Reviewer #1

As a specialist in past ecological change, and having worked with reconstructing fire histories in the Amazon basin, I was interested to read the discussion manuscript by Le Page et al. related to the likely impact of future climate change on fire in Amazonia. In this manuscript Le Page et al. develop the global intermediate complexity Human-Earth System FIRE (HESFIRE) model (Le Page et al. 2015) to explore fire dynamics in the Amazon basin. The new outputs presented here project how understory fire activity could change within Amazonia over the next c. 100 years under two different future climate change scenarios (Representative Concentration Pathways 4.5 and 8.5;Thompson et al. 2011, Riahi et al. 2011). The HESFIRE model is evaluated favourably against observed fire activity between 1999 and 2010; interestingly the new parameterisation of the model (this manuscript) is shown to be a considerable improvement on the original parameterisation used in the global model (compare Figure 2 with FigureS2). The authors predict that over the coming decades climatic change will lead to changes in relative humidity, temperature and fuel moisture that will lead to increased duration and size of fires, and that fires will impact a larger area of the basin.

The manuscript presented by Le Page et al. is clearly written, well organised and contains clear figures (notwithstanding minor comments below). The model parameters make intuitive sense to me but I am not an expert in this area. The conclusion that the synergy of land-use (humans) and climate change are likely to increasing fire risk in Amazon basin is reasonable based on the data presented. It also does not come as a surprise to me as there is a long history of human-climate-fire interactions within the Amazon basin. Fire (most probably triggered by early human populations) has been a component of Amazonia for c. 8,000-9,000 years (e.g. Bush et al. 2007; Hammond et al. 2007), and the impact of this fire has likely been modulated by past climate change (Bush et al. 2008; Bush et al. 2017; Cordeiro et al. 2014). Indeed Bush et al. (2017) make a specific link to past changes in the El Nino Southern Oscillation(ENSO), human activity, and changes in the Amazonian fire regime (based on fossil charcoal records). Given that the message from the past, and the projections for the future, seem to be providing consistent message (humans and climate synergistically modifying fire regimes within Amazonia) it might be interesting to add a short section of discussion to this manuscript to make this comparison. This could fit well at the start of the discussion section where ENSO is discussed in the context of future predictions.

We appreciate the reviewer's suggestion to better integrate our contemporary and future examination of fire dynamics in the Amazon with insights from paleo studies. We highlighted the consistency with paleo studies in introduction and discussion:
In introduction (P.2 l.25): "Satellite observations over the last 40 years have confirmed the importance of these fire-climate-land use interactions (Alencar et al., 2015; Chen et al., 2013; Laurance, 1998), consistent with paleorecords of charcoal accumulation rates inferred from sedimentary cores (Bush et al., 2007; Cordeiro et al., 2014)."

In addition, in the discussion we note that (P.8 l.20): "Model results with RCP4.5 land use projections suggest that a significant and regional-scale reduction in agricultural activities and landscape fragmentation can disrupt these climate-fire interactions. This is consistent with contemporary studies (Alencar et al., 2004; Morton et al., 2013), and with the clear signature of land use activities in charcoal paleorecords since the onset of Amazonian agriculture (Bush et al., 2007; Cordeiro et al., 2014). In fact, (Bush et al., 2017) analyzed a 6900 years sedimentary record in western Amazonia, and found that the

ENSO-fire signal was strongly expressed at times of widespread agricultural activity, being otherwise undetectable in the record and most likely absorbed by natural vegetation."

MINOR COMMENTS

Page 3, line 10-20: There seems to be a bit of a jump in the HESFIRE model. It would be useful to add some linking text that makes clear what this model is, how it has been previously used and why the work presented her is a good next step.

In the revised manuscript, we have expanded the text to discuss previous applications of the model at a global scale and clarified the basis for applying the model in regional studies such as this one:

P.3 l.20: "The model has been applied at global scale (Le Page et al., 2015) and used in a sensitivity experiment to evaluate the propagation of uncertainties from land cover and climate input data to estimates of fire activity (Le Page, 2016). The HESFIRE model was designed to facilitate the development of regional versions – a capability used in leveraged in this Amazon-scale study - with the integration of a data assimilation component to regionally adjust the parameterization of fire drivers based on observed fire dynamics."

Page 4, line 13: Additional space between "Figure" (also: page 6 line 11, page 7 line30, page 8 line 29, page 10 line 10).

Thanks !

Page 8, line 33: Referencing anonymous new data seems a bit odd. Can you find a clearer way of referencing the source of these data?

We have corrected the citation format for these data. The correct reference is a website with near real-time estimates of fire risk in the Amazon based on Chen et al., 2011 (also cited). We now provide the URL directly (https://www.ess.uci.edu/~amazonfirerisk/).

Figures: Various fonts are used on the different figures. I think it would help the manuscript to look more coherent if these were standardised.

We agree that more uniform fonts would improve the figures. If the paper is accepted for final publication, we will harmonize fonts to the extent possible.