

# MESCAN-SURFEX data stored into MARS archive in the framework of UERRA project.

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# ECMWF MARS archive

## Meteorological Archie and Retrieval System

- GRIB, BUFR, ODB
- Access to the archives via a pseudo-meteorological language
- Managed archive: data has to follow a certain structure based on archiving and retrieval patterns
- Tape based



# MESCAN-SURFEX parameters archived in MARS

Surface/soil level parameters are stored at 5.5km resolution and at 6 hourly output for analysis mode and hourly output for forecast mode

Ensemble data set (stream=enda): 8 members for the testbed period 2006-2010

Deterministic data set (stream=oper) : 55 years of data since 1961

MESCAN-SURFEX : (lfpw, oper) for type=an

## UERRA GRIB2

Parameter	Unit	paramId	shortName	Time
Accumulated total precipitation	mm	228228	tp	Only available at 6h (24h accumulated from 6 to 6)
2 m relative humidity	%	260242	2r	0, 6, 12, 18
10 m wind speed	m s-1	207	10si	0, 6, 12, 18
10 m wind direction	degree true	260260	10wdir	0, 6, 12, 18
2 m temperature	K	167	2t	0, 6, 12, 18
Land cover (1=land,0=sea)	(0-1)	172	lsm	constant
Orography (surface geopot height)	m	228002	orog	constant

# MESCAN-SURFEX parameters archived in MARS

MESCAN-SURFEX : (lfpw, oper) for type=fc

## UERRA GRIB2

Parameter	Unit	paramId	shortName	Time
Surface pressure	Pa	134	Sp	av. at 6h step
Accumulated total precipitation	kg m-2	228228	tp	av. at 6h step
2 m relative humidity	%	260242	2r	av. at 6h step
2 m temperature	K	167	2t	av. at 6h step
10 m wind speed	m s-1	207	10si	av. at 6h step
10 m wind direction	degree true	260260	10wdir	av. at 6h step
Surface runoff	kg m-2	174008	sro	av. at 1h step
Albedo	%	260509	al	av. at 1h step
Net long-wave radiation flux at the surface	J m-2	177	str	av. at 1h step
Net short-wave radiation flux at the surface	J m-2	176	ssr	av. at 1h step
Direct short-wave radiation flux at the surface	J m-2	260264	tidirswrf	av. only at 6h step
Surface sensible heat flux	J m-2	146	sshf	av. at 1h step

# MESCAN-SURFEX parameters archived in MARS

Skin temperature	K	235	skt	av. at 1h step
Water equ. of acc. snow depth	kg m-2	228141	sd	av. at 1h step
Acc. total snowfall	kg m-2	228144	sf	av. at 1h step
Snow density	kg m-3	33	rsn	av. at 1h step
Snow depth	m	3066	sde	av. at 1h step
Soil temperature on 14 levels	K	260360	sot	av.at 1h step
Volumetric soil water on 14 levels	m3 m-3	260199	vsw	av.at 1h step
Liquid non-frozen volumetric soil moisture on 14 levels	m3 m-3	260210	liqvsm	av.at 1h step
Soil heat flux	J m-2	260364	sohf	av.at 1h step
surface roughness	m	173	sr	av.at 1h step
Volumetric wilting point	m3 m-3	260200	vwiltm	constant
Volumetric field capacity	m3 m-3	260211	voltso	constant

# MESCAN-SURFEX parameters archived in MARS

The screenshot shows a Mozilla Firefox browser window displaying the ECMWF Confluence Wiki page for 'Surface level parameters'. The browser's address bar shows the URL: <https://software.ecmwf.int/wiki/display/JER/Surface+level+parameters>. The page title is 'Surface level parameters - UERRA - ECMWF Confluence Wiki - Mozilla Firefox'. The page content includes a list of parameters:

- 10 metre wind direction
- 10 metre wind gust
- 10 metre wind speed
- Albedo
- Evaporation
- High cloud cover
- Land-sea mask
- Low cloud cover
- Mean sea level pressure
- Medium cloud cover
- Orography
- Percolation
- Skin temperature
- Snow density
- Snow depth
- Snow depth water equivalent
- Snow fall water equivalent
- Soil heat flux
- Surface air maximum temperature
- Surface air minimum temperature
- Surface air relative humidity
- Surface air temperature
- Surface pressure
- Surface roughness

The left sidebar shows the UERRA logo and navigation options like 'SPACE SHORTCUTS' (S2S, TIGGE, TIGGE-LAM, UERRA, YOPP) and 'PAGE TREE' (News, Description, Models, Parameters, Surface level parameters).

