The Front

NOAA's National Weather Service

April 2019

Volcanic Ash Graphic Improvements at Anchorage Volcanic Ash Advisory Center

By Joshua A. Maloy, Senior Forecaster NWS, Alaska Aviation Weather Unit/ Anchorage Volcanic Ash Advisory Center

The Volcanic Ash Graphic (VAG) produced by the Alaska Aviation Weather Unit/ Anchorage Volcanic Ash Advisory Center (VAAC) is getting a new look and feel. In an effort to improve the quality of the graphic, the unit experimented with a new version in the summer of 2018.

During the test, both the legacy graphic and the new version were displayed simultaneously. NWS also sent out a Service Change Notice to solicit formal feedback from the aviation community. The unit worked closely with the Alaska Region Test Bed to fine-tune the graphic and ensure service was not degraded while the updated VAG was tested. The changes are driven by a marked increase in demand for an improved tool that would allow aviation decision makers to leverage the information better. The legacy VAG has three key limitations the new version seeks to mitigate:

- Does not show the entire volcanic ash polygon once it moves outside of the Anchorage VAAC Area of Responsibility (AOR) boundary

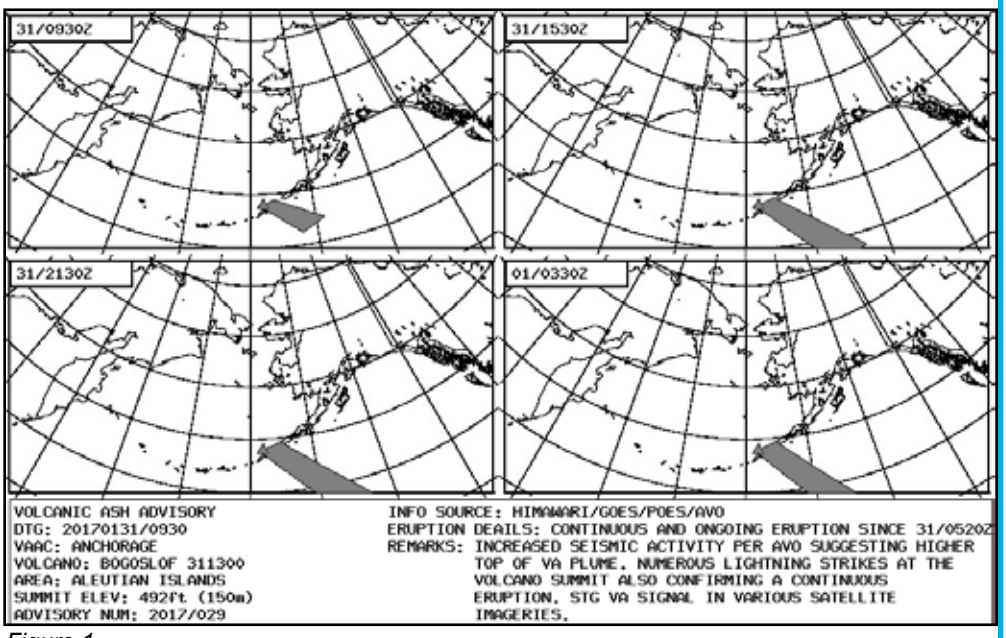

Figure 1

Inside

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The Front

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Mission Statement

To enhance aviation safety by increasing the pilot's knowledge of weather systems and processes and National Weather Service products and services.

