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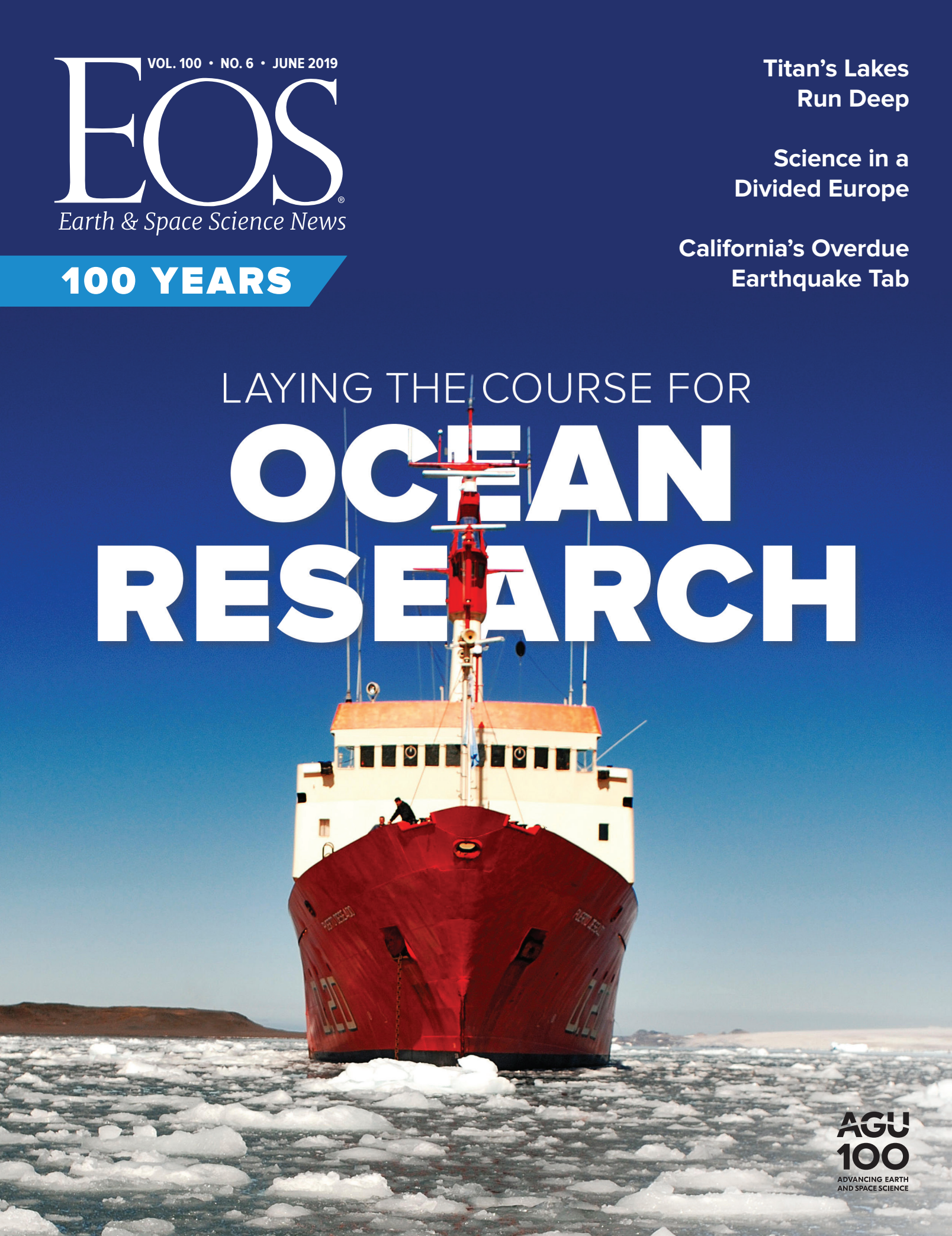

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ADVANCING EARTH AND SPACE SCIENCE

the early 2000s, Weisse noted. However, she said that although the country's primary forest loss of 1.3 million hectares in 2018 is less than the 2016–2017 fire-related spike, the losses otherwise are the highest for Brazil since 2006.

