Foreword

Water vapour is the most important of all the greenhouse gases. Were there no water vapour in the troposphere, near-surface air temperatures would be several tens of degrees less. Greenhouse warming research investigates a potential change of several degrees in this already existing substantial warming, and explores the impact of such a change. Consequently, understanding and correctly modelling how more water vapour in the atmosphere will amplify the contribution to near-surface warming caused by other greenhouse gases, and how this extra water may alter cloud cover and therefore surface solar radiation, are arguably the two biggest challenges for improved climate change prediction. At the same time, it is through potential changes in the nature and availability of precipitation falling over land surfaces, and ensuing changes in the water available for crops, river flow, and groundwater recharge, together with possible associated changes in evaporative demand, that a changing climate will have its most direct impact on human welfare and ecological services. This is all the more true because these climate-related changes in the Earth's hydrological cycle, which are the indirect result of the growth in human population and human expectations, will exacerbate the inevitable stress on water resource systems that will result from the direct impact of a massively growing global population on water demand and water quality.

Consequently, the importance of the relationship between climate and hydrology cannot be overstated. This book is motivated by the need to stimulate and foster this branch of science to address the challenge. The subject area it documents lies at the interface between climate science and hydrological science, and is identified in the preface as "climate hydrology". The scope of this important emerging topic is massive, and consequently the scope of this book is also massive. In fact, the 15 chapters it contains cover much that is currently known in the fields of surface hydrology, hydrometeorology, and cold climate and remote sensing science, as well as exploring the interfaces and coupling processes that link these fields. Yet every one of the self-contained chapters is written by an expert, and all are written with evident depth of perception and relevant understanding. Their collection together in this volume represents a huge new resource: a graduate level textbook and source of reference in the critical area of climate hydrology that was hitherto unavailable. This is a book which is timely, comprehensive, thorough and comprehensible, but above all, a book that is needed.

Jim Shuttleworth
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James W. Shuttleworth, Professor of Hydrology and Atmospheric Science
University of Arizona, USA