

Solar wind slowed by helium, research suggests

by Nancy Ambrosiano

Like a sea anchor slacking the pace of a wind-driven ship, helium may be the drag that slows the solar wind in its million-mile-per-hour rush across the cosmos. And because the ordinary solar wind just can't pull hard enough, the helium may build up in the solar atmosphere, until massive amounts of it are explosively expelled during eruptive solar events called coronal mass ejections. These ejections produce the biggest near-Earth disturbances caused by solar wind.

Those are the principal findings of researchers analyzing a decade's worth of data collected by the Solar Wind Experiment, onboard the NASA spacecraft Wind.

Solar wind is a gas of electrically charged particles continuously emanating from the sun that fills all of interplanetary space.

The Solar Wind Experiment measures the speed, density, and temperature of solar wind's charged particles, primarily hydrogen with some helium and trace amounts of heavier elements. The measurement in space of hydrogen and helium has been a long-standing field of expertise for the Laboratory, whose John Steinberg of Space Science and Applications (ISR-1) shares responsibility for scientific interpretation with the institutions behind the experiment: NASA's Goddard Space Flight Center, the University of New Hampshire, and the Massachusetts Institute of Technology.

"We study the solar wind for practical reasons; the character of the solar wind blowing by Earth at any time determines conditions in the near-Earth space environment," Steinberg said. "We've flown instruments for similar solar wind measurements on spacecraft dating back to the 1960s. Currently, Los Alamos instruments are measuring the solar wind on the ACE and Ulysses spacecraft.

"It turned out that the Wind Solar Wind Experiment data were ideal for this particular study because of continuous data coverage that the spacecraft provided during the previous solar activity cycle minimum in 1996, through the recent solar max in 2001, and into the solar activity declining phase afterward," said Steinberg. In addition, the Wind Solar Wind Experiment instrument turned out to be particularly well suited to giving accurate measurements at the slowest solar wind speeds, he said.

On any given day, solar wind potentially affects Earth, satellites, and astronauts alike. Most effects are benign,

but some solar wind effects strongly disturb space weather, which in turn can affect satellite operations. The team reported that the biggest disturbances are associated with eruptive events on the sun called coronal mass ejections (different than solar flares), which incidentally have 5 to 10 times the amount of helium typically seen in solar wind.

"This result gives us another clue about how the solar wind is accelerated, which may help us better understand space weather," said Justin Kasper of the Kavli Institute for Astrophysics and Space Research at the Massachusetts Institute of Technology, lead author of a paper published last month in *Astrophysical Journal*.

"We don't yet understand a most basic aspect of the solar wind: how exactly does material in the solar corona accelerate to the solar wind speeds of between 600,000 and a million miles per hour?" Steinberg said. "The results of this study give us important clues. The clues came from having a look at the rare times when the solar wind is at its slowest, only 600,000 miles per hour, when it is almost all hydrogen and hardly any helium."

In Earth's atmosphere, helium is the really light stuff, allowing it to float above heavier oxygen and nitrogen. In the solar corona, however, most of the material is hydrogen, the lightest element, which should have an easier time than the heavier helium escaping the sun's gravity. "We suspect that as the hydrogen tries to escape the solar corona, it always tends to drag some of the heavy helium with it. But dragging the helium along slows down the hydrogen." It may be that 600,000 miles per hour is a rough speed limit, below which the helium applies too much drag on the hydrogen to let it escape, Steinberg explained.

The Solar Wind Experiment instrument on board the Wind spacecraft took some 2.5 million measurements over of more than 10 years.

"The instrument has been extremely stable over all this time, so we know the changes we see in the solar wind are real and not just from changes in the instrument," said Keith Ogilvie of Goddard Space Flight Center in Greenbelt, Maryland, principal investigator for the SWE instrument and a co-author of the paper.

Launched in November 1994, Wind is the first of two NASA spacecraft in the Global Geospace Science initiative and part of the International Solar Terrestrial Physics Project.

