THE DETECTION AND SURVEILLANCE OF ACTIVE FIRE USING HIMAWARI-8

Simon Jones[1], Karin Reinke[1], Luke Wallace[1], Chathura H. Wickramasinghe[1], Bryan Hally[1]

[1] School of Science, RMIT University, VIC

HIMAWARI-8 PRESENTS EXCITING OPPORTUNITIES TO MAP FIRES IN NEAR REAL TIME. EXPLOITING INFORMATION ACROSS TEMPORAL AND SPATIAL DOMAINS ENABLES A NEW PARADIGM IN FIRE DETECTION AND SURVEILLANCE.

PROJECT OVERVIEW

The detection and monitoring of wildfire in Australia has heavily relied on aircraft, low earth orbiting satellites and in-situ observations. These methods can be resource intensive and may lack the timeliness required to adequately assess the danger of a fire incident.

The launch of Himawari-8 has the potential to enhance fire detection and monitor fire spread at increased temporal resolution. This poster reports on the progress made in developing new generation algorithms that exploit the information provided by the Himawari-8 AHI sensor for detecting and monitoring fire.

EARLY FIRE DETECTION WITH HIMAWARI-8

The Himawari-8 sensor provides a unique opportunity to improve upon existing methods used for early fire detection. Fire detection algorithms have mainly focused upon single-image contextual methods, which treat each image from a sensor independently. AHI's 10 minute revisit time gives observers greater scope to examine using consecutive images to build information about a fire pixel's background state, which can lead to more comprehensive and earlier fire detection. More information on work regarding this topic can be found on the poster entitled "The diurnal cycle and its role in fire detection using Himawari-8", also on display at this presentation.

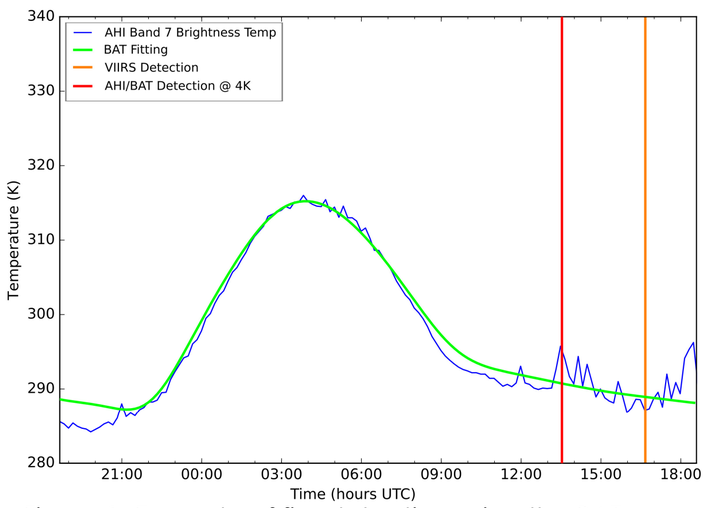

Figure 1: Example of fire detection using the BAT temperature fitting method, with a VIIRS active fire detection for comparison. Use of this method improved fire detection time by 3 hours, 20 minutes in this case. The fire activity shown was not detected by the MODIS active fire product.

