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Interactive
comment

# *Interactive comment on* "Varying relationships between fire intensity and fire size at global scale" *by* Pierre Laurent et al.

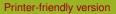**Pierre Laurent et al.**

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Please find our point-by-point answers to specific comments in the following.

1) L35. Why is Van Wagner cited in relation to Rothermel's model, with which he had no relation whatsoever? Van Wagner was Canadian, and so involved with the Canadian fire behaviour prediction system, not the U.S.

Answer: This was a mistake. We removed the reference to Van Wagner.

2) L36-37. "whose rate of spread scales with a power function of the wind velocity, landscape slope and fire intensity." The authors are referring to reaction intensity, not fire intensity (aka fireline intensity, which is the product of rate of spread, fuel consumption and heat of combustion and can be correlated to a certain extent with FRP).

Answer: Yes. This was also a remark from all reviewers. We did not define clearly what we meant by fire intensity. We now explicitly say in the text that this is fire reaction intensity of the flaming front.

3) L41-42. "On the other hand, the velocity of fire propagation determines the amount of fuel entering the combustion zone, and therefore feeds back on the intensity of the fire event." Not sure what this means. Rate of spread is an intrinsic component of fire intensity but not because it affects fuel consumption.

Answer: We meant that a fire need 'new' fuel to continue to burn. There is therefore a feedback between fire intensity and rate of spread: an intense fire is more likely to propagate faster, therefore to have more fresh fuel entering the combustion zone, therefore to continue burning, etc ...

4) L42-43. "fire intensity also significantly impacts the fuel combustion completeness". It's the other way around, fuel consumption is an element in the calculation of fire intensity.

Answer: You are right. This was a mistake, and we removed the sentence from the text.

5) L57. This is general, i.e. not specific of Rothermel 0 s model. For given fuel conditions/ fuel types faster fires are more intense, and faster fires will become large.

Answer: Yes this is true. We have changed the text.

6) L95. Has fire intensity been defined?

Answer: See answer to comment 2.

7) L170. The hypothesis does not stem from Rothermel's model, it just happens that fire intensity by definition (Byram 1959) is the product of rate of spread, fuel consumption and heat of combustion, as mentioned before.

Answer: Yes, this is true that this effect rather depends from Byram definition of fire

intensity, not from Rothermel's model. We will modify the text (and also mention that we used the Byram definition of fire intensity).

8) L221. "They can therefore propagate further than ground fire and fire resistant species found in savannas and woodlands". This sentence is confusing. Fire in savanna is driven by grass, not by trees (which are resistant only in the sense that they are fire adapted).

Answer: We realized that this sentence was not clear. We rephrased it in the manuscript: 'They can therefore propagate further than ground fire and fire resistant species found in savannas and woodlands in semi-arid tropical regions' => 'they can therefore propagate further than herbaceous fires hardly turning into crown fires in savannas and woodlands in semi arid tropical regions.'

9) I think the interpretation of the findings, by being concentrated on the effect of fuel connectivity, is restrictive. The authors could improve the discussion by considering that the most powerful driver of fire spread/size is wind speed (see the switches of Bradstock 2010). Thus, fuels can be totally available to burn due to drought, and produce intense fires that are not that large because they do not coincide with strong winds and low relative atmospheric humidities. Thus, the annual cycle of fire extent and intensity is also a matter of timing of coincidence between drought and atmospheric conditions.

Answer: We agree, but this would require a dedicated analysis using wind power/wind orientation datasets. We will mention this in the discussion.

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