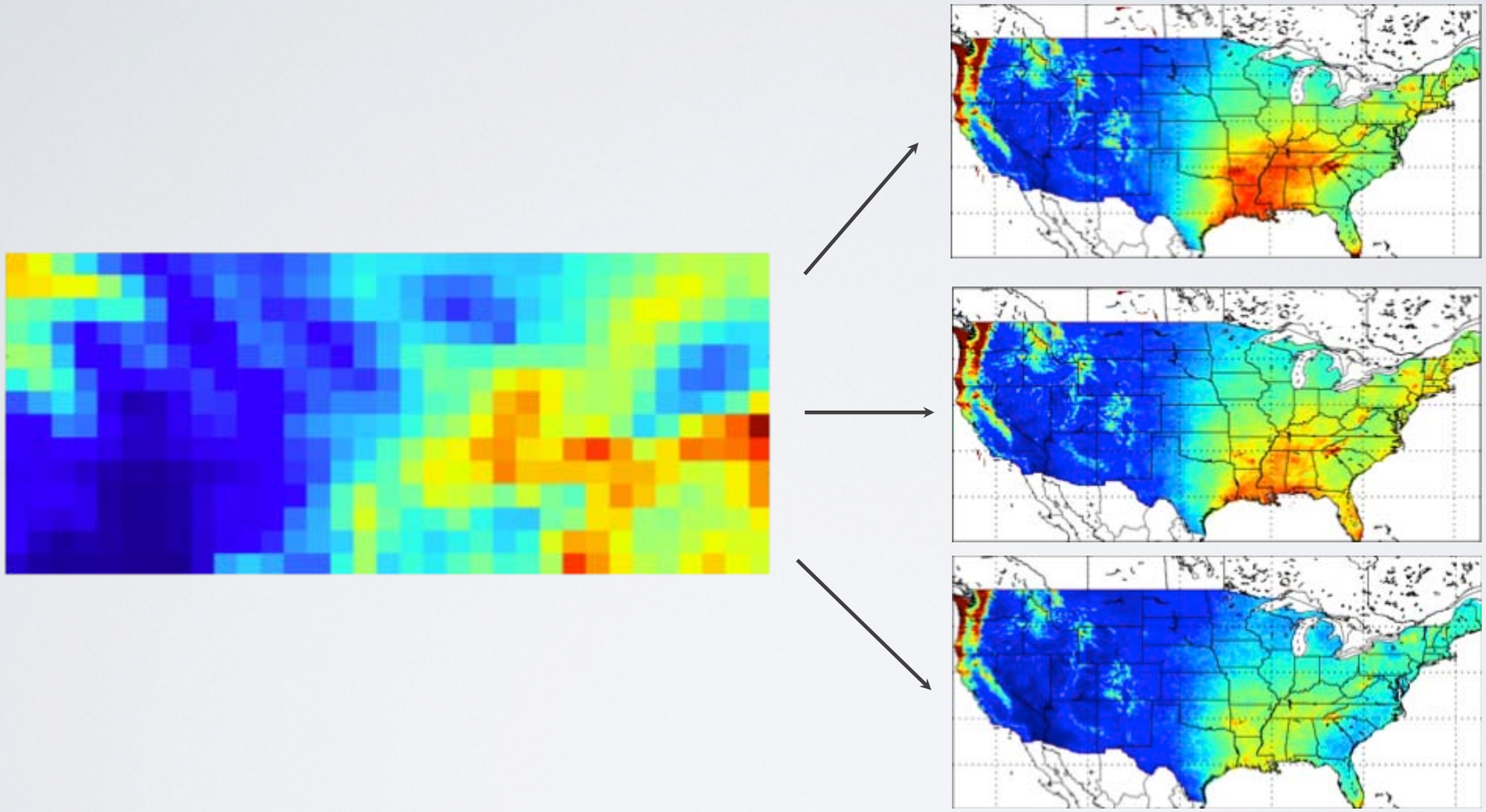
Statistical Downscaling Inter-comparison



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CESM-SDWG 2013 Annual Workshop - 6/20/2013

Outline

Precipitation, CONUS

- Statistical Downscaling Methods
- Observation Datasets and GCM proxies
- Comparison Metrics
- What does what, how and why?
- A note on 6km vs 12km “observed” datasets

For details see Gutmann et al. (submitted) : Journal of Climate
An Intercomparison of Statistical Downscaling Methods over the Contiguous United States.

