**UNIFIED MODEL DOCUMENTATION PAPER 73**

# ANCILLARY FILE CREATION

## For the UM

by

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Version 4

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Model Version 4.4

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| **Modification Record** | | |
|---|---|---|
| **Document version** | Author | Description..... |
| 1 | Dave Robinson | First release of central ancillary program to make ancillary files. |
| 2 | Dave Robinson | Update for 3.4. Additions to OROG, OZONE and SSTICE Namelists. Revised Appendix A. |
| 3 | Dave Robinson | **Librarian's note: this version was not issued.** Update for 4.0. New namelists DEEPST and SMCSNOW. Additions to OROG and SSTICE namelist. New Vertical specification for Ozone files. |
| 4 | Clive Jones | Update for 4.4. Scripts completely overhauled. |
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**Version 1**

There is an UM requirement to have a central program containing the source to create an ancillary file. During 1993 and 1994, the first steps were taken and the source code to create most of the ATMOSPHERE ancillary files were put into this program. The code for the OCEAN and other sub-models will be added in due course.

In February 1994, it was decided that the new program would be used to recreate all the operational and climate ancillary files for UM Version 3.2 on the C90. The release of this UMDP coincides with the release of the new program for general use as well as creating the operational files. This paper is to be developed over several versions and Version 1 concentrates on how to create an ancillary file using the Cray script and namelists available.

**Version 2** - UM Version 3.4

New fields available are the orographic gradient fields for the new Gravity Wave Drag Scheme and orographic roughness fields for the new Orographic Roughness Scheme in the UM. These fields are indicated by (NEW) in section 2. The OROG namelist has a number of new variables to create those new fields and to cater for the new range of input source data available. In the SSTICE namelist, a value can be chosen for the seaice concentration.

**Version 3** - UM Version 4.0

The OROG namelist has a range of new variables which mainly involve orographic roughness fields. Two new namelists DEEPST and SMCSNOW have been added. The SMCSNOW namelist can be used to set up Soil Moisture files for the new Multilayer hydrology scheme. The A and B values for the model hybrid levels in the ozone file are now calculated in the ancillary program rather than read in via a namelist. The SSTICE namelist provides an alternative method for the setting up the Sea Ice Concentration field.

**Version 4** - UM Version 4.4

The scripts used to create ancillary files have been completely rewritten at this release as they were becoming cumbersome and difficult to maintain. Now, instead of a user taking a template script and editing it for his/her own needs, a user calls a script with various options and a script is created tailored to the user's requirements. This script is then executed to create the required ancillary files. Experienced users may chose to edit this script before running for experimental purposes. The program now runs on the T3E MPP computer although, as of yet, no parallel code is code.

## 1. INTRODUCTION

This paper describes how to create an ancillary file for the UM. Section 2 lists the ancillary files and fields that are available, see UMDP 70 for further details of the fields.

The creation of ancillary files is partly controlled by the options provided to the scripts and partly by control namelists for each individual dataset. Some of the script options are used to create the control namelist or are used to select the appropriate namelist from a central library. In other cases, the user must ensure that the namelist is consistent with the script options. Section 3 describes the scripts and the control options available and section 4 describes the control namelists.

Section 5 lists the namelists held centrally and section 6 gives examples on how the utility was used to generate datasets on standard configurations.

## 2. ANCILLARY FILES AVAILABLE.

The ancillary files available from the program are listed below. For each file, the fields put in each file are listed. All the fields are put in the file unless it is indicated that they are optional.

### 2.1 Mask file

- Land-Sea Mask
- River runoff outflow points (Optional, normally only climate 96x73 resolution)

### 2.2 Orography file

- Mean heights, (m)
- Standard deviation, $\sigma$(m)
- Gradient xx-component, $\sigma_{xx}$ (Optional)
- Gradient xy-component, $\sigma_{xy}$ (Optional)
- Gradient yy-component, $\sigma_{yy}$ (Optional)
- A/S for orography roughness Scheme (Optional)
- h/2$\sqrt{2}$ for orography roughness scheme (Optional)

### 2.3 Ozone file

- Ozone fields (Zonal/Full fields for Global/LAM grids)

### 2.4 Deep Soil Temperature file

(Available for either single level or MOSES I hydrology schemes)

- Deep Soil Temperatures, T (K), repeated for each layer

### 2.5 Soil Moisture and Snow Amount file

(Available for either single level or MOSES I hydrology schemes)

- Soil Moisture Content, m ($kgm^{-2}$)
- Soil Moisture Content in a layer ($kgm^{-2}$) (Optional), repeated for each layer
- Snow Amount, S ($kgm^{-2}$)
- Fractional time for snow amount changes

## 2.6 Vegetation Parameters file

Vegetation Type dependent fields
- Vegetation fraction, $\upsilon$
- Root Depth, $D_R$ (m)
- Snow free Albedo, $\alpha_o$
- Asymptotic Deep Snow Albedo, $\alpha_s$
- Stomatal Resistance to evaporation, $r_s$ ($sm^{-1}$)
- Canopy Capacity, $C_M$ ($kgm^{-2}$)
- Infiltration Enhancement factor, $\beta_v$
- Surface Roughness, $z_o$ (m)
- Leaf Area Index (LAI)*
- Canopy Height (m)*

* Used in MOSES I hydrology only.

