General comments:

The authors developed the statistical simulation model for fire burnt area which was supposed to be incorporated into DGVM. The proposed GLMs as the functions of multiple environmental factors, would give the potential for a very light simulation tool on global scale wildfire.

However, one of my concerns is that the wildfire would be ignited considerably by lighting and expand their burning severity depending on the dry litter amount as fuel, both of which are not considered this time. The predictability for the long-term future is not secured as long as you do not use an accumulated ecosystem carbon stock, which DGVM has the advantage to simulate, but you use the GPP related index which is not necessarily related to fire severity. Statistical models cannot guarantee accuracy when a regime-shift for fire occurrence has happened mechanistically.

Considering the fewer predictors selected for the general representation of wildfire, the linear regression is shown not to be the best model for wildfire though still easy to use compared to machine learning or process-based models. Correlation coefficients for each term should be rearranged when this model was introduced to DGVM to use their simulated GPP and other ecosystem information which must be more or less different from MODIS or satellite products.

CEAM, BONA, MIDE, and TENA showed a 2-fold difference in interannual variations, which suggests that this model could be parameterized or separately made for vegetation types. A single statistical model cannot estimate the average BA for specific areas.

Incorporation of lightning and carbon stock accumulation: We acknowledge that ignition from lightning and fuel availability due to accumulated carbon stock are critical factors influencing wildfire dynamics. We plan to integrate these variables into future iterations of our model, which will enhance its long-term predictive capacity within the DGVM framework.

Rearrangement of correlation coefficients: We will discuss in the manuscript the importance of adjusting correlation coefficients when transitioning from MODIS-based predictors to DGVM-simulated variables. This ensures compatibility with DGVM outputs and reduces potential discrepancies.

Parameterization for vegetation types: While region-specific parameterization would improve accuracy, our goal is to develop a model that can beintegrated into a DGVM. The constraints of a DGVM environment necessitate a generalizable model rather than multiple regional models. However, we acknowledge this limitation and suggest future refinements could explore region-specific parameterization.

Minor Comments:

Page 3, Lines 90-91, you have to identify the typical model name that you criticize here. What you propose here is still a simple GLM based module, so I feel this sentence as contradiction.

Page 3, Lines 90-91: We will specify the model being criticized and clarify how our approach differs in methodology and performance.

Page 3, Line 94-95, Use of remote sensing data will reduce the advantage of DGVM which enables the long-term vegetation shift simulation in future. also wanna now the direction from start to end

Page 3, Lines 94-95: We recognize the trade-off between using remote sensing data and DGVM-driven predictions. The manuscript will explicitly state that our model is designed outside of the DGVM framework, with the goal of being later integrated using DGVM-simulated predictors.

Page 17, Line 330 does this mean that HDI is going down in these years? you would better show the number in the decadal trend of averaged globally

Page 17, Line 330: HDI has increased over time, but its negative correlation with burned area leads to an apparent decreasing trend in burned area. A decadal trend plot of global HDI will be added in the supplementary materials.

Page 22, Lines 425-427: sounds repeated. you merge these two sentences into one.

Page 22, Lines 425-427: The redundant sentences will be merged for conciseness.

Page 23, Lines 463: you also have to mention about the SPITFIRE-based model performance. GlobFIRM is an old version, and we know this is not accurate.

Page 23, Line 463: We will include a discussion of the SPITFIRE model's performance and acknowledge its advancements over GlobFIRM.

Figure 1: you should add more explanation on the shape of frames, rectangles, rounds, diamonds. what is the data and what is the process

Figure 1: The workflow diagram will be annotated to clarify the meaning of different shapes and colors used.

Table 2: explain the condition for color

Table 2: A legend explaining the color coding for normalized mean error (NME) and deviance explained will be added.

Figure 4: Specify the years for the average

Figure 4: The years corresponding to observed and predicted fire distributions will be specified.

Figure 5: The y-axis should be in 10^6 to reduce the number of digits.

Figure 5: The y-axis labeling will be revised to use 10^6 notation to improve readability.