RESEARCH AND TEACHING CENTER IN ATMOSPHERIC ENVIRONMENT

CEREA

JOINT LABORATORY ENPC-EDF R&D

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11 permanent staff
10 PhDs
6 post-doctoral fellows
0 supply staff

CEREA was created in 2003 as a research center at Ecole Nationale des Ponts et Chaussées on the basis of the Air Team of CEREVE. CEREA has become in 2004 a joint laboratory ENPC-EDF R&D, with two locations (ENPC/Champs sur Marne and EDF R&D/Chatou). Its research activities concern the modeling of the atmospheric environment with a special focus on the assessment of environmental impact of transport and energy production (thermal or nuclear). These activities are coupled with the programs of EDF R&D and strongly related to the other organizations of the french Ministry for Transport, the METLMT, through its Research Directorate (DRAST).

Other relationships have been developed for specific applications. Among them, one may cite agreements with IRSN for radionuclides, INERIS for impact studies and ONERA for impact of aircraft emissions. Part of the scientific works (especially devoted to aerosols and data assimilation) is supported by CNRS/PNCA (National Program for Atmospheric Chemistry).

CEREA organizes its multidisciplinary activities through four research teams: fluid mechanics and dispersion at local scale, dispersion at regional and continental scales, multiphase modeling, and data assimilation. The data assimilation team is also part of an INRIA project, the CLIME project.

Research topics

CEREA develops modeling activities mainly with two numerical models: a CFD (Computational Fluid Dynamics) tool, Mercure_Saturne, for small scale dispersion (urban pollution, industrial risk), and a Chemistry Transport Model, POLAIR, for regional/continental dispersion. It is therefore necessary to develop appropriate physical parametrizations and multiphase reactive box models to be plugged in these three-dimensional models.
The resulting models are compared to measured data and used for impact studies or environmental forecast. In this framework, the research actions devoted to data assimilation (coupling between model outputs and measurements) aim at improving the ability of models to make good forecasts and/or perform inverse modeling of pollutants.

Local scale and fluid mechanics
(group leader: Bertrand Carissimo)

The research actions are related to the preoccupations of the French Ministry for Transport (urban pollution) and those of EDF (dispersion at an industrial site). They mainly rely on the development of an integrated numerical model on the basis of the model MERCURE (EDF), by including the appropriate parameterizations for the applications (chemistry, aerosols, ...).

2003 has been a transition year for the model MERCURE. The solver, which was initially based on the numerical kernel ESTET, is now based on the so-called Saturne kernel. The resulting modifications are strong, especially for the grid structure (an unstructured mesh is now available). This has many advantages (taking into account complex geometries for instance) but also some drawbacks (parameterizations).

Small scale reactive dispersion

A chemical mechanism describing the fastest atmospheric chemical reactions has been coupled to MERCURE, for instance, the NO/NO2 conversion just after emission. This reactive version of MERCURE has been compared to data measured in a street of Copenhagen (the Jagtveg Street). This data basis has already been used for box models. The results (a common work of S. Lacour, E. Colin, B. Carissimo) prove that the reactive version of MERCURE leads to a better estimation of chemical concentrations when the chemical regime is standard.

In a common work with CETU, the reactive version of MERCURE has also been used in order to model the impact of a tunnel plume.

Urban dispersion

The topics related to urban dispersion have been investigated by modeling dispersion in a network of blocks. The outputs of MERCURE have been compared to measured data obtained in an experience led in the United States (the MUST campaign). The results are acceptable for similar boundary conditions. This work is included in a new PhD work devoted to urban modeling of dispersion and dynamics (Maya Milliez).

Indoor Air Quality

A collaboration with CSTB has been initiated for indoor air quality modeling. A primary box model has been developed in order to describe the indoor/outdoor transfer, indoor chemical reactions and deposition. The model outputs have been compared to data measured in a flat (in the Paris suburb). The results validate the model and indoor deposition velocities have been proposed. A strenghtened cooperation with CSTB is intended for 2004**.**

Impact studies

A research project devoted to the development of a modeling chain for the assessment of local impact of air pollution related to traffic emissions has been initiated by CEREA with CSTB, ECL and INRETS. The first phase of this project has been supported by the national research program PREDIT. The PhD work of Rémy Lagache is part of this project.

Regional and continental scales
(group leader: Luc Musson-Genon)

The activity of this group focuses on air quality modeling at regional/continental scales for applications ranging from forecast to impact studies. The emissions are either related to traffic (more generally: transport) or to electric power (thermal or nuclear production). The numerical platform used for the modeling of reactive dispersion is the Chemistry-Transport-Model POLAIR coupled to different input data.

