Interactive comment on “Fire weather index: the skill provided by ECMWF ensemble prediction system” by Francesca Di Giuseppe et al.
Anonymous Referee #1

The authors present an assessment on the skill of the GEFF system in forecasting fire danger up to 10 days ahead. The system uses as proxy for fire danger the FWI index predicted from the ECMWF 10-day forecasts. The authors use FWI computed from a number of SYNOP observations as well as the ERA5 reanalysis as a substitute for weather observations. It is my opinion that this work is important as it well documents the system and in general highlights its strengths and weaknesses in terms of deterministic as well as probabilistic forecasts. The use of the "standard" GFED4 regions for comparison is a good idea, even if they encompass large regions with heterogeneous fire regimes. I recommend it for publication with minor reviews pending the following suggestions are addressed.

We would like to thank the reviewer for the overall positive comments and the suggestion that we have tried to address. Detailed answers to the comments can be found in the following

- p. 3 section 2.2.1 - the text is a direct copy of other works, should be summarized with a reference to the original work

Yes it is very similar to the previous paper as it briefly describes the FWI. I have shortened it even further and referred to the previous publication

The Fire Weather Index system provides an indication of fire danger conditions as influenced by weather \citep{vanwagner:87}. It models the moisture content of dead woody debris of different diameter classes laying on three fuel beds and from these an indication of what would be the rate of fire spread and the fuel available for combustion, It also provides a general indicator of fire danger, the Fire Weather Index (FWI).

- p. 4 line 107 - using the era5-base reanalysis without proper validation is a bit problematic. Key findings should be summarized here.

This is a good point and era-5 based FWI reanalysis has been fully validated in a paper that is under review in the Scientific Data journal. Considering the timing that paper will be published ahead of this and probably could be fully referenced. For now we have added a reference as submitted as follows

A full validation of the FWI database derived from ERA5 can be found in \cite{vitolo2020}

-section 3.1 (last paragraph) - The system is worse than climatology for the 2 South American regions, authors omit this and do not postulate any reason for this poor performance

Sorry for this omission. The very bad results in these regions needed some clarifications. We are unsure as to what degradates the CRPS so much that even at day 1 is worse than climatology. As CRPS is heavily affected by systematic biases one of the reasons could be due to a systematic bias in the weather inputs in these regions that then project into a bad performance on the FWI calculation. Strong surface biases are a combination of land -atmospheric exchange process and clouds. We have provided a new plot here which assess the biases and have written an extensives justification which reads

Exceptionally poor is the performance in the two South American regions where the forecast at any lead time is below the climate line. As mentioned CRPS is heavily influenced by the forecast bias which can induce a fast decline in the CRPS curve. Looking at the mean bias as a function of the lead time (figure

\ref{fig:bias_region}) it is evident how these two regions are indeed strongly affected by systematic biases with the largest values recorded, at least in the first three days of forecast. In general for all the regions the decline in CRPSS (Fig \ref{fig:bias_region}) can, to some extent, be explained by the negative bias (too low FWI values when compared to ERA5-FWI). Interestingly the bias of the forecast is not spatially consistent, it is generally larger in the Southern Hemisphere regions and lower in the Northern Hemisphere, in agreement with what discussed on the expected skills of the weather forecast. The consistent negative bias at all lead times also highlights that there is scope to improve the overall skill of the prediction through bias corrections of the meteorological forcing a \citep{piani:10,digiuseppe:13a,digiuseppe:03b}.

-section 3.1 - due to a poor spatial coverage of SYNOP stations in tropical areas, I suggest the analysis be done with ERA5 data as a proxy for SYNOP, and results provided in supp. material

The same figure used for the previous analysis also addresses this question as it provides the comparison with ERA5 on all the points x

Some general remarks and comments:

- p. 2 line 40 - authors ignore the uncertainty in initial state which can also lead to forecast error - p. 2 line 57 - authors should mention that the configuration used for the ensemble forecasts is done at lower spatial resolution

Yes thanks the sentence was a bit convoluted and has been reworded as

When weather forecasts are used in place of observations, uncertainties can be introduced. Sources of uncertainty can be: (i) the limited knowledge of the initial state and (ii) the misrepresentation of physical processes.

Also we have mentioned the lower resolution of the ensemble forecast in the following sentence

Given the expenses of running an ensemble system these simulations are usually conducted at a lower resolution than a single deterministic run.

- p. 5. line 134 - I would suggest replacing "era5 simulations" with "era5 reconstructions" here and elsewhere.
Simulation is a more used word in the NWP community and we have decided to retain it
- p. 5. line 138 - replace "quality of the computation" with "quality of the forecast"
Word replaced
- p. 9 line 199 - replace "Boreas" with "Boreal" (also in the last paragraph of the text.
Word replaced
- p. 13 line 265 - replace "signal extend" with "signal extends"
Corrected
- p. 15 line 277 - replace "predictive skills" with "predictive skill"
Corrected
- p. 15 line 277 - add "for most of the GFED4 regions studied" after
Added
- p. 15 line 278 - fix reference format
Done
- p. 15 line 283 - also the FWI was developed for Boreal forests which might explain its better performance in those regions

This consideration has been added