Configuration e923 user guide

ALADIN cycle AL12
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1 Introduction

This manual is prepared for the 1st ALADIN Maintenance and Phasing Workshop (Budapest, 25-29 November, 2002). It is intended to be used as a guide for preparing climatological files.

Because of the lack of time is not finished yet and also revision is missing. If you have some comments, you are missing something or is unclear written, if you find any bugs or other deficiencies, please send mesage to neva.pristov@rzs-hm.si.

2 Basic information about configuration e923

Configuration e923 is a procedure which interpolates climatic information from global fields into an arbitrarily chosen limited area. It creates the climatological files, containing the following 2D grid point fields:

- constants describing orography
- constants describing surface, soil, vegetation, which may be monthly dependent fields
- monthly climatological values for soil or surface variables

A climatological file is created in at least 3, up to 6, steps:

step 1	- definition of orography
step 2	- definition of surface, soil and vegetation characteristics without annual cycle
step 3	- definition of monthly climatological values, modification of albedo and emissivity according to the climatology sea-ice limit
step 4	- definition/modification of the vegetation and surface characteristics
step 5	- modification of fields created by step 2 or 4 over land from high resolution datasets (for each month)
step 6	- modification of climatological values

The first 4 steps are required for the ISBA surface scheme. For the non-ISBA case the first 3 steps are required and the input files for step 2 differ. Steps 5 and 6 are also usually performed.

3 Basic usage

To get climatological file the model has to be run for each step with a special namelists. Namlists are almost the same each step except for the value of N923 in NAMMCC which is changing according to step and in namelist for step 5 information about local data base is added in NAMCLI. Each step different files with corresponding data are read. The list of all needed input files is in the next subsection. The output file is `Const.Clim` where output fields are written. Geographycal projection of fields is determined with the definition of geometry in namelists. The `master` program is run without options. Steps 4 to 6 have to be run for each month.

3.1 Main features of namelists

List of important namelist parameters:

NAMMCC		
	LN923=.TRUE.	
	N923= 1/2/3/4/5/6	step
NAMCLI ! datasets		
	LIEEE=.TRUE./.FALSE.	data coding ieee/ascii format
	LGLOBE=.TRUE.	global datasets
	ELONSW, ELATSW	SW corner for local datasets(deg.)
	ELONNE, ELATNE	NE corner for local datasets(deg.)
	NDATX, NDATY	size of datasets
	NPINT	size of interpolation box
	SVEG	definition of desert
	SFCZ0	scaling factor for z0 (vegetation, urbanization)
NAMCLA ! orography		
	FACZ0	scaling factor for the orographic part of roughness length
	NFLIS	level of smooting for the orog. part of roughness length
	FENVN=0.	amplitude of the enveloppe orography
	LNORO=.FALSE.	key for reading new orography from separate file (named Neworog)
	LNLSM=.FALSE.	key for reading new land-sea mask from separate file (named Neworog) only if LNORO=.T.
	LKEYF=.TRUE.	key for spectral fit on the orography
	LNEWORO	switch to the cost function (Bouteloup) in spectral fit of orography
	LNEWORO2	switch to the cost function (Jerczynski) in spectral fit of orography
		constants for the optimization of spectral fit
	QMAX=4.	Maximum value of weight
	QMIN=2.	Minimum value of weight
	HMIN=150.	Reference height in the formulation of weight
	HDIM=1.	Scaling factor for the orography deviation
	XINCOC=0.	Part of the fraction of sea in the weight
	QPOWER=3.5	Exponent in the additional term (additional for LNEWORO2=.T.)
	QCONST=0.4	Scaling factor in the additional term (additional for LNEWORO2=.T.)
	LNEWORO3	switch to the envelope, the type of grid (quadratic, semi-linear, linear)
	FENVP=0.	definition of weight
	FENVA=0.	definition of weight
	NDIAOR=0	Diagnostics for orography: 0 none, 1 simple, 2 expensive
NAMDIM grid dimensioning		
NEMGEO definition of the domain		
NAMPHY		
	LSOLV=.TRUE.	for ISBA scheme
	LVGSN=.TRUE.	for ISBA scheme
	LMPHYS=.TRUE.	

