

Chapter 2 : Getting Started



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Topics of Discussion:

- Requirements
- Where to obtain MM5 source code (tar files)?
- What is in these tar files?
- How to run the MM5 programs?
- What is job deck / job script?
- What to modify in a job script?
- Input and output files
- Where to find data to run MM5?
- Conventions used in MM5 system

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Requirements:

- The code is portable
- The entire modeling system software can be run most major vendor's computers
 - Mainframes
 - Unix workstations
 - Computers running Linux

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Requirements:

- The code has been ported to:
 - DEC_Alpha
 - SGI
 - SUN
 - IBM
 - HP
 - PC running Linux
 - Cray
 - Fujitsu
 - NEC
- The code does NOT run on PC's running Windows

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Requirements:

- MM5 model and its preprocessing software are written in Fortran.
 - Older programs are in Fortran 77
 - Newer programs are in Fortran 90
- A few utility routines are in C

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Requirements:

- The MM5 model can be run in different ways, depending on your computer.
- The MM5 model can be run:
 - On a single processor computer (serial run)
 - On shared memory architecture (OpenMP)
 - On distributed memory architecture (MPI)

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Requirements:

- **The model has been run on a variety of parallel platforms:**

- IBM (SP2, SP-Silver, SP-Power 3)
- SGI Origin 200/2000
- CRAYs (J90, C90, T3E)
- DEC_Alphas, Alphas running Linux
- Sun
- Fujitsu VPP
- NEC SX/5
- network of Linux PCs

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Requirements:

- **Software requirements (must-have):**

- Fortran 90 and 77 compiler
- C compiler
- For Linux:
 - Fortran and C compilers from Portland Group
 - Often need an extra library: libf2c.a / libg2c.a
 - <ftp.ucar.edu/mesouser/MM5V3/Test/libf2c.a>
 - Fortran and C compilers from Intel

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Requirements:

- **Software requirements:**

- Optional:
 - NCAR Graphics (free), <http://ngwww.ucar.edu>
 - MPI tools for running MPI MM5 model

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Requirements:

- **Hardware requirements:**

- 0.5 Gb or more memory
- a few Gb disk space

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Source Code: :

