

Review of Karu, E., Li, M., Ernle, L., Brenninkmeijer, C. A. M., Lelieveld, J., and Williams, J.: Atomic emission detector with gas chromatographic separation and cryogenic pre-concentration (CryoTrap-GC-AED) for atmospheric trace gas measurements

This paper describes the development of a new GC analysis system for atmospheric VOC observations that incorporates a high-resolution AED, allowing low pptv range measurements over a wide concentration range. This is a very well written and interesting paper. The components of the system are well described, with clear diagrams, although there are a few comments below regarding technical details. The response of the instrument has been well characterised and the methodology, limits of detection and response discussed. I would like to see some further discussion on the variability of RF values for single compounds included. Two case studies of instrument deployment and laboratory characterisation of whole air samples show the applicability of the method, although it is not clear whether the new instrument has any advantages over existing methods for these analysis. I recommend publication in AMT subject to minor corrections and clarifications outline below.

Line 62: Is there any data to show that the adsorption to the Silonite-D layer to de-active surfaces is very low?

Figure 1: please say what part of the cycle this configuration is in, it took me a while to work out the flow regime in the valves. In the module 3, pre-concentration trap, does this contain packing or is it just a coated empty tube?

Line 98: Can you be sure 100 % conversion to elements in the AED? Could this also be part of the reason for compound RF variability?

Line 105: What is element installation?

Line 113: This sentence is not very clear. Please consider rewording.

Line 121: give details of the MFC

Line 147: Why are the RFs for heteroatom containing species given as a per C RF? Does Table 1 consider solely the C signal and not the other wavelengths? I can see when reading further that this is the case. Perhaps just include a sentence to describe that you will first look at C only and then consider the other elements separately.

Figure 1: Are all 84 species chromatographically separated in the C wavelength signal? This is essential if the C wavelength response is used. Also, how was the retention order determined? Was a GC-MS /retention indices used to determine the retention times prior to this detector being added?

Table 2: Is there a trend in RF or RF variability based on whether a compound is a hydrocarbon or hetero-VOC?

Figure 4: I would like to see more discussion of the reproducibility for each compound. In some cases the standard deviation seem high and there is a significant discrepancy between the two standards.

Line 196, Figure 2: It might be worth pointing out here that the high background is responsible for the higher LOD. The hetero-atom chromatograms show very useful selectivity and removal of the complex background signal. This is not really discussed here but seems like it would be useful in ambient samples, although only if the reduction in LOD is not an issue. Could you identify any other heteroatom containing species in the ambient samples, rather than just the targeted ones shown? It would be good to see the chromatograms for the other elements for a real sample, rather than just a gas standard. I can see this is where the technique could have advantages over an FID. As presented, the case studies don't really provide exciting new data that couldn't be achieved with more standard instrumentation.

Line 236: perhaps direct reader that this information is about to be presented. When I first read this, I wondered why this information was given here.

Line 258: extra space in 1400

Line 301: why was the NPL standard only used at 50 mL? This seems odd considering the Apel-Riemer is at much higher concentrations

Line 325: should this say "marine OR volcanically"?