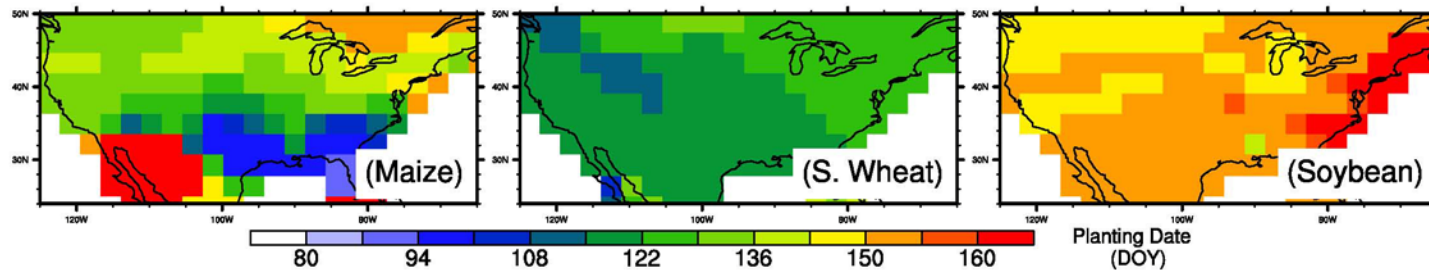


# Assessing the impacts of a new planting date scheme on crop productivity and yield

Beth Drewniak

# CLM-Crop Plant Date - fixed

- Fixed Plant Dates used in CLM - based on Crop Calendar Dataset (Sacks et al., 2010)



But, fixed dates lack farmer decision

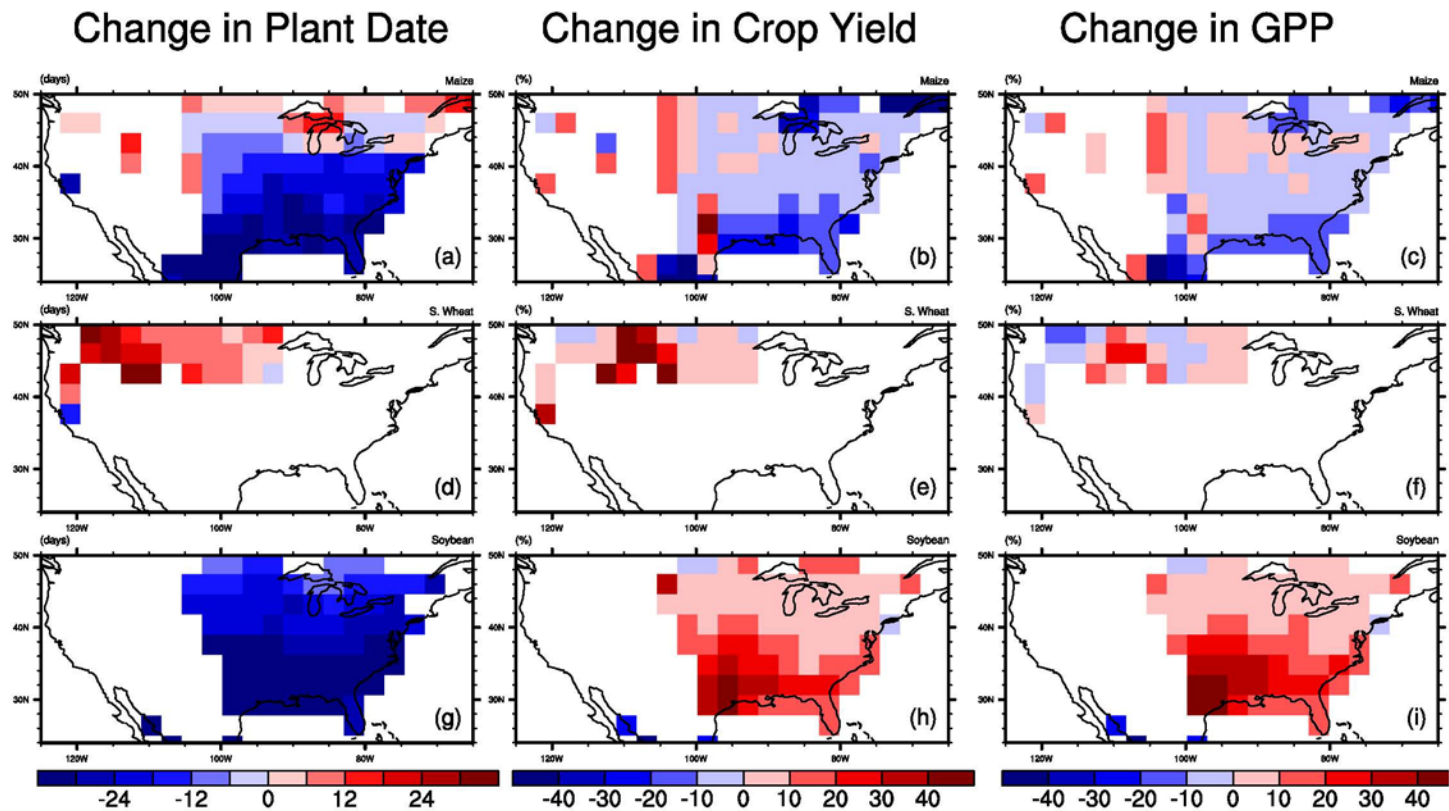
Site	Year	Crop Type	Observed Plant Date	Fixed Plant Date
Bondville, IL	2001	Corn	April 19	May 13
	2002	Soybean	June 2	May 28
	2003	Corn	April 16	May 13
	2004	Soybean	May 7	May 28
Mead, NE	2001	Corn	May 14	May 9
	2002	Soybean	May 20	June 1
	2003	Corn	May 13	May 9
	2004	Soybean	June 2	June 1

