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

R. Abida, E. Bazile, A. Verrelle, P. Le Moigne, C. Szczypta, and F. Besson

Toulouse, 18 December 2017

ECMWF MARS archive

Meteorological Archie and Retrieval System

- GRIB, BUFR, ODB
- Access to the archives via a pseudo-meteorological langage
- 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

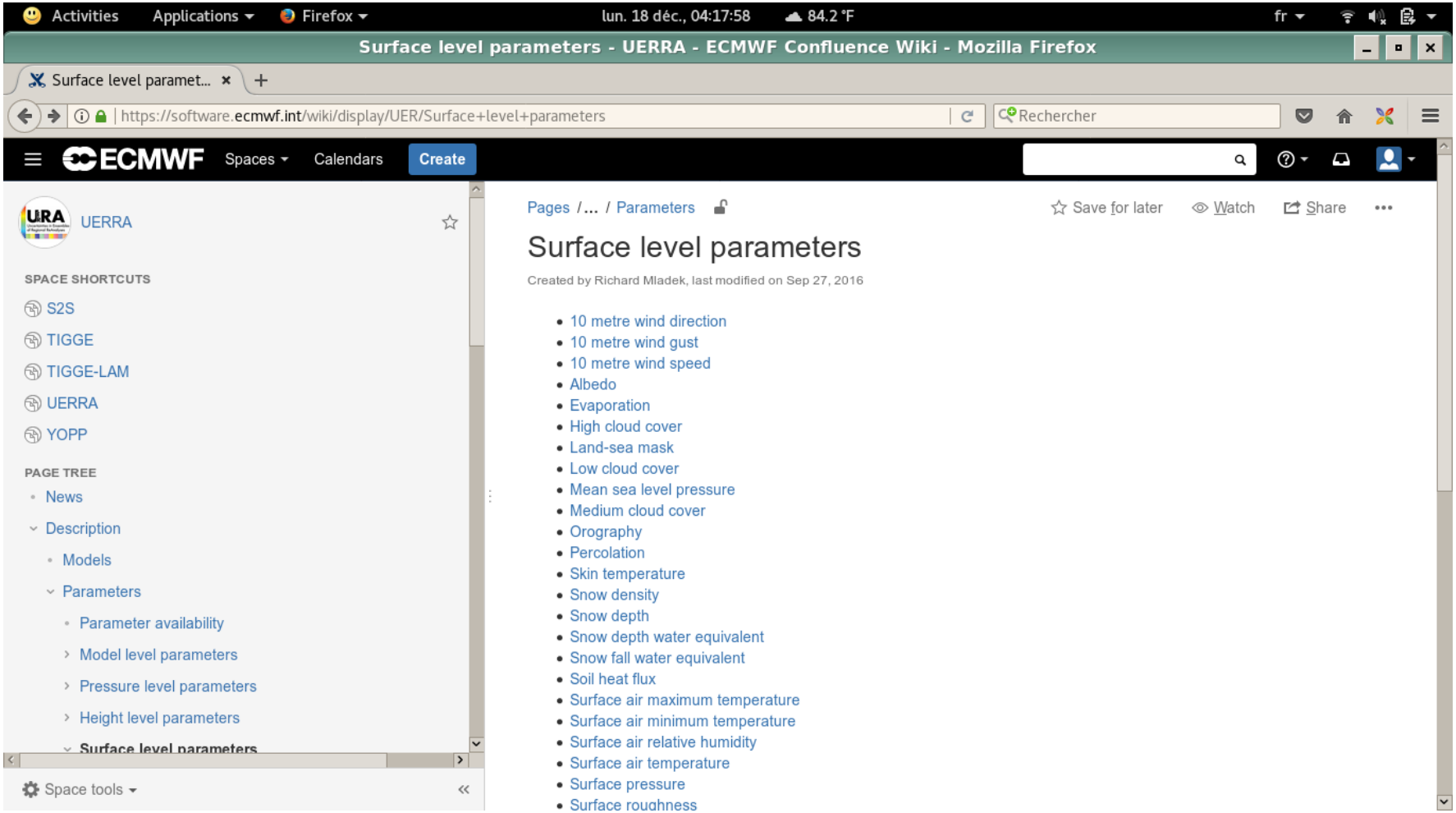
MESCAN-SURFEX : (lfpw, oper) for type=fc

