

Table 1. Threat Score comparisons for eight precipitation events for T1, T2 and T3.

CASES	time period (dd.hh)	T3	T2	T1	(T3-T1)/ T1·100%	(T2-T1)/ T1·100%
1	2.12-7.06	0.518	0.334	0.326	58.9	2.5
2	7.18-9.12	0.314	0.281	0.333	-5.7	-15.6
3	10.06-13.06	0.482	0.252	0.327	47.4	-22.9
4	14.12-17.18	0.417	0.185	0.224	86.2	-17.4
5	23.00-24.18	0.403	0.151	0.213	89.2	-29.1
6	25.18-27.12	0.436	0.144	0.149	192.6	-3.4
7	19.06-22.12	0.532	0.349	0.389	36.8	-10.3
8	29.06-31.00	0.469	0.27	0.338	38.8	-20.1

Table 2. Biases for the five regions of R1-R5 and three tests T1-T3.

	R1	R2	R3	R4	R5
T1	0.73	0.62	0.55	0.60	0.60
T2	0.75	0.63	0.95	0.80	0.54
T3	1.13	1.11	0.92	0.90	1.19

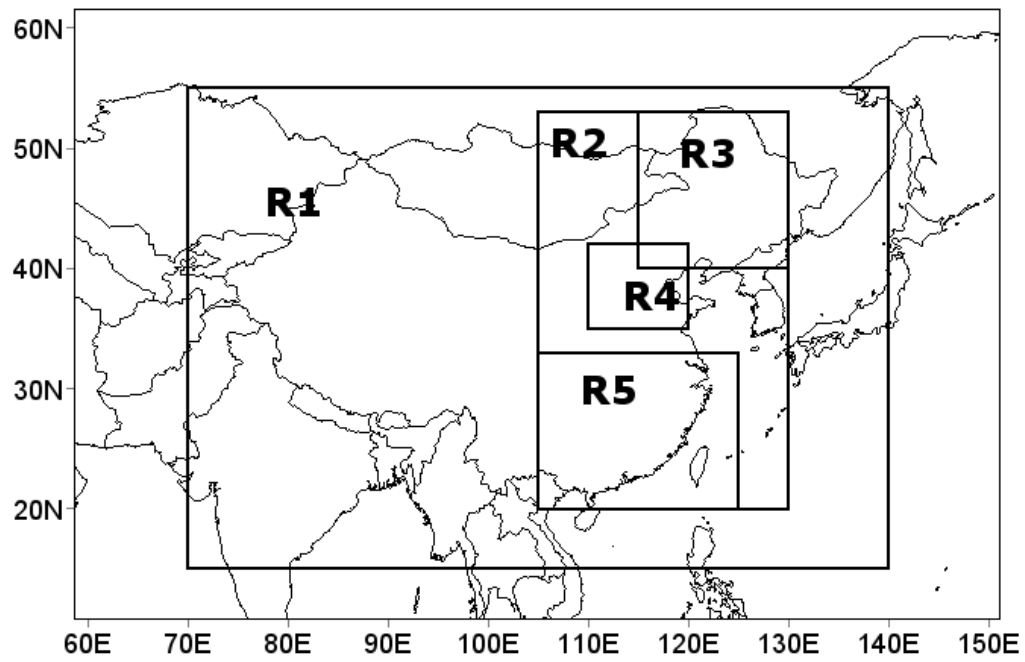
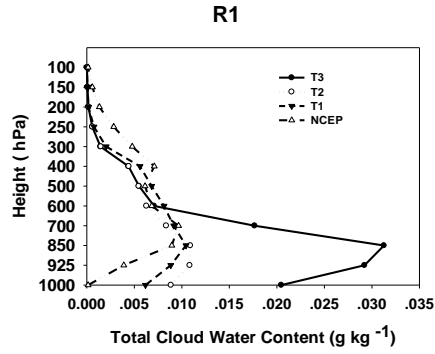


Figure 1. Model domain and five targeting areas. R1 is for the whole China, R2 is for East China, R3 is for Northeast China, R4 is for North China Plain and R5 is for South China.

