



LEVERHULME

Centre for **Wildfires,**  
**Environment and Society**

Imperial College  
London

KING'S  
*College*  
LONDON



ROYAL  
HOLLOWAY  
UNIVERSITY  
OF LONDON



University of  
**Reading**

# Remote sensing of tropical vegetation properties in response to fire return time

Ramesh K. Ningthoujam<sup>1,2</sup>

25 May 2022

Nayane C.C.dos S. Prestes<sup>3</sup>, Marcelo Feitosa de Andrade<sup>4</sup>, Maria Antonia Carniello<sup>4</sup>, Corli Wigley-Coetsee<sup>5</sup>, Mark E. Harrison<sup>6,13</sup>, Kitso Kusin<sup>7</sup>, Azad Rusal<sup>8</sup>, Agata Hoscilo<sup>9</sup>, Adam Pellegrini<sup>10</sup>, Imma Oliveras<sup>11</sup>, Ted R. Feldpausch<sup>12</sup>, Susan Page<sup>13</sup>, Keith J. Bloomfield<sup>2</sup>, **Sandy P. Harrison**<sup>1,14</sup> and  
**Iain Colin Prentice**<sup>1,2</sup>

[www.centreforwildfires.org](http://www.centreforwildfires.org)



EGU22-6549

LEVERHULME  
TRUST



@centrewildfires



# Motivation: Remote sensing of vegetation-fire interactions

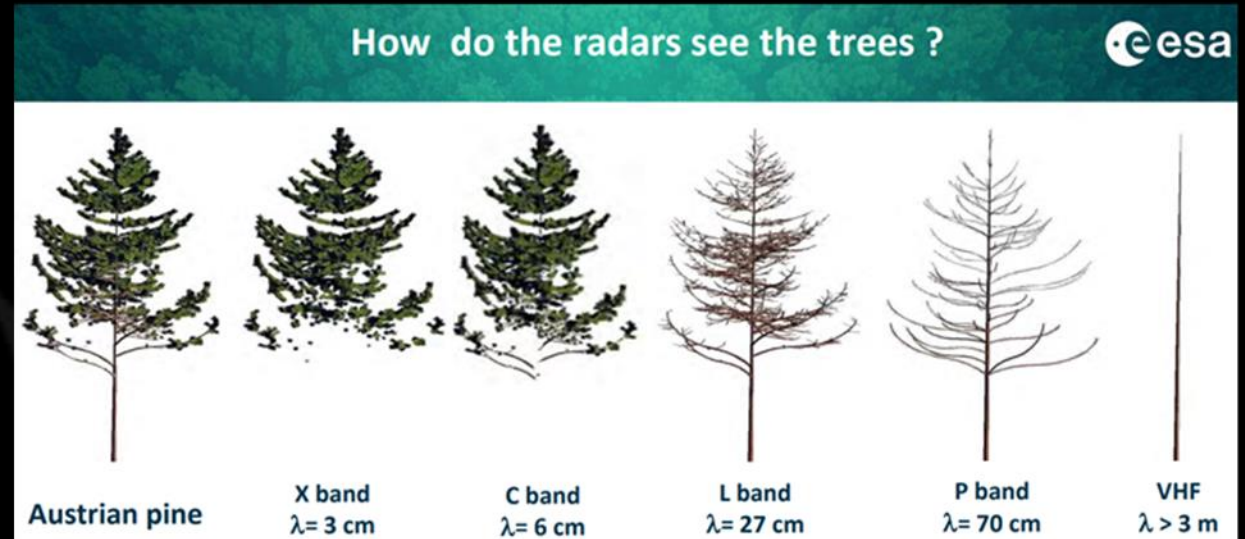
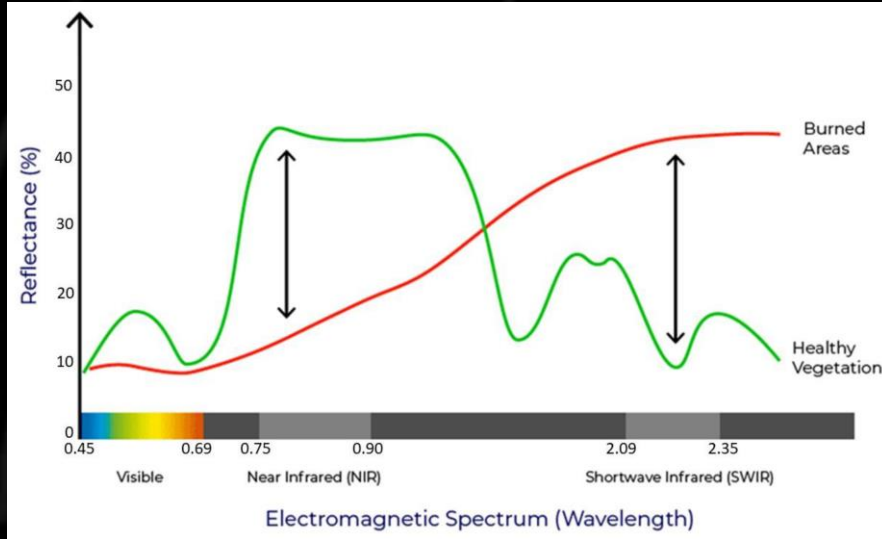


