Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Influence of meteorology and interrelationship with greenhouse gases (CO$_2$ and CH$_4$) at a sub-urban site of India" *by* G. Sreenivas et al.

Anonymous Referee #1

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General comments: Atmospheric greenhouse gases (GHGs) are important climate forcing agents and have significant impacts on global climate. This study brings outs first continuous measurements of atmospheric GHGs (CO2 and CH4) using high precision Los Gatos Research's-greenhouse gas analyser (LGR-GGA) over Shadnagar, a suburban site of Central India during the period of 2014. The authors also investigate the influences of meteorology on GHGs and their interrelationship. It is useful to estimate quantitatively the radiative effects of GHGs on regional or global climate change. Obviously, there are numerous grammatical and technical errors in the manuscript. This paper is reconsidered to be acceptable and published after major revisions.

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Specific comments: (1) Abstract, lines 1-18: "Atmospheric greenhouse gases (GHGs) such as carbon dioxide......It implies the seasonal variations in source-sink mechanisms of CO2 and CH4. Present study also confirms implicitly the presence OH radicals as a major sink of CH4 over the study region". âĞŠ This study aims to analyze the seasonal variations of CO2 and CH4 over a suburban site of Central India and investigate the influences of prevailing meteorology (e.g., air temperature, wind speed, wind direction, relative humidity, boundary layer height) on GHGs and their interrelationship. The manuscript also reveals that biomass burning (forest fire and crop residue burning) has a role in pre-monsoon enhancement of CO2 over study site (Page 34219, lines 4-17). And the air mass trajectories of crops agriculture residue burning in the NW and NE regions part of India can reach the study site at different altitudes during post-monsoon to early pre-monsoon (Page 34220, lines 1-5). Therefore, in order to investigate the exact influences of prevailing meteorology on GHGs, the CO2 contributions of regional biomass burning and long range transport should be excluded from the CO2 measurements. Otherwise, many conclusions in present study make no sense.

(2) "4.6 Influence of vegetation on GHGs", Page34218, lines 25-28 and Page34219, lines 1-3: "The main source for CH4 emissions are soil microbial (Kirschke et al., 2013) activity which are more active during monsoon and post monsoon seasons......The predominating factors which control the soil emissions of CO2 and CH4 are moisture content, soil temperature, vegetation and soil respiration (Smith et al., 2003; Jones et al., 2005; Chen et al., 2010) respectively." âĞŠ So, we recommend strongly that the authors add and discuss the possible influences of soil parameters (such as, moisture content, soil temperature, vegetation and soil respiration) on GHGs and their interrelationship in the manuscript. And we believe that the authors would acquire many interesting findings.

(3) Page 34212, lines 6-9: "Enhancement in pre-monsoon is due to higher temperature and solar radiation prevailing during these months which stimulate the assimilation of

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CO2 in the daytime and respiration in the night (Fang et al., 2014)" âĞŠ As discussing in the later section (4.6 and 4.7), quantitative contributions of regional biomass burning and long range transport to atmospheric CO2 concentration at the study site are very important to the interpretation of enhancement CO2 in pre-monsoon.

(4) Figure 3 to Figure 5: The authors study the interrelationships between monthly mean meteorology and GHGs. We suggest that the authors add the interrelationships between daily mean meteorology and GHGs, whether it is the same variation with monthly mean? If not, what is about for daily average?

Minor comments: (1) Title: "Influence of meteorology and interrelationship with greenhouse gases (CO2 and CH4) at a sub-urban site of India" âĞŠ Change "sub-urban" to "suburban", and modify the other places in the whole manuscript. (2) Abstract, Page 34206, lines 2-4: "Atmospheric greenhouse (GHGs) such as carbon dioxide (CO2) and methane (CH4) are important climate forcing agents due to their significant impact on the climate system." âĞŠ Change to "Atmospheric greenhouse (GHGs), such as carbon dioxide (CO2) and methane (CH4), are important climate forcing agents due to their significant impacts on the climate system." (3) Abstract, Page 34206, line 5; Page 34207, line 24; Page 34208, line 7: change "GHG's" to "GHGs", and modify the other places in the whole manuscript. (4) Abstract, Page 34206, lines 6-8; Page 34220, lines 10-11: "The annual mean of CO2 and CH4 over the study region is found to be 394±2.92 and 1.92±0.07 ppm (mean, ïA■±1SD, ïAş) respectively." âĞŠ Change to "The annual mean CO2 and CH4 over the study region are found to be 394±2.92 ppm and 1.92±0.07 ppm (mean±standard deviation, ïA■±1ïAş) respectively." (5) Abstract, Page 34206, line 8, line 14; Page 34220, line 11: change "showed" to "show" and keep the consistency in the manuscript. (6) Abstract, Page 34206, lines 14-16: "CO2 and CH4 showed a strong positive correlation during winter, pre-monsoon, monsoon and post-monsoon with R equal to 0.80, 0.80, 0.61 and 0.72 respectively." âĞŠ Change to "CO2 and CH4 show a strong positive correlation during winter, pre-monsoon, monsoon, and post-monsoon with correlation coefficients (Rs)

