Remote Sensing of Ice and Snow

Remote Sensing of Ice and Snow

DOROTHY K. HALL
JAROSLAV MARTINEC

London New York
CHAPMAN AND HALL

First published in 1985 by
Chapman and Hall Ltd
11 New Fetter Lane, London EC4P 4EE
Published in the USA by
Chapman and Hall
29 West 35th Street, New York, NY 10001

ISBN-13: 978-94-010-8647-9 e-ISBN-13: 978-94-009-4842-6
DOI: 10.1007/978-94-009-4842-6

British Library Cataloguing in Publication Data

Hall, Dorothy K.
Remote sensing of ice and snow. —— (Remote sensing applications)
1. Glaciology 2. Remote sensing
I. Title II. Martinec, Jaroslav III. Series
551.3'1'028 QE576

Library of Congress Cataloguing in Publication Data

Hall Dorothy K., 1952–
Remote sensing of ice and snow.

Includes bibliographies and index.
1. Ice—remote sensing. 2. Snow—Remote sensing.
3. Frozen ground—Remote sensing. I. Martinec, J.
II. Title.
GB2401.72.R42H35 1985 551.3'1 85–9712

Contents

Preface

Remote sensing using aircraft and satellites has helped to open up to intensified scientific scrutiny the cold and remote regions in which snow and ice are prevalent. In this book, the utility of remote sensing for identifying, mapping and analyzing surface and subsurface properties of worldwide ice and snow features is described. Emphasis is placed on the use of remote sensing for developing an improved understanding of the physical properties of ice and snow and understanding the interrelationships of cryospheric processes with atmospheric, hydrospheric and oceanic processes. Current and potential applications of remotely sensed data are also stressed.

At present, all-weather, day and night observations of the polar regions can be obtained from sensors operating in different portions of the electromagnetic spectrum. Because the approaches for analysis of remotely sensed data are not straightforward, Chapter 1 serves to introduce the reader to some of the optical, thermal and electrical properties of ice and snow as they pertain to remote sensing. In Chapter 2 we briefly describe many of the sensors and platforms that are referred to in the rest of the book. The remaining chapters deal with remote sensing of the seasonal snow cover, lake and river ice, permafrost, glacier ice and sea ice.

We would like to thank the individuals whose comments and reviews led to many improvements in the book: Dr Robert Bindschadler (NASA/Goddard Space Flight Center, Greenbelt, Maryland), Dr Jerry Brown (US Army Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire), James Foster (NASA/Goddard Space Flight Center), Dr Robert Gurney (NASA/Goddard Space Flight Center), Dr Claire Parkinson (NASA/Goddard Space Flight Center), Donald Wiesnet (Satellite Hydrology, Inc., Vienna,

Virginia), Dr Richard Williams, Jr (US Geological Survey, Reston, Virginia) and Russell Wright (University of Maryland, College Park, Maryland). Thanks are also due to Joyce Tippett for typing the manuscript.