SUMMARY OF WG3 MEETING

FAIRMODE TECHNICAL MEETING
AVEIRO 24-25 June 2015

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FAIRMODE
Forum for air quality modelling in Europe

Joint Research Centre

RSE
Ricerca Sistema Energetico

MAIN TOPICS

- SA Intercomparison exercise
- Performance indicators
- CEN working groups: functioning and deliverables
- Proposal for the revision of the Protocol/Guidelines
- SPECIEUROPE
- Source Apportionment in e-reporting
- Training inititaitives

European emission inventory version with fuel details (J. Kuenen, TNO)
Developments in SA of fine PM with AMS / ACSM instruments (Prevot, PSI)
Results of the ACCEPT AND AIRUSE LIFE projects on SA (E. Diapouli, DEMOKRITOS)

CONNECTED PROJECTS/ACTIVITIES

European emission inventory version with fuel details (J. Kuenen, TNO)
EI specially updated to fit the measurements time window with fuel details to ease the comparison between CTM and RMs

Developments in SA of fine PM with AMS / ACSM instruments (Prevot, PSI)
Ongoing phenomenology of ACSM
SoFi ME2 tool for source apportionment (constrained analyses)/ automated rolling source finding
Offline AMS analises

Results of the ACCEPT AND AIRUSE LIFE projects on SA (E. Diapouli, DEMOKRITOS)
ACCEPT Tool with a database of SA studies with historical record of control measures
Support the policy makers to evaluate the effects of control measures
ACCEPT Develop and propose effective air pollution mitigation measures for Southern European countries
Focus on: Biomass burning, Industrial emissions, Traffic , Natural sources

SA INTERCOMPARISON EXERCISE

RMs the input dataset was presented by O. Favez (INERIS)
Urban background site in northern France
Speciated PM10 real-world dataset rich in organic markers

Meteo and EI data will be also provided

Starting date July 2015 end June 2016

CTMs MODELING PROTOCOL

- The the CTMs-RMs inter-comparison will be focused on a **reference site** (Lens, France), where both kind of models will be applied
- Around **15 RMs** and **6 CTMs** will partecipate
- **Two 3-months periods** ("hot" and "cold" season) will be simulated
- Centralized MPE of the base case will be performed with DELTA tool
- Main input: WRF model driven by ECMWF analysis, MACC global reanalysis, TNO_SoAp emission inventory
- Around **10 source categories** will be tracked
- Output data will be delivered at a **set of receptors**, including Lens
- Optionally an evaluation of **source areas** contribution will be performed

PERFORMANCE INDICATORS: OVERVIEW

Belis C.A. et al. 2015 accepted paper

Complementary tests: provide ancillary information about the solutions' performance

Mass apportionment
Number of factor/sources

Preliminary tests: test if source/factors belong to a given source category

Chemical profiles → Pearson, Pearson (log-transformed), SID, WD

Time-trends → Pearson

Contribution-to-species (%) → Pearson

= % of species total matrix (EPA PMF v3) = explained variation (PMF 2) = contribution by species (CMB 8.2)

Performance tests Evaluate if source/factor SCEs fall within an established quality objective

Z-scores → test solution bias coherence with the quality objective (σ_p)

Zeta-scores → test SCE reported uncertainty coherence with the one of the reference

RMSD* → test the bias, amplitude and phase of the SCE time trends

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PERFORMANCE INDICATORS: SUMMARY

- This comprehensive methodology evaluates the most important aspects of the model solutions including the most critical steps.
- This makes for assessing the performance and the uncertainty of the SA models in detail.
- Moreover, the analysis provides evidence to make a diagnoses of the causes of the poor performances.
- The combination of real-world and synthetic datasets makes it possible to assess both models' performance with respect to an unbiased reference and their ability to deal with data noise.
- The RMSD'* is used to assess the time series evaluating bias, phase and amplitude at once.
- The adopted approach is flexible enough to be applied to any type of SCEs regardless the model used to produce them.

