

Supplementary material to: “*The Met Office Unified Model Global Atmosphere 4.0 and JULES Global Land 4.0 configurations*”, submitted to Geosci. Model Dev.

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1 Introduction

This supplementary material to the main paper is designed to help users of GA4.0 and GL4.0 in configuring their systems to correctly implement the new configurations.

2 GA4.0 settings that vary with global horizontal resolution

Table 1 lists model settings (as set by the Unified Model User Interface) that should be changed when changing horizontal resolution. The resolutions includes span from N96 resolution (≈ 135 km in the mid-latitudes) to N512 resolution (≈ 25 km in the mid-latitudes) although GA4.0 could be used at global resolutions as high as N1024 (≈ 12.5 km in the mid-latitudes). We have also run GA4.0 in Limited Area Model (LAM) systems with resolutions up to ≈ 12 km, but do not include details of how to do this here.

Panel name	N96	N216	N320	N512
Variable name				
Atmos \rightarrow Model resolution and domain				
Number of columns	192	432	640	1024
Number of rows	145	325	481	769
Extended EW halo size (points)	4	4	4	5
Extended NS halo size (points)	5	7	7	8
Number of land points	Use relevant number from mask file			
Atmos \rightarrow Sci params \rightarrow Timestepping				
Number of timesteps per period (timestep)	72	96	120	144
$\implies \Delta t$ (mins):	20	15	12	10
Atmos \rightarrow Sci params \rightarrow Sec-by-sec \rightarrow Sec10: Solver				
ADI pseudo-timestep	0.0008	0.0003	0.0002	0.00015
Maximum solver iterations	100	200	200	500
Atmos \rightarrow Sci params \rightarrow Sec-by-sec \rightarrow Sec12: Advection				
SL advection scheme: Theta	0 3*	0 1	0 1	0 1
SL advection scheme: Moisture/tracers	1 6*	1 7	1 7	1 7
SL advection scheme: Winds	0 3*	0 1	0 1	0 1
Atmos \rightarrow Sci params \rightarrow Sec-by-sec \rightarrow Sec4: LSP				
Number of substeps over full column	Use equivalent of 1 step per 2 mins			
Atmos \rightarrow Sci params \rightarrow Sec-by-sec \rightarrow Sec5: Convection				
Threshold vertical velocity	0.3	0.4	0.4	0.4
Atmos \rightarrow Sci params \rightarrow Sec-by-sec \rightarrow Sec13: Diffusion \rightarrow Combi				
Max number of filter sweeps	8	8	8	16
Atmos \rightarrow Sci params \rightarrow Sec-by-sec \rightarrow Sec13: Diff \rightarrow Targ				
Targeted diffusion test value (m/s)	0.3	1	1.5	2.5

Table 1: GA4.0 settings that vary with global horizontal resolution. *N.B. N96 uses a quasi-cubic interpolation in the horizontal, whilst all higher resolutions (including regional models) use cubic.

3 GA4.0 settings that vary with vertical resolution

3.1 MetUM settings to change with level set

Table 2 lists model settings (as set by the Unified Model User Interface) that should be changed when changing vertical resolutions. Note that as discussed in the main paper, GA4.0 systems should only use either L85(50_t,35_s)₈₅, L70(50_t,20_s)₈₀, or L70(50_t,13_s)₄₀ level sets.

Panel name	Variable name	L85(50 _t ,35 _s) ₈₅	L70(50 _t ,20 _s) ₈₀	L70(50 _t ,13 _s) ₄₀
Atmos → Model resolution and domain → Vertical				
	Number of levels	85	70	63
	Number of wet levels	85	70	63
	Number of ozone levels	85	70	63
	Number of cloud levels in radiation	85	70	63
	User defined level set	Point to appropriate level set (see below)		
Atmos → Model Configuration → Atm. Tracers:				
	Number of tracer levels	85	70	63
Atmos → Sci params → Level by level				
	End level for Div damping coeffs=0.0	85	70	63
	End level for Rhcrit=0.8	85	70	63
Atmos → Sci params → H ₂ O prod by CH ₄ oxidation				
	Model top boundary (m)	85000	80000	40000
Atmos → Sci params → Sec-by-sec → Sec13: Diffusion				
	Start level for dry adjustment of theta	51	50	51
	End level for dry adjustment of theta	85	70	63
	Horizontal level of 1 st flat level	51	50	51
Atmos → Sci params → Sec-by-sec → Sec13: Diff → Targ				
	Targeted diffusion apply end level	53	52	53
	Horizontal level to switch off steep slope check	51	50	51

Table 2: GA4.0 settings that vary with atmospheric vertical resolution

3.2 Details of vertical level sets

In the vertical, the MetUM uses the terrain-following height coordinate η , which is normalised to be $\eta = 0$ at the lower boundary, and $\eta = 1$ at a height z_T , the height of the fixed model lid. In between, the height above mean sea level at any given point, z , is defined by

$$z = \begin{cases} \eta z_T + h \left(1 - \frac{\eta}{\eta_I}\right)^2, & 0 \leq \eta \leq \eta_I; \\ \eta z_T, & \eta_I \leq \eta \leq z_T, \end{cases} \quad (1)$$

where h is the height of the model orography above the earth's mean radius and η_I is the level at and above which the levels are flat.

The namelists below detail the level sets used with GA4.0. In these namelists, the variable `z_top_of_model`= z_T (in metres), `eta_theta` is the array of η values for the levels on which the prognostic potential temperature (θ) is held including the surface, `eta_rho` is the array of η values for the levels on which the prognostic density (ρ) is held, and `first_constant_rho_level` is the ρ -level at which $\eta = \eta_I$.

Level set L85(50_t,35_s)₈₅

```
&VERTLEVS
  z_top_of_model =      85000.00 ,
  first_constant_rho_level=   51 ,
  eta_theta=
  0.0000000E+00,   0.2352941E-03,   0.6274510E-03,   0.1176471E-02,   0.1882353E-02,
  0.2745098E-02,   0.3764706E-02,   0.4941176E-02,   0.6274510E-02,   0.7764705E-02,
  0.9411764E-02,   0.1121569E-01,   0.1317647E-01,   0.1529412E-01,   0.1756863E-01,
  0.2000000E-01,   0.2258823E-01,   0.2533333E-01,   0.2823529E-01,   0.3129411E-01,
  0.3450980E-01,   0.3788235E-01,   0.4141176E-01,   0.4509804E-01,   0.4894118E-01,
```

0.5294117E-01,	0.5709804E-01,	0.6141176E-01,	0.6588235E-01,	0.7050980E-01,
0.7529411E-01,	0.8023529E-01,	0.8533333E-01,	0.9058823E-01,	0.9600001E-01,
0.1015687E+00,	0.1072942E+00,	0.1131767E+00,	0.1192161E+00,	0.1254127E+00,
0.1317666E+00,	0.1382781E+00,	0.1449476E+00,	0.1517757E+00,	0.1587633E+00,
0.1659115E+00,	0.1732221E+00,	0.1806969E+00,	0.1883390E+00,	0.1961518E+00,
0.2041400E+00,	0.2123093E+00,	0.2206671E+00,	0.2292222E+00,	0.2379856E+00,
0.2469709E+00,	0.2561942E+00,	0.2656752E+00,	0.2754372E+00,	0.2855080E+00,
0.2959203E+00,	0.3067128E+00,	0.3179307E+00,	0.3296266E+00,	0.3418615E+00,
0.3547061E+00,	0.3682416E+00,	0.3825613E+00,	0.3977717E+00,	0.4139944E+00,
0.4313675E+00,	0.4500474E+00,	0.4702109E+00,	0.4920571E+00,	0.5158098E+00,
0.5417201E+00,	0.5700686E+00,	0.6011688E+00,	0.6353697E+00,	0.6730590E+00,
0.7146671E+00,	0.7606701E+00,	0.8115944E+00,	0.8680208E+00,	0.9305884E+00,
0.1000000E+01,				
eta_rho=				
0.1176471E-03,	0.4313726E-03,	0.9019608E-03,	0.1529412E-02,	0.2313725E-02,
0.3254902E-02,	0.4352941E-02,	0.5607843E-02,	0.7019607E-02,	0.8588235E-02,
0.1031373E-01,	0.1219608E-01,	0.1423529E-01,	0.1643137E-01,	0.1878431E-01,
0.2129412E-01,	0.2396078E-01,	0.2678431E-01,	0.2976470E-01,	0.3290196E-01,
0.3619608E-01,	0.3964706E-01,	0.4325490E-01,	0.4701960E-01,	0.5094118E-01,
0.5501961E-01,	0.5925490E-01,	0.6364705E-01,	0.6819607E-01,	0.7290196E-01,
0.7776470E-01,	0.8278431E-01,	0.8796078E-01,	0.9329412E-01,	0.9878433E-01,
0.1044314E+00,	0.1102354E+00,	0.1161964E+00,	0.1223144E+00,	0.1285897E+00,
0.1350224E+00,	0.1416128E+00,	0.1483616E+00,	0.1552695E+00,	0.1623374E+00,
0.1695668E+00,	0.1769595E+00,	0.1845180E+00,	0.1922454E+00,	0.2001459E+00,
0.2082247E+00,	0.2164882E+00,	0.2249446E+00,	0.2336039E+00,	0.2424783E+00,
0.2515826E+00,	0.2609347E+00,	0.2705562E+00,	0.2804726E+00,	0.2907141E+00,
0.3013166E+00,	0.3123218E+00,	0.3237787E+00,	0.3357441E+00,	0.3482838E+00,
0.3614739E+00,	0.3754014E+00,	0.3901665E+00,	0.4058831E+00,	0.4226810E+00,
0.4407075E+00,	0.4601292E+00,	0.4811340E+00,	0.5039334E+00,	0.5287649E+00,
0.5558944E+00,	0.5856187E+00,	0.6182693E+00,	0.6542144E+00,	0.6938630E+00,
0.7376686E+00,	0.7861323E+00,	0.8398075E+00,	0.8993046E+00,	0.9652942E+00,

