

# **An improved canopy wind model for predicting wind adjustment factors and wildland fire behavior**

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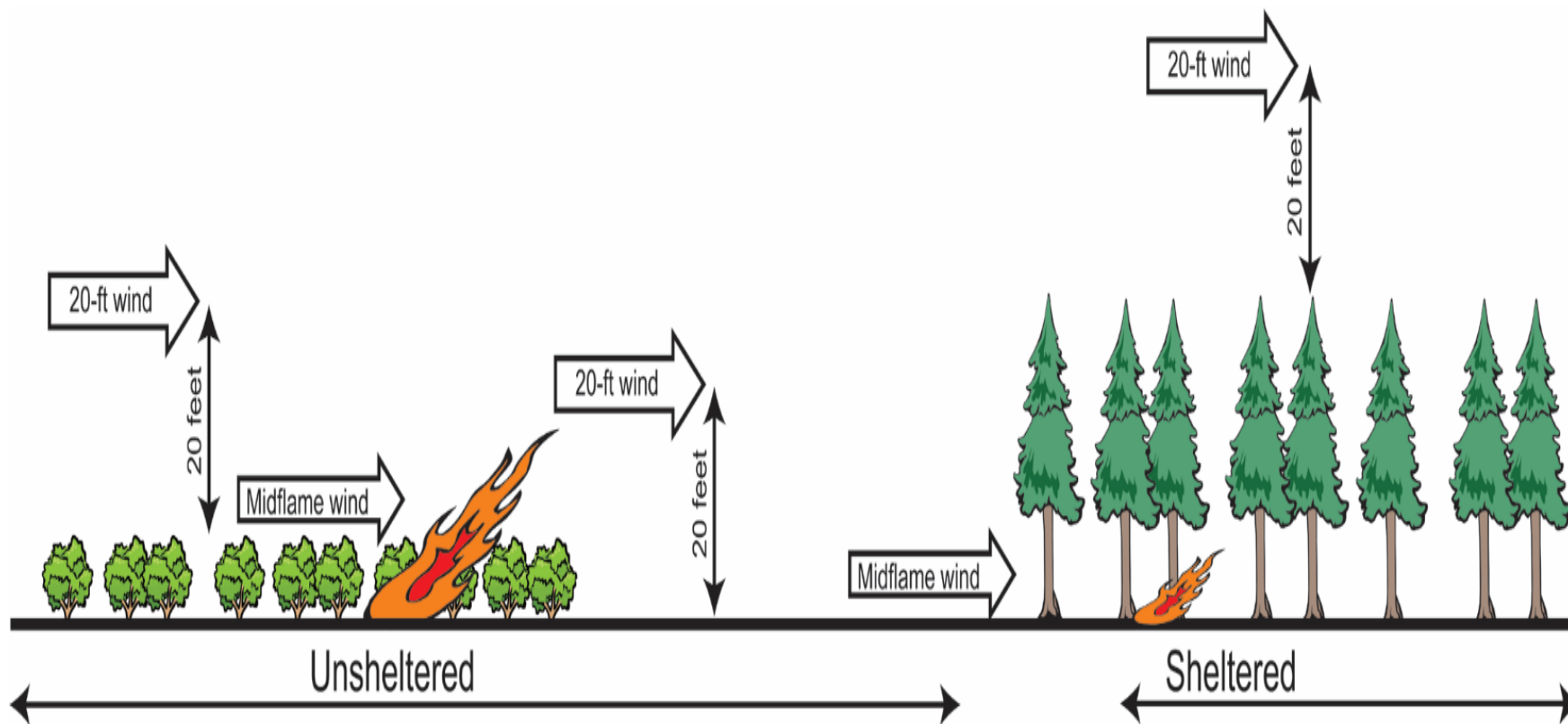
US Forest Service

