

Review of essd-2025-483

State of Wildfires 2024-25

General comments

The authors are to be commended for their efforts to so comprehensively summarise the complex and complicated state of wildfires on our planet, to wrangle the datasets and models needed to make sense of a phenomenon that is at once a natural part of our world and a terrifying threat to our existence. However, this document is a beast to read and having read through pretty much all of the 100 pages of the main part of the paper (I admit to skipping some parts just to maintain my sanity), I wonder if any of the authors have in fact read the thing in its entirety. There is a very large amount of repetition in the document. Much of this comes from the nature of the methods employed, being similar in many of the different components being presented, but these could be streamlined to a great extent—this might not reduce the overall length by much but would improve the readability considerably; we don't need to be told more than once that FWI is the Canadian Fire Weather Index and we don't need yet another explanation of its origin.

In the same vein to improve the reading experience, I would strongly suggest the authors consider moving their Conclusions section to the very front of the paper. I found this section to be the most readable and to convey all the important information any reader of the article would want without the need to wade through the pages and pages of detail on method before getting to the juicy stuff—I think it works better than the Abstract in this because it hasn't been so condensed; maybe call it an extended abstract or similar. This may break with the standard article structure of this journal and the previous State of Wildfires (I've not read it), but would make future editions of this report so much easier to ingest. The detail of the methods could then follow.

Some other high-level comments:

1. I don't quite see the point of the climate projections for the four selected extreme event localities. Unpacking what happened to them this year makes perfect sense but why would one care more about the seasonal and multi-decadal outlooks for these areas than anywhere else?
2. In section 5 on Attribution to Global Change, be consistent in the language used to present level and extent of attribution. Section 5.2.1 deals largely with 'probability of occurrence being x times higher' or 'times more likely' than the counterfactual, which may be the same thing but is confusing. 5.2.2. suddenly presents attribution as 'x% likelihood of whereas The introduction of Amplification Factor without an explanation of what it was threw me while I was trying to unpack the probabilities that were presented.
3. In many of the analyses, there is much discussion of the comparison of predicted 'hotspots' versus actual 'hotspots' (being satellite derived). But's not clear how these 'hotspots' compare with actual fire events. Most of the discussion assumes that hotspots and fire events are synonymous, but they are not. Can the discussion be made more specific to fire events, since that is what the metric being assessed is?
4. Similarly, there is much discussion throughout in which analysis of fire weather is conflated with ignition potential, particularly in regard to the use of the Canadian Fire Weather Index. The FWI is not designed to provide any insight into ignition potential or

fire occurrence and so it is no surprise it does not perform well in this role. Since it is recognised as such (e.g. L1634), why do so many of the analyses persist with it? Has there been any published validation of the FWI for such uses? This is particularly important since it is stated on L1633 that FWI does not consider vegetation state in biomes other than boreal forest. And yet not 40 lines later (L1674) it states the FWI successfully identifies regions with elevated fire danger aligning with BA anomalies outside the boreal forests. There needs to be some consistent application of tools such as FWI and their treatment in the ms.

5. Reliance upon FWI and PoF is largely going to highlight fire weather as the cause of fire events because they are largely (and specifically in the case of the FWI) fire weather products. Extrapolating these (particularly FWI) to fire occurrence a long bow to draw.
6. Despite the effort to explain what is meant by 'extreme' fire there is still no robust definition that I could find in the ms. A full and complete definition of the following words is required at the beginning of the ms:
 - a. Extreme fire event
 - b. Extreme fire area/extent
 - c. Extreme fire emission
 - d. Extreme fire activity
 - e. Extreme wildfire
 - f. Extreme wildfire season
7. Similarly, fire intensity is not defined (e.g. L383). Fire intensity can be interpreted any number of ways which are not compatible (e.g. fireline intensity (kW/m) and fire radiative intensity (kW/m²). Please define and use consistently words like 'fire intensity' and similar (e.g. intensity of fire).
8. It is understood that MODIS is being phased out, to be replaced by VIIRS and Sentinel 3, etc. Since it is intended for this series of articles to continue can the authors provide a plan for enabling the future results to be comparable with current and past results using MODIS, even if it is a period of parallel presentation if necessary.
9. In the results section, be consistent in your comparative language. In some places, quantitative comparisons are number of times greater while in others it is given as a percentage, sometimes in the same sentence (see L912). This is related to Point 2 above in the attribution section.
10. Be consistent in the presentation of large numbers. In some cases these are given as numerals, in others they are spelled out in full. e.g. 290 thousand ha versus 290000 ha.
11. Be consistent in presentation of units. In some cases there is a space between the value and the unit, and in others there is not.
12. There is also a mix of tense throughout the ms, shifting sometimes in the same sentence between present and past tense.
13. FWI seems to be defined every time it is introduced (e.g. L356 & L 719 & L1602 to name a few). It only needs to be defined once.

