

Figure S1. CF versus RH at three cloud levels (top to bottom: high, middle, and low clouds) simulated by (a) the default Park, (b) T_pdf, and (c) U_pdf schemes. Daily data of the two grid points ((180° E, 45° N) and (180° E, 45° S)) from 1999 to 2000 are used to generate the scatter plots, and linear regression lines with correlation coefficients are also shown.

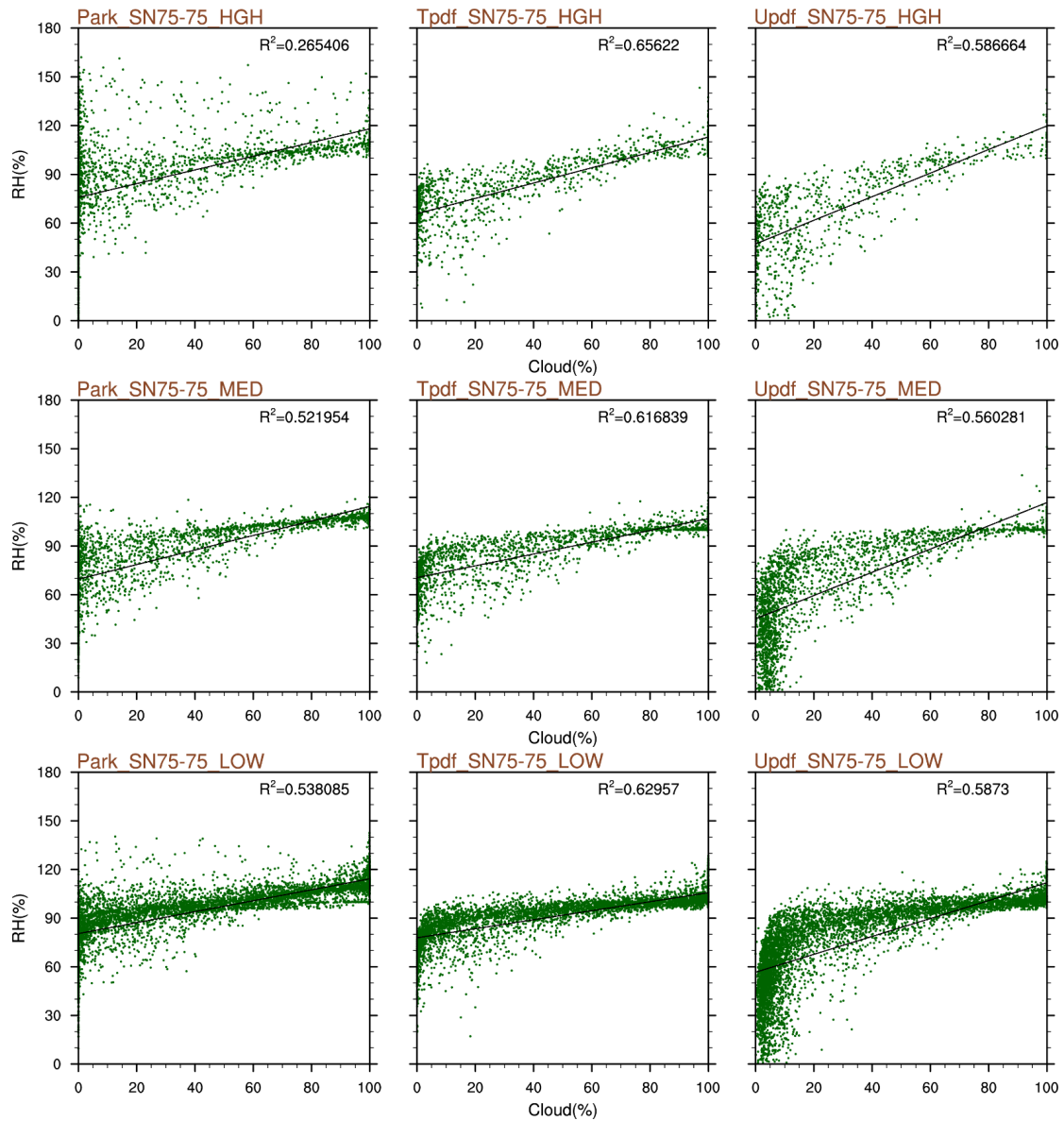


Figure S2. CF versus RH at three cloud levels (top to bottom: high, middle, and low clouds) simulated by (a) the default Park, (b) T_pdf, and (c) U_pdf schemes. Daily data of the two grid points ((180° E, 75° N) and (180° E, 75° S)) from 1999 to 2000 are used to generate the scatter plots, and linear regression lines with correlation coefficients are also shown.