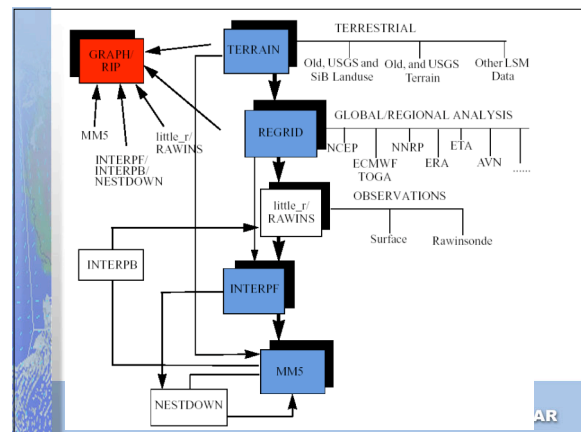
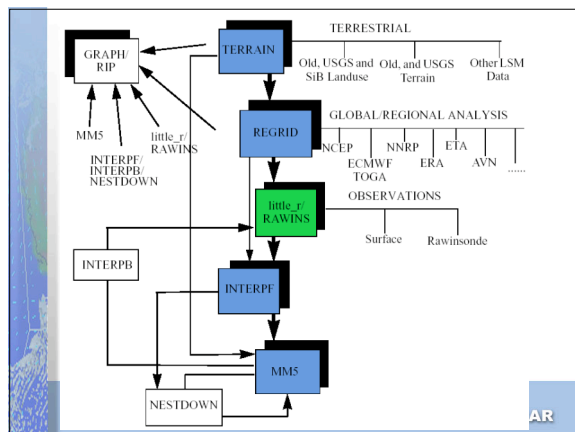
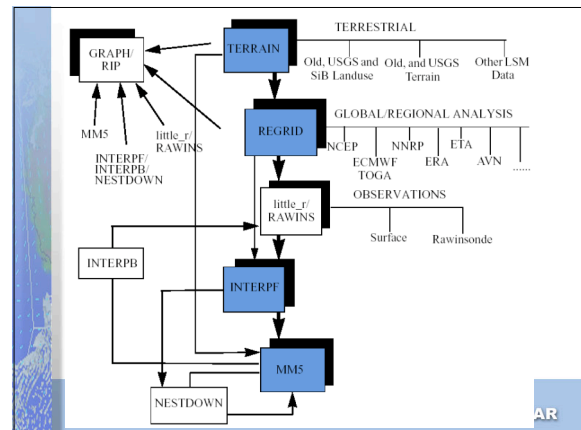
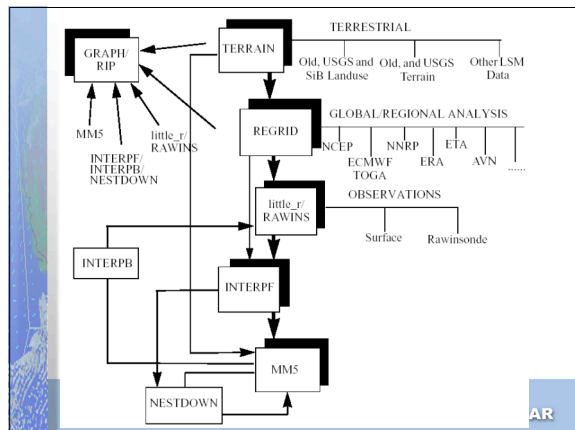
Program	Source Code	Compiler
TERRAIN	Fortran 77	F77 (or F90)
REGRID	Fortran 90	F90
LITTLE_R	Fortran 90	F90
RAWINS	Fortran 77	F77 (or F90)
INTERPF	Fortran 90	F90
MM5	Fortran 77	F77 (or F90)
NESTDOWN	Fortran 90	F90
INTERPB	Fortran 90	F90
RIP/GRAPH	Fortran 77	F77 (or F90)

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Source Code:

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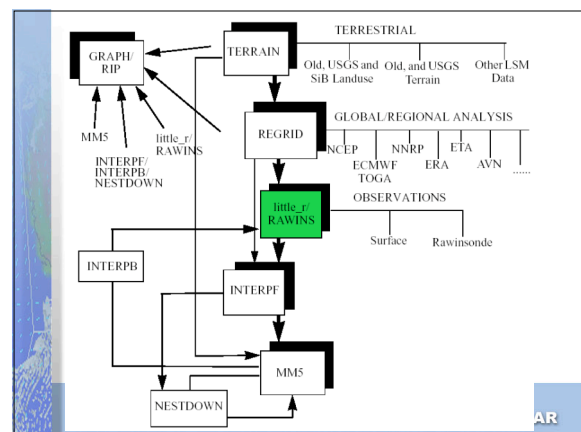


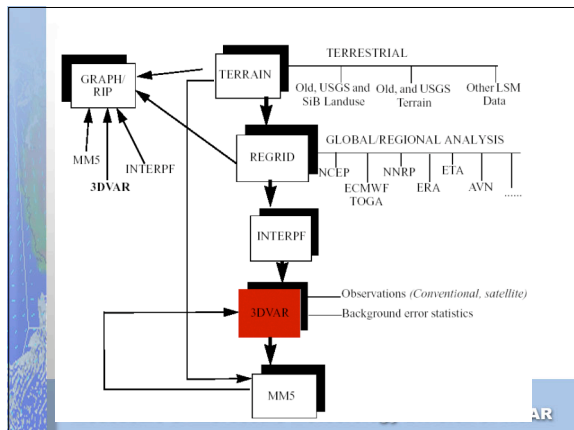
Objective Analysis

VS

3DVAR

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Where to obtain TAR files:

- NCAR's anonymous ftp site:
<ftp://ftp.ucar.edu/mesouser/MM5V3>
- NCAR/SCD computers:
`~mesouser/MM5V3`
- NCAR/SCD Mass Storage System:
`/MESOUSER/MM5V3`

