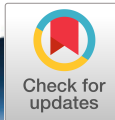
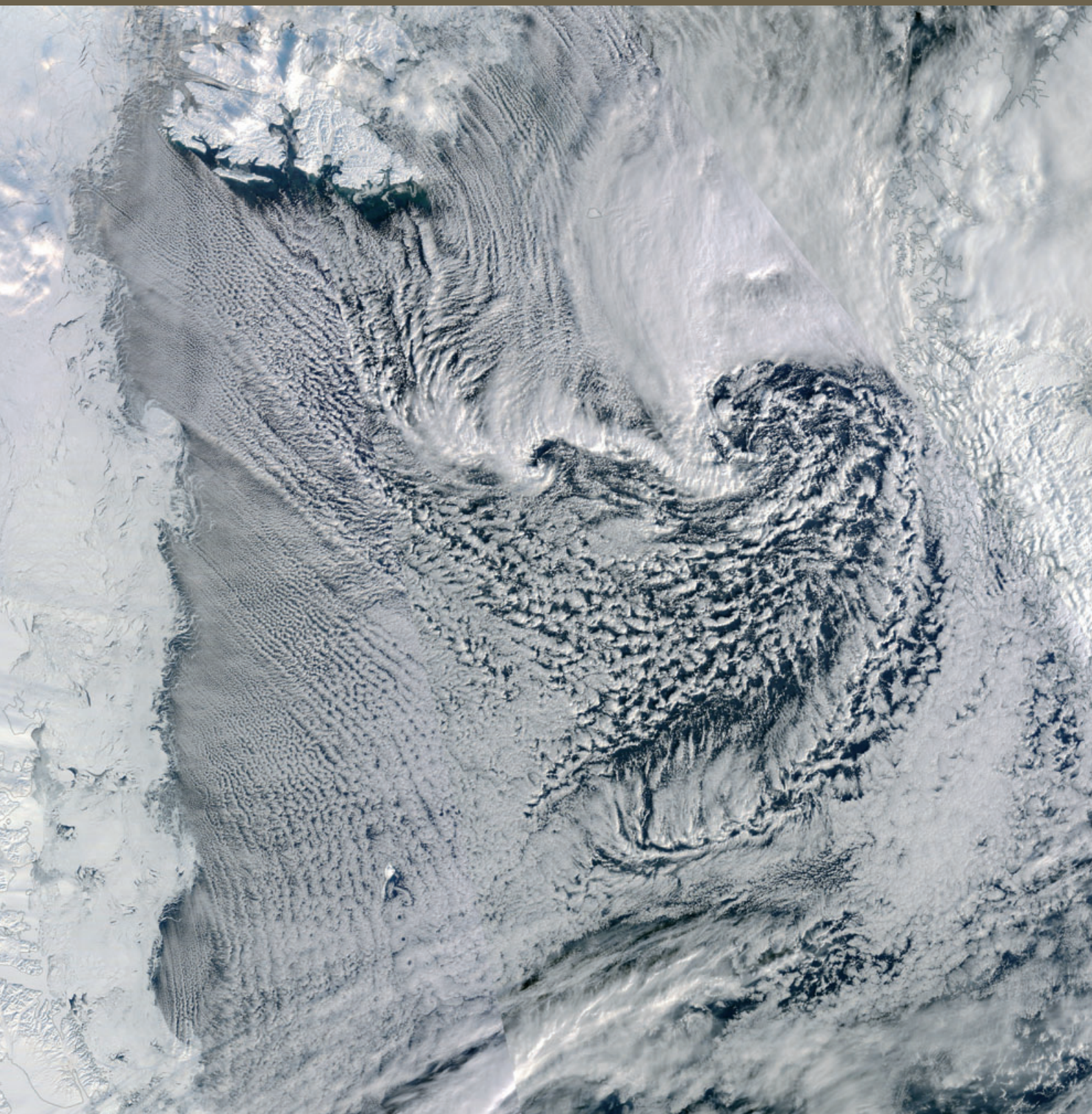


# Geophysical Research Letters

AN AGU JOURNAL



Volume 45 • Issue 5 • 16 March 2018 • Pages 2125–2562





# Geophysical Research Letters

AN AGU JOURNAL

**Aims and Scope.** *Geophysical Research Letters* publishes high-impact, innovative, and timely research on major scientific advances in all the major geoscience disciplines. Papers are communications-length articles and should have broad and immediate implications in their discipline or across the geosciences. GRL maintains the fastest turn-around of all high-impact publications in the geosciences and works closely with authors to ensure broad visibility of top papers.

