The new CEN working group 44 on source apportionment

CEN/TC 264

25th plenary meeting of CEN/TC 264
27 and 28 May 2015
Rome, Italy

Decision 939 (Rome 12)

CEN/TC 264 decides to establish CEN/TC 264/WG 44 "Source apportionment" in order to elaborate prCEN/TS xxxxx *"Ambient air – Methodology for the assessment of the performance of source apportionment model applications".* The secretariat is kindly provided by DIN (secretary: Mr. Simon Jaeckel).

Decision 940 (Rome 13)

decides to appoint Mr. Claudio Belis, JRC, as Convenor of Working Group *44* "Source apportionment" for a period of *6 years* starting on *2015-05-27*

Purpose and justification of the proposal for a new WG on Source Apportionment

- Identification of sources is a **key task** for the management of air quality

- Quantitative estimations of source contributions are needed to **identify suitable abatement measures** for air quality plans.

- Reporting on contribution of sources is mandatory (Decision 12/12/2011)

- 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** and **performance indicators**.

CEN/TC 264 WG 44

Members at February 2016: **25**
21 experts, 2 document monitors

Countries represented: **10** (NL, BE, DE, FR, ES, NO, UK, AT, IT, SE)

Each national standardization body can nominate up to 5 experts
and there is no deadline for nomination.

The involvement of FAIRMODE experts is welcome

CEN/TC 264 WG 44

The first meeting of WG 44 took place on 14 - 15 October 2015 in Düsseldorf (Germany).

- It was attended by 10 experts
- There was an introduction about the CEN working methodology
- The methodology developed in Fairmode for SA model performance assessment and related indicators was presented.
- The sceintific publication describing the methodology was distributed.
- Were discussed the title, the kind of document, the scope and the list of contents.
- The first draft of the document is now under preparation and will be discussed in the next meeting
- It was agreed that the WG44 will work in close collaboration with FAIRMODE.

CEN kinds of deliverables

A **Technical Specification** (TS) is a normative document made available in at least one of the three official languages.

No public enquiry is needed.

Conflicting national standards may continue to exist.

A Technical Specification is reviewed every 3 years at the latest.

A **European Standard** (EN) is a normative document made available in the three official languages.

The elaboration of a European Standard includes a public enquiry, followed by an approval by weighted vote of CEN/CENELEC national members and final ratification.

Every conflicting national standard is withdrawn.

CEN/TC 264 WG 44

- The current orientation is to draft a technical specification (TS) which is the previous step to the preparation of a Standard.

- The scope of the document is to define the methodology to test the performance of SA model applications

- The orientation of the document will not prescribe a methodology. However, an annex with recommended steps for SA has been proposed

Evaluation Methodology

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
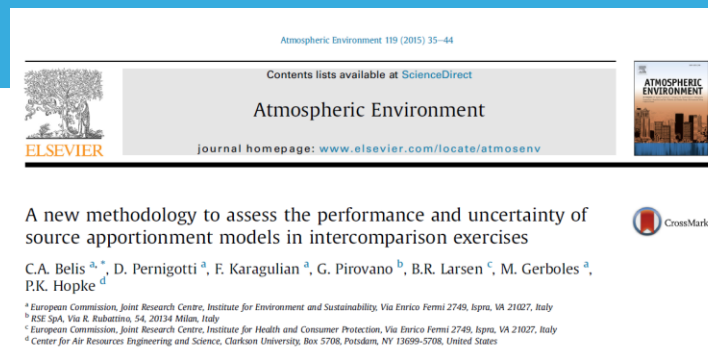
Contribution-to-species (%) → Pearson

= % 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

The uncertainty of the source profiles

<u>The weighted difference (Karagulian and Belis, 2012)</u>

is the bias of every species in the source profile

scaled by its uncertainty and the one of the

 reference.