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Where to obtain TAR files:

- Must have and NCAR account to access these sources
<http://www.scd.ucar.edu/resources/apply.html>
- NCAR/SCD computers:
`~mesouser/MM5V3`
- NCAR/SCD Mass Storage System:
`/MESOUSER/MM5V3`

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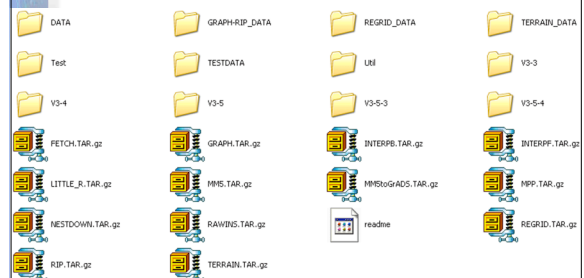
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Where to obtain TAR files:

- NCAR's anonymous ftp site:
<ftp://ftp.ucar.edu/mesouser/MM5V3>



Where to obtain TAR files:

ftp **ftp.ucar.edu**

Name: **anonymous**

Password: **your-email-address**

```
ftp > cd mesouser/MM5V3
ftp > binary
ftp > get MM5.TAR.gz
ftp > quit
```

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Where to obtain TAR files:

- Uncompress, and untar the files to create program directories:

```
- gunzip X.TAR.gz           (gunzip TERRAIN.TAR.gz)
- tar -xvf X.TAR           (tar -xvf TERRAIN.TAR)
- cd X                     (cd TERRAIN)
```

- Read the **README** file for instructions on how to compile and run each individual program

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What is in a program tar file?

- All program tar files contain the following:
 - **README**: instruction on how to compile and run
 - **CHANGES**: description of changes
 - **Diff/**: directory containing diff files
 - **Makefile**: top-level makefile for creating executable
 - **Templates/**: directory containing job deck and script
 - TERRAIN, RAWINS, MM5, and GRAPH only
 - **src/**: source directory (except for MM5, which has several directories to host source code)

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How to run the MM5 programs:

• FORTRAN 77 programs

```
- make x.deck
- vi x.deck (edit)
- x.deck (compile & run)
```

• TERRAIN, MM5 & (RAWINS)

• FORTRAN 90 programs

```
- make (compile)
- vi namelist.input (edit) OR
- edit script
- regrider (run program)
```

• REGRID, LITTLE_R, INTERPF, INTERPB, NESTDOWN

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Functions of a job deck/script:

- Help setup and run programs
- Similar functions
- Assume source code to be local
- job decks (x.deck) [batch jobs/interactive]
- job scripts (x.csh) [interactive only]
- x.csh will be in tar file
- x.deck are created for each computer (eg, make x.deck)

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Functions of a job deck/script:

- Control how and where to get input data
 - For IBM job scripts, it also controls where to dispose data
- Job switches (*shell variables*)
- Parameter statements
 - (used in Fortran 77 programs, e.g. TERRAIN)
- Fortran namelists
 - runtime options, ie, options that do not require recompilation)
- Set up file links, create executable, obtain data
 - (this section normally does not require user modification)

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What to modify in script/deck?

- **Shell variables**

- usually appear up front
- eg. out of pregrid.csh

```
# Select source of 3D data
#
# set SRC3D = ON84
# set SRC3D = NCEP
set SRC3D = GRIB
```

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What to modify in script/deck?

- **Parameter statements**

- only used in FORTRAN 77 code
- TERRAIN, RAWINS, GRAPH
- **syntax important**
- **must recompile after a change**
- eg. out of terrain.deck

```
cat > src/parame.incl <<EOF
C IIMX,JJMX are the max size of the domains
  PARAMETER(IIMX=136,JJMX=181,NSIZE=IIMX*JJMX)
EOF
```

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What to modify in script/deck?

