WG1 - Source apportionment in support AQ management

Comparison and complementarity of receptor and source oriented models

WG1 Session

FAIRMODE PLENARY MEETING
Paris - 26/27 February 2024

WG1 agenda

- Status and future steps (15')

- **Discussion (35')**

  ❖ *How can we best use available approaches in combination to support planning in the context of the AQQD?*

  ✓ What can we learn from the integration of source and receptor oriented models? (follow up from REMY project and interactions with RI-URBANS and CAMEO projects)

  ✓ How can we use CAMS and other SA products available at EU level?

  ✓ ~~How can we combine t~~ Postponed.../ ~~methods for SA?~~

Receptor and Source oriented models

Key questions

Questions on topics… to define the final goal of the activity

Could we compare/combine RM ad SM results to improve:

- EC (BC) modelling (total mass; fossil fuel vs biomass burning)?

- OA modelling (primary vs secondary, fossil fuel vs biomass,…)?

- The reconstruction of road transport resuspension and non-exhaust PM?

- The temporal modulation of specific source sectors (e.g. biomass burning)?
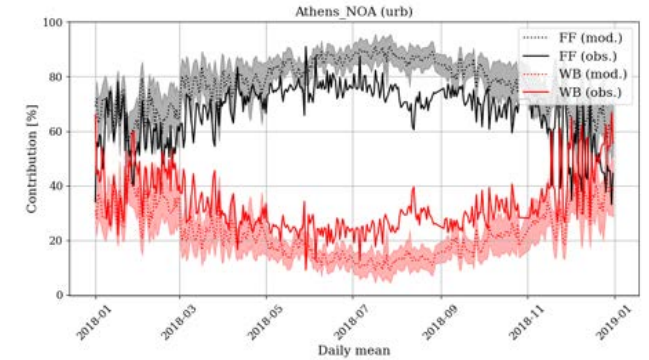
- *Spatial Source apportionment?*

Receptor and Source oriented models

Where are we? eBC and OA modelling

Athens_NOA (urb)

BC: Comparison between CTMs and AE33

Objectives: Propose a methodology to compare results of CTM to eBC contributions
Difficulties: Agree on consistent eBC definition (in coll. With ACTRIS); Account for uncertainties in measurement

OA: Comparison between CTMs and ACSM PMF

Objectives: Propose a methodology to compare the results of CTMs to ACSM PMF OA contributions

Difficulties: SOA mechanisms do not have the same precision; distinction among OOA species is not straightforward.
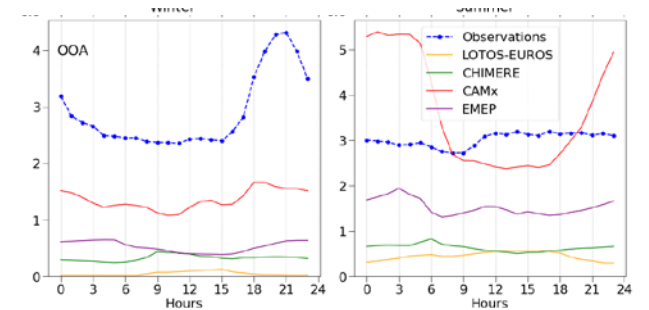
OA: Comparison between CTMs and PMF / ACSM PMF

Objectives: Propose a (simple) methodology to estimate precursors (VOC, I/SVOC, POA) and simulate OA

Difficulties: How to estimate I/SVOC emissions? How to valide results? Which (simple) SOA mechanism?

BIOMASS   TRAFFIC
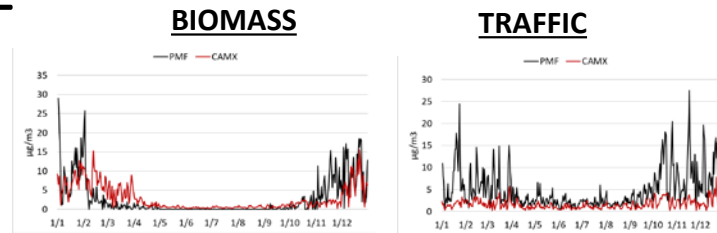
Receptor and Source oriented models

Comparison of CTM and PMF results for source sector contributions

TNO **TNO**
LOTOS-EUROS
Tagging & sensitivity (15% ER)

Metnorway Norwegian Meteorological Institute
EMEP
Sensitivity (15% ER)

INERIS **INE-RIS**
CHIMERE
Surrogate model (ACT)
= Fitting of polynomials to BF training runs

RSE **RSE** Ricerca Sistema Energetico
CAMx
Tagging (& sensitivity)

