

Comment on **essd-2022-33**

Anonymous Referee #2

Referee comment on "Methane, carbon dioxide, hydrogen sulfide, and isotopic ratios of methane observations from the Permian Basin tower network" by Vanessa C. Monteiro et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-33-RC2>, 2022

General comments:

Monteiro et al. present the core elements of a new in-situ network, which was established to monitor atmospheric CH₄, CO₂, H₂S and d¹³CH₄ in the Permian Basin. They detail: station design, instruments used, measurement and calibration procedures as well as data processing and flagging rules in detail. The dataset is made publicly available and the manuscript also includes a first order analysis of results, discussing relevant quantities such as diurnal cycles for each season, intra-network mixing ratio gradient changes over time as well as the relationship between site level CH₄ mixing ratios and meteorological conditions. Overall, the manuscript is well-written and sections are clearly structured. This manuscript fits well within the scope of ESSD and should be considered for publication after some minor and technical comments have been addressed.

Specific and technical comments:

L14: change to 'species'

L17: suggest to change to: 'prior *to* deployment' or 'before deployment'

L24: Which tower are you referring to here? There are multiple towers in this network.

L31: change to CO₂

L34: please consider clarifying this statement/ How much reduction would be considered 'dramatic' 50%, 80%? What does 'near-term' mean here? 1 year, 10 years, 50 years?

L47: consider clarifying what 'these basins' refers to here

L72: This is a good summary of different O&G monitoring techniques. However, you only mention Lin et al. 2021 for in-situ monitoring, while Chan et al. 2020, preceded this work and demonstrated the ability of in-situ monitoring to be used to quantify CH₄ emissions for the Western Canadian Sedimentary Basin spanning Alberta and Saskatchewan:
<https://pubs.acs.org/doi/abs/10.1021/acs.est.0c04117>

L110, figure 1: please add a symbol indication the location of Lea County Regional Airport or give an indication of its distance from the HOBBS site. Please also update the labels of the 5 tower sites to match the manuscript (all uppercase letters). Furthermore, please consider adding information about the facility (e.g. O&G wells) locations or other CH₄ emission priors to sub-figure (a) or at least refer to figure 7 here. It is very hard to judge if the network locations is suitable without knowing where emissions are to be expected.

L125, table 1: please add the data of the move/re-install of CARL station in the Install data column.

L189: Presumably the d13CH₄ data is reported on the VPDB scale or some equivalent?

L268: Please elaborate, what are 'hourly composites'? Are you referring to the average, median, mode of the measurement distribution gathered within one hour?

L299: Consider adding the information on local time (especially for non-US readers), i.e. what is 20 – 23 UTC in LT?