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The Crater Chronicle

Fall Begins September 22nd at 7:21 am PDT.

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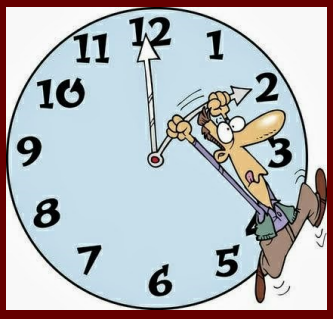


Daylight Savings Time Ends November 6th! Set Your Clocks Back One Hour!

INSIDE THIS ISSUE

GOES-R ~ NEXT GENERATION SATELLITE SET FOR LAUNCH

Marc Spilde, *Meteorologist*

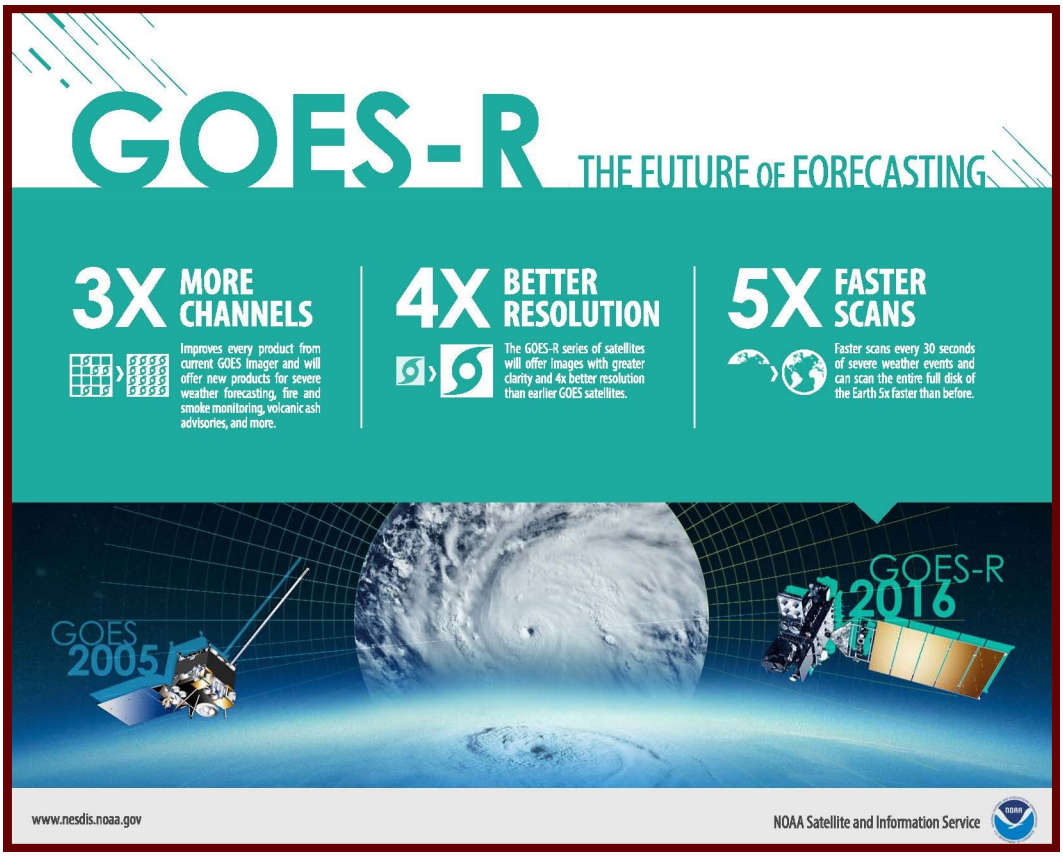
Satellites have been an integral part of weather observing and forecasting for over four decades. Since 1975, when the GOES (Geostationary Operational Environmental Satellite) program began, meteorologists have relied upon satellite data in order to gain a deeper understanding of the weather processes affecting Earth. While ground-based networks (surface stations and upper-air balloons) provide necessary local measurements of weather data, meteorologists also need satellites to remotely measure the speed, movement and duration of larger scale weather systems. Ultimately, this provides a broad, complete and uninterrupted view of atmospheric conditions, which is vital in the prediction of everything from mid-latitude cyclones to severe local storms.


