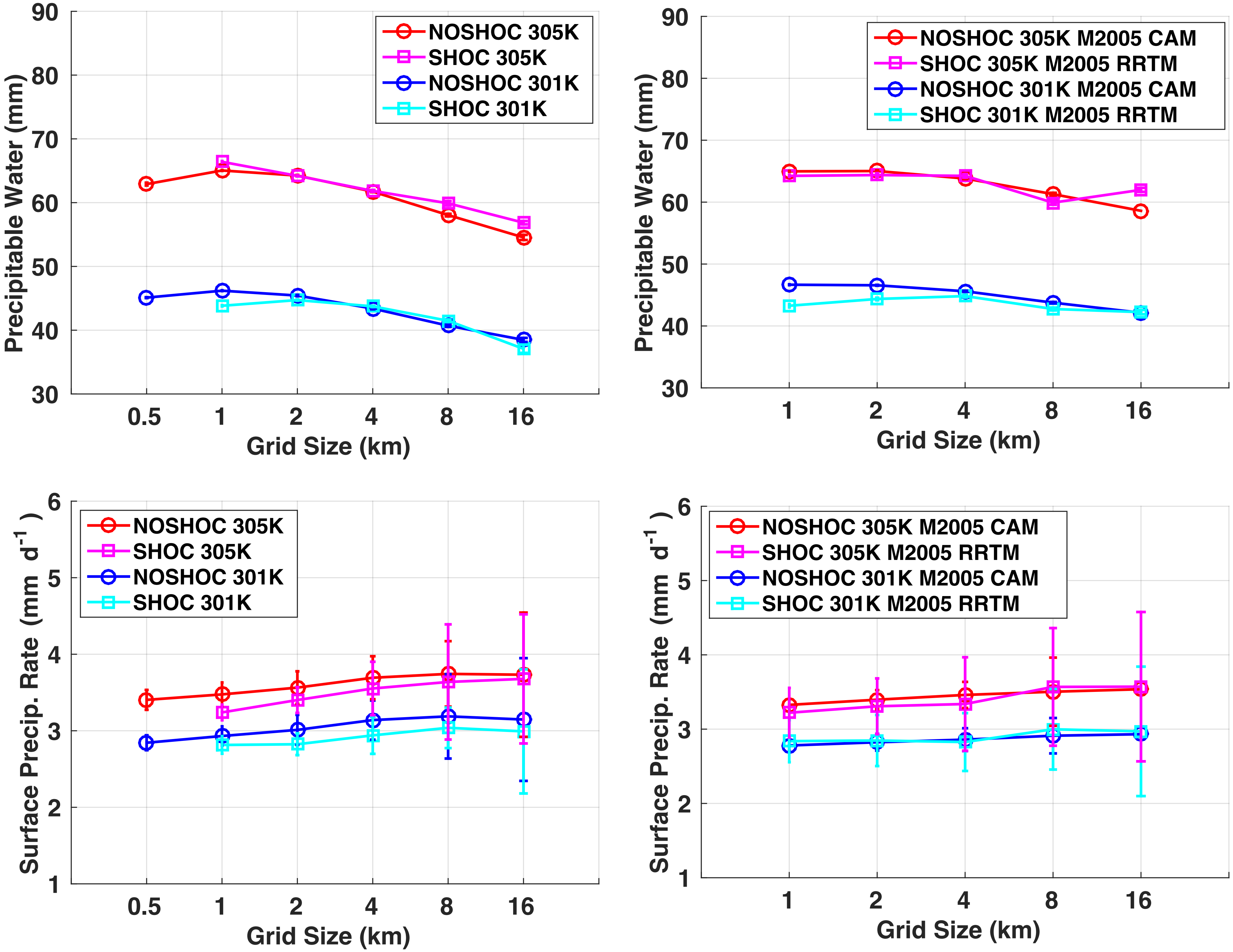
Poster Abstract

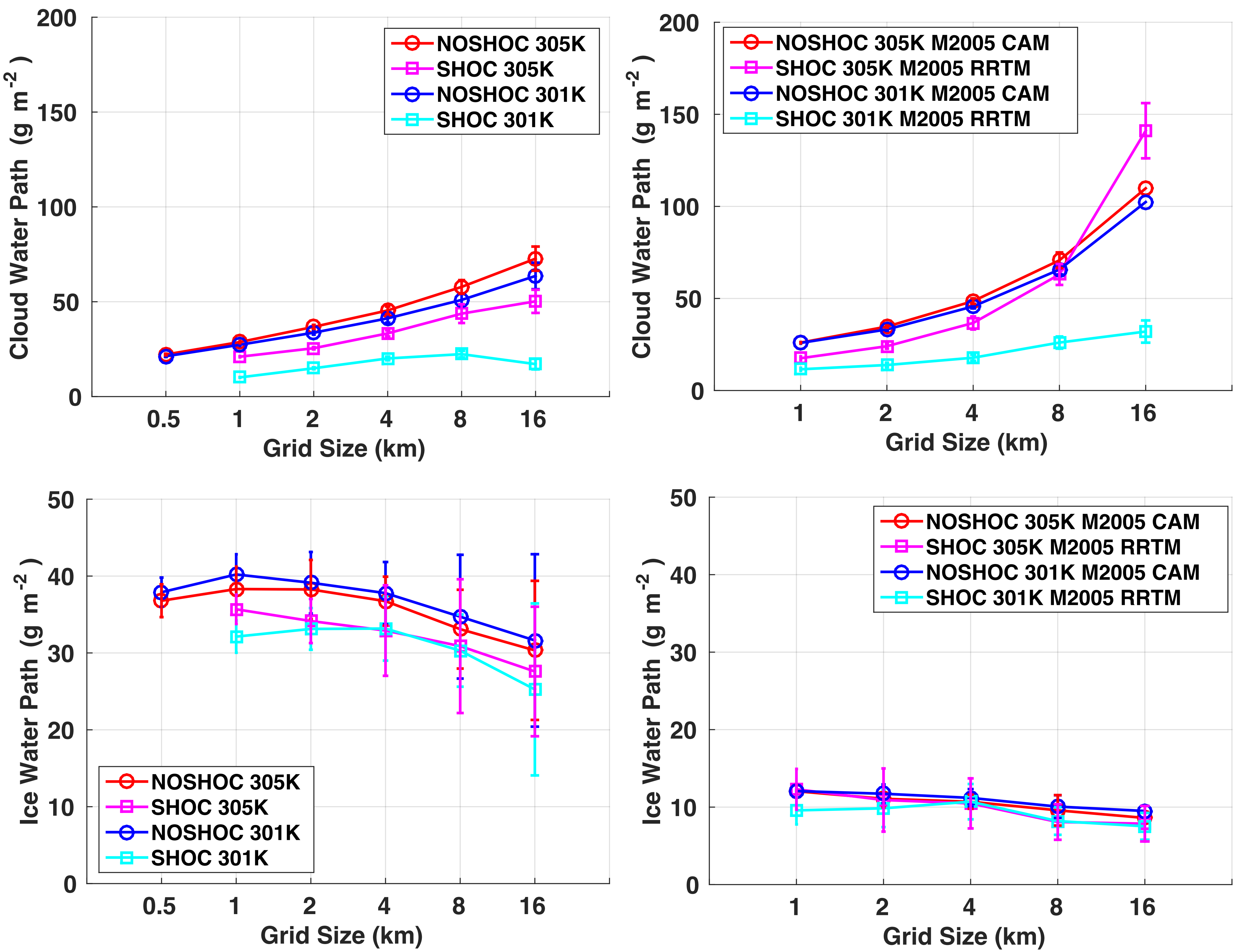
Radiative-Convective Equilibrium (RCE) 50-day model simulations were performed for a “Grey Zone” case using the System for Atmospheric Modeling (SAM). Dozens of model runs allowed for evaluation of turbulence closure schemes, microphysics (SAM's single-moment microphysics and a Morrison et al. (2005) double-moment scheme), grid spacing (0.5km to 16km), and SST (301K and 305K). The turbulence closure schemes tested were a 1.5-order closure using a prognostic equation for subgrid-scale turbulent kinetic energy (SGS-TKE) and the Simplified Higher-Order Closure (SHOC) parameterization.

x = 256, * = 128, **= 128&64			1M	2M	1M	2M
NOSHOC	301K	16km	x*	x		
		8km	x	x		
		4km	x	x	x	x
		2km	x	x		
		1km	x*	x	*	*
	305K	16km	x	x		
		8km	x	x		
		4km	x	x	x	x
		2km	x	x		
		1km	x*	x	*	*
SHOC	301K	16km	x*			
		8km	x*			
		4km	x*		x*	
		2km	x*			
		1km	x*		*	
	305K	16km	x*			
		8km	x*			
		4km	x*		x*	
		2km	x			
		1km	x*		*	
SHOC B8	301K	16km		x		*
		8km		x		*
		4km	x	x*		x**
		2km		x		**
		1km	x	x		**
	305K	16km		x		*
		8km		x		*
		4km		x		x**
		2km		x		**
		1km		x		**

