Anomalous variations of tropopause height in low latitude regions

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Successful attempts have been made in early 1990s to link the possible influence of equatorial stratospheric quasi-biennial-oscillation (QBO) on tropopause dynamics at longer period scales, leading ultimately to the evolution of strong El Nino events of global economic importance (Gray et al., 1992, GRL, JMSJ). As a result of this influence, it is possible that the tropopause height may be increasing instead of decreasing with latitude from the equator in tropical regions during particular phase of QBO (say westerly phase over the equator). In the present work we report such observations using radiosonde data obtained from fourteen different tropical (30^oN to 30^oS) radiosounding stations located in the wide longitudinal zone of South East Asia, South Pacific, and Africa in the year 2004. The daily tropopause height determined at 00:00 and 12:00 hrs. GMT is averaged for each month separately. The tropopause height (Cold Point Tropopause, CPT) is determined by noting the height of minimum temperature between 12 and 20 km. It is observed further that the latitude variation of tropopause height in southern Hemisphere is much less when compared to that in the Northern Hemisphere. The reason for this asymmetric characteristic of tropopause about the equator may be that greater fraction of the northern hemisphere is covered with land and it is ocean in the southern hemisphere. Because of large variations in topography of the land and the associated thermal conductivity, it is possible that convection activities of the atmosphere vary larger in the northern hemisphere and consequently the tropopause height. Moreover, within 15° of the equatorial region in the southern hemisphere and in the whole northern hemisphere (within 30°), it is observed in general (both at 00:00 and 12:00 hrs. GMT) that when it is higher the tropopause height, cooler is the tropopause temperature. This can be explained on the basis that when the particular phase (say easterly) of stratospheric QBO induces cooling in the lower stratosphere, the thickness of which will get reduced and as a result the tropopause height will increase. It may be noted here that the latitudinal variation of tropopause height and temperature observed in the present work is not confined to a particular longitude region. Because of the limitations in the availability of the data, the study of latitudinal variation of tropopause height has been carried out for wider longitudinal zones covering Africa, South East Asia and South Pacific. Detailed investigation on this tropopause height variation in low latitude regions is being carried out, which is

consistent with the results reported using GPS Radio occultation measurements, along with other radiosondes data in different years so that the effects of different phases of QBO on tropopause dynamics can be brought out.