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Agro-Climatic Data by County (ACDC): Methods and Data Generating Processes

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Introduction

- Popularity of high resolution satellite image data
  - Many names: remote censing data, GIS data, raster data, …
  - Abundant publicly and freely accessible data sources
  - Numerous applications in interdisciplinary works
- Agro-climatic relation: one of the most common topic
  - $Y = f(H, P, S, X)$
  - Ag production, food security, climate change, etc
  - Increasing studies in precision ag and big data analysis
- Two frequent approaches in agro-climatic relation
  - Process-based models (e.g., Rosenzweig et al., 2014)
  - Statistical models (e.g., Schlenker and Roberts, 2009)
  - High demand on imagery data in both approaches

Agro-Climatic Analysis and Data Works

- Wolfram Schlenker says:

  "A funny thing about that paper (PNAS 2009 with Michael Roberts): Many reference it, and often claim that they are using techniques that follow that paper. But in the end, as far as I can tell, very few seem to actually have read through the finer details of that paper or try to implement the techniques in other settings. Granted, people have done similar things that seem inspired by that paper, but not quite the same. Either our explication was too ambiguous or people don't have the patience to fully carry out the technique, so they take shortcuts." (G-FEED, 1/10/2015)

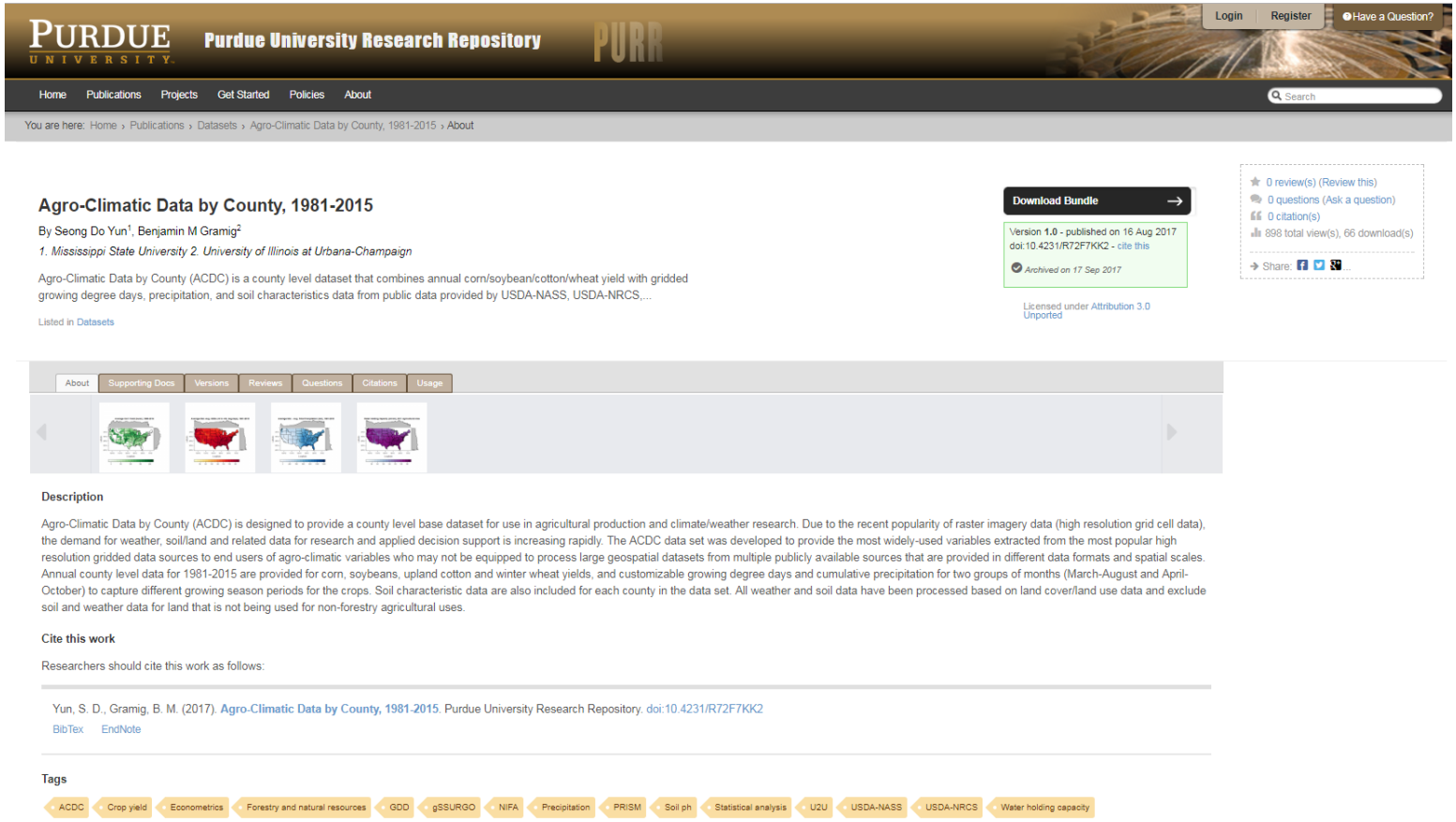
- Data management is a big step
  - Limited knowledge on data itself and management skill sets
  - Often enormous computational time and effort

