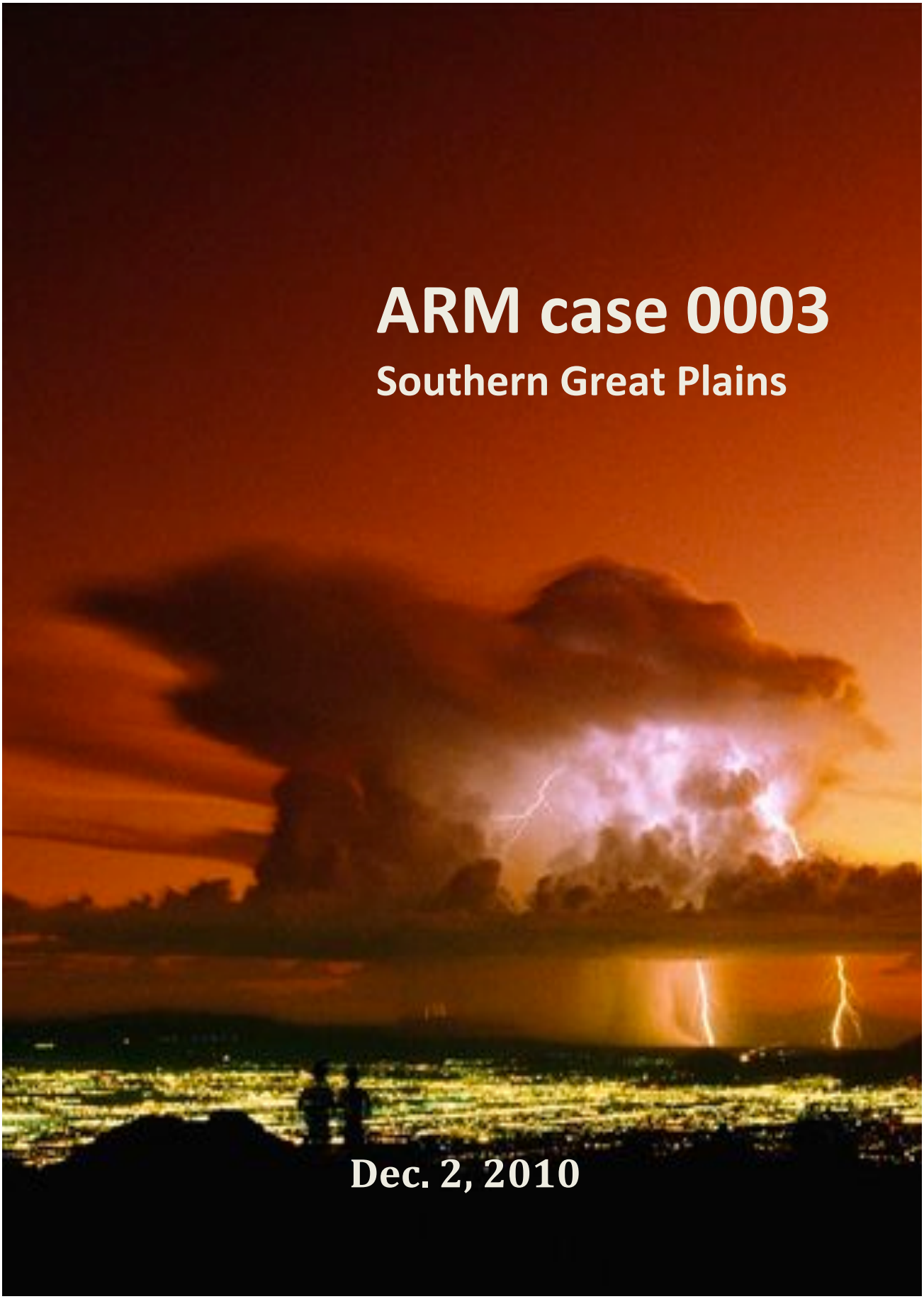


ARM case 0003

Southern Great Plains

Dec. 2, 2010

Mingxuan Chen

chen@atmos.colostate.edu

Dec 2, 2010

ARM case 0003
Location: Southern Great Plains (center at 36.61N,97.49W)
data source:
sgp3hIOPsndgBasedV3.4_ConstVarAnaX1.c1.20000301.000000.cdf
from http://iop.archive.arm.gov/arm-iop/0eval-data/xie/scm-forcing/iop_at_sgp/200003/

Steps to prepare input data (*.txt) for VVM
1)NCL should be installed prior to excute the following commands
2) WRAPIT prt_sfc90.stub prt_sfc.f90 --> produces prt_sfc90.so
3) WRAPIT prt_tot90.stub prt_tot.f90 --> produces prt_tot90.so
4) ncl read_sgp3h.ncl (calls prt_sfc90.so and prt_tot90.so)
It extrapolates the data to 25 mb level from 40 mb and 65 mb.
input: sgp3hIOPsndgBasedV3.4_ConstVarAnaX1.c1.20000301.000000.cdf
outputs:
i. ARM_0003_sfc.txt (surface data)
ii. ARM_0003_sndlsf.dat (combined sounding, large-scale forcing and surface data).
5) compile and run the fortran program "interp_arm.f90"
(Do not change parameter nt,nk3 and zb. because nt,nk3 and zb should be consistent with read_sgp3h_2.ncl.)
Parameters nz=40, domain=24000m,dz1=100m and mesh type=1 maybe modified according to VVM resolution.
Input: ARM_0003_sndlsf.dat (see 4)ii)
outputs:
i..ARM_0003_interp_zz1.txt (large –scale forcing data at vorticity levels)
Includes: density (rhoz), pressure (Pz), exponential function (Pi), large-scale forcing of vertical velocity (wls), large-scale forcing of potential temperature (thls), large-scale forcing of water vapor mixing ratio (qvls), map factor of vorticity levels (fnz) and height (zz). After the first two lines (header of the file), there is a time sequence of profile data. In each profile data, first line is time (Julian day), number of observation levels and surface pressure, and next line is surface variables.

ARM0003 Forcing Data for VVM (vorticity-levels)

rhoz(kg/m^3)	Pz(Pa)	piz()	wLS(m/s)	thLS(K/h)	qvLS(g/kg/h)	fnz	zz(m)	
61.7291980	40	97894.4921875						
1.1865120000	97894.4920000000	0.9939355200	0.0000000000	0.0000000000	0.0000000000	6.8823530000	318.1999000000	
1.1790590000	96740.6600000000	0.9905499200	-0.0008654869	-0.1293363000	-0.0348873000	5.3181820000	418.1999000000	
1.1678401000	95299.2100000000	0.9862965000	-0.0019027650	-0.1648787000	-0.0588363330	4.3333334000	543.8409400000	
1.1513884000	93581.0930000000	0.9811771000	-0.0033358040	-0.1098946300	-0.0663211710	3.6562500000	695.1229200000	

ii. ARM_0003_interp_zt1.txt (sounding data at potential temperature levels)
Include: density (rho), pressure(P), potential temperature (theta), water vapor mixing ratio(qv), exponential function(pi), zonal wind(u), meridional wind(v), map factor of theta levels (fnt) and height (zt). After the first two lines (header of the file), there is a time sequence of profile data. In each profile data, first line is time

(Julian day), number of observation levels and surface pressure, and next line is surface variables.

ARM0003 Sounding Data for VVM (theta-levels)

rho(kg/m^3)	P(Pa)	theta(K)	qv(g/g)	pi()	u(m/s)	v(m/s)	fnt	zt(m)	
61.7291980	40	97894.4921875							
1.1865120000	97894.4920000000	289.2318100000	0.0034381712	0.9939355200	-2.9448910000	0.4400735000	6.8823530000	318.1999000000	
1.1830441000	97354.5620000000	288.9402400000	0.0033845000	0.9923513000	-3.3360562000	0.3753096400	6.0000000000	364.9948000000	
1.1745930000	96052.8000000000	288.2373000000	0.0032551010	0.9885316000	-4.2791404000	0.2191666200	4.7755103000	477.8153000000	
1.1604313000	94472.4600000000	288.3218000000	0.0029762273	0.9838443300	-4.7861640000	0.0727877840	3.9661020000	616.2769000000	

iii. ARM_0003_basic_state_zz1.txt (basic state variables at vorticitylevels)
time averaged profile data during the period of ARM 2000 03 IOP.
include: level number, density (rhoz), pressure (pz), temperature (tz), potential temperature (thetaz) and height (zz)

iv. ARM_0003_basic_state_zt1.txt (basic state in theta levels)
time averaged profile data during the period of ARM 2000 03 IOP.
include: level number, density (rho), pressure (p), exponential function (pi), temperature(t), potential temperature (theta) ,water vapor mixing ratio (qv) and height (zt).

Figures of observation to evaluate models results

1)time series : from fig 1 to fig 8., sample program: time_plot.ncl
data source:
sgp3hIOPsndgBasedV3.4_ConstrVarAnaX1.c1.20000301.000000.cdf
from http://iop.archive.arm.gov/arm-iop/0eval-data/xie/scm-forcing/iop_at_sgp/200003/

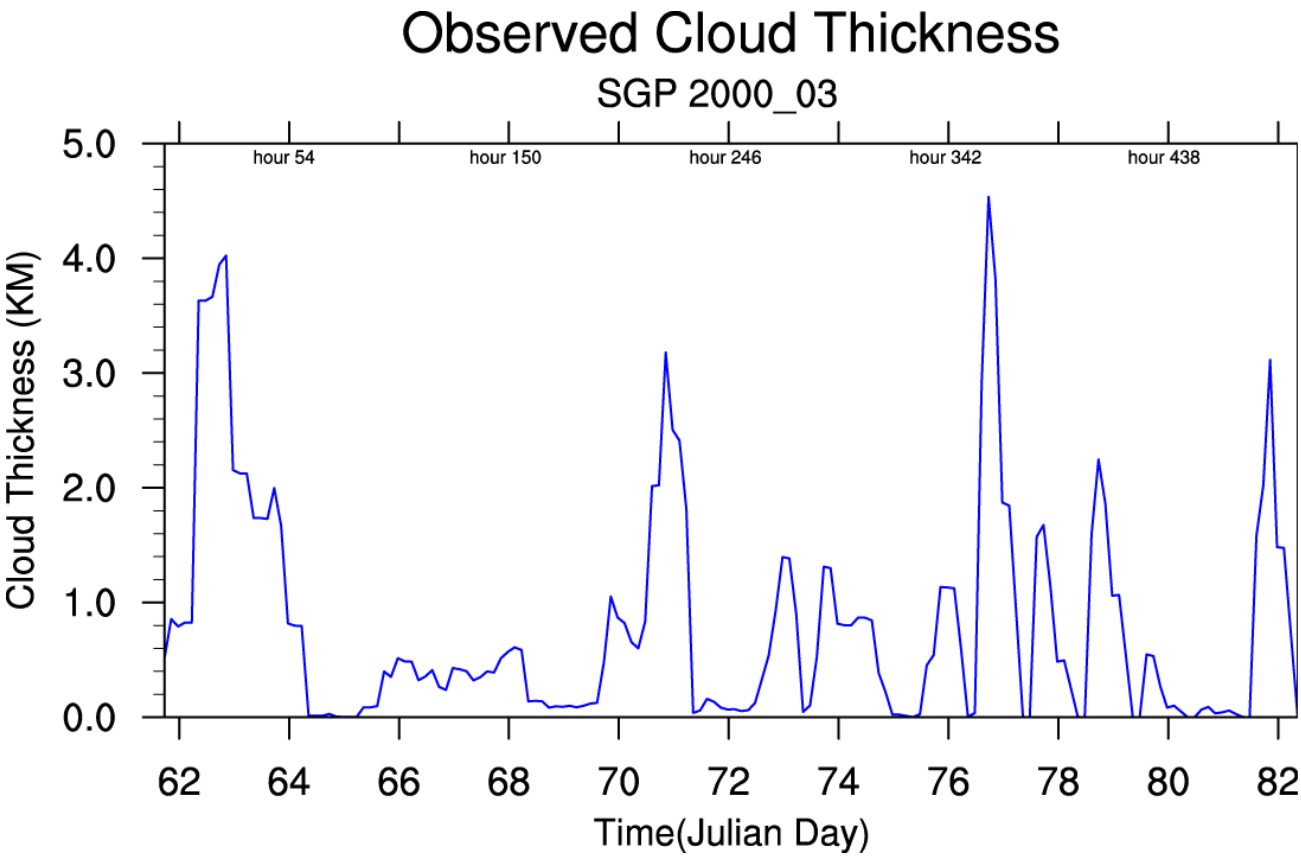


Fig 1. Time series of observed cloud thickness during the March 2000 IOP.

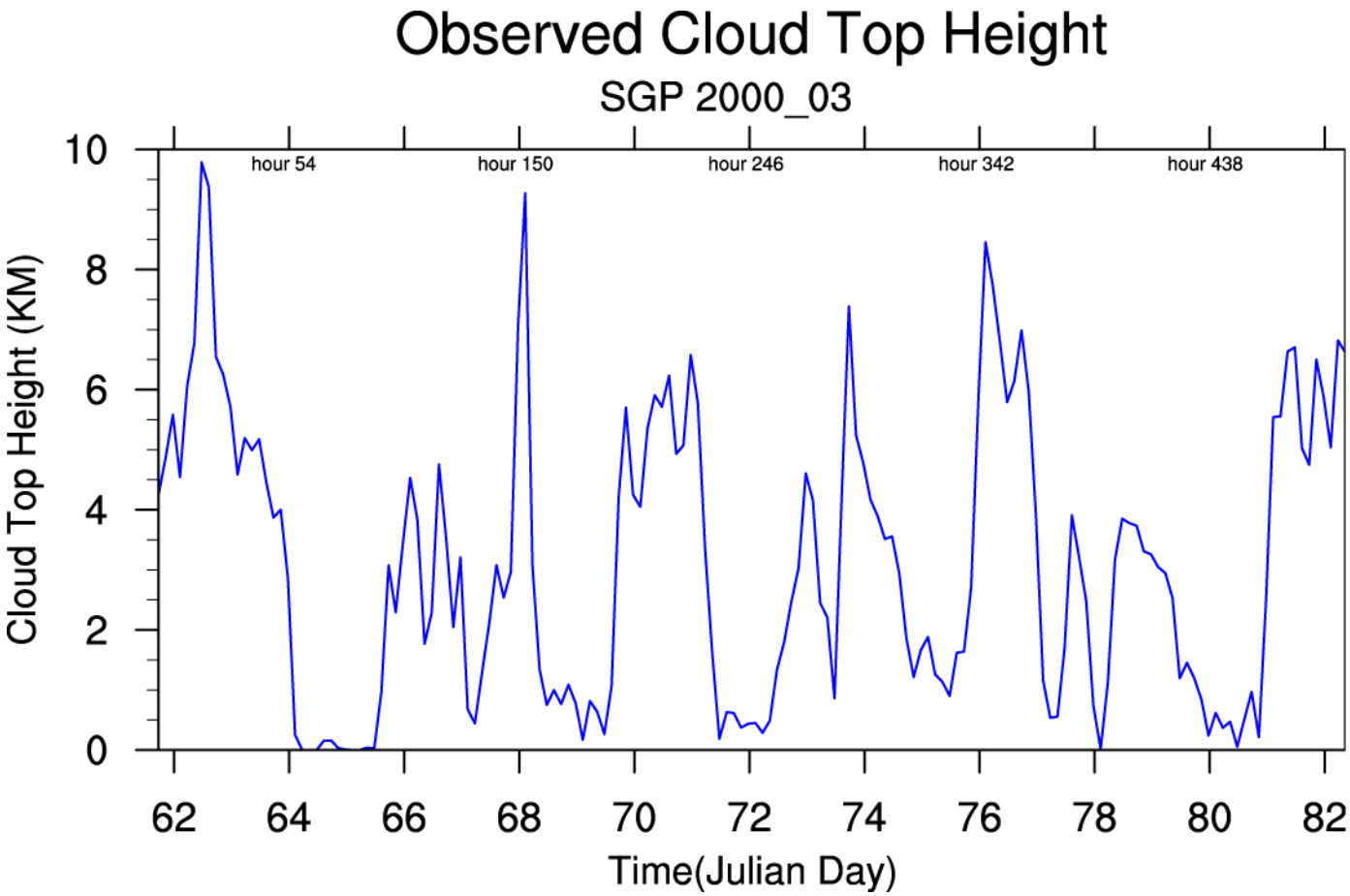


Fig 2. Time series of observed Cloud top height during the March 2000 IOP.

