Spotter Training for Northwest Alaska

National Weather Service Fairbanks, AK

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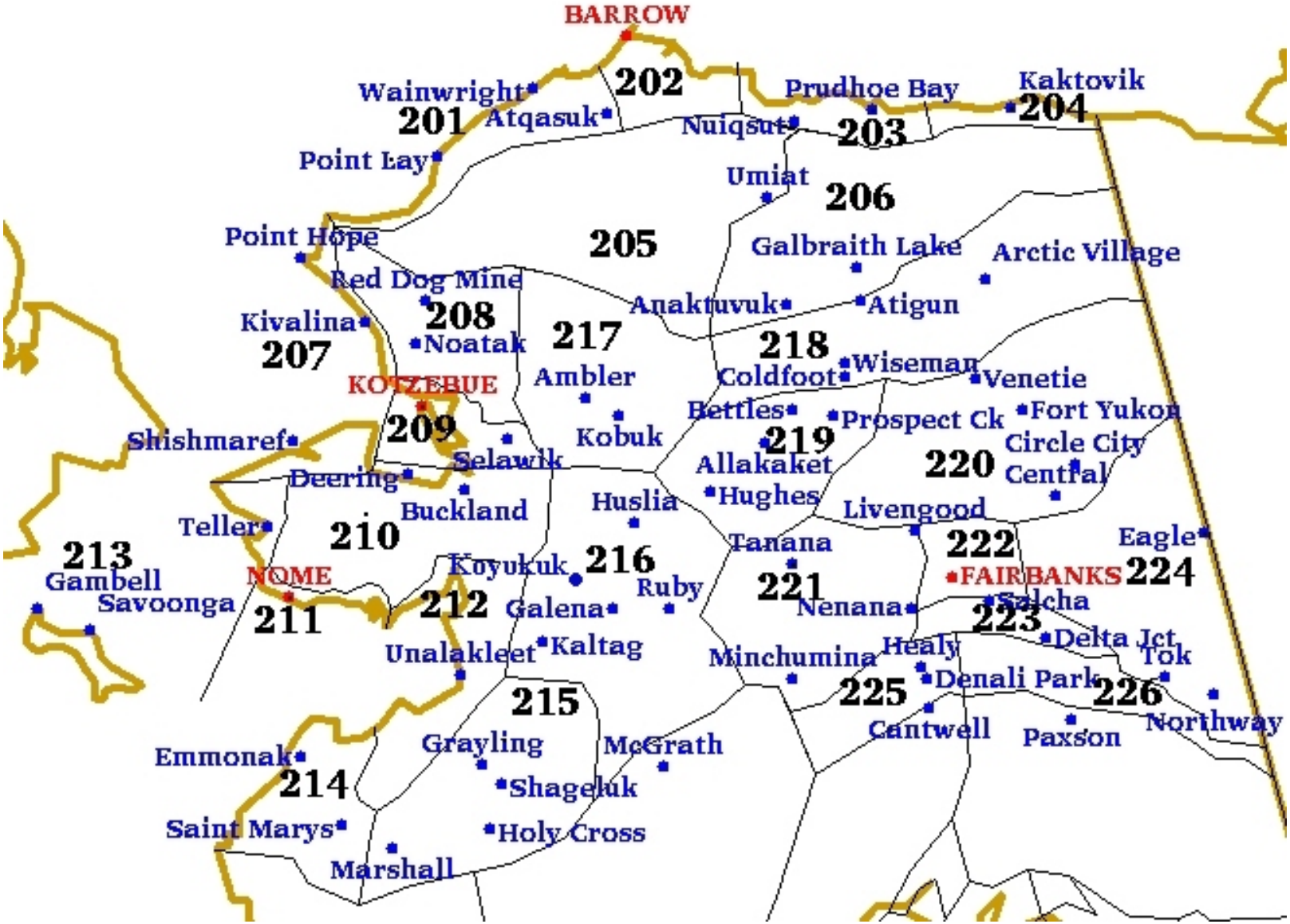
Outline of Training

- Overview of NWS Operations
- Criteria for issuing Warnings and Advisories
- Data Types used in developing Warnings and Advisories
- Why Spotters are important
- When Spotter Observations are needed
- How to take Spotter Observations

Overview of NWS Operations

Northern Alaska: 26 Public Zones



Overview of NWS Operations

- Routine Forecasts
  - Public - 5am and 4pm
    - Periods: 12 hour time segments
      - Day: 6am-6pm
      - Night: 6pm-6am
    - Each Period contains:
      - Sky Cover
      - Precipitation, if any
      - Temperature: High (Day) or Low (Overnight)
      - Wind Speed and Direction - average and maximum: First 5 periods
    - Covers 7 days
    - Site Forecasts for Specific Locations:
      - Temperature: Maximum, Minimum
      - Probability of Precipitation

Overview of NWS Operations

Example Zone Forecast

```
AKZ209-200000-
BALDWIN PENINSULA AND SELAWIK VALLEY-
INCLUDING...KOTZEBUE...SELAWIK...NOORVIK
500 AM MONDAY MAY 19 2003

...DENSE FOG ADVISORY IS ENDED...

.TODAY...PARTLY CLOUDY. HIGHS 45 TO 55. EAST WINDS 5 TO 15
MPH.
.TONIGHT AND TUESDAY...PARTLY CLOUDY. LOWS 35 TO 40. HIGHS
45 TO 55. EAST WINDS TO 15 MPH.
.TUESDAY NIGHT AND WEDNESDAY...PARTLY CLOUDY. LOWS 35 TO
40. HIGHS 40 TO 50. LIGHT NORTHWEST WINDS.
.THURSDAY THROUGH SUNDAY...PARTLY CLOUDY. LOWS 30 TO 40.
HIGHS 40 TO 50.

.<          TEMPERATURE / PRECIPITATION
KOTZEBUE     49  37  52 /    0   0    0
```

Overview of NWS Operations

- Marine - 4am and 4pm
  - Six Zones
  - Period format:
    - Separate 12 hours for first 48 hours
    - 24-hour segments for days 3-5
  - Includes:
    - Wind Speed
    - Wind Direction
    - Sea Height
    - Significant Weather Through Day 3
  - Advisories and Warnings during first 2 periods.