# Extract MESCAN-SURFEX from MARS

## Public users

- Via dedicated web data portal
  - Data discovery for specific datasets
  - Retrieval of smaller samples up to 1 month
- Via Web MARS catalogue
  - Hierarchical access to partial data
  - Retrieval of smaller samples up to 1 month
- Via ECMWF Web API
  - For use outside ECMWF via internet
  - Recommended for downloading bigger data amount

## Restricted access (account at ECMWF needed)

- All previous options
- Via MARS batch requests (command line or Web API) for bigger retrievals

# Extract MESCAN-SURFEX from MARS

UERRA retrieval efficiency - UERRA - ECMWF Confluence Wiki - Mozilla Firefox

UERRA retrieval effici... x +

https://software.ecmwf.int/wiki/display/UER/UERRA+retrieval+efficiency

Rechercher

ECMWF Spaces Calendars Create



UERRA

SPACE SHORTCUTS

- S2S
- TIGGE
- TIGGE-LAM
- UERRA
- YOPP

PAGE TREE

- News
- Description
- Support
- Resources
  - Development phase
  - Issues with data
  - UERRA retrieval efficiency
    - UERRA SMHI retrieval efficiency
- Site map

Space tools

## How is UERRA data organised in MARS?

In general it is organised, as a **huge tree**, with the indentation below, showing different levels down that tree:

### 1) Deterministic data (stream oper):

- origin and model
  - type of data (analysis, forecast, etc)
    - year
      - month
        - type of level (model level, pressure level, surface etc)
          - dates, times, steps (for forecast type), levels (for non surface levels), parameters

### 2) Ensemble data (stream enda):

- origin and model
  - type of data (analysis, forecast, etc)year
    - month
      - type of level (model level, pressure level, surface etc)
        - dates
          - times, steps (for forecast type), levels (for non surface levels), parameters, members

**⚠** The items on the lowest level in the trees above are archived on the same tape. The tree structure can be easily understood by investigating [the deepest UERRA Web MARS page](#) (where one can select exactly which parameters are needed). **All selectable items listed in the web listboxes on that page represent data occupying the same archiving tape.**



# Extract MESCAN-SURFEX from MARS

apps.ecmwf.int/datasets/data/uerra-mescan-surfex-en/levtype=sfc/stream=enda/type=an/ 190% Rechercher



Home Chart dashboard Contact

Search ECMWF

rachid abida | Sign out

About Forecasts Computing Research Learning

## Type of level

Soil levels

► Surface

## Type

► Analysis

Forecast

## Models

HARMONIE/V1

HARMONIE/V2

UM

UM/En

COSMO/En

MESAN/V1

MESCAN-SURFEX

MESCAN-SURFEX/En

## About

Conditions of use

Documentation

## Navigation

## UERRA, MESCAN-SURFEX/En

### Select a month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2007	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2008	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2009	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2010	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Select time

00:00:00  06:00:00  12:00:00  18:00:00

[Select All](#) or [Clear](#)

### Select number

1  2  3  4  5  6  7  8

[Select All](#) or [Clear](#)

### Select parameter

2 metre relative humidity  2 metre temperature  10 metre wind direction  10 metre wind speed  
 Land-sea mask  Orography  Total Precipitation

[Select All](#) or [Clear](#)

View the MARS request

Retrieve GRIB

# Extract MESCAN-SURFEX from MARS

The screenshot shows the ECMWF MARS Catalogue website. The browser address bar displays the URL: `apps.ecmwf.int/mars-catalogue/?origin=lfpw&class=ur&expver=prod`. The page features the ECMWF logo and a navigation menu with links for Home, Chart dashboard, and Contact. A search bar is present with the text "Search ECMWF". The user's name "rachid abida" and a "Sign out" link are visible in the top right corner.

The main content area is titled "MARS Catalogue" and "Météo France". It includes a "Choose the stream:" section with a "Deterministic forecasts" link and a "► Atmospheric model" link. Below this is an "Ensemble data assimilation" section with another "► Atmospheric model" link.

The "Current selection:" section shows the following parameters:

- origin: [edzw](#), [egrr](#), [eswi](#), [lfpw](#)
- expver: [prod](#), [test](#)
- class: [at](#), [be](#), [c3](#), [ch](#), [co](#), [cs](#), [de](#), [dk](#), [dm](#), [dt](#), [e2](#), [e4](#), [ea](#), [ei](#), [el](#), [em](#), [en](#), [ep](#), [er](#), [es](#), [et](#), [fr](#), [ie](#), [it](#), [l5](#), [la](#), [mc](#), [me](#), [ms](#), [nl](#), [no](#), [nr](#), [od](#), [pt](#), [pv](#), [rd](#), [rm](#), [s2](#), [se](#), [te](#), [ti](#), [to](#), [tr](#), [uk](#), [ur](#), [yp](#), [yt](#)

At the bottom left, there is a "Top of page" link. At the bottom right, the copyright notice "copyright © ECMWF" is displayed.

