## 3<sup>rd</sup> ECATS Conference

13 – 15 October 2020, Online

#### **Time-resolved Aircraft Dispersion Modelling**

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Simple example

- Line source near ground oriented east-west
- Constant NOx emission rate
- First hour wind from South
- Second hour wind from East
- Wind speed 2 m/s at 10 m height, stable stratification
- Mean concentration in hour 1 and hour 2



















# Time-resolved dispersion modelling

More realistic description of transport dynamics

In particular for situations with varying wind conditions and at larger source distances (transport time ~> averaging time)

Realistic description of time-varying emissions

In particular on a sub-hour scale

## $\rightarrow$ 4 examples



## Example 1: aircraft at take-off (Düsseldorf/DE)



LASPORT (LASAT, Lagrangian particle model according to VDI 3945 Part 3)

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## Example 1: aircraft at take-off (Düsseldorf/DE)



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# Example 2: aircraft at taxiing (Salzburg/A)



LASPORT (LASAT, Lagrangian particle model according to VDI 3945 Part 3)

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# Example 2: aircraft at taxiing (Salzburg/A)



Setup following Vorage et al. in: Gefahrenstoffe, 79 (2019)

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# Example 3: aircraft at approach (Zürich/CH)



#### Example 3: aircraft at approach (Zürich/CH)



LASPORT (LASAT, Lagrangian particle model according to VDI 3945 Part 3)

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### Example 4: Complex flow fields (CAEPport)



#### CFD model CEDRE (ONERA)

#### $\rightarrow$ Talk by Emmanuel Montreuil in this session

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![](_page_12_Picture_5.jpeg)

# Time-resolved aircraft dispersion modelling

- Study of dynamical effects in the context of aircraft emissions
- Detailed comparison with measurements in sub-minute resolution
- In particular: ultrafine particle concentrations; dynamics of wing vortex /exhaust interactions
- $\rightarrow$  Talk by Sarav Arunachalam in this session

Standardisation by suitable parametrisation, also applicable to stationary and simpler dispersion models

#### $\rightarrow$ AVIATOR (aviatorproject.eu)

 $\rightarrow$  Talk by Devora Hormigo in this session

![](_page_13_Picture_8.jpeg)

![](_page_13_Picture_9.jpeg)

# Thank you!

Measurement Instruments and Modelling

Measurement Instruments. Aircraft Engine Probe, Management and Engine Understanding

Management, Airline Involvement, Madrid Airport Detailed Sensor Study and Supporting Aircraft Engine Measurements

![](_page_14_Picture_3.jpeg)

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Modelling – Plume, Local and Regional, Measurement Kit, 2 Further Airports and Different Locations

![](_page_14_Picture_7.jpeg)