IEP-NRI **IOŚ-PIB** Institute of Environmental Protection National Research Institute
GEM-AQ
Sensitivity

AMEO

LIFE REMY

PM PMF datasets for core years 2018-2019 evaluation

- Barcelona/Montseny (2018- mar 2019), PM2.5 and PM10
- Zwitserland 5 stations (jun 18 – may 19), PM10 sources
- Melpitz (nov 18- oct 19), PM10 sources
- Stuttgart (Freiburg 2018, Gärtringen 2018-2019 ,Stuttgart 2018-2019), PM10
- Milan, 2017-2019, PM2.5 and PM10, **(LIFE-REMY)**
- Athens, 2018-2019, PM2.5 and PM10
- (Krakow 2019, **LIFE-REMY** (7-day average) requested)

extend or connect with eBC and OA comparisons from e.g. RI-urbans
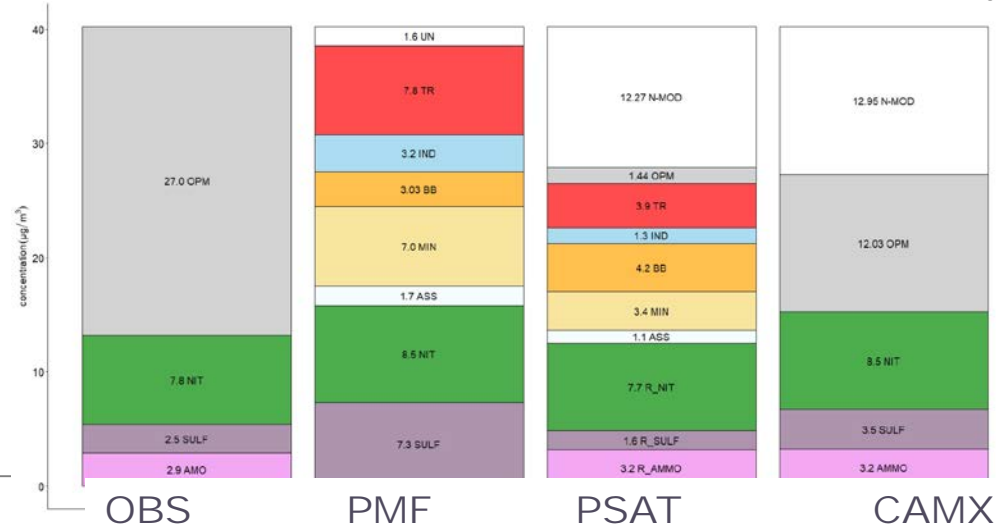
PM PMF (2017 and 2019)

- Barcelona/Montseny (2017- mar 2019), PM2.5 and PM10
- Milan, 2017-2019, PM2.5 and PM10
- Krakow 2019, PM10 (7-day average)

Milan (Pascal)

Receptor and Source oriented models

Example of activities...

1. **Collection** and **verification** of observed and simulated data already available

2. Definition and possible execution of **missing simulations** (TAG or Brute Force...)

3. Review of the **harmonization methodologies** between RM and SM results applied so far

4. Definition/confirmation of **methodologies** and **indicators** for a quantitative comparison between RM and SM

5. Identification and modeling verification of possible **improvement actions** (= emission estimation), e.g.:

   1. Temporal modulation of biomass emissions

   2. Traffic resuspension

   3. Primary and secondary organic particulate matter

6. Contribution to **FAIRMODE guidance**

Receptor and Source oriented models

Deadlines and main outcomes

Time scheduling

- Brain storming meeting (online, April 2024)

- Technical activity (May 2024 – March 2025)

- Intermediate meetings (FAIRMODE technical meeting, October 2024, Plenary meeting February 2025)

- Contribution to guidance (March 2025 – October 2025)

Final products

- contribution to the Fitness-for-purpose guidance

- contribution to SA protocol

- Datasets

- Papers

Receptor and Source oriented models

Survey and discussion

Survey

1. Are you interested in contributing?

2. Do you agree with the main goal of the activity?

3. Which topics are you mostly interested in?

   - EC (BC) modelling (total mass; fossil fuel vs biomass burning)?

   - OA modelling (primary vs secondary, fossil fuel vs biomass,…)?

   - The reconstruction of road transport resuspension and non-exhaust PM?

   - The temporal modulation of specific source sectors (e.g. biomass burning)?

   - Spatial Source apportionment?