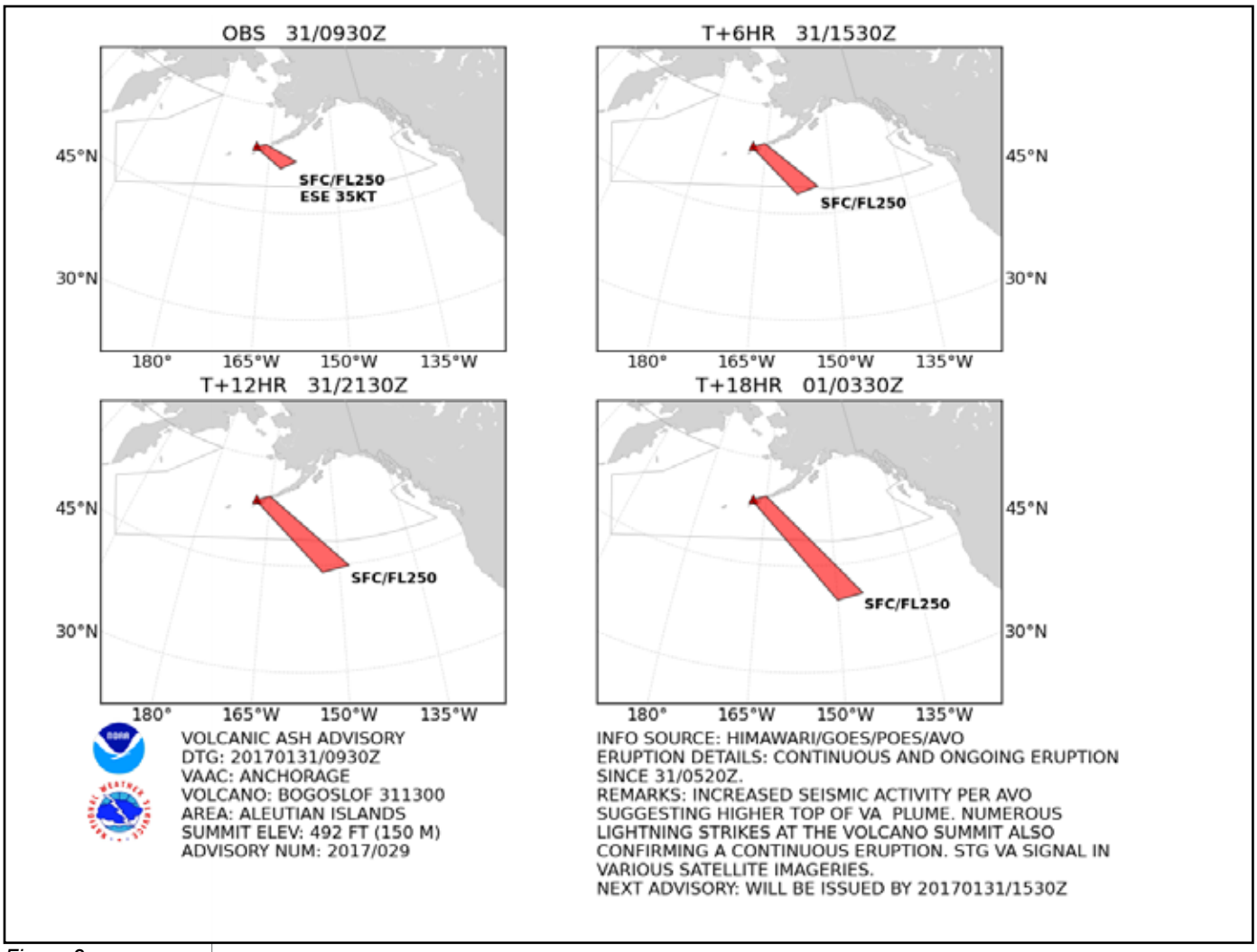


Figure 2

- Lacks useful labels and has little contrast between land areas and oceans
- Inadvertently cuts off some of the longer remarks used to communicate uncertainty or other relevant information about the volcanic event

The new version of the graphic will feature a fluid map projection that better captures the polygons. For example, when polygons are long and extend well downstream of the volcano summit, the projection will zoom out to capture its location, even when the polygons are well into an adjacent VAAC's AOR. (**Figure 1** and **2**). For smaller polygons and those closer to the volcano summit, the projection will zoom in to capture better details (**Figure 3** and **4**).

The new version will also include latitude/longitude grid labels and highlight the Anchorage VAAC boundary. Additionally, the new graphic offers improved color contrast between the volcano, polygon and land/ocean areas.

Finally, the new version will not truncate the longer forecaster remarks, ensuring the graphics can convey confidence and other amplifying information about projected volcanic ash areas.

Collectively, these changes will improve the vocabulary and service delivery of Impact-Based Decision Support Services provided by the Anchorage VAAC. The Anchorage VAAC is targeting a change-over to the new graphic in FY2019.