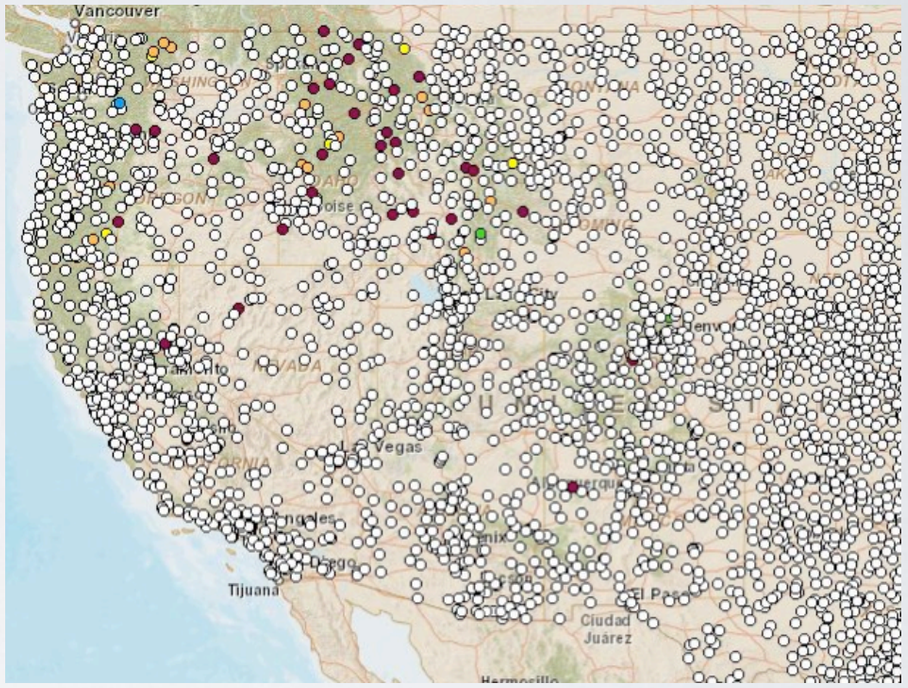
Downscaling Methods

Trained : 1979-1999 Applied : 2000-2008

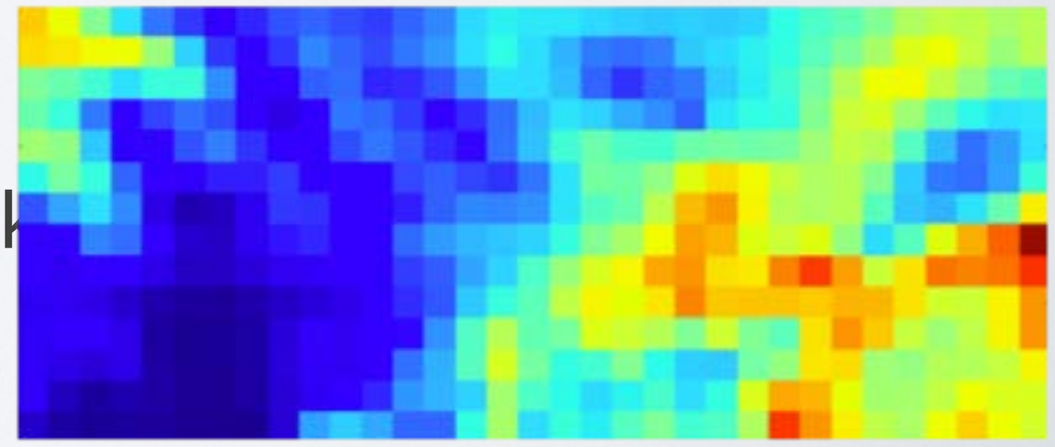
- Bias Corrected Spatial Disaggregation
  - BCSDm : Monthly - disaggregated to daily (Wood et al., 2004)
  - BCSDd : Direct to Daily (Thrasher et al., 2012)
- Bias Corrected Constructed Analogue (Maurer et al., 2010)
  - BCCA : Applied over CONUS
  - BCCAr : Applied to a sub-domain
- Asynchronous Regression (Stoner et al., 2012)
  - AR
- WRF (4km) Rasmussen et al. (in prep.)
  - Applied to a sub-domain

Datasets

- **Observed Datasets**
  - Maurer et al. (2002) - 1/8° (~12km)
  - Livneh et al. (2012) - 1/16° (~6km)

