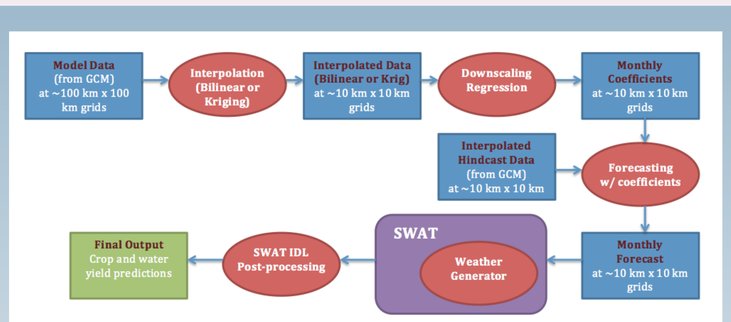
Assessing Decadal Climate Impacts on Water Resources within Missouri River Sub-basins

UMBC REU Site: Interdisciplinary Program in High Performance Computing
Joseph U. Emelike[1], David Harper[2], Charlotte Z. Mann[3], Kwame Owusu-Boaitey[4]
Graduate assistant: Sai Kumar Popuri[5] Faculty mentor: Nagaraj K. Neerchal[5]
Client: Amita Mehta, Joint Center for Earth Systems Technology (JCET), UMBC
[1]U. of Vermont [2]Bowie State U. [3]Carleton College [4]CSEE, UMBC [5]Math & Stat, UMBC

Background

- Decadal climate variability (DCV) has a significant impact on water resources in the Missouri River Basin (MRB).
- The UMBC-JCET team uses data provided by Global Climate Models (GCMs), specifically MIROC5 & HadCM3 to generate input to the Soil and Water Assessment Tool (SWAT), a a river basin scale model that quantifies the impact of climate variability and change on water and agricultural yeilds.
- Low-resolution (∼100km x 100km) GCM data are interpolated and matched to high-resolution (∼10km x 10 km) observed data, a process referred to as downscaling, as input to SWAT.

Problem Statement



- Streamline the computational procedure outlined by the figure above and generate appropriate visualizations to facilitate exploratory data analysis.
- Improve prediction accuracy through use of multiple linear regression (MLR), simple linear regression (SLR) and monthly data.

References

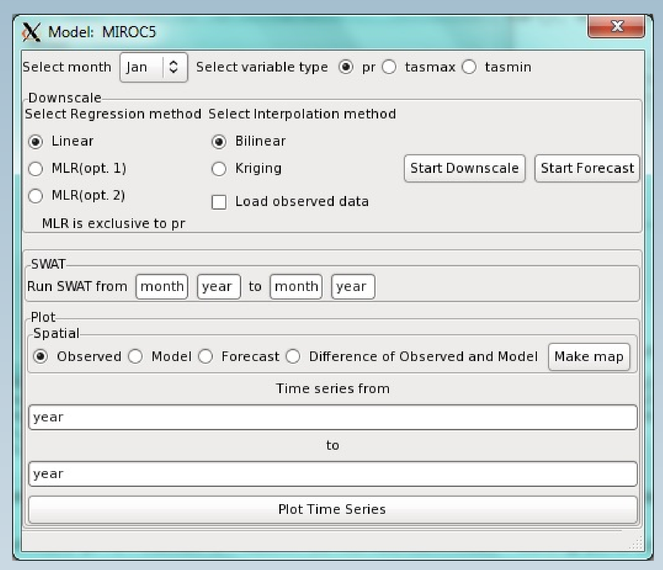
Full Technical Report: HPCF–2015–22
hpcf.umbc.edu > Publications.