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equal to 0.80, 0.80, 0.61, and 0.72, respectively." (7) Abstract, Page 34206, lines 17-18: "Present study also confirms implicitly the presence OH radicals as a major sink of CH4 over the study region." âĞŠ Change to "Present study also confirms implicitly the presence hydroxyl radicals (OH) as a major sink of CH4 over the study region." (8) Page 34206, line 21: change "globalwaming" to "global warming" (9) Page 34206, lines 22-24: "CO2 and CH4 concentrations have increased by 40 and 150âĞŠ Change to "CO2 and CH4 concentrations have increased by 40Please add the citation of Huang et al., 2015 in the manuscript: Huang J.*, Yu H., Guan X., Wang G. and Guo R., 2015: Accelerated dryland expansion under climate change, Nature Climate Change, doi:10.1038/nclimate2837.

(10) Page 34207, line 3: change "constitutes" to "constitute" (11) Page 34207, line 6: delete "that" (12) Page 34207, line 8: change "andecosystems" to "and ecosystems" (13) Page 34207, line 13: change "the part of the atmosphere" to "part of the atmosphere" (14) Page 34207, line 14: change "donimatethe" to "dominate the" (15) Page 34208, lines 5-7: "Major source of pollutants over Shadnagar can be from small and medium scale industries, biomass burning and bio-fuel aswell as from domestic cooking." âĞŠ Change to "Major sources of pollutants over Shadnagar can be from small and medium scale industries, biomass burning and bio-fuel as well as from domestic cooking." (16) Page 34208, lines 11-12: "Mean monthly variations of temperature (âĎČ) and RH (âĞŠ Change to "Monthly mean variations of temperature (âĎČ) and relative humidity (RH, (17) Page 34208, line 16: Change "Relative humidity (RH) in Shadnagar reached a maximum of 82(18) Page 34209, lines 17-21: "In the present study we used GGA retrieved CO2 and CH4 data. High resolution data are diurnally averaged and is used in further analysis. Due to failure of internal central processing unit (CPU) of the analyzer data is not recorded from pre-monsoon month of May to a few days in June during the study period." âĞŠ Change to "In the present study we used GGA to retrieve CO2 and CH4 data. High resolution data sets are diurnally averaged and used in further analysis. Due to failure of internal central processing unit (CPU) of the analyzer, data are not recorded from pre-monsoon month of May to

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a few days in June during the study period." (19) Page 34209, lines 23-25: "Surface concentrations of O3 and NOX have been measured continuously using on-line analyzers Model No.s: 49i and 42i for O3 and NOX respectively, procured from Thermo Scientific, USA) since July 2014." âĞŠ Change to "Surface concentrations of O3 and NOX have been measured continuously using on-line analyzers (Model No.s: 49i and 42i for O3 and NOX respectively), procured from Thermo Scientific, USA since July 2014." (20) Page 34210, lines 2-3: "The NOx analyzer utilizes a molybdenumconverter to convert NO2 into NO and estimates the NOx concentration..." âĞŠ Change to "The NOx analyzer utilizes a molybdenum converter to convert NO2 into NO and estimate the NOx concentration..." (21) Page 34210, line 5: change "zero and span calibration" to "zero and span calibrations" (22) Page 34210, line 7: change "an automatic weather stations (AWS)" to "an automatic weather station (AWS)" (23) Page 34210, line 13: change "of 250, 500 m, and 1 km" to "of 250 m, 500 m, and 1 km" (24) Page 34211, lines 7-8: "Geophysical parameters like temperature and humidity profiles have been simultaneously obtained from..." âĞŠ Change to "Geophysical parameters (such as, temperature and humidity profiles) have been simultaneously obtained from..." (25) Page 34212, lines 1-2: "Background (average) values of CO2..." âĞŠ Please add "How to define or calculate background average values of CO2..." (26) Page 34212, line 3: change "and 392±7.0 and 393±7.0 ppm with respectively winter, pre-monsoon, monsoon and post-monsoon." to "392±7.0, and 393±7.0 ppm respectively with winter, pre-monsoon, monsoon, and post-monsoon." (27) Page 34213, line 4: change "Figure 2c and d depicts" to "Figure 2c and 2d depict" (28) Page 34213, line 6: change "such as land use land cover change" to "such as land use and land cover change" (29) Page 34213, line 26: change "while a not so significant correlation suggest the influence of regional transport" to "while a not so significant correlation suggests the influence of regional transport" (30) Page 34214, lines 1-5: "Figure 3a and b shows scatter plot between GHG's and wind speed during different seasons. Analysis of Fig. 3b shows that there exist an inverse correlation between monthly mean wind speed and GHG's. Correlation coefficient (R) between wind speed and CO2 during pre-monsoon, monsoon,

