



## **Global and regional emissions of HFC-143a (CH<sub>3</sub>CF<sub>3</sub>) and HFC-32 (CH<sub>2</sub>F<sub>2</sub>) from in situ and air archive atmospheric observations**

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High frequency, in situ observations from the Advanced Global Atmospheric Gases Experiment (AGAGE), and AGAGE associated stations, Gosan (South Korea), and Hateruma (Japan) for the period 2003 to 2010, combined with archive flask measurements dating back to 1978, have been used to capture the rapid growth of HFC-143a (CH<sub>3</sub>CF<sub>3</sub>) and HFC-32 (CH<sub>2</sub>F<sub>2</sub>) in the atmosphere. These are the first reported in situ global measurements of these two gases. HFC-143a is the third and HFC-32 is the sixth most abundant HFC. At the beginning of 2010 the global average for HFC-143a was 9.6 ppt in the lower troposphere and the growth rate was 13%/yr, and HFC-32 was 3.3 ppt with a growth rate was 23%/yr. The extensive observations have been combined with the AGAGE 2-D 12-box atmospheric transport model to simulate global atmospheric abundances and derive global emission estimates. It is estimated that ~18 Gg/yr of HFC-143a and ~11 Gg/yr of HFC-32 were emitted globally in 2009, and the emissions are estimated to have increased 15%/yr for HFC-143a and 26%/yr for HFC-32 since 2000. Observations of polluted air masses at selected individual AGAGE sites have been used to produce regional emission estimates for Europe (the EU15 countries), China, and Australia, respectively. Comparisons between these top-down estimates to bottom-up estimates based on reports by individual countries to the UNFCCC show a range of approximately four in the differences. This process of independent verification of emissions, and an understanding of the differences, is vital for assessing the effectiveness of international treaties, such as the Kyoto Protocol.