
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

● 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	95246140	129.128	00:00:00
2002-05-01	0	526350	850	95772490	130.128	00:00:00
2002-05-01	0	526350	500	105751468	129.128	00:00:00
2002-05-01	0	526350	500	106277818	130.128	00:00:00
2002-05-01	0	526350	1000	305352700	129.128	12:00:00
2002-05-01	0	526350	1000	305879050	130.128	12:00:00
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)
```

Use directive
'output=cost' for
summary report.

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,  
  expver  = 1,  
  levtype    = sfc,  
  date     = 20010101,  
  time     = 00/06/12/18,  
  target   = "analysis.{shortName}"
```

```
mars - INFO - 20140222.164526 - Creating target name: an_t.grib  
mars - INFO - 20140222.164527 - Creating target name: an_u.grib  
mars - INFO - 20140222.164527 - Creating target name: an_v.grib
```

- 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) 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** 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"
```

- \$TMPDIR is used for fieldsets. For big fieldsets, define \$TMPDIR to point to \$SCRATCHDIR.

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 wrong. 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: example

- 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.
- Build “new meteorological” fields from existing fields. See for example:

www.ecmwf.int/products/changes/soil_hydrology_cy32r3/

Reference

- Mars user guide:

www.ecmwf.int/publications/manuals/mars/guide/