Typical situation

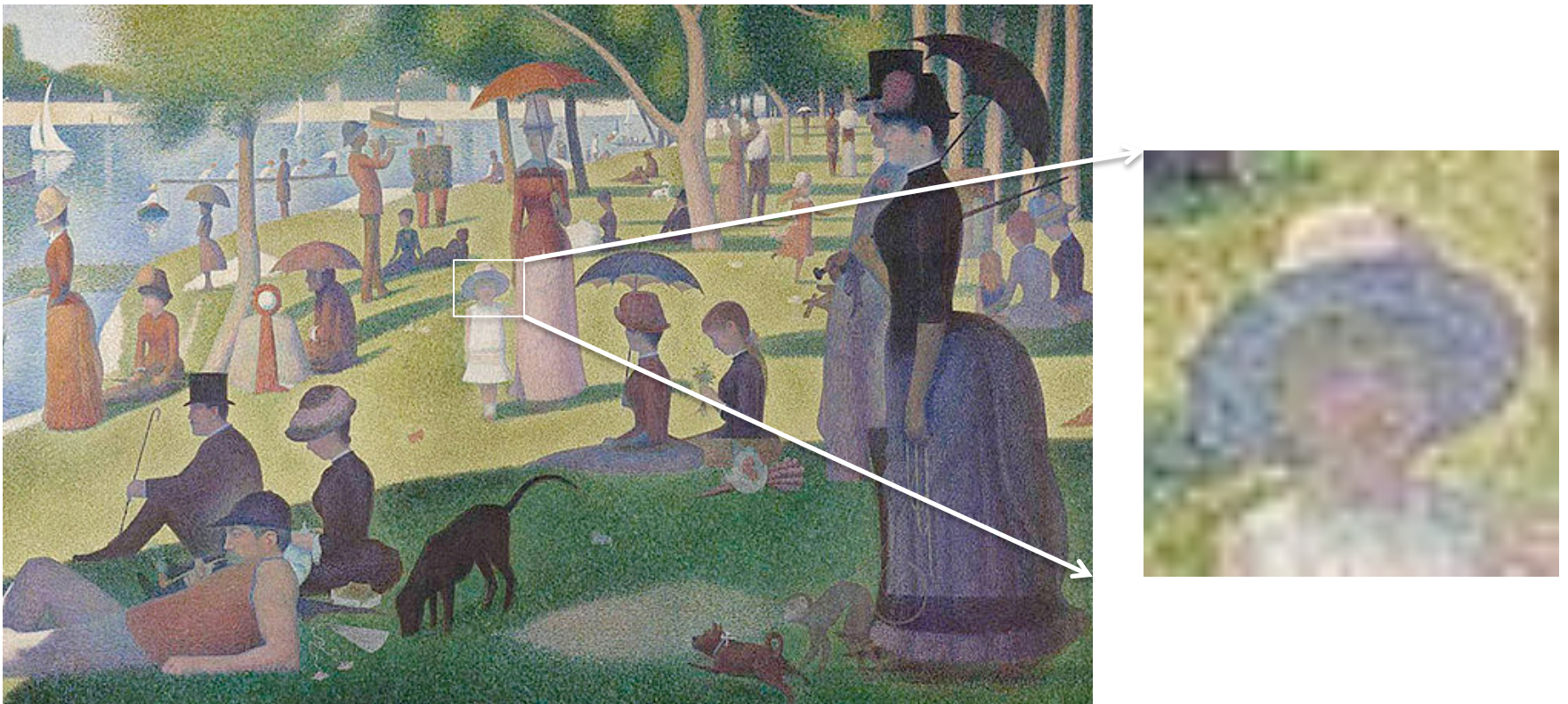Forecast
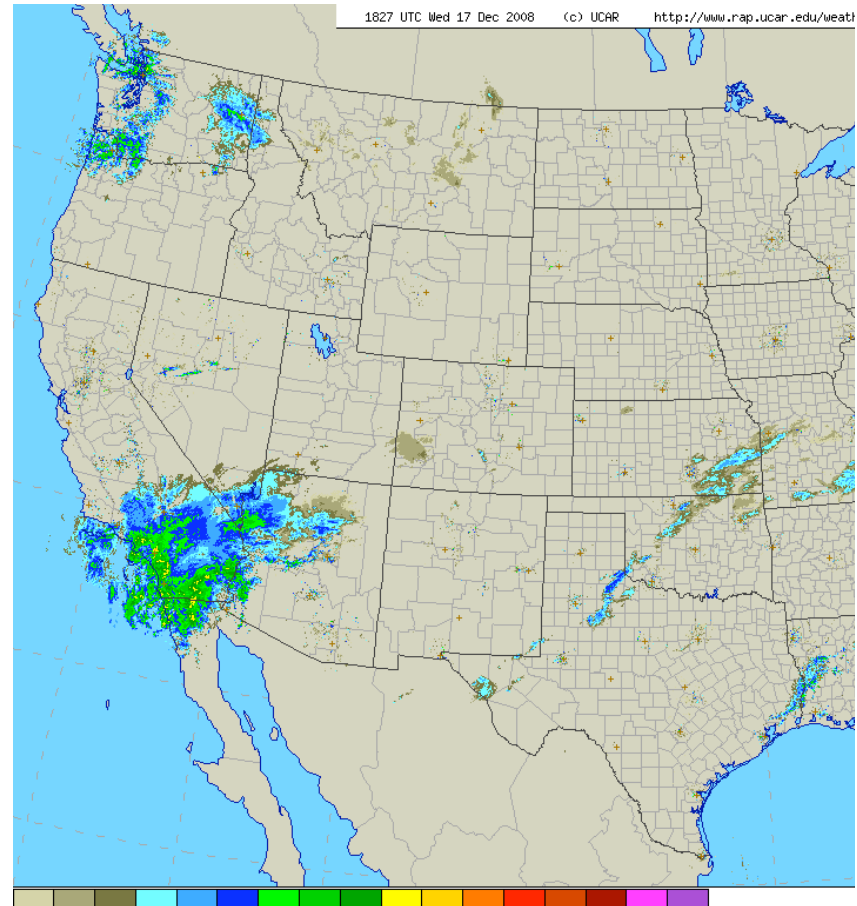
Observation