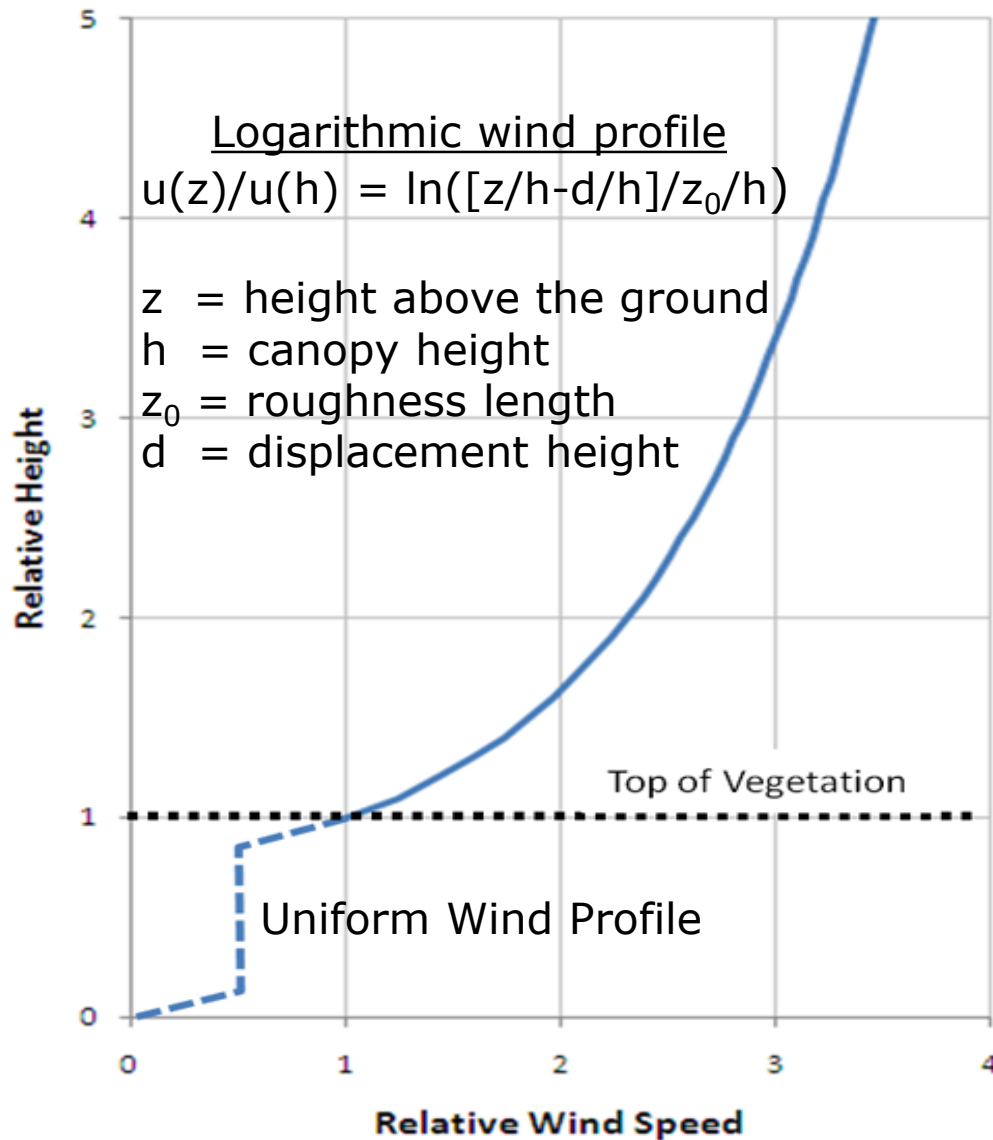
Rocky Mountain Research Station  
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Current models used to predict the spread rate of prescribed fire require input wind speed at a height of 20 feet above the top of a canopy to make a rapid estimate of the output wind speed beneath the canopy or near the ground.

- $\text{output wind speed} / \text{input wind speed} = \text{WAF}$
- spread rate = Metric of Fire Behavior
- rapid = numerically efficient and robust to uncertainties in input parameters



