



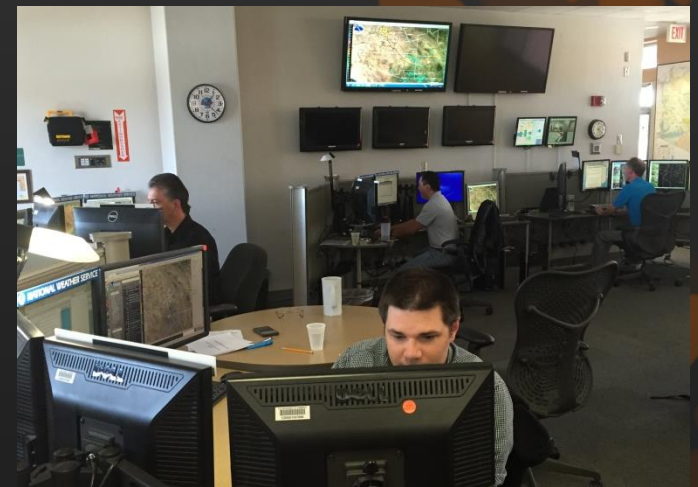
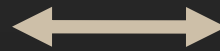
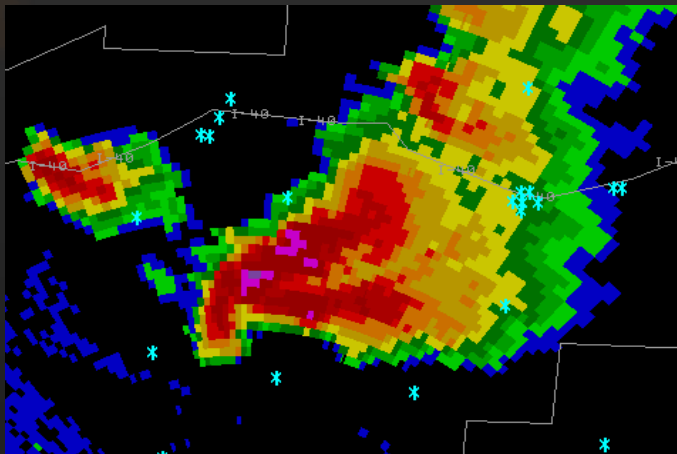
Severe Weather 101

National Weather Service - Tucson, Arizona



Help us...

- Recognize features associated with severe weather
- Report severe weather in **real time** to NWS meteorologists
- Be an integral part of the warning process



...and we can help you, too!

- Documentation of weather events/damage such as frost and hail can help with insurance claims
- Your observations help improve our forecasts for your area



Severe Weather Climatology of AZ

(From Shoemaker and Davis, 2008)

Flash Flood/Flood

- 75% July – Sept, secondary maximum Jan - Mar
- Most occurrences 4 pm – 7 pm
- 2nd to extreme temps in fatalities

Severe Wind (≥ 58 mph)

- Average 29 per year
- Thunderstorm winds peak in Jul & Aug
- Most occurrences 3pm – 9 pm with peak at 7 pm
- Record measured thunderstorm wind speed for AZ is 175 kts in Yavapai Co, 9/6/96 at 11:15 am (FGZ)

Tornadoes

- Average 4 per year
- 196 reported since 1950 with 3 fatalities
- Over 95% occur May - Sept, with 60% occurring July – Sept
- Majority b/w 11 am & 11 pm

Hail

- 12 severe events per year ($> 3/4$ "*)
- Damaging hail most common June – Aug, secondary peak in Sept
- 70% of occurrences 2 pm - 6 pm
- Record for AZ is 4.5" in Yavapai Co, 9/28/95 (FGZ)

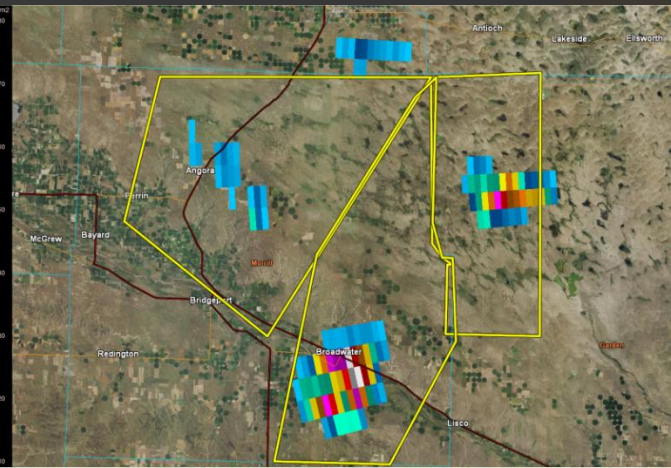
Hail Detection - Nebraska

- First guess at hail probability and detection often comes from radar
- Use products like VIL, MESH, and POSH to detect hail in storms
 - This becomes a problem in areas where there is beam blockage

