NAME III Documentation

NAME Met Data

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Introduction

This document contains information on the meteorological data stored for and used by NAME.

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Met Types and Time Periods

Met Data type	Start Date	End Date
Global data.		
GLOV3		
GLOH	01/01/1999	09/02/2001
GLOH2001	01/01/2001	07/08/2002
GLOUM5	24/07/2002	06/12/2005
GLOUM6	01/11/2005	Current met
Cut out from global data covering Europe and North Atlantic.		
REGV3	01/01/1995	01/01/1999
REGH	01/01/1999	06/08/2002
REGH2001	01/01/2001	07/08/2002
REGUM5	24/07/2002	19/12/2005
REGUM6	01/11/2005	Current met
Mesoscale domain covering UK, Ireland and Most of France.		
MESV3	01/01/1996	31/12/1998 (most of 1998 missing)
MESH	01/01/1999	09/02/2001
MESH2001	01/01/2001	07/08/2002
MESUM5	07/08/2002	02/04/2009
Cut out from NAE domain covering Europe.		
REGNAE	07/09/2006	Current met
UK 4km UM data		
UK4km	01/01/2007	27/11/2007
UK4km_L50	26/11/2007	Current met
South Asia crisis area model. Covers Egypt, Middle East and most of India.		
SAM	01/07/08	Current met

Considerable effort has been expended to patch these archives so that they are complete. However some files are still missing. A full listing of which files are missing can be found on Helen Champions web Met pages that are linked to from here home page: http://www-nwp/%7Eaphh/.

Met Definitions Files & Naming Conventions

Met Data type	**Met Definition File Name**	**Met Definition Name** (Used in NAME input file in 'NWP Met Module Instances:')	**Met File Suffix**
GLOV3	MetDefnUMV3G.txt	UMV3G	GLOV3
GLOH	MetDefnUMHG.txt	UMHG	GLOH
GLOH2001	MetDefnUMH2001G.txt	UMH2001G	GLOH2001
GLOUM5	MetDefnUM5G.txt	UM5G	GLOUM5
GLOUM6	MetDefnUM6G.txt MetDefnUM6Gpp.txt MetDefnUM6GL40.txt MetDefnUM6GL40pp.txt	UM6G UM6G UM6GL40 UM6GL40	GLOUM6 GLOUM6.pp GLOUM6_L40 GLOUM6_L40.pp
REGV3	MetDefnUMV3R.txt	UMV3R	REGV3
REGH	MetDefnUMHR.txt	UMHR	REGH
REGH2001	MetDefnUMH2001R.txt	UMH2001R	REGH2001
REGUM5	MetDefnUM5R.txt	UM5R	REGUM5

	MetDefnUM5Rpp.txt	UM5R	REGUM5.pp
REGUM6	MetDefnUM6R.txt MetDefnUM6Rpp.txt	UM6R UM6R	REGUM6 REGUM6.pp
MESV3	MetDefnUMV3M.txt	UMV3M	MESV3
MESH	MetDefnUMHM.txt	UMHM	MESH
MESH2001	MetDefnUMH2001M.txt	UMH2001M	MESH2001
MESUM5	MetDefnUM5MDt1.txt MetDefnUM5MDt1pp.txt	UM5M UM5M	MESUM5 MESUM5.pp
REGNAE	MetDefnUM6REGNAEpp.txt	UM6REGNAE	REGNAEUM6.pp
UK4km	MetDefnUM4kmMk2pp.txt	UM4kmMk2	4KM2_UM6.pp
UK4km_L50	MetDefnUM4kmMk3_L50pp.txt	UM4kmMk3_L50	4KM50L_UM6.pp
SAM	MetDefnUM6SAM_dt3pp.txt	UM6SAM	SAMUM6.pp

NAME uses a file called a Met definition to define the characteristics of NWP met data. These files define the coordinate systems, grids and variables contained within the Met data files. The files are stored with each version of NAME within the directory: Resources/Defns.

