OUTPUT SPECIFICATION FOR MEAN CONCENTRATION AND DEPOSITION FLUXES

CERC

1. Introduction

The Output Specification describes the user-specified output points and the calculation grid used in short-term and long-term calculations. Output points may be specified in Cartesian coordinates defined with respect to fixed north-east coordinate axes, or cylindrical polar coordinates.

2. Output Points

2.1 Gridded

The user may define a grid which has regularly or variably spaced values of X, Y and Z for a Cartesian grid, or R, θ and Z for a cylindrical polar grid. Figures 1 to 4 illustrate the grid options in the horizontal plane.

When a polar grid is used the origin of the grid must be specified, as the source locations are entered in Cartesian coordinates with units of metres. θ=0° defines a line west-east aligned and θ is then measured anticlockwise according to the usual mathematical description. Note however that whereas the output θ is measured anticlockwise from the east, the wind direction is measured clockwise from the north and care must be taken in interpreting the results.

Figure 1 Regular Cartesian Grid

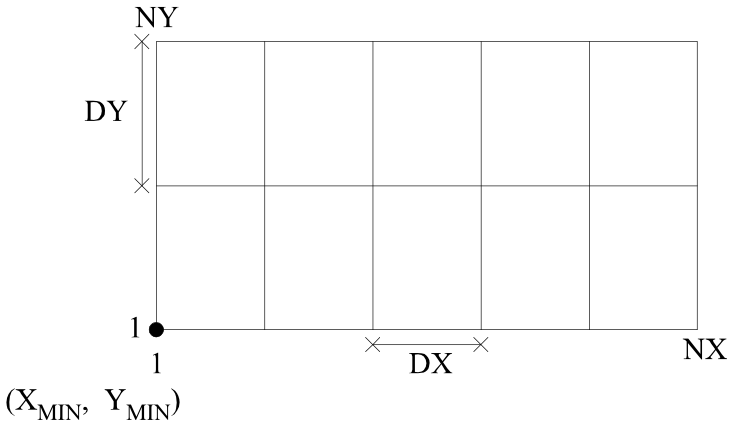


Figure 2 Regular Polar Grid

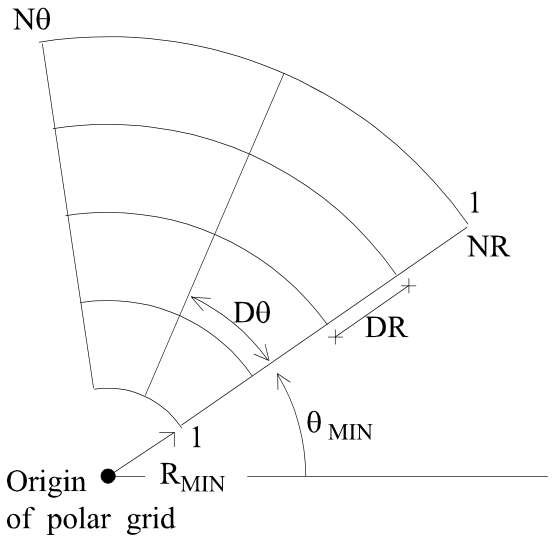


Figure 3 Variable Cartesian Grid

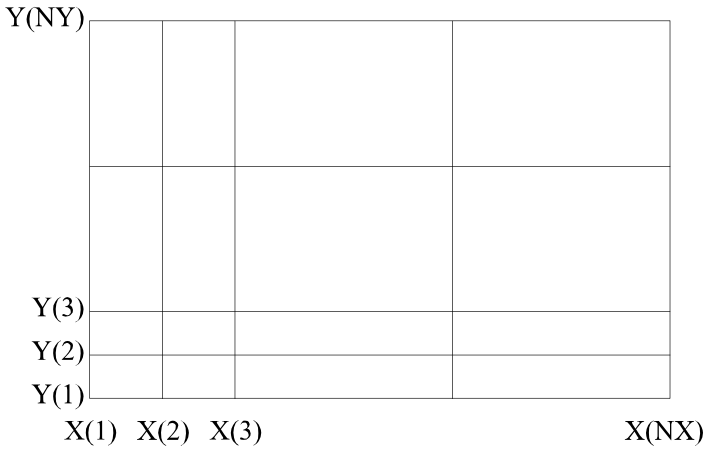
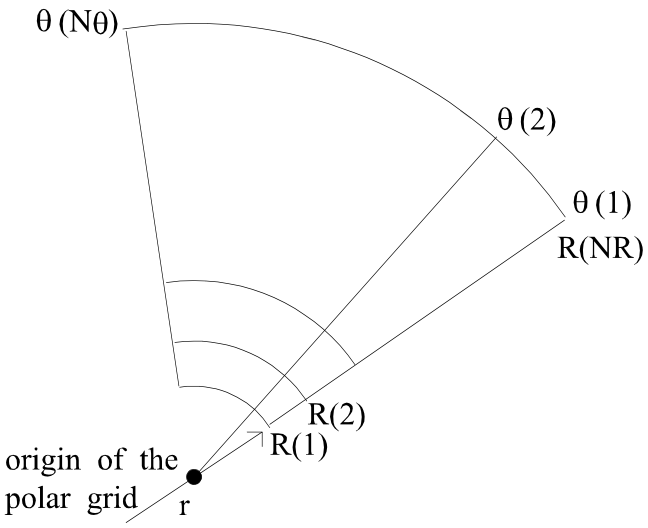


Figure 4 Variable Polar Grid



2.2 Specified Points

Up to 100 points may be defined with respect to Cartesian coordinates (X, Y, Z), or cylindrical polar coordinates (R, θ, Z). The points may be at different heights, Z, and must be in the same coordinate system as the gridded output if both gridded and specified output points are being used. Each receptor may be given a name of up to 20 characters.