CEREA now has an access to the meteorological data of ECMWF (the European Center for Medium Weather Forecast). At regional scale, CEREA also uses the meteorological model MM5. MERCURE is another possible tool for the regional scale. The main works in 2003 have consisted in plugging POLAIR to these various sets of meteorological input data.

For reactive dispersion, the work is organized around the multiscale and multipollutant Chemistry-Transport-Model POLAIR. A package for computing the physical, meteorological and chemical parameterizations has been developed in 2003 (AtmoData, work of Vivien Mallet). POLAIR is now developed under CVS, an apropriate framework for distributed development. To conclude, new chemical gas-phase mechanisms (RACM, CBM4, Meclchior and a simplified version of chemical kinetics for gaseous mercury) have been added to POLAIR, as an output of the chemical processor SPACK.

Air quality forecast

A monodimensional version of POLAIR has been coupled to a monodimensional meteorological model describing the atmospheric boundary layer, Caillou. The objective is to perform local adaptation for forecast of nitrogen oxides. A variational method has been applied to the resulting model for inverse modeling of emissions over Paris (Bastien Albriet and Luc Musson-Genon).

At continental scale, the outputs of POLAIR have been compared to measurements for the period April-August 2001, in the framework of the Pioneer project held at Laboratoire de Météorologie Dynamique. Data from 242 terrestrial sensors were available and the root mean square error for ozone peaks is about 25 micrograms per cubic meter, which gives a fair basis for future work (Vivien Mallet).

Impact studies

Impact studies have to be done over long time periods and for many emission scenarios. A work has been devoted to reducing methods for chemistry, especially through input/output look-up tables (High Dimensional Model Representation). The sensitivity with respect to the meteorological fields has also been investigated by runs over 10 years at the continental scale (PhD work of Jaouad Boutahar). Sensitivity studies have been performed with the use of the adjoint model of POLAIR for acidification models based on the EMEP's chemical mechanism.

Heavy metals and mercury

New modules describing heavy metals (lead, cadmium, zinc, arsenic and copper) and mercury under its gaseous form have

been added to POLAIR. In a first phase, they have been considered as passive tracers and the coupling to aerosols has not been taken into account. The first runs have been done for year 2001 over Europe and the results have been compared to the measurements of the EMEP monitoring network (PhD work of Yelva Roustan).

ESCOMPTE

The group is also active for modeling the ESCOMPTE field campaign, that focuses on photochemistry in the region of southern France (Fos-Berre-Marseille, summer 2001). A work has begun for EDF (Mission Thermique) in order to estimate the impact of the emissions related to the power plant of Martigues. POLAIR is used with input data given by ECMWF. The use of meteorological fields given by the mesoscale model RAMS and the use of an improved emission inventory are also works under progress (post-doc of Wilfran Moufouma-Okia).

Multiphase models
(Group leader: Bruno Sportisse)

The objective of the group is to develop multiphase models to be coupled to tridimensional host models, such as POLAIR or MERCURE (PhD work of Bastien Albriet).

PAM Project

The works devoted to multiphase modeling (water/gas/aerosols) have been done in the framework of the PAM project (Multiphase Air Pollution), funded by the national research program Primequal/Predit. This activity is also supported by the aerosol project of PNCA (the french research program for atmospheric chemistry).

The focus has been put in 2003 on the development of models for describing the dynamics of aerosols under the influence of condensation/evaporation, coagulation and nucleation processes. Two models have been developed: MAM (Modal Aerosol Model, post-doc of Karine Sartelet) and SIREAM (Size Resolved Aerosol Model, PhD work of Edouard Debry) which are based on a modal representation and a resolved representation of the size distribution, respectively. The chemical species are either inorganic species (in this case, the condensation/evaporation fluxes are given by the thermodynamic model ISORROPIA developed by S.Pandis, A.Nenes and C.Pilinis) or organic species (on the basis of classical two-products formulation to be included in the gas-phase mechanisms).

Both models have been coupled to the Chemistry-Transport-Model POLAIR and are currently under evaluation by comparison to measured data at continental scale (post-doc of Hadjira Foudhil) and at regional scale (post-doc of Mohammad Taghavi).

The modeling of aqueous-phase processes (inside fogs or clouds) and the improvement of currently used models for thermodynamics (especially for organics) are actions to be developed in the near future (post-doc of Kathleen Fahey).

