Table 2.1 gives definitions for various "average" diameters. For a lognormally distributed aerosol the different diameters defined in Table 2.1 can be related by the equation (Raabe, 1971)

$$d_p = d_g \exp(p \ln^2 \sigma_g) \tag{2.11}$$

**TABLE 2.1 Definitions for Various "Average" Diameters**

| Indicated diameter | Symbol | Definition | Description |
|---|---|---|---|
| Mode | $d_0$<br>$p = -1$ | $d$ at maximum $n_i$ | Diameter associated with the maximum number of particles in a distribution |
| Geometric mean | $d_g$<br>$p = 0$ | $\log^{-1}(\Sigma n_i \log d_i / \Sigma n_i)$ | The $\Sigma n$th root of the product of all particle diameters, also for a lognormal distribution the median diameter |
| Arithmetic mean | $d$<br>$p = 0.5$ | $\Sigma n_i d_i / \Sigma n_i$ | The sum of all diameters divided by the total number of particles |
| $d$ of average surface | $d_s$<br>$p = 1$ | $\sqrt{\Sigma n_i d_i^2 / \Sigma n_i}$ | The diameter of a hypothetical particle having average surface area |
| $d$ of average volume (mass) | $d_v$<br>$p = 1.5$ | $\sqrt[3]{\Sigma n_i d_i^3 / \Sigma n_i}$ | The diameter of a hypothetical particle having average volume or mass |
| Surface median diameter | $d_{smd}$<br>$p = 2$ | $\log^{-1}(\Sigma n_i d_i^2 \log d_i / \Sigma n_i d_i^2)$ | The geometric mean of the particle surface areas or for a lognormal distribution the area median diameter |
| Surface mean diameter (Sauter diameter) | $d_{sm}$<br>$p = 2.5$ | $\Sigma n_i d_i^3 / \Sigma n_i d_i^2$ | The average diameter based on unit surface area of a particle |
| Volume median diameter (mass) | $d_{mmd}$<br>$p = 3$ | $\log^{-1}(\Sigma n_i d_i^3 \log d_i / \Sigma n_i d_i^3)$ | The geometric mean of particle volumes (mass) or for a lognormal distribution the volume (mass) median diameter |
| Volume mean diameter (mass) | $d_{vm}$<br>$p = 3.5$ | $\Sigma n_i d_i^4 / \Sigma n_i d_i^3$ | The average diameter based on the unit volume (mass) of a particle |

$p$ values assume a lognormal distribution.