



EGUsphere, author comment AC2  
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## Reply on RC2

Rona L. Thompson and Ignacio Pisso

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Author comment on "A flexible algorithm for network design based on information theory" by Rona L. Thompson and Ignacio Pisso, EGU sphere, <https://doi.org/10.5194/egusphere-2022-213-AC2>, 2022

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### Comment

*The manuscript "A Flexible Algorithm for Network Design Based on Information Theory" by Thompson and Pisso describes the development of a novel method for optimising the distribution of a measurement network, with the aim of maximising the information content provided by these measurements for a flux inversion. Previous methods, usually based on quantifying the posterior uncertainty of the inversion, were computationally expensive but the metric presented here should be more efficient. The new method is applied to improving the current European measurement network for CH<sub>4</sub> and CO<sub>2</sub> through inclusion of isotopic measurements at a subset of locations. The paper is well-written and presented, with thorough explanation of the methodology and clear figures. The new method appears to provide a justifiable technique for network design.*

*My only significant comment is that the discussion of the results of the new method in the context of previous methods is very brief. The results are compared to those using the clustering-based selection discussed earlier in the text, which is based on discounting sites with similar observed signals. However, there is no comparison of the merits of the new method compared to those based on posterior uncertainty. Whilst, for computational reasons, I understand that the authors might not want to explicitly perform such an analysis for direct comparison, I do think that there needs to be some further discussion of the potential differences, advantages and disadvantages of the new method compared to the the full range of alternative methods. If the last sections are expanded to include such discussion, I am happy to recommend this manuscript for publication in this journal.*

### Response

We thank the reviewer for his/her thoughtful comments. We have expanded the Discussion section to include a comparison of the information content metric with the posterior uncertainty metric for the example of CH<sub>4</sub> fluxes. This was also included in response to a comment by reviewer 1.

### Minor/technical comments

*line 30: brackets around reference year*

*line 70: slightly unclear. heterogeneity in terms of flux?*

*figure 1: It would be good to also mark the locations of the sites that were not selected by the algorithm in Figure 1. I appreciate that they are shown in a later figure, but it is easiest for the reader, and would aid comprehension of Fig. 1, if they are noted earlier than later.*

*figure 5: Is it possible to say anything in the main text concerning why the two sites located very close to each other in France might have been selected using this method?*

## **Responses**

L30: done

L70: Actually it is the heterogeneity of the atmosphere, we now specify this.

Figure 1: We now include both locations of unselected and selected sites in Fig. 1 for CH<sub>4</sub> and Fig. 4, the equivalent figure for CO<sub>2</sub>.

Figure 5: The two French sites are SAC (Saclay, located just south of Paris) and TRN (Trainou, located approximately 95 km south of SAC). The two sites have slightly different footprints with SAC sampling more the Paris region and TRN sampling more to the south and east. For this reason, and considering the fairly large emissions from these regions of France, both sites are selected. However, the choice of TRN is somewhat dependent on the set-up, e.g. if the fluxes are only resolved annually, then TRN is no longer selected but rather HPB, which also indicates that the information from selecting this site is similar to that of some other candidate sites (i.e. HPB). We have now included this explanation in the last paragraph of section 3.2.