



# A Global Agroclimatology Data Base: Thirty Plus Years of Satellite-Derived Solar Insolation and Assimilation Model Meteorological Parameters

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Synergy in Science: Partnering for Solutions  
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## Prediction of Worldwide Energy Resource (POWER) Project

### Data Sources & Validation

#### POWER Overview

- Objectives:** Improve the Nation's and Global public private capability for integrating environmental data from NASA research to support increased renewable energy development, energy efficiency and agricultural modeling.
- Goals:** Through partnerships, derive, validate and provide parameters relevant to industry needs, link to decision support tools and transition capabilities when possible.
- Website:** <http://power.larc.nasa.gov>

**Prediction of Worldwide Energy Resource**

Surface meteorology and Solar Energy (SSE-release 6.0):  
A renewable energy resource with site sponsored by NASA's Applied Sciences Program in the Science Mission Directorate, Applied Sciences Program

Earth Science for Society: Accelerating the realization of economic and societal benefits from Earth science, information, and technology

Home | Renewable Energy Parameters | Sustainable Buildings Parameters | Agroclimatology Parameters

Access Data

- SSE-Renewable Energy
- Sustainable Buildings
- Agroclimatology

Documentation

- About the POWER Project
- About Renewable Energy
- About Sustainable Buildings
- About Agroclimatology
- Global Geospatial Information
- POWER Publications

Processing, archiving, and distributing solar insolation and meteorological parameters for:

- SSE-RENEWABLE ENERGY:** Satellite and modeled derived data supporting Renewable Energy Technologies (RETE).
- Over 200 satellite-derived meteorology and solar energy parameters
- Monthly averaged parameters for the period July 1, 1983 through June 30, 2005
- Daily averaged solar and meteorological data over the time period July 1983 - June 2005
- Global coverage on a 1° latitude by 1° longitude grid
- Data for the RETE/Power/International Clean Energy Project Analysis Software
- Data for the Hybrid Optimization Model for Electric Renewables (HOMER software)
- SSE Methodology: Executive Summary
- SSE Methodology: User's Manual (PDF, Ver. 1.0)

**AGROCLIMATOLOGY:** Satellite and modeled derived solar and meteorological data supporting agroclimatology

- Daily solar radiation from July 1, 1983 through near real-time
- Daily averaged air temperature (average minimum/maximum point) from January 1, 1983 through near real-time
- Daily averaged precipitation from January 1987 through February 2013
- Global coverage on a 1° latitude by 1° longitude grid
- Agroclimatology Methodology: Executive Summary
- Agroclimatology Methodology: User's Manual (PDF, Ver. 1.0)
- SSE Methodology: User's Manual (PDF, Ver. 1.0)

**AMBIENT METEOROLOGY:** Satellite and modeled derived solar and meteorological data supporting agroclimatology

- Daily solar radiation from July 1, 1983 through near real-time
- Daily averaged air temperature (average minimum/maximum point) from January 1, 1983 through near real-time
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Navigation and Help

- Atmospheric Science Data Center
- Science Mission Directorate
- NASA's Applied Sciences Program
- Other Related Sites

