## Observations Necessary for Useful Global Climate Models

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#### Introduction

Observational facts about our "inner" planet and potentially those about other planets should force realism and civility into the political and media discussions about alleged human-caused global warming. Climate change assumptions rather than facts, and computer modeling rather than real-world observations, underpin political attempts to combat global warming. The science behind this massive intrusion into American and global economies requires more than a "consensus" of like-minded climate analysts. It needs to be right.

Critical differences exist between scientists who observe weather and climate and those who attempt to model nature's complexities. Compare, for example, the differing analyses and conclusions in the UN's Intergovernmental Panel on Climate Change (IPCC) Summary for Policy Makers (2007)<sup>1</sup> and the Idso and Singer (2009) Climate Change Reconsidered<sup>2</sup>. Those who observe the natural, economic, and sociological aspects of climate change are "realists," not "skeptics." The modelers, on the other hand, believe complex mathematics and broad assumptions about critical variables can produce forecasts the future of climate, Earth's most complex system. These differences require a significantly extended database of Earth observation to resolve; however, observations of the natural variations of climate argue for calm rather than panic and precipitous actions.

A comprehensive and continuous program of Earth observation should exist using appropriate Earth-orbiting satellites. In addition, the role of the Moon in this program should be evaluated closely. The integration of data from LEO and GEO satellites using whole Earth views from the Moon has compelling and synergistic benefits for climate observation. An Earth observatory on the Moon near a pole, with a greater than 50% observing time, offers a stable telescopic platform as well as the opportunity for spectral integration that includes the polar regions as the Earth libration brings them into view. A long-term, integrated of the spectra of a

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biologically active planet has great importance in the search for Earth-like plants elsewhere. In addition, layering in the lunar regolith may provide a decipherable history of the sun back to 3.8 billion years, the age of the oldest regolith on basaltic lava flows of the lunar maria. The potential for such a historical record of solar activities is unique to the Moon, until Mercury becomes accessible.

### Background

Careful analysis by geophysicist Syun Akasofu of the International Artic Research Center shows a natural warming of the lower atmosphere by half a degree Celsius per 100 years since about 1660, that is, the coldest time of the Little Ice Age. Warming and cooling intervals during this general warming trend have occurred as they have for thousands of years, and warming has not accelerated during industrialization. Further, the recent 50-year increase in carbon dioxide of one molecule of per 10,000 molecules of air every five years has had no detectable effect on climate.

Where is all the carbon dioxide from fossil fuels? Geoscientists have long known that atmospheric carbon dioxide cycles through the oceans every 5-10 years, not every 200 years as claimed by the UN's IPCC and as much as 1000 years claimed by others. Further, for every fossil-fuel carbon dioxide molecule added to the atmosphere, the ocean soaks up about 50 such molecules within a decade. These observational facts mean that humans cannot cause the doomsday assumption of a "doubling of atmospheric carbon dioxide". Engineer and climate expert Fred Goldberg of Sweden's Royal School of Technology also points out the greenhouse effect of carbon dioxide decreases rapidly with increasing concentration. About 95% of that effect already has been used up at today's level of 385 parts per million.

Unfortunately for the computer modelers, their models do not work. The models' unanimous prediction that the troposphere (lower 0-15 km of the atmosphere) should have warmed significantly in response to current levels of carbon dioxide does not match actual measurements. A team led by physicist David Douglass of the University of Rochester has shown that the troposphere has remained unchanged or cooled slightly since 1979 when satellite and balloon-borne measurements of atmospheric temperature began. Models cannot truly deal with the realities of weather, that is, evaporation, convection, clouds, rain, and all the other pathways in which nature inexorably moves heat from where it is warm to where it is cold.

And then there are the sun and the oceans. Observational and geological records, changing of the seasons, and correlation of historical

variations with solar activity cycles, all confirm that radiation and magnetic fields emanating from the sun drive changes in weather and climate. As Willie Soon of the Harvard-Smithsonian Center for Astrophysics has documented, the position and orientation of the Earth in its orbit around the sun and the sun's variable activity determine weather and climate. As part of this process, oceans store enormous amounts of solar energy. They create climate variations over vast regions by transferring that energy around the globe over decades and centuries through a system of interconnected currents and current oscillations.

Given what we actually know about climate, as well as the remaining uncertainties, Americans should think long and hard before giving up liberties and incomes to politicians and bureaucrats who just want to "do something" to satisfy a particular special interest. Prudent protection of local environments is one thing – a long-term political agenda to gather power at the expense of liberty is quite another.

A very high probability exists that "doing something" will not work against natural climate forces we only incompletely understand. When we realize what liberties have been lost, the probability also is very great that we will deeply regret not just preparing for climate change rather than trying to stop it. Instead, our focus should be on producing more energy to raise worldwide living standards and not on how to limit energy use and resulting improvements in the human condition.

