

Trends in Convection Over the Central United States

Victor A. Gensini and Jennifer M. Laflin

University of Georgia, Athens, GA and National Weather Service, Sioux Falls, SD



1. Introduction

Temperature changes lead to changes in precipitation, which is a global concern relating to the availability of fresh water.

Character of precipitation is important

- Stratiform rain more beneficial to agriculture
- Convective precipitation leads to increased runoff and flash flood potential

CAPE can be used as predictor of convective changes and could increase at $50 - 100 \text{ J kg}^{-1} \text{ K}^{-1}$ (Ye et al. 98)

Clausius-Clapeyron equation predicts a 7% increase in moisture per degree C; IPCC models predict a 1-2% increase in rainfall

- Ratio of convective to stratiform precipitation events will increase
- Overall number of precipitation events will decrease

Warm air “holds” more moisture than cool: increasing temperatures → more available moisture

Warmer temperatures lead to higher CAPE but also higher CIN → Overall effect??

2. Data

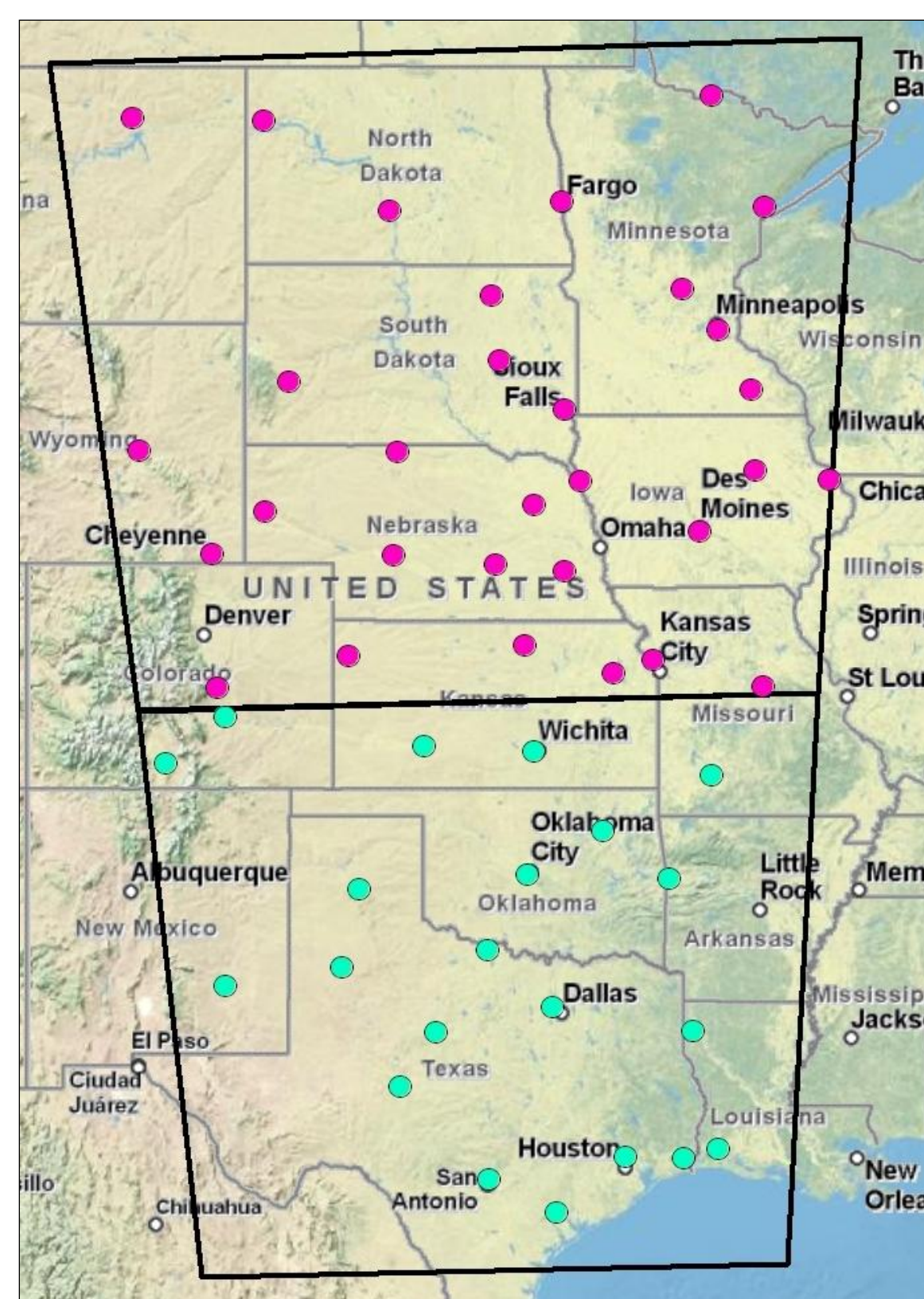
Precipitation

- Hourly rainfall for 52 stations in the central U.S., April - September

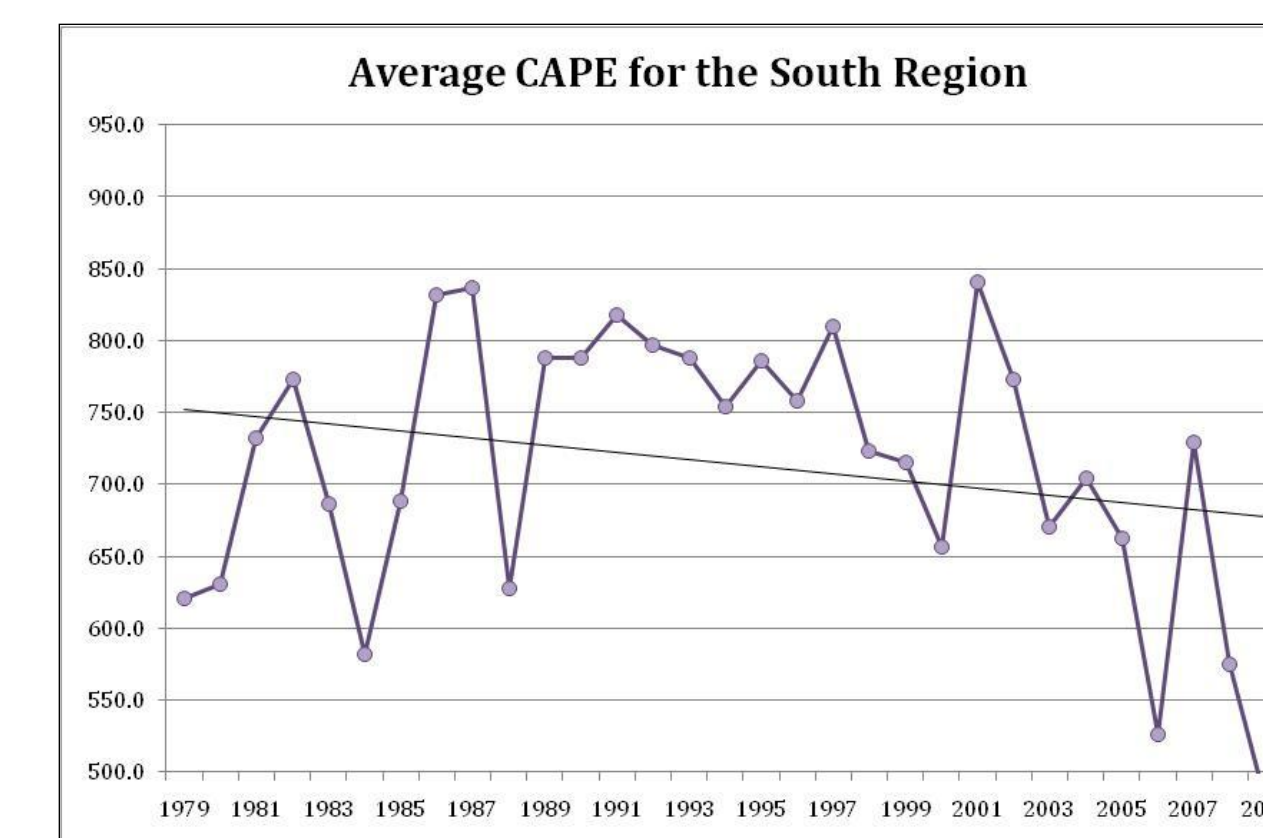
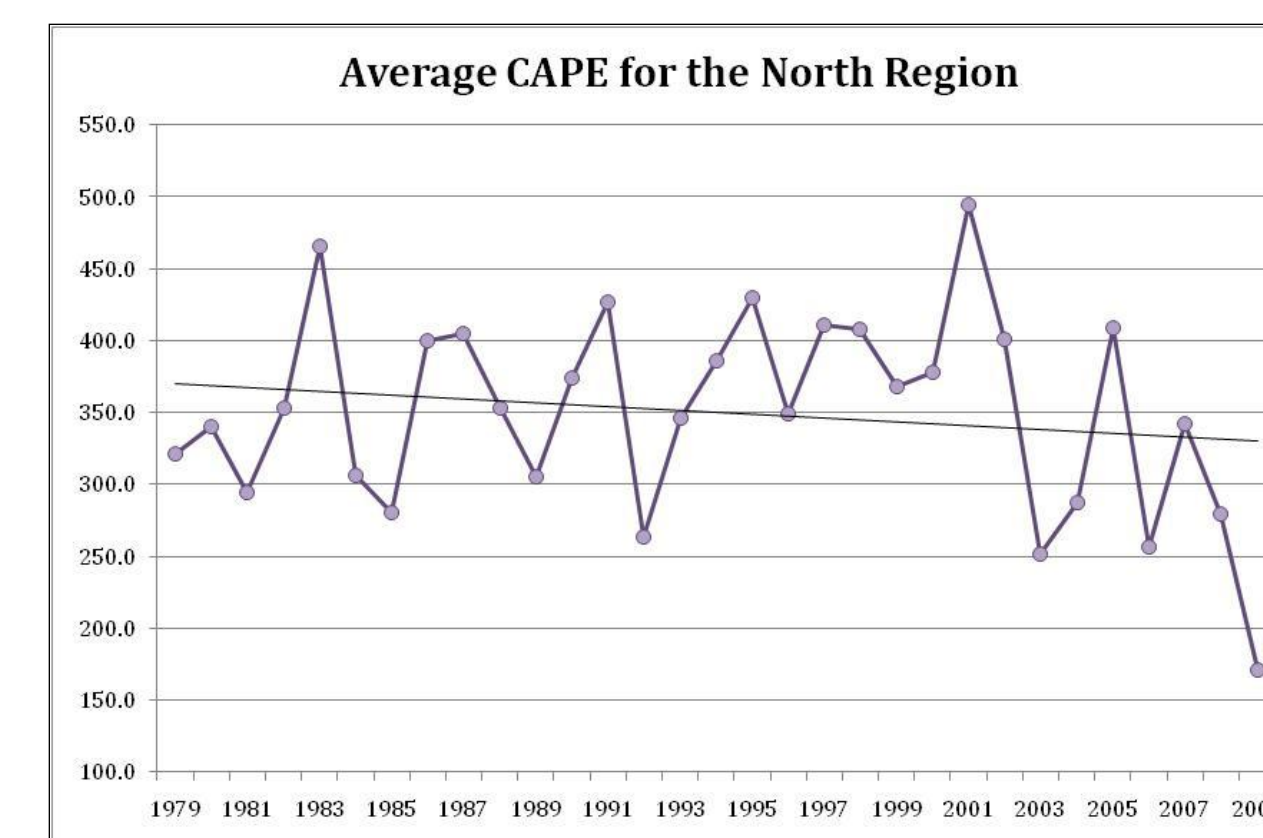
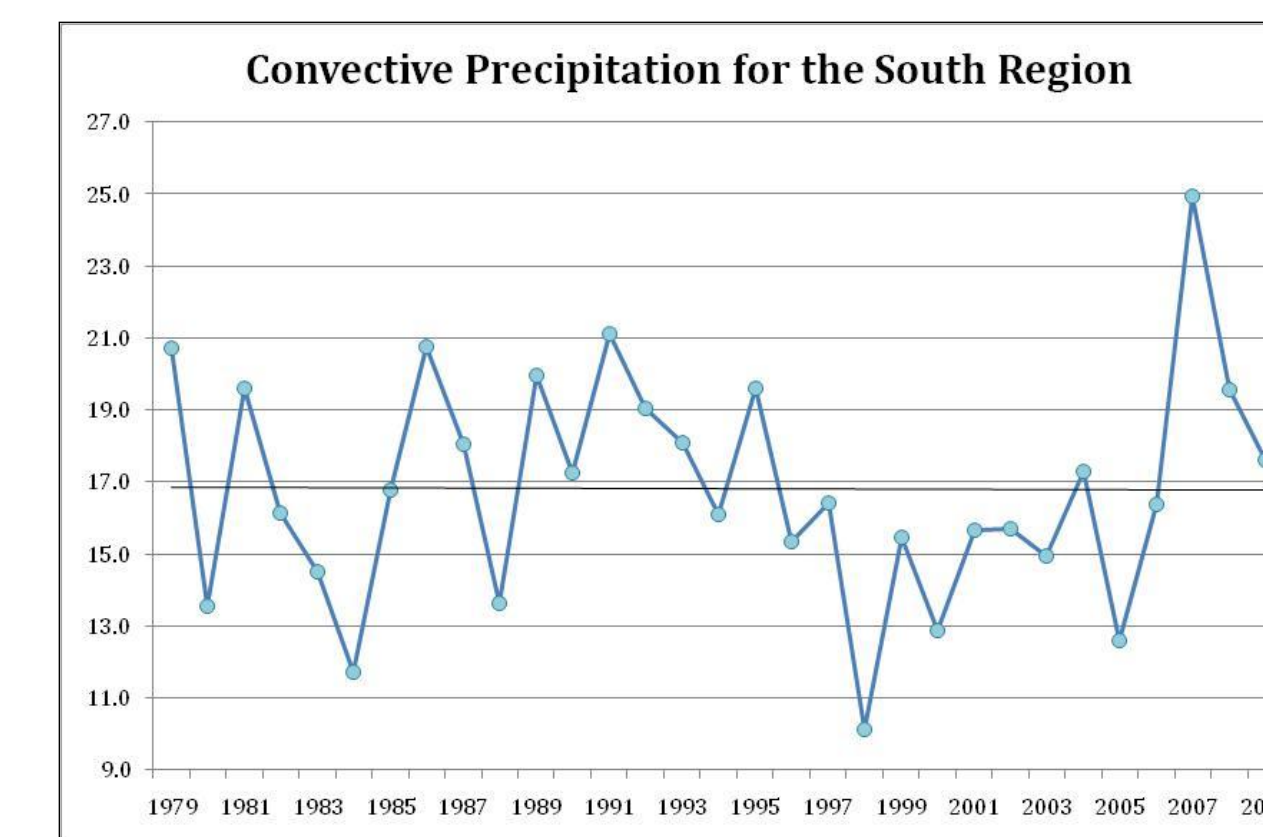
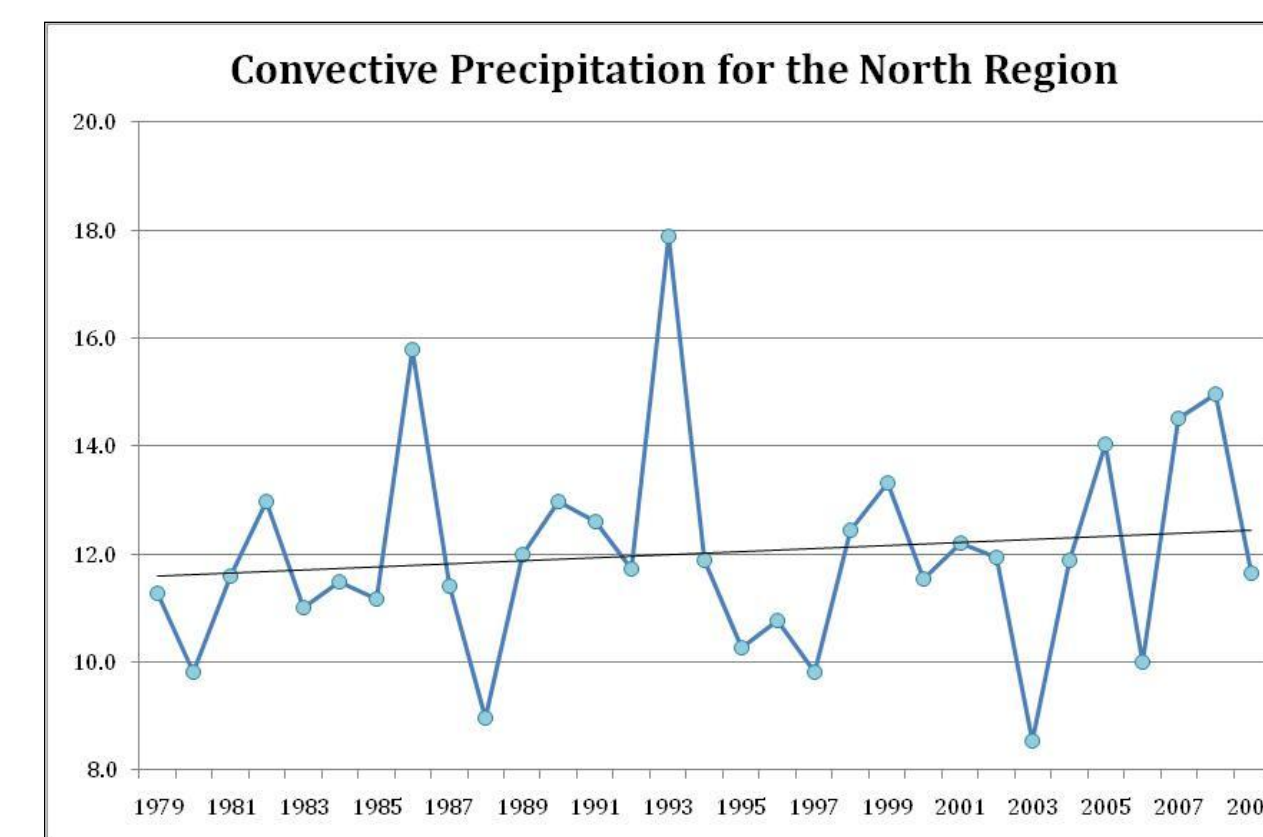
CAPE and CIN

