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Global Warming: Frequently Asked Questions

By David Easterling and Tom Karl, National Climatic Data Center, Asheville, NC

This is the last of a three part series on this topic.

assess the likelihood of large-scale melting of these sheets.

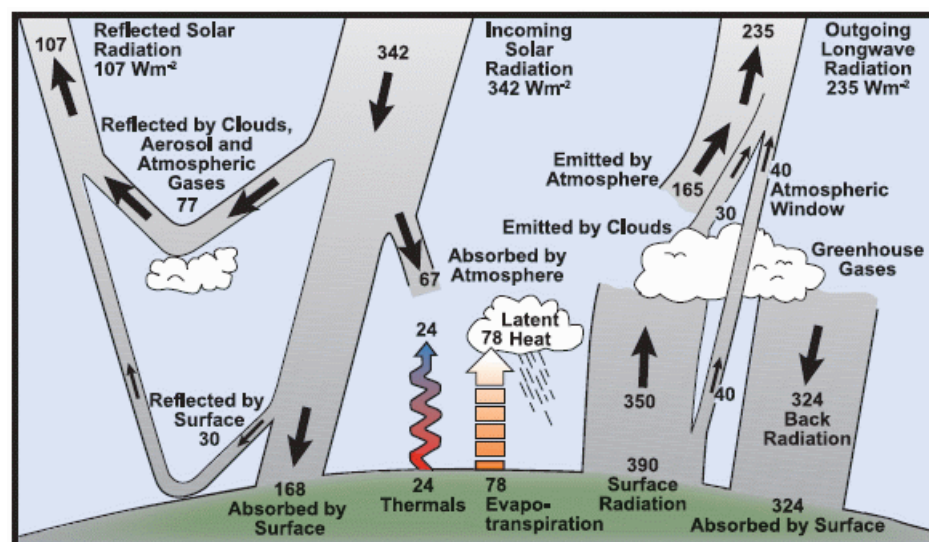
Is Sea Level Rising?

Global mean sea level has been rising at an average rate of 1.7mm/year (plus or minus 0.5mm) over the past 100 years. This rate is significantly larger than the averaged over the last several thousand years. Depending on which greenhouse gas increase scenario is used, sea-level rise is projected to be anywhere from 0.18 meters to 0.59 meters. This increase is due mainly to thermal expansion and water from melting glaciers. The rise does not include potential water from melting ice sheets in Greenland or Antarctica. We cannot rule out larger increases but our understanding of ice sheets does not allow us to accurately

Can The Observed Changes Be Explained By Natural Variability?

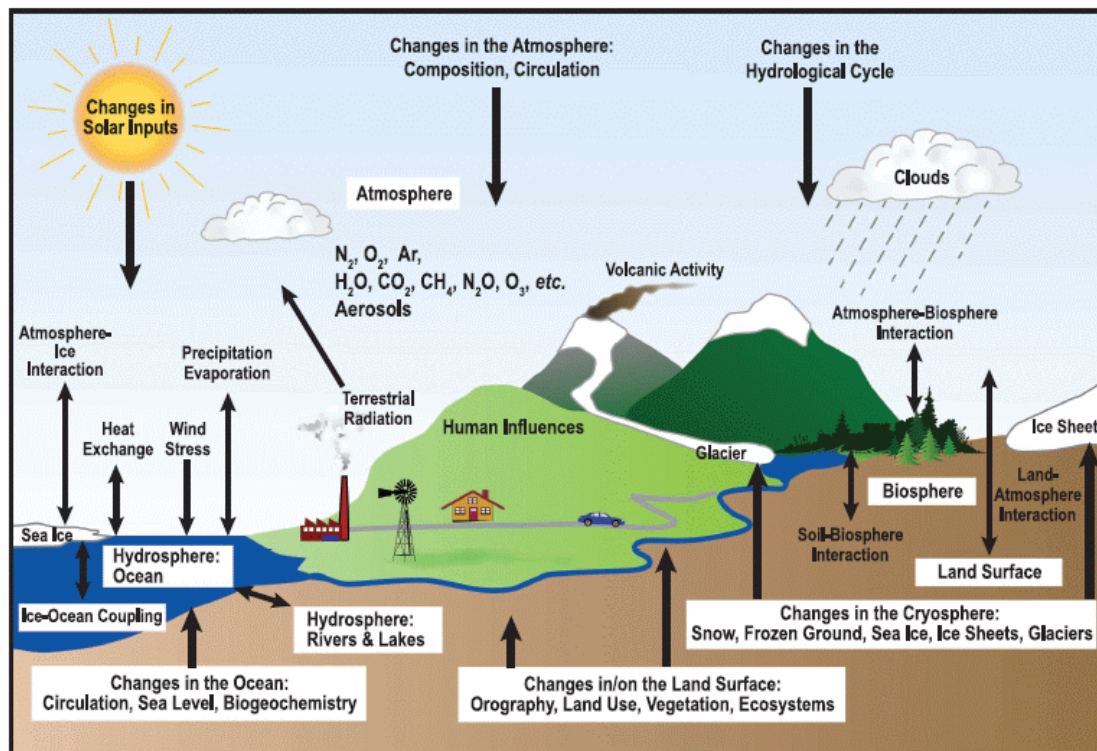
Since our climate system is largely driven by energy from the sun, it stands to reason that if the sun's energy output were to change, so would Earth's climate. Since the advent of space-borne measurements in the late 1970s, solar output has indeed varied. With 28 years of reliable satellite observations, there is confirmation of earlier suggestions of an 11 (and 22) year cycle of irradiance related to sunspots but no longer term trend in these data.