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



Extract MESCAN-SURFEX from MARS

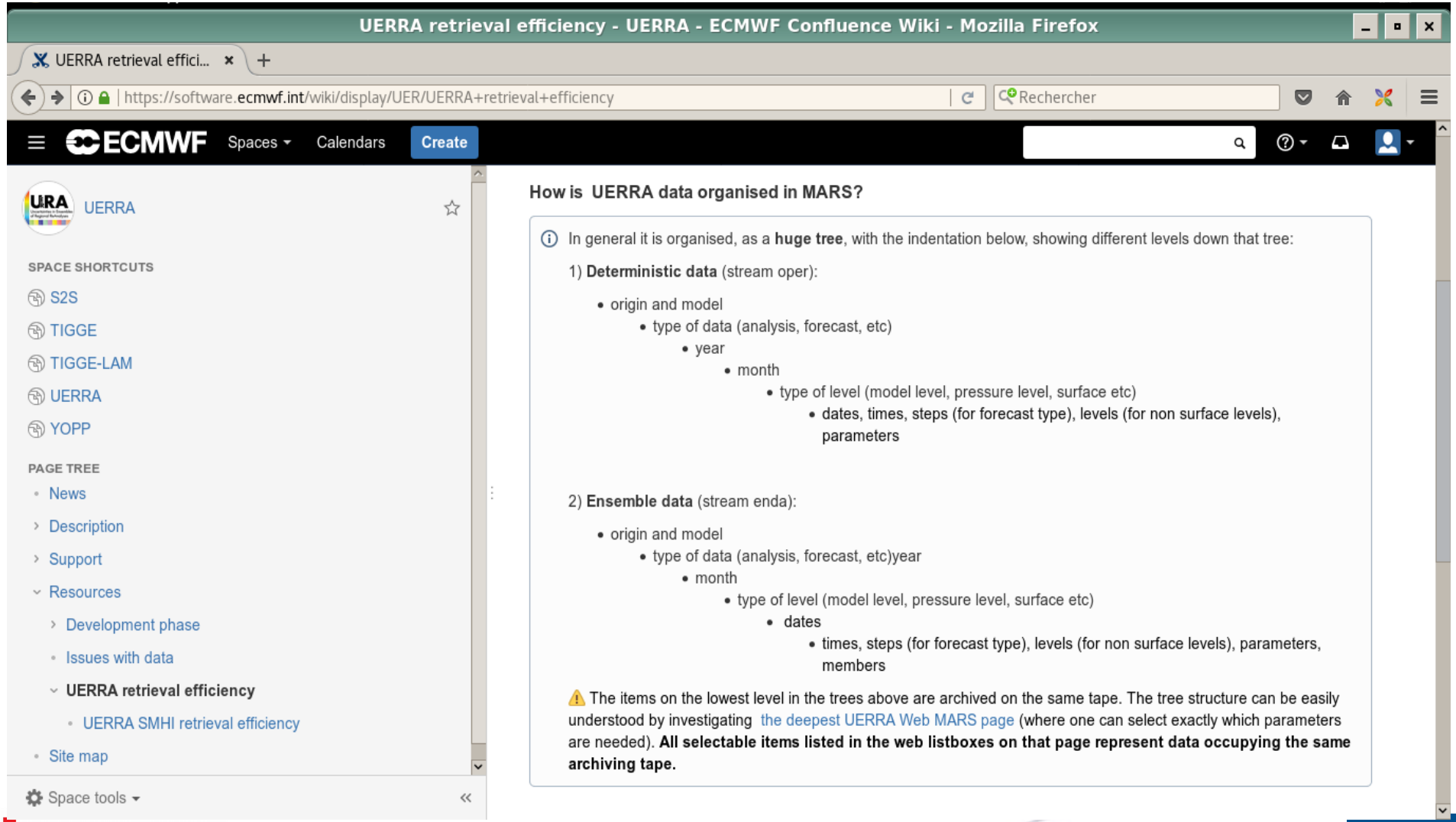
Public users

- 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 downloanding bigger data amount

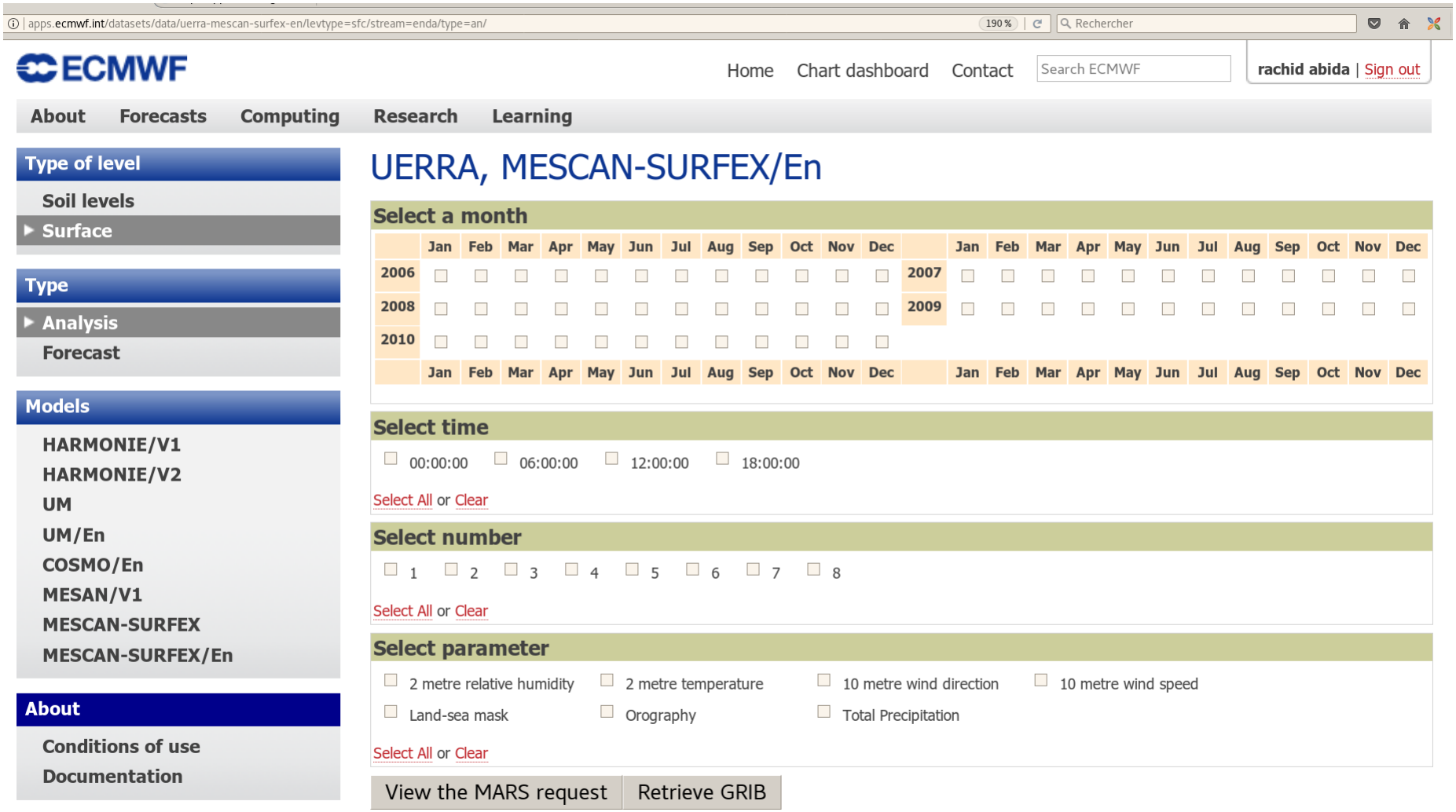
Restricted access (account at ECMWF needed)

