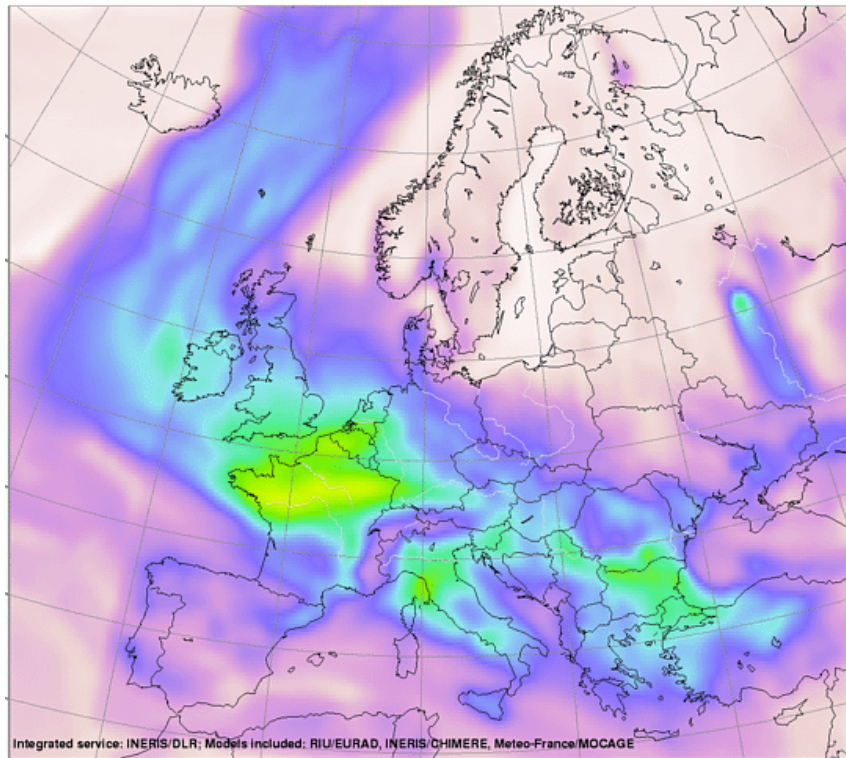


# The PROMOTE Integrated Air Quality Platform

## User Guide



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This user manual is available at  
[http://wdc.dlr.de/data\\_lib/IAQP/L4/LATEST/iaqp\\_users\\_guide.pdf](http://wdc.dlr.de/data_lib/IAQP/L4/LATEST/iaqp_users_guide.pdf)

Please send comments, suggestions, and questions to [Thilo.Erbertseeder@dlr.de](mailto:Thilo.Erbertseeder@dlr.de)

## The PROMOTE European Integrated air quality platform

This service provides a daily ensemble forecast of air pollutant concentrations up to 72 hours for all of Europe.

It delivers ground level concentrations, at ambient conditions, of

- ozone,
- nitrogen dioxide and
- particulate matter

The pollutant forecasts are integrated from several well established and validated chemistry-transport models. The final product is based on an ensemble approach in order to get the best result from a combination of different models. Currently, forecasts are provided at a spatial resolution of  $0.5^{\circ} \times 0.5^{\circ}$  and a temporal resolution of 1 hour.

In the near future analysed maps will be available, too. They will be issued from simulations including assimilated in-situ observations. All products are available daily using near-real-time observational data from satellite and ground.

Currently the following air quality forecasting systems are included:

- CHIMERE by INERIS, France
- EURAD by the Rhenish Institute for Environmental Research, Germany
- MOCAGE by Météo France

And we are now working to add:

- SILAM by FMI, Finland
- LOTOS-EUROS by TNO, The Netherlands
- POLYPHEMUS by CEREAS, France

