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EOS

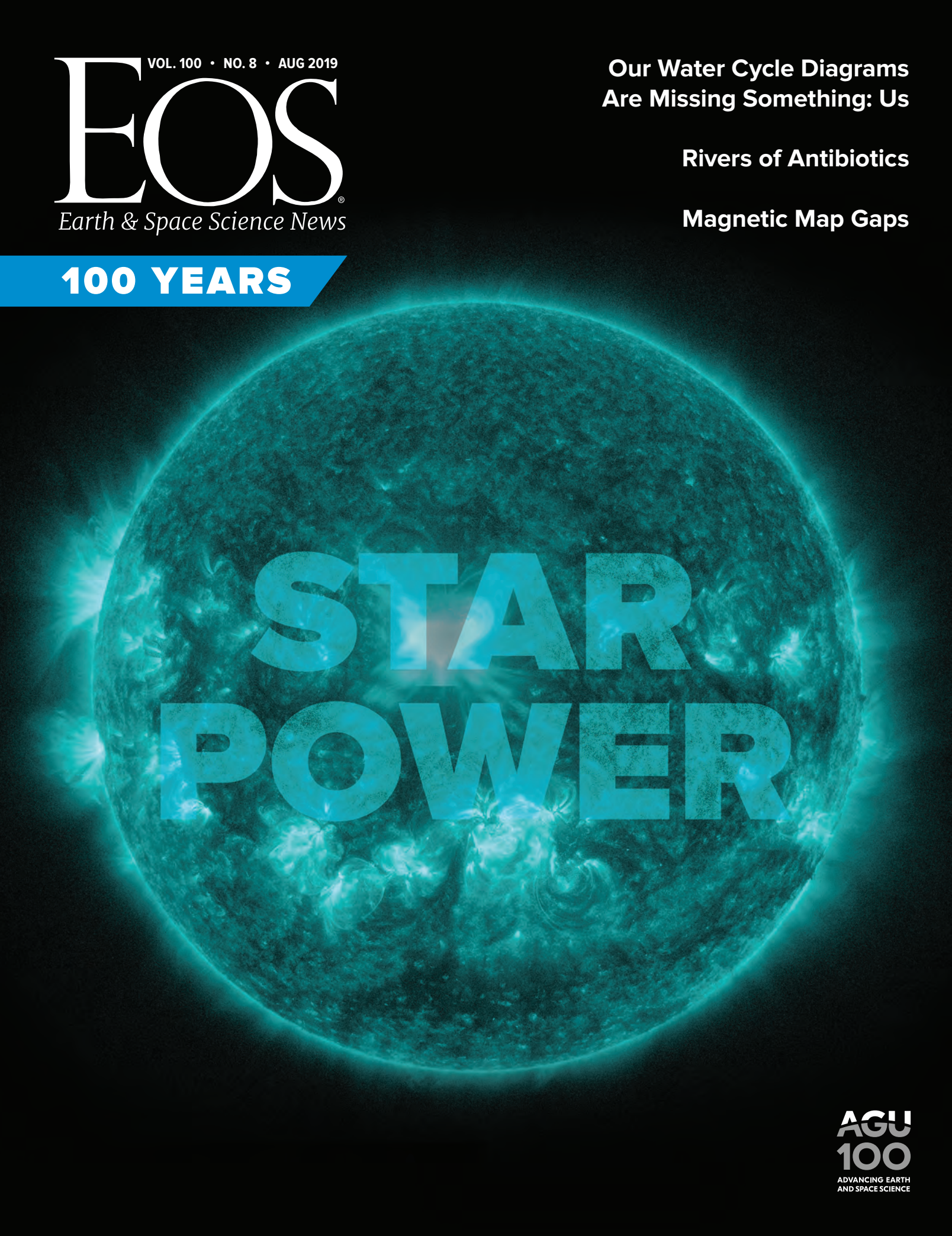
Earth & Space Science News

100 YEARS

Our Water Cycle Diagrams Are Missing Something: Us

Rivers of Antibiotics

Magnetic Map Gaps



STAR POWER

AGU 100

ADVANCING EARTH AND SPACE SCIENCE

Citizens United weaponry, ruthlessly, through dark money attacks and threats, the fossil fuel industry snuffed out Senate bipartisanship on climate change. Weaponization of that new unlimited dark money power by the fossil fuel industry cost us a decade of climate progress."

Whitehouse told *Eos* that he tells congressional colleagues who publicly supported climate action prior to *Citizens United* that time is running out for meaningful action on climate change.

"You will be on the right side of history" if you support climate action, Whitehouse tells colleagues. "When these fossil fuel pirates blow up, which they will—the whole thing is a big charade; it's phony as a $3 bill—you don't want to go down with them."

> "I think we can disable their dark money power structure, shame corporate America into stepping up in a way that they to this point have not, and keep enormous pressure on the fossil fuel industry."

Whitehouse said he is hopeful that the influence of dark money on climate change efforts can be turned around. He said that corporations are vulnerable to public opinion, and he pointed to polls showing that Americans are concerned about corruption in government and about the impacts of climate change.

"I think we can disable their dark money power structure, shame corporate America into stepping up in a way that they to this point have not, and keep enormous pressure on the fossil fuel industry," he said.

He remains hopeful, too, about the upcoming 2020 elections.

"The dark money problem and the fraudulent climate denial, that whole mess, is something we can attack, and that is a real vulnerability for Republicans," he told *Eos*. "I think that if we had a Democratic president and Democratic majority leader even without a filibuster-proof Senate, and a Democratic speaker, we absolutely could find a way to get a very meaningful bill passed."

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

Spy Satellite Reveals Accelerated Pace of Himalayan Glacier Melt

Declassified images taken during the Cold War show that the thickness of Himalayan glaciers has been declining twice as fast since 2000.

A study released in June in *Science Advances* compares the thickness of 650 glaciers in the Central Himalayas over a 40-year period (bit .ly/glacier-spies). The results relied on modern methods to digitize declassified film photographs taken by U.S. spy satellites between 1973 and 1976. The analysis revealed that even over large swaths of the Himalayas, which have a range of local climates and pollution levels, scientists found a detectable link between diminishing glacial ice and warming air temperature.

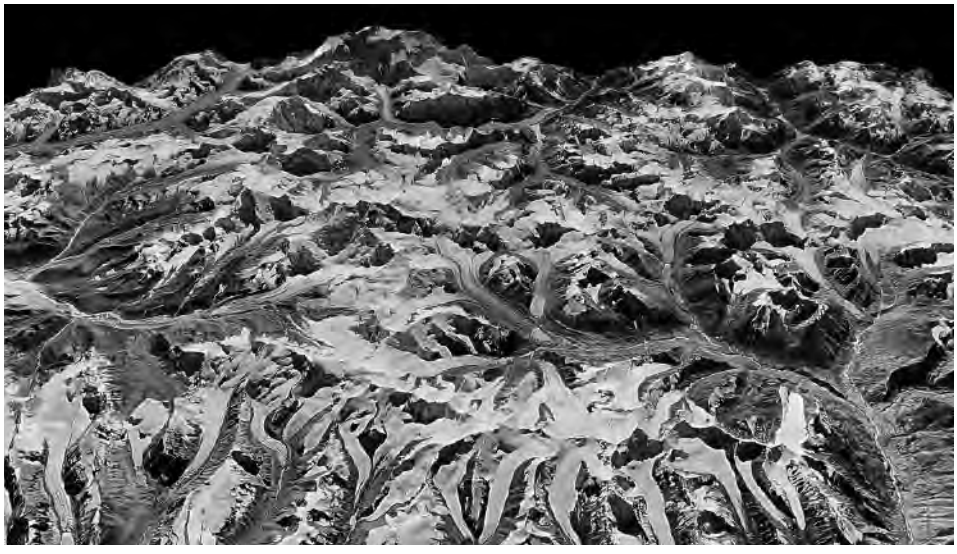
"We see the clearest picture yet of how Himalayan glaciers have responded to climate change," first author and doctoral student at Columbia University Josh Maurer told *Eos*. "As temperatures continue to rise, ice loss will continue to accelerate." He warned of drier days to come for those downstream as water stores melt away.

Tracking glacier melt in the Himalayas can be a tricky business. Unlike some glaciers that recede as they melt, like Exit Glacier in Alaska, Himalayan glaciers often keep their spatial extent but simply become thin. The glacier loses mass, dwindling in height, but the change is difficult to assess from top-down snapshots, like those available in the 20th century when air temperatures began to ramp up due to global warming.

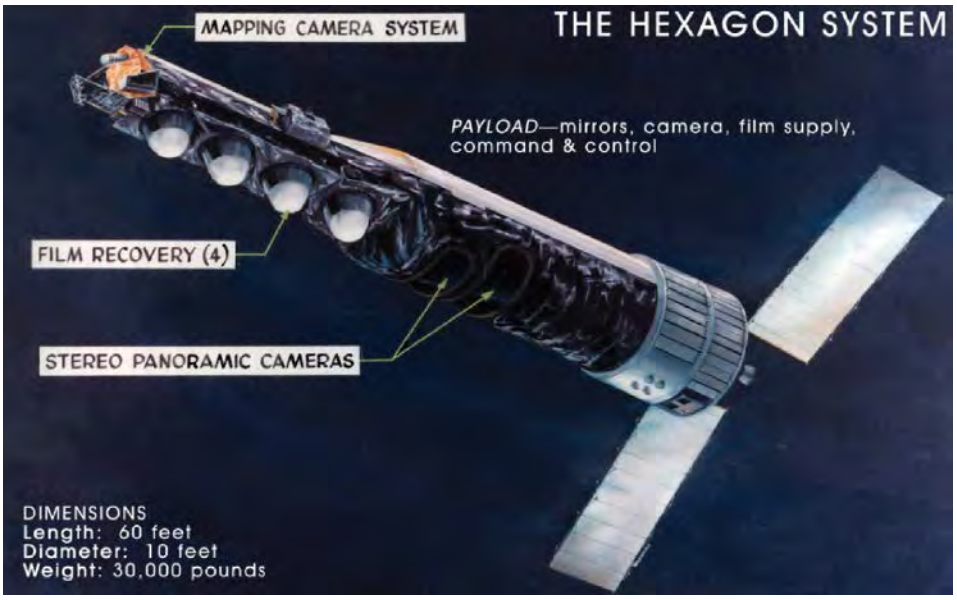
Starting in the 1950s, however, the United States designed sophisticated cameras to spy on the former Soviet Union and allied European and Asian countries. The KH-9 Hexagon spy satellite, first launched in 1971, snapped images from hundreds of kilometers above at such fine resolution that U.S. officials could count the number of launchpads at Soviet missile sites. Images from Hexagon and other spy satellites were declassified in the 2000s, giving scientists a new trove of historical data.

> "We see the clearest picture yet of how Himalayan glaciers have responded to climate change."

The declassified Hexagon images present researchers with a new angle that traditional satellite images couldn't: The spy satellite took photos that overlapped by more than 50% so that U.S. intelligence officials back in Washington could create three-dimensional



A three-dimensional view of the Himalayas was created from declassified KH-9 Hexagon photographs. Credit: Josh Maurer/LDEO



An artist's illustration outlines the KH-9 Hexagon satellite and its camera components. The satellite used nearly 100 kilometers (60 miles) of film per deployment. Credit: National Reconnaissance Office

images. Having the overlapping images allowed Maurer to extract not only the extent of the glaciers but also their volume over time.

"That third dimension is really important," Maurer explained. He created a digital elevation model for the Himalayan region using the old black-and-white film and compared it with three-dimensional images taken today.

The glaciers now have just under three quarters of their 1975 ice mass.

A Landscape Melting Away

The latest study shows the quickening pace of the Himalayan glacial melt. According to the research, the glaciers shrank by an average of a quarter of a meter between 1975 and 2000. Since 2000, however, the glaciers lost twice that amount over the same length of time.

All told, Himalayan glaciers now lose billions of tons of ice per year, Maurer said, enough to fill 3.2 million Olympic-sized swimming pools annually. The glaciers now have just under three quarters of their 1975 ice mass.

The effect wasn't isolated to just one part of the Central Himalayas. "We see a rather homogenous pattern of ice loss across a large and climatically complex region," Maurer explained.

Using measurements from weather stations in the area, the study points to global warming as the underlying cause. "The correlation we observed between rising air temperatures and acceleration of glacier melts over the past 4 decades really highlights how vulnerable these glaciers are to climate change," Maurer noted.

The 650 glaciers considered in the study contain only about half the glacial mass in the Central Himalayas. But Maurer said that the study is representative of the region, because the analysis included the largest glaciers, which have the most to lose, and spans a wide area.

Glaciologist Etienne Berthier, from the French National Centre for Scientific Research, called the paper's doubling pace of ice loss "very convincing" but also said that scientists should wait until further study to attribute ice melt to warming temperatures. "This work paves the way toward more thorough attribution studies," he told *Eos.*

Maurer plans to apply this method to other parts of High Mountain Asia, such as the Hindu Kush mountain range at the Afghan and Pakistani border. He said that the Hexagon program didn't cover just U.S. adversaries but has images worldwide.

"They were taking images wherever they could, all over the globe," Maurer said. "There are lots of images that are just sitting there in an archive waiting to be used."

By **Jenessa Duncombe** (@jrdscience), News Writing and Production Fellow