rama2grads

3.0

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Chapter 1

RAMA2GrADS

1.1 Introduction

Air quality and meteorological observation data is commnly measured and available, one way to study and analize it is by visualization it in a map. In the case of Mexico City the Integral Air Quality Monitorig System (SIMAT) collects data since 1986 up to now, the data is in an ascii comma separated values (CSV) format and the location of the stations is also available. The Grid Analisis and Display System (GrADS) is an interactive desktop tool capable to display station data and model result. in order to use the larga data set of measurements it is necesary to convert the station database in format useful for the GrADS. This convertion from SIMAT data base to in made by this system.

1.2 Code Description

The conversion system uses the station locations and data from different files, after maching the location with the measured vairalbe it is written to a binary file following the format requiered for station GrADS format.

The RAMA2GrADS system contains functions and subroutines to acomplish this task. The subroutine **lee_simat_dat** loads the measured data, int this case meteorological data and pollutnat data are in different files . **lee_estaciones_rama** subroutine reads the stations locations. In the **output** subroutine it is located the code to write surface station data.

1.3 Usage

The RAMA2GrADS system requieres a configuration file for setting the time period and names for the meteorological and pollutant files. This is obtained by setting the variables in the **namelis.nml** file

```
&FECHA
anio=2011
imes=01
fmes=12
idia=01
fdia=31
met_file="meteorologia_2011.csv"
pol_file="contaminantes_2011.csv"
/
```

- **anio** year of the data.
- **imes** starting moth for storing the data.
- **fmes** end month.
- **idia** starting day for storing the data
- **fdia** ending day
- **met_file** meteorolgical data with SIMAT format
- **pol_file** contains the pollutant measured data with SIMAT format

The files met and pol contain 11 header lines with the following format:

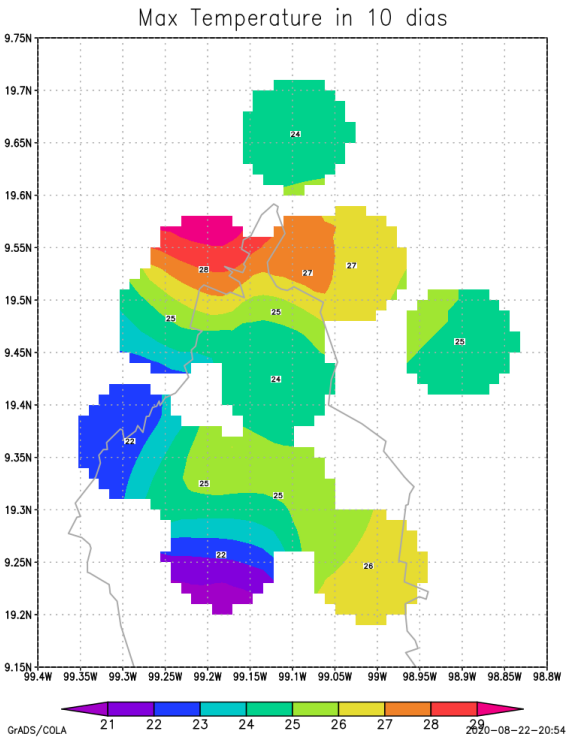
```
01/01/2011 01:00,ACO,RH,,6
01/01/2011 01:00,MON,RH,38,6
01/01/2011 01:00,CHO,RH,,6)
```

