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# Notices

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AMS

*Advancing research. Creating connections.*

*The cover is based on "Modeling Sea Ice," page 1535.*

# Modeling Sea Ice

*Kenneth M. Golden, Luke G. Bennetts, Elena Cherkaev, Ian Eisenman, Daniel Feltham, Christopher Horvat, Elizabeth Hunke, Christopher Jones, Donald K. Perovich, Pedro Ponte-Castañeda, Courtenay Strong, Deborah Sulsky, and Andrew J. Wells*

*Kenneth M. Golden is a Distinguished Professor of Mathematics at the University of Utah. His email address is* golden@math.utah.edu.
*Luke G. Bennetts is an associate professor of applied mathematics at the University of Adelaide. His email address is* luke.bennetts@adelaide.edu.au.
*Elena Cherkaev is a professor of mathematics at the University of Utah. Her email address is* elena@math.utah.edu.
*Ian Eisenman is an associate professor of climate, atmospheric science, and physical oceanography at the Scripps Institution of Oceanography at the University of California San Diego. His email address is* eisenman@ucsd.edu.
*Daniel Feltham is a professor of climate physics at the University of Reading. His email address is* d.l.feltham@reading.ac.uk.
*Christopher Horvat is a NOAA Climate and Global Change Postdoctoral Fellow at the Institute at Brown for Environment and Society at Brown University. His email address is* christopher_horvat@brown.edu.
*Elizabeth Hunke is a deputy group leader, T-3 fluid dynamics and solid mechanics group at the Los Alamos National Laboratory. Her email address is* eclare@lanl.gov.
*Christopher Jones is a Bill Guthridge Distinguished Professor of Mathematics at the University of North Carolina, Chapel Hill. His email address is* ckrtj@unc.edu.
*Donald K. Perovich is a professor of engineering at the Thayer School of Engineering at Dartmouth College. His email address is* donald.k.perovich@dartmouth.edu.
*Pedro Ponte-Castañeda is a Raymond S. Markowitz Faculty Fellow and professor of mechanical engineering and applied mechanics and of mathematics at the University of Pennsylvania. His email address is* ponte@seas.upenn.edu.
*Courtenay Strong is an associate professor of atmospheric sciences at the University of Utah. His email address is* court.strong@utah.edu.
*Deborah Sulsky is a professor of mathematics and statistics and of mechanical engineering at the University of New Mexico. Her email address is* sulsky@math.unm.edu.
*Andrew J. Wells is an associate professor of physical climate science at the University of Oxford. His email address is* Andrew.Wells@physics.ox.ac.uk.

*Communicated by* Notices *Associate Editor Reza Malek-Madani.*

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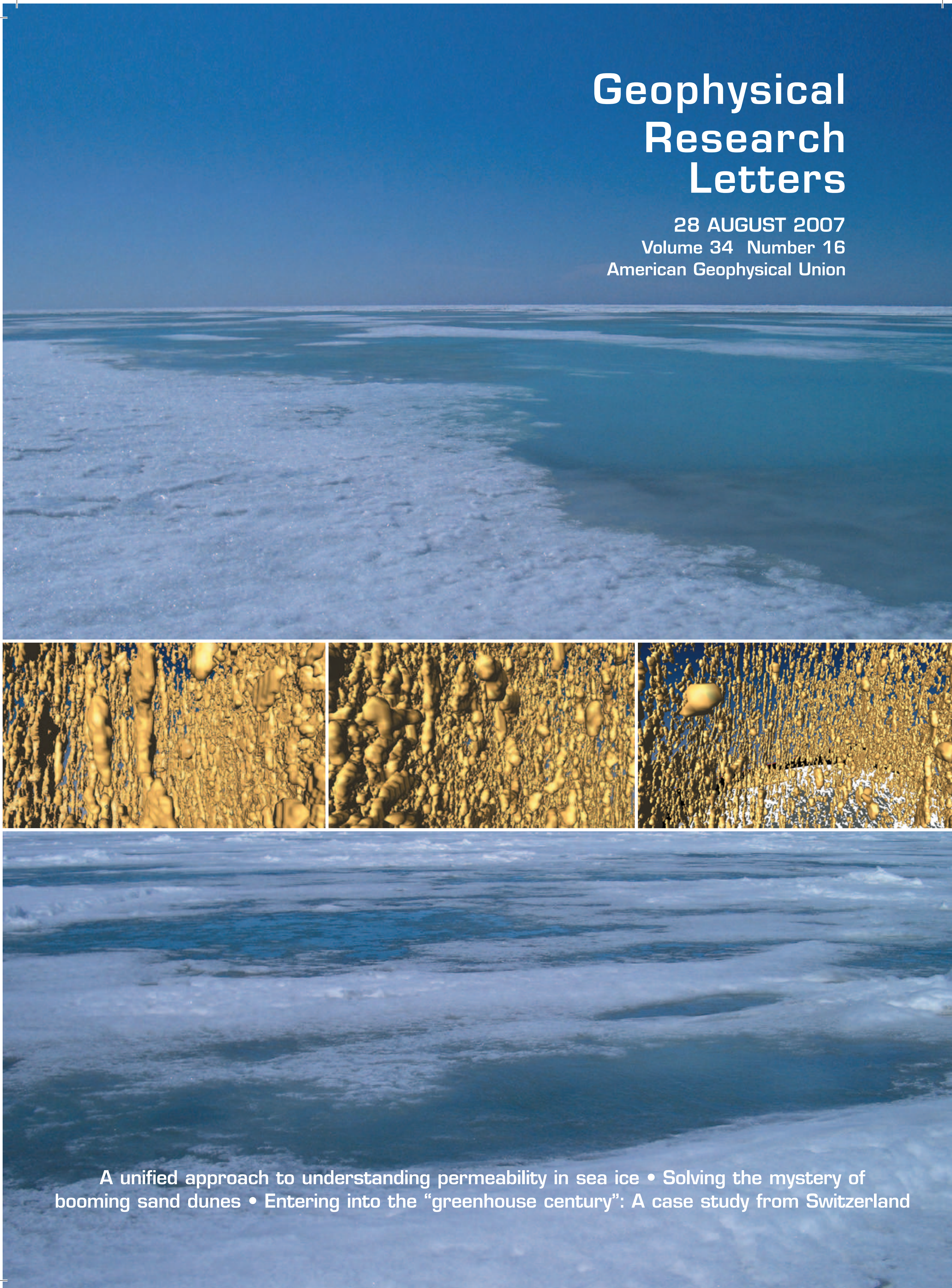
Climate Change and the Mathematics of Transport in Sea Ice