# Extract MESCAN-SURFEX from MARS via Web API

```
#!/usr/bin/env python
import calendar
from ecmwfapi import ECMWFDataServer
server = ECMWFDataServer()

def retrieve_uerra_eswi():
    """
    A function to demonstrate how to iterate efficiently
    over several years and months etc for a particular UERRA request.
    """
    yearStart = 2008
    yearEnd = 2009
    monthStart = 1
    monthEnd = 12
    for year in list(range(yearStart, yearEnd + 1)):
        for month in list(range(monthStart, monthEnd + 1)):
            startDate = '%04d%02d%02d' % (year, month, 1)
            numberOfDays = calendar.monthrange(year, month)[1]
            lastDate = '%04d%02d%02d' % (year, month, numberOfDays)
            target = "uerra_eswi_daily_%04d%02d.grb" % (year, month)
            requestDates = (startDate + "/TO/" + lastDate)
            uerra_eswi_request(requestDates, target)

def uerra_lfpw_request(requestDates, target):
    """
    A UERRA request for MESCAN analysis
    """
    server.retrieve({
        "class": "ur",
        "dataset": "uerra",
        "date": "1965-07-01",
        "expver": "prod",
        "levtype": "sfc",
        "origin": "lfpw",
        "param": " 167/172/207/228002/228228/260242/260260",
        "stream": "oper",
        "time": "00:00:00/06:00:00/12:00:00/18:00:00",
        "type": "an",
        "target": "out.grib",
    })

if __name__ == '__main__':
    retrieve_uerra_lfpw()
```

out.grib



# Extract MESCAN-SURFEX from MARS via Web API

```
$ cat << EOF > my_request
retrieve,
class=ur,
date=1965-07-01,
expver=prod,
levtype=sfc,
origin=lfpw,
param=167/172/207/228002/228228/260242/260260,
stream=oper,
time=00:00:00/06:00:00/12:00:00/18:00:00,
type=an,
target="out.grib"
EOF
```

```
mars -n my_request
```

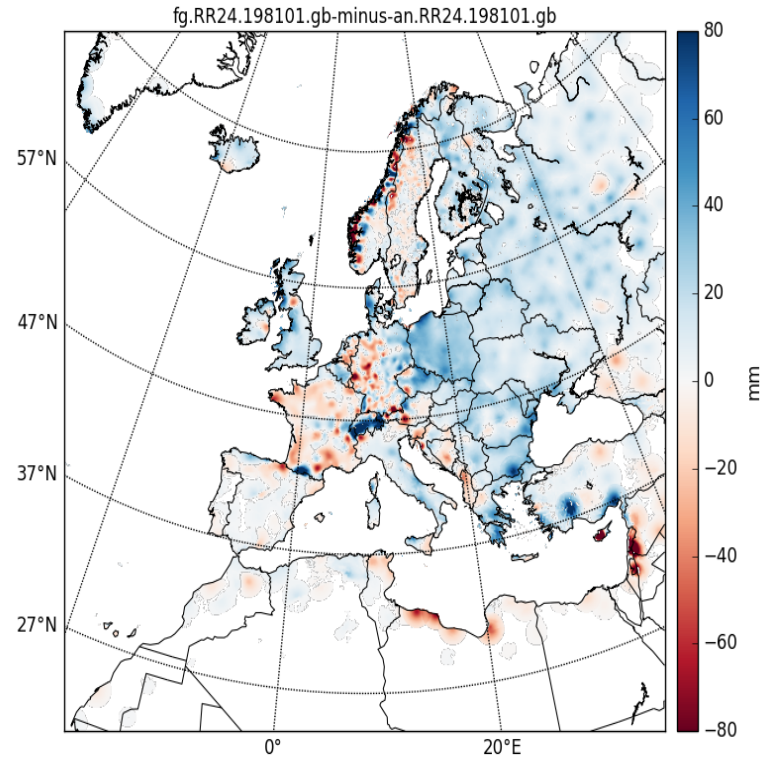
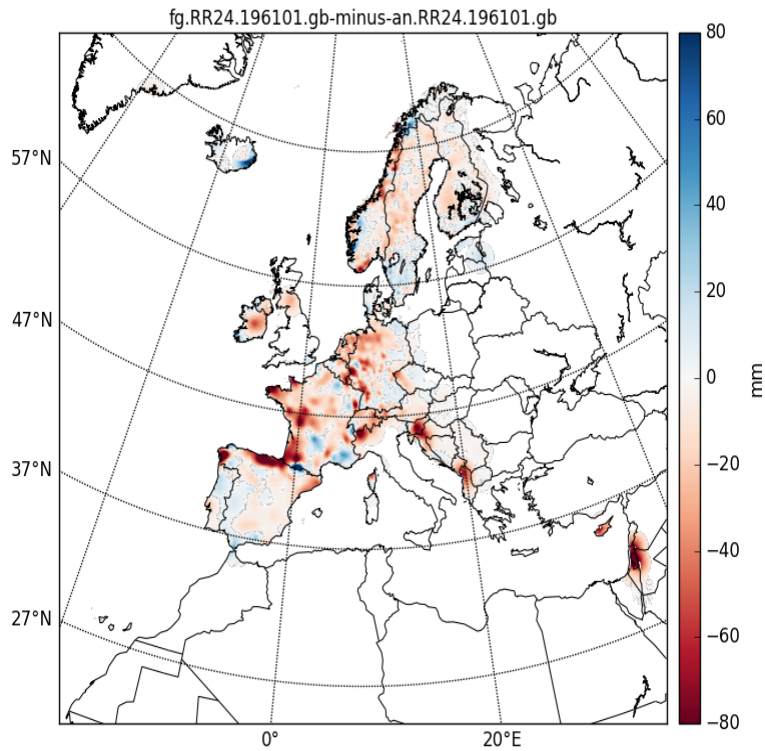
Note that you can execute this request from batch script by iterating over years & months for efficient big retrieval

