EMS Annual Meeting Abstracts
Vol. 15, EMS2018-232, 2018

Surface solar radiation variability and trends over the Piedmont region (northwest Italy) for the 1990-2016 period

Veronica Manara (1), Manuela Bassi (2), Michele Brunetti (1), Barbara Cagnazzi (2), Maurizio Maugeri (3,1)

(1) Institute of Atmospheric Sciences and Climate, ISAC-CNR, Bologna, Italy (v.manara@isac.cnr.it), (2) Department of Forecasting Systems, Regional Agency for Environmental Protection of Piedmont, Turin, Italy, (3) Department of Environmental Science and Policy, Università degli Studi di Milano, Italy

A new surface solar radiation database composed of 74 daily series is set up for the Piedmont region (northwest Italy) for the 1990-2016 period. All the series are subjected to a detailed quality control, homogenization and gap-filling procedure and are transformed into relative annual/seasonal anomaly series. Finally, a gridded version (0.5°x0.5°) of the database is generated. The resulting Piedmont series show, in agreement with the "brightening period" reported in literature, an increasing tendency of about +2.5% per decade at annual scale, with the strongest trend in autumn (about +4% per decade). The only exception is found in winter, where a negative but not significant trend is observed. Considering the mean series representative of the plain (elevation lower than 500m) and the mountain areas, the trends are more intense for low than for high elevations, showing a negative vertical gradient in the trend of about -0.03% per decade per 100m at annual scale, with strongest gradient in spring of about -0.07% per decade per 100m. Removing the cloud effect selecting only the clear days (by comparison with satellite data over the 1991-2015 period, CMSAF-COMET database [Stöckli et al., 2017]), the trend over the whole Piedmont becomes positive and significant also in winter (about +3% per decade). Comparing the plain and mountain series under clear-sky conditions the trends are comparable during spring and summer and stronger for the plain area during winter and autumn. This difference can be noticed also observing the negative vertical gradient in the trend amount of about -0.1% per decade per 100m obtained in winter. Overall, these results show, on one side, how a high station density is important to perform a more detailed quality control and to capture regional peculiarities otherwise impossible to observe (e.g., differences between low and high elevations). On the other side, the comparison between all- and clear-sky conditions shows how the cloud effect contributed to intensify the increase of solar radiation observed during the brightening period with the only exception of winter (in this season cloud cover masked the brightening effect) and that this trend results more intense (or comparable) for low than high elevation both under all- and clear-sky conditions. Moreover, this vertical gradient in the trend is particularly evident in winter under clear-sky conditions.

Stöckli, Reto; Duguay–Tetzlaff, Anke; Bojanowski, Jedrzej; Hollmann, Rainer; Fuchs, Petra; Werscheck, Martin (2017): CM SAF ClOud Fractional Cover dataset from MEteosat First and Second Generation - Edition 1 (COMET Ed. 1), Satellite Application Facility on Climate Monitoring, DOI:10.5676/EUM_SAF_CM/CFC_METEOSAT/V001, https://doi.org/10.5676/EUM_SAF_CM/CFC_METEOSAT/V001.