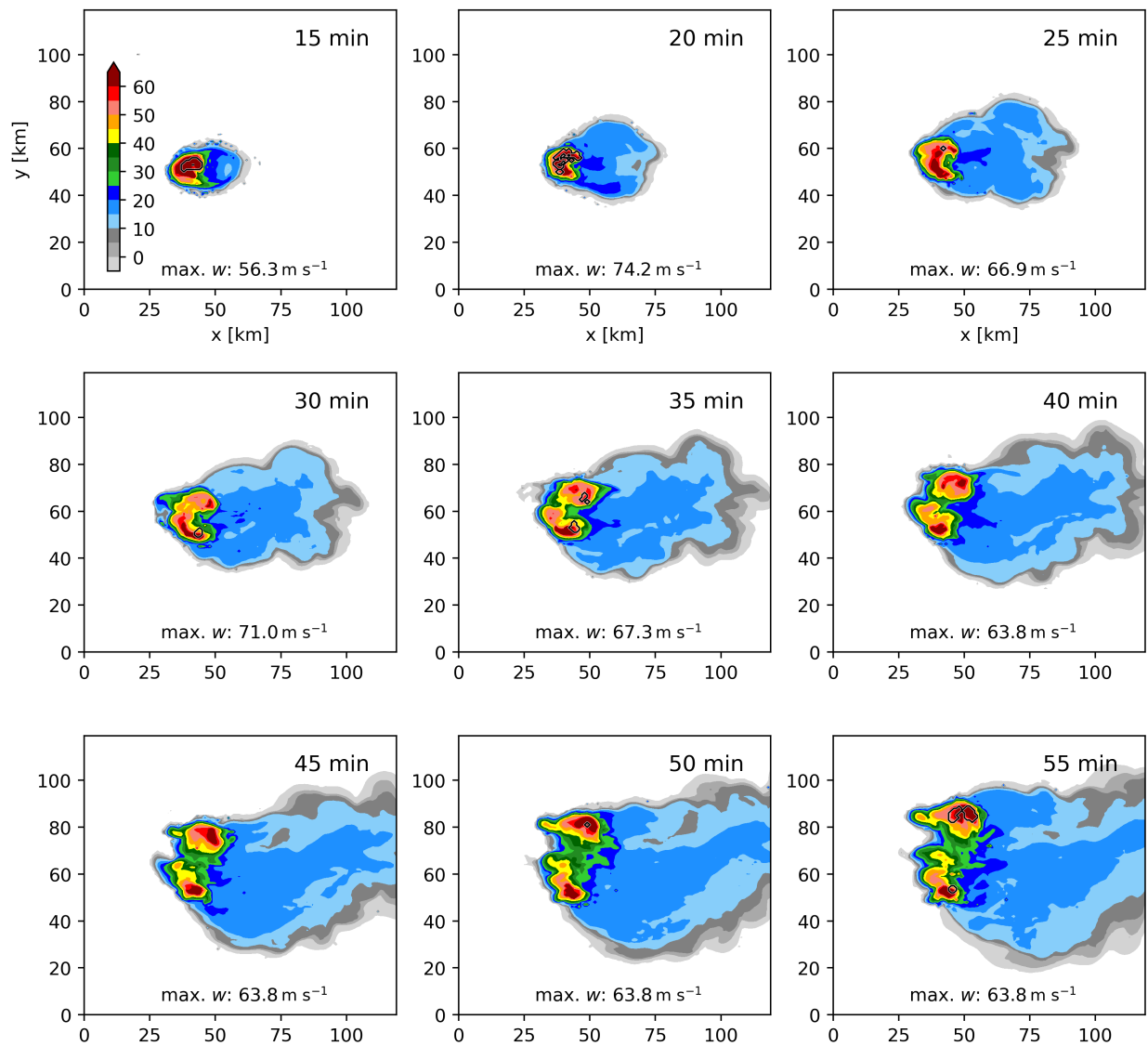2025-09-05:
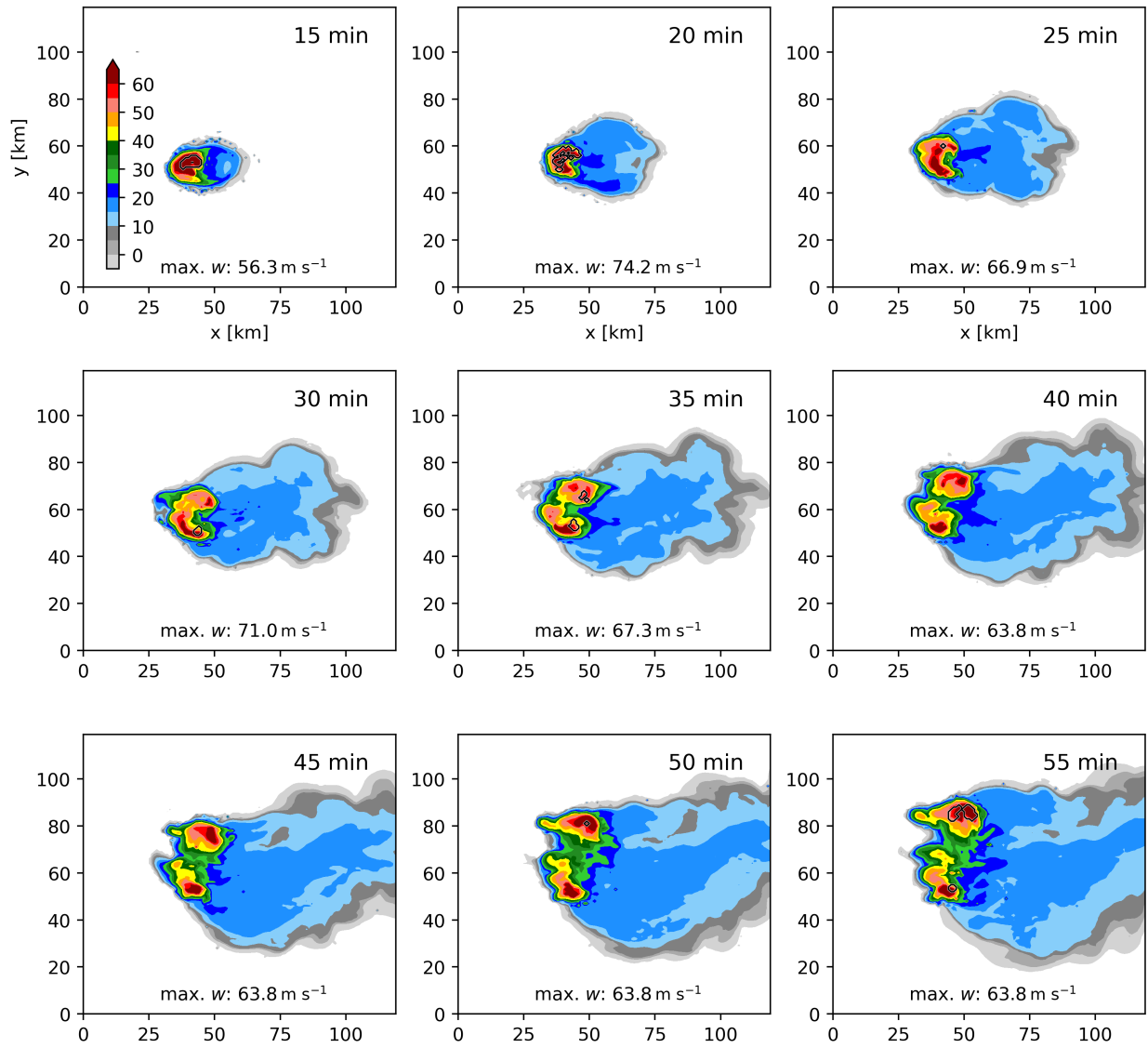**CM1 tests from 1-km simulations of Grealy, OK case**

Small differences in reflectivity fields for v5.4.7+sedi_v19 (the last commit before merging for v5.4.8). Attributable to order-of-operations changes in code.