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

Extract MESCAN-SURFEX from MARS



Extract MESCAN-SURFEX from MARS

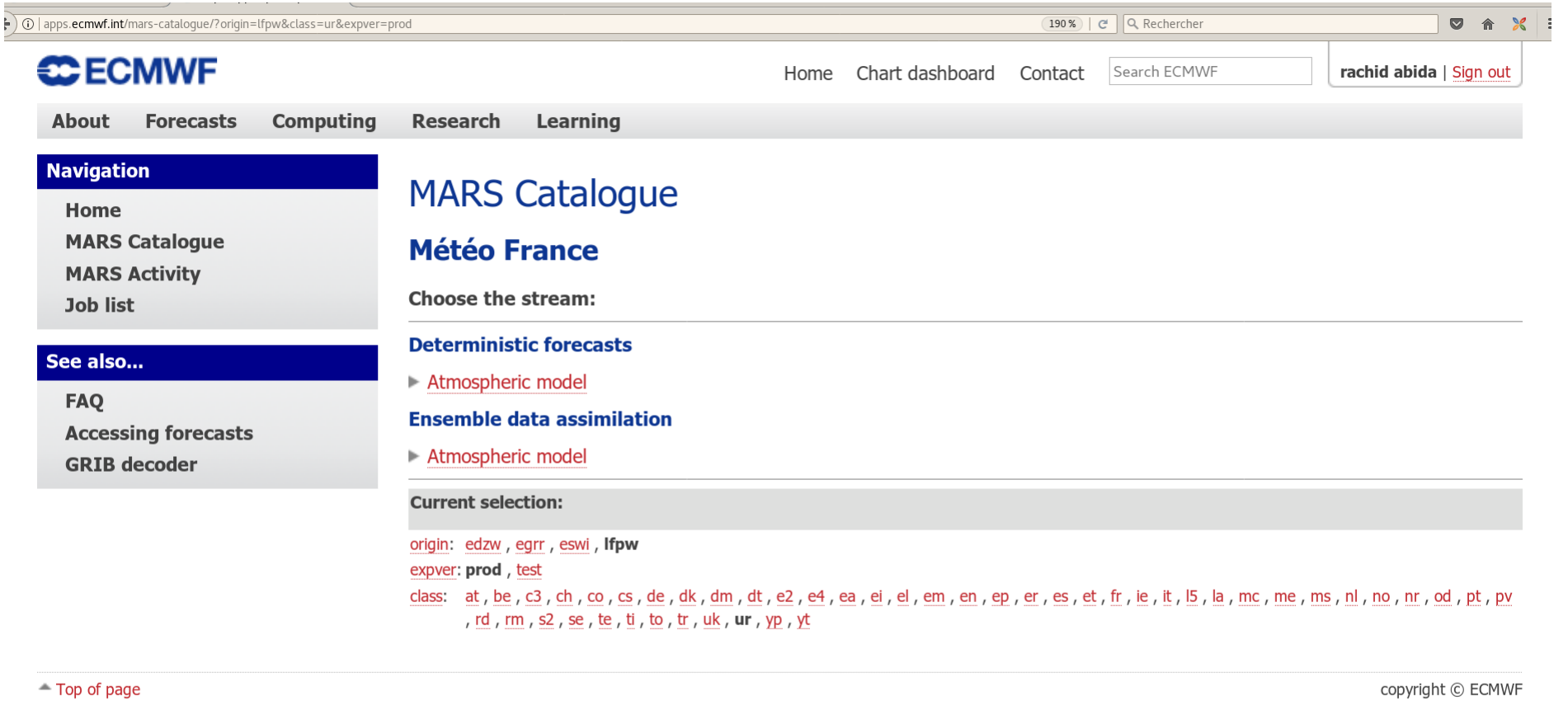


UERRA
Uncertainties in Ensembles of Regional ReAnalyses

cnrs

METEO FRANCE

Extract MESCAN-SURFEX from MARS



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

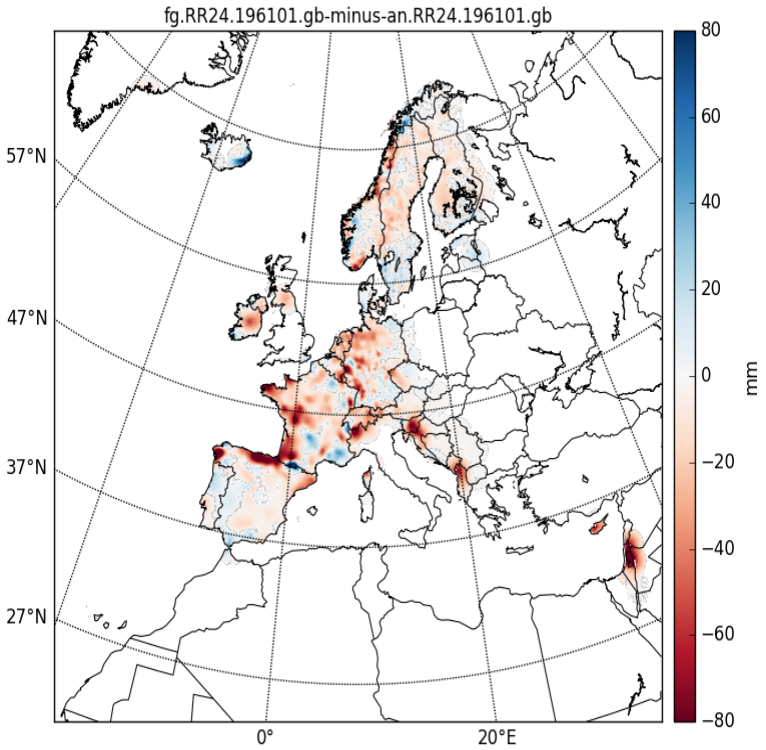
