Volume 2, Issue 1
March 1, 2011

ZSE Weather Watch

A newsletter from your Seattle ARTCC Center Weather Service Unit

INSIDE THIS ISSUE:

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Wind Storms *by John Werth, Meteorologist in Charge*

Remember the wind storm that hit the area on Friday night the 17th of December 2010? Strong winds, gusting to over 70 mph in the Enumclaw area, downed trees and power lines, leaving thousands in the dark. We even lost several trees that night here on the grounds of the ARTCC. Fortunately, there was little or no damage from the downed trees, but as you can see from **Figure 1**, others were not so lucky. Even though winter will be quickly coming to an end, it's still climatologically possible to get strong wind storms well into late spring across the Pacific Northwest. Therefore, it seems like appropriate time to discuss "all things wind."

Figure 1 – Downed tree in the Enumclaw area Dec. 17, 2010.

Wind is almost never constant; usually there is a steady stream of peaks and lulls. As a result, we (meteorologists) describe wind in terms of its sustained speed and its associated gustiness. **ASOS** measures sustained wind, wind gusts, and peak instantaneous wind. All are reported in the body of the **METAR** observation.

ASOS continuously measures wind direction and speed once every second. Five-second averages are then computed from the 1-second readings. The 5-second averages are retained for 2 minutes. Every 5 seconds, a running 2-minute average wind speed and direction is computed and further used to describe the character of the wind. If the computed 2-minute average wind speed is 2 knots or less, the 2-minute average wind direction and speed is recorded as "calm" (00000KT).

The actual wind reported in the **METAR** observation is a 10-minute average (of the 2-minute average winds) for the 10-minute period immediately preceding the observation.

Wind character information (wind gusts and variable wind) is added to the METAR when the variability in the steady state wind exceeds certain threshold criteria. **ASOS** uses a similar 10-minute observation period (using the greatest 5-second average wind speed calculated over a 1-minute period) to calculate wind gusts. The minimum gust speed reported by **ASOS** is 14 knots.

Figure 2 – ASOS wind instruments.

A variable wind is reported when the wind direction varies by 60 degrees or more during the 2-minute period prior to the observation. If the 2-minute wind speed is 6 knots or less, then a VRB indicator is used in the **METAR** wind group, such as "VRB03KT". If the wind speed is greater than 6 knots, then a variable wind direction group is appended to the basic wind group in the body of the **METAR**, such as 27010KT 240V300.

"Wind gusts can be as much as 30-40% higher than sustained winds.

"I've battened down the TV to protect us from weather reports."

Thinking back to the Enumclaw wind storm, you may be asking yourself "Why isn't the wind steady all the time….why do we get wind gusts in the first place?"

The answer to that question lies in the fact that the earth's surface is not flat. Big objects, such as hills, mountains, tall buildings, etc., block the flow of air near the earth's surface. Valleys and channels between them create bottlenecks, forcing the wind to move through them faster than it normally would. The sun also plays a role in creating gusty winds. Have you ever noticed on warm, summer days gusty winds tend to die down shortly after sunset? The sun tends to stir things up in the atmosphere, both in the horizontal and the vertical, due to differential heating of the earth's surface. Warm air rises during the hottest part of the day allowing cooler surrounding air nearby to rush in and take its place. These are two of the main reasons why we experience gusty winds.

Wind gusts can also be caused by the mixing down of stronger winds aloft. As you probably know, winds above the surface generally increase with height. When air near the earth's surface becomes unstable, turbulent eddies transport stronger winds aloft down to the surface, resulting in gusty surface winds. When air moves back up, winds tend to decrease, resulting in a lull.

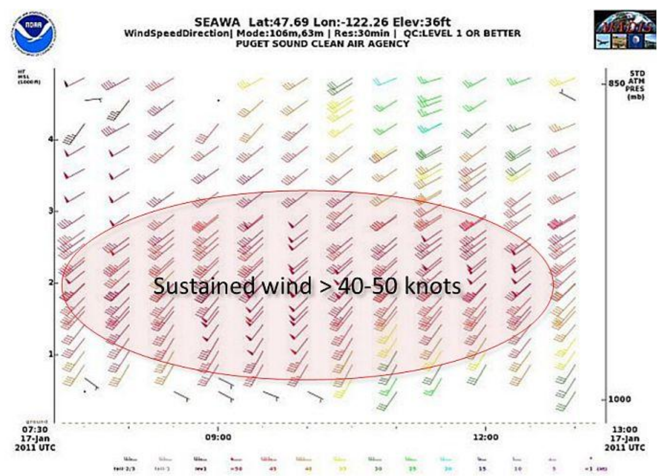

Figure 3 – Sandpoint profiler winds morning January 17, 2011.

