DRYLAND ECOHYDROLOGY

Dryland Ecohydrology

Edited by

PAOLO D'ODORICO

*Department of Environmental Sciences,
University of Virginia, U.S.A.*

and

AMILCARE PORPORATO

*Department of Civil and Environmental Engineering,
Duke University, U.S.A.*

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Preface

This volume presents recent advances in the observation, understanding, and modeling of fundamental processes and feedback mechanisms occurring among climate, soil, and vegetation in dryland ecosystems. The goal is to provide scientists and students with a synthesis of new research approaches and recent results in the emerging field of Ecohydrology.

The focus on drylands is motivated by the strong coupling existing between ecological and hydrological processes in arid and semiarid environments. These ecosystems are highly sensitive to fluctuations in hydrologic conditions and, in turn, play an important role in affecting the regional water cycle.

The chapters collected in this book have been contributed by authors with different expertise, who work in several arid areas around the World. Mindful of the multidisciplinary and interdisciplinary nature of this effort, the authors of each chapter have included a broad and organic introduction with a sound review of the state of the art in the specific research area. At the same time, each chapter presents the most recent results and indicates future research directions in related subjects. The subdivision of the contributions in different topics tries to avoid overlap while preserving a wide coverage across disciplines. Each topic is covered in depth by field-experts, while cross-references to the other chapters indicate important connections to other related disciplines. It is hoped that this approach enhances both the breath and the depth of this synthesis of ecohydrological studies of arid and semiarid environments.

The book is structured more by ecosystem components and processes (e.g. soils, water budget, nutrient cycles, vegetation, etc.) than by ecosystem type (e.g. grassland, savanna, temperate forest, etc.), though - when necessary - some chapters focus on properties and processes characteristic of specific biomes. Such a structure is motivated by the very nature of this book which addresses not only ecologic dynamics but also a number of water-related processes which are not necessarily dependent on the ecosystem type. At the same time the analyses do not focus on a specific geographic region in that all authors have provided - when possible - a synthesis that goes beyond the presentation of region- or site-specific results.

We are indebted with several colleagues and friends, who have provided useful comments and suggestions. In particular, Ignacio Rodriguez-Iturbe (Princeton University) has pointed us to the field of Ecohydrology and has been an important source of inspiration. We thank him for his guidance and companionship. A number of colleagues around the world have reviewed the chapters contained in this volume. We refrain from going through this long list of referees to preserve their anonymity. The completion of this book has been possible thanks to the support from the DOE-Office of Science (Biological and Environmental Research Program) through NIGEC, Great Plains Regional Center (grant #DEFC02-03ER63613), NSF-Hydrology Program (grant #EAR-0236621), NSF-Geoscience Program (grant #EAR-0409305), USDA (Cooperative Agreement #2002-35102-11585), and NASA (grant #NNG-04-GM71G). We are also indebted with our institutions, the University of Virginia (Department of Environmental Sciences) and Duke University (Department of Civil and Environmental Engineering) for providing a high-quality academic environment that stimulates and inspires our work.

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Paolo D'Odorico and Amilcare Porporato