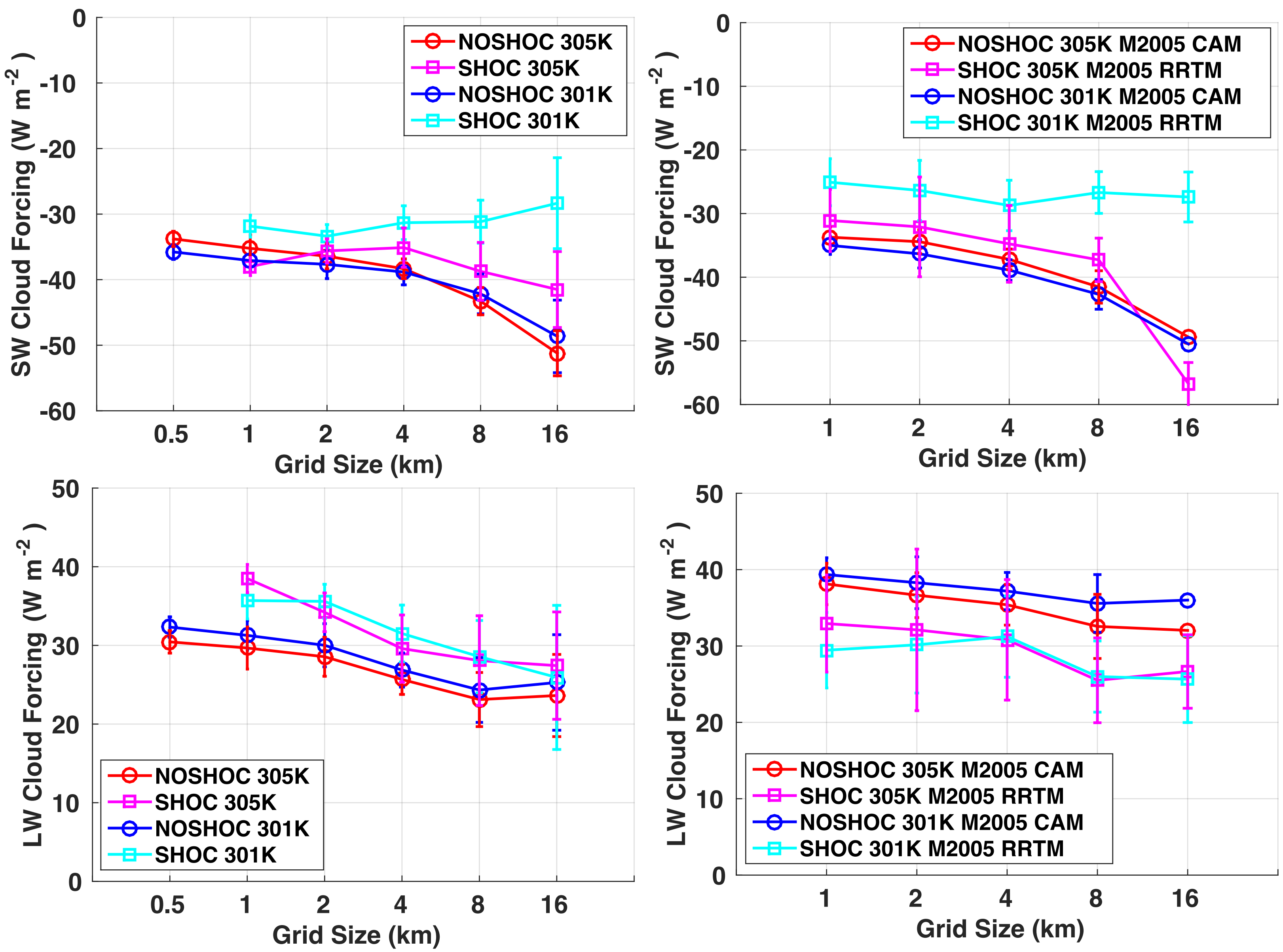
Precipitable water and precipitation were most significantly dependent on SST. Cloud water path and ice water path were primarily dependent on grid size and turbulence closure scheme choice. Shortwave cloud radiative equilibrium (CRE) values were larger in magnitude for SGS-TKE runs while SHOC runs had larger magnitude longwave CRE values.