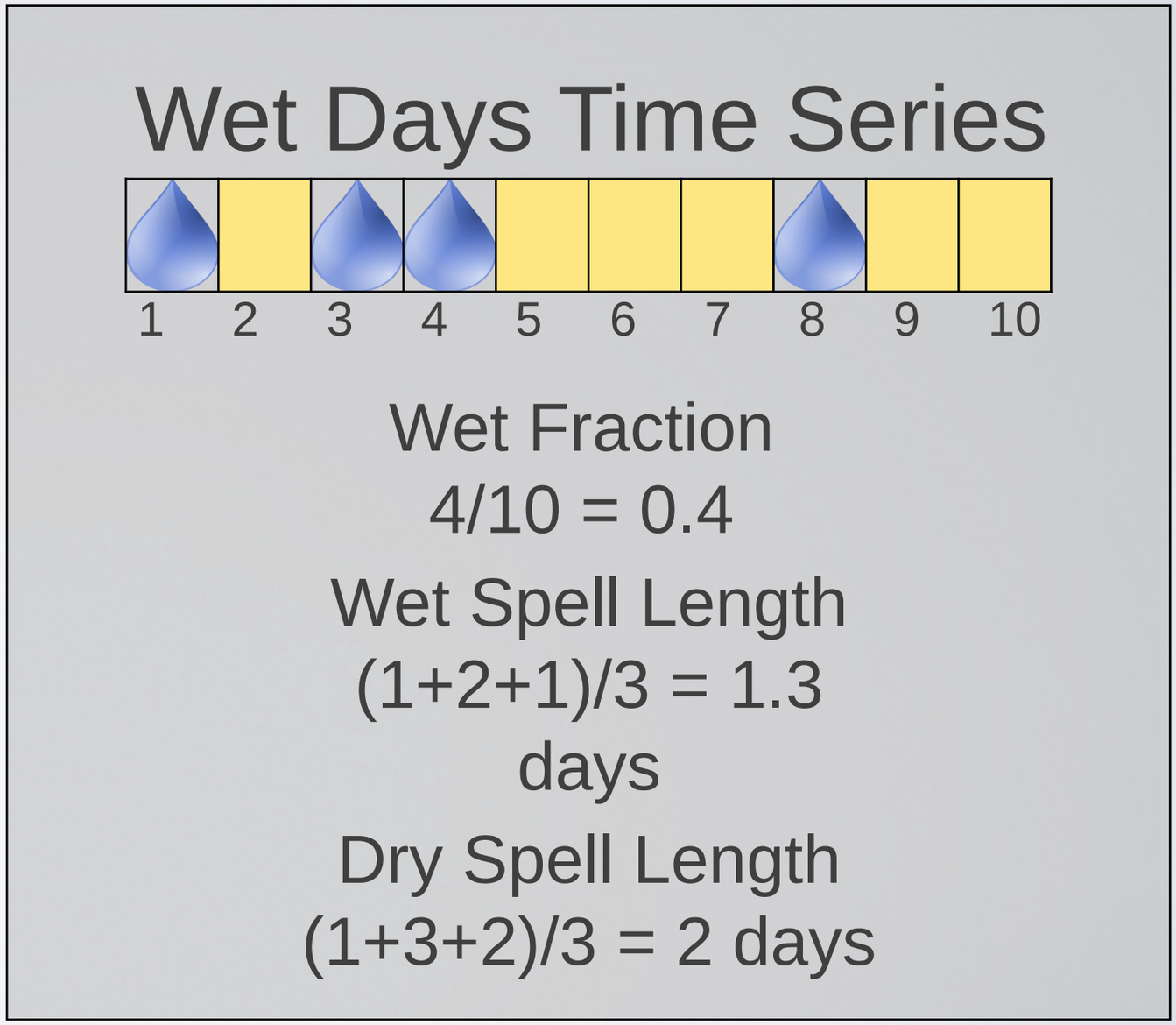


- **GCM Proxies**
  - NCEP/NCAR Reanalysis 1.9° (~200k
  - NARR 32km

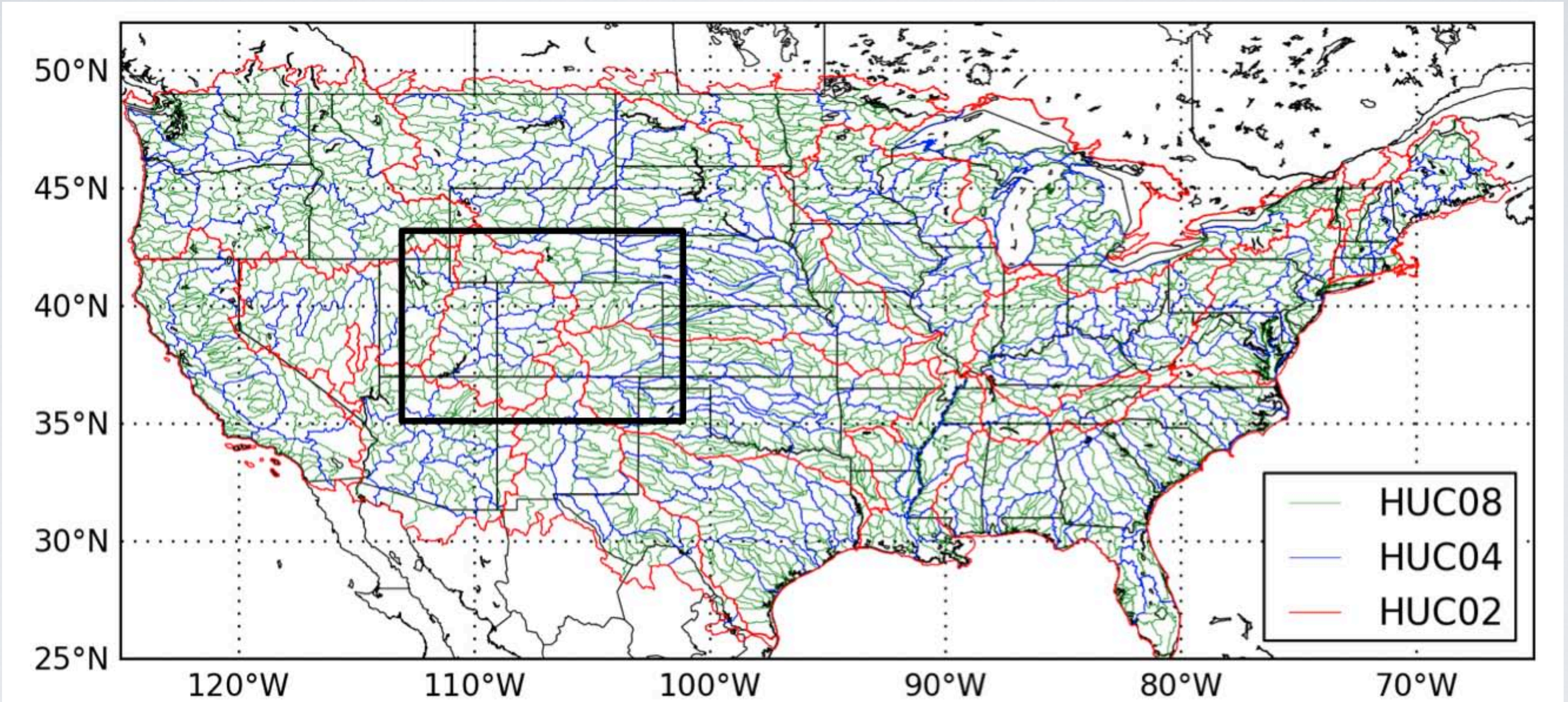


Metrics

- Mean Annual Precipitation (Bias)
- Wet Day Fraction
- Wet / Dry Spell Length
- Extreme Event
  - 50yr return 1 day total



