

rama2grads

3.0

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# Chapter 1

## RAMA2GrADS

### 1.1 Introduction

Air quality and meteorological observation data is commonly measured and available, one way to study and analyze it is by visualization in a map. In the case of Mexico City the Integral Air Quality Monitoring 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 Analysis and Display System (GrADS) is an interactive desktop tool capable to display station data and model results. In order to use the large data set of measurements it is necessary to convert the station database in a format useful for the GrADS. This conversion from SIMAT data base to is made by this system.

### 1.2 Code Description

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

The RAMA2GrADS system contains functions and subroutines to accomplish this task. The subroutine **lee\_simat**↵↵**\_dat** loads the measured data, in this case meteorological data and pollutant 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 requires 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** meteorolglcal 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:

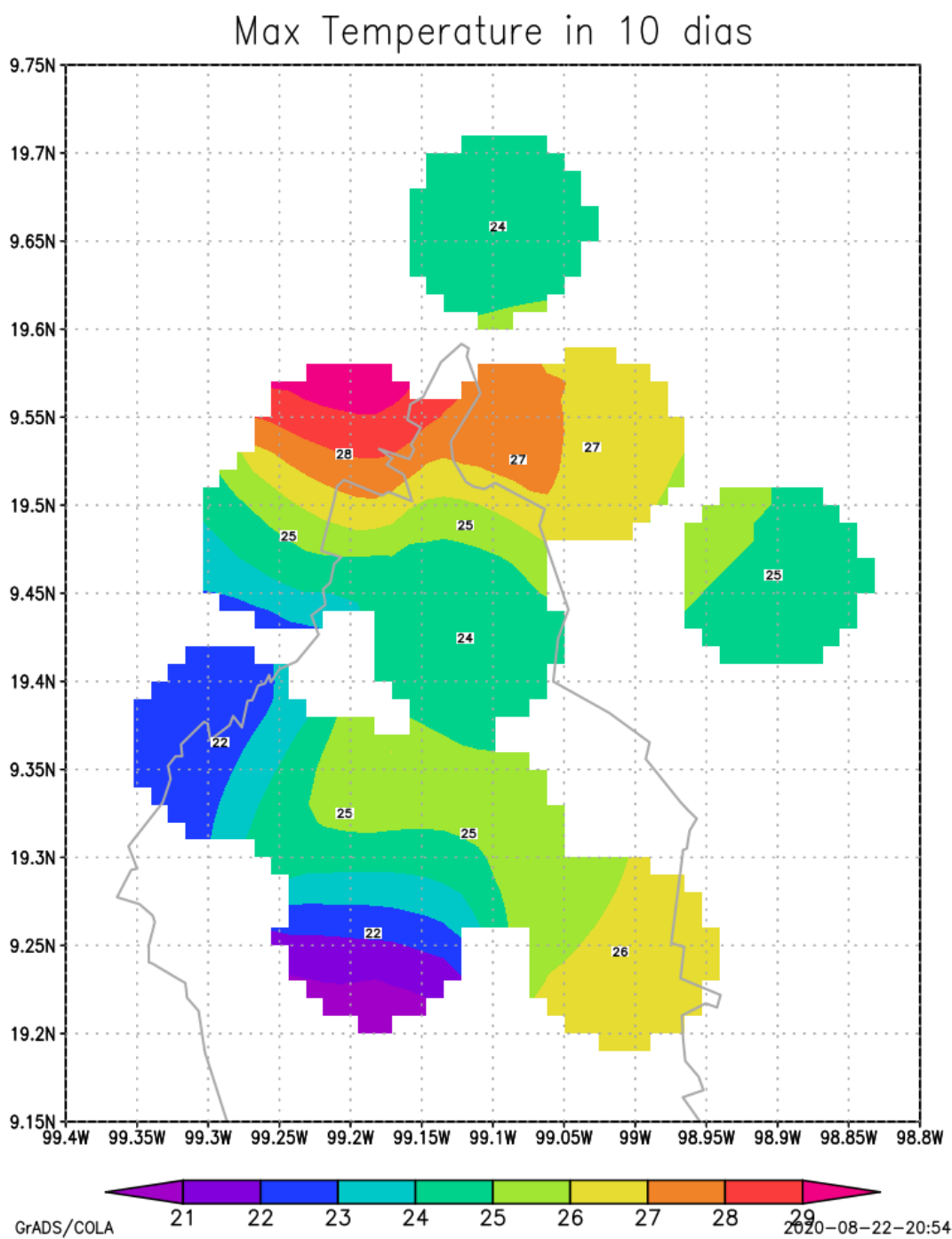
```
01/01/2011 01:00,ACO,RH,,6
01/01/2011 01:00,MON,RH,38,6
01/01/2011 01:00,CHO,RH,,6)
```