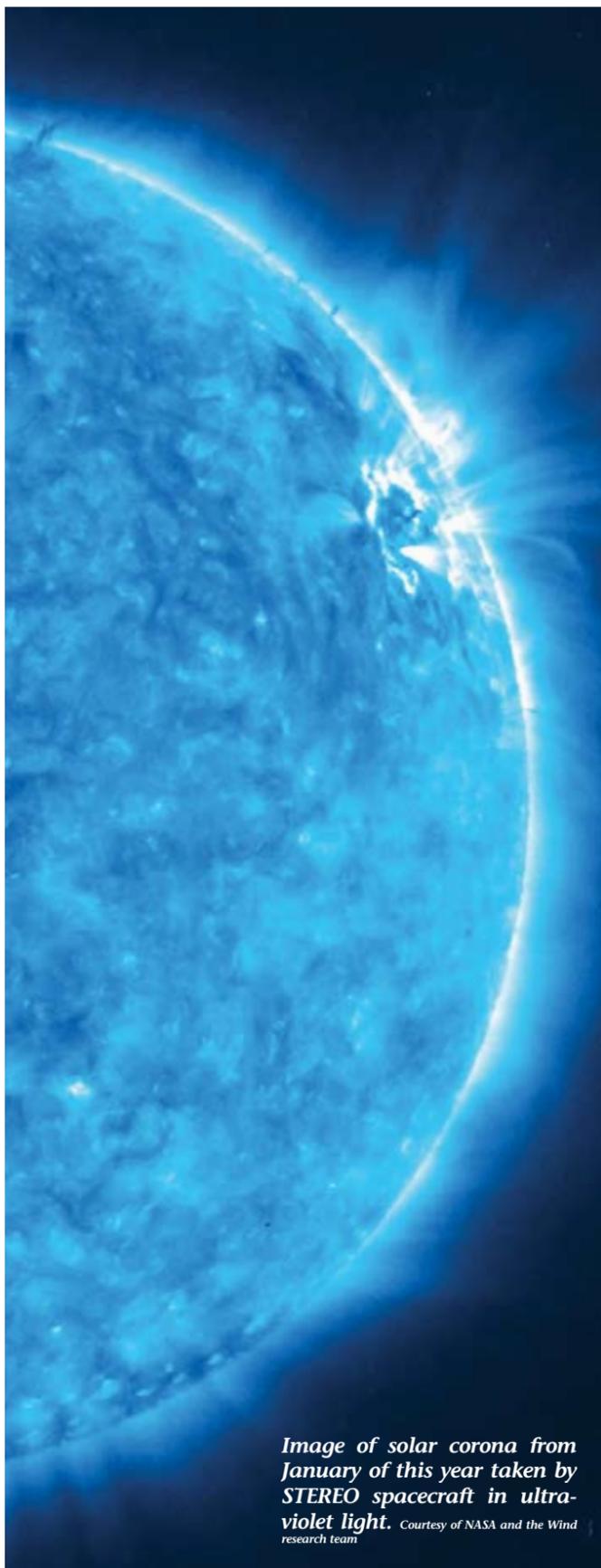


Image of solar corona from January of this year taken by STEREO spacecraft in ultraviolet light. Courtesy of NASA and the Wind research team

 **NewsLetter**

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Lightning safety

Lightning is one of the most underrated severe weather hazards, according to the National Weather Service. In the United States every year, lightning kills more people than hurricanes or tornadoes.

One ground lightning strike can heat its path five times hotter than the surface of the sun and generates between 100 million and 1 billion volts of electricity.

When the threat of thunderstorms develops, the following precautions should be taken, according to the National Weather Service:

- If your hair stands on end or you feel a tingling sensation, lightning may be about to strike. If no shelter is available squat down with feet together and place hands over ears to minimize hearing damage from thunder. This also reduces your chances of being struck or becoming a conductor for nearby lightning strikes.
- Remember the "30/30" rule. If lightning is sighted and its accompanying thunder arrives in less than 30 seconds, the lightning is within 6 miles and shelter should be taken. Remain in that shelter for 30 minutes after the last clap of thunder.
- Avoid projecting above the surrounding terrain as you would if standing in an open field or on a mountain top.
- Stay away from open water.
- If indoors, avoid water and stay away from doors and windows. Don't use telephones with cords and take off headsets. If possible, turn off appliances.
- Turn off computers, power tools and televisions because an exterior lightning strike of electric or telephone lines can induce shocks to indoor equipment.
- Stay off motorcycles and bicycles, tractors and other metal farm or construction equipment.

