

A 10-year statistical study of double stratopause structure as observed by LiDAR over a southern sub-tropical site, Reunion Island (21 S, 55 E)

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Stratopause, the layer separates the stratosphere and mesosphere, is becoming an important one for addressing various atmosphere phenomenon. The studies on stratopause provide better understanding of the atmosphere vertical coupling, wave dynamics, meridional circulations, middle atmosphere structure and dynamics, model developments and the atmosphere chemistry.

Globally, the stratopause is found to be located in the height region between 40 km and 60 km. Small changes in the stratopause occur due to atmospheric waves and chemical constituents (mainly ozone). These propagating atmospheric waves may cause different stratopause structure and make difficulty to locate the stratopause height. Here, the present study is focused on interesting features of the middle atmosphere temperature profiles, occurrence of double stratopause structure in the height region from 40 km to 60 km. Using 11 years of Rayleigh lidar measurements from a southern sub-tropical station, Reunion (21 S, 55 E), the characteristics of double (separated) stratopause occurrence are investigated and presented here. Statistical characteristics are obtained for the heights of Normal Stratopause (NS), Lower level of Double Stratopause (LDS) and Upper level of Double Stratopause (UDS). The following emerging points are noted:

- Double stratopause structures are found to occur for nearly 45 % of cases. The monthly percentage of occurrence shows maximum number of occurrence during March and September.
- The NS fall on LDS for 27 % cases with maximum number of cases for August (35 %) and minimum during April (19.8 %). Similarly, the percentage of occurrence of NS appear on UDS for 16 % with maximum during September (26 %) and minimum during January (8 %).
- The monthly mean NS shows the height distribution between 47 km and 49

km with the highest NS occurring during April and July and the lowest NS occurring during February and October.

- The heights of occurrence of LDS and UDS are found in the height range from 46.0 km to 47.5 km and from 48.5 km to 50.0 km, respectively.
- The distance of separation between LDS and UDS is found in between 2 km and 4 km with maximum during March and minimum during January. The mean separation between NS and LDS is in the range from 0.3 km to 2 km with minimum during February and maximum during March. The separation between NS and UDS is distributed between 0.9 km and 2.4 km with maximum during February and minimum during April. In general, LDS is found to be located closer to NS than between UDS and NS.
- The height at which minimum temperature recorded is distributed between 47.6 km and 49.0 km with minimum and maximum values during September and July.

Further, the result will be analyzed and presented to discuss the causative mechanisms in terms of wave activity.