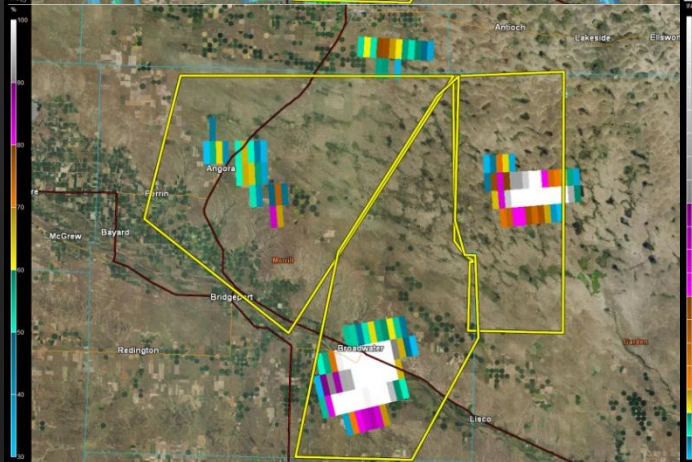
Z



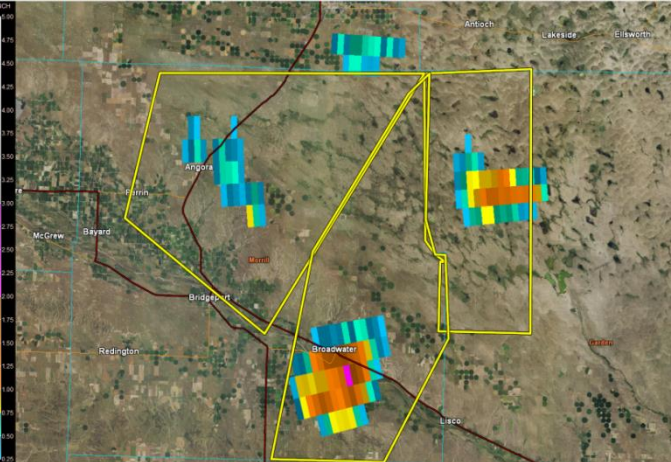
VIL



POSH



MESH

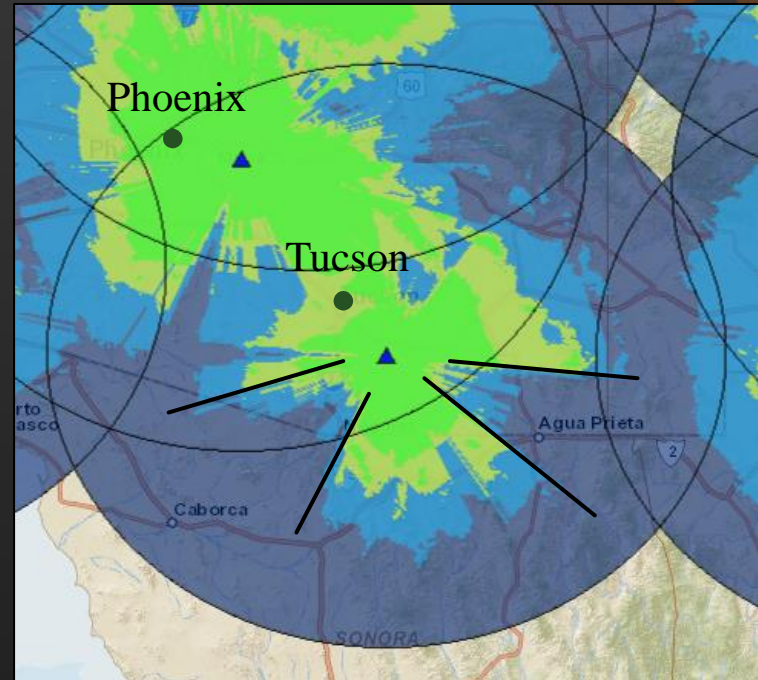


SEAZ Radar Coverage

- Coverage gaps/beam blockage for several locations
- Radar information alone cannot support an insurance claim