out.grib



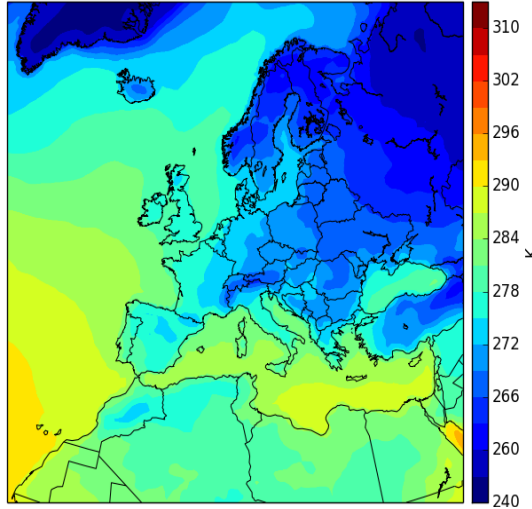
# MESCAN validation

## Impact of observation network size

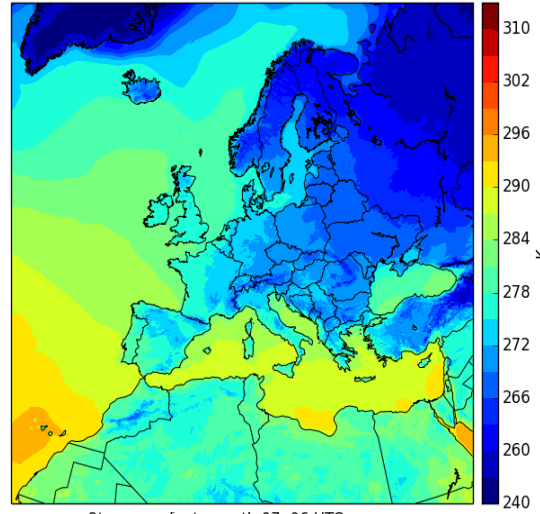


# Monthly mean T2m analysis for 2006-2010. MESCAN T2m .vs. Era-interim

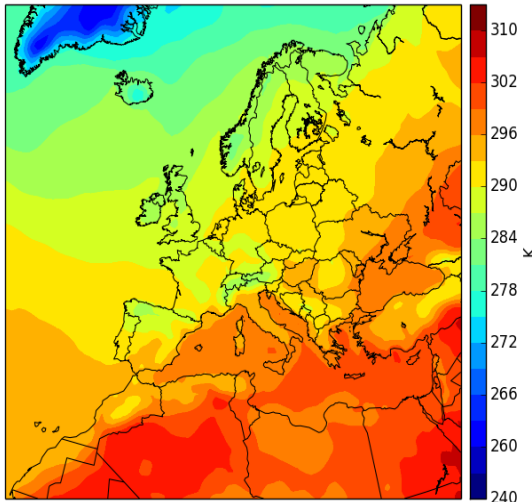
2t, erai, month 01, 06 UTC, mean



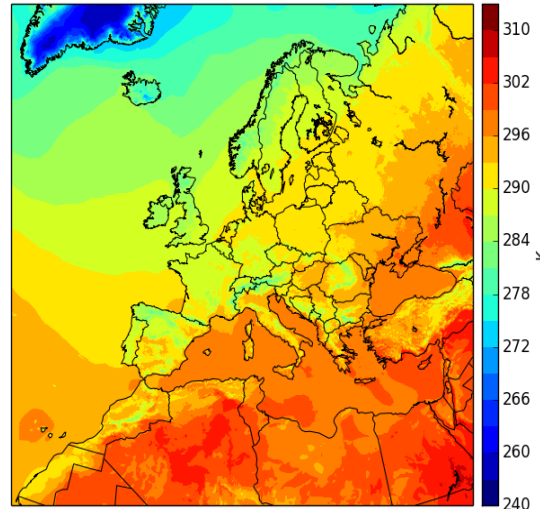
2t, uerra, rfnet, month 01, 06 UTC, mean



