

1. EXPERTISE

1.1 Industrial emission

Atmospheric dispersion, air quality and meteorology

Top-level expertise in atmospheric dispersion, meteorology and the development of urban air quality models, together with its mastery of maths and physics tools, place NUMTECH in a prime position to offer a broad panel of studies tailored to the diverse issues facing managers of industrial and institutional facilities.

These studies are underpinned by an array of internationally recognised numerical modelling systems providing use of different spatio-temporal scales within a highly varied range of contexts and weather situations.

Research into the atmospheric dispersion of industrial emissions (impact studies, hazard studies)



NUMTECH employs the very latest Gaussian dispersion models, such as ADMS or AERMOD/ISC, to produce studies for a wide range of industrial sites, while factoring in particularly complex effects such as hilly terrain, mixed land use patterns, obstacles, local weather conditions, etc. For sites with a particularly complex configuration, our engineers bring even more sensitive 3-D tools into play, selected according to the scales involved:

- CFD Code_Saturne model (Eulerian and Lagrangian approach) for dispersion studies involving near fields and complex environments,
- mid-scale models (RAMS, MM5, WRF), coupled with a Lagrangian model when the study requires an impact assessment over greater distances. Integral models (GASTAR) are used to factor in the dispersion of denser-than-air gases for some hazard studies.

The experience gained in working on hundreds of dispersion studies, combined with recent research conducted jointly with our partners (CEA, Ecole Centrale de Lyon), means we are well equipped to provide critical analysis on computed results and their implementation, and also to assess the uncertainty level corresponding to the results supplied.

International databases (meteorological data, topography, land use, etc.) make it possible to conduct research at sites on a worldwide scale.

1.2 Dispersion of odours

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NUMTECH uses specific software applications to model the dispersion of odours as part of its impact studies on composting activities, water treatment, animal waste disposal and petrochemicals.

Based on flow quantification data and a representative meteorological time chart (generally covering several years), the models are used to map odour concentrations (UO/m³) throughout the facilities' surrounding environment, factoring in complex effects such as obstacles, multiple-point sources, near fields, turbulent fluctuation of odour levels, etc.

The computations enable industrials to meet regulatory requirements (orders governing animal waste disposal and composting dated 12 February 2003 and 22 April 2008 respectively) and/or to determine the heights of stacks or the size of deodorizing systems so as to limit their impact on neighbouring populations.

Weather diagnostics provide site administrators with data on weather situations that might have adverse effects on odour dispersion, and therefore enable them to plan ahead and reschedule certain activities (turning of windrows, etc.).

1.3 Road infrastructures

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Impact studies on road infrastructures « Air and Health » strand



Using the latest cutting-edge modelling tools, NUMTECH coordinates end-to-end production of the « Air and Health » strands of road infrastructure impact studies in collaboration with the Centre d'Etudes de l'Impact de l'Environnement sur la Santé (C.E.I.E.S.) and specialist partners in the field of metrology.

According to the recommendations of the interministerial circular dated February 2005, our partners take measurements using passive samplers and, where appropriate, mobile laboratories, in order to quantify initial air quality prior to conducting projects.

Using the COPERT III or COPERT IV method, we make emission calculations to set initial values in our dispersion models (ADMS-Roads, FLUENT 3-D model), and thereby assess air concentrations of pollutants listed in the circular. These results are used to map Urban Pollution Indexes, and provide comparisons with regulatory air quality criteria.

In partnership with C.E.I.E.S., NUMTECH produces health risk assessment studies as part of Level 1 research that factor in the results of dispersion studies, together with inhalation and oral (ingestion) pathways.

1.4 Urban air quality

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Modelling urban air quality

Through our experience of pollution and urban weather studies, combined with our partners' development of specific benchmark numerical models such as ADMS-Urban and SIRANE, we have conducted several urban air quality studies in France (Strasbourg, Nice, Toulon, Aix-en-Provence, and Clermont-Ferrand) and, on a international scale, in Dubai...

These studies are generally based on index map sections that integrate data on emissions from road networks, industrial facilities, residential/commercial sectors, biogenic emissions, airports, etc.