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The following is from a recent all-employee memo from Laboratory Director Michael Anastasio.

June marks one year

*While it's been a tough year,
it's been a good year ...*



Michael Anastasio

June 1 marked a year since Los Alamos National Security, LLC, assumed the management and operating contract for the Laboratory—a year since I had the honor of becoming your director. It has been a year of challenges and successes. We have met mission milestones, made significant improvements in safety and security, garnered recognition of our outstanding science, and developed 12 institutional goals that will help ensure our future.

We have a clear vision: Los Alamos, the premier national security science laboratory for the 21st century. At the end of our first year together, we have overcome many obstacles and made substantial progress to realize our vision. I am proud of your hard work. While it's been a tough year, it's been a good year, and I encourage you to take time to reflect. I began part of that reflection when I discussed with reporters the following few examples that illustrate our notable achievements:

We've boosted our efficiency and effectiveness

- We absorbed increased costs without sacrificing mission or our commitment to employees
- We improved physical security and cyber security by reducing risks and eliminated and consolidated our classified material
 - We cut CREM by 30 percent
 - We reduced classified computing systems by a fifth
 - We reduced the number of vault-type rooms by 15 percent
 - We expanded drug-testing and physical searches
- We dramatically improved safety—with 30 percent fewer injuries than in the prior year
- We began a new era of fully contained high-explosive DARHT tests
- We witnessed the successful launch of the Cibola Flight Experiment.

We plan and act for a successful and sustainable future

- We've adopted 12 large-scale, long-term goals and concrete commitments toward achieving them, such as:
 - Successfully launching the first phase of the Roadrunner supercomputer
 - Launching a Super Vault Type Room prototype effort
- We launched Performance Based Leadership, an effort to improve leadership Labwide, and Human Performance Improvement, a leading approach to minimizing risk and maximizing performance
- We launched a Labwide process improvement effort
- We continue to focus on our student pipeline to recruit and retain the best and the brightest for our future.

We're more accountable and reliable than ever

- We added dimensions of oversight and accountability including:
 - A demanding and expert Board of Governors
 - A Contractor Assurance System
 - Accountability to our colleagues and employees through Performance-Based Leadership
- We met 103 out of 104 New Mexico Environment Department Consent Order deliverables on time and have since completed the outstanding action
- We have a Community Commitment Plan focused on education, economic development, and community giving
 - We more than doubled the Lab's United Way contribution—to \$1.5 million this year.

I will review the past year and discuss our future at an all-employee meeting during the week of June 11. I also will be sharing our successes and our plan for the future with the Northern New Mexico community later this summer.

In addition, we are planning a summer picnic to thank all of you for your efforts on behalf of the nation and to give us all the chance to relax and mingle with coworkers. Watch Links (<http://int.lanl.gov/news/index.php/fuseaction/links.issue/>) for more information.

As I have said before, I am excited about what lies ahead for the Laboratory. The best is yet to come. Certainly there will be challenges, but working as a team, we will continue to anticipate, innovate, and deliver the outstanding science that matters for the security of our nation.

Los Alamos National Laboratory NewsLetter

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So...what do you think?

Q: Los Alamos National Security, LLC, has been managing the Laboratory for one year, and Director Michael Anastasio recently sent an all-employee memo acknowledging the one-year mark and noting some of the accomplishments during this period. In your opinion, what are the one or two most important items or issues LANS should focus on as it begins its second year of operating the Laboratory and why? These items or issues can be new or something that the Lab should continue to address.



Diane Senutovitch of Emergency Planning and Preparedness (ER-EP)

Job security and the second is hiring staffing to meet past, current, and future workloads. Fewer people are having to manage two to three full-time employee workloads, so burnout is to be expected if we can't hire and train new employees and/or retain employees, especially limited-term.