➢ Agro-climatic Data by County (ACDC)

- Goal: provide the most widely-used variables from the most popular high resolution gridded data sources to endusers of agro-climatic variables

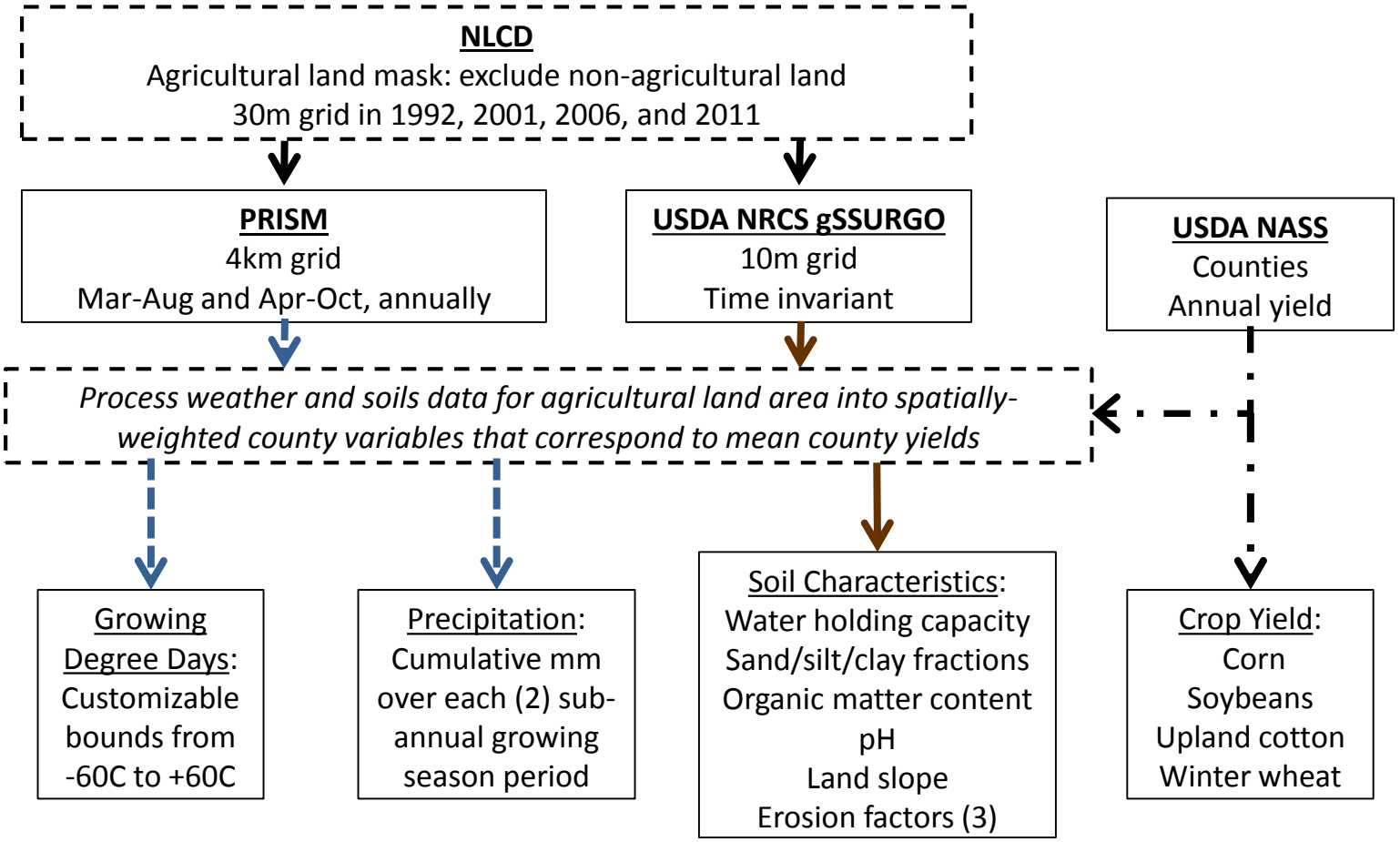
ACDC v. 1.0.0

- Available at: http://dx.doi.org/10.4231/R72F7KK2
- Data, county map, and user manual are available!