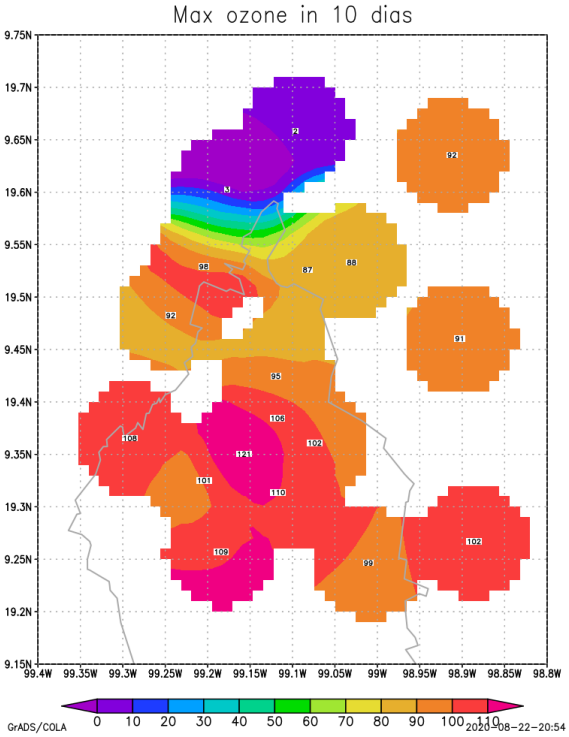
the est_rama.txt stations file has one header with the following format:

```
Alias   Latitud    Longitud  Altitud  Estacion description
ACO     19.635501  -98.912003  2198    Acolman
AJM     19.2721    -99.207658  2619    Ajusco Medio
HGM   19.411617    -99.152207  2234    Hospital General de M<8E>xico
```

1.3.1 output

The are generated two files one with the binary data file and the descriptor file (ctl)





1.4 References

Grid Analysis and Display System (Grads) `Creating a Station Data File`

Mexico Air quality Network `SIMAT`

Chapter 2

Modules Index

2.1 Modules List

Here is a list of all modules with brief descriptions:

Chapter 3

File Index

3.1 File List

Here is a list of all files with brief descriptions:

Chapter 4

Module Documentation

4.1 vp_ramatograds Module Reference

Variables used for the conversion from ascii to GrADS station data file.

Functions/Subroutines

- subroutine lee_nml (fnml)

  read namelist input file for selecting specific days
- subroutine output

  Creates binary file (simat_2011.dat) and descripting file (simat2011.ctl) for GrADS
- subroutine libera_memoria

  Find if an array has been allocated and release the memory.
- subroutine lee_simat_data (file_read)

  Reads SIMAT database files and stores values in matrix rama.
- subroutine lee_estaciones_rama

  Reads est_rama.txt file containing localization stations.
- integer function estacion (cvar)

  Identify the statios in the data set.
- integer function vconvert (cvar)

  Set ID number to the variable name.
- character(len=3) function num2char (month)

  converts month numbert to its name
- integer function hourinyr (ndia, nmes, nanio, hora)

  Obtains the number of hours in a year from day, month, year and hour.
- integer function cuenta (iunit)

  count the number of rowns in a file
- subroutine logs (texto)

  display log during different program stages

Variables

- real, parameter rnulo =-99.

  number used for represent null value
- integer, parameter nvars =14

  SIMAT/RAMA variables (TMP,WSP,WMD,RH,PBa, O3,SO2,NOx,NO2,NO,CO,PM10,PM25,PMCO)
- integer n_ramau

  Number of stations in output file.
- integer n_rama =65

  n_rama Number of stations in localization file est_rama.txt
- integer hrs_yr

  Total hour in year.
- integer hr_ini

  Initial hour in year for the storing data.
- integer hr_end

  End hour in year for the storing data.
- real, dimension(:), allocatable lon

  longitud localization of SIMAT station
- real, dimension(:), allocatable lat

  latitude localization of SIMAT station
- real, dimension(:), allocatable msn

  Altitude of station.
- real, dimension(:,:,:), allocatable rama

  Array with all data for all the time period and stations.
- character(len=3), dimension(:), allocatable id_name

  Station identification name.
- integer anio

  year from input data
- integer idia

  start day for output
- integer imes

  start month for output
- integer fdia

  end day for output
- integer fmes

  end month for output
- character(len=23) met_file

  SIMAT meteorological data file.
- character(len=23) pol_file

  SIMAT pollution data file.
- logical, dimension(:), allocatable est_util

  used stations from est_rama.txt

4.1.1 Detailed Description

Variables used for the conversion from ascii to GrADS station data file.

Author

Dr. Agustin Garcia Reynoso

Date

2020,2016,2004

Version

3.0

Copyright

Universidad Nacional Autonoma de Mexico.