/

Level set L70(50_t,20_s)₈₀

&VERTLEVS

```

z_top_of_model = 8000.0,
first_constant_r_rho_level= 50,
eta_theta=
.0000000, .0002500, .0006667, .0012500, .0020000,
.0029167, .0040000, .0052500, .0066667, .0082500,
.0100000, .0119167, .0140000, .0162500, .0186667,
.0212500, .0240000, .0269167, .0300000, .0332500,
.0366667, .0402500, .0440000, .0479167, .0520000,
.0562500, .0606667, .0652500, .0700000, .0749167,
.0800000, .0852500, .0906668, .0962505, .1020017,
.1079213, .1140113, .1202745, .1267154, .1333406,
.1401592, .1471838, .1544313, .1619238, .1696895,
.1777643, .1861929, .1950307, .2043451, .2142178,
.2247466, .2360480, .2482597, .2615432, .2760868,
.2921094, .3098631, .3296378, .3517651, .3766222,
.4046373, .4362943, .4721379, .5127798, .5589045,
.6112759, .6707432, .7382500, .8148403, .9016668,
1.0000000,
eta_rho=
.0001250, .0004583, .0009583, .0016250, .0024583,
.0034583, .0046250, .0059583, .0074583, .0091250,
.0109583, .0129583, .0151250, .0174583, .0199583,
.0226250, .0254583, .0284583, .0316250, .0349583,
.0384583, .0421250, .0459583, .0499583, .0541250,
.0584584, .0629583, .0676250, .0724583, .0774583,
.0826250, .0879584, .0934586, .0991261, .1049615,
.1109663, .1171429, .1234950, .1300280, .1367499,
.1436715, .1508076, .1581776, .1658067, .1737269,

```

```
.1819786, .1906118, .1996879, .2092815, .2194822,
.2303973, .2421538, .2549014, .2688150, .2840981,
.3009862, .3197505, .3407014, .3641936, .3906297,
.4204658, .4542161, .4924589, .5358422, .5850902,
.6410096, .7044966, .7765451, .8582535, .9508334,
```

/

Level set L63(50_t,13_s)₄₀

```
&VERTLEVS
```

```
z_top_of_model = 41022.39,
first_constant_r_rho_level= 50,
eta_theta=
```

```
0.0000000E+00, 4.8753872E-04, 1.3001683E-03, 2.4376935E-03, 3.9003098E-03,
5.6880168E-03, 7.8006196E-03, 1.0238313E-02, 1.3001097E-02, 1.6088778E-02,
1.9501548E-02, 2.3239411E-02, 2.7302168E-02, 3.1690016E-02, 3.6402956E-02,
4.1440792E-02, 4.6803717E-02, 5.2491732E-02, 5.8504645E-02, 6.4842649E-02,
7.1505740E-02, 7.8493737E-02, 8.5806817E-02, 9.3444988E-02, 1.0140806E-01,
1.0969621E-01, 1.1830946E-01, 1.2724760E-01, 1.3651083E-01, 1.4609917E-01,
1.5601239E-01, 1.6625071E-01, 1.7681430E-01, 1.8770337E-01, 1.9891910E-01,
2.1046326E-01, 2.2233970E-01, 2.3455390E-01, 2.4711467E-01, 2.6003483E-01,
2.7333215E-01, 2.8703120E-01, 3.0116495E-01, 3.1577647E-01, 3.3092082E-01,
3.4666792E-01, 3.6310497E-01, 3.8034007E-01, 3.9850461E-01, 4.1775790E-01,
4.3829069E-01, 4.6033016E-01, 4.8414484E-01, 5.1004976E-01, 5.3841203E-01,
5.6965858E-01, 6.0428101E-01, 6.4284474E-01, 6.8599641E-01, 7.3447162E-01,
7.8910542E-01, 8.5084140E-01, 9.2074203E-01, 1.0000000E+00,
```

```
eta_rho=
```

```
2.4376936E-04, 8.9375599E-04, 1.8688334E-03, 3.1690018E-03, 4.7940658E-03,
6.7442209E-03, 9.0194661E-03, 1.1619608E-02, 1.4544840E-02, 1.7795164E-02,
2.1370383E-02, 2.5270693E-02, 2.9496092E-02, 3.4046389E-02, 3.8921777E-02,
4.4122253E-02, 4.9647629E-02, 5.5498090E-02, 6.1673649E-02, 6.8174094E-02,
7.4999638E-02, 8.2150280E-02, 8.9625798E-02, 9.7426422E-02, 1.0555213E-01,
1.1400293E-01, 1.2277844E-01, 1.3187923E-01, 1.4130490E-01, 1.5105568E-01,
1.6113155E-01, 1.7153251E-01, 1.8225874E-01, 1.9331124E-01, 2.0469119E-01,
2.1640146E-01, 2.2844680E-01, 2.4083437E-01, 2.5357473E-01, 2.6668346E-01,
2.8018168E-01, 2.9409820E-01, 3.0847082E-01, 3.2334876E-01, 3.3879438E-01,
3.5488644E-01, 3.7172252E-01, 3.8942233E-01, 4.0813133E-01, 4.2802429E-01,
4.4931039E-01, 4.7223738E-01, 4.9709725E-01, 5.2423090E-01, 5.5403531E-01,
5.8696973E-01, 6.2356299E-01, 6.6442049E-01, 7.1023387E-01, 7.6178843E-01,
8.1997347E-01, 8.8579178E-01, 9.6037108E-01,
```

/

4 Settings that may vary with system/application

As described in the main paper, GA4.0/GL4.0 defines the scientific configuration of the MetUM/JULES components used in various systems. In addition to the differences with horizontal and vertical resolution described above, there are some settings that may be seen as system dependent, which we illustrate in this section. In Table 3 we illustrate the systems settings that vary between deterministic global NWP and climate research configurations of GA4.0/GL4.0. A good example of such a difference is the use of conservative advection for moist variables and tracers. For the advection scheme to exactly conserve these variables requires use of the computationally more expensive Priestly algorithm. This is necessary for long free-running integrations, such as those used for climate projections. For short forecast runs, however, this is not necessary; because the process of data assimilation (DA) of atmospheric moisture and tracers will not precisely conserve the mass of these tracers, it is not necessary to leave this on for the integrity of the continuous assimilation cycle.

Panel name	NWP	Climate
Variable name		
Input/Output Control → General Configuration		
Use 360 day calendar	Off	On*
Ind sec opts → Misc sec 94-98		
Summation type	Fast, non-reprod.	Double-double reprod.
Atmos → Sci params → Sec-by-sec → Sec3: BL → Land		
Use coastal tiling	Off	On
Atmos → Sci params → Sec-by-sec → Sec11: Tracer adv		
Advect tracers with cons. scheme	On unless using tracer DA	On
Atmos → Sci params → Sec-by-sec → Sec12: Advection		
Moisture conservation	Off	More accurate
Atmos → Sci params → Sec-by-sec → Sec13: Diff		
HadGEM2 polar filter	Off	On
Atmos → Sci params → Sec-by-sec → Sec13: Diff → Combi		
Diffusion of horizontal winds	On	On
Diffusion of theta	On	Off
Polar filter start latitude	87	85
Atmos → Sci params → Sec-by-sec → Sec14: Energy corr.		
Energy correction	Off	Dry mass
Atmos → Sci params → Sec-by-sec → Sec17: Aerosol		
As required by system**		

Table 3: Example of GA4.0 settings that may vary with system/application. *N.B. 360 day calendar not compulsory for GA4.0 climate jobs, but still used as standard. ** As discussed in the main paper, the aerosol definition is dependent on the system. Most climate runs use full CLASSIC aerosol with offline oxidants. Runs on Seasonal timescales or shorter use CLASSIC aerosol climtologies, but at GA4.0 these only interact with the physics via the direct radiative effect. Finally, we are starting to introduce dust forecasting on NWP timescales, but this does not yet usually interact with the rest of the model evolution.

5 Example MetUM namelists for a GA4.0/GL4.0 job

Here, we include a set of MetUM/JULES Fortran namelists for a GA4.0/GL4.0 job at code base vn8.1. The job in question is an N96 resolution (≈ 135 km in the mid-latitudes) L85(50_t,35_s)₈₅ level set Atmosphere/Land-only climate simulation labelled N96-AL_clim in Sec. 4 of the main paper.

5.1 Namelist file: CNTLATM

```
&NLSTCATM
MODELDOMAIN=1 ,
LSNOW_ALBEDO=.FALSE. ,
LSSICE_ALBEDO=.FALSE. ,
LSICE_MELTPONDS=.FALSE. ,
LSICE_SCATTERING=.FALSE. ,
LSICE_HADGEM1A=.FALSE. ,
A_SW_RADSTEP_DIAG=3,
A_SW_RADSTEP_PROG=9,
A_LW_RADSTEP_DIAG=3,
A_LW_RADSTEP_PROG=9,
L_RAD_DEG=.FALSE. ,
L_RAD_SZACOR=.TRUE. ,
```

```

L_RAD_PERTURB=.TRUE. ,
L_MOD_BARKER_ALBEDO=.TRUE. ,
L_USE_SPEC_SEA=.TRUE. ,
L_SICE_HEATFLUX=.TRUE. ,
L_MURK=.FALSE. ,
L_MURK_SOURCE=.FALSE. ,
L_MURK_ADVECT=.FALSE. ,
L_MURK_BDRY=.FALSE. ,
L_MURK_RAD=.FALSE. ,
L_BL_TRACER_MIX=.FALSE. ,
L_MICROPHY=.TRUE. ,
L_SULPC_SO2=.TRUE. ,
L_SO2=.TRUE. ,
L_SO4_AITKEN=.TRUE. ,
L_SO4_ACCU=.TRUE. ,
L_SO4 DISS=.TRUE. ,
L_DMS=.TRUE. ,
L_NH3=.TRUE. ,
L_SOOT=.TRUE. ,
L_SOOT_NEW=.TRUE. ,
L_SOOT_AGD=.TRUE. ,
L_SOOT_CLD=.TRUE. ,
CALL_CHEMFREQ=1,
L_SO2_SURFEM=.TRUE. ,
L_SO2_HILEM=.TRUE. ,
L_SO2_NATEM=.TRUE. ,
L_SULPC_DMS=.TRUE. ,
L_DMS_EM=.TRUE. ,
L_DMS_EM_INTER=.TRUE. ,
L_DMS_OINTER=.FALSE. ,
L_DMS_Liss_Merlivat=.FALSE. ,
L_DMS_Wanninkhof=.TRUE. ,
L_DMS_Nightingale=.FALSE. ,
L_SULPC_OZONE=.TRUE. ,
L_SULPC_ONLINE_OXIDANTS=.FALSE. ,
L_SULPC_2_WAY_COUPLING=.FALSE. ,
L_SULPC_NH3=.TRUE. ,
L_USE_SULPC_DIRECT=.TRUE. ,
L_NH3_EM=.FALSE. ,
L_SULPC_SO2_O3_NONBUFFERED=.TRUE. ,
L_USE_SULPC_INDIRECT_SW=.TRUE. ,
L_USE_SULPC_INDIRECT_LW=.TRUE. ,
L_USE_SULPHATE_AUTOCONV=.TRUE. ,
L_USE_SULPHATE_SULPC=.TRUE. ,
L_NITRATE=.FALSE. ,
L_NITR_ACC=.FALSE. ,
L_NITR_DISS=.FALSE. ,
L_USE_NITRATE_DIRECT=.FALSE. ,
L_USE_NITRATE_INDIRECT=.FALSE. ,
L_USE_NITRATE_AUTOCONV=.FALSE. ,
L_USE_NITRATE_SULPC=.FALSE. ,
L_USE_SEASALT_INDIRECT=.TRUE. ,
L_USE_SEASALT_AUTOCONV=.TRUE. ,
L_USE_SEASALT_SULPC=.TRUE. ,
L_USE_SEASALT_DIRECT=.TRUE. ,
L_USE_SEASALT_PM=.FALSE. ,
L_SOOT_SUREM=.FALSE. ,
L_SOOT_HILEM=.TRUE. ,
L_USE_SOOT_DIRECT=.TRUE. ,
L_USE_SOOT_INDIRECT=.FALSE. ,
L_USE_SOOT_AUTOCONV=.FALSE. ,
L_USE_SOOT_SULPC=.FALSE. ,
L_BIOMASS=.TRUE. ,

