H11-076

LASPORT – A MODEL SYSTEM FOR AIRPORT-RELATED SOURCES BASED ON A LAGRANGIAN PARTICLE MODEL

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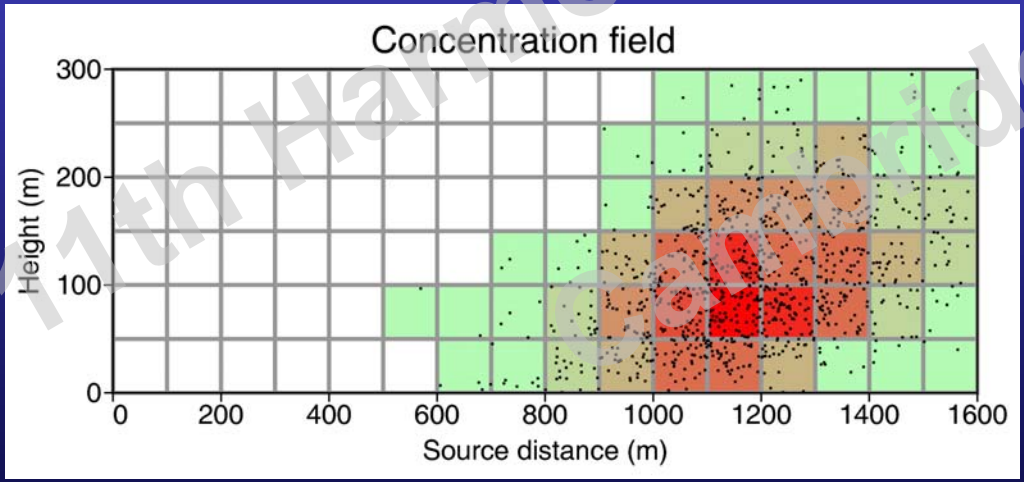
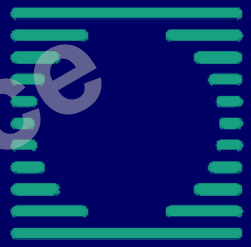
Lagrange in a nutshell, 1st half

Lagrangian particle model:
Simulation of the atmospheric transport of individual particles by a stochastic process on the computer



Time-dependent concentration is derived from the mass of all particles present in a given grid cell and time interval

