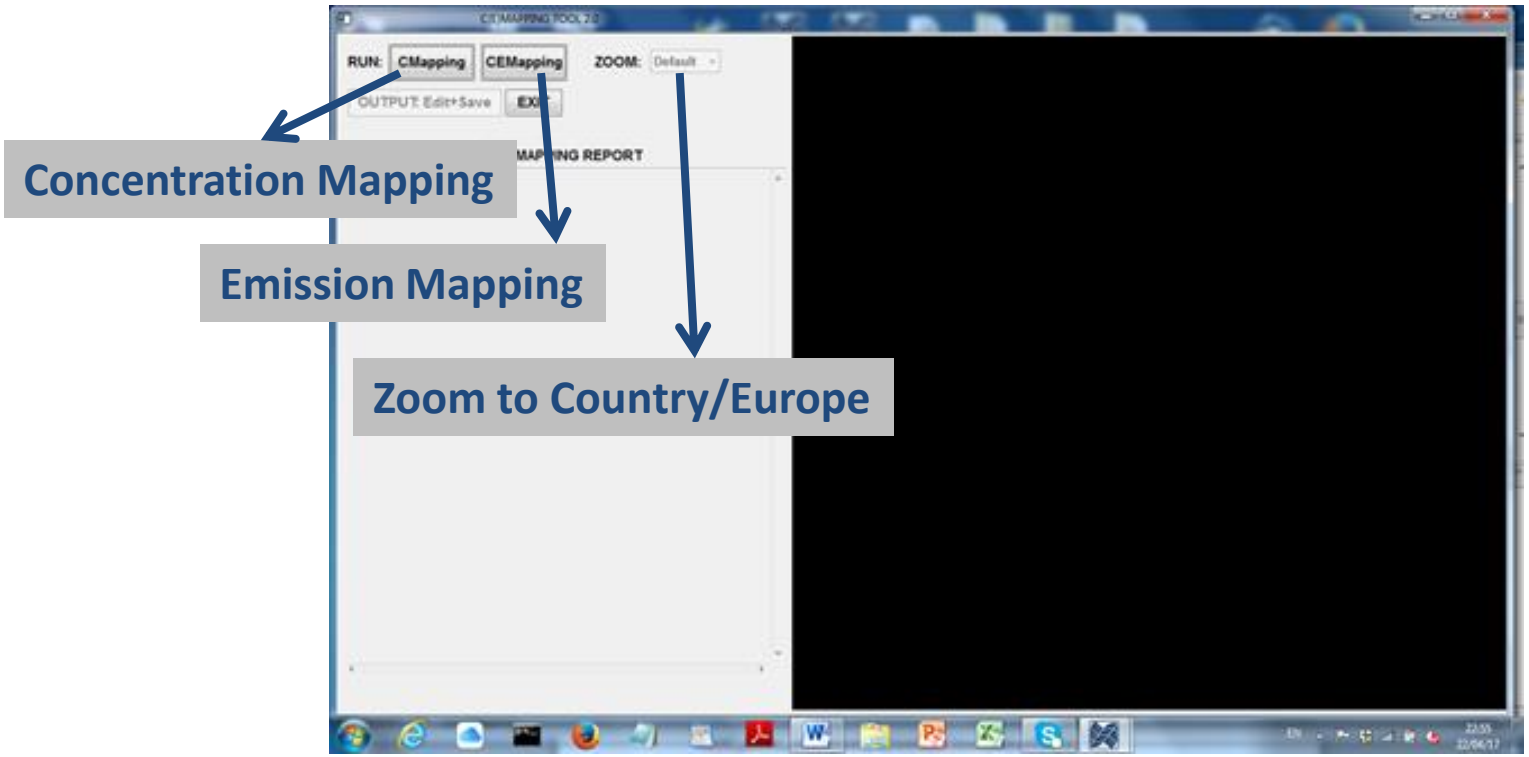
CMAP/CEMAP TOOL on compliance to the standards for Fairmode Composite Mapping

- IDL-based executable
- To be installed on your pc
- Many checks/tests on compliance to the standards
- Outcome: User input is Yes/No ready for uploading to the database

- Setup file downloadable from Fairmode Website
- 50 Mb, including examples, and user's guide (no licences needed)
- Folder structure: CMAP_Home -> UserInput
  UserOutput
  Conversion
  CMAPinput (hidden)

Openings window



User Input File Format:

- **CMAP_*Model_CountryCode_Pollutant_EPSGxxx_info.extension***
  Pollutants: NO2, PM10, PM2.5, O3 [µg/m3]
- **CEMAP_*InvName_CountryCode_Pollutant_Sector_EPSGxxx_info.extension***
  Pollutants: CO, NH_3, NMVOC, NOx, PM10, PM2.5, SO_2, CH_4 [Ton/km2/year]
  Sectors: S1, S2, …, S10

Examples

- CMAP_CHIM_ESP_NO2_EPSG4326_annual_mean_2012.asc
- CMAP_CHIM_PRT_NO2_EPSG3763_info.asc
- CMAP_CAMX_SVK_PM10_EPSG2065_2011.asc
- CMAP_ADMS_GBR_NO2_EPSG4258_info.tif
- CMAP_GRAL_AUT_NO2_EPSG31255_linz_total.tif

- CEMAP_MACC1_ESP_NO2_S3_EPSG4326_annual_mean_2012.asc
- CEMAP_ EC4MACS _SVK_PM10_S4_EPSG2065_2011.asc
- CEMAP_ myInventory _BEL_PM10_S7_EPSG3447_2012_raster.asc
- CEMAP_ JRCinv _GBR_NO2_S1_EPSG4258_info.tif
- CEMAP_ anyName _BEL_PM10_S10_EPSG3447_2012.tif

=> Test on the FileName structure

2 extensions: asc (ascii)
tif (tagged image format)

Type 1: asc

Domain: square with dx and dy
If noValue then NODATA

Example 1

ncols 161
nrows 90
xllcorner -10.5
yllcorner 35.500056179775
cellsize 0.099887640449438
NODATA_value -9999

-9999 -
9999 -9999
-9999 -
9999 -9999
-9999 -
9999 -9999
-9999 -
9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
-9999 -
9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 –
....

---90 rows with each 161 numbers-

Example 2

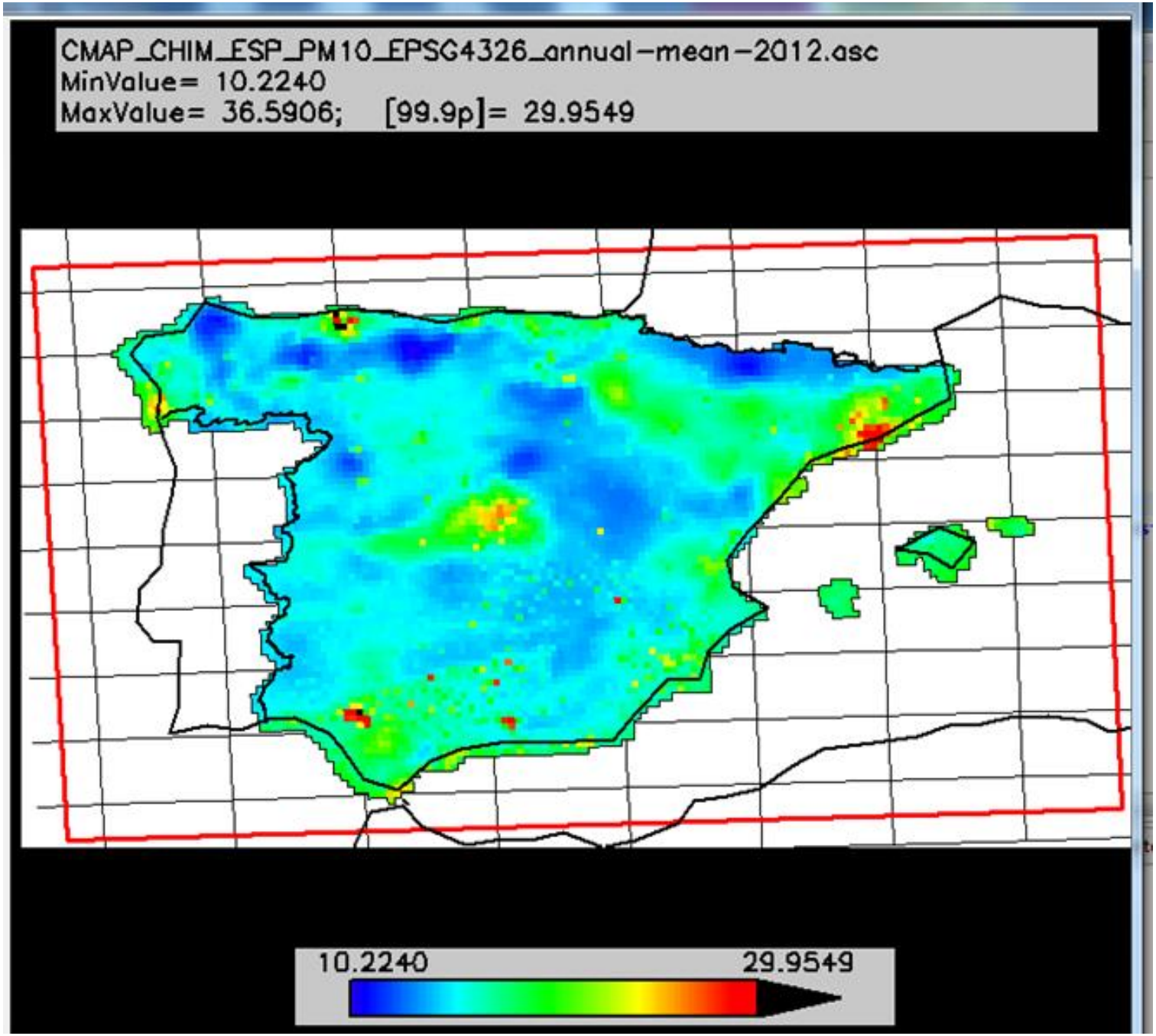
ncols 287
nrows 251
xllcenter -2331198
yllcenter -2682412
cellsize 24000 24000
NODATA_value -9999
---251 rows with each 287 numbers---