Extension to other applications

The application of the resulting models to other cases than photochemistry has also been initiated. This concerns for instance the case of particles in the vicinity of a road (with a gaussian model), the case of radioactive aerosols (with IRSN) and particles in a exhaust jet (aircraft emissions, with ONERA: post-doc of Cécile Fereira-Gago).

Data Assimilation
(group leader: Marc Bocquet)

The key event in 2003 has been the creation of a new INRIA (the French Institute for Computer Science) project, the CLIME

project, by merging the former INRIA project AIR (led by Isabelle Herlin) and the data assimilation group of CEREA. The objective is the coupling of model outputs and observed data provided by monitoring networks. The topics of the data assimilation group (atmospheric modeling and sequential/variational methods) are complementary to those of the former AIR project (data assimilation of satellital data, especially images).

This year, the works of the group have mainy been devoted to variational methods and inverse modeling of linear tracers. The use of sequential methods applied to reactive transport has also been initiated.

The group will focus in 2004 on advanced methods for data assimilation, especially ensemble forecast (PhD work of Vivien Mallet) and more generally topics related to the nonlinearity of reactive dispersion. These topics will be related to operational forecast in the framework of our collaboration with INERIS.

Inverse modeling of emissions

The dispersion of a passive tracer is given by a linear model of advection/diffusion. The objective is to compute the emission terms on the basis of measured data given by a monitoring network. Through the linearity of the model, the information is included in the so-called retroplumes, defined as solutions of the adjoint model of dispersion (work of Jean-Pierre Issartel).

If the source is supposed to be a point source, the simplex method can be used in order to perform inverse modeling. Such a method has been applied to the results of the ETEX1 campaign (Jean-Pierre Issartel). Another application is the inverse modeling of arsenic emissions in Santiago de Chile. This work has been led by Jean-Pierre Issartel in the framework of a common project with the Research Center for Mathematical Modeling of Chile (Laura Gallardo Klenner) and is inserted in the CLIME project.

The problem is much more complicated for diffuse sources. An extension of the retroplumes approach has been proposed by Jean-Pierre Issartel. An alternative approach is currently defined and tested by Marc Bocquet (regularization by entropy).

Variational assimilation

The use of variational methods at CEREA includes the development of an adjoint model for POLAIR through automatic differentiation (work of Denis Quélo). The adjoint model is necessary for computing in an efficient way the gradient of the so-called cost function (an estimation of the discrepancy between observations and numerical outputs). In this context, the influence of the slow/fast kinetics of chemical species has been investigated by Denis Quélo and Bruno Sportisse. The adjoint model of POLAIR has also been used for sensitivity studies (PhD work of Vivien Mallet).

In the framework of a common work with the LSCE (CNRS/CEA), Bruno Sportisse is involved in the PhD work of Diégo Santaren. The subject is the inverse modeling of input parameters in a biosphere model giving the biogenic CO2 fluxes at ground.

The works devoted to variational data assimilation for atmospheric chemistry have been supported by PNCA, especially for the connection to satellite data.

Sequential methods

German Torrès has begun an ERCIM post-doctoral work in the framework of the CLIME project. The objective is to compare sequential and variational methods for atmospheric chemistry with special attention paid to air quality forecasts over Berlin. POLAIR and REGOZON are the

Chemistry-Transport models used in this work, while MM5 is the meteorological solver. The german partner is GMD First.

A work devoted to new advanced sequential methods for atmospheric chemistry has been initiated by Marc Bocquet. These methods (SIR, particle filter) are numerically expensive but may take into account the nonlinearity of the reactive models.

Applied projects

A strong cooperative program has been developed with IRSN (the French Institute for Nuclear Safety), especially the board for atmospheric environment in the center for emergency management. The main topics are related to the MIRA project (Inverse Modeling of Emission in the Atmosphere), devoted to short-range forecast of dispersion for radionuclides in an emergency situation. CEREA is in charge of the inverse modeling of key parameters, such as deposition velocities and sources (diffuse and point sources). A first work has focused on parameter identification for data assimilation parameters (PhD of Monika Krysta). The application to data obtained in an experience at Ecole Centrale de Lyon has also begun (Monika Krysta, Shailendra Mudgal).

Teaching activities

CEREA has a strong involvement in the teaching activities at Ecole Nationale des Ponts et Chaussées. This includes courses devoted not only to applications (Air Pollution, Bruno Sportisse) but also to academic fields (Applied mathematics). A course devoted to forecast and inverse modeling (Marc Bocquet) has been initiated for the so-called "European Week" at ENPC but has not been held due to the small number of students.