Paleoclimatic (proxy) reconstructions of solar irradiance suggest a trend of about



Estimate of Earth's annual and global mean energy balance. Over the long term, the amount of incoming solar radiation absorbed by the Earth and atmosphere is balanced by the Earth and atmosphere releasing the same amount of outgoing long wave radiation. About half of the incoming solar radiation is absorbed by the Earth's surface. This energy is transferred to the atmosphere by warming the air in contact with the surface (thermals), by evapotranspiration and by long wave radiation absorbed by clouds and greenhouse gases. The atmosphere in turn radiates long wave energy back to Earth and out to space. Source: Kiehl and Trenberth (1997).

There is a strong need to refine our understanding of key natural forcing mechanisms of the climate, including solar irradiance changes, to improve projections of future climate change.



Schematic view of the components of the climate system, their processes and interactions

+0.12 W/m² since 1750, about half the estimate given in the last IPCC report in 2001. There is though, a great deal of uncertainty in estimates of solar irradiance beyond what can be measured by satellites, and still the contribution of direct solar irradiance forcing is small compared to the greenhouse gas component.

Our understanding, however, of the indirect effects of changes in solar output in the climate system is minimal. There is a strong need to refine our understanding of key natural forcing mechanisms of the climate, including solar irradiance changes, to improve projections of future climate change.

In addition to changes in energy from the sun itself, the Earth's position and orientation relative to the sun (our orbit) also varies slightly, bringing us closer and further away from the sun in predictable cycles. Variations in these cycles are believed to be the cause of Earth's Ice Ages or glacials. Particularly important for the development of glacials is the radiation receipt at high northern latitudes. Diminishing radiation at these latitudes during the summer months would have enabled winter snow and ice cover to persist throughout the year,

eventually leading to a permanent snow or icepack. While these cycles have tremendous value as a theory to explain Ice Ages and long-term changes in the climate, they are unlikely to have much impact on the decade-century timescale. Over several centuries, it may be possible to observe the effect of these orbital parameters, however for the prediction of climate change in the 21st century, these changes will be far less important than radiative forcing from greenhouse gases.

What About the Future?

Due to the enormous complexity of the atmosphere, the most useful tools for gauging future changes are computer-based mathematical models that simulate, in three dimensions, the climate's behavior, its components and its interactions.

Climate models are constantly improving based on our understanding and the increase in computer power, though by definition, a computer model is a simplification and simulation of reality, meaning that it is an *approximation* of the climate system. The first step in any modeled projection of climate change is to simulate the present climate

and compare it to observations. If the model accurately represents modern climate, then some parameters can be changed, such as greenhouse gas concentration. These changes help scientists understand how Earth's climate would change in response to these gases. Projections of future climate changes therefore depend on factors such as how well the computer model simulates the current climate.

The IPCC Special Report on Emission Scenarios determines the range of factors such future possible greenhouse gas concentrations based on variables such as population and economic growth and energy efficiency.

According to the range of possible scenarios, and taking into account uncertainty in climate model performance, the IPCC projects a global temperature increase of 1.8°C – 4.0°C with a possible range of 1.1°C - 6.4°C by 2100, depending in which

emissions scenario is used. This global average, however, integrates widely varying regional responses, such as the likelihood that land areas will warm much faster than ocean temperatures, particularly land areas in northern high latitudes (and mostly in the cold season). In addition, heat waves and other hot extremes are likely to increase.

Precipitation is also expected to increase over the 21st century, particularly at northern mid-high latitudes. The trend may vary more in the tropics, with much of the increase coming in more frequent heavy rainfall events. Over mid-continental areas, summers are expected to be drier due to evaporation from increased temperatures, resulting in more drought in those regions.

Snow extent and sea-ice are also projected to decrease further in the northern hemisphere, and glaciers and ice caps are expected to continue to retreat. ☼

He was impressed by the dedication and commitment of NWS volunteers. He plans to expand the Cambodian climate program and is investigating a variety of data collection methods and types of equipment.

Cambodian Visitor Praises U.S. Coop Program

While on assignment in Hawaii, the Deputy Director of Cambodia's Department of Meteorology, Ryna Oum, had the opportunity to observe NWS programs. He also visited Coop sites and helped Kevin Kodama, NWS Honolulu Senior Service Hydrologist, and Mark Farnsworth, Observations Program Leader (OPL) present several Observer awards.

