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How My Observations Concerning Global Warming Complement and Differ From the IPCC Consensus

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The Intergovernmental Panel on Climate Change (IPCC) has forged an international consensus on climate change through four assessment reports developed over twenty years. The Fourth Assessment Report, issued in 2007, provides the state of the art summary of how greenhouse gases have accumulated in the atmosphere causing global warming. More than a dozen climate models calculate the effects and project how they might change in the future. There is little doubt that greenhouse gases are accumulating and that they are the primary cause of global warming.

The issue, though, is why are they accumulating? The IPCC assumes that the primary cause is increased emissions due to man. Implicit in this assumption is that the atmosphere's ability to oxidize and therefore remove greenhouse gases has remained relatively constant. Clearly, the net concentration of greenhouse gases in the atmosphere is primarily a function of emissions minus consumption. The IPCC emphasizes emissions while paying less attention to consumption. I have found clear evidence that the atmosphere's ability to consume greenhouse gases, the oxidizing capacity, has been changing and that the primary cause of this change has been the continuous and increasing emission of sulfur dioxide. I therefore emphasize consumption while agreeing that emissions play a role.

I discovered (Ward, 2009) that all periods of rapid and significant global warming in the past 46,000 years are contemporaneous with major increases in the concentration of volcanic sulfate measured in layers of ice from the Greenland Ice Sheet Program drill hole 2 (GISP2). This correlation is particularly strong since more than 70% of these layers of ice contain no volcanic sulfate. Furthermore, during periods of rapid warming, the sulfate anomalies occur in many contiguous layers, implying a high rate of volcanic activity over many years to decades. Volcanic eruptions, as large as or larger than the eruption of Mt. Pinatubo in the Philippines in 1991, have occurred, on average, once per century for the past 2000 years. The GISP2 data imply that similar sized eruptions were occurring every few months to every year or two during periods of rapid warming. Large amounts of sulfur dioxide gas erupted frequently and regularly into the atmosphere appear to have caused global warming prior to the 20th century.

During the 20th century, man began producing sulfur emissions at significant and increasing rates through the burning of fossil fuels. The increase in sulfate measured in the GISP2 ice layers tracks the known increase in sulfur emissions by man. By 1962, the amount of sulfate in one layer of ice in GISP2, representing 1.7 years of time, contained as much "volcanic" sulfate as one large actual volcanic eruption had caused in the past. Volcanic activity had not increased. All ice layers since 1930 had increasing amounts of sulfate. Such concentrations in so many contiguous layers have only occurred in the past during times of known rapid global warming. The total sulfate accumulated between 1930 and 1980 is equivalent to the total amounts accumulated during the highest rates of global warming at the end of the last ice age.

After 1930, global temperatures began to rise, with the highest rates after 1962. By 1980, man, worried about acid rain, began reducing sulfur emissions and succeeded by 2000 to reduce them 18%. By 1990, the rate of increase of methane in the atmosphere began to decrease, suggesting an increase in oxidizing capacity. By 2000, the increases in methane and temperature essentially came to a halt. Both have remained relatively constant for the past 8 years, even decreasing slightly in the past 2 years. These changes cannot be explained by the IPCC other than to suggest that they are within normal range of variation, a position that is becoming harder and harder to defend.

Meanwhile the rate of increase in carbon dioxide showed no change. Following the last three ice ages, the concentration of carbon dioxide in the atmosphere increased 500 to 1000 years after the temperature increased. Carbon dioxide appears to have been a good proxy for ocean temperature. Increases in carbon dioxide did not cause global warming in the past. There were times in geologic history when the concentration of carbon dioxide appears to have been as much as 17 times current levels, yet glaciers were still being formed. Carbon dioxide is a greenhouse gas removed from the atmosphere primarily by its solubility in cold water and by plant life. Increased emissions of carbon dioxide by man compound global warming, but do not appear to initiate global warming. We will need to develop new climate models that account for sulfate chemistry before we can determine the relative importance of carbon dioxide.

The primary implication of recognizing the importance of sulfur emissions in controlling atmospheric oxidizing capacity is that our highest priority for reducing global warming should be decreasing sulfur emissions. This is good news. We know how to do it both technically and politically. Reducing sulfur emissions will also reduce acid rain and the pollution that is killing hundreds of thousands of people each year in China, India, and elsewhere.

It is very important to humanity that scientists address the SO_2 issues raised here thoroughly, but quickly, so that politicians can proceed with the solution that is most likely to succeed.

Ward, P.L., 2009, Sulfur Dioxide Initiates Global Climate Change in Four Ways, Thin Solid Films, Volume 517, Number 11. doi:10.1016/j.tsf.2009.01.005
Also available at www.tetontectonics.org/climate.html