This parameter evaluates the output uncertainty

estimated by the models.

$$WD_{ij} = 1/n \sum_{a=1}^{n} \frac{x_{ia} - x_{ja}}{\sqrt{s_{ia}^2 + s_{ja}^2}}$$

190   *Int. J. Environment and Pollution, Vol. 50, Nos. 1/2/3/4, 2012*

Enhancing source apportionment with receptor models to foster the air quality directive implementation

Federico Karagulian and Claudio A. Belis*

Weighted Difference by Participants (fr)

Belis C.A.
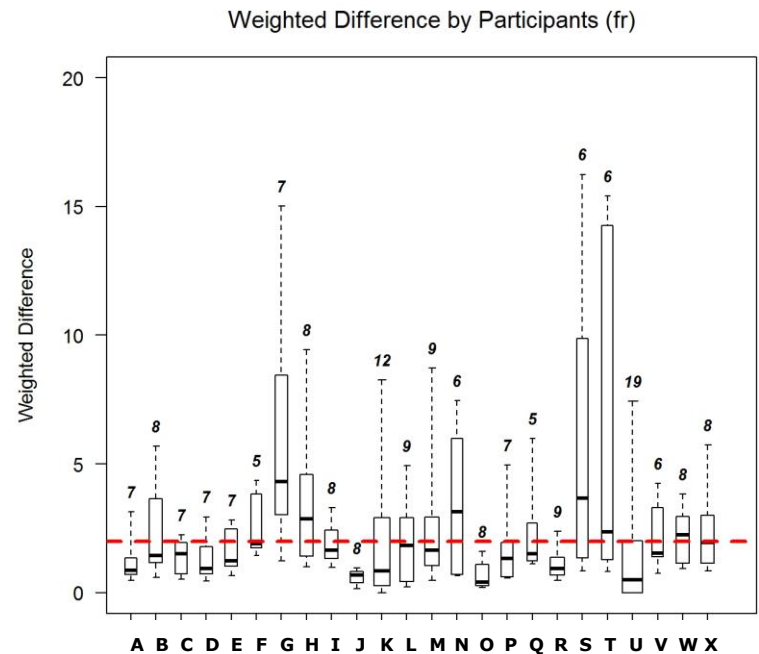
SID: Another New Indicator

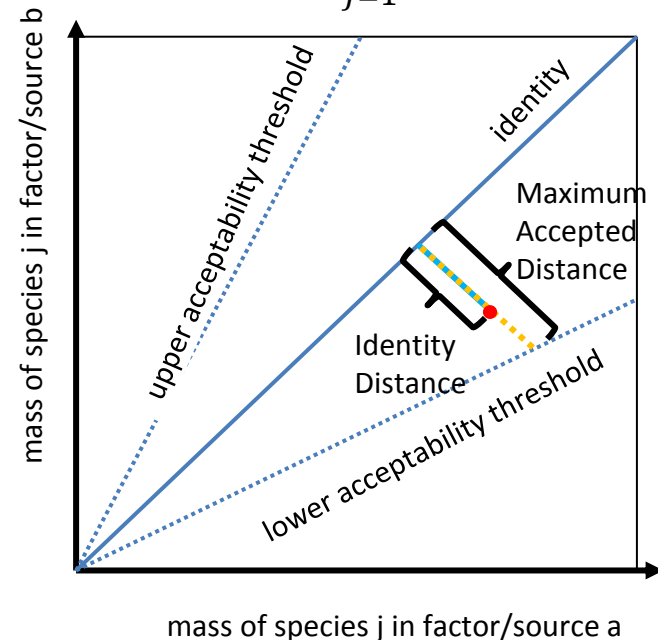The identity distance (ID) is the distance to the identity line.

ID is not influenced by the differences in scale of the species.

In addition, a criterion of acceptance can be established by defining an acceptability threshold proportional to the mass of the species. This is called standardized identity distance (SID).