CEREA is also active in the animation of the Teaching Department VET through Vincent Pircher.

A post-graduate course is organized at ENSTA in the framework of the Postgraduate Studies (DEA) M2SAP (modeling, simulation and data assimilation for atmospheric chemistry, Bruno Sportisse). CEREA is also involved in the teaching program, Modeling and Simulation (DESS), at the University of Marne La Vallée, especially through a course devoted to atmospheric environment.

International collaborations

10 citizenships are represented at CEREA, which gives CEREA a multinational character.

CEREA has been honoured to welcome for one week (January 2003) Professor Spyros Pandis from the Carnegie-Mellon University (USA). This has allowed CEREA to stengthen the relations with his team after the mission of Edouard Debry to the States, especially through the post-doctoral position of Kathleen Fahey, which has begun in September 2003.

Professor Maithilis Sharan from IIT Delhi has been welcomed for one month, thanks to the support of the french embassy in Delhi. A common research project with Jean-Pierre Issartel has been sent to the CEFIPAR.

CEREA has developed relations with the CMM of Santiago de Chile, with topics devoted to inverse modeling of pollutants (mission of Jean-Pierre Issartel to Chile, mission of Laura Gallardo at CEREA). This work is supported by CONYCIT/INRIA and is part of the CLIME project.

A common project has been initiated with GMD First (Berlin, Germany) for air quality forecast and data assimilation, through the post-doc of German Torrès, supported by ERCIM. This work is part of a PROCOPE french/german program and is inserted in

the CLIME project.

CEREA has also a cooperative work inside the CAMP program (Comprehensive Atmospheric Modeling Program) of Georges Mason University (USA). This concerns short-scale dispersion and is led by Bertrand Carissimo.

To conclude, the post-doctoral work of Karine Sartelet (aerosol modeling) is part of a common project with CRIEPI (Japan) and is supported by the Canon Fondation for Research.

Scientific Staff

ALBRIET Bastien (*)
BOCQUET Marc
BOUTAHAR Jaouad (*)
BOUZEREAU Emmanuel (*)
CARISSIMO Bertrand
DEBRY Edouard (*)
DUPONT Eric
FAHEY Kathleen (**)
FEREIRA-GAGO Cécile (**, #)
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LACOUR Stéphanie
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MALLET Vivien (*)
MILLIEZ Maya (*)
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MUDGAL Shailendra
MUSSON-GENON Luc
PIRCHER Vincent
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QUELO Denis (*)
ROUSTAN Yelva (*)
SARTELET Karine (**)
SPORTISSE Bruno
TAGHAVI Mohammad (**)
TORRES German (**)
WENDUM Denis

(*) PhD
(**) Post-doctoral fellow
(#) Not member of CEREA at 1/1/2004

Master thesis 2003

MABROUKKI Intissar (1st year, ENPC 2003)
POMMIER Julien (1st year, ENPC 2003)
PANZARELLA Sébastien (DESS UMLV)

Teaching activities

*Forecast and inverse modeling for geosciences***,** course of ENPC (not held)

Marc BOCQUET, in charge.

Jean-Pierre ISSARTEL, Bruno SPORTISSE.

Applied mathematics, course of ENPC.

Bruno SPORTISSE.

Air Pollution, course of ENPC.

Bruno SPORTISSE, in charge.

Marc BOCQUET, Stéphanie LACOUR, Rémy LAGACHE, Luc MUSSON-GENON.

Modeling, Simulation, Data Assimilation for atmospheric chemistry, course of the postgraduate studies ENSTA/DEA M2SAP X-UVSQ. Bruno SPORTISSE.

Teaching Unit "Atmospheric Environnement" of the applied postgraduate studies (DESS) Modeling and Simulation , UMLV.

François GARNIER, in charge.

Bertrand CARISSIMO, Jean-Pierre ISSARTEL, Stéphanie LACOUR, Luc MUSSON-GENON, Bruno SPORTISSE.

Postgraduate formation in the department Environnement

Jean-Pierre ISSARTEL, in charge.
Stéphanie LACOUR.

Articles and reports

Accepted or published (with peer review)

Boutahar J., Lacour S., Mallet V., Musson-Genon L., Quélo D., Roustan Y. and Sportisse B. Development and validation of a fully modular platform for the numerical modeling of Air Pollution: POLAIR. Accepted for publication in International Journal for Environmental Pollution.