Discussion

1. Do you see any other relevant goals for this activity?

2. Any other available dataset (RMs + SMs) that could be added?

Slido.com
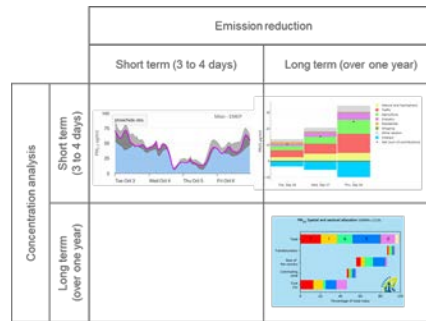
Pwd: WG1

SA Methods to Design Air Quality Plans

How to use SA methods to apply the EU directive?

EU directive [proposal]: Where, in given zones the levels of pollutants in ambient air exceed any limit value, laid down in Section 1 of Annex I, Member States shall establish air quality plans for those zones as soon as possible and no later than 2 years after the calendar year during which that exceedance of any limit value was recorded. Those air quality plans shall set out appropriate measures to achieve the concerned limit value and to keep the exceedance period as short as possible, and in any case no longer than 3 years from the end of the calendar year in which the first exceedance was reported.
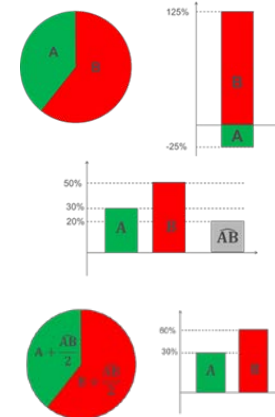
Exercise 1
Spatial Scales and SA

Exercise 2
Temporal Scales of SA

Exercise 3
SA To be or not to be

Exercise
SA Protocol

also discussed in CEN

SA Methods to Design Air Quality Plans

How to use SA methods to apply the EU directive?

Use of SA tools for AQ planning on several receptors.

1st webinar

- Inventory and presentation of the available tools (SHERPA, CAMS, « local tools »)
- Identification of the possible receptors (space and time) to be used for the exercise

2d webinar

- Each group presents its analysis of the results on the receptor site it has chosen

Technical meeting

- Presentation of the exercice results an drafting a guidance about best practice

OA: Comparison between CTMs and ACSM PMF within RI-URBANS

Participants: CHIMERE (INERIS), CAMx (PSI), EMEP (Met-Norway), LOTOS-EUROS (TNO), led by INERIS (F. Couvidat)

Objectives: Propose a methodology to compare the results of CTMs to ACSM PMF OA contributions

Selected Method:

- Compare BBOA to POA from biomass burning (if possible considered semivolatile)
- Compare HOA to POA from other sources (if possible considered semivolatile)
- Compare OOA (sum of L-OOA and M-OOA) to all SOA compounds (including aged POA compounds if POA is considered as semivolatile)

Difficulties:

- SOA mechanisms do not have the same precision (e.g. some mechanisms may treat POA as non volatile without aging). Some mechanisms may account for the degree of oxidation, other do not.
- The comparison to L-OOA (low oxidized) and M-OOA (more oxidized) is not straightforward. No clear criteria on O/C to distinguish compounds in L-OOA to M-OOA

Results (preliminary)

- POA are considered semivolatile by LOTOS-EUROS and CHIMERE => important effect on concentrations
- Compensation between observed&modelled BBOA and OOA in wintertime
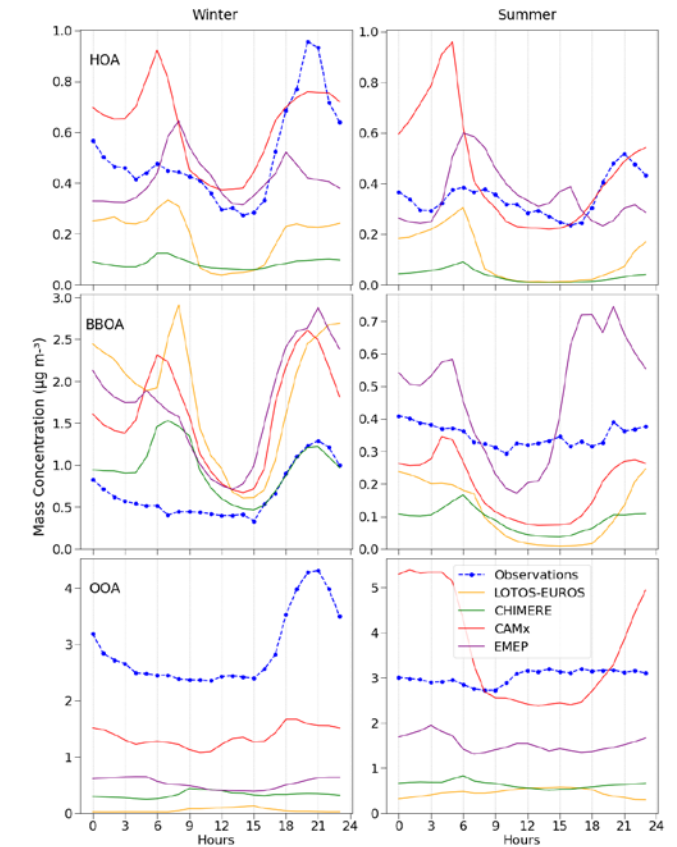
BC: Comparison between CTMs and AE33 within RI-URBANS