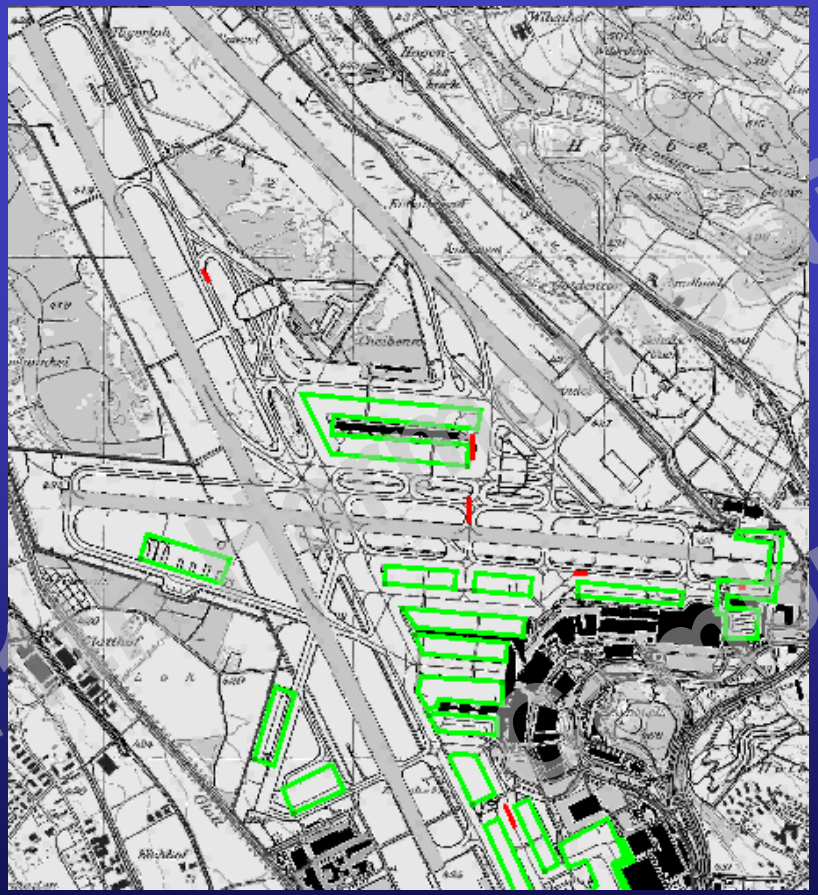
Lagrange in a nutshell, 2nd half



Some advantages over other modelling techniques:

- Independent of calibration parameters
- Time-dependent description of the dispersion process (important e.g. in the far field)
- Realistic description of the turbulent diffusion (important e.g. in the near field)
- Source shapes are accounted for in their exact form (important for complex configurations)
- No averaging in the vertical over meteorological profiles (important e.g. at the ground)
- Three-dimensional wind and turbulence fields can be directly applied (important in complex terrain)

Aircraft emission



Aircraft: Moving pollutant sources with time-varying

- positions and velocities
- emitted mass per unit time
- exhaust dynamics

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Time-dependent dispersion calculation using a Lagrangian particle model