**Editors:** Noah Diffenbaugh (Editor-in-Chief) ([diffenbaugh@stanford.edu](mailto:diffenbaugh@stanford.edu), <http://orcid.org/0000-0002-8856-4964>), Suzana J. Camargo, M. Bayani Cardenas (<http://orcid.org/0000-0001-6270-3105>), Rebecca J. Carey, Rose Cory, Meghan Cronin, Andrew J. Dombard, Lucy M. Flesch, Gavin P. Hayes, Andy M. Hogg, Tatiana Ilyina (<http://orcid.org/0000-0002-3475-4842>), Steven D. Jacobsen, Monika Korte, Gang Lu (<http://orcid.org/0000-0001-5350-2889>), Gudrun Magnusdottir, Merav Opher (<http://orcid.org/0000-0002-8767-8273>), Jeroen Ritsema (<http://orcid.org/0000-0003-4287-7639>), Janet Sprintall (<http://orcid.org/0000-0002-7428-7580>), Julienne Stroeve (<http://orcid.org/0000-0002-0476-381X>), Hui Su, Joel A. Thornton, Valerie M. Trouet (<http://orcid.org/0000-0002-2683-8704>), Andrew Yau.

**Associate Editors:** Olivier Bachmann, Marine Denolle, Ake Fagereng, Melodie French, Valeriy Ivanov, Mingming Li, Paola Passalacqua, Shafer Smith, Daoyuan Sun, Toste Tanhua, Jacob Tielke, Aradhna E. Tripathi, Mathias Vuille.

**AGU Editorial Team.** For assistance with submitted manuscripts, file specifications, or AGU publication policy please contact [grronline@agu.org](mailto:grronline@agu.org).

For submission instructions or to submit a manuscript visit: <http://grl-submit.agu.org>.

The journal to which you are submitting your manuscript employs a plagiarism detection system. By submitting your manuscript to this journal you accept that your manuscript may be screened for plagiarism against previously published works.

*Geophysical Research Letters* accepts articles for Open Access publication. Please visit <http://olabout.wiley.com/WileyCDA/Section/id-406241.html> for further information about OnlineOpen.

**Publication Charges.** The publication charge income received for *Geophysical Research Letters* helps support rapid publication, allows more articles per volume, makes possible the low subscription rates, and supports many of AGU's scientific and outreach activities. Publication charge information can be found here: <http://publications.agu.org/author-resource-center/>.

To encourage papers to be written in a concise fashion, there is an excess length fee. For *Geophysical Research Letters* the fee is assessed only on the equivalent of more than 12 publication units. The excess length fee does not apply to review articles, and the editor may waive the fee on a limited number of concisely written papers that merit being longer. There is no charge for color in any format.

**Copyright and Photocopying.** Copyright © 2018. American Geophysical Union. All rights reserved. No part of this publication may be reproduced, stored or transmitted in any form or by any means without the prior permission in writing from the copyright holder. Authorization to copy items for internal and personal use is granted by the copyright holder for libraries and other users registered with their local Reproduction Rights Organisation (RRO), e.g. Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, USA ([www.copyright.com](http://www.copyright.com)), provided the appropriate fee is paid directly to the RRO. This consent does not extend to other kinds of copying such as copying for general distribution, for advertising or promotional purposes, for creating new collective works or for resale. Permissions for such reuse can be obtained using the RightsLink "Request Permissions" link on Wiley Online Library. Special requests should be addressed to: [publications@agu.org](mailto:publications@agu.org).

**Cover:** This satellite image from the MODIS instrument on NASA's Aqua satellite shows a cold air outbreak from Fram Strait into the Greenland Sea that occurred in the wake of an extratropical cyclone with its center in the Norwegian Sea. The cold air outbreak is evident from the characteristic flow-parallel cloud streets that form off the sea ice edge and which transition into cellular convective cells further downstream. Such cold air outbreaks provide favorable conditions for the development of mesoscale cyclones, as the one visible south-west of Svalbard, and they lead to strong upward fluxes of sensible and latent heat that cool the ocean. See also Papritz and Grams (pp. 2542–2553; <https://doi.org/10.1002/2017GL076921>). Image Credit: NASA/Goddard Space Flight Center/Earth Science Data and Information System (ESDIS) Project.