Explanation of Suffix convention:

Suffix GLO...	indicates global data
Suffix GLO..._L40	indicates global data (40 levels). Not archived – only kept for emergency response.
Suffix REG...	indicates regional data
Suffix NAE...	indicates North-Atlantic & European data
Suffix MES...	indicates mesoscale data (including crisis area mesoscale models)
Suffix 4KM1_...	indicates UK 4km model (original domain)
Suffix 4KM2_...	indicates UK 4km model (2nd domain, i.e. extended to include the Shetlands)
Suffix SAM...	indicates South Asian model

Types of Met File: non-pp and pp

PP files are a Met Office format for holding 2-d NWP fields.

Old Name met files (those not suffixed with pp) are a modification of this format. The modifications are:

1. field headers all reals,
2. fields split into ny nx-long records instead of one nx*ny-long record,
3. field header array elements 34-37 used to indicate area of cut down met and <= 0 for non-cut down met,
4. field header array element 1 set to <= 0 to indicate a missing field - for missing fields the following field records are not present.

Modifications (1) and (2) make transferring to/from GPCS easier.

Horizontal Grid Information

Met Data type	Horizontal Grid spacing long-lat in decimal degrees	Horizontal Grid spacing long-lat in km

[a] For Global (GLO) and Regional (REG) data sets (expect REGV3) the longitude grid sixe approximation is calculated at 50 deg North.

		(approximately[ab])
GLOV3	1.25, 0.8333333	90 x 90
GLOH	0.8333333, 0.5555556	60 x 60
GLOH2001	0.8333333, 0.5555556	60 x 60
GLOUM5	0.8333333, 0.5555556	60 x 60
GLOUM6	0.5625, 0.375	40 x 40
REGV3	0.4425, 0.4425	50 x 50
REGH	0.8333333, 0.5555556	60 x 60
REGH2001	0.8333333, 0.5555556	60 x 60
REGUM5	0.8333333, 0.5555556	60 x 60
REGUM6	0.5625, 0.375	40 x 40
MESV3	0.15, 0.15	17 x 17
MESH	0.11, 0.11	12 x 12
MESH2001	0.11, 0.11	12 x 12
MESUM5	0.11, 0.11	12 x 12
REGNAE	0.11, 0.11	12 x 12
UK4km	0.036, 0.036	4 x 4
UK4km_L50	As for UK4km	
SAM	0.15 x 0.15	17 x 17

Vertical Grid Information

Full information on the vertical grids can be found in the relevant Met Definition file.

Met Data type	U Grid Lowest 5 levels	W Grid Lowest 5 (or 7) levels	Top of Data
GLOV3	0.9988 (10 m agl), 0.9970, 0.9750, 0.9304, 0.8698 eta	0.994, 0.956, 0.903, 0.835, 0.750 eta	0.075 eta
GLOH	0.9988 (10 m agl), 0.9970, 0.9750, 0.9304, 0.8800 eta	0.994, 0.956, 0.905, 0.855, 0.800 eta	0.09 eta
GLOH2001	0.9988 (10 m agl), 0.9970, 0.9750, 0.9304, 0.8800 eta	0.994, 0.956, 0.905, 0.855, 0.800 eta	0.09 eta
GLOUM5	9.99821, 49.9989, 130.000, 249.998, 410.001 m agl	20.0003, 80.0014, 179.999, 320.001, 500.001 m agl	19500 m agl
GLOUM6	9.99777, 50.0014, 130.003, 250.001, 410.003 m agl	20.0018, 80.0011, 179.998, 319.998, 500.002 m agl	19500 m agl
REGV3	0.9988, 0.9970, 0.9750, 0.9304, 0.8698 eta	0.994, 0.956, 0.905, 0.835, 0.750 eta	0.04 eta
REGH	As for GLOH		
REGH2001	As for GLOH2001		
REGUM5	As for GLOUM5		
REGUM6	As for GLOUM6		
MESV3	0.99880, 0.99525, 0.98820, 0.97769, 0.96494 eta	0.9929, 0.9835, 0.9719, 0.9580, 0.9400 eta	0.075 eta
MESH	As for MESV3		0.065 eta
MESH2001	As for MESH		