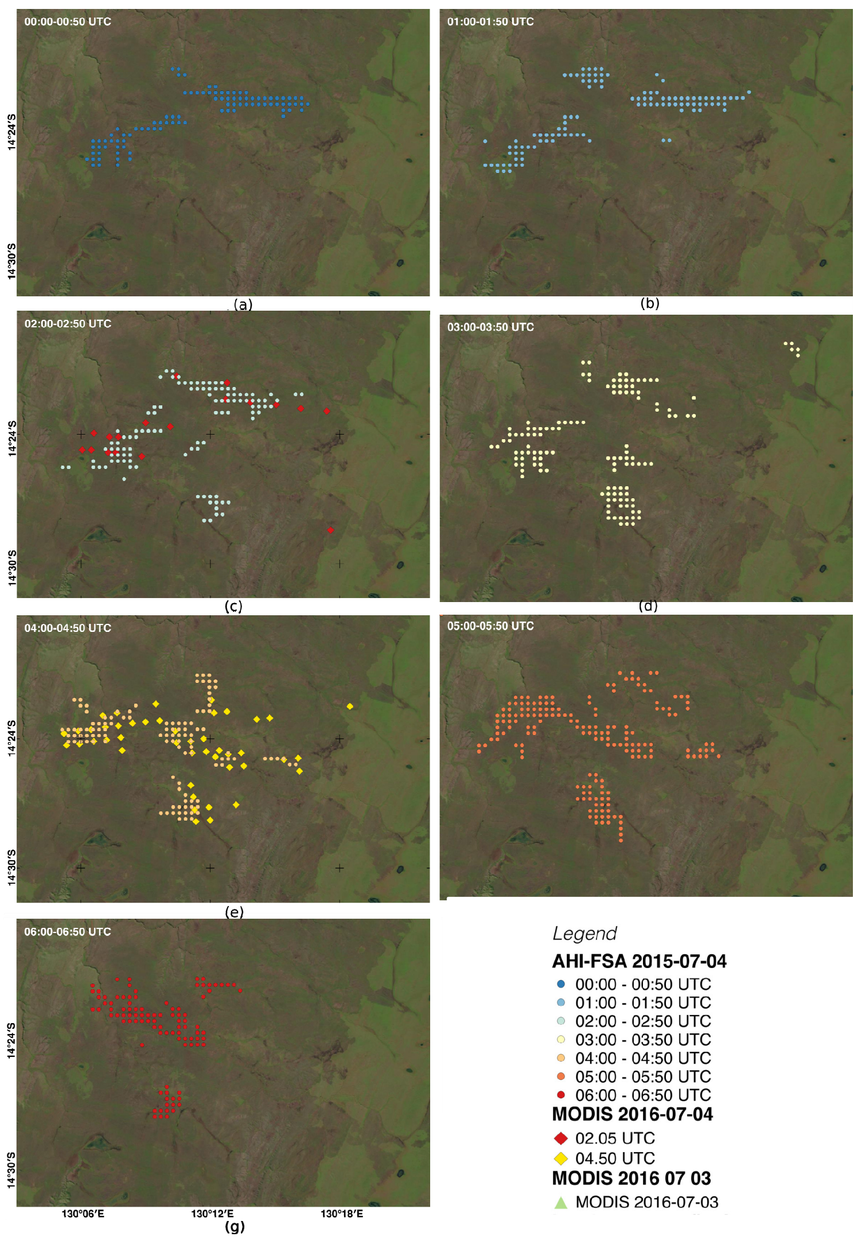

Figure 2: AHI-FSA fire line mapping for a fire at Claravale, Northern Territory. AHI-FSA fireline detections are aggregated per hour for the day light hours of 2016-07-04. MODIS hotspots are also shown in figures c and e.

FIRE MONITORING WITH AHI-FSA

The AHI fire surveillance algorithm (AHI-FSA) has been developed to exploit the high temporal resolution of Himawari-8, while making use of the higher resolution information found in the NIR and red bands than the commonly used 2km MIR band. This approach allows fire to be monitored at a resolution of 500 m.

AHI-FSA applies the following conditions to attribute an area as part of the fireline;

- The MIR band is used to detect thermal anomolies at 2km.
- A NIR difference slope based threshold is used to identify the burning and non burning pixels at 1km resolution.
- The RED channel is used to identify edge between smoke and non-smoke at 500m resolution.

ASSESSING AHI-FSA IN THE NT

A case study to evaluate AHI-FSA was undertaken within the Nothern Territory of Australia, during two study periods at the start of the dry season being 02-06 and 25-29 July 2016 selected due to high fire activity. Intercomparison between AHI-FSA and other satellite products suggest;

- A low false detection rate as only 7% of AHI-FSA fire line points fall outside a Landsat-8 burn scar
- 70.9% of the fires before any MODIS overpass
- Only 2.2% of MODIS hotspots and 19.7% VIIRS hotspots are not detected by AHI-FSA.

SURVEILLANCE WITH AHI-FSA

Figure 2 demonstrates a fire can being monitored byAHI-FSA.

- The fire was detected by AHI-FSA at 00:00UTC and spread linearly along the north-east direction (Figure 2a) .
- At the time of the first MODIS overpass, the fire had spread in the south-east direction (Figure 2b).
- AHI-FSA detects a new fire line in the center of the map at 03:00 UTC (figure 2c).
- This new fire line is not detected by MODIS until 04:50 UTC, by which time the main fire front had grown further to the south-east (Figure 2e).

CASE STUDY HIGHLIGHTS

- Fire detection with Himawari-8 occurs up to 6 hours earlier than MODIS, VIIRS
- AHI-FSA allows fire movements to be monitored at 500m resolution every 10 mins.

This project will assist agencies to detect, respond and monitor fires especially at those times during severe weather days when no other source of information is available. This has positive and real outcomes for our community.
(Naomi Withers, Forest, Fires and Regions, DELWP)

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