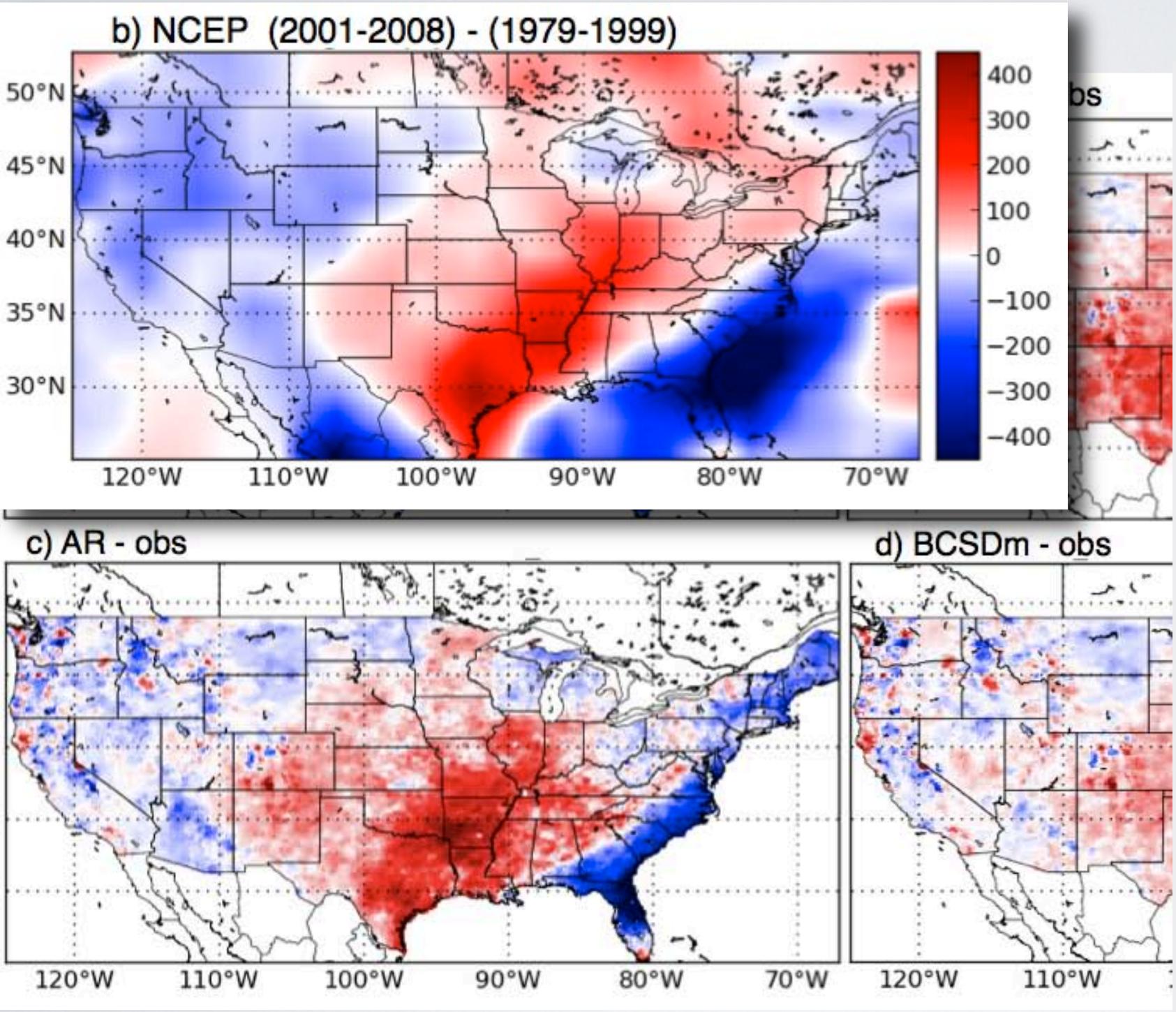
Metrics : Spatial Scaling



HUC = Hydrologic Unit Code : 8 digits, 4 digits, 2 digits

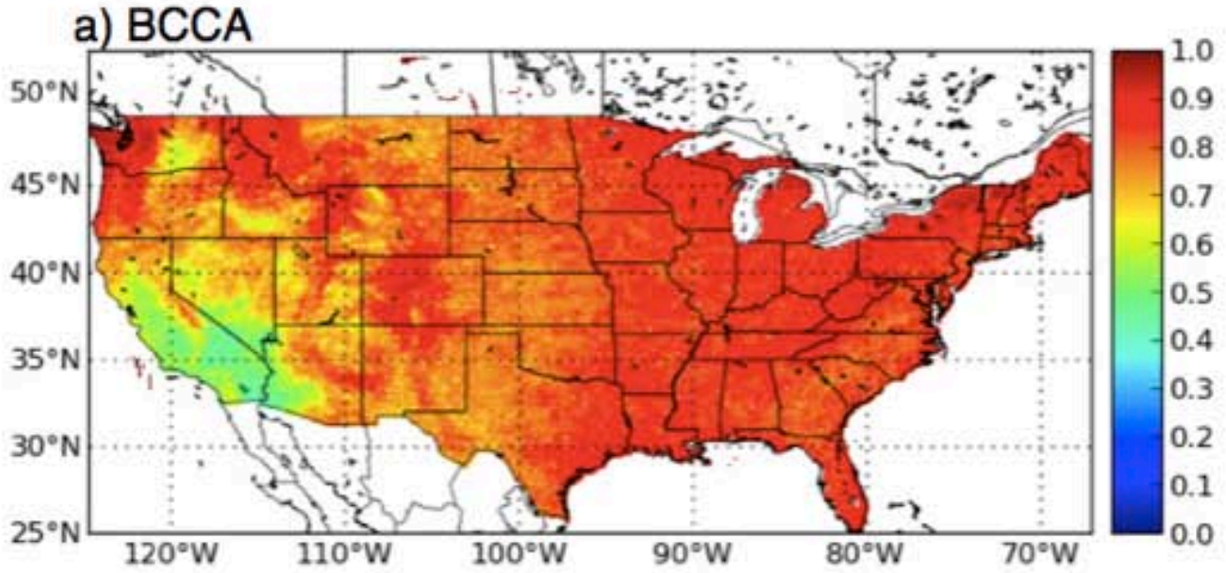
HUC8 = smallest basins, HUC2 = largest basins