```

```

L_BMASS_SUREM=.TRUE. ,
L_BMASS_HILEM=.TRUE. ,
L_USE_BMASS_DIRECT=.TRUE. ,
L_USE_BMASS_INDIRECT=.TRUE. ,
L_USE_BMASS_AUTOCONV=.TRUE. ,
L_USE_BMASS_SULPC=.TRUE. ,
L_BMASS_NEW=.TRUE. ,
L_BMASS_AGD=.TRUE. ,
L_BMASS_CLD=.TRUE. ,
L_USE_BIOGENIC=.TRUE. ,
L_USE_ARCLBIOM=.FALSE. ,
L_USE_ARCLBLCK=.FALSE. ,
L_USE_ARCLSSLT=.FALSE. ,
L_USE_ARCLSULP=.FALSE. ,
L_USE_ARCLDUST=.FALSE. ,
L_USE_ARCLOCFF=.FALSE. ,
L_USE_ARCLDLTA=.FALSE. ,
L_OCOFF=.TRUE. ,
L_OCOFF_SUREM=.FALSE. ,
L_OCOFF_HILEM=.TRUE. ,
L_USE_OCOFF_DIRECT=.TRUE. ,
L_USE_OCOFF_INDIRECT=.TRUE. ,
L_USE_OCOFF_AUTOCONV=.TRUE. ,
L_USE_OCOFF_SULPC=.TRUE. ,
L_OCOFF_NEW=.TRUE. ,
L_OCOFF_AGD=.TRUE. ,
L_OCOFF_CLD=.TRUE. ,
L_DUST=.TRUE. ,
L_dust_diag=.FALSE. ,
L_USE_DUST=.TRUE. ,
L_DUST_DIV1=.TRUE. ,
L_DUST_DIV2=.TRUE. ,
L_DUST_DIV3=.TRUE. ,
L_DUST_DIV4=.TRUE. ,
L_DUST_DIV5=.TRUE. ,
L_DUST_DIV6=.TRUE. ,
L_CAM_DUST=.FALSE. ,
L_TWOBIN_DUST_CNTRLATM=.FALSE. ,
L_DUST_DIV1_LBC_OUT=.FALSE. ,
L_DUST_DIV2_LBC_OUT=.FALSE. ,
L_DUST_DIV3_LBC_OUT=.FALSE. ,
L_DUST_DIV4_LBC_OUT=.FALSE. ,
L_DUST_DIV5_LBC_OUT=.FALSE. ,
L_DUST_DIV6_LBC_OUT=.FALSE. ,
L_SO2_LBC_OUT=.FALSE. ,
L_SO4_AITKEN_LBC_OUT=.FALSE. ,
L_SO4_ACCU_LBC_OUT=.FALSE. ,
L_SO4 DISS_LBC_OUT=.FALSE. ,
L_DMSS_LBC_OUT=.FALSE. ,
L_NH3_LBC_OUT=.FALSE. ,
L_SOOT_NEW_LBC_OUT=.FALSE. ,
L_SOOT_AGD_LBC_OUT=.FALSE. ,
L_SOOT_CLD_LBC_OUT=.FALSE. ,
L_BMASS_NEW_LBC_OUT=.FALSE. ,
L_BMASS_AGD_LBC_OUT=.FALSE. ,
L_BMASS_CLD_LBC_OUT=.FALSE. ,
L_OCOFF_NEW_LBC_OUT=.FALSE. ,
L_OCOFF_AGD_LBC_OUT=.FALSE. ,
L_OCOFF_CLD_LBC_OUT=.FALSE. ,
L_NITR_ACC_LBC_OUT=.FALSE. ,
L_NITR DISS_LBC_OUT=.FALSE. ,
L_DUST_DIV1_LBC=.FALSE. ,
L_DUST_DIV2_LBC=.FALSE. ,

```



```

L_DUST_DIV3_LBC=.FALSE. ,
L_DUST_DIV4_LBC=.FALSE. ,
L_DUST_DIV5_LBC=.FALSE. ,
L_DUST_DIV6_LBC=.FALSE. ,
L_SO2_LBC=.FALSE. ,
L_SO4_AITKEN_LBC=.FALSE. ,
L_SO4_ACCU_LBC=.FALSE. ,
L_SO4 DISS_LBC=.FALSE. ,
L_DMS_LBC=.FALSE. ,
L_NH3_LBC=.FALSE. ,
L_SOOT_NEW_LBC=.FALSE. ,
L_SOOT_AGD_LBC=.FALSE. ,
L_SOOT_CLD_LBC=.FALSE. ,
L_BMASS_NEW_LBC=.FALSE. ,
L_BMASS_AGD_LBC=.FALSE. ,
L_BMASS_CLD_LBC=.FALSE. ,
L_OCOFF_NEW_LBC=.FALSE. ,
L_OCOFF_AGD_LBC=.FALSE. ,
L_OCOFF_CLD_LBC=.FALSE. ,
L_NITR_ACC_LBC=.FALSE. ,
L_NITR_DISS_LBC=.FALSE. ,
HSWBANDS= 6,
HLWBANDS= 9,
L_CLD_AREA=.FALSE. ,
L_ACF_CUSACK=.FALSE. ,
L_ACF_BROOKS=.FALSE. ,
L_PC2=.TRUE. ,
L_PC2_RESET=.FALSE. ,
l_pc2_diag_sh=.FALSE. ,
NPMSL_HEIGHT=500.00 ,
L_PMSL_SOR=.FALSE. ,
LEMCORR=.TRUE. ,
LMASS_CORR=.TRUE. ,
LQT_CORR=.FALSE. ,
LEMQ_PRINT=.TRUE. ,
A_ENERGYSTEPS=72,
L_RHCPT=.FALSE. ,
L_AUTO_DEBIAS=.FALSE. ,
L_3D_CCA=.TRUE. ,
L_PHASE_LIM=.TRUE. ,
L_CO2_INTERACTIVE=.FALSE. ,
L_CO2_EMITS=.FALSE. ,
L_Q10=.TRUE. ,
L_NEG_TSTAR=.FALSE. ,
L_VEG_FRACS=.TRUE. ,
L_TRIFFID=.FALSE. ,
L_PHENOL=.FALSE. ,
L_TRIF_EQ=.FALSE. ,
L_NRUN_MID_TRIF=.FALSE. ,
L_DISTURB=.FALSE. ,
CAN_MODEL=4,
PHENOL_PERIOD=0,
TRIFFID_PERIOD=0,
L_UM_JULES_IO=.TRUE. ,
L_FLAKE_MODEL_IO=.FALSE. ,
L_URBAN2T_IO=.FALSE. ,
L_CTILE=.TRUE. ,
A_ASSIM_MODE='AC' ,
problem_number=0,
L_USE_METHOX=.TRUE. ,
Z_TOP=85000.00 ,
L_GWD=.TRUE. ,
L_USE_USSP=.TRUE. ,

```

```

L_RIVERS=.TRUE. ,
L_INLAND=.TRUE. ,
RIVER_STEP=10800,
L_MCR_QCF2=.FALSE. ,
L_MCR_QRAIN=.TRUE. ,
L_MCR_QGRAUP=.FALSE. ,
L_MCR_QCF2_LBC=.FALSE. ,
L_MCR_QRAIN_LBC=.FALSE. ,
L_MCR_QGRAUP_LBC=.FALSE. ,
L_PC2_LBC=.FALSE. ,
L_MURK_LBC=.FALSE. ,
L_int_uvw_lbc=.FALSE. ,
L_TOP=.TRUE. ,
L_PDM=.FALSE. ,
L_USE_TPPS_OZONE= .FALSE. ,
L_OZONE_INT= 2,
L_RADIATION=.TRUE. ,
L_RAIN=.TRUE. ,
L_MR_PHYSICS1=.TRUE. ,
L_BL=.TRUE. ,
L_HYDROLOGY=.TRUE. ,
L_SOIL_SAT_DOWN=.TRUE. ,
L_anthrop_heat_src=.FALSE. ,
L_ICOUNT=.FALSE. ,
L_UKCA=.FALSE. ,
L_UKCA_RADAER=.FALSE. ,
L_NUDGING=.FALSE. ,
L_FORCING= .FALSE. ,
L_TIMESTEP= .TRUE. ,
L_RADIANCE=.FALSE. ,
L_INHOM_CLOUD=.FALSE. ,
L_USE_OROG_CORR= .FALSE. ,
L_USE_GRAD_CORR= .TRUE. ,
L_use_skyview= .FALSE. ,
L_orog_unfilt= .FALSE. ,
L_USE_AOD= .TRUE. ,
L_MOD_K_FLUX=.TRUE. ,
L_CCRad= .TRUE. ,
L_USE_CARIOLLE=.FALSE. ,
L_USE_OZONEINRAD=.FALSE. ,
L_STPHSEED_WRITE=.FALSE. ,
L_STPHSEED_READ=.FALSE. ,
L_OASIS=.FALSE. ,
L_COUPLE_MASTER=.FALSE. ,
L_CONV_HIST=.FALSE. ,
L_DeCplTScr_Prg=.TRUE. ,
L_CldBaseDD_prg=.TRUE. ,
L_conv_opt=3,
L_tke_closure = .FALSE. ,
/

&IAU_nl
L_IAU=.FALSE. ,
/

&TDF_nl
L_TDF=.FALSE. ,
/

&RUN_BL
FORMDRAG=1,
L_use_bl_diag_term=.FALSE. ,