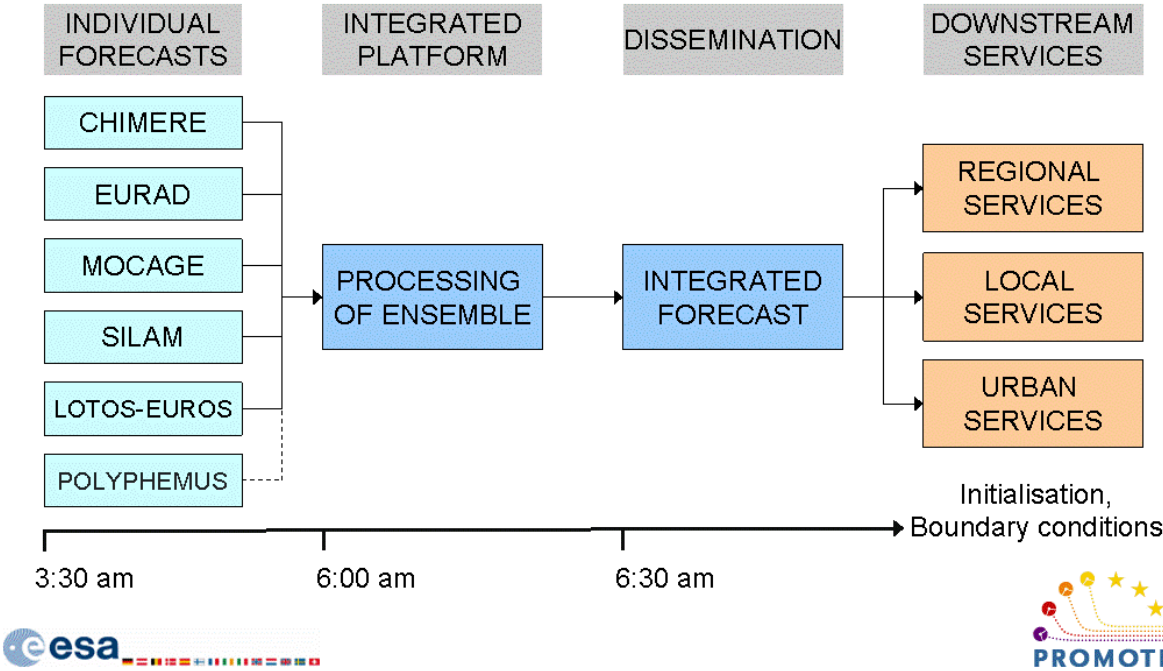
The integrated air quality platform is coordinated by INERIS, France and the platform is provided by DLR, Germany

All products and information is available at the service homepage  
[http://wdc.dlr.de/data\\_products/projects/promote/IAQ/index.html](http://wdc.dlr.de/data_products/projects/promote/IAQ/index.html)

# Timeline and Delivery

The operational integrated air quality forecast is currently available daily at 6:30 am Central European Time. If you require an earlier delivery, please let us know.

The current and all previous forecasts are freely accessible via a web archive. It comprises images and data. All products are referenced by the issue date of the forecasts.



## How to obtain data and images?

All data products are referenced by the issue date of the forecast in the filename.

### Alternative 1 – Direct Access

- Access the latest forecast data in NCDF format directly via the URL [http://wdc.dlr.de/data\\_lib/IAQP/L4/LATEST/index.php](http://wdc.dlr.de/data_lib/IAQP/L4/LATEST/index.php)
- Access the IAQ data archive directly via the URL [http://wdc.dlr.de/data\\_lib/IAQP/L4/SPECIES/CONC/FC/V1/hourly/index.php](http://wdc.dlr.de/data_lib/IAQP/L4/SPECIES/CONC/FC/V1/hourly/index.php)  
Browse the archive by date download the data files in NCDF format
- Access the IAQ image archive directly via the URL [http://wdc.dlr.de/data\\_lib/IAQP/L4/SPECIES/CONC/FC/V1/daily/GIF/EU/index.php](http://wdc.dlr.de/data_lib/IAQP/L4/SPECIES/CONC/FC/V1/daily/GIF/EU/index.php)  
Browse the archive by date download the data files in NCDF format

**Please note:** all data and images are provided via the World Data Center for Remote Sensing of the Atmosphere (<http://wdc.dlr.de>). All products are freely accessible after a short registration.

### Alternative 2 – Via Webpage

The data products and images are freely available via the service homepage [http://wdc.dlr.de/data\\_products/projects/promote/IAQ/index.html](http://wdc.dlr.de/data_products/projects/promote/IAQ/index.html)

See section “Data and Image Archive”

- In order to obtain the latest IAQ forecast data (for the current date) please click [Latest 72 hour forecast, hourly resolution](#)
- To obtain archived data browse the archive by date and download the files in NCDF format under [Archived 72 hour forecasts, hourly resolution](#)
- Images of the pollutant forecasts for O<sub>3</sub>, NO<sub>2</sub> and PM<sub>10</sub> can be accessed via [Latest and archived images of pollutant maxima, minima and means](#)

**Please note:** all data and images are provided via the World Data Center for Remote Sensing of the Atmosphere (<http://wdc.dlr.de>). All products are freely accessible after a short registration.

