CALCULATION OF EXCEEDENCES USING THE FLUCTUATIONS MODULE

CERC

In this document 'ADMS' refers to ADMS 5.2.

1. Introduction

When calculating concentrations for comparison with air quality limits and guidelines, it is useful to be able to predict how often a limit value will be exceeded over a long period of time. In ADMS, as well as calculating the number of times the *mean* concentration exceeds the limit value (as described in P07/04), it is also possible to predict the number of exceedences taking into account the *short-term fluctuations* in concentration. The ADMS fluctuations module is used to construct a long-term PDF, from which the expected number of exceedences is calculated. This method is described in detail below.

2. Calculation of the long-term average PDF

The fluctuations module calculates statistics of short-term fluctuations in concentration due to turbulence and changes in meteorology. Output from the fluctuations module includes PDFs of exceeding a given limit. For long-term calculations, the probability of exceeding a given limit during the long-term averaging period is calculated by taking the mean value of the PDFs calculated for each line of met data.

As described in P07/04, when the wind data are in large sectors, for each met line calculations are carried out for n (=5) wind directions. Concentrations are calculated separately for each resolved wind direction and then averaged. Similarly, separate PDFs are calculated for each wind direction and the results averaged. For wind data in small sectors or not in sectors, it is only necessary to do calculations for one wind direction per met line (i.e. n =1).

The long-term PDF is given by

$$P(C > C_0) = \frac{1}{f_{total}} \sum_{i=1}^{metlines} \sum_{j=1}^{n} P_{ij}\,(C > C_0) f(i)/n$$

where *metlines* is the total number of lines of met. data, $P_{ij}(C > C_0)$ is the probability of exceeding C_0 given the meteorological conditions of met. line i and wind direction j, $f(i)$ is the frequency of occurrence of met line i, and f_{total}, the total frequency of all the met conditions, is given by

$$f_{total}\left(=\sum_{i=1}^{metlines} f\,(i)\right)$$