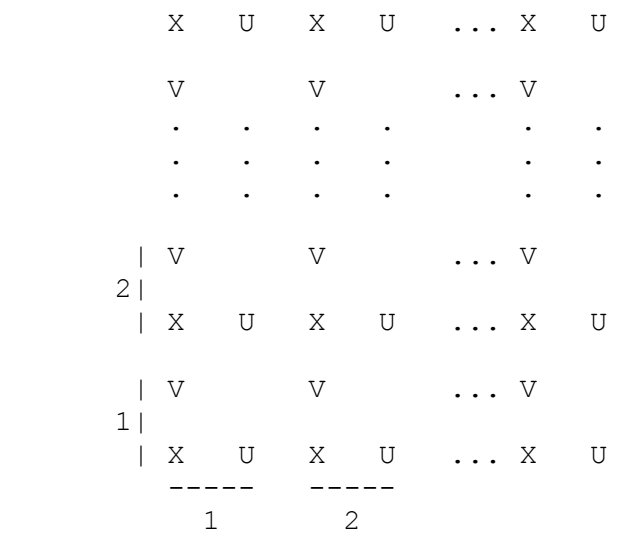
[b] The MES, NAE, UK4km, SAM and REGV3 are all limited area models. These are defined in a rotated coordinate system that means the equator of the rotated system runs through the domain of interest. Therefore approximate grid spacing is calculated as if on the equator.

MESUM5	9.99821, 49.9989, 130.000, 249.998, 410.001 m agl	20.0003, 80.0014, 179.999, 320.001, 500.001 m agl	19500 m agl
REGNAE	As for MESUM5		8800 m agl
UK4km	9.99821, 49.9989, 130.000, 249.998, 410.001 m agl	20.0003, 80.0014, 179.999, 320.001, 500.001 m agl	19500 m agl
UK4km_L50	2.5, 13.3, 33.3, 60.0, 93.3, 133.3, 180.0 m agl	5.0, 21.7, 45.0, 75.0, 111.7, 155.0, 205.0 m agl	8700 m agl
SAM	As for MESUM5		

Explanation of Met Grids

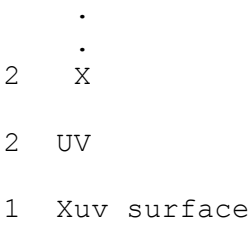
UM5 and later grids - height based coord system.

Horizontal (Arakawa C):



- U = U, U10, UStress
- V = V, V10, VStress
- X = Everything else
- 1,2 ... are indices used in NAME II/III

Vertical (Charney-Philips):



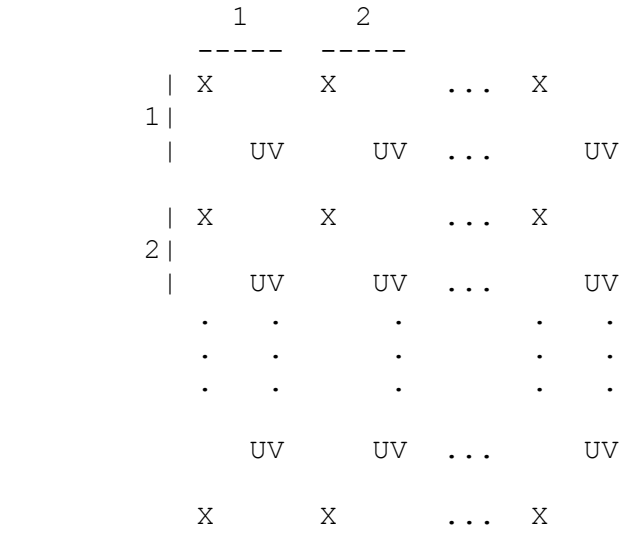
- UV = U, V (and, in the UM but not NAME II/III, P and Rho)
- X = Everything else (including P in NAME II/III)
- lower case = NAME II/III but not UM
- 1,2 ... are indices used in NAME II/III

- UM uses 0, 1/2, 1, 3/2 ... or 0, 1, 1, 2 ...
- Not all UM levels have been retained in the UM met files for NAME, but the interleaving of levels is retained.
- The UM output has P on both X and UV levels - the UM met files for NAME use the P values from the X levels.
- The UM met files for NAME do not contain Rho - this is calculated internally in NAME II/III.

