

## Introduction

Short-Term Climate Extremes: Prediction Skill and Predictability, Becker et al. (2012)

- "How well can we currently predict short-term climate extremes?"
- Showed extremes more predictable on monthly timescales.

This project looks at surface temperature and precipitation prediction skill on daily and weekly timescales.

Model: CFSv2

Observations: NCAR/NCEP Reanalysis 1

1999-2010: March, June, September, December

## Measuring Prediction Skill

How Do We Quantify Prediction/Predictability?

$$AC(m, \tau) = \frac{\sum_s \sum_j F'(s, j, m, \tau) O'(s, j, m)}{\left\{ \sum_s \sum_j [F'(s, j, m, \tau)]^2 \sum_s \sum_j [O'(s, j, m)]^2 \right\}^{1/2}}$$

- Anomaly Correlation Coefficient
- ACC=1 if the forecast is perfect.
- ACC=-1 if the reverse happens.
- s=space, j=year, m=target month, τ=lead

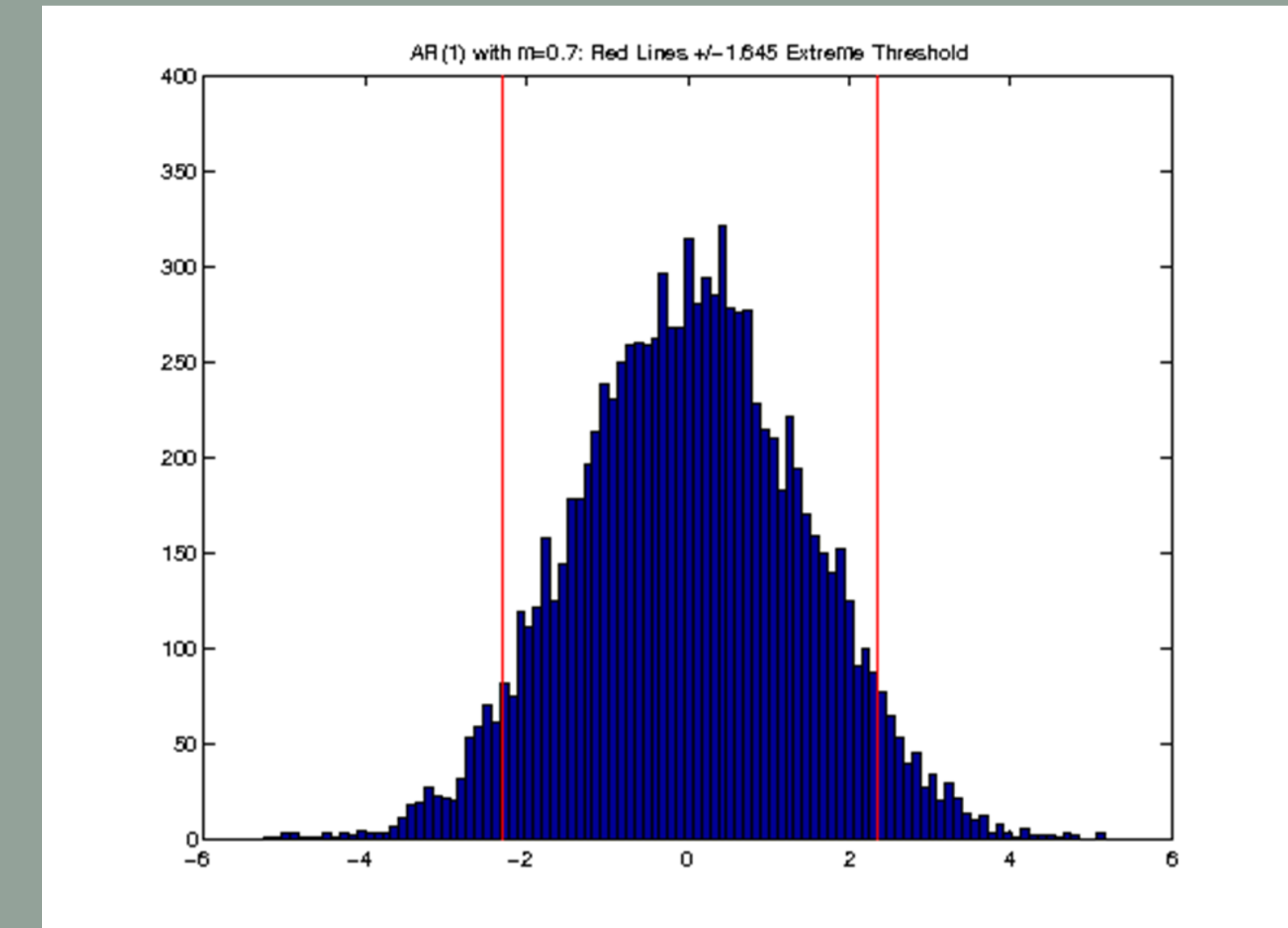
## Defining an Extreme Event

Calculate the standardized anomaly for data set (Y).

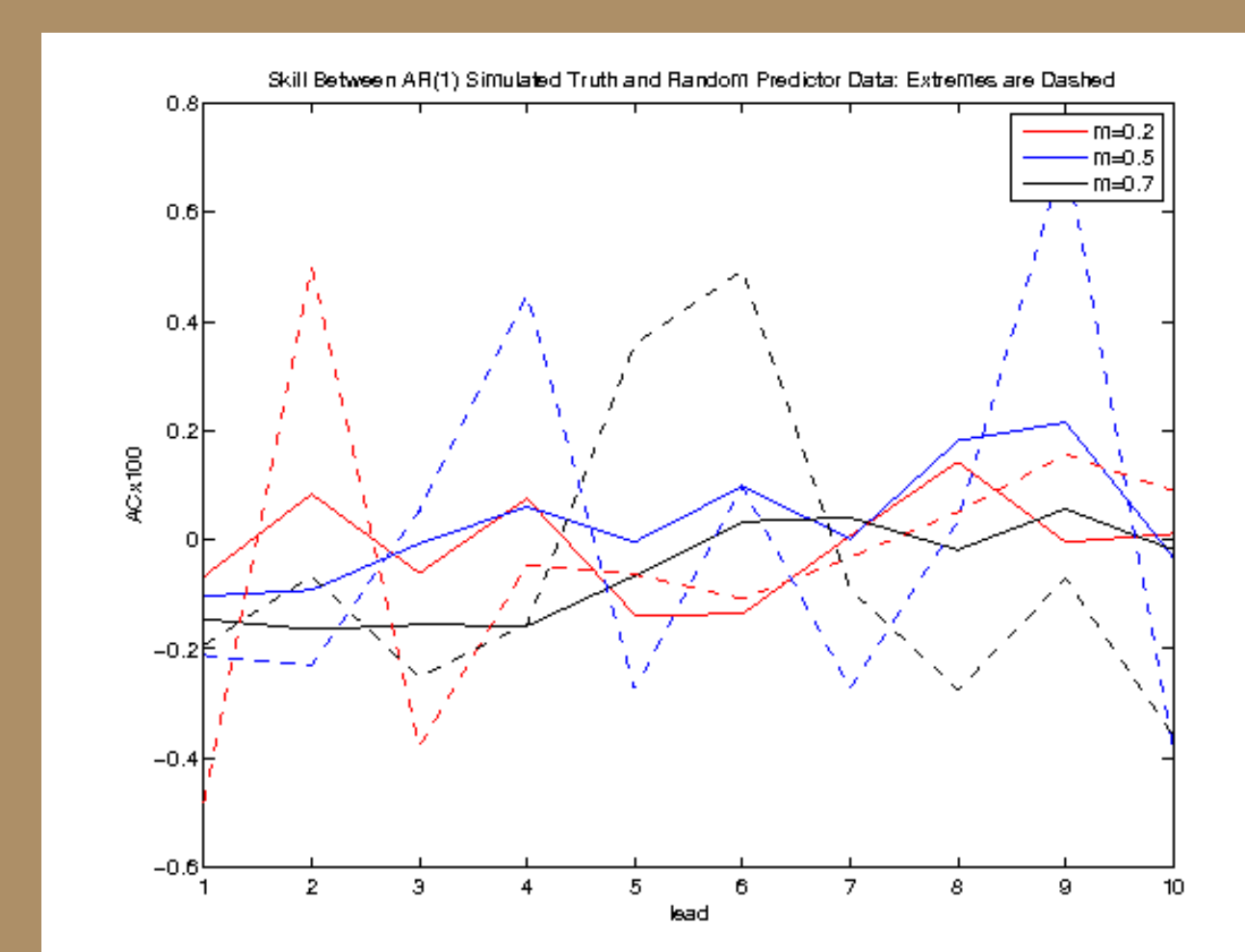
$$ANOM_{STD}(t) = \frac{Y(t) - \text{clim}_Y}{std_Y}$$

If  $|ANOM_{STD}| > 1.645$  (5<sup>th</sup> and 95<sup>th</sup> percentile threshold) then the event is extreme.