3.2 Overview of input files and output fields

Step 1
Datasets are prepared from GLOBE25 or from GTOPT030 data in resolution 2'30"
Input data from directory:

delage: ~mrpe603/RELIEF_G/GLOB95
delage: ~mrpe603/RELIEF_G/GTOPT030

Input files

Water_Percentage	- Land/Sea mask (% of water)
Oro_Mean	- Mean orography Hmean(m)
Sigma	- Sub-grid std dev of Hmean (m)
Nb_Peaks	- Number of sub-grid peaks
Urbanisation	- Fraction of urbanization (% of city)
Dh_over_Dx_Dh_over_Dy	- the xy component of orography variance tensor
Dh_over_Dx_square	- the xx component of orography variance tensor
Dh_over_Dy_square	- the yy component of orography variance tensor
Hmax-HxH-Hmin_ov4	- (Hmax-Hmean)(Hmean-Hmin)/4

Output fields in the output file Const.Clim

SURFIND.TERREMER	- land(1)/water(0) mask
SURFGEOPOTENTIEL	- surface geopotential (grid point)
SPECSURFGEOPOTEN	- surface geopotential (spectral)
SURFET.GEOPOTENT	- G times the standard deviation of the orography
SURFVAR.GEOP.ANI	- the anisotropy coefficient
SURFVAR.GEOP.DIR	- the direction of principal axis of topography (in radian)
SURFZ0REL.FOIS.G	- G times the roughness length of bare surface
SURFPROP.TERRE	- the fraction of land
SURFPROP.URBANIS	- the fraction of urbanization
SURFZ0.FOIS.G	- same as SURFZ0REL.FOIS.G

Step 2

Datasets are prepared from different sources (Meteosat, NOAA-4, CLIMAP, ISLSCP, climatology from Webb, tables, classifications Wilson&Henderson-Sellers, Mahfouf)
Input data from directory:
delage: ~mrpe603/SURFACE_G/version1/i3e

Input files

itp_GL	- dominant land use type
alb_GL	- bare ground albedo
emi_GL	- emissivity
dps_GL	- hydrological depth of soil
arg_GL	- corresponding percentages of clay
sab_GL	- corresponding percentages of sand
vgx_GL	- max. vegetation cover along the annual cycle
dpr_GL	- root depth
Const.Clim	(from previous step)

Output fields in the output file Const.Clim (added)

SURFIND.VEG.DOMI	- dominant land use type
SURFALBEDO.COMPL	- bare ground albedo
SURFALBEDO.SOLNU	-
SURFEMISSIVITE	- emissivity
SURFEPAI.SOL.MAX	- maximum depth of the soil column
SURFPROP.ARGILE	- percentage of clay
SURFPROP.SABLE	- percentage of sand
SURFPROP.VEG.MAX	- maximum vegetation fraction
SURFEPAIS.SOL	- useful depth of the soil column
SURFALBEDO	- same as SURFALBEDO.COMPL
SURFPROP.VEGETAT	- same as SURFPROP.VEG.MAX

Step 3
Datasets are prepared from US Navy data, CLIMAP, climatology from NCAR, AMIP
Input data from directory:
delage: ~mrpe603/N108/i3e
Input files

N108_GL	- Fraction of land
	G times Orography
	Fraction of the land covered by ice caps
	monthly surface temperature
	monthly surface Td
	monthly SST
Const.Clim	(from previous step)

Output fields in the 12 output files Const.Clim.$MM ($MM is number of month)
(added and modified)

SURFTEMPERATURE	- climatological surface temperature
PROFTEMPERATURE	- climatological deep soil temperature
SURFPROP.RMAX.EA	- climatological surface relative moisture content
PROFPROP.RMAX.EA	- climatological deep soil relative moisture content
SURFRESERV.NEIGE	- an empirically estimated equivalent water depth snow climatology
RELATEMPERATURE	- relaxation values for deep temperature
RELAPROP.RMAX.EA	- relaxation values for deep soil moisture
SURFEMISSIVITE	- emissivity (monthly) modified over sea only
SURFALBEDO	- albedo (monthly) modified over sea only

