Review

KÄÄB, A. 2005. *Remote sensing of mountain glaciers and permafrost creep*. Zürich, University of Zürich. Department of Geography. (Physical Geography Series 48.) 266pp. ISBN 3 85543 244 9, paperback US$30, €25.

Andreas Kääb, the author (and editor) of *Remote sensing of mountain glaciers and permafrost creep*, has written (and compiled) a fine review of theory and methods and the application of remote sensing and geographic information science to the study and monitoring of changes in mountain glaciers and permafrost. He uses the term GIScience to distinguish geographic information science from geographic information systems (GIS). The book, perhaps better described as a manual, is divided into five parts: introduction, theory and methods, case studies and application schemes, conclusions and perspectives, and references. It is based on research by Kääb on the principal topics, students' dissertations on topics supervised by him, and on case histories based on research by other scientists alone or in collaboration with Kääb.

The book provides an excellent introduction to the application of remote sensing and GIScience (which Kääb also calls geoinformatics) to the measurement of terrain dimensions, geometry of, and changes in, terrain, and spectral characteristics of terrain, as well as multidimensional data analysis and visualization. The five case histories on glacier dynamics from different geographic areas are drawn from the various authors' work on using data from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) sensor flown on the Terra satellite. The six case histories on rock-glacier dynamics, all from Switzerland, are drawn from the work of Kääb and other scientists; the research is based on field observations and analysis of aerial photographs. Two case histories of the dynamics of paraglacial slope deformation are also presented. The graphics used throughout the book are of high quality. Of particular interest to students of remote sensing of glaciers and permafrost creep are tables that compare the value and usefulness of different sensor data and analytical techniques to specific phenomena. Figure 1-1 (actually a table) compares the capability of various space-borne, airborne and ground sensors and instruments to measure changes in high-mountain environments. Table 12-1 provides a superb comprehensive review of glacier- and permafrost-related hazards in high mountains with respect to hazard type, processes, applicability to the use of remote sensing, and citations to references of case histories.

European scientists have been among the leaders in the application of satellite and airborne remote sensing and GIS to glacier inventories and quantitative measurement of glacier change. Both Andreas Kääb and Frank Paul (the new Swiss Glacier Inventory 2000, 2004) are among that leadership cadre. Kääb's *Remote sensing of mountain glaciers and permafrost creep* and Paul's (2004) outstanding work should be part of every glaciologist's library.

I have three observations about aspects of the book that somewhat diminish its overall excellence. Firstly, I was disappointed in the brief text given to 'Satellite-derived glacier inventorying': chapter 11 is only four pages long and is derived from Paul's superb 2004 work. I expected more coverage of this important topic because of the main title of the book and also the reference in chapter 1 (p. 15) to 'mapping and monitoring glacier extent from space'. Secondly, in four of the case histories of glacier dynamics, none of the authors cite previous work published on analysis of Landsat multispectral scanner (MSS) images by five of the more than 120 scientists involved in the authorship of volumes in the *Satellite image atlas of glaciers of the world* series (US Geological Survey Professional Paper 1386-A–K, seven volumes currently available in print and online) (see 'Tasman Glacier, Mount Cook area' in Chinn, 1989; 'Kronebreen, Svalbard' in Liestøl, 1993; 'Nigardsbreen, southern Norway' in Østrem and Haakensen, 1993; 'Glacier Chico, Southern Patagonia Icefield' in Lliboutry, 1998). Thirdly, the focus by the ASTER scientific community on high-mountain glaciers, while important and commendable, continues to generally ignore the largest area (96.8%) and volume (99.3%) of glacier ice on Earth, the ice sheets and outlet glaciers in Greenland and Antarctica. Only a few citations in the references pertain to glaciers in Greenland and Antarctica. It is hoped that as remote sensing and geoinformatics applied to glaciers matures, more emphasis will be directed at investigations of larger glaciers, such as ice caps and ice sheets and their associated outlet glaciers. I encourage Andreas Kääb to author a sequel ('Remote sensing of glaciers'?) to his excellent work *Remote sensing of mountain glaciers and permafrost creep*.

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REFERENCES

Chinn, T.J.H. 1989. Glaciers of New Zealand (H-2). In Williams, R.S., Jr and J.G. Ferrigno, *eds*. Satellite Image Atlas of Glaciers of the World. *USGS Professional Paper*, 1386-H (Glaciers of Irian Jaya, Indonesia and New Zealand), H21-H48.

Liestöl, O. 1993. Glaciers of Svalbard, Norway (E-5). In Williams, R.S., Jr and J.G. Ferrigno *eds*. Satellite Image Atlas of Glaciers of the World Europe. *USGS Professional Paper*, 1386-E (Glaciers of Europe), E127-E151.

Lliboutry, L. 1998. Glaciers of Chile and Argentina (I-6). In Williams, R.S., Jr and J.G. Ferrigno, *eds*. Satellite Image Atlas of Glaciers of the World. *USGS Professional Paper*, 1386-I (Glaciers of South America), I109-I206.

Østrem, G. and N. Haakensen. 1993. Glaciers of Norway. In Williams, R.S., Jr and J.G. Ferrigno, *eds*. Satellite Image Atlas of Glaciers of the World. *USGS Professional Paper*, 1386-E (Glaciers of Europe), E63-E109.

Paul, F. 2004. The new Swiss glacier inventory 2000: application of remote sensing and GIS. (PhD thesis, University of Zürich.)

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