



Supplement of

Observed trends in clouds and precipitation (1983–2009): implications for their cause(s)

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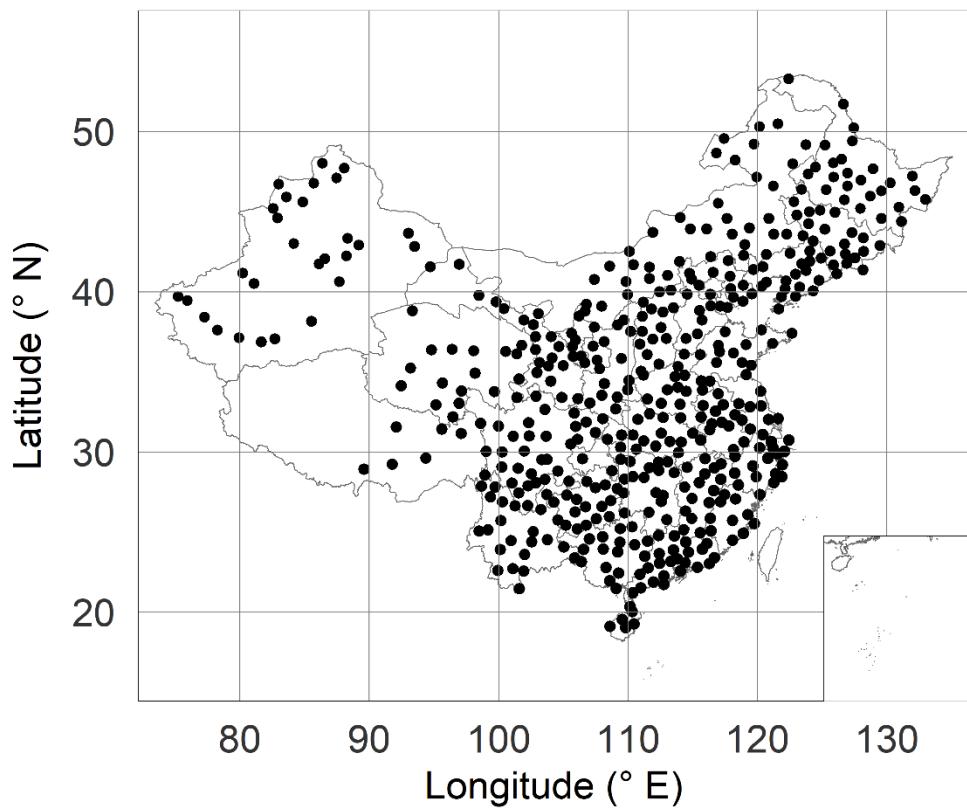


Figure S1. Spatial distribution of 477 stations used in this study.

PDO & GT & AMO 1950-2017

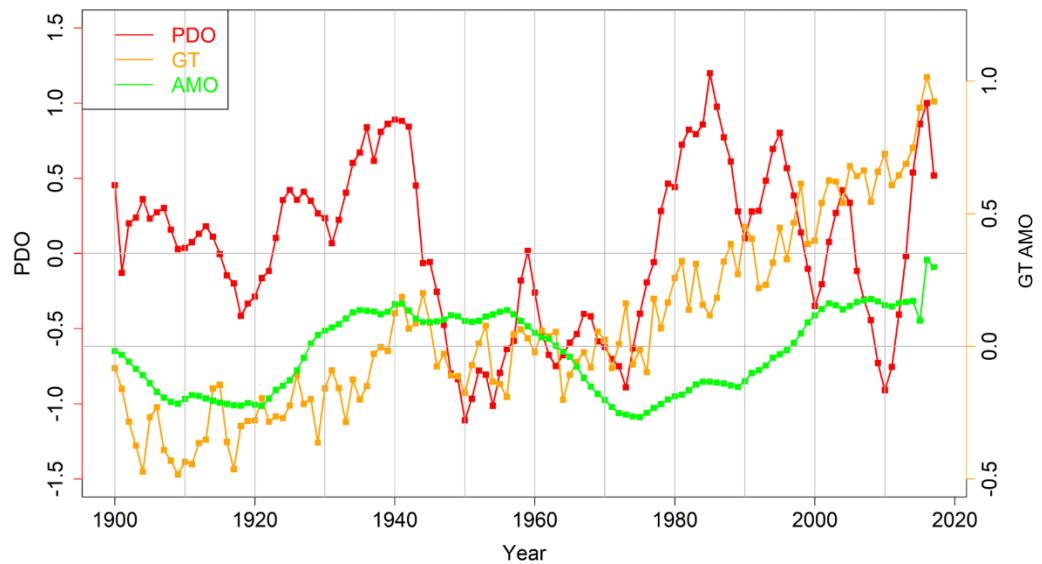


Figure S2. Time series of global temperature (GT), AMO and PDO.