Extract MESCAN-SURFEX from MARS via Web API

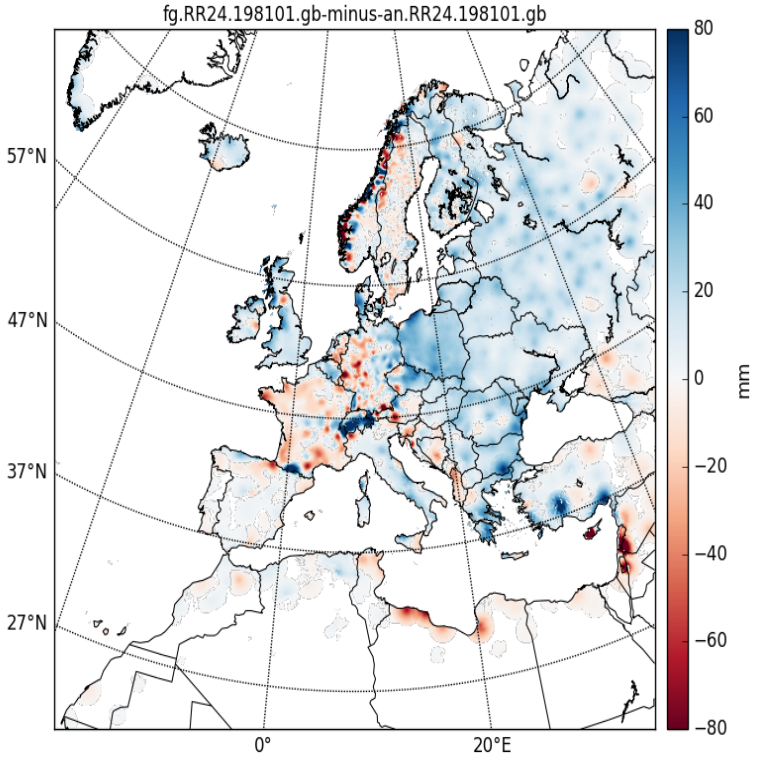
```
$ cat << EOF > my_request
retrieve,
class=ur,
date=1965-07-01,
expver=prod,
levtype=sfc,
origin=lfpw,
param=167/172/207/228002/228228/260242/260260,
stream=oper,
time=00:00:00/06:00:00/12:00:00/18:00:00,
type=an,
target="out.grib"
EOF

mars -n my_request
```

