ME5310 Dispersed Multiphase Flows

Assignment 2

Consider the given particle size distribution (obtained from an experiment) for answering the questions below. You can use Matlab, Excel etc. to generate the plots.

1) Plot the number histogram of particle size distribution for 2, 10, 20 and 30 number of bins.

2) Plot the number probability distribution for the above cases. Mention your observation on the effect of increasing the number of bins.

3) If particle sizing accuracy is 3 microns, select a bin size that you would prefer to represent the particle size distribution. For the same bin size,

i) plot (a) cumulative number probability distribution (b) cumulative mass probability distribution.

ii) Find the mode and median.

iii) Find (a) AMD, (b) SMD, (c) VMD, and (c) Variance of the particle size distribution.

iv) Find the shape and scale parameters of a Rossin-Rammler distribution that can represent the above size distribution.

4) The minimum and maximum particle size in a one-dimensional transport of water droplets in air flow are 10 microns and 100 microns, respectively, when considered within a given sample volume (1 m^3). The particle number density function and particle velocity distribution are assumed to be linear as depicted in Fig 1.

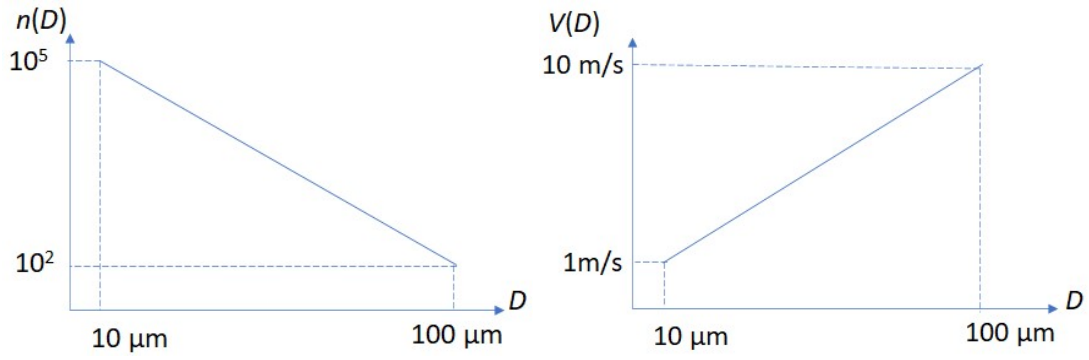

Figure 1

Find (a) number density of all particles, (b) particle volume fraction (c) particle bulk density (d) particle mass flux in the flow direction, corresponding to the given volume.