Step 4
Datasets are prepared from Henderson-Sellers classification + tables
Input data from directory:
delage: ~mrpe603/SURFACE_G/version1/i3e
Input files

z0v_GL	- roughness length of vegetation
alv_GL	- albedo of vegetation
rsm_GL	- minimum surface resistance
veg_GL (veg${MM}_GL)	- fraction of vegetation cover
lai_GL (lai${MM}_GL)	- leaf area index
Const.Clim (Const.Clim.$MM)	(from previous step)

Output fields in the output file Const.Clim (added and changed)

SURFIND.FOLIAIRE	- leaf area index (monthly)
SURFRESI.STO.MIN	- minimum surface resistance (monthly)
SURFGZ0.THERM	- G times thermal roughness length (monthly)
SURFZ0VEG.FOIS.G	- G times cinetic roughness length (monthly)
SURFALBEDO.VEG	
SURFZ0.FOIS.G	- global roughness length is changed (adding contributions from vegetation and urbanization)
SURFPROP.VEGETAT	- fraction of vegetation cover (monthly)
SURFALBEDO	- albedo (monthly)

Step 5
Datasets are result from the combination of a AVHRR-derived vegetation mapping over Europe and the ESA forest mask. The initial data have a resolution of 2 km but have been interpolated onto a regular 0.1^ox0.1^o grid. The area is ELATSW=30^o, ELONSW=-25^o, ELATNE=72^o, ELONNE=61^o
Input data from directory:

delage: ~mrpe603/SURFACE_L/EUROPEb_v1/i3e

Input files

alv_HR	- albedo of vegetation
dpr_HR	- root depth
itp_HR	- dominant land use type
msk_HR	- mask describing missing data
rsm_HR	- minimum surface resistance
vgx_HR	- maximum vegetation cover
z0v_HR	- roughness length of vegetation
veg_HR (veg${MM}_HR)	- current vegetation cover
lai_HR (lai${MM}_HR)	- leaf area index
Const.Clim (Const.Clim.$MM)	(from previous step)

Output fields in the output file Const.Clim (can be modified according to available data)

SURFIND.VEG.DOMI	- land use type
SURFPROP.VEGETAT	- percentage of vegetation
SURFPROP.VEG.MAX	- max. percentage of vegetation
SURFIND.FOLIAIRE	- leaf area index
SURFRESI.STO.MIN	- minimum surface resistance of vegetation
SURFEPAIS.SOL	- useful soil depth
SURFZ0.FOIS.G	- global roughness length
SURFZ0VEG.FOIS.G	- cinetic roughness length
SURFGZ0.THERM	- thermal roughness length
SURFALBEDO	- albedo
SURFALBEDO.COMPL	- bare ground albedo
SURFEMISSIVITE	- emissivity
SURFPROP.ARGILE	- percentage of clay
SURFPROP.SABLE	- percentage of sand
SURFEPAI.SOL.MAX	- maximum soil depth

Step 6

Datasets were created from one-year assimilation experiment performed with ARPEGE and truncation T79. This was necessary to obtain climatological values consistent with ISBA and the new vegetation.

Input data from directory

delage: ~mrpe603/CLIM_G/version1/i3e

Input files

rel_GL (rel_GL.Z)	- G times Orography
snl_GL (snl_${MM}.Z)	- Snow cover
tpl_GL (tpl_${MM}.Z)	- Mean Land Surface Temperature
tsl_GL (tsl_${MM}.Z)	- Land Surface Temperature
wpl_GL (wpl_${MM}.Z)	- Mean soil moisture
wsl_GL (wsl_${MM}.Z)	- Superficial soil moisture
Const.Clim (Const.Clim.$MM)	(from previous step)

Output fields in the output file Const.Clim (if modified)