## 2.7 Soil Parameters file

Soil Type dependent fields
- Volumetric soil moisture concentration at wilting point, $\chi_w$
- Volumetric soil moisture concentration at critical point, $\chi_c$
- Volumetric soil moisture concentration at field capacity, $\chi_f$
- Volumetric soil moisture concentration at saturation, $\chi_s$
- Saturated hydrological soil conductivity, $K_s$ ($kgm^{-2}s^{-1}$)
- Eagleson's exponent, c, or Clapp-Hornberger, b parameter.*
- Thermal capacity of soil, $C_s$ ($Jm^{-3}K^{-1}$)
- Thermal conductivity of soil, $\lambda_s$ ($Jm^{-1}K^{-1}s^{-1}$)
- Saturated soil water suction (SATHH)

*Single level hydrology scheme uses Eagleson's exponent, MOSES I hydrology scheme uses the Clapp-Hornberger parameter.

## 2.8 Sea Surface Temperature file

- Sea surface temperatures (K)

## 2.9 Seaice file

- Seaice concentration, $f_I$
- Seaice 'Equivalent' Thickness (**fixed or variable** values), $D_I$ (m)
- Fractional time for seaice concentration changes.

## 3. Creating the ancillary files.

To create any of the ancillary file datasets run script $UMDIR/vn$VN/ancil/atmos/scripts/master/ancil_top_level with various options, described below, specifying what datasets are required. Most options are optional except where stated although it may be advisable to include all applicable options to ensure that the precise requirements are met. Where files are requested it is recommended that the full path name is used.

**ancil_top_level**

| | |
|---|---|
| -l {file} | land sea mask file if not in output directory or $UMDIR for standard resolutions or not created as part of job. |
| -m {model id} | model identifier (default=cl_9673) |
| -n {file} | grid namelist (if non standard grid) |
| -o {directory name} | directory for output files (default = $HOME/ancil.vn{version}/model_id and will be automatically created if necessary |
| -r | Do not run script (allows for editing before submission) |
| -s {file} | name of created script (default=make_ancil_file) |
| -t {file} | name of namelist control file (default= ancil_namelists} |
| -u {version} | UM version number (default=4.4) |
| -v | verbose mode |
| -x {file} | executable to run if not default |
| -z {list} | list of datasets to create, permissible values are: mask, orog, vegsoil, sstice, slt, smow, ozone, ozoneli. At least one must be specified. |
| | |
| -a {list} | options for land sea mask creation |
| -b {list} | options for orography creation |
| -c {list} | options for vegetation and soils parameters creation |
| -d {list} | options for soil moisture and snow creation |
| -e {list} | options for sea surface temperature and seaice creation |
| -f {list} | options for deep soil temperature creation |
| -g {list} | options for ozone/ozoneli creation |

**Notes:**

**1)** The script and program must be run in batch mode and the program is run on a high memory processor due to the large memory requirement.

**2)** A model identifier must be specified on the -m option. This is used to create new directories and to search centrally held directories for standard files.

**3)** If a land sea mask is not being created as part of the job then one must pre-exist. The file would normally be called qrparm.mask and exist in the directory specified for the output files or, if a standard configuration, the file held centrally would be used. A file may also be specified on the -l option and this file would be used in preference to the above two alternatives.

**4)** A namelist specifying the grid details must be provided. Standard configurations are held centrally but for any new grid, including amendments to standard configuraions such as altering the number of vertical levels, a GRID namelist must be created within a file and this file specified using the -n option.

The options for each of the lower level scripts are:

**land_sea_mask**

| | |
|---|---|
| -c {file} | file with overrides to land sea mask (default files used for standard models) |
| -d {ten,tenBAS,five} | source dataset to use: 10' US Navy, 10' US Navy with BAS data, 5' NCAR |
| -f {} | threshold land value (default=0.5) |
| -i {file} | user supplied fractional land dataset |
| -j {file} | user supplied river runoff field |
| -l | apply overrides to mask. If standard grid list of changes will be obtained from central store, otherwise specify file on option c |
| -n {file} | namelist (not normally required) |
| -o {} | optional suffix to file name |
| -r | include river runoff points (96x73 only) |

**Notes:**

**1)** The land sea mask namelist is created from the options specified and therefore a separate namelist file need not normally be specified.

**2)** If manual overrides are to be made to the objectively created mask then specify the -l option and specify the file containing the overrides on the -c option unless it is a standard configuration and the centrally held overrides are required.

**orography**

```
-d {ten,tenBAS,five} source dataset to use: 10' US Navy,
                     10' US Navy with BAS data, 5' NCAR
-i {file}            user supplied source orography file
-j {file}            user supplied roughness parameters file
-m                   use separate land sea mask for orography
                     dataset.  (file should be called
                     qrparm.orog.mask and must pre-exist in
                     your output directory)
-n {file}            namelist (defaults for standard models)
-o {}                optional suffix to file name
```

**Notes:**

**1)** If creating a standard resolution then the centrally held namelist will automatically be used otherwise it is recommended that a new namelist is specified although a default is available. Any namelist file specified on the -n option will be used in preference to those held centrally.

**2)** If the orography file is to be made using a different land sea mask to other datasets then the file must pre-exist and be called qrparm.orog.mask. Standard resolutions are held centrally, otherwise it must be in the user's output directory. It cannot be created within the same job.