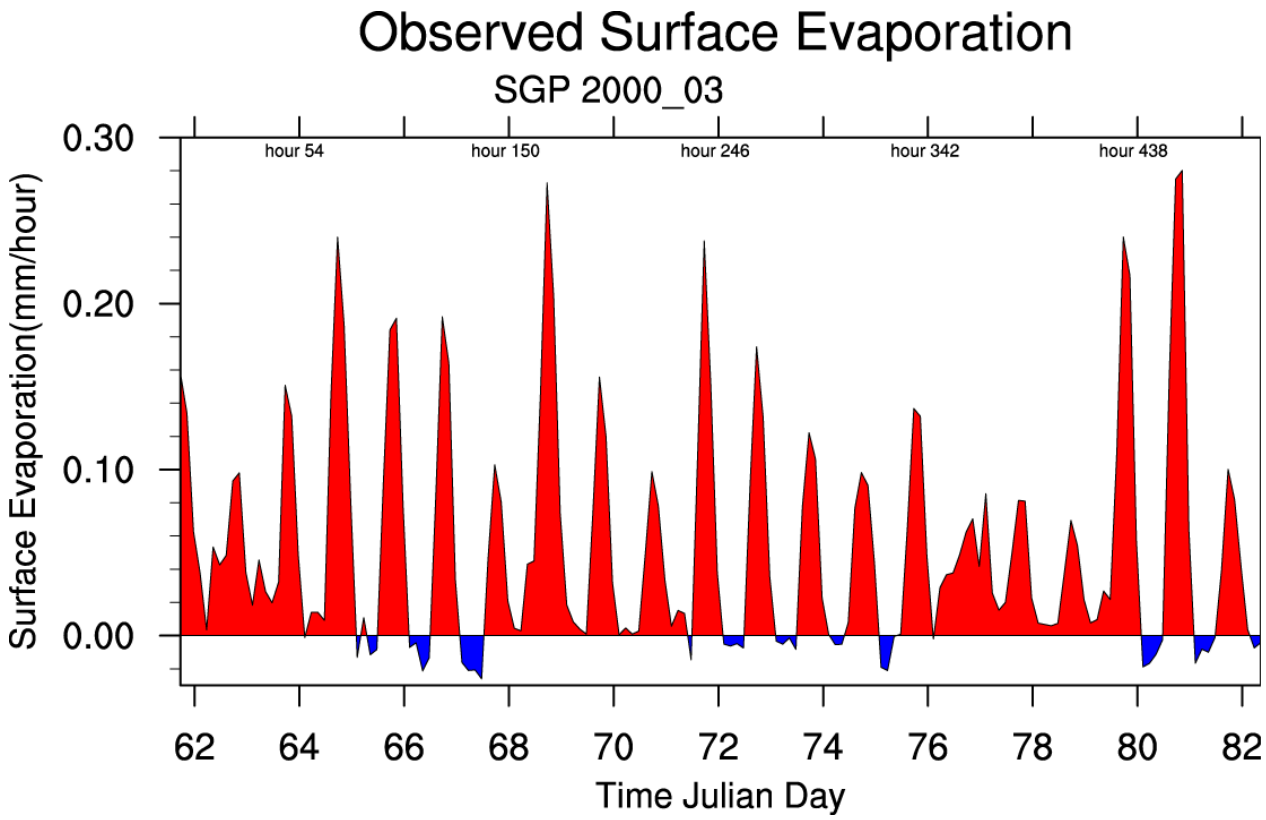


Fig 3. Time series of observed Surface evaporation rate during the March 2000 IOP.

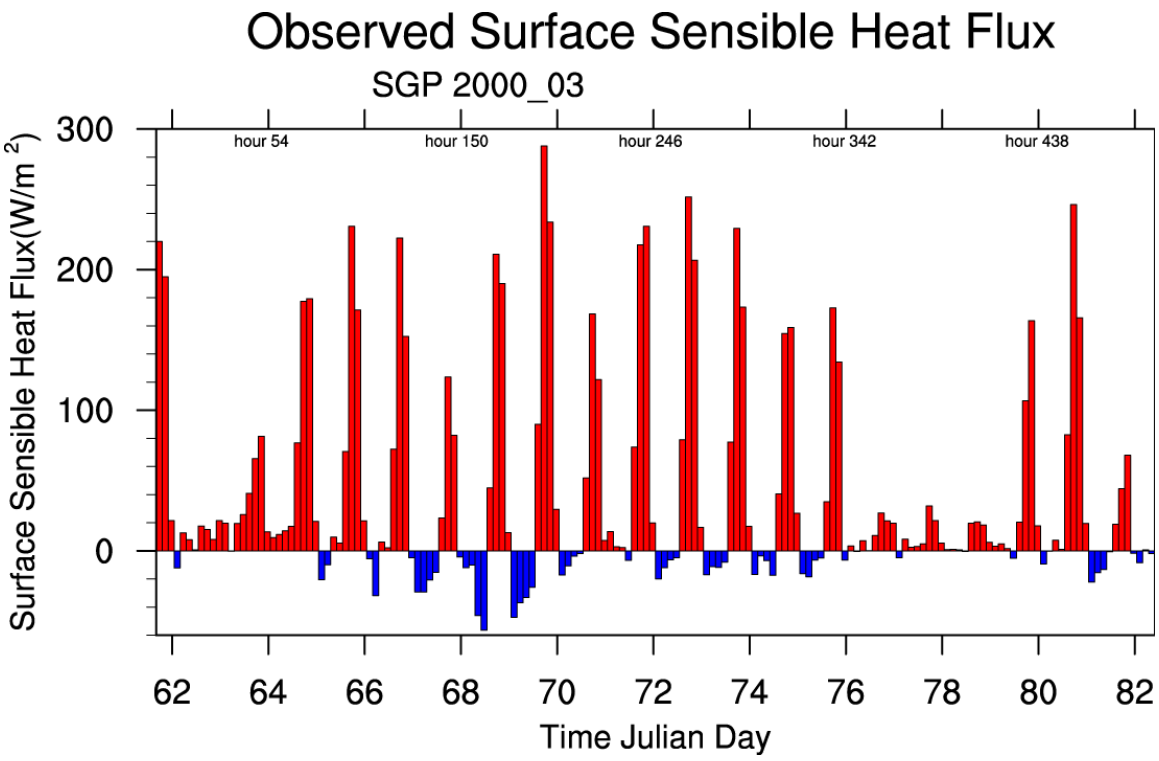


Fig 4. Time series of Surface sensible heat flux during the March 2000 IOP.

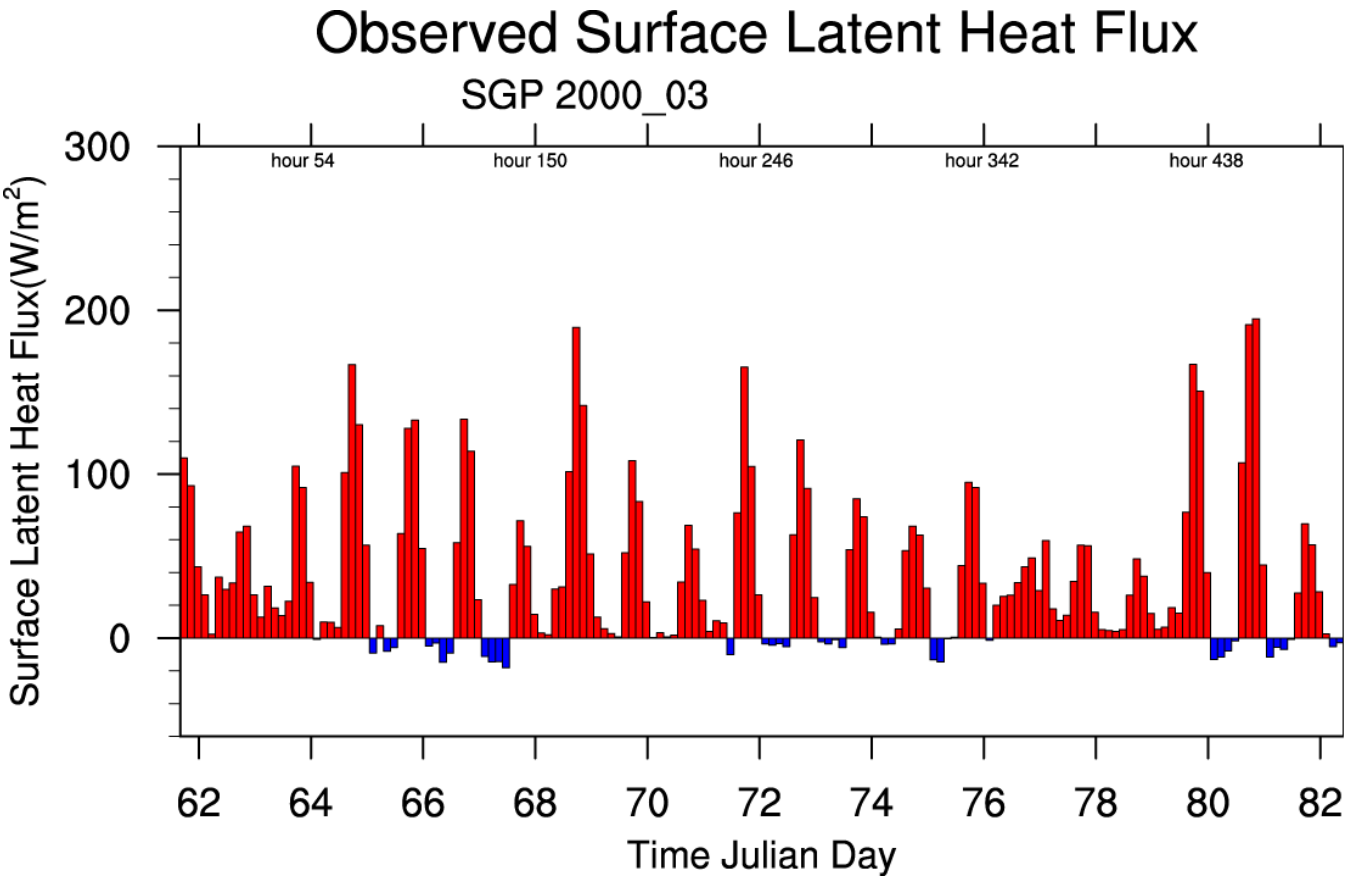


Fig 5. Time series of observed Surface latent heat during the March 2000 IOP.

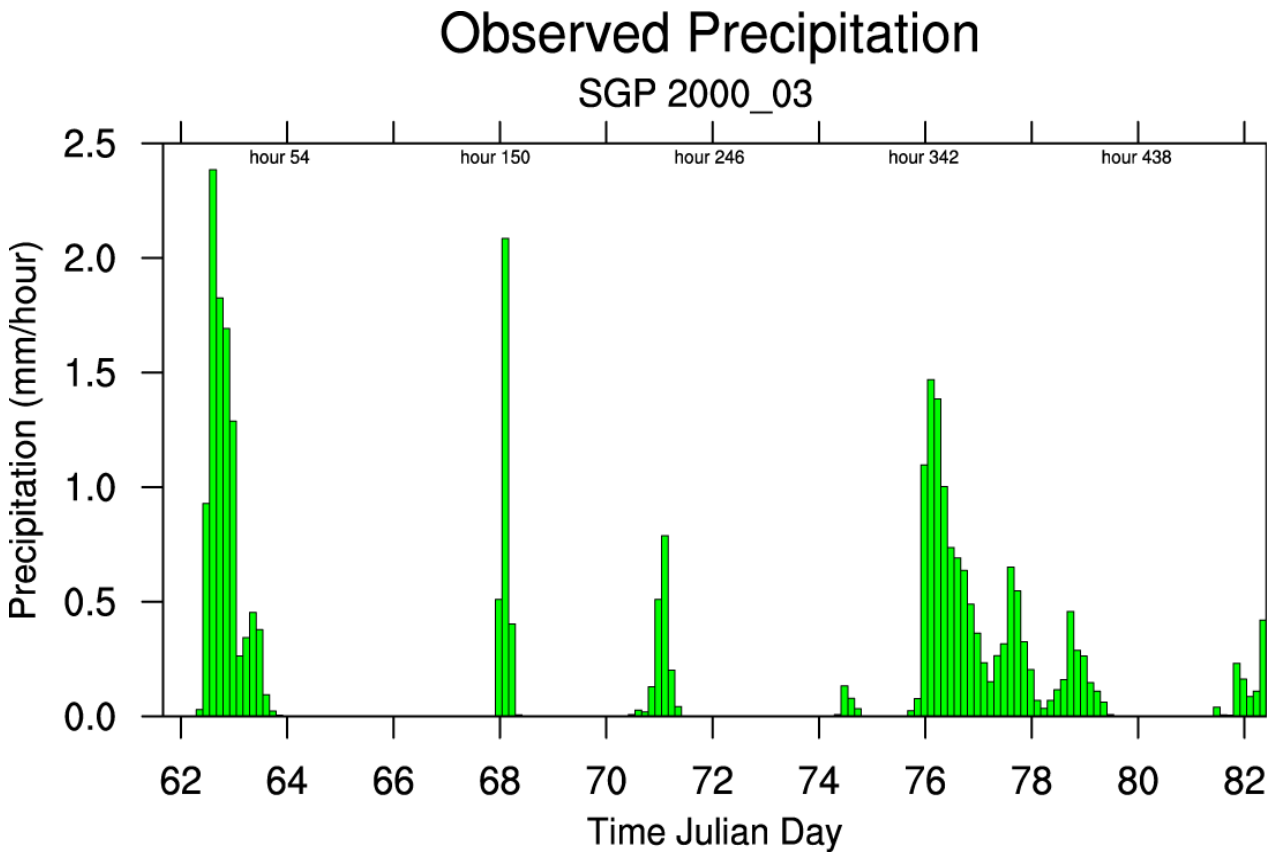


Fig 6. Time series of observed surface precipitation rate during the March 2000 IOP.

