

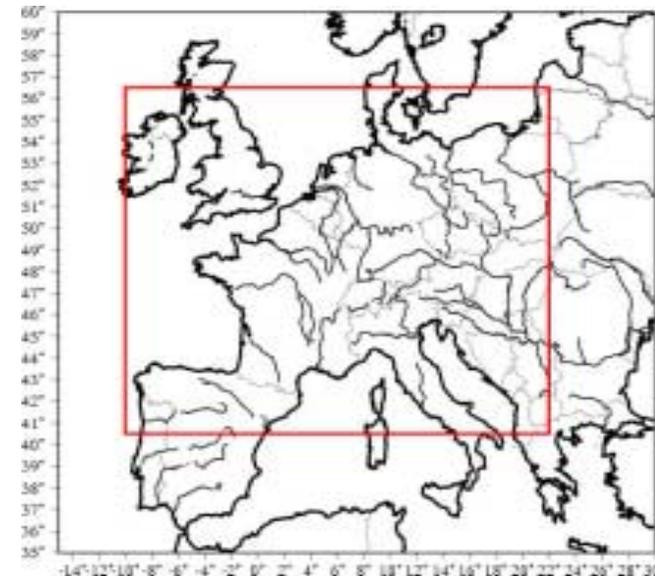
The PREV'AIR System: a Collaborative Project

- MEDD (Ministry of Ecology and Sustainable Development)
- INERIS (National Institute for Industrial Environment and Risks)
- IPSL (Pierre-Simon Laplace Institute), National Center for Scientific Research
- ADEME (Agency for Environment and Energy Management)



Objectives of the PREV'AIR System

- Provide the MEDD with technical support in relation with European negotiations on transboundary air pollution
 - UNECE/CLRTAP
 - UE/CAFE
- Complement local information delivered by the French qualified associations for air quality monitoring (AASQA) UNECE/CLRTAP



