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Comparison between instrumental sunshine duration and surface solar radiation trends for Italy over the period 1959-2013

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A dataset of quality checked and homogenized Italian instrumental sunshine duration (SD) and surface solar radiation (SSR) records has been set up collecting data from different sources, and the regional records for North and South Italy are obtained for both the variables. The trends refer to the period 1936-2013 for SD and to the period 1959-2013 for SSR. The SD records show an increasing tendency starting at the beginning of 1980s (i.e. brightening) and a decreasing tendency (i.e. dimming) in the previous period, which is, however, less evident than the more recent brightening, especially in northern Italy [Manara et al., 2015]. The SSR series show a decrease until the mid of 1980s and a following increase until the end of the series in all seasons with the only exception of summer in the North where the dimming period is very weak and winter and autumn in the South where the brightening periods is not significant. The comparison between the two variables over the common period (1959-2013) shows some discrepancies in the magnitude of the trends, especially during the dimming period with a more intense and significant tendency for SSR than for SD. Another peculiarity of the SSR trends with respect to the ones obtained from SD is a shift of the trend reversal from the mid of 1980s to the beginning of 1980s. The correlations between the two variables for the annual mean are 0.65 and 0.50 for the North and the South respectively. At seasonal scale they range between 0.71 (autumn) and 0.88 (spring) in the North and between 0.58 (autumn) and 0.75 (spring) in the South.
A more detailed understanding of differences highlighted by the comparison between SD and SSR records needs further research, based as an example on the comparison of the trends obtained also under clear-sky conditions. Nevertheless, the obtained results are in agreement with those reported in literature where the discrepancies observed during the dimming period are supposed to be caused by a different sensitivity of the two variables to the increase of aerosols concentration and/or to changes in cloud cover.
Manara, V., M. C. Beltrano, M. Brunetti, M. Maugeri, A. Sanchez-Lorenzo, C. Simolo, and S. Sorrenti (2015), Sunshine duration variability and trends in Italy from homogenized instrumental time series (1936-2013), Journal of Geophysical Research: Atmospheres, 120(9), 3622–3641, doi:10.1002/2014JD022560.