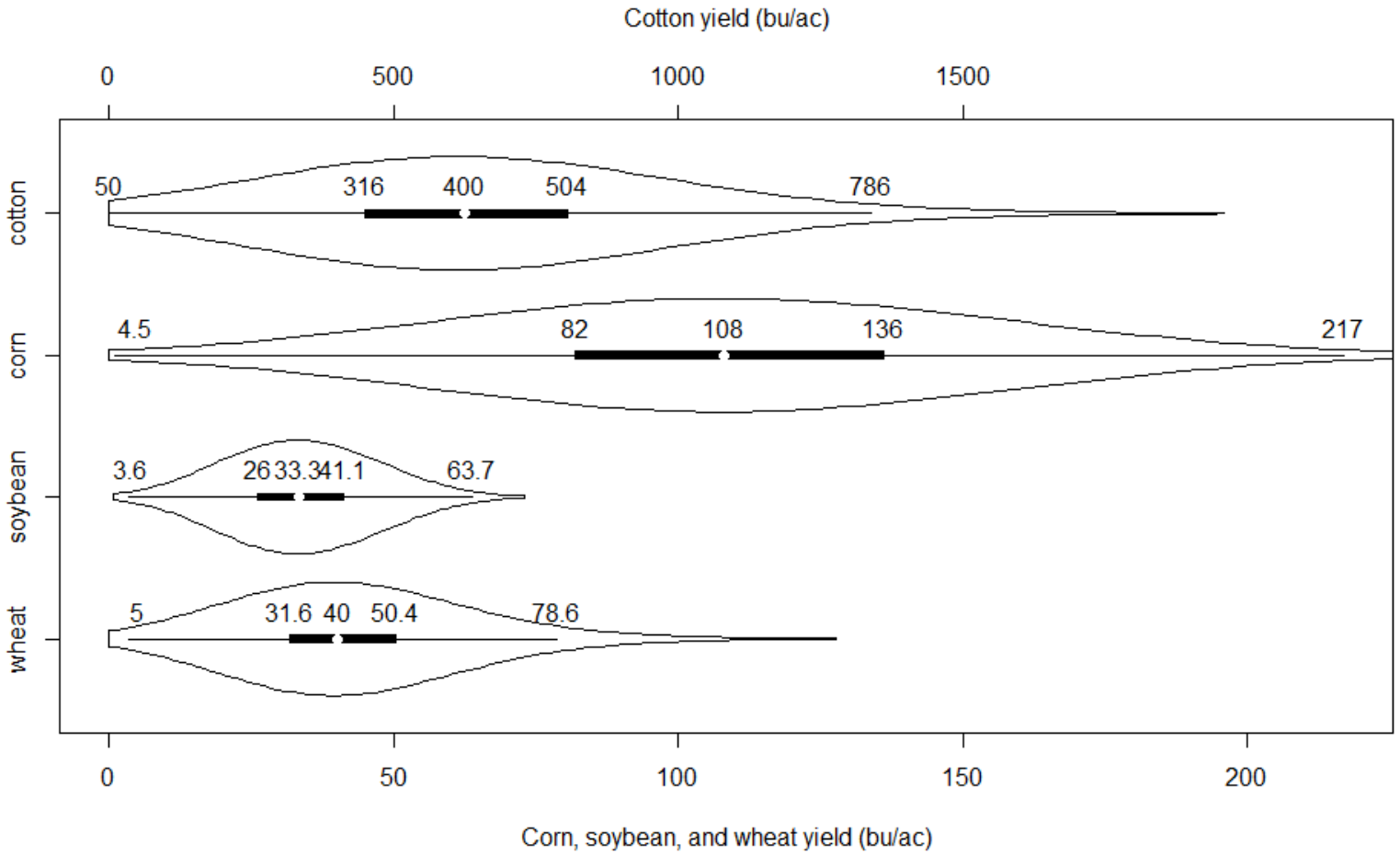
Data Structure

- County level, 1981 ~ 2015



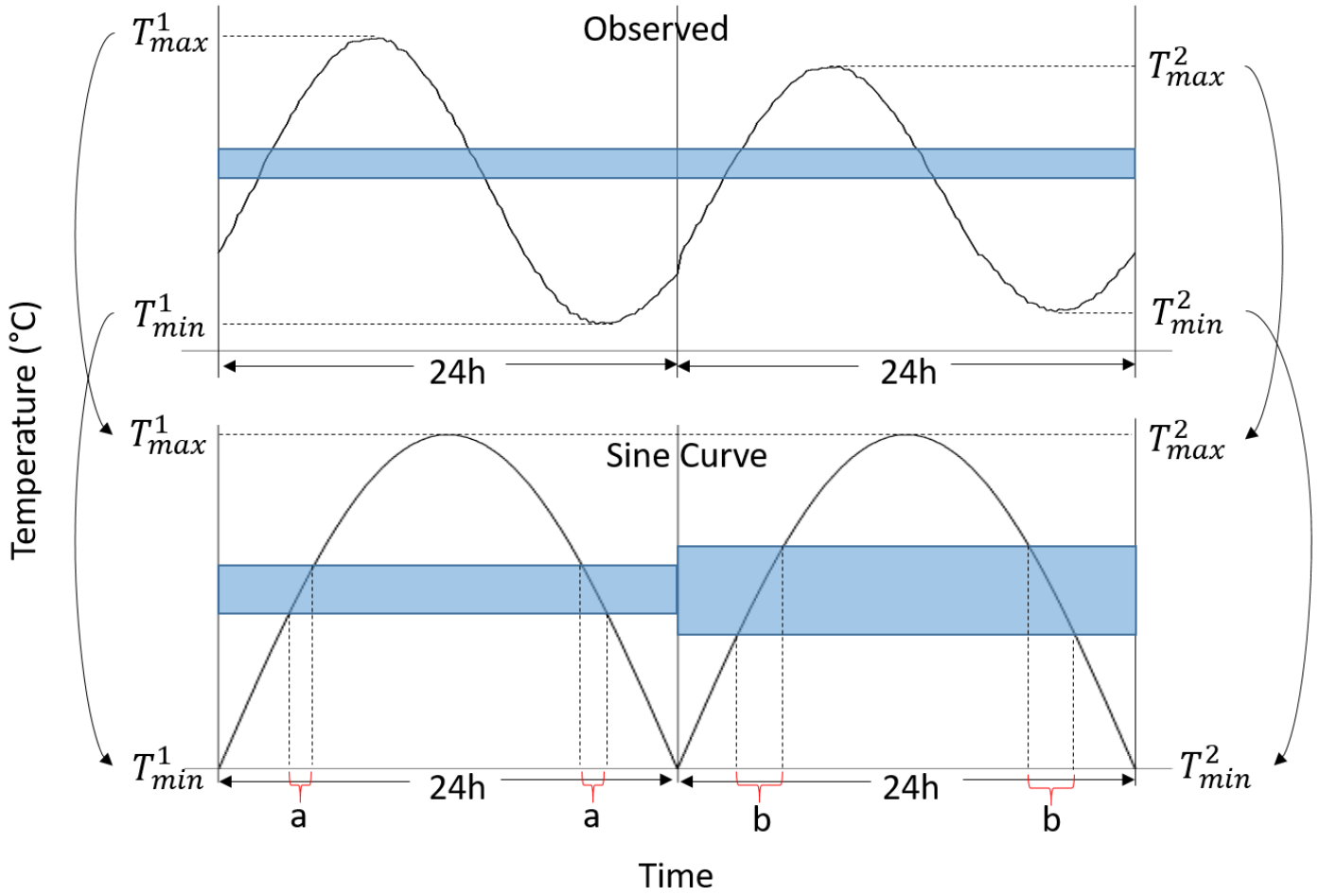