**Disclaimer.** The Publisher, American Geophysical Union, and Editors cannot be held responsible for errors or any consequences arising from the use of information contained in this journal; the views and opinions expressed do not necessarily reflect those of the Publisher, American Geophysical Union, and Editors, neither does the publication of advertisements constitute any endorsement by the Publisher, American Geophysical Union, and Editors of the products advertised.

**Individual Subscriptions.** Member subscriptions are available through [members.agu.org](http://members.agu.org) or by contacting the AGU Member Service Center. The Service Center is open from 8:00 a.m. to 8:30 p.m. Eastern time: +1 202 462 6900, +1 800 966 2481; Fax: +1 202 777 7393; e-mail: [service@agu.org](mailto:service@agu.org). Questions about meetings or membership will be referred to the appropriate staff.

**Publisher.** *Geophysical Research Letters* is published on behalf of the American Geophysical Union by Wiley Periodicals, Inc., 111 River St., Hoboken, NJ, 07030-5774, +1 201 748 6000.

**Delivery Terms and Legal Title.** Where the subscription price includes print issues and delivery is to the recipient's address, delivery terms are Delivered at Place (DAP); the recipient is responsible for paying any import duty or taxes. Title to all issues transfers FOB our shipping point, freight prepaid. We will endeavour to fulfil claims for missing or damaged copies within six months of publication, within our reasonable discretion and subject to availability.

GEOPHYSICAL RESEARCH LETTERS, (ISSN 0094-8276), is published semi-monthly by Wiley Subscription Services, Inc., a Wiley Company, 111 River St., Hoboken, NJ 07030-5774.

Periodical Postage Paid at Hoboken, NJ and additional offices.

Postmaster: Send all address changes to GEOPHYSICAL RESEARCH LETTERS, John Wiley & Sons Inc., C/O The Sheridan Press, PO Box 465, Hanover, PA 17331.

**Journal Customer Services.** For institutional subscription information, claims and any enquiry concerning your journal subscription please go to [www.wileycustomerhelp.com/ask](http://www.wileycustomerhelp.com/ask) or contact your nearest office.

**Americas:** Email: [cs-journals@wiley.com](mailto:cs-journals@wiley.com); Tel: +1 781 388 8598 or +1 800 835 6770 (toll free in the USA & Canada).

**Europe, Middle East and Africa:** Email: [cs-journals@wiley.com](mailto:cs-journals@wiley.com); Tel: +44 (0) 1865 778315.

**Asia Pacific:** Email: [cs-journals@wiley.com](mailto:cs-journals@wiley.com); Tel: +65 6511 8000.

**Japan:** For Japanese speaking support, Email: [cs-japan@wiley.com](mailto:cs-japan@wiley.com); Tel: +65 6511 8010 or Tel (toll-free): 005 316 50 480.

Visit our Online Customer Help available in 7 languages at [www.wileycustomerhelp.com/ask](http://www.wileycustomerhelp.com/ask).

**Production Editor.** For assistance with post-acceptance articles and other production issues please contact [GRLprod@wiley.com](mailto:GRLprod@wiley.com).

Access to this journal is available free online within institutions in the developing world through the AGORA initiative with the FAO, the HINARI initiative with the WHO, the OARE initiative with UNEP, and the ARDI initiative with WIPO. For information, visit [www.aginternetwork.org](http://www.aginternetwork.org), [www.int/hinari/en/](http://www.int/hinari/en/), [www.oaresciences.org](http://www.oaresciences.org), or [www.wipo.int/ardi/en](http://www.wipo.int/ardi/en).

ISSN 0094-8276 (Print)

ISSN 1944-8007 (Online)