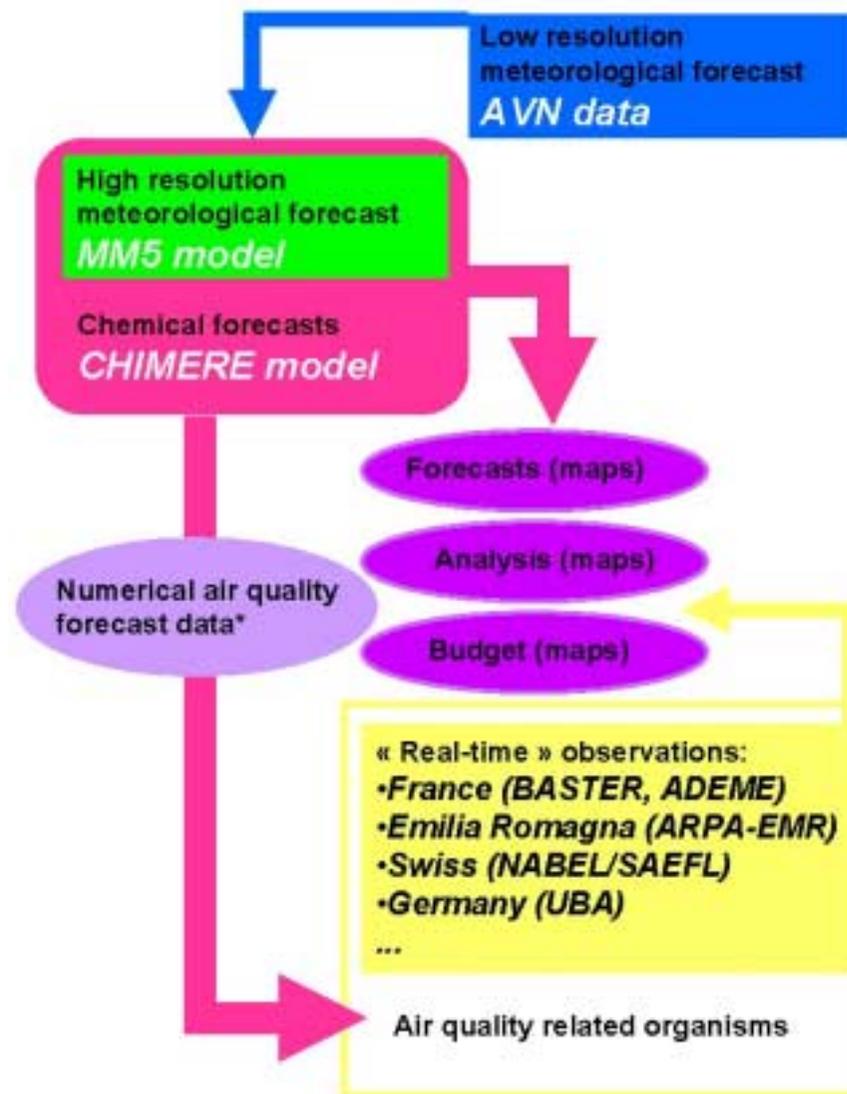
Architecture of the PREV'AIR System

- Meteorology and air quality simulation numerical models and I/O data interface modules

- Meteorology: AVN data
- Emissions: 1999 EMEP data
- Observation data: BASTER real-time data base

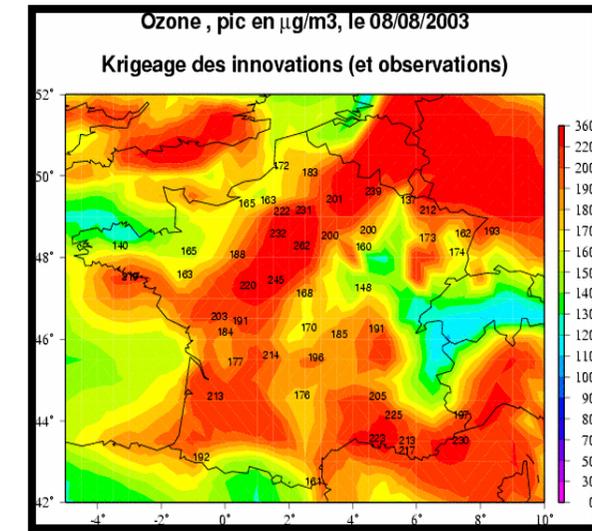
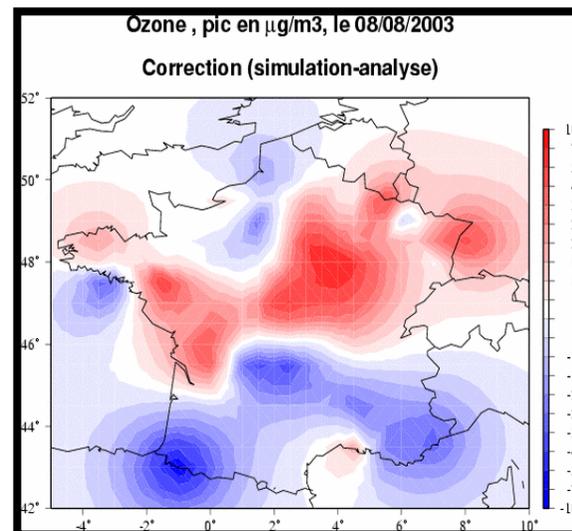
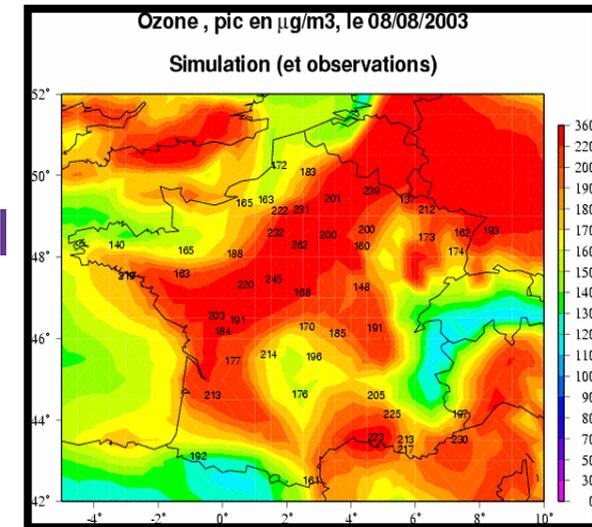
- Products delivery through the Internet:

- <http://prevair.ineris.fr>



PREV 'AIR Outputs (2): Maps for the Day Before

- Simulated O₃, NO₂ daily peak and mean concentration maps
- Observation data assimilation in model simulations
 - D-1 O₃ peak analyzed map, delivered at D+0, 08:00 h UT



Kriging on Model Errors (Innovations)

model simulations

observations

$$Z^a(s_a) - Z^b(s_a) = \sum_{k=1}^p w_k(s_a) \cdot \underbrace{(Y^o(s_k) - Z^b(s_k))}_{\text{Innovation}}$$

Analyzed concentration

Weights are computed so th

$$E(Z^a(s_a) - Z^t(s_a)) = 0$$

$$E\left(\left(Z^a(s_a) - Z^t(s_a)\right)^2\right) \text{ is minimum}$$

Difficulties:

- Observation errors: Variance-covariance matrix
- Model errors: Variance-covariance matrix ☒ Choice of a model
- Choice of measurement stations

Kriging on Model Errors (Innovations)

Model errors variance-covariance matrix:

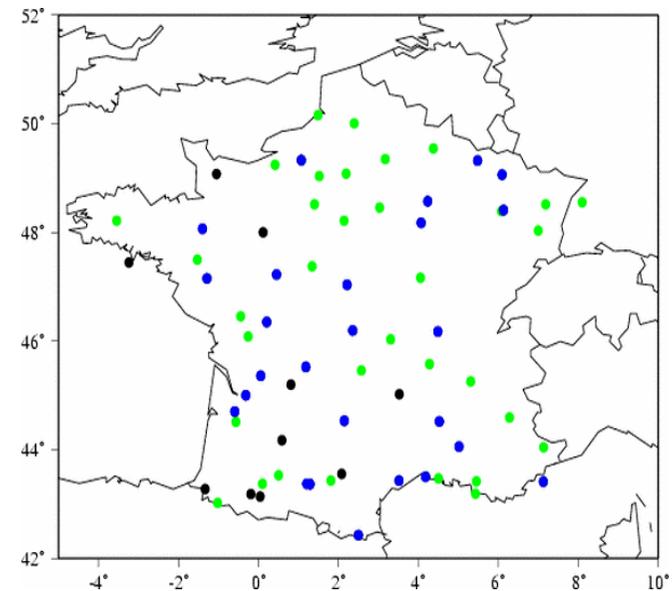
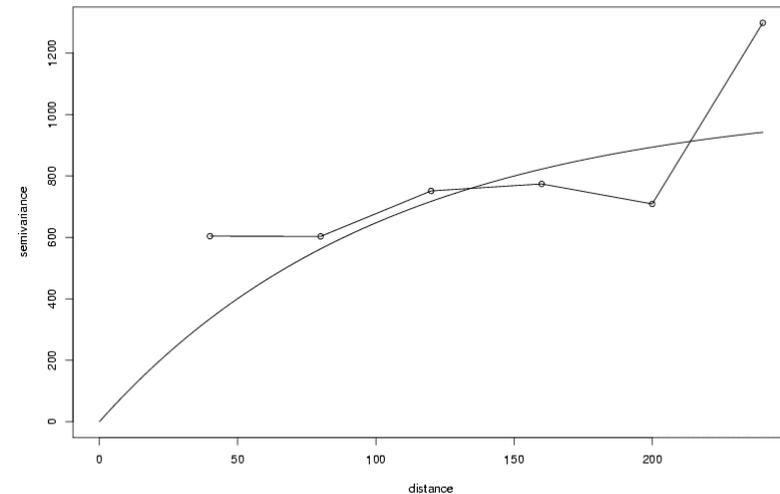
- Homogeneity and Isotropy:

$$\text{Cov}\left(\left(\mathbf{Z}^o(s_k) - \mathbf{Z}^b(s_k)\right)\left(\mathbf{Z}^o(s_l) - \mathbf{Z}^b(s_l)\right)\right) = C(|s_k - s_l|)$$

