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Models**

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**Metrics for model evaluation**

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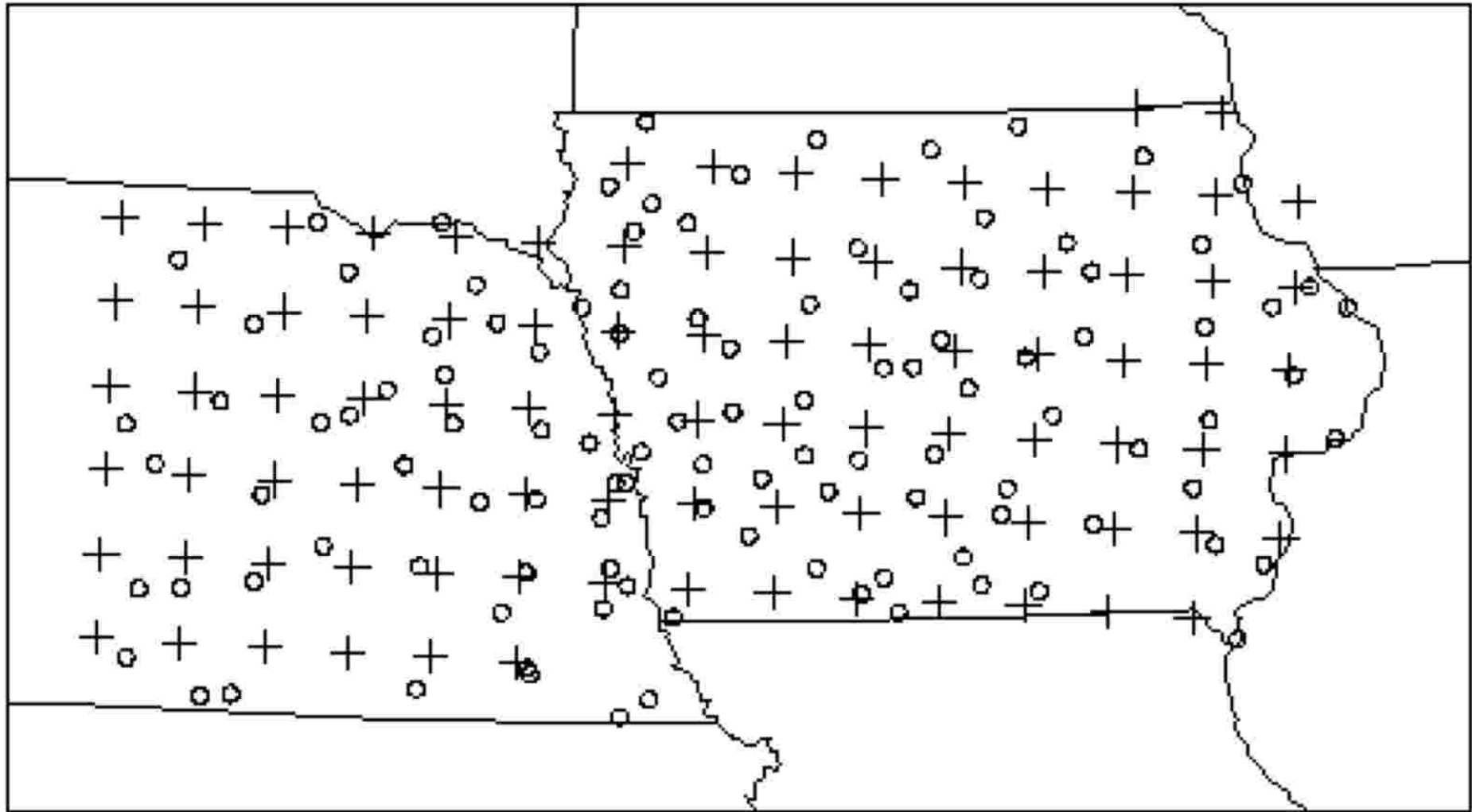
# Metrics for Model Evaluation

What is good - what is bad – what is acceptable - in climate simulation?

# Issues

1. What observations are available?
  1. Scale, type, quality...?
2. What are the targets?
  1. Means, variability, time series ...?
  2. Extreme (rare) events?
3. What is added value vs. GCMs?
4. Physical consistency?

## Scale Limits of Observations: Example from Well-Observed Region in the U.S.



o = observing site      + = model grid point (0.5° grid)

# Data Processing Issues

**Can data assimilation fill gaps in**

- **Space?**
- **Time?**
- **Variables?**

**Scale selection? What are targets?**

- **Averaging**
- **Filtering**

# Matrix of Metrics

1. Quick-look (e.g., Taylor diagrams)
2. More detailed, region-targeted

Need process-based metrics,  
perhaps regionally focused (e.g.,  
Easterly waves in Africa)

# Matrix of Metrics

1. Quick-look (e.g., Taylor diagrams)
2. Regional Biases
3. Portrait diagrams – models x regions showing biases
4. Temporal Variability (sometimes done with Taylor diagram)
5. Climate typing? (e.g., Koppen regions)

# Matrix of Metrics

1. Extremes? PDF? Thresholds?  
Box (Tukey) diagrams? Can use Taylor diagrams for these, too.
2. Precipitation intensity; length of “dry” periods.
3. Meteo-alarm web site: European-specific thresholds.
4. Threat scores (for hindcasts)
5. Spectral (wavelet) diagrams
6. Multi-year trends



# Matrix of Metrics

1. More detailed, region-targeted
  - Seasonal variation (e.g., beginning/end of a season)
  - Diurnal cycle behavior
  - Total seasonal rainfall for the rainy season
  - Region-specific processes (low-level jet, monsoon & monsoon indices, see-saw behavior, ice/snow formation/melt, drought indices, sea breezes)
  - Dry spell length between wet seasons
  - ITCZ seasonal migration
  - Transient waves (e.g, African easterly)
  - Teleconnections
  - Tropical storms and strong extratropical storms, including trajectory analysis
  - Synoptic (weather) typing

# Matrix of Metrics

1. More detailed, region-targeted
  - Sensitivity measures (to data sources, boundaries)
  
2. Added value information
  - Mesoscale signal (scale-selective filtering in space and in time; filter out large scale *and* filter out small scales [two comparisons])
  - Process behavior
  - Side-by-side comparison of GCM and RCM behavior (e.g., on Taylor diagrams)

# Standard Metadata

1. How initialized
2. Specified parameters
3. Parameterizations