Referee 1:

This study compared six widely-used fire emission products and merged them using the three-cornered hat method (TCH). A new global fire emission dataset, FiTCH, was developed to quantify the fire emissions between 2001 and 2021. Fire emissions in different regions and biomes were derived and analyzed. The impact of drought on fire emissions was also evaluated. This study is timely and valuable as global climate change is expected to cause more frequent extreme events, such as extreme droughts and fires. Figuring out the uncertainties of the existing fire emission products and producing accurate fire emission data are important for global climate change analysis. Overall, this manuscript is solid and well-structured. However, the descriptions of some important points are inadequate. I suggest an accept after addressing the concerned and comments below.

Thanks for your valuable suggestions. We have improved our manuscript accordingly. Please refer to the point-to-point responses below.

Comments:

1. In Section 2.3, the impact of drought on fire emissions was quantified, which helped to illustrate the influence of drought on fire. Can the authors also analyze the effects of different drought severity? For example, -3 < PDSI < -2, -4< PDSI < -3, and PDSI < -4 usually indicate moderate drought, severe drought, and extreme drought, respectively. The fire emissions might change under different drought severity. Maybe add this extra analysis to the supplementary material.

We added a supplementary Figure S3 (shown below) to illustrate the effects of drought severity on fire emissions. Higher drought severity (e.g. extreme drought) did contribute to larger fire emissions in Boreal forests, TROPICS, Temperate forests, and Tundra. For GRASS, extreme drought caused larger decreases in fire emissions.

Please also refer to line 286 in the revised manuscript.

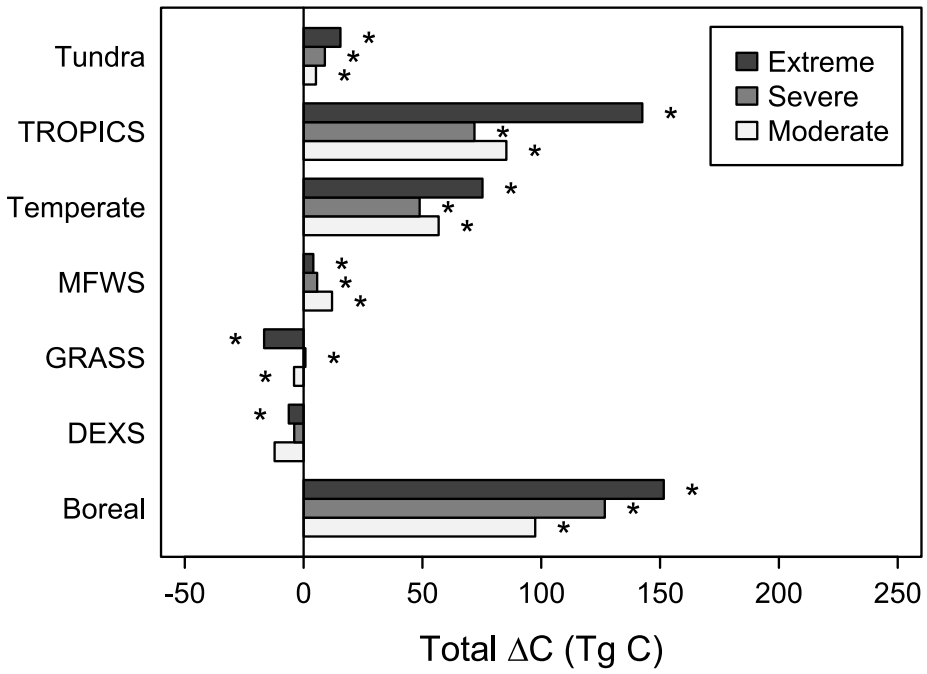

Figure S3. The impacts of drought severity (moderate, severe, and extreme drought) on fire emissions, where the asterisk indicates significant ($p < 0.05$). For extreme drought, the difference between average fire emissions (ΔC) in extreme drought (PDSI < -4) years and non-drought years was calculated following the procedure in Eq. (8). The ΔC values for severe (-4< PDSI < -3) and moderate (-3 < PDSI < -2) droughts were also calculated using Eq. (8). Total ΔC was the sum of ΔC from the available 0.1° pixels. Some pixels might not have extreme drought years, and they were not considered when analyzing extreme drought. 1 Tg = 1000 Gg.

2. In Section 3.5, the correlations between fire emissions and temperature were described. However, only the RETRO data and the proposed FiTCH data were used. Can the authors also analyze the relationships between the six fire emission products and the temperature? For example, use a scatterplot for each product like Figure S3, with the x axis and the y axis for temperature and fire emissions, respectively. This analysis may also go to the supplement. Otherwise, Figure 8 will be too large.

We added the correlations between the six fire emission products and the temperature to supplementary Figure S4, which was shown below. The results were comparable to those shown in Figure 8, where fire emissions were decoupled from temperature (negatively correlated or not correlated) in the past two decades.