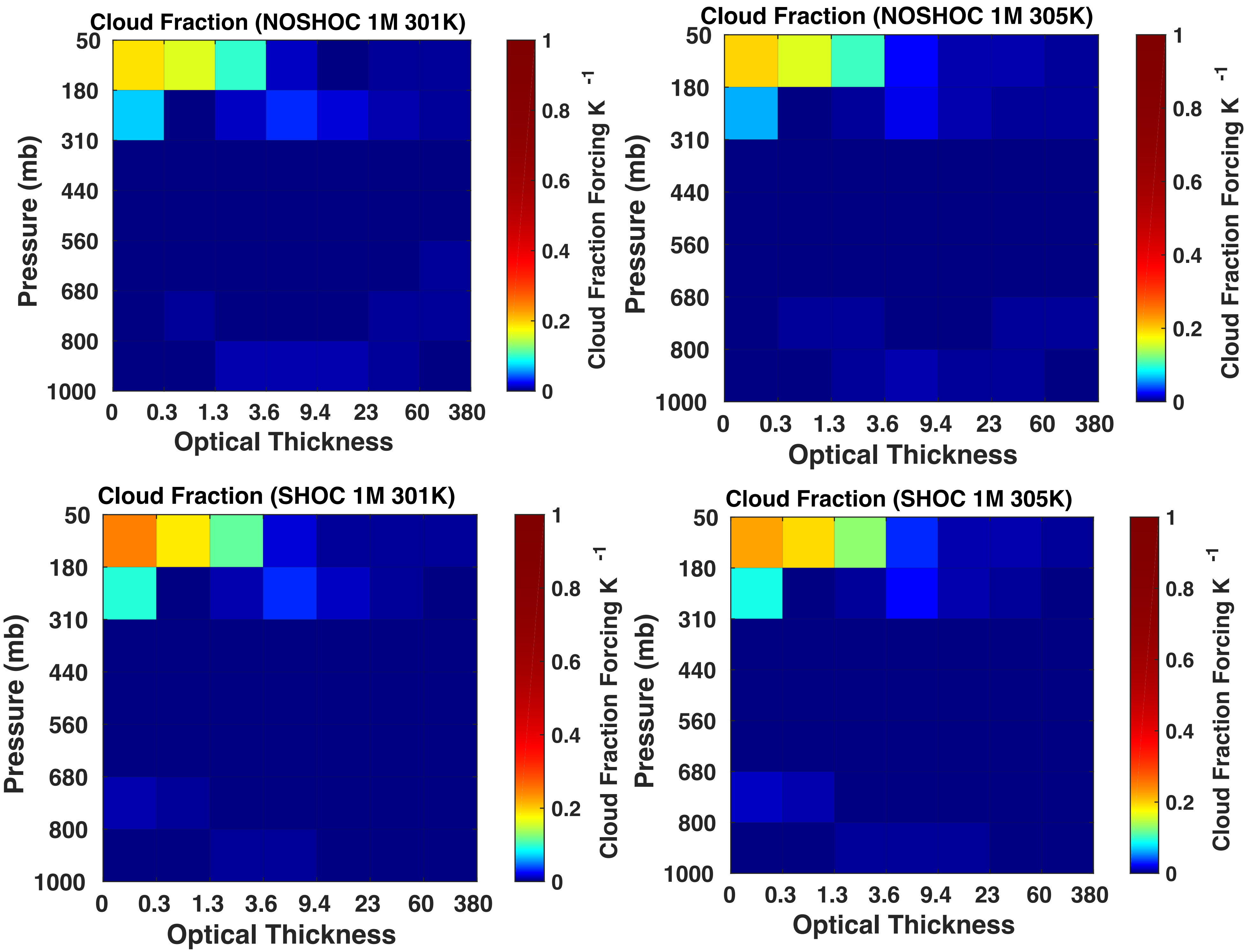
Precipitable water and precipitation were most significantly dependent on SST. Cloud water path and ice water path were primarily dependent on grid size and turbulence closure scheme choice. Shortwave cloud radiative equilibrium (CRE) values were larger in magnitude for SGS-TKE runs while SHOC runs had larger magnitude longwave CRE values.



