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

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DATA SOURCES & VALIDATION

### POWER Overview

- **Objectives:** Improve the Nation’s and Global public private capability for integrating environmental data from NASA research stations into 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](http://power.larc.nasa.gov)

### POWER Data Sources

<table>
<thead>
<tr>
<th>Dates</th>
<th>Radiation Source</th>
<th>Meteorology Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983-2007</td>
<td>SRB 3.0</td>
<td>MERRA</td>
</tr>
<tr>
<td>2008-2012</td>
<td>FLASHFlux Version 2H</td>
<td>MERRA</td>
</tr>
<tr>
<td>8/14/2013-2014</td>
<td>FLASHFlux Version 3A</td>
<td>MERRA</td>
</tr>
<tr>
<td>8/15/2014 - current</td>
<td>FLASHFlux Version 3B</td>
<td>MERRA</td>
</tr>
</tbody>
</table>

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)

#### Baseline Surface Radiation Network (BSRN) Sites with Data Starting from 1992

![Solar data vs. observations from Baseline Surface Radiation Network (BSRN) surface sites.](image)

### Temperature (MERRA)

#### MERRA HDD and CDD vs. surface observations

![MERRA based climate zone map with 95% confident trends over the past 34 years](image)

### 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:**

\[ HDD = \sum (T_{base} - T) \]

**Cooling Degree Days:**

\[ CDD = \sum (T - T_{base}) \]

*Note that negative values are not included in sum*

**Example:**

- **HDD** = 18.3°C (65°F)
- **CDD** = 10°C (50°F)

### Future Changes

- The POWER archives are currently undergoing major updates that include the production and validation of 1 x 1 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 solar data.
- 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.