Traditional verification matches up points, then sums them up.

Many forecasts are more than the sums of their parts.

Pixels or Pictures?

Object verification
is more like what
humans
do.

Objects recognize
the spatial relationship
between points.

Simple example

Observed

Forecast
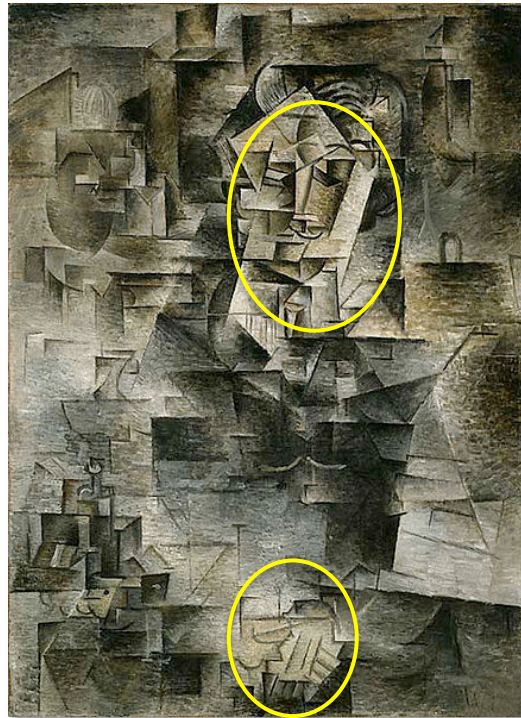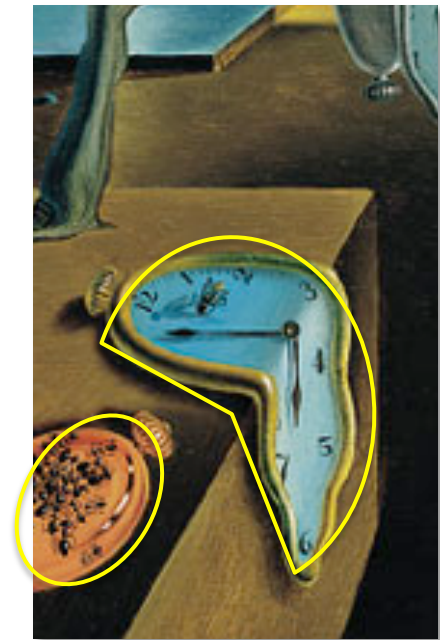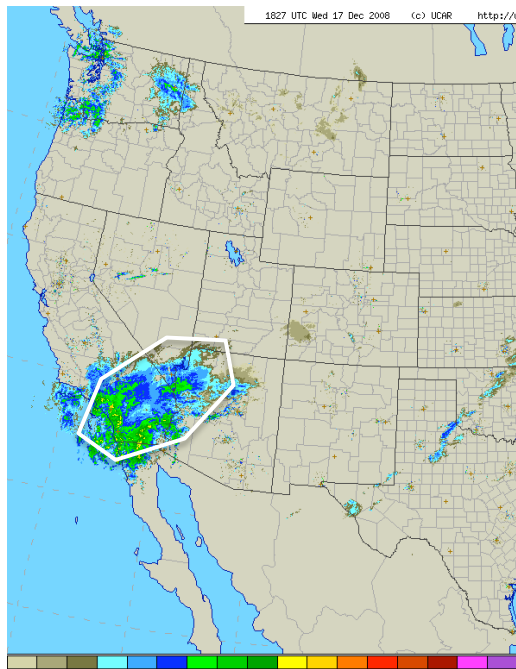
Shifted