Overview of NWS Operations

- Aviation - Issued every 6 hours
  - 12 TAF (Terminal Aerodrome Forecast) Sites:
    - Fairbanks, Delta Junction, Northway, Tanana, Bettles, Galena, Unalakleet, Nome, Kotzebue, Barrow, Nuiqsut, Deadhorse
  - Contain:
    - Wind speed and direction
    - Cloud heights
    - Visibility
    - Weather Type
  - Covers 24 hours, emphasis on first 6-12 hours

Overview of NWS Operations

- Fire weather forecasts (May through August)
  - Issued twice daily for interior Public Zones (8am & 5pm)
  - In addition to Clouds, Weather, Temperature, Wind
    - Thunderstorm Type: wet or dry
    - Relative humidity
  - "Red Flag" Warnings issued for extreme conditions
  - Upon request, Spot Forecasts are written to support fire fighting efforts at particular fires.
  - Incident Meteorologists (IMETs) are dispatched to wildfire areas where on-site forecasting expertise is needed.

Overview of NWS Operations

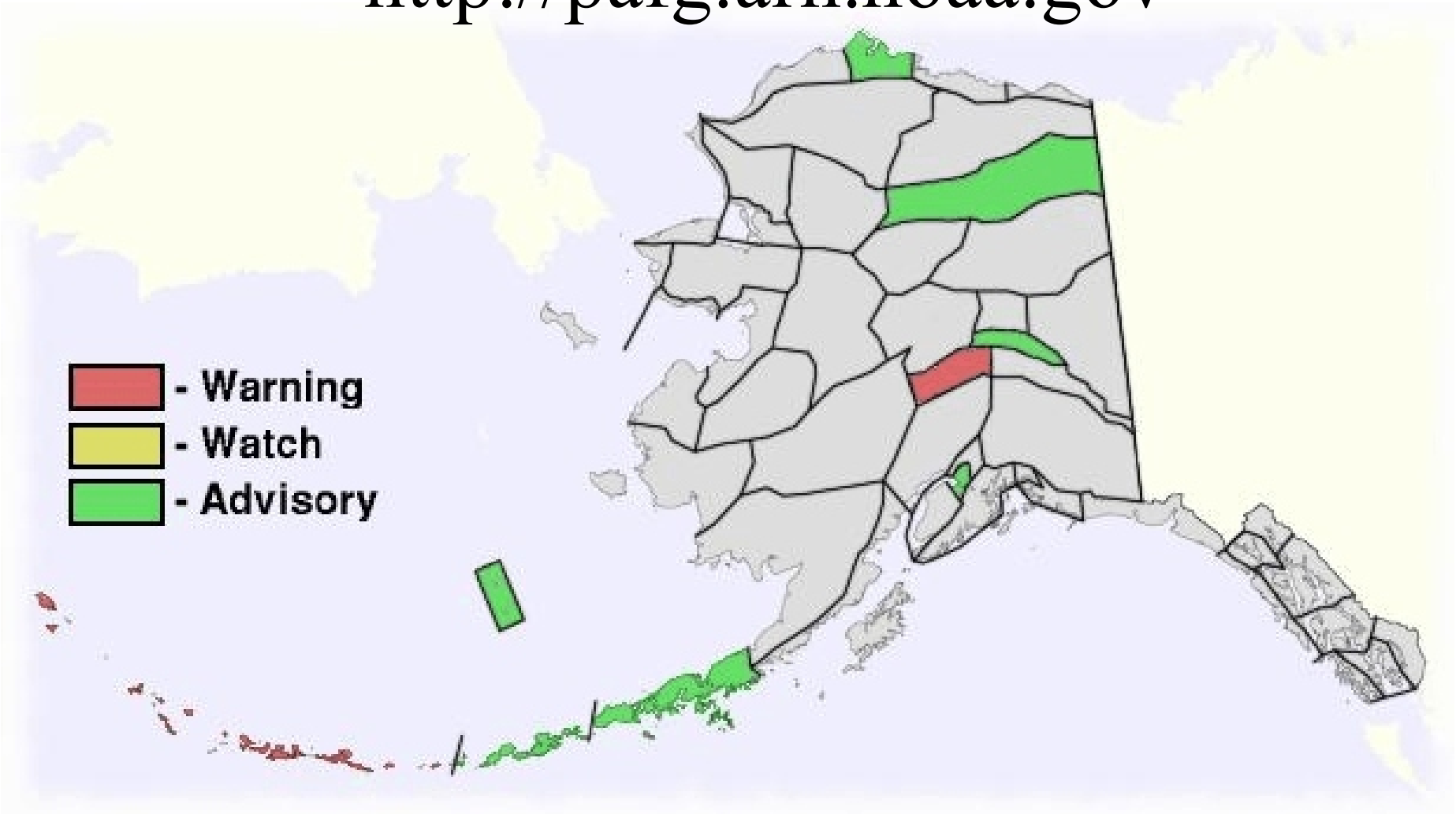
- Non-Routine Products:
  - Nowcast/Short Term Forecast:
    - Issued for:
      - Middle Tanana Valley (Zone 222 - Fairbanks Area)
      - Northern Arctic Coast (Zone 202 - Barrow Area)
      - Baldwin Peninsula and Selawik Valley (Zone 209 -Kotzebue Area)
      - Southern Seward Peninsula Coast (Zone 211 -Nome Area)
    - Lasts up to 6 hours; provides detail in the form of precipitation begin, end, amount, areal extent or movement, etc. May be issued routinely.
  - **Watches and Warnings**: Public and Hydrologic
    - Headlines in Public Forecasts
    - Separate Bulletin, with 6-12 hour "normal" update cycle
    - Initial Warning - **Alarmed** on NOAA Weather Radio
  - Advisories - headlines only in Public Forecasts

Overview of NWS Operations

- **Public Advisory, Watch, Warning Program**
  - **Advisory**: a potentially hazardous weather event is occurring or imminent. Such an event does not reach the severity of a Warning, but could end up being hazardous
  - **Watch**: conditions are favorable for the development of a serious threat to life and property.
  - **Warning**: a serious threat to life and property is occurring, imminent, or has a very high probability of occurrence at the time the warning is issued.

