Spring 2018
Volume 7, Issue 1

NATIONAL WEATHER SERVICE - MEDFORD, OREGON

THE CRATER CHRONICLE

GOES-S Launch Successful, Now GOES-17

By Marc Spilde, *Meteorologist*

GOES-S, the 2nd in a series of four next generation satellites (**R,S,T** and **U**), launched successfully from Kennedy Space Center on March 1, 2018. It is now in geostationary orbit, residing at its checkout location of 89.5° W longitude, and approximately 22,300 miles above the equator. These new next generation satellites are bringing advanced technology to the network of satellites that have been watching our planet since the mid-1970s.

Upon reaching orbit, GOES-S was given a new number – **GOES-17**. Over the next 6 months (checkout period), it will undergo numerous tests to ensure optimal functionality with the first images expected to arrive in mid-May.

After the checkout period, the satellite will move to its operational location at 137° W longitude and become NOAA's **GOES-West,** currently being occupied by GOES-15.

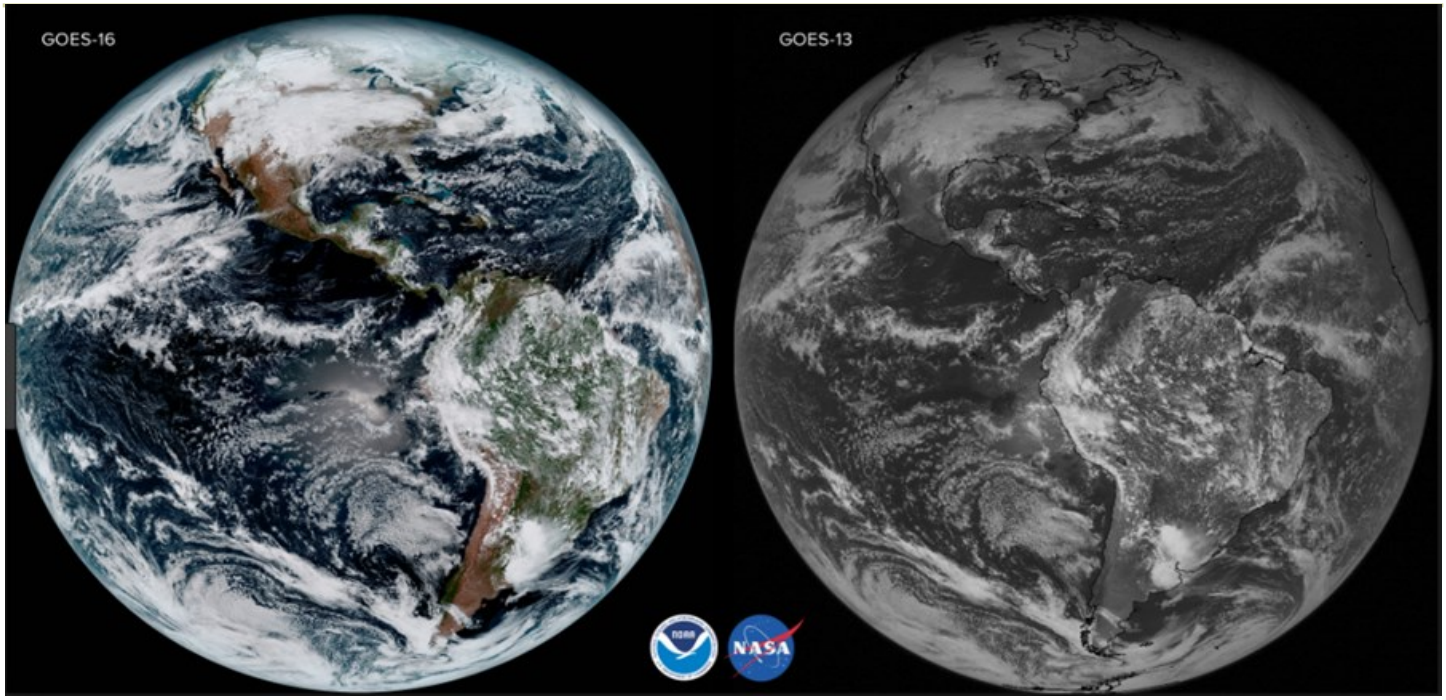
In late 2016, GOES-R, the 1st of the next generation satellites, was successfully launched and is now operational as GOES-16 (East), located directly above the equator at 75.2° W longitude.

