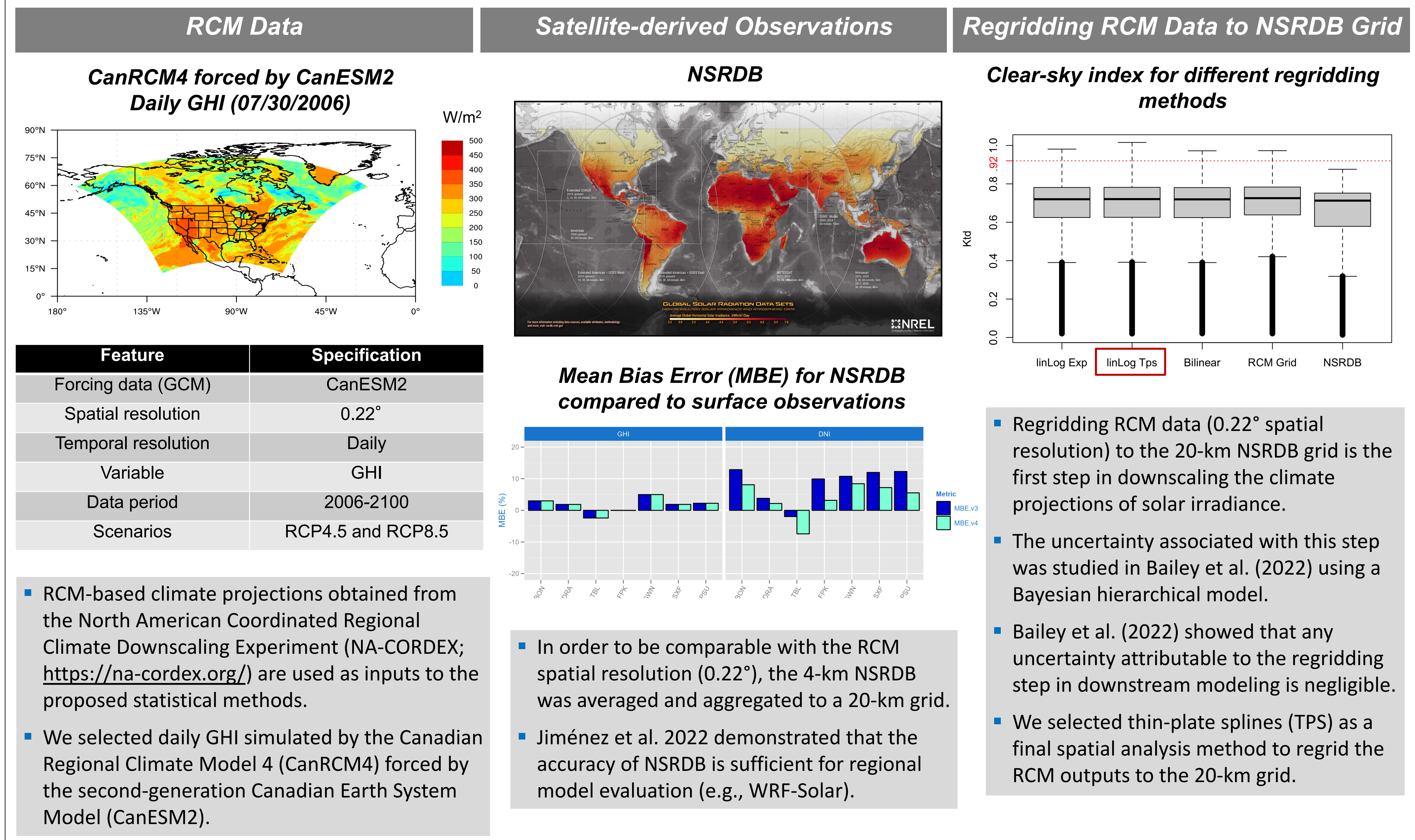


1. INTRODUCTION

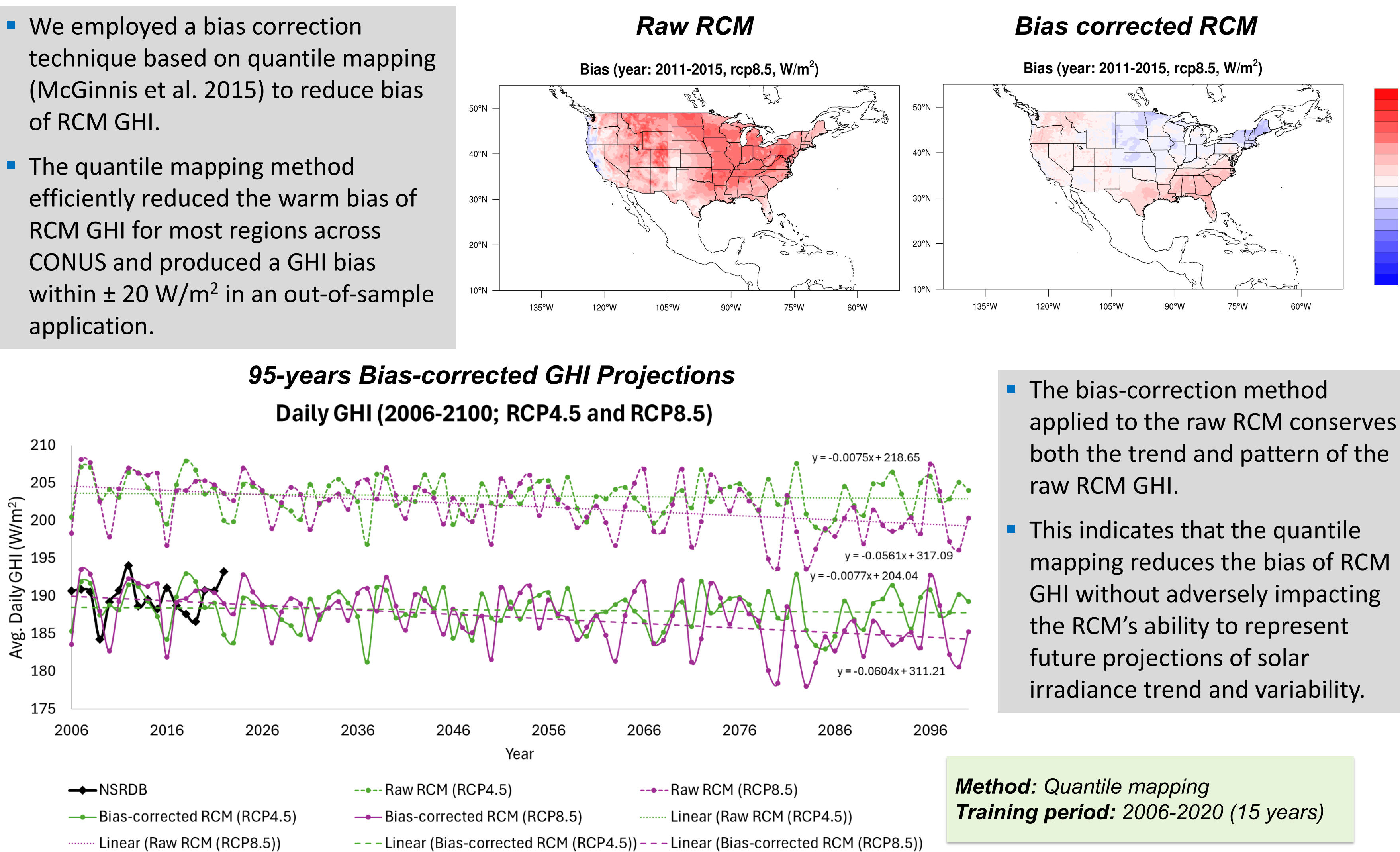
- Assessing solar energy resources under future climate scenarios has been highlighted to understand potential impacts of future climate change in solar generation on the power sector.
- Climate model projections have been recognized by the renewable energy community as a useful data set to analyze the impacts of future climate change on renewable resources.
- However, spatial and temporal resolutions of the GCMs (e.g., ~100 km and daily for spatiotemporal resolution) are too coarse for regional climate studies.
- Usually, regional solar resource assessments under future climate are performed using downscaled general circulation models (GCMs) using either-
 - regional climate models (RCMs) or
 - statistical/machine-learning based approaches.
- The main purpose of this study is to **develop statistical methods within an efficient framework** for downscaling future climate data sets tailored for solar energy applications.
- The **National Solar Radiation Database (NSRDB) (Sengupta et al. 2018)** is used to build and calibrate the statistical downscaling models with:

1) Bias-correction, 2) Temporal downscaling, and 3) Spatial downscaling

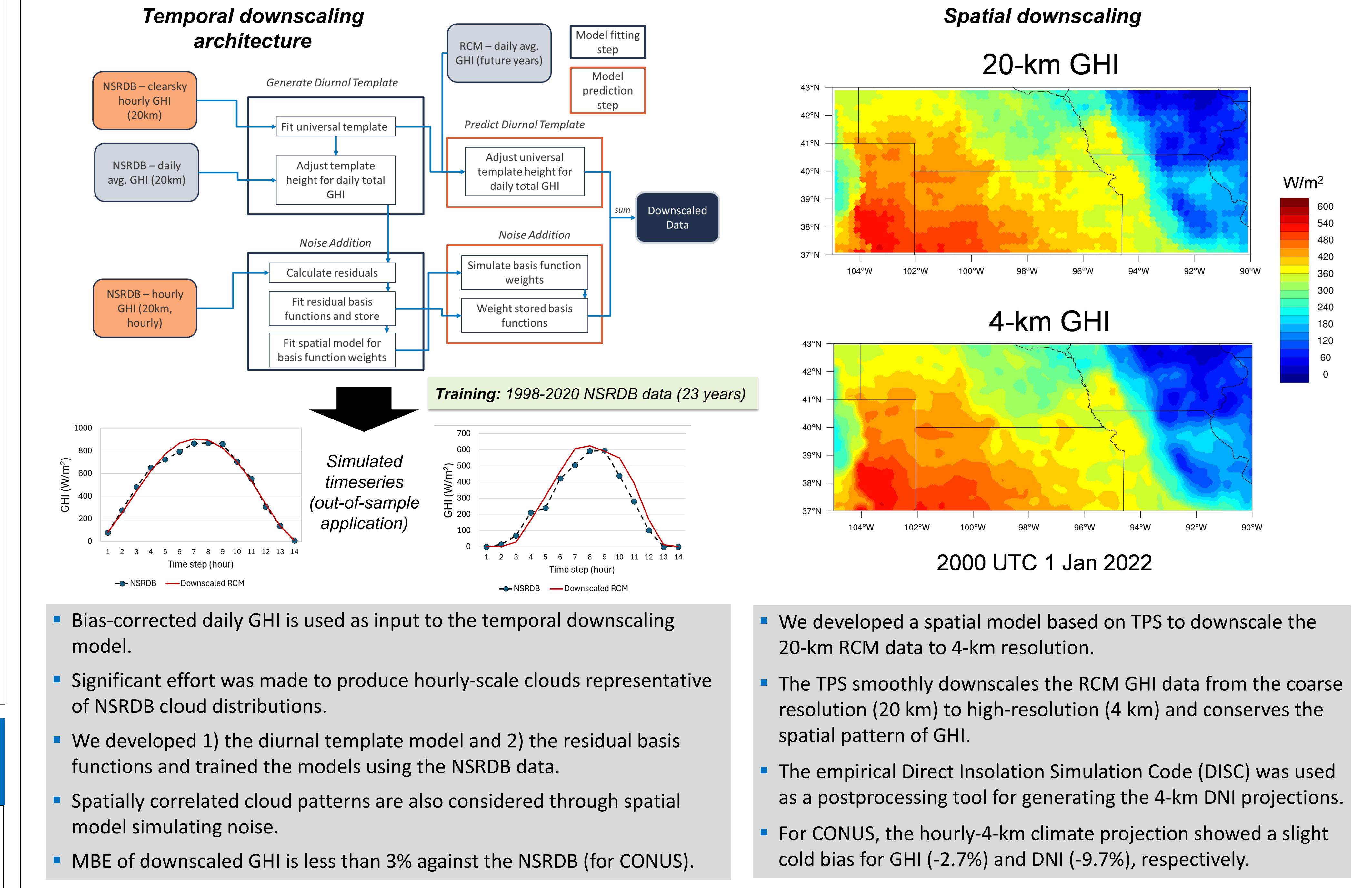
2. DATA



3. BIAS CORRECTION



4. TEMPORAL AND SPATIAL DOWNSCALING



5. SUMMARY

- A statistical method was developed to correct biases of future projections of GHI simulated using RCMs and to downscale daily~20-km RCM GHI to hourly~4-km resolution GHI.
- The NSRDB data sets were used to calibrate the RCM output (from CanRCM4) and validate the downscaled GHI projections for CONUS.
- MBE for the downscaled hourly GHI was calculated to be ~3% (DNI: ~10%) when compared to the NSRDB.
- The long-term solar radiation data set that covers entire CONUS will be publicly available.

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