View this journal online at <http://grl.agu.org>

**Space Sciences**

- 2128** C. C. Chaston, J. W. Bonnell, J. R. Wygant, G. D. Reeves, D. N. Baker, and D. B. Melrose  
Radiation Belt “Dropouts” and Drift-Bounce Resonances in Broadband Electromagnetic Waves  
(<https://doi.org/10.1002/2017GL076362>)
- 2138** Matthieu Kretzschmar, Martin Snow, and Werner Curdt  
An Empirical Model of the Variation of the Solar Lyman- $\alpha$  Spectral Irradiance  
(<https://doi.org/10.1002/2017GL076318>)
- 2145** Dupinder Singh, S. Gurubaran, and Maosheng He  
Evidence for the Influence of DE3 Tide on the Occurrence of Equatorial Counterstreamer  
(<https://doi.org/10.1002/2018GL077076>)
- 2151** R. L. McPherron, B. J. Anderson, and Xiangning Chu  
Relation of Field-Aligned Currents Measured by the Network of Iridium® Spacecraft to Solar Wind and Substorms  
(<https://doi.org/10.1002/2017GL076741>)
- 2159** Chang Yang, Fuliang Xiao, Yihua He, Si Liu, Qinghua Zhou, Mingyue Guo, and Wanli Zhao  
Storm Time Evolution of Outer Radiation Belt Relativistic Electrons by a Nearly Continuous Distribution of Chorus  
(<https://doi.org/10.1002/2017GL075894>)
- 2168** O. Agapitov, J. F. Drake, I. Vasko, F. S. Mozer, A. Artemyev, V. Krasnoselskikh, V. Angelopoulos, J. Wygant, and G. D. Reeves  
Nonlinear Electrostatic Steepening of Whistler Waves: The Guiding Factors and Dynamics in Inhomogeneous Systems (<https://doi.org/10.1002/2017GL076957>)

**Planets**

- 2177** M. J. Keskinen  
New Model for Ionospheric Irregularities at Mars (<https://doi.org/10.1002/2017GL076507>)
- 2184** G. Filacchione, M. Ciarniello, E. D'Aversa, F. Capaccioni, P. Cerroni, B. J. Buratti, R. N. Clark, K. Stephan, and C. Plainaki  
Photometric Modeling and VIS-IR Albedo Maps of Dione From Cassini-VIMS\*  
(<https://doi.org/10.1002/2017GL076869>)
- \*This article is part of a Special Section—Cassini's Final Year: Science Highlights and Discoveries

**Solid Earth**

- 2193** V. De Novellis, S. Carlino, R. Castaldo, A. Tramelli, C. De Luca, N. A. Pino, S. Pepe, V. Convertito, I. Zinno, P. De Martino, M. Bonano, F. Giudicepietro, F. Casu, G. Macedonio, M. Manunta, C. Cardaci, M. Manzo, D. Di Bucci, G. Solaro, G. Zeni, R. Lanari, F. Bianco, and P. Tizzani  
The 21 August 2017 Ischia (Italy) Earthquake Source Model Inferred From Seismological, GPS, and DInSAR Measurements (<https://doi.org/10.1002/2017GL076336>)
- 2203** L. Caron, E. R. Ivins, E. Larour, S. Adhikari, J. Nilsson, and G. Blewitt  
GIA Model Statistics for GRACE Hydrology, Cryosphere, and Ocean Science  
(<https://doi.org/10.1002/2017GL076644>)
- 2213** Jeffrey B. Johnson, Leighton M. Watson, Jose L. Palma, Eric M. Dunham, and Jacob F. Anderson  
Forecasting the Eruption of an Open-Vent Volcano Using Resonant Infrasound Tones  
(<https://doi.org/10.1002/2017GL076506>)
- 2221** S. Tung and T. Masterlark  
Delayed Poroelastic Triggering of the 2016 October Visso Earthquake by the August Amatrice Earthquake, Italy  
(<https://doi.org/10.1002/2017GL076453>)
- 2230** Jianbao Sun, Han Yue, Zhengkang Shen, Lihua Fang, Yan Zhan, and Xiangyu Sun  
The 2017 Jiuzhaigou Earthquake: A Complicated Event Occurred in a Young Fault System  
(<https://doi.org/10.1002/2017GL076421>)

