Description of work for Website

Topic of interest to ADMLC
A Review of Methods used to assess the Performance of Atmospheric Dispersion Models

Description

An important aspect of using atmospheric dispersion models is to understand how the model performs against measured data. Many commercially available models go through a validation process using widely available datasets, using a number of statistical metrics (e.g. correlation, Root Mean Square Error etc), or graphics (e.g. scatter, Q-Q plots, statistical distributions) by the model developer. This gives an understanding that the model is suitable for use, especially where monitoring data is unavailable, however, it is important that when data is available, model users are able test the model performance for their specific project and understand the uncertainties (including both model inputs and inherent model uncertainties) in the specific case they are undertaking.

Many factors may influence the type of model performance tests carried out such as model inter-comparison tests, model types (e.g. Numerical/Gaussian/CFD), environments (e.g. urban/rural), source types, monitoring methods or different averaging periods (e.g. short term v long term). In each case the performance tests required, or the acceptability criteria for 'good performance', may differ

There are several published methods of quantifying model performance, including statistical metrics (Chang and Hanna (2004); Venekatram (2008); Liu et al (2011)) and downloadable tools (CERC Model Evaluation Toolkit, FAIRMODE tools, or the open source R library 'OpenAir') which assess model performance, and which publish model acceptability criteria. It has been noted that these tools use different statistical metrics for assessing model performance, and that the published model 'acceptability criteria' can vary. Methodologies to interpret the data are constantly evolving, such as the analysis of sensors in arc around a source (Hanna, Chang and Strimaitis (1993) ; https://www.nfpa.org/News-and-Research/Data-research-and-tools/Hazardous-Materials/LNG-model-evaluation-protocol-and-validation-database-update)

ADMLC is interested in a review of the different published methods for comparing models against observed data. Observed data can include sources other than ground level monitors (e.g. satellites). ADMLC are not looking to develop new statistical metrics, or formalise an approach, but are interested in a review of published methods that will highlight their strengths and weaknesses and provide recommendations and guidance on when to use particular statistical tests.