# "Early global brightening" during the first part of the 20th century: What sunshine duration can tell us?

**A. Sanchez-Lorenzo [1], Martin Wild [1], Josep Calbó [2], Enric Pallé [3], Rudolf Brazdil [4], Xiangao Xia [5], Gerald Stanhill [6], and Michele Brunetti [7]**

*[1] ETH Zürich, Zürich, Switzerland (arturo.sanchez@env.ethz.ch)*

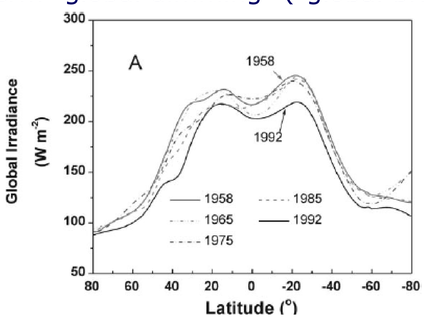
*[2] University of Girona, Group of Environmental Physics, Girona, Spain, [3] Institute of Astrophysics of the Canary Islands, Spain,*

*[4] Masaryk University, Institute of Geography, Czech Republic, [5] LAGEO, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China,*

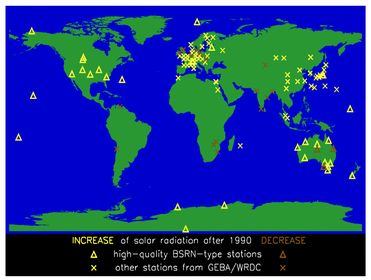
*[6] Department of Environmental Physics and Irrigation, The Volcani Center, Israel, [7] Institute of Atmospheric Sciences and Climate, Italian National Research Council, Italy*

## 1. What is the "early global brightening"?

- A widespread reduction (increase) of surface solar radiation (SSR) has been established in many regions of the world from the 1950s (1980s) to the 1980s (current times), coining the term "global dimming" ("global brightening").

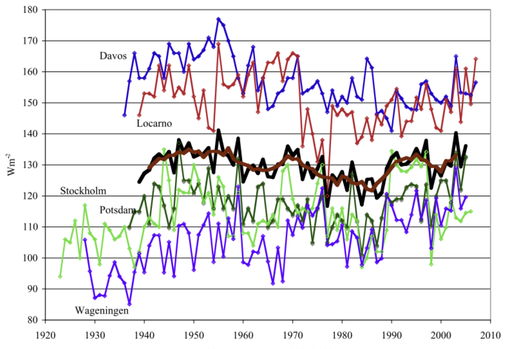



Stanhill and Cohen (2001)



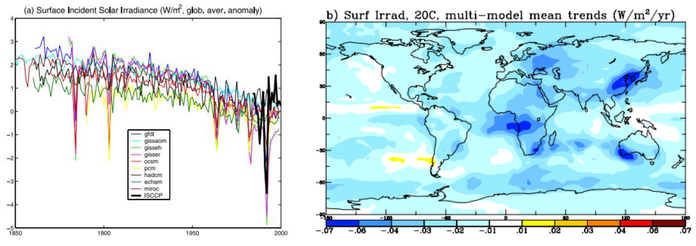

Wild et al. (2005)

- A possible "early global brightening" has also been described (e.g. Ohmura 2006, 2009), by using only the scarce surface solar radiation series available over Europe before the 1950s.




Ohmura (2009)

- This "early global brightening" is not consistent with climate model simulations of the IPCC 4AR (Romanou et al., 2007).

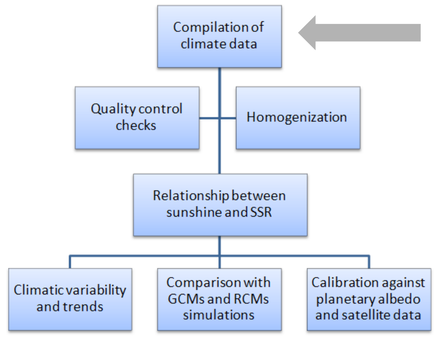



Romanou et al. (2007)

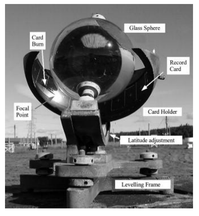
- **Conclusion**: the reliability of a worldwide brightening during the first half of the 20th century is specially uncertain.