Picture Credit: United Launch Alliance

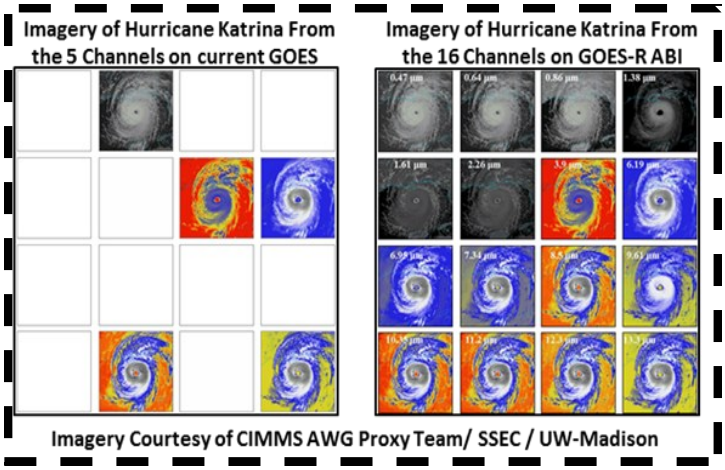
Exciting times are ahead as we are less than two months away from the launch of GOES-R, the first of NOAA's next-generation geostationary weather satellites. GOES-R will lift off from Kennedy Space Center, Cape Canaveral, FL, on November 4, 2016 at 5:40 pm EDT (2:40 pm PDT), aboard an Atlas V 541 rocket. When it reaches geostationary orbit - about 22,300 miles above Earth - it will be designated with a number, GOES-16, and then placed in a checkout (test) location at 89.5° West longitude. The testing period will last approximately one year, at which time it will become operational and placed in its operational position. The satellite's operational orbit will be determined by NOAA's Office of Satellite and Product Operations and will be based upon the health and performance of the current GOES constellation (network of satellites) - GOES-13 (East), 14 (spare) and 15 (West).

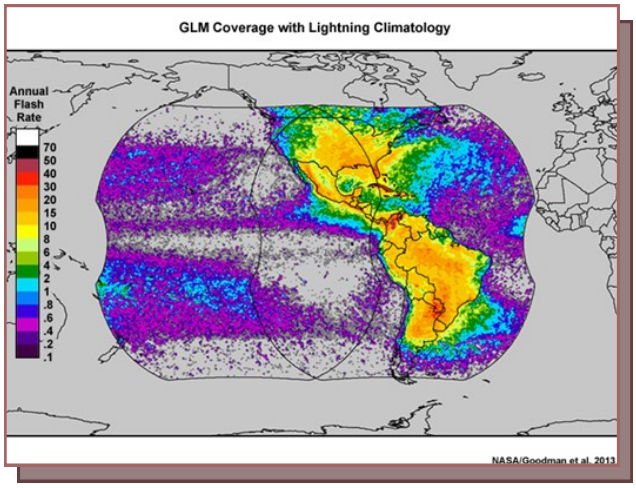
cont. on next page.

In short, GOES-R is a game-changer that will reshape how scientists view the Earth-Sun system. The satellite has a primary suite of six instruments, four of which will face the Sun - the Extreme Ultraviolet/X-Ray Irradiance Sensor, the Magnetometer, the Space Environmental In-Situ Suite and the Solar Ultraviolet Imager - and two that will face the Earth - the Advanced Baseline Imager and the Geostationary Lightning Mapper. These instruments will provide continuous imagery and atmospheric measurements of Earth's Western Hemisphere, including total lightning data and also space weather monitoring.