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

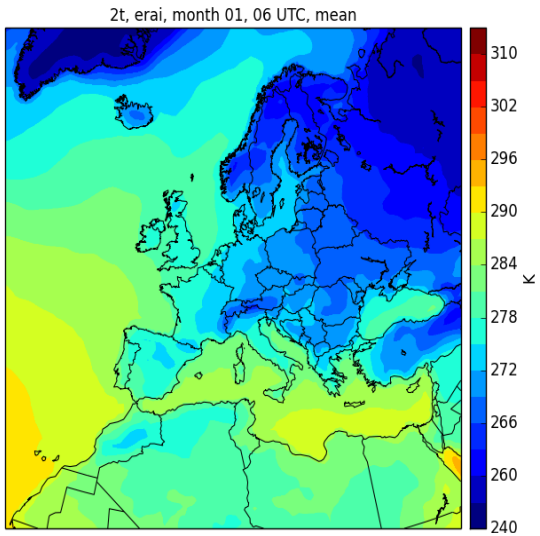
MESCAN validation

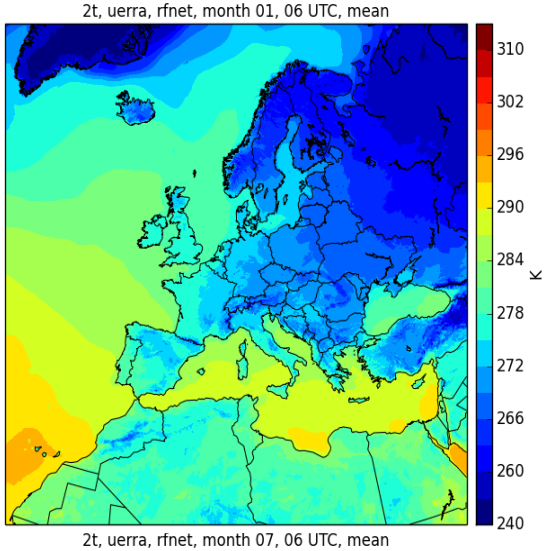
Impact of observation network size

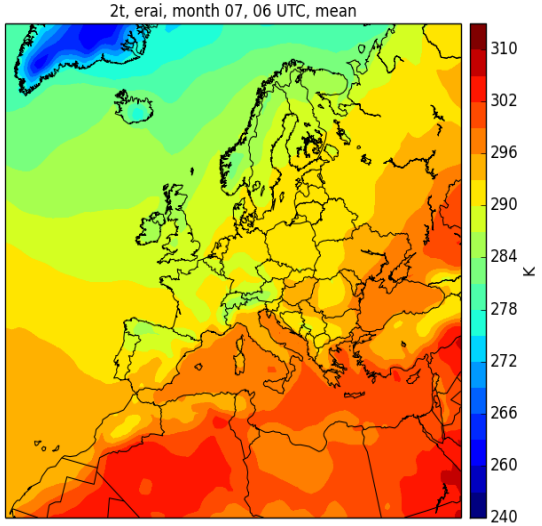


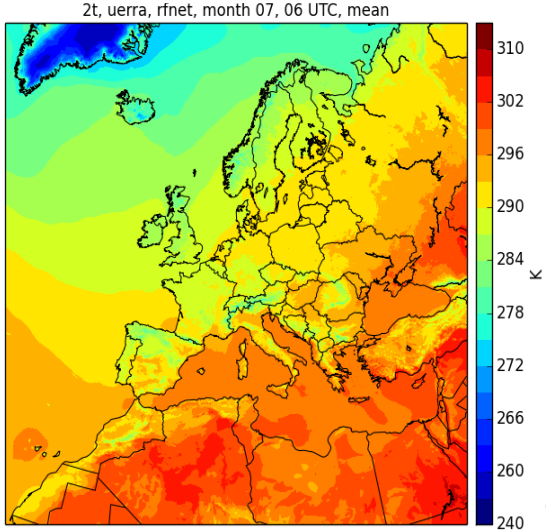


Monthly mean T2m analysis for 2006-2010. MESCAN T2m .vs. Era-interim







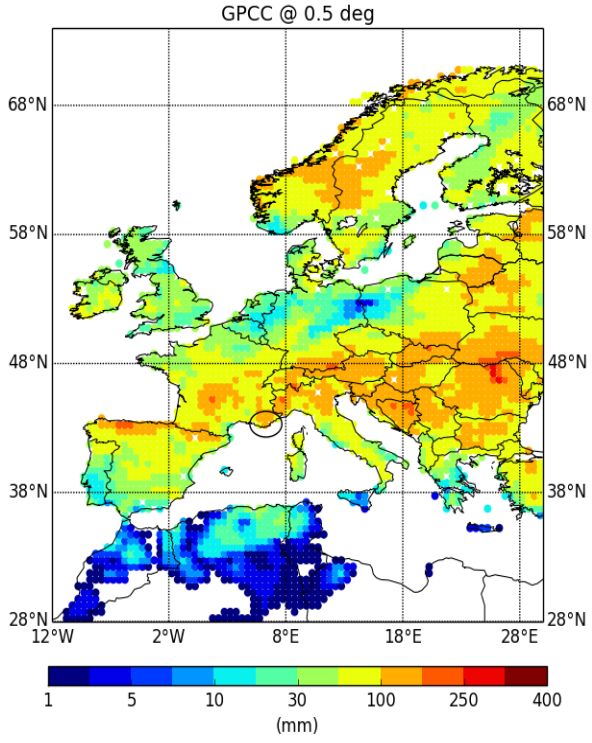


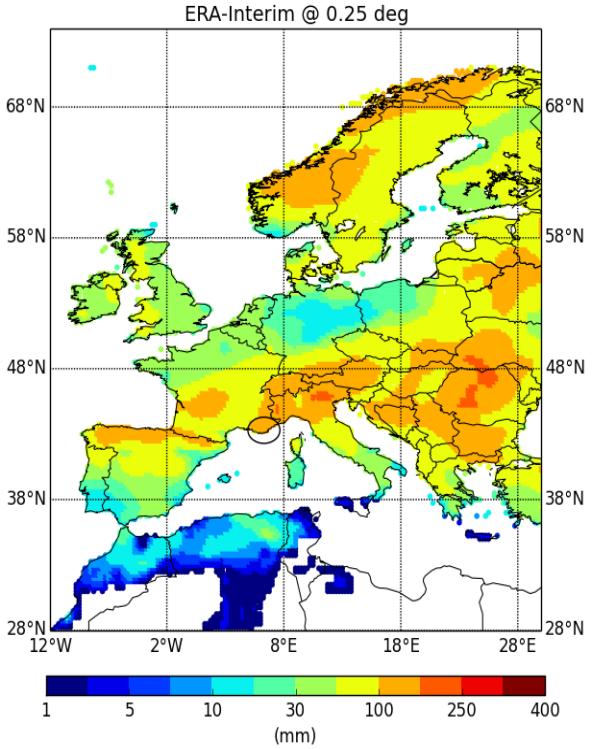
UERRA
Uncertainties in Ensembles of Regional ReAnalyses