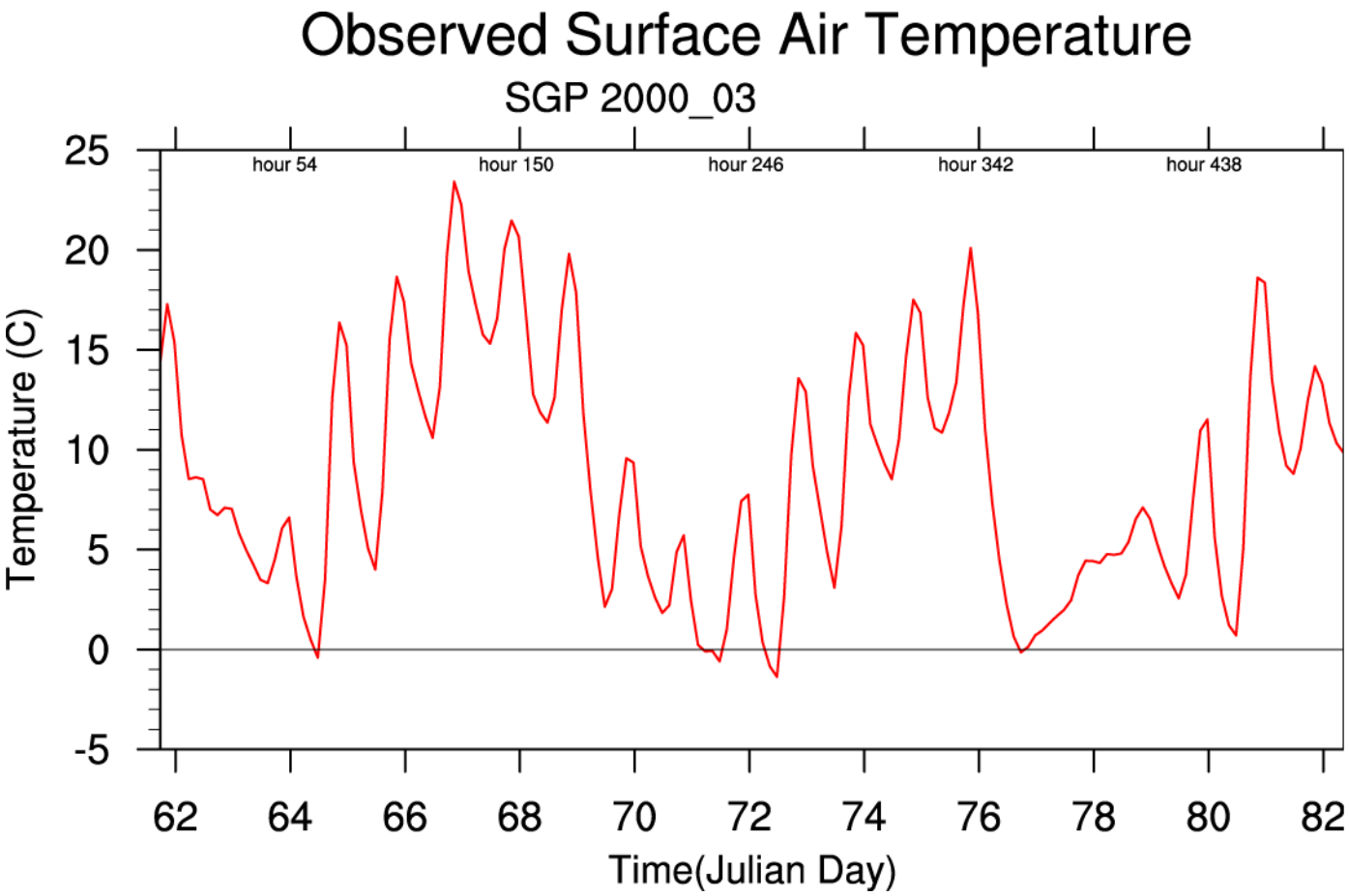


Fig 7. Time series of observed surface air temperature during the March 2000 IOP.

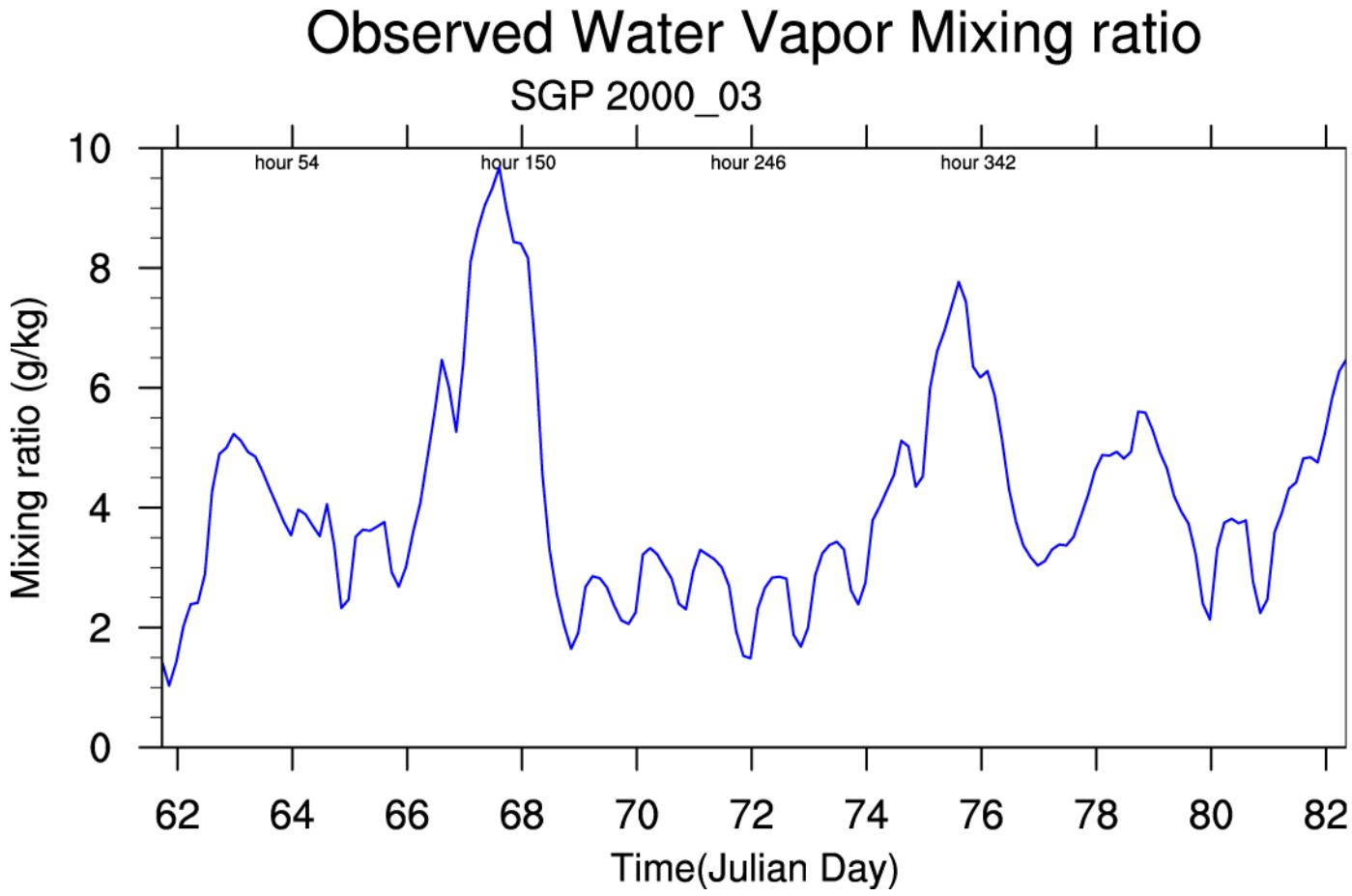


Fig 8. Time series of observed surface water vapor mixing ratio during the March 2000 IOP.

2)Time-height cross-section of cloud fraction :Fig 9, sample program: cld.ncl
data soure :
sgpcmbe-cldrad-v2p1C1.c1.20000101.000000.cdf
fro m http://iop.archive.arm.gov/arm-iop/ arm-iop/0showcase-data/cmbe/cmbe/sgpC1/ cmbe-cldrad/

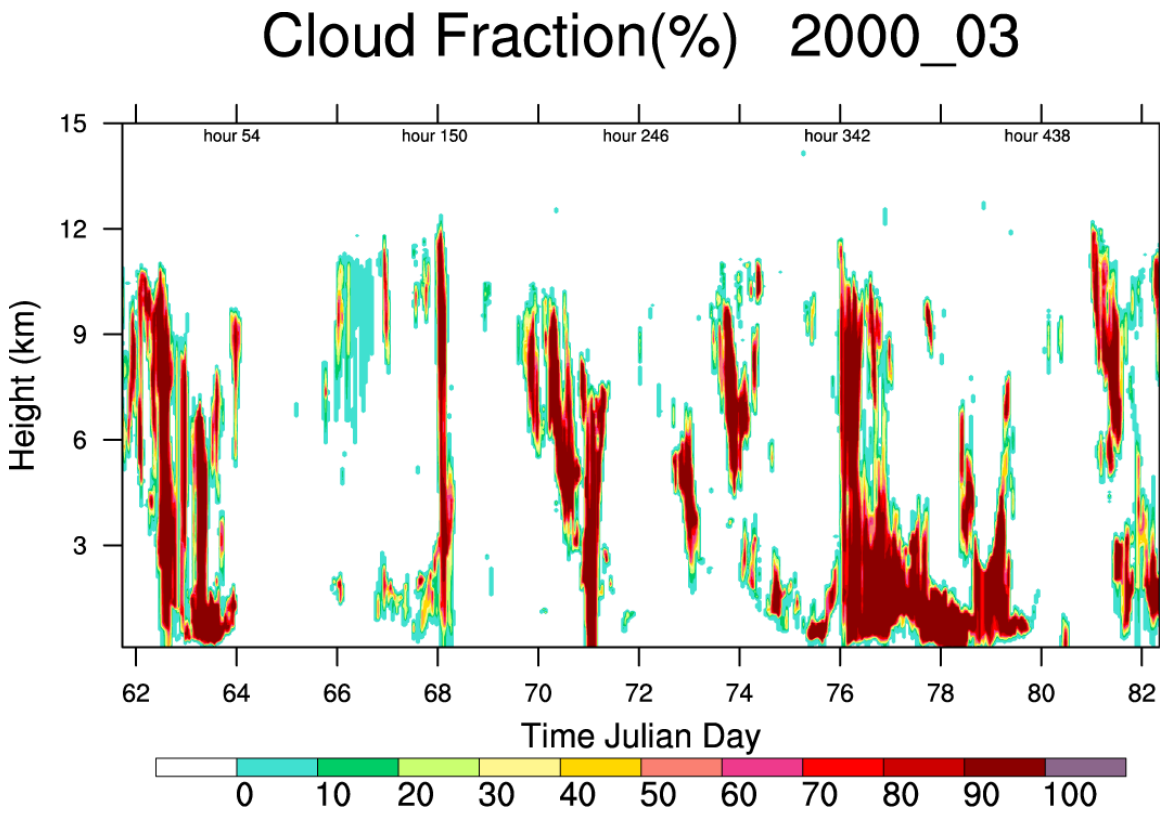


Fig 9 . Time-height cross-section of observed hourly mean Cloud Fraction based on Millimeter-wave Cloud Radars and Micropulse Lidars during the March 2000 IOP.

3)Vertical profiles: from Fig 10 to Fig 19
data: ARM_0003_interp_zz1.dat and ARM_0003_interp_zt1.dat
sample program: profi_t.pro
profi_w.pro
profi_q.pro
profi_lsf.pro
profi_u.pro

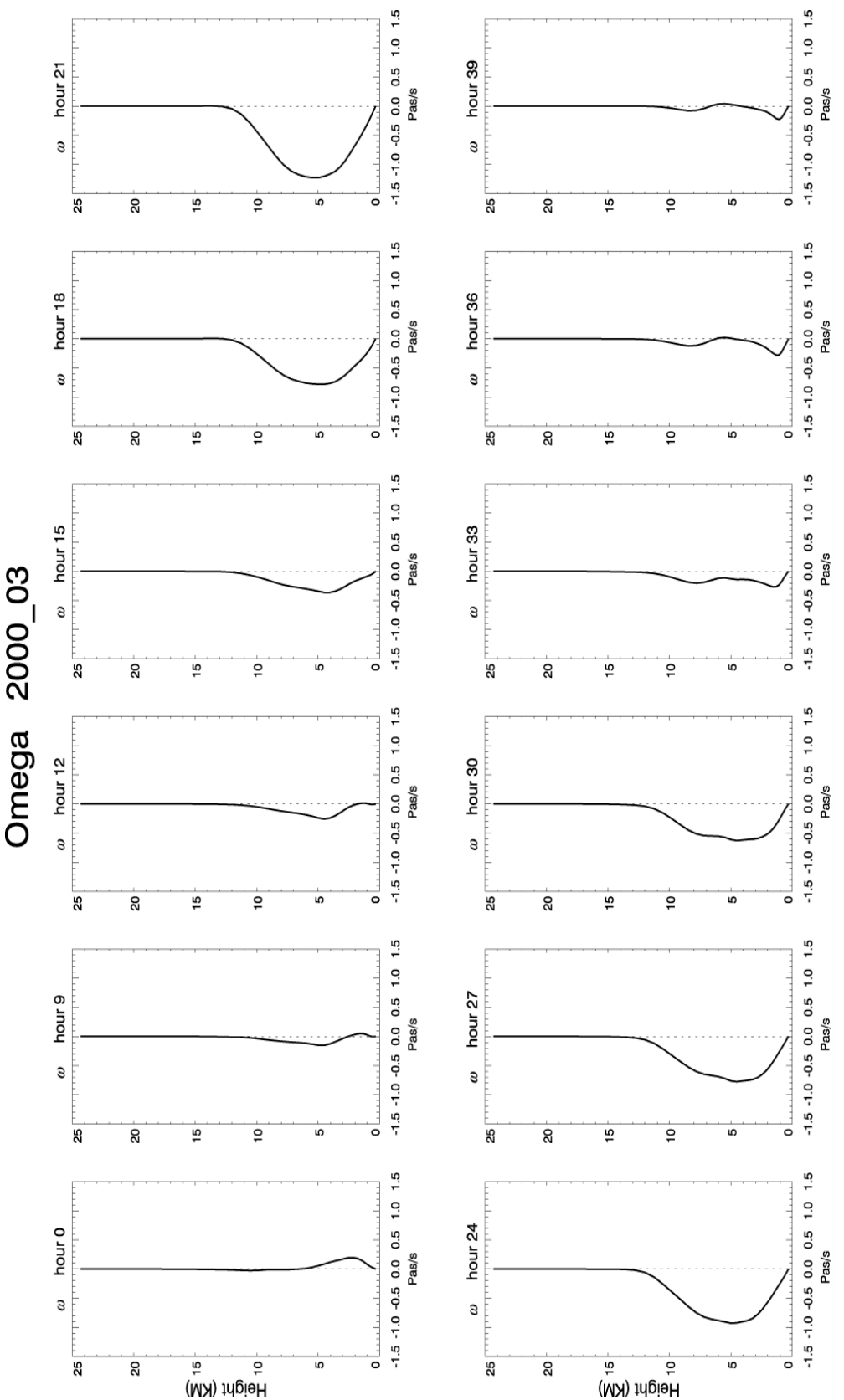


Fig10. Vertical profiles of observed omega at selected time during the March 2000 IOP.

