

SATELLITE REMOTE SENSING OF SOLAR RADIATION IN PUERTO RICO AND THE NORTHERN CARIBBEAN REGION

Eric W. Harmsen¹, John Mecikalski², Terry Nipp³

¹Dept. of Agricultural and Biosystems Engineering, UPRM,

²Dept. of Atmospheric Science, University of Alabama-Huntsville

³Agricultural and Environmental Geographic Information Systems, Ltd.

eric.harmsen@upr.edu

In early 2009, collaboration between the University of Puerto Rico-Mayagüez Campus and the University of Alabama in Huntsville resulted in the availability of a solar radiation satellite remote sensing product for Puerto Rico (PR), the U.S. Virgin Islands (USVI), Dominican Republic, Haiti, Jamaica and Cuba. The half-hourly and daily-integrated data are available at 1-km spatial resolution for PR and the USVI and 2-km resolution for the other islands. These data are valuable for analyzing solar energy and natural resource-related problems.

Prior to 2009, daily and hourly solar data were only available from weather station pyranometers. These sensors were limited in number and in their spatial and temporal distribution. On the other hand, the 1-km GOES Satellite data for Puerto Rico provides 9,000 pixels of estimated solar data, as compared to 10 or 20 sensors that were available before 2009.

The GOES satellite method used to obtain ground level solar radiation is based on a radiation energy balance of the atmosphere. A validation study conducted in Florida and Puerto Rico indicate that the method provides reasonably accurate solar radiation data for most locations, approaching ~91-92% once de-biasing to ground-based pyranometers is done. In 2018, use of 500 m resolution GOES-16 data will further improve the product.

As an example application of the solar data, it has been used as input to the GOES-Puerto Rico Water and Energy Balance (GOES-PRWEB) algorithm that provides 30 hydro-climate products on a daily basis. The solar data has also been used to support the design of numerous photo-voltaic solar energy systems in the Northern Caribbean Region, with the majority in Haiti.

The presentation will present an example of how the solar data could be used to evaluate the performance of a small residential solar system in PR.