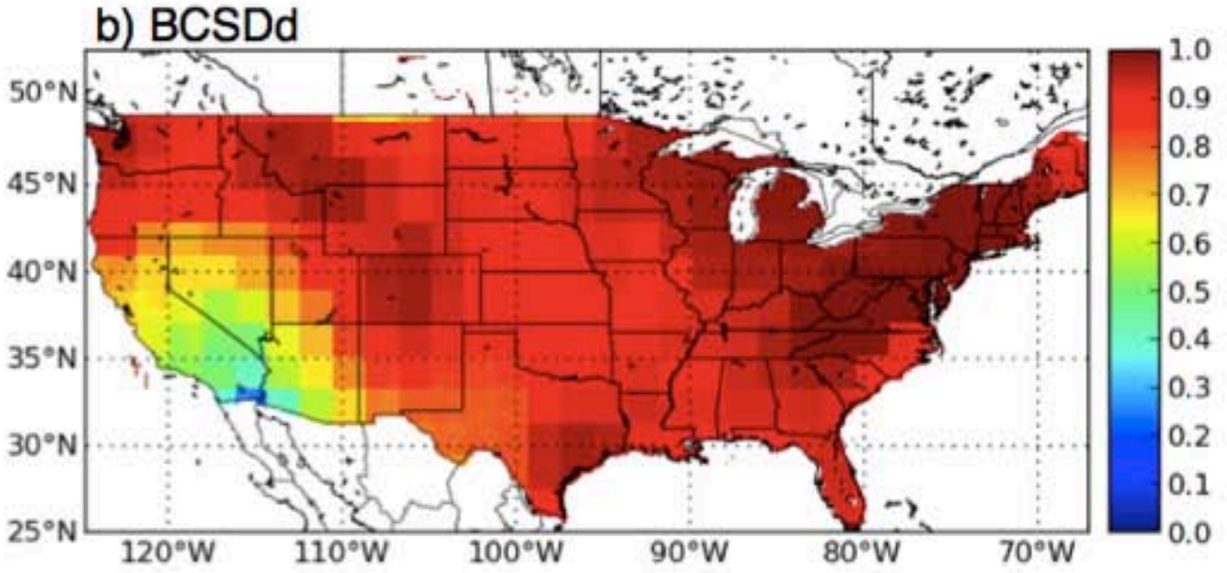
Bias : Large scales

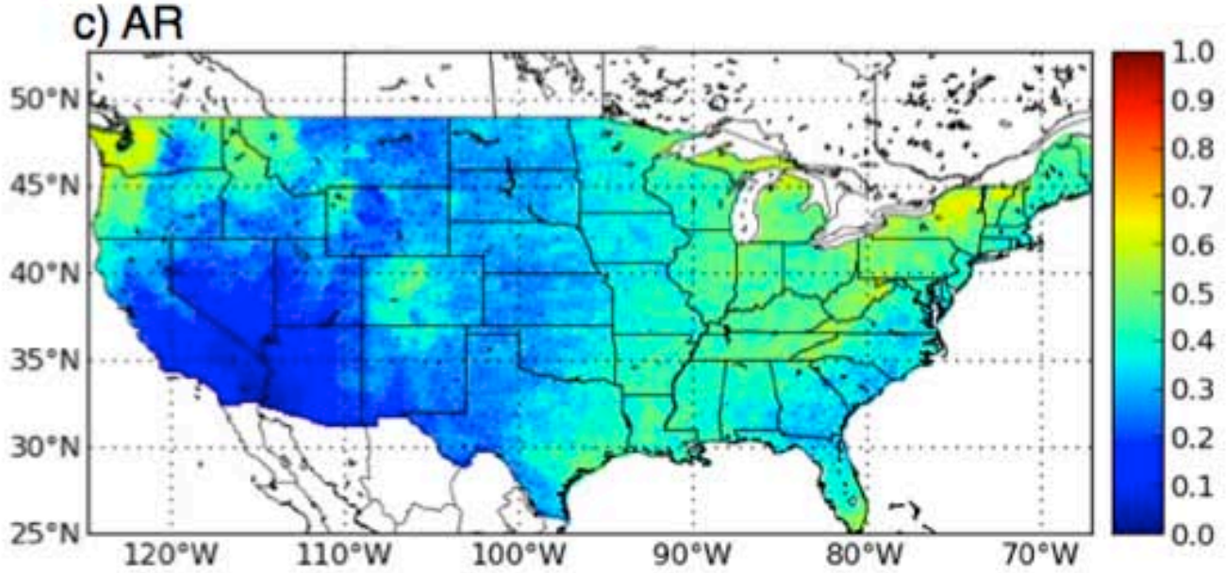


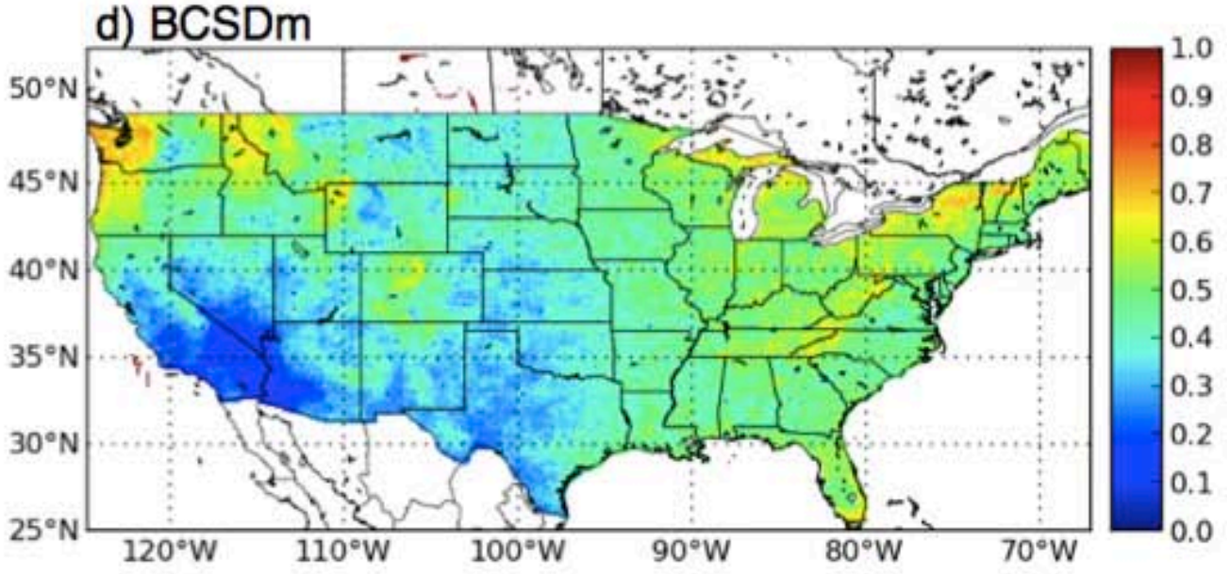
- BCCA is biased low
- Other large scale biases due to changes in NCEP
- Reanalyses are not stable over time (Trenberth et al., 2011)
- Satellites and other assimilated datasets come and go

