



## **All-sky and clear-sky downward surface solar radiation trends for Italy from homogenized instrumental time series (1959-2013)**

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A dataset of 54 daily Italian downward surface solar radiation records (SSR) has been set up collecting data from different sources. The records have been quality checked and the dataset has been homogenized and completed by means of the neighboring records. Specifically, SSR records required an extensive homogenization procedure which led to adjust most of them, especially during the early period, in order to eliminate non climatic signals caused by changes either in the conditions of the corresponding meteorological station or by changes in the environment surrounding the station. The records were interpolated onto a regular grid and subjected to Principal Component Analysis that allowed identifying two regions: northern and southern Italy. The records of these areas were averaged in order to get all-sky regional SSR records for the 1959-2013 period. In addition, starting from the daily homogenized records, SSR series under clear-sky conditions were established for the 1959-2013 period with the same procedure used for the all-sky series, by considering only the days with a daily total cloud cover mean of 0 okta from corresponding ground-based cloudiness observations.

All-sky SSR annual records show a decreasing tendency until the mid-1980s (i.e. dimming) followed by an increasing tendency (i.e. brightening) both for north and south Italy. The strength and the persistence of the tendencies are not the same in all seasons, however the overall picture of Italian SSR trends turns out in reasonable agreement with the dimming/brightening phases observed in many areas of the world. The clear-sky SSR records present stronger tendencies than all-sky SSR records, especially during the dimming period in all seasons and during the brightening period in winter and autumn. This could suggest that the variation of all-sky SSR caused by the increase/decrease in aerosol content has been partially masked by cloud cover variations, especially during the dimming period.