post-monsoon and winter is 0.56, 0.32, 0.06 and 0.67 respectively." âĞŠ Change to "Figure 3a and 3b show scatter plot between GHG's and wind speed during different seasons. Fig. 3b shows that there exists an inverse correlation between monthly mean wind speed and GHG. Correlation coefficients (Rs) between wind speed and CO2 during pre-monsoon, monsoon, post-monsoon, and winter are 0.56, 0.32, 0.06, and 0.67, respectively." (31) Page 34214, line 16: change "The meteorological parameters (temperature and relative humidity) influenceon trace gases" to "The influence of meteorological parameters (temperature and relative humidity) on trace gases" (33) Page 34214, line 18: change "shows the scatter plot of temperature vs. relative humidity" to "show the scatter plot of temperature versus relative humidity" (34) Page 34214, line 19: change "Hence, dailymean data" to "Hence, daily mean data" (35) Page 34215, line 17: change "An average monthly air temperature" to "A monthly average air temperature" (36) Page 34216, line 1: change "between hourly averaged CO2 and CH4 during all season" to "between hourly average CO2 and CH4 during all seasons" (37) Page 34216, line 21: change "is" to "are" (38) Page 34217, lines 3-6: "Atmospheric CH4 is mainly (70-80âĞŠ Hence, it is very essential to discuss the possible influences of soil parameters (such as, moisture content, soil temperature, vegetation and soil respiration) on GHGs and their interrelationship in the manuscript. (39) Page 34218, lines 20-21: change "..is calculated from daily day time (10:00-16:00 LT) mean." to "..is calculated from daily mean in day time (10:00-16:00 LT)." (40) Page 34219, line 19: change "To understand the role of long range circulation we separated the trajectory into 4 clusters" to "To understand the role of long range circulation, we separated the trajectory into 4 clusters" (41) Page 34220, lines 20-22: "Correlation coefficient (R) between wind speed and CO2 during pre-monsoon, monsoon, post-monsoon and winter is 0.56, 0.32, 0.06 and 0.67 respectively. While for CH4 it is found to be 0.28, 0.71, 0.21, and 0.60 respectively." âĞŠ Change to "Correlation coefficients (Rs) between wind speed and CO2 during pre-monsoon, monsoon, post-monsoon and winter are 0.56, 0.32, 0.06, and 0.67, respectively. While CH4 are found to be 0.28, 0.71, 0.21, and 0.60, respectively." (42) Page 34232: "Figure 1. b to e represent the seasonal vari-

ations of wind direction, wind speed, relative humidity, and air temperature.", please keep the consistencies with the context (Page 34208, line 11; lines 18-19). And please add the different symbols of monthly mean variations of prevailing meteorology from Fig. 1b to 1e. (43) The following related citations are recommended to be quoted in the manuscript: [1] Huang, J.*, W. Zhang, J. Zuo, J. Bi, J. Shi, X. Wang, Z. Chang, Z. Huang, S. Yang, B. Zhang, G. Wang, G. Feng, J. Yuan, L. Zhang, H. Zuo, S. Wang, C. Fu and J. Chou, 2008: An overview of the Semi-Arid Climate and Environment Research Observatory over the Loess Plateau, Advances in Atmospheric Sciences, 25(6), 1-16. [2] Wang, G., J. Huang*, W. Guo, J. Zuo, J. Wang, J. Bi, Z. Huang, and J. Shi, 2010: Observation analysis of land-atmosphere interactions over the Loess Plateau of northwest China, J. Geophys. Res., 115, D00K17,doi:10.1029/2009JD013372. [3] Xie J., J. Huang*, G. Wang, K. Higuchi, J. Bi, Y. Sun, H. Yu, and T. Wang, 2010: The effects of clouds and aerosols on net ecosystem CO2 exchange over semi-arid Loess Plateau of Northwest China, Atmos. Chem. Phys., 10, 8205-8218.

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