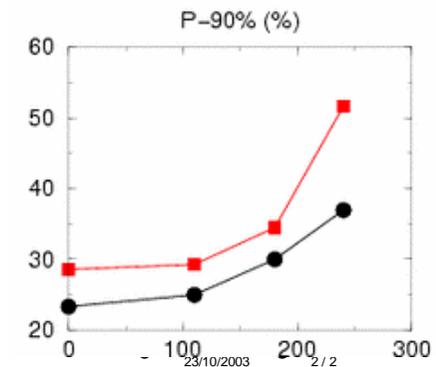
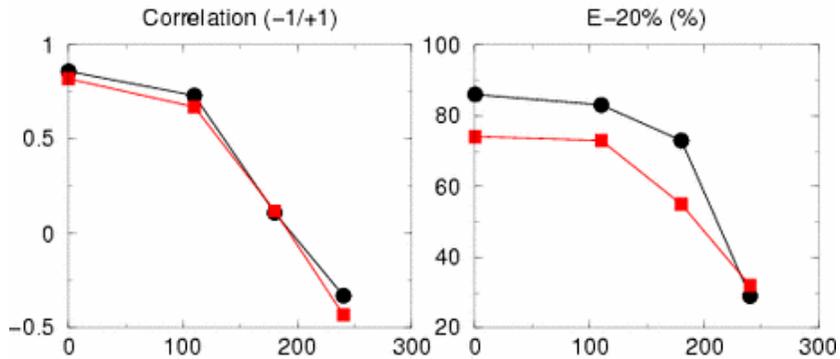
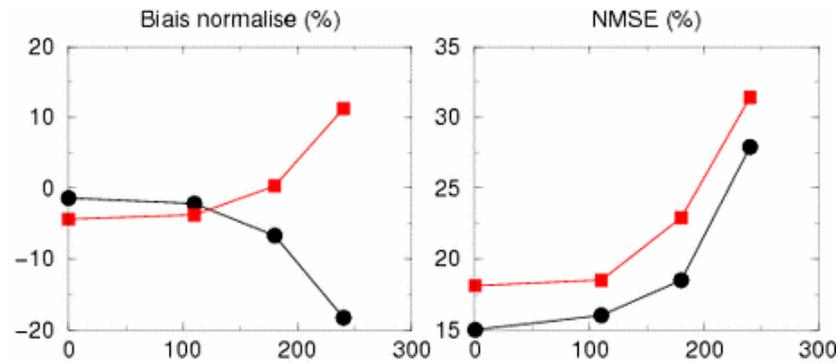
- « exponential » model

Measurement stations:

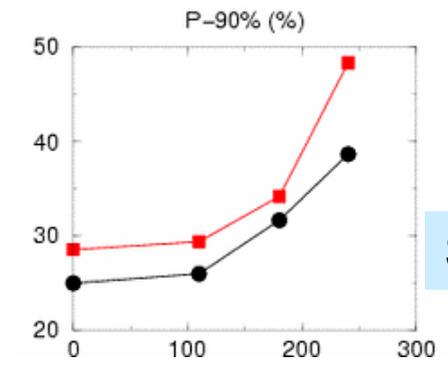
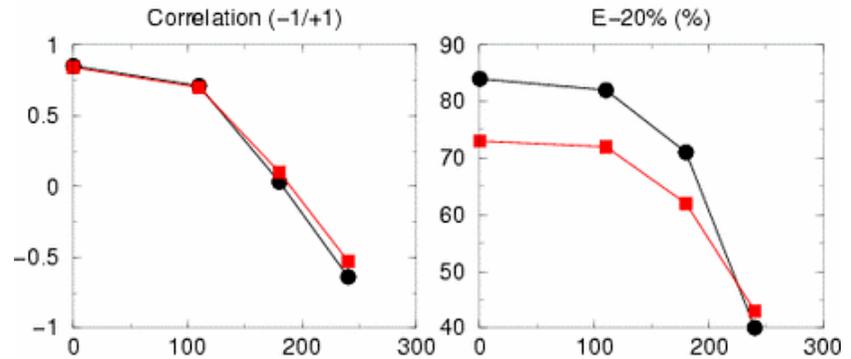
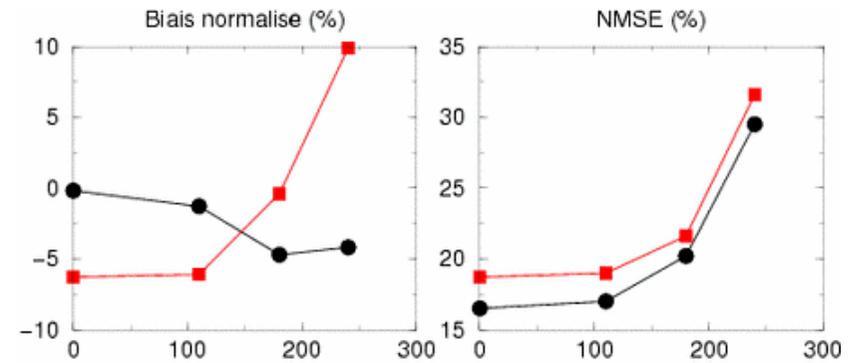
- Rural (34)
- Suburban (26)
- Urban (10)