CEN TC/264 WG44
PURPOSE AND JUSTIFICATION OF THE PROPOSAL

- Identification of sources is a key task for the management of air quality
- Knowledge about sources is required for the **implementation of the AQD**:
- Quantitative estimations are needed to develop abatement measures in air quality plans.
- Reporting on contribution of sources is **mandatory** (Decision 12/12/20211)
- There is a need of harmonisation of the **terminology and the methodology** to make results comparable across Europe.
- Definition of **minimum quality standards** is required to ensure the output of the models is suitable for AQ management.
- SA methodologies are specific and yield specific outputs that require specific methods, quality standards and performance indicators.

CEN TC/264 WG44
PURPOSE AND JUSTIFICATION OF THE PROPOSAL

- The new working items open the opportunity to go from harmonisation towards standardisation in the field of modelling
- The standards are mainly oriented to define quality standards for models
- The input from Fairmode was considered relevant to create the WGs
- The participation of Fairmode experts would ensure the maximum comunication, coherence and synergies between the work of CEN and Fairmode
- Fairmode experts are advised to contact their national representatives and request to be nominated as members of WGs 43 and 44
- First meetings of WGs 43 and 44 next to each other on 13/14 and 14/15 October in Düsseldorf (Germany).

REVISION OF GUIDELINES

1. Introduction to Source Apportionment with Source Oriented Models

- General notes on the use of Air Quality models for S.A.
- Preliminary introduction of some key concepts: linear effects, zero-out modelling, tagged species approach

Only PM species?

2. Source Apportionment protocol for source oriented models

2.1 Problem framework

- Area of study, kind of sources, kind of pollutants

2.2 Emissions

- Emission inventories and other requested data
- Speciation profiles: a key aspect

Actually, this is a key aspect in case of SM and RM comparison either when the focus is on specific pollutants. It is less relevant for PM bulk mass

TABLE OF CONTENTS

2.3 Base Case (or Reference) simulation

- Input definition
- Model validation
- …

The base case simulation is exactly the same as a traditional air quality evaluation. Could we could refer to PM modeling guidance already published in FAIRMODE?

2.4 Source apportionment

- Zero out modelling: approach, weaknesses and strengths
- Tagged species modelling: approach (PSAT LOTOS, PSAT CAMx, ISAM CMAQ, others?), weaknesses and strengths
- Category sources and Area sources

3. Comparing Source and Receptor oriented modelling

- Introduction: the need for source apportionment "validation"
- Methods:
  - Source definition
  - Mass closure verification
  - Source ranking and estimates
  - Temporal correlation and exceedances analysis
  - Specific sources analysis
  - Secondary pollutants
  - Use of tracers
  - ……

Only a description of the different approaches? Examples of applications?

SPECIEUROPE: DATABASE ARCHITECTURE

Principal table:

1. Profiles' species relative concentrations, their uncertainties and the analytical technique used.

Metadata tables:

1. Single profile name and description.
2. Publication information (each publication normally contains more than one profile).
3. Information on source categories (next slide).

→ **Ancillary tables** store the codification system used for uncertainty methods, chemical families, chemical species, chemical analytical methods and source categories' description.

→ Each species is generally corresponding to the one reported in SPECIATE

→ The source profiles are identified by a unique ID, which should be reported

SPECIEUROPE: CONCLUSIONS

reference chemical composition of the PM sources for source apportionment applications in Europe.

