Collision-coalescence growth

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

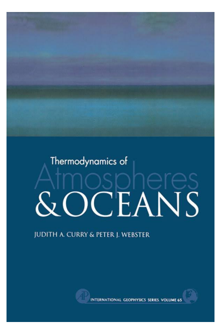
$$K(x, y) = \begin{cases} 9.44 \cdot 10^9 (x^2 + y^2), & R \leqslant 50\mu m, \\ 5.78 \cdot 10^3 (x + y), & R > 50\mu m, \end{cases} \tag{1}$$

   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 ithe collection kernel against the radius of the bigger drop. Exemple result is given in Fig. 1 and in Fig. 9 in Lang (1974).

2. Plot the drop growth rate due to condensation (diffucion) and collision (accretion). For diffusional growth assume different supersaturations. For the growth by collision-coalescence assule the gravitational kernel given by Long (1974) and different values of the cloud mixing ratios. Exemples of results are given in Figs. 2-3.

   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.



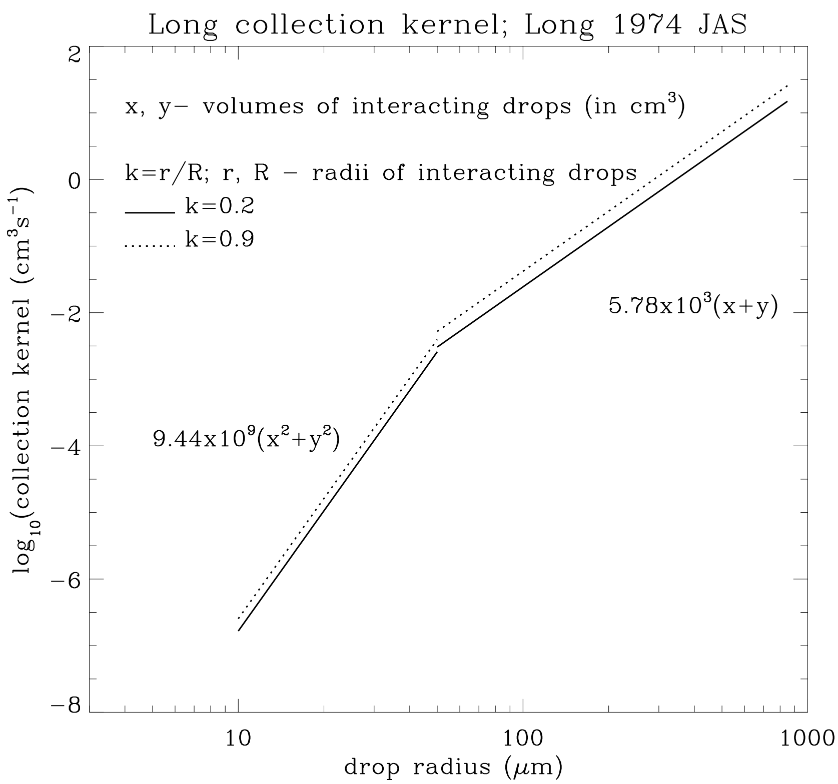


Figure 1: Collection kernel using the Long formula from Long, A. B., 1974: Solutions to the Droplet Collection Equation for Polynomial Kernels, *Journal of the Atmospheric Sciences*, **31**, 1040-1052.

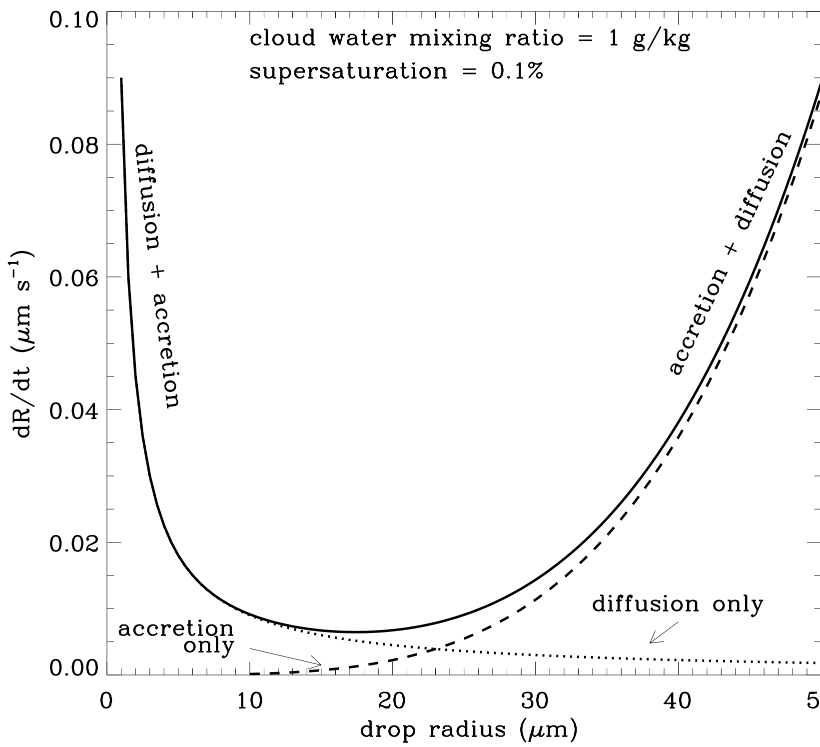


Figure 2: Drop growt rate by diffusion and accrection. Cloud water mixing ratio: 1 g/kg. Supersaturation : 0.1%.

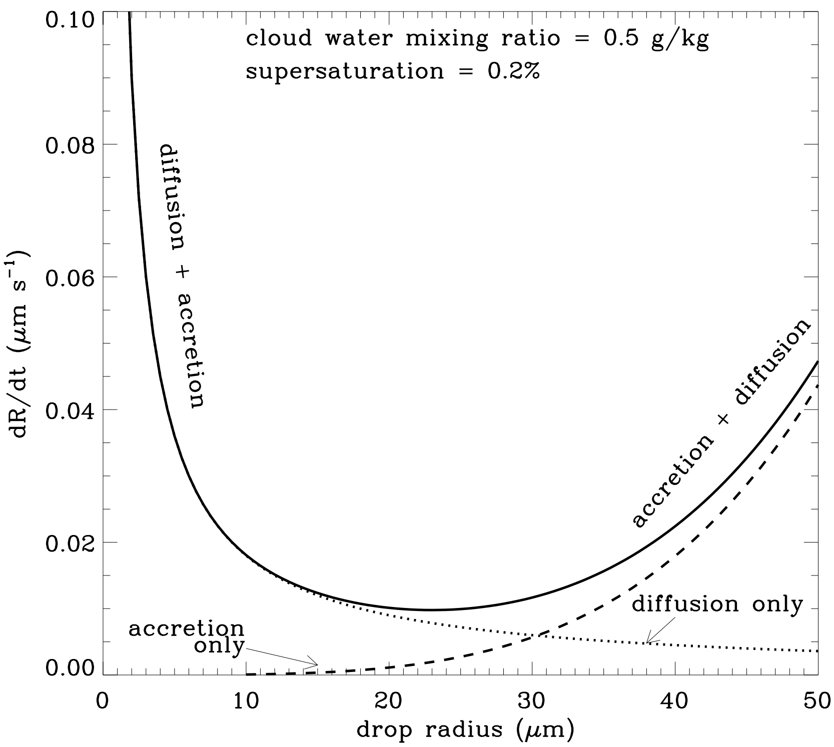


Figure 3: Drop growth rate by diffusion and accrection. Cloud water mixing ratio: 0.5 g/kg. Supersaturation : 0.2%.