COMPARING CROP AND WATER YIELD OUPUT FROM SWAT BASED ON OBSERVED AND DOWNSCALED GLOBAL CLIMATE MODEL DATA

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This project creates a graphical R interface to streamline the computational procedure to assess the impact of climate variability on the agricultural production in the Missouri River Basin (MRB), a major grain producing region of United States. The computational procedure involves two phases: 1) generate high-resolution weather parameters (temperature and precipitation) from Global Climate Models (GCM) to be input into the Soil and Water Assessment Tool (SWAT) and 2) visualize GCM temperature and precipitation data as well as SWAT outputs of crop data.

The weather parameters from GCMs with multi-decadal predictions are derived for two GCMs, MIROC5 and HadCM3. The low resolution GCM outputs (~100x100 km^2) need to be downscaled to lower resolution (~10x10 km^2) for use in SWAT. The downscaling method involves two steps: i) use bilinear interpolation or Kriging to make the low resolution GCM data into high resolution data and ii) implement Linear or Tobit regression between the GCM and the observed data to accurately model the GCM temperature and precipitation at high resolution. Once the regression coefficients are computed, they are used to generate temperature and precipitation from retrospective forecasts from the two GCMs which are then provided to SWAT to estimate yearly water and crop yields. Different statistical methods of downscaling model data mentioned above are used to generate different SWAT inputs to assess their impact on SWAT outputs. The R interface allows climate models and SWAT outputs to be more easily compared for different scenarios, thus help assess climate variability and its impact on crop yields over MRB efficiently and easily and help get a better understanding of the United States food security under varying climate conditions.

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