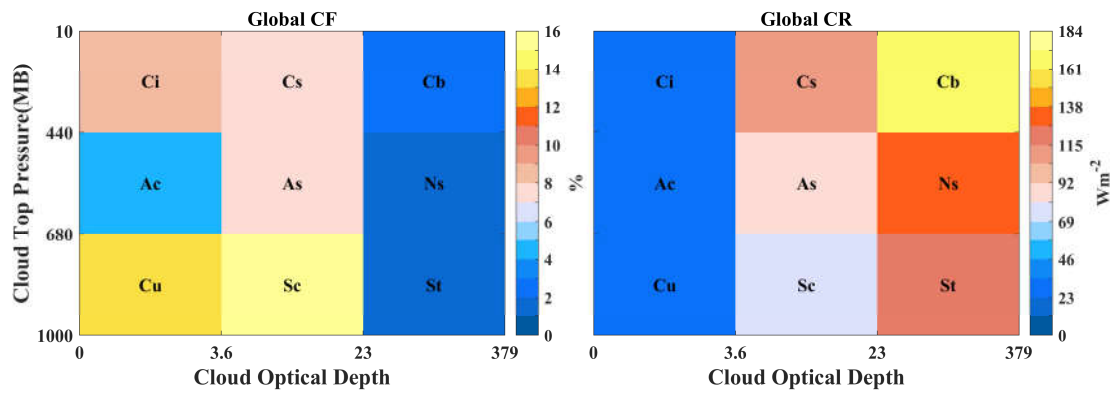


Supplementary Materials for

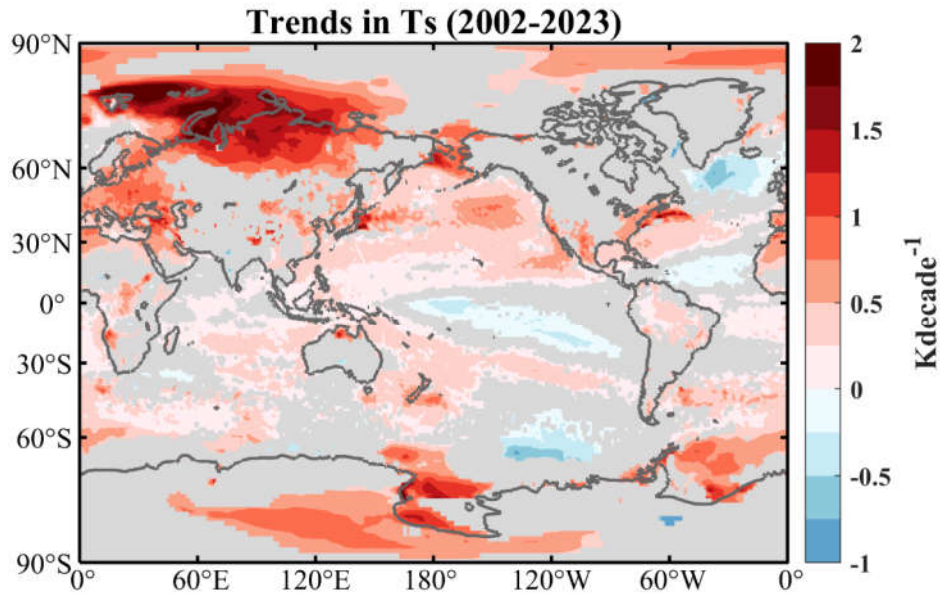
**Planetary Albedo Change Exacerbates Surface Warming: A Perspective From Cloud Transition**

Ruixue Li<sup>1</sup>, Jiming Li<sup>1\*</sup>, Bida Jian<sup>1</sup>, Lijie Zhang<sup>1</sup>, Jiayi Li<sup>1</sup>

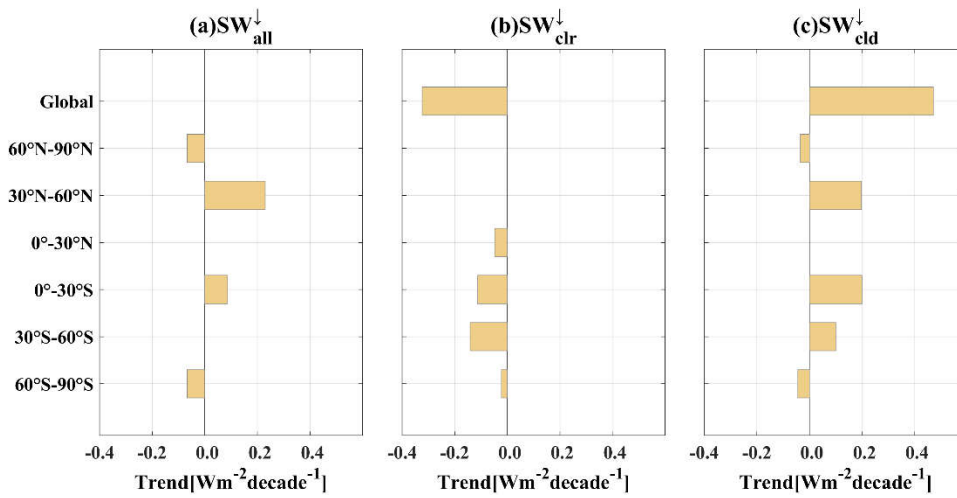
<sup>1</sup>Key Laboratory for Semi-Arid Climate Change of the Ministry of Education, College of Atmospheric Sciences, Lanzhou University, Lanzhou, China