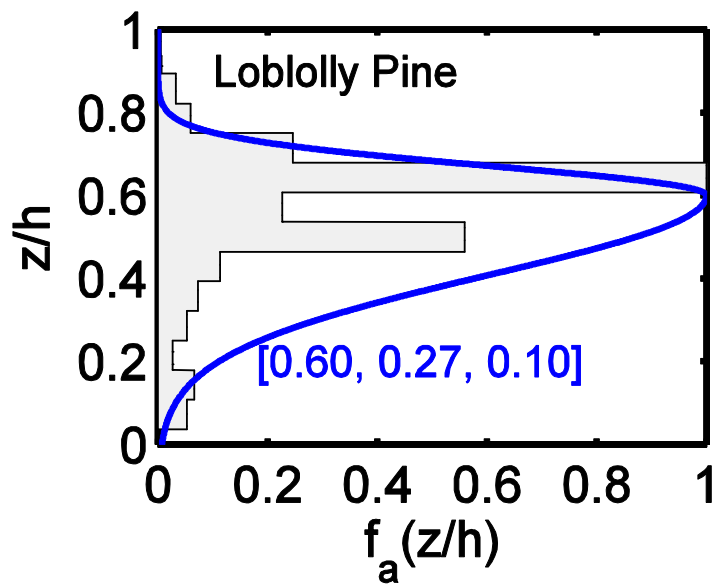
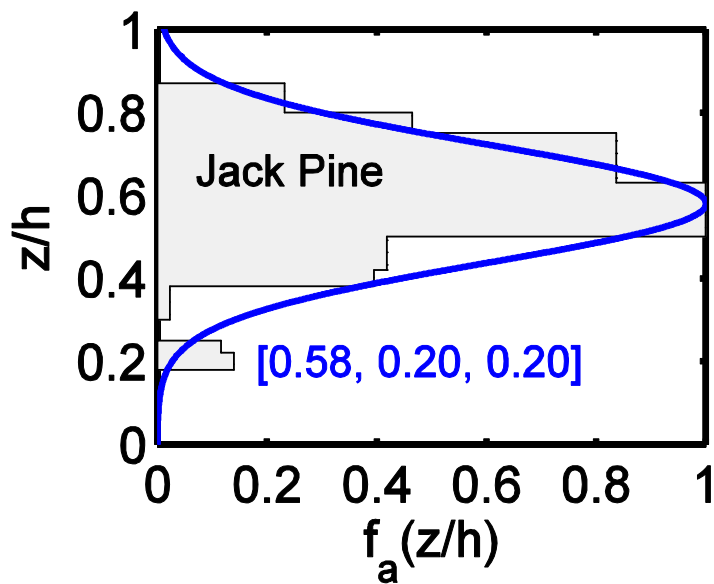
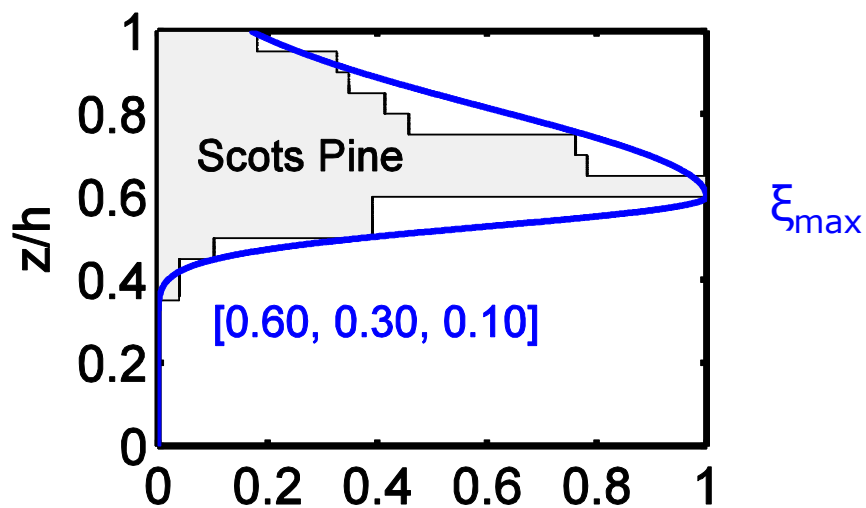
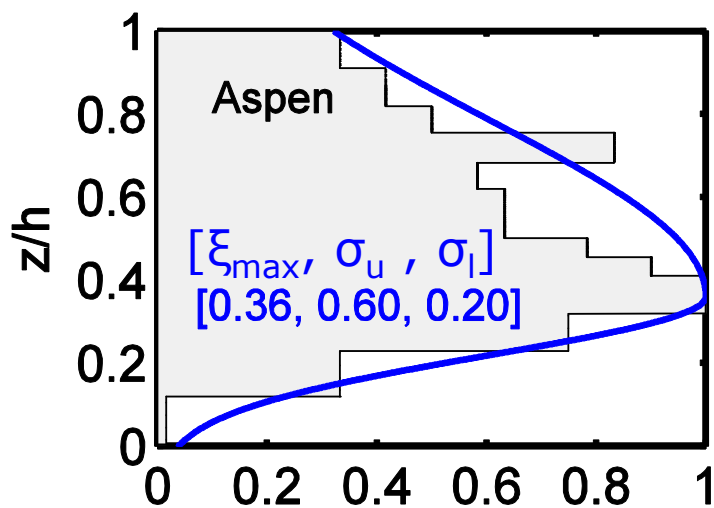


