The process of hydrostatic adjustment in a vertical column is discussed in the context of rain formation and sedimentation. The authors assume an event of instantaneous condensation in a midatmospheric layer that removes mass from the gas phase and produces latent heating. It is shown that the rain formation leads to a change of the surface pressure after a short period of acoustic wave activity. There is, however, no hydrostatic surface effect once the particles reach terminal velocity. It is not until the rain reaches the ground that the surface pressure decreases consistently with the mass removed by the phase change.

Only the mass removal introduces perturbations below the layer of rain formation, where it acts to stretch the lower levels, reducing pressure and temperature. Above the layer of rain formation, the effects of latent heating dominate over the effects of mass removal by an order of magnitude. The hydrostatic adjustment time is found to be approximately equal to $e^{2}N_a^{-1}$ (340 s, where $N_a$ is the acoustic cutoff frequency and $e$ is the Euler constant) and is proportional to the temperature of the isothermal basic state. The energy distribution is found to be dominated by the latent heating. However, the mass removal significantly alters the amount of energy lost due to work done by the pressure perturbations. The implications for numerical modeling are discussed.

For the two dimensional case, mass is also distributed horizontally. The ratio of the effects of latent heating and mass removal depend, in addition to the Coriolis parameter and stratification, on the horizontal and vertical scales of the event of condensation. Typically the effects of latent heating dominate the effects of mass removal by one to two orders of magnitude.