



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

SHORT ABSTRACT

The FAIRMODE CT4: Intercomparison Exercise of Urban Microscale Models and Methodologies for deriving annual pollutant concentrations distribution with very high spatial resolution

Fernando Martín; CIEMAT, Research Center for Energy, Environment and Technology, Avenida Complutense 40, 28040 Madrid, Spain,

E-mail: fernando.martin@ciemat.es

Stijn Janssen, Jorge Sousa; VITO NV, Flemish Institute for Research and Technology. Boeretang 200, 2400 Mol, Belgium

Kees Cuvelier; Philippe Thunis, European Commission, Joint Research Centre (JRC), Ispra, Italy*

José Luis Santiago, Esther Rivas; CIEMAT, Avenida. Complutense 40, 28040 Madrid, Spain,

Jenny Stocker, Rose Jackson; Cambridge Environmental Research Consultants (CERC), UK

Felicita Russo, Maria Gabriella Villani; ENEA, Italian National Agency for New Technologies, Energy and Sustainable Economic Development, 40129, Bologna, Italy.

Gianni Luigi Tinarelli, Daniela Barbero; ARIANET S.r.l., via Crespi 57 20159 Milano, Italy

Roberto San Jose, Juan Luis Pérez-Camanyo; Computer Science School, Technical University of Madrid (UPM, Campus de Montegancedo, s/n, 28660 Madrid, Spain

Gabriela Sousa Santos; NILU, Norwegian Institute for Air Research, Norway.

John G. Bartzis, Ioannis A. Sakellaris; University of Western Macedonia (UOWM), Dept. of Mechanical Engineering, Sialvera & Bakola Str., 50132, Kozani, Greece.

Nicola Masey, Scott Hamilton; Ricardo Energy & Environment, 18 Blythswood Square, Glasgow, G2 4BG, UK

Zoltán Horváth, László Környei, Bence Liskai, Ákos Kovács; Széchenyi István University, Győr, Hungary

Abstract

FAIRMODE is the Forum for Air Quality Modelling in Europe created in 2007 for exchanging experience and results from air quality modelling in the context of the Air Quality Directives (AQD) and for promoting the use of modelling for air quality assessment and management in a harmonized manner between Member States. Several working groups or cross-cutting tasks (CT) have been created to tackle several aspects of the air quality modelling in Europe. One of them is CT4 on Microscale Modelling. It refers to air quality modelling at very high spatial resolution in urban environments, where local hot-spots occur. Hence, this kind of obstacle resolving models is being



**21th International Conference on
Harmonisation within Atmospheric Dispersion Modelling
for Regulatory Purposes**

27-30 September 2022, Aveiro, Portugal

required more and more in an AQD policy context. However, some techniques such as CFD require large computational resources to perform simulations over a period of one year, which makes this type of models difficult to use. In this context, one of the main aims of FAIRMODE CT4 is to determine how to derive annual averaged concentrations (and other AQD statistics such as percentiles) with a micro-scale model as a first step to discuss how to use micro-scale models for air quality assessment or planning in the framework of AQ Directives. An Intercomparison Exercise has been launched where 9 European groups have applied their urban micro-scale models and methodologies to an urban district of Antwerp (Belgium) to compute NO₂ concentrations. Three steps were designed to provide input for the intercomparison exercise: hourly NO₂ concentrations for one particular day, monthly NO₂ concentrations maps, and annual maps, respectively. The results were compared with observations from two air quality stations, and from 73 passive samplers deployed during one month in the district. The model results were also intercompared. CFD, Lagrangian, Urban Gaussian models and parameterized street canyon models were used. Additionally, different methodologies were applied for deriving long-term NO₂ averaged concentrations based on a number of steady state simulation of specific meteorological and emission conditions. In this presentation, this CT4 Intercomparison Exercise will be presented showing the main findings and possible recommendations for a good use of the microscale modelling for microscale urban air quality assessment.

Motivation

This work deals with two important aspects of the Harmo initiative:

1. The use of models for regulatory purpose. This work is about how to use microscale modelling for air quality assessment in urban areas in the framework of the Air Quality Directives.
2. The harmonization in the use of models. This work is about the evaluation and intercomparison of urban microscale models and methodologies to estimate annual concentrations.