Figure 3

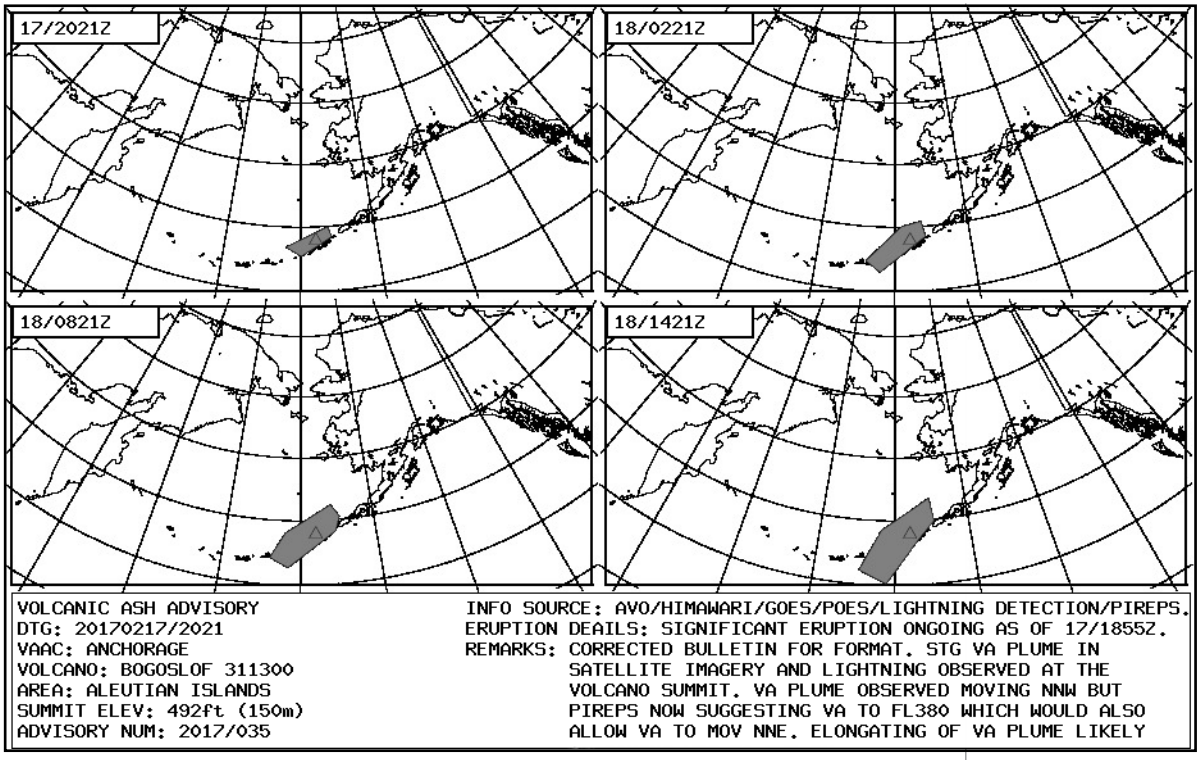
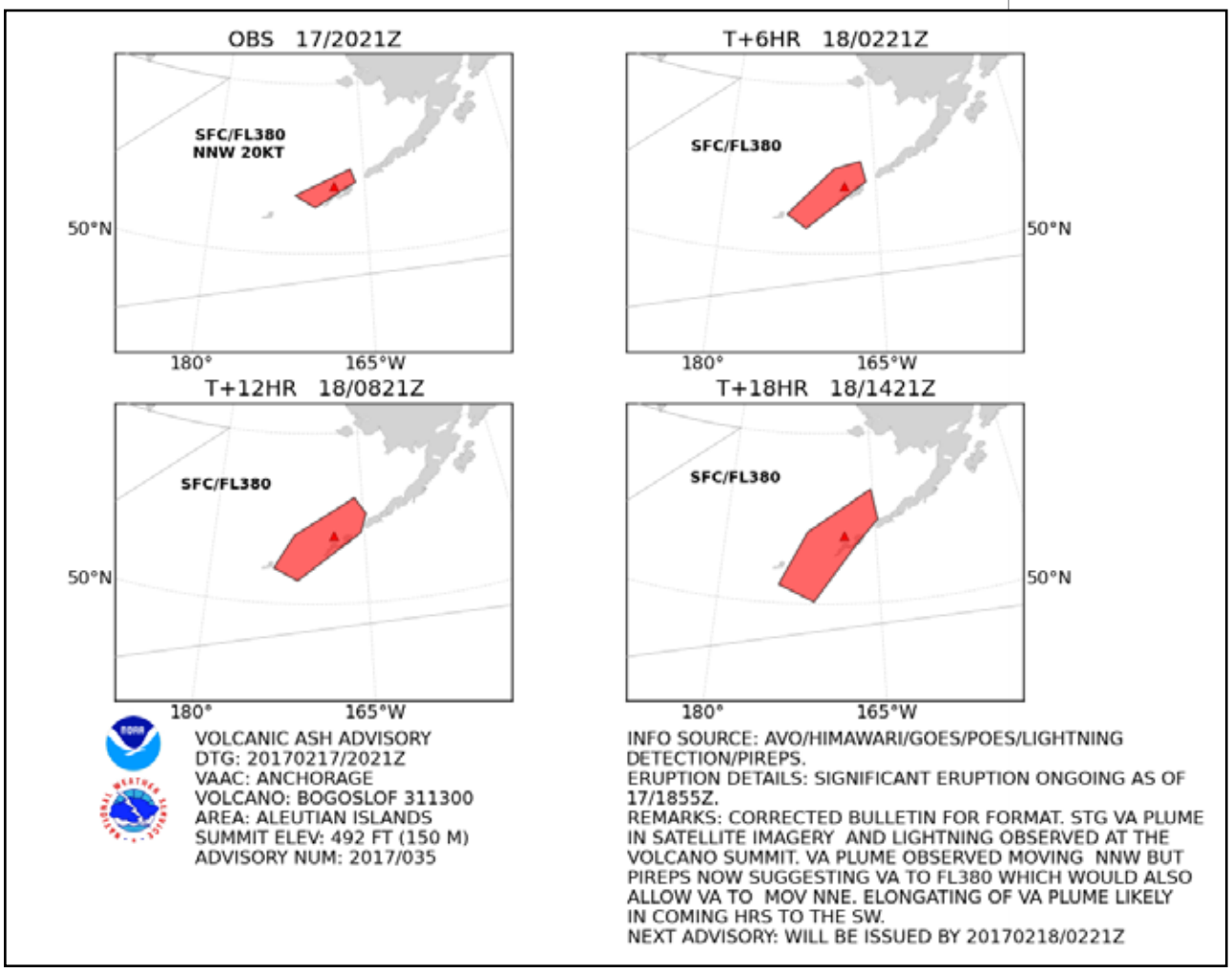


