Geophysical Research Letters

Supporting Information for

Stratospheric ozone loss enhances summer precipitation over the southern slope of the Tibetan Plateau

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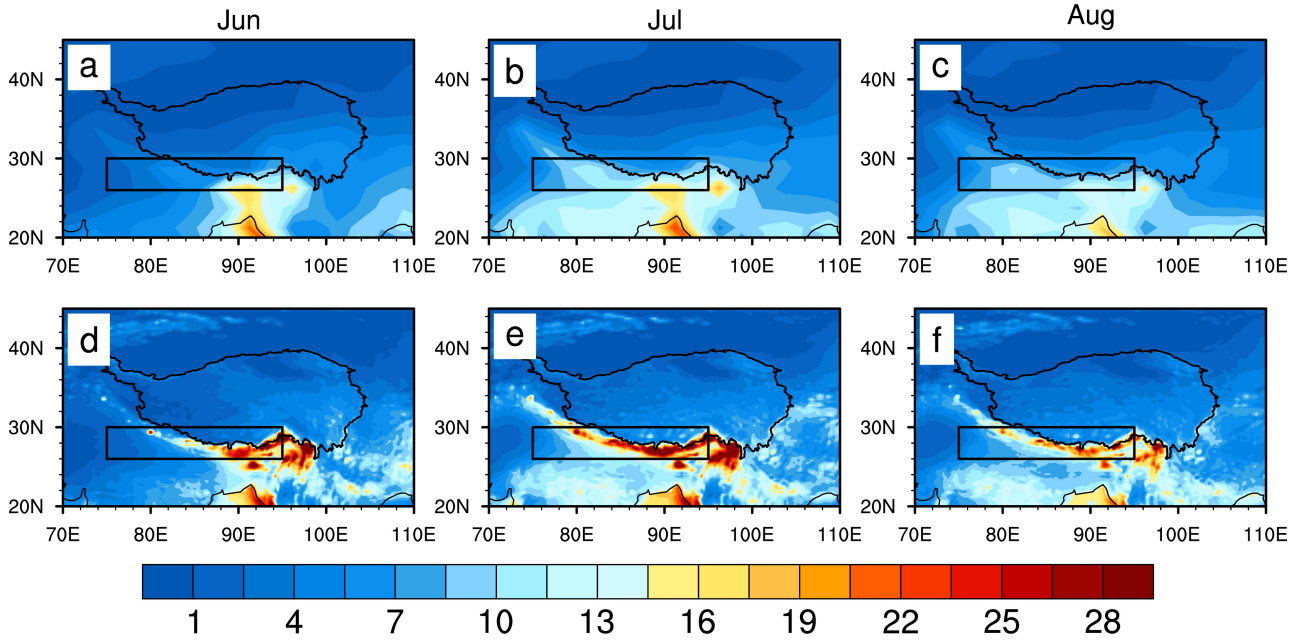

Fig. S1. Geographic distributions of multi-year average of precipitation (Unit: mm/day) in (a and d) June, (b and e) July, and (c and f) August over 1979–2022 in (a-c) GPCP and (d-f) ERA5. Black boxes indicate the concerned southern slope of the TP over 26°–30°N and 75°–95°E.