SURFALBEDO	- albedo (if modified according to SST)
SURFEMISSIVITE	- emissivity (if modified according to SST)
SURFTEMPERATURE	- climatological sea/land surface temperature
PROFTEMPERATURE	- climatological mean soil temperature
SURFPROP.RMAX.EA	- climatological surface moisture
PROFPROP.RMAX.EA	- climatological soil moisture
SURFRESERV.NEIGE	- an empirically estimated equivalent water depth snow climatology
RELATEMPERATURE	- relaxation values for deep temperature
RELAPROP.RMAX.EA	- relaxation values for deep soil moisture

Table 1: List of all input global fields with some additional information about size of file, number of bytes per data, number of points and resolution of global data. In one box are files for one step for ISBA case.

file	size	Nb bytes per data	points in lon.	points in lat.	resolution (deg.)
Water_Percentage	37324800	1			
Oro_Mean	74649600	2			
Sigma	74649600	2			
Nb_Peaks	37324800	1			
Urbanisation	37324800	1	8640	4320	0.042
Dh_over_Dx_Dh_over_Dy	149299200	4			
Dh_over_Dx_square	149299200	4			
Dh_over_Dy_square	149299200	4			
Hmax-HxH-Hmin_ov4	149299200	4			
itp_GL					
alb_GL					
emi_GL					
dps_GL	518408	8	360	180	1.
arg_GL	*8				
sab_GL	=4147264				
vgx_GL					
dpr_GL					
N108_GL	29180736	8	432	216	0.83
z0v_GL					
alv_GL					
rsm_GL	518408	8	360	180	1.
veg${MM}_GL	*27				
lai${MM}_GL	=13997016				
alv_HR					
dpr_HR					
itp_HR					
msk_HR					
rsm_HR	2889608	8	860	420	0.1
vgx_HR	*31				
z0v_HR	=89577848				
veg${MM}_HR					
lai${MM}_HR					
rel_GL					
snl_${MM}					
tpl_${MM}	230408	8	240	120	1.5
tsl_${MM}	*61				
wpl_${MM}	14054888				
wsl_${MM}					

Input files are also available in ascii format for steps 2, 4, 5 and 6 (soon also for step 3). Location is the same just sub-directory is *ascii* instead of *i3e*. This format can be also used by e923 with setting LIEEE=.FALSE. in NAMCLI, but usually takes longer time. It is useful for visualization and for transfer to other platforms. A conversion tool (i3e+doc <-> ascii+doc) is available by E. Escaliere.

4 Notes

4.1 Compilation

In generaly there should be no major problems. But if they occur are connected to reading of binary input files. Some compiles have automatic promotion of integer and real to x bytes.

The problem can appear in eincli1.F:

Alpha

record length in direct access files is given in units of 4 bytes, be careful with definitions of IARRAY16 and IARRAY32.

eincli1.F90 : IARRAY32 is integer*4
by opening binary files RECL should be divided by 4
OPEN(31, FILE='Water_Percentage', ... , RECL=NDATX/4)

Intel with Lahey/Fujitsu compiler

compilation option (–long) is used, but this is not correct for reading variables IARRAY16 and IARRAY32. So use options -CcdRR8 -CcdII8 instead of –long –dbl for compiling eincli1.F90.
INTEGER_S :: IARRAY16(NDATX) replace with INTEGER $*$ 2 :: IARRAY16(NDATX)
INTEGER_M :: IARRAY32(NDATX) replace with INTEGER $*$ 4 :: IARRAY16(NDATX)

4.2 Local domain

The first step of configuration e923 can be run also on data set for local domain (LGLOBE=.FALSE.), not just for the data for whole globe (LGLOBE=.TRUE.).
This is very useful for running e923 locally. Files for step 1 with data over whole globe are quite huge. From them data for selected domain (a little bigger than for clim file) can be extracted. Description how to do it is in the appendix A (and B).

