

## Global Climate Change

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### Position Statement

The Geological Society of America (GSA) supports the scientific conclusions that Earth's climate is changing; the climate changes are due in part to human activities; and the probable consequences of the climate changes will be significant and blind to geopolitical boundaries. Furthermore, the potential implications of global climate change and the time scale over which such changes will likely occur require active, effective, long-term planning. GSA also supports statements on the global climate change issue made by the joint national academies of science (June, 2005), American Geophysical Union (December, 2003), and American Chemical Society (2004). GSA strongly encourages that the following efforts be undertaken internationally: (1) adequately research climate change at all time scales, (2) develop thoughtful, science-based policy appropriate for the multifaceted issues of global climate change, (3) organize global planning to recognize, prepare for, and adapt to the causes and consequences of global climate change, and (4) organize and develop comprehensive, long-term strategies for sustainable energy, particularly focused on minimizing impacts on global climate.

### Background

The geologic record provides a direct measure of the frequency, range, and duration of significant global climate changes throughout Earth's history. Natural phenomena and processes have caused significant alterations of Earth's climate. Of significance to the issue of modern global climate change are the interpretations of the geologic record showing that the rate of change in atmospheric composition, especially with respect to carbon dioxide and other greenhouse gases, is unprecedented in Earth's recent history. Specifically, the carbon dioxide content of the atmosphere is higher than at any time in the past 650,000 years, and probably higher than at any time in the past 30 million years. In addition, the geologic record shows that global climate change can have significant consequences to Earth's life systems, with effects ranging from global modification of ecosystem distribution to large-scale extinctions. Because the geologic record provides the important archive of the consequences of global climate changes and harbors examples of icehouse-greenhouse transitions potentially analogous to modern climate change, the current nature and magnitude of global climate change should be evaluated in the context of Earth's full geologic record.

Many earth-science disciplines contribute to the scientific and public understanding of the complex, global climate change issue, including sedimentary geology, Quaternary geology, geochemistry, paleontology, and paleohydrology, in addition to oceanography and atmospheric sciences. The understanding of the full spectrum of magnitudes and rates of climate change over geologic time provides boundary conditions for evaluating any human impacts on climate and for producing more reliable predictions of the extent of future climate change. In addition, understanding of active geologic processes provides invaluable information to better understand and monitor ongoing climate change and to develop approaches for adapting to the consequences of climate change. Earth scientists also contribute to research on carbon capture and storage — potential methods for preventing atmospheric carbon dioxide from building up as a result of the burning of fossil fuels and biomass and the production of cement and lime.

Current predictions of the consequences of global climate change include: (1) rising sea level, (2) significant alteration of global and regional climatic patterns with an impact on water availability, (3) fundamental changes in global temperature distribution, (4) melting of polar ice, and (5) major changes in the distribution of plant and animal species. While the precise magnitude and rate of climate change cannot be predicted with absolute certainty, significant change will affect the planet and stress its inhabitants.

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In summary, the geologic record, from both near- and deep time, is a sensitive indicator of the magnitude and extent of global climate change over time and the potential consequences of such changes. Furthermore, knowledge of geologic processes is fundamental to identifying and developing effective measures to mitigate any impact on global climate due to human activities (for example, future energy production and utilization).

### **Implementation**

The GSA adopts this statement as a reflection of our institutional and individual commitment to the following:

- Given the importance of integrating information from a variety of scientific disciplines to understand and predict effects of global climate change, GSA issues the following challenges to global policy makers, funding agencies, the scientific community, and the GSA membership at large.
- Climate change science and policy needs to further incorporate an earth-science perspective. Significant research remains to be done to understand the causes and consequences of global climate change, formulate sustainable energy strategies and policies for the future, and adapt to changes in Earth's climate. Appropriate and sustained funding should be made available to address these research issues.
- As policy makers address the issue of global climate change, the scientific community needs to continue to provide objective science as a basis for policy decisions.
- GSA members should work actively to communicate with the general public and policy makers regarding the importance of earth-science research and publication to the global climate change dialogue.