Totally
wrong

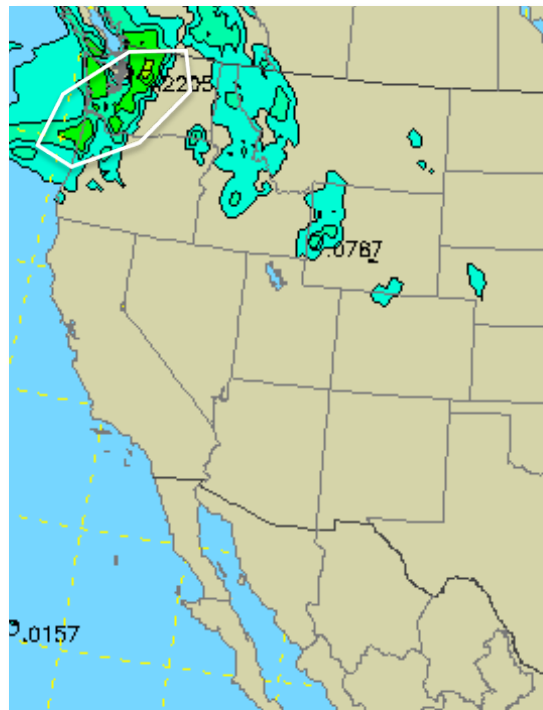REAL - observed

Forecast 2 –
Another distorted
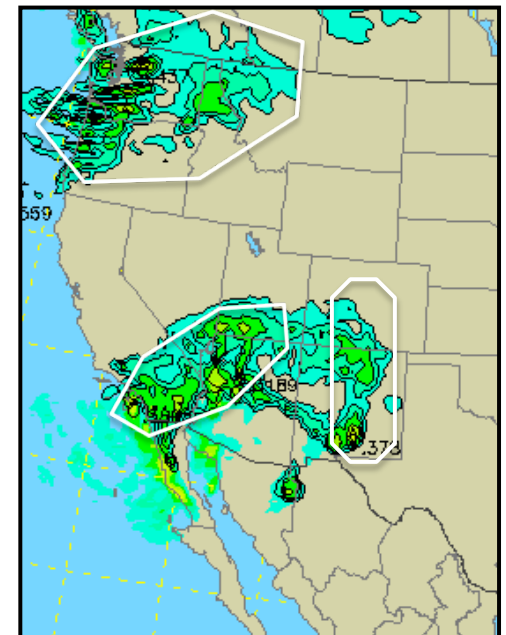view of reality

