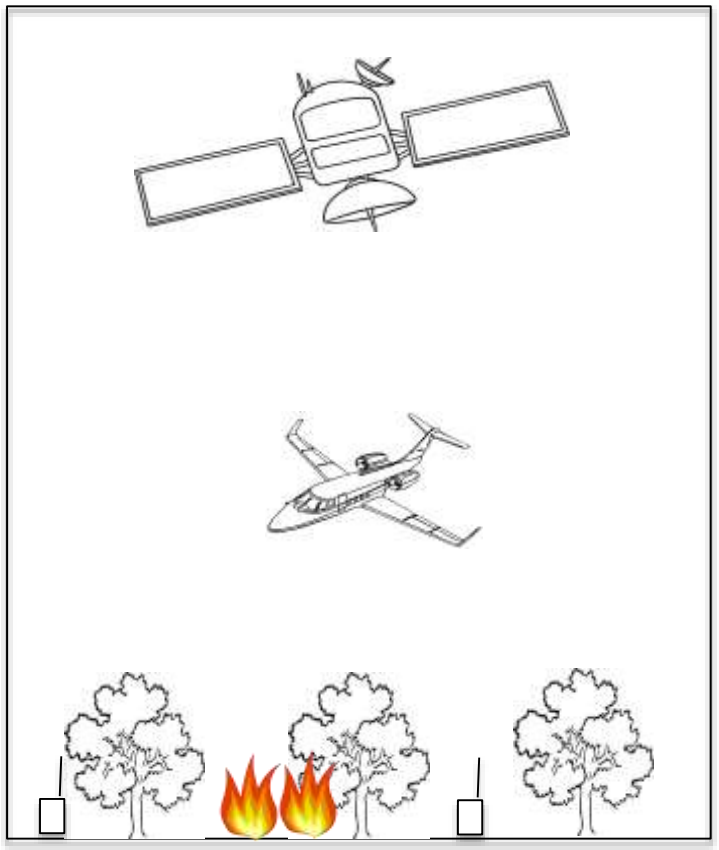
- ✓ Digitising and compilation of **fire/burned area geodatabase** for 2000-2013.
- ✓ Calculate **spatial and temporal metrics.**
- ➢ **Comparison of metrics** between different land use areas, bioregions and/or Australian states (*Q3.2015*).
- ➢ Publication to Int. Journal of Wildland Fire.
- ➢ **Comparison of fire detection** with TET-1.

WP1(C): SENSOR +ALGORITHM PERFORMANCE



- ✓ **IDL and Python Code** to generate simulated fire landscapes.
- ✓ Performance of TET-1 sensor and algorithm to **detect** and accurately map fire under a range of scenarios for **fire temperature and fire size**.
- ✓ Extend simulations to explore effects of **fire spatial configuration and complexity, background surface temperature and off-NADIR takes** on detection and mapping.
- ➢ Evaluation of **other sensor systems** (e.g. DEPI linescanner, Himawari 8) and short report to end-users.
- ➢ Publication to Int. Journal of Remote Sensing.

WP1(D): MULTI-SCALE DATA VALIDATION



- ✓ Prototype development and testing of **fire loggers**.
- ✓ **Manufacturing** of 30 electronic fire loggers and 100 heat sensitive paint pyrometers.
- ➢ Deployment in **multi-scale field campaign**.
- ✓ Nominated **priority landscapes**: grasslands, closed forest and peri-urban areas.
- ✓ Target burn locations and timings (FOPS), **survey design and logistics** (initially for Vic and then roll out to interstate study areas).
- ➢ DLR **camera install**.
- ➢ **Data capture** (planned and opportunistic).
- ➢ **Validation, analysis and accuracy assessment**.

WORK PACKAGE 2+3: OBJECTIVES

To develop methods and protocols for the remotely sensed assessment of burn severity and fuel change (pre-& post-fire) in the surface and near-surface layer.

