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

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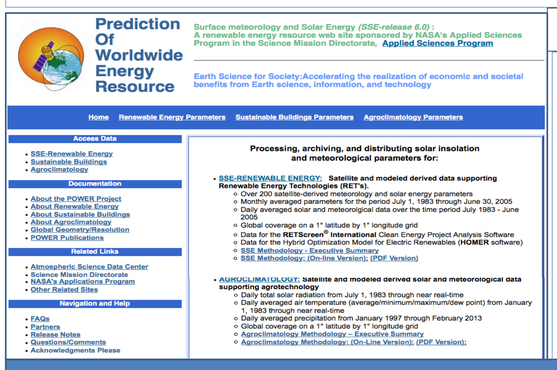
Prediction of Worldwide Energy Resource (POWER) Project

Data Sources & Validation

Applications & Updates to POWER Archive

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



POWER Data Sources

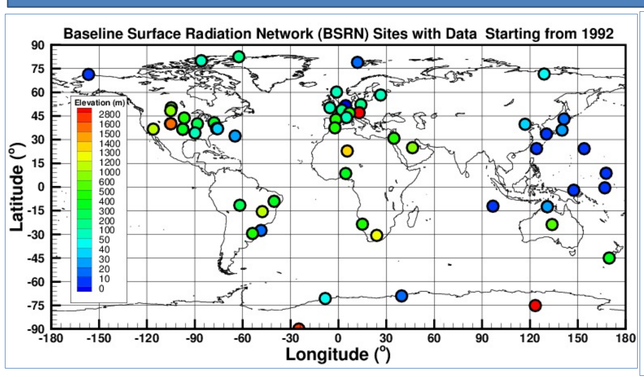
Dates	Radiation Source	Meteorology Source
1983 - 2007	SRB 3.0	MERRA
2008 - 2012	FLASHFlux Version 2H	MERRA
8/14/2013 - 2014	FLASHFlux Version 3A	MERRA
8/15/2014 - current	FLASHFlux Version 3B	MERRA

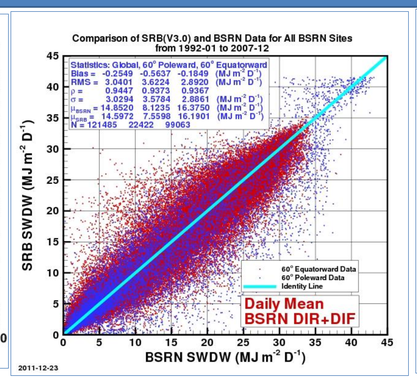
MERRA: Modern Era Retrospective-analysis for Research and Applications
SRB: Surface Radiation Budget
FLASHFLux: Fast Longwave and Shortwave Flux
(All parameters globally available on a half-degree grid)

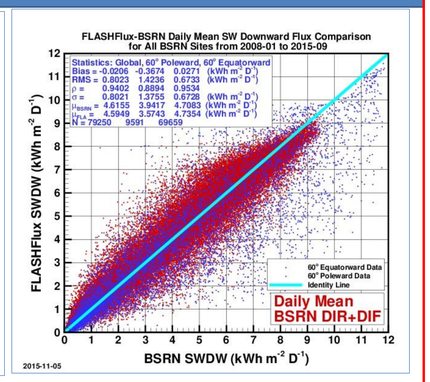
Validation of POWER Parameters

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.

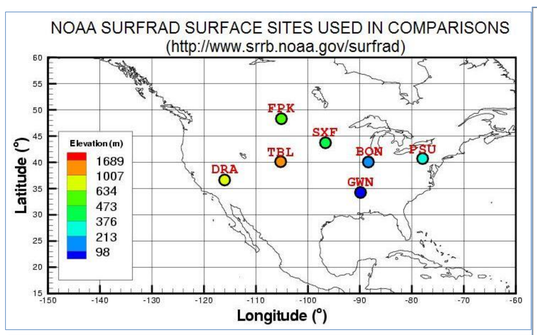
Solar (SRB & FLASHFLux)

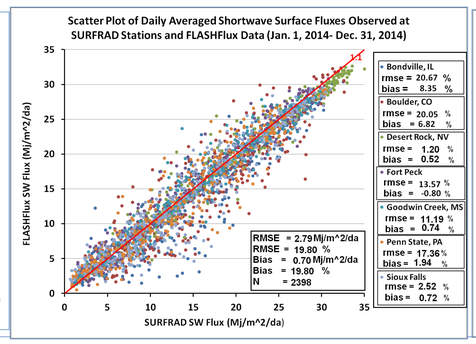


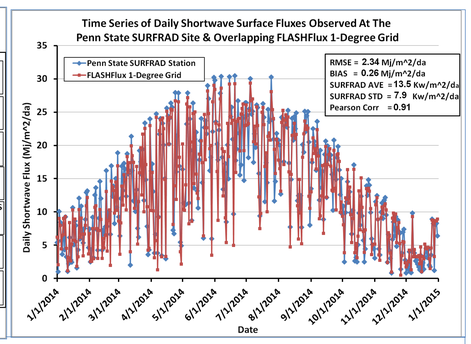




POWER solar data vs. observations from globally distributed Baseline Surface Radiation Network (BSRN) surface sites.