- **Fortran namelist**

- used in FORTRAN 77/90 code
- **syntax important**
- **NO need to recompile after a change**
- eg. out of terrain.deck

<pre>&MAPBG PHIC = 36.0, XLONC = -85.0, IPROJ = 'LAMCON', &END</pre>	<pre>&MAPBG PHIC = 36.0, XLONC = -85.0, IPROJ = 'LAMCON', /</pre>
--	---

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Output files:

- **Intermediate File format**

- Output of REGRID/pregrid
- Input to REGRID/regridder
- Chapter 5 of Notes

- **MM5 Output**

- TERRAIN/REGRID/LITTLE_R/INTERPF/MM5,...
- Unique output format (NOT GRIB)
- Binary
- readv3.f
- Chapter 13 of Notes

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Output Files:

- **Output files name convention:**

program-name_DOMAINx
(e.g. TERRAIN_DOMAIN1)

- **A user is required to move output files to another place if the files are to be saved. A rerun of a program will overwrite the existing output files.**

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Input files:

- **TERRAIN**

- Terrestrial Data

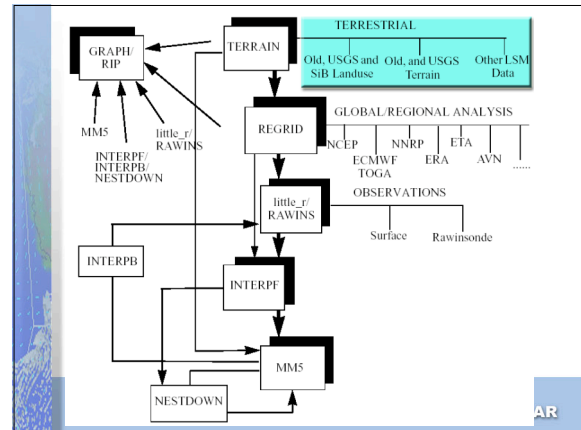
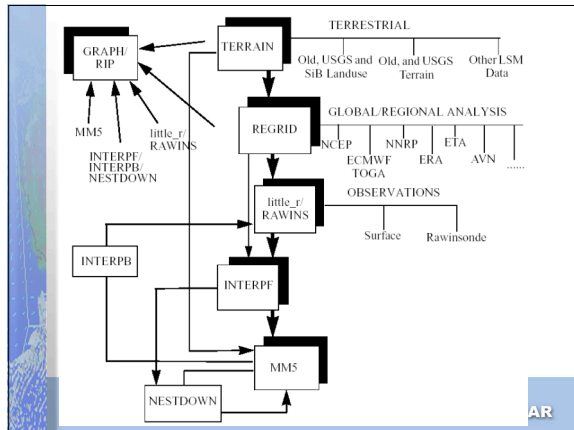
- **REGRID**

- Global/Regional Analysis

- **LITTLE_R**

- Observations

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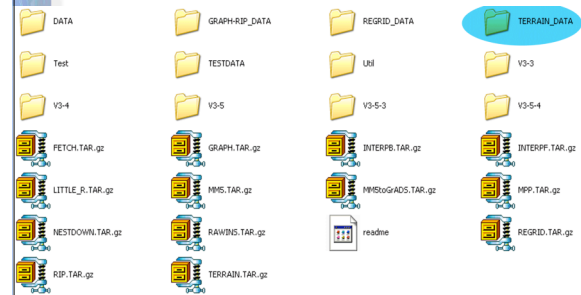
TERRAIN Input Files:

- mesouser provides six-resolution terrestrial datasets for program TERRAIN including:
 - elevation
 - landuse
 - land-water mask
- If you want to use the land-surface model option in MM5:
 - soil types
 - deep soil temp
 - vegetation fraction

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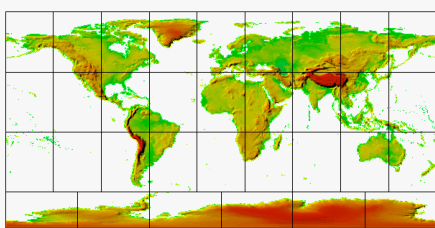
TERRAIN Input Files:

- NCAR's anonymous ftp site:
<ftp://ftp.ucar.edu/mesouser/MM5V3>

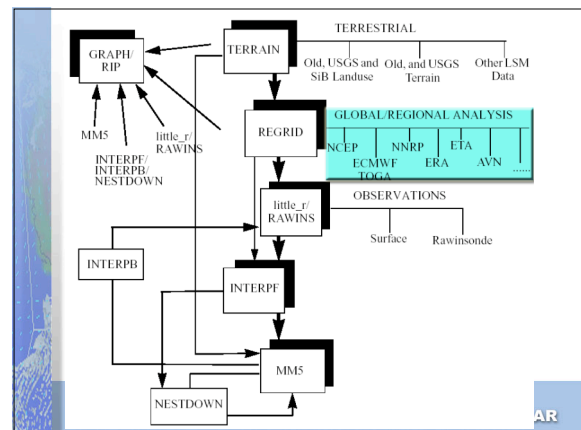


TERRAIN Input Files:

- 30sec terrain elevation data:
<http://edcdaac.usgs.gov/gtopo30/gtopo30.html>



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REGRID Input Files:

- **Gridded analysis data**
 - GRIB
 - NCEP (GDAS & ON84)
 - *Unsupported formats, via intermediate files*
- **Multiple data time periods are required – this is because the model not only requires initial condition to start the model, it needs lateral boundary conditions to carry on integration.**

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REGRID Input Files:

- **Where to get analysis data?**
 - Your local Weather Service may have
 - Real-time data from NCEP
[ftp://ftp.prdd.ncep.noaa.gov/pub/data/nccf](http://ftp.prdd.ncep.noaa.gov/pub/data/nccf)

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REGRID Input Files:

- **Where to get analysis data?**
 - NCAR archive
 - ON84 (ds082.0) & NCEP GDAS (ds083.0)
 - NCEP Final Analysis (ds083.2)
 - Reanalysis data (ds090.0)
 - ERA15 (ds115) & ERA40 (ds118)
 - NCEP Eta (AWIP) data (ds609.2)
 - *(See chapter 2 for more details)*

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REGRID Input Files:

- **Where to get NCAR archive data?**
 - Need an account on NCAR computer
<http://www.scd.ucar.edu/resources/apply.html>
 - Use “get” scripts to download data from
 - ~mesouser/MM5V3/Util
 - REGRID/pregrid/
 - Chapter 14 (14.2.5)

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REGRID Input Files:

- **“get” scripts**

get_on84	NCEP GDAS in ON84 format (ds082.0)
get_ncep	NCEP GDAS in GRIB format (ds083.0)
get_fnl	NCEP Final Analysis in GRIB (ds083.2)
get_nnrp	NCEP Reanalysis data (ds090.0)
get_awip	NCEP Eta (AWIP) data (ds609.2)
get_era	ERA15 Reanalysis data (ds115)
get_toga	ECMWF Toga data (ds111.2)

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REGRID Input Files:

- **“get” scripts**

startdate	Start date
ndates	Number of time periods needed
itimint	Interval of available data

- **All data will be downloaded on (NCAR IBM):
/ptmp/\$USER**

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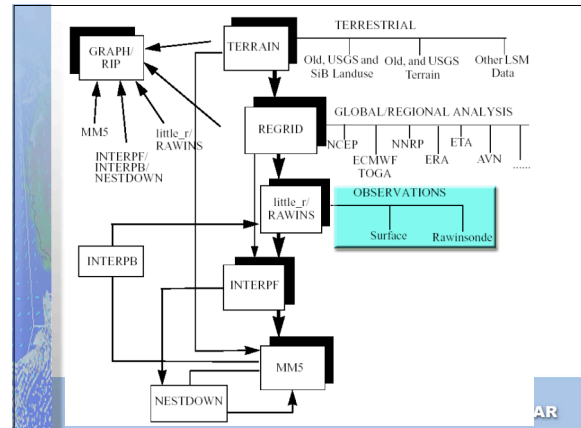
REGRID Input Files:

- Where to get analysis data?

