Geophysical Research Abstracts
Vol. 19, EGU2017-14994, 2017
EGU General Assembly 2017

Tilt to horizontal global solar irradiance conversion: application to PV systems data

Caroline Housmans (1), Jonathan Leloux (2), and Cédric Bertrand (3)

(1) RMI, Uccle, Belgium (caroline.housmans@meteo.be), (2) Universidad Politécnica de Madrid, Madrid, Spain (jonathan.leloux@gmail.com), (3) RMI, Uccle, Belgium (cedric.bertrand@meteo.be)

Many transposition models have been proposed in the literature to convert solar irradiance on the horizontal plane to that on a tilted plane requiring that at least two of the three solar components (i.e. global, direct and diffuse) are known. When only global irradiance measurements are available, the conversion from horizontal to tilted planes is still possible but in this case transposition models have to be coupled with decomposition models (i.e. models that predict the direct and diffuse components from the global one). Here, two different approaches have been considered to solve the reverse process, i.e. the conversion from tilted to horizontal: (i) one-sensor approach and (ii) multi-sensors approach. Because only one tilted plane is involved in the one-sensor approach, a decomposition model need to be coupled with a transposition model to solve the problem. By contrast, at least two tilted planes being considered in the multi-sensors approach, only a transposition model is required to perform the conversion. First, global solar irradiance measurements recorded on the roof of the Royal Meteorological Institute of Belgium's radiation tower in Uccle were used to evaluate the performance of both approaches. Four pyranometers (one mounted in the horizontal plane and three on inclined surfaces with different tilts and orientations) were involved in the validation exercise. Second, the inverse transposition was applied to tilted global solar irradiance values retrieved from the energy production registered at residential PV systems located in the vicinity of Belgian radiometric stations operated by RMI (for validation purposes).