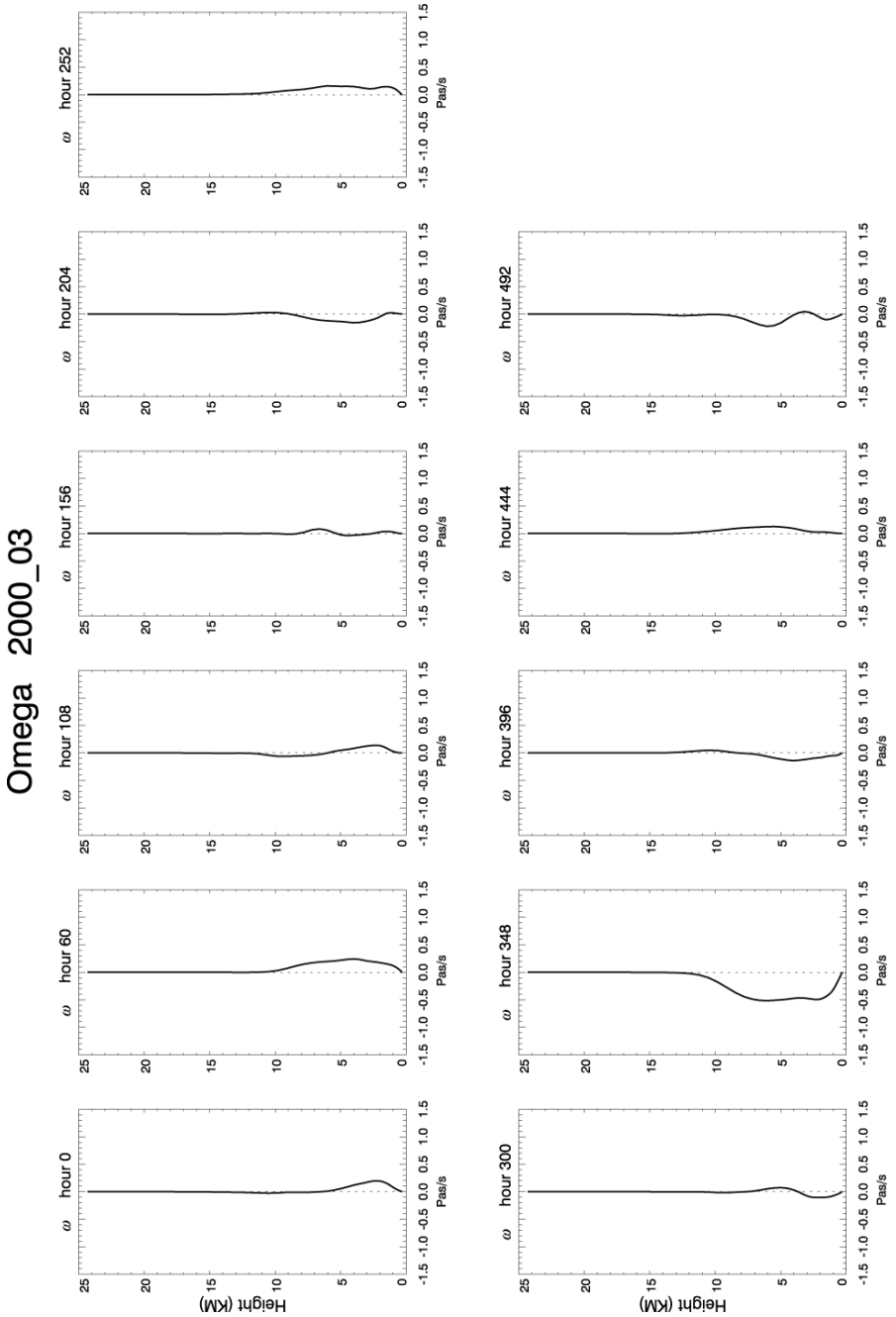
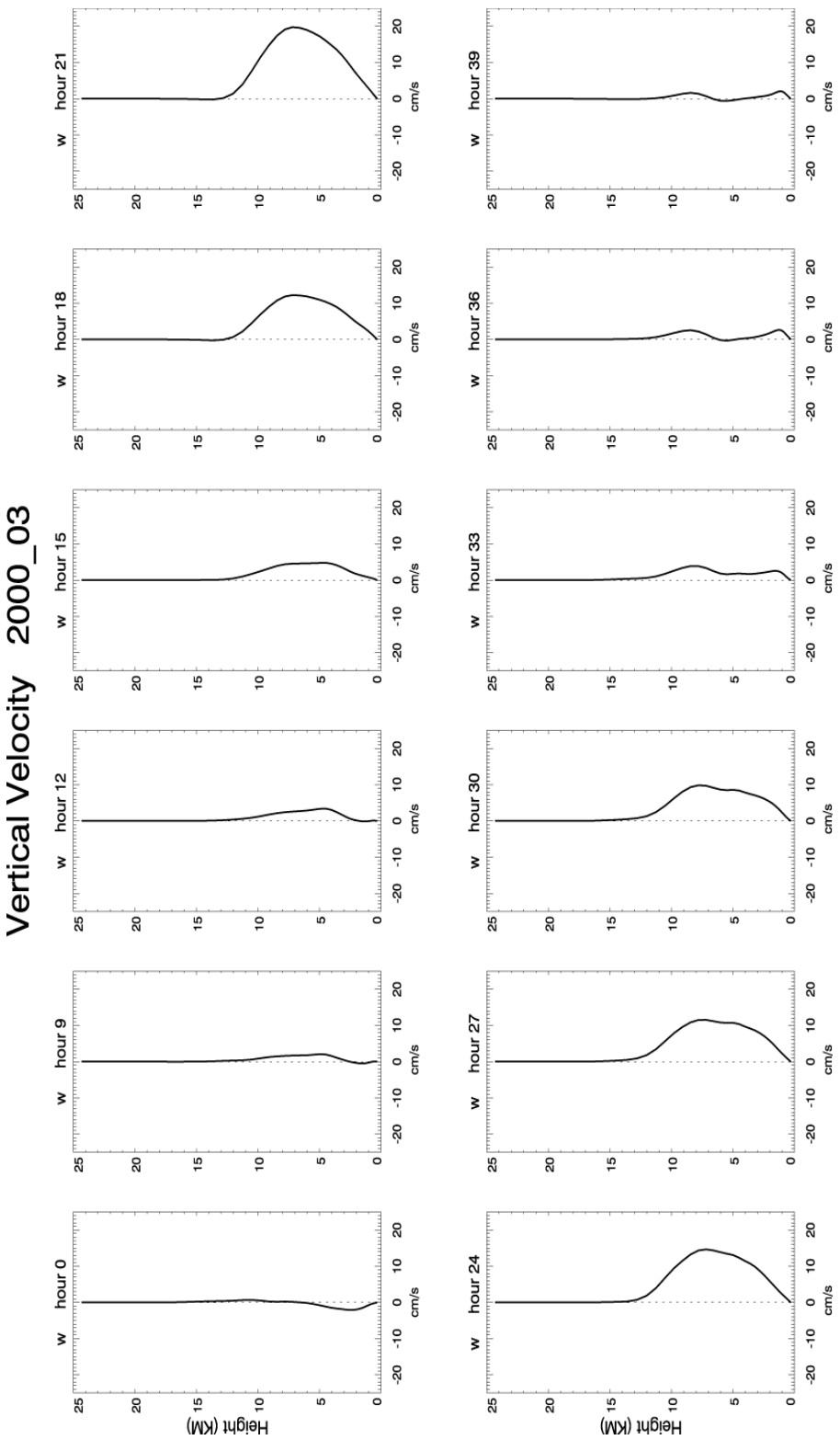


Fig. 10 Continued



F1g 11. Vertical profiles of observed vertical velocity at selected time during the March 2000 IOP.

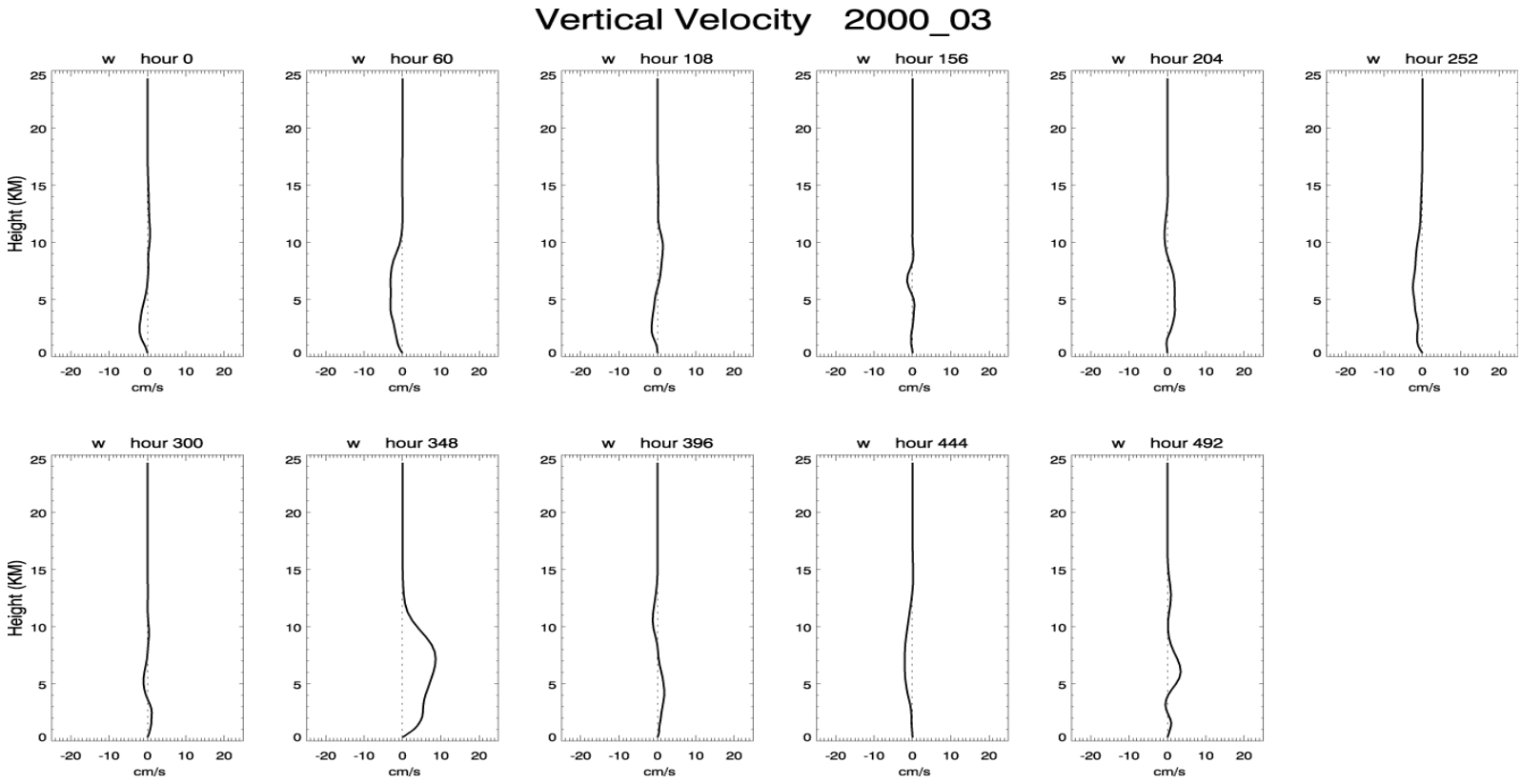


Fig 11. continue

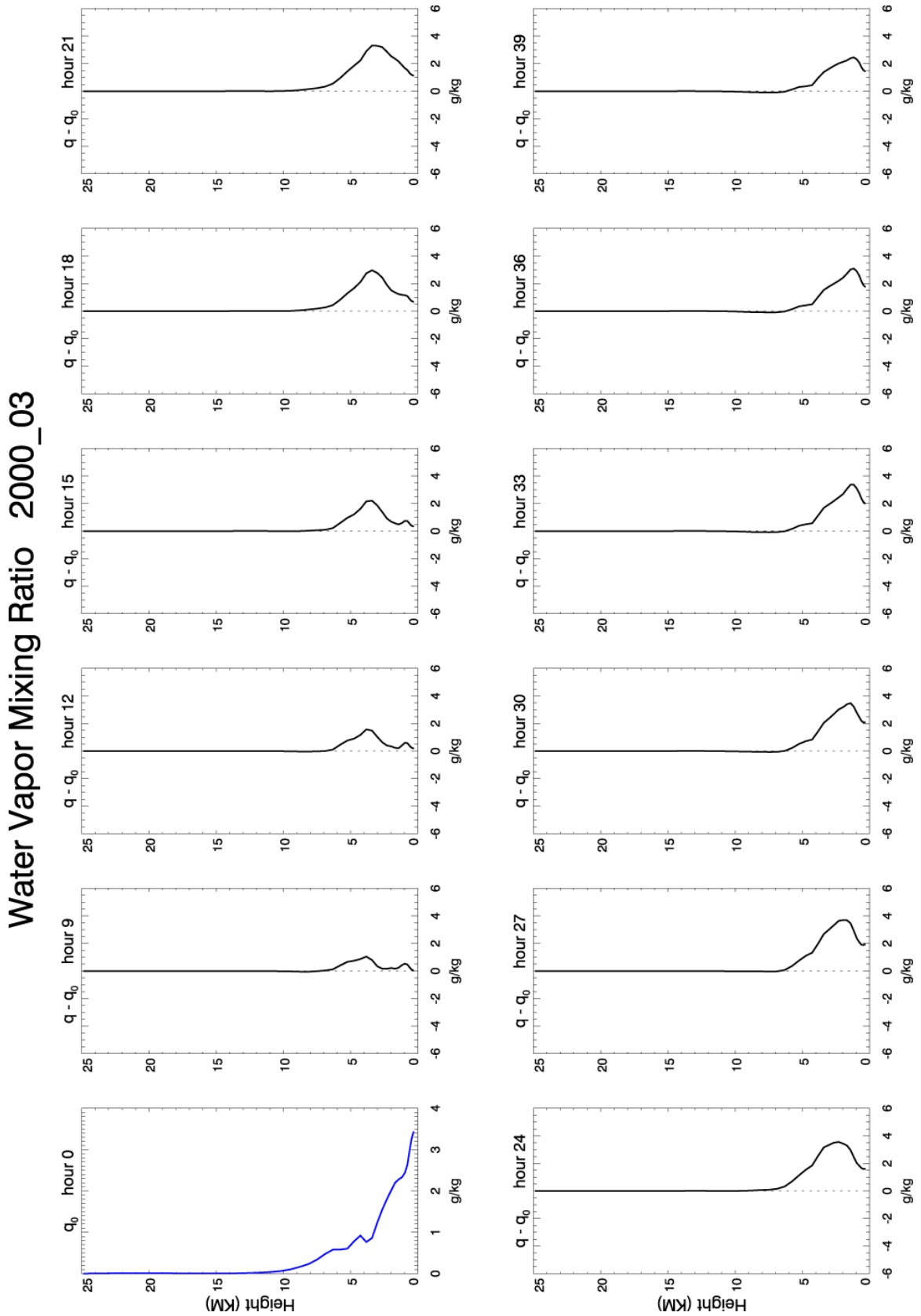


Fig 12. Vertical profiles of observed water vapor mixing ratio at selected time during the March 2000 IOP.

