A GUI for Visualization and Preparing GCM Data for Use in SWAT

UMBC REU Site: Interdisciplinary Program in High Performance Computing

Christopher Evans[1], Abigail Gartrell[2], Lauren Gomez[3], Moise Mouyebe[4], Darius Oxley[5]

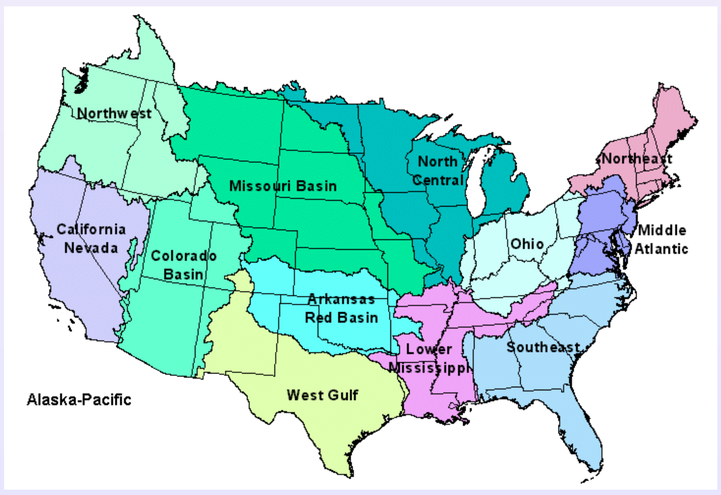
Graduate assistant: Sai Kumar Popuri[5], Faculty mentor: Nagaraj K. Neerchal[5]

Client: Amita Mehta, Joint Center for Earth Systems Technology (JCET), UMBC

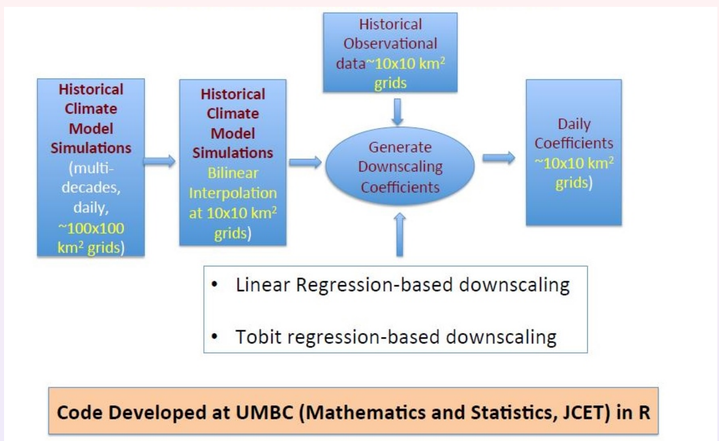
[1]Hampden-Sydney College, [2]U. of Maryland, College Park, [3]Cal Poly Pomona, [4]U. of Michigan, Flint, [5]UMBC

Background

- The USDA-NIFA supports the endeavor to assess the impacts of natural decadal climate variability on agricultural yields in the Missouri River Basin (MRB).
- The UMBC-JCET team uses data provided by Global Climate Models (GCMs), specifically MIROC5.
- The GCM data is used to generate input to the Soil, Water Assessment Tool (SWAT), a modeling tool that predicts long term agricultural yields



Problem Statement

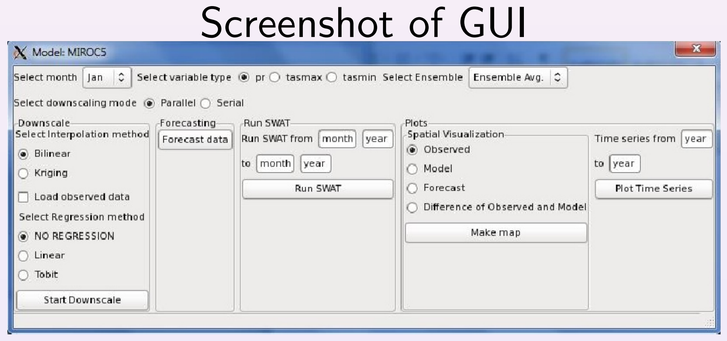


- Streamline the computational procedure of the above figure and generate appropriate visualization.
- Improve computational efficiency.

