



On line real-time odours dispersion modelling systems : presentation of operational sites

ARIA Technologies SA
Jacques MOUSSAFIR - Didier BUTY
Christophe OLRV - Pierre CASTANIER
jmoussafir@aria.fr

Alpha MOS
Louis VIVOLA
vivola@alpha-mos.com
Tel : 06 34 49 19 41



ARIA Technologies SA 8-10, rue de la Ferme – 92100 Boulogne Billancourt – France
Tel : +33 (0)1 46 08 68 70 – Fax: +33 (0)1 41 41 93 17 e-mail: info@aria.fr – <http://www.aria.fr>

ARIA Technologies : company profile

ARIA Technologies was founded in 1990 by a group of researchers from the R&D department of EDF, the French electricity board.

It is now an independent company, leader in its field in Europe. Its headquarters are located near Paris, with offices in France and sister companies in Italy, Brazil, India, Mexico.

One single field of activity:

**Atmospheric
Environment**



One single concern: modeling the atmospheric environment

- from building scale to continental scale
- from simple screening models to full-blown CFD solutions
- keeping consulting, software, systems and training tightly linked
- with an international and open approach, close to top R&D centres



■ Consulting

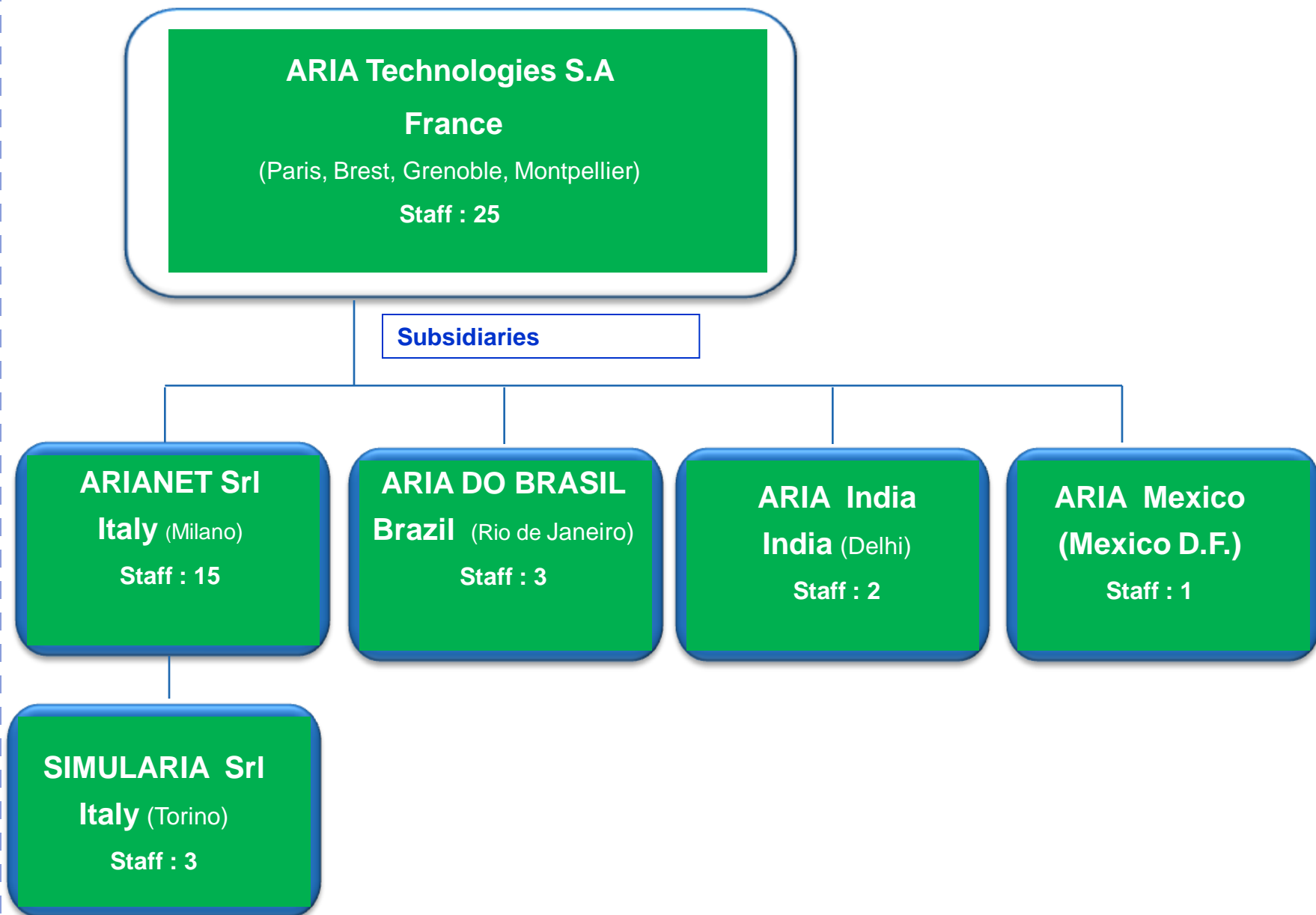
- ✓ Impact and Risk studies / Regulatory assessments
- ✓ Urban & Regional Air Quality
- ✓ Applied Meteorology: wind energy, building



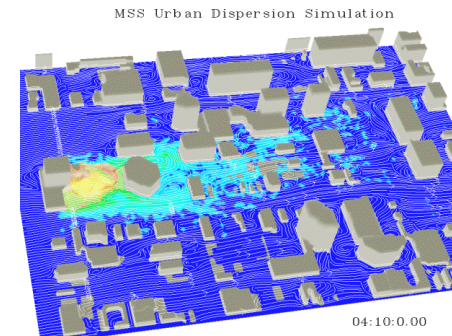
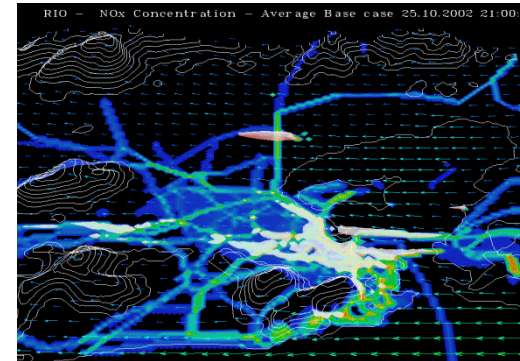
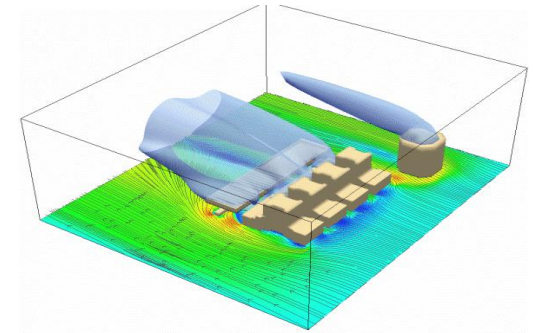
■ Software and systems