Mathematics and the Internet: A Source of Enormous Confusion and Great Potential



*Real analysis in polar coordinates (see page 613)*


Geophysical
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Letters
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Volume 34 Number 16
American Geophysical Union
A unified approach to understanding permeability in sea ice • Solving the mystery of
booming sand dunes • Entering into the "greenhouse century": A case study from Switzerland

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Proc. R. Soc. A | Volume 471 | Issue 2174 | 8 February 2015

# PROCEEDINGS A

350 YEARS OF SCIENTIFIC PUBLISHING

An invited review commemorating 350 years of scientific publishing at the Royal Society

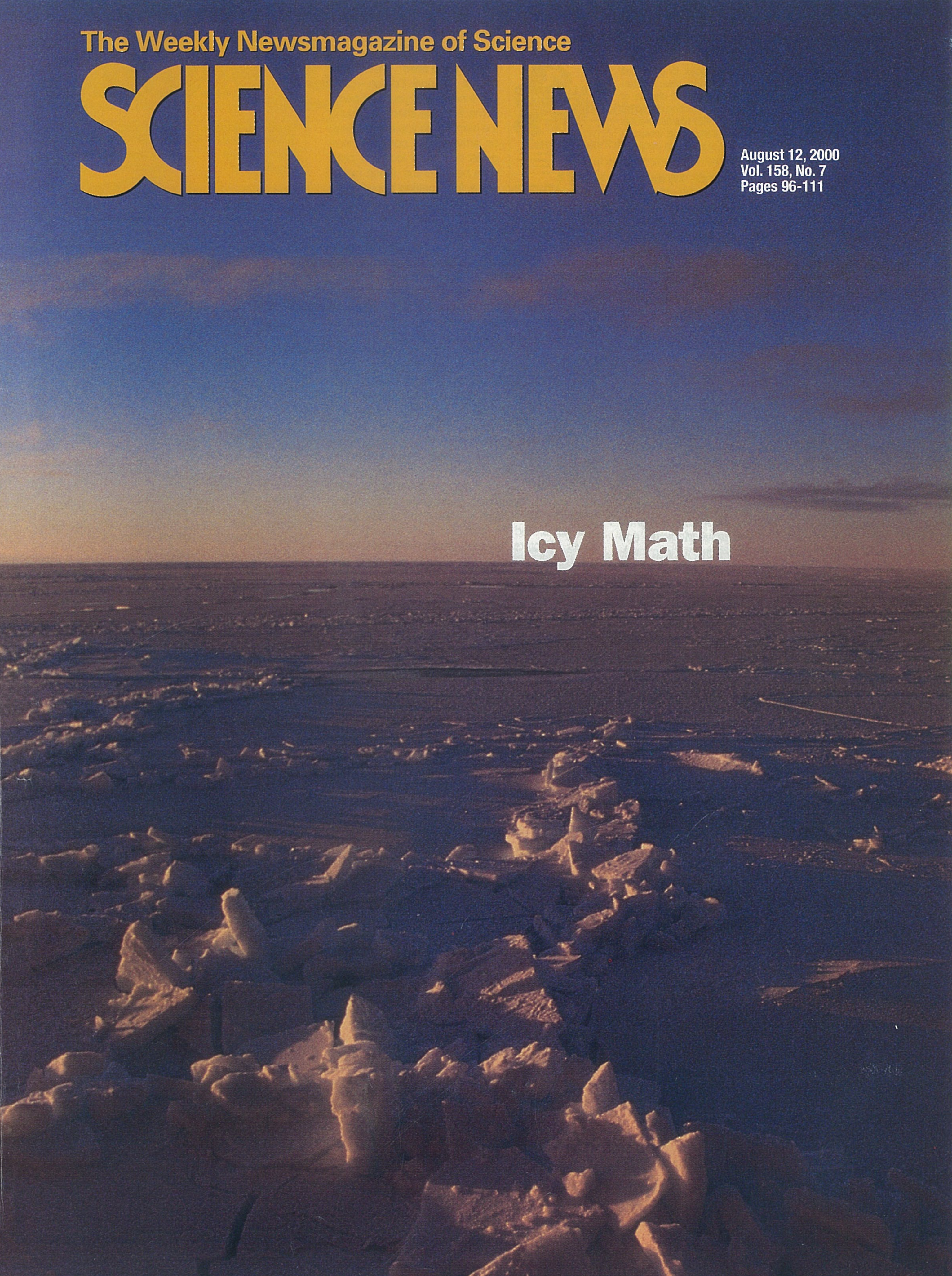
A method to distinguish between different types of sea ice using remote sensing techniques