Debry E., Sportisse B. and Jourdain B. A stochastic approach for the numerical simulation of the general dynamics equation for aerosols. J. Comp. Phys. 2003. Vol 184. Pages 649:689.

Djouad R., Audiffren N. and Sportisse B. Sensitivity analysis using automatic differentiation applied to a multiphase chemical mechanism. Atmospheric Environment. 2003. Vol 37, nr 22, pages 3029-3038.

Djouad R., Sportisse B. and Audiffren N. Reduction of Multiphase Atmospheric Chemistry. Journal of Atmospheric Chemistry. 2003. Vol 46. Pages 131-57.

Djouad R. and Sportisse B. Solving reduced models in Air Pollution Modelling. Applied Numerical Mathematics. 2003. Vol 44, nr 1, pages 49:61.

Issartel J.-P. and Baverel J., Rebuilding sources of linear tracers after atmospheric concentration measurements, Atmos. Chem. Phys., 3, 475--486, 2003

Issartel J.-P. and Baverel J., Inverse transport for the verification of the CTBT, Atmos. Chem. Phys., 3, 475--486, 2003

Wotawa, G., de Geer, L.-E., Denier, P., Kalinowski, M., Toivonen, H., d'Amours, R., Desiato, F., Issartel, J.-P., Langer, M., Seibert, P., Frank, A., Sloan, C., Yamazawa, H., Atmospheric transport modelling in support of CTBT verification. Overview and basic concepts, Atmospheric Environment 37, 2525--2537, 2003.

Sportisse B. and Djouad R. Investigation of mass transfer for atmospheric pollutants into a fixed droplet with aqueous chemistry. Journal of Geophysical Research Atmospheres. 2003. Vol 108. Nr D2.

Sportisse B. and Quélo D. Data assimilation

and inverse modeling of atmospheric chemistry. Proc. of Indian National Science Academy. Part A Physical Sciences. Nov. 2003. Vol 69.

Sportisse B., Boutahar J., Debry E., Quélo D. and Sartelet K. Some tracks in Air Pollution Modeling. RACSAM Journal of the Spanish Science Academy, Real Academia de Ciencias de Espana. 2003. Vol 96. Nr 3.

Accepted or published (without peer review)

Debry E. et Sportisse B. Modélisation de la dynamique des aérosols: le modèle SIREAM. Pollution Atmosphérique et Journal of Aerosol Sciences.

Sportisse B. Quelques aspects de la modélisation de la pollution atmosphérique. Annales des Ponts et Chaussées, « Modélisation: nouvelles pratiques ».

Sportisse B. Modélisation et simulation de la pollution atmosphérique. Compte-rendu 2003 du CNFGG .

C Clerbaux, A. Hauchecorne, S. Bekki, C. Granier, M. Pirre, B. Sportisse, J.P.Issartel et J.L. Attié. Assimilation de données satellitaires et inversion de sources pour l'étude de la composition chimique atmosphérique. Compte-rendu 2003 du CNFGG.

Submitted articles

Lacour S. and Sportisse B. Estimating Indoor velocity deposition taking into account chemical reactions. Submitted to Atmos.Environ.

Mallet V. and Sportisse B. 3D chemistry-transport model Polair: numerical issues, validation and inverse-modeling strategy, by Mallet, V. and Sportisse, B. Submitted to Atmos.Chem.Phys.Disc. (ACPD), special issue EGS.

Quélo D., Sportisse B. and Isnard O. Data assimilation for short range atmospheric dispersion of radionuclides. A case study. Submitted to J. of Env. Radiol.

Proceedings

Lacour S., Megueulle C., Carlotti P., Soulhac L. and Sportisse B. Unsteady effects on pollutant dispersion around a tunnel portal. In Proceedings of Urban Air Quality Conference (UAQ'4), Prague, mars 2003.

Lacour S. and Joumard R. Sampling vehicles for pollutant emission modeling. In Proceedings of the 8th Conference on Transport and Air Pollution, Avignon, juin 2003.

Reports

Rapport 2003-1: J.Boutahar et B.Sportisse. Propagation d'incertitude dans un modèle de chimie-transport. Premières applications à un modèle 0D. Rapport de contrat EDF.

Rapport 2003-2: B.Sportisse. Proposition de programme de travail pour la convention IRSN/ENPC ``Dispersion atmosphérique de radionucléides".

