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A new database of sunshine duration for Italy from instrumental time series (1936-2013)

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A dataset of Italian sunshine duration records 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. Finally, the records have been gridded 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 regional records for the 1936-2013 period. The records show an increasing tendency starting in the 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. In the early period, from mid of the 1930s to the 1950s there is some evidence of an increasing tendency although this early brightening signal concerns a period in which data availability is very low, causing a greater uncertainty in regional records. The overall picture of Italian sunshine duration trends turns out in reasonable agreement with the early brightening – dimming – brightening phases observed in many areas of the world, specifically the southern part of the Greater Alpine Region and eastern Spain. This good agreement is interesting as it shows that sunshine duration exhibits a rather coherent signal over large regions, but also it allows us to increase the confidence in the quality of the regional sunshine records both for Italy and the neighboring regions. Finally, we compared also the Italian sunshine duration records with the corresponding total cloud cover records available for Italy. The comparison shows a negative correlation only during some periods. So, in order to better understand this behavior the effect of cloud cover on sunshine duration was separated. This separation suggests that during the global dimming period there is an important fraction of sunshine duration evolution that cannot be explained by total cloud cover. It could depend on other factors as, for example, changes in aerosol optical thickness and water vapor content. Nevertheless, in Italy, especially in the northern region, the clear dimming caused by these other factors has been partially masked by a strong reduction in total cloud cover. Also the strong brightening observed in Italy after the beginning of the 1980s is probably, at least up to 1995, dominated by a decrease in total cloud cover. A more detailed understanding of the mechanism driving Italy sunshine duration variability and trends needs further research.