

Future atmospheric abundances and climate forcings from scenarios of global and regional hydrofluorocarbon (HFCs) emissions

Guus J.M. Velders^a, David W. Fahey^b, John S. Daniel^b, Stephen O. Andersen^c, Mack McFarland^d

a) National Institute for Public Health and the Environment (RIVM), PO Box 1, 3720 BA Bilthoven, The Netherlands, phone: +31 30 274 2331, e-mail: guus.velders@rivm.nl

b) National Oceanic and Atmospheric Administration, Earth System Research Laboratory, Chemical Sciences Division, Boulder, CO 80305 USA

c) Institute for Governance & Sustainable Development, Washington, DC 20007 USA

d) DuPont Fluorochemicals, Wilmington, DE 19805 USA

Abstract

Hydrofluorocarbons (HFCs) are used as substitutes for ozone-depleting substances that are being phased out globally under Montreal Protocol regulations. New global scenarios of HFC emissions reach 4.0-5.3 GtCO₂-eq yr⁻¹ in 2050, which corresponds to a projected growth from 2015 to 2050 which is 9% to 29% of that for CO₂ over the same time period. New baseline scenarios are formulated for 10 HFC compounds, 11 geographic regions, and 13 use categories. These projections are the first to comprehensively assess production and consumption of individual HFCs in multiple use sectors and geographic regions with emission estimates constrained by atmospheric observations. In 2050, in percent of global HFC emissions, China (~30%), India and the rest of Asia (~25%), Middle East and northern Africa (~10%), and USA (~10%) are the principal source regions; and refrigeration and stationary air conditioning are the major use sectors. National regulations to limit HFC use have been adopted recently in the European Union, Japan and USA, and four proposals have been submitted in 2015 to amend the Montreal Protocol to substantially reduce growth in HFC use. Calculated baseline emissions are reduced by 90% in 2050 by implementing the North America Montreal Protocol amendment proposal. Global adoption of technologies required to meet national regulations would be sufficient to reduce 2050 baseline HFC consumption by more than 50% of that achieved with the North America proposal for most developed and developing countries. The new HFC scenarios and effects of national regulations and Montreal Protocol amendment proposals will be presented.