Specific comments:

L124: Superscript '2'. Define what you mean by 'extreme fire seasons'.

L160: Delete apostrophe.

L167: Should this not be 'climate change and land use attribution'? Currently it reads like the attribution has already been made.

L179: 'extremely large, fast-moving or intense fires'. Is this your definition of 'extreme fire'? Seems circular.

L190: Define 'extreme fire extent'. I don't think 'extent' in this context is correct as it refers to the outer bounds of something, not the total area, which is what I think is intended.

L243: What about marine sinks? How do they compare?

L249: 'India, the EU27 or the USA'. Do you mean together or separately? Not clear.

L251: 'greater vegetation mortality'. How true is this? How was it determined? In many fires across the globe, vegetation is not necessarily killed by fire—often it is the dead vegetation that is burning.

L264-267: Not clear. Are you referring to use of fire as a land management tool (be it traditional or otherwise)? Be explicit here.

L277-281: Other mechanisms such as ignition risk reduction, pre-suppression, rapid early/initial attack are also employed.

L325: Insert 'the' before 'context'

L329: Change 'four extremes' to 'four extreme events'

L334: Predict what for each focal event? By the looks of what is presented, you are attempting to predict fire occurrence. Please add that here.

L345: When you say 'size and rate of growth' are you talking average, median or peak values?

L356: How suited is FWI to this purpose? Has it been validated for this use? Provide references.

L383: 'fire intensity' needs to be defined as there are many different interpretations of it.

L384: What is the functional difference between 'BA' and 'fire size'?

L395-409: This needs to come earlier, with a concise definition in the abstract.

L397: 'comprehensive'. Do you mean 'rigorous'? In regard to impacts are you referring to direct impacts or long-term impacts?

L413: Define what you mean by 'extreme fire weather days'.

L442: For those of us who are not EO experts, what does 0.1 degree translate to metres at, say, the equator?

L451: What does 'scaled to emissions' mean?

L455: As with L383, 'intensity of the fires' needs to be defined. How is it determined from BA and daily growth rate? It certainly would not be the 95th percentile of actual fire intensity.

L458: Can you explain exactly how FRP is directly related to 'the fire's intensity and fuel consumption' and how these are measured remotely?

L464: How can four daily measures of FRP provide information on fire intensity enough for a meaningful estimate of 95th percentile?

L469-472: As mentioned in the general comments, what is the plan to eventually transition over to VIIRS or Sentinel and what will it mean for consistency of reporting in this series? Point to section 2.1.1.4 for comparison of the various products.

L479: Not just small fires, but short-lived fires.

L481: An increase of global BA by 93% is huge.

L482: Given such a large increase in BA by including small fires, it is difficult to believe variability and trends in regional BA do not significantly differ when small fires are included. How can this be?

L483-485: This is not clear. What is the generation of biases got to do with anything and why is it in line with the sensitivity of different sensors? Clarify.

L488: 'deemed highly suitable'. But is it the preferred option given the access to other sources of data? If you could use other products, would they produce better results? Seems like an attempt to sweep the problem under the carpet.

L490-497: How can uncertainties in a product be determined by comparing the uncertainties in other similar products? Uncertainty at some point needs to be related to actual burnt area that may or may not be observed remotely. What are the implications for the continued use of MODIS?

L502-505: It is not clear what you mean here. Clarify.

L505-50513: This essentially repeats the first half of this paragraph.

L515-534: So what is the uncertainty in FRP data?

L528: Define 'MIR'

L547: Repeats L380.

L551: Do you mean boreal spring?

L558: How are these determined and validated?

L590-594: This is scary, if the new products are largely the same as the old products with similar uncertainties and no improvements. Is this correct?

L595: What does 'generally replicated' mean?

L597-599: Repeats previous statement. Where are improvements to come from?

L620-626: This is a reasonable approach, but for outyears beyond the current ms, will you maintain the top 5 or the upper quartile? They are close enough now, but in a few years where you need 6 fires to be a quartile, what will you do? Best to decide now if you will now and forever take the top 5 or the upper quartile.

L629: 'event's peak'. To be clear, to which event are you referring?

L644-648: Unnecessary detail. At the scale we are talking, most cells will contain components of each combustion mode.

L675-680: Repeats L400.

L726: Explain why you chose 95%. Previously it was the upper quartile. Be consistent in what you consider 'extreme'.

L760: What is the basis for this conclusion?

L763: You start off by saying '3.7 million km² burned globally, but now at the end of the paragraph you say '*at least* 3.7 million km²'. Say this first.

L781: here and throughout: What do you mean by '(sub)tropical'? Is it tropical or subtropical or both? Be clear.

