New Series

The Geoscience of Climate and Energy: An Introduction

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This new series in Geoscience Canada focuses on the science presented at the Gussow–Nuna conference on the Geoscience of Climate Change, held at the Banff Centre, Alberta, 20–22 October, 2008. The two and one-half day conference consisted of invited oral presentations, followed by a one-day field trip to examine the record of Holocene climate change in the Banff–Calgary area. The two major objectives of the conference were, i) to thoroughly explore the record of climate change through the last few million years of Earth history and work toward a better understanding of what it tells us about the dynamics of the climate system, and ii) to review the state of energy supply, energy sustainability, and energy alternatives. Authors prepared extended, illustrated abstracts of their presentations, and this series has developed from these abstracts, which, in most cases, have been expanded and updated.

The history of Earth's climate is one of continual change. Many natural processes contribute to this change, including i) long-term forcing related to the movement and elevation of the Earth's continental plates, ii) changes in the amount and distribution of solar radiation received by the Earth, driven by regular changes in the earth's orbit and the sun's activity, and iii) climatic modulations driven by periodic oscillations in the pattern of oceanic and atmospheric currents.

There is a global consensus amongst most scientists that the climate is now also being forced by the anthropogenic addition of greenhouse gases to the atmosphere. The level of carbon dioxide in our atmosphere is now greater than at any time in the past 800 000 years. However, the balance of forces that are driving current changes in climate remains unclear.

One of the most important ways to evaluate current models of climate change is to thoroughly explore the record of change through the last few million years of Earth history. To examine this record and work toward a better understanding of what it tells us about the dynamics of the climate system, at all space and time scales, is an exercise for the geosciences, and was the first of the two conference objectives. There is a rich record of paleoclimatic variability and an array of techniques for evaluating climate history, including the study of landscapes, sedimentary rocks, soils and paleosols, palynology, cave deposits, marine sediment cores, ice cores, and other records. Only by working from such an understanding can we reliably evaluate the contribution being made to climate change by anthropogenic processes.

The major cause of greenhouse gas increases is the combustion of fossil fuels, and there is an increasing realization that means must be found to increase the efficiencies in our use of fossil fuels to bring about substantial net reductions in their use in the coming decades. This presents a two-part problem: worldwide economic growth is increasing rather than reducing the use of fossil fuels, leading to an accelerating depletion of these resources, and many experts predict a decline in the availability of inexpensive oil, natural gas and coal within the foreseeable future. Similar problems are emerging with the other crucial natural resource: water. Impending shortages, therefore, constitute a second equally important reason for reducing the use of fossil fuels; hence, the second major objective of this conference was to review the state of the fossil fuel supply, to discuss energy sustainability, and to examine energy alternatives and some possible technical solutions.

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