Precipitable water and precipitation were most significantly dependent on SST. Cloud water path and ice water path were primarily dependent on grid size and turbulence closure scheme choice. Shortwave cloud radiative equilibrium (CRE) values were larger in magnitude for SGS-TKE runs while SHOC runs had larger magnitude longwave CRE values.



Cloud radiative kernels reveal that the clouds generated in the model are primarily upper-level cirrus. Net cloud radiative forcings derived from kernels were negative for single-moment SGS-TKE and positive for double-moment SHOC. Net cloud radiative forcings were positive in the abundant high altitude cirrus and negative for other cloud types. Cloud feedbacks were positive for single-moment SGS-TKE runs but negative for SHOC runs.



Cloud radiative kernels reveal that the clouds generated in the model are primarily upper-level cirrus. Net cloud radiative forcings derived from kernels were negative for single-moment SGS-TKE and positive for double-moment SHOC. Net cloud radiative forcings were positive in the abundant high altitude cirrus and negative for other cloud types. Cloud feedbacks were positive for single-moment SGS-TKE runs but negative for SHOC runs.

G205_ISCCP	Model	Climate	C/M %	Obs	O/M %	NOSHOC 1M 301K
LWCF	36.8	51.4	140%	37.5	102%	1km resolution, 64km grid
SWCF	-42.4	-47.6	112%	-47.4	112%	
NCF	-5.6	3.9		-9.9		

G405_ISCCP	Model	Climate	C/M %	Obs	O/M %	NOSHOC 1M 305K
LWCF	35.9	52.0	145%	38.1	106%	1km resolution, 64km grid
SWCF	-40.7	-46.1	113%	-45.9	113%	
NCF	-4.8	5.9		-7.8		

G305_ISCCP	Model	Climate	C/M %	Obs	O/M %	SHOC 1M 301K
LWCF	37.0	54.7	148%	38.7	105%	1km resolution, 64km grid
SWCF	-32.5	-38.8	119%	-38.6	119%	
NCF	4.5	15.9		0.1		

G505_ISCCP	Model	Climate	C/M %	Obs	O/M %	SHOC 1M 305K
LWCF	40.9	60.5	148%	43.8	107%	1km resolution, 64km grid
SWCF	-39.5	-46.1	117%	-45.9	116%	
NCF	1.4	14.4		-2.1		

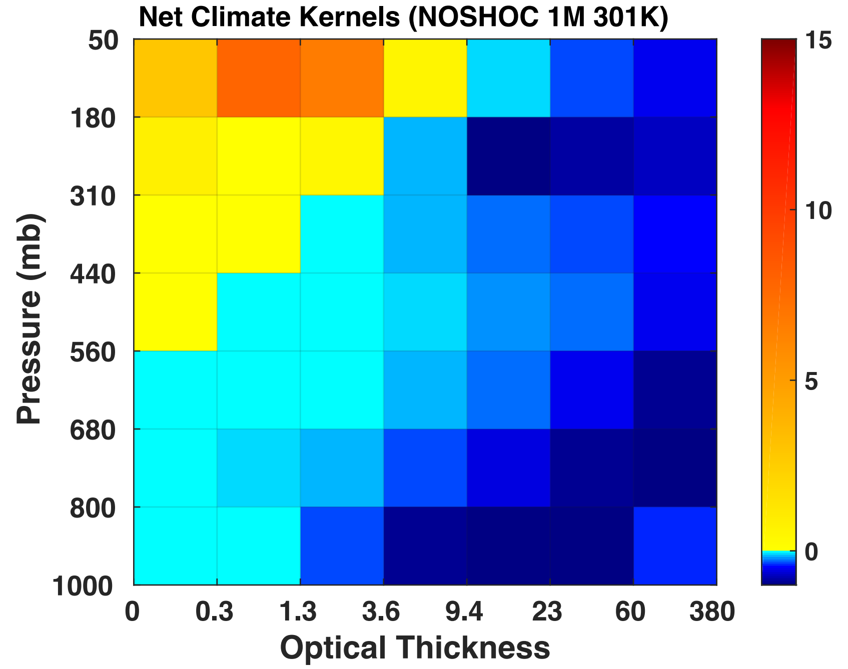
G205M_ISCCP	Model	Climate	C/M %	Obs	O/M %	NOSHOC 2M 301K
LWCF	32.2	57.0	177%	38.3	119%	1km resolution, 64km grid
SWCF	-33.5	-39.1	117%	-38.9	116%	
NCF	-1.3	17.9		-0.6		