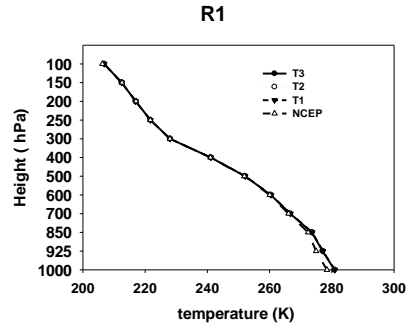
total cloud water

temperature

R1

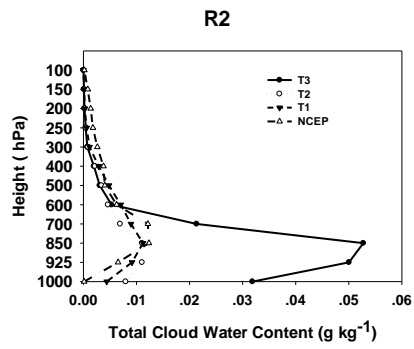


a1

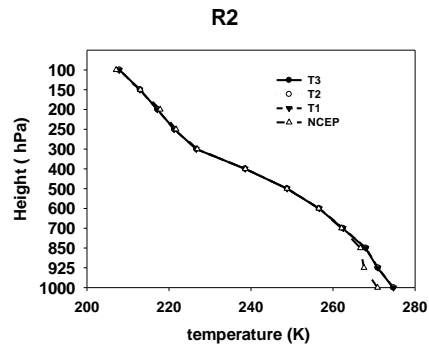


b1

R2

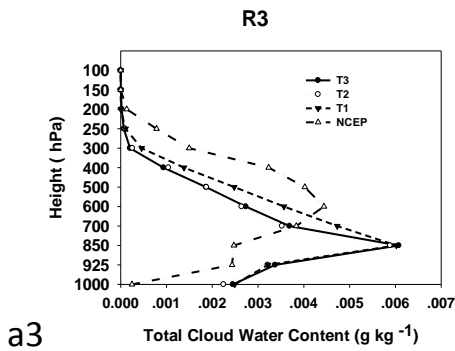


a2

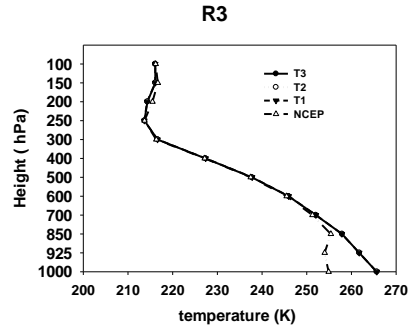


b2

R3

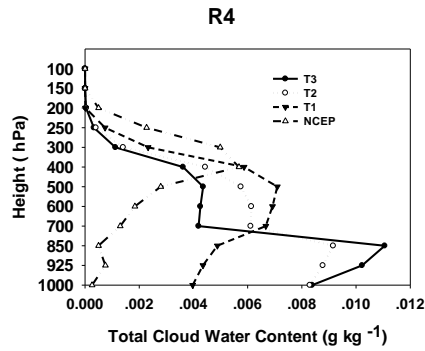


a3

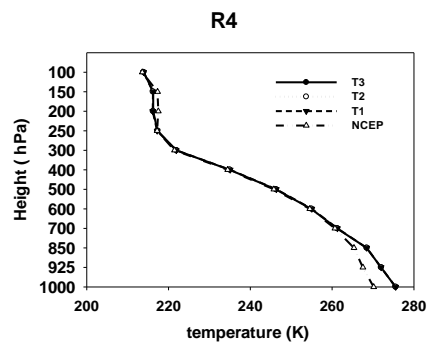


b3

R4

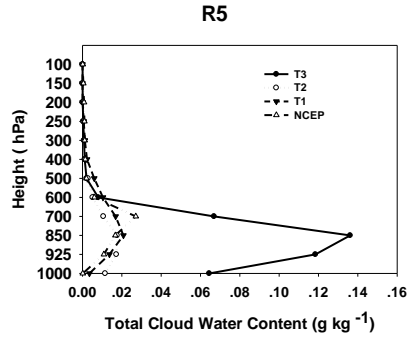


a4



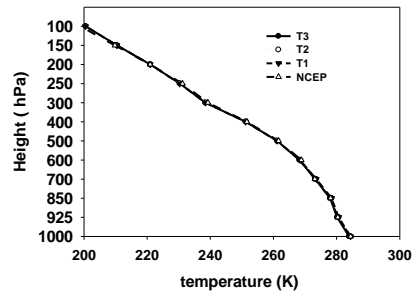
b4

R5



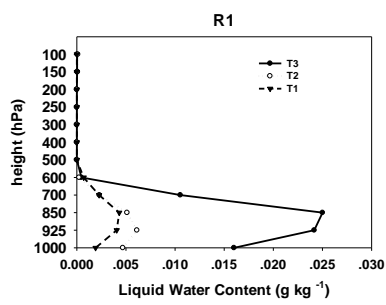
a5

R5

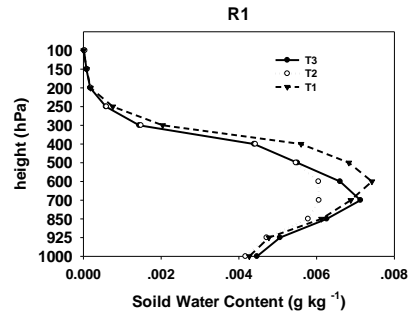


b5

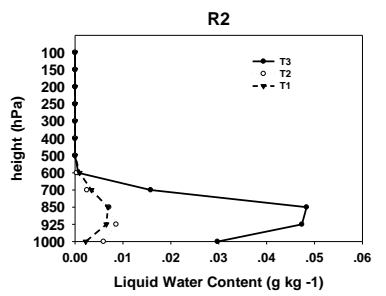
Figure 2. Vertical profiles of regional mean total cloud water content (**a1-a5**) and temperature (**b1-b5**) from 1000 hPa to 100 hPa for R1, R2, R3, R4 and R5. T1 is for WSM6, the control test, T2 is for WDM6 with K2000 activation scheme, T3 is for WDM6 with aerosol activated from CUACE. NCEP is for NCEP reanalysis.



