New Generation Mobile Source Emissions Modeling

John Koupal
EPA Office of Transportation and Air Quality (OTAQ)

Mobile Source Technical Review Subcommittee
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MOBILE6

- Current status
  - Coding and Alpha Testing complete
  - Limited beta testing underway
- Release: January 31, 2001
- Next Steps
  - Finalizing technical documentation
  - Adding PM, Toxics
  - Validation

MOBILE6 - Major Emission Content Changes

- Exhaust Emissions
  - Light and heavy duty emission rates
  - Facility-based off-cycle and speed corrections
  - Sulfur effects and fuel composition
  - Heavy duty NOx excess
  - Air Conditioning
- Evaporative Emissions
  - Liquid leaker emissions
  - New diurnals and resting loss data
  - Multi-day and partial-day diurnals

MOBILE6 - Fleet and Activity Changes

- Fleet characterization
  - Mileage accumulation
  - Registration (age) distributions
  - VMT mix
- Vehicle activity
  - Trip length estimates
  - Soak time distributions
  - Trip start and trip ends
  - VMT by hour of day, facility, speed

MOBILE6 Structural Changes

Separation of start/running

Additional vehicle sub-classes

- LDGT 1-4, HDGV 2b-8b, HDDV 2b-8b, Buses

Database output option - disaggregated by:

- pollutant
- start/running (exhaust)
- resting/running/diurnal/hot soak/refuel (evap)
- vehicle class
- age
- facility
- hour

MOBILE6 is a much better tool...

Better represents real world emissions

Better estimates program benefits

More useful tool for transportation applications

BUT

It is still fundamentally a “macro-scale” model.

A NEW GENERATION EMISSIONS

MODEL IS NEEDED

NRC Recommendations

Develop microscale and mesoscale modeling capability for transportation applications

Coordinate with DOT, ARB and others to develop long-range mobile source emissions modeling plan

Improved emission characterization:

- In-use emissions
- High Emitters
- Heavy-Duty Vehicles
- PM and Toxics

NRC Recommendations, cont.

Model evaluation:

- Validation
- Sensitivity and Uncertainty analyses

More frequent updates

New Generation Model - Effort to Date

- DOT coordination
  - Short-term goal: TRANSIMS pilot implementation
  - Long-term goal: Coordinate TRANSIMS and NGM
- Site visits
  - ARB: EMFAC2000, GIS work
  - UC Riverside: Comprehensive Modal Emissions Model
  - Georgia Tech: MEASURE / MOBILE MEASURE
- Intra-Agency Mobile Source Modeling Workgroup
  - OTAQ, ORD, OAQPS, Region

New Generation Model - Planning Goals

Issue Paper / Initial Proposal - April 2001

Comprehensive Plan - September 2001

- Model system structure
- Model algorithms
- Underlying data and research needs
- Linkage with transportation and air quality models
- Validation plan
- Project timing

New Generation Model - Proposed Guidelines (1)

Estimate emissions at the microscale, mesoscale or macroscale for criteria pollutants, particulate matter, air toxics, and greenhouse gases

Compatible with current and advanced transportation and air quality modeling frameworks (TRANSIMS, MODELS3)

Usable, as defined by: ease of access and use, reasonable software/hardware requirements, ability to generate and input activity and fleet information.

Underlying database structure which allows updates from multiple sources, including in-use emissions and activity data

New Generation Model - Proposed Guidelines (2)

Structured to enable validation of individual modules

Comprehensive documentation for the model and its use, covering model operation, structure, code, algorithms, inputs, testing and user guidance.

Adherence with the EPA Council for Regulatory Environmental Modeling (CREM) guidelines for peer review, validation, model uncertainty, and documentation.

Developed in coordination with stakeholder, users and other entities engaged in mobile source emissions modeling

Short-Term Drivers

- Motor Vehicle Toxics Rule
  - Desire micro/mesoscale emissions modeling in several urban area for improved exposure modeling resolution
- Desire to use microscale models to evaluate transportation measures in conformity analyses
  - TRANSIMS pilot implementation begins Fall 2001
- Climate Change
  - Need to develop inventory development capability for policy evaluation

Possible Interim Steps

Develop macro/meso/microscale capability within Geographic Information System (GIS) framework

MOBILE6 (with PM, toxics, GHGs) remains the basis of emission predictions

Source of activity and fleet information depends on analysis scale

Structure with an eye towards NGM

Possible Interim Steps - Macroscale

Purpose: Develop a structure for national inventory development using MOBILE6 (w/ PM, Toxics, GHGs)

Activity and fleet info aggregated by grid or county

GIS would allow easy shift in scales:

grid > county > nonattainment > state > region > nation

Maintain national database for county-level activity, fleet and control program information

Possible Interim Steps - Micro/Mesoscale (1)

MOBILE6 emissions disaggregated to smaller scale

Allows evaluation of microscale vehicle activity within MOBILE6 SIP/Conformity budgets

- Initial step could simply be guidance which allows use of micro/meso models within context of MOBILE6 budgets

Allows more resolved inventories accounting for speed/accel activity, spatial/temporal allocation (Toxics, Climate Change)

Possible Interim Steps - Micro/Mesoscale (2)

Activity and fleet information

MEASURE (Ga Tech/EPA ORD) framework promising

Activity info via Travel Demand Model

- Speed and volume by link
  - Disaggregation to speed/accel distribution via driving surveys
- Trip generation/attraction by zone
  - Further spatial allocation based on land use

Fleet info via vehicle registration database

- Spatial allocation via address matching, census data
- Further refinement/validation possible with RSD

Possible Interim Steps - Micro/Mesoscale (3)

Emissions information

MOBILE6 (with PM, toxics, GHGs) provides aggregate emissions predictions

Allocation of MOBILE6 emissions at the link level to account for speed/accel behavior on that link

- Would require modal or microscale model to accomplish
- Evaluate existing models (e.g. UC Riverside, Georgia Tech) to determine best approach

Aggregate MOBILE6 emissions untouched for sources with no micro/meso component (e.g. evap, heavy-duty)

Possible Interim Steps - Micro/Mesoscale (4)

Target selected urban areas

- Will feed toxics rule exposure analysis

Develop guidance for other areas to adopt

Develop database for activity and fleet inputs

Interim Steps ⟶ NGM

Update modules as appropriate:

Emissions

- More integrated approach to macro/meso/micro emissions
- Better data resolution on heavy-duty, toxics, PM, GHGs
- PEMS

Activity

- Advanced transportation models, GPS

Fleets

- RSD, VIN decoding

Stretch Goal: Incorporate NONROAD

Next Steps

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Comprehensive Plan - September 2001

FACA Modeling Workgroup will meet in conjunction with the MSTRS to provide comment on these products