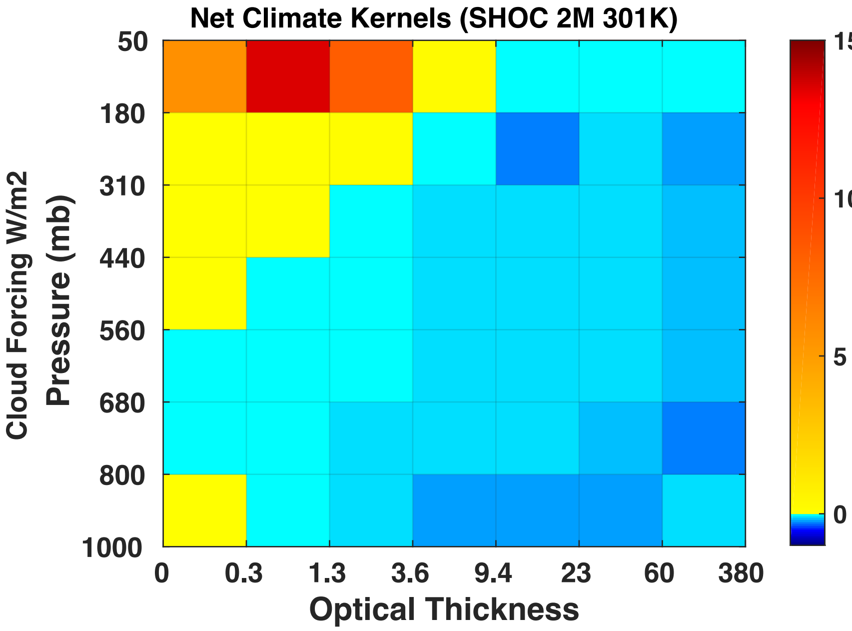
G405M_ISCCP	Model	Climate	C/M %	Obs	O/M %	NOSHOC 2M 305K
LWCF	31.0	56.0	181%	37.8	122%	1km resolution, 64km grid
SWCF	-32.6	-38.4	118%	-38.2	117%	
NCF	-1.6	17.6		-0.4		

G305M_ISCCP	Model	Climate	C/M %	Obs	O/M %	SHOC 2M 301K
LWCF	29.5	54.4	184%	35.7	121%	1km resolution, 64km grid
SWCF	-25.1	-30.2	120%	-30.1	120%	
NCF	4.4	24.2		5.6		

G505M_ISCCP	Model	Climate	C/M %	Obs	O/M %	SHOC 2M 305K
LWCF	32.7	59.0	180%	39.7	121%	1km resolution, 64km grid
SWCF	-31.0	-36.2	117%	-36.1	116%	
NCF	1.7	22.8		3.6		

Cloud radiative kernels reveal that the clouds generated in the model are primarily upper-level cirrus. Net cloud radiative forcings derived from kernels were negative for single-moment SGS-TKE and positive for double-moment SHOC. Net cloud radiative forcings were positive in the abundant high altitude cirrus and negative for other cloud types. Cloud feedbacks were positive for single-moment SGS-TKE runs but negative for SHOC runs.





25-day avg forcings (W/m2 per K)

1M NOSHOC	Model	Climate	C/M %	Obs	O/M %
LWCF	-0.225	0.15	1.25%	0.15	1%
SWCF	0.425	0.375	0.25%	0.375	0.25%
NCF	0.2	0.5		0.525	