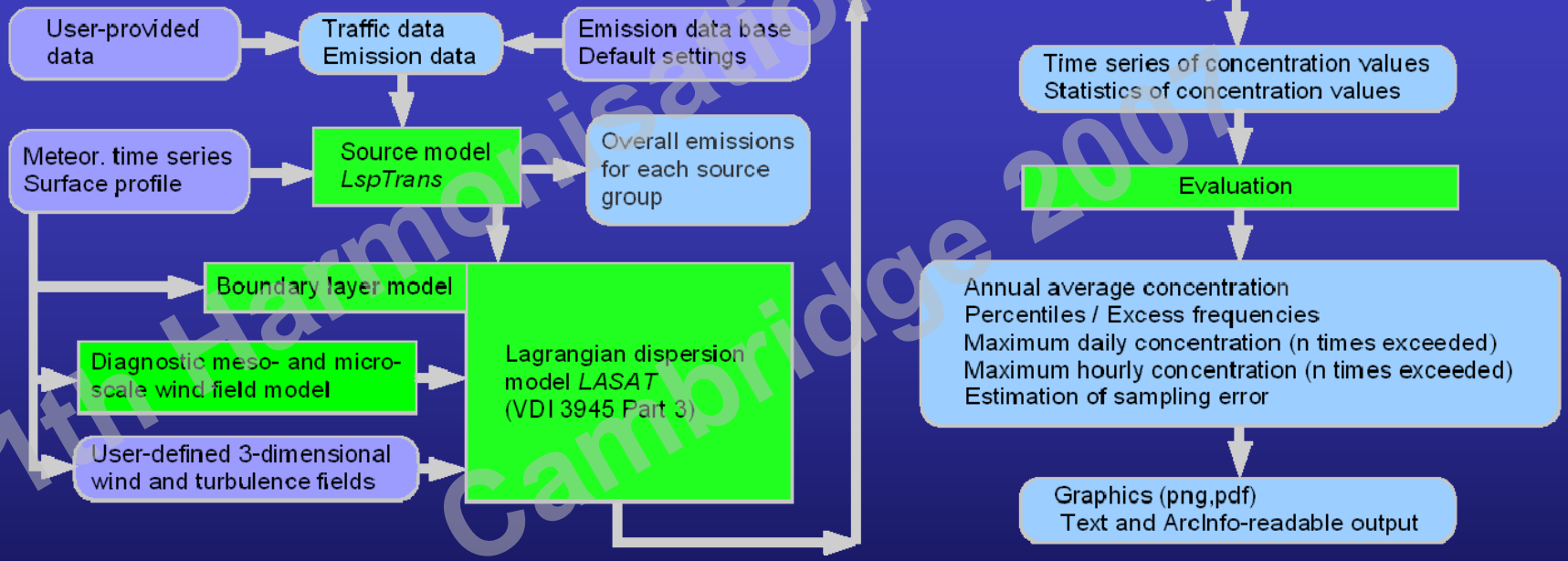
Realisation

LASPORT – LASAT for Airports

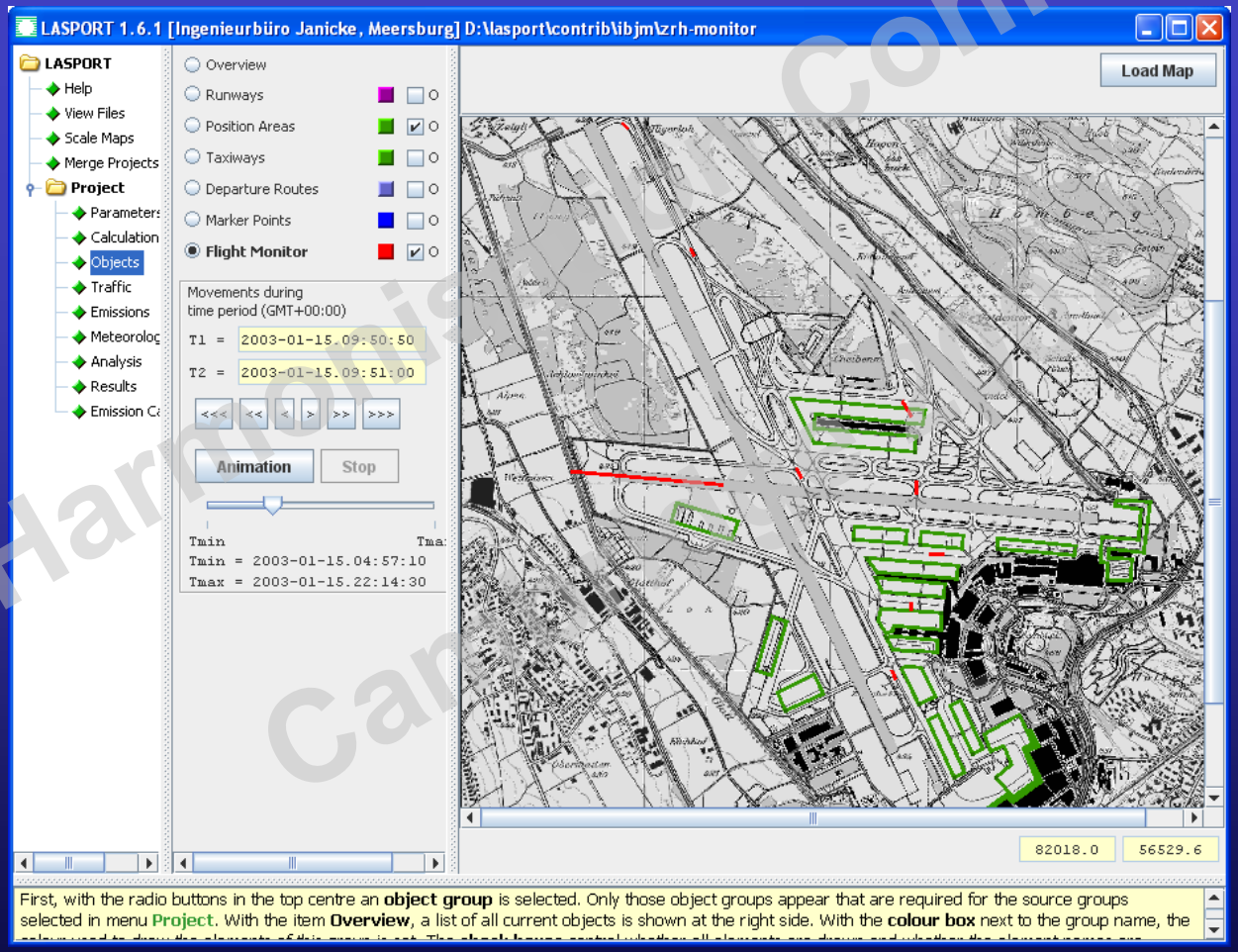
- Developed 2002 on behalf of the German Airport Association (ADV)
- Implements the Lagrangian particle model LASAT
- Extended in cooperation with EUROCONTROL
- Applied at various airports in Europe