# New planting scheme based on climate too

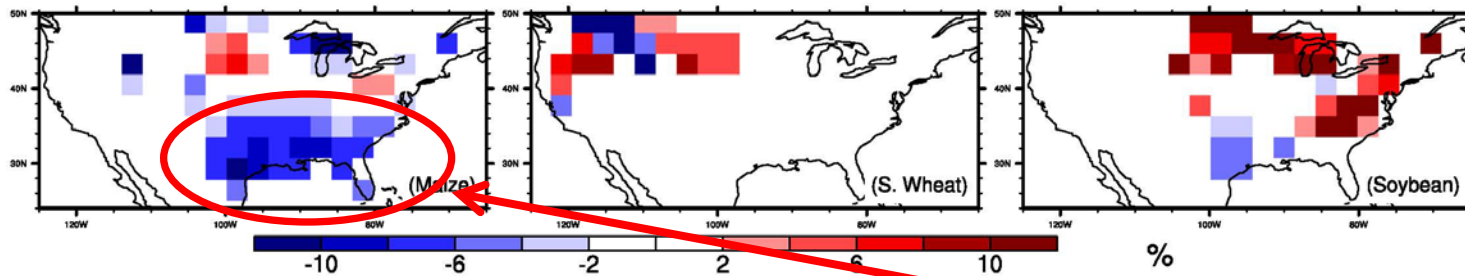
- Goal – provide more realistic planting mechanism that is flexible, climate based, and constrained by observations
- Methodology:
  - Plant date triggered by
    - 10-day running means of average daily temperature
    - 10-day minimum daily temperature
    - Must fall within earliest and latest plant dates from Sacks et al. (2010)

	Scenario	Maize	Spring Wheat	Soybean
10-day running average temperature	Fixed	NA – fixed	NA – fixed	NA – fixed
	LowPTEMP	12°C	11°C	7°C
	HighPTEMP	22°C	21°C	17°C
10-day running average minimum temperature	All	6°C	0°C	6°C

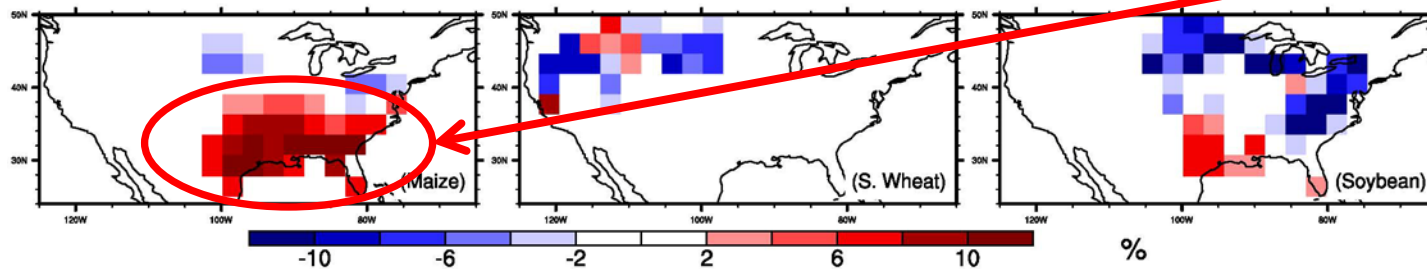
# Low temperature planting trigger leads to earlier planting dates