The NAME structure and numbering of fields discussed above refers to the structure and numbering of fields as read in to (or calculated at the surface by) either (i) NAME II versions which number levels starting with 1 at the ground, or (ii) NAME III. (Fields may be interpolated to different grids within NAME II).

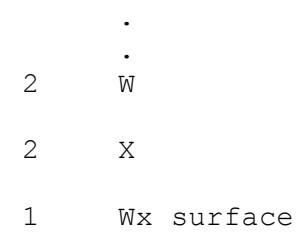
Pre-UM5 grids - pressure based eta coord system.

Horizontal (Arakawa B):



- UV = U, V, U10, V10, UStress, VStress
- X = Everything else
- 1,2 ... are indices used in NAME II/III

Vertical (Lorentz):



- W = W
- X = Everything else
- lower case = NAME II/III but not UM
- 1,2 ... are indices used in NAME II/III
- UM uses 1/2, 1, 3/2, 2 ... or 1, 1, 2, 2 ...

Note however that the UM met files for NAME have a diagnostic 10m level for some quantities. If there is no 10m level in the UM, or if there is but the met file has data separately for both the model level and the diagnostic level, this can lead to two X levels in the met file without an interleaving W level:

```
      .
      .
2/2   W

3/2   X

2/-   X

1/1   Wx surface
```

If there are two levels nominally at 10m, both levels are used in NAME II but not in NAME III. Otherwise the extra level is used in both NAME II and NAME III. The level numbers shown above (e.g. 3/2) reflect differences in numbering depending on whether the extra 10m level is used.

Not all UM levels have been retained in the UM met files for NAME, so there is no guarantee of interleaving of levels at higher levels either (or of there not being another X level before the first retained elevated W level).

NAME NWP Meteorological Input Variables

This section lists the meteorological variables, and their STASH code, contained within A NAME UM met data file.

Field Name	Lowest Level	Highest Level	Field Code	3-d?
wind (u-cpt)	2	Top	2	Yes
wind (v-cpt)	2	Top	3	Yes
wind (w-cpt)	2	Top	150	Yes
temperature (K)	2	Top	16004	Yes
specific humidity	2	Top	10	Yes
dynamic cloud liquid water (kg/kg)	2	Top	4205	Yes
dynamic cloud ice (kg/kg)	2	Top	4206	Yes
pressure (Pa)	2	Top	408	No
surface stress (u-cpt) (N/m^2)	1	1	3219	No
surface stress (v-cpt) (N/m^2)	1	1	3220	No
surface sensible heat flux	1	1	3217	No
sea level pressure (Pa)	1	1	16222	No
pressure (Pa)	1	1	409	No
temperature (K)	1	1	3236	No
convective cloud amount (0-1)	1	1	5262	No
convective cloud base	1	1	5207	No
convective cloud top	1	1	5208	No
dynamic rain rate (kg/(m^2 s))	1	1	4203	No
convective rain rate (kg/(m^2 s))	1	1	5205	No
dynamic snow rate (kg/(m^2 s))	1	1	4204	No
convective snow rate (kg/(m^2 s))	1	1	5206	No
dynamic high cloud amount (0-1)	1	1	9205	No
dynamic medium cloud amount (0-1)	1	1	9204	No

dynamic low cloud amount (0-1)	1	1	9203	No
roughness length	1	1	26	No
boundary layer depth	1	1	25	No
roughness length	1	1	3026	No
soil moisture in layer (kg/m^2)	1	1	8223	No
dummy	1	1	8223	No
dummy	1	1	8223	No
dummy	1	1	8223	No

UM variables 3026 and 8223 were only added to the NAME output files during 2008. STASH 3026 is the preferred measure of roughness length over 26.