Figure 1. Optical spectra and microwave (USDA Forest Service and European Space Agency)

- Strong NIR decrease, SWIR increase and reduced volume backscattering
- Aim is to evaluate Landsat derived Vegetation Indices (VI) and PALSAR Mosaic dual polarisation backscatter sensitivity to fire return time and vegetation properties for four tropical biomes.

# Results: Response of Landsat VI to fire return time

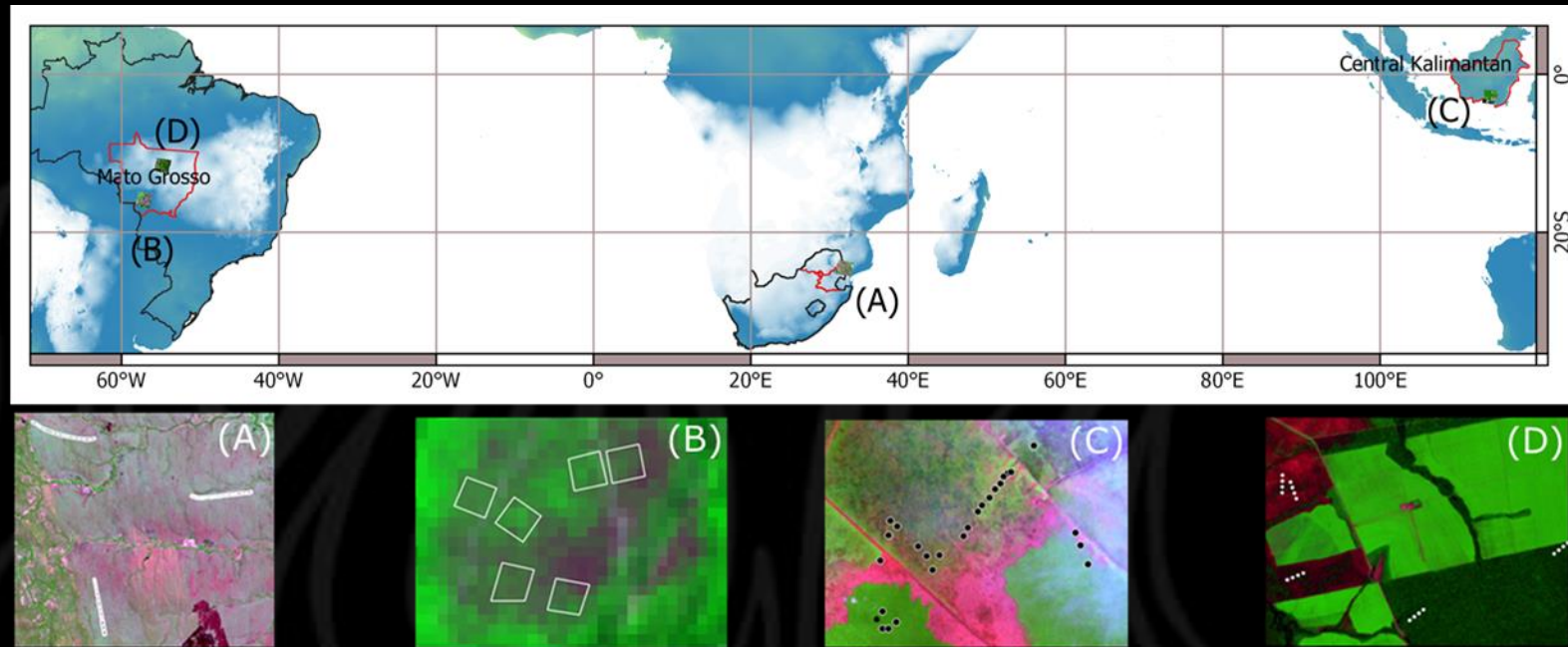


Figure 2. Four tropical biomes (A) savanna (Kruger NP) (B) savanna forest (Mato Grosso) (C) mixed peat swamp forest (Central Kalimantan) (D) evergreen forest (Mato Grosso) having different fire regimes with prescribed burn (A, B) and wildfires (C, D).