5 How to run configuration e923

- Transfer all needed input files from delage. If you have problems with space extract subdomain from global data for files needed for step 1.
- Prepare the namelists file.
- Run the model for all steps (script is useful), be careful: steps 4 to 6 have to be done for each month.
- Some testing can be useful. The coice of the dataset (GLOB95 or GTOPT030) and the choice of the cost function (Bouteloup or Jerczynski) are depending on the domain. Cost function parameters QMIN,QMAX,XINCOC,.. can also be tuned.

6 Work connected to 923

Woyciechowska Jadwiga, 2002: Documentation for configuration 923 in ARPEGE/ALADIN step 1, 1. version

Alexandru Steluta, 2001: Tuning the orography representation in the e923 configuration, 10th ALDIN Workshop, Toulouse, June 2001, 87-98

Alexandru Steluta, 2001: Optimization of the spectral orography considering the fraction of water, report from stay in Toulouse

Alexandru Steluta, 2000: Improving the representation of orography in Arpege/Aladin, report from stay in Toulouse

Pristov Neva, El Abed Mehdi, 1998: Introduction of the local orography data, report from stay in Toulouse and ALADIN Newsletter 16

Pristov Neva, El Abed Mehdi, 1998: Testing configuration e923 on DEC workstation, report from stay in Toulouse and ALADIN Newsletter 15

Jerczynski Marek, 1994: Spectral representation of the LACE domain orography with a variational method, report from stay in Toulouse

Bouteloup Yves, 1994: Improvement of the Spectral Representation of the Earth Topography with a Variational Method, Monthly Weather Review, Vol. 123, No.5 1560-1573

7 Appendix A: Commands for extraction domain from global data

Extraction can be done with the program from E. Legrand. Maybe there are problems if domain includes longitude 0^o. Another possibility is described in Appendix B where this problem is solved.

```
usage: /u/mpre/mpre001/progs/extrait_globe [-E East] [-W West] [-N North] [-S South]
               [-e east] [-w west] [-n north] [-s south]
               [-x input_nblon] [-y input_nblat]
               [-i input_file] [-o output_file]
               [-r resol_sampling_longitude] [-R resol_sampling_latitude]
              [[-h nb_bits of input header]/[-H nb_Bytes of input header]]
              [[-b nb_bits of 1 elt]/[-B nb_Bytes of 1 elt]]

-E, -W, -N, -S: limits of the input file (in degrees)
-e, -w, -n, -s: limits of the output file (in degrees)

        Default settings:
        ----------------
-i: Entree              -o: Sortie
-E: 180.0  -W: -180.0  -N: 90.0  -S: -90.0
        -e, -w, -n, -s: idem -E, -W, -N, -S

-x: 8640  -y: 4320      -r 1 -R 1 (every point)
-B: 2  -H: 0
```

