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Causes of the Global Warming Observed since the 19th Century

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ABSTRACT

Measurements show that the Earth's global-average near-surface temperature has increased by about 0.8°C since the 19th century. It is critically important to determine whether this global warming is due to natural causes, as contended by climate contrarians, or by human activities, as argued by the Intergovernmental Panel on Climate Change. This study updates our earlier calculations which showed that the observed global warming was predominantly human-caused. Two independent methods are used to analyze the temperature measurements: Singular Spectrum Analysis and Climate Model Simulation. The concurrence of the results of the two methods, each using 13 additional years of temperature measurements from 1998 through 2010, shows that it is humanity, not nature, that has increased the Earth's global temperature since the 19th century. Humanity is also responsible for the most recent period of warming from 1976 to 2010. Internal climate variability is primarily responsible for the early 20th century warming from 1904 to 1944 and the subsequent cooling from 1944 to 1976. It is also found that the equilibrium climate sensitivity is on the low side of the range given in the IPCC Fourth Assessment Report.

KEYWORDS

Climate Change; Global Warming; Climate Forcing; Internal Variability

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