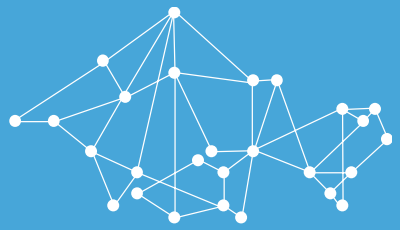
FAIRMODE
Forum for air quality modelling in Europe

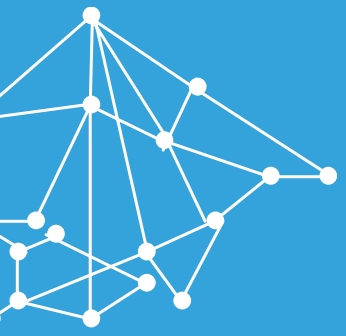


EU COMPOSITE MAPPING FIRST PROTOTYPE

STIJN JANSSEN, WIM PEELAERTS, PHILIPPE THUNIS & LUCA SPANO

CONTENT

- Objective
- First prototype
- Contributions so far
- The process: uploading data sets & processing maps
- The platform
- The future
- Discussion

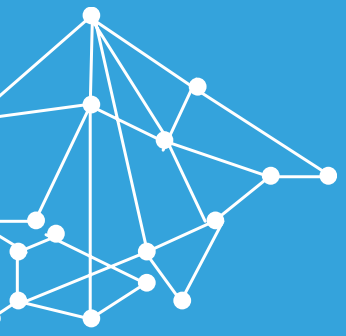


Objective

OBJECTIVE

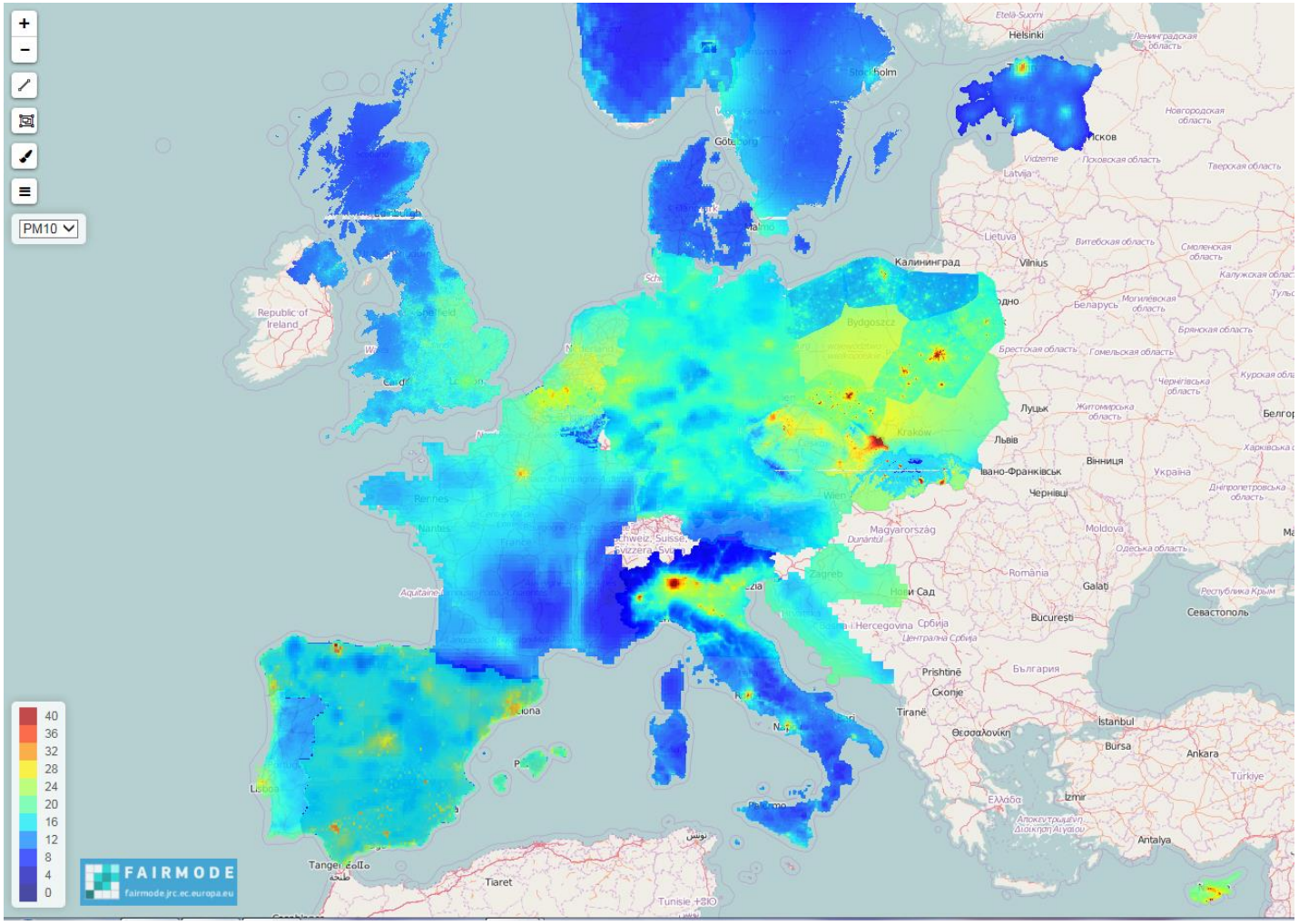
EU Composite Mapping Exercise

- Collect national, regional or local air quality assessment maps
- Compile an overall composite EU air quality map
- Use the map and the process as support to provide updated model QA/QC guidelines (MQO, emissions, data assimilation, e-Reporting…)

