## TRANSACTIONS OF THE ROYAL SOCIETY OF EDINBURGH



# EARTH SCIENCES

Volume 82 Part 2

PUBLISHED BY THE ROYAL SOCIETY OF EDINBURGH 22 GEORGE STREET · EDINBURGH · EH2 2PQ

1991

#### **Editorial Board**

E. N. K. CLARKSON University of Edinburgh (Chairman)

J. B. DAWSON University of Edinburgh

C. H. DONALDSON University of St Andrews

A. L. HARRIS University of Liverpool

B. HARTE University of Edinburgh (Executive Editor) J. MCMANUS University of St Andrews

C. D. WATERSTON General Secretary Royal Society of Edinburgh R. MCQUILLIN Edinburgh D. M. RAMSAY University of Dundee E. K. WALTON University of St Andrews W. DUNCAN Executive Secretary

### **Consulting Editors**

SHOHEI BANNO Kyoto University

W. L. BROWNCentre de Recherches Pétrographiques et Géochimiques,Vandoeuvre-les-NancyB. W. CHAPPELL

Australian National University, Canberra J. M. COLEMAN

Louisiana State University, Baton Rouge J. F. DEWEY University of Oxford D. G. GEE Lunds Universitet

R. W. HUTCHINSON Colorado School of Mines E. JÄGER Universität Bern

J. KONTA Charles University, Prague R. MACDONALD University of Lancaster

D. B. MCINTYRE Kinfauns, Perth

K. J. MÜLLER Rhein. Friedrich-Wilhelms-Universität Bonn

D. F. STRONG Memorial University, St Johns

V. C. THAKUR Wadia Institute of Himalayan Geology

S. UYEDA University of Tokyo

O. VAN BREEMEN Geological Survey of Canada, Ottawa

R. WOODALL Western Mining Co., Adelaide

#### Publications Manager, Royal Society of Edinburgh: T. Dart

COPYRIGHT: It is the policy of the Royal Society of Edinburgh not to charge any royalty for the production of a single copy of any one article made for private study or research. Specific permission will not be required for photocopying multiple copies of copyright material, to be used for *bona fide* educational purposes, provided this is done by a member of the staff of the university, school or other comparable institution, for distribution without profit to student members of that institution and provided the copies are made from the original journal. Requests for the copying or reprinting of any article for any other purpose should be sent to the Royal Society of Edinburgh.

© 1991 The Royal Society of Edinburgh and the authors of individual papers