## Data Description

The forecast product contains ground level concentrations of ozone, nitrogen dioxide and particulate matter 10 at ambient conditions in  $\mu\text{g}/\text{m}^3$ . The concentrations are calculated from the volume mixing ratios using pressure and temperature of the lowermost level of each CTM. This is done for each ensemble member separately using the individual ambient conditions. Then the ensemble is built based on the ambient concentration levels.

The forecast product further contains 3 vectors describing the 3 dimensions of the pollutant data sets: <longitude> defines the longitudes along the x axis, <latitude> defines the latitudes along the y axis and <time> defines the date and time of the forecasts along the t axis.

### Data

rank	name	dimensions	dimension sizes	units	data type
1	longitude	1	211	degrees North	float
2	latitude	1	91	degrees East	float
3	time	1	72	YYYYmmddhh	integer
4	O3	3	211 x 91 x 72	$\mu\text{g}/\text{m}^3$	float
5	NO2	3	211 x 91 x 72	$\mu\text{g}/\text{m}^3$	float
6	PM10	3	211 x 91 x 72	$\mu\text{g}/\text{m}^3$	float

## Metadata

<b>parameter</b>	<b>value</b>
Data format	NetCDF
x min (longitude)	-40°E
x max (longitude)	65°E
y min (latitude)	30°N
y max (latitude)	75°N
t min (time)	Day 0 + 1 hour
t max (time)	Day 0 + 72 hours
x dimension size	211
y dimension size	91
t dimension size	72
dx (spatial increment of longitude)	0,5°
dy (spatial increment of latitude)	0,5°
dt (temporal increment of time)	1 hour

## How to read the data?

### The network Common Data Format

The PROMOTE IAQP data products are written in NCDF (Network Common Data Form) format. NCDF is a set of software libraries and machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data.

See the alternatives below to read the PROMOTE IAQP forecasts in NCDF format.

Further information can be obtained from the NCDF Homepage <http://www.unidata.ucar.edu/software/netcdf/>

### Alternative 1: PANOPLY Data Browser

Panoply is a freely available Java application for visualisation and exploration of geo-gridded arrays from NCDF datasets.

Download PANOPLY at <http://www.giss.nasa.gov/tools/panoply/>

A User Guide is available on this page as well.

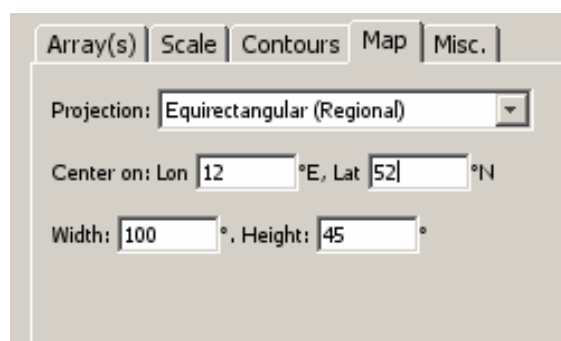
Install PANOPLY

Start PANOPLY and open an IAQP forecast NCDF data file in the PANOPLY datasets browser