Crop Yields

- Yields (bu/ac) of the four major US field crops from NASS



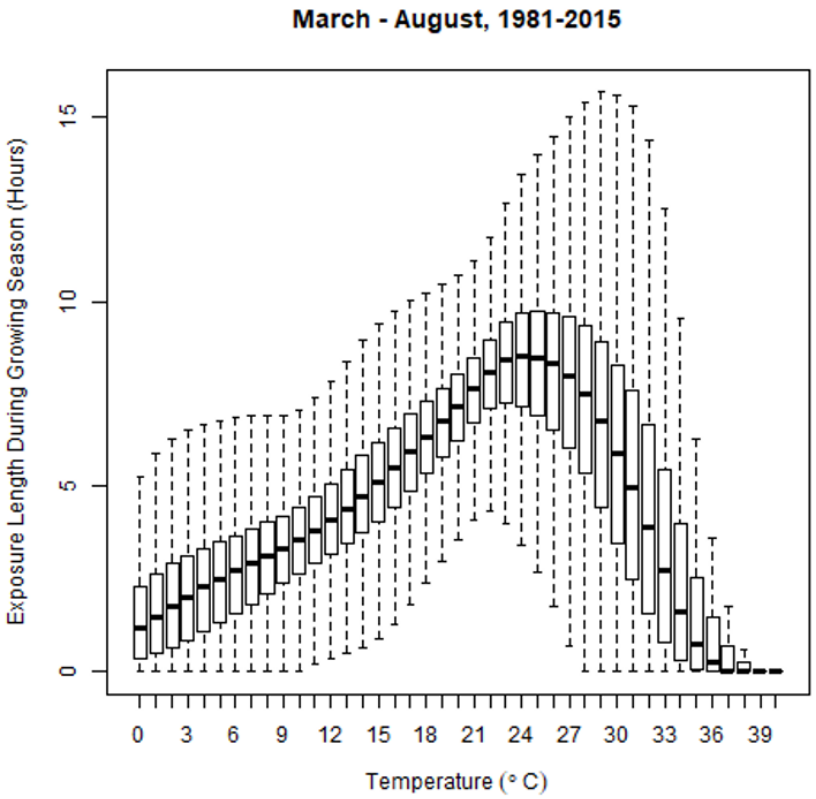