```

```

ALPHA_CD= 2.000e+00,1.500e+00,1.500e+00,1.500e+00,
1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,
1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,
1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,
1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,
1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,
1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,1.500e+00,
L_SBLEq=.FALSE. ,
SBL_OP=6,
ISHEAR_BL = 1,
NG_STRESS=2,
par_mezcla_max= 0.500 ,
par_mezcla= 0.150 ,
par_mezcla_min= 0.005 ,
G0_max=20.000 ,
G0_RP=10.000 ,
G0_min= 5.000 ,
Charnock_max= 0.026 ,
Charnock=0.0180 ,
Charnock_min= 0.010 ,
LAMBDA_MIN_MAX=100.000 ,
LAMBDA_MIN_RP=40.000 ,
LAMBDA_MIN_MIN=20.000 ,
RICRIT_MAX= 1.000 ,
RICRIT_RP= 1.000 ,
RICRIT_MIN= 0.250 ,
A_ENT_1_MAX= 0.400 ,
A_ENT_1_RP= 0.230 ,
A_ENT_1_MIN= 0.100 ,
G1_MAX= 1.500 ,
G1_RP= 0.850 ,
G1_MIN= 0.500 ,
SeaSalinityFactor= 0.98 ,
ISeaZ0T= 1 ,
IDynDiag= 4 ,
zhloc_depth_fac=0.30 ,
subs_couple_fix=1,
COR_UST= 2 ,
TRWEIGHTS1= 1 ,
LLAMBDAM2= .FALSE. ,
LFULL_LAMBDA= .FALSE. ,
LEMIS_LAND_GEN=.TRUE. ,
EMIS_LAND_GEN=0.9700 ,
FLUX_GRAD= 0 ,
Entr_enhance_by_Cu= 1 ,
relax_sc_over_cu=0,
Dec_Thres_Cloud=0.10 ,
L_us_blsol=.TRUE. ,
Pstb = 2.000 ,
Puns = 0.500 ,
NON_LOCAL_BL=1,
LOCAL_FA=1,
BUDDY_SEA=1,
OROG_DRAG_PARAM= 0.15 ,
FD_stab_dep=0,
Keep_Ri_FA=1,
NL_BL_LEVELS=30,
COR_MO_ITER=3,
Variable_RiC=1,
cbl_op=2,
sg_orog_mixing=0,
ISrfExCnvGust=1,

```

```
Fric_heating=1,  
Prandtl=1,  
/  

```

```
&RUN_BLICE  
ZOHSEA= 4.00000e-05,  
ZOMIZ= 5.00000e-04,  
ZOSICE= 5.00000e-04,  
/  

```

```
&RUN_BLVEG  
ALBSNCNVG = 4.00000e-01, 8.00000e-01, 8.00000e-01, 8.00000e-01,  
ALBSNFNVG = 1.80000e-01, 6.00000e-02, -1.00000e+00, 7.50000e-01,  
CATCHNVG = 5.00000e-01, 0.00000e+00, 0.00000e+00, 0.00000e+00,  
GSNVG = 0.00000e+00, 0.00000e+00, 1.00000e-02, 1.00000e+06,  
INFIL_NVG = 1.00000e-01, 0.00000e+00, 5.00000e-01, 0.00000e+00,  
ROOTD_NVG = 5.00000e-01, 1.00000e+00, 1.00000e-01, 0.00000e+00,  
Z0_NVG = 1.00000e+00, 1.00000e-04, 1.00000e-03, 5.00000e-04,  
CH_NVG = 2.80000e+05, 2.11000e+07, 0.00000e+00, 0.00000e+00,  
VF_NVG = 1.00000e+00, 1.00000e+00, 0.00000e+00, 0.00000e+00,  
CANRAD_MOD=4,  
ILAYERS=10,  
/  

```

```
&RUN_PFT  
ALBSNC_MAX = 2.50000e-01, 2.50000e-01, 6.00000e-01, 6.00000e-01, 4.00000e-01,  
ALBSNC_MIN = 3.00000e-01, 3.00000e-01, 8.00000e-01, 8.00000e-01, 8.00000e-01,  
ALBSNF_MAX = 1.43000e-01, 8.80000e-02, 1.92000e-01, 1.59000e-01, 1.15000e-01,  
DZ0V_DH = 5.00000e-02, 5.00000e-02, 1.00000e-01, 1.00000e-01, 1.00000e-01,  
CATCH0 = 5.00000e-01, 5.00000e-01, 5.00000e-01, 5.00000e-01, 5.00000e-01,  
DCATCH_DLAI = 5.00000e-02, 5.00000e-02, 5.00000e-02, 5.00000e-02, 5.00000e-02,  
INFIL_F = 4.00000e+00, 4.00000e+00, 2.00000e+00, 2.00000e+00, 2.00000e+00,  
KEXT = 5.00000e-01, 5.00000e-01, 5.00000e-01, 5.00000e-01, 5.00000e-01,  
ROOTD_FT = 3.00000e+00, 1.00000e+00, 5.00000e-01, 5.00000e-01, 5.00000e-01,  
/  

```

```
&RUN_LAND  
FRAC_SNOW_SUBL_MELT=1,  
WARMSNOW_MELT_FIX=.TRUE. ,  
MASKD= 0.20 ,  
L_VG_SOIL=.TRUE. ,  
SOILHC_METHOD=2,  
ALL_TILES=0,  
IScrnTDIag=2,  
i_modiscopt=0,  
/  

```

```
&RUN_Precip  
RHCRT= 0.920 ,0.918 ,0.916 ,0.912 ,0.908 ,0.903 ,0.898 ,0.891 ,  
0.885 ,0.877 ,0.869 ,0.859 ,0.850 ,0.839 ,0.828 ,0.815 ,0.803 ,0.800 ,0.800 ,0.800 ,0.800 ,  
0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,  
0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,  
0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,  
0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,0.800 ,  
L_IT_MELTING=.FALSE. ,  
L_AUTOC_3B=.FALSE. ,  
L_AUTOLIM_3B=.FALSE. ,  
LAUTOCONV_MURK=.FALSE. ,  
EC_AUTO= 0.5500 ,  
X1R=2.2000e-01 ,
```

```

X2R= 2.2000 ,
X4R= 0.0000 ,
ntot_land=3.0000e+08,
ntot_sea=1.0000e+08,
X1I=2.0E6,
X1IC=40.0E6,
l_psd=.FALSE. ,
l_psd_global=.FALSE. ,
l_hallett_mossop=.FALSE. ,
AI=1.8500e-02,
BI=1.9000e+00,
AIC=1.8500e-02,
BIC=1.9000e+00,
as_rrmax=1.0,
l_mcr_iter=.TRUE. ,
lsiter=1,
NITER_BS=10,
LSP_EI=2.072000e-01,
LSP_FI=6.3800e-01,
LSP_EIC=6.049000e-02,
LSP_FIC=8.3100e-01,
L_CRY_AGG_DEP=.FALSE. ,
l_rainfall_as=.TRUE. ,
l_mcr_asmax=.FALSE. ,
RHCRIT_max= 0.910 ,
RHCRIT_min= 0.875 ,
M_CI_max= 1.400 ,
M_CI= 1.000 ,
M_CI_min= 0.600 ,
l_droplet_settle=.TRUE. ,
l_droplet_tpr=.FALSE. ,
z_peak_nd=500.0,
ndrop_surf=20.0E6,
l_taper_new=.FALSE. ,
max_drop_surf=10.0E7,
/

&RUN_Cloud
L_EACF=.FALSE. ,
CLOUDFRACTIONMETHOD=2,
OVERLAP_ICE_LIQUID= -1.0000,
ICE_FRACTIONMETHOD=1,
CTT_WEIGHT=0.333,
T_WEIGHT=0.333,
QSAT_FIXED=0.1E-3,
SUB_CLD=0.225,
dbsdtbs_turb_0=1.50e-04,
l_micro_eros=.FALSE. ,
i_pc2_erosion_method=3,
i_pc2_conv_coupling=3,
l_ensure_min_in_cloud_qcf=.TRUE. ,
l_fixbug_pc2_bl_cff=.FALSE. ,
l_fixbug_pc2_qcl_incr=.TRUE. ,
i_fixbug_pc2_checks=2,
pc2_falliceshear_method=2,
cff_spread_rate= 1.00e-03,
starticeTKelvin=273.15,
alliceTdegC=-20.00,
/

&RUN_Convection
LMOM=.TRUE. ,
l_re diagnosis=.FALSE. ,

```

```

L_CONV4A=.TRUE. ,
L_CAPE=.TRUE. ,
L_SDXS=.FALSE. ,
L_XSCOMP=.TRUE. ,
deep_cmt_opt=5,
mid_cmt_opt=0,
DD_opt=1,
icvdiag=1,
tv1_sd_opt=2,
plume_water_load=0,
dil_plume_water_load=0,
cvdiag_sh_wtest=0.020 ,
cvdiag_inv=0,
mid_cnv_pmin=10000.00 ,
bl_cnv_mix=1,
l4a_kterm=.FALSE. ,
CCW_FOR_PRECIP_OPT=4,
qlmin=3.0000e-04,
fac_qsar=0.500 ,
L_CLOUD_DEEP=.TRUE. ,
A_CONVECT_SEGMENTS=-99,
A_CONVECT_SEG_SIZE=80,
MPARWIR=1.5000e-03,
L_anvil=.TRUE. ,
ANVILFACTOR=1.0000 ,
TOWERFACTOR=1.0000 ,
UDFACTOR=1.0000 ,
N_CONV_CALLS=2,
CAPE_TIMESCALE=3600,
CAPE_OPT=3,
ADAPT=7,
R_DET=0.9000 ,
amdetsfac= 3.00 ,
ENT_FAC=1.0 ,
CAPE_MIN=0.5 ,
W_CAPE_LIMIT=    0.3 ,
CAPE_BOTTOM=5,
CAPE_TOP=50,
CONVECTION_OPTION=3,
TICE=263.1500 ,
QSTICE=3.5000e-03,
L_EMAN_DD=.FALSE. ,
L_fix_udfactor=.FALSE. ,
Rad_cloud_decay_opt=2,
Sh_pert_Opt=1,
termconv=1,
fixed_cld_life= 7200.00 ,
cca_min= 2.000e-02,
anv_opt= 0,
limit_pert_opt=2,
cnv_wat_load_opt=0,
cca2d_sh_opt= 1,
cca2d_dp_opt= 1,
cca2d_md_opt= 1,
cca_sh_knob= 0.00 ,
cca_dp_knob= 0.00 ,
cca_md_knob= 0.00 ,
ccw_sh_knob= 0.00 ,
ccw_dp_knob= 0.00 ,
ccw_md_knob= 0.00 ,
cld_life_opt= 0,
ICONV_SHALLOW=1,
ICONV_CONGESTUS=0,

```

```

ICONV_DEEP=1,
ICONV_MID=1,
ent_opt_dp=3,
ent_dp_power=2.00,
ent_fac_dp=1.35,
ent_opt_md=0,
ent_fac_md=0.90,
/

```

```

&RUN_Stochastic
L_SKEB2=.FALSE. ,
L_SKEB2_PSIDISP=.FALSE. ,
L_SKEB2_SKEB1DISP=.FALSE. ,
L_SKEB2_PSICDISP=.FALSE. ,
L_SKEB2_CDISP_CAPE=.TRUE. ,
L_SKEB2_CDISP_MFLX=.FALSE. ,
alphac=2.00e-03,
N1=20,
N2=144,
tot_backscat=1.00e-04,
bR= 0.0275,
skeb2_botlev=2,
skeb2_toplev=37,
tau=2.00e+04,
L_SKEB2_VELPOT=.FALSE. ,
L_RP2=.FALSE. ,
/