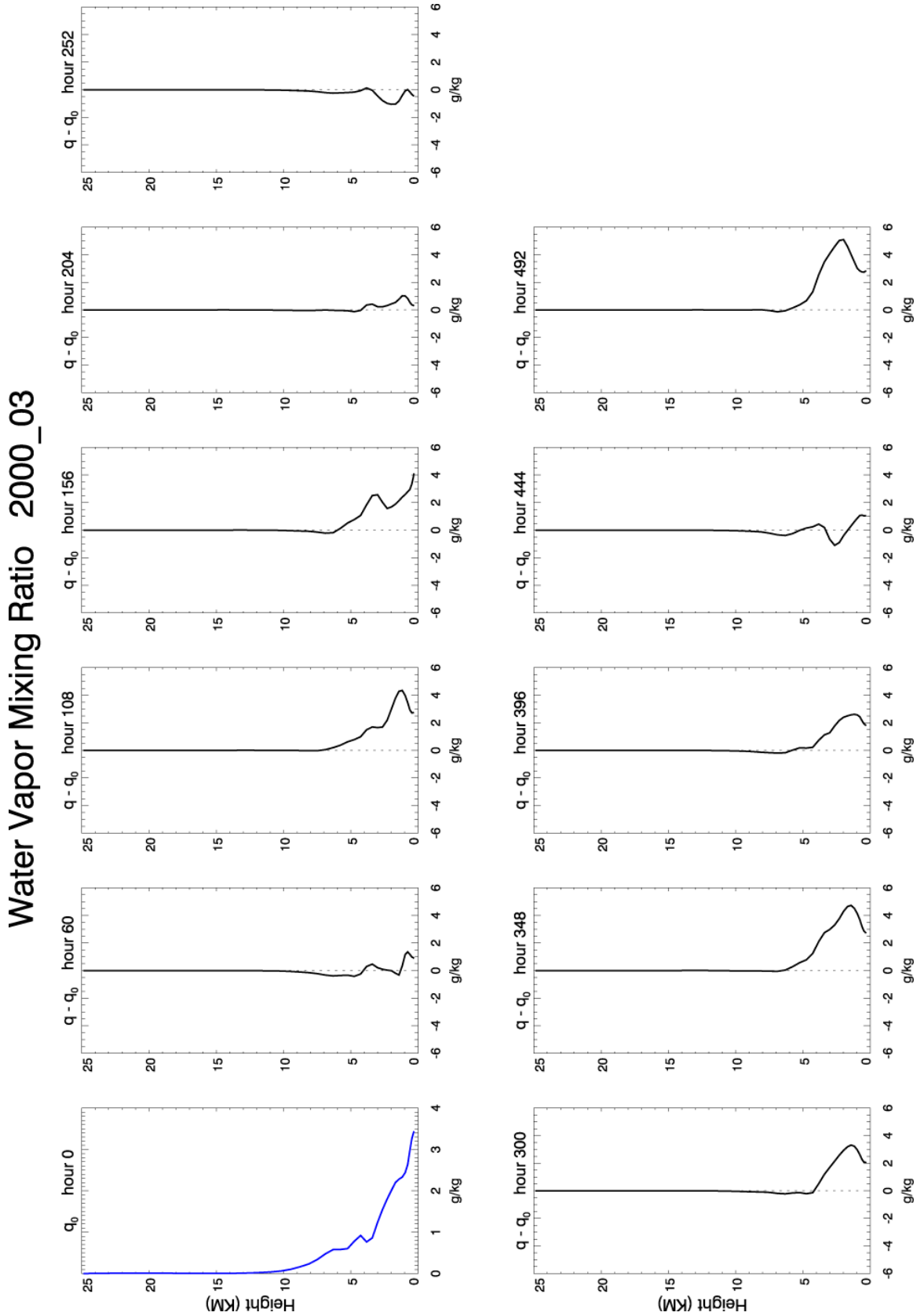


Fig 12. Continued

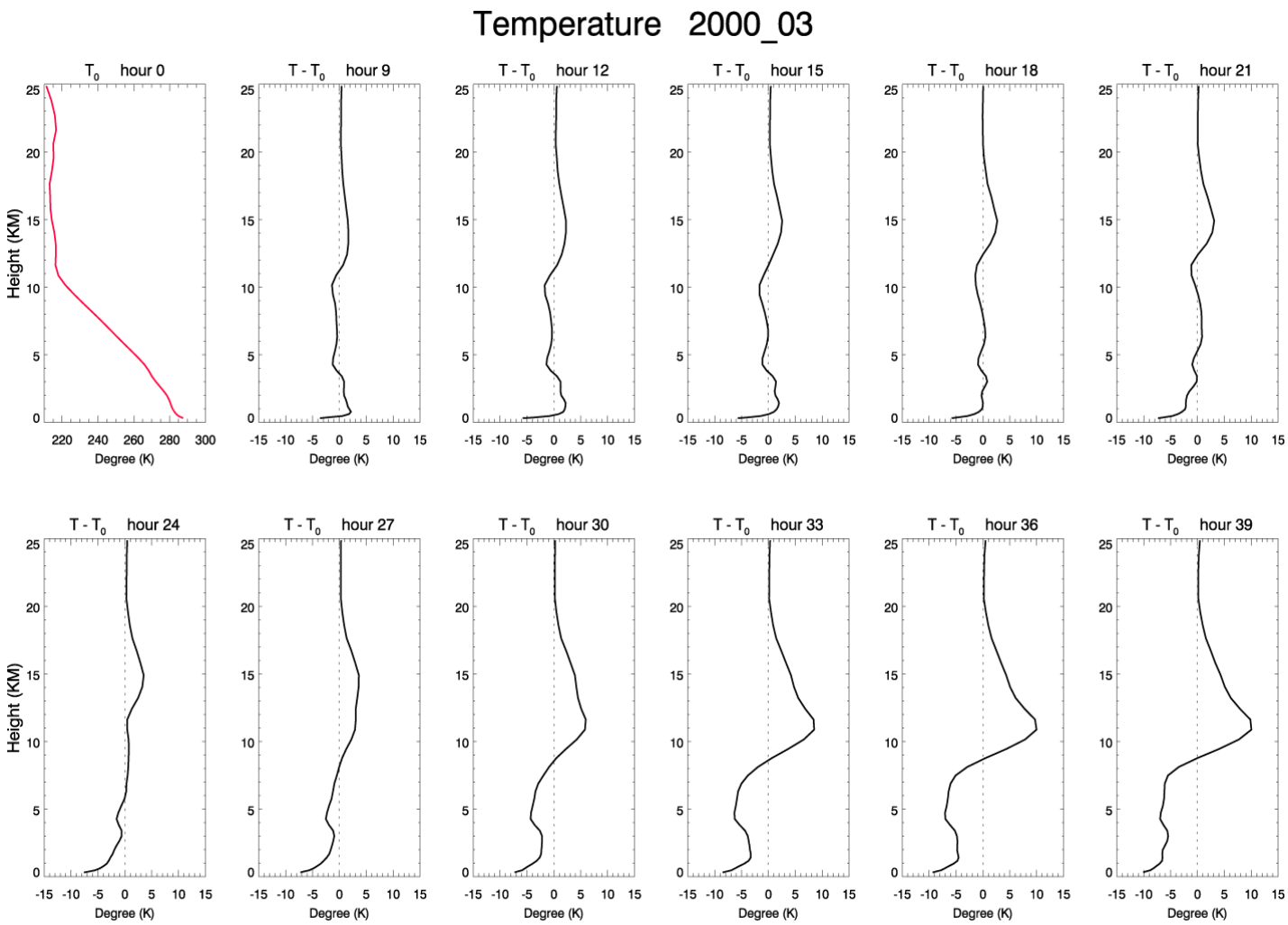


Fig 13. Vertical profiles of observed air temperature at selected time during the March 2000 IOP.

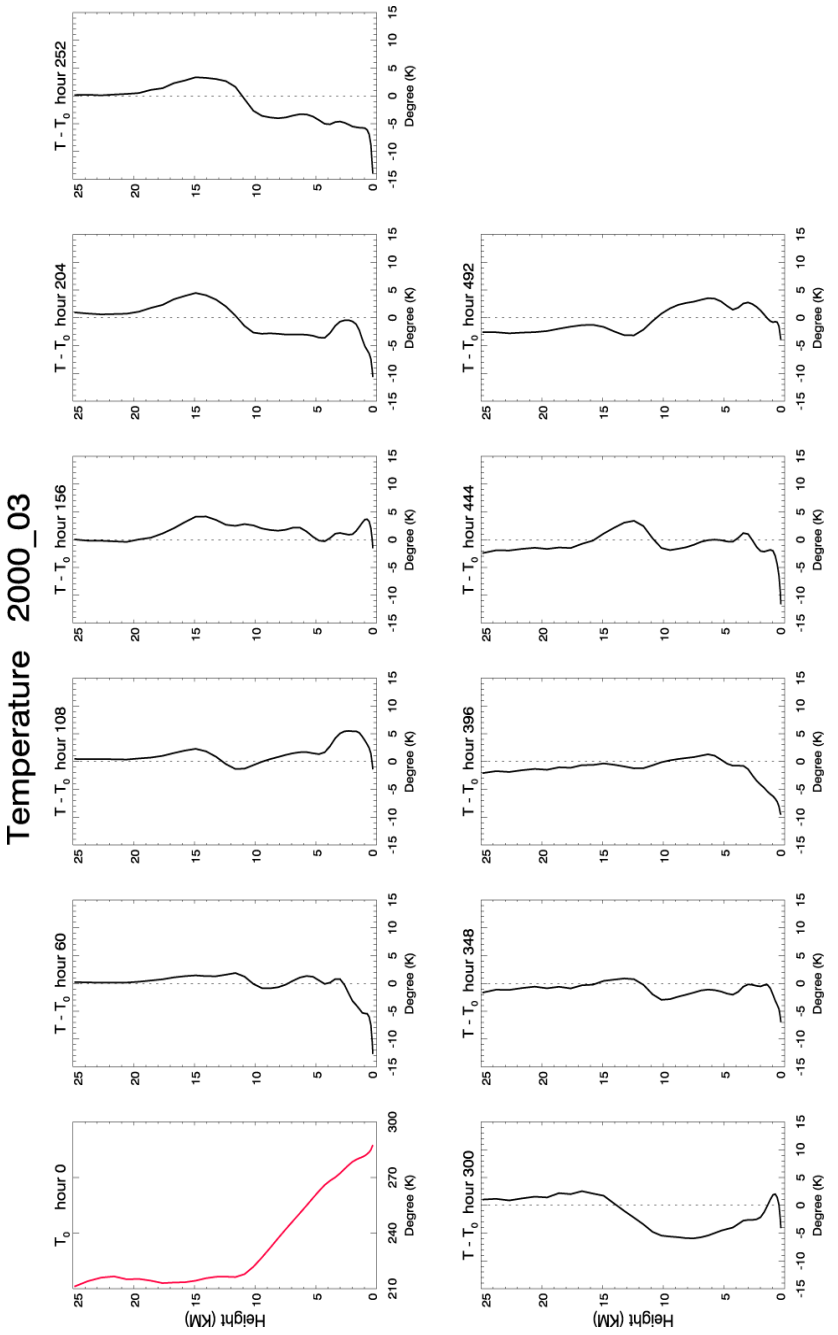


Fig 13. Continued

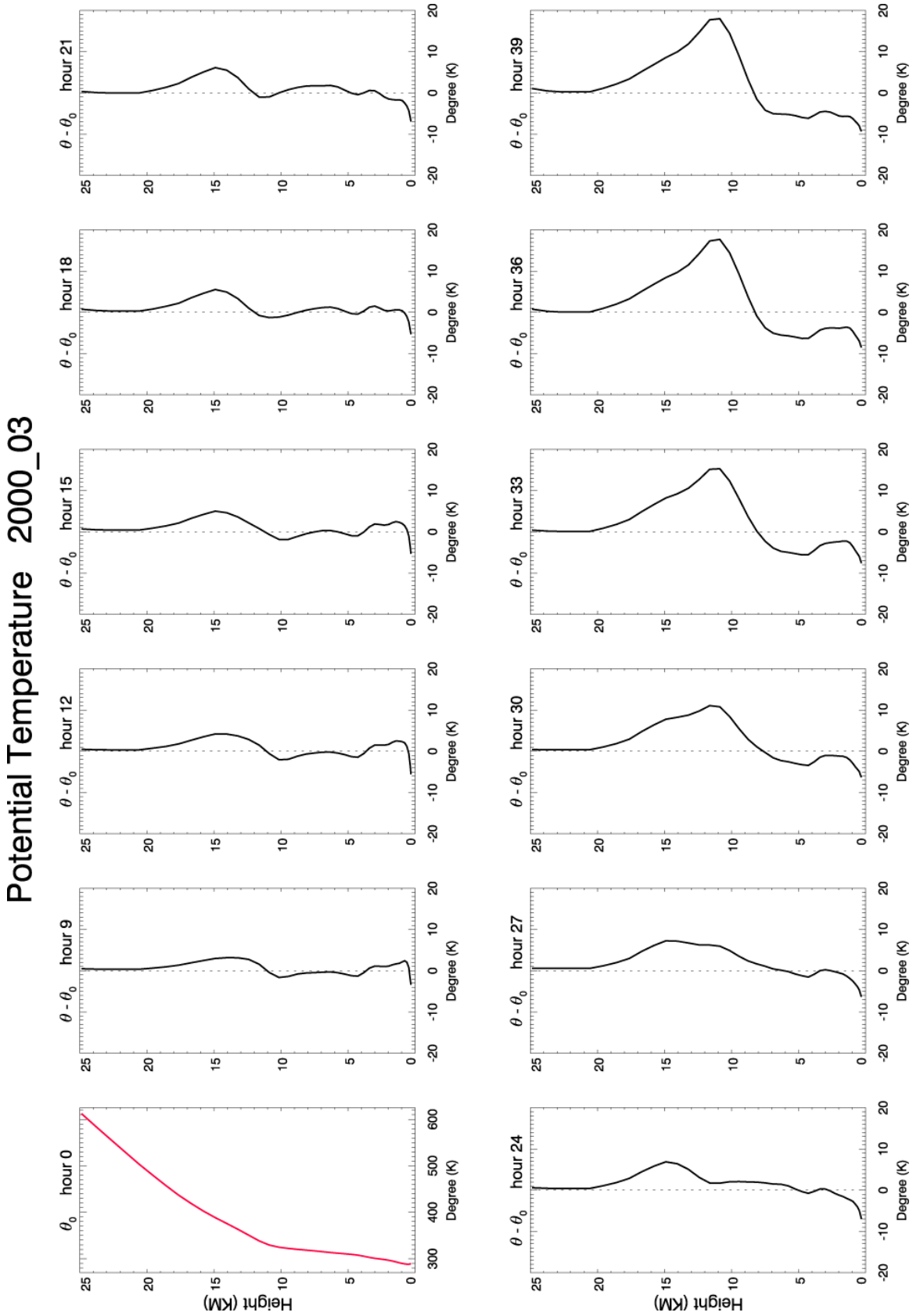


Fig 14. Vertical profiles of observed air potential temperature at selected time during the March 2000 IOP.

