Principles of Snow Hydrology

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PRINCIPLES OF SNOW HYDROLOGY. By David R. DeWalle and Albert Rango. Cambridge and New York: Cambridge University Press, 2008. 410 pp. $150.00 (hardcover). ISBN 978-0-521-82362-3.

Most general textbooks in hydrology offer a chapter on snow hydrology but it has been almost 30 years since the last comprehensive treatment of snow on the ground (Gray and Male, 1981) was published. For that reason, this volume will be welcomed by researchers and graduate students concerned with snow on the ground and as a water resource. It sets out to describe "the factors that control the accumulation, melting, and runoff of water from seasonal snowpacks over the surface of the earth" and generally achieves this objective successfully.

Twelve chapters follow the sequence used in many courses on snow hydrology. An introduction that defines the nature of snow and snow hydrology is followed by a chapter on the formation of snow in the atmosphere and its geographic distribution. The third chapter treats snow on the ground: its metamorphism, temperature and liquid water content. The following two chapters cover the measurement of snowpacks, first by ground measurements and then by remote-sensing techniques. The following two chapters cover energy exchanges between the seasonal snow cover and its environment: first on an open, horizontal surface and then on more complicated terrain and under a vegetation cover. The chemical nature of snow, snowpacks, and the meltwater derived from them form the subjects of Chapter 8. Following this is a longer chapter on snowmelt and the processes of runoff and streamflow generation from snowmelt. A general chapter on the modeling of snowmelt and flow responses leads to a further chapter on the Snowmelt Runoff Model (Martinec, 1975), with which both authors have long experience. The final chapter treats the management of snowpacks and their modification in managing water resources. Two brief appendices close the volume: one of important physical constants and the properties of snow, ice, and water and another on potential solar radiation. Each chapter includes a comprehensive list of references and it is good to find included in these such classics as Corps of Engineers (1956) and Garstka et al. (1958), which form the foundation of empirical research on snow hydrology in the U.S.A.

The result is an attractive and useful volume that all snow hydrologists will need. It is clearly produced, with many figures and illustrations and a section of color plates which augment the monochrome photographs included in the main text.

However, *Principles of Snow Hydrology* generates a few complaints. Its emphasis is on North American research with only a few references to European experience and little consideration of snow in other parts of the world. Conversions to SI units are frequently a concern when hydrologic data from the U.S.A. are used for any purpose. In this book they are not always consistently well managed. For example, some figures (e.g. Fig. 1.4) remain in "American" units, while others have been converted but with an implied precision that is obviously unrealistic. Figure 2.6 suggests that average snow depths on a continental scale can be measured with a precision of 0.1 mm. Figure 6.3 shows temperature on the body of the figure as degrees Fahrenheit (as the original), but the polynomial equation on the figure uses degrees Celsius. While it is good to find reference to classic work, the volume contains relatively few references to work published in the last decade; Chapter 3 includes only one reference published after 2000. Finally, there are a surprising number of ambiguities and typographic errors in the text. These are not usually a problem but the number of them is disturbing and suggests a failure of copy editing. A few examples illustrate this: author names Kline (should be Cline) and Lewowicz (Lewkowicz); pentab (pentad); cumulous (cumulus). Finally, the notation is inconsistent in places, for example, NO_3, NO_3^- and NO3 all appear in the space of a few pages in Chapter 8.

In general, these are minor complaints which should be easily corrected in a revised edition. They will not seriously handicap its use as a text and reference volume. Despite them, it remains a valuable contribution, perhaps one that is destined for a life as long and useful as that of its classical predecessors. It is a volume

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that will be sought by researchers, watershed managers, and students, especially those in North America.

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