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THE WHISTLE

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Report shows signs of recovery in atmospheric ozone

Jane Sanders
Research News

Concentrations of atmospheric ozone — which protect Earth from the sun's ultraviolet radiation — are showing signs of recovery in the most important regions of the stratosphere above the mid-latitudes in both the Northern and Southern hemispheres, a new study shows.

Researchers attribute the improvement to both a reduction in ozone-depleting chemicals phased out by the global Montreal Protocol treaty and to changes in atmospheric transport dynamics. The study, funded by NASA, is the first to document a difference among stratospheric regions in ozone-level improvement and to establish a cause-and-effect relationship based on direct measurements by ozone-monitoring systems.

"We do think we're on the road to recovery of stratospheric ozone, but what we don't know is exactly how that recovery will happen," said Derek Cunnold, a professor in the School of Earth and Atmospheric Sciences. "Many in the scientific community think it will be at least 50 years before ozone levels return to the pre-1980 levels when ozone began to decline."

The research results will be published Sept. 9, 2006 in the American Geophysical Union's *Journal of Geophysical Research-Atmospheres*. Georgia Tech research scientist Eun-Su Yang led the study in close collaboration with Cunnold and other researchers from government and education.

The study's data indicate that atmospheric ozone has stopped decreasing in one region and is

actually increasing in the other of the two most important lower regions of the stratosphere.

Scientists attribute the stabilization of ozone levels in the past decade to the Montreal Protocol, a treaty that phased out the use of ozone-depleting chemicals, including chlorofluorocarbons (CFCs) emitted from such sources as spray-can propellants, refrigerator coolants and foam insulation.

"There is now widespread agreement in the scientific community that ozone is leveling off in the 18- to 25-kilometer region of the stratosphere because of the Montreal Protocol," Cunnold said. "And we believe there is some tendency toward an increase in ozone in this region, though further study is needed to be certain."

"In the 11- to 18-kilometer region, ozone is definitely increasing because of changes in atmospheric dynamics and transport not related to the Montreal Protocol," he added. "But we don't know the long-term effect this change will have in this region."

Other recent studies complement these new findings. Among them are a study published in 2003 in the *Journal of Geophysical Research*, which reported a slowdown in the ozone depletion rate in the upper stratosphere at about 22 to 28 miles altitude. More recently, a study published in the journal *Nature* on May 3, 2006 indicated a stabilization and slight increase in the total-column stratospheric ozone in the past decade.

In the current study, Yang, Cunnold and their co-authors reached their conclusions based on satellite and ground-based atmospheric ozone measurements. They analyzed data from instruments on NASA satellites that began collecting data in 1979. Ground-based ozone measurements and balloons, provided essential complementary data for the study, Yang said. The satellites and the balloons measured ozone levels by atmospheric region. The ground-based data recorded measurements for the total ozone column.

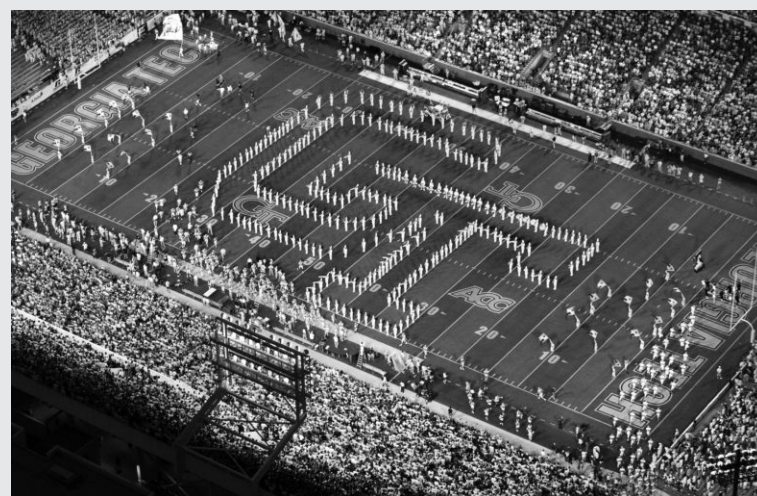
"The ground-based measurements were especially important for the lower atmosphere because satellites

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Earth and Atmospheric Sciences Research Scientist Eun-Su Yang and Professor Derek Cunnold, outside their research building

Bobby Dodd packs 'em in



During its pregame performance, the Georgia Tech Marching Band formed the Institute logo before a raucous capacity crowd of 56,680, who packed into Bobby Dodd Stadium for Georgia Tech's first football game of the year — a nationally televised matchup against the University of Notre Dame. The Yellow Jackets jumped out to an early lead, but were unable to score in the second half, losing 14-10.