Rapport 2003-3: B.Sportisse. Compte-rendu scientifique du projet "Modélisation de la chimie multiphasique". Rapport pour le Programme National de Chimie Atmosphérique (INSU/PNCA).

Rapport 2003-4: Y.Roustan. Rapport d'avancement ADEME/EDF 1. Modélisation de l'impact des métaux lourds, du mercure, et des particules (PM2.5 et PM10) à l'échelle du continent Européen.

Rapport 2003-5: I.Mabrouki et S.Lacour. Modélisation de la qualité de l'air à l'intérieur d'un bâtiment.

Rapport 2003-6: B.Albriet et S.Lacour. Etude de la dispersion réactive d'un rejet tunnel dans une rue canyon. Rapport CETU.

Rapport 2003-7: J.Boutahar et B.Sportisse. Application de la méthode HDMR à un Modèle de Chimie-Transport 3D: POLAIR 3D. Rapport de contrat EDF.

Rapport 2003-8: S.Panzarella. Modélisation numérique de la dispersion de polluant en milieu urbain idéalisé (expérience MUST).

Rapport 2003-9: J.Boutahar, S.Lacour,

V.Mallet, D.Quélo, Y.Roustan and B.Sportisse. Development and validation of a fully modular platform for the numerical modeling of Air Pollution: Polair. Accepted for publication in International Journal of Environmental Pollution.

Rapport 2003-10: Y.Roustan. Rapport d'avancement numéro 2 ADEME/EDF. Modélisation de l'impact des métaux lourds, du mercure et des particules à l'échelle du continent Européen.

Rapport 2003-11: P.Pommier. Localisation de source de polluant atmosphérique et application à l'accident de Tchernobyl.

Rapport 2003-12: C.Ferreira-Gago. Rapport de contrat ONERA. Guide d'utilisation de FLUDILES.

Rapport 2003-13: M.Krysta, M.Bocquet et B.Sportisse. Identification des paramètres d'assimilation de données. Eléments bibliographiques et premières applications au modèle de dispersion de l'IRSN.

Rapport 2003-14: E.Debry et B.Sportisse. Modélisation numérique de la dynamique des aérosols: le module SIREAM (SIze REsolved Aerosol Model)

Rapport 2003-15: D.Quélo and B.Sportisse. Data assimilation for short range atmospheric dispersion of radionuclides: a case study. Sumitted to J.of Env.Rad.

Rapport 2003-16: V.Mallet and B.Sportisse. 3D chemistry-transport model Polair: numerical issues, validation and inverse-modeling strategy. Sumitted to ACPD.

Rapport 2003-17: B.Albriet. Modèles gaussiens pour la dispersion des particules. Calculs préliminaires.

Rapport 2003-18: B.Albriet. Merging dans les modèles modaux d'aérosols.

Rapport 2003-19: S.Lacour. Dispersion de particules liées aux transports routiers - Eléments bibliographiques.

Rapport 2003-20: R.Lagache. Effets sur la santé liés à la pollution atmosphérique.

PhD works

B. ALBRIET

Modeling of aerosols at local and regional scales. ENPC.

J. BOUTAHAR

Reduction for air quality modeling and impact studies at continental scales. ENPC.

E. BOUZEREAU

Modeling liquid water content with the model Mercure_Saturne. Paris 6.

E. DEBRY

Numerical modeling of the General Dynamics Equation for aerosols. ENPC.

M KRISTA

Inverse modeling of radionuclides dispersion in the atmosphere. Paris 12.

R. LAGACHE

Coupling models for small scale impact studies. Application to the case of air pollution induced by traffic.

V MALLET

Air Quality forecast and Ensemble methods. ENPC.

M MILLIEZ

Application of Mercure_Saturne. for modeling urban environment. ENPC.

D. QUELO

Variational data assimilation applied to atmospheric chemistry. ENPC.

Y. ROUSTAN

Modeling dispersion of mercury and heavy metals at continental scale. ENPC.

Contracts

Agreement 2003 with EDF R&D

EDF R&D

Agreement 2003 with DRAST

S. Lacour, R. Lagache, B. Sportisse

METLMT

Impact study for the power plant of Martigues

W. Moufouma-Okia, L. Musson-Genon, B. Sportisse

Mission thermique EDF R&D.

Impact studies at continental scale. Reducing methods.