One may ask, "Why do we need GOES-17 if GOES-16 is already up there watching what's going on down here"? For one, GOES-17 will complement GOES-16, featuring all the same important capabilities that GOES-16 already has to offer. The **A**dvanced **B**aseline **I**mager (**ABI**) onboard, will provide faster, more accurate, and more detailed data in near real-time than the current GOES-15 (West) imager. *Cont. on next pg.*

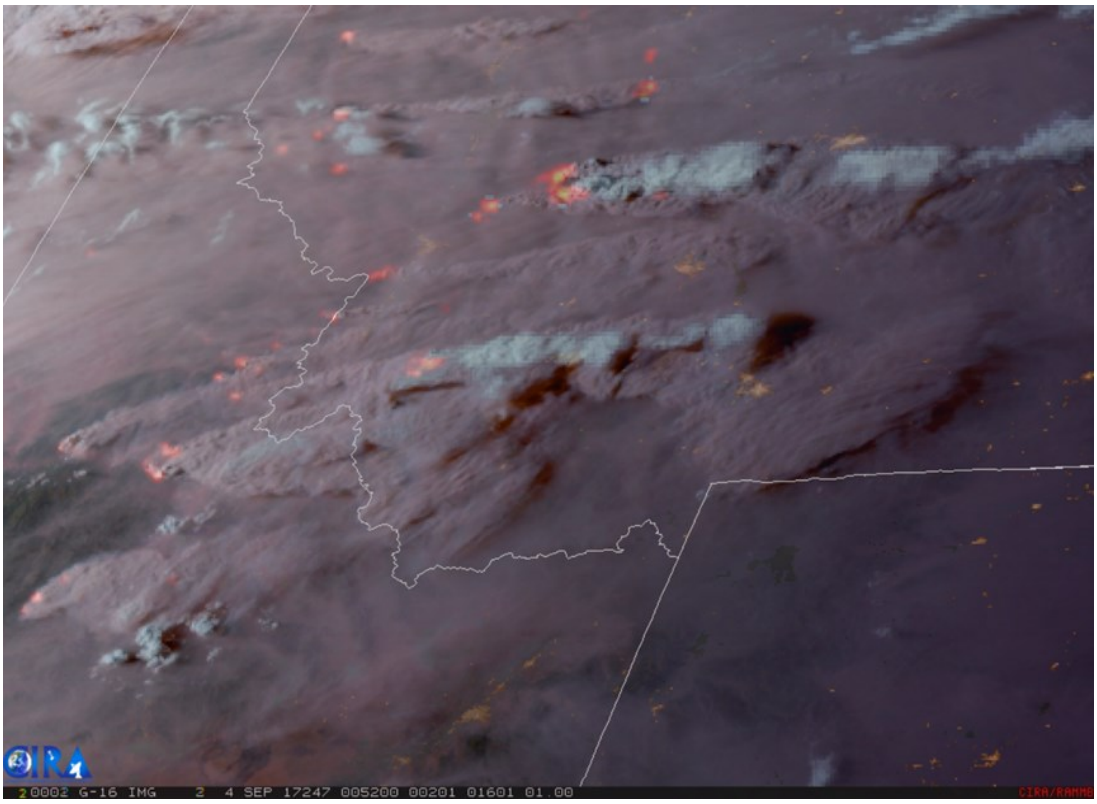
Photo Credit: NASA/Kim Shiflett

INSIDE THIS ISSUE

Spring Began on March 20th at 3:29 am PDT.



GOES-16 multi-spectral full-disk "True Color" image (at left) side-by-side with an older GOES-13 visible image (at right). Like GOES-16, GOES-17 will produce this full-disk image every 15 minutes.