Heat Exposure Length (GDDs)

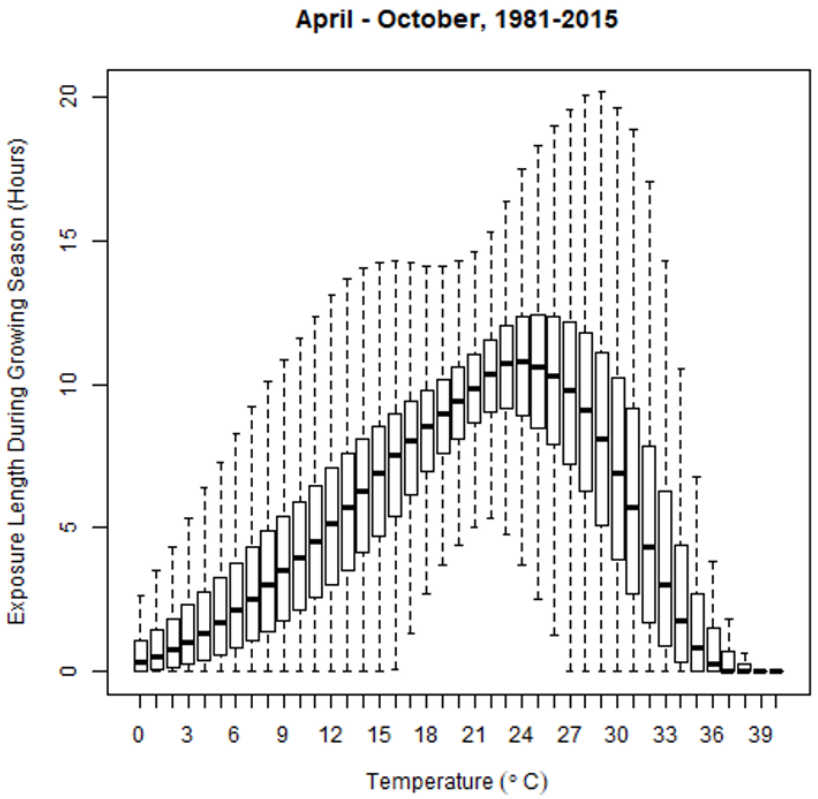
- Sine Method



Heat Exposure Length (GDDs)

