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Mapping methane plumes and the delta C-13 composition of anthropogenic sources in southwest Germany

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A mobile analyser based on Cavity-Ring-Down Spectroscopy was installed on a vehicle, together with a GPS receiver. This allows us to measure atmospheric methane and carbon dioxide mole fractions and the C-13 isotopes of both gases while driving. Methane mole fraction measurements show a good repeatability even for high frequency measurements whereas the 13CH4 measurements need a longer averaging time of 1 minute for 1 ‰ repeatability and 15 minutes for 0.23 ‰ repeatability. Driving through an emission plume, the signal is typically only 60 seconds long. To overcome the precision problem for the isotope measurements we filled a 25 m tubing when driving through the plume, which was then flushed back through our analyser during 30 minutes. During several campaigns we visited a land fill site, a biogas plant, a dairy cow farm and a natural gas storage and measured an averaged isotopic methane signature(C-13) of –58.3 ±3 ‰ -62.5 ± 1‰ -62.2 ± 2‰ -51 ± 7‰ respectively.