A.2 Lecture 2

Example 1.2a In a convective cloud over the oceans, the supersaturation at cloud base, $T = 273$ K, over a flat liquid surface might be around 5%. In a similar cloud over the continent the supersaturation might be around 1% . Taking into account Kelvin's equation alone what would be the "cut off" size below which particles would not grow into droplets in both maritime and continental cases?

Answer Use Eq. 2.14 and divide by e_0 to get $s_l = \exp\left(\frac{2\sigma}{R_v T \rho_l r}\right)$. Rearrange for r to get:

$$r = \frac{2\sigma}{R_v T \rho_l \ln s_l}$$

use $\sigma = 0.075$ Nm^{-1} and $\rho_l = 1000$ kg m^{-3} and set $s_l = 1.05$ and $s_l = 1.01$ to yield $r_{maritime} = 24$ nm and $r_{continental} = 120$ nm.

Example 1.2b what does the above result tell you about the activated fraction (the fraction of aerosols that grow into cloud drops) of aerosol particles in maritime vs continental type clouds?

Answer Martime clouds tend to have higher activated fractions of aerosol particles than continental clouds.