2t, erai, month 07, 06 UTC, mean



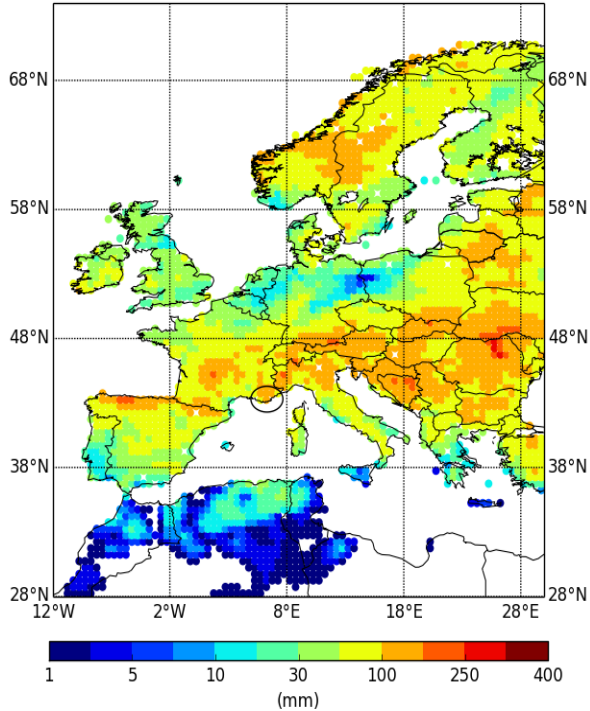
2t, uerra, rfnet, month 07, 06 UTC, mean



