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Reassessment and update of the trends in the surface solar radiation over Europe by means of homogenized series from the GEBA

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A widespread reduction of surface solar radiation (SSR) has been well established and documented from the 1950s to the 1980s, and an opposite trend has been detected in many regions of the world since the 1980s. This decrease and increase in SSR has been defined as “global dimming” and “brightening” periods, respectively. Nevertheless, the importance of the availability of high-quality SSR data in order to estimate long-term trends is well known, particularly with respect to the quality and homogeneity of the databases. Up to now many efforts have been made by the scientific community to improve the quality, in terms of homogeneity, of temperature and precipitation datasets, but few has been done for other variables, such as SSR. In this work, the trends of SSR over Europe using a homogeneous dataset of surface observations from the Global Energy Balance Archive (GEBA) over Europe are presented. The series have been homogenized by means of algorithms that use the conventional relative Standard Normal Homogeneity Test (SNHT) for the detection of shifts in the mean. The dataset consists of 56 series with monthly SSR data starting from the 1920s, Stockholm being the longest available record, going back to 1923. Equally, two other relative homogeneity tests have been applied in order to test the suitability of the homogenization previously carried out. In addition, these GEBA series have been compared against the records of the World Radiation Data Centre (WRDC), for the same stations, in order to check the consistency of the records stored in the GEBA. Finally, the annual and seasonal trends of the SSR have been studied for the mean series over Europe during the period 1961-2011, as well as for different regions defined by means of a Principal Component Analysis (PCA).