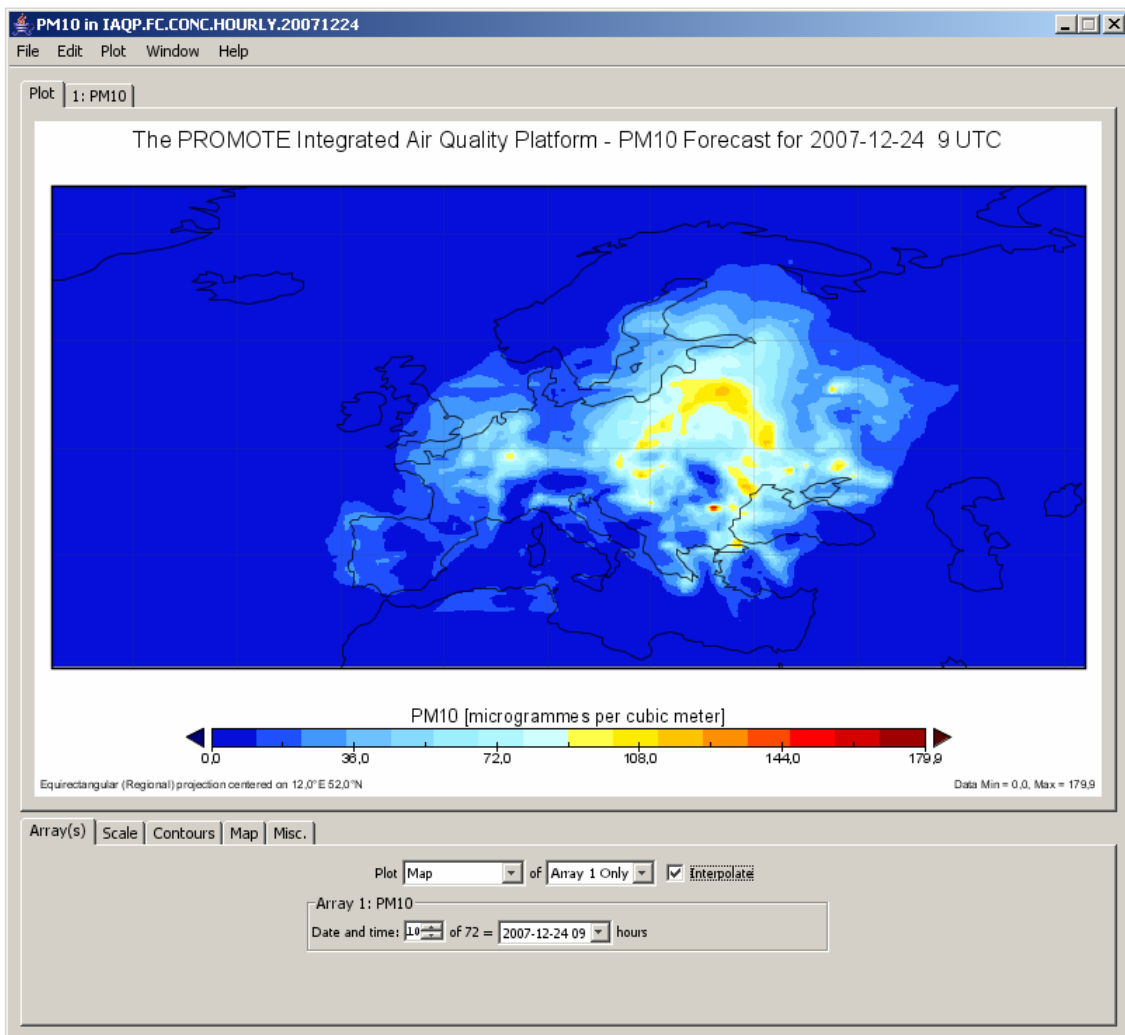
Select one air pollutant by double click

Select plot type “lon-lat”

A global air pollutant map will now be depicted. To confine the map to Europe, select the tab “Map”, select Projection Equirectangular (Regional) and set the coordinate values as follows:



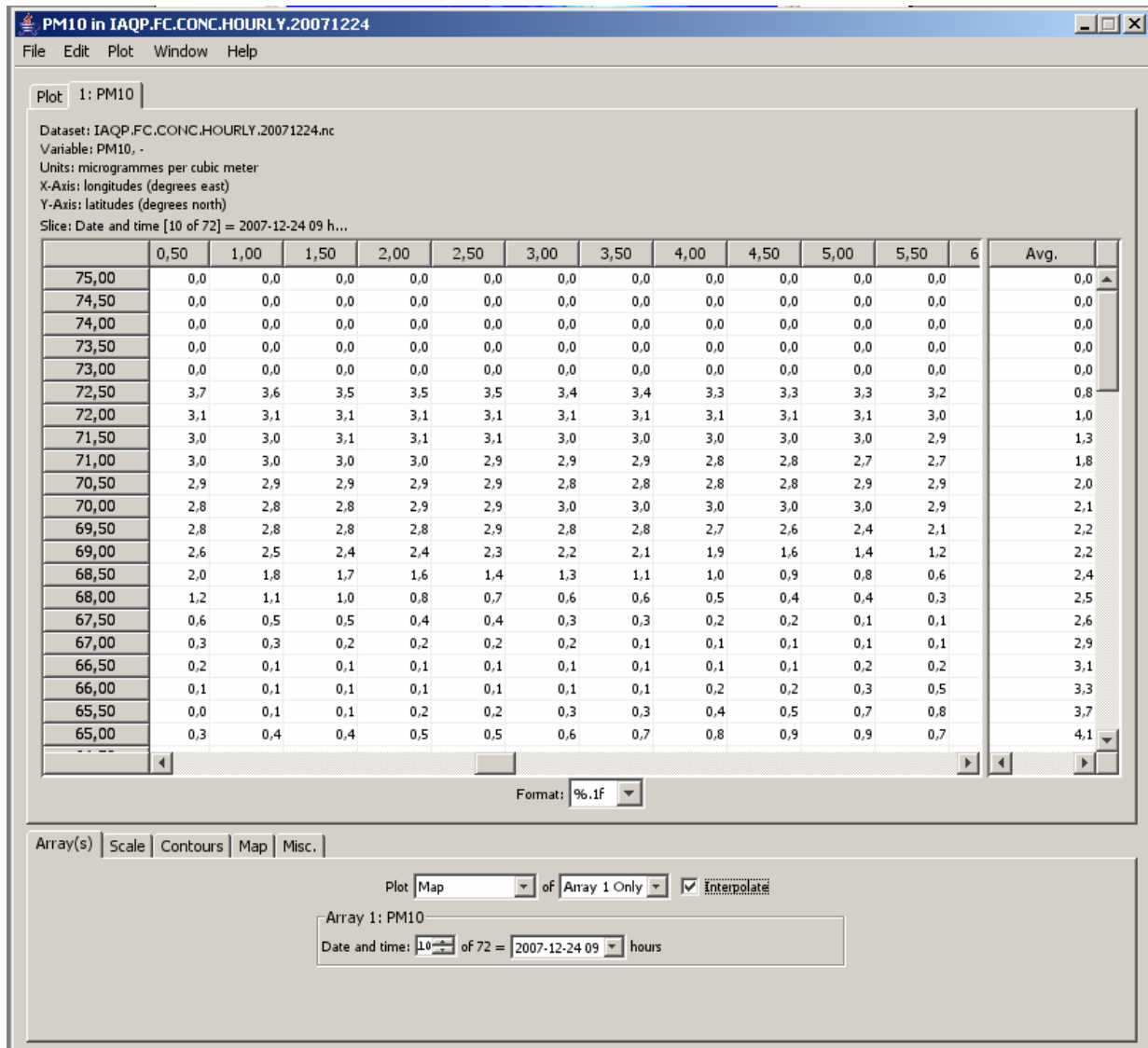
The map should then look something like:



Since each IAQP forecast is issued for 72 hours you may select the date and time in the bottom line. Date and time is given as YYYY-MM-DD hh.

To export the image, select "File", "save image as" and choose one of the data types PNG, PostScript, PDF or GIF.

By clicking the tab on top the data values can be seen as well as the zonal averages on the right.