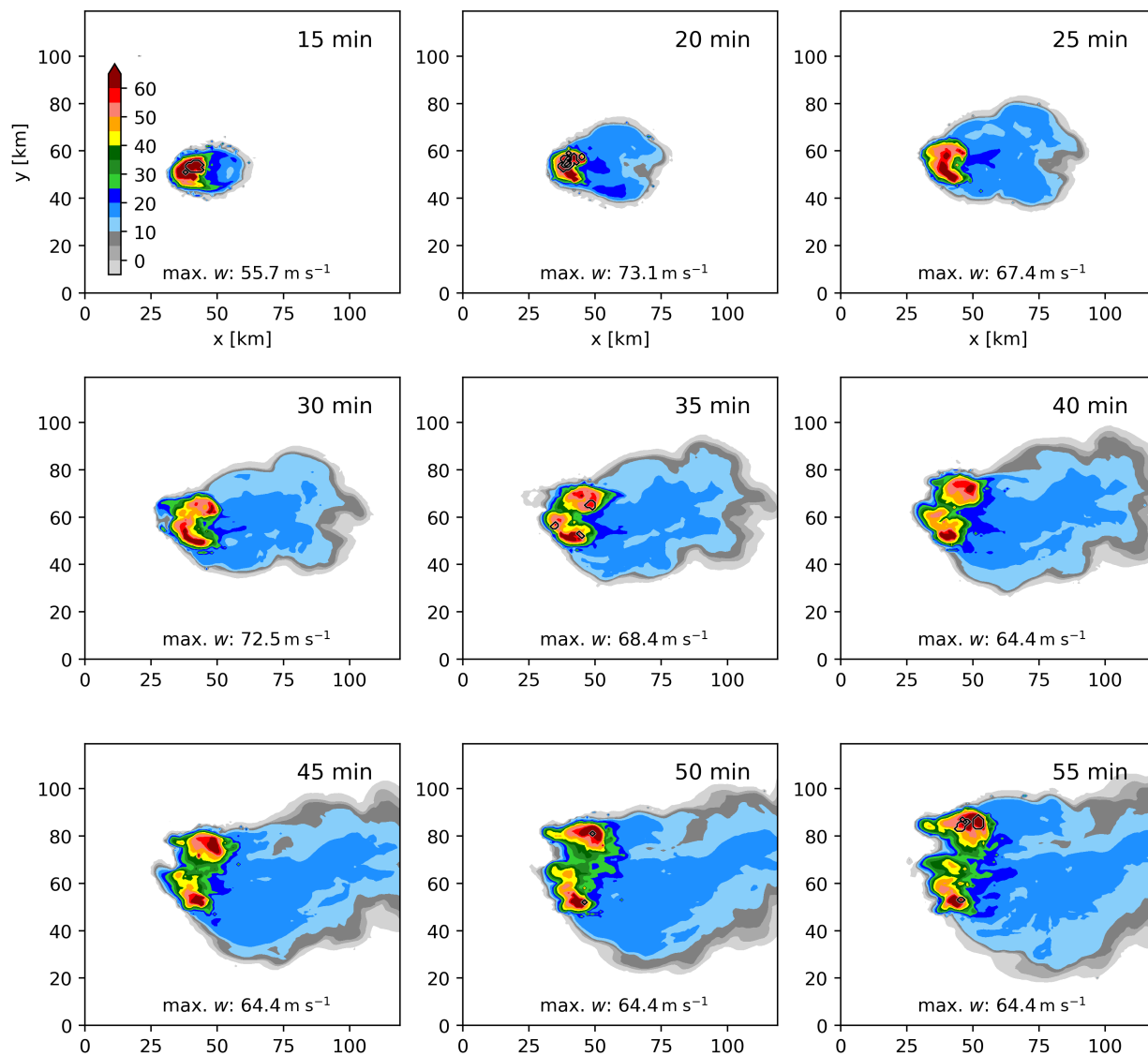
v5.4.6 (ptype 60)

v5.4.6 (ptype 60)

v5.4.7 + sedi_v19 (ptype 60)

CM1 input:

```
[r003-geary_supercell_1]: cat input_sounding.29may2004
 957.2300    309.27    16.0891
   0.00   309.27   16.0891   -3.400    12.900   95723.0
  50.00   309.27   16.0786   -3.351    13.350   95180.1
 150.00   309.28   16.0565   -3.274    14.244   94125.2
 250.00   309.28   16.0326   -3.214    15.026   93078.6
 350.00   309.29   15.9953   -3.148    15.960   92040.4
 450.00   309.30   15.9522   -3.128    16.777   91010.5
 550.00   309.32   15.9066   -3.029    17.471   89988.9
 650.00   309.34   15.8471   -2.790    18.212   88975.5
```

750.00	309.38	15.7722	-2.399	18.906	87970.4
850.00	309.45	15.6787	-1.841	19.409	86973.5
950.00	309.53	15.5688	-1.132	19.732	85985.0
1050.00	309.66	15.4239	-0.224	19.969	85004.7
1153.18	309.84	15.2270	0.895	20.122	84002.1
1262.92	310.07	14.9617	2.172	20.187	82945.6
1379.64	310.31	14.6707	3.406	20.187	81833.1
1503.77	310.59	14.3240	4.864	20.133	80662.3
1635.80	310.90	13.9096	6.486	19.977	79431.1
1776.23	311.28	13.3732	8.280	19.633	78137.5
1925.59	311.67	12.7519	9.957	19.197	76779.5
2084.44	312.17	11.9124	11.523	18.603	75355.2
2253.39	312.73	10.9456	12.840	17.984	73862.9
2433.08	313.28	10.0536	13.849	17.430	72300.9
2624.20	313.91	9.0803	14.887	16.603	70667.7
2827.47	314.60	8.0862	15.802	15.385	68962.4
3043.67	315.29	7.1770	16.255	14.120	67184.1
3273.61	316.08	6.2288	16.253	13.239	65332.2
3518.17	316.88	5.3571	15.933	13.167	63406.7
3778.28	317.89	4.4143	16.628	14.545	61408.2
4054.93	318.72	3.7377	17.539	15.800	59337.4
4349.17	319.81	2.9756	17.818	15.648	57195.7
4662.12	320.63	2.4756	17.609	13.603	54984.8
4994.96	321.77	1.8765	16.793	7.836	52707.3
5348.97	322.97	1.3947	16.038	4.743	50367.4
5725.49	324.19	1.0301	17.632	6.810	47969.5
6125.95	325.44	0.7668	19.678	9.925	45518.7
6551.87	326.76	0.5821	21.940	10.634	43021.0
7004.87	328.20	0.4681	24.666	10.717	40483.9
7486.67	329.64	0.4104	28.521	10.777	37915.8
7985.00	331.08	0.3693	36.344	11.006	35395.1
8485.00	332.52	0.3028	38.803	14.075	32998.8
8985.00	334.33	0.2570	39.984	15.694	30731.5
9485.00	335.97	0.2263	42.148	17.114	28588.6
9985.00	337.78	0.1253	43.434	16.901	26564.7
10485.00	340.35	0.0543	45.539	15.135	24657.4
10985.00	343.70	0.0210	47.263	16.509	22865.3
11485.00	347.29	0.0122	46.778	18.247	21184.7
11985.00	350.31	0.0082	45.956	15.603	19609.1
12485.00	355.90	0.0049	44.275	14.013	18136.7
12985.00	363.45	0.0032	41.638	11.446	16769.8
13485.00	368.20	0.0025	33.962	5.077	15499.3
13985.00	370.30	0.0019	28.045	6.948	14310.0
14485.00	374.12	0.0017	27.796	10.201	13196.0
14985.00	384.59	0.0017	25.125	5.183	12164.7