# What explains the differences in response between crop types?



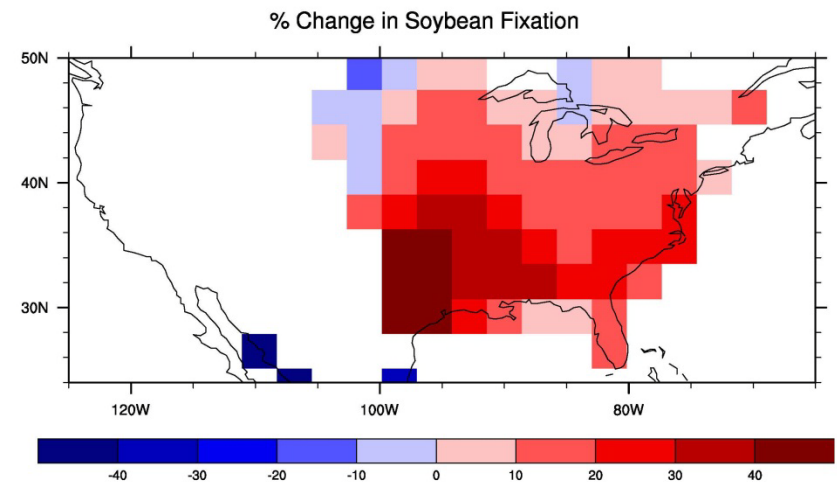
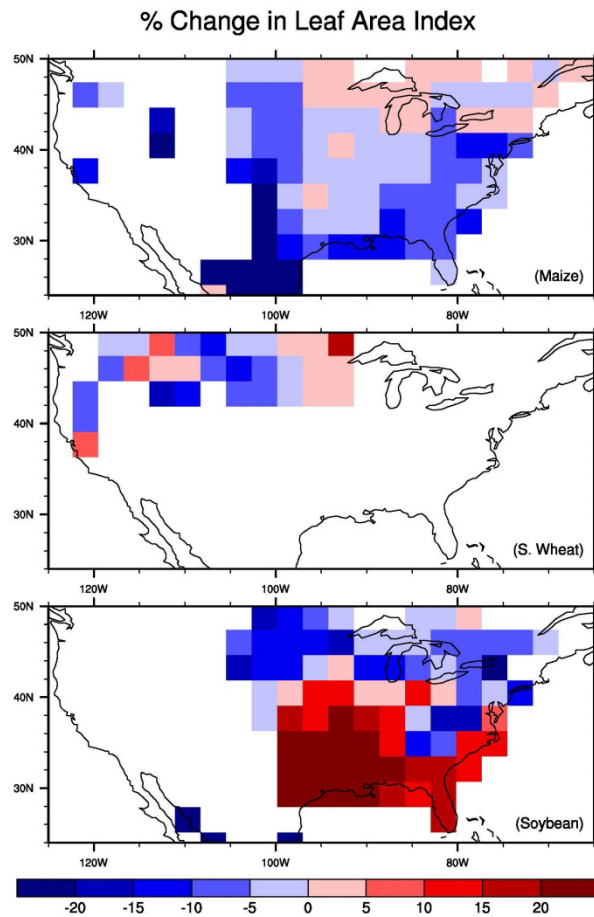
Percent change in temperature during the growth period