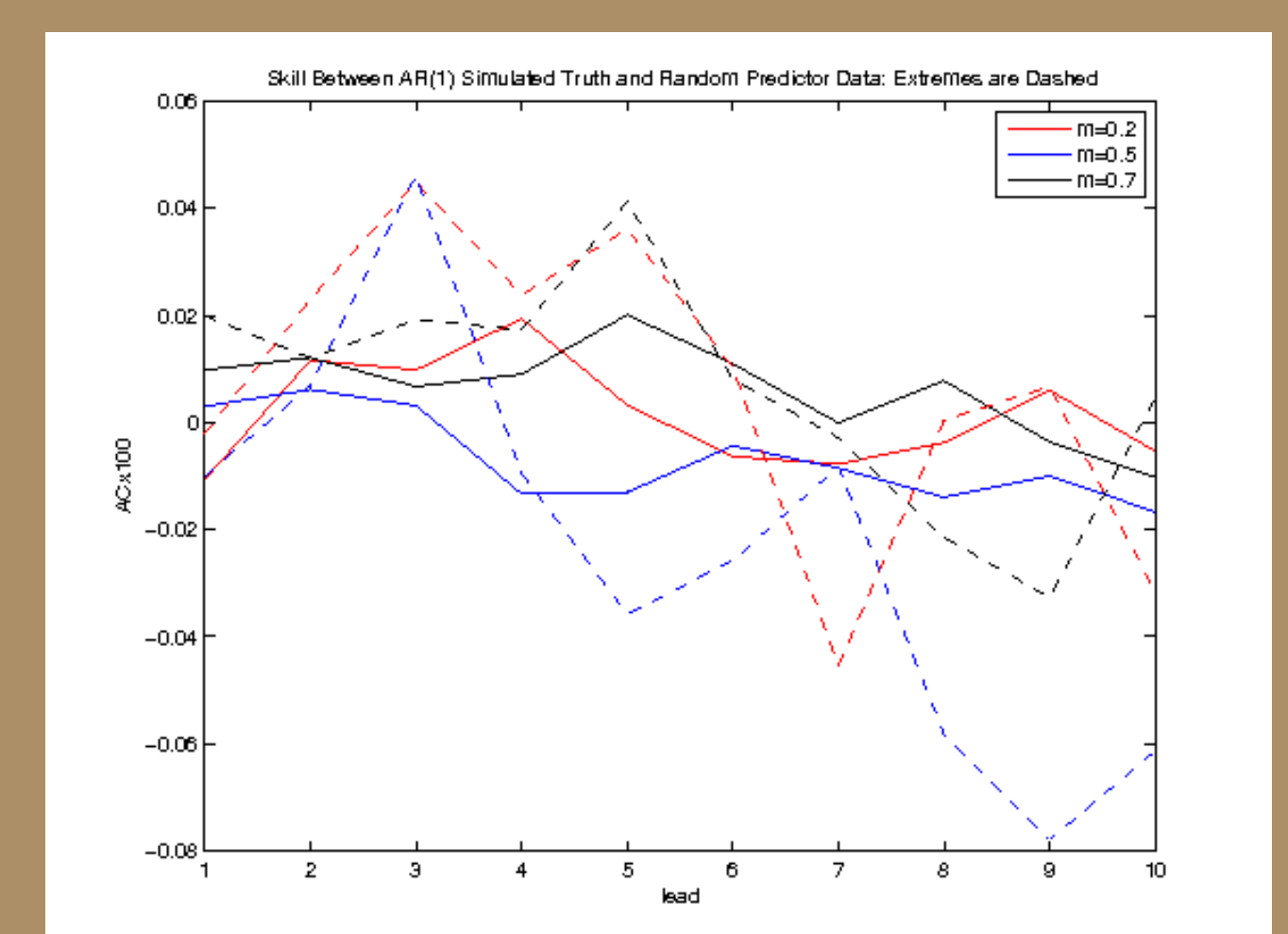
Figure: Distribution of AR(1) processes using below equation.  
 $y_{t+1} = my_t + \varepsilon$