This can also happen when vigorous frontal systems move through the area. On January 17, 2011, strong, gusty winds hit the Seattle area when a Pacific cold front moved through during the early morning hours. The Seattle profiler (**Figure 3**) showed a period of 40-50 knot sustained winds 1-3 thousand feet above the surface.

Wind gusts can be a lot stronger than sustained winds, often 30-40% stronger. In hurricanes, wind gusts can even be higher, up to twice the sustained winds.

Numerical models used by meteorologists to predict weather, provide forecasts of sustained winds and that output is for instantaneous wind – not a 2-minute average wind. Forecasters have to add wind gusts to the forecast when conditions are appropriate.

We Need Your Input *by John Werth*

As a direct partner with the FAA, and specifically with the ZSE ARTCC, our success depends on meeting your needs. The CWSU staff constantly review the products and services we provide, to make sure we're meeting your needs. While we do our best to keep current with your needs and requirements, we need your help to identify areas where we can improve our service.

If you have suggestions or ideas about ways we could improve our efforts, please speak to any of the CWSU staff, or send me an email at john.werth@noaa.gov.

SIGMET Alerts *by James Vasilj*

ERAM does not properly distribute non-convective (i.e., turbulence, icing, and volcanic ash) SIGMETs. Therefore a program was set up on a computer in the CWSU operations area next to the "WE WANT YOUR PIREPS" poster to alert the acting OM overnight when a meteorologist is not present (9pm-5am). When a SIGMET issued that covers the Rockies or the West Coast, it will activate an audible alarm on a CWSU computer (***Bubble***), sounding like a stuck key on the keyboard. The program will also print a hardcopy on the printer to the left of ***Bubble***, but be patient - the hardcopy takes awhile to print because of the type of printer.

To turn off the alarm, please click on the red box in the lower right-hand side of the screen (**Figure 4**). ***Please do not close the program, lower or mute the volume, or shut down the computer.*** Because this is a safety issue, it is important that the computer remain up and running to alert the OM, and thus the controllers, of very hazardous weather. This information is also on a sheet of paper attached to the Bubble computer's monitor.

*"**Bubble** will sound an audible alarm and print a hard copy each time a SIGMET is issued for areas covering the Rockies or the West Coast."*

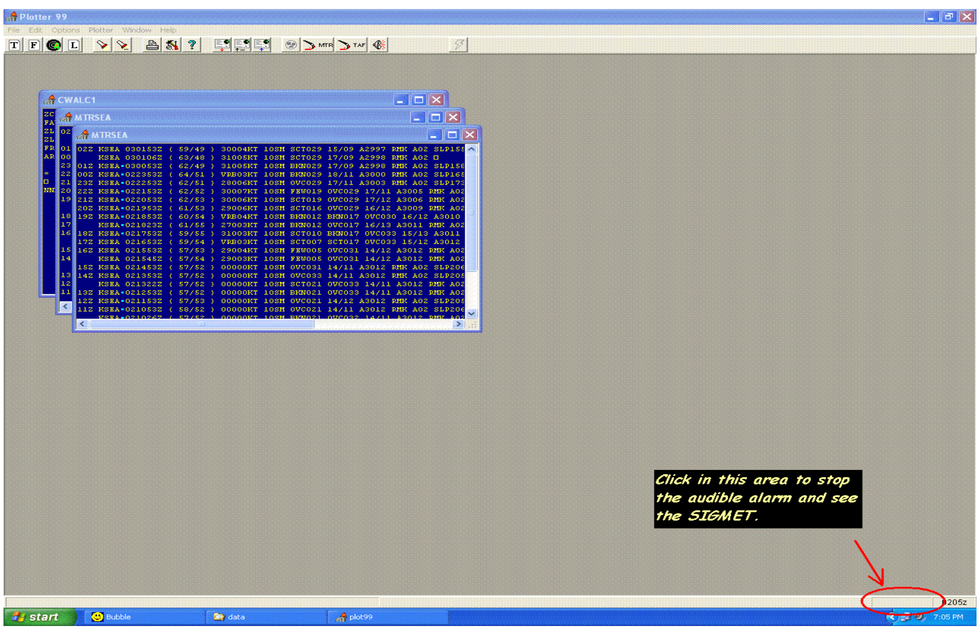

Figure 4 – Screen image of the "Bubble" computer in located in the CWSU work area.