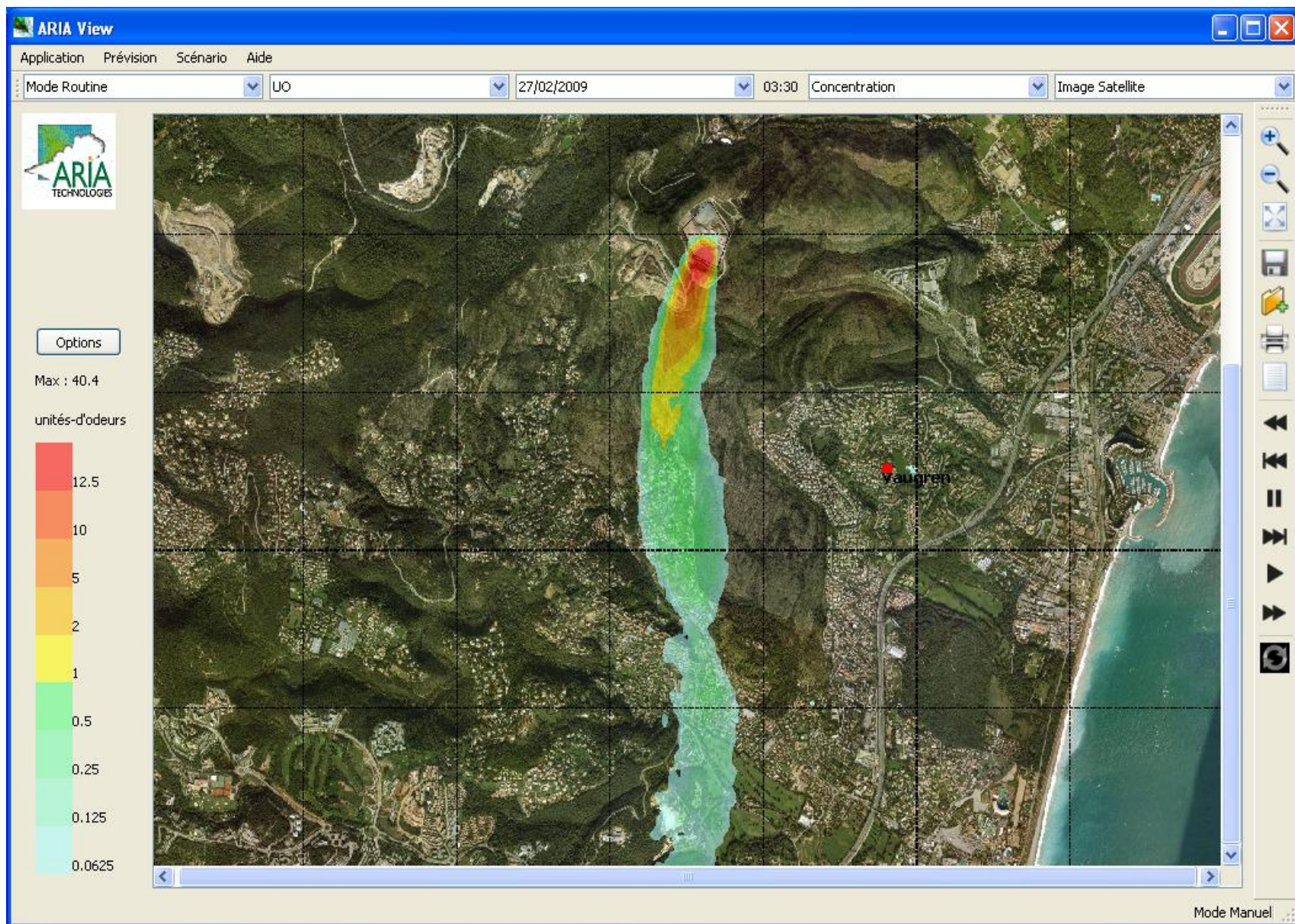
- ✓ Off the shelf complete solutions
- ✓ Specific developments
- ✓ Training





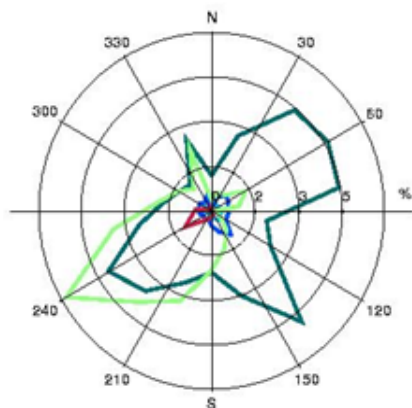
- **Industry** (TOTAL, RENAULT, EDF, SAUDI ARAMCO, TECHNIP, QP ..)
- **Public Sector** (National Agencies, World Bank, Paris, Roma, Rio de Janeiro, Beijing)
- **Defence** (France, UAE, USA..)





Principle of operation

Meteorological data (site station - forecast)



Maps of results (Web compatible)

- Concentrations, depositions
- Odours
- Tracking critical points
- Backwards trajectories

Data collection, model runs

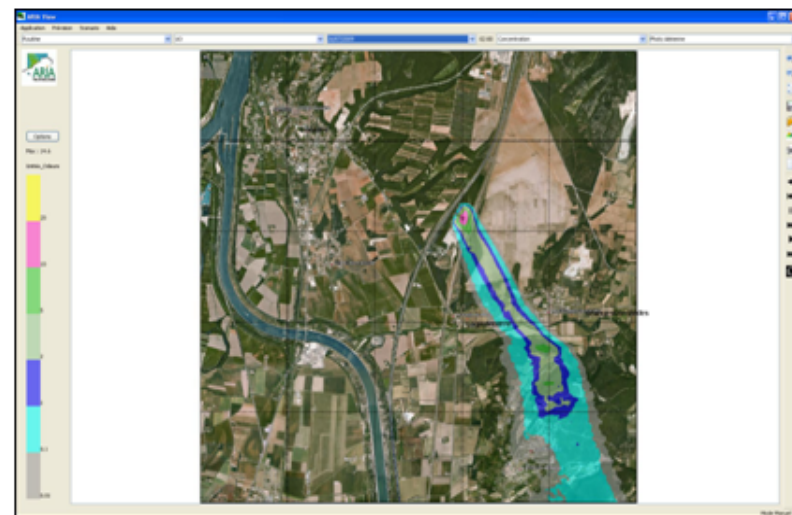


Emission data, computed / measured



kg/j

	SO ₂	CO	PS	Pb
J1	264	30	48	0,6
J2	222	25	40	0,5
J3	342	39	62	0,8
J4	350	40	64	0,8
...				
J28	425	48	77	1,0
J29	369	42	67	0,9
J30	201	23	36	0,5



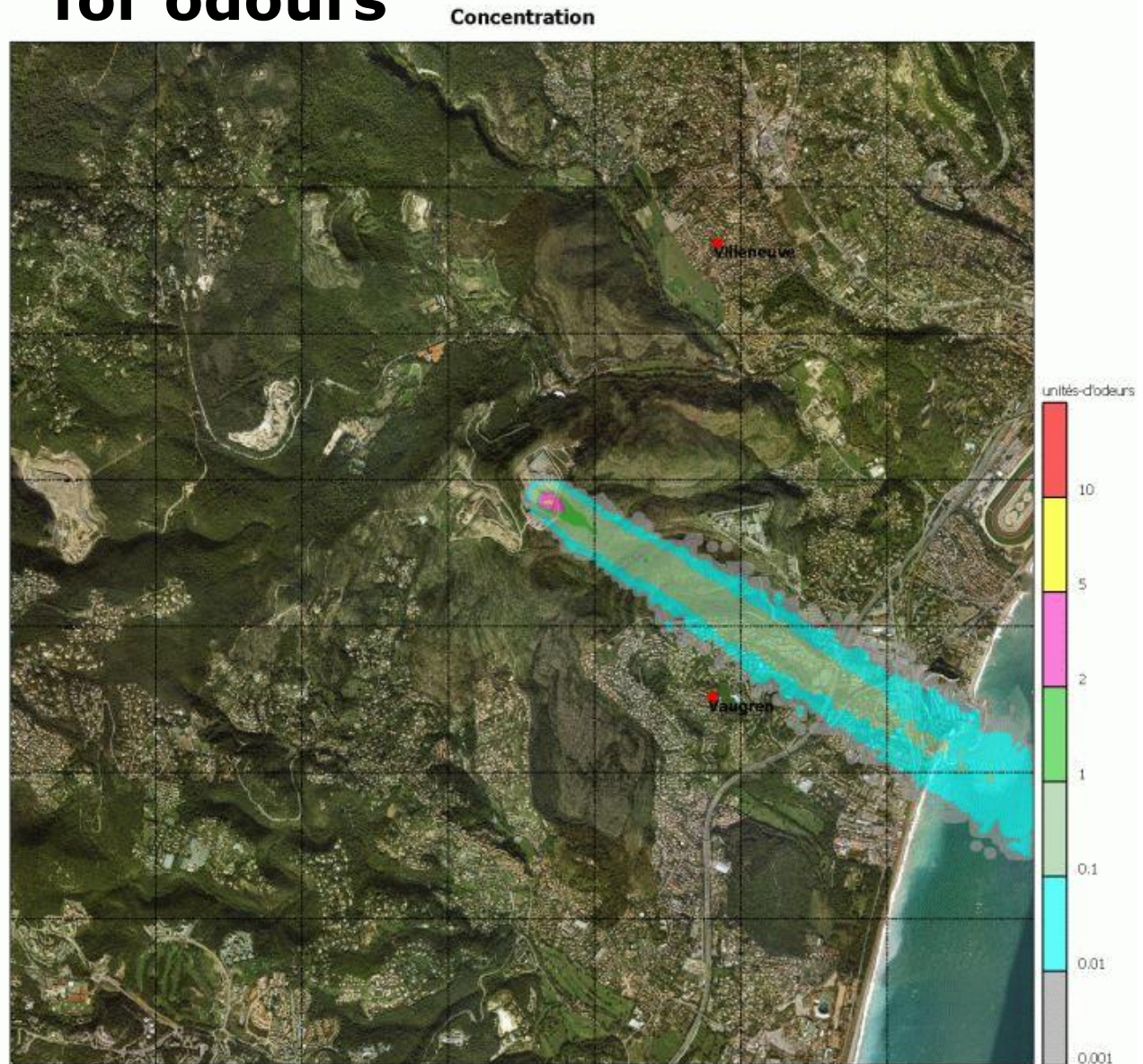
- Manage exposure and risk
- Broadcast results
- Evaluate health risks

