Geographic patterns of fire severity following an extreme *eucalyptus* forest fire in Southern Australia

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BACKGROUND

- Fire severity is an important aspect of fire regimes though it has received less attention than burnt area mapping globally and in Australia.
- We report fire severity patterns in the 2013 Forcett-Dunalley fire in SE Tasmania (Fig. 1(1)).
- A large (25,000 ha), globally significant fire characterised by extreme fire behaviour.

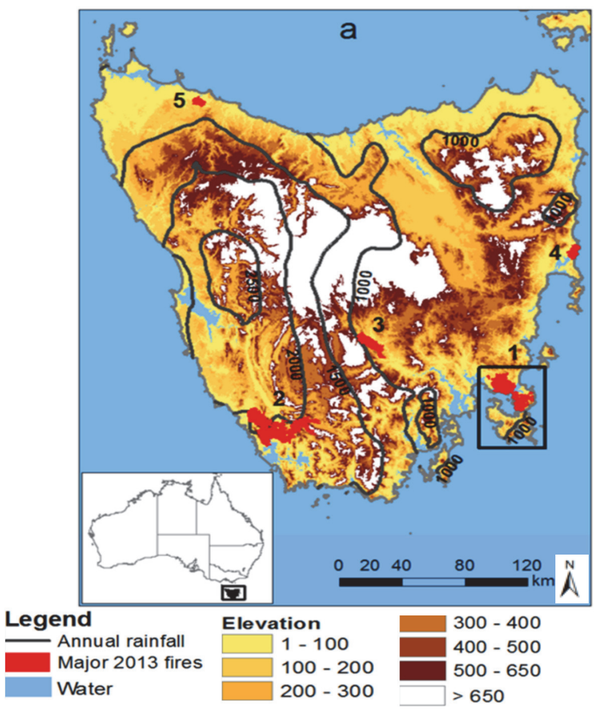

Fig 1: Major 2013 fires, 1: Forcett-Dunalley

METHODS

- Fireline intensity calculated from McArthur equations.
- Maximum Likelihood (ML) classification and validation of aerial photography.
- Variety of satellite fire severity measures calculated (Fig. 2).
- Congruence determine between satellite approaches & aerial photo classification.
- GLM analysis of influence of vegetation type, weather and terrain on probability of congruence.

RESEARCH QUESTIONS

1. How did fire severity and intensity vary across the landscape?
2. How did satellite-based measures of fire severity perform against the 'gold standard' aerial photo classification?
3. What were the constraints of landscape fire severity using dNBR classification?