For the purpose of this article, we will focus on the two main instruments that will provide forecasters with weather and lightning data - the Advanced Baseline Imager (ABI) and the Geostationary Lightning Mapper (GLM). According to NOAA/NASA, the ABI is the cornerstone of the GOES-R mission. Its 16 channels (compared to only 5 channels on the current GOES imager) include two visible channels, four near-infrared channels and 10 infrared channels. These will deliver significant improvements to spectral coverage as well as spatial and temporal resolution. To be more specific, the ABI will provide three times more images, four times higher spatial resolution and five times faster imaging than current GOES satellites. The ABI will employ two different scan strategies—Continuous Full Disk mode and Flex mode. Flex mode will be the default mode where a Western Hemisphere full disk image will be taken every 15 minutes, a Continental U.S. image every five minutes, and two smaller, mesoscale images every 60 seconds (or one sub-region every 30 seconds). Continuous Full Disk mode will provide uninterrupted scans of the full disk every 5 minutes. The imagery and derived products extracted from the ABI are expected to bring numerous enhancements to weather forecasting, such as the ability to closely monitor pre-convective and storm environments, to track storms/hurricanes with much greater detail, and to monitor wildfires and floods, among many others. Fusing ABI imagery with model data and other observational data sets like radar imagery and surface-based lightning networks will allow meteorologists to leverage the strengths of each system. This will result in improved analyses, increased situational awareness and forecaster confidence when issuing life-saving warnings.





Meanwhile, the GLM will measure total lightning including in-cloud (IC), cloud-to-cloud (CC) and cloud-to-ground (CG), continuously over the Americas and adjacent ocean regions with near-uniform spatial resolution of approximately 10 km. While GLM will not be able to precisely distinguish between IC, CC, and CG, it will be able to collect information such as the

frequency, location and extent of lightning discharges to identify intensifying thunderstorms and tropical cyclones. Significant upward trends in total lightning can provide critical information to forecasters allowing them to focus on strengthening convection much earlier, well before the storms can produce damaging winds, hail or tornadoes. Storms that exhibit a lightning "spike" often eventually go on to produce severe weather. This phenomenon often occurs several minutes before radar detects the potential for severe weather. The lightning data from GLM, used in conjunction with other satellite data, surface-based lightning networks and radar data, has the capability of increasing lead time for severe thunderstorm and tornado warnings, while also reducing false alarm rates. The collective observations from GOES-R ABI and GLM will offer new observing capabilities to improve forecasts for a variety of phenomena including tropical and mid-latitude cyclones, thunderstorms, coastal fog, low clouds, air quality, high winds, wildfires, volcanoes and changing climate conditions.

For more in-depth information and other facts about this landmark step forward in science, visit www.goes-r.gov

DID YOU KNOW? .... the GOES-R satellite will produce 3.5 **terabytes** of data per day? Current geostationary and polar-orbiting satellites combined only produce 90 gigabytes of data per day.

Astronomy Highlights

Misty Duncan, *Meteorologist Intern*

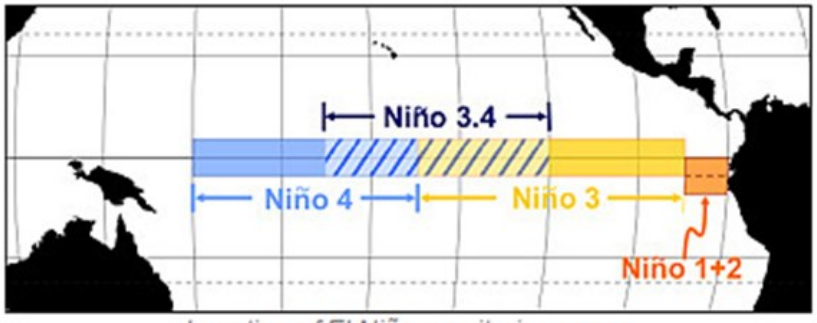
Meteor Showers Remaining in 2016

	Draconids	Orionids	South Taurids	North Taurids	Leonids	Geminids
Active Period	Oct. 6th – Oct. 10th	Oct. 4th – Nov. 14th	Sept. 7th – Nov. 19th	Oct. 19th – Dec. 10th	Nov. 5th – Nov. 30th	Dec. 4th – Dec. 16th
Peak Date	Oct. 7th	Oct. 21st & 22nd	Nov. 4th & Nov. 5th	Nov. 12th & 13th	Nov 17th	Dec 13th & 14th
Best time to view	After sunset—just after nightfall	After midnight—just before dawn	Late night on the 4th until dawn of the 5th	Late night on the 11th until dawn of the 12th	After midnight—just before dawn	Mid-evening until dawn, centered @ 2 am local time
# meteors per hour	~20… sometimes hundreds	~10 to 20	~5-10	~5-10	~10-15…can be many more	~50-100… rivaling the Perseids
Moon Phase	Waxing Crescent	Waning Gibbous	Waxing Crescent, sets early evening	Waxing Gibbous	Waning Gibbous	Full
Comet of Origin	Giacobini-Zinner	Halley	Encke	Encke	Tempel-Tuttle	Phaethon
Constellation of Origin/Radiant	Draco, near Eltanin & Rastaban	Orion, north of Betelgeuse	Taurus	Taurus	Leo	Gemini, near Castor & Pollox
Direction to Look	Northwest	Southeast	South	South	East	East

