Study of Future Atmospheric Concentrations of CO2 and CH4 on Global Heat Absorption and Retention

Moore, Nicholas (School: South Iredell High School)

Atmospheric greenhouse gas concentrations of both carbon dioxide (CO2) and methane (CH4) are increasing at a decennial rate of +34 parts per million for CO2 and +70 parts per billion for CH4. The purpose was to determine the severity of CO2 versus CH4 on temperatures using this trend. Six sealed boxes were built to contain specific concentrations of CO2 and CH4 to test their ability to absorb and retain heat. The testing chambers contained (control) current atmosphere air, (experiment 1) CO2 concentration projected to year 2070, (experiment 2) CH4 concentration projected to year 2070, (experiment 3) combined CO2 and CH4 concentrations projected to year 2070, (experiment 4) CO2 concentration projected to year 2220, and (experiment 5) CH4 concentration projected to year 2220. Test chambers were placed outside and subjected to various environmental conditions for equal amounts of time. Outside temperatures ranged from -2.8C to 20.0C under conditions from sun to fully overcast. Internal temperatures were recorded using calibrated thermometers inside each chamber. Every chamber showed significantly higher temperatures and net heat gain (Q) versus the control. Chamber 3 (combined CO2 and CH4 concentrations) showed the highest average net gain of heat at 15.40J compared to control at 10.12J, a 52.2% increase. The others averaged 24.1% to 46.6% higher than the control. CO2 and CH4 together contributed more to heat absorption than either one alone. Comparatively only very small concentrations of CH4, 1/1000 times that of CO2, caused similar warming and heat retention trends. Additional studies of the combined effects of these gases as well as the half-life of CH4 in the atmosphere need to be conducted.