# DETERMINATION OF BACKGROUND CONCENTRATIONS USING SPECTRUM ANALYSIS OF MONITORING DATA

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**Abstract:** To predict pollutant concentrations with dispersion models, it is important to account for any sources of pollution that are not explicitly considered in the model run. Therefore, inappropriate selection of background pollutant levels could be a significant source of uncertainty in the modelling results.

In general, there are two approaches to define the background concentration: (i) using monitoring air quality data or (ii) modelling outputs from larger domain. In both situations, choosing of appropriate values is critical due to temporal and spatial variation of pollutant concentration and because of the necessity to avoid a double counting for the modelling sources. Hence, consistent methodology to determine background concentration is required to guarantee the quality of model predictions. This methodology should take into account the purpose of modelling assessment and the data availability.

The current work proposes an approach for estimation background concentration using air quality measured data decomposed on deterministic and short-term components. For this purpose, the spectral density was obtained for air quality monitoring data based on the Fourier series analysis. At next, short-term fluctuations associated with local emission sources were extracted from the original measurements using an iterative moving average filter and taking into account contribution of higher frequencies determined from the spectral analysis. The deterministic component obtained by the filtering is characterised by wider spatial and temporal representativeness than original monitoring data and is assumed to be appropriate for establishing the background values.

The microscale CFD model VADIS was applied to a selected domain within the Lisbon urban area to predict PM10 concentrations in ambient air. Two distinct approaches to determine background values were compared to initialise the model runs: using decomposed air quality measured data, and $PM_{10}$ grid cell concentrations estimated by MM5/CAMX mesoscale modelling system. The results present a better performance of the microscale model initialised by decomposed time series and demonstrate an importance of the proposed methodology to reduce the uncertainty of the model predictions.