(references are provided in the extended abstract)

LASPORT model structure

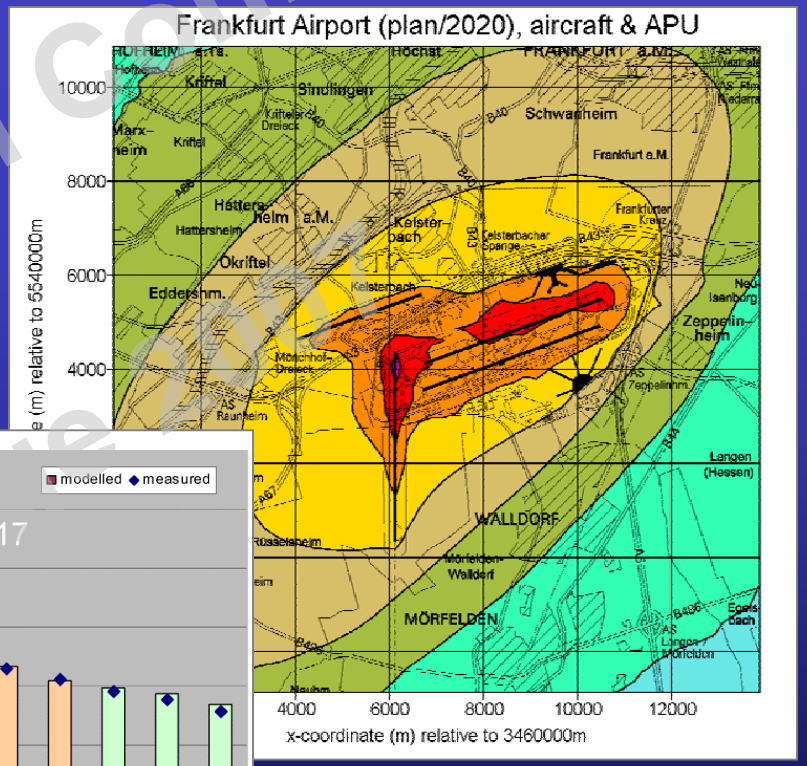


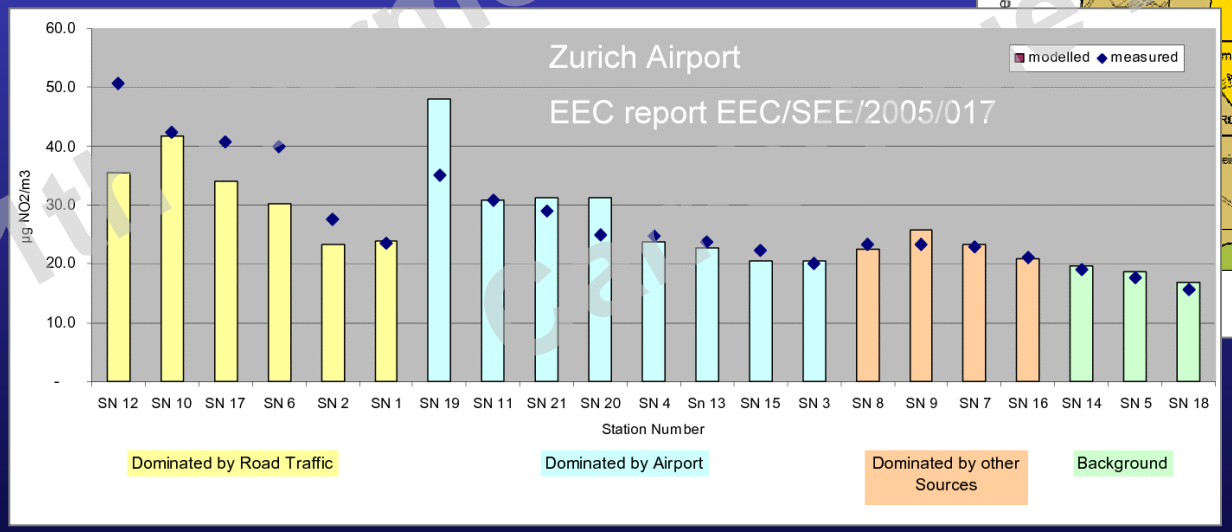
LASPORT GUI



Application – Airport air quality

- Licensing procedures
- Local air quality assessment

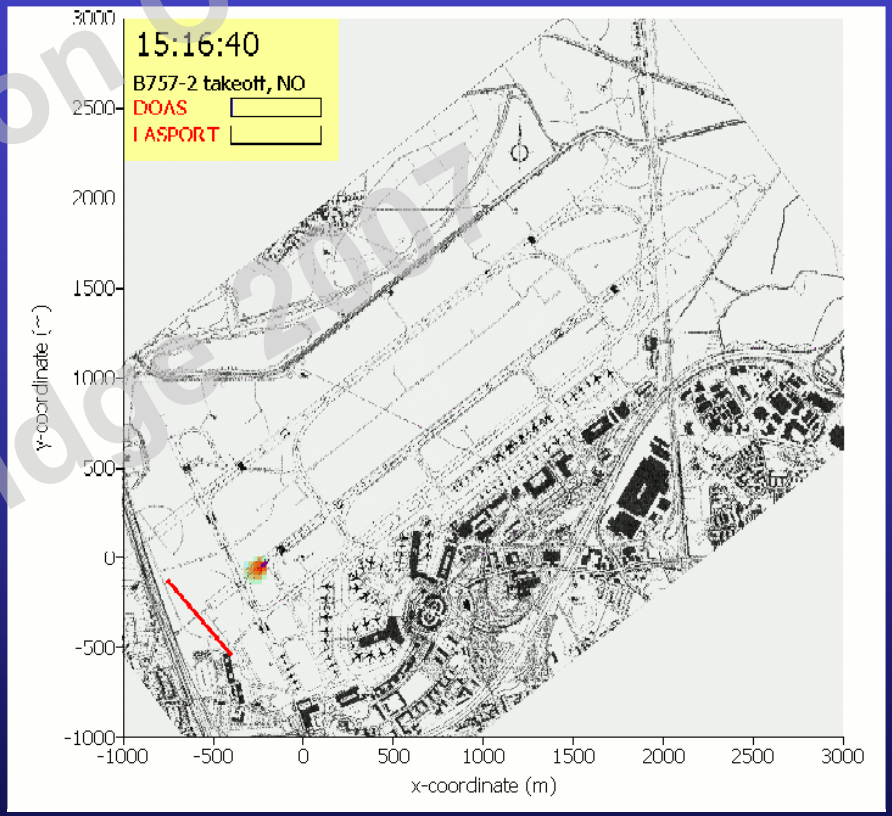




Application – Research

Example:

Study of individual aircraft with a high spatial and temporal resolution; comparison with DOAS measurements