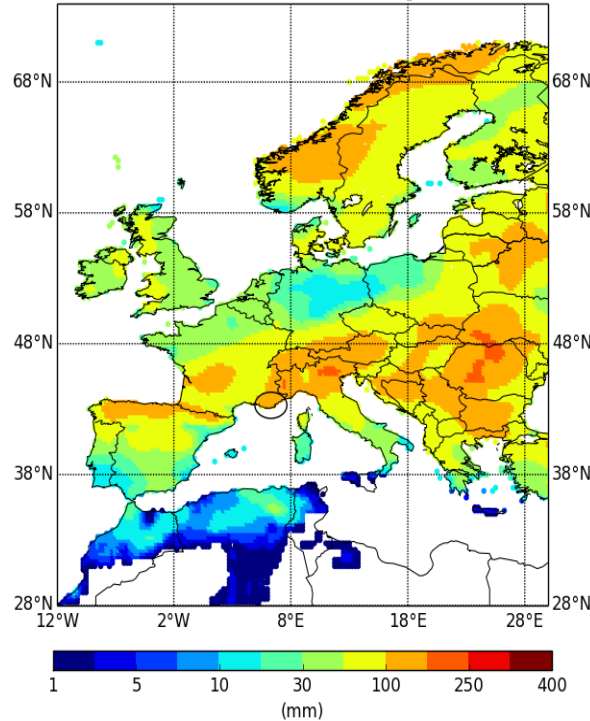


# Monthly mean RR24 analysis for June 2010: MESCAN vs ERA-Interim and GPCC

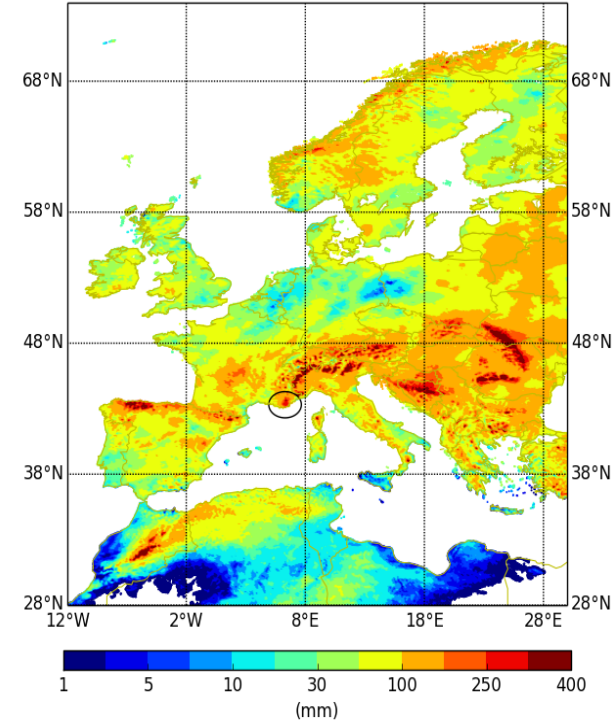
GPCC @ 0.5 deg



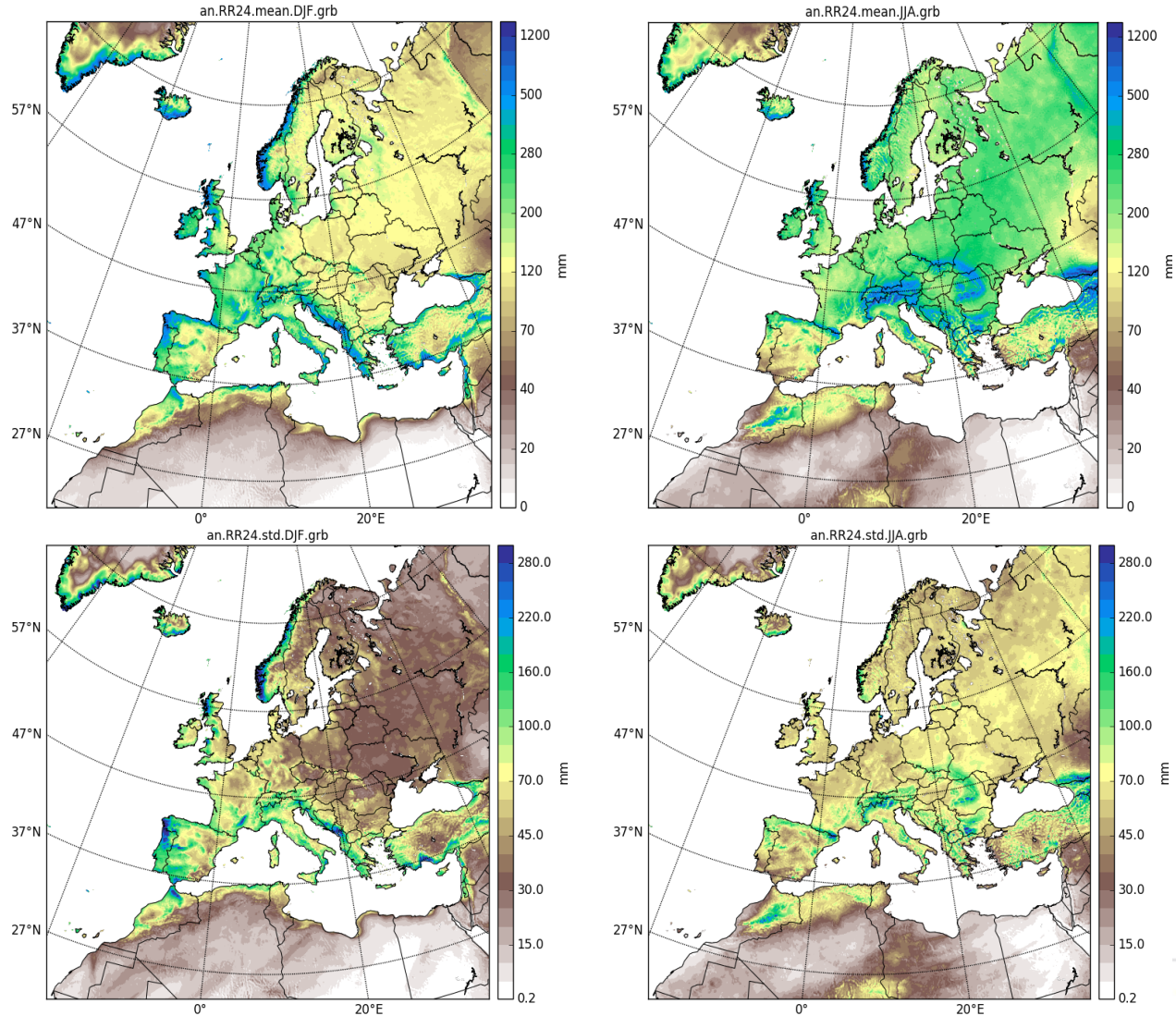
