

Comments on “Towards monitoring CO₂ source-sink distribution over India via inverse modelling: Quantifying the fine-scale spatiotemporal variability of atmospheric CO₂ mole fraction”

Vishnu Thilakan, et al., ACP (under review)

This is a very interesting and timely paper for the regional carbon cycle and flux inversions. The authors have focused to obtain representative errors in the models leading to significant errors in the source/sink estimations in the inversions. Notably, they have quantified that these REs can be as large as 9 ppm which is well above the observational uncertainty and as comparable to enhancement at any point source region.

Unfortunately, the study fails to acknowledge recent other similar studies in the Indian flux inversions. To be specific, Nalini et al., (2019) quantified the potential uncertainty reduction achievable by using data from existing tower-based observations over India. Moreover, they also have proposed 17 new stations spread across various parts of India and put forward this important recommendation to initiate observations to benefit Indian flux inversions especially when satellite constellations fail to capture Indian footprints during the heavy rainy season. A large ensemble of particle trajectories and Bayesian inversions with incremental optimization is done in their OSSE work. It is pity that the authors fail to discuss this paper in their work.

Tiwari et al, (2013), Ravi Kumar et al., (2016) also discussed the atmospheric concentration variability over India at seasonal and intra-seasonal scales. The authors also discuss the similar RE variation at seasonal and inter-monthly scale due to changes in meteorology. Therefore the above papers should be mentioned in this context.

References

Nalini, K., S. Sijikumar, Vinu Valsala, Yogesh K. Tiwari, Radhika Ramachandran, 2019, Designing surface CO₂ monitoring network to constrain the Indian land fluxes, Atmospheric Environment 218 2019. 117003, <https://doi.org/10.1016/j.atmosenv.2019.117003>, 28 Sept., 2019

Ravi Kumar K., Valsala V., Yogesh K. Tiwari*, Revadekar J.V., Pillai P., Chakraborty S., Murtugudde R., 2016, Intra-seasonal variability of atmospheric CO₂ concentrations over India during summer monsoons, *Atmospheric Environment*, 142, October 2016, ISSN:1352-2310, DOI:10.1016/j.atmosenv.2016.07.023, 229-237

Yogesh K. Tiwari, Vinu Valsala, Ramesh K. Vellore, Ravi K. Kunchala, 2013, Effectiveness of surface monitoring stations in capturing regional CO₂ emissions over India. *Climate Research*, Vol. 56: 121–129, 12 March 2013, ISSN 1616- 1572, DOI: 10.3354/cr01149