The Source Apportionment Delta tool

D. Pernigotti[1] and C.A. Belis[1]

[1]European Commission Joint Research Centre, Ispra, 21027, Italy
Keywords: source apportionment, factor identification, model performance, model uncertainty.
Presenting author email: claudio.belis@jrc.ec.europa.eu

Identification and quantification of the contribution of emission sources to a given area is a key task for the design of abatement strategies. Moreover, European member states are obliged to report this kind of information for zones where the pollution levels exceed the limit values.

At present, a variety of methodologies are used for SA. However, little is known about the performance and uncertainty of methods and the comparability between the results of studies using different methods is not straightforward.

The source apportionment Delta (SA Delta) is a tool developed by the EC-JRC to support the run of models for the quantification of source contributions and to assess the performance and uncertainty of their methodological setup including the skills of the practitioner.

The SA Delta is designed to test any kind of SA model that delivers source contribution estimates (SCE) as output. It can be used with receptor oriented (receptor models) or source oriented (chemical transport models) approaches.

The SA Delta is provided through the website (http://source-apportionment.jrc.ec.europa.eu/). It implements the performance indicators and tests used in previous European SA intercomparison exercises (Belis et al., 2015a). The tool can be used in two ways: source identification or model performance.

The source identification mode makes it possible to test factor profiles obtained in a SA model run (based on multivariate factor analysis) using the Pearson and SID indicators to compare with source profiles from public repositories (Pernigotti et al., 2016).

In the model performance mode, the user can test the whole output of a SA model by using a series of testing datasets available from the tool. For that purpose, the tool executes preliminary tests, aimed at establishing the identity of the factors, and performance tests for the evaluation of the model results by comparison them with a reference value (for a detailed description see Belis et al., 2015b).

In a typical model performance session, the user select and downloads a testing dataset, run his/her own model, and upload the results in the format required by the tool.

The tool is designed so support the exploration of the model output: number of sources, explained mass, source chemical profiles, trends and uncertainties. After the evaluation the user receives a report with the results of the evaluation either as tables or summary graphics. In this way the user can easily assess the model output by comparing it not only with the reference but also with other users.

An example of summary graph is depicted in figure 1. Scores within the green circle fall in the area of acceptance. More details on this application of target plots in Belis et al., 2015b.

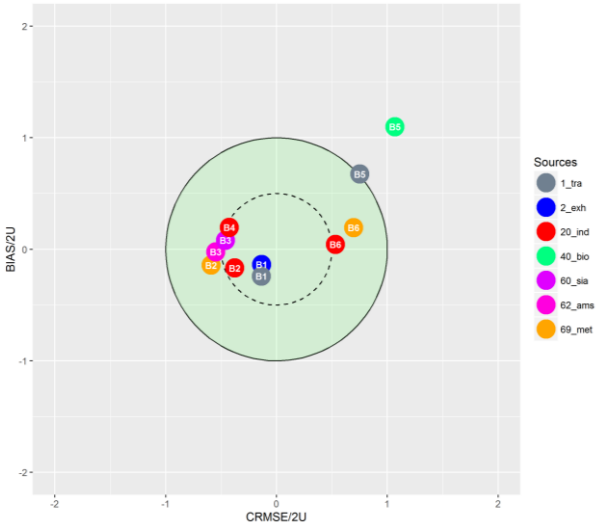

Figure 1. Target plot summarizing the performance of a model output (B) for different factor/sources (subindexes 1-6) and their correspondence with SPECIEUROPE source categories (color code).

Belis, C.A., Karagulian, F., Amato, F., Almeida, M., Artaxo, P., Beddows, D.C.S., Bernardoni, V., Bove, M.C., Carbone, S., Cesari, D., Contini, D., Cuccia, E., Diapouli, E., Eleftheriadis, K., Favez, O., El Haddad, I., Harrison, R.M., Hellebust, S., Hovorka, J., Jang, E., Jorquera, H., Kammermeier, T., Karl, M., Lucarelli, F., Mooibroek, D., Nava, S., Nøjgaard, J.K., Paatero, P., Pandolfi, M., Perrone, M.G., Petit, J.E., Pietrodangelo, A., Pokorná, P., Prati, P., Prevot, A.S.H., Quass, U., Querol, X., Saraga, D., Sciare, J., Sfetsos, A., Valli, G., Vecchi, R., Vestenius, M., Yubero, E., Hopke, P.K. (2015a) *Atmospheric Environment*, **123**, 240-250.

Belis, C.A., Pernigotti, D., Karagulian, F., Pirovano, G., Larsen, B.R., Gerboles, M., Hopke, P.K. (2015b) *Atmospheric Environment* **119** 35-44.

Pernigotti D., Belis C.A. and Spanò L., *Atmospheric Pollution Research* (2016) in press http://dx.doi.org/10.1016/j.apr.2015.10.007.