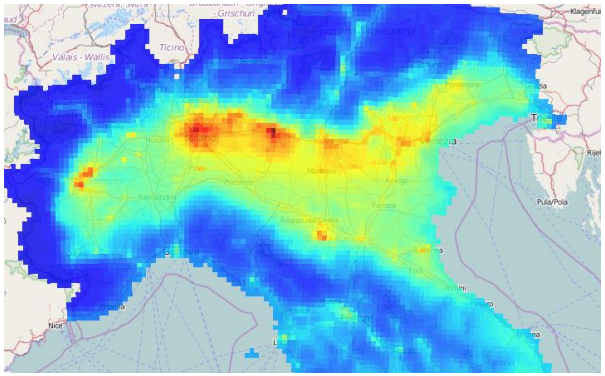


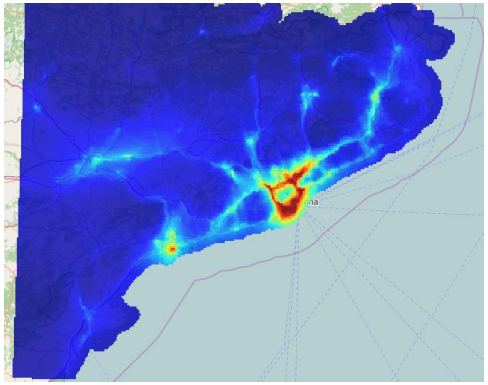
First prototype

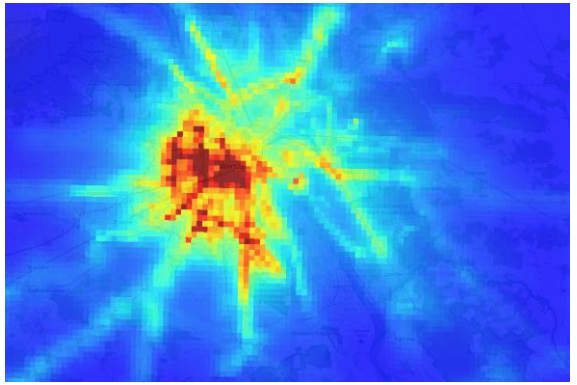
EU COMPOSITE MAP

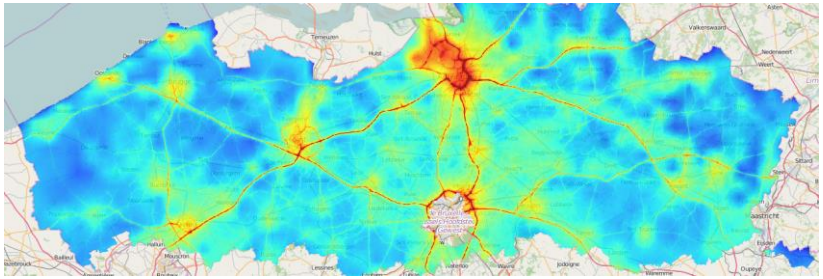


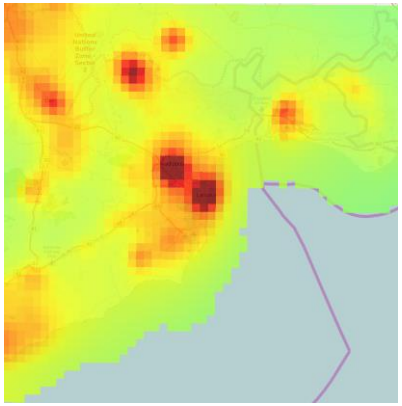
REGIONAL MAPS

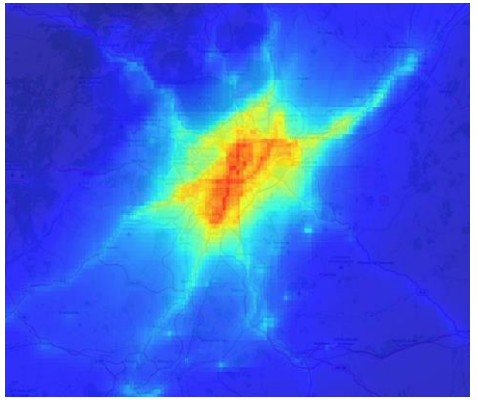




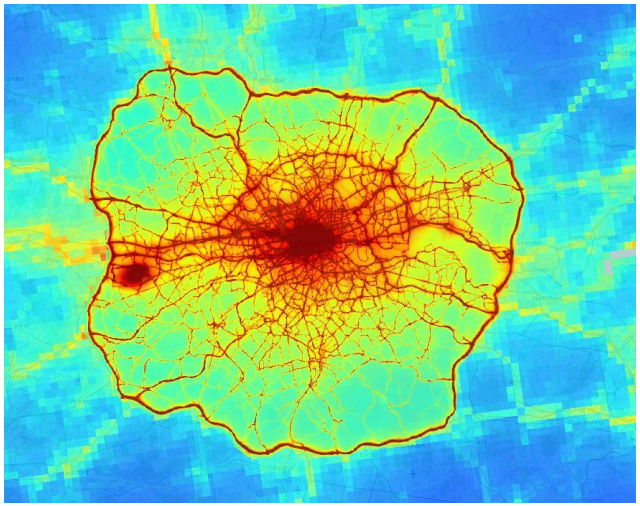


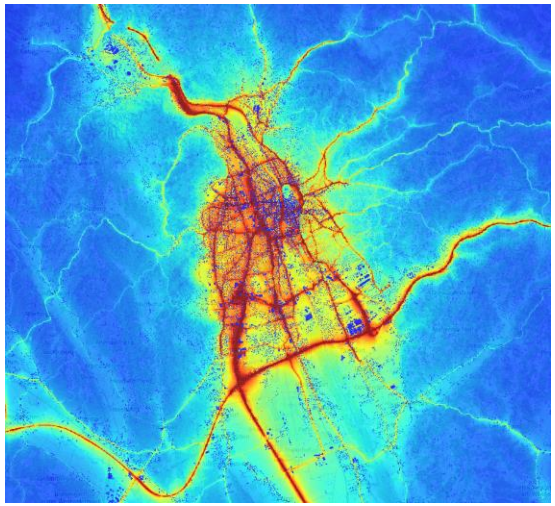


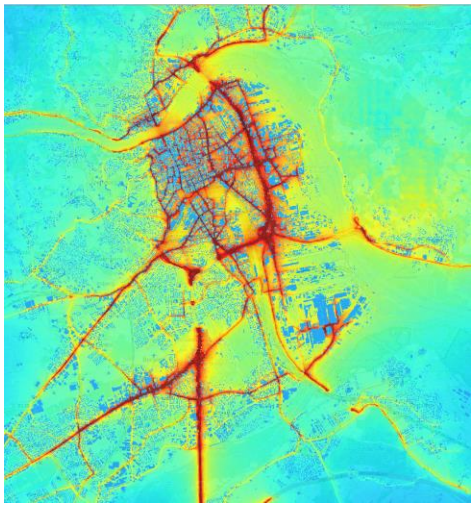


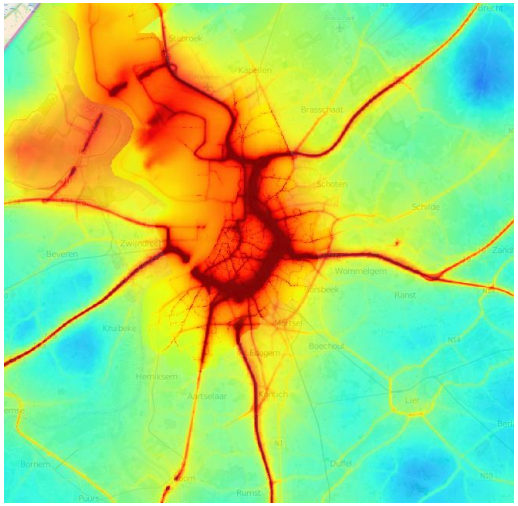


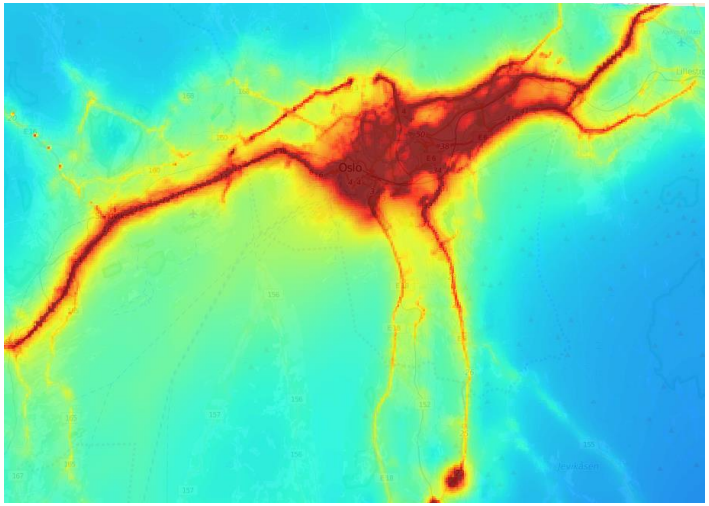
URBAN MAPS

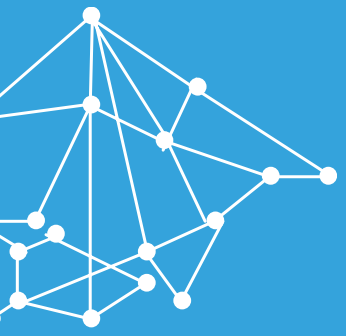






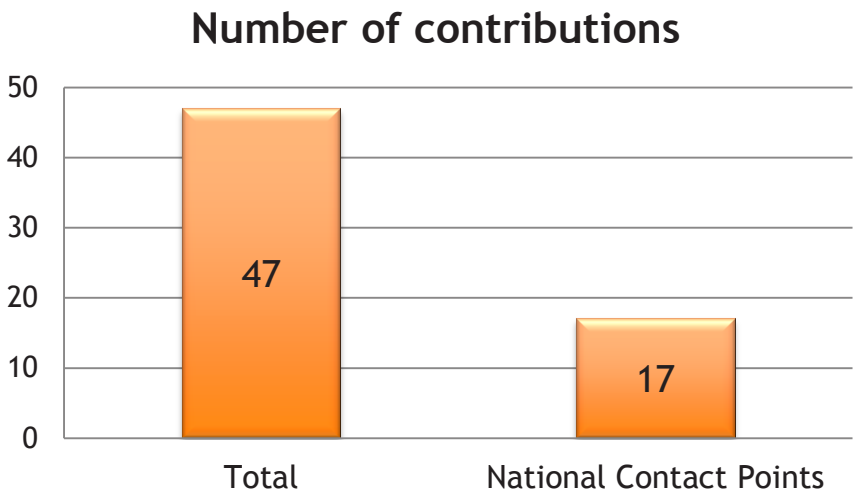


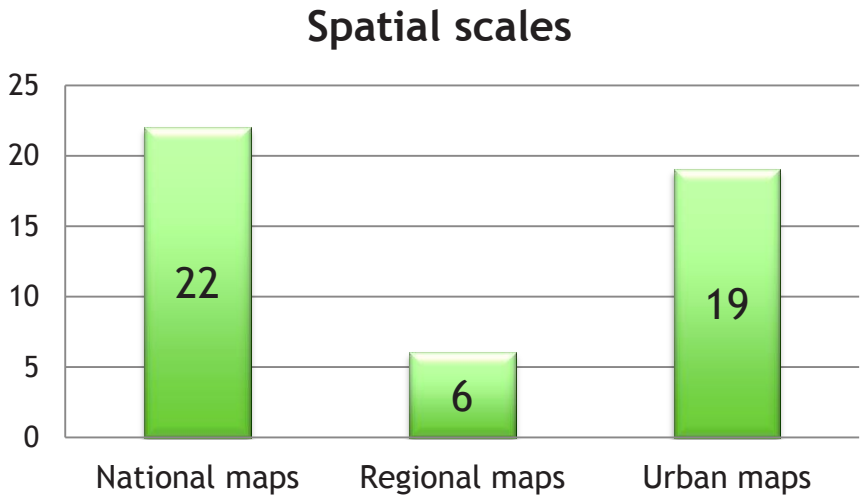




Contributions

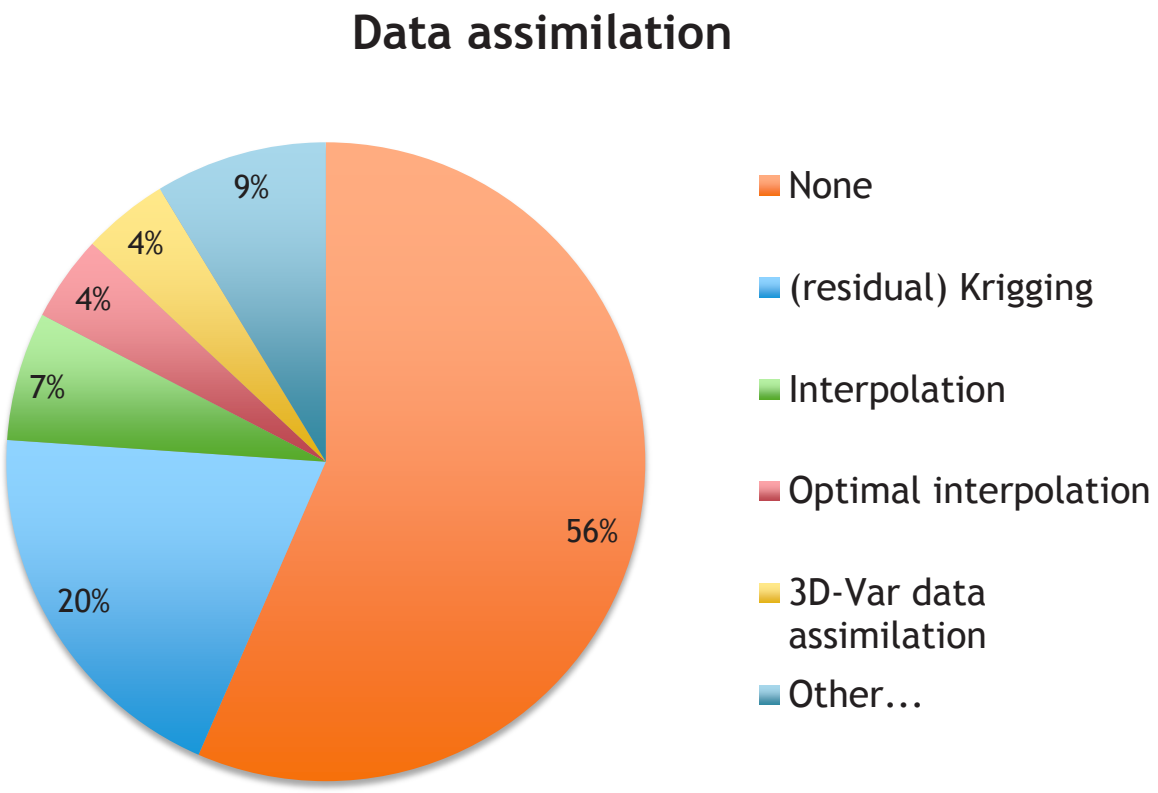
CONTRIBUTIONS SO FAR

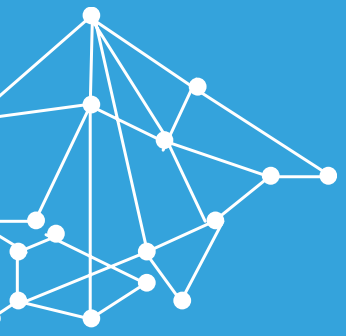




Country	Region/City	Institute	Contact person	Model
Austria	Austria	ZAMG	Hirtl Marcus	WRF-Chem
	Styria	Federal state government of styria	Payer Ingrid	Gral-Graz2
	Linz	Linz - Amt der Oö. Landesregierung	Oitzl Stefan	GRAL-Linz
Belgium	Belgium	IRCEL	Fierens Frans	RIO
	Flanders	IRCEL	Fierens Frans	RIO-IFDM
	Antwerp	VITO	Lefebvre Wouter	RIO-IFDM-OSPM
Croatia	Croatia	DHZ	Sonja Vidic	EMEP
Cyprus	Cyprus	University Thessaloniki	Tsegas Georgios	MARS-aero
	Nicosia	University Thessaloniki	Tsegas Georgios	MARS-aero
	Famagusta	University Thessaloniki	Tsegas Georgios	MARS-aero
	Limassol	University Thessaloniki	Tsegas Georgios	MARS-aero
	Larnaca	University Thessaloniki	Tsegas Georgios	MARS-aero
	Paphos	University Thessaloniki	Tsegas Georgios	MARS-aero
Czech Republic	Czech Republic	CHMI	Benešová Nina	RIMM
Denmark	Denmark	Ahrus University	Jesper Heile Christensen	DEHM
Estonia	Estonia	KLAB	Erik Teinemaa	SMHI Grid model
Finland	Finland	Finnish Meteorological Institute	Karppinen Ari	SILAM
France	France	INERIS	MELEUX Frederik	CHIMERE
Germany	Germany	Umweltbundesamt	Nordmann Stephan	RCG
	Germany	Research Center Juelich	Krajsek Kai	EURAD_IM
Italy	Italy	ENEA	Ciucci Alessandra	AMS-MINNI
	Emila Romagna	ARPA Emilia Romagna	stortini michele	NINFAPESCO
Netherlands	Netherlands	RIVM	Joost Wesseling	NL-OPS

