Modeling Nuclear Fallout Kernel Review

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Introduction

Accidents happen:

Fukushima - 2011

Chernobyl – 1986

What happens after the accident?

What is the impact on the region?

How long are the effects noticeable?

Problem Statement

- Provide a program that will model atmospheric dispersion of radioactive particles from an event and provide ground level concentrations as well as estimated increase in radiation levels from calculated concentrations
- Base line
  - Fire in RAM of one isotope, immediate dispersion and dose
- Expansion
  - Time factor, account for decay to estimate concentrations and exposure-5y, 50y, 500y.
  - Multiple isotopes
  - More violent source, i.e. – explosion vs. fire
  - Addition of more real world factors, i.e. – gravity, buoyancy and mass of particles

Proposed Solution

- Dispersion equation

$$C(x,y,0,H) = \frac{Q}{2\,\pi\,\sigma_y\,\sigma_z\,u} e^{\frac{-1}{2}(\frac{y}{\sigma_y})^2} e^{\frac{-1}{2}(\frac{H}{\sigma_z})^2}$$

- Simple **for()** loop to evaluate user given variable wind speed, atmospheric conditions (i.e. turbulent, calm, day, or night), estimated/known source radioactivity amount, and height of plume.

- Exposure equation

$$\dot{X} = 5.263\ x\ 10^{-6}\ \frac{AyE(\mu_{en}/\rho)}{r^2}$$

- Another **for()** loop evaluating output of the dispersion loop for each location.

What's Next?

- 4/26 – have baseline program completed.
- 4/27 – add time decay consideration.
- 4/28 – add minimum 3 more isotopes.
- 4/29 – expand for more energetic source.
- 4/30 – work on Project Review.
- 5/1 – work on paper/presentation.

Desired End Result