RAPTOR KoM

Paris, 18th November 2019

WP5 Modelling Review / Task 5.1, Selected Issues

(1) Volatile and non-volatile PM

- Non-volatile PM (~soot) approximately inert with respect to number. Clear interface (engine exit) and modelling (conservation of number).
- Volatile PM highly variable: Dependent on transport time, fuel composition, ambient parameters. Apparent number emission index can be much higher than for nvPM.
- Most measurements so far record sum of nvPM and vPM. CAEP regulation only addresses nvPM. Health assessment requires both.

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WP5 Modelling Review / Task 5.1, Selected Issues

(2) Merging measurement data

- Measured PM number depends on diameter threshold, loss correction, fuel sulfur and OM content, S conversion fraction, ambient parameters, transport time. This hampers comparisons and merging into a common data base.
- vPM apparent emission indices can be mapped to a common value set of some of these parameters by reverse modelling. An approach is described by Kärcher et al. (2000).
- Such concept may be useful as well for setting up effective vPM emission indices.

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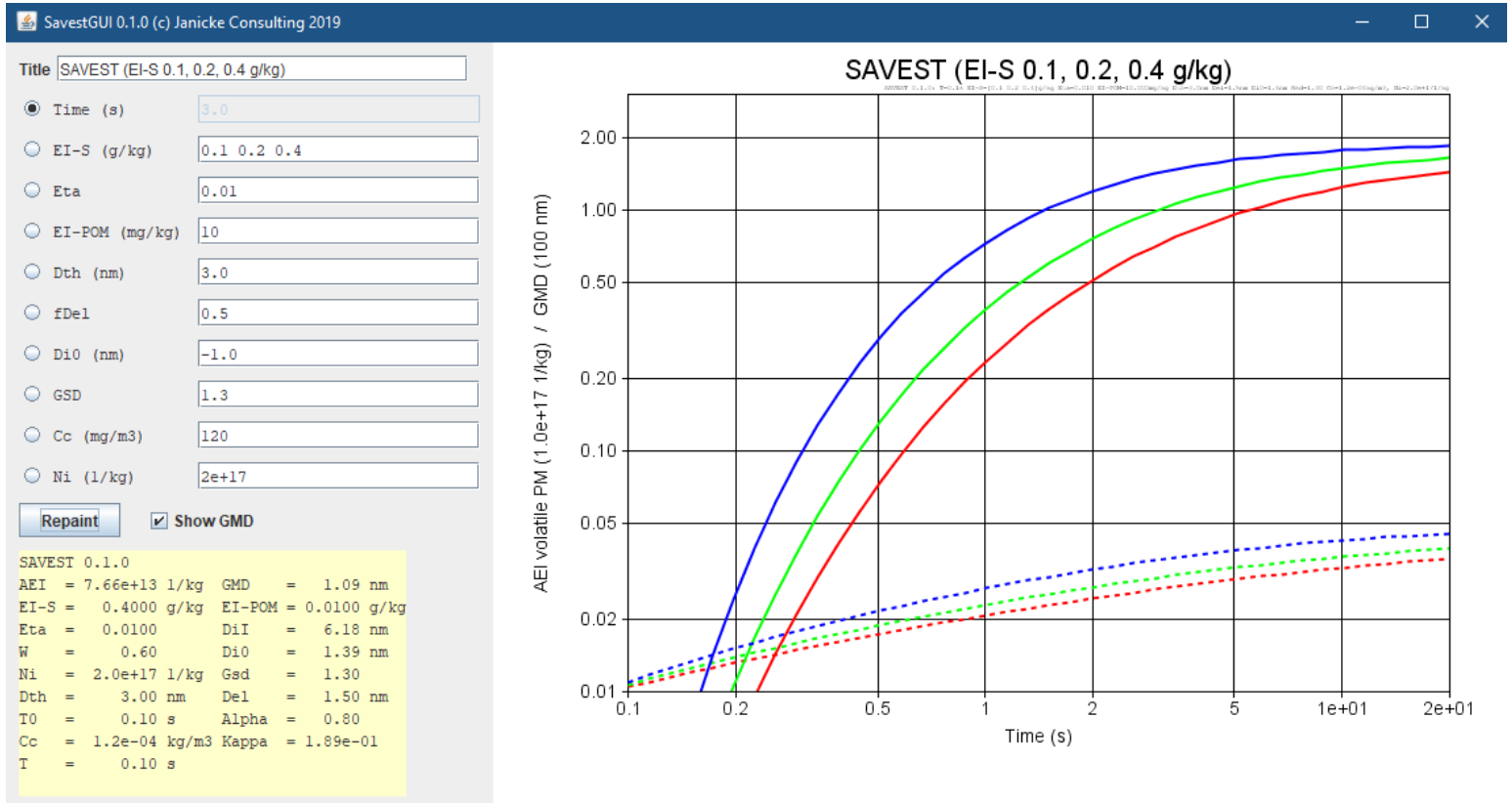
SAVEST - Simple Aviation Volatile pm emission index ESTimator (ongoing work in AVIATOR based on Kärcher et al., 2000)



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(3) Modelling approaches

There are different approaches with different input requirements and scopes. This must be considered when investigating recommendations and standards.