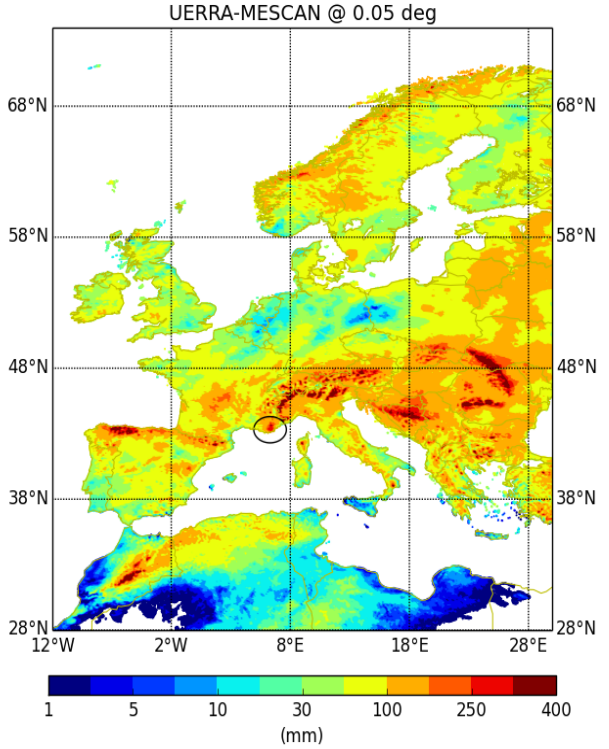
cnrs

METEO FRANCE

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





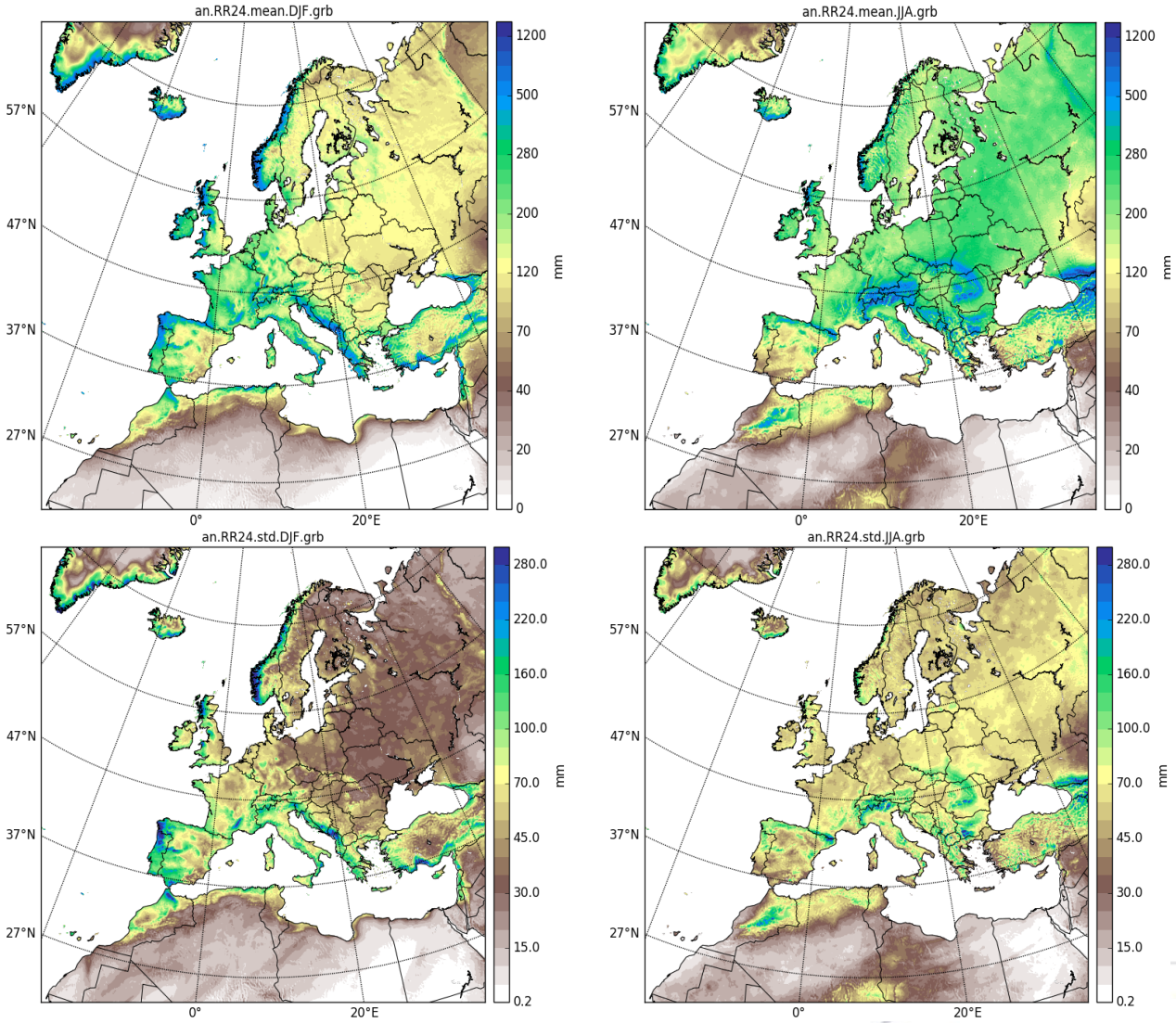


UERRA
Uncertainties in Ensembles of Regional ReAnalyses

cnrs