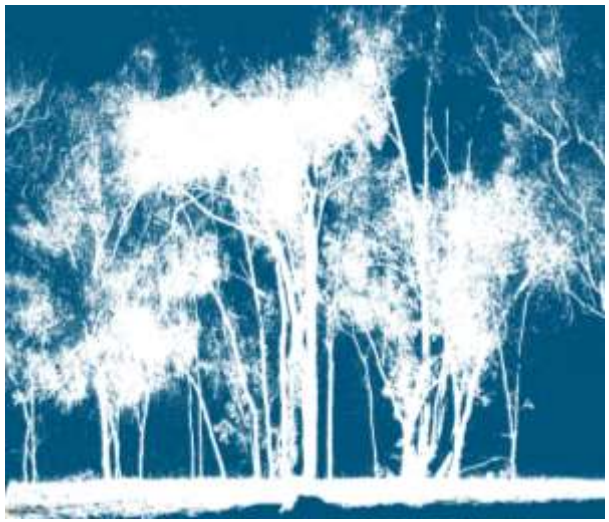
a) Literature review and report (*behind schedule, revised Q3.2014 to Q1.2015)* .
b) Measuring fuel biomass - live versus dead versus live/dead combined materials - using different methods (visual assessment/rising plate meter/remote sensing) (*on track Q1.2015*).
c) Measuring change in fuel biomass and metric performance (*on track Q1.2016*).
d) Transforming TLS metrics into meaningful metrics (*on track Q1.2016*).
e) Scaling-up from the site to the landscape (*on track Q4.2016*).

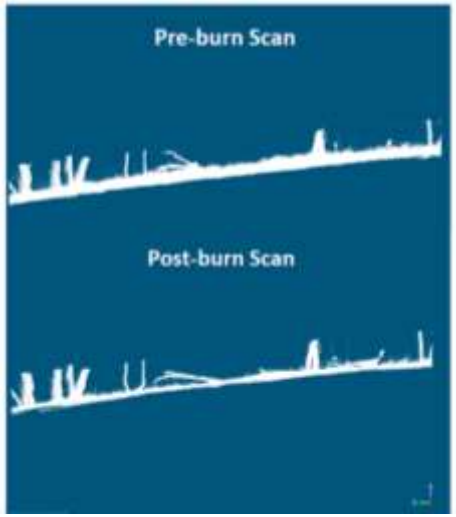
How can understorey fuel loads be estimated in a way that is accurate, repeatable? How do we overcome issues of obscuration? Is the method efficient and scaleable? Are the metrics meaningful?

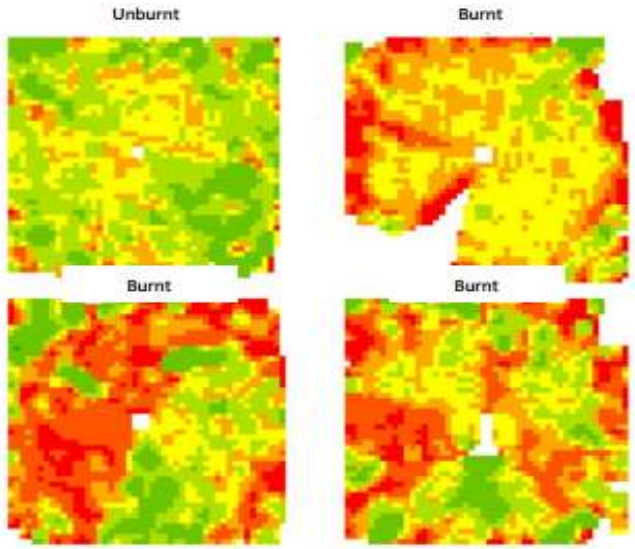
WP2+3(B): MEASURING FUEL

- ✓ **Instruments, survey design** and **study area** identified.
- ➢ Data collection of proportion of live/dead material for surface and near surface fuel layers using **visual assessments, fuel accumulation curves, rising plate meters, TLS and dry weights.**
- ➢ Comparison between the estimates of each method for different EVC communities.
- ➢ **Feasibility assessment** of implementation, and **scaling up** from the site to the region.

