BOOK REVIEW

Runoff Prediction in Ungauged Basins: Synthesis Across Processes, Places and Scales

Edited by Günter Blöschl, Murugesu Sivapalan, Thorsten Wagener, Alberto Viglione, and Hubert Savenije
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A question about how to predict the runoff from a basin where there is no history of flow measurements is probably featured in almost every hydrology graduate student's oral examinations. It has certainly been one of the longest-standing problems for the profession. The International Association of Hydrological Sciences Prediction in Ungauged Basins initiative [*Wagener et al.,* 2004] has focused researchers and meetings on the topic, culminating in this book, which assembles the thoughts gathered over the last decade.

Runoff Prediction in Ungauged Basins: Synthesis across Processes, Places and Scales was written by about 130 authors led by a group of five editors. The two lead editors are well known for their previous syntheses on scaling of hydrologic processes, and in this book they return to similar themes of fragmented theory bounded by a surfeit of models and process understanding without a consistent or even coordinated scientific approach to solving these problems. Questions central to scaling regarding the relative utility of distributed modeling approaches versus upscaled physical hydrology have reprised their appearances as bottom-up and top-down approaches, and panning has been added to the scope of the "zooming" problem. The debate, though, has been reframed, noting that regardless of formulation, shortcomings in mathematically describing processes at catchment scales have led to calibration as a principal activity, burying process uncertainty in more parameters. The ungauged basin is offered as an archetypal blank slate for which there is no pretense, only performance.

The book is written and edited as a single book with coherent and consistent themes progressing from beginning to end. Although the book is large and gives an initial physical appearance similar to that of many syntheses of the last couple of decades, wherein hard covers bookend a series of quasi-independent papers, the editors and authors have bound a single story here told from several different angles. Most of the chapters are organized around hydrologic outcomes, such as high flows, low flows, or annual runoff, the kinds of metrics one might wish to estimate in an ungauged basin.

Each chapter is organized similarly, beginning with a brief review of work on the topic and a brief description of the hydrologic processes influencing the particular behavior. The reviews are not comprehensive but are thorough enough that readers will be able to effectively find the literature. The meat comes in describing and comparing the several modeling approaches applied in studies of each process. Performance metrics are drawn from the papers discussed in each section and compared based on the nature of the approach (e.g., statistical, geostatistical, physically based, or similarity derived). A summary chapter near the end explores these performance metrics arrayed across the various chapter topics, regions, climates, study scale, and alternative inferential approaches. The final chapters apply the synthesis to shape a path for more coordinated and fruitful science toward understanding hydrologic processes.

The book is not written as a typical textbook, although it could be effectively used as one for an advanced discussion class (being mindful of student budgets). While its general scope and progression lend it reasonably to being read like a nonfiction book, it is too heavy to comfortably read in your favorite chair (unless you obtain the less expensive electronic tablet version) and too dry for casual reading. It may practically be relegated to the role of reference for many users, although this is not its best utility. The price is reasonable for the heft and abundant color graphics, but the true measure is in the reading. This reviewer is happy for the time spent and will be revisiting parts of the book in the future.

Several topics are recurrent visitors throughout the book: the utility of similarity in the context of comparative hydrology; the idea of the "hydrologic signature" of a basin; and coevolution of soils, vegetation, and hydrology. A fairly fundamental conclusion is that if you want to draw understanding from the places you have measured and apply it to places where you have not, there is no substitute for appreciating the value of context. Similarity and proximity are two relatively easy sources of context, as are some aspects of stream geomorphology, vegetation cover, or topography. A simple mapping, listing, or ranking of the various dimensions and hierarchy of hydrologic contexts (independent of those obtained from direct flow measurements) would be a useful summary point for the book to make.

In summary, this book represents a step forward in advancing hydrologic theory. In combing through many hydrologic representations and inferential approaches to contrast their performances in several contextual frames, the authors have provided a coherent and solid platform from which to explore hydrologic processes.

Reference

Wagener, T., M. Sivapalan, J. McDonnell, R. Hooper, V. Lakshmi, X. Liang, and P. Kumar (2004), Predictions in ungauged basins as a catalyst for multidisciplinary hydrology, *Eos Trans. AGU, 85*(44), 451, 457, doi:10.1029/2004EO440003.

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