Liberian president to visit Tech for talk in bridging African ICT gap

Elizabeth Campell
Institute Communications
and Public Affairs

During her first visit to Georgia Tech on September 13, Liberian President Ellen Johnson-Sirleaf, the first woman ever elected head of an African state, will give her first major address on "The Role of Information and Communication Technologies (ICT) in Liberian Development." This lecture is her first public address where she will reveal elements of their National ICT Policy in the post-conflict redevelopment of Liberia.

"This visit demonstrates our interest and commitment to Africa and the country of Liberia," says Michael Best, assistant professor in the School of International Affairs and adjunct assistant professor in the College of Computing, who invited Johnson-Sirleaf. "This visit underscores the mission of Georgia Tech's international plan and Tech's philosophy of engaging scholars in science and



President Ellen Johnson-Sirleaf

technology with policy issues and bridging the gap between cutting edge technology and international affairs."

Best currently leads an active research project for Liberia,

President continued, page 3

QUOTE UNQUOTE

"I'm thrilled to see this. It shows that we do understand the biological system well enough to make a mimic that works in a similar way."
—*Jeannette Yen, a professor in the School of Biology and director of the Center for Biologically Inspired Design, on reports that a team of researchers have developed the world's first functional artificial hair cell to mimic one of nature's most widespread and versatile data-collecting systems: the lateral lines of fish, which use a linear swatch of hair cells on their sides [known as the lateral line] to coordinate group movements, avoid predators and otherwise navigate.*
(*Science*)

Rocketeer hopes to make space travel 'routine'

Neil McGahee
Alumni Association

Stephen Fleming, Georgia Tech's chief commercialization officer, believes spaceships will one day take off and land routinely from the nation's airports. In fact he's betting on it.

"I've invested in three privately financed space programs," he said. "And they are all taking different approaches to the core problem — it's too expensive to send people or things into orbit using the space shuttle."

Fleming said he became interested in private space flight in the late 1980s.

"I was living in Washington, D.C., and made friends with a group of people who were involved in space policy," he said. "This was right after the Challenger explosion, and these hardcore rocket scientists were saying the space shuttle was like a horse that was designed by a committee but it turned out to be a camel. They were saying there had to be a better way to get people and enterprises into space."

"Several got involved with a privately funded rocket company and when it failed, they approached me — I was a venture capitalist then — and asked if I could find a way to keep a really good team of engineers together. I found some partners and invested some of my own money, and that became the nucleus of XCOR



Stephen Fleming has invested in several privately funded space programs.

Aerospace based in Mojave, California. It's like investing in commercial aviation in the 1920s."

XCOR has developed a series of rocket planes and engines for use in short, suborbital missions, Fleming said.

"There are so many applications for this. It is an invaluable tool for astronomers," he said. "If you can get above the atmosphere for even 10 minutes, it is possible to observe things that can't be seen from Earth. There's only one Hubble telescope and it's almost impossible to get time on it. Our planes allow scientists to see into space as well as use Earth sensing and material testing applications."

To tout the abilities of its planes, XCOR and other private rocketeers

created the Rocket Racing League, a kind of futuristic NASCAR event featuring 200 mile-per-hour rocket planes racing around a giant three-dimensional track 5,000 feet above the Earth.

The liquid oxygen/alcohol fuel mix only has a four-minute burn time so pilots must repeatedly shut down their engines and glide, then restart as needed to pass opponents.

"The purpose of the race is not to push the envelope of going higher, farther or faster," Fleming said. "We want to show that rocket operations can be spectacular but routine. If these planes have a problem, you don't have time to put down your tools and go into a conference room. You only have 20 minutes to get back into the air for the next race so you must find new ways to deal with issues. No one has ever operated rockets like they were general aviation."

Four X-Racer planes based on XCOR's EZ-Rocket design are scheduled to compete in a demonstration event in October at Las Cruces, N.M., with a full 10-plane race scheduled in 2007.

Fleming wants to take an even more active role in his investments. If he gets his way, he'll be strapped in as soon as possible.