The checks

- Does the name of the input file start with CMAP? (CEMAP)
- Is the extension asc or tif?
- Format of the file name ok?
- Is the Country code correct?
- Is the Pollutant and accepted one?
- Is the EPSG code (coordinate/projection system) an existing one?
- Is the line for NCOLS correct?
- Is the line for NROWS correct?
- Is the line for XLLCORNER / XLLCENTER correct?
- Is the line for YLLCORNER / YLLCENTER correct?
  - Note: XLL and YLL are given in the EPSG CS
- Is the line for CELLSIZE correct?
  - Note: CELLSIZE is in EPSG CS.
    If one value is given, then dx is equal to dy, otherwise different.
- Is the line for NODATA_value correct?
- Are all pollutant values >= 0, or equal to NODATA_value?
- Using the GDAL cs2cs application (spawn command in IDL) the user EPSGxxx CS is converted in EPSG4326, which is the standard (global lat-lon) WGS84 CS.
- Is the centre of the domain in Europe / Country?
- Min, Max, and Mean values of the pollutant are calculated. Are they in the expected range?
- Bounds of the map are calculated. Do they fall within the bounds of the Country?
- Finally, a map is produced, and the user has to decide about the correctness of the results.

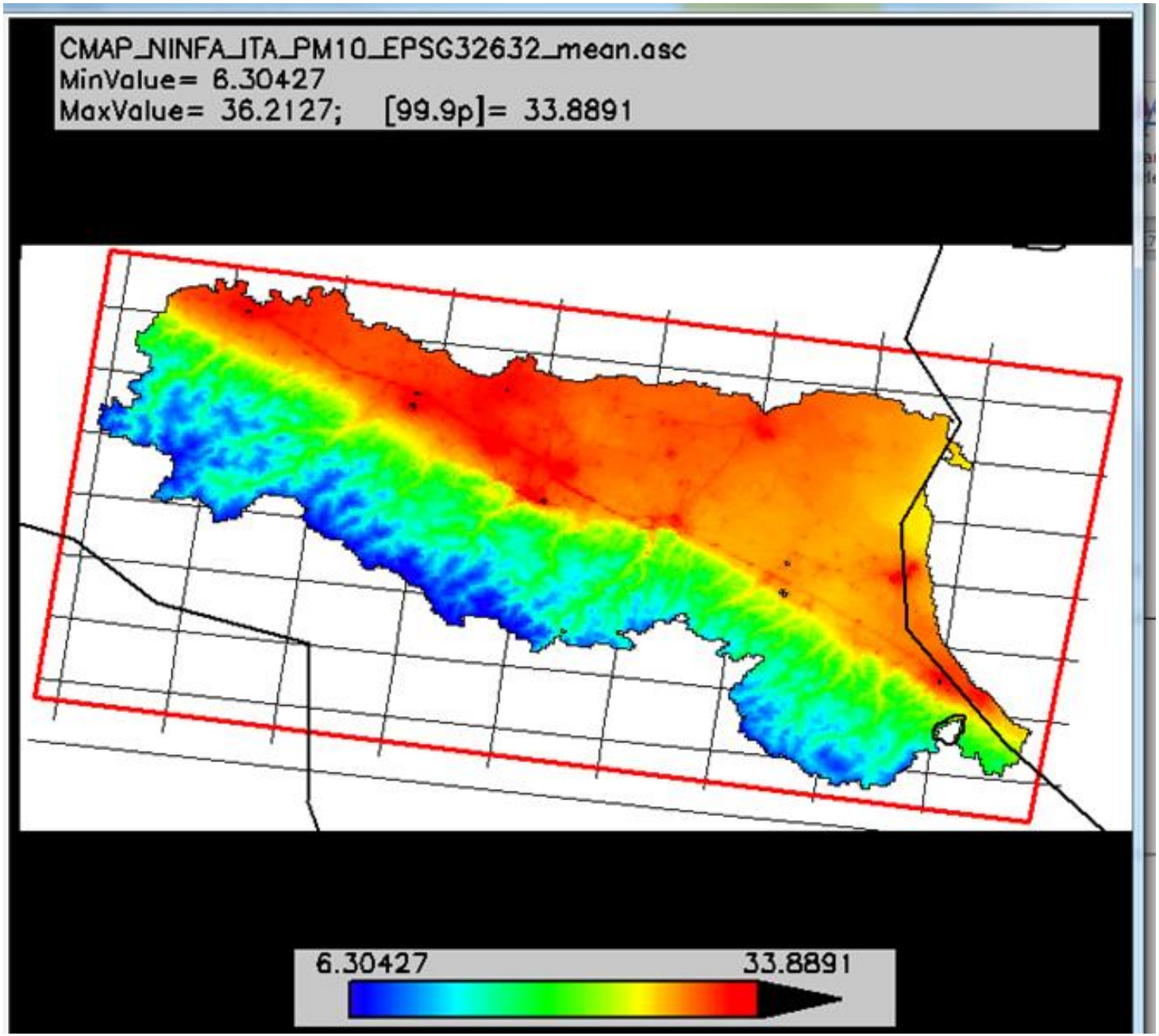
Example: SPAIN

```
Home_Directory:  C:\CMapping\
Tue Jan 24 11:44:05 2017
********************************************************************************
****************************

Please select an ASC or GeoTIFF file...
FILE:         CMAP_CHIM_ESP_PM10_EPSG4326_annual-mean-2012.asc
FOLDER:       C:\CMapping\UserInput\Examples_ASC
FILE_TYPE:    ASC
MODEL:        CHIM
COUNTRY:      SPAIN  ESP
POLLUTANT:    PM10
EPSG:         EPSG4326
EPSG info:    # WGS 84: <4326> +proj=longlat +datum=WGS84 +no_defs  <>
NCOLS:        161
NROWS:        90
DIMENSIONS:   161       90
CELLSIZE:     0.099887640449438    0.099887640449438
NODATA_value: -9999
All Values >= 0. or equal to -9999  => ok
Domain (EPSG4326) cell corners saved in Conversion\tmpInputCoord.dat
LL_CORNER:    Lon=-10.5499      Lat=35.4501            in  EPSG4326
Start cs2cs
Done cs2cs
Domain (EPSG4326) cell corners saved in Conversion\tmpOutputCoord.dat
LL_CORNER:    Lon=-10.5499      Lat=35.4501            in  EPSG4326
POLLUTANT:    Min Max Mean  =  10.2240    36.5906    16.0481
Is this within the expected range ??  Yes
Map Bounds:     UL= [-10.5499,44.3901]      UR= [5.48200,44.3901]
                LL= [-10.5499,35.4501]      LR= [5.48200,35.4501]
Country Bounds: UL= [-11.0000, 45.0000]     UR= [6.00000, 45.0000]
                LL= [-11.0000, 34.0000]     LR= [6.00000, 34.0000]
The map is saved as ... C:\CMapping\\UserOutput\PICT_CMAP_1.tif

QUESTION !!,  , IS THIS OK ??
YES ... Input Data => OK !!
********************************************************************************
```