L781: The use of the same numerical value (290,000 km²) for two things in this paragraph is a tad confusing. Is this correct?

L788/Figure 1: Is there any reason why the secondary y-axis cannot be scaled such that the heights of the boxes cannot also be read as relative anomaly (%) instead of using an additional symbol that is almost impossible to see against the blue?

L882-892: How do you know that these BA weren't burned by multiple individual fires that had coalesced?

L892: 'intensity value'. What is this? Explain. See L458.

L1044/Figure 5: Put the panels of this figure in the same order in which they are presented in the text (i.e. Amazonia, Pantanal, SoCal, Congo). (Or reorder the text to match the figure).

L1061-1063: Do we need this sentence, since it's already been explained?

L1068: What is 'climatological mean'?

L1079-1080: How was this determined?

L1092: January- March 2024 is largely outside your year of study.

L1128-1132: What is the difference here between 'homes' and 'structures'? Can you present consistently as one or the other, rather than both?

L1143-1147: Not a sentence. What about the water from the federal reservoirs?

L1176: 'prior year to two'. What does this mean?

L1266: Should this sub-head be 'Carbon Offset Projects Exposure' to be fully correct? See L1268.

L1290: 'a toxic mix of gases'. The mix is not toxic but some of the gases in it are toxic. Include volatile organic compounds (VOCs) in the list.

L1294: Are cancers in this list?

L1307: What do you mean by 'prescribed'? I would avoid this word in connection with fires as many planned burns are called 'prescribed' fires.

L1462: Something missing from 'the northern tropical of South America'.

L1487: Delete comma after 'Note'.

L1497: As per L1266.

L1499: Change to ‘...cost-effective climate change mitigation...’

L1525: Everywhere else you refer only to BA, not burned area. Consistency.

L1601: FWI is not designed for predicting fire occurrence, for many of the reason stated in the analysis L1631-1641. Why was it used in the first place? Seems criminal to abuse such a venerable system in this way and then complain about it.

L1619: Do you mean predictions of wildfire occurrence?

L1628-1630: Performance of PoF should be compared against actual, not FWI.

L1634-1635: What do you mean ‘too far in advance of actual fire emergence’?

L1674: This sentence conflicts with what is presented in L1631-1641.

L1681-1694: Is this detail necessary? Suggest cutting.

L1713-1724: Repeats L343-L365.

L1744: How is this error determined?

L1751-1753: Fuel moisture does not lead to increased vegetation growth.

L1755: ‘...lots of trees...’ Huh?

L1761: In many of the subsection in these results, way too much background is provided. This could be pruned considerably.

L1768: How is number of ‘hotspots’ converted to number of fires? These are not necessarily the same. What are you suddenly referring to hotspots instead of fires?

L1776-1777: Are these not parts of two separate fire seasons? 2023/4 and 2024/5?

L1781: ‘fire hotspots’ Are these separate fires?

L1788-1797: This paragraph is essentially discussing the difference between fire weather and ignition potential. Fires do not occur without both but each does not influence the other.

L1803: How useful is this? Are these separate fire ignitions?

L1814: ‘worst water crisis’. What is this? Too little or too much water? Poor quality? Be specific.

L1828-1829: How does this translation work? How well do they compare?

L1877: This is true only if the total number of fires remains constant.

L1938: Change ‘controls’ to ‘factors’. Topography is critical for influencing fire intensity.

L2345: Insert ‘Initiative’ before ‘(Barnes’.

L2354: Why mean daily relative humidity? Why not minimum to match the maximum air temperature?

L2537: Is there a reference for DSR? Van Wagner 1987 is a reference for FWI, not DSR.

L2553: Change ‘lead’ to ‘led’.

L2583: What is 'Amplification Factor' and why is it suddenly being introduced here? It should at least be introduced in the methods section of this chapter. It needs a full explanation since it becomes an important metric.

L2610-2617: Why is this paragraph here? It is superfluous background.

L2888: It's not clear why this section is here. Did you do it for the previous State of Wildfires? If so, can you analyze the quality of the predictions you did for this fire season? I'm not sure how detailed outlooks for regions that burned this season will be of much relevance next year.

L3326: This chapter is an excellent summary of the breadth and depth of the document and deserves to be placed at the very beginning of the document, perhaps with some streamlining.

L3670: Add 's' to 'deviation'.

L3671: Ditto.

L3692: 'vegetation growth'. There is *always* vegetation growth when it rains. What about it? Is there a missing adjective?

L3710: Change 'find' to 'found'.

L3737: Delete 'made'.

L4024: Insert comma after 'data'.

L4029: Insert 'research' before 'projects'.

L4040: Should this read '...international collaborators routinely...'?