After presenting the awards, Oum had a chance to spend time with the Observers. He was impressed by the dedication and commitment of NWS volunteers. He plans to expand the Cambodian climate program and is investigating a variety of data collection methods and types of equipment.

His visit was part of a 6-week program in which he worked with the Pacific International Training Desk at the Honolulu Forecast Office. The office is part of the University of Hawaii's Manoa Campus. The current Pacific Desk Instructor is Robert Larson, a retired NWS Lead Forecaster, who has worked with individuals from 17 countries to date. The Pacific Desk Program is administered by the Joint Institute for Marine and Atmospheric

Research, in conjunction with the University of Hawaii and NWS. The program offers weather professionals from various Pacific Rim countries an opportunity to enhance their knowledge of tropical meteorology, hydrometeorology and data collection.

Participants observe the daily operations



Ryna Oum, Deputy Director of Cambodia's Department of Meteorology and Kevin Kodama NWS Honolulu SSH, present a Coop Service Award (See Page 19 for details).

In the off hours I've made myself a pest at the USAF Weather Service from Mountain Home AFB in Idaho, to Kunsan AFB, Korea (I love the South China Sea; darn cold and wet in the winter)

of the Forecast Office, receive training and exposure to meteorological programs, and receive instruction on systems and practices that may be suitable for use in their country. ✪

True Tales from Coop Subscribers

Weather from Korea to Iraq

By Michael Neely, Nellis AFB, NV

I've been interested in weather for years. I have a personal weather station I monitor outside my second story window. When I wake up at 4:30 am, I check temperature, barometer, and humidity then weather broadcaster watch Sherry Swensk on television and the NWS forecaster until I go to work at 6:30 am. During the day I monitor the visual weather picture by observation until I get home. I have a Blackberry to keep check on NWS alerts during the day.

My on-air "career" started when I won an auction on our local National Public Radio station in 2007 to be a guest forecaster on television. I still trade occasional emails about the weather with local broadcasters. Sherry Swensk has been my mentor in weathercasting by including not only the weathercast, but also astronomical events and the weather history of our valley. I've watched KLAS-TV since 1984, when I arrived at Nellis Air Force Base (AFB) in Nevada. My family got here just before Hurricane Andrew destroyed Homestead AFB and South Florida.

I grew up in a mill town in North Carolina by the Haw River, where Burlington Industries started. My family, Mom, Dad, and three sisters, grew our own food and worked at the Swepsonville Mills. We had a company store up the hill where we could get what we couldn't grow. Just like the song, we didn't get paid, we got credit at the company store.

We walked both ways uphill in the snow to get to school (just kidding, only in the winter). I was in the USAF Junior ROTC in high school and joined the Air Force in the later years of the Vietnam War. I'll never forget getting a helicopter ride in a Huey from Seymour AFB,



Michael Neely, Observer and Weather Broadcaster Sherry Swensk

NC, and seeing the clouds from eye level!

I was trained as a Fighter Aircraft Crew Chief and served with the finest daughters and sons of this nation. We maintained our jets in all weather, night and day. (Patriotic music in the background, please!)

In the off hours I've made myself a pest at the USAF Weather Service from Mountain Home AFB in Idaho, to Kunsan AFB, Korea (I love the South China Sea; darn cold and wet in the winter), Hill AFB, UT, love those (hatu) HUAWTU winds that bring the lake effect snow from the Great Salt Lake. I also served in the Philippines, Germany, Spain, and Newfoundland and in support of the British Falklands war, Grenada, Desert Shield and Desert Storm.

I retired from the USAF and began my civilian life in 1994. I did 120 foot boom service for construction companies until I got a call from an employment agency to be trained as an Recreational Vehicle technician. I received my Master Certification in 1995 and have been saving vacations ever since.

I have two daughters, Laura, who is soon to be a Registered Nurse, and Jennifer who works for the Arizona School District in nutrition services.

Are you a weather buff with a story to share? Send your story to the editor at melody.magnus@noaa.gov. ✪

Thomas Jefferson Award



The Hannigans, seated at left, are presented the Thomas Jefferson Award from Meteorologist-in-Charge (MIC) Doug Crowley (center) and DAPM John Kyle (right) of NWS Grand Junction, CO.

For the past 48 years **Joseph and Velma Hannigan** of Norwood, CO, have performed the same daily ritual. Every day —17,532 times over 48 years— they have checked and recorded the weather at their Norwood home and sent that information to NWS to include in its weather data.

On July 19, the couple received NWS's highest honor for Cooperative Weather Observers, the Thomas Jefferson Award for their outstanding volunteerism.

The Jefferson Award was presented before hundreds of attendees at the Norwood's Pioneer Days. "It was an honor," smiles Velma Hannigan. "It's been 48 years that we've been doing it, and it's been very interesting."