- NARR data for two regions in the central U.S., April – September

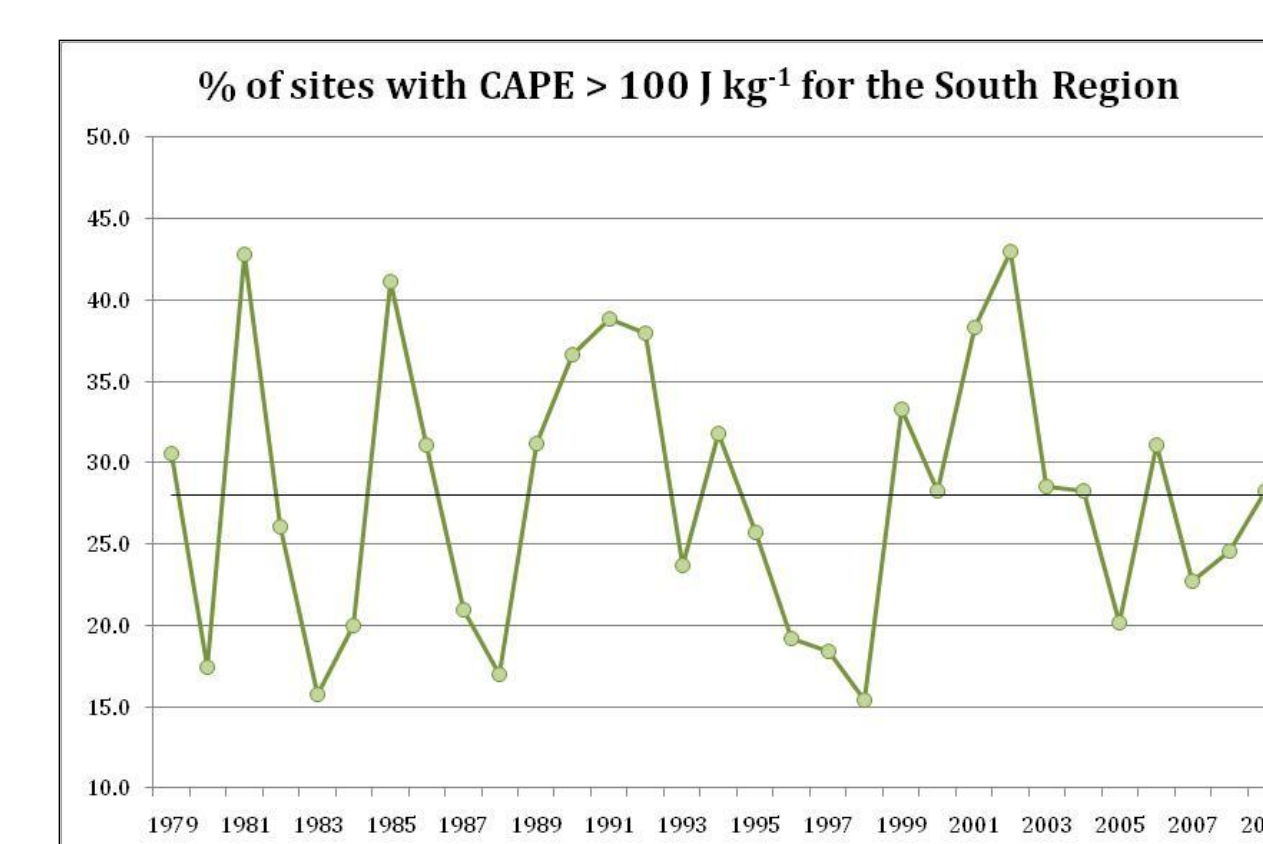
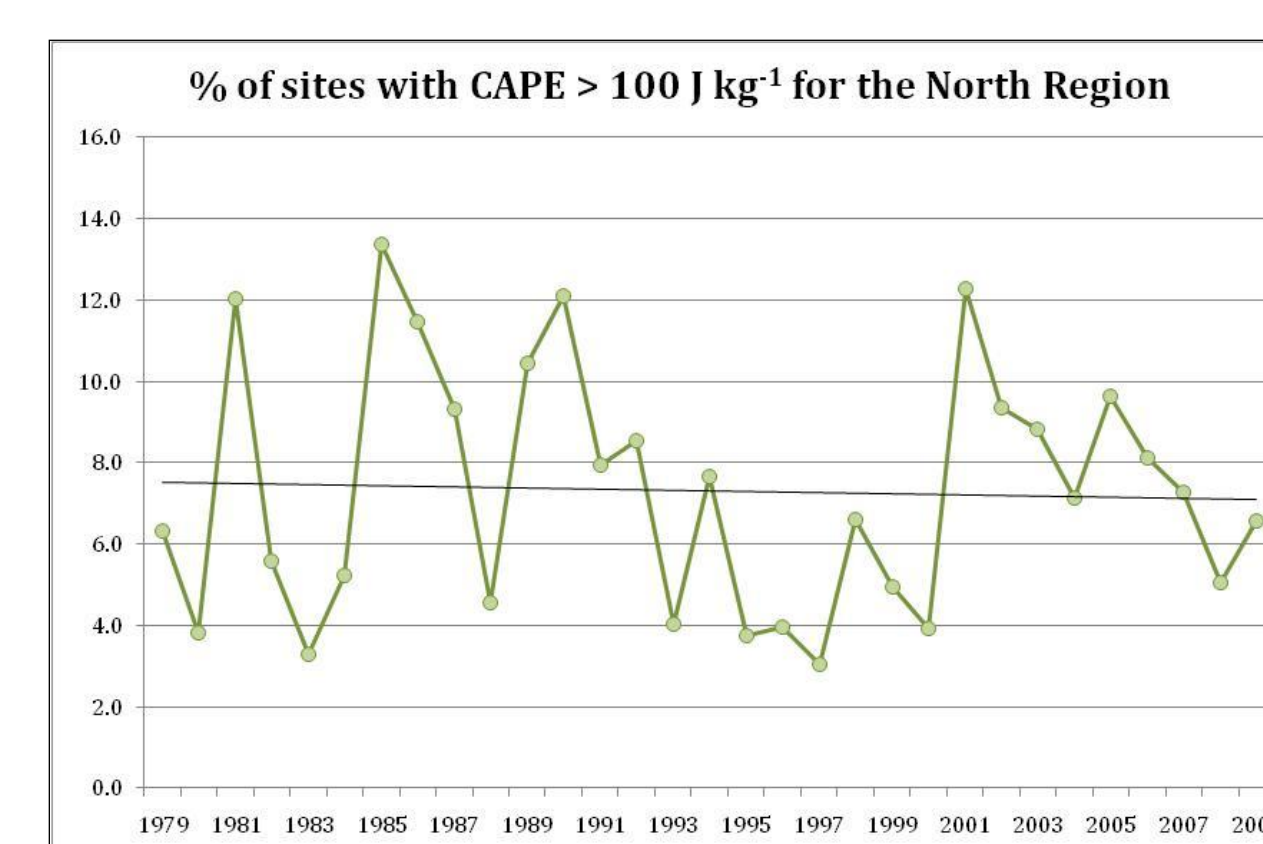
Comparing # of hours with convective precip and average CAPE per convective season



