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*CORRIGENDUM*

*Corrigendum* to:

**Assessment of crown fire initiation and spread models in Mediterranean conifer forests by using data from field and laboratory experiments**

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The authors wish to alert readers of the following changes designed to clarify the text.

1.- Page 1, Abstract

*Main results*: The commonly used crown fire models underestimated the crown fire spread rate observed in the full-scale experiment, but the proposed new integrated approach yielded better fits. Without wind-forced convection, tree crowns did not ignite until flames from an intense surface fire contacted tree foliage. Bench-scale tests based on radiation heat flux therefore offer a limited insight to full-scale phenomena.

should read as follows

*Main results*: The Rothermel's (1991) and Finney's (1998) crown fire models underestimated and Cruz *et al.* (2005) overestimated ROS, relative to observed values, in the full-scale experiment whereas the proposed new integrated approach yielded better fit for moderate wind speed. Buoyancy with strong turbulent convection seemed to play a key role in crown fire initiation even in absence of wind. The three methodological approaches provided similar flame residence time in canopy fuels.

*Research highlights*: Existing crown fire behaviour models may underestimate the rate of spread of crown fires in many Mediterranean ecosystems.

should read as follows

*Research highlights*: Different existing crown fire behaviour models show no conclusive results of predicted ROS, likely reflecting their strong dependency on the stands characteristics and environmental conditions that served as a base for their development.

2.- Page 6, Table 4 should read as follows

**Table 4.** Validation of crown fire rate of spread models for the crown fire events (A, B, C) in the full-scale crown fire experiment (Las Traviesas).

| **Event** | **Slope** | **EFFM** | **U** | **CBD** | **ROS**[1] | **ROS (m/min)**[2] | | |
|---|---|---|---|---|---|---|---|---|
| | **(%)** | **(%)** | **(km/h)** | **(kg/m$^3$)** | **(m/min)** | **Rothermel-Finney** | **Cruz *et al*.** | **UCO** |
| A | 30 | 11 | 5.9 | 0.123 | 8 | 7.5 | 16.9 | 14.3 |
| B | 30 | 11 | 5.9 | 0.061 | 10 | 7.5 | 14.9 | 13.8 |
| C | 30 | 11 | 14.04 | 0.108 | 21 | 13.5 | 36.1 | 19.4 |

EFFM=estimated fine fuel moisture content; U=wind speed (at 10 m height in the open); CBD=canopy bulk density; ROS=fire rate of spread; [1]observed; [2]estimated with Rothermel and Finney, Cruz *et al*. and University of Córdoba (UCO) models. The respective fire run length and time for each event were: A (35 m/3.4 min), B (67 m/6.7 min) and C (40 m/1.9 min).

Note: The weather conditions in the fire experiment (05/18/2012 at 11:30) were: air temperature 20.5º C, relative humidity 54.5%. With these values, and those of slope, day-time, fuel exposition class and month, the EFFM (%), as per Rothermel's (1983) tables, was 11%. The values of the canopy bulk density were calculated considering only foliage. The values of ROS estimated from the Cruz *et al.* (2005) model have been calculated with a slope correction factor following McArthur (1967) and fit by Noble *et al.* (1980). The steepness of the slope considered is 30%, although the terrain of the fire experiment site is terraced, with flat portions alternating with others with slope, resulting in about 15% of equivalent average slope steepness.

3.- Page 8, lines 8-12 of the left column,

"Wind speed was moderate (5.9 km/h), but a mass fire (Finney & McAllister, 2016) was observed, generating an increase in local wind speed (14 km/h) detected by the meteorological station closest to the crown fire event C (Table 4)."

should read as follows

"Wind speed was low (5.9 km/h) for events A and B, whereas it was moderate (14.04 km/h) for event C. Those values (Table 4) were recorded by one anemometer (10 m height) located at 674 m on a fuelbreak 100 m wide, built some days before the experimental fire. That anemometer was 70 m far from the border of the experimental plot."