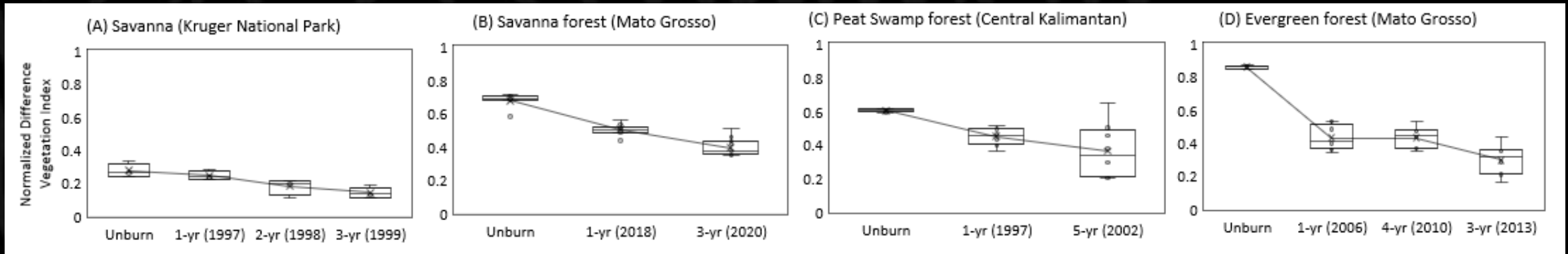


Figure 3. Landsat VI sensitivity to fire return time

# Results: Sensitivity of Landsat VI to species number

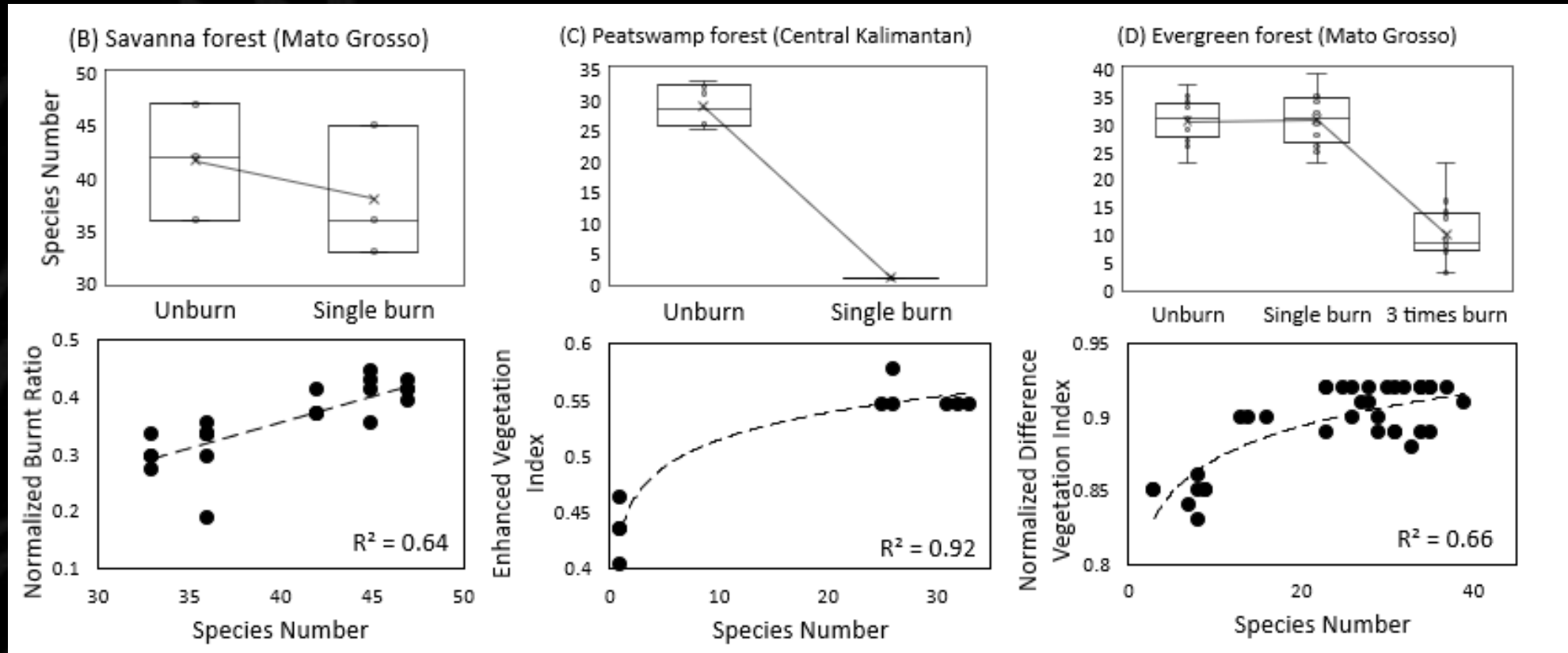


Figure 4. Species number in response to fire treatments (top panel) and Landsat VI sensitivity to species number ( $p < 0.001$ )

