Minutes of the FAIRMODE technical meeting

WG3 Source Apportionment

Oslo 28-29 April 2014

The meeting was attended by 37 experts

Results of the JRC initiative on Source apportionment 2010-2013

C. Belis (JRC) presented the summary of the activities carried out by the group in the first three years’ work plan and illustrated the deliverables already published and those being finalised. Hard copies of the recently published European Guide on Source Apportionment with Receptor Models including the Harmonized technical protocol were distributed to all participants. A summary of the two intercomparisons was presented. Two scientific papers concerning the intercomparison work are at an advanced stage.

Action: C. Belis will distribute the manuscript with the results of the intercomparison to all participants for their comments.

Keynote Speech

J. Watson and J. Chow (Desert Research Institute) delivered the keynote speech: “The Role of Receptor Models in Creating a Weight-of-Evidence Emission Reduction Strategy” The first part focused on analytical and procedural approaches. A summary of steps for evaluation and validation of model results were presented combined with examples of common pitfalls, limitations, and uncertainties in source apportionment studies and how to overcome them. Finally, suggestions for improving the receptor model common protocol were provided. The second part of the keynote speech was centered on additional measurements to resolve source contributions. A review of common chemical analysis for PM networks including methods for characterization of specific source makers was presented providing examples on their use for the validation of source apportionment results.

Work plan 2014-2016 and the role of Source Apportionment in the new TSAP

C. Belis (JRC) illustrated the working group activity programme 2014-2016 including the comments received during the Plenary meeting. The programme include the following steps:

- Model Performance Evaluation
- Harmonization of the different methodologies
- Improving input data quality and availability (es. source profiles)
- Development of different kind of tools (CTM, RM, lagrangian)
- Inter-Validation of point 4
- Knowledge dissemination within the MS
- Feedbacks from users and local authorities
The new scheme is a continuation of the previous activities combined with an increased attention to the dissemination of results and the feed-back from final users. The relevance of source identification for the implementation of the European Directives on Air Quality was underlined. Two important issues: e-reporting and standardization, were discussed under the light of the source apportionment. Concern was expressed by the WG members about the current provisions in the e-reporting mechanism which are not fully consistent with the atmospheric processes associated with pollution sources and their spatial patterns and the way they are reported in many up to date methodologies. Concerning the standardization many participants expressed satisfaction about the interest of CEN /TC264 on Air Quality to launch standardization process for “source apportionment” taking as reference the Common Technical Protocol prepared by our working group.

Action: participants take contact with their national standardization bodies to express their interest in a future standardization process on source apportionment.
Action: to nominate a representative of WG3 to participate in the Fairmode e-reporting team (C. Belis, volunteers?).

**Session on Specific Sources**

**Non exhaust emissions (A. Amato, CSIC).** The first talk of the session reported the gaps and needs for future research in the field of non exhaust emissions from vehicles. The monitoring techniques and relevance of factors like climate (e.g. precipitation) and road properties were described. The elevated heavy metal concentration in this kind of emissions make them potentially hazardous for exposed population. A summary of common abatement measures was also presented.

**Biomass Burning emissions (R. Vecchi, Univ. Milan).** A review of the approaches used in the quantification of the contribution of wood burning/ biomass burning to atmospheric PM was presented including: macro-tracers, tailored emission factors, CMB and PMF using profiles with organic markers, aethalometener model and AMS.

**Ship emissions (P. Prati, Univ. Genoa).** In this were presented the results of different source apportionment studies in the Mediterranean Sea using on-board and land based instrumentation within the framework of the project APICE. A comparison between PMF2 and CAMx was carried out in different sites in the area of Genoa. Comparing sources categories obtained with different models has been identified as a critical issue.
At the end of the session a short discussion about the repository for European source profiles that is being created by the JRC to support source apportionment studies in Europe took place. JRC asked the collaboration of WG3 to retrieve relevant bibliographic sources. Some preliminary questions concerning the design of a repository for source profiles are:
- What kind of information should be collected? (i.e. what data and metadata)
- Which data format to be adopted?
- How to contribute to the repository? How to query the database?

Action: G. Argyropoulos (Univ. Thessaloniki), F. Amato (CSIC), J. Moldanova (IVL) will contribute with profiles of general or specific sources (e.g. non-exhaust, ships). R. Vecchi (U. Milan) will promote linking this activity with a similar one planned under the Italian Aerosol Association.