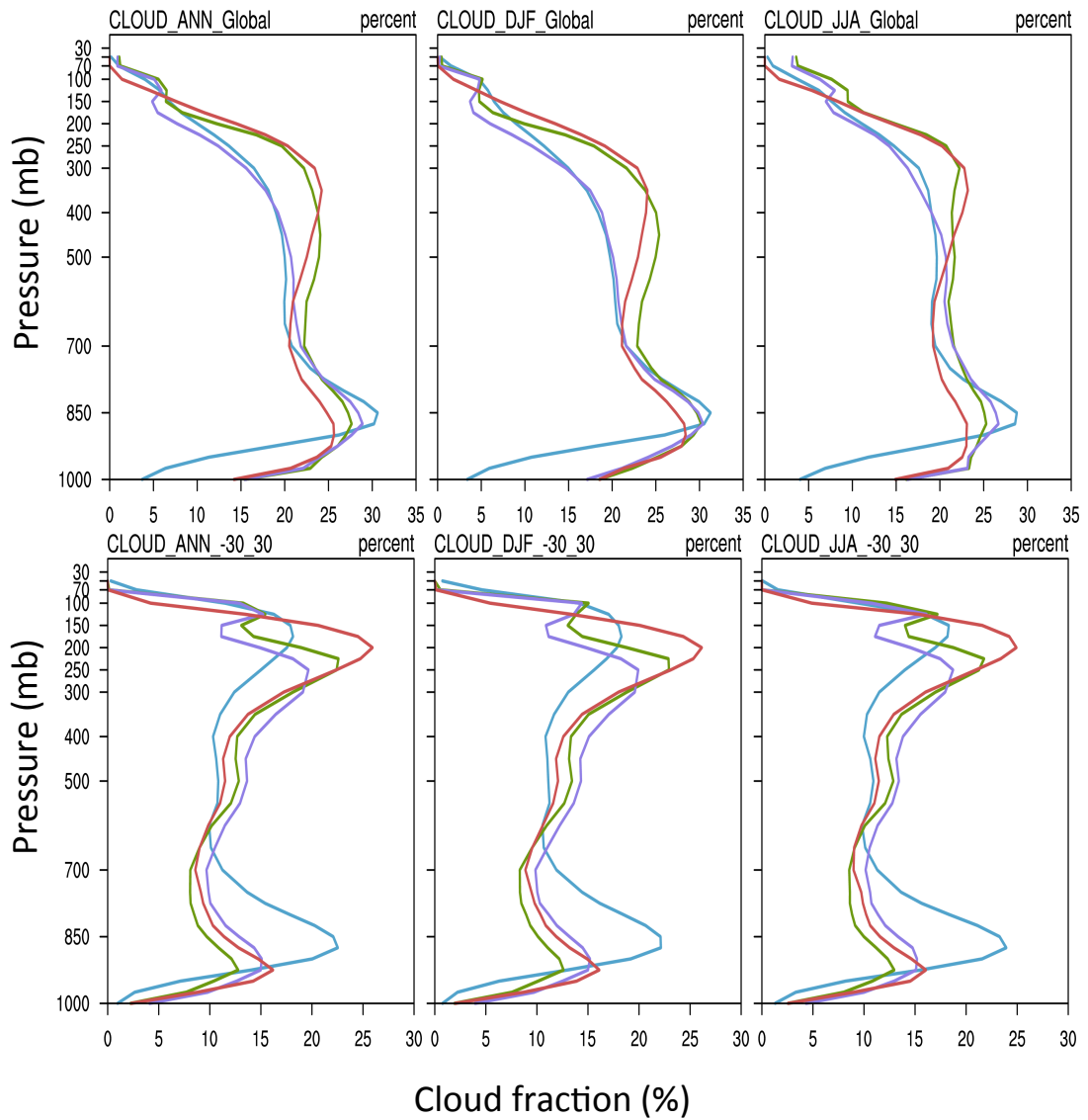


Figure S3. Vertical CF profiles averaged globally (upper) and for 30°N–30°S (lower), and for three periods (left: annual; central: DJF; right: JJA). Colored lines represent observational data from CloudSat/CALIPSO (blue) and the simulations by Park (red), U_pdf (purple), and T_pdf (green).