METEO FRANCE

MESCAN seasonal precipitation patterns computed using the 55 years data

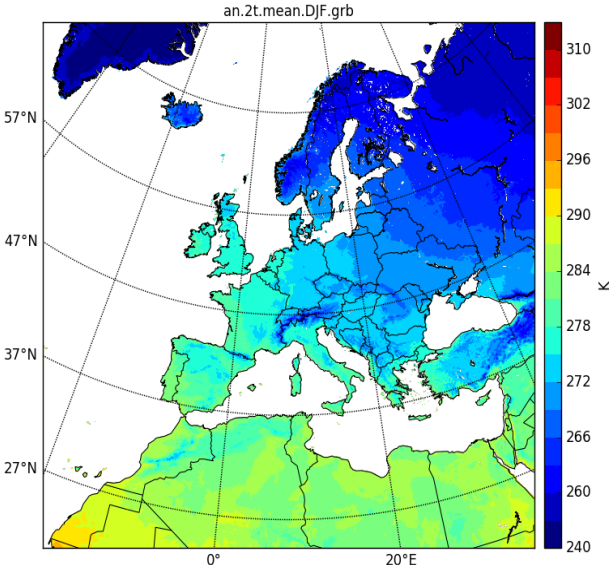


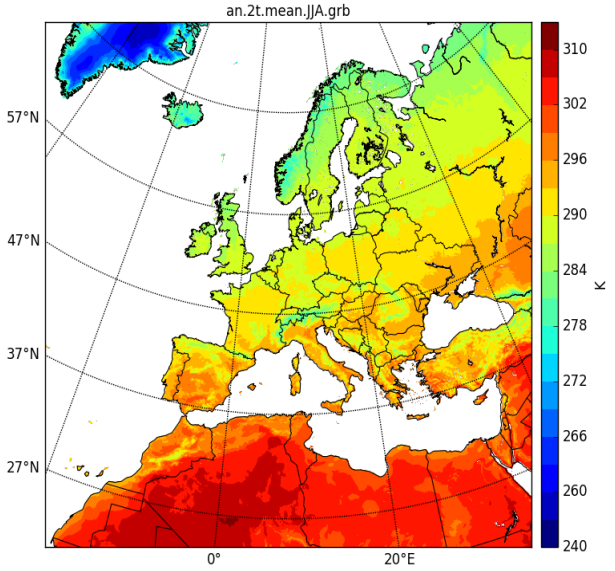
UERRA
Uncertainties in Ensembles of Regional ReAnalyses