The retired Norwood couple have been witnessing the weather long enough to have seen its most remarkable fluctuations. Velma recalled a week in January 1963 where the temperature never got above zero degrees, and actually hit 33 degrees below zero. She said that it never seems to get too hot, at least at their house, but about a decade ago it hit 102 degrees Fahrenheit in July.

"Generally it stays in the 90s. Our average high in the summers is about 89 degrees," says Hannigan. When they started in November 1960, they had to go outside and spin their thermometer, she recalls. But as the years passed, the technology improved and made the job much more convenient. Now they have electric thermometers they read from inside, she says, although they still need to go outside to collect and measure precipitation.

Hannigan says that it wasn't an interest in meteorology or a sense of civic obligation that got them started as weather observers—it was their house. The previous occupants, two men who lived consecutively in the same home, were both weather observers. So the Hannigans just took over the observations. "We kind of fell heir to it," laughs Hannigan. After nearly five decades of being on duty, the Hannigans are ready to retire. They have put the word out that they will relinquish the job to anyone willing and curious about the weather. "If anyone would be interested, let us know," says Hannigan. "It's fun to watch."

60 Year Helmut E. Landsberg Award



Pictured left Al Shipe, Lynn Maximuk, **Ruth Everhart**, Dan McCarthy and DAPM Mike Shartran. Photo by Ashley Brooks

To recognize six decades of dedication, NWS named Seymour, IN, Coop Observer **Ruth Everhart** a recipient of the agency's Helmut E. Landsberg Award for 60 years of outstanding service. Ruth is the first Indiana Observer to receive the Landsberg Award and only the second in the history of the Indiana program to reach this milestone.

Lynn P. Maximuk, NWS Central Region Director; Daniel McCarthy, MIC in Indianapolis; and James Bullard, Mayor of Seymour, presented the award to Ruth during a ceremony at Central Christian Church in Seymour.

"Ruth's dedication to the Coop program is amazing," said Service Hydrologist Al Shipe. "Ruth has logged near 22,000 daily observations during her long tenure.

That illustrious career also includes the auspicious Holm and Jefferson awards. About 75 of Ruth's family and friends were on hand for the ceremony and luncheon.

75 Year Honored Institution Award

A 75 Year Honored Institution Award was presented to the **Bent Creek Forest Experimental Station**.

Pictured from left are Data Acquisition Program Manager (DAPM) Terry Benthall from NWS Greenville-Spartanburg, SC; **Tracy Roof**, Bent Creek Supervisor; **Jacqui Adams**, Observer; and NWS Meteorologist Chris Horne.



50 Year Honored Institution Awards

Robert Hilla, right, manager, **Alpena WWTP** in Michigan, is shown accepting a 50 Year Honored Institution Award from NWS Gaylord, MI, Cooperative Program Manager (CPM) Denny Fruehauf, center. Plant employee **Wayne Schaedig**, looks on. Photo by NWS Gaylord Met Intern Scott Rozanski.



The 50 Year Honored Institution Award was presented to the observers at the **Duke Power/Lee Plant** near Belton, SC. Pictured from left are DAPM Terry Benthall, NWS Greenville-Spartanburg; and Coop Observers **Larry Timmerman** and **Les Holliday**. Photo by **Reggi King**, Plant Supervisor.

50 Year Honored Institution Awards



Jewell Cothren, of the city government in **Elma, WA**, accepts a 50 Year Honored Institution Award for her department. The presentation was made by NWS Seattle OPL Arthur Gaebel.

Mike Praegitzer of Shoshone, ID, accepts a 50 Year Honored Institution Award for the **Idaho Transportation Department**. Mike also received a lapel pin for his company's 50 years of distinguished service.



From left, **Mike Praegitzer** shows the award presented by Vernon Preston, Weather Coordination Meteorologist (WCM), NWS Pocatello, ID.
Photo by Gary Wicklund, NWS Pocatello.

50 Year Honored Institution Award



The **Oconaluftee Ranger Station** near Cherokee, NC, was presented a 50 Year Honored Institution Award. Pictured from left are **Lisa Brown**, Assistant Supervisor; **Walt West**, Area Supervisor; **Tom Landimarino**, District Ranger and DAPM Terry Benthall, who presented the award on behalf of the NWS Greenville-Spartanburg Office. The rangers also provide the weather report for Newfound Gap, NC.

45 Year Richard Hagemeyer Length of Service Award

From left, **Stuart J. Haby** of Vanderpool, TX, accepts a 45 Year Richard Hagemeyer Award from MIC Joe Arellano from the NWS Austin/San Antonio Office. Stuart has been observing at this site since 1963. Photo by NWS Hydrometeorological Technician Steve Smart.



45 Year Richard Hagemeyer Length of Service Award

Observer **Emerson Travinchek**, center, was presented the Richard Hagemeyer Award for 45 Years of Service providing precipitation readings for the Rosalia, KS, area. NWS Wichita, KS, CPM Leon Wasinger and Service Hydrologist Janet Spurgeon, presented this award to Emerson. Photo by MIC Richard Elder.