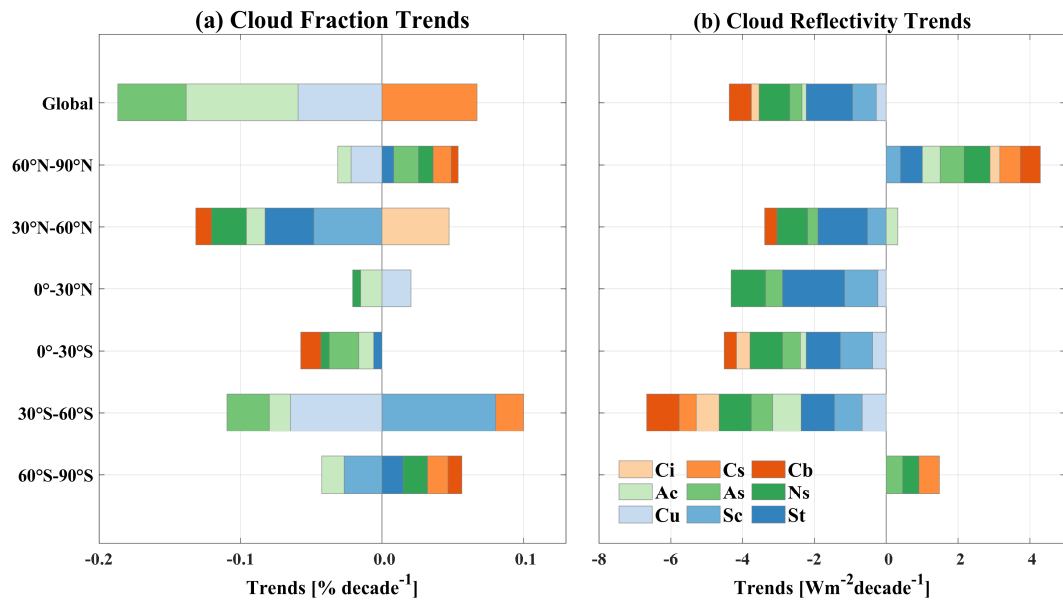
**Figure S1.** Global mean climatology (January 2003 to December 2022) of the classification of nine cloud types and their properties: (a) cloud fraction (CF), and (b) cloud reflectivity (CR).



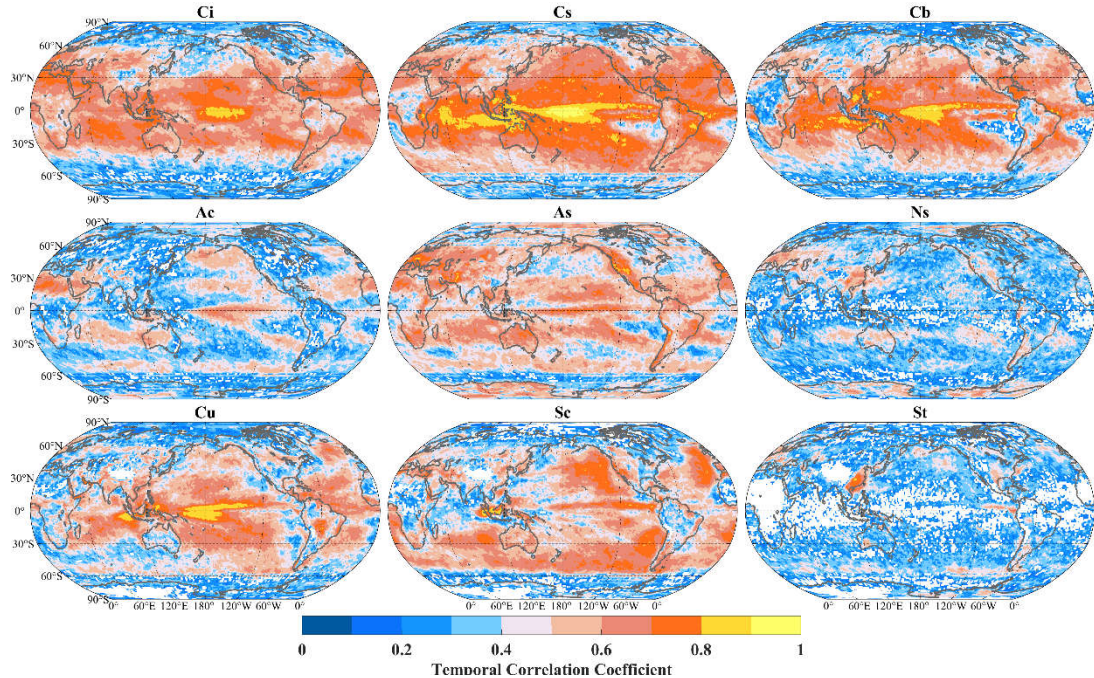
**Figure S2.** ERA5 decadal surface temperature trends during July 2002 to February 2023 (only grids significant at >95% level shown).



