IRS2012-297
International Radiation Symposium 2012
Dahlem Cube, Berlin, Germany, 06 – 10 August 2012


# Comparison of different measurements of diffuse solar irradiance at Badajoz (Spain)

G. Sánchez, A. Serrano, M.L. Cancillo, and M. Antón
Universidad de Extremadura, Física, Badajoz, Spain (mananton@unex.es)

The diffuse component of solar radiation plays an active role in thermal, chemical and biological processes at the earth's surface. Its interest has increased in the last years because of its importance for climate studies and for the development of solar radiation as renewable energy.
For both aims not only the total amount of solar radiation reaching the earth's surface but also its partition into its direct and diffuse components must be accurately measured. In contrast to global solar radiation, which is one of the most available variables measured at meteorological stations, its direct/diffuse components are scarcely measured. Additionally, the instrumentation used to measure them is very diverse and, therefore, studies aimed at comparing measurements and determining the accuracy of different methodologies are demanded.
In the present study, diffuse irradiance have been simultaneously measured using two Kipp&Zonen CMP11 pyranometers, one of them shaded by a Kipp&Zonen CM121 shadow band, and the other one shaded by a ball installed on a Kipp&Zonen SOLYS2 solar tracker. Additionally, the diffuse irradiance has been derived from the subtraction between the global and direct measurements recorded by a Kipp&Zonen CMP11 pyranometer and a CHP1 pyrheliometer, respectively. All these measurements have been performed at Badajoz, Spain, at a one minute basis from 7 August 2010 to 8 August 2011. The three datasets of the diffuse data are compared each other. Results show that diffuse irradiance measured with shadow band and shadow ball are significantly lower than that estimated as difference between measurements of global and direct irradiance. The mean values of the relative differences respect to the estimations obtained by this latter method are 11.6±0.5 % for measurements with shadow ball and about 11.1±0.5% for measurements with shadow band. The dependences of the relative difference on solar zenith angle and clearness index have been analysed. It is observed that the highest difference between diffuse measurements obtained from shadow ball and the estimations using global and direct irradiance measurements decreases as solar zenith angle increases. Regarding the dependence with the clearness index, the difference increases as the clearness index increases. For measurements obtained by shadow band it is difficult to established relationships with solar zenith angle and clearness index since these differences show a large dispersion
This study contributes to a better knowledge of the experimental methodologies aimed at the estimation of the solar diffuse radiation. The results show that, although the three methodologies applied perform generally well, it is clear the need to improve the correction of the shadow band effect in order to obtain reliable solar diffuse radiation values. In the future the dependences with the solar zenith angle and the clearness index will be accurately characterized in order to propose new better correction approaches.