35 Year Length of Service Award



Malcolm Gregory was presented a 35 Year Length of Service Award at the NWS Greenville-Spartanburg Office. This year also marks the 115 year anniversary of his family's service record—since 1893—as Cooperative Observers at Santuck, SC. The award was presented with NWS Greenville-Spartanburg staff's appreciation and participation in the operations area of the office.

From left are MIC Larry Gabric, Coop Observer **Malcolm Gregory**, and DAPM Terry Benthall.

35 Year Length of Service Awards

NWS Atlanta, GA, proclaimed "**L. Douglas Griffith Day**" on July 21, 2008. On that day, Douglas was honored in a ceremony with the Southeast River Forecast Center (SERFC) and NWS Atlanta. Douglas, a past Jefferson and Holm Award Winner, was presented with a 35 Year Award from NWS MIC Lans Rothfusz and a Certificate of Appreciation from Todd Hamill and the SERFC.



Helping to celebrate "L. Douglas Griffith Day" from left are NWS Atlanta Staff Members Mike Leary, Nene Robertson, Brett Whitin, Frank Taylor, Todd Hamill, Wylie Quillian, Verno Murrell, **L. Douglas Griffith** (center), Barry Gooden, Lans Rothfusz, Judi Bradberry, Laura Griffith, Robert Beasley and Matt Grantham. Photo by Rick Ullom, SERFC.



Larry Ruthi, left, MIC, NWS Dodge City, KS, presented **Jack Kersting**, with a 35 Year Length of Service Award. Jack is the original observer for rural Offerle, KS. He started the station in 1973. Also in attendance was Duane Wofle, CPM, Dodge City. Photo by Jesse Lee, OPL.

35 Year Length of Service Awards

Don Reeves has provided the rainfall reports at Canto, NC, for the past 35 years. About 150 feet from his store, Reeves Grocery, is the Sandymush Creek. He has seen the creek overflow across the road on several occasions. During one event, the creek washed away an old building that had served as a store and post office. He comments, "That was pretty bad, but afterwards I was able to make that my garden spot." His garden is still there today along with his rain gauge.

Don, along with his two grandsons, **Benjamin** and **Joshua**, was presented his 35 Year Length of Service Award by MIC Larry Gabric, NWS Greenville-Spartanburg. His grandsons enjoy playing Blue Grass music in their band named "The Canto Boys."



Pictured from left are **Benjamin** on banjo, MIC Larry Gabric, **Don Reeves**, and **Joshua** on mandolin. Photo by DAPM Terry Benthall.



Coop Observer **John Tucker** was presented a 35 Year Length of Service Award for the Oswego, KS, area. Leon Wasinger, CPM, NWS Wichita, KS, presented the award. John also provides precipitation and river readings for the Oswego area.



Dorothy I. Mercer is shown receiving her 35 Year Length of Service Award from NWS Atlanta, GA. The award was presented to Dorothy at her home in Juliette, GA. Photo by Frank Taylor, OPL, NWS Atlanta, GA.

30 Year Length of Service Awards



Rex Harrison, left, of Floydada, TX, receives his 30 Year Award as a Cooperative Observer from MIC Justin E. Weaver, NWS Lubbock, TX. Rex was in town and took time out from his very busy schedule to drop by and chat with us and tour the office before heading back home. Photo by NWS SSH John W. Lipe.



Paul Fobian of New Hartford, IA, shows his 30 Year Length of Service Award for dedicated support of the NWS Coop program. The presentation was made by Brad Fillbach, HMT, Des Moines, IA.



James Schnaidt shows his 30 Year Length of Service Award presented by DAPM Donald Morin and HMT Don Miller of NWS Sioux Falls, SD.



Michael Siercks of Landa, ND, received a 30 Year Service certificate and pin from NWS Bismarck, ND. Michael has measured and reported the official rain and snow amounts from his farm near the Canadian border since 1978. He was a high school student when he saw a notice in the paper for volunteer weather reporters and decided it would be interesting to be the official reporter for the area.

25 Year Length of Service Awards



William H. Dilbeck, center, shows his 25 Year Length of Service Award. The award ceremony was held at William's home in Jasper, GA. Presenting the award are MIC Lans Rothfusz, NWS Atlanta, left, and OPM Frank Taylor. Photo by WCM Barry Gooden.



Observer **Gordon Fowler** of Aiea, HI, is presented a 25 Year Length of Service Award for the Fowler family. The award was presented by OPL Mark Farnsworth, NWS Honolulu.



From left, NWS Honolulu OPL Mark Farnsworth presents Coop Observer **Wayne Jones**, of Upper Wahiawa, HI, with his 25 Year Length of Service Award with help from SSH Kevin Kodama and Pacific Desk Trainer Robert Larson. Photo by Ryna Oum, Deputy Director of Cambodia Department of Meteorology.