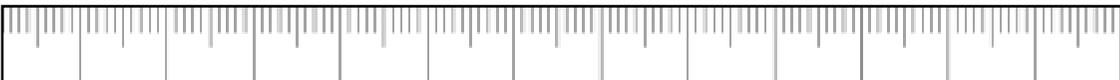
Evaluation of the Analysis Methods



Rural stations



Suburban stations

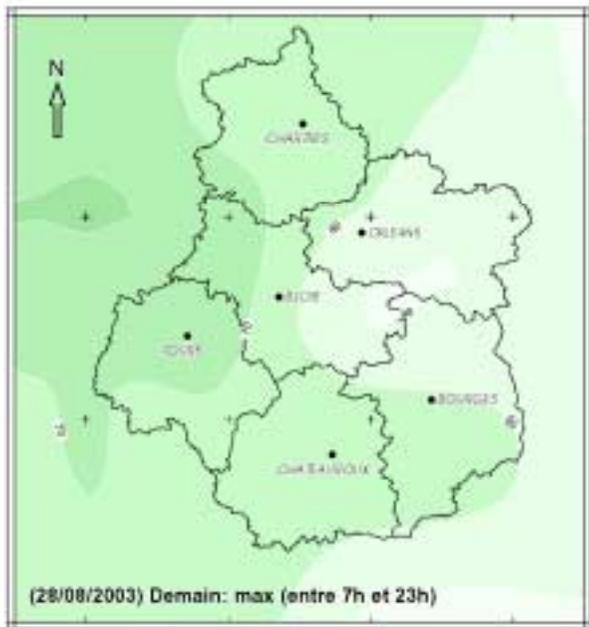


PREV'AIR Outputs (3): Numerical Data Delivery

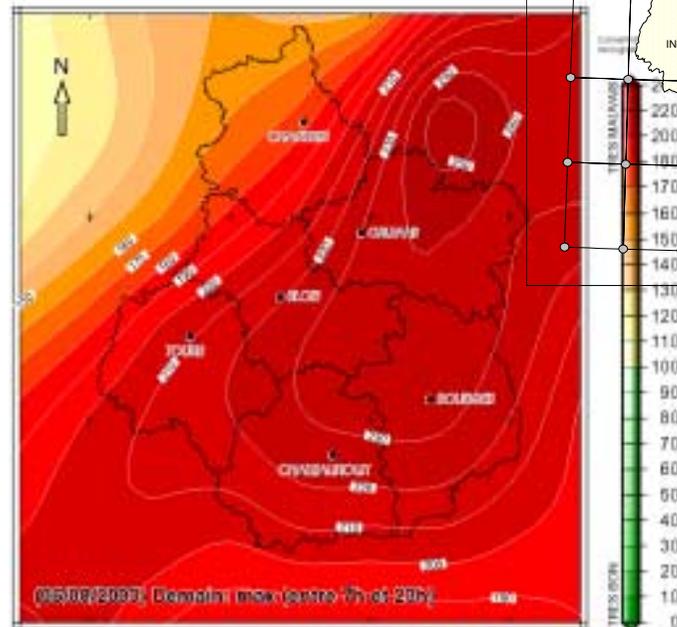
- Daily output available at 22:00 h UT
- D-1, D+0, D+1, D+2 numerical data
- 2 types of data:
 - Surface O₃ and NO₂
 - 3D data for 22 chemical species
- Up to now: 15 users (12 AASQA)