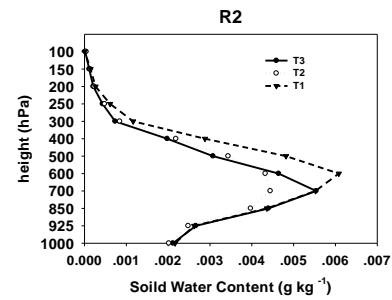
a1



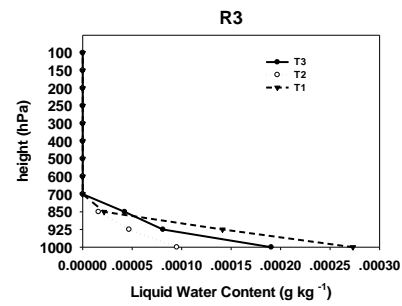
a2



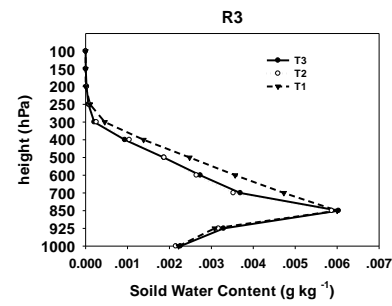
b1



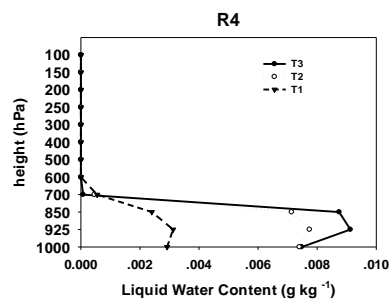
b2



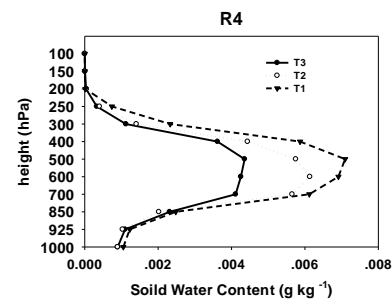
c1



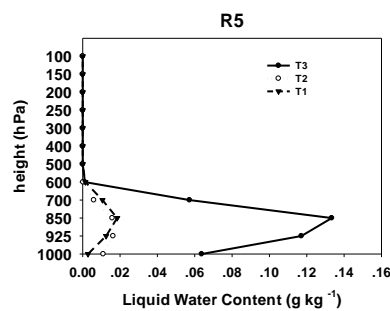
c2



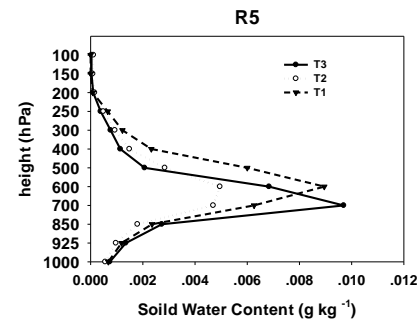
d1



d2



f1



f2