15485.00	390.06	0.0013	24.860	4.764	11211.8
15985.00	397.64	0.0013	22.146	3.970	10327.9
16485.00	409.59	0.0016	21.989	4.741	9514.6
16985.00	419.81	0.0016	15.380	2.261	8768.0
17485.00	433.01	0.0020	8.856	5.325	8083.0

```
17985.00   442.99   0.0020   9.481   8.510   7453.7
18485.00   453.35   0.0020   9.481   8.510   6873.4
18985.00   463.94   0.0020   9.481   8.510   6338.2
19485.00   474.79   0.0020   9.481   8.510   5844.7
19985.00   485.89   0.0020   9.481   8.510   5389.7
20485.00   497.25   0.0020   9.481   8.510   4970.0
20985.00   508.87   0.0020   9.481   8.510   4583.1
21485.00   520.77   0.0020   9.481   8.510   4226.2
21985.00   532.94   0.0020   9.481   8.510   3897.2
22485.00   545.40   0.0020   9.481   8.510   3593.7
22985.00   558.15   0.0020   9.481   8.510   3313.9
23485.00   571.20   0.0020   9.481   8.510   3055.9
23985.00   584.56   0.0020   9.481   8.510   2818.0


[r003–geary_supercell_1]: cat namelist.input

&param0
nx            =       120,
ny            =       120,
nz            =        60,
ppnode        =        1,
timeformat    =        1,
timestats     =        1,
terrain_flag = .false.,
procfiles     = .false.,
outunits      =        1,
/

&param1
dx      =  1000.0,
dy      =  1000.0,
dz      =   400.0,
dtl     =     5.0,
timax   =  7200.0,
run_time =  −999.9,
tapfrq =    300.0,
rstfrq =   7200.0,
statfrq =    60.0,
prclfrq =    60.0,
/

&nssl2mom_params
!  ndebug = −1,   ! =−1 debug off, >0 debug on
!  alphah = 0,    ! shape parameter of graupel
   alphahl = 1.0, ! shape parameter of hail
   ccn     = 0.8e9 ! base ccn concentration
!  ihlcnh   = 1,
!  iturbenhance = 2,
!  imurain = 1,
   icdx = 3,
   icdxhl = 3,
!  imltshddmr = 1,
!  ehw0      = 0.5,
!  ibinhmlr  = 1,
!  ibinhlmlr = 1,
!  cnor     = 8.e6,
!  cnoh     = 4.e4,
```

```
    irenuc  = 7,
/

&nssl_mp_params
!  iscni = 0
          hdnmn           = 50.0
          ehw0    = 0.90,
     !    efw0    = 0.90,
          ehlw0   = 0.90,
          infall          = 4,
          icdx            = 3,
          icdxhl          = 3,
          ibinhmlr        = 0,
          ibinhlmlr       = 1,
          irenuc          = 5,
          ihlcnh          = 3,
          iusedw          = 1,
!          incwet          = 1,
          dwmin           = 5.e-3,
          icefallfac      = 1.5,
          snowfallfac      = 1.25,
/

 &param2
! nssl_3moment = .true.,
 cm1setup  =  1,
 testcase  =  0,
 adapt_dt  =  0,
 irst      =  0,
 rstnum    =  1,
 iconly    =  0,
 hadvordrs =  5,
 vadvordrs =  5,
 hadvordrv =  5,
 vadvordrv =  5,
 advwenos  =  2,
 advwenov  =  0,
 weno_order = 9,
 apmasscon =  1,
 idiff     =  0,
 mdiff     =  0,
 difforder =  6,