Country	Region/City	Institute	Contact person	Model
Norway	Norway	NILU	Vogt Matthias	Basemap
	Oslo	NILU	Vogt Matthias	Episode
Poland	Poland	Ekometria	Malgorzata Paciorek	CAMx
	Dolnoslaskie Voivodship	Ekometria	Malgorzata Paciorek	CALPUFF
	Lodzkie Voivodship	Ekometria	Malgorzata Paciorek	CALPUFF
	Mazowieckie Voivodship	Ekometria	Malgorzata Paciorek	CALPUFF
	Opolskie Voivodship	Ekometria	Malgorzata Paciorek	CALPUFF
	Podlaskie Voivodship	Ekometria	Malgorzata Paciorek	CALPUFF
	Pomorskie Voivodship	Ekometria	Malgorzata Paciorek	CALPUFF
	Warminsko-mazurskie Voivodship	Ekometria	Malgorzata Paciorek	CALPUFF
	Zachodniopomorskie Voivodship	Ekometria	Malgorzata Paciorek	CALPUFF
Portugal	Portugal	Universidade de Aveiro	Monteiro Alexandra	CHIMERE
Slovakia	Slovakia	SHMU	Matejovicova jana	IDWA
	Slovakia	SHMU	Matejovicova jana	CEMOD
Spain	Mainland Spain and the Balearic Islands	CIEMAT	Theobald Mark	CHIMERE
	Canary Islands	Barcelona Supercomputing Center	Pay Maria Teresa	CALIOPE
	Iberian Peninsula and Balearic Islands	Barcelona Supercomputing Center	Pay Maria Teresa	CALIOPE
	Madrid	Barcelona Supercomputing Center	Pay Maria Teresa	CALIOPE
	Andalucia	Barcelona Supercomputing Center	Pay Maria Teresa	CALIOPE
	Catalonia	Barcelona Supercomputing Center	Pay Maria Teresa	CALIOPE
	Spain	Technical University of Madrid (UPM)	Borge Rafael	CMAQ
Sweden	Sweden	SMHI	Backström Hans	SIMAIR
UK	UK	Ricardo-AEA	Brookes Daniel	PCMBK
	London	CERC	Kate Johnson	ADMS-Urban

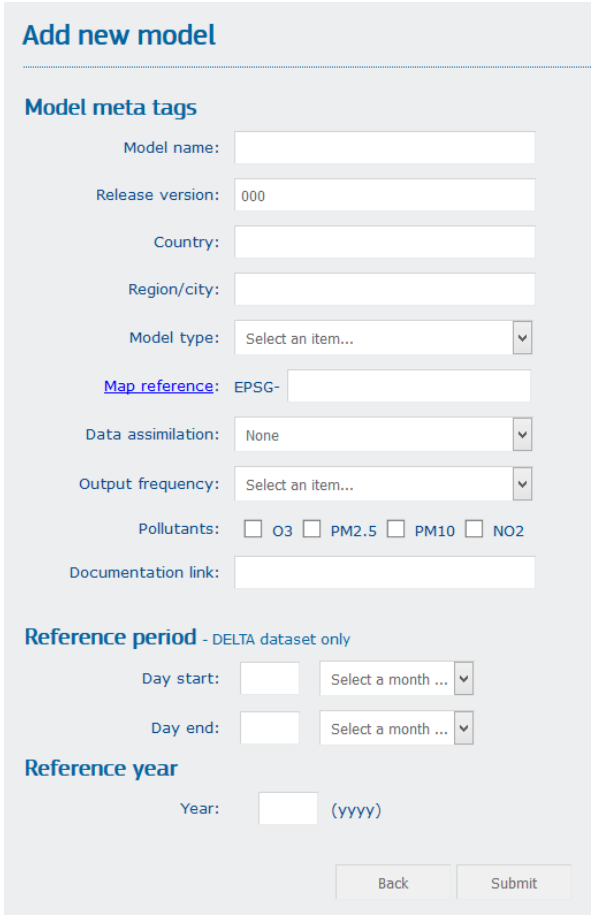

Data assimilation
9%
4%
4%
7%
56%
20%
None
(residual) Krigging
Interpolation
Optimal interpolation
3D-Var data assimilation
Other...

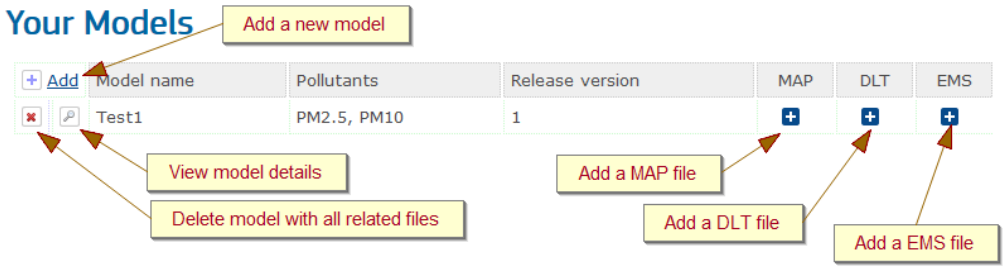


The process

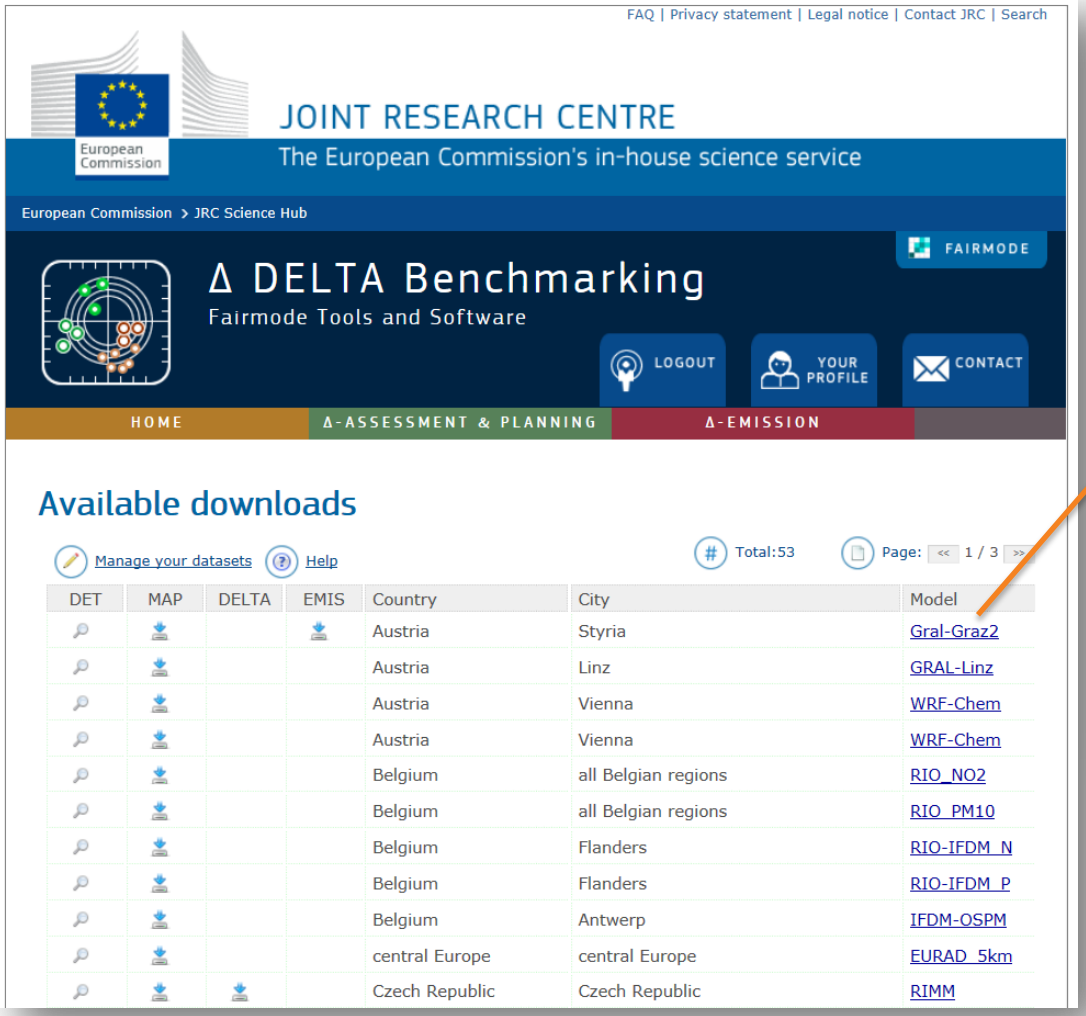
UPLOAD FUNCTIONALITY VIA FAIRMODE WEBSITE

Upload & manage your own input data (MAP, DELTA input & Emissions)