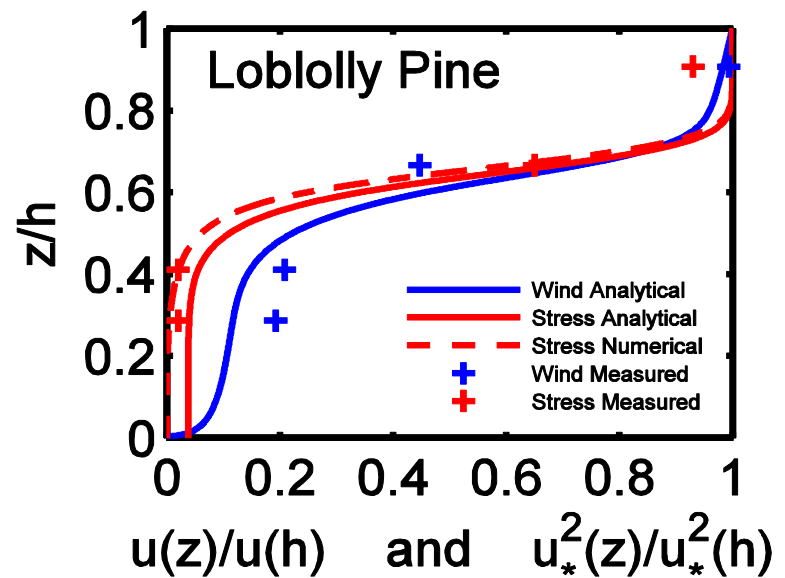
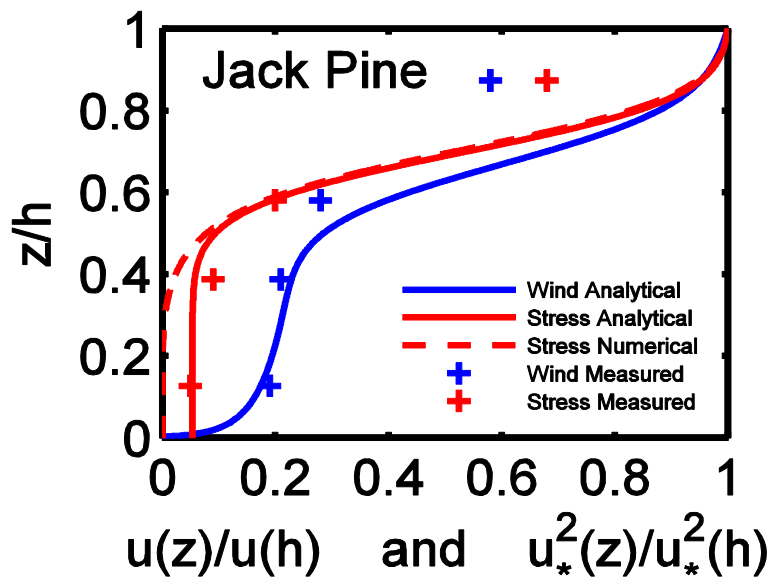
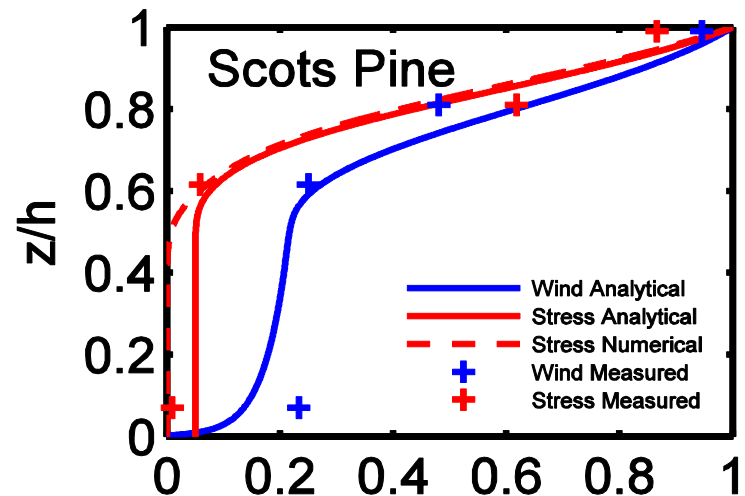
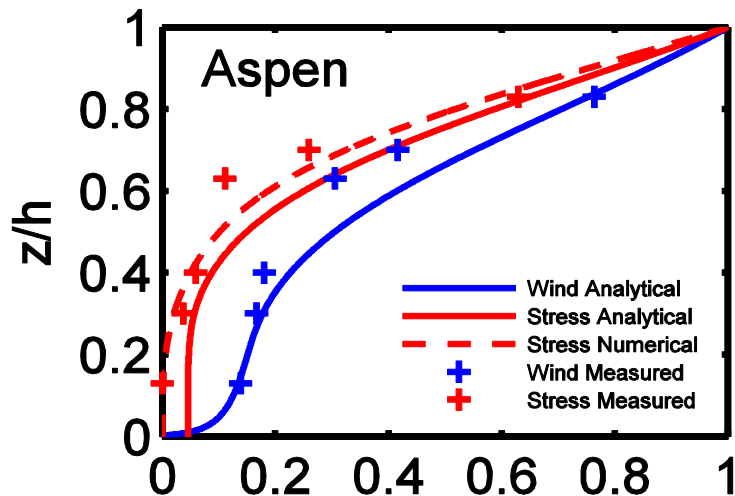
## Current (Albini) Wind Model