```

```

&RUN_Radiation
L_CLIMAT_AEROSOL=.TRUE. ,
L_HadGEM1_Clim_Aero=.TRUE. ,
L_RAD_USE_CLIM_VOLC=.FALSE. ,
ALPHAC= 0.80 , ALPHAM= 0.60 , DTICE= 10.00 ,
A_SW_SEGMENTS=-99,
A_SW_SEG_SIZE=80,
A_LW_SEGMENTS=-99,
A_LW_SEG_SIZE=80,
L_EQT=.TRUE. ,
L_SEC_VAR=.FALSE. ,
L_CLIM_AERO_HGT=.FALSE. ,
AERO_BL_LEVELS=50,
CO2MMR= 5.24100e-04 ,
O2MMR= 0.2314,
N2OMMR= 4.665e-07,
CH4MMR= 9.139e-07,
C11MMR= 1.053e-09,
C12MMR= 1.595e-09,
IS_NCOL=300,
DP_CORR_STRAT=10000.000,
RAD_MCICA_SIGMA= 0.750,
RAD_MCICA_SAMPLING= 2,
/

```

```

&RUN_GWD
KAY_GWAVE= 3.30e+03,
GWD_FRC= 4.00,
GWD_FRC_max= 4.000,
GWD_FRC_min= 2.000,
KAY_GWAVE_max=133000.000,
KAY_GWAVE_min= 75000.000,
SAT_SCHEME=0,

```

```
GWDFSAT=1.0,  
L_FIX_GWSATN= .TRUE. ,  
L_GWD_40KM=.TRUE. ,  
L_USSP_OPAQUE=.TRUE. ,  
USSP_LAUNCHFACTOR=1.5000 ,  
/  

```

```
&RUN_Dust  
us_am= 1.45 ,  
sm_corr= 0.50 ,  
horiz_d= 2.50 ,  
l_fix_size_dist= .FALSE. ,  
dust_veg_emiss= 1 ,  
/  

```

```
&RUN_Aerosol  
SO2_HIGH_LEVEL=8,  
SOOT_HIGH_LEVEL=3,  
BMASS_HIGH_LEVEL_1=3,  
BMASS_HIGH_LEVEL_2=20,  
OCFF_HIGH_LEVEL=3,  
L_TRACER1_NON_HYDRO= .TRUE. ,  
/  

```

```
&RUN_UKCA  
LUKCA_FAMILY=.FALSE. ,  
LUKCA_USEOXID=.FALSE. ,  
LUKCA_ADVH2O= .FALSE. ,  
LUKCA_PHOT2D= .FALSE. ,  
LUKCA_FASTJ= .FALSE. ,  
LUKCA_CHEM= .FALSE. ,  
LUKCA_STRAT= .FALSE. ,  
LUKCA_WACHEM= .FALSE. ,  
LUKCA_TROP= .FALSE. ,  
LUKCA_RAQ=.FALSE. ,  
LUKCA_TROPISOP= .FALSE. ,  
LUKCA_STRATTROP= .FALSE. ,  
LUKCA_STRATCFC= .FALSE. ,  
LUKCA_AERCHEM= .FALSE. ,  
LUKCA_USER= .FALSE. ,  
LUKCA_MODE= .FALSE. ,  
LUKCA_DUST=.FALSE. ,  
LUKCA_RNPB= .FALSE. ,  
LUKCA_O3BUDGET= .FALSE. ,  
LUKCA_QCH4INTER= .FALSE. ,  
LUKCA_ISOPINTER= .FALSE. ,  
LUKCA_TERPINTER= .FALSE. ,  
LUKCA_PRESCRIBECH4= .FALSE. ,  
LUKCA_BUDGET2= .FALSE. ,  
LUKCA_QF11F12MBR= .FALSE. ,  
LUKCA_USEUMUIVALS= .FALSE. ,  
LUKCA_NAT_SEDI= .FALSE. ,  
LUKCA_HET_PSC= .FALSE. ,  
LUKCA_H2O_FEEDBACK= .FALSE. ,  
LUKCA_CLBRCONS= .FALSE. ,  
LUKCA_USERO3= .FALSE. ,  
LUKCA_USECO3= .FALSE. ,  
LUKCA_USERRELAXO3= .FALSE. ,  
LUKCA_RADO3= .FALSE. ,  
LUKCA_RADCH4= .FALSE. ,  
LUKCA_RADN2O= .FALSE. ,  
LUKCA_RADF11= .FALSE. ,  
LUKCA_RADF12= .FALSE. ,
```



```

LUKCA_RADF113= .FALSE. ,
LUKCA_RADF22= .FALSE. ,
LUKCA_RADCH2O= .FALSE. ,
LUKCA_INTDD= .FALSE. ,
PHOT2D_DIR='PHOT2D_DIR is unset' ,
JVSPEC_DIR='JVSPEC_DIR is unset' ,
JVSPEC_FILE='JVSPEC_FILE is unset' ,
STRAT2D_DIR='STRAT2D_DIR is unset' ,
JPCTR=0,
JPSPEC=0,
JPBK=0,
JPTK=0,
JPPJ=0,
JPHK=0,
JPNR=0,
JPDD=0,
JPDW=0,
JPEQ=2,
/

```

```

&RUN_Nudging
/

```

```

&RUN_Dyn
L_PRIMITIVE=.TRUE. ,
L_DRY=.FALSE. ,
L_free_slip=.FALSE. ,
L_ADJUST_WET=.FALSE. ,
L_perturb_IC_theta=.FALSE. ,
L_PHYSICS=.TRUE. ,
IntRand_seed=0,
L_BACKWARDS=.FALSE. ,
L_INTERP_DEPART=.FALSE. ,
ALPHA_1= 0.70 ,
ALPHA_2= 1.00 ,
ALPHA_3= 0.70 ,
ALPHA_4= 1.00 ,
ALPHA_1_2=0.6 ,
ALPHA_2_2=1.0 ,
ALPHA_3_2=0.6 ,
ALPHA_4_2=1.0 ,
L_NEW_TDISC=.FALSE. ,
NUMCYCLES=1,
EXTRP_WEIGHT=1.50 ,
GCR_USE_TOL_ABS=.TRUE. ,
GCR_USE_RESIDUAL_TOL=.FALSE. ,
GCR_TOL_RES=0.0 ,
GCR_TOL_ABS=1.000e-02 ,
GCR_ZERO_INIT_GUESS=.TRUE. ,
L_GCR_CYCLE_OPT=.TRUE. ,
GCR_MAX_ITERATIONS=100 ,
GCR_DIAGNOSTICS=1 ,
GCR_ITS_AVG_STEP= 12,24,1440 ,
GCR_PRECON_OPTION=4 ,
GCR_ADI_ADD_FULL_SOLN=.TRUE. ,
L_GCR_FAST_X=.FALSE. ,
GCR_N_ADL_PSEUDO_TIMESTEPS=1 ,
GCR_ADL_PSEUDO_TIMESTEP=0.00080 ,
GCR_RESTART_VALUE=2 ,
G_term_tol=0.9 ,
L_mix_ratio=.TRUE. ,
L_QWATERLOAD=.TRUE. ,
L_fint_theta=.FALSE. ,

```

```

N_RIMS_TO_DO=1,
L_REGULAR=.TRUE. ,
L_LBC_BALANCE=.FALSE. ,
L_LBC_NEW=.FALSE. ,
L_RUN_WITH_PHYSICS2 = .TRUE. ,
L_thmono_fixed=.TRUE. ,
/

```

```

&RUN_SL
L_CONSERV=.FALSE. , .TRUE. , .FALSE. , .FALSE. ,
L_MOIST_NONHYDRO_CONSERVE=.TRUE. ,
L_MONO= .FALSE. , .TRUE. , .FALSE. , .FALSE. ,
L_HIGH= .TRUE. , .TRUE. , .TRUE. , .FALSE. ,
MONOTONE_SCHEME= 0 , 1 , 0 , 0 ,
HIGH_ORDER_SCHEME= 3 , 6 , 3 , 0 ,
DEPART_SCHEME=1,
DEPART_ORDER=2,
L_RITCHIE_MONO=.TRUE. ,
L_RITCHIE_HIGH=.FALSE. ,
RITCHIE_MONOTONE_SCHEME=1,
RITCHIE_HIGH_ORDER_SCHEME=0,
INTERP_VERTICAL_SEARCH_TOL=22,
L_2D_SL_GEOMETRY=.FALSE. ,
L_SL_HALO_REPROD=.FALSE. ,
THMONO_HEIGHT=5.00000 e+02,
L_CONSERVE_TRACERS=.TRUE. ,
/

```

```

&RUN_Diffusion
L_DIFF_CTL=.TRUE. ,
L_DIFFUSION=.FALSE. ,
L_CDIFUSION= .FALSE. ,
HORIZONTAL_LEVEL=51,
L_subfilter_horiz=.FALSE. ,
L_subfilter_vert=.FALSE. ,
L_subfilter_blend=.FALSE. ,
TOP_FILT_START= 1000,
TOP_FILT_END= 1000,
TOP_DIFF= 0.10 ,
L_UPPER_RAMP=.FALSE. ,
L_VERTICAL_DIFFUSION=.FALSE. ,
L_RAMP=.FALSE. ,
L_ADJUST_THETA=.TRUE. ,
ADJUST_THETA_START= 51,
ADJUST_THETA_END= 85,
L_VDIFF_UV= .FALSE. ,
VDIFFUV_START= 1000,
VDIFFUV_END= 1000,
VDIFFUV_TIMESCALE= 1,
VDIFFUV_TEST= 100.0 ,
L_SPONGE= .FALSE. ,
SPONGE_EW= 0,
SPONGE_NS= 0,
SPONGE_POWER= 1,
L_DIVDAMP= .FALSE. ,
DIV_DAMP_COEFFICIENT=-1.0,
L_QPOS=.TRUE. ,
Q_POS_METHOD=4,
QLIMIT=1.000e-08,