**veg_soil**

```
-i {file}            user supplied WHS code file
-m                   write internal 'master' datasets
-o {}                optional suffix to file name
-n {file}            namelist (generally not needed)
-r                   use vegetation parameters with increased
                     z0 values
-s {single,MOSES1}   scheme (default=single level hydrology)
-t                   use ITE data
-w                   use WHS data
```

**Notes:**

**1)** The vegetation and soils namelist is created from the options and therefore one need not normally be specified.

**2)** ITE data is only available for rotated models covering the UK.

**3)** The increased z0 values (requested using the -r option) were originally intended to compensate for the lack of orographic roughness roughness but since orographic roughness was introduced they are generally no longer required.

**smow**

```
-a                  use scaled climatology
-i {file}           user supplied climatology
-n {file}           namelist (default depends upon scheme}
-o {}               optional suffix to file name
-s {single,MOSES1}  scheme (default=single level hydrology)
```

**Notes:**

**1)** Various namelists for soil moisture and snow amount are held centrally and the appropriate one is used according to the scheme selected. It is also possible to specify a namelist on the -n option.

**sst_ice**

```
-c {}               value for CRIT_CONC (default=0.5)
-d {GISST20,MOHSST3,USER} climatology to use
                    (default=GISST 2.0}
-f                  fractional seaice required
-i {file}           input seaice climatology if user
-j {file}           input SST climatology if user
-m {file}           user supplied ICEDEPTHS namelist
-n {file}           namelist (generally not needed}
-o {}               optional suffix to file name
-s                  SLAB model datasets required
-v {}               value for CONC_VALUE (default=1.0)
```

**Notes:**

**1)** The sea surface temperature and seaice namelist is created from the options and therefore one need not normally be specified.

**slt**

```
-i {file}           user supplied source temperature file
-n {file}           namelist (default depends upon scheme}
-o {}               optional suffix to file name
-s {single,MOSES1}  scheme (default=single level hydrology)
```

**Notes:**

**1)** Various namelists for soil moisture and snow amount are held centrally and the appropriate one is used according to the scheme selected. It is also possible to specify a namelist on the -n option.

**ozone**

```
-c {SBUV,LI,PCMDI}  climatology to use (default=LI)
-e                  Use ECMWF levels from UM comdecks
-i {file}           user supplied climatology
-k                  append no. of model levels to dataset name
-l {}               No. of model levels
-n {file}           namelist (not normally required)
-o {}               optional suffix to file name
-p                  if SBUV/CIRA climatology, provide data on
                    stratospheric models only
-s                  if Li/PCMDI smooth data
-t {}               if Li lowest model level to provide data
-v {file}           VERTICAL namelist (defaults for standard
                    levels)
-z                  if Li/PCMDI provide zonal mean data
```

**Notes:**

**1)** The ozone namelist is created from the options and therefore one need not normally be specified.

**2)** For SBUV/CIRA climatology (which is not recommended and is being phased out) the number of model levels is specified by the P_LEVELS variable in the GRID namelist. For Shine & Li and PCMDI the number of model levels is specified both by the P_LEVELS variable in the GRID namelist and by the -l option. These MUST agree.

## 4.1 Main Control Namelists

For each namelist the columns are variable name, variable type, default value (if preset in code) and function. I/R/L denote that the variable is integer/real/logical.

The following two namelists are required to control the program.

ANCILL - which datasets to create

| | | | |
|---|---|---|---|
| **LSMASK** | **L** | **F** | T to create land sea mask dataset |
| **OROG** | **L** | **F** | T to create orography dataset |
| **OZONE** | **L** | **F** | T to create ozone dataset using SBUV/CIRA data |
| **OZONE_LI** | **L** | **F** | T to create ozone dataset using either Shine & Li data or PCMDI data |
| **DEEPST** | **L** | **F** | T to create deep soil temperature dataset |
| **SMCSNOW** | **L** | **F** | T to create soil moisture and snow dataset |
| **VEGSOIL** | **L** | **F** | T to create vegetation parameters and soil parameters datasets |
| **SSTICE** | **L** | **F** | T to create sea surface temperature and seaice datasets |

GRID - definition of target grid

| | | | |
|---|---|---|---|
| **POINTS_LAMBDA_TARG** | **I** | **288** | No. of points in longitude |
| **POINTS_PHI_TARG** | **I** | **217** | No. of points in latitude |
| **LAMBDA_ORIGIN_TARG** | **R** | **0.0** | Longitude of first column |
| **PHI_ORIGIN_TARG** | **R** | **90.0** | Latitude of first row |
| **DELTA_LAMBDA_TARG** | **R** | **1.25** | Longitude resolution |
| **DELTA_PHI_TARG** | **R** | **0.8333** | Latitude resolution |
| **LAMBDA_POLE** | **R** | **0.0** | Real longitude of model pole |
| **PHI_POLE** | **R** | **90.0** | Real latitude of model pole |
| **ROTATED** | **L** | **F** | T if grid is rotated |
| **GLOBAL** | **L** | **T** | T if grid is global (Note global rotated grids not yet supported) |
| **IDAY_YEAR** | **I** | **365** | No. of days in year |
| **P_LEVELS** | **I** | **19** | No. of model levels |

For each separate dataset there exists a control namelist in which are set options governing the creation of the dataset. This section details each of the control namelists.

