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ARM Facilities Newsletter

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Atmospheric Radiation Measurement Program

www.arm.gov

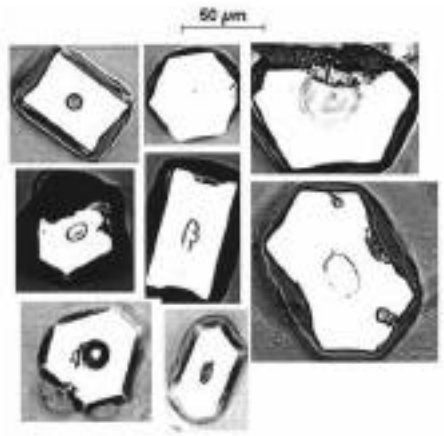
ARM Data Used in Hurricane Research

The SGP CART site in Oklahoma and the Facility for Atmospheric Remote Sensing in Salt Lake City, Utah, provided the data for a recently published study of the 1997 Hurricane Nora.

In September of 1997, Hurricane Nora developed over the Pacific Ocean near Panama. As the storm moved north along the Baja Peninsula and into California, its strong winds stripped microscopic sea salt particles from the ocean surface and launched the particles into the cold upper troposphere. There water vapor condensed on the particles, which acted as cloud condensation nuclei. The resulting cloud droplets froze to become ice crystals. These, in turn, formed wispy cirrus clouds that were swept hundreds miles from shore.

Data from the clouds were gathered by ground-based instruments in Utah and Oklahoma, and research aircraft collected ice particle samples in clouds over the SGP site. Analyses showed that some of the ice crystals had formed on sea salt nuclei, but other crystals had ocean plankton (microscopic marine life) nuclei. This was the first discovery of plankton as nuclei of ice crystals in hurricane-derived cirrus clouds.

Cirrus cloud ice crystals grow and develop differently, depending on the particle used as a nucleus. Crystal shape can affect the interactions of the crystals — and of the clouds they



Plankton and microbes in cloud ice crystals. (Photo: Desert Research Institute.)

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form — with incoming sunlight and outgoing infrared energy. Characterizing this type of interaction between sun, clouds, and Earth's surface is the major focus of the ARM Program.

The study on Hurricane Nora was published in the American Meteorological Society's *Journal of the Atmospheric Sciences*. Authors were researchers from the Universities of Alaska, Utah, Maryland, and North Dakota; the Desert Research Institute; and NASA Goddard Space Flight Center.

Lightning Awareness Week: June 22-28, 2003

The National Weather Service (NWS) is promoting public safety by sponsoring the Third Annual Lightning Awareness Week — June 22-28, 2003. Lightning is the second deadliest weather phenomenon in the United States (second only to floods). With the summer months just ahead, now is the time to learn about protecting ourselves from this hazard.

According to the NWS, approximately 25 million cloud-to-ground lighting flashes occur each year. Lightning packs a punch equal to 100 million volts of electricity, a force powerful enough to tear through roofs and explode walls and chimneys. A lightning strike can generate temperatures as high as 50,000 degrees Fahrenheit and can easily ignite fires.

In addition to causing property destruction, direct lightning strikes kill an average of 73 people each year, topping annual deaths by tornadoes or hurricanes. Lightning can strike as far as 10 miles from a storm, even with clear skies overhead. If you can hear thunder, you are at risk. The odds of being struck by lightning in a lifetime are 1 in 3000, with roughly 10% of victims being killed. Survivors can suffer severe, life-long injury and disability. Although the odds of being killed are low, complete protection from a direct hit (to you or your house) is impossible. Nevertheless, some precautions will help to avoid injury or property damage.

The National Lightning Safety Institute suggests several ways to protect yourself when a lightning storm approaches. First and foremost, seek shelter immediately. Outdoors, you are essentially unprotected. Indoors, stay away from doors, windows, and electrical appliances, even before the approach of the storm. Small electrical surges due to nearby lightning strikes can seriously damage appliances that are sensitive to power fluctuations. Stay away from plumbing, including sinks, bathtubs, and faucets. Lightning can enter your home through buried water supply lines, then travel through metal piping and cause electrocution if you are in contact with the pipes (for example, while taking a shower). Do not use your telephone during a storm, because a lightning strike can travel through telephone wires and cause serious injury. Also avoid natural gas pipes, which, like water supply lines, can transport lightning energy.

Lightning strikes during a nighttime thunderstorm. (Photo: NOAA Photo Library)

If you are outside when a lightning storm approaches, your first priority is to seek proper shelter, preferably inside a safe building or a metal vehicle with the windows fully closed. If this is not possible, seek shelter away from isolated trees, and avoid contact with electric wires, fences, clotheslines, metal pipes, motors, power tools, telephone poles, and other conductors. Avoid bodies of water such as lakes, ponds, and swimming pools. Stay away from isolated objects like single trees, canopies, wood or metal bleachers, or small picnic shelters. If no man-made shelter is available but a large grove of trees is nearby, position yourself in the middle of the grove, midway between trees. Put down any object that might conduct electricity, such as a rake, hoe, shovel, or golf club. Seek a position in a low spot, and minimize your contact with the ground by crouching down with only your knees and toes touching the ground. Cover your ears to protect your hearing from thunder. Don't lie flat on the ground, and stay at least 15 feet away from other people. If your hair stands on end, lightning might be about to strike nearby.

Lightning protection systems are the most useful method for safeguarding buildings and equipment against lighting damage. The systems collect electrostatic charge and provide a preferred path to channel the lightning energy to the ground, then allow the charge to dissipate harmlessly. Most systems have three main components: air terminals (lightning rods), conductors, and grounding rods or plates. The initial electrical charge built up in the atmosphere due to a thunderstorm is picked up by the air terminal, transferred through the conductors, and dissipated deep underground through the grounding rod or plate. Because the charge is dissipated, no lightning flash takes place, keeping a building safe from damage. All lightning protection equipment must be designed to standards of the Lightning Protection Institute, Underwriters Laboratories, the National Fire Protection Association, or the National Electrical Code.

Keep informed of the weather conditions when storms are in the area, paying close attention to watches or warnings that have been issued. Every thunderstorm can produce lighting, but because lightning is a random process of nature, predicting where it will strike is impossible. Storm and safety awareness, as well as sensible thinking, will help to reduce potential injuries and minimize hazards. Although following lighting safety guidelines may be inconvenient, doing so will help to save lives.

For more information on lighting and lighting safety, visit the NWS web site at

http://www.lightningsafety.noaa.gov

Billings Rotary Club Visits SGP Central Facility

John Schatz (left), ARM Program deputy site operations manager and site safety officer, is pictured with fellow members of the Billings Rotary Club at the SGP central facility near Lamont, Oklahoma. Ten members toured the facility with John and facility manager Dan Nelson on May 13, 2003.