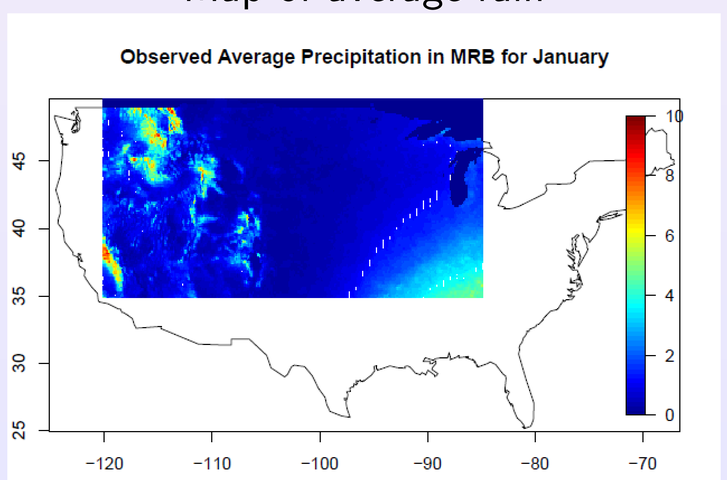
Methods

- Develop GUI: Streamline modelling process of downscaling, run SWAT and visualize data
- Improve Accuracy: Implement Tobit Regression for precipitation
- Parallelization: Write routine using parSapplyLB to perform regression at 30,000+ locations for 57 years of data

Screenshot of GUI



Map of average rain

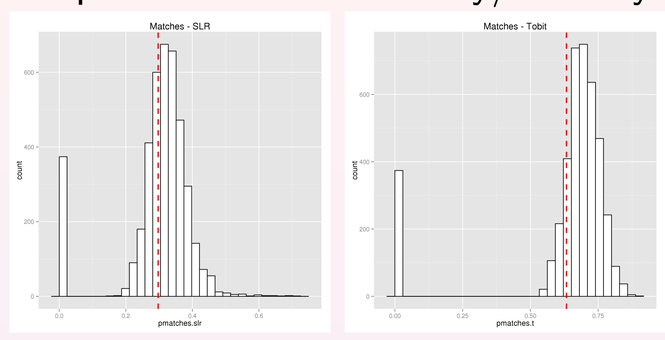


References

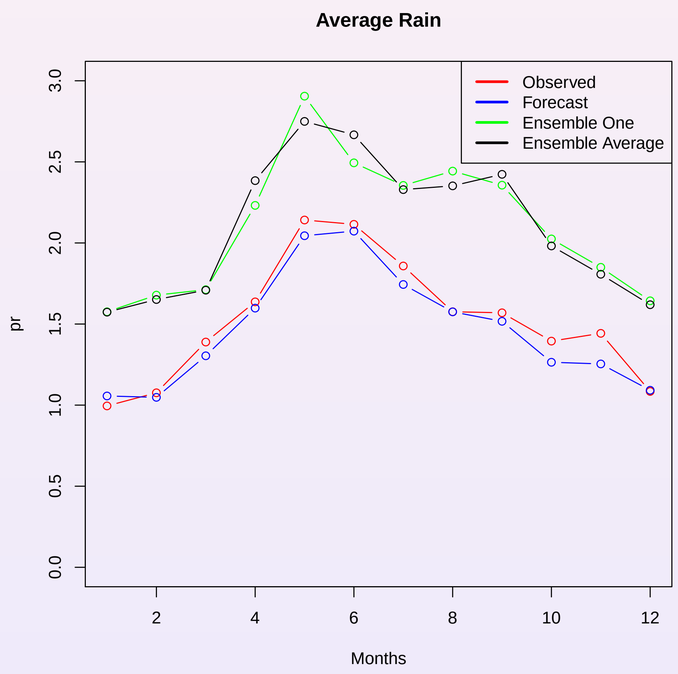
- Full technical report: HPCF–2014–12 www.umbc.edu/hpcf > Publications.
- Background picture taken from http://water.weather.gov/ahps/rfc/rfc.gif
- Problem statement flow chart taken from Client project proposal

Results

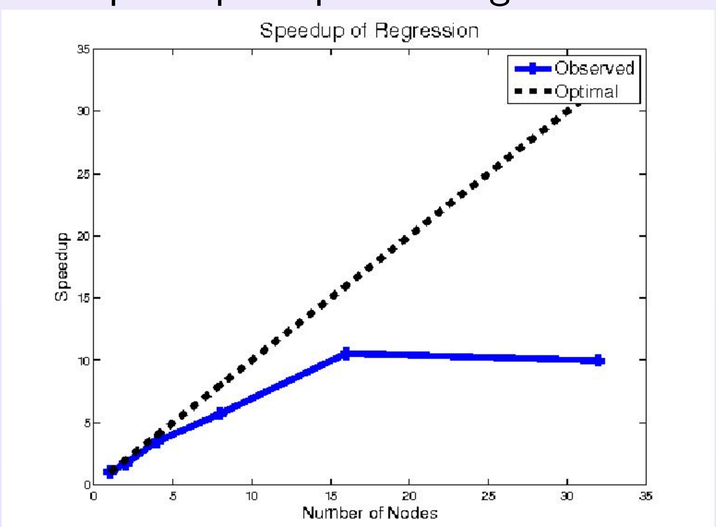
Proportion of matched dry/wet days



Monthly average rain for each data set



Speedup for parallel regression



Acknowledgments

REU Site: www.umbc.edu/hpcreu, funded jointly by NSF, NSA, UMBC, HPCF, CIRC, CRCES