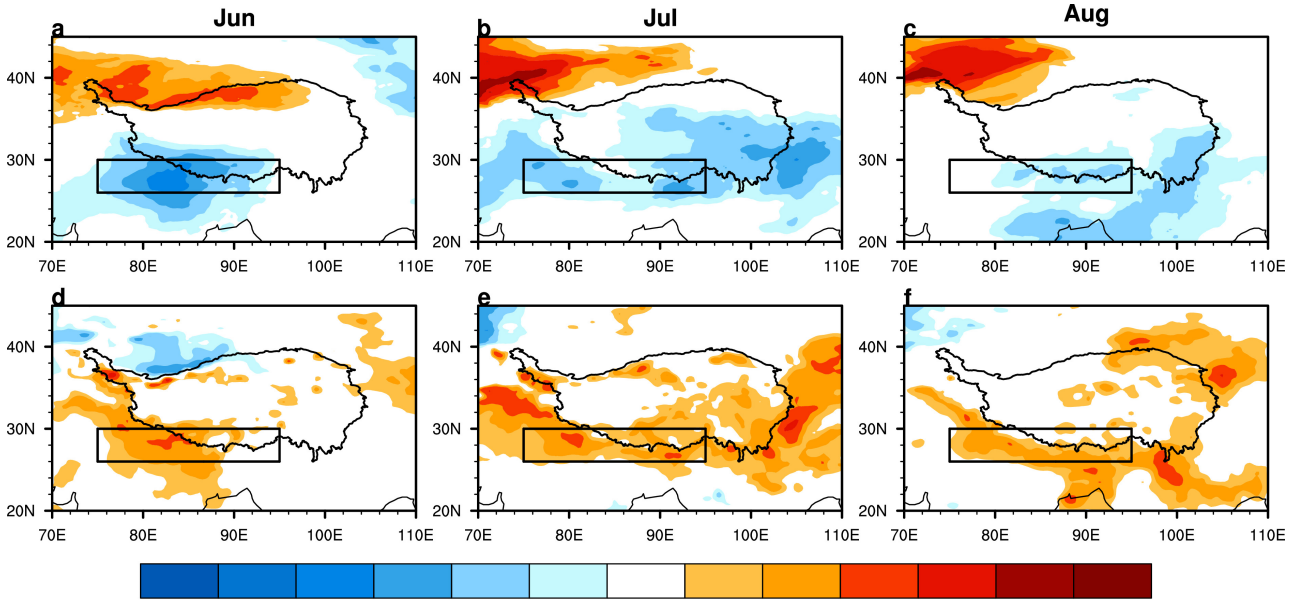

Fig. S2. Correlation coefficients between total ozone and (a-c) high clouds and (d-f) surface UV radiation. The correlation coefficients are calculated over 1979–2022 in June, July, and August based on ERA5 reanalysis. The correlation coefficient of ±0.3 corresponds to the 95% confidence level for the 41 years. Black boxes indicate the concerned southern slope of the TP over 26°–30°N and 75°–95°E.

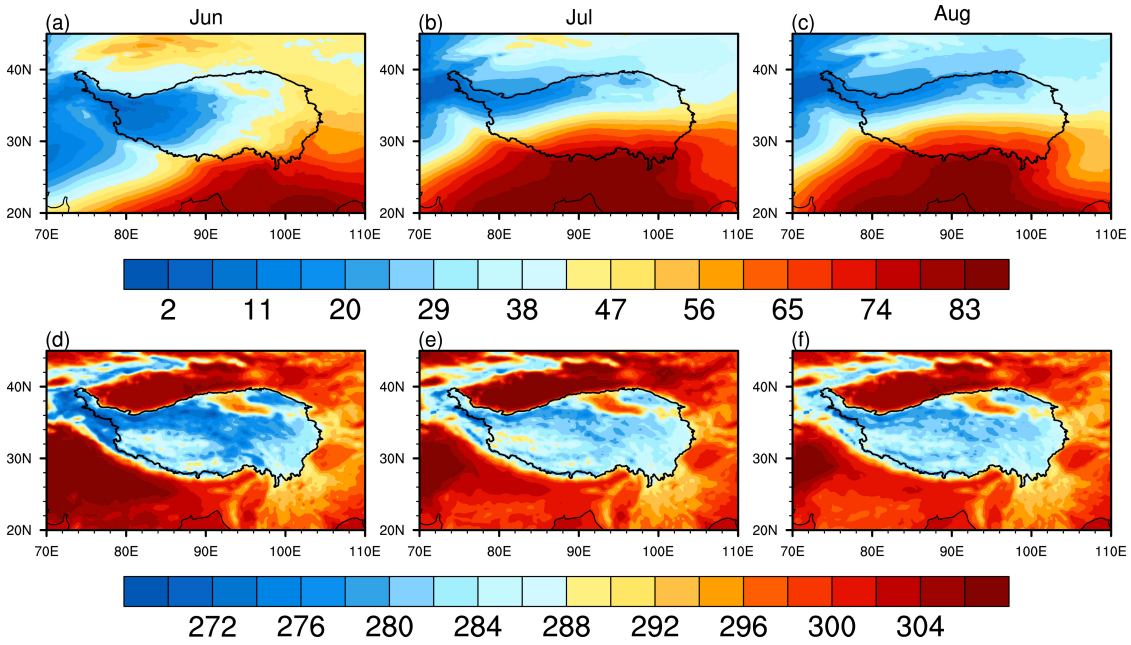

Fig. S3. Geographic distributions of multi-year averages of (a-c) high clouds (Unit: %) and (d-f) surface temperature (Unit: K) in June, July, and August over 1979–2022 in the ERA5.