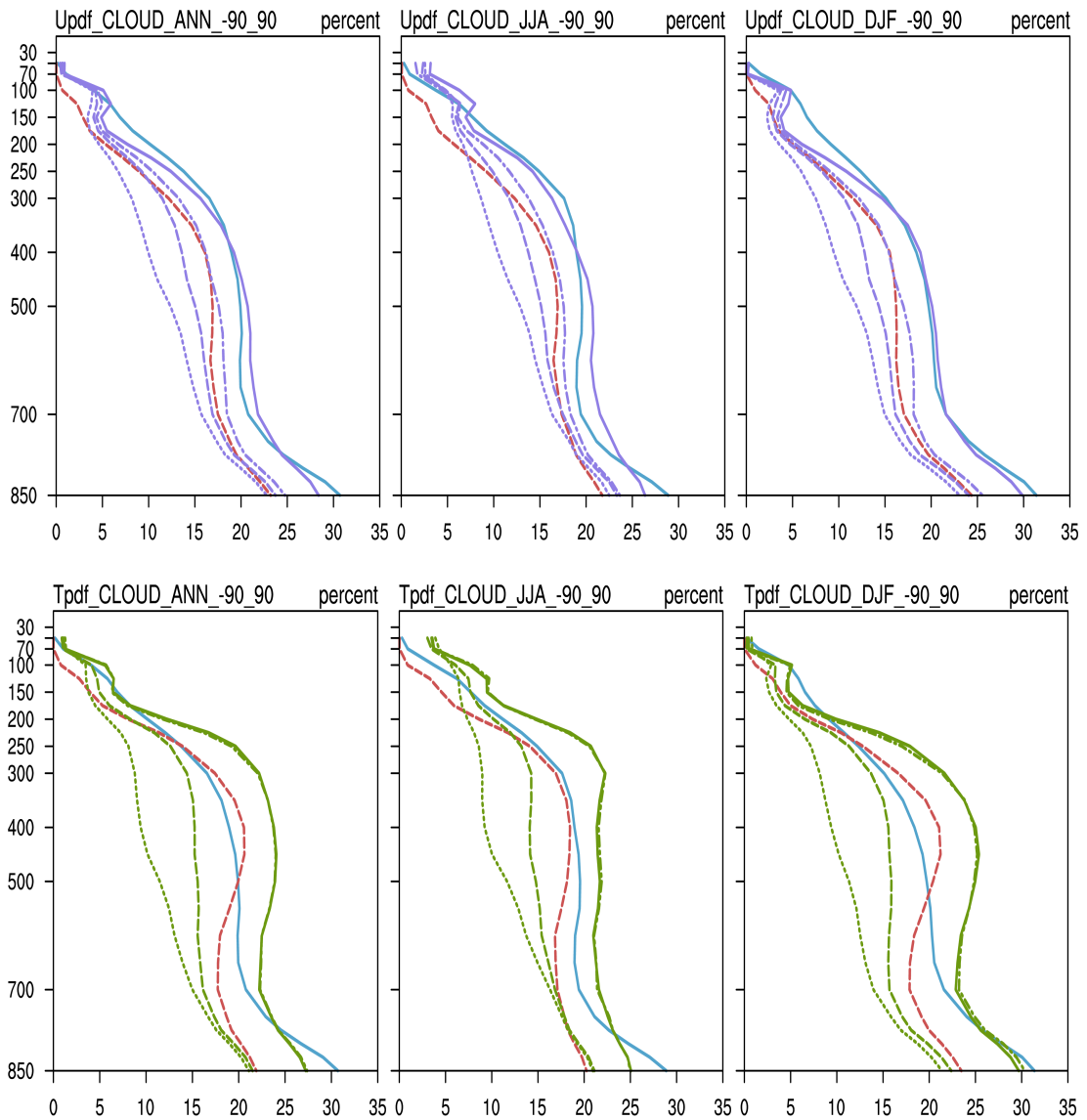


Figure S4. Sensitivity of vertical CF profile to the super-saturation ratio value (sup) for U_pdf (upper row) and T_pdf (lower row), with respect to annual (left), DJF (central), and JJA (right) global means. Colored lines represent observational data from CloudSat/CALIPSO (solid blue) or simulations by U_pdf (purple) or T_pdf (green) with $sup = 1.0$ (solid), $sup = 1.0005$ (dash-dot), $sup = 1.005$ (dashed), or $sup = 1.05$ (dotted) as well as by the Park (dashed Red).

