

FAIRMODE Technical meeting

Oslo 18-20/10/2022

About 70 participants from 20 countries registered to the technical meeting that was held in Oslo. The meeting was organized in sessions, each dedicated to one of the cross-cutting tasks (CTs) that constitute the current work structure in FAIRMODE. All CTs had a dedicated session attended by 30 to 40 participants. This document summarizes the outcome of the discussions for each of these CTs sessions. All presentations are available on the FAIRMODE web pages.

CT1. Source apportionment (SA) to support air quality management

The discussions in CT1 focused on (1) the extension of the work to NO₂ (finalization of the ongoing exercise), O₃ and possibly to the PM₁₀ local sources, mainly related to the coarse fraction; (2) on the protocol for SA. As a first step towards this protocol, a group exercise has been set up to understand how to order different air quality management components (emissions, receptor modelling, speciated measurements, brute force or tagging SA...). The exercise revealed the need to proceed with this discussion, in particular to understand the strengths and weaknesses of each element in view of their use in air quality planning. G. Pirovano mentioned the possible re-starting of the CEN TC264/WG44 that would focus on source oriented approaches.

Actions:

1. Finalise the NO₂ exercise (including publication) → March 2023
2. Brainstorming meeting to discuss possible extensions to O₃ and PM₁₀ → March 2023
3. Proceed with the online meetings dedicated to SA complementarity → December 2022
4. Proceed with CEN contacts to re-start WG44 activities → December 2022
5. Brainstorming meeting to discuss updates on Receptor models contribution to SA -> March 2023

CT2. Towards an extended QA/QC protocol for air quality assessment

As a follow-up of the CEN TC264/WG43 on modelling quality objectives (MQO), the FAIRMODE community identified a need to develop an extended QA/QC protocol to ensure a more comprehensive evaluation of the quality of a modelling application beyond the current pass/fail MQO test. The goals of this session were to (1) review the current status of the work related to the QA/QC protocol and associated metadata and (2) to discuss and agree on a proposal for the composite mapping platform that would include (a) an on-the-fly Model Quality Indicator calculation; (b) the creation of a NUTS3 “Frankenstein” map constructed from the best (MQI based) available map for each NUTS3; (c) a proposed template to report metadata and (d) an emission dashboard to monitor the level of consistency of the underlying emissions (restricted to aggregated input) QA/QC process for emissions. The proposal was widely accepted by the participants.

Actions

1. Enlarge the testing of the QA/QC proposed additional indicators with more datasets (e.g. CAMS)
2. JRC to update the composite mapping platform to allow the creation of the “Frankenstein” assessment map (Summer 2023)
3. JRC to develop the emission dashboard (summer 2023)
4. Participants to upload their best EU/country/region/city maps together with associated aggregated emission data (July 2023)

CT3. Quality control indicators for modelling of air quality forecast

This CT aims at providing a specific benchmarking framework for modelled air quality forecasts. Performance indicators have been developed to provide additional information about the capability of the forecasting system to detect/anticipate regulatory threshold exceedances and to check its ability to provide accurate forecasts (more accurate than a ‘persistence model’). After a welcome and introduction from the chair and co-chair, some specific results were presented during the session, specifically: with the delta tool forecast on Portugal, on Belgium, on the Emilia-Romagna region (Italy), from Kosovo and from CAMS regional production. Finally there was some discussion on the next steps.

Actions

1. Clarify the relevant output of the evaluation, in terms of acceptability of the forecast performance
2. Focus on developing Air Quality Index plots for improving communication of results to non experts, simplifying the message of the evaluation
3. Documentation of the procedure for experts (possible outputs: slideshow, video, training sessions)
4. New software platform: aiming to switch to R/Python, in accordance with other CTs
5. Expand the tests on more applications: more forecast years, more model applications, more teams

CT4. Microscale air quality modelling

CT4 aims during this Meeting were (1) to show the last results of the intercomparison exercise, (2) to present work of different groups including beyond the intercomparison exercise, (3) to discuss the draft recommendations about the use of microscale models for retrieving annual-averaged pollutant concentration maps in urban hot spots, and (4) to discuss activities for 2023-2025. The main conclusions were: (1) CT4 was efficient in identifying different modeling approaches and methodologies for microscale air quality in urban areas used in Europe. Their use for AQ assessment and management under the AAQD is currently being analyzed in order to determine the best practices and recommendations; (2) Several microscale models and methodologies for deriving annual average concentrations have been compared by means of an intercomparison exercise in an urban area. Additional work would be needed for the case

of computation of other annual statistics as limit value-related percentiles; (3) the result of this work is the first step to investigate how microscale models can be used for air quality assessment or planning in urban areas in the framework of AQ directives.