# Results: Sensitivity of Landsat VI and PALSAR to vegetation structure

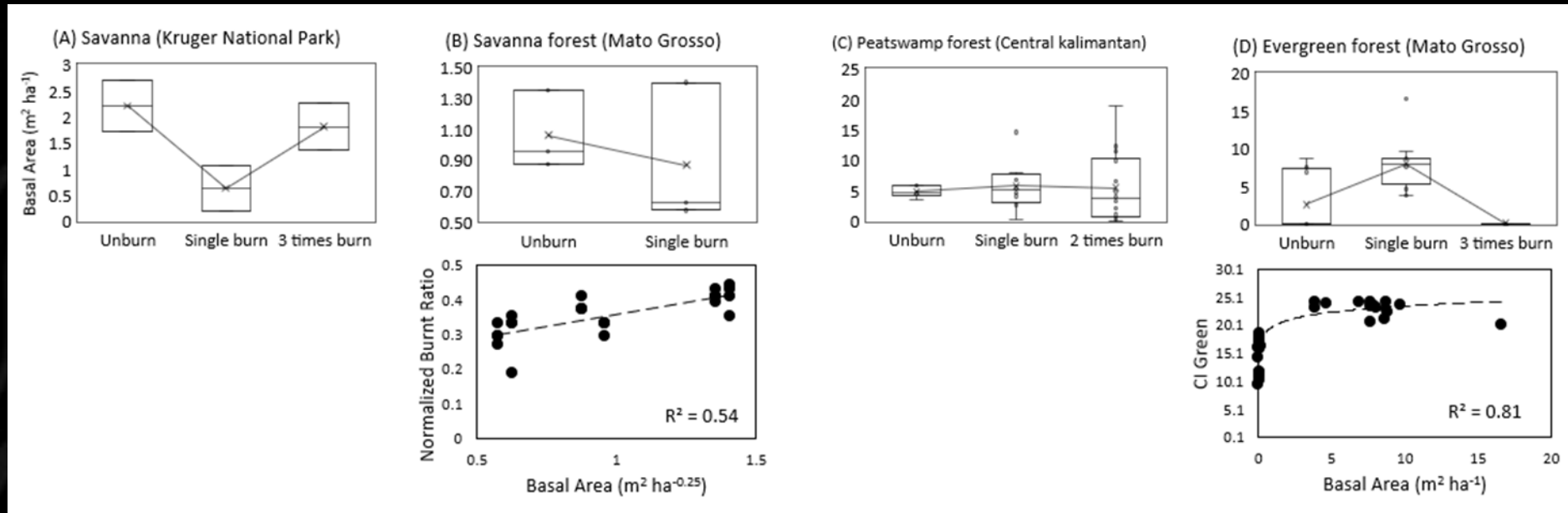


Figure 5. Basal area in response to fire treatments (top panel) and Landsat VI sensitivity to basal area ( $p < 0.001$ )

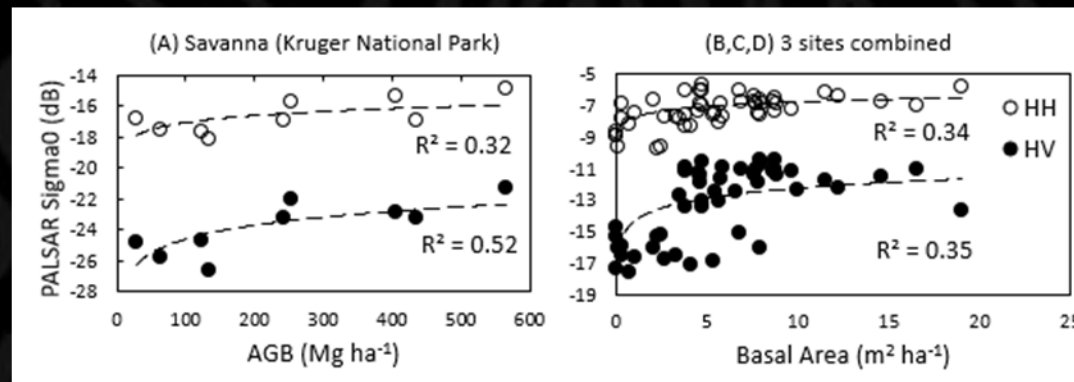


Figure 6. PALSAR<sub>HH,HV</sub> sensitivity to basal area and AGB ( $p < 0.001$ )

# Conclusions

- Landsat's **red, NIR and SWIR channels** provide better vegetation burn severity signals in response to **fire return time** and highest in **annual burnt regimes** in **four selected tropical biomes**.
- **NDVI, EVI, NDMI and NBR indices** showed better relationship against species number and basal area in response to fires than SR, SAVI, MSAVI, CI Green and Green NDVI.