4.- Page 8, lines 21-28 of the left column,

“The most commonly used crown fire models (Rothermel, 1991; Finney, 1998; Cruz *et al*., 2005) underestimated the ROS relative to observed values (particularly the Cruz *et al*. approach) (Table 4). Although the best-fit for event A was yielded by the Rothermel and Finney model, the best-fit for events B and C was achieved with the proposed new integrated model (Table 4).”

should read as follows

“The best-fit for ROS in event A was yielded by the Rothermel’s and Finney’s model but this model slightly underestimated ROS for event B and particularly for event C. The model from Cruz *et al.* (2005) overestimated ROS for the three fire runs and more markedly in event C (Table 4). The predictions of UCO overestimated for events A and B whereas gave rise to the best ROS prediction for event C.”

5.- Page 9, lines 3-11 of the right,

"The new integrated equation (Eq. [1]) yielded better results for the mean absolute error and standard deviation (14.62±4.06) than obtained by the approaches used by Rothermel (1991) and Finney (1998) (23.11±16) and by Cruz *et al.* (2005) (58.59±2.04) and also provided a reasonable fit for observed values of ROS in the three events analysed during the full-scale “LasTraviesas” experiment (Table 4)."

should read as follows

"The new integrated equation (Eq. [1]) yielded better results for moderate wind speed (event C). The mean absolute error and standard deviation of this integrated equation were 31.51±4.76, being 26.92±5.51 for the Rothermel (1991) and Finney (1998) approach and 74.23±16.65 for Cruz *et al*. (2005)."

6.- Page 9, lines 11-15 of the right column,

"Although Molina (2015) obtained overestimates for wind speeds, the most commonly used models (Rothermel 1991, Finney 1998, Cruz *et al*., 2005) underestimated the ROS."

should read as follows

"Although Molina (2015) observed overestimates for high wind speeds of the most commonly used models, in Las Traviesas experiment Rothermel (1991) and Finney (1998) model underestimated the ROS, as well as Cruz *et al.* (2005) model when used without slope correction factor (McArthur (1967), fit by Noble *et al*. (1980))”.

7.- Page 11, first phrase of Conclusions,

“The results of the first crown fire full-scale experiment in a Mediterranean conifer stand in Spain indicate that the current crown fire behaviour models may underestimate the rate of spread of crown fires in many Mediterranean ecosystems”

should read as follows

“Although the available information is still very scarce to draw conclusions, the data from the full scale experiment suggest that Rothermel’s and Finney’s models may underestimate the rate of spread of crown fires in Mediterranean conifer ecosystems similar to those of this study. This seems more probable for moderate wind speed and for stands with low CBD along with low wind speed. Conversely, the model of Cruz *et al*. (2005), taking into account the slope factor from McArthur (1967) and fit by Noble *et al.* (1980), resulted in ROS overestimations about 50% for low CBD and low wind velocity and roughly 100% for usual CBD values and moderate wind velocity. This latter trend may markedly increase for typical severe meteorological conditions during fire season in the Mediterranean area."

8.- Pages 13-14, References

McArthur AG, 1967. Fire behaviour in eucalypt forests. Commonw. Aust. Dep. Natl. Dev., Forest and Timber Bureau, Camberra, Leaflet nº107, 36 p.

Noble IR, Bary GAV, Gill AM, 1980. McArthur’s fire-danger meters expressed as equations. Austral Ecology 5:201-203. https://doi.org/10.1111/j.1442-9993.1980.tb01243.x

Rothermel RC, 1983. How to predict the spread and intensity of forest and range fires. USDA Forest Service, General Technical Report INT-143, Ogden, UT, USA, 161 p.

should be added.

Finney MA, McAllister SS, 2016. Fire interactions and mass fires. In: Synthesis of knowledge of extreme fire behaviour, Vol 2; Werth PA *et al*. (eds), USDA Forest Service, General Technical Report PNW-GTR-891, Portland, OR, USA, pp: 83-104.

should be deleted.

The changed text does not substantially affect the findings of the published paper.

We acknowledge Martin E. Alexander and Miguel Cruz for bringing their comments about Cruz *et al.* 2005 model application, regarding the fine canopy fuels (up to 6 mm) and slope correction factor to our attention.