Figure 3. Vertical profiles of regional mean liquid water (**a1-f1**) and solid water (**a2-f2**) for R1, R2, R3, R4 and R5 from 1000 hPa to 100 hPa. T1 is for WSM6, the

control test, T2 is for WDM6 with K2000 activation scheme, T3 is for WDM6 with aerosol activated from CUACE. NCEP is for NCEP reanalysis.

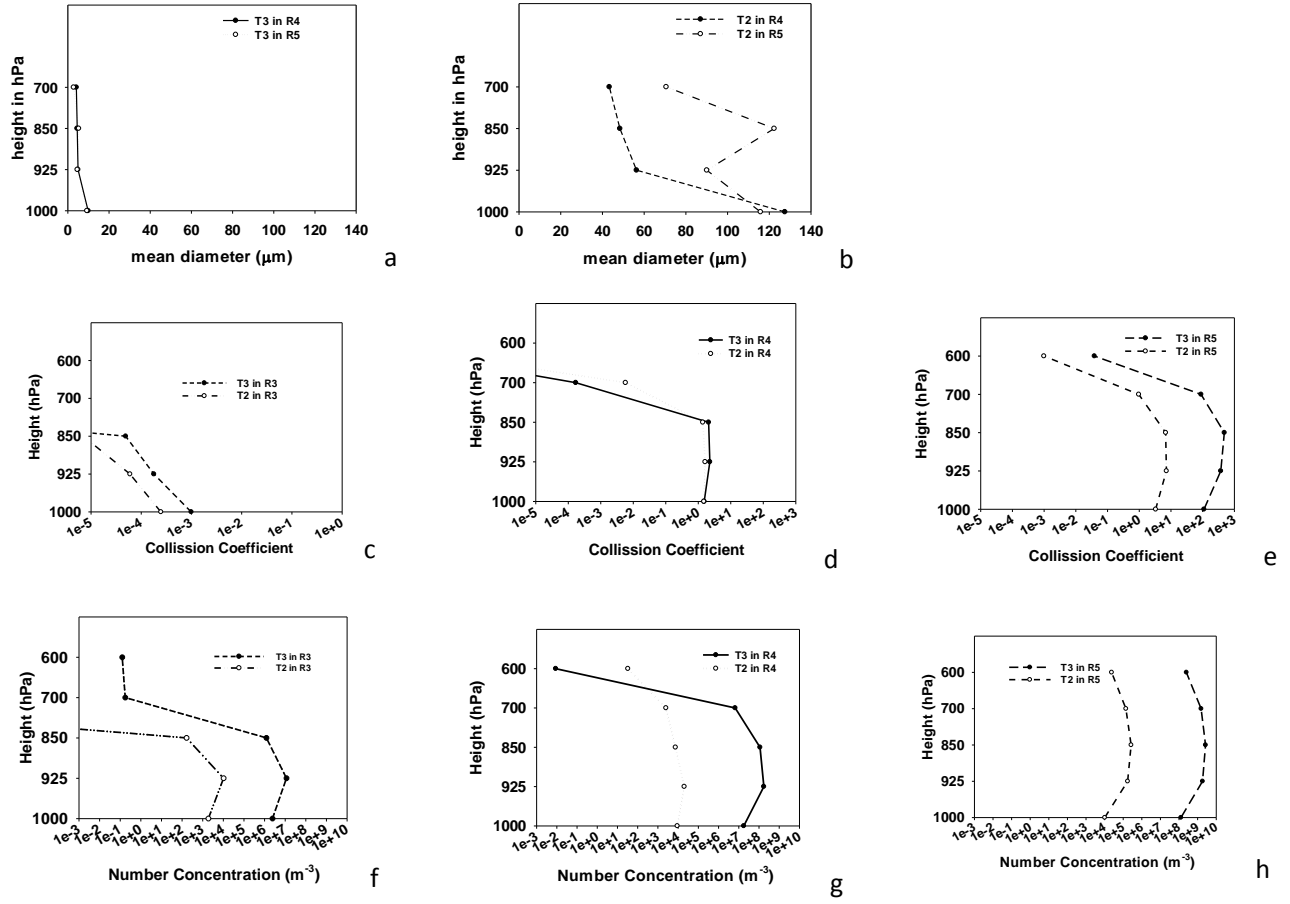
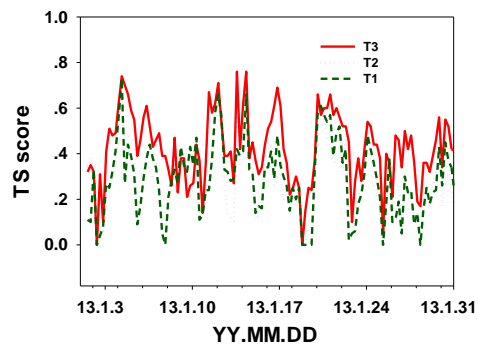
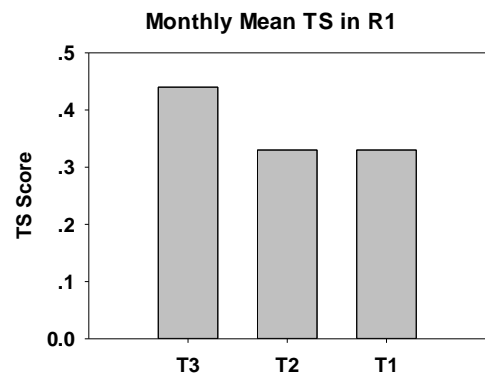