Methods

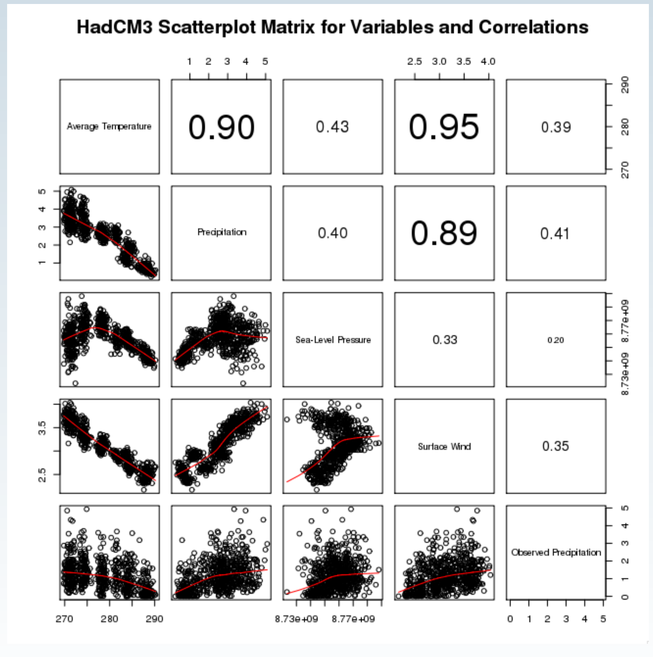
- A graphical user interface is used to simplify the process of downscaling the data, running SWAT, and viewing the results.
- Bilinear interpolation and Kriging are used in the downscaling process.
- Coefficients produced by SLR (Pr 1, Tmin, Tmax) and MLR (Pr 2: Pr 1 + AveTemp, Pr 3: Pr 2 + SLP + Wind) are used in forecasting.

Results

A Screenshot of GUI



GUI Visualization



Results

Comparison of Standardized MSE

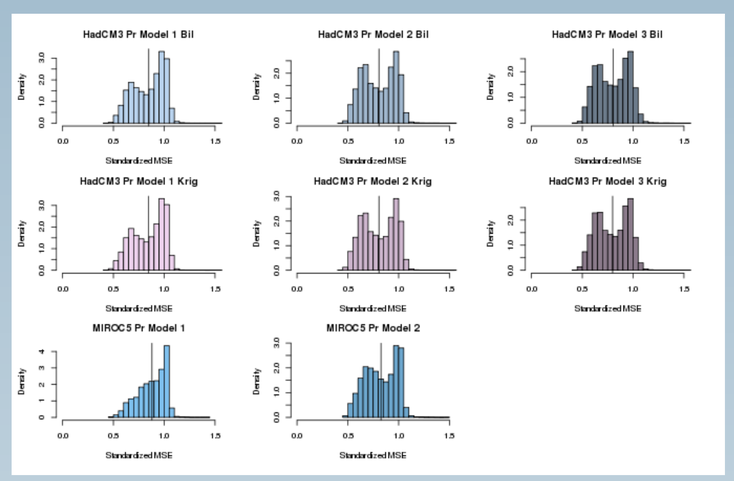
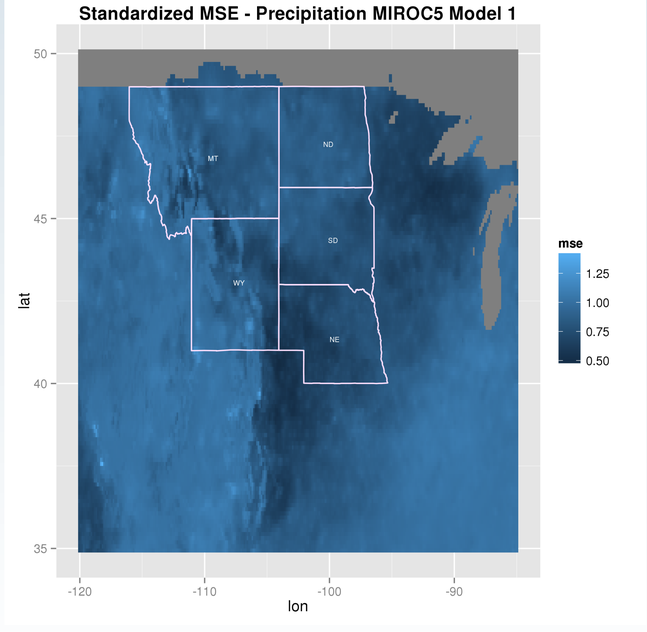


Table of Mean Standardized MSE

Model	MIROC5	HadCM3 Bil	HadCM3 Krig
Pr 1	0.8793	0.8477	0.8452
Pr 2	0.8262	0.8063	0.8065
Pr 3	NA	0.8033	0.7987
Tmin	0.0967	0.0800	0.0800
Tmax	0.0757	0.0701	0.0702

Map of Standardized MSE by location



Acknowledgments

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