

Interactive comment on “Linking local wildfire dynamics to pyroCb development” by R. H. D. McRae et al.

Anonymous Referee #3

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The manuscript entitled “Linking local wildfire dynamics to pyroCb development” by McRae et al. describes an attempt to associate the development of deep pyrocumulonimbus clouds with identifiable types of fire behavior in two Australian wildfires. I find the paper to be interesting, concise, and well-written. The scientific concepts are clearly presented, the methodology is described completely, and the conclusions are justified by the results. When the authors have addressed the mostly quite minor points details below, I feel the manuscript will be ready for publication.

Minor Points:

1) Page 7272, line 6: First, it is not entirely clear which events are being referred to in this sentence. I can accept that events impacting the stratosphere are likely to be

C2980

among the most extreme. However, I am not as certain that all “cases where interactions between strong winds and rugged topography resulted in rapid wildfire development” (from the previous paragraph) fall into this category. Please clarify.

Additionally, I'm not comfortable with the reference to a pyroconvective scale in this sentence. It could be interpreted as suggesting that a formal scale for pyroconvective activity exists in the literature, which is not the case.

2) Page 7272, line 15: I don't agree that it is surprising, without a better defined context for the surprise. Strong Cb routinely penetrate the stratosphere, why should strong pyroCb be any different?

3) Page 7272, line 29: I question whether “blew up” is the appropriate terminology here. The discussion later in the manuscript indicates that the authors are well-acquainted with the imprecision associated with the use of “blow-up” both in the field and in the literature. For this reason, I feel the authors should be more precise here in how they echo Fromm et al.'s use of “blow-up” in reference to the development of a pyroCb (i.e. that Fromm et al. uses it in reference to the development of a very deep plume, without any direct discussion of associated fire behavior or changes in fire behavior).

4) Page 7272, line 26: I do not see where Fromm et al. 2012 stated that “the extreme fire behavior” in these two events needs to be further scrutinized. My reading suggests they proposed that the predictors of extreme fire behavior in general receive additional scrutiny. At several points in the discussion they indicated that extreme conditions occurred, but Fromm et al. 2012 never stated explicitly that these fires exhibited extreme fire behavior. As with “blow-up” above, “extreme fire behavior” is terminology that has been used very loosely in the past. Considering the recent efforts to more clearly define the criteria for “extreme fire behavior”, I would prefer that the authors avoid this terminology when discussing these specific fires unless they wish to refer explicitly to the developing definition (see e.g. Synthesis of Knowledge of Extreme Fire Behavior: Volume I for Fire Managers by Werth et al.) and then establish that those conditions

C2981

occurred in these events.

5) Page 7278, line 11-13: I do not see the “quantitative connection” here. Can we say from this data that a certain value or threshold indicative of “violent pyroconvective activity” is associated with a certain value or threshold indicative of “intense, lateral spread”? I don’t believe these results establish that association, and without it I don’t see how one can claim that a “quantitative connection” has been established.

6) Page 7278, line 17-18: I do not think “fully” or “certainly” are necessary in this sentence.

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