- Applications at the local scale:
 - Mapping and observation data assimilation
 - Forecasting

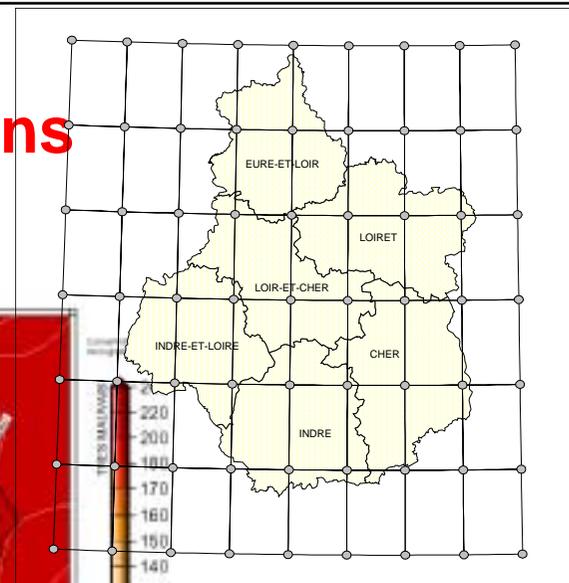
Mapping of Air Pollutant Concentrations

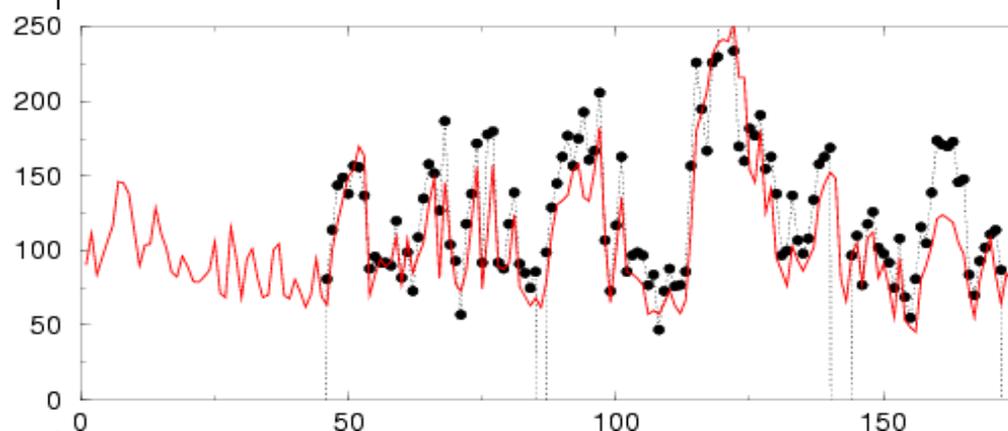
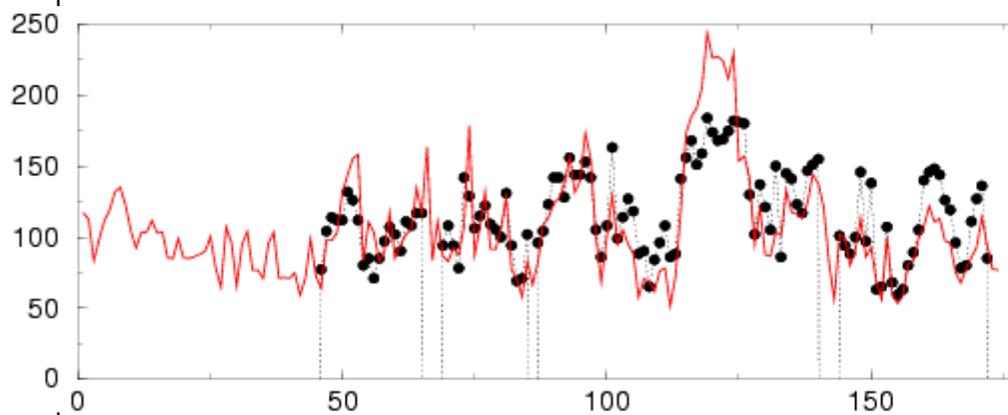
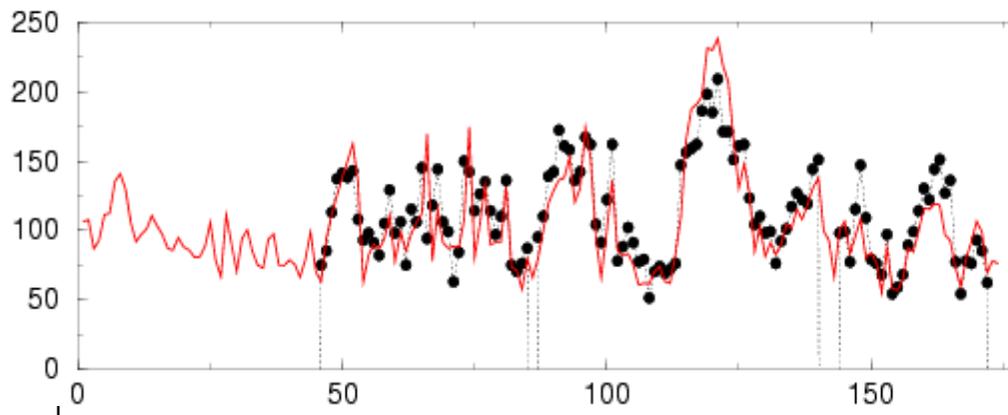