Actions

Providing guidance and updated recommendations for the use of microscale modeling tools in the context of the AAQD, with a focus on:

1. Testing the robustness of the wind direction sector scenario approach for all AAQD indicators (annual average, percentiles, ...) and check new approaches
2. Investigating the differences between the unsteady full-year simulations and the scenario (wind direction sector) approach.
3. Specifying requirements for microscale emissions (link with CT7)
4. Setting up requirements for observation data sets for validation (space & time, link with CT2/CT6)
5. Investigating the use of microscale models for determining spatial representativeness area of AQ stations and exceedance area in urban hot spots (link with CT8)
6. Exploring the need for a new intercomparison exercise at a new location (e.g. Győr) with different urban morphology
7. Preparing a scientific paper for early 2023

CT5. Best practices for local/regional air quality management

The objective of this CT is to produce guidelines on air quality management practices, in particular to explain how to proceed from specific abatement measures, to evaluate consequent emissions and then concentrations.

The first session was about the 2020-2022 roadmap achievements. We presented the work done during the last year, starting from the 'pilot exercise', and then moving to the preparation of the document 'Best practices for local and regional Air Quality management'. This 'best practices' document is now online, and provides an overview of the work done at EU scale on air quality plans, providing specific examples of best practices to design plans at regional / local scale.

The second session was about the current work to 'improving the reporting of measures in air quality plans'. In this session we worked on a group exercise, in which participants, starting from 2 hypothetical air quality plans, had to fill in a template for plans reporting. This template should provide a simplified view on air quality plans, focusing on the general features of the measure, on its impact on emissions, concentrations and impacts. The result of the group exercise was that more methodological information should be provided when reporting plans, to allow for a better understanding and possible replicability of the plans themselves.

The third session about the future of this CT5. The main outcome of this session was that more work should be done to connect CT5 to other existing CTs, as CT1 (on source allocation), CT9 (on scenarios),

etc. These connections among CTs are deemed to be essential to improve the quality of plans in the future.

Action: Review and further process the template to report air quality measures → February 2023

CT6. Near-real time assessment with sensors

CT6 is organizing an inter-comparison exercise on sensor/model integration. The exercise consists in generating data sets with artificial/synthetic sensor data both for PM2.5 (500-1000 low-cost sensors distributed in a “large region”) and for NO2 (25-50 relatively low-cost sensors distributed in a “city”). The objectives for the benchmark are to develop/test/compare methods to 1) select which sensors in the data sets to use for every hour; 2) to obtain best estimates for “calibrated”/ “corrected” sensor data and 3) to combine cleaned/calibrated sensor data with other info/model data (Data Fusion and/or Data Assimilation).

The first part of the session was dedicated to presentations (P. Joassin, S. Janssen, J. Wesseling, A. Grescent) highlighting the results of the work performed on the inter-comparison exercise on calibration and sensor/model integration. The discussion focused on the foreseen data fusion exercise, in particular on the uncertainties that it will introduce/reduce (also a lot of remarks on using smaller sets of sensors, like on a city-scale).

Actions

1. Test data fusion using the three sets of processed sensor data;
2. Report the results and recommendations obtained so far.

CT7. Compilation of urban scale emission inventories

CT7 discussions were organized around 3 main topics: best practices, metadata and benchmarking. On best practices, the main point was on interactions with the TFEIP, in particular on the update of the EEA/EMEP Guidebook chapter on spatial mapping of emissions to improve usability. CT7 will contribute to the update with an evaluation of the spatial proxies used. On metadata, CT7 will start an inter-comparison exercise with the purpose of checking which emission data are relevant for assessment and planning applications, using the emission dashboard (see CT2). On benchmarking, the emission dashboard introduced by the JRC is seen as a useful flagging/screening tool for aggregated emission data. The dashboard can be used to identify pollutant/sectors that need to be selected for deeper analysis (for example with the composite mapping platform for emissions).

