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Global warming and agriculture

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INTRODUCTION: Global warming is a phrase that refers to the effect on the climate of human activities, in particular the burning of fossil fuels (coal, oil and gas) and large-scale deforestation, which cause emissions to the atmosphere of large amounts of 'greenhouse gases', of which the most important is carbon dioxide. Such gases absorb infrared radiation emitted by the Earth's surface and act as blankets over the surface keeping it warmer than it would otherwise be. Associated with this warming are changes of climate. The basic science of the 'greenhouse effect' that leads to the warming is well understood. More detailed understanding relies on numerical models of the climate that integrate the basic dynamical and physical equations describing the complete climate system. Many of the likely characteristics of the resulting changes in climate (such as more frequent heat waves, increases in rainfall, increase in frequency and intensity of many extreme climate events) can be identified. Substantial uncertainties remain in knowledge of some of the feedbacks within the climate system (that affect the overall magnitude of change) and in much of the detail of likely regional change. Because of its negative impacts on human communities (including for instance substantial sea-level rise) and on ecosystems, global warming is the most important environmental problem the world faces. Adaptation to the inevitable impacts and mitigation to reduce their magnitude are both necessary. International action is being taken by the world's scientific and political communities. Because of the need for urgent action, the greatest challenge is to move rapidly to much increased energy efficiency and to non-fossil-fuel energy sources.

Global Warming: The Hard Science presents a comprehensive, qualitatively rigorous, and critical discussion of the science underlying the global warming issue. The major processes in the climate system needed to understand projected human-induced climatic change are presented in detail. Observational systems used to monitor changes in the climate system and the ways in which the raw data are analyzed in order to produce estimates of current trends are also critically reviewed. The author discusses the hierarchy of computer models used to project changes in the carbon cycle, in climate, and in sea level and examines the physical principles underlying the greenhouse effect and projected warming. The text also presents a detailed discussion of the carbon cycle, of climate sensitivity, and of projected patterns of climatic change through time. Sea level rise and issues of risk and potential surprises are also critically assessed. Emphasis is placed throughout on developing an intuitive understanding of those results that do not depend on the details of any one computer simulation model. A series of boxes illustrate the key points through step-by-step calculations. Anthropogenic climate change has the potential for slightly increasing the intensity of tropical cyclones through warming of sea surface temperatures. Emanuel has shown a striking and surprising association between sea surface temperatures and destructiveness by tropical cyclones in the Atlantic and western North Pacific basins. However, I question his analysis on the following grounds: it does not properly represent the observations described; the use of his Atlantic bias-removal scheme may not be warranted; and further investigation of a substantially longer time series for tropical cyclones affecting the continental United States does not show a tendency for increasing destructiveness. These factors indicate that instead of “unprecedented” tropical cyclone activity having occurred in recent years, hurricane intensity was equal or even greater during the last active period in the mid-twentieth century.