

## ***Interactive comment on “Extreme Wildfire occurrence in response to Global Change type Droughts in the Northern Mediterranean” by Julien Ruffault et al.***

### **Anonymous Referee #2**

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The manuscript examines extreme fire events in southern France in 2003 and 2016 and compare the fire weather conditions with those observed on average. They conclude that increased fuel dryness created somewhat novel combinations of conditions, respectively marked by pronounced fuel aridity combined with strong wind and “normal” wind combined with fuel aridity (to a lesser degree) and a heat wave. I find these conclusions sound and the ms. generally robust, although the discussion could be deeper given the wealth of information provided by the graphed results. My major concerns are some inaccuracies and errors in nomenclature (or uunderstanding of fire dynamics?), namely: - Fuel aridity does not apply to dead fuel dryness induced by short-term atmospheric influences; - What the authors describe as “heat-driven” is in

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fact dryness-driven (not necessarily drought-driven, because drought implies a longer time scale).

P1, L24. Rephrase. The sentence suggests that spatially continuous fuels are expected to limite fire spread. Also simplify to “dead and live fuels”, as litter is only a factor in forests.

P2, L15-16. Unclear sentence: “theirs impacts of fire behavior for vegetation communities”. Do you mean “their impacts on fire behavior”? Vegetation communities is not really needed in the sentence.

P2, L16. They burn woody vegetation, but are in fact “foliage-fueled”.

P2, L16. FWT refer to fire weather types, not to fire types, so correct the sentence. Also, “heat-driven” doesn’t say anything and is incorrect to refer to this type of fires. “Plume-driven” is the right designation and would be the preferred option to replace the less accurate “convective”; all fires are driven by convection as the prevailing heat transfer mechanism, irrespective of their nature or intensity. A second objection is that you have no data supporting the claim that these types of fires are convection/heat/plume driven, because that depends of atmosphere stability and stratification. All you can say is that those fires developed under weaker winds and dry conditions. Hence you should be conservative and describe them as fuel-driven or dryness-driven fires.

P2, L21. Rephrase “that transport the flame closer to fresh fuel”. The flame is not transported by wind, and fuel is not “fresh”.

P2, L34. Correct “for to the”.

P4, L5. I understand that these fires threatened valuable resources but find hard to accept that fires of ~300 ha are classified as extreme. The nature of the fire (i.e. extreme or not as determined by the fire environment) should not be mixed with its impact for the purpose of a study of this type. The single fact of being controlled at

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such size suggests they were not that extreme. Please justify better.

P4, L13. This is not true, i.e. extreme fires can spread for several days. I suggest you justify the option by stating that the main fire runs often occur on the first day.

P4, L13-14. The concept of fuel aridity (check the original papers) is different from low fuel moisture contents attained on the short to mid-term so you should not use it in this context. Can an absence of rain for 4-6 weeks (drying time for the fuels represented by the DMC) be designated as “drought”?

P4, L16. Again, this is not correct, the fuel moisture content of surface fuels in the FWI system is expressed by the FFMC. The DMC accounts for the part of the forest floor that produces flame plus more compacted layers that smoulder, i.e. it includes sub-surface fine and coarse fuels.

P4, L19. Make the sentence clearer, because the DC was not conceived to track the moisture content of live fuels.

P5, L1-2. You certainly do not need to include this explanation.

P5, L10. This line is not understandable.

P5, L16. Wildfire, not wildfires.

P7, L12. “charactering”.

P7, L26. What about the fires of 2017 in southern France? You could discuss them in this framework.

P7, L28. Not clear what you mean with “some new generations of fires”. Increase in the occurrence of hot droughts and press droughts simply imply that the distribution of fire behavior characteristics will change to include more extreme fires at higher frequency.

Figure 9 is nice, but again I have problems with the nomenclature adopted (see previous comments): the aridity concept does not apply to fast drying fuels, and “heat

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driven” is quite poor and inaccurate when in fact these fires are driven by fuel dryness, both on the short and long term. I suppose “heat” is used because of the high temperatures, but temperature in fire behavior only acts indirectly through its effect on live fuel desiccation and dead fuel moisture content.

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