WP2+3(C): MEASURING CHANGE IN FUEL





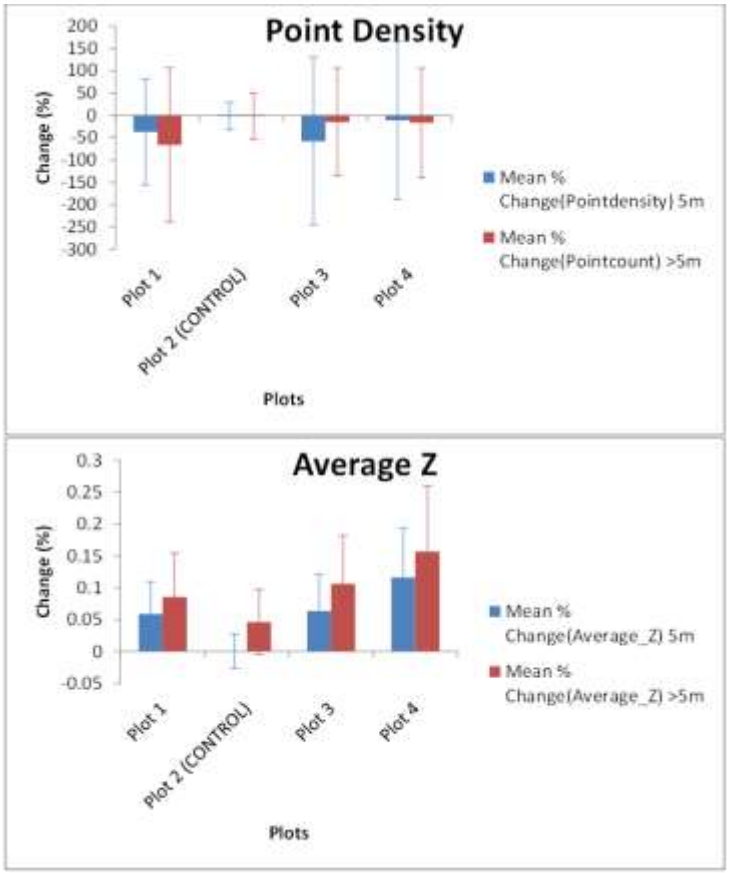


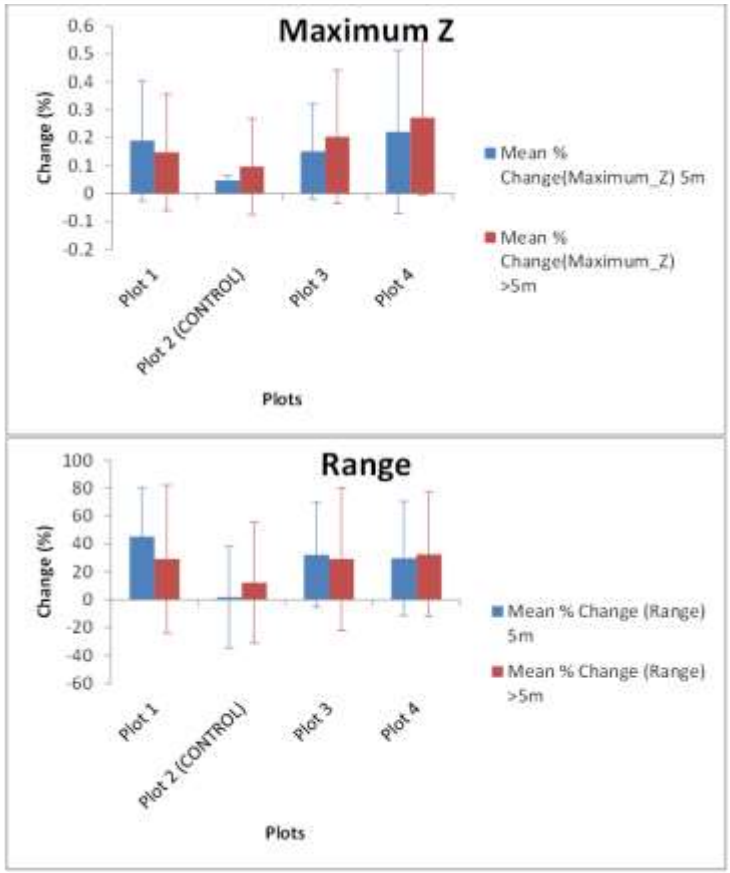
✓**Data collection** pre-burn, 2 weeks after the burn and 2 years after the burn (burn conducted 2012, St. Andrews in Victoria) using visual assessments and TLS.

