Modeling Climate Changes

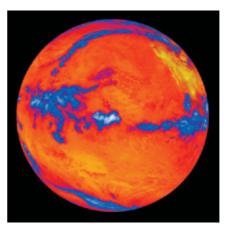
Does the well-documented increase in greenhouse gas levels enable detailed predictions? Atmospheric physicists have greatly improved their models in recent years. The models are able to correctly predict past ice ages and to account for the energy-absorbing qualities of oceans. But such models remain oversimplified, partly because of a lack of detailed long-term data. In addition, the effects of many variables, such as fluctuations in solar energy output and volcanic processes, are poorly understood and cannot be factored into predictions.

Effects of Global Warming

Although an increase in atmospheric temperature of 0.6°C over 100 years sounds small, small increases in temperature can have pronounced effects if they continue to occur. Increased temperatures can eventually cause the ice in polar regions to melt. Then, ocean levels will rise, which may flood some coastal areas. Such disasters depend on whether global temperatures continue to increase. Although this issue is being debated, most scientists believe that action should be taken to reduce the levels of greenhouse gases in the environment. Opponents argue that economic costs must also be taken into account and weighed together with the environmental concerns to make the best overall decision.

Taking Action

In February 2005, the Kyoto Protocol went into effect. The Kyoto Protocol, ratified by more than 160 countries, commits developed nations to reducing their emissions of carbon dioxide and other greenhouse gases. Although the United States has not ratified the Kyoto Protocol, in 2002 President Bush announced a commitment to reduce greenhouse gas levels in the United States by 18% over the next decade. This reduction will require a combination of voluntary, incentive-based, and mandatory measures. Proponents of this plan claim that it will provide reductions similar to those mandated by the Kyoto Protocol.



This false-color image shows the energy radiating from Earth's upper atmosphere. The blue areas are the coldest. The American southwest is in the upper right-hand corner.



Researching the Issue

1. Carbon dioxide levels in the atmosphere have varied during Earth's history. Research the roles of volcanoes, plants, and limestone formation, and determine whether these processes have any bearing on the current increase in CO₂ concentrations. Can you think of any practical means of using these processes to reduce CO₂ concentrations? What would be the advantages and disadvantages?

2. Find out what technological developments have been suggested for slowing climatic warming. Can they be easily implemented? What are the drawbacks of these methods?