ARIA View™ for odours

Landfill,
Villeneuve-
Loubet,
France

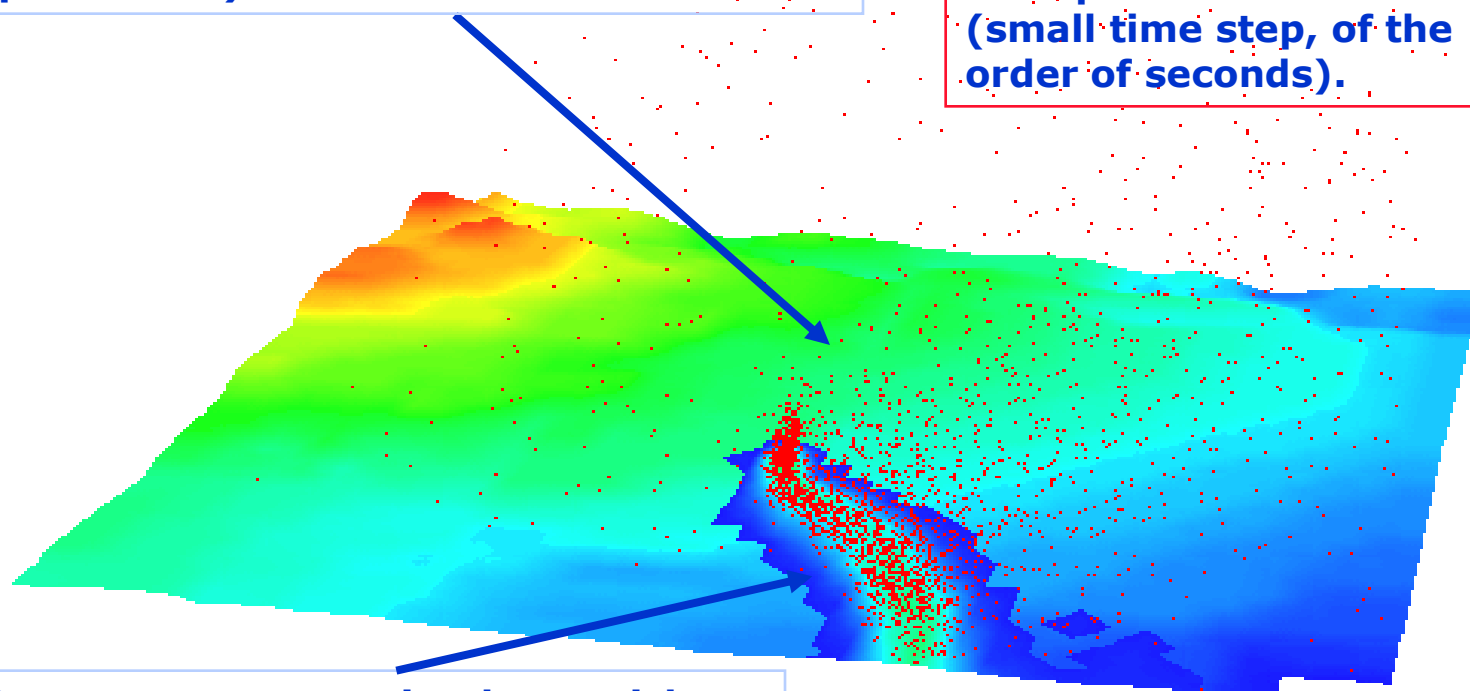


NEZ RQ BOX



In a 3D non-stationary meteorological wind field, follow the dynamics of a very large number of fluid parcels (« particles »)

Time-dependent resolution of the Langevin equations for each particle (small time step, of the order of seconds).



Compute concentration by particle counting on a grid (here ground level footprint)

Advantages of Lagrangian dispersion models

Realistic dispersion

- Arbitrarily complex wind fields (wind shear)
- Non-Gaussian dispersion (asymmetry)
- Takes into account obstacles (buildings)



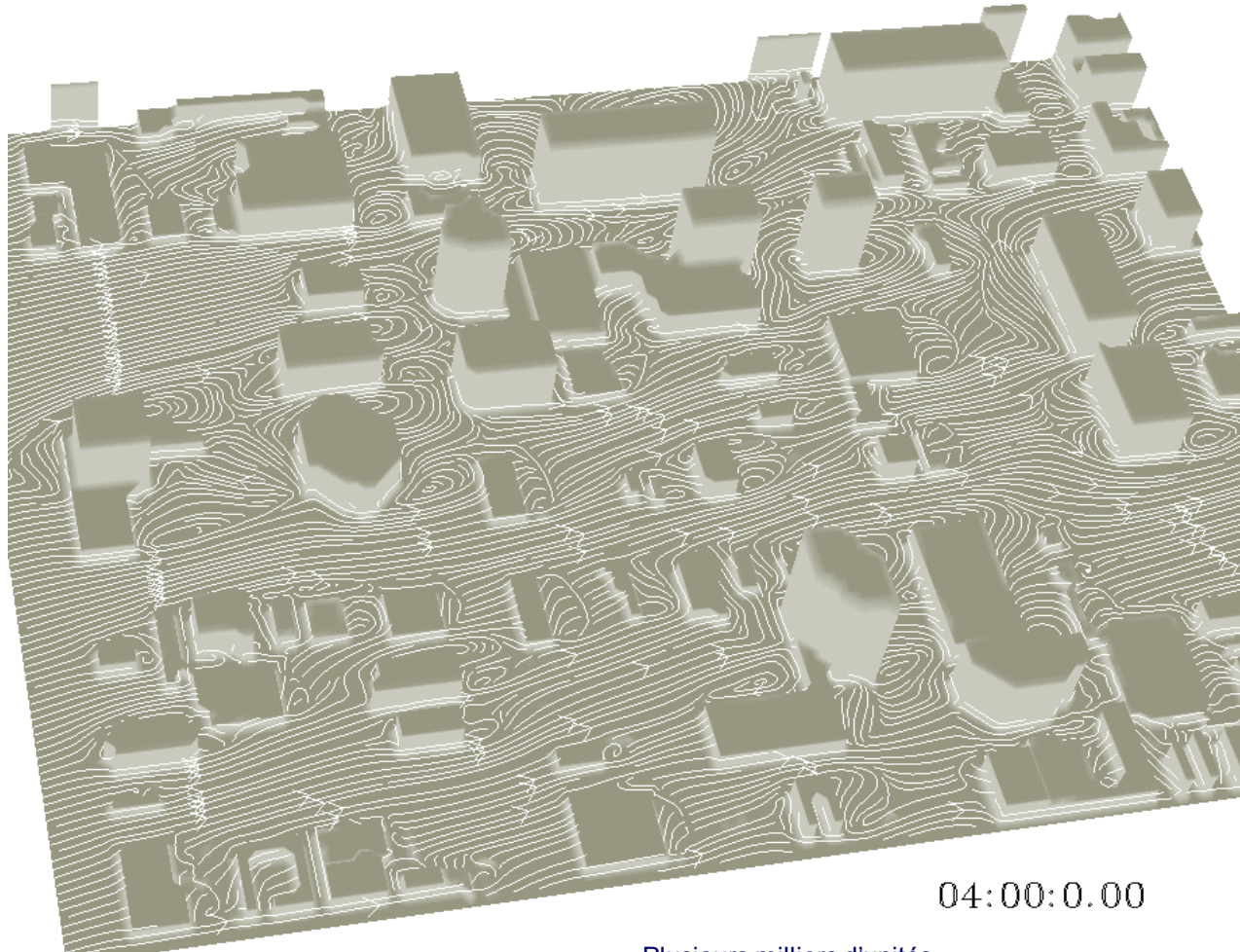
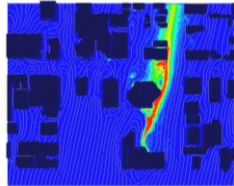
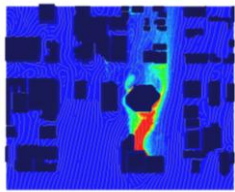
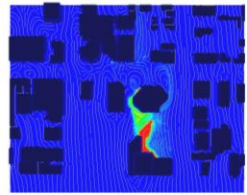
Simplicity and generality

