



What determines the distribution of shallow convective mass flux through cloud base?

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The distribution of cumulus cloud population is studied using large-eddy simulations of two shallow cumulus cases, one representing conditions over the tropical ocean, and another representing mid-latitude conditions over land. In particular, the distribution of mass flux through cloud base differs among these two cases on a log-log plot. The case over the ocean shows a concave shape, while the case over land shows a straight line shape. The question of this study is what sets these differences. We find that the magnitude of the surface fluxes and its variation over the diurnal cycle do not influence the distribution shape. The latter is also not controlled by the level of organization in the cloud field. It is instead controlled by the ratio of the surface sensible heat flux to the surface latent heat flux, the Bowen ratio B . Using a theoretical thermodynamic cycle, we explain why B controls the distribution shape and how it connects to the average mass flux per cloud $\langle m \rangle$.