21th International Conference on
Harmonisation within Atmospheric Dispersion Modelling
for Regulatory Purposes
27-30 September 2022, Aveiro, Portugal

SHORT ABSTRACT

Abstract title: NO_2 response to emission reduction scenarios - comparing brute force and tagging source apportionment methods

Name and Affiliation of the First Author: Joana Ferreira, CESAM & Department of Environment and Planning, University of Aveiro, Portugal

Email of first author: jferreira@ua.pt

Names and Affiliations of the Co-authors: Sílvia Coelho[1], Diogo Lopes[1], Guido Pirovano[2]

[1] CESAM & Department of Environment and Planning, University of Aveiro, Portugal

[2] Sustainable Development and Energy Sources Modelling and Air Quality UnitRicerca sul Sistema Energetico - RSE S.p.A, Milan, Italy

Abstract text *(maximum 350 words.)*

In the scope of FAIRMODE source-apportionment crosscutting activity, a modelling exercise has been performed to investigate the behaviour of the different source apportionment (SA) methods regarding NO_2, namely by analysing the NO_2 response for different scenarios and different modelling frameworks. This work presents a contribution to the referred exercise, by the application of CAMx air quality model to the Aveiro region in Portugal, at 1 km^2 spatial resolution. A winter period (22 days in December 2017), with high NO_2 concentrations registered in the air quality monitoring stations of the area, was selected, and the two main activity sectors contributing to NOx emissions were considered – industry and road transport. According to the FAIRMODE exercise guidelines, a set of 24 scenarios were run, as a Brute Force (BF) SA method, considering 25, 50, 75 and 100% (4 strengths) emission reductions of NOx and all pollutants (2 types of reduction), for the two sectors separately and combined (3 options). Additionally, the CAMx Ozone Source Apportionment Technology (OSAT) was applied, as a SA tagging method, to allow a comparison of both approaches for NO_2 concentrations. The results were analysed in three locations corresponding to the air quality measurement sites existing in the region (a traffic, an industrial and a suburban background station)

BF outputs showed a consistency of NO_2 response to the range of emission reductions (0-100%) and an additivity regarding impacts of the two sources. The preliminary comparative analysis reveals differences between the two applied SA methods. The tagging approach shows a higher contribution of industry and a lower contribution of road transport than the BF impact on NO_2 concentrations. When the emission reduction is applied in both sectors simultaneously, the BF method leads to a higher impact on NO_2

levels. This exercise highlights the need for a better understanding of the usefulness and limitations of SA, for an adequate applicability of those methods for air quality management support.

Motivation

This work is a contribution to the FAIRMODE recommendations to support the revision of the EU rules on air quality. In this sense, it will support air quality policy decision making, and also the air quality modelling community, in what concerns the applicability of source apportionment techniques to study NO_2 behaviour and the harmonization of these approaches for an adequate usage.