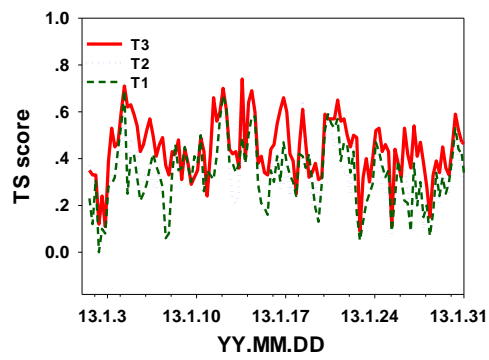
Figure 4. (a) is the vertical profile of mean diameter of cloud droplets for T3 in R4 and R5, (b) is same to (a) but for T2. (c) is collision coefficient for T2 and T3 in R3, (d) and (e) are same to (c) but for R4 and R5. (f) is cloud droplet number concentration for T2 and T3 in R3, (g) and (h) are the same to (f) but for R4 and R5.



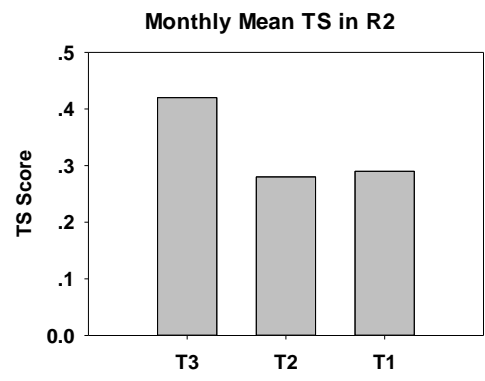
a



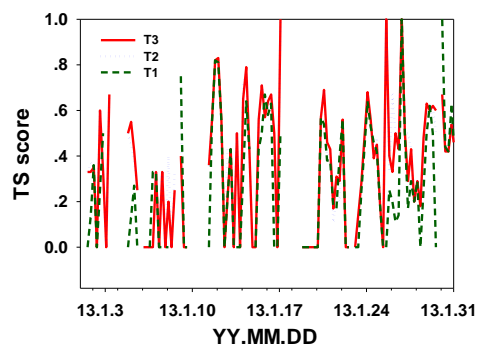
f



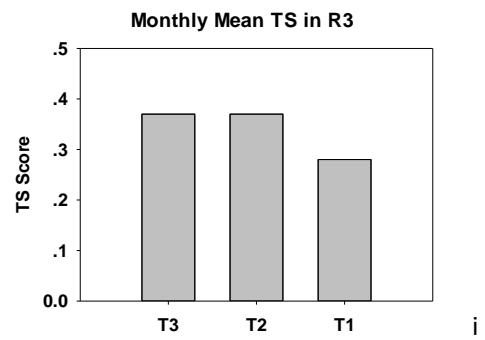