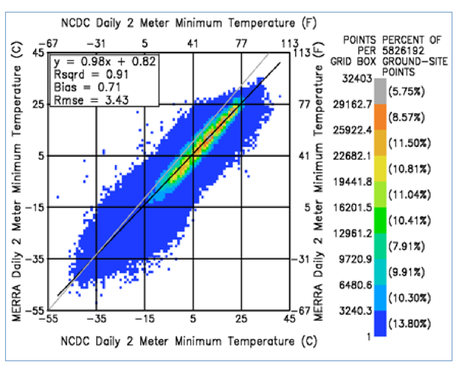


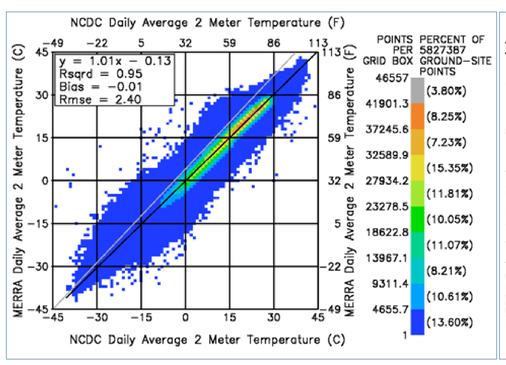


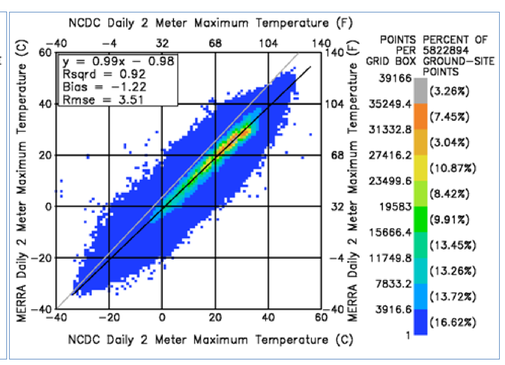


POWER solar vs. observations from the CONUS Surface Radiation Budget Network (SURFRAD)

Temperature (MERRA)