Ancillary files of surface properties

Fields considered:

- land use fractions (9 land use types)
- clay mass fraction
- silt mass fraction
- sand mass fraction
- soil particle mass fractions (6 size bins)
- soil moisture

These are all < 0 over the sea. Note: don't know what happens in partially sea grid boxes - e.g. sum to 1 or < 1?

Land use fraction refers to the following 9 land use categories:

1. Broadleaf trees (BL)
2. Needle leaf trees (NL)
3. C3 (temperate) grass (C3G)
4. C4 (tropical) grass (C4G)
5. Shrubs (sh)
6. Urban (ur)
7. Inland water (wa)
8. Soil (bs)
9. Ice (ic)

These are generated from the IGBP land use dataset (see http://www-nwp/~frsurf/ancillary_files/ancil_code/UM6.6/v1.1/doc/IGBP_to_MOSES).

The IGBP dataset gives a single land use for each point (i.e. not land use fractions) at high resolution. The IGBP categories are

1. Evergreen Needleleaf Forest
2. Evergreen Broadleaf Forest
3. Deciduous Needleleaf Forest
4. Deciduous Broadleaf Forest
5. Mixed Forest
6. Closed Shrublands
7. Open Shrublands
8. Woody Savannas
9. Savannas
10. Grasslands
11. Permanent Wetlands
12. Croplands

13. Urban and Built-Up
14. Cropland/Natural Vegetation Mosaic
15. Snow and Ice
16. Barren or Sparsely Vegetated
17. Water Bodies

In NAME II Nikki Morrison produced a land use data set by reducing the resolution of the IGBP dataset by 4x4 and combining classes (see Morrison, 2003, Using a land use map within NAME). This gave a single land use from 10 categories for each 16 raw land use grid squares.

The 6 soil particle mass fractions cover the following particle size ranges

0.0632 to 0.200
0.200 to 0.632
0.632 to 2.00
2.00 to 6.32
6.32 to 20.0
20.0 to 63.2

Soil moisture is taken from the 1st UM soil level.

NAME Output Meteorological Variables

It is possible to ask NAME to output certain meteorological variables. This can be used to extract single points, profiles or even full 3d arrays. This list is not the same as the input variable list as NAME calculates certain derived quantities and does not pass all the raw data through to the output routine.

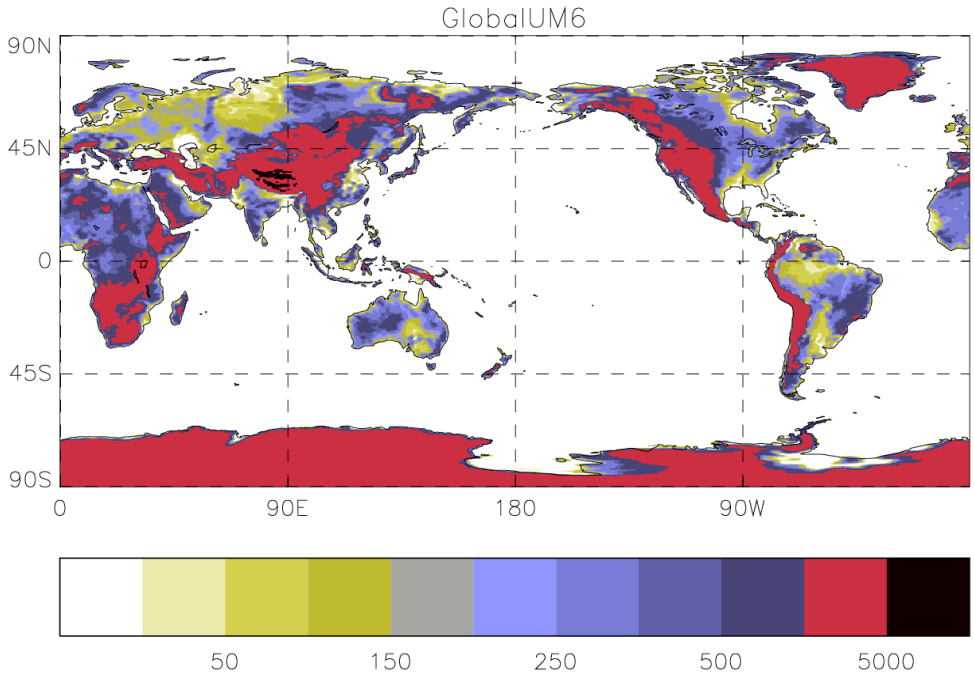
Variable	Description
Mean Flow U	
Mean Flow V	
Mean Flow W	
Wind Speed	
Wind Direction (degrees)	
Temperature (K)	
Potential Temperature (K)	
Specific Humidity	
Pressure (Pa)	
Density	
Topography	
u-star	
Sensible Heat Flux	
Boundary Layer Depth	
Precipitation Rate (mm/hr)	
Temperature (C)	
Cloud Amount (oktas)	
Relative Humidity (%)	
Pasquill Stability	
Sigma VV	
Meander Sigma VV	
Sigma WW	
Tau WW	
Dyn Cloud Water (kg/kg)	
Dyn Cloud Ice (kg/kg)	
3d Cloud (Fraction)	