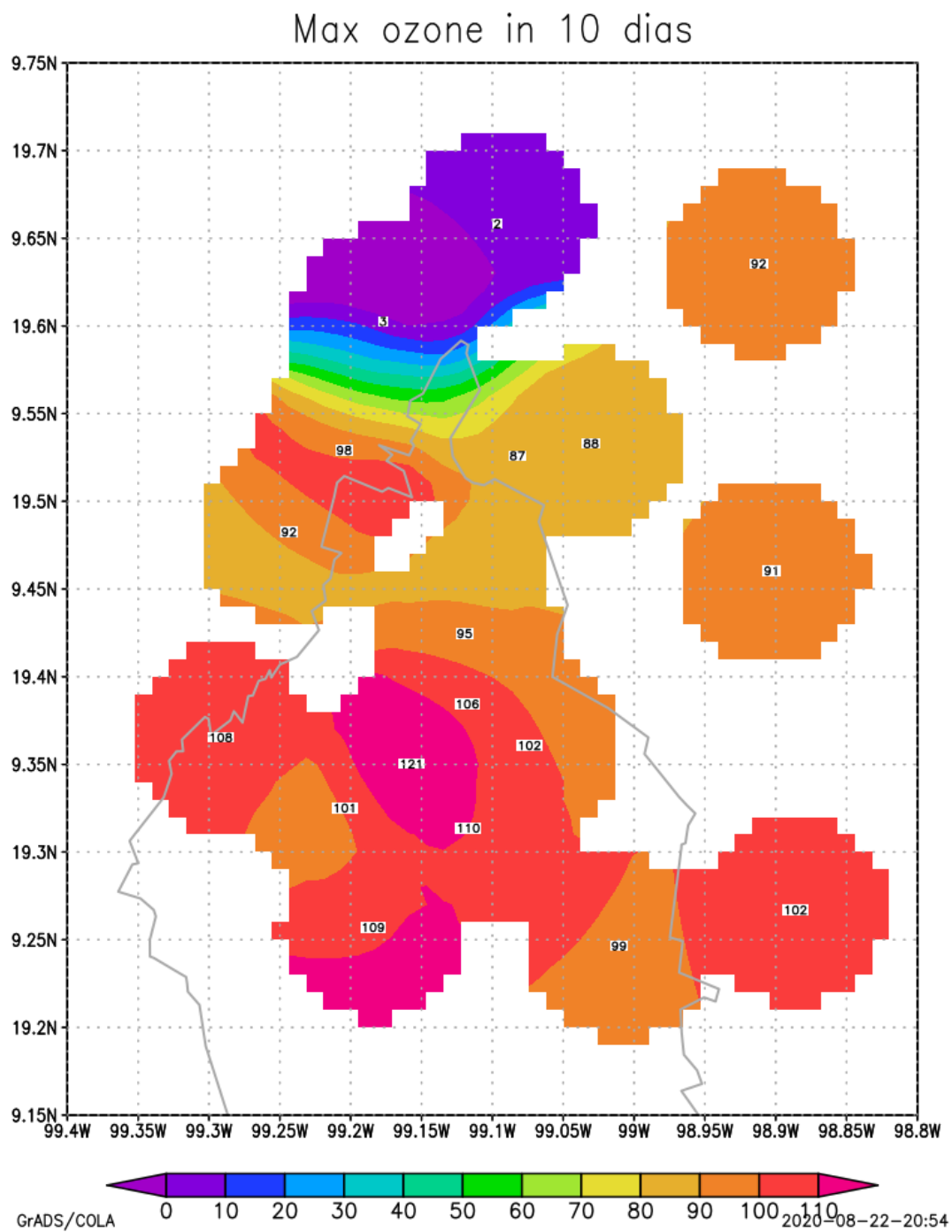
the [est\\_rama.txt](#) stations file has one header with the following format:

