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The state of greenhouse gases in the atmosphere using global observations through 2008

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The Global Atmosphere Watch Programme of the World Meteorological Organization is the only existing long-term international global programme providing a framework for observing and assessing the state and development of environmental issues related to greenhouse gases and climate change. The WMO-GAW Global Greenhouse Gas Monitoring Network, a comprehensive network of the Global Climate Observing System (GCOS), integrates the observations from different platforms (surface-based, aircraft and satellite). Surface observations are made at about 180 stations for CO_2. The latest analysis shows that the globally averaged mixing ratios of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) have reached new highs in 2008 with CO_2 at 385.2 ppm, CH_4 at 1797 ppb and N_2O at 321.8 ppb: higher than those in pre-industrial times (before 1750) by 38%, 157% and 19%, respectively. Atmospheric growth rates of CO_2 and N_2O in 2008 are consistent with recent years. The increase in atmospheric CH_4 was 7 ppb from 2007 to 2008, similar to the increase of the year before. These are the largest increases since 1998. From the existing data it is not clear if this 14 ppb increase over two years represents the beginning of a new upward trend in CH_4. The NOAA Annual Greenhouse Gas Index (AGGI) shows that from 1990 to 2008 the radiative forcing by all long-lived greenhouse gases has increased by 26.2%. The combined radiative forcing by halocarbons is nearly double that of N_2O. Some halocarbons are decreasing slowly as a result of emission reductions under the Montreal Protocol on Substances That Deplete the Ozone Layer, whereas others are increasing rapidly. GAW is supporting the atmospheric component of the Integrated Global Carbon Observation System that assesses routinely the state of the global carbon budget and is aimed at better understanding atmospheric carbon sources and sinks through top-down inverse modelling.