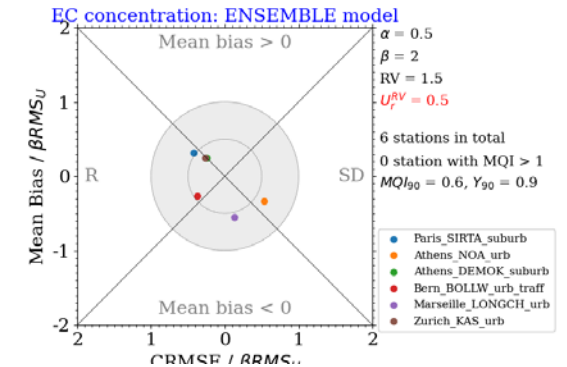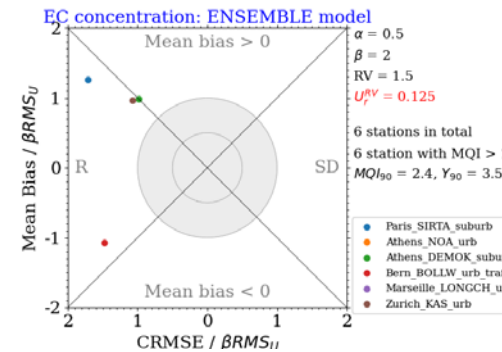Participants: all CAMS models (from CAMS_61) , led by INERIS (A. Guion)

Objectives: Propose a methodology to compare results of CTM to eBC contributions

Difficulties:
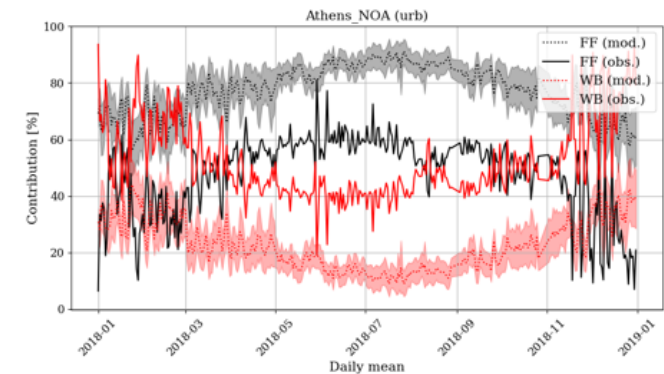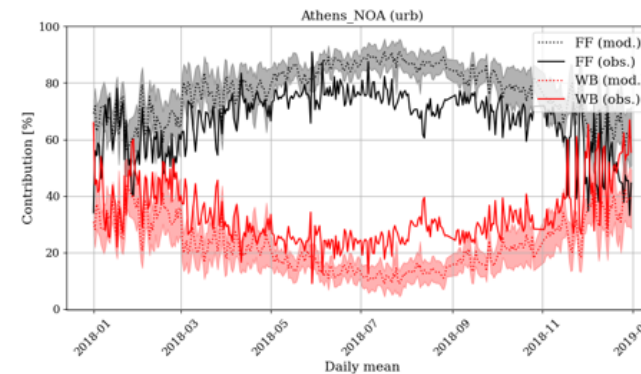
- Agree on consistent eBC definition (in coll. With ACTRIS)
- Apply to total eBC and sf/lf fractions
- Account for uncertainties in measurement

Status:

- Demonstrator for NRT evaluation of eBC and source app.

c)   Source apportionment comparison with two AAE values used for measurement estimates :

Receptor and Source oriented models

Where are we? CAMEO project

Task 6.3 Source sector contributions (TNO, with MET Norway and INERIS) June 2023 – June 2025
There is also a task on country and local contributions but this will not be compared to receptor apportionment)

TNO
LOTOS-EUROS
Tagging & sensitivity (15% ER)

Metnorway
EMEP
Sensitivity (15% ER)

INERIS
CHIMERE
Surrogate model (ACT)
= Fitting of polynomials to BF training runs

