Climate, Hydrology & Water Supply: A Preface

Understanding the effects of climate change on water supply is crucial to formulating how best to manage our environmental resources.

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Climate change and possible global warming are now commonly discussed in the public literature. Controversy abounds relative to the scientific premises behind the so-called greenhouse phenomena, the possible impacts of any greenhouse warming and the response that our nation and others should have to this threat to our environment.

Much of the discussion on climate change revolves around changes in global temperature averages. Nevertheless, much of the impact of any climate change will be regional. It will involve changes in "downstream" variables like soil moisture, precipitation, runoff, evaporation and vegetation. These factors are all hydrologic variables that control agriculture, water supply, water quality, and electric power production, among many other things.

The 1989 Freeman Lecture, a symposium on climate, hydrology and water supply, was organized to inform the membership of the Boston Society of Civil Engineers Section/ASCE (BSCES), and the community at large, of some of the climate change issues that impact the hydrology of our environment and the use of water in our society. The idea was to raise consciousness and inform so that educated debate can continue.

Three speakers were invited to make presentations on these relevant issues at the symposium held at the Massachusetts Institute of Technology (MIT) on April 10, 1989, and sponsored jointly by the BSCES's Freeman Fund and the Ralph M. Parsons Laboratory at MIT. The three following papers included in this issue of *Civil Engineering Practice* are based on the presentations at the symposium. R.T. Wetherald and S. Manabe are leaders in the development of global circulation models. These models are the primary tool in the forecasting and the analysis of potential, man-induced climate change. In their article, "Hydrologic Sensitivity to CO_2-Induced Global Warming" on pages 33-36, they give the latest global predictions of changes in soil moisture — the key hydrologic variable — as a result of a doubling of carbon dioxide concentrations in the atmosphere.

Models have to be ultimately verified with data. Given the long time scales of climate change, the available data must be of paleologi-

cal origin — *i.e.*, the time series of related variables must be used as surrogates for quantities like temperature, precipitation, evaporation, *etc.* One of the most useful and valuable techniques of this nature is tree-ring analysis. Charles W. Stockton is and has been a leader in this field. His article, "Climatic, Hydrologic & Water Supply Inferences From Tree Rings" on pages 37-52, explains how tree rings are used to infer past climate changes and gives useful examples of applying this methodology.

Finally, Peter H. Gleick synthesizes all that we know about climate change and guides us through the implications to regional hydrology and, in particular, water supply in his article, "Global Climatic Changes: A Summary of Regional Hydrological Impacts" on pages 53-68.

Climate change is, perhaps, the hottest, most controversial, most active subject at the moment in the earth sciences. The premises, ideas, tools and conclusions are constantly changing. The following set of three articles should help the engineering community follow the ongoing arguments and, if necessary, it should help engineers respond quickly and responsibly to any threat to our global and regional environment.

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