Percent change in the length of the growth period

Cooler temps and longer growth periods typically correlate with higher yields

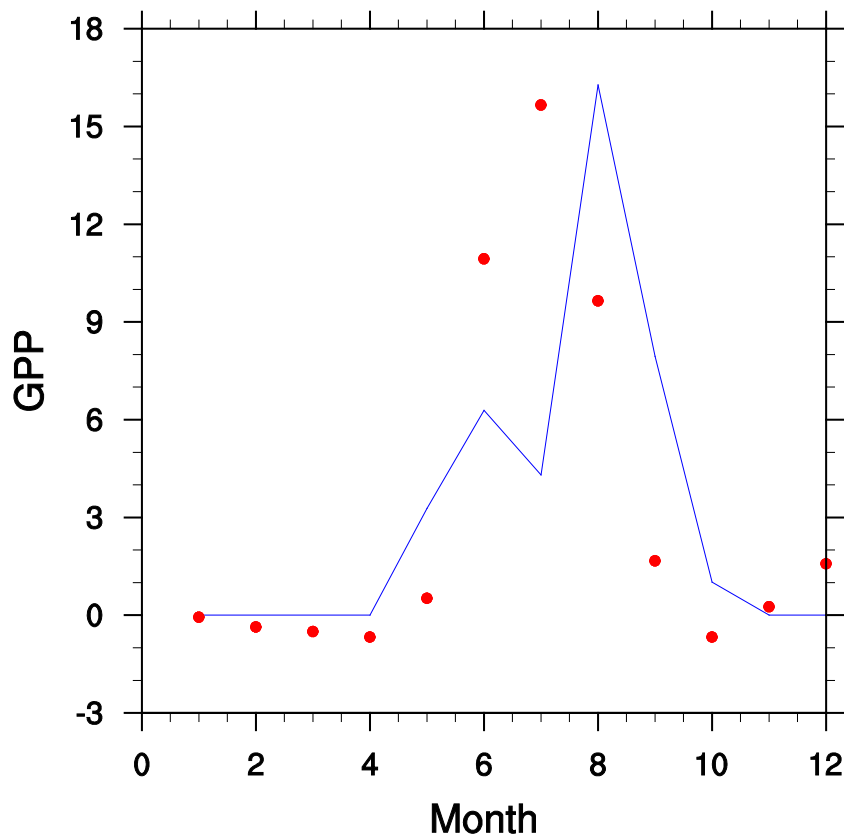
# What explains the differences in response between crop types?



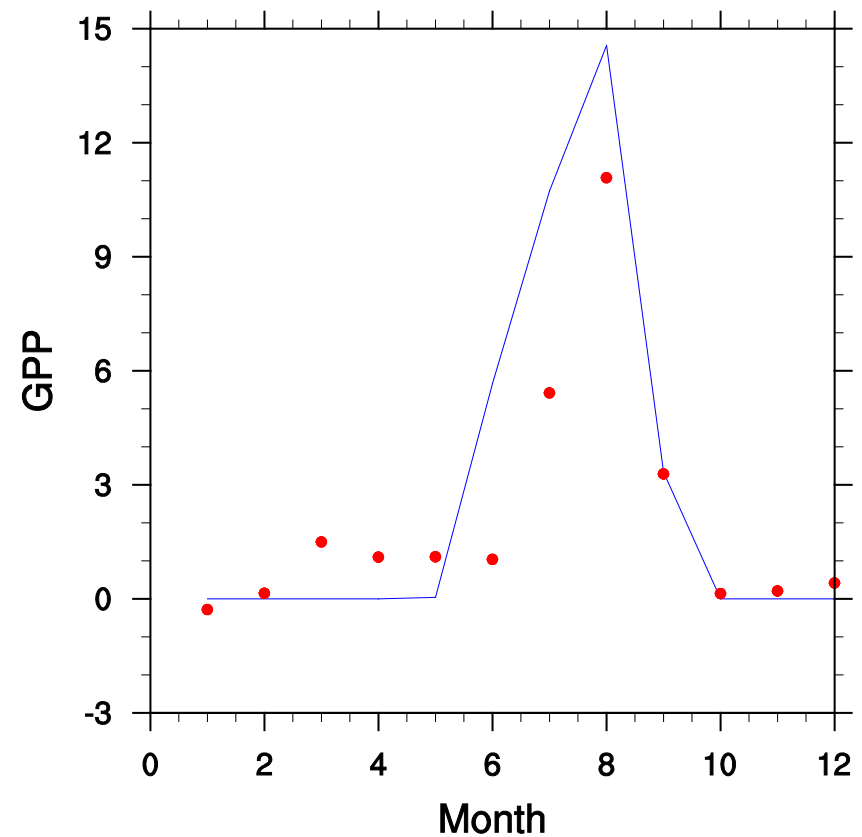
Soybean fixation scheme overcomes nitrogen limitation