FAQ | Partners | Release Notes | Question/Comments | Acknowledgments/Press

#### POWER Data Sources

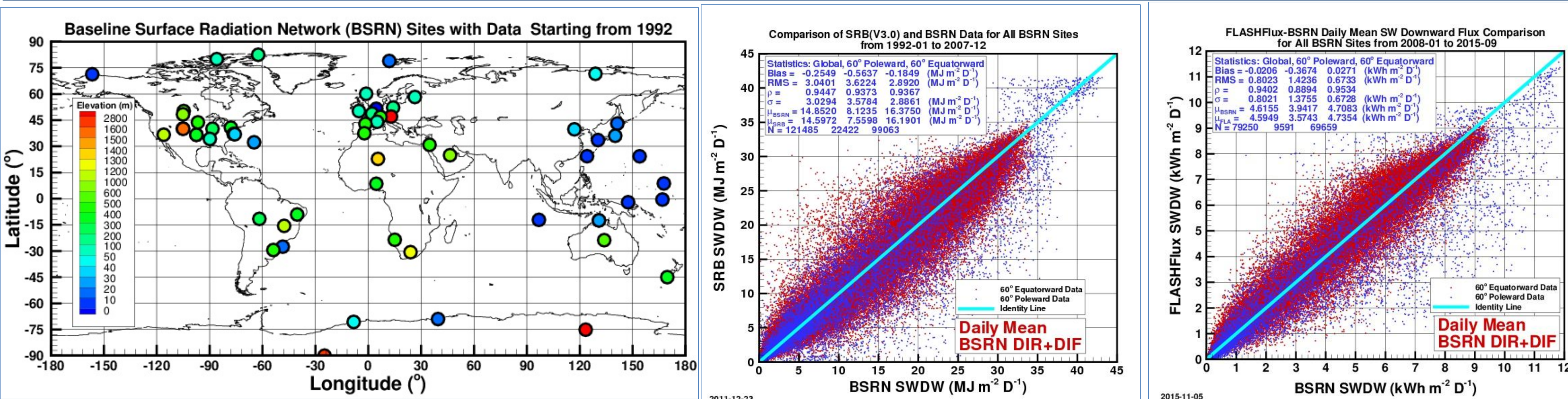
Dates	Radiation Source	Meteorology Source
1983 - 2007	SRB 3.0	MERRA
2008 - 2012	FLASHFlux Version 2H	MERRA
8/14/2013 - 2014	FLASHFlux Version 3A	MERRA
8/15/2014 - current	FLASHFlux Version 3B	MERRA

MERRA: Modern Era Retrospective-analysis for Research and Applications  
SRB: Surface Radiation Budget  
FLASHFlux: Fast Longwave and Shortwave Flux  
(All parameters globally available on a half-degree grid)

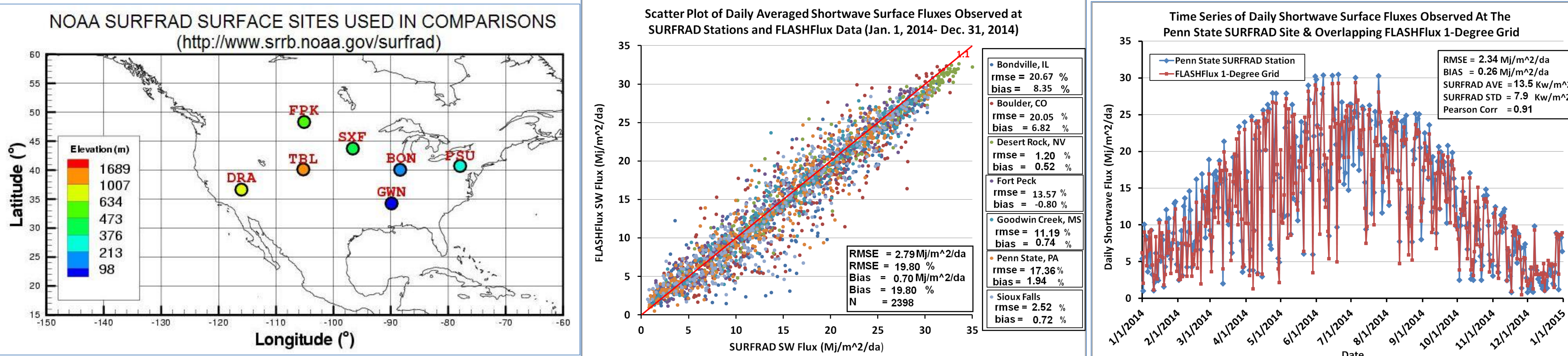
### Validation of POWER Parameters

A core component of the POWER project is the assessment of the respective accuracies of the solar and meteorological data. This is accomplished through comparisons of the POWER data with reliable surface observations. Results of these studies are provided online methodology documentation in order that potential users can assess the applicability of the POWER data to their particular project.