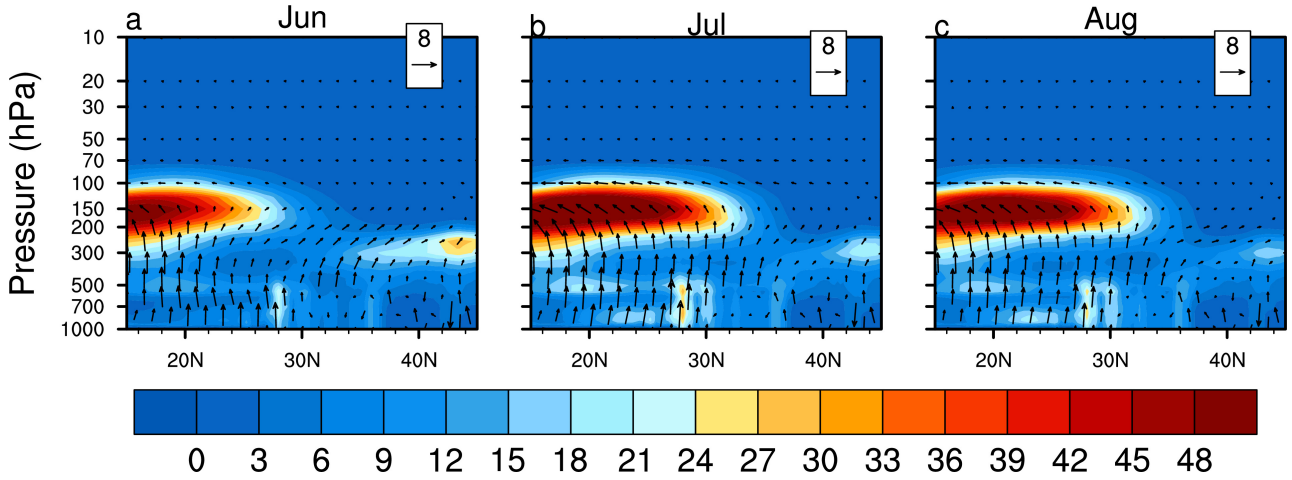

Fig. S4. Vertical cross-section of multi-year averages cloud cover (color contours) with meridional and vertical winds (vectors) averaged over 75 °–95 °E over 1979–2022 based on ERA5 reanalysis. The units are %, m/s, and 10 hPa/day for the cloud cover, meridional wind, and vertical wind, respectively.