Figure 4



Staying Within Your Weather Thresholds

By Patrick Ayd, Lead Forecaster, NWS Weather Forecast Office, Bismarck, ND

You checked the weather. By the regulations, you are good to go, but should you? Just because it is legal to fly in the current and forecast weather conditions doesn't mean you have to go or continue on if you are already in the air. Ensuring that conditions are within your own personal weather thresholds can be a live-saving tool.

Setting personal weather thresholds is about taking an honest examination of your experience and setting boundaries based on your skill and experience level. The key to effective thresholds is being honest with yourself. What makes you uneasy? What weather have you NOT had to face in a long time? While this isn't an exhaustive list, consider it an inventory of your experience and currency in various weather scenarios:

Crosswinds:

- When was the last time I operated in significant crosswinds? How did that landing or takeoff go?
- How many crosswind landings have I done in the last month, three months or year?
- How confident was I operating in those conditions?
- Did I walk away from the airplane on the ramp saying "that was a bit too much to deal with"?

Ceiling/Visibility:

- While it may be clear right now, am I comfortable flying above small temperature and dewpoint spreads at night?
- How marginal of a ceiling is too marginal? e.g., the last time I flew with 1500 ft. ceilings it was stressful. I became fixated trying to read what the clouds were doing. I lost some situational awareness of the aircraft systems.
- How marginal of a visibility is too marginal? e.g., light snow with 6SM visibility is OK or I want nothing falling from the sky?

Thunderstorms:

- The once shallow cumulus is building into towering cumulus ahead of me, do I keep going or divert?
- There is nothing on the radar, but a Severe Thunderstorm Watch has just been issued, should I takeoff?
- The Terminal Aerodrome Forecast (TAF) has vicinity of thunderstorm (VCTS) or a PROB30 for thunderstorms at my destination during my expected arrival, am I still comfortable with departing for that airport? How about a temporary (TEMPO) group?

Turbulence/Low Level Wind Shear (LLWS)

- When was the last time I encountered LLWS? How did that landing or takeoff go?
- LLWS is in the TAF or there is an AIRman's METeorological Information (AIRMET) TANGO for LLWS for my destination airport, am I still going to fly there?
- Do I know how LLWS will impact the performance of my aircraft during critical flight phases?
- Can I anticipate mechanical turbulence impacting takeoff and/or landing?
- The last time I flew through that kind of turbulence I almost got sick. It's better to not be distracted by your stomach.

