Carbon tetrachloride (CCl₄) emissions from the US during 2008 – 2012

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Motivation

- Importance of CCl₄
  - It depletes stratospheric ozone (ODP = 0.82)
  - It is a potent greenhouse gas (GWPₜw=1730)
- CCl₄ mystery
  - Global production and consumption of CCl₄ for emissive uses have been phased-out for many years due to the Montreal Protocol (MP). However, emissions derived from reported production and feedstock uses of CCl₄ are much less than those derived from atmospheric observations (in 2012, the difference is ~30 – 80 Gg/y).
- US CCl₄ emission
  - Inventory-based emission reported by US EPA: < 0.5 Gg/y for 2009 to 2013
  - Correspondence to: L. Hu Carbon tetrachloride (CCl₄)

Observational Evidence for Surface Emissions of CCl₄ within the US

- Questions to be addressed
  - Are US CCl₄ emissions really close to zero? Or were the previous atmosphere-based studies not conducted during emissive times or over emissive regions? Or were there other reasons (e.g. poor measurement precision, poor correlation with their selected tracers) that limited their ability to estimate CCl₄ emissions?
  - With our extensive long-term air sampling network over the US and high-precision measurements we made, what emission magnitudes of CCl₄ are implied?
  - If US CCl₄ emissions are above zero, where do those emissions come from?
  - Based on our atmospheric observations, can we identify any possible sources of CCl₄ that contribute to its on-going global emission?

US national- and regional- emissions of CCl₄

- We are in the best position to provide the most reliable atmosphere-derived US emission of CCl₄ because:
  - We have the most extensive long-term monitoring air-sampling network over the US (9 tower sites and 12 aircraft sites).
  - 100% of grid cells over the contiguous US have an average sensitivity above 0.002 ppt (pmol m⁻³ s⁻¹) and 80% is above 0.005 ppt (pmol m⁻³ s⁻¹)

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