URBAN*AIR*®

An operational modelling system for survey and forecasting of air quality at urban scale

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[3] ASPA, Strasbourg, France

Harmo 13, Paris, 1-4 June 2010

PRESENTATION

DEPLOYMENT

APPLICATIONS

DEVELOPMENTS

PACA

Outline

- Presentation of the system
- Deployment methodology
- Examples of operational applications
- Current developments
- Applied use in the PACA Region (Atmo PACA)

Presentation

URBAN*AIR*®: high resolution modeling system

- An operational modeling system developed by NUMTECH (2005) with the support of ADEME, in collaboration with Ecole Centrale de Lyon since 2009.

- Based on high resolution dispersion models : ADMS-Urban (Mc Hugh et al., 1997) and SIRANE (Soulhac, 2000).

- The system provides pollutant concentrations (NO_2, O_3, PM_{10}, C_6H_6, SO_2) at street scale on the whole urban area, generally at hourly time step.

Presentation

Air quality observations

Meteo observations and predictions

Background concentrations

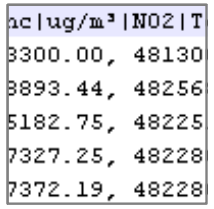
Emission inventory

Surface topography

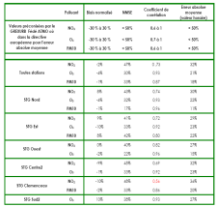
Land use

URBAN*AIR*®

Daily pollution map

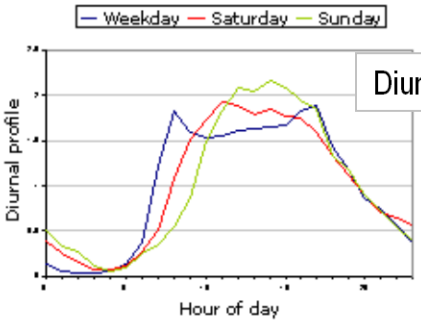


Text & data summaries

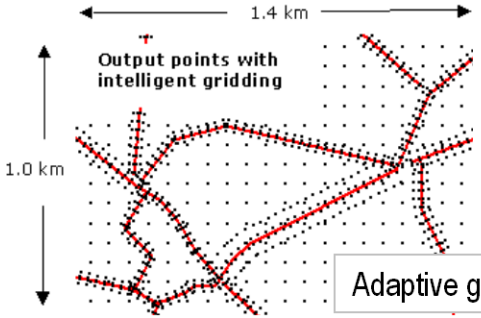


UAS performances

Alerts and informations

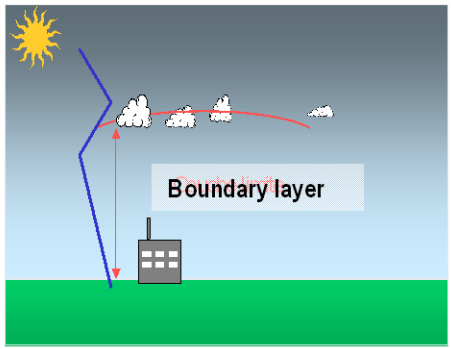


Diurnal profiles



Adaptive gridding

Meteo pre processor



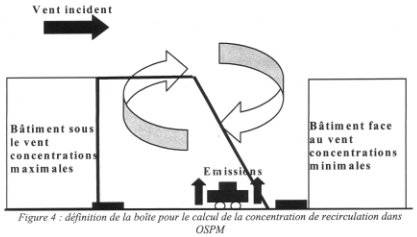
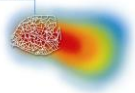
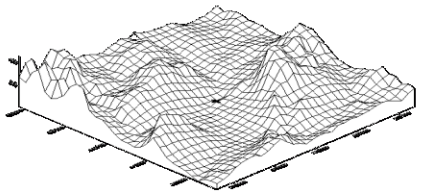


Figure 4 : définition de la boîte pour le calcul de la concentration de recirculation dans OSPM

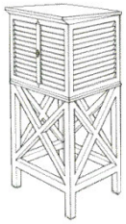
« Street canyon » effect

ADMS URBAN
Atmospheric Dispersion Modelling System

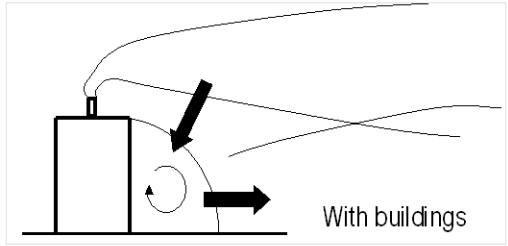




Topography effects



Meteo data

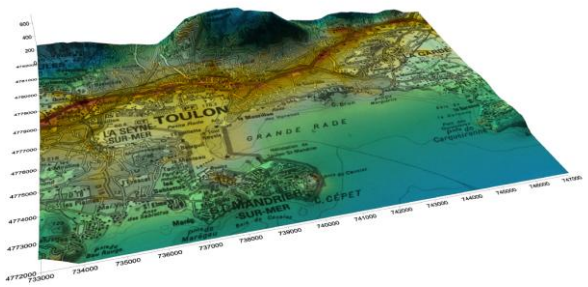


Building effects

Presentation

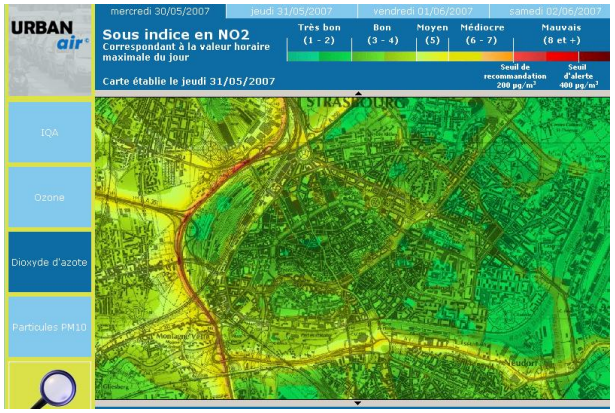
Operating modes

Diagnostic mode



- study of pollution episode
- AQ directive / reporting
- Mitigation / source apportionnement

Operational mode



- “Nowcasting” calculation of concentrations
- 48-hour forecasting

PRESENTATION
DEPLOYMENT
APPLICATIONS
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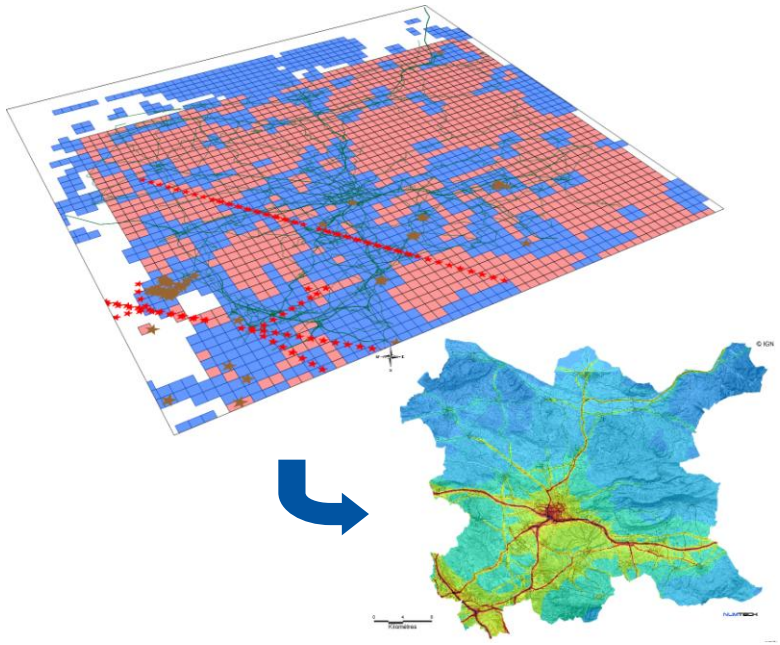
PACA

Deployment of the system

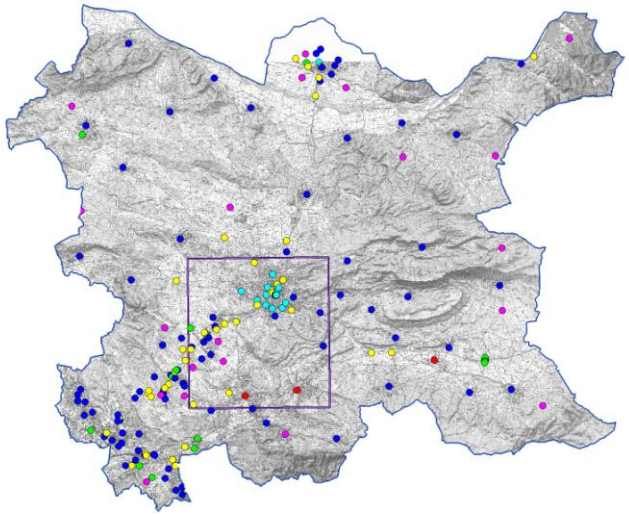
Deployment of the system

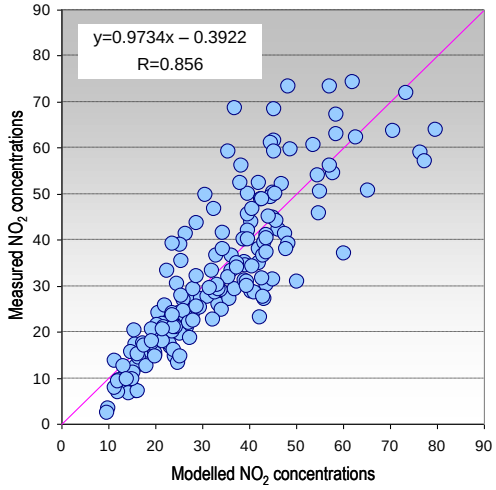
- Step 1: Modeling phase and first calculations