4.1.2 Function/Subroutine Documentation

4.1.2.1 cuenta()

```
integer function vp_ramatograds::cuenta (
             integer, intent(in) iunit )
```

count the number of rowns in a file

Author

Jose Agustin Garcia Reynoso

Date

07/13/2020

Version

2.2

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Parameters

iunit	file unit where the count has to be made

Definition at line 401 of file mod_rama2grads.F90.

4.1.2.2 estacion()

```
integer function vp_ramatograds::estacion (
            character (len=3), intent(in) cvar )
```

Identify the statios in the data set.

Author

Agustin Garcia

Date

28/08/2012.

Version

3.0

Copyright

Universidad Nacional Autonoma de Mexico 2020 station name for identification

Definition at line 294 of file mod_rama2grads.F90.

4.1.2.3 hourinyr()

```
integer function vp_ramatograds::hourinyr (
            integer, intent(in) ndia,
            integer, intent(in) nmes,
            integer, intent(in) nanio,
            character (len=5), intent(in) hora )
```

Obtains the number of hours in a year from day, month, year and hour.

Author

Agustin Garcia

Date

28/08/2012.

Version

3.0

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Universidad Nacional Autonoma de Mexico 2020

Parameters

ndia	day for evaluation
nmes	month for evaluation
nanio	year for evaluation
hora	Day hour

Definition at line 368 of file mod_rama2grads.F90.

4.1.2.4 lee_estaciones_rama()

```
subroutine vp_ramatograds::lee_estaciones_rama
```

Reads est_rama.txt file containing localization stations.

Author

Agustin Garcia

Date

28/08/2012.

Version

3.0

Copyright

Universidad Nacional Autonoma de Mexico.

Definition at line 264 of file mod_rama2grads.F90.

4.1.2.5 lee_nml()

```
subroutine vp_ramatograds::lee_nml (
             character(len=*), intent(in) fnml )
```

read namelist input file for selecting specific days

Author

Jose Agustin Garcia Reynoso

Date

08/02/2020

Version

2.0

Copyright

Universidad Nacional Autonoma de Mexico

Parameters

fnml	namelist file name

Definition at line 53 of file mod_rama2grads.F90.

4.1.2.6 lee_simat_data()

```
subroutine vp_ramatograds::lee_simat_data (
             character(len=*), intent(in) file_read )
```

Reads SIMAT database files and stores values in matrix rama.

Author

Agustin Garcia

Date

16/08/2020.

Version

3.0

Copyright

Universidad Nacional Autonoma de Mexico 2020

Parameters

file_read	datafile from SIMAT to be read

conversion de mmHg a Pa

Definition at line 190 of file mod_rama2grads.F90.

4.1.2.7 libera_memoria()

```
subroutine vp_ramatograds::libera_memoria
```

Find if an array has been allocated and release the memory.

Author

Agustin Garcia

Date

23/08/2020.

Version

3.0

Copyright

Universidad Nacional Autonoma de Mexico 2020

Definition at line 168 of file mod_rama2grads.F90.

4.1.2.8 logs()

```
subroutine vp_ramatograds::logs (
             character(len=*), intent(in) texto )
```

display log during different program stages

Author

Jose Agustin Garcia Reynoso

Date

25/08/2020

Version

2.3

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Universidad Nacional Autonoma de Mexico 2020

Parameters

texto	text to be displayed

Definition at line 426 of file mod_rama2grads.F90.

4.1.2.9 num2char()

```
character(len=3) function vp_ramatograds::num2char (
            integer, intent(in) month )
```

converts month numbert to its name

Author

Agustin Garcia

Date

28/08/2012.

Version

3.0

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Parameters

month	number to convert

Definition at line 344 of file mod_rama2grads.F90.

4.1.2.10 output()

```
subroutine vp_ramatograds::output
```

Creates binary file (simat_2011.dat) and descripting file (simat2011.ctl) for GrADS

Author

Agustin Garcia

Date

28/08/2012.

Version

3.0

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Number of data groups following the header.

If set to 1, then there are surface variables following the header.

