

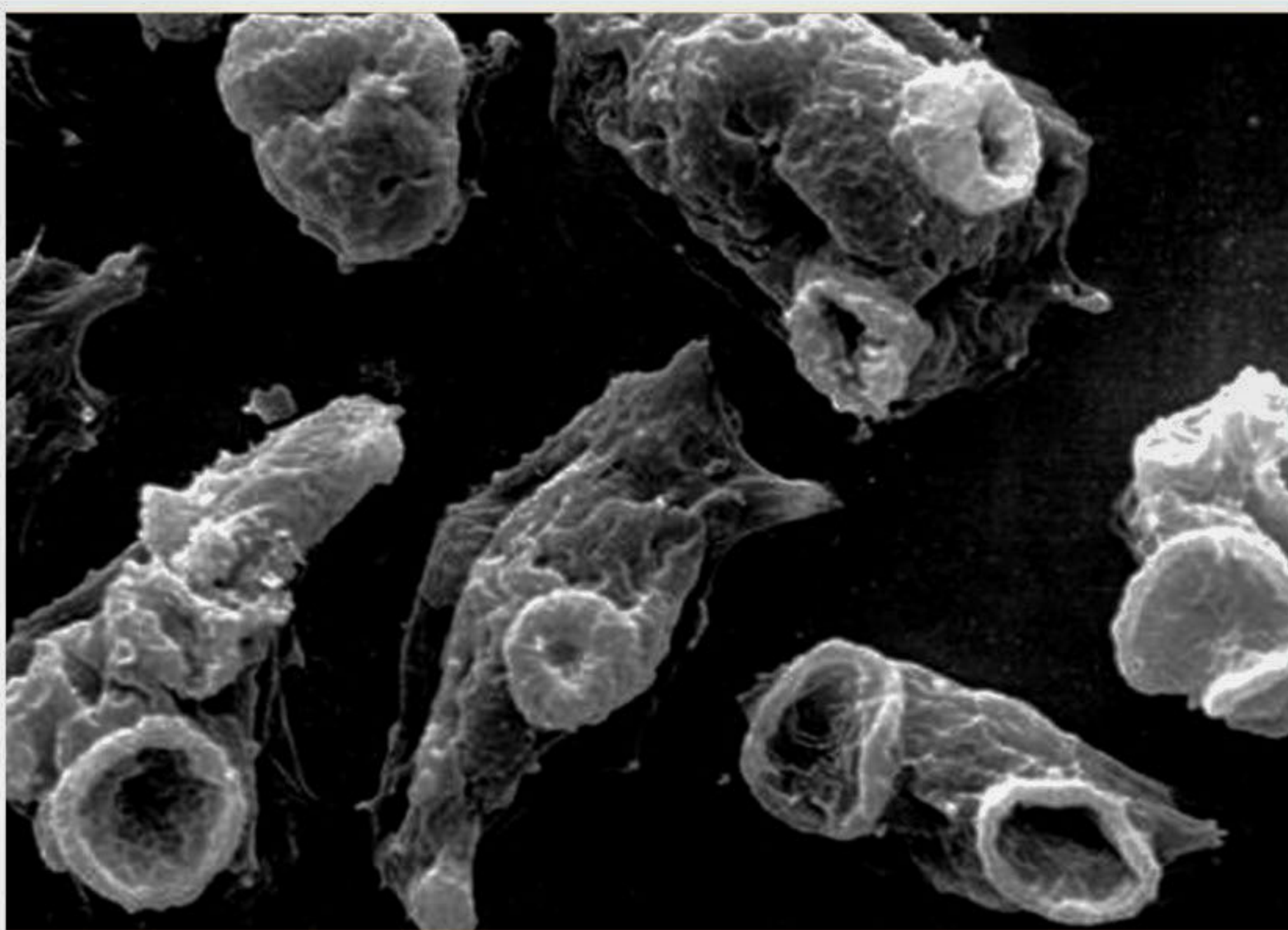
# Amoeba threatens global health

**A**MOEBAS blob-shaped microbes linked to several deadly diseases contaminate drinking-water systems around the world, according to a new analysis. The study finds that amoebas are appearing often enough in water supplies and even in treated tap water to be considered a potential health risk.