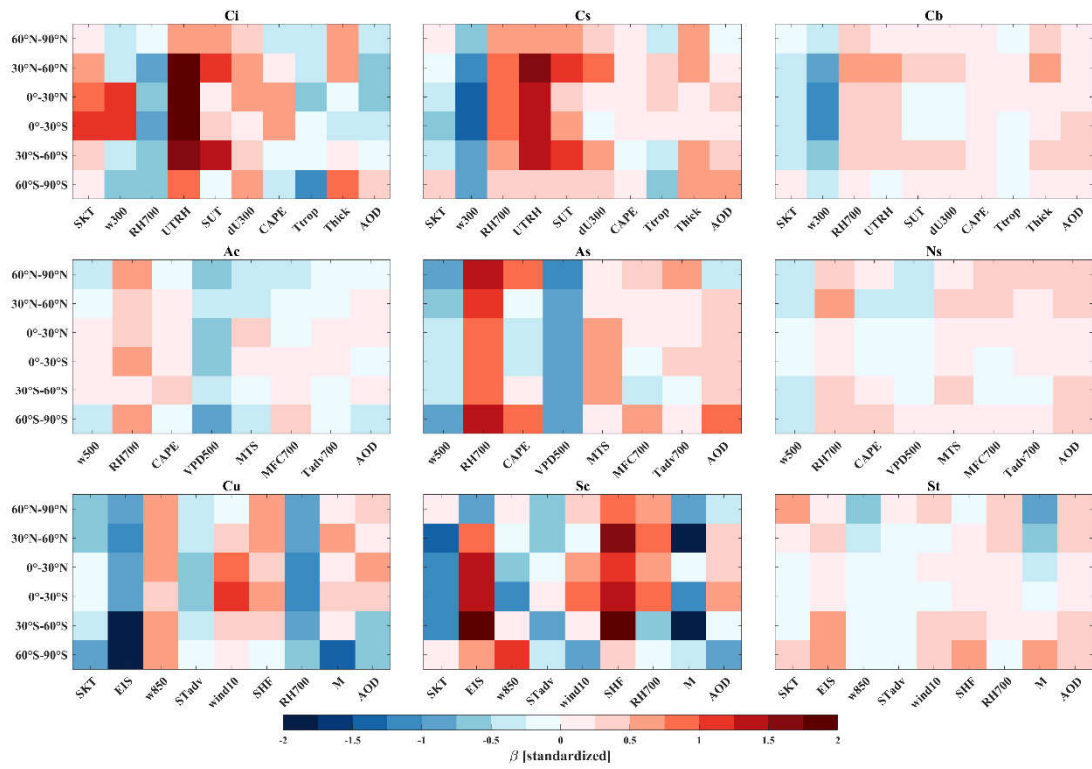
**Figure S3.** Global and latitude-zone averaged trends in (a) all-sky surface downward shortwave radiation fluxes ( $SW_{all}^{\downarrow}$ ), (b) clear-sky surface downward shortwave radiation fluxes ( $SW_{clr}^{\downarrow}$ ), and (c) the difference between all-sky and clear-sky conditions ( $SW_{cld}^{\downarrow} = SW_{all}^{\downarrow} - SW_{clr}^{\downarrow}$ ). Note that latitudinal-mean trends are area-weighted to account for their contributions to the global mean; the sum of the zonal trends approximately equals the global mean. Only trends significant at the 95% confidence level are shown.



**Figure S4.** Latitude-zone and global averaged trends (2001–2024) for (a) CF and (b) CR. The CF trends for each zone are area-weighted to represent global contributions. Only trends significant at the 95% confidence level are shown.



**Figure S5.** Spatial distribution of the temporal correlation coefficient between the observed and regressed cloud fraction anomalies for nine cloud types.



**Figure S6.** Standardized regression coefficients ( $\beta$ ) of cloud controlling factors for nine cloud types across six latitudinal zones.