Forecast 1 –
Distorted view of reality

REAL - observed

Forecast 1 –
Distorted view of reality

Forecast 2 –
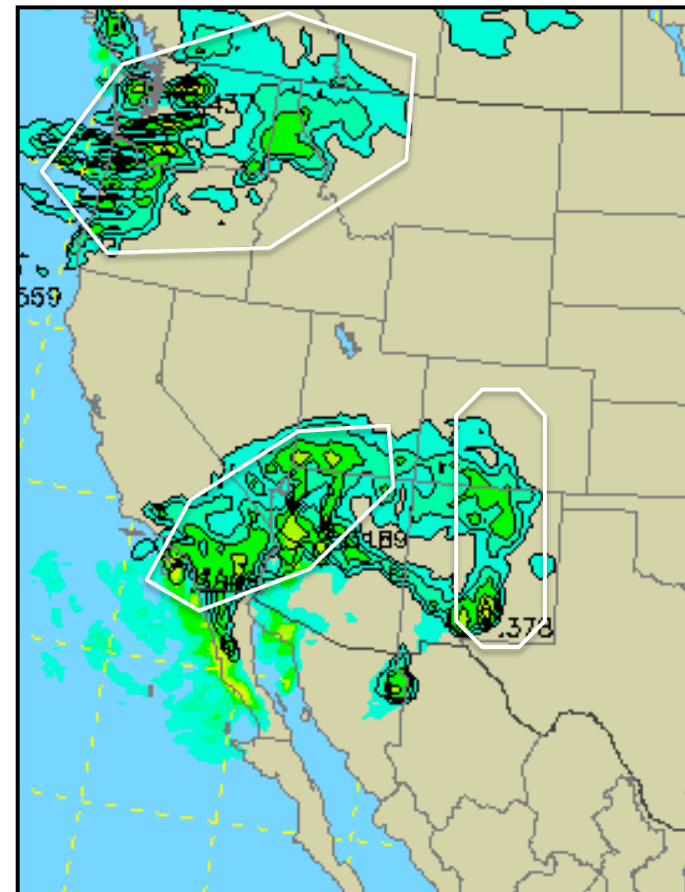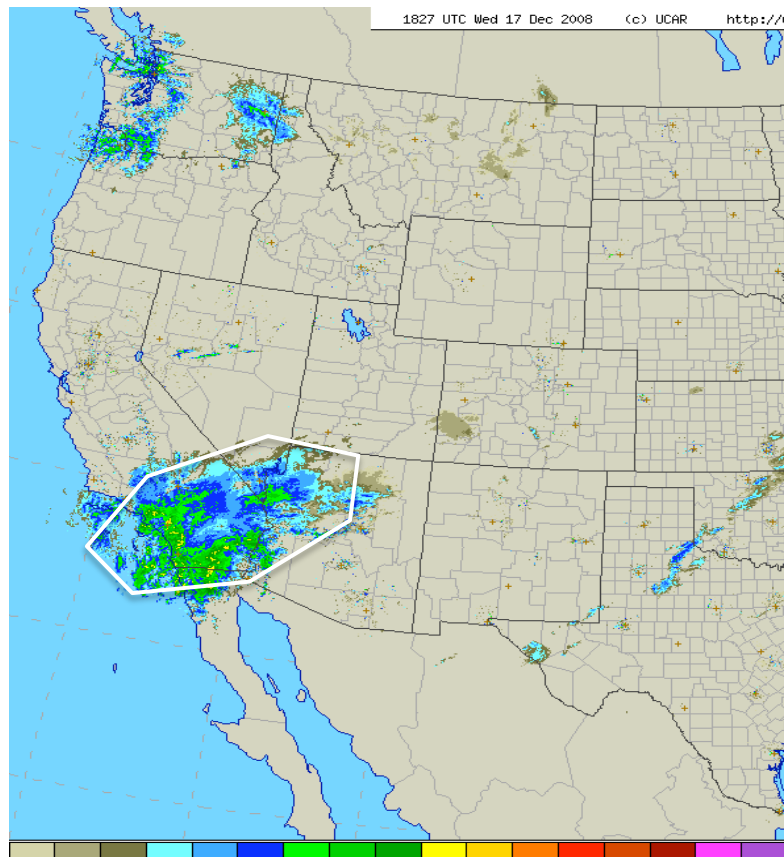Another distorted
view of reality

We can compare attributes of forecast and observations even when they are not in the same place!

- Is the object in the right place?
- Does the size of these objects match?
- Is the intensity within the objects similar?