2016-2017 Wet Season Outlook

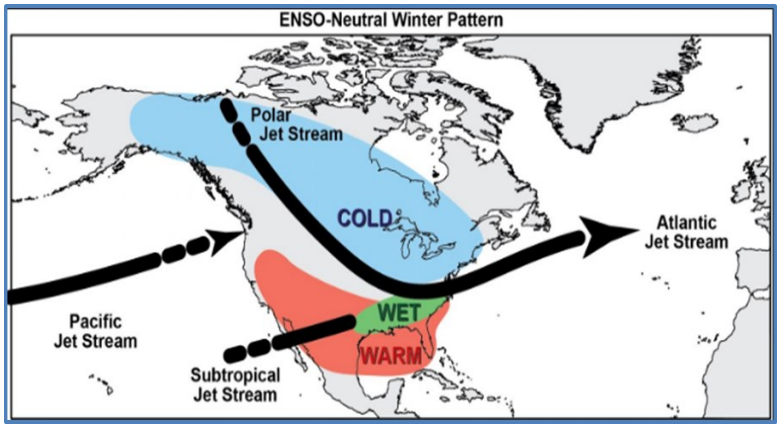
Brett Lutz, *General Forecaster*

Climatologists have been watching the Equatorial Pacific Ocean this 2016 Summer for the development of La Nina conditions. La Nina is defined as sea surface temperatures (SSTs) at or below 0.5° Celsius below the climatological average in the Nino 3.4 zone (pictured right), persisting for 5 overlapping 3 month periods. Currently, the climate average period we use for comparison is 1981-2010. Although La Nina SSTs are currently present and are expected to persist during Fall 2016 into the 2016-17 Winter, the Climate Prediction Center is expecting that the 5 consecutive overlapping 3 month period criteria for defining the event as a La Nina will not be met. Therefore, we are expecting an ENSO (El Nino Southern Oscillation) neutral winter, with a lean toward La Nina.



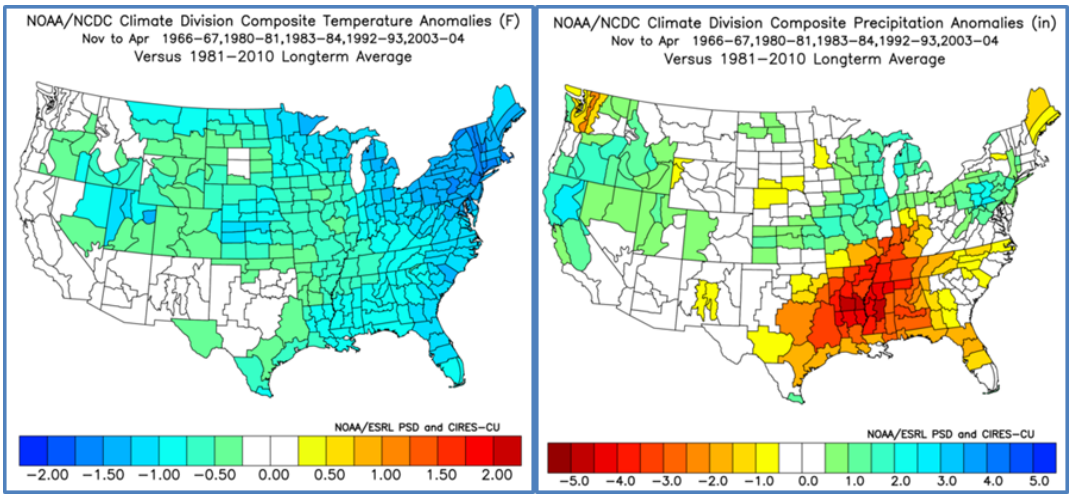
Location of El Niño monitoring zones

Additional predictors for this season include the Pacific Decadal Oscillation, which has trended from strongly positive last season to near neutral as of August 2016. Somewhat similar oceanic indicators that have existed in the Pacific since 1950, occurred in the Wet Seasons of 1966-67, 1980-81, 1983-84, 1992-93, and 2003-04. Ultimately, these give us some idea of the general conditions we might expect this winter.