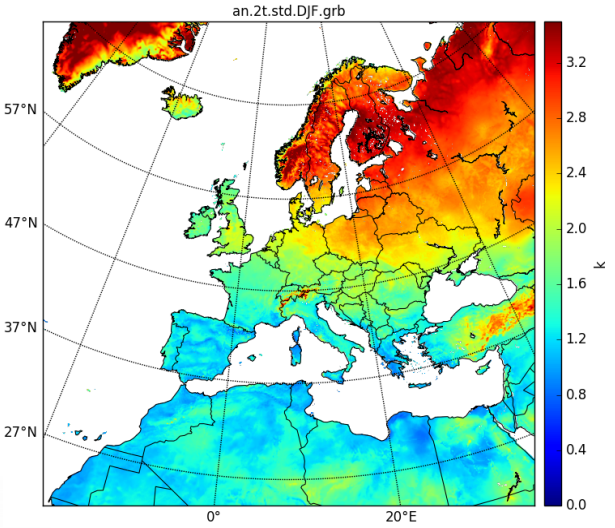
cnrs

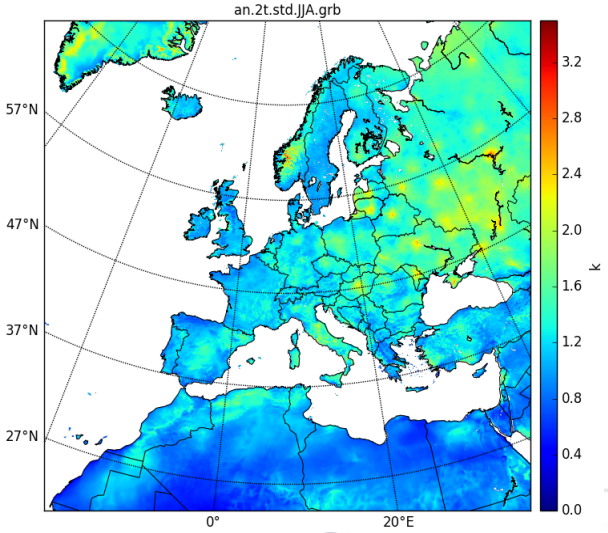
METEO FRANCE

MESCAN seasonal T2m patterns computed using the 55 years data







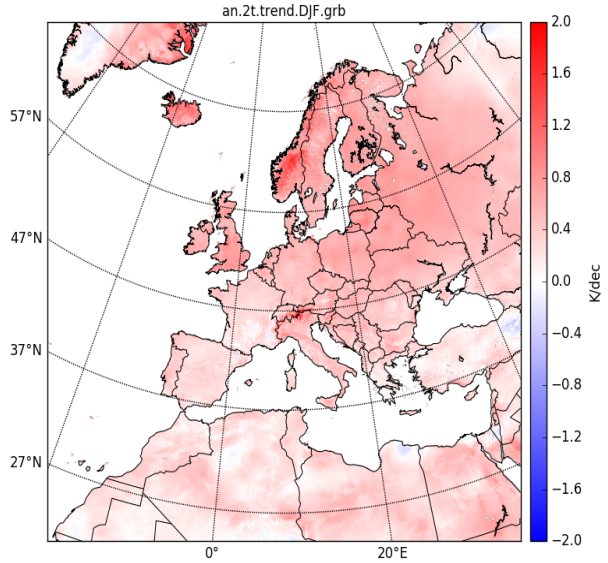


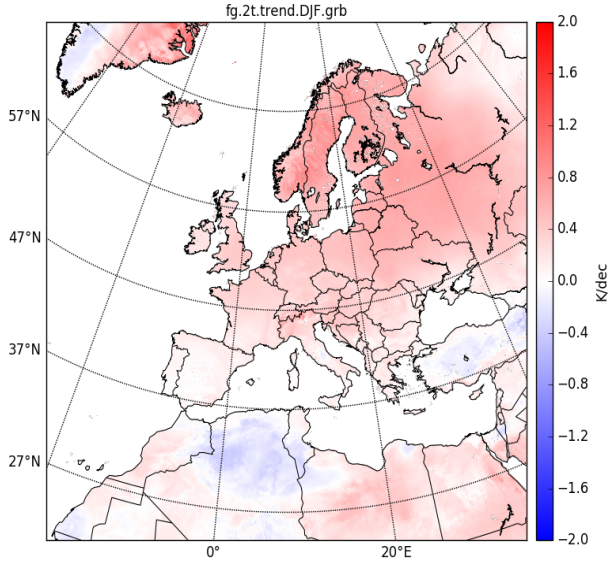
URA
Uncertainties in Ensembles of Regional ReAnalyses

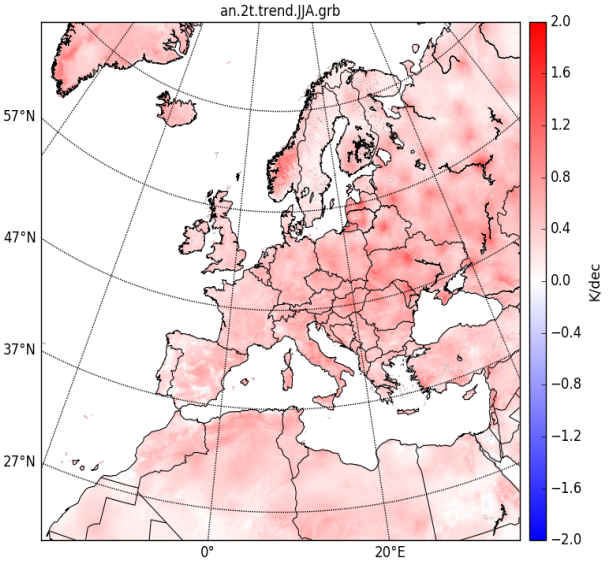
cnrs

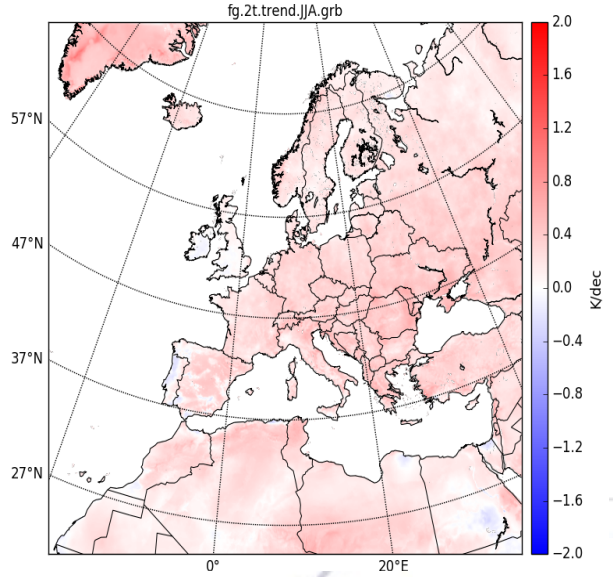
METEO FRANCE

MESCAN T2m seasonal trend patterns computed using the 55 years data









UERRA
Uncertainties in Ensembles of Regional ReAnalyses

cnrs

METEO FRANCE

Thank you for your attention! Questions ?