Joyce Porter of Lynne, FL, accepts a 25 year Length of Service Award from Mike McAllister, OPL, NWS Jacksonville, FL. Joyce's mother, Flossie Mills, was the original observer in Lynne starting in 1966. After her mother passed away, Joyce assumed responsibility for the program.

The site has now been in the family for 42 years. In addition to weather, Joyce is keeping a close watch for a black bear that recently destroyed a bird feeder in the yard.

Photo by David Shuler, Meteorologist.

25 Year Length of Service Awards



Dwight Freeman, Coop Observer at Saco was presented a 25 Year Length of Service Award by WCM Tanja Fransen, NWS Glasgow, MT. Photo by OPL Matthew Moorman.



Maurice Usher, left, of Gibbonsville, ID, received his 25 Year Length of Service Award from NWS Missoula, MT, OPL Stan Krenz. Photo by Mike Johnson, NWS Missoula.

25 Year Honored Institution Award



Observer **Steve Human**, left, from the **city of Jefferson**, accepted a 25 Year Honored Institution Award from Meteorological Technician Rodger Nelson, NWS Portland, OR.

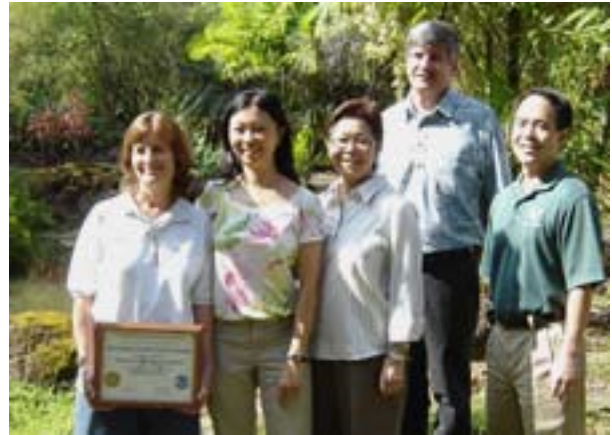


NWS Milwaukee/Sullivan, WI, presented a 25 Year Honored Institution Award to the **city of Montello, WI, Waste Water Treatment Plant**. Pictured from left are Coop Observers **Ken Kaub**, **Glen Buchholz** and **Jamie Tuinstra**. Photo by NWS DAPM Rudy Schaar.

25 Year Honored Institution Award 20 Year Length of Service Awards



DAPM Rudy Schaar from NWS Milwaukee/Sullivan, WI, presented a 25 Year Honored Institution Award to the city of **Union Grove, WI, Wastewater Treatment Plant (WWTP)**. Pictured are WWTP Coop Observers **Joe Firkus, Brad Maier, Gary Hanson, Casey Statton**, and Supervisor **Mark Osmundsen**.



Waimea Valley Hi'ipaka received its 25 Year Honored Institution Award. From left are Observers **Linda Bard**, Nursery Operator; **Josephine Hoh**, Botanical Manager; and **Gail Ann Chew**, Interim Executive Director of Hi'ipaka LLC, as well as NWS Honolulu, HI, OPL Mark Farnsworth and SSH Kevin Kodama. Photograph by Waimea Valley Business Manager **Loren Shim**.



DAPM Terry Benthall from the NWS Greenville-Spartanburg office presented a 25 Honored Institution Award to the **Spartanburg/Fairforest Water Treatment Plant**. Observers **Ed Neal**, left, and **Gary Vanderford** received the award on behalf of the entire staff.



Bradley Harvey of rural Collyer, KS, was presented with a 20 Year Length of Service Award by OPL Jesse Lee, NWS Dodge City, KS.

20 Year Length of Service Awards



Frank Luepke, left, of Sheldon, IA, accepts his 20 Year Length of Service Award from DAPM Donald Morin of NWS Sioux Falls, SD. Photo by HMT Mike Buss.



Coop Observer **Randy Patterson**, right, was presented a 20 Year Length of Service Award for the Anthony, KS, area. DAPM Joe Rosner presented this award at the NWS Wichita Office.



L. Mac Reid of Hamlin, TX, shows his 20 Year Length of Service Award presented by Eva Mullen, HMT at NWS San Angelo, TX.



Bill and Barbara Schreiber of Ranson, KS, were presented with a 20 Year Length of Service Award by Jesse Lee, OPL, Dodge City, KS.

20 Year Length of Service Awards



Robert A. Simpson shows his 20 Year Length of Service Award. The award was presented to Robert in front of his garden in Siloam, GA. Robert is 82 years young and still works and enjoys gardening. Photo by Frank Taylor, OPL, NWS Atlanta, GA.



Michael Sink, left, was presented with a 20 Year Length of Service Award by DAPM Terry Benthall of NWS Greenville-Spartanburg, SC. Michael is the owner and radio station manager of Station WKYK. Photo by Meteorologist Chris Horne.