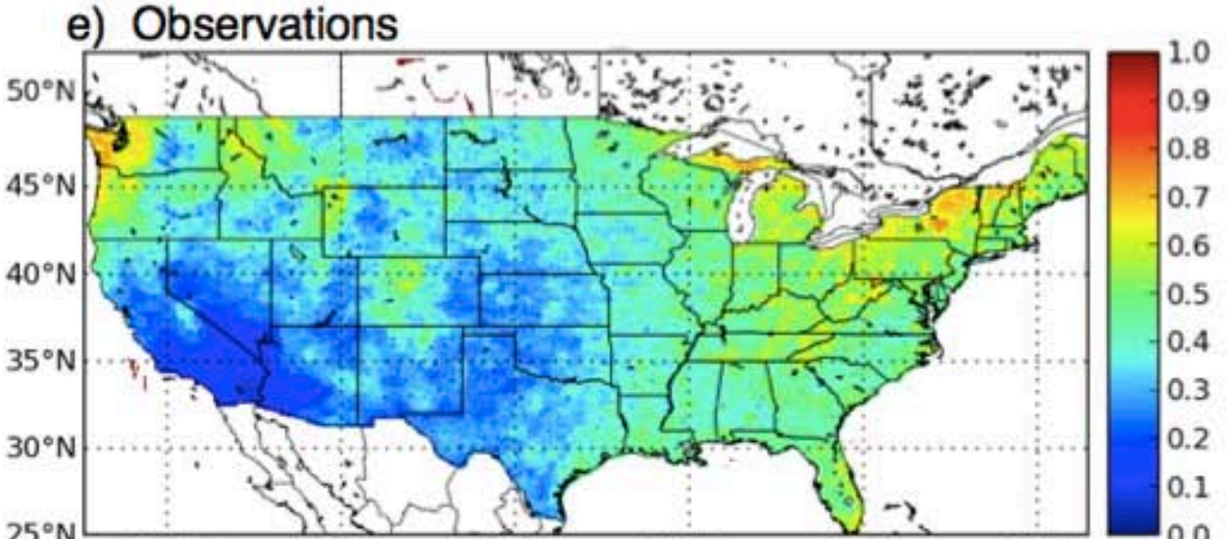
Wet day fraction

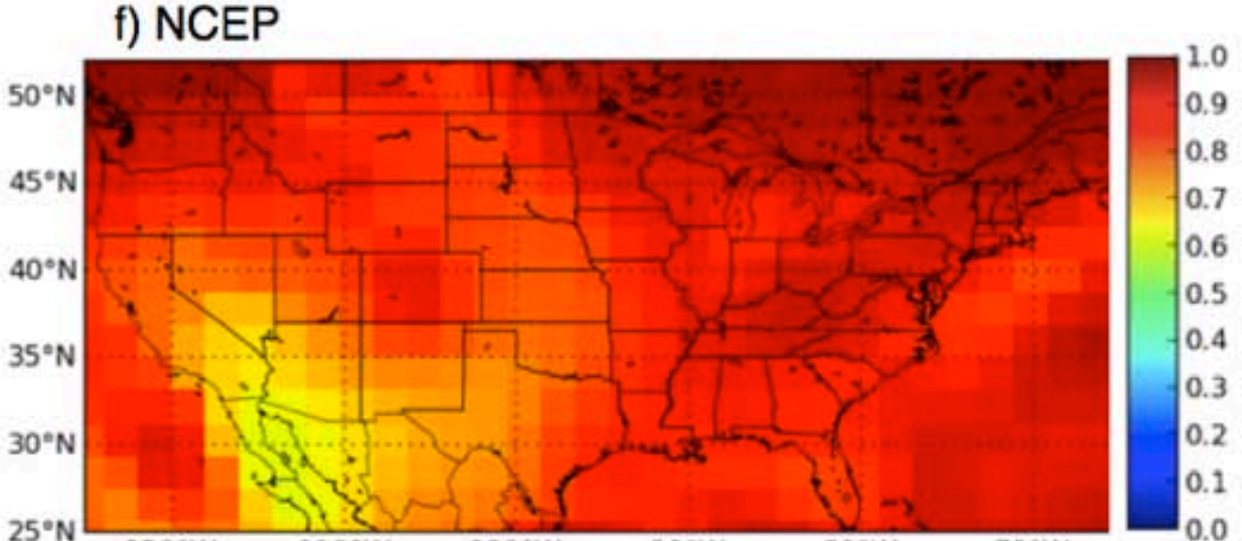






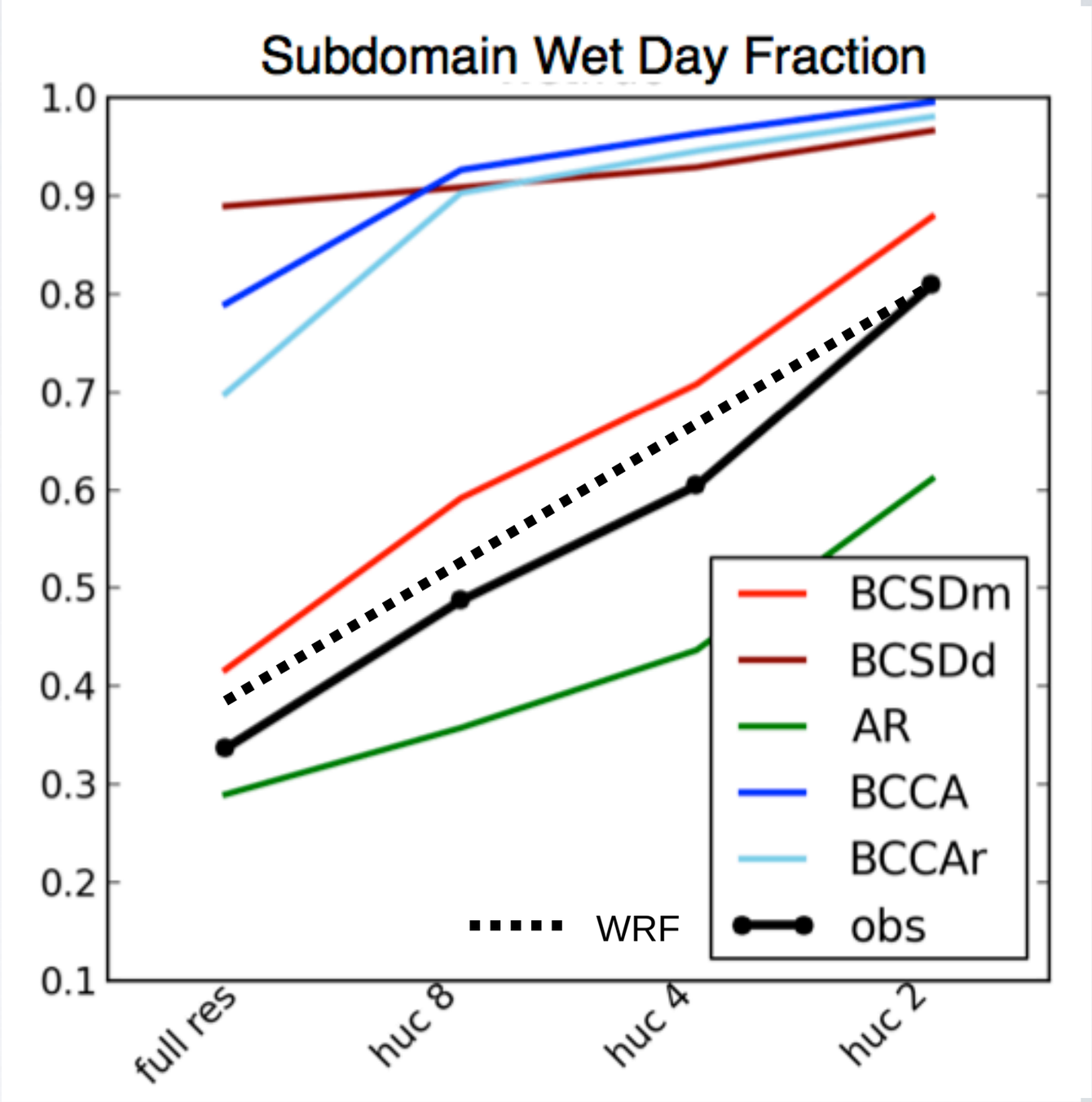




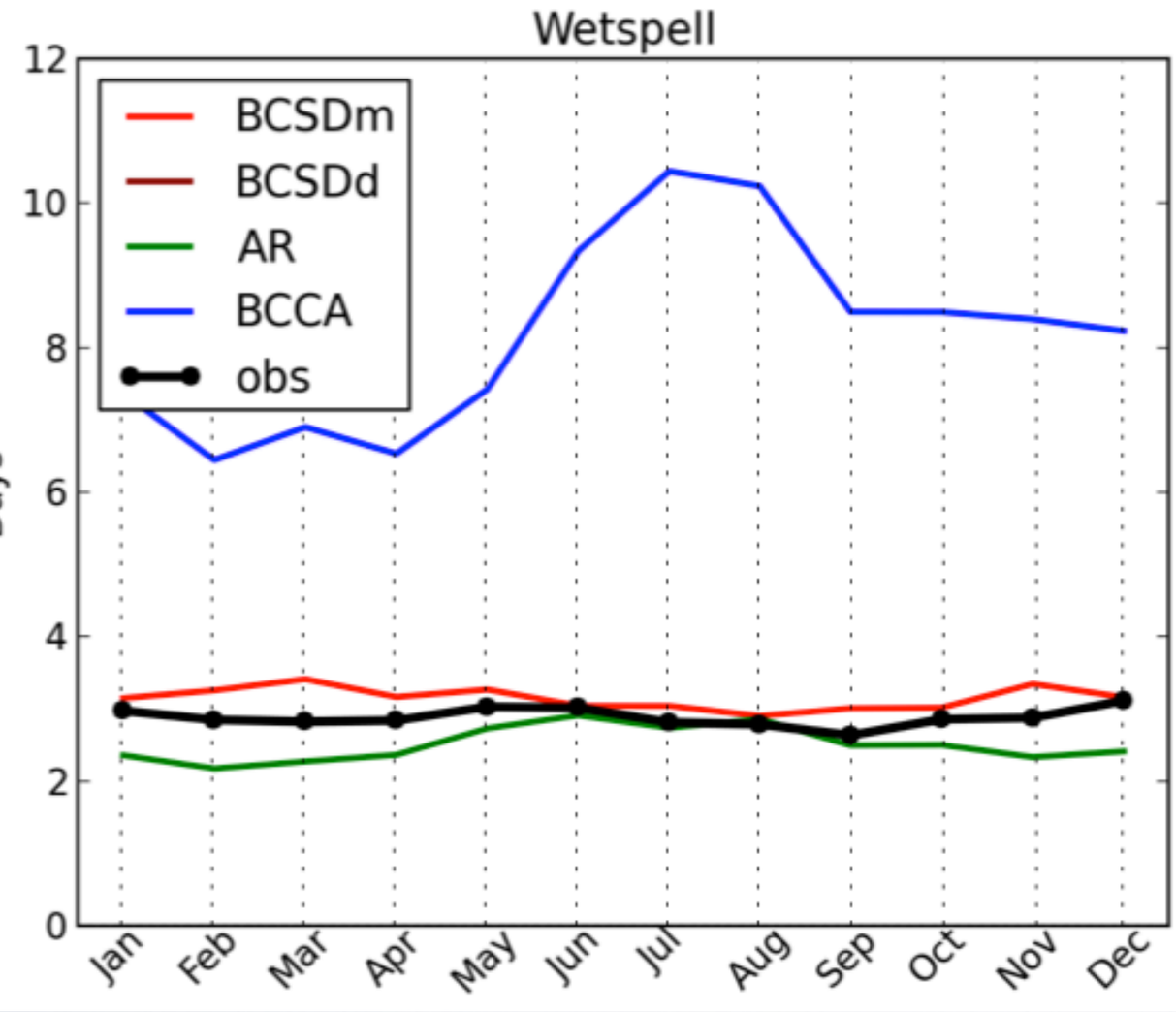


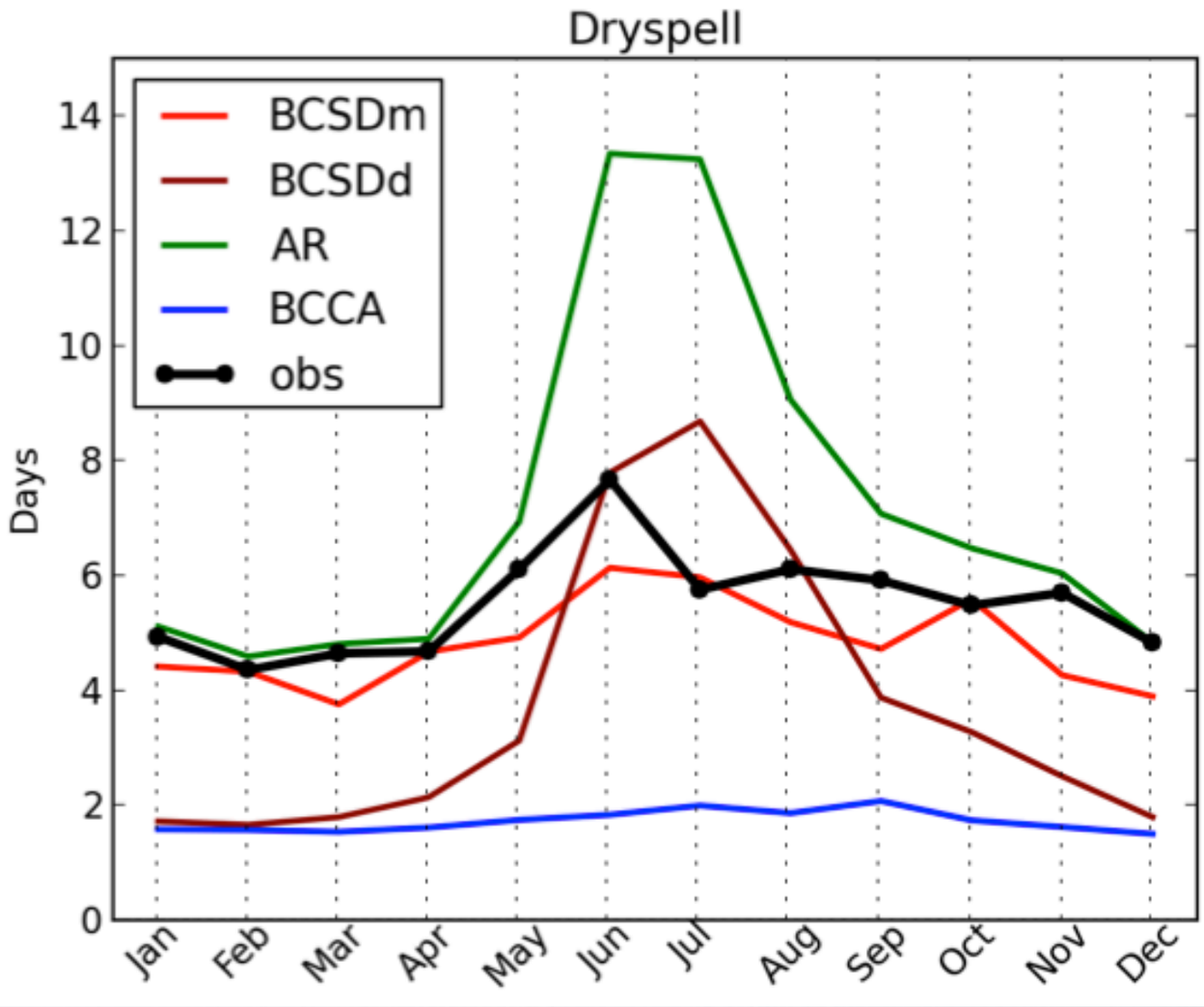
Wet day fraction

- BCCA, BCSDd overestimate wet day fraction
- BCSDd and AR do not scale correctly (BCCA sort of)