**Session on innovative methods and sites of interest**

**Robotic CMB (G. Argyropoulos, U. Thessaloniki)**. This talk introduced the recently developed Robotic CMB tool which has been designed as a development of the widespread US EPA CMB 8.2. The new method uses a Boolean function to fit the best combination of source profiles taken from a pool pre-selected by the user.

**Studies in France using off-line organic measurements (J. L. Jaffrezo, LGGE)**. The use of organic markers using filter based sampling for the identification of specific sources (biomass burning, marine biogenic, soil biogenic, SOA, etc.) in rural and urban sites in France was illustrated. Sulphured PAHs were used as industrial/coal tracers. The talk also addressed the use of nitrogen stable isotopes to identify sources of ammonium.

**Source of organic fine PM with ACSM, SoFi tool and intercomparison (R. Froelich, PSI)**. The Aerosol Chemical Speciation Monitor (ACSM), used for the characterization and apportionment of PM1 and the European network of sites where these measurements take place were introduced. The SoFi tool developed for accomplishing constrained factor analysis was also presented. A general outline and preliminary results of the intercomparison exercise consisting of deploying 15 instruments in one single site for two weeks was also given.
Session on source apportionment with CTMs and RM and Benchmarking

Comparing source apportionment results from CTM with PMF/tracer data (C. Hendriks, TNO). A number of studies comparing PMF and the CTM LOTOS EUROS were discussed. The study stresses the need to compare RM and CTM in order to obtain valuable insights for both model communities, even though comparison between source contributions are not straightforward due to the different source definition.

PM2.5 source apportionment in Lombardy: Comparison of CAMX and CMB modeling results (G. Pirovano, RSE). The study concludes that comparing models belonging to different categories makes it possible to identify strengths and weaknesses of both methods and leads to more accurate quantitative source contribution estimates and to a better understanding of aerosol formation processes.

The Eurodelta III exercise (B. Bessagnet, INERIS). An outline of the modeling intercomparison exercise carried under the Eurodelta intitiative was presented. The exercise provides understanding about the variability between models with the support of the Delta tool which is used to compare model with measured data. Including dust resuspension has proven to improve model behaviour and a better understanding derives from the analysis of deposition and concentrations.

The Joint Fairmode-Eurodelta source apportionment intercomparison exercise (C. Belis, JRC). The outline of the next intercomparison exercise for RM and CTM was presented and discussed with participants. A dataset for RM including organic markers provided by LGGE, LCME and INERIS is available. For CTM it is foreseen to carry out runs at two spatial resolution (European domain at medium resolution and local domain, around the sampling site, at high resolution). Input data for CTM, including emission inventories, meteorological fields, and boundary conditions, is being retrieved by JRC in collaboration with TNO, RSE, INERIS and U. of Warsaw. Addition of secondary sites will be proposed and confirmed by participants by the end of May. 18 groups expressed their interest to participate in the intercomparison.

Action: LGGE provides additional data for the primary site: pollutants, meteo, analytical uncertainty and MDLs (end of May);
JRC and TNO take necessary steps to make high resolution EI available for the relevant time window (end of May);
Source profiles this topic will be addressed by the team working on the source repository
INERIS, retrieve meteorological data from ECWMF (before summer 2014), U. Warsaw converts into WRF (autumn 2014);
INERIS, retrieve boundary conditions from global model (MACC II) (autumn 2014);
RSE (in collaboration with JRC, INERIS?) retrieve air quality data from AIRBASE and EMEP databases
U. Genoa, U Athens, CSIC, U. Florence, U. Warsaw, ENEL, FMI, UoB check availability of datasets for secondary sites (end of May)

Financial Support
The main aspects of the new LIFE programme 2014-2020 were described. Participants were encouraged to prepare proposals connected with the activities running under Fairmode.

Cross cutting activities

Measurement and Modelling (A. Monteiro, U. Aveiro). A short presentation illustrating the possible areas of connection between SA and measurements was the introduction for the discussion. Availability of advanced monitoring data either for input or for validation of source apportionment output was identified as one of the areas in which work is needed

Spatial representativeness (O. Kracht, JRC; Laure Malherbe, INERIS). Short presentations illustrated the different approaches in this field. The discussion conclusions are: a) due to the kind of available data, a priori estimation of representativeness seems to be the most suitable methodology for understanding the representativeness of the sources deriving from measurements in one single point; b) Geostatistical approach would require many contemporaneous measurements. Few examples available, work on these datasets could be of interest.

Next meeting

13 participants gave a preliminary availability for a follow up meeting in September-October 2014.