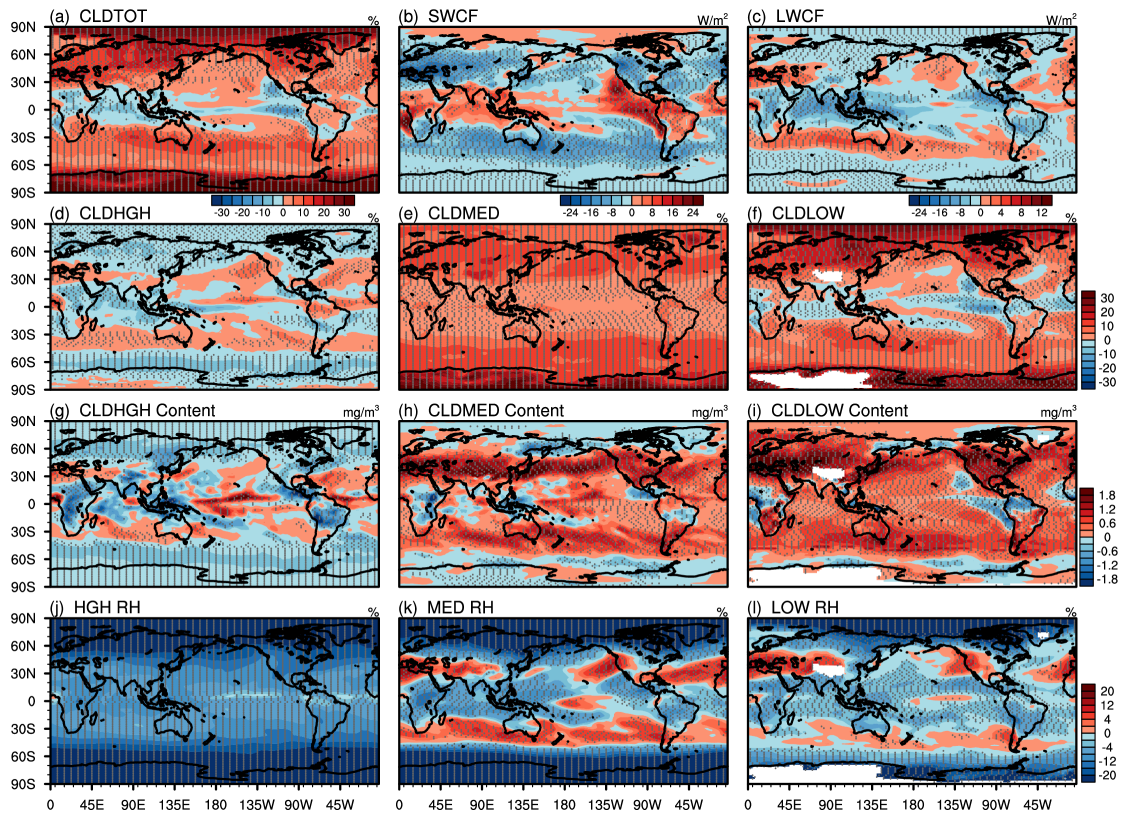


Figure S5 Similar as Figure 18 in the paper but for U_pdf of GTS scheme.

Table S1 Correlation, variance, and bias corresponding to the space-time Taylor diagram for the 10 climatic parameters shown in Figure 11 of the paper.

Space-Time	Park			U_pdf			T_pdf		
	cor	var	bias	cor	var	bias	cor	var	bias
Sea Level Pressure (ERA)	0.961	1.11	0.0177	0.964	1.04	0.0137	0.963	1.1	0.0125
SW Cloud Forcing (CERES-EBAF)	0.832	1.19	10.7	0.856	1.16	16	0.867	1.16	6.55
LW Cloud Forcing (CERES-EBAF)	0.844	1.25	7.76	0.859	1.07	14.6	0.858	1.12	16.6
Land Rainfall (30N-30S GPCP)	0.8	1.03	2.33	0.826	1.08	11.5	0.82	1.15	12.6
Ocean Rainfall (30N-30S GPCP)	0.834	1.19	29.8	0.828	1.22	34.8	0.831	1.22	29.6
Land 2m Temperature (Willmott)	0.985	1.13	0.0368	0.986	1.14	0.302	0.985	1.14	0.114
Pacific Surface Stress (5N-5S ERS)	0.751	1.57	13.7	0.746	1.62	18.9	0.731	1.6	19.2
Zonal Wind (300mb ERAI)	0.974	0.935	0.301	0.978	0.922	1.84	0.978	0.927	0.342
Relative Humidity (ERAI)	0.884	0.888	13.4	0.85	0.996	2.23	0.899	0.927	6.56
Temperature (ERAI)	0.973	1.06	0.632	0.987	1.04	0.652	0.983	1.05	0.682