Relationship between total incoming solar radiation and sun hours in Corunna (Spain) during 12 years

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There is an increasing demand for information on the availability of solar radiation for different uses. However, solar radiation data are not as exhaustive as bright sunshine observations. In this paper, daily relationships between total solar irradiation and sun hours were studied in La Coruña (Spain) from 1/1/1993 to 31/12/2004, continuing previous studies from 1982 to 1992. In order to relate solar irradiation with sun hours, Ängstrom equation was used: $R/R_0 = a + b \, n/N$; where R is the daily total irradiation over a surface (J/m^2), R_0 is the daily total irradiation without cloudiness, n is the daily amount of sun hours and N is the maximum daily duration. Parameters a and b are constants. Moreover, in order to assess the autocorrelation between errors, Durbin-Watson statistics were computed. For the twelve year study period, linear relationship between solar irradiation and sun hours was described by the following equation: $R/R_0 = 0.224 + 0.539 \, (n/N)$. On a yearly basis, between 1993 and 2004, different linear functions relating solar radiation and sun hours were found, these equations showed values of b between 0.522 and 0.566 and r^2 between 0.61 and 0.91, higher than those found in a former study. Parameter b was significantly different for all the study years. Moreover, from 2000 onwards, b average was 0.56, higher than the former period with b = 0.54. Thus, regression values were found to be no stable over the time. Durbin-Watson coefficients indicated that there was no autocorrelation in 75% of the cases; they also showed that there was no autocorrelation among the errors.