EMS Annual Meeting Abstracts
Vol. 12, EMS2015-622-2, 2015
15th EMS / 12th ECAM

Trend evaluations of meteorological variables and solar global and ultraviolet horizontal irradiation in Spain

Julia Bilbao, Roberto Román, and Argimiro de Miguel
University of Valladolid. Faculty of Sciences. Atmosphere and Energy Laboratory. Spain.

The analysis of solar energy systems and simulation methods in energy efficiency is inconvenienced by the random behavior of the weather. The present work seeks to analyze long-term database of solar radiation and meteorological variables between the period 1950 and 2011 and to determine their statistically significant trends. Data used correspond to nine measurement stations in Spain.
We found that yearly sunshine hours decreased between 1950 and 1980 and increased from 1980 to 2011. Sunshine hour trends are -4.57, -3.42 and -2.18 %dc-1 in spring, summer and yearly respectively and during the dimming period. During the brightening period trend display positive values of 2.35 and 2.84 % dc-1 for summer and yearly series. This behavior appears at all locations and has also been observed by different authors in Iberian Peninsula.
Global solar irradiation trends show similar evolution to sunshine hours. The solar global trend is 0.76 %dc-1. In general precipitation does not show statistical significant trends. Air temperature decreased from 1950 and 1980, with temperatura increasing after this date. Authors attribute this to green-house effect.
Wind velocity decreased from 1950 to 2011. Wind velocity is known to depend on local conditions and wind trends might be influenced by the increase in built-up areas.
Solar global irradiation decreases from 1950 to 1980 and increases from 1980 to 2011. The first period is called “global dimming” and has been considered as a global phenomenon. The second period is called “global brightening”. This results might be due to aerosol variation in the atmosphere which increased up to 1980.
Total ozone column, TOC, and ultraviolet (UV) solar irradiation trends have been evaluated. TOC diminished after Chinchon and Pinatubo eruptions in 1982 and 1991 respectively. Dimming on UV is not as clear as on global solar irradiation perhaps due to ozone evolution.

References

Wild, M.: Global dimming and brightening: A review, J. Geophys. Res., 114, D00D16, 2009.
R. Román, J. Bilbao, and A. de Miguel. 2014.Erythemal ultraviolet irradiation trends in the Iberian Peninsula from 1950 to 2011. Atmos. Chem. Phys. 14, 15545–15590, 2014