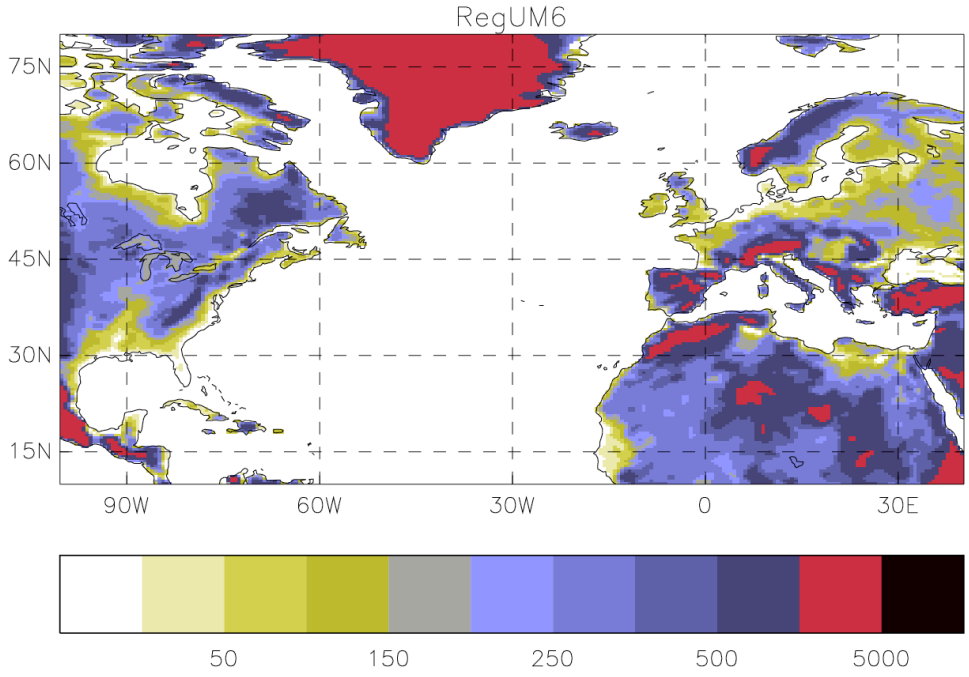
Roughness Length	
Sea Level Pressure (Pa)	

