

RU
N28/g

JULY 2014 VOL 7 NO 7
www.nature.com/naturegeoscience

nature geoscience

TITAN'S SEAS

Seasonally dynamic

FIRST CONTINENTAL CRUST

Formed in Iceland-like setting?

COASTAL OCEAN UPWELLING

Iron stress boosts opal burial

Pulsed winter influx into Greenland's fjords



**COVER IMAGE**

The factors that control the submarine melt rate at Greenland's glaciers are uncertain and largely inferred from brief summer surveys in the fjords where glaciers terminate. Continuous records of water properties and velocity for the months September to May from two large Greenland fjords reveal strong variability on 3- to 10-day timescales as a result of pulses of water that are propagated from the shelf ocean. The image shows an iceberg in Sermilik Fjord on Greenland's southeast coast, in August 2013. The iceberg is a fragment of Helheim Glacier that has calved into the ocean.

Letter p503

IMAGE: MAGDALENA ANDRES

COVER DESIGN: DAVID SHAND

ON THE COVER

Titan's seas
Seasonally dynamic
Letter p493

First continental crust
Formed in Iceland-like setting?
Letter p529; News & Views p482

Coastal ocean upwelling
Iron stress boosts opal burial
Article p541



Nature Geoscience is printed on paper recycled from post-consumer waste.

EDITORIAL

477 Recovery and discovery

COMMENTARY

479 Missing a trick in geothermal exploration
Paul L. Younger

NEWS & VIEWS

481 Cryosphere: Bottom-up restructuring of ice
Joseph A. MacGregor

482 Early Earth: A new recipe for old crust
Anthony I. S. Kemp

483 Geomorphology: Tales of topography
Rebecca M. Flowers

485 Thomas J. Crowley: A broad view of climate history
Gerald R. North

PROGRESS ARTICLE

487 The Indonesian seas and their role in the coupled ocean-climate system
Janet Sprintall, Arnold L. Gordon, Ariane Koch-Larrouy, Tong Lee, James T. Potemra, Kandaga Pujiana and Susan E. Wijffels

LETTERS

493 Transient features in a Titan sea
J. D. Hofgartner, A. G. Hayes, J. I. Lunine, H. Zebker, B. W. Stiles, C. Sotin, J. W. Barnes, E. P. Turtle, K. H. Baines, R. H. Brown, B. J. Buratti, R. N. Clark, P. Encrenaz, R. D. Kirk, A. Le Gall, R. M. Lopes, R. D. Lorenz, M. J. Malaska, K. L. Mitchell, P. D. Nicholson, P. Paillou, J. Radebaugh, S. D. Wall and C. Wood

497 Deformation, warming and softening of Greenland's ice by refreezing meltwater
Robin E. Bell, Kirsteen Tinto, Indrani Das, Michael Wolovick, Winnie Chu, Timothy T. Creyts, Nicholas Frearson, Abdulhakim Abdi and John D. Paden
→N&V p481

503 Externally forced fluctuations in ocean temperature at Greenland glaciers in non-summer months
Rebecca H. Jackson, Fiammetta Straneo and David A. Sutherland

509 Contribution of light-absorbing impurities in snow to Greenland's darkening since 2009
M. Dumont, E. Brun, G. Picard, M. Michou, Q. Libois, J-R. Petit, M. Geyer, S. Morin and B. Josse

513 Indonesian vegetation response to changes in rainfall seasonality over the past 25,000 years
Nathalie Dubois, Delia W. Oppo, Valier V. Galy, Mahyar Mohtadi, Sander van der Kaars, Jessica E. Tierney, Yair Rosenthal, Timothy I. Eglinton, Andreas Lückge and Braddock K. Linsley

518 Rejuvenation of Appalachian topography caused by subsidence-induced differential erosion
Lijun Liu



The high elevation in Earth's topography of hard rocks, such as granites and basalts, was thought to be caused by their inherent resistance to erosion. Numerical modelling now demonstrates, counterintuitively, that erosion-induced isostatic rebound of rocks, which is density dependent, causes granites and basalts to occupy high elevations because they are denser than surrounding rocks.

Image by Jean Braun.

Article p534; News & Views p483



Giant volcanic eruptions occur when large volumes of magma accumulate in crustal reservoirs and do not cool and crystallize to form a solid pluton of rock in the crust. Geochronological dating of a pluton from Elba, Italy, shows that the magma solidified in the crust within just 10 to 40 thousand years of being injected into the crust, implying that the time window for an eruption was short.

Image by Mélanie Barboni; thin section by François Bussy.

Letter p524

524 Short eruption window revealed by absolute crystal growth rates in a granitic magma

Mélanie Barboni and Blair Schoene

529 Earth's earliest evolved crust generated in an Iceland-like setting

Jesse R. Reimink, Thomas Chacko, Richard A. Stern and Larry M. Heaman

→N&V p482

ARTICLES

534 Topographic relief driven by variations in surface rock density

Jean Braun, Thibaud Simon-Labric, Kendra E. Murray and Peter W. Reiners

→N&V p483

541 Silica burial enhanced by iron limitation in oceanic upwelling margins

L. E. Pichevin, R. S. Ganeshram, W. Geibert, R. Thunell and R. Hinton

547 Addendum

547 Corrigenda



nature publishing group

Nature Geoscience (ISSN 1752-0894, USPS 025065) is published monthly by Nature Publishing Group, a division of Macmillan Publishers Ltd, The Macmillan Building, 4 Crinan Street, London N1 9XW, UK. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form (electronic or otherwise) without prior permission from permissions@nature.com. US Periodicals postage paid at Jamaica, NY, and additional mailing post offices. US POSTMASTER: Send address changes to Nature Publishing Group, Air Business Ltd, c/o Worldnet Shipping Inc., 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA. © 2014 Macmillan Publishers Limited. All rights reserved. Printed in United Kingdom.