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:

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## Chapter 3

# File Index

### 3.1 File List

Here is a list of all files with brief descriptions:

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## 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 describing file (simat2011.ctl) for [GrADS](#)*
- 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_ramatograde::cuenta (  
    integer, intent(in) iunit )
```

count the number of rows in a file

**Author**

Jose Agustin Garcia Reynoso

**Date**

07/13/2020

**Version**

2.2

**Copyright**

Universidad Nacional Autonoma de Mexico 2020

**Parameters**

<i>iunit</i>	file unit where the count has to be made
--------------	--

Definition at line 393 of file mod\_rama2grade.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 287 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

##### Copyright

Universidad Nacional Autonoma de Mexico 2020



## Parameters

<i>ndia</i>	day for evaluation
<i>nmes</i>	month for evaluation
<i>nanio</i>	year for evaluation
<i>hora</i>	Day hour

Definition at line 360 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 257 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**

<i>fnml</i>	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**

<i>file_read</i>	datafile from SIMAT to be read
------------------	--------------------------------

conversion de mmHg a Pa

Definition at line 183 of file mod\_rama2grads.F90.

**4.1.2.7 logs()**

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

display log during different program stages

**Author**

Jose Agustin Garcia Reynoso

**Date**

08/08/2020

**Version**

2.2

**Copyright**

Universidad Nacional Autonoma de Mexico 2020

**Parameters**

<i>texto</i>	text to be displayed
--------------	----------------------

Definition at line 418 of file mod\_rama2grade.F90.

**4.1.2.8 num2char()**

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

converts month number to its name

**Author**

Agustin Garcia

**Date**

28/08/2012.

**Version**

3.0

**Copyright**

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**Parameters**

<i>month</i>	number to convert
--------------	-------------------

Definition at line 336 of file mod\_rama2grads.F90.

**4.1.2.9 output()**

```
subroutine vp_ramatograds::output
```

Creates binary file (simat\_2011.dat) and describing file (simat2011.ctl) for **GrADS**

**Author**

Agustin Garcia

**Date**

28/08/2012.

**Version**

3.0

**Copyright**

Universidad Nacional Autonoma de Mexico 2020

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.

**4.1.2.10 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

**Copyright**

Universidad Nacional Autonoma de Mexico 2020

## Parameters

<i>cvar</i>	name of the variable to convert
-------------	---------------------------------

Definition at line 305 of file mod\_rama2grade.F90.

### 4.1.3 Variable Documentation

#### 4.1.3.1 anio

```
integer vp_ramatograde::anio
```

year from input data

Definition at line 34 of file mod\_rama2grade.F90.

#### 4.1.3.2 est\_util

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

used stations from [est\\_rama.txt](#)

Definition at line 41 of file mod\_rama2grade.F90.

#### 4.1.3.3 fdia

```
integer vp_ramatograde::fdia
```

end day for output

Definition at line 37 of file mod\_rama2grade.F90.

#### 4.1.3.4 fmes

```
integer vp_ramatograde::fmes
```

end month for output

Definition at line 38 of file mod\_rama2grade.F90.

#### 4.1.3.5 hr\_end

```
integer vp_ramatograde::hr_end
```

End hour in year for the storing data.

Definition at line 26 of file mod\_rama2grade.F90.

#### 4.1.3.6 hr\_ini