J. Boutahar, L. Musson-Genon, B. Sportisse

EDF R&D

Inverse modeling of emissions in the atmosphere (MIRA project)

M Bocquet, M. Krista, S. Mudgal, B. Sportisse

IRSN

Agreement IRSN

S. Mudgal, B. Sportisse

IRSN

National Program for Atmospheric Chemistry (PNCA), aerosol project

Debry E., Sportisse B.

CNRS

National Program for Atmospheric Chemistry (PNCA), data assimilation project

Quélo D., Issartel J.P., Sportisse B.

CNRS

Dispersion of pollutants in a tunnel portal

S. Lacour, B. Albriet

CETU

PAM Project (Multiphase Air Pollution), Primequal-Predit

E. Debry, K. Fahey, H. Foudhil, K. Sartelet, M. Taghavi, B. Sportisse

MEDD

Coupling aerosols and turbulence in a jet

C Fereira-Gago, F. Garnier

ONERA

Conferences, seminars, missions

Conferences

Debry E., Congrès annuel de l'ASFERA (Association Française d'Etudes et de Recherche sur les Aérosols), Paris (France). Décembre 2003. «Le modèle SIREAM pour la dynamique des aérosols». Avec B. Sportisse.

Issartel J.-P., Pan-American Advanced Studies Institute, Centro de Modelamiento Matematico, Santiago (Chili). 6-18 janvier 2003. «Inverse modeling of atmospheric tracers».

Issartel J.-P., Simposio de Cambio global: hacia una vision sistematica, Punta Arenas (Chili). Janvier 2003.

Issartel J.-P., EGS - AGU - EUG Joint Assembly, Nice (France). Avril 2003.

Issartel J.-P., Atelier de Modélisation Atmosphérique de Météo-France, Toulouse (France). 5 décembre 2003.

Lacour S., Urban Air Quality Conference (UAQ'4), Prague (République Tchèque). Mars 2003. «Unsteady effects on pollutant dispersion around a tunnel portal». Avec C.Megueulle, P.Carlotti et L.Soulhac.

Lacour S., Conference on Transport and Air Pollution, Avignon (France). Juin 2003. «Sampling vehicles for pollutant emission modeling». Avec R.Joumard.

Lacour S., Colloque de l'ADEME

« Modélisation des émissions du transport routier », Paris (France). Avril 2003. «Intercomparaison d'outils et de méthodes d'inventaires d'émission d'origine routière».

Mallet V., EGS - AGU - EUG Joint Assembly, Nice (France). Avril 2003. «Validation of the 3D chemistry-transport model POLAIR and preliminary results on inverse modeling of emissions ». Avec J.Boutahar, D.Quélo, K.Sartelet et B.Sportisse.

Mallet V., Gloream-Eurasap Workshop, Cologne (Allemagne). 29/09-01/10 2003. « Sensitivity analysis with the 3D chemistry-transport model POLAIR ». Avec D.Quélo et B.Sportisse.

Seminars

Issartel J.P., séminaire du DEA M2SAP X-ENSTA-UVSQ. Novembre 2003. « Modélisation inverse de sources».

Issartel J.P. « Méthode des rétropanaches ». 15 mai 2003. Université de Calais.

Roustan Y., Journée des doctorants ADEME. 20 mai 2003. « Modélisation de l'impact des métaux lourds, du mercure et des particules à l'échelle européenne ».

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Sportisse B., séminaire ESIEE/DEA télédétection. Février 2003. « Assimilation de données pour la pollution atmosphérique ».

Missions

Bocquet M., EGS - AGU - EUG Joint Assembly, Nice (France). Avril 2003. Session « Assimilation de données » .

Bocquet M., école d'été E2Phi 2003 à Bordeaux. Août 2003, 4 jours. « *La physique de notre planète, la Terre, et son climat* ».

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Issartel J.P., mission au CMM, Santiago du Chili (Chili). Janvier 2003.

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Sportisse B., Journée PNCA/assimilation de données, CERFACS, Toulouse. 2 Décembre 2003.

Seminars at CEREA

8 janvier 2003: Spyros Pandis, Carnegie Mellon University, Etats-Unis.

3 février 2003: Cécile Ferreira-Gago, ONERA.

10 février 2003: Xavier Vancassel, Laboratoire de Physico-Chimie de l'Atmosphère, Université de Strasbourg.

15 avril 2003: Laura Gallardo Klenner, Centro de Modelamiento Matematico, Université du Chili, Santiago.

22 avril 2003: Patrice Mestayer, Ecole Centrale de Nantes.

10 juin 2003: Sylvain Cheinet, LMD.