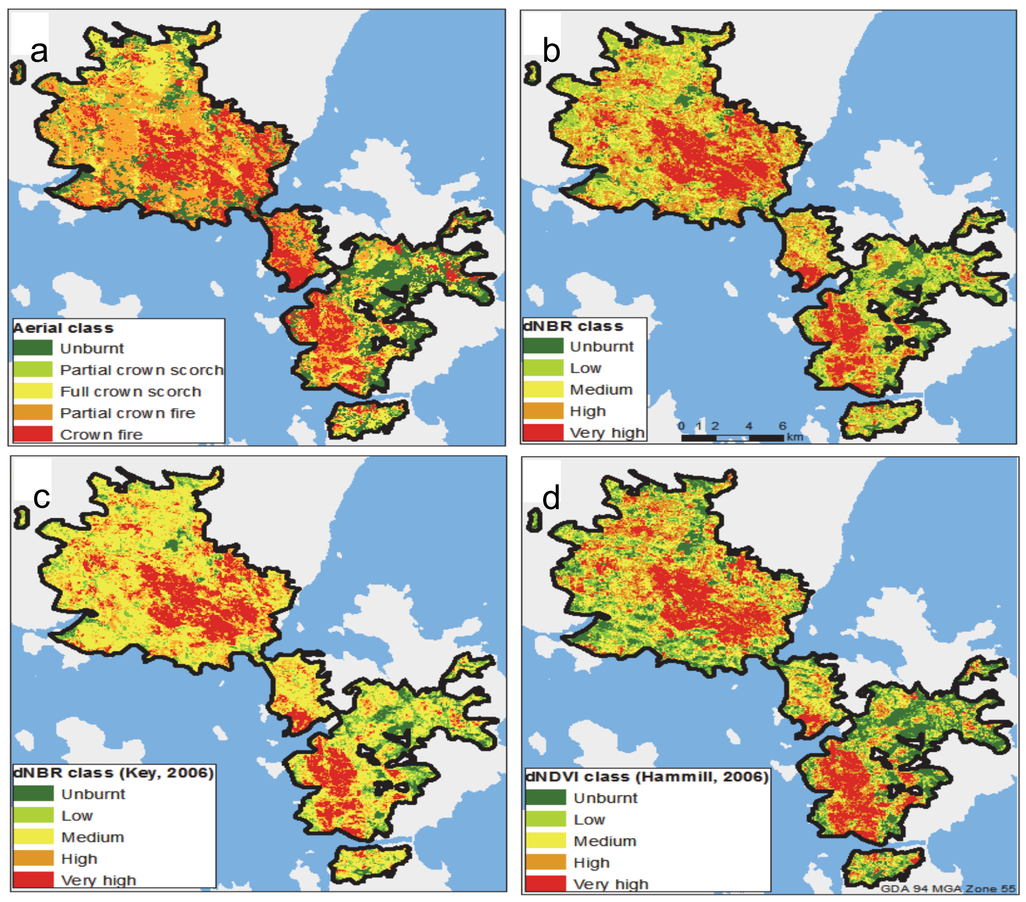

Fig 2: Fire severity maps, a) ML classification of aerial photo, b) dNBR using class ranges based on ground data , c) dNBR ranges used by Key & Benson (2006) for US forests, and d) dNDVI ranges used by Hammill & Bradstock (2006) in Australian forests.

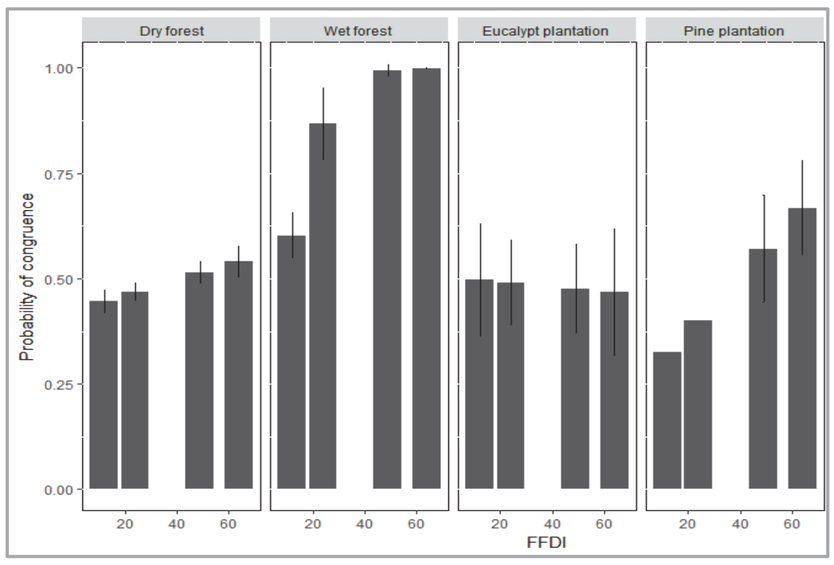

Fig 3: Congruence of aerial photography and best dNBR map from GLM based on vegetation/FFDI interactions.

RESULTS & DISCUSSION

- Extreme fire intensities in dry and wet *Eucalyptus* forests across all FFDI classes except for low FFDI, reaching 66,000 kW m^{-1}.
- Small areas of wet forest severely burnt because of geographic location during passage of fire.
- High intensity due to long unburnt dry forest
- Highest congruence of field-based dNBR with aerial ML map (45%) (Fig 2a,b).
- Congruence due to FFDI and vegetation interplay (Fig 3).
- High congruence in high-intensity fires due to distinct radiometric signal. Low congruence in low intensity fires due to dense canopy (in wet forests) and cured understory (in unburnt dry forest).

CONCLUSION

- High fuel loads and extreme FFDI drive extreme fires
- Recommend field validation of satellite fire severity measures

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