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# VERTICAL FIRE TRANSITIONS AND PROPAGATION MECHANISMS IN EUCALYPT FORESTS

Miguel Cruz[1]

[1] CSIRO Ecosystem Sciences and CSIRO Climate Adaptation Flagship, Canberra, Australia

**The Problem:**

- Vertical fire transitions between fuel layers are recognized as a decisive process in fire growth and development in eucalypt forests.
- As the fire transitions between fuel layers, its dynamics will change considerably with possible significant implications for fire management, namely fire fighting safety, suppression effectiveness and fire effects.

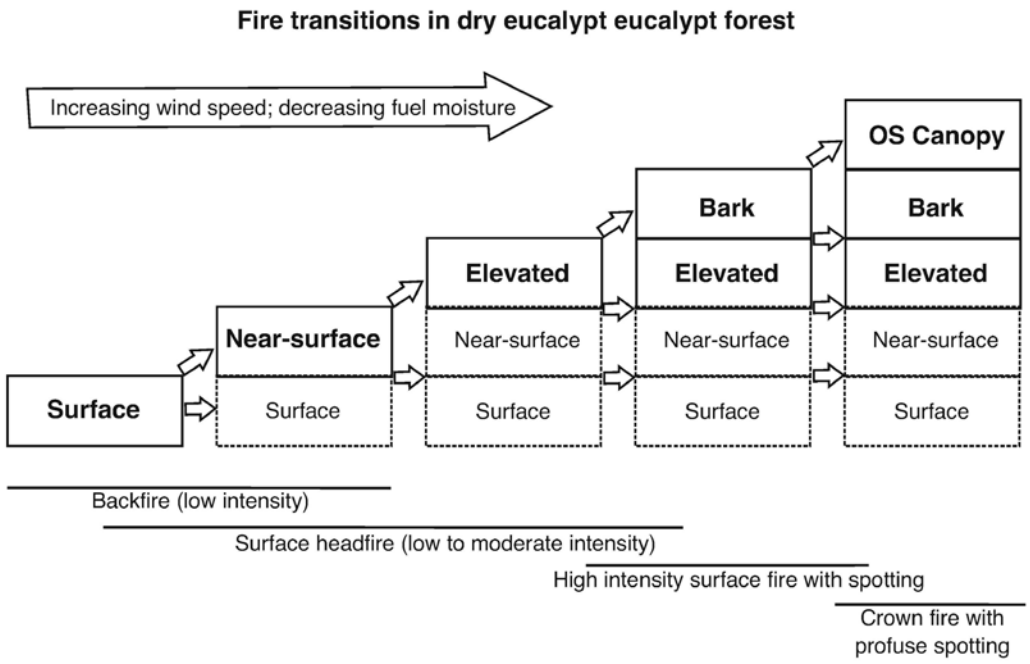
**Objectives:**

The main objective of the current project is to increase our understanding of the factors and mechanisms involved in vertical fire propagation between:
(1) surface / near-surface and elevated fuels;
(2) surface / near-surface / elevated and bark fuels; and
(3) understorey and overstorey fuels.

**Modelling framework:**

The framework is based on a simplified energy balance of unburned fuels and takes into account as main processes **(1)** the energy released through combustion processes, **(2)** flame structure, **(3)** the structure of the buoyant plume, and **(4)** radiative and convective (advection and flame contact) energy transfer.

**Key assumption #1:** The combustion wave propagates by igniting thermally thin fuels typically located at the top of the fuel layer (Cheney 1990);
**Key assumption #2:** Fuels with higher thermal inertia contribute to the flame development, and to a lesser extent to fire spread.




**Project outcomes:**

A model that provides a better understanding of fire dynamics in eucalypt forests, namely identifying the variables and processes controlling vertical fire transitions and ensuing fire behaviour.

Model development is being carried out with the intention that its design will allow it to be used as a fire management decision support tool.

**References:**
Cheney, N.P (1990). Quantifying bushfires. *Mathematical and Computer Modelling,* 13, 9-15.