David Redman of Systems Engineering and Integration (D-3)

The Lab needs to continue to focus on the long-term financial stability of this fine institution. I believe there still are many changes that need to be made. I'm surprised that changes are coming as slowly as they are.



Carla Martinez of Service Center (HR-SVSCTR)

Retaining the current work force by converting limited term appointments. Rehire more students to keep the best and the brightest returning to the Laboratory.



Jeremy Martinez of the Research Library (STBPO-RL)

I would like to see Los Alamos National Security, LLC, focus on improving the national public view. All of the news I hear seems to be negative, and I would like people to see the good things the Laboratory has to offer.



Charles Zeeb of Monte Carlo Codes (X-3-MCC)

LANS should try to make funding stable.

PEOPLE



Matz named fellow of American Industrial Hygiene Association



Dina Matz

Dina Matz of Institutional Programs (IHS-IP) is a new Fellow of the American Industrial Hygiene Association.

Only five percent of AIHA's 11,600 members can qualify for the Fellow Award, which is awarded to "those individuals who have made significant contributions to the field of industrial hygiene," said Frank Renshaw, president of AIHA.

"[AIHA looks] forward to continuing to work with [Matz] ... to improve the work environment and advance the practice of industrial hygiene," Renshaw added.

AIHA serves occupational and environmental health professionals who practice industrial hygiene.

Matz became a Laboratory employee in 1998 and currently is group leader in IHS-IP. She has a bachelor's degree in environmental health from Colorado State University, and a master's degree in environmental science from the Colorado School of Mines. She also is board certified in industrial hygiene, occupational safety, and biological safety.

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Employee receives award for 'setting the standard'

Marjorie Gavett of Independent Assessments (QA-IA) recently earned a certificate of acclimation from the American Society of Mechanical Engineers.

Gavett earned the certificate from ASME's Codes and Standard Sector for her work developing Nuclear Quality Assurance (NQA-1), Part III, Appendix 17A-2 - Nonmandatory Guidance for Electronic Records.

NQA-1 is a consensus standard created by ASME that the Laboratory utilizes for aspects of its nuclear operations in order to meet its quality assurance requirements. NQA-1 establishes requirements for the establishment and execution of quality assurance programs during decisions about the site, design, construction, operation, and decommissioning of nuclear facilities and the activities at these facilities, explained Gavett.

ASME was founded in 1880 and has 120,000 members. The professional organization focuses on the issues of the worldwide engineering and technology community.

Gavett has worked at the Laboratory for 26 years and has served on NQA-1 subcommittees since 1999. She is a member of the NQA-1 Main Committee.

"My hope is that this recognition will help raise awareness about the standard," said Gavett. "I want Laboratory employees to know that I can serve as a resource for NQA-1 related topics."

Lightning safety ...

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- Put down golf clubs and take shelter. Metal-spiked golf shoes increase the probability of being struck.
- Don't stand under natural lightning rods such as tall, isolated trees.
- Avoid taking shelter in small structures that are isolated in an open area.
- If in a forest, seek shelter in a low area under a thick growth of small trees; if in an open area, seek a low place such as a ravine or valley but stay alert for possible flash flooding.

Laboratory employees and subcontract personnel who work outdoors should be especially alert to the possibility of being struck by lightning. Heavy equipment vehicles and cranes serve as grounding paths for lightning because of their metal construction and girth.

Ninety percent of lightning victims survive a lightning strike. Individuals struck by lightning do not carry a charge, and it is safe to touch them to provide medical treatment. Providing first aid, even though an individual looks dead, may save a life. This would involve cardiopulmonary resuscitation, because the lightning may cause an individual's heart and lungs to stop functioning.

In Memoriam

Charles L. Warner

Laboratory retiree Charles L. Warner died April 9. He was 78.

Warner joined the Laboratory in 1960 as a staff member in the Physics (P) Division. While at the Laboratory, he also worked in the former Health (H); Health, Safety, and Environment (HSE); and Technology and Safety Assessment (TSA) divisions. He retired in 1991 from the former Nuclear Technology and Engineering (N) Division.