UPLOAD FUNCTIONALITY VIA FAIRMODE WEBSITE



Model details

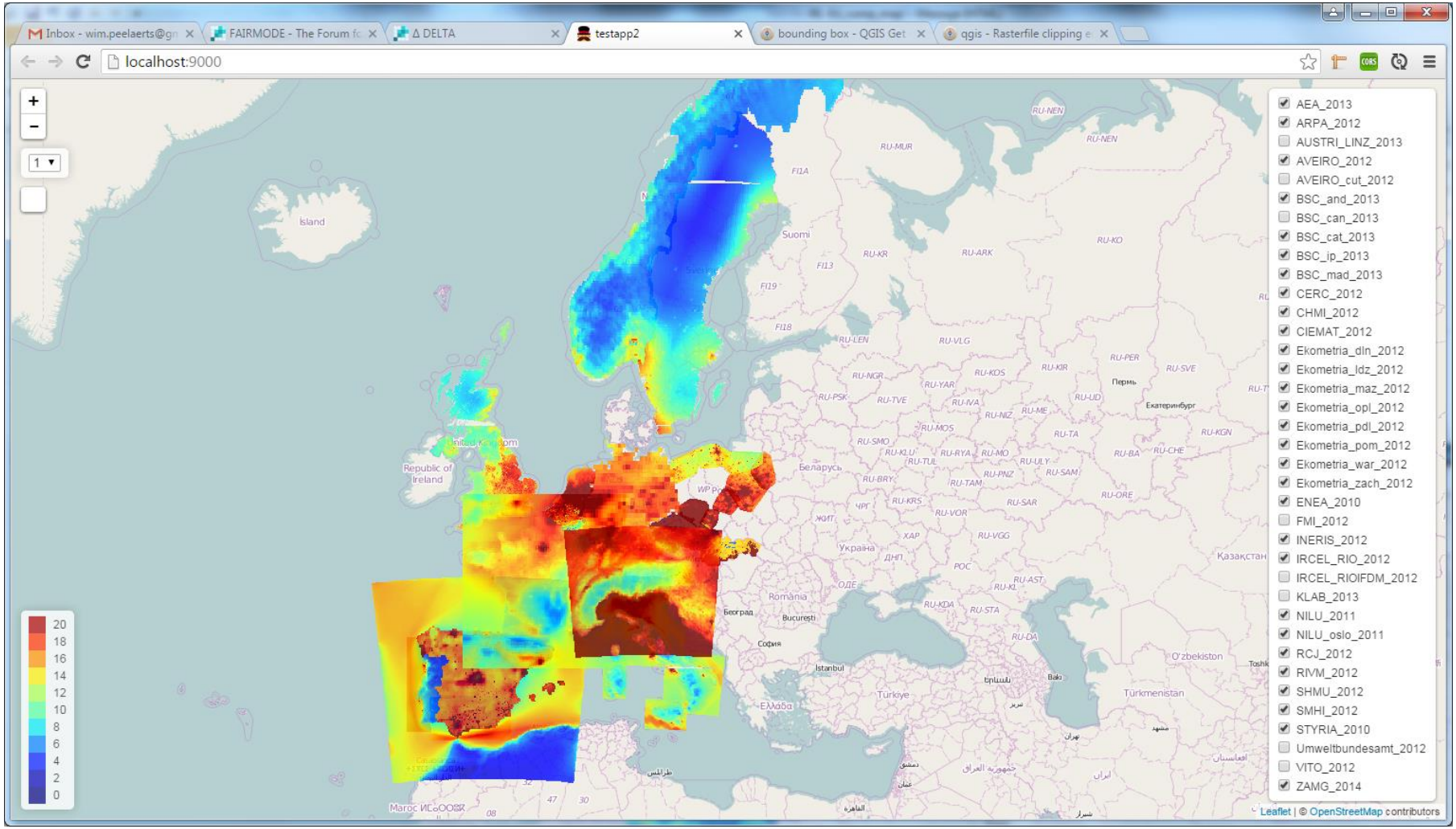
Name: Gral-Graz2
Release version: 001
Country: Austria
City | Region: Styria
Model type: Lagrangian
Map reference: EPSG-32633
Data assimilation: None
Frequency: Yearly
Pollutants: PM2.5, PM10, NO2
Time start: 01/01/2010
Time end: 31/12/2010
Documentation: http://app.luis.steiermar[...]
Owner: Payer Ingrid
Affiliation: Austria, federal state government of styria
Created on: 21/01/2016 03.24.12

CLOSE

DATA COLLECTION & PROCESSING

- The platform is respecting all national projection grids:
  - No interpolation or resampling of any data set
  - We keep data as delivered (in GeoTiff or ESRI ASCII)

- Better instructions from our side:
  - Units in µg/m^3 (not in ppmv, µgN/m^3,…)
  - Clip at national boarders → no interference with EuroDELTA, AQMEII,…


Inbox - wim.peelaerts@gn
FAIRMODE - The Forum fo
Δ DELTA
testapp2
bounding box - QGIS Get
qgis - Rasterfile clipping e
localhost:9000
AEA_2013
ARPA_2012
AUSTRI_LINZ_2013
AVEIRO_2012
AVEIRO_cut_2012
BSC_and_2013
BSC_can_2013
BSC_cat_2013
BSC_ip_2013
BSC_mad_2013
CERC_2012
CHMI_2012
CIEMAT_2012
Ekometria_dln_2012
Ekometria_ldz_2012
Ekometria_maz_2012
Ekometria_opl_2012
Ekometria_pdl_2012
Ekometria_pom_2012
Ekometria_war_2012
Ekometria_zach_2012
ENEA_2010
FMI_2012
INERIS_2012
IRCEL_RIO_2012
IRCEL_RIOIFDM_2012
KLAB_2013
NILU_2011
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RCJ_2012
RIVM_2012
SHMU_2012
SMHI_2012
STYRIA_2010
Umweltbundesamt_2012
VITO_2012
ZAMG_2014
20
18
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14
12
10
8
6
4
2
0
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LESSONS LEARNT DURING DATA PROCESSING

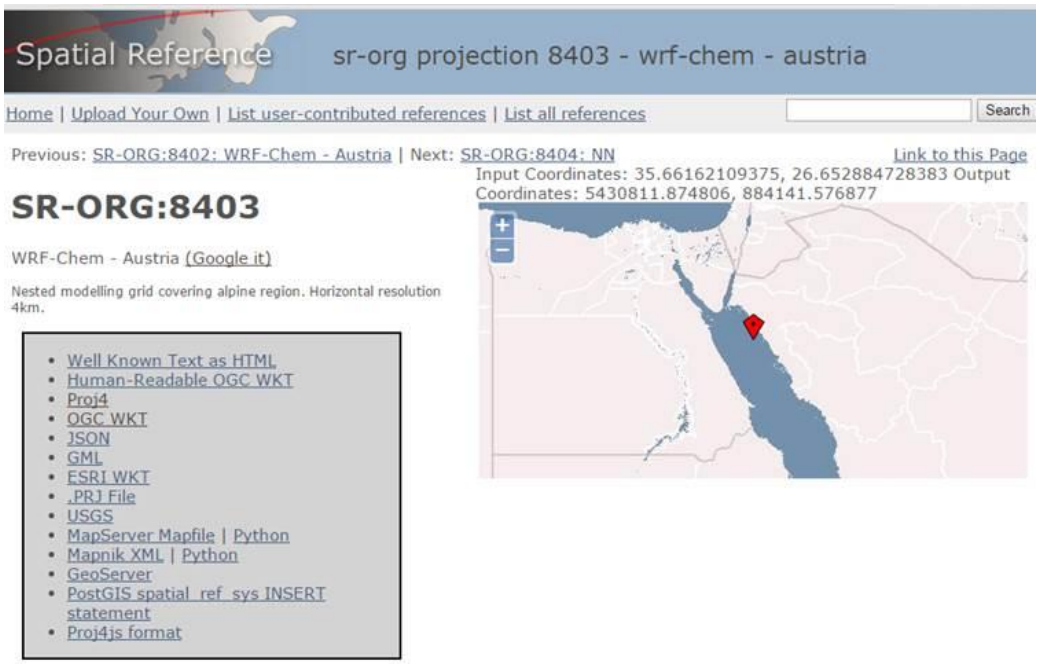
- Things that went wrong during the data delivery:
  - GeoTiff data stored as color bands → store your data in the grey band as values
  - Shapefiles uploaded instead of rasterfiles
  - No (or unknown/homemade) projection system provided → try to use the EPSG convention
  - Map projection not according to defined projection in meta data
  - ASCII grids not in line with the ESRI GRIDS definition
  - Wrong values in the data fields
  - …

THINGS THAT WENT WRONG

Files without projection system,

First of all, thanks for your contribution, but when we are processing the files we experience some problems.

Projection system EPSG-8403 does not exist. I tried other systems like SR-ORG:8403 but none of them maps a center of
xllcenter 544000
yllcenter 888000
in Austria.



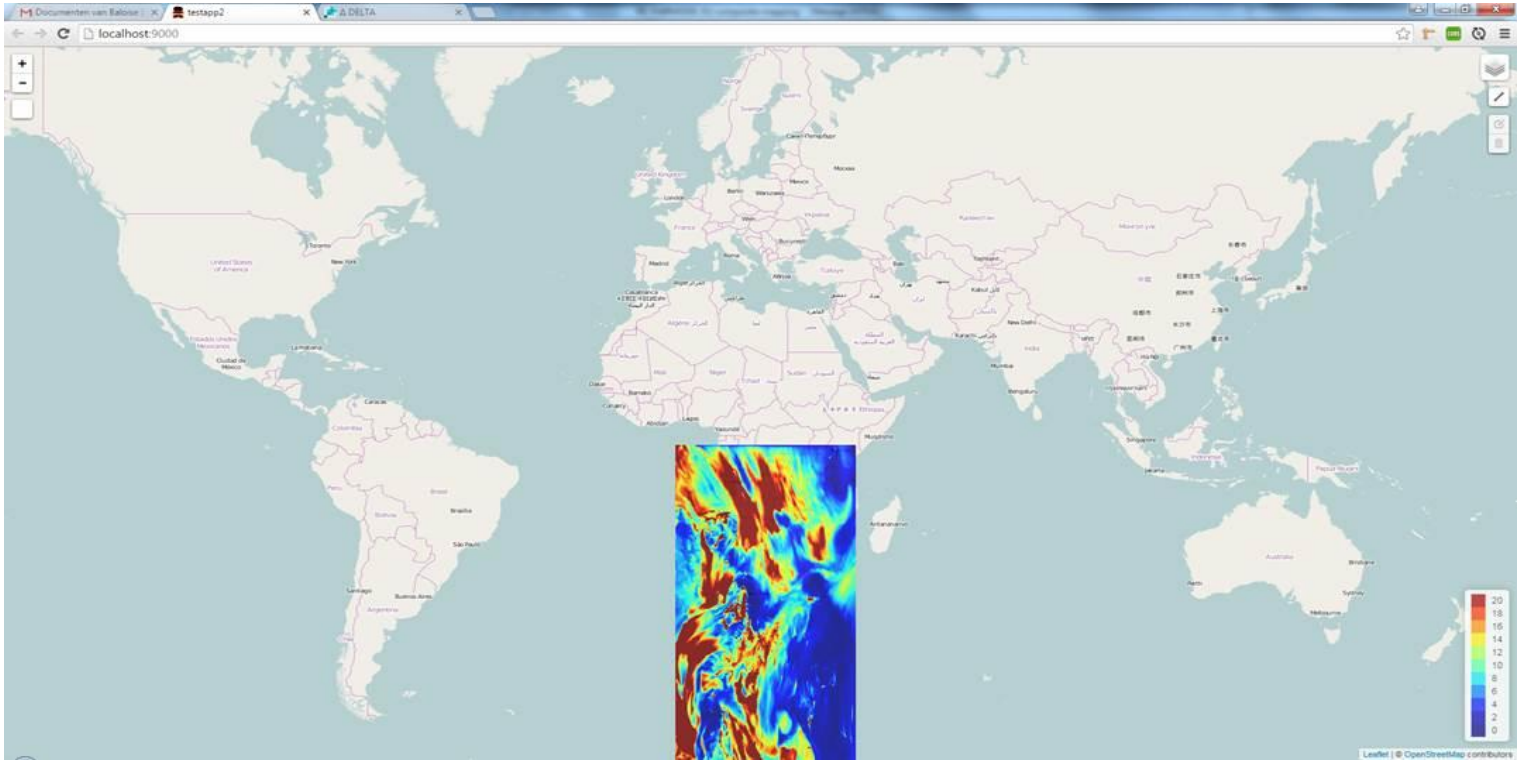
with homemade projection systems,

myself. My main problem right now is when I try to upload the files to the FAIRMODE server. In one step it asks for the map reference. My output projection is not in this list. In fact, my map projection is a Lambert Conformal Conic with the following characteristics:

Projection: Lambert_Conformal_Conic
False_Easting: 0,0
False_Northing: 0,0
Central_Meridian: -3,0
Standard_Parallel_1: 37,0
Standard_Parallel_2: 43,0
Scale_Factor: 1,0
Latitude_Of_Origin: 42,5
Linear Unit: Meter (1,0)
Geographic Coordinate System: GCS_WGS_1984

All these information is necessary for plotting our maps properly.

with wrong projection systems,



with a description of the grid via email.