- 2241** *Jiangang Han, John E. Vidale, Heidi Houston, David A. Schmidt, and Kenneth C. Creager*  
Deep Long-Period Earthquakes Beneath Mount St. Helens: Their Relationship to Tidal Stress, Episodic Tremor and Slip, and Regular Earthquakes (<https://doi.org/10.1002/2018GL077063>)
- 2248** *S. Kaneki, T. Ichiba, and T. Hirono*  
Mechanochemical Effect on Maturation of Carbonaceous Material: Implications for Thermal Maturity as a Proxy for Temperature in Estimation of Coseismic Slip Parameters (<https://doi.org/10.1002/2017GL076791>)
- 2257** *Takahiko Uchide and Seok Goo Song*  
Fault Rupture Model of the 2016 Gyeongju, South Korea, Earthquake and Its Implication for the Underground Fault System (<https://doi.org/10.1002/2017GL076960>)
- 2265** *Mohammadreza Jalali, Valentin Gischig, Joseph Doetsch, Rico Näf, Hannes Krietsch, Maria Klepikova, Florian Amann, and Domenico Giardini*  
Transmissivity Changes and Microseismicity Induced by Small-Scale Hydraulic Fracturing Tests in Crystalline Rock (<https://doi.org/10.1002/2017GL076781>)
- 2274** *M. Khoshmanesh and M. Shirzaei*  
Multiscale Dynamics of Aseismic Slip on Central San Andreas Fault (<https://doi.org/10.1002/2018GL077017>)
- 2283** *H. Perfettini, W. B. Frank, D. Marsan, and M. Bouchon*  
A Model of Aftershock Migration Driven by Afterslip (<https://doi.org/10.1002/2017GL076287>)
- 2294** *Kuang He, Sophie C. Roud, Stuart A. Gilder, Ramon Egli, Christoph Mayr, and Nikolai Petersen*  
Seasonal Variability of Magnetotactic Bacteria in a Freshwater Pond (<https://doi.org/10.1002/2018GL077213>)
- 2303** *Yuanyuan Hua, Dapeng Zhao, Yixian Xu, and Xin Liu*  
Age of the Subducting Philippine Sea Slab and Mechanism of Low-Frequency Earthquakes (<https://doi.org/10.1002/2017GL076531>)
- 2311** *Benjamin A. Heath, Emilie E. E. Hoof, and Douglas R. Toomey*  
Autocorrelation of the Seismic Wavefield at Newberry Volcano: Reflections From the Magmatic and Geothermal Systems (<https://doi.org/10.1002/2017GL076706>)
- 2319** *Michael P. Poland and Daniele Carbone*  
Continuous Gravity and Tilt Reveal Anomalous Pressure and Density Changes Associated With Gas Pistoning Within the Summit Lava Lake of Kilauea Volcano, Hawai'i (<https://doi.org/10.1002/2017GL076936>)
- 2328** *Kristel Chanard, Luce Fleitout, Eric Calais, Sylvain Barbot, and Jean-Philippe Avouac*  
Constraints on Transient Viscoelastic Rheology of the Asthenosphere From Seasonal Deformation (<https://doi.org/10.1002/2017GL076451>)
- 2339** *K. Sośnica, G. Bury, and R. Zajdel*  
Contribution of Multi-GNSS Constellation to SLR-Derived Terrestrial Reference Frame (<https://doi.org/10.1002/2017GL076850>)
- 2349** *Peter J. Clarke*  
Seasonal Surface Loading Helps Constrain Short-Term Viscosity of the Asthenosphere (<https://doi.org/10.1002/2018GL077494>)

## **Hydrology and Land Surface Studies**

- 2352** *Haider Ali and Vimal Mishra*  
Contributions of Dynamic and Thermodynamic Scaling in Subdaily Precipitation Extremes in India (<https://doi.org/10.1002/2018GL077065>)
- 2362** *Xing Yuan and Enda Zhu*  
A First Look at Decadal Hydrological Predictability by Land Surface Ensemble Simulations (<https://doi.org/10.1002/2018GL077211>)

## **The Cryosphere**

- 2370** *D. G. Barber, D. G. Babb, J. K. Ehn, W. Chan, L. Matthes, L. A. Dalman, Y. Campbell, M. L. Harasyn, N. Firoozy, N. Theriault, J. V. Lukovich, T. Zagon, T. Papakyriakou, D. W. Capelle, A. Forest, and A. Gariepy*  
Increasing Mobility of High Arctic Sea Ice Increases Marine Hazards Off the East Coast of Newfoundland (<https://doi.org/10.1002/2017GL076587>)

## **Oceans**

- 2380** *K. Snow, S. R. Rintoul, B. M. Sloyan, and A. Mcc. Hogg*  
Change in Dense Shelf Water and Adélie Land Bottom Water Precipitated by Iceberg Calving (<https://doi.org/10.1002/2017GL076195>)