Overview of NWS Operations

http://pafg.arh.noaa.gov



Advisories/Warnings and their criteria for Northern Alaska

- Winter Weather:
  - Blizzard:
    - **Warning**: Wind 35 mph (gusts or sustained) and visibility often <1/4 mile in Blowing Snow.
    - **Advisory**: "Blowing Snow" : 25-34 mph; frequently 1/4 mile visibility
  - Heavy Snow:
    - **Warning**: 6" in 24 hours or less
    - **Advisory**: 4-5" in 12 hours
  - Wind Chill
    - **Warning**: at least 15 mph and -60 F ***NEW*** Wind Chill or colder (-65 for zones 201-206
    - **Advisory**: at least 15 mph and -40 F ***NEW*** Wind Chill or colder (-50 for zones 201-206)

Advisories/Warnings and their criteria for Northern Alaska

- Winter Weather
  - Freezing Rain
    - **Warning**: 0.10"or greater, of ice accumulation on surface
    - **Advisory**: Trace to 0.10 inch of ice accumulation on surface
- Non-Precipitation
  - High Winds -
    - Gusts (few seconds) or
    - Sustained (few minutes)
    - **Warning**: 60 mph (50 mph for zones 201-206 and 218-226),
    - **Advisory**: 40 mph (35 mph for zones 222, 201-206; 50 mph for zone 213)

Advisories/Warnings and their criteria for Northern Alaska

- Hydrologic - Rivers overbank, Roads partially/fully washed out, structures threatened
  - Flash Flood Warnings - small streams (smaller than Chena) with time to crest < 12 hours from causative event.
  - River Flood Warnings - larger streams, rivers.
  - Ice Jam Flood Warnings - any stream or river.
  - Urban and Small Stream Flood Advisory - Non-life-threatening flooding of small streams, streets, low-lying areas

Advisories/Warnings and their criteria for Northern Alaska:

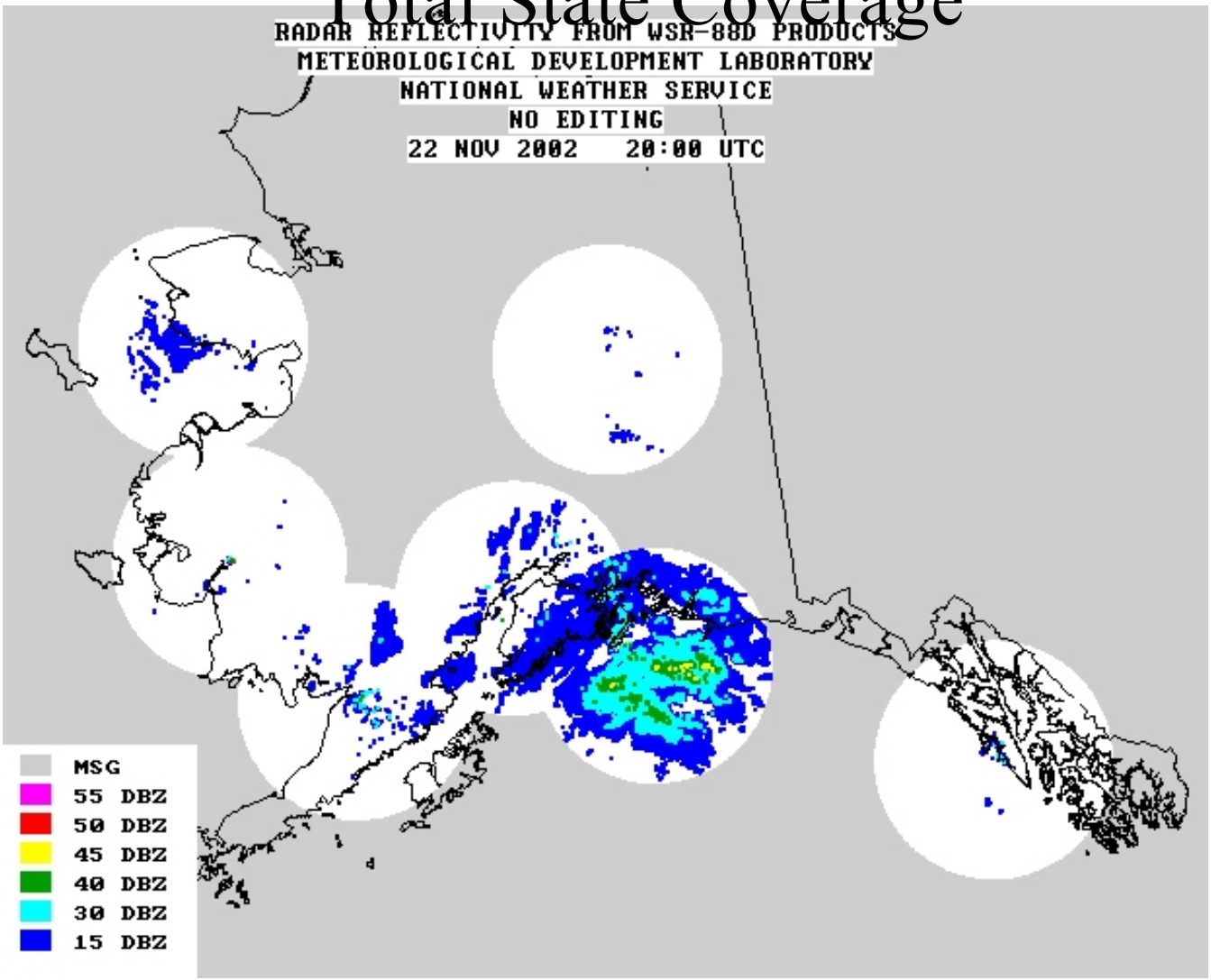
- Convective Weather (Thunderstorms)
  - Most all storms fall below Severe Criteria, but can produce:
    - High Winds, some Hail up to ½ inch, and Heavy Rain.
    - Special Weather Statements can be issued, (or a Short Term Forecast for zones 222, 202, 209, 211)
    - Currently Developing a Severe Weather Operations Plan to notify for Severe Thunderstorms
- Coastal Flood Warnings:
  - Issued for minor coastal flooding to major beach erosion

Data used to issue Advisories/Watch/Warnings

- Doppler Radar
- Satellite Imagery
- Upper Air Observations
- Surface Observations
  - Automated
  - Manual
  - Volunteer Daily (CO-OP)
- Computer Model output
- SPOTTERS!

