

MARS – Advanced use

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User Support

Content

- Other verbs: list, read, write, compute
- List archive contents (list)
- Manipulate already retrieved data (read)
- Multiple targets
- Multiple requests
- Compute
- Examples
- Practical session

List

- Alternative to the archive catalogue on the web
 - Amount of data
 - Number of fields
 - Number of tapes. (directive 'output=cost' required)
 - Suitable for batch mode
- Default is **all**, except for **class**, **expver**, **stream**, **type** and **date**
- It does list only the archive, not the Fields Database
- Can keep a report specifying **target**

List

- Example

list,

class	= od,
stream	= oper,
expver	= 1,
date	= 20020501,
time	= 00/12,
type	= an,
levtype	= pl,
levelist	= 1000/850/500,
param	= z/t

List

Use directive
'output=cost' for
summary report.

- Output

```
class = od
cost = 12 fields, 6.0236 Mbytes online
expver = 1
file[0] = marsa:/marsodoper:/1/an/20020501/pl/126649:/20020512.125422
id = 126649
levtype = pl
stream = oper
type = an
date      file  length levelist  offset      param      time
2002-05-01 0    526350 1000      84740812    129.128    00:00:00
2002-05-01 0    526350 1000      85267162    130.128    00:00:00
...
2002-05-01 0    526350 850       315858028   129.128    12:00:00
2002-05-01 0    526350 850       316384378   130.128    12:00:00
2002-05-01 0    526350 500       326363356   129.128    12:00:00
2002-05-01 0    526350 500       326889706   130.128    12:00:00
```

Grand Total:

=====

```
Entries      : 12
Total        : 6,316,200 (6.0236 Mbytes)
```

List: incomplete datasets

- example

list,

class	= od,
stream	= kwbc,
expver	= 1,
date	= 20020501,
time	= 00/12,
type	= an,
levtype	= pl,
levelist	= 1000/850/500,
param	= z/t

List: incomplete datasets

- output

```
class = od
cost = 6 fields, 32.3047 Kbytes online, 54.3438 Kbytes on 1 tape
expver = 1
file[0] = marsa:/marsodkwbc:/1/an/20020501/pl/126932:/20020512.124906
file[1] = -
id = 126932
levtype = pl
stream = kwbc
type = an
date file length levelist offset param time
2002-05-01 0 16540 1000 0 129.128 00:00:00
2002-05-01 0 11284 850 16540 130.128 00:00:00
2002-05-01 0 16540 500 27824 129.128 00:00:00
2002-05-01 0 16540 1000 44364 129.128 12:00:00
2002-05-01 0 11284 850 60904 130.128 12:00:00
2002-05-01 0 16540 500 72188 129.128 12:00:00
```

Grand Total:

=====

```
Entries : 6
Total : 88,728 (86.6484 Kbytes)
```

Retrieve incomplete datasets

- expect

retrieve,

class	= od,
stream	= kwbc,
expver	= 1,
date	= 20020501,
time	= 00/12,
type	= an,
levtype	= pl,
levelist	= 1000/850/500,
expect	= 6,
param	= z/t

Read: filtering

- Read requests can be used to filter/manipulate already retrieved data
- Read UNIX file specified by **source**
- Data written to a file specified by **target**
- Read doesn't need all directives

read,

source

= "myfile",

levelist

= 1000,

grid

= 2.5/2.5,

target

= "only_1000"

Filtering

- Retrieve fails if desired data is not present in **source**

```
retrieve,  
  class      = od,  
  stream     = oper,  
  expver     = 1,  
  date       = 20010101,  
  time       = 12,  
  type       = an,  
  levtype    = pl,  
  levelist   = 1000,  
  param      = z/t,  
  source     = "myfile",  
  target     = "only_1000"
```

Multi-target

- Can organise GRIB target files depending on values of MARS language keywords or of GRI_API key
- MARS Keyword (as echoed by MARS) enclosed in **square** brackets

retrieve,

```
type           = an,  
expver         = 1,  
levtype       = sfc,  
date           = 20010101,  
time           = 00/06/12/18,  
target         = "analysis.[time]"
```

...

