



Solar radiation trend across China in recent decades: a revisit with quality-controlled data

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Solar radiation is one of the most important factors affecting climate and environment, and its long-term variation is of much concern in climate change studies. In the light of the limited number of radiation stations with reliable long-term time series observations, this paper presents a new evaluation of the long-term variation of surface solar radiation over China by combining quality-controlled observed data and two radiation models. One is the ANN-based (Artificial Neural Network) model and the other is a physical model. The two models produce radiation trends comparable to the observed ones at a few validation stations possessing reliable and continuous data. Then, the trend estimate is extended by the ANN-based model to all 96 radiation stations and furthermore extended by the physical model to all 716 China Meteorological Administration (CMA) routine stations. The new trend estimate is different from previous ones in two aspects. First, the magnitude of solar radiation over China decreased by about $-0.23 \text{ W m}^{-2} \text{ yr}^{-1}$ between 1961 and 2000, which is greatly less in magnitude than trend slopes estimated in previous studies (ranging over $-0.41 \sim -0.52 \text{ W m}^{-2} \text{ yr}^{-1}$). Second, the “From Dimming to Brightening” transition in China during the late 1980s and the early 1990s was addressed in previous studies, but this study indicates the solar radiation reached a stable level since the 1990s and the transition is not noticeable. These differences are attributed to inappropriate data and approaches in previous studies. Finally, an obvious transition from brightening to dimming around 1978 is found over the Tibetan Plateau, where aerosol loads are very low, indicating that the importance of cloud changes in altering solar radiation may be comparable to that of the aerosol changes.

Reference

Tang, W.-J., K. Yang, J. Qin, C. C. K. Cheng, and J. He, 2011 [U+FF1A] Solar radiation trend across China in recent decades: a revisit with quality-controlled data. *Atmos. Chem. Phys.*, 11, doi:10.5194/acp-11-1-2011.