# GPP shows nitrogen stress during mid growing season for maize

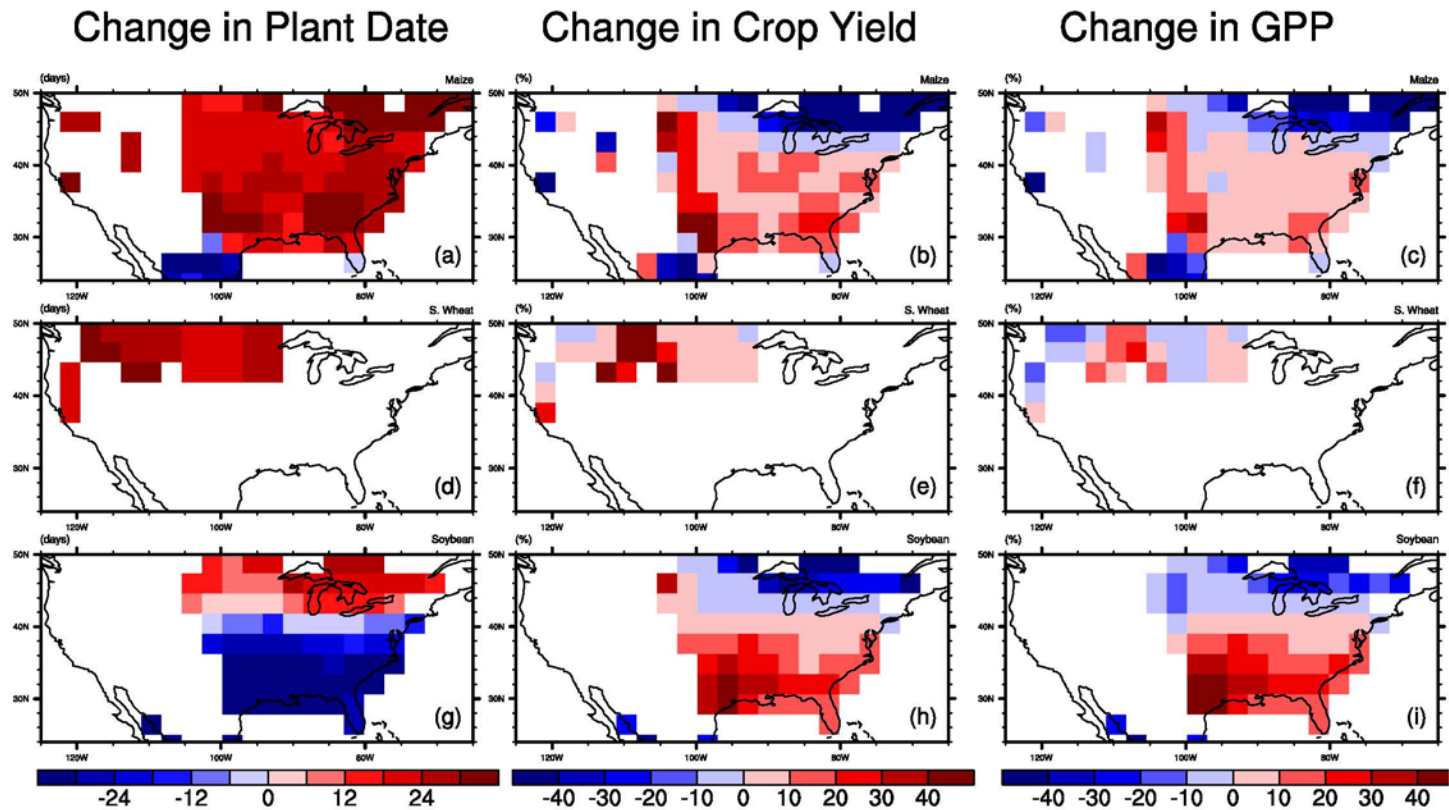
Maize – Bondville 2001



Soybean – Bondville 2002



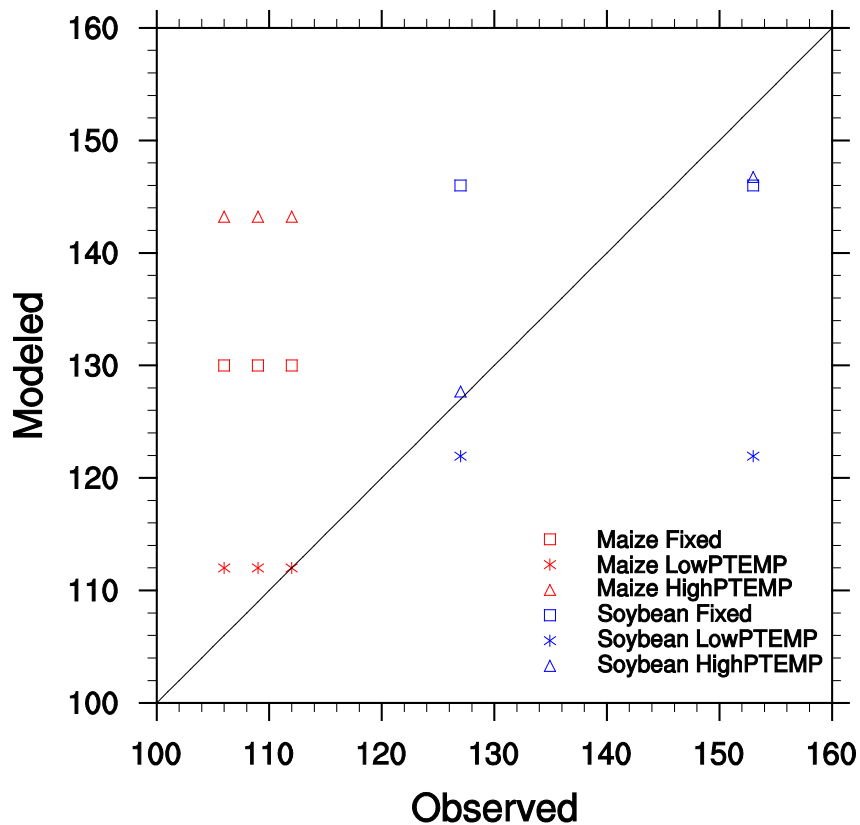
# High temperature planting trigger leads to later planting dates (mostly)



