



The SunCloud project: worldwide compilation of long-term series of sunshine duration and cloudiness observations

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One problem encountered when establishing the causes of global dimming and brightening is the limited number of long-term solar radiation series with accurate and calibrated measurements. For this reason, the analysis is often supported and extended with the use of other climatic variables such as diurnal temperature range, cloud cover, evaporation, visibility, or sunshine duration records. Moreover, it is of vital importance to study the reliability of the “early brightening” identified by different studies during the first half of the 20th century, which cannot be detected by using the current downward solar radiation dataset. Therefore proxy variables are required again. Specifically, sunshine duration is defined as the amount of time usually expressed in hours that direct solar radiation exceeds a certain threshold (usually taken at 120 W m^{-2}). Consequently, this variable can be considered as an excellent proxy measure of global and direct solar radiation at interannual and decadal time scales, with the advantage that measurements of this variable were initiated in the late 19th century in different main meteorological stations. Nevertheless, detailed and up-to-date analysis of sunshine duration behavior on global or hemispheric scales are still missing.

Thus, in the framework of different research projects we will engage a worldwide compilation of the longest daily or monthly sunshine duration series from the late 19th century until present, using data freely available on the Internet or by means of direct contacts with meteorological institutions/individual researchers with access to long-term sunshine databases. We also plan to digitize long-term sunshine duration series when these become available only in analog format. Several quality control checks and homogenization methods will be applied to the generated sunshine dataset.

The relationship between the more precise downward solar radiation series from the *Global Energy Balance Archive* (GEBA) and the homogenized sunshine series will be studied in order to reconstruct global and regional solar irradiance at the Earth’s surface since the late 19th century. Equally, we plan to calibrate sunshine duration measurements against planetary albedo estimations from the Earthshine measurements and other satellite radiation data.

Since clouds are the main cause of interannual and decadal variability of radiation reaching the Earth’s surface, as a complement to the long-term sunshine series we will also compile worldwide surface cloudiness observations.

With this abstract we seek to encourage the climate community to contribute with their own local datasets to the SunCloud project. In the near future we will create a webpage with the main details of this project.