Example for preparing data files over local domain for first step of configuration e923.

```
LATS=38.0
LATN=53.0
LONW=2.0
LONE=25.0
EXP=EAsi

/u/mpre/mpre001/progs/extrait_globe -E 360.0  -W 0.0  -N 90.0  -S -90.0
 -s $LATS -n $LATN -w $LONW -e $LONE -i Oro_Mean -o ${EXP}_Oro_Mean
```

```
 -x 8640  -y 4320 -r 1 -R 1 -B 2  -H 0

/u/mpre/mpre001/progs/extrait_globe -E 360.0  -W 0.0  -N 90.0  -S -90.0
 -s $LATS -n $LATN -w $LONW -e $LONE -i Sigma -o ${EXP}_Sigma
 -x 8640  -y 4320 -r 1 -R 1 -B 2  -H 0

/u/mpre/mpre001/progs/extrait_globe -E 360.0  -W 0.0  -N 90.0  -S -90.0
 -s $LATS -n $LATN -w $LONW -e $LONE -i Water_Percentage -o ${EXP}_Water_Percentage
 -x 8640  -y 4320 -r 1 -R 1 -B 1  -H 0

/u/mpre/mpre001/progs/extrait_globe -E 360.0  -W 0.0  -N 90.0  -S -90.0
 -s $LATS -n $LATN -w $LONW -e $LONE -i Nb_Peaks -o ${EXP}_Nb_Peaks
 -x 8640  -y 4320 -r 1 -R 1 -B 1  -H 0

/u/mpre/mpre001/progs/extrait_globe -E 360.0  -W 0.0  -N 90.0  -S -90.0
 -s $LATS -n $LATN -w $LONW -e $LONE -i Dh_over_Dy_square -o ${EXP}_Dh_over_Dy_square
 -x 8640  -y 4320 -r 1 -R 1 -B 4  -H  0

/u/mpre/mpre001/progs/extrait_globe -E 360.0  -W 0.0  -N 90.0  -S -90.0
 -s $LATS -n $LATN -w $LONW -e $LONE -i Dh_over_Dx_square -o ${EXP}_Dh_over_Dx_square
 -x 8640  -y 4320 -r 1 -R 1 -B 4  -H 0

/u/mpre/mpre001/progs/extrait_globe -E 360.0  -W 0.0  -N 90.0  -S -90.0
 -s $LATS -n $LATN -w $LONW -e $LONE -i Dh_over_Dx_Dh_over_Dy  -o ${EXP}_Dh_over_Dx_Dh_over_Dy
 -x 8640  -y 4320 -r 1 -R 1 -B 4  -H 0

/u/mpre/mpre001/progs/extrait_globe -E 360.0  -W    0.0  -N 90.0 -S -90.0
 -s $LATS -n $LATN -w $LONW -e $LONE -i Urbanisation  -o ${EXP}_Urbanisation
 -x 8640 -y 4320 -r 1 -R 1 -B 1  -H 0

/u/mpre/mpre001/progs/extrait_globe -E 360.0  -W    0.0  -N 90.0  -S -90.0
 -s LATS -n $LATN -w $LONW -e $LONE -i Hmax-HxH-Hmin_ov4  -o ${EXP}_Hmax-HxH-Hmin_ov4
 -x 8640  -y 4320 -r 1 -R 1 -B 4  -H 0
```

8 Appendix B: Script and program for extraction domain from global data

The program for extraction subdomain from the global data set which is used in the configuration e923 part 1 is available. Files are from `delage:~mrpe603/RELIEF_G/GLOB95/*` where data are organized from 0 to 360 deg.. It works also if subdomain includes longitude 0 deg..
The program needs the namelist where coordinates of subdomain are defined:

```
&NAMORO
FILE_IN='$1',        ! input filename
FILE_OUT='$2',       ! output filename
NDATX=8640,          ! number of columns in the input global file
NDATY=4320,          ! number of lines in the input global file
ELONSW=0.,           ! coordinates of the output domain
ELATSW=40.
ELONNE=18.
ELATNE=60.
/
```

Program for extraction and namelist are included in the script `extract.sh`. The script is run with following parameters: `extract.sh input_file output_name numbers_of_bytes`. Names of the output files are composed like: `output_name.NbColumnsxNbLines` Inside the program the number of bytes has to be precise, so compilation has to be done in the script.

Script can be found on: ??

Example of the script which extract domain for all needed input files for e923 part 1:

```
#!/bin/ksh
cd $tmpdir
outdir=$workdir/test
# files Oro_Mean,Sigma,... should be already here
cp /u/gp/mrpm/mrpm611/extract/extract.sh extract.sh
chmod +x extract.sh
extract.sh Oro_Mean $outdir/Oro_Mean 2
extract.sh Urbanisation $outdir/Urbanisation 1
extract.sh Water_Percentage  $outdir/Water_Percentage 1
extract.sh Sigma  $outdir/Sigma 2
extract.sh Nb_Peaks  $outdir/Nb_Peaks 1
extract.sh Dh_over_Dx_Dh_over_Dy  $outdir/Dh_over_Dx_Dh_over_Dy  4
extract.sh Dh_over_Dx_square  $outdir//Dh_over_Dx_square 4
extract.sh Dh_over_Dy_square  $outdir/Dh_over_Dy_square 4
extract.sh Hmax-HxH-Hmin_ov4 $outdir/Hmax-HxH-Hmin_ov4 4
```

