Which will Dominate Future Global Temperature Changes in the Next 200 Years: Solar Irradiance or Greenhouse Gases?

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ABSTRACT

There are two views of what will be the change of global temperature over the next 25 to 100 years. One, view is that greenhouse gases (GMs) will drive up temperature as scores of global circulation models appear to indicate. Two, is a view that the sun is moving towards a minimum of sun spot activity and associated irradiance and this will drive global temperature downwards. The first view gets a vastly greater amount of press and thus is driving the general (political) discussion. The second is held by a number of scientists. This difference of numbers is really not the way to come to a scientific conclusion. To answer this question there is a need to compare the possible impacts of each. There is a historical record of temperature during solar activity minimums (SAMs) compared to other times proceeding and following. What is the difference of temperature during these SAMs compared to other time periods that are not during solar activity minimums? The impacts of greenhouse gas are determined by a series of global circulation model results. These two changes of temperature are compared to see which is larger.

The historic record of oxygen isotope data is the proxy for temperature that is used. This data is available from for a variety of sources for hundreds of thousands of years. There have been five of these SAMs noted by previous workers over the past 1100 years: Oort, Wolf, Spore, Maunder, and Dalton. These periods occur approximately 200 years apart and last for decades each. There will be a comparison of temperature for 25 year intervals prior and after each of the five SAMs with temperature during the SAM. After considering dozens of sites, which ice core, tree ring, and coral and speoterm sites, an average change/difference between time within a solar minimum and outside will be determine. Statistical analysis comparing the differences among sets of data of each site and overall results was made using a T–test to determine if differences are statistically significant.

Looking at the last five solar activity minimum, Oort, Wolf, Sporer, Maunder, and Dalton usually there is a decrease of temperature relative to 50-years surrounding these periods. On average the decrease is approximately 0.1°C. However, for about 25% of the comparisons the decrease of temperature is over 0.3°C. This is a significant portion of the increase of temperature since 1880, 0.8°C. This still significantly smaller than predicted change of temperature expected by running Global Climate Models through-

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out the remainder of the 21st century which are between 1 and 5^{o}C. The impact could cancel for decade or two of temperature increase due increasing GMs, but clearly is unlikely to cancel a full century of expected change.