Bridging the scale gap – Advancing high-resolution biodiversity monitoring with hyperspectral and lidar drone technologies

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Drone remote sensing offers a transformative approach to capturing ultrahigh-resolution ecological data, enabling precise and scalable biodiversity assessments. By bridging the scale gap between ground-based measurements and broad-scale satellite observations, drones provide unparalleled insight into fine-scale ecosystem dynamics.

This presentation will highlight three recent projects leveraging drone technology for biodiversity monitoring. The first project applies hyperspectral and lidar sensors to quantify functional diversity across several Australian forested ecosystems. This work integrates advanced trait-based metrics to assess the richness and divergence of canopy structures and physiological traits, revealing spatial variability that drives ecosystem processes.

The second project focuses on using shortwave-infrared imaging spectroscopy to map water stress indicators in Australian forests, with a specific emphasis on leaf water potential. This indicators serve as early-warning signs of drought vulnerability, offering a non-invasive method for tracking plant water status and its role in ecosystem resilience.

The third project operationalises drone-based monitoring of Australia's ecosystems through a national-scale program, enabling the collection of ultrahigh-resolution data to enhance calibration and validation of satellite products. This initiative will provide critical data for tracking ecosystem health, detecting environmental change, and supporting long-term conservation efforts.

These projects collectively demonstrate the growing capacity of drone remote sensing to deliver detailed, actionable insights into plant function and biodiversity, contributing to more effective ecosystem management and monitoring.
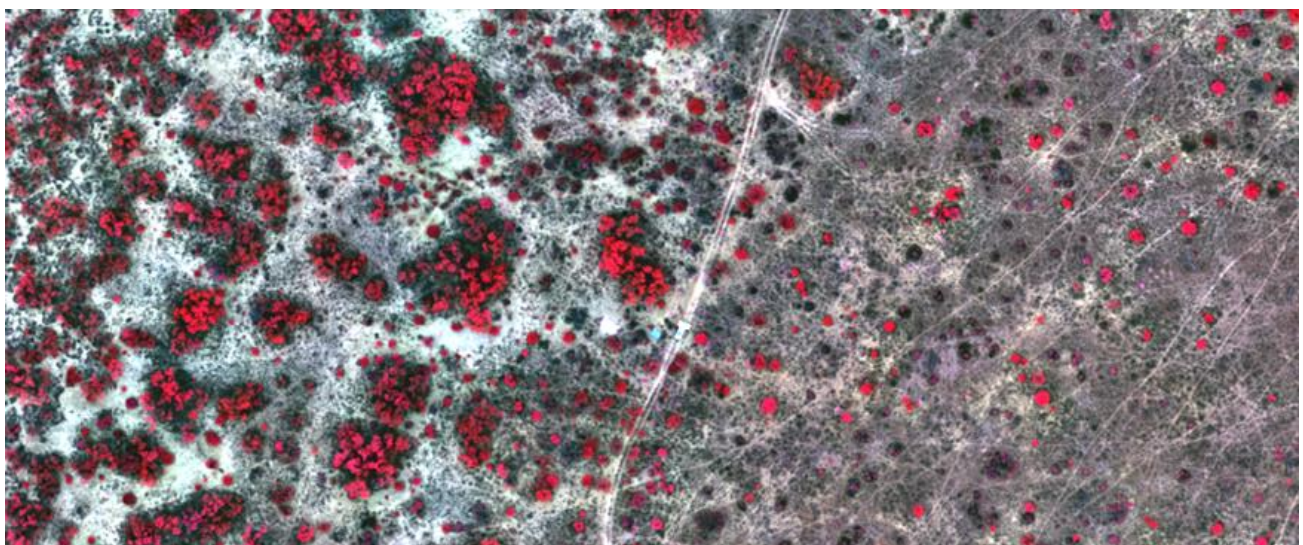
Professor Arko Lucieer biography

As Head of the School of Geography, Planning, and Spatial Sciences and Professor in Remote Sensing at the University of Tasmania, I lead a team of 50 academic and professional staff, focusing on addressing key regional challenges and shaping a sustainable future. As the founder and leader of the TerraLuma research group, my work centres on developing and applying drone-based remote sensing technologies to enhance biodiversity mapping and ecosystem assessment. My academic career has been driven by a passion for using remote sensing to bridge the scale gap between field data and satellite observations, advancing our understanding of ecosystem dynamics. I am also dedicated to teaching and mentoring the next generation of remote sensing specialists, fostering an environment that integrates practical application with theoretical knowledge.