- Small number of parameters
- “Grid free” particle dynamics
- Extremely flexible source representation
- Mobile sources mobiles easily modelled
- Tagging particles : substance, source, age,...
- Indoor infiltration
- Parallel processing easy

Lagrangian model with obstacles

Detailed building effects

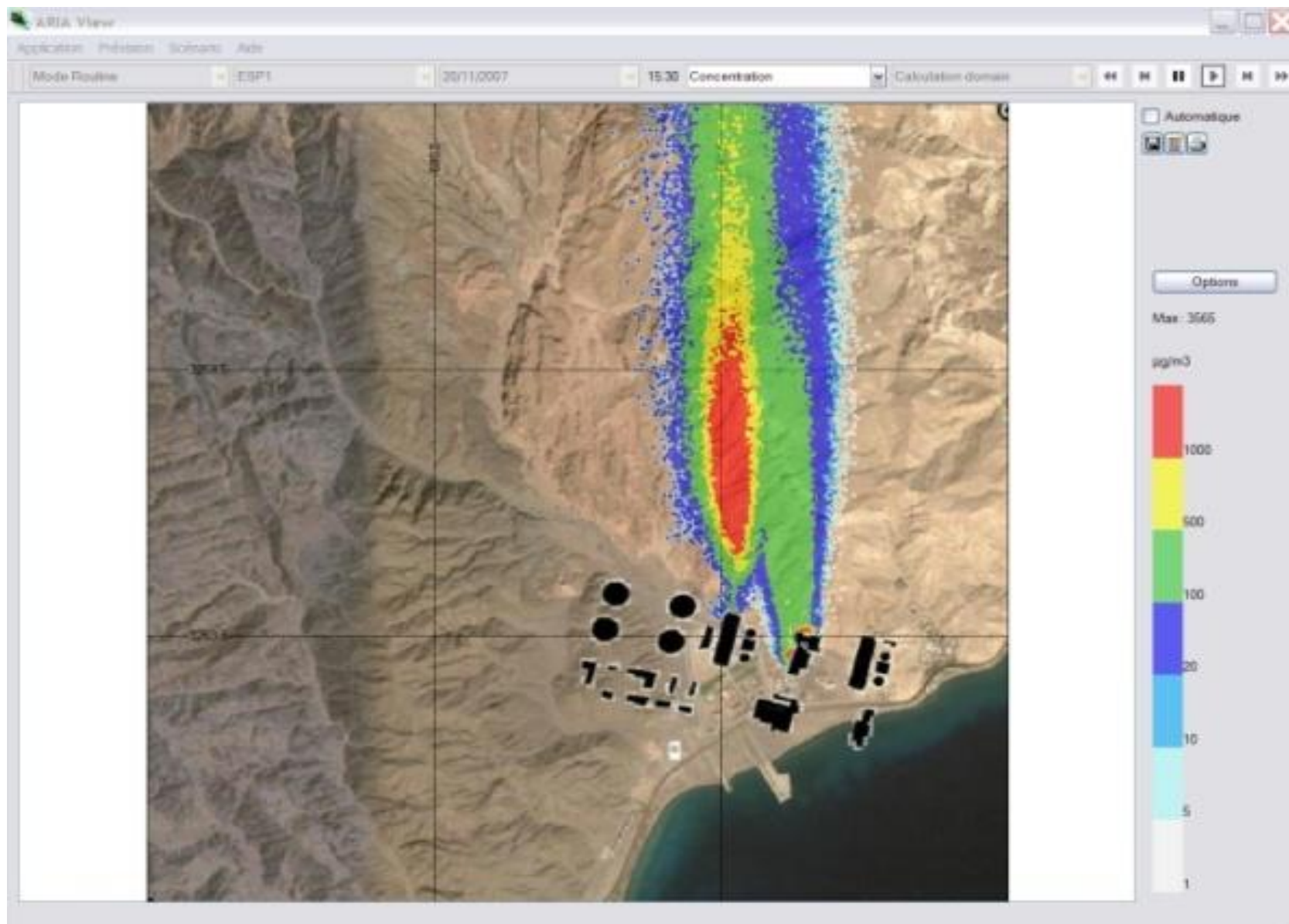
MSS Urban Dispersion Simulation



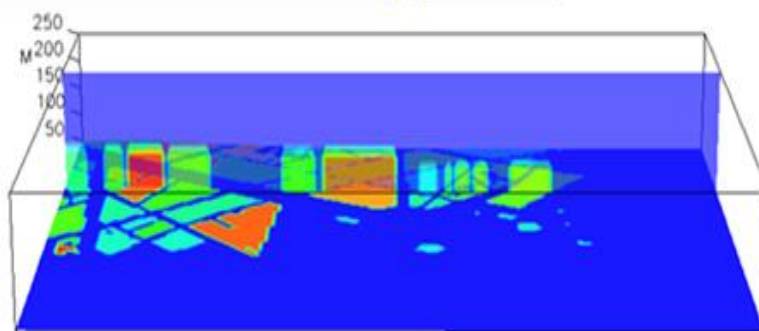
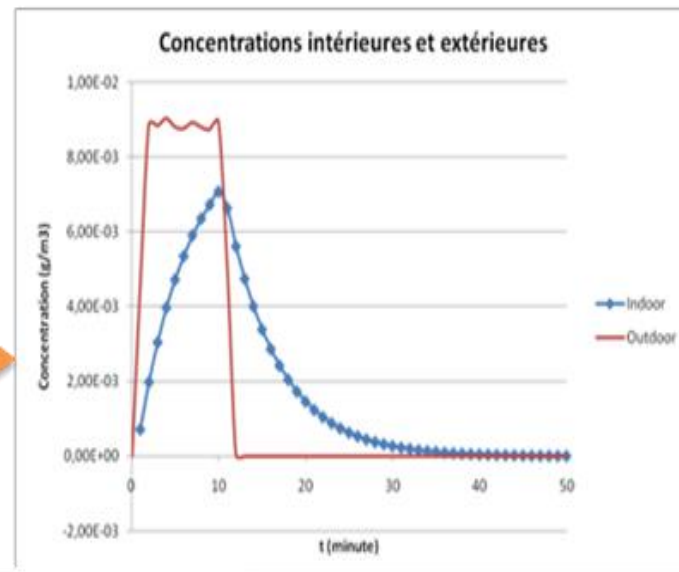
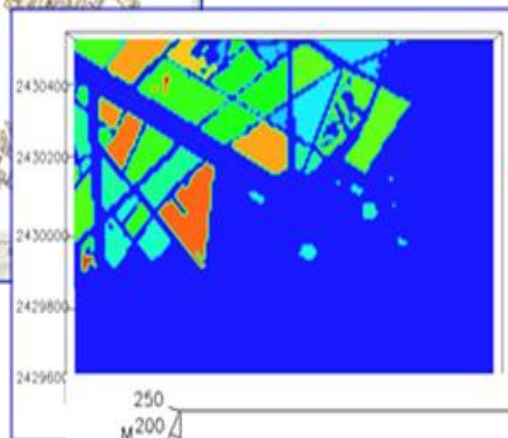
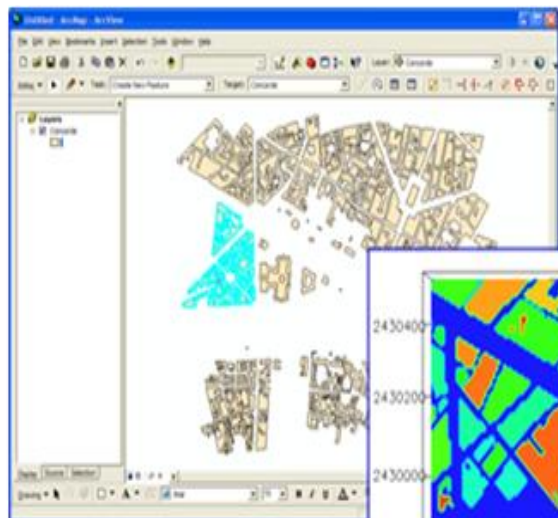
04:00:0.00