Deployment of the system

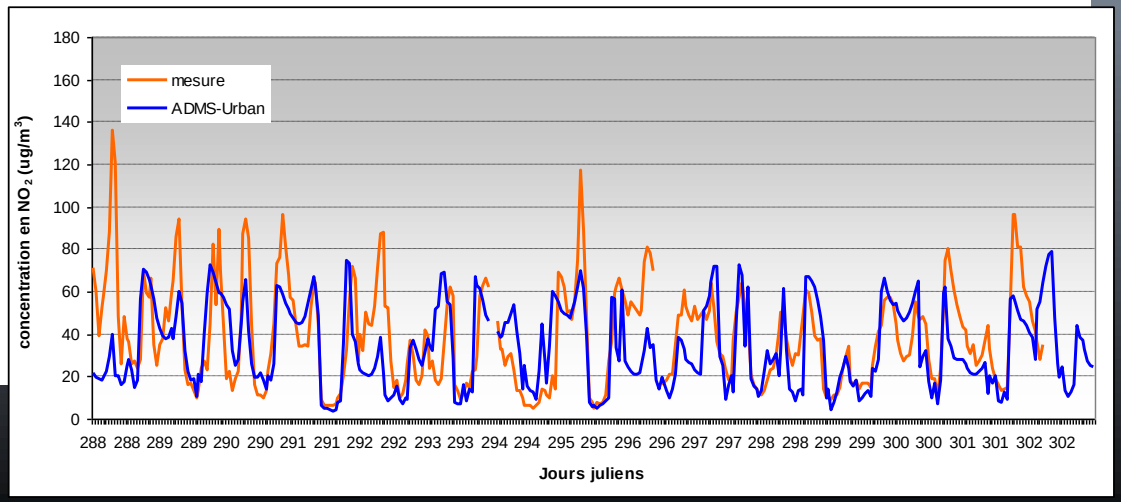
- Step 1: Modeling phase and first calculations
- Step 2: capacity of the system to reproduce the spatial distribution of the concentrations?





Deployment of the system

- Step 1: Modeling phase and first calculations
- Step 2: capacity of the system to reproduce the spatial distribution of the concentrations?
- Step 3: capacity of the system to reproduce the temporal evolution of the concentrations?



Deployment of the system

- Step 1: Modeling phase and first calculations
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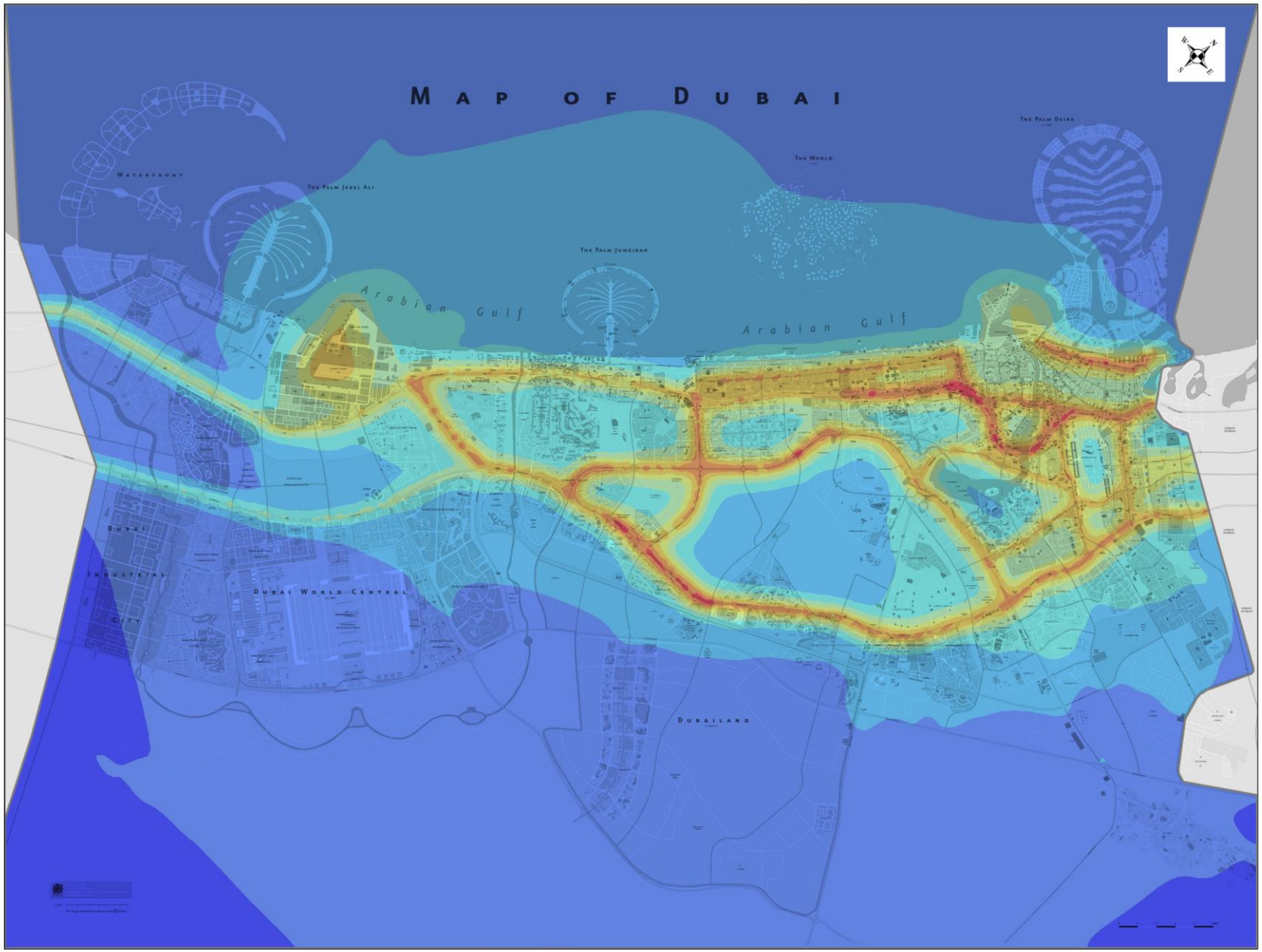
- Step 3: capacity of the system to reproduce the temporal evolutions of the concentrations?
- Step 4: quality of the results in forecast mode (which depends on meteorological and background pollution prediction)

Deployment of the system

- Step 1: Modeling phase and first calculations
- Step 2: capacity of the system to reproduce the spatial distribution of the concentrations?
- Step 3: capacity of the system to reproduce the temporal evolutions of the concentrations?
- Step 4: quality of the results in forecast mode (which depends on meteorological and background pollution prediction)
- Step 5: Implementation of the operational system

Average annual NO_2 concentration
Dubai Municipality



Site : **DUBAI**

Units : **µg/m³ (0.000001 g/m³)**

Averaging time: **Hourly**

Meteorological period : **2007**

NO_2 (µg/m³)

2 - 4
4.1 - 10
11 - 18
19 - 28
29 - 39
40 - 51
52 - 65
66 - 85
86 - 160

NUMTECH
L'ATMOSPHÉRISATION

aspa air' d'Alsace

Prochaine mise à jour du site le mercredi 02/06/2010 à 16H

air d'alsace

Strasbourg

URBAN air

IQA

Ozone

Dioxyde d'azote

Particules PM10

Cliquez sur la carte pour zoomer

NUMTECH L'ATMOSPHÉRISATION

lundi 31/05/2010 | mardi 01/06/2010 | mercredi 02/06/2010 | jeudi 03/06/2010

Sous indice en NO2

Correspondant à la valeur horaire maximale du jour

PREVISION établie le mardi 01/06/2010

Très bon (1 - 2)	Bon (3 - 4)	Moyen (5)	Médiocre (6 - 7)	Mauvais (8 et +)

