DISASTER LANDSCAPE ATTRIBUTION ATTRIBUTING ACTIVE FIRE USING SIMULATED FIRE LANDSCAPES

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ACTIVE FIRES ARE INCREASINGLY BEING IDENTIFIED USING SATELLITE REMOTE SENSING TO DETERMINE THEIR SIZE AND SEVERITY. VERIFYING THE INFORMATION DERIVED FROM THE WIDE VARIETY OF DIFFERENT SENSORS AND THEIR ASSOCIATED FIRE ALGORITHMS CAN BE A CHALLENGING TASK.

RESEARCH OBJECTIVES

Validation of remotely sensed data is critical to ensure the quality and consistency of products derived from, and information obtained using, this data. For land products derived from sensor observations, validation is generally achieved using *in-situ* (ground) reference data. Due to the ephemeral nature of fire, this type of product validation is difficult to achieve, and current verification of fire products is heavily dependent on intercomparison of products from different sensors. By using simulated fire landscapes, this research will test the ability of many common sensors to detect and correctly attribute active fires without the restrictions imposed by short-lived, sporadic fires and the logistical difficulties of obtaining *in-situ* measurements from active fires.

This research will generate a model for simulating fire landscapes and the sensors used to detect fires(Figure 1 below).

Landscape Simulation

Fires come in a variety of shapes and sizes, dependent upon such factors as fire age, prevailing weather conditions, time of day and previous suppression measures in the fire area. This research will create a series of synthetic fire landscapes recreating a range of fire scenarios.

Fire configurations to be examined include:

- Thin, sinuous fire fronts of a high intensity, with limited adjacent smouldering fire, simulating high wind days (Figure 2a)
- Low intensity blocks of fire, of a large areal extent, mimicking prescribed burning operations and controlled fire conditions (Figure 2b)
- Ember attack, with many small spot fires of a high intensity (Figure 2c)

Research will focus on how size and configuration of fire affects the ability of a sensor to accurately estimate intensity and areal extents.

Sensors

A range of sensors are currently used to image Australia and surrounding areas, and many of these have an associated fire product. Sensors to be analysed in this research are listed in Table 1.

Table 1. Sensor specifications – sensors chosen are relevant to active fire in Australia.

Sensor System	Temporal resolution	Spatial resolution (m)	Swath Width (km)
ASTER	16 days	15-90	60
AVHRR	4 daily	1100	2400
Landsat 7 ETM+	16 days	30-60	185
MODIS	4 daily	250-1000	2330
VIIRS	2 daily	375-750	3000
FIREBIRD (TET-1)	5 days	40-320	211
Himawari	10 min	500-2000	500

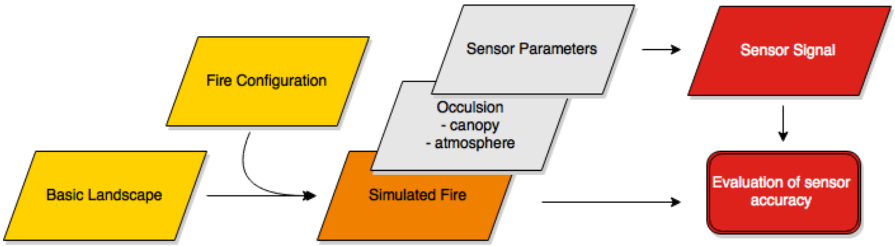

Figure 1. Proposed Fire Landscape Simulation Model

A comprehensive reconstruction of sensor conditions will be undertaken, including camera models, point spread functions, band response curves and orbital parameters, to allow for intercomparison between various sensors and their products for detection and attribution of fires.

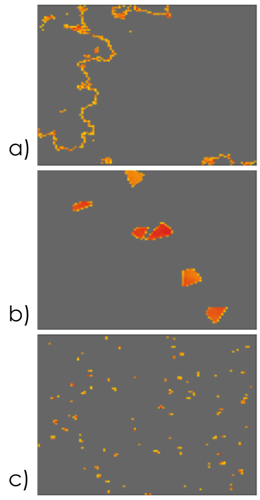

Figure 2. Examples of fire configuration

FURTHER RESEARCH

The effects of canopy cover on occlusion of the fire signal has yet to be accurately quantified. Canopy cover may cause obscuration of the fire signal to sensors, especially in the case of low intensity fires. A measure of canopy cover will be incorporated into the fire landscape model to quantify the effect of such occlusion on the fire signal.

An additional focus will be to use the Advanced Himawari Imager (AHI-8/9) to detect fires in Australia. The utility of this new geostationary platform to detect fires of various types will be assessed, along with an assessment of the areal detection and intensity detection limits of the sensor. Once suitability is determined, a fire product will be generated based upon existing fire products from similar sensors.