Dear V

Please

plot to

maybe send me the

```
>>>>>>>>>>>>>>>>>>>>>>>>>>
Formal description of the stuff

dimensions:
        time = 8784 ;
        lon = 468 ;
        lat = 268 ;
variables:
        int time(time) ;
                time:units = "seconds since 2012-01-01 00:00:00" ;
        float lon(lon) ;
                lon:units = "degrees_east" ;
        float lat(lat) ;
                lat:units = "degrees_north" ;
        float SO4(time, lat, lon) ;
                SO4:units = "ugS/m3" ;
                SO4:_FillValue = -999 ;
                SO4:describe =
"PROJ((../output/macc2012_eva_v4_acid/macc2012_eva_v4_acid.grads.ctl:cnc_SO4_m_70*3.2e+07+cnc_SO4_m_20*3.2e+07+cnc_NH415SO_040*3.2e+07+cnc_NH
;
        float SO2(time, lat, lon) ;
                SO2:units = "ug/m3" ;
                SO2:_FillValue = -999 ;
                SO2:describe = "PROJ((../output/macc2012_eva_v4_acid/macc2012_eva_v4_acid.grads.ctl:cnc_SO2_gas*6.4e+07))" ;
        float PM2_5(time, lat, lon) ;
                PM2_5:units = "ug/m3" ;
                PM2_5:_FillValue = -999 ;
                PM2_5:describe =
"PROJ((../output/macc2012_eva_v4_acid/macc2012_eva_v4_acid.grads.ctl:cnc_NH4NO3_m_70*8e+07+cnc_sslt_m_05*1e+09+cnc_sslt_m_50*1e+09+cnc_SO4_m
1e+09+cnc_PM_FRP_m_50*1e+09+cnc_PMAS_m_50*1e+09+cnc_NH415SO_040*1.23e+08+cnc_NH415SO_039*1.23e+08+cnc_PM_m_50*1e+09))" ;
        float PM10(time, lat, lon) ;
                PM10:units = "ug/m3" ;
                PM10:_FillValue = -999 ;
                PM10:describe =
"PROJ((../output/macc2012_eva_v4_acid/macc2012_eva_v4_acid.grads.ctl:cnc_NH4NO3_m_70*8e+07+cnc_sslt_m_05*1e+09+cnc_sslt_m3_0*1e+09+cnc_sslt_m
```

```
;55.03125;3.6
;55.03125;4.5
;55.03125;4.5
;55.03125;4.5
;55.03125;4.5
;55.03125;6.2
;55.03125;6.2
;55.03125;6.2
;55.03125;6.2
25;55.03125;4.7
75;55.03125;4.7
25;55.03125;4.7
75;55.03125;4.7
25;55.03125;4.6
75;55.03125;4.6
25;55.03125;4.6
75;55.03125;4.5
25;55.03125;4.3
75;55.03125;4.3
25;55.03125;4.3
75;55.03125;4.3
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25;55.03125;3.8
75;55.03125;3.8
25;55.03125;4.5
75;55.03125;4.5
25;55.03125;4.5
75;55.03125;4.6
25;55.03125;5.6
35;9.6875;55.03125;5.6
36;9.8125;55.03125;5.6
37;9.9375;55.03125;5.7
38;10.0625;55.03125;5.2
39;10.1875;55.03125;5.2
40;10.3125;55.03125;5.2
41;10.4375;55.03125;5.2
```

Not compliant to the file type standards (ESRI ASCII)

the map doesn't cover entire Germany so there is an error in the figure. The lower left corner (XLLCENTER, YLLCENTER) of the map is correct but the cell size is wrong. Please be careful, it is not the same in x and y direction. In x-direction it has to be 0.125 and in y-direction 0.0625. You took 0.0625 in bot

Optimale Int
OI-Jahr: 201
NO2 Jahresm
NCOLS
NROWS
XLLCENTER
YLLCENTER
CELLSIZE 0.1
NODATA_V

The PM10 d

NCOLS 268
NROWS 46
XLLCENTRE
YLLCENTRE
CELLSIZES_
NODATA_V

```
     5.7     5.5     5.4     5.4     6.2     5.7     5.6     6.2     6.0     6.5     7.2     6.5     6.8
     6.4     5.6     5.2     5.0     4.9     4.8     4.7     5.0     4.9     4.9     5.1     5.9    10.2
     7.3     6.8     5.8     4.3
     4.9     4.6
     5.7     6.1
    11.0    10.5
     5.2     4.7
     5.1     4.9
     6.1     5.4
     7.4     7.2
     4.2     4.6
     5.5     5.6
     6.4     6.6
     4.2     4.0
     4.1     3.8
     4.2     4.2
     6.8     6.8
Optimale Interpolati
OI-Jahr: 2012
PM10 Jahresmittelwer
NCOLS             82
NROWS            126
XLLCENTER    5.437500
YLLCENTER    47.21875
CELLSIZE   0.12500000
NODATA_VALUE -999'
    19.6    19.8
    19.3    19.3
    12.9    12.9
    12.3    12.3
    12.1    12.3
    13.9    13.9
    10.2    10.2
    19.8    20.1
    20.3    20.2
```

```
NCOLS 180
NROWS  80
XLLCENTER  7.025
YLLCENTER 54.025
CELLSIZE  0.050
NODATA_VALUE -999.99
********************************************************************************************************************************
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5.35************************************************************************************************************************
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4.40************************************************************************************************************************
```
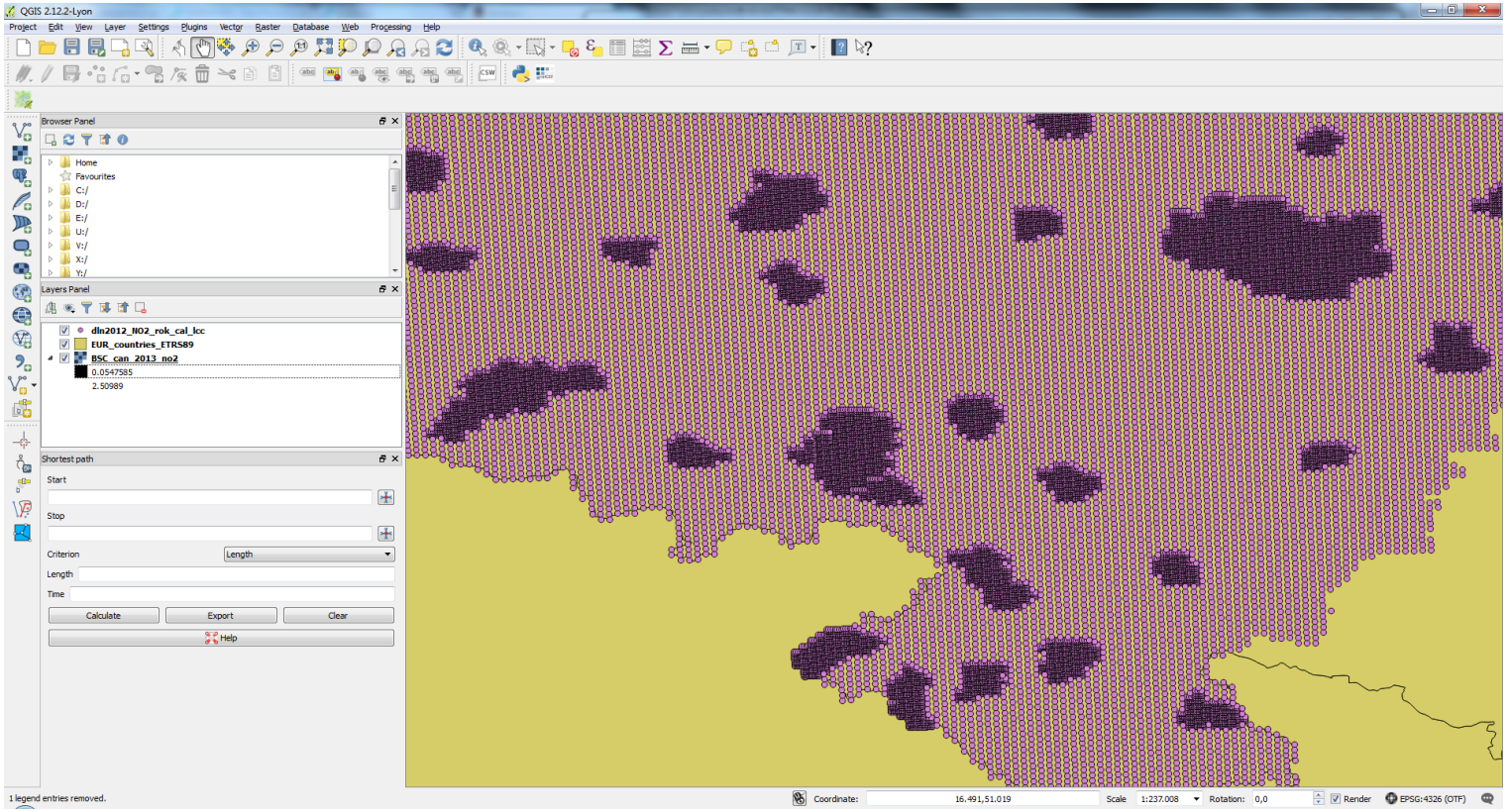

FAIRMOD
Forum for air quality

Not compliant to the file type standards

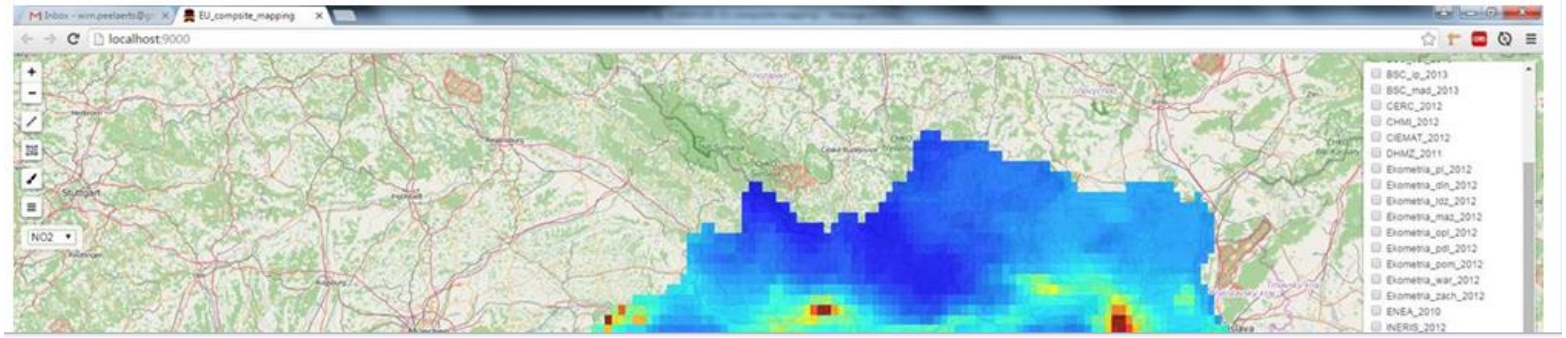


Units in µg/m³ (not in ppmv, µgN/m³,…)