Seuil de recommandation 200 µg/m³

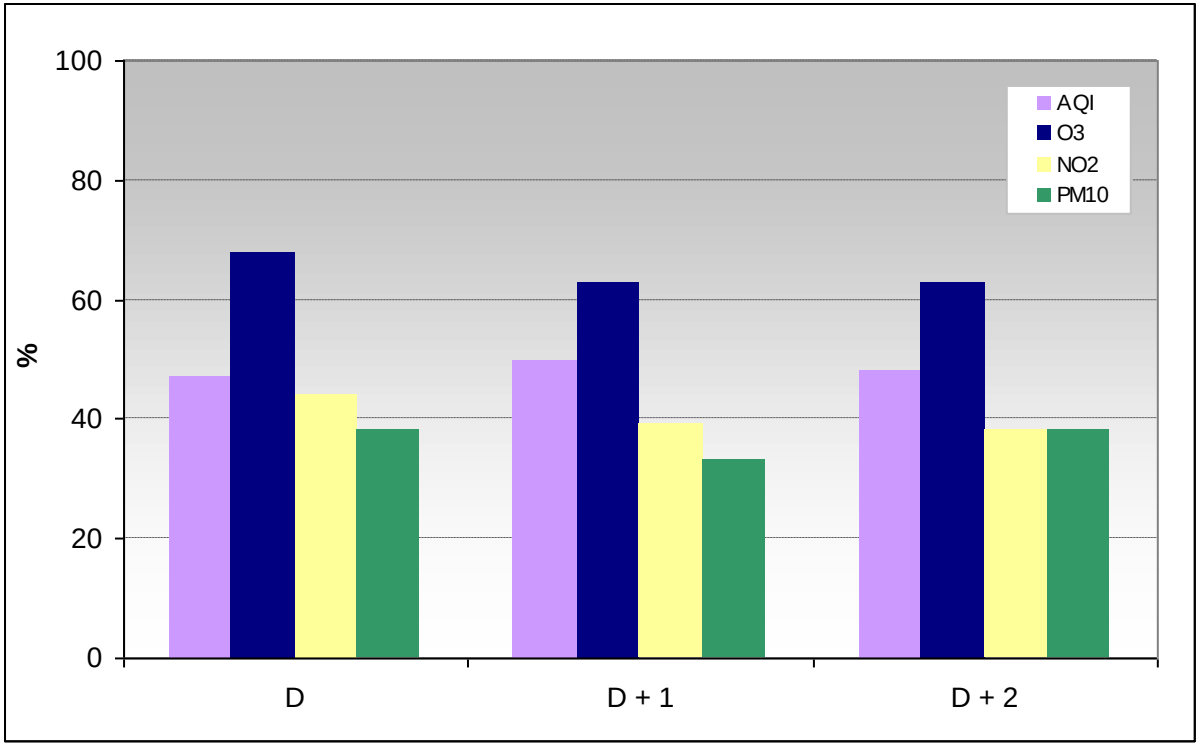
Seuil d'alerte 400 µg/m³

Cette carte représente la spatialisation des sous-indices en dioxyde d'azote rencontrés sur Strasbourg pour la journée du jeudi 03/06/2010.

Le dioxyde d'azote provient des installations de combustion (centrales thermiques, chaudières,...) et de la circulation routière.La circulation routière est actuellement la principale source d'émission en Alsace. Le NO2 intervient dans le processus de formation d'ozone dans la basse atmosphère.

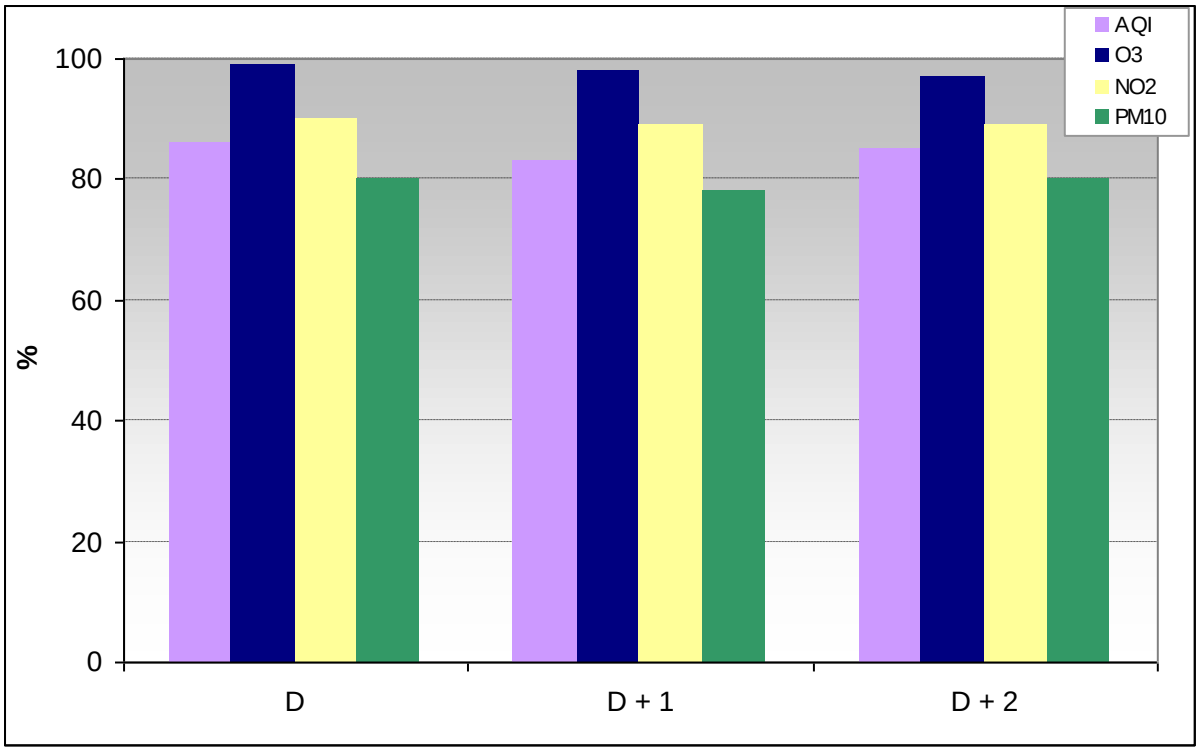
Some results for Strasbourg

Proportion of good prediction (%) of AQ indexes for the year 2009



Some results for Strasbourg

Proportion of good prediction (%) of AQ indexes +/- 1 for the year 2009

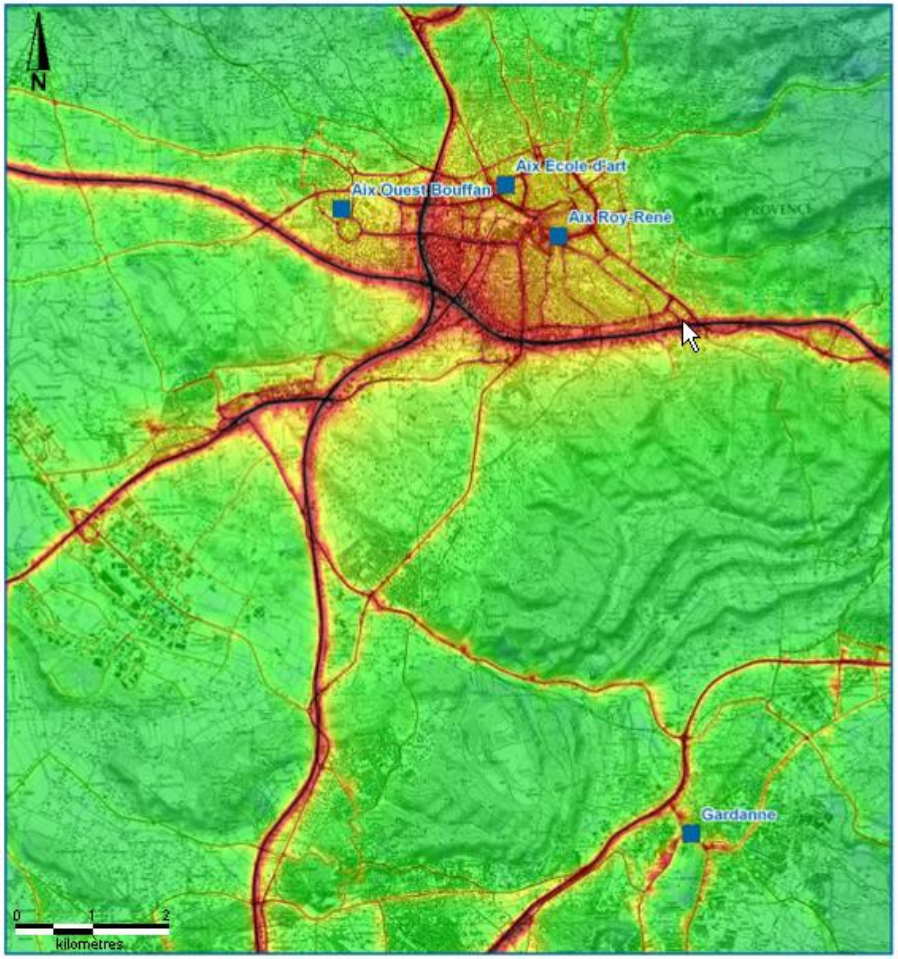


URBAN air

Lundi 22/03/2010 | Mardi 23/03/2010 | Mercredi 24/03/2010 | Jeudi 25/03/2010

Aix-en-Provence

Maximum journalier NO2
Prévision du 23/03/2010 pour aujourd'hui

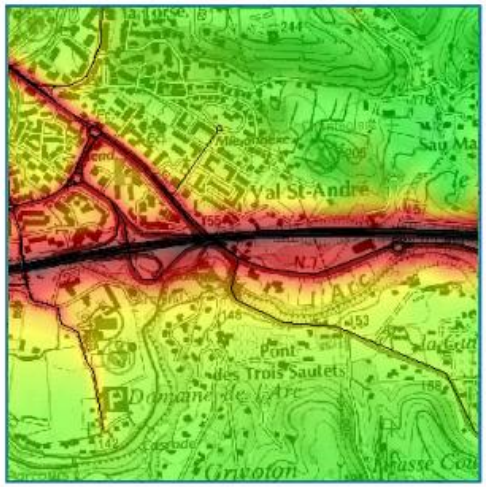


10 — 80 µg/m³
seuil d'alerte → 9 — 70 µg/m³
8 — 60 µg/m³
seuil d'information → 7 — 50 µg/m³
6 — 40 µg/m³
5 — 30 µg/m³
4 — 20 µg/m³
3 — 10 µg/m³
2 — 0 µg/m³
1
0

