DISASTER LANDSCAPE ATTRIBUTION: FROM THE GROUND TO SPACE: VALIDATION OF TET-1 AND HIMAWARI-8 FOR ACTIVE FIRE DETECTION

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UNDERSTANDING THE UTILITY OF THERMAL REMOTE SENSING SYSTEMS FOR ACTIVE FIRE DETECTION AND MONITORING. EXPLORING ISSUES OF SCALE, ACCURACY AND RELIABILITY THROUGH SIMULATIONS AND FIELD VALIDATION.

INTRODUCTION

This project aims to understand and report the trade-offs between sensors and their ability to map and measure fire related attributes over a range of fires across different landscapes. The purpose is to develop approaches that provide new information to assist fire agencies in responding to fire management tasks and to future proof their practices to parallel developments in remote sensing.

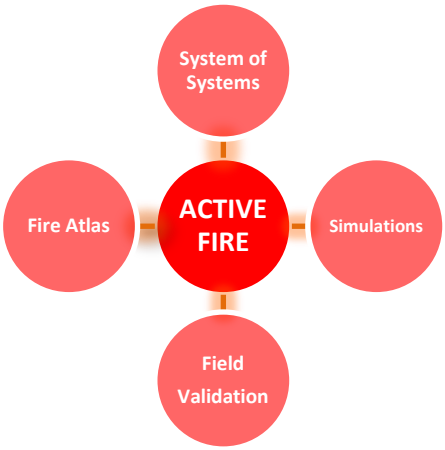

Figure 1. The key activities that inform the active fire detection, mapping and monitoring project.

FIRE ATLAS

A southern Australia fire history atlas has been compiled for analysing the spatial and temporal characteristics of fire. This atlas allows us to ask questions such as, What is the average rate of fire spread? What is the total area of all fires at any given time, and what is the geographic spread of these fires?

These questions can help determine the requirements for satellite observation of fire in the Australian landscape. Further analysis reveals other trends in the data including an increasing incidence in the number and size of wildfires since 1990. As an example, data for Tasmania is shown in Figure 2.

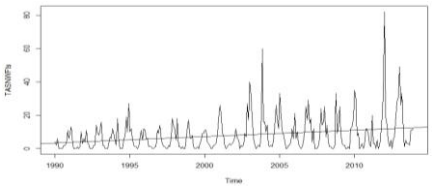

Figure 2. Increasing incidence of wildfires in Tasmania from 1990-2013.

SIMULATIONS

Thousands of simulations, (see AFAC poster by PhD student Bryan Hally), will theoretically assess the performance of thermal sensing systems for mapping wildfires different conditions and landscapes.

MULTI-SCALE FIELD VALIDATION

TET-1 and Himawari-8 are next generation satellites offering new opportunities for active fire detection and mapping. Two case studies form early steps towards multi-scale validation campaigns scheduled to coincide with prescribed burning activities in Victoria and interstate.

Case study #1 Prescribed burn mapping

Manual and electronic fire-loggers were tested in the field for mapping the spread of fire during a prescribed

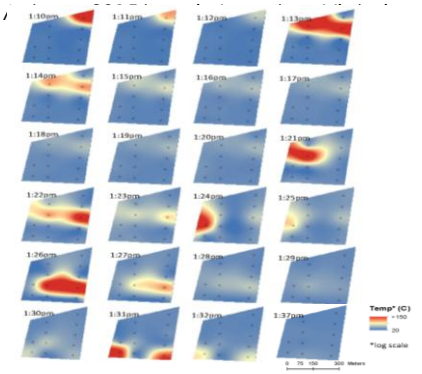

Figure 3. Surface temperature at 1min intervals during a grassland prescribed burn.

Case study #2 Fire front detection

In Winter 2015, a simulated fire front of 16 linear metres was created (See Figure 4). Burning times coincided with TET-1 and Himawari-8 satellite overpass times. The first ignition occurred at night and simulated "spot fires". The second ignition was done during the day and simulated a "continuous ribbon of fire".

Figure 4. Experiment set-up for low-intensity active fire front detection.

Thermocouples were positioned along the fire front to measure surface temperature, as shown in Figure 5, and will be used to compare to satellite observations.

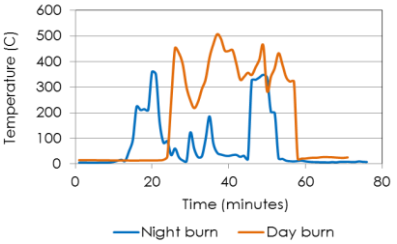

Figure 5. Surface temperatures of simulated fire fronts coincident to satellite overpass times.

SYSTEM OF SYSTEMS

Fire histories, simulations and empirical observations are used to understand the utility of remote(thermal) sensing for the surveillance of fire across peri-urban, grassland and forest landscapes in Australia in order to create a multi-scale, approach to fire surveillance.

"The provision of timely, synoptic remotely sensed data on bushfires can save resources & time. The project will assist in the collection of vital bushfire information acquired through state-of-the-art remote sensing technology as needed by fire & emergency management, now & in the future" D. Nicholls, CFA.