ERA-Interim @ 0.25 deg



UERRA-MESCAN @ 0.05 deg

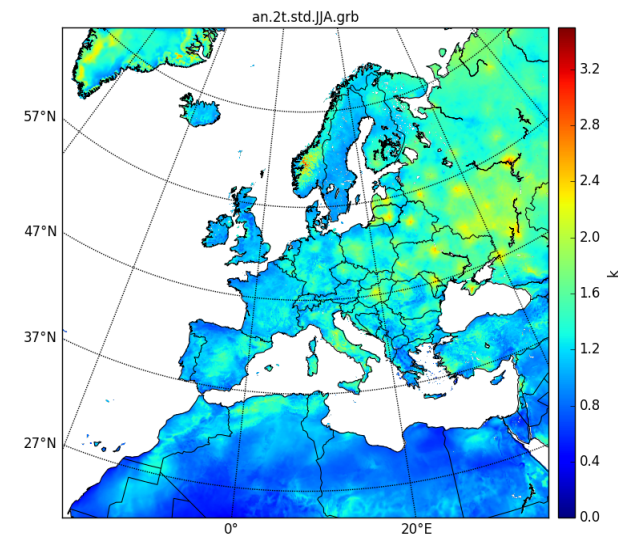
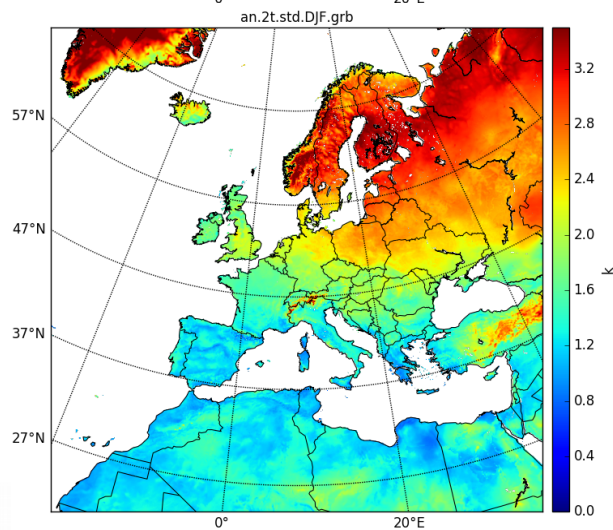
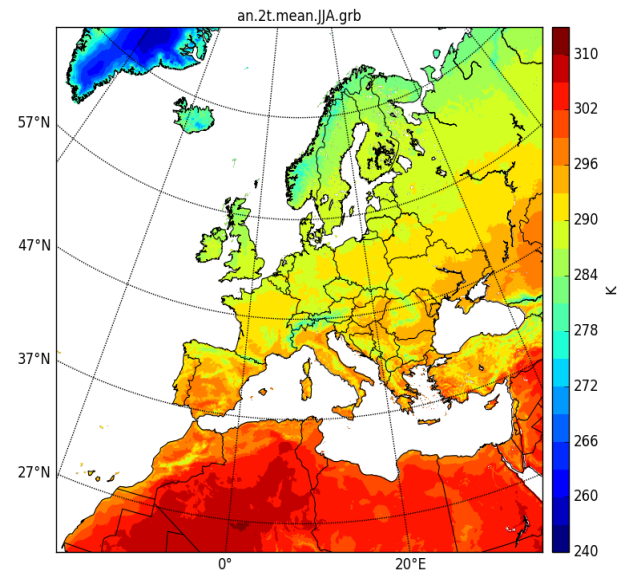
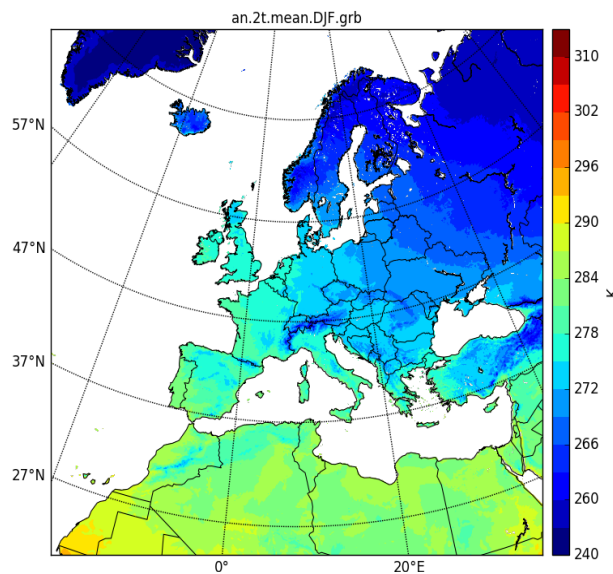