### Solar (SRB & FLASHFLUX)

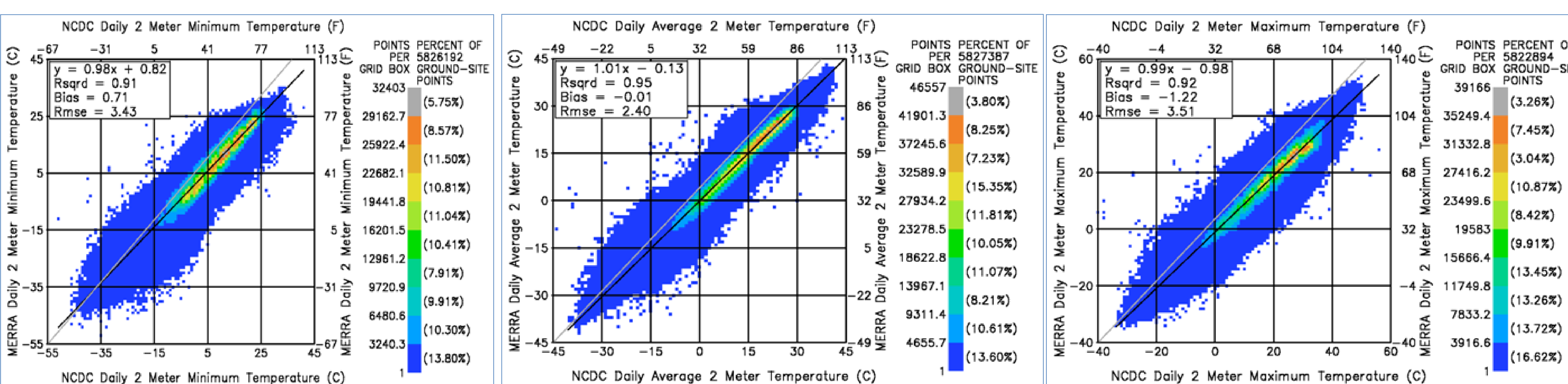


### POWER solar data vs. observations from globally distributed Baseline Surface Radiation Network (BSRN) surface sites.



### POWER solar vs. observations from the CONUS Surface Radiation Budget Network (SURFRAD)

### Temperature (MERRA)

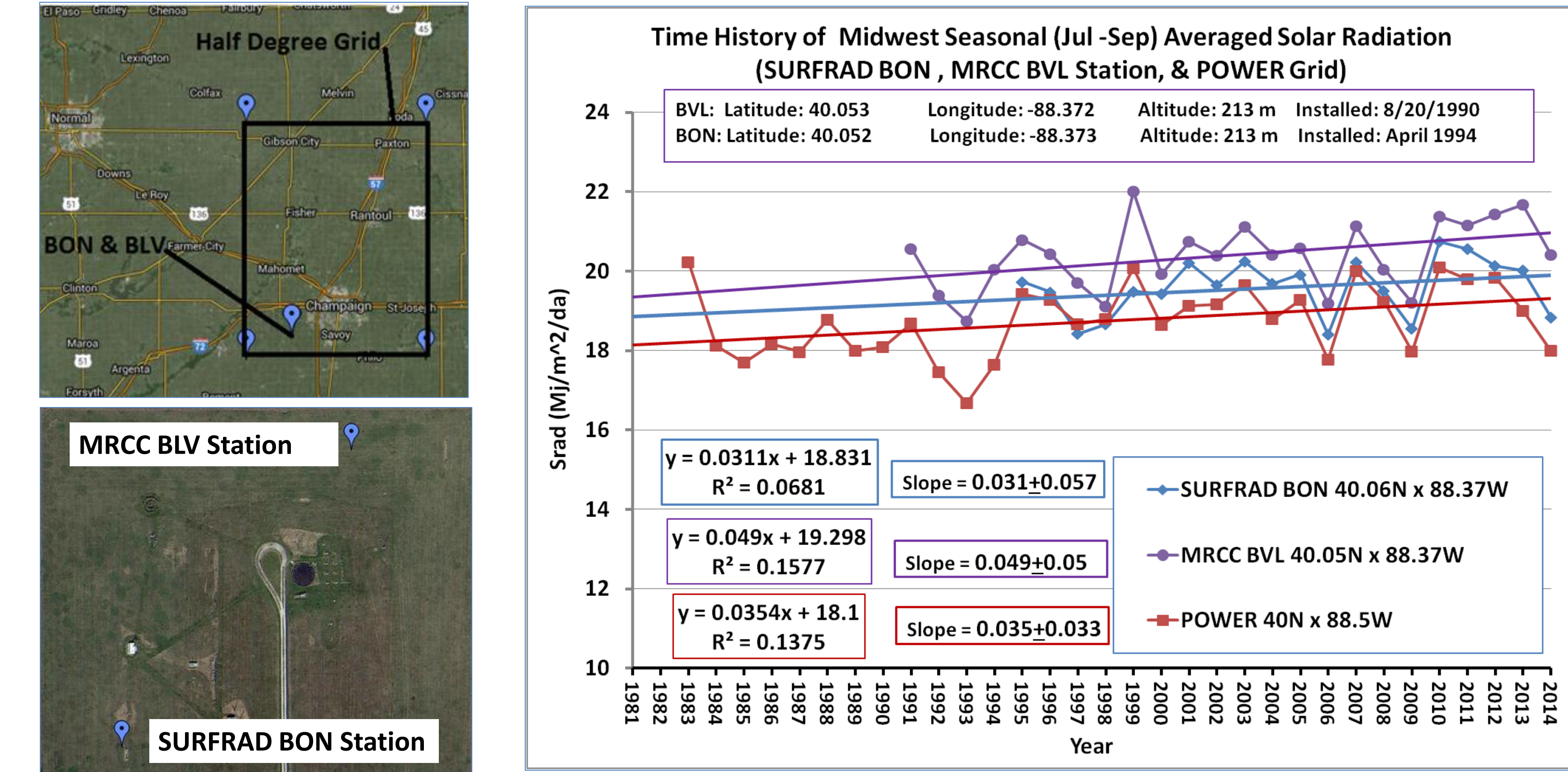


Scatter plots of the MERRA temperatures ( $T_{ave}$ ,  $T_{max}$ , and  $T_{min}$ ) for 0.5° x 0.5° grid boxes versus observations from surface stations contained within those MERRA grid boxes. The comparison covers 1,116 surface stations in the CONUS meeting our 85% selection criteria. The color bar is indicative of the number and percentage of observations represented by each color.