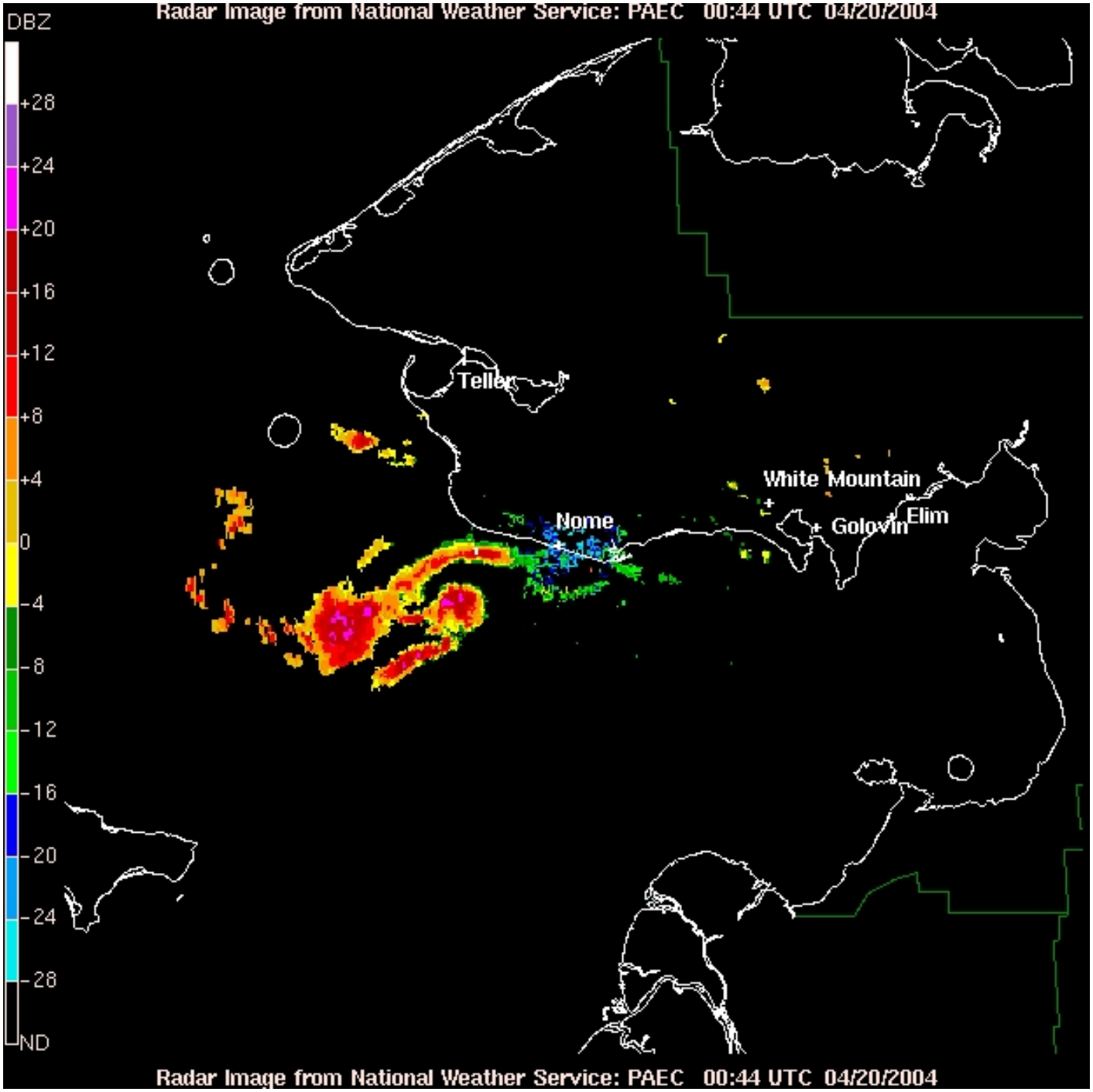
Doppler Radar

Total State Coverage



Doppler Radar

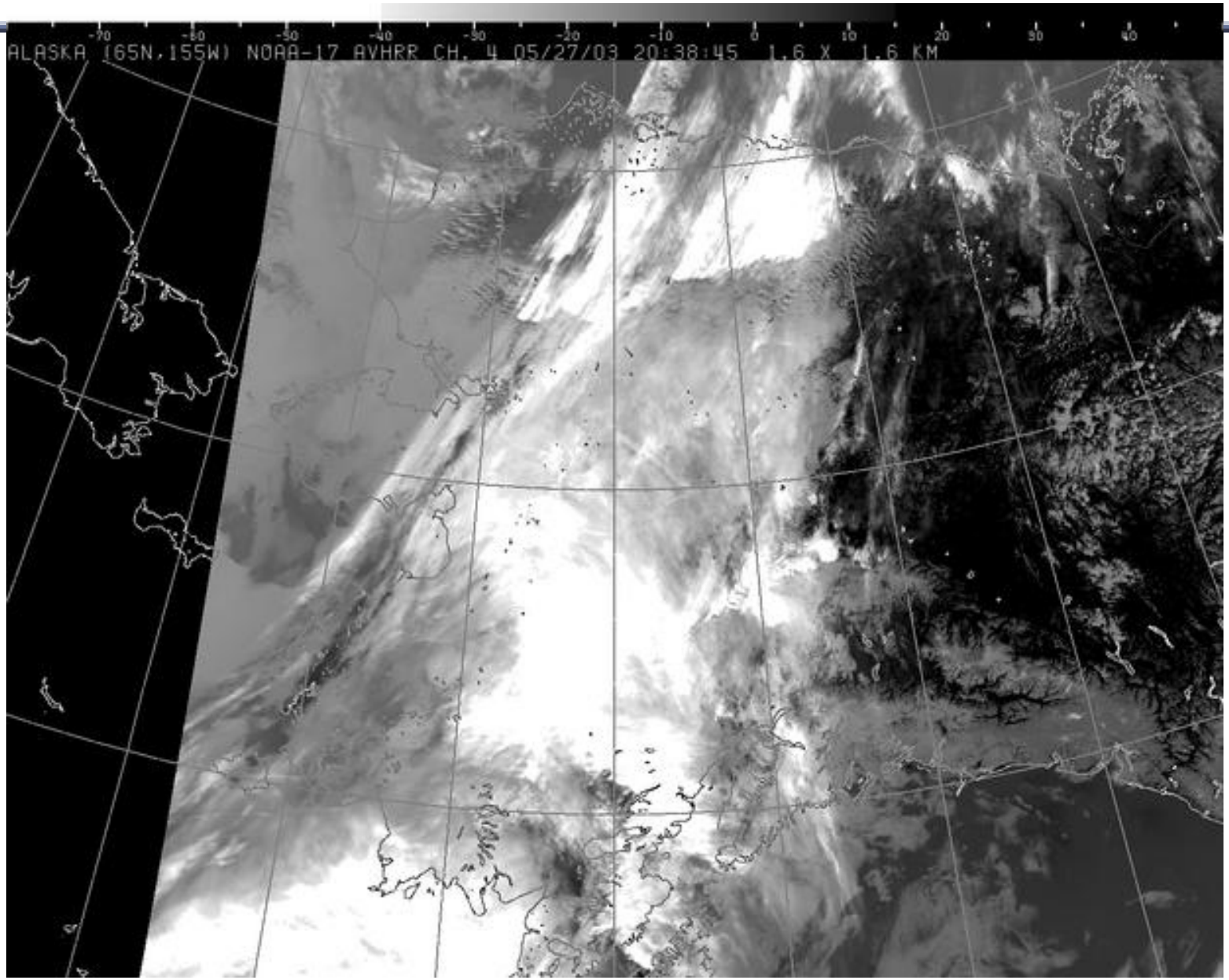
- Reflectivity
  - Rain drops, snow flakes, ice crystals, and hail stones are good targets for the radar to detect
  - Returns are plotted and color-coded according to intensity making it easy to track the development and movement of individual cells or cloud bands
  - During bad weather, the radar can scan the atmosphere every 5 minutes
- Velocity
  - The key feature of the Doppler radar is its ability to measure wind velocity
  - An algorithm computes velocity using the phase shift of successive return pulses


Radar Image from National Weather Service: PAEC 00:44 UTC 04/20/2004
DBZ
+28
+24
+20
+16
+12
+8
+4
0
-4
-8
-12
-16
-20
-24
-28
ND
Teller
Nome
White Mountain
Golovin
Elim
Radar Image from National Weather Service: PAEC 00:44 UTC 04/20/2004