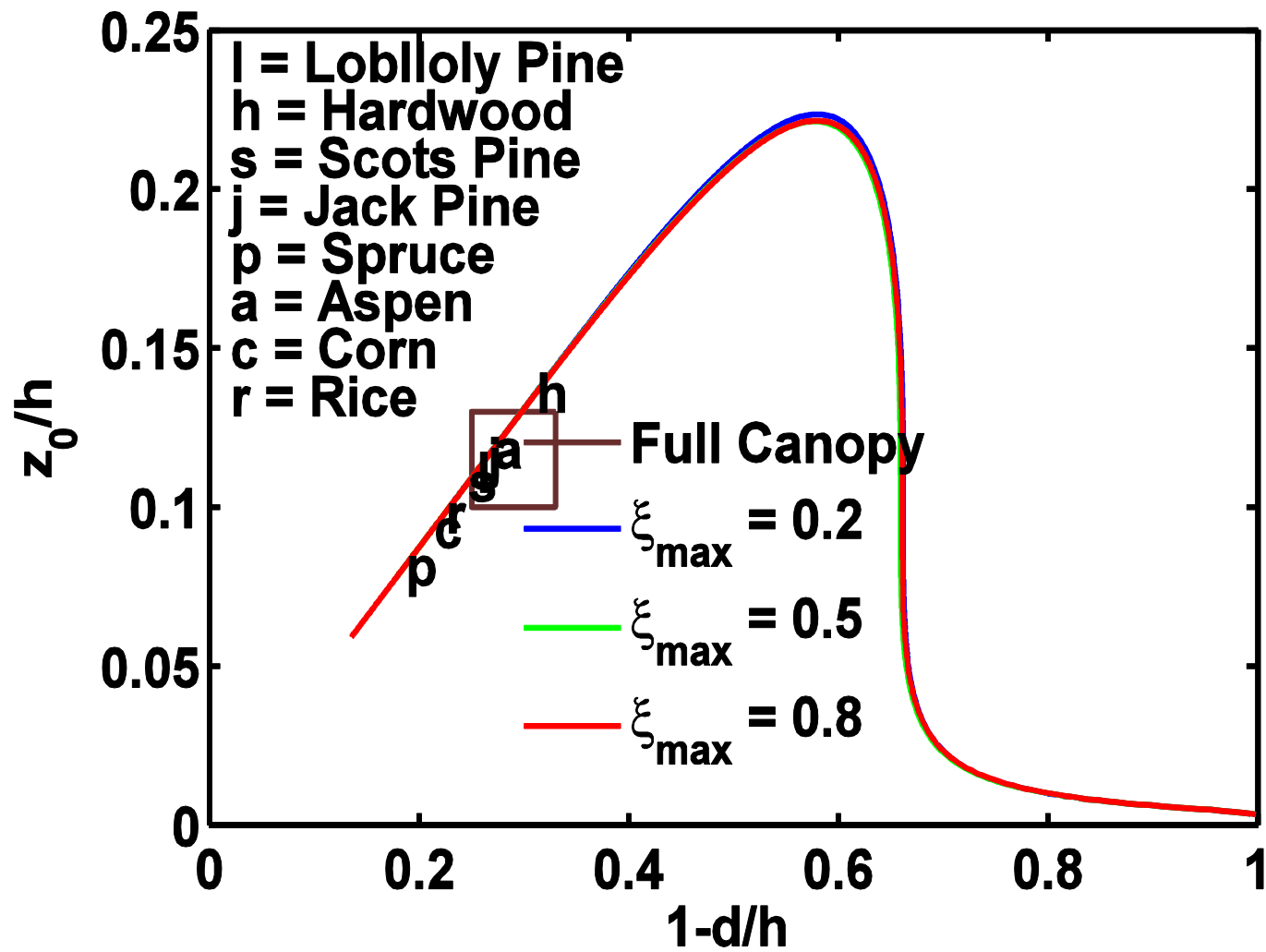
- (a) Logarithmic profile above
- (b)  $d/h$ ,  $z_0/h$  = full canopy
- (c) No foliage structure
- (d) Uniform profile within