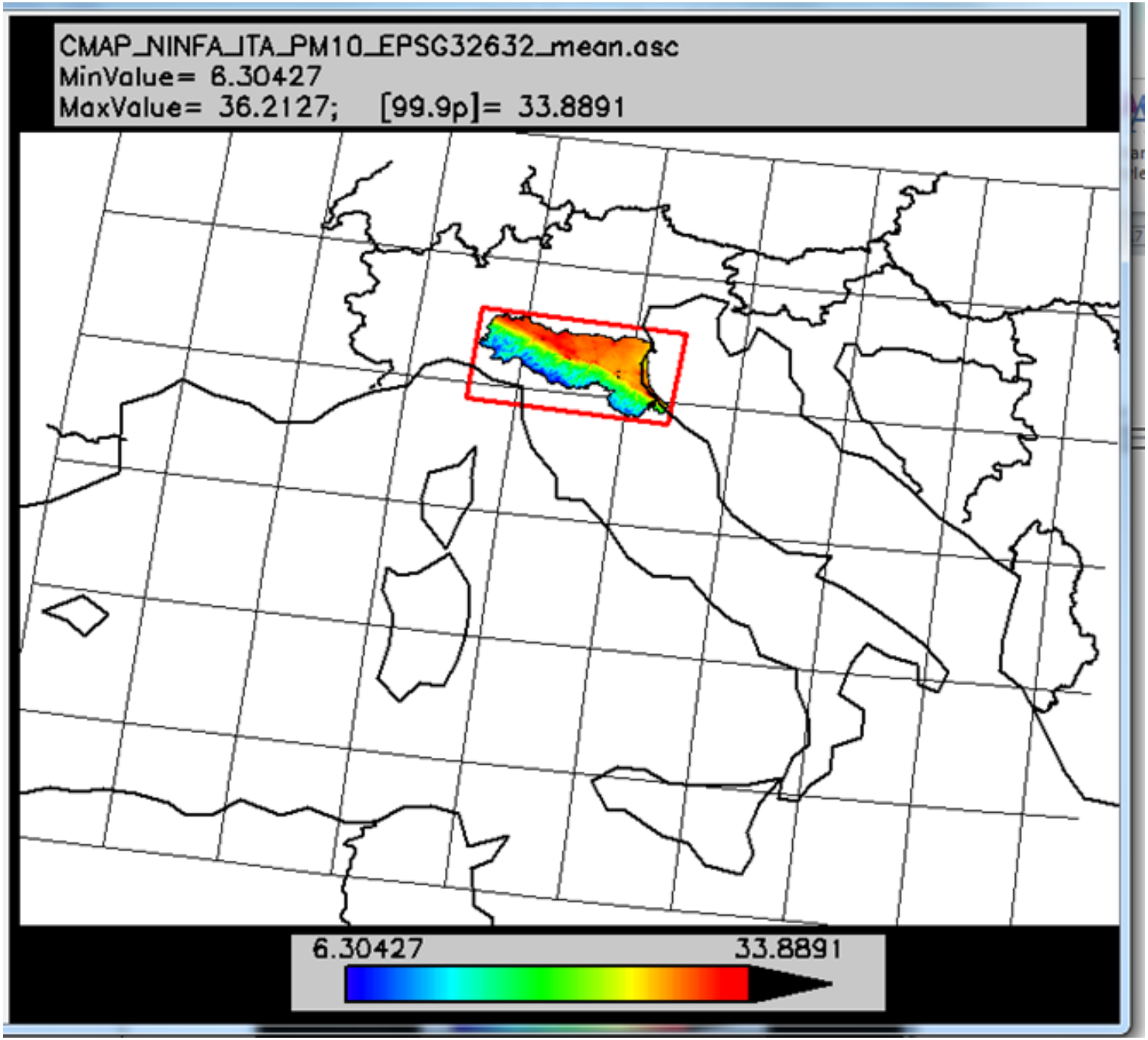

CMAP_CHIM_ESP_PM10_EPSG4326_annual-mean-2012.asc
MinValue= 10.2240
MaxValue= 36.5906; [99.9p]= 29.9549
10.2240
29.9549