A number of these microorganisms can directly trigger disease, from a blinding corneal infection to a rapidly lethal brain inflammation. But many amoebas possess an equally sinister if less well-recognized alter ego: As Trojan horses, they can carry around harmful bacteria, allowing many types to not only multiply inside amoeba cells but also evade disinfection agents at water-treatment facilities.

Even though recent data indicate that amoebas can harbor many serious waterborne human pathogens, U.S. water systems don't have to screen for the parasites, according to study coauthor Nicholas Ashbolt of the U.S. Environmental Protection Agency's National Exposure Research Laboratory in Cincinnati. He coauthored a study of amoebas' "yet unquantified emerging health risk" posted online December 31 in Environmental Science & Technology.

He and Jacqueline Thomas of



**Naegleria fowleri amoebas, like these, can glom onto nerve endings in the nose of an exposed individual and motor along them into the brain**

the University of New South Wales in Sydney analyze data from 26 studies conducted in 18 countries. All had identified amoebas in drinking-water systems. Some reports had focused on measurements at treatment plants, others

in exiting water; some even extracted the parasites from tap water. Indeed, among 16 studies that looked for tap-water contamination, 45 percent reported finding amoebas.

In 2003, Francine Marciano-

Cabral of Virginia Commonwealth University in Richmond and her colleagues identified one species of amoeba that is directly lethal Naegleria fowleri in water throughout the plumbing of an Arizona home where two young

girls had recently died. The amoeba explained the girls' fatal encephalitis, a brain disease.

"We suspect they got it from submerging in the bathtub," Marciano-Cabral says. The family's private water supplies had not been chlorinated, a disinfection process that can limit amoeba contamination.

Thomas and Ashbolt reviewed six studies that together included data from 16 different water-treatment plants and probed for sources of the amoebas that the studies had turned up. Five of those studies reported finding a high prevalence of the parasites in anywhere from 75 to 100 percent of the surface waters, such as rivers, that were sampled. After water treatment, often using carbon filtration or chlorination, contamination levels dropped somewhat, to fewer than 50 percent of water samples.

In general, the new analysis points out, water treatment appears to reduce amoeba concentrations to a tenth or one-hundredth of starting concentrations, "but breakthrough events do occur and release potentially high numbers of free-living amoebae" roughly 110 of the parasites per liter into drinking-water distribution systems.

Source: Science News



## CLOUDY FACTS

### Wild card of Climate Change



**This Research in Action article was provided to LiveScience in partnership with the National Science Foundation**

It is a little-known, but significant, fact that about 70 percent of the Earth's surface is covered by clouds at any given time. But, not all clouds are the same; different types of clouds affect the Earth's climate differently. While some types of clouds help to warm the Earth, others help to cool it.

Currently, all of the Earth's clouds exert a net cooling effect on our planet. But the substantial and opposing influences of clouds begs the question: What will be the net effect of all of the Earth's clouds on climate as the Earth continues to warm in the future? Will clouds accelerate warming or help offset, or dull, warming?

Right now, "The scientific community is uncertain about how the effects of clouds will change in the future," says Hugh Morrison, a scientist at the National Center for Atmospheric Research (NCAR) in Boulder, Colo.

Most scientists doubt that the net cooling effect of clouds will ever be large enough to completely offset ongoing warming. But many scientists say that if warming were to increase cooling clouds or decrease warming clouds, the current net cooling effect of clouds on the Earth's climate would probably increase.

This would moderate, or offset, ongoing warming. The result: The Earth's end-of-the-century temperature may be pulled down toward the lower end of its predicted range.