A computer model to determine how a human should walk so as to expend the least energy

THE ROYAL SOCIETY PUBLISHING

Cover image
The Australian icebreaker Aurora Australis sails through a vast field of pancake ice in the Southern Ocean off the coast of East Antarctica. The pancakes form in wavy conditions, and typically have a granular polycrystalline microstructure. (Image courtesy of A. Gully, J. Lin, E. Cherkaev and K. M. Golden, Bounds on the complex permittivity of polycrystalline materials by analytic continuation. Proc. R. Soc. A 471: 20140702; http://dx.doi.org/10.1098/rspa.2014.0702.)

The Weekly Newsmagazine of Science
SCIENCE NEWS
August 12, 2000
Vol. 158, No. 7
Pages 96-111



# Icy Math

# Daybreak SCIENCE & MEDICINE

Ken Golden/University of Utah

A penguin poses for the camera as the National Science Foundation's icebreaking research ship, the Nathaniel Palmer, is docked in the distance during a trip to Antarctica to study polar sea ice.

Ken Golden/University of Utah

Researchers measure increase in ice thickness in Antarctica. Study is aimed at understanding polar ice and major role it plays in Earth's climate and weather.

# THE MATHEMATICS OF ICE

## U. Professor Goes South to Study Antarctica's 'Blanket'

By Lee Siegel
THE SALT LAKE TRIBUNE

The glittering beauty of light as it danced off snow and ice drew Ken Golden to mathematics, to Utah and to an Antarctic adventure amid fierce storms, 30-foot seas and frigid floes.

And delays during his latest trip to Earth's southernmost seas almost made him miss his own wedding.

Golden, an associate professor of mathematics at the University of Utah, is among 50 scientists nationwide working on a $10 million Navy effort to learn how microwaves reflect and scatter off polar sea ice.

As the project's theoretical research coordinator, his workis aimed at improving the accuracy of measurements when planes and satellites bounce microwaves off polar ice, then capture the reflected microwaves to learn what the ice is like: its age, thickness, roughness, brine content, porosity and so forth.

The project, which began in 1992, stemmed from the Navy's desire to help U.S. submarines navigate and communicate beneath the ice shelf. The findings still should help ships navigate around ice, said physicist Art Jordan, of the Naval Research Laboratory in Washington.

With the end of the Cold War, the research now is aimed at understanding polar ice and the major role it plays in Earth's climate and weather. The transfer of heat from oceans to the atmosphere drives the planet's weather, and sea ice serves as an insulating blanket that influences the process.

By determining the detailed internal structure of sea ice — a mixture of frozen water, brine and air — Golden also hopes to learn more about other "composite" materials: mixtures of substances that don't react chemically with each other.

The movement of sea water through porous ice is similar to the movement of electrons through certain semiconductors, the formation of cracks in metals and the weakening of human bone by the disease osteoporosis.

"Developing the mathematics for understanding sea ice will help us understand the fractures of metals in things like airplane wings and buildings, and will help us understand the development of osteoporosis in bones," Golden said.

Using microwaves to study sea-ice characteristics also is similar to making medical images of the body with

■ See ICE, C-2