

Review of “Review of Hammer et al: Assessment of a multi-species in-situ FTIR for precise atmospheric greenhouse gas observations” for publication in Atmospheric Measurement Techniques

This paper describes in detail, the operation, layout and performance of a continuous and precise FTIR trace gas measurement system for CO₂, CH₄, CO, N₂O and ¹³C of CO₂. The authors clearly characterize all dependences of the system in order to meet the WMO inter laboratory compatibility requirements. The authors present findings on the long and short term stability of the system, sensitivities of the system due to flow, temperature and pressure fluctuations and cross sensitivities of the analyzer to water and CO₂. The paper describes calibration requirements and stability of the system using a surveillance tank of known concentrations. The authors make a compelling case of the suitability of this system for use in national and international observational network systems such as ICOS (Europe’s integrated carbon observing system) to measure atmospheric GHG levels for use in global carbon cycle understanding and greenhouse gas emission studies.

Overall the paper is very well written and the presentation of the scientific methods is organized. The results clearly support the interpretation. The existing literature is adequately cited. The work is most relevant for publication in the AMT special Issue and I highly recommend publication.

General Comments:

I find the abstract to be extremely thin and lacking in detail. The paper is a laborious read and important details will be difficult to extract for a reader glancing through its content. I can appreciate that these findings and the associated specific details are important for inclusion in an “instrumental type” manuscript but it would be handy for an interested reader to find a summary of important findings to spark his/her interest in obtaining such an instrument. These results will be of great interest to parties linked with surface GHG observational programs. The abstract should include short statements on specific findings of this study. Statements such as “*moderate*” stable laboratory conditions (L11) are too general.

Although I noted that the overall lay out of the presentation is fine, it’s not ideal. The structure is not framed to get the important messages out. Many of the interested facts are masked by descriptive sentences and background information. The paper should be framed for the audience that it is intended for. A more appropriate layout would have included many smaller sections highlighting results with further reference to additional information in auxiliary sections. In reading the paper, I found the figures and tables to be most useful in providing details, not the text.

Lastly, as an interested reader, I was left wondering how this instrument compares to other commercially available instruments such as Cavity Ring Down Analyzers. There was mention of benefits of the FTIR over the use of gas chromatographs. For example, the possibility of measuring 5 species with one analyzer is of great interest and the

precision of the ^{13}C is most impressive. Although the ^{13}C may not meet WMO comparability requirements, the continuous mode of sampling and precision is attractive for use in applications where strong variations of the ^{13}C , such as in forested sites and urban centres, are high. I can appreciate that comparisons to other instruments may be out of the scope of this paper, but none the less, even statements that the precision levels are in line with other current insitu commercially available instruments might be important to include.