In this GeoColor image, including the fire temperature "hot spot" RGB, smoke and heat (orange) can be seen from wildfires in Idaho and Montana on Sept. 3, 2017. City lights (yellow) can also be see in eastern Idaho, Wyoming and southern Montana (Source: RAMMB/CIRA)

Older imagers like GOES-13 and GOES-15 do not have the spectral capabilities that GOES-16 has, so the "True Color" GOES-16 image shown on the above left was not previously possible.

To further demonstrate GOES-16's spectral capabilities, in the GeoColor image to the left, the new fire temperature "hot spot" red, green, blue (RGB), easily detected wildfires burning in Idaho and Montana in Sept 2017.

So, what is RGB imagery? Some images use true colors from red, green and blue wavelengths. These produce colors as if one was viewing the land, sea, and clouds directly. So, water appears blue, clouds appear white and trees appear green. However, others use infrared light to enhance the imagery. This allows certain features that aren't easily distin-

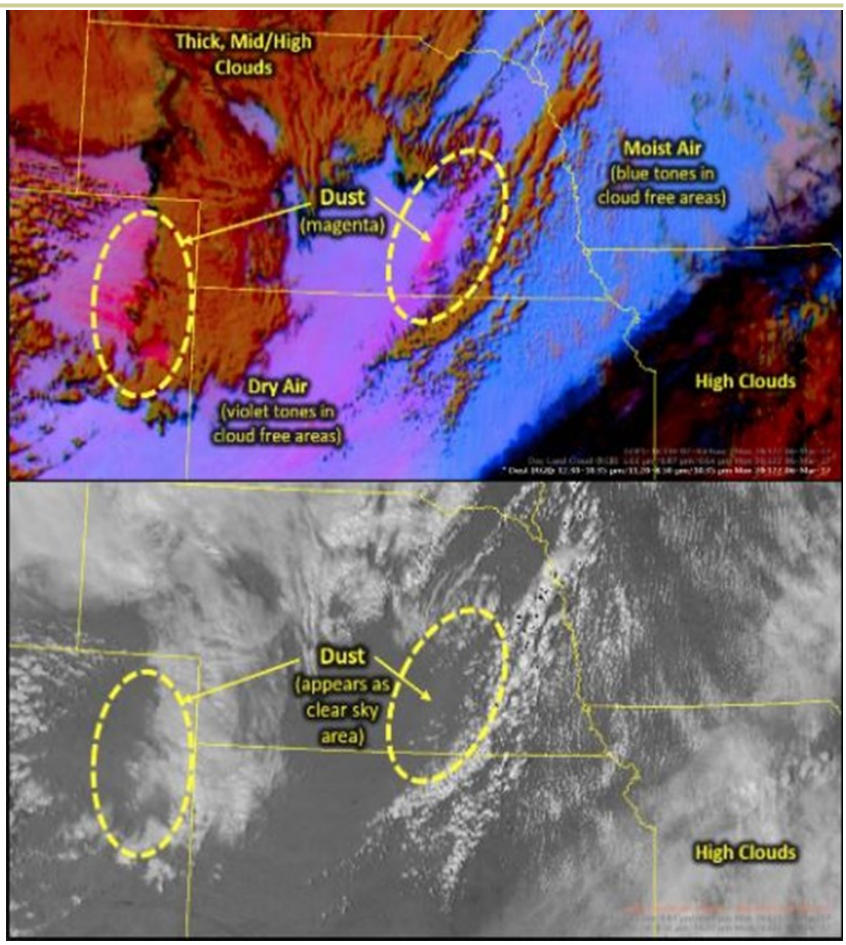
guished to be drawn out of the imagery. These are known as "False Color" images and can help forecasters discern different types of clouds, snow, dust, wildfire smoke, and even volcanic ash.

Check out the Dust RGB image to the right. Can you spot the dust in the bottom visible image? No? The Dust RGB at the top uses several infrared-based channels to differentiate various cloud characteristics and dust.

