

# JOURNAL OF THE GEOLOGICAL SOCIETY

## EDITORIAL BOARD

**Chief Editor:** Andrew Carter (Birkbeck College, London, UK)

### Editors

<b>Peter Clift</b> (Louisiana State University, USA)	<b>Adrian Hartley</b> (University of Aberdeen, UK)	<b>Conall Mac Niocaill</b> (University of Oxford, UK)	<b>Yuntao Tian</b> (Sun Yat-sen University, Guangzhou, China)
<b>Stephen Daly</b> (University College Dublin, Ireland)	<b>Philip Hughes</b> (University of Manchester, UK)	<b>Randall Parrish</b> (University of Portsmouth, UK)	<b>Veerle Vandeginste</b> (University of Nottingham, UK)
<b>Philip Donoghue</b> (University of Bristol, UK)	<b>Stuart Jones</b> (Durham University, UK)	<b>Tyrone Rooney</b> (Michigan State University, USA)	<b>Igor Villa</b> (University of Bern, Switzerland)
<b>Ian Fitzsimons</b> (Curtin University, Australia)	<b>Linda Kirstein</b> (University of Edinburgh, UK)	<b>Karel Schulmann</b> (Université Louis Pasteur, Strasbourg, France)	<b>Sebastian Watt</b> (University of Birmingham, UK)
<b>Deta Gasser</b> (Høgskulen i Sogn og Fjordane, Norway)	<b>Stephen Lokier</b> (Bangor University, UK)	<b>Graham Shields-Zhou</b> (University College London, UK)	<b>Wenjiao Xiao</b> (Chinese Academy of Sciences)
<b>Yanni Gunnell</b> (Université de Lyon, France)	<b>John MacDonald</b> (University of Glasgow, UK)	<b>Carl Stevenson</b> (University of Birmingham, UK)	<b>Shihong Zhang</b> (China University of Geosciences Beijing)

**Production Editor:** Patricia Pantoş (e-mail: [patricia.pantos@geolsoc.org.uk](mailto:patricia.pantos@geolsoc.org.uk))

*The Journal of the Geological Society* is published bi-monthly in January, March, May, July, September and November.

**Subscriptions:** All correspondence relating to trade subscriptions should be addressed to the Journal Subscriptions Department, Geological Society Publishing House, Unit 7, Brassmill Enterprise Centre, Brassmill Lane, Bath, UK, BA1 3JN (tel 01225 445046; fax 01225 442836; e-mail: [sales@geolsoc.org.uk](mailto:sales@geolsoc.org.uk)). The online + print subscription prices for 2019 can be found here: <https://www.geolsoc.org.uk/lcprices>. More information about subscription options can be found at <http://www.geolsoc.org.uk/lcaccess>.

Outside Europe, the Journal is dispatched by various forms of airspeeded delivery. Airfreight and mailing in the USA by agent named Air Business Ltd, c/o Worldnet Shipping Inc., 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA. Periodicals postage paid at Jamaica NY 11431. US Postmaster: send address corrections to The Journal of the Geological Society, Air Business Ltd, c/o Worldnet Shipping Inc., 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA. Back numbers are normally dispatched by surface mail.

**Editorial correspondence and material submitted for publication:** see inside back cover.

**The Geological Society of London** was founded in 1807. It is the oldest national geological society in the world and the largest in Europe. It was incorporated under Royal Charter in 1825 and is Registered Charity 210161. To find out about the Society and how you can join, please visit our website at [www.geolsoc.org.uk](http://www.geolsoc.org.uk) or e-mail [enquiries@geolsoc.org.uk](mailto:enquiries@geolsoc.org.uk).

© The Geological Society of London 2019. No reproduction, copy or transmission of all or part of this publication may be made without the prior written permission of the publisher. In the UK, users may clear copying permissions and make payment to The Copyright Licensing Agency Ltd, Saffron House, 6-10 Kirby Street, London EC1N 8TS UK, and in the USA to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, USA. Other countries may have a local reproduction rights agency for such payments. Full information on the Society's permissions policy can be found at: [www.geolsoc.org.uk/permissions](http://www.geolsoc.org.uk/permissions)

Typeset by Nova Techset Private Limited, Bengaluru and Chennai, India.

Printed and bound by Henry Ling Ltd, Dorset Press, Dorchester, Dorset DT1 1HD, UK