

Inhibition of moist convection in the atmospheres of Jovian planets: the case of NH₄SH formation by chemical reaction of NH₃ and H₂S

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In the atmospheres of Jovian planets, condensation of heavy components, such as H₂O, NH₃, CH₄, is thought to suppress vertical convection (Guillot, 1995). In addition to these clouds resulting from condensation of the above components, the formation of NH₄SH by chemical reaction of NH₃ and H₂S is predicted as the important cloud formation processes. Because the chemical process consumes the components heavier than the lighter major components as condensation process does, it can be anticipated that the formation of NH₄SH can also suppress convection. However, the degree of possible suppression, or whether it can inhibit convection, have not investigated yet.

Here we investigate the criterion of convection inhibition associated with the formation of NH₄SH in thermochemical equilibrium framework. With the convection inhibition criteria obtained in the investigation, we also examine the structure of convection in parameters where convection inhibition by NH₄SH formation is thought to emerge using cloud convection model (Sugiyama et al 2009; 2011; 2014).

Keywords: atmosphere of Jovian planet, cloud convection, numerical calculation