"It's too early to say whether this increase is related to Brazil's new administration," Weisse said. "Next year's data should give us a better idea." Brazilian president Jair Bolsonaro, who has indicated his support for expanded development in the Amazon, took office on 1 January 2019.

Other countries of concern include Ghana, where primary forest loss in 2018 jumped 60% higher than in 2017. Madagascar lost 2% of its primary forest in 2018, the most by percentage of any tropical country.

> "We know what to do to stop forest loss, but we're not doing enough of it."

Some Cause for Cautious Optimism

One bright spot appears to be Indonesia. Although Indonesia lost 340,000 hectares of primary forest in 2018, it was that country's lowest rate of loss since 2003. Reasons for this improvement include recent government policies about forest and peatland management, according to Belinda Arunarwati Margono, director of forest resources inventory and monitoring for the Indonesian Ministry of Environment and Forestry.

"We can expect dryer, more fire prone conditions in the 2019 El Niño year, a true test of how successful these policies are," WRI documents state.

Other causes for optimism include increased monitoring, protection, and enforcement measures, along with heightened concern among people in tropical countries about forest loss.

"Clearly, at the end of the day, the decisions about whether to continue allowing tree cover loss to take place [are] going to take place in the forest countries themselves," Seymour said. "And increasingly, there is an appreciation within those countries of why preserving the forest is important domestically."

She added, "We know what to do to stop forest loss, but we're not doing enough of it."

By **Randy Showstack** (@RandyShowstack), Staff Writer

Satellite Imagery Reveals Plastic Garbage in the Ocean

Discarded plastics such as water bottles, fishing nets, and grocery bags have been identified in the far reaches of the ocean, both on the surface and in places as deep as the Mariana Trench.

Most of this garbage has been found laboriously: Cameras towed underwater have snapped images, and humans have peered over the sides of boats—or even swum through the debris.

Now scientists have used satellite imagery to pinpoint aggregations of floating plastic debris off the coasts of Scotland and Canada, a technique that opens up wide swaths of the remote ocean for analysis, the researchers suggest. Their results were presented in April at the European Geosciences Union General Assembly in Vienna, Austria.

Ben Mierement, NOAA NOS (ret.)

A New Application

Lauren Biermann, a marine satellite scientist at Plymouth Marine Laboratory in Plymouth, U.K., and her colleagues used imagery from the Sentinel-2A and Sentinel-2B satellites, platforms intended to image Earth's landforms. These satellites, orbiting roughly 780 kilometers above Earth, were never designed for marine applications, Biermann said. But their frequent overpasses—the satellites image the same patch of Earth every few days—and high spatial resolution (10 meters) make them perfect for imaging discarded plastics near coastlines.

Using sightings of plastic debris reported in the literature and on Twitter, the researchers focused on two areas: Gabriola Island, British Columbia, Canada, and the eastern coast of Scotland near Edinburgh. They collected Sentinel images of these regions and compared them with reference measurements of how water, floating plants (e.g., *Sargassum* seaweed), and plastics reflect and absorb light.

Biermann and her collaborators then estimated the relative contributions of these different materials to each pixel. Plastics exhibit a spectral peak in the near infrared, and vegetation emits at certain wavelengths because of its photosynthetic activity, said Biermann.

"There are distinct differences that we can use to determine what is what."

A Promising Monitoring Tool

Biermann and her colleagues inferred that aggregations of plastics—probably water bottles, polystyrene, and packaging—were present off the coasts of Canada and Scotland.

It's critical to do follow-up fieldwork to validate these findings, however, Biermann said. That's because one possible source of confusion might be marine creatures: Some of the plastic debris measured near Scotland might have instead been northern gannets, large seabirds common along the shorelines of the Atlantic Ocean.

This work is promising, said Stefanie Rynders, an oceanographer at the National Oceanography Centre in the United Kingdom not involved in the research, but follow-on research is necessary. "Provided they can do the ground truthing, it will be a useful monitoring tool, for both natural ecosystems and man-made pollution."

In the future, Biermann and her colleagues hope to automate their analysis. Right now it takes half a day to manually process a single image, she said. By developing an algorithm to pinpoint pixels that likely contain plastics, this work could be expanded to encompass coastal regions around the world.

"What we'd like to do eventually is build a global hot spot map," said Biermann.

By **Katherine Kornei** (@katherinekornei), Freelance Science Journalist