Radar Coverage

Best	
Better	
Fair	
Limited	

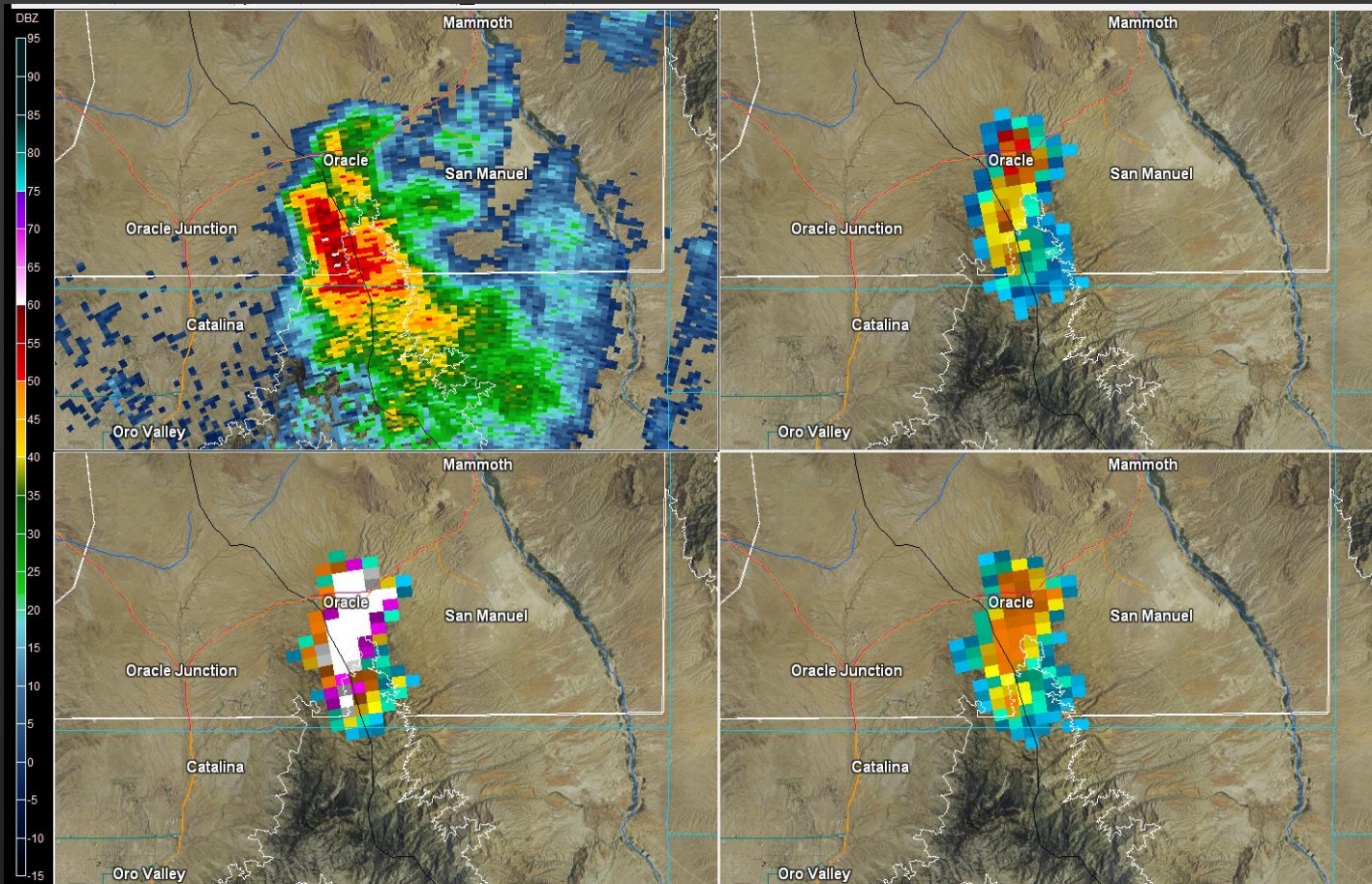


SEAZ Hail Detection Ex 1

No Beam Blockage

1" Hail in Oracle

Z

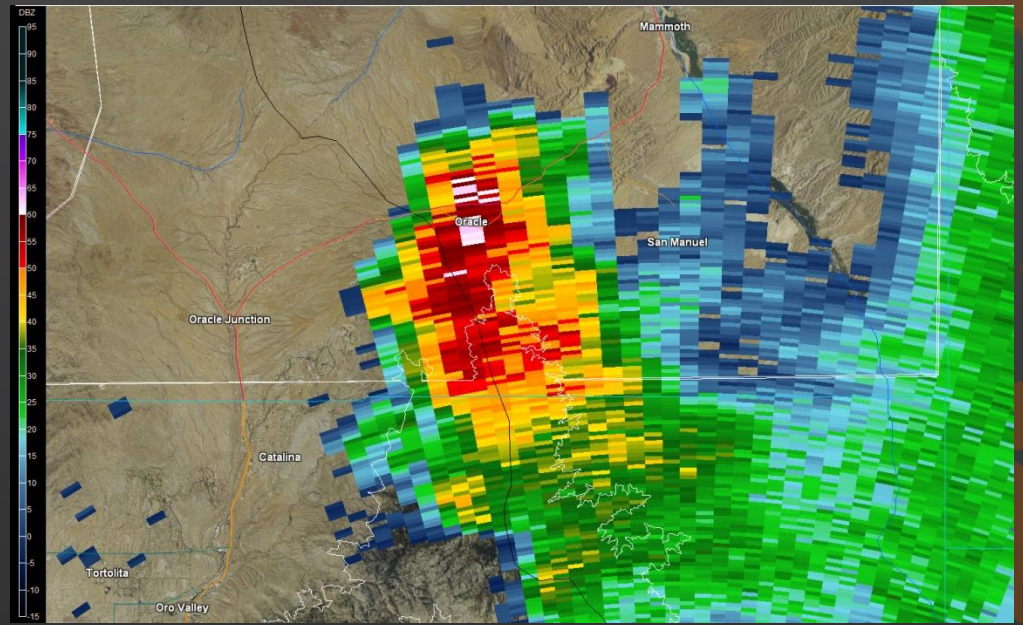


VIL

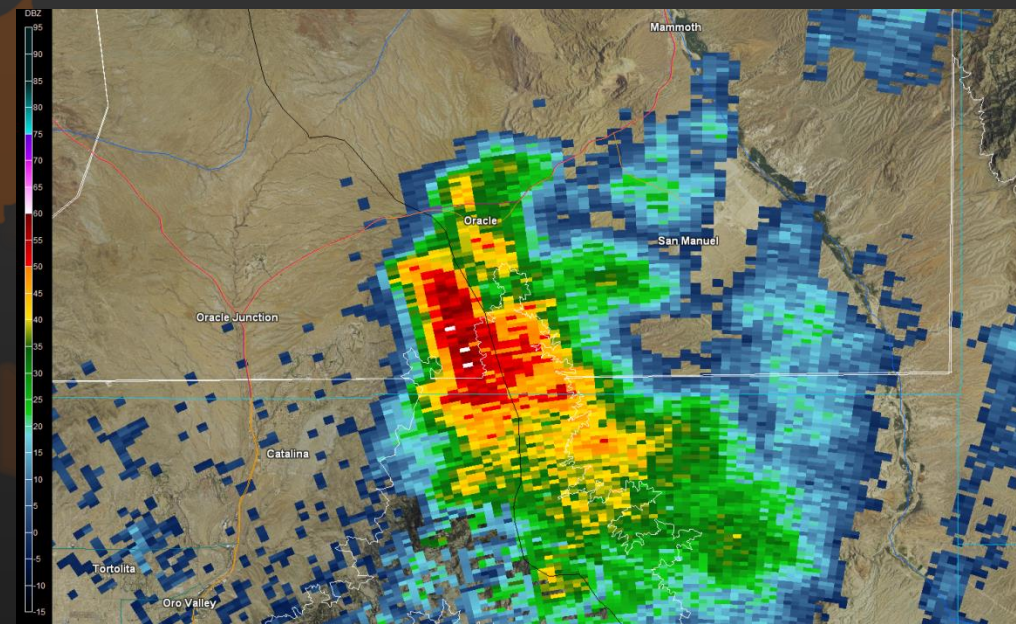
MESH

POSH

Reflectivity



Mid-Level



Low-Level

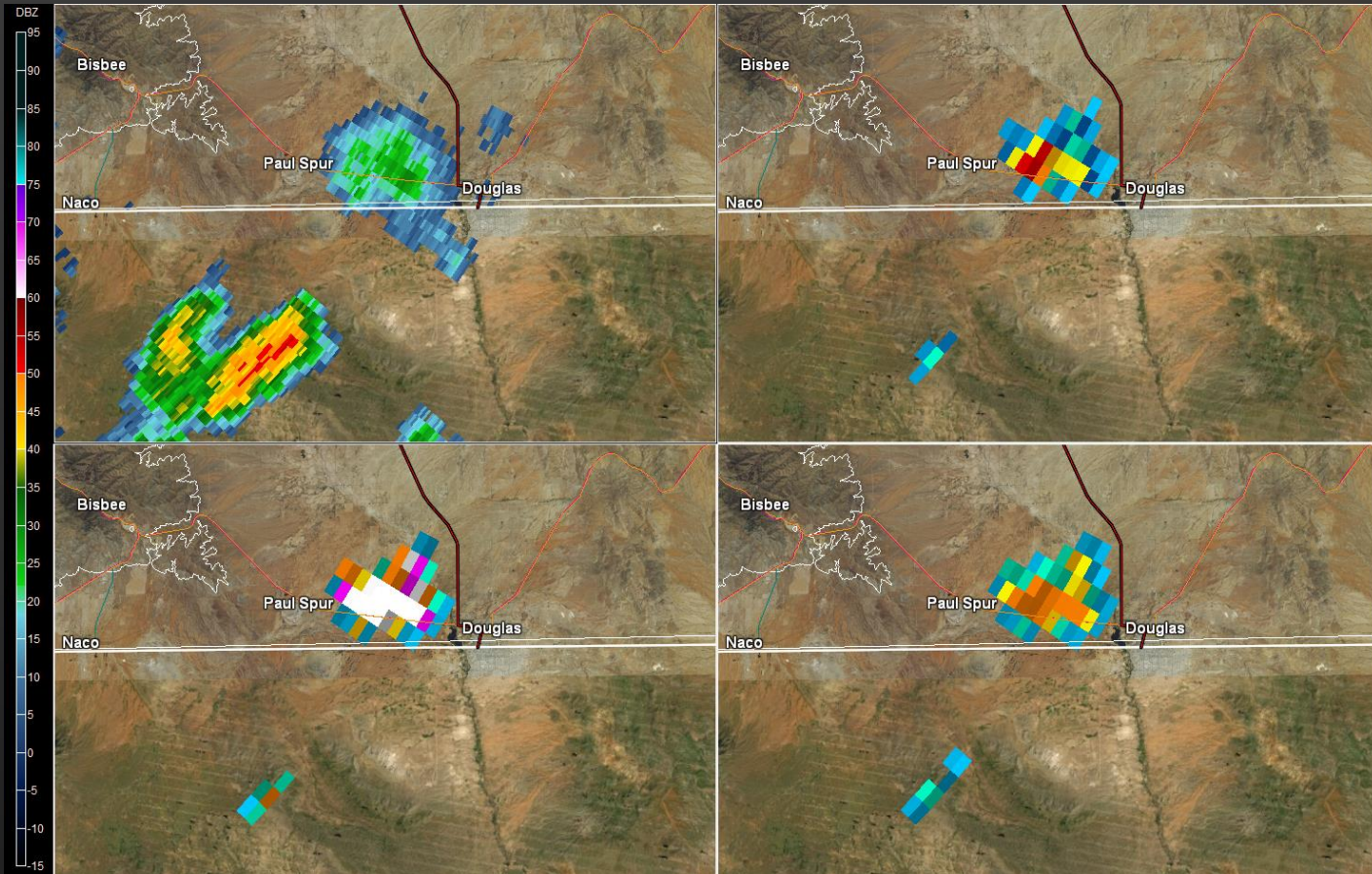