Carte de prévision du 28 août 2003 pour le lendemain



Carte de prévision du 6 août 2003 pour le lendemain





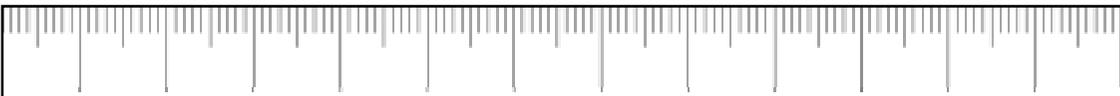
128.5	-17.5	31.0	0.79	34003	Chambord	R
124.2	-12.3	25.0	0.86	34011	Prefecture	U
125.2	-12.8	27.7	0.82	34012	La_Source	U
130.4	-18.5	31.1	0.81	34014	St_Jean	S
121.8	-14.1	24.9	0.86	34021	Ville_aux_Dames	S
115.6	-9.1	22.8	0.84	34023	Jardin_Botanique	U
121.5	-14.2	26.8	0.82	34024	Joue_les_Tours	U
113.0	-5.5	20.2	0.87	34025	La_Bruyere	U
124.0	-12.8	26.3	0.83	34031	Gibjons	U
120.8	-9.3	24.5	0.83	34032	Leblanc	U
116.0	-4.8	23.0	0.84	34033	Bourges_sud	S
131.7	-22.3	29.3	0.90	34041	Fulbert	U
123.4	-14.5	23.4	0.91	34042	Luce	U
128.2	-16.2	26.0	0.90	34043	Oysonville	R
121.5	-13.0	24.5	0.82	34051	Chateauroux_Sud	U
122.5	-12.6	24.8	0.86	34061	Blois_nord	U
120.4	-10.4	23.4	0.86	34062	Blois_centre	U



LCSQA Study, 2002 « Local scale mapping and forecasting of air pollution fields using simulations of a continental scale chemistry-transport model »
IPSL/ Orsay University

CD-Rom with programs, data, graphical tools:

- R software version 6.0
- Generic Mapping Tools (GMT)
- Freely available from the Internet
- For Unix / Linux, Windows and Mac platform



Current and Future Developments

- Web site
- Aerosol module by the end of 2003
- 25kmx25km resolution over France
- New observation data (NABEL, ARPA EMR, UBA, RIVM, ...) for score computation and analysis
- Analysis:
 - Sensitivity studies (methods and parameters)
 - Choice of measurement stations