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**

Requirements:

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

Requirements:

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

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

Requirements:

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)**

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)

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

Requirements:

- **Software requirements:**
  - Must-have:
    - Fortran 90 and 77 compiler
    - C compiler
    - For Linux:
      - Fortran and C compilers from Portland Group
      - Fortran and C compilers from Intel work, but are not yet supported
      - Often need an extra library: libf2c.a **ftp.ucar.edu/mesouser/MM5V3/Test/libf2c.a**

Requirements:

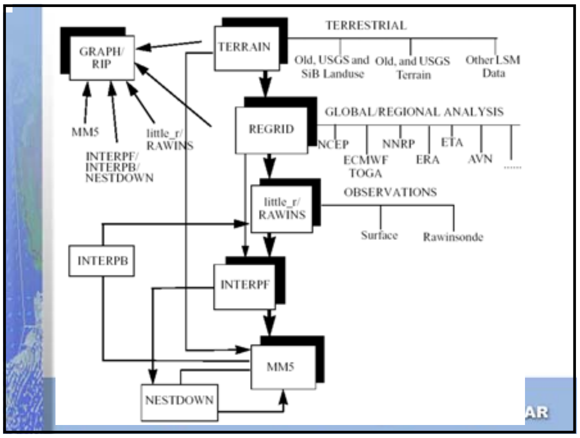
- **Software requirements:**
  - Optional:
    - NCAR Graphics (free), **http://ngwww.ucar.edu**
    - MPI tools for running MPI MM5 model

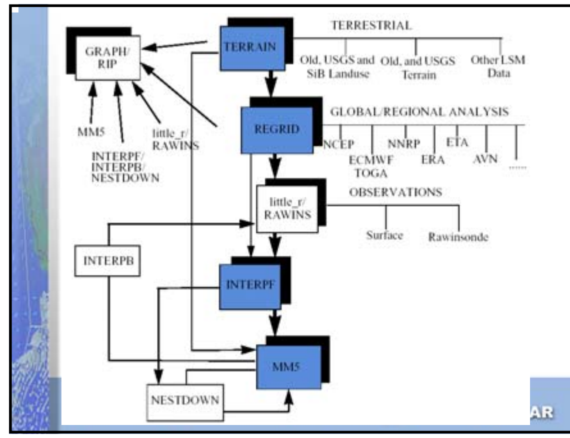
Requirements:

- **Hardware requirements:**
  - 0.5 Gb or more memory
  - a few Gb disk space

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)