- NCAR archive
 - ON84 (ds082.0) & NCEP GDAS (ds083.0)
 - NCEP Final Analysis (ds083.2)
 - Reanalysis data (ds090.0)
 - ERA15 (ds115) & ERA40 (ds118)
 - NCEP Eta (AWIP) data (ds609.2)

http://www.mmm.ucar.edu/mm5/mm5v3/data/free_data.html

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LITTLE_R Input Files:

- Require observational data for OA

- Local sources
- archive at NCAR
 - On MSS, need NCAR account
 - Use "fetch" script to download data
 - ~mesouser/MM5V3/Util
 - fetch-little_r-data.deck.ibm
 - Need only start and end dates
 - Download ADP format data from MSS
 - Convert to LITTLE_R format
 - Download data to /ptmp/\$USER/FETCH

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LITTLE_R Input Files:

- Require observational data for OA

- Local sources
- archive at NCAR

http://www.mmm.ucar.edu/mm5/mm5v3/data/free_data.html

- Download ADP format data
- Convert to LITTLE_R format

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Conventions used in MM5:

- Representation of latitude and longitude:

- Northern latitude is *positive*, southern is *negative*
- Eastern longitudes are *positive*, and western longitudes are *negative* – those are the longitudes between the dateline and Greenwich

- Representation of winds:

- All gridded u and v components of the wind are with *respect to model grid*, not earth

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Conventions used in MM5:

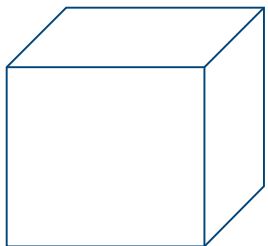
- Representation of date:

- Use up to 24 characters
- In the form of yyyy-mm-dd_hh:mm:ss:xxxx
 - yyyy: 4-digit year
 - mm: 2-digit month
 - dd: 2-digit day
 - hh: 2-digit hour
 - mm: 2-digit minutes
 - ss: 2-digit second
 - xxxx: 4-digit ten thousandths of a second (*optional*)
- **Example:** 2005-01-24_12:00:00

- Date and time refer to Universal Time (GMT), not local time

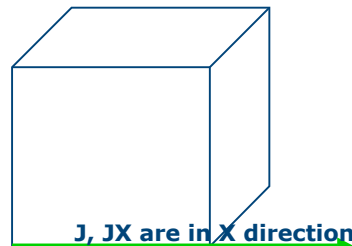
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Conventions used in MM5: Array Indices



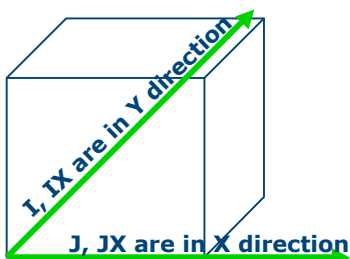
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Conventions used in MM5: Array Indices



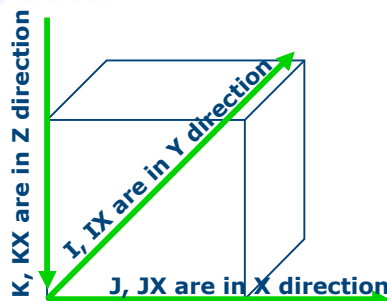
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Conventions used in MM5: Array Indices



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Conventions used in MM5: Array Indices



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Other useful programs:

- **Utility programs available under** mesouser/MM5V3/Util directory
- **User-contributed programs available under** mesouser/user-contrib directory (currently only available from ftp site)
- **Also browse other mesouser directories**
- **Lots of extra information/documentation on Web**

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Summary:

- **Code portable (run on most Unix and Linux systems)**
- **Fortran 77/90 and C compilers are required**
- **Source code available on mesouser account (ftp site/MSS/NCAR SCD computers)**
- **Instructions on how to compile and run any program are available in README files**

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Summary:

- Unique output files (Chapter 13 / readv3.f)
- TERRAIN input files available on ftp site
- MM5 requires meteorological datasets for multiple time periods to run
- MM5 IJK convention difference from other models
- For reference, read Chapter 2.

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*There are
10
types of people in this
world.
Those that understand
binary
and those that doesn't.*