

# Weather: Where to Go, What you Need, and How to use it



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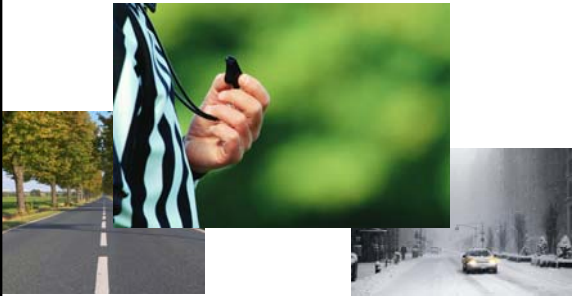
## You have all been here before

- Typical late afternoon at work
- TV weather stations are all over the place in forecasting a snow storm tonight.
  - One is forecasting a major snow storm by rush hour.
  - The others are starting it much later; towards midnight.
- You keep looking at sources on the internet, but are they helping?
- Your boss keeps coming in to check on your decision.
- Should you keep crews through the evening, or send everyone home and bring them back later?**



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## Time for you to make the call!



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## What do we need to make our decision easier?



- Current weather information
  - Information that is relevant to our job!
- Measure conditions ourselves
  - It is more than sticking our head outside
  - Monitoring it on the move
  - Who is monitoring it and when we are they not?
- Using weather forecast to work for us
  - Weather pitfalls
  - It is not always what they are saying



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## We are going to begin by assuming nothing!

- Let's build a weather decision plan



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## Now...



### Know what is going on now!

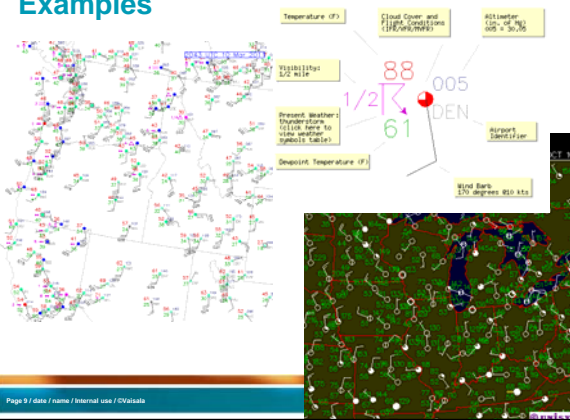
- It is IMPOSSIBLE to plan for anything if you do not know what is going on now.
- Every meteorologist that ever lived begins with looking at what is going on now.
- Yes, one of these does come in handy.
- What should we look at?



### Current Surface Conditions

- NCAR Weather Page
    - <http://www.rap.ucar.edu/weather/>
  - Unisys Weather
    - <http://weather.unisys.com/index.html>
  - Weather Channel (very limited)
    - [www.weather.com](http://www.weather.com)
  - National Weather Service (very limited)
    - [www.weather.gov](http://www.weather.gov)
- The current surface conditions should be where you always start first! **Not with Radar!**

### Examples



### Now we can look at Radar!

- National Weather Service
  - [www.weather.gov](http://www.weather.gov)
- Weather Channel
  - [www.weather.gov](http://www.weather.gov)

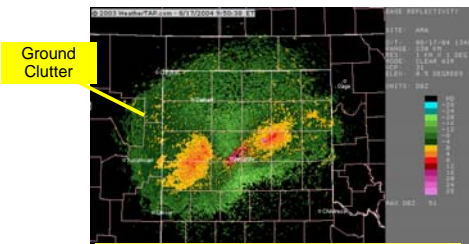


### Problems with Radar



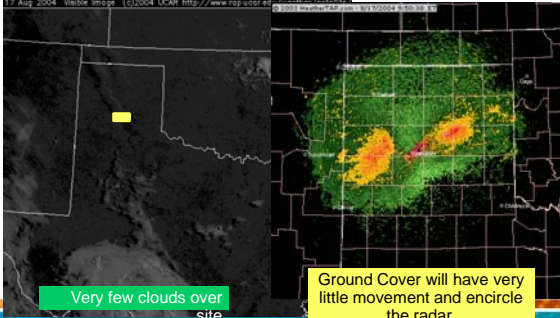
Can Radar Lie?

