4B.3 - California Dominates U.S. Emissions of Sulfuryl Fluoride, a Synthetic Pesticide and Potent Greenhouse Gas

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Abstract

Sulfuryl fluoride (SO_2F_2) is a synthetic pesticide and a potent greenhouse gas (GHG) that is accumulating in the global atmosphere. SO_2F_2 has been increasingly used for agricultural and structural fumigation worldwide to replace methyl bromide (CH_3Br), which was largely phased out under the Montreal Protocol to protect the ozone layer. Rising emissions of SO_2F_2 are concerning due to its relatively long atmospheric lifetime and high global warming potential (GWP). However, there is a paucity of information on how emissions of SO_2F_2 are distributed across the U.S., and there is currently no inventory of SO_2F_2 emissions for the U.S. or individual states. We provide an atmospheric measurement-based constraint on U.S. SO_2F_2 emissions using high-precision SO_2F_2 measurements from the NOAA Global Greenhouse Gas Reference Network (GGGRN) and a geostatistical inverse model. We find that California has the largest SO_2F_2 emissions among all U.S. states, with the highest emissions from southern coastal California (Los Angeles, Orange, and San Diego counties). Outside of California, only very small and infrequent SO_2F_2 emissions are detected by our analysis of GGGRN data. We find that California emits 60-85\% of U.S. SO_2F_2 emissions, at a rate of 0.26 (+/-0.10) Gg yr^{-1}. Furthermore, we estimate that emissions of SO_2F_2 from California are equal to 5.5-12% of global SO_2F_2 emissions -- a large contribution from a single state.

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