But if, on the other hand, warming were to increase warming clouds or decrease cooling clouds, scientists say the current net cooling effect of clouds on the Earth's climate would probably decrease, and an important moderating force on ongoing warming would thereby diminish. The result: The Earth's end-of-the-century temperature may be pushed up toward the upper end of its predicted range.

Source: Live Science

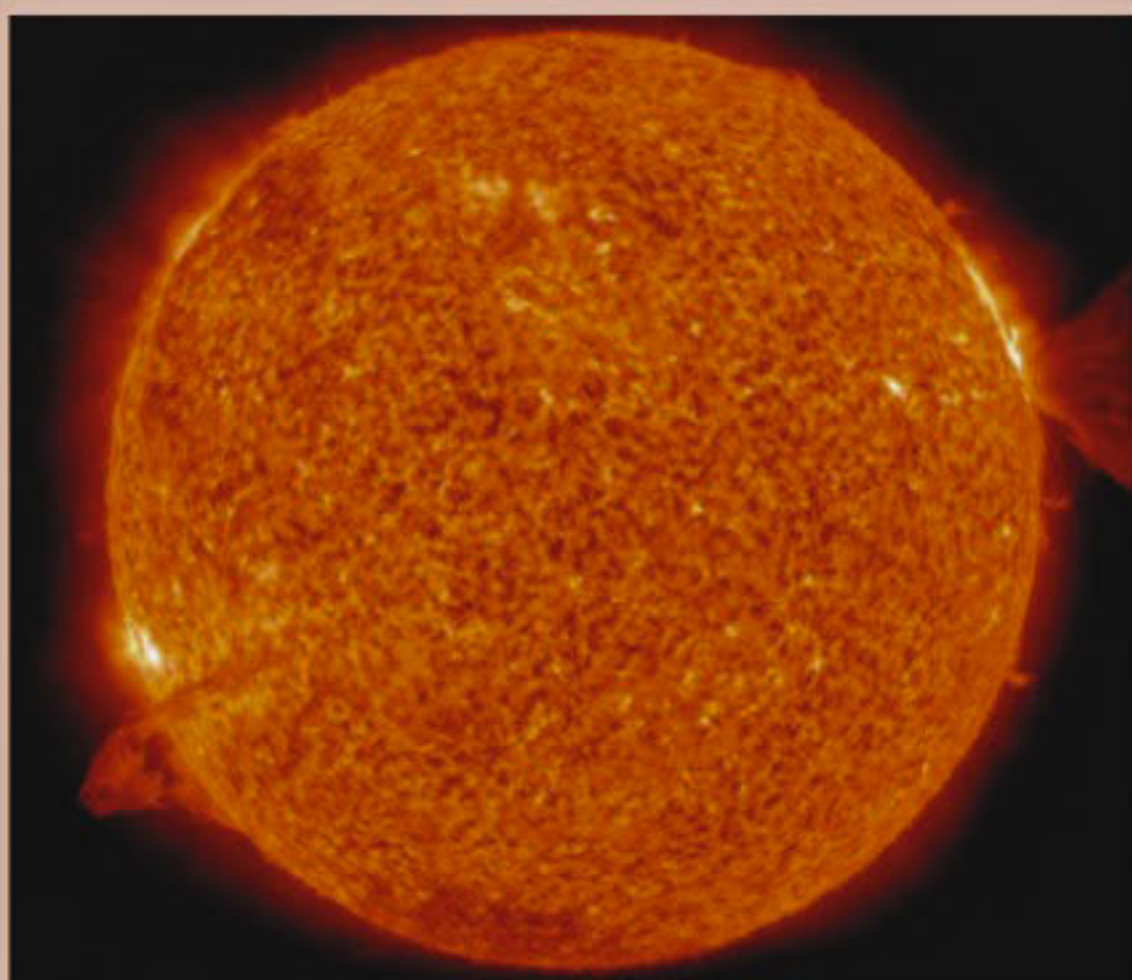


## SUNNY STORM



## MET OFFICE IN SPACE

### Sun's rare double whammy



**This still from SDO caught the action in freeze-frame splendor when the Sun popped off two events at once (Jan. 28, 2011)**

The sun unleashed two powerful solar eruptions on Jan. 28 in a spectacular double blast caught on camera by a NASA spacecraft.

