

l'Europe

















A comprehensive high resolution modeling in the Intelligent digital city



context

8-10, Rue de la Ferme, 92100 BOULOGNE BILLANCOURT - FRANCE Tél : 33 (0)1 46 08 46 60 --- www.aria.fr

Urban Meteorology and Air quality for Intelligent Digital City





Traffic-induced air pollution



Observed $PM_{2.5}$ at traffic station in Paris over the limit value in 2015

TECHNOLOG

Daily air quality forecast by regional CTM in most cities is not used to model the traffic pollution at micro-scale.



Urban street air quality



Street canyon effect



TECHNOLOGI

Traffic Tunnel outlet

CFD: computationally too expensive for a large domain with very high resolution



Develop a revolutionary numerical simulation tool to **represent and predict the meteorological condition and the dispersion of traffic-induced air pollution at any point in Paris** with a very high resolution of 3m



http://www.aria.fr/projets/aircity/

Modeled by Parallel Micro (scale) <u>SWIFT SPRAY</u> (PMSS), a simplified CFD applicable to atmospheric environment SWIFT: Meteorological diagnostic model SPRAY: Lagrangian particle dispersion model

Scale steps & nested domains 多尺度嵌套(45km->3m)



Nested domains and meteorology 多尺度嵌套(45km→3m)





Study domains

Two calculation domains with a resolution (grid) of 3 meters

Hypercenter – by a medium cluster :

- ✤ 2.3 x 2.3 km²
- Center of Paris: the Seine, street canyons, large open zones, dense road network
- ♦ 4 air quality measurement stations (traffic), AIRPARIF
- ✤ 4 subdomains of 400(x)×400(y)×35(z)

<u>Tout Paris – by a giant cluster : (480</u> processors)

- ◆14 x 11.5 km²
- ✤Paris and buffer zone of 1 km
- More than 20 air quality measurement stations (traffic and background)
- 120 subdomains of 400(x)×400(y)×35(z)





Principal urban data

TECHNOLOG

- ✤ BDALTI : topographic data with a resolution of 1 meter
- BDTOPO : building layer (190 000 polygons for all Paris)
- ✤ Road network: more than 48 000 traffic segments (> 1700 km)
- ✤ OPENDATA : trees alignment



Traffic emission modeling

TRAFFIC

EMISSIONS

Fleet and technologies (DVD Ville de Paris ADEME/IFSTTAR, CITEPA) **ARIA** TECHNOLOGIES

Real time traffic data (ville de Paris, DIRIF)





lle-de-France







Operational forecast/nowcast and on-line validation

短期预报,实时模拟及在线评估



COMPAS





Web service for the public

Wind and NO_x hourly concentration for all Paris with a resolution of 3m

TECHNOLOGIE



ARIA City[™] software ♠







Cit

A software integrated into ArcGIS

- 3 types of dispersion models to be chosen
- 1. AIM: gaussian dispersian model
- 2. Micro SWIFT SPRAY: simplified CFD
- 3. SATURNE: CFD

A traffic emission model TREFFIC[™] is integrated



Simulated hazardous release at Place de la Concorde (CEA)



TECHNOLOGIES

Impact of EV in city (Roma)



Urban planning (Lilla)

谢谢! Merci!

ARIA Technologies SA, Founded in 1990 by researchers from EDF R&D

- Headquarter in Boulogne-Billancourt, the Greater Paris region
- ✓ Offices in Grenoble, Toulouse, Brest, Mexico
- Subsidiary company in Milan (Italy) since 2000: ARIANET
- Subsidiary company in Turin (Italy) since 2010: SIMULARIA
- Subsidiary company in Rio (Brazil) since 2010 : ARIA do Brazil