Icing (Assuming the aircraft is rated for icing conditions)**:**

- How much icing is too much for me, e.g., light rime or moderate clear etc.?
- What icing types would I rather not deal with? Can I anticipate weather patterns that favor those types?
- When was the last time I flew in icing conditions?
- I have not encountered ice in a couple of years, the AIRMET is forecasting moderate icing, but I see no pilot reports (PIREPS) yet. Should I alter my routing or fly through the AIRMET?
- Am I comfortable flying across a warm front in winter (warm fronts can pose a significant icing threat)?

Use your personal weather thresholds to provide you a buffer zone before your skills or the aircraft's performance limitations are exceeded. Are you not comfortable with crosswind landings, or flight planning for thunderstorms or icing? Don't be afraid to ask an instructor, get your questions answered and your skills sharpened.

ASOS and AWOS – Getting to Know Your Local Weather Observations

By Rick Mamrosh, Meteorologist, NWS Green Bay, WI

Surface Weather Observing

Airport weather observing, i.e., Meteorological Actual Report (METAR)/Special Report (SPECI), changed dramatically in the United States 20 years ago, going from humans recording the weather in the 1990s to automated systems such as Automated Surface Observing Systems (ASOS) or Automated Weather Observing Systems (AWOS). Lets discuss the automation of the METAR and SPECI, its benefits and how these automated sensors evaluate the current weather at your airport.

More Observations

As the cost of the automated systems came down, more and more smaller airports were able to buy and install automated systems to broadcast their local METAR. For example, in 1995, if you were flying from Pittsburgh, PA, to Philadelphia, PA, at night you might have had seven locations in the state reporting weather 24/7. By 2019, if I flew across Pennsylvania overnight, I would have had as many as 44! Think about that, a more than 6-fold increase in the number of sites with observations just for Pennsylvania alone.

Have you ever wanted to know how many METARs or TAFs are available in your state? Just follow these steps:

- Go to the Aviation Weather Center website
- Click on METAR

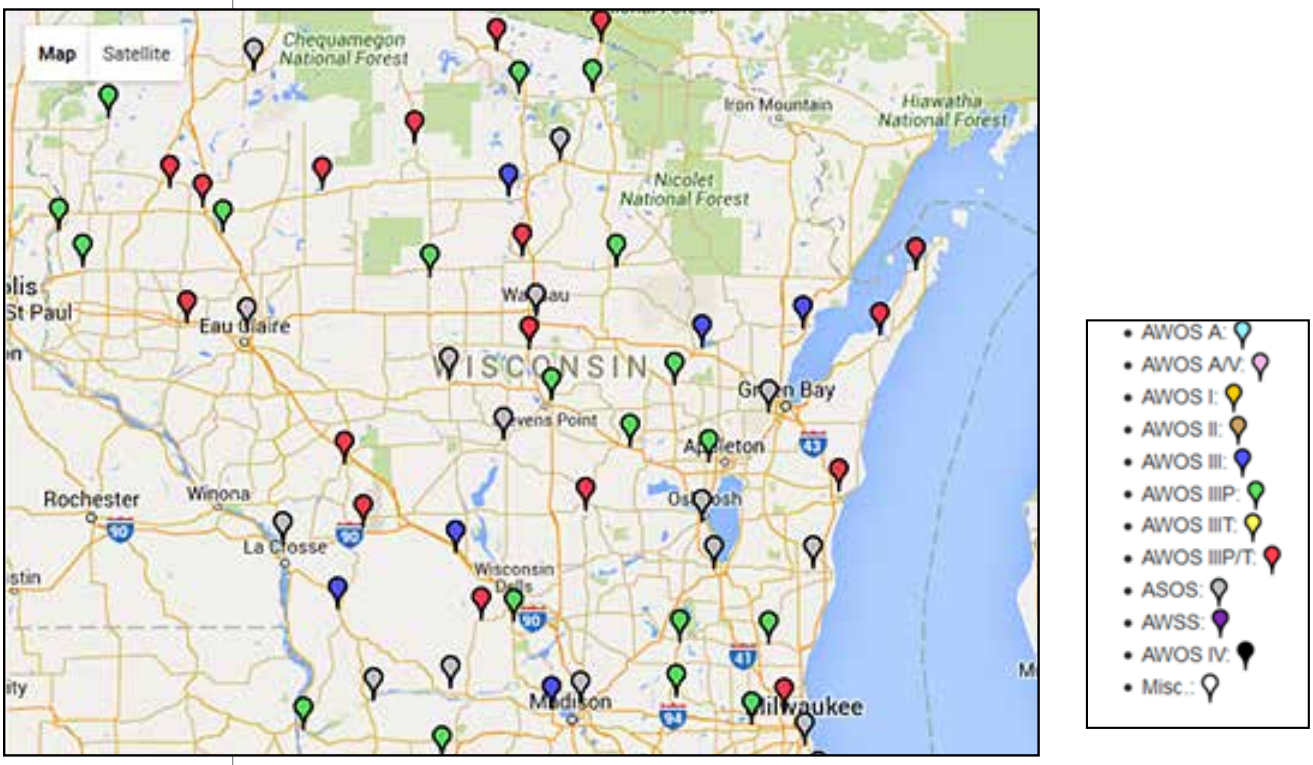
- Scroll down to **Request METAR data** or to **Request TAF data**
- Where it says "**ids"** enter the @ symbol followed by your two letter state code, e.g., for Pennsylvania, enter @PA, then hit return.

