1. South Pole NOx profile
Measurements over the South Pole indicate that surface NOx emissions are at $2 \times 10^9$ molecules cm$^{-2}$ s$^{-1}$. The eddy diffusion coefficient $K$ is $1$ m$^2$ s$^{-1}$. (Assume that the air density is constant at $1.5 \times 10^{19}$ molecules cm$^{-3}$)
(a) Calculate and plot the (0-1 km) vertical profile of NOx over the South Pole if the chemical lifetime of NOx is constant at 7 hours.
(b) Chemical calculations show that the lifetime of NOx ($\tau$) is approximately linear with its mixing ratio ($\chi$) at $\tau = 7 + 0.02 \chi$, where $\tau$ is in hours and $\chi$ is in pptv. Calculate and plot the (0-1 km) vertical profile of NOx. (Hint: try to use $dz=1$m, $\alpha=0.01$, and convergence criterion of 1%).
(c) Comment on the reason for the difference of the profiles.

2. Term-paper project
Describe the topic of your term-paper project. It can either be a limited-scope independent research project or a critical review of a controversial scientific issue related to air pollution. My preference is an independent research project.