SEAZ Hail Detection Ex 2

Extreme Beam Blockage

1.25" Hail west
of Douglas

Z

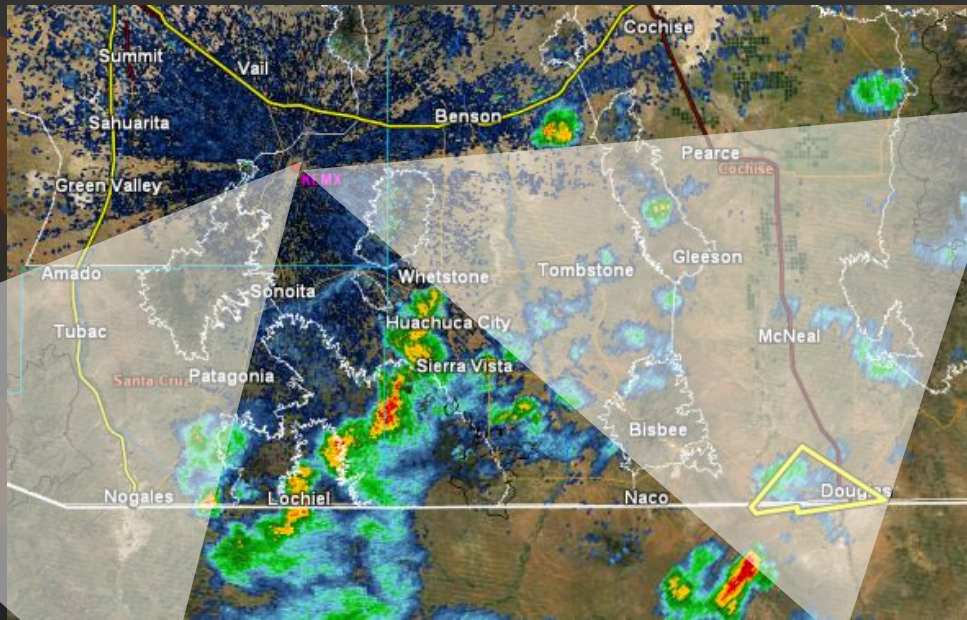
POSH



VIL

MESH

Reflectivity



Mid-Level

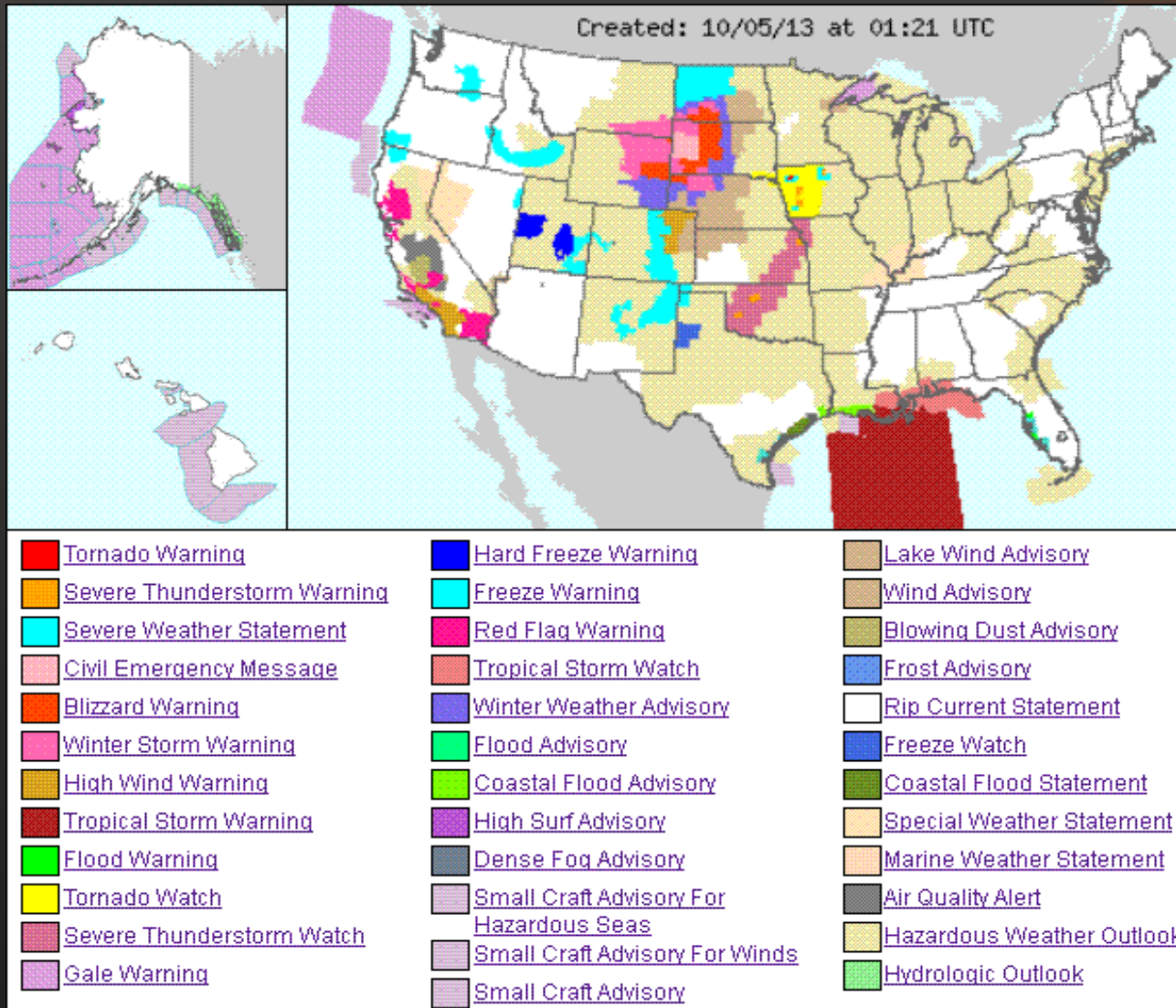
Low-Level

Hail Pad



- Consists of a 12" X 12" square of styrofoam covered in heavy duty aluminum foil
- East to construct and relatively inexpensive
- Good first guess to hail size
- Can be used as evidence of a hail event occurring
- More details can be found at <http://www.cocorahs.org>

NWS Map of Colors (WWA)



Watch, **Warning**, and **Advisory**

■ Watch

- Issued when life-threatening weather is possible.
- Be prepared. Remain alert to changing conditions.