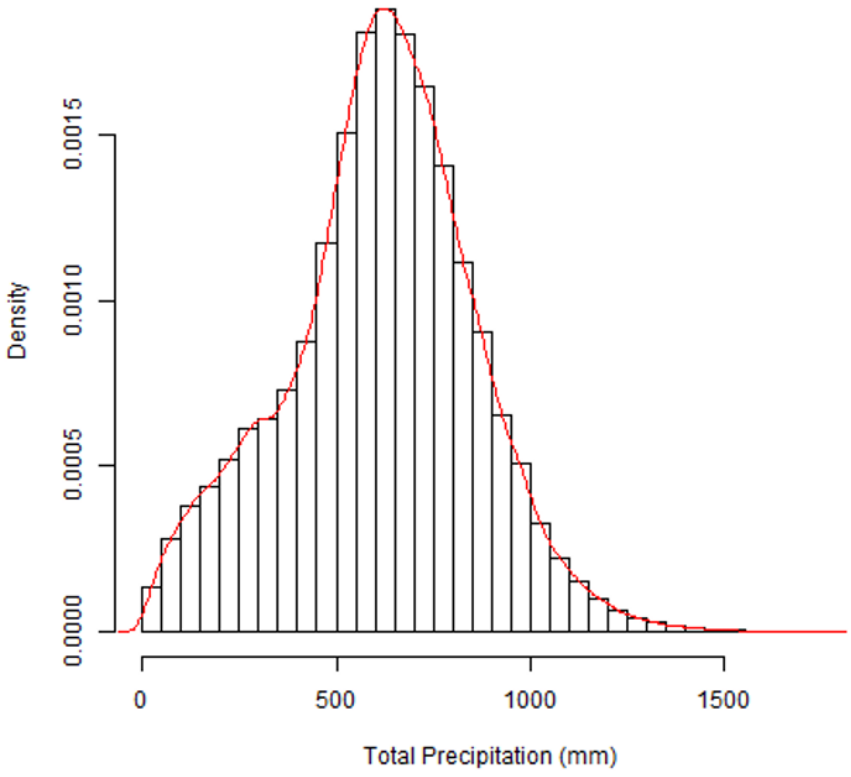
- -60°C ~ +60°C by 1°C intervals using PRISM



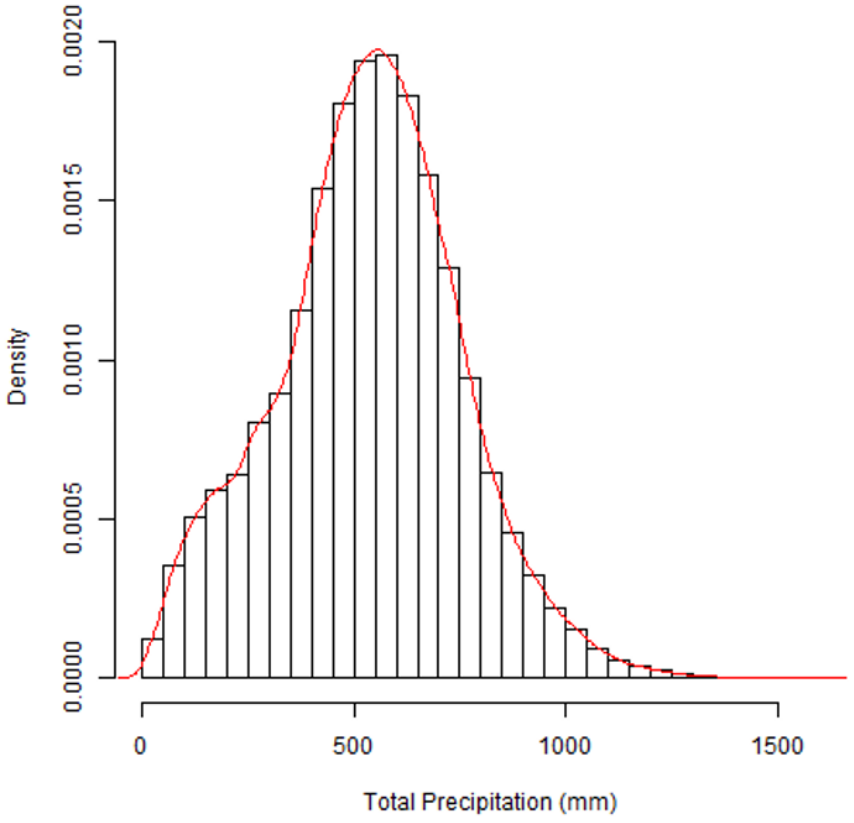


Total Precipitations

- Aggregation of daily precipitation (PRISM)