Plusieurs milliers d'unités
de l'US Army équipées

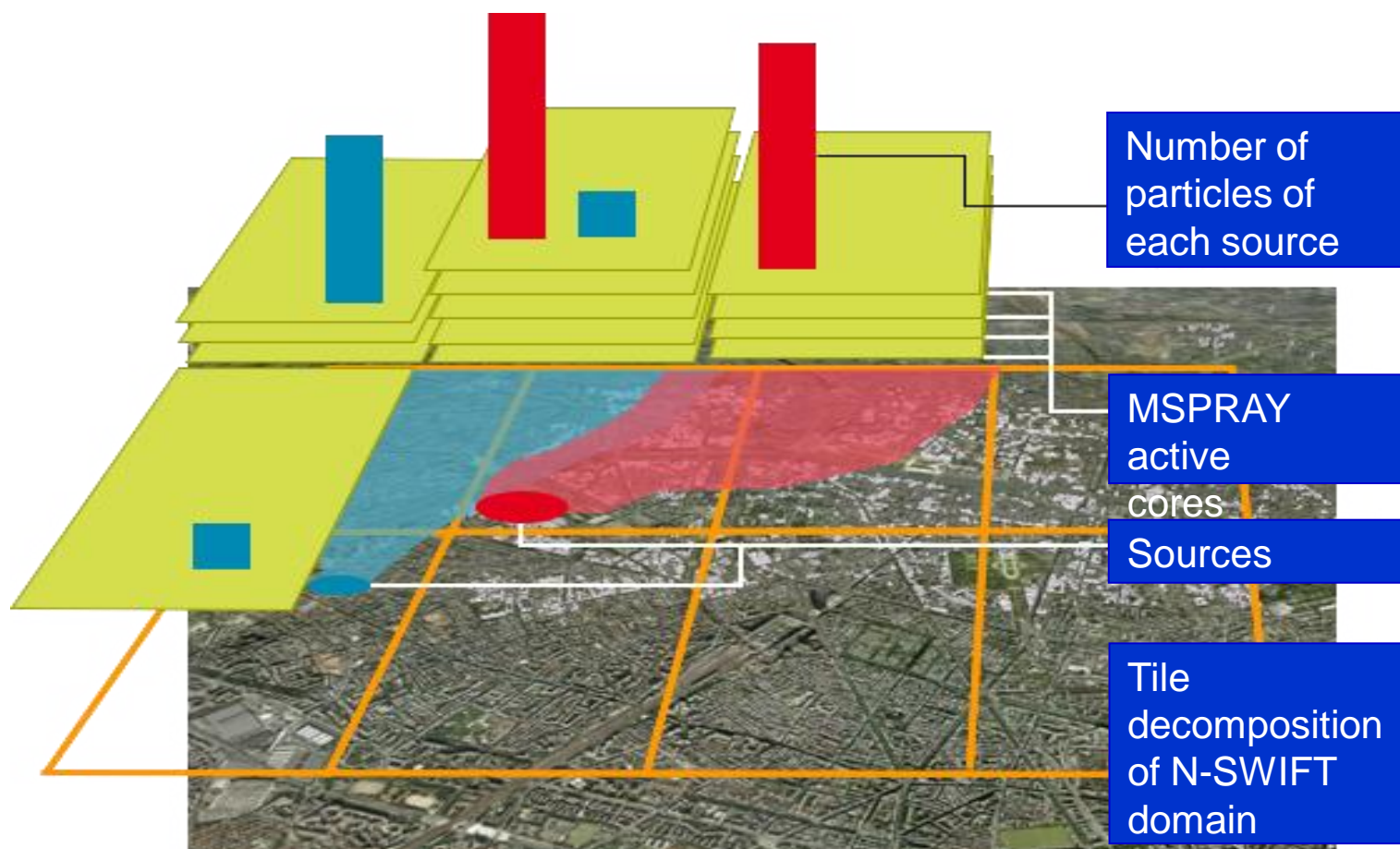
Including buildings and complex terrain



Modelling indoor infiltration

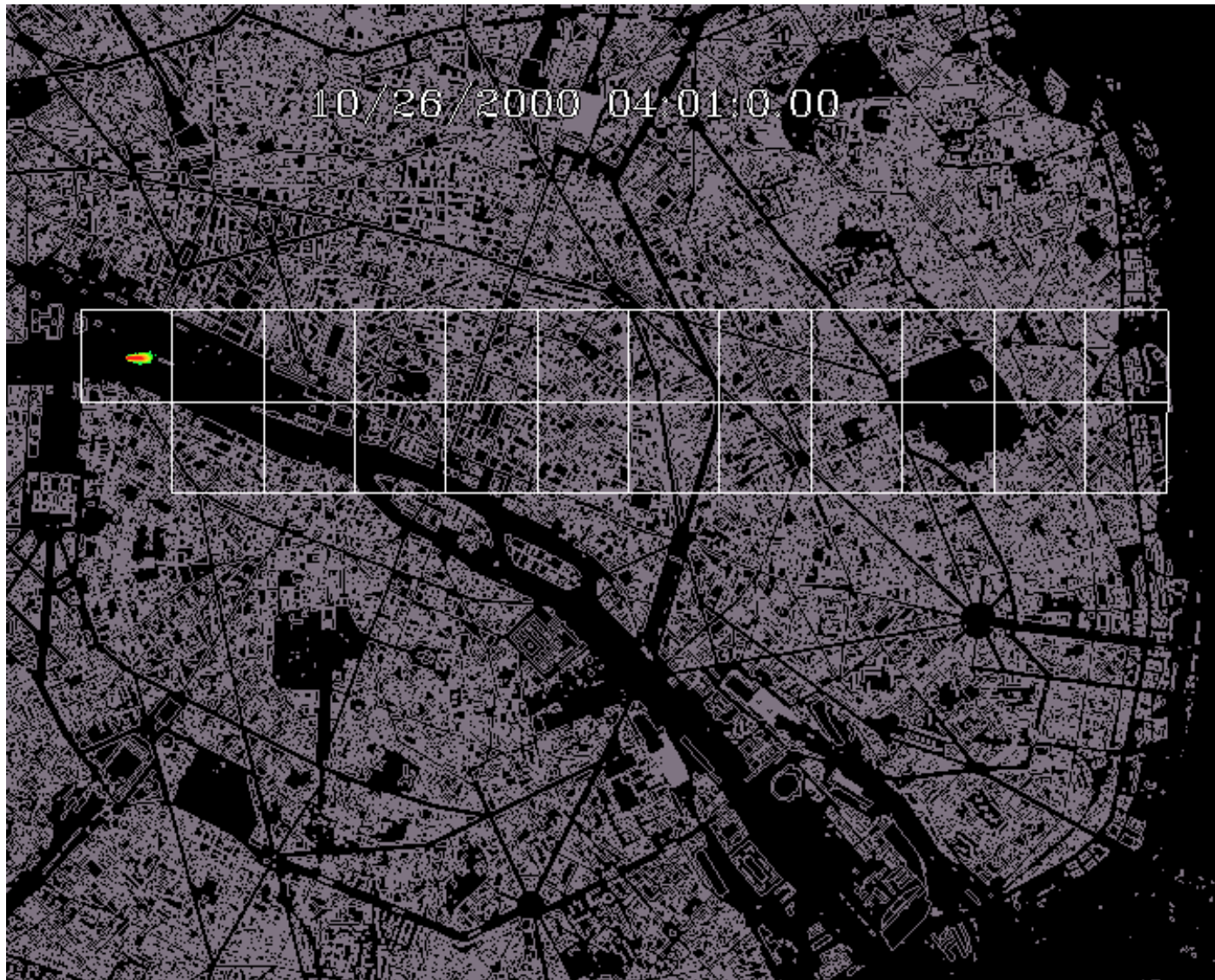


Parallel modelling in urban conditions



Parallel version of MSS

Example of application: "Greater Paris"



Continuous monitoring of olfactory nuisance and gas emissions