## 4.2 MASK Namelist

| | | | |
|---|---|---|---|
| **LAND_FRAC** | **R** | **0.5** | Fraction cover threshold for land points. If land fraction cover >= LAND_FRAC then land point. |
| **LNCAR** | **L** | **F** | T : If using NCAR 5' Fractional Cover primary data, see note a), F otherwise |
| **LOVERRIDE** | **L** | **F** | T : If providing a file overriding the settings given by the objective procedure, see note b) |
| **LRIVER_RUN** | **L** | **F** | T : To include river runoff outflow points |

Notes:
a) The NCAR 5' data only covers the limited area 66N to 35N and 21W to 25.5E and is used for the UK and Bosnia mesoscale models. The program checks that the target grid is completely within the NCAR grid and if not the program aborts. One exception to this is the Bosnia mesoscale grid ; the SW corner is just outside the NCAR grid and the check is skipped.

b) When creating a land sea mask for a new grid it may be desirable to override the settings for certain points such as single grid point lakes, islands, coastal inlets etc to reduce noise in the lower bondary layer physics. This may be done by providing a file listing the points to be changed and setting LOVERRIDE=T in the namelist. The file takes the form

```
 &DATAC FIELD_NO=1, POINT_NO=x, DATA_NEW=y &END
```

It can be seen that the entries are in the form of a NAMELIST and therefore must start in column 2. x is the point number and y is T to set this point to be land, F to set this point to be sea. Repeat the namelist for as many times as is required.

### 4.3 OROG Namelist

General Control Variables:

**ENVELOPE** **L F** T: To produce envelope orography field ($x = x + \sigma$)

**OROG_MASK** **L F** T: A separate land sea mask is used for orography fields

**OROG_MASK_CONTROL** **L T** T: To set sea points to zero

**LFILT_SRCE** **L T** T: To apply filter to source high resolution data before interpolation

**LFILT_121** **L F** T: To apply E-W 1-2-1 filter to mean orography after interpolation.

**REMOVE_MEAN_GRAD** **L T** T: To remove mean gradient before calculation of sigma fields

**LGRAD** **L F** T: Include orographic gradient component fields.

**LROUGH** **L F** T: Include orographic roughness fields

**SET_OROG_ZERO** **L F** T: All fields are zeroed everywhere

**LDIAG_MAP** **L F** T: To print out diagnostic maps

Variables to control filtering:

**FILT_SRCE_LENGTH** **R 10000.** Filter scale length (m) if LFILT_SRCE=T

**FILT_NTIMES** **I 1** No. of time to apply filter if LFILT_121=T

**FILT_LAT** **R 60.0** Minimum latitude to apply filter to if LFILT_121=T

Variables for roughness parameters (only if LROUGH=T)

**AS_FROM_SIG** **L T** Calculate entire A/S and h/2√2 fields from σ field

**LFILLIN_AS** **L F** Only calculate A/S and h/2√2 fields from σ field in areas not covered by high resolution data

**LAS_LINEAR** **L T** Use linear relationship between A/S and σ field

**OVERRIDE_H** **L F** Set h/2√2 field to be σ even if high resolution data is used

**LROUGH_AFRICA** **L F** Include African data in A/S and h/2√2 interpolation

**LROUGH_INC_SEA** **L T** Include sea points in area averaging of A/S and h/2√2 fields

**HSIG_COEF** **R 1.0** Multiply σ field by this value to calculate h/2√2 field

**HSIG_HRES_COEF** **R 1.0** Mulitply h/2√2 field calculated from high resolution data by this value

**ASSIG_COEF** **R -1.0** If LAS_LINEAR=T this is the value that σ is mulitplied by to calculate A/S field. If value is -ve then it is calculated internally

### 4.4 OZONE Namelist (old SBUV/CIRA climatology)

| | | | |
|---|---|---|---|
| **SAVELEVS** | **L** | **T** | T : Ozone data not repeated for levels in the troposphere where there is no vertical variation. Reduces memory requirements at run-time and size of ozone file. |
| **LDIAG** | **L** | **F** | Diagnostic output switch. Prints out all data for zonal fields and first point in each row for full fields. |

### 4.5 OZONE namelist (new Shine & Li and PCMDI climatologies)

| | | | |
|---|---|---|---|
| **NO_MODEL_LEVELS** | **I** | **1** | No. of model levels |
| **START_OZONE_LEVEL** | **I** | **1** | Only provide ozone data from this model level upwards. Reduces memory requirements at run-time and size of ozone file and may be necessary if using a high resolution grid |
| **ZONAL_MEAN** | **L** | **F** | T to produce zonal mean field |
| **SMOOTH** | **L** | **F** | T to apply N-S 5 point filter. (Recommended for Shine & Li data) |
| **PCMDI** | **L** | **F** | T to use PCMDI data |

Note: Whichever ozone climatology is being used the user must supply the VERTICAL namelist as will be used when the model is run. This consists of the following variables:

| | | | |
|---|---|---|---|
| **ETAH** | **R** | **-** | Array of model eta-half levels |
| **MAX_SIG_HLEV** | **I** | **5** | Model level below which sigma coordinates are used |
| **MIN_PRS_HLEV** | **I** | **17** | Model level above which pressure coordinates are used |
| **METH_LEV_CALC** | **I** | **5** | Method used for calculating ak, bk etc |