TERRESTRIAL
GRAPH/ RIP
TERRAIN
Old, USGS and SiB Landuse
Old, and USGS Terrain
Other LSM Data
MM5
little_r/ RAWINS
INTERPF/ INTERPB/ NESTDOWN
REGRID
GLOBAL/REGIONAL ANALYSIS
NCEP
NNRP
ETA
ECMWF TOGA
ERA
AVN
little_r/ RAWINS
OBSERVATIONS
Surface
Rawinsonde
INTERPB
INTERPF
MM5
NESTDOWN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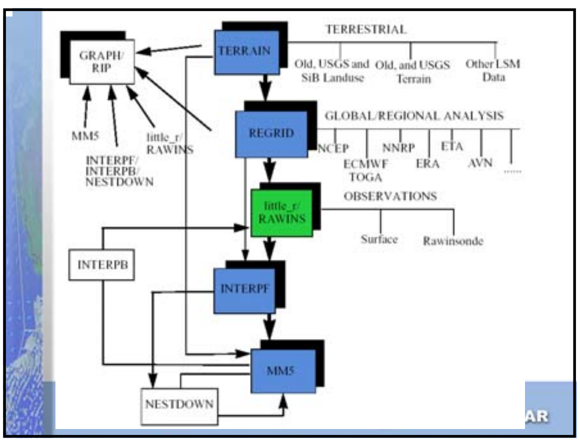
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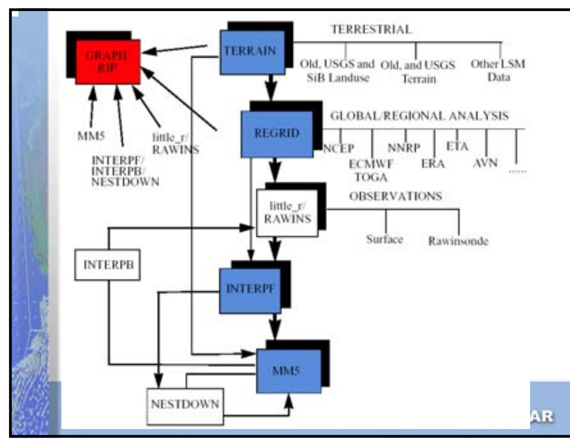
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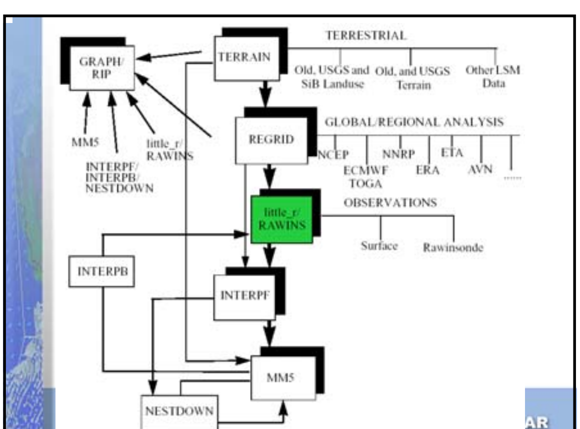
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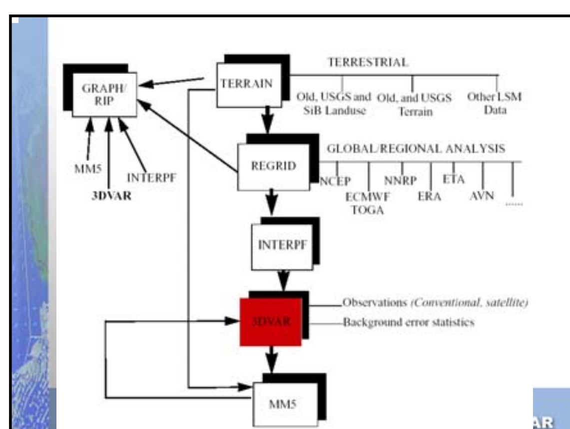
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GRAPH/ RIP
TERRAIN
Old, USGS and SiB Landuse
Old, and USGS Terrain
Other LSM Data
MM5
3DVAR
INTERPF
REGRID
GLOBAL/REGIONAL ANALYSIS
NCEP
NNRP
ETA
ECMWF TOGA
ERA
AVN
INTERPF
3DVAR
Observations (Conventional, satellite)
Background error statistics
MM5

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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  /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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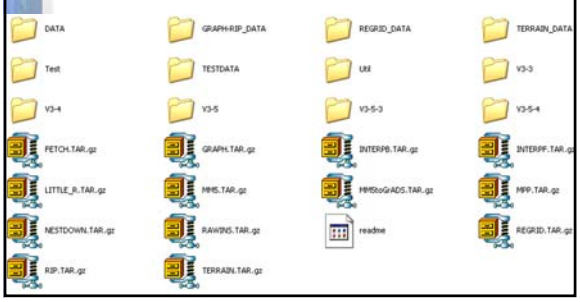

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Where to obtain TAR files:

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**

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)

How to run the MM5 programs:

- **FORTRAN 77 programs**
  - make *x*.deck
  - vi *x*.deck *(edit)*
  - *x*.deck *(compile & run)*
- **TERRAIN & RAWINS**

- **FORTRAN 90 programs**
  - make *(compile)*
  - vi namelist.input *(edit) OR*
  - *edit script*
  - regridder *(run program)*
- **REGRID, LITTLE_R, INTERPF, INTERPB, NESTDOWN**

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*)**

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)*

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
```

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
```


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

```
&MAPBG
   PHIC = 36.0,
   XLONC = -85.0,
   IPROJ = 'LAMCON',
&END
```

```
&MAPBG
   PHIC = 36.0,
   XLONC = -85.0,
   IPROJ = 'LAMCON',
/
```


Output files:

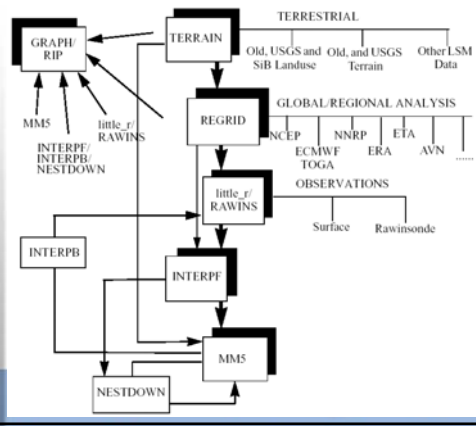
- **Intermediate File format**
  - Output of REGRID/pregrid
  - Input to REGRID/regridder
  - Chapter 5 of Notes
- **MM5 Output**
  - TERRAIN/REGRID/LITTLE_R/INTERPF/MM5,…
  - Unique output format (NOT GRIB)
  - Binary
  - readv3.f
  - Chapter 13 of Notes

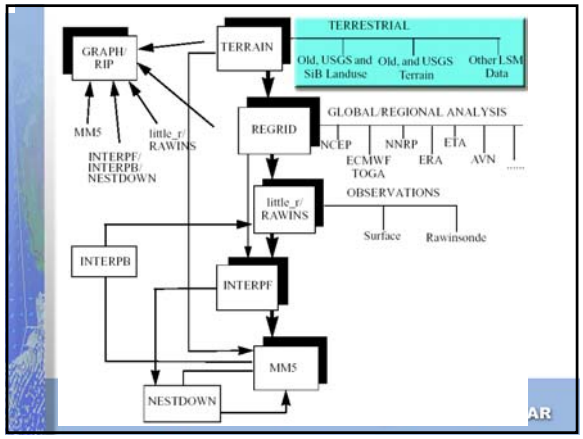
Output Files:

- **Output files name convention:**
  program-name*_DOMAIN*x
  (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.**

Input files:

- **TERRAIN**
  - Terrestrial Data
- **REGRID**
  - Global/Regional Analysis
- **LITTLE_R**
  - Observations



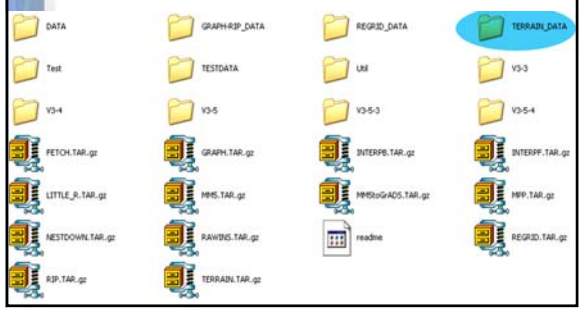


TERRAIN Input Files:

- **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

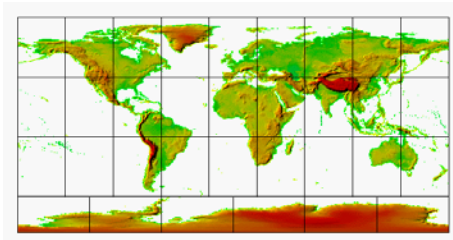
TERRAIN Input Files:

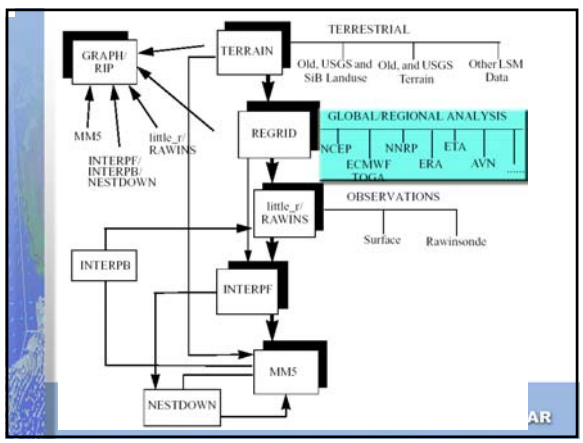
- **NCAR's anonymous ftp site:**
  ftp://ftp.ucar.edu/mesouser/MM5V3



TERRAIN Input Files:

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





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.**

REGRID Input Files:

- **Where to get analysis data?**
  - Your local Weather Service may have
  - Real-time data from NCEP
    ftp://ftpprd.ncep.noaa.gov/pub/data/nccf
  - NCAR archive
    - ON84 (ds082.0)
    - NCEP GDAS (ds083.0)
    - NCEP Final Analysis (ds083.2)
    - Reanalysis data (ds090.0)
    - NCEP Eta (AWIP) data (ds609.2)
      (see pages 2-11 to 2-13)

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)

REGRID Input Files:

- **"get" scripts**

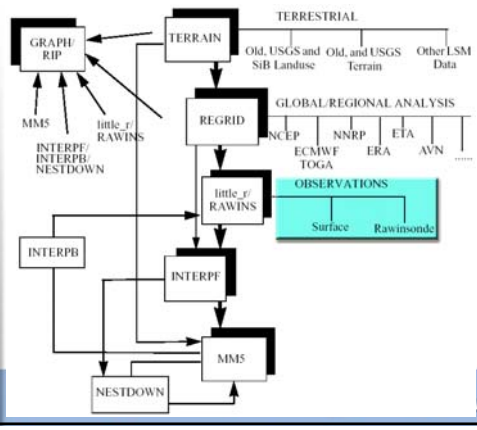
get_on84	**NCEP GDAS in ON84 format (ds082.0)**
get_ncep	**NCEP GDAS in GRIB format (ds083.0)**
get_fnl	**NCEP Final Analysis in GRIB (ds083.2)**
get_nnrp	**NCEP Reanalysis data (ds090.0)**
get_awip	**NCEP Eta (AWIP) data (ds609.2)**
get_era	**ECMWF Reanalysis data (ds511)**
get_toga	**ECMWF Toga data (ds111.2)**

REGRID Input Files:

- **"get" scripts**

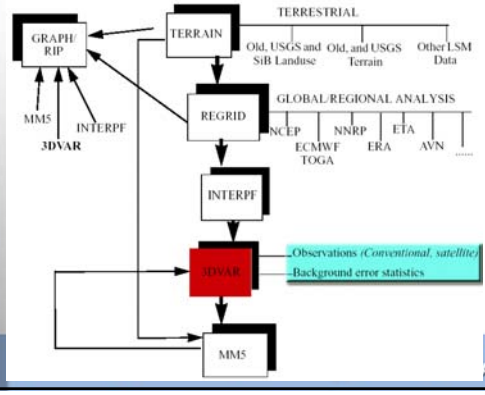
startdate	**Start date**
ndates	**Number of time periods needed**
itimint	**Interval of available data**

- **All data will be downloaded on:**
  /ptmp/$USER/REGRID/pregrid/



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



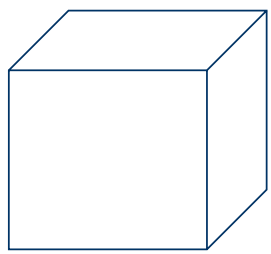
Conventions used in MM5:

- **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

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**: 2003-08-18_12:00:00
- **Date and time refer to Universal Time (GMT),** not local time

Conventions used in MM5:
Array Indices



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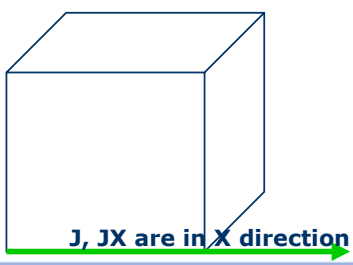

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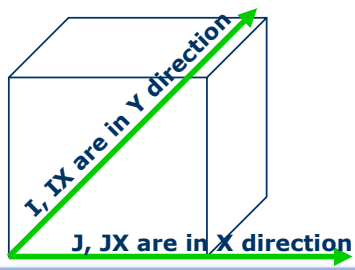

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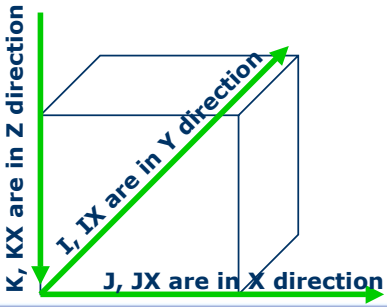
Array Indices



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**

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**

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.**