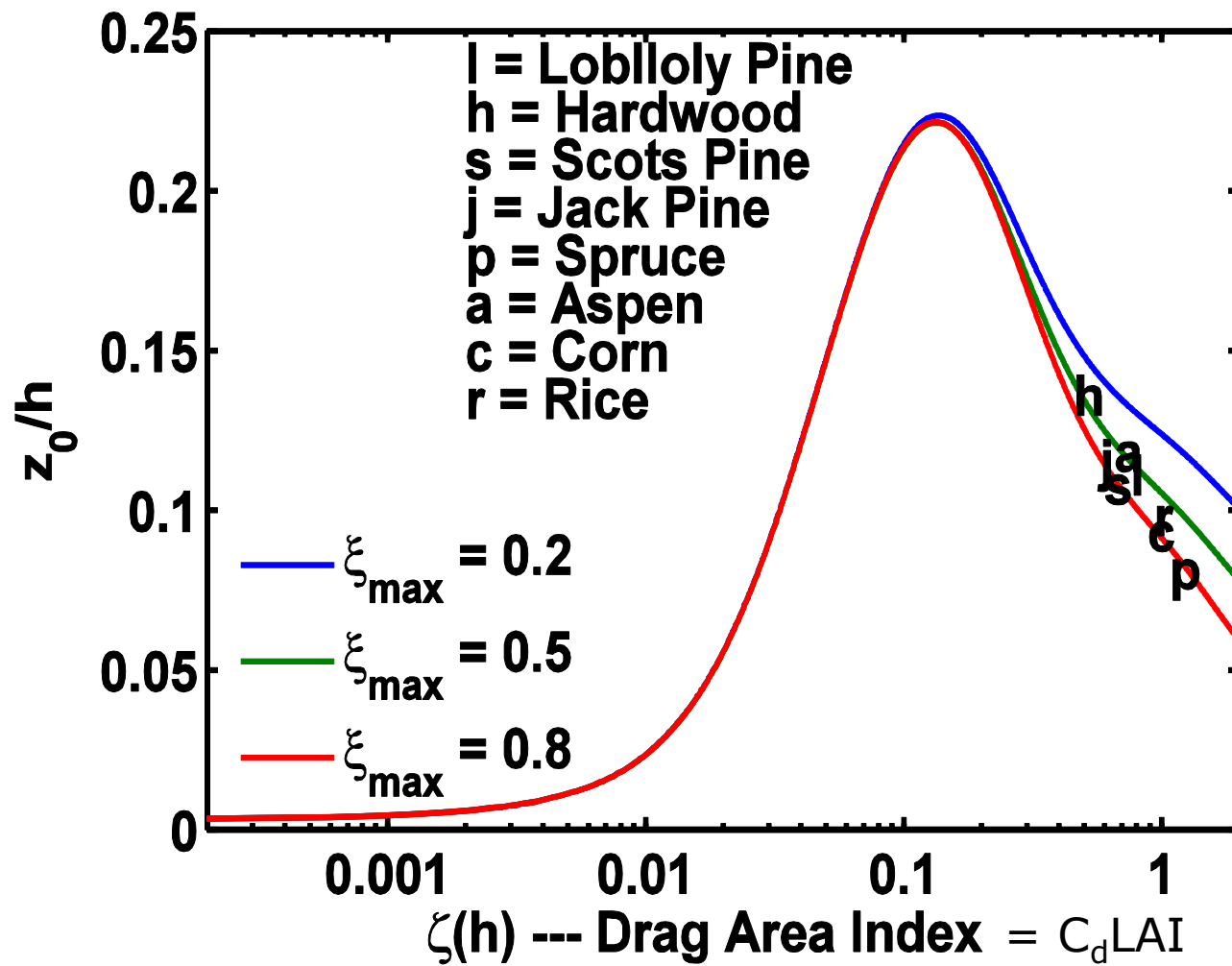
## New (Massman) Model

- (a) Logarithmic profile above
- (b) Function of LAI,  $a(z)$ ,  $C_d$
- (c) Variable structure
- (d) Function of LAI,  $a(z)$ ,  $C_d$