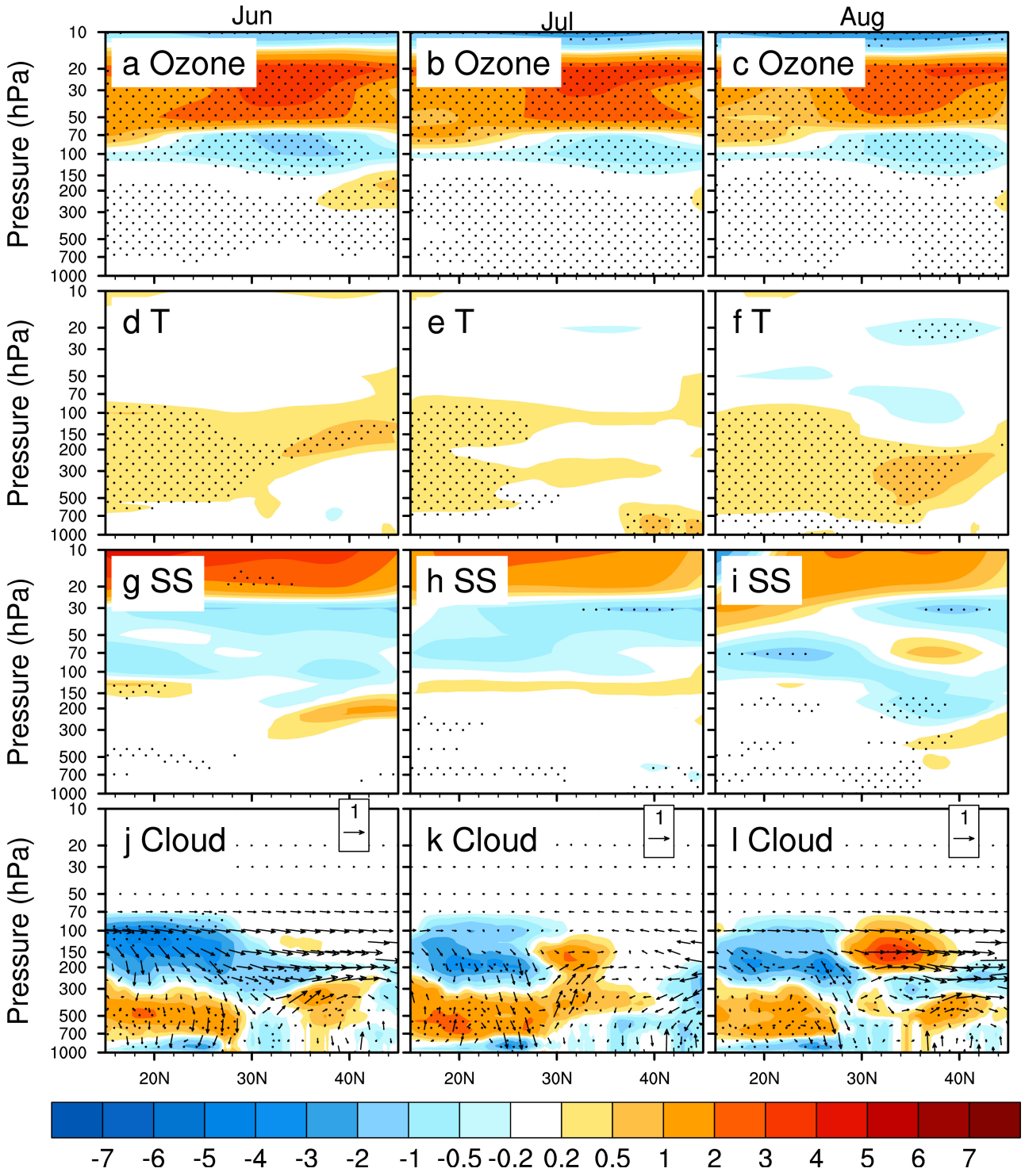

Fig. S5. Vertical cross-section of long-term trends of (a-c) ozone, (d-f) temperature, (g-i) static stability, and (j-l) clouds (color contours) with winds (vectors) averaged over 75 °–95 °E during 1996–2022 in June, July, and August based on ERA5 reanalysis. The unit of panels (a-c) is 10^{-1} ppm/decade, (d-f) is K/decade, (g-i) is 10^{-2} K/hPa/decade, and then (j-l) is %/decade, and they share the same colormap. Regions with dots are the places where regressions have statistical significance levels higher than the 95% confidence level based on the Student's t-test.