Example: EMR -ITA

```
Home_Directory:  C:\CMapping\
Tue Jan 24 11:50:07 2017
********************************************************************************************************************

Please select an ASC or GeoTIFF file...
FILE:         CMAP_NINFA_ITA_PM10_EPSG32632_mean.asc
FOLDER:       C:\CMapping\UserInput\Examples_ASC
FILE_TYPE:    ASC
MODEL:        NINFA
COUNTRY:      ITALY  ITA
POLLUTANT:    PM10
EPSG:         EPSG32632
EPSG info:    # WGS 84 / UTM zone 32N: <32632> +proj=utm +zone=32 +datum=WGS84 +units=m +no_defs  <>
NCOLS:        297
NROWS:        161
DIMENSIONS:   297       161
CELLSIZE:     1000    1000
NODATA_value: -9999
All Values >= 0. or equal to -9999  => ok
Domain (EPSG32632) cell corners saved in Conversion\tmpInputCoord.dat
LL_CORNER:    Lon=509500.       Lat=4.84250e+006       in  EPSG32632
Start cs2cs
Done cs2cs
Domain (EPSG4326) cell corners saved in Conversion\tmpOutputCoord.dat
LL_CORNER:    Lon=9.11800       Lat=43.7355            in  EPSG4326
POLLUTANT:    Min Max Mean  =  6.30427    36.2127    22.9524
Is this within the expected range ??  Yes
Map Bounds:     UL= [9.12090,45.1804]      UR= [12.8902,45.1142]
                LL= [9.11800,43.7355]      LR= [12.7957,43.6725]
Country Bounds: UL= [2.66109, 47.2000]     UR= [20.4474, 47.2000]
                LL= [2.66109, 36.4000]     LR= [20.4474, 36.4000]
The map is saved as ... C:\CMapping\\UserOutput\PICT_CMAP_3.tif

QUESTION !!,  , IS THIS OK ??
YES ... Input Data => OK !!
********************************************************************************
```


CMAP_NINFA_ITA_PM10_EPSG32632_mean.asc
MinValue= 6.30427
MaxValue= 36.2127; [99.9p]= 33.8891
6.30427
33.8891

Is this ok ??


CMAP_NINFA_ITA_PM10_EPSG32632_mean.asc
MinValue= 6.30427
MaxValue= 36.2127; [99.9p]= 33.8891
6.30427
33.8891