Carol Smith of St. Regis, MT, accepted her 20 Year Length of Service Award with help from her husband Frank. Carol maintains and services a Fischer Porter gage along the banks of the Clark Fork River in addition to taking daily temperature, precipitation and snow reports. Stan Krenz, NWS Missoula, MT, presented the award.



Sara Waddall and her daughter **Samantha** have been providing rainfall reports consistently for more than 20 years at Woodruff, SC. The 20 Year Length of Service Awards were presented by DAPM Terry Benthall, NWS Greenville-Spartanburg, SC. Sara's mother and father were the prior observers from August 29, 1956 to 1987.

20 and 15 Year Length of Service Awards



From left, **Mike Childs**, and **Lynn Harmon** receive their 20 Year and 10 Year Length of Service Awards, respectively, from Gary Wicklund, OPL, NWS Pocatello, ID. Photo by WCM Vernon Preston.



Dennis and Mary Honrud, left, were presented with a 15 Year Length of Service Award from NWS Glasgow, MT, WCM Tanja Fransen. Dennis and Mary continue a tradition dating back to 1940. Photo by OPL Matthew Moorman.



Mary Margaret Bulgin, of Franklin, NC, shows her 15 Year Award presented by DAPM Terry Benthall, NWS Greenville-Spartanburg, SC. In addition to being an observer, Mary Margaret just opened a shop called the "Smithery." Her father was an iron smith in Franklin for many years. Mary Margaret recently retired from nursing and started her new hobby with some of the tools and the anvil from her father's shop.



From left, Ryna Oum, Deputy Director of Cambodia's Department of Meteorology and Kevin Kodama, NWS Honolulu SSH, present a 15 Year Length of Service Award to Kaneohe, HI, Observer **Dick Borsukiewicz**. Photo by Robert Larson of the Pacific Desk.



On the right, **Sid Chaney** of Utopia, TX, accepts a 15 Year Length of Service Award from Steve Smart, HMT, NWS Austin/San Antonio, TX.

15 Year Length of Service Awards



Marge and Jim Heinemann, of Rhinelander, WI, show their 15 Year Award presented by Dan Clark, HMT, NWS Green Bay, WI



Shown above is a 15 Year Length of Service Award presented to **Frank Johnson** of Preston, GA. Photo by Frank Taylor, OPL, NWS Atlanta, GA.



Jajeon Johnston of Water Valley, TX, shows her 15 Year Length of Service Award presented by Eva Mullen, HMT, NWS San Angelo, TX.



Jack Passmore, left, of Candler, NC, holds his 15 Year Award presented by DAPM Terry Benthall, NWS Greenville-Spartanburg, SC. Jack was an employee at the National Climatic Data Center in Asheville before retiring last year. He now has more time to fish at his lake getaway on Lake Hartwell, SC. Photo by Meteorologist Chris Horne.



Randall Schenck, right, of West Jasper, NY, shows his 15 Year Length of Service Award presented by Mitch Gilt, HMT, NWS Binghamton, NY. Randall continues 60 years of precipitation data collection started by his grandfather.

15 and 10 Year Length of Service Awards



From left, NWS Honolulu SSH Kevin Kodama and OPL Mark Farnsworth present Waihee, HI, Observer **George Seaman**, with a 15 Year Length of Service Award. Ryna Oum, Deputy Director of Cambodia Department of Meteorology looks on. Photo by Pacific Desk Trainer Robert Larson.



Gary Wicklund, left, OPL, NWS Pocatello, ID, presents a 15 Year Length of Service Award to **Leland Miller** of Fort Hall, ID. Photo by WCM Rick Dittmann.



Ivan Donnell, right, of Crothersville, IN, received a 10 Year Length of Service Award. Besides participating in the Coop program, Ivan is an avid fisher, gardener, and musician. He plays several blue grass instruments. The award was presented by HMT Ed Terrell from Indianapolis. Photo by Bradford Herold.



Stan Darmofal, left, Coop Observer at Harrisville, MI, is shown receiving his 10 Year Length of Service Award from NWS Gaylord, MI, CPM Denny Fruehauf. Photo by Meteorological Intern Scott Rozanski.



From left, Rick Dittmann, MIC, NWS Pocatello, ID, presents a 10 Year Length of Service Award to **Lloyd and Sheryl Haderlie**. Photo by Gary Wicklund.

10 Year Length of Service Awards



Edward "Skip" Jackson of Candor, NY, shows his 10 Year Length of Service Award. The award was presented by Mitch Gilt, HMT, NWS Binghamton, NY. Skip is continuing more than 60 years of precipitation data collection from the Candor area.



Observer **Ross Janssen** was presented a 10 Year Length of Service Award for the Geneseo, KS, area. Ross is assisted by his father, **Jack Janssen**. DAPM Joe Rosner presented the award at the NWS Wichita Office.



