

Changes in water balance in the Corn Belt over the last 30 years

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Introduction

Global climate change is having an impact on many different industries. Agriculture is one that is very directly affected and has a reverse impact on climate due to land use changes. As the climate changes so too will farming practices. Our goal is to measure changes in the magnitude and seasonal timing of potential evapotranspiration (PET) associated with cropping changes in the northern plains, where pastureland has been converted to crops, especially corn during the last 30 years.

Methods

Most of the project will be done through analysis of the North American Land Data Assimilation System (NLDAS) dataset.

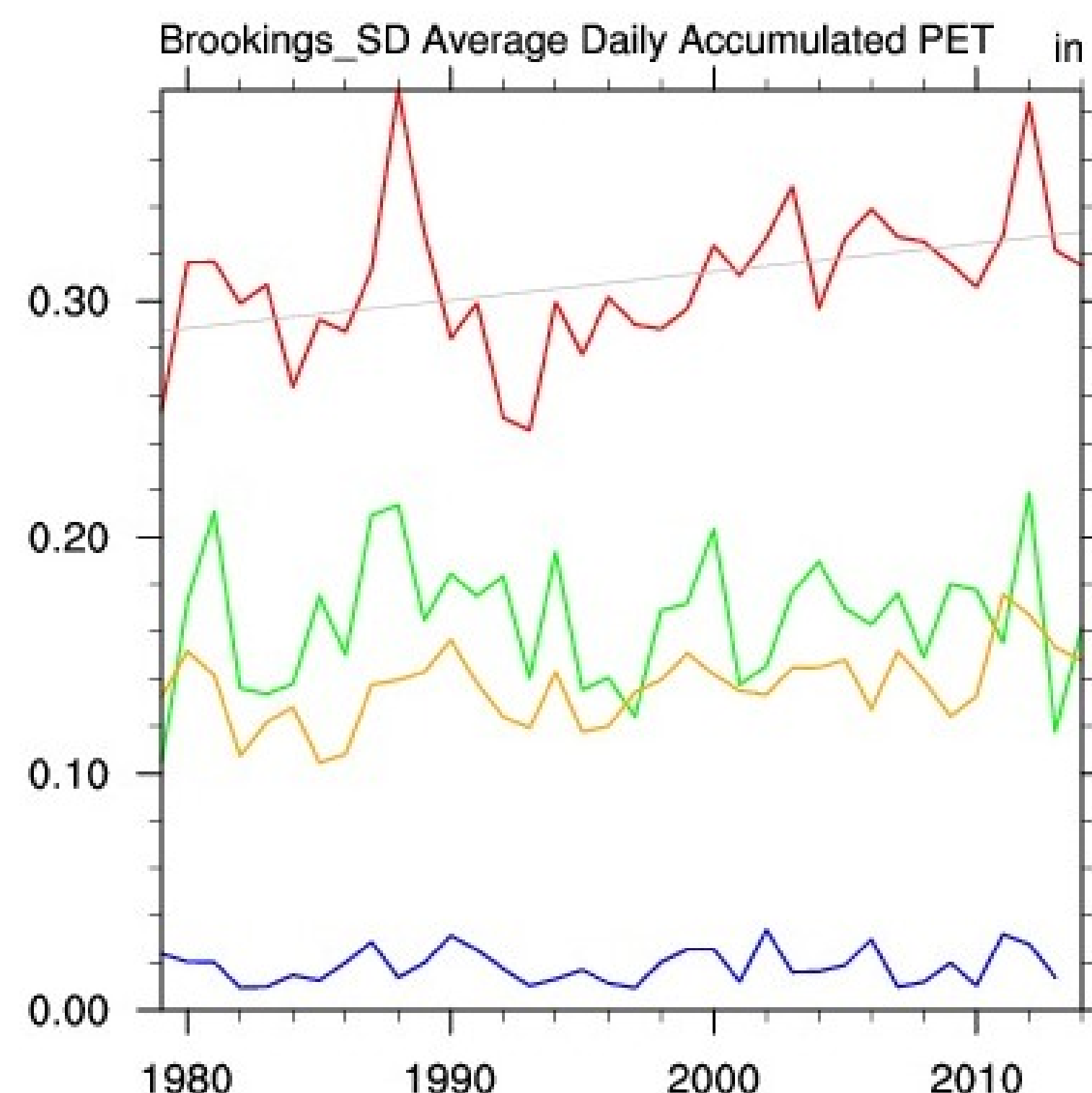
Features of NLDAS

- Reanalysis dataset
- Output in places where no measurements are taken
- 1/8th degree spatial resolution
 - 1 hour time step
- Analysis from 1979 to present

We will use this analysis to find changes in water balance across the corn belt with a specific emphasis on the northern plains.

