Interactive comment on "Quantitative assessment of fire and vegetation properties in historical simulations with fire-enabled vegetation models from the Fire Model Intercomparison Project" *by* Stijn Hantson et al.

Sergey Venevsky (Referee)

venevsky@tsinghua.edu.cn

Received and published: 25 March 2020

The paper presents evaluation of historical simulations made for the nine FireMIP models with regard to fire and vegetation properties. This is very important and necessary inter comparison study aimed to support and move further global fire modelling activities. Both methods and results are clearly presented and scientifically sounded and proven. The only methodological weakness is a bit short period of comparison of the models with the observations which could be clearly longer. I think that Discussion in this paper is the weakest part and needs more effort to make conclusions from the

model inter-comparison to be stronger and more clear. In particularly 1. The part about relation of areas burnt to vegetation production (lines 387 -396 and 405-411) should describe in more details why and how exactly fuel load influence burnt areas in the FIREmip nine models 2. Part on influence of areas burnt upon GPP/NPP is absent and should be added

Comments/questions/suggestions: Line 66 – "Willdfires and anthropogenic fires" – how you define and classify these types of fires in global models? Further on no clarifications for this important question. . . Line 126 Lightning data 1900-1920.population density and land use 1700 where do these data come from? Line 132 The baseline FireMIP simulation is a transient experiment starting in 1700 CE and continuing to 2013. Why simulation is only up to 2013 and comparison is only for 2002-2012 ? Can simulation be somehow extended to include recent years? Similarly, inter-comparison only for decade looks not so sounded, for example 1997/1998 El Ninio years are out. . . Which climate data was used? Lines 150-159 What was the principle of selection of all these datasets? Why no global water cycle related datasets (e.g. runoff) where selected? Water status is obviously important for both fire and vegetation, I would compare at least also runoff for 2002-2012 Line 173 "As model benchmarking techniques become more sophisticated it would be beneficial to better evaluate the datasets the models are compared against to ensure the models are being benchmarked appropriately" Please, delete or rephrase (shorten) Line 175-180. I think you should move formulae of NME from Supplementary back to the main text. You write in Supplementary that you applied NME for areas burnt, but it is clear from Table 3 and S1 that you apply the same metrics for other variables for benchmarking, please, correct. As well Table 3 is quite difficult to read, why not to use semaphore colors (not so good- red, OK –yellow, good –green) or any other color scheme? Figure 1p. Performance in fire emissions by the models is the worst from all variables. How you can explain it? How reliable is observation data set? Please, make more explanation in Discussion part. Line 219 CLM (NME: 0.63-0.80) and ORCHIDEE-SPITFIRE (0.70-0.73) are the best performing models. What makes these models to be the best in burnt areas description (for CLM

as I understood it is related to cropland fires, what about ORCHIDEE-SPITFIRE ? Line 326 to 334 "... the overall difference between the models (...JSBACH, LPJ-GUESS and ORCHIDEE..) reflect feedbacks between the fire and vegetation modules " what are these feedbacks? Where lays difference in their descriptions of these three models (in DGVMs)? Lines 345-349 "there is a positive relationship between simulated burnt area scores and the seasonal concentration of GPP (R2 = 0.30-0.84) and, to a lesser extent, the seasonal phase of GPP (R2 = 0.09-0.24). This supports the idea that seasonal vegetation production and senescence, which have an important influence on fuel loads, drive the interactions between vegetation and fire within each model" – I doubt this statement. It is more likely that similar dynamics of burnt areas and the seasonal concentration of GPP/ the seasonal phase of GPP are related to dependence of both areas burnt and GPP variables from soil moisture in the fire models and DGVMs. Please, either prove, or delete this paragraph.

I wish all the best for FIREmip in their further valuable research activities

Sergey Venevsky