Remote Sensing of fuel Flammability

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## Applying remote sensing to bushfire decision making

### Focus of my talk

<table>
<thead>
<tr>
<th>Pre-Fire: Preparation &amp; Preparedness</th>
<th>During-Fire: Response</th>
<th>Post-Fire: Recovery</th>
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</thead>
<tbody>
<tr>
<td>Fuel - amount, type, condition, arrangement</td>
<td>Active fire mapping, Smoke detection, Lightning detection, Weather conditions, Water bodies accessibility, Areas of elevated fire risk, All Pre-fire information</td>
<td>Burn extent, Burn severity - built environment, Burn severity - natural environment, Water quantity, Air quality, Vegetation recovery</td>
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<td>Weather conditions</td>
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<td>Land use</td>
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<td>Water quantity</td>
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<td>Road and track network</td>
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<td>Critical infrastructure - locations</td>
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Bushfire Earth Observation Taskforce Report, 2020
Fuel Flammability

Arrangement
Quantity/load
Moisture content (FMC)

Flammability
(ignitibility, sustainability and combustibility)
Why monitoring live fuel moisture content?

Rossa et al., 2016, IJWF

Chuvieco et al. 2009, IJWF
Why monitoring live fuel moisture content?

Maintaining ‘greener’ vegetation around houses provides additional protection from wildfires (data from 499 houses from three wildfires that ignited on 7 February 2009 in south-eastern Australia)

Gibbons et al. 2018, Landscape and urban planning
The Australian Flammability Monitoring System (AFMS)

First **continental-scale** web site providing spatial information on landscape-scale **fuel moisture content and flammability** derived from **satellite observations**
Very dry fuel in most of Australia in 2019

Annual minimum live fuel moisture content for 2019

LFMC (%)
- ≥133
- 116 - 133
- 100 - 116
- 83 - 100
- 66 - 83
- 50 - 66
- 33 - 50
- 16 - 33
- 0 - 16

https://www.wenfo.org/aer/fire/

Scortechini, IN preparation
Higher spatial resolution version of the AFMS

MODIS (500m)

Sentinel-2 (10m)
FMC for Europe (EFFIS)

LFMC median and burnt area for grass fuel type (2008-2019)

Preliminary analysis
Fuel age maps derived from satellite

Most likely spread of the fire using SPARK (CSIRO 61)
• **Effective adaptation** to extreme fire events and an increasingly challenging fire management situation requires accurate and timely data on fuel flammability

• **Remote Sensing technology** provides accurate and detail information on fuel flammability but it is still not used at full potential in fire management (e.g. not directly ingested in current operational systems)

• **Further R&D is needed so** remote sensing derived-fuel flammability variables are
  - converted into secondary variables more easily to be integrated into fire management decision making
  - incorporated into the new generation of fire behaviour models
Thanks

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