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Towards a homogenization of the long-term surface solar global radiation series over Europe

Arturo Sanchez-Lorenzo (1), Martin Wild (1), Michele Brunetti (2), and Jose Antonio Guijarro (3)

(1) ETH Zurich, Institute for Atmospheric and Climate Science, Zürich, Switzerland (arturo.sanchez@env.ethz.ch), (2) Institute of Atmospheric Sciences and Climate, Italian National Research Council, Italy , (3) State Meteorological Agency (AEMET), Balearic Islands Office, Spain

Historical surface measurements of solar radiation series (SSR) have been used during the last decades to suggest that SSR has not been constant on decadal time scales. Continuous observations dating back to 1920s are available, measurements becoming more common after the 1957/1958 International Geophysical Year. A widespread reduction of global solar radiation has been well established and documented from the 1950s to the 1980s, and since the 1980s an opposite trend has been detected in many regions of the world. This decrease and increase in surface solar radiation has been defined as "global dimming" and "global brightening", respectively. Also an "early brightening" during the 1930s and 1940s has been detected in the few SSR series available during this period.

Comparisons between surface measurements and remote sensing estimations of SSR are currently of great interest in order to provide a global coverage for this climatic variable. Another useful application of the SSR measurements is to check the reliability, and improve the well-known limitations, of Global Climate Models (GCM) simulations of downward irradiance. For these and other purposes, it is very important the availability of good SSR data, particularly with respect to the quality and homogeneity of the databases.

In this work we present, for the first time, an attempt to homogenize the long-term series over Europe currently available at the Global Energy Balance Archive (GEBA). The data set consists of about 45 series with monthly SSR data starting from the 1920s, Stockholm and Wageningen being the longest available records, going back to 1923 and 1928, respectively.

Three different relative homogeneity tests have been applied in order to detect and correct breaks in the series. The comparison of the results obtained with different tests is a recommended strategy in the homogenization field, especially when metadata are not available or there is a low station density in the data set. We used two versions of the Standard Normal Homogeneity Test (Alexandersson and Moberg, 1997), the RHTest (Wang et al, 2007) and the Craddock Test (Brunetti et al., 2006). After the homogenization using these four methods, the trends differences regarding the original series are assessed on a seasonal and annual basis.

References:

Alexandersson, H. and A. Moberg (1997), Homogenization of Swedish temperature data .1. Homogeneity test for linear trends, Int. J. Climatol., 17, 25-34.

Brunetti, M., M. Maugeri, F. Monti and T. Nanni (2006), Temperature and precipitation variability in Italy in the last two centuries from homogenized instrumental time series, Int. J. Climatol., 26, 345– 381.

Wang, X. L., Q. H. Wen and Y. Wu (2007), Penalized maximal t test for detecting undocumented mean change in climate data series, J. Appl. Meteor. Climatol., 46 (6), 916-931.