As well as entering up to 100 specified points in the interface, extra specified points may be defined using an 'additional specified points' file, which is a comma-separated text file with the extension *.asp* that contains a line of data for every extra specified point required. Each line of data contains the point's name, X (or R) coordinate, Y (or θ) coordinate and Z coordinate, in that order. The number of regular grid points plus the number of points entered in the .asp file must not exceed 51,005.

3. Calculation Grids

In order to calculate the concentration at each output point, it is necessary to transform to a coordinate system centred on the source, with the x-axis aligned along the wind direction. An internal calculation grid is used to ensure that the results are independent of the resolution of the user-defined output domain. The internal calculation grid is given by

$x(I) = x(I-1)\ 50{,}000^{1/249}$ for $I > 2$, with $x(1) = 1$ for convective conditions, and

$x(I) = x(I-1)\ 50{,}000^{1/199}$ for $I > 2$, with $x(1) = 1$ for stable and neutral conditions,

where x is the downwind distance from the source in metres. Dispersion calculations can then proceed as described in P10/01&P12/01. As dispersion calculations only need to continue downstream until the downstream edge of the output domain is reached, the number of internal grid points at which calculations are carried out depends on the extent of the output domain.

Concentrations at the user-defined output points (X, Y, Z) are calculated by transforming the output points to the wind-aligned coordinate system, so the new coordinates are (X', Y',Z), where X' is the downwind distance of the output point from the source, and Y' is the crosswind distance (Figure 5). The output point heights Z are unaffected by the transformation. The dispersion parameters from which the concentrations are calculated are obtained by interpolating from the internal calculation grid points.

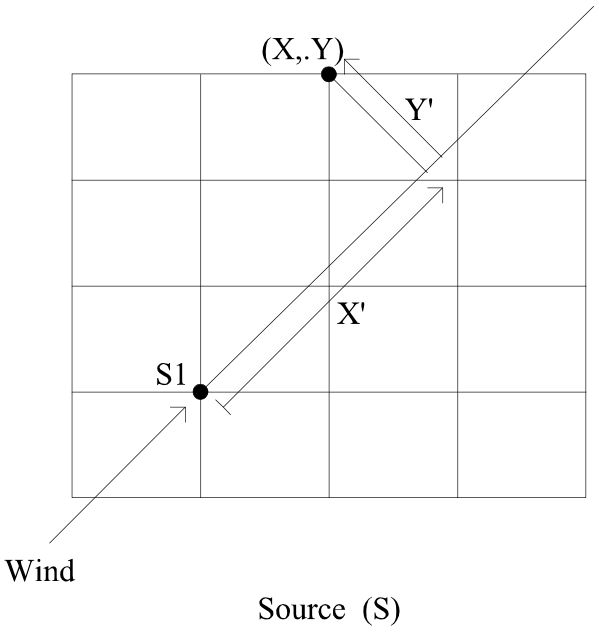


Figure 5 Original and wind-aligned coordinates of output point

APPENDIX Maximum and Minimum Values of Output Parameters

1. Gridded Output

(i) Regular Cartesian Grid

XMIN, XMAX	min: –9,999,999 m	max: 9,999,999 m
YMIN, YXMAX	min: –9,999,999 m	max: 9,999,999 m
ZMIN, ZMAX	min: 0.0 m	max: 15,000 m
NX, NY, NZ	min: 1	max: 101

(ii) Regular Polar Grid

RMIN, RMAX	min: 0.0 m	max: 150,000 m
NR	min: 1	max: 101
θMIN, θMAX	min: 0.0°	max: 360°
Nθ	min: 1	max: 101
ZMIN, ZMAX	min: 0.0 m	max: 15,000 m
NZ	min: 1	max: 101

(iii) Variable Cartesian Grid

X(I), I=1, NX	min: –9,999,999 m	max: 9,999,999 m
Y(J), J=1, NY	min: –9,999,999 m	max: 9,999,999 m
Z(K), K=1, NZ	min: 0.0 m	max: 15,000 m
NX, NY, NZ	min: 1	max: 100

(iv) Variable Polar Grid

R(I), I=1, NR	min: 0.0 m	max: 9,999,999 m
NR	min: 1	max: 100
θ(J), J=1, Nθ	min: 0.0°	max: 360°
Nθ	min: 1	max: 100
Z(K), K=1, NZ	min: 0.0 m	max: 15,000 m
NZ	min: 1	max: 100

2. Specified Point Output

(i) Cartesian coordinates

X, Y	min: –9,999,999 m	max: 9,999,999 m
Z	min: 0.0 m	max: 15,000 m

(ii) Polar coordinates

R	min: 1.0 m	max: 150,000 m
θ	min: 0.0°	max: 360°
Z	min: 0.0 m	max: 15,000 m

3. Polar Grid Origin

X, Y	min: –9,999,999 m	max: 9,999,999 m