Preliminary Results

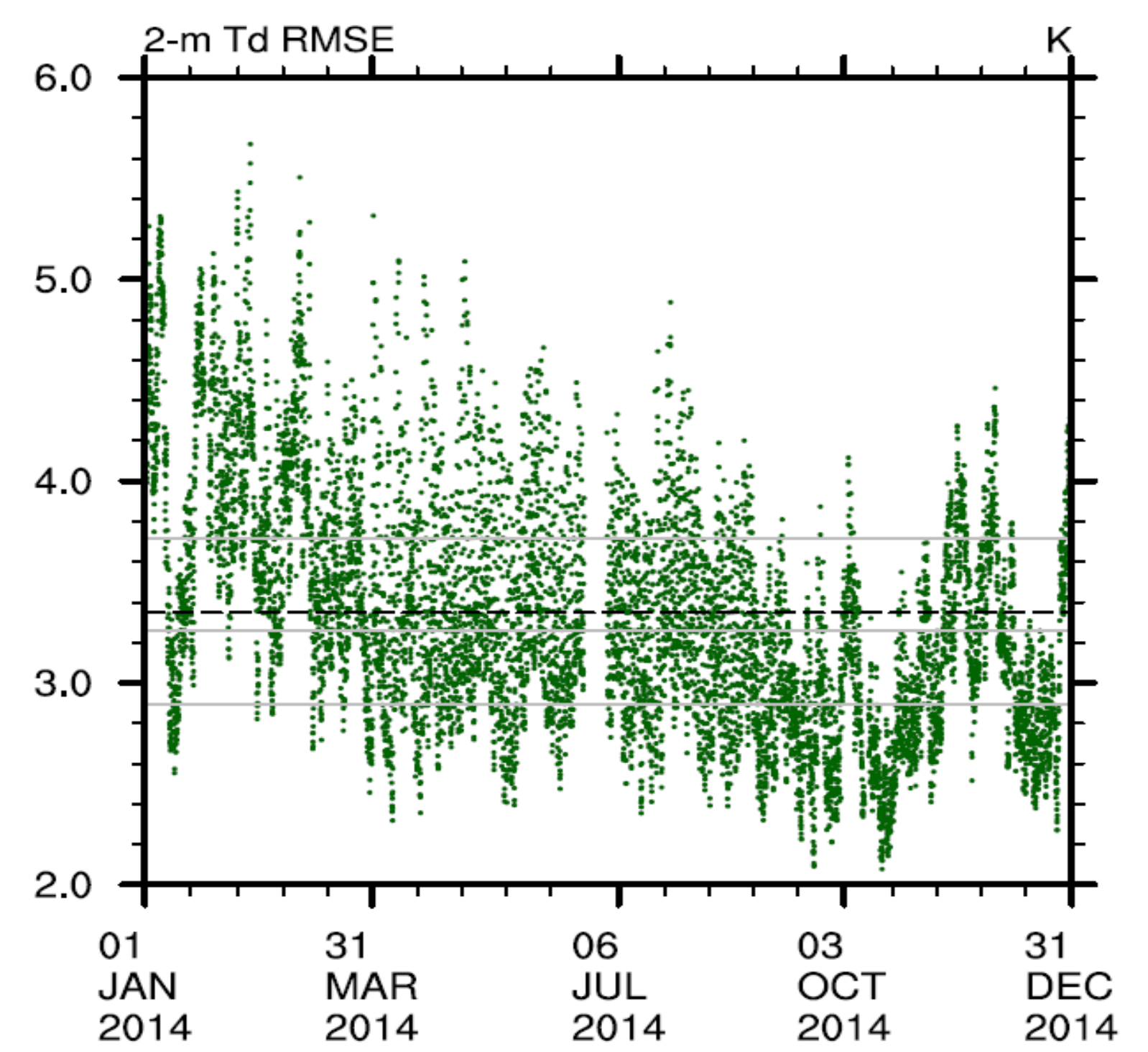
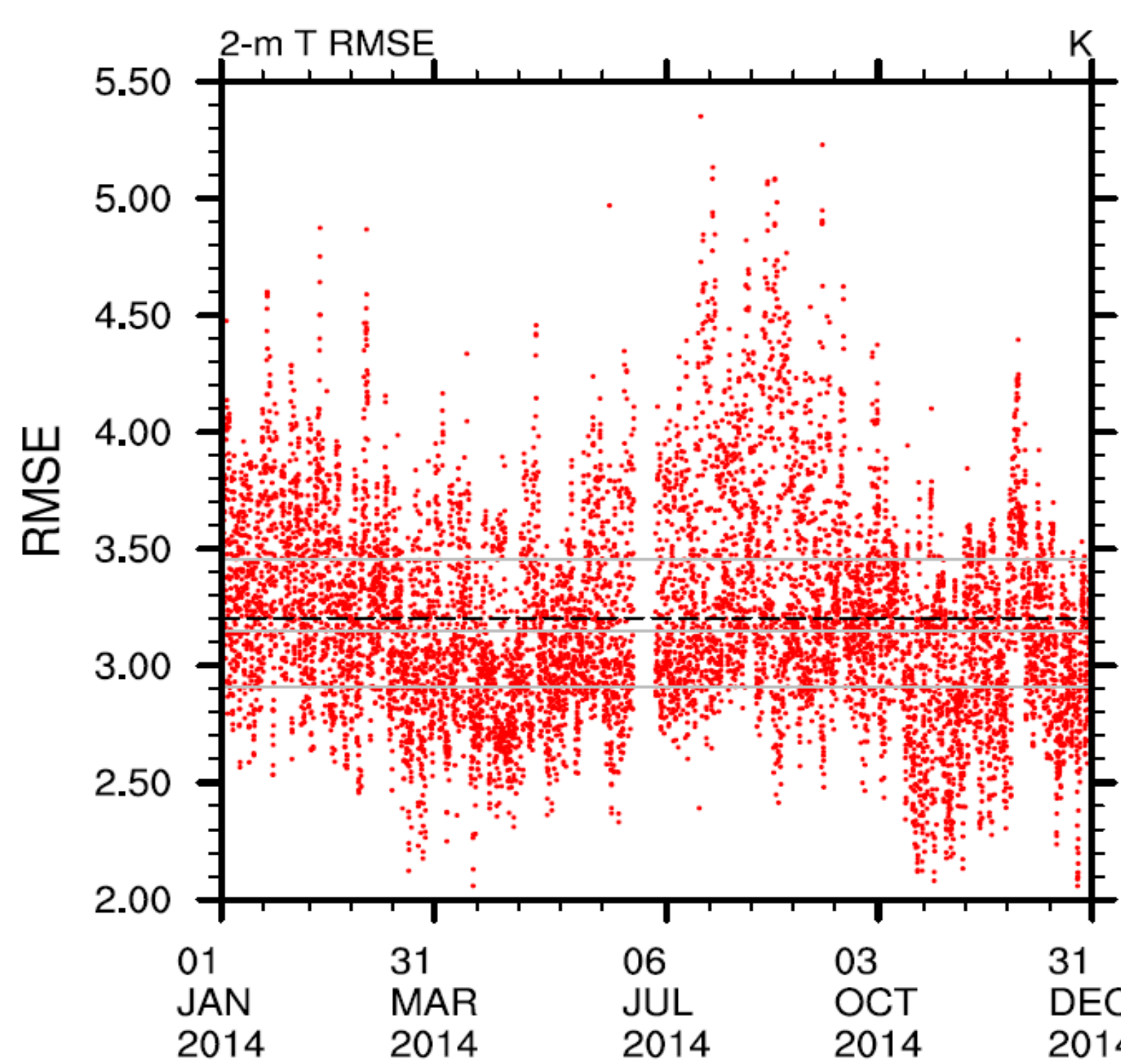
Seasonal Results for Brookings, SD
1979 through 2014



If we focus on the summer months, we can see a gentle upward trend with a slope of about 0.001 inches per year. More tests need to be done to check for statistical significance.

- March, April, and May
- June, July, and August
- September, October, and November
- December, January, and February

2014 NLDAS validation over contiguous U.S.



The above charts show the root mean squared error for temperature (left) and dew point (right). It is important for these values to be small as they play a large part in the computation of PET.

Conclusions

These are preliminary results from one location. Some differences are apparent among locations. Although we have yet to produce anything statistically significant, there is and apparent upward trend in the amount of PET occurring in the northern plains during the summer months. Further work must be done to understand the full implications of the changes.

Recommendations

More work needs to be done to find other spatio-temporal changes in water balance. Specifically, we need to look for changes in how PET is distributed during each season.

Acknowledgements

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