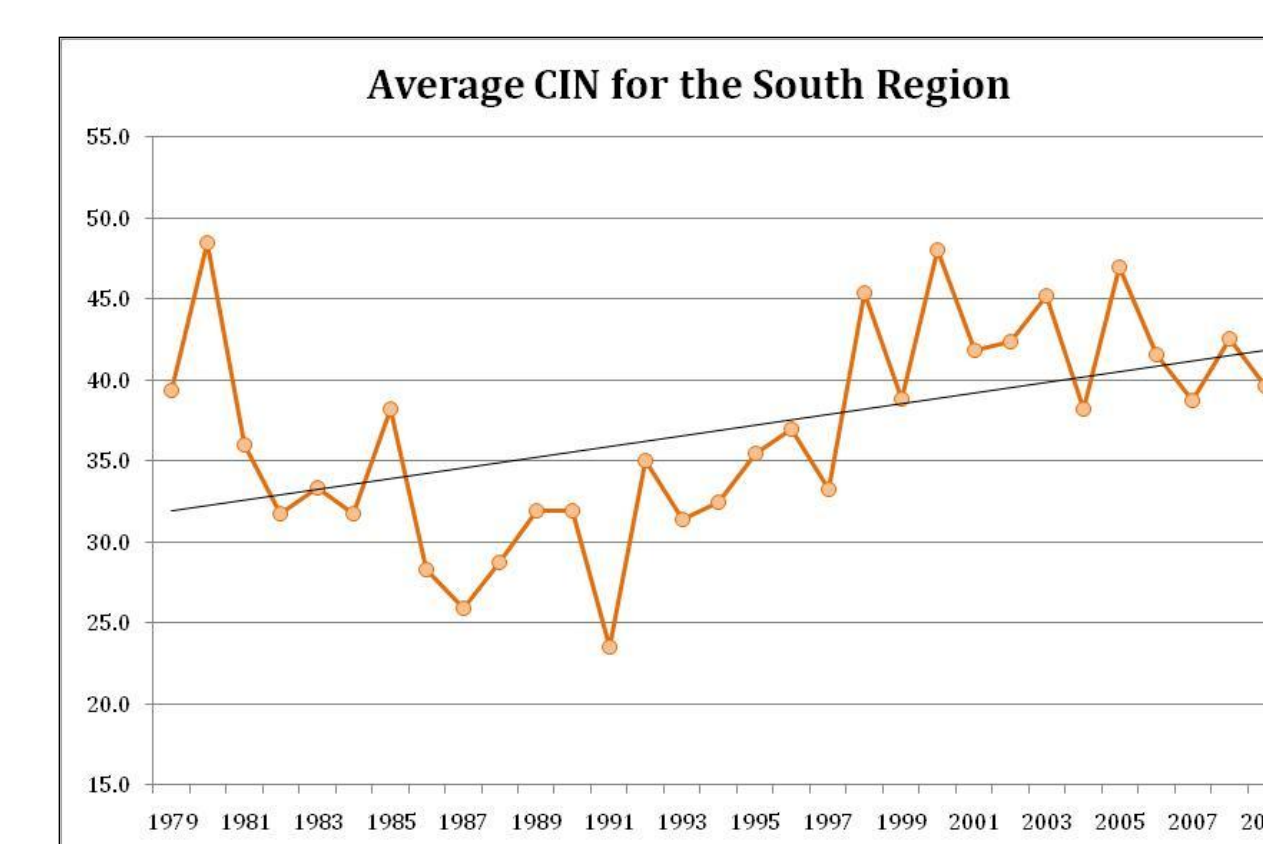
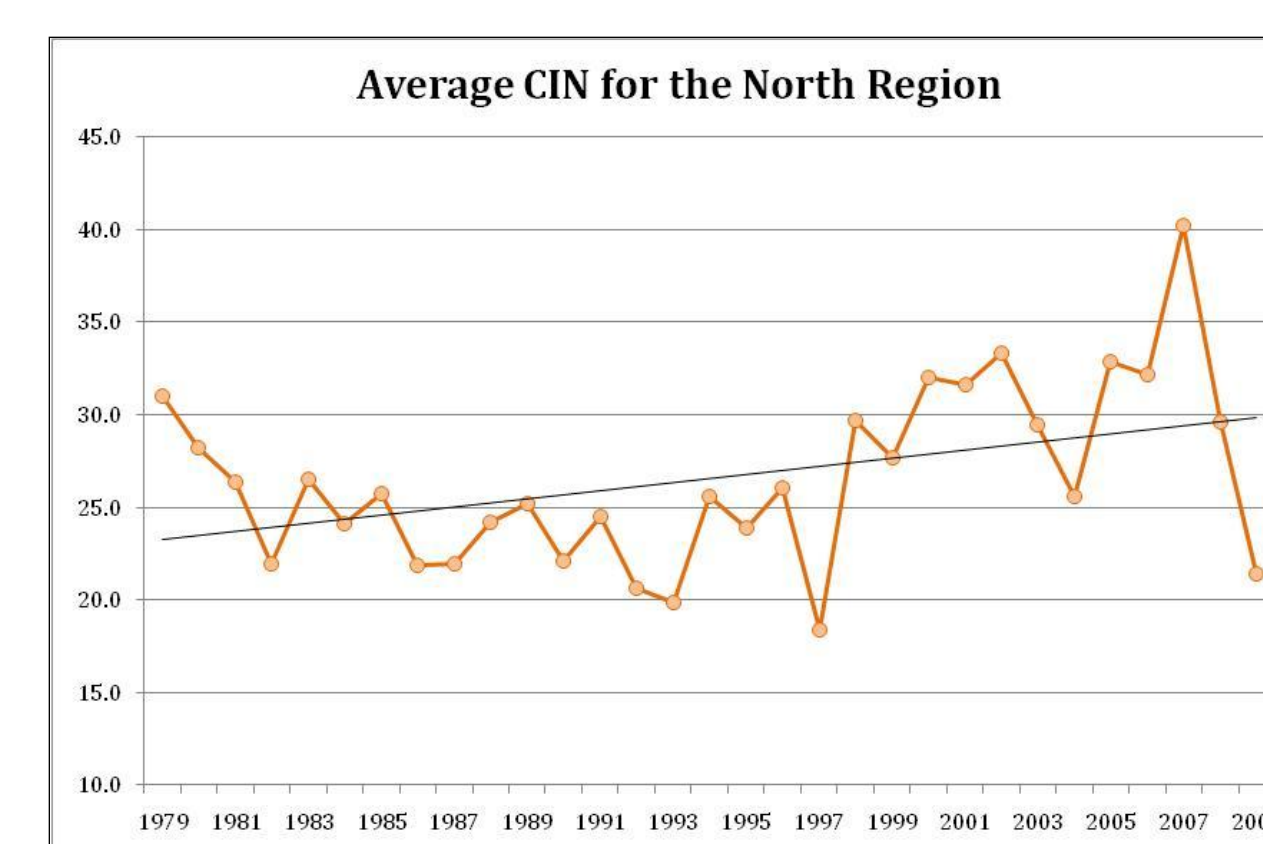
3. Annual Results