 imoist    =  1,
 ipbl      =  0,
 sgsmodel  =  1,
 tconfig   =  1,
 bcturbs   =  1,
 horizturb =  0,
 doimpl    =  1,
 irdamp    =  1,
 hrdamp    =  0,
 psolver   =  3,
 ptype     = 61,
 ihail     =  1,
 iautoc    =  1,
 cuparam   =  0,
 icor      =  0,
 lspgrad   =  0,
 eqtset    =  2,
 idiss     =  1,
 efall     =  0,
```

```
rterm     =  0,
wbc       =  2,
ebc       =  2,
sbc       =  2,
nbc       =  2,
bbc       =  1,
tbc       =  1,
irbc      =  4,
roflux    =  0,
nudgeobc  =  0,
isnd      =  7,
iwnd      =  2,
itern     =  0,
iinit     = 12,
irandp    =  0,
ibalance  =  0,
iorigin   =  1,
axisymm   =  0,
imove     =  1,
iptra     =  0,
npt       =  1,
pdtra     =  1,
iprcl     =  0,
nparcels  =  1,
/

&param3
kdiff2  =    75.0,
kdiff6  =     0.040,
fcor    = 0.00005,
kdiv    = 0.10,
alph    = 0.60,
rdalpha = 3.3333333333e-3,
zd      = 15000.0,
xhd     = 100000.0,
alphobc = 60.0,
umove   =   8.0,
vmove   =   6.0,
v_t     =        7.0,
l_h     =      100.0,
lhref1  =      100.0,
lhref2  =     1000.0,
l_inf   =       75.0,
ndcnst  =      250.0,
nt_c    =      250.0,
csound  =      300.0,
cstar   =       30.0,
/

&param11
radopt  =          0,
dtrad   =      300.0,
ctrlat  =      36.68,
ctrlon  =     -98.35,
year    =       2009,
month   =          5,
day     =         15,
hour    =         18,
minute  =         00,
second  =         00,
/
```

```
&param12
isfcflx     =        0,
sfcmodel    =        0,
oceanmodel  =        0,
initsfc     =        1,
tsk0        = 299.28,
tmn0        = 297.28,
xland0      =      2.0,
lu0         =       16,
season      =        1,
cecd        =        3,
pertflx     =        0,
cnstce      =   0.001,
cnstcd      =   0.001,
isftcflx    =        0,
iz0tlnd     =        0,
oml_hml0    =     50.0,
oml_gamma   =     0.14,
set_flx     =        0,
cnst_shflx  =     0.24,
cnst_lhflx  =  5.2e-5,
set_znt     =        0,
cnst_znt    =     0.16,
set_ust     =        0,
cnst_ust    =     0.25,
ramp_sgs    =        1,
ramp_time   =   1800.0,
t2p_avg     =        1,
/

&param4
stretch_x =        0,
dx_inner  =    1000.0,
dx_outer  =    7000.0,
nos_x_len =   40000.0,
tot_x_len =  120000.0,
/

&param5
stretch_y =        0,
dy_inner  =    1000.0,
dy_outer  =    7000.0,
nos_y_len =   40000.0,
tot_y_len =  120000.0,
/

&param6
stretch_z =   0,
ztop      = 18000.0,
str_bot   =      0.0,
str_top   =   2000.0,
dz_bot    =    125.0,
dz_top    =    500.0,
/

&param7
bc_temp   = 1,
ptc_top   = 250.0,
ptc_bot   = 300.0,
viscosity = 25.0,
```

```
  pr_num     = 0.72,
/

&param8
var1       =    0.0,
var2       =    0.0,
var3       =    0.0,
var4       =    0.0,
var5       =    0.0,
var6       =    0.0,