## Alternative 2: IDL

```
pro read_nc, filename, longitude, latitude, time, O3, NO2, PM10

; procedure reads data of the PROMOTE integrated air quality forecasts in netCDF format
;
; each netcdf file contains 6 datasets:
;   latitude, longitude, time, O3, NO2, PM10
;
; the geographic domain of the forecast is defined by the datasets "latitude" and "longitude"
; the date and time for each forecast from 1 to 72 hours is defined in the dataset "time"
;
; 20070115 thilo.erbertseder@dlr.de

nc_id = NCDF_OPEN(filename,/NOWRITE)

print,' ' & print,'-- CONTENT of ', filename
print,' ' & print,'-- DIMENSIONS --'

; read longitudes
var_id = NCDF_VARID(nc_id,'longitude')
NCDF_VARGET, nc_id, var_id, longitude
NCDF_ATTGET, nc_id, var_id, 'long_name', long_name
NCDF_ATTGET, nc_id, var_id, 'units', units
print,string(long_name), min(longitude), max(longitude), ' ', string(units)

; read latitudes
var_id = NCDF_VARID(nc_id,'latitude')
NCDF_VARGET, nc_id, var_id, latitude
NCDF_ATTGET, nc_id, var_id, 'long_name', long_name
NCDF_ATTGET, nc_id, var_id, 'units', units
print,string(long_name), min(latitude), max(latitude), ' ', string(units)

; read date and time
var_id = NCDF_VARID(nc_id,'time')
NCDF_VARGET, nc_id, var_id, time
NCDF_ATTGET, nc_id, var_id, 'long_name', long_name
NCDF_ATTGET, nc_id, var_id, 'units', units
print,string(long_name), min(time), max(time), ' ', string(units)

print,' ' & print,'-- DATASETS --'

; read the ozone dataset
var_id = NCDF_VARID(nc_id,'O3')
NCDF_VARGET, nc_id, var_id, O3
NCDF_ATTGET, nc_id, var_id, 'species', species
NCDF_ATTGET, nc_id, var_id, 'units', units
print,string(species),' in ', string(units), ' ', size of dataset: ',size (O3)

; read the nitrogen dioxide dataset
var_id = NCDF_VARID(nc_id,'NO2')
NCDF_VARGET, nc_id, var_id, NO2
NCDF_ATTGET, nc_id, var_id, 'species', species
NCDF_ATTGET, nc_id, var_id, 'units', units
print,string(species),' in ', string(units), ' ', size of dataset: ',size (NO2)
```

```

; read the PM10 data set
var_id = NCDF_VARID(nc_id,'PM10')
NCDF_VARGET, nc_id, var_id, PM10
      NCDF_ATTGET, nc_id, var_id, 'species', species
      NCDF_ATTGET, nc_id, var_id, 'units', units
      print, string(species),' in ', string(units), ', size of dataset: ',size (PM10)

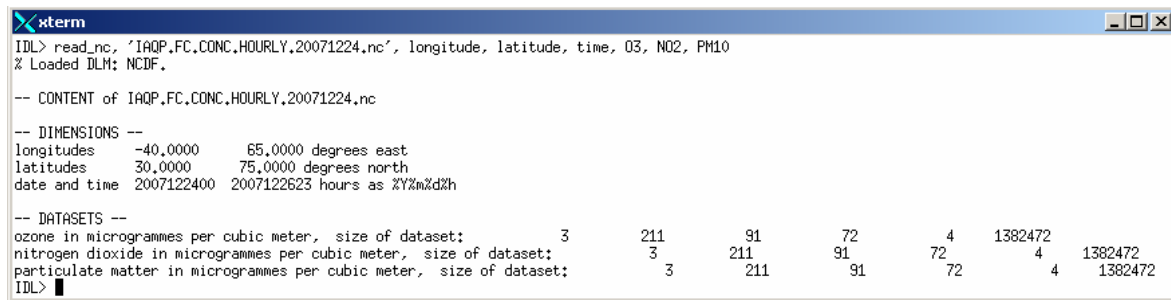
```

```
NCDF_CLOSE, nc_id
```

```
RETURN
END
```

## Example:

For the file *IAQP.FC.CONC.HOURLY.20071224.nc* the procedure output in the IDL Shell should look like:



```

xterm
IDL> read_nc, 'IAQP.FC.CONC.HOURLY.20071224.nc', longitude, latitude, time, O3, NO2, PM10
% Loaded DLH: NCDF.

-- CONTENT of IAQP.FC.CONC.HOURLY.20071224.nc

-- DIMENSIONS --
longitudes  -40,0000    65,0000 degrees east
latitudes    30,0000    75,0000 degrees north
date and time 2007122400 2007122623 hours as %Y%m%d%h

-- DATASETS --
ozone in microgrammes per cubic meter, size of dataset:      3      211      91      72      4      1382472
nitrogen dioxide in microgrammes per cubic meter, size of dataset: 3      211      91      72      4      1382472
particulate matter in microgrammes per cubic meter, size of dataset: 3      211      91      72      4      1382472
IDL>

```

## Alternative 3

ncdump <http://www.unidata.ucar.edu/software/netcdf/docs/ncdump-man-1.html>

## Alternative 4

Other interfaces to NCDF for Python, Fortran, C or Java are described at <http://www.unidata.ucar.edu/software/netcdf/>

## **Conditions of Data Usage**

If data obtained from PROMOTE IAQP is used for any presented or published activities, research, or is further disseminated, it is important to acknowledge and reference its origin as being "the PROMOTE European Integrated Air Quality Platform." You may also cite the URL <http://www.gse-promote.org>

## **Acknowledgments**

We thank Mark Jackson (CERC) for his valuable comments.