Cloud Physics Lab
LAB 10: Rain Size Distribution

Purpose:

Study the rain size distribution

Theory:

The best way to characterize rain reaching the ground is through drop-size distribution.

Drop-Size distribution
Number of drops per unit size interval per unit volume.
Size interval is usually diameter (or radius)

How do we mathematically represent this drop-size distribution?

The Marshall-Palmer Drop-size Distribution
Raindrop size distribution are often given by the *Marshall-Palmer* distribution,

$$n_d = n_o e^{-\Lambda D} \quad (1)$$

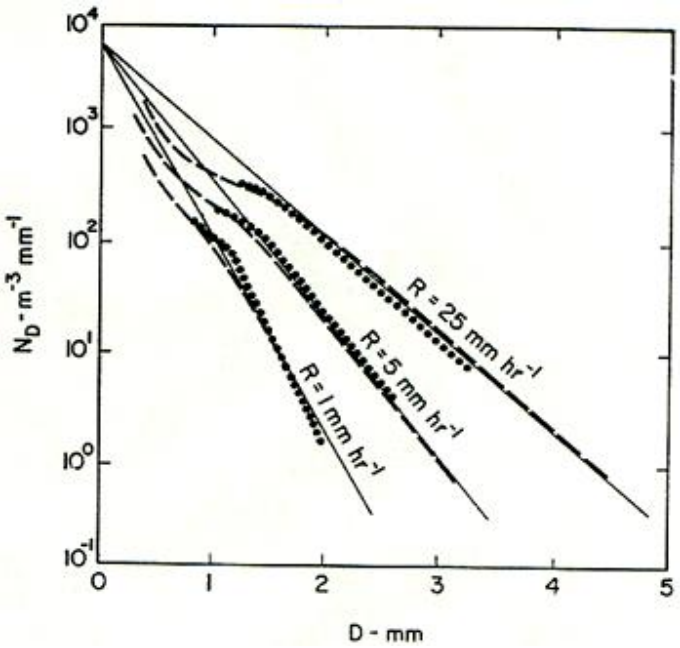
where n_o is called the intercept parameter, and Λ is called the slope factor.

The intercept factor is a constant, and is often given a value of $n_o = 0.08$ cm^{-4} or (8000 m^{-3} mm^{-1}).

Empirically, the slope factor has been found to depend on rainfall rate via

$$\Lambda = 4.1R^{-0.21} \quad (2)$$

where R has units of mm/hr and Λ has units of mm^{-1}.



Methodology

1- Run the Matlab script *LAB10.m* to plot the Marshall-Palmer rain size distribution for rainfall rates 2, 5, and 25 mm/hr.
2- From the plot extract the data for droplet diameters 0.2, 0.4, 0.6, 0.8, 1.0 mm.

Rain drop diameter (mm)	Rainfall rate (mm/hr)		
	2	5	25
0.2			
0.4			
0.6			
0.8			
1.0			

3- Discuss your results