Estimating Bounds on Extreme Precipitation Events

A Brief Assessment

Committee on Meteorological Analysis, Prediction, and Research

Board on Atmospheric Sciences and Climate

Commission on Geosciences, Environment, and Resources

National Research Council

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Preface

One of the most important societal applications of meteorological knowledge is the prediction of unusual weather events that lead to extremes of temperature, wind, or precipitation. Such predictions are crucial on short time scales. They also are important on very long time scales for designing buildings and other structures to ensure comfort, fuel efficiency, and safety. As our understanding of meteorological processes improves, we can expect to see increasingly accurate estimates of occurrence probabilities for extreme weather events.

For many years the design criteria for the construction of high-hazard structures, such as dams and nuclear power plants, have included an assessment of the largest flood to which a structure might be exposed during its lifetime. This assessment involves, among other things, determining the greatest precipitation anticipated for the appropriate drainage basin over time scales relevant to flood production. This is usually expressed in terms of what is called the Probable Maximum Precipitation (PMP).

Even very small changes in PMP estimates can result in large changes in construction or retrofitting costs. This sensitivity leads to considerations of cost versus safety and sometimes to confrontations between industry and regulators. Hydrometeorologists providing information on extreme weather events cannot ignore how that information will be used and the consequences of their advice. Therefore, it is important that the best available techniques be used in determining PMP or other estimates of precipitation extremes.

In view of these issues, the Federal Energy Regulatory Commission requested that the National Research Council, through its Committee on Meteorological Analysis, Prediction, and Research (CMAPR), make a preliminary assessment of the current scientific understanding of extreme precipitation events, evaluate the status of current procedures for determining PMP, and examine alternatives. As part of its study, the CMAPR organized a public symposium for a "Preliminary Assessment of Probabilities and Bounds on Extreme Precipitation Events" (see the Appendix). The symposium was attended by more than 70 experts and interested parties. We thank all of the speakers for their participation.

Particular thanks are due James Smith, who played a lead role in organizing the symposium and in preparing this report. The Committee also thanks its NRC staff officer, Mark Handel, for his competent and efficient assistance.

Peter V. Hobbs, *Chair*

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