b



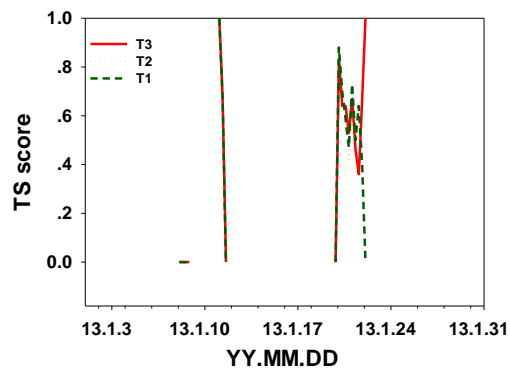
g



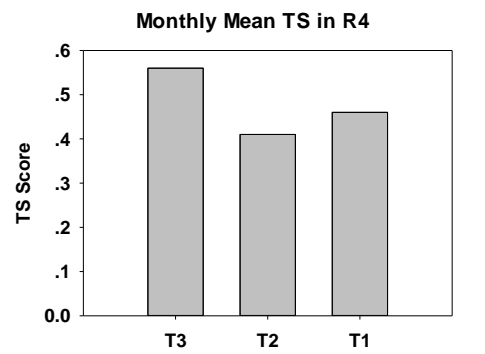
c



i



d



l

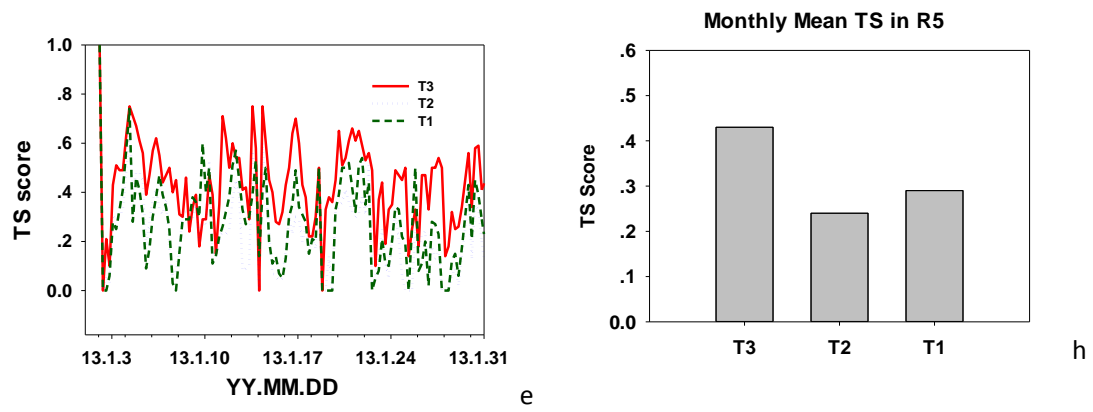
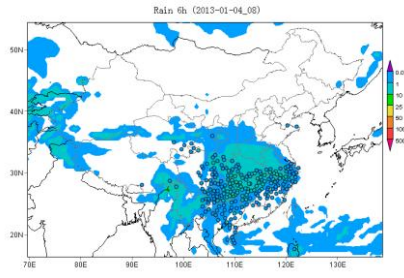


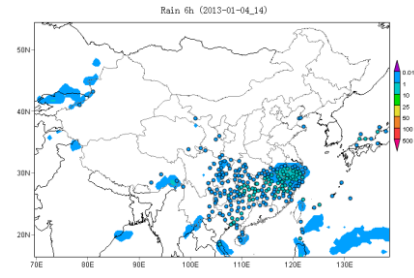
Figure 5. Time series of 6-h precipitation TS scoring (a-e) and monthly mean TS score (f-h) for R1, R2, R3, R4, R5. T1 is for WSM6, the control test, T2 is for WDM6 with K2000 activation scheme, T3 is for WDM6 with aerosol activated from CUACE.

