Empirical analysis of spot-fire and firebrand behaviour during extreme fire weather conditions

bushfire&natural HAZARDS CRC

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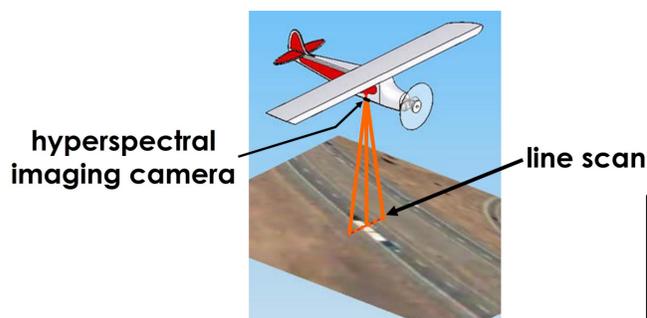
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OCCURRENCE OF SPOT-FIRES IS VERY DIFFICULT TO OBSERVE AND PREDICT, ESPECIALLY IN EXTREME BUSHFIRES. INTERROGATING 15 YEARS WORTH OF BUSHFIRE LINE-SCANS CAN HELP TO PREDICT THIS PHENOMENON MORE ACCURATELY

Infrared and multispectral line-scans have been regularly acquired by aircraft deployed over bushfires in eastern Australia for the past 15 years. These systems can "see" through smoke and haze to construct an accurate 2D map image of a bushfire. A large dataset now exists. This work will use this data to help answer: How far do spot-fires ignite from source fires under different environmental conditions? How densely do spot-fires ignite during bushfires? How fast do bushfires spread and how do spot-fires contribute?
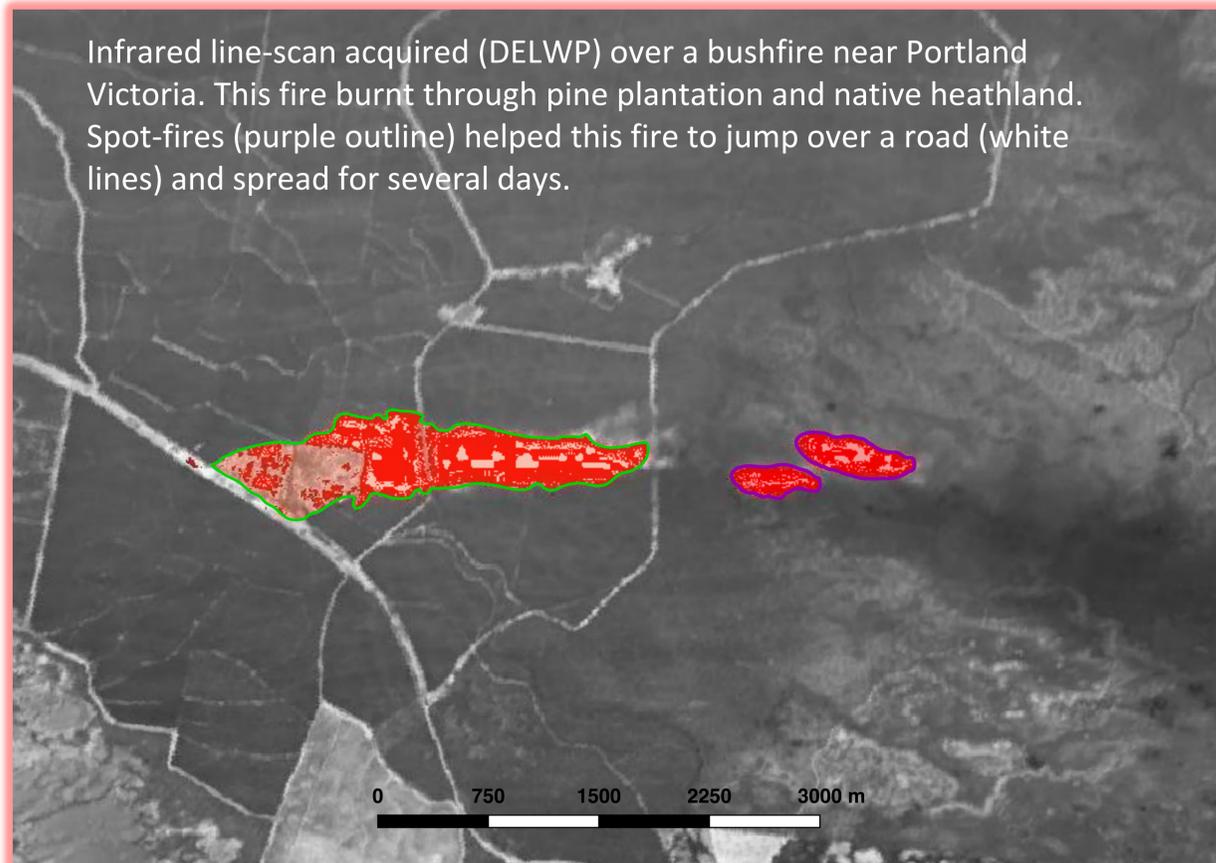
Infrared line-scan acquired (DELWP) over a bushfire near Portland Victoria. This fire burnt through pine plantation and native heathland. Spot-fires (purple outline) helped this fire to jump over a road (white lines) and spread for several days.

Airborne system

hyperspectral imaging camera — **line scan**

requires GPS correction of flight path and plane attitude

WORK TO DATE

Preparation of line-scan data in GIS is complete:

▶ 15000 infrared and multispectral images provided by Dept. Environment Land Water and Planning in Victoria, and the Rural Fire Service in NSW (acquired by Air Affairs) have been processed

▶ 1300 scans identified with some type of spot-fire occurrence

▶ From the 1300, a set of 315 examples of bushfires with spot-fires have been geo-referenced and digitized into a GIS dataset.

▶ 90 sets of sequential line-scans have been identified, and will be used to develop an empirical rate of spread model for bushfires.

WORK TO COMPLETE

▶ Relate spatial layers of potential predictor variables (weather, topography, vegetation, source fire shape) to line-scan data in GIS

▶ Develop empirical model for maximum spotting distance and spot-fire density

▶ Digitize all line-scans to be used for rate of spread analysis

▶ Develop empirical model for rate of spread, including presence of spot-fires as a potential predictor.

Spot-fires in heath vegetation, Wayne Rigg CFA

FEEDBACK TO AGENCIES

A number of issues making analysis for spot-fires difficult in the current set of line-scans have been identified. Feedback will be provided to RFS and DELWP on the issues identified and potential improvements that could be made to line-scan acquisition and processing. This includes:

▶ Scanning the entire active fire area, and a distance ahead of the fire where potential spots may be burning, will improve confidence that all spot-fires are captured

▶ More frequent scanning could allow for more accurate fire spread measurement

▶ Data naming protocols could be altered to allow faster data interrogation

END USER COMMENT

"*NSW Rural Fire Service would be keen to see the models developed from this research incorporated into improved fire behaviour models for operational and strategic planning purposes.*" Simon Heemstra, Manager Community Planning NSW RFS