Centroid distance = 25
Area ratio = 85%
50 dBZ vs 40 dBZ

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This is not really a new idea . . .

Analytic cubists "analyzed" natural forms and reduced the forms into basic geometric parts on the two-dimensional picture plane.

Analytic cubism was developed between 1908 and 1912 . . .

Comparing objects can tell you things about your forecast like . . .

This:

30% Too Big
(area ratio=1.3)

Shifted west 1 km
(centroid distance = 1km)

Rotated 15°
(angle diff = 15%)

Peak Rain 1/2" too much
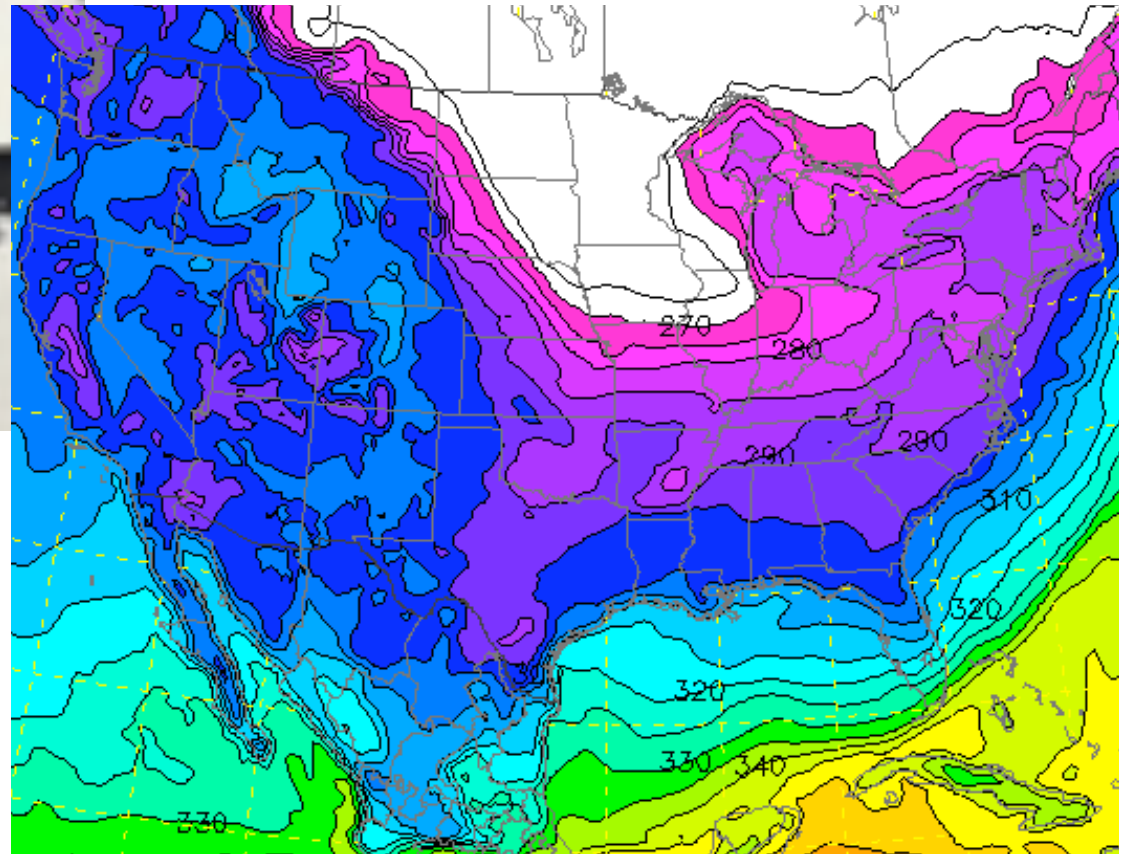(diff in 90th percentile of intensities = 0.5)

Instead of this:

POD = 0.35

FAR = 0.7235

CSI = 0.1587

Verifying with objects doesn't always make sense . . .

- In MET, object based verification is done using the MODE (Method for Object-Based Diagnostic Evaluation) tool.

  – Define objects
  – Compute attributes (e.g. area, centroid, axis angle, intensity)
  – Merge objects (e.g. thunderstorm cells merge into line)
  – Match forecast and observed objects
  – Compare attributes between matches
  – Output summary statistics