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ZSE Weather Watch

A newsletter from your Seattle ARTCC Center Weather Service Unit

New GeoLocated Mobile Page *by James Vasilj*

A new page geared toward mobile devices was designed to take advantage of the ability to detect the location of the user. The main page (**Figure 1**) will display the local NWS radar and satellite images; METAR and TAF for the nearest airport with a TAF; the latest nearby observation and NWS forecast; forecast maps for turbulence, icing, IFR conditions, and convective activity; an area map of flight categories (VFR, MVFR, IFR, and LIFR); and sunrise, sunset, and civil twilight. From this main page a user can quickly get an idea about local, aviation-related conditions. The user is able to change the location manually via a button toward the end of the page. The page is designed to fill the screen of a mobile device so only vertical scrolling should be necessary.

There are links to other geolocated pages. The first button is for a modified Google Maps page (**Figure 2**). This opens with the flight categories displayed by default. Other parameters, such as AIRMETs, NWS warnings, CCFP forecasts, ceiling height, surface temperature, and altimeter, are available to be plotted by clicking on the “Toggle Map / KML List” button.

Another page is on the second button and is a compilation of nearby METARs, TAFs, and PIREPs. This page is strictly text-based.

The third button is for a nearby vertical wind profile (based on the nearest TAF site) from the Seattle CWSU. It is the version that goes up to 20,000ft and is based on the RAP model. The user is able to manually enter the ID for a different site.

The fourth button takes advantage of the new NWS forecast page. The user’s geolocation is used to retrieve the current NWS forecast. Links for the local radar, satellite image, forecast discussions, forecast graphics, etc are available.

The icons for the radar, satellite, and AIRMET/SIGMET images can be clicked to retrieve a larger version. To set a new location the user should click the “Change Location” button and then pan the map to the desired new location.

Although the page was designed with mobile devices in mind, it can also be used with PCs. If a location cannot be determined for the device, then a default location near Seattle will be used.

http://www.wrh.noaa.gov/zse/mobgeoloc.php

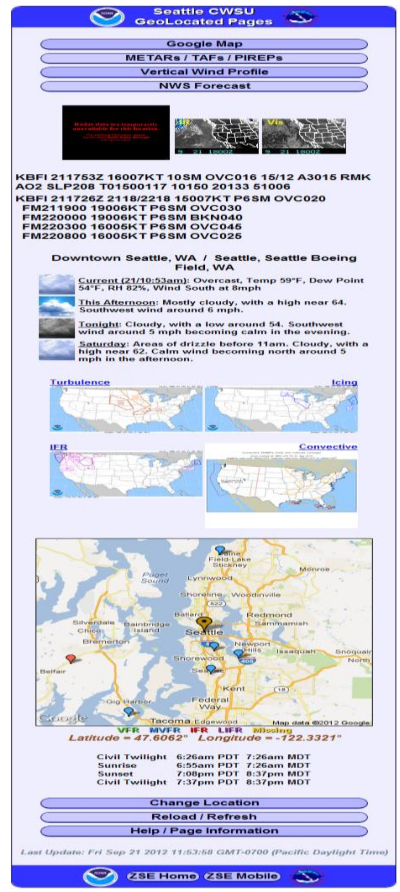

Figure 1 - Smartphone Display

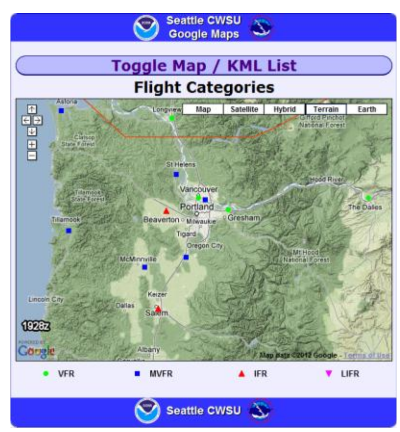

Figure 2 - Flight Categories Map

In This Issue

Langley Hill radar data is now included in WARP radar mosaic products and controller display screens

Improved ZSE Radar Mosaics *by John Werth*

In May 2007, the FAA began using a new algorithm for creating the WARP 0-60 kft composite reflectivity (CR) mosaic used on air traffic display systems at Air Route Traffic Control Centers (ARTCC). The new algorithm utilizes radar data from NEXRAD radars that provide overlapping coverage of ZSE's airspace. For each specific area of the mosaic, a series of tests is used to classify contributing radars as either a primary or a secondary contributor to each mosaic bin. The next step is to determine the highest and second highest primary contributor. One of two tests is used to select either the highest or second highest primary contributor as the starting mosaic bin value. For cases where multiple radars provide coverage of a particular mosaic product bin but only the radar with the lower elevation coverage sees the weather, a series of four validity checks are executed to determine whether the value from the one radar should be used in the mosaic bin. If this value fails the validity checks, the mosaic bin is set to zero, i.e. no weather.