Dispersion models are configured based on features specific to the urban environment, i.e. canyon effects for roads lined with buildings, urban weather contexts (heat islands), urban

photochemistry, regional pollution forcing, etc. The results of these simulations are used to produce GIS-based air quality maps at urban scale, with a sufficiently fine-scale resolution to be able to zoom in down to street scale.

Furthermore, these studies are often the first step in deploying the URBAN'Air operational system, developed to monitor and predict air quality at whole-town scale.

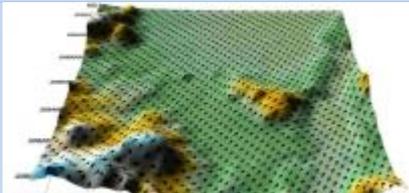
1.5 Weather modelling

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Weather modelling



The team's meteorologists work on missions for a broad customer base that includes industrials, research bodies and specialist design offices. These services are mainly based on the use of accurate 3-D models that reconstruct the meteorological fields making up the atmosphere, i.e. wind profiles, temperature inversions, stability, wind shear at altitude, etc.

These studies are generally conducted during acute pollution episodes in order to gain insight into and reconstruct pollutant dispersion patterns in an industrial or urban environment.

We also use data from the meteorological models we employ (RAMS, MM5, WRF) to accurately set dispersion models (e.g. Lagrangian models) in order to reconstruct recorded pollution episodes.

These same meteorological models are used at larger spatial scales (i.e. regional scale) to provide meteorological data and input for customer-specific dispersion models when the target area is not covered by meteorological measurement stations, or when these ground-level stations are not equipped to factor in data on predominant meteorological phenomena at altitude, such as wind shear or temperature inversion...

The output from these models can also be used to accurately pinpoint potential wind farm sites within complex topographical areas.

2. OPERATIONAL SYSTEMS

2.1 Air quality

Operational decision support systems

NUMTECH's work in designing and developing operational systems is driven by its expertise in atmospheric dispersion and meteorology, its skills in the use of mathematical, physics and modelling tools, and the experience gained by working in close collaboration with industrials and local environmental issues managers.

These systems, designed to analyse and monitor atmospheric discharges and air quality, are tailored to the specific needs of each individual entity, providing historic, real-time and forecast computations at extremely fine geographic scales.

They give decision-makers a means to deal with unforeseeable weather conditions, and to make plans and take measurements aimed at preserving environmental quality while ensuring minimal interference with economic activity. This forward planning can be used to optimise the financial management of regulatory compliance while curbing the risks of environmental accidents.

Informing the public on air quality



City dwellers and urban planners are pressing for more and more information on air quality. NUMTECH has developed an operational system that analyses previous days' events, real-time situations and provides 3-day forecasts on changes in air quality. These monitoring systems use several different atmospheric dispersion models (Lagrangian, Eulerian, Gaussian) to produce extremely fine-scale spatio-temporal forecasts.

The information can be made available to a group of urban areas, a town, a business district, a throughway, a neighbourhood or a street.

Users :

- Local authorities
- Public bodies

2.2 Weather events

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Monitoring weather events



Economic activities that are dependent on prevailing weather conditions need to have access to accurate data on any factors that risk disrupting their operation in order to make appropriate arrangements, and thereby limit the potential financial and human spin-off. The systems tailored to each company provide :

- dedicated weather forecasts based on a diverse range of weather events, and on a specific spatio-temporal scale ;
- expert analysis and support aimed at improving operational forecasting performance while seeking to limit constraints on work organisation;
- an on-site, standalone operational forecasting, monitoring and warning system.

Users :

- Energy sector, wind farms (electricity production forecasts, site safety measures, etc.),
- Public works and civil engineering sector (scheduling, worksite safety measures, etc.),
- Transport sector (weather alerts, etc.),
- Agriculture sector (scheduling and forward planning of crop spraying, seeding, harvests, etc.).