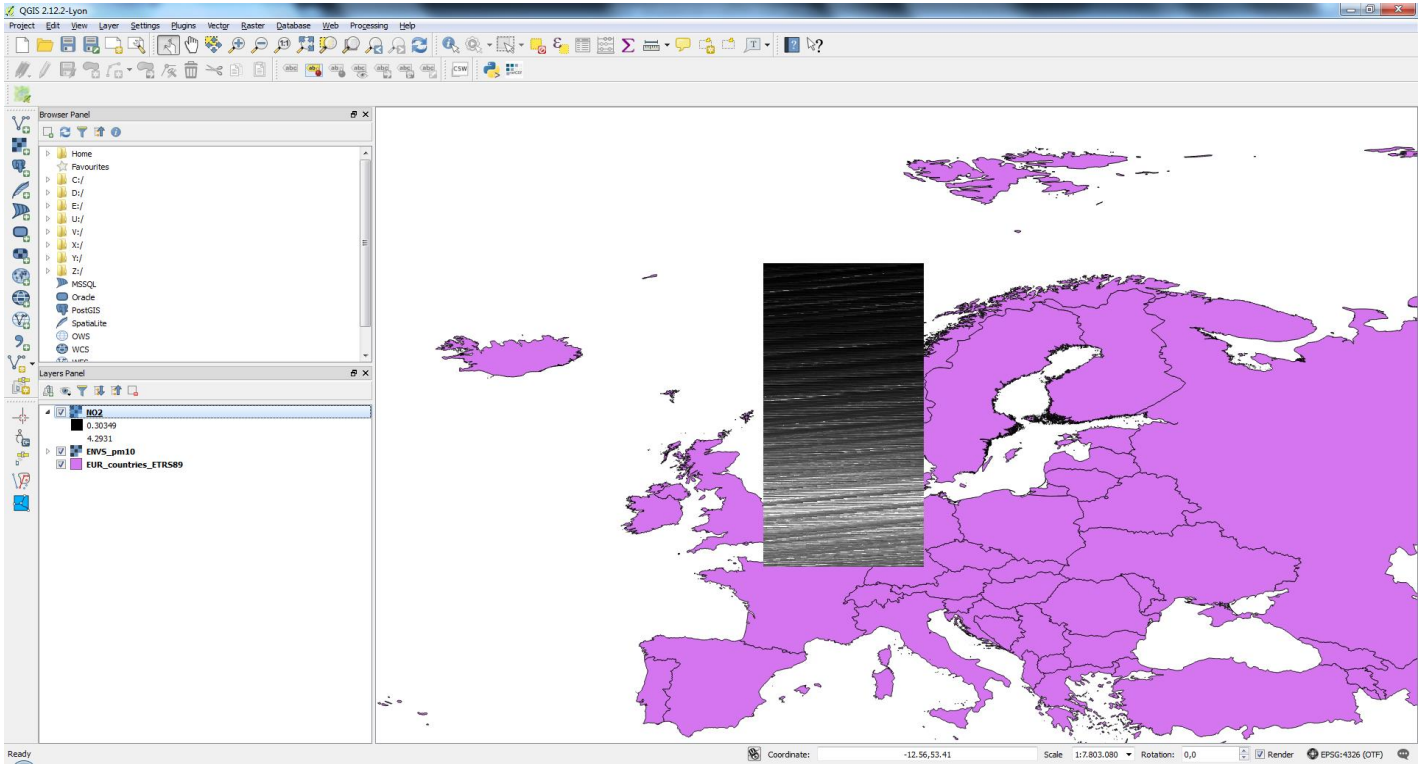
Hi All,

I multiplied the whole grid with 1912,7.
This seems more reasonable to me. Shall we keep this one in the system?

Regards
Wim



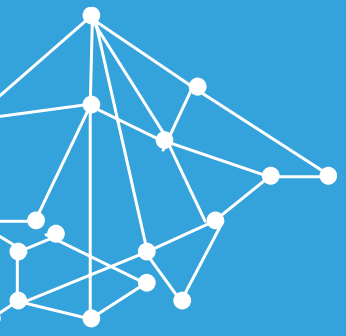
Lat/Lon/value mixup



IDEA'S FOR OPTIMISATION

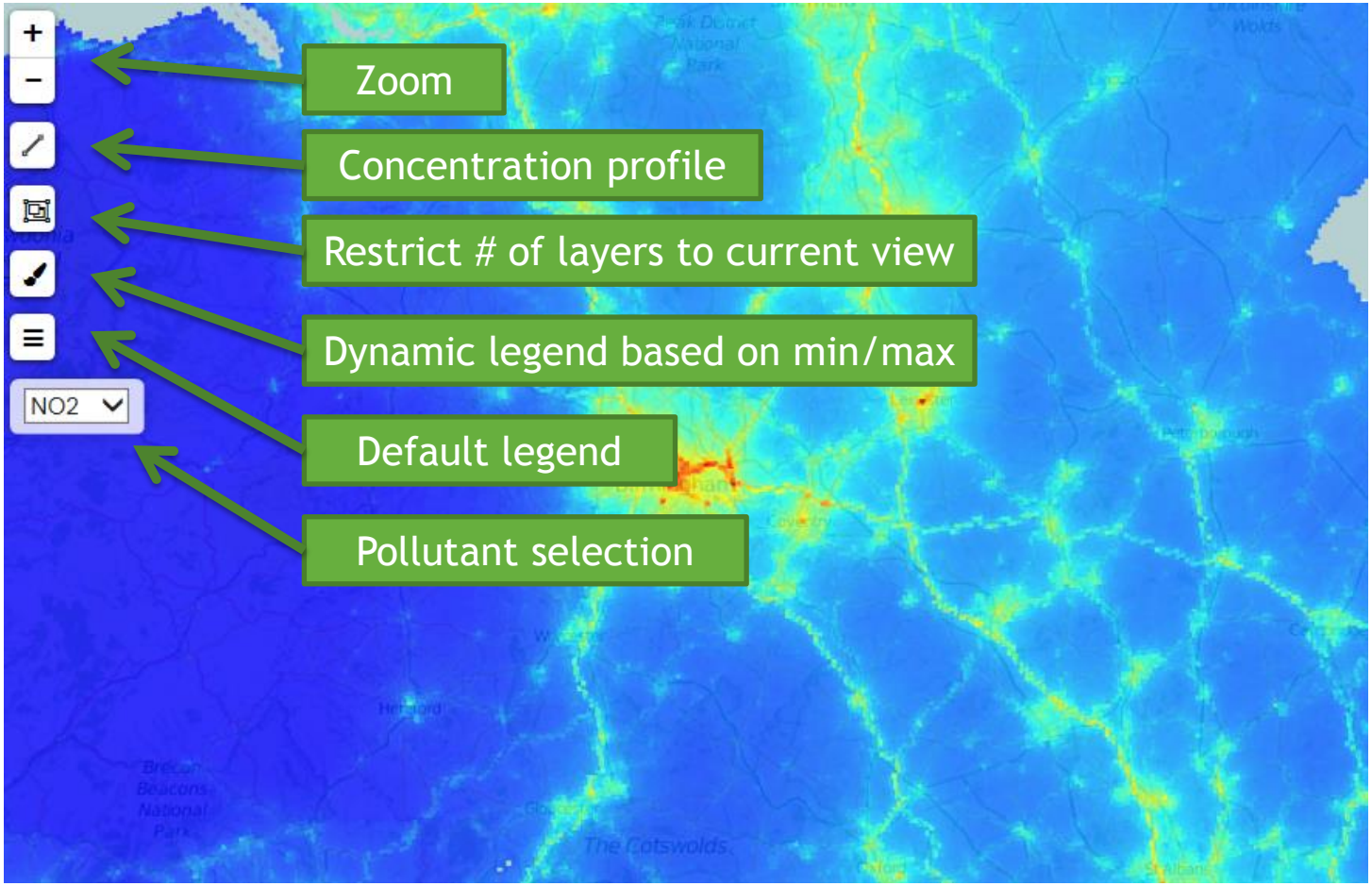
Idea's that can facilitate the data harvesting

- Things have to be automated & manual quality checks have to be limited.
- Naming conventions must be imposed. Now everything is labeled by the modelling team and base year. Alternative suggestions?
- More strict data requirements. We imposed GeoTiff (GDAL standard) and ARCASCII (open format for ESRI user). Is this sufficient, should we include additional types?
- Can we impose EPSG:4326 (WGS84)