After the initial value has been selected by one of the primary contributor tests, the secondary contributor data is then compared to the initial mosaic bin value. This is done because the secondary contributor data may represent rapidly developing weather from a more recent radar scan that should be included in the final mosaic product.

Noise - defined as clutter, anomalous propagation (AP), and bright band contamination - has been greatly reduced in the mosaic product by removing all precipitation echoes below 30 dBZ and by removing any power spikes or maintenance bulls-eyes from the base radar data. The optimal mosaic algorithm will then typically remove about 80% of the remaining AP and clutter.

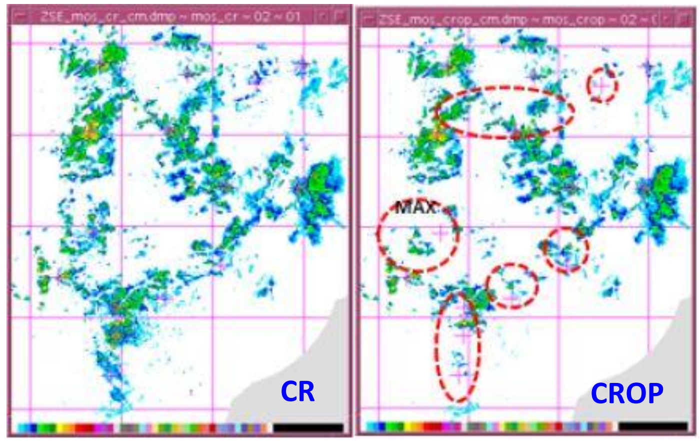

Figure 3 – WARP CR and CROP mosaic March 17, 2011 at 0030 UTC.

In March 2011, ZSE controllers identified at least two instances where the optimal mosaic algorithm appeared to have removed valid weather returns in the 0-60 kft WARP mosaic. In October 2011 the WARP program office tasked Unisys to conduct a more detailed analysis of the incidents and to recommend changes to the optimal mosaic algorithm to prevent removal of valid weather returns.

Figure 3 shows the mosaic products generated for March 17, 2011 at 0030 UTC showing small scattered, low-topped cells moving through ZSE's airspace. The image on the left side of the figure (**CR**) is the original, unfiltered composite reflectivity mosaic. The image on the right side (**CROP**) is the controller's display of the weather after the optimal mosaic algorithm had been run. Dashed red circles in CROP are areas where the algorithm removed valid weather returns.

The vast majority of the dropped returns were removed by the boundary layer check - one of the four primary contributor validity checks - in the optimal mosaic algorithm. None of the surrounding radars saw above threshold returns in the dashed red circles.

The second incident occurred on March 25, 2011. In this case there was an extended area (20,000 km^2) of low altitude stratiform precipitation moving through the area where the problem was reported. As happened in the first case, none of the surrounding radars saw any above threshold returns in the mosaic bins where the valid returns were eliminated.

In both cases, the optimal mosaic algorithm removed shallow precipitation echoes seen by only one radar - the radar with the lowest elevation view of the weather. The algorithm works well where multiple radars provide overlapping coverage of the weather. However, in the West there are significant gaps in the radar coverage - especially at lower elevations - caused by terrain blockage of the radar beam or by the placement of radars on remote mountain tops. For example, Medford, OR NEXRAD (MAX) is located on Mt. Ashland at an elevation of 7,562 feet above sea level. The NEXRAD in Eureka, CA (BHX) has the next best view of weather over southwest Oregon, but it doesn't see any returns below about 15,000 feet in the Medford area. So low elevation precipitation moving through the Medford area is only seen by one radar (Medford) and oftentimes that data does not pass the series of validity checks.

Unisys engineers were able to overcome these limitations by modifying adaptation settings used in the optimal mosaic algorithm. The image on the right side in **Figure 4** shows the effect of "relaxing" the adaptation settings compared to the image on the left which was created using original baseline adaptation settings. Most of the weather returns removed by the original optimal mosaic algorithm have been recovered in the "improved" version of the algorithm with only minimal degradation in the removal of non-weather returns.