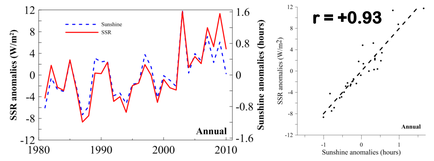
## 2. What is the SunCloud project?

- Worldwide compilation of the longest sunshine duration series since the late 19th century. Currently in the first step of data compilation:




- Sunshine duration is defined as the amount of time (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 solar radiation at interannual and decadal time scales.




Relationship between SSR and sunshine duration in 17 series over Switzerland

- Any co-operation is highly welcome and we seek to encourage the climate community to contribute with their own datasets to the SunCloud project.
- More details in:

**http://www.iac.ethz.ch/people/arturos/suncloud**


- Rudolf Brazdil
- Michele Brunetti
- John Butler
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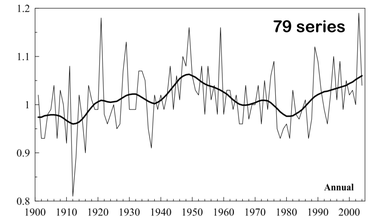
- Albert Klein Tank
- Christos Lolis
- Enric Pallé
- Carlos Raichijk
- Gerald Stanhill
- Martin Wild
- Xiangao Xao

## 3. What sunshine can tell us about the "early brightening"?

- Currently a few long-term (< 1950s) sunshine series are available in the SunCloud dataset, mainly located over Europe, Japan, China and the U.S.
- Here we show the preliminary (and not homogenized) annual mean series for these regions (series are expressed as relative deviations):

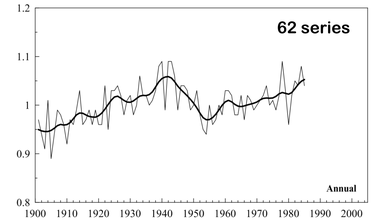
### 3.1. Western Europe

- Significant increase during the 1901-2000s period, with a clear "early global brightening" during the first half of the 20th century.



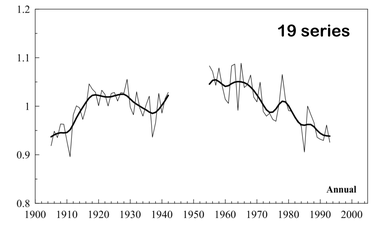

### 3.2. Japan

- Significant increase during the 1901-1985 period (with a common Jordan recorder), as well as during the 1901-1950 subperiod.
- No dimming during the 1950s-1980s period, and clear drop in the 1940s.



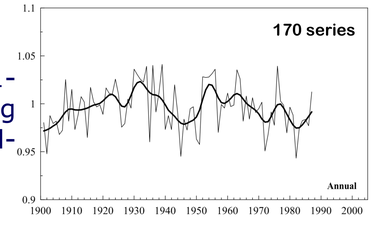

### 3.3. China

- First time evidence of a possible "brightening" during the 1900s-1940s period in China, with a well-known strong decrease afterwards. Significant increase during the 1905-1943 period.
- Gaps and apparent inhomogeneities between mid-40s and mid-50s.




### 3.4. United States

- No significant trend for the whole 1901-1987 period, but clear brightening (significant trend) between 1901 and mid-1930s.
- Clear drop between mid-1930s and 1950.




### 3.5. Conclusions

- In the 4 studied areas a clear "early brightening" has been detected during the first half of the 20th century. Otherwise, the existence of a worldwide early brightening during the first half of the 20th century is still unclear.
- Future work is needed to extend the geographical coverage of the available time series and test the homogeneity of the data set.

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