Studies confirm greenhouse mechanisms even further into past

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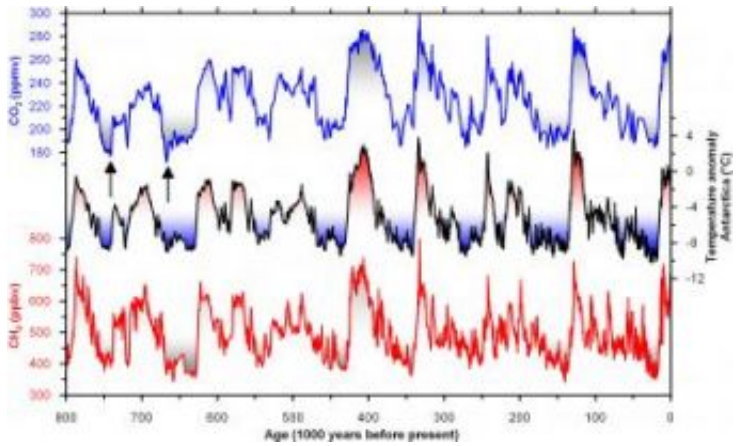

The ice core boring at Dome C in Antarctica shows that the curves for the temperature and the greenhouse gases carbon dioxide and methane follow each other over the past 800,000 years -- with few deviations. (See arrows) Credit: Professor Thomas Blunier, Centre for Ice and Climate, Niels Bohr Institute, University of Copenhagen

The newest analysis of trace gases trapped in Antarctic ice cores now provide a reasonable view of greenhouse gas concentrations as much as 800,000 years into the past, and are further confirming the link between greenhouse gas levels and global warming, scientists reported today in the journal *Nature*.

They also show that during that entire period of time, there have never been concentrations of carbon dioxide and methane as high as the

current levels, said Edward Brook, an associate professor of geosciences at Oregon State University, and author of a *Nature* commentary on the new studies.

“The fundamental conclusion that today’s concentrations of these greenhouse gases have no past analogue in the ice-core record remains firm,” Brook said in the report. “The remarkably strong correlations of methane and carbon dioxide with temperature reconstructions also stand.”

The latest research, done by members of the European Project for Ice Coring in Antarctica, extend the data on trace gases back another 150,000 years beyond any studies done prior to this, Brook said. Ultimately, researchers would like to achieve data going back as much as 1.5 million years.

The tiny bubbles of ancient air trapped in polar ice cores have been used to provide records of trace gases in the atmosphere at distant points in the past, and better understand the natural fluctuations that have occurred, largely as a result of cyclical changes in Earth’s orbit around the sun.

“These natural cycles that occur on the order of tens or hundreds of thousands of years can help us understand both the forces that have controlled and influenced Earth’s climate in the past, and the implications of current changes on future climate” said Brook, who is co-chair of an international group that organizes global studies in this field.

According to the data, the current levels of primary greenhouse gases – those that are expected to cause global warming - are off the charts.

The concentration of carbon dioxide is now a bit more than 380 parts per million, compared to a range of about 200-300 parts per million during

the past 800,000 years. The current concentration of methane is 1,800 parts per billion, compared to a range of about 400-700 parts per billion during that time.

In every case during that extended period, warm periods coincide with high levels of greenhouse gases. Of some interest, the latest studies are showing that the temperature increases have been even more pronounced during the most recent 450,000 years, compared to several hundred thousand years prior to that.

“It appears there may even be very long term natural cycles that have operated on much longer periods of 400,000 years or more,” Brook said. “We still have quite a bit to learn about these past cycles and all the forces that control them.”

Most of the time during the past 800,000 years, the Earth has experienced long, cooler periods about 80,000 to 90,000 years long, which eventually lead to ice ages. Those have been regularly interrupted by “interglacial” periods about 10,000 to 20,000 years long that are considerably warmer – this is the stage the Earth is in right now. Abrupt climate changes on much shorter time scales are also possible, researchers believe, possibly due to shifts in ocean circulation patterns or other forces.

Scientists are continuing to search for the optimal sites in Antarctica that will allow them to take the ice core records back even further, Brook said.

Source: Oregon State University