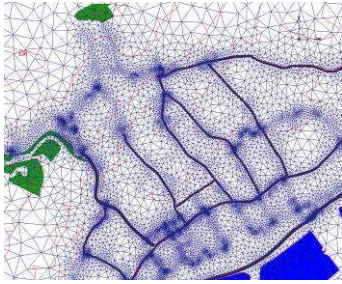
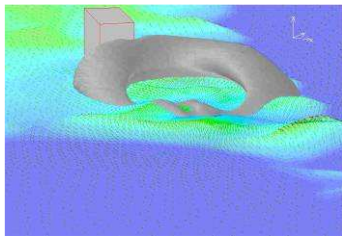




ENVIRONMENT AND INDUSTRIAL RISK ANALYSIS WITH 3D FLUID DYNAMICS

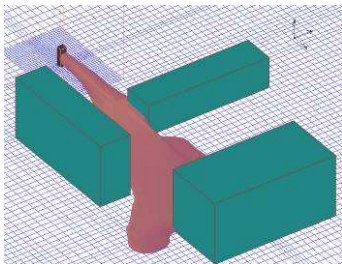


fluidyn - **PANACHE 4.0** is a software family dedicated to the simulation of atmospheric pollutant dispersion and air quality prediction. The modelling tools in *fluidyn* - **PANACHE 4.0** include deterministic solutions of the 3D fluid dynamics equations with structured and unstructured meshes.



fluidyn - **PANACHE 4.0** takes into account different physical phenomena such as :

- Large and small scale dispersion
- Effects of complex 3D topography
- Effects of buildings and obstacles
- Effects of different types of land cover
- Weather conditions (including low winds)
- Atmospheric turbulence and mechanical turbulence around obstacles
- Transient or chronic releases with any kind of pollutant (heavy gases, hot gases, light gases, particles...).

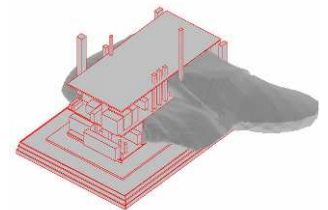


An user friendly interface allows easy and fast use of *fluidyn* - **PANACHE 4.0** family tools for pre processing phases (numerical model construction, source term definition, meshing...) and post processing phases (results analysis).

fluidyn - **PANACHE 4.0** is derived into several modules depending on the applications:

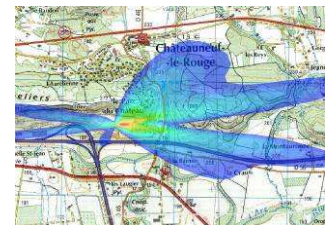
fluidyn - **PANEPR** *Accidental dispersions*

- Heavy gases: gravity phenomena, stratification, heat exchange with ground
- Multiple sources: stacks, point, road, surface and volume sources
- Near field modelling of local phenomena (obstacles, buildings...)
- Droplets formation, transport, aerosol and pool evaporation
- Dispersion of combustion products due to fire
- Emergency response: fast estimation of plume dispersion in case of accidents.



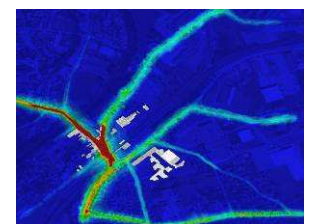
fluidyn - **PANEIA** *Industrial impact on air quality*

- Annual mean impact as per wind rose diagrams
- Precise modelling of local phenomena in near field (due to obstacles, buildings...);
- Urban and industrial impact
- PM-, droplets and odour: dispersion, source identification
- Measurement site choice (pollution and wind)
- Panache visibility
- Quantitative elements for health risk assessment (inhalation, contact, ingestion)



fluidyn - **PANAIR** *Urban air quality*

- Traffic impact, industrial emissions
- Traffic emissions and dispersion (CO, SO₂, PM10, VOC, NO_x, Benzene)
- Exact modelling of topography and meteorology on different scales (quarter, city, regional scale).



Other dedicated modules:

fluidyn – **PANROAD**

Atmospheric dispersion due to traffic

fluidyn – **PANFIRE**

Heat radiation due to solid and liquid fires

fluidyn – **PANEOLE**

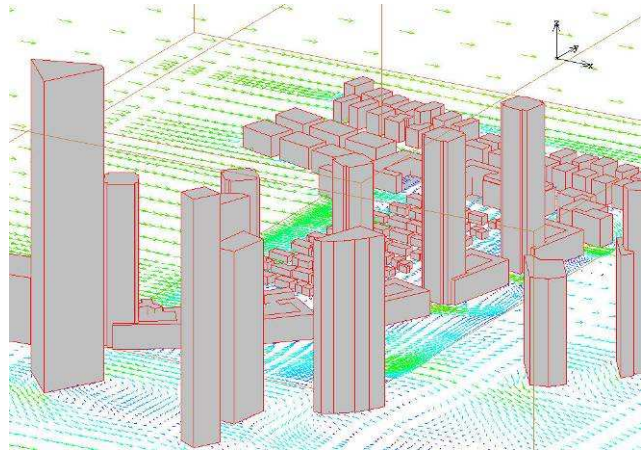
Wind power analysis & map for potential, farms & micro-siting

fluidyn – **PANWAVE**

Wave effect on retention bunds

fluidyn – **PANWIND**

Airflow calculation around obstacles



fluidyn – **PANACHE 4.0** technology is also applied on other environmental problematic :



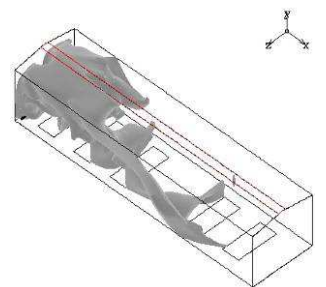
fluidyn – **FLOWCOAST** Numerical simulation of surface water flows

- Pollutant slick dispersion (sea and river)
- Currentology: river, estuaries...
- Impact study: streamline calculation
- Thermal plume dispersion calculation
- Sedimentation, particle transport



fluidyn – **POLLUSOL** Ground and underground water pollution (saturated/ unsaturated zones & aquifers)

- Prediction of underground water pollution impact
- Waste storage sites, leaks in sewage systems
- Dispersion, advection, degradation, adsorption and filtration
- Visualisation of the pollutant propagation



fluidyn – **VENTIL** Confined phenomena simulation

- Ventilation and air conditioning of confined spaces: workshop, offices, residences
- Accidental or continuous dispersion
- Confined explosions: deflagration, detonations
- Road and rail tunnels, mines.

REFERENCES: ALGADE, ALTRAN, ANTEA, APAVE, BIOCITECH, BUREAU VERITAS, BURGEAP, CEM, CENTRALE DES CARRIERES, CETE NORD PICARDIE, CHU Clermont-Ferrand, COELYS, ESCOTA, GORONICKEL, HERCO, IDE, INEOS, NEXTER, NORISKO, PREVENTEC, RATP, SAINT-GOBAIN, SETUDE, SHELL, SIAAP, SOLVAY, TIOXIDE, TNO, TOTAL, UNIVERSITE de LIEGE, UNIVERSITE de MULHOUSE, UNIVERSITE de REIMS, VEOLIA, VISTEON ...

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