### 4.6 VEGSOIL Namelist

| | | | |
|---|---|---|---|
| **USE_WHS** | **L** | **T** | T to use Wilson and Henderson-Sellers dataset |
| **USE_ITE** | **L** | **F** | T to use ITE UK data |
| **LWRITE1D** | **L** | **F** | T If interim 'master' fields are to be written out |
| **MOSES1** | **L** | **F** | T to create datasets for MOSES1 hydrology |

### 4.7 SSTICE Namelist

| | | | |
|---|---|---|---|
| **LFRAC_ICE** | **L** | **F** | T if Sea Ice concentrations required, F for an seaice mask |
| **CONC_VALUE** | **R** | **1.0** | Seaice mask concentration value (only required if LFRAC_ICE=F) |
| **CRIT_CONC** | **R** | **0.5** | If LFRAC_ICE=T then this is the minimum seaice concentration value allowed. Values below this value are set to zero and those above are left unchanged. If LFRAC_ICE=F then all values above this value are set to be CONC_VALUE, zero otherwise |
| **LICEDPT** | **L** | **F** | T for varying seaice thickness field. In this case also need to specify ICEDEPTHS namelist, see below |

**ICEDEPTHS Namelist**

This namelist is only required in if LICEDPT=T in the SSTICE namelist.

| | | | |
|---|---|---|---|
| **NH_DEPTHS** | **R** | ***** | Depths at North Pole for Jan, Mar, May, July, Sept and Nov. Defaults are 3.3, 3.7, 3.7, 3.7, 3.1 and 3.2. |
| **SH_DEPTHS** | **R** | ***** | Depths at South Pole for Jan, Mar, May, July, Sept and Nov. Every 30 degrees longitude westwards starting at 180E. The list of default values can be browsed in deck ICEDPTH |

### 4.8 SMCSNOW Namelist

| | | | |
|---|---|---|---|
| **SMC_MOSES** | **L** | **F** | T to produce dataset for MOSES1 hydrology |
| **NO_LAYERS** | **I** | **4** | No of layers if SMC_MOSES=T |
| **LAYER_DEPTHS** | **R** | ***** | Layer thicknesses if SMC_MOSES=T |

### 4.9 DEEPST Namelist

| | | | |
|---|---|---|---|
| **SLT_MOSES** | **L** | **F** | T to create dataset fro MOSES1 hydrology |
| **NO_LAYERS** | **I** | **4** | No. of soil layers |
| **LAYER_DEPTHS** | **R** | **-** | Depth of each layer. The soil temperature will be calculated at the middle of each layer. These are normalised depths, for MOSES1 see note below |
| **OMEGA_A** | **R** | **1.9923849x10-7** | frequency of annual wave |
| **OMEGA_1** | **R** | **3.55088x10-4** | frequency of wave at level 1 |
| **LEVEL_ONE** | **T** | **F** | T to include top level temperatures in dataset (for MOSES1) |
| **MOSES_LAYERS** | **R** | **-** | True MOSES1 layer thicknesses (0.1, 0.25, 0.65, 2.0) |

Note: Current MOSES1 soil temperatures have been calculated using normalised soil depths of 1.0, 2.3, 6.9 and 24.15 with

an OMEGA_1 value of 1.45444x10-4 rather than the true normalised depths.

### 4.10 Sundry namelists

There are two further namelists which should be specified.

PACK, to determine whether data in output datasets is packed.

| | | | |
|---|---|---|---|
| **LPACK** | **L** | **F** | T to pack data |

SEARCH, criteria for setting data at unresolved grid points

| | | | |
|---|---|---|---|
| **SEARCH_RADIUS** | **I** | **5** | Maximum no. of grid lengths to search for data |
| **ZPOLE** | **R** | **55.0** | Above this latitude use default values for high latitudes |
| **ZTROPIC** | **R** | **25.0** | Below this latitude use default values for low latitudes |

(Between ZPOLE and ZTROPIC use default values for medium latitudes)

Note: All namelists that will be read must be present in the namelist file. If it is intended to use the default values then an empty namelist must be supplied.

## 5. NAMELISTS HELD CENTRALLY

This section lists those namelists that are held centrally but excludes those which are created according to options specified to the scripts.

### 5.1 GRID namelist

In directory
$UMDIR/vn$VN/ancil/atmos/card_input/namelist/grids

#### 5.1.1 Standard Climate Resolution 360 day year

cl_9673

```
 &GRID
  POINTS_LAMBDA_TARG=96,POINTS_PHI_TARG=73,
  LAMBDA_ORIGIN_TARG=0.0,PHI_ORIGIN_TARG=90.0,
  DELTA_LAMBDA_TARG=3.75,DELTA_PHI_TARG=2.5,
  PHI_POLE=90.0,LAMBDA_POLE=0.0,ROTATED=F,
  GLOBAL=T,IDAY_YEAR=360,P_LEVELS=19
 &END
```

#### 5.1.2 Standard Climate Resolution 365 day year

cl365_9673

```
 &GRID
  POINTS_LAMBDA_TARG=96,POINTS_PHI_TARG=73,
  LAMBDA_ORIGIN_TARG=0.0,PHI_ORIGIN_TARG=90.0,
  DELTA_LAMBDA_TARG=3.75,DELTA_PHI_TARG=2.5,
  PHI_POLE=90.0,LAMBDA_POLE=0.0,ROTATED=F,
  GLOBAL=T,IDAY_YEAR=365,P_LEVELS=19
 &END
```

