CLIMATE CHANGE, Part I: A Geologist's View

W. W. (Bill) Little, Professor of Geology, Brigham Young University Idaho

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ABSTRACT

Though often portrayed as "settled," there is actually considerable debate regarding the role of human activity in global climate change occurring since the advent of the Industrial Age. As a geologist (sedimentologist/stratigrapher), I use pattern recognition in bodies of rock to identify and interpret ancient depositional systems and the history of sea-level change by applying the concept of uniformitarianism, that is, the same physical, chemical, and biological laws that govern Earth today were in operation and produced similar results in the past.

Uniformitarianism must also be applied if we are to isolate the human contribution to climate change. It is imperative that we first identify and understand short- and long-term natural patterns, including all components that affect those patterns and how these components interact with one another. We also need to recognize that global conditions have changed as the earth has evolved. Once we understand the natural climatic system, and we are far from it, we can look for deviations and consider whether or not they are the result of human interference. Specific concerns I think need to be resolved include:

1) Earth's climate is in continual flux, with the last few thousand years being abnormally stable. Past temperatures, including historic pre-industrial time spans, have been warmer than today. How does this fit with steadily rising CO_2 levels?

2) Data from ice cores show that rises in temperature consistently precede rises in CO_2 levels. If there is a cause-and-effect relationship, does not the cause need to occur prior to the effect?

3) According to sea-level studies, we are experiencing the coldest interglacial of the past 800,000 years. Some studies suggest, following the pattern of other interglacials, sea-level should be about 7 m higher than its current elevation.

4) There is little agreement between computer simulations and known climate history. Computer simulations consistently show a dramatically higher increase in temperature than what has been recorded by actual measurements.

5) There is little agreement between computer simulations and current atmospheric measurements, as recorded by radio sondes and satellites.

6) Computer simulations show tremendous discrepancy between each other (e.g. the Hadley and the Canadian Models) in terms of both temperature and precipitation. Often, one will indicate a drought while another predicts extreme wetness for the same region.

7) Most historical land-based temperature measurements have been obtained from what are now acknowledged as "urban heat islands," usually surrounded by rural areas that lack warming trends. I have found little attempt to explain this discrepancy.

8) Temperature curves for recent climate records correspond much more closely to natural events, such as El Nino/La Nina cycles and variation in solar radiation, than they do to steadily rising CO_2 levels.

9) Some reports indicate that CO_2 is ineffective as a greenhouse gas above ~50 ppm, well within the natural contribution. If true, the warming ability of CO_2 is exhausted long before anthropogenic sources have any opportunity to play a role.

As I consider these and other questions, and observe data for the past thousands to millions of years, I do not see conditions or trends that exceed interpreted natural occurrences. I have, therefore, come to the conclusion that recent climatic patterns are related primarily to normal Earth atmospheric processes.