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Interactive comment on "Using cellular automata to simulate wildfire propagation and to assist in fire prevention and fighting" *by* Joana G. Freire and Carlos C. DaCamara

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The authors thank Referee #3 for his very constructive comments.

1. In the introduction, the authors wrote that deterministic models attempt to a physic based description of process. As a matter of fact, several deterministic empirical models exist and are widely used operationally (e.g. FARSITE). Please change the formulation of this section.

Answer: We agree with the Reviewer and the text about fire propagation models was substantially revised (see answers to Comments #6 and #7 by Referee #2).

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2. In section 3.2 the description of the modified neighborhood rule is given. This should be the most detailed part of the method section, since it represents the major innovation over the baseline model. However, I've found the description to be lacking important details. The authors wrote that the fire propagation neighborhood is extended in the wind direction, but it's unclear how they consider wind directions that are not aligned with the possible propagation directions on the 2d lattice of the grid (e.g. directions that are not multiple of 45). Are you considering all the cells in the N2 neighborhood or only the boundaries of the region? How is the neighborhood shaped? Does the shape depend on wind speed? Please extend the description in order to include more details.

Answer: We agree with the reviewer and the text was expanded as follows: In order to better mirror the role played by the wind in fire propagation, a modification was introduced in the model by means of a new rule that allows propagation to non-adjacent cells with the aim of incorporating the effects due to fire spotting. In contrast with the baseline rule N1 that at each time step fire can only spread to its nearest and next-nearest neighbors, according to the new rule N2, for each burning cell at a given time step, fire propagation is modeled according to the two following steps: apply the baseline wind rule and determine the direction(s) of fire spread (if any) for each cell in the next-nearest neighborhood. If: i) according to the previous step, the fire propagates to a new cell, ii) the wind speed at the considered burning cell is above the threshold of 8 m/s and iii) the angle between the wind direction and the displacement vector (from the considered burning cell to the newly ignited cell) is lower than pi/10, then fire also spreads to a number of other contiguous cells (along the displacement vector), the number of ignited cells depending on the wind speed at the considered burning cell (Figure 5). The model with the new propagation rule N2 will be hereafter referred to as the modified model.

3. In section 4.1, the methodology for assessing the time step used by the model is explained. In my opinion, it's important to point out that the method used to estimate the time step cannot be used during operational activities, and this represents a major

throwback in the actual applicability of the model in real field usage. Model-wise, it's also important to note the limit of using a fixed time step for the propagation of fire on a fixed lattice, hence implying a fixed rate of spread. Following these considerations, the analysis of the performances of the model regarding the propagation time assessment are not very relevant. Please justify your modeling choices or include some considerations on this issue in the discussion.

Answer: The point raised by the reviewer is relevant since fair estimates of the time step are required given that the inputs of wind information require adequate temporal information. The new wind propagation rule that we are proposing is an attempt to circumvent the problem of having a fixed time-step for the propagation of fire on a fixed lattice. This is now mentioned in the Conclusion section.

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