#### 5.1.3 Stratospheric Model

gs_9673

```
 &GRID
  POINTS_LAMBDA_TARG=96,POINTS_PHI_TARG=73,
  LAMBDA_ORIGIN_TARG=0.0,PHI_ORIGIN_TARG=90.0,
  DELTA_LAMBDA_TARG=3.75,DELTA_PHI_TARG=2.5,
  PHI_POLE=90.0,LAMBDA_POLE=0.0,ROTATED=F,
  GLOBAL=T,IDAY_YEAR=365,P_LEVELS=42
 &END
```

### 5.1.4 Low Resolution Climate Resolution 360 day year

```
cl_4837

&GRID
 POINTS_LAMBDA_TARG=48,POINTS_PHI_TARG=37,
 LAMBDA_ORIGIN_TARG=0.0,PHI_ORIGIN_TARG=90.0,
 DELTA_LAMBDA_TARG=7.5,DELTA_PHI_TARG=5.0,
 PHI_POLE=90.0,LAMBDA_POLE=0.0,ROTATED=F,
 GLOBAL=T,IDAY_YEAR=360,P_LEVELS=19
&END
```

### 5.1.5 Global 288x217 Resolution

```
gl_288217

&GRID
 POINTS_LAMBDA_TARG=288,POINTS_PHI_TARG=217,
 LAMBDA_ORIGIN_TARG=0.0,PHI_ORIGIN_TARG=90.0,
 DELTA_LAMBDA_TARG=1.25,DELTA_PHI_TARG=0.8333,
 PHI_POLE=90.0,LAMBDA_POLE=0.0,ROTATED=F,
 GLOBAL=T,IDAY_YEAR=365,P_LEVELS=19
&END
```

### 5.1.6 Operational Global 432x325 Resolution

```
gl_432325

&GRID
 POINTS_LAMBDA_TARG=432,POINTS_PHI_TARG=325,
 LAMBDA_ORIGIN_TARG=0.0,PHI_ORIGIN_TARG=90.0,
 DELTA_LAMBDA_TARG=0.8333,DELTA_PHI_TARG=0.5555,
 PHI_POLE=90.0,LAMBDA_POLE=0.0,ROTATED=F,
 GLOBAL=T,IDAY_YEAR=365,P_LEVELS=30
&END
```

### 5.1.7 Limited Area Model

```
la_229132

&GRID
 POINTS_LAMBDA_TARG=229,POINTS_PHI_TARG=132,
 LAMBDA_ORIGIN_TARG=309.11,PHI_ORIGIN_TARG=25.66,
 DELTA_LAMBDA_TARG=0.4425,DELTA_PHI_TARG=0.4425,
 PHI_POLE=30.0,LAMBDA_POLE=160.0,ROTATED=T,
 GLOBAL=F,IDAY_YEAR=365,P_LEVELS=19
&END
```

### 5.1.8 UK Mesoscale Model

```
ms_9292_uk

&GRID
 POINTS_LAMBDA_TARG=92,POINTS_PHI_TARG=92,
 LAMBDA_ORIGIN_TARG=352.95,PHI_ORIGIN_TARG=8.25,
 DELTA_LAMBDA_TARG=0.15,DELTA_PHI_TARG=0.15,
 PHI_POLE=37.50,LAMBDA_POLE=177.50,ROTATED=T,
 GLOBAL=F,IDAY_YEAR=365,P_LEVELS=31
&END
```

### 5.1.9 New UK Mesoscale Model

```
ms_146182_uk

&GRID
 POINTS_LAMBDA_TARG=146,POINTS_PHI_TARG=182,
 LAMBDA_ORIGIN_TARG=352.95,PHI_ORIGIN_TARG=11.5,
 DELTA_LAMBDA_TARG=0.11,DELTA_PHI_TARG=0.11,
 PHI_POLE=37.50,LAMBDA_POLE=177.50,ROTATED=T,
 GLOBAL=F,IDAY_YEAR=365,P_LEVELS=38
&END
```

### 5.1.10 Bosnia Mesoscale Model

```
mb_9292_alp

&GRID
 POINTS_LAMBDA_TARG=92,POINTS_PHI_TARG=92,
 LAMBDA_ORIGIN_TARG=346.35,PHI_ORIGIN_TARG=6.9,
 DELTA_LAMBDA_TARG=0.15,DELTA_PHI_TARG=0.15,
 PHI_POLE=47.0,LAMBDA_POLE=205.0,ROTATED=T,
 GLOBAL=F,IDAY_YEAR=365,P_LEVELS=31
&END
```

### 5.1.11 Gulf Mesoscale Model

```
mg_92104_glf

&GRID
 POINTS_LAMBDA_TARG=92,POINTS_PHI_TARG=104,
 LAMBDA_ORIGIN_TARG=352.35,PHI_ORIGIN_TARG=9.3,
 DELTA_LAMBDA_TARG=0.15,DELTA_PHI_TARG=0.15,
 PHI_POLE=60.50,LAMBDA_POLE=227.50,ROTATED=T,
 GLOBAL=F,IDAY_YEAR=365,P_LEVELS=31
&END
```