"I've already signed up for a space trip," he said. "The next XCOR design will have a passenger seat and I fit in it."



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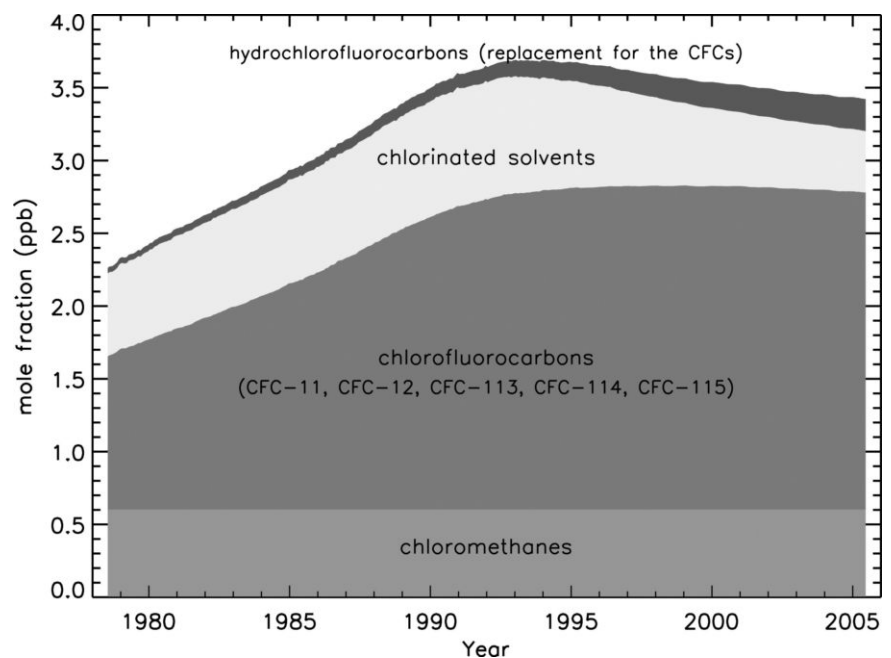
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can have difficulty in sensing the lowest regions," Yang said.

To accurately attribute the ozone level changes to the Montreal Protocol, researchers had to account for long- and short-term natural fluctuations in ozone concentration, Cunnold noted. One such fluctuation is an 11-year solar cycle, and another is a two-year oscillation that occurs in the tropics, but affects ozone in other latitudes because of atmospheric transport. Despite the natural fluctuations, Yang, Cunnold and their co-authors are very confident in the conclusions they reached from the data they analyzed.

"We know from the study we've just published that the Montreal Protocol — the first major global agreement related to atmospheric change — is working," Cunnold said.

A new NASA satellite called Aura is continuing to measure ozone in various regions of the stratosphere, and these same researchers are involved in the ongoing study of the ozone layer using the satellite's data.



The above chart represents the accumulation of total organic chlorine (number per billion atmospheric molecules) in the lower atmosphere. It plots the changing contributions from human-made chlorofluorocarbons (CFCs), chlorinated solvents and the replacements for these compounds (called the HCFCs). Also shown is the almost-constant contribution from chloromethanes, which are mostly produced by natural processes.

The data is derived from continuous sampling of the Earth's atmosphere since 1978 at five remote locations around the world by the Advanced Global Atmospheric Gases Experiment (AGAGE), which is sponsored by NASA.

Mythbusters live!



Georgia Tech students enthusiastically welcomed television personalities Jamie Hyneman and Adam Savage, who spoke to a standing room audience in the First Center last week. Together, they form the core of the Discovery Channel show "Mythbusters," a program that takes a scientific approach to debunk (or, in some cases, confirm) so-called urban legends.

IN BRIEF:

In memoriam

The Georgia Tech Research Institute lost one of its longtime employees over the holiday weekend. Orville Smith, 47, was involved in a fatal traffic accident on Sept. 2 near his home in Stockbridge. Smith joined GTRI in January 1980 and most recently served as GTRI's mail supervisor in the Support Services Department.



Sciences names interim dean

As Gary Schuster prepares to assume the role of Georgia Tech's provost, Professor Kent Barefield will serve the College of Sciences as interim dean, effective Sept. 15.

Barefield has been a faculty member in the School of Chemistry since 1976 and has served as associate dean of the College since 1995. A national search for a new dean will commence this fall.

