

# Air Pollution Dispersion Gaussian Plume Modeling

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## Abstract

Computational analysis of air pollution dispersion using Gaussian plume models and deposition calculations.

## 1 Introduction

Air pollution dispersion models predict pollutant concentrations downwind of emission sources.

## 2 Gaussian Plume Model

$$C(x, y, z) = \frac{Q}{2\pi u\sigma_y\sigma_z} \exp\left(-\frac{y^2}{2\sigma_y^2}\right) \left[ \exp\left(-\frac{(z-H)^2}{2\sigma_z^2}\right) + \exp\left(-\frac{(z+H)^2}{2\sigma_z^2}\right) \right]$$

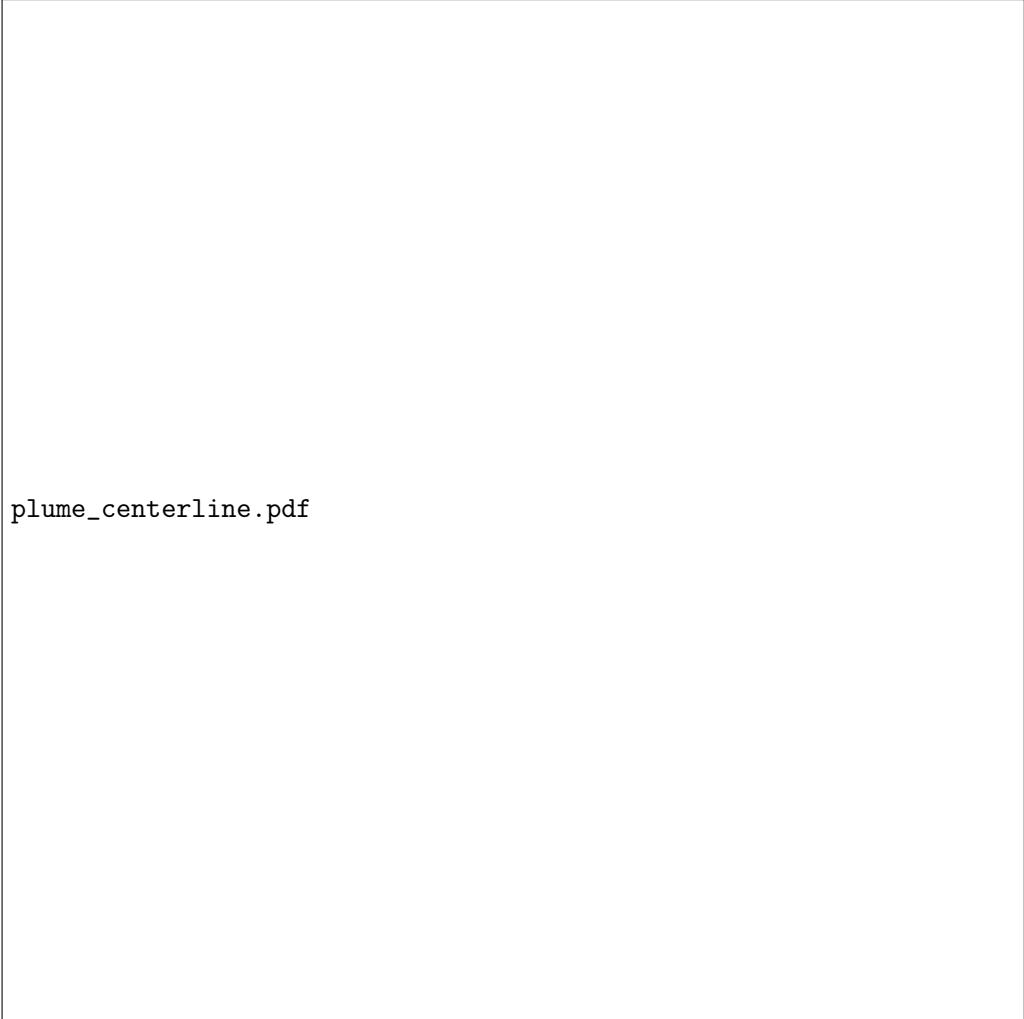


Figure 1: Ground-level pollutant concentration along plume centerline.

### 3 Stability Class Effects



stability\_effects.pdf

Figure 2: Concentration for different stability classes.

## 4 2D Concentration Field



concentration\_field.pdf

Figure 3: 2D ground-level concentration contours.

