CLOUD PHYSICS - tutorial 5

Collision-coalescence

1. Long (1974) suggested the following approximation to the collection kernel:

$$K(x,y) = \begin{cases} 9.44 \cdot 10^9 (x^2 + y^2), & R \leqslant 50\mu m, \\ 5.78 \cdot 10^3 (x + y), & R > 50\mu m, \end{cases} \tag{1}$$

   where x and y denote volume of droplets (in cm^3) having radii r and R (bigger droplet); K is in $cm^3 s^-1$.

   Plot the collection kernel against the radius of the bigger drop. An example result is given in Fig. 9 in Long (1974).

   Long, A. B., 1974: Solutions to the Droplet Collection Equation for Polynomial Kernels. *J. Atmos. Sci.*, v.31, issue 4,p 1040-1052.

2. Plot the drop growth rate due to condensation (diffusion) and collision (accretion). For diffusional growth assume different supersaturations. For the growth by collision-coalescence assume the gravitational kernel given by Long (1974) and different values of the cloud mixing ratios.

   See also Fig 8.6 in section 8.2 Precipitation Processes in i*Thermodynamics of Atmospheres and Oceans* by Judith A. Curry and Peter J. Webster.