The tropopause is an important atmospheric boundary and a climate change indicator. The tropical tropopause in particular is important for understanding the role of water vapor and cloud in the climate system. We present a GPS data analysis of the tropical tropopause and examine the difference in tropopause height and temperature between the WMO lapse rate definition (LRT) and the cold point definition (CPT), with a specific interest in the impact on the cloud top–tropopause relationship. We use four years of temperature profiles measured by the COSMIC satellite mission to describe the frequencies and 2D spatial structure of CPT/LRT separations. Consistent with previous work, the average CPT/LRT in the deep tropics was ~500 m; however, 17% of deep tropical temperature profiles show a separation of over 1 km. The CPT/LRT separations are well correlated with the LRT temperature anomaly, indicating that large separations primarily occur during the warm phase of equatorial wave perturbations. Occurrences of cloud top above both the LRT and the CPT are examined using co-located CALIPSO cloud top data. We find a much smaller fraction of clouds above the CPT than the LRT. The occurrence is nevertheless significant, especially over the western Pacific in DJF season and over the Asian monsoon region in JJA season.