mars - INFO - 20020515.1237 - Creating target name: analysis.0000

mars - INFO - 20020515.1237 - Creating target name: analysis.0600

mars - INFO - 20020515.1237 - Creating target name: analysis.1200

mars - INFO - 20020515.1237 - Creating target name: analysis.1800

Multi-target

- GRIB_API key name enclosed in curly brackets retrieve,

```
type           = an,  
param          = t/u/v,  
expver         = 1,  
levtype        = sfc,  
date           = 20010101,  
time           = 00/06/12/18,  
target         = "analysis.{shortName}"
```

...

```
mars - INFO - 20140222.164526 - Creating target name: analysis.t  
mars - INFO - 20140222.164527 - Creating target name: analysis.u  
mars - INFO - 20140222.164527 - Creating target name: analysis.v
```

- Set env. variable MARS_MULTITARGET_STRICT_FORMAT to 1 to use directive values as reported by MARS. This variable also expands GRIB1 and GRIB2 parameter numbers in a different way.

Multiple requests

- More than one request in a single call to MARS
- Append to target

```
retrieve,  
  date = 20010101,  
  time = 12,  
  type = an,  
  target = "analysis"
```

```
retrieve,  
  date = 20000101,  
  time = 12,  
  type = an,  
  target = "analysis"
```

Multiple requests

- Parameter inheritance
 - Parameters not set in the second request (and subsequent ones) are inherited from the previous one.

```
retrieve,  
  class = od,  
  expver = 1,  
  stream = oper,  
  date = -10,  
  time = 12,  
  type = an,  
  target = "analysis"
```

```
retrieve,  
  type = fc,  
  step = 24/to/72/by/24,  
  target = "forecast"
```

Multiple requests: inheritance

- Unwanted inherited parameters are removed by specifying “off”, e.g.

```
retrieve,  
  class   = od,  
  expver  = 1,  
  stream  = enfo,  
  type    = pf,  
  date    = -10,  
  levtype = pl,  
  levelist = 1000/500,  
  step    = 12,  
  number  = 1/to/50,  
  target  = “ensemble.data”
```

```
retrieve,  
  type    = fc,  
  stream  = oper,  
  number  = off,  
  target  = “deterministic.data”
```

Fieldset

- Temporary storage for further processing:

retrieve,

class	= od,
expver	= 1,
stream	= oper,
date	= -10,
levtype	= ml,
levelist	= 1/to/60,
time	= 12,
type	= an,
fieldset	= analysis

Fieldset

- ‘analysis’ above can be seen as a variable to be referenced in a further request.
- At the end of the call to MARS, all fieldsets are released.
- Write requests save fieldsets into UNIX files

write,
fieldset = analysis,
target = “data.grb”

Compute

- Computations on GRIB fields with same shape:
 - fieldset
 - formula
 - Scalar values allowed
 - Predefined functions in formula, e.g.

compute,
formula = "x/2+log(y)*x",
fieldset = z

where x and y are two fieldsets which have been initialised beforehand.

Compute

- Mixing fields and scalars
 - Compute on 2 fields is a field
 - Compute on a field and a scalar is a field
 - Compute on 2 scalars is a scalar
- Bitmaps and missing values
 - Not considered on computations but copied
- GRIB headers on result of **compute** are incorrect. They are copied from the first fieldset.

Compute: example

```
retrieve,  
  class = od, expver = 1, stream = oper,  
  type = analysis, date = -10,  
  param = u, grid = 2.5/2.5,  
  fieldset = u  
retrieve, param = v,  
  fieldset = v  
compute,  
  formula = "sqrt(u*u + v*v)",  
  fieldset = speed  
write,  
  fieldset = speed,  
  target = "windspeed"
```

Compute: applications.

- Compute Surface pressure from LNSP.
- Apply the land/sea mask to some fields.
read, source="temperature.grib", param=T, fieldset=temp
read, source="lsm.grib", fieldset=lsm, param=lsm
compute, fieldset=lsm_temp, formula="(lsm>0.5)*temp"
write, fieldset=lsm_temp, target="temperature_lsm.grib"
- Statistical calculations ... min, max, mean, rms ...
- De-accumulate fields (see practical).
- Build "new meteorological" fields from existing fields. See for example:

old.ecmwf.int/products/changes/soil_hydrology_cy32r3/

Reference

- Mars user guide:

software.ecmwf.int/wiki/display/USS/MARS+User+Guide