IQA
Ozone
Poussières PM_{10}
Dioxyde d'azote

Prévision établie le : 23/03/2010 9h
Prochaine mise à jour : 11h

Zone survolée



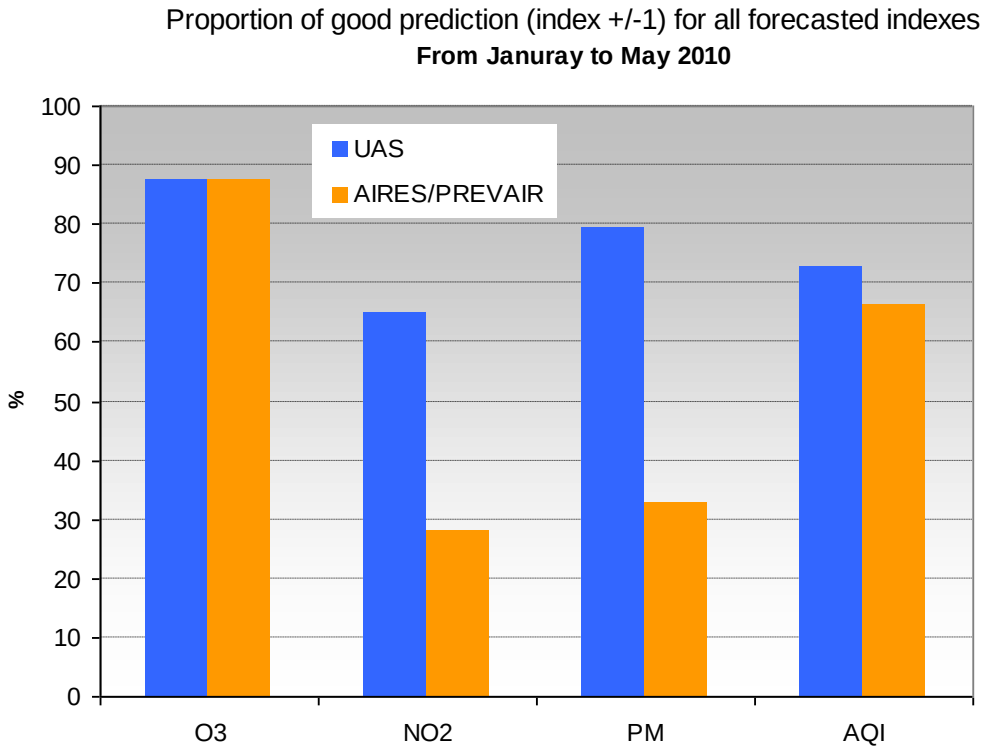
En savoir plus :
- Calcul de l'indice Atmo
- Les polluants

NUMTECH
AtmoPACA Qualité de l'Air

AVERTISSEMENT : ces cartographies constituent une sortie brute des outils de modélisation et voient être considérées comme telles ; elles ne constituent qu'un des paramètres analysés par les prévisionnistes d'Atmo PACA pour établir leur prévision de la qualité de l'air.

Some results for Aix-en-Provence

Comparison between UAS and regional modeling platform (AIRES/PREVAIR)



Some results for Aix-en-Provence

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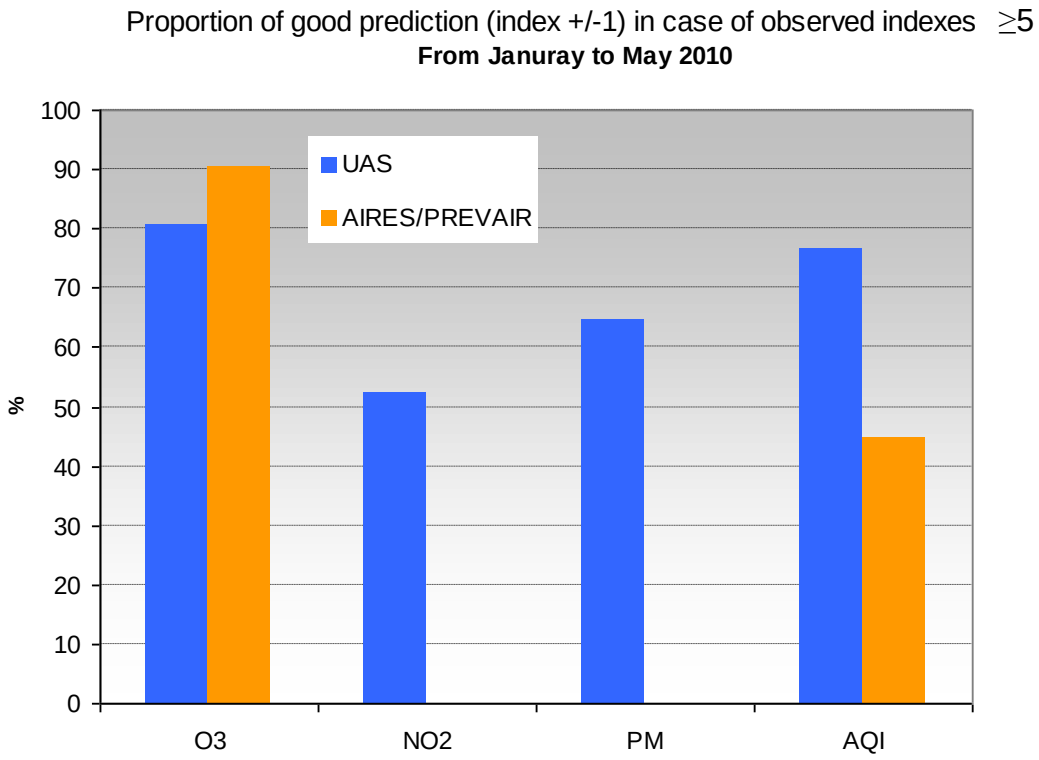
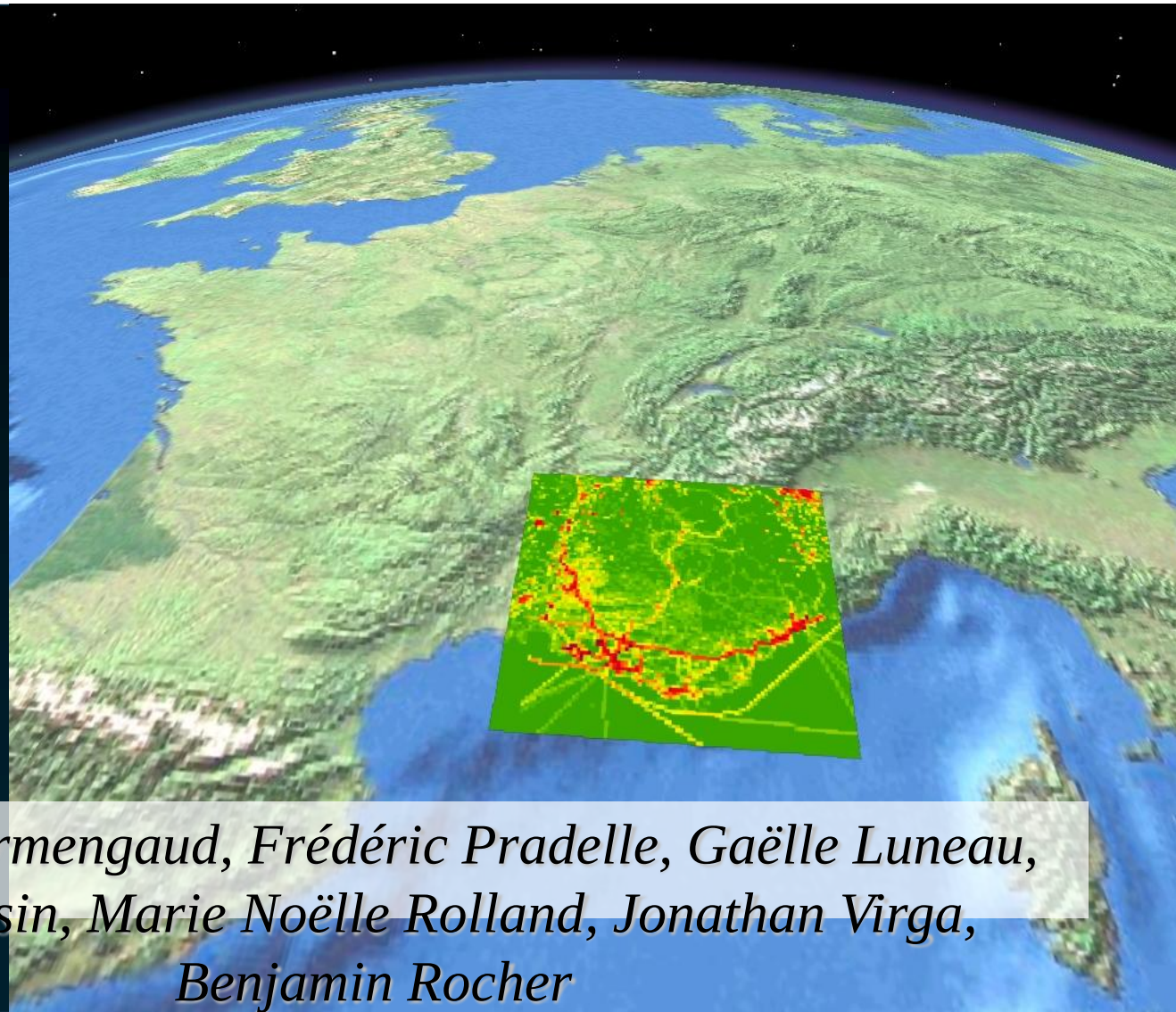