Satellites

- Geosynchronous Satellites (GOES)
  - 22,300 Miles from Earth
  - Information every 15 minutes BUT
    - Perspective over Northern AK is stretched due to curvature of earth
  - GOES 10 is at 135 degrees West (Pacific)
- Polar Orbiting Satellites (POES)
  - 520 Miles from Earth (more detail)
  - Information approximately every 1.5 hours, BUT
    - A 6 hour gap beginning around midnight
    - A 3-4 hour gap beginning early afternoon

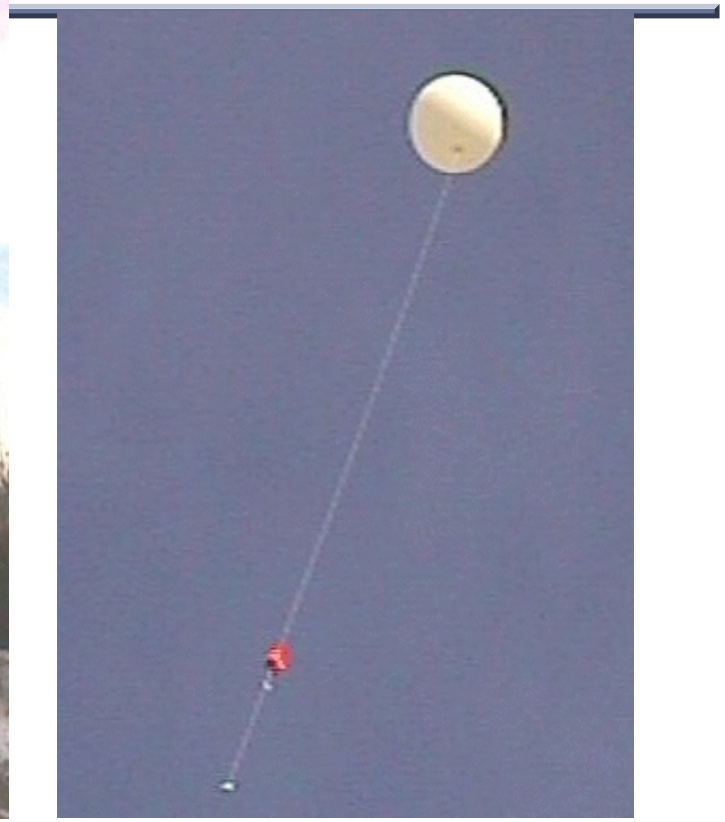
Satellites



Upper Air Observations

- Northern AK sites:
  - Fairbanks, Barrow, Nome, Kotzebue
- "Nearby" sites:
  - McGrath, Bethel, Anchorage, Yakutat
- Measurements:
  - Temperature
  - Pressure
  - Wind Direction and Speed
  - Humidity
  - Every 12 hours:
    - 0000 UTC/GMT and 1200 UTC/GMT or:
    - 3am/pm AST
    - 4am/pm ADT