■ Warning

- Issued when life-threatening weather is imminent or ongoing.
- **Take action NOW to protect yourself and your property!**

■ **Advisory**

- Issued to bring extra attention to hazardous but non-severe/non-life-threatening weather.
- **Special interest groups may want to take some kind of action.**

Hydrology Products

- Flood – Mainstem Rivers (Gila and Santa Cruz Rivers), long duration
- Flash Flood – Short duration, can occur anywhere
- Areal Flood – Wide spread, likely not life-threatening
- Urban and Small Stream Flood – Localized, not life-threatening

Hydrology Products

- Flash Flood and Flood Watches
 - Issued 6 hours to few days in advance
- Flash Flood and Flood Warnings
 - Issued 30 minutes to 12 hours in advance
- Flood Advisories
 - Issued 30 minutes to a few hours in advance

Scales of Predictability

Severe/Fire Wx

Days

- SPC – Outlooks
- WFO – Fire Wx Watch (within 96 hours)

Hours

- SPC – Watches
- WFO – Fire Wx Warning (within 48 hours)

Minutes

- WFO – Warnings/Special Weather Statements

Dust/Hydro

Days

- WPC – Precip Outlooks
- WFO - Watches (sometimes) issued within 48 hours of hydro event

Hours

- WFO – Advisory for dust *occasionally* issued within 24 hours

Minutes

- WFO – Warnings/Advisories

Winter Wx

Days

- WFO - Watches issued for winter wx/freezing conditions (within 48 hours*)

Hours

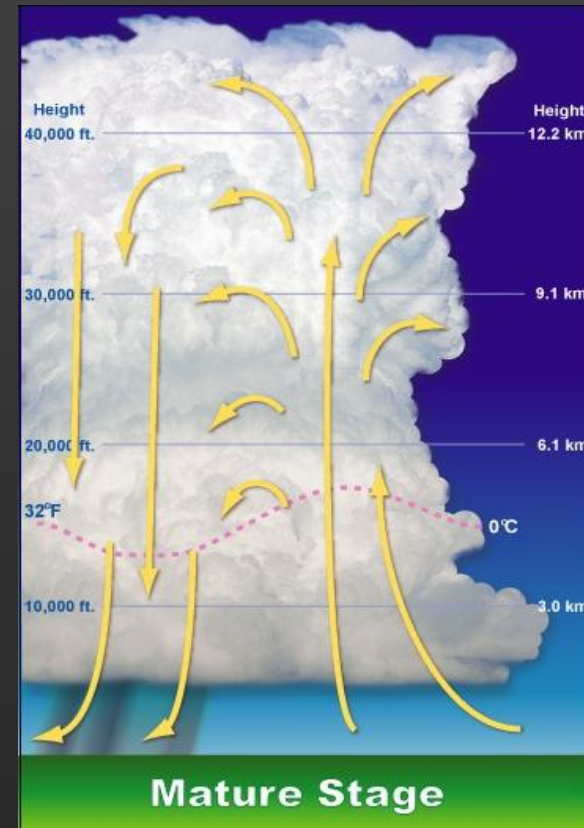
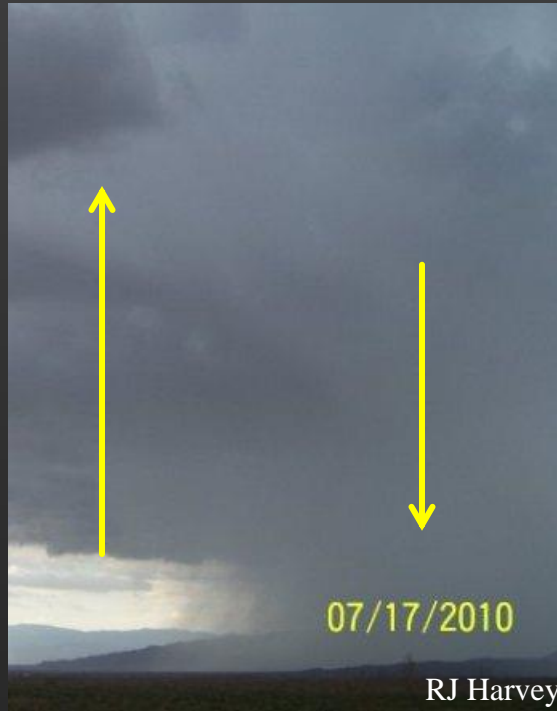
- WFO – Warnings/Advisories issued for winter wx/freezing conditions (within 24 hours*)

*Heat/Wind/Dense Fog

Severe Weather Spotting



Typical Arizona Thunderstorms “Pulse-Severe”



- Life cycle of typical pulse-severe thunderstorm is only 30-60 minutes
- A **SEVERE** thunderstorm produces:
 - Hail ≥ 1 " diameter and/or wind gusts ≥ 58 mph with or without damage