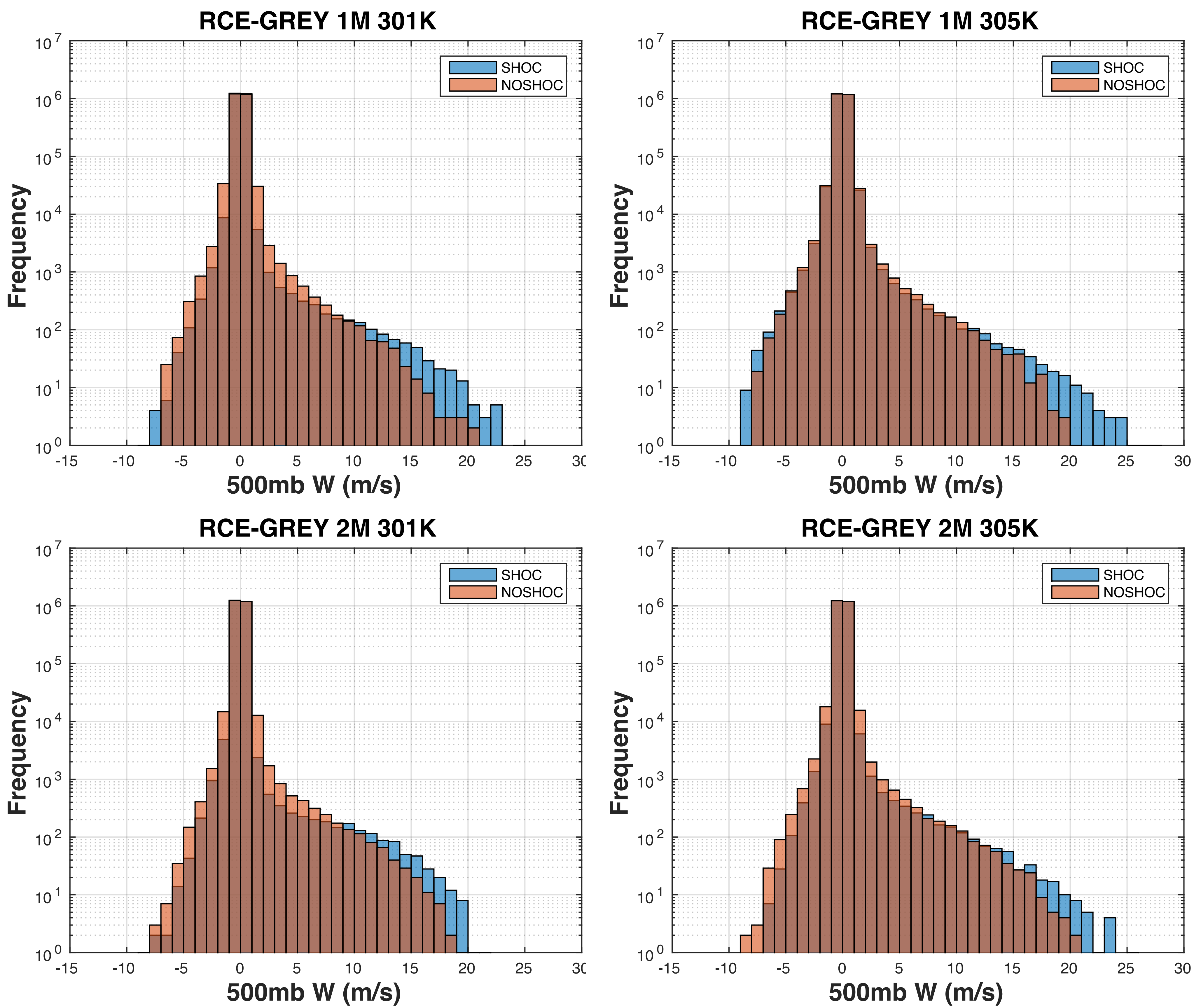
1M SHOC	Model	Climate	C/M %	Obs	O/M %
LWCF	0.975	1.45	0%	1.275	0.50%
SWCF	-1.75	-1.825	-0.50%	-1.825	-0.75%
NCF	-0.775	-0.375		-0.55	

2M NOSHOC	Model	Climate	C/M %	Obs	O/M %
LWCF	-0.3	-0.25	1%	-0.125	0.75%
SWCF	0.225	0.175	0.25%	0.175	0.25%
NCF	-0.075	-0.075		0.05	

2M SHOC	Model	Climate	C/M %	Obs	O/M %
LWCF	0.8	1.15	-1%	1	0
SWCF	-1.475	-1.5	-0.75%	-1.5	-1%
NCF	-0.675	-0.35		-0.5	

On average, warmer, single-moment and/or SHOC runs had more frequent strong 500mb vertical velocity updrafts.

Heavier precipitation events were slightly more frequent in double-moment runs. Warmer SGS-TKE runs had more precipitation events at all intensities; however, warmer SHOC runs had more light precipitation events and fewer heavy precipitation events.



On average, warmer, single-moment and/or SHOC runs had more frequent strong 500mb vertical velocity updrafts. Heavier precipitation events were slightly more frequent in double-moment runs. Warmer SGS-TKE runs had more precipitation events at all intensities; however, warmer SHOC runs had more light precipitation events and fewer heavy precipitation events.