Climate model output often contains significant biases that must be removed before the data is used for impacts analyses or as a forcing input for other models. We apply quantile mapping to monthly mean surface air temperature and precipitation data from the NARCCAP output archive and examine the characteristics of the distributions of these fields on a regional basis. We adjust the data (equivalent to bias correction) by mapping is performed using QMAPPING, which maps the quantiles of model data from the current simulation domain and throughout the annual cycle. We examine these changes on a regional basis for the entire North American continent.

Because the statistical distributions are characterized by two parameters, we can calculate quantiles for observations and model data and corresponding quantile in the observed data using the following formulas:

- For precipitation:
  
  $$ q_{mod} = 1 + \log \left( \frac{1 + \log(1 + q_{obs})}{1 + \log(1 + q_{obs})} \right) $$

- For temperature:
  
  $$ q_{mod} = 1 + \log \left( \frac{\exp\left( q_{obs} - 1 \right)}{\exp\left( q_{obs} - 1 \right) + 1} \right) $$

Where the statistical distributions are characterized by two parameters, we use QMAPPING to independently correct monthly data at the gridcell level, and also will provide guidance on the transfer function's utility in correcting daily data at the regional scale. The quantile mapping approach is applied to output from the future climate simulations to match the characteristics of the current climate simulations. Finally, we bias correct model output by adjusting the data (equivalent to bias correction) to remove climate change signals from the future climate simulations. Because the statistical distributions are characterized by two parameters, we use QMAPPING to independently correct monthly data at the gridcell level, and also will provide guidance on the transfer function's utility in correcting daily data at the regional scale.