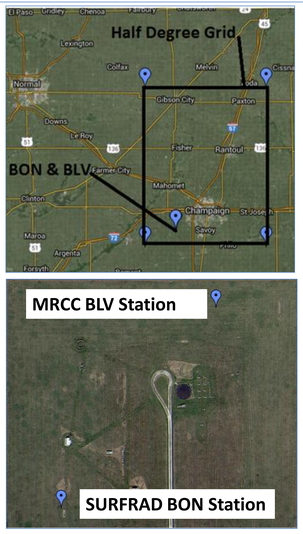


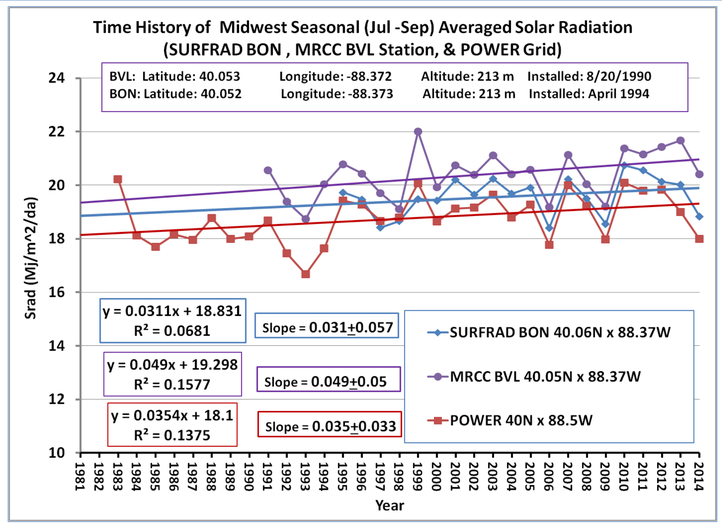




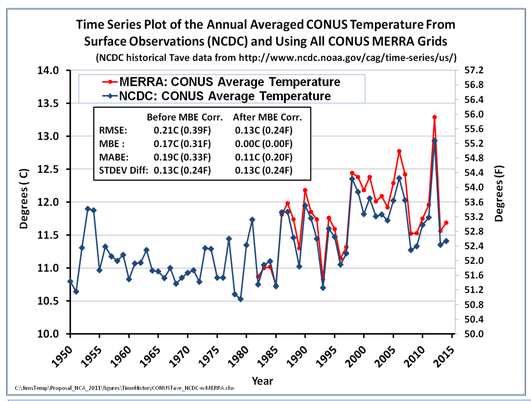
Scatter plots of the MERRA temperatures (T_{ave}, T_{max}, and T_{min}) for 0.5° x 0.5° grid boxes versus observations from surface stations contained within those MERRA grid boxes. The comparison covers 1,116 surface stations in the CONUS meeting our 85% selection criteria. The color bar is indicative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

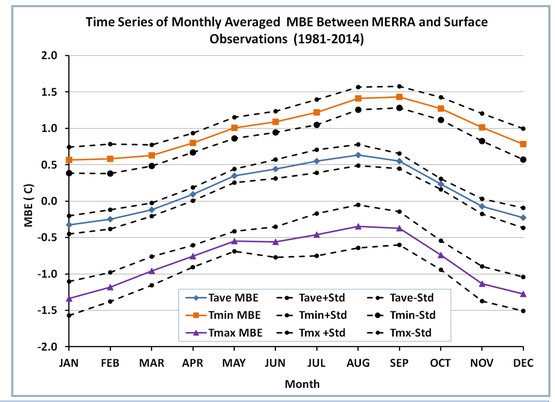
Analysis of Potential US Midwest Seasonal Solar Trends
Midwest Regional Climate Center (MRCC) BVL, SURFRAD BON Stations, & POWER Half-Degree Grid





CONUS Temperature Trends





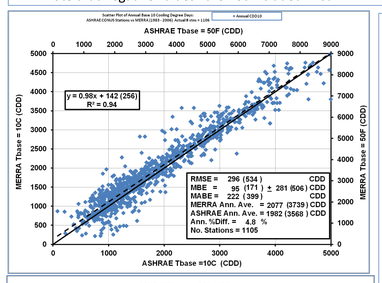
Trends in Building Climate Zones (Similar to Growing Degree Days)

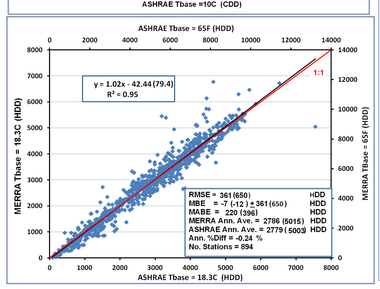
Based upon surface observations heating and cooling degree day criteria for climate zone maps, which are used to develop local building codes, have been developed by ASHARE & DOE. MERRA temperatures offer the potential to augment missing and/or incomplete surface data.

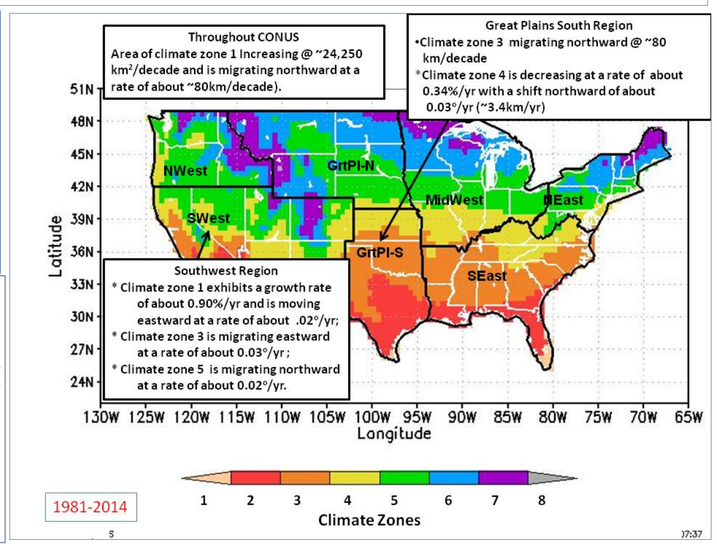
Heating Degree Days: $HDD = \sum \left(T_{base} - < T_i >\right)^+$ T_{base} = 18.3°C (65°F)

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

*Note that negative values are not included in sum







MERRA HDD and CDD vs. surface observations

MERRA based climate zone map with 95% confident trends over the past 34 years

Near Future Changes

- The POWER archives are currently undergoing major updates that include the production and validation of ½ x ½ 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 web site 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.