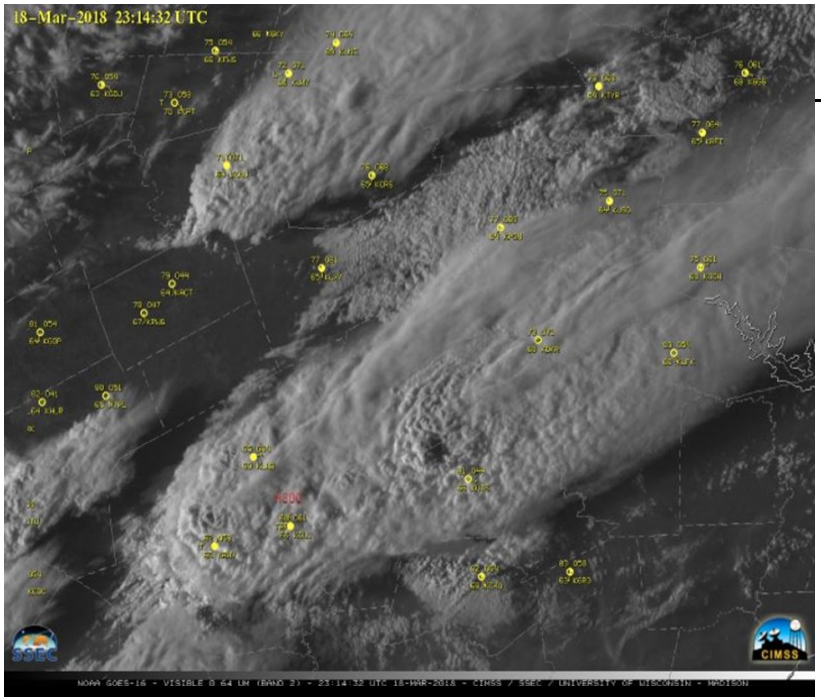
RGB imagery is a major advantage with GOES-16 and GOES-17 over the current suite of satellite products available with GOES-15. The added spectral capabilities will help forecasters track storm systems, lightning, wildfires, coastal fog, and other hazards that affect the western U.S., Hawaii and Alaska.

Spatially and temporally, the next generation satellites outperform their predecessors as well. In this mesoscale sector imagery (pictured below) via GOES-16, which can be provided at 30 second or 1 minute intervals, surface inflow and overshooting tops can be seen in the convection over east Texas.

So, the next generation satellites bring increased spatial and temporal resolution as well as more spectral capabilities than ever before. Again, "Why do we need GOES-17 if GOES-16 is already up there watching what's going on down here"?



In this comparison, the Dust RGB (top) clearly shows the dust (magenta) in NE Colorado and southern Nebraska, while it is difficult to discern in the visible image (bottom). (Source: NASA/SPoRT)



This image (from GOES-16), shows increased spatial resolution and depicts an overshooting top associated with convection over east Texas on Mar 18, 2018.

Source: CIMMS/SSEC/Univ. of Wisconsin-Madison

Applications of the new imagery are seemingly limitless. The information is assimilated into numerical weather models, which will improve their forecast accuracy and skill. Weather forecasters are trained to interpret and utilize the imagery to help provide more accurate and timely forecasts for all types of weather. An operational GOES-17, parked above the equator at 137° W longitude, will give the Western Hemisphere two next-generation geostationary satellites. Together, GOES-16 and GOES-17 will keep an eye on the weather and environmental hazards all the way from the coast of New Zealand to the west coast of Africa. But, most importantly, the imagery will help forecasters provide impact-based decision support services and ultimately save lives and property.

To see more of GOES-16's images and animations, please check out NOAA's NESDIS (National Environmental Satellite Data and Information Service). GOES-17 will be providing these views very soon.

KMAX Radar on top of Mt. Ashland, looking over the Rogue Valley. Photo: Michael Stavish, NWS SOO

Better Doppler Radar Coverage Coming

Ryan Sandler, *Warning Coordination Meteorologist*

The Doppler radar commissioned on top of Mt. Ashland on April 30th, 1996 was the first radar able to detect both precipitation and wind over southern Oregon and northern California. This radar is still being used today at an elevation of 7513 feet above sea level.

You may be wondering why this radar was located so high above the valleys. The main purpose of this radar is to detect severe storms, the kind of storms which are spawned by cumulonimbus clouds that can extend beyond 60,000 feet high in the atmosphere. This radar does a good job of seeing into these tall storms, helping us to issue severe thunderstorm and flash flood warnings. This mountaintop location minimizes radar beam blockage by other mountains but some blockage still occurs, especially from Mt. McLoughlin and Mt. Shasta. If we were to move the radar down to the Rogue Valley Airport we would be hindered by massive blocking from the mountains surrounding the valley.

