

COGLEY, J.G. and 10 others. 2011. *Glossary of glacier mass balance and related terms. Prepared by the Working Group on Mass-balance Terminology and Methods of the International Association of Cryospheric Sciences (IACS)*. Paris, UNESCO–International Hydrological Programme. IACS. (IHP-VII Technical Documents in Hydrology No. 86, IACS Contribution No. 2.) 114pp., paperback. Available free from IHP Secretariat, UNESCO, Division of Water Sciences, 1 rue Miollis, 75732 Paris Cedex 15, France, or from ihp@unesco.org, and as free download from <http://unesdoc.unesco.org/images/0019/001925/192525E.pdf>.

Measuring the mass balance of a glacier sounds like an easy task. Set a mess of stakes in the glacier and measure their height above the surface. Come back and repeat the measurements a year later. I know one glaciologist who figured he could get a good first-order estimate of the mass balance with only one stake, judiciously placed. But what about meltwater that runs down into the underlying firn and refreezes? What about ice loss, by both melting and calving, from vertical ice fronts ending in water? What about basal melt, particularly on floating ice tongues? What about settling of the snowpack? This paperback A4-format volume covers these topics and much more. Indeed, the term ‘glossary’ is an understatement. Many definitions are followed by lengthy discussions worthy of an encyclopedia.

The 16 introductory pages of the book are broken into eight sections. Section 2 reviews the history of mass-balance measurements, noting that while the earliest measurements were made in the late 19th century on Rhonegletscher, Switzerland, modern data collection began only in the late 1940s, and formalization of the terminology was not initiated until 1962. The latter culminated in an anonymous paper published in this journal in 1969. Glaciers have retreated dramatically since then and, as concern over climate change has developed, demand for a broader base of more detailed and reliable data has increased. The 1969 standard has evolved with this demand, but in addition numerous technological advances have led to new techniques for measuring mass balance as well as other properties of glaciers. Thus, this glossary provides a timely update of the terminology, old and new.

Sections 3 and 4 include good discussions of mass-balance terminology and of the various components of mass balance (alluded to above), respectively. A subsection of section 3 deals with use of the overdot, as in \dot{b} (where b is the sum of accumulation and ablation, both measured, say, in meters). Extensive use of the overdot in section 4 is well intentioned but may serve to confuse rather than to help. The discussion correctly notes that such overdots normally represent a derivative with respect to time, as in $\dot{x} = \partial x / \partial t$ where x is any variable. Thus, \dot{b} is the instantaneous change in mass balance, and $b = \int_{t_1}^{t_2} \dot{b} dt$. However, \dot{b} is zero during most of the time between t_1 and t_2 , differing from zero only during storms or periods of active melting (ignoring, for the moment, calving and also internal and basal accumulation or loss). Thus, it is not a particularly useful parameter in most studies. Furthermore, b is meaningless without a time dimension (commonly 1 year), so it is, in essence, already a rate.

Section 6 discusses departures from the recommendations of Anonymous (1969), of which the most important are in symbology. Anonymous suggests using b_n for specific *net* balances measured in the stratigraphic system, and b_a for specific *annual* balances measured using the fixed-date system. As this distinction is widely ignored, the present authors recommend retiring b_n and admonish contributors to be diligent in reporting the method of measurement, and particularly the dates of field surveys.

The glossary itself, which follows the introductory section, begins with three pages of acronyms which should be useful for many for whom GLIMS and InSAR are not household words. Eighty pages of definitions follow. The term being defined is in bold type. For some terms, there are ‘nested subheadings for closely related terms’. The ‘Mass balance’ entry, for example, has 18 subheadings occupying two and a half pages. The subheadings are in italicized bold type which, unfortunately, is not sufficiently distinct from the bold headings to immediately catch the user’s eye. Thus, one can open to a page and find definitions in what appears to be a rather unconventional alphabetical order.

Most of the 14 illustrations are clear and sharp and several are in color. A few, however, appear to have been photocopied from earlier works and to have lost their crispness in the process.

Among the definitions that I read, and I did not read all of them, I was most surprised to learn that the authors consider ‘polar glacier’ to be an obsolete term. I was also surprised not to find ‘Julian day’ (as opposed to ‘Julian date’ and ‘Julian day number’), as Julian day is used fairly commonly, although apparently incorrectly. (The correct phraseology is ‘day of the year’.) Finally, I was disappointed that the entry for ‘Combined system’, referring to combining two time systems of mass-balance measurement, was not more explicit about how the time systems are combined.

The volume closes with two appendices, a list of references and an index. Appendix B, a comprehensive list of physical properties of water and ice, is a particularly useful addition. The index, however, seems superfluous as the entries in the glossary are already in alphabetical order.

Minor glitches notwithstanding, this is a volume that belongs on the bookshelf, in an easily accessed location, of every scientist dealing with snow and ice on Earth’s surface. In order to maximize the value of their data for future users, anyone making mass-balance measurements on glaciers should take particular care to ensure that their procedures conform to the recommendations given. The authors are to be commended for their Herculean effort in compiling this volume. I wish there were a hardcover edition because this one is likely to be dog-eared before it becomes obsolete.

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