✓Data processing from **3D point cloud into 2D images** for all metrics.

✓Evaluation of derived TLS metrics against **stability, sensitivity to detect change, sensitivity to occlusion and accuracy**.

✓Publication in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (J-Stars).





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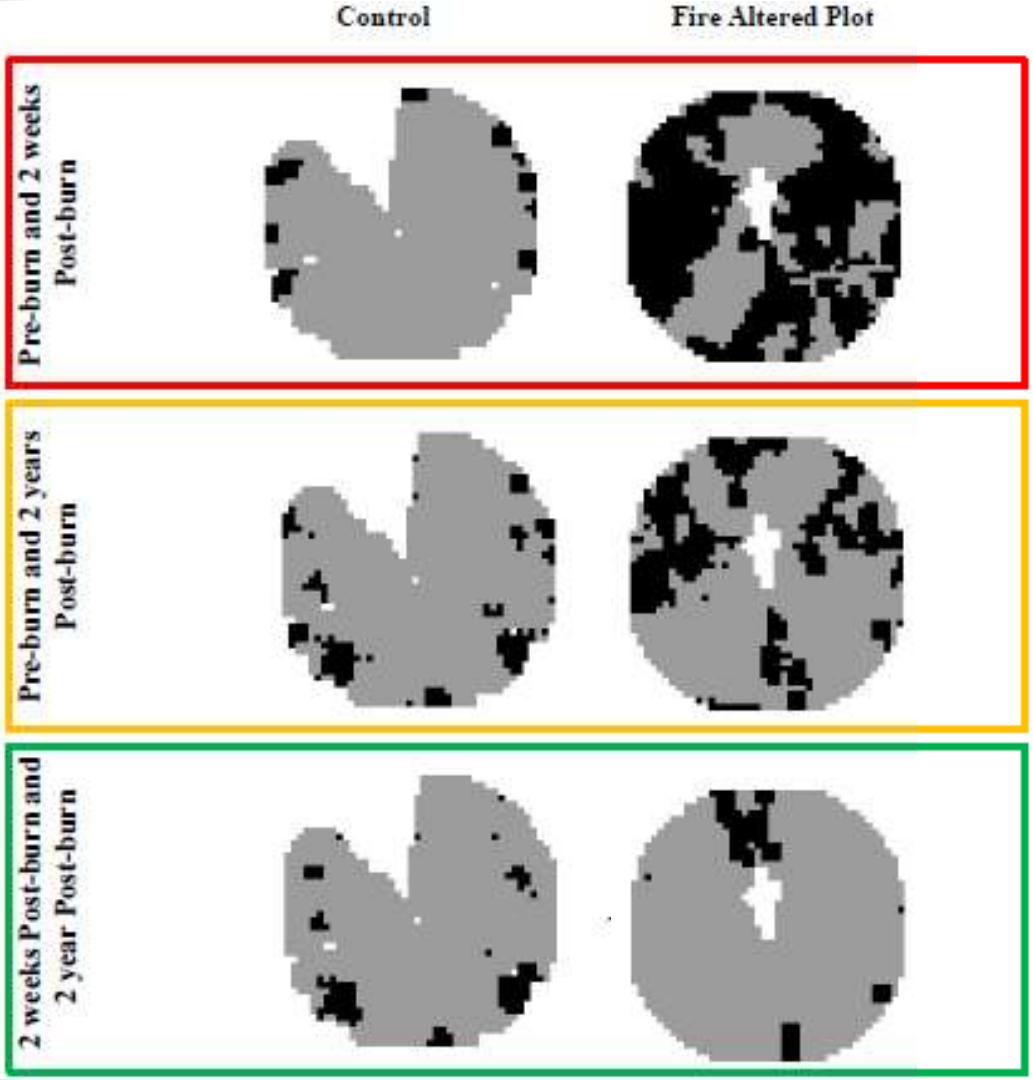


Control

Post-burn 2 weeks

Post-burn 2 years

Fire-altered Plot 3

Post-burn 2 weeks

Post-burn 2 years

ADDITIONAL HIGHLIGHTS FROM 2013-2014

- ✓ End-user group meeting to prioritise work activities.
- ✓ Access to a second (improved) terrestrial laser scanner (Trimble TX8) purchased by RMIT University.
- ✓ TET-1 imagery received and trial data downlink facilitated between DLR and Geoscience Australia.
- ✓ Launch date set for BIROS for 9th September 2015; second satellite to TET-1 in the FireBird constellation.