T1



a

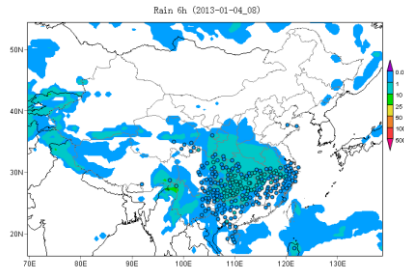
TS=0.69
Bias=1.14



b

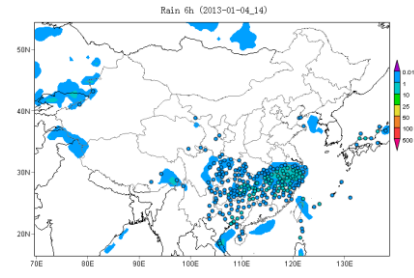
TS=0.25
Bias=0.32

T2



c

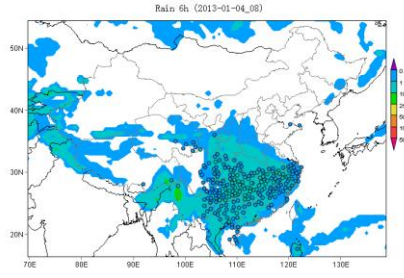
TS=0.62
Bias=1.04



d

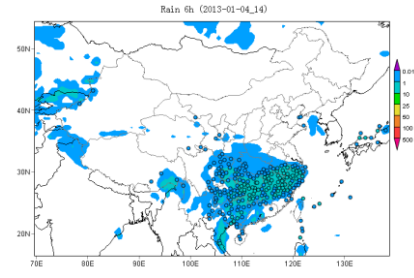
TS=0.32
Bias=0.56

T3



e

TS=0.71
Bias = 1.35



f

TS=0.62
Bias=1.19

Figure 6. (a) is the distribution of 6-h accumulated precipitation(shaded) compared with observation(dotted) with the TS scoring and bias at 8:00 LT Jan. 4, 2013 by T1. (b) is the same to (a) but for 14:00 LT, (c) is the same to (a) but for T2, (d) is same to c but for 14:00 LT. (f) is the same to (a) but for T3, (f) is the same to (e) but for 14:00 LT.