Current developments

- Optimization of the codes
- Development of a “tool box” for the users
- Assimilation of observation data (partnership with INRIA)
- Current implementation of the system on several cities: Aix-en- Provence, Nice, Orléans, Tours, Clermont-Ferrand…

4 urban platforms dedicated to air quality survey in PACA region

HARMO13



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ATMO PACA

38 observatories approved by the French Ministry of the Environment and gathered within federation ATMO

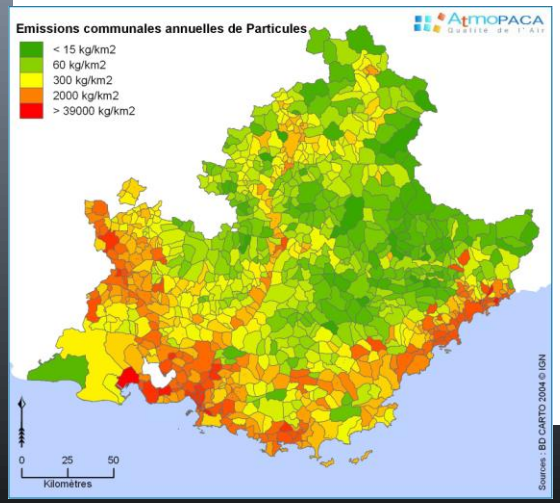
fédération Atmo
Associations Agréées de Surveillance de la Qualité de l'Air

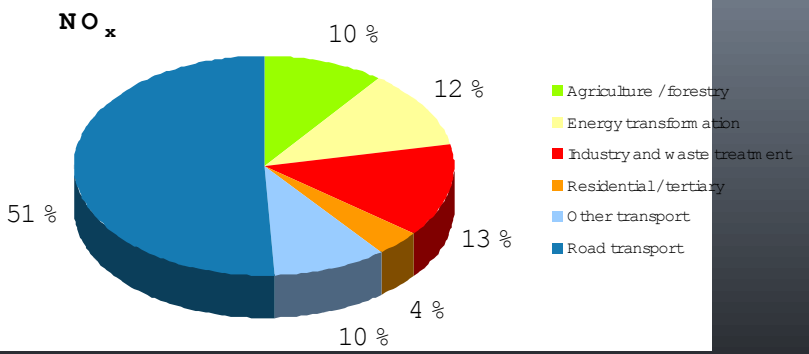
NUMTECH

MISSIONS

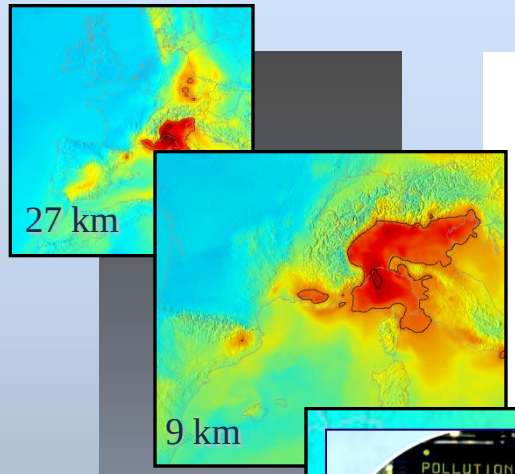
We have to :

- Know the air quality on the territory and its evolution in time,
- Characterize the levels by report/ratio with health and environmental standards,
- Forecast episodes of pollution,
- Inform population within the best time,
- Sensitize with the air quality,
- To be used as point of support with research,
- To take part in the reflexions on urban development : tools of decision-making aid.





AIRES-MEDITERRANEE.ORG



Inter REGIONAL SYSTEM AIRES

METEO & CHIMISTRY

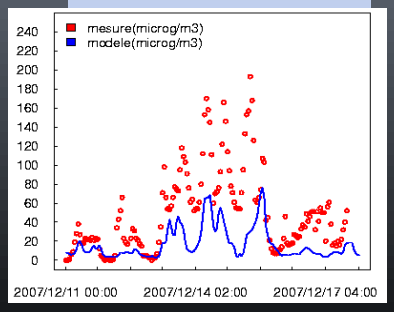
MM5

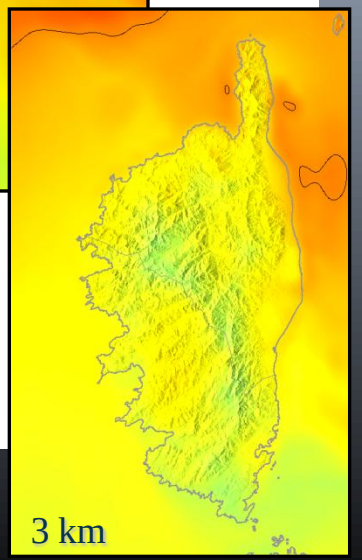
WRF

CHIMERE

System Integrated, Modular for Forecast (48h) , Survey and Scenarios at different scales, O_3, NO_2, PM …

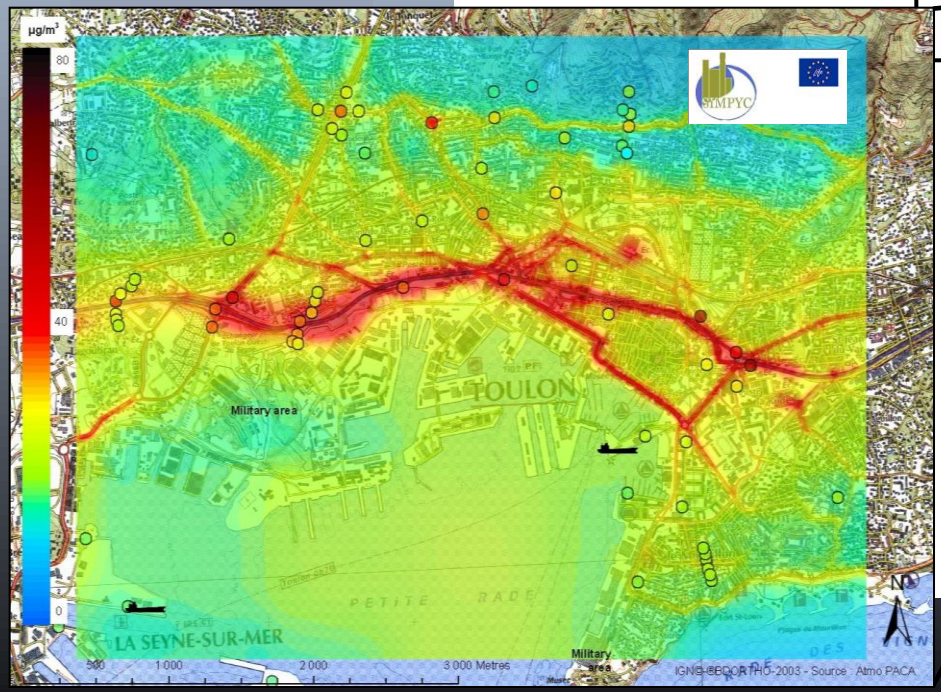
T2 | V10 | P | CL | EO | O_3 | NO_2 | PM10

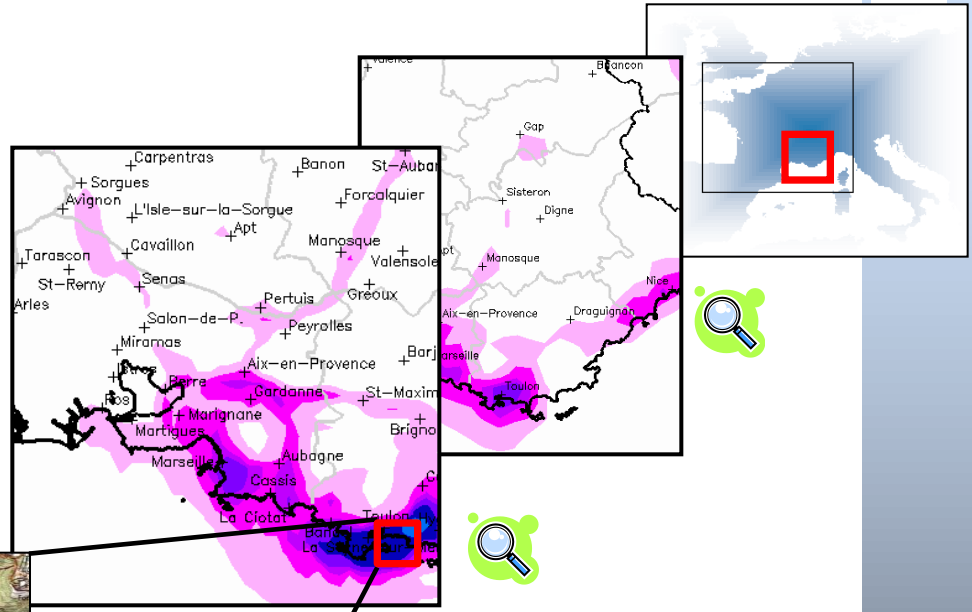


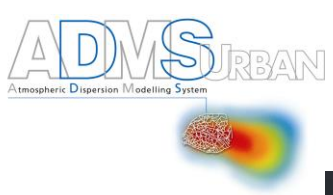


AIRES : from occitan « Aire » [aire] : n.m. air : Atmospheric Integrated REgional System

