Changes in occurrence-weighted and mass-weighted cloud heights, as a function of aerosol optical depths and CO mixing ratios at 215 hPa, are calculated over the oceans and land in the tropics for 2008. The cloud height derivatives are calculated from an analysis of RL-GEOPROF cloud vertical structure data from the CALIPSO and CloudSat experiments. The structures are binned according to thermodynamic and dynamical influences (e.g. relative humidity from the AIRS experiment) and aerosol microphysical influences (i.e. MODIS aerosol optical depths and MLS CO at 215 hpa, an aerosol proxy). Since not all cirrus in the upper troposphere is directly related to deep convection, the cloud structures are also binned according to the vertical depths of the observed cirrus, for cloud widths less than 1 km to those greater than 10 km. CloudSat data is used to specify the cloud mass densities associated with the cirrus of different vertical depths. Changes in the occurrence-weighted and mass-weighted altitude centroids are less than 100 m per 0.1 increment change in AOD over the land and oceans. These derivatives are substantially smaller (by factors between 2 and 10) than those calculated previously based upon MODIS cloud top pressure data. The MLS derivatives do not indicate an increase in cloud heights as 215 hPa CO increases.