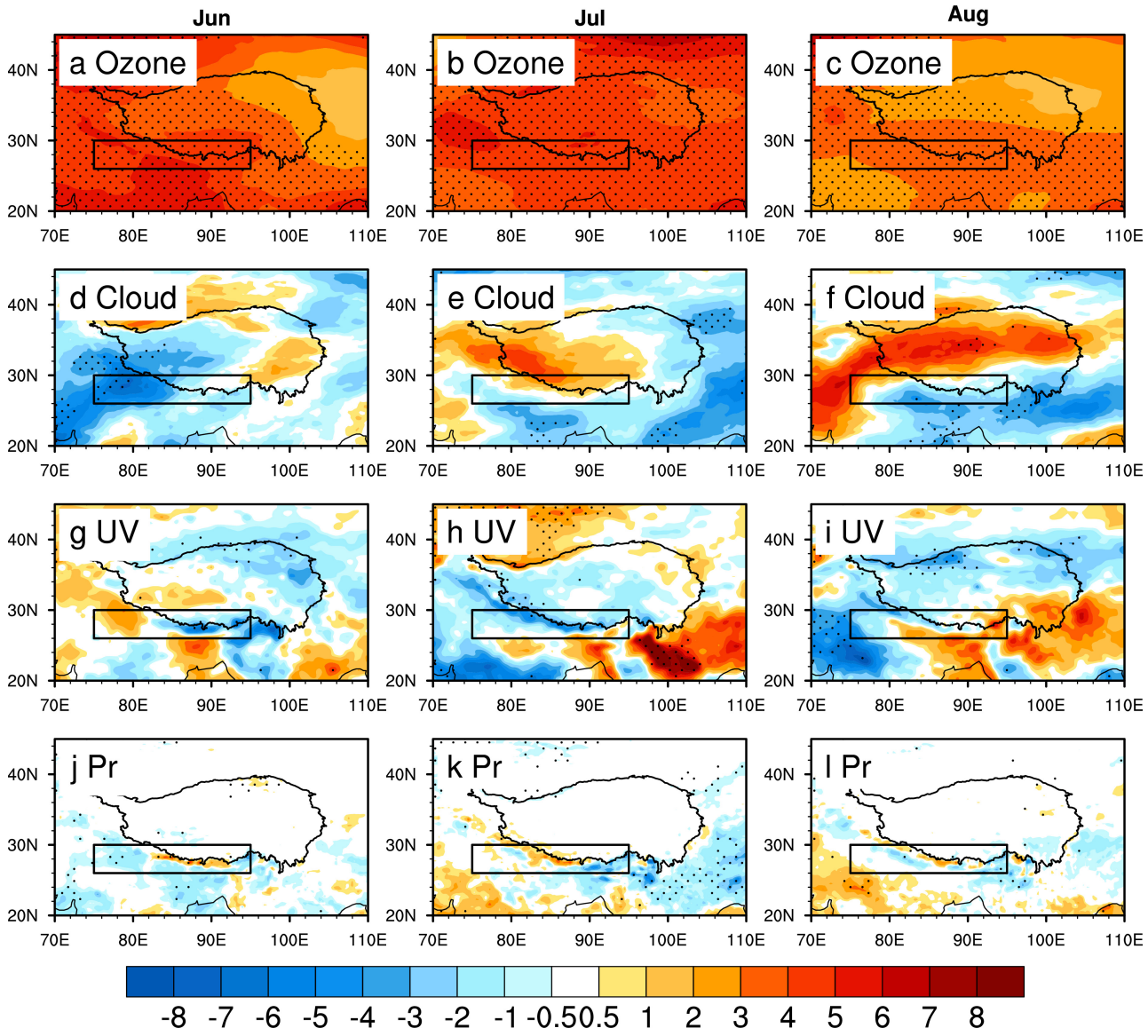

Fig. S6. Geographic distributions of long-term trends of (a-c) total ozone, (d-f) high clouds, (g-i) surface UV radiation, and (j-l) precipitation during 1996–2022 in June, July, and August based on ERA5 reanalysis. The unit of panels (a-c) is DU/decade, (d-f) is %/decade, (g-i) is W m^{-2}/decade, and then (j-l) is mm/day/decade, and they share the same colormap. Regions with dots are the places where regressions have statistical significance levels higher than the 95% confidence level based on the Student's t-test.