## AR(1) Process



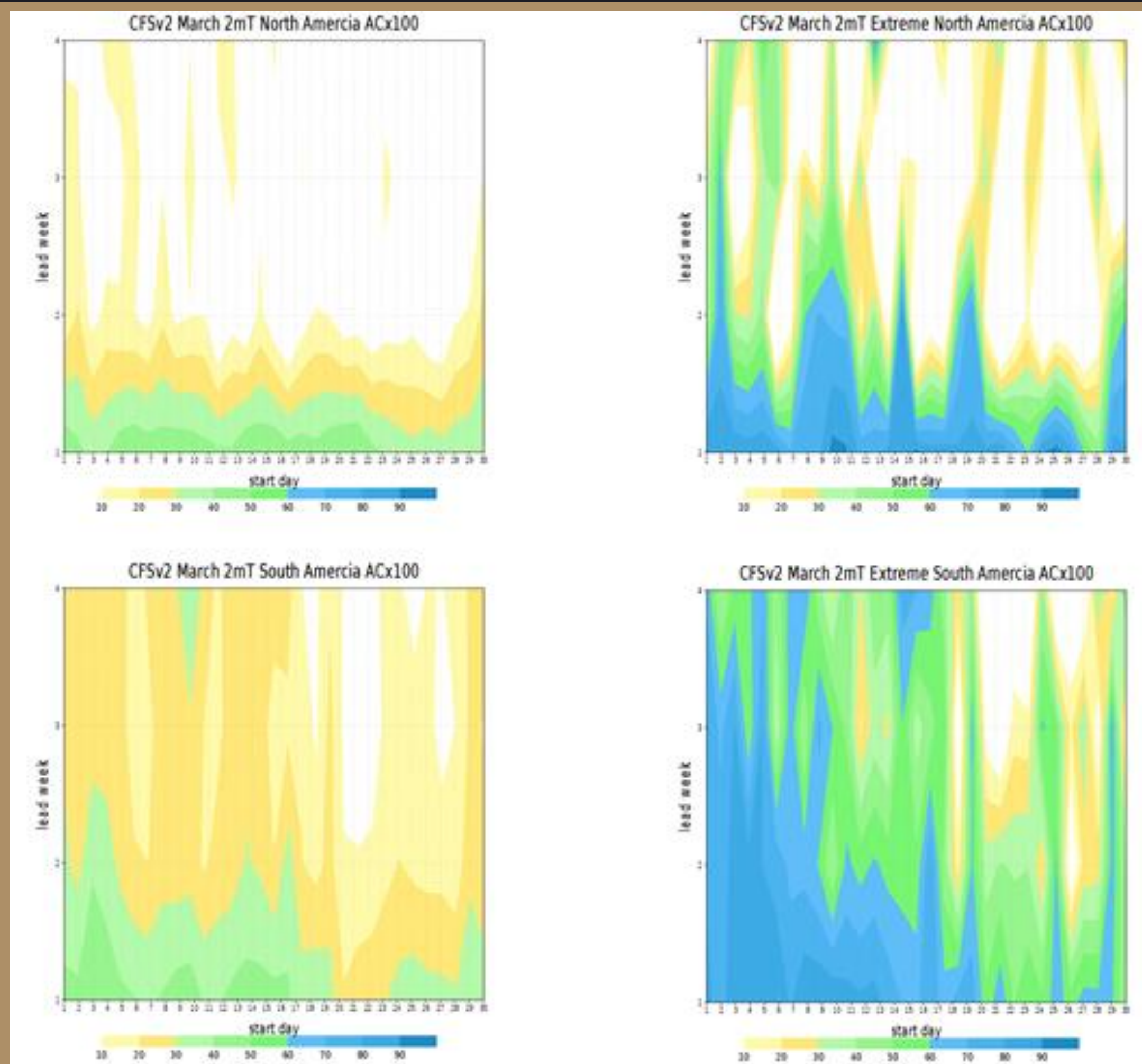
1,000 Cases



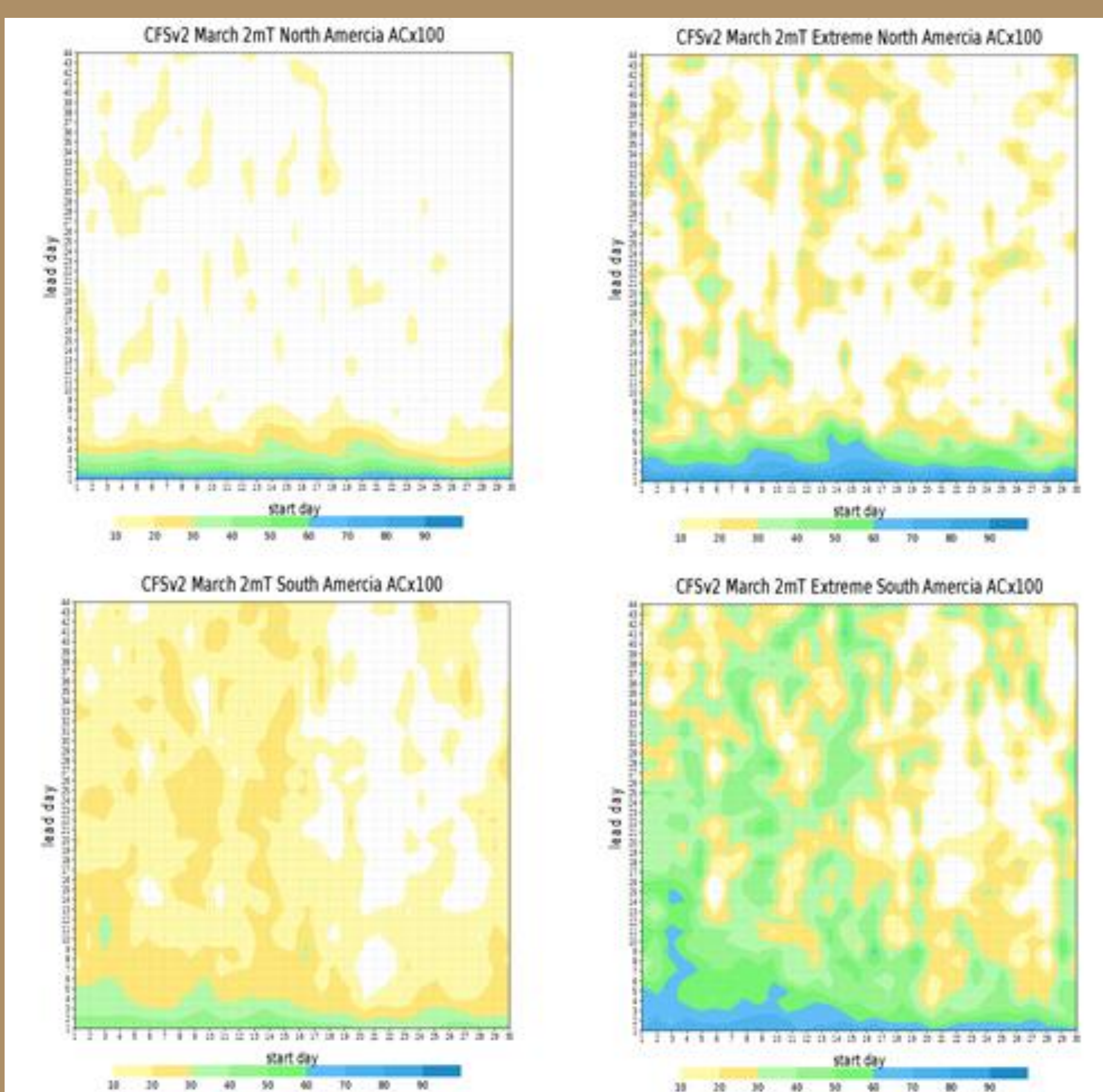
10,000 Cases

No reason to expect extremes of a distribution to be more predictable by random chance.