The twin solar storms occurred in concert and marked an impressive start for the 2011 space weather season.

A video recorded by NASA's Solar Dynamics Observatory shows the two sun storms erupting from opposite sides of the star. Neither of the events posed a space weather threat to Earth or its satellites, NASA officials said.

A still image released by NASA shows a filament a long magnetic tendril of super-hot plasma become unstable on the sun's left side (as seen by the SDO spacecraft). As the tendril snapped, it burst into a major solar eruption.

At the same time, a major event occurred on the other side of the sun. A powerful M-1 class flare blasted into space from the right side of the sun, along with a massive explosion of charged solar particles which scientists call a coronal mass ejections.

Scientists measure solar flares according to a class system that includes three tiers.

Source: Space.com

## Physics-based space weather model

**T**HE first large-scale, physics-based space weather prediction model is transitioning from research into operation.

Scientists affiliated with the National Science Foundation (NSF) Center for Integrated Space Weather Modeling (CISM) and the National Weather Service reported the news January 27 at the annual American Meteorological Society (AMS) meeting in Seattle, Wash.

The model will provide forecasters with a one-to-four day advance warning of high speed streams of solar plasma and Earth-directed coronal mass ejections (CMEs).

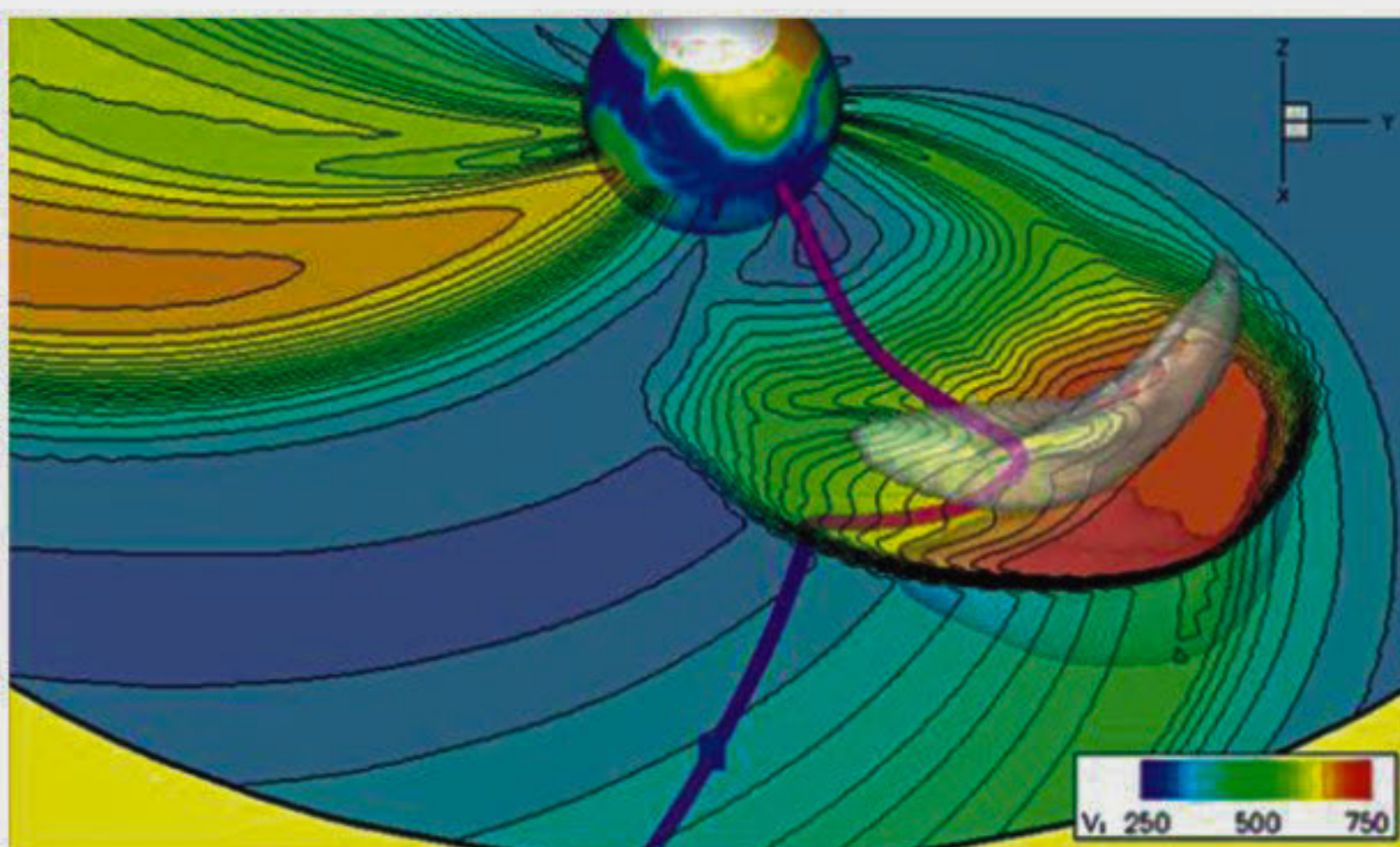
These streams from the Sun may severely disrupt or damage space- and ground-based communications systems, and pose hazards to satellite operations.