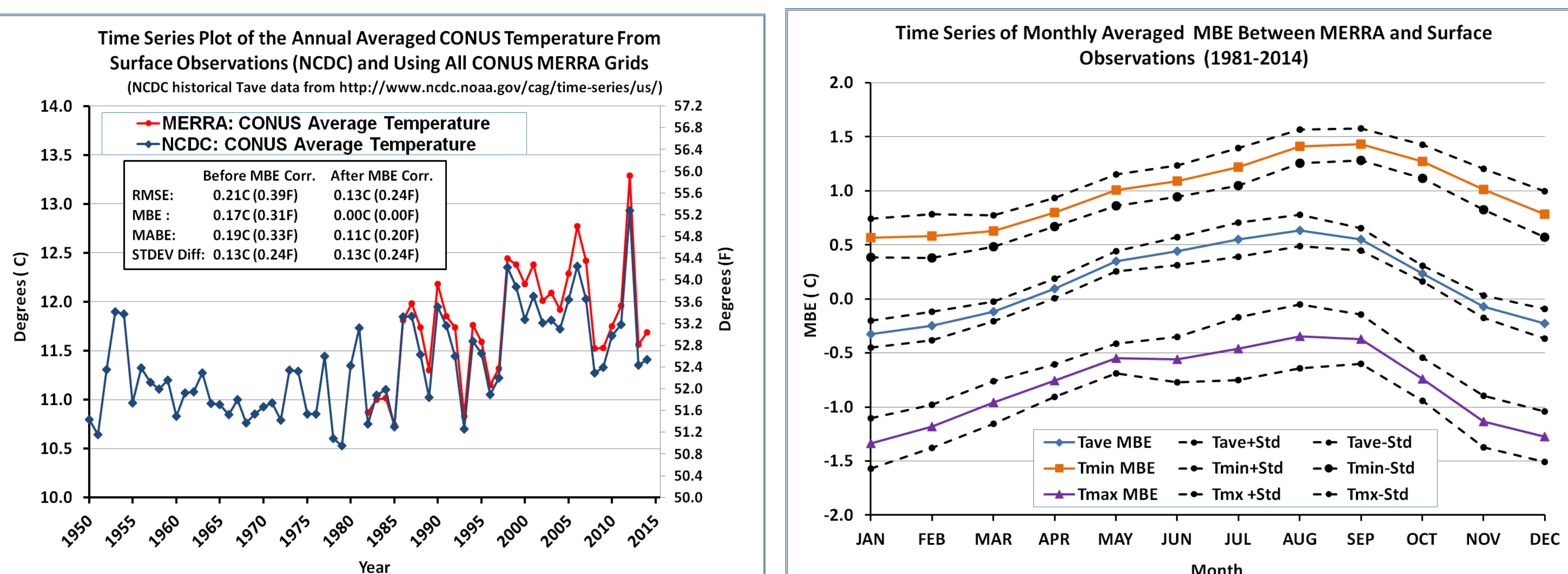
### Applications & Updates to POWER Archive

