Airborne Trifluoroacetic Acid and Its Fraction from the Degradation of HFC-134a in Beijing, China

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Trifluoroacetic acid (TFA) has been attracting increasing attention worldwide because of its increased environmental concentrations and high aquatic toxicity. Atmospheric deposition is the major source of aquatic TFA, but only a few studies have reported either air concentrations or deposition fluxes for TFA. This is the first study to report the atmospheric concentrations of TFA in China, where an annular denuder and filter pack collection system were deployed at a highly urbanized site in Beijing. In total, 144 air samples were collected over the course of 1 year (from May 2012 to April 2013) and analyzed directly using high-performance liquid chromatography-tandem mass spectrometry (HPLC-MS/MS) or following derivatization by gas chromatography-mass spectrometry (GC-MS). The annual mean atmospheric concentration of TFA was 1580 ± 558 pg/m..., higher than the previously reported annual mean levels in Germany and Canada.

For the first time, it was demonstrated that maximum concentrations of TFA were frequently observed in the afternoon, following a diurnal cycle and suggesting that a major source of airborne TFA is likely degradation of volatile precursors. Using a deposition model, the annual TFA deposition flux was estimated to be 619 ± 264 ...g m... year.... Nevertheless, a box model estimated that the TFA deposition flux from the degradation of HFC-134a contributed only 14% (6-33%) to the total TFA deposition flux in Beijing. Source analysis is quite important for future TFA risk predictions; therefore, future research should focus on identifying additional sources.

SOURCE : Environmental Science & Technology