## 5 Stack Height Effects

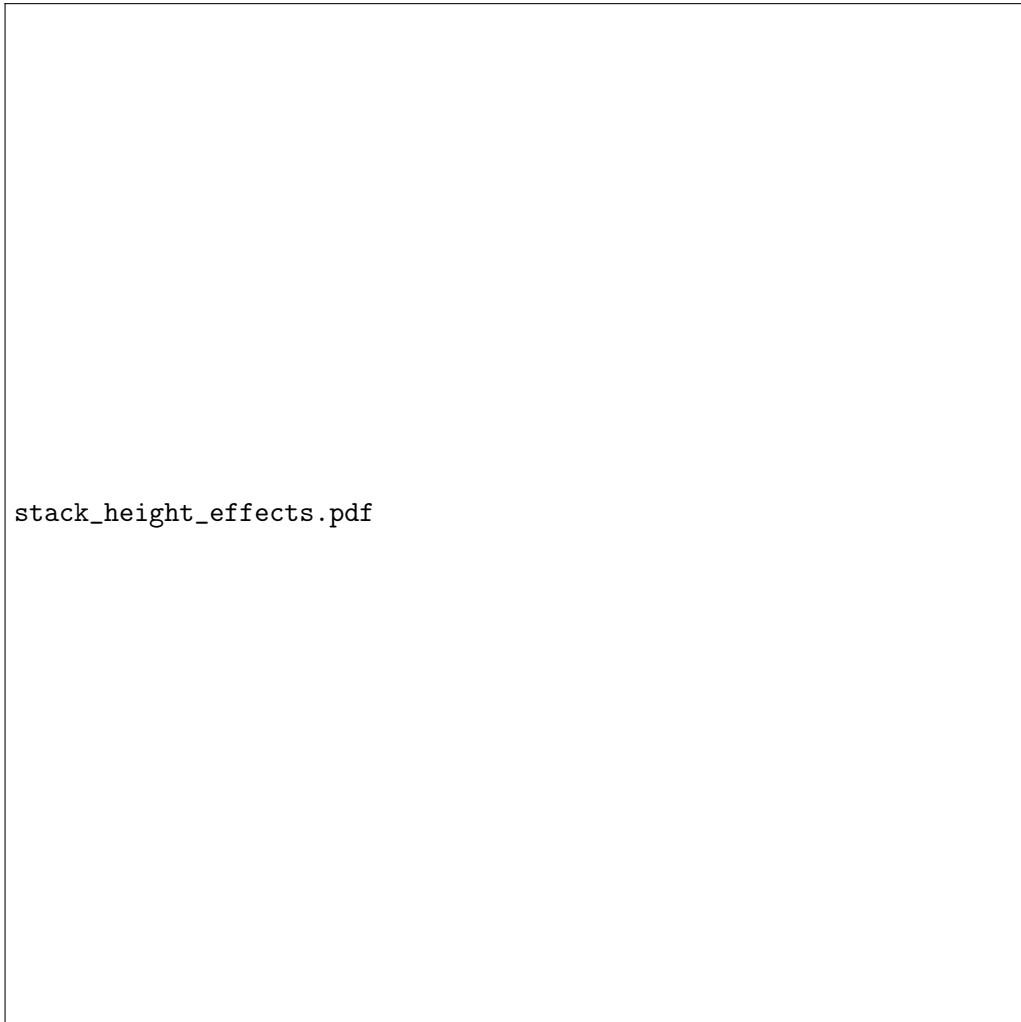


Figure 4: Ground concentration for different stack heights.