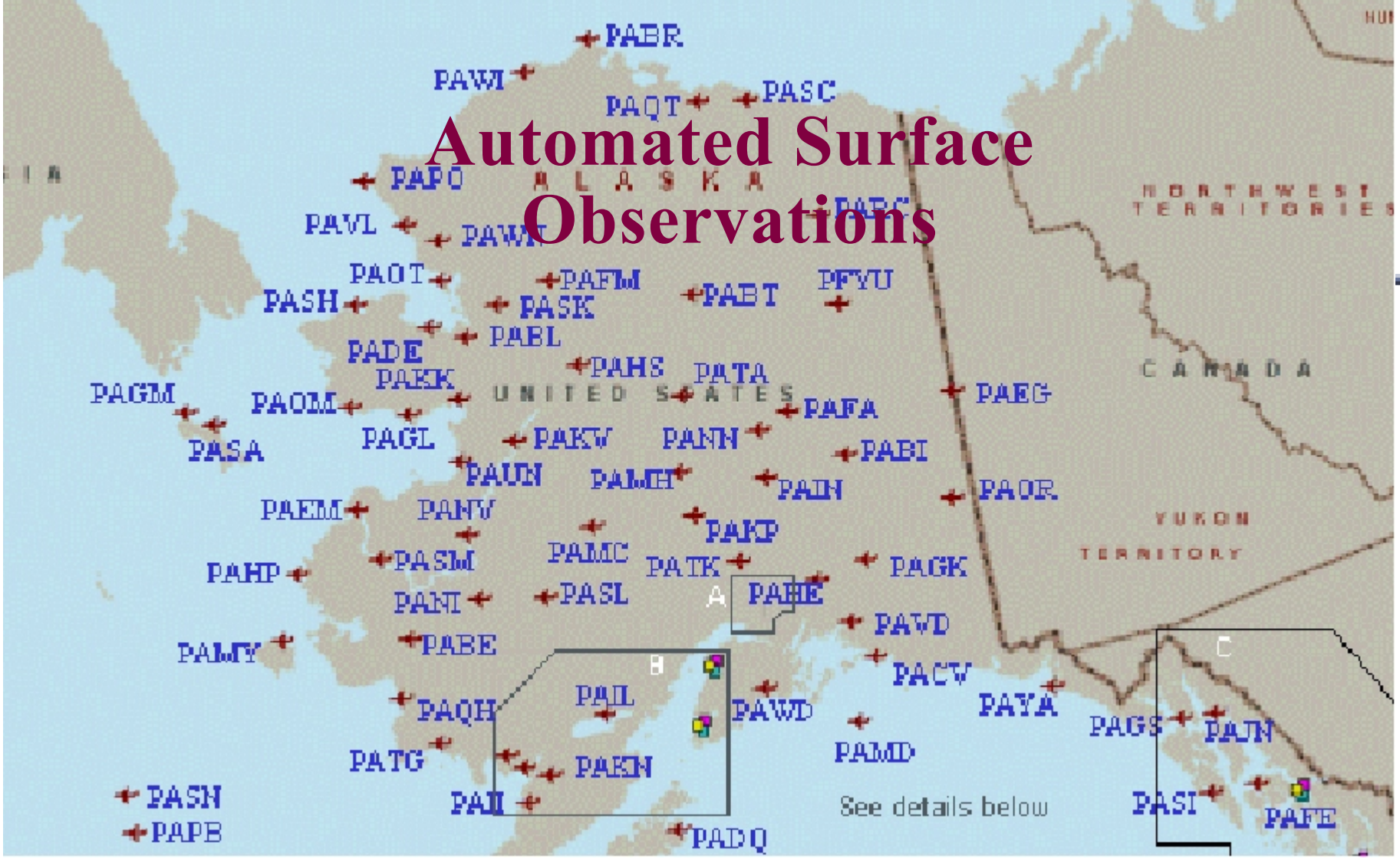
Upper Air
Inflation Building



Weather balloons are inflated in buildings like this. Beneath the dome at the top of the building is a dish that receives the signal from the weather instrument package attached to the balloon. This is how the data is received and how the balloon is tracked.

