bushfire CRC

Relating vertical wind profiles to vegetation structure for fire behaviour prediction

Kangmin Moon, Dr. Thomas Duff, Dr. Kevin Tolhurst

[1]Department of Forest Ecosystem Science, University of Melbourne, Victoria.

The Issue:

Forecast winds are a key input for the prediction of fire behaviour for operational purposes. Wind forecasts predict wind speed and direction for predetermined heights above the ground in open areas. However, wind varies greatly with height and is greatly affected by vegetation structure. As a consequence, in the wind which drives the actual spread of a fire may be substantially different from the forecast winds.

There is the potential for improving predictions of fire spread in forested areas by recognising how wind varies through the profile, and quantifying the effect of vegetation structure.

Research Questions:

• Can wind speed at different heights above the ground be predicted from wind speed measured at 10m in the open and vegetation structure?

• Can the aspects of vegetation structure that influence wind speed be characterised at a landscape level?

• Is there a consistent relationship between the vertical and horizontal structure of vegetation and wind?

• Can fire spread be predicted more accurately with estimates of wind speed at mid-flame height rather than forecast height?

Variation of wind speed with height (left) (Holland W.P. (2000)), and variation of wind speed in response to diverse vegetation structure (right) (Cionco, R.M. (1972))
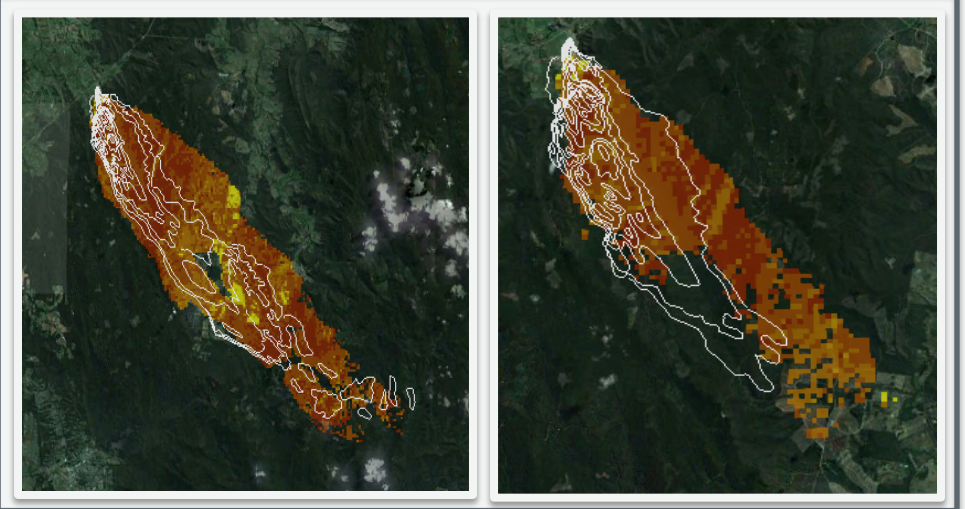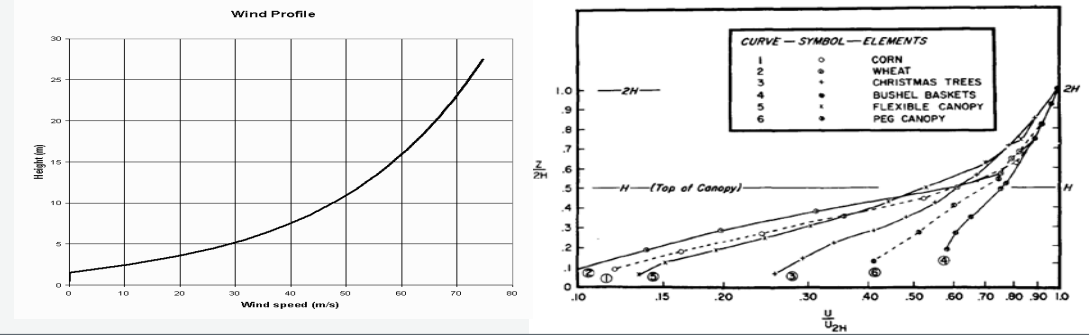
Research approach:

• Wind profiles will be measured in a range of vegetation types and related to wind speeds in the open

(e.g. heath, mallee, mixed species forest, wet forest)

• Quantification methods will be developed to characterise the elements of vegetation structure that affect the passage of wind. There will be a focus on techniques which allow the measurement of structure over large areas, such as satellite imagery or airbourne LiDAR

• The effect that vegetation structure has on the wind profile will be evaluated empirically and used to develop predictive models.

• A dynamic model for calculating mid-flame height wind speed will be incorporated into the fire model Phoenix Rapidfire and results will be evaluated to determine whether predicted spread patterns are more accurate than those using a single wind reduction factor from forecast 10m winds.

PhD student Since March, 2012
k.moon@student.unimelb.edu.au

CRC AUSTRALIA

THE UNIVERSITY OF MELBOURNE