### Ground Clutter



- Caused by:
- Ground targets such as buildings, trees, and cars
  - Airborne objects such as birds and insects

### How can we verify?



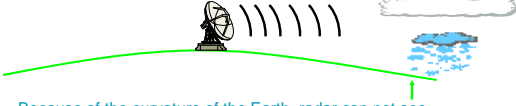
Very few clouds over site

Ground Cover will have very little movement and encircle the radar.

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### Locating "real" precipitation

Why does radar sometimes not show all the precipitation?




Because of the curvature of the Earth, radar can not see lower snow clouds very far from the radar site. However, it can see the mid and high level clouds of an approaching storm, and since these clouds do reflect well, it appears that precipitation is closer than it really is.

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Why does radar sometimes show snow everywhere but it is not snowing out the window?

One common weather feature that can be misleading to view on Radar is Virga.



Dry Air

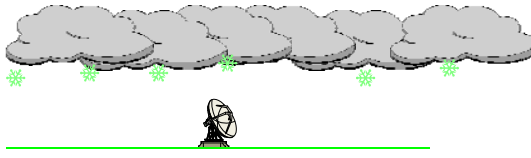
As the snow falls from the clouds it falls into the drier air near the surface which causes the snowflakes to evaporate before they reach the ground.

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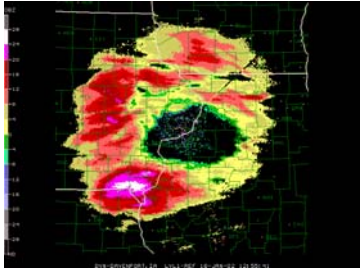
### How does this look on radar?

On Radar, it will appear there is snow nearby, and sometimes it will even look like snow is all around the radar but not at the radar site.



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### Classic Doughnut Hole Example



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As the snow falls, it slowly increases the moisture in the atmosphere (increases surface dew point) allowing the snowflakes to fall closer to the ground over time.

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There is one location we can look at where weather has a huge impact on our job.

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### Pavement Condition

- The most important weather condition ANYONE responsible for winter maintenance should monitor is pavement temperature.
- Pavement temperature** is the key because this is where the weather is impacting the road surface.

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### Other Weather Parameters

- Air temperature – still important
  - Above freezing equals rain
  - Below freezing equals snow
- Dew Point – critical!
  - Monitor frost/black ice formation
  - Monitor the start of falling snow
- Winds
  - Blowing and drifting

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### How can we monitor pavement weather?

- We need to use something that can accurately measure pavement temperature.
  - Human Eye – “Doesn’t snow accumulating on the pavement mean road is below freezing?” Not necessarily!
    - What do you use before there is snow or ice on the road?
  - Handheld temperature sensor – check accuracy
  - Mobile Sensors
  - Road Weather Information Systems

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### The First Mobile Weather Station

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### The Next Step in Mobile Weather

- Air Temperature
- Dew Point
- Relative Humidity

Display

Probe

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### Year-round Uses of Moisture Data

- There are year-round uses for moisture information
  - Paint Spraying – helps predict drying time
  - Weed Control – some chemicals can only be sprayed at certain levels
  - Chip Sealing
- This sensor gives the moisture reading exactly where you are, not at an airport or RWIS site a great distance away.

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### Fixed Weather Stations

- State DOTs, larger cities and counties, and airports have invested in Road Weather Information Systems (RWIS) over the past 35 years.
- “A single RWIS site could be 50-100 thousand dollars! For one site”
- “A small city could never afford, or see the return on investment from an RWIS site.”
- When RWIS first came out it was expensive, but there has been a shift in the industry towards **low cost alternatives**.

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### Improvements in technology will be key for municipalities.

- Non-intrusive Sensors
  - Less expensive to install
  - Less expensive to maintain
  - Better measurement of road condition
  - Provides a new condition: Road friction
- Vendor hosted systems
  - Easier to deploy
  - Lower up-front costs

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### Keys to RWIS for municipalities

- Lower communication costs
  - Digital modems make data collection cheaper
- Lower cost total solutions
  - Overall costs drop prices by \$25,000
- Manufacture hosted solutions are also cost effective

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### The benefits of fixed RWIS

- Road data 24/7...alerts....nothing else offers true 24/7
- True scientific data not some guess...makes decision making more accurate.
- RWIS provides:
  - Pavement temperature
  - Road condition
  - Atmospheric conditions
  - Amount of chemical on road
  - Traffic data
- Automatic activation of signage for flooding, winds, traffic, etc.