var7       =    0.0,
var8       =    0.0,
var9       =    0.0,
var10      =    0.0,
var11      =    0.0,
var12      =    0.0,
var13      =    0.0,
var14      =    0.0,
var15      =    0.0,
var16      =    0.0,
var17      =    0.0,
var18      =    0.0,
var19      =    0.0,
var20      =    0.0,
/

&param9
output_format    = 2,   ! 2 = netcdf
output_filetype  = 2,
output_interp    = 0,
output_rain      = 1,
output_sws       = 1,
output_svs       = 1,
output_sps       = 1,
output_srs       = 1,
output_sgs       = 1,
output_sus       = 1,
output_shs       = 1,
output_coldpool  = 0,
output_sfcflx    = 0,
output_sfcparams = 0,
output_sfcdiags  = 0,
output_psfc      = 0,
output_zs        = 0,
output_zh        = 0,
output_basestate = 0,
output_th        = 1,
output_thpert    = 0,
output_prs       = 1,
output_prspert   = 0,
output_pi        = 0,
output_pipert    = 0,
output_rho       = 0,
output_rhopert   = 0,
output_tke       = 1,
output_km        = 1,
output_kh        = 1,
output_qv        = 1,
output_qvpert    = 0,
output_q         = 1,
output_dbz       = 1,
```

```
   output_buoyancy  = 0,
   output_u         = 1,
   output_upert     = 0,
   output_uinterp   = 1,
   output_v         = 1,
   output_vpert     = 0,
   output_vinterp   = 1,
   output_w         = 1,
   output_winterp   = 1,
   output_vort      = 1,
   output_pv        = 0,
   output_uh        = 1,
   output_pblten    = 0,
   output_dissten   = 0,
   output_fallvel   = 0,
   output_nm        = 0,
   output_def       = 0,
   output_radten    = 0,
   output_cape      = 0,
   output_cin       = 0,
   output_lcl       = 0,
   output_lfc       = 0,
   output_pwat      = 0,
   output_lwp       = 0,
   output_thbudget  = 0,
   output_qvbudget  = 0,
   output_ubudget   = 0,
   output_vbudget   = 0,
   output_wbudget   = 0,
   output_pdcomp    = 0,
 /

 &param16
   restart_format   = 1,
   restart_filetype = 2,
   restart_reset_frqtim  =  .true.,
   restart_file_theta    =  .false.,
   restart_file_dbz      =  .false.,
   restart_file_th0      =  .false.,
   restart_file_prs0     =  .false.,
   restart_file_pi0      =  .false.,
   restart_file_rho0     =  .false.,
   restart_file_qv0      =  .false.,
   restart_file_u0       =  .false.,
   restart_file_v0       =  .false.,
   restart_file_zs       =  .false.,
   restart_file_zh       =  .false.,
   restart_file_zf       =  .false.,
   restart_file_diags    =  .false.,
   restart_use_theta     =  .false.,
 /

 &param10
   stat_w       = 1,
   stat_wlevs   = 1,
   stat_u       = 1,
   stat_v       = 1,
   stat_rmw     = 0,
   stat_pipert  = 1,
   stat_prspert = 1,
   stat_thpert  = 1,
```

```
      stat_q          = 1,
