



Possible role of the dimming/brightening in observed temperatures across Europe since the second half of the 20th century

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The surface solar radiation (SSR) is the fundamental source of energy in the climate system, and consequently the source of life on our planet, due to its central role in the surface energy balance. Therefore, a significant impact on temperatures is expected due to the widespread dimming/brightening phenomenon observed since the second half of the 20th century (Wild, 2009). Previous studies pointed out the effects of SSR trends in temperatures series over Europe (Makowski et al., 2009; Philipona et al., 2009), although the lack of long-term SSR series limits these results. This work describes an updated sunshine duration (SS) dataset compiled by the European Climate Assessment and Dataset (ECA&D) project based on around 300 daily time series over Europe covering the 1961-2010 period. The relationship between the SS and temperature series is analysed based on four temperature variables: maximum (TX), minimum (TN) and mean temperature (TG), as well as the diurnal temperature range (DTR). Regional and pan-European mean series of SS and temperatures are constructed. The analyses are performed on annual and seasonal scale, and focusing on the interannual and decadal agreement between the variables. The results show strong positive correlations on interannual scales between SS and temperatures over Europe, especially for the DTR and TX during the summer period and regions in Central Europe. Interestingly, the SS and temperatures series show a tendency towards higher correlations in the smoothed series, both for different regions and temperature variables. These results confirm the relationship between temperature and SS trends over Europe since the second half of the 20th century, which has been speculated to partially decrease (increase) temperatures during the dimming (brightening) period (Makowski et al., 2009; Wild, 2009). Further research is needed to confirm this cause-effect relationship currently found only using correlation analysis.

References:

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