Automated Surface Observations

Automated Surface Observations

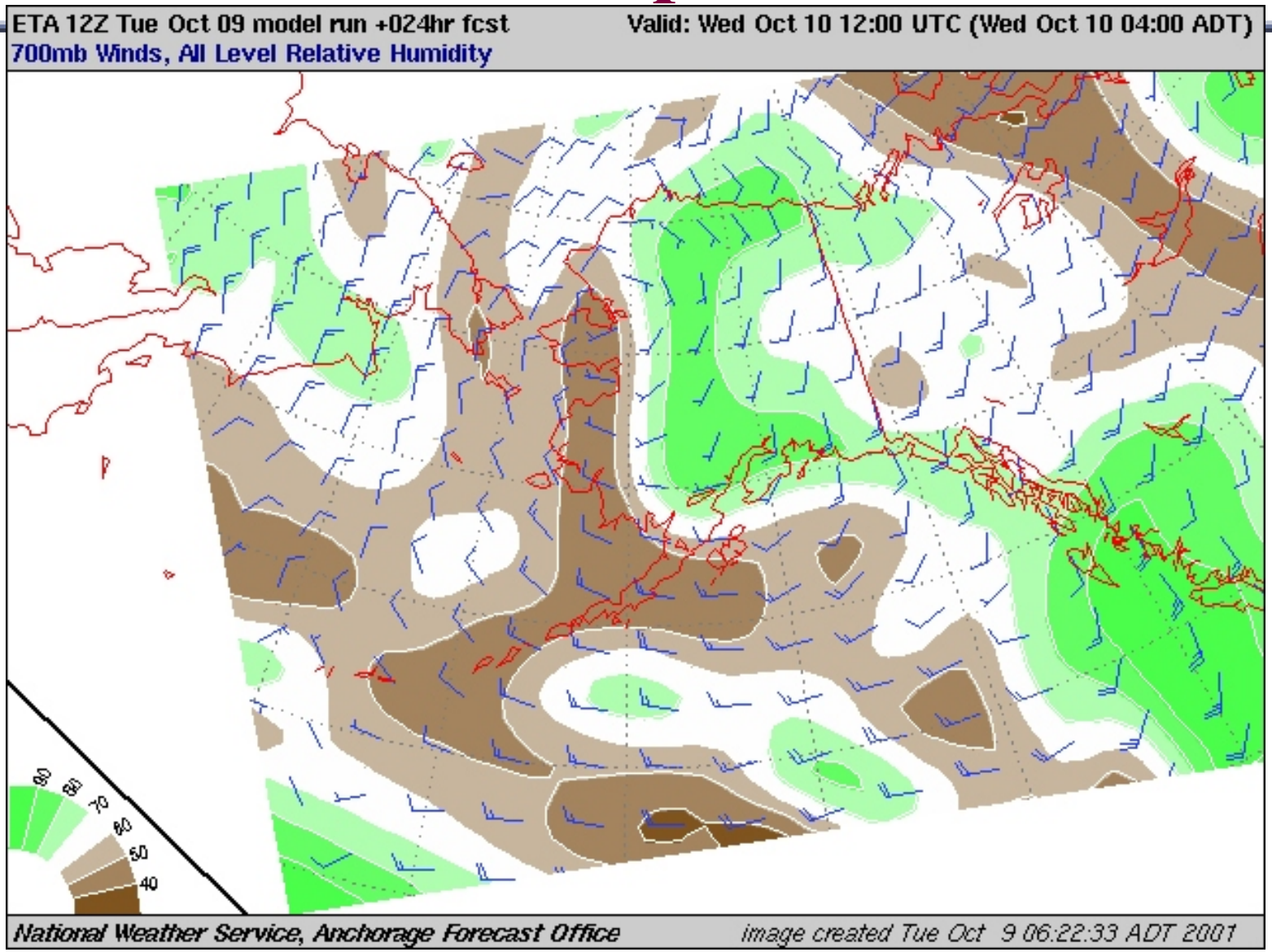


Automated Surface Observations

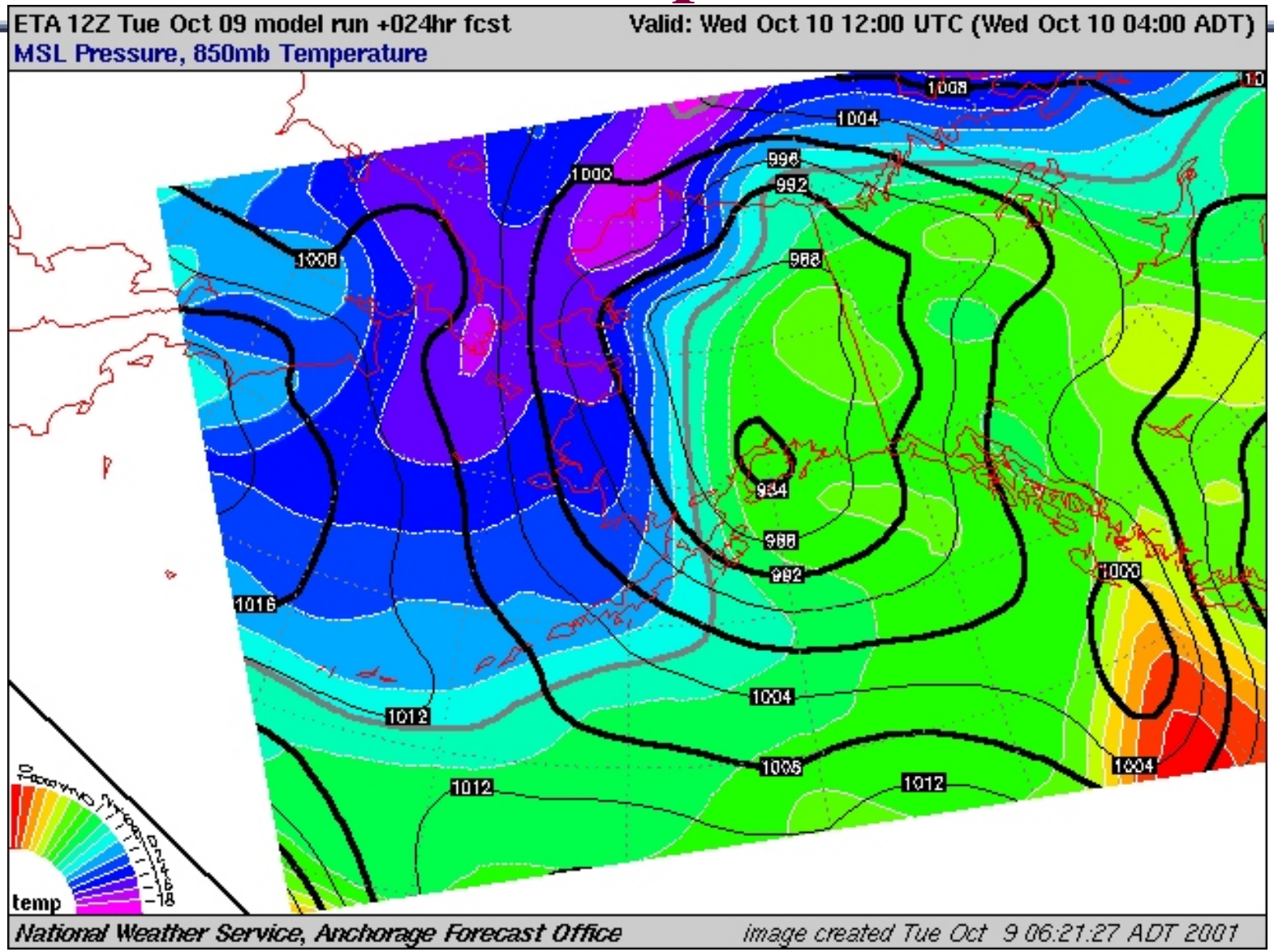
ASOS (NWS & FAA), AWOS (FAA)
What do they measure?