PM PMF datasets for core years 2018-2019 evaluation

- Barcelona/Montseny (2018- mar 2019), PM2.5 and PM10

- Zwitserland 5 stations (jun 18 – may 19), PM10 sources

- Melpitz (nov 18- oct 19), PM10 sources

- Stuttgart (Freiburg 2018, Gärtringen 2018-2019 ,Stuttgart 2018-2019), PM10

- Milan, 2017-2019, PM2.5 and PM10, (Life-Remy)

- Athens, 2018-2019, PM2.5 and PM10

- (Krakow 2019, Life-remy (7-day average) requested)

- (Ijmuiden, NL, larger uncertainty because of changing temporal resolution)

extend or connect with eBC and OA comparisons from e.g. RI-urbans

Receptor and Source oriented models

Rationale and main goal

From the FAIRMODE roadmap…

- 1.　Consolidating the fitness for purpose source apportionment (SA) guide, in particular with the following topics: **complementarity of SA approaches**, **receptor modelling**, extension to O3, NO2, PM coarse...

Main goal of the proposed activity

- To develop/update methods to compare SM and RM that could mainly support air quality modelling assessment. We would like to go beyond the usual IE and trying to provide concrete contribution to the guidance

Receptor and Source oriented models

Where are we? The FAIRMODE contribution

FAIRMODE guidance on receptor models application

- European Guide on Air Pollution Source Apportionment with Receptor Models (2014)

- European guide on air pollution source apportionment with receptor models - Revised version (2019)

CEN/TS on receptor models evaluation

- CENTS 17458 (2020)

FAIRMODE guidance on source apportionment techniques and fitness-for-purpose

- European guide on air pollution source apportionment for particulate matter with source oriented models and their combined use with receptor models (2020)

- Source apportionment to support air quality management practices, A fitness-for-purpose guide (2022)

Receptor and Source oriented models

Key questions

Specific questions… to define the contents of the activity

- how can we harmonize RM and SM results to compare them?

- What species can we compare?

- What sources can we compare?

- Which indicators and methodology could we define to compare RMs and SMs?

- Is there any difference between ST and LT analysis?

RSE
CAMx
Tagging (& sensitivity)

RSE
Ricerca
Sistema
Energetico

IEP-NRI
GEM-AQ
Sensitivity

IOŚ-PIB
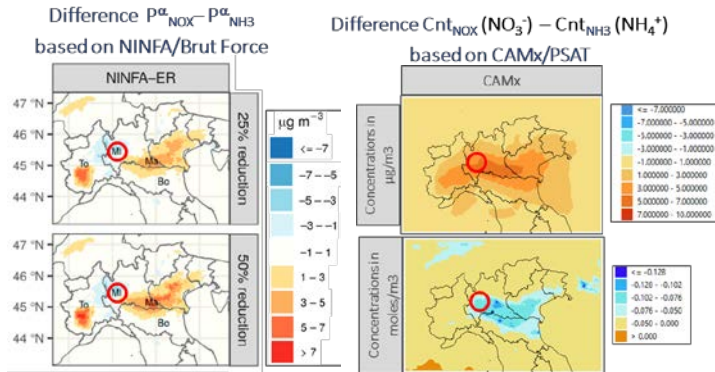Institute of Environmental Protection
National Research Institute

SA Methods to Design Air Quality Plans
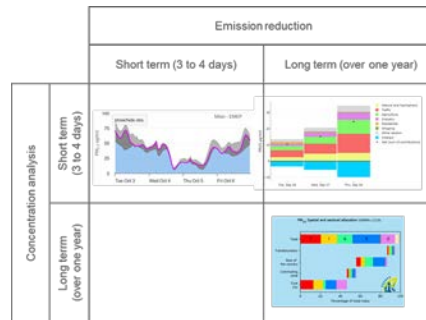
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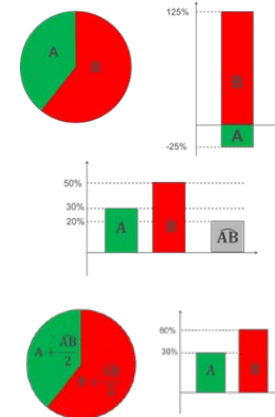
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also discussed in CEN

SA Methods to Design Air Quality Plans

How to use SA methods to apply the EU directive?

Too many excedances are reported at a given receptor. Choose the tools to design an abatment strategy and explain how to use them?

1st webinar (April, 11th, 15:30)

- Inventory and presentation of the available tools (SHERPA, CAMS, « local tools »)

- Identification of possible receptors (space and time)

2d webinar

- Each group presents its analysis of the results on the chosen receptor site

Technical meeting

- Presentation of the results and drafting of best practice guidance