2.3 Atmospheric discharges

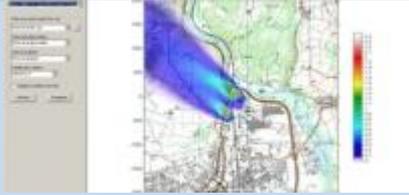
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Controlling atmospheric discharges



NUMTECH has developed a system that predicts the occurrence of potential pollution peaks and overruns of regulatory thresholds based on fine-scale weather forecasts and atmospheric emission schedules. By integrating one or more atmospheric dispersion models based on the location of the site and its surrounding environment, this system can provide forecasts at up to 96 hours, thus enabling site managers to adapt their business activity in order to limit air pollution. When coupled with emission and meteorological measurement tools, these systems provide real-time monitoring of a site's atmospheric discharges into its surrounding environment.

Users :

Administrators of industrial plants and public or private facilities.

2.4 Risk management

Operational decision support systems

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Risk management

Public and private administrators now consistently factor accidental risks into efforts to preserve environmental quality.

Bolstered by its extensive experience with industrial operators and air quality monitoring networks, NUMTECH offers operational systems designed to monitor a site's atmospheric discharges 24/7.

Coupled with measurement systems, these early warning systems can detect, locate and quantify any accidental sources of atmospheric discharges and map the potential impacts.

These systems also provide a software platform that facilitates fast, content-tailored analysis and decision support regarding the response to accidental or terrorist-based atmospheric discharges (CBN risks).

3. SOFTWARE SOLUTION

3.1 ADMS 5

On-site deployment of software solutions

On-site deployment of a range of software solutions covering atmospheric dispersion modelling and air quality monitoring systems, factoring in of results objectives, technical means and staff qualification programmes.

Analysis of each of these parameters makes it possible to recommend a solution, develop custom-designed applications and tailor training and follow-up programmes to fit the needs of each individual company and/or institution.

- ✓ On-site installation and configuration
- ✓ Custom-designed training and follow-up
- ✓ Technical support
- ✓ ADMS range (exclusive partnership with the CERC)
- ✓ RAMS – WRF
- ✓ HYPACT – FLEXPART
- ✓ CALMET / CALPUFF

ADMS 5



The ADMS system has been in use for over 15 years now and incorporates the latest technological and scientific advances in the field of atmospheric dispersion modelling.

Packed with new features, ADMS 5 is the benchmark tool for assessing industrial risks and impacts.

3.2 ADMS Roads

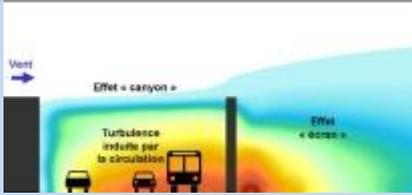
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ADMS Roads



ADMS-Roads is an easy-to-use software solution that has been custom-designed to study the impact of road traffic on air quality. It is the benchmark tool for producing the «Air and Health» strands of road network impact studies.

3.3 ADMS Urban

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ADMS Urban



ADMS-Urban is an air quality modelling platform incorporating several models designed specifically to calculate urban air pollutant concentrations.

Designed to work at a range of scales, from street-scale to city-wide scale, ADMS-Urban is the benchmark system for quantifying population exposure to urban pollution sources, i.e. road traffic and transport, industry, domestic/commercial, etc.

3.4 ADMS Airport

On-site deployment of software solutions

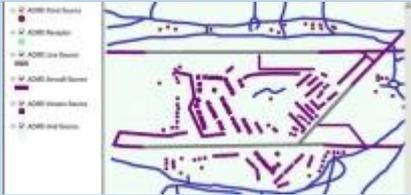
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ADMS-Airport



Designed for airport managers and air quality monitoring organizations, ADMS-Airport is the benchmark system for modelling air quality at airports.

3.5 FLOWSTAR

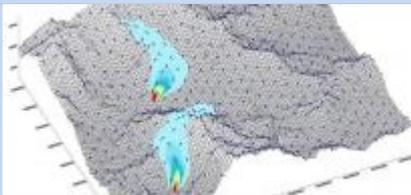
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FLOWSTAR



The FLOWSTAR model produces 3-D wind field and turbulence predictions using global met. data, and factoring in the effects of hilly terrain and land occupation.