#### Analysis of Potential US Midwest Seasonal Solar Trends

#### Midwest Regional Climate Center (MRCC) BVL, SURFRAD BON Stations, & POWER Half-Degree Grid



#### CONUS Temperature Trends



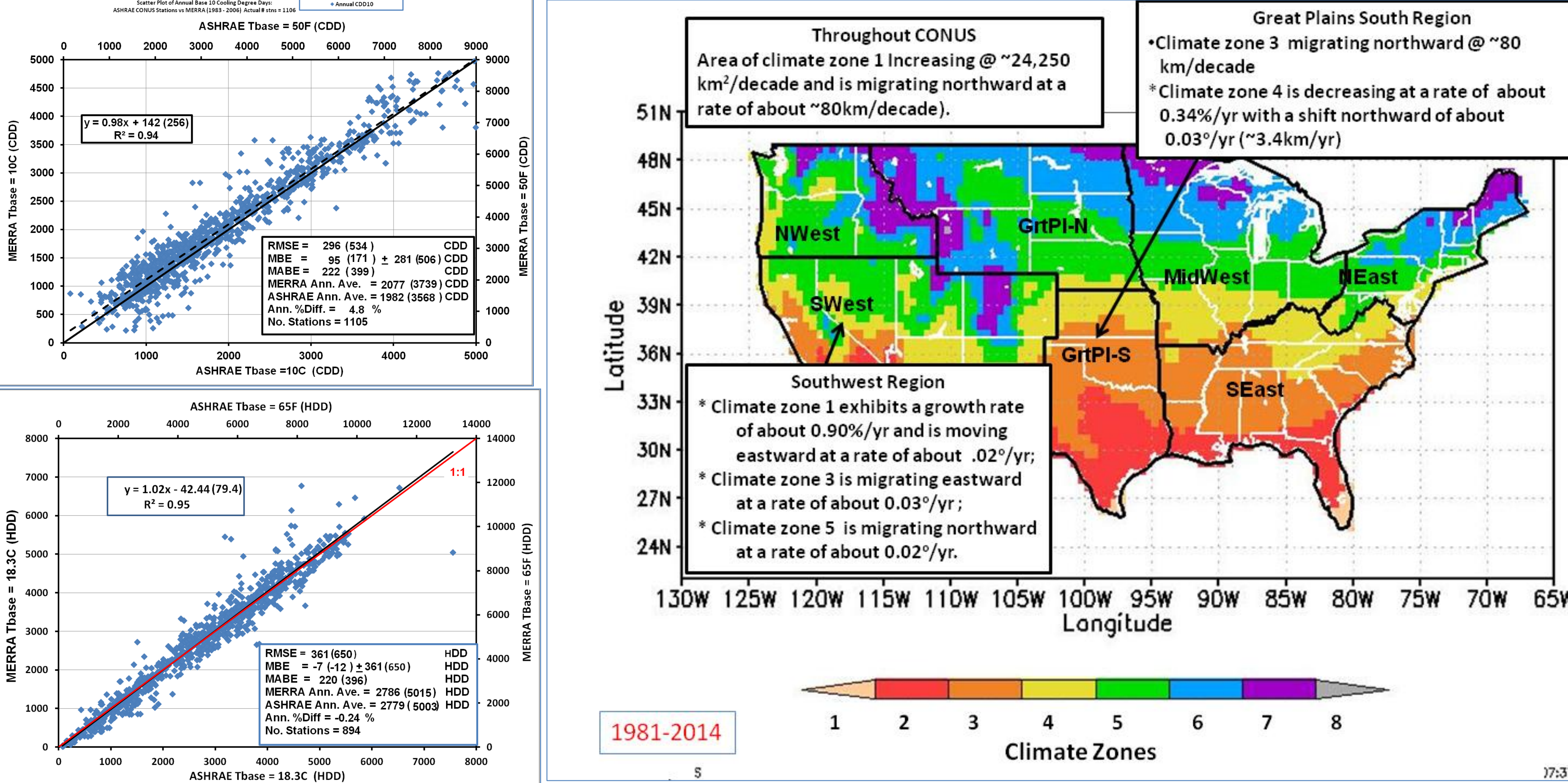
#### Trends in Building Climate Zones (Similar to Growing Degree Days)

Based upon surface observations heating and cooling degree day criteria for climate zone maps, which are used to develop local building codes, have been developed by ASHARE & DOE. MERRA temperatures offer the potential to augment missing and/or incomplete surface data.

Heating Degree Days:  $HDD = \sum (T_{base} - < T_i >)^+$   $T_{base} = 18.3^{\circ}C (65^{\circ}F)$

Cooling Degree Days:  $CDD = \sum (< T_i > - T_{base})^+$   $T_{base} = 10^{\circ}C (50^{\circ}F)$

\*Note that negative values are not included in sum



#### Near Future Changes

- The POWER archives are currently undergoing major updates that include the production and validation of 1/2 x 1/2 degree data products and the expansion of the data set to a full 30 years. As part of this transition, data parameters from the Modern Era Retrospective-analysis for Research and Applications (MERRA) will be being used for the main data source for surface meteorological data parameters along with the current solardata.
- Also, the POWER website is undergoing a complete transformation to allow users to obtain data sets and parameters utilizing an ARC\_GIS platform. Users will be able to obtain customized data sets and parameters in a variety of formats including GIS compatible formats besides the traditional DSSAT ascii formatted data.

**Adding GIS for Web Site Modernization and Mobile Devices**

ASDC Geospatial Portal

Featured Maps and Apps

- 22 Year Daily Average
- 2015 Daily Average
- 2014 Daily Average
- 2013 Daily Average
- 2012 Daily Average
- 2011 Daily Average
- 2010 Daily Average
- 2009 Daily Average
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