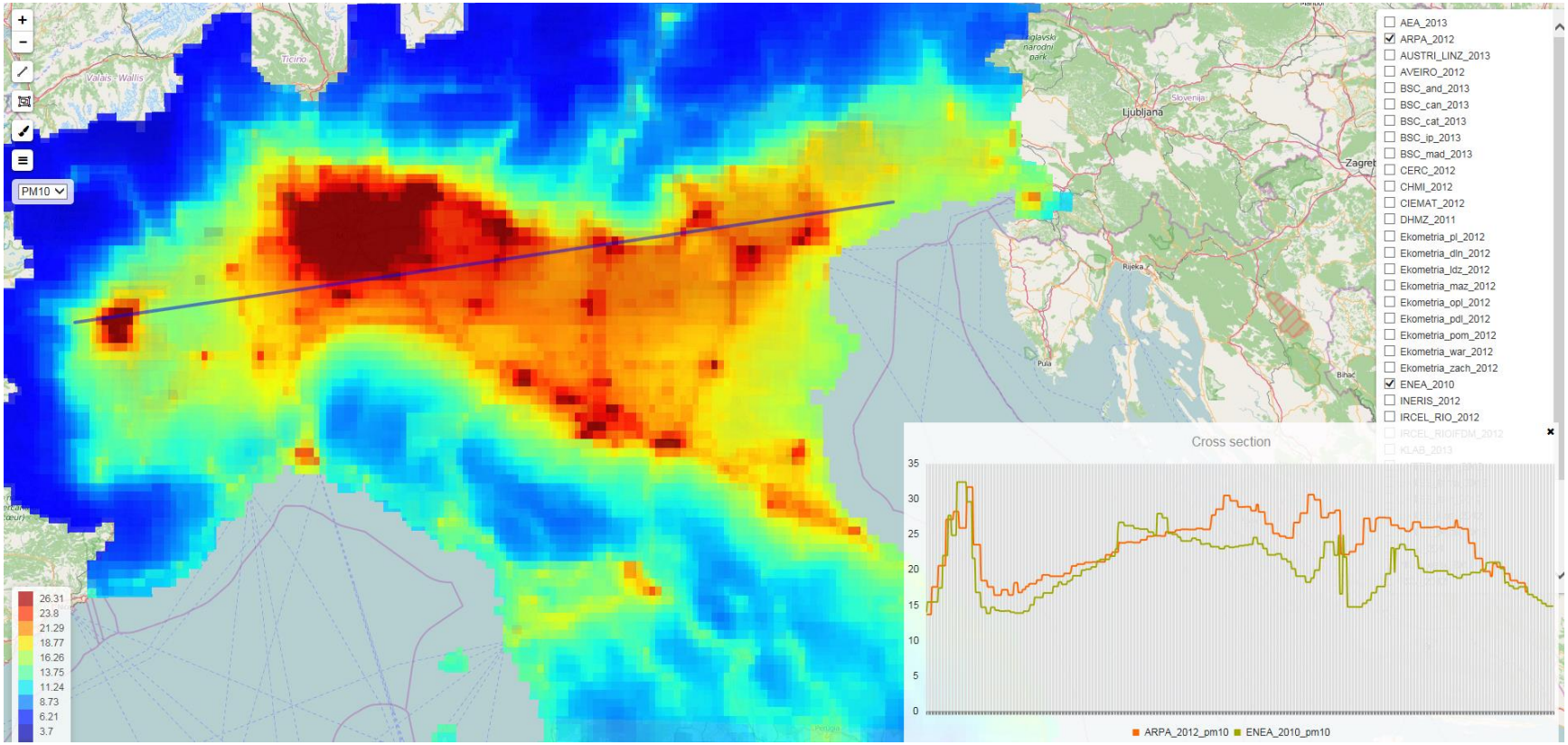


The platform

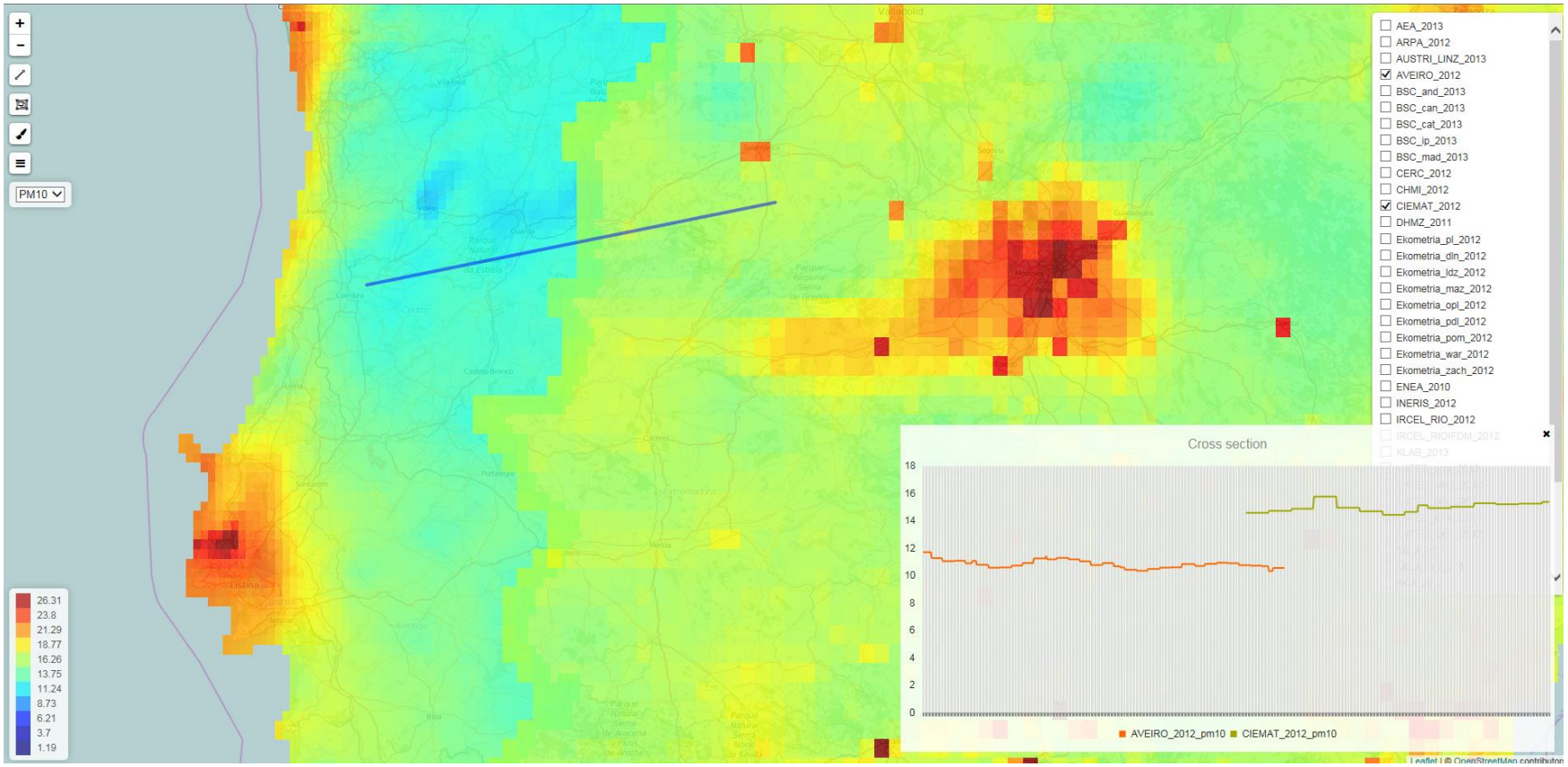
ANALYSIS FUNCTIONALITY



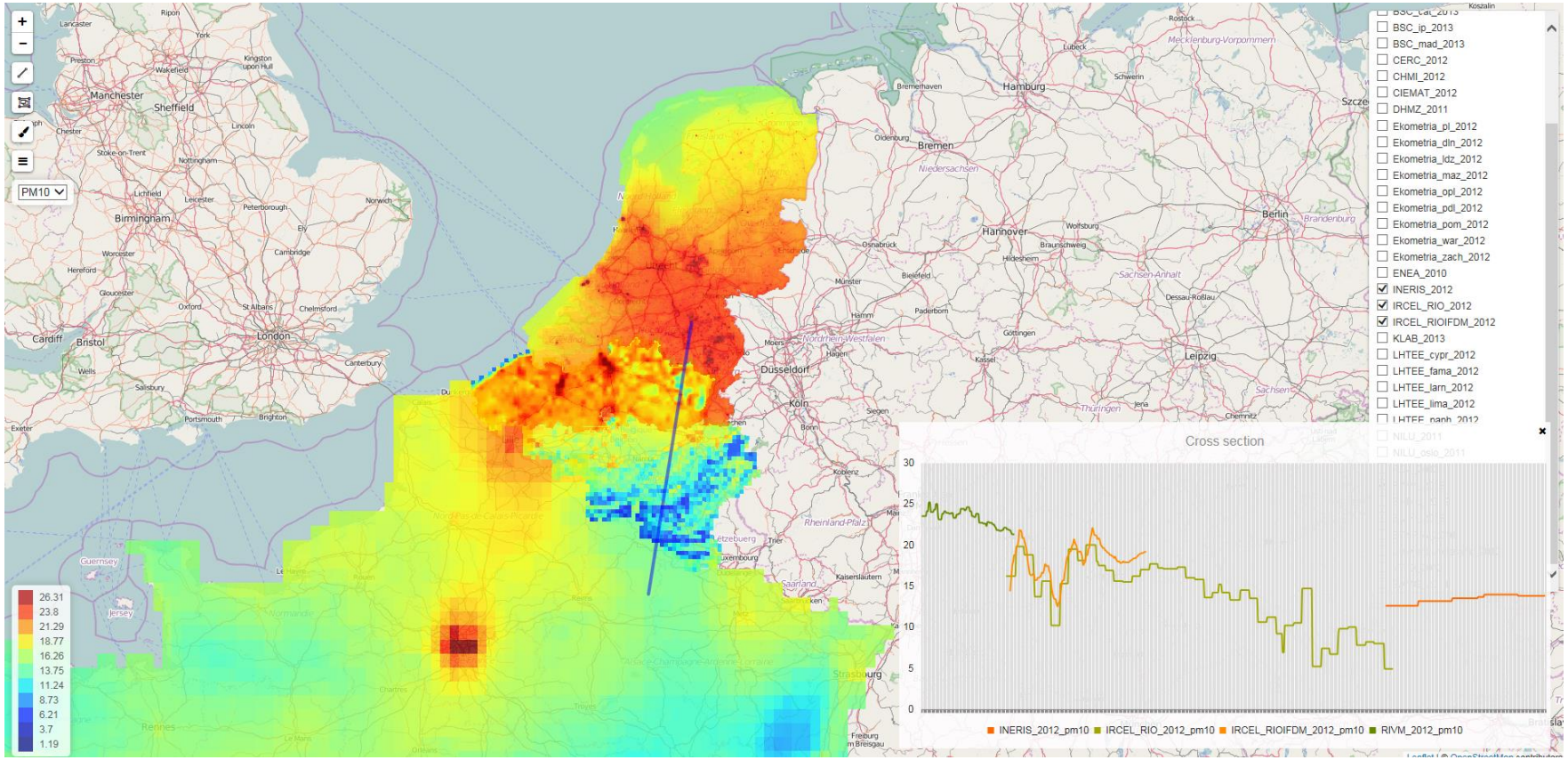
CONCENTRATION PROFILES



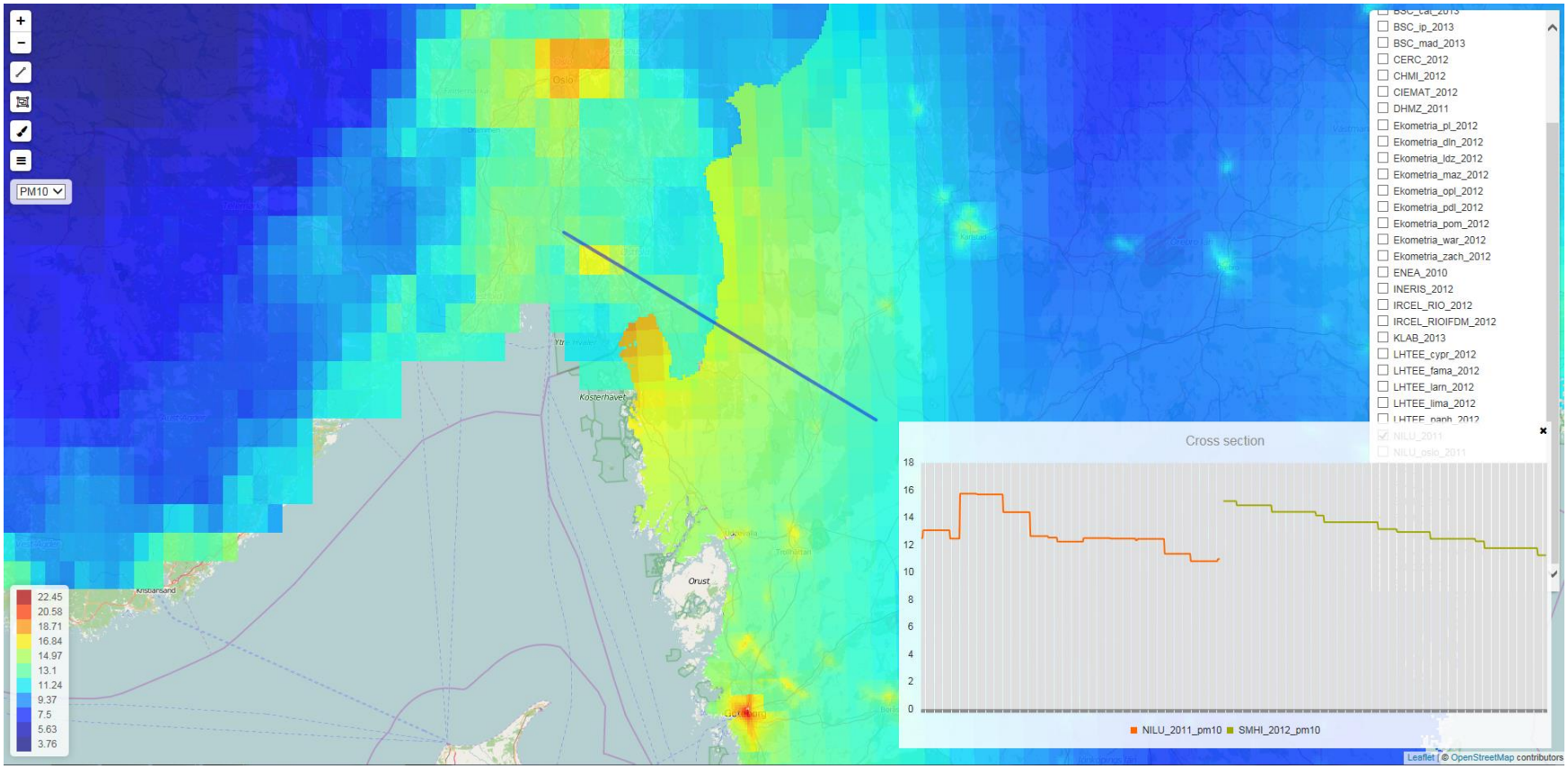
BOARDER EFFECTS



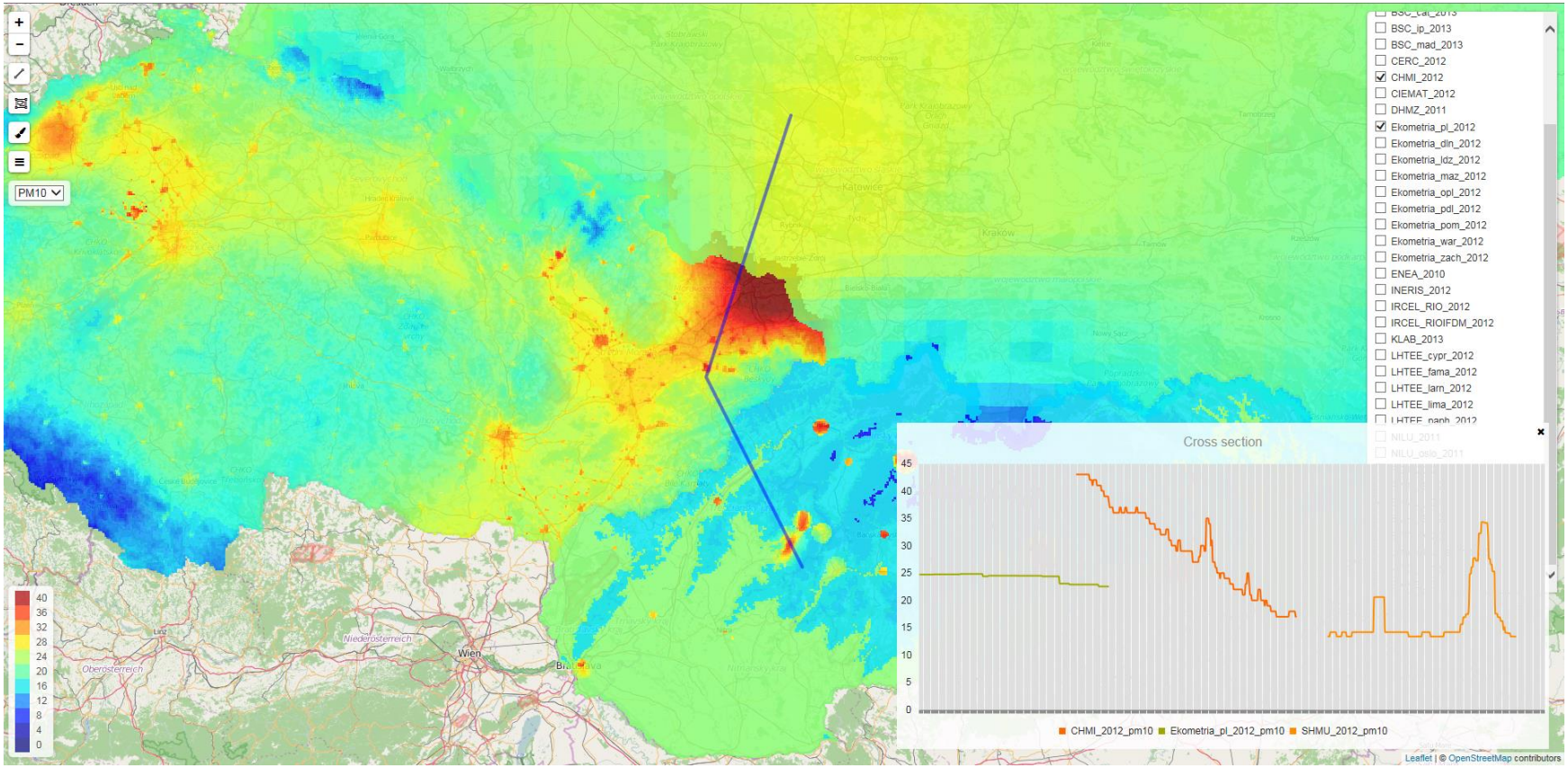
BOARDER EFFECTS



BOARDER EFFECTS



BOARDER EFFECTS

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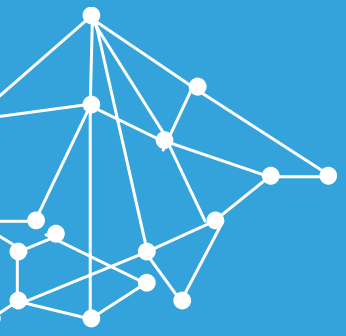
How to contribute
Members of FAIRMODE can upload their data through the Δ DELTA Benchmarking website. Before uploading, you need to register as a "Database contributor".
If you already have a username and password, you can login and proceed to your profile page where a dedicated area for database contributors is available.
Background
One of the aims of FAIRMODE is to harmonize modelling practices and provide guidance to EU Member States (MS) on the use of models in the framework of the Air Quality Directive. A recent survey completed by the National Contact Points pointed out that modelling activities have a clear added value to the policy making process but there is still a lack of clarity in legislation and a lack of common guidance on how to apply models in support of the implementation of the Air Quality Directive.
Current Activities
EU Composite Maps
Source App. Intercomp.
Spat. Repr. Intercomp.
About FAIRMODE
Working groups
WG1 - Assesment
WG2 - Emissions
WG3 - Source App.
WG4 - Planning
Tools
Δ - Benchmarking Tool

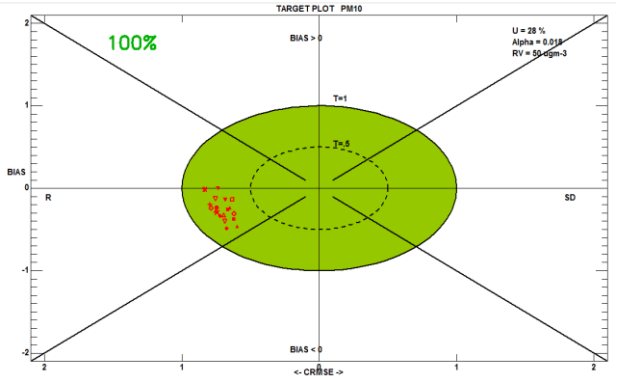


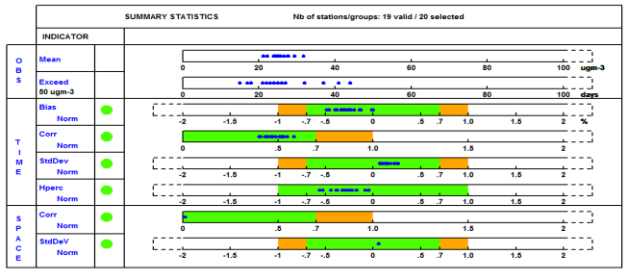
The future

WHAT CAN FAIRMODE DO WITH THIS EXERCISE

Potential ideas for further FAIRMODE WG1 work

- Use platform to solve inter-regional or inter-national discrepancies
- Use air quality maps in combination with MQO Benchmarking report to analyze validity of the AQ maps
- Trigger discussions on:
  - Use of data assimilation or data fusion techniques to produce air quality maps
