## Fine-scale thermal structure of the tropical cold-point tropopause derived from the COSMIC GPS/RO measurements

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Fine-scale thermal structure of the tropical cold-point tropopause (CPT) is investigated for consecutive four years (September 2006 - August 2010) based on high-resolution temperature profiles which are derived from the COSMIC/FORMOSAT-3 GPS/RO measurements. The climatology and seasonal/intraseasonal variabilities of temperature of the CPT (T-CPT) are examined in detail. The T-CPT demonstrates distinct local minima in tropics where strong convections prevail and shows a strong seasonality. Regardless of longitudinal location, the tropical CPT is cold in temperature during boreal winter, but it is warm during boreal summer. This seasonality is associated with both circulation in the stratosphere and upwelling in the upper troposphere and lower stratosphere (UTLS) as evident from the same phase of seasonal cycle of temperature in the lower-stratosphere. The seasonal cycle in the T-CPT is strongest over the western Pacific warm pool sector but weakest over the east-central Pacific, where the upward and downward branch of the Walker circulation exists, respectively. This locality of seasonal cycle is connected with tropospheric processes such as convection and largescale circulation, and this also indicates that tropospheric processes modulate localities of the CPT. The intraseasonal variability of the T-CPT shows the signature of the Madden-Julian oscillation (MJO) and Kelvin wave. These intraseasonal variabilities are reasonably well matched to convective activities, which is presented with outgoing long-wave radiation (OLR), in the tropics, however, the Kelvin wave signature is related to both convectively driven and free Kelvin waves in the UTLS.