```
integer vp_ramatograde::hr_ini
```

Initial hour in year for the storing data.

Definition at line 25 of file mod\_rama2grade.F90.

#### 4.1.3.7 hrs\_yr

```
integer vp_ramatograde::hrs_yr
```

Total hour in year.

Definition at line 24 of file mod\_rama2grade.F90.

#### 4.1.3.8 id\_name

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

Station identification name.

Definition at line 32 of file mod\_rama2grade.F90.

#### 4.1.3.9 idia

```
integer vp_ramatograde::idia
```

start day for output

Definition at line 35 of file mod\_rama2grade.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_ramatograde`  
*Variables used for the conversion from ascii to GrADS station data file.*

#### Functions/Subroutines

- subroutine `vp_ramatograde::lee_nml` (fnml)  
*read namelist input file for selecting specific days*
- subroutine `vp_ramatograde::output`  
*Creates binary file (simat\_2011.dat) and describing file (simat2011.ctl) for `GrADS`*
- subroutine `vp_ramatograde::lee_simat_data` (file\_read)  
*Reads SIMAT database files and stores values in matrix rama.*
- subroutine `vp_ramatograde::lee_estaciones_rama`  
*Reads `est_rama.txt` file containing localization stations.*
- integer function `vp_ramatograde::estacion` (cvar)  
*Identify the statios in the data set.*
- integer function `vp_ramatograde::vconvert` (cvar)  
*Set ID number to the variable name.*
- character(len=3) function `vp_ramatograde::num2char` (month)  
*converts month numbert to its name*
- integer function `vp_ramatograde::hourinyr` (ndia, nmes, nanio, hora)  
*Obtains the number of hours in a year from day, month, year and hour.*
- integer function `vp_ramatograde::cuenta` (iunit)  
*count the number of rowns in a file*
- subroutine `vp_ramatograde::logs` (texto)  
*display log during different program stages*

## Variables

- real, parameter `vp_ramatograde::rnulo` = -99.  
*number used for represent null value*
- integer, parameter `vp_ramatograde::nvars` = 14  
*SIMAT/RAMA variables (TMP,WSP,WMD,RH,PBa, O3,SO2,NOx,NO2,NO,CO,PM10,PM25,PMCO)*
- integer `vp_ramatograde::n_rama`  
*Number of stations in output file.*
- integer `vp_ramatograde::n_rama` = 65  
*n\_rama Number of stations in localization file `est_rama.txt`*
- integer `vp_ramatograde::hrs_yr`  
*Total hour in year.*
- integer `vp_ramatograde::hr_ini`  
*Initial hour in year for the storing data.*
- integer `vp_ramatograde::hr_end`  
*End hour in year for the storing data.*
- real, dimension(:), allocatable `vp_ramatograde::lon`  
*longitud localization of SIMAT station*
- real, dimension(:), allocatable `vp_ramatograde::lat`  
*latitude localization of SIMAT station*
- real, dimension(:), allocatable `vp_ramatograde::msn`  
*Altitude of station.*
- real, dimension(:, :, :), allocatable `vp_ramatograde::rama`  
*Array with all data for all the time period and stations.*
- character(len=3), dimension(:), allocatable `vp_ramatograde::id_name`  
*Station identification name.*
- integer `vp_ramatograde::anio`  
*year from input data*
- integer `vp_ramatograde::idia`  
*start day for output*
- integer `vp_ramatograde::imes`  
*start month for output*
- integer `vp_ramatograde::fdia`  
*end day for output*
- integer `vp_ramatograde::fmes`  
*end month for output*
- character(len=23) `vp_ramatograde::met_file`  
*SIMAT meteorological data file.*
- character(len=23) `vp_ramatograde::pol_file`  
*SIMAT pollution data file.*
- logical, dimension(:), allocatable `vp_ramatograde::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

**Copyright**

Universidad Nacional Autonoma de Mexico.

Definition at line 14 of file rama2grads.F90.

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



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