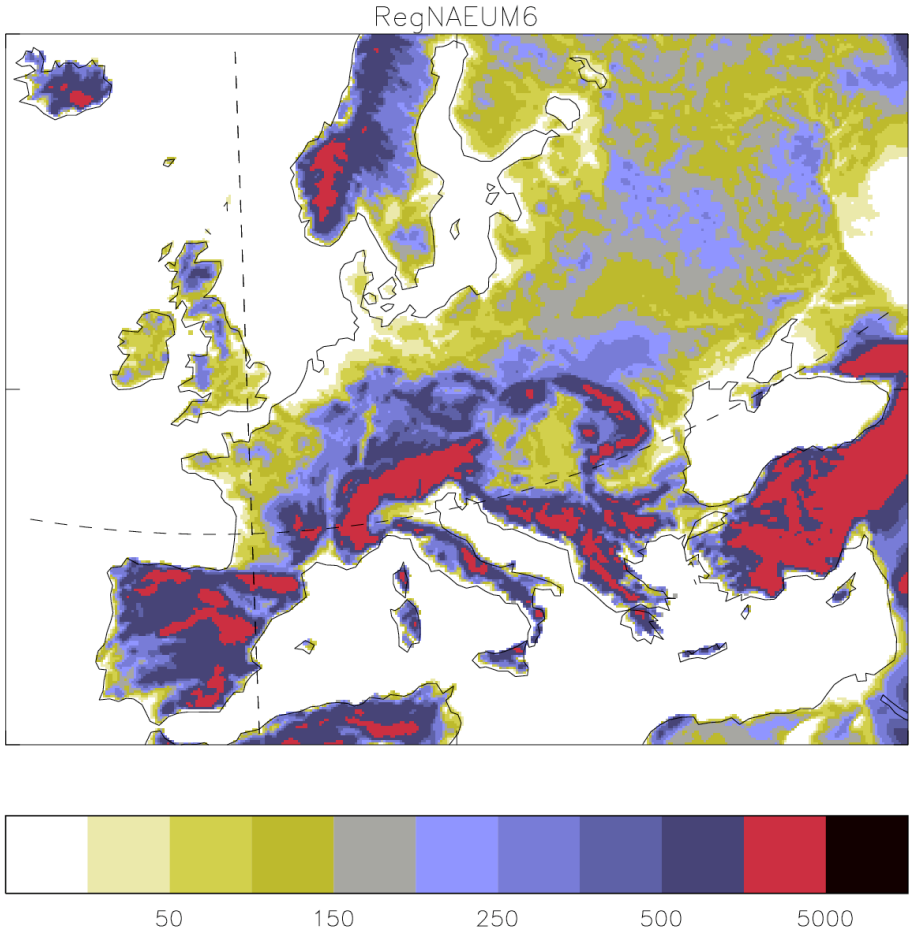
Archive Data Volumes & Location

Met Data type	Data Size (Gb) Files are zipped!	Data location on project network drives
GLOV3		
GLOH	66	/project/NAME_GloMet/apnm/met/GLOH
GLOH2001	144	/project/NAME_GloMet/apnm/met/GLOH2001
GLOUM5	444	/project/NAME_GloMet/apnm/met/GLOUM5
GLOUM6	800 (29/06/09)	/project/NAME_GloMet/apnm/met/GLOUM6 /project/NAME_GloMet/apnm/met/GLOUM6pp
REGV3	44	/project/NAME_LAM/apnm/REG/REGV3
REGH	27	/project/NAME_LAM/apnm/ REG/REGH
REGH2001	12	/project/NAME_LAM/apnm/ REG/REGH2001
REGUM5	67	/project/NAME_LAM/apnm/ REG/REGUM5
REGUM6	130 (??/??/??) 63 pp (29/06/09)	/project/NAME_LAM/apnm/ REG/REGUM6 /project/NAME_LAM/apnm/ REG/REGUM6pp
MESV3	34	/project/NAME_LAM/apnm/MES/MESV3
MESH	50	/project/NAME_LAM/apnm/MES/MESH
MESH2001	105	/project/NAME_LAM/apnm/MES/MESH2001
MESUM5	402	/project/NAME_LAM/apnm/MES/MESUM5
REGNAE	628 (29/06/09)	/project/NAME_LAM/apnm/REGNAE
UK4km	198	/project/NAME_LAM/apnm/ 4KM2_UM6
UK4km_L50	662 (29/05/09)	/project/NAME_LAM/apnm/ 4KM50L_UM6
SAM	113 (29/06/09)	/project/NAME_LAM/apnm/ SAMUM6

Appendix A: Pictures of Met Domains






RegNAEUM6
50
150
250
500
5000