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NEW DETECTABILITY IN ATMOSPHERIC PERFLUOROCARBON TRACING

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Using a carbon layer capillary column, the current family of 5 intentionally-releasable 6 perfluorocarbon tracers (PFTs) are determinable to their current ambient air levels of about 1 to 5 femtoliters per liter (fL/L or ppq--parts per quadrillion) with a few percent precision for 3- to 6-L adsorbent-tube air samples. A packed precut column, reducing catalysts, and capillary refocussing trap provide for physical removal and chemical destruction of potential interferents and for very reproducible electron capture chromatograms with limits-of-detection of about 0.05 fL. The sample's PFT concentration is the ratio of the PFT peak area divided by the reference (non-released) PFT area relative to that ratio at ambient times the independently-determined ambient concentration; this approach allows quantification of released PFTs from 0.1 to almost 10,000 ppq in 1- to 2-h duration, actively-collected, air samples--without knowledge of sample volume or concern for instrument response. Five different PFT types were released 10 to 40 miles off the Los Angeles-area coastline in three separate tests in late-summer 1997. The two- to three-hour line (from moving ships) and point-source releases initially impacted the coast over a 5- to 40-mile extent; the next day, in some cases, the recirculated impact was of comparable magnitude, but now measurably distributed over more than 120 miles of coastline. Persistence for 12 days after release was seen, providing for quantification of regional air-turnover times.

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