Waste . Industry . Composting . Water . Rendering

ODOURS

VOC

H₂S

NH₃

MERCAPTA
NS



RQ Box e-nose

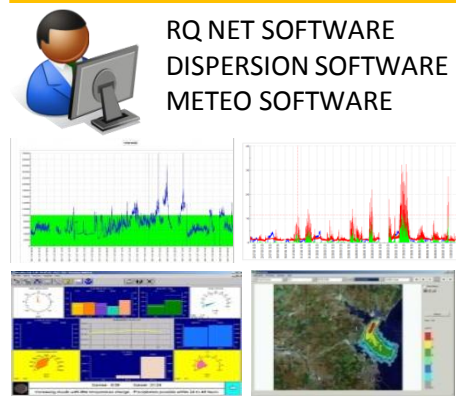
- ✓ Odour diagnosis
- ✓ Continuous emission measurement
- ✓ Dynamic 3D odour mapping
- ✓ Real-time alerts
- ✓ Control of odour treatment facilities



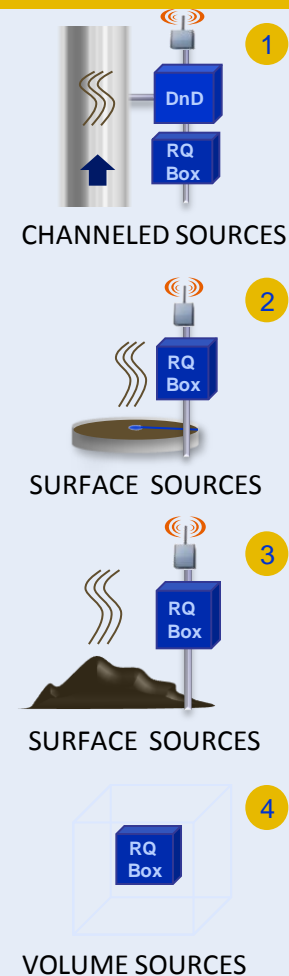
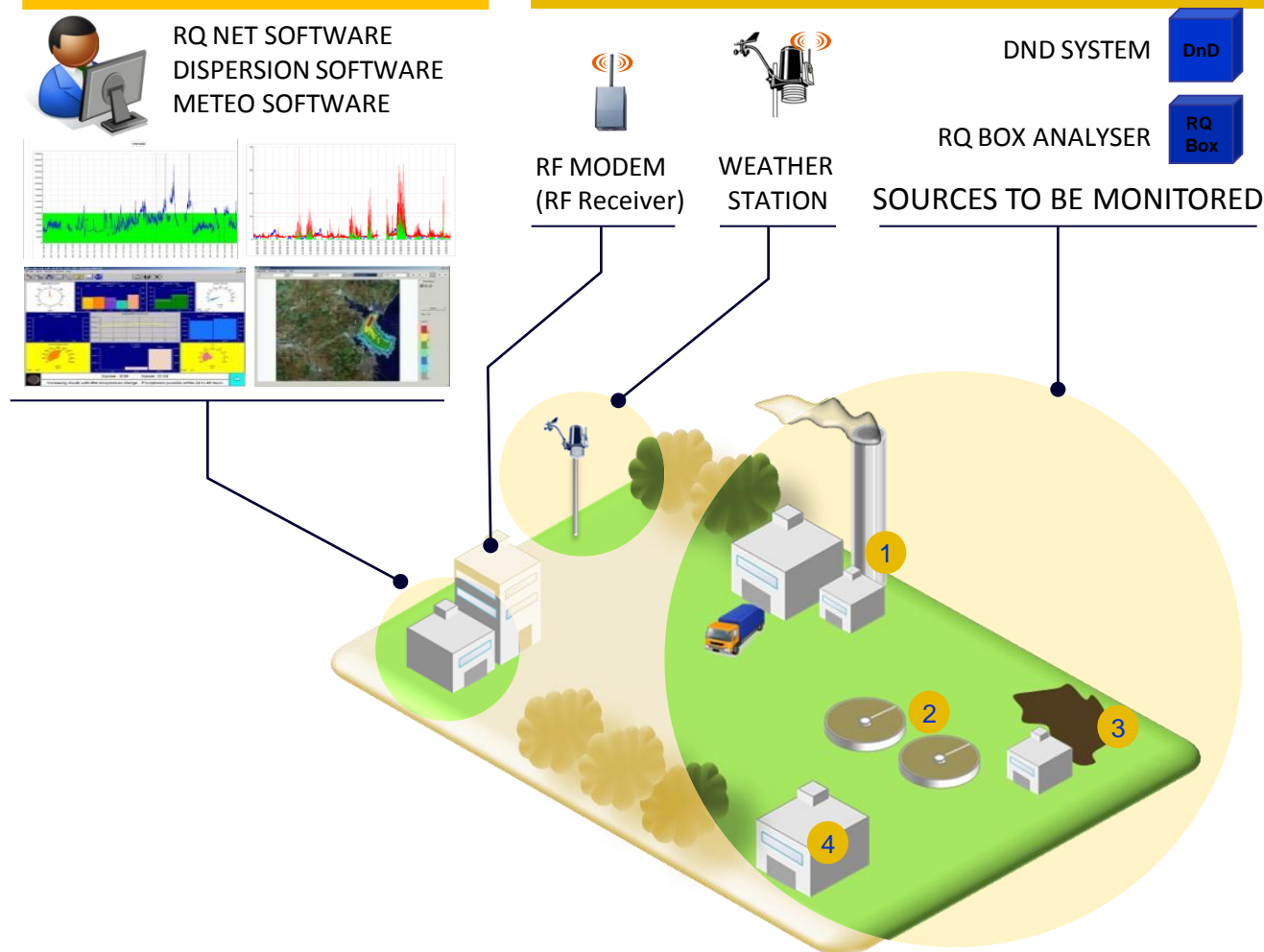
SINGLE- OR MULTI-SITE, LOCAL OR REMOTE MONITORING

