
**Anthropogenic climate change:
a geological perspective**

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Earth scientists are well known as a group of scientific stakeholders unusually sceptical of the importance of anthropogenic climate change. This presentation will examine reasons for this scepticism and the positive role that Earth scientists can play in the debate about the consequences of atmospheric greenhouse gasses. The scepticism arises from ignorance, bloody-mindedness, a Lyellian aversion to catastrophism, our training in the use of multiple working hypotheses, and our knowledge of a geologic record that shows constant change. Numerous processes act on different time scales to cause climate change. The geologic record confirms the atmospheric science predictions that abundant atmospheric carbon dioxide is correlated with times of warmer temperatures. Previous high carbon dioxide or high methane events, such as the Paleocene-Eocene Thermal Maximum and later Quaternary interglacials, provide partial analogues for current high greenhouse-gas abundance. The rate of increase in greenhouse gas abundance was likely less rapid in these past events than is now observed, making disequilibrium conditions more severe during the present event. Current changes in climate trends are those predicted by modelling greenhouse gasses together with solar variability and volcanic activity.

Earth scientists provide an important perspective on the consequences of change due to global warming. The geologic record suggests that the two more catastrophic consequences of the current event, if left unchecked, could be massive methane release from permafrost areas and melting of the Greenland and/or West Antarctic ice sheets. In the geological record, the former led to spectacular extinction, whereas the latter would incorporate many densely populated urban areas into a transgressive systems tract. Not every response to human abuse of the environment can be ascribed to global warming: for example, in Bangladesh, it is flood-control structures on

the coast and rivers, not rising eustatic sea level, that pose the most immediate threat to millions of people.

Many geologists were initially resistant to the concepts of plate tectonics, invented by geophysicists, just as they have been to anthropogenic global warming, invented by atmospheric scientists. Analogous to the state of plate tectonics in the early 1970s, it is becoming increasingly untenable for geologists to argue that forcing mechanisms other than anthropogenic carbon dioxide are the principal cause of current climate trends. As a profession, we must play a more positive and influential role in the scientific debates on the nature of future climate change and its implications. The medical profession provides a useful analogue for the professional behaviour of individual earth scientists in providing a balanced assessment to policy makers and the public. As geologists, we understand the consequences of population explosions and rapid environmental changes, and we should urge the application of the precautionary principle.