Lakkis, Susan G.; Lavorato, Mario; Canziani, Pablo O.

Estimation of monthly global solar radiation in Buenos Aires: preliminary analysis

Artículo publicado en Journal of Advances in Physics Vol. 5 Nº 1, 2014

Cómo citar el documento:


Susan G. Lakkis, Mario Lavorato, Pablo O. Canziani

Facultad de Ciencias Agrarias, Pontificia Universidad Católica Argentina (UCA), Equipo Interdisciplinario para el Estudio del Cambio Global (PEPACG), Pontificia Universidad Católica Argentina (UCA), Argentina.

gabylakkis@uca.edu.ar; gabylakkisetul@gmail.com
División Radar Laser, DEILAP (CITEDEF – CONICET), Argentina

Equipo Interdisciplinario para el Estudio del Cambio Global (PEPACG), Pontificia Universidad Católica Argentina (UCA); Consejo Superior de Investigaciones Científicas y Técnicas (CONICET), Argentina

ABSTRACT
Six existing models and one proposed approach for estimating global solar radiation were tested in Buenos Aires using commonly measured meteorological data as temperature and sunshine hours covering the years 2010-2013. Statistical predictors as mean bias error, root mean square, mean percentage error, slope and regression coefficients were used as validation criteria. The variability explained (R²), slope and MPE indicated that the higher precision could be excepted when sunshine hours are used as predictor. The new proposed approach explained almost 99% of the R² variability with deviation of less than ± 0.1 MJm⁻²day⁻¹ and with the MPE smallest value below 1 %. The well known Ångström-Prescott methods, first and third order, was also found to perform for the measured data with high accuracy (R²=0.97-0.99) but with slightly higher MBE values (0.17 -0.18 MJm⁻²day⁻¹). The results pointed out that the third order Ångström type correlation did not improve the estimation accuracy of solar radiation given the highest range of deviation and mean percentage error obtained. Where the sunshine hours were not available, the formulae including temperature data might be considered as an alternative although the methods displayed larger deviation and tended to overestimate the solar radiation behavior.

Indexing terms/Keywords
Monthly solar radiation, meteorological data, statistical predictors, Argentina.

Academic Discipline And Sub-Disciplines
Atmospheric Environment, Renewable energy

SUBJECT CLASSIFICATION
Solar radiation, solar-terrestrial physics

TYPE (METHOD/APPROACH)
Ångström-Prescott methods, empirical estimation, regression coefficients.