## 5.2 OROG NAMELIST (non default values only)

In directory $UMDIR/vn$VN/ancil/atmos/card_input/namelist/orog

### 5.2.1 Standard Climate Resolution, 360 day year

orog.cl_9673

```
 &OROG
  LGRAD=T,LFILT_121=T,LROUGH=T,ASSIG_COEF=0.000084454
 &END
```

### 5.2.2 Standard Climate Resolution, 365 day year

orog.cl365_9673

```
 &OROG
  LGRAD=T,LFILT_121=T,LROUGH=T,ASSIG_COEF=0.000084454
 &END
```

### 5.2.3 Stratospheric Model

orog.gs_9673

```
 &OROG
  LGRAD=T,LFILT_121=T,LROUGH=T,ASSIG_COEF=0.000084454
 &END
```

### 5.2.4 Low Resolution Climate Resolution, 360 day year

orog.cl_4837

```
 &OROG
  LGRAD=T,LFIT_121=T,LROUGH=T,ASSIG_COEF=0.0000586778
 &END
```

### 5.2.5 Global 288x217 Resolution

orog.gl_288217

```
 &OROG
  OROG_MASK=T,LGRAD=T,LROUGH=T,AS_FROM_SIG=F,LFIILIN_AS=T,
  ASSIG_COEF=0.0001679,HSIG_HRES_COEF=1.8,LROUGH_INC_SEA=F
 &END
```

### 5.2.6 Operational Global 432x325 Resolution

orog.gl_432325

```
 &OROG
  OROG_MASK=T,LGRAD=T,LROUGH=T,AS_FROM_SIG=F,LFILLIN_AS=T
 &END
```

### 5.2.7 Limited Area Model

orog.la_229132

```
 &OROG
  OROG_MASK=T,LGRAD=T,LROUGH=T,AS_FROM_SIG=F,LFILLIN_AS=T
  ASSIG_COEF=0.0002986,LROUGH_INC_SEA=F
 &END
```

### 5.2.8 UK Mesoscale Model

orog.ms_9292_uk

NB: Current orography dataset created outside the central ancillary program.

```
 &OROG
  LROUGH=T,LFILLIN_AS=T,LAS_LINEAR=F,AS_FROM_SIG=F,LFILT_SRCE,
  LROUGH_INC_SEA=F
 &END
```

### 5.2.9 New UK Mesoscale Model

orog.ms_146182_uk

NB: Current orography dataset created outside the central ancillary program.

```
 &OROG
 LROUGH=T,LFILLIN_AS=T,LAS_LINEAR=F,AS_FROM_SIG=F,LFILT_SRCE,
 &END
```

### 5.2.10 Bosnia Mesoscale Model

orog.mb_9292_alp

```
 &OROG
  LFILT_SRCE=F,LROUGH=T,AS_FROM_SIG=F,LFILLIN_AS=T,
  LAS_LINEAR=F,LROUGH_AFRICA=T,LROUGH_INC_SEA=F
 &END
```

### 5.2.11 Gulf Mesoscale Model

orog.mg_92104_glf

```
 &OROG
  LFILT_SRCE=F

 &END
```

### 5.2.12 Default namelist

orog

```
 &OROG
  LGRAD=T,LROUGH=T,AS_FROM_SIG=F,LFILLIN_AS=T
 &END
```

## 5.3 DEEPST NAMELIST

In directory $UMDIR/vn$VN/ancil/atmos/card_input/namelist/slt

### 5.3.1 Single level Hydrology

slt

```
 &DEEPST
  LEVEL_ONE=F,NO_LAYERS=4,LAYER_DEPTHS=1.0,3.908,14.05,44.65
 &END
```

### 5.3.2 MOSES 1 Hydrology

slt_MOSES

```
 &DEEPST
  LEVEL_ONE=T,NO_LAYERS=4,LAYER_DEPTHS=1.0,2.3,6.9,24.15,
  OMEGA_1=1.45444E-4,
  SLT_MOSES=T,MOSES_LAYERS=0.1,0.25,0.65,2.0
 &END
```

## 5.4 SMCSNOW NAMELIST

In directory $UMDIR/vn$VN/ancil/atmos/card_input/namelist/smow

### 5.4.1 Single Level Hydrology

smcsnow

```
 &SMCSNOW
 &END
```

### 5.4.2 MOSES 1 Hydrology

smcsnow_MOSES

```
 &SMCSNOW
  SMC_MOSES=T,NO_LAYERS=4,LAYER_DEPTHS=0.1,0.25,0.65,2.0
 &END
```

## 5.5 SEARCH NAMELIST

file $UMDIR/vn$VN/ancil/atmos/card_input/namelist/search

```
 &SEARCH
  SEARCH_RADIUS=5,ZPOLE=55.0,ZTROPIC=25.0
 &END
```

## 5.6 PACK NAMELIST

### 5.6.1 Packed

file $UMDIR/vn$VN/ancil/atmos/card_input/namelist/pack

```
 &PACK
  LPACK=T
 &END
```

5.6.2 Unpacked

file $UMDIR/vn$VN/ancil/atmos/card_input/namelist/pack

```
 &PACK
  LPACK=F
 &END
```

## 6. SCRIPTS USED TO GENERATE CENTRALLY HELD FILES

This section gives examples on how the utility was used to create files held centrally on standard configurations. Note that some output files are renamed before being copied to the central directories. See UMDP 70 for full details on files held centrally.

