



Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

Introduction

Surface measurements of solar radiation series (SSR) have been used to suggest that SSR has not been constant on decadal time scales. Observations dating back to 1920s are available, measurements becoming more common after the 1957/1958 International Geophysical Year. A widespread reduction of SSR 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. 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 the availability of good SSR data is very important, particularly with respect to the quality and homogeneity of the databases.

1. The Global Energy Balance Archive (GEBA)

 \succ The GEBA comprises over 2,500 worldwide stations with quality-controlled \succ monthly means values of various surface energy parameters, mainly SSR.



Global distribution of the over 2,500 stations included in the GEBA data set



Global distribution of stations including SSR data with more than 10 (orange triangles) and 20 (red triangles) years of measurements.

2. Homogenization of the long-term SSR series at GEBA

- > The homogenization of the GEBA is still lacking. Thus, we want to homogenize the complete data set in the next 2 years, including the long (<1970s) and short (>1980s) term series.
- > Any co-operation in the homogenization is highly welcome. More details and future analysis and results in: http://www.iac.ethz.ch/people/arturos/homgeba

Eldgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich	INSTITUTE FOR ATMOSPHERIC AND CLIMATE SCIENCE
	News & Events About Us People Research Education Publications
	Groups Open Positions Alumni
ETH Zurich - D-UWIS - IACETH -	People - Dr. Arturo Sanchez-Lorenzo - Homogenization of the long-term surface solar global radiation series at the Global Energy
People	Homogenization of the long-term surface solar global radiation series at the (GEBA)
	<u>I. Homogenization of the longest GEBA series over Europe (January 2011 - Summer 2011)</u>
	Researchers: Arturo Sanchez-Lorenzo (ETH Zürich, Switzerland), Jose Antonio Guijarro (AEMET, Spain), Mich (ISAC-CNR, Italy), Martin Wild (ETH, Zürich).
	In this first step we present an attempt to homogenize the long-term series over Europe currently available a Balance Archive (GEBA). The data set consists of about 45 series with monthly solar radiation series starting 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 set comparison of the results obtained with different tests is a recommended strategy in the homogenization field metadata are not available or there is a low station density in the data set. We used two versions of the Sta Homogeneity Test (Alexandersson and Moberg, 1997), the RHTest (Wang et al, 2007) and the Craddock Test 2006).
	<u>II. Homogenization of the longest GEBA series over the World (Summer 2011 - Summer 2012)</u>
	III. Homogenization of the full GEBA dataset (2012?)
IAC eth	

• **References**

- Alexandersson, H. and A. Moberg (1997), Int. J. Climatol., 17, 25-34.
- Brunetti, M., M. Maugeri, F. Monti and T. Nanni (2006), Int. J. Climatol., 26, 345–381. Guijarro, J.A. (2011), Climatol version 2.0, an R contributed package for homogenization of climatological series. State Meteorological Agency, Balearic Islands Office, Spain, http://webs.ono.com/climatol/climatol.html
- Stepanek, P. (2007): AnClim software for time series analysis (for Windows). Dept. of Geography, Fac. of Natural Sciences, Masaryk University, Brno. 1.47 MB.

Acknowledgments: This research was supported by the Spanish Ministry of Science and Innovation project NUCLIERSOL (CGL2010-18546). The first author was granted by a postdoctoral position funded by the government of Catalonia (2009 BP-A 00035).

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

Arturo Sanchez-Lorenzo¹, José Antonio Guijarro², Michele Brunetti³, Martin Wild¹ ¹ ETH Zürich, Zürich, Switzerland (arturo.sanchez@env.ethz.ch) ⁽²⁾ State Meteorological Agency (AEMET), Balearic Islands Office, Spain ⁽³⁾ Institute of Atmospheric Sciences and Climate, Italian National Research Council, Italy,



3. First step: Longest GEBA series over Europe

- correct breaks in the series.

3.3

3.a. Davos (1590 m. asl) and Weissfluhjoch (2760 m. asl)

> In Fig. 3.3 and 3.4 are shown the results of the homogenization for the two nearby meteorological stations of Davos and Weissfluhjoch, in Switzerland. The results clearly show important inhomogeneities in both SSR series, being the corrections greater with the Craddock test than with both SNHT tests.



Wm ⁻² /decade	1961-
Original	+0.27
Climatol	+0.51

We want to homogenize the long-term series over Europe currently compare different homogenization methods, consists of 59 series with { monthly SSR data (**3.1**), Stockholm and Wageningen being the longest available records, going back to 1923 and 1928, respectively (3.2). Different relative homogeneity tests will be applied in order to detect and

> Preliminary results are presented: 3.a) comparison for two stations using 3 methods: the Craddock test (Brunetti et al., 2006) and two versions of the SNHT (Alexandersson and Mober, 1997) implemented in the AnClim-*ProClim* (Stepanek, 2007) and *Climatol v.2.0* (Guijarro, 2011) software; 3.b) comparison of the pan-European SSR trends in the original data and the homogenized data set using the Climatol software.