He received a bachelor's degree in chemistry from Texas Wesleyan College and later earned a master's degree.

He is survived by his wife, Ella Mae; sons Jim and Bryan of Rio Rancho; three step-children, Robert Gore of Los Angeles, Judi Voelz of Las Cruces, New Mexico, and Jim Gore of Rio Rancho; and numerous grandchildren.

Robert Donohoe

Laboratory employee Robert Donohoe died April 26. He was 50.

Donohoe was deputy group leader in Physical Chemistry and Applied Spectroscopy (C-PCS). His wife, Anne, works in Threat Reduction and Physics (FME-TRP).

Donohoe joined the Laboratory as a postdoc in 1988 in the former Isotope and Nuclear Chemistry (INC) Division. His expertise was in Raman spectroscopy, which he applied to a variety of projects from environmental efforts, the electronic behavior of novel materials, to biomedical systems. He was the co-author of more than 60 publications, mostly detailing the development and application of spectroscopic methods to the study of molecular structure, dynamics, and chemistry.

Donohoe earned bachelor's degrees in math and chemistry from the University of Arizona, and a doctoral degree in physical chemistry from North Carolina State University.

In addition to his wife, Donohoe is survived by sons Sean and Patrick; mother Lillian of Woodbridge, Virginia; a sister, Ellen Donohoe-Sundahl of Hillsdale, Michigan; and brothers Kevin of Boston and John of Woodbridge, Virginia.



Carrying on a family tradition

Lab employee wins Southern Mountain Regional Dulcimer Championship

by Krista D. Wilde

Jonathan Dowell of Applied Electromagnetics (IAT-2) stepped into a spectacular auditorium with sixty-foot vaulted ceilings and three hundred audience members to compete in the Southern Regional Mountain Dulcimer Championship.

His playing on that April day so impressed the judges that Dowell walked away with first prize, a trophy, a new dulcimer, and entry into the National Championship in Kansas, where he will compete in September.

Dowell arranged and played "Star of the County Down," "Devil in the Strawstack," and "Wild Mountain Thyme" in the competition. He prepared for the competition with practice, perseverance, and some research. A woman named Jean Jennings established the contest. The judges use a score sheet based on her philosophy, so Dowell had to learn what she liked to hear.

"She didn't focus simply on fast and furious playing. She also cared about emotional expression, the purity of a note, and the intellect of the composition. The other competitors were very good, so I think it was my composition that distinguished me," said Dowell, who arranged all the songs he played.

"Arranging almost is a spiritual phenomenon. First I learn to pick out the melody and then I live with the song for a while. Finally, the arrangement starts to come to me," he said.

Dowell plays the mountain dulcimer, which is a guitar-like instrument that originated in Appalachia as a tool for teaching elementary-aged children about music. The dulcimer became part of popular folk music in the 1950s.

Dowell's love for the dulcimer is rooted in his heritage. His mother plays the dulcimer and attended jamborees for thirty years. His grandparents are from the Ozarks, and his ancestors are from Northern Ireland.

"I like to think I have this music in my blood. The Ozarks are so important to my grandparents and that strengthens the importance of this music to me," he said. "These are ancient tunes, so playing them helps preserve the culture of the hill people, who were my ancestors."

Dowell and his wife, Tessa of Property Management (ASM-PM), first attended jamborees with Dowell's mother, and he began playing about eight years ago. He learned to play by taking lessons at jamborees and using self-teaching books to learn the basics.

Last spring, Dowell recorded a CD called *Algorhythm 1.0*, which includes Celtic Aires. Dowell also collaborated with his coworker, Bob Velasco, on two original songs, which are on the CD. He wants to record a second CD to feature fiddle tunes.

"Music is related to human spirituality," said Dowell. "It's the expression of who we are, what we think, and how we feel. It is one way I try to bring joy to the world."

Those who want to learn more about dulcimers or Dowell, or who want to hear samples of dulcimer music can visit his Web site at <http://www.reefnews.com/celticdulcimer>.



Photo by Tessa Dowell, Property Management