All COE programs among nation's best

Georgia Tech's College of Engineering, the largest engineering program in the country, is the only U.S. engineering college with all of its undergraduate programs ranked in the top 10 of their specialty areas, according to U.S. News and World Report.

Four of Georgia Tech's engineering programs ranked in the top five among their specialty areas. Aerospace engineering ranked second; biomedical engineering placed fourth; civil engineering ranked third; and industrial engineering ranked first. Electrical engineering and mechanical engineering both placed sixth; computer engineering ranked seventh; materials engineering placed ninth; and chemical engineering ranked tenth.

"Our students, faculty and staff are among the very best in the nation," said College of Engineering Dean Don Giddens. "We are always pushing the envelope in research and education. There is a collegial 'can do' spirit here that is remarkable."

Georgia Tech established its first engineering program, mechanical engineering, in 1888.

Clothing drive begins

The Institute Partnerships Department has begun its annual clothing drive to provide clothing and toiletries for needy families in the surrounding community. Items of clothing may be placed in a bin located on the first floor of the Wardlaw Building (177 North Avenue) outside of room 107. A specific need is business attire: suits, dresses, slacks, shirts, blouses, jackets, ties and shoes.

The drive will run until Nov. 1. For additional information, e-mail shondra.carter@icpa.gatech.edu or call 894-5187.

Outreach event introduces students to electrical engineering

Jackie Nemeth
Electrical and Computer Engineering

Freshmen from the School of Electrical and Computer Engineering (ECE) and undecided engineering majors attended ECE Rush recently to learn more about research, education, student organizations, and career opportunities from the School's faculty, staff and upperclassmen.

In welcoming the students, Douglas Williams, associate chair for ECE Undergraduate Affairs, noted that many devices and services created during the last 25 years — hybrid cars, modern hearing aids, and cell phones — have improved the quality of everyday life, either by enabling faster communications, providing cleaner energy sources or helping people with disabilities lead fuller lives.

"All of these products share the commonality that they were all made possible by the ingenuity of electrical engineers and computer engineers," Williams said. "Besides doing meaningful work,

our students are majoring in disciplines that are in the top 10 'most in demand' professions."

To bring engineering technology and its uses to life, ECE faculty members ran demonstrations on microprocessor architecture, while ECE student organizations were on hand to introduce new students to their activities.

Several teams of freshmen students competed to be the first to build a working FM transmitter, with members of the winning team earning an MP3 player with a radio receiver.

Many students commented that it was hands-on experiences such as this one that helped them decide to pursue an engineering education. Others had family or friends involved in the field.

"My uncle and grandfather were both engineers, which led me to pursue an electrical engineering degree," Gregory Watkins, a freshman, said. "I have always done well in math and have been interested in computers, science and technology, so electrical engineering is a perfect fit for me."

President, cont'd from page 1

supported by the Open Society Institute for West Africa, involving five Georgia Tech graduate students who are studying ICT challenges in Liberia and providing technical assistance. Later this year, three of the students will travel to Monrovia, the capital of Liberia, to conduct a national ICT audit and collaborate with government officials to develop a national ICT policy for the country.

"Today there are no fixed phone lines left in Liberia," says Best. "The copper wire was looted during the civil war, and you'll see copper wire used to tie loads onto ox carts. That shows you the state of their infrastructure in a country where the civil conflict ended only two years ago."

During President Johnson-Sirleaf's visit, several organizations including Microsoft and the Soros Foundation are expected to announce specific commitments for ICT activities in Liberia.

Prior to her election as President, Johnson-Sirleaf held a number of prominent positions,

including assistant administrator and director of the regional bureau for Africa of the United Nations Development Programme with the rank of assistant secretary general of the United Nations.

The Ivan Allen College of Liberal Arts and the College of Computing are co-sponsoring Johnson-Sirleaf's visit, which includes a public lecture, a media briefing, and a private luncheon and working meeting involving representatives from Hewlett Packard, IBM, Microsoft, the Open Society Institute, the World Bank on rebuilding Liberia's devastated ICT infrastructure. The Liberian delegation will include Charles Minor, Liberian ambassador to the United States and Amara Konneh, deputy chief of staff to the Republic of Liberia. Femi Oke, anchor for CNN's Inside Africa, will emcee the public lecture.

President Johnson-Sirleaf's public lecture will be held at 10:30 a.m. in room 236 of the Global Learning and Conference Center.