Mono site RQ Box

MONITORING CENTRE



FIELD-INSTALLED MEASURING DEVICE



Multi-sites RQ Box



Data



DnD

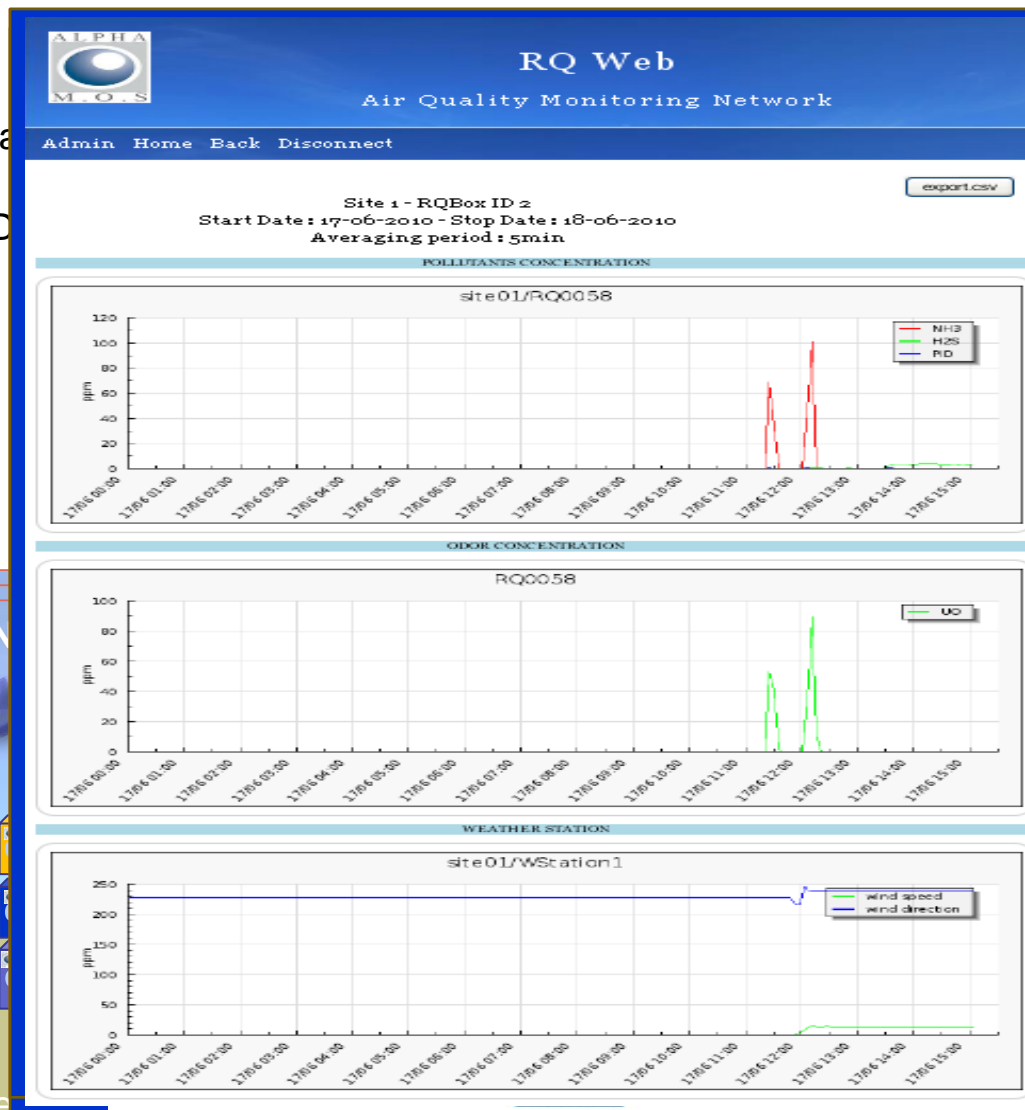


RQ

SITE 1

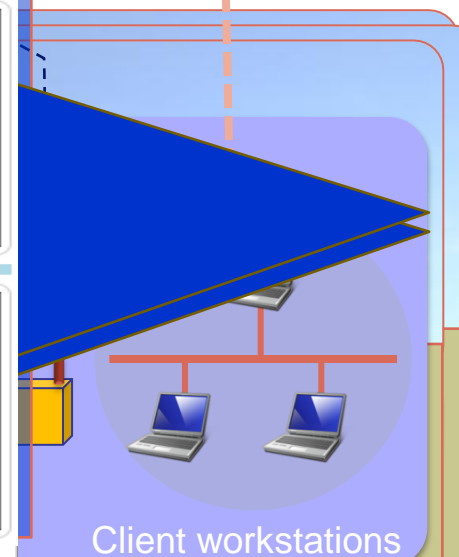
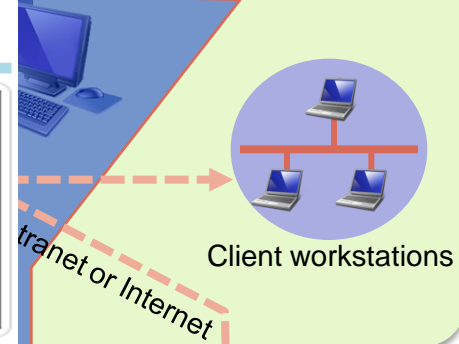
FIELD IN

Channel



SITES MONITORING CENTER

DISPERSION PC



RQ Box Solution



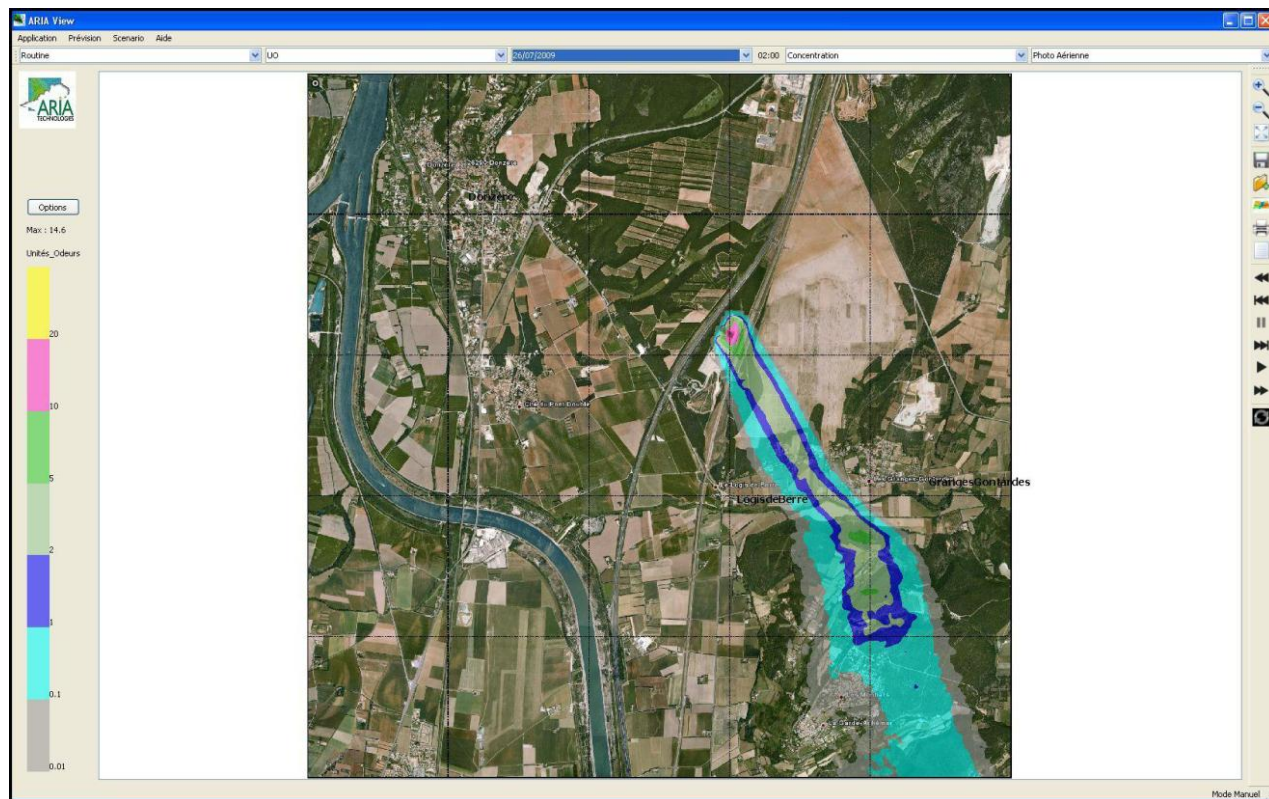
Alpha-MOS : RQ-Box product

- Electronic nose RQ BOX
 - ✓ MOS
 - ✓ PID
 - ✓ CE (RSH, H₂S)
- gas used : air
- Internal pump
- Network of modules
 - ✓ Wireless data communication