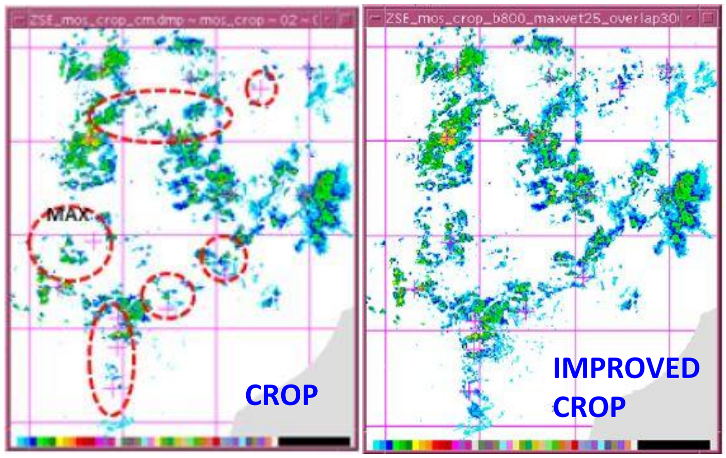

Figure 4 – Improved WARP CROP mosaic for March 17, 2011 0030 UTC.

ICING! The January 2012 Ice Storm *by Linnae Neyman*

Cold dry air is denser than warm moist air. So when a mass of warm air meets a slug of cold air at the surface, the warmer air will slide up over the colder air (**Figure 5**). As the warm moist air rises, it expands and cools and cannot hold as much water. As a result, liquid rain falls down through the cold air, losing heat as it falls.

If the colder air near the surface is below freezing, the falling droplets will cool to freezing or even below freezing. Some of the rain drops will freeze on the way down to form ice pellets or sleet. If the precipitation stays liquid to the ground, it will freeze on contact with all those

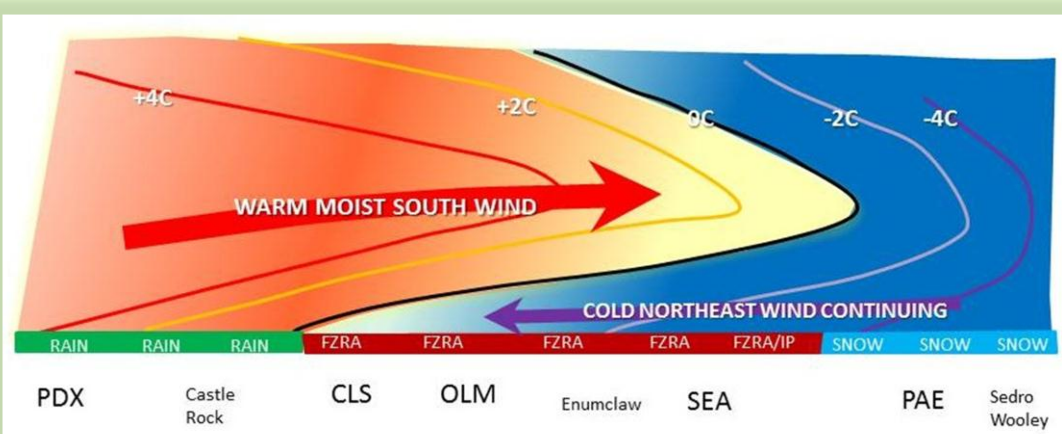

Figure 5 – Conceptual vertical temperature profile for the 19 January 2012 ice storm.

Pilot's Icing Definitions

Trace *Ice becomes noticeable. Trace ice is generally not hazardous unless the condition is encountered for an extended period of time.*

Light *Flight into light icing conditions may become a problem if flight is prolonged in this environment for over an hour. Occasional use of deicing/anti-icing equipment is required.*

Mod *The rate of ice accumulation is such that even short encounters could become hazardous. The use of deicing and/or anti-icing equipment is necessary.*

Severe *The rate of ice accumulation is such that deicing/anti-icing equipment fails to reduce or control the hazard. Immediate flight diversion is necessary.*

freezing surfaces on the ground such as trees, houses, cars, roads, parked aircraft, etc. What type of precipitation you get depends upon where you are underneath the frontal structure. **Figure 5** shows the predominant precipitation types from south to north during the event on 19 January 2012.

On Wednesday, 18 January, western WA had had several days of cold below-freezing air flowing out of the northeast. So things on the ground north of Castle Rock were below freezing when the warmer moist air overran the below freezing surface air early in the morning on 19 January. By 5 AM Thursday, 19 January, ice covered all those cold surfaces and was getting thicker by the hour (**Figure 6**).

We are used to worrying about aircraft inflight icing. We are not so used to seeing ice on all the outdoor surfaces around us. In both cases, the principal that causes icing is the same in many ways. A cold below-freezing aircraft will fly into a cloud that contains water droplets and/or ice crystals. The aircraft may experience light, moderate, severe, or even no icing on its journey through the cloud, depending on the location, nature and temperature of the water that makes up the cloud.

