

Today, we will:

- Discuss the **Gaussian puff diffusion model** (sudden burst of air pollution from a point)
- Discuss particle vs. steam plumes and how to distinguish them (Slides)
- Start talking about **particles** (sizes, shapes, terminology, classifications, etc.) (Slides)

Example: Gaussian puff diffusion

Given: A ground-level tank containing 10 kg of hydrogen cyanide (HCN) ruptures at a chemical plant early in the morning. The atmosphere is very stable, and a gentle breeze is blowing at $U = 1.5$ m/s. The ground absorbs the HCN on contact. Workers downwind of the explosion are exposed to the HCN.

To do:

- (a) Estimate the dose of HCN that would constitute hazardous conditions for the workers.
- (b) Predict the dose directly downwind. How far downstream is this hazardous?

Solution:

(a)

(b)

Equation for ground level dose, absorbing ground:

$$D_j(x, y, 0) = \frac{m_j}{\pi U \sigma_{yi} \sigma_{zi}} \exp \left\{ -\frac{1}{2} \left[\left(\frac{y}{\sigma_{yi}} \right)^2 + \left(\frac{H}{\sigma_{zi}} \right)^2 \right] \right\}$$

Table to be filled in during class:

| x (km) | D_j (mg s/m ³) |
|----------|------------------------------|
| 1.0 | |
| 1.5 | |
| 2.0 | |
| 2.5 | |
| 3.0 | |
| 3.5 | |
| 4.0 | |
| 4.5 | |

| x (km) | D_j (mg s/m ³) |
|----------|------------------------------|
| - | - |
| 5.0 | |
| 5.5 | |
| 6.0 | |
| 6.5 | |
| 7.0 | |
| 7.5 | |
| 8.0 | |