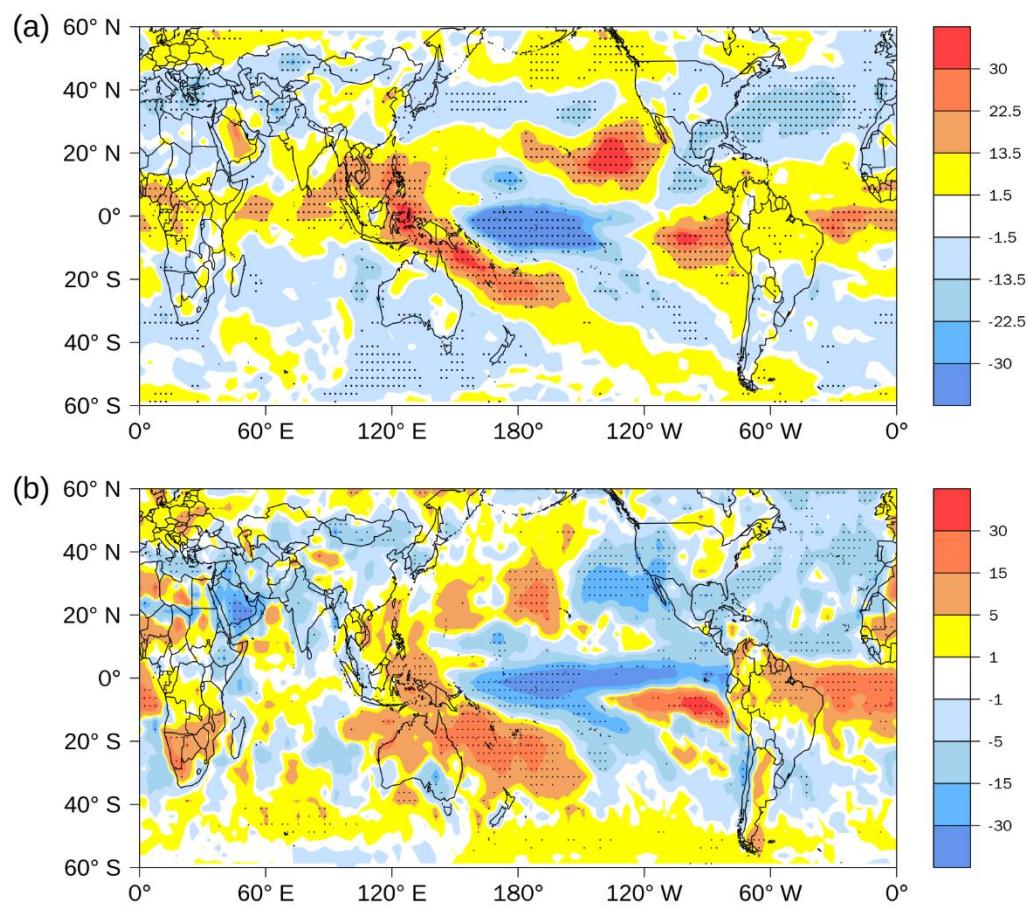


Figure S3. (a) Slope of linear regression between total cloud cover and -PDO (units: % std⁻¹) at individual grids from corrected ISCCP D2 data set (1983–2009). (b) Slope of linear regression between annual total precipitation and -PDO (units: % std⁻¹) at individual grids from GPCP pentad V2.2 (1983–2009).