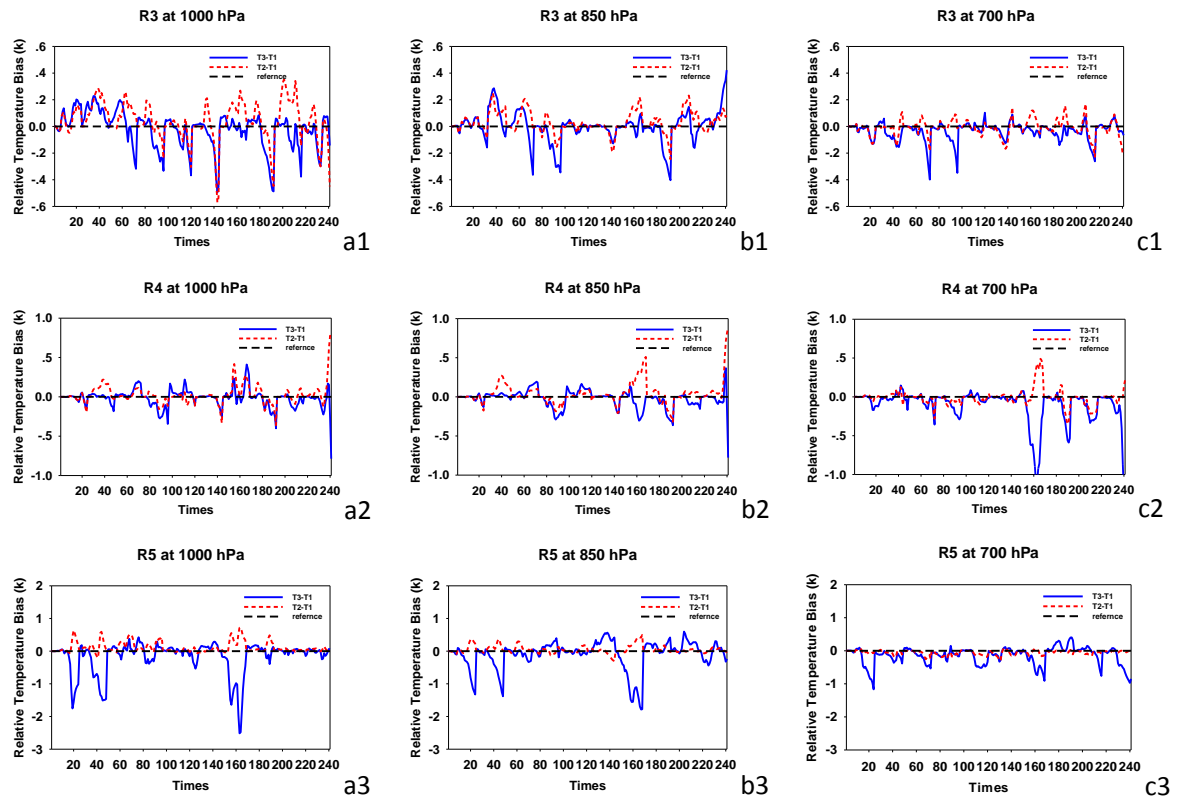


Figure 7. Temperature bias differences between T3 and T1, T2 and T1 at three heights of 1000hpa, 850hpa and 700hPa for the three regions of R3 (**a1-a3**), R4 (**b1-b3**) and R5 (**c1-c3**).

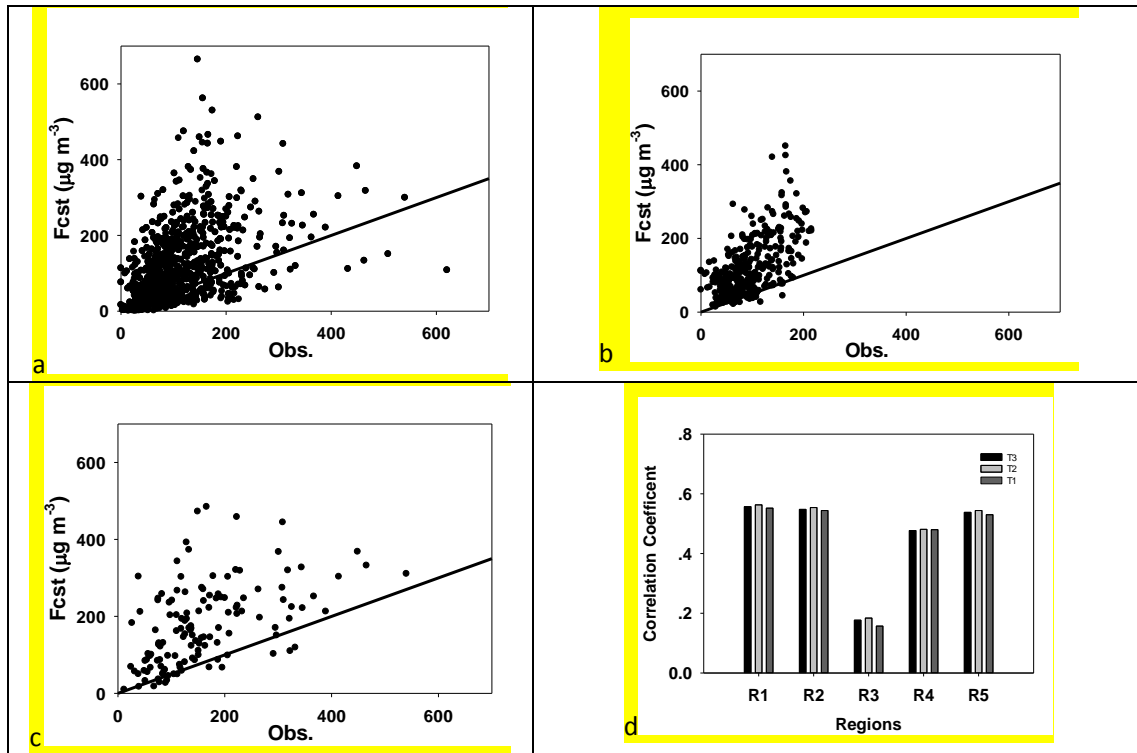


Figure 8. (a) , (b) and (c) are scatter plots of daily average PM_{2.5} between the model and the observations for T3 in R1, R4 and R5. (d) is correlation coefficients of PM_{2.5} between simulation and measurements for T1, T2 and T3 in five regions of R1, R2, R3, R4 and R5.