The Doppler radar's lowest elevation beam angle was set to 0.5 degrees ***above*** the horizon (which in this case is the radar's elevation). By this summer, the lowest elevation angle will be set to 0.2 degrees ***below*** the horizon. This lowering of the radar beam will improve detection of precipitation and wind across the region, especially farther from the radar due to the earth's curvature effect (despite what The Flat Earth Society says).

For example, over Coos Bay the center of the radar beam is 20,000 feet above the ground allowing lower level nimbostratus rain clouds to go undetected or under-detected. Over the cities of Lakeview and Alturas, the center of the beam is nearly 16,000 above the ground. If you follow the weather closely, you may notice there is often a radar gap in the detection of precipitation moving onshore across the southern Oregon coast. This gap is caused by the radar beam over-shooting much of the low-level precipitation.

With this new lower elevation scan, the radar beam will be able to detect much more precipitation occurring closer to the ground. In fact, the coverage area at 2,000 feet above the radar site will improve by 328% as seen on the image below. I've highlighted in blue the northwest sector of the radar beam because there is no blockage in this region (lower mountains) allowing us an even better look at low-level nimbostratus precipitation moving onshore. Our meteorologists are very much looking forward to this long-awaited radar upgrade.

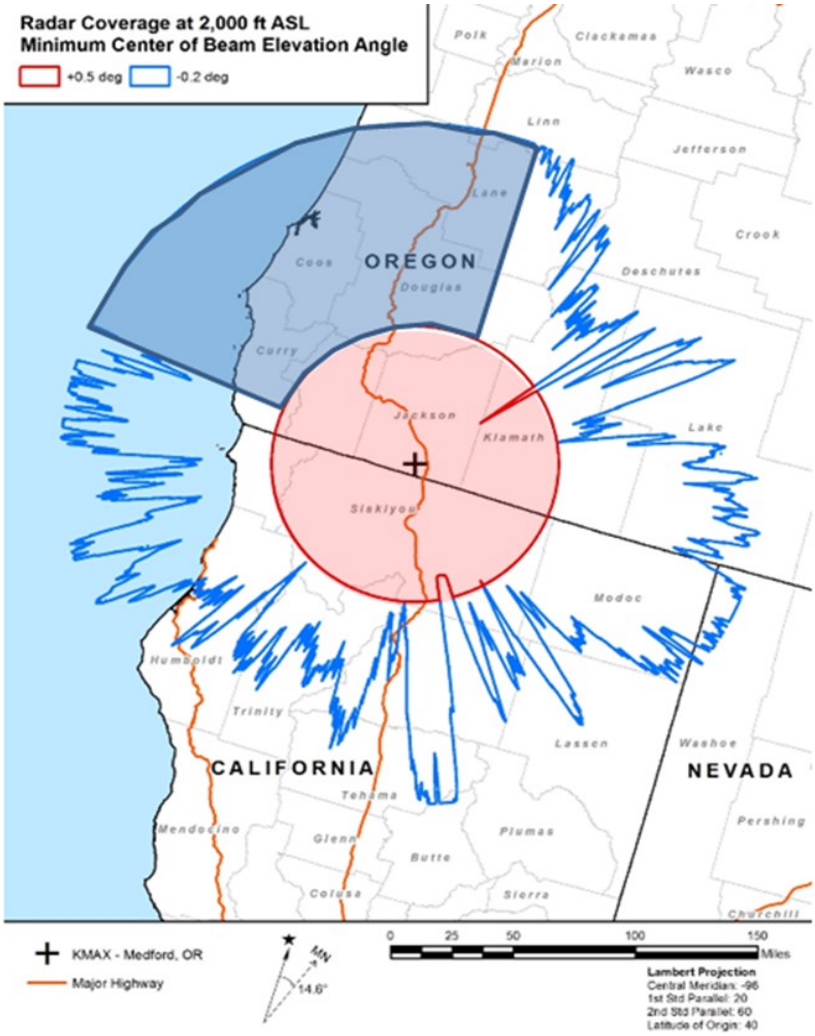


Figure 5: Proposed KMAX WSR-88D Coverage at 2,000 ft above Site Level

American Meteorological Society Conference 2018

Shad Keene, *Meteorologist*

Poster Session at the 2018 AMS Conference. Photo: Shad Keene

Over 4,000 scientists, educators, students, and other professionals from across the weather, water, and climate community gathered in Austin, Texas from 7–11 January, 2018 to share, learn, and collaborate (AMS 2018 web page). I was fortunate enough to attend and share with others about our local partnership with the U.S. Coast Guard Search and Rescue, and I'll never forget the experience. The hard work and breadth of knowledge that was on display was inspirational. Many of the presenters are subject matter experts and are sharing their life's work with others. For those that couldn't attend, recordings of the presentations were made so others can learn remotely. This means that over 2000 presentations were recorded and are available to anyone! Some of these presentations are very technical and some are not, but I bet there's something for everyone. The majority of the presentations are 12 minutes plus questions and answers, so there is time to sample a lot of different material. Here's the web page where you can view the presentations: https://ams.confex.com/ams/98Annual/webprogram/start.html

Here's one idea I found very interesting. Did you know that only 3 percent of satellite data is used in the computer models to help improve forecasts? As we get more and more satellite data, the usage of this in computer weather models is becoming even more important. Machine learning, an application of artificial intelligence, can help us use satellite data in the smartest way possible, so weather forecasts can be improved.

I recommend using the keyword search box to find material that may be of interest to you. Some search topics that may yield interesting and/or relevant results, "Atmospheric River", "Machine Learning", and "Climate Change". Have fun exploring!!