## 6 Maximum Concentration

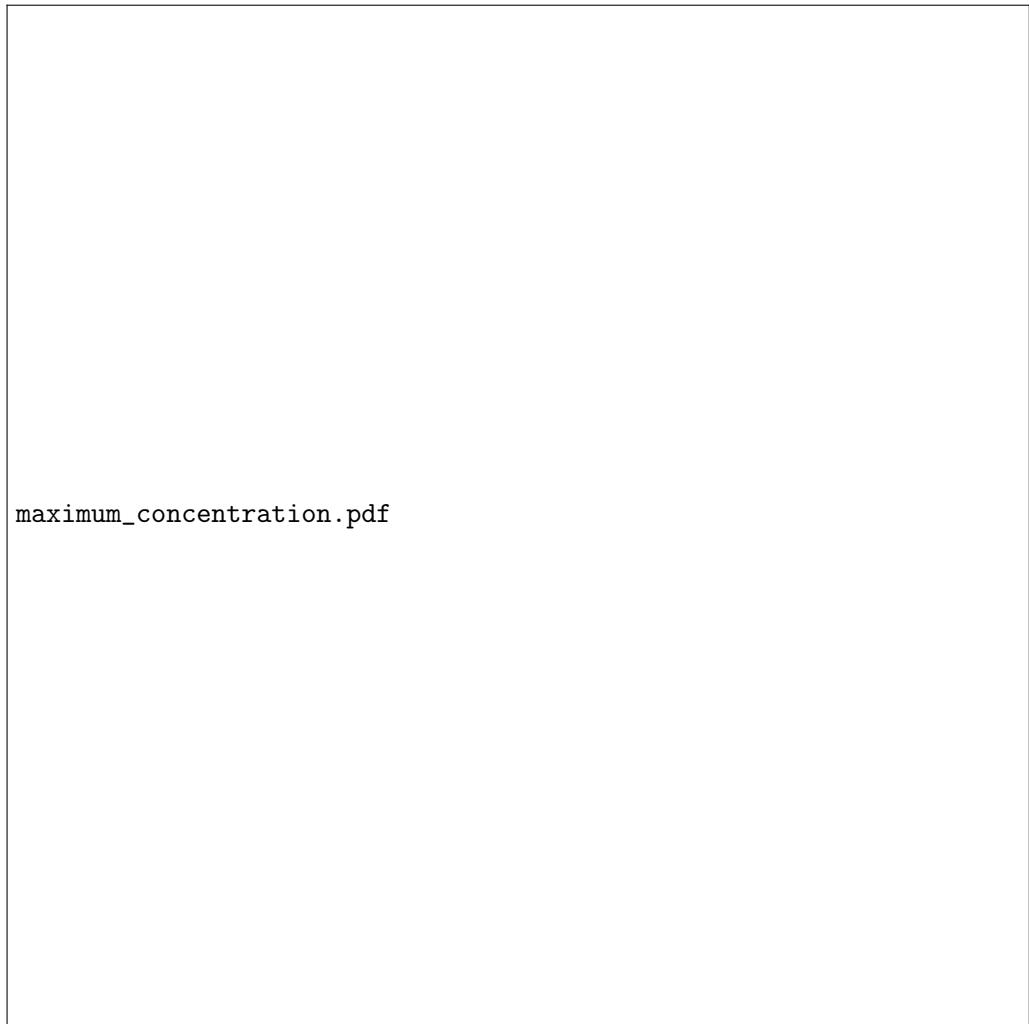


Figure 5: Location and magnitude of maximum concentration.

## 7 Vertical Profile

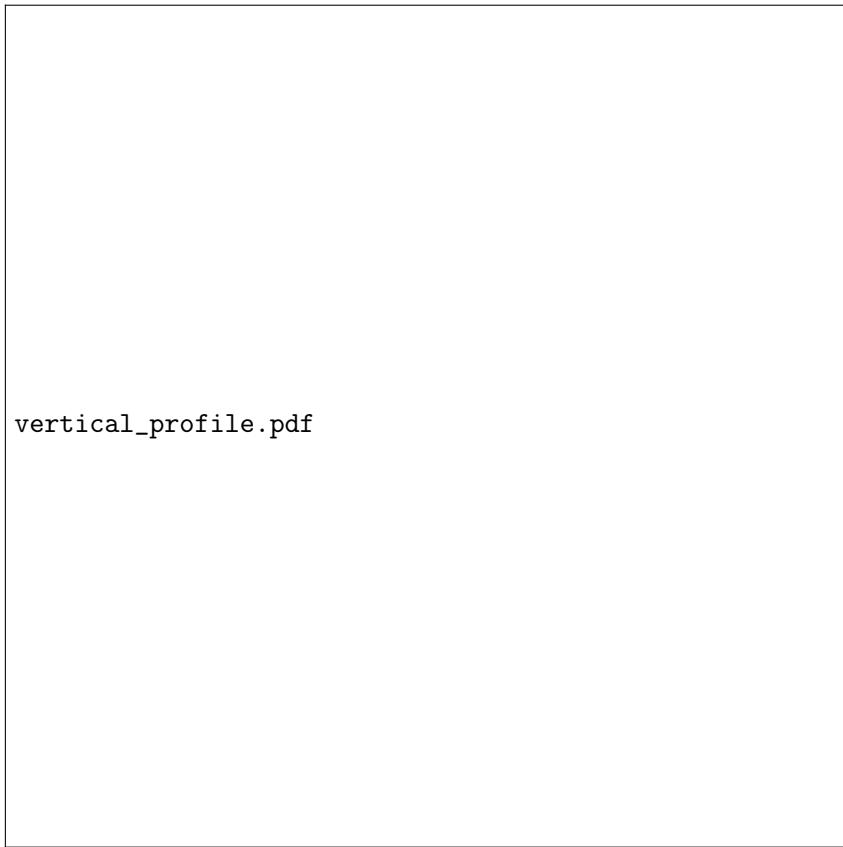


Figure 6: Vertical concentration profile.

## 8 Results

## 9 Conclusions

Gaussian plume models provide practical estimates of pollutant dispersion for regulatory applications.