      stat_tke        = 1,
      stat_km         = 1,
      stat_kh         = 1,
      stat_div        = 1,
      stat_rh         = 1,
      stat_rhi        = 1,
      stat_the        = 1,
      stat_cloud      = 1,
      stat_sfcprs     = 1,
      stat_wsp        = 1,
      stat_cfl        = 1,
      stat_vort       = 1,
      stat_tmass      = 1,
      stat_tmois      = 1,
      stat_qmass      = 1,
      stat_tenerg     = 1,
      stat_mo         = 1,
      stat_tmf        = 1,
      stat_pcn        = 1,
      stat_qsrc       = 1,
      /

      &param13
      prcl_th         = 1,
      prcl_t          = 1,
      prcl_prs        = 1,
      prcl_ptra       = 1,
      prcl_q          = 1,
      prcl_nc         = 1,
      prcl_km         = 1,
      prcl_kh         = 1,
      prcl_tke        = 1,
      prcl_dbz        = 1,
      prcl_b          = 1,
      prcl_vpg        = 1,
      prcl_vort       = 1,
      prcl_rho        = 1,
      prcl_qsat       = 1,
      prcl_sfc        = 1,
      /

      &param14
      dodomaindiag    =    .false.,
      diagfrq         =       60.0,
      /

      &param15
      doazimavg        =    .false.,
      azimavgfrq       =     3600.0,
      rlen             =   300000.0,
      do_adapt_move    =    .false.,
      adapt_move_frq   =     3600.0,
      /

      &param17
      les_subdomain_shape     =        1 ,
      les_subdomain_xlen      =   200000.0,
      les_subdomain_ylen      =   200000.0,
      les_subdomain_dlen      =   200000.0,
      les_subdomain_trnslen   =     5000.0,
```

```
/

&param18
do_recycle_w         =  .false.,
do_recycle_s         =  .false.,
do_recycle_e         =  .false.,
do_recycle_n         =  .false.,
recycle_width_dx     =     6.0,
recycle_depth_m      =  1500.0,
recycle_cap_loc_m    =  4000.0,
recycle_inj_loc_m    =     0.0,
/

&param19
do_lsnudge           =     .false.,
do_lsnudge_u         =     .false.,
do_lsnudge_v         =     .false.,
do_lsnudge_th        =     .false.,
do_lsnudge_qv        =     .false.,
lsnudge_tau          =    1800.0,
lsnudge_start        =    3600.0,
lsnudge_end          =    7200.0,
lsnudge_ramp_time    =     600.0,
/

&param20
do_ib        =     .false.,
ib_init      =       4,
top_cd       =      0.4,
side_cd      =      0.4,
/

&param21
hurr_vg      =       40.0,
hurr_rad     =    40000.0,
hurr_vgpl    =      -0.70,
hurr_rotate  =        0.0,
/

&nssl2mom_params
  alphah  = 0,      ! shape parameter of graupel
  alphahl = 0.5,    ! shape parameter of hail
  ccn     = 0.6e9   ! base ccn concentration; see README.namelist
  cnor    = 8.e6,   ! for single moment only
  cnoh    = 4.e4,   ! for single moment only
/
```