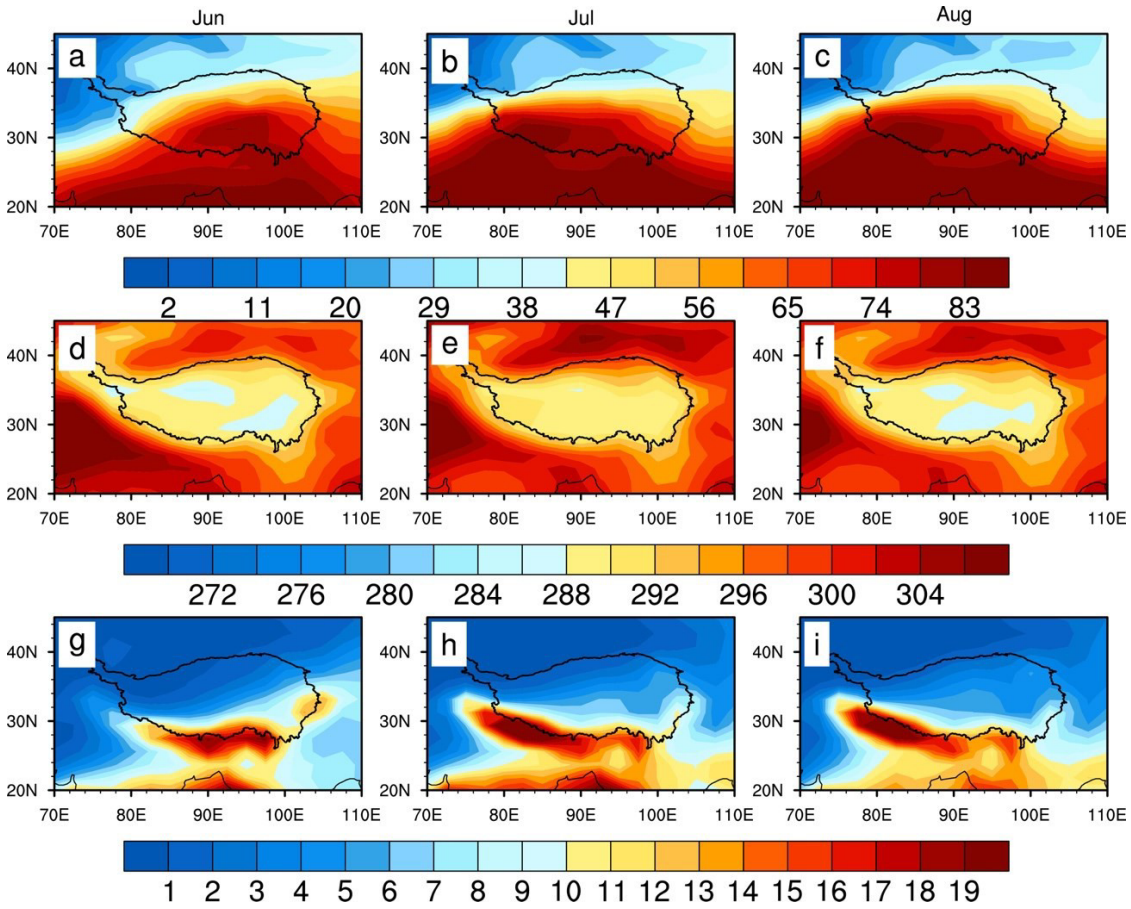

Fig. S7. Geographic distributions of multi-year averages of (a-c) high clouds (Unit: %), (d-f) surface temperature (Unit: K), and (g-i) precipitation (Unit: mm/day) in June, July, and August in the control simulations of CAM6.

