General comments:

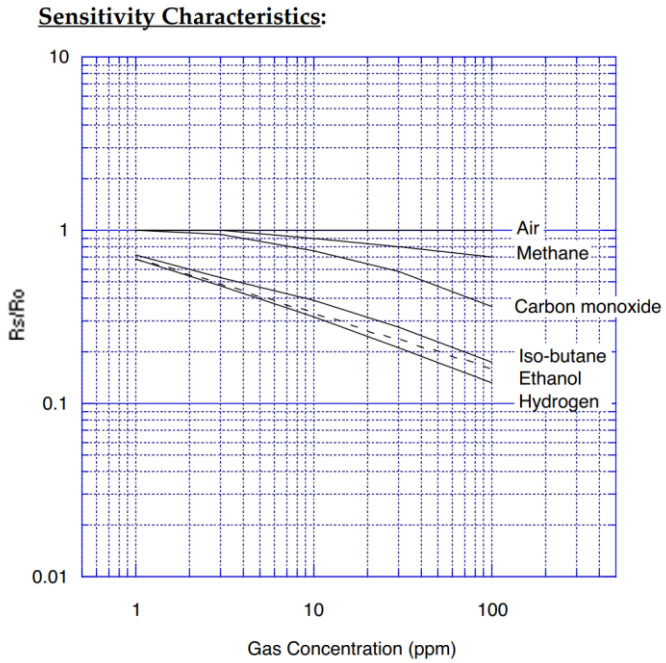
This paper gives a good test on low cost sensors in detecting CH4 leakages. Using reference instruments, statistics models and atmospheric inversions, this study obtained relatively good results on methane concentrations and then the emissions rates, showing the promising use of such sensors. I think this study falls in the scope of AMT, but the MS needs further substantial revisions for potential publication in this journal.

Major comments:

1. Line106-107 showed that inversion errors from high precision measurements are 23-30% and 8-10m, and inversions from low-cost sensors can reach the same level in the abstract (25%, 9.5m), why is this? And the authors need to point these out in the abstract, which are associated with L336-337 and L410-412: "highlighting the higher impact of the model error on the inversion than the reconstruction error of CH4 mole fractions". Without high precision instruments (e.g. the background information), can this be achieved? Add the role of high precision instruments in the abstract. Since performances of inversions are associated with wind conditions, the applications are also have

such limitations, which should be pointed out.

2. Add limitations and conditions of this method and implications of this study in the abstract;
3. Line 140-141 reported that 2600 are useless, but there are reports that they are useful e.g. in Eugster et al., 2020 (AMT) , and it needs more discussions on Rs/R0 ratio, which is sensitive to methane (10-100ppm) from 0.7-1.0 in the datasheet (see below figure), and also R_L;



4. The writing and expression need substantial improvements. And many parts are very hard to follow. The manuscript needs to be polished by an experienced language editor, to thoroughly improve the fluency and remove grammar errors;
5. Discuss why E00 is bad compared with C00, e.g. in Fig.4 and 7;
6. Add designs, and photos on low-cost sensor instrument;

7. I suggest the authors provide spatial distributions of simulations and inversions for typical cases, e.g. to show the real emission sources and the inversed sources and their distances.
8. I recommend the authors to make the inversion code publicly available to improve the wide influences and applications of this study.

Minor comments:

Add regression coefficients (slope, intercept and p value) in all related figures (e.g. Fig.5-6; Fig. A4-A12) that are statistically significant.

Figure 4: Add scatter plots (and coefficients) of the corrected and reference data.

Line99: participate in;

Line100-101: ambiguous for "for the estimation of … based on …high precision", better to separate this for another sentence? "And the TRACE program is …";

L112: consist of doing is better to be changed to consist of sth.

L115: You may mean "connected **to an upstream chamber which holds** the high precision instruments…"

L116: (Picarro ~~CRDS~~ or LGR), or provide specific type;

L122: better to use the datasheet parameter: "less than 3 ppb per

month”

L124-127: hard to follow, needs to be rewritten in short sentences;

L129: redundant, combine sensors: “the CH_4 and environmental sensors”

L131: two ~~sensors~~ other sensors;

L134-135: add “**a”** ···ADC board ;··· change “recorded” to records

L146: Why they are used in the training of models?

L217: We use**d**

L219 and 222: presente**d**

L220: the unit of hmax is ppm? And thus the NRMSE is dimensionless?

L244: change “are” to “were”

L245: **T**able 4

L275-276: how long is the typical time decay?

L316: discuss a bit on why

L333-335: redundant and a bit ambiguous

L340, 348: comply with the journal requirements on capitals of figures and keep consistency through the text (Figure A14 and fig 9a).

L366-372: These contents seems to be more suitable for conclusion

L431-433: The study of how many sensors are needed and the layout of these sensors are also needed.