Heavy snow forecasting rules

1) Q: Where do you need to be to get heavy snow?
   A: Left of storm track, some distance away
2) Q: Why?
   A: Cold enough to snow, but still in good position for moisture supply and lift from upper-level forcing (e.g. PVA) and overrunning
3) Q: Will temperature continue to support snow?
   A: consider horizontal temp. advection, vertical motion, evaporative cooling and melting

Location rules for heavy snow band

Surface:

- 2 - 4 degrees of latitude left of low track is best, although 1 - 4.5 degrees is possible
- Deepening sfc low is best for heavy snow

Location rules for heavy snow band

850 mb:

- 1 - 4 degrees of latitude left of low track
- Temp of -5 C (-2 to -8 C OK)
- North of -5 C Dew Point contour
- Dew points > 12 C feeding into storm needed to get 10 inches or more in 12 h
- WAA needed

Location rules for heavy snow band

700 mb:

- Along track of 700 mb low
- Heavy snow starts at 700 ridge line and ends at trof line
- Temps of -6 to -8 C
- South of -10 C Dew Point contour

Location rules for heavy snow band

500 mb:

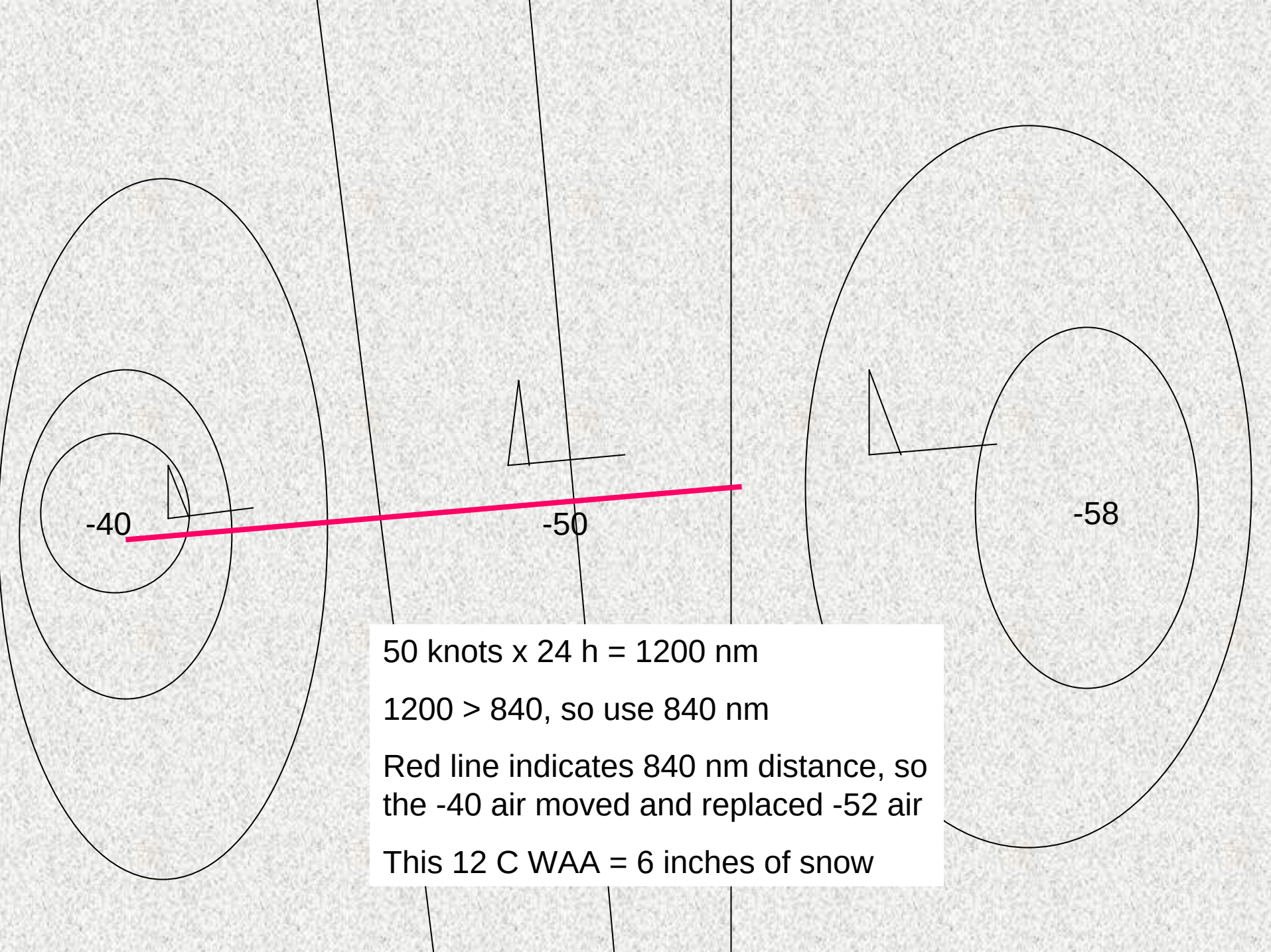
- Along track of 500 mb low if it exists
- Along – 2.5 degrees left of vort center or height fall maximum
- Temperatures of -20 to -25 C