9 Appendix C: Script for running 923

One example:

```
#!/bin/sh
#  $DATA......name of directory with data
#  $NP........name of directory with namelist
#  $LAM.......the binary of ALADIN program
#  $NAMELIST..$NP/fort.4.923

  MMS="01 02 03 04 05 06 07 08 09 10 11 12"

########
# Step 1
########
  FILES="Dh_over_Dx_Dh_over_Dy Dh_over_Dx_square Dh_over_Dy_square
         Hmax-HxH-Hmin_ov4 Nb_Peaks Oro_Mean Sigma Urbanisation
         Water_Percentage"
  for file in $FILES; do
    ln -sf $DATA/${file}.0528x0360 $file
  done
  sed  -e "s/N923=0/N923=1/g"  -e "s/LGLOBE=.TRUE./LGLOBE=.FALSE.,NDATX=528, NDATY=360, ELATSW=38.0,
        ELONSW=2., ELONNE=24.0, ELATNE=53.0/g" $NAMELIST > fort.4
#  cp $NP/fort.4.e923.1 fort.4
  $LAM

########
# Step 2
########
  FILES="itp_GL alb_GL emi_GL dps_GL arg_GL sab_GL vgx_GL dpr_GL"
  for file in $FILES; do
    ln -sf $DATA/$file $file
  done
# Const.Clim  is available from previous step
  sed  -e "s/N923=0/N923=2/g"  $NAMELIST > fort.4
# cp $NP/fort.4.e923.2 fort.4
  $LAM

########
# Step 3
########
```

```
FILES="N108_GL"
for file in $FILES; do
 ln -sf $DATA/${file} $file
done
sed  -e "s/N923=0/N923=3/g"  $NAMELIST > fort.4
#cp $NP/fort.4.e923.3 fort.4
  $LAM
# output is in 12 files: Const.Clim.$MM, MM=01..12

########
# Step 4
########
FILES="z0v_GL alv_GL rsm_GL"
for file in $FILES; do
 ln -sf $DATA/$file $file
done
sed  -e "s/N923=0/N923=4/g"  $NAMELIST > fort.4
#cp $NP/fort.4.e923.4 fort.4
for MM in $MMS; do
 ln -sf $DATA/veg${MM}_GL veg_GL
 ln -sf $DATA/lai${MM}_GL lai_GL
 mv Const.Clim.$MM Const.Clim
  $LAM
 mv Const.Clim Const.Clim.$MM
done

########
# Step 5
########
FILES="alv_HR dpr_HR itp_HR  msk_HR rsm_HR vgx_HR z0v_HR"
for file in $FILES; do
 ln -sf $DATA/$file $file
done
sed  -e "s/N923=0/N923=5/g" -e "s/LGLOBE=.TRUE./LGLOBE=.FALSE.,NDATX=860, NDATY=420,
      ELATSW=30.0, ELONSW=-25., ELONNE=61.0, ELATNE=72.0/g" $NAMELIST > fort.4
#cp $NP/fort.4.e923.5 fort.4
for MM in $MMS; do
 ln -sf $DATA/veg_${MM}_HR veg_HR
 ln -sf $DATA/lai_${MM}_HR lai_HR
 cp Const.Clim.$MM Const.Clim
  $LAM
 mv Const.Clim Const.Clim.$MM
done

########
# Step 6
########
FILES="snl tpl tsl wpl wsl"
ln -sf $DATA/rel_GL rel_GL
sed  -e "s/N923=0/N923=6/g"  $NAMELIST > fort.4
#cp $NP/fort.4.e923.6 fort.4
for MM in $MMS; do
 for file in $FILES; do
  ln -sf $DATA/${file}_$MM ${file}_GL
 done
 cp Const.Clim.$MM Const.Clim
  $LAM
 mv Const.Clim Const.Clim.$MM
done
```

10 Appendix D: Namelists

Example will be included.