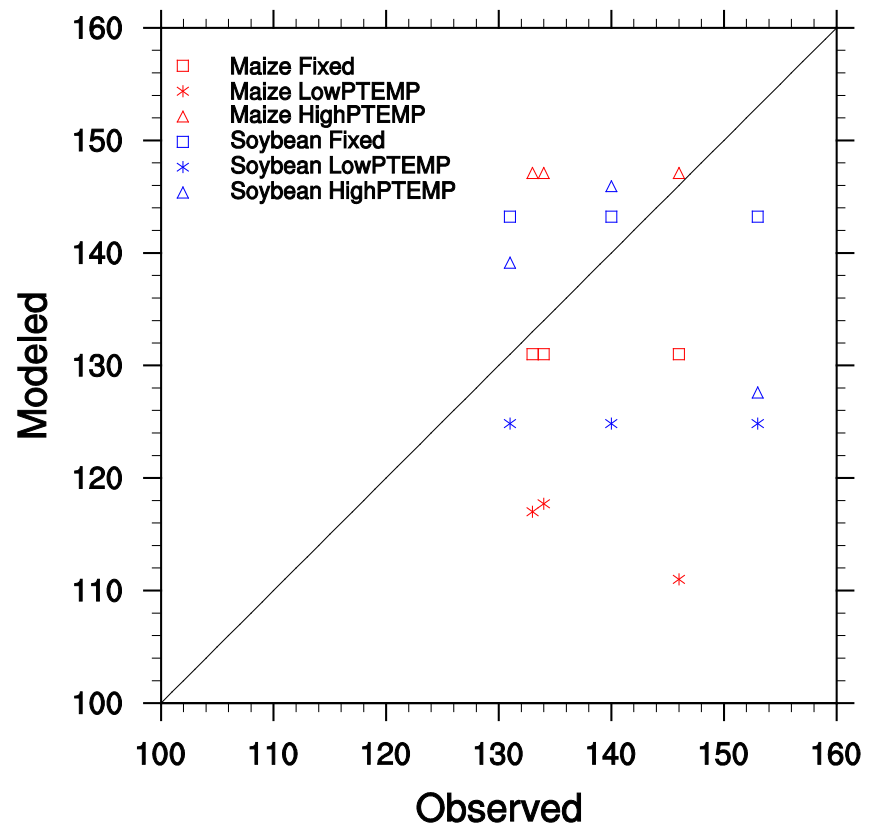


# CLM4 plant date comparisons at two AmeriFlux sites with observed yields

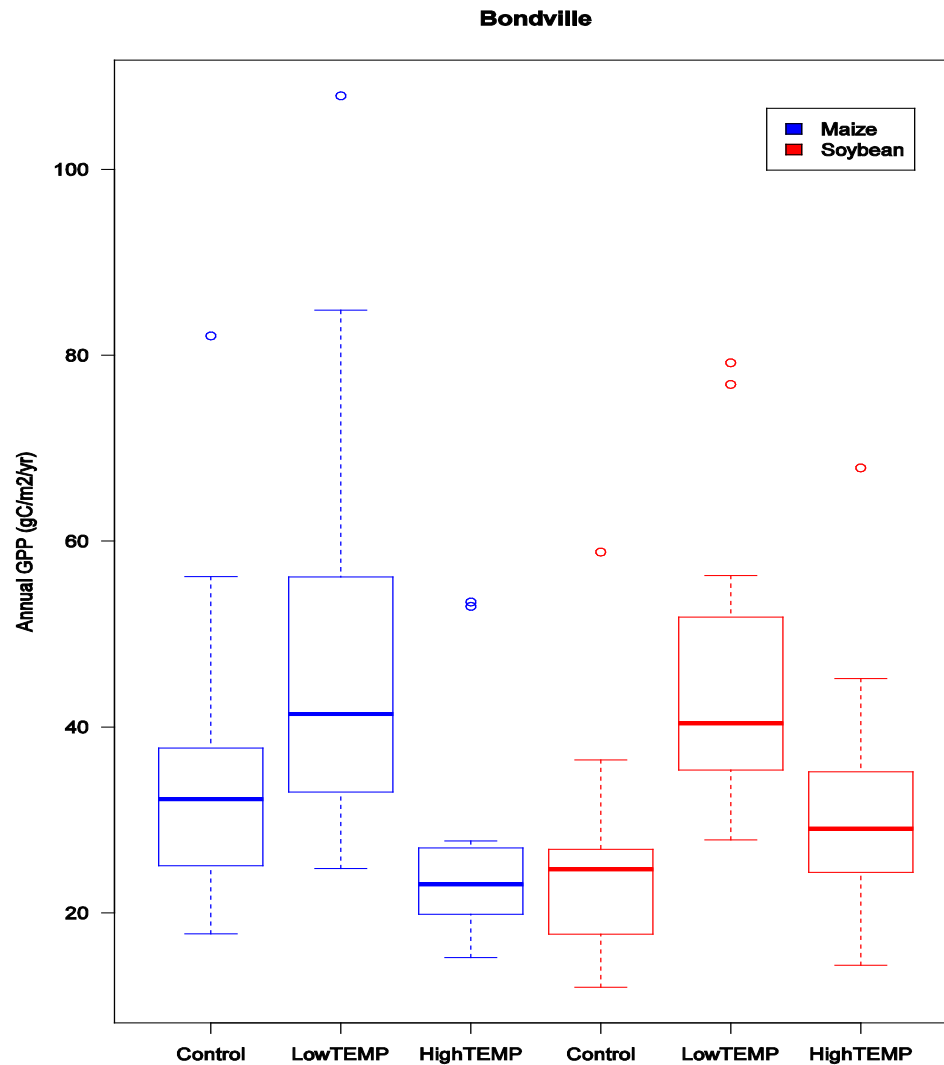
## Bondville, IL



## Mead, NE



# Annual GPP at Bondville for 1996-2007



# Conclusions

- Incorporating a flexible planting date doesn't always improve timing of planting
- Early planting results in higher yields for soybean and lower yields for corn
- Demonstrates a high sensitivity to the early growth period
  - For maize, insufficient early growth has significant negative effect on productivity
  - Soybean nitrogen fixation overcomes nutrient stress

## Future Work

- Resolve maize nitrogen deficiency
- Improve plant trigger
  - Global temperature average at planting
  - Include soil moisture for maize