Analysis of the analogous years indicates that we're most likely to continue experiencing warmer and drier than normal conditions during the Sep-Oct-Nov period. Both climatology and analysis of the analogous oceanic indicator years show an increased likelihood of wetter and less warm conditions as we move into late fall and beginning of winter. For Dec-Jan-Feb, there is low confidence in the temperature forecast, though the most likely result is that temperatures will be near to slightly above normal and precipitation is expected to be near to above normal. When we look at November 1st to April 30th, our analogous years indicate near normal temperatures and near to above normal precipitation will be the most likely scenario for the Medford Weather Forecast Area. However, we expect temperatures are more likely to edge toward near to above normal conditions due to the global warming trend that has been observed since at least the late 1970s. This trend has locally increased significantly in the last 3 years.

The data shown below for the core Wet Season and snowpack accumulating months, November through April, is promising for water supply considering the drought conditions that were observed between 2013 and 2016. However, it should be noted that this data is simply the best estimate of what will occur based on previously observed similar conditions with the caveat that increasing greenhouse gases will likely make it warmer than the graphic below indicates. Additionally, Nov-Apr 1980-81 was drier than normal over most of the area, with some areas getting as little as 50% of normal precipitation. Similarly, temperatures were well below normal in 1992-93, especially during Dec-Jan-Feb, when they were as much as 8° Fahrenheit below normal for the area. So, there is still a possibility that the drought will worsen, though unlikely. That said, the majority of the data indicates that snowpack should be healthy this winter. A close look at snow course data form Caliban 2 on Mount Ashland supports this conclusion, as well.



BMH: The Newest Addition to Half a Century of Weather Radio Evolution

Brad Schaaf, *Meteorologist Intern*

Have you listened to your NOAA All-Hazards Weather Radio recently? If you have, you probably noticed something slightly different than what you're used to. That's because we've been making some big changes at the National Weather Service office in Medford. In the past quarter, we have completely revamped our NOAA weather radio system and replaced the outdated Console Replacement System, or CRS, with the new Broadcast Message Handler (BMH). BMH has become the new standard in the long history in the progress of hazard communication through the weather radio.

Since the beginning of the Weather Service, it was important for meteorologists to broadcast weather alerts quickly. Meteorologists would record their forecasts on tapes and then those tapes would be transmitted over the airwaves. They even utilized this method for time-sensitive warnings like tornadoes or tsunamis. Unfortunately, this process took time and wasted vital moments people could use to find shelter—if they actually received the warning in the first place.

To help remedy the problem, the NWS wanted to capture a person's attention right before a vital message was played. The first solution began as the Warning Alarm Tone. Although there were a few drawbacks to using the alarm tone—namely it did not integrate well with media outlets and the emergency broadcast system, it seemed like an idea worth expanding upon. In 1985, the NWS began experimenting with placing special codes at the beginning and ending of watches and warnings. These special codes would allow for specific weather radios and media partners within a watch or warning area to play the warning alarm tone, allowing for a more automated process. This technique took over a decade to develop, but it became the Specific Area Message Encoding (SAME) technology that weather radios across North America still use today.