- **PALSAR HH-polarisation** provides better relationship against species number and basal area in response to fires.
- Low sensitivity of Landsat VI and PALSAR backscatter signal due to vegetation structural differences and signal saturation.
- To test these indices and backscatter in fire-related vegetation properties of the North (peatland) and prescribed burnt plots of temperate vegetation (Cedar Creek).



LEVERHULME

Centre for **Wildfires,**  
**Environment and Society**

Imperial College  
London

KING'S  
*College*  
LONDON



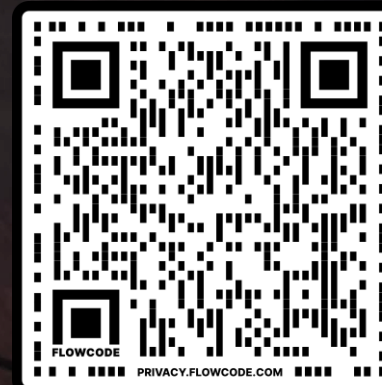
ROYAL  
HOLLOWAY  
UNIVERSITY  
OF LONDON



University of  
**Reading**

Thank you

r.ningthoujam@imperial.ac.uk



[www.centreforwildfires.org](http://www.centreforwildfires.org)



5/25/2022

@centrewildfires

LEVERHULME  
TRUST — 7 —