Spring Thunderstorms in the Pac NW *by Steve Adams*

As the season transitions from winter into spring, the thunderstorm risk gradually increases. The "increase" is a relative term as ZSE's airspace receives nearly the lowest amount of thunderstorm activity annually of any region in the country. See **Figure 5** next page.

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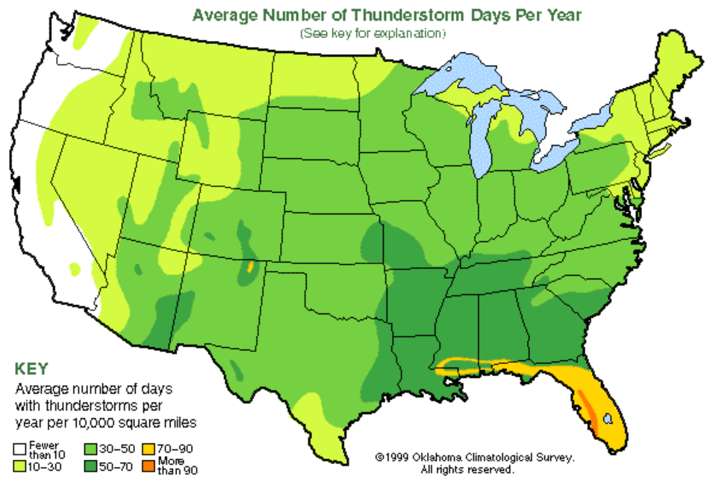

Figure 5 - Average number of thunderstorm days per year

Thunderstorms in early- to mid-spring generally occur when late, cold season, upper-level low pressure systems swing southeastward from the northeast Pacific and the Gulf of Alaska. This will bring a colder-than-normal air mass aloft over the Pacific Northwest, which destabilizes the atmosphere, setting the stage for cold air mass type thunderstorms. Cold air mass thunderstorms generally exhibit lower echo tops than warm air mass thunderstorms and can be enhanced by local terrain influences and/or induced along boundaries of low level convergence - such as the Puget Sound Convergence Zone. **Figure 6** is an example of this type of pattern. They are usually isolated and short-lived.

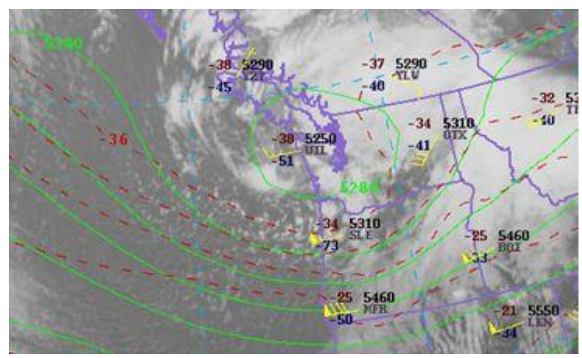

Figure 6 – Typical cold air mass type thunderstorm pattern.

In late spring and summer, thunderstorm development more commonly occurs as weak mid- and upper-level disturbances move inland into the ZSE airspace from off the Pacific. These disturbances combine with mid-level moisture to produce isolated to scattered, high-based thunderstorms. These types of thunderstorms develop along or are enhanced when they move over higher terrain. These storms persist longer , have much higher echo tops, and can be high-based, increasing the potential for strong downdrafts, outflow boundaries and microbursts (**Figure 7**).

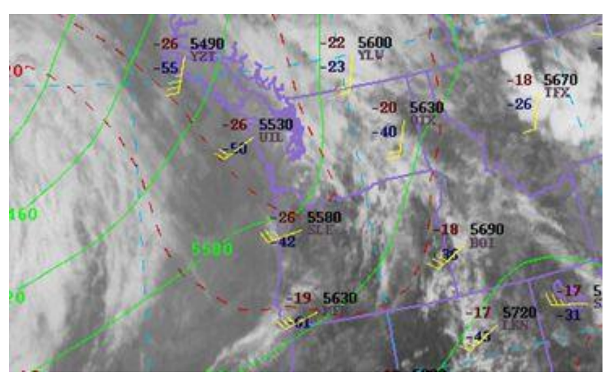

Figure 7 **-** High-based thunderstorm pattern