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Global Warming in Current Century

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ABSTRACT: A common opinion is that it would maintain or intensify the present global pace of warming. In recent decades, however, we contend that global warming has been caused primarily by non-CO_2 greenhouse gases (GHGs), such as chlorofluorocarbons, CH_4 and N_2O, and not by fossil fuel burning materials, CO_2 and aerosols, which are partly offsetting the positive and negative climate forcings. In the last decade, the growth rate of non-CO_2 GHGs has decreased. If the sources of CH_4 and O_3 precursors were reduced in the future, climate change forcing non-CO_2 GHGs could be close to zero over the next 50 years. This reduction in non-CO_2 GHGs, combined with a drop in black carbon emissions and a plausible progress in slowing CO_2 emissions, may lead to a decline in the rate of global warming, thus decreasing the likelihood of drastic climate change. Such an emphasis on air pollution has practical advantages which unite developed and developing countries' interests. Nevertheless, the evaluation of current and potential climate change needs specific long-term global aerosol property monitoring.

KEYWORDS: Greenhouse Gases (Ghgs), Perturbation, Chlorofluorocarbon(CFC), Intergovernmental Panel on Climate Change (IPCC).

INTRODUCTION

Since 1975, the global surface temperature has increased by about 0.5 °C, a burst of warming that in the past millennium has taken the global temperature to its highest level. There is a growing consensus that warming is the result of increasing anthropogenic greenhouse gases, at least in part (GHGs). GHGs are causing a forced global climate, i.e. an imposed disturbance of the energy balance of the Earth with space. There are many competing natural and anthropogenic climate forcings, but it is estimated that increasing GHGs are the largest forcing, resulting in a net positive forcing, particularly over the last few decades[1]. A number of scenarios for future GHGs have been considered by the Intergovernmental Panel on Climate Change (IPCC), which has been further expanded in its Special Report on Emissions Scenarios. Yet simulations of global warming have focused on "business as usual "scenarios with GHGs increasing rapidly.Throughout the twenty-first century, these scenarios yield a steep, relentless rise in global temperature with warming of several degrees Celsius by 2100, if climate sensitivity is 2-4 °C for doubled CO_2, as climate models suggest. These figures may give the impression that global warming curtailment is almost hopeless[2]. The Kyoto Protocol of 1997, which calls on industrialized countries to reduce their CO_2 emissions to 95% of 1990 levels by 2012, is itself considered to be a difficult target to achieve.

On an alternate, more positive, example, we recommend similar focus. During the next 50 years, this situation focuses on reducing non-CO_2 GHGs and black carbon. Our projections of global temperature forcings suggest that much observed global warming has been caused by non-CO_2GHGs. This understanding should not change the desirability of lowering CO_2 emissions since it is possible that the potential equilibrium of forcings will move toward aerosol domination of CO_2. However, we say that slowing global warming is more realistic than is often thought.

Climate Forcings

Forcings for particular GHGs vary from the values we previously calculated by as much as many percent: CO_2 (21 percent), CH_4 (12 percent), N_2O (23 percent), chlorofluorocarbon 11 (CFC-11) (16 percent), and CFC-12 (16 percent) (18 percent). Analytical fits to equations using a one-dimensional radiative-convective model were our prior observations, used by the IPCC. The present results are based on modified radiative forcing measurements, using the three-dimensional environment model of the SI2000 edition of the Goddard Institute for Space Studies, with absorption coefficients appropriate for line-by-line radiative transfer calculations, using current data from the HITRAN absorption line. The present effects are thus enriched in many respects[3].

Estimated Forcings

Since they are generated by different processes and have different growth rates, we distinguish CO_2, CH_4, and CFCs. The indirect effects of CH_4 on tropospheric O_3 and stratospheric H_2O are correlated with CH_4 in order to make explicit the significance of CH4 as a climate power. We believe that one-fourth of the 0.4 Wym2 forcing atmosphere is induced by rising CH_4 due to increasing tropospheric O_3. For CH_4 oxidized to H_2O in the stratosphere, we determine an indirect impact of 0.1 Wym2. The latest trend in stratospheric H_2O is much greater than that which may be triggered by CH4, but part of the observed trend could be attributed to tropospheric transport.20.1 Wym2, the measured negative forcing due to stratospheric O_3 depletion, is less than the 20.2 Wym2 that we used earlier due to shifts from measurements estimated in the vertical profile of O3 depletion. In the tropopause area (where O_3 loss results in surface cooling), O_3 patterns recommended by the World Meteorological Organisation have less depletion and greater loss in the middle stratosphere (where O_3 loss results in surface warming) relative to the O_3 improvements we used earlier[4].