### 6.1 Climate 96x73 Resolution 360 day year

#### 6.1.1 Standard Datasets

Land sea mask including river runoff field
Orography
Vegetation and soils parameters for single level hydrology
Sea surface temperature and seaice
Deep soil temperature for single level hydrology
Soil moisture content and snow amount for single level hydrology
Ozone using Shine & Li climatology

```
ancil_top_level -m cl_9673 -s ancil_std -t name_std \
-z "mask orog vegsoil sstice slt smow ozoneli" \
-a "-r -l" \
-c "-w" \
-e "-f" \
-g "-z -l19 -s"
```

#### 6.1.2 MOSES 1 Hydrology Datasets

Vegetation and soils parameters
Deep soil temperature
soil moisture content and snow amount

```
ancil_top_level -m cl_9673 -s ancil_moses -t name_moses \
-z "vegsoil slt smow" \
-c "-sMOSES1 -w" \
-f "-sMOSES1" \
-d "-sMOSES1"
```

#### 6.1.3 Test Orography

Orography using new BAS data

```
ancil_top_level -m cl_9673 -s ancil_bas -t name_bas \
-z "orog" \
-b "-dtenBAS -o".BAS""
```

#### 6.1.4 Shine & Li Ozone climatology on 31 levels

Shine & Li ozone data on mesoscale model 31 levels
Notice that this requires a new GRID namelist which is the same as standard except for P_LEVELS being set to 31

```
ancil_top_level -m cl_9673 -s ancil_o331 -t name_o331 \
-z "ozoneli" \
-n $TMPDIR/newgrid \
-g "-l31 -z -s -k
```

## 6.2 Climate 96x73 Resolution 365 day year

### 6.2.1 Standard Datasets

Land sea mask including river runoff field
Orography
Vegetation and soils parameters for single level hydrology
Sea surface temperature and seaice
Deep soil temperature for single level hydrology
Soil moisture content and snow amount for single level hydrology
Ozone using Shine & Li climatology

```
ancil_top_level -m cl365_9673 -s ancil_std -t name_std \
-z "mask orog vegsoil sstice slt smow ozoneli" \
-a "-r -l" \
-c "-w" \
-e "-f" \
-g "-z -l19 -s"
```

### 6.2.2 MOSES 1 Hydrology Datasets

Vegetation and soils parameters
Deep soil temperature
soil moisture content and snow amount

```
ancil_top_level -m cl365_9673 -s ancil_moses -t name_moses \
-z "vegsoil slt smow" \
-c "-sMOSES1 -w" \
-f "-sMOSES1" \
-d "-sMOSES1"
```

## 6.3 Operational Global 432x325 Resolution

### 6.3.1 Standard Datasets

Land sea mask
Orography
Vegetation and soils parameters for single level hydrology
Sea surface temperature and seaice
Deep soil temperature for single level hydrology
Soil moisture content and snow amount for single level hydrology
Ozone using Shine & Li climatology

```
ancil_top_level -m gl_432325 -s ancil_std -t name_std \
-z "mask orog vegsoil sstice slt smow ozoneli" \
-a "-l -dtenBAS" \
-b "-m" \
-c "-w" \
-d "-a" \
-g "-z -l30 -s"
```

### 6.3.2 MOSES 1 Hydrology Datasets

Vegetation and soils parameters
Deep soil temperature
soil moisture content and snow amount

```
ancil_top_level -m gl_432325 -s ancil_moses -t name_moses \
-z "vegsoil slt smow" \
-c "-sMOSES1 -w" \
-f "-sMOSES1" \
-d "-sMOSES1"
```

### 6.3.3 Test Orography

Orography using new BAS data

```
ancil_top_level -m gl_432325 -s ancil_bas -t name_bas \
-z "orog" \
-b "-dtenBAS -o".BAS""
```

### 6.3.4 Shine & Li Ozone Climatology on ECMWF 31 levels

Shine & Li ozone climatology on ECMWF 31 level model. Notice that this requires a new GRID namelist which is the same as standard except for P_LEVELS being set to 31. Also, data is only provided from level 21 upwards.

```
ancil_top_level -m gl_432325 -s ancil_ec31 -t name_ec19 \
-z "ozoneli" \
-n $TMPDIR/newgrid \
-g "-e -k -z -l31 -s -t21"
```

## 6.4 NEW MESOSCALE MODEL

### 6.4.1 Standard Datasets

Land sea mask
Orography
Vegetation and soils parameters for single level hydrology
Sea surface temperature and seaice
Deep soil temperature for single level hydrology
Soil moisture content and snow amount for single level hydrology
Ozone using Shine & Li climatology

```
ancil_top_level -m ms_146182_uk -s ancil_std -t name_std \
-z "mask orog vegsoil sstice slt smow ozoneli" \
-a "-dfive -l" \
-c "-w -t" \
-d "-a" \
-g "-l38 -t28 -s"
```

### 6.4.2 MOSES 1 Hydrology Datasets

Vegetation and soils parameters
Deep soil temperature
soil moisture content and snow amount

```
ancil_top_level -m ms_146182_uk -s ancil_moses -t name_moses \
-z "vegsoil slt smow" \
-c "-sMOSES1 -w" \
-f "-sMOSES1" \
-d "-sMOSES1"
```