Anthropogenic forcings, such as greenhouse gases, are starting to show their influence on the climate, as evidenced by a global warming trend observed in the past century. A robust climate change, a weakening of tropical circulation, has been found among climate model simulations. Intuitively, the weakening of tropical circulation can be explained by a change in atmospheric stability, which is either induced by changes in lapse rate or changes in depth of convection. In observations, however, changes in tropical circulation are very inconsistent. Here we use gross moist stability as an index to examine atmospheric stability. In climate model simulations, the effect of lapse rate does stabilize the atmosphere, but it will be canceled out by the effect of low-level water vapor. Thus, the effect associated with depth of convection become dominant in changes of atmospheric stability. In observations, on the other hand, the effect of lapse rate is very weak, which implies a small influence of global warming on atmospheric stability. The atmospheric stability is determined by the effects of low-level water vapor and depth of convection.