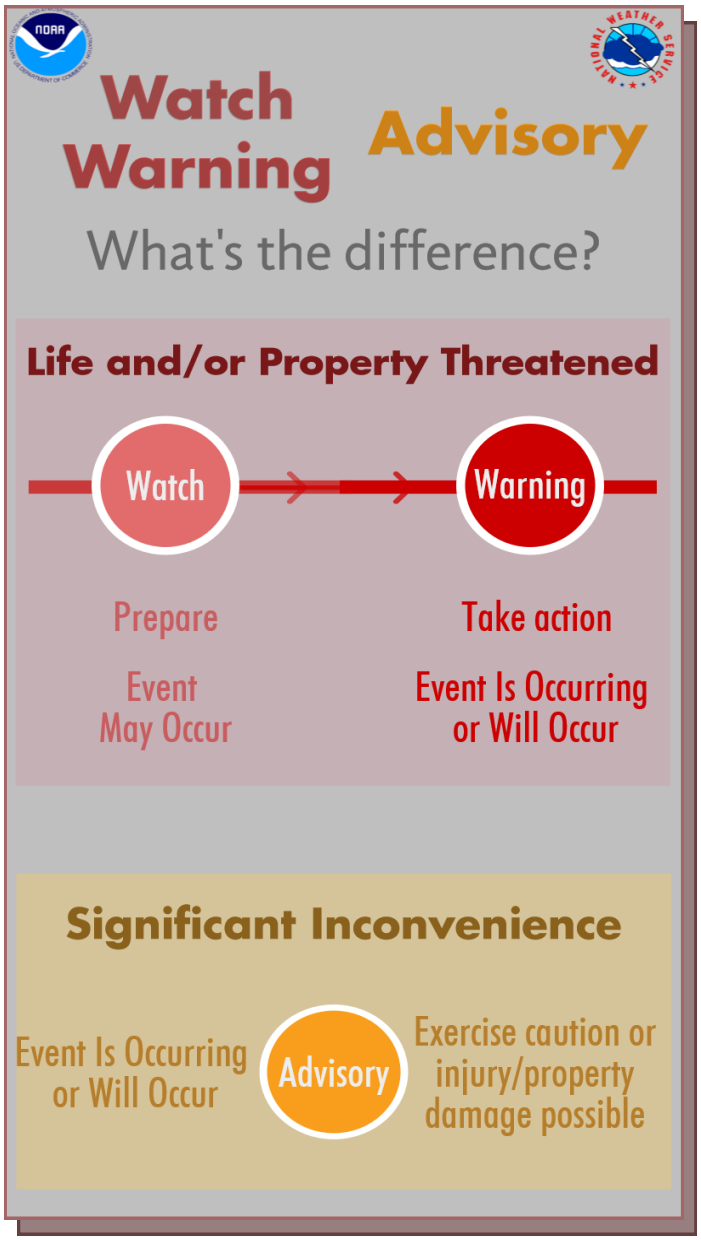
Now that there was a more effective way of alerting people of a life-threatening weather message being broadcast, the NWS had a second problem to fix: there needed to be a more efficient way of getting the warnings to the radio. Experimentation in the 90s led the NWS to adopt CRS. With its text to speech software and its ability to handle messages simultaneously, CRS allowed forecasters to solely focus on issuing timely watches and warnings. In fact, some test sites noted an increase in time savings of 8 times that of the previous recording method. Consequently, in 1998, the software was distributed nationwide to each NWS office.

With the rapid advances in technology over the past 20 years, CRS quickly became outdated. This necessitated a move to a more nimble system that could be updated and evolve with the rate of technological evolution. As a result, BMH has been established. The biggest improvement with BMH is that it operates through our forecasting software. It has also made the system easier for the forecasters to use. BMH is also more stable than CRS, so weather radio outages will be less likely. In addition, the most notable difference is the new voice. His name is "Paul," and, he will likely be around for a while as NOAA Weather Radio and BMH continue to evolve.

Do You Know the Difference Between Watch, Warning, & Advisory?

Shad Keene, *General Forecaster* & Misty Duncan, *Meteorologist Intern*

Recent surveys done by folks at the Medford office show that many people don't understand the difference between these products. While many do understand the difference between watch and warning, most people don't understand what we mean by "Advisory". Survey results show that most people liken an advisory to a watch, thinking that conditions are *possible*. This is simply not true. When an "Advisory" is issued, it is because conditions are either *occurring or will occur*. Conditions aren't expected to be as severe as warning criteria but are likely to cause a significant inconvenience in your daily routine. As a colleague once said to me: "With a wind ***advisory***, you worry about patio furniture and trashcans being blown around. With a high wind ***warning***, you worry about trees falling, possibly on your house or car." The graphic below summarizes the differences between a watch, warning, and advisory. Notice how "Advisory" stands on it's own?



