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A new look at solar dimming and brightening in China

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Published composite time series of SSR (Surface Solar Radiation) over China showed a sudden upward jump during 1990–1993, when a nationwide reorganization of the SSR observing network occurred. This adds uncertainty to the real existence of the transition from dimming to brightening in the SSR trend over China since the 1990s. With the methods of the accumulated deviation curve and the Mann-Whitney U test, this jump is found to be prevalent in 23 out of the total 130 stations due to both natural (7 stations) and operational factors (16 stations). After eliminating the 16 affected stations containing artifacts, as well as 51 stations with discontinuous records, a transition from dimming to brightening remains in the SSR trend over China. This indicates the transition to brightening is not merely an artifact of restructuring the monitoring network in China. A new estimate for the magnitude of solar dimming and brightening has been derived for China, with a significant decrease by a rate of –8.3 W/m2/decade for 1961–1989 and thereafter a significant increase by 2.1 W/m2/decade for 1989–2013. In addition, the inconsistency in the previous estimates of the seasonal SSR trends has been resolved after excluding spurious effects.