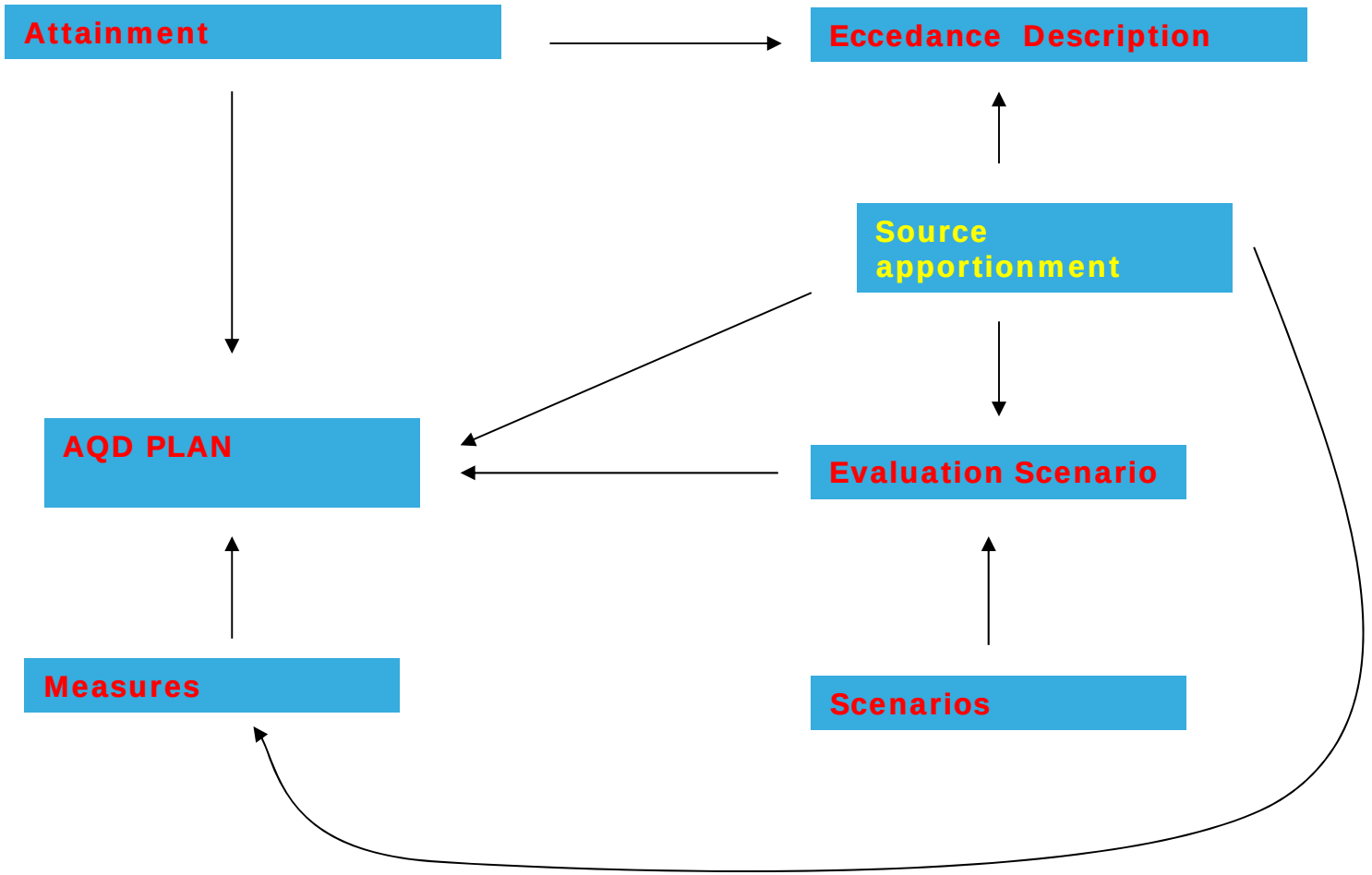
common reference → better definition of the sources

more measurements → needed to better characterize sources form the chemical and geographical point of view

cluster analysis → checking data quality and finding good source category markers

ranking → need of a good source characterization and optimization of the metrics

E-REPORTING: PLANS AND PROGRAMS



SOURCE APPORTIONMENT IN E-REPORTING

Clarifications and interpretation are needed in order to support MS to implement the IPR.

Due to the complexity of the matter a thorough discussion is required to properly assess the different technical options and propose most suitable choices.

WG3 proposes to develop a Position Paper to:

-point out areas that require technical clarification,
-evaluate pros and cons of the different options
-propose solutions at relevant levels and time frameworks

CAPACITY BUILDING

Proposed training activities

Develop training on the Protocol
Summer schools

Funding schemes

H2020 Marie Curie
COST actions

Collaboration with IAEA project on SA

European Commission

Thank you for your attention

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