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REVIEWS

The Thermophysics of Glaciers. By I. A. Zotikov. Reidel, 1986. 275 pp. Dfl 230.00 or £74.00.

This is a 1986 translation of a 1982 Russian publication; the translation, by R. Hardin, is of high quality. There is an excellent brief Introduction noting the importance of glaciers and ice sheets to world climate, the state of the oceans, and to world economy, and emphasizing that the application of thermophysical methods has enormous potential as an approach to obtaining new data; that is, knowledge of temperature profiles yields information about processes and quantities not so readily observed and measured, for example basal boundary conditions. Chapters 1 and 2 discuss temperature measurement in a glacier and the methods of thermal drilling. Chapter 3 starts with a clumsy derivation of the basic balance laws of continuum mechanics, followed by a complicated description of a nonlinearly viscous fluid model adapted for glacier ice on long timescales, concluding with the introduction of scaled dimensionless variables and the consequent dimensionless parameters. A glacier is then defined as a natural ice formation with substantial movement, in which the motion influences the temperature field through significant heat advection, and this requires a Péclet number to be order unity (not small); the existence of non-glacial ice formation is also implied. This Péclet-number definition uses a timescale based on thermal diffusivity; however, if time is scaled by depth and vertical velocity magnitude, natural to surface accumulation conditions, advection is always significant. Certainly, most of the Earth's glaciers, from small to the great ice caps of Antarctica, do not have small Péclet numbers and advection is important. Next is proposed the simplification to a block motion in which the horizontal velocity u is independent of height y, but I fail to follow the moving-coordinate argument or see its relevance to equation (3.59) which is simply the heat balance (3.54) for steady-state temperature in fixed spatial coordinates if the (undefined) characteristic time is taken equal to L/u_{H}. Then follows a 'flat block glacier' approximation in which dependence on the horizontal distance x is neglected, giving a one-dimensional heat transfer equation for $T(y)$ which plays a central role in the subsequent material. There is no restoration of x-dependence until the final Chapter 10. Developments in glacier dynamics over the last ten years have demonstrated the significance of both vertical and horizontal gradients in the global mechanical and thermal balances, so that treatments based solely on a vertical heat transfer equation must be examined critically. The book does not provide a sound theoretical thermomechanics reference, but contains a wealth of physical observation based on the author's long experience. It can be recommended to workers in the field, provided they treat the theory with caution.

L. W. Morland

Interfacial Phenomena: Equilibrium and Dynamic Effects. By C. A. Miller and P. Neogi. Dekker, 1985. 354 pp. $69.50.

The intent of the authors is to provide an introduction to the subject of interfacial phenomena, beginning with the fundamental aspects of equilibrium properties of interfaces and then proceeding to discussion of how these properties influence dynamics through their coupling with transport processes in the bulk of fluids.

Accordingly, the book consists of roughly equal parts, with the first including chapters on the static properties of interfacial tension, wetting and contact angles, dispersions of small particles affected by both electrical and long-range van der Waals forces, and phase and interfacial behaviour of surfactants. The second half, which, although heat and mass transfer are discussed, deals primarily with fluid mechanics, contains three chapters on waves, convection driven by transport of heat and mass, and some free-boundary problems in droplet and coating flows.

The treatment is at advanced undergraduate/first-year graduate student level, and given the wide scope of topics, is necessarily superficial in parts. Thus, it is not particularly well-suited as a textbook. The production is from camera-ready typescript which is reasonably well done and appears free from major typographical errors.

Researchers in fluid mechanics will find the last half of the book disappointing, as it deals primarily but not exclusively with the linear stability of simple flows which are either one-dimensional or static rest states. Examples include capillary instability of jets, Kelvin–Helmholtz instability, onset of surface-tension-driven convection, thin-film stability, and waves on flowing liquid films. These and most of the other topics in the latter half of the book are well covered in more depth in standard books on the subject, and the wealth of understanding of nonlinear phenomena is not covered. On the other hand, the initial chapters may serve fluid dynamicists as a useful introduction to static properties of interfaces before they approach some of the more specialized monographs available on interfacial and colloid chemistry.

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