ATMO/CHEE 469b/569b ***Spring 2007***

Homework1

Due date: Monday, January 22, 2007

Using the data below, prepare the following number distributions. The first row of the Table has been completed as a guide. Use a spreadsheet or graph paper.

1. Plot a simple histogram (n_N *vs*. D_p; actually column 2, the mean of the size interval).
2. Prepare a semi-logarithmic plot of the same data (n_N^e *vs*. ln D_p). Calculate Δ ln D_p from the first column.
3. Prepare a cumulative distribution plot (% less than the indicated D_p vs. D_p)
4. Prepare a log-normal plot using the attached log-probability paper (D_p vs. percent-less-than-the-indicated D_p).
5. Recognizing that $\overline{D}_{pg} = D_{median}$ and that $\sigma_g = D_{p\ 84.1\%}/\overline{D}_{pg}$, read off $\overline{D}_{pg}$ and σ_g from your plot (e.g., Figure 4.12).
6. Use these parameters to calculate a continuous log-normal distribution curve and superimpose the curve onto the discrete raw data to check the goodness of fit (see Fig. 14.2 for example).

Size Interval (μm)	Geometric Mean Diam., $\overline{D}_{pg}$ (μm)	Concentration within Interval, ΔN (#/cm^3)	n(D_p) = dN/d(D_p) (#/cm^3/μm)	ln D_p	Δ ln D_p	n(ln D_p) = dN/d(ln D_p) (#/cm^3)	Cum. % less than	n(ln D_p) (calculated from eq 1 below)
0.1-0.2	0.14	50	500	-1.956	0.693	72	.99	207.8
0.2-0.4	0.28	460						
0.4-0.7	0.53	1050						
0.7-1.0	0.84	980						
1-2	1.41	1700						
2-4	2.83	680						
4-7	5.29	100						
7-10	8.37	10						
10-20	14.1	2						

$$n_N(\ln D_p) = \frac{dN}{d\ln D_p} = \frac{N}{\sqrt{2\pi}\ln\sigma_g}\exp\left(-\frac{(\ln D_p - \ln \overline{D}_{pg})^2}{2\ln^2\sigma_g}\right) \qquad \text{eq 1.}$$

Graduate Students (and Undergraduates for extra Credit)
Do Q 4.5.

probability x 2 log cycles