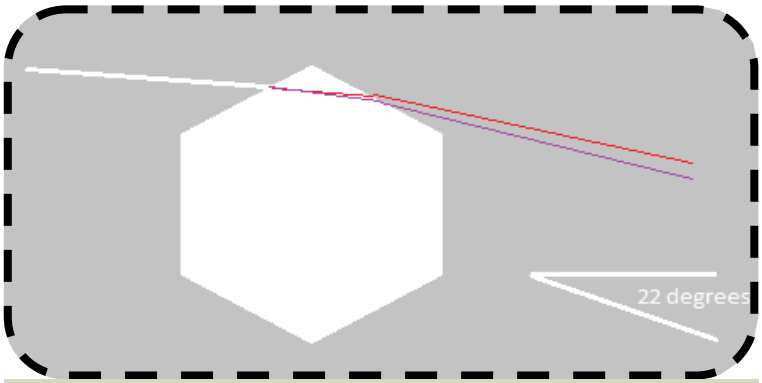
Optical Phenomena - Part 2, Ice Crystals

John Lovegrove, *Meteorologist-In-Charge*

There are many times during the year when you can look to the sky and see splashes of color or other optical phenomena. Some of these events are fairly common, such as a rainbow, or they can be very rare. Generally, these phenomena can be broken down into three categories: caused by liquid water, caused by ice crystals or caused by something else. Part 1 discussed events caused by liquid water, so in Part 2 we will explore events caused by ice crystals.

Ice crystals in the atmosphere generally form as either a six-sided plate or a six-sided column. Sunlight can either reflect off of the flat surfaces or refract as the light passes through the crystal. The crystals can nearly always be seen as thin cirrus clouds and can form several varieties of halos and arcs.

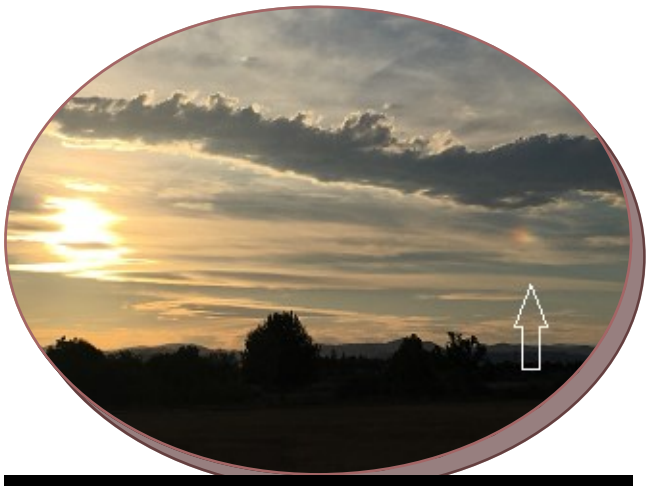
Probably the most widely seen ice-caused phenomena is the 22 degree halo. The name comes from the angle from the sun to the inner red edge of the halo. The other rainbow colors follow red before turning white and fading off further away from the sun. The colors come from sunlight refracting through the column ice crystals which breaks the light into the visible spectrum.



Depiction of the sun's rays being refracted as they pass through an ice crystal.

The bright area after the colors is caused by light reflecting off the flat faces of the crystals, while the inner part of the halo is dark because no extra light is being refracted or reflected to your eye.

The crystals are oriented in all different directions in the sky but only the light that is refracted through them reaches your eye. The light that is not perfectly aligned goes off in other directions. That is how the chaos of cirrus cloud can make a perfectly circular halo.



Sundog from east Medford on June 6, 2016.

Photo Credit: John Lovegrove

The next event is the sundog or parhelia (pictured to the left). The sundog is formed by sunlight refracting through a plate ice crystal. The plates fall flat through the air much like a leaf falling from a tree. The light is bent at the same 22 degree angle as the halo above so sundogs can frequently be seen on a halo to either side of the sun. If the crystals wobble as they fall, the sundog gets taller. The more the wobble, the taller the sundog.