Did you know you can see the International Space Station (ISS) without a telescope?! NASA has a website where you can lookup your location to find the optimal date to see the ISS. For those of us surrounded by mountains, be sure to pick a date where the max height is at least 30°, possibly higher depending on the height of your surrounding mountains. For the Medford area, it looks like April 8th will be a great time to "Spot the Station"...fingers crossed the weather cooperates! Check out the website to learn how to "Spot the Station" and find optimal dates for your location! https://spotthestation.nasa.gov/

Spring Meteor Showers

Lyrids—This meteor shower is active between April 16th and 25th, and peaks on the night of April 22nd. The first quarter moon could make this shower difficult to see before midnight, but the moon will set shortly after, try to catch this show after midnight if possible. The meteors are caused by debris from the comet Thatcher and will radiate from the constellation Lyrid where you can expect an average of 20 meteors per hour during the peak. If weather allows, look to the east after midnight and enjoy the show!

Eta Aquarids—Debris from this shower is produced by the comet Halley. During the peak of this shower, you could see up to 60 meteors per hour! The Eta Aquarids are active between April 19th and May 28th, but peaks on the night of May 6th. The radiant point for the Aquarids is the constellation Aquarius. A waning gibbous moon will likely block out the faintest meteors, but if you're patient, you should be able to see the brightest ones. So if the weather looks optimal, get away from those city lights, grab a friend and look to the east for some shooting stars!

Weather Observations

John Lovegrove, *Meteorologist-In-Charge*

We often are asked why the official weather observation for most cities is taken at the airport. That's really pretty easy to answer. Weather is VERY important to aircraft so ever since the beginnings of aviation, detailed weather observations have come from airports. These observations are valid for the airport but generally are still in the ballpark of the rest of the city and surrounding areas.

If you own a rain gauge or thermometer, your readings will vary from the airport. Factors that influence the differences are: distance to the airport, terrain, elevation and local microclimates. Most newer cars now have built-in thermometers and you can watch how the temperature can vary as you drive around. We can also see the effect that elevation has by seeing snow on the hills but none in the valleys. Also, a wind gust or shower may affect one part of town but not others.

Airport observations aren't the only source of weather information - they are just easiest to obtain and the most complete. The NWS supports a network of volunteer cooperative observers who record precipitation and sometimes temperatures. Oregon Department of Transportation and California Department of Transportation operate roadside weather stations. The Forest Service and Bureau of Land Management have a network of remote automated weather stations (RAWS) on land they manage. The automated stations can provide up-to-the-minute data or at least hourly. The manual cooperative observers generally report once per day. There is also a Citizens Weather Observation Network (CWOP) where anyone with a capable weather station can upload observations to websites.