- 2388** *Hong Che and Jing Zhang*  
Water Mass Analysis and End-Member Mixing Contribution Using Coupled Radiogenic Nd Isotopes and Nd Concentrations: Interaction Between Marginal Seas and the Northwestern Pacific  
(<https://doi.org/10.1002/2017GL076978>)
- 2396** *Michel C. Bouffadel, Feng Gao, Lin Zhao, Tamay Özgökmen, Richard Miller, Thomas King, Brian Robinson, Kenneth Lee, and Ira Leifer*  
Was the Deepwater Horizon Well Discharge Churn Flow? Implications on the Estimation of the Oil Discharge and Droplet Size Distribution (<https://doi.org/10.1002/2017GL076606>)
- 2404** *R. T. Pinker, B. Z. Zhang, R. A. Weller, and W. Chen*  
Evaluating Surface Radiation Fluxes Observed From Satellites in the Southeastern Pacific Ocean  
(<https://doi.org/10.1002/2017GL076805>)
- 2413** *Shantong Sun, Ian Eisenman, and Andrew L. Stewart*  
Does Southern Ocean Surface Forcing Shape the Global Ocean Overturning Circulation?  
(<https://doi.org/10.1002/2017GL076437>)
- 2424** *Louis Clément and Andreas M. Thurnherr*  
Abyssal Upwelling in Mid-Ocean Ridge Fracture Zones (<https://doi.org/10.1002/2017GL075872>)
- 2433** *Robin Waldman, Samuel Somot, Marine Herrmann, Florence Sevault, and Pål Erik Isachsen*  
On the Chaotic Variability of Deep Convection in the Mediterranean Sea (<https://doi.org/10.1002/2017GL076319>)
- 2444** *Ken L. Ferrier, Qi Li, Tamara Pico, and Jacqueline Austermann*  
The Influence of Water Storage in Marine Sediment on Sea-Level Change (<https://doi.org/10.1002/2017GL076592>)
- 2455** *Roland Séférian, Sarah Berthet, and Matthieu Chevallier*  
Assessing the Decadal Predictability of Land and Ocean Carbon Uptake (<https://doi.org/10.1002/2017GL076092>)

### **Climate**

- 2467** *Soon-Il An, Seul-Hee Im, and Sang-Yoon Jun*  
Changes in ENSO Activity During the Last 6,000 Years Modulated by Background Climate State  
(<https://doi.org/10.1002/2017GL076250>)
- 2476** *Anjana Devanand, Mathew Koll Roxy, and Subimal Ghosh*  
Coupled Land-Atmosphere Regional Model Reduces Dry Bias in Indian Summer Monsoon Rainfall Simulated by CFSv2 (<https://doi.org/10.1002/2018GL077218>)
- 2487** *Robert C. Wills, Tapio Schneider, John M. Wallace, David S. Battisti, and Dennis L. Hartmann*  
Disentangling Global Warming, Multidecadal Variability, and El Niño in Pacific Temperatures  
(<https://doi.org/10.1002/2017GL076327>)

### **Atmospheric Science**

- 2497** *Fei Li, Yvan J. Orsolini, Huijun Wang, Yongqi Gao, and Shengping He*  
Atlantic Multidecadal Oscillation Modulates the Impacts of Arctic Sea Ice Decline  
(<https://doi.org/10.1002/2017GL076210>)
- 2507** *B. M. Freitag, U. S. Nair, and D. Niyogi*  
Urban Modification of Convection and Rainfall in Complex Terrain (<https://doi.org/10.1002/2017GL076834>)
- 2516** *M. Virman, M. Bister, V. A. Sinclair, H. Järvinen, and J. Räisänen*  
A New Mechanism for the Dependence of Tropical Convection on Free-Tropospheric Humidity  
(<https://doi.org/10.1002/2018GL077032>)
- 2524** *M. Benetti, J.-L. Lacour, A. E. Sveinbjörnsdóttir, G. Aloisi, G. Reverdin, C. Risi, A. J. Peters, and H. C. Steen-Larsen*  
A Framework to Study Mixing Processes in the Marine Boundary Layer Using Water Vapor Isotope Measurements  
(<https://doi.org/10.1002/2018GL077167>)
- 2533** *Hugh S. Baker, Cheikh Mbengue, and Tim Woollings*  
Seasonal Sensitivity of the Hadley Cell and Cross-Hemispheric Responses to Diabatic Heating in an Idealized GCM  
(<https://doi.org/10.1002/2018GL077013>)
- 2542** *L. Papritz and C. M. Grams*  
Linking Low-Frequency Large-Scale Circulation Patterns to Cold Air Outbreak Formation in the Northeastern North Atlantic (<https://doi.org/10.1002/2017GL076921>)
- 2554** *D. A. Gorinov, I. V. Khatuntsev, L. V. Zasova, A. V. Turin, and G. Piccioni*  
Circulation of Venusian Atmosphere at 90–110 km Based on Apparent Motions of the O<sub>2</sub> 1.27 μm Nightglow From VIRTIS-M (Venus Express) Data (<https://doi.org/10.1002/2017GL076380>)