ALSO… within 1000-500 mb thickness ridge between 5310-5370 thickness values

Rules for snow amount

COOK Method

- 200 mb warm pool will move toward cold pool
- Ave snow (inches) in 24 hrs is ½ the max. warm advection (degrees C) at 200 mb
- Determine how far the warm pool will move in 24 hrs, but not allowed to use more than 840 nm



50 knots x 24 h = 1200 nm

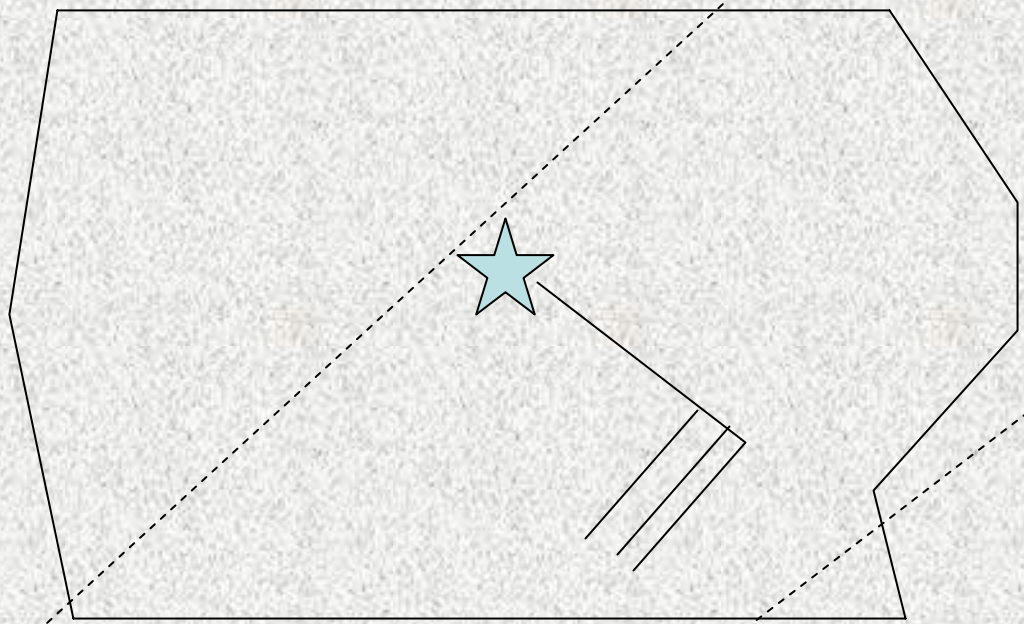
1200 > 840, so use 840 nm

Red line indicates 840 nm distance, so the -40 air moved and replaced -52 air

This 12 C WAA = 6 inches of snow

Garcia Method (most popular today?)

- Find isentropic sfc halfway between 700 and 750 mb (zone where snowflakes grow best)
- On that isentropic surface, find mixing ratio and value that could advect in over 6-12 h
- Take average mixing ratio to be 6 h snowfall (or double it to get 12 h snowfall)
- Modify number down if forcing won't last whole period, or dry air present initially



2 g/kg

4 g/kg

6 g/kg

- Assume this is 295K sfc which passed through Ames at about 725 mb
- Current mixing ratio is 2
- 30 knots x 6 h = 180 nm
- Mixing ratio 180 nm upwind is around 4
- Ave mix ratio is 3 g/kg
- So, Ames will have 3 inches of snow in 6 h

Magic Chart

- How much is air lifted over 12 h period arriving at 700 mb (if temps support snow)
- DIFAX map used to exist that showed this displacement
- Snow amount in 12 h is the amount of lift (mb) divided by 10 (e.g., 90 mb = 9 inches)
- Can try to compute this using FOUS data, which provides 700 mb omega
- Should only use for a well-developed storm

Precipitation type

- Soundings work best – if max temp anywhere < 1 C = snow

  max temp of 1-2 C = sleet

  max temp > 3 C = freezing rain
- Snow/rain thickness: 1000-500 mb = 5400 m

  1000-850 mb = 1300 m

  1000-700 mb = 2840 m

  850 – 700 mb = 1550
- Frz Rain most common in interior Pacific NW, IA/MO area, Lee of Appalachians, NE USA

Mesoscale snow bands

- Previous rules help define the synoptic snow band
- Much heavier snow amounts can occur in mesoscale bands due to following processes:

Mesoscale snow bands

- Frontogenesis (deformation band too)
- Upright elevated convective bands
- Coupled jet streak circulations
- CSI (in 2 weeks)
- Bands where max omega is in -13- -17C layer
- Strong delta-P gradient on isentropic map
- Ahead of dry slot