THE RESEARCH TEAM FOR 2015

Project Leaders

Professor Simon Jones

Dr. Karin Reinke

Postdoctoral Research Fellows

Dr. Luke Wallace*

Dr. Sofia Oliveira*

PhD Students

Mr. Bryan Halley*

Mr. Vaibhav Gupta

Mr. James Leversha

Mr. Simon Mitchell

Masters Students

Mr. Sam Hillman*

Ms. Megan Byrne*

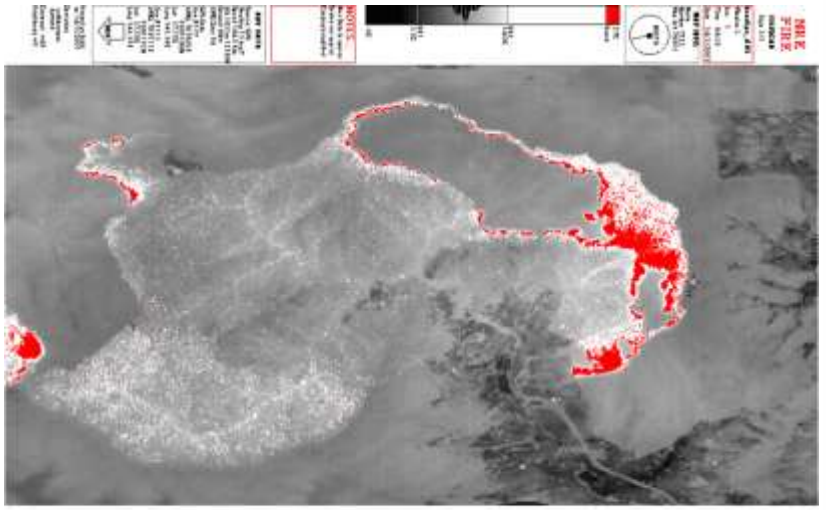
*commencing 2015

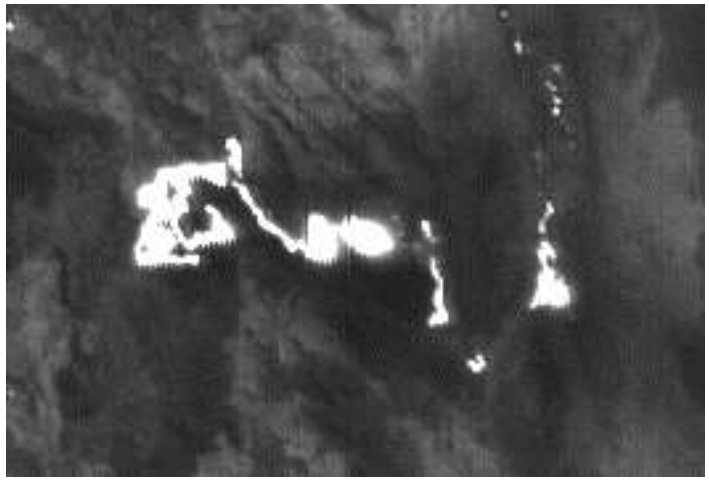
Dr. Luke Wallace received his PhD from the University of Tasmania, where he developed a world first mini **UAV LiDAR mapping system** and demonstrated its application in measuring and monitoring forest attributes. Luke has also worked as the primary programmer and spatial analyst in the development of **annual bushfire risk models** for the Tasmanian Parks and Wildlife since 2011.

Dr. Sofia Oliveira was awarded a PhD for her research into fire regimes in tropical savannas using field data and remote sensing, undertaken at the University of Lisbon in collaboration with Bushfires NT and Charles Darwin University. Her primary research interests include fire risk mapping, **remote sensing of burnt areas and landcover**, and the study of fire regimes and their **spatial and temporal dynamics at a regional scale**.

END-USER REPRESENTATIVE

Adam Damen – DEPI (Vic)





QUESTIONS

Thank you