Airport weather observations began as a manual and labor intensive effort. Observers maintained a constant watch on the weather for changing conditions and reported on at least an hourly basis. This began to change in the mid-1990s with the introduction of the automated surface observation system (ASOS). This was a joint project by the Department of Defense, NWS and the Federal Aviation Administration. There are seven ASOSs in the Medford forecast area: Roseburg, Sexton Summit, Medford, Montague, Mt. Shasta City, Klamath Falls, and Alturas. The FAA maintains a similar system called AWOS (automated weather observing system). These are located in North Bend, Brookings, and Lakeview. Exactly how these systems work is the subject of a whole other article.

Weather observation is an inexact science. The natural variations previously described coexist with inherent limitations of the equipment. All equipment has specifications allowing for some variability. Also, environmental factors will affect observations. Rain or snow with strong winds will result in some precipitation missing the gauge. A bird roosting on an anemometer will result in lower wind speed. This all results in a range of values in observed weather for any given area. So while the official observation in many cases comes from the airport, you should expect what you experience at home or work to vary a little bit from that. It's the nature of weather.

Mt. Shasta City ASOS. Photo: NWS Medford Electronics Technicians

The Life of a Spotter Report

Brad Schaaf, *Meteorologist*

You measure the rain in your rain gauge, take a ruler and measure the snow, or notice that it is windy enough to bend the trees. Knowing that you're a spotter, you decide to help us at the National Weather Service office in Medford by giving us a call. We jot down your report, and then what? One of the more frequent questions I've received from spotters is, "what do you actually do with our reports?" The process seems simple, but each report is extremely beneficial.

After we hang up the phone, we check to make sure that the report makes sense. If it does, then we input the report into a computer system connected to the web. This report includes the time of the event, what happened, and the duration of the event (if known). These reports are then used in many ways. The most common way that these reports are used is to verify any advisories or warnings—especially if the spotter report included damage to trees or buildings. The reports that go into verification help meteorologists understand the real-world impacts that these weather systems cause. It also further helps us communicate hazards to our partners who can echo our message to you the next time a similar system comes to town.

When it comes to rainfall reports, they are combined with other observations such as radar estimates, and other data from remote automated weather stations. This data is then transferred to regional river forecast centers to provide a more accurate portrayal of existing conditions. This is particularly useful in the winter when multiple systems bring several periods of moderate rainfall. These existing conditions are used to estimate how saturated soils are, thus predicting runoff amounts and ultimately river forecasts. Consequently, your reports help us determine if river flooding is a concern for a particular system!

Additionally, your snowfall reports are extremely helpful. Snow levels are notoriously difficult to forecast in lower elevations (where it matters), and when showers can bring cold air towards the surface, thus bringing the freezing level down with it, it is always good to know exactly where this is occurring. With your reports, we can talk with the local Department of Transportations and give them real-time information to help them do their jobs.

These are just three examples of how your spotter reports help us and what happens to them after you give them to us. You are extremely important because you are our eyes and ears away from the office. With how diverse the southern Oregon and northern California terrain is, you are crucial to helping us in our mission to protect life and property. Thank you for giving us your reports, and we look forward to hearing from you in the future!

Meteorologist Brad Schaaf

Weather Fest 2018

Do you consider yourself as a weather enthusiast? Have you wondered how your weather forecast is made? Are you looking for something fun to entertain kids that won't take up your whole day? Well, you're in luck! The National Weather Service in Medford is opening its doors and hosting an open house this June.

Come behind the scenes at our office and learn how the forecast is made and how our partners use our forecasts to keep you safe in the summer heat. We'll have a special balloon launch, tours, and fun weather talks. You can also meet with a few of our partners as we all work together to keep your summer fun.

The open house is scheduled for Saturday, June 16, 2018 from 9:30 AM until 1:30 PM at our office here in Medford. Keep your eye out on social media for more details.

National Weather Service - Medford, Oregon

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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.