

Multivariate Linear Regression Technique for Computing Solar Irradiance Estimations Using the SURFRAD and Integrated Surface Irradiance Study (ISIS) Networks

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The increased use of solar photovoltaic cells as energy sources on electrical grids has created the need for accurate solar irradiance assessment over continental scales. In the present paper, we discuss a technique for computing solar irradiance estimations that utilizes numerical weather model variables, satellite data, and SURFRAD and ISIS network measurements. The numerical weather model used is the Rapid Update Cycle. The solar irradiance estimations found are more accurate than the solar irradiance fields provided by the satellites alone. Moreover, estimations are provided for the global horizontal, direct normal, and diffuse horizontal irradiance fields. The multivariate regression implemented allows accurate estimations of solar irradiance, but relies on high quality solar measurements at the surface over a geographically diverse domain. The technique developed in the present paper is also applicable to solar irradiance forecasts.

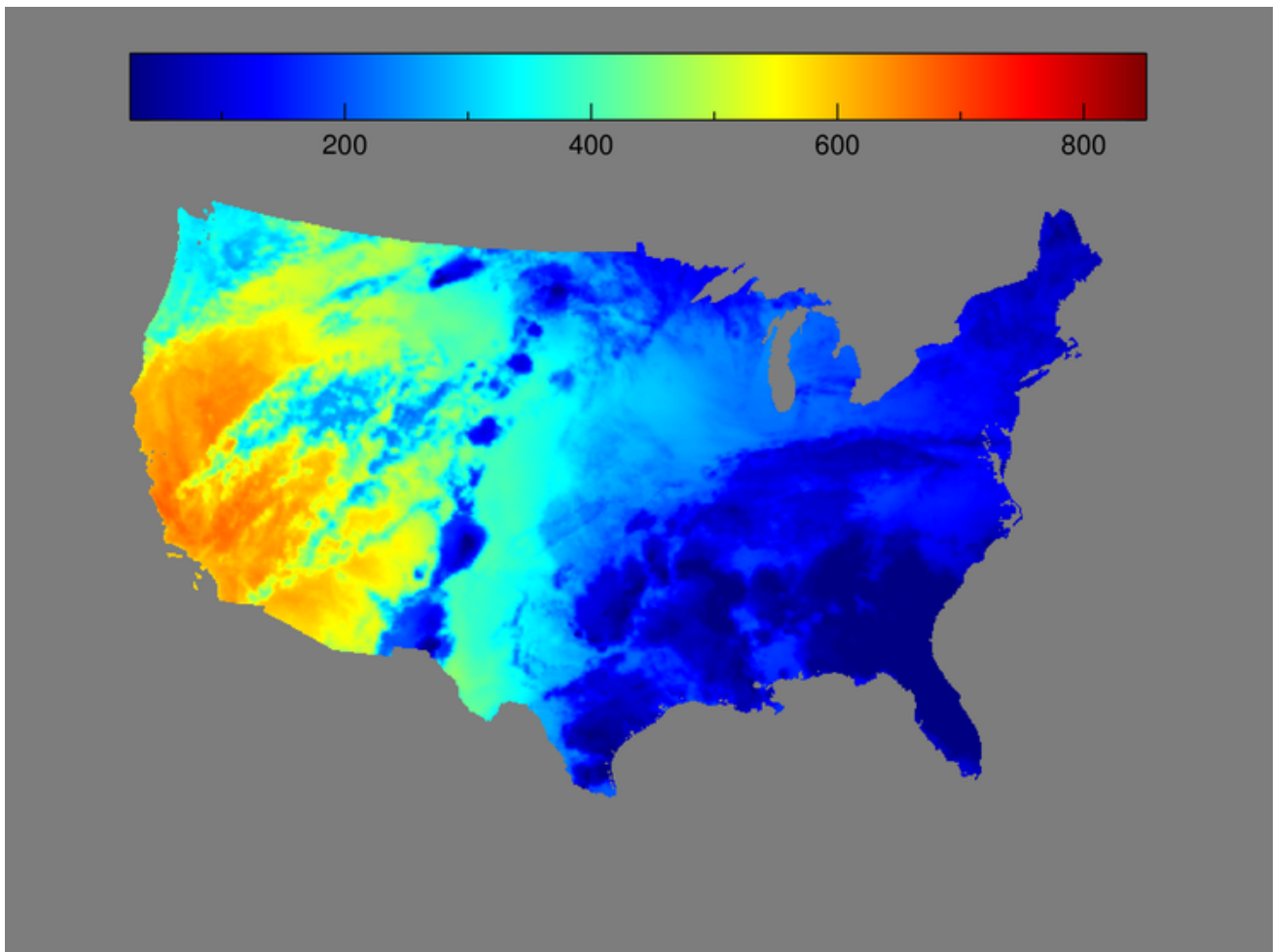


Figure 1. Image of total solar irradiance estimate produced by the multivariate regression technique for 23:00 (Coordinated Universal Time) July 1 2007. Scale is in W / m^2 .