```

```

L_QPOS_DIAG_PR=.FALSE. ,
Q_POS_TRACER_METHOD=4,
L_TARDIFF_Q=.TRUE. ,
TARDIFFQ_FACTOR= 0.10 ,
W_CONV_LIMIT= 0.3 ,
TARDIFFQ_TEST=5,
TARDIFFQ_START=1,
TARDIFFQ_END=53,
TAR_HORIZONTAL=51,
L_DIAG_PRINT=.TRUE. ,
L_DIAG_PRINT_OPS= .FALSE. ,
L_flush6= .TRUE. ,
L_PRINT_PE= .FALSE. ,
PRINT_STEP=1,
DIAG_INTERVAL= 1,
L_PRINT_W=.TRUE. ,
W_PRINT_LIMIT= 0.4 ,
L_PRINT_WMAX= .TRUE. ,
L_PRINT_DIV= .FALSE. ,
L_PRINT_LAPSE= .FALSE. ,
L_PRINT_THETA1= .TRUE. ,
L_PRINT_MAX_WIND= .FALSE. ,
L_DIAG_WIND= .FALSE. ,
L_PRINT_SHEAR= .FALSE. ,
L_DIAG_NOISE= .FALSE. ,
L_DIAG_L2NORMS= .FALSE. ,
L_DIAG_L2HELM= .FALSE. ,
NORMLEV_START= 1,
NORMLEV_END= 85,
L_POLAR_FILTER= .FALSE. ,
L_POLAR_FILTER_INCS= .FALSE. ,
POLAR_FILTER_LAT_LIMIT= 0.0 ,
POLAR_FILTER_NORTH_LAT_LIMIT= 0.0 ,
POLAR_FILTER_SOUTH_LAT_LIMIT= 0.0 ,
POLAR_FILTER_N_SWEEPS= 0,
POLAR_FILTER_COEFFICIENT= 0.0 ,
POLAR_FILTER_STEP_PER_SWEEP= 0,
L_POFIL_NEW= .TRUE. ,
L_DIFF_AUTO= .TRUE. ,
L_PFTHETA=.TRUE. ,
L_PFUW=.TRUE. ,
L_PFW=.TRUE. ,
L_PFINCS=.TRUE. ,
L_DIFF_THERMO=.FALSE. ,
L_DIFF_WIND=.FALSE. ,
L_DIFF_W=.TRUE. ,
L_DIFF_INCS=.FALSE. ,
DIFF_ORDER_THERMO=1,
DIFF_TIMESCALE_THERMO=0,
DIFF_ORDER_WIND=0,
DIFF_TIMESCALE_WIND=0,
DIFF_COEFF_REF= 0.000 ,
REF_LAT_DEG= 0.0 ,
SCALE_RATIO=2.000 ,
POLAR_CAP=85.000 ,
MAX_SWEEPS=8,
L_pfexner=.TRUE. ,
L_pofil_hadGEM2=.TRUE. ,
first_norm_print=1,
/

```

```

&RUN_RIVERS
RIVER_VEL=0.400000 ,

```

RIVER_MCOEF=1.400000 ,
/

&RADFCDIA
/

&PPRINTXN
LPRVXN=.FALSE. ,
LPPRINT=.FALSE. ,
LPRFLD=.FALSE. ,
/

&ANCILCTA
LSSTANOM=.FALSE. ,
LAMAPII=.TRUE. ,
/

&UPANCA ANC_REF_NO=7, PERIOD=3, INTERVAL=30 /
&UPANCA ANC_REF_NO=27, PERIOD=3, INTERVAL=1 /
&UPANCA ANC_REF_NO=28, PERIOD=3, INTERVAL=1 /
&UPANCA ANC_REF_NO=29, PERIOD=3, INTERVAL=1 /
&UPANCA ANC_REF_NO=39, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=40, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=70, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=73, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=74, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=75, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=76, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=77, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=84, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=85, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=121, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=122, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=123, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=157, PERIOD=3, INTERVAL=5 /
&UPANCA ANC_REF_NO=187, PERIOD=3, INTERVAL=5 /

&INTFCNSTA
/

&R2SWNCAL
N_SWCall= 2 ,
/

&R2SWCLNL
SPECTRAL_FILE_SW='\$SPECTRAL/spec_sw_ga3_0 ',
FIRST_BAND_SW=1,
LAST_BAND_SW=6,
L2STREAM_SW=16,
LGAS_OVERLAP_SW=5,
L_LOCAL_CNV_PARTITION_SW=.TRUE. ,
L_CLOUD_REPRESENTATION_SW=2,
L_CLOUD_SW=10,
L_SOLVER_SW=13,
L_O2_SW=.TRUE. ,
L_ST_WATER_SW=5,
L_CNV_WATER_SW=5,
L_ST_ICE_SW=8,
L_CNV_ICE_SW=8,
L_CH4_SW=.FALSE. ,
L_N2O_SW=.FALSE. ,
/

```

&R2SWCLNL
SPECTRAL_FILE_SW='$SPECTRAL/spec_sw_cloud3_0',
FIRST_BAND_SW=1,
LAST_BAND_SW=2,
L2STREAM_SW=16,
LGAS_OVERLAP_SW=5,
LLOCAL_CNV_PARTITION_SW=.TRUE.,
LCLOUD_REPRESENTATION_SW=2,
LCLOUD_SW=2,
LSOLVER_SW=16,
L_O2_SW=.FALSE.,
LST_WATER_SW=5,
LCNV_WATER_SW=5,
LST_ICE_SW=8,
LCNV_ICE_SW=8,
L_CH4_SW=.FALSE.,
L_N2O_SW=.FALSE.,
/
&R2LWNCAL
N_LWCALL= 2,
/

```

```

&R2LWCLNL
SPECTRAL_FILE_LW='$SPECTRAL/spec_lw_ga3_0',
FIRST_BAND_LW=1,
LAST_BAND_LW=9,
L2STREAM_LW=12,
LGAS_OVERLAP_LW=5,
LLOCAL_CNV_PARTITION_LW=.TRUE.,
LCLOUD_REPRESENTATION_LW=2,
L_IR_SOURCE_QUAD_LW=.TRUE.,
LCLOUD_LW=10,
LSOLVER_LW=13,
LSCATTER_METHOD_LW=1,
L_N2O_LW=.TRUE.,
L_CH4_LW=.TRUE.,
L_CFC11_LW=.TRUE.,
L_CFC12_LW=.TRUE.,
L_HCFC22_LW=.FALSE.,
L_CFC113_LW=.FALSE.,
L_CFC114_LW=.FALSE.,
L_HFC125_LW=.FALSE.,
L_HFC134A_LW=.FALSE.,
LST_WATER_LW=5,
LCNV_WATER_LW=5,
LST_ICE_LW=8,
LCNV_ICE_LW=8,
LMICROPHYSICS_LW=.TRUE.,
LSOLAR_TAIL_FLUX=.FALSE.,
/

```

```

&R2LWCLNL
SPECTRAL_FILE_LW='$SPECTRAL/spec_lw_cloud3_0',
FIRST_BAND_LW=1,
LAST_BAND_LW=1,
L2STREAM_LW=12,
LGAS_OVERLAP_LW=5,
LLOCAL_CNV_PARTITION_LW=.TRUE.,
LCLOUD_REPRESENTATION_LW=2,
L_IR_SOURCE_QUAD_LW=.TRUE.,
LCLOUD_LW=2,
LSOLVER_LW=16,
LSCATTER_METHOD_LW=1,

```

```

L_N2O_LW=.FALSE. ,
L_CH4_LW=.FALSE. ,
L_CFC11_LW=.FALSE. ,
L_CFC12_LW=.FALSE. ,
L_HCFC22_LW=.FALSE. ,
L_CFC113_LW=.FALSE. ,
L_CFC114_LW=.FALSE. ,
L_HFC125_LW=.FALSE. ,
L_HFC134A_LW=.FALSE. ,
LST_WATER_LW=5,
LCNV_WATER_LW=5,
LST_ICE_LW=8,
LCNV_ICE_LW=8,
L_MICROPHYSICS_LW=.FALSE. ,
L_SOLAR_TAIL_FLUX=.FALSE. ,
/
&CLMCHFCG
L_CLMCHFCG=.FALSE. ,
/

```

!!! BEGIN JULES NAMELISTS !!!

```

!!! Only variables where no default is provided in the corresponding !!!
!!! module are defined here                                     !!!

```

&JULES_SWITCHES

!!! OTHERS LEFT AS DEFAULTS !!!

```

COR_MO_ITER=3,
L_MODISCOPT=0,
L_AGGREGATE=.FALSE. ,
BUDDY_SEA=1,
FRAC_SNOW_SUBL_MELT=1,
CAN_MODEL=4,
L_EPOT_CORR=.TRUE. ,
CAN_RAD_MOD=4,
ALL_TILES=0,
L_FLAKE_MODEL=.FALSE. ,
ISeaZ0T=1,
L_VG_SOIL=.TRUE. ,
SOILHC_METHOD=2,
L_SNOWDEP_SURF=.TRUE. ,
ISCRNTDIAG=2,
/

```

&JULES_NSTYPES

```

NPFT=5,
NNVG=4,
URBAN=6,
LAKE=7,
SOIL=8,
ICE=9,
/

```

&JULES_NVEGPARM

```

ALBSNC_NVG_IO = 4.00000e-01, 8.00000e-01, 8.00000e-01, 8.00000e-01,
ALBSNF_NVG_IO = 1.80000e-01, 6.00000e-02, -1.00000e+00, 7.50000e-01,
CATCH_NVG_IO = 5.00000e-01, 0.00000e+00, 0.00000e+00, 0.00000e+00,
GS_NVG_IO = 0.00000e+00, 0.00000e+00, 1.00000e-02, 1.00000e+06,
INFIL_NVG_IO = 1.00000e-01, 0.00000e+00, 5.00000e-01, 0.00000e+00,
Z0_NVG_IO = 1.00000e+00, 1.00000e-04, 1.00000e-03, 5.00000e-04,
CH_NVG_IO = 2.80000e+05, 2.11000e+07, 0.00000e+00, 0.00000e+00,
VF_NVG_IO = 1.00000e+00, 1.00000e+00, 0.00000e+00, 0.00000e+00,
EMIS_NVG_IO = 9.70000e-01, 9.85000e-01, 9.00000e-01, 9.90000e-01,