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### Can't I just use a video camera?

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### Lost Trail Pass, Idaho : Guess the driving conditions on the following days?

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### Did you get them right? The weather sensors did!

<p>Air Temp: 29°F Road Temp: 32°F Road State: Wash Grip: Good</p>	<p>Air Temp: 25°F Road Temp: 30°F Road State: Dry Grip: Excellent</p>	<p>Air Temp: 28°F Road Temp: 43°F Road State: Wet Grip: Good</p>
<p>Air Temp: 20°F Road Temp: 32°F Road State: Ice Grip: Poor</p>	<p>Air Temp: 23°F Road Temp: 43°F Road State: wet Grip: Good</p>	<p>Air Temp: 24°F Road Temp: 37°F Road State: Ice Grip: Very poor</p>
<p>Air Temp: 36°F Road Temp: 39°F Road State: Dry Grip: Excellent</p>	<p>Air Temp: 23°F Road Temp: 31°F Road State: Ice Grip: Poor</p>	<p>Air Temp: 14°F Road Temp: 21°F Road State: Dry Grip: Excellent</p>

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### Guess the driving conditions?

Malad Summit, Idaho  
April 4<sup>th</sup> 2009 0650am

Malad Summit, Idaho  
April 4<sup>th</sup> 2009 0950am

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### Did you get it right? The weather sensor did!

Malad Summit, Idaho  
April 4<sup>th</sup> 2009 0650am  
Cross Wind 36 MPH

Malad Summit, Idaho  
April 4<sup>th</sup> 2009 0950am  
Cross Wind 6 MPH

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### The future is everything!

And only a weather forecast can give it to you!

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### Is this really relevant to your job?

Right Now	Next 36 Hours		
 Cloudy <b>43°F</b> Falls Low: 38° Get FREE weather on your desktop!	 Tonight Alpn / Snow Showers / Wind <b>33°</b> Low	 Tomorrow All Snow Showers <b>49°</b> High	 Tomorrow Night Snow Showers Late <b>31°</b> Low
Past 24 hr Snow: 0 in Past 24 hr Precip: 0.05 in (est.)	Snowfall: <b>0 in</b> No significant snow accumulations	Snowfall: <b>0 in</b> No significant snow accumulations	Snowfall: <b>0 in</b> No significant snow accumulations
Wind From SW at 12mph	Wind SW at 10 mph	Wind SW at 11 mph	Wind SW at 8 mph
Hourly   Text Forecast   Video	Hourly Graph	10-Day Forecast	

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### False Sense of Security = Internet



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### What kind of forecast is right for us?

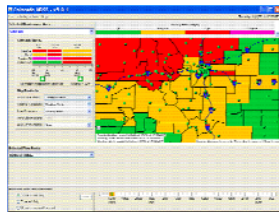
- Provides specific timing
- Provides accurate and meaningful percentages
- Provides road temperatures
- Significant road weather event information
  - Frost
  - Black ice
  - Freezing Rain (freezing where?)
- Consultation
- Updates that are there when you make your decisions



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### Pavement Weather Forecast


- Precise timing when pavement temperature will go above and below freezing.
- Newer software solutions offer decision support such as chemical applications amount and timing.
- Pavement forecasts and decision support solutions offer a more complete level of support.



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### What is that forecast really telling you?

- The key to using weather is not always reading them for their face value...what is the forecaster really trying to say...even if they don't know it.
  - Probabilities of Precipitation
  - Air Temperature
  - Precipitation Type
  - Accumulations
  - Trends



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### Forecast Trends

- Watching how a forecast trends is probably one of **best ways** to determine where the real outcome likely will be.
- For example a forecast for Friday:
  - On Tuesday - Snow: 1-3" Start: Noon-2pm
  - On Wednesday - Snow: 1-3" Start: 1-3pm
  - On Thursday - Snow: 2-4" Start: 2-4pm
  - On Friday Morning - Snow: 3-6" Start 5-7pm
  - Actual: 5" of snow Start: 8pm

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## Summary

- Make sure we have weather tools that are relevant to our job!
- We must have a weather plan, and a plan to grow as our experience, needs, abilities grow.
- The internet is wonderful tool to monitor the weather, however it is not perfect.
- Road weather solution options have improved greatly. Don't think it is out of your reach.
- Choice a good source for weather forecast, one with a pavement forecast is best.

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## Questions?

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