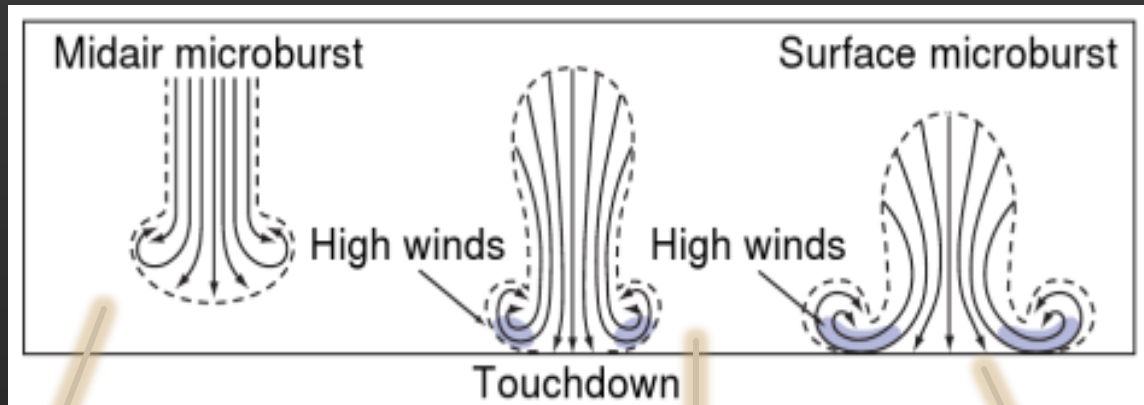
Rotating “Supercell” Thunderstorms

- Not as common in AZ, but do sometimes occur
- Almost all supercells produce severe weather
 - Rotation separates the updraft & downdraft
 - Updrafts are stronger
 - Storms can survive several hours



Downbursts & Microbursts

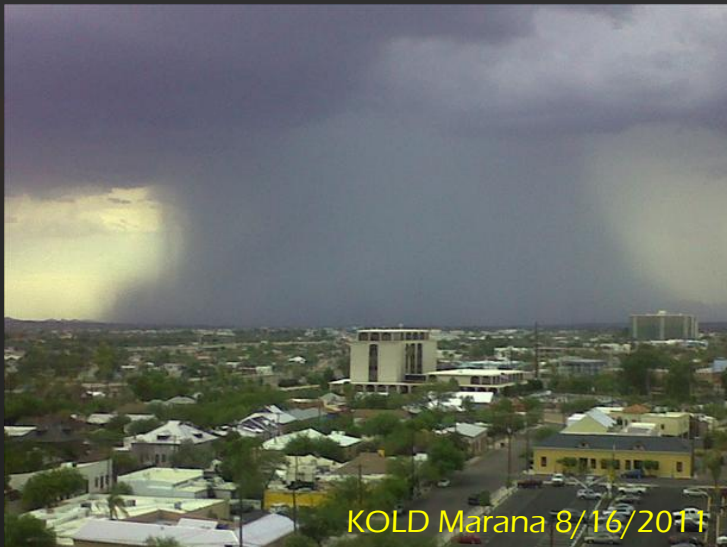
- Downward rush of cool air (and sometimes rain) hits the ground
- Spreads out horizontally in all directions



Downbursts & Microbursts

- Same process, different size
 - Microburst is smaller
- Can be “wet” or “dry”
 - Is rain reaching the ground?
- Can trigger blowing dust and haboobs
- Can do extensive damage

Wet



KOLD Marana 8/16/2011

Dry



Brian Morganti.

Wall Clouds

- Abrupt, localized, persistent cloud lowering below the base of a thunderstorm
 - Rare feature in Arizona, but can occur
 - If a wall cloud is rotating: keep watching
 - If you see a funnel, call it in!



07/13/2014 Tucson – Kelly Hansen



07/22/2012 Elfrida

Other Thunderstorm Cloud Features

Shelf Cloud



Roll Cloud



Mammatus



Hail

- ❖ Not all thunderstorms produce hail
- ❖ Measure with a ruler or compare to a coin or ball
- ❖ Very rarely larger than golf balls (1.5") in Arizona



Rio Rico May 9, 2012 courtesy of Terry Ketron and Nogales International

Tornadoes

- Funnel Cloud
 - Funnel-shaped, rotating column of air extending from cloud base but not touching the ground
- Tornado
 - Violently rotating column of air extending from cloud base to the ground

Funnel
Cloud



Tucson Glider & KOLD 07/04/2012

Dust Devils

- Usually occur on hot and unstable days
- NOT a tornado
 - *Can* become a landspout tornado if connection to a cloud base is established



Flash Flooding

- Short duration/rapid onset of dangerous flows in normally dry washes, low-lying areas, or roadways, usually due to heavy rain or dam/levee failure



7/29/2012 Silverbell Road - KOLD

Blowing Dust

- “Haboobs” are often a result of thunderstorm downbursts



- “Channelized” dust storms can be just as dangerous if not more since they can happen quickly and without warning

What to Report

- Sustained wind or gusts 45 mph or stronger
 - Measured with an anemometer
 - Effects using the handout
 - *Severe* winds are ≥ 58 mph
- Any wind damage
 - Including roof damage, downed power poles or trees
 - Tree/branch type & size
 - Building type/material
- Hail
 - The size of dimes or larger
 - Coins, golf balls, or measure using a ruler
 - Largest size observed & any damage
 - Accumulations of small hail which create slick roads

What to Report

- Funnel clouds
 - Watch for organization, rotation, and persistence
- Tornadoes
 - Did you see any damage?
 - How long was it on the ground?
 - Beginning and ending times
 - How wide was it? How far did it travel on the ground (if known)?
- Property damage (including road damage) or road closure due to flooding
- Water, greater than 8 inches deep, rapidly moving across any road
- Water, at least 12 inches deep, moving down a normally dry wash or stream bed
- Heavy rain
 - More than 0.50" in less than 1 hour

What to Report

- Reduced visibility
 - Less than 1 mile, for any reason (dust, fog, smoke, snow)
 - Accompanying wind speeds are helpful
- If you are in dust...
 - Is it getting worse?
- If you are seeing a wall of dust in the distance...
 - Approximately how tall/wide from your vantage point?
 - How far away are you?
 - What direction are you looking and what direction is the dust heading?
- Winter Weather
 - Freezing rain, ice accumulation on roads or damage
 - Significant snowfall accumulation or damage
 - Specifically if it is covering the road
- Any other weather-related property damage, injuries, or fatalities

What NOT to report...