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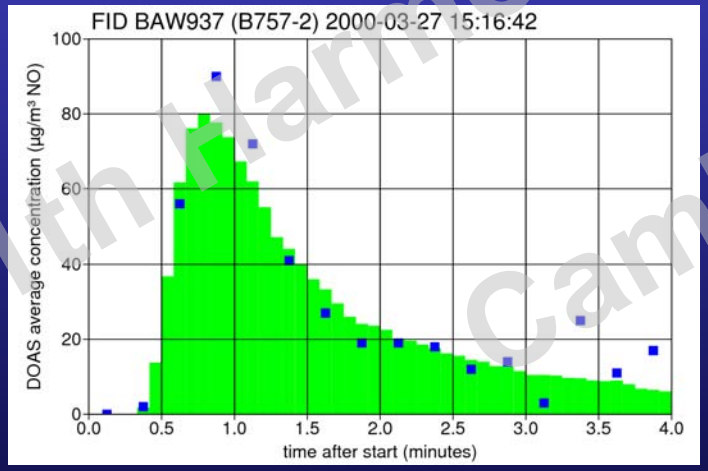

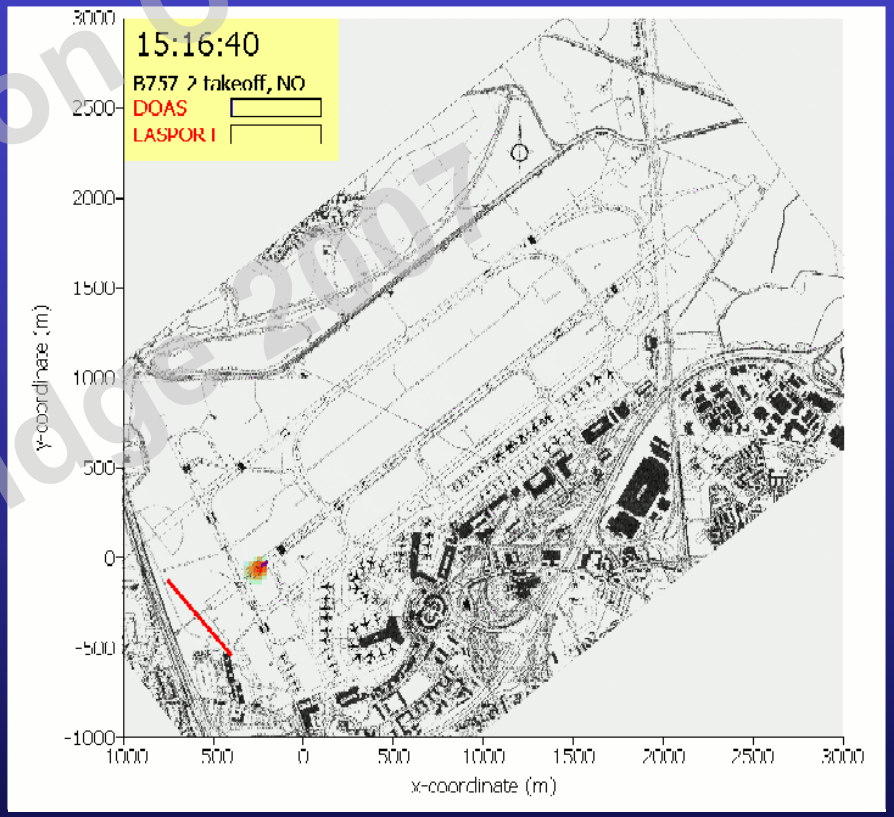

LASPORT as standard utility

trade-off between

complexity and demanded input data

(e.g. LTO details, plume dynamics)

and required practicability

(user friendliness, applicability to any airport)

Outlook

- Adjustments to CAEP requirements
  (multi-airport emissions, external data bases)
- Adjustments to operational LTO
  (emission values, >4 operational modes)
- Investigation of plume dynamics
  (validation data sets, PLURIS)
- Refined NO/NO_2 chemistry
  (conversion rates, higher-order reactions with LASAT extension LASREA)