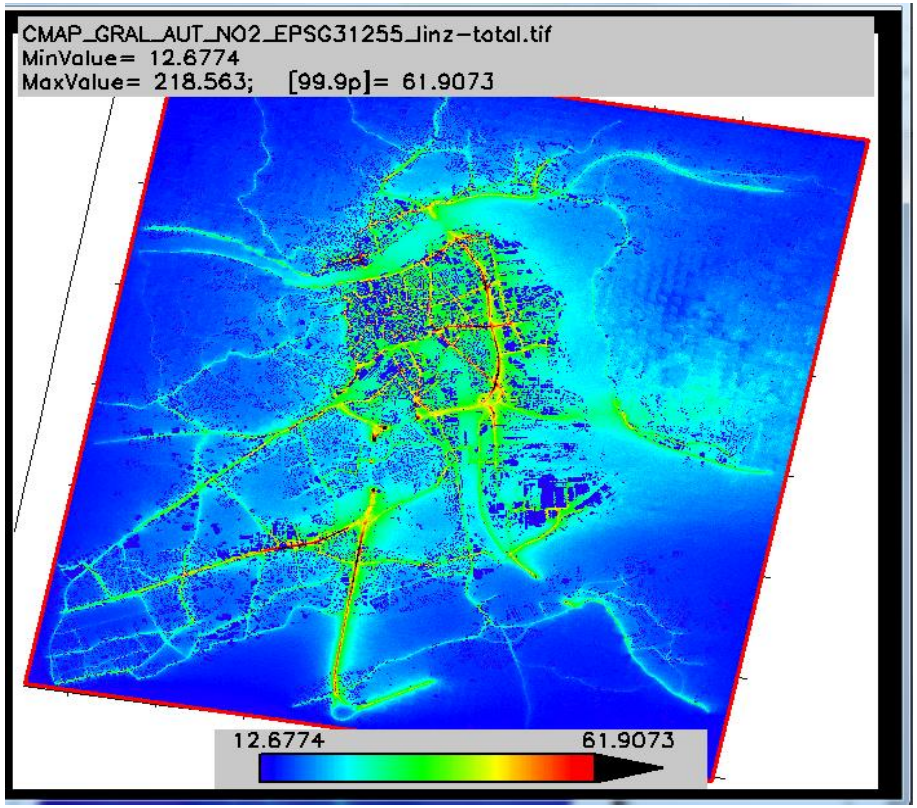
Type 2: tif The checks

- Check on the existence of the *.tif file.
- Extraction of ‘tiff_info’ and geotiff_info information.
- The number of tif channels must be equal to 1. If the value is equal to 3 then data is stored as colour band. Data must be stored in the grey band as actual values.
- Check on the array dimensions of the map (similar to NCOLS and NROWS above)
- Check on the number of images, must be 1. Only one pollutant per file is allowed
- Check on the orientation of the map (top, bottom, left, right), this is used to make the correct plot of the map, and not up-side down.
- Determine the position of the origin of the domain in the EPSG CS.
  The origin is the centre of the upper-left cell of the domain.
- Resolution in X and Y direction (similar to CELLSIZE above).
- Using the GDAL cs2cs application (spawn command in IDL) the user EPSGxxx CS is converted in EPSG4326, which is the standard WGS84 CS.
- Min, Max, and Mean values of the pollutant are calculated. Are they in the expected range?
- Bounds of the map are calculated. Do they fall within the bounds of the Country?
- Finally, a map is produced, and the user has to decide about the correctness of the results.

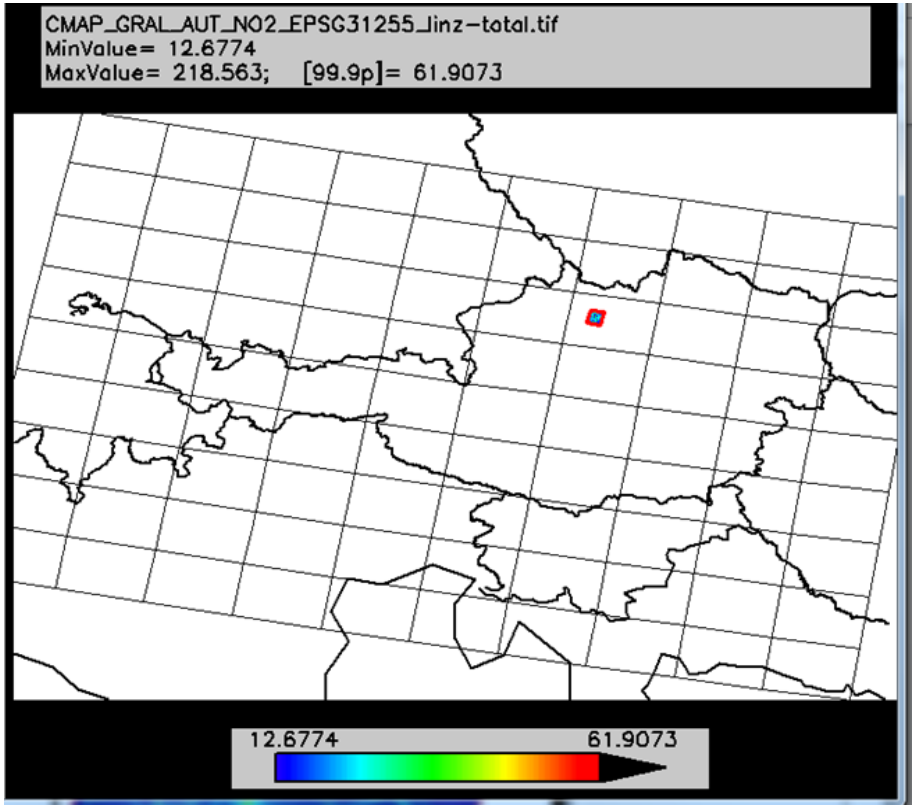
Example: Linz - AUT

```
Home_Directory:  C:\CMapping\
Tue Jan 24 11:53:23 2017

Please select an ASC or GeoTIFF file...