- Cloud features such as mammatus, roll clouds, or shelf clouds
- Hail smaller than dimes or ambiguous terms
 - "Peas" "Corn" "Marbles" "Grapes"
- "Really strong winds"
 - Use wind speed chart
- Non-rotating wall clouds
 - If a wall cloud does begin to rotate, please report it!
- Lightning, thunder, dust devils, gustnadoes
 - Unless damage or injuries have occurred

What NOT to report...

- Light rain amounts
 - Less than 0.50" in an hour
 - Less than 0.25" in 15 minutes
- "Washes are running" or "a little" water in low water crossings
 - Normal non-life-threatening runoff
- Rain reports the next day
 - We need them in real time for warning purposes
- Sparse areas of elevated blowing dust
 - If there is not a hazard
- If visibility appears to be greater than 1 mile

Reporting by Telephone

- **Who** you are (if no spotter number)
- **What** you are seeing
- **Where** you are seeing it
 - Distance & direction from your location
 - Are you home? Use cross streets or well-known landmarks
- **When** you saw it
 - Now? 10 minutes ago? Beginning and ending times are helpful
- Don't be afraid to express any uncertainty to you have
- **PLEASE** keep your calls short and specific

Tucson Local Calling Area
(520) 670-5162

Toll-free
(800) 238-3747

Reporting Via Twitter

- Twitter is currently our most valuable form of social media for storm reports
 - ✓ We get reports in real time and it allows us to see photos
 - ✓ Gives us the ability to tweet you back if we need more information
- When reporting on Twitter:
 - ✓ Please use **#azwx**
 - ✓ Tweet us directly **@NWSTucson**





Reporting Via Twitter



Darren McCollum
@DarrenMcCollum

Follow

Pocket change! After 1 hour of melt. #hail
#azwx #flagstaff #monsoon2013



6:02 PM - 2 Jul 2013

Additional Training Online

<https://www.meted.ucar.edu/index.php>

- ✓ Optional, additional information in the form of 2 online courses
- ✓ About 2 hours long
- ✓ FREE!

- To become a certified Skywarn Weather Spotter, you must attend a local training session
- We offer multiple sessions at various locations each spring
- FREE

The screenshot displays the MetEd website interface. At the top, there is a navigation bar with the MetEd logo and links for 'Sign Up', 'Have an account?', and 'Sign In'. Below this is a secondary navigation bar with tabs for 'HOME', 'EDUCATION & TRAINING', 'COMMUNITIES', 'RESOURCES', 'ABOUT', and 'MY METED'. The main content area is titled 'Course Listing » Course Description' and features a search bar. The featured course is 'SKYWARN® Spotter Training'. It includes a thumbnail image of a sunset over water, a description of the course, and an 'Enroll' button. The course details are as follows:

Course Title	Language	Completion Time	Topics	Average Score
SKYWARN® Spotter Training	English	2 hrs	Convective Weather, Other	N/A

Below the course details, there are tabs for 'Description', 'Objectives', 'Overview', and 'Additional Resources'. The 'Description' tab is active, showing the following text:

Description

This course covers the basics of being a SKYWARN Spotter. The goal of the course is to provide baseline training for all spotters through multiple modules covering the procedures for spotting (including communication and spotter report criteria) and safety considerations for all hazards.

You can choose to register as a SKYWARN Spotter with the National Weather Service (NWS) by using the checkbox that appears after you Enroll in the course. If you check the box, you may be able to register with the NWS after passing the course. Your local NWS Warning Coordination Meteorologist will determine if there is additional training on other weather hazards, such as heavy snow, ice storms, floods, etc., and their reporting that must be completed through local spotter training.

For questions or more information about the SKYWARN Spotter program of the NWS, visit <http://www.weather.gov/skywarn/> or the "Frequently Asked Questions" (FAQs) under the "Overview" tab of this course page.

Below the description, there is a 'Course Outline' section with a table of 'Core Topics':

Topic Title	Language	Publish Date	Skill Level	Topics
Role of the Skywarn Spotter	English	2011-04-22	1	Convective Weather, Emergency Management
Skywarn Spotter Convective Basics	English	2011-04-22	1	Convective Weather, Other

On the right side of the page, there is a 'What is a Course?' section and a 'Registration Support and FAQs' section. A 'Go' button is located at the bottom of the right sidebar.

Ag-Specific Reports

- Widespread **freezing temperatures** or **frost** during vulnerable times of the year
- Significant amounts of **small hail**

- ✓ Especially if losses have occurred
- ✓ Document with photos and e-mail us (use hail pad if available)
- ✓ In both cases, we can document an estimated dollar amount of loss with your report

Official Documentation

- If you'd like to have an official record of storm damage for something such as an insurance claim, you may e-mail photos to us at nws.tucson@noaa.gov with information on what, where, and when the damage occurred.
- Your damage report will be prepared by us and sent to NCEI (formerly NCDC). Their database is the "official" source for storm damage information which can be used in legal cases.



National Centers for Environmental Information


Questions?

NWS Tucson

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