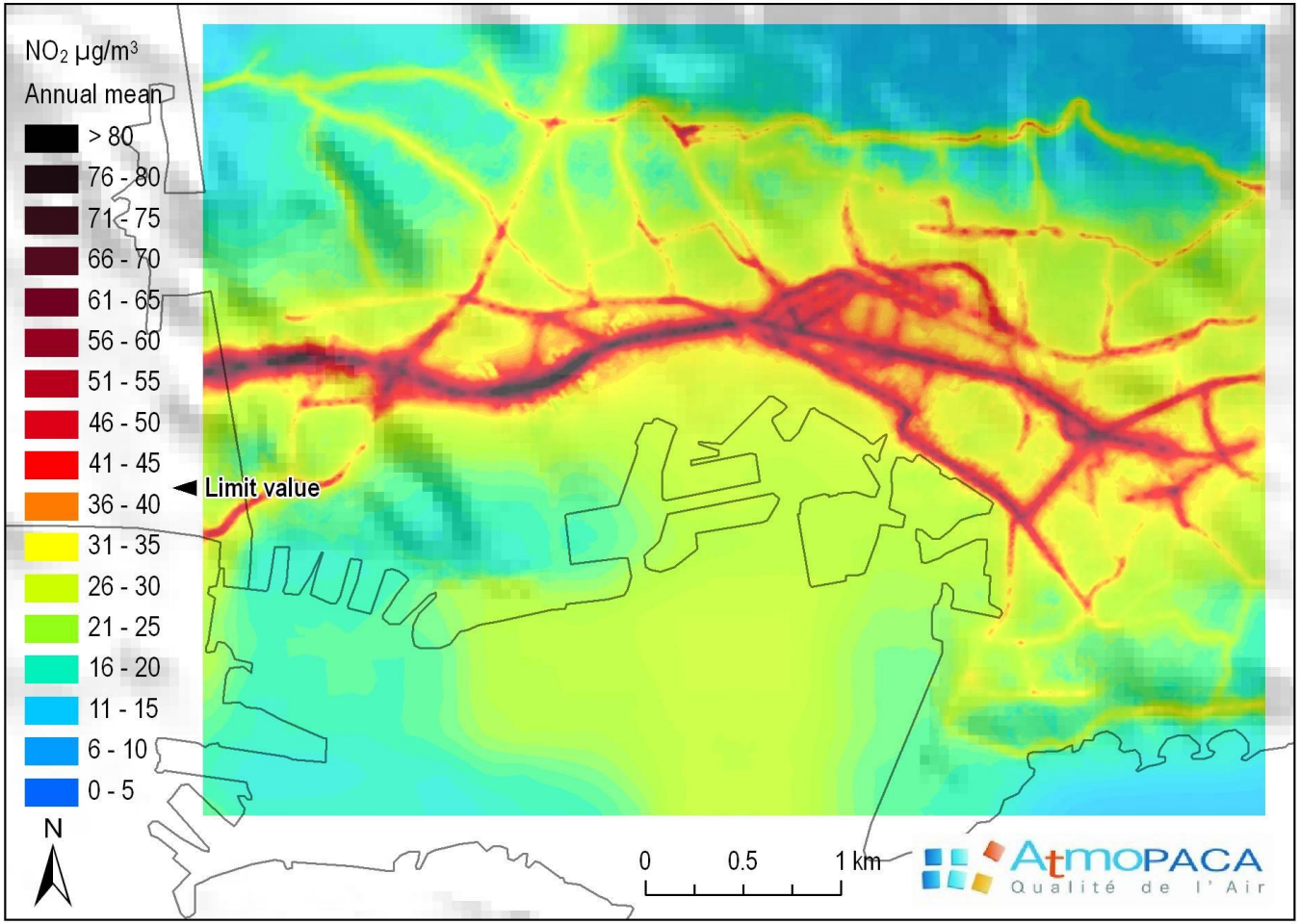
REGIONAL TO URBAN SCALE

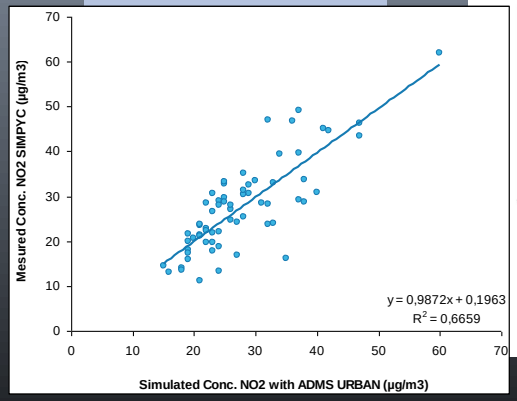






TOULON

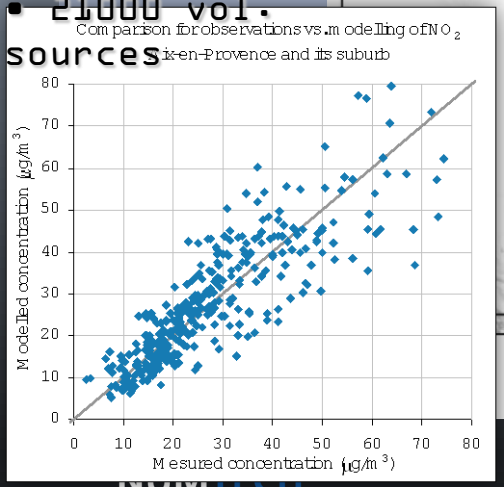


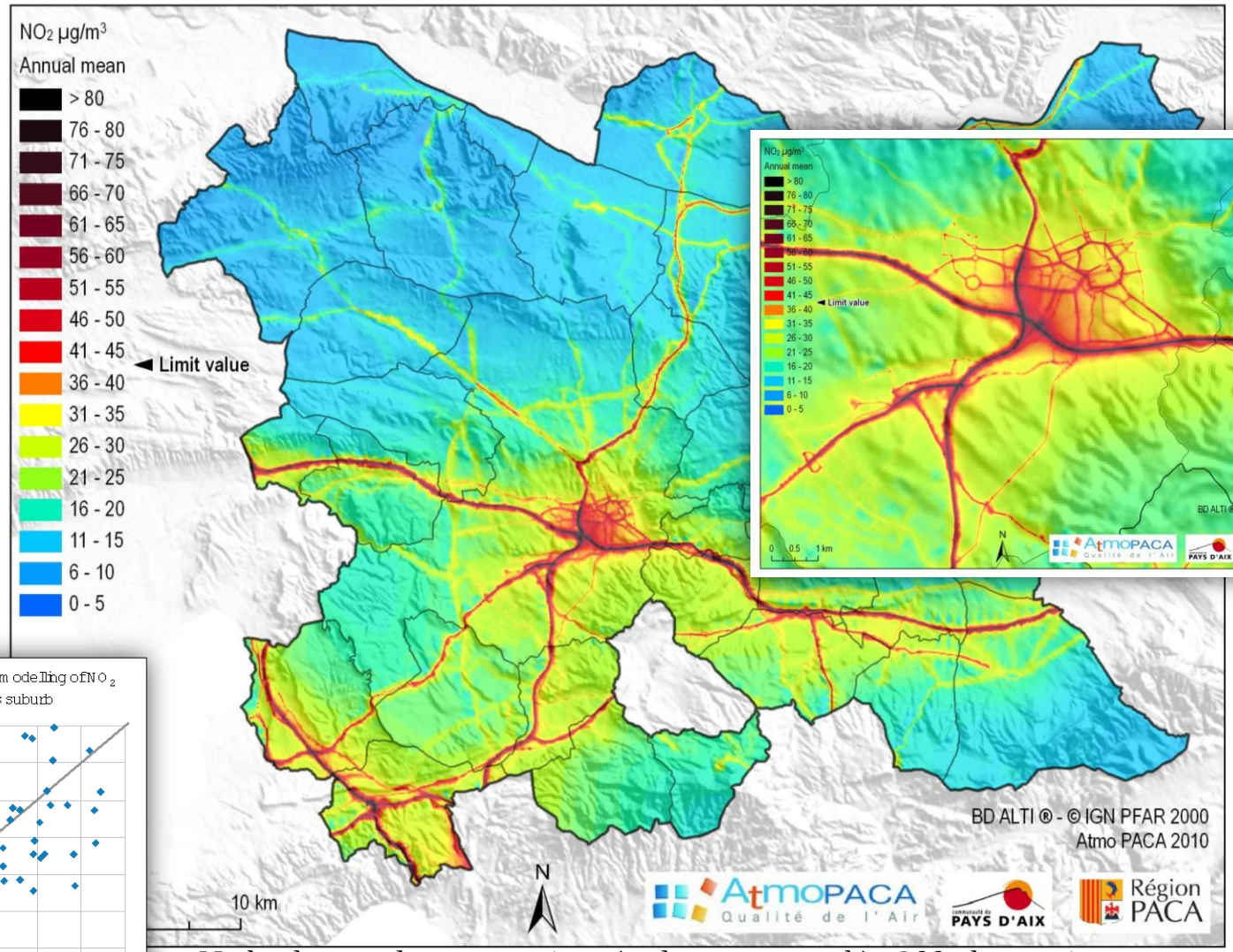


- No background concentrations (cadastre approach) ; 103 observations
- Bias : -3 mg/m^3 (annual)
- Correlation : 0.8 (annual)