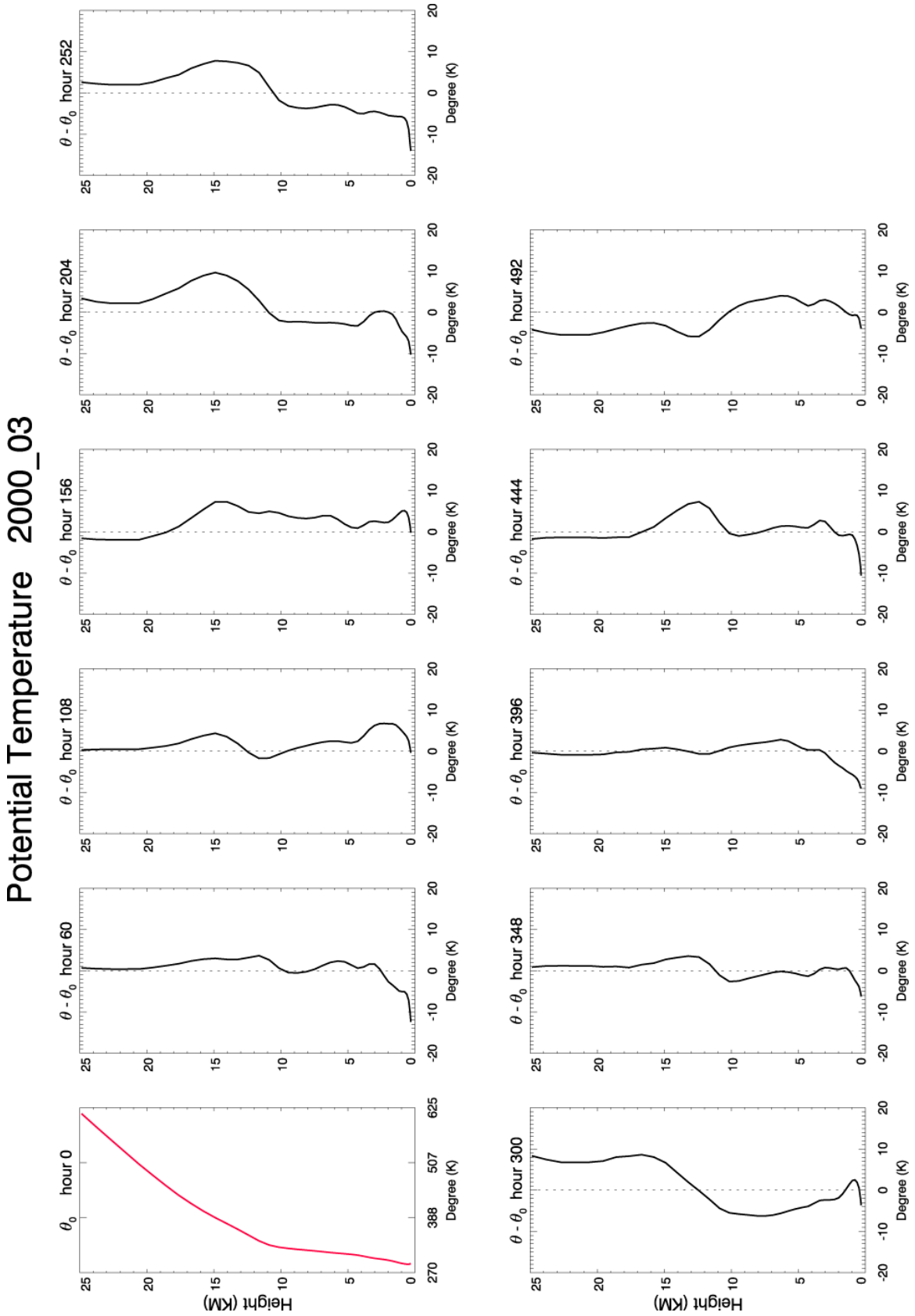


Fig 14. Continued

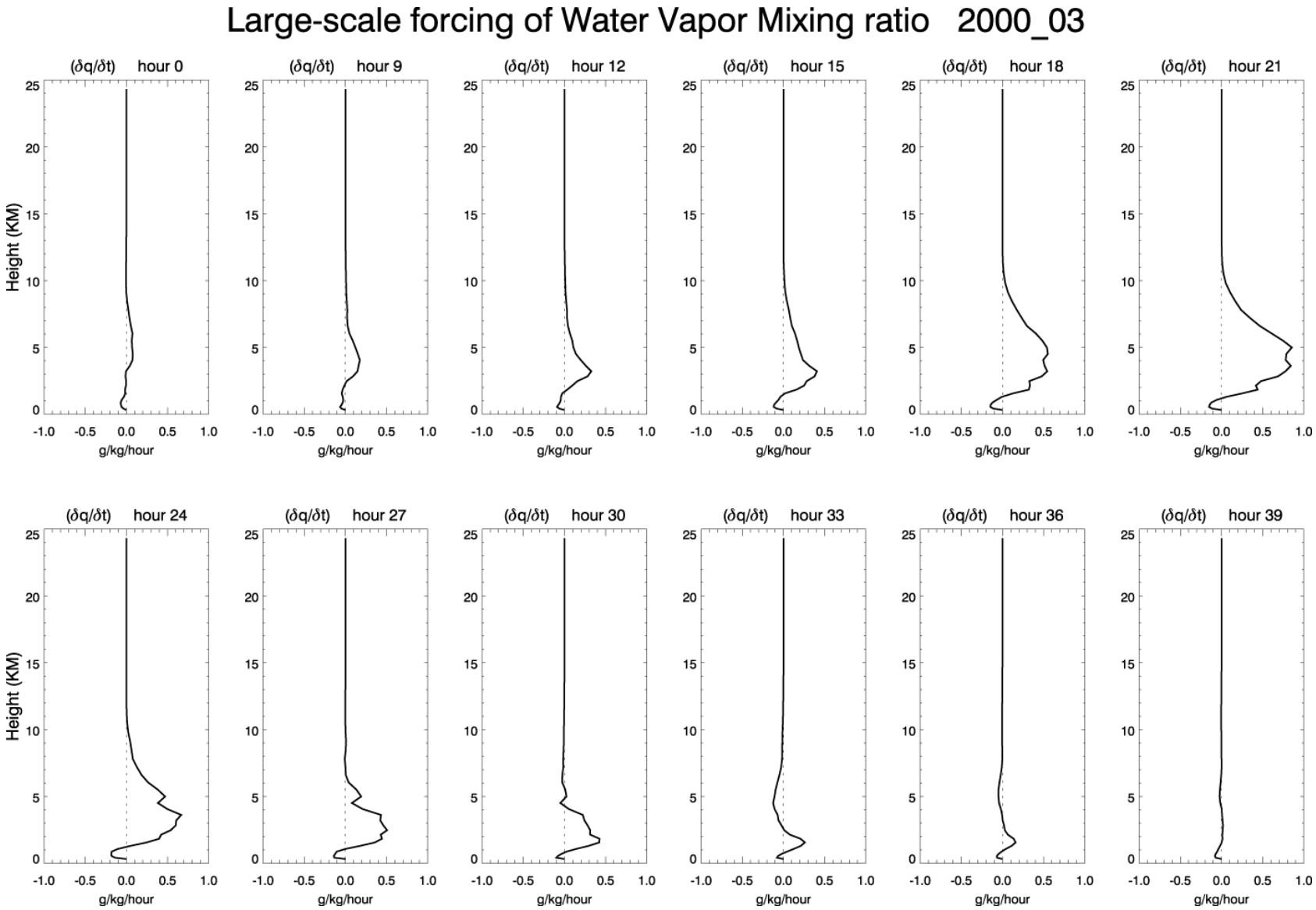


Fig 15. Vertical profiles of large-scale forcing of water vapor mixing ratio at selected time during the March 2000 IOP.

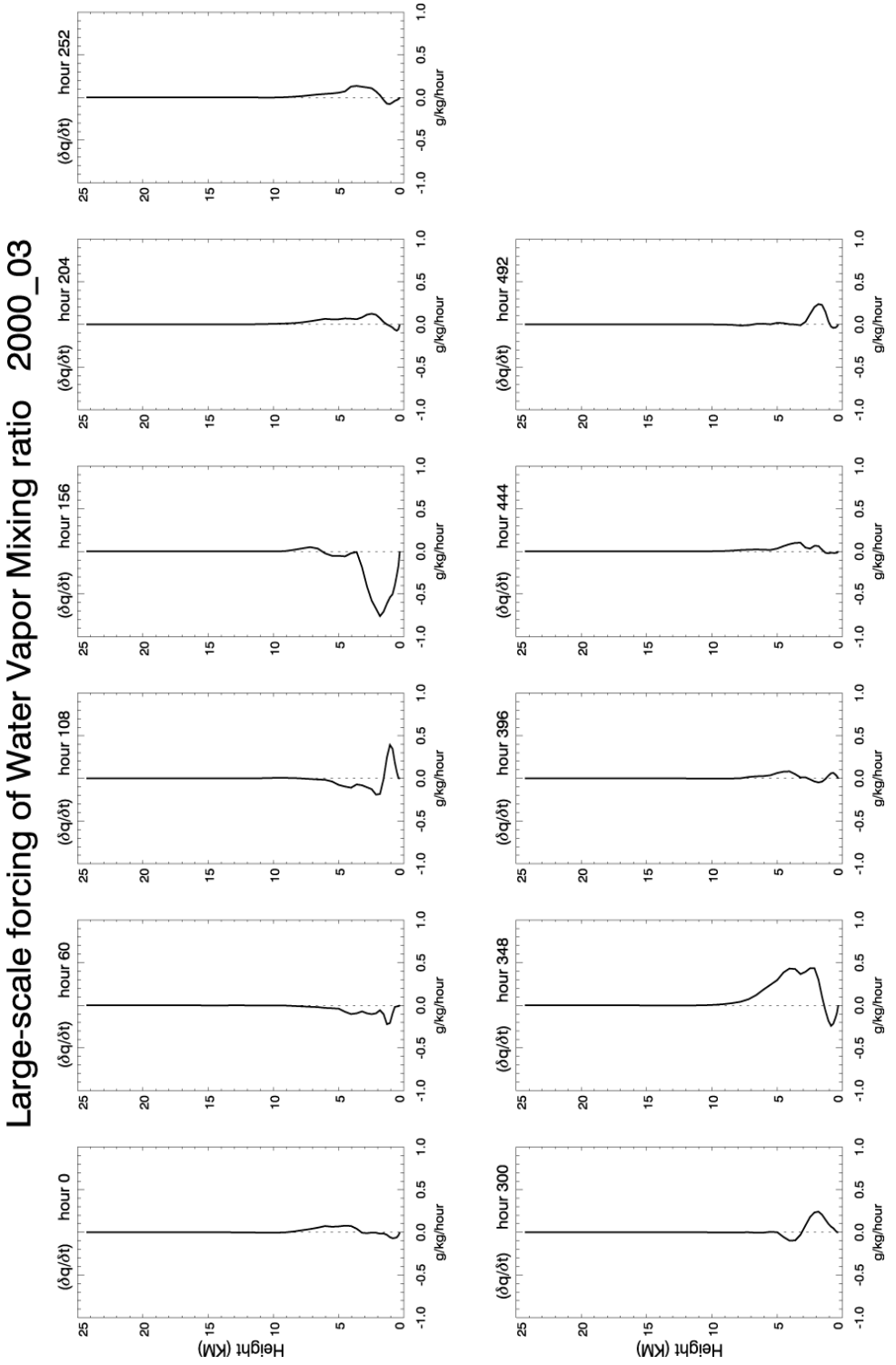


Fig 15. Continued

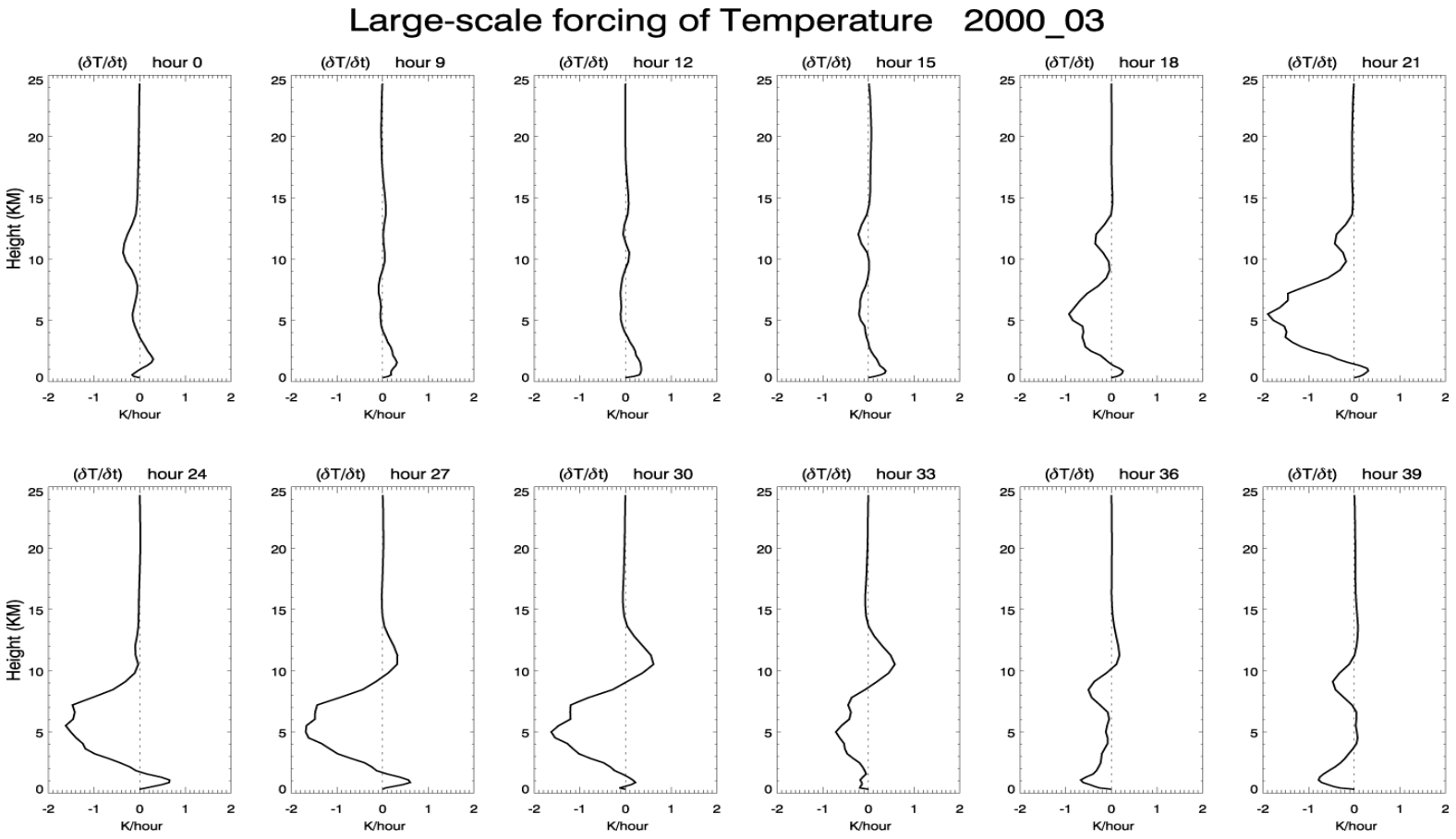


Fig 16. Vertical profiles of observed large scale forcing of temperature at selected time during the March 2000 IOP.

