

TOWARDS THE UNIFYING OF THE DETECTION SYSTEMS FOR THE MEASUREMENT OF THE MAJOR GREENHOUSE GASES AND RELATED TRACERS

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Atmospheric chemistry laboratories which measure trace gases, in particular greenhouse gases (GHGs), use a variety of methods and equipment for measuring specific species in order to get the best precision. This often requires separate sampling pathways and multiple calibration tanks, which in turn requires more laboratory space and equipment investment.

The Global Atmospheric Sampling LABORatory (GASLAB) at CSIRO is working toward unifying the methods and equipment for measuring such GHGs by using the Pulsed Discharge Helium Ionisation Detector (PDHID) coupled to a gas chromatograph (GC). This presentation is a continuation of the work presented at GGMT-2015 (La Jolla, USA) on the use of PDHID for hydrogen and some GHGs, with a focus on precise measurements of methane and nitrous oxide.

The initial results show that comparable precision for nitrous oxide on a PDHID can be obtained compared to the electron capture detector (ECD) results, where the PDHID shows significantly smaller magnitude in the non-linear response function than the ECD's. Better precision for methane has been obtained on PDHID when compared to the flame ionisation detector (FID) results, but with slightly more non-linear response. Previously we confirmed that PDHID offers superior results (precision and linearity) over the Reduction Gas Analyser (RGA) detectors for molecular hydrogen. While the precision for the direct measurement of carbon dioxide on PDHID is gradually approaching the precision of the well-established GC-FID (after its conversion to methane) in the ongoing research in our laboratory, the work on the precise measurement of carbon monoxide on PDHID is in its initial phase. In summary, major GHGs and related tracers currently measured on three different detectors could in the near future be measured on one single detection platform - PDHID.