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The state of greenhouse gases in the atmosphere using global observations through 2017

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We present results from the fourteenth annual Greenhouse Gas Bulletin (https://library.wmo.int/doc_num.php?explnum_id=5455) of the World Meteorological Organization (WMO). The results are based on research and observations performed by laboratories contributing to the WMO Global Atmosphere Watch (GAW) Programme (www.wmo.int/gaw).

The Bulletin presents results of global analyses of observational data collected according to GAW recommended practices and submitted to the World Data Center for Greenhouse Gases (WDCGG). Bulletins are prepared by the WMO/GAW Scientific Advisory Group for Greenhouse Gases (http://www.wmo.int/pages/prog/arep/gaw/ScientificAdvisoryGroups.html) in collaboration with WDCGG.

Observations used for the global analysis are collected at more than 100 marine and terrestrial sites worldwide for CO_2 and CH_4 and at a smaller number of sites for other greenhouse gases. The globally averaged surface mole fractions calculated from this in situ network reached new highs in 2017, with CO_2 at 405.5 $\pm$ 0.1 ppm, CH_4 at 1 859 $\pm$ 2 ppb and N_2O at 329.9 $\pm$ 0.1 ppb. These values constitute, respectively, 146%, 257% and 122% of pre-industrial (before 1750) levels. The increase in CO_2 from 2016 to 2017 is smaller than that observed from 2015 to 2016 and practically equal to the average growth rate over the last decade. The increase of CH_4 from 2016 to 2017 was slightly smaller than that observed from 2015 to 2016 but also practically equal to the average growth rate over the last decade. The increase of N_2O from 2016 to 2017 was slightly higher than that observed from 2015 to 2016 and equal to the average growth rate over the past 10 years. The National Oceanic and Atmospheric Administration (NOAA) Annual Greenhouse Gas Index (AGGI) shows that from 1990 to 2017, radiative forcing by long-lived greenhouse gases (LLGHGs) increased by 42%, with CO_2 accounting for about 82% of this increase.

The Bulletin highlights the value of atmospheric observations for the improved knowledge of the greenhouse gas sources and sinks. The cover story represents the use of the chlorofluorocarbon CFC-11 observations for detection of the unknown emission source in eastern Asia. Three other stories that follow the principles of the Integrated Global Greenhouse Gas Information System (IG^3IS) demonstrate how atmospheric observations are used to identify a strong forest carbon sink in New Zealand, to improve national GHG emissions in the United Kingdom and to better estimate methane emissions from the oil and gas sector in Alberta, Canada.

Further details can be found in the WMO Greenhouse Gas Bulletin which is available online in all six official languages of WMO at https://library.wmo.int/index.php?lvl=notice_display&id=20697#.XDYo_q6nGUk.