The time of this report, in grid-relative units. Typically have the range of - 0.5 to 0.5

value of the parameter to store

Definition at line 83 of file mod_rama2grads.F90.

4.1.2.11 vconvert()

```
integer function vp_ramatograds::vconvert (
            character (len=3), intent(in) cvar )
```

Set ID number to the variable name.

Author

Agustin Garcia

Date

28/08/2012.

Version

3.0

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Universidad Nacional Autonoma de Mexico 2020

Parameters

cvar	name of the variable to convert

Definition at line 312 of file mod_rama2grads.F90.

4.1.3 Variable Documentation

4.1.3.1 anio

```
integer vp_ramatograds::anio
```

year from input data

Definition at line 34 of file mod_rama2grads.F90.

4.1.3.2 est_util

```
logical, dimension(:), allocatable vp_ramatograds::est_util
```

used stations from est_rama.txt

Definition at line 41 of file mod_rama2grads.F90.

4.1.3.3 fdia

```
integer vp_ramatograds::fdia
```

end day for output

Definition at line 37 of file mod_rama2grads.F90.

4.1.3.4 fmes

```
integer vp_ramatograds::fmes
```

end month for output

Definition at line 38 of file mod_rama2grads.F90.

4.1.3.5 hr_end

```
integer vp_ramatograds::hr_end
```

End hour in year for the storing data.

Definition at line 26 of file mod_rama2grads.F90.

4.1.3.6 hr_ini

```
integer vp_ramatograds::hr_ini
```

Initial hour in year for the storing data.

Definition at line 25 of file mod_rama2grads.F90.

4.1.3.7 hrs_yr

```
integer vp_ramatograds::hrs_yr
```

Total hour in year.

Definition at line 24 of file mod_rama2grads.F90.

4.1.3.8 id_name

```
character(len=3), dimension(:), allocatable vp_ramatograds::id_name
```

Station identification name.

Definition at line 32 of file mod_rama2grads.F90.

4.1.3.9 idia

```
integer vp_ramatograds::idia
```

start day for output

Definition at line 35 of file mod_rama2grads.F90.

4.1.3.10 imes

```
integer vp_ramatograds::imes
```

start month for output

Definition at line 36 of file mod_rama2grads.F90.

4.1.3.11 lat

```
real, dimension(:), allocatable vp_ramatograds::lat
```

latitude localization of SIMAT station

Definition at line 29 of file mod_rama2grads.F90.

4.1.3.12 lon

```
real, dimension(:), allocatable vp_ramatograds::lon
```

longitud localization of SIMAT station

Definition at line 28 of file mod_rama2grads.F90.

4.1.3.13 met_file

```
character(len=23) vp_ramatograds::met_file
```

SIMAT meteorological data file.

Definition at line 39 of file mod_rama2grads.F90.

4.1.3.14 msn

```
real, dimension(:), allocatable vp_ramatograds::msn
```

Altitude of station.

Definition at line 30 of file mod_rama2grads.F90.

4.1.3.15 n_rama

```
integer vp_ramatograds::n_rama =65
```

n_rama Number of stations in localization file est_rama.txt

Definition at line 23 of file mod_rama2grads.F90.

4.1.3.16 n_ramau

```
integer vp_ramatograds::n_ramau
```

Number of stations in output file.

Definition at line 21 of file mod_rama2grads.F90.

4.1.3.17 nvars

```
integer, parameter vp_ramatograds::nvars =14
```

SIMAT/RAMA variables (TMP,WSP,WMD,RH,PBa, O3,SO2,NOx,NO2,NO,CO,PM10,PM25,PMCO)

Definition at line 20 of file mod_rama2grads.F90.

4.1.3.18 pol_file

```
character(len=23) vp_ramatograds::pol_file
```

SIMAT pollution data file.

Definition at line 40 of file mod_rama2grads.F90.

4.1.3.19 rama

```
real, dimension(:,:,:), allocatable vp_ramatograds::rama
```

Array with all data for all the time period and stations.

Definition at line 31 of file mod_rama2grads.F90.