## Results: Start Day vs. Lead

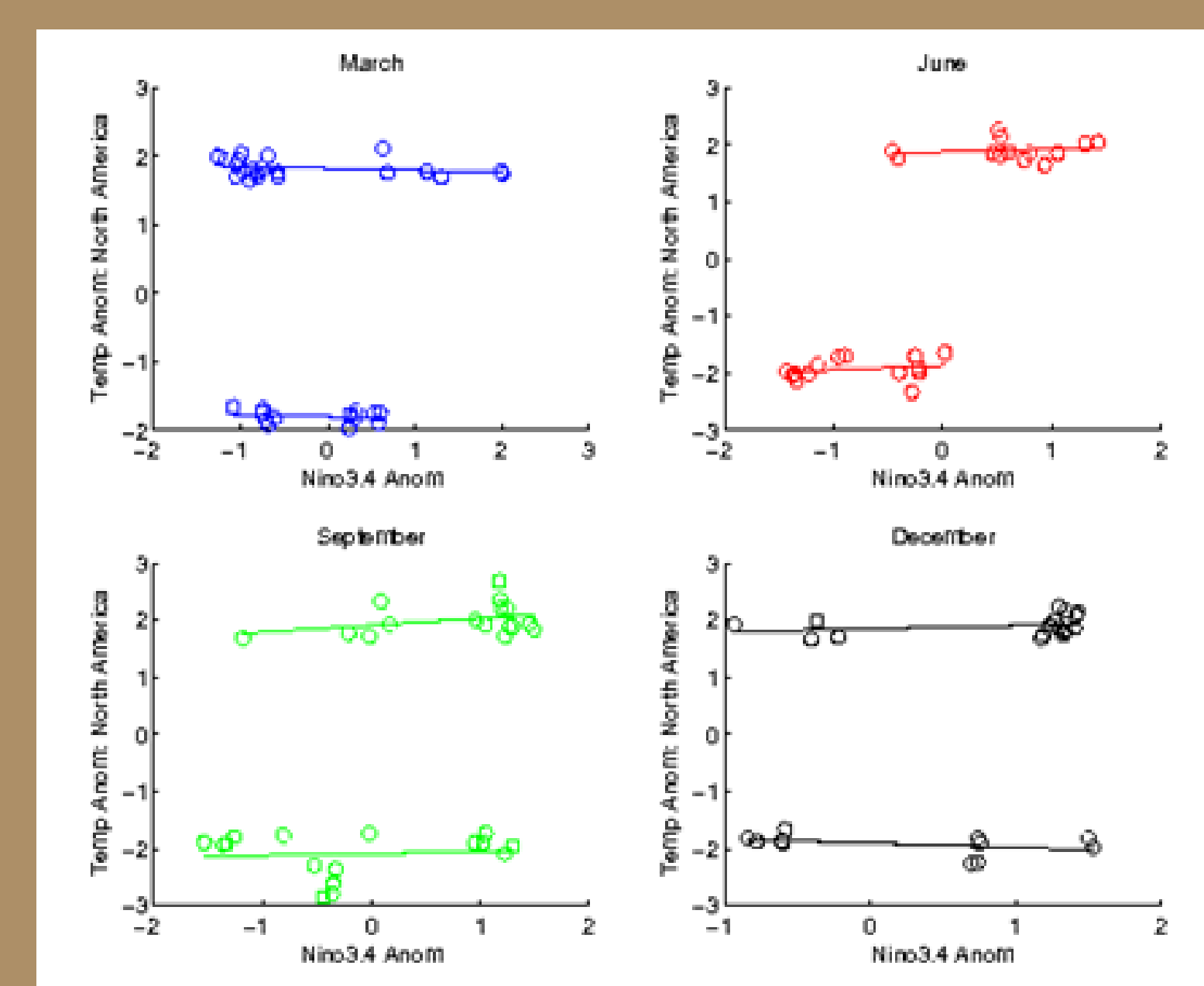
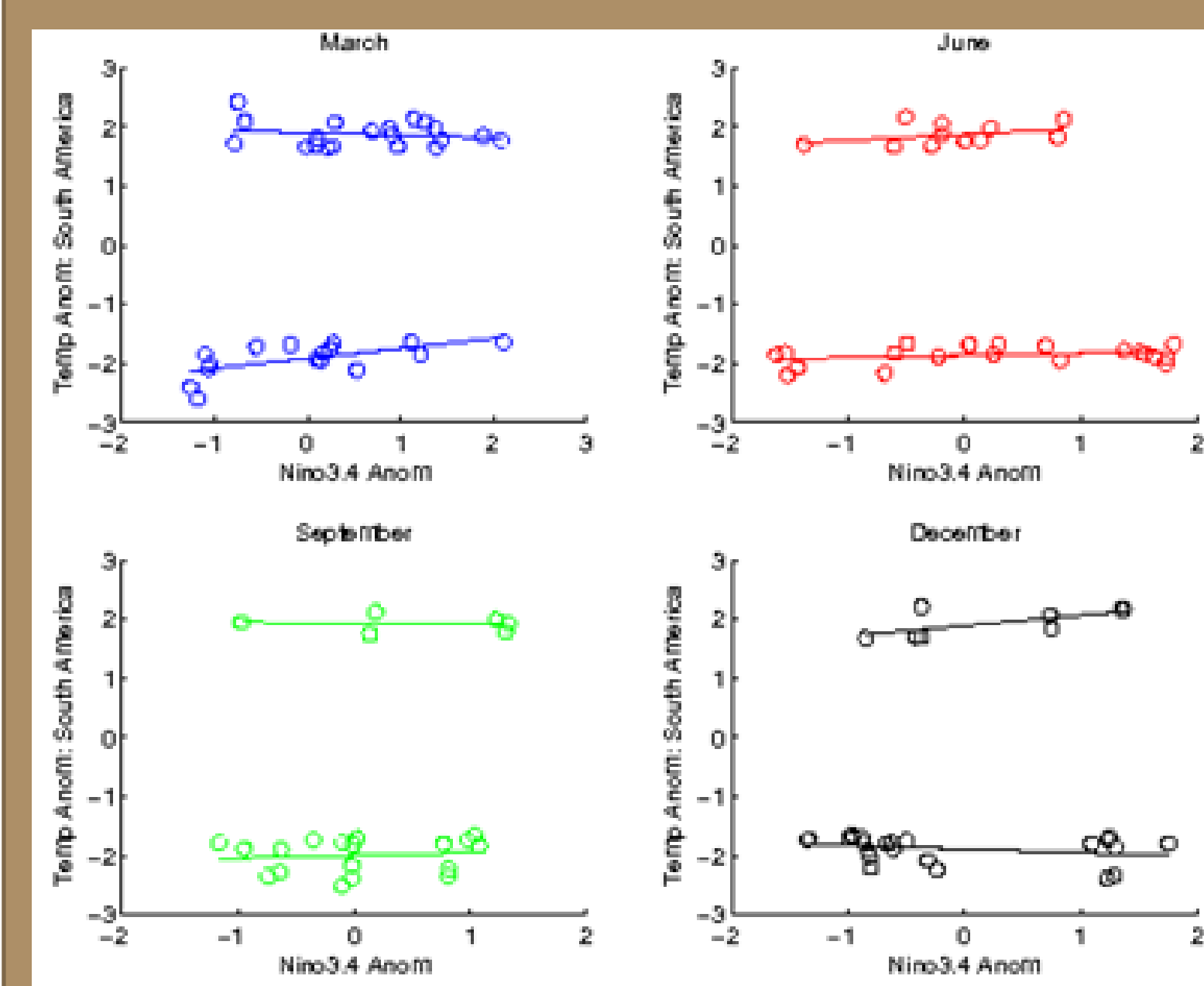


March weekly surface temperature over North (top) and South (bottom) America  
All data (left) and extreme time series (right)



March daily surface temperature over North (top) and South (bottom) America  
All data (left) and extreme time series (right)

## Relationship to ENSO



Regression between the observed extreme events and the Nino3.4 standardized sea surface temperature (SST) anomaly. In all cases there does not seem to be a relationship between ENSO and the extreme events, indicating that there is another driving force behind the increased skill.

## CONCLUSIONS

Coinciding with the results found in Becker et al. (2012) the AC associated with the extreme time series is higher on both daily and weekly time scales.

Additional skill is not due to the reduced sample size (proven in Becker et al. (2012), random chance, or a teleconnection with ENSO.

Further investigation needs to be done in order to answer the questions why do extreme events have more skill.