Actions

1. Contribution to the EMEP/EEA guidebook on spatial mapping → November 2022
2. Finalize metadata requirement based on a simpler approach than the decision tree (January 2023)
3. Test JRC methodology to compare the ensemble with high-resolution emissions (summer 2023).
4. JRC to develop emission dashboard and data uploading interfaces → summer 2023 (see CT2)

CT8. Exposure & exceedance indicators and network optimization

The session focused on three distinct but related topics:

- Spatial Representativeness (SR): based on joint efforts by the CT8 community a consolidated proposal for a definition and assessment method for an SR area of monitoring stations was presented. Feedback was collected from Austria, Germany, Norway and Belgium and some open issues for further refinement were identified. In general the CT8 proposal for SR was adopted.
- Exceedance situation indicators: a proposal was presented for a 2 stage assessment and reporting scheme of the exceedance situation indicators. This 2 stage approach would facilitate and simplify the reporting obligations by Member States, in the same time requesting for the relevant information at the start of an air quality planning process.
- Monitoring network design: a online tool MoNet was presented which can support an intercomparison exercise on monitoring network design. The exercise will run in the fall of 2022 and a call for contributions was made.

Actions

1. Refine the definition of SR based on the latest feedback and resolve the remaining open issues, mainly on pollutant specific lower cutoff values (March 2023).
2. Refine the definition of the exceedance flagging indicator (EFI): evaluate if an EFI based on an absolute number of citizens exposed above the limit value is a useful concept (March 2023).
3. Refine the definition of the exceedance situation indicator (ESI): clarify how an area in exceedance and a road length in exceedance can be further integrated in a transparent ESI (March 2023).
4. Launch an intercomparison exercise on monitoring network design based on the MoNet tool (November 2022) and collect some first lessons learnt (March 2023)

CT9. Effectiveness and robustness of air quality projections

This CT is dedicated to the assessment of the robustness of air quality projections. In practice, this assessment consists in analyzing the sensitivity of the model responses to emission reductions scenarios, when input data (emissions, meteorology...) or the model itself are changed. For this activity, a modeling inter-comparison was launched, with more than 10 modelling research groups participating already.

The CT9 session included, first, a group of presentations with the state-of-art and overview of the first results of the intercomparison exercise and use of the DELTA platform (with the participation of some of the research groups) and, secondly, a brainstorming activity (break-out sessions in small rooms) to address two main topics: (1) How can we best use the platform and available results to understand the variability of the responses. Is there a need for additional simulations and if so which ones?; (2) Use of modeled delta for impact assessment (Case study). The answers to these questions were then presented and discussed among all participants, and new actions were highlighted. One of the outcome was to focus on short-term episodes rather than on annual averages because model results are more variable and it is easier to understand the underlying processes. A collaboration with CT5 is also foreseen on the use of combined observations/modelling results for air quality planning, with the aim of developing

guidance on how to use modelled concentration delta for projections. New modelling groups - from Croatia and Greece (University of West Macedonia) have integrated the CT9 intercomparison exercise.

Actions

1. Submission of a new version of the paper “platform and preliminary results” → February 2023
2. Keep model groups to work on individual processes → summer 2023

2023-2025 roadmap

Two sessions were organized to discuss the 2023-2025 FAIRMODE roadmap. The first was dedicated to review the achievements and future priorities of each CT and discuss the plan for each of them either to proceed, merge with other CT or stop. From the discussion, it became clear that all CT's would go on for another 3 years round. The exercise was also useful to identify potential connections among CTs. The purpose of the second session was to brainstorm on an update of the current FAIRMODE structure to best account of the priorities identified at CT level. The discussion led to the following main conclusions.

- Although based on a “silo” approach, the current structure around 9 groups have proved to work efficiently and all CT have achieved most of their objectives.
- To strengthen the FAIRMODE overall priorities, to better align each working group’s objective along these priorities and for outside communication, a simpler structure based on two main blocks: assessment and planning would be welcome. These two blocks would be composed of sub-groups (current CT)
- Interactions between CT should be driven by a bottom-up process rather than being imposed from the top.
- Some participants also suggested a possible delay in moving to a new structure to be in phase with the revision process of the AAQD.

Next meeting

The next plenary meeting will take in Rome on 2nd and 3th March 2023.