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Investigating the Causes of Interannual Variation in Solar Radiation Reflection at the Top of the Atmosphere over the Tibetan Plateau

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In the context of global warming, the radiation balance in the Tibetan Plateau region is closely linked to changes in the cryosphere, such as glacier retreat, reduced snow cover, and degradation of permafrost. The abnormal changes in radiation balance further impact the East Asian circulation and global climate change. In this study, based on 23 years (2000-2022) of data from the Clouds and the Earth's Radiant Energy System (CERES) for atmospheric and surface radiation fluxes, the temporal and spatial characteristics of solar radiation reflection at the top of the atmosphere (TOA) over the Tibetan Plateau (TP) and its components, including cloud, atmospheric, and surface components, were analyzed. The results showed that the average TOA solar radiation reflection over the TP was 128.5 W m^{-2}, with cloud component contributing approximately 60.3 %, clear-sky atmospheric component contributing approximately 18.4 %, and surface component contributing approximately 21.3%. From 2000 to 2015, there was a significant decreasing trend in TOA solar radiation reflection over the TP, with a Sen's slope of -1.59 W m^{-2} $10a^{-1}$. The interannual variability intensity (i.e., standard deviation of anomalies) was approximately 1.44 during this period. However, from 2016 to 2022, the interannual variability intensity increased to 3.62. The changes in interannual variability of TP solar radiation reflection were closely related to the changes in cloud, atmospheric, and surface parameters. Further analysis is needed to understand the reasons for the changes in radiation balance over the TP. This study plans to explore the impacts and contributions of various atmospheric circulation factors on the interannual changes in TP solar radiation reflection and its components using reanalysis meteorological data and synthesis analysis, aiming to reveal the possible mechanisms behind the abrupt change in interannual variability intensity around 2015.