$$ID_{j,ab} = \frac{1}{\sqrt{2}}\left|x_{ja} - y_{jb}\right|$$
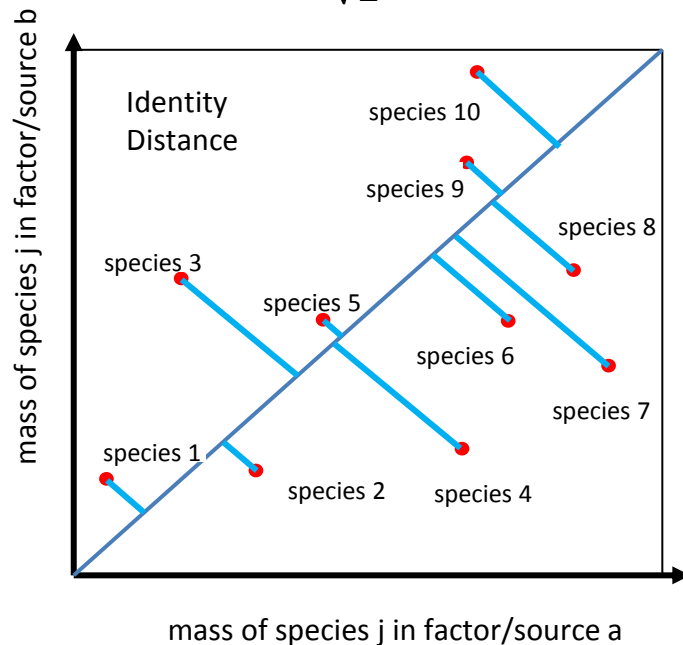
$$SID_{ab} = \frac{1}{n}\sum_{j=1}^{n}\frac{ID_{ab}}{MAD_{ab}}$$

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The reference value in the performance test

Performance test accomplished using the z-score indicator

$$z_{(SCE)} = \frac{x_i - X}{\sigma_p}$$

Reference value (X) obtained as the mean of participants

The uncertainty of the reference is proportional to the differences among participants.

If all or the majority of partners are biased the assessment method is not able to detect the bias

Synthetic dataset with pre-established reference values

Is an unbiased reference

The uncertainty is added artificially simulating the uncertainty of real-world datasets.

Made using the analytical uncertainty.

Results of the first two intercomparisons

Contents lists available at ScienceDirect

Atmospheric Environment

A new methodology to assess the performance and uncertainty of source apportionment models II: The results of two European intercomparison exercises

C.A. Belis [a, *], F. Karagulian [a], F. Amato [b], M. Almeida [c], P. Artaxo [d], D.C.S. Beddows [e], V. Bernardoni [f], M.C. Bove [g], S. Carbone [h], D. Cesari [i], D. Contini [i], E. Cuccia [g], E. Diapouli [j], K. Eleftheriadis [j], O. Favez [k], I. El Haddad [l], R.M. Harrison [e, m], S. Hellebust [n], J. Hovorka [o], E. Jang [e], H. Jorquera [p], T. Kammermeier [q], M. Karl [r], F. Lucarelli [s], D. Mooibroek [t], S. Nava [s], J.K. Nøjgaard [u], P. Paatero [v], M. Pandolfi [b], M.G. Perrone [w], J.E. Petit [l, z], A. Pietrodangelo [x], P. Pokorná [o], P. Prati [h], A.S.H. Prevot [m], U. Quass [q], X. Querol [b], D. Saraga [y], J. Sciare [z], A. Sfetsos [y], G. Valli [g], R. Vecchi [g], M. Vestenius [i], E. Yubero [aa], P.K. Hopke [ab]

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Connected work

- SPECIEUROPE the European database for source chemical profiles is being updated and an analysis of the data contained therein was published
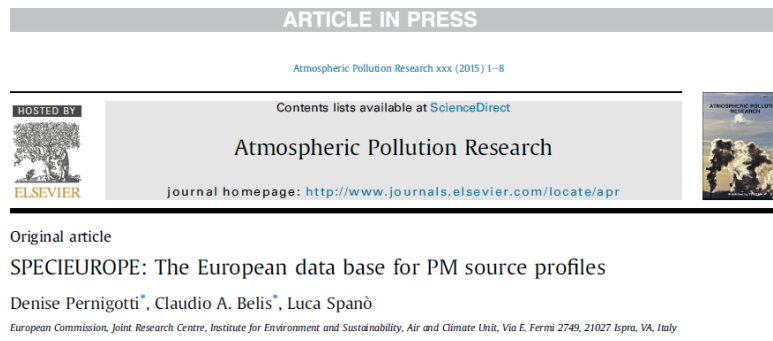
- The JRC is developing a Source Apportionment Delta tool to make it possible to test the performance of SA models using the datasets of the previous intercomparison exercise

CEN/TC 264 WG 44

The second meeting will take place on 20 and 21 April 2016 at

NILU -Norwegian Institute for Air Research

Instituttveien 18,

N-2007 Kjeller

Norway

Registration deadline 8/4/2016

Conclusions

- 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 communication, 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

Thank you for your attention