- AR underestimates wet day fraction, esp. at coarser scales
- BCSDm slightly overestimates wet day fraction
- BCCAr is only slightly better than BCCA



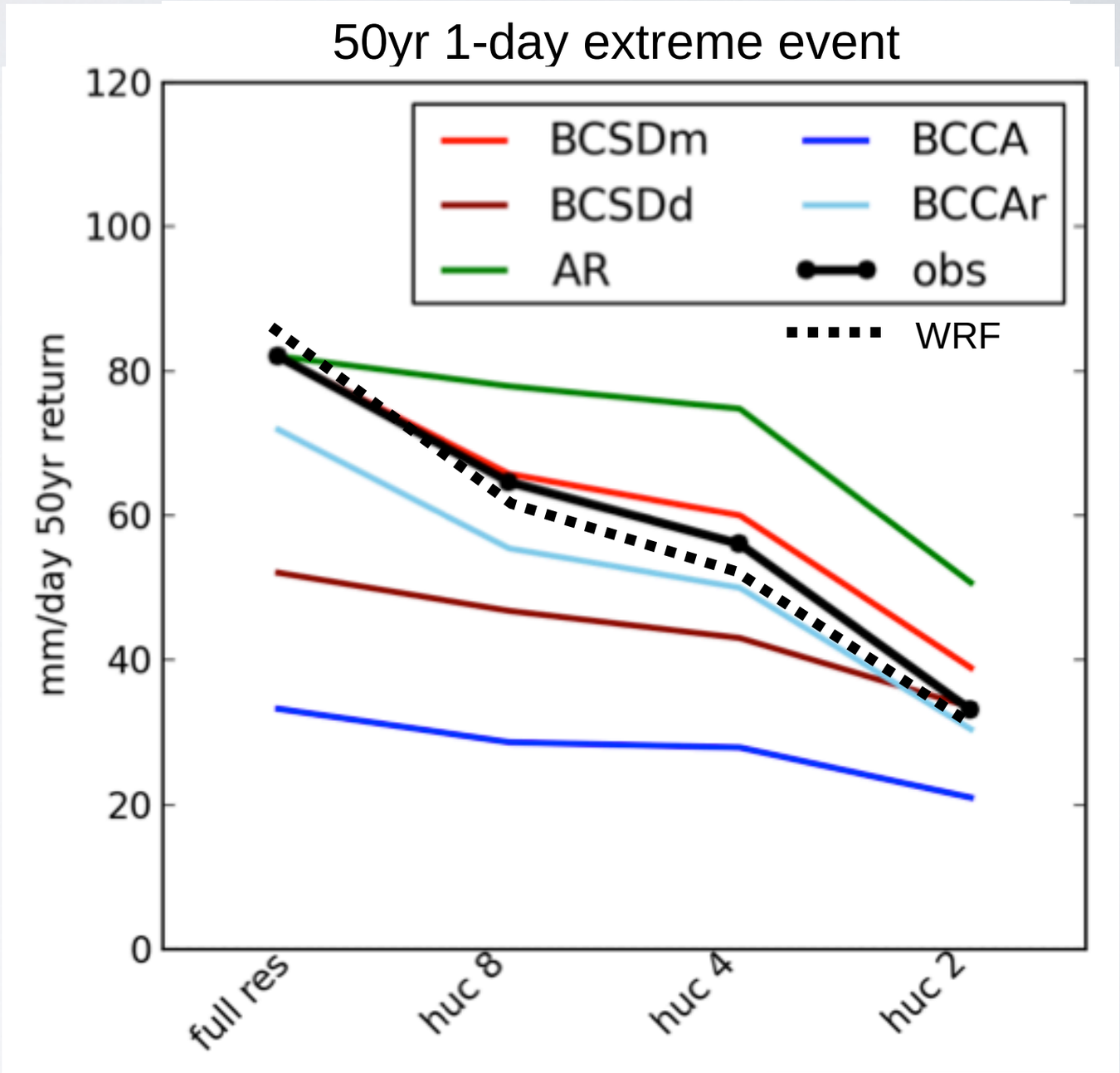
Wet / dry spell lengths





Extreme events

- BCCA, BCSDd underestimate Extreme events
- BCSDd, AR, and BCCA do not scale correctly
- AR overestimates extreme events, esp. at coarser scales
- BCSDm is largely unbiased
- BCCAr is substantially better than BCCA
- WRF is largely unbiased



Conclusions

	Bias	Wet Day Fraction	Extreme event	Scaling
BCCA	LOW	HIGH	LOW	ok
BCCAr	low	HIGH	low	ok
BCSDd	-	HIGH	LOW	poor
BCSDm	-	high	-	good
AR	-	low* (scale)	high* (scale)	poor
WRF	-	-	-	good

Also: Be cautious of gridded “observations”