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# Comment on acp-2021-317

Anonymous Referee #1

Referee comment on "Measurement report: Regional characteristics of seasonal and long-term variations in greenhouse gases at Nainital, India, and Comilla, Bangladesh" by Shohei Nomura et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-317-RC1, 2021

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Measurement report: Regional characteristics of seasonal and long-term variations in greenhouse gases at Nainital, India and Comilla, Bangladesh

This manuscript presents important observation data for major GHGs from the northern Indian region. The weekly flask samples taken at a northern Indian station (Nainital, NTL) and a Bangladesh station (Comilla, CLA) for 2006-2012 were analyzed for the atmospheric concentrations of CO2 (and d13C-CO2, d18O-CO2), CH4, CO, H2, N2O and SF6. Authors discussed their seasonal variabilities considering regional climate conditions and contributions of regional sources and sinks. This study expanded the GHGs datasets for the Indian subcontinent, which is one of the most important regions in terms of the GHGs global budget, and thus provides new information about the regional characteristic features of major GHGs. This paper contains significant material and merits publication in Atmospheric Chemistry and Physics. The following comments will be considered for minor revision.

Specific comments:

- Authors use 10-day average values to calculate a long-term trend and a smooth fit. And the seasonal variabilities were based on the deviation of a 10-day mean from the long-term trend curve. Were those 10-day means determined from a 10-day “moving” average? Can you explain why the 10-day means were used? Actually weekly raw data used for 10 day averaging are only one or two, and thus original data features might be

misled due to this averaging of inconsistent number of data.

- For Fig. 4, the atmospheric CO2 concentrations at NTL and CLA were compared with those from two background stations, and seasonal high values in August-October were explained by influence of air masses passing over the Indo-Gangetic plain. In addition, other noticeable features for CLA are ca. 20 ppm higher CO2 concentrations peaks shown above the smooth fit, and the corresponding lowest d13C-CO2 values, which periodically appeared at the beginning of each year. Air mass trajectory analysis for those data points and appropriate explanations for those distinctive values need to be added.
- For the CO2 growth rates in Fig. 5, the observations at the Cape Rama (CRI) station on the western coast of India can be compared with those for NTL and CLA because CRI represents the SH regional background site.
- Line 378-379: the long term trend of d18O-CO2 at CLA (Fig. 8b) seems to decrease, and authors suggested the amount effect of precipitation increase. But d18O-CO2 of CLA in Fig. 8f doesn't seem correlated well with precipitation amount.
- Fig. 9a showed that the pollution signals of CH4 concentrations at CLA increased after 2018. The increases are more noticeable in 2019-2020. If there is any possibility of recent changes in rice field area, could the observed change in CH4 pollution concentrations be related with the increased rice cultivation in this region?
- Line 137: move "by MT-252" (Air d13C-CO2 and d18O-CO2 were measured by MT-252 using….)