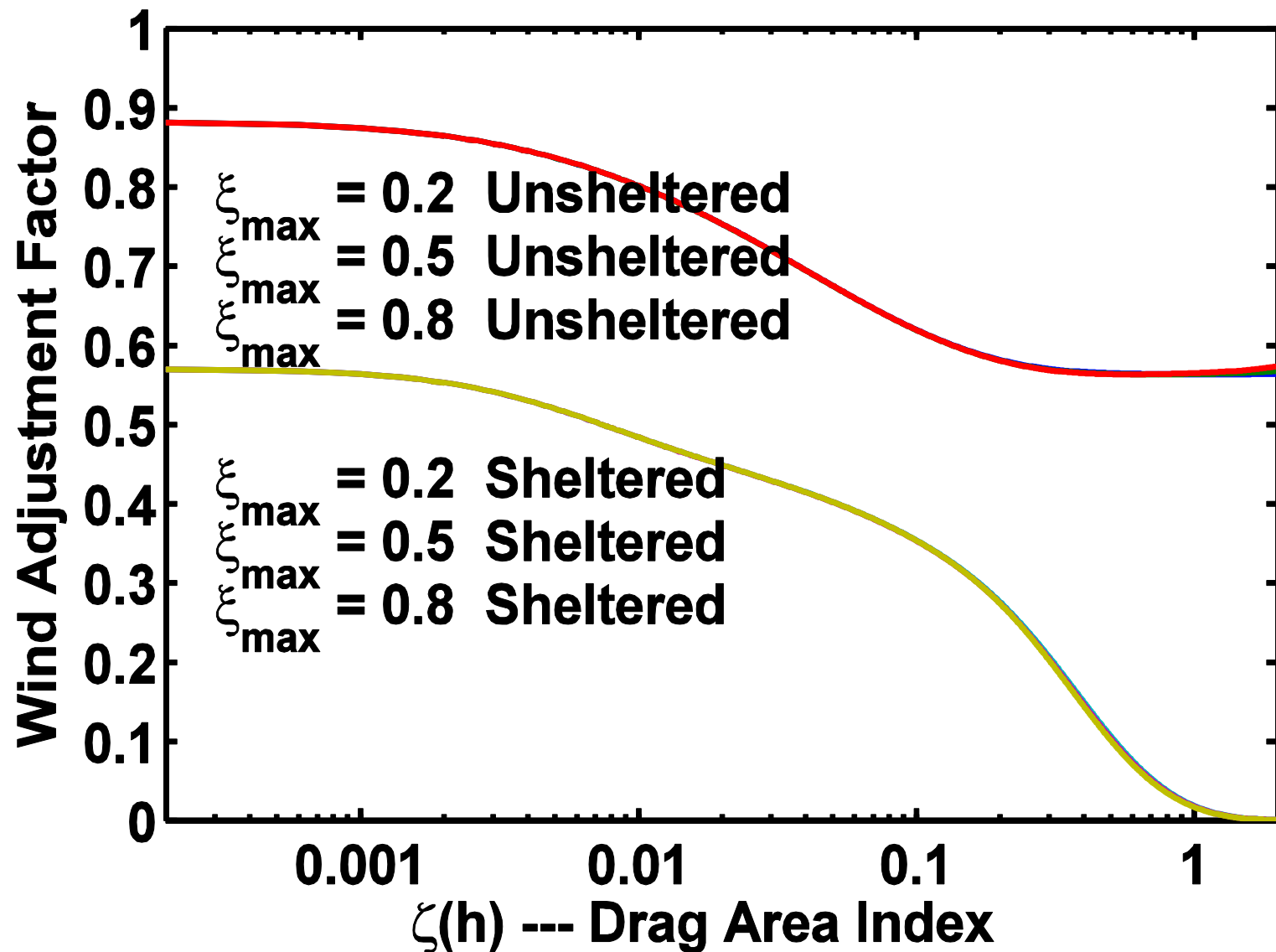




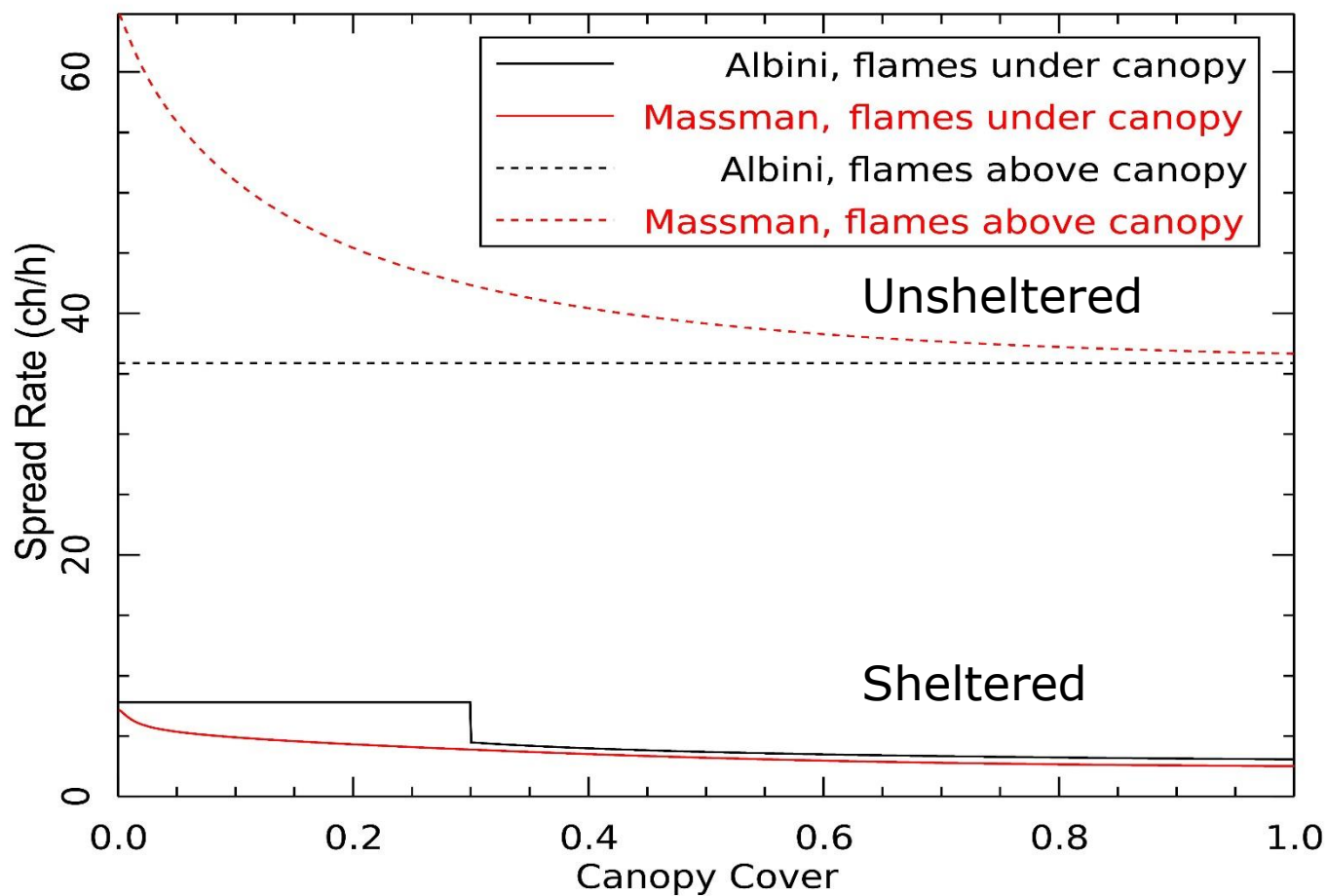








# Albini vs. Massman Spread Rate



# **Conclusions**

- (1) New model is more physically realistic than the older model and its predictions of WAF and spread rate are reasonable.
- (1) Model WAF is not particularly sensitive to foliage distribution, but it is sensitive to LAI and  $C_d$  and to the ground surface roughness length. This latter sensitivity is most significant for unsheltered fires in ecosystems of sparse canopy cover.
- (3) The “universal” wind profile developed for this study does work well for full or complete canopies and it needs further verification in sparse or thin canopies where  $LAI < 1$ .

**Thank you !**

Questions?