

[Home](#)

[Online Library HESS](#)

- [Recent Final Revised Papers](#)
- [Volumes and Issues](#)
- [Special Issues](#)
- [Full Text Search](#)
- [Title and Author Search](#)

[Online Library HESSD](#)

[Alerts & RSS Feeds](#)

[General Information](#)

[Submission](#)

[Review](#)

[Production](#)

[Subscription](#)

[Comment on a Paper](#)

## Journal Metrics

 **IF 2.462**

 **5-year IF 2.670**

 **SNIP 0.856**

 **SJR 0.099**

[Definitions](#)

ARCHIVED IN



PORTICO

[Volumes and Issues](#) [Contents of Issue 12](#) [Spec](#)

Hydrol. Earth Syst. Sci., 14, 2479-2494, 2010

[www.hydrol-earth-syst-sci.net/14/2479/2010/](http://www.hydrol-earth-syst-sci.net/14/2479/2010/)

doi: 10.5194/hess-14-2479-2010

© Author(s) 2010. This work is distributed

under the Creative Commons Attribution 3.0 License.

## Topographic effects on solar radiation distribution in mountainous watersheds and their influence on reference evapotranspiration estimates at watershed scale

C. Aguilar<sup>1</sup>, J. Herrero<sup>2</sup>, and M. J. Polo<sup>1</sup>

<sup>1</sup>Fluvial Dynamics and Hydrology Research Group, University of Córdoba

<sup>2</sup>Fluvial Dynamics and Hydrology Research Group, University of Granada

**Abstract.** Distributed energy and water balance models require topographic surfaces of the climatological variables involved in hydrological processes. Among them, solar radiation constitutes a key variable to the water cycle in the atmosphere. Most of the hydrological GIS-based models use simple interpolation techniques to data measured at few weather stations, disregarding topographic effects. Here, a topographic solar radiation algorithm has been included for the generation of detailed time-series of solar radiation surfaces using limited data and simple methods in a mountainous watershed in southern Spain. The results show the role of topography in local values and differences between the topographic approximation and the direct interpolation to measured data (IDW) of up to +42% and -1800% in the estimated daily values. Also, the comparison of the predicted values with experimental data proves the usefulness of the algorithm for the estimation of spatially-distributed radiation values in a complex terrain, with a good fit for daily values ( $R^2 = 0.93$ ) and topographic fits under cloudless skies at hourly time steps. Finally, evapotranspiration fields estimated through the ASCE-Penman-Monteith equation using corrected and non-corrected radiation values address the hydrological importance of using topographically-corrected solar radiation fields as inputs to the equation over uniform values with mean differences in a watershed of 61 mm/year and 142 mm/year of standard deviation. The speed of computations in a 1300 km<sup>2</sup> watershed in the south of Spain up to a one-hour time scale in 30 × 30 m<sup>2</sup> cells can be easily carried out on a desktop PC.

[Final Revised Paper](#) (PDF, 2290 KB) [Discussion Paper](#) (HESSD)

Citation: Aguilar, C., Herrero, J., and Polo, M. J.: Topographic effects on solar radiation distribution in mountainous watersheds and their influence on reference evapotranspiration estimates at watershed scale, Hydrol. Earth Syst. Sci., 14, 2479-2494, doi:10.5194/hess-14-2479-2010, 2010. [Bibtex](#) [EndNote](#) [Reference Manager](#) [XML](#)