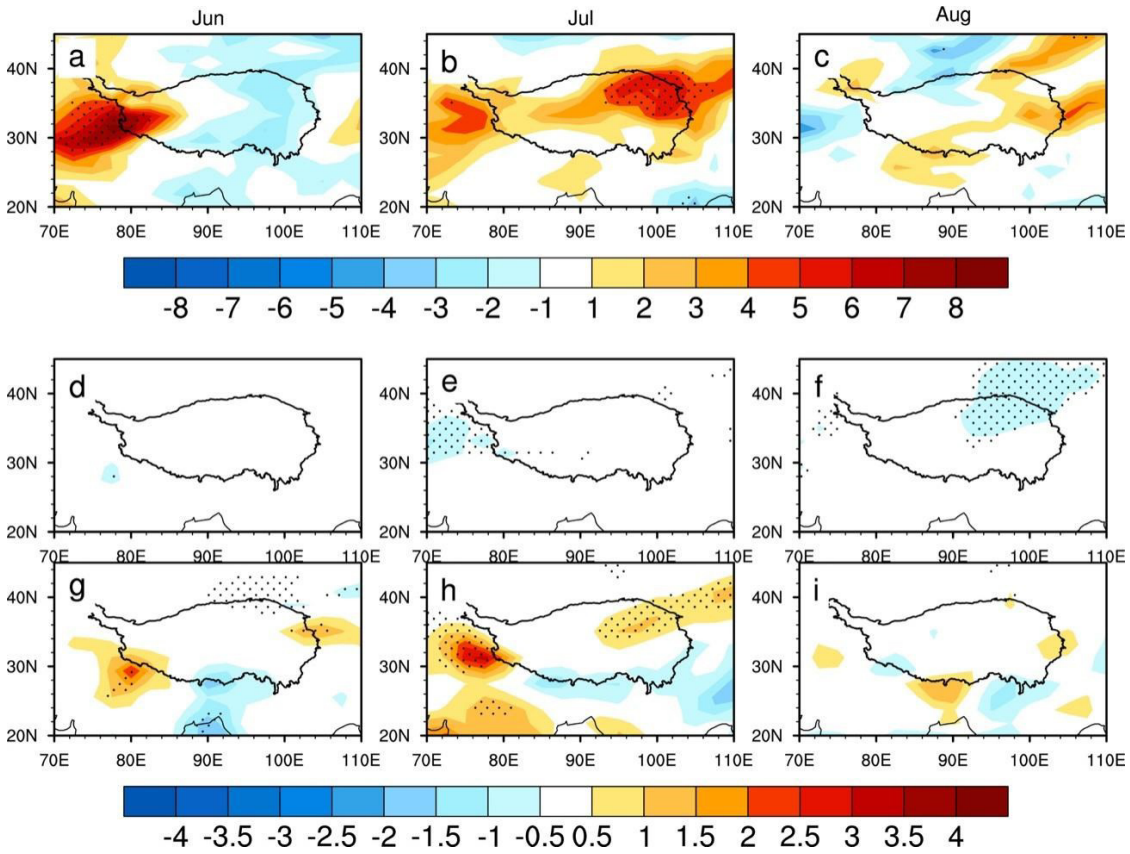

Fig. S8. Geographic distributions of responses of (a-c) high clouds (Unit: %), (d-f) surface temperature (Unit: K), and (g-i) precipitation (Unit: mm/day) in June, July, and August in CAM6. Regions with dots are the places where regressions have statistical significance levels higher than the 95% confidence level.

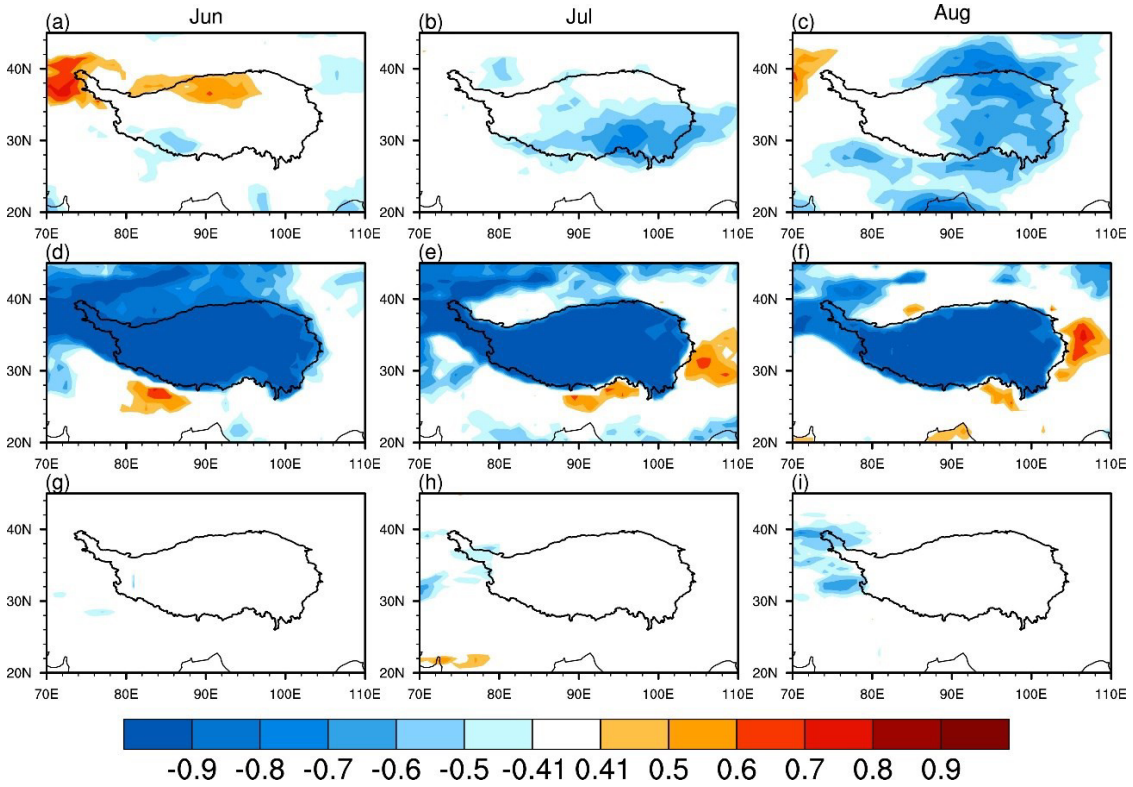

Fig. S9. Correlation coefficients between total ozone and (a-c) high clouds, (d-f) surface UV radiation, and (g-i) precipitation based on satellite observations. The correlation coefficients are calculated over 2000–2019 for panels (a-f) and 1998–2019 for panels (g-i) in June, July, and August. The correlation coefficient of ±0.41 corresponds to the 95% confidence level for the 20 years.