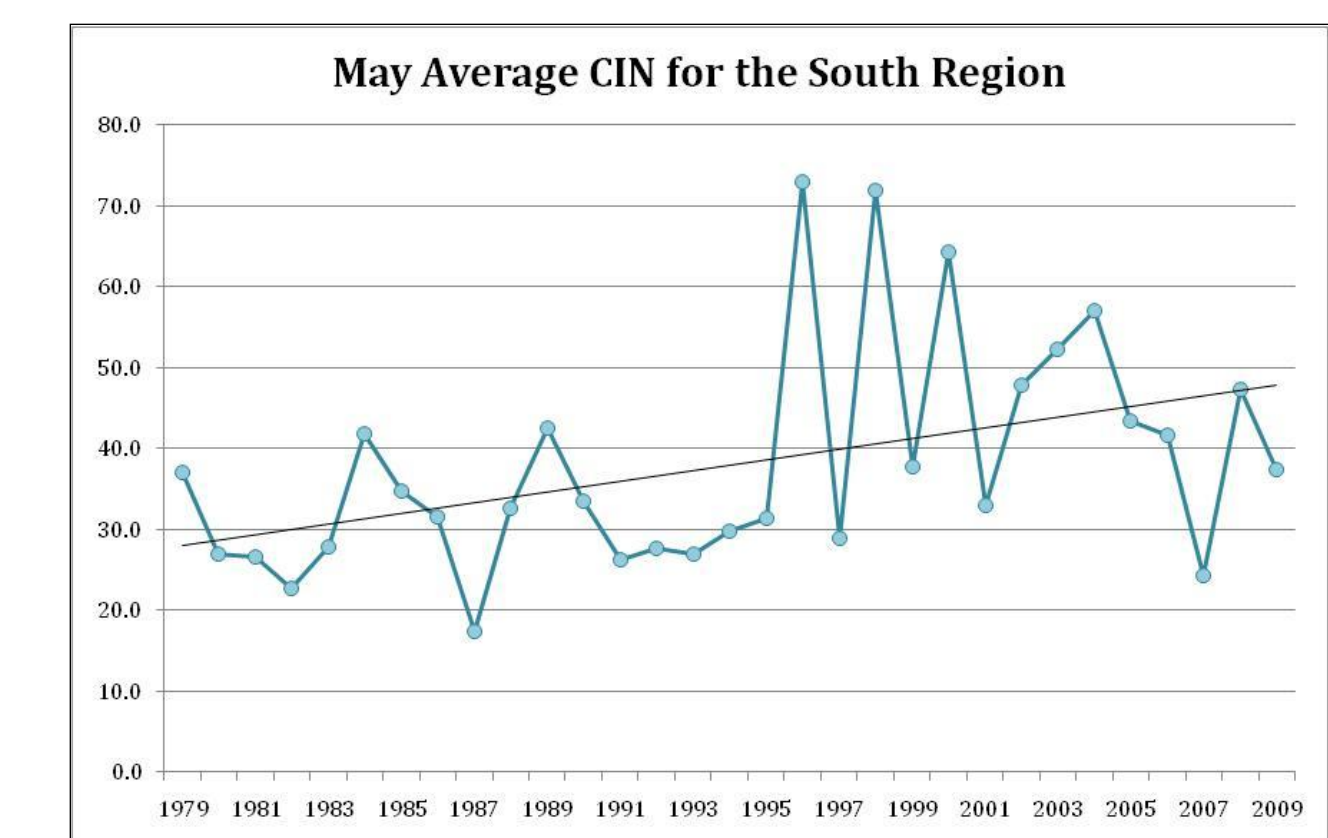
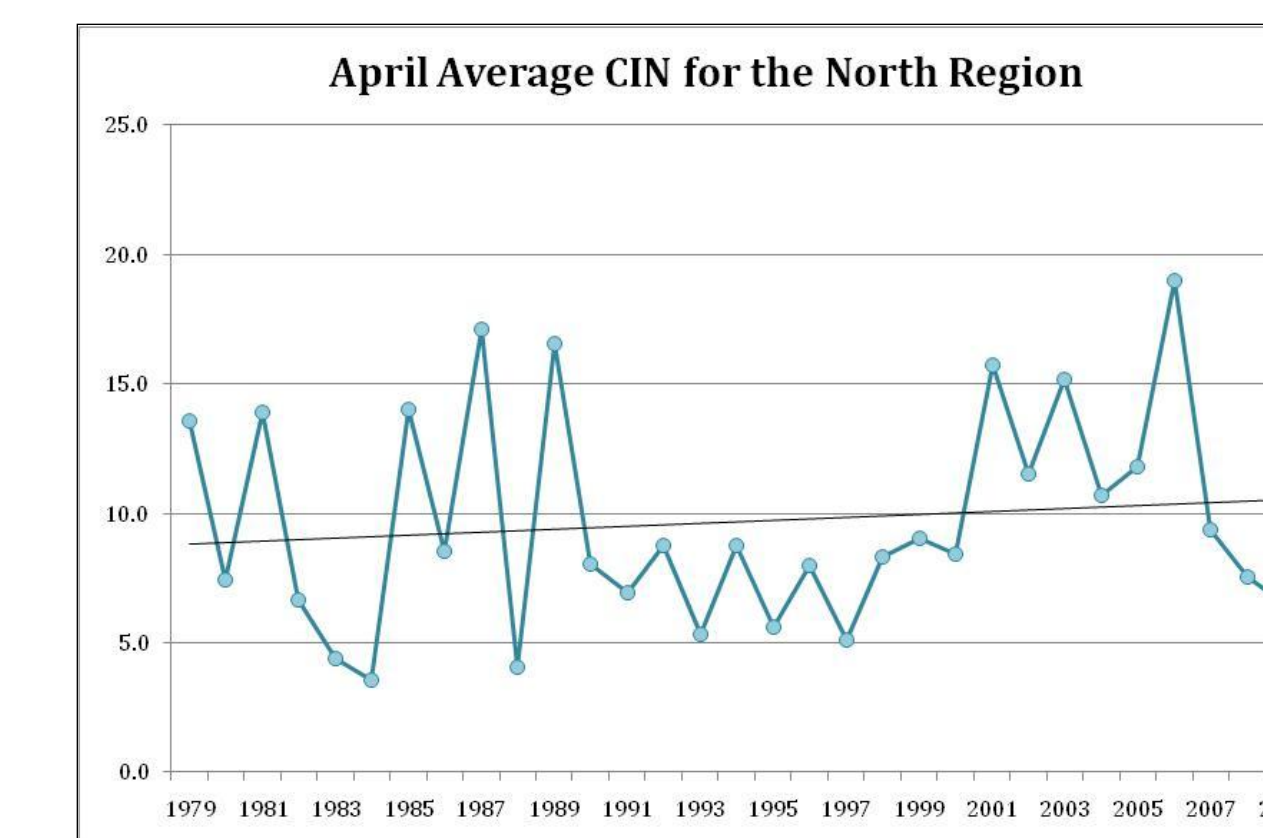
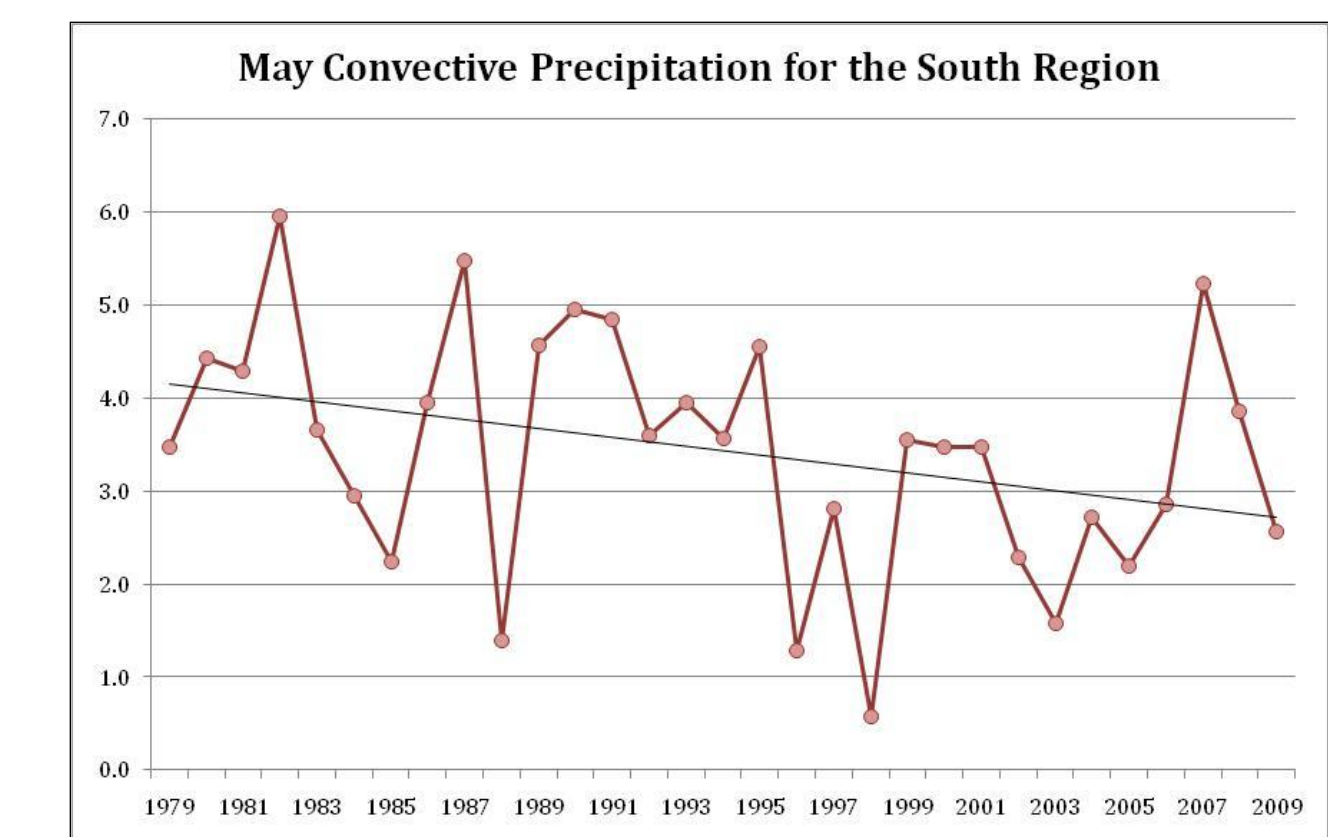
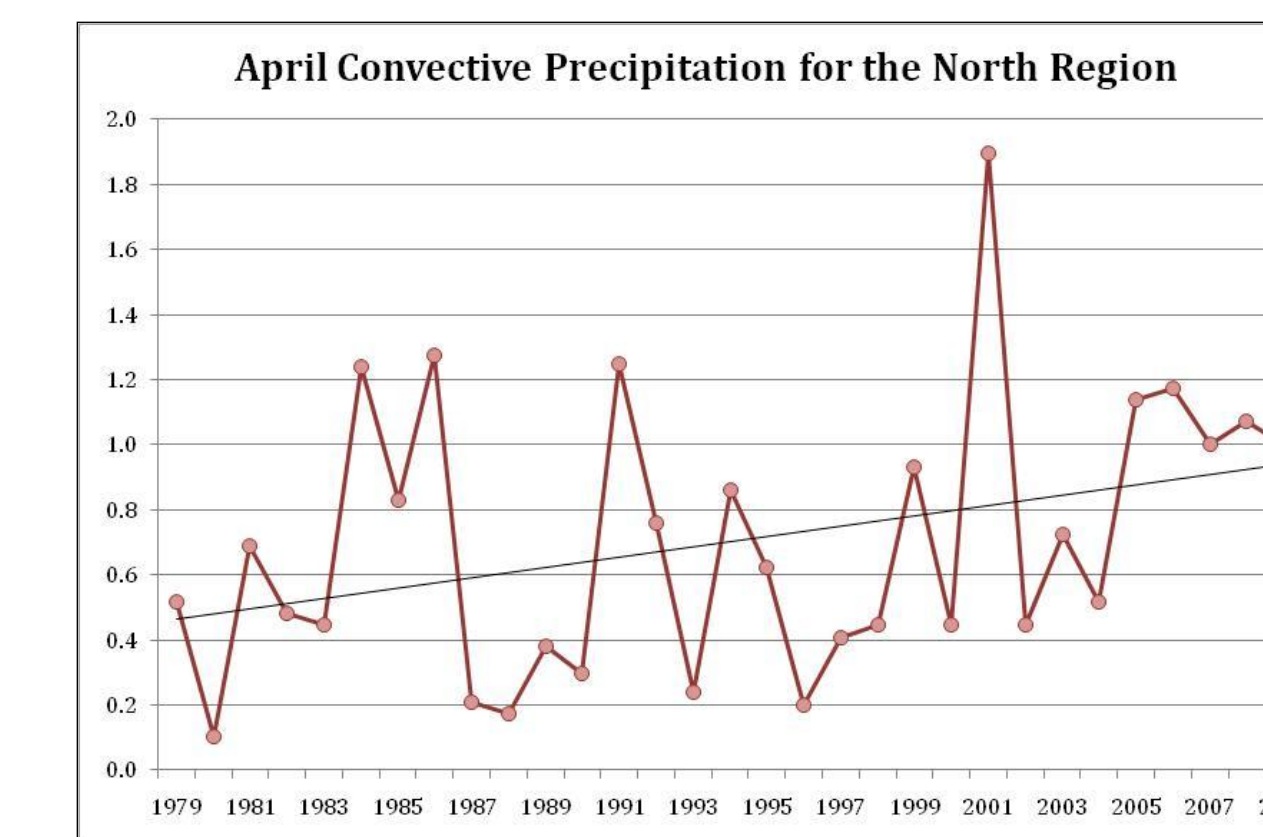
Higher CAPE doesn't necessarily equal more convection, since only some CAPE is required for convective initiation



Increasing temperatures may support increasing CAPE but also supports increasing values of CIN → less convective precipitation



4. Monthly Results



5. Conclusions

CAPE and convective precipitation are not well correlated over the Central U.S.

CIN appears to have a higher correlation to convective precipitation, especially in the south

- Averaged values in the north are less than 20 J kg^{-1} which is generally too low to inhibit convection

Higher CAPE does not necessarily indicate a better potential for convective rainfall

Possible earlier shift of the convective season to the north, seen from May convective precipitation in the south and April convective precipitation in the north.

Increasing values of CIN in the south correlate well to decreasing convective precipitation during the late spring → warming temperatures

CIN trends correlate to recent temperature trends