

Review of the paper:

Title

Assessment of surface solar irradiance derived from real-time modelling techniques and verification with ground-based measurements by Kosmopoulos et al.

General comment

This paper shows the assessment of surface solar irradiance estimated in real time from a multi-regression function (MRF) and a neural network (NN). In the case of NN the results for the integrated spectrum and for the spectral irradiance are considered.

The output of MRF and NN are compared with Baseline Surface Radiation Network (BSRN) observations and with the training dataset, created by the libRadtran model. Nine stations with different climates are considered, giving to the discussion a general applicability.

The verification against the BSRN shows that the uncertainty of the real-time estimations of GHI ranges from -100 W/m^2 to 40 W/m^2 for the 15-min GHI, while the error decreases for averages computed for longer time ranges (down to $-20, 20 \text{ W/m}^2$ for monthly averages). The impact of the aerosols and cloud optical thickness on the GHI is also discussed in detail.

The paper is well written and interesting and deserves publication on AMT. There are few points that I would remark to improve the quality of the paper.

Specific comments

The paper well discusses the performance of the methods presented for the estimation of the GHI in real-time. The advantages and the usability of the method is clear for the estimation of the GHI, as well as other quantities useful for the exploitation of solar energy, at a site where observations are not available. Nevertheless, because of the importance given to the paper to the fact that a real-time estimation of the GHI is presented, a discussion on the potential of the method for the short-term forecast should be provided in this paper. Also, a deeper discussion of the application fields of the methodology would be welcome.

At line 12 of page 7 it is written that NN is less computationally demanding than the interpolation. A quantification of this point should be given to better understand how the procedures work operationally.

Paragraph 3.2.1 Cloud effect: in the Figure 8, regression lines and determination coefficients should be included and discussed to give a quantitative estimation of the differences among the techniques.

Minor comments

Page 3 line 10: "coverege" -> "coverage".

At the end of section 2.2 explain how the relative components of the errors are computed.

Figure 9: Add units to standard deviation.