4.1.3.20 rnulo

```
real, parameter vp_ramatograds::rnulo =-99.
```

number used for represent null value

Definition at line 18 of file mod_rama2grads.F90.

Chapter 5

File Documentation

5.1 /Users/agustin/proyectos/rama2gradsv2/est_rama.txt File Reference

5.2 /Users/agustin/proyectos/rama2gradsv2/mod_rama2grads.F90 File Reference

Modules

- module vp_ramatograds

  Variables used for the conversion from ascii to GrADS station data file.

Functions/Subroutines

- subroutine vp_ramatograds::lee_nml (fnml)

  read namelist input file for selecting specific days
- subroutine vp_ramatograds::output

  Creates binary file (simat_2011.dat) and descripting file (simat2011.ctl) for GrADS
- subroutine vp_ramatograds::libera_memoria

  Find if an array has been allocated and release the memory.
- subroutine vp_ramatograds::lee_simat_data (file_read)

  Reads SIMAT database files and stores values in matrix rama.
- subroutine vp_ramatograds::lee_estaciones_rama

  Reads est_rama.txt file containing localization stations.
- integer function vp_ramatograds::estacion (cvar)

  Identify the statios in the data set.
- integer function vp_ramatograds::vconvert (cvar)

  Set ID number to the variable name.
- character(len=3) function vp_ramatograds::num2char (month)

  converts month numbert to its name
- integer function vp_ramatograds::hourinyr (ndia, nmes, nanio, hora)

  Obtains the number of hours in a year from day, month, year and hour.
- integer function vp_ramatograds::cuenta (iunit)

  count the number of rowns in a file
- subroutine vp_ramatograds::logs (texto)

  display log during different program stages

Variables

- real, parameter vp_ramatograds::rnulo =-99.

  number used for represent null value
- integer, parameter vp_ramatograds::nvars =14

  SIMAT/RAMA variables (TMP,WSP,WMD,RH,PBa, O3,SO2,NOx,NO2,NO,CO,PM10,PM25,PMCO)
- integer vp_ramatograds::n_ramau

  Number of stations in output file.
- integer vp_ramatograds::n_rama =65

  n_rama Number of stations in localization file est_rama.txt
- integer vp_ramatograds::hrs_yr

  Total hour in year.
- integer vp_ramatograds::hr_ini

  Initial hour in year for the storing data.
- integer vp_ramatograds::hr_end

  End hour in year for the storing data.
- real, dimension(:), allocatable vp_ramatograds::lon

  longitud localization of SIMAT station
- real, dimension(:), allocatable vp_ramatograds::lat

  latitude localization of SIMAT station
- real, dimension(:), allocatable vp_ramatograds::msn

  Altitude of station.
- real, dimension(:,:,:), allocatable vp_ramatograds::rama

  Array with all data for all the time period and stations.
- character(len=3), dimension(:), allocatable vp_ramatograds::id_name

  Station identification name.
- integer vp_ramatograds::anio

  year from input data
- integer vp_ramatograds::idia

  start day for output
- integer vp_ramatograds::imes

  start month for output
- integer vp_ramatograds::fdia

  end day for output
- integer vp_ramatograds::fmes

  end month for output
- character(len=23) vp_ramatograds::met_file

  SIMAT meteorological data file.
- character(len=23) vp_ramatograds::pol_file

  SIMAT pollution data file.
- logical, dimension(:), allocatable vp_ramatograds::est_util

  used stations from est_rama.txt

5.3 /Users/agustin/proyectos/rama2gradsv2/rama2grads.F90 File Reference

Functions/Subroutines

- program rama2grads

  Main program for convert ascii files SIMAT/RAMA to binary file for GrADS

5.3.1 Function/Subroutine Documentation

5.3.1.1 rama2grads()

```
program rama2grads
```

Main program for convert ascii files SIMAT/RAMA to binary file for GrADS

Author

Dr. Agustin Garcia Reynoso

Date

2020,2016,2004

Version

3.0

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Definition at line 14 of file rama2grads.F90.

5.4 /Users/agustin/proyectos/rama2gradsv2/README.md File Reference

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