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Integration of solar radiation maps from MSG-SEVIRI imagery and ground observations with a statistical copula model

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The incident solar radiation constitutes, together with the precipitation, the main forcing for the hydrologic response of a catchment. The radiation is the forcing for the surface energy budget, in particular it affects the evapotranspiration flux. An accurate estimation of this variable on a large area needs a dense network of ground sensors and information on the cloud cover, that are rarely available. A valid alternative is constituted by remote sensing, that can provide reliable measures of the cloud cover with high spatial and temporal resolutions. In this work a simple algorithm has been used in order to integrate the products of shortwave incident radiation obtained from MSG-SEVIRI imagery (produced by the Land SAF) with ground measures of global incident radiation. A statistical approach that utilizes a copula function was followed in order to define a criterion for accept or reject the ground sensors observations. In this approach both the mean daily error between the ground measure and a theoretical radiation time series and the cloud cover measures from MSG imagery were modelized with probability distribution functions. The theoretical time series was obtained from astronomical radiation values with a simple cloud cover correction formula. Through the use of the Frank's Copula, a conditional probability distribution function of the radiation error given the cloud cover was built and used for the accepting criterion. The results of the application of the algorithm on the national radiometers network of Italy in a period of 6 months (second semester 2005) are presented and discussed.