The biggest forcing is the forcing of atmosphere by CO_2, but it does not dwarf those.The power of CH_4 (0.7 Wym2) is half the size of CO_2, and the overall force of non-CO_2 GHGs (1.4 Wym2) is equal to CO_2. In addition, we must remember that the fossil fuels that provide much of the CO_2 are also the key source of aerosols, in particular sulphates, black carbon, and organic aerosols, when contrasting forcings attributable to different practices[5]. Just a small part of non-CO_2

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GHG growth is added by fossil fuels by emissions that are not important to energy production. By reflecting sunlight and indirectly by altering cloud properties, aerosols induce a temperature forcing directly.As aerosols contribute to a greater number and smaller size of cloud droplets, and increased cloud cover, the indirect result entails increased cloud brightness, as smaller droplets inhibit rainfall and increase cloud life.By heating the atmosphere, collecting aerosols induce a semi-direct pressing, thus minimizing large-scale cloud cover. Additionally, the absorption of aerosols in cloud decreases and in interstitial air lowers the visibility of the cloud. Atmospheric aerosol forcing remains unclear, but studies from the last decade suggests that it is substantial. The forcing of the aerosol we predict has the same magnitude (1.4 Wym2) but a sign compared to the forcing of CO_2. The primary cause of both CO_2 and aerosols is the use of fossil fuel, with land conversion and wood combustion also leading to both forcings.While fossil fuels contribute to the growth of some of the other GHGs, the net global temperature is likely to be much less than 1.4 Wym2 due to processes that generated CO_2 in the past century. There was mention of this partial offsetting of aerosol and greenhouse forcings. Offsetting global average forcings does not mean that there are marginal impacts on the atmosphere. A corollary of this is that non-CO_2 GHG (1.4 Wym2) climate forcing is almost equal to the net sum of all documented forcings for the period 1850-2000 (1.6 Wym2).Therefore, assuming only that our calculations are roughly accurate, we argue that in the past century, the mechanisms that generate non-CO_2 GHGs have been the key cause of climate change.

Growth Rates of Greenhouse Gases

In recent years, ambient concentrations of the major human-influenced GHGs have been tracked and collected for earlier cycles from air bubbles embedded in polar ice sheets. The most famous scenario for climate model simulations is the IPCC IS92 scenario. Many predictions include these climate forcing estimates which are very unclear. For all well-mixed GHGs, like CFCs, the IS92a force was already a 15 percent decrease from the key 1990 IPCC scenario. In the 1990s, the reported rise in CH_4 dropped below the lowest IS92 scenario, while CO_2 fell below the lowest IS92 scenario.Climate forcing patterns are best revealed by average growth estimates for anthropogenic GHGs. From the equations, the forcings are determined[6]. Ed Dlugokencky and Tom Conway of the National Oceanic and Atmospheric Administration Temperature Monitoring and Diagnostics Laboratory gave the CO_2 and CH_4 numbers for 1999.

I. ***Carbon Dioxide***

Between the 1950s and the 1970s, the growth rate of pressing CO2 doubled but was flat from the late 1970s to the late 1990s, including a 30 percent rise in the use of fossil fuels. This result suggests a recent rise, which may be temporary, in terrestrial andyor oceanic sinks for CO2. In 1998, the highest annual rise in CO_2, 2.7 ppm, occurred[7]. The annual rise was 2.1 ppm in 1999, but by the end of the year the growth rate had fallen to 1.3 ppm.

II. Methane

For CH4, a dramatic growth rate shift has occurred. Inherent in ice core data, the slight inter-annual variability of CH4 before 1982 represents smoothing. As discussed below, variables that may have hindered the CH4 growth rate are known, but most of them are not quantified correctly.

III. CFCs

The growth rate of the two major CFCs is close to zero and, as a result of the output constraints imposed by the Montreal Protocol, would be negative in the future. Together, other CFCs trigger a climate power that can approach that of CFC-12 early in the twenty-first century[8]. But most of these are being phased out, and the net improvement in the CFC environment pressuring over the next 50 years, assuming conformity with production agreements, will be minimal.

CONCLUSION

A useful alert about the prospects for human-made climate change is provided by business-as-usual scenarios. An alternate scenario based on eliminating non-CO_2 GHGs and black carbon (soot) aerosols is proposed in our study of climate forcings as a method to slow global warming. Technology investments are also required to boost energy production and build non-fossil energy sources in order to slow CO_2 emissions growth and increase future policy options. The emphasis on air pollution, especially aerosols and tropospheric ozone that have human health and ecological impacts, is a key feature of this strategy.For example, if the World Bank were to fund new technologies and air quality management investments in India and China, lowering tropospheric ozone and black carbon would not only boost local health and agricultural production, but would also help the global environment and air quality.

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