You should now see all the current METARs or TAFs in Pennsylvania.

First, some terms for the automated systems:

- **ASOS:** Automated Surface Observing System owned by the FAA and maintained by the NWS
- **AWOS:** Produced by different companies, owned and maintained by the FAA, state or contractor
- **AWSS:** Airport Weather Sensor System – owned by the FAA

The figure below shows the types of automated systems providing METARs and SPECIs.



The Federal Aviation Administration (FAA) air traffic link will tell you what your state has to offer under automated stations and what type of system.

ASOS/AWOS use computer algorithms to measure pressure, temperature, humidity, wind, ceiling height, visibility and weather. Knowing how these systems work can help you use them more effectively for a safe flight.

5-Minute Temperature and Dewpoint Lag in ASOS Observations

ASOS measures temperature and dewpoint every 10 seconds and averages those into a 1-minute observation. Did you know that the software used to produce a METAR or SPECI temperature and dewpoint report from ASOS uses the average of the last five 1-minute observations? Why is this important?

Let's say a cold front moved through at 2145Z and the temperature dropped from 10°C to 4oC and the dewpoint dropped from 8°C to 2°C in 2 minutes. ASOS would report something like the text below in the METAR:

KGRB 122145Z 18012KT P6SM SKC 10/08
KGRB 122146Z 32018KT P6SM SKC 10/08
KGRB 122147Z 33019KT P6SM SKC 09/07
KGRB 122148Z 34020KT P6SM SKC 08/06
KGRB 122149Z 35023KT P6SM SKC 07/05

As you can see, the use of a 5-minute average causes the reported temperature to lag behind the actual temperature. This lag may be important when temperatures are near freezing. It may take up to 5 minutes to report the true temperature.

Wind Speed and Direction

ASOS units employ a sonic anemometer to measure wind speed and direction. A two minute average wind speed is obtained from 24 five second averages. Gusts and peak winds are the highest 3-second averages. ASOS uses a 2 minute average of 5 second averages for wind direction. The lag in wind measurements is usually not as extreme as temperature.

Cloud Cover

ASOS/AWOS determines cloud cover by using a laser looking straight up, so it uses a time averaging method to determine cloud cover. This method can sometimes result in METARs that do not represent real conditions for a period of time.

What does this mean? An algorithm processes data from the last 30 minutes but weights the most recent 10 minutes of data twice as heavily.

The time averaging can result in a considerable lag before ASOS/AWOS reports rapidly changing sky cover. For example, if the sky quickly becomes cloudy with the arrival of a cold front, it will take ASOS/AWOS 2 minutes to go from SKC to SCT, and as much as 10 minutes to report a BKN ceiling. This might be especially important to VFR pilots.

Visibility

Visibility: The visibility report in ASOS/AWOS is a 10-minute harmonic mean of 1-minute visibility measurements. This differs from a straight-forward arithmetic average in that it will lower the visibility report faster in deteriorating conditions (i.e., decreasing visibility) and will increase the visibility more slowly in improving conditions (i.e., increasing visibility). The harmonic mean was implemented in order to favor aviation safety since ASOS is using a .75 cubic foot volumetric measurement in order to represent the large spatial area of the operational runway complex (which can be several square miles or more). In other words, measurements are time averaged, so there is a lag in reporting quickly changing visibilities. If the visibility improves quickly from 1 mile to 7 miles, it will take ASOS 3 minutes to report 3 miles and 9 minutes to report 7 miles.