AIX EN PROVENCE – PAYS D'AIX

- 6000 roads
- 95000 calculation pts
- 340 industrials sources
- 21000 vol. sources

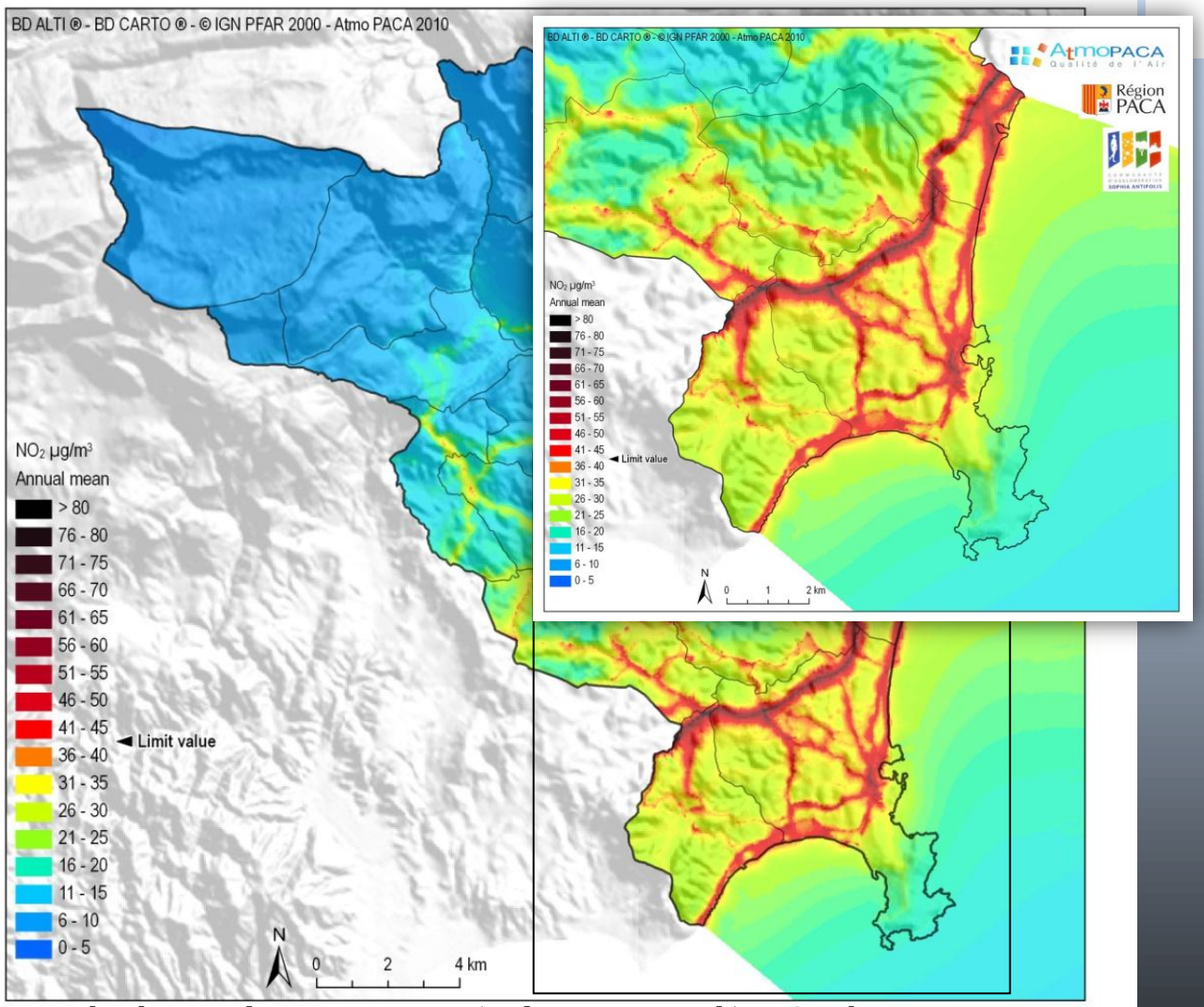


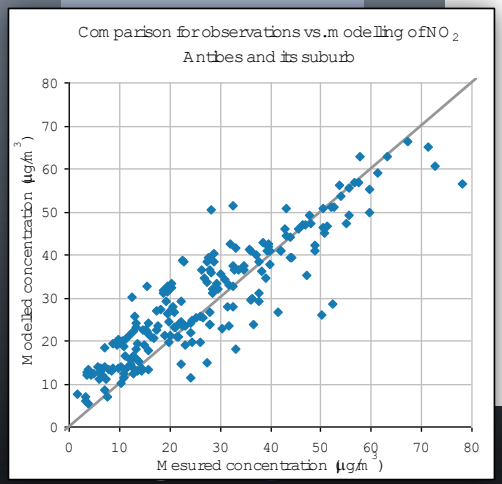


- No background concentrations (cadastre approach) ; 200 observations
- Bias : -1 mg/m^3 (summer) +1.3 mg/m^3 (winter)
- Correlation : 0.84 (summer) - 0.86 (winter)

