POLAR GEOPHYSICS

GEOPHYSICS OF THE POLAR REGIONS. Husebye, E. S., Johnson, G. L. and Kristoffersen, Y. (editors). 1985. Amsterdam, Elsevier. 470 p, illustrated, hard cover. ISBN 0–444–42498–9. Price US$98.25; DFl 265.00.

A symposium on the geophysics of polar regions was held in conjunction with the 10th General Assembly of the IUGG in Hamburg in 1983. Most of the papers presented at that two-day meeting have been published in this book. The book is divided into four unequal parts, dealing with both north and south polar regions as well as marine geology-geophysical studies. It is always difficult in such collections of articles to identify coherent themes. Papers are offered at meetings for a variety of reasons; some present new data, while others may investigate specific regions or provide up-to-date reviews. It is a rare luxury to be able to develop a single topic. This volume is no exception, and suffers from the weakness of diversity in material and quality. Nevertheless from these 23 papers, by scientists from 11 countries, there is an excellent flavour of the style of geophysical research currently being prosecuted in polar regions.

The first seven papers address the Arctic Ocean basin and surrounding areas. A short review by J. F. Sweeney discusses mostly Cretaceous evolution of basins, using results from recent geophysical exploration. Papers by H. R. Jackson and S. P. Srivastava detail the key area of Nares Strait between Greenland and Ellesmere Island, important in the geophysical development of that part of the Arctic Ocean bounded by the Eurasian continental shelf and the Lomonosov Ridge. Geophysical results (both seismic refraction and reflection data) of the Fram II and IV experiments in the eastern Arctic Ocean in 1980 and 1982 respectively are discussed by G. L. Duckworth and A. B. Baggeroer, and Y. Kristoffersen and E. S. Husebye. Several dipping reflections, principally from the Norwegian continental margin, are used by J. C. Mutter to describe various break-up scenarios for continental margins. The final paper in this section, by D. A. Dinter, deals with Quaternary sedimentation on the Alaskan continental shelf—particularly the contribution from glaci-marine deposits.

The second section of four papers focuses upon the tectonic development of Svalbard and the Barents Sea area. S. A. Vincenz and M. Jelenska present palaeomagnetic evidence from Palaeozoic and late Mesozoic dolerites on the independent motion of Svalbard. W. W. Chan and B. J. Mitchell describe micro-earthquakes associated with fault complexes in north Nordaustlandet, Svalbard, which are interpreted to be intraplate. C. Craddock and four co-workers provide a résumé of tectonic activity in the west Spitsbergen fold belt, based on geological mapping from Late Protezoic times to the Tertiary. The final contribution in this section, by N. I. Davydova, N. I. Pavlenkova, Yu. V. Tulina and S. M. Zverev, interprets deep seismic soundings carried out in the Barents Sea in 1976. Similarities are demonstrated with deep sedimentary basins of the Russian Platform.

The next three papers focus on Southern Ocean geophysics, particularly on plate reconstruction from ocean floor spreading data. L. A. Lawver, J. G. Sclater and L. Meinke present new data for the southwest Indian Ridge which allow improved Gondwana reconstructions. J. C. Mutter, K. A. Hegarty, S. C. Cande and J. K. Weissel examine separation between Antarctica and Australia, supporting an earlier date (about 85 Ma BP) of rifting and rapid subsidence of the continental margins. The final article, by D. Rouland, S. H. Xu and F. Schindele, deals with upper mantle composition in the southeast Indian Ocean, from surface waves recorded at Dumont d'Urville, Terre Adélie.

The last group of nine papers is concerned with the Antarctic continental margin and aspects of its resource potential. K. Haugland, Y. Kristoffersen and A. Velde report results of 16–channel seismic data collected in the Weddell Sea in 1976–77 and 1978–79.

Areas of basement are located between Belgrano and Halley stations but there is progradation west and north into a major undisturbed sedimentary basin with up to 5 km of deposits. H. M. J. Staff examines similar data gathered in 1982 in the Prydz Bay region on the other side of the continent; a major sedimentary basin with at least 5 km of deposits is recognized, a possible failed rift-arm from Antarctic–India continental separation. L. O. McGinnis and four co-workers analyse seismic profile data and other geophysical measurements gathered in McMurdo Sound, investigating the complex boundary between East and West Antarctica. The Palaeozoic Ross orogen appears to control the deep structures but there is pronounced thinning of the crust to the east. K. Kaminuma, S. Ueki and J. Kienle report present-day seismic activity associated with volcanic earthquake swarms at Mt Erebus on Ross Island. A. Ikami, K. Ito, K. Shibuya and K. Kaminuma use a range of geophysical data to investigate crustal structure of the Mizuho Plateau and Ongul Island area. No velocities less than 6 km s^{-1} were found suggesting no well-developed upper sedimentary horizon. Similar studies, derived from a considerable quantity of seismic data, are reported by A. Guterch, M. Grad, T. Janik, E. Perchuc and J. Pajchel for the complex crustal sections of the western Antarctic Peninsula. D. Gonzalez-Ferran discusses the volcanic and tectonic evolution of northern Antarctic Peninsula since the Late Cenozoic, while R. D. Crabtree, B. D. Storey and C. S. M. Doake, using mainly radio echo sounding bedrock topographic data and known geology, outline the structural evolution of George VI Sound. The final paper by F. J. Davey investigates the possible hydrocarbon potential of the Antarctic continental margin. Reviews of existing geophysical data are presented and in appropriate cases the level of maturation of sediments sufficient for hydrocarbon generation is assessed, using a thermal model. Only the western Weddell Sea and Ross Sea sedimentary basins appear prospective.

The book is well produced and illustrated and will be a useful collection for those seriously interested in polar solid earth geophysics. (David J. Drewry, Scott Polar Research Institute, University of Cambridge, Lensfield Road, Cambridge CB2 1ER.)

REMOTE SENSING FOR POLAR REGIONS

REMOTE SENSING ICE AND SNOW. Hall, D. K. and Martinec, J. 1985. London, New York, Chapman and Hall. 189 p, illustrated, hard cover. ISBN 0 412 25910 9.

Environmental remote sensing, the observation and measurement of the Earth from space, has developed as an important discipline during the last decade. Active and passive microwave sensors are now routinely flown in aircraft, satellites and spacecraft, and acquire considerable quantities of physical information about our planet. Some satellites such as Meteosat have geostationary orbits many tens of thousands of kilometres above the surface, and, by maintaining pace with the earth's rotation, constantly view the same region of our globe. Others orbit the earth many times each day, and at various inclinations, and with variable precession, may obtain closely or widely spaced ground coverage. For polar regions the benefits of remote sensing are considerable. The hostile environment, long periods of darkness and logistic complexities make observations from space highly attractive. Moreover the coverage from space allows a synoptic view of polar regions, unobtainable by conventional surface or even airborne operations.

This book deals with the remote sensing of snow and ice. Although it is not exclusively devoted to polar regions, the Arctic and Antarctic figure very significantly. In Chapter 1 it provides a brief review of some important physical principles involved in remote sensing of ice and snow (optical and electrical properties) and in Chapter 2 goes on to