Weather Types

Automated systems generally cannot identify smoke, ice pellets, ice crystals, hail or blowing snow, sand or dust. Most report fog, haze, rain, snow, freezing rain and unknown precipitation.

Present Weather

ASOS/AWOS use Light Emitting Diodes in the infrared spectrum. A signal is pulsed at 50 KHz. Snow, rain and other precipitation will produce changes to the wavelength and amplitude of the signal. Algorithms combine these signal changes with current temperature and visibility to determine present weather.

Some ASOS/AWOS units have a freezing rain sensor that measures the frequency change of a vibrating wire. When the wire gets coated with ice, it becomes heavier and moves slower. Algorithms are used to ensure freezing rain is not reported when it's warm outside. Freezing rain is possible with temperatures just above freezing if there are considerable differences between the temperature and dew point.

Precipitation Type

While ASOS/AWOS are generally reliable, you might consider calling the fixed-base operator (FBO) or airport manager when unknown precipitation is reported, or any of the weather elements are questionable. Airport webcams may also be helpful such as this one for Alaska.

Location at Airport

AWOS/ASOS observations can sometimes seem unrepresentative due to their location on an airfield.

Dense fog may be present at the sensor site but not over one or all of the runways.

To wrap up, automation has increased our observational capability greatly. More observations are a good thing and can help improve your situational awareness along with other sources of weather information like weather cameras, etc. It is important, however, to understand how these algorithms differ from what you perceive as a person looking up at the sky or measuring any of the other values, particularly in fast changing situations, including the onset and cessation of thunderstorms.

As we mentioned above, when in doubt pick up the phone and call that FBO. Safe Flying!

SAWS VIII 2019 Meeting: June 7-8, 2019

By Bianca Hernandez, General Forecaster; Larry Hopper, Senior Forecaster, NWS Phoenix, AZ

"Informing, Improving and Innovating Aviation Weather Safety in the Southwest"

The 8th Southwest Aviation Weather Safety Workshop (SAWS VIII), hosted by the National Weather Service, will be held at the Residence Inn Tempe/Downtown University in Tempe, AZ, June 7-8, 2019.

With the theme of "Informing, Improving, and Innovating Aviation Weather Safety in the Southwest," SAWS VIII seeks to promote aviation safety and productivity through improved weather awareness and forecasting services. SAWS Workshops offer an excellent opportunity for aviation professionals and enthusiasts alike to sharpen their meteorological skills. SAWS also offers an environment to network with others in the aviation and weather forecasting communities who support the National Airspace System (NAS).

To achieve this goal, the workshop is structured to have topics of interest to aviation weather forecasters on Friday and aviators on Saturday. Attendance can earn applicants FAA WINGs credit. The workshop will address the following areas:

- Advancements in the delivery of aviation weather products and services, including Digital Aviation Services (DAS) and GOES 16-17 satellite innovations and advancements
- Best practices in aviation impact-based decision support services (IDSS), focusing on high-impact weather for recent aviation events and incidents
- Convective and non-convective forecasting, initiation, impacts and safety
- Best practices for safe flying and/or controlling aircraft across the Southwest

Friday's topics will focus on helping forecasters understand and better meet the needs of operators in the NAS, including pilots, briefers, air traffic controllers and airport personnel. Saturday's topics will inform operators within the NAS of all aviation weather hazards throughout the year, including convective and non-convective phenomena and forecasts.

We invite abstracts for oral and poster presentations for both workshop days on these focus areas. We also encourage abstracts highlighting best practices in the areas of communication and outreach, decision support tools, and preparedness methods to advance aviation weather safety in the Southwest.

The meeting format will include a combination of oral and poster presentation sessions, panel discussions, and keynote speakers that address the workshop theme. For more details and submission of abstracts, please refer to the 2019 SAWS VIII website at www.weather.gov/psr/saws.

Lodging and other logistics will be posted to the workshop website as this information becomes available. The workshop hotel is 4 miles east of Sky Harbor International Airport and is accessible via Valley Metro light rail.

For additional information, please contact the workshop organizers at sr.saws@noaa.gov. If you need immediate assistance, contact Bianca Hernandez, *or* Larry Hopper or call us at 602-275-7002.