**Donzère,
France
SITA site**



- **Get a deeper knowledge of odor sources**
 - ✓ **Investigate process operations to identify the odor sources**
 - ✓ **Track odor emission events**
- **Better understand the site's odor emissions impact on neighborhood**
 - ✓ **Monitor emissions responsible for the unpleasant odor**
 - ✓ **Model the atmospheric dispersion of odor around the site**
 - ✓ **Provide a live site's odor plume to evaluate odor dispersion**
- **Make communication with side residents easier**
 - ✓ **Rely on objective and quantified information on the site's odor emissions**
 - ✓ **Correlate side resident perception with instrumental measurement**

SIDE RESIDENT PERCEPTION



Daily record of neighborhood complaints

CORRELATION STUDY

SIDE RESIDENT PERCEPTION



INSTRUMENTAL ODOR MEASUREMENT

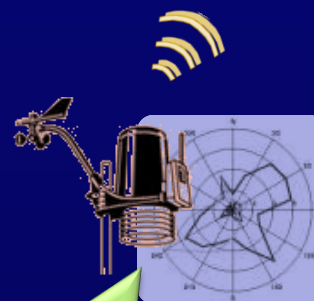
INSTRUMENTAL ODOR MEASUREMENT

ODOR MONITORING CENTER

Computed live odor plume based on 3D dispersion model



Wireless communication



Real time & local weather data

H₂S, NH₃, VOC and odor concentrations measured every 5 s



WEATHER STATION

RQ BOX E-NOSE

■ Essential key features for the project

- ✓ **Odor expertise and environmental knowledge**
- ✓ **Live monitoring of target gazes in addition to odor detection and dispersion**
 - *Quantitative data*
 - *Flexible and configurable solution with dedicated sensors : NH₃, VOC, H₂S or mercaptans, etc.*
- ✓ **Wireless communication for data transmission**

■ Key differentiators

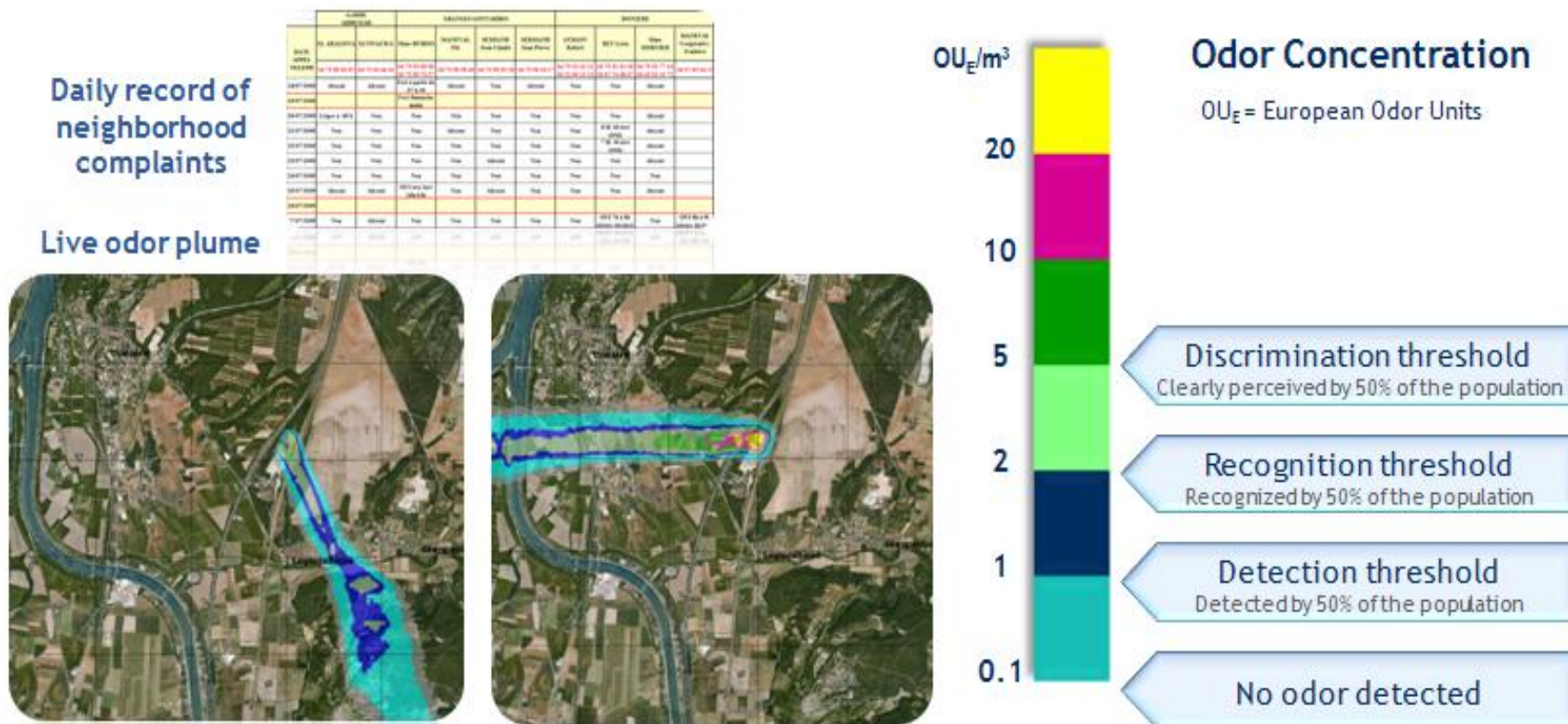
- ✓ **Try before you buy : full system rental option available**
 - *Evaluate the technology with limited risks*
 - *Test the relevance and reliability of results*
- ✓ **State-of-the-art 3D dispersion model**
 - *Topography and air turbulences taken into account for odor dispersion model*
 - *Well correlated with side residents perception with the ARIA VIEW software*

■ Other reference sites already equipped within Suez Environment and Sita

Key Figures

A 60-day correlation study for odor impact using ARIA View (Lagrangian model)

100% correlation between instrumental measurement and side resident perception



- **Acquisition of a permanent and real time air monitoring system**
 - ✓ Conclusive results turned system rental into purchase decision

- **Olfactive nuisance forecast, up to 2 hours in advance**
 - ✓ Starting point for corrective actions at the source of odor
 - ✓ Possible integration with future odor treatment systems for optimized performance

- **Improved communication with municipal authorities and side residents**
 - ✓ Objective and quantified data available for meetings
 - ✓ Better response to neighborhood complaint thanks to forecast

- **Authorization for site extension**
 - ✓ Demonstrated control of emissions to the relevant authorities

- Coverage of the RQ Box monitoring system extended to the future extension area of the site
- Internal communication about the project led to an increasing number of RQBox system installation within the Suez Environment group



SITA Dectra : 3 RQ Box

Non-hazardous waste storage facility
Allemand, France



Novergie Amethyst : 3 RQ Box

Methanization plant
Montpellier, France



SITA Esperance : 2 RQ Box

Non-hazardous waste storage facility
Sainte Rose, Guadeloupe, France

- **Development of an operational system now installed on about ten sites, coupling RQ-BOX electronic noses and ARIA View modeling system**
 - ✓ **Multi-sources**
 - ✓ **Multi-sites (corporate or regional level)**
 - ✓ **Client server**
- **Further developments include :**
 - ✓ **Parallel version to be deployed**
 - ✓ **Source term estimate algorithms (inverse modeling)**

>>Find SUEZ case study on the Eau Industrie Nuisances magazine

- **Montpellier 18 octobre**
- **Grenoble 20 octobre**
- **Lille 22 octobre**

- **Contacter Bernard FAVRE et Audrey DEBLAY qui sont ici**