Observer **Alice Lunt** of Tantalus, HI, accepts a 10 Year Length of Service Award for the **Lunt family** from NWS Honolulu SSH Kevin Kodama. Photo by Honolulu OPL Mark Farnsworth .



Lynn Milstead of Marineland, FL, shows her 10 Year Length of Service Award. The Coop site was originally established in 1941 at Marine Studio, Inc., as a "Cooperative Hurricane Reporting Substation". Photo by OPL Mike McAllister.

Buddy Hanna holds up a 10 Year Length of Service Award by DAPM Terry Benthall from NWS Greenville-Spartanburg, SC.



10 Year Length of Service Awards



Fred Phol and **John Hoffman** were presented a 10 Year Award for providing reports from the top of Beech Mountain, NC. Fred's Store is the place to find just about anything you need on the mountain from lunch at the sandwich shop, to bird houses and ski rentals. Fred's snow reports are invaluable winter data. During a recent record breaking 100°+ heat wave near NWS Greenville-Spartanburg, the mountain stayed in the mid 70s for the award presentation by DAPM Terry Benthall.



Kimbra Satterfield, center, Coop Observer at Ball Ground, GA, is shown receiving her 10 Year Length of Service Award from Patricia Atwell, Meteorologist, NWS Atlanta, GA, and Frank Taylor, OPL. Photo by Austin Satterfield, Kimbra's son.



Milt Hovland, Coop Observer at Plentywood, MT, shows his 10 Year Length of Service Award with a little help from Steve Apfel, MIC, NWS Glasgow. Photo by Matthew Moorman, OPL.



Ken Taylor was presented a 10 Year Length of Service Award for service as the Cooperative Observer at West Pelzer, SC. Ken is the Chief at the South Greenville Fire Station. Photo by DAPM Terry Benthall, Greenville-Spartanburg, SC.



Mike Meharg, Coop Observer at Alpena, MI, is shown receiving his 10 Year Length of Service Award presented by NWS Gaylord CPM Dennis R. Fruehauf.

The Cooperative Observer

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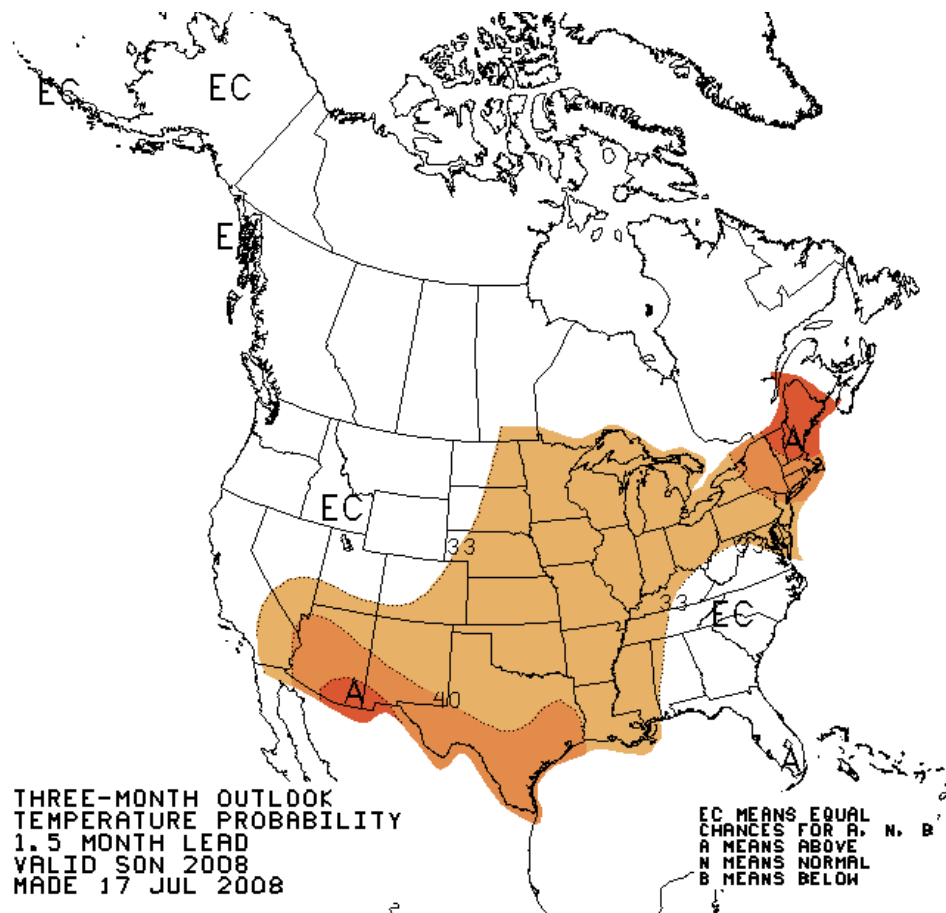
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September, October, November Temperature Outlook From the Climate Prediction Center



NOAA's National Weather Service
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