1er juillet 2003: Maithili Sharan, Center for Atmospheric Sciences, Indian Institute of Technology, New Delhi.

2 juillet 2003: Mohammad Thagavi, Laboratoire de Météorologie Physique.

4 septembre 2003: Christian Seigneur, Atmospheric & Environmental Research, Etats-Unis.

30 septembre 2003: Kathleen Fahey (CEREA et Carnegie Mellon University).

13 octobre 2003: German Torres (CEREA et ERCIM).

21 octobre 2003: Laurent Li, LMD.

4 novembre 2003: Maya Milliez, CEREA.

17 décembre 2003: Claire Carouge et Philippe Peylin, LSCE/CEA.

Softwares

AtmoData

Library for parameterizations of a Chemistry-Transport Model.

V Mallet

ENPC

Caillou 1D

Vertical modeling of the atmospheric boundary layer.

L. Musson-Genon

EDF R&D et Météo France.

Mam 1.0

Modal modeling for aerosol dynamics (Modal Aerosol Model).

K. Sartelet, B. Sportisse

ENPC

Mercure_Code Saturne

CFD model for the atmosphere.

E. Bouzereau, B. Carissimo, E. Dupont, S. Lacour, M. Milliez

EDF R&D

Polair 2.1

Chemistry-Transport Model, version 2.1

J. Boutahar, H. Foudhil, V. Mallet, D. Quélo, Y. Roustan, B. Sportisse

ENPC

Siream 1.0

Size-resolved modeling for aerosol dynamics (Size Resolved Aerosol Model).

E. Debry, B. Sportisse

ENPC

Spack

Preprocessor for atmospheric chemistry (Simplified Preprocessor for Atmospheric Chemical Kinetics)

B. Sportisse, P. Plion

ENPC

Abbreviations

ADEME	Agence pour le Défense de l'Environnement et la Maîtrise de l'Energie
CEA	Commissariat à l'Energie Atomique
CEFIPRA	Centre Franco-Indien pour la Promotion de la Recherche Avancée
CEPMMT	Centre Européen de Prévision Météorologique à Moyen Terme
CEREA	Centre d'Enseignement et de Recherche sur l'Environnement Atmosphérique
CEREVE	Centre d'Enseignement et de Recherche Eau Ville Environnement
CETE	Centre d'Etudes Techniques de l'Equipement
CETU	Centre d'Etude des Tunnels
CNFGG	Comité National Français de Géodésie et de Géophysique
CNRS	Centre National de Recherche Scientifique
CONICYT	Comision National de Investigacion Cientifica y Tecnologica de Chile
CRIEPI	Central Research Institute for Electric Power Industry (Japon)
CSTB	Centre Scientifique et Technique du Bâtiment
DRAST	Direction de la Recherche et des Affaires Scientifiques et Techniques du METMLT
ECL	Ecole Centrale de Lyon
EDF R&D	Electricité de France Recherche et Développement
ENPC	Ecole Nationale des Ponts et Chaussées
ENSTA	Ecole Nationale Supérieure des Techniques Avancées
ERCIM	European Research Consortium for Informatics and Mathematics
GMD FIRST	German National Research Institute for Information Technology
INRIA	Institut National de Recherche en Informatique et Automatique
INERIS	Institut National sur l'Environnement et les Risques Industriels et Sanitaires
INRETS	Institut National de Recherche et d'Etude sur les Transports et la Sécurité
IRSN	Institut de Radioprotection et de Sureté Nucléaire
LMD	Laboratoire de Météorologie Dynamique (X-ENS-CNRS)
LSCE	Laboratoire Surveillance du Climat et de l'Environnement (CEA/CNRS)
M2SAP	DEA Modélisation, Simulation, Applications à la Physique (X-ENSTA-UVSQ)
MEDD	Ministère de l'Ecologie et du Développement Durable
METLMT	Ministère de l'Equipement, des Transports, du Logement, de la Mer et du Tourisme
ONERA	Office National d'Etudes et de Recherches Aérospatiales
PNCA	Programme National de Chimie Atmosphérique
PPF	Plan Pluriannuel de Formation
PREDIT	Programme pour la Recherche, le Développement et l'Innovation dans les transports terrestres
PRIMEQUAL	Programme Interministériel d'Etude de la Qualité de l'Air
PROCOPE	Programme d'action intégrée franco-allemand
UMLV	Université de Marne La Vallée
UVSQ	Université de Versailles-Saint Quentin
VET	Département Ville-Environnement-Territoire de l'ENPC