In PIREPs, structural ice on aircraft is called rime ice, clear ice (sometimes called glaze), or mixed ice.

Rime ice (**Figure 7**) is rough, milky white, and generally forms from small droplets that impact the leading edge of aircraft structures (wings, engine cowlings, tail, cables, antennas, etc.). Deice systems and anti-ice treatments can remove most of the rime ice.

Clear ice (**Figure 8**) is mostly clear and smooth. It forms more quickly from larger droplets that flow backward along the wing to areas that are not protected by deice systems. It is denser and harder than rime ice. It doesn't respond as well to deice systems and anti-ice treatments as does rime ice.

Mixed ice is a combination of rime and clear ice.

Ice accumulation on an aircraft will reduce lift, increase drag, and adversely affect aircraft handling qualities.

Figure 6 – An Alaska Airlines jet on the ground at SEA Thursday morning, 19 January 2012.

Figure 7 – Rime ice

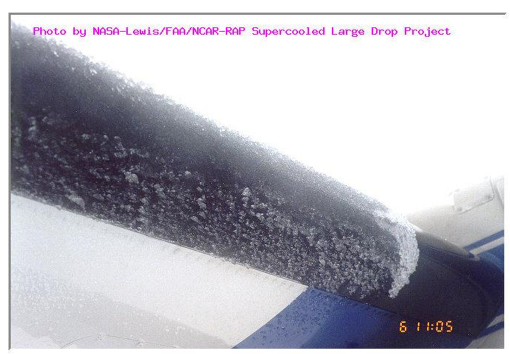

Figure 8 – Clear ice.

Because of our closeness to the Pacific Ocean and the frequent storm systems that move through our area during fall and winter, the Pacific Northwest has a high incidence of aircraft icing conditions compared to other parts of the US.

Weather Codes in METARs and TAFs *by James Vasilj*

Many of the weather codes, such as "RA" for rain and "HZ" for haze are fairly easy to figure out. However, others such as "GS" and "BR" may not be very obvious. The reason is that the codes that were developed included some based on French words. This happened when we switched from the old SAO and FT formats for observed weather and terminal forecasts to the newer METAR and TAF format in the 1990s. Also, some of the less frequently used codes such as "BL" and "SG", while based on English terms, may not be very familiar.

Descriptor	*Meaning in English*	*French Derivation*
MI	Shallow (little vertical extent)	"**Mi**nce" (thin slice)
BC	Patches (little vertical extent/reduces horizontal visibility)	"**B**an**c**" (bank, as in fog bank)
PR	**P**a**r**tial	
BL	**Bl**owing	
DR	**Dr**ifting	
FZ	**F**ree**z**ing	
SH	**Sh**owers	
TS	**T**hunder**s**torm	
DZ	**D**ri**z**zle	
RA	**Ra**in	
SN	**Sn**ow	
SG	**S**now **G**rains	
GS	Small Hail/Snow Pellets (<¼" diameter)	"**Gr**e**s**il" (small hail)
GR	Hail (≥¼" diameter)	"**Gr**êle" (hail)
PL	Ice **P**e**l**lets	
IC	**I**ce **C**rystals	
UP	**U**nknown **P**recipitation (automated only)	
BR	Mist (Visibility ≥⅝sm)	"**Br**ume" (mist)
FG	**F**o**g** (Visibility <⅝sm)	
FU	Smoke	"**Fu**mée" (smoke)
HZ	**H**a**z**e	
VA	**V**olcanic **A**sh	
SA	**Sa**nd	
DU	Widespread **Du**st	
PY	S**py**ray	
SQ	**Sq**uall	
FC	**F**unnel **C**loud (+FC indicates Tornado or Water Spout)	
SS	**S**and **S**torm	
DS	**D**ust **S**torm	
PO	Well Developed Dust/Sand Whirls	"**Po**ussiere" (dust)
VC	**V**i**c**inity (US within 5-10sm, elsewhere 8000m)	
+	Heavy	
No Sign	Moderate	
-	Light	
NSW	**N**o **S**ignificant **W**eather	

Here are a few helpful hints you could use for the French-derived codes:

Think of "**MI**ncing" for **MI** (shallow)

"**B**its and **C**hunks" for **BC** (patches)

Small hail is **GS**, la**R**ge hail is **GR**

FU (smoke) could be **FU**mes from smoke

PO (dust/sand whirl) could be **PO**wder

BR (mist/light fog) could be **B**lu**R**ry

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