We thank the reviewers for their thoughtful, valuable and detailed comments and suggestions that have helped us improve the paper quality. Our detailed responses (Blue) to the reviewers' questions and comments (*Italic*) are listed below.

Anonymous Referee #1

Overall, the manuscript has improved a lot compared to the first draft with more clarity and better organization. It will be a significant contribute to the field. I suggest "accepted as is".

We highly appreciate the reviewer's invaluable suggests.

Anonymous Referee #2

Thanks to the authors for their reply. I am glad to accept most their responses and revised manuscript. However, I do have a couple of concerns before recommending for publication:

We appreciate the detailed comments from the reviewer which have helped us improve the paper quality.

1. I would like to encourage the authors to make their code and data open to the public, or at least to the reviewers/editors. I appreciate that the authors honestly let us know that they found some errors in previous computer programming as for the difference between FireCCI and MCD64.

We appreciate the reviewer's suggestion. The data used in this study were all downloaded and obtained from the official data website. We have already described the data source information in the manuscript at lines 518-525: "**The MOD14 product and FireCCI51 dataset can be downloaded from https://firms.modaps.eosdis.nasa.gov/ (last access: 25 February 2022), and https://climate.esa.int/en/projects/fire/data/ (last access: 12 February 2022) respectively. The MCD64CMQ product from https://modis-fire.umd.edu/ba.html (last access: 23 February 2023). Fire emission data from the Global Fire Assimilation System (GFAS) (https://apps.ecmwf.int/datasets/data/cams-gfas/, last access: 3 February 2022). ERA-5 Reanalysis data were provided by the European Centre for Medium Weather Forecasts, (https://cds.climate.copernicus.eu/, last access: 17 February 2022)**.".

Due to copyright considerations, it is not suitable for us to publish the data. Readers and researchers can obtain corresponding data from the above websites. In addition, the raw data occupies too much storage space, so we have uploaded the main data and code of this study to cloud storage (https://pan.baidu.com/s/1xGRjQtUIjzyS90Pbgg0LnQ, password: 8aml) for reviewing by reviewers and editors. The data for FireCCI, MCD64, and GFAS is in the "DATA" folder. The code includes the extraction and calculation of variables related to fire and its emissions, all in the "CODE" folder.

2. I am still confused how q statistics works and how can the geographical detectors explain the percentage of the causes of fires. Open code and data would help to this question. On the other hand, my understanding of the q statistics citation (Wang et al. (2010, 2016)) is that this could be applied to measure the spatial stratified heterogeneity. Can the authors provide more explanation how this related to influence of meteorological factors on fires?

Geodetector has an official website that introduces the principles of the model and specific operating steps (http://www.geodetector.cn/#_Download,_with_Datasets_1). I believe that most users obtain, learn, and use the software based on the detailed introduction on this official website. The software was developed using Excel 2007, R and QGIS, respectively. According to my understanding, users can choose a Geodetector software based on their actual situation. In this study, I chose the Excel version of the software, which does not require programming and can be run and output results according to the specific steps on the official website. So, there is no publicly

available code for this part of the calculation. We have uploaded the downloaded software package and the initial results after running the software to the "Geodetector" folder of cloud storage.

As for the second question, in my understanding, existing scientific researches have shown that natural fires are influenced by meteorological factors. Based on such prior knowledge, we conduct relevant analysis and explanations in our research. As for the spatial stratified heterogeneity, both the dependent variable (Y) and the independent variable (X) have spatial distribution, but it is not necessary to layer them in geographical space, and attribute stratification can also be done, that is, the stratification of Y or X can be in geographical space, time, or attribute. The above is based on my learning and understanding of this model. I believe that the introduction and explanation provided by the development team on the official website are more authoritative. We added the description at Lines 185-194: "**We use Geographical Detector (Geodetector) to quantify the contribution of meteorological conditions (temperature, relative humidity, soil moisture, and total precipitation) to fire changes in different regions. The Excel version of Geodetector used in this study was obtained from the development team's official website (http://www.geodetector.cn/#_Download,_with_Datasets_1). The Geodetector can explain the degree of variability of various independent variables (x) to dependent variable (y). Note that the layering of y or x can be geographical space, time, or attributes. The q statistic in the calculation results indicates the degree of interpretation of the corresponding variable and its value range is 0-1 (Eq.2). The larger the q is, the stronger the explanatory power of (x) to (y) is. The Geodetector has currently been used extensively in research for quantitative attribution analysis (Wang et al., 2016; Zhang et al., 2019). Detailed description of this model can refer to the studies by Wang et al. (2010, 2016)**.".

3. Same request to the relative change question (fig 4).

The relative change is the calculation of the difference in the mean of each region relative to the average of 12 regions. This step is relatively simple, so I calculated them using the formula directly in the table, and the specific file have been uploaded to "the relative change" folder of the cloud storage. We added the description at Lines 180-184: "**In addition, the relative change is used in this study to represent the variation of fire characteristics in a region relative to all 12 regions (Eq.1).**

$$\mathbf{RC} = (\boldsymbol{k_i} - \boldsymbol{f_i})/\boldsymbol{f_i} \quad \textbf{(1)}$$

where RC represents the relative change, k_i represents the mean of variable i in one region, and f_i represents the mean of variable i in 12 study regions.".

Minor:

Line92: What does the "West Bank of the United States" mean? Do you mean "the Western United States"?

Sorry for the confusion. We have corrected it to "**the West Coast of the United States**".

Line 99-105: The authors stated here that "model simulation results are likely more inaccurate than the observational data". However, the data used from GFAS in this paper is also modeled data. This is confusing.

We agree and thank the reviewer's comment. To avoid ambiguity, we modified the description are Lines 93-95: "**Meanwhile, the information regarding the emissions of various compounds caused by fires still has great uncertainty (Zhang et al., 2016; Zheng et al., 2021)**.". We chose GFAS in this study because it calculates biomass burning emissions by assimilating Fire Radiative Power (FRP) observations from the MODIS instruments onboard the Terra and Aqua satellites. It corrects for gaps in the observations, which are mostly due to cloud cover, and filters spurious FRP observations of volcanoes, gas flares and other industrial activity.

Line 210-212: Please consider including the Mann-Kendall (M-K) statistical test and Sen's slope results if applicable. This suggestion applies to the rest of the analysis.

We thank the reviewer for the comment. The Mann-Kendall (M-K) statistical test and Sen's slope method are important tools for geosciences spatial analysis, which are mainly used to identify and judge the trend changes and differences under the spatial distribution of research objects. It is not very suitable to only consider the relatively clear trend change analysis of fires at a time scale, such as shown in Fig. 1 and Fig. 4. Therefore, we have not conducted repeated analysis of this part for the time being, but thank the reviewer for the suggestion.

Line 213-214, 231-234: Please rephrase the sentences like Line 249-250 when compared to other studies.

We have corrected them.

Line 340: Typo "Since" instead of "Science".

Sorry for the typo and we have corrected it.