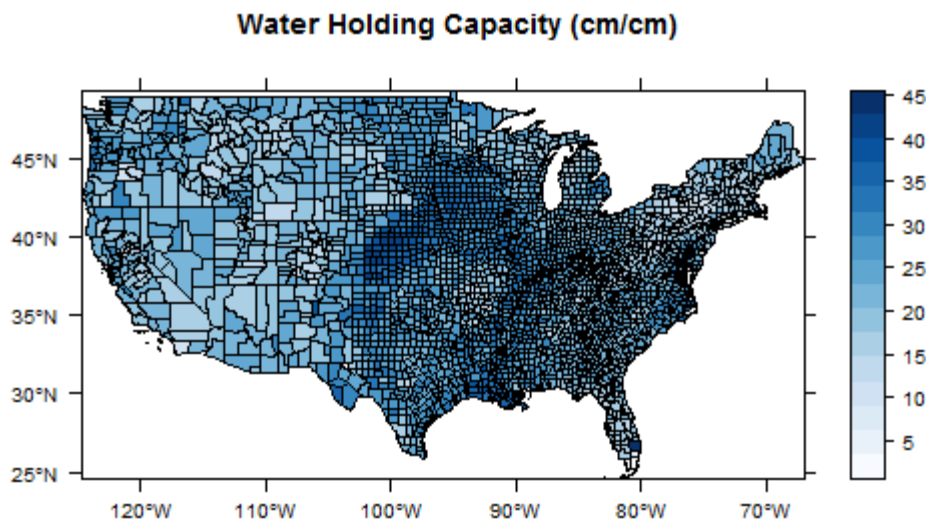
MAR-AUG

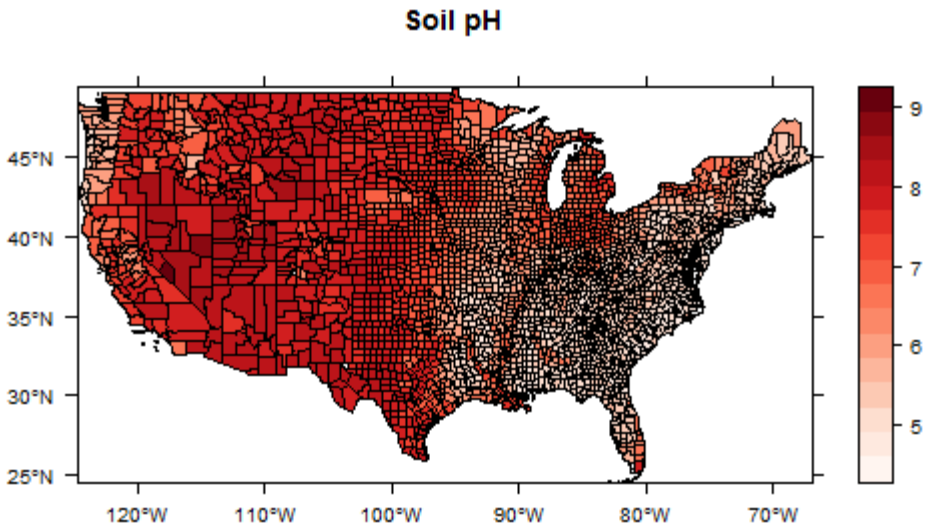


APR-OCT

Soil Variables

- Ten major soil variables from gSSURGO
- 1992, 2001, 2006, and 2011

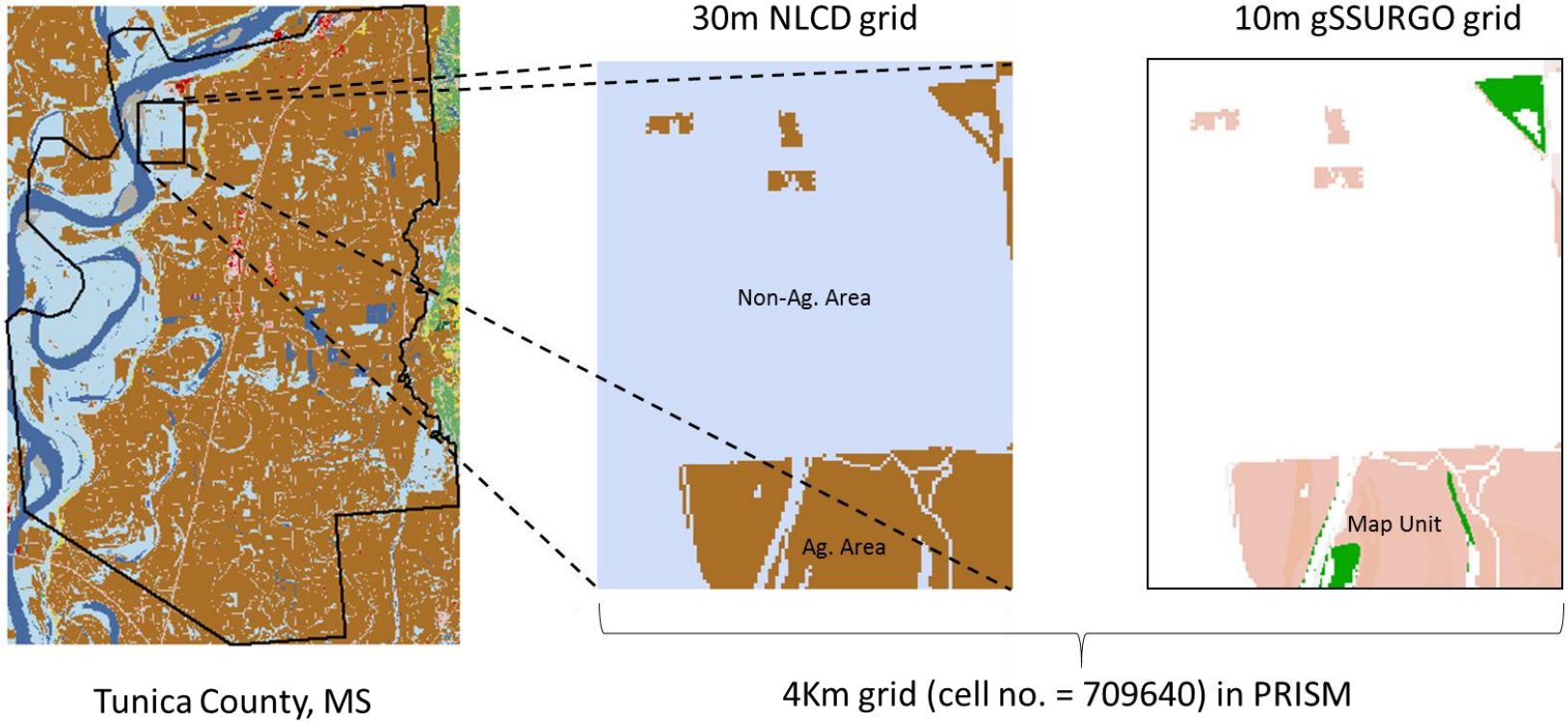




Water holding capacity and Soil pH from year 2011

Agricultural Masks

- Agricultural area mask from NLCD



- Weather data: ag-area weighted average in a county
- Soil data: ag-area only average in a county

Aggregation or Disaggregation of ACDC

- Aggregation of ACDC
  - For example, county to state
  - Aggregation is a smoothing in geocomputation
  - Minimum level: county due to the yield data
- Disaggregation of ACDC
  - For example, county to zipcode
  - Require assumption to assign values to a finer level
