As climate change and extreme weather events threaten our environment and day-to-day lives, scientists continue to gather evidence, but tomorrow’s students will be left to pick up the pieces. Traditionally, students have been trained in single disciplines, such as hydrology, meteorology, atmospheric sciences, or groundwater. Recent research investigations have demonstrated the complexity of land-atmosphere processes, making it necessary for the next generation of scientists to have a multidisciplinary background. Fortunately, the new book by James Shuttleworth, Terrestrial Hydrometeorology, addresses this issue by combining both hydrology and meteorology.

Terrestrial Hydrometeorology uses an innovative pedagogy in that it combines and lays out the connections and governing elements in hydrology and meteorology. Traditionally, hydroclimatologists were thought to study only atmospheric processes and their effects on the land. However, we now realize that the energy budget is a two-way street: the land and ocean affect the atmosphere and weather as much as the sun does. This book delves into the various aspects of hydrometeorology, from global atmospheric processes and features to catchment-scale surface-atmosphere exchanges, which in turn affect the global or regional dynamics. It makes a clear distinction between hydroclimatology and hydrometeorology, the former being the study of time-averaged movements of water and energy (e.g., climate) and the latter being the short-term effects (e.g., weather).

This 472-page book is ripe with information, chapter summaries, sample questions and answers, and a companion website with downloadable figures and tables. Chapters 1 to 3 provide a good overview of terrestrial hydrometeorology, global water resources, and the atmosphere. Chapters 4 to 7 provide a summary of the energy balance, while Chapters 8 and 9 give an overview of general circulation models as well as global-scale influences in hydrometeorology. Chapters 10 to 14 discuss the formation of clouds and precipitation, measurements and observations of precipitation, and temporal and spatial analysis of precipitation. Chapters 15 to 20 discuss the mathematical and conceptual tools for studying turbulence, and provide equations of both atmospheric and turbulent flow in the atmospheric boundary layer. Furthermore, Chapters 15 to 20 discuss how these equations control atmospheric behavior by considering observed diurnal changes in variables and fluxes in the atmospheric boundary layer, and turbulent transport in stable and unstable conditions. Chapters 21 to 24 explain canopy processes and interactions, how to estimate evaporation, and soil-vegetation-atmosphere transfer (SVAT) schemes. The last two chapters (25 and 26) discuss the influence of land-surface changes on weather and climate, and provide example questions and answers for students. Although there are numerous equations in the book, they are easy to follow and informative.

As stated in the author’s acknowledgments, this book was designed for students in hydrometeorology and hydrology. The ideal target audience is graduate students in hydrology looking to learn more about meteorology and vice versa. The book is modestly priced at $105 for paperback and an online pdf version is available for $85, which will be of great interest to students. As a new faculty member in water resources, I will definitely be adding this to my bookshelf, and I recommend students and faculty of all ranks do the same.

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