  - Quality and consistency of underlying emission inventories
  - Choice of an adequate spatial resolution for a particular application
  - …
- Provide guidance for e-Reporting

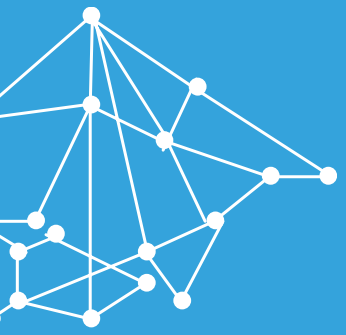




WISH LIST EXTRA FUNCTIONALITY

- Introduce more quality checks during the upload (even visual analysis of uploaded data sets).
- Harmonize labeling (naming) of the layers.
- Add AirBASE measurement data in the platform for visual inspection.
- Add link to pop-up with Target diagram to each layer.
- Add underlying emission datasets (per SNAP sector?) to the platform.
- Add raw model results + data fusion/assimilation residues.
- Add maps for multiple years.
- Add more pollutants (e.g. SO2, O3) & AQD statistics (e.g. PM10 exceedances,…).
- …

Discussion and WG1-WG2 cooperation



Leonor Tarrason & Stijn Janssen

HOW CAN FAIRMODE LEARN?

- Reasons for inter-national/inter-regional differences:
  - Are they related to model performance?
    → Further evaluation of/via MQO
  - Are they related to the scale of the application ?
    → Recommendations on appropriate spatial scales?
  - Are they related to the underlying emission inventories?
    → Only 3 countries reported emission totals, not enough for an analysis on the influence of emission in the results
    → Possible further cooperation with WG2: composite map for emissions?
  - Are they related to data fusion methodologies?
    → Data assimilation WG? Recommendations on data assimilation/data fusion methodologies?

- Volunteers to establish small working groups and to report about findings / recommendations during the next Technical Meeting?
- Recommendations for e-Reporting?

PRACTICAL QUESTIONS

» Do we need a FAIRMODE password for the Composite Map?

» How to keep track of the different versions of the composite maps? How do we document the evolution of the system?