FILE:       CMAP_GRAL_AUT_NO2_EPSG31255_linz-total.tif
FOLDER:     C:\CMapping\UserInput\Examples_TIF
FILE_TYPE:   TIF
MODEL:      GRAL
COUNTRY:    AUSTRIA  AUT
POLLUTANT:   NO2
EPSG:       EPSG31255
EPSG info:   # MGI / Austria GK Central: <31255> +proj=tmerc +lat_0=0 +lon_0=13.33333333333333 +k=1 +x_0=0 +y_0=-5000000 +datum=h
CHANNELS:    1
DIMENSIONS:  1165     1416     (Warning: More than 5M gridcells !!)
NUM_IMAGES:  1
ORIENTATION:  1
UL-ORIGIN cell centre in  EPSG31255:      66675.0   357035.
RESOLUTION:  10.0000   -10.0000
Wait ...     100% done
Domain (EPSG31255) cell corners saved in Conversion\tmpInputCoord.dat
LL_CORNER:   Lon=66670.0      Lat=342880.          in  EPSG31255
Start cs2cs
Wait ... cs2cs
Done cs2cs
Wait ...     100% done
Domain (epsg4326) cell corners saved in Conversion\tmpOutputCoord.dat
LL_CORNER:   Lon=14.2298      Lat=48.2207          in  EPSG4326
POLLUTANT:   Min Max Mean  =  12.6774    218.563    20.6904
Is this within the expected range ??  Yes
Map Bounds:    UL= [14.2320,48.3480]     UR= [14.3891,48.3467]
           LL= [14.2298,48.2207]     LR= [14.3865,48.2194]
Country Bounds: UL= [8.63474, 49.5000]     UR= [17.4327, 49.5000]
           LL= [8.63474, 45.0000]     LR= [17.4327, 45.0000]
Wait ...     100% done
The map is saved as ... C:\CMapping\\UserOutput\PICT_CMAP_4.tif

QUESTION !!,  , IS THIS OK ??
YES ... Input Data => OK !!
```

