



FINDINGS

GLOBAL MODELS CAN PRODUCE RELIABLE SMOKE EMISSION ESTIMATES FROM *EUCALYPTUS* FOREST FIRES

Characterising smoke emissions from the 2013 *Eucalyptus* forest fire in Southern Australia

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Introduction

Episodic wildfires in Australian temperate forests have produced significant smoke emissions but have received less attention than the North American conifer forests and the Australian tropical savanna fires.

We use the Forcett-Dunalley fire as a case study to understand smoke emissions dynamics from temperate *Eucalyptus* ecosystems and compare a basic emissions model with a global model GFED.

Methods

- Map spatial patterns of carbon dioxide (CO₂) and particulate matter (PM_{2.5}) emission using basic model (FS) that incorporates fine scale fuel attributes.
- Investigate the reliability of GFED by comparing with the basic model.
- Conduct a sensitivity analysis to determine the effect of variability in fire severity on emissions estimation.

Results

- From the basic (FS) inventory, total CO₂ emission was 1.125 ± 0.232 Tg (or 56 t ha⁻¹) while PM_{2.5} emission was 0.022 ± 0.006 Tg (or 1.1 t ha⁻¹).
- Both inventories produced comparable estimates for CO₂ (difference of 27%), but PM_{2.5} estimates were a factor of three (or difference of 70%) lower for GFED.

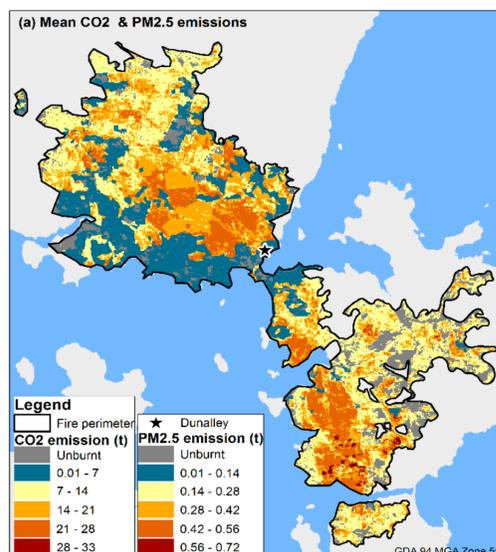


Fig. 1: Spatial distribution of the two emissions types (in tonnes) from the fire using the basic model.

- The spatial distribution based on GFED was poor compared to basic model (Figs. 1, 2).
- Fire severity contributed to an emissions variability of 34-38%.

Discussion

We highlight GFED's reliability within the limits of emissions uncertainties in *Eucalyptus* ecosystems because of comparable:

- Burnt area estimates with FS inventory.
- Total CO₂ emissions with FS inventory.
- Temporal evolution of both CO₂ and PM_{2.5} emissions (Fig. 3).

To further improve emissions estimation, we recommend the following:

- More detailed field assessments of coarse wood fuels (CWD) and fuel consumption.
- An upward revision of emissions factors for PM_{2.5} within GFED.

Figures

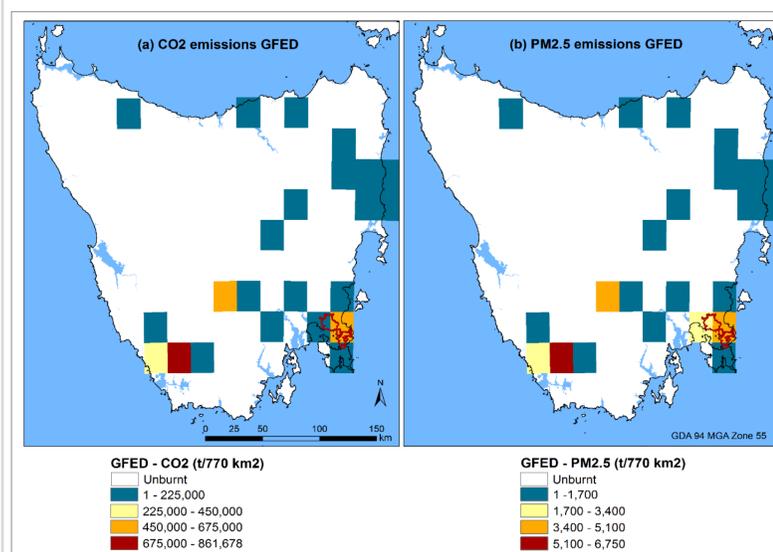


Fig. 2: Spatial distribution of the two emission types (in tonnes) from several fires in mainland Tasmania, including the Forcett-Dunalley fire.

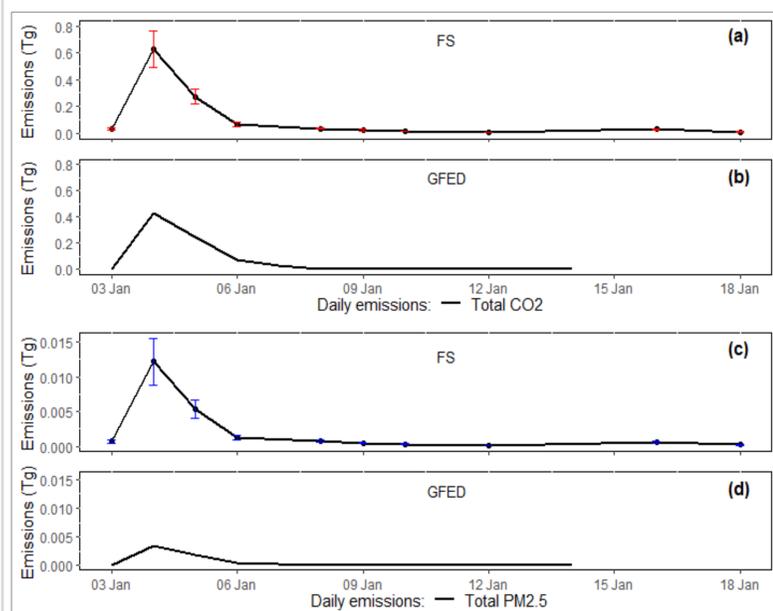


Fig. 3: Daily variability of the two emission types from the Forcett-Dunalley fire between the fine scale (FS) and GFED inventories.

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