The last common event I'll discuss is the pillar. This is seen as a column of light either above or below the sun. The pillar is simply sunlight reflecting off the flat surface of a plate ice crystal. So the pillar isn't a ray of light beaming away from the sun but million upon millions of glints of light bouncing off of tiny ice crystals. Generally, they are only seen when the sun is low in the sky or even below the horizon.

These are the three most common ice formed optical phenomena. Sunlight can also pass through other parts of the ice crystals leading to more infrequent events. These include tangent arcs, parhelic circles, circumzenithal arc, and more. Some of these events may only be seen by someone once in a lifetime. Whenever there are thin cirrus clouds in the sky, keep looking up - you just might see a beautiful and rare event.

Cooperative Observer Program Awards

Spencer Higginson, *Service Hydrologist*

The National Weather Service (NWS) Cooperative Observer Program (COOP) is truly the Nation's weather and climate observing network of, by and for the people. More than 8,700 volunteers take observations on farms, in urban and suburban areas, National Parks, seashores, and mountaintops. The data are truly representative of where people live, work and play.

As observers serve year after year, the time adds up. As a token of appreciation for the time, effort and dedication put forward by these volunteer observers, the NWS gives awards when certain milestones are reached. There are three types of awards:

- The Individual awards are given to individuals who take observations year in and year out. The Individual award is given to an observer after completing 10 years of service and then every 5 years thereafter, up to 40 years. After 40 years, the individual awards have different titles in honor of past observers.

- Awards are also given to institutions/government agencies at businesses or government facilities where observations are taken by different people from day to day or even year to year. This award is called The Honored Institution Award is presented every 25 years.

- Family Heritage awards are given where the role of the observer is passed from family member to family member; truly creating a family heritage of service. This award is granted to a family upon achieving 75 years of continuous cooperative observations. Additional recognition is presented every 25 years thereafter.

Six observers will have reached milestones and received length-of-service awards by the end of 2016; 3 Individual awards and 3 Institution/Government awards .

⇒ Vernon Fueston of Montague, California for **15** years of service (February 6, 2001).

⇒ Duane McGarva of Jess Valley, California for **20** years of service (October 8, 1996).

⇒ Marian Hayden of Callahan, California for **45** years of service (April 1, 1971).

⇒ The Radio Station KJAO in Grants Pass, Oregon for **25** years of service (May 1, 1991).

⇒ The city of Glendale, Oregon for **50** years of service (March 8, 1966)

⇒ The PacifiCorp employees at Lemolo Lake in Oregon for **50** years of service (September 30, 1966).

We would like to congratulate these observers and thank all of those who contribute such valuable information for our climate records and for our forecasting efforts.

In 2015, Laurel Lorenzen accepted a 75-year Family Heritage on behalf of herself and several other family members who all volunteered at different times as the official observer for Day, California. Pictured above (from left to right): Brian Nieuwenhuis, Spencer Higginson, Dr. Grant Cooper, Susie Lorenzen, Laurel Lorenzen, John Lovegrove, and Ryan Sandler.

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Our Vision

Professionals focusing on science, teamwork, and customer service to design and deliver the best decision-support information to our community.

Our Mission

Our team at the National Weather Service Office in Medford strives to deliver the best observational, forecast, and warning information through exceptional customer service, extensive training and education, maintaining quality electronic systems, and relying upon an outstanding team of weather spotters and cooperative observers. We do this within the overall mission of the NWS to build a Weather-Ready Nation:

To provide weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community.

Our Values

Trust, Integrity, Professionalism, Service, Teamwork, Ingenuity, Expertise, and Enthusiasm.

About Us

The Weather Forecast Office in Medford, Oregon, is one of more than 120 field offices of the National Weather Service, an agency under the National Oceanic and Atmospheric Administration and the United States Department of Commerce. The Weather Forecast Office in Medford serves 7 counties in southwestern Oregon and 2 counties in northern California, providing weather and water information to more than a half-million citizens. We are also responsible for the coastal waters of the Pacific Ocean from Florence, Oregon, to Point St. George, California, extending 60 miles offshore. The office is staffed 24 hours a day, 7 days a week, and 365 days a year by a team of 26 meteorologists, hydrologists, electronic technicians, hydrometeorological technicians, and administrative assistants, under the direction of Meteorologist-In-Charge John Lovegrove.