```

ZOHM_NVG_IO = 1.00000e-07, 2.50000e-01, 2.00000e-02, 2.00000e-01,
/

&JULES_PFTPARAM

C3_IO = 1, 1, 1, 0, 1,
ORIENT_IO = 0, 0, 0, 0, 0,
A_WL_IO = 0.65, 0.65, 0.005, 0.005, 0.10,
A_WS_IO = 10.00, 10.00, 1.00, 1.00, 10.00,
ALBSNC_MAX_IO = 2.50000e-01, 2.50000e-01, 6.00000e-01, 6.00000e-01, 4.00000e-01,
ALBSNC_MIN_IO = 3.00000e-01, 3.00000e-01, 8.00000e-01, 8.00000e-01, 8.00000e-01,
ALBSNF_MAX_IO = 1.43000e-01, 8.80000e-02, 1.92000e-01, 1.59000e-01, 1.15000e-01,
DZ0V_DH_IO = 5.00000e-02, 5.00000e-02, 1.00000e-01, 1.00000e-01, 1.00000e-01,
CATCH0_IO = 5.00000e-01, 5.00000e-01, 5.00000e-01, 5.00000e-01, 5.00000e-01,
DCATCH_DLAL_IO = 5.00000e-02, 5.00000e-02, 5.00000e-02, 5.00000e-02, 5.00000e-02,
INFIL_F_IO = 4.00000e+00, 4.00000e+00, 2.00000e+00, 2.00000e+00, 2.00000e+00,
KEXT_IO = 5.00000e-01, 5.00000e-01, 5.00000e-01, 5.00000e-01, 5.00000e-01,
ROOTD_FT_IO = 3.00000e+00, 1.00000e+00, 5.00000e-01, 5.00000e-01, 5.00000e-01,
ZOHM_PFT_IO = 1.65000e+00, 1.65000e+00, 1.00000e-01, 1.00000e-01, 1.00000e-01,
ALPHA_IO = 0.08, 0.08, 0.08, 0.040, 0.08,
ALNIR_IO = 0.45, 0.35, 0.58, 0.58, 0.58,
ALPAR_IO = 0.10, 0.07, 0.10, 0.10, 0.10,
B_WL_IO = 1.667, 1.667, 1.667, 1.667, 1.667,
DGL_DM_IO = 0.0, 0.0, 0.0, 0.0, 0.0,
DGL_DT_IO = 9.0, 9.0, 0.0, 0.0, 9.0,
DQCRIT_IO = 0.090, 0.060, 0.100, 0.075, 0.100,
ETA_SL_IO = 0.01, 0.01, 0.01, 0.01, 0.01,
FD_IO = 0.015, 0.015, 0.015, 0.025, 0.015,
FSMC_OF_IO = 0.00, 0.00, 0.00, 0.00, 0.00,
F0_IO = 0.875, 0.875, 0.900, 0.800, 0.900,
G_LEAF_0_IO = 0.25, 0.25, 0.25, 0.25, 0.25,
GLMIN_IO = 1.0E-6, 1.0E-6, 1.0E-6, 1.0E-6, 1.0E-6,
KPAR_IO = 0.50, 0.50, 0.50, 0.50, 0.50,
NEFF_IO = 0.8e-3, 0.8e-3, 0.8e-3, 0.4e-3, 0.8e-3,
NL0_IO = 0.040, 0.030, 0.060, 0.030, 0.030,
NR_NL_IO = 1.00, 1.00, 1.00, 1.00, 1.00,
NS_NL_IO = 0.10, 0.10, 1.00, 1.00, 0.10,
OMEGA_IO = 0.15, 0.15, 0.15, 0.17, 0.15,
OMNIR_IO = 0.70, 0.45, 0.83, 0.83, 0.83,
R_GROW_IO = 0.25, 0.25, 0.25, 0.25, 0.25,
SIGL_IO = 0.0375, 0.1000, 0.0250, 0.0500, 0.0500,
TLEAF_OF_IO = 273.15, 243.15, 258.15, 258.15, 243.15,
TLOW_IO = 0.0, -5.0, 0.0, 13.0, 0.0,
TUPP_IO = 36.0, 31.0, 36.0, 45.0, 36.0,
EMIS_PFT_IO = 0.98, 0.99, 0.98, 0.98, 0.98,
DUST_VEG_SCJ_IO = 0.0, 0.0, 1.0, 1.0, 0.5,
/

&JULES_TRIFFID

CROP_IO = 0, 0, 1, 1, 0,
G_AREA_IO = 0.005, 0.004, 0.25, 0.25, 0.05,
G_GROW_IO = 20.00, 20.00, 20.00, 20.00, 20.00,
G_ROOT_IO = 0.25, 0.25, 0.25, 0.25, 0.25,
G_WOOD_IO = 0.01, 0.01, 0.20, 0.20, 0.05,
LAI_MAX_IO = 9.00, 9.00, 4.00, 4.00, 4.00,
LAI_MIN_IO = 3.00, 3.00, 1.00, 1.00, 1.00,
/

&JULES_SNOWPARAM

!!! USE DEFAULTS FOR SCALARS !!!
DZSNOW_IO = 0.1, 0.2, 0.2, ! Note that this will only be copied to
! the actual dzsnow if nsmax > 0 above
canSnowPft = .FALSE., .TRUE., .FALSE., .FALSE., .FALSE.,
/

```

&JULES_SOIL_PARAM
  !!! USE DEFAULTS FOR SCALARS !!!
  DZSOIL_IO = 0.1000, 0.2500, 0.6500, 2.0000,
  /

&JULES_SURF_PARAM
  emis_sea=0.985,
  emis_sice=0.976,
  !!! USE DEFAULTS FOR MOST VARIABLES !!!
  z0miz=5.00000e-04,
  z0sice=5.00000e-04,
  z0h_z0m_miz = 0.2,
  z0h_z0m_sice = 0.2,
  /

&JULES_ELEVATE
  !!! THIS IS ONLY USED IF LAGGREGATE IS FALSE !!!
  SURF_HGT_IO = 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00,
  /

&JULES_RAD_PARAM
  !!! USE DEFAULTS FOR ALL !!!
  /

&JULES_CS_MIN
  !!! USE DEFAULT !!!
  /

&JULES_SEED
  !!! USE DEFAULTS FOR ALL !!!
  /

&JULES_SIGM
  !!! USE DEFAULT !!!
  /

&URBAN_SWITCHES
  l_moruses_albedo      = .FALSE.,
  l_moruses_emissivity  = .FALSE.,
  l_moruses_rough       = .FALSE.,
  l_moruses_storage     = .FALSE.,
  l_moruses_storage_thin = .FALSE.,
  l_moruses_macdonald   = .FALSE.,
  l_urban_empirical     = .FALSE.,
  /

&URBAN2T_PARAM
  !!! Not required for URBAN-1T Scheme !!!
  /

!!! END JULES NAMELISTS !!!

!!! END OF FILE !!!

```



```

L_SOOT_CLD=.TRUE. ,
CALL_CHEMFREQ=1,
L_SO2_SURFEM=.TRUE. ,
L_SO2_HILEM=.TRUE. ,
L_SO2_NATEM=.TRUE. ,
L_SULPC_DMS=.TRUE. ,
L_DMS_EM=.TRUE. ,
L_DMS_EM_INTER=.TRUE. ,
L_DMS_OINTER=.FALSE. ,
L_DMS_Liss_Merlivat=.FALSE. ,
L_DMS_Wanninkhof=.TRUE. ,
L_DMS_Nightingale=.FALSE. ,
L_SULPC_OZONE=.TRUE. ,
L_SULPC_ONLINE_OXIDANTS=.FALSE. ,
L_SULPC_2_WAY_COUPLING=.FALSE. ,
L_SULPC_NH3=.TRUE. ,
L_USE_SULPC_DIRECT=.TRUE. ,
L_NH3_EM=.FALSE. ,
L_SULPC_SO2_O3_NONBUFFERED=.TRUE. ,
L_USE_SULPC_INDIRECT_SW=.TRUE. ,
L_USE_SULPC_INDIRECT_LW=.TRUE. ,
L_USE_SULPHATE_AUTOCONV=.TRUE. ,
L_USE_SULPHATE_SULPC=.TRUE. ,
L_NITRATE=.FALSE. ,
L_NITR_ACC=.FALSE. ,
L_NITR DISS=.FALSE. ,
L_USE_NITRATE_DIRECT=.FALSE. ,
L_USE_NITRATE_INDIRECT=.FALSE. ,
L_USE_NITRATE_AUTOCONV=.FALSE. ,
L_USE_NITRATE_SULPC=.FALSE. ,
L_USE_SEASALT_INDIRECT=.TRUE. ,
L_USE_SEASALT_AUTOCONV=.TRUE. ,
L_USE_SEASALT_SULPC=.TRUE. ,
L_USE_SEASALT_DIRECT=.TRUE. ,
L_USE_SEASALT_PM=.FALSE. ,
L_SOOT_SUREM=.FALSE. ,
L_SOOT_HILEM=.TRUE. ,
L_USE_SOOT_DIRECT=.TRUE. ,
L_USE_SOOT_INDIRECT=.FALSE. ,
L_USE_SOOT_AUTOCONV=.FALSE. ,
L_USE_SOOT_SULPC=.FALSE. ,
L_BIOMASS=.TRUE. ,
L_BMASS_SUREM=.TRUE. ,
L_BMASS_HILEM=.TRUE. ,
L_USE_BMASS_DIRECT=.TRUE. ,
L_USE_BMASS_INDIRECT=.TRUE. ,
L_USE_BMASS_AUTOCONV=.TRUE. ,
L_USE_BMASS_SULPC=.TRUE. ,
L_BMASS_NEW=.TRUE. ,
L_BMASS_AGD=.TRUE. ,
L_BMASS_CLD=.TRUE. ,
L_USE_BIOGENIC=.TRUE. ,
L_USE_ARCLBIOM=.FALSE. ,
L_USE_ARCLBLCK=.FALSE. ,
L_USE_ARCLSSLT=.FALSE. ,
L_USE_ARCLSULP=.FALSE. ,
L_USE_ARCLDUST=.FALSE. ,
L_USE_ARCLOCF=.FALSE. ,
L_USE_ARCLDLTA=.FALSE. ,
L_OCF=.TRUE. ,
L_OCF_SUREM=.FALSE. ,
L_OCF_HILEM=.TRUE. ,
L_USE_OCF_DIRECT=.TRUE. ,