- Cloud heights and amount of sky cover
- Present weather - only rain, snow and fog (Only ASOS)
- Visibility
- Wind direction and speed - no instantaneous gusts
- Temperature and dewpoint
- Altimeter (barometric pressure)
- Precipitation amount in terms of water equivalent (ASOS and *some* AWOS)

Computer Model Output



Computer Model Output



Why Spotter Observations are Important

- They provide real- time weather information when hazardous weather is occurring or imminent.

- While the science of meteorology has moved leaps and bounds forward with the advent of computer models, satellites, and Doppler radar, the role of the human observer is still essential.

- Spotters become the additional eyes and ears of the NWS, providing information that assists in the issuance of timely and accurate warnings that may *save lives and minimize property damage*.

When Spotter Obs are needed:

- Coastal Flooding and **severe shore erosion**
- Any **strong wind** that causes damage, even occurring without a thunderstorm (e.g. blew items some distance away)
- Any **Freezing rain**,
  - Estimate amount of ice accumulation (fraction of an inch)
  - Estimate the time period it occurred.
- **Blizzard** (and near-blizzard) conditions:
  - Visibility below 1/4 (½) mile
  - Wind at least 35 (25) mph - even gusts
- Heavy Snowfall anytime, (4" in 12 hours or less)

When Spotter Obs are needed:

- **Funnel clouds** and **Tornados**
  - are rare and weak; also damaging dust devils
- **Strong** Thunderstorms or even strong showers with any of these:
  - damaging winds,
  - hail greater than 1/4 inch diameter
  - Significant rainfall in a short amount of time (see next item...)
- **Heavy rainfall** anytime, such as
  - More than .50 Inch or more in 1 hour
  - More than .75 Inch or more in 3 hours
  - More than 1.00 Inch or more in 6 hours

When Spotter obs are needed

- **Flooding** - Swollen Rivers due to rain, snow-melt or ice jam blockage
  - Roads impassable due to high water
  - Streams or Rivers overflowing their banks - any occurring or potential property damage?
  - Mudslides - Roads fully or partially blocked, property destroyed/damaged
  - Breakup - The FIRST occurrence when ice on the river is breaking up and moving.

Taking SPOTTER Observations

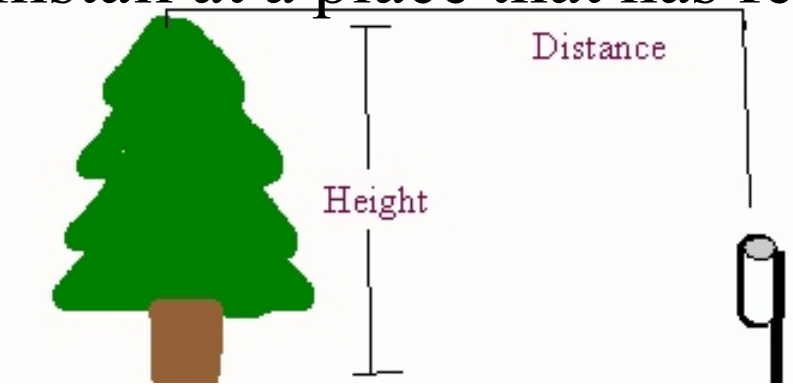
- **Reporting Wind Speeds**
  - Estimate from Experience
  - Use commercially-bought weather stations
- **Determining Hail Size**
  - Pea-size 0.25 inch (1/4 inch)
  - Dime-size 0.50 inch (½ inch)
  - Nickel-size 0.75 inch (3/4 inch)
  - Quarter-size 1.00 inch
- **Ice Pellets vs. Hail**
  - Ice Pellets are clear and smooth, mostly in winter or early spring,
  - Hail is white stone-like appearance, always from Thunderstorms or Showers

Taking SPOTTER Observations

- **Coastal Flooding**
  - Height of waves
  - Rise in water level of sea
  - Amount of inland area that is covered by sea water
  - Evacuations/Injuries/Fatalities
  - Road closures/Property damaged OR threatened
- **Beach Erosion**
  - Height of waves
  - Amount of erosion of beach (from a previous time)
  - Evacuations/Injuries/Fatalities
  - Road closures/Property damaged OR threatened

Taking SPOTTER Observations

- **Rain amounts - 4-inch Rain Gauge**
  - Install at a place that has few obstructions



Distance from gage to nearest obstruction (tree, house) should be **greater** than the height of the obstruction

  - How to read gauge: inside cylinder-
    - MAIN markings (with numerals) are TENTHS of an inch
    - Minor markings (horizontal ticks) are in HUNDREDTHS of an inch!
  - Determining time length of event; How long has it been raining?
  - Empty daily if rain occurs!

Taking SPOTTER Observations

- **Snow Board/Snow Stick**
  - Reading the Snow Stick -Ruler is in TENTHS of an inch!
  - Wipe board off daily if a lesser amount of snow occurs.
  - Wipe board off after snow event is over.
- **Freezing Precipitation**
  - Surface is already at/below freezing
  - If possible use a metal surface (car, railing, etc)
  - Estimate thickness in fractions of an inch.
- **Also...**
  - Report any weather-related damage you witness or hear about from a reliable source. Time of event, too.

Lastly, a little PAPERWORK!!!

- Spotter Info: Fill out Registration
  - Propose a name for your site
    - As brief as possible!
  - We will assign you a spotter number: XXX-ZZZ
  - We will issue you a certificate
- Waiver of pay - sign and have us witness it.
- Spotter Guide, Warning/Advisory Criteria - *Take it with you*, and post in a location near your phone.

Reporting Procedures:

- Call
  - 12am to 4pm Daily **COLLECT**
    Kotzebue: 442-3231
  - 4pm to Midnight Daily **COLLECT**
    Fairbanks: 458-3708
- State, "This is Spotter (your location ID and #)
- Then give your report... (whatever element(s) you have just observed)
- IF YOUR OBSERVATION WAS NOT MADE AT YOUR HOME, be sure to give your location!

Questions?

Thanks for joining our team!
If you have questions later, please don't hesitate to contact me:

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