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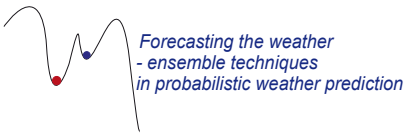

A 1961-90 high-resolution solar radiation climatology for Italy

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Despite the great importance of solar radiation in climate models and in energy budget applications, Italy still lacks of a validated high-resolution spatial model that evaluates the solar radiation starting from real measured data. Due to the fact that global solar radiation long-term records are too sparse for Italy, we used sunshine duration station data as the basis for our solar radiation climatologies. We constructed a quality-checked new database that includes more than 150 sunshine duration climate normals for the reference period 1961-90. The area of interest is Italy and the Alpine Region. 1961-90 high-resolution monthly radiation (horizontal resolution is 30 arc-second) solar climatologies for flat and real surfaces are shown. 12 monthly maps of direct, diffuse, reflected, global, and absorbed solar radiation are presented. The climatologies were obtained by means of a solar radiation model that starts from sunshine duration data and astronomical parameters in order to obtain Clearness Index grids for Italy; from Clearness Index, we inferred Direct, Diffuse, and Global Radiation for flat surfaces using decomposition models. We calculated a modified Turbidity Linke's factor and we implemented a shading model in order to create Direct Radiation grids for real surfaces; using the sky view factor, the obstructed view factor, and albedo grids, we obtained Diffuse and Reflected Radiation grids for real surfaces. In the end, Global and Absorbed Radiation grids were derived. This provisional model has been validated using 35 Air Force global Radiation records: the final monthly average relative mean absolute error is 4.6%.