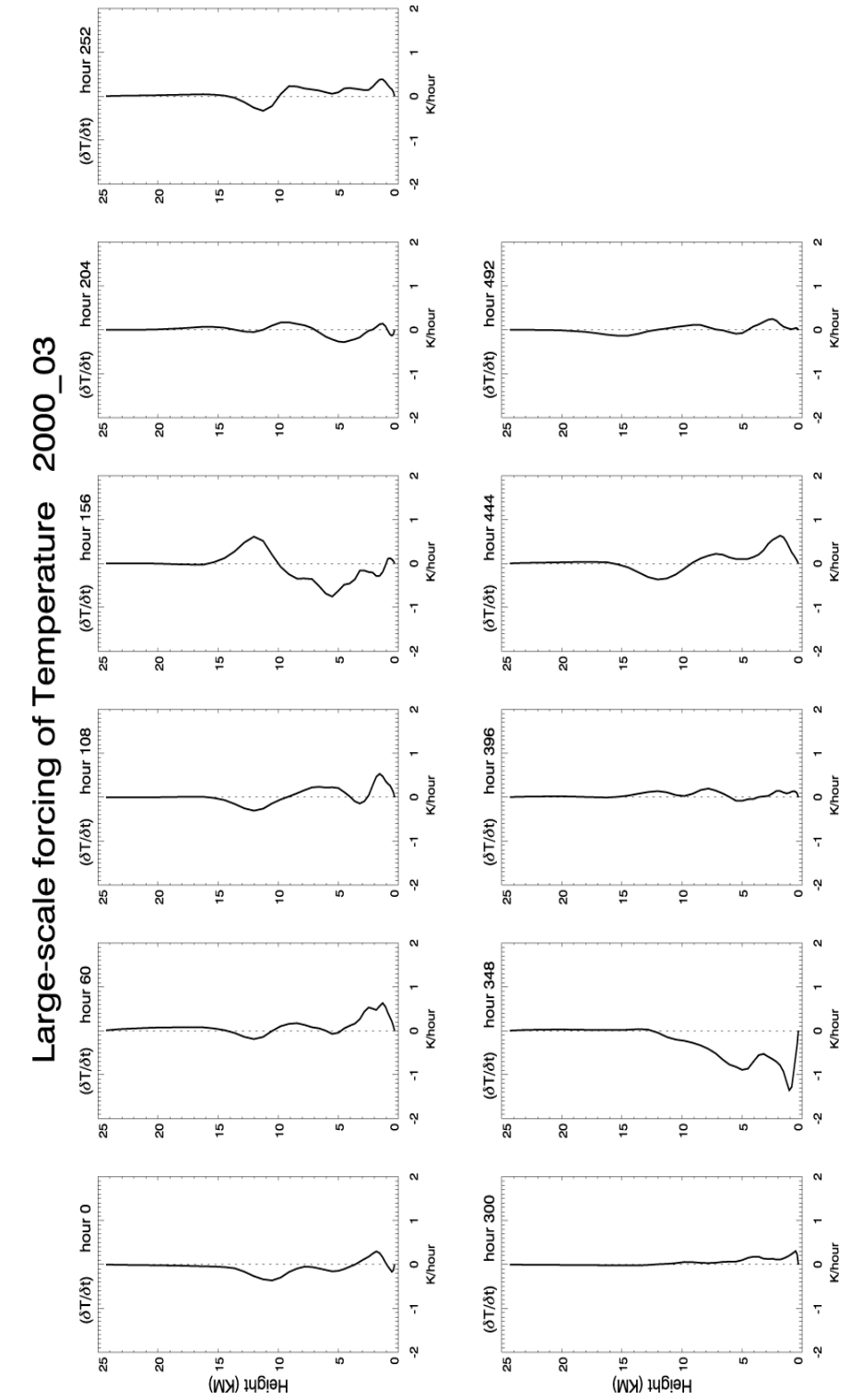


Fig 16. continue

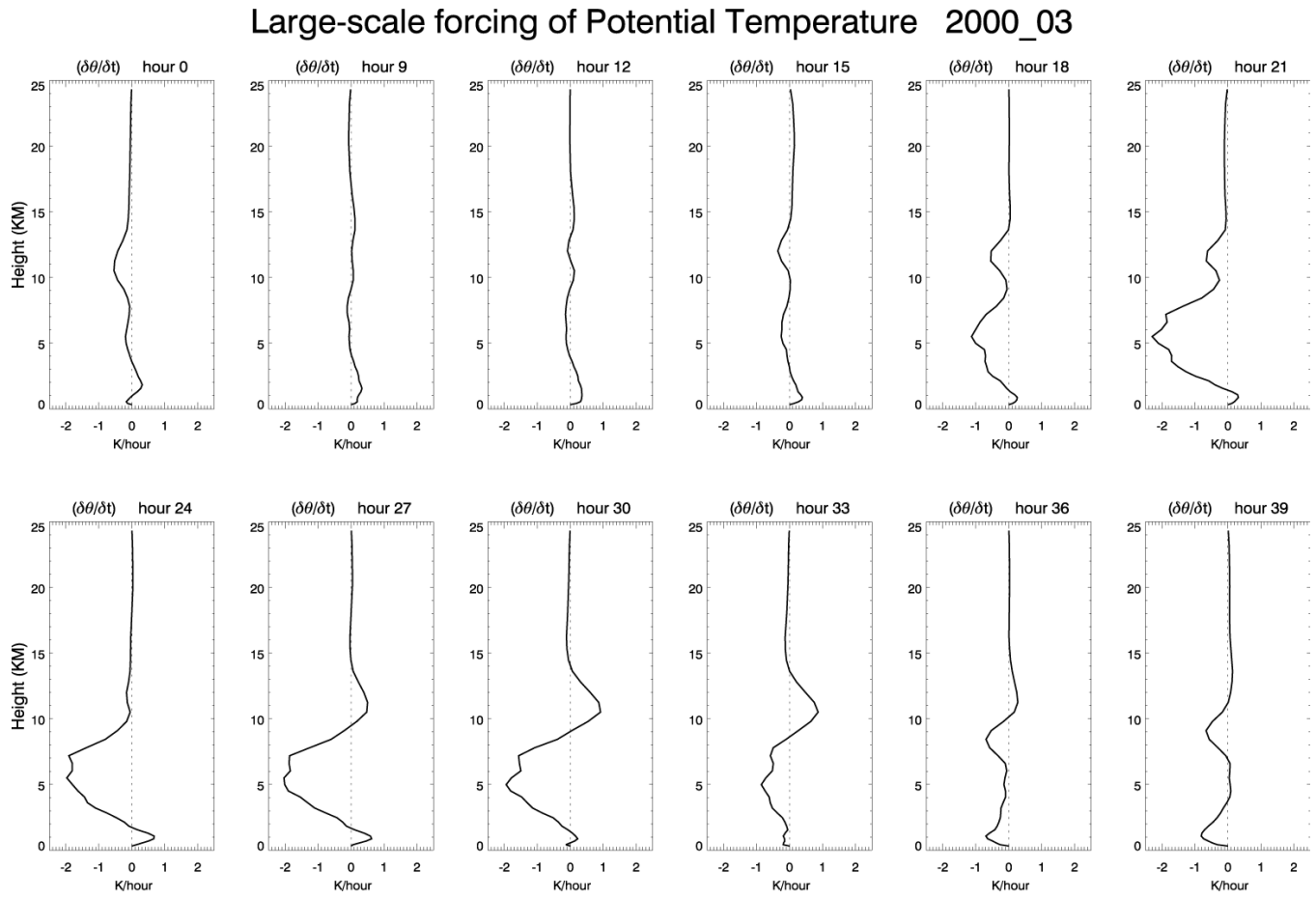


Fig 17. Vertical profiles of observed large scale forcing of potential temperature at selected time during the March 2000 IOP.

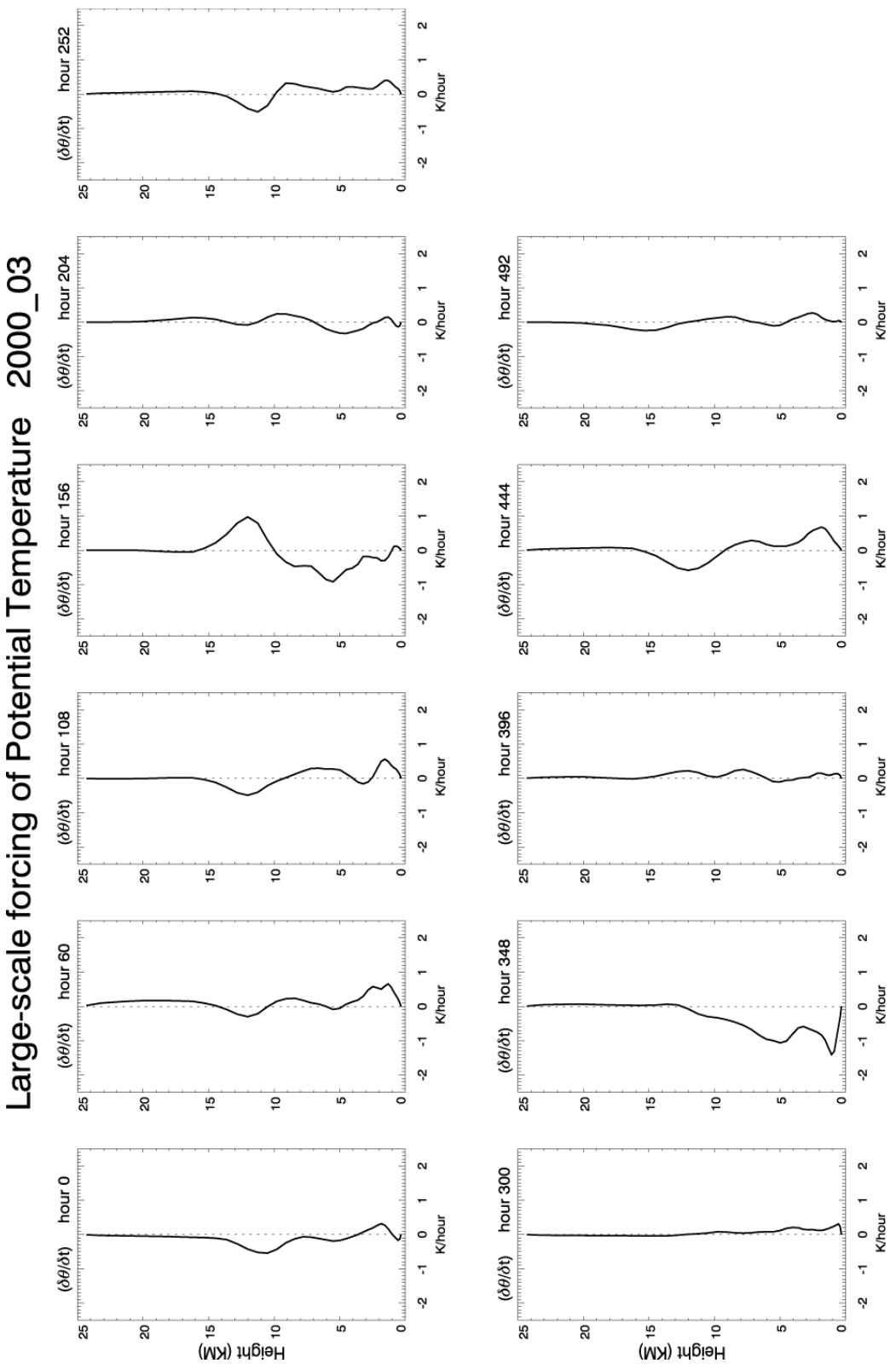


Fig 17. Continued

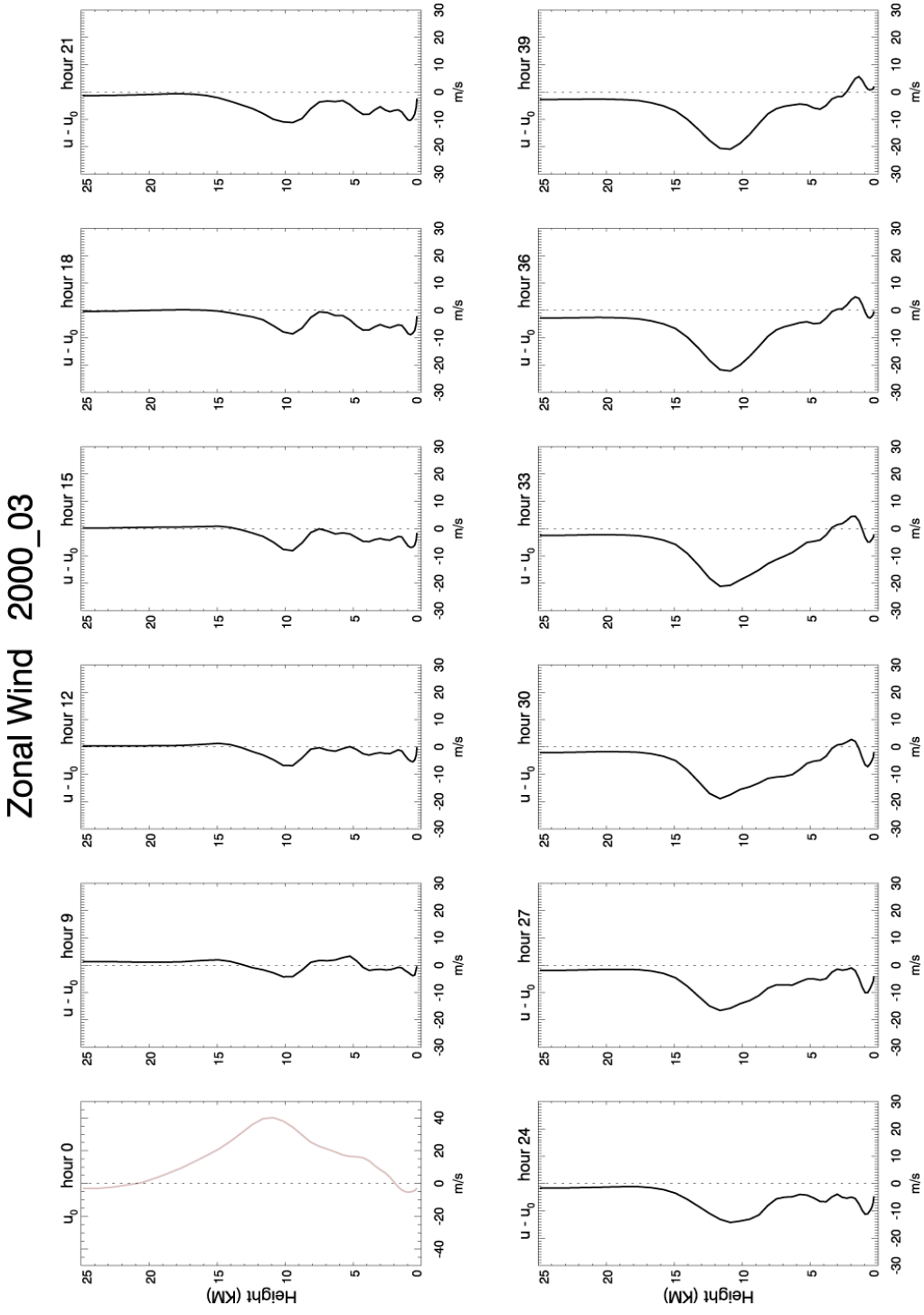


Fig 18. Vertical profiles of observed zonal wind at selected time during the March 2000 IOP.