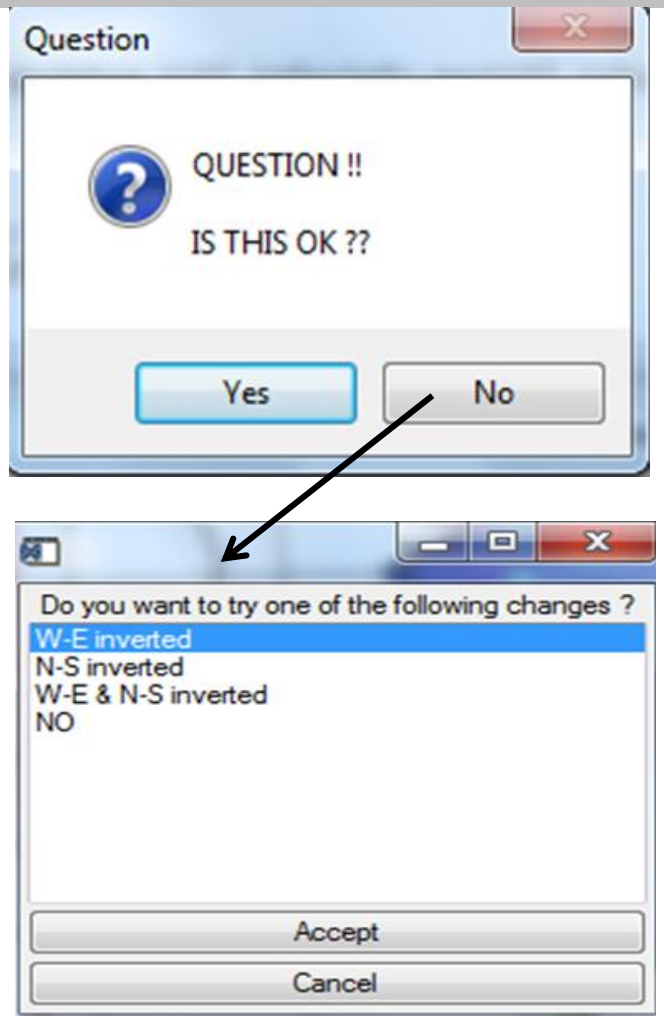
Original map



Zoom out



Final Question:
Is the map ready for uploading to the database?



User guides in the Help folder:

- CMAP
- CEMAP

- Idl based executable – local pc – compliance to the standards
- Size executable – installation – examples of user input files
- Folder structure
- CMAP*, CEMAP*
  concentrations NO2, PM10, PM2.5, O3 [µg/m3]
  emissions CO, NH_3, NMVOC, NOx, PM10, PM2.5, SO_2, CH_4 [Ton/km2/year]
- File format CMAP, CEMAP
- Run, openings window
- File structure test – examples
- Type 1: asc
- Examples
- The tests
- Report: cs2cs transforms to 4326 (lon-lat)
  old and new saved in Conversion
  min max mean (is this ok)
  map bounds, Country bounds
  Map is saved in UserOutput
- Example Spain
- Example NINFA – zoom out
- Type 2: tif
- Similar
- Example Linz – Austria
- Final Question: Is the map ready for upload to the database?
- Y/N: Try inversion of N-S and/or E-W
- Two user guides (CMAP, CEMAP)