

THE ATMOSPHERIC RESERVOIR

Examining the Atmosphere and Atmospheric Resource Management

Panel Releases Report on Climate Change

By Mark D. Schneider

Six years ago, the Intergovernmental Panel on Climate Change (IPCC) released its Third Assessment Report and since then many new discoveries have been made concerning climate change. Last month the IPCC issued a Fourth Assessment Report with findings from over 2,000 scientists worldwide. The report emphasizes that there is very high confidence that the burning of fossil fuels and other human activities have contributed to global warming.

Carbon dioxide, or CO₂, is the primary greenhouse gas produced by the combustion of fossil fuels. According to the IPCC Fourth Assessment Report, "The atmospheric concentration of carbon dioxide in 2005 exceeds by far the natural range over the last 650,000 years (180 to 300 ppm) as determined from ice cores." The measured level of CO₂ in 2005 was a staggering 379 parts per million (ppm). The most noticeable increases of CO₂ began with the industrial revolution and since that time levels have continued to increase. The last few decades, however, show unprecedented levels of CO₂ being emitted and retained in our earth's atmosphere (see graph).

Greenhouse gases allow incoming solar radiation to pass through our atmosphere because it has a short wavelength. This shortwave radiation reaches the earth's surface and is reradiated back into the atmosphere as longwave radiation. Greenhouse gases trap this outgo-

ing longwave radiation and create an energy surplus in our atmosphere. Our oceans have absorbed more than 80 percent of the energy surplus, but not without repercussions. Thermal

completely disappear by the end of the 21st century.

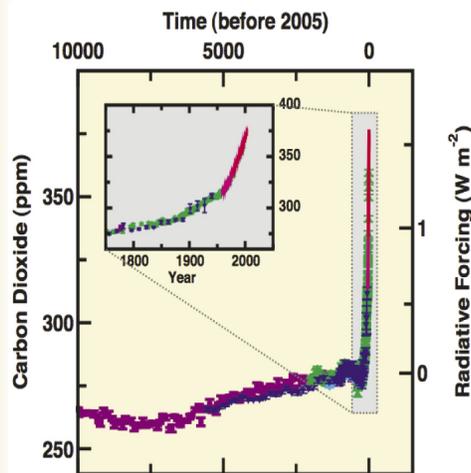
What scientists are now measuring is an increase in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level. The IPCC Fourth Assessment Report states that there is a "very high confidence that the globally averaged net effect of human activities since 1750 has been one of warming." In addition, "At continental, regional, and ocean basin scales, numerous long-term changes in climate have been observed. These include changes in Arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones."

There is plenty of evidence showing that our earth went through warm periods and ice ages long before man inhabited it. What research scientists can now say with very high confidence is that man has rapidly accelerated the current warm climatic period.

Watch for additional articles on the findings of the IPCC Fourth Assessment Report in upcoming issues of *ND Water*.

Atmospheric Resource Board
North Dakota State Water Commission
900 East Boulevard, Bismarck, ND 58505
(701) 328-2788
<http://swc.nd.gov>
ND Weather Modification Association
PO Box 2599, Bismarck, ND 58502
(701) 223-4232

Changes in Carbon Dioxide from Ice-Core and Modern Data



Atmospheric concentrations of carbon dioxide over the last 10,000 years (large panel) and since 1750 (inset panel). Measurements are shown from ice cores (symbols with different colors for different studies) and atmospheric samples (red lines). The corresponding radiative forcings are shown on the right hand axis of the large panel (units are in watts per meter squared or W m⁻²).

expansion occurs when the oceans absorb heat and the result is a rise in sea level. In addition, warmer oceans point to accelerated melting of our ice caps. The IPCC states that, "The last time the polar regions were significantly warmer than present for an extended period (about 125,000 years ago), reductions in polar ice volume led to 4 to 6 meters of sea level rise." It is estimated that the Arctic late-summer sea ice could