- Example 1: EIs from Mazaheri (2009, total PM) plus simple Gaussian model plus adjustments to PM measurements (RIVM, 2019).
- Example 2: Engine-specific nvPM EIs (FOA3N) plus complex Lagrange model without adjustments (UBA, 2019).
- Example 3: Time resolved nvPM and vPM exhaust plume from individual aircraft (AVIATOR, 2020).

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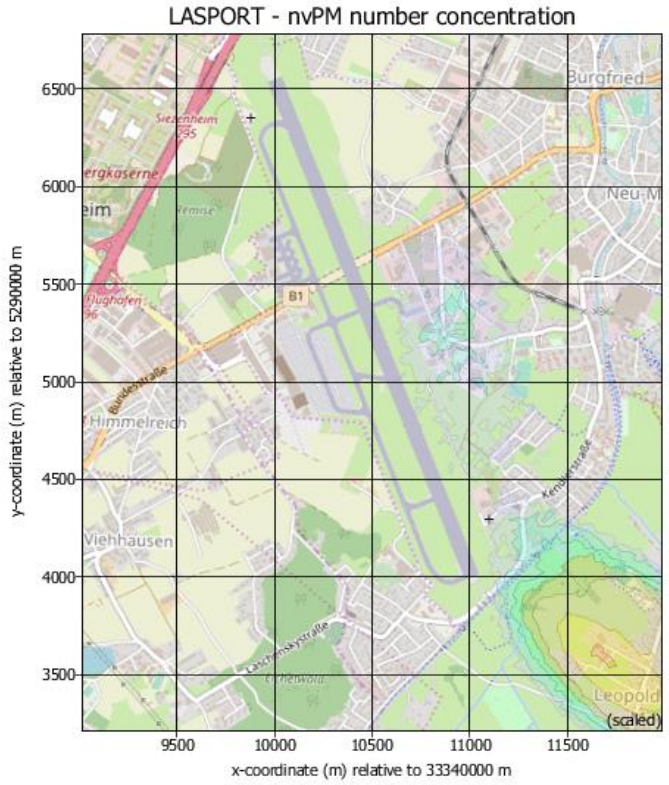
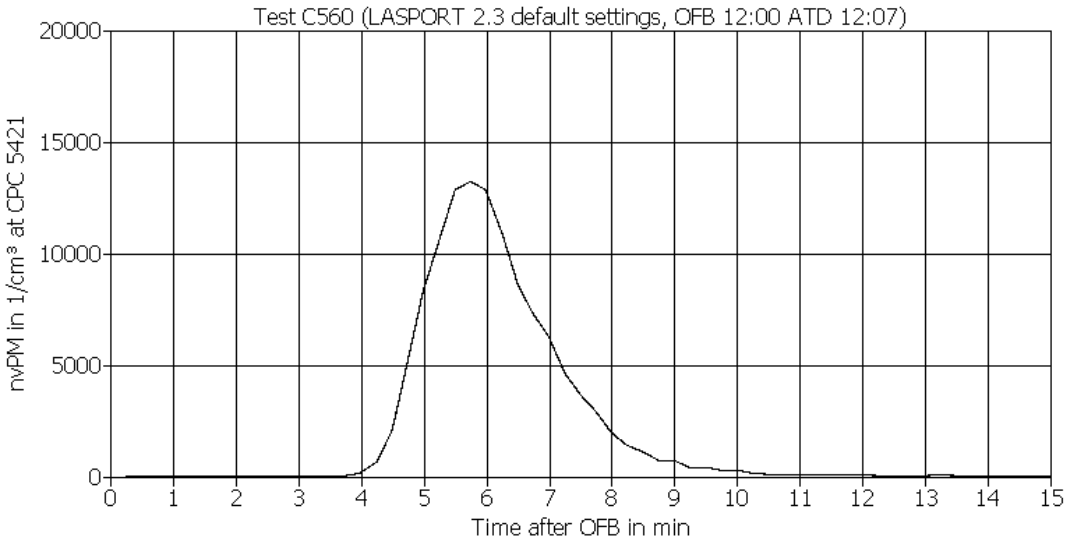
Example 3: LASPORT dispersion modelling for an individual aircraft





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(4) Other issues

- Calculating nvPM emissions at cruise
- PM emissions from non-regulated engines including APU
- Intra-engine processes
- Deposition of UFP
- Short time (<1h) versus long time (a) predictions
- Advances in CAEP/12 and other projects
- Interdependencies with NOX, CO2, Noise → ANIMA (H2020)
- …

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