# What May Be Climate's Primary Natural Driver?

Observations of natural variations in atmospheric and oceanic temperatures, gas concentrations, and currents provide clear indications of how, but not when, climate will change. Historical and geological records also illustrate the levels of uncertainty existing forecasts of either the direction or the timing of changes. New analyses of correlations between El Nino related oscillations and global climate suggest that single ocean and wind related variation may account for much of the global variability in climate.

Forecasts based on computer models have proved to be unsuccessful due to the great number and great complexity of critical climate variables, some of which, like water vapor and clouds, so far defy mathematical definition. In combination, water vapor and clouds have about 20 times the greenhouse effect of carbon dioxide (CO2). Little wonder that climate models fail, repeatedly, in both replication of current conditions and in forecasting the future.

Observations provide two important facts about atmospheric CO2. First, a general but irregular trend of global warming, by half a degree Centigrade per 100 years, has existed since about 1660, the coldest part of the Little Ice Age. Obviously, this slow warming persisted for hundreds of years before industrialization began to add CO2 to natural emissions from the biosphere and the oceans. Second, detailed studies of ice cores show that increases in CO2 follow global temperature increases by many centuries rather than leading, much less causing any warming. Further, actual observations show no measurable, long-term alteration of climate patterns during the last century's slow increase in atmospheric CO2.

The obvious explanation for the absence of any CO2 effect on modern climate lies in the physical fact that the greenhouse warming potential of CO2 decreases with increasing concentration. Most of any CO2-induced warming has already taken place at concentrations well below the present level of about 0.0385 percent.

If not CO2, what causes the historically and geologically observed changes in climate? Hundreds of years of recorded observation show that the position and orientation of the Earth in its orbit around the sun along with variations in solar activity determine changes in climate. For example, as Serbian mathematician Milutin Milankovic in 1941 and others since have pointed out, the major ice ages on Earth correlate with 41,000 and 100,000-year cycles in the position of the Earth in its solar orbit. Further, the Medieval Warm Period (800-1300) and the Little Ice Age (1400-1900) correlate, respectively, with very active and very passive periods of solar flare and magnetic activity. Widely published analyses exist of tree rings, layering in cave stalagmites and cores of lake and ocean bottom sediments, and high altitude wind variations that document broadly accepted correlations of climate variations with many systematic repetitions in solar activity, ranging from the 11-year sun spot cycle up to the long-term repetitions mentioned above.

As to the explanation of this apparent solar influence on climate, research by Henrik Svensmark of Denmark's Center for Sun-Climate Research reminds us that the strength of solar magnetic fields influence the flux of cosmic rays that enter the Earth's atmosphere. Cosmic rays consist of largely of extremely high-energy, electrically charged hydrogen and helium nuclei. Cosmic ray collisions with gases in the atmosphere produce rare isotopes that provide a measurable history of variations in cosmic ray intensity when taken up in tree rings and other annually deposited materials. Most importantly, these particles also ionize gases in the lower atmosphere, providing points for water vapor condensation.

Periods of weak solar magnetic fields allow cosmic rays penetrate more readily into the lower atmosphere where they ionize more gas molecules than average. The reverse occurs with periods of strong solar magnetic fields. Satellite observations of cloud cover, isotopic analysis of tree rings, ice cores and stalagmites, and historical analyses of solar activity by Svensmark and many others support this hypothesis.

As cloud cover expands, more solar radiation reflects back into space, resulting in a net cooling of the atmosphere and increased snow accumulation, particularly in temperate and arctic regions. A current illustration of the cooling effect of decreased solar activity appears to be the currently very quiet sun and the recent reversal of the slightly elevated warming trend of the 1970s through 1990s. How long this cooling trend will persist remains to be seen; however, Greenland glaciers have been advancing since 2006, Artic sea ice has returned to 1989 levels of coverage, and snowy, cold winters and cool summers have dominated northern North America and Europe.

#### Conclusion

Critical differences exist between scientists who observe weather and climate and those who attempt to model nature's complexities. Those who observe the natural, economic, and sociological aspects of climate change see no evidence indicating that human activities have influenced global climate. Actual observations show that climate varies in response to natural forces and that human burning of fossil fuels has had negligible if any effect over the last 100 years. The modelers, on the other hand, believe complex mathematics and broad assumptions can forecast the future of climate, Earth's most complex system. Models do not yet match observations; however, continuous space-based observation, including, stable, integrating, whole globe views from the Moon, can provide the basis for ultimate creation of useful global climate models. These observations more immediately can provide data for near term anticipation of actions necessary to mitigate the effects of climate change, whether warming or cooling.

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<sup>&</sup>lt;sup>1</sup> Intergovernmental Panel on Climate Change, 2007, Summary for Policy Makers, in Climate Change 2007: Synthesis Report, WHO/UNEP.

<sup>&</sup>lt;sup>2</sup> Idso, C., and S. F. Singer, 2009, Climate Change Reconsidered: The Report of the Nongovernmental Panel on Climate Change, Heartland Institute, Chicago.

<sup>&</sup>lt;sup>3</sup> Jolliff, B. L., 2008, Editor, Lunar Science Workshop, NP-2008-542-HQ. pp. 39-41.