ANTIBES – SOPHIA ANTIPOLIS

- 4000 roads
- 65000 calculation pts

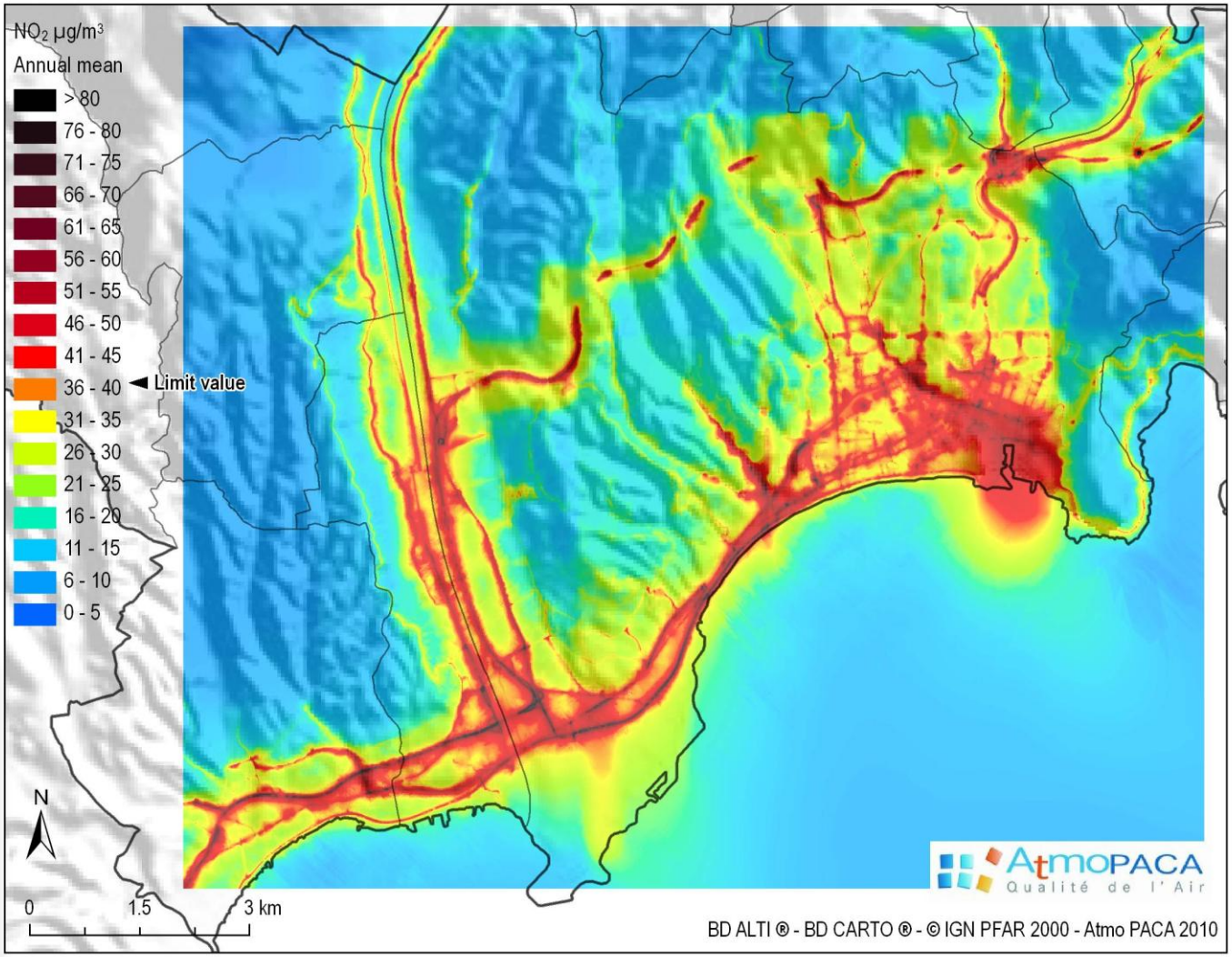


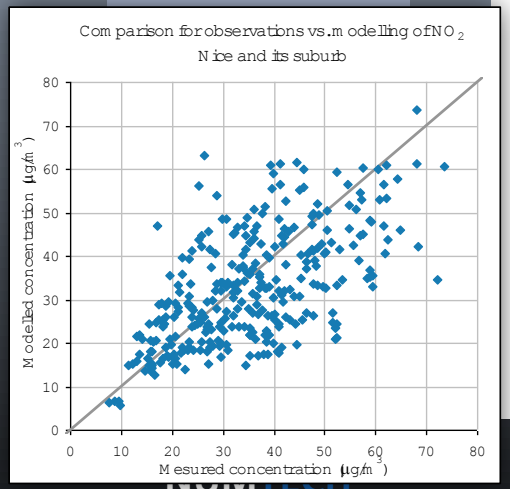


- No background concentrations (cadastre approach) ; 102 observations
- Bias : +4.6 mg/m^3 (summer) -0.8 mg/m^3 (winter)
- Correlation : 0.89 (summer) - 0.92 (winter)

NICE CÔTE D'AZUR

- 8000 Roads
- 80000 calculation pts

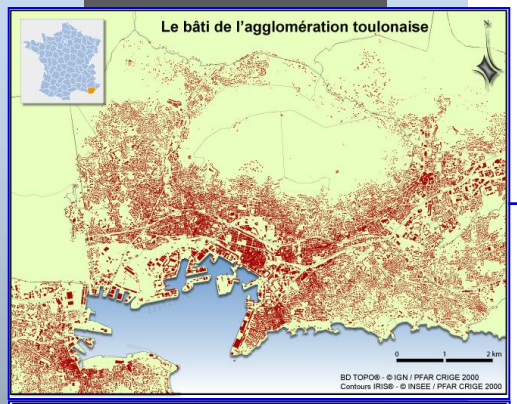


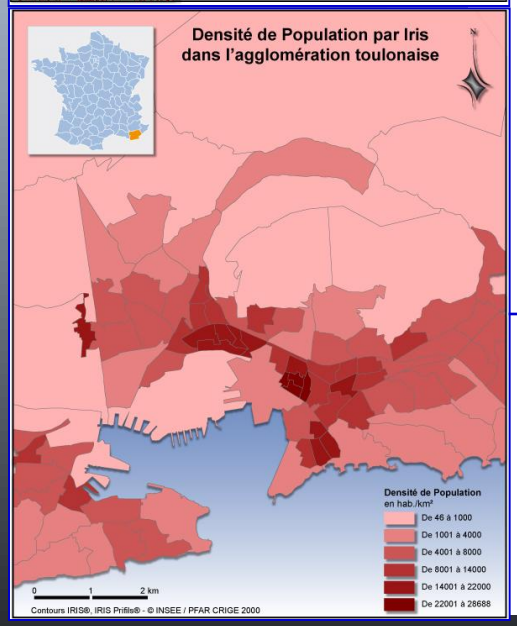


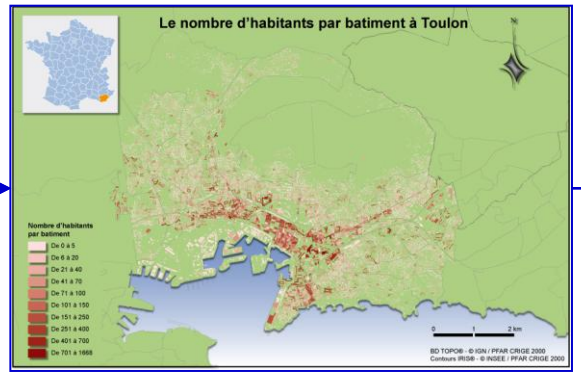
- No background concentrations (cadastre approach) ; 160 observations
- Bias : +3 mg/m^3 (summer) -8 mg/m^3 (winter)
- Correlation : 0.7 (summer & winter)

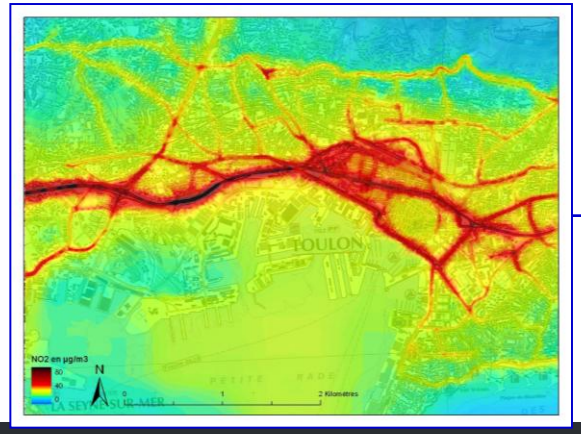
EXPOLOGY

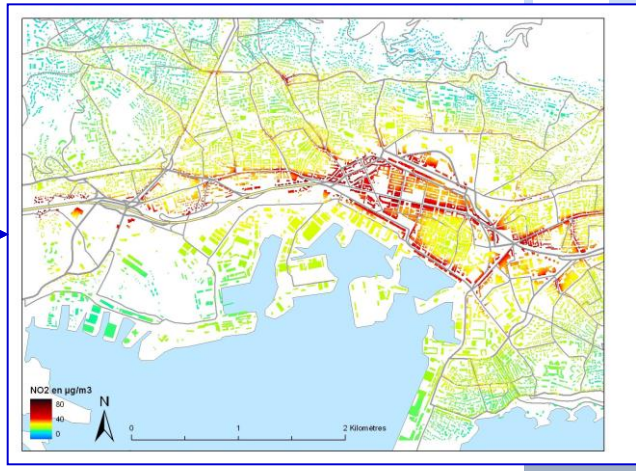
Soil occupation, buildings , population

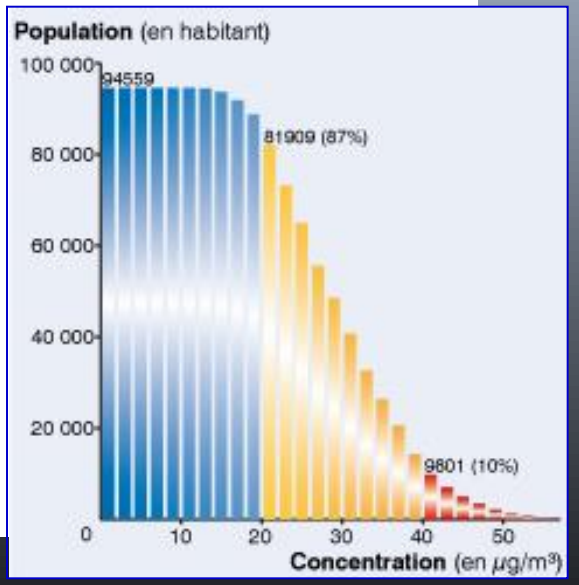












CONCLUSIONS

Mapping Air Quality & Survey territory

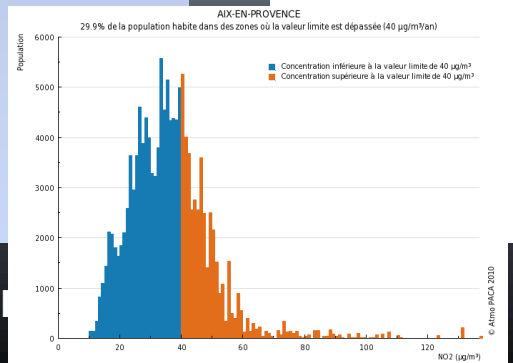
Forecast and Communication

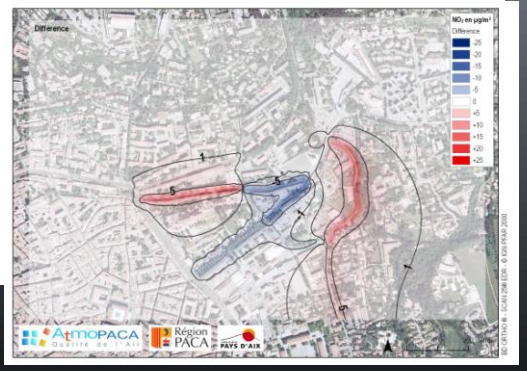
Regulation & actions plans

Urban and Metropolitan Air Quality platforms are necessary

National , European Reporting European Directives and Urban Health impacts

Scenarios Decision making aid





THANK YOU FOR YOUR ATTENTION

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