# MESCAN seasonal precipitation patterns computed using the 55 years data

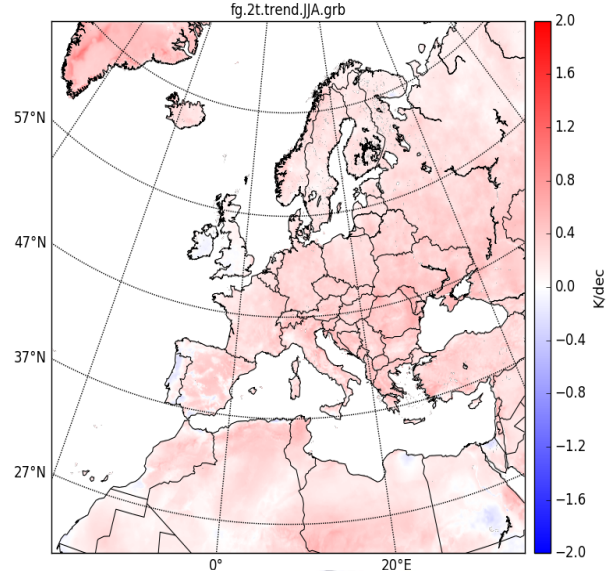
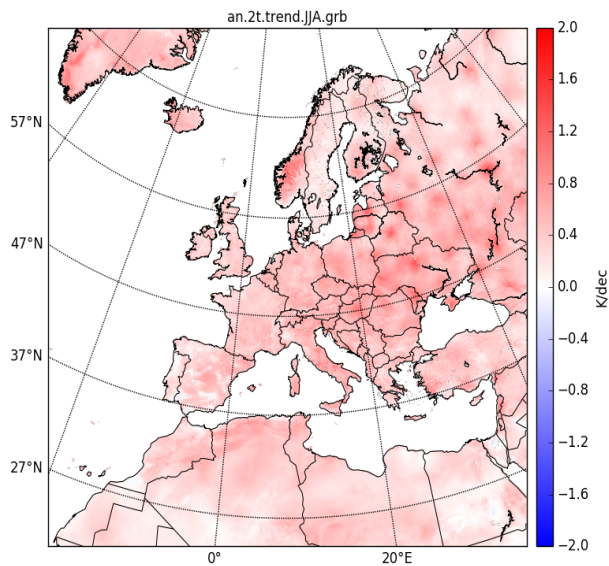
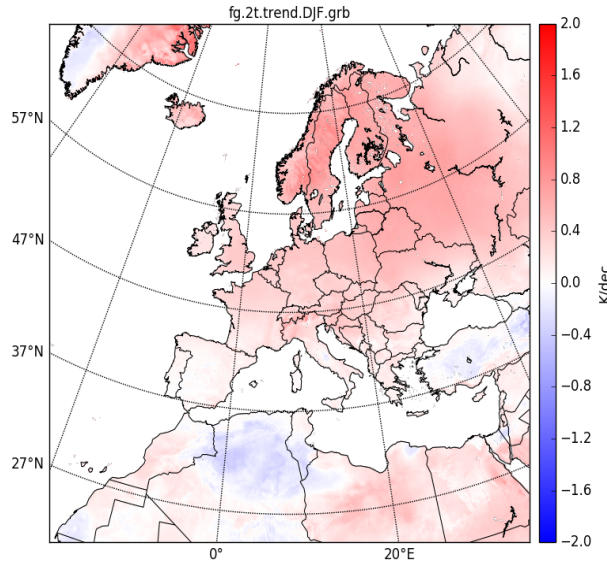
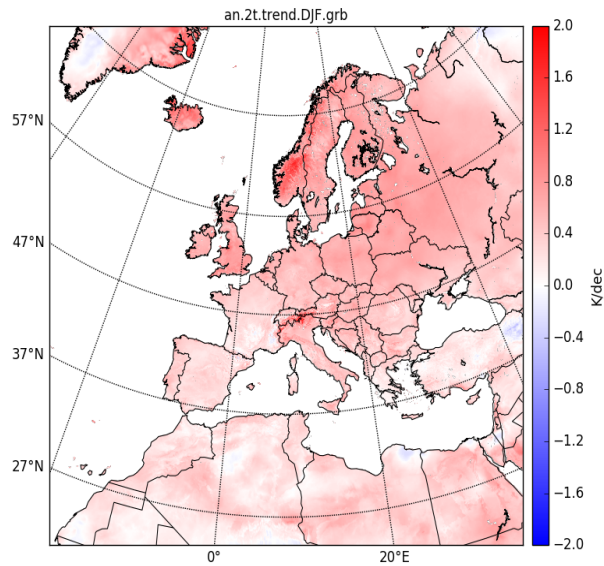




# MESCAN seasonal T2m patterns computed using the 55 years data



# MESCAN T2m seasonal trend patterns computed using the 55 years data



Thank you for your attention! Questions ?

