

Topic 3 – Have Humans Caused the Climate Change of the Last 50 Years?

The climate system is too complex to allow a simple correlation between temperature and greenhouse gas concentrations. Other factors, some natural, like changes in the intensity of solar radiation, and others man-made, like particulate emissions, also affect climate. The only practical way to study the climate impact of human activities is with a climate model.

Scientists and engineers use models for a wide variety of applications. Some of them are so accurate that we don't even think of them as models. For example, we can send space probes to rendezvous with the moons of Saturn because we have a highly accurate and highly sophisticated model of the gravitational interactions in the solar system. We can design bridges because we have an accurate model of the stresses that will be created by cars and trucks crossing the bridge, water flow under the bridge, and wind hitting the bridge structure.

Even though climate models are so large and complex that they require weeks of supercomputer time to complete a full simulation of past or future climate, they are not as accurate as the models used to guide space probes or design bridges. However, most climate scientists believe they are accurate enough to yield meaningful results.

One of the studies carried out with climate models was an attempt to simulate 20th century temperature changes using only natural causes of climate change (variations in solar intensity and the effects of volcanic eruptions), then using both natural and man-made causes of climate change. The results for global average temperature are shown in Figure 10.

The black line is the change in observed global average temperature for each decade from 1900 to 2000 relative to the 1901-1950 average temperature. The blue band shows the results of model simulations using only natural causes of climate change; and the pink band, the results of model simulations using both natural and man-made causes of climate change. While it is possible to get a reasonable simulation of observed temperatures increases to 1950 using only natural causes of climate change, it is not possible to simulate observed temperatures increases after 1950 without including man-made causes of climate change. Similar results were obtained for just the Earth's land areas, for just the oceans, and for each of the continents, except Antarctica. Too few temperature measurements were made in Antarctica before 1950 to allow such a comparison to be made.

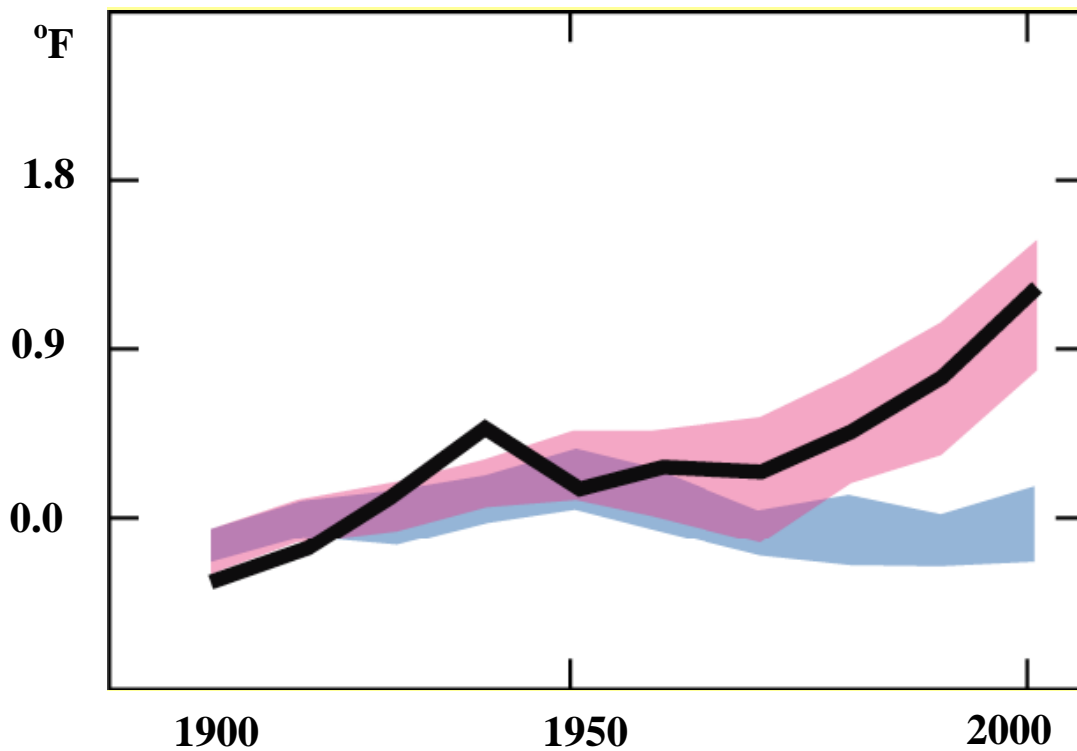


Figure 10 – Global Average Temperature Change Compared to 1901-1950 Average

Black line is observed 10-year average temperature. Blue band is climate model simulations using only natural causes of climate change. Pink band is climate model simulations using both natural and man-made causes of climate change.

Source: *Intergovernmental Panel on Climate Change Fourth Assessment Report*, www.ipcc.ch