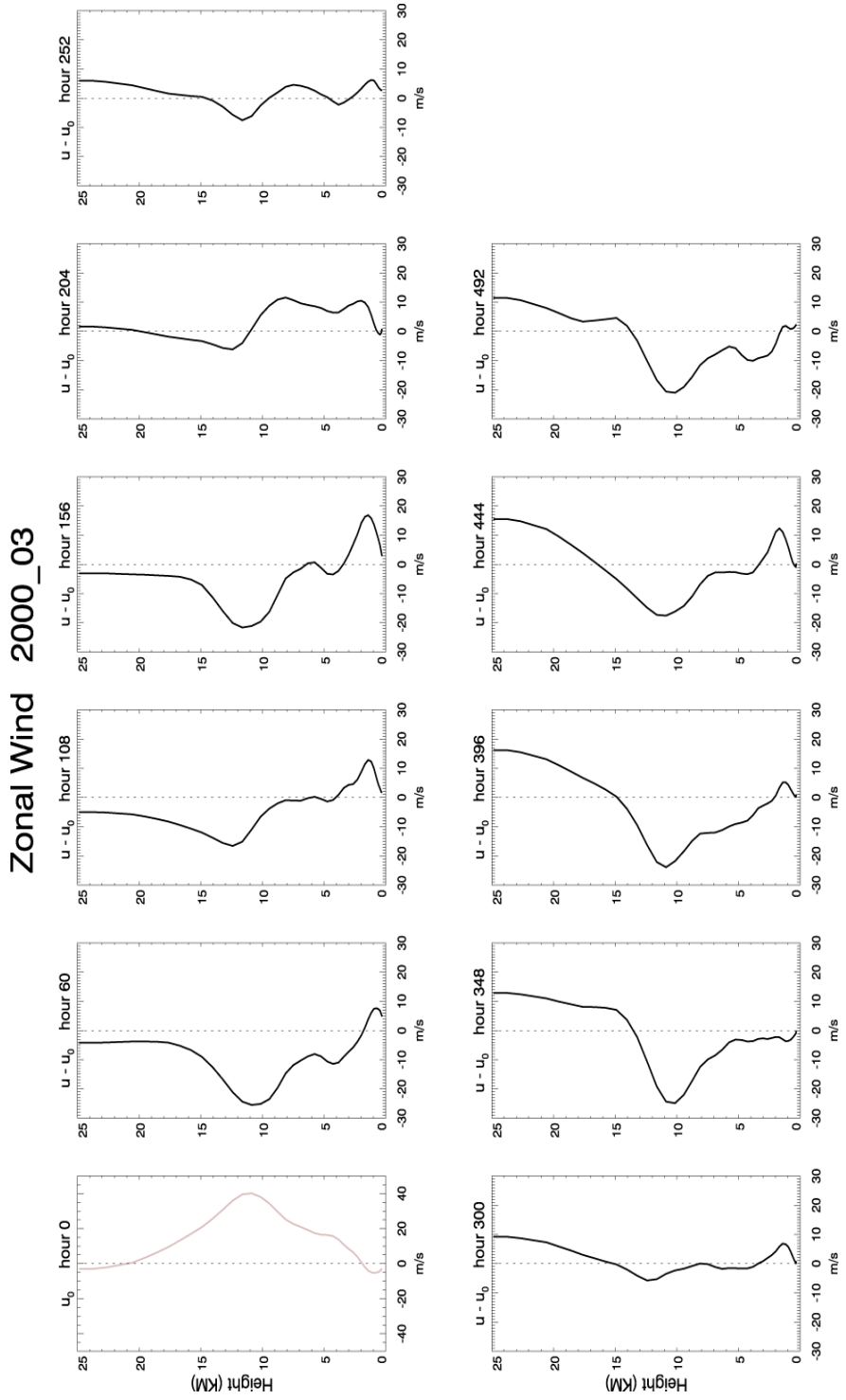


Fig 18. Continued

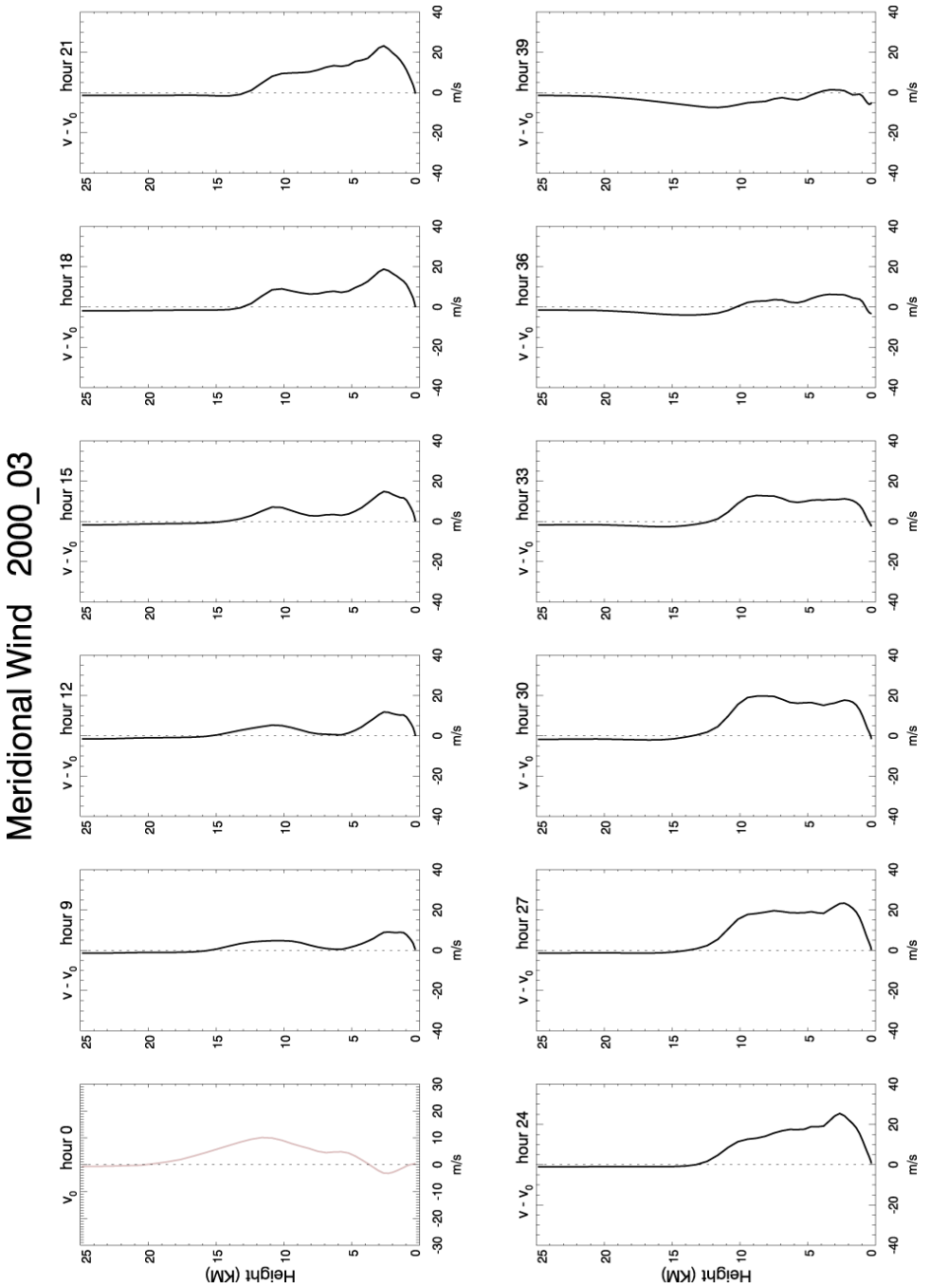


Fig 19. Vertical profiles of observed meridional wind at selected time during the March 2000 IOP.

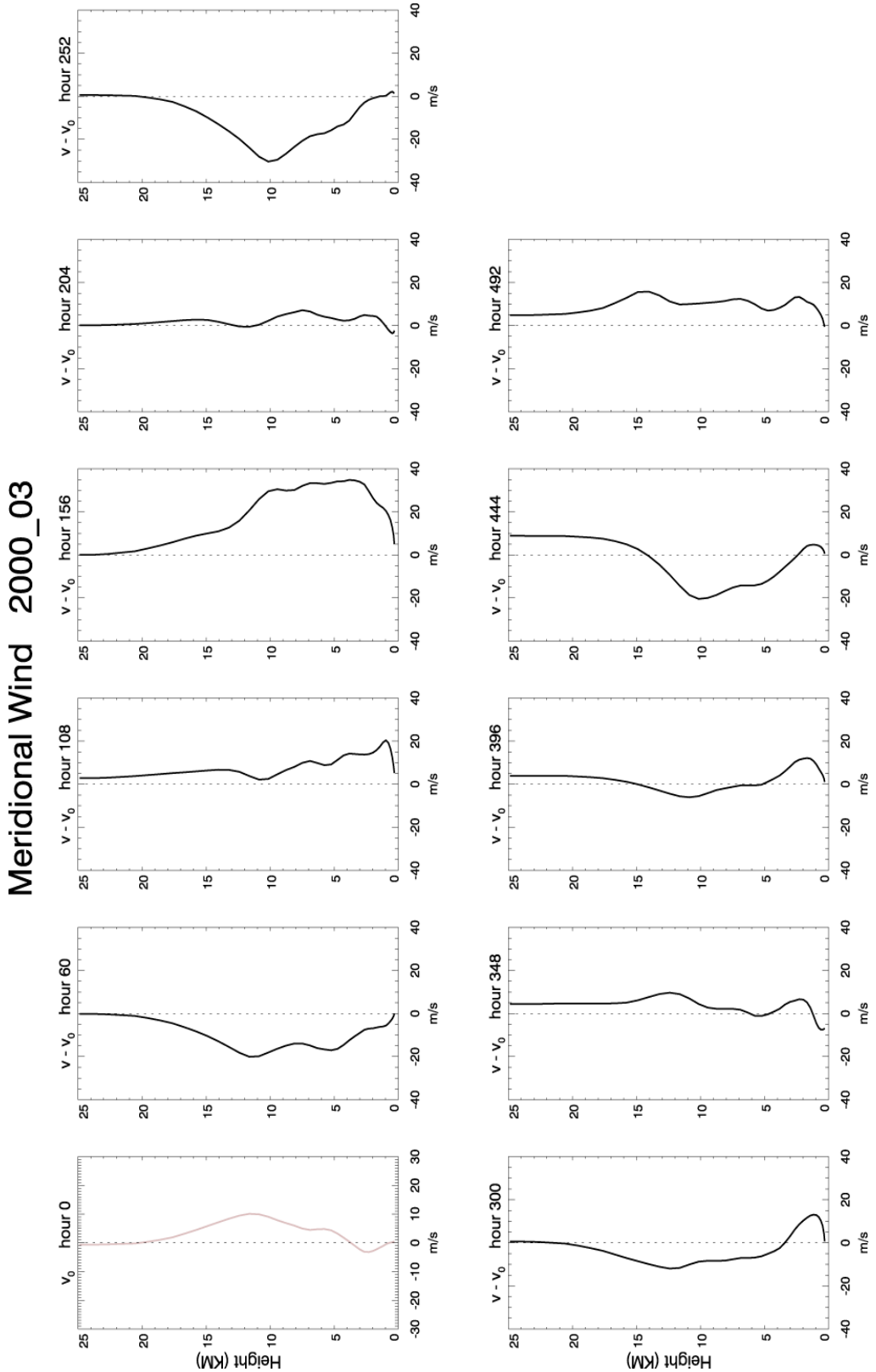


Fig 19. Continued

4) Profiles averaged during the period from 61.7291 to 82.3542 Julian day.
Data: ARM_0003_basic_state_zt1.txt (see 5)iv)
Sample program: prof_b.pro.

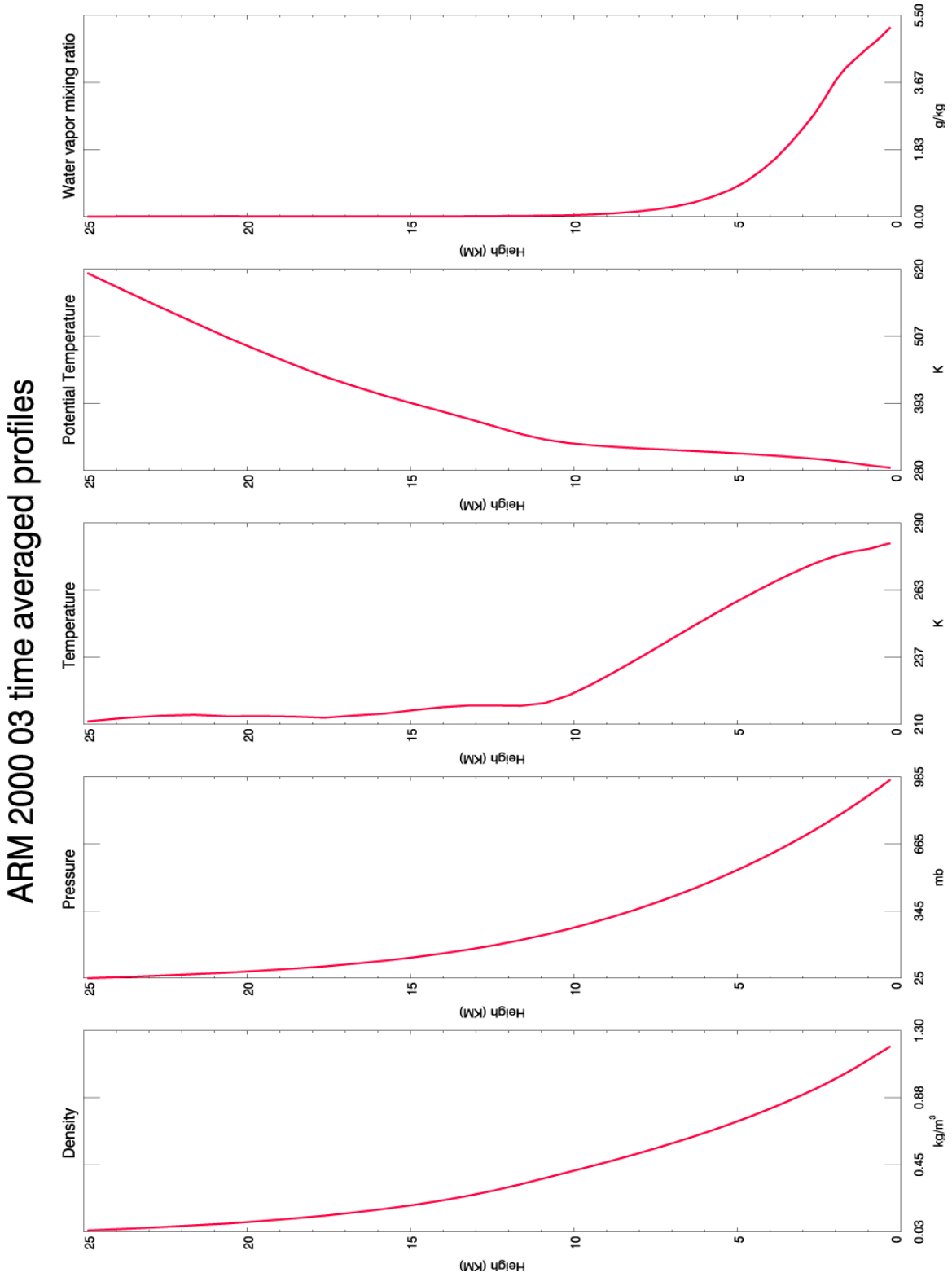


Fig 20. Time averaged profiles during the period of ARM 2000_03 IOP.

List of sample programs:
1.prt_sfc.f90, prt_sfc90.stub
2.prt_tot.f90, prt_tot90.stub
3.read_sgp3h_2.ncl
4. interp_arm.f90
5.time_plot.ncl
6.cld.ncl
7.profi_t.pro
8.profi_w.pro
9.profi_q.pro
10.profi_lsf.pro
11.profi_u.pro
12. prof_b.pro

list of data files for VVM:
ARM_0003_sfc.txt
ARM_0003_basic_state_zt1.txt
ARM_0003_basic_state_zz1.txt
ARM_0003_interp_zt1.txt
ARM_0003_interp_zz1.txt