  - A better way

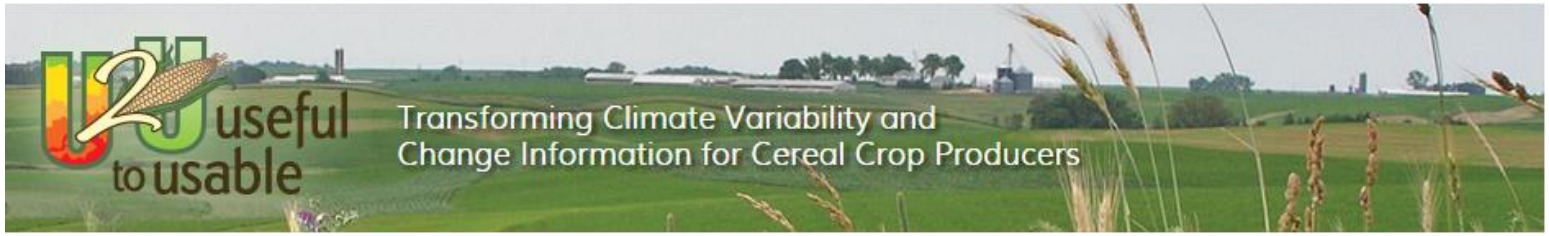
    Aggregate up the original data to the target-area level

➢ Not recommended to aggregate up or disaggregate down!

Concluding Remarks

- Agro-Climatic Data by County (ACDC) v. 1.0.0.
  - We are preparing a paper submission to the Environmental Modelling & Systems
  - Depending on the availability of newer data, ACDC will be updated on the repository
- Empirical applications of ACDC
  - Spatial econometrics (Yun et al., 2015 AAEA)
  - Ex-post crop yield response (Yun and Gramig, 2017 AAEA)
- Inquires on ACDC?
  - Data repository: http://dx.doi.org/10.4231/R72F7KK2
  - Contact: Seong Yun (seong.yun@misstate.edu)

THANK YOU



www.agclimate4u.org

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