```

```

L_USE_OCFF_INDIRECT=.TRUE. ,
L_USE_OCFF_AUTOCONV=.TRUE. ,
L_USE_OCFF_SULPC=.TRUE. ,
L_OCFF_NEW=.TRUE. ,
L_OCFF_AGD=.TRUE. ,
L_OCFF_CLD=.TRUE. ,
L_DUST=.TRUE. ,
L_dust_diag=.FALSE. ,
L_USE_DUST=.TRUE. ,
L_DUST_DIV1=.TRUE. ,
L_DUST_DIV2=.TRUE. ,
L_DUST_DIV3=.TRUE. ,
L_DUST_DIV4=.TRUE. ,
L_DUST_DIV5=.TRUE. ,
L_DUST_DIV6=.TRUE. ,
L_CAM_DUST=.FALSE. ,
L_TWOBIN_DUST_CNTRLATM=.FALSE. ,
L_DUST_DIV1_LBC_OUT=.FALSE. ,
L_DUST_DIV2_LBC_OUT=.FALSE. ,
L_DUST_DIV3_LBC_OUT=.FALSE. ,
L_DUST_DIV4_LBC_OUT=.FALSE. ,
L_DUST_DIV5_LBC_OUT=.FALSE. ,
L_DUST_DIV6_LBC_OUT=.FALSE. ,
L_SO2_LBC_OUT=.FALSE. ,
L_SO4_AITKEN_LBC_OUT=.FALSE. ,
L_SO4_ACCU_LBC_OUT=.FALSE. ,
L_SO4 DISS_LBC_OUT=.FALSE. ,
L_DMS_LBC_OUT=.FALSE. ,
L_NH3_LBC_OUT=.FALSE. ,
L_SOOT_NEW_LBC_OUT=.FALSE. ,
L_SOOT_AGD_LBC_OUT=.FALSE. ,
L_SOOT_CLD_LBC_OUT=.FALSE. ,
L_BMASS_NEW_LBC_OUT=.FALSE. ,
L_BMASS_AGD_LBC_OUT=.FALSE. ,
L_BMASS_CLD_LBC_OUT=.FALSE. ,
L_OCFF_NEW_LBC_OUT=.FALSE. ,
L_OCFF_AGD_LBC_OUT=.FALSE. ,
L_OCFF_CLD_LBC_OUT=.FALSE. ,
L_NITR_ACC_LBC_OUT=.FALSE. ,
L_NITR DISS_LBC_OUT=.FALSE. ,
L_DUST_DIV1_LBC=.FALSE. ,
L_DUST_DIV2_LBC=.FALSE. ,
L_DUST_DIV3_LBC=.FALSE. ,
L_DUST_DIV4_LBC=.FALSE. ,
L_DUST_DIV5_LBC=.FALSE. ,
L_DUST_DIV6_LBC=.FALSE. ,
L_SO2_LBC=.FALSE. ,
L_SO4_AITKEN_LBC=.FALSE. ,
L_SO4_ACCU_LBC=.FALSE. ,
L_SO4 DISS_LBC=.FALSE. ,
L_DMS_LBC=.FALSE. ,
L_NH3_LBC=.FALSE. ,
L_SOOT_NEW_LBC=.FALSE. ,
L_SOOT_AGD_LBC=.FALSE. ,
L_SOOT_CLD_LBC=.FALSE. ,
L_BMASS_NEW_LBC=.FALSE. ,
L_BMASS_AGD_LBC=.FALSE. ,
L_BMASS_CLD_LBC=.FALSE. ,
L_OCFF_NEW_LBC=.FALSE. ,
L_OCFF_AGD_LBC=.FALSE. ,
L_OCFF_CLD_LBC=.FALSE. ,
L_NITR_ACC_LBC=.FALSE. ,
L_NITR DISS_LBC=.FALSE. ,

```

```

HLSWBANDS= 6 ,
HLWBANDS= 9 ,
L_CLD_AREA=.FALSE. ,
L_ACF_CUSACK=.FALSE. ,
L_ACF_BROOKS=.FALSE. ,
L_PC2=.TRUE. ,
L_PC2_RESET=.FALSE. ,
l_pc2_diag_sh=.FALSE. ,
NPMSL_HEIGHT=500.00 ,
L_PMSL_SOR=.FALSE. ,
LEMCCORR=.TRUE. ,
LMASS_CORR=.TRUE. ,
LQT_CORR=.FALSE. ,
LEMQ_PRINT=.TRUE. ,
A_ENERGYSTEPS=72 ,
L_RHCPT=.FALSE. ,
L_AUTO_DEBIAS=.FALSE. ,
L_3D_CCA=.TRUE. ,
L_PHASE_LIM=.TRUE. ,
L_CO2_INTERACTIVE=.FALSE. ,
L_CO2_EMITS= .FALSE. ,
L_Q10= .TRUE. ,
L_NEG_TSTAR=.FALSE. ,
L_VEG_FRACS=.TRUE. ,
L_TRIFFID=.FALSE. ,
L_PHENOL=.FALSE. ,
L_TRIF_EQ=.FALSE. ,
L_NRUN_MID_TRIF=.FALSE. ,
L_DISTURB=.FALSE. ,
CAN_MODEL=4 ,
PHENOL_PERIOD=0 ,
TRIFFID_PERIOD=0 ,
L_UM_JULES_IO=.TRUE. ,
L_FLAKE_MODEL_IO=.FALSE. ,
L_URBAN2T_IO=.FALSE. ,
L_CTILE=.TRUE. ,
A_ASSIM_MODE='AC' ,
problem_number=0 ,
L_USE_METHOX=.TRUE. ,
Z_TOP=85000.00 ,
L_GWD=.TRUE. ,
L_USE_USSP=.TRUE. ,
L_RIVERS=.TRUE. ,
L_INLAND=.TRUE. ,
RIVER_STEP=10800 ,
L_MCR_QCF2=.FALSE. ,
L_MCR_QRAIN=.TRUE. ,
L_MCR_QGRAUP=.FALSE. ,
L_MCR_QCF2_LBC=.FALSE. ,
L_MCR_QRAIN_LBC=.FALSE. ,
L_MCR_QGRAUP_LBC=.FALSE. ,
L_PC2_LBC=.FALSE. ,
L_MURK_LBC=.FALSE. ,
L_int_uvw_lbc=.FALSE. ,
L_TOP=.TRUE. ,
L_PDM=.FALSE. ,
L_USE_TPPS_OZONE= .FALSE. ,
L_OZONE_INT= 2 ,
L_RADIATION=.TRUE. ,
L_RAIN=.TRUE. ,
L_MR_PHYSICS1=.TRUE. ,
L_BL=.TRUE. ,
L_HYDROLOGY=.TRUE. ,

```

```
L_SOIL_SAT_DOWN=.TRUE. ,
l_anthrop_heat_src=.FALSE. ,
L_ICOUNT=.FALSE. ,
L_UKCA=.FALSE. ,
L_UKCA_RADAER=.FALSE. ,
L_NUDGING=.FALSE. ,
L_FORCING= .FALSE. ,
L_TIMESTEP= .TRUE. ,
L_RADIANCE=.FALSE. ,
L_INHOM_CLOUD=.FALSE. ,
L_USE_OROG_CORR= .FALSE. ,
L_USE_GRAD_CORR= .TRUE. ,
l_use_skyview= .FALSE. ,
l_orog_unfilt= .FALSE. ,
L_USE_AOD= .TRUE. ,
L_MOD_K_FLUX=.TRUE. ,
L_CCRad= .TRUE. ,
L_USE_CARIOLLE=.FALSE. ,
L_USE_OZONEINRAD=.FALSE. ,
L_STPHSEED_WRITE=.FALSE. ,
L_STPHSEED_READ=.FALSE. ,
L_OASIS=.FALSE. ,
L_COUPLE_MASTER=.FALSE. ,
L_CONV_HIST=.FALSE. ,
L_DeCplTScr_Prg=.TRUE. ,
L_CldBaseDD_prg=.TRUE. ,
l_conv_opt=3,
L_tke_closure = .FALSE. ,
/
###END OF FILE###
```

6 Namelist differences between GA4.0/GL4.0 and GA3.0/GL3.0

The namelist differences between GA3.0 and GA4.0 are tabulated in Table 4, whilst the differences between GL3.0 and GL4.0 are tabulated in Table 5. In addition to the namelist options, another important input setting is the section version used for each section of atmospheric code. These are currently defined through compiler preprocessor directives (e.g. #IFDEF). The differences in these section versions between GA3.0 and GA4.0 are tabulated in Table 6

MetUM Namelist	Variable name	GA3.0 value	GA4.0 value
&NLSTCATM	L_MR_PHYSICS1	.FALSE.	.TRUE.
	IDynDiag	2	4
	zhloc_depth_fac		0.3
	COR_MO_ITER	1	3
	cbl_op	0	2
	Prandtl		1
&RUN_Precip	X1R	26.2	2.2000e-01
	X2R	1.57	2.2000
	lsiter	10	1
&RUN_Cloud	NITER_BS	1	10
	dbstdtbs_turb_0	-4.50e-05	1.50e-04
	i_pc2_erosion_method	1	3
	i_pc2_conv_coupling	1	3
&RUN_Convection	pc2_falliceshear_method	1	2
	icvdiag	7	1
	tv1_sd_opt	1	2
	l4a_kterm	.TRUE.	.FALSE.
	CCW_FOR_PRECIP_OPT	2	4
	qlmin	2.0000e-04	3.0000e-04
	MPARWTR	1.0000e-03	1.5000e-03
	CAPE_TIMESCALE	5400	3600
	ADAPT	5	7
	R_DET	0.7500	0.9
	amdet_fac	1.50	3.00
	ENT_FAC	0.90	1.0
	ent_opt_dp		3
	ent_dp_power		2.00
ent_fac_dp		1.35	
&RUN_Dyn	ent_opt_md		0
	L_mix_ratio	.FALSE.	.TRUE.
&RUN_Diffusion	L_thmono_fixed	.FALSE.	.TRUE.
	Q_POS_METHOD	2	4
	Q_POS_TRACER_METHOD	2	4
	TARDIFFQ_END	85	53
	L_DIFF_W	.FALSE.	.TRUE.
&NLST_MPP	DIFF_ORDER_THERMO	0	1
	global_sum_method	1	2

Table 4: Differences in MetUM namelists between GA3.0 and GA4.0.

JULES Namelist	Variable name	GA3.0 value	GA4.0 value
&JULES_SWITCHES	COR_MO_ITER	1	3
	L_SNOWDEP_SURF	.FALSE.	.TRUE.
&JULES_NVEGPARM	Z0_NVG_IO	1.0e+00, 3.0e-04, 3.0e-04, 5.0e-04,	1.0e+00, 1.0e-04, 1.0e-03, 5.0e-04,
	EMIS_NVG_IO	9.7e-01, 9.7e-01, 9.7e-01, 9.7e-01,	9.7e-01, 9.85e-01, 9.0e-01, 9.9e-01,
	Z0HM_NVG_IO	1.0e-01, 1.0e-01, 1.0e-01, 1.0e-01,	1.0e-07, 2.5e-01, 2.0e-02, 2.0e-01,
&JULES_PFTPARM	Z0HM_PFT_IO	0.1, 0.1, 0.1, 0.1, 0.1,	1.65, 1.65, 0.1, 0.1, 0.1,
	EMIS_PFT_IO	0.97, 0.97, 0.97, 0.97, 0.97,	0.98, 0.99, 0.98, 0.98, 0.98,
	DUST_VEG_SCJ_IO		0.0, 0.0, 1.0, 1.0, 0.5,
&JULES_SURF_PARAM	emis_sea	1.0	0.985
	emis_sice	1.0	0.976
	z0h_z0m_miz	1.0	0.2
	z0h_z0m_sice	1.0	0.2

Table 5: Differences in JULES namelists between GL3.0 and GL4.0.

UM Code Section	GA3.0 version	GA4.0 version
Section 5: Convection	<4A>	<5A>
Section 10: Dynamical Solver	System dependant: <2A> or <2B>	<2B> in all systems

Table 6: Differences in MetUM code section versions GA3.0 and GA4.0.