

Reviewer -2

Response to Reviewer-2

The current manuscript titled “**Emissions of Methane from Coal, Thermal power plants and Wetlands and its implications on Atmospheric Methane across the South Asian Region**” by Mahalakshmi et al., carried out a detailed study on atmospheric column CH₄ using the satellite data and bottom-up emission inventory data. This work is well executed and importantly carried out an extensive analysis over different source type of methane which is an important approach. The content is well-written and structured. The study looked into the effects of changes Emissions of Methane from Coal, Thermal power plants and Wetlands and its implications on Atmospheric Methane across the South Asian Region. Author (s) could use potentially the S5P/TROPOMI observations to map the point level sources. The present study has many important points in which it highlights the emission source versus concentrations in the IGP region. Also they carried out methane emissions variability in the agroclimatic zones. Therefore, I believe this paper may be accepted with the following minor corrections.

Reply: Thank you for the overall comments and positive feedback provided from the present study. All the comments provided by you are addressed in the revised manuscript line-by-line.

1. In the title capitalisation of every letter of the word may not be required.

Reply: Thank you for the suggestion. The title is modified as “Emissions of methane from coal, thermal power plants and wetlands and its implications on atmospheric methane across the South Asian region” and same has been updated in the revised manuscript.

2. 205: Is there any references supporting this statement “higher concentrations of CH₄ were observed in the Indo-Gangetic Plain (IGP) and northwest (NW) areas of India, southeast of China, and NW of China. Southern China and north China are marked with wetlands and rice paddy fields, which are the primary sources of CH₄”

Reply: Thank you for the suggestion. The references supporting the above statement are (Kavitha et al., 2018; Chandra et al., 2019; Guo et al., 2023).The same has been updated in the revised manuscript.

3. Figures 5c adjust the x axis scale accordingly with the Fig. 5(a) and (b).

Reply: Figures 5a-c shows the monthly time series of XCH₄ over the specific sources of CH₄ plotted in the Indian region during 2009 to 2022 along with the overall growth rate at the respective site from 2009 to 2022. The revised figure is updated with 2021 and 2022 data and x axis scale is made uniform for the figures 5a,b,c.

4. There is a typo in the caption of Figure 7, indi. “Figure 7. S5P/TROPOMI XCH₄ gridded to 0.05° × 0.05° over Indi and XCH₄ over wetland, coal, and thermal power plant sites with a radius of 100 km”

Reply: The typo in the caption of Figure 7 is corrected as below

Figure 7.S5P/TROPOMI XCH₄ gridded to 0.05° × 0.05° over Indian region and XCH₄ over wetland, coal, and thermal power plant sites with a radius of 100 km.

5. Significant high emissions of CH₄, as shown in Figure 7c, but there is no Figure 7c it is missing.

Reply: The figure in section 4.3 is figure 9c instead of figure 7c and the same has been corrected in the revised manuscript.

6. Figures 7 and 8 are described differently than their respective figures. Furthermore, the description of Figure 8 comes before that of Figure 7.

Reply: Thank you for the comment. The figures numbers were wrongly written in the text of the manuscript. Figure 7 shows the continuous XCH₄ data from S5P/ TROPOMI complementing the GOSAT efforts instead of figure 8 which was written in the manuscript. In section 4.3, significant high emissions of CH₄ as shown in figure 9c, instead of figure 7c which was written in the manuscript. The figures numbers were corrected in the revised manuscript.