Please also refer to line 306 in the revised manuscript.

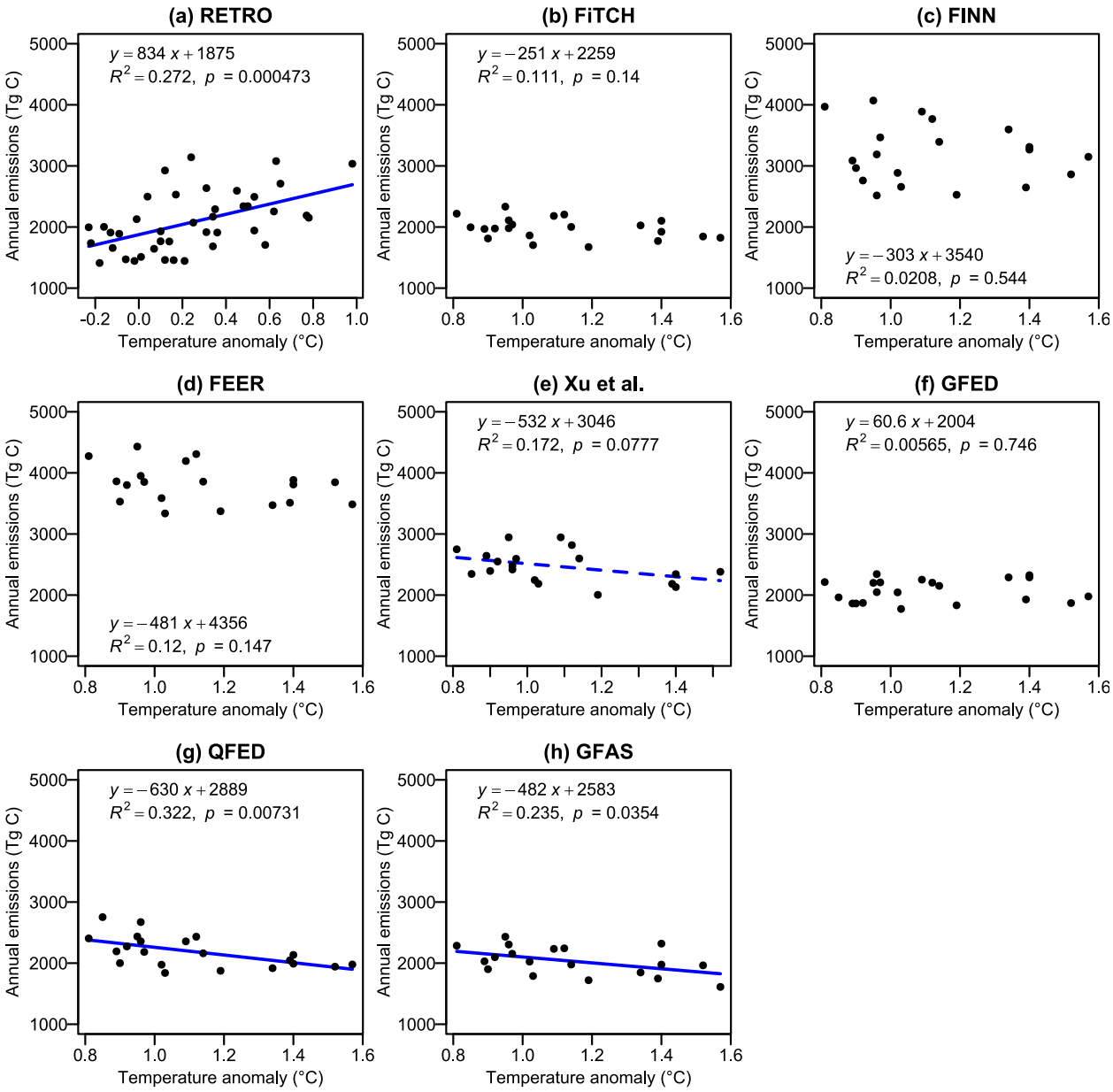

Figure S4. The correlation between temperature anomalies and annual fire emissions using the (a) RETRO (1960–2000), (b) FiTCH (2001–2021), (c) FINN (2002–2021), (d) FEER (2003–2021), (e) Xu et al. (2001–2019), (f) GFED (2001–2021), (g) QFED (2001–2021), and (h) GFAS (2003–2021). The blue lines are the regression lines (solid lines and dashed lines indicate $p < 0.05$ and $p < 0.1$, respectively).

3. The manuscript used the term “the three-corner hat”, however, it is more common to use “the three-cornered hat”. Maybe revise the term to make it consistent with the current literature.

We revised the term to “the three-cornered hat” throughout the manuscript. Please refer to line 1, line 10, line 72, and line 140 in the revised manuscript.