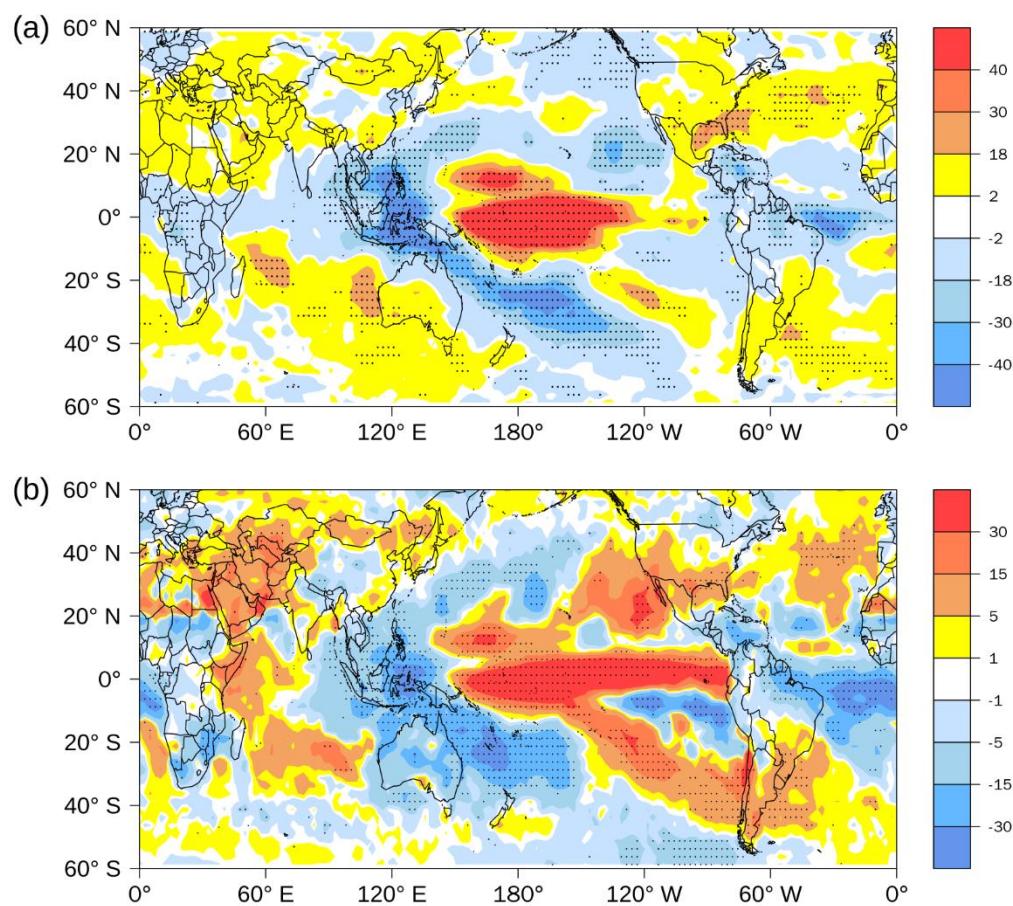


Figure S4. (a) Slope of linear regression between total cloud cover and Nino3.4 (units: % K⁻¹) at individual grids from corrected ISCCP D2 data set (1983–2009). **(b)** Slope of linear regression between annual total precipitation and Nino3.4 (units: % K⁻¹) at individual grids from GPCP pentad V2.2 (1983–2009).

Table S1. Correlation coefficients (detrended data)

R	Trend of TCC	Trend of TP
$\delta(\text{GT})$	-0.23 ***	-0.16 ***
$\delta(\text{-PDO})$	0.33 ***	0.10
$\delta(\text{AMO})$	-0.02	-0.16 ***
$\delta(\text{Niño3.4})$	-0.19 ***	0.05
$\delta(\text{GT})+\delta(\text{-PDO})$	0.32 ***	0.04
$\delta(\text{GT})+\delta(\text{AMO})$	-0.21 ***	-0.18 ***
$\delta(\text{GT})+\delta(\text{Niño3.4})$	-0.22 ***	-0.17 ***
$\delta(\text{-PDO})+\delta(\text{AMO})$	0.30 ***	0.04
$\delta(\text{-PDO})+\delta(\text{Niño3.4})$	0.32 ***	0.09 ***
$\delta(\text{AMO})+\delta(\text{Niño3.4})$	0.03	-0.15 **
$\delta(\text{GT})+\delta(\text{-PDO})+\delta(\text{AMO})$	0.29 ***	-0.01
$\delta(\text{GT})+\delta(\text{-PDO})+\delta(\text{Niño3.4})$	0.32 ***	0.04
$\delta(\text{GT})+\delta(\text{AMO})+\delta(\text{Niño3.4})$	-0.18 ***	-0.18 ***
$\delta(\text{-PDO})+\delta(\text{AMO})+\delta(\text{Niño3.4})$	0.29 ***	0.04
$\delta(\text{GT})+\delta(\text{-PDO})+\delta(\text{AMO})+\delta(\text{Niño3.4})$	0.28 ***	-0.01

By detrended time series, it was calculated as $d(\text{detrended TCC})/(d(\text{detrended GT})/\text{std}(\text{detrended GT}))$; linear trends are the same with the original one.

Note: GT denotes global temperature anomalies. $\delta(\text{GT})$ denotes $\Delta\text{GT} \times d\text{TCC}/d(\text{GT}/\text{GT}_\sigma)$ or $\Delta\text{GT} \times d\text{TP}/d(\text{GT}/\text{GT}_\sigma)$, where ΔGT is the change of GT for the studied period and GT_σ is the standard deviation of GT, and other factors likewise. ***, ** indicate statistically significant at the 99% and 95% confidence level based on student's *t* test.