CISM is an NSF Science and Technology Center (STC) made up of 11 member institutions. Established in 2002, CISM researchers address the emerging system-science of Sun-to-Earth space weather.

The research-to-operations transition has been enabled by an unprecedented partnership between the Boston University-led CISM and the National Oceanic and Atmospheric Administration (NOAA)'s Space Weather Prediction Center.

"It's very exciting to pioneer a path from research to operations in space weather," says scientist Jeffrey Hughes of Boston University, CISM's director. "The science is having a real impact on the practical problem of predicting when 'solar storms' will affect us here on Earth."

The development comes in response to the growing critical need to protect the global communications



**A coronal mass ejection (CME) in a model; the CME is the gray cloud toward the lower right**

infrastructure and other sensitive technologies from severe space weather disruptions.

This transition culminates several years of close cooperation between CISM and its partner organizations to integrate, improve and validate a model for operational forecast use.

"This milestone represents important scientific progress, and underscores the effectiveness of NSF's Science and Technology Centers in applying research results to real-world problems," says Robert Robinson of NSF's Division of Atmospheric and Geospace Sciences, which funds CISM.

CISM team members worked on-site with scientists and forecasters at NOAA's Space Weather Prediction Center to improve models and visualizations.

Having key team members co-located during this critical phase of development enabled an ongoing

discussion between forecasters and scientists that enhanced the development of the model, says Hughes, and ultimately led to NOAA's decision to bring it into operation as the first large-scale physics-based space weather model.

CISM's research and education activities center on developing and validating physics-based numerical simulation models that describe the space environment from the Sun to the Earth.

The models have important applications in understanding the complex space environment, developing space weather specifications and forecasts, and designing advanced tools for teaching, Hughes says.

CISM partners include the U.S. Air Force Research Laboratory, NASA's Community Coordinated Modeling Center, and the NOAA Space Weather Prediction Center.

Source: Science Daily

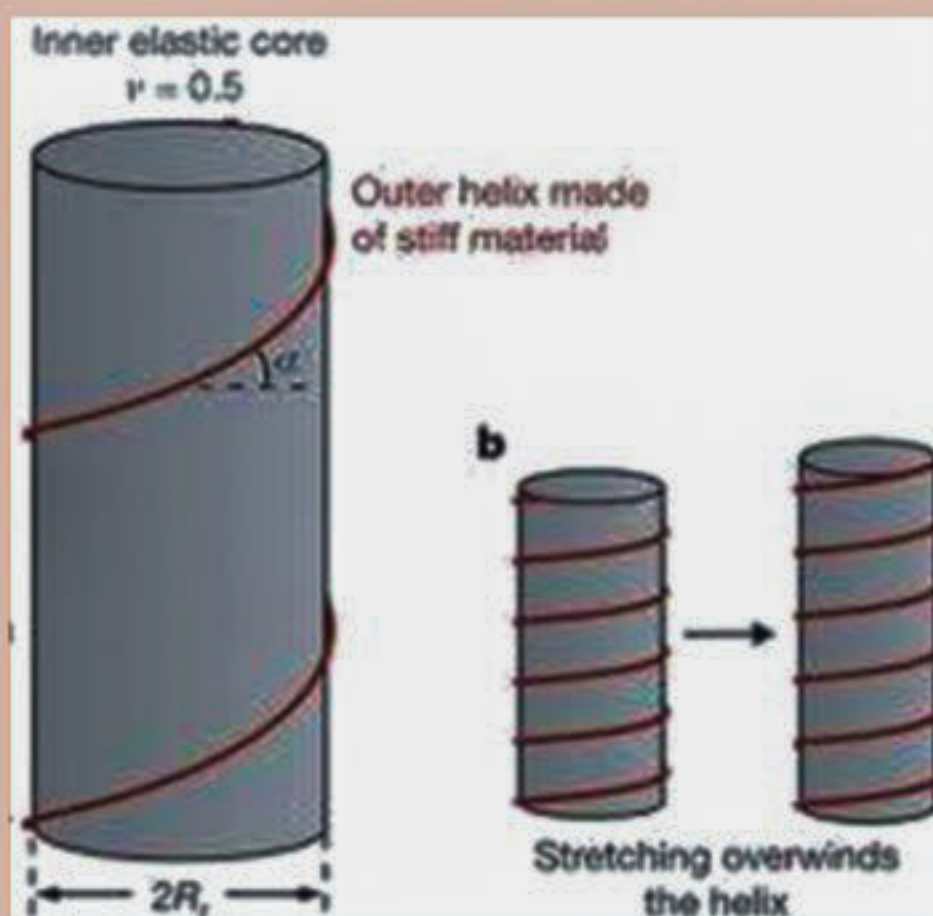


## LIKE A SLINKY



## DO YOU KNOW?

### When the DNA stretches..



DNA "springy, stretchy and coiled" is the cell's Slinky. And just like a Slinky, a DNA double helix can be stretched too far. The mechanics behind this process, called "overstretching," may be less cut-and-dried than scientists previously thought, a new study suggests.

Contrary to one prevailing theory, DNA molecules don't have to have loose-hanging single strands called free ends to overstretch, say researchers at the National Institute of Standards and Technology in Boulder, Colo. With or without free ends, the team reports in a paper to appear in the Journal of the American Chemical Society, DNA double helices spring to almost twice their length at the same elastic stretching point.

Like a Slinky, DNA plays nice under tiny forces, stretching as molecular theory predicts. But when scientists pull on these molecules hard enough using devices called optical traps, DNA seems to get extra elastic. At 65 piconewtons of force DNA elongates by 70 percent.

Source: Science News

### What is emission trading?



Emissions trading (also known as cap and trade) is an administrative approach used to control pollution by providing economic incentives for achieving reductions in the emissions of pollutants.

A